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Coastal Inlets Research Program

Physical Model Study of Wave Diffraction-Refraction at an Idealized Inlet

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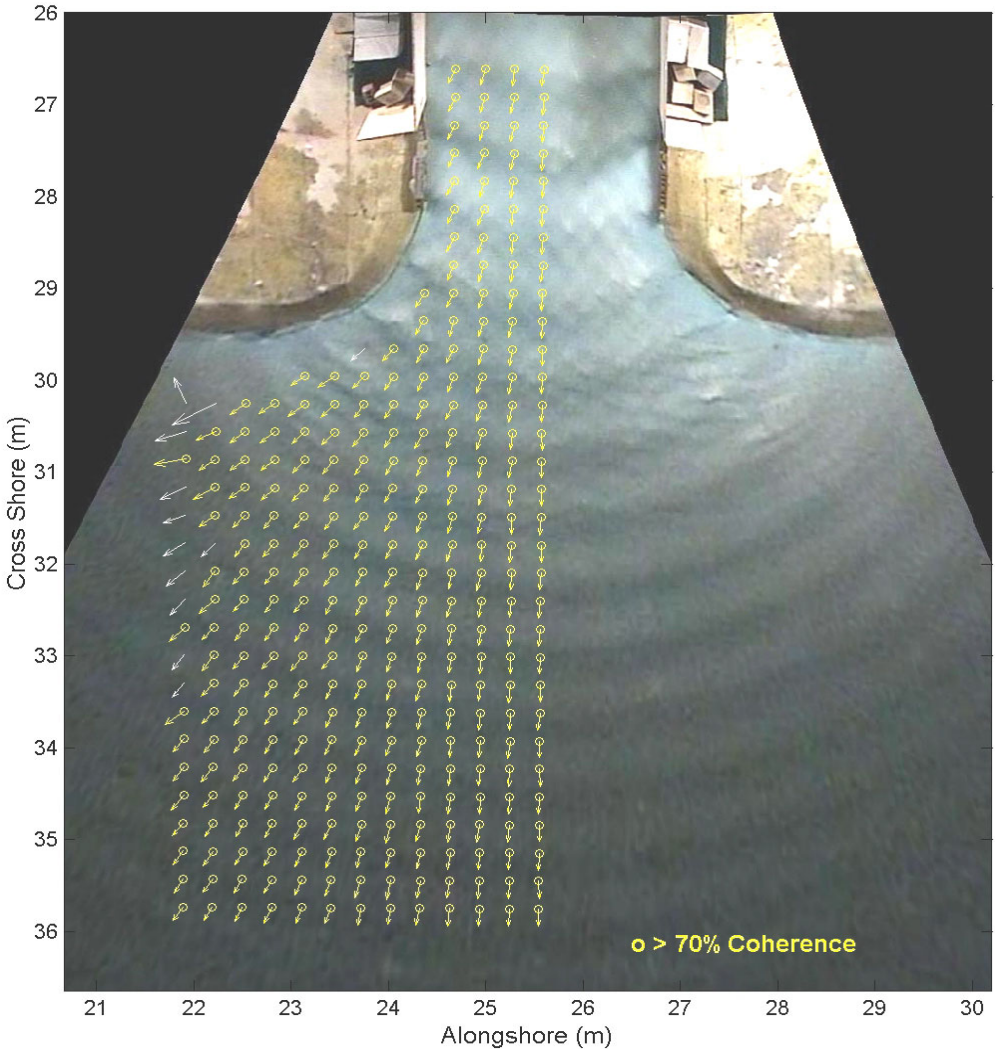

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14. ABSTRACT

Waves at tidal inlets refract, diffract, and shoal as they travel from deeper water, over the ebb shoal, and into the navigation channel toward the bay. How waves transform as they change direction and height is of interest to navigation because the knowledge will assist in understanding sediment transport in the inlet, especially near the navigation channel, and anticipating wave-related processes inside the inlet, such as shoreline erosion and accretion. In particular, waves diffract where they encounter a jetty, breakwater, or other discontinuity. Diffraction at a jetty can cast a wave shadow either inside the inlet or on the adjacent beach, depending on the incident wave direction. Controlled measurements of wave diffraction on a sloping beach are lacking, yet this combined transformation process is ubiquitous at all coastal inlets.

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Contents

Preface xv

1—Introduction 1

Background 1
Refraction and Diffraction Processes 3
Objectives 4
Scope 4

2—Laboratory Facility, Equipment, and Experiment Design 5

Idealized Inlet Facility 5
Instrumentation and Calibration 9
Experiment Design 9

3—Measurement Procedures and Data Analysis 18

Data Sampling and Wave Generation 18
Data Analysis 19

4—Physical Model Results 23

Structure 1 23
Structure 2 25
Structure 3 27
Structure 4 29

5—Video-Based Wave Direction Measurement 31

Background 31
Equipment Installation and Experiment Preparation 33
Data Acquisition and Analysis Procedures 36
Sampling design 36
Image processing 38
Time series analysis 46
Validation 50
Results 52

6—Summary and Conclusions 57

Summary 57
Conclusions 57

References 59

Appendix A: Notation A1
Appendix B: Data Tables for Structure 1 ..... B1
Appendix C: Wave Diffraction-Refraction Plots for Structure 1 ..... C1
Appendix D: Data Tables for Structure 2 ..... D1
Appendix E: Wave Diffraction-Refraction Plots for Structure 2 ..... E1
Appendix F: Data Tables for Structure 3 ..... F1
Appendix G: Wave Diffraction-Refraction Plots for Structure 3 ..... G1
Appendix H: Data Tables for Structure 4 ..... H1
Appendix I: Wave Diffraction-Refraction Plots for Structure 4 ..... I1
Appendix J: Energy Density versus Frequency Plots J1
Appendix K: Basin Bathymetry K1
Appendix L: Location of Structure 1 Wave Gauges L1
Appendix M: Location of Structure 2 Wave Gauges M1
Appendix N: Location of Structure 3 Wave Gauges N1
Appendix O: Location of Structure 4 Wave Gauges O1
Appendix P: ADV and CIIS Measurement Comparison: Structure 1 ..... P1
Appendix Q: CIIS Measurement Results Q1

List of Figures

Figure 1. Wave diffraction and refraction into Shinnecock, Bay, Long Island, New York 2
Figure 2. Idealized inlet model research facility 6
Figure 3. Model facility showing bathymetry 7
Figure 4. Idealized inlet entrance channel with oblique wave approaching inlet 8
Figure 5. Structure 1: Experiment arrangement 11
Figure 6. Structure 1: 0.8-sec irregular wave 12
Figure 7. Example of sensor placement for Structure 2 experiment 12
Figure 8. Structure 2: Experiment arrangement 13
Figure 9. Structure 3: Experiment arrangement 14
Figure 10. Structure 4: Experiment arrangement 15

Figure 11. Structure 3: Experiment arrangement, looking into bay behind the inlet 16
Figure 12. Structure 4: Experiment arrangement showing parallel jetties 16
Figure 13. Comparison of targeted and measured spectra for wave generation 19
Figure 14. Time series of water-surface elevation η at wave generator 20
Figure 15. Contoured plot of wave height transformation for Structure 1, Experiment 1 24
Figure 16. Contoured plot of wave height transformation for Structure 2, Experiment 1 26
Figure 17. Contoured plot of wave height transformation for Structure 3, Experiment 1 28
Figure 18. Contoured plot of wave height transformation for Structure 4, Experiment 1 30
Figure 19. Geometric relationship between the camera, the object of interest observed on the image plane and in real-world coordinates, angles of camera rotation, and the camera focal length 32
Figure 20. Example pixel resolution for 8mm focal length 34
Figure 21. Example pixel resolution for 6mm focal length 34
Figure 22. Structures 3 and 4 C1 camera view 35
Figure 23. Structure 1, Experiment 1, Camera 4 video snapshot demonstrating undesired high-intensity signals and gradients 36
Figure 24. Structure 1, Experiment 4, Camera 4 video snapshot demonstrating the use of white pigment to eliminate refraction of light through the water column 37
Figure 25. 0.8- by 0.8-m-aperture cross-shaped pixel sampling array orientation and pixel sensor spacing 38
Figure 26. Structure 1, Camera 4, image space sampling element locations 39
Figure 27. Structure 1, Camera 6, image space sampling element locations 40
Figure 28. Structure 2, Camera 3, image space sampling element locations 41
Figure 29. Structure 2, Camera 4, image space sampling element locations 42
Figure 30. Structure 2, Camera 5, image space sampling element locations 43
Figure 31. Structure 2, Camera 6, image space sampling element locations 44
Figure 32. Structures 3 and 4, Camera 1, image space sampling element locations 45
Figure 33. Example 10-sec-duration timestack recorded in the diffraction region during the Structure 4 monochromatic wave experiment 47
Figure 34. Example 10-sec time series records measured by collocated capacitive wave rod and pixel sampling element in the diffraction region during the Structure 4 monochromatic wave experiment 47

Figure 35. Example 10-sec normalized timestacks obtained from the alongshore elements of a cross-shaped array during a spectral wave experiment 49
Figure 36. Representative collocated video-ADV spectra 50
Figure 37. CIIS and ADV intercomparison for wave direction measurements obtained near the spectral peak for Structures 1 through 4 53
Figure 38. Peak vector-mean wave direction CIIS analysis for Structure 1, Experiment 4, Camera 4 54
Figure 39. Peak vector-mean wave direction CIIS analysis for Structure 2, Experiment 1, Camera 6 56
Figure B1. Structure 1 gauge arrangement enlargement B2
Figure D1. Structure 2 gauge arrangement enlargement D2
Figure F1. Structure 3 gauge arrangement enlargement F2
Figure H1. Structure 4 gauge arrangement enlargement H2
Figure K1. Model layout and origin of axes K1
Figure P1. Structure 1, Camera 4 and ADV measurement locations P2
Figure P2. Structure 1, Camera 6 and ADV measurement locations P3

List of Tables

Table 1. Model-Prototype Scale Relations at 1:50 Undistorted Scale 8
Table 2. CIRP Diffraction Experiments 17
Table 3. Calculated Wave Parameters from Down-crossing Analysis 21
Table 4. Calculated Wave Parameters from Signal Channel Frequency Domain Analysis 22
Table 5. Number of Pixel Sampling Elements and CIIS Arrays 46
Table 6. Structure 1: ADV versus CIIS Validation Statistics for Mean Wave Directions Measured Near the Spectral Peak 52
Table B1. Structure 1: Gauge Arrangement 1, Irregular Wave, Wave Period 0.8 sec B3
Table B2. Structure 1: Gauge Arrangement 2, Irregular Wave, Wave Period 0.8 sec B4
Table B3. Structure 1: Gauge Arrangement 3, Irregular Wave, Wave Period 0.8 sec B5
Table B4. Structure 1: Gauge Arrangement 4, Irregular Wave, Wave Period 0.8 sec B6

Table B5. Structure 1: Gauge Arrangement 5, Irregular Wave, Wave Period 0.8 sec B7

Table B6. Structure 1: Gauge Arrangement 1, Irregular Wave, Wave Period 1.6 sec B8

Table B7. Structure 1: Gauge Arrangement 2, Irregular Wave, Wave Period 1.6 sec B9

Table B8. Structure 1: Gauge Arrangement 3, Irregular Wave, Wave Period 1.6 sec B10

Table B9. Structure 1: Gauge Arrangement 4, Irregular Wave, Wave Period 1.6 sec B11

Table B10. Structure 1: Gauge Arrangement 5, Irregular Wave, Wave Period 1.6 sec B12

Table B11. Structure 1: Gauge Arrangement 1, Monochromatic Wave, Wave Period 0.8 sec B13

Table B12. Structure 1: Gauge Arrangement 2, Monochromatic Wave, Wave Period 0.8 sec B14

Table B13. Structure 1: Gauge Arrangement 3, Monochromatic Wave, Wave Period 0.8 sec B15

Table B14. Structure 1: Gauge Arrangement 4, Monochromatic Wave, Wave Period 0.8 sec B16

Table B15. Structure 1: Gauge Arrangement 5, Monochromatic Wave, Wave Period 0.8 sec B17

Table B16. Structure 1: Gauge Arrangement 1, Wave Generator at 20-deg Angle, Wave Period 0.8 sec B18

Table B17. Structure 1: Gauge Arrangement 2, Wave Generator at 20-deg Angle, Wave Period 0.8 sec B19

Table B18. Structure 1: Gauge Arrangement 3, Wave Generator at 20-deg Angle, Wave Period 0.8 sec B20

Table B19. Structure 1: Gauge Arrangement 4, Wave Generator at 20-deg Angle, Wave Period 0.8 sec B21

Table B20. Structure 1: Gauge Arrangement 5, Wave Generator at 20-deg Angle, Wave Period 0.8 sec B22

Table B21. Structure 1: Gauge Arrangement 1, Wave Generator at 20-deg Angle, Wave Period 1.6 sec B23

Table B22. Structure 1: Gauge Arrangement 2, Wave Generator at 20-deg Angle, Wave Period 1.6 sec B24

Table B23. Structure 1: Gauge Arrangement 3, Wave Generator at 20-deg Angle, Wave Period 1.6 sec B25

Table B24. Structure 1: Gauge Arrangement 4, Wave Generator at 20-deg Angle, Wave Period 1.6 sec B26

Table B25. Structure 1: Gauge Arrangement 5, Wave Generator at 20-deg Angle, Wave Period 1.6 sec B27

Table B26. Structure 1: Gauge Arrangement 1, Wave Generator at 20-deg Angle, Monochromatic Wave Period 0.8 sec B28

Table B27. Structure 1: Gauge Arrangement 2, Wave Generator at 20-deg Angle, Monochromatic Wave Period 0.8 sec B29

Table B28. Structure 1: Gauge Arrangement 3, Wave Generator at 20-deg Angle, Monochromatic Wave Period 0.8 sec B30

Table B29. Structure 1: Gauge Arrangement 4, Wave Generator at 20-deg Angle, Monochromatic Wave Period 0.8 sec B31

Table B30. Structure 1: Gauge Arrangement 5, Wave Generator at 20-deg Angle, Monochromatic Wave Period 0.8 sec B32

Table C1. Summary ADV Probe Vector Plot Data, Structure 1 ..... C8

Table D1. Structure 2: Gauge Arrangement 1, Irregular Wave, Wave Period 0.8 sec D3

Table D2. Structure 2: Gauge Arrangement 2, Irregular Wave, Wave Period 0.8 sec D4

Table D3. Structure 2: Gauge Arrangement 3, Irregular Wave, Wave Period 0.8 sec D5

Table D4. Structure 2: Gauge Arrangement 4, Irregular Wave, Wave Period 0.8 sec D6

Table D5. Structure 2: Gauge Arrangement 5, Irregular Wave, Wave Period 0.8 sec D7

Table D6. Structure 2: Gauge Arrangement 1, Irregular Wave, Wave Period 1.6 sec D8

Table D7. Structure 2: Gauge Arrangement 2, Irregular Wave, Wave Period 1.6 sec D9

Table D8. Structure 2: Gauge Arrangement 3, Irregular Wave, Wave Period 1.6 sec D10

Table D9. Structure 2: Gauge Arrangement 4, Irregular Wave, Wave Period 1.6 sec D11

Table D10. Structure 2: Gauge Arrangement 5, Irregular Wave, Wave Period 1.6 sec D12

Table D11. Structure 2: Gauge Arrangement 1, Monochromatic Wave, Wave Period 0.8 sec D13

Table D12. Structure 2: Gauge Arrangement 2, Monochromatic Wave, Wave Period 0.8 sec D14

Table D13. Structure 2: Gauge Arrangement 3, Monochromatic Wave, Wave Period 0.8 sec D15

Table D14. Structure 2: Gauge Arrangement 4, Monochromatic Wave, Wave Period 0.8 sec D16

Table D15. Structure 2: Gauge Arrangement 5, Monochromatic Wave, Wave Period 0.8 sec D17

Table D16. Structure 2: Gauge Arrangement 1, Wave Generator at 20-deg Angle, Wave Period 0.8 sec D18

Table D17. Structure 2: Gauge Arrangement 2, Wave Generator at 20-deg Angle, Wave Period 0.8 sec D19

Table D18. Structure 2: Gauge Arrangement 3, Wave Generator at 20-deg Angle, Wave Period 0.8 sec D20

Table D19. Structure 2: Gauge Arrangement 4, Wave Generator at 20-deg Angle, Wave Period 0.8 sec D21

Table D20. Structure 2: Gauge Arrangement 5, Wave Generator at 20-deg Angle, Wave Period 0.8 sec D22

Table D21. Structure 2: Gauge Arrangement 1, Wave Generator at 20-deg Angle, Wave Period 1.6 sec D23

Table D22. Structure 2: Gauge Arrangement 2, Wave Generator at 20-deg Angle, Wave Period 1.6 sec D24

Table D23. Structure 2: Gauge Arrangement 3, Wave Generator at 20-deg Angle, Wave Period 1.6 sec D25

Table D24. Structure 2: Gauge Arrangement 4, Wave Generator at 20-deg Angle, Wave Period 1.6 sec D26

Table D25. Structure 2: Gauge Arrangement 5, Wave Generator at 20-deg Angle, Wave Period 1.6 sec D27

Table D26. Structure 2: Gauge Arrangement 1, Wave Generator at 20-deg Angle, Monochromatic Wave Period 0.8 sec D28

Table D27. Structure 2: Gauge Arrangement 2, Wave Generator at 20-deg Angle, Monochromatic Wave Period 0.8 sec D29

Table D28. Structure 2: Gauge Arrangement 3, Wave Generator at 20-deg Angle, Monochromatic Wave Period 0.8 sec D30

Table D29. Structure 2: Gauge Arrangement 4, Wave Generator at 20-deg Angle, Monochromatic Wave Period 0.8 sec D31

Table D30. Structure 2: Gauge Arrangement 5, Wave Generator at 20-deg Angle, Monochromatic Wave Period 0.8 sec D32

Table E1. Summary ADV Probe Vector Plot Data, Structure 2 ..... E8

Table F1. Structure 3: Gauge Arrangement 1, Irregular Wave, Wave Period 0.8 sec F3

Table F2. Structure 3: Gauge Arrangement 2, Irregular Wave, Wave Period 0.8 sec F4

Table F3. Structure 3: Gauge Arrangement 3, Irregular Wave, Wave Period 0.8 sec F5

Table F4. Structure 3: Gauge Arrangement 4, Irregular Wave, Wave Period 0.8 sec F6

Table F5. Structure 3: Gauge Arrangement 1, Irregular Wave, Wave Period 1.6 sec F7

Table F6. Structure 3: Gauge Arrangement 2, Irregular Wave, Wave Period 1.6 sec F8

Table F7. Structure 3: Gauge Arrangement 3, Irregular Wave, Wave Period 1.6 sec F9

Table F8. Structure 3: Gauge Arrangement 4, Irregular Wave, Wave Period 1.6 sec F10

Table F9. Structure 3: Gauge Arrangement 1, Monochromatic Wave, Wave Period 0.8 sec F11

Table F10. Structure 3: Gauge Arrangement 2, Monochromatic Wave, Wave Period 0.8 sec F12

Table F11. Structure 3: Gauge Arrangement 3, Monochromatic Wave, Wave Period 0.8 sec F13

Table F12. Structure 3: Gauge Arrangement 4, Monochromatic Wave, Wave Period 0.8 sec F14

Table F13. Structure 3: Gauge Arrangement 1, Irregular Wave with Current, Wave Period 0.8 sec F15

Table F14. Structure 3: Gauge Arrangement 2, Irregular Wave with Current, Wave Period 0.8 sec F16

Table F15. Structure 3: Gauge Arrangement 3, Irregular Wave with Current, Wave Period 0.8 sec F17

Table F16. Structure 3: Gauge Arrangement 4, Irregular Wave with Current, Wave Period 0.8 sec F18

Table F17. Structure 3: Gauge Arrangement 1, Irregular Wave with Current, Wave Period 1.6 sec F19

Table F18. Structure 3: Gauge Arrangement 2, Irregular Wave with Current, Wave Period 1.6 sec F20

Table F19. Structure 3: Gauge Arrangement 3, Irregular Wave with Current, Wave Period 1.6 sec F21

Table F20. Structure 3: Gauge Arrangement 4, Irregular Wave with Current, Wave Period 1.6 sec F22

Table F21. Structure 3: Gauge Arrangement 1, Monochromatic Wave with Current, Wave Period 0.8 sec F23

Table F22. Structure 3: Gauge Arrangement 2, Monochromatic Wave with Current, Wave Period 0.8 sec F24

Table F23. Structure 3: Gauge Arrangement 3, Monochromatic Wave with Current, Wave Period 0.8 sec F25

Table F24. Structure 3: Gauge Arrangement 4, Monochromatic Wave with Current, Wave Period 0.8 sec F26

Table G1. Structure 3 ADV Probe Vector Plots Data G8

Table H1. Structure 4: Gauge Arrangement 1, Irregular Wave, Wave Period 0.8 sec H3
Table H2. Structure 4: Gauge Arrangement 2, Irregular Wave, Wave Period 0.8 sec H4
Table H3. Structure 4: Gauge Arrangement 3, Irregular Wave, Wave Period 0.8 sec H5
Table H4. Structure 4: Gauge Arrangement 4, Irregular Wave, Wave Period 0.8 sec H6
Table H5. Structure 4: Gauge Arrangement 1, Irregular Wave, Wave Period 1.6 sec H7
Table H6. Structure 4: Gauge Arrangement 2, Irregular Wave, Wave Period 1.6 sec H8
Table H7. Structure 4: Gauge Arrangement 3, Irregular Wave, Wave Period 1.6 sec H9
Table H8. Structure 4: Gauge Arrangement 4, Irregular Wave, Wave Period 1.6 sec H10
Table H9. Structure 4: Gauge Arrangement 1, Monochromatic Wave, Wave Period 0.8 sec H11
Table H10. Structure 4: Gauge Arrangement 2, Monochromatic Wave, Wave Period 0.8 sec H12
Table H11. Structure 4: Gauge Arrangement 3, Monochromatic Wave, Wave Period 0.8 sec H13
Table H12. Structure 4: Gauge Arrangement 4, Monochromatic Wave, Wave Period 0.8 sec H14
Table H13. Structure 4: Gauge Arrangement 1, Irregular Wave with Current, Wave Period 1.6 sec H15
Table H14. Structure 4: Gauge Arrangement 2, Irregular Wave with Current, Wave Period 1.6 sec H16
Table H15. Structure 4: Gauge Arrangement 3, Irregular Wave with Current, Wave Period 1.6 sec H17
Table H16. Structure 4: Gauge Arrangement 4, Irregular Wave with Current, Wave Period 1.6 sec H18
Table I1. Structure 4 ADV Probe Vector Plot Data I6
Table L1. Structure 1: Gauge Arrangement 1 ..... L2
Table L2. Structure 1: Gauge Arrangement 2 ..... L2
Table L3. Structure 1: Gauge Arrangement 3 ..... L2
Table L4. Structure 1: Gauge Arrangement 4 ..... L3
Table L5. Structure 1: Gauge Arrangement 5 ..... L3
Table L6. Structure 1 Shore Parallel Breakwater Coordinates L3
Table M1. Structure 2: Gauge Arrangement 1 ..... M2

Table M2. Structure 2: Gauge Arrangement 2 ..... M2
Table M3. Structure 2: Gauge Arrangement 3 ..... M2
Table M4. Structure 2: Gauge Arrangement 4 ..... M3
Table M5. Structure 2: Gauge Arrangement 5 ..... M3
Table M6. Structure 2: Dogleg Jetty Coordinates M4
Table N1. Structure 3: Gauge Arrangement 1 ..... N2
Table N2. Structure 3: Gauge Arrangement 2 ..... N2
Table N3. Structure 3: Gauge Arrangement 3 ..... N3
Table N4. Structure 4: Gauge Arrangement 4 ..... N3
Table O1. Structure 4: Gauge Arrangement 1 ..... O2
Table O2. Structure 4: Gauge Arrangement 2 ..... O2
Table O3. Structure 4: Gauge Arrangement 3 ..... O3
Table O4. Structure 4: Gauge Arrangement 4 ..... O3
Table O5. Structure 4: Parallel Jetty Coordinates O4
Table P1. Nomenclature P1
Table P2. S1X4G1 ADV Spectral Energy Density (m^2/Hz) and Vector-Mean Wave Direction (deg) P29
Table P3. S1X4G2 ADV Spectral Energy Density (m^2/Hz) and Vector-Mean Wave Direction (deg) P31
Table P4. S1X4G3 ADV Spectral Energy Density (m^2/Hz) and Vector-Mean Wave Direction (deg) P33
Table P5. S1X4G4 ADV Spectral Energy Density (m^2/Hz) and Vector-Mean Wave Direction (deg) P35
Table P6. S1X4G5 ADV Spectral Energy Density (m^2/Hz) and Vector-Mean Wave Direction (deg) P37
Table P7. S1X5G1 ADV Spectral Energy Density (m^2/Hz) and Vector-Mean Wave Direction (deg) P39
Table P8. S1X5G2 ADV Spectral Energy Density (m^2/Hz) and Vector-Mean Wave Direction (deg) P41
Table P9. S1X5G3 ADV Spectral Energy Density (m^2/Hz) and Vector-Mean Wave Direction (deg) P43
Table P10. S1X5G4 ADV Spectral Energy Density (m^2/Hz) and Vector-Mean Wave Direction (deg) P45
Table P11. S1X5G5 ADV Spectral Energy Density (m^2/Hz) and Vector-Mean Wave Direction (deg) P47
Table P12. S1X6G1 ADV Spectral Energy Density (m^2/Hz) and Vector-Mean Wave Direction (deg) P49

Table P13. S1X6G2 ADV Spectral Energy Density (m^2/Hz) and Vector-Mean Wave Direction (deg) P51

Table P14. S1X6G3 ADV Spectral Energy Density (m^2/Hz) and Vector-Mean Wave Direction (deg) P53

Table P15. S1X6G4 ADV Spectral Energy Density (m^2/Hz) and Vector-Mean Wave Direction (deg) P55

Table P16. S1X6G5 ADV Spectral Energy Density (m^2/Hz) and Vector-Mean Wave Direction (deg) P57

Table P17. S1X4G1 CIIS Spectral Pixel Intensity Energy Density (I^2/Hz) and Vector-Mean Wave Direction (deg) P59

Table P18. S1X4G2 CIIS Spectral Pixel Intensity Energy Density (I^2/Hz) and Vector-Mean Wave Direction (deg) P61

Table P19. S1X4G3 CIIS Spectral Pixel Intensity Energy Density (I^2/Hz) and Vector-Mean Wave Direction (deg) P63

Table P20. S1X4G4 CIIS Spectral Pixel Intensity Energy Density (I^2/Hz) and Vector-Mean Wave Direction (deg) P65

Table P21. S1X4G5 CIIS Spectral Pixel Intensity Energy Density (I^2/Hz) and Vector-Mean Wave Direction (deg) P67

Table P22. S1X5G1 CIIS Spectral Pixel Intensity Energy Density (I^2/Hz) and Vector-Mean Wave Direction (deg) P69

Table P23. S1X5G2 CIIS Spectral Pixel Intensity Energy Density (I^2/Hz) and Vector-Mean Wave Direction (deg) P71

Table P24. S1X5G3 CIIS Spectral Pixel Intensity Energy Density (I^2/Hz) and Vector-Mean Wave Direction (deg) P73

Table P25. S1X5G4 CIIS Spectral Pixel Intensity Energy Density (I^2/Hz) and Vector-Mean Wave Direction (deg) P75

Table P26. S1X5G5 CIIS Spectral Pixel Intensity Energy Density (I^2/Hz) and Vector-Mean Wave Direction (deg) P77

Table P27. S1X6G1 CIIS Spectral Pixel Intensity Energy Density (I^2/Hz) and Vector-Mean Wave Direction (deg) P79

Table P28. S1X6G2 CIIS Spectral Pixel Intensity Energy Density (I^2/Hz) and Vector-Mean Wave Direction (deg) P81

Table P29. S1X6G3 CIIS Spectral Pixel Intensity Energy Density (I^2/Hz) and Vector-Mean Wave Direction (deg) P83

Table P30. S1X6G4 CIIS Spectral Pixel Intensity Energy Density (I^2/Hz) and Vector-Mean Wave Direction (deg) P85

Table P31. S1X6G5 CIIS Spectral Pixel Intensity Energy Density (I^2/Hz) and Vector-Mean Wave Direction (deg) P87

Table Q1. Structure 1, Camera 4 CIIS Array Analysis Output Locations Q4

Table Q2. Structure 1, Camera 6 CIIS Array Analysis Output Locations Q5

Table Q3. Structure 2, Camera 3 CIIS Array Analysis Output Locations Q16

Table Q4. Structure 2, Camera 4 CIIS Array Analysis Output Locations Q17
Table Q5. Structure 2, Camera 5 CIIS Array Analysis Output Locations Q18
Table Q6. Structure 2, Camera 6 CIIS Array Analysis Output Locations Q20
Table Q7. Structures 3 and 4, Camera 1 CIIS Array Analysis Output Locations Q48

Preface

The research investigation described herein was conducted as part of the Coastal Inlets Research Program (CIRP) under Work Unit 32935, "Inlet Laboratory Investigations." Overall program management for CIRP is directed by Headquarters, U.S. Army Corps of Engineers (HQUSACE). Program Monitors for the CIRP at HQUSACE are Messrs. Barry W. Holliday and Charles B. Chesnutt. The Program Manager was Mr. Clark McNair followed by Dr. Nicholas C. Kraus, U.S. Army Engineer Research and Development Center (ERDC), Coastal and Hydraulics Laboratory (CHL), Vicksburg, MS. Mr. William C. Seabergh is Principal Investigator of the Inlet Laboratory Investigations Work Unit.

The mission of the CIRP is to conduct applied research to improve USACE capability to manage federally maintained inlets, which exist on all coasts of the United States (including Atlantic, Gulf, Pacific, and the Great Lakes regions). Objectives are to (a) make management of channels--design, maintenance, and operation--more effective to reduce the cost of dredging, and (b) preserve the adjacent beaches in a systems approach that treats the inlet and beach together. To achieve these objectives, CIRP includes work units on short-wave and circulation modeling, channels and adjacent shorelines, inlet scour, laboratory investigations, field investigations, and technology transfer.

This study was conducted by CHL personnel under the general direction of Dr. James R. Houston, former Director of CHL, and Mr. Thomas W. Richardson, current Director. The experiment series was conceived and initially designed by Dr. Kraus. Direct guidance was provided by Mr. Dennis Markle, Chief, Harbors and Entrances Branch, CHL. Experiments were conducted by Mr. John Evans, Civil Engineering Technician, and Ms. Leonette J. Thomas, Mathematician, under the direction of Mr. Seabergh, all of the Harbors and Entrances Branch. Mr. John Mahoney of the ERDC Information Technology Laboratory provided instrumentation support. This report was prepared by Mr. Seabergh, Mr. William R. Curtis, Coastal Evaluation and Design Branch, CHL, Ms. Thomas, and Mr. Kent K. Hathaway, Field Research Facility, Coastal Engineering Branch, CHL. Word Processing and formatting were completed by Ms. J. Holley Messing, Coastal Engineering Branch. Dr. Zeki Demirbilek, Harbors and Entrances Branch; Dr. Lihwa Lin, Coastal Engineering Branch; and Mr. Gene Berek of Metocean, Coastal and Offshore Technologies, provided suggestions from a user's point of view. Technical consultation for Coastal Inlets Imaging System (CIIS) development was provided by Dr. Robert Holman and Mr. John Stanley, Oregon State University, Corvallis, and Dr. K. Todd Holland, U.S. Naval Research Laboratory. Dr. Holland also provided

computational code development consultation for the estimation of video-derived wave number moments and the extension to estimates of wave direction.

At the time of publication of this report, Dr. James R. Houston was Director of ERDC and COL John W. Morris, III, EN, was Commander and Executive Director.

1 Introduction

Waves at tidal inlets refract, diffract, and shoal as they travel from deeper water, over the ebb shoal, and into the navigation channel toward the bay. How waves transform as they change direction and height is of interest to navigation because the knowledge will assist in understanding sediment transport in the inlet, especially near the navigation channel, and anticipating wave-related processes inside the inlet, such as shoreline erosion and accretion. In particular, waves diffract where they encounter a jetty, breakwater, or other discontinuity. Diffraction at a jetty can cast a wave shadow either inside the inlet or on the adjacent beach, depending on the incident wave direction. Controlled measurements of wave diffraction on a sloping beach are lacking, yet this combined transformation process is ubiquitous at all coastal inlets.

Background

The purpose of these laboratory experiments was to measure wave height and direction in typical coastal inlet conditions with emphasis on wave diffraction and refraction. At many locations, coastal structures are built to reduce wave height and minimize sedimentation of the navigation channel. In this study, a shore-parallel breakwater and a dogleg jetty were examined in the seaward side of the inlet. Measurements were also made on the bay side of the inlet for a jettied and nonjettied condition.

Figure 1 illustrates diffraction and refraction on the bay side of Shinnecock Inlet, Long Island, New York. Coastal inlet entrance channels are typically incised in relatively shallow depths and are thus susceptible to movement of sediment into the channel by coastal currents of tidal and wind wave-generated origin. The entrance channel may be flanked by jetties and/or breakwaters to reduce sediment influx to the channel and to provide protection for navigation. In order to understand the mechanisms of sediment movement into the channel, the simulation of the wind-wave field is a central component of any modeling study of techniques to minimize channel shoaling. Historically, for coastal problems at sites with complex bathymetry and protective structures such as jetties, breakwaters, and groins, studies were conducted in physical models.

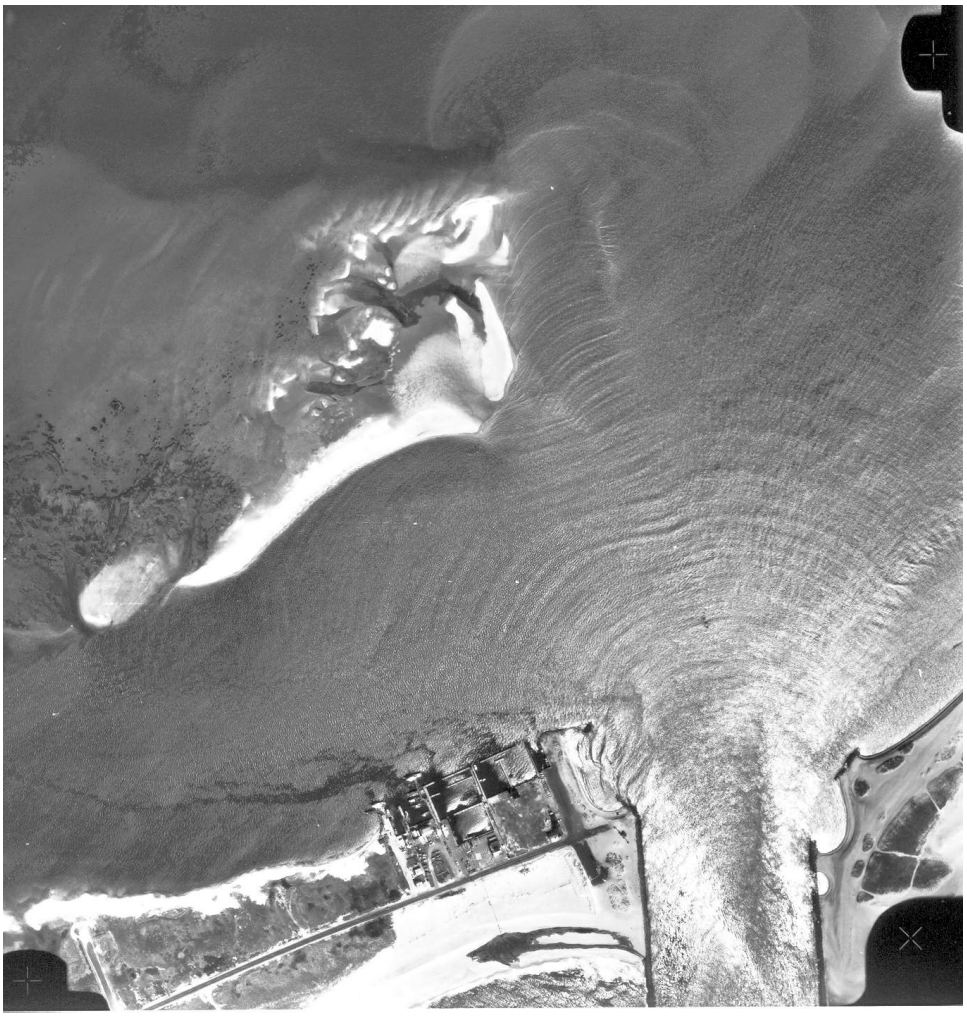


Figure 1. Wave diffraction and refraction into Shinnecock Bay, Long Island, New York

With the advancement of numerical techniques to simulate wind-waves, laboratory data sets have proven beneficial for checking the reliability of the numerical code. As part of the Coastal Inlets Research Program (CIRP),[1] this study was performed to provide data to support numerical model development and to understand wave refraction-diffraction in the vicinity of coastal inlet entrance channels. In particular, wave height and wave direction were measured throughout the inlet region.

Previous laboratory simulations of refraction-diffraction phenomena have been conducted on flat or uniformly sloping bottom contours in the vicinity of a jetty, offshore breakwater, or two semi-infinite offshore breakwaters with a gap. Harms (1979) examined diffraction behind a shore-connected breakwater. Hales (1980) examined wave refraction-diffraction behind a shore-connected breakwater with a uniform beach slope. Briggs, Thompson, and Vincent (1995) studied diffraction behind a semi-infinite breakwater on a flat bottom. Yu et al.

[1] For convenience, symbols and abbreviations are listed in the notation (Appendix A).

(2000) performed experiments of refraction-diffraction on a flat bottom, a sloping bottom, and a third configuration with a flat bottom with a channel incised through two semi-infinite breakwaters. Such studies have measured or examined wave height, but not wave direction. The present study was designed to measure both wave height and direction.

Refraction and Diffraction Processes

Some of the following material is taken from Hales (1980), who presents background material describing the refraction and diffraction of water waves. Except in deep water, the wave phase speed depends on water depth. Because wave celerity decreases as depth decreases, the wavelength must also decrease for the period to remain constant. Phase velocity varies along the crest of a wave propagating at an angle to underwater contours because that part of the wave in deeper water moves faster than that part in shallower water. This variation causes the wave crest to bend toward alignment with the contours. The bending of wave crests in response to changes in bottom topography, called refraction, depends on the relation of water depth to wavelength and is analogous to refraction of other types of waves such as light, where, in the case of water waves, water depth determines the refractive index. A basic assumption in wave refraction theory is the conservation of energy between orthogonals (i.e., no diffraction of energy along wave crests).

Diffraction of water waves is the phenomenon where wave energy propagates into the sheltered lee of structures apart from bathymetric refraction. Here, wave crests bend (even in constant water depth) and gradients of wave height exist along the wave crest. The theory of water wave diffraction can be explained by Huygen's principle. Each point of an advancing wave crest may be considered as the center of a secondary circular wave that advances in all directions. The resultant shape of the crest is the sum of all these secondary waves. In a straight-crested wave, the envelope of the secondary waves is a straight line also. As the wave passes an obstruction, the energy at a certain point is a vector combination of all the circular waves emitted by every point of the passing wave train.

The bathymetry in the vicinity of coastal structures can be irregular, and the phenomenon of refraction can occur in conjunction with diffraction. The historical procedure to determine the wave-height variation behind the coastal structure was to construct refraction diagrams from the sea toward the structure, then construct diffraction diagrams for three or four wavelengths shoreward of the structure and then refract the last wave crest on toward the shoreline (Hales 1980). Mobarek (1962) experimentally investigated refraction-diffraction and found that this "rule of thumb" was reasonable for medium-period waves, but for longer periods, transformation by refraction over a shoaling bottom should be taken into consideration.

Various numerical approaches for numerical work examining diffraction-refraction include those of Liu and Mei (1976), Liu and Lozano (1979), Houston (1980), and Goda (1985).

Objectives

In this report, combined wave diffraction, refraction, and shoaling were examined through physical-model measurements made in an idealized inlet. One goal of the study was to provide the data to develop and validate numerical models of refraction, diffraction, and shoaling at an inlet that will help to better understand the processes. The other goal was to validate a video system developed for measurement of wave direction to develop improved technology for calculating wave transformation at inlets.

Scope

Following this Introduction are the experiment design (including the laboratory facility, the instrumentation, and the experimental series), described in Chapter 2; wave direction measurement technique and experiment procedures discussed in Chapter 3; and data analysis (including sequence of events, calibration, sampling, data analysis methods, data format, and example plots) presented in Chapter 4. Chapter 4 discusses and presents results of data collection for four structural configurations. Note that Chapter 5 presents a new technique for determining wave direction that was developed in this study. Also presented are comparisons of video and velocity meter measurements of wave angle. Chapter 6 summarizes the report and presents conclusions.

2 Laboratory Facility, Equipment, and Experiment Design

As part of the CIRP, a physical model facility was created to address research and field problems of tidal inlets (Seabergh 1999). The model and appurtenances necessary to study inlet problems are discussed in this chapter.

Idealized Inlet Facility

An idealized inlet was designed to fit in a 46-m- (150-ft-) wide by 99-m- (325-ft-) long concrete basin with 0.6-m- (2-ft-) high walls. The approach was to design an inlet with simplified bathymetry and relatively steep beach slopes so additional features (such as an ebb shoal) could easily be added. Plans included using fine sand as both a tracer and as a fully mobile bed that could be placed over the concrete bottom in a thick veneer. A 1:50 undistorted scale was assumed to determine reasonable inlet dimensions to model; however, other scales can easily be assumed to accommodate studies of specific processes with the simplified bathymetry.

Figure 2 shows the facility and basin area. The Idealized Inlet Facility is connected to a large sump (not shown, volume of 1.98×10^6 L (523,000 gal)) for water exchange. Tides may be produced in the ocean of the facility to drive tidal currents into and out of the inlet bay. A constant inflow is introduced from the sump into the ocean of the facility, while a rolling gate either reduces or increases flow area over an exit pipe into the sump, which causes ocean rise or fall, respectively. The rolling gate is regulated by a controller connected to a feedback loop comparing actual to desired water level. The two cylinders in Figure 2 are storage tanks each holding 182,000 L (48,000 gal) water. The tanks can be activated to simulate a much larger bay area by storing flood tide water and releasing it back to the bay to flow to the ocean during ebb flow. Pumps and control valves associated with this procedure are located adjacent to the storage tanks.

A steady-state flow may also be established for simulating ebbing or flooding currents. The piping system appears in Figures 2 and 3. Water is either collected (flood flow) or distributed (ebb flow) through a system of manifolds in the bay

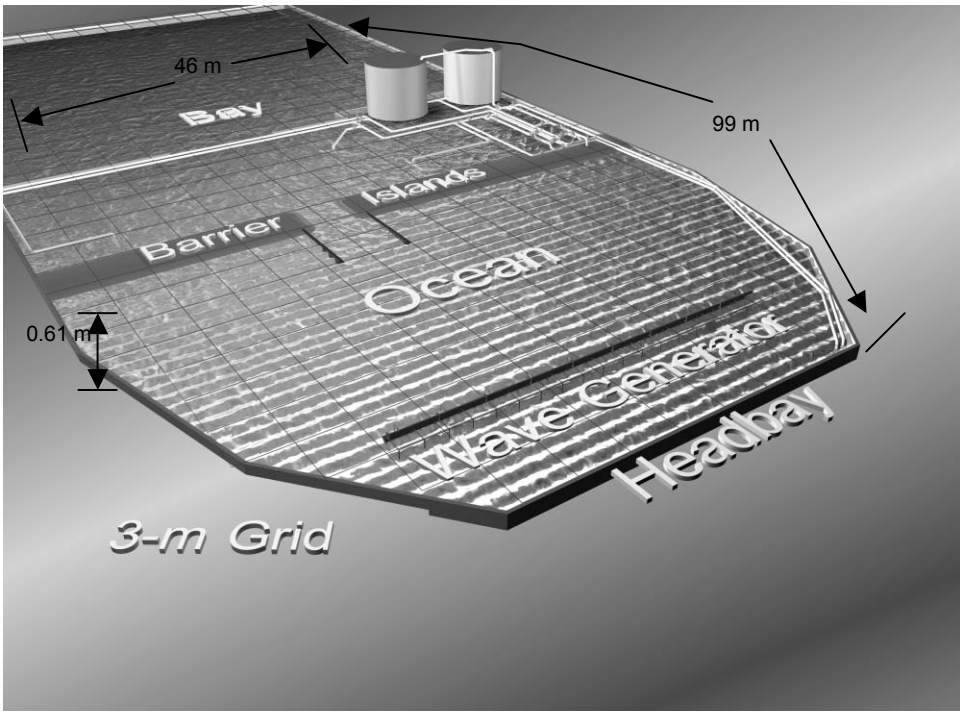


Figure 2. Idealized inlet model research facility

that may be adjusted for one, two, or three bay channels or a uniform flow across the bay. Water is either released (flood flow) or taken from (ebb flow) the ocean headbay to complete the circulation energized by the pumps located in the upper right side of Figure 2.

Figure 3 shows bottom contours at a 1:50 scale. The ocean-side parallel contours were specified by applying an equilibrium profile equation from Dean (1977):

$$d = Ax^{0.67} \tag{1}$$

where

d = still-water depth

x = distance offshore

and A is determined by sediment characteristics. A value of $A = 0.24$ ft$^{1/3}$ was specified to represent a relatively steep beach. The contoured beach slope extends to the 18.3-cm (0.6-ft) mean low water (mlw) depth (or 9.1 m (30 ft) scaled by 1:50).

The inlet throat region converges to a depth of 15.2 cm (or if scaled to 1:50, to a depth of 7.6 m (25 ft)) relative to an mlw datum. The minimum width is 267 cm (8.76 ft) (or if scaled by 1:50, 133.4 m (438 ft)) across the inlet between mlw contours. Figure 4 shows the inlet with a parallel jetty configuration.

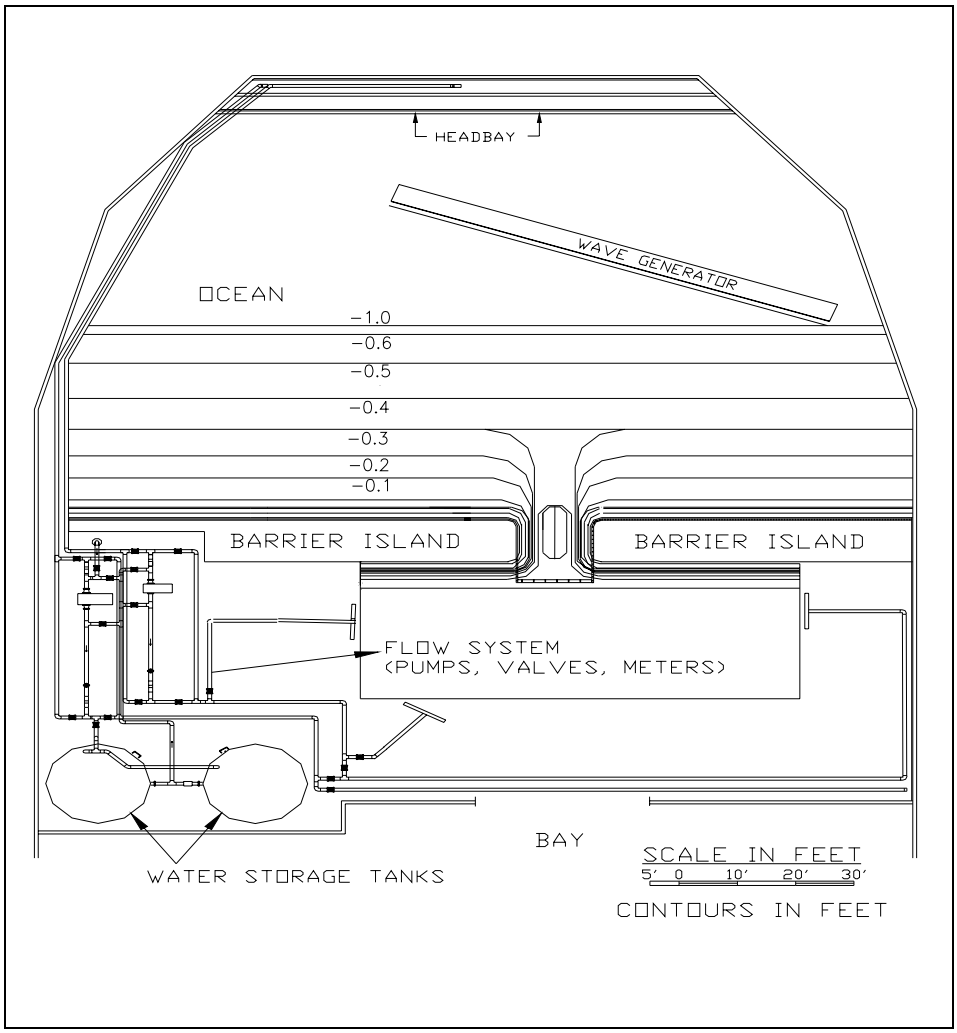


Figure 3. Model facility showing bathymetry (measurements given in feet may be converted to meters by multiplying by 0.3048)

Based on Froude's model law (Hughes 1993) and the linear scale of 1:50, the model-prototype relations in Table 1 were derived. Dimensions are in terms of length ℓ and time t. Figure 4 shows the model inlet during testing. As mentioned previously, other scales may be assumed for the bathymetric contours, so different scaling relationships would apply from these in Table 1.

A movable, 24.4-m- (80-ft-) long, unidirectional wave generator (Figure 2) was located on the ocean side of the facility to produce either irregular or monochromatic waves of fixed direction (long-crested waves). Unscaled wave periods could be varied from 0.5 to about 3 sec and wave heights to 10 cm (0.3 ft) (at the generator location and for this model configuration). Wave angle (incident wave direction) was varied for specific tests by moving the generator on its casters.

Table 1 Model-Prototype Scale Relations at 1:50 Undistorted Scale		
Characteristic	**Dimension**	**Model-Prototype Scale Relation**
Length	ℓ	ℓ_r = 1:50
Area	ℓ^2	$A_r = \ell_r^2$ = 1:2,500
Volume	ℓ^3	$V_r = \ell_r^3$ = 1:125,000
Time (tidal and short wave period)	t	$t_r = \sqrt{\ell_r}$ = 1:7.07
Velocity	ℓ/t	$U_r = \ell_r / t_r$ = 1:7.07

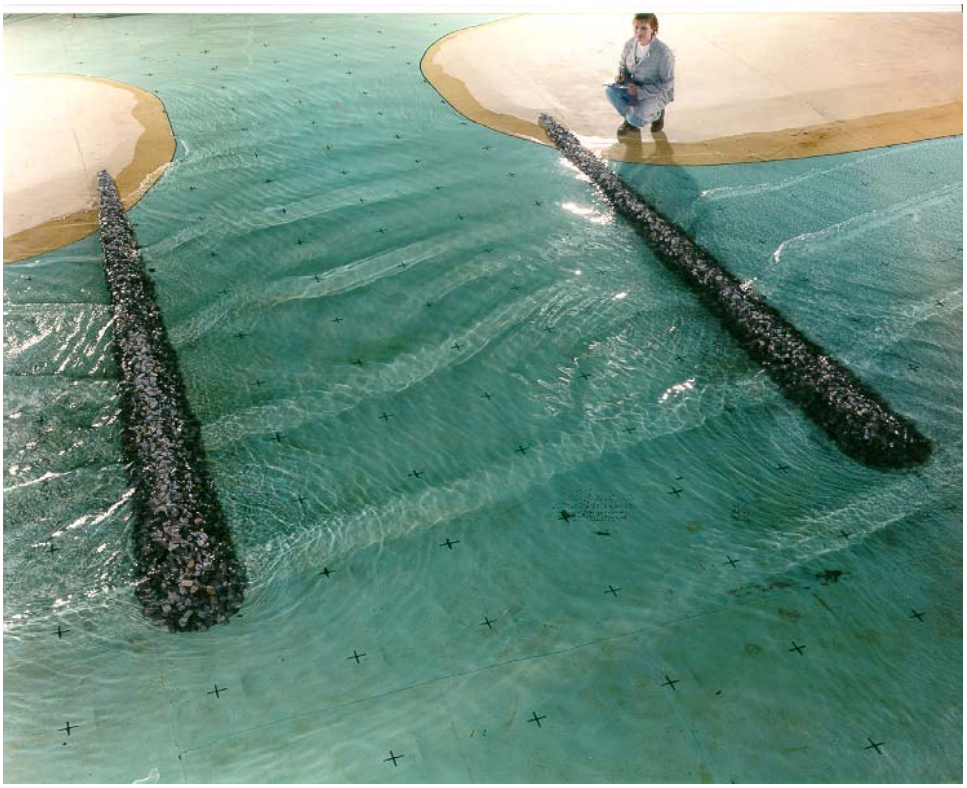


Figure 4. Idealized inlet entrance channel with oblique wave approaching inlet (spacing 62 cm (2.0 ft) between "+" marking on research facility basin floor)

Instrumentation and Calibration

Wave height and period data were collected on electrical capacitance wave gauges, which were calibrated daily with a computer-controlled procedure incorporating a least-square fit of measurements at 11 steps. This averaging technique, using 21 voltage samples per gauge, minimizes the errors of slack in the gear drives and hysteresis in the sensors. Typical calibration errors are less than 1 percent of full scale for the capacitance wave gauges. Wave signal generation and data acquisition were controlled by a DEC MicroVax I computer.

Water velocity data were collected with SonTek 2D Acoustic Doppler Velocimeters (ADV) with a side-looking probe that is oriented to measure x-y horizontal velocity information in a horizontal plane. Samples were collected at 20 Hz, though the instrument makes 250 pings/sec and averages for each output sample. Accuracy is 0.5 percent of the measured velocity, with resolution of 0.1 mm/sec and threshold of 0.1 cm/sec. The probe samples a 0.25-cu-cm volume located 5 cm from the sensor heads. The velocity data were analyzed for wave direction.

The sensor placement locations are discussed in the next section. A gauge rack was designed to hold the wave sensors in a co-linear manner, with a 0.61-m (2.0-ft) separation between gauges. The rack was then moved to other locations for various test runs.

Experiment Design

Four idealized “structural” arrangements, constructed of 3/4-in. marine plywood, were examined. The first was a shore-parallel breakwater (Structure 1), the second was a typical dogleg jetty (Structure 2), and the third and fourth structures were arranged for measurements of diffraction-refraction into the bay for an unjettied (Structure 3) and jettied (Structure 4) inlet. Wave conditions consisted of two irregular waves (0.8 sec, 0.2 ft (6.1 cm) and 1.6 sec, 0.15 ft (4.6 cm)) and one regular wave (0.8 sec, 0.15 ft (4.6 cm)) for all model structure configurations. Shore-normal waves were generated for all structures, and a 20-deg wave from shore normal was created for Structures 1 and 2. The 20-deg wave was created from the same wave-generator location, resulting in increased wave energy for Structure 1 relative to the shore-normal wave and decreased energy for Structure 2 relative to the shore-normal wave.

A flood current was created for the Structure 3 (no jetties) condition. The determination to create a flood current for this condition arose from the observation that currents created by the breaking waves on each beach adjacent to the inlet flowed into the inlet and exited seaward, interacting with the incoming waves. This wave-current interaction caused breaking waves and reduced wave energy entering the bay. Data were collected for both the flood current and no-flood current conditions. For Structure 4, the jetties prevented the longshore currents from entering the channel.

Structure 1, the shore-parallel breakwater (Figures 5 and 6), was placed offshore of the beach in a region with shore-parallel contours. The breakwater extended 9.1 m (30 ft) to the sidewall of the model. The wave generator was initially set parallel to the shoreline, then moved to a 20-deg angle with the shoreline, positioned to enhance increased energy propagation behind the breakwater. Note the partition across the channel that isolated the bay from the ocean. Data collection consisted of wave heights and direction from gauges on movable racks at 20 locations and at 10 fixed locations. Thirty locations were sampled simultaneously for a given instrument arrangement. There were five arrangements of the movable gauge racks for the offshore breakwater, for a total of 100 gauge locations shoreward of the breakwater. Five fixed wave gauges were located on line with the offshore breakwater defining the incident wave that would refract-diffract behind the breakwater. Five additional gauges were placed at the wave generator to define deeper water wave conditions and ensure consistent wave generation. Also placed on the wave gauge rack were two ADVs, which were analyzed to define wave direction. This portion of the data collection was to provide a crosscheck of the wave direction measurements made through analysis of video photography from multiple cameras to determine wave direction.

Structure 2, the dogleg jetty, is shown in Figure 7 with its gauge arrangement depicted in Figure 8. The gauge arrangements of Structures 3 and 4 are shown in Figures 9 and 10, respectively, and photographs of the setups are shown in Figures 11 and 12, respectively. Table 2 summarizes the experiments. Horsehair wave absorber was located on the outside of Structures 1, 2, and 4 to minimize reflection back to the wave generator and ocean basin region. For Structures 1 and 2, the absorber was terminated 0.9 m (3 ft) from the tip of the structure. See Figure 7 for absorber location. For Structure 4, the absorber was placed on the oceanside of each of the parallel jetties, extending to the tip (Figure 12). The absorber extended through the water surface. Chapter 4 contains additional details for each structure.

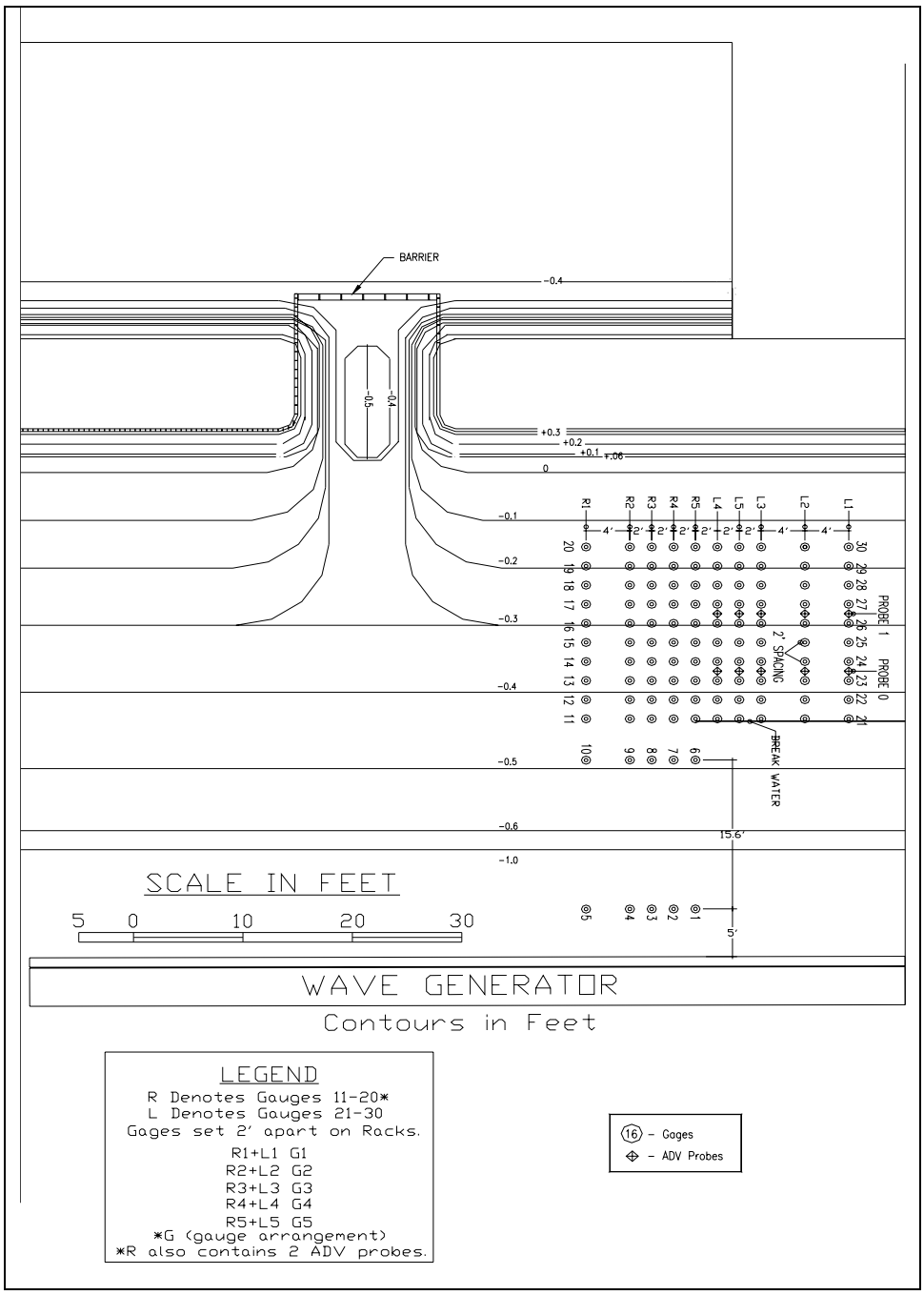


Figure 5. Structure 1: Experiment arrangement (to convert contours to meters, multiply by 0.3048)

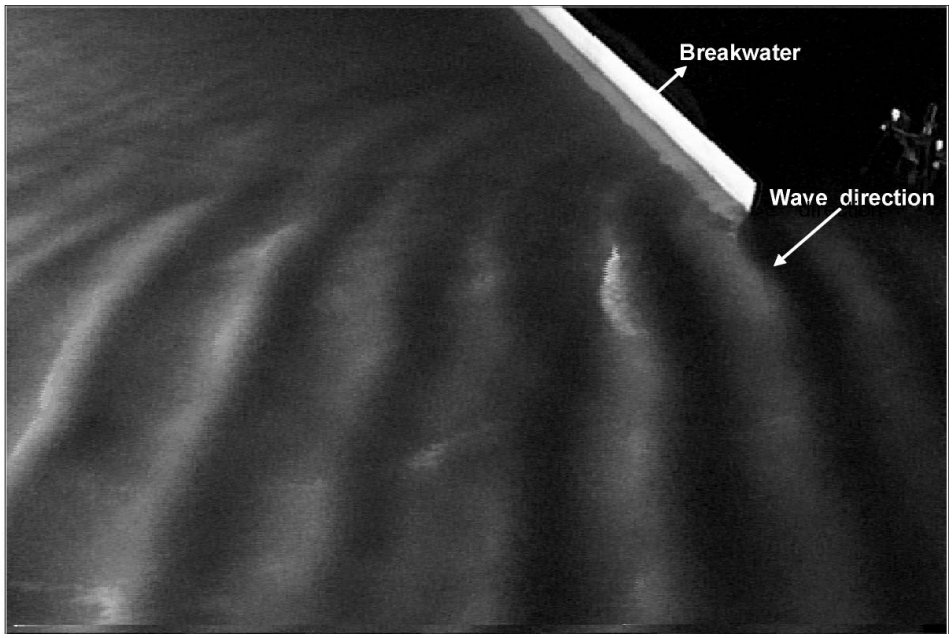


Figure 6. Structure 1: 0.8-sec irregular wave

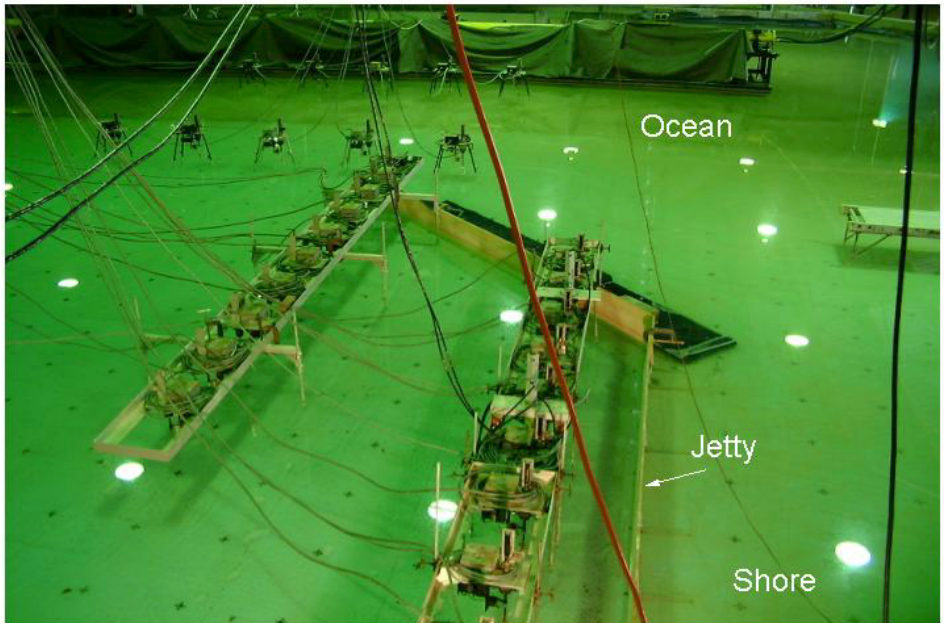


Figure 7. Example of sensor placement for Structure 2 experiment

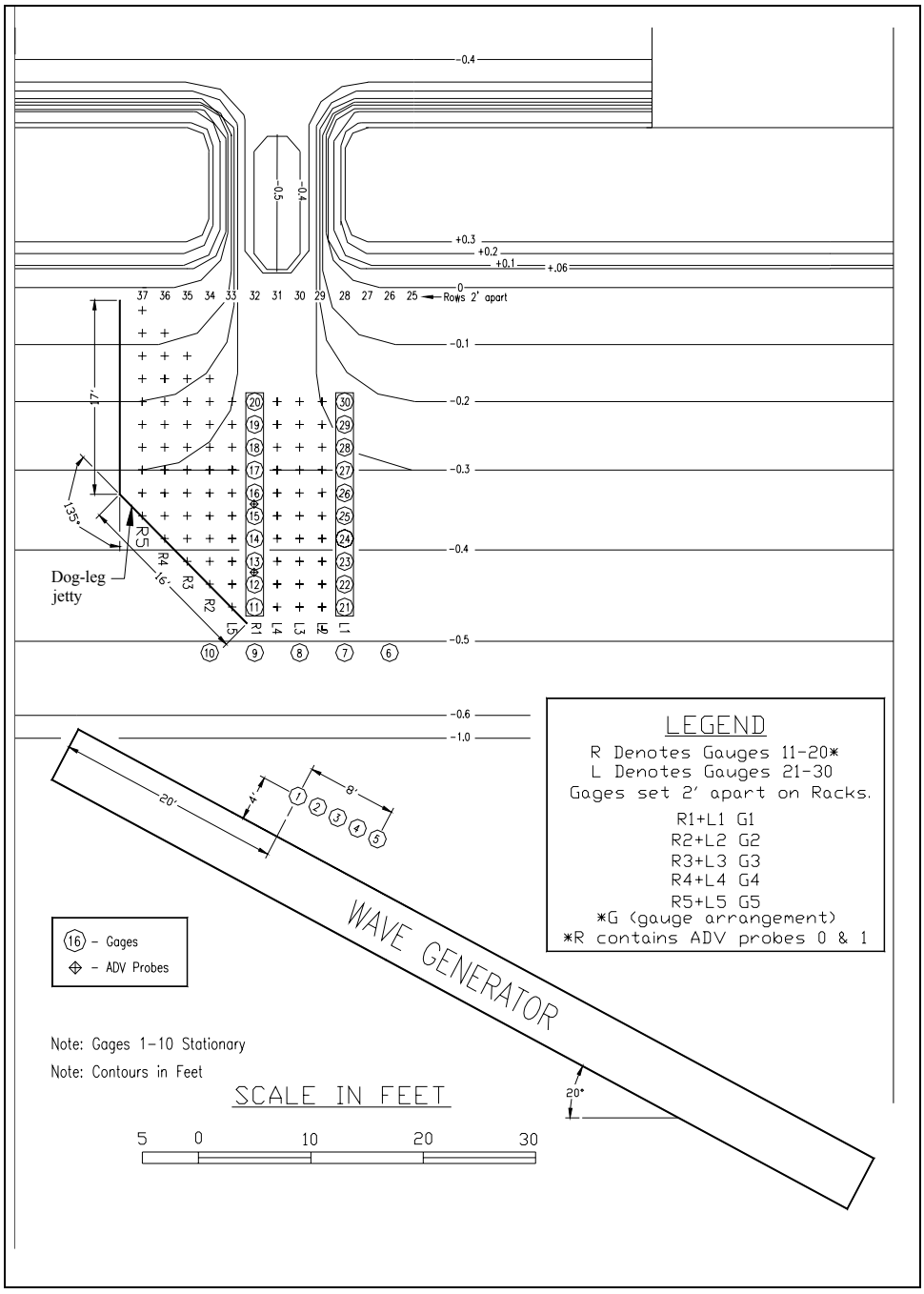


Figure 8. Structure 2: Experiment arrangement (to convert contours to meters, multiply by 0.3048)

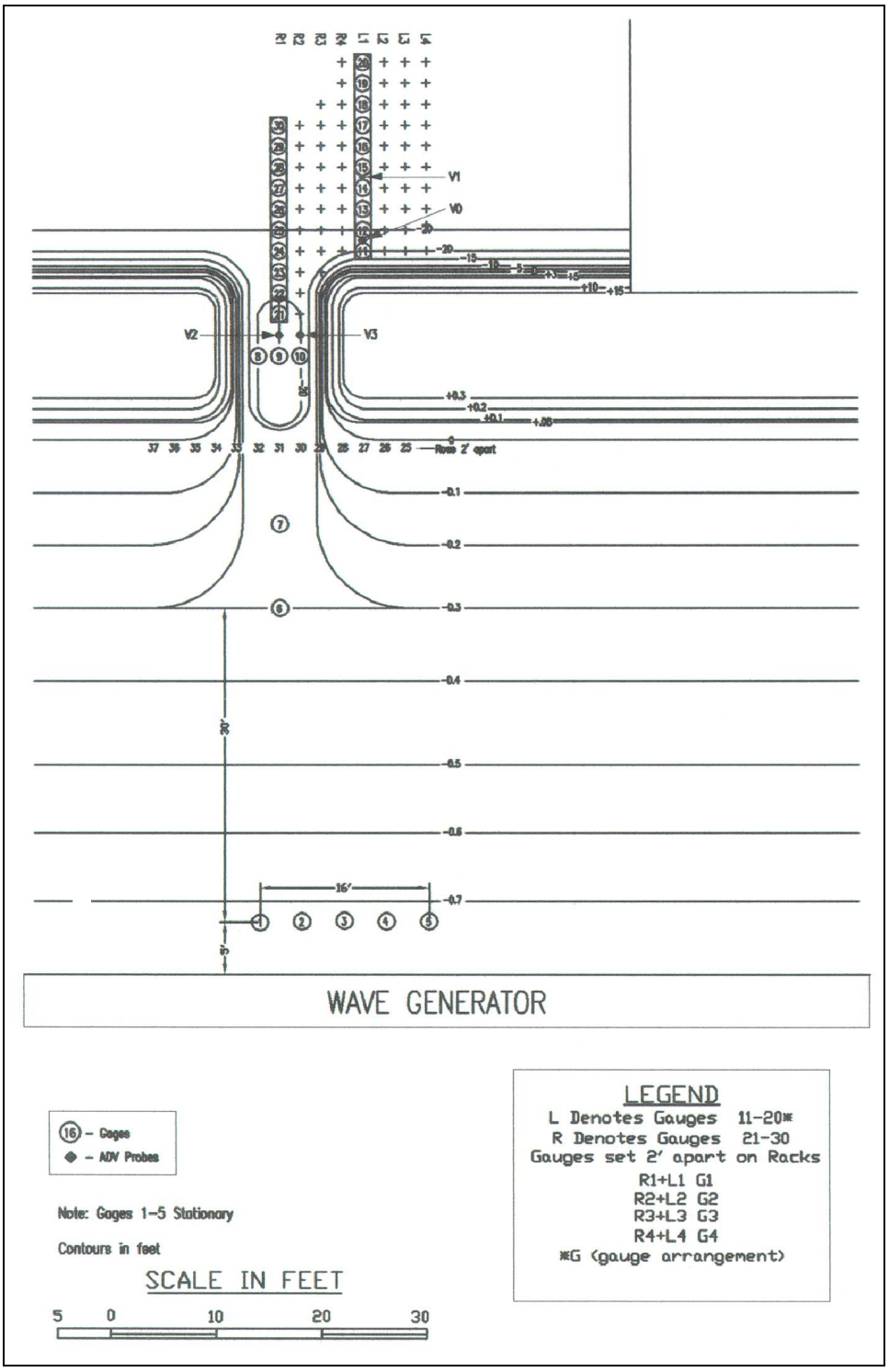


Figure 9. Structure 3: Experiment arrangement (to convert contours to meters, multiply by 0.3048)

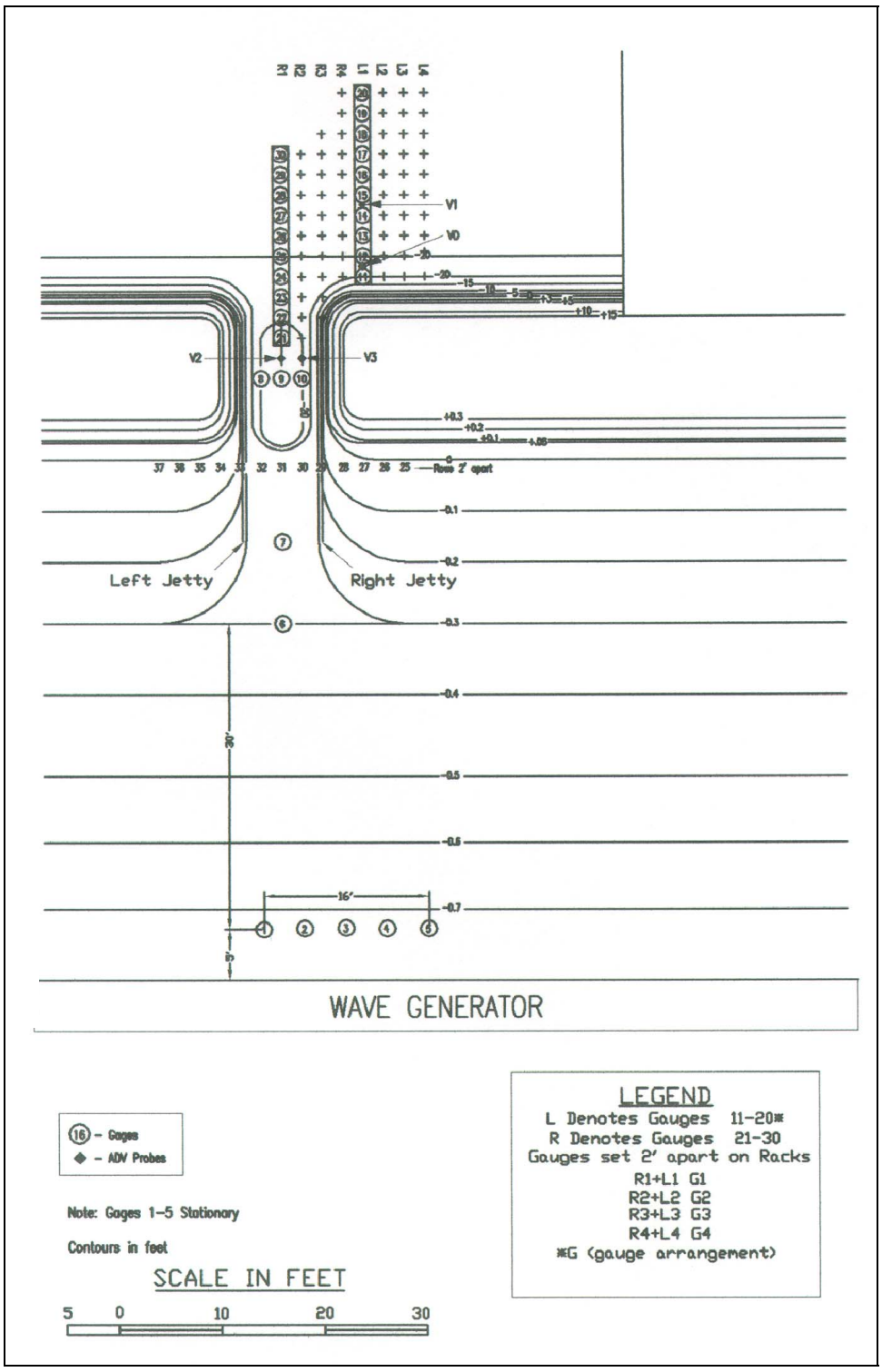


Figure 10. Structure 4: Experiment arrangement (to convert contours to meters, multiply by 0.3048)

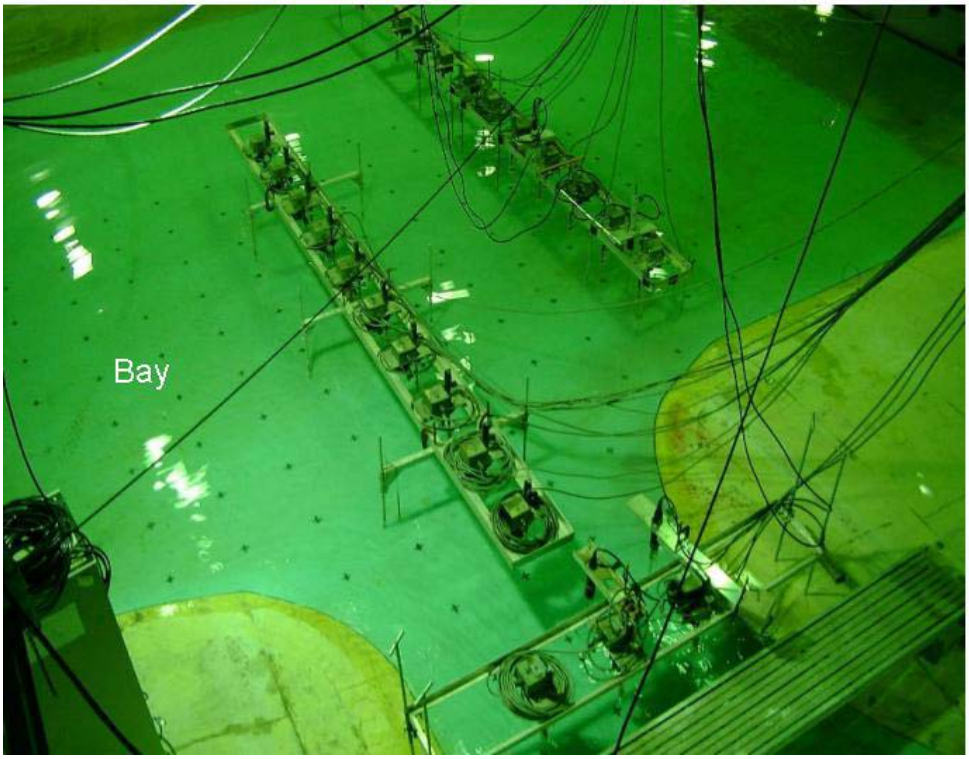


Figure 11. Structure 3: Experiment arrangement, looking into bay behind the inlet

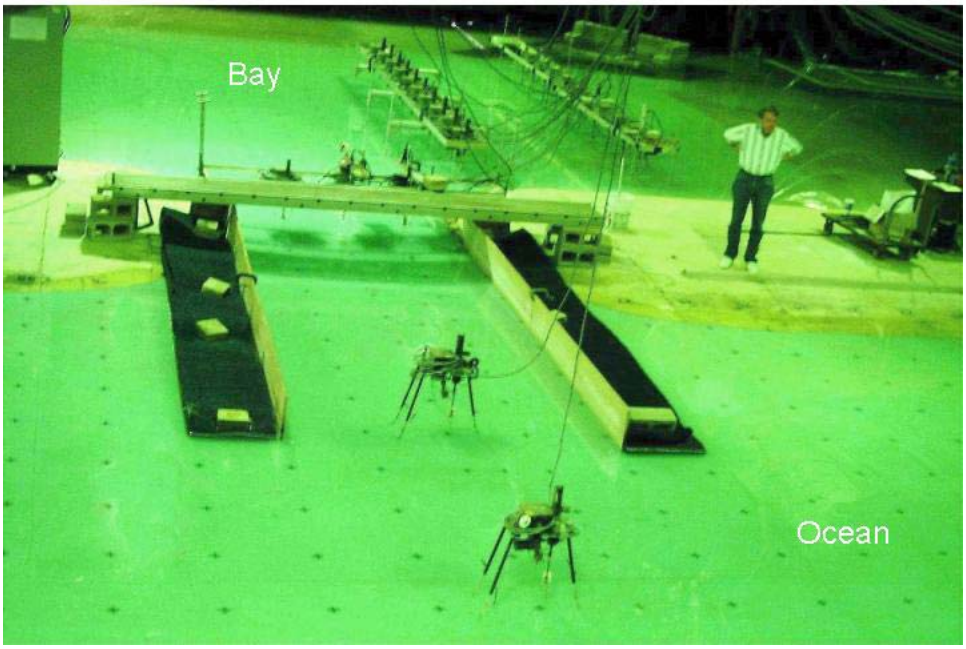


Figure 12. Structure 4: Experiment arrangement, showing parallel jetties

Table 2
CIRP Diffraction Experiments

Experiment No.	Wave Direction, deg	Wave Period, Wave Height, and Wave Type	Current On/Off
Structure 1 (Offshore Breakwater Parallel to Shore, Near Inlet)			
S1**X1	0	0.8 sec, 6.1 cm (0.2 ft), irregular wave	Off
S1**X2	0	1.6 sec, 4.6 cm (0.15 ft), irregular wave	Off
S1**X3	0	0.8 sec, 4.6 cm (0.15 ft), monochromatic wave	Off
S1**X4	20	0.8 sec, 6.1 cm (0.2 ft), irregular wave	Off
S1**X5	20	1.6 sec, 4.6 cm (0.15 ft), irregular wave	Off
S1**X6	20	0.8 sec, 4.6 cm (0.15 ft), monochromatic wave	Off
Structure 2 (Dogleg Jetty at Inlet)			
S2**X1	0	0.8 sec, 6.1 cm (0.2 ft), irregular wave	Off
S2**X2	0	1.6 sec, 4.6 cm (0.15 ft), irregular wave	Off
S2**X3	0	0.8 sec, 4.6 cm (0.15 ft), monochromatic wave	Off
S2**X4	20	0.8 sec, 6.1 cm (0.2 ft), irregular wave	Off
S2**X5	20	1.6 sec, 4.6 cm (0.15 ft), irregular wave	Off
S2**X6	20	0.8 sec, 4.6 cm (0.15 ft), monochromatic wave	Off
Structure 3 (Bay Measurements, No Jetties at Inlet)			
S3**X1	0	0.8 sec, 6.1 cm (0.2 ft), irregular wave	Off
S3**X2	0	1.6 sec, 4.6 cm (0.15 ft), irregular wave	Off
S3**X3	0	0.8 sec, 4.6 cm (0.15 ft), monochromatic wave	Off
S3**X1C	0	0.8 sec, 6.1 cm (0.2 ft), irregular wave	On (flood current)
S3**X2C	0	1.6 sec, 4.6 cm (0.15 ft), irregular wave	On (flood current)
S3**X3C	0	0.8 sec, 4.6 cm (0.15 ft), monochromatic wave	On (flood current)
Structure 4, (Bay Measurements, Parallel Jetties at Inlet)			
S4**X1	0	0.8 sec, 6.1 cm (0.2 ft), irregular wave	Off
S4**X2	0	1.6 sec, 4.6 cm (0.15 ft), irregular wave	Off
S4**X3	0	0.8 sec, 4.6 cm (0.15 ft), monochromatic wave	Off
S4**X2C	0	1.6 sec, 4.6 cm (0.15 ft), irregular wave	On (flood current)

NOTE: Water level for all experiments was +2.5 ft mean low water (mlw) (in prototype units) or +0.05 ft mlw, actual basin elevation.

** - Gauge arrangement number
Structure 1 – Five gauge arrangements, numbers G1, G2, G3, G4, and G5.
Structure 2 – Five gauge arrangements, numbers G1, G2, G3, G4, and G5.
Structure 3 – Four gauge arrangements, numbers G1, G2, G3, and G4.
Structure 4 – Four gauge arrangements, numbers G1, G2, G3, and G4.

3 Measurement Procedures and Data Analysis

This chapter provides information on the data collection procedure and analysis. Selected example plots of data are also shown.

Data Sampling and Wave Generation

Following daily calibration of the wave gauges (Chapter 2), and incident wave conditions, the experiments began and both current and wave data were collected. The wave generator was operated for 420 sec with a 10-sec ramp-up and ramp-down time. The wave gauge sampling rate was 20 Hz, so 20,400 water elevation data points were collected at each gauge, and 10,200 additional velocity data samples (initially a 10-Hz sampling rate, but increased to 20 Hz early in the study) for each sensor were collected during a run.

All spectral wave tests were made with a unidirectional JONSWAP wave spectrum using the following spectral parameters:

a. For the tests with a target wave height H_s of 6.1 cm and peak wave period T_p of 0.8 sec, a wave generator signal was created using the peak enhancement factor γ of 3.3, low and high peak decay frequencies σ_a of 0.07 and σ_b of 0.09, respectively, and Phillips constant α of 0.03198. The low and high cutoff frequencies of the spectrum were set to the frequencies having 3 and 97 percent of the total spectral variance. In these tests, these were 0.998 Hz and 2.839 Hz, respectively.

b. For the tests with H_s of 4.6 cm and T_p of 1.6 sec, a wave generator signal was created with γ of 3.3, σ_a of 0.07 and σ_b of 0.09, and α of 0.00108. The low and high cut-off frequencies of the spectrum were set to the frequencies having 3 and 97 percent of the total spectral variance. In these tests, these were 0.4989 Hz and 1.4196 Hz, respectively.

Figure 13 shows an example comparison of target and measured spectra at a wave gauge location in front of the wave generator. Figure 14 shows a snapshot of water-surface variation at two gauges.

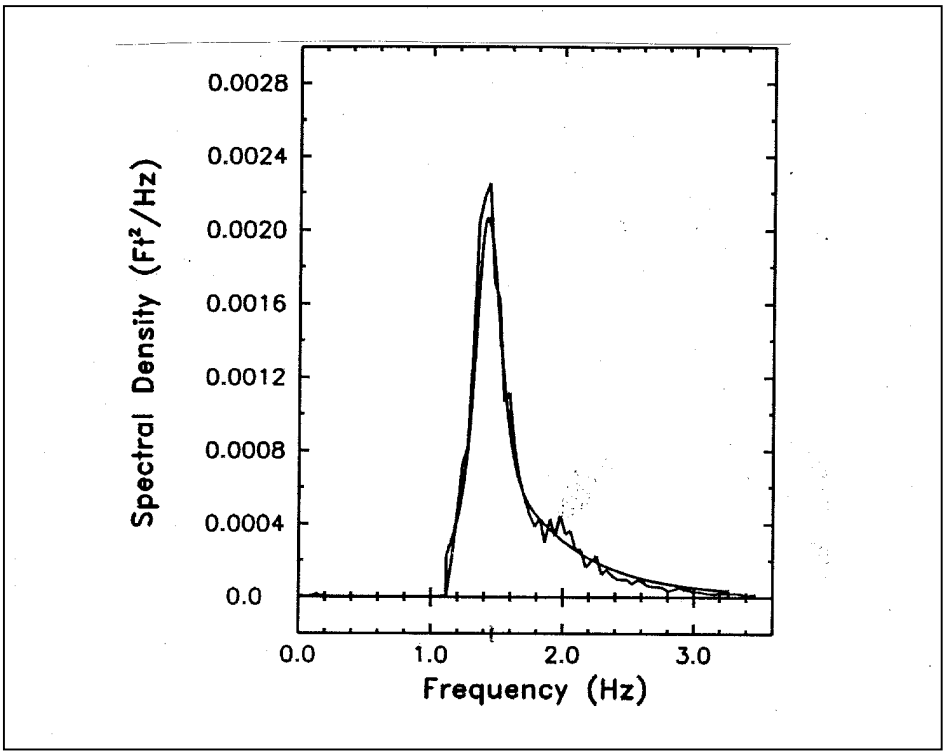


Figure 13. Comparison of targeted and measured spectra for wave generation

Data Analysis

The velocity data were analyzed to determine wave direction with a program adapted from a PUV (pressure and horizontal velocity components) directional wave gauge analysis program as outlined by Earle, McGehee, and Tubman (1995). Because water level variation was unavailable at the location of the current meter probe, the wave direction and energy for each frequency were determined from the harmonics of the directional spectum related to velocity. These harmonics are calculated from auto- and cross-spectra determined from a Fast Fourier Transform (FFT) of the velocity records.

Wave data were analyzed in two ways. A down-crossing analysis was performed on the time series of water elevations as well as spectral analysis using an FFT. The down-crossing analysis produced the calculated parameters shown in Table 3.

FFT or single-channel frequency domain analysis was performed over the entire 20,400 data points (Δt = 0.05 sec). In the analysis, the mean was removed and a cosine square taper applied over 10 percent of the data at the beginning and end of the data record. The spectral parameters calculated are listed in Table 4.

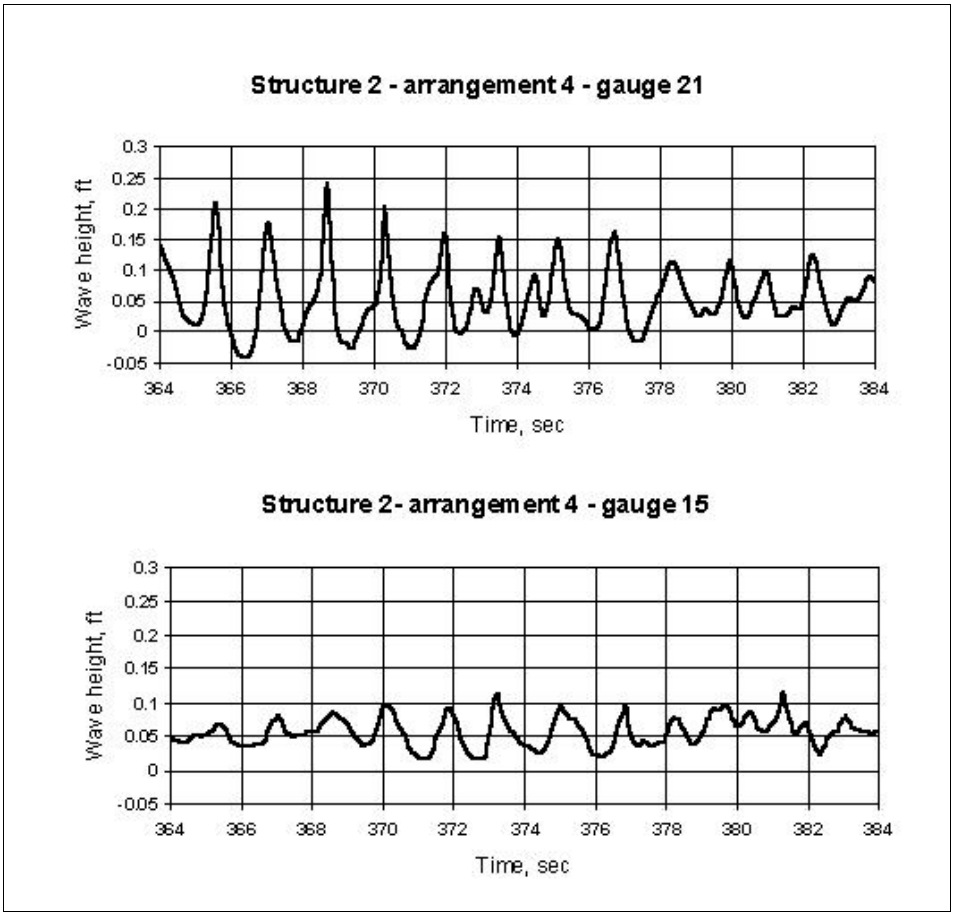


Figure 14. Time series of water-surface elevation η at wave generator (Gauge 21 and Gauge 15)

Tables 3 and 4 list the parameters available from the data analysis, which are available on compact disk (CD) from the Coastal and Hydraulics Laboratory, U.S. Army Engineer Research and Development Center. Water level variation and velocity data are also included in CD format for all experiments discussed in this report.

It should be noted that entire data records were analyzed to produce the tables of wave parameters. It was observed that for Structures 3 and 4 there were some transient and unsteady effects in the wave records, typically at the start of data collection. These effects may have resulted from different processes. First, especially for Structure 3, longshore currents, created by breaking waves along the shoreline, could be observed during these experiments; and these currents were moving into the inlet from both beaches. Once in the inlet, these wave-induced currents would then turn seaward and interact with the incoming waves. Within the narrow inlet, reflected waves from the sides of the inlet appeared to converge and interact at the center of the narrowest and deepest part of the inlet channel. On the bay side of the inlet, slow circulation patterns were created that took a while to develop. The transient effects seemed to be stronger for the

monochromatic waves. Therefore, care should be exercised in analyzing the raw time-series data in either time or frequency domain. It may be appropriate for the user of the data to view the data carefully and select later segments of the data stream for comparison to numerical model estimates.

Table 3
Calculated Wave Parameters from Down-crossing Analysis

Parameter Name	Description
ETABAR	Average water level
ETARMS	Root-mean-squared water level
ETAMAX	Maximum water-surface elevation
ETASD	Standard deviation of water level
RHOHH	Correlation between wave heights
RHOHT	Correlation between heights and periods
HMIN	Smallest wave height
HMAX	Largest wave height
HBAR	Average wave height
H 1/3	Significant wave height, average of highest 33 percent of wave heights
H 1/10	Average of highest 10 percent of wave heights
H 1/20	Average of highest 5 percent of wave heights
H 1/100	Average of highest 1 percent of wave heights
TBAR	Average wave period
T 1/3	Significant wave period, average period of highest 33 percent of waves
T 1/10	Average wave period of highest 10 percent of wave heights
T 1/20	Average wave period of highest 5 percent of wave heights
T 1/100	Average wave period of highest 1 percent of wave heights
WEIBULL ALPHA	For Rayleigh distribution of wave heights, alpha = 2 and beta = 0.5. Truncation of higher wave heights by breaking increases alpha.
WEIBULL BETA	
NO. OF WAVES	Number of waves in record.
H (P=0.5)	Median wave height (exceeded 50 percent)
T (P=0.5)	Median wave period (exceeded 50 percent)

Table 4
Calculated Wave Parameters from Single Channel Frequency Domain Analysis

Parameter Name	Description
FPC	Peak frequency, CERC method[1]
FPS	Peak frequency, single band
FPD	Peak frequency
TPC	Peak period, CERC method[1]
TPS	Peak period, single band
TPD	Peak period, Delft method
HMO	Wave height, zero moment
QPG	Spectral width parameter (Goda 1970)
EMO	Zeroth moment of the energy spectrum
EM1	First moment of the energy spectrum
EM2	Second moment of the energy spectrum
TO2	Average period, calculated as $(EMO/EM2)^{0.5}$

[1] J. Ahrens. (1983). "Important parameters, irregular waves," Internal Memorandum For Record, 9 December 1983, U.S. Army Engineer Waterways Experiment Station, Coastal Engineering Research Center, Vicksburg, MS.

4 Physical Model Results

The purpose of these laboratory experiments was to measure wave height and wave direction in the lee of coastal structures and inside an inlet entrance to verify numerical techniques and models for combined wave diffraction, refraction, and shoaling. This chapter presents the results of the wave height and direction measurements collected for the four structures. Wave height data were plotted spatially and contoured. Spectral energy density versus frequency plots are also examined. Wave direction measurement techniques and results are discussed in Chapter 5.

Structure 1

The Structure 1 configuration represented a semi-infinite offshore breakwater with a shoreward sloping bottom behind the breakwater (Figure 5) terminating at the beach. Appendix B contains data tables for the gauge arrangement for each experiment. A total of six experimental conditions were studied as noted in Table 2. For an incident wave direction of 0.0 deg, irregular waves of 0.8 sec, 6.1 cm (0.2 ft), and 1.6 sec, 4.6 cm (0.15 ft) and monochromatic waves of 0.8 sec, 4.6 cm (0.15 ft) were produced. The wave generator was repositioned for a 20-deg incident wave direction and the same three wave conditions repeated. Initial experiments with the 0-deg wave approach indicated very small wave heights at the distant wave gauges behind the breakwater, so to obtain additional wave energy penetration behind the breakwater, the 20-deg experiments were performed.

The tables in Appendix B contain gauge number, depth at the gauge, average water surface elevation relative to the still-water level, significant wave period, significant wave height, average wave height, and maximum wave height. The data are arranged in tables for each gauge arrangement, as shown in Figure 5. Appendix C presents contoured dimensional wave height plots. Figure 15 shows the 0.8-sec experiment wave height contours, with mean wave direction given at selected locations as determined from the velocity gauges. The x-y arrows depicted on the plots indicate the basin x-y position that corresponds to the plot origin (0,0). Appendix J contains sample spectral energy density versus frequency plots for selected wave gauge locations. The overall basin bathymetry, the shore-parallel breakwater structure, the dogleg jetty structure, and the parallel jetties structure are referenced in Appendix K. The large volume of data has been placed on the accompanying CD. The location of the wave gauges and breakwater within the coordinate system is given in Appendix L.

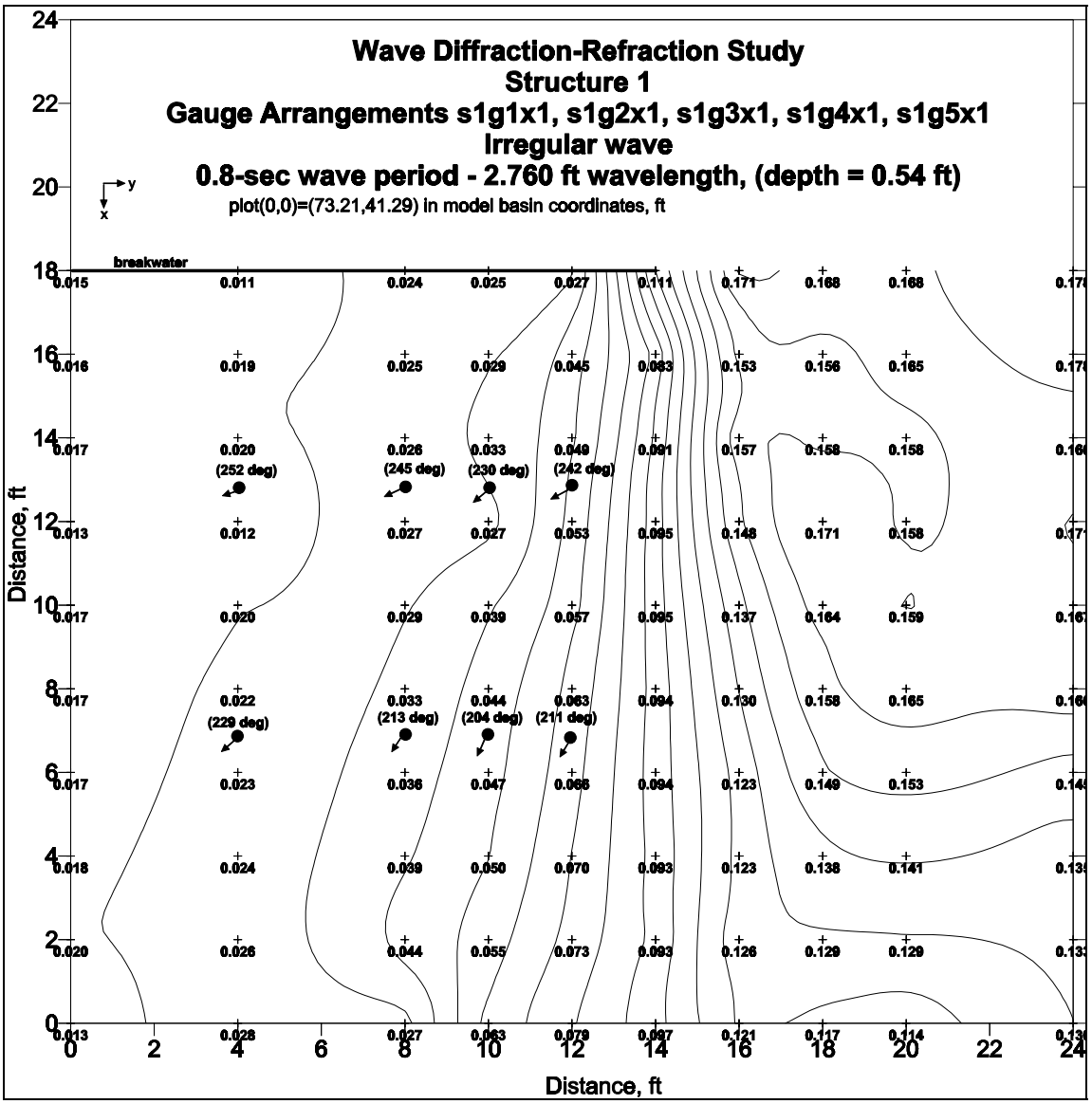


Figure 15. Contoured plot of wave height transformation for Structure 1, Experiment 1 (gauge arrangements 1 through 5). Wave period is 0.8 sec, wave approach 0 deg (perpendicular to the breakwater) for this irregular wave case. Contour interval is 0.30 cm (0.01 ft). Arrows show peak wave direction acquired at peak period

Structure 2

The Structure 2 configuration was similar to that of Structure 1, but in place of the shore-parallel breakwater, it contained one dogleg jetty with the inner segment perpendicular to the shore (Figure 7). A total of six experimental conditions were studied, as noted in Table 2. For an incident wave direction of 0.0 deg, irregular waves of 0.8 sec, 6.1 cm (0.2 ft), and 1.6 sec, 4.6 cm (0.15 ft), and monochromatic waves of 0.8 sec, 4.6 cm (0.15 ft), were produced. The wave generator was repositioned for a 20-deg incident wave direction and the same three wave conditions were repeated. The 20-deg angle was oriented such that less energy would be propagated behind the breakwater.

The tables in Appendix D contain gauge number, depth at the gauge, average water surface elevation relative to the still-water level, significant wave period, significant wave height, average wave height, and maximum wave height. The data are in tables for each gauge arrangement, as shown and noted in Figure 8. Appendix E presents contoured dimensional wave height plots. Figure 16 shows the 0.8-sec wave experiment wave-height contours and wave direction from the velocity gauges. The x-y arrows in the plots indicate the basin x-y position that corresponds to the plot origin (0.0). Appendix J contains sample spectral energy density versus frequency plots for selected wave gauge locations. The overall basin bathymetry, the shore-parallel breakwater structure, the dogleg jetty structure, and the parallel jetties structure are referenced in Appendix K. Due to the large volume of data, it has been placed on the accompanying CD. The location of wave gauges and the dogleg jetty within the coordinate system is given in Appendix M.

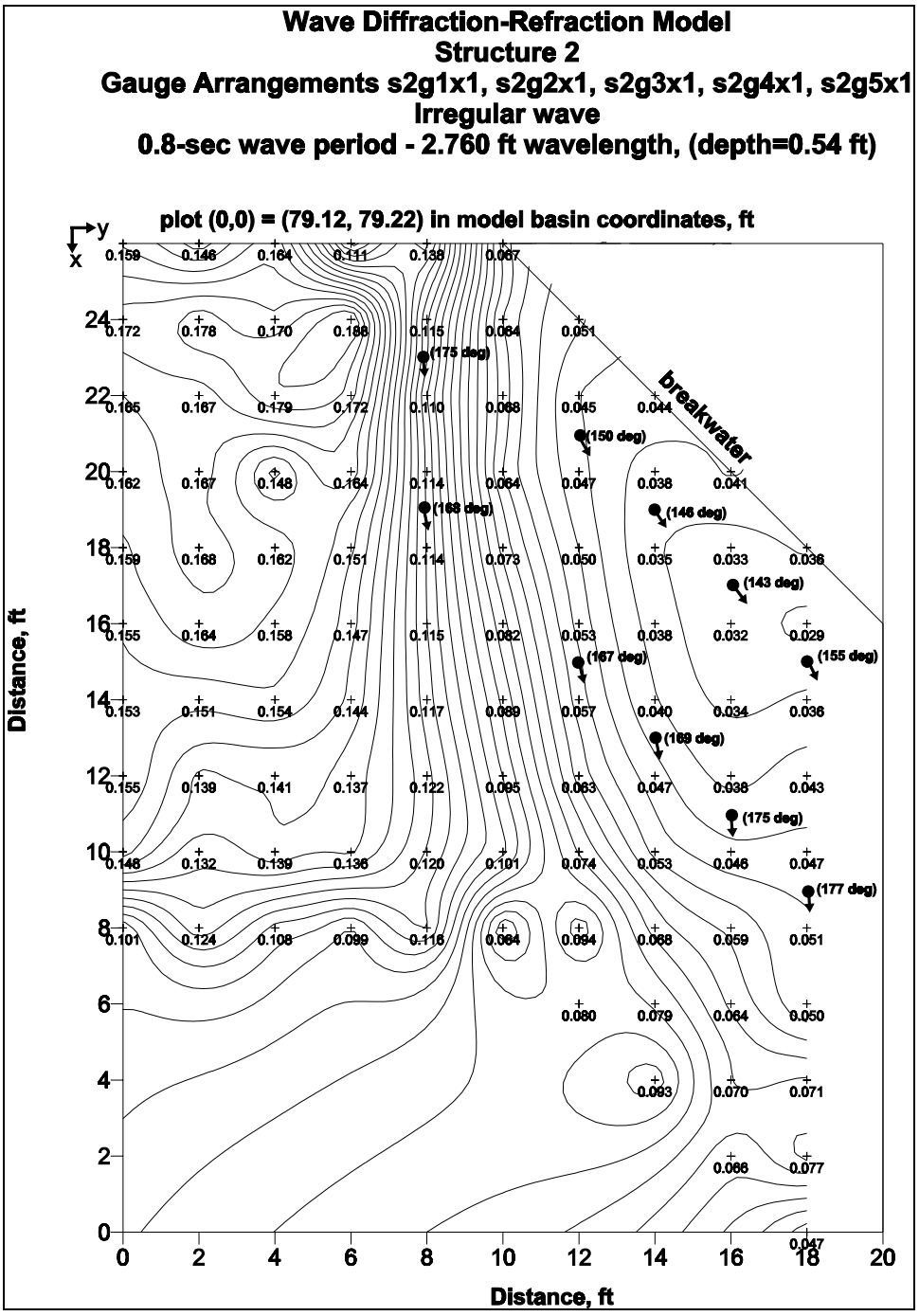


Figure 16. Contoured plot of wave height transformation for Structure 2, Experiment 1 (gauge arrangements 1 through 5). Wave period is 0.8 sec, wave approach 0 deg for this irregular wave case. Contour interval is 0.03 m (0.01 ft). Arrows show peak wave direction acquired at peak period

Structure 3

The Structure 3 configuration contained no jetties, and was designed to simulate diffraction through a gap, such as shown in Figure 1. The placement of the gauges was bayward (see Figure 11), as opposed to seaward, as with the Structure 1 and 2 configurations. For some of these experiments, the physical model was arranged to produce a flood current as discussed in Chapter 2. The wave direction remained perpendicular to the shoreline, 0 deg, throughout the testing sequence. A total of six experimental conditions were studied, as noted in Table 2. For no-flood current conditions (Chapter 2), irregular waves of 0.8 sec, 6.1 cm (0.2 ft), and 1.6 sec, 4.6 cm (0.15 ft), and monochromatic waves of 0.8 sec, 4.6 cm (0.15 ft), were produced. The flood current conditions were created and the same three wave conditions were repeated. Appendix F contains data tables for the gauge arrangement, shown in Figure 9, for each experiment.

The tables contain gauge number, depth at the gauge, average water surface elevation relative to the still-water level, significant wave period, significant wave height, average wave height, and maximum wave height. Appendix G presents contoured dimensional wave height plots. Figure 17 shows the 0.8-sec wave experiment wave height contours and wave direction from the velocity gauges. The x-y arrows depicted on the plots indicate the basin x-y position that corresponds to the plot origin (0,0). Appendix J contains sample spectral energy density versus frequency plots for selected wave gauge locations. The overall basin bathymetry, the shore-parallel breakwater structure, the dogleg jetty structure, and the parallel jetties structure are referenced in Appendix K. Due to the large volume of data, it has been placed on the accompanying CD. The location of wave gauges within the coordinate system is given in Appendix N.

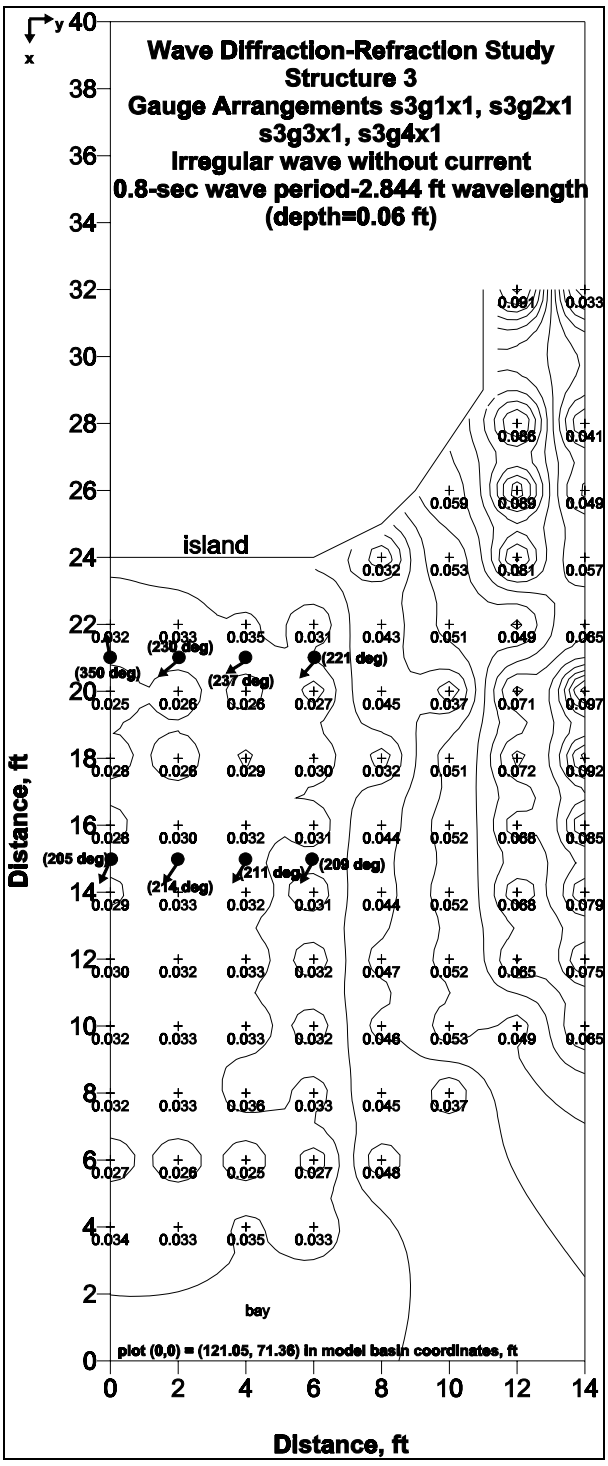


Figure 17. Contoured plot of wave height transformation for Structure 3, Experiment 1 (gauge arrangements 1 through 4). Wave period is 0.8 sec, flood current off, wave approach 0 deg (perpendicular to shoreline) for this irregular wave case. Contour interval is 0.30 cm (0.01 ft). Arrows show peak wave direction acquired at peak period

Structure 4

The Structure 4 configuration consisted of two jetties perpendicular to shore. The placement of the gauges was bayward (Figure 12) as opposed to seaward as with the Structure 1 and 2 configurations. A total of four experimental conditions were studied, as noted in Table 2. For no-flood current conditions (Chapter 2), irregular waves of 0.8 sec, 6.1 cm (0.2 ft), and 1.6 sec, 4.6 cm (0.15 ft), and monochromatic waves of 0.8 sec, 4.6 cm (0.15 ft), were produced. The flood current conditions were created and the same irregular wave, 1.6 sec, 4.6 cm (0.15 ft), was repeated. Appendix H contains data tables for the gauge arrangement, shown in Figure 10, for each experiment.

The tables contain gauge number, depth at the gauge, average water surface elevation relative to the still-water level, significant wave period, significant wave height, average wave height, and maximum wave height. Appendix I presents contoured dimensional wave height plots. Figure 18 shows the 0.8-sec wave experiment. The x-y arrows depicted on the plots indicate the basin x-y position that corresponds to the plot origin (0.0). Appendix J contains sample spectral energy density versus frequency plots for selected wave gauge locations. The overall basin bathymetry, the shore-parallel breakwater structure, the dogleg jetty structure, and the parallel jetties structure are referenced in Appendix K. Due to the large volume of data, it has been placed on the accompanying CD. The location of wave gauges and the parallel jetties within the coordinate system is given in Appendix O.

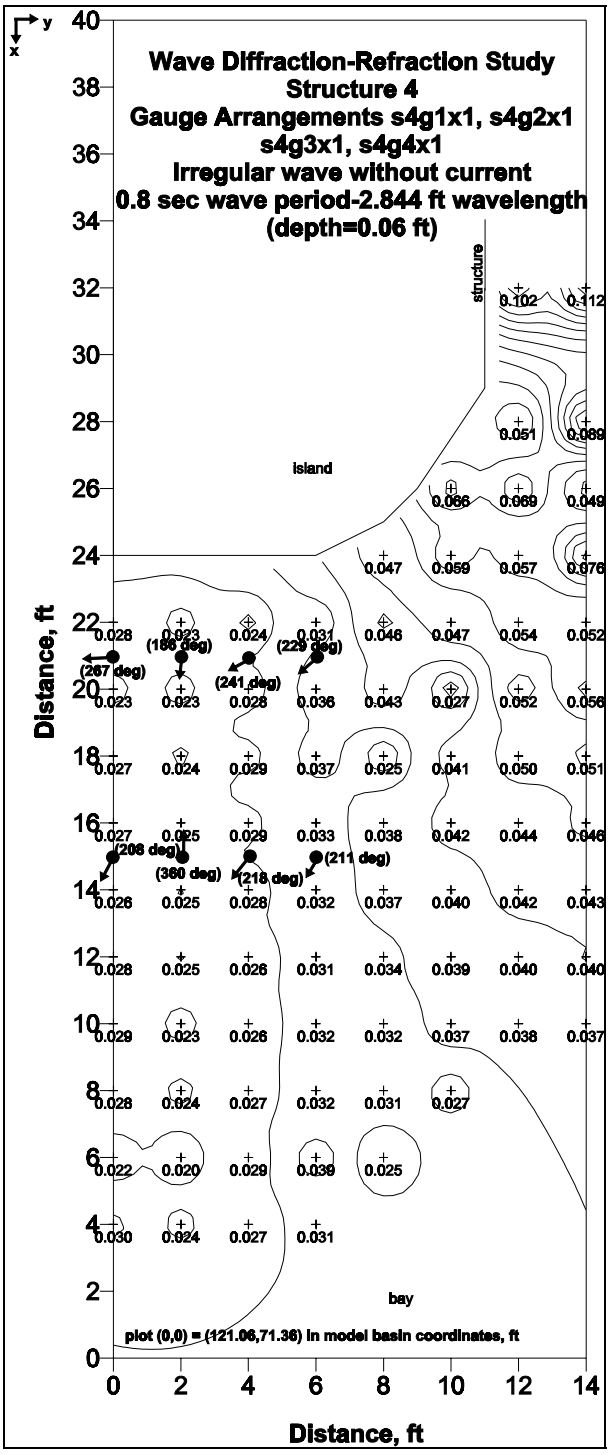


Figure 18. Contoured plot of wave height transformation for Structure 4, Experiment 1 (gauge arrangements 1 through 4). Wave period is 0.8 sec, flood current off, wave approach 0 deg (perpendicular to shoreline) for this irregular wave case. Contour interval is 0.30 cm (0.01 ft). Arrows show peak wave direction acquired at peak period

5 Video-Based Wave Direction Measurement

This chapter discusses the need for implementing a video-based wave direction measurement system in the physical model setting and describes procedures followed for making these measurements. Results from the video-based analysis for each experiment conducted in the idealized coastal inlet physical model are presented.

Background

In the physical model setting, the primary diagnostic tools to investigate the complex interaction of incident wind-waves with variations in inlet bathymetry, engineered inlet structures, and tidal currents are capacitive wave rods and ADV probes. These instruments are deployed at discrete locations to measure wave height and current fields. A disadvantage of the application of wave rods and ADV probes is that they are intrusive and cause localized disturbance in the fluid motions of the model. To minimize these undesired perturbations, CIRP implemented a video-based nonintrusive technique to measure wave parameters accurately with high spatial and temporal resolution. This technique is called the Coastal Inlets Imaging System (CIIS). Specifically, the CIIS provides measurements of vector-mean wave direction of wind-wave fields with time- and space-varying scales observed on the free surface of the model. Measurements obtained with the CIIS have broad application and can provide quantitative information for understanding basic coastal inlet process and supporting computational model development and validation.

During the past decade, video techniques have been developed and applied in the coastal region to measure variations in hydrodynamic processes (Hathaway and Bottin 1997; Holland, Holman, and Sallenger 1991; Holland et al. 1995; Holland and Holman 1996; Holland and Holman 1999; Lippmann and Holman 1991; Stockdon and Holman 2000) and morphologic processes (Konicki and Holman 2000; Lippmann and Holman 1990; Lippmann, Holman, and Hathaway 1993; Plant and Holman 1997; Ruessink et al. 2000). Development of the CIIS builds on these photogrammetric and image-processing techniques developed by the Argus Research Program coordinated by the Coastal Imaging Lab, Oregon State University (Holman et al. 1993; Aarninkhof and Holman 1999). The physical model video system consists of obliquely looking monoscopic camera stations mounted at vantage points above the physical model. Lens distortions,

camera locations, and ground control coordinates are measured to establish a geometric model relating phenomena observed in two-dimensional (2-D) image coordinates (u,v) to the physical model's three-dimensional (3-D) x-, y-, z-coordinate system via a direct linear transformation. Figure 19 shows the geometric relationship between an object observed in image space and in object space. The capability to transform accurately between image and object space enables the CIIS to operate as a measurement system. Holland et al. (1997) gives a comprehensive treatise on the mathematics of the camera calibration (lens distortion correction) and application of photogrammetric methods.

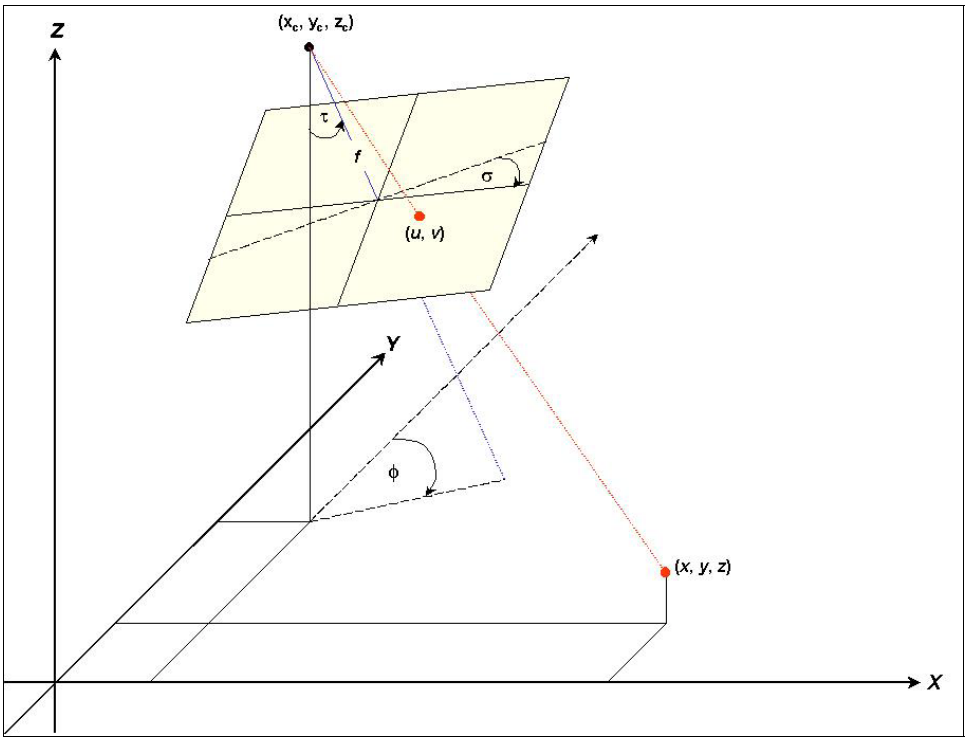


Figure 19. Geometric relationship between the camera (x_c, y_c, z_c), the object of interest observed on the image plane (u, v) and in real-world coordinates (x, y, z), angles of camera rotation (τ,σ,ϕ), and the camera focal length (f) (after Holland et al. 1997)

The general premise for video-based wave direction measurement in the physical model is as follows. Diffuse lamps create a directional gradient of light over the model. As waves propagate by a fixed point on the free surface, the intensity of directional specular reflection from the surface of the wave slope varies from light to dark. The degree of variation depends on the viewing angle relative to the direction of wave propagation and illumination. A vertical camera angle observes a field of high- and low-intensity bands over the free surface as waves propagate toward the source illumination. That is, the forward face of the wave has a higher intensity signature than the back face of the wave shadowed by the front. These temporal and spatial variations in light intensity are observed by a camera and recorded on videotape. The signals are digitized and analyzed to

determine the relationship between the phase structures (time lag) of light intensity time series records measured at specified locations within the field of view of the camera. It is assumed that the physical relationship between the visual signature of the wave in image space and the true wave in object space is spatially constant.

Equipment Installation and Experiment Preparation

The data acquisition component of the CIIS comprises several commercially available video components. Synchronized Sony™ SSC-54A color video charge-coupled device cameras are mounted at vantage points above the physical model on support beams. Synchronization of the cameras is required for simultaneous data acquisition from each camera view. Manual iris Navitar™ lenses with focal lengths of 8 and 6mm provide the desired degree of spatial resolution. Figures 20 and 21 show pixel resolutions for a typical imaged area in the physical model for camera stations located 3.8 m (12.5 ft) above the free surface for the 8 and 6mm lenses, respectively. For example purposes, the cameras are located arbitrarily in a rectilinear coordinate system. The 8mm lens-camera combination is oriented with a tilt angle of 55 deg off nadir and a roll angle of 0 deg, and it has a horizontal field of view of 40 deg. This camera orientation results in < 2-cm pixel resolution in the direction perpendicular to the camera azimuth over the entire imaged area. Pixel footprints in the direction of the camera azimuth are highly resolved in both the near and far fields (< 4 cm). The 6mm lens-camera combination has a tilt angle of 48 deg, a roll angle of 0 deg, and a horizontal field of view of 54.6 deg. The shorter focal length provides a wider field of view and slightly lower resolution. Cross-azimuth pixel resolution is < 2 cm over the imaged area, and along-azimuth resolution is < 4 cm.

Camera-lens combinations are calibrated at the Field Research Facility, Duck, NC, Coastal and Hydraulics Laboratory, U.S. Army Engineer Research and Development Center, to determine lens distortion coefficients and optical characteristics of a given camera-lens combination prior to installation. Cameras identified as 1 and 2 in this report have 6mm focal length lenses, and cameras identified as 3 through 6 have 8mm lenses. Each camera is connected to a Panasonic™ AG-1980P videocassette recorder (VCR) via Belden™ 8281F composite video cable. Super Video Home System™ (SVHS) cable is desired for increased videotape resolution; however, long cable lengths between cameras and VCRs (>30 m) dictated the use of composite video cable to prevent loss of signal strength. The video signal from each camera passes through a synchronized Horita™ vertical interval time code (VITC) generator before being recorded by the VCR at a frame rate of 30 Hz. VITC time code is recorded on each video frame to allow identification of a specific frame of interest during VCR playback and image digitization.

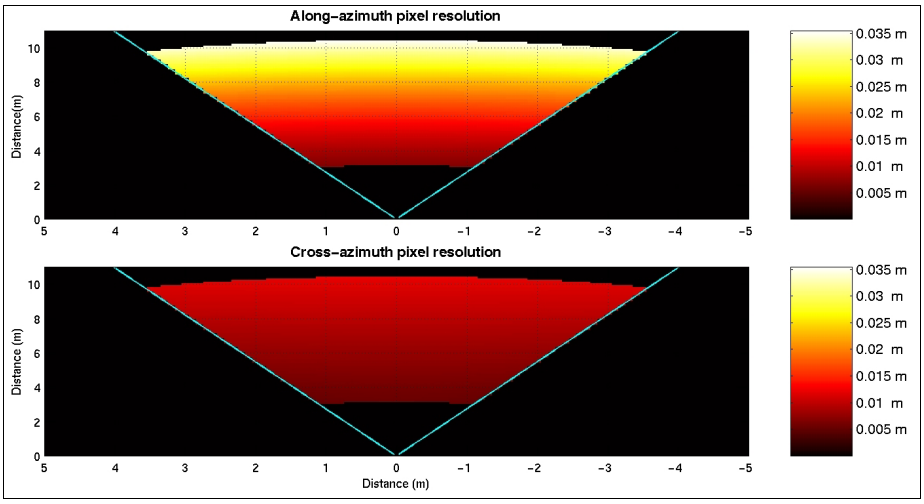


Figure 20. Example pixel resolution for 8 mm focal length

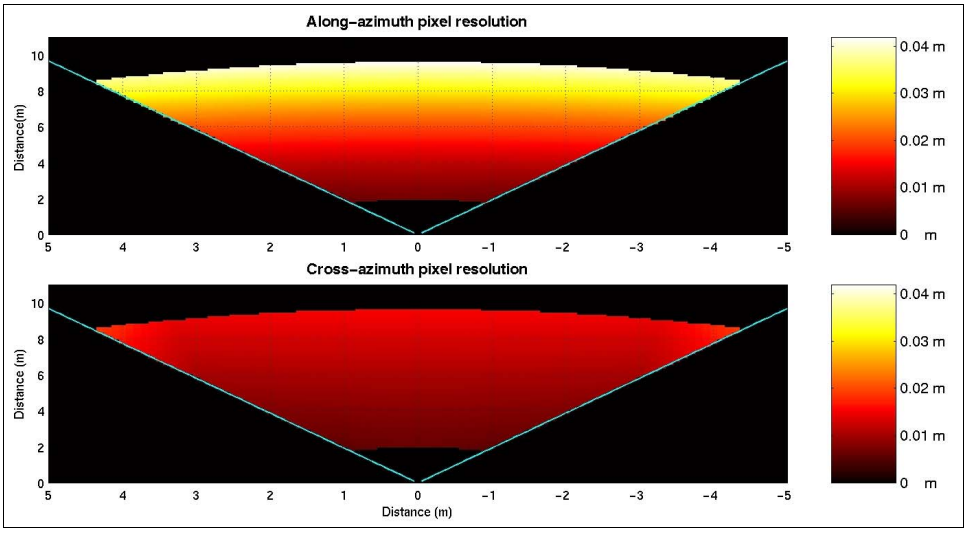


Figure 21. Example pixel resolution for 6mm focal length

Following equipment installation, horizontal and vertical coordinates of the camera locations and ground control points (GCPs) are surveyed with a total survey station. GCPs are landmarks observed in a camera view that have known object space and image space coordinates. For the series of physical model experiments conducted, GCPs consisted of tick marks painted on the varying bathymetry of the model. Figure 22 shows example GCPs for the Structure 3 and 4 experiments. Survey data, lens distortion corrections, image digitizer information, and a video snapshot of the drained physical model determined geometry solutions for each camera view. A geometry solution can be determined for each camera view with as few as two GCPs. However, more GCPs allow for a least-squares solution with minimal error. For each physical model configuration (i.e., Structures 1 through 4), cameras were reoriented to provide a field of view of the desired measurement area. A geometry solution was calculated for each camera orientation and stored in a database for access by the image processor and coordinate transformation algorithms. Structures 3 and 4 had the same camera orientation, eliminating recalculation of camera geometry.

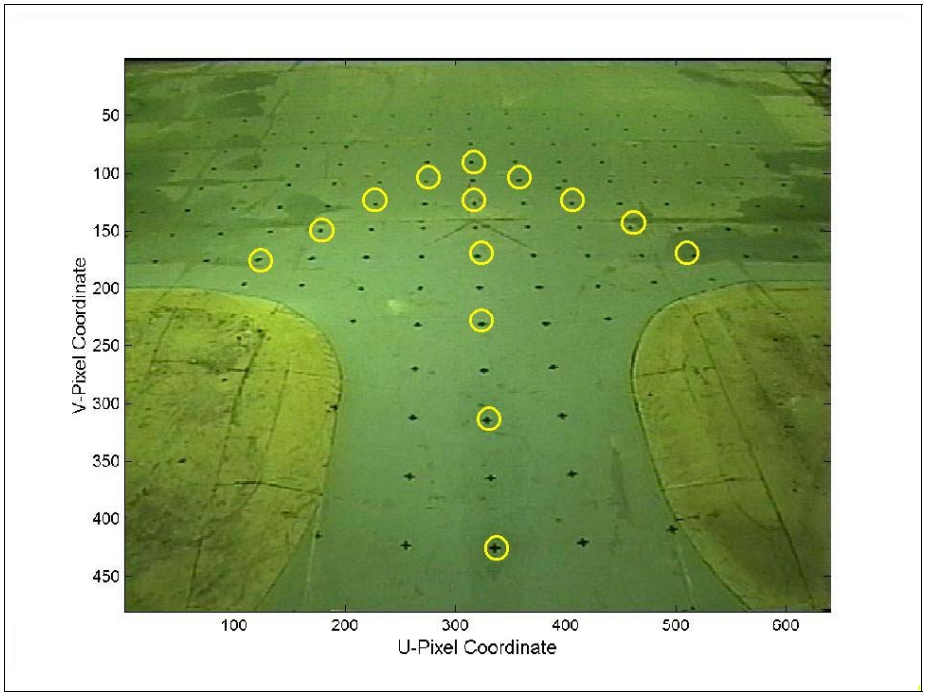


Figure 22. Structures 3 and 4 C1 camera view. GCP locations used for view geometry solution are circled

Diffuse incandescent lamps are positioned to illuminate the waves over an area of interest on the free surface in a manner to create a clearly visible signature of the wave field by the camera. Care is taken to prepare the area around and above the physical model to minimize undesired shadows and illumination within the field of view. During the testing phase of CIIS development, it was observed that the model illumination was refracted through the water column onto the model bathymetry. The refracted high-intensity bands dominated the video signal and degraded the phase structure of the observed

surface wave signal (Figure 23). To prevent the light refraction through the water column and to increase the strength of the desired signal, Sphericel™ hollow glass spheres were distributed throughout the water column (Figure 24). The spheres have the appearance of a white powder and a range of specific gravity of 0.1-1.5 g/cc. During wave generation, distribution of white pigmentation in the water column remains well mixed.

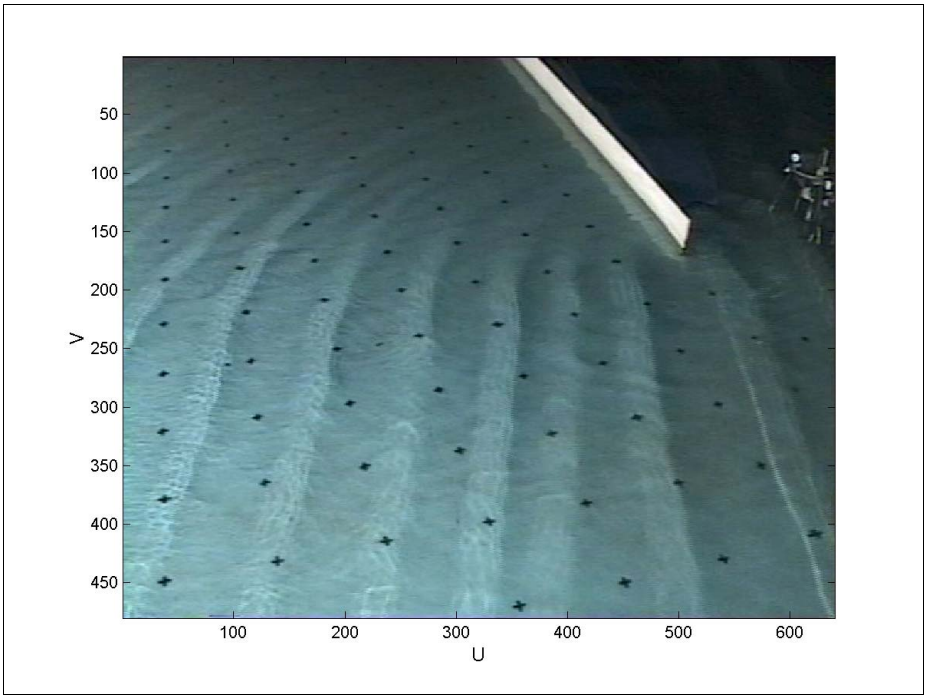


Figure 23. Structure 1, Experiment 1, Camera 4 video snapshot demonstrating undesired high-intensity signals and gradients in light intensity between wave crests caused by light refraction through the clear water column onto the model bathymetry, and reflection of light from the engineered structure

Structure 1, Experiments 1 through 3, were conducted before the application of the pigmentation to the physical model. Although video data were collected during Structure 1, Experiments 1 through 3, analysis is not presented due to poor signal quality. All other experiments conducted for Structures 1 through 4 included application of the pigment.

Data Acquisition and Analysis Procedures

Sampling design

For each experiment, an idealized field of virtual wave gauge arrays was designed to provide estimates of mean wave direction at high spatial resolution within the physical model. Based upon the generated target spectra and mean model water depth, an 0.8- by 0.8-m aperture cross-shaped array was designed to

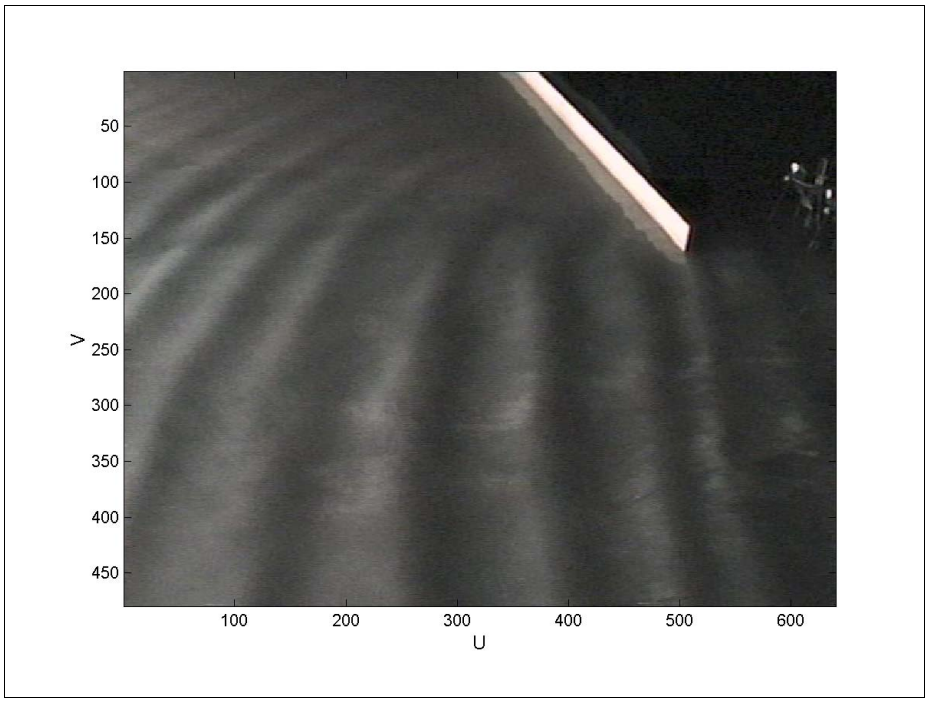


Figure 24. Structure 1, Experiment 4, Camera 4 video snapshot demonstrating the use of white pigment to eliminate refraction of light through the water column. High-intensity bands are the illuminated forward-facing surface wave slopes

optimize measurement of expected wavelengths (Figure 25). The array orientation resulted in 39 independent lag distances between all possible combinations of sensor locations. The wave phenomena of interest exist in a 3-D physical model coordinate system. However, the waves are observed with a 2-D video image. Image coordinates cannot be transformed to physical model coordinates since the problem is underdetermined. To solve the problem of coordinate transformation, information in addition to the camera geometry solution must be known. For the video application herein, the additional information required was the physical model still-water level (swl). Assuming that the pixel array sampling elements are located on the free surface of the physical model, the location of the swl and the camera geometry solution are combined to make the transformation between the 2-D and 3-D coordinate systems. Thus, each array element has a unique xy-coordinate and a common z-coordinate equivalent to swl in the physical model reference frame.

Pixel arrays are located to cover the region of interest in each camera view. Figures 26 through 32 show the superposition of the elements (+) of each pixel array for each camera view and model configuration. Open circles indicate array analysis output locations, and solid circles indicate collocated ADV-CIIS measurement locations. The number of pixel sampling elements for time series collection is described in Table 5.

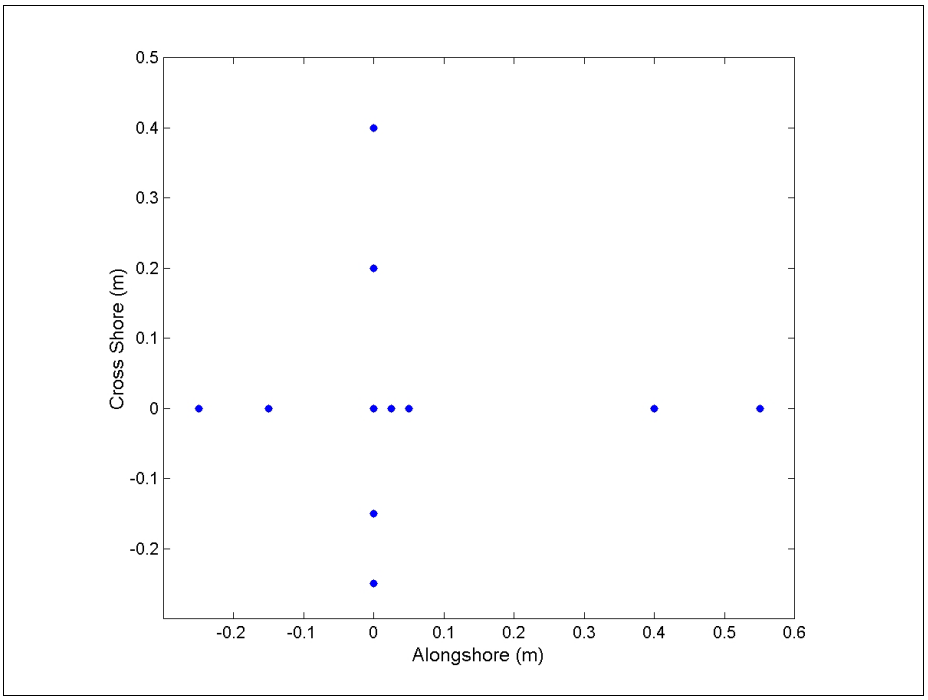
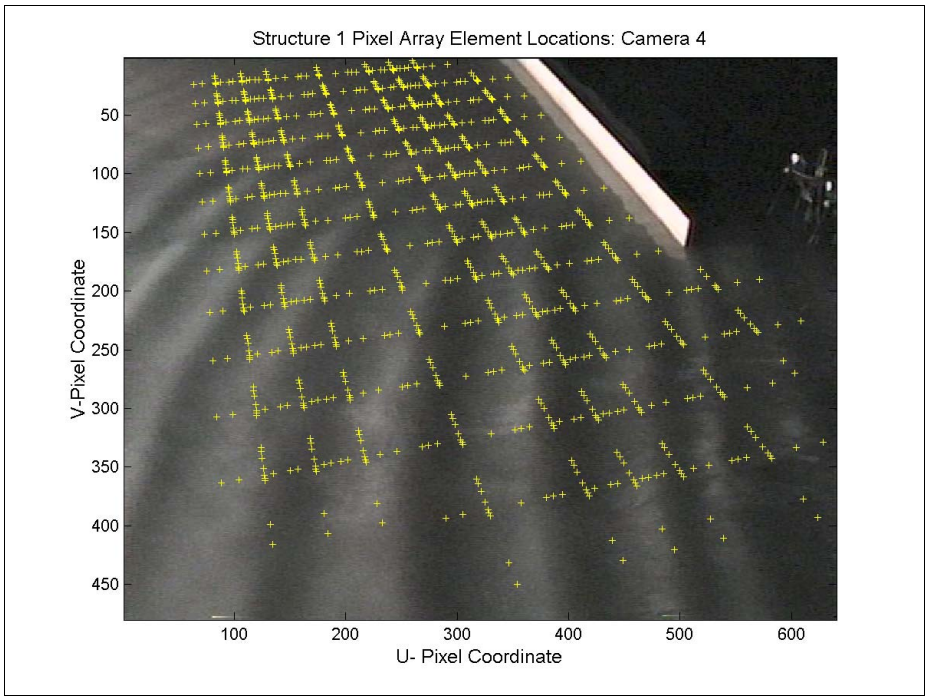


Figure 25. 0.8- by 0.8-m-aperture cross-shaped pixel sampling array orientation and pixel sensor spacing

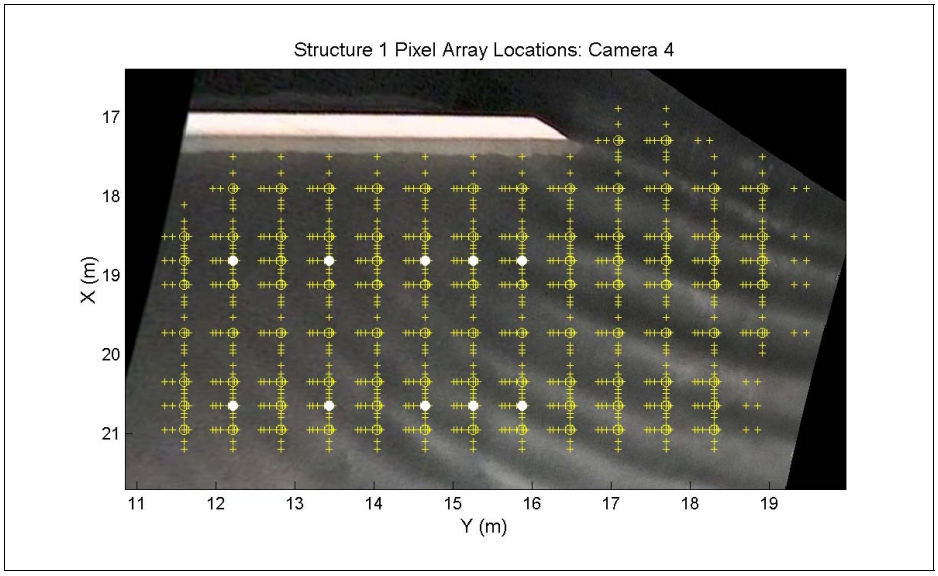
For Structure 1, the two camera views overlap slightly resulting in 20 collocated CIIS arrays. The combination of the two views results in 82 video-based directional measurement locations. The Structure 2 experiment arrangement required four camera views to cover the measurement area of interest. Arrays are regularly spaced in a 0.3-m grid. Edges of the camera views overlap slightly, resulting in 72 collocated CIIS arrays. Combination of the Structure 2 camera views produces 481 video-based directional measurement locations. For the Structure 3 and 4 arrangements, a single camera view was required to observe the measurement area. Arrays are regularly spaced at 0.3-m intervals, giving 305 measurement locations. Sampling elements are located on only one-half of the diffraction region, because it is assumed that diffraction patterns are symmetric in the bay for this model configuration.

Image processing

Recorded video of the wave experiment is played back to the image processor for digitization. The platform for the image processing software is a Silicon Graphics Inc™ R5000 video workstation. The highest frequency that can be defined by the CIIS sampling rate of 30 Hz is 15 Hz. Frequency content above 15 Hz in the original signal will be aliased or "folded" into the frequency range between 0 and 15 Hz. Because the high-frequency limits of the target spectra were sufficiently lower (<70 percent) than the band limiting frequency,

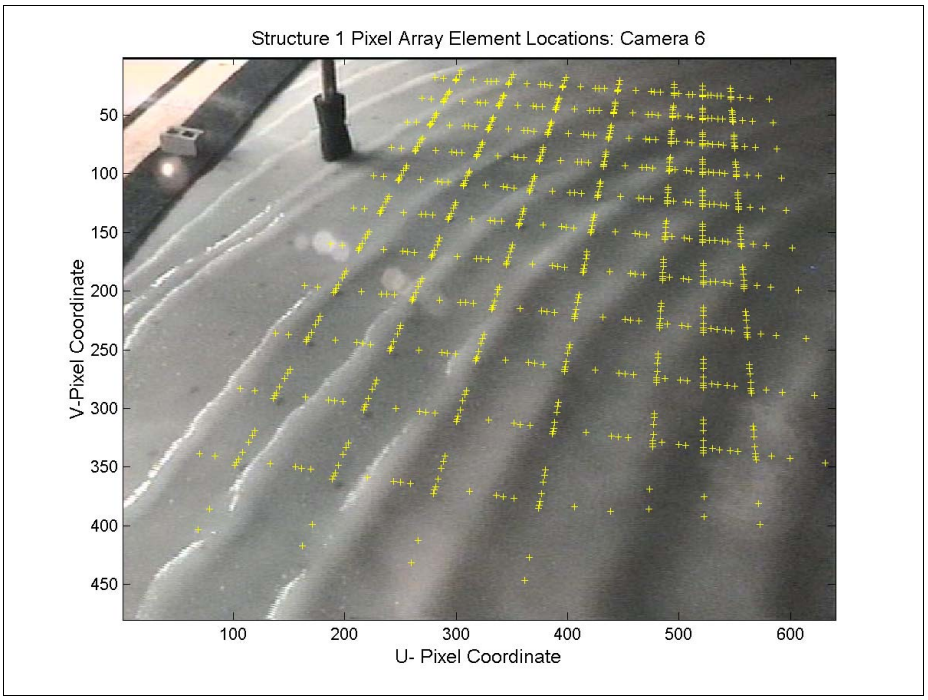


a. Sampling element locations superimposed on a Experiment 4 snapshot

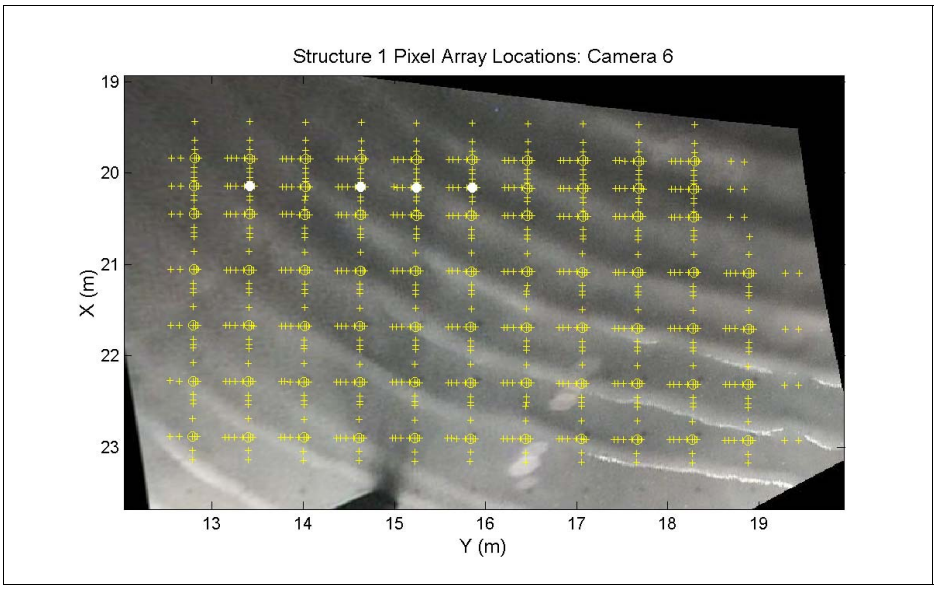


b. Sampling element locations transformed from image space to object space

Figure 26. Structure 1, Camera 4, image space sampling element locations

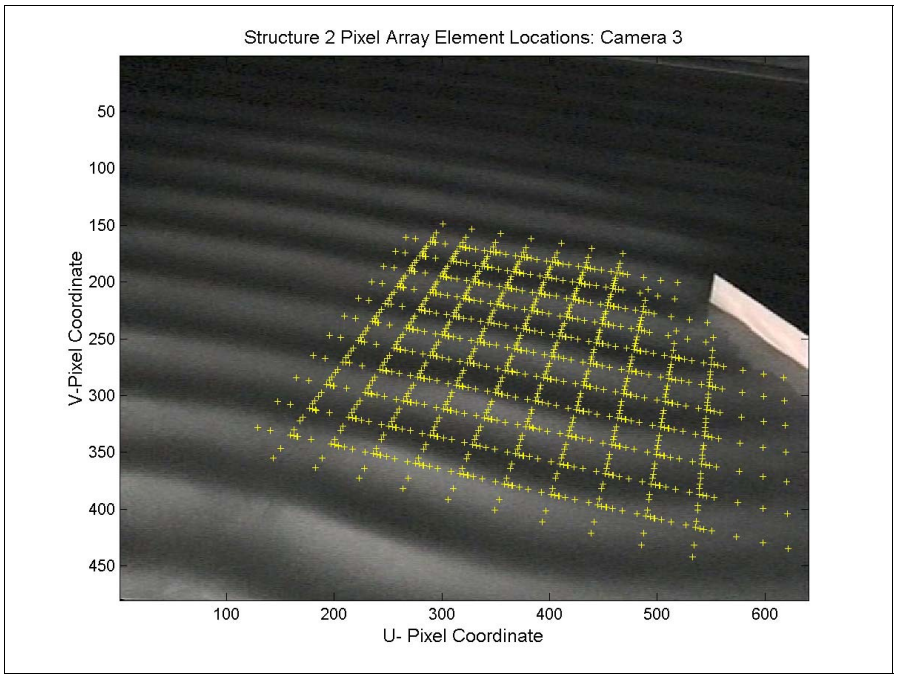


a. Sampling element locations superimposed on an Experiment 4 snapshot

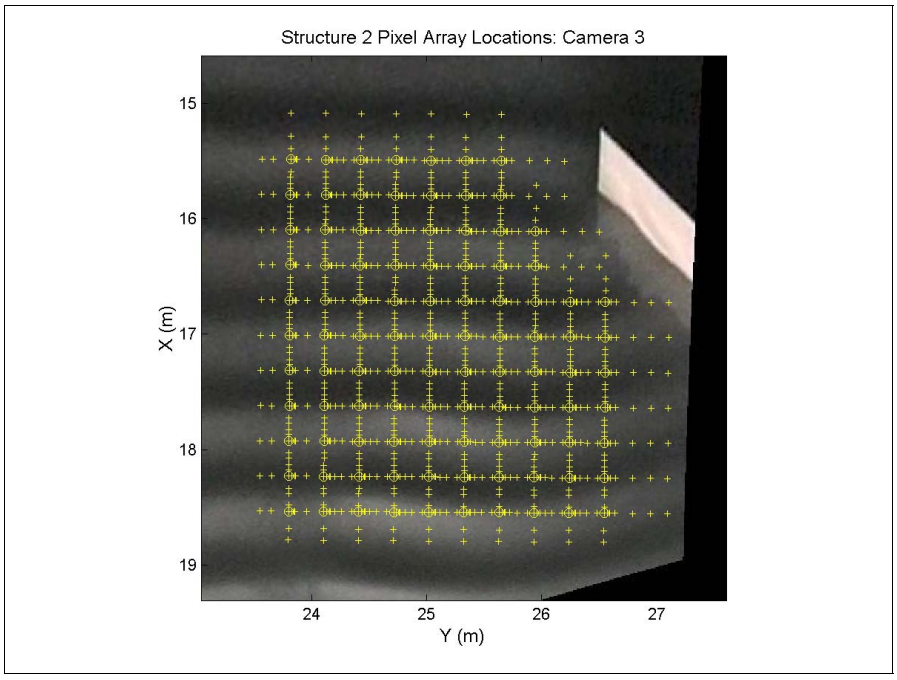


b. Sampling element locations transformed from image space to object space

Figure 27. Structure 1, Camera 6, image space sampling element locations

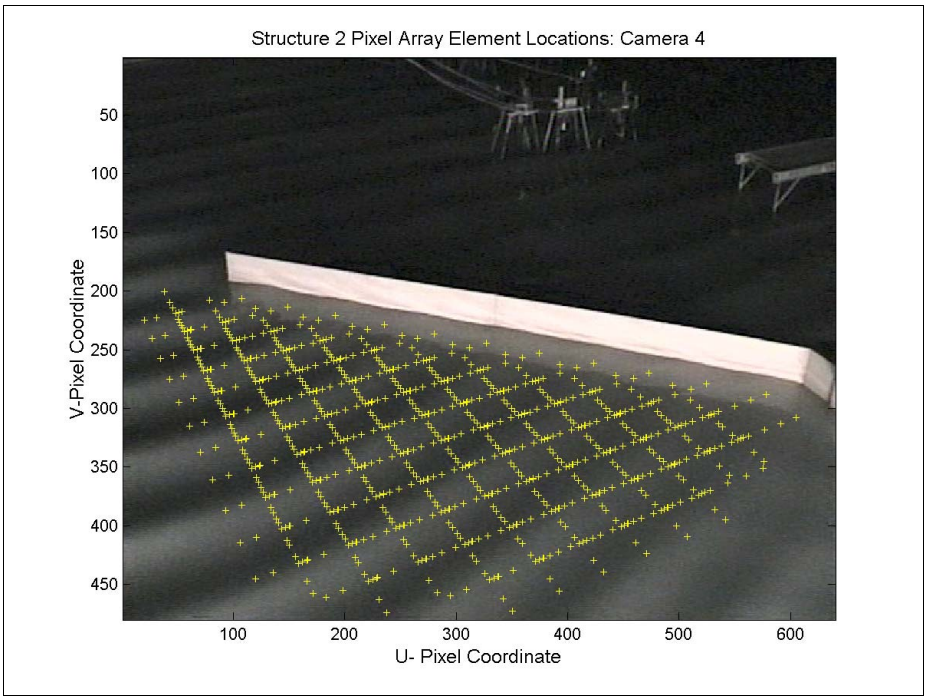


a. Sampling element locations superimposed on an Experiment 3 snapshot

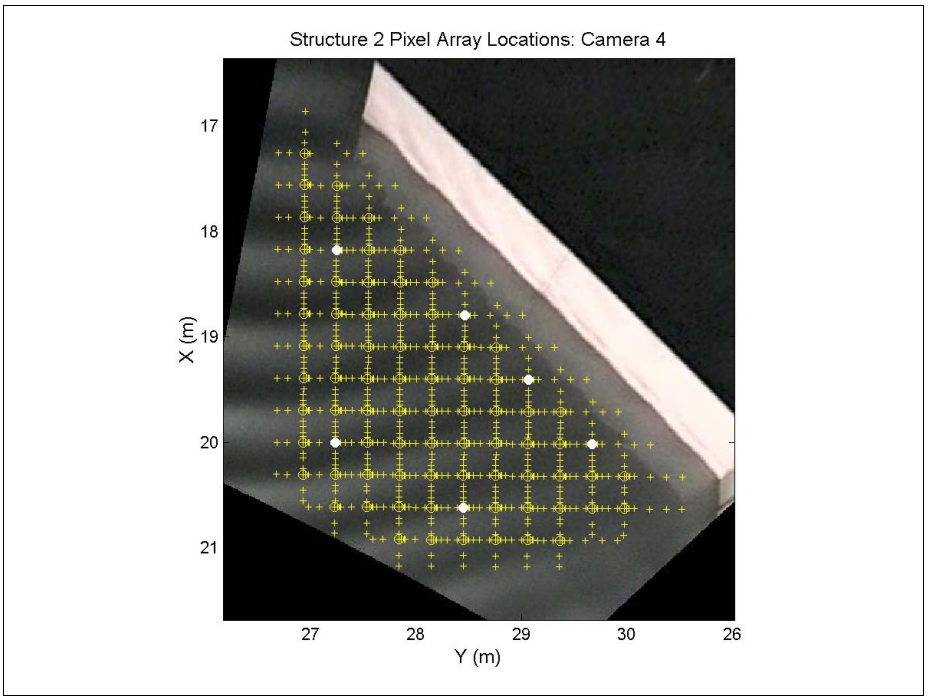


b. Sampling element locations transformed from image space to object space

Figure 28. Structure 2, Camera 3, image space sampling element locations

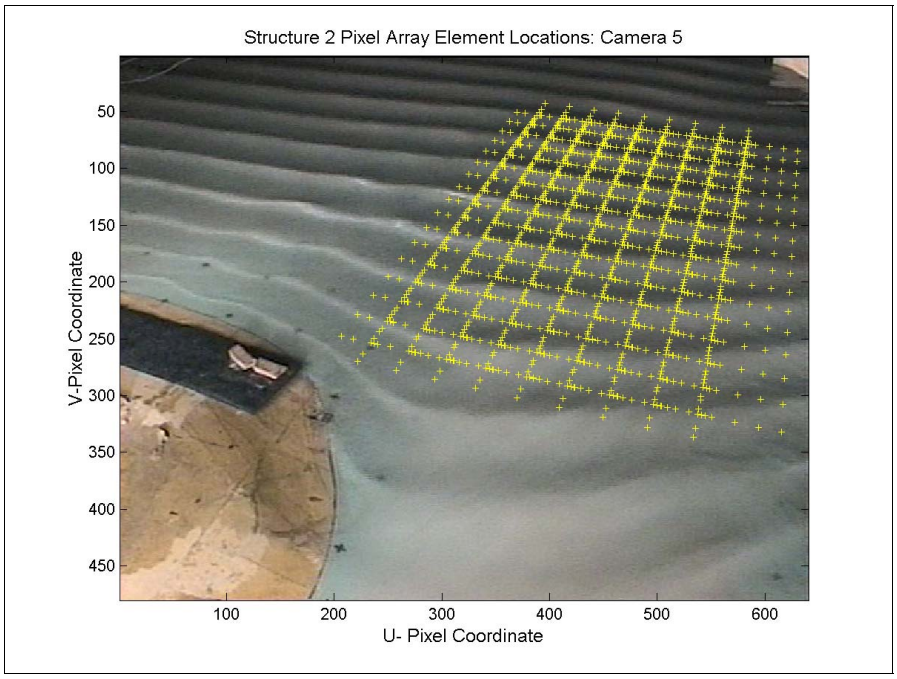


a. Sampling element locations superimposed on an Experiment 3 snapshot

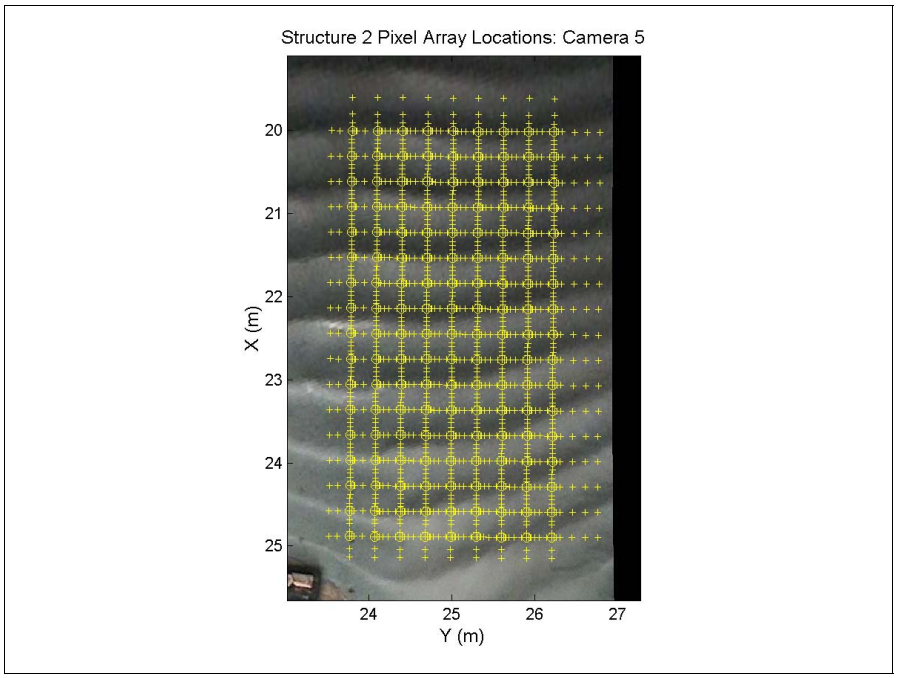


b. Sampling element locations transformed from image space to object space

Figure 29. Structure 2, Camera 4, image space sampling element locations

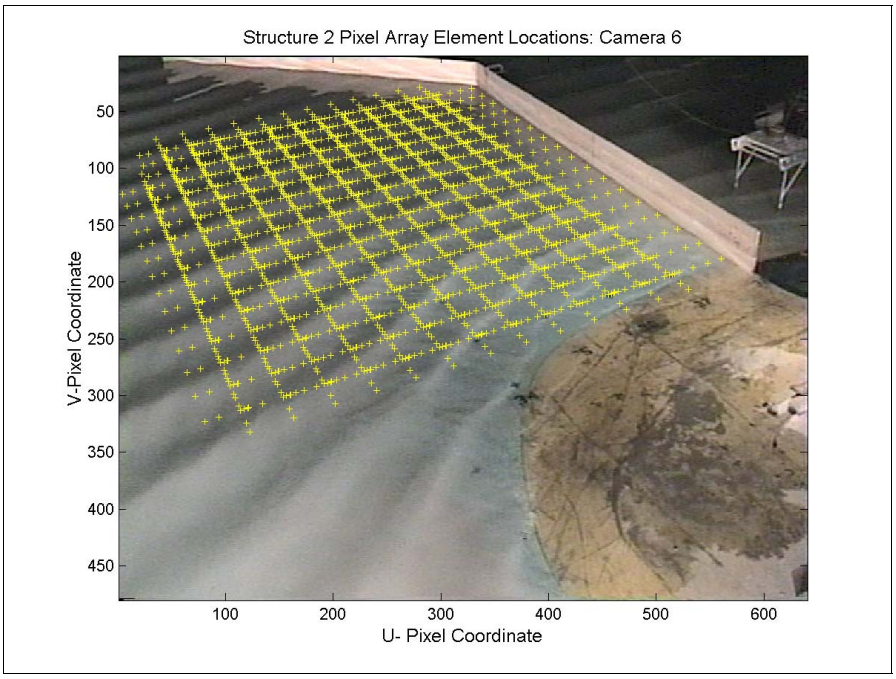


a. Sampling element locations superimposed on an Experiment 3 snapshot

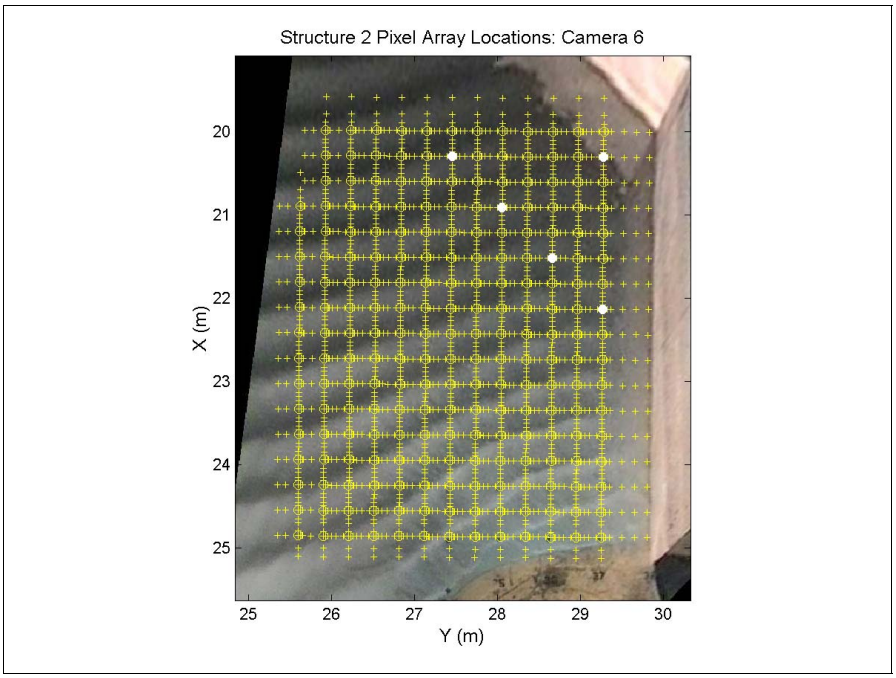


b. Sampling element locations transformed from image space to object space

Figure 30. Structure 2, Camera 5, image space sampling element locations

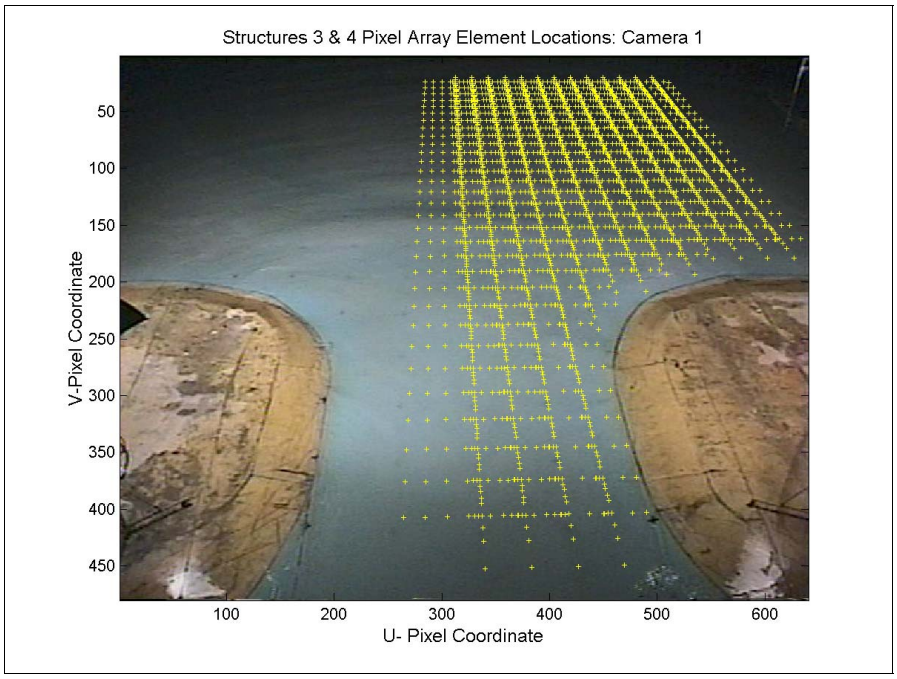


a. Sampling element locations superimposed on an Experiment 3 snapshot

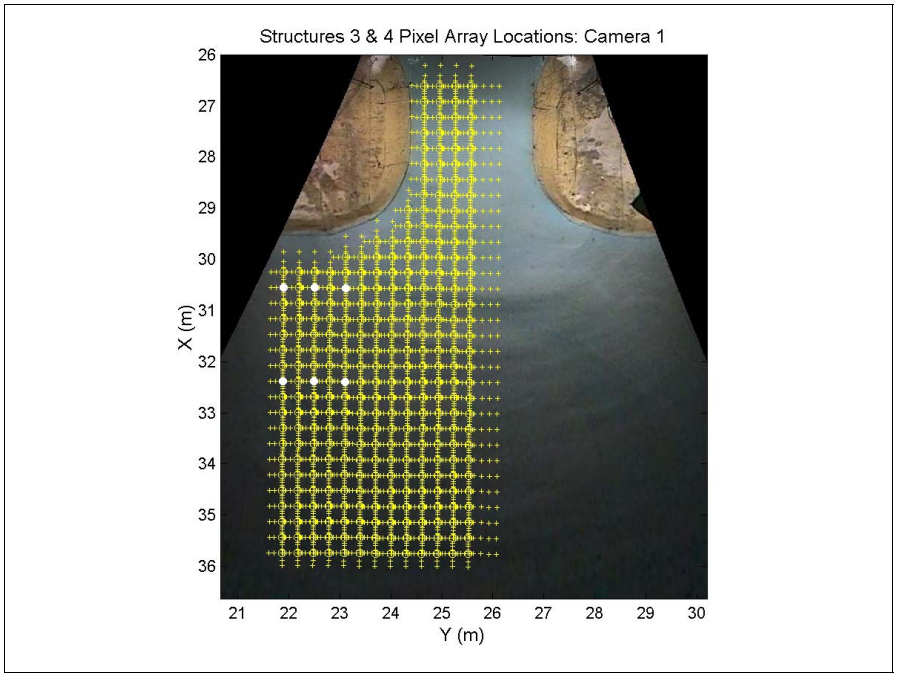


b. Sampling element locations transformed from image space to object space

Figure 31. Structure 2, Camera 6, image space sampling element locations



a. Sampling element locations superimposed on an Experiment 3 snapshot



b. Sampling element locations transformed from image space to object space

Figure 32. Structures 3 and 4, Camera 1, image space sampling element locations

Table 5
Number of Pixel Sampling Elements and CIIS Arrays

Experimental Arrangement	Camera View	Sampling Elements	Arrays	Collocated CIIS Arrays
Structure 1	C4	1133	103	20
	C6	814	74	
Structure 2	C3	1100	100	72
	C4	902	82	
	C5	1683	153	
	C6	2398	218	
Structure 3	C1	3355	305	NA
Structure 4	C1	3355	305	NA

no effort was made to remove information contained in the original analog signals. During the playback process, the image processor collects time series records of pixel intensity at locations corresponding to measurement array elements. The software reads VITC on each video frame to locate the image records of interest.

Pixel intensity time series records are called timestacks. Pixel intensities are recorded as unsigned numerical representatives of gray values ranging from 0 (dark) to 255 (bright). Figure 33 shows an example timestack collected at a sample rate of 30 Hz for duration of 10 sec during a random wave test. Bright regions of the timestack are associated with the wave crest and wave slope facing the illumination source. Dark regions of the timestack are associated with the wave trough and slope of the wave facing away from the illumination in the shadow of the wave.

Time series analysis

As previously mentioned, the premise for use of CIIS as a wave direction measurement system is that, for waves propagating past a fixed point on the free surface, the intensity of directional specular reflection from the surface of the wave slope varies from light to dark. It is assumed that, outside of the wave-breaking region, the phase structure of the timestacks is a proxy for the phase structure of the true propagating wave signal. To exemplify this assumption, Figure 34 shows synchronized time series records of reflected light intensity and wave height from a collocated pixel sampling element and capacitive wave rod. These measurements were obtained during a Structure 4 monochromatic wave test in the diffraction region, and temporal variations from peak to trough are strongly correlated.

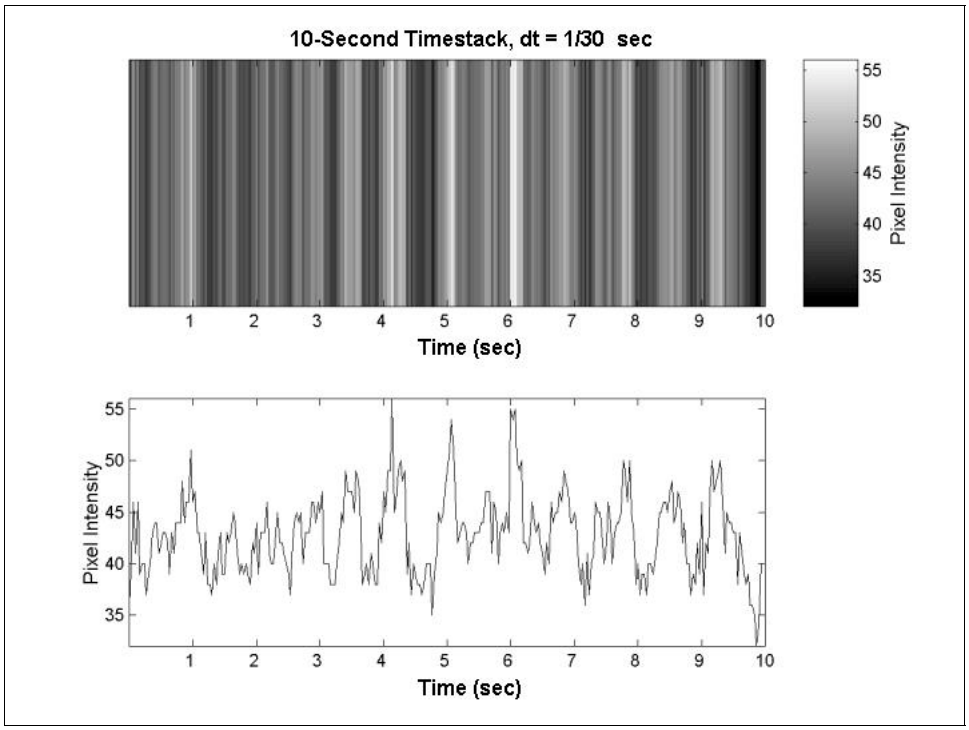


Figure 33. Example 10-sec-duration timestack recorded in the diffraction region during the Structure 4 monochromatic wave experiment

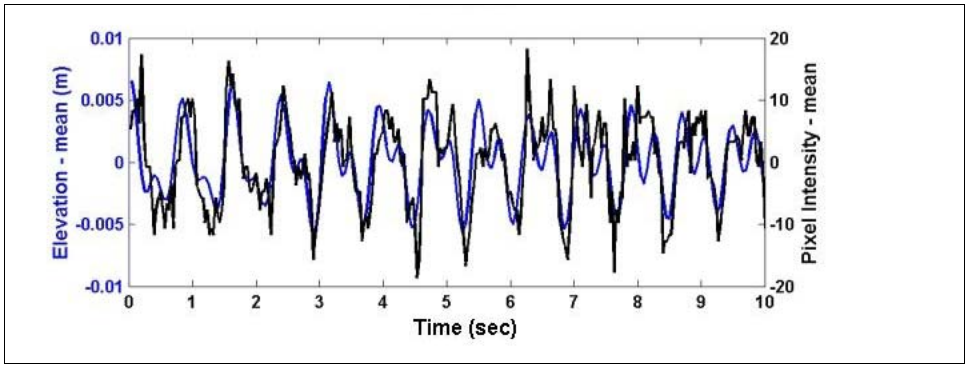


Figure 34. Example 10-sec time series records measured by collocated capacitive wave rod and pixel sampling element in the diffraction region during the Structure 4 monochromatic wave experiment

Timestacks are analyzed to provide estimates of vector-mean wave direction $\theta_m(f)$. Directions are derived from the phase difference between the signals measured at one location relative to the signal at another for all array elements. Figure 35 shows a visual example of the phase structure observed by the alongshore elements of a pixel array during a random wave test for a duration of 10 sec. Focusing on the record between 3 and 4 sec, the slight temporal offset of the low intensity between sampling locations is indicative of a wave propagating obliquely through the array. With the separation distance between elements of a pixel array known in real-world coordinates, timestacks are analyzed in terms of an estimated root-mean-square average wave number $k_{rms}(f)$ following Herbers, Elgar, and Guza (1995). This method is based on an expansion of the theoretical cross-spectrum of gravity waves for small sensor separations relative to wavelength. The computed wave number moments are extended to calculations of alongshore and cross-shore components of wave number $k_y(f)$ and $k_x(f)$ by linear combination of normalized quadspectra:

$$k_x = \sum_{p=1}^{N}\sum_{q=1}^{N}\alpha_{pq}\frac{Q_{pq}(f)}{\sqrt{P_{pp}(f)P_{qq}(f)}} \tag{2}$$

where

Qpq = quad-spectrum of pixel sensor pair locations in 3-D coordinate system $[x_p, y_p]$ and $[x_q, y_q]$

N = number of array elements

P_{pp} and P_{qq} = autospectra for pixels sensors located at $[x_p, y_p]$ and $[x_q, y_q]$

Least-squares fit solutions of wave number coefficients α_{pq} are obtained by singular value decomposition of

$$\sum_{p=1}^{N}\sum_{q=1}^{N}\alpha_{pq}i^n\frac{(x_p-x_q)^{n-m}(y_p-y_q)^m}{(n-m)!m!}=1 \tag{3}$$

for $n = 2$, $m = 0$ and $n = 2$, $m = 1$, and

$$\sum_{p=1}^{N}\sum_{q=1}^{N}\alpha_{pq}i^n\frac{(x_p-x_q)^{n-m}(y_p-y_q)^m}{(n-m)!m!}=0 \tag{4}$$

for n and m = other and $i^n = \sqrt{-i}$. The number of terms in the expansion was constrained to 8, and the truncation value for the smallest eigenvalue (relative to the largest eigenvalue) was 10^{-4}.

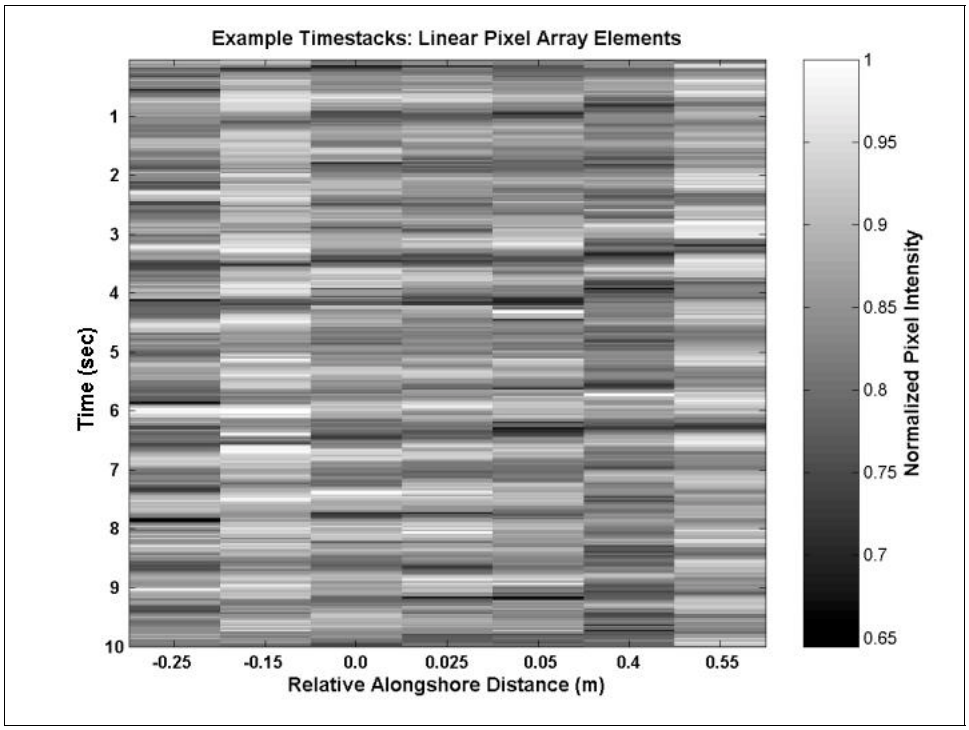


Figure 35. Example 10-sec normalized timestacks obtained from the alongshore elements of a cross-shaped array during a spectral wave experiment

Estimates of the normalized cospectra and quadspectra are obtained from Fourier transforms of sensor pair timestacks. Each timestack is 7 min in duration and consists of 12,600 samples. To improve computational performance, frequencies above 3 Hz were not considered for analysis. Timestacks were linearly detrended, tapered, and divided into six ensembles of 2,048 samples and band averaged resulting in a frequency resolution of 0.0439 Hz and 36 deg of freedom.

With each physical model configuration (Structure) and generated wave spectrum (Experiment), the direction region represented a broad range of wave heights. In addition, a gradient in light illuminated the measurement areas. Therefore, noisy pixel intensity signals and low coherence between sampling elements of pixel arrays were anticipated. For example, low-amplitude and low-variance pixel intensity fluctuations may be observed across a poorly illuminated array. Conversely, high pixel intensity and low variance may be observed across array elements in brightly lit areas. The coherence-squared function was calculated for all possible gauge pairings in an array. To avoid spurious results in the calculation of $\theta_m(f)$, a coherence-squared threshold amplitude value of 0.7 was arbitrarily selected. Coherence-squared estimates equal to or above the threshold value indicate meaningful coherence between array element pairings. Only frequency content of array pairings with meaningful coherences was accepted to calculate estimates of $\theta_m(f)$ with reliability. Estimates of $\theta_m(f)$ meeting the coherence cutoff criteria are typically at or near the spectral peak.

Validation

Video measurements of $\theta_m(f)$ are validated against collocated in situ ADV probe measurements. ADV observations of horizontal velocity components were sampled at a rate of 20 Hz for a duration of 204.8 sec, resulting in 4,096 samples. Time series records were linearly detrended, tapered, and ensemble averaged resulting in a frequency resolution of 0.078 Hz and 32 deg of freedom with a maximum frequency cutoff of 5 Hz.

To facilitate comparison, ADV energy density and direction values were interpolated using a piecewise cubic Hermite interpolation within the frequency bands observed by the video system. Superimposed on the rectified (lower) images shown in Figures 26, 27, 29, 31, and 32 are solid circles that represent ADV and CIIS measurement collocations. Figure 36 is a representative graphical comparison of normalized energy density and direction versus frequency at a single measurement location for a random wave experiment (f_{peak}= 1.25 Hz). The peak spectral density for graphical comparison normalizes the variance spectrum. For visual reference, Appendix P presents a graphical comparison of energy density and mean direction versus frequency for each Structure 1 collocated CIIS-ADV location.

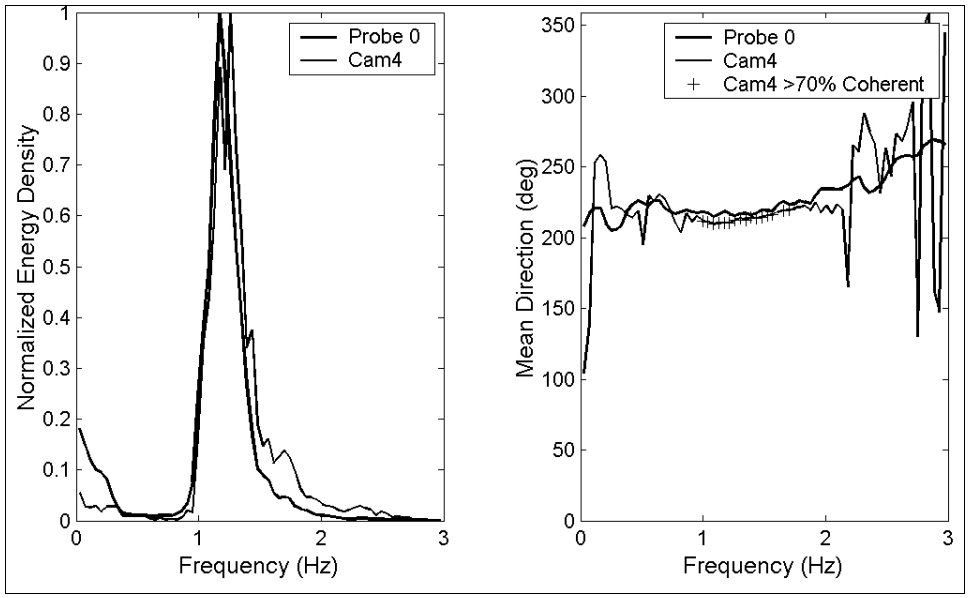


Figure 36. Representative collocated video-ADV spectra

Several statistics were selected to compare mean wave directions obtained near the peak of the spectra for the two measurement techniques. These statistics include mean angular difference (scalar wave direction bias), standard deviation of mean angular difference, root-mean-square error and correlation coefficient. These statistics are defined as follows for X_i (ADV observation) and Y_i (CIIS observation), and a wave direction vector magnitude of unity:

a. Wave Direction Mean Angular Difference, <Δθ>.

$$\langle \Delta\theta \rangle = \tan^{-1}\left[\frac{\sum \sin(Y_i - X_i)^2}{\sum \cos(Y_i - X_i)^2} \right] \tag{5}$$

b. Standard Deviation of Wave Direction Mean Angular Difference, σ_{θ}.

$$\varepsilon = \sqrt{1 - \left[\left(\sin \Delta\theta \right)^2 + \left(\cos \Delta\theta \right)^2 \right]} \tag{6}$$

$$\sigma_{\theta} = \sin^{-1} \varepsilon \left[1 + 0.1547 \varepsilon^3 \right] \tag{7}$$

c. Wave Direction Root-Mean-Square Error $RMSE_{\theta}$.

$$RMSE_U = \sqrt{\frac{1}{N} \sum \left\{ \left[\cos Y_i - \cos X_i - \left(\langle \cos Y \rangle - \langle \cos X \rangle \right) \right] \right\}^2} \tag{8}$$

$$RMSE_V = \sqrt{\frac{1}{N} \sum \left\{ \left[\sin Y_i - \sin X_i - \left(\langle \sin Y \rangle - \langle \sin X \rangle \right) \right] \right\}^2} \tag{9}$$

$$RMSE_{\theta} = \sqrt{RMSE_U{}^2 + RMSE_V{}^2} \tag{10}$$

where subscripts *U* and *V* indicate the u-vector and v-vector components.

d. Wave Direction Vector Scatter Index SI_{θ}.

$$SI_{\theta} = \frac{RMSE_{\theta}}{\sqrt{\langle \cos X \rangle^2 + \langle \sin X \rangle^2}} * 100 \tag{11}$$

e. Wave Direction Vector Correlation Coefficient R_{θ}.

$$R_U = \frac{\sum(\cos X_i - \langle \cos X \rangle)(\cos Y_i - \langle \cos Y \rangle)}{\sqrt{\sum(X_i - \langle \cos X \rangle)^2 \sum(Y_i - \langle \cos Y \rangle)^2}} \quad (12)$$

$$R_V = \frac{\sum(\sin X_i - \langle \sin X \rangle)(\sin Y_i - \langle \sin Y \rangle)}{\sqrt{\sum(X_i - \langle \sin X \rangle)^2 \sum(Y_i - \langle \sin Y \rangle)^2}} \quad (13)$$

$$R_\theta = \sqrt{\frac{1}{2}({R_U}^2 + {R_V}^2)} \quad (14)$$

Figure 37 contains scatterplots of wave directions near the spectral peak for collocated CIIS and ADV observations. Only CIIS observations meeting the coherence cutoff criterion were selected for comparison. Table 6 summarizes the scatterplots. The statistics show good correlation between the two measurement techniques, with low scatter indices. Where the CIIS coherence cutoff criterion is met, wave directions are typically within the reported margin of error for the ADV probe measurements.

Table 6
Structure 1: ADV versus CIIS Validation Statistics for Mean Wave Directions Measured Near the Spectral Peak

Experimental Arrangement	<Δθ> deg	σ_θ deg	$RMSE_\theta$ deg	SI_θ	R_θ
Structure 1[a]	2.64	4.57	4.58	8	0.89
Structure 2	1.98	7.02	6.99	12	0.79
Structure 3[b]	-5.16	13.08	13.14	24	0.77
Structure 4[c]	-1.27	7.78	7.66	14	0.93

[a] Structure 1: Only experiments X4, X5, X6 analyzed.
[b] Structure 3: X1c and X2c did not meet coherence cutoff criterion.
[c] Structure 4: X2 did not meet coherence cutoff criterion.

Results

Analysis of pixel array timestacks resulted in estimates of mean spectral density $S(f)$ and vector-mean wave direction $\theta_m(f)$. To demonstrate the video system application, peak vector-mean wave direction for Structure 1, Experiment 2 (random wave, f_{peak} = 1.25 Hz) is indicated by arrows (scaled by wave celerity) superimposed on a rectified snapshot of the wave field in Figure 38. Arrows with a circled tail represent directions obtained from analyses meeting the strict coherence cutoff criterion. Some arrows without circled tails are spurious in direction and magnitude in the diffraction area behind the breakwater.

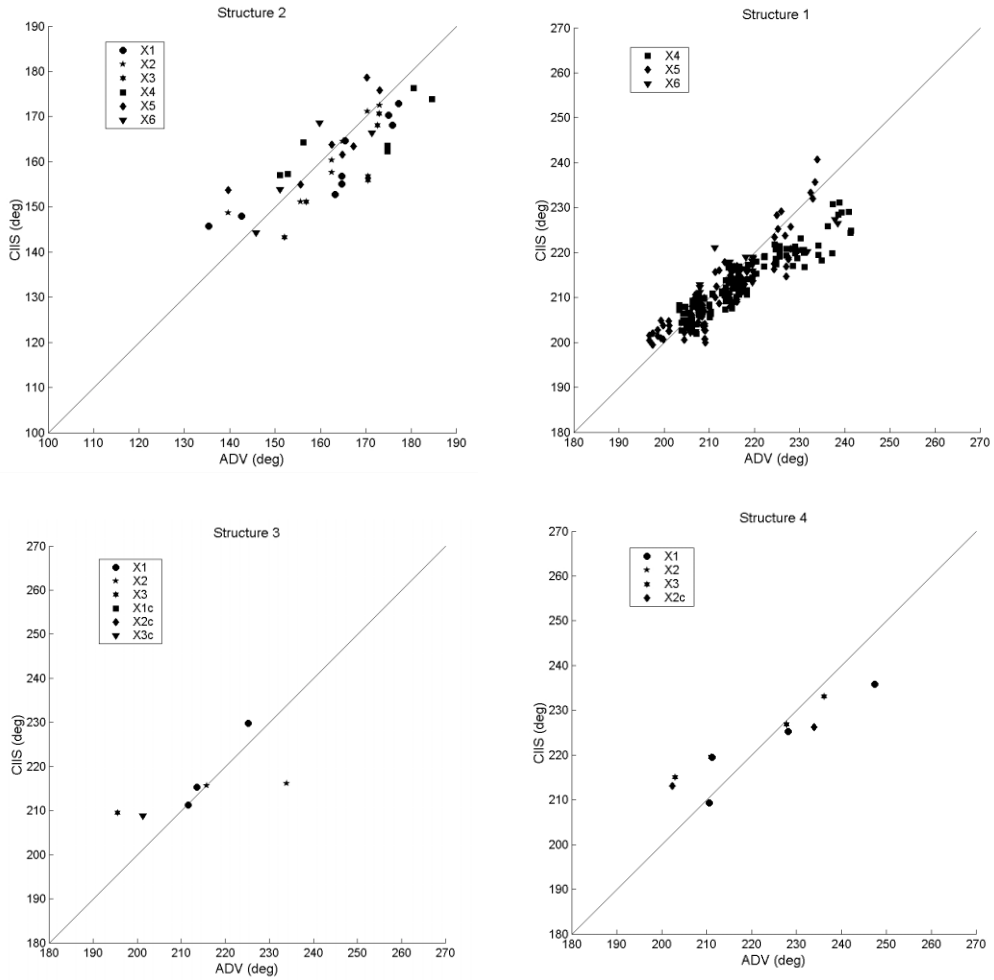


Figure 37. CIIS and ADV intercomparison for wave direction measurements obtained near the spectral peak for Structures 1 through 4. Solid line is 1:1 slope. Only CIIS observations meeting the coherence cutoff criterion were selected for analysis

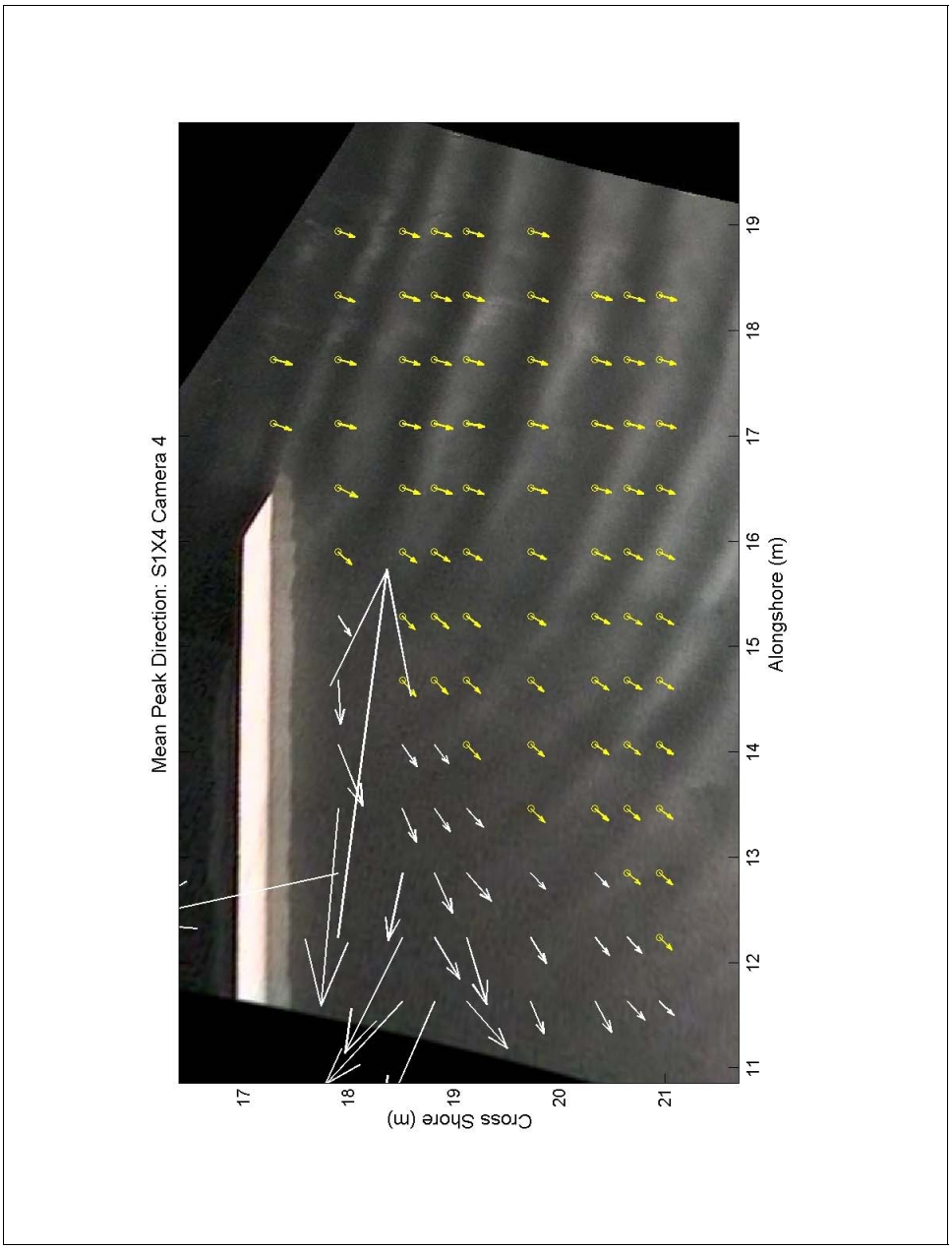


Figure 38. Peak vector-mean wave direction CIIS analysis for Structure 1, Experiment 4, Camera 4

Several general sources of measurement error are identified and the accuracy of the CIIS may be improved upon in future experimentation. In the wave diffraction region where wave height is significantly reduced or in regions of the measurement area that are poorly illuminated, the visual signal of the wave degrades due to lack of contrast. Figure 38 exemplifies lack of image contrast in the diffraction region behind the breakwater structure where the wave direction arrows are spurious. Image contrast may be improved by adjustment of the lens iris, improved directional illumination, and use of a monochromatic camera system. With a monochromatic camera, signal degradation may be reduced and image contrast improved. In the Structure 3 and 4 experiments, the camera and sources of illumination were directed along the axis of the inlet. The rear face of waves was illuminated as they propagated through the inlet to the bay. Waves entering the bay were refracted and diffracted, with the sharpest turning angles at the shoulder of the inlet. In this area, wave crests approached an alignment parallel with spectral illumination, reducing the variance in radiance between the forward and rear faces of the wave received by the camera. Put simply, the ability to visually distinguish between front and rear faces of the wave was diminished.

Figure 39 shows the effect of undesired light reflection on the video analysis. In the upper right corner of the image the reflection of the jetty structure is observed on the water surface. The shape of the reflection deforms with perturbations of the water surface, and the channels of the pixel array record its visual signal. The contaminated time-history records prevent the phase relationship between array channels to be determined accurately for the phenomenon of interest. Shadows cast within a measurement array may also cause this contamination of signal.

Another potential source of measurement error is array geometry. It is assumed that processes being measured are homogeneous within the array aperture. However, this may not be the case where large changes in direction are occurring over a small area. Measurement array geometry may be optimized to better resolve wave direction where waves are making large turning angles approaching a direction perpendicular to the long axis of the array. Waves breaking on currents and the shore also produced inhomogeneities within the measurement array.

For each model configuration, experiment, and camera view, spectral peak vector-mean wave direction plots are presented in Appendix Q. Due to the large volume of analysis results generated by this investigation, $S(f)$ and $\theta_m(f)$ are presented in tabular form in ASCII data files compiled on a CD that accompanies this report. It describes the naming convention and file formats for the data contained on the CD.

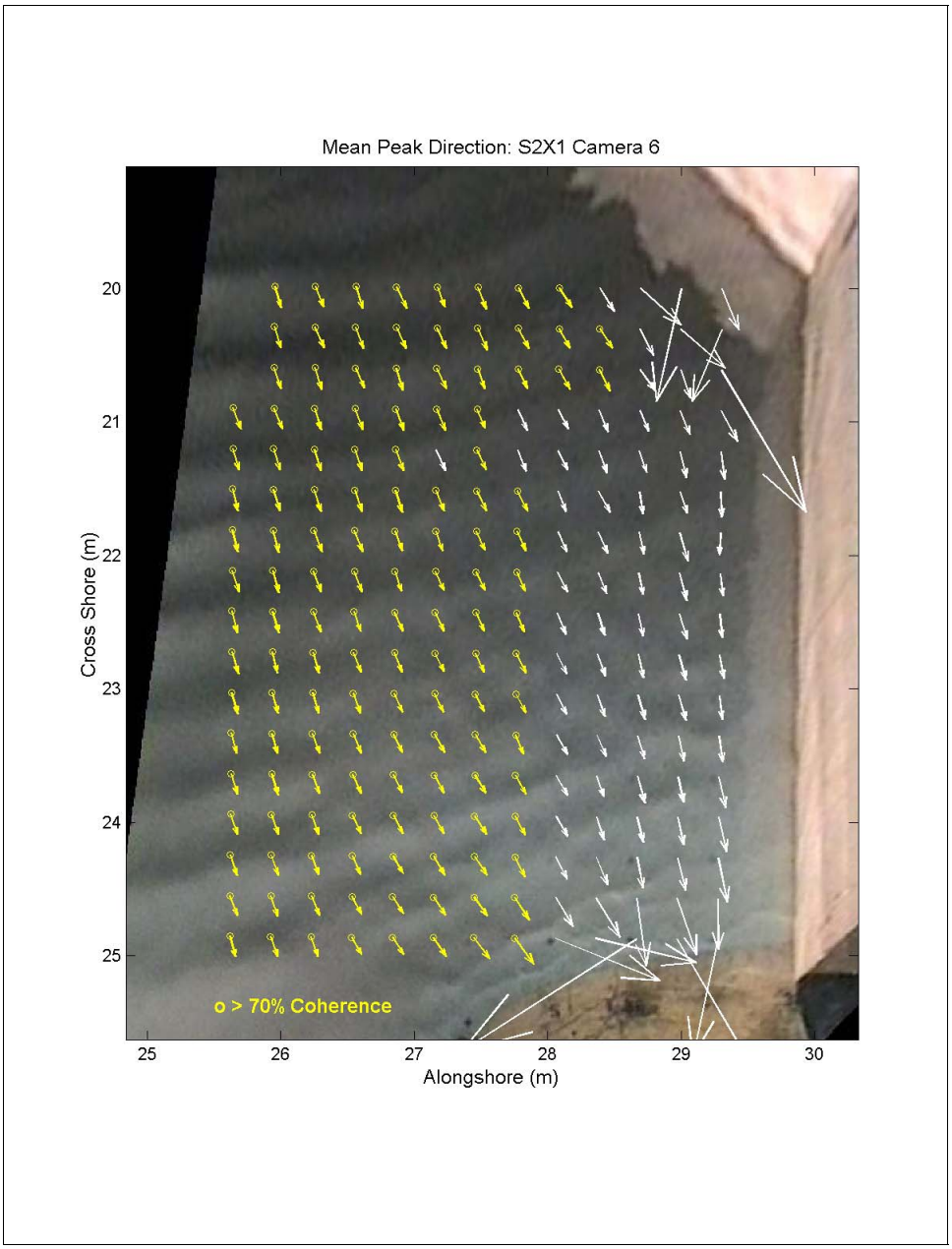


Figure 39. Peak vector-mean wave direction CIIS analysis for Structure 2, Experiment 1, Camera 6

6 Summary and Conclusions

Summary

Water level (wave height variation) and wave directional data were collected at numerous locations for situations typical of coastal inlets. The objective was to supply data sets that contain information with diffracting, refracting, and shoaling waves to aid in the development of numerical models that simulate field conditions. The measurements were collected at an idealized inlet with smooth contours. The following configurations were examined:

a. An offshore breakwater directly up-coast of the inlet region with a bathymetry behind it that has a sloping bottom terminating at the beach (Structure 1).

b. A dogleg jetty on one side of a coastal inlet (Structure 2).

c. An unjettied inlet, with measurements collected on the bay side (Structure 3). These experiments were performed with and without a flood current.

d. A jettied inlet, with measurements collected on the bay side (Structure 4). These experiments were performed with and without a flood current.

Results from a physical model laboratory study of spatially dense wave direction measurements in the diffraction regions of coastal inlet structures were presented. To obtain these measurements, a video-based metric system was developed, implemented, and validated. This system is called the Coastal Inlets Imaging System (CIIS). Although the system was developed using commercially available hardware and standard image processing and photogrammetric techniques, the application of the CIIS to provide spatially dense measures of wave direction over a large area of interest represents an advance in wave measurement technology. Experimentation confirms that the system provides spatially dense and accurate measures of wave direction over a large area of interest, which is not economically obtained by standard in situ methods.

Conclusions

Based on the information presented in this report, it is concluded that:

a. The comprehensive data presented in this report will provide calibration information for numerical models of wave refraction and diffraction.

b. The CIIS was successfully validated and provided wave-direction—frequency information in the difficult physical model environment.

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Appendix A
Notation

2-D	Two-dimensional
3-D	Three-dimensional
ADV	Acoustic Doppler Velocimeter
C	Wave celerity
C1, C2, C3, C4, C5, C6	Cameras 1, 2, 3, 4, 5, 6
CD	Compact disc
CIIS	Coastal Inlets Imaging System
CIRP	Coastal Inlets Research Program
d	Still-water depth, ft
e	Average water level relative to pretest still-water level, ft, referenced to mean water level
f	Frequency, 1 sec
f	Lens focal length
GCP	Ground control point
H_a	Average wave height from down-crossing time series analysis
H_m	Maximum wave height, ft
H_s	Significant wave height from down-crossing time series analysis, ft
i	$\sqrt{-i}$
I	Pixel intensity
k	Wave number
k_x	Cross-shore wave number component
k_y	Alongshore wave number component
k_{rms}	Root-mean-square average wave number

ℓ	Length
N	Number of array elements
NA	Not applicable
P_{pp}	Autospectra of pixel sensor pair at $[x_p, y_p]$
p_{qq}	Autospectra of pixel sensor pair at $[x_q, y_q]$
PUV	Pressure and horizontal velocity components
Q_{pq}	Quad-spectrum of pixel sensor pair location in 3-D coordinate system $[x_p, y_p]$ and $[x_q, y_q]$
R_U	u-vector component of wave direction correlation coefficient
R_V	v-vector component of wave direction correlation coefficient
R_θ	Wave direction vector correlation coefficient
$RMSE_U$	u-vector component of wave direction root-mean-square error
$RMSE_V$	v-vector component of wave direction root-mean-square error
$RMSE_\theta$	Wave direction root-mean-square error
$S(f)$	Mean spectral density as a function of frequency presented in units of m^2/Hz for ADV and I^2/Hz for CIIS
$S(f)_n$	Normalized mean spectral density as a function of frequency presented in units of m^2/Hz for ADV and I^2/Hz for CIIS. Normalized by maximum $S(f)$
SI_θ	Wave direction vector scatter index
t	Time
T_p	Peak wave period
T_s	Significant wave period, sec
u	Horizontal image coordinate
v	Vertical image coordinate
VITC	Vertical Interval Time Code
x	Distance offshore; X-coordinate of imaged object in 3-D coordinate system
x_c	X-coordinate of camera location in 3-D coordinate system
(x_p,y_p), (x_q,y_q)	Pixel sensor pair locations in 3-D coordinate system

X	X-axis, real-world 3-D coordinate system (cross-shore)
X_i	ADV observation for statistical analysis
y	Y-coordinate of imaged object in 3-D coordinate system
y_c	Y-coordinate of camera location in 3-D coordinate system
Y	Y-axis, real-world 3-D coordinate system (alongshore)
Y_i	CIIS observation for statistical analysis
z	Z-coordinate of imaged object in 3-D coordinate system
z_c	Z-coordinate of camera location in 3-D coordinate system
Z	Z-axis, real-world 3-D coordinate system
α	Phillips constant
α_{pq}	Wave number coefficient
γ	Enhancement factor
η	Water-surface elevation
θ_m	Vector-mean wave direction
$\theta_m(f)$	Vector-mean wave direction as function of frequency presented in units of deg relative to model coordinate system
$\theta_m(f)_c$	Vector-mean wave direction as a function of frequency presented in units of deg relative to model coordinate system following application of coherence cutoff criteria
$<\Delta\theta>$	Wave direction mean angular difference
σ	Camera roll rotation angle
σ_α	Low-frequency peak decay factor
σ_b	High-frequency peak decay factor
σ_θ	Standard deviation of wave direction mean angular difference
τ	Camera tilt rotation angle
ϕ	Camera pan rotation angle

Appendix B
Data Tables for Structure 1

Tables B1 through B30 list measurements for the waves experiments in Structure 1. The tables include the still-water depth d, average water surface elevation e, significant wave period T_s, significant wave height H_s, average wave height H_a, and maximum wave height H_m. The gauge locations are shown in Figure 5, and Figure B1 provides an enlargement with concentration on placements of the Acoustic Doppler Velocimeter (ADV) probes. Gauges 1, 2, 3, 4, and 5 are the furthest offshore (near the generator). Gauges 6, 7, 8, 9, and 10 are also offshore, but nearer to breakwater. The gauge spacing for the rack gauges 11-20 and 21-30 is 0.6 m (2 ft) between consecutive gauges. The gauge locations in the basin coordinate system are given in Appendix L. To convert measurements given in feet to meters, multiply by 0.3048.

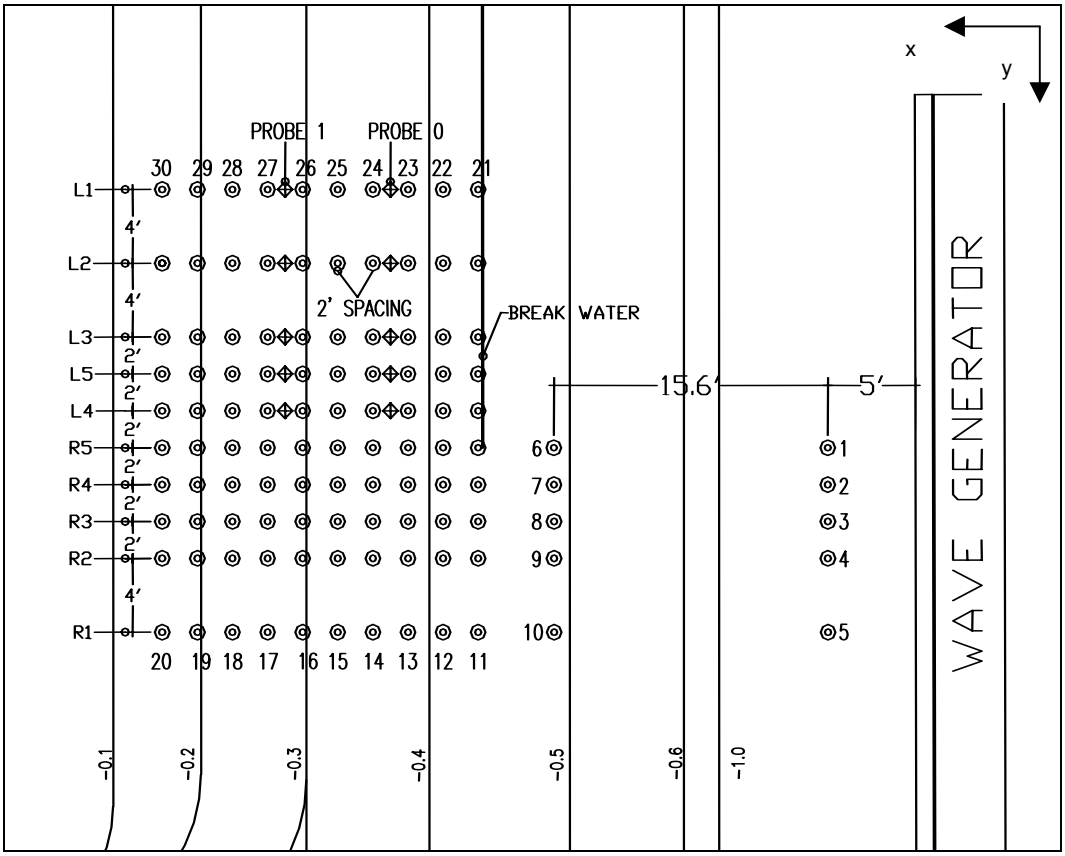


Figure B1. Structure 1 gauge arrangement enlargement

Table B1						
Structure 1 - Gauge Arrangement 1						
Irregular Wave						20 hz
Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.052	0.75	0.191	0.124	0.288
2	1.05	0.052	0.75	0.199	0.126	0.356
3	1.05	0.051	0.76	0.203	0.131	0.309
4	1.05	0.053	0.75	0.198	0.126	0.293
5	1.05	0.048	0.77	0.192	0.123	0.295
6	0.50	0.050	0.76	0.201	0.124	0.316
7	0.50	0.050	0.78	0.187	0.115	0.277
8	0.50	0.049	0.78	0.185	0.118	0.285
9	0.50	0.050	0.78	0.171	0.109	0.260
10	0.50	0.055	0.78	0.175	0.110	0.245
11	0.54	0.049	0.78	0.178	0.114	0.251
12	0.51	0.052	0.78	0.178	0.109	0.280
13	0.50	0.049	0.79	0.160	0.104	0.229
14	0.47	0.051	0.79	0.171	0.109	0.262
15	0.44	0.047	0.80	0.167	0.110	0.243
16	0.41	0.052	0.81	0.166	0.111	0.236
17	0.40	0.051	0.80	0.145	0.097	0.217
18	0.35	0.051	0.80	0.135	0.096	0.179
19	0.32	0.052	0.82	0.133	0.096	0.181
20	0.28	0.052	0.80	0.130	0.097	0.184
21	0.55	0.050	1.36	0.015	0.010	0.025
22	0.52	0.051	1.29	0.016	0.011	0.024
23	0.50	0.052	1.17	0.017	0.011	0.026
24	0.47	0.052	1.05	0.013	0.009	0.020
25	0.43	0.052	1.00	0.017	0.011	0.029
26	0.40	0.051	1.04	0.017	0.012	0.029
27	0.38	0.052	1.02	0.017	0.012	0.028
28	0.34	0.052	0.95	0.018	0.012	0.034
29	0.30	0.051	0.95	0.020	0.013	0.042
30	0.24	0.052	1.06	0.013	0.009	0.020

Table B2						
Structure 1 - Gauge Arrangement 2						
Irregular Wave						20 hz
Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
ft	ft	sec	ft	ft	ft	
1	1.05	0.050	0.75	0.190	0.123	0.274
2	1.05	0.050	0.75	0.201	0.129	0.350
3	1.05	0.049	0.75	0.199	0.129	0.303
4	1.05	0.049	0.75	0.193	0.123	0.310
5	1.05	0.050	0.76	0.189	0.121	0.283
6	0.50	0.049	0.76	0.200	0.125	0.316
7	0.50	0.049	0.77	0.189	0.119	0.290
8	0.50	0.049	0.77	0.186	0.117	0.280
9	0.50	0.049	0.77	0.170	0.109	0.259
10	0.50	0.049	0.77	0.180	0.115	0.260
11	0.54	0.052	0.79	0.168	0.110	0.248
12	0.51	0.051	0.79	0.165	0.107	0.300
13	0.50	0.051	0.79	0.158	0.102	0.234
14	0.47	0.049	0.79	0.158	0.103	0.248
15	0.44	0.050	0.80	0.159	0.103	0.241
16	0.41	0.053	0.80	0.165	0.107	0.224
17	0.40	0.051	0.81	0.141	0.098	0.184
18	0.35	0.048	0.81	0.141	0.098	0.186
19	0.32	0.051	0.81	0.129	0.094	0.178
20	0.28	0.051	0.81	0.114	0.086	0.154
21	0.55	0.050	1.71	0.011	0.008	0.022
22	0.52	0.051	1.02	0.019	0.013	0.033
23	0.50	0.051	0.95	0.020	0.014	0.037
24	0.47	0.051	1.68	0.012	0.008	0.023
25	0.43	0.048	0.99	0.020	0.013	0.040
26	0.40	0.051	0.94	0.022	0.015	0.040
27	0.38	0.050	0.91	0.023	0.015	0.040
28	0.34	0.050	0.86	0.024	0.016	0.049
29	0.30	0.052	0.86	0.026	0.017	0.061
30	0.24	0.051	0.86	0.028	0.018	0.069

Table B3						
Structure 1 - Gauge Arrangement 3						
Irregular Wave						20 hz
Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.052	0.75	0.191	0.124	0.274
2	1.05	0.052	0.74	0.203	0.129	0.357
3	1.05	0.051	0.75	0.201	0.129	0.307
4	1.05	0.051	0.76	0.198	0.128	0.305
5	1.05	0.051	0.77	0.190	0.121	0.283
6	0.50	0.050	0.76	0.198	0.121	0.314
7	0.50	0.050	0.77	0.187	0.117	0.279
8	0.50	0.050	0.77	0.185	0.117	0.285
9	0.50	0.050	0.77	0.171	0.107	0.265
10	0.50	0.051	0.77	0.178	0.114	0.275
11	0.54	0.049	0.78	0.168	0.105	0.235
12	0.51	0.048	0.79	0.156	0.100	0.250
13	0.50	0.050	0.80	0.158	0.101	0.211
14	0.47	0.049	0.80	0.171	0.110	0.251
15	0.44	0.050	0.80	0.164	0.106	0.236
16	0.41	0.051	0.80	0.158	0.103	0.243
17	0.40	0.050	0.81	0.149	0.100	0.200
18	0.35	0.050	0.80	0.138	0.095	0.174
19	0.32	0.049	0.80	0.129	0.090	0.164
20	0.28	0.051	0.81	0.117	0.086	0.152
21	0.55	0.048	0.97	0.024	0.017	0.038
22	0.52	0.049	0.96	0.025	0.017	0.044
23	0.50	0.052	0.88	0.026	0.017	0.039
24	0.47	0.050	0.83	0.027	0.018	0.058
25	0.43	0.050	0.87	0.029	0.019	0.050
26	0.40	0.051	0.83	0.033	0.022	0.055
27	0.38	0.051	0.85	0.036	0.023	0.137
28	0.34	0.050	0.84	0.039	0.025	0.079
29	0.30	0.050	0.83	0.044	0.028	0.082
30	0.24	0.050	0.83	0.027	0.018	0.058

Table B4						
Structure 1 - Gauge Arrangement 4						
Irregular Wave						20 hz
Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.051	0.75	0.190	0.121	0.276
2	1.05	0.051	0.75	0.199	0.127	0.342
3	1.05	0.051	0.75	0.202	0.130	0.314
4	1.05	0.052	0.76	0.198	0.128	0.303
5	1.05	0.051	0.76	0.189	0.117	0.283
6	0.50	0.050	0.76	0.195	0.121	0.314
7	0.50	0.049	0.77	0.191	0.120	0.301
8	0.50	0.050	0.78	0.188	0.120	0.283
9	0.50	0.050	0.77	0.172	0.110	0.282
10	0.50	0.052	0.78	0.177	0.113	0.254
11	0.54	0.049	0.78	0.171	0.110	0.245
12	0.51	0.053	0.79	0.153	0.099	0.221
13	0.50	0.050	0.79	0.157	0.100	0.225
14	0.47	0.050	0.79	0.149	0.096	0.220
15	0.44	0.046	0.78	0.137	0.090	0.203
16	0.41	0.051	0.79	0.130	0.084	0.206
17	0.40	0.051	0.79	0.123	0.081	0.197
18	0.35	0.050	0.80	0.123	0.079	0.183
19	0.32	0.051	0.81	0.126	0.082	0.165
20	0.28	0.050	0.81	0.121	0.083	0.149
21	0.55	0.050	0.85	0.027	0.018	0.043
22	0.52	0.049	0.82	0.045	0.030	0.074
23	0.50	0.056	0.82	0.049	0.031	0.078
24	0.47	0.050	0.85	0.029	0.019	0.045
25	0.43	0.052	0.81	0.057	0.036	0.100
26	0.40	0.051	0.81	0.063	0.040	0.100
27	0.38	0.051	0.81	0.066	0.042	0.107
28	0.34	0.049	0.80	0.070	0.044	0.143
29	0.30	0.049	0.79	0.073	0.048	0.126
30	0.24	0.050	0.79	0.079	0.049	0.135

Table B5						
Structure 1 - Gauge Arrangement 5						
Irregular Wave						20 hz
Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.053	0.76	0.194	0.126	0.273
2	1.05	0.052	0.74	0.201	0.128	0.359
3	1.05	0.051	0.75	0.202	0.130	0.314
4	1.05	0.052	0.75	0.198	0.126	0.295
5	1.05	0.054	0.76	0.192	0.124	0.283
6	0.50	0.051	0.76	0.199	0.123	0.318
7	0.50	0.051	0.77	0.186	0.113	0.279
8	0.50	0.051	0.78	0.186	0.119	0.279
9	0.50	0.051	0.77	0.171	0.110	0.245
10	0.50	0.051	0.78	0.176	0.112	0.285
11	0.54	0.053	0.81	0.111	0.075	0.160
12	0.51	0.044	0.81	0.083	0.055	0.148
13	0.50	0.052	0.81	0.092	0.059	0.135
14	0.47	0.051	0.80	0.095	0.062	0.148
15	0.44	0.051	0.80	0.095	0.062	0.152
16	0.41	0.049	0.80	0.094	0.061	0.155
17	0.40	0.050	0.80	0.094	0.062	0.149
18	0.35	0.050	0.80	0.093	0.060	0.167
19	0.32	0.051	0.81	0.093	0.060	0.150
20	0.28	0.050	0.81	0.097	0.061	0.141
21	0.55	0.054	0.92	0.025	0.017	0.046
22	0.52	0.053	0.84	0.085	0.057	0.147
23	0.50	0.056	0.82	0.033	0.022	0.057
24	0.47	0.050	0.92	0.027	0.018	0.049
25	0.43	0.050	0.82	0.039	0.025	0.069
26	0.40	0.050	0.83	0.044	0.028	0.074
27	0.38	0.048	0.82	0.047	0.029	0.083
28	0.34	0.051	0.82	0.050	0.030	0.092
29	0.30	0.050	0.82	0.055	0.036	0.111
30	0.24	0.049	0.82	0.063	0.041	0.110

Table B6						
Structure 1 - Gauge Arrangement 1						
Irregular Wave						20 hz
Wave Period = 1.6 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.051	1.43	0.129	0.084	0.207
2	1.05	0.050	1.40	0.133	0.084	0.235
3	1.05	0.050	1.42	0.138	0.089	0.244
4	1.05	0.051	1.42	0.138	0.090	0.258
5	1.05	0.049	1.44	0.130	0.084	0.239
6	0.50	0.049	1.48	0.182	0.116	0.289
7	0.50	0.050	1.39	0.152	0.093	0.356
8	0.50	0.049	1.36	0.140	0.087	0.253
9	0.50	0.050	1.41	0.152	0.094	0.285
10	0.50	0.051	1.42	0.156	0.098	0.276
11	0.54	0.046	1.46	0.156	0.100	0.238
12	0.51	0.052	1.45	0.173	0.106	0.289
13	0.50	0.048	1.45	0.150	0.097	0.259
14	0.47	0.050	1.41	0.159	0.102	0.297
15	0.44	0.050	1.43	0.156	0.101	0.259
16	0.41	0.051	1.43	0.163	0.103	0.279
17	0.40	0.050	1.44	0.166	0.106	0.257
18	0.35	0.048	1.48	0.173	0.113	0.232
19	0.32	0.051	1.47	0.162	0.109	0.214
20	0.28	0.051	1.41	0.147	0.097	0.197
21	0.55	0.049	3.22	0.015	0.010	0.026
22	0.52	0.051	2.40	0.021	0.014	0.034
23	0.50	0.051	2.22	0.021	0.014	0.036
24	0.47	0.051	3.17	0.017	0.011	0.027
25	0.43	0.052	1.84	0.020	0.014	0.033
26	0.40	0.050	1.96	0.022	0.014	0.035
27	0.38	0.052	1.88	0.021	0.014	0.038
28	0.34	0.051	2.03	0.023	0.015	0.043
29	0.30	0.050	2.03	0.025	0.016	0.039
30	0.24	0.052	1.99	0.027	0.016	0.046

Table B7						
Structure 1 - Gauge Arrangement 2						
Irregular Wave						20 hz
Wave Period = 1.6 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.051	1.43	0.127	0.083	0.209
2	1.05	0.048	1.39	0.132	0.084	0.233
3	1.05	0.048	1.42	0.135	0.087	0.246
4	1.05	0.049	1.44	0.134	0.088	0.251
5	1.05	0.049	1.44	0.128	0.082	0.235
6	0.50	0.048	1.49	0.180	0.115	0.283
7	0.50	0.048	1.39	0.148	0.092	0.342
8	0.50	0.048	1.36	0.138	0.087	0.249
9	0.50	0.048	1.42	0.149	0.092	0.269
10	0.50	0.048	1.43	0.157	0.100	0.279
11	0.54	0.050	1.41	0.144	0.092	0.228
12	0.51	0.050	1.43	0.136	0.088	0.220
13	0.50	0.051	1.47	0.142	0.090	0.234
14	0.47	0.048	1.45	0.162	0.102	0.296
15	0.44	0.049	1.41	0.171	0.109	0.307
16	0.41	0.052	1.45	0.180	0.113	0.270
17	0.40	0.049	1.39	0.173	0.109	0.245
18	0.35	0.047	1.37	0.166	0.109	0.218
19	0.32	0.049	1.44	0.152	0.102	0.193
20	0.28	0.050	1.39	0.133	0.091	0.173
21	0.55	0.050	2.90	0.016	0.010	0.032
22	0.52	0.051	2.29	0.024	0.016	0.038
23	0.50	0.052	1.94	0.024	0.016	0.035
24	0.47	0.050	2.87	0.017	0.011	0.033
25	0.43	0.048	1.79	0.023	0.015	0.040
26	0.40	0.050	1.83	0.026	0.017	0.046
27	0.38	0.049	1.83	0.026	0.017	0.053
28	0.34	0.049	1.78	0.028	0.019	0.050
29	0.30	0.051	1.77	0.030	0.019	0.058
30	0.24	0.051	1.89	0.032	0.020	0.072

Table B8						
Structure 1 - Gauge Arrangement 3						
Irregular Wave						20 hz
Wave Period = 1.6 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.051	1.43	0.130	0.085	0.210
2	1.05	0.049	1.40	0.134	0.085	0.240
3	1.05	0.049	1.42	0.138	0.089	0.253
4	1.05	0.051	1.43	0.138	0.089	0.256
5	1.05	0.050	1.44	0.130	0.084	0.240
6	0.50	0.049	1.48	0.183	0.116	0.285
7	0.50	0.049	1.41	0.152	0.094	0.359
8	0.50	0.049	1.36	0.141	0.088	0.252
9	0.50	0.049	1.42	0.152	0.094	0.272
10	0.50	0.050	1.43	0.158	0.099	0.279
11	0.54	0.047	1.39	0.142	0.089	0.230
12	0.51	0.054	1.43	0.149	0.093	0.239
13	0.50	0.049	1.44	0.158	0.100	0.274
14	0.47	0.050	1.40	0.164	0.104	0.287
15	0.44	0.044	1.37	0.160	0.099	0.271
16	0.41	0.050	1.38	0.163	0.103	0.297
17	0.40	0.049	1.39	0.160	0.101	0.241
18	0.35	0.050	1.39	0.154	0.100	0.215
19	0.32	0.048	1.39	0.147	0.097	0.195
20	0.28	0.050	1.41	0.137	0.092	0.172
21	0.55	0.049	2.28	0.017	0.011	0.028
22	0.52	0.051	1.87	0.030	0.021	0.044
23	0.50	0.054	1.82	0.032	0.021	0.058
24	0.47	0.049	2.27	0.018	0.011	0.030
25	0.43	0.050	1.60	0.031	0.021	0.058
26	0.40	0.051	1.67	0.034	0.023	0.055
27	0.38	0.051	1.72	0.038	0.025	0.065
28	0.34	0.049	1.69	0.039	0.026	0.076
29	0.30	0.050	1.63	0.044	0.028	0.101
30	0.24	0.049	1.57	0.052	0.032	0.153

Table B9						
Structure 1 - Gauge Arrangement 4						
Irregular Wave						20 hz
Wave Period = 1.6 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.051	1.42	0.130	0.085	0.211
2	1.05	0.050	1.41	0.135	0.086	0.233
3	1.05	0.050	1.42	0.139	0.089	0.248
4	1.05	0.051	1.44	0.138	0.090	0.256
5	1.05	0.051	1.44	0.131	0.084	0.241
6	0.50	0.049	1.48	0.181	0.114	0.286
7	0.50	0.049	1.40	0.152	0.095	0.360
8	0.50	0.049	1.36	0.141	0.088	0.250
9	0.50	0.050	1.43	0.153	0.095	0.275
10	0.50	0.051	1.44	0.159	0.101	0.283
11	0.54	0.048	1.45	0.147	0.093	0.229
12	0.51	0.053	1.41	0.124	0.081	0.208
13	0.50	0.049	1.42	0.126	0.082	0.224
14	0.47	0.050	1.43	0.122	0.079	0.228
15	0.44	0.049	1.41	0.113	0.073	0.202
16	0.41	0.051	1.42	0.114	0.074	0.200
17	0.40	0.050	1.43	0.116	0.074	0.212
18	0.35	0.049	1.46	0.121	0.077	0.198
19	0.32	0.047	1.38	0.122	0.079	0.185
20	0.28	0.049	1.40	0.128	0.084	0.180
21	0.55	0.049	1.62	0.044	0.029	0.065
22	0.52	0.051	1.61	0.048	0.032	0.075
23	0.50	0.056	1.59	0.052	0.035	0.079
24	0.47	0.050	1.53	0.050	0.030	0.105
25	0.43	0.052	1.54	0.055	0.036	0.099
26	0.40	0.051	1.56	0.058	0.039	0.097
27	0.38	0.051	1.59	0.061	0.040	0.112
28	0.34	0.049	1.54	0.065	0.042	0.157
29	0.30	0.052	1.53	0.073	0.047	0.170
30	0.24	0.050	1.53	0.050	0.030	0.105

Table B10						
Structure 1 - Gauge Arrangement 5						
Irregular Wave						20 hz
Wave Period = 1.6 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.052	1.43	0.129	0.085	0.213
2	1.05	0.050	1.40	0.134	0.086	0.233
3	1.05	0.050	1.42	0.138	0.089	0.250
4	1.05	0.052	1.42	0.137	0.090	0.255
5	1.05	0.050	1.44	0.130	0.083	0.241
6	0.50	0.050	1.49	0.183	0.117	0.289
7	0.50	0.050	1.40	0.152	0.094	0.352
8	0.50	0.049	1.36	0.140	0.088	0.256
9	0.50	0.050	1.43	0.152	0.094	0.269
10	0.50	0.051	1.43	0.156	0.099	0.276
11	0.54	0.051	1.45	0.100	0.068	0.165
12	0.51	0.053	1.46	0.076	0.049	0.156
13	0.50	0.051	1.46	0.080	0.052	0.139
14	0.47	0.051	1.48	0.082	0.053	0.148
15	0.44	0.049	1.48	0.080	0.052	0.143
16	0.41	0.050	1.46	0.079	0.053	0.131
17	0.40	0.049	1.50	0.083	0.055	0.148
18	0.35	0.050	1.52	0.088	0.057	0.167
19	0.32	0.050	1.48	0.096	0.060	0.180
20	0.28	0.049	1.49	0.106	0.067	0.164
21	0.55	0.052	1.80	0.034	0.021	0.056
22	0.52	0.055	1.64	0.100	0.062	0.148
23	0.50	0.050	1.70	0.038	0.025	0.074
24	0.47	0.049	1.58	0.040	0.022	0.084
25	0.43	0.049	1.60	0.040	0.024	0.078
26	0.40	0.050	1.58	0.045	0.031	0.076
27	0.38	0.048	1.61	0.047	0.031	0.082
28	0.34	0.051	1.62	0.050	0.033	0.113
29	0.30	0.049	1.53	0.058	0.037	0.150
30	0.24	0.049	1.57	0.040	0.022	0.084

Table B11						
Structure 1 - Gauge Arrangement 1						
Monochromatic Wave						20 hz
Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.051	0.80	0.155	0.143	0.160
2	1.05	0.051	0.80	0.167	0.149	0.170
3	1.05	0.048	0.80	0.143	0.128	0.152
4	1.05	0.049	0.80	0.134	0.114	0.145
5	1.05	0.051	0.80	0.172	0.156	0.177
6	0.50	0.051	0.80	0.182	0.155	0.192
7	0.50	0.052	0.80	0.157	0.137	0.167
8	0.50	0.048	0.79	0.141	0.128	0.160
9	0.50	0.051	0.80	0.140	0.128	0.150
10	0.50	0.051	0.80	0.152	0.132	0.154
11	0.54	0.047	0.80	0.155	0.139	0.158
12	0.51	0.050	0.80	0.153	0.135	0.156
13	0.50	0.047	0.79	0.143	0.126	0.148
14	0.47	0.052	0.80	0.143	0.116	0.153
15	0.44	0.048	0.79	0.136	0.120	0.152
16	0.41	0.053	0.79	0.148	0.133	0.163
17	0.40	0.052	0.80	0.158	0.140	0.167
18	0.35	0.049	0.80	0.155	0.099	0.161
19	0.32	0.051	0.80	0.140	0.124	0.149
20	0.28	0.050	0.80	0.124	0.105	0.133
21	0.55	0.051	0.80	0.010	0.008	0.012
22	0.52	0.055	0.80	0.010	0.008	0.011
23	0.50	0.048	0.81	0.010	0.008	0.012
24	0.47	0.051	0.80	0.010	0.008	0.012
25	0.43	0.049	0.80	0.011	0.009	0.012
26	0.40	0.050	0.80	0.011	0.009	0.012
27	0.38	0.051	0.80	0.014	0.011	0.015
28	0.34	0.052	0.80	0.017	0.013	0.019
29	0.30	0.050	0.81	0.016	0.013	0.017
30	0.24	0.051	0.80	0.010	0.008	0.012

Table B12						
Structure 1 - Gauge Arrangement 2						
Monochromatic Wave						20 hz
Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.052	0.80	0.155	0.142	0.158
2	1.05	0.049	0.80	0.166	0.148	0.169
3	1.05	0.048	0.80	0.140	0.126	0.150
4	1.05	0.049	0.80	0.133	0.113	0.141
5	1.05	0.051	0.80	0.172	0.155	0.177
6	0.50	0.050	0.80	0.181	0.155	0.193
7	0.50	0.050	0.80	0.158	0.139	0.167
8	0.50	0.049	0.79	0.138	0.126	0.157
9	0.50	0.049	0.80	0.137	0.125	0.149
10	0.50	0.050	0.80	0.150	0.131	0.152
11	0.54	0.048	0.80	0.135	0.122	0.151
12	0.51	0.053	0.80	0.134	0.122	0.145
13	0.50	0.052	0.79	0.141	0.124	0.142
14	0.47	0.050	0.79	0.131	0.117	0.142
15	0.44	0.050	0.80	0.117	0.101	0.144
16	0.41	0.051	0.80	0.128	0.110	0.157
17	0.40	0.008	0.80	0.144	0.128	0.164
18	0.35	0.048	0.80	0.146	0.128	0.169
19	0.32	0.050	0.80	0.145	0.126	0.154
20	0.28	0.050	0.80	0.134	0.113	0.141
21	0.55	0.050	0.81	0.090	0.074	0.097
22	0.52	0.051	0.81	0.015	0.013	0.015
23	0.50	0.053	0.81	0.014	0.011	0.016
24	0.47	0.051	0.81	0.095	0.075	0.010
25	0.43	0.049	0.80	0.020	0.016	0.022
26	0.40	0.051	0.81	0.018	0.015	0.021
27	0.38	0.050	0.80	0.017	0.015	0.018
28	0.34	0.051	0.80	0.021	0.017	0.022
29	0.30	0.053	0.80	0.020	0.016	0.022
30	0.24	0.052	0.80	0.021	0.016	0.022

Table B13						
Structure 1 - Gauge Arrangement 3						
Monochromatic Wave						20 hz
Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.051	0.80	0.157	0.144	0.160
2	1.05	0.048	0.80	0.162	0.148	0.164
3	1.05	0.048	0.80	0.144	0.131	0.155
4	1.05	0.049	0.80	0.134	0.114	0.142
5	1.05	0.052	0.80	0.172	0.158	0.177
6	0.50	0.050	0.80	0.173	0.153	0.185
7	0.50	0.050	0.80	0.162	0.144	0.169
8	0.50	0.050	0.80	0.140	0.128	0.157
9	0.50	0.050	0.80	0.144	0.131	0.150
10	0.50	0.050	0.80	0.147	0.129	0.148
11	0.54	0.051	0.80	0.149	0.134	0.160
12	0.51	0.051	0.80	0.132	0.118	0.155
13	0.50	0.050	0.80	0.127	0.114	0.152
14	0.47	0.050	0.80	0.139	0.123	0.165
15	0.44	0.049	0.80	0.148	0.135	0.165
16	0.41	0.051	0.80	0.144	0.128	0.161
17	0.40	0.050	0.80	0.136	0.119	0.154
18	0.35	0.051	0.80	0.135	0.102	0.151
19	0.32	0.049	0.80	0.134	0.120	0.140
20	0.28	0.050	0.80	0.131	0.115	0.140
21	0.55	0.048	0.80	0.019	0.015	0.021
22	0.52	0.052	0.80	0.021	0.017	0.022
23	0.50	0.058	0.80	0.019	0.016	0.020
24	0.47	0.051	0.80	0.024	0.018	0.025
25	0.43	0.051	0.80	0.025	0.022	0.026
26	0.40	0.052	0.80	0.025	0.022	0.026
27	0.38	0.052	0.80	0.027	0.023	0.031
28	0.34	0.050	0.80	0.030	0.024	0.033
29	0.30	0.051	0.80	0.032	0.027	0.035
30	0.24	0.051	0.80	0.024	0.017	0.025

Table B14						
Structure 1 - Gauge Arrangement 4						
Monochromatic Wave						20 hz
Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.051	0.80	0.156	0.144	0.161
2	1.05	0.049	0.80	0.167	0.151	0.170
3	1.05	0.049	0.80	0.144	0.129	0.153
4	1.05	0.050	0.80	0.137	0.117	0.145
5	1.05	0.053	0.80	0.173	0.157	0.178
6	0.50	0.051	0.80	0.176	0.155	0.188
7	0.50	0.051	0.80	0.159	0.141	0.166
8	0.50	0.050	0.79	0.140	0.128	0.156
9	0.50	0.050	0.80	0.144	0.130	0.151
10	0.50	0.051	0.80	0.147	0.128	0.149
11	0.54	0.053	0.80	0.133	0.117	0.151
12	0.51	0.051	0.80	0.123	0.112	0.132
13	0.50	0.052	0.80	0.139	0.116	0.146
14	0.47	0.051	0.80	0.132	0.116	0.139
15	0.44	0.052	0.80	0.120	0.093	0.133
16	0.41	0.051	0.80	0.119	0.106	0.128
17	0.40	0.051	0.80	0.116	0.087	0.122
18	0.35	0.051	0.80	0.108	0.093	0.116
19	0.32	0.050	0.80	0.108	0.087	0.118
20	0.28	0.050	0.80	0.108	0.071	0.126
21	0.55	0.054	0.80	0.018	0.014	0.020
22	0.52	0.059	0.80	0.112	0.098	0.118
23	0.50	0.054	0.80	0.046	0.039	0.049
24	0.47	0.050	0.80	0.019	0.015	0.021
25	0.43	0.051	0.80	0.049	0.041	0.052
26	0.40	0.051	0.80	0.059	0.051	0.060
27	0.38	0.050	0.80	0.059	0.049	0.061
28	0.34	0.052	0.80	0.064	0.054	0.065
29	0.30	0.052	0.80	0.063	0.056	0.065
30	0.24	0.050	0.80	0.063	0.057	0.068

Table B15						
Structure 1 - Gauge Arrangement 5						
Monochromatic Wave						20 hz
Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.052	0.80	0.179	0.156	0.186
2	1.05	0.048	0.80	0.140	0.127	0.146
3	1.05	0.049	0.80	0.142	0.122	0.152
4	1.05	0.050	0.80	0.138	0.125	0.147
5	1.05	0.052	0.80	0.168	0.153	0.186
6	0.50	0.050	0.80	0.156	0.141	0.174
7	0.50	0.052	0.80	0.160	0.142	0.166
8	0.50	0.049	0.80	0.134	0.115	0.153
9	0.50	0.050	0.80	0.137	0.124	0.149
10	0.50	0.050	0.80	0.138	0.128	0.147
11	0.54	0.054	0.81	0.097	0.085	0.098
12	0.51	0.050	0.80	0.070	0.064	0.072
13	0.50	0.051	0.80	0.075	0.067	0.077
14	0.47	0.050	0.80	0.080	0.073	0.082
15	0.44	0.048	0.80	0.087	0.073	0.089
16	0.41	0.050	0.80	0.083	0.076	0.086
17	0.40	0.050	0.80	0.082	0.073	0.088
18	0.35	0.050	0.80	0.081	0.074	0.087
19	0.32	0.050	0.80	0.092	0.082	0.093
20	0.28	0.050	0.80	0.088	0.079	0.095
21	0.55	0.054	0.80	0.025	0.021	0.027
22	0.52	0.058	0.80	0.074	0.061	0.077
23	0.50	0.056	0.80	0.030	0.026	0.031
24	0.47	0.050	0.81	0.037	0.028	0.040
25	0.43	0.051	0.80	0.032	0.024	0.033
26	0.40	0.051	0.81	0.033	0.027	0.035
27	0.38	0.049	0.81	0.041	0.034	0.043
28	0.34	0.051	0.80	0.042	0.038	0.044
29	0.30	0.048	0.80	0.043	0.031	0.045
30	0.24	0.050	0.81	0.037	0.028	0.040

Table B16						
Structure 1 - Gauge Arrangement 1						
Wave Generator @ 20 deg angle						20 hz
Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.050	0.74	0.190	0.124	0.322
2	1.05	0.050	0.74	0.198	0.131	0.281
3	1.05	0.050	0.75	0.196	0.128	0.327
4	1.05	0.052	0.74	0.195	0.127	0.283
5	1.05	0.053	0.75	0.188	0.124	0.263
6	0.50	0.050	0.77	0.192	0.119	0.306
7	0.50	0.050	0.78	0.177	0.115	0.260
8	0.50	0.048	0.77	0.176	0.113	0.251
9	0.50	0.050	0.77	0.170	0.110	0.268
10	0.50	0.050	0.77	0.174	0.114	0.272
11	0.54	0.049	0.78	0.173	0.111	0.256
12	0.51	0.051	0.78	0.172	0.112	0.260
13	0.50	0.049	0.78	0.164	0.109	0.221
14	0.47	0.054	0.79	0.172	0.113	0.237
15	0.44	0.050	0.79	0.162	0.108	0.220
16	0.41	0.050	0.80	0.164	0.108	0.236
17	0.40	0.051	0.80	0.156	0.103	0.224
18	0.35	0.051	0.80	0.155	0.106	0.216
19	0.32	0.052	0.80	0.132	0.095	0.175
20	0.28	0.051	0.81	0.130	0.095	0.202
21	0.55	0.051	1.76	0.020	0.014	0.035
22	0.52	0.052	1.56	0.020	0.014	0.035
23	0.50	0.052	1.42	0.020	0.013	0.031
24	0.47	0.051	0.86	0.021	0.013	0.037
25	0.43	0.045	0.89	0.022	0.015	0.033
26	0.40	0.050	0.87	0.025	0.017	0.040
27	0.38	0.052	0.85	0.026	0.018	0.049
28	0.34	0.053	0.80	0.027	0.019	0.049
29	0.30	-0.023	0.33	0.086	0.059	0.124
30	0.24	0.051	0.86	0.021	0.013	0.038

Table B17						
Structure 1 - Gauge Arrangement 2						
Wave Generator @ 20 deg angle						20 hz
Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.049	0.74	0.192	0.126	0.322
2	1.05	0.048	0.75	0.202	0.135	0.289
3	1.05	0.049	0.74	0.192	0.125	0.320
4	1.05	0.048	0.74	0.195	0.129	0.287
5	1.05	0.052	0.75	0.187	0.122	0.273
6	0.50	0.049	0.77	0.193	0.121	0.307
7	0.50	0.048	0.77	0.177	0.112	0.274
8	0.50	0.050	0.77	0.176	0.112	0.248
9	0.50	0.048	0.78	0.169	0.109	0.274
10	0.50	0.050	0.77	0.176	0.116	0.258
11	0.54	0.051	0.78	0.168	0.109	0.255
12	0.51	0.049	0.78	0.162	0.106	0.246
13	0.50	0.049	0.79	0.163	0.106	0.246
14	0.47	0.049	0.80	0.166	0.107	0.243
15	0.44	0.049	0.79	0.161	0.106	0.213
16	0.41	0.049	0.80	0.163	0.107	0.246
17	0.40	0.050	0.79	0.153	0.100	0.223
18	0.35	0.051	0.81	0.145	0.103	0.197
19	0.32	0.050	0.80	0.130	0.096	0.174
20	0.28	0.052	0.80	0.132	0.099	0.187
21	0.55	0.054	1.47	0.024	0.016	0.042
22	0.52	0.048	1.41	0.075	0.052	0.117
23	0.50	0.053	1.13	0.025	0.017	0.037
24	0.47	0.050	0.80	0.029	0.019	0.059
25	0.43	0.053	0.90	0.054	0.036	0.089
26	0.40	0.052	0.86	0.032	0.021	0.062
27	0.38	0.052	0.82	0.035	0.023	0.056
28	0.34	0.052	0.79	0.041	0.026	0.070
29	0.30	0.014	1.38	0.147	0.085	0.263
30	0.24	0.050	0.80	0.030	0.019	0.059

Table B18						
Structure 1 - Gauge Arrangement 3						
Wave Generator @ 20 deg angle						20 hz
Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.051	0.74	0.192	0.126	0.298
2	1.05	0.051	0.74	0.200	0.133	0.303
3	1.05	0.051	0.74	0.194	0.127	0.318
4	1.05	0.053	0.75	0.195	0.129	0.295
5	1.05	0.053	0.75	0.186	0.122	0.255
6	0.50	0.050	0.77	0.181	0.112	0.297
7	0.50	0.050	0.78	0.175	0.111	0.251
8	0.50	0.049	0.77	0.172	0.111	0.257
9	0.50	0.050	0.77	0.167	0.106	0.252
10	0.50	0.051	0.77	0.174	0.113	0.257
11	0.54	0.050	0.78	0.173	0.110	0.273
12	0.51	0.054	0.78	0.165	0.106	0.235
13	0.50	0.048	0.79	0.154	0.100	0.239
14	0.47	0.051	0.79	0.159	0.103	0.236
15	0.44	0.050	0.80	0.159	0.102	0.236
16	0.41	0.051	0.81	0.166	0.107	0.258
17	0.40	0.050	0.81	0.156	0.103	0.215
18	0.35	0.051	0.81	0.145	0.101	0.187
19	0.32	0.051	0.81	0.133	0.098	0.172
20	0.28	0.052	0.80	0.123	0.092	0.170
21	0.55	0.051	1.12	0.030	0.020	0.050
22	0.52	0.051	1.06	0.030	0.020	0.046
23	0.50	0.051	0.90	0.027	0.018	0.048
24	0.47	0.041	0.77	0.054	0.034	0.097
25	0.43	0.051	0.84	0.040	0.027	0.067
26	0.40	0.050	0.81	0.050	0.032	0.084
27	0.38	0.051	0.79	0.060	0.038	0.098
28	0.34	0.050	0.80	0.068	0.043	0.110
29	0.30	0.032	0.77	0.090	0.057	0.163
30	0.24	0.050	0.79	0.095	0.061	0.135

TableB19						
Structure 1 - Gauge Arrangement 4						
Wave Generator @ 20 deg angle						20 hz
Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.044	0.74	0.189	0.126	0.296
2	1.05	0.045	0.74	0.202	0.137	0.294
3	1.05	0.046	0.74	0.192	0.128	0.322
4	1.05	0.047	0.74	0.195	0.130	0.282
5	1.05	0.047	0.75	0.186	0.124	0.263
6	0.50	0.046	0.78	0.180	0.115	0.272
7	0.50	0.043	0.77	0.173	0.115	0.242
8	0.50	0.047	0.77	0.170	0.110	0.266
9	0.50	0.044	0.77	0.167	0.110	0.253
10	0.50	0.045	0.77	0.180	0.120	0.263
11	0.54	0.040	0.77	0.163	0.106	0.249
12	0.51	0.049	0.79	0.166	0.109	0.242
13	0.50	0.044	0.79	0.165	0.109	0.224
14	0.47	0.045	0.78	0.177	0.118	0.243
15	0.44	0.046	0.78	0.167	0.112	0.234
16	0.41	0.045	0.79	0.170	0.115	0.241
17	0.40	0.045	0.80	0.157	0.111	0.212
18	0.35	0.045	0.80	0.140	0.102	0.182
19	0.32	0.047	0.80	0.131	0.098	0.181
20	0.28	0.041	0.81	0.119	0.094	0.149
21	0.55	0.044	0.93	0.047	0.034	0.072
22	0.52	0.037	0.90	0.055	0.040	0.087
23	0.50	0.041	0.82	0.066	0.046	0.129
24	0.47	0.044	0.82	0.068	0.047	0.108
25	0.43	0.045	0.81	0.091	0.062	0.151
26	0.40	0.046	0.79	0.101	0.066	0.159
27	0.38	0.041	0.78	0.111	0.076	0.168
28	0.34	0.042	0.78	0.118	0.080	0.165
29	0.30	0.043	0.79	0.123	0.083	0.176
30	0.24	0.044	0.82	0.067	0.047	0.108

Table B20						
Structure 1 - Gauge Arrangement 5						
Wave Generator @ 20 deg angle						20 hz
Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.049	0.74	0.187	0.122	0.293
2	1.05	0.048	0.74	0.200	0.133	0.303
3	1.05	0.050	0.74	0.192	0.127	0.332
4	1.05	0.047	0.75	0.190	0.125	0.300
5	1.05	0.050	0.75	0.266	0.175	0.364
6	0.50	0.051	0.78	0.186	0.118	0.300
7	0.50	0.048	0.77	0.175	0.113	0.249
8	0.50	0.050	0.77	0.173	0.110	0.262
9	0.50	0.050	0.77	0.169	0.110	0.255
10	0.50	0.049	0.76	0.178	0.116	0.251
11	0.54	0.052	0.79	0.118	0.080	0.184
12	0.51	0.057	0.80	0.118	0.077	0.186
13	0.50	0.052	0.79	0.127	0.082	0.204
14	0.47	0.051	0.78	0.139	0.090	0.205
15	0.44	0.050	0.79	0.135	0.087	0.194
16	0.41	0.054	0.79	0.148	0.096	0.207
17	0.40	0.053	0.80	0.145	0.098	0.197
18	0.35	0.051	0.79	0.141	0.096	0.180
19	0.32	0.053	0.80	0.136	0.096	0.193
20	0.28	0.054	0.81	0.126	0.091	0.160
21	0.55	0.049	0.98	0.033	0.023	0.059
22	0.52	0.052	0.91	0.035	0.024	0.066
23	0.50	0.055	0.08	0.041	0.028	0.075
24	0.47	0.051	0.80	0.056	0.036	0.089
25	0.43	0.054	0.80	0.061	0.039	0.106
26	0.40	0.053	0.78	0.072	0.047	0.128
27	0.38	0.055	0.80	0.084	0.054	0.140
28	0.34	0.055	0.78	0.095	0.060	0.167
29	0.30	0.054	0.79	0.107	0.070	0.165
30	0.24	0.053	0.80	0.059	0.038	0.093

Table B21						
Structure 1 - Gauge Arrangement 1						
Wave Generator @ 20 deg angle						20 hz
Wave Period = 1.6 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.048	1.45	0.129	0.081	0.221
2	1.05	0.049	1.43	0.138	0.088	0.260
3	1.05	0.048	1.43	0.137	0.087	0.249
4	1.05	0.050	1.43	0.137	0.087	0.252
5	1.05	0.050	1.44	0.138	0.088	0.254
6	0.50	0.049	1.46	0.181	0.112	0.282
7	0.50	0.050	1.71	0.158	0.097	0.307
8	0.50	0.048	1.43	0.148	0.092	0.244
9	0.50	0.048	1.45	0.151	0.094	0.311
10	0.50	0.050	1.41	0.139	0.095	0.349
11	0.54	0.044	1.43	0.154	0.097	0.240
12	0.51	0.051	1.44	0.153	0.096	0.250
13	0.50	0.045	1.42	0.153	0.097	0.261
14	0.47	0.050	1.44	0.148	0.090	0.262
15	0.44	0.052	1.41	0.155	0.096	0.266
16	0.41	0.054	1.45	0.161	0.096	0.266
17	0.40	0.050	1.40	0.166	0.103	0.285
18	0.35	0.050	1.47	0.168	0.108	0.242
19	0.32	0.050	1.40	0.162	0.106	0.228
20	0.28	0.050	1.45	0.150	0.103	0.212
21	0.55	0.043	2.88	0.032	0.020	0.070
22	0.52	0.057	3.52	0.026	0.016	0.055
23	0.50	0.047	2.58	0.029	0.019	0.064
24	0.47	0.051	3.47	0.021	0.012	0.044
25	0.43	0.054	1.86	0.028	0.017	0.045
26	0.40	0.050	1.79	0.030	0.019	0.061
27	0.38	0.050	1.95	0.028	0.018	0.053
28	0.34	0.051	1.90	0.030	0.020	0.062
29	0.30	0.048	1.53	0.039	0.024	0.068
30	0.24	0.051	1.74	0.035	0.020	0.078

Table B22						
Structure 1 - Gauge Arrangement 2						
Wave Generator @ 20 deg angle						20 hz
Wave Period = 1.6 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.049	1.48	0.129	0.081	0.223
2	1.05	0.049	1.42	0.139	0.087	0.254
3	1.05	0.049	1.43	0.137	0.086	0.240
4	1.05	0.048	1.43	0.136	0.087	0.253
5	1.05	0.049	1.45	0.138	0.087	0.252
6	0.50	0.049	1.48	0.175	0.108	0.274
7	0.50	0.049	1.38	0.150	0.092	0.330
8	0.50	0.049	1.43	0.151	0.094	0.256
9	0.50	0.005	1.44	0.149	0.093	0.331
10	0.50	0.050	1.41	0.155	0.096	0.342
11	0.54	0.047	1.43	0.148	0.094	0.230
12	0.51	0.051	1.43	0.142	0.092	0.233
13	0.50	0.047	1.42	0.143	0.092	0.241
14	0.47	0.049	1.46	0.151	0.097	0.266
15	0.44	0.050	1.46	0.160	0.099	0.254
16	0.41	0.051	1.46	0.173	0.107	0.256
17	0.40	0.051	1.46	0.178	0.111	0.273
18	0.35	0.050	1.50	0.179	0.114	0.249
19	0.32	0.049	1.44	0.167	0.109	0.228
20	0.28	0.051	1.46	0.162	0.108	0.225
21	0.55	0.053	3.41	0.025	0.015	0.050
22	0.52	0.042	2.49	0.102	0.065	0.208
23	0.50	0.057	2.22	0.033	0.022	0.063
24	0.47	0.049	3.33	0.024	0.014	0.047
25	0.43	0.063	1.80	0.063	0.042	0.122
26	0.40	0.052	1.83	0.036	0.024	0.069
27	0.38	0.053	1.71	0.039	0.026	0.077
28	0.34	0.054	1.75	0.019	0.028	0.085
29	0.30	0.034	2.03	0.173	0.101	0.281
30	0.24	0.051	1.56	0.051	0.031	0.118

Table B23						
Structure 1 - Gauge Arrangement 3						
Wave Generator @ 20 deg angle						20 hz
Wave Period = 1.6 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.049	1.45	0.129	0.082	0.220
2	1.05	0.050	1.43	0.139	0.088	0.253
3	1.05	0.049	1.43	0.137	0.087	0.241
4	1.05	0.049	1.44	0.137	0.087	0.255
5	1.05	0.049	1.45	0.138	0.087	0.255
6	0.50	0.049	1.47	0.175	0.108	0.275
7	0.50	0.048	1.37	0.149	0.092	0.327
8	0.50	0.049	1.43	0.150	0.094	0.261
9	0.50	0.048	1.44	0.148	0.092	0.323
10	0.50	0.049	1.41	0.154	0.096	0.351
11	0.54	0.048	1.43	0.144	0.093	0.232
12	0.51	0.056	1.49	0.148	0.095	0.231
13	0.50	0.048	1.50	0.153	0.098	0.250
14	0.47	0.049	1.49	0.172	0.109	0.304
15	0.44	0.050	1.49	0.179	0.112	0.284
16	0.41	0.052	1.49	0.193	0.116	0.330
17	0.40	0.050	1.49	0.188	0.119	0.279
18	0.35	0.051	0.15	0.179	0.115	0.279
19	0.32	0.050	1.50	0.156	0.105	0.217
20	0.28	0.051	1.48	0.134	0.081	0.202
21	0.55	0.051	2.53	0.025	0.016	0.040
22	0.52	0.052	2.03	0.040	0.025	0.074
23	0.50	0.053	1.95	0.035	0.023	0.062
24	0.47	0.053	2.49	0.028	0.017	0.046
25	0.43	0.051	1.58	0.044	0.028	0.069
26	0.40	0.053	1.57	0.050	0.034	0.104
27	0.38	0.051	1.60	0.056	0.037	0.134
28	0.34	0.051	1.54	0.061	0.039	0.184
29	0.30	0.091	1.49	0.176	0.105	0.337
30	0.24	0.050	1.50	0.087	0.051	0.147

TableB24						
Structure 1 - Gauge Arrangement 4						
Wave Generator @ 20 deg angle						20 hz
Wave Period = 1.6 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.050	1.46	0.130	0.082	0.228
2	1.05	0.048	1.42	0.140	0.088	0.254
3	1.05	0.049	1.43	0.138	0.088	0.251
4	1.05	0.049	1.44	0.138	0.087	0.255
5	1.05	0.049	1.44	0.137	0.087	0.248
6	0.50	0.048	1.48	0.176	0.109	0.284
7	0.50	0.047	1.37	0.148	0.092	0.286
8	0.50	0.049	1.44	0.151	0.093	0.266
9	0.50	0.049	1.44	0.150	0.094	0.307
10	0.50	0.049	1.41	0.155	0.097	0.340
11	0.54	0.044	1.47	0.155	0.100	0.248
12	0.51	0.052	1.49	0.152	0.100	0.251
13	0.50	0.049	1.49	0.146	0.096	0.244
14	0.47	0.048	1.44	0.156	0.099	0.294
15	0.44	0.052	1.45	0.150	0.094	0.245
16	0.41	0.049	1.43	0.166	0.102	0.276
17	0.40	0.049	1.46	0.165	0.105	0.253
18	0.35	0.047	1.48	0.164	0.104	0.220
19	0.32	0.050	1.46	0.154	0.102	0.214
20	0.28	0.045	1.43	0.138	0.093	0.203
21	0.55	0.050	1.58	0.056	0.037	0.094
22	0.52	0.045	1.57	0.060	0.040	0.107
23	0.50	0.049	1.56	0.065	0.043	0.135
24	0.47	0.049	1.52	0.073	0.046	0.107
25	0.43	0.049	1.50	0.079	0.051	0.141
26	0.40	0.049	1.53	0.086	0.056	0.155
27	0.38	0.045	1.51	0.096	0.063	0.185
28	0.34	0.044	1.51	0.105	0.067	0.189
29	0.30	0.048	1.50	0.120	0.075	0.182
30	0.24	0.049	1.52	0.073	0.046	0.107

Table B25						
Structure 1 - Gauge Arrangement 5						
Wave Generator @ 20 deg angle						20 hz
Wave Period = 1.6 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.049	1.47	0.128	0.081	0.219
2	1.05	0.048	1.42	0.140	0.089	0.256
3	1.05	0.050	1.43	0.137	0.088	0.250
4	1.05	0.047	1.45	0.137	0.087	0.256
5	1.05	0.053	1.45	0.200	0.127	0.362
6	0.50	0.049	1.49	0.176	0.109	0.282
7	0.50	0.047	1.39	0.149	0.093	0.302
8	0.50	0.049	1.43	0.151	0.094	0.265
9	0.50	0.050	1.44	0.148	0.092	0.299
10	0.50	0.049	1.42	0.153	0.095	0.353
11	0.54	0.049	1.45	0.114	0.074	0.207
12	0.51	0.054	1.48	0.105	0.069	0.178
13	0.50	0.049	1.47	0.104	0.068	0.190
14	0.47	0.050	1.44	0.115	0.074	0.217
15	0.44	0.056	1.47	0.108	0.068	0.194
16	0.41	0.052	1.45	0.120	0.075	0.222
17	0.40	0.051	1.46	0.129	0.081	0.234
18	0.35	0.049	1.45	0.138	0.087	0.221
19	0.32	0.051	1.46	0.142	0.090	0.205
20	0.28	0.051	1.42	0.138	0.089	0.200
21	0.55	0.047	1.94	0.028	0.019	0.055
22	0.52	0.051	1.78	0.047	0.031	0.094
23	0.50	0.053	1.73	0.049	0.034	0.099
24	0.47	0.050	1.97	0.029	0.019	0.056
25	0.43	0.053	1.55	0.058	0.039	0.104
26	0.40	0.052	1.51	0.065	0.043	0.128
27	0.38	0.054	1.51	0.071	0.046	0.181
28	0.34	0.052	1.54	0.079	0.051	0.187
29	0.30	0.052	1.58	0.094	0.056	0.170
30	0.24	0.052	1.48	0.103	0.062	0.156

Table B26						
Structure 1 - Gauge Arrangement 1						
Wave Generator @ 20 deg angle						20 hz
Monochromatic Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.050	0.79	0.135	0.120	0.140
2	1.05	0.050	0.79	0.150	0.145	0.152
3	1.05	0.051	0.79	0.172	0.160	0.175
4	1.05	0.049	0.79	0.154	0.146	0.156
5	1.05	0.050	0.79	0.166	0.153	0.170
6	0.50	0.055	0.79	0.204	0.186	0.207
7	0.50	0.049	0.79	0.135	0.123	0.152
8	0.50	0.050	0.79	0.148	0.134	0.152
9	0.50	0.050	0.79	0.149	0.136	0.152
10	0.50	0.050	0.79	0.135	0.122	0.155
11	0.54	0.049	0.79	0.145	0.133	0.151
12	0.51	0.052	0.79	0.143	0.126	0.153
13	0.50	0.049	0.79	0.134	0.121	0.156
14	0.47	0.051	0.79	0.158	0.114	0.162
15	0.44	0.056	0.79	0.135	0.113	0.156
16	0.41	0.052	0.79	0.131	0.114	0.159
17	0.40	0.050	0.79	0.137	0.120	0.159
18	0.35	0.049	0.79	0.143	0.130	0.158
19	0.32	0.050	0.79	0.147	0.132	0.158
20	0.28	0.050	0.79	0.180	0.152	0.210
21	0.55	0.052	0.87	0.016	0.012	0.019
22	0.52	0.054	0.97	0.012	0.010	0.015
23	0.50	0.051	0.87	0.017	0.013	0.021
24	0.47	0.051	0.80	0.021	0.013	0.025
25	0.43	0.053	0.79	0.018	0.014	0.021
26	0.40	0.051	0.80	0.021	0.016	0.024
27	0.38	0.051	0.08	0.013	0.010	0.014
28	0.34	0.053	0.80	0.024	0.018	0.027
29	0.30	0.031	1.73	0.101	0.066	0.114
30	0.24	0.052	0.80	0.021	0.014	0.025

Table B27						
Structure 1 - Gauge Arrangement 2						
Wave Generator @ 20 deg angle						20 hz
Monochromatic Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.048	0.81	0.142	0.138	0.144
2	1.05	0.048	0.81	0.146	0.143	0.147
3	1.05	0.048	0.80	0.142	0.137	0.146
4	1.05	0.047	0.80	0.138	0.124	0.141
5	1.05	0.048	0.81	0.136	0.126	0.141
6	0.50	0.050	0.81	0.160	0.147	0.164
7	0.50	0.048	0.80	0.139	0.123	0.153
8	0.50	0.050	0.80	0.140	0.131	0.146
9	0.50	0.046	0.80	0.130	0.120	0.142
10	0.50	0.049	0.80	0.149	0.137	0.151
11	0.54	0.052	0.80	0.135	0.123	0.150
12	0.51	0.052	0.80	0.125	0.116	0.143
13	0.50	0.051	0.80	0.128	0.116	0.144
14	0.47	0.047	0.80	0.131	0.112	0.144
15	0.44	0.051	0.80	0.126	0.117	0.140
16	0.41	0.050	0.81	0.140	0.114	0.147
17	0.40	0.050	0.80	0.146	0.133	0.152
18	0.35	0.050	0.80	0.136	0.124	0.147
19	0.32	0.049	0.80	0.137	0.125	0.142
20	0.28	0.050	0.80	0.144	0.127	0.158
21	0.55	0.052	0.89	0.016	0.012	0.018
22	0.52	0.053	0.85	0.054	0.043	0.064
23	0.50	0.057	0.81	0.020	0.014	0.022
24	0.47	0.052	0.81	0.028	0.022	0.033
25	0.43	0.033	0.81	0.038	0.029	0.044
26	0.40	0.052	0.81	0.027	0.023	0.030
27	0.38	0.052	0.81	0.024	0.020	0.026
28	0.34	0.053	0.81	0.043	0.034	0.047
29	0.30	0.044	0.95	0.055	0.031	0.129
30	0.24	0.052	0.81	0.028	0.022	0.033

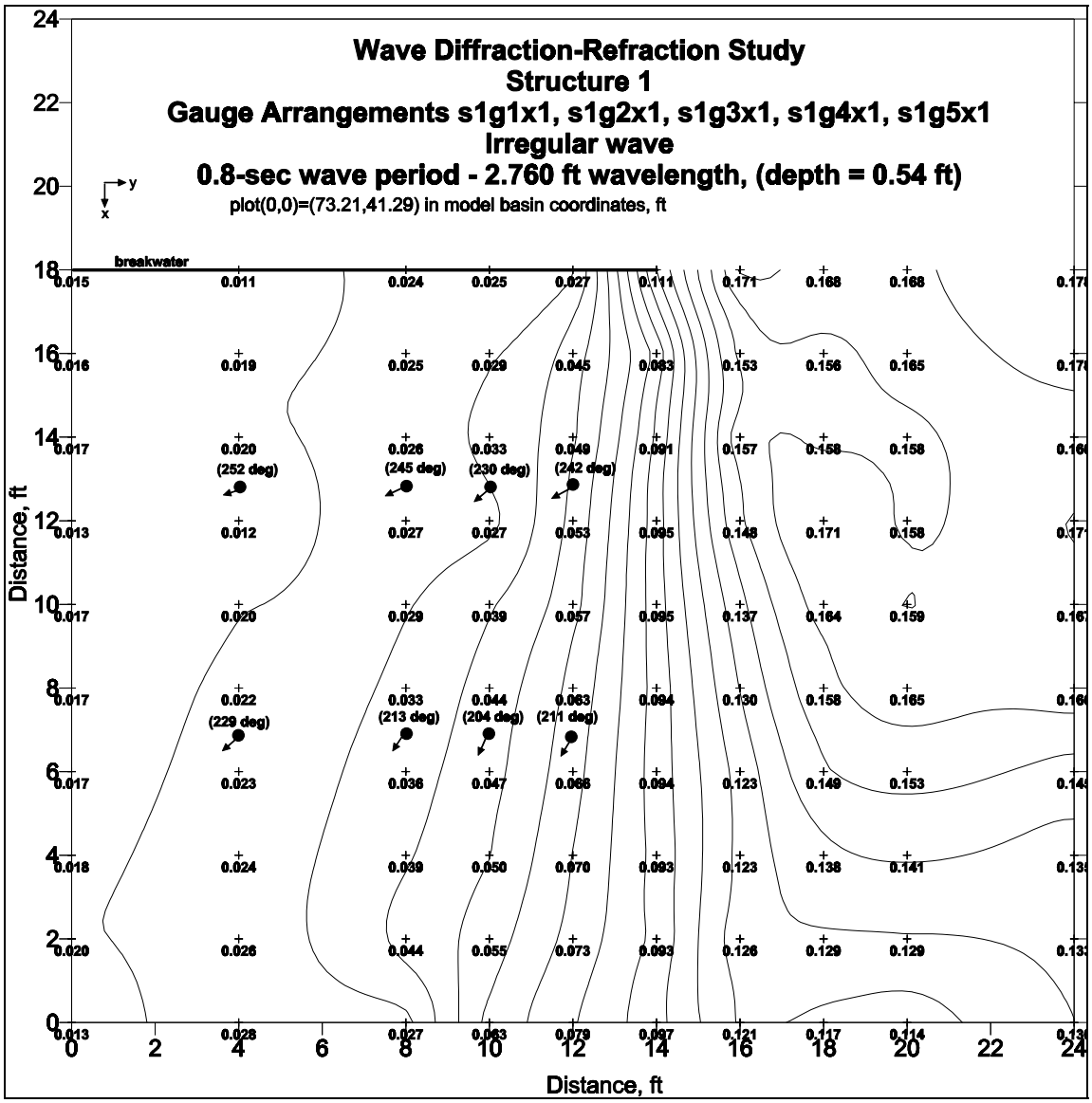
Table B28						
Structure 1 - Gauge Arrangement 3						
Wave Generator @ 20 deg angle						20 hz
Monochromatic Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.051	0.80	0.142	0.133	0.144
2	1.05	0.050	0.80	0.143	0.136	0.147
3	1.05	0.050	0.80	0.139	0.132	0.143
4	1.05	0.049	0.80	0.134	0.121	0.138
5	1.05	0.049	0.80	0.135	0.119	0.140
6	0.50	0.051	0.81	0.161	0.147	0.164
7	0.50	0.050	0.80	0.133	0.118	0.144
8	0.50	0.051	0.80	0.133	0.123	0.138
9	0.50	0.049	0.80	0.128	0.118	0.139
10	0.50	0.050	0.80	0.143	0.131	0.148
11	0.54	0.051	0.80	0.130	0.119	0.143
12	0.51	0.055	0.80	0.138	0.124	0.145
13	0.50	0.053	0.80	0.130	0.109	0.144
14	0.47	0.049	0.80	0.126	0.113	0.144
15	0.44	0.053	0.80	0.132	0.106	0.138
16	0.41	0.053	0.80	0.126	0.113	0.137
17	0.40	0.051	0.80	0.125	0.111	0.145
18	0.35	0.052	0.80	0.141	0.121	0.149
19	0.32	0.049	0.80	0.143	0.119	0.148
20	0.28	0.052	0.81	0.151	0.119	0.165
21	0.55	0.052	0.81	0.020	0.015	0.023
22	0.52	0.053	0.81	0.022	0.019	0.024
23	0.50	0.053	0.81	0.025	0.021	0.027
24	0.47	0.053	0.77	0.025	0.019	0.029
25	0.43	0.051	0.81	0.035	0.027	0.039
26	0.40	0.052	0.81	0.044	0.036	0.046
27	0.38	0.050	0.81	0.051	0.043	0.055
28	0.34	0.052	0.80	0.062	0.051	0.066
29	0.30	0.036	0.80	0.110	0.079	0.166
30	0.24	0.050	0.77	0.025	0.018	0.029

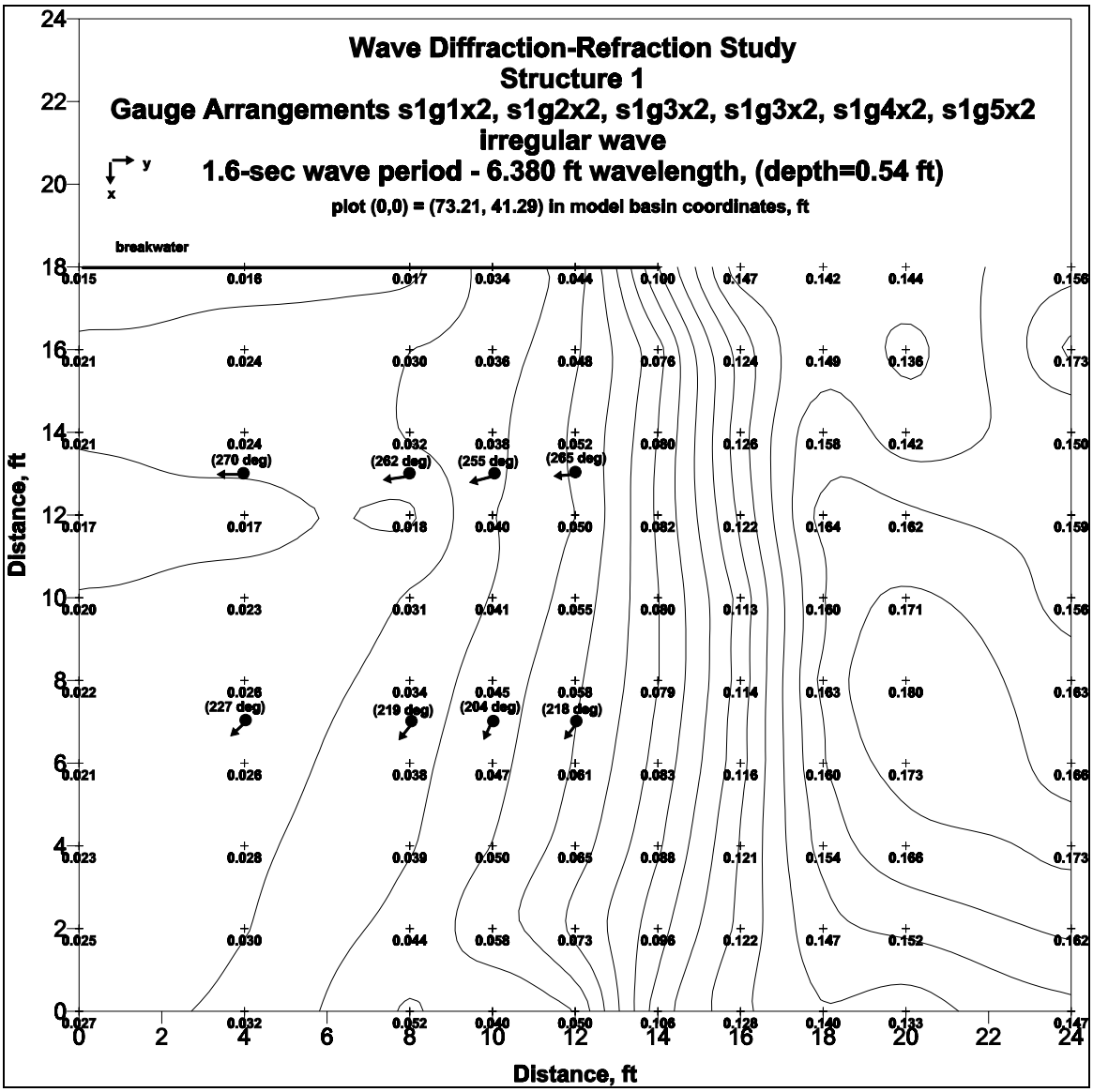
TableB29						
Structure 1 - Gauge Arrangement 4						
Wave Generator @ 20 deg angle						20 hz
Monochromatic Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.051	0.80	0.140	0.135	0.142
2	1.05	0.048	0.80	0.141	0.137	0.143
3	1.05	0.049	0.80	0.140	0.136	0.142
4	1.05	0.049	0.80	0.134	0.121	0.138
5	1.05	0.049	0.80	0.131	0.118	0.136
6	0.50	0.050	0.80	0.160	0.146	0.162
7	0.50	0.048	0.80	0.132	0.118	0.142
8	0.50	0.050	0.80	0.134	0.126	0.137
9	0.50	0.049	0.80	0.127	0.119	0.138
10	0.50	0.050	0.80	0.141	0.129	0.143
11	0.54	0.046	0.80	0.130	0.118	0.140
12	0.51	0.053	0.81	0.126	0.111	0.134
13	0.50	0.051	0.80	0.129	0.093	0.138
14	0.47	0.049	0.80	0.139	0.127	0.152
15	0.44	0.055	0.80	0.132	0.116	0.148
16	0.41	0.050	0.80	0.145	0.133	0.151
17	0.40	0.050	0.80	0.142	0.112	0.152
18	0.35	0.048	0.80	0.129	0.102	0.149
19	0.32	0.051	0.80	0.155	0.133	0.161
20	0.28	0.046	0.81	0.149	0.108	0.158
21	0.55	0.050	0.81	0.028	0.022	0.031
22	0.52	0.045	0.81	0.047	0.041	0.052
23	0.50	0.048	0.80	0.060	0.052	0.063
24	0.47	0.050	0.81	0.030	0.024	0.033
25	0.43	0.049	0.80	0.080	0.061	0.087
26	0.40	0.049	0.80	0.097	0.086	0.104
27	0.38	0.046	0.80	0.098	0.085	0.108
28	0.34	0.045	0.80	0.104	0.091	0.111
29	0.30	0.049	0.81	0.126	0.105	0.134
30	0.24	0.050	0.81	0.103	0.074	0.111

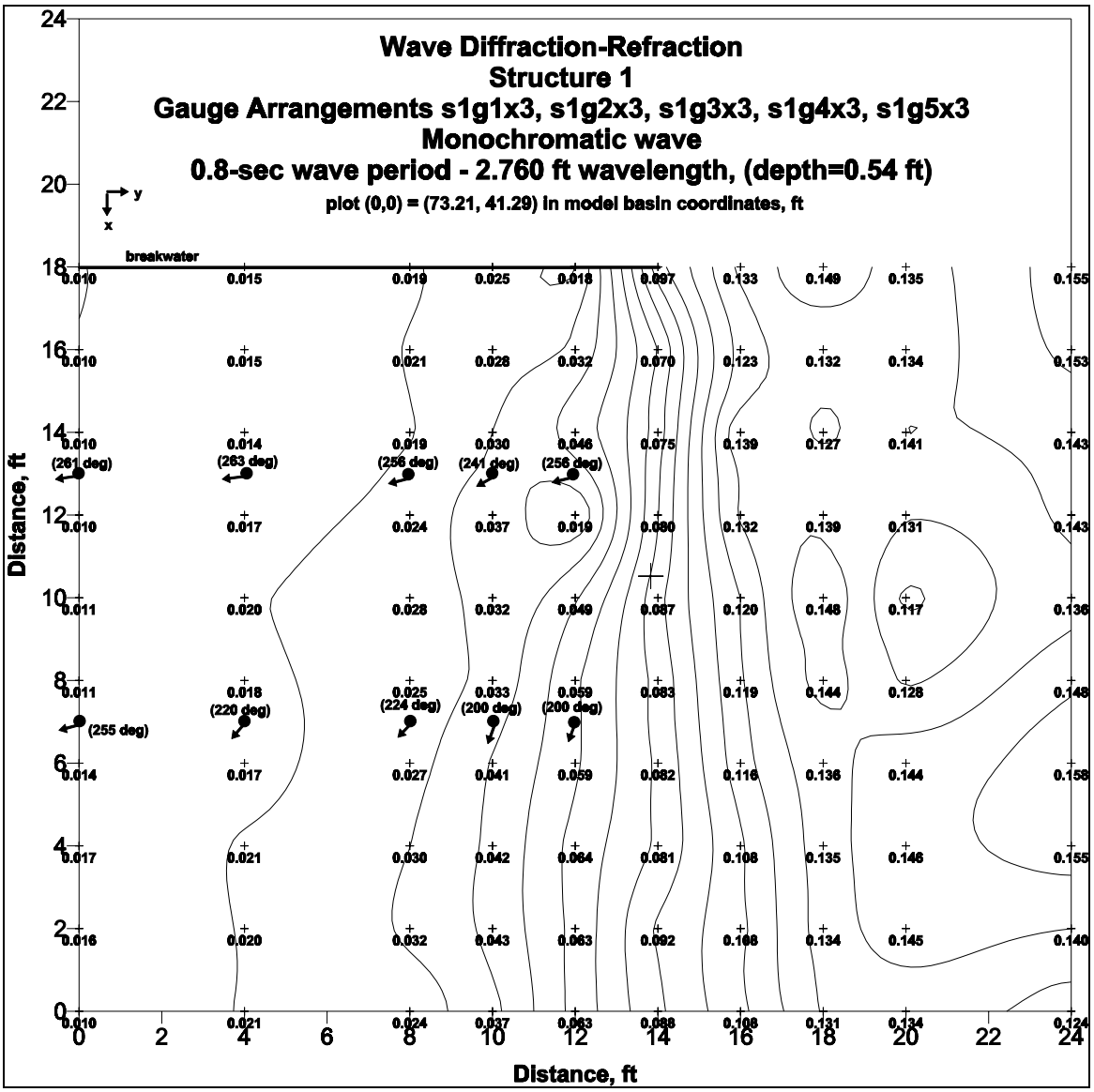
Table B30						
Structure 1 - Gauge Arrangement 5						
Wave Generator @ 20 deg angle						20 hz
Monochromatic Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.050	0.81	0.144	0.138	0.145
2	1.05	0.048	0.81	0.129	0.140	0.145
3	1.05	0.050	0.81	0.140	0.134	0.144
4	1.05	0.047	0.81	0.136	0.123	0.139
5	1.05	0.056	0.81	0.195	0.183	0.202
6	0.50	0.050	0.81	0.162	0.150	0.166
7	0.50	0.048	0.80	0.140	0.124	0.134
8	0.50	0.050	0.80	0.140	0.131	0.143
9	0.50	0.050	0.80	0.124	0.116	0.136
10	0.50	0.050	0.81	0.144	0.133	0.147
11	0.54	0.052	0.81	0.104	0.095	0.117
12	0.51	0.056	0.81	0.112	0.101	0.115
13	0.50	0.049	0.80	0.111	0.099	0.118
14	0.47	0.051	0.81	0.123	0.108	0.132
15	0.44	0.050	0.81	0.122	0.112	0.127
16	0.41	0.053	0.80	0.125	0.112	0.136
17	0.40	0.054	0.81	0.134	0.117	0.140
18	0.35	0.051	0.81	0.134	0.120	0.139
19	0.32	0.053	0.81	0.126	0.089	0.138
20	0.28	0.053	0.81	0.133	0.120	0.137
21	0.55	0.049	0.81	0.025	0.019	0.028
22	0.52	0.054	0.81	0.031	0.028	0.035
23	0.50	0.055	0.81	0.037	0.032	0.040
24	0.47	0.052	0.80	0.044	0.031	0.049
25	0.43	0.054	0.81	0.060	0.051	0.064
26	0.40	0.054	0.81	0.069	0.058	0.074
27	0.38	0.055	0.81	0.073	0.062	0.077
28	0.34	0.054	0.80	0.081	0.070	0.083
29	0.30	0.054	0.81	0.086	0.075	0.096
30	0.24	0.053	0.79	0.047	0.027	0.052

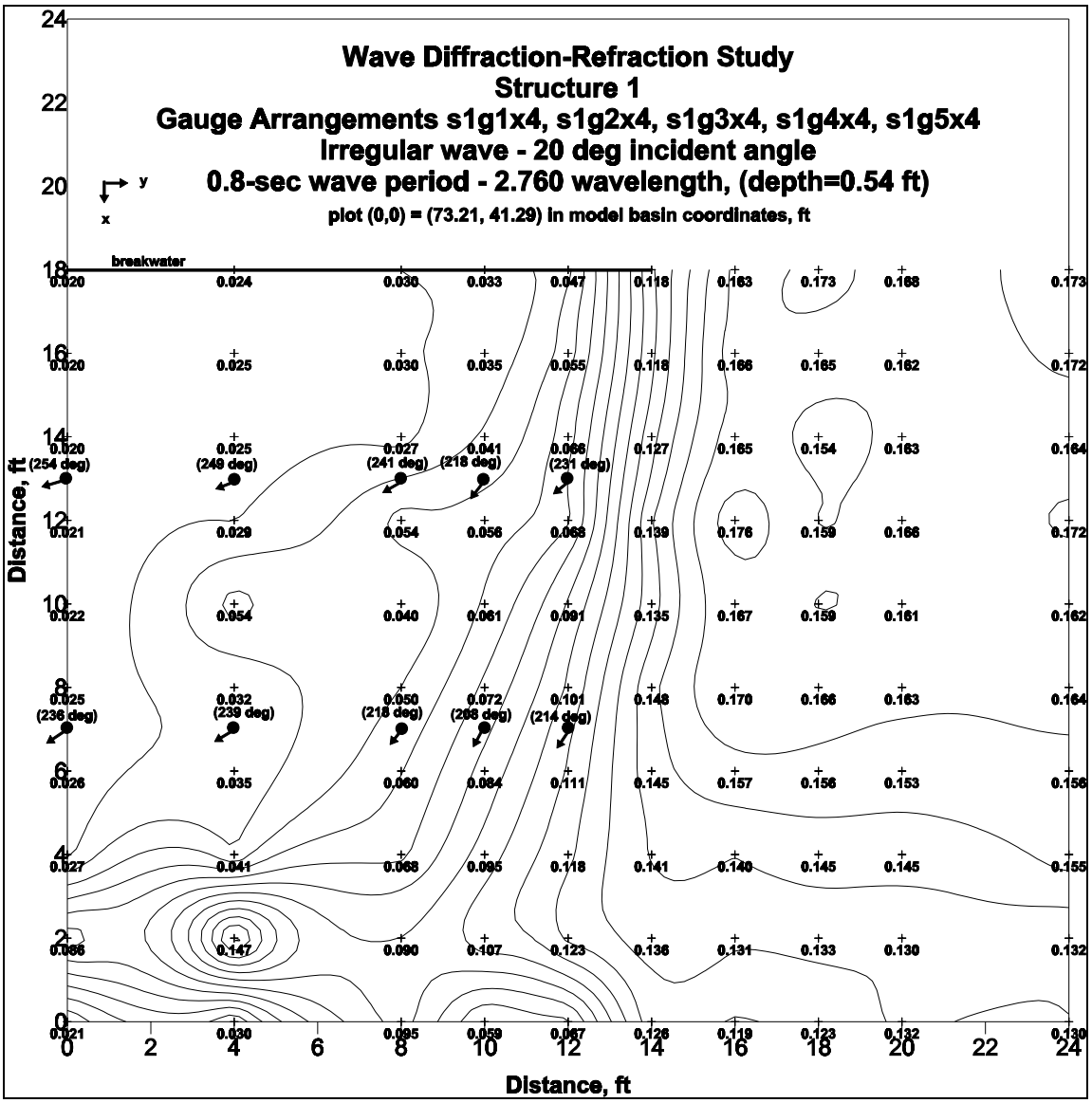
Appendix C
Wave Diffraction-Refraction Plots for Structure 1

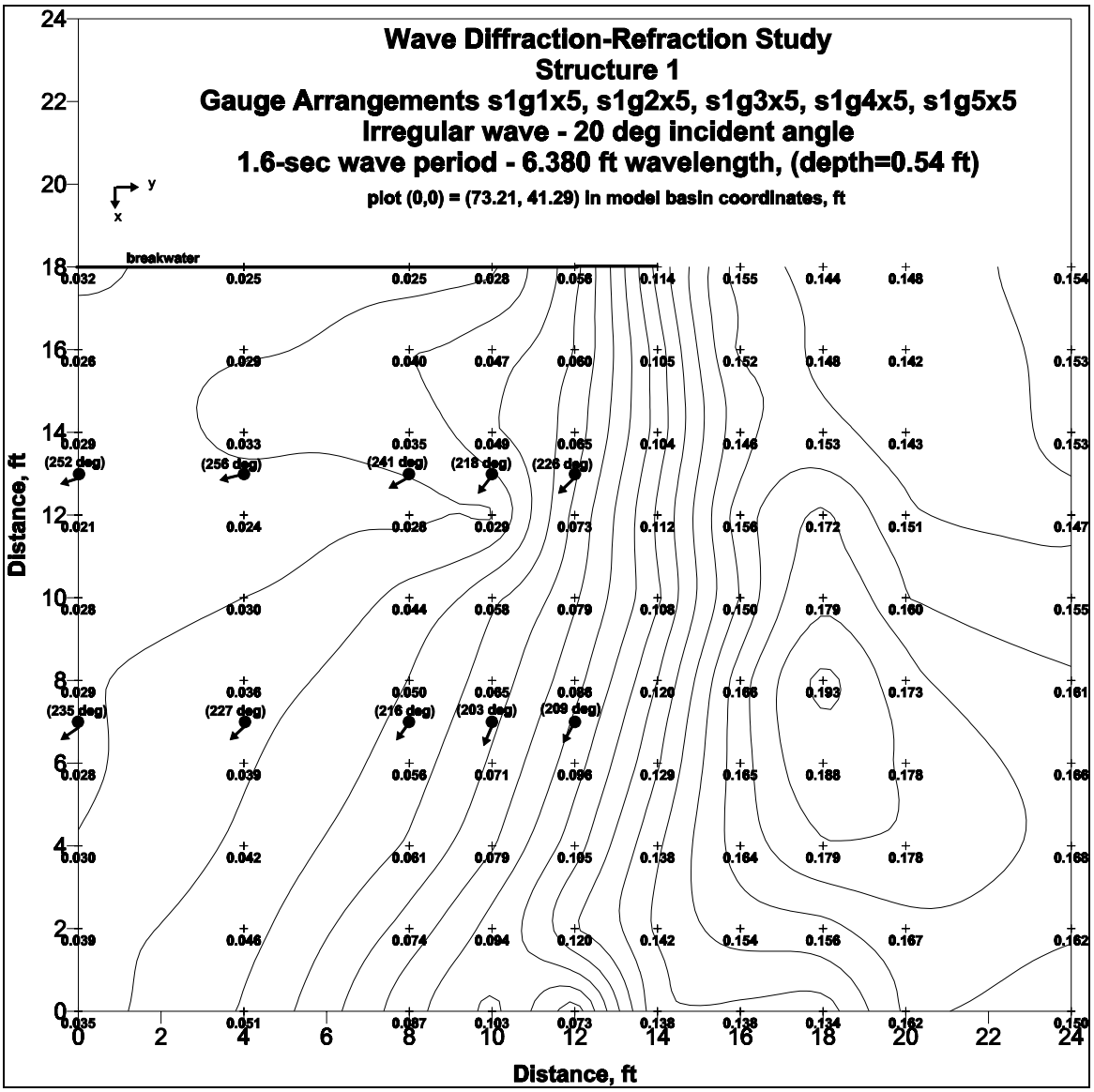
The wave diffraction-refraction plots in this appendix are contour maps describing the wave height transformation at the five different gauge arrangements. Contour interval is 0.003 m (0.01 ft). The vectors on the maps depict the peak wave direction acquired at the peak period from the Acoustic Doppler Velocimeter (ADV) probe. Table C1 summerizes ADV probe vector plot data for Structure 1. To convert measurements given in feet to meters, multiply by 0.3048. To convert measurements given in square feet to square meters, multiply by 0.093.


Wave Diffraction-Refraction Study
Structure 1
Gauge Arrangements s1g1x1, s1g2x1, s1g3x1, s1g4x1, s1g5x1
Irregular wave
0.8-sec wave period - 2.760 ft wavelength, (depth = 0.54 ft)
plot(0,0)=(73.21,41.29) in model basin coordinates, ft
y
x
breakwater
Distance, ft
Distance, ft
0.020 (252 deg)
0.026 (245 deg)
0.033 (230 deg)
0.049 (242 deg)
0.022 (229 deg)
0.033 (213 deg)
0.044 (204 deg)
0.063 (211 deg)


Wave Diffraction-Refraction Study
Structure 1
Gauge Arrangements s1g1x2, s1g2x2, s1g3x2, s1g3x2, s1g4x2, s1g5x2
irregular wave
1.6-sec wave period - 6.380 ft wavelength, (depth=0.54 ft)
plot (0,0) = (73.21, 41.29) in model basin coordinates, ft
y
x
breakwater
Distance, ft
Distance, ft


Wave Diffraction-Refraction
Structure 1
Gauge Arrangements s1g1x3, s1g2x3, s1g3x3, s1g4x3, s1g5x3
Monochromatic wave
0.8-sec wave period - 2.760 ft wavelength, (depth=0.54 ft)
plot (0,0) = (73.21, 41.29) in model basin coordinates, ft
y
x
breakwater
Distance, ft
Distance, ft


Wave Diffraction-Refraction Study
Structure 1
Gauge Arrangements s1g1x4, s1g2x4, s1g3x4, s1g4x4, s1g5x4
Irregular wave - 20 deg incident angle
0.8-sec wave period - 2.760 wavelength, (depth=0.54 ft)
plot (0,0) = (73.21, 41.29) in model basin coordinates, ft
y
x
breakwater
Distance, ft
Distance, ft


Wave Diffraction-Refraction Study
Structure 1
Gauge Arrangements s1g1x5, s1g2x5, s1g3x5, s1g4x5, s1g5x5
Irregular wave - 20 deg incident angle
1.6-sec wave period - 6.380 ft wavelength, (depth=0.54 ft)
plot (0,0) = (73.21, 41.29) in model basin coordinates, ft
y
x
breakwater
Distance, ft
Distance, ft
0 2 4 6 8 10 12 14 16 18 20 22 24
0.032 0.025 0.025 0.028 0.056 0.114 0.155 0.144 0.148 0.154
0.026 0.029 0.040 0.047 0.060 0.105 0.152 0.148 0.142 0.153
0.029 (252 deg) 0.033 (256 deg) 0.035 (241 deg) 0.049 (218 deg) 0.065 (226 deg) 0.104 0.146 0.153 0.143 0.153
0.021 0.024 0.028 0.029 0.073 0.112 0.156 0.172 0.151 0.147
0.028 0.030 0.044 0.058 0.079 0.108 0.150 0.179 0.160 0.155
0.029 (235 deg) 0.036 (227 deg) 0.050 (216 deg) 0.065 (203 deg) 0.086 (209 deg) 0.120 0.166 0.193 0.173 0.161
0.028 0.039 0.056 0.071 0.096 0.129 0.165 0.188 0.178 0.166
0.030 0.042 0.061 0.079 0.105 0.138 0.164 0.179 0.178 0.168
0.039 0.046 0.074 0.094 0.120 0.142 0.154 0.156 0.167 0.162
0.035 0.051 0.087 0.103 0.073 0.138 0.138 0.134 0.162 0.150

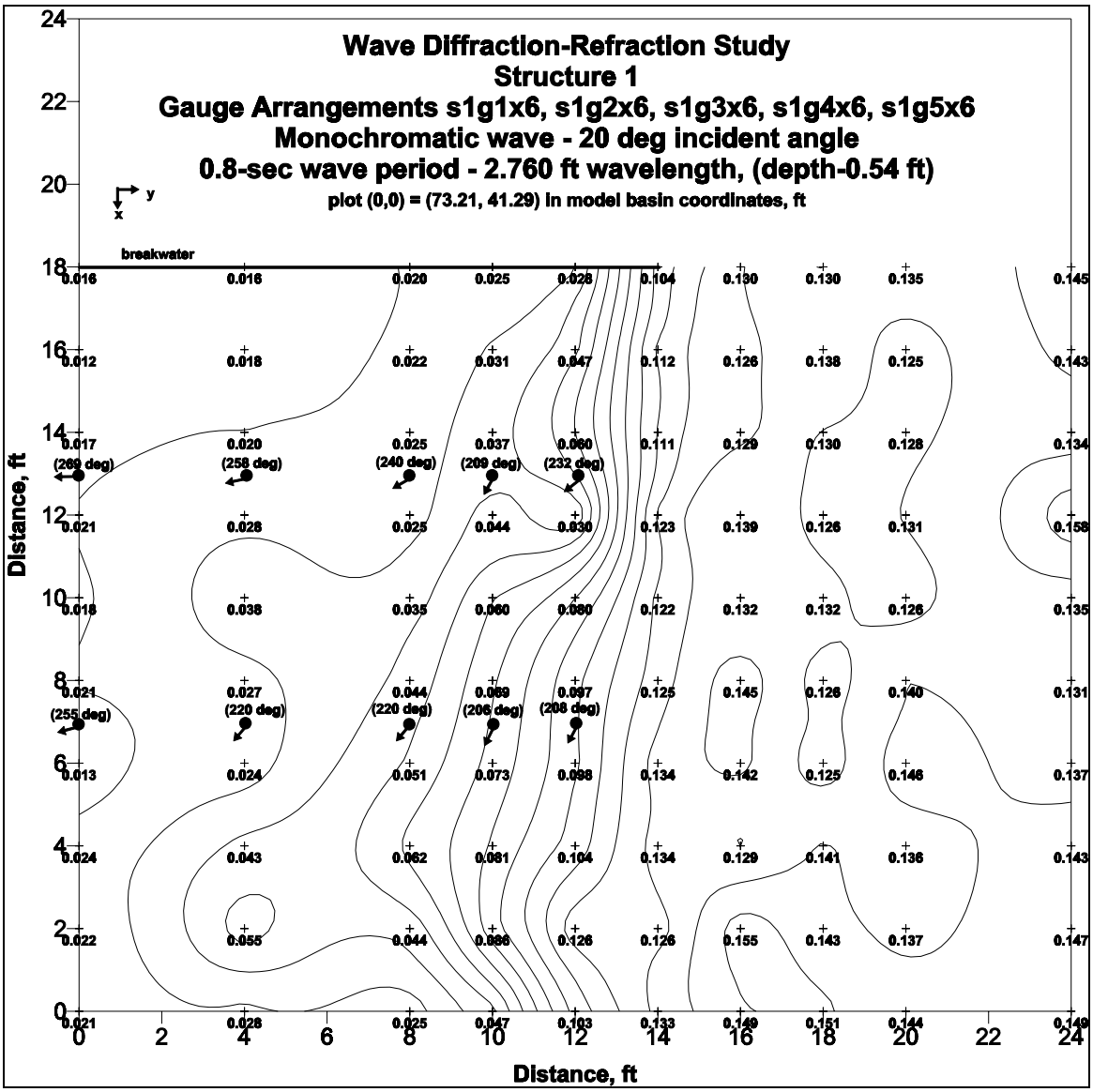

Wave Diffraction-Refraction Study
Structure 1
Gauge Arrangements s1g1x6, s1g2x6, s1g3x6, s1g4x6, s1g5x6
Monochromatic wave - 20 deg incident angle
0.8-sec wave period - 2.760 ft wavelength, (depth-0.54 ft)
plot (0,0) = (73.21, 41.29) in model basin coordinates, ft
y
x
breakwater
0.016 0.016 0.020 0.025 0.028 0.104 0.130 0.130 0.135 0.145
0.012 0.018 0.022 0.031 0.047 0.112 0.126 0.138 0.125 0.143
0.017 (269 deg) 0.020 (258 deg) 0.025 (240 deg) 0.037 (209 deg) 0.060 (232 deg) 0.111 0.129 0.130 0.128 0.134
0.021 0.028 0.025 0.044 0.030 0.123 0.139 0.126 0.131 0.158
0.018 0.038 0.035 0.060 0.060 0.122 0.132 0.132 0.126 0.135
0.021 (255 deg) 0.027 (220 deg) 0.044 (220 deg) 0.069 (206 deg) 0.097 (208 deg) 0.125 0.145 0.126 0.140 0.131
0.013 0.024 0.051 0.073 0.098 0.134 0.142 0.125 0.146 0.137
0.024 0.043 0.062 0.081 0.104 0.134 0.129 0.141 0.136 0.143
0.022 0.055 0.044 0.056 0.126 0.126 0.155 0.143 0.137 0.147
0.021 0.028 0.025 0.047 0.103 0.133 0.149 0.151 0.144 0.149
Distance, ft
Distance, ft
0 2 4 6 8 10 12 14 16 18 20 22 24

Table C1
Summary ADV Probe Vector Plot Data
Structure 1

Gauge Arrangement	ADV Probe 0			ADV Probe 1		
	Peak Period sec	Peak Energy Density ft^2/Hz	Peak Direction deg	Peak Period sec	Peak Energy Density ft^2/Hz	Peak Direction deg
g1x1	NO DATA					
g2x1	0.985	0.0038	252.00	0.985	0.0162	229.10
g3x1	0.853	0.0132	245.34	0.853	0.1811	212.78
g4x1	0.985	0.1250	230.25	0.914	0.6038	203.77
g5x1	0.800	0.0289	242.050	0.800	0.1797	210.86
g1x2	NO DATA					
g2x2	2.559	0.0037	269.89	1.829	0.0595	226.75
g3x2	2.133	0.0047	261.56	2.133	0.0266	219.08
g4x2	2.600	0.0217	255.30	2.560	0.0361	204.06
g5x2	2.560	0.0023	264.77	2.133	0.0369	218.21
g1x3	0.914	0.0002	261.46	0.948	0.0002	255.20
g2x3	0.985	0.0002	263.13	0.914	0.0028	220.13
g3x3	0.948	0.0006	255.74	0.883	0.0046	224.10
g4x3	0.985	0.0042	240.73	0.853	0.0643	199.75
g5x3	0.914	0.0084	256.41	0.853	0.0461	199.51
g1x4	0.985	0.0074	253.52	0.985	0.0221	236.10
g2x4	0.914	0.0175	249.01	0.914	0.0362	238.57
g3x4	0.800	0.0789	240.84	0.800	0.5159	218.42
g4x4	0.853	1.1224	218.36	0.800	2.2828	207.86
g5x4	0.800	0.2194	231.08	0.985	0.6914	214.42
g1x5	2.560	0.0117	251.75	2.560	0.0123	234.72
g2x5	2.560	0.0104	255.64	1.829	0.0994	226.79
g3x5	2.560	0.0202	240.68	1.829	0.6386	216.19
g4x5	1.829	0.6549	217.85	2.560	0.2355	203.34
g5x5	2.560	0.0356	225.67	1.829	1.2113	208.51
g1x6	0.914	0.0011	269.36	0.800	0.1757	254.69
g2x6	0.914	0.0015	258.28	0.853	0.0423	220.43
g3x6	0.985	0.0097	239.58	0.914	0.0628	220.50
g4x6	0.914	0.1165	208.94	0.914	0.4129	205.61
g5x6	0.914	0.0316	231.70	0.985	0.0898	208.31

Appendix D
Data Tables for Structure 2

Tables D1 through D30 list measurements for the wave experiments in Structure 2. The tables include the still-water depth d, average water surface elevation e, significant wave period T_s, significant wave height H_s, average wave height H_a, and maximum wave height H_m. The gauge locations are shown in Figure 8, and Figure D1 provides an enlargement with concentration on placement of the Acoustic Doppler Velocimeter (ADV) probes. Gauges 1, 2, 3, 4, and 5 are the furthest offshore (near the generator). Gauges 6, 7, 8, 9, and 10 are also offshore, but nearer to the jetty. The gauge spacing for the rack gauges, 11-20 and 21-30, is 0.6 m (2 ft) between consecutive gauges. The gauge locations in the basin coordinate system are given in Appendix M. To convert measurements given in feet to meters, multiply by 0.3048.

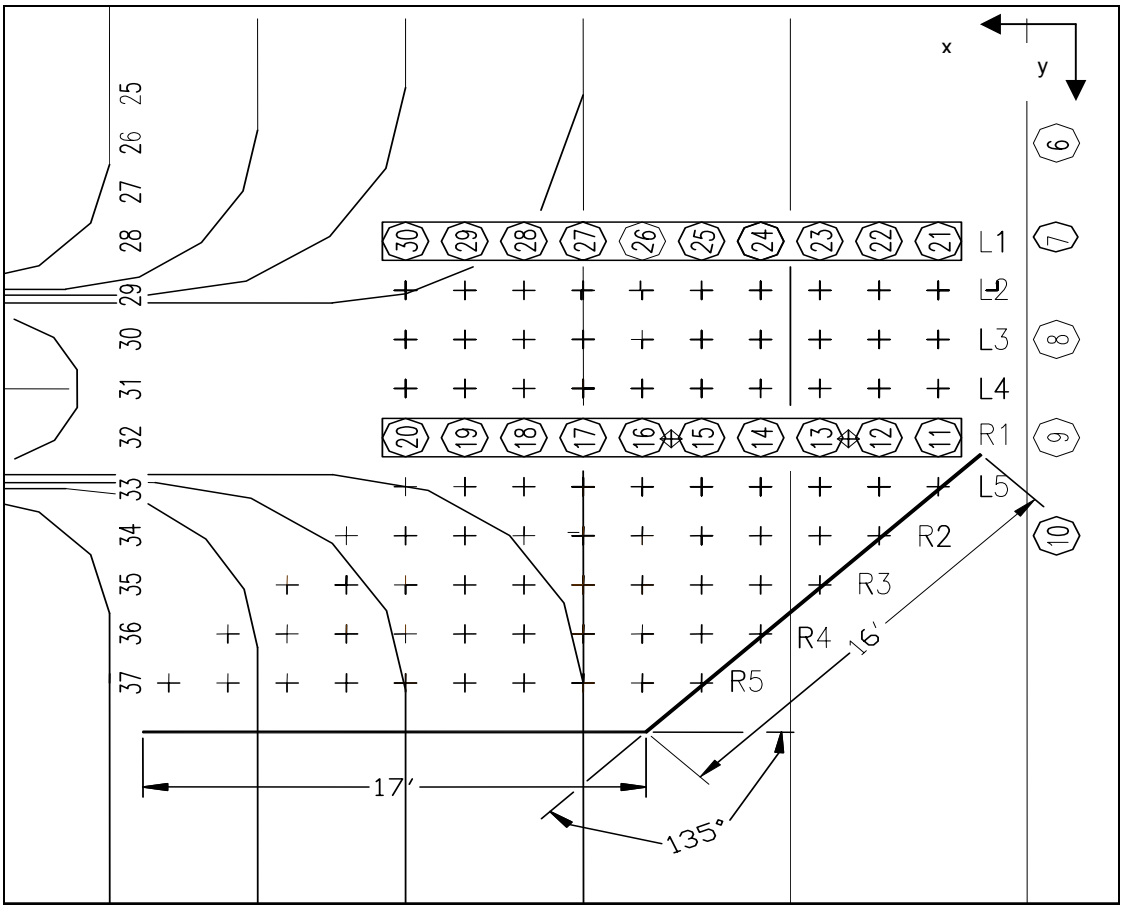


Figure D1. Structure 2 gauge arrangement enlargement

Table D1						
Structure 2 - Gauge Arrangement 1						
Irregular Wave						20 hz
Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.048	0.07	0.188	0.124	0.312
2	1.05	0.047	0.74	0.199	0.131	0.330
3	1.05	0.048	0.74	0.194	0.127	0.311
4	1.05	0.049	0.75	0.189	0.125	0.303
5	1.05	0.049	0.75	0.183	0.120	0.304
6	0.63	0.049	0.78	0.173	0.112	0.279
7	0.62	0.049	0.77	0.177	0.115	0.260
8	0.62	0.049	0.77	0.179	0.116	0.269
9	0.62	0.049	0.76	0.181	0.118	0.292
10	0.62	0.050	0.77	0.175	0.114	0.283
11	0.55	0.045	0.79	0.138	0.092	0.193
12	0.52	0.052	0.80	0.115	0.075	0.168
13	0.49	0.050	0.80	0.110	0.070	0.176
14	0.47	0.049	0.80	0.114	0.072	0.172
15	0.44	0.050	0.80	0.114	0.074	0.164
16	0.40	0.050	0.80	0.115	0.075	0.166
17	0.38	0.050	0.80	0.117	0.075	0.164
18	0.39	0.051	0.81	0.122	0.081	0.175
19	0.39	0.050	0.80	0.120	0.081	0.161
20	0.39	0.050	0.80	0.116	0.078	0.157
21	0.55	0.027	0.78	0.159	0.103	0.240
22	0.52	0.050	0.78	0.172	0.111	0.237
23	0.49	0.051	0.79	0.165	0.107	0.238
24	0.46	0.047	0.80	0.101	0.066	0.167
25	0.44	0.050	0.79	0.159	0.106	0.245
26	0.40	0.049	0.79	0.155	0.102	0.241
27	0.39	0.050	0.80	0.153	0.100	0.220
28	0.38	0.050	0.81	0.155	0.104	0.206
29	0.36	0.049	0.81	0.148	0.102	0.200
30	0.34	0.047	0.80	0.101	0.065	0.167

Table D2						
Structure 2 - Gauge Arrangement 2						
Irregular Wave						20 hz
Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.036	0.74	0.185	0.120	0.327
2	1.05	0.035	0.73	0.197	0.130	0.333
3	1.05	0.040	0.74	0.194	0.127	0.305
4	1.05	0.032	0.74	0.188	0.124	0.305
5	1.05	0.037	0.74	0.183	0.121	0.301
6	0.63	0.040	0.77	0.175	0.113	0.263
7	0.62	0.039	0.77	0.178	0.113	0.256
8	0.62	0.045	0.76	0.177	0.114	0.259
9	0.62	0.041	0.77	0.180	0.117	0.298
10	0.62	0.042	0.77	0.173	0.112	0.294
11	0.52	0.053	0.80	0.051	0.034	0.075
12	0.50	0.071	0.81	0.045	0.030	0.067
13	0.46	0.078	0.81	0.047	0.030	0.080
14	0.45	0.067	0.81	0.050	0.032	0.091
15	0.41	0.053	0.81	0.053	0.033	0.095
16	0.39	0.041	0.80	0.057	0.037	0.098
17	0.39	0.044	0.79	0.063	0.039	0.102
18	0.37	0.072	0.80	0.074	0.044	0.123
19	0.33	0.096	0.80	0.094	0.059	0.165
20	0.29	0.099	0.80	0.109	0.069	0.153
21	0.55	0.057	0.81	0.146	0.094	0.268
22	0.52	0.056	0.78	0.178	0.116	0.246
23	0.50	0.060	0.78	0.167	0.109	0.238
24	0.47	0.221	0.81	0.227	0.145	0.419
25	0.44	0.051	0.80	0.168	0.108	0.253
26	0.39	0.051	0.79	0.164	0.101	0.234
27	0.39	0.057	0.81	0.305	0.202	0.411
28	0.30	0.051	0.80	0.139	0.094	0.176
29	0.40	0.051	0.81	0.132	0.089	0.177
30	0.38	0.052	0.82	0.124	0.085	0.160

Table D3						
Structure 2 - Gauge Arrangement 3						
Irregular Wave						20 hz
Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.051	0.74	0.188	0.123	0.308
2	1.05	0.049	0.73	0.201	0.133	0.320
3	1.05	0.050	0.74	0.196	0.128	0.327
4	1.05	0.047	0.74	0.190	0.125	0.318
5	1.05	0.050	0.74	0.183	0.121	0.311
6	0.62	0.049	0.77	0.174	0.111	0.261
7	0.62	0.049	0.77	0.178	0.114	0.280
8	0.62	0.050	0.77	0.175	0.113	0.260
9	0.62	0.050	0.77	0.181	0.117	0.270
10	0.50	0.050	0.77	0.175	0.113	0.266
11	0.47	0.046	0.79	0.044	0.029	0.079
12	0.44	0.053	0.82	0.038	0.026	0.060
13	0.41	0.052	0.80	0.035	0.023	0.060
14	0.38	0.049	0.81	0.038	0.025	0.067
15	0.36	0.052	0.78	0.040	0.026	0.092
16	0.33	0.051	0.78	0.047	0.031	0.101
17	0.28	0.051	0.78	0.053	0.032	0.095
18	0.25	0.052	0.79	0.068	0.042	0.128
19	0.21	0.051	0.81	0.079	0.049	0.134
20	0.55	0.050	0.80	0.093	0.059	0.165
21	0.52	0.059	0.78	0.164	0.107	0.248
22	0.50	0.064	0.78	0.170	0.110	0.258
23	0.47	0.067	0.79	0.180	0.111	0.254
24	0.44	0.052	0.81	0.119	0.076	0.165
25	0.41	0.051	0.80	0.172	0.115	0.228
26	0.39	0.077	0.80	0.155	0.106	0.214
27	0.39	0.051	0.80	0.294	0.188	0.385
28	0.39	0.049	0.81	0.138	0.096	0.178
29	0.39	0.050	0.81	0.136	0.094	0.175
30	0.39	0.052	0.81	0.119	0.076	0.165

Table D4						
Structure 2 - Gauge Arrangement 4						
Irregular Wave						20 hz
Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.049	0.74	0.189	0.123	0.339
2	1.05	0.051	0.73	0.203	0.134	0.337
3	1.05	0.050	0.74	0.196	0.127	0.311
4	1.05	0.049	0.74	0.189	0.124	0.307
5	1.05	0.050	0.74	0.186	0.121	0.297
6	0.63	0.051	0.77	0.177	0.114	0.266
7	0.62	0.049	0.77	0.177	0.136	0.254
8	0.62	0.051	0.77	0.178	0.114	0.270
9	0.62	0.049	0.77	0.175	0.110	0.283
10	0.62	0.052	0.77	0.176	0.114	0.272
11	0.47	0.049	0.81	0.041	0.027	0.069
12	0.44	0.054	0.82	0.033	0.022	0.055
13	0.41	0.051	0.79	0.032	0.021	0.056
14	0.37	0.049	0.80	0.034	0.022	0.066
15	0.33	0.053	0.77	0.038	0.025	0.076
16	0.30	0.051	0.79	0.046	0.030	0.112
17	0.25	0.055	0.77	0.059	0.037	0.120
18	0.22	0.053	0.79	0.064	0.039	0.123
19	0.20	0.052	0.79	0.070	0.043	0.131
20	0.16	0.054	0.82	0.066	0.044	0.101
21	0.54	0.053	0.83	0.111	0.071	0.182
22	0.51	0.055	0.79	0.188	0.124	0.264
23	0.49	0.055	0.79	0.173	0.115	0.229
24	0.46	0.051	0.83	0.164	0.106	0.269
25	0.43	0.049	0.80	0.151	0.096	0.198
26	0.40	0.050	0.80	0.147	0.098	0.200
27	0.38	0.052	0.80	0.144	0.096	0.193
28	0.39	0.054	0.80	0.137	0.091	0.192
29	0.39	0.051	0.81	0.136	0.094	0.187
30	0.39	0.052	0.80	0.099	0.069	0.132

Table D5						
Structure 2 - Gauge Arrangement 5						
Irregular Wave						20 hz
Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.049	0.74	0.188	0.122	0.344
2	1.05	0.047	0.74	0.199	0.132	0.331
3	1.05	0.048	0.74	0.197	0.128	0.333
4	1.05	0.047	0.74	0.192	0.126	0.311
5	1.05	0.047	0.74	0.186	0.123	0.294
6	0.62	0.048	0.77	0.177	0.113	0.263
7	0.62	0.048	0.77	0.176	0.112	0.257
8	0.62	0.049	0.77	0.178	0.115	0.256
9	0.62	0.048	0.76	0.182	0.116	0.281
10	0.62	0.050	0.78	0.177	0.114	0.288
11	0.45	0.052	0.79	0.036	0.024	0.068
12	0.41	0.053	0.81	0.029	0.019	0.048
13	0.37	0.050	0.82	0.036	0.024	0.058
14	0.34	0.051	0.78	0.043	0.029	0.083
15	0.31	0.048	0.77	0.047	0.029	0.087
16	0.26	0.051	0.80	0.051	0.033	0.093
17	0.24	0.050	0.80	0.050	0.029	0.108
18	0.20	0.051	0.79	0.071	0.043	0.122
19	0.16	0.053	0.80	0.077	0.049	0.132
20	0.16	0.053	0.96	0.047	0.032	0.078
21	0.54	0.050	0.81	0.067	0.044	0.110
22	0.53	0.049	0.81	0.064	0.042	0.105
23	0.50	0.052	0.81	0.068	0.043	0.111
24	0.46	0.049	0.81	0.064	0.042	0.107
25	0.44	0.049	0.79	0.073	0.046	0.134
26	0.41	0.050	0.81	0.082	0.052	0.137
27	0.39	0.049	0.81	0.089	0.056	0.140
28	0.40	0.050	0.80	0.095	0.061	0.140
29	0.40	0.049	0.80	0.101	0.066	0.152
30	0.39	0.050	0.81	0.064	0.042	0.107

Table D6						
Structure 2 - Gauge Arrangement 1						
Irregular Wave						20 hz
Wave Period = 1.6 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.052	1.45	0.134	0.083	0.233
2	1.05	0.047	1.47	0.142	0.092	0.239
3	1.05	0.050	1.43	0.133	0.084	0.225
4	1.05	0.048	1.44	0.133	0.084	0.237
5	1.05	0.050	1.43	0.128	0.082	0.224
6	0.63	0.049	1.42	0.149	0.095	0.262
7	0.62	0.049	1.43	0.149	0.094	0.291
8	0.62	0.048	1.45	0.158	0.100	0.272
9	0.62	0.048	1.39	0.148	0.093	0.308
10	0.62	0.049	1.51	0.182	0.115	0.345
11	0.55	0.050	1.39	0.126	0.080	0.239
12	0.52	0.055	1.43	0.105	0.068	0.186
13	0.49	0.051	1.46	0.096	0.064	0.153
14	0.47	0.049	1.50	0.095	0.063	0.148
15	0.44	0.051	1.50	0.095	0.064	0.150
16	0.40	0.052	1.49	0.095	0.063	0.149
17	0.38	0.049	1.52	0.104	0.067	0.178
18	0.39	0.050	1.47	0.106	0.068	0.198
19	0.39	0.049	1.46	0.103	0.065	0.199
20	0.39	0.049	1.47	0.103	0.067	0.204
21	0.55	-0.129	1.53	0.143	0.086	0.258
22	0.52	-0.070	1.48	0.139	0.087	0.243
23	0.49	-0.105	1.47	0.126	0.080	0.227
24	0.46	0.049	1.55	0.123	0.079	0.216
25	0.44	0.049	1.48	0.165	0.103	0.272
26	0.40	0.048	1.45	0.170	0.098	0.252
27	0.39	0.048	1.47	0.178	0.113	0.263
28	0.38	0.048	1.45	0.173	0.109	0.258
29	0.36	0.047	1.45	0.160	0.091	0.232
30	0.34	0.049	1.42	0.147	0.097	0.223

Table D7						
Structure 2 - Gauge Arrangement 2						
Irregular Wave						20 hz
Wave Period = 1.6 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.041	1.43	0.135	0.085	0.237
2	1.05	0.037	1.47	0.143	0.092	0.242
3	1.05	0.040	1.43	0.134	0.085	0.222
4	1.05	0.033	1.44	0.135	0.085	0.247
5	1.05	0.040	1.44	0.129	0.082	0.240
6	0.63	0.041	1.41	0.150	0.092	0.260
7	0.62	0.040	1.43	0.152	0.096	0.313
8	0.62	0.046	1.46	0.156	0.097	0.263
9	0.62	0.041	1.41	0.147	0.092	0.310
10	0.62	0.043	1.51	0.185	0.117	0.347
11	0.52	0.055	1.56	0.059	0.040	0.099
12	0.50	0.072	1.61	0.055	0.036	0.097
13	0.46	0.078	1.60	0.054	0.038	0.098
14	0.45	0.067	1.59	0.053	0.036	0.085
15	0.41	0.053	1.60	0.052	0.032	0.089
16	0.39	0.042	1.60	0.058	0.039	0.108
17	0.39	0.044	1.53	0.058	0.037	0.141
18	0.37	0.072	1.51	0.063	0.038	0.165
19	0.33	0.096	1.58	0.069	0.041	0.196
20	0.29	0.100	1.53	0.082	0.051	0.197
21	0.55	0.055	1.41	0.140	0.086	0.247
22	0.52	0.053	1.43	0.153	0.097	0.263
23	0.50	0.060	1.47	0.164	0.103	0.282
24	0.47	0.219	1.48	0.241	0.140	0.490
25	0.44	0.048	1.48	0.181	0.113	0.281
26	0.39	0.050	1.46	0.184	0.115	0.239
27	0.39	0.049	1.45	0.363	0.226	0.486
28	0.30	0.046	1.44	0.166	0.106	0.230
29	0.40	0.049	1.38	0.152	0.088	0.240
30	0.38	0.050	1.48	0.121	0.070	0.244

Table D8						
Structure 2 - Gauge Arrangement 3						
Irregular Wave						20 hz
Wave Period = 1.6 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.055	1.43	0.136	0.084	0.228
2	1.05	0.052	1.47	0.142	0.090	0.242
3	1.05	0.052	1.44	0.130	0.081	0.221
4	1.05	0.049	1.46	0.135	0.085	0.240
5	1.05	0.055	1.43	0.132	0.083	0.240
6	0.62	0.049	1.40	0.152	0.095	0.267
7	0.62	0.050	1.43	0.154	0.096	0.322
8	0.62	0.052	1.45	0.151	0.096	0.265
9	0.62	0.052	1.41	0.144	0.090	0.307
10	0.50	0.052	1.52	0.183	0.115	0.340
11	0.47	0.051	1.77	0.048	0.033	0.098
12	0.44	0.056	1.67	0.044	0.029	0.077
13	0.41	0.052	1.90	0.042	0.028	0.079
14	0.38	0.051	1.63	0.046	0.031	0.082
15	0.36	0.053	1.69	0.043	0.028	0.077
16	0.33	0.052	1.61	0.043	0.028	0.080
17	0.28	0.053	1.68	0.050	0.032	0.110
18	0.25	0.052	1.66	0.063	0.041	0.157
19	0.21	0.052	1.69	0.071	0.043	0.157
20	0.55	0.052	1.70	0.092	0.055	0.150
21	0.52	0.050	1.44	0.133	0.079	0.240
22	0.50	0.045	1.49	0.159	0.102	0.279
23	0.47	0.049	1.46	0.166	0.105	0.301
24	0.44	0.050	1.47	0.113	0.068	0.196
25	0.41	0.051	1.45	0.168	0.105	0.279
26	0.39	0.050	1.46	0.165	0.100	0.258
27	0.39	0.054	1.44	0.316	0.194	0.437
28	0.39	0.051	1.42	0.150	0.094	0.209
29	0.39	0.051	1.41	0.141	0.090	0.206
30	0.39	0.050	1.47	0.115	0.072	0.195

Table D9						
Structure 2 - Gauge Arrangement 4						
Irregular Wave						20 hz
Wave Period = 1.6 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.049	1.44	0.138	0.087	0.248
2	1.05	0.051	1.47	0.145	0.093	0.249
3	1.05	0.051	1.44	0.136	0.087	0.236
4	1.05	0.049	1.44	0.138	0.087	0.254
5	1.05	0.052	1.43	0.133	0.084	0.241
6	0.63	0.050	1.42	0.149	0.089	0.266
7	0.62	0.050	1.43	0.153	0.097	0.255
8	0.62	0.051	1.46	0.158	0.099	0.265
9	0.62	0.051	1.40	0.147	0.093	0.298
10	0.62	0.052	1.54	0.186	0.118	0.329
11	0.47	0.048	1.88	0.046	0.031	0.076
12	0.44	0.053	1.94	0.040	0.025	0.063
13	0.41	0.048	1.86	0.041	0.025	0.065
14	0.37	0.050	1.64	0.046	0.030	0.074
15	0.33	0.053	1.72	0.048	0.032	0.097
16	0.30	0.052	1.65	0.052	0.034	0.131
17	0.25	0.054	1.75	0.067	0.043	0.215
18	0.22	0.050	1.72	0.064	0.037	0.186
19	0.20	0.051	1.72	0.077	0.049	0.138
20	0.16	0.050	1.66	0.079	0.050	0.148
21	0.54	0.054	1.42	0.147	0.095	0.256
22	0.51	0.056	1.43	0.151	0.097	0.260
23	0.49	0.057	1.42	0.141	0.092	0.224
24	0.46	0.051	1.48	0.099	0.065	0.145
25	0.43	0.048	1.45	0.135	0.088	0.224
26	0.40	0.052	1.43	0.131	0.082	0.216
27	0.38	0.050	1.44	0.135	0.086	0.221
28	0.39	0.052	1.43	0.131	0.084	0.206
29	0.39	0.050	1.44	0.128	0.084	0.193
30	0.39	0.051	1.48	0.099	0.065	0.146

Table D10						
Structure 2 - Gauge Arrangement 5						
Irregular Wave						20 hz
Wave Period = 1.6 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.050	1.44	0.137	0.086	0.239
2	1.05	0.049	1.46	0.145	0.094	0.246
3	1.05	0.049	1.44	0.136	0.087	0.223
4	1.05	0.049	1.45	0.136	0.086	0.248
5	1.05	0.050	1.43	0.133	0.085	0.239
6	0.62	0.048	1.42	0.154	0.097	0.262
7	0.62	0.048	1.44	0.153	0.098	0.251
8	0.62	0.049	1.44	0.157	0.099	0.270
9	0.62	0.049	1.41	0.151	0.095	0.286
10	0.62	0.052	1.54	0.190	0.122	0.340
11	0.45	0.051	2.21	0.045	0.028	0.089
12	0.41	0.053	2.00	0.038	0.022	0.079
13	0.37	0.049	2.08	0.033	0.021	0.065
14	0.34	0.049	1.85	0.036	0.024	0.063
15	0.31	0.049	2.12	0.042	0.027	0.081
16	0.26	0.049	2.00	0.049	0.031	0.129
17	0.24	0.049	2.04	0.055	0.030	0.113
18	0.20	0.048	1.91	0.062	0.037	0.124
19	0.16	0.049	1.82	0.067	0.041	0.130
20	0.16	0.050	2.39	0.053	0.034	0.098
21	0.54	0.052	1.46	0.074	0.048	0.136
22	0.53	0.051	1.49	0.071	0.048	0.112
23	0.50	0.056	1.55	0.072	0.048	0.123
24	0.46	0.050	1.60	0.057	0.035	0.111
25	0.44	0.050	1.50	0.070	0.047	0.112
26	0.41	0.048	1.51	0.071	0.048	0.114
27	0.39	0.047	1.52	0.073	0.043	0.156
28	0.40	0.049	1.50	0.078	0.051	0.171
29	0.40	0.048	1.52	0.082	0.053	0.150
30	0.39	0.050	1.61	0.058	0.036	0.111

Table D11						
Structure 2 - Gauge Arrangement 1						
Monochromatic Wave						20 hz
Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.051	0.80	0.151	0.147	0.155
2	1.05	0.047	0.80	0.150	0.146	0.156
3	1.05	0.050	0.80	0.141	0.138	0.146
4	1.05	0.050	0.80	0.133	0.127	0.138
5	1.05	0.049	0.80	0.135	0.132	0.138
6	0.63	0.051	0.80	0.126	0.121	0.149
7	0.62	0.050	0.80	0.132	0.127	0.146
8	0.62	0.049	0.80	0.133	0.130	0.148
9	0.62	0.050	0.80	0.148	0.144	0.152
10	0.62	0.052	0.80	0.151	0.147	0.156
11	0.55	0.054	0.80	0.118	0.115	0.129
12	0.52	0.055	0.80	0.097	0.094	0.107
13	0.49	0.054	0.80	0.090	0.086	0.099
14	0.47	0.050	0.80	0.092	0.089	0.099
15	0.44	0.052	0.80	0.094	0.091	0.099
16	0.40	0.053	0.80	0.094	0.089	0.099
17	0.38	0.051	0.80	0.094	0.088	0.098
18	0.39	0.051	0.80	0.087	0.076	0.094
19	0.39	0.050	0.80	0.082	0.078	0.090
20	0.39	0.051	0.80	0.091	0.085	0.095
21	0.55	-0.124	0.80	0.115	0.112	0.123
22	0.52	-0.693	0.80	0.135	0.128	0.139
23	0.49	-0.105	0.80	0.113	0.110	0.117
24	0.46	0.050	0.80	0.145	0.129	0.152
25	0.44	0.051	0.80	0.133	0.126	0.155
26	0.40	0.050	0.80	0.124	0.116	0.147
27	0.39	0.050	0.80	0.131	0.121	0.148
28	0.38	0.050	0.80	0.143	0.133	0.155
29	0.36	0.049	0.80	0.152	0.141	0.177
30	0.34	0.050	0.80	0.145	0.129	0.151

Table D12						
Structure 2 - Gauge Arrangement 2						
Monochromatic Wave						20 hz
Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.039	0.80	0.143	0.138	0.149
2	1.05	0.036	0.80	0.150	0.145	0.158
3	1.05	0.040	0.80	0.143	0.139	0.147
4	1.05	0.034	0.80	0.146	0.141	0.150
5	1.05	0.037	0.80	0.136	0.133	0.141
6	0.63	0.041	0.80	0.141	0.136	0.147
7	0.62	0.040	0.80	0.142	0.137	0.157
8	0.62	0.045	0.80	0.132	0.128	0.151
9	0.62	0.040	0.80	0.143	0.138	0.155
10	0.62	0.043	0.80	0.154	0.147	0.165
11	0.52	0.058	0.80	0.045	0.039	0.053
12	0.50	0.073	0.08	0.044	0.040	0.048
13	0.46	0.079	0.80	0.043	0.039	0.051
14	0.45	0.066	0.80	0.045	0.040	0.050
15	0.41	0.054	0.80	0.037	0.033	0.041
16	0.39	0.043	0.80	0.048	0.039	0.054
17	0.39	0.045	0.80	0.048	0.042	0.054
18	0.37	0.073	0.80	0.067	0.052	0.075
19	0.33	0.097	0.80	0.075	0.056	0.083
20	0.29	0.102	0.80	0.084	0.064	0.095
21	0.55	0.053	0.80	0.125	0.119	0.145
22	0.52	0.054	0.80	0.140	0.134	0.156
23	0.50	0.061	0.80	0.140	0.132	0.164
24	0.47	0.049	0.80	0.088	0.058	0.134
25	0.44	0.049	0.80	0.139	0.132	0.157
26	0.39	0.051	0.80	0.151	0.141	0.175
27	0.39	0.052	0.80	0.319	0.291	0.381
28	0.30	0.047	0.80	0.150	0.140	0.168
29	0.40	0.050	0.80	0.155	0.143	0.163
30	0.38	0.050	0.80	0.141	0.108	0.149

Table D13						
Structure 2 - Gauge Arrangement 3						
Monochromatic Wave						20 hz
Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.053	0.79	0.152	0.146	0.159
2	1.05	0.051	0.79	0.161	0.155	0.166
3	1.05	0.051	0.79	0.148	0.144	0.153
4	1.05	0.048	0.79	0.144	0.141	0.149
5	1.05	0.053	0.79	0.131	0.128	0.141
6	0.62	0.051	0.79	0.136	0.130	0.150
7	0.62	0.051	0.79	0.138	0.132	0.155
8	0.62	0.052	0.79	0.132	0.127	0.148
9	0.62	0.051	0.79	0.135	0.129	0.162
10	0.50	0.052	0.79	0.148	0.143	0.154
11	0.47	0.054	0.79	0.033	0.028	0.040
12	0.44	0.058	0.79	0.030	0.027	0.034
13	0.41	0.055	0.79	0.031	0.029	0.034
14	0.38	0.052	0.79	0.034	0.030	0.038
15	0.36	0.053	0.79	0.028	0.025	0.031
16	0.33	0.052	0.79	0.036	0.031	0.039
17	0.28	0.054	0.79	0.043	0.034	0.054
18	0.25	0.052	0.79	0.068	0.043	0.080
19	0.21	0.052	0.79	0.068	0.049	0.078
20	0.55	0.051	0.79	0.078	0.052	0.122
21	0.52	0.052	0.79	0.136	0.131	0.145
22	0.50	0.053	0.79	0.128	0.122	0.151
23	0.47	0.055	0.79	0.142	0.137	0.171
24	0.44	0.051	0.79	0.134	0.116	0.140
25	0.41	0.052	0.79	0.150	0.137	0.187
26	0.39	0.053	0.79	0.157	0.144	0.181
27	0.39	0.057	0.79	0.308	0.288	0.358
28	0.39	0.048	0.79	0.140	0.133	0.157
29	0.39	0.053	0.79	0.137	0.130	0.152
30	0.39	0.051	0.79	0.133	0.116	0.140

Table D14						
Structure 2 - Gauge Arrangement 4						
Monochromatic Wave						20 hz
Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.049	0.78	0.144	0.137	0.153
2	1.05	0.052	0.78	0.165	0.158	0.171
3	1.05	0.050	0.78	0.147	0.141	0.154
4	1.05	0.050	0.78	0.145	0.138	0.152
5	1.05	0.053	0.78	0.154	0.148	0.158
6	0.63	0.051	0.78	0.135	0.131	0.143
7	0.62	0.051	0.78	0.146	0.142	0.149
8	0.62	0.052	0.78	0.145	0.140	0.151
9	0.62	0.051	0.78	0.137	0.133	0.144
10	0.62	0.053	0.78	0.170	0.159	0.176
11	0.47	0.053	0.78	0.039	0.028	0.047
12	0.44	0.055	0.78	0.030	0.025	0.035
13	0.41	0.051	0.78	0.027	0.023	0.032
14	0.37	0.049	0.78	0.026	0.023	0.029
15	0.33	0.053	0.78	0.041	0.034	0.047
16	0.30	0.052	0.78	0.054	0.043	0.059
17	0.25	0.054	0.78	0.078	0.052	0.089
18	0.22	0.052	0.78	0.091	0.052	0.108
19	0.20	0.050	0.78	0.081	0.054	0.095
20	0.16	0.051	0.78	0.084	0.058	0.123
21	0.54	0.053	0.78	0.082	0.075	0.089
22	0.51	0.052	0.78	0.164	0.159	0.169
23	0.49	0.051	0.78	0.155	0.148	0.162
24	0.46	0.050	0.78	0.120	0.110	0.130
25	0.43	0.048	0.78	0.144	0.137	0.150
26	0.40	0.052	0.78	0.134	0.127	0.140
27	0.38	0.051	0.78	0.130	0.122	0.136
28	0.39	0.055	0.78	0.124	0.115	0.134
29	0.39	0.053	0.78	0.121	0.113	0.132
30	0.39	0.053	0.78	0.094	0.087	0.099

Table D15						
Structure 2 - Gauge Arrangement 5						
Monochromatic Wave						20 hz
Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.049	0.80	0.156	0.152	0.162
2	1.05	0.050	0.80	0.181	0.175	0.184
3	1.05	0.050	0.80	0.165	0.158	0.170
4	1.05	0.048	0.80	0.134	0.129	0.141
5	1.05	0.050	0.80	0.138	0.135	0.141
6	0.62	0.050	0.80	0.136	0.129	0.151
7	0.62	0.049	0.80	0.138	0.134	0.150
8	0.62	0.050	0.80	0.135	0.132	0.150
9	0.62	0.050	0.80	0.148	0.143	0.157
10	0.62	0.052	0.80	0.147	0.142	0.154
11	0.45	0.051	0.80	0.035	0.028	0.040
12	0.41	0.053	0.80	0.025	0.021	0.032
13	0.37	0.051	0.80	0.038	0.033	0.043
14	0.34	0.050	0.80	0.050	0.041	0.057
15	0.31	0.049	0.80	0.049	0.039	0.058
16	0.26	0.051	0.80	0.058	0.044	0.070
17	0.24	0.050	0.80	0.061	0.038	0.074
18	0.20	0.049	0.80	0.067	0.040	0.077
19	0.16	0.049	0.80	0.083	0.053	0.101
20	0.16	0.051	0.78	0.047	0.035	0.072
21	0.54	0.052	0.80	0.063	0.059	0.070
22	0.53	0.051	0.80	0.062	0.058	0.066
23	0.50	0.055	0.80	0.060	0.056	0.066
24	0.46	0.050	0.80	0.063	0.059	0.066
25	0.44	0.050	0.80	0.059	0.055	0.064
26	0.41	0.053	0.80	0.065	0.060	0.069
27	0.39	0.048	0.80	0.071	0.059	0.078
28	0.40	0.051	0.80	0.073	0.068	0.078
29	0.40	0.049	0.80	0.076	0.067	0.084
30	0.39	0.050	0.80	0.063	0.059	0.066

Table D16						
Structure 2 - Gauge Arrangement 1						
Wave Generator @ 20 deg angle						20 hz
Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.050	0.75	0.190	0.121	0.323
2	1.05	0.051	0.73	0.198	0.129	0.313
3	1.05	0.050	0.73	0.201	0.125	0.322
4	1.05	0.051	0.73	0.199	0.132	0.349
5	1.05	0.056	0.74	0.201	0.131	0.319
6	0.63	0.050	0.77	0.173	0.112	0.267
7	0.62	0.049	0.77	0.176	0.114	0.279
8	0.62	0.049	0.76	0.181	0.116	0.273
9	0.62	0.049	0.76	0.181	0.118	0.267
10	0.62	0.050	0.76	0.189	0.121	0.288
11	0.55	0.045	0.78	0.110	0.074	0.162
12	0.52	0.058	0.78	0.085	0.056	0.124
13	0.49	0.045	0.78	0.072	0.047	0.118
14	0.47	0.049	0.78	0.068	0.043	0.109
15	0.44	0.050	0.79	0.065	0.042	0.108
16	0.40	0.049	0.79	0.065	0.042	0.121
17	0.38	0.048	0.79	0.059	0.036	0.110
18	0.39	0.048	0.79	0.058	0.037	0.104
19	0.39	0.048	0.79	0.058	0.037	0.108
20	0.39	0.049	0.80	0.059	0.035	0.120
21	0.55	0.044	0.79	0.159	0.103	0.250
22	0.52	0.050	0.77	0.178	0.110	0.250
23	0.49	0.050	0.78	0.159	0.106	0.249
24	0.46	0.050	0.77	0.097	0.060	0.251
25	0.44	0.048	0.79	0.169	0.113	0.253
26	0.40	0.049	0.79	0.158	0.107	0.224
27	0.39	0.049	0.80	0.145	0.095	0.196
28	0.38	0.048	0.80	0.137	0.095	0.187
29	0.36	0.048	0.81	0.136	0.095	0.181
30	0.34	0.049	0.81	0.132	0.089	0.173

Table D17						
Structure 2 - Gauge Arrangement 2						
Wave Generator @ 20 deg angle						20 hz
Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.049	0.74	0.191	0.124	0.327
2	1.05	0.048	0.73	0.200	0.131	0.298
3	1.05	0.047	0.74	0.198	0.127	0.329
4	1.05	0.049	0.73	0.191	0.127	0.331
5	1.05	0.047	0.74	0.188	0.123	0.290
6	0.63	0.050	0.76	0.178	0.116	0.282
7	0.62	0.048	0.77	0.180	0.116	0.294
8	0.62	0.048	0.76	0.181	0.118	0.278
9	0.62	0.048	0.76	0.182	0.118	0.289
10	0.62	0.048	0.76	0.193	0.125	0.316
11	0.52	0.051	0.79	0.042	0.028	0.067
12	0.50	0.054	0.79	0.036	0.024	0.051
13	0.46	0.051	0.81	0.033	0.022	0.047
14	0.45	0.051	0.80	0.035	0.024	0.057
15	0.41	0.051	0.79	0.034	0.023	0.054
16	0.39	0.050	0.77	0.035	0.024	0.058
17	0.39	0.050	0.77	0.036	0.024	0.061
18	0.37	0.050	0.78	0.035	0.023	0.067
19	0.33	0.049	0.78	0.036	0.024	0.072
20	0.29	0.050	0.77	0.039	0.025	0.083
21	0.55	0.048	0.77	0.169	0.112	0.265
22	0.52	0.048	0.80	0.296	0.196	0.452
23	0.50	0.051	0.79	0.173	0.106	0.275
24	0.47	0.049	0.80	0.088	0.058	0.134
25	0.44	0.050	0.79	0.155	0.106	0.213
26	0.39	0.050	0.79	0.146	0.099	0.201
27	0.39	0.050	0.79	0.137	0.094	0.191
28	0.30	0.049	0.80	0.127	0.084	0.173
29	0.40	0.049	0.80	0.125	0.084	0.176
30	0.38	0.050	0.80	0.105	0.065	0.158

Table D18						
Structure 2 - Gauge Arrangement 3						
Wave Generator @ 20 deg angle						20 hz
Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.050	0.74	0.190	0.122	0.320
2	1.05	0.050	0.73	0.200	0.131	0.326
3	1.05	0.050	0.74	0.200	0.129	0.320
4	1.05	0.051	0.74	0.195	0.128	0.325
5	1.05	0.046	0.74	0.176	0.115	0.289
6	0.62	0.049	0.76	0.171	0.112	0.275
7	0.62	0.049	0.77	0.178	0.112	0.294
8	0.62	0.049	0.77	0.180	0.118	0.264
9	0.62	0.049	0.76	0.178	0.112	0.265
10	0.50	0.050	0.75	0.191	0.124	0.290
11	0.47	0.048	0.79	0.034	0.022	0.057
12	0.44	0.053	0.80	0.029	0.019	0.049
13	0.41	0.050	0.82	0.026	0.018	0.039
14	0.38	0.050	0.79	0.028	0.018	0.039
15	0.36	0.050	0.82	0.028	0.019	0.044
16	0.33	0.050	0.79	0.030	0.020	0.060
17	0.28	0.050	0.76	0.030	0.020	0.055
18	0.25	0.050	0.78	0.033	0.022	0.072
19	0.21	0.050	0.81	0.034	0.023	0.068
20	0.55	0.050	0.82	0.039	0.025	0.085
21	0.52	0.048	0.77	0.163	0.107	0.266
22	0.50	0.050	0.79	0.183	0.121	0.270
23	0.47	0.050	0.78	0.172	0.118	0.237
24	0.44	0.049	0.79	0.093	0.061	0.149
25	0.41	0.050	0.79	0.139	0.094	0.199
26	0.39	0.050	0.79	0.128	0.085	0.185
27	0.39	0.050	0.79	0.117	0.078	0.165
28	0.39	0.049	0.79	0.108	0.072	0.156
29	0.39	0.018	0.94	0.155	0.111	0.213
30	0.39	0.049	0.79	0.092	0.057	0.149

Table D19						
Structure 2 - Gauge Arrangement 4						
Wave Generator @ 20 deg angle						20 hz
Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.049	0.75	0.191	0.123	0.335
2	1.05	0.052	0.73	0.201	0.132	0.336
3	1.05	0.050	0.73	0.201	0.130	0.302
4	1.05	0.049	0.73	0.195	0.128	0.325
5	1.05	0.050	0.74	0.195	0.128	0.306
6	0.63	0.051	0.76	0.172	0.113	0.279
7	0.62	0.050	0.77	0.177	0.114	0.278
8	0.62	0.051	0.76	0.181	0.120	0.251
9	0.62	0.049	0.76	0.178	0.116	0.291
10	0.62	0.051	0.76	0.188	0.122	0.299
11	0.47	0.051	0.82	0.028	0.018	0.049
12	0.44	0.054	0.88	0.025	0.017	0.041
13	0.41	0.050	0.88	0.024	0.016	0.041
14	0.37	0.053	0.84	0.027	0.018	0.044
15	0.33	0.050	0.82	0.026	0.018	0.043
16	0.30	0.054	0.81	0.030	0.020	0.049
17	0.25	0.051	0.84	0.030	0.020	0.060
18	0.22	0.051	0.89	0.033	0.021	0.073
19	0.20	0.051	0.85	0.038	0.025	0.073
20	0.16	0.050	0.89	0.039	0.023	0.066
21	0.54	0.051	0.78	0.184	0.122	0.277
22	0.51	0.052	0.77	0.160	0.101	0.225
23	0.49	0.055	0.78	0.134	0.084	0.191
24	0.46	0.050	0.80	0.073	0.045	0.110
25	0.43	0.051	0.79	0.104	0.067	0.173
26	0.40	0.051	0.79	0.097	0.062	0.165
27	0.38	0.051	0.80	0.092	0.058	0.151
28	0.39	0.051	0.80	0.085	0.054	0.144
29	0.39	0.048	0.67	0.091	0.059	0.161
30	0.39	0.051	0.80	0.073	0.045	0.110

Table D20						
Structure 2 - Gauge Arrangement 5						
Wave Generator @ 20 deg angle						20 hz
Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.049	0.74	0.192	0.125	0.329
2	1.05	0.049	0.73	0.201	0.132	0.319
3	1.05	0.048	0.74	0.203	0.131	0.325
4	1.05	0.048	0.73	0.194	0.128	0.317
5	1.05	0.027	0.74	0.220	0.145	0.368
6	0.62	0.049	0.76	0.175	0.115	0.276
7	0.62	0.048	0.76	0.177	0.116	0.284
8	0.62	0.049	0.76	0.181	0.119	0.265
9	0.62	0.048	0.76	0.179	0.116	0.284
10	0.62	0.050	0.76	0.190	0.124	0.334
11	0.45	0.052	0.87	0.027	0.018	0.048
12	0.41	0.053	0.93	0.023	0.015	0.039
13	0.37	0.050	0.84	0.027	0.019	0.042
14	0.34	0.050	0.81	0.030	0.020	0.045
15	0.31	0.049	0.80	0.027	0.018	0.045
16	0.26	0.051	0.85	0.029	0.019	0.046
17	0.24	0.050	0.88	0.026	0.018	0.049
18	0.20	0.052	0.95	0.025	0.016	0.042
19	0.16	0.051	1.09	0.029	0.019	0.049
20	0.16	0.051	1.38	0.032	0.021	0.052
21	0.54	0.062	0.80	0.057	0.039	0.103
22	0.53	0.068	0.80	0.051	0.034	0.085
23	0.50	0.062	0.79	0.049	0.034	0.079
24	0.46	0.162	0.80	0.134	0.098	0.181
25	0.44	0.053	0.79	0.046	0.030	0.076
26	0.41	0.050	0.79	0.046	0.030	0.075
27	0.39	0.050	0.80	0.046	0.030	0.075
28	0.40	0.052	0.78	0.045	0.029	0.071
29	0.40	0.162	0.81	0.134	0.098	0.180
30	0.39	0.049	0.80	0.047	0.031	0.086

Table D21						
Structure 2 - Gauge Arrangement 1						
Wave Generator @ 20 deg angle						20 hz
Wave Period = 1.6 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.051	1.44	0.132	0.084	0.241
2	1.05	0.050	1.43	0.141	0.087	0.244
3	1.05	0.050	1.43	0.139	0.087	0.244
4	1.05	0.049	1.45	0.141	0.090	0.246
5	1.05	0.050	1.46	0.134	0.085	0.233
6	0.63	0.050	1.44	0.147	0.093	0.263
7	0.62	0.048	1.45	0.159	0.100	0.322
8	0.62	0.050	1.41	0.150	0.094	0.263
9	0.62	0.050	1.47	0.160	0.100	0.301
10	0.62	0.050	1.39	0.146	0.090	0.246
11	0.55	0.050	1.41	0.101	0.064	0.190
12	0.52	0.053	1.43	0.082	0.053	0.149
13	0.49	0.052	1.52	0.071	0.046	0.115
14	0.47	0.052	1.48	0.067	0.044	0.119
15	0.44	0.051	1.48	0.067	0.043	0.127
16	0.40	0.053	1.53	0.067	0.044	0.130
17	0.38	0.050	1.54	0.065	0.041	0.135
18	0.39	0.051	1.53	0.063	0.039	0.134
19	0.39	0.051	1.53	0.063	0.041	0.150
20	0.39	0.051	1.56	0.059	0.033	0.144
21	0.55	0.051	1.42	0.143	0.092	0.240
22	0.52	0.046	1.46	0.305	0.199	0.553
23	0.49	0.054	1.47	0.169	0.109	0.310
24	0.46	0.051	1.51	0.118	0.075	0.204
25	0.44	0.052	1.43	0.180	0.113	0.259
26	0.40	0.051	1.42	0.169	0.107	0.221
27	0.39	0.051	1.37	0.159	0.098	0.212
28	0.38	0.050	1.36	0.152	0.097	0.197
29	0.36	0.050	1.35	0.142	0.091	0.191
30	0.34	0.052	1.51	0.118	0.075	0.204

Table D22						
Structure 2 - Gauge Arrangement 2						
Wave Generator @ 20 deg angle						20 hz
Wave Period = 1.6 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.052	1.43	0.133	0.084	0.243
2	1.05	0.051	1.43	0.141	0.090	0.251
3	1.05	0.050	1.43	0.140	0.088	0.248
4	1.05	0.049	1.45	0.140	0.091	0.249
5	1.05	0.051	1.45	0.134	0.085	0.232
6	0.63	0.050	1.45	0.147	0.093	0.262
7	0.62	0.049	1.46	0.159	0.100	0.310
8	0.62	0.049	1.41	0.148	0.094	0.262
9	0.62	0.051	1.46	0.160	0.100	0.312
10	0.62	0.050	1.40	0.147	0.090	0.312
11	0.52	0.051	1.55	0.044	0.029	0.069
12	0.50	0.053	1.52	0.041	0.027	0.067
13	0.46	0.050	1.57	0.038	0.026	0.059
14	0.45	0.050	1.55	0.038	0.025	0.076
15	0.41	0.052	1.62	0.038	0.026	0.057
16	0.39	0.052	1.62	0.041	0.028	0.073
17	0.39	0.050	1.57	0.037	0.022	0.073
18	0.37	0.052	1.53	0.035	0.023	0.068
19	0.33	0.051	1.59	0.036	0.021	0.084
20	0.29	0.050	1.67	0.039	0.024	0.105
21	0.55	0.056	1.46	0.151	0.099	0.292
22	0.52	0.060	1.46	0.341	0.216	0.670
23	0.50	0.056	1.45	0.179	0.114	0.358
24	0.47	0.050	1.49	0.104	0.064	0.206
25	0.44	0.050	1.42	0.164	0.104	0.270
26	0.39	0.051	1.41	0.153	0.097	0.229
27	0.39	0.052	1.39	0.143	0.089	0.205
28	0.30	0.050	1.41	0.130	0.083	0.196
29	0.40	0.051	1.38	0.124	0.079	0.178
30	0.38	0.050	1.50	0.105	0.065	0.206

Table D23						
Structure 2 - Gauge Arrangement 3						
Wave Generator @ 20 deg angle						20 hz
Wave Period = 1.6 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.051	1.43	0.131	0.082	0.241
2	1.05	0.053	1.43	0.140	0.088	0.241
3	1.05	0.052	1.42	0.139	0.086	0.243
4	1.05	0.051	1.46	0.139	0.088	0.257
5	1.05	0.054	1.46	0.128	0.081	0.230
6	0.62	0.050	1.44	0.144	0.090	0.258
7	0.62	0.050	1.46	0.157	0.093	0.319
8	0.62	0.050	1.40	0.150	0.092	0.256
9	0.62	0.051	1.46	0.156	0.094	0.299
10	0.50	0.050	1.38	0.144	0.088	0.303
11	0.47	0.050	1.63	0.038	0.025	0.057
12	0.44	0.054	1.63	0.034	0.022	0.062
13	0.41	0.049	1.67	0.034	0.023	0.052
14	0.38	0.050	1.61	0.035	0.023	0.056
15	0.36	0.051	1.60	0.032	0.020	0.061
16	0.33	0.053	1.59	0.033	0.021	0.060
17	0.28	0.052	1.64	0.036	0.024	0.065
18	0.25	0.051	1.64	0.040	0.025	0.070
19	0.21	0.052	1.62	0.045	0.029	0.102
20	0.55	0.049	1.73	0.058	0.035	0.148
21	0.52	0.053	1.48	0.157	0.096	0.287
22	0.50	0.055	1.44	0.161	0.103	0.302
23	0.47	0.056	1.44	0.151	0.095	0.278
24	0.44	0.050	1.46	0.084	0.053	0.168
25	0.41	0.049	1.42	0.126	0.081	0.226
26	0.39	0.050	1.42	0.120	0.077	0.218
27	0.39	0.052	1.43	0.113	0.070	0.215
28	0.39	0.049	1.40	0.108	0.068	0.185
29	0.39	0.048	1.52	0.136	0.079	0.211
30	0.39	0.051	1.46	0.084	0.053	0.167

Table D24						
Structure 2 - Gauge Arrangement 4						
Wave Generator @ 20 deg angle						20 hz
Wave Period = 1.6 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.049	1.43	0.132	0.083	0.246
2	1.05	0.051	1.42	0.141	0.088	0.249
3	1.05	0.050	1.44	0.139	0.086	0.244
4	1.05	0.049	1.46	0.142	0.091	0.254
5	1.05	0.051	1.46	0.137	0.089	0.247
6	0.63	0.050	1.42	0.148	0.093	0.262
7	0.62	0.049	1.47	0.162	0.102	0.314
8	0.62	0.052	1.39	0.145	0.090	0.250
9	0.62	0.050	1.45	0.157	0.097	0.298
10	0.62	0.051	1.45	0.157	0.098	0.312
11	0.47	0.049	1.86	0.033	0.021	0.054
12	0.44	0.053	1.79	0.030	0.020	0.049
13	0.41	0.050	1.89	0.030	0.019	0.046
14	0.37	0.050	1.71	0.034	0.022	0.074
15	0.33	0.049	1.61	0.034	0.023	0.060
16	0.30	0.052	1.68	0.041	0.027	0.067
17	0.25	0.050	1.67	0.036	0.023	0.069
18	0.22	0.051	1.67	0.040	0.024	0.087
19	0.20	0.050	1.92	0.046	0.027	0.088
20	0.16	0.049	2.04	0.054	0.033	0.091
21	0.54	0.050	1.41	0.143	0.092	0.256
22	0.51	0.051	1.41	0.124	0.079	0.213
23	0.49	0.054	1.43	0.107	0.069	0.188
24	0.46	0.050	1.46	0.060	0.037	0.135
25	0.43	0.050	1.44	0.089	0.057	0.166
26	0.40	0.050	1.48	0.084	0.055	0.156
27	0.38	0.051	1.49	0.083	0.050	0.168
28	0.39	0.051	1.47	0.080	0.048	0.176
29	0.39	0.049	1.32	0.082	0.051	0.164
30	0.39	0.050	1.46	0.060	0.037	0.135

Table D25						
Structure 2 - Gauge Arrangement 5						
Wave Generator @ 20 deg angle						20 hz
Wave Period = 1.6 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.049	1.43	0.133	0.085	0.248
2	1.05	0.050	1.42	0.141	0.087	0.256
3	1.05	0.049	1.44	0.138	0.087	0.242
4	1.05	0.048	1.45	0.141	0.091	0.253
5	1.05	0.050	1.45	0.136	0.087	0.241
6	0.62	0.049	1.44	0.150	0.094	0.268
7	0.62	0.049	1.47	0.161	0.099	0.302
8	0.62	0.048	1.39	0.145	0.091	0.252
9	0.62	0.049	1.45	0.158	0.098	0.304
10	0.62	0.049	1.46	0.159	0.099	0.309
11	0.45	0.054	2.00	0.032	0.021	0.056
12	0.41	0.052	1.93	0.028	0.017	0.045
13	0.37	0.051	1.98	0.023	0.015	0.036
14	0.34	0.050	1.84	0.025	0.015	0.056
15	0.31	0.049	2.02	0.030	0.020	0.049
16	0.26	0.050	2.03	0.034	0.022	0.056
17	0.24	0.050	2.09	0.040	0.025	0.068
18	0.20	0.052	1.99	0.042	0.028	0.061
19	0.16	0.050	2.32	0.055	0.035	0.081
20	0.16	0.050	2.96	0.050	0.025	0.109
21	0.54	0.061	1.46	0.058	0.035	0.087
22	0.53	0.067	1.52	0.054	0.033	0.086
23	0.50	0.064	1.54	0.053	0.033	0.088
24	0.46	0.085	1.57	0.061	0.038	0.144
25	0.44	0.049	1.54	0.048	0.032	0.084
26	0.41	0.050	1.53	0.048	0.032	0.085
27	0.39	0.051	1.54	0.046	0.031	0.087
28	0.40	0.049	1.58	0.048	0.031	0.083
29	0.40	0.013	1.58	0.202	0.146	0.319
30	0.39	0.049	1.57	0.036	0.023	0.086

Table D26						
Structure 2 - Gauge Arrangement 1						
Wave Generator @ 20 deg angle						20 hz
Monochromatic Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.052	0.80	0.144	0.140	0.147
2	1.05	0.052	0.80	0.149	0.147	0.152
3	1.05	0.051	0.80	0.134	0.132	0.139
4	1.05	0.049	0.81	0.155	0.152	0.159
5	1.05	0.050	0.81	0.133	0.127	0.139
6	0.63	0.050	0.80	0.132	0.128	0.144
7	0.62	0.052	0.80	0.133	0.128	0.147
8	0.62	0.051	0.80	0.135	0.133	0.146
9	0.62	0.050	0.80	0.145	0.142	0.149
10	0.62	0.052	0.80	0.128	0.122	0.145
11	0.55	0.048	0.80	0.089	0.086	0.093
12	0.52	0.054	0.80	0.064	0.059	0.069
13	0.49	0.051	0.80	0.059	0.055	0.062
14	0.47	0.051	0.80	0.053	0.051	0.056
15	0.44	0.050	0.80	0.040	0.038	0.046
16	0.40	0.050	0.80	0.043	0.040	0.047
17	0.38	0.051	0.80	0.036	0.034	0.040
18	0.39	0.051	0.80	0.032	0.031	0.035
19	0.39	0.049	0.80	0.041	0.037	0.045
20	0.39	0.050	0.80	0.038	0.034	0.042
21	0.55	0.048	0.80	0.121	0.118	0.133
22	0.52	0.049	0.80	0.281	0.273	0.314
23	0.49	0.045	0.80	0.129	0.125	0.143
24	0.46	0.049	0.80	0.071	0.057	0.081
25	0.44	0.049	0.80	0.162	0.157	0.166
26	0.40	0.049	0.80	0.158	0.154	0.164
27	0.39	0.048	0.81	0.155	0.149	0.163
28	0.38	0.048	0.80	0.136	0.129	0.143
29	0.36	0.049	0.80	0.135	0.129	0.143
30	0.34	0.050	0.80	0.082	0.066	0.094

Table D27						
Structure 2 - Gauge Arrangement 2						
Wave Generator @ 20 deg angle						20 hz
Monochromatic Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.051	0.80	0.140	0.137	0.147
2	1.05	0.051	0.80	0.146	0.141	0.151
3	1.05	0.049	0.80	0.136	0.133	0.140
4	1.05	0.049	0.80	0.149	0.146	0.155
5	1.05	0.049	0.80	0.125	0.120	0.135
6	0.63	0.050	0.80	0.133	0.128	0.144
7	0.62	0.050	0.80	0.142	0.135	0.152
8	0.62	0.051	0.80	0.140	0.129	0.145
9	0.62	0.052	0.80	0.149	0.146	0.154
10	0.62	0.052	0.80	0.137	0.131	0.144
11	0.52	0.051	0.80	0.026	0.024	0.032
12	0.50	0.052	0.80	0.028	0.026	0.033
13	0.46	0.050	0.80	0.022	0.019	0.023
14	0.45	0.049	0.80	0.025	0.023	0.026
15	0.41	0.051	0.80	0.024	0.022	0.027
16	0.39	0.050	0.80	0.021	0.018	0.024
17	0.39	0.050	0.80	0.032	0.030	0.034
18	0.37	0.052	0.80	0.014	0.011	0.020
19	0.33	0.052	0.80	0.017	0.015	0.021
20	0.29	0.050	0.80	0.017	0.014	0.023
21	0.55	0.056	0.80	0.125	0.119	0.140
22	0.52	0.059	0.80	0.289	0.276	0.297
23	0.50	0.056	0.80	0.162	0.149	0.169
24	0.47	0.050	0.80	0.100	0.084	0.109
25	0.44	0.051	0.80	0.151	0.135	0.156
26	0.39	0.052	0.80	0.138	0.121	0.143
27	0.39	0.052	0.80	0.118	0.101	0.126
28	0.30	0.049	0.80	0.111	0.106	0.116
29	0.40	0.051	0.80	0.114	0.103	0.123
30	0.38	0.051	0.80	0.100	0.084	0.109

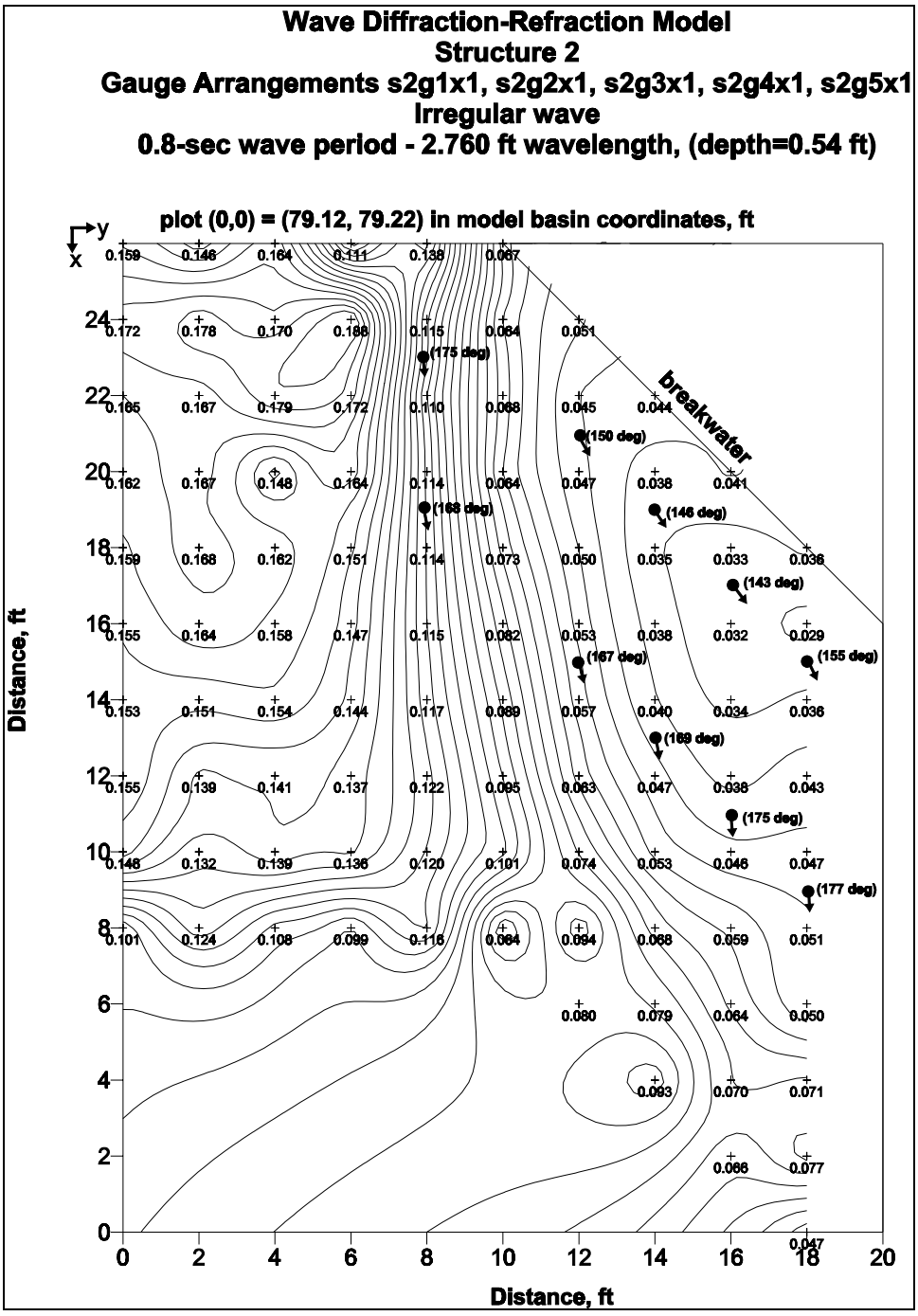
Table D28						
Structure 2 - Gauge Arrangement 3						
Wave Generator @ 20 deg angle						20 hz
Monochromatic Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.051	0.81	0.137	0.134	0.143
2	1.05	0.053	0.81	0.148	0.145	0.154
3	1.05	0.051	0.81	0.135	0.131	0.140
4	1.05	0.051	0.81	0.151	0.148	0.155
5	1.05	0.054	0.81	0.131	0.128	0.134
6	0.62	0.050	0.80	0.137	0.132	0.142
7	0.62	0.050	0.80	0.130	0.122	0.148
8	0.62	0.051	0.80	0.137	0.134	0.145
9	0.62	0.051	0.80	0.145	0.138	0.148
10	0.50	0.051	0.81	0.127	0.120	0.146
11	0.47	0.052	0.80	0.015	0.011	0.022
12	0.44	0.054	0.80	0.019	0.016	0.023
13	0.41	0.052	0.80	0.020	0.018	0.024
14	0.38	0.050	0.81	0.016	0.014	0.019
15	0.36	0.050	0.79	0.015	0.013	0.018
16	0.33	0.052	0.80	0.020	0.019	0.022
17	0.28	0.052	0.80	0.019	0.018	0.021
18	0.25	0.051	0.80	0.016	0.013	0.023
19	0.21	0.051	0.80	0.013	0.011	0.016
20	0.55	0.050	0.80	0.014	0.008	0.019
21	0.52	0.051	0.80	0.146	0.134	0.153
22	0.50	0.055	0.80	0.177	0.165	0.182
23	0.47	0.055	0.80	0.160	0.156	0.165
24	0.44	0.051	0.81	0.105	0.095	0.111
25	0.41	0.051	0.80	0.116	0.111	0.124
26	0.39	0.051	0.80	0.104	0.099	0.112
27	0.39	0.052	0.80	0.093	0.088	0.104
28	0.39	0.054	0.80	0.086	0.081	0.099
29	0.39	0.039	0.81	0.111	0.086	0.166
30	0.39	0.051	0.81	0.105	0.094	0.111

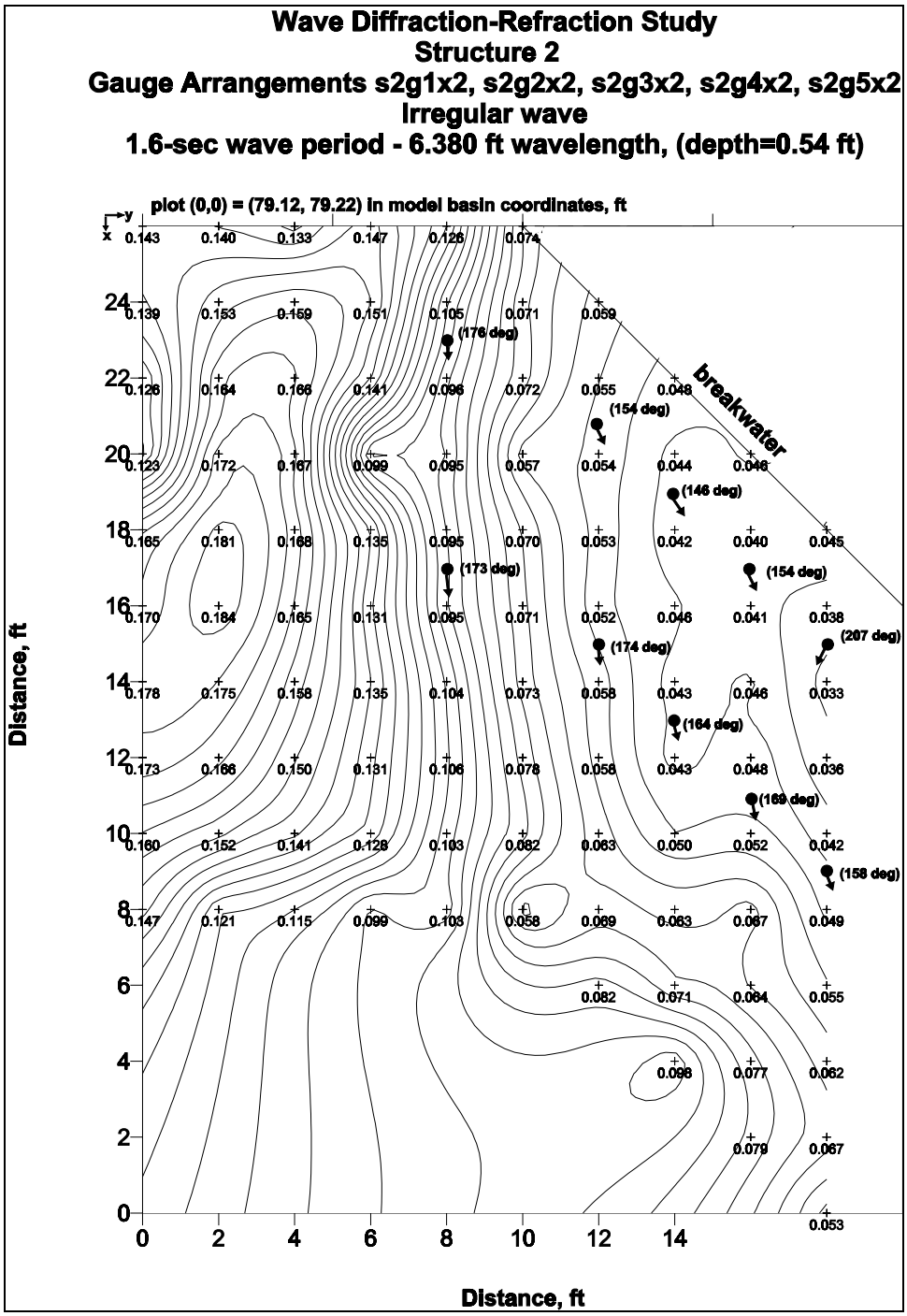
Table D29						
Structure 2 - Gauge Arrangement 4						
Wave Generator @ 20 deg angle						20 hz
Monochromatic Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.049	0.80	0.138	0.133	0.144
2	1.05	0.052	0.80	0.156	0.153	0.160
3	1.05	0.050	0.80	0.133	0.129	0.140
4	1.05	0.050	0.80	0.151	0.148	0.155
5	1.05	0.051	0.80	0.138	0.135	0.142
6	0.63	0.050	0.80	0.135	0.131	0.147
7	0.62	0.050	0.80	0.145	0.140	0.149
8	0.62	0.053	0.80	0.142	0.138	0.146
9	0.62	0.050	0.80	0.144	0.140	0.147
10	0.62	0.052	0.80	0.141	0.133	0.160
11	0.47	0.050	0.80	0.028	0.023	0.033
12	0.44	0.051	0.80	0.024	0.021	0.027
13	0.41	0.050	0.80	0.018	0.016	0.022
14	0.37	0.051	0.80	0.017	0.014	0.021
15	0.33	0.050	0.80	0.024	0.021	0.026
16	0.30	0.054	0.80	0.022	0.020	0.024
17	0.25	0.048	1.00	0.006	0.003	0.018
18	0.22	0.051	0.80	0.017	0.015	0.021
19	0.20	0.051	0.80	0.020	0.017	0.025
20	0.16	0.050	0.80	0.013	0.011	0.016
21	0.54	0.051	0.80	0.159	0.149	0.163
22	0.51	0.051	0.80	0.120	0.116	0.136
23	0.49	0.055	0.80	0.098	0.095	0.110
24	0.46	0.050	0.80	0.071	0.067	0.073
25	0.43	0.050	0.80	0.071	0.068	0.082
26	0.40	0.050	0.80	0.079	0.073	0.083
27	0.38	0.050	0.80	0.073	0.069	0.075
28	0.39	0.052	0.80	0.065	0.061	0.069
29	0.39	0.049	0.80	0.068	0.064	0.087
30	0.39	0.050	0.80	0.071	0.067	0.074

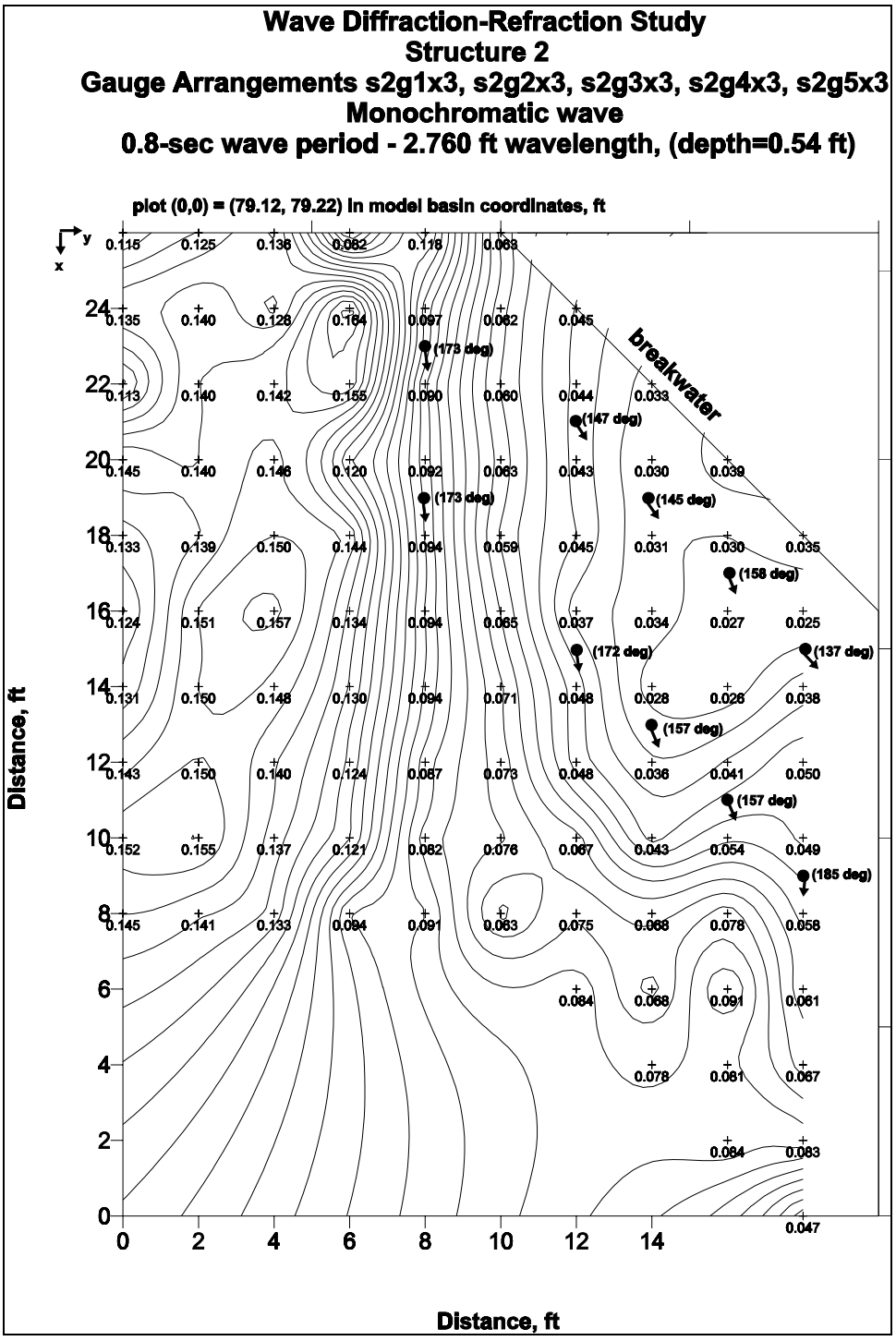
Table D30						
Structure 2 - Gauge Arrangement 5						
Wave Generator @ 20 deg angle						20 hz
Monochromatic Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.050	0.80	0.138	0.135	0.143
2	1.05	0.051	0.80	0.152	0.147	0.156
3	1.05	0.050	0.80	0.136	0.134	0.140
4	1.05	0.048	0.80	0.146	0.143	0.148
5	1.05	0.050	0.80	0.144	0.138	0.148
6	0.62	0.050	0.80	0.138	0.134	0.141
7	0.62	0.050	0.80	0.154	0.150	0.159
8	0.62	0.049	0.80	0.144	0.139	0.149
9	0.62	0.049	0.80	0.141	0.138	0.144
10	0.62	0.052	0.81	0.157	0.149	0.170
11	0.45	0.050	0.80	0.020	0.018	0.024
12	0.41	0.053	0.80	0.016	0.014	0.019
13	0.37	0.049	0.80	0.021	0.019	0.027
14	0.34	0.050	0.80	0.020	0.017	0.025
15	0.31	0.048	0.80	0.018	0.015	0.022
16	0.26	0.051	0.80	0.019	0.016	0.021
17	0.24	0.050	0.80	0.016	0.013	0.021
18	0.20	0.051	0.80	0.015	0.012	0.017
19	0.16	0.050	0.80	0.014	0.012	0.016
20	0.16	0.050	0.81	0.021	0.017	0.025
21	0.54	0.060	0.80	0.037	0.035	0.041
22	0.53	0.066	0.80	0.038	0.032	0.041
23	0.50	0.064	0.80	0.032	0.029	0.037
24	0.46	0.085	0.80	0.056	0.050	0.060
25	0.44	0.048	0.80	0.034	0.031	0.037
26	0.41	0.050	0.80	0.037	0.034	0.040
27	0.39	0.050	0.80	0.029	0.025	0.034
28	0.40	0.049	0.80	0.024	0.021	0.027
29	0.40	-0.038	0.74	0.208	0.159	0.226
30	0.39	0.049	0.80	0.033	0.030	0.036

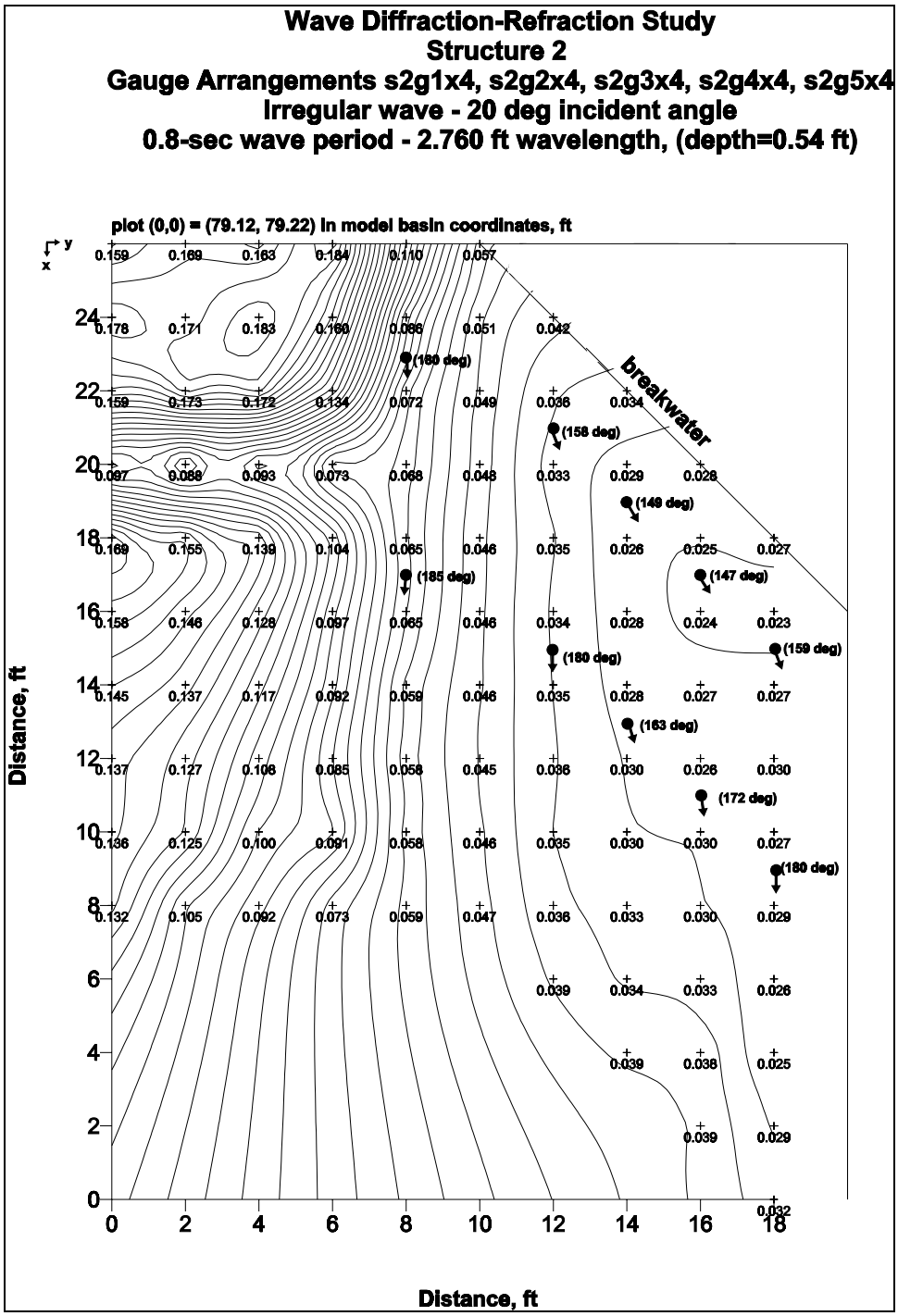
Appendix E
Wave Diffraction-Refraction Plots for Structure 2

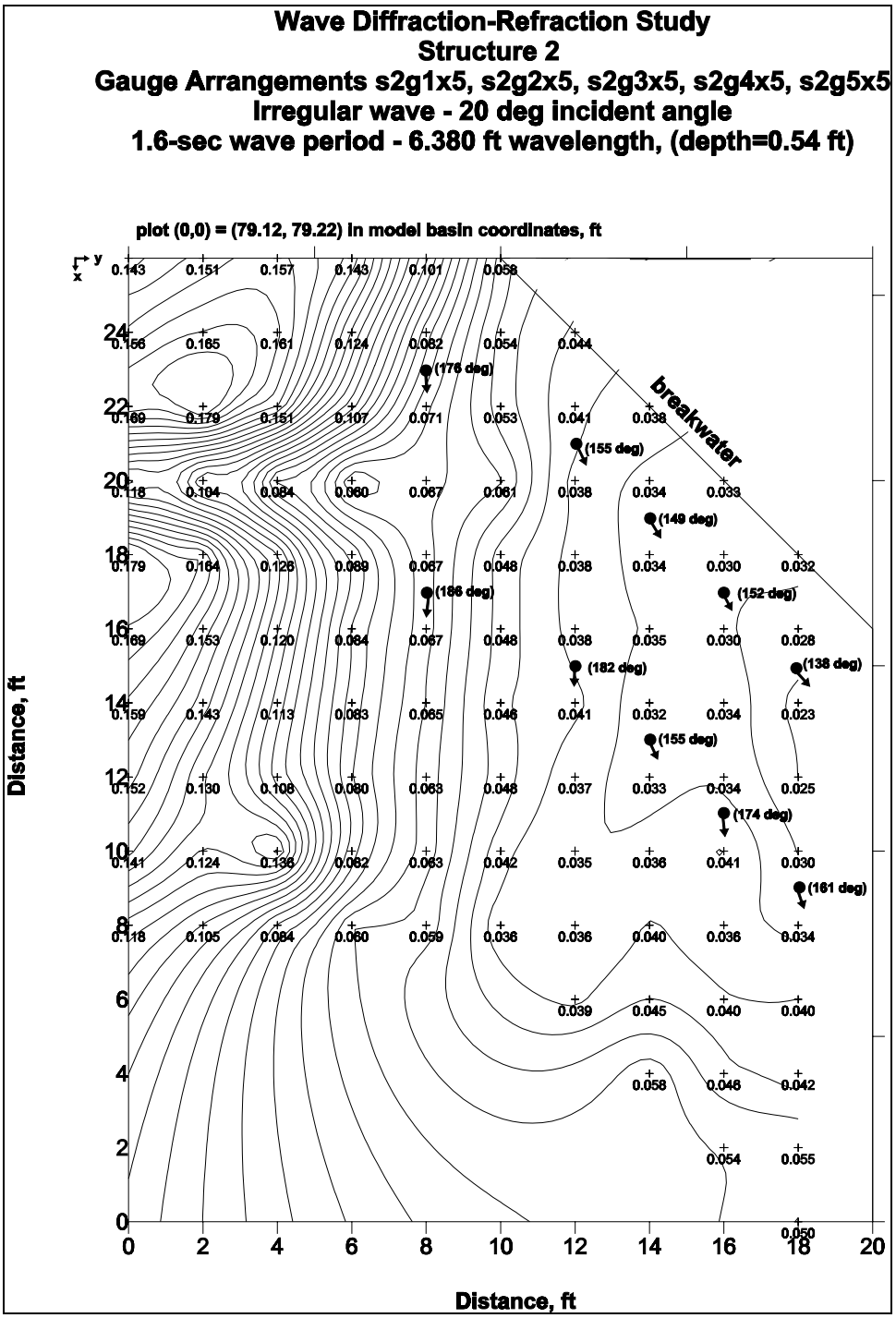
The wave diffraction-refraction plots in this appendix are contour maps describing the inlet wave height transformation at the five different gauge arrangements. Contour interval is 0.003 m (0.01 ft). The vectors on the maps depict the peak wave direction acquired at the peak period from the Acoustic Doppler Velocimeter (ADV) probe. Table E1 summarizes ADV probe vector plot data for Structure 2. To convert measurements given in feet to meters, multiply by 0.3048. To convert measurements given in square feet to square meters, multiply by 0.093.


Wave Diffraction-Refraction Model
Structure 2
Gauge Arrangements s2g1x1, s2g2x1, s2g3x1, s2g4x1, s2g5x1
Irregular wave
0.8-sec wave period - 2.760 ft wavelength, (depth=0.54 ft)
plot (0,0) = (79.12, 79.22) in model basin coordinates, ft
y
x
breakwater
(175 deg)
(150 deg)
(168 deg)
(146 deg)
(143 deg)
(167 deg)
(155 deg)
(169 deg)
(175 deg)
(177 deg)
Distance, ft
Distance, ft
0
2
4
6
8
10
12
14
16
18
20
22
24


Wave Diffraction-Refraction Study
Structure 2
Gauge Arrangements s2g1x2, s2g2x2, s2g3x2, s2g4x2, s2g5x2
Irregular wave
1.6-sec wave period - 6.380 ft wavelength, (depth=0.54 ft)
plot (0,0) = (79.12, 79.22) in model basin coordinates, ft
breakwater
(176 deg)
(154 deg)
(146 deg)
(173 deg)
(154 deg)
(174 deg)
(207 deg)
(164 deg)
(169 deg)
(158 deg)
Distance, ft
Distance, ft


Wave Diffraction-Refraction Study
Structure 2
Gauge Arrangements s2g1x3, s2g2x3, s2g3x3, s2g4x3, s2g5x3
Monochromatic wave
0.8-sec wave period - 2.760 ft wavelength, (depth=0.54 ft)
plot (0,0) = (79.12, 79.22) in model basin coordinates, ft
breakwater
(173 deg)
(147 deg)
(145 deg)
(158 deg)
(172 deg)
(137 deg)
(157 deg)
(157 deg)
(185 deg)
Distance, ft
Distance, ft


Wave Diffraction-Refraction Study
Structure 2
Gauge Arrangements s2g1x4, s2g2x4, s2g3x4, s2g4x4, s2g5x4
Irregular wave - 20 deg incident angle
0.8-sec wave period - 2.760 ft wavelength, (depth=0.54 ft)
plot (0,0) = (79.12, 79.22) in model basin coordinates, ft
y
x
breakwater
(180 deg)
(158 deg)
(149 deg)
(185 deg)
(147 deg)
(180 deg)
(159 deg)
(163 deg)
(172 deg)
(180 deg)
Distance, ft
Distance, ft


Wave Diffraction-Refraction Study
Structure 2
Gauge Arrangements s2g1x5, s2g2x5, s2g3x5, s2g4x5, s2g5x5
Irregular wave - 20 deg incident angle
1.6-sec wave period - 6.380 ft wavelength, (depth=0.54 ft)
plot (0,0) = (79.12, 79.22) in model basin coordinates, ft
y
x
breakwater
(176 deg)
(155 deg)
(149 deg)
(166 deg)
(152 deg)
(182 deg)
(138 deg)
(155 deg)
(174 deg)
(161 deg)
Distance, ft
Distance, ft

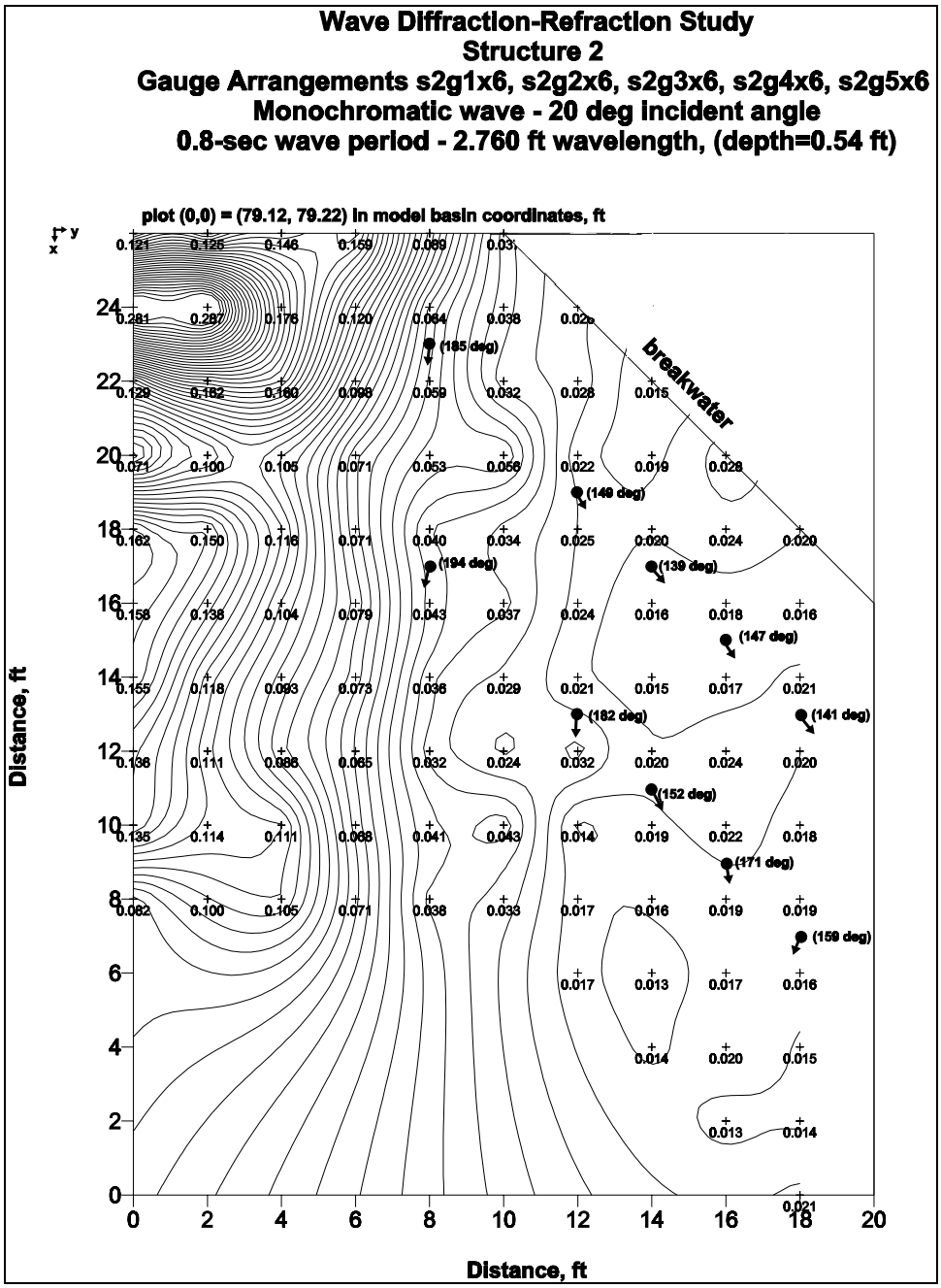

Wave Diffraction-Refraction Study
Structure 2
Gauge Arrangements s2g1x6, s2g2x6, s2g3x6, s2g4x6, s2g5x6
Monochromatic wave - 20 deg incident angle
0.8-sec wave period - 2.760 ft wavelength, (depth=0.54 ft)
plot (0,0) = (79.12, 79.22) in model basin coordinates, ft
breakwater
(185 deg)
(149 deg)
(194 deg)
(139 deg)
(147 deg)
(182 deg)
(141 deg)
(152 deg)
(171 deg)
(159 deg)
Distance, ft
Distance, ft

Table E1
Summary ADV Probe Vector Plots Data
Structure 2

Gauge Arrangement	ADV Probe 0			ADV Probe 1		
	Peak Period sec	Peak Energy ft^2/Hz	Peak Direction deg	Peak Period sec	Peak Energy ft^2/Hz	Peak Direction deg
g1x1	0.800	1.286	175.454	0.914	1.772	167.720
g2x1	0.914	0.364	150.031	0.985	0.497	166.774
g3x1	0.914	0.208	146.499	0.914	0.551	169.353
g4x1	0.853	0.206	142.853	0.853	0.853	175.037
g5x1	0.985	0.088	154.967	0.800	0.795	177.486
g1x2	2.560	0.187	175.861	1.600	4.569	172.634
g2x2	2.133	0.170	154.281	2.560	0.120	174.046
g3x2	1.829	0.405	145.507	2.133	0.252	164.307
g4x2	2.133	0.148	154.176	1.829	0.846	168.842
g5x2	2.560	0.070	207.420	2.560	0.191	158.487
g1x3	0.800	20.644	172.898	0.800	23.525	172.602
g2x3	0.800	2.917	146.964	0.985	0.028	172.230
g3x3	0.914	0.004	144.792	0.800	2.387	156.711
g4x3	0.914	0.022	158.084	0.853	0.141	156.863
g5x3	0.853	0.009	137.347	0.985	0.111	184.889
g1x4	0.800	1.752	180.493	0.914	1.372	185.048
g2x4	0.853	0.379	157.573	0.985	0.196	180.099
g3x4	0.853	0.186	148.894	0.853	0.277	163.436
g4x4	0.853	0.111	146.507	0.800	0.235	172.364
g5x4	0.985	0.060	159.337	0.800	0.453	180.219
g1x5	1.600	3.676	175.720	1.829	1.456	185.936
g2x5	1.829	0.300	155.369	2.133	0.149	181.731
g3x5	2.133	0.072	149.297	2.133	0.137	155.102
g4x5	2.560	0.036	152.160	1.600	1.098	174.288
g5x5	2.133	0.046	138.468	1.600	0.310	160.814
g1x6	0.914	0.208	184.881	0.853	0.274	193.783
g2x6	0.914	0.012	149.159	0.914	0.040	182.373
g3x6	0.914	0.009	139.399	0.853	0.031	152.052
g4x6	0.800	0.518	146.862	0.800	1.483	171.450
g5x6	0.914	0.009	141.408	0.985	0.018	158.983

Appendix F
Data Tables for Structure 3

Tables F1 through F24 list measurements for the wave experiments in Structure 3. The tables include the still-water depth d, average water surface elevation e, significant wave period $T_{s,}$ significant wave height H_s, average wave height H_a, and maximum wave height H_m. The gauge locations are shown in Figure 9, and Figure F1 provides an enlargement with concentration on placement of the Acoustic Doppler Velocimeter (ADV) probes. Gauges 1, 2, 3, and 4 are the furthest offshore (near the generator). Gauges 8, 9, and 10 are in the inlet throat, and Gauges 6 and 7 are in the entrance channel. The gauge spacing for the rack gauges 11-20 and 21-30 is 0.6 m (2 ft) between consecutive gauges. The gauge locations in the basin coordinate system are given in Appendix N. To convert measurements given in feet to meters, multiply by 0.3048.

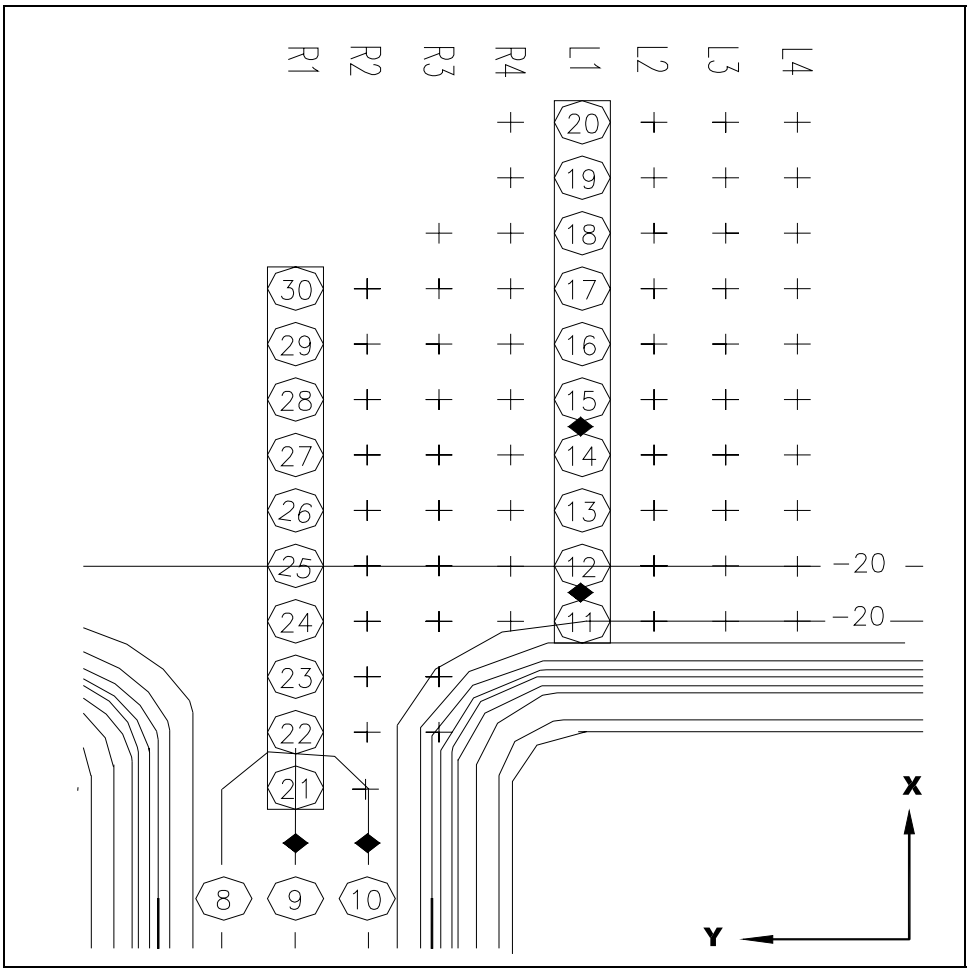


Figure F1. Structure 3 gauge arrangement enlargement

Table F1						
Structure 3 - Gauge Arrangement 1						
Irregular Wave						20 hz
Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.043	0.74	0.187	0.121	0.315
2	1.05	0.045	0.74	0.198	0.130	0.320
3	1.05	0.046	0.74	0.190	0.124	0.332
4	1.05	0.045	0.74	0.191	0.125	0.318
5	1.05	0.046	0.74	0.187	0.123	0.300
6	0.63	0.046	0.80	0.163	0.110	0.216
7	0.62	0.046	0.81	0.147	0.104	0.198
8	0.50	0.051	0.82	0.112	0.073	0.192
9	0.60	0.055	0.77	0.158	0.100	0.259
10	0.50	0.052	0.81	0.088	0.058	0.139
11	0.46	0.045	0.79	0.031	0.019	0.062
12	0.50	0.052	0.82	0.027	0.018	0.053
13	0.50	0.049	0.83	0.030	0.020	0.052
14	0.49	0.052	0.80	0.031	0.021	0.057
15	0.50	0.052	0.79	0.031	0.021	0.055
16	0.50	0.047	0.78	0.032	0.020	0.056
17	0.50	0.052	0.80	0.032	0.020	0.064
18	0.48	0.052	0.80	0.033	0.021	0.063
19	0.48	0.050	0.81	0.027	0.018	0.046
20	0.48	0.052	0.79	0.033	0.021	0.068
21	0.50	0.039	0.79	0.120	0.077	0.202
22	0.50	0.037	0.80	0.118	0.075	0.214
23	0.49	0.037	0.80	0.111	0.067	0.178
24	0.49	0.051	0.80	0.065	0.038	0.132
25	0.48	0.052	0.81	0.097	0.058	0.172
26	0.50	0.056	0.81	0.092	0.055	0.158
27	0.50	0.051	0.81	0.085	0.050	0.149
28	0.50	0.054	0.81	0.079	0.048	0.155
29	0.49	0.050	0.82	0.075	0.045	0.121
30	0.49	0.051	0.80	0.065	0.038	0.132

Table F2						
Structure 3 - Gauge Arrangement 2						
Irregular Wave						20 hz
Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.044	0.74	0.187	0.122	0.328
2	1.05	0.045	0.74	0.199	0.131	0.315
3	1.05	0.044	0.75	0.189	0.123	0.321
4	1.05	0.048	0.74	0.191	0.126	0.309
5	1.05	0.044	0.74	0.185	0.122	0.298
6	0.63	0.044	0.80	0.157	0.107	0.213
7	0.62	0.043	0.80	0.148	0.108	0.207
8	0.50	0.047	0.81	0.105	0.073	0.160
9	0.60	0.048	0.77	0.152	0.101	0.245
10	0.50	0.048	0.82	0.094	0.065	0.140
11	0.46	0.050	0.79	0.035	0.022	0.058
12	0.50	0.049	0.79	0.026	0.017	0.054
13	0.50	0.049	0.81	0.029	0.020	0.045
14	0.49	0.052	0.79	0.032	0.021	0.053
15	0.50	0.056	0.81	0.032	0.021	0.054
16	0.50	0.054	0.81	0.033	0.022	0.065
17	0.50	0.050	0.79	0.033	0.021	0.060
18	0.48	0.052	0.80	0.036	0.024	0.064
19	0.48	0.050	0.88	0.025	0.017	0.046
20	0.48	0.050	0.80	0.035	0.023	0.062
21	0.50	0.049	0.83	0.086	0.057	0.137
22	0.50	0.051	0.81	0.089	0.059	0.127
23	0.49	0.052	0.81	0.081	0.054	0.136
24	0.49	0.052	0.81	0.049	0.030	0.110
25	0.48	0.049	0.82	0.071	0.046	0.115
26	0.50	0.051	0.81	0.072	0.045	0.133
27	0.50	0.052	0.81	0.068	0.043	0.129
28	0.50	0.048	0.81	0.068	0.042	0.115
29	0.49	0.049	0.82	0.065	0.040	0.122
30	0.49	0.052	0.81	0.049	0.030	0.110

Table F3						
Structure 3 - Gauge Arrangement 3						
Irregular Wave						20 hz
Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.045	0.74	0.188	0.122	0.303
2	1.05	0.043	0.74	0.201	0.131	0.316
3	1.05	0.044	0.74	0.188	0.122	0.318
4	1.05	0.044	0.74	0.192	0.124	0.305
5	1.05	0.044	0.74	0.187	0.124	0.290
6	0.63	0.045	0.80	0.161	0.108	0.210
7	0.62	0.046	0.81	0.153	0.110	0.201
8	0.50	0.050	0.81	0.124	0.084	0.216
9	0.60	0.052	0.78	0.153	0.095	0.261
10	0.50	0.050	0.82	0.084	0.053	0.138
11	0.46	0.051	0.80	0.033	0.021	0.064
12	0.50	0.053	0.83	0.026	0.017	0.049
13	0.50	0.054	0.80	0.026	0.017	0.043
14	0.49	0.052	0.79	0.030	0.020	0.053
15	0.50	0.054	0.80	0.033	0.021	0.060
16	0.50	0.053	0.79	0.032	0.021	0.055
17	0.50	0.052	0.81	0.033	0.021	0.064
18	0.48	0.051	0.78	0.033	0.021	0.066
19	0.48	0.050	0.82	0.026	0.017	0.047
20	0.48	0.053	0.79	0.033	0.021	0.064
21	0.50	0.055	0.85	0.059	0.037	0.095
22	0.50	0.052	0.82	0.053	0.034	0.096
23	0.49	0.058	0.78	0.051	0.033	0.093
24	0.49	0.051	0.79	0.037	0.022	0.064
25	0.48	0.050	0.79	0.051	0.033	0.094
26	0.50	0.050	0.79	0.052	0.033	0.089
27	0.50	0.051	0.80	0.052	0.032	0.091
28	0.50	0.051	0.81	0.052	0.031	0.088
29	0.49	0.051	0.81	0.053	0.031	0.101
30	0.49	0.051	0.79	0.037	0.022	0.064

Table F4						
Structure 3 - Gauge Arrangement 4						
Irregular Wave						20 hz
Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.047	0.74	0.191	0.124	0.298
2	1.05	0.047	0.75	0.200	0.131	0.317
3	1.05	0.046	0.75	0.188	0.123	0.314
4	1.05	0.047	0.74	0.195	0.128	0.311
5	1.05	0.046	0.74	0.189	0.125	0.298
6	0.63	0.046	0.80	0.162	0.110	0.212
7	0.62	0.047	0.81	0.154	0.110	0.207
8	0.50	0.050	0.80	0.125	0.084	0.212
9	0.60	0.052	0.77	0.155	0.100	0.257
10	0.50	0.051	0.81	0.099	0.062	0.192
11	0.46	0.045	0.80	0.032	0.021	0.059
12	0.50	0.053	0.83	0.025	0.017	0.048
13	0.50	0.054	0.83	0.028	0.018	0.052
14	0.49	0.051	0.82	0.028	0.019	0.061
15	0.50	0.052	0.80	0.029	0.019	0.050
16	0.50	0.047	0.80	0.030	0.019	0.059
17	0.50	0.050	0.80	0.032	0.021	0.047
18	0.48	0.051	0.80	0.032	0.021	0.049
19	0.48	0.053	0.85	0.027	0.017	0.052
20	0.48	0.051	0.81	0.034	0.022	0.058
21	0.50	0.051	0.80	0.032	0.021	0.046
22	0.50	0.051	0.80	0.043	0.028	0.070
23	0.49	0.050	0.78	0.045	0.029	0.086
24	0.49	0.051	0.80	0.032	0.021	0.047
25	0.48	0.051	0.79	0.044	0.028	0.081
26	0.50	0.051	0.77	0.044	0.028	0.084
27	0.50	0.051	0.80	0.047	0.030	0.095
28	0.50	0.051	0.82	0.046	0.029	0.086
29	0.49	0.052	0.80	0.045	0.028	0.086
30	0.49	0.051	0.80	0.047	0.030	0.090

Table F5						
Structure 3 - Gauge Arrangement 1						
Irregular Wave						20 hz
Wave Period = 1.6 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.049	1.47	0.142	0.092	0.245
2	1.05	0.047	1.44	0.144	0.092	0.260
3	1.05	0.048	1.46	0.140	0.090	0.249
4	1.05	0.048	1.45	0.140	0.089	0.256
5	1.05	0.046	1.46	0.139	0.091	0.256
6	0.63	0.047	1.44	0.176	0.111	0.268
7	0.62	0.046	1.50	0.180	0.123	0.284
8	0.50	0.051	1.26	0.093	0.056	0.205
9	0.60	0.053	1.25	0.138	0.089	0.236
10	0.50	0.051	1.25	0.094	0.060	0.161
11	0.46	0.044	1.42	0.031	0.020	0.061
12	0.50	0.053	1.49	0.029	0.019	0.062
13	0.50	0.051	1.48	0.029	0.018	0.058
14	0.49	0.052	1.47	0.031	0.020	0.054
15	0.50	0.050	1.41	0.031	0.020	0.058
16	0.50	0.053	1.42	0.033	0.020	0.060
17	0.50	0.052	1.38	0.033	0.021	0.063
18	0.48	0.052	1.43	0.033	0.021	0.057
19	0.48	0.051	1.29	0.030	0.019	0.058
20	0.48	0.052	1.41	0.034	0.021	0.061
21	0.50	0.050	1.32	0.122	0.076	0.202
22	0.50	0.051	1.30	0.119	0.076	0.225
23	0.49	0.052	1.27	0.104	0.067	0.217
24	0.49	0.051	1.29	0.053	0.035	0.082
25	0.48	0.051	1.25	0.080	0.052	0.139
26	0.50	0.054	1.28	0.075	0.048	0.121
27	0.50	0.051	1.34	0.069	0.044	0.109
28	0.50	0.050	1.28	0.063	0.041	0.115
29	0.49	0.050	1.32	0.060	0.039	0.108
30	0.49	0.051	1.29	0.053	0.035	0.082

Table F6						
Structure 3 - Gauge Arrangement 2						
Irregular Wave						20 hz
Wave Period = 1.6 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.045	1.44	0.141	0.091	0.248
2	1.05	0.046	1.46	0.146	0.093	0.259
3	1.05	0.046	1.44	0.139	0.089	0.253
4	1.05	0.046	1.44	0.141	0.091	0.260
5	1.05	0.046	1.44	0.139	0.089	0.251
6	0.63	0.044	1.46	0.176	0.111	0.264
7	0.62	0.047	1.49	0.174	0.119	0.263
8	0.50	0.050	1.28	0.096	0.060	0.185
9	0.60	0.050	1.30	0.133	0.084	0.226
10	0.50	0.050	1.30	0.091	0.059	0.160
11	0.46	0.057	1.38	0.032	0.021	0.059
12	0.50	0.052	1.58	0.026	0.017	0.049
13	0.50	0.052	1.38	0.028	0.018	0.054
14	0.49	0.052	1.41	0.030	0.019	0.061
15	0.50	0.052	1.44	0.031	0.020	0.050
16	0.50	0.051	1.37	0.030	0.019	0.057
17	0.50	0.051	1.34	0.033	0.021	0.053
18	0.48	0.052	1.34	0.033	0.021	0.056
19	0.48	0.052	1.66	0.030	0.018	0.059
20	0.48	0.053	1.33	0.032	0.021	0.056
21	0.50	0.056	1.46	0.071	0.046	0.132
22	0.50	0.056	1.44	0.073	0.047	0.127
23	0.49	0.057	1.41	0.075	0.046	0.148
24	0.49	0.051	1.37	0.043	0.028	0.073
25	0.48	0.051	1.37	0.070	0.044	0.135
26	0.50	0.052	1.32	0.067	0.042	0.116
27	0.50	0.053	1.38	0.063	0.040	0.099
28	0.50	0.052	1.32	0.060	0.039	0.108
29	0.49	0.051	1.28	0.057	0.036	0.096
30	0.49	0.051	1.36	0.043	0.028	0.073

Table F7						
Structure 3 - Gauge Arrangement 3						
Irregular Wave						20 hz
Wave Period = 1.6 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.045	1.45	0.139	0.089	0.243
2	1.05	0.046	1.44	0.142	0.090	0.247
3	1.05	0.046	1.46	0.136	0.087	0.246
4	1.05	0.047	1.45	0.139	0.088	0.254
5	1.05	0.047	1.44	0.139	0.091	0.258
6	0.63	0.047	1.44	0.173	0.106	0.247
7	0.62	0.046	1.48	0.166	0.113	0.228
8	0.50	0.049	1.25	0.109	0.069	0.209
9	0.60	0.051	1.35	0.136	0.087	0.237
10	0.50	0.049	1.32	0.085	0.054	0.136
11	0.46	0.053	1.37	0.030	0.019	0.054
12	0.50	0.054	1.76	0.025	0.016	0.042
13	0.50	0.054	1.45	0.026	0.016	0.047
14	0.49	0.052	1.42	0.028	0.018	0.050
15	0.50	0.054	1.41	0.029	0.019	0.048
16	0.50	0.051	1.44	0.030	0.019	0.050
17	0.50	0.052	1.42	0.030	0.019	0.051
18	0.48	0.051	1.50	0.032	0.020	0.056
19	0.48	0.050	1.83	0.028	0.018	0.051
20	0.48	0.053	1.37	0.033	0.021	0.058
21	0.50	0.056	1.42	0.055	0.034	0.095
22	0.50	0.054	1.25	0.050	0.030	0.092
23	0.49	0.059	1.42	0.053	0.033	0.088
24	0.49	0.051	1.41	0.035	0.021	0.074
25	0.48	0.049	1.41	0.055	0.034	0.098
26	0.50	0.050	1.43	0.054	0.034	0.095
27	0.50	0.050	1.44	0.052	0.033	0.094
28	0.50	0.051	1.44	0.050	0.032	0.092
29	0.49	0.051	1.43	0.048	0.031	0.083
30	0.49	0.051	1.41	0.035	0.021	0.074

Table F8						
Structure 3 - Gauge Arrangement 4						
Irregular Wave						20 hz
Wave Period = 1.6 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.047	1.46	0.142	0.092	0.245
2	1.05	0.047	1.44	0.144	0.093	0.257
3	1.05	0.046	1.45	0.140	0.090	0.246
4	1.05	0.047	1.44	0.141	0.089	0.258
5	1.05	0.046	1.46	0.139	0.090	0.255
6	0.63	0.045	1.46	0.174	0.109	0.262
7	0.62	0.046	1.47	0.177	0.120	0.275
8	0.50	0.049	1.25	0.098	0.061	0.235
9	0.60	0.051	1.29	0.138	0.086	0.219
10	0.50	0.050	1.25	0.091	0.059	0.162
11	0.46	0.047	1.40	0.028	0.018	0.055
12	0.50	0.053	1.75	0.023	0.014	0.045
13	0.50	0.053	1.65	0.025	0.016	0.052
14	0.49	0.051	1.54	0.026	0.016	0.050
15	0.50	0.052	1.32	0.025	0.016	0.044
16	0.50	0.048	1.33	0.026	0.016	0.044
17	0.50	0.050	1.36	0.027	0.017	0.050
18	0.48	0.051	1.40	0.028	0.017	0.049
19	0.48	0.052	2.10	0.024	0.015	0.047
20	0.48	0.051	1.42	0.030	0.019	0.051
21	0.50	0.050	1.51	0.052	0.030	0.122
22	0.50	0.052	1.25	0.038	0.024	0.063
23	0.49	0.053	1.26	0.040	0.025	0.073
24	0.49	0.051	1.31	0.030	0.018	0.061
25	0.48	0.052	1.34	0.041	0.024	0.075
26	0.50	0.051	1.35	0.042	0.025	0.079
27	0.50	0.051	1.40	0.044	0.027	0.093
28	0.50	0.052	1.34	0.043	0.026	0.070
29	0.49	0.053	1.39	0.041	0.025	0.074
30	0.49	0.051	1.31	0.030	0.018	0.061

Table F9						
Structure 3 - Gauge Arrangement 1						
Monochromatic Wave						20 hz
Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.041	0.80	0.130	0.126	0.133
2	1.05	0.042	0.80	0.150	0.146	0.155
3	1.05	0.043	0.80	0.153	0.149	0.160
4	1.05	0.042	0.80	0.150	0.148	0.154
5	1.05	0.042	0.80	0.139	0.137	0.141
6	0.63	0.043	0.80	0.153	0.142	0.189
7	0.62	0.043	0.80	0.181	0.149	0.241
8	0.50	0.051	0.80	0.094	0.071	0.131
9	0.60	0.055	0.80	0.228	0.143	0.265
10	0.50	0.051	0.80	0.103	0.068	0.136
11	0.46	0.049	0.80	0.042	0.031	0.057
12	0.50	0.054	0.80	0.038	0.024	0.055
13	0.50	0.051	0.80	0.037	0.025	0.052
14	0.49	0.052	0.80	0.038	0.025	0.054
15	0.50	0.053	0.80	0.037	0.026	0.056
16	0.50	0.052	0.80	0.037	0.027	0.048
17	0.50	0.053	0.80	0.041	0.031	0.053
18	0.48	0.053	0.80	0.042	0.030	0.050
19	0.48	0.053	0.80	0.039	0.025	0.066
20	0.48	0.053	0.80	0.041	0.031	0.060
21	0.50	0.051	0.80	0.158	0.108	0.193
22	0.50	0.052	0.80	0.170	0.109	0.193
23	0.49	0.052	0.80	0.136	0.082	0.175
24	0.49	0.052	0.79	0.045	0.031	0.079
25	0.48	0.052	0.80	0.106	0.060	0.129
26	0.50	0.055	0.80	0.106	0.057	0.131
27	0.50	0.053	0.80	0.090	0.051	0.110
28	0.50	0.051	0.80	0.086	0.051	0.122
29	0.49	0.051	0.80	0.081	0.048	0.097
30	0.49	0.052	0.79	0.046	0.031	0.080

Table F10						
Structure 3 - Gauge Arrangement 2						
Monochromatic Wave						20 hz
Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.044	0.80	0.134	0.129	0.137
2	1.05	0.042	0.80	0.151	0.147	0.156
3	1.05	0.044	0.80	0.153	0.149	0.156
4	1.05	0.043	0.80	0.152	0.149	0.156
5	1.05	0.043	0.80	0.141	0.138	0.144
6	0.63	0.043	0.80	0.189	0.157	0.211
7	0.62	0.043	0.80	0.181	0.150	0.270
8	0.50	0.052	0.80	0.104	0.076	0.126
9	0.60	0.051	0.80	0.204	0.133	0.236
10	0.50	0.051	0.79	0.091	0.064	0.124
11	0.46	0.054	0.80	0.035	0.022	0.058
12	0.50	0.053	0.80	0.032	0.022	0.046
13	0.50	0.051	0.80	0.036	0.025	0.051
14	0.49	0.053	0.80	0.035	0.027	0.045
15	0.50	0.053	0.80	0.040	0.028	0.057
16	0.50	0.057	0.80	0.034	0.024	0.048
17	0.50	0.052	0.80	0.037	0.026	0.055
18	0.48	0.053	0.81	0.045	0.028	0.055
19	0.48	0.052	0.80	0.036	0.025	0.050
20	0.48	0.054	0.81	0.044	0.027	0.056
21	0.50	0.063	0.80	0.080	0.052	0.130
22	0.50	0.060	0.80	0.087	0.065	0.114
23	0.49	0.062	0.80	0.085	0.064	0.106
24	0.49	0.052	0.79	0.034	0.022	0.078
25	0.48	0.051	0.80	0.078	0.052	0.105
26	0.50	0.052	0.81	0.079	0.045	0.102
27	0.50	0.053	0.80	0.070	0.046	0.105
28	0.50	0.052	0.81	0.071	0.040	0.098
29	0.49	0.051	0.80	0.066	0.043	0.105
30	0.49	0.052	0.79	0.033	0.022	0.078

Table F11						
Structure 3 - Gauge Arrangement 3						
Monochromatic Wave						20 hz
Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.043	0.80	0.135	0.130	0.141
2	1.05	0.044	0.80	0.153	0.148	0.158
3	1.05	0.044	0.80	0.154	0.150	0.158
4	1.05	0.045	0.80	0.152	0.149	0.156
5	1.05	0.045	0.80	0.140	0.137	0.144
6	0.63	0.044	0.80	0.154	0.144	0.168
7	0.62	0.044	0.80	0.187	0.155	0.232
8	0.50	0.051	0.80	0.113	0.079	0.148
9	0.60	0.053	0.80	0.225	0.144	0.278
10	0.50	0.051	0.80	0.107	0.065	0.149
11	0.46	0.054	0.80	0.042	0.027	0.059
12	0.50	0.055	0.80	0.035	0.024	0.059
13	0.50	0.053	0.81	0.035	0.025	0.046
14	0.49	0.051	0.80	0.035	0.022	0.045
15	0.50	0.054	0.81	0.036	0.023	0.047
16	0.50	0.053	0.80	0.041	0.030	0.058
17	0.50	0.052	0.80	0.037	0.024	0.055
18	0.48	0.052	0.80	0.043	0.030	0.060
19	0.48	0.051	0.81	0.042	0.029	0.062
20	0.48	0.053	0.80	0.043	0.030	0.064
21	0.50	0.056	0.80	0.058	0.043	0.073
22	0.50	0.054	0.80	0.069	0.047	0.094
23	0.49	0.058	0.80	0.064	0.047	0.087
24	0.49	0.052	0.80	0.060	0.044	0.076
25	0.48	0.049	0.80	0.067	0.047	0.083
26	0.50	0.050	0.80	0.066	0.045	0.091
27	0.50	0.050	0.80	0.067	0.044	0.097
28	0.50	0.051	0.81	0.066	0.043	0.093
29	0.49	0.051	0.81	0.068	0.041	0.102
30	0.49	0.051	0.80	0.066	0.040	0.102

Table F12						
Structure 3 - Gauge Arrangement 4						
Monochromatic Wave						20 hz
Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.045	0.80	0.136	0.134	0.142
2	1.05	0.045	0.80	0.151	0.147	0.154
3	1.05	0.044	0.80	0.152	0.148	0.157
4	1.05	0.046	0.80	0.152	0.148	0.155
5	1.05	0.044	0.80	0.140	0.137	0.144
6	0.63	0.043	0.80	0.158	0.144	0.197
7	0.62	0.044	0.80	0.172	0.147	0.223
8	0.50	0.050	0.80	0.106	0.073	0.153
9	0.60	0.052	0.80	0.221	0.142	0.268
10	0.50	0.051	0.80	0.100	0.068	0.151
11	0.46	0.052	0.81	0.035	0.023	0.055
12	0.50	0.055	0.80	0.025	0.014	0.051
13	0.50	0.058	0.81	0.036	0.020	0.060
14	0.49	0.052	0.79	0.024	0.016	0.039
15	0.50	0.054	0.80	0.032	0.022	0.056
16	0.50	0.051	0.80	0.030	0.019	0.056
17	0.50	0.050	0.80	0.030	0.021	0.049
18	0.48	0.052	0.80	0.039	0.024	0.058
19	0.48	0.053	0.81	0.030	0.019	0.043
20	0.48	0.053	0.80	0.041	0.024	0.064
21	0.50	0.052	0.80	0.063	0.039	0.085
22	0.50	0.050	0.80	0.051	0.031	0.070
23	0.49	0.054	0.80	0.055	0.035	0.085
24	0.49	0.051	0.80	0.024	0.017	0.037
25	0.48	0.054	0.80	0.051	0.037	0.077
26	0.50	0.052	0.80	0.045	0.031	0.064
27	0.50	0.052	0.80	0.047	0.036	0.062
28	0.50	0.052	0.80	0.042	0.030	0.055
29	0.49	0.053	0.81	0.048	0.033	0.062
30	0.49	0.051	0.80	0.024	0.016	0.036

Table F13						
Structure 3 - Gauge Arrangement 1						
Irregular Wave With Current						20 hz
Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.047	0.74	0.190	0.124	0.321
2	1.05	0.046	0.74	0.201	0.132	0.328
3	1.05	0.046	0.74	0.194	0.126	0.320
4	1.05	0.046	0.73	0.195	0.128	0.315
5	1.05	0.045	0.74	0.184	0.121	0.302
6	0.63	0.047	0.80	0.166	0.112	0.237
7	0.62	0.046	0.81	0.142	0.099	0.194
8	0.50	0.049	0.81	0.093	0.064	0.144
9	0.60	0.050	0.78	0.103	0.074	0.175
10	0.50	0.049	0.80	0.092	0.062	0.143
11	0.46	0.043	0.81	0.021	0.014	0.055
12	0.50	0.054	0.81	0.032	0.021	0.060
13	0.50	0.047	0.82	0.030	0.019	0.060
14	0.49	0.051	0.83	0.028	0.018	0.067
15	0.50	0.052	0.78	0.027	0.018	0.072
16	0.50	0.050	0.79	0.025	0.015	0.080
17	0.50	0.051	0.79	0.025	0.016	0.057
18	0.48	0.052	0.84	0.025	0.016	0.057
19	0.48	0.052	0.77	0.036	0.023	0.064
20	0.48	0.052	0.82	0.022	0.014	0.048
21	0.50	0.052	0.73	0.082	0.055	0.204
22	0.50	0.052	0.77	0.091	0.059	0.190
23	0.49	0.052	0.82	0.098	0.063	0.193
24	0.49	0.050	0.81	0.066	0.040	0.151
25	0.48	0.050	0.81	0.095	0.057	0.165
26	0.50	0.052	0.79	0.094	0.060	0.157
27	0.50	0.049	0.79	0.091	0.058	0.163
28	0.50	0.049	0.80	0.086	0.055	0.163
29	0.49	0.051	0.79	0.083	0.051	0.144
30	0.49	0.051	0.82	0.066	0.040	0.151

Table F14						
Structure 3 - Gauge Arrangement 2						
Irregular Wave With Current						20 hz
Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.054	0.74	0.192	0.125	0.336
2	1.05	0.052	0.74	0.201	0.133	0.323
3	1.05	0.053	0.75	0.196	0.129	0.332
4	1.05	0.053	0.74	0.195	0.128	0.313
5	1.05	0.052	0.74	0.188	0.123	0.317
6	0.63	0.051	0.80	0.163	0.110	0.221
7	0.62	0.053	0.81	0.144	0.101	0.195
8	0.50	0.050	0.81	0.094	0.065	0.136
9	0.60	0.049	0.79	0.101	0.073	0.166
10	0.50	0.051	0.81	0.097	0.061	0.139
11	0.46	0.052	0.80	0.032	0.021	0.053
12	0.50	0.052	0.76	0.035	0.023	0.060
13	0.50	0.050	0.82	0.037	0.023	0.063
14	0.49	0.053	0.80	0.035	0.022	0.064
15	0.50	0.053	0.78	0.034	0.022	0.080
16	0.50	0.056	0.81	0.032	0.021	0.072
17	0.50	0.051	0.79	0.031	0.020	0.050
18	0.48	0.053	0.79	0.033	0.021	0.061
19	0.48	0.053	0.79	0.032	0.021	0.060
20	0.48	0.053	0.81	0.030	0.019	0.048
21	0.50	0.062	0.85	0.087	0.056	0.132
22	0.50	0.059	0.81	0.080	0.051	0.125
23	0.49	0.059	0.77	0.072	0.045	0.131
24	0.49	0.052	0.81	0.039	0.024	0.063
25	0.48	0.051	0.78	0.057	0.036	0.096
26	0.50	0.053	0.80	0.054	0.034	0.101
27	0.50	0.053	0.82	0.051	0.032	0.096
28	0.50	0.052	0.86	0.050	0.031	0.087
29	0.49	0.050	0.87	0.049	0.031	0.100
30	0.49	0.052	0.81	0.039	0.024	0.063

Table F15						
Structure 3 - Gauge Arrangement 3						
Irregular Wave With Current						20 hz
Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.055	0.74	0.194	0.126	0.316
2	1.05	0.055	0.74	0.204	0.134	0.333
3	1.05	0.053	0.74	0.198	0.128	0.338
4	1.05	0.054	0.74	0.198	0.129	0.317
5	1.05	0.054	0.74	0.189	0.124	0.312
6	0.63	0.054	0.80	0.168	0.111	0.232
7	0.62	0.057	0.81	0.149	0.103	0.206
8	0.50	0.054	0.80	0.090	0.070	0.154
9	0.60	0.055	0.78	0.103	0.070	0.168
10	0.50	0.054	0.80	0.094	0.061	0.148
11	0.46	0.049	0.83	0.025	0.016	0.048
12	0.50	0.057	0.78	0.025	0.016	0.040
13	0.50	0.054	0.79	0.030	0.020	0.055
14	0.49	0.055	0.80	0.030	0.020	0.053
15	0.50	0.058	0.81	0.029	0.019	0.052
16	0.50	0.058	0.82	0.026	0.017	0.052
17	0.50	0.055	0.81	0.025	0.016	0.063
18	0.48	0.055	0.80	0.025	0.017	0.052
19	0.48	0.055	0.84	0.024	0.016	0.051
20	0.48	0.055	0.83	0.024	0.015	0.056
21	0.50	0.044	0.81	0.065	0.042	0.110
22	0.50	0.042	0.81	0.059	0.037	0.092
23	0.49	0.044	0.79	0.053	0.034	0.074
24	0.49	0.054	0.80	0.030	0.019	0.052
25	0.48	0.055	0.78	0.044	0.028	0.080
26	0.50	0.052	0.77	0.041	0.026	0.079
27	0.50	0.055	0.80	0.039	0.025	0.070
28	0.50	0.055	0.80	0.038	0.024	0.062
29	0.49	0.057	0.84	0.036	0.023	0.067
30	0.49	0.054	0.80	0.030	0.019	0.052

Table F16						
Structure 3 - Gauge Arrangement 4						
Irregular Wave With Current						20 hz
Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.052	0.74	0.193	0.127	0.310
2	1.05	0.051	0.74	0.202	0.133	0.316
3	1.05	0.052	0.74	0.197	0.129	0.321
4	1.05	0.052	0.73	0.196	0.128	0.323
5	1.05	0.051	0.74	0.186	0.122	0.305
6	0.63	0.050	0.80	0.167	0.110	0.223
7	0.62	0.052	0.81	0.144	0.100	0.202
8	0.50	0.050	0.82	0.090	0.061	0.158
9	0.60	0.053	0.78	0.107	0.077	0.168
10	0.50	0.049	0.81	0.090	0.062	0.141
11	0.46	0.053	0.79	0.023	0.015	0.049
12	0.50	0.054	0.82	0.023	0.015	0.039
13	0.50	0.057	0.78	0.027	0.018	0.046
14	0.49	0.052	0.77	0.028	0.018	0.059
15	0.50	0.053	0.79	0.028	0.018	0.054
16	0.50	0.051	0.80	0.028	0.017	0.050
17	0.50	0.051	0.80	0.026	0.016	0.053
18	0.48	0.051	0.82	0.025	0.015	0.051
19	0.48	0.053	0.92	0.021	0.014	0.035
20	0.48	0.051	0.81	0.025	0.016	0.044
21	0.50	0.053	0.77	0.032	0.020	0.071
22	0.50	0.051	0.81	0.047	0.029	0.077
23	0.49	0.054	0.83	0.043	0.028	0.075
24	0.49	0.053	0.77	0.032	0.021	0.073
25	0.48	0.054	0.78	0.035	0.023	0.060
26	0.50	0.052	0.79	0.033	0.022	0.057
27	0.50	0.050	0.79	0.032	0.020	0.054
28	0.50	0.053	0.81	0.029	0.019	0.047
29	0.49	0.054	0.79	0.027	0.018	0.043
30	0.49	0.052	0.79	0.026	0.017	0.040

Table F17						
Structure 3 - Gauge Arrangement 1						
Irregular Wave With Current						20 hz
Wave Period = 1.6 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.047	1.46	0.141	0.091	0.251
2	1.05	0.047	1.44	0.141	0.090	0.259
3	1.05	0.047	1.44	0.139	0.089	0.255
4	1.05	0.048	1.43	0.140	0.088	0.260
5	1.05	0.048	1.45	0.137	0.087	0.258
6	0.63	0.047	1.46	0.168	0.105	0.242
7	0.62	0.046	1.46	0.162	0.107	0.246
8	0.50	0.050	1.21	0.081	0.050	0.143
9	0.60	0.052	1.45	0.102	0.066	0.173
10	0.50	0.049	1.20	0.084	0.052	0.150
11	0.46	0.044	1.76	0.024	0.016	0.043
12	0.50	0.054	1.06	0.029	0.019	0.051
13	0.50	0.049	1.22	0.028	0.018	0.050
14	0.49	0.052	1.50	0.028	0.018	0.049
15	0.50	0.052	1.53	0.028	0.018	0.049
16	0.50	0.052	1.46	0.028	0.017	0.043
17	0.50	0.051	1.68	0.028	0.018	0.045
18	0.48	0.052	1.62	0.027	0.017	0.041
19	0.48	0.050	0.98	0.033	0.021	0.055
20	0.48	0.052	1.72	0.026	0.017	0.043
21	0.50	0.051	1.39	0.100	0.063	0.176
22	0.50	0.051	1.28	0.102	0.062	0.196
23	0.49	0.051	1.24	0.094	0.058	0.169
24	0.49	0.050	1.11	0.050	0.032	0.089
25	0.48	0.051	1.15	0.076	0.047	0.118
26	0.50	0.054	1.16	0.072	0.045	0.129
27	0.50	0.052	1.13	0.066	0.042	0.103
28	0.50	0.050	1.10	0.065	0.040	0.120
29	0.49	0.050	1.08	0.062	0.039	0.109
30	0.49	0.050	1.10	0.050	0.032	0.089

Table F18						
Structure 3 - Gauge Arrangement 2						
Irregular Wave With Current						20 hz
Wave Period = 1.6 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.056	1.45	0.142	0.092	0.248
2	1.05	0.053	1.44	0.145	0.092	0.257
3	1.05	0.054	1.45	0.139	0.088	0.260
4	1.05	0.055	1.43	0.140	0.089	0.264
5	1.05	0.054	1.44	0.139	0.089	0.255
6	0.63	0.054	1.44	0.171	0.106	0.248
7	0.62	0.054	1.48	0.164	0.108	0.245
8	0.50	0.052	1.27	0.082	0.051	0.137
9	0.60	0.052	1.40	0.100	0.064	0.162
10	0.50	0.052	1.17	0.085	0.056	0.140
11	0.46	0.050	1.47	0.026	0.017	0.041
12	0.50	0.053	1.11	0.028	0.018	0.044
13	0.50	0.052	1.08	0.029	0.019	0.044
14	0.49	0.053	1.28	0.029	0.019	0.048
15	0.50	0.053	1.32	0.029	0.019	0.054
16	0.50	0.055	1.41	0.028	0.018	0.047
17	0.50	0.052	1.51	0.028	0.018	0.050
18	0.48	0.053	1.52	0.029	0.018	0.048
19	0.48	0.053	1.14	0.032	0.021	0.062
20	0.48	0.054	1.56	0.026	0.017	0.042
21	0.50	0.064	1.48	0.039	0.025	0.067
22	0.50	0.060	1.34	0.064	0.040	0.105
23	0.49	0.061	1.38	0.063	0.040	0.107
24	0.49	0.053	1.47	0.042	0.027	0.074
25	0.48	0.053	1.41	0.056	0.035	0.084
26	0.50	0.054	1.46	0.054	0.035	0.094
27	0.50	0.054	1.38	0.050	0.031	0.076
28	0.50	0.053	1.40	0.047	0.030	0.079
29	0.49	0.052	1.34	0.046	0.029	0.083
30	0.49	0.052	1.31	0.047	0.029	0.080

Table F19						
Structure 3 - Gauge Arrangement 3						
Irregular Wave With Current						20 hz
Wave Period = 1.6 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.056	1.45	0.143	0.092	0.260
2	1.05	0.056	1.44	0.142	0.089	0.256
3	1.05	0.054	1.45	0.139	0.088	0.256
4	1.05	0.055	1.44	0.142	0.091	0.261
5	1.05	0.054	1.45	0.139	0.089	0.256
6	0.63	0.055	1.48	0.171	0.107	0.260
7	0.62	0.057	1.53	0.169	0.112	0.253
8	0.50	0.054	1.23	0.083	0.051	0.150
9	0.60	0.056	1.45	0.104	0.067	0.163
10	0.50	0.054	1.21	0.087	0.054	0.161
11	0.46	0.047	1.52	0.026	0.017	0.054
12	0.50	0.057	1.34	0.027	0.017	0.045
13	0.50	0.055	1.21	0.027	0.017	0.044
14	0.49	0.056	1.17	0.026	0.017	0.042
15	0.50	0.058	1.18	0.027	0.017	0.046
16	0.50	0.059	1.25	0.026	0.017	0.047
17	0.50	0.056	1.48	0.026	0.017	0.047
18	0.48	0.056	1.46	0.027	0.018	0.048
19	0.48	0.056	1.48	0.028	0.018	0.048
20	0.48	0.055	1.61	0.025	0.016	0.037
21	0.50	0.044	1.61	0.061	0.036	0.104
22	0.50	0.042	1.24	0.045	0.027	0.073
23	0.49	0.045	1.36	0.045	0.028	0.078
24	0.49	0.055	1.31	0.029	0.018	0.049
25	0.48	0.055	1.48	0.045	0.028	0.075
26	0.50	0.053	1.42	0.043	0.027	0.072
27	0.50	0.055	1.43	0.042	0.027	0.067
28	0.50	0.056	1.43	0.042	0.027	0.075
29	0.49	0.058	1.36	0.041	0.026	0.073
30	0.49	0.055	1.30	0.029	0.018	0.049

Table F20						
Structure 3 - Gauge Arrangement 4						
Irregular Wave With Current						20 hz
Wave Period = 1.6 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.052	1.46	0.142	0.091	0.254
2	1.05	0.050	1.44	0.141	0.090	0.257
3	1.05	0.051	1.44	0.138	0.088	0.256
4	1.05	0.052	1.44	0.140	0.090	0.261
5	1.05	0.051	1.45	0.139	0.090	0.258
6	0.63	0.051	1.46	0.169	0.105	0.248
7	0.62	0.052	1.49	0.167	0.110	0.239
8	0.50	0.050	1.28	0.082	0.050	0.150
9	0.60	0.053	1.39	0.101	0.060	0.164
10	0.50	0.049	1.30	0.083	0.049	0.162
11	0.46	0.053	1.41	0.026	0.017	0.045
12	0.50	0.053	1.40	0.023	0.015	0.047
13	0.50	0.056	1.28	0.025	0.016	0.042
14	0.49	0.051	1.14	0.024	0.016	0.041
15	0.50	0.053	1.20	0.025	0.016	0.045
16	0.50	0.048	1.22	0.025	0.016	0.043
17	0.50	0.051	1.29	0.025	0.016	0.041
18	0.48	0.050	1.44	0.026	0.017	0.050
19	0.48	0.052	1.98	0.024	0.015	0.042
20	0.48	0.050	1.47	0.027	0.017	0.046
21	0.50	0.052	1.45	0.034	0.020	0.062
22	0.50	0.050	1.11	0.038	0.024	0.069
23	0.49	0.053	1.28	0.037	0.024	0.062
24	0.49	0.052	1.45	0.035	0.021	0.062
25	0.48	0.054	1.47	0.034	0.022	0.054
26	0.50	0.051	1.45	0.033	0.021	0.055
27	0.50	0.050	1.58	0.033	0.021	0.048
28	0.50	0.052	1.57	0.032	0.021	0.061
29	0.49	0.053	1.48	0.031	0.020	0.047
30	0.49	0.051	1.52	0.030	0.019	0.048

Table F21						
Structure 3 - Gauge Arrangement 1						
Monochromatic Wave With Current						20 hz
Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.045	0.80	0.138	0.136	0.142
2	1.05	0.046	0.80	0.147	0.144	0.150
3	1.05	0.046	0.80	0.154	0.150	0.158
4	1.05	0.047	0.80	0.149	0.147	0.152
5	1.05	0.046	0.80	0.142	0.139	0.147
6	0.63	0.046	0.80	0.151	0.146	0.155
7	0.62	0.046	0.80	0.137	0.132	0.142
8	0.50	0.049	0.80	0.125	0.107	0.144
9	0.60	0.048	0.80	0.132	0.101	0.162
10	0.50	0.049	0.80	0.142	0.127	0.165
11	0.46	0.048	0.79	0.050	0.034	0.072
12	0.50	0.054	0.68	0.034	0.022	0.052
13	0.50	0.049	0.78	0.044	0.033	0.060
14	0.49	0.052	0.78	0.049	0.037	0.064
15	0.50	0.052	0.77	0.052	0.040	0.071
16	0.50	0.052	0.80	0.052	0.041	0.067
17	0.50	0.051	0.80	0.057	0.040	0.073
18	0.48	0.052	0.77	0.045	0.033	0.060
19	0.48	0.051	0.56	0.018	0.011	0.072
20	0.48	0.052	0.78	0.041	0.029	0.058
21	0.50	0.052	0.80	0.157	0.112	0.192
22	0.50	0.051	0.80	0.188	0.130	0.229
23	0.49	0.052	0.80	0.208	0.169	0.240
24	0.49	0.050	0.80	0.083	0.060	0.116
25	0.48	0.051	0.80	0.165	0.139	0.185
26	0.50	0.054	0.80	0.145	0.127	0.159
27	0.50	0.053	0.80	0.131	0.116	0.145
28	0.50	0.049	0.80	0.121	0.106	0.131
29	0.49	0.050	0.80	0.110	0.094	0.122
30	0.49	0.050	0.80	0.084	0.061	0.116

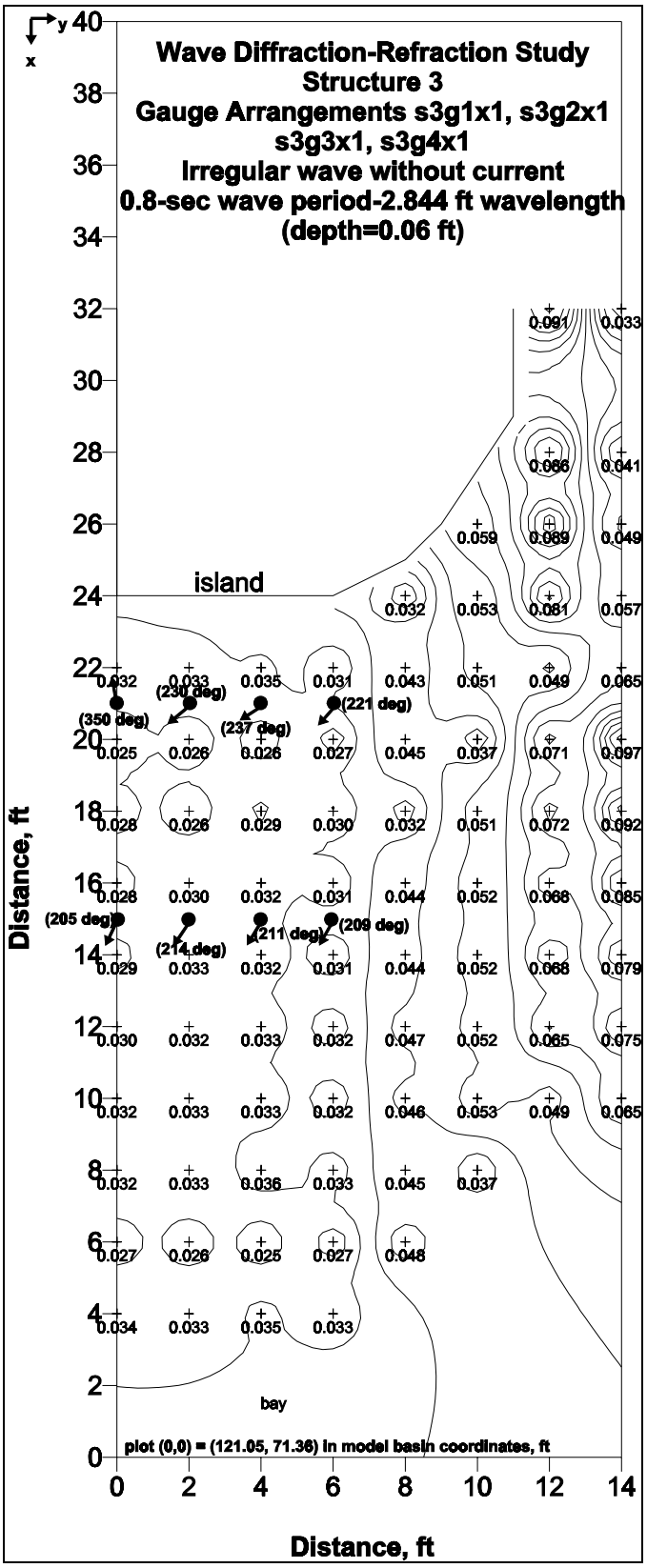
Table F22						
Structure 3 - Gauge Arrangement 2						
Monochromatic Wave With Current						20 hz
Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.055	0.80	0.140	0.137	0.143
2	1.05	0.053	0.80	0.153	0.150	0.157
3	1.05	0.054	0.80	0.157	0.153	0.159
4	1.05	0.054	0.80	0.156	0.153	0.159
5	1.05	0.053	0.80	0.145	0.142	0.148
6	0.63	0.054	0.80	0.156	0.151	0.159
7	0.62	0.054	0.80	0.146	0.141	0.154
8	0.50	0.054	0.80	0.122	0.105	0.143
9	0.60	0.054	0.80	0.161	0.119	0.200
10	0.50	0.054	0.80	0.141	0.128	0.161
11	0.46	0.051	0.80	0.043	0.028	0.064
12	0.50	0.055	0.67	0.020	0.011	0.054
13	0.50	0.054	0.80	0.039	0.024	0.056
14	0.49	0.056	0.79	0.038	0.024	0.060
15	0.50	0.056	0.77	0.040	0.024	0.068
16	0.50	0.057	0.80	0.044	0.031	0.056
17	0.50	0.054	0.80	0.043	0.027	0.062
18	0.48	0.056	0.80	0.060	0.044	0.074
19	0.48	0.055	0.76	0.022	0.013	0.063
20	0.48	0.056	0.80	0.059	0.043	0.073
21	0.50	0.066	0.80	0.073	0.054	0.100
22	0.50	0.063	0.80	0.119	0.098	0.138
23	0.49	0.063	0.79	0.079	0.053	0.117
24	0.49	0.055	0.80	0.080	0.060	0.109
25	0.48	0.055	0.80	0.083	0.064	0.101
26	0.50	0.056	0.80	0.097	0.072	0.118
27	0.50	0.056	0.80	0.105	0.086	0.121
28	0.50	0.055	0.80	0.096	0.077	0.113
29	0.49	0.054	0.80	0.100	0.081	0.109
30	0.49	0.054	0.80	0.091	0.075	0.105

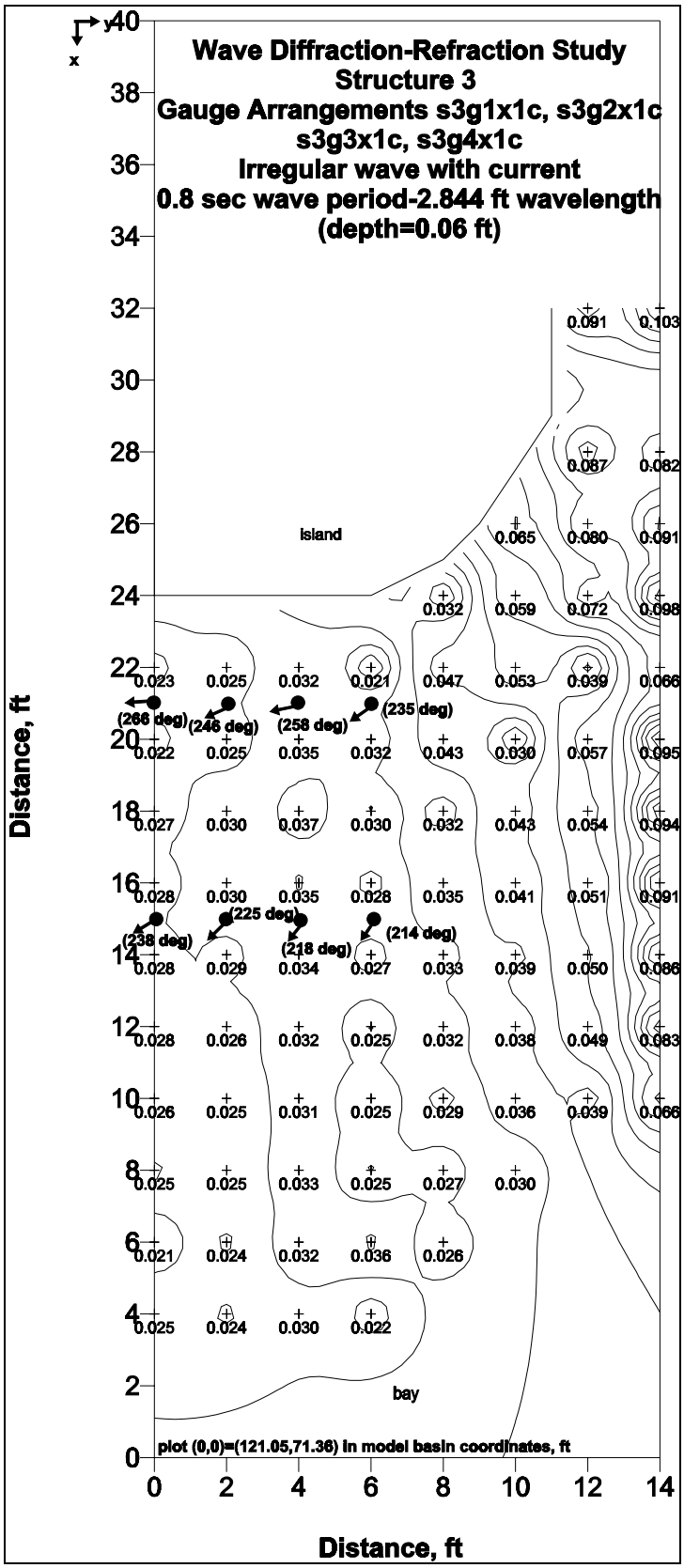
Table F23						
Structure 3 - Gauge Arrangement 3						
Monochromatic Wave With Current						20 hz
Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.057	0.80	0.140	0.135	0.149
2	1.05	0.058	0.80	0.152	0.148	0.158
3	1.05	0.055	0.80	0.155	0.152	0.157
4	1.05	0.057	0.80	0.157	0.154	0.161
5	1.05	0.056	0.80	0.146	0.144	0.150
6	0.63	0.057	0.80	0.155	0.151	0.160
7	0.62	0.058	0.80	0.139	0.132	0.150
8	0.50	0.057	0.80	0.120	0.101	0.154
9	0.60	0.058	0.80	0.116	0.091	0.133
10	0.50	0.057	0.80	0.142	0.126	0.168
11	0.46	0.049	0.80	0.051	0.035	0.066
12	0.50	0.058	0.77	0.017	0.010	0.043
13	0.50	0.055	0.76	0.023	0.012	0.056
14	0.49	0.058	0.79	0.029	0.017	0.058
15	0.50	0.061	0.79	0.028	0.015	0.059
16	0.50	0.061	0.80	0.032	0.022	0.040
17	0.50	0.057	0.80	0.040	0.025	0.060
18	0.48	0.058	0.80	0.041	0.030	0.056
19	0.48	0.057	0.79	0.022	0.015	0.037
20	0.48	0.057	0.80	0.057	0.039	0.068
21	0.50	0.047	0.80	0.073	0.055	0.101
22	0.50	0.044	0.75	0.056	0.038	0.085
23	0.49	0.047	0.80	0.072	0.060	0.090
24	0.49	0.057	0.80	0.050	0.041	0.066
25	0.48	0.057	0.79	0.066	0.042	0.097
26	0.50	0.055	0.71	0.038	0.023	0.061
27	0.50	0.058	0.79	0.055	0.038	0.081
28	0.50	0.057	0.80	0.051	0.038	0.071
29	0.49	0.060	0.80	0.066	0.048	0.078
30	0.49	0.057	0.80	0.050	0.040	0.066

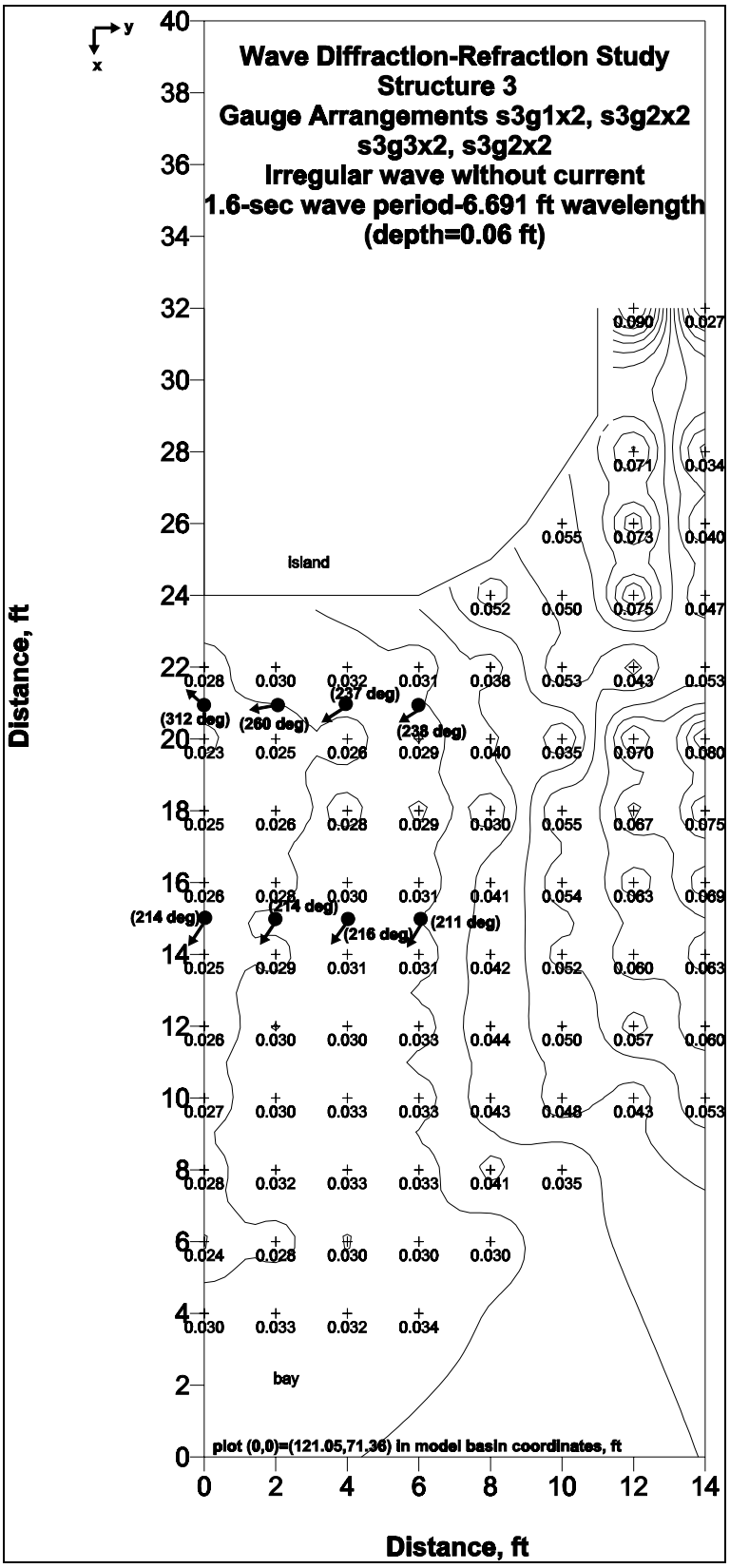
Table F24						
Structure 3 - Gauge Arrangement 4						
Monochromatic Wave With Current						20 hz
Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.052	0.80	0.144	0.139	0.147
2	1.05	0.050	0.80	0.150	0.146	0.153
3	1.05	0.051	0.80	0.156	0.153	0.159
4	1.05	0.051	0.80	0.156	0.152	0.159
5	1.05	0.051	0.80	0.142	0.140	0.145
6	0.63	0.051	0.80	0.154	0.149	0.159
7	0.62	0.051	0.80	0.134	0.127	0.139
8	0.50	0.051	0.80	0.119	0.104	0.133
9	0.60	0.053	0.80	0.106	0.087	0.124
10	0.50	0.050	0.80	0.145	0.125	0.167
11	0.46	0.053	0.80	0.034	0.023	0.043
12	0.50	0.053	0.79	0.018	0.012	0.039
13	0.50	0.056	0.80	0.027	0.019	0.046
14	0.49	0.050	0.79	0.020	0.013	0.041
15	0.50	0.052	0.79	0.024	0.018	0.045
16	0.50	0.048	0.80	0.023	0.017	0.045
17	0.50	0.051	0.80	0.028	0.020	0.039
18	0.48	0.050	0.80	0.028	0.019	0.044
19	0.48	0.052	0.80	0.030	0.020	0.043
20	0.48	0.050	0.80	0.040	0.028	0.050
21	0.50	0.051	0.80	0.041	0.035	0.050
22	0.50	0.049	0.77	0.051	0.035	0.083
23	0.49	0.053	0.80	0.062	0.048	0.082
24	0.49	0.051	0.80	0.042	0.036	0.051
25	0.48	0.053	0.80	0.066	0.050	0.088
26	0.50	0.051	0.79	0.056	0.042	0.070
27	0.50	0.049	0.79	0.059	0.037	0.083
28	0.50	0.052	0.75	0.048	0.031	0.074
29	0.49	0.053	0.71	0.038	0.025	0.057
30	0.49	0.051	0.77	0.049	0.034	0.062

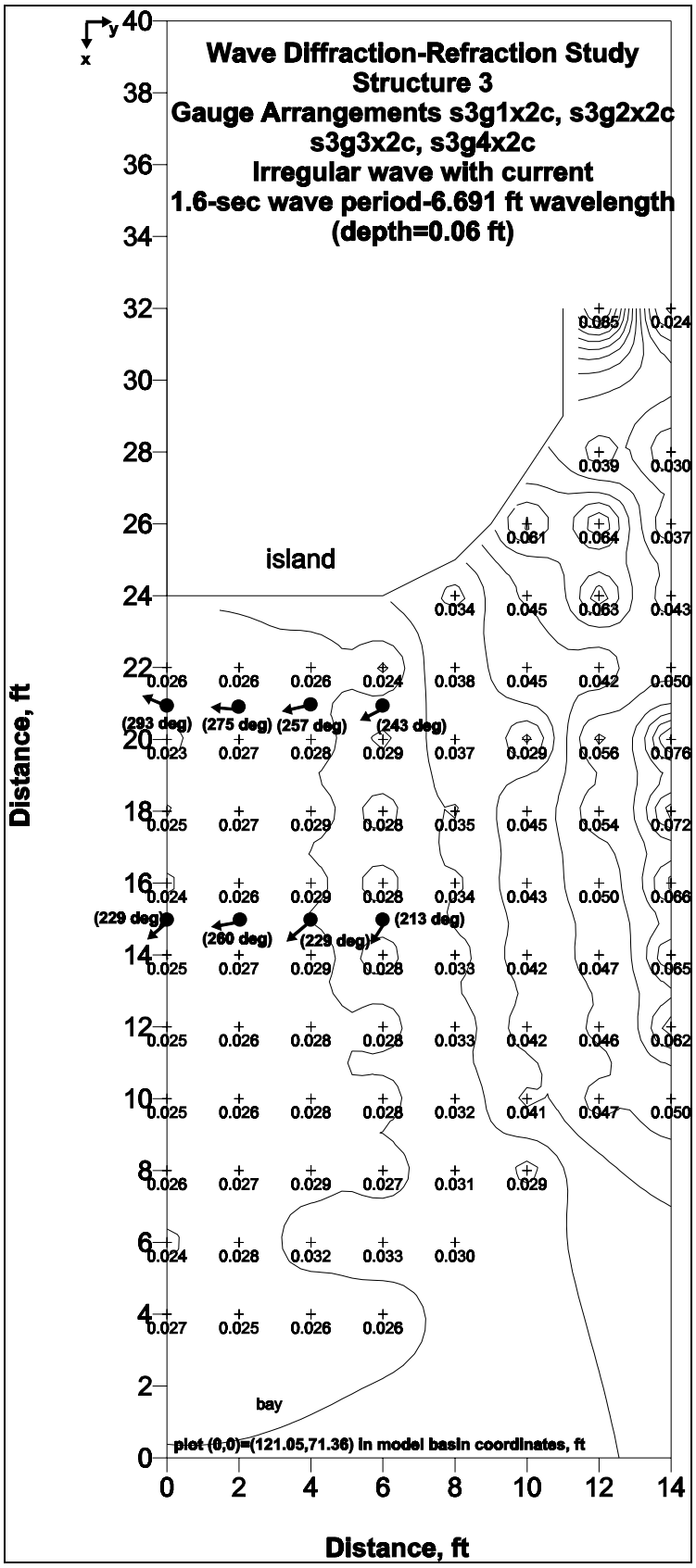
Appendix G
Wave Diffraction-Refraction Plots for Structure 3

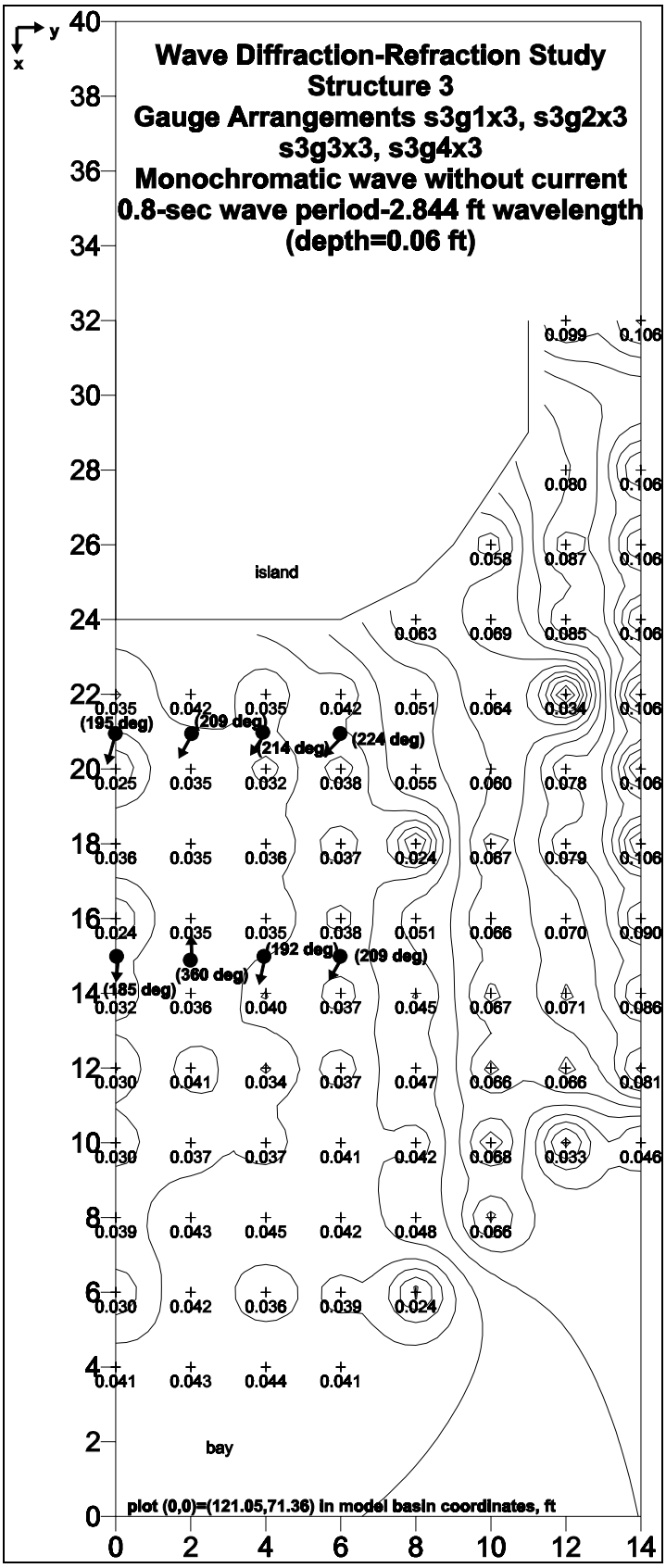
The wave diffraction-refraction plots in this appendix are contour maps describing wave height transformation at the four different gauge arrangements. Contour interval is 0.003 m (0.01 ft). The vectors on the maps depict the peak wave direction acquired at the peak period from the Acoustic Doppler Velocimeter (ADV) probe. Table G1 presents ADV probe vector plot data for Structure 3. To convert measurements given in feet to meters, multiply by 0.3048. To convert measurements given in square feet to square meters, multiply by 0.093.


Wave Diffraction-Refraction Study
Structure 3
Gauge Arrangements s3g1x1, s3g2x1
s3g3x1, s3g4x1
Irregular wave without current
0.8-sec wave period-2.844 ft wavelength
(depth=0.06 ft)
y
x
island
bay
(350 deg)
(230 deg)
(237 deg)
(221 deg)
(205 deg)
(214 deg)
(211 deg)
(209 deg)
plot (0,0) = (121.05, 71.36) in model basin coordinates, ft
Distance, ft
Distance, ft


Wave Diffraction-Refraction Study
Structure 3
Gauge Arrangements s3g1x1c, s3g2x1c
s3g3x1c, s3g4x1c
Irregular wave with current
0.8 sec wave period-2.844 ft wavelength
(depth=0.06 ft)
y
x
Island
bay
(266 deg)
(246 deg)
(258 deg)
(235 deg)
(238 deg)
(225 deg)
(218 deg)
(214 deg)
plot (0,0)=(121.05,71.36) in model basin coordinates, ft
Distance, ft
Distance, ft


Wave Diffraction-Refraction Study
Structure 3
Gauge Arrangements s3g1x2, s3g2x2
s3g3x2, s3g2x2
Irregular wave without current
1.6-sec wave period-6.691 ft wavelength
(depth=0.06 ft)
y
x
Island
bay
(312 deg)
(260 deg)
(237 deg)
(238 deg)
(214 deg)
(214 deg)
(216 deg)
(211 deg)
plot (0,0)=(121.05,71,36) in model basin coordinates, ft
Distance, ft
Distance, ft


Wave Diffraction-Refraction Study
Structure 3
Gauge Arrangements s3g1x2c, s3g2x2c
s3g3x2c, s3g4x2c
Irregular wave with current
1.6-sec wave period-6.691 ft wavelength
(depth=0.06 ft)
y
x
island
bay
(293 deg)
(275 deg)
(257 deg)
(243 deg)
(229 deg)
(260 deg)
(229 deg)
(213 deg)
plot (0,0)=(121.05,71.36) in model basin coordinates, ft
Distance, ft
Distance, ft


Wave Diffraction-Refraction Study
Structure 3
Gauge Arrangements s3g1x3, s3g2x3
s3g3x3, s3g4x3
Monochromatic wave without current
0.8-sec wave period-2.844 ft wavelength
(depth=0.06 ft)
y
x
island
bay
(195 deg)
(209 deg)
(214 deg)
(224 deg)
(185 deg)
(360 deg)
(192 deg)
(209 deg)
plot (0,0)=(121.05,71.36) in model basin coordinates, ft

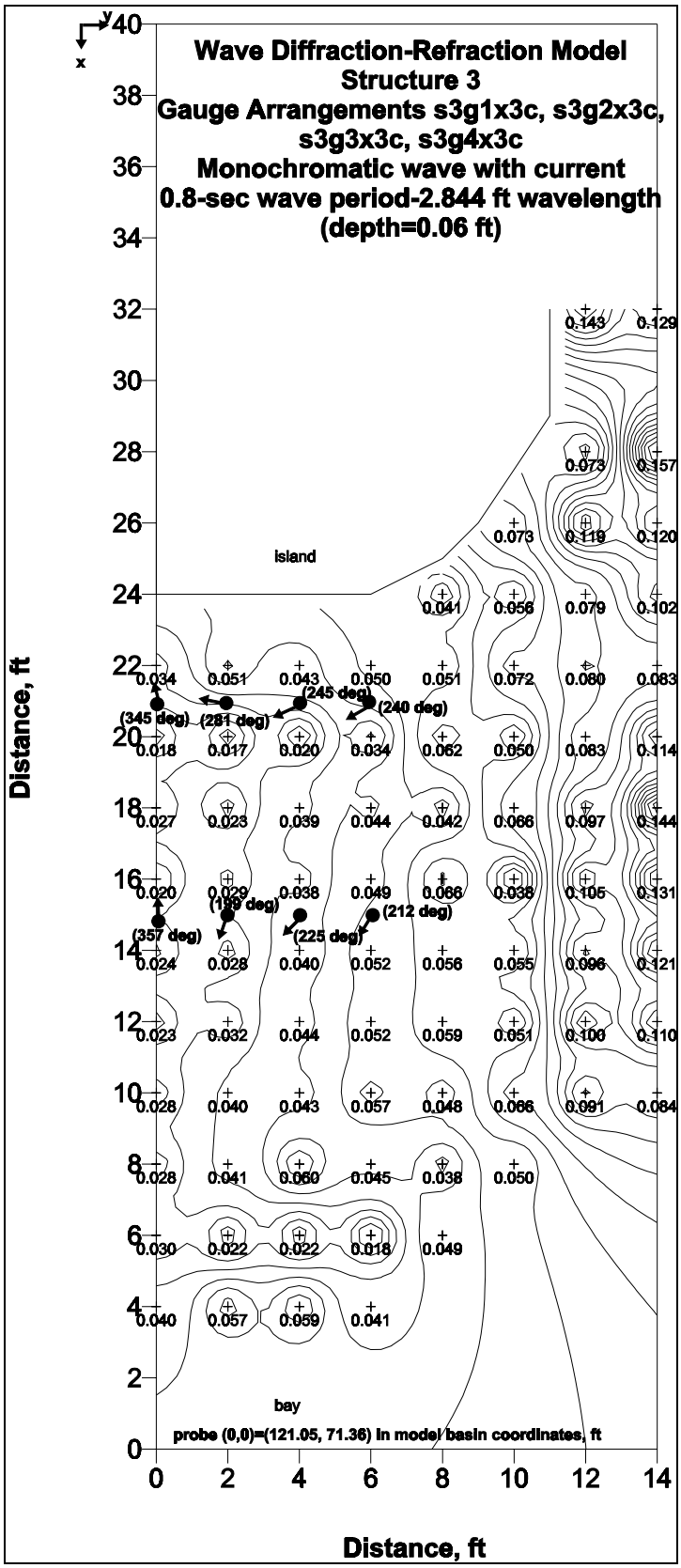

Wave Diffraction-Refraction Model
Structure 3
Gauge Arrangements s3g1x3c, s3g2x3c, s3g3x3c, s3g4x3c
Monochromatic wave with current
0.8-sec wave period-2.844 ft wavelength
(depth=0.06 ft)
y
x
island
bay
probe (0,0)=(121.05, 71.36) in model basin coordinates, ft
(345 deg)
(281 deg)
(245 deg)
(240 deg)
(357 deg)
(189 deg)
(225 deg)
(212 deg)
0.143 0.129
0.073 0.157
0.073 0.119 0.120
0.041 0.056 0.079 0.102
0.034 0.051 0.043 0.050 0.051 0.072 0.080 0.083
0.018 0.017 0.020 0.034 0.062 0.050 0.083 0.114
0.027 0.023 0.039 0.044 0.042 0.066 0.097 0.144
0.020 0.029 0.038 0.049 0.066 0.038 0.105 0.131
0.024 0.028 0.040 0.052 0.056 0.055 0.096 0.121
0.023 0.032 0.044 0.052 0.059 0.051 0.100 0.110
0.028 0.040 0.043 0.057 0.048 0.066 0.091 0.084
0.028 0.041 0.060 0.045 0.038 0.050
0.030 0.022 0.022 0.018 0.049
0.040 0.057 0.059 0.041
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40
Distance, ft
Distance, ft

Table G1
Structure 3 ADV Probe Vector Plots Data

Gauge Arrangement	ADV Probe 0			ADV Probe 1		
	Peak Period sec	Peak Energy Density ft^2/Hz	Peak Direction deg	Peak Period sec	Peak Energy Density ft^2/Hz	Peak Direction deg
g1x1	0.080	0.043	221.39	0.800	0.023	209.26
g2x1	0.985	0.061	237.35	0.985	0.040	210.95
g3x1	0.985	0.023	229.71	0.853	0.083	213.69
g4x1	0.914	0.019	349.50	0.914	0.029	205.35
g1x2	2.560	0.083	238.40	2.560	0.031	211.31
g2x2	1.829	0.039	237.21	1.829	0.037	216.22
g3x2	2.560	0.047	260.45	1.600	0.051	214.37
g4x2	2.560	0.041	312.33	1.829	0.027	213.97
g1x3	0.800	0.797	223.85	0.800	0.462	208.75
g2x3	0.800	0.218	214.30	0.800	0.189	192.03
g3x3	0.800	0.251	208.58	0.985	0.003	359.69
g4x3	0.800	0.156	195.23	0.853	0.025	184.54
g1x1c	0.985	0.075	235.36	0.800	0.058	214.27
g2x1c	0.985	0.039	258.06	0.853	0.115	218.11
g3x1c	0.985	0.035	246.03	0.800	0.063	224.74
g4x1c	0.985	0.029	265.57	0.800	0.132	237.70
g1x2c	1.829	0.071	242.60	2.560	0.046	212.85
g2x2c	1.600	0.032	256.90	1.829	0.035	229.06
g3x2c	2.560	0.050	275.31	1.829	0.024	259.97
g4x2c	1.829	0.026	292.54	1.600	0.035	228.76
g1x3c	0.853	0.029	239.56	0.800	0.126	212.21
g2x3c	0.800	0.141	245.33	0.800	0.051	224.73
g3x3c	0.800	0.307	280.98	0.914	0.004	198.93
g4x3c	0.853	0.019	345.47	0.914	0.003	357.01

Appendix H
Data Tables for Structure 4

Tables H1 through H16 list measurements for the wave experiments in Structure 4. The tables include the still-water depth d, average water surface elevation e, significant wave period T_s, significant wave height H_s, average wave height H_a, and maximum wave height H_m. The gauge locations are shown in Figure 10, and Figure H1 provides an enlargement with concentration on placement of the Acoustic Doppler Velocimeter (ADV) probes. Gauges 1, 2, 3, and 4 are the furthest offshore (near the generator). Gauges 8, 9, and 10 are in the inlet throat, and Gauges 6 and 7 are in the entrance channel. The gauge spacing for the rack gauges 11-20 and 21-30 is 0.6 m (2 ft) between consecutive gauges. The gauge locations in the basin coordinate system are given in Appendix O. To convert measurements given in feet to meters, multiply by 0.3048.

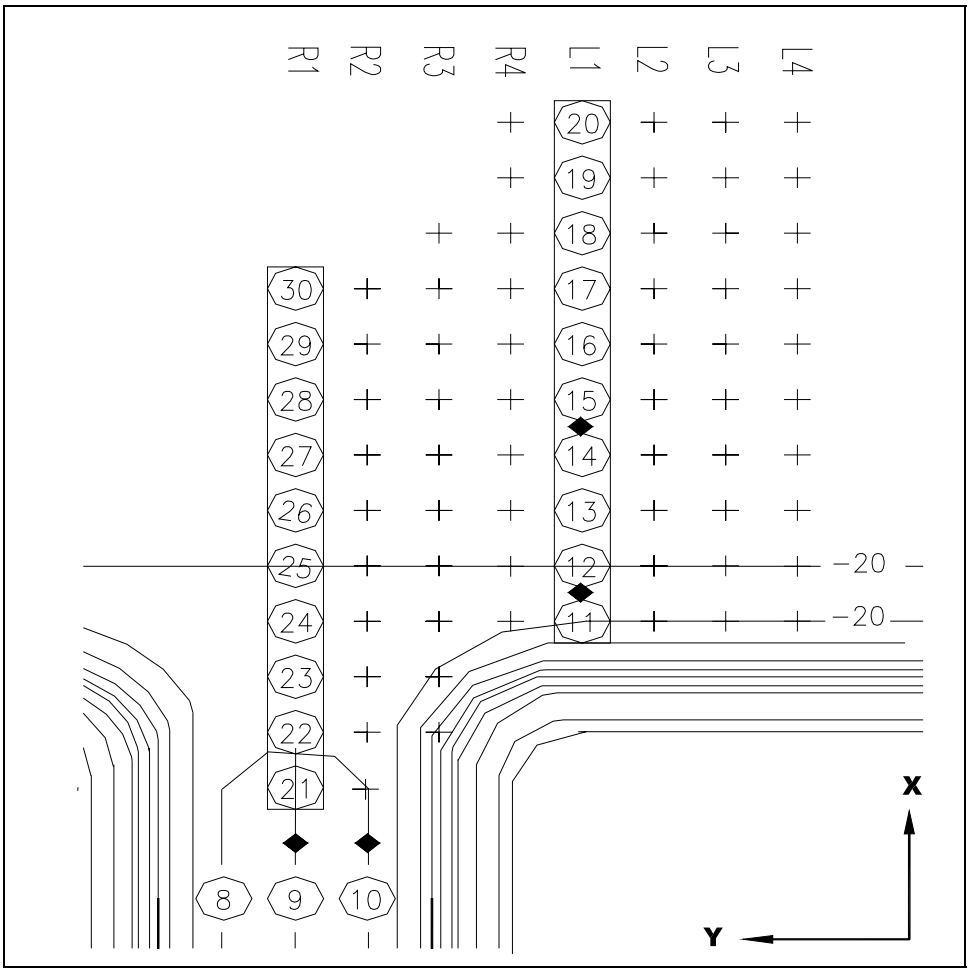


Figure H1. Structure 4 gauge arrangement enlargement

Table H1						
Structure 4 - Gauge Arrangement 1						
Irregular Wave						20 hz
Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.049	0.74	0.192	0.126	0.299
2	1.05	0.050	0.75	0.203	0.134	0.305
3	1.05	0.050	0.74	0.193	0.127	0.334
4	1.05	0.051	0.74	0.197	0.128	0.327
5	1.05	0.048	0.74	0.189	0.124	0.292
6	0.63	0.049	0.80	0.161	0.110	0.220
7	0.62	0.051	0.80	0.150	0.106	0.209
8	0.50	0.051	0.76	0.091	0.057	0.145
9	0.60	0.050	0.75	0.115	0.079	0.187
10	0.50	0.049	0.78	0.106	0.071	0.160
11	0.50	0.051	0.77	0.031	0.021	0.057
12	0.50	0.055	0.65	0.036	0.023	0.065
13	0.50	0.053	0.65	0.037	0.024	0.069
14	0.49	0.052	0.71	0.033	0.022	0.059
15	0.50	0.051	0.73	0.032	0.021	0.055
16	0.49	0.053	0.75	0.031	0.021	0.059
17	0.50	0.051	0.76	0.032	0.021	0.062
18	0.50	0.052	0.75	0.032	0.021	0.059
19	0.49	0.050	0.72	0.039	0.024	0.060
20	0.49	0.051	0.74	0.031	0.021	0.058
21	0.59	0.054	0.71	0.089	0.060	0.139
22	0.59	0.058	0.77	0.049	0.032	0.086
23	0.58	0.052	0.77	0.076	0.054	0.126
24	0.49	0.050	0.78	0.052	0.033	0.090
25	0.49	0.051	0.75	0.056	0.039	0.101
26	0.50	0.051	0.75	0.051	0.034	0.108
27	0.49	0.051	0.74	0.046	0.031	0.083
28	0.49	0.052	0.73	0.043	0.029	0.073
29	0.49	0.051	0.75	0.040	0.027	0.072
30	0.50	0.051	0.76	0.037	0.025	0.067

Table H2						
Structure 4 - Gauge Arrangement 2						
Irregular Wave						20 hz
Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.050	0.74	0.188	0.123	0.308
2	1.05	0.049	0.75	0.204	0.135	0.297
3	1.05	0.050	0.74	0.195	0.127	0.332
4	1.05	0.050	0.74	0.197	0.128	0.324
5	1.05	0.052	0.74	0.188	0.124	0.295
6	0.63	0.049	0.80	0.165	0.112	0.222
7	0.62	0.050	0.81	0.148	0.105	0.195
8	0.50	0.050	0.75	0.099	0.066	0.150
9	0.60	0.052	0.74	0.106	0.073	0.195
10	0.50	0.050	0.76	0.106	0.070	0.156
11	0.47	0.052	0.77	0.024	0.015	0.039
12	0.50	0.054	0.71	0.028	0.018	0.045
13	0.50	0.051	0.66	0.029	0.019	0.058
14	0.49	0.051	0.66	0.029	0.019	0.063
15	0.50	0.051	0.69	0.028	0.018	0.049
16	0.50	0.050	0.73	0.026	0.017	0.047
17	0.49	0.052	0.75	0.026	0.017	0.040
18	0.49	0.052	0.76	0.027	0.018	0.046
19	0.48	0.050	0.77	0.029	0.019	0.048
20	0.48	0.051	0.76	0.027	0.018	0.048
21	0.48	0.053	0.77	0.051	0.033	0.090
22	0.50	0.051	0.69	0.069	0.046	0.140
23	0.49	0.055	0.74	0.057	0.036	0.103
24	0.49	0.051	0.77	0.054	0.035	0.094
25	0.49	0.050	0.76	0.052	0.034	0.091
26	0.49	0.051	0.75	0.050	0.033	0.086
27	0.49	0.051	0.77	0.045	0.030	0.073
28	0.50	0.053	0.76	0.042	0.028	0.065
29	0.48	0.052	0.74	0.040	0.027	0.060
30	0.49	0.051	0.75	0.038	0.025	0.068

Table H3						
Structure 4 - Gauge Arrangement 3						
Irregular Wave						20 hz
Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.046	0.74	0.184	0.120	0.329
2	1.05	0.048	0.74	0.196	0.129	0.295
3	1.05	0.049	0.75	0.187	0.122	0.325
4	1.05	0.050	0.73	0.190	0.124	0.317
5	1.05	0.049	0.75	0.182	0.119	0.308
6	0.63	0.050	0.98	0.161	0.108	0.237
7	0.62	0.049	0.80	0.146	0.102	0.209
8	0.50	0.049	0.77	0.098	0.066	0.158
9	0.60	0.049	0.73	0.116	0.073	0.190
10	0.50	0.049	0.76	0.098	0.066	0.156
11	0.48	0.060	0.73	0.023	0.015	0.038
12	0.49	0.054	0.85	0.023	0.015	0.037
13	0.50	0.054	0.73	0.024	0.016	0.039
14	0.49	0.051	0.70	0.025	0.016	0.043
15	0.50	0.052	0.68	0.025	0.016	0.046
16	0.50	0.049	0.68	0.025	0.016	0.040
17	0.49	0.052	0.70	0.023	0.015	0.051
18	0.49	0.052	0.75	0.024	0.016	0.040
19	0.48	0.052	0.87	0.020	0.012	0.036
20	0.48	0.051	0.75	0.024	0.015	0.044
21	0.38	0.043	0.70	0.066	0.041	0.113
22	0.34	0.043	0.70	0.059	0.036	0.099
23	0.45	0.048	0.69	0.047	0.031	0.078
24	0.50	0.051	0.72	0.027	0.018	0.055
25	0.49	0.051	0.74	0.041	0.025	0.076
26	0.49	0.050	0.74	0.042	0.028	0.085
27	0.49	0.050	0.74	0.040	0.027	0.068
28	0.50	0.050	0.08	0.039	0.026	0.070
29	0.50	0.050	0.76	0.037	0.025	0.068
30	0.50	0.051	0.73	0.027	0.018	0.055

Table H4						
Structure 4 - Gauge Arrangement 4						
Irregular Wave						20 hz
Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.050	0.74	0.188	0.123	0.329
2	1.05	0.050	0.74	0.200	0.133	0.315
3	1.05	0.048	0.74	0.191	0.125	0.328
4	1.05	0.048	0.74	0.195	0.129	0.323
5	1.05	0.045	0.74	0.252	0.165	0.385
6	0.63	0.048	0.81	0.163	0.110	0.230
7	0.62	0.050	0.81	0.147	0.104	0.225
8	0.50	0.051	0.76	0.099	0.062	0.153
9	0.60	0.052	0.76	0.112	0.074	0.176
10	0.50	0.050	0.74	0.099	0.065	0.146
11	0.46	0.050	0.78	0.028	0.017	0.050
12	0.50	0.053	0.79	0.023	0.015	0.041
13	0.50	0.049	0.79	0.027	0.018	0.047
14	0.49	0.051	0.77	0.027	0.017	0.045
15	0.50	0.053	0.74	0.026	0.017	0.049
16	0.50	0.057	0.74	0.028	0.018	0.045
17	0.50	0.050	0.73	0.029	0.018	0.057
18	0.48	0.050	0.73	0.028	0.018	0.047
19	0.48	0.049	0.09	0.022	0.014	0.040
20	0.48	0.051	0.07	0.030	0.019	0.055
21	0.50	0.046	0.08	0.047	0.029	0.088
22	0.50	0.051	0.07	0.046	0.030	0.082
23	0.49	0.051	0.07	0.043	0.028	0.063
24	0.49	0.051	0.07	0.025	0.016	0.042
25	0.48	0.045	0.07	0.038	0.024	0.065
26	0.50	0.045	0.07	0.037	0.024	0.063
27	0.50	0.046	0.07	0.034	0.022	0.066
28	0.50	0.047	0.07	0.032	0.021	0.061
29	0.49	0.041	0.08	0.031	0.019	0.060
30	0.49	0.051	0.07	0.025	0.016	0.042

Table H5						
Structure 4 - Gauge Arrangement 1						
Irregular Wave						20 hz
Wave Period = 1.6 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.049	1.45	0.145	0.092	0.252
2	1.05	0.050	1.44	0.148	0.094	0.263
3	1.05	0.049	1.46	0.143	0.092	0.256
4	1.05	0.050	1.44	0.142	0.089	0.250
5	1.05	0.049	1.45	0.142	0.091	0.260
6	0.63	0.048	1.46	0.178	0.110	0.296
7	0.62	0.050	1.51	0.170	0.115	0.245
8	0.50	0.051	1.27	0.097	0.062	0.158
9	0.60	0.050	1.10	0.101	0.058	0.175
10	0.50	0.049	1.24	0.107	0.072	0.191
11	0.50	0.052	1.32	0.031	0.020	0.055
12	0.50	0.055	1.03	0.041	0.027	0.080
13	0.50	0.053	1.09	0.042	0.027	0.072
14	0.49	0.052	1.05	0.038	0.024	0.064
15	0.50	0.050	1.18	0.037	0.023	0.071
16	0.49	0.053	1.19	0.035	0.021	0.062
17	0.50	0.051	1.25	0.033	0.021	0.056
18	0.50	0.051	1.24	0.033	0.020	0.053
19	0.49	0.051	1.07	0.043	0.027	0.074
20	0.49	0.051	1.32	0.031	0.020	0.050
21	0.59	0.050	1.10	0.093	0.056	0.158
22	0.59	0.054	1.01	0.083	0.050	0.191
23	0.58	0.053	1.14	0.082	0.052	0.161
24	0.49	0.050	0.98	0.043	0.025	0.153
25	0.49	0.051	1.05	0.068	0.040	0.145
26	0.50	0.047	1.00	0.065	0.038	0.131
27	0.49	0.051	0.96	0.062	0.039	0.105
28	0.49	0.053	1.05	0.057	0.034	0.110
29	0.49	0.051	1.01	0.053	0.033	0.092
30	0.50	0.051	0.98	0.043	0.025	0.072

Table H6						
Structure 4 - Gauge Arrangement 2						
Irregular Wave						20 hz
Wave Period = 1.6 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.051	1.45	0.142	0.086	0.249
2	1.05	0.050	1.45	0.149	0.095	0.261
3	1.05	0.051	1.46	0.143	0.091	0.263
4	1.05	0.050	1.44	0.140	0.088	0.248
5	1.05	0.051	1.44	0.137	0.082	0.256
6	0.63	0.048	1.48	0.176	0.110	0.259
7	0.62	0.051	1.49	0.162	0.110	0.231
8	0.50	0.050	1.25	0.095	0.059	0.167
9	0.60	0.051	1.09	0.098	0.060	0.173
10	0.50	0.051	1.27	0.101	0.068	0.165
11	0.47	0.047	1.24	0.026	0.017	0.044
12	0.50	0.054	1.27	0.034	0.022	0.067
13	0.50	0.052	1.09	0.034	0.022	0.060
14	0.49	0.050	1.04	0.034	0.022	0.059
15	0.50	0.053	1.18	0.034	0.023	0.060
16	0.50	0.051	1.11	0.031	0.021	0.055
17	0.49	0.053	1.19	0.032	0.021	0.053
18	0.49	0.052	1.19	0.030	0.020	0.050
19	0.48	0.047	1.48	0.032	0.019	0.060
20	0.48	0.051	1.31	0.029	0.019	0.050
21	0.48	0.051	1.09	0.087	0.054	0.166
22	0.50	0.052	1.09	0.083	0.053	0.146
23	0.49	0.052	1.06	0.071	0.045	0.124
24	0.49	0.050	1.02	0.036	0.021	0.061
25	0.49	0.048	1.16	0.054	0.031	0.097
26	0.49	0.051	1.23	0.051	0.033	0.091
27	0.49	0.050	1.26	0.048	0.028	0.083
28	0.50	0.053	1.27	0.046	0.029	0.098
29	0.48	0.052	1.34	0.046	0.029	0.094
30	0.49	0.050	1.02	0.036	0.021	0.061

Table H7						
Structure 4 - Gauge Arrangement 3						
Irregular Wave						20 hz
Wave Period = 1.6 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.048	1.44	0.141	0.090	0.252
2	1.05	0.050	1.45	0.146	0.093	0.262
3	1.05	0.049	1.54	0.139	0.088	0.259
4	1.05	0.050	1.45	0.138	0.087	0.255
5	1.05	0.047	1.44	0.137	0.085	0.257
6	0.63	0.048	1.48	0.176	0.111	0.275
7	0.62	0.049	1.48	0.167	0.113	0.259
8	0.50	0.049	1.23	0.095	0.062	0.172
9	0.60	0.049	1.09	0.100	0.066	0.176
10	0.50	0.049	1.24	0.106	0.071	0.196
11	0.48	0.055	1.20	0.029	0.019	0.046
12	0.49	0.053	1.63	0.026	0.015	0.054
13	0.50	0.056	1.33	0.029	0.019	0.049
14	0.49	0.052	1.13	0.030	0.018	0.055
15	0.50	0.053	1.05	0.030	0.020	0.047
16	0.50	0.052	1.00	0.030	0.021	0.047
17	0.49	0.053	1.06	0.028	0.019	0.050
18	0.49	0.050	1.16	0.030	0.020	0.054
19	0.48	0.051	1.97	0.027	0.015	0.056
20	0.48	0.051	1.25	0.028	0.019	0.049
21	0.38	0.042	1.39	0.083	0.049	0.126
22	0.34	0.043	1.06	0.065	0.040	0.124
23	0.45	0.047	1.06	0.057	0.037	0.082
24	0.50	0.050	1.06	0.031	0.020	0.047
25	0.49	0.051	1.14	0.048	0.032	0.077
26	0.49	0.049	1.26	0.044	0.028	0.067
27	0.49	0.049	1.26	0.043	0.028	0.067
28	0.50	0.049	1.21	0.038	0.025	0.062
29	0.50	0.050	1.29	0.038	0.025	0.062
30	0.50	0.050	1.07	0.031	0.020	0.047

Table H8						
Structure 4 - Gauge Arrangement 4						
Irregular Wave						20 hz
Wave Period = 1.6 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.050	1.44	0.143	0.092	0.251
2	1.05	0.048	1.45	0.148	0.094	0.260
3	1.05	0.048	1.46	0.141	0.090	0.252
4	1.05	0.048	1.46	0.141	0.090	0.251
5	1.05	0.044	1.45	0.186	0.119	0.336
6	0.63	0.050	1.49	0.177	0.110	0.266
7	0.62	0.050	1.51	0.166	0.114	0.242
8	0.50	0.051	1.27	0.097	0.063	0.157
9	0.60	0.052	1.09	0.106	0.069	0.200
10	0.50	0.051	1.25	0.105	0.069	0.181
11	0.46	0.052	1.11	0.030	0.020	0.046
12	0.50	0.051	1.56	0.026	0.017	0.051
13	0.50	0.048	1.46	0.028	0.018	0.058
14	0.49	0.051	1.27	0.029	0.019	0.054
15	0.50	0.054	1.12	0.030	0.020	0.049
16	0.50	0.051	1.05	0.031	0.020	0.051
17	0.50	0.051	0.93	0.029	0.020	0.046
18	0.48	0.051	1.07	0.031	0.020	0.060
19	0.48	0.049	2.10	0.027	0.016	0.057
20	0.48	0.051	1.07	0.030	0.017	0.050
21	0.50	0.042	1.46	0.068	0.038	0.105
22	0.50	0.042	0.96	0.052	0.034	0.091
23	0.49	0.044	0.99	0.047	0.031	0.080
24	0.49	0.051	1.04	0.027	0.017	0.047
25	0.48	0.052	1.06	0.041	0.027	0.065
26	0.50	0.049	1.23	0.039	0.025	0.060
27	0.50	0.051	1.20	0.038	0.025	0.066
28	0.50	0.046	1.21	0.036	0.024	0.051
29	0.49	0.048	1.20	0.034	0.023	0.054
30	0.49	0.051	1.05	0.027	0.017	0.047

Table H9						
Structure 4 - Gauge Arrangement 1						
Monochromatic Wave						20 hz
Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.050	0.80	0.145	0.141	0.152
2	1.05	0.050	0.80	0.147	0.142	0.154
3	1.05	0.050	0.80	0.154	0.149	0.158
4	1.05	0.051	0.80	0.157	0.153	0.165
5	1.05	0.049	0.80	0.137	0.131	0.147
6	0.63	0.048	0.80	0.145	0.138	0.160
7	0.62	0.050	0.80	0.156	0.142	0.166
8	0.50	0.050	0.80	0.111	0.090	0.130
9	0.60	0.050	0.75	0.122	0.098	0.161
10	0.50	0.050	0.80	0.138	0.119	0.158
11	0.50	0.051	0.80	0.037	0.030	0.045
12	0.50	0.055	0.62	0.044	0.031	0.060
13	0.50	0.054	0.62	0.040	0.029	0.057
14	0.49	0.052	0.74	0.033	0.023	0.048
15	0.50	0.051	0.80	0.037	0.027	0.051
16	0.49	0.053	0.80	0.036	0.024	0.053
17	0.50	0.052	0.80	0.040	0.032	0.053
18	0.50	0.051	0.80	0.035	0.025	0.047
19	0.49	0.050	0.78	0.048	0.037	0.061
20	0.49	0.051	0.80	0.030	0.021	0.039
21	0.59	0.050	0.73	0.104	0.078	0.127
22	0.59	0.055	0.80	0.112	0.087	0.131
23	0.58	0.052	0.79	0.088	0.072	0.106
24	0.49	0.051	0.78	0.032	0.024	0.040
25	0.49	0.052	0.80	0.064	0.044	0.075
26	0.50	0.048	0.80	0.059	0.041	0.071
27	0.49	0.051	0.80	0.057	0.044	0.064
28	0.49	0.053	0.80	0.057	0.045	0.069
29	0.49	0.051	0.80	0.053	0.042	0.058
30	0.50	0.051	0.78	0.032	0.024	0.040

Table H10						
Structure 4 - Gauge Arrangement 2						
Monochromatic Wave						20 hz
Wave Period = 0.8 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.050	0.80	0.136	0.131	0.146
2	1.05	0.048	0.80	0.138	0.132	0.153
3	1.05	0.050	0.80	0.151	0.147	0.156
4	1.05	0.050	0.80	0.166	0.162	0.174
5	1.05	0.053	0.80	0.135	0.131	0.143
6	0.63	0.049	0.80	0.141	0.135	0.159
7	0.62	0.050	0.80	0.146	0.139	0.156
8	0.50	0.049	0.80	0.116	0.100	0.158
9	0.60	0.051	0.77	0.138	0.103	0.158
10	0.50	0.049	0.80	0.122	0.110	0.138
11	0.47	0.053	0.80	0.030	0.025	0.033
12	0.50	0.055	0.79	0.034	0.025	0.044
13	0.50	0.052	0.56	0.028	0.021	0.047
14	0.49	0.049	0.06	0.031	0.019	0.044
15	0.50	0.051	0.57	0.021	0.014	0.035
16	0.50	0.050	0.78	0.029	0.019	0.038
17	0.49	0.053	0.78	0.028	0.022	0.041
18	0.49	0.052	0.80	0.030	0.023	0.040
19	0.48	0.049	0.80	0.035	0.031	0.049
20	0.48	0.051	0.80	0.027	0.020	0.034
21	0.48	0.053	0.74	0.100	0.076	0.118
22	0.50	0.053	0.73	0.074	0.050	0.088
23	0.49	0.055	0.80	0.077	0.064	0.089
24	0.49	0.050	0.80	0.078	0.064	0.086
25	0.49	0.048	0.80	0.071	0.059	0.079
26	0.49	0.049	0.80	0.069	0.056	0.077
27	0.49	0.052	0.80	0.060	0.047	0.066
28	0.50	0.055	0.80	0.055	0.042	0.062
29	0.48	0.052	0.80	0.052	0.045	0.056
30	0.49	0.050	0.80	0.057	0.048	0.066

Table H11						
Structure 4 - Gauge Arrangement 3						
Monochromatic Wave						20 hz
Wave Period = 0.8 secs						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.047	0.80	0.136	0.132	0.142
2	1.05	0.050	0.80	0.143	0.138	0.146
3	1.05	0.050	0.80	0.147	0.144	0.150
4	1.05	0.050	0.80	0.152	0.148	0.156
5	1.05	0.046	0.80	0.132	0.127	0.139
6	0.63	0.049	0.80	0.140	0.133	0.155
7	0.62	0.049	0.80	0.150	0.141	0.159
8	0.50	0.047	0.80	0.100	0.082	0.125
9	0.60	0.049	0.72	0.131	0.098	0.180
10	0.50	0.048	0.80	0.136	0.119	0.161
11	0.48	0.060	0.80	0.032	0.026	0.043
12	0.49	0.053	0.80	0.028	0.024	0.038
13	0.50	0.057	0.80	0.031	0.020	0.038
14	0.49	0.052	0.79	0.037	0.026	0.050
15	0.50	0.051	0.69	0.030	0.019	0.039
16	0.50	0.050	0.66	0.029	0.018	0.040
17	0.49	0.052	0.72	0.026	0.020	0.032
18	0.49	0.051	0.78	0.028	0.016	0.037
19	0.48	0.051	0.80	0.025	0.018	0.032
20	0.48	0.050	0.80	0.029	0.017	0.038
21	0.38	0.042	0.76	0.055	0.042	0.078
22	0.34	0.043	0.72	0.064	0.052	0.087
23	0.45	0.047	0.76	0.050	0.037	0.074
24	0.50	0.050	0.75	0.059	0.045	0.082
25	0.49	0.052	0.80	0.057	0.044	0.071
26	0.49	0.050	0.80	0.048	0.039	0.059
27	0.49	0.051	0.80	0.050	0.037	0.058
28	0.50	0.051	0.80	0.041	0.035	0.047
29	0.50	0.053	0.80	0.046	0.035	0.053
30	0.50	0.052	0.80	0.038	0.031	0.044

Table H12						
Structure 4 - Gauge Arrangement 4						
Monochromatic Wave						20 hz
Wave Period = 0.8 secs						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.049	0.80	0.140	0.134	0.147
2	1.05	0.046	0.80	0.145	0.138	0.152
3	1.05	0.047	0.80	0.149	0.145	0.153
4	1.05	0.048	0.80	0.157	0.152	0.163
5	1.05	0.041	0.80	0.180	0.174	0.190
6	0.63	0.048	0.80	0.145	0.139	0.161
7	0.62	0.049	0.80	0.154	0.142	0.165
8	0.50	0.049	0.80	0.105	0.092	0.116
9	0.60	0.051	0.75	0.142	0.105	0.163
10	0.50	0.051	0.80	0.122	0.108	0.145
11	0.46	0.052	0.80	0.029	0.018	0.041
12	0.50	0.051	0.80	0.026	0.016	0.031
13	0.50	0.048	0.80	0.033	0.024	0.039
14	0.49	0.049	0.80	0.032	0.023	0.049
15	0.50	0.051	0.80	0.041	0.034	0.051
16	0.50	0.056	0.75	0.031	0.019	0.041
17	0.50	0.051	0.80	0.037	0.020	0.046
18	0.48	0.050	0.78	0.032	0.020	0.042
19	0.48	0.049	0.80	0.031	0.019	0.037
20	0.48	0.053	0.80	0.039	0.021	0.047
21	0.50	0.043	0.80	0.061	0.045	0.082
22	0.50	0.045	0.76	0.060	0.046	0.086
23	0.49	0.047	0.70	0.043	0.029	0.066
24	0.49	0.051	0.55	0.018	0.012	0.035
25	0.48	0.052	0.79	0.040	0.031	0.049
26	0.50	0.050	0.80	0.041	0.033	0.058
27	0.50	0.052	0.80	0.037	0.029	0.046
28	0.50	0.049	0.80	0.044	0.036	0.050
29	0.49	0.048	0.79	0.029	0.024	0.041
30	0.49	0.051	0.55	0.018	0.012	0.035

Table H13						
Structure 4 - Gauge Arrangement 1						
Irregular Wave With Current						20 hz
Wave Period = 1.6 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.053	1.44	0.144	0.092	0.249
2	1.05	0.053	1.44	0.146	0.092	0.265
3	1.05	0.052	1.46	0.141	0.089	0.250
4	1.05	0.052	1.45	0.139	0.089	0.257
5	1.05	0.051	1.43	0.141	0.090	0.263
6	0.63	0.051	1.47	0.169	0.105	0.242
7	0.62	0.049	1.47	0.154	0.104	0.213
8	0.50	0.048	1.10	0.101	0.065	0.153
9	0.60	0.048	1.08	0.086	0.054	0.138
10	0.50	0.050	1.09	0.109	0.069	0.167
11	0.50	0.050	1.00	0.043	0.028	0.071
12	0.50	0.055	0.98	0.044	0.029	0.078
13	0.50	0.052	0.98	0.049	0.031	0.079
14	0.49	0.052	0.91	0.051	0.033	0.100
15	0.50	0.050	0.92	0.050	0.033	0.108
16	0.49	0.053	0.94	0.047	0.031	0.080
17	0.50	0.051	0.95	0.046	0.030	0.078
18	0.50	0.051	1.00	0.044	0.028	0.074
19	0.49	0.050	1.06	0.045	0.029	0.088
20	0.49	0.051	0.95	0.041	0.027	0.067
21	0.59	0.055	0.99	0.049	0.031	0.081
22	0.59	0.054	1.04	0.082	0.052	0.158
23	0.58	0.055	1.03	0.075	0.047	0.125
24	0.49	0.049	0.99	0.050	0.031	0.082
25	0.49	0.049	1.10	0.058	0.038	0.124
26	0.50	0.047	1.05	0.053	0.034	0.106
27	0.49	0.051	1.05	0.049	0.031	0.094
28	0.49	0.052	1.10	0.047	0.030	0.080
29	0.49	0.051	1.11	0.044	0.028	0.077
30	0.50	0.049	1.14	0.043	0.026	0.075

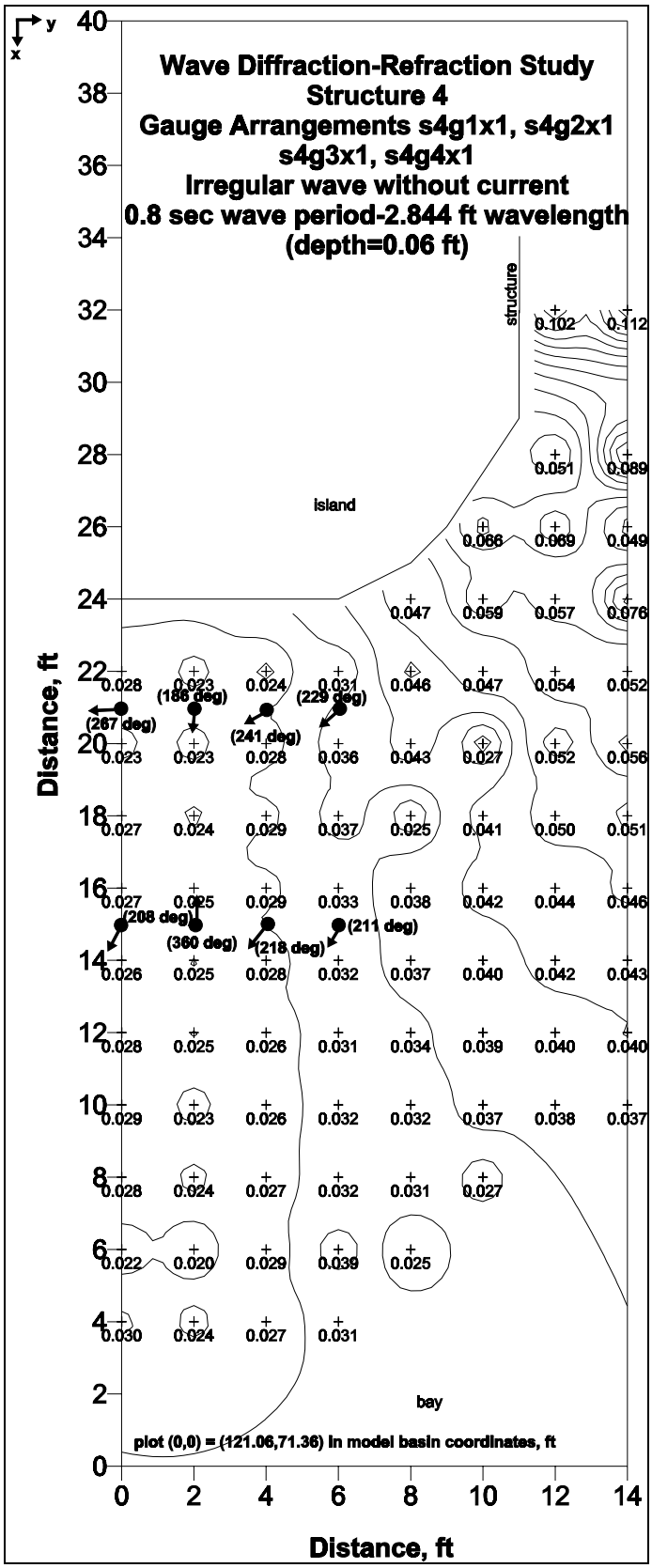
Table H14						
Structure 4 - Gauge Arrangement 2						
Irregular Wave With Current						20 hz
Wave Period = 1.6 sec						
Gauge	d, ft	e, ft	Ts, sec	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.055	1.46	0.145	0.092	0.259
2	1.05	0.055	1.45	0.148	0.094	0.263
3	1.05	0.054	1.47	0.143	0.092	0.249
4	1.05	0.053	1.44	0.140	0.088	0.243
5	1.05	0.055	1.36	0.141	0.091	0.256
6	0.63	0.052	1.47	0.173	0.108	0.248
7	0.62	0.050	1.45	0.155	0.105	0.230
8	0.50	0.050	1.08	0.099	0.060	0.173
9	0.60	0.051	1.01	0.088	0.055	0.148
10	0.50	0.048	1.03	0.109	0.067	0.165
11	0.47	0.052	0.97	0.037	0.024	0.068
12	0.50	0.055	1.32	0.037	0.025	0.061
13	0.50	0.053	1.12	0.039	0.026	0.061
14	0.49	0.050	1.05	0.042	0.027	0.088
15	0.50	0.053	0.94	0.045	0.029	0.091
16	0.50	0.049	0.94	0.047	0.030	0.086
17	0.49	0.053	0.10	0.045	0.030	0.068
18	0.49	0.052	1.01	0.042	0.028	0.063
19	0.48	0.048	1.43	0.035	0.022	0.057
20	0.48	0.050	0.99	0.041	0.026	0.072
21	0.48	0.052	1.08	0.057	0.036	0.099
22	0.50	0.048	1.02	0.079	0.049	0.130
23	0.49	0.052	0.96	0.075	0.047	0.123
24	0.49	0.049	1.09	0.060	0.038	0.104
25	0.49	0.047	0.98	0.066	0.042	0.136
26	0.49	0.049	1.02	0.064	0.041	0.120
27	0.49	0.050	0.98	0.058	0.037	0.113
28	0.50	0.051	1.00	0.054	0.034	0.101
29	0.48	0.052	1.08	0.052	0.032	0.094
30	0.49	0.049	1.09	0.048	0.031	0.089

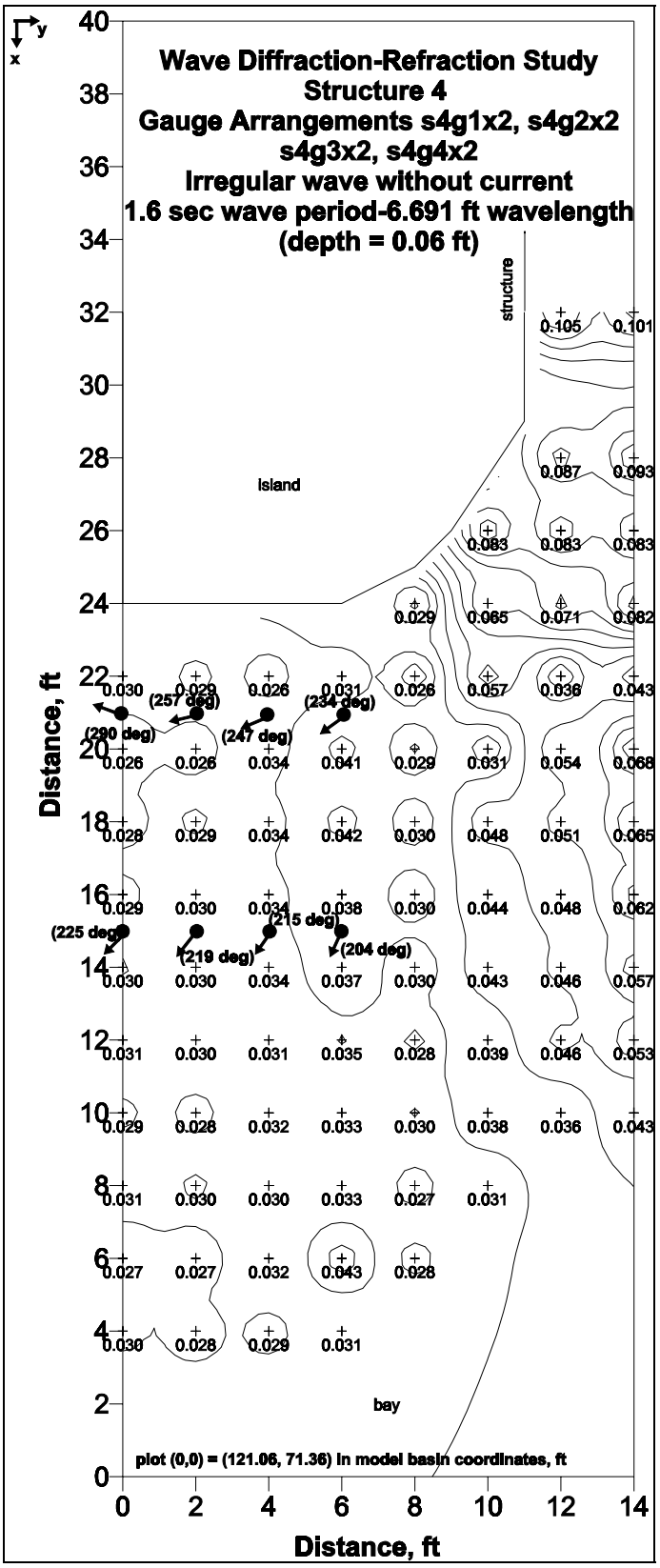
Table H15						
Structure 4 - Gauge Arrangement 3						
Irregular Wave With Current						20 hz
Wave Period = 1.6 sec						
Gauge	d, ft	e, ft	Ts, ft	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.049	1.44	0.143	0.092	0.254
2	1.05	0.050	1.44	0.144	0.091	0.244
3	1.05	0.048	1.44	0.139	0.087	0.247
4	1.05	0.052	1.44	0.138	0.088	0.255
5	1.05	0.046	1.44	0.137	0.087	0.251
6	0.63	0.047	1.47	0.169	0.104	0.254
7	0.62	0.046	1.41	0.152	0.101	0.224
8	0.50	0.041	1.04	0.095	0.061	0.167
9	0.60	0.042	0.98	0.081	0.051	0.124
10	0.50	0.042	1.07	0.106	0.068	0.171
11	0.48	0.047	0.99	0.038	0.024	0.068
12	0.49	0.047	1.53	0.028	0.018	0.054
13	0.50	0.043	1.34	0.030	0.020	0.054
14	0.49	0.047	1.22	0.032	0.021	0.059
15	0.50	0.051	1.06	0.034	0.022	0.066
16	0.50	0.052	1.07	0.036	0.023	0.059
17	0.49	0.044	1.02	0.037	0.024	0.062
18	0.49	0.048	0.95	0.037	0.024	0.069
19	0.48	0.044	1.79	0.028	0.018	0.054
20	0.48	0.045	0.96	0.037	0.025	0.063
21	0.38	0.038	1.20	0.058	0.046	0.156
22	0.34	0.040	0.90	0.071	0.043	0.123
23	0.45	0.036	0.91	0.068	0.044	0.108
24	0.50	0.046	0.88	0.037	0.024	0.063
25	0.49	0.030	1.80	0.071	0.049	0.137
26	0.49	0.051	0.95	0.058	0.036	0.112
27	0.49	0.046	0.97	0.054	0.035	0.110
28	0.50	0.044	1.01	0.052	0.033	0.091
29	0.50	0.049	1.03	0.048	0.030	0.085
30	0.50	0.046	0.88	0.037	0.024	0.063

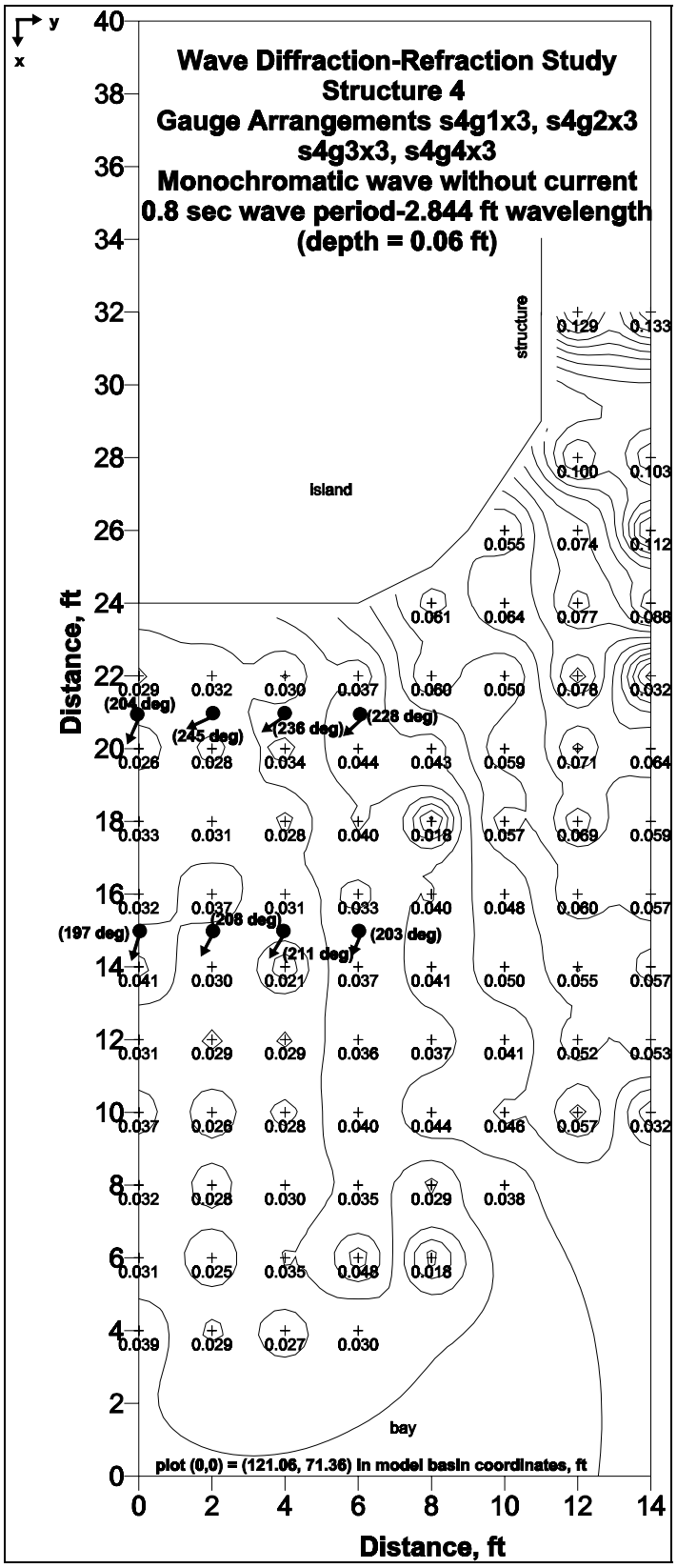
Table H16						
Structure 4 - Gauge Arrangement 4						
Irregular Wave With Current						20 hz
Wave Period = 1.6 sec						
Gauge	d ft	e ft	Ts, ft	Hs, ft	Ha, ft	Hm, ft
1	1.05	0.030	1.45	0.139	0.090	0.247
2	1.05	0.030	1.43	0.144	0.089	0.254
3	1.05	0.028	1.46	0.136	0.086	0.239
4	1.05	0.031	1.44	0.136	0.087	0.243
5	1.05	0.027	1.43	0.136	0.086	0.241
6	0.63	0.027	1.43	0.170	0.107	0.255
7	0.62	0.027	1.44	0.152	0.104	0.231
8	0.50	0.021	1.08	0.093	0.061	0.147
9	0.60	0.022	0.10	0.079	0.051	0.128
10	0.50	0.023	1.05	0.100	0.064	0.154
11	0.46	0.026	0.93	0.034	0.021	0.073
12	0.50	0.029	1.95	0.023	0.014	0.046
13	0.50	0.025	1.55	0.024	0.014	0.049
14	0.49	0.027	1.37	0.025	0.015	0.050
15	0.50	0.029	1.15	0.026	0.018	0.045
16	0.50	0.031	1.14	0.030	0.019	0.052
17	0.50	0.026	1.01	0.030	0.018	0.070
18	0.48	0.028	0.90	0.033	0.021	0.064
19	0.48	0.026	2.97	0.023	0.013	0.046
20	0.48	0.026	0.95	0.034	0.021	0.064
21	0.50	0.027	1.30	0.063	0.036	0.115
22	0.50	0.027	0.90	0.051	0.034	0.092
23	0.49	0.027	0.79	0.052	0.032	0.099
24	0.49	0.026	0.93	0.032	0.020	0.058
25	0.48	0.024	0.92	0.049	0.031	0.075
26	0.50	0.038	0.10	0.047	0.030	0.083
27	0.50	0.027	0.94	0.046	0.029	0.074
28	0.50	0.026	0.97	0.045	0.028	0.075
29	0.49	0.026	1.04	0.042	0.026	0.073
30	0.49	0.026	0.93	0.032	0.021	0.058

Appendix I
Wave Diffraction-Refraction Plots for Structure 4

The wave diffraction-refraction plots in this appendix are contour maps describing wave height transformation at the four different gauge arrangements. Contour interval is 0.003 m (0.01 ft). The vectors on the maps depict the peak wave direction acquired at the peak period from the Acoustic Doppler Velocimeter (ADV) probe. Table I1 presents Structure 4 ADV probe vector plot data. To convert measurements given in feet to meters, multiply by 0.3048. To convert measurements given in square feet to square meters, multiply by 0.093.


Wave Diffraction-Refraction Study
Structure 4
Gauge Arrangements s4g1x1, s4g2x1
s4g3x1, s4g4x1
Irregular wave without current
0.8 sec wave period-2.844 ft wavelength
(depth=0.06 ft)
structure
island
bay
plot (0,0) = (121.06,71.36) in model basin coordinates, ft
(267 deg)
(186 deg)
(241 deg)
(229 deg)
(208 deg)
(360 deg)
(218 deg)
(211 deg)
Distance, ft
Distance, ft


Wave Diffraction-Refraction Study
Structure 4
Gauge Arrangements s4g1x2, s4g2x2
s4g3x2, s4g4x2
Irregular wave without current
1.6 sec wave period-6.691 ft wavelength
(depth = 0.06 ft)
structure
Island
bay
(257 deg)
(290 deg)
(247 deg)
(234 deg)
(225 deg)
(219 deg)
(215 deg)
(204 deg)
plot (0,0) = (121.06, 71.36) in model basin coordinates, ft
Distance, ft
Distance, ft


Wave Diffraction-Refraction Study
Structure 4
Gauge Arrangements s4g1x3, s4g2x3
s4g3x3, s4g4x3
Monochromatic wave without current
0.8 sec wave period-2.844 ft wavelength
(depth = 0.06 ft)
y
x
structure
island
bay
plot (0,0) = (121.06, 71.36) in model basin coordinates, ft
Distance, ft
Distance, ft
(204 deg)
(245 deg)
(236 deg)
(228 deg)
(197 deg)
(208 deg)
(211 deg)
(203 deg)
0.129 0.133
0.100 0.103
0.055 0.074 0.112
0.061 0.064 0.077 0.088
0.029 0.032 0.030 0.037 0.060 0.050 0.078 0.032
0.026 0.028 0.034 0.044 0.043 0.059 0.071 0.064
0.033 0.031 0.028 0.040 0.018 0.057 0.069 0.059
0.032 0.037 0.031 0.033 0.040 0.048 0.060 0.057
0.041 0.030 0.021 0.037 0.041 0.050 0.055 0.057
0.031 0.029 0.029 0.036 0.037 0.041 0.052 0.053
0.037 0.028 0.028 0.040 0.044 0.046 0.057 0.032
0.032 0.028 0.030 0.035 0.029 0.038
0.031 0.025 0.035 0.048 0.018
0.039 0.029 0.027 0.030

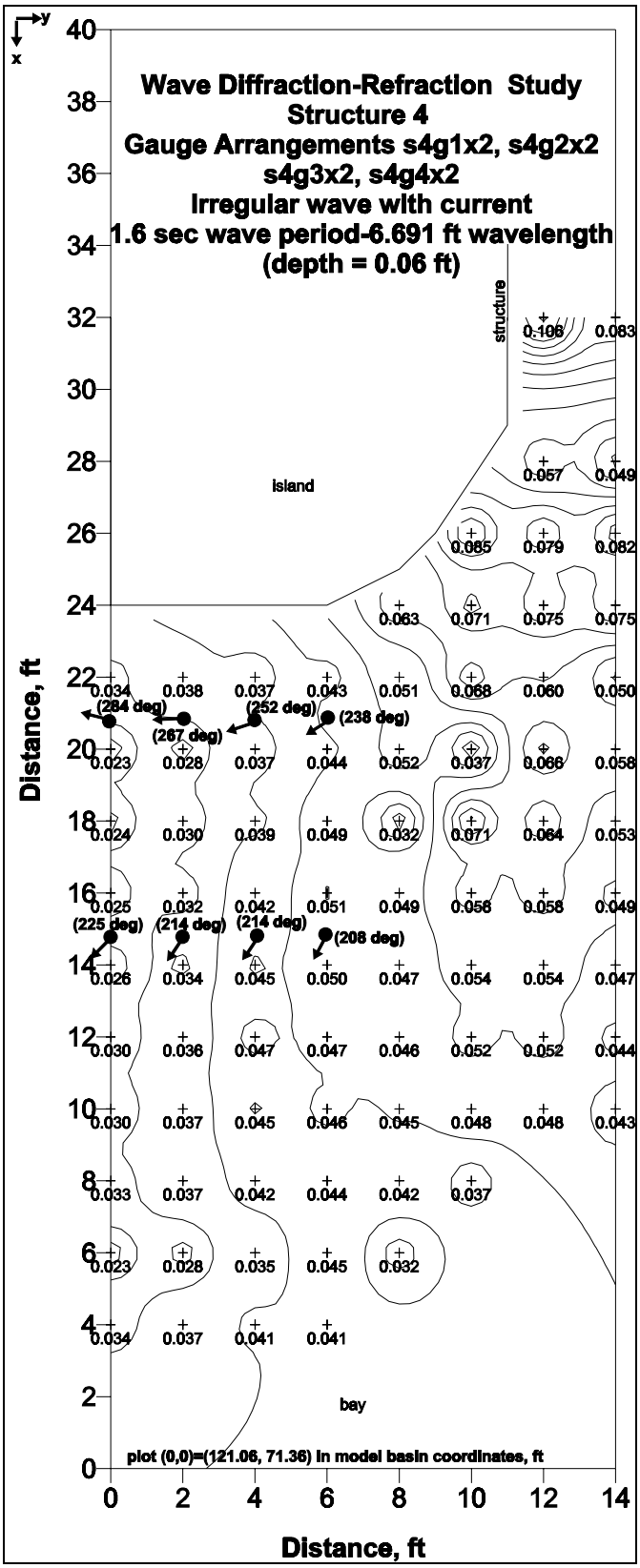
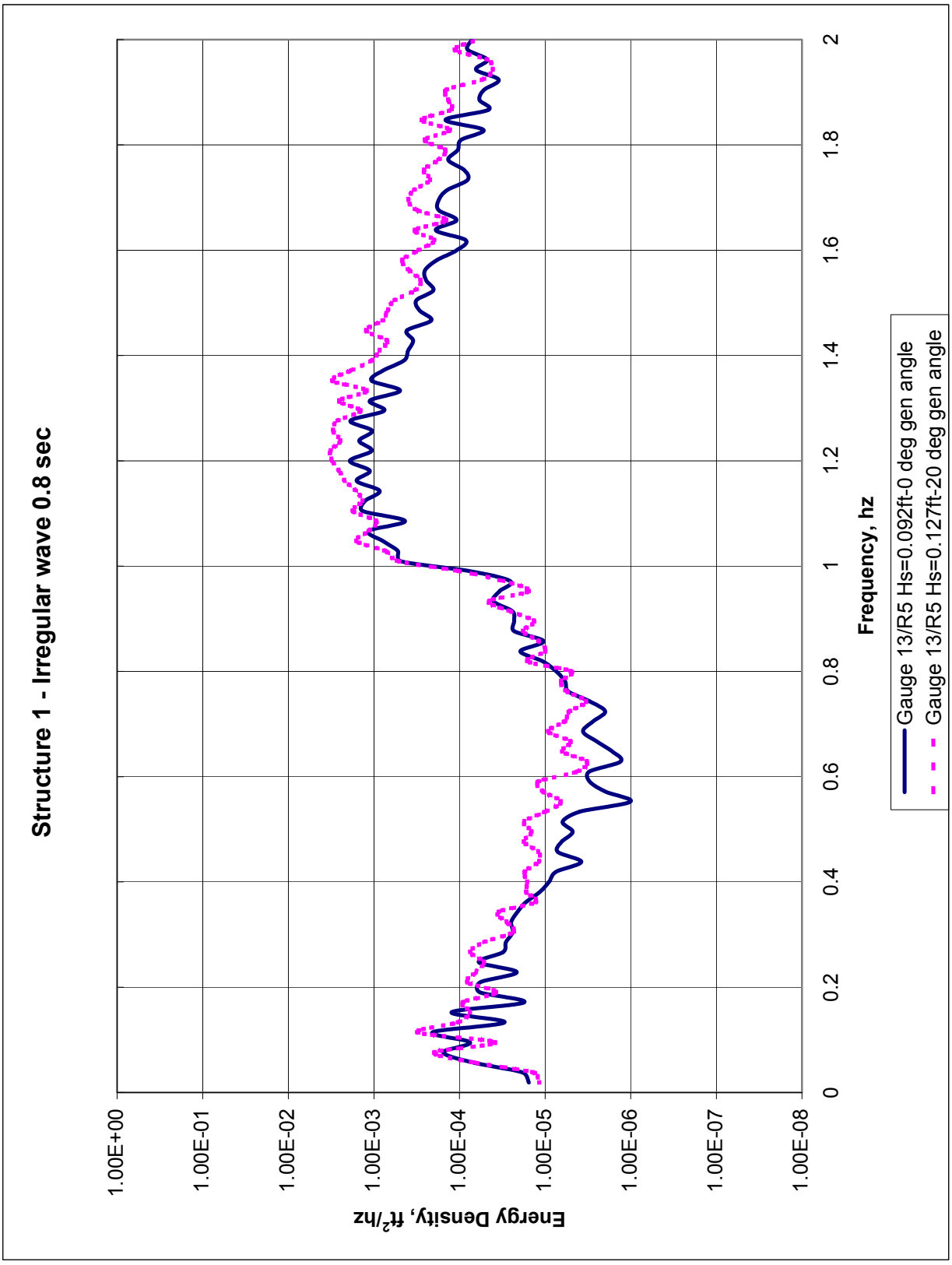

Wave Diffraction-Refraction Study
Structure 4
Gauge Arrangements s4g1x2, s4g2x2
s4g3x2, s4g4x2
Irregular wave with current
1.6 sec wave period-6.691 ft wavelength
(depth = 0.06 ft)
structure
island
bay
plot (0,0)=(121.06, 71.36) in model basin coordinates, ft
Distance, ft
Distance, ft
(284 deg)
(267 deg)
(252 deg)
(238 deg)
(225 deg)
(214 deg)
(214 deg)
(208 deg)

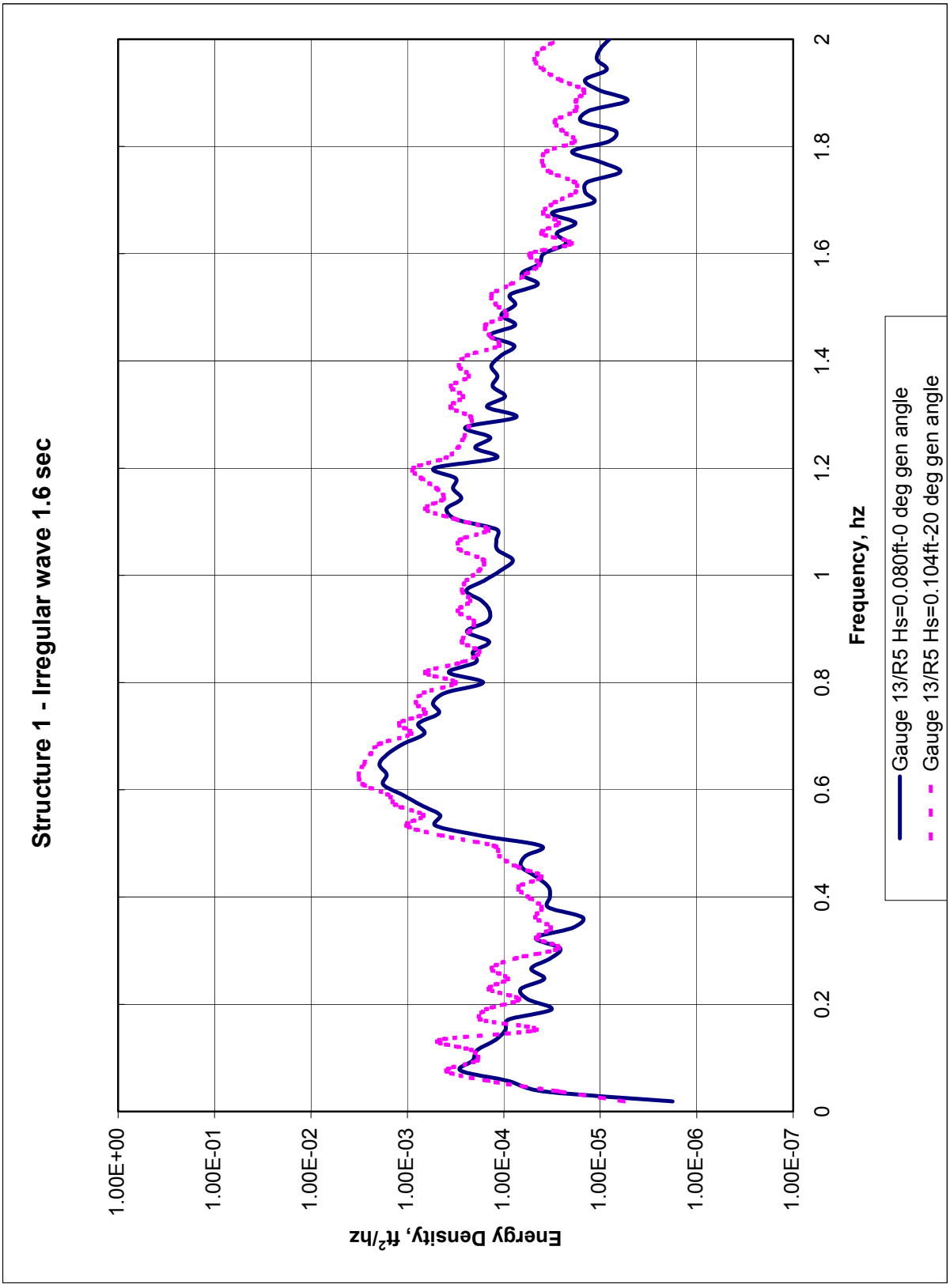
Table I1
Structure 4 ADV Probe Vector Plot Data

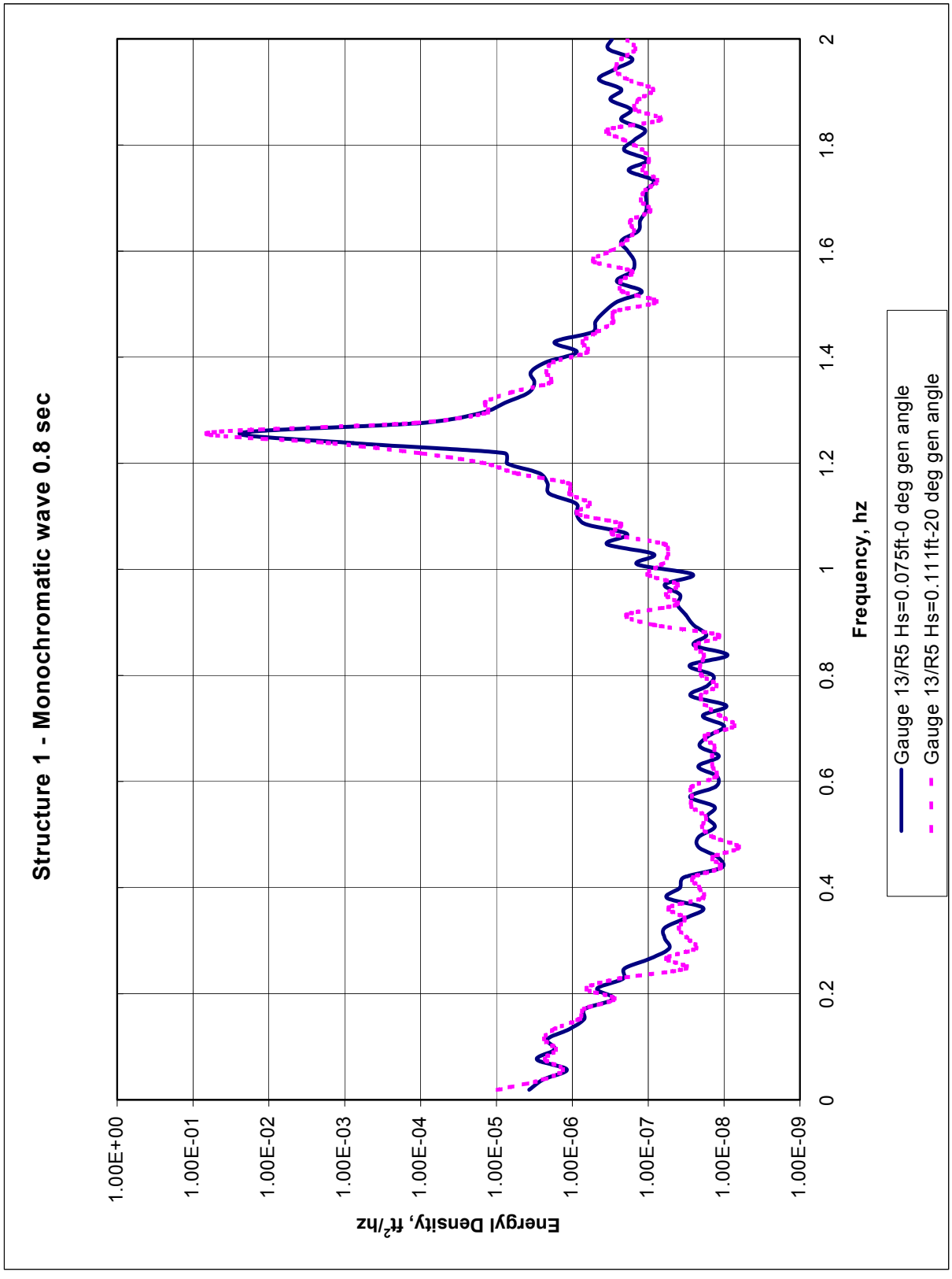
Gauge Arrangement	ADV Probe 0			ADV Probe 1		
	Peak Period sec	Peak Energy Density ft^2/Hz	Peak Direction deg	Peak Period sec	Peak Energy Density ft^2/Hz	Peak Direction deg
g1x1	0.098	0.033	229.46	0.098	0.014	210.82
g2x1	0.985	0.033	240.53	0.985	0.072	217.52
g3x1	0.853	0.000	186.30	0.985	0.000	359.76
g4x1	0.985	0.014	266.68	0.853	0.044	207.85
g1x2	1.600	0.099	234.30	1.829	0.026	204.09
g2x2	1.600	0.056	247.02	1.600	0.027	214.93
g3x2	2.560	0.082	256.93	2.560	0.045	218.89
g4x2	2.133	0.039	290.17	1.829	0.031	225.37
g1x3	0.800	0.667	227.82	0.800	0.149	202.62
g2x3	0.800	1.066	235.80	0.800	0.145	210.99
g3x3	0.800	0.746	245.10	0.853	0.005	208.24
g4x3	0.914	0.005	204.46	0.800	0.543	197.15
g1x2c	2.133	0.147	238.16	1.829	0.063	208.47
g2x2c	1.600	0.062	252.12	1.829	0.062	214.06
g3x2c	2.133	0.053	266.83	2.560	0.079	213.84
g4x2c	1.829	0.026	283.86	1.600	0.023	225.26

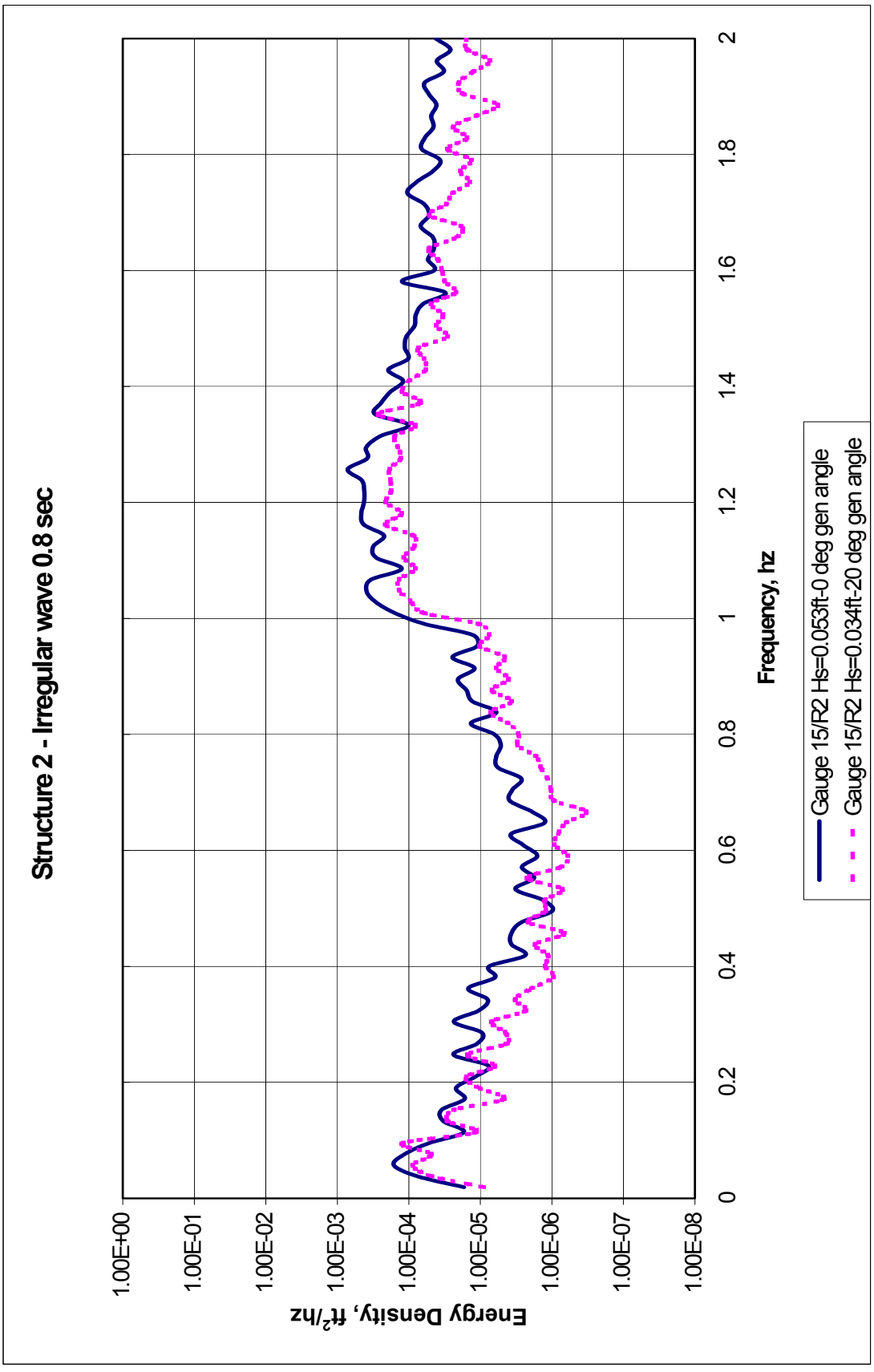
Appendix J
Energy Density Versus Frequency Plots

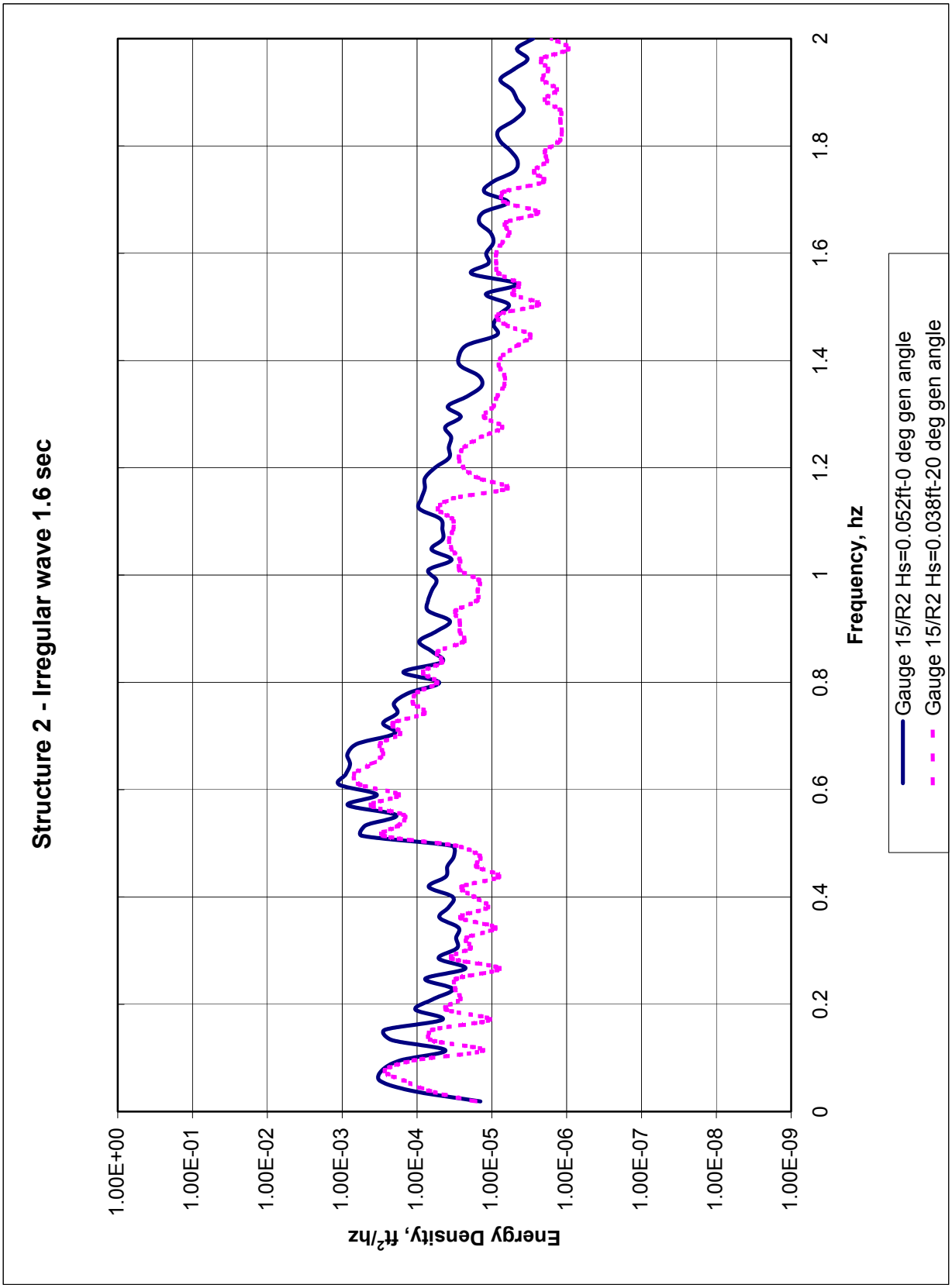
Representative wave gauges were chosen for creation of spectral energy density versus frequency plots. Locations of gauges for Structure 1 are shown in Figures 5 and B1, for Structure 2 Figures 8 and D1, for Structure 3 Figures 9 and F1, and for Structure 4, Figures 10 and H1. To convert measurements given in feet to meters, multiply by 0.3048. To convert measurements given in square feet to square meters, multiply by 0.093.

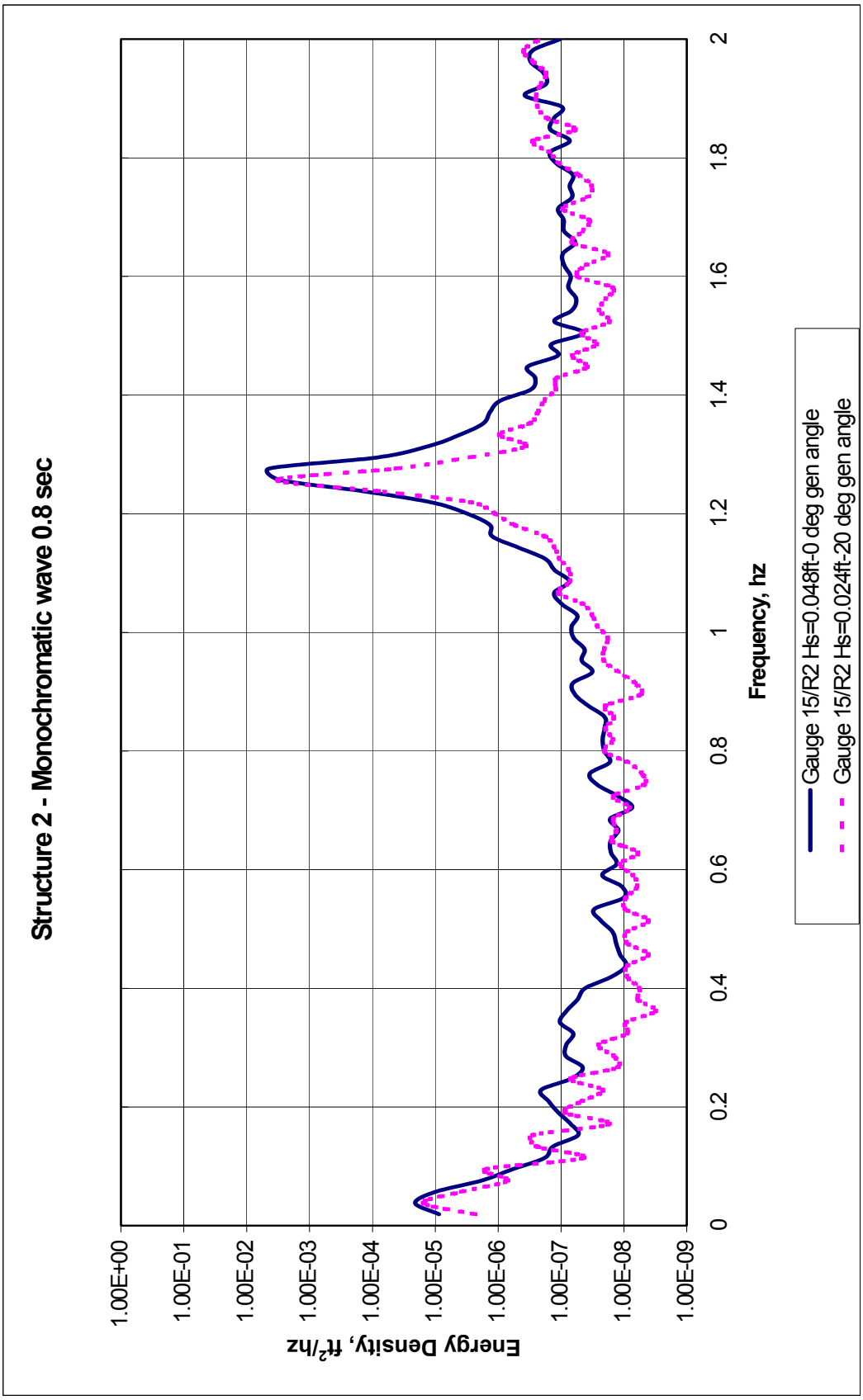

Structure 1 - Irregular wave 0.8 sec
Energy Density, ft²/hz
1.00E+00
1.00E-01
1.00E-02
1.00E-03
1.00E-04
1.00E-05
1.00E-06
1.00E-07
1.00E-08
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
Frequency, hz
Gauge 13/R5 Hs=0.092ft-0 deg gen angle
Gauge 13/R5 Hs=0.127ft-20 deg gen angle

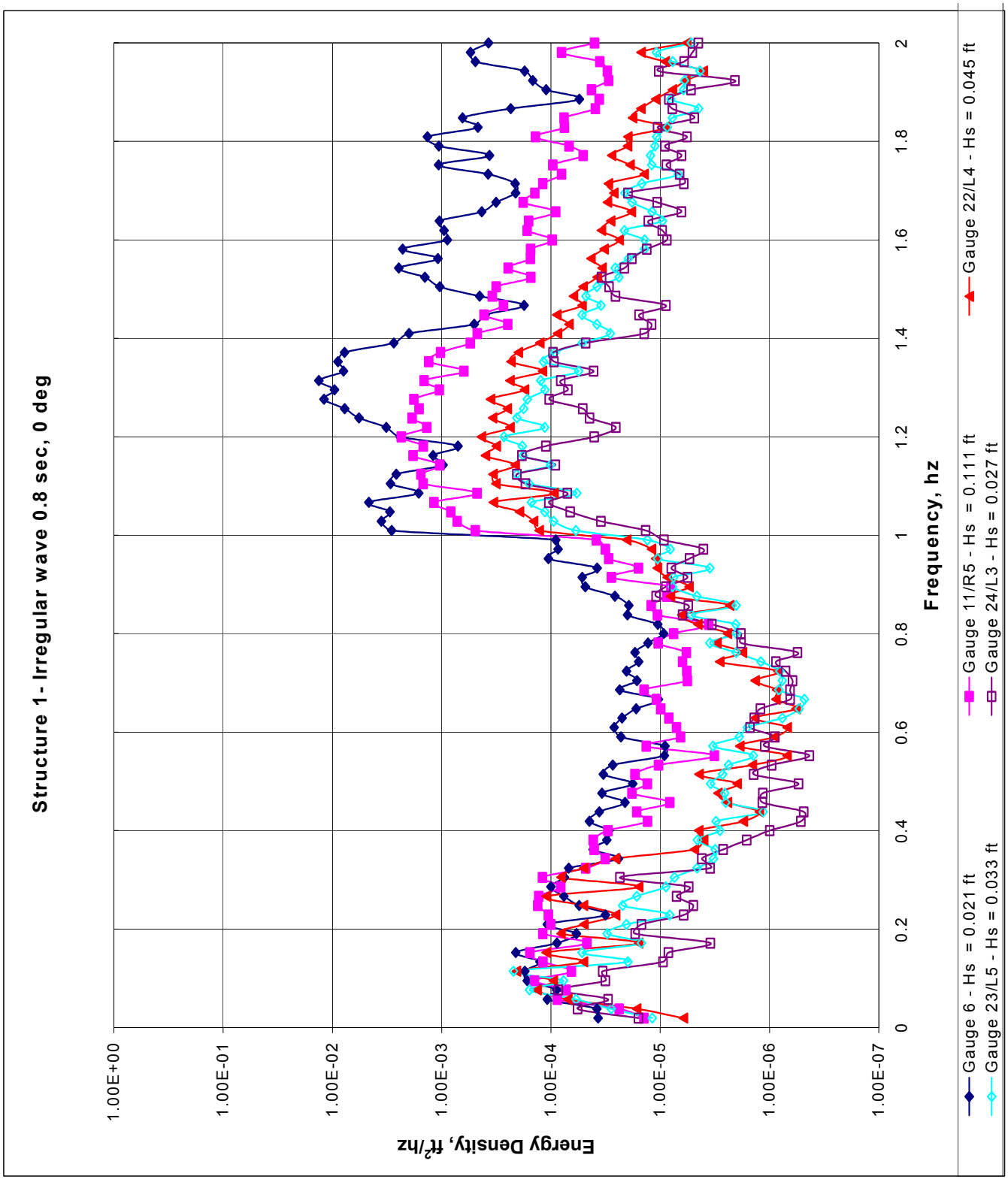

Structure 1 - Irregular wave 1.6 sec
Energy Density, ft²/hz
1.00E+00
1.00E-01
1.00E-02
1.00E-03
1.00E-04
1.00E-05
1.00E-06
1.00E-07
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
Frequency, hz
Gauge 13/R5 Hs=0.080ft-0 deg gen angle
Gauge 13/R5 Hs=0.104ft-20 deg gen angle

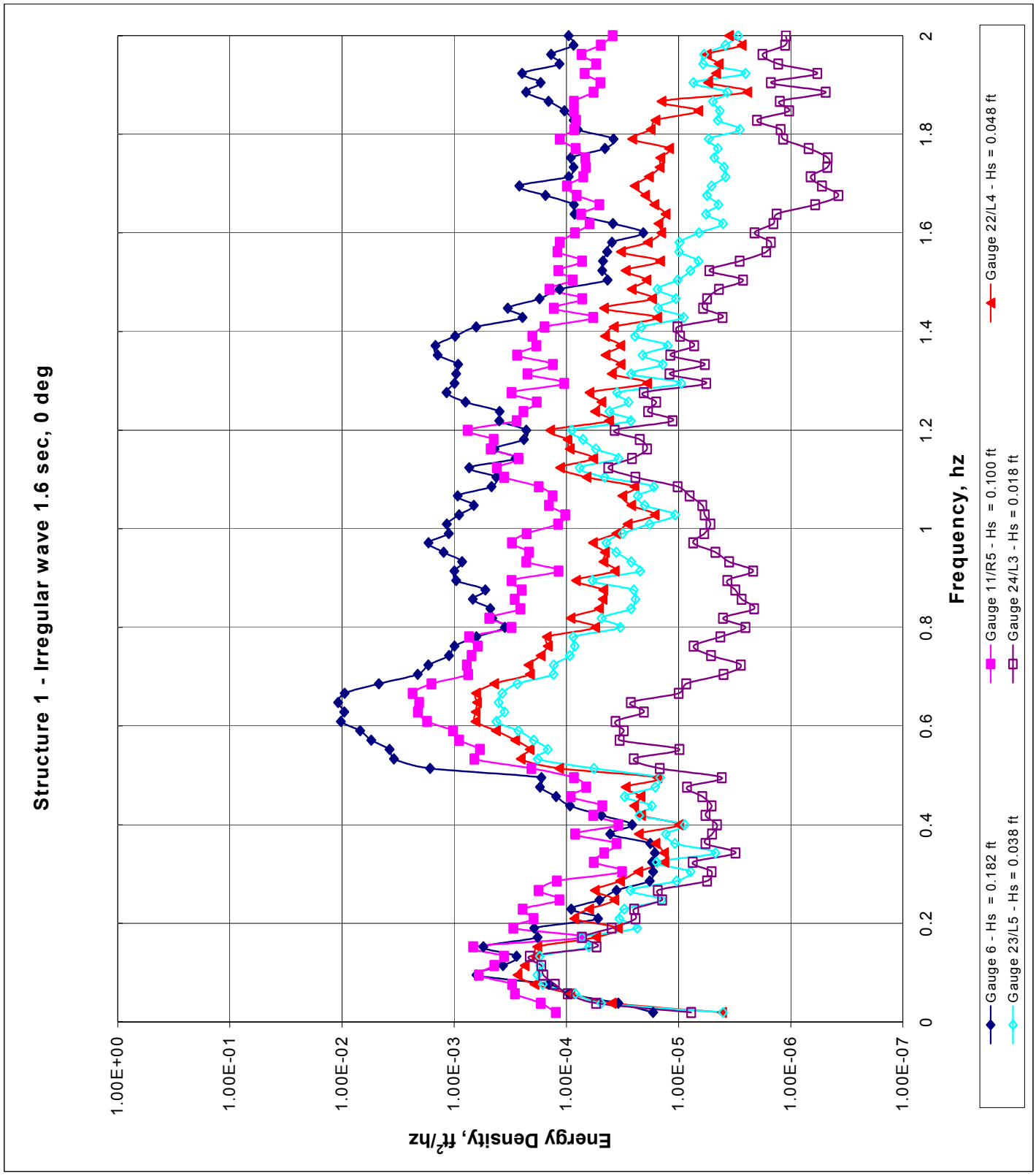

Structure 1 - Monochromatic wave 0.8 sec
Energy Density, ft²/hz
1.00E+00
1.00E-01
1.00E-02
1.00E-03
1.00E-04
1.00E-05
1.00E-06
1.00E-07
1.00E-08
1.00E-09
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
Frequency, hz
Gauge 13/R5 Hs=0.075ft-0 deg gen angle
Gauge 13/R5 Hs=0.111ft-20 deg gen angle

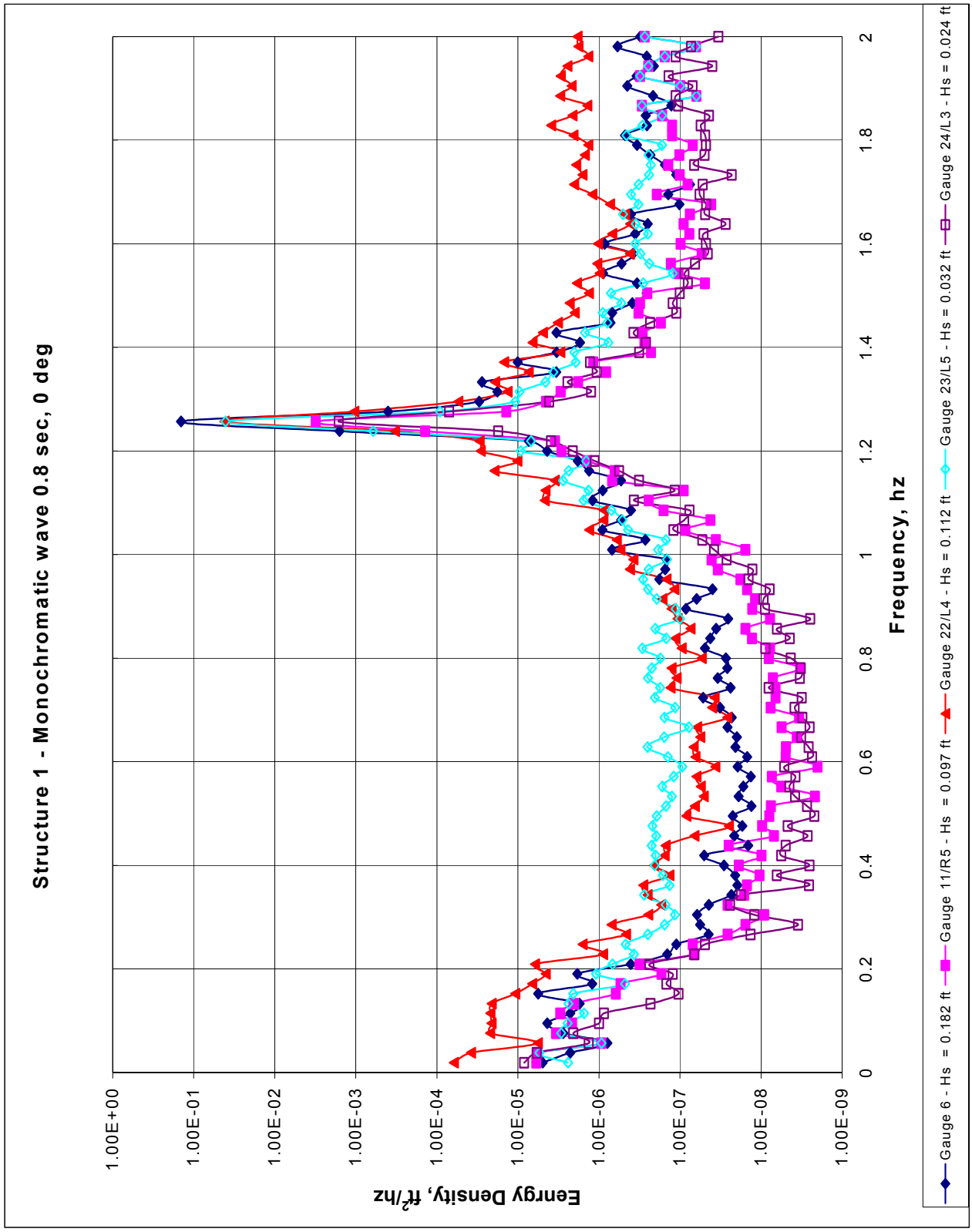

Structure 2 - Irregular wave 0.8 sec
Energy Density, ft²/hz
1.00E+00
1.00E-01
1.00E-02
1.00E-03
1.00E-04
1.00E-05
1.00E-06
1.00E-07
1.00E-08
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
Frequency, hz
Gauge 15/R2 Hs=0.053ft-0 deg gen angle
Gauge 15/R2 Hs=0.034ft-20 deg gen angle

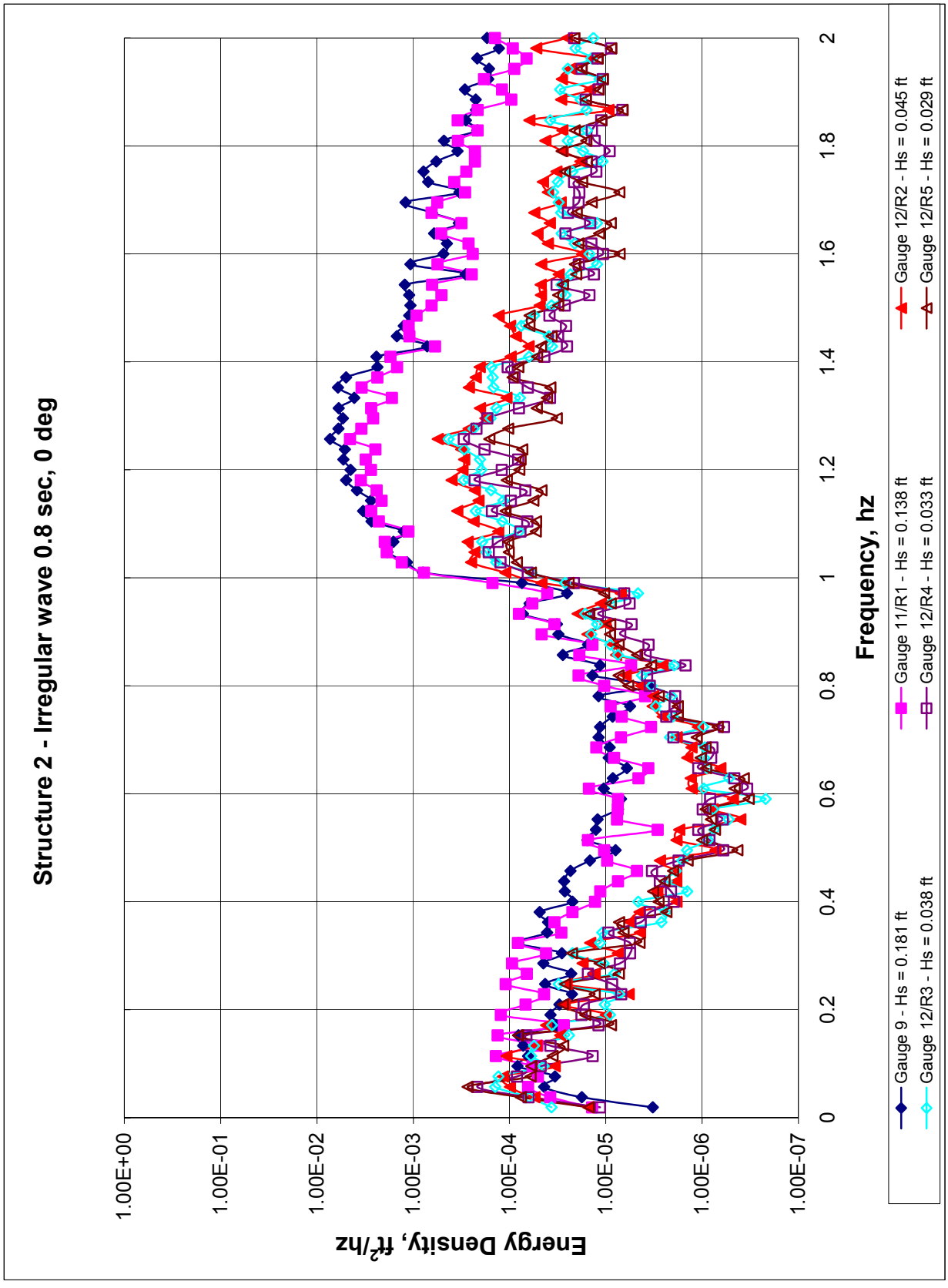

Structure 2 - Irregular wave 1.6 sec
Energy Density, ft²/hz
1.00E+00
1.00E-01
1.00E-02
1.00E-03
1.00E-04
1.00E-05
1.00E-06
1.00E-07
1.00E-08
1.00E-09
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
Frequency, hz
Gauge 15/R2 Hs=0.052ft-0 deg gen angle
Gauge 15/R2 Hs=0.038ft-20 deg gen angle

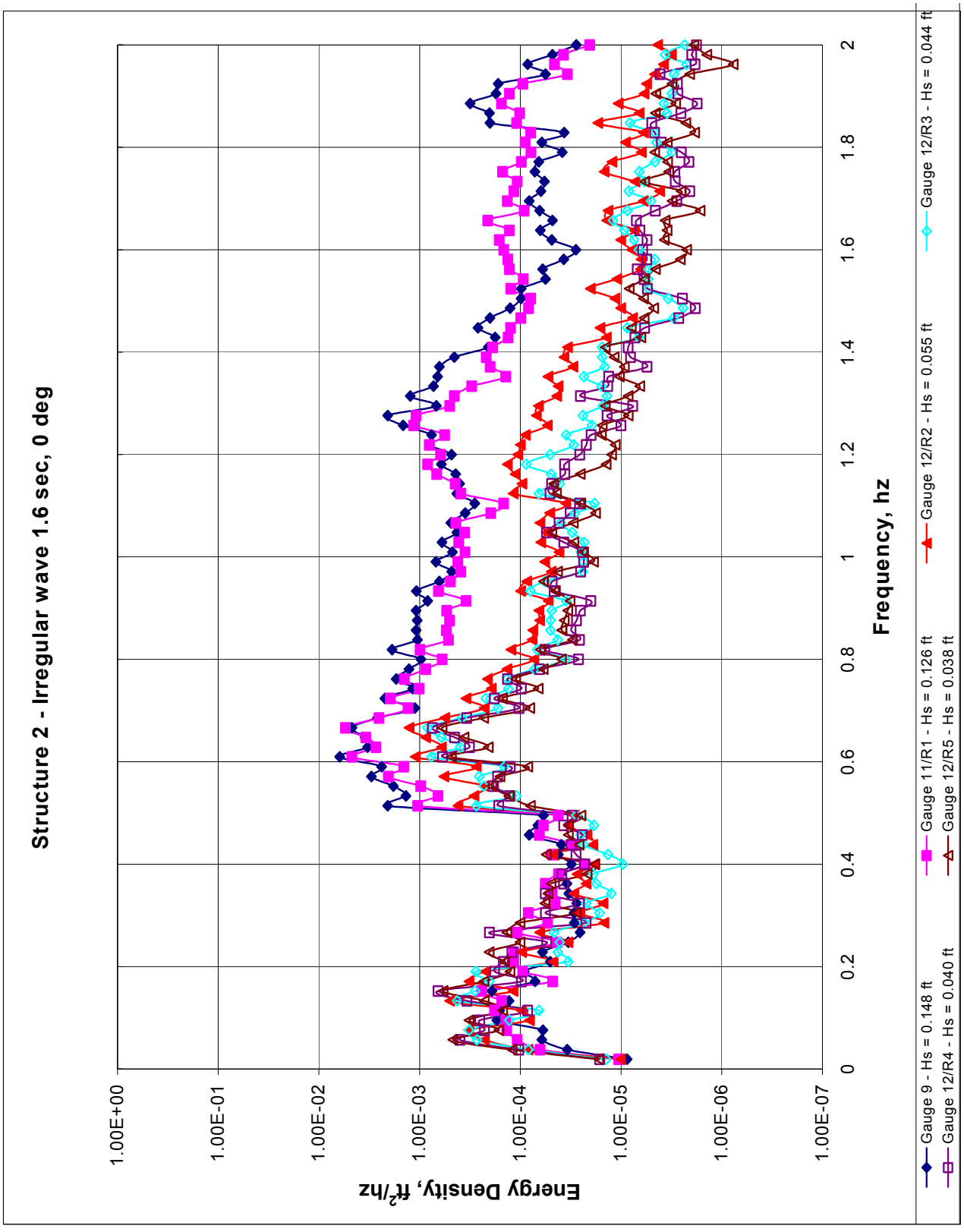

Structure 2 - Monochromatic wave 0.8 sec
Energy Density, ft²/hz
1.00E+00
1.00E-01
1.00E-02
1.00E-03
1.00E-04
1.00E-05
1.00E-06
1.00E-07
1.00E-08
1.00E-09
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
Frequency, hz
Gauge 15/R2 Hs=0.048ft-0 deg gen angle
Gauge 15/R2 Hs=0.024ft-20 deg gen angle

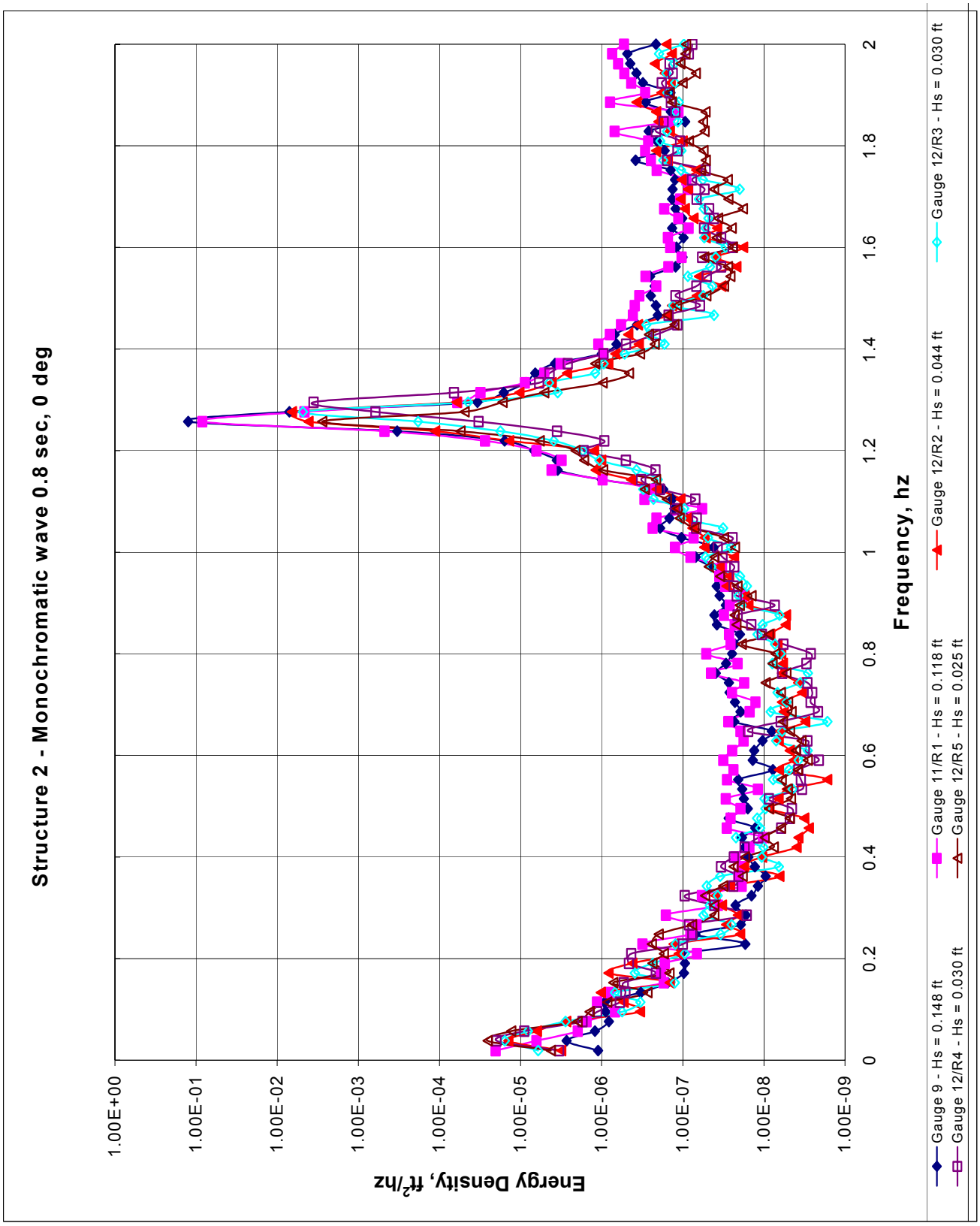

Structure 1 - Irregular wave 0.8 sec, 0 deg
Energy Density, ft²/hz
1.00E+00
1.00E-01
1.00E-02
1.00E-03
1.00E-04
1.00E-05
1.00E-06
1.00E-07
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
Frequency, hz
Gauge 6 - Hs = 0.021 ft
Gauge 11/R5 - Hs = 0.111 ft
Gauge 22/L4 - Hs = 0.045 ft
Gauge 23/L5 - Hs = 0.033 ft
Gauge 24/L3 - Hs = 0.027 ft

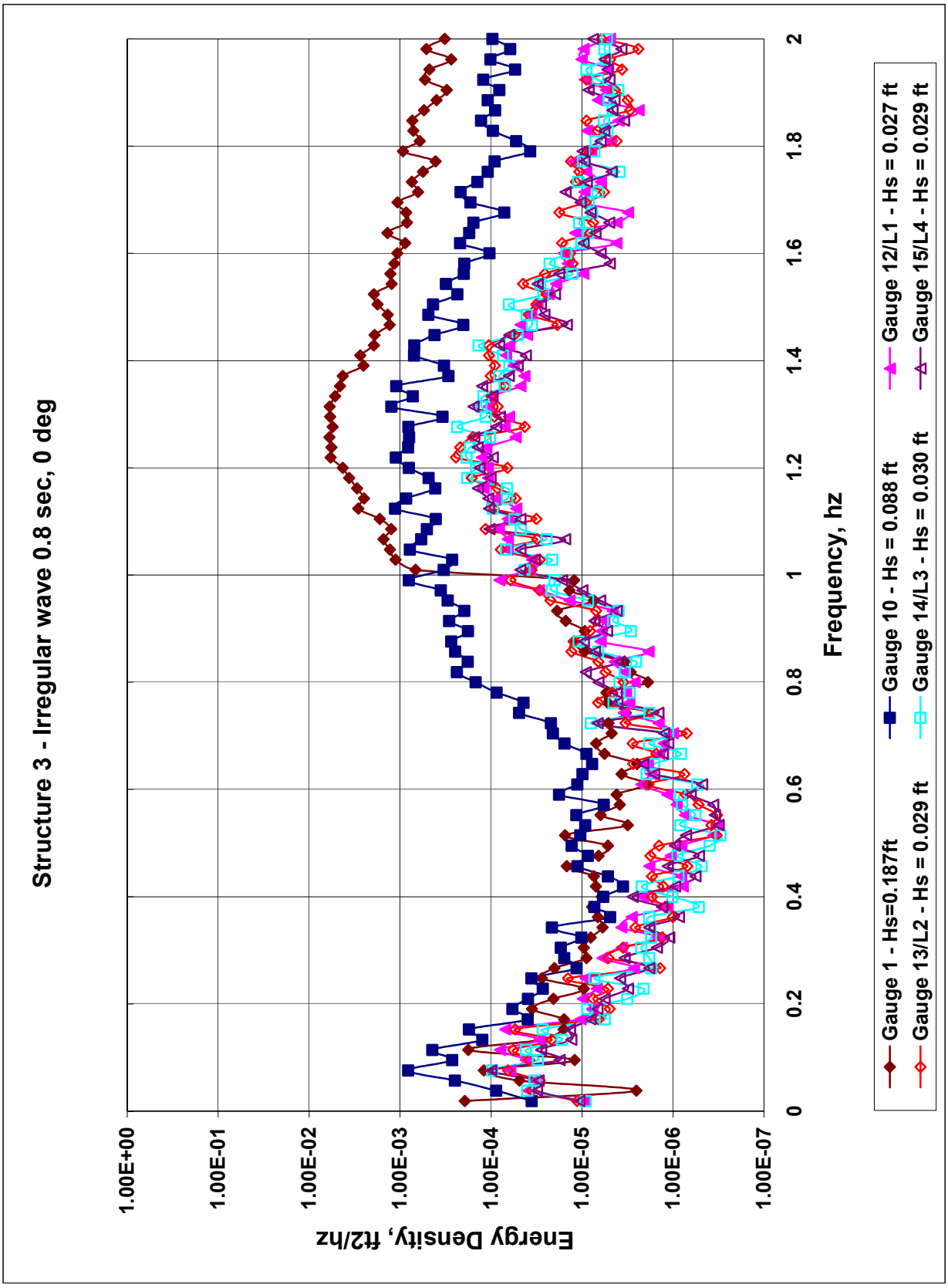

Structure 1 - Irregular wave 1.6 sec, 0 deg
Energy Density, ft²/hz
1.00E+00
1.00E-01
1.00E-02
1.00E-03
1.00E-04
1.00E-05
1.00E-06
1.00E-07
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
Frequency, hz
Gauge 6 - Hs = 0.182 ft
Gauge 11/R5 - Hs = 0.100 ft
Gauge 22/L4 - Hs = 0.048 ft
Gauge 23/L5 - Hs = 0.038 ft
Gauge 24/L3 - Hs = 0.018 ft

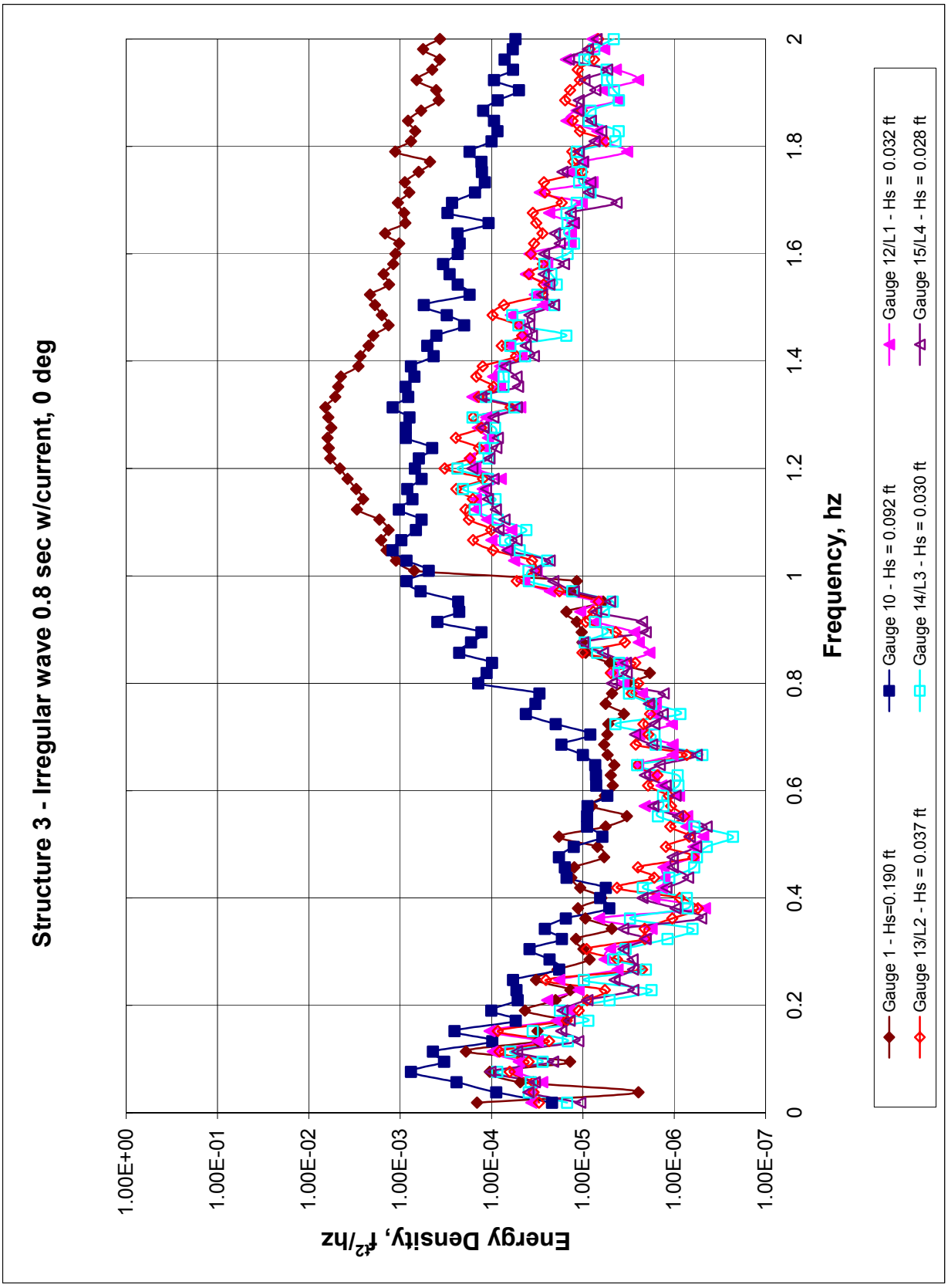

Structure 1 - Monochromatic wave 0.8 sec, 0 deg
Energy Density, ft²/hz
1.00E+00
1.00E-01
1.00E-02
1.00E-03
1.00E-04
1.00E-05
1.00E-06
1.00E-07
1.00E-08
1.00E-09
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
Frequency, hz
Gauge 6 - Hs = 0.182 ft
Gauge 11/R5 - Hs = 0.097 ft
Gauge 22/L4 - Hs = 0.112 ft
Gauge 23/L5 - Hs = 0.032 ft
Gauge 24/L3 - Hs = 0.024 ft

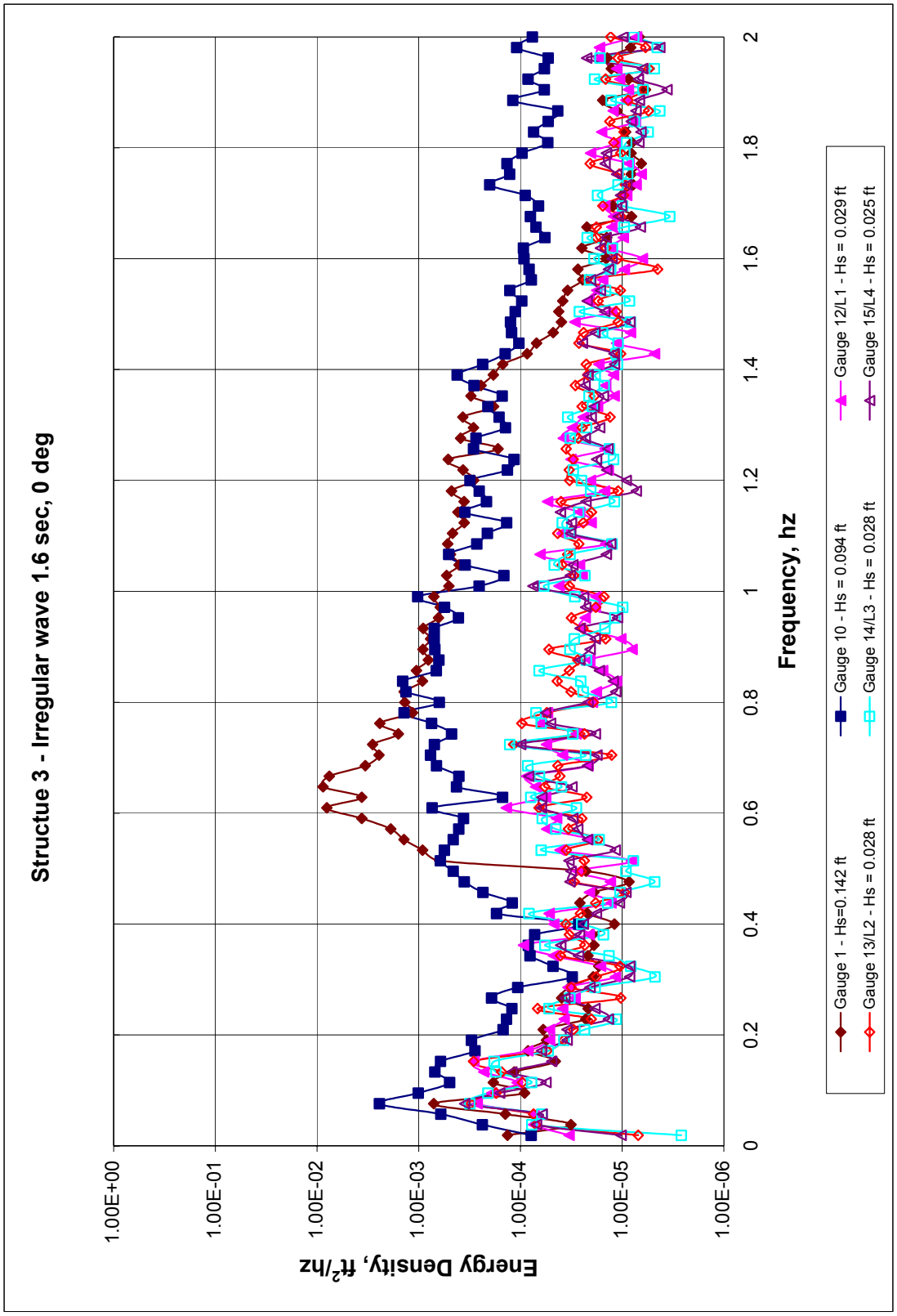

Structure 2 - Irregular wave 0.8 sec, 0 deg
Energy Density, ft²/hz
1.00E+00
1.00E-01
1.00E-02
1.00E-03
1.00E-04
1.00E-05
1.00E-06
1.00E-07
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
Frequency, hz
Gauge 9 - Hs = 0.181 ft
Gauge 11/R1 - Hs = 0.138 ft
Gauge 12/R2 - Hs = 0.045 ft
Gauge 12/R3 - Hs = 0.038 ft
Gauge 12/R4 - Hs = 0.033 ft
Gauge 12/R5 - Hs = 0.029 ft

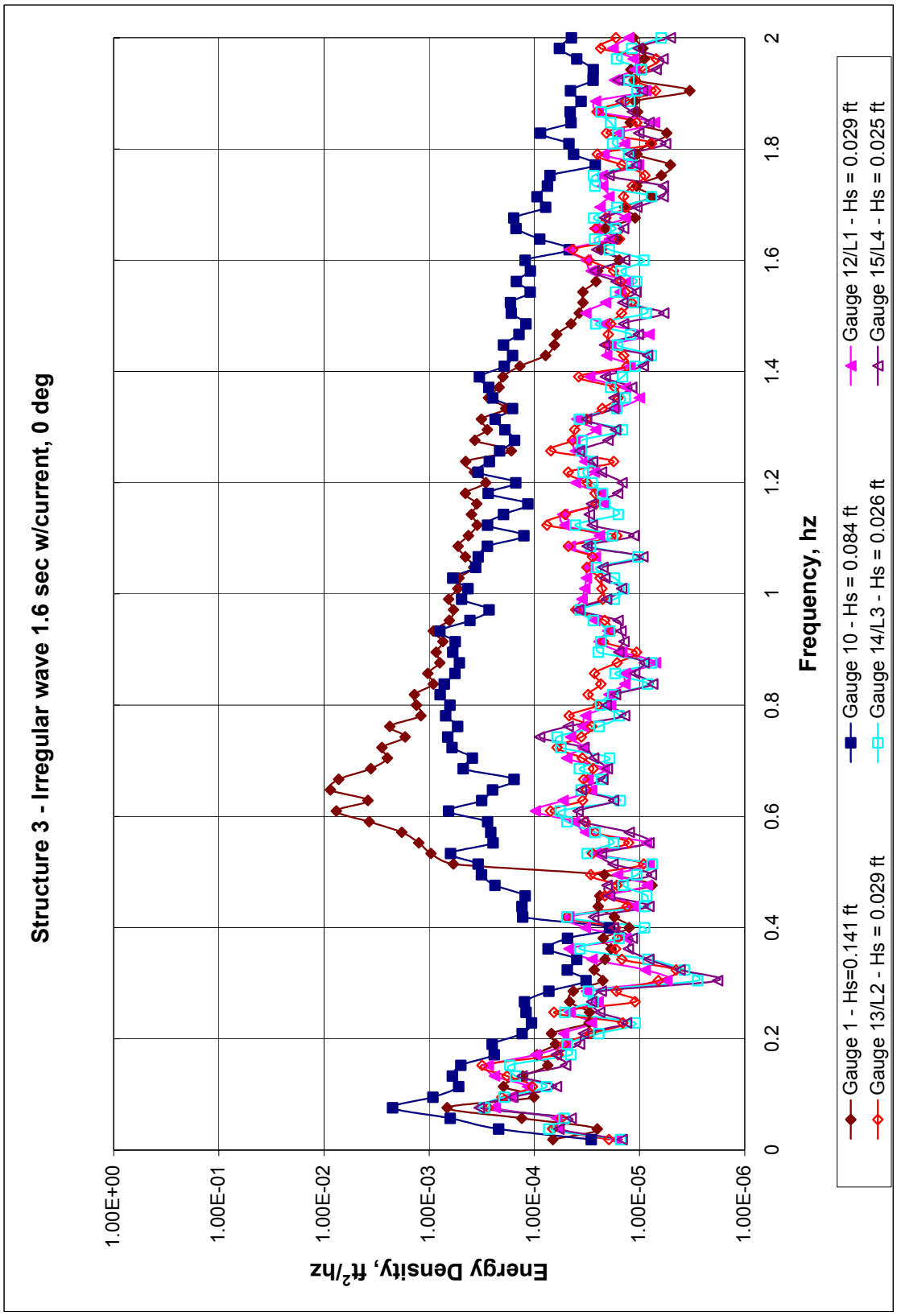

Structure 2 - Irregular wave 1.6 sec, 0 deg
Energy Density, ft²/hz
1.00E+00
1.00E-01
1.00E-02
1.00E-03
1.00E-04
1.00E-05
1.00E-06
1.00E-07
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
Frequency, hz
Gauge 9 - Hs = 0.148 ft
Gauge 11/R1 - Hs = 0.126 ft
Gauge 12/R2 - Hs = 0.055 ft
Gauge 12/R3 - Hs = 0.044 ft
Gauge 12/R4 - Hs = 0.040 ft
Gauge 12/R5 - Hs = 0.038 ft

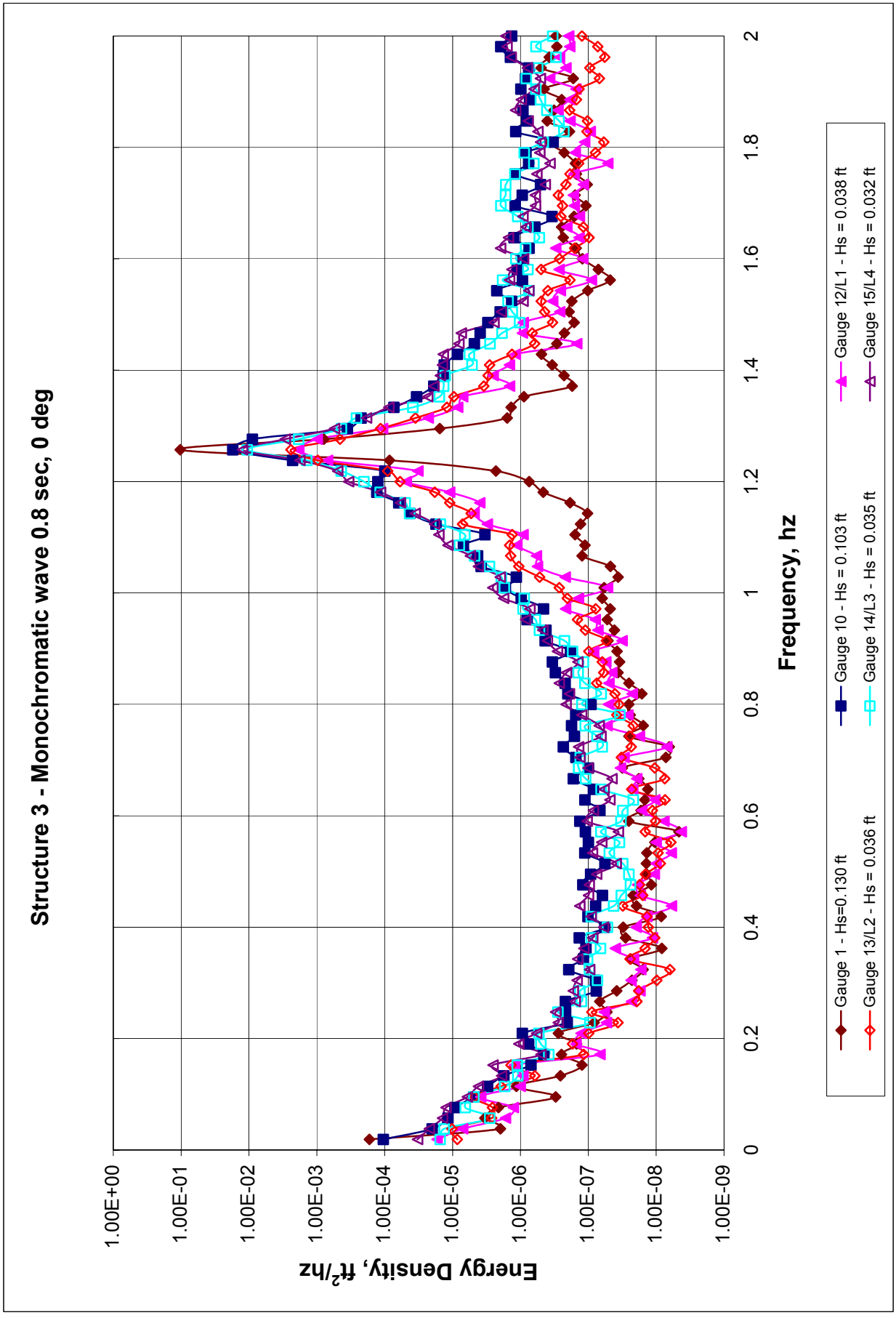

Structure 2 - Monochromatic wave 0.8 sec, 0 deg
Energy Density, ft²/hz
1.00E+00
1.00E-01
1.00E-02
1.00E-03
1.00E-04
1.00E-05
1.00E-06
1.00E-07
1.00E-08
1.00E-09
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
Frequency, hz
Gauge 9 - Hs = 0.148 ft
Gauge 11/R1 - Hs = 0.118 ft
Gauge 12/R2 - Hs = 0.044 ft
Gauge 12/R3 - Hs = 0.030 ft
Gauge 12/R4 - Hs = 0.030 ft
Gauge 12/R5 - Hs = 0.025 ft

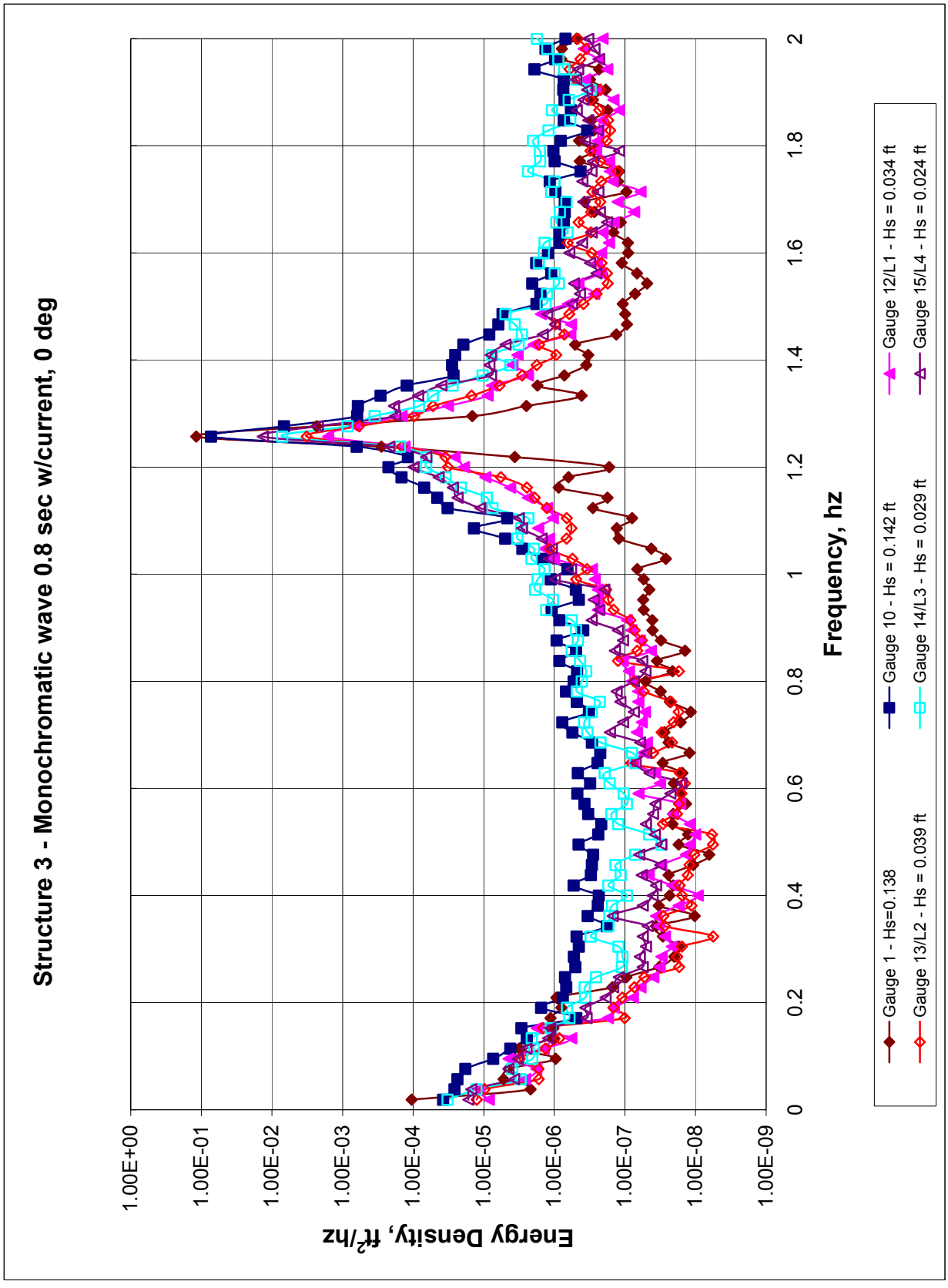

Structure 3 - Irregular wave 0.8 sec, 0 deg
Energy Density, ft2/hz
1.00E+00
1.00E-01
1.00E-02
1.00E-03
1.00E-04
1.00E-05
1.00E-06
1.00E-07
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
Frequency, hz
Gauge 1 - Hs=0.187ft
Gauge 10 - Hs = 0.088 ft
Gauge 12/L1 - Hs = 0.027 ft
Gauge 13/L2 - Hs = 0.029 ft
Gauge 14/L3 - Hs = 0.030 ft
Gauge 15/L4 - Hs = 0.029 ft

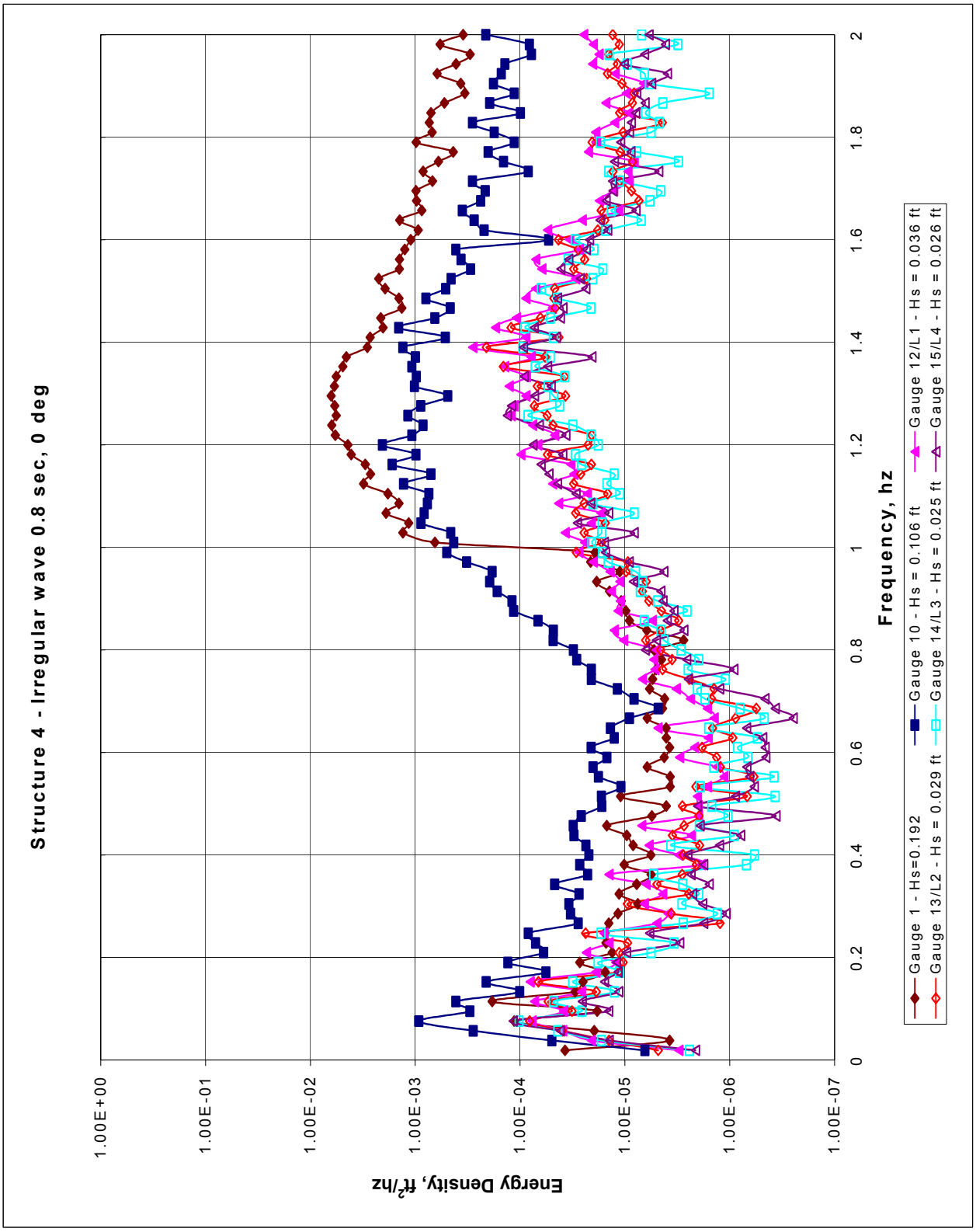

Structure 3 - Irregular wave 0.8 sec w/current, 0 deg
Energy Density, ft²/hz
1.00E+00
1.00E-01
1.00E-02
1.00E-03
1.00E-04
1.00E-05
1.00E-06
1.00E-07
Frequency, hz
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
Gauge 1 - Hs=0.190 ft
Gauge 10 - Hs = 0.092 ft
Gauge 12/L1 - Hs = 0.032 ft
Gauge 13/L2 - Hs = 0.037 ft
Gauge 14/L3 - Hs = 0.030 ft
Gauge 15/L4 - Hs = 0.028 ft

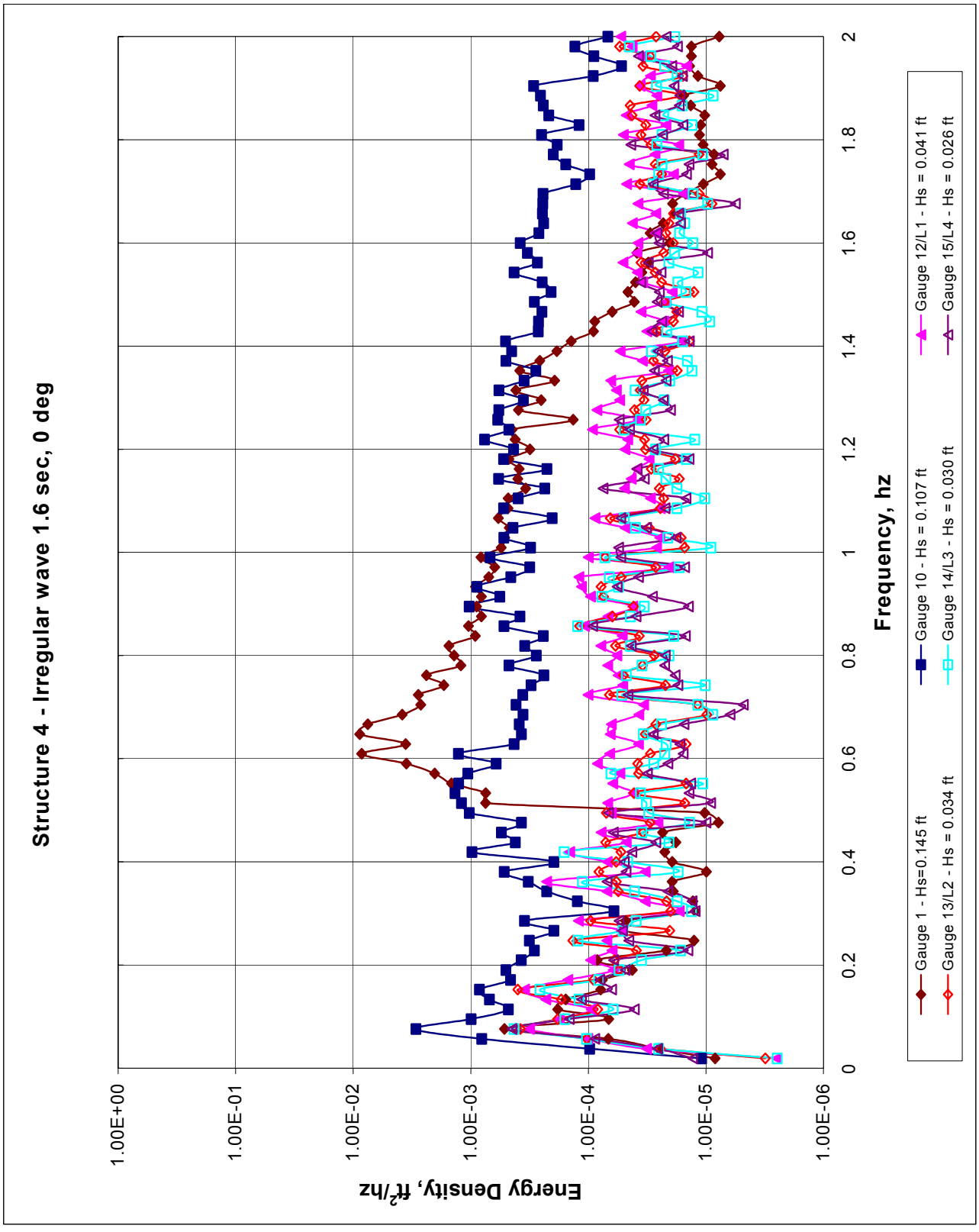

Structue 3 - Irregular wave 1.6 sec, 0 deg
Energy Density, ft²/hz
1.00E+00
1.00E-01
1.00E-02
1.00E-03
1.00E-04
1.00E-05
1.00E-06
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
Frequency, hz
Gauge 1 - Hs=0.142 ft
Gauge 10 - Hs = 0.094 ft
Gauge 12/L1 - Hs = 0.029 ft
Gauge 13/L2 - Hs = 0.028 ft
Gauge 14/L3 - Hs = 0.028 ft
Gauge 15/L4 - Hs = 0.025 ft

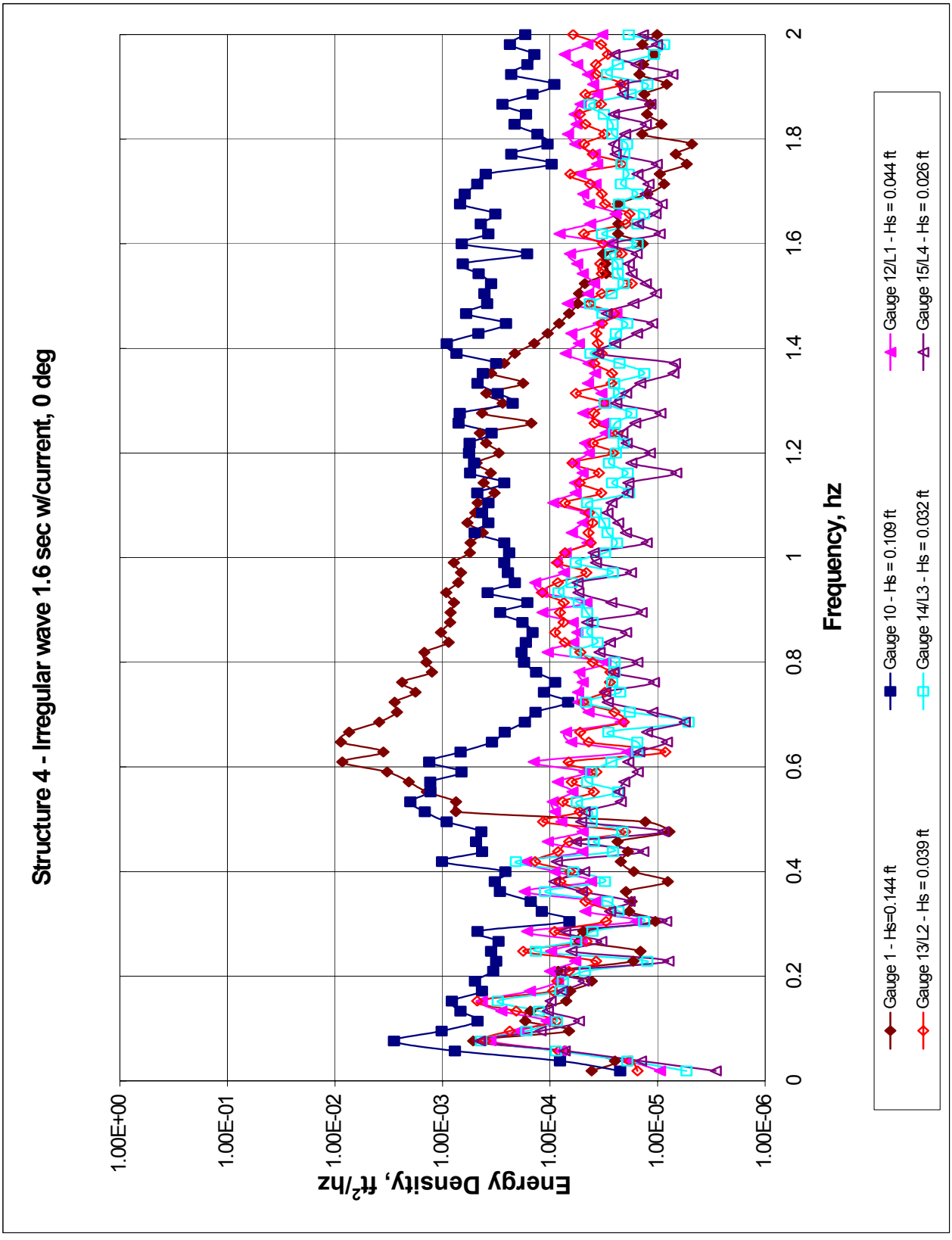

Structure 3 - Irregular wave 1.6 sec w/current, 0 deg
Energy Density, ft²/hz
1.00E+00
1.00E-01
1.00E-02
1.00E-03
1.00E-04
1.00E-05
1.00E-06
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
Frequency, hz
Gauge 1 - Hs=0.141 ft
Gauge 10 - Hs = 0.084 ft
Gauge 12/L1 - Hs = 0.029 ft
Gauge 13/L2 - Hs = 0.029 ft
Gauge 14/L3 - Hs = 0.026 ft
Gauge 15/L4 - Hs = 0.025 ft

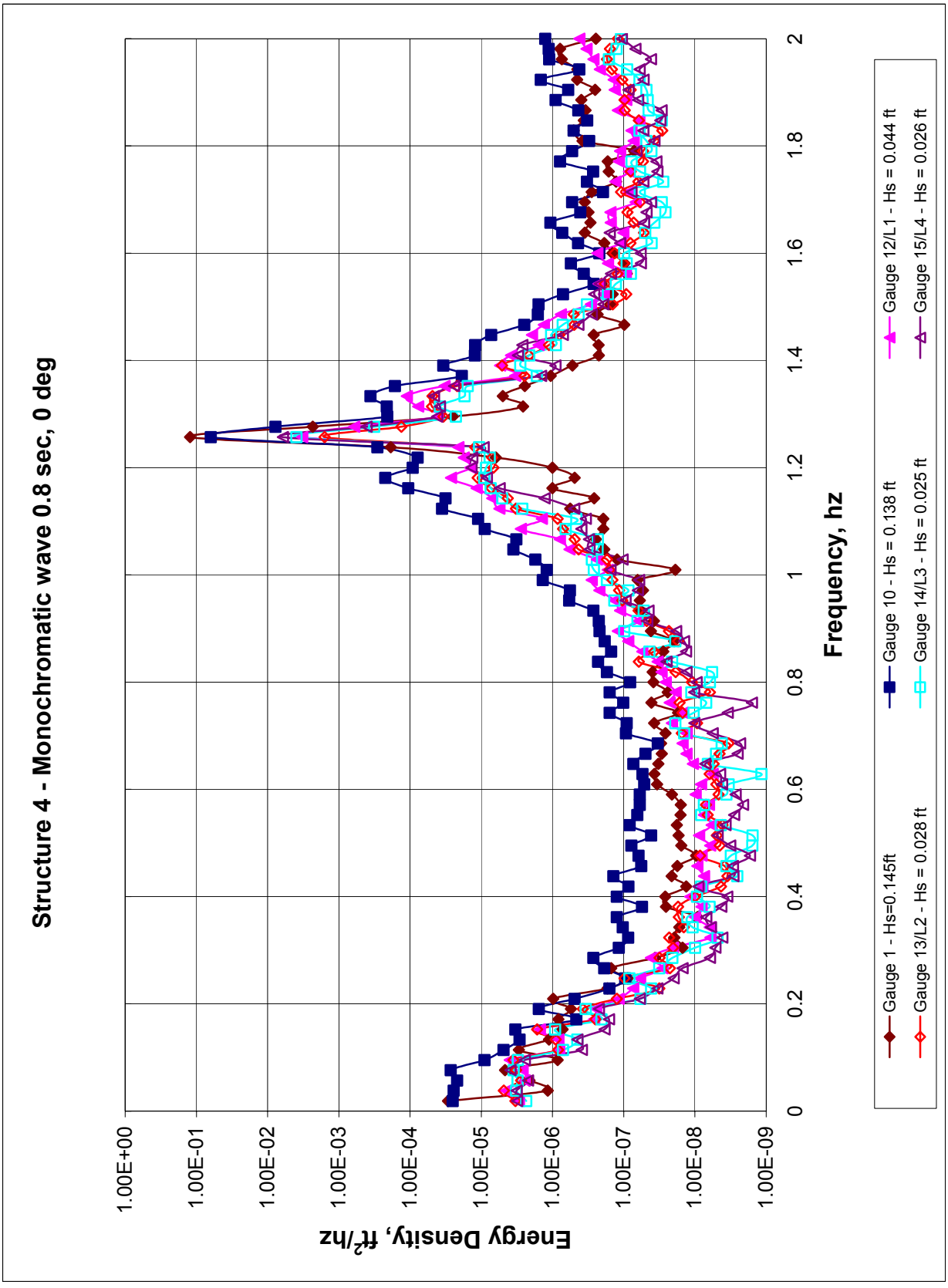

Structure 3 - Monochromatic wave 0.8 sec, 0 deg
Energy Density, ft²/hz
1.00E+00
1.00E-01
1.00E-02
1.00E-03
1.00E-04
1.00E-05
1.00E-06
1.00E-07
1.00E-08
1.00E-09
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
Frequency, hz
Gauge 1 - Hs=0.130 ft
Gauge 10 - Hs = 0.103 ft
Gauge 12/L1 - Hs = 0.038 ft
Gauge 13/L2 - Hs = 0.036 ft
Gauge 14/L3 - Hs = 0.035 ft
Gauge 15/L4 - Hs = 0.032 ft


Structure 3 - Monochromatic wave 0.8 sec w/current, 0 deg
Energy Density, ft²/hz
1.00E+00
1.00E-01
1.00E-02
1.00E-03
1.00E-04
1.00E-05
1.00E-06
1.00E-07
1.00E-08
1.00E-09
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
Frequency, hz
Gauge 1 - Hs=0.138
Gauge 10 - Hs = 0.142 ft
Gauge 12/L1 - Hs = 0.034 ft
Gauge 13/L2 - Hs = 0.039 ft
Gauge 14/L3 - Hs = 0.029 ft
Gauge 15/L4 - Hs = 0.024 ft


Structure 4 - Irregular wave 0.8 sec, 0 deg
Energy Density, ft²/hz
1.00E+00
1.00E-01
1.00E-02
1.00E-03
1.00E-04
1.00E-05
1.00E-06
1.00E-07
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
Frequency, hz
Gauge 1 - Hs=0.192
Gauge 10 - Hs = 0.106 ft
Gauge 12/L1 - Hs = 0.036 ft
Gauge 13/L2 - Hs = 0.029 ft
Gauge 14/L3 - Hs = 0.025 ft
Gauge 15/L4 - Hs = 0.026 ft


Structure 4 - Irregular wave 1.6 sec, 0 deg
Energy Density, ft²/hz
1.00E+00
1.00E-01
1.00E-02
1.00E-03
1.00E-04
1.00E-05
1.00E-06
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
Frequency, hz
Gauge 1 - Hs=0.145 ft
Gauge 10 - Hs = 0.107 ft
Gauge 12/L1 - Hs = 0.041 ft
Gauge 13/L2 - Hs = 0.034 ft
Gauge 14/L3 - Hs = 0.030 ft
Gauge 15/L4 - Hs = 0.026 ft


Structure 4 - Irregular wave 1.6 sec w/current, 0 deg
Energy Density, ft²/hz
1.00E+00
1.00E-01
1.00E-02
1.00E-03
1.00E-04
1.00E-05
1.00E-06
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
Frequency, hz
Gauge 1 - Hs=0.144 ft
Gauge 10 - Hs = 0.109 ft
Gauge 12/L1 - Hs = 0.044 ft
Gauge 13/L2 - Hs = 0.039 ft
Gauge 14/L3 - Hs = 0.032 ft
Gauge 15/L4 - Hs = 0.026 ft


Structure 4 - Monochromatic wave 0.8 sec, 0 deg
Energy Density, ft²/hz
1.00E+00
1.00E-01
1.00E-02
1.00E-03
1.00E-04
1.00E-05
1.00E-06
1.00E-07
1.00E-08
1.00E-09
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
Frequency, hz
Gauge 1 - Hs=0.145ft
Gauge 10 - Hs = 0.138 ft
Gauge 12/L1 - Hs = 0.044 ft
Gauge 13/L2 - Hs = 0.028 ft
Gauge 14/L3 - Hs = 0.025 ft
Gauge 15/L4 - Hs = 0.026 ft

Appendix K
Basin Bathymetry

The basin bathymetry is provided in x-, y-, and z-coordinates for each of the four model configurations and structural arrangements. x-, y-, and z-values are presented at the 1:50 scale. The model was operated at the +1.5-m- (+5.0-ft-) mlw water level. Figure K1 shows the origin with the positive x-axis running horizontally to the left and the y-axis running vertically down from the point located in the upper right corner. Due to the large size of each file, this information is presented in ASCII text on the CD accompanying this report.

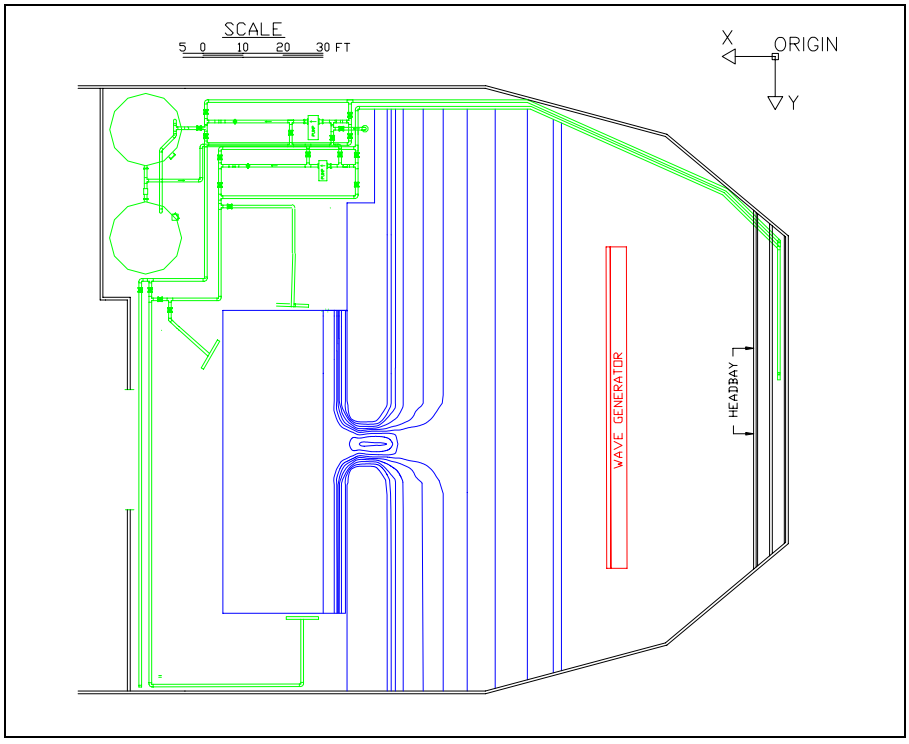


Figure K1. Model layout and origin of axes

Appendix L
Location of Structure 1 Wave Gauges

Tables L1 through L5 list the location and depths, in feet, of the gauges placed in the physical model for Structure 1 wave runs. Table L6 contains the x- and y-coordinates in feet for the shore-parallel breakwater structure used in this model configuration. The rack housing gauges 11-20 is referenced by the letter R, and L denotes the rack that holds wave gauges 21-30. To convert measurements given in feet to meters, multiply by 0.3048.

Table L1											
Structure 1 Gauge Arrangement 1											
				R1				L1			
Gauges	x, ft	y, ft	z, ft	Gauges	x, ft	y, ft	z, ft	Gauges	x, ft	y, ft	z, ft
1	35.32	55.29	1.05	11	55.22	65.29	0.54	21	55.22	41.29	0.55
2	35.32	57.29	1.05	12	57.23	65.29	0.51	22	57.23	41.29	0.52
3	35.32	59.29	1.05	13	59.22	65.29	0.50	23	59.22	41.29	0.50
4	35.32	61.29	1.05	14	61.21	65.29	0.47	24	61.21	41.29	0.47
5	35.32	65.29	1.05	15	63.24	65.29	0.44	25	63.24	41.29	0.43
6	50.91	55.29	0.50	16	65.21	65.29	0.41	26	65.21	41.29	0.40
7	50.91	57.29	0.50	17	67.21	65.29	0.40	27	67.21	41.29	0.38
8	50.91	59.29	0.50	18	69.21	65.29	0.35	28	69.21	41.29	0.34
9	50.91	61.29	0.50	19	71.21	65.29	0.32	29	71.21	41.29	0.30
10	50.91	65.29	0.50	20	73.21	65.29	0.28	30	73.21	41.29	0.24
								probe			
								0	60.21	41.29	
								1	66.21	41.29	
Table L2											
Structure 1 Gauge Arrangement 2											
				R2				L2			
Gauges	x, ft	y, ft	z, ft	Gauges	x, ft	y, ft	z, ft	Gauges	x, ft	y, ft	z, ft
1	35.32	55.29	1.05	11	55.22	61.29	0.55	21	55.22	45.29	0.54
2	35.32	57.29	1.05	12	57.23	61.29	0.53	22	57.23	45.29	0.52
3	35.32	59.29	1.05	13	59.22	61.29	0.50	23	59.22	45.29	0.50
4	35.32	61.29	1.05	14	61.21	61.29	0.47	24	61.21	45.29	0.47
5	35.32	65.29	1.05	15	63.24	61.29	0.44	25	63.24	45.29	0.44
6	50.91	55.29	0.50	16	65.21	61.29	0.41	26	65.21	45.29	0.41
7	50.91	57.29	0.50	17	67.21	61.29	0.38	27	67.21	45.29	0.38
8	50.91	59.29	0.50	18	69.21	61.29	0.34	28	69.21	45.29	0.35
9	50.91	61.29	0.50	19	71.21	61.29	0.31	29	71.21	45.29	0.31
10	50.91	65.29	0.50	20	73.21	61.29	0.28	30	73.21	45.29	0.25
								probe			
								0	60.21	45.29	
								1	66.21	45.29	
Table L3											
Structure 1 Gauge Arrangement 3											
				R3				L3			
Gauges	x, ft	y, ft	z, ft	Gauges	x, ft	y, ft	z, ft	Gauges	x, ft	y, ft	z, ft
1	35.32	55.29	1.05	11	55.22	59.29	0.54	21	55.22	49.29	0.55
2	35.32	57.29	1.05	12	57.23	59.29	0.51	22	57.23	49.29	0.52
3	35.32	59.29	1.05	13	59.22	59.29	0.50	23	59.22	49.29	0.50
4	35.32	61.29	1.05	14	61.21	59.29	0.48	24	61.21	49.29	0.48
5	35.32	65.29	1.05	15	63.24	59.29	0.44	25	63.24	49.29	0.45
6	50.91	55.29	0.50	16	65.21	59.29	0.41	26	65.21	49.29	0.41
7	50.91	57.29	0.50	17	67.21	59.29	0.38	27	67.21	49.29	0.40
8	50.91	59.29	0.50	18	69.21	59.29	0.34	28	69.21	49.29	0.36
9	50.91	61.29	0.50	19	71.21	59.29	0.31	29	71.21	49.29	0.31
10	50.91	65.29	0.50	20	73.21	59.29	0.28	30	73.21	49.29	0.28
								probe			
								0	60.21	49.29	
								1	66.21	49.29	

Table L4											
Structure 1 Gauge Arrangement 4											
				R4				L4			
Gauges	x, ft	y, ft	z, ft	Gauges	x, ft	y, ft	z, ft	Gauges	x, ft	y, ft	z, ft
1	35.32	55.29	1.05	11	55.22	57.29	0.55	21	55.22	53.29	0.55
2	35.32	57.29	1.05	12	57.23	57.29	0.51	22	57.23	53.29	0.52
3	35.32	59.29	1.05	13	59.22	57.29	0.50	23	59.22	53.29	0.50
4	35.32	61.29	1.05	14	61.21	57.29	0.46	24	61.21	53.29	0.47
5	35.32	65.29	1.05	15	63.24	57.29	0.44	25	63.24	53.29	0.44
6	50.91	55.29	0.50	16	65.21	57.29	0.41	26	65.21	53.29	0.41
7	50.91	57.29	0.50	17	67.21	57.29	0.38	27	67.21	53.29	0.38
8	50.91	59.29	0.50	18	69.21	57.29	0.33	28	69.21	53.29	0.34
9	50.91	61.29	0.50	19	71.21	57.29	0.31	29	71.21	53.29	0.30
10	50.91	65.29	0.50	20	73.21	57.29	0.28	30	73.21	53.29	0.27
								probe			
								0	60.21	53.29	
								1	66.21	53.29	
Table L5											
Structure 1 Gauge Arrangement 5											
				R5				L5			
Gauges	x, ft	y, ft	z, ft	Gauges	x, ft	y, ft	z, ft	Gauges	x, ft	y, ft	z, ft
1	35.32	55.29	1.05	11	55.22	55.29	0.54	21	55.22	51.29	0.54
2	35.32	57.29	1.05	12	57.23	55.29	0.52	22	57.23	51.29	0.51
3	35.32	59.29	1.05	13	59.22	55.29	0.50	23	59.22	51.29	0.50
4	35.32	61.29	1.05	14	61.21	55.29	0.47	24	61.21	51.29	0.46
5	35.32	65.29	1.05	15	63.24	55.29	0.44	25	63.24	51.29	0.44
6	50.91	55.29	0.50	16	65.21	55.29	0.41	26	65.21	51.29	0.40
7	50.91	57.29	0.50	17	67.21	55.29	0.37	27	67.21	51.29	0.37
8	50.91	59.29	0.50	18	69.21	55.29	0.34	28	69.21	51.29	0.34
9	50.91	61.29	0.50	19	71.21	55.29	0.31	29	71.21	51.29	0.30
10	50.91	65.29	0.50	20	73.21	55.29	0.27	30	73.21	51.29	0.28
								probe			
								0	60.21	51.29	
								1	66.21	51.29	
Table L6											
Structure1 Shore Parallel Breakwater Coordinates											
Starting Point is tip of breakwater (refer to figure 5)											
x, ft	y, ft										
54.96	55.25										
54.96	53.94										
54.96	51.26										
54.96	49.26										
54.96	47.52										
54.96	45.3										
54.96	41.34										
54.96	25.34										

Appendix M
Location of Structure 2 Wave Gauges

Tables M1 through M5 list the location and depths, in feet, of the gauges placed in the physical model for Structure 2 wave runs. Table M6 contains the x- and y-coordinates in feet for the dogleg jetty structure used in this model configuration. The rack housing gauges 11-20 is referenced by the letter R, and L denotes the rack that holds wave gauges 21-30. To convert measurements given in feet to meters, multiply by 0.3048.

Table M1											
Structure 2 Gauge Arrangement 1											
				R1				L1			
Gauges	x, ft	y, ft	z, ft	Gauges	x, ft	y, ft	z, ft	Gauges	x, ft	y, ft	z, ft
1	36.57	83.42	1.05	11	53.12	87.34	0.55	21	53.12	79.22	0.55
2	35.61	81.70	1.05	12	55.12	87.34	0.52	22	55.12	79.22	0.52
3	34.66	79.98	1.05	13	57.12	87.34	0.49	23	57.12	79.22	0.49
4	33.70	78.20	1.05	14	59.12	87.34	0.47	24	59.12	79.22	0.46
5	32.78	76.41	1.05	15	61.12	87.34	0.44	25	61.12	79.22	0.44
6	49.09	75.33	0.63	16	63.12	87.34	0.40	26	63.12	79.22	0.40
7	49.16	79.35	0.62	17	65.12	87.34	0.38	27	65.12	79.22	0.39
8	49.09	83.33	0.62	18	67.12	87.34	0.39	28	67.12	79.22	0.38
9	49.06	87.34	0.62	19	69.12	87.34	0.39	29	69.12	79.22	0.36
10	49.12	91.32	0.62	20	71.12	87.34	0.39	30	71.12	79.22	0.34
				probe							
				0	56.14	87.35					
				1	62.17	87.35					
Table M2											
Structure 2 Gauge Arrangement 2											
				R2				L2			
Gauges	x, ft	y, ft	z, ft	Gauges	x, ft	y, ft	z, ft	Gauges	x, ft	y, ft	z, ft
1	36.57	83.42	1.05	11	55.12	91.30	0.52	21	53.12	81.32	0.55
2	35.61	81.70	1.05	12	57.12	91.30	0.50	22	55.12	81.32	0.52
3	34.66	79.98	1.05	13	59.12	91.30	0.46	23	57.12	81.32	0.50
4	33.70	78.20	1.05	14	61.12	91.30	0.45	24	59.12	81.32	0.47
5	32.78	76.41	1.05	15	63.12	91.30	0.41	25	61.12	81.32	0.44
6	49.09	75.33	0.63	16	65.12	91.30	0.39	26	63.12	81.32	0.39
7	49.16	79.35	0.62	17	67.12	91.30	0.39	27	65.12	81.32	0.39
8	49.09	83.33	0.62	18	69.12	91.30	0.37	28	67.12	81.32	0.39
9	49.06	87.34	0.62	19	71.12	91.30	0.33	29	69.12	81.32	0.40
10	49.12	91.32	0.62	20	73.12	91.30	0.29	30	71.12	81.32	0.38
				probe							
				0	58.12	87.35					
				1	64.12	87.35					
Table M3											
Structure 2 Gauge Arrangement 3											
				R3				L3			
Gauges	x, ft	y, ft	z, ft	Gauges	x, ft	y, ft	z, ft	Gauges	x, ft	y, ft	z, ft
1	36.57	83.42	1.05	11	57.11	93.31	0.47	21	53.12	83.33	0.52
2	35.61	81.70	1.05	12	59.11	93.31	0.44	22	55.12	83.33	0.50
3	34.66	79.98	1.05	13	61.11	93.31	0.41	23	57.12	83.33	0.47
4	33.70	78.20	1.05	14	63.11	93.31	0.38	24	59.12	83.33	0.44
5	32.78	76.41	1.05	15	65.11	93.31	0.36	25	61.12	83.33	0.41
6	49.09	75.33	0.62	16	67.11	93.31	0.33	26	63.12	83.33	0.39
7	49.16	79.35	0.62	17	69.11	93.31	0.28	27	65.12	83.33	0.39
8	49.09	83.33	0.62	18	71.11	93.31	0.25	28	67.12	83.33	0.39
9	49.06	87.34	0.62	19	73.11	93.31	0.21	29	69.12	83.33	0.39
10	49.12	91.32	0.50	20	75.11	93.31	0.55	30	71.12	83.33	0.39
				probe							
				0	60.12	87.35					
				1	66.12	87.35					

Table M4											
Structure 2 Gauge Arrangement 4											
				R4				L4			
Gauges	x, ft	y, ft	z, ft	Gauges	x, ft	y, ft	z, ft	Gauges	x, ft	y, ft	z, ft
1	36.57	83.42	1.05	11	59.12	95.32	0.47	21	53.12	85.30	0.54
2	35.61	81.70	1.05	12	61.12	95.32	0.44	22	55.12	85.30	0.51
3	34.66	79.98	1.05	13	63.12	95.32	0.41	23	57.12	85.30	0.49
4	33.70	78.20	1.05	14	65.12	95.32	0.37	24	59.12	85.30	0.46
5	32.78	76.41	1.05	15	67.12	95.32	0.33	25	61.12	85.30	0.43
6	49.09	75.33	0.62	16	69.12	95.32	0.30	26	63.12	85.30	0.40
7	49.16	79.35	0.62	17	71.12	95.32	0.25	27	65.12	85.30	0.38
8	49.09	83.33	0.62	18	73.12	95.32	0.22	28	67.12	85.30	0.39
9	49.06	87.34	0.62	19	75.12	95.32	0.20	29	69.12	85.30	0.39
10	49.12	91.32	0.62	20	77.12	95.32	0.16	30	71.12	85.30	0.39
				probe							
				0	62.12	87.35					
				1	68.12	87.35					
Table M5											
Structure 2 Gauge Arrangement 5											
				R5				L5			
Gauges	x, ft	y, ft	z, ft	Gauges	x, ft	y, ft	z, ft	Gauges	x, ft	y, ft	z, ft
1	36.57	83.42	1.05	11	61.13	97.30	0.45	21	53.12	89.31	0.54
2	35.61	81.70	1.05	12	63.13	97.30	0.41	22	55.12	89.31	0.53
3	34.66	79.98	1.05	13	65.13	97.30	0.37	23	57.12	89.31	0.50
4	33.70	78.20	1.05	14	67.13	97.30	0.34	24	59.12	89.31	0.46
5	32.78	76.41	1.05	15	69.13	97.30	0.31	25	61.12	89.31	0.44
6	49.09	75.33	0.62	16	71.13	97.30	0.26	26	63.12	89.31	0.41
7	49.16	79.35	0.62	17	73.13	97.30	0.24	27	65.12	89.31	0.39
8	49.09	83.33	0.62	18	75.13	97.30	0.20	28	67.12	89.31	0.40
9	49.06	87.34	0.62	19	77.13	97.30	0.16	29	69.12	89.31	0.40
10	49.12	91.32	0.62	20	79.13	97.30	0.16	30	71.12	89.31	0.39
				probe							
				0	64.13	87.35					
				1	70.13	87.35					

Table M6											
Structure 2 Dogleg Jetty Coordinates											
Starting point is seaward tip of dogleg jetty, (refer to Figure 8)											
x, ft	y, ft										
51.12	87.13										
53.12	89.13										
55.12	91.30										
57.11	93.31										
59.12	95.13										
61.13	97.30										
63.13	99.30										
65.13	99.30										
67.13	99.30										
69.13	99.30										
71.13	99.30										
73.13	99.30										
75.13	99.30										
77.13	99.30										
80.13	99.30										

Appendix N
Location of Structure 3 Wave Gauges

Tables N1 through N4 list the location and depths, in feet, of the gauges placed in the physical model for Structure 3 wave runs. The rack housing gauges 11-20 is referenced by the letter L, and R denotes the rack that holds wave gauges 21-30. To convert measurements given in feet to meters, multiply by 0.3048.

Table N1											
Structure 3 Gauge Arrangement 1											
				L1				R1			
Gauges	x, ft	y, ft	z, ft	Gauges	x, ft	y, ft	z, ft	Gauges	x, ft	y, ft	z, ft
1	35.06	91.64	1.05	11	99.06	77.36	0.50	21	93.04	85.30	0.59
2	35.06	87.65	1.05	12	101.06	77.36	0.50	22	95.04	85.30	0.59
3	35.06	83.65	1.05	13	103.06	77.36	0.50	23	97.04	85.30	0.58
4	35.06	79.65	1.05	14	105.06	77.36	0.49	24	99.04	85.30	0.49
5	35.06	75.65	1.05	15	107.06	77.36	0.50	25	101.04	85.30	0.49
6	65.06	85.32	0.63	16	109.06	77.36	0.49	26	103.04	85.30	0.50
7	73.06	85.32	0.62	17	111.06	77.36	0.50	27	105.04	85.30	0.49
8	89.06	87.30	0.50	18	113.06	77.36	0.50	28	107.04	85.30	0.49
9	89.06	85.35	0.60	19	115.06	77.36	0.49	29	109.04	85.30	0.49
10	89.06	83.33	0.50	20	117.06	77.36	0.49	30	111.04	85.30	0.50
probe				probe							
3	91.02	83.28		0	100.07	77.39					
2	90.99	85.32		1	106.05	77.37					
Table N2											
Structure 3 Gauge Arrangement 2											
				L2				R2			
Gauges	x, ft	y, ft	z, ft	Gauges	x, ft	y, ft	z, ft	Gauges	x, ft	y, ft	z, ft
1	35.06	91.64	1.05	11	99.02	75.34	0.47	21	93.04	83.35	0.48
2	35.06	87.65	1.05	12	101.02	75.34	0.50	22	95.04	83.35	0.50
3	35.06	83.65	1.05	13	103.02	75.34	0.50	23	97.04	83.35	0.49
4	35.06	79.65	1.05	14	105.02	75.34	0.49	24	99.04	83.35	0.49
5	35.06	75.65	1.05	15	107.02	75.34	0.50	25	101.04	83.35	0.49
6	65.06	85.32	0.63	16	109.02	75.34	0.50	26	103.04	83.35	0.49
7	73.06	85.32	0.62	17	111.02	75.34	0.49	27	105.04	83.35	0.49
8	89.06	87.30	0.50	18	113.02	75.34	0.49	28	107.04	83.35	0.50
9	89.06	85.35	0.60	19	115.02	75.34	0.48	29	109.04	83.35	0.48
10	89.06	83.33	0.50	20	117.02	75.34	0.48	30	111.04	83.35	0.49
probe				probe							
3	91.02	83.28		0	100.02	75.39					
2	90.99	85.32		1	106.02	75.39					

Table N3											
Structure 3 Gauge Arrangement 3											
				L3				R3			
Gauges	x, ft	y, ft	z, ft	Gauges	x, ft	y, ft	z, ft	Gauges	x, ft	y, ft	z, ft
1	35.06	91.64	1.05	11	99.05	73.35	0.48	21	95.04	81.36	0.38
2	35.06	87.65	1.05	12	101.05	73.35	0.49	22	97.04	81.36	0.34
3	35.06	83.65	1.05	13	103.05	73.35	0.50	23	99.04	81.36	0.45
4	35.06	79.65	1.05	14	105.05	73.35	0.49	24	101.04	81.36	0.50
5	35.06	75.65	1.05	15	107.05	73.35	0.50	25	103.04	81.36	0.49
6	65.06	85.32	0.63	16	109.05	73.35	0.50	26	105.04	81.36	0.49
7	73.06	85.32	0.62	17	111.05	73.35	0.49	27	107.04	81.36	0.49
8	89.06	87.30	0.50	18	113.05	73.35	0.49	28	109.04	81.36	0.50
9	89.06	85.35	0.60	19	115.05	73.35	0.48	29	111.04	81.36	0.50
10	89.06	83.33	0.50	20	117.05	73.35	0.48	30	113.04	81.36	0.50
probe				probe							
3	91.02	83.28		0	100.05	73.39					
2	90.99	85.32		1	106.05	73.39					
Table N4											
Structure 3 Gauge Arrangement 4											
				L4				R4			
Gauges	x, ft	y, ft	z, ft	Gauges	x, ft	y, ft	z, ft	Gauges	x, ft	y, ft	z, ft
1	35.06	91.64	1.05	11	99.05	71.36	0.46	21	97.03	79.32	0.50
2	35.06	87.65	1.05	12	101.05	71.36	0.50	22	99.03	79.32	0.50
3	35.06	83.65	1.05	13	103.05	71.36	0.50	23	101.03	79.32	0.49
4	35.06	79.65	1.05	14	105.05	71.36	0.49	24	103.03	79.32	0.49
5	35.06	75.65	1.05	15	107.05	71.36	0.50	25	105.03	79.32	0.48
6	65.06	85.32	0.63	16	109.05	71.36	0.50	26	107.03	79.32	0.50
7	73.06	85.32	0.62	17	111.05	71.36	0.50	27	109.03	79.32	0.50
8	89.06	87.30	0.50	18	113.05	71.36	0.48	28	111.03	79.32	0.50
9	89.06	85.35	0.60	19	115.05	71.36	0.48	29	113.03	79.32	0.49
10	89.06	83.33	0.50	20	117.05	71.36	0.48	30	115.03	79.32	0.49
probe				probe							
3	91.02	83.28		0	100.05	71.36					
2	90.99	85.32		1	106.05	71.36					

Appendix O
Location of Structure 4 Wave Gauges

Tables O1 through O4 list the location and depths, in feet, of the gauges placed in the physical model for Structure 4 wave runs. Table O5 contains the x- and y-coordinates in feet for the parallel jetty structure used in this model configuration. The rack housing gauges 11-20 is referenced by the letter L, and R denotes the rack that holds wave gauges 21-30. To convert measurements given in feet to meters, multiply by 0.3048.

Table O1											
Structure 4 Gauge Arrangement 1											
				L1				R1			
Gauges	x, ft	y, ft	z, ft	Gauges	x, ft	y, ft	z, ft	Gauges	x, ft	y, ft	z, ft
1	35.06	91.64	1.05	11	99.06	77.36	0.50	21	93.04	85.30	0.59
2	35.06	87.65	1.05	12	101.06	77.36	0.50	22	95.04	85.30	0.59
3	35.06	83.65	1.05	13	103.06	77.36	0.50	23	97.04	85.30	0.58
4	35.06	79.65	1.05	14	105.06	77.36	0.49	24	99.04	85.30	0.49
5	35.06	75.65	1.05	15	107.06	77.36	0.50	25	101.04	85.30	0.49
6	65.06	85.32	0.63	16	109.06	77.36	0.49	26	103.04	85.30	0.50
7	73.06	85.32	0.62	17	111.06	77.36	0.50	27	105.04	85.30	0.49
8	89.06	87.30	0.50	18	113.06	77.36	0.50	28	107.04	85.30	0.49
9	89.06	85.35	0.60	19	115.06	77.36	0.49	29	109.04	85.30	0.49
10	89.06	83.33	0.50	20	117.06	77.36	0.49	30	111.04	85.30	0.50
probe				probe							
3	91.02	83.28		0	100.07	77.39					
2	90.99	85.32		1	106.05	77.37					
Table O2											
Structure 4 Gauge Arrangement 2											
				L2				R2			
Gauges	x, ft	y, ft	z, ft	Gauges	x, ft	y, ft	z, ft	Gauges	x, ft	y, ft	z, ft
1	35.06	91.64	1.05	11	99.02	75.34	0.47	21	93.04	83.35	0.48
2	35.06	87.65	1.05	12	101.02	75.34	0.50	22	95.04	83.35	0.50
3	35.06	83.65	1.05	13	103.02	75.34	0.50	23	97.04	83.35	0.49
4	35.06	79.65	1.05	14	105.02	75.34	0.49	24	99.04	83.35	0.49
5	35.06	75.65	1.05	15	107.02	75.34	0.50	25	101.04	83.35	0.49
6	65.06	85.32	0.63	16	109.02	75.34	0.50	26	103.04	83.35	0.49
7	73.06	85.32	0.62	17	111.02	75.34	0.49	27	105.04	83.35	0.49
8	89.06	87.30	0.50	18	113.02	75.34	0.49	28	107.04	83.35	0.50
9	89.06	85.35	0.60	19	115.02	75.34	0.48	29	109.04	83.35	0.48
10	89.06	83.33	0.50	20	117.02	75.34	0.48	30	111.04	83.35	0.49
probe				probe							
3	91.02	83.28		0	100.02	75.39					
2	90.99	85.32		1	106.02	75.39					

Table O3											
Structure 4 Gauge Arrangement 3											
				L3				R3			
Gauges	x, ft	y, ft	z, ft	Gauges	x, ft	y, ft	z, ft	Gauges	x, ft	y, ft	z, ft
1	35.06	91.64	1.05	11	99.05	73.35	0.48	21	95.04	81.36	0.38
2	35.06	87.65	1.05	12	101.05	73.35	0.49	22	97.04	81.36	0.34
3	35.06	83.65	1.05	13	103.05	73.35	0.50	23	99.04	81.36	0.45
4	35.06	79.65	1.05	14	105.05	73.35	0.49	24	101.04	81.36	0.50
5	35.06	75.65	1.05	15	107.05	73.35	0.50	25	103.04	81.36	0.49
6	65.06	85.32	0.63	16	109.05	73.35	0.50	26	105.04	81.36	0.49
7	73.06	85.32	0.62	17	111.05	73.35	0.49	27	107.04	81.36	0.49
8	89.06	87.30	0.50	18	113.05	73.35	0.49	28	109.04	81.36	0.50
9	89.06	85.35	0.60	19	115.05	73.35	0.48	29	111.04	81.36	0.50
10	89.06	83.33	0.50	20	117.05	73.35	0.48	30	113.04	81.36	0.50
probe				probe							
3	91.02	83.28		0	100.05	73.39					
2	90.99	85.32		1	106.05	73.39					
Table O4											
Structure 4 Gauge Arrangement 4											
				L4				R4			
Gauges	x, ft	y, ft	z, ft	Gauges	x, ft	y, ft	z, ft	Gauges	x, ft	y, ft	z, ft
1	35.06	91.64	1.05	11	99.05	71.36	0.46	21	97.03	79.32	0.50
2	35.06	87.65	1.05	12	101.05	71.36	0.50	22	99.03	79.32	0.50
3	35.06	83.65	1.05	13	103.05	71.36	0.50	23	101.03	79.32	0.49
4	35.06	79.65	1.05	14	105.05	71.36	0.49	24	103.03	79.32	0.49
5	35.06	75.65	1.05	15	107.05	71.36	0.50	25	105.03	79.32	0.48
6	65.06	85.32	0.63	16	109.05	71.36	0.50	26	107.03	79.32	0.50
7	73.06	85.32	0.62	17	111.05	71.36	0.50	27	109.03	79.32	0.50
8	89.06	87.30	0.50	18	113.05	71.36	0.48	28	111.03	79.32	0.50
9	89.06	85.35	0.60	19	115.05	71.36	0.48	29	113.03	79.32	0.49
10	89.06	83.33	0.50	20	117.05	71.36	0.48	30	115.03	79.32	0.49
probe				probe							
3	91.02	83.28		0	100.05	71.36					
2	90.99	85.32		1	106.05	71.36					

Table O5										
Structure 4 Parallel Jetty Coordinates										
Starting point is seaward tip of left jetty						Starting point is seaward tip of left jetty				
(refer to Figure 12)						(refer to Figure 12)				
x, ft	y, ft					x, ft	y, ft			
73.06	89.30					73.06	81.33			
75.06	89.30					75.06	81.33			
77.06	89.30					77.06	81.33			
79.06	89.30					79.06	81.33			
81.06	89.30					81.06	81.33			
83.06	89.30					83.06	81.33			
85.06	89.30					85.06	81.33			
87.06	89.30					87.06	81.33			
89.06	89.30					89.06	81.33			

Appendix P
ADV and CIIS Measurement Comparison: Structure 1

This appendix presents plots and tables of normalized spectral energy density versus frequency $S(f)_n$ and vector-mean wave direction versus frequency $\theta_m(f)$ for collocated Coastal Inlets Imaging system (CIIS) and Accoustic Doppler Velocimeter (ADV) measurements for Structure 1, Experiments 4 through 6. $S(f)$ is normalized by the maximum value of the variance spectrum for a given experiment and sensor. Tick ("+") marks on wave direction curves represent CIIS measurements that meet the coherence cutoff criterion discussed in Chapter 5.

Plot and table titles include 6-digit strings that indicate structure (characters 1-2), experiment (characters 3-4), and gauge arrangement (characters 5-6). For example, S1X4G1 represents Structure 1, Experiment 4, Gauge Arrangement 1. The legend of each plot indicates ADV probe identification number and camera identification number.

Table P1
Nomenclature

Alongshore	Y-axis of model coordinate system
Cross-shore	X-axis of model coordinate system
NaN	Not a number
I	Pixel intensity
f	Frequency (Hz)
$S(f)$	Mean spectral density as a function of frequency presented in units of m^2/Hz for ADV and I^2/Hz for CIIS
$S(f)_n$	Normalized mean spectral density as a function of frequency presented in units of m^2/Hz for ADV and I^2/Hz for CIIS . Normalized by maximum $S(f)$.
$\theta_m(f)$	Vector-mean wave direction as a function of frequency presented in units of deg relative to model coordinate system
$\theta_m(f)_C$	Vector-mean wave direction as a function of frequency presented in units of deg relative to model coordinate system following application of coherence cutoff criteria. Values of not meeting the cutoff criterion are presented as NaN values (i.e., not-a-number).

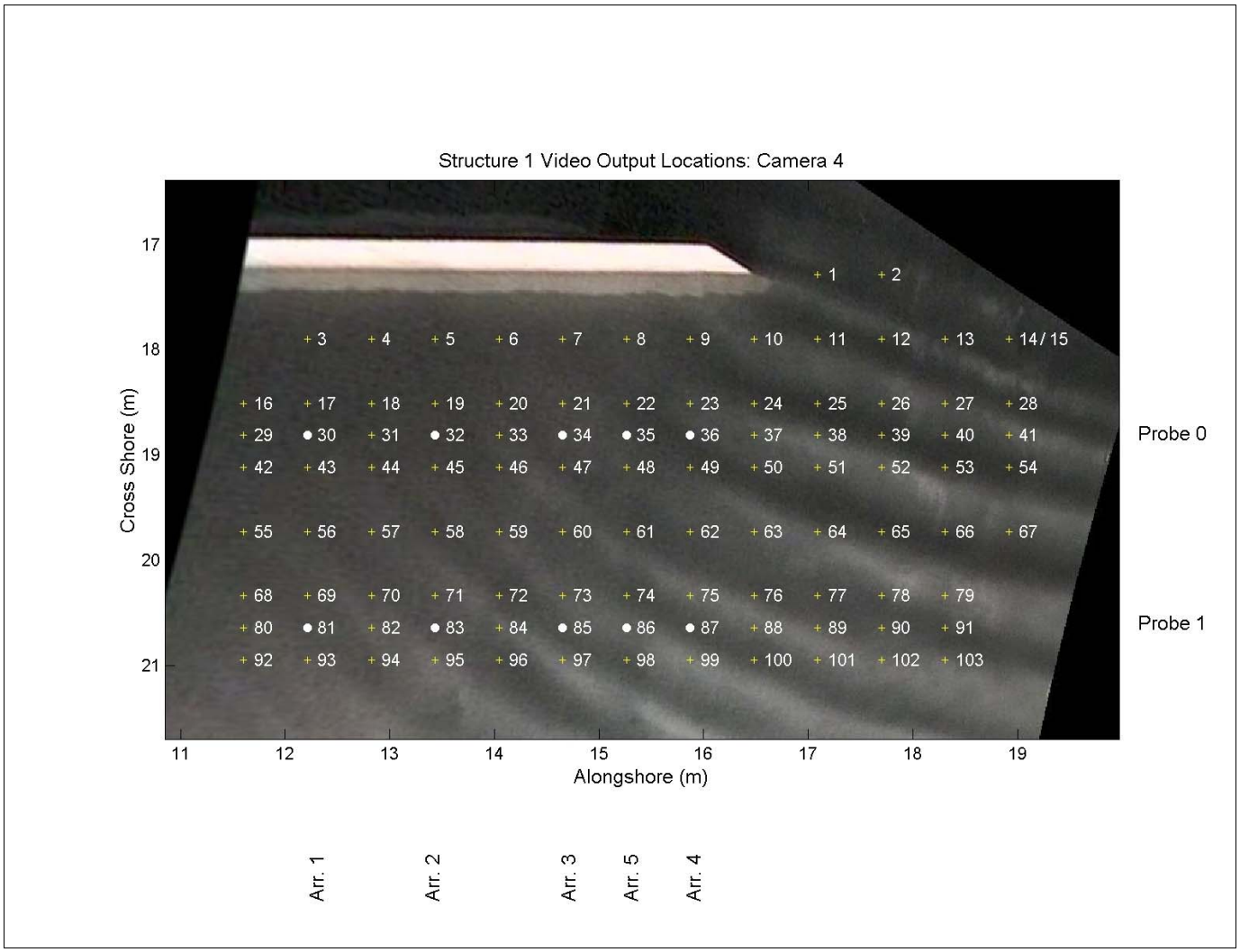


Figure P1. Structure 1, Camera 4 and ADV measurement locations. CIIS output locations indicated by "+". ADV locations for probe arrangements 1 through 5 indicated by circles

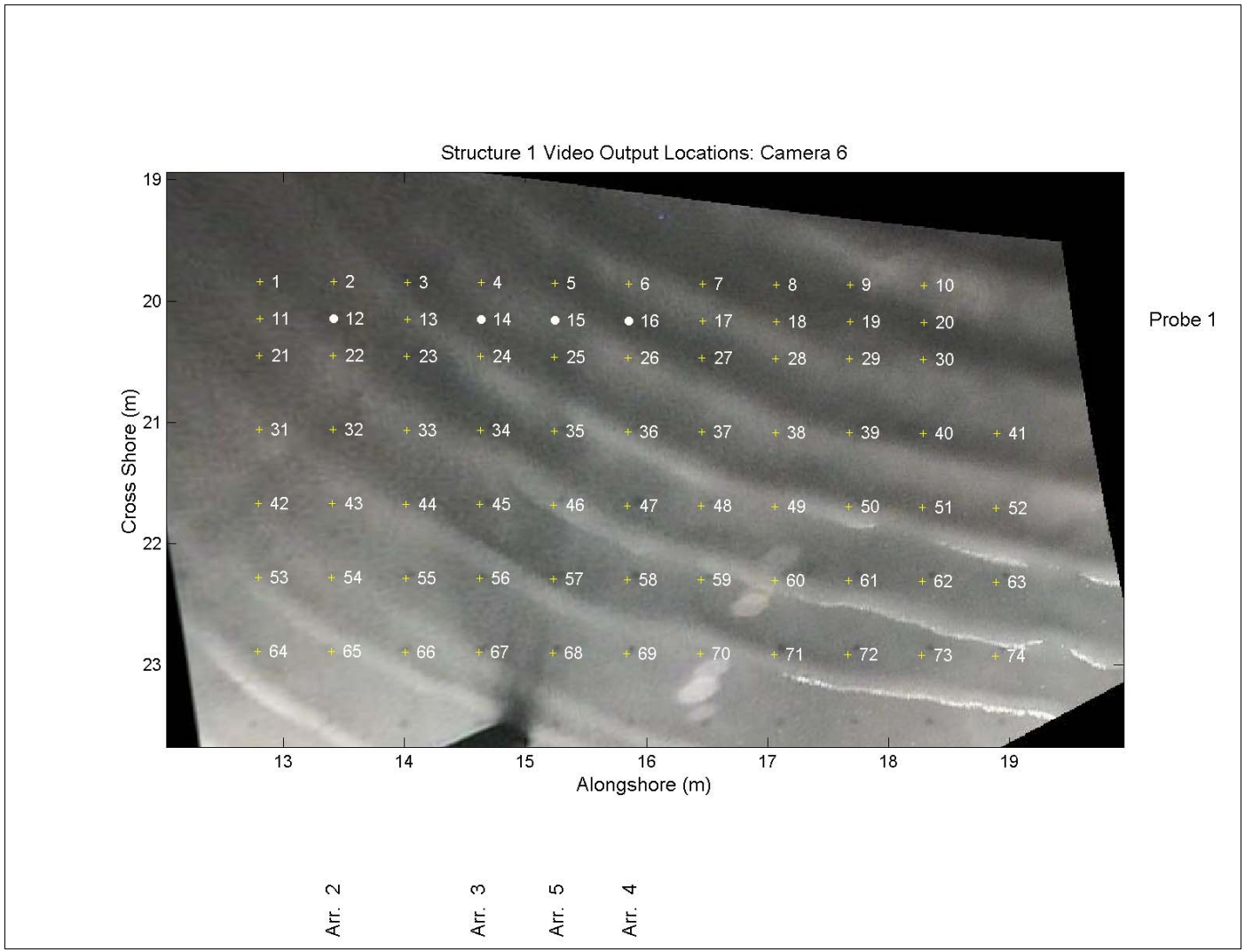
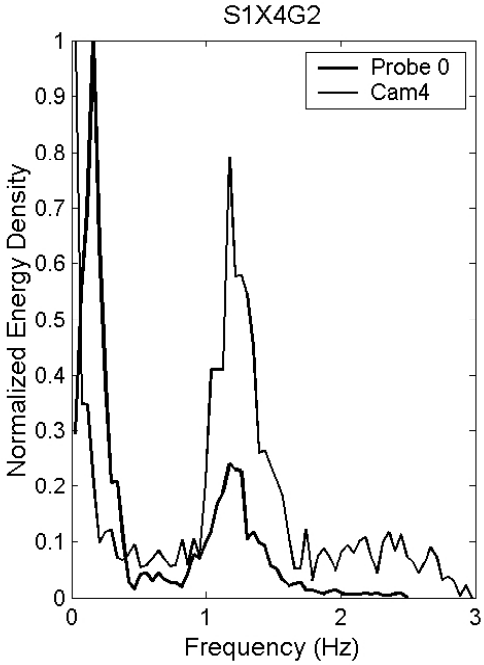
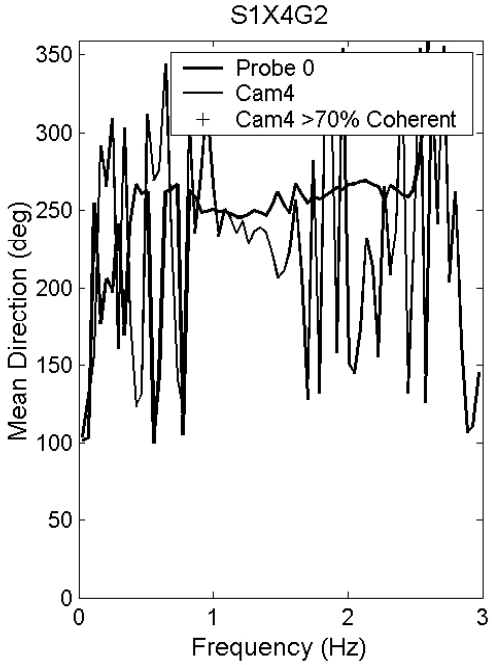
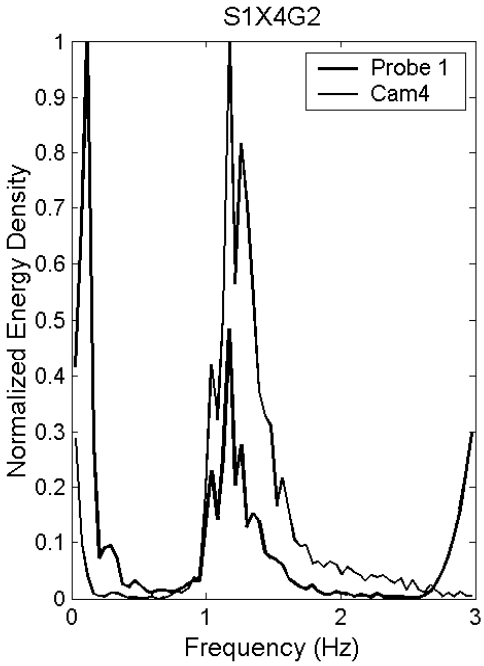
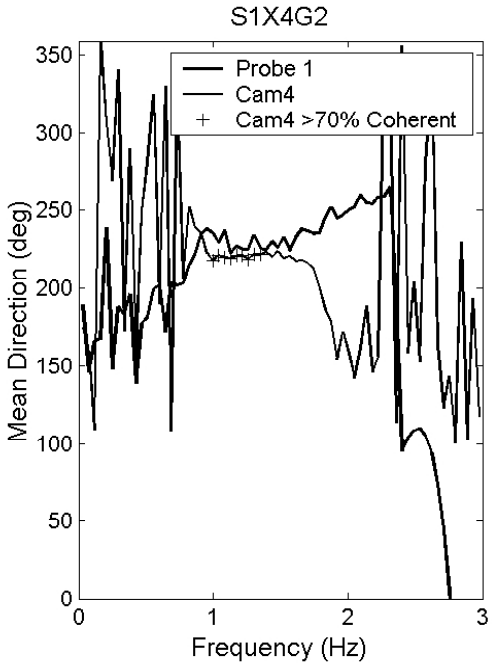


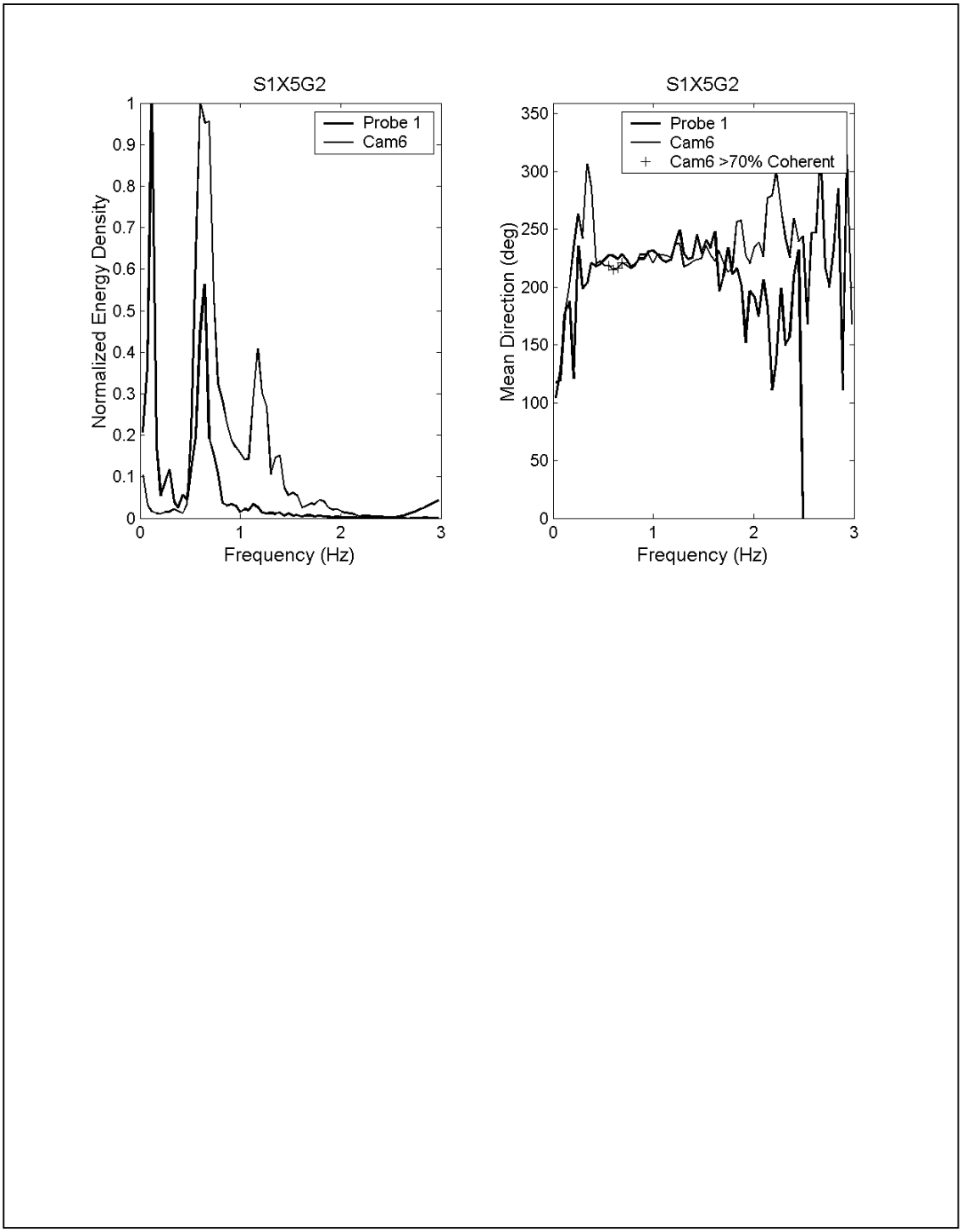
Figure P2. Structure 1, Camera 6 and ADV measurement locations. CIIS output locations indicated by "+". ADV locations for probe arrangements 2 through 5 indicated by circles

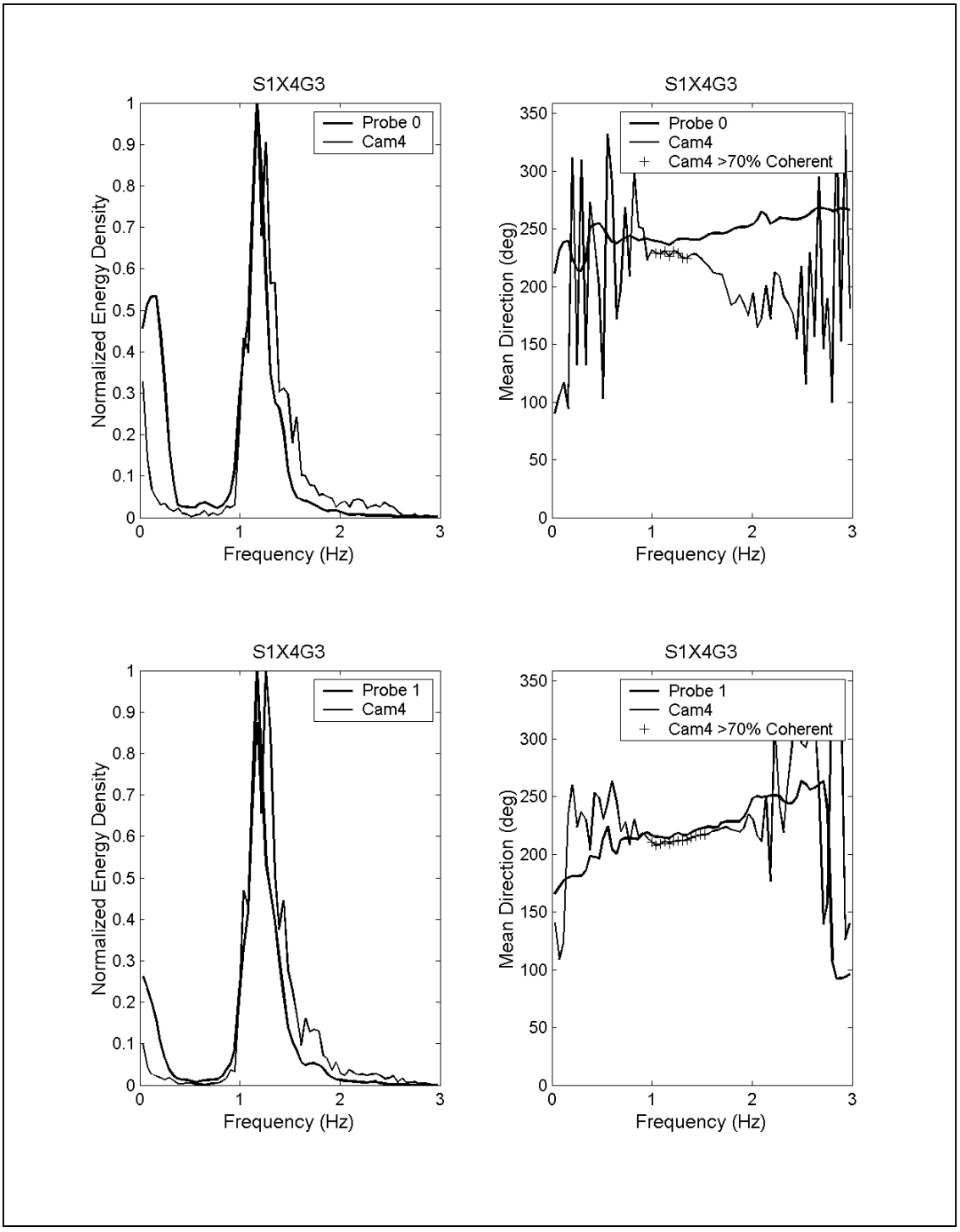

S1X4G2
Probe 0
Cam4
Normalized Energy Density
Frequency (Hz)

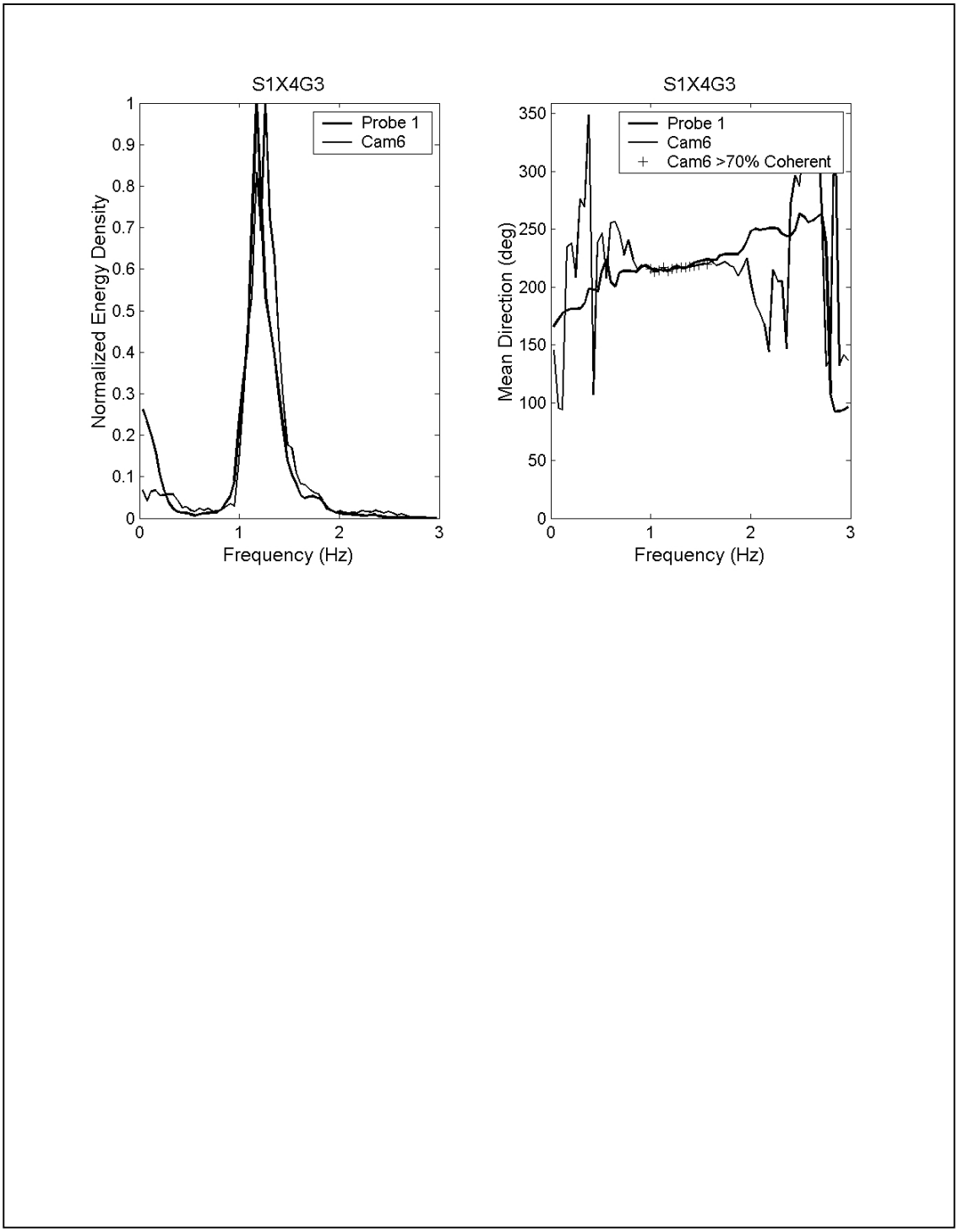

S1X4G2
Probe 0
Cam4
Cam4 >70% Coherent
Mean Direction (deg)
Frequency (Hz)

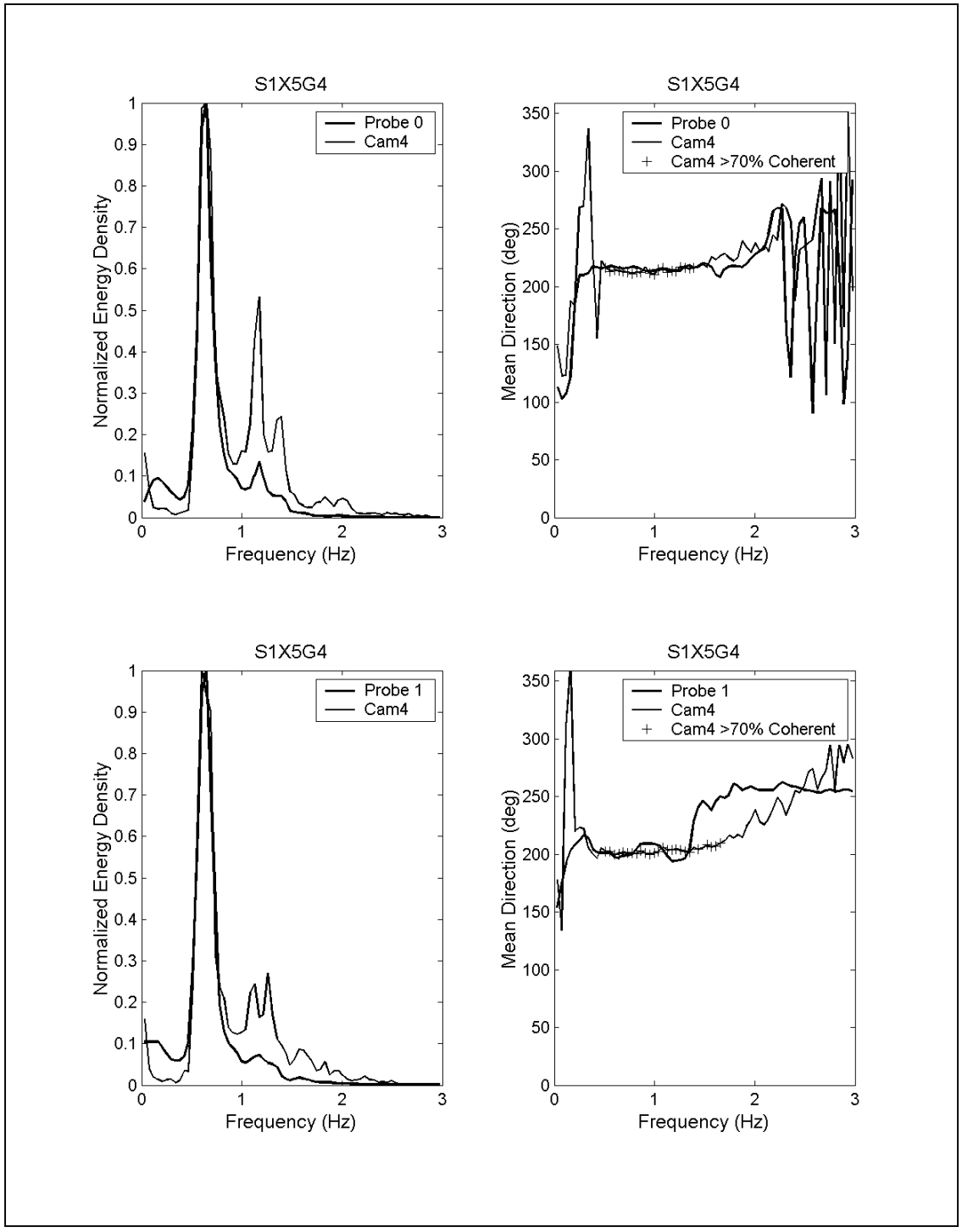

S1X4G2
Probe 1
Cam4
Normalized Energy Density
Frequency (Hz)

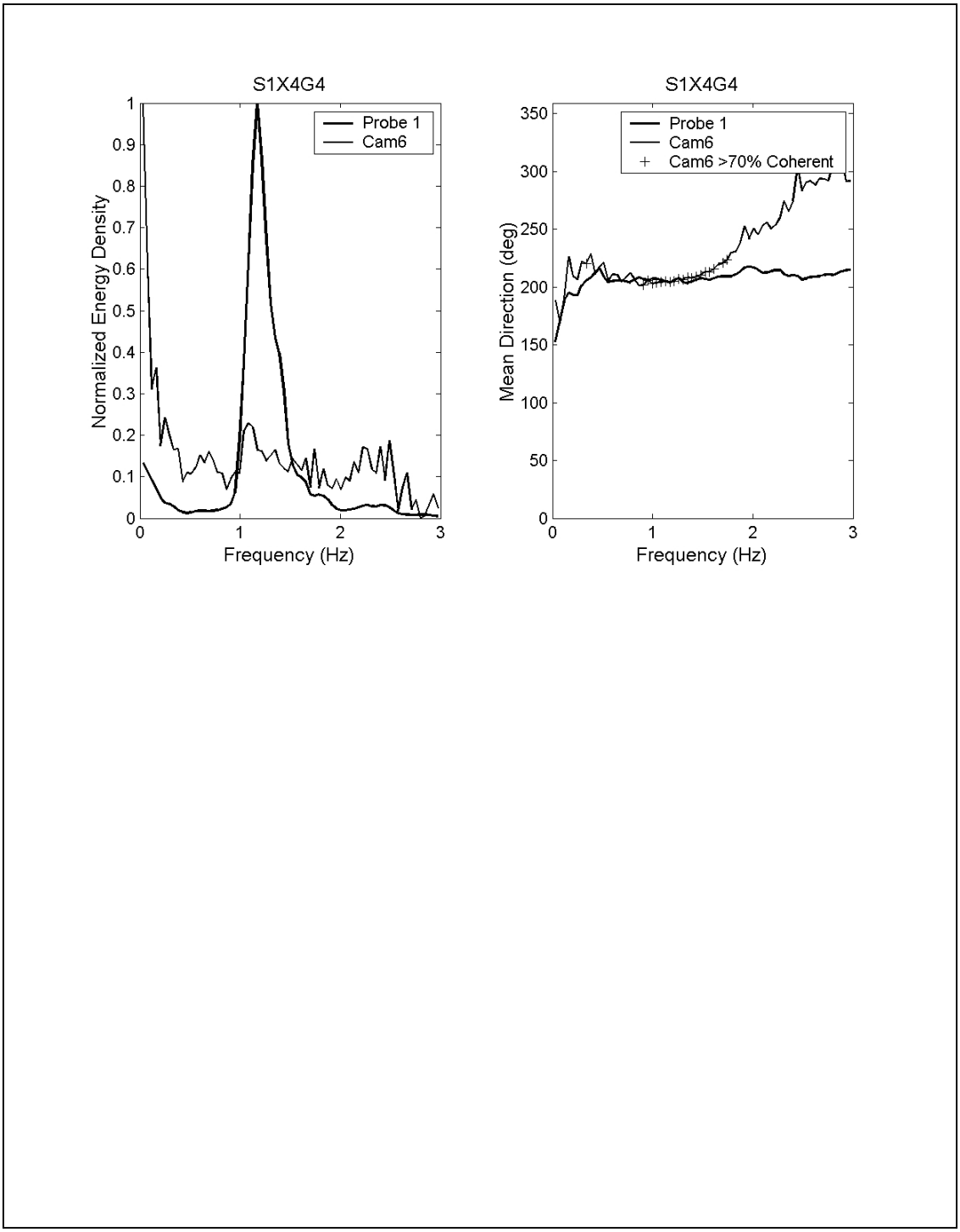

S1X4G2
Probe 1
Cam4
Cam4 >70% Coherent
Mean Direction (deg)
Frequency (Hz)

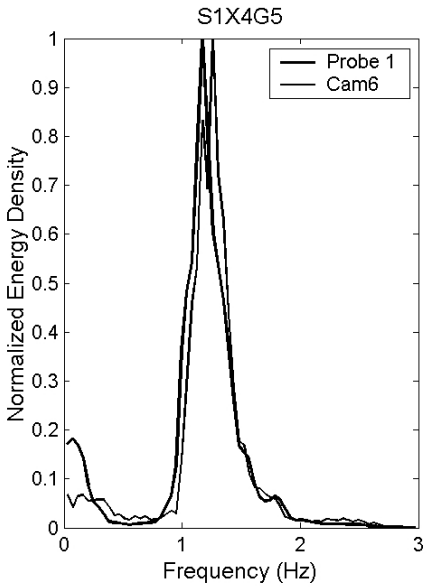

S1X5G2
Probe 1
Cam6
Normalized Energy Density
Frequency (Hz)
S1X5G2
Probe 1
Cam6
Cam6 >70% Coherent
Mean Direction (deg)
Frequency (Hz)

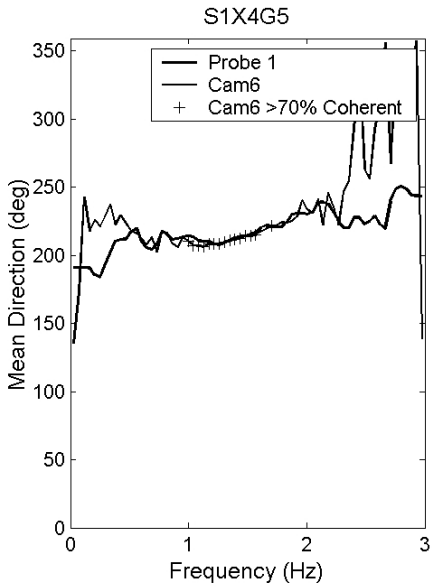

S1X4G3
Probe 0
Cam4
Normalized Energy Density
Frequency (Hz)
S1X4G3
Probe 0
Cam4
Cam4 >70% Coherent
Mean Direction (deg)
Frequency (Hz)
S1X4G3
Probe 1
Cam4
Normalized Energy Density
Frequency (Hz)
S1X4G3
Probe 1
Cam4
Cam4 >70% Coherent
Mean Direction (deg)
Frequency (Hz)

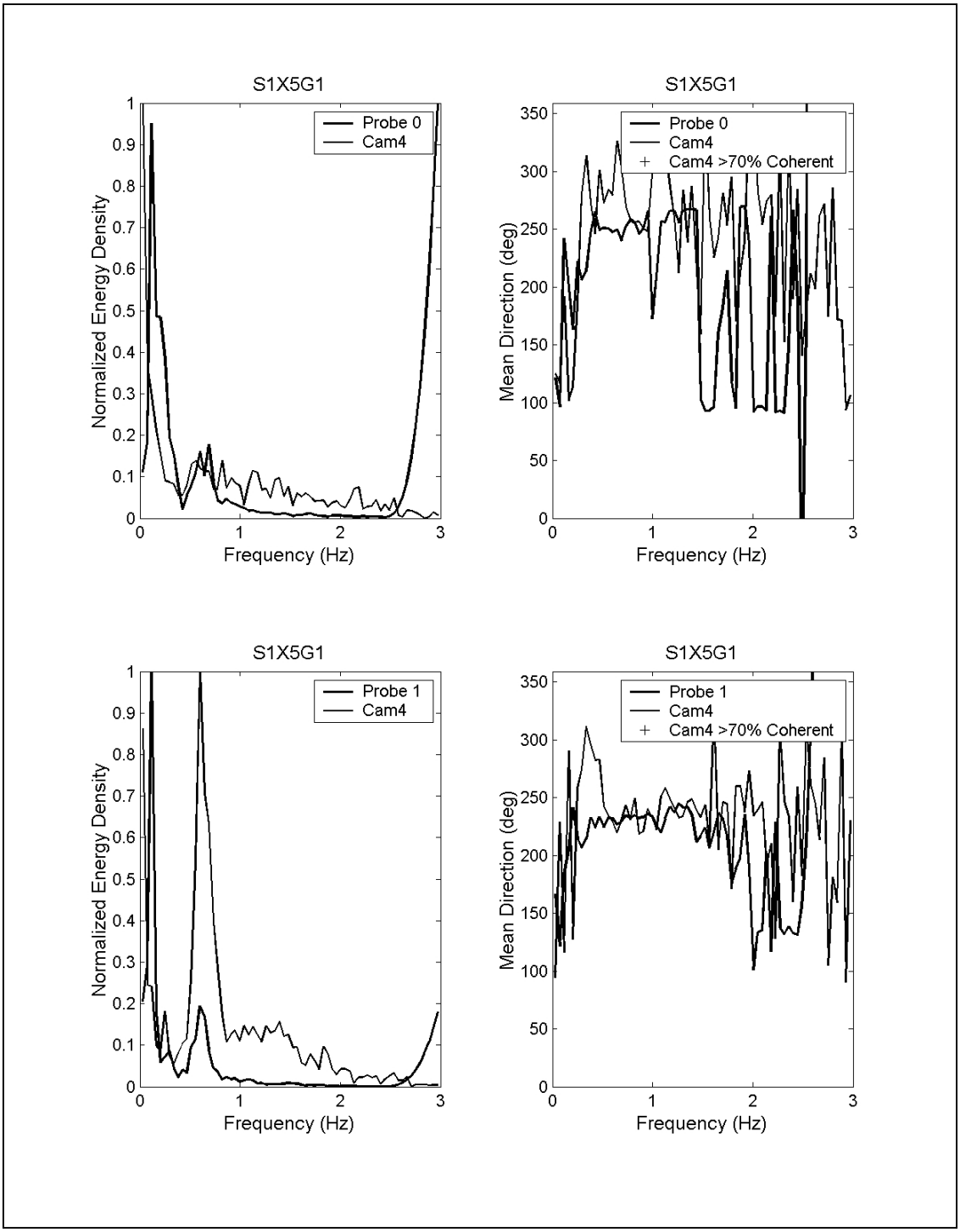

S1X4G3
Probe 1
Cam6
Normalized Energy Density
Frequency (Hz)
S1X4G3
Probe 1
Cam6
Cam6 >70% Coherent
Mean Direction (deg)
Frequency (Hz)

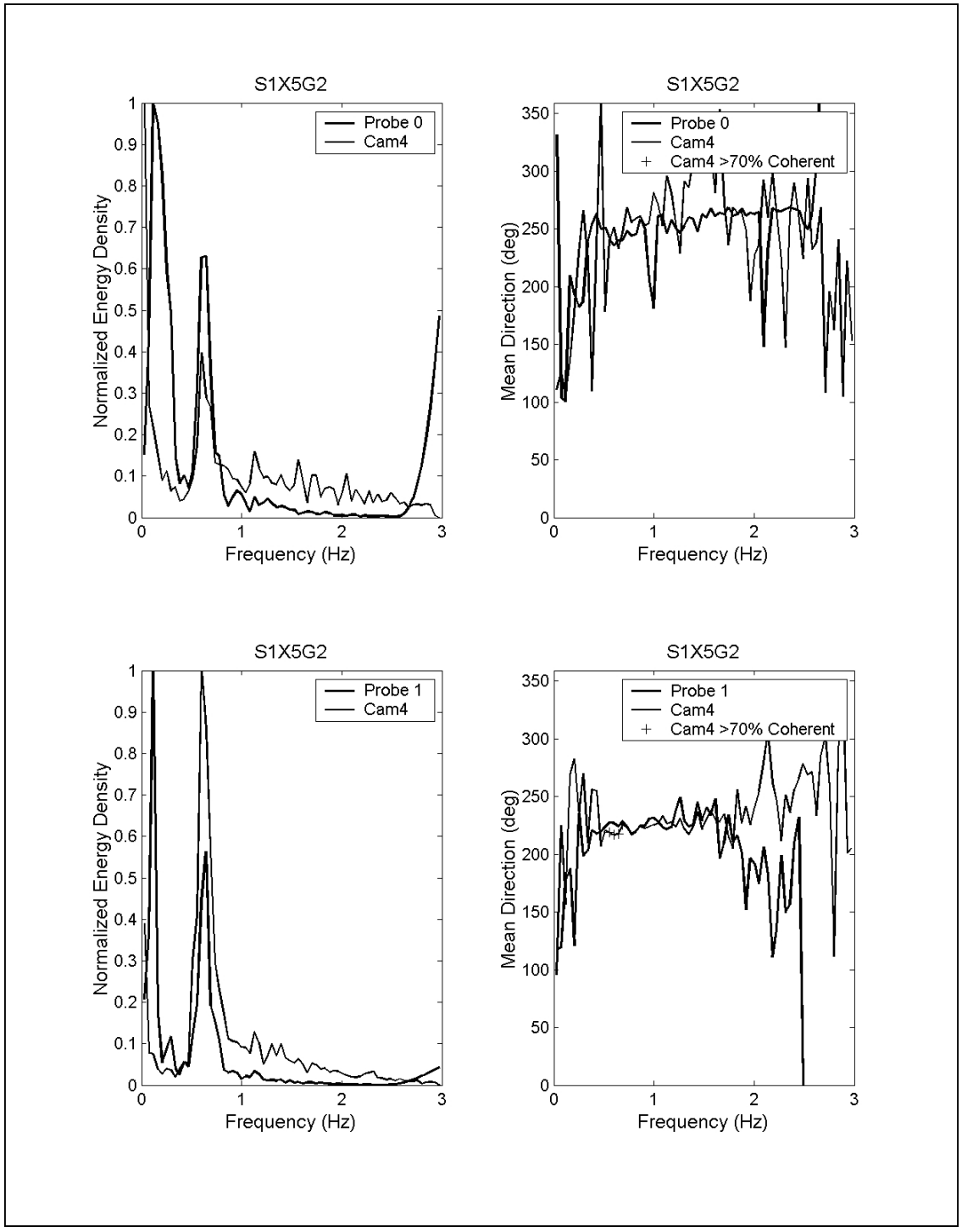

S1X5G4
Probe 0
Cam4
Normalized Energy Density
Frequency (Hz)
S1X5G4
Probe 0
Cam4
Cam4 >70% Coherent
Mean Direction (deg)
Frequency (Hz)
S1X5G4
Probe 1
Cam4
Normalized Energy Density
Frequency (Hz)
S1X5G4
Probe 1
Cam4
Cam4 >70% Coherent
Mean Direction (deg)
Frequency (Hz)

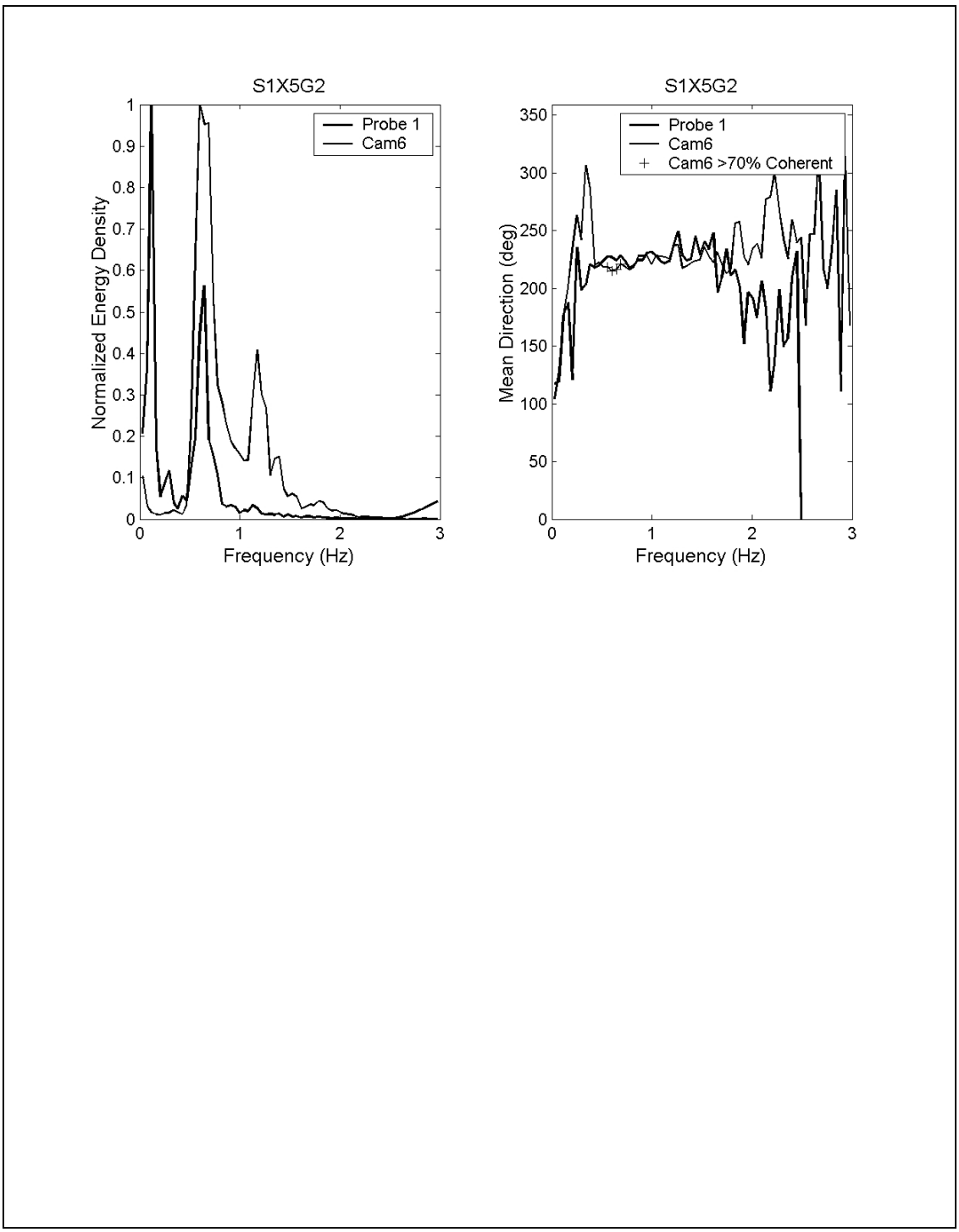

S1X4G4
Probe 1
Cam6
Normalized Energy Density
Frequency (Hz)
S1X4G4
Probe 1
Cam6
Cam6 >70% Coherent
Mean Direction (deg)
Frequency (Hz)

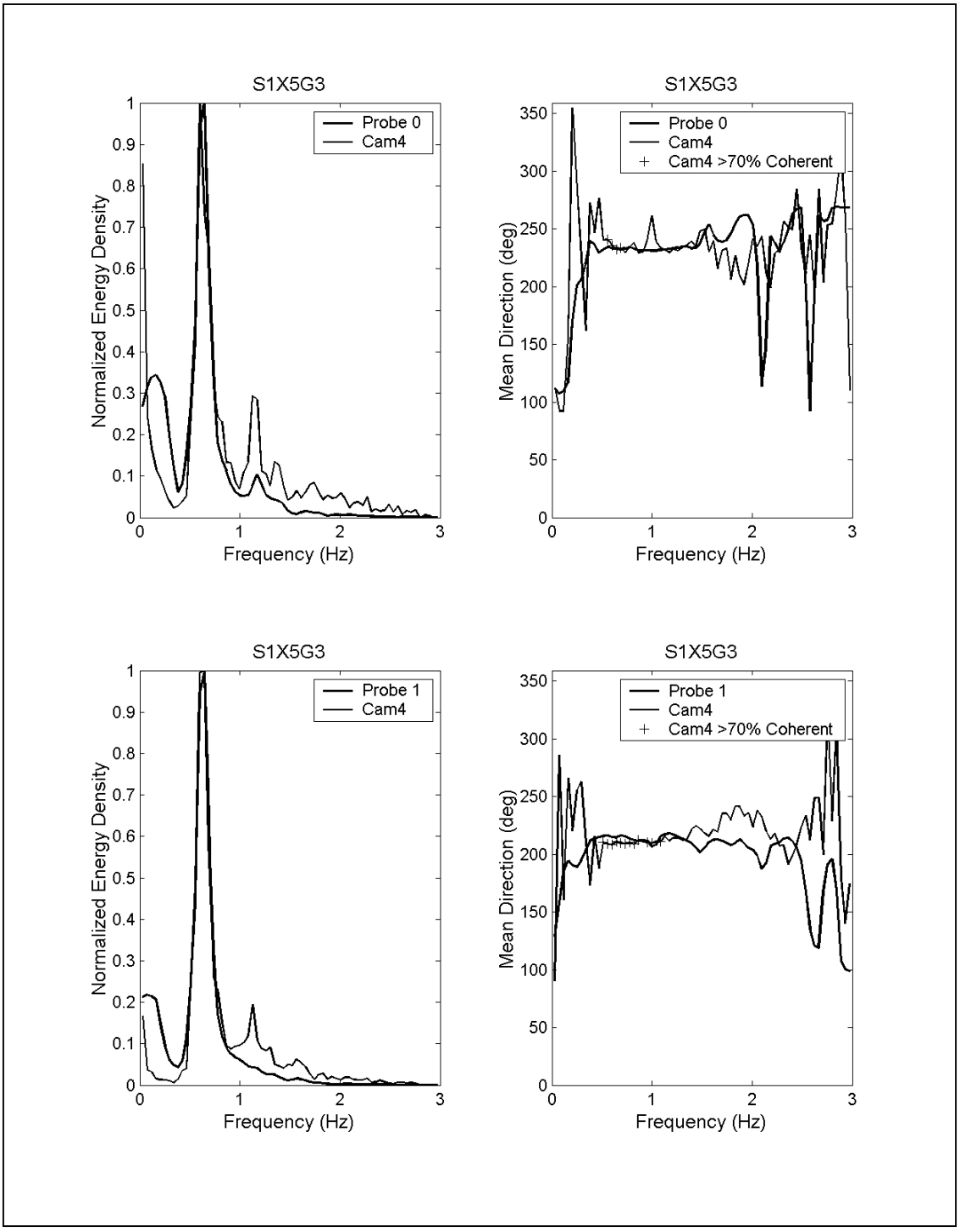

S1X4G5
Probe 1
Cam6
Normalized Energy Density
Frequency (Hz)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0
1
2
3

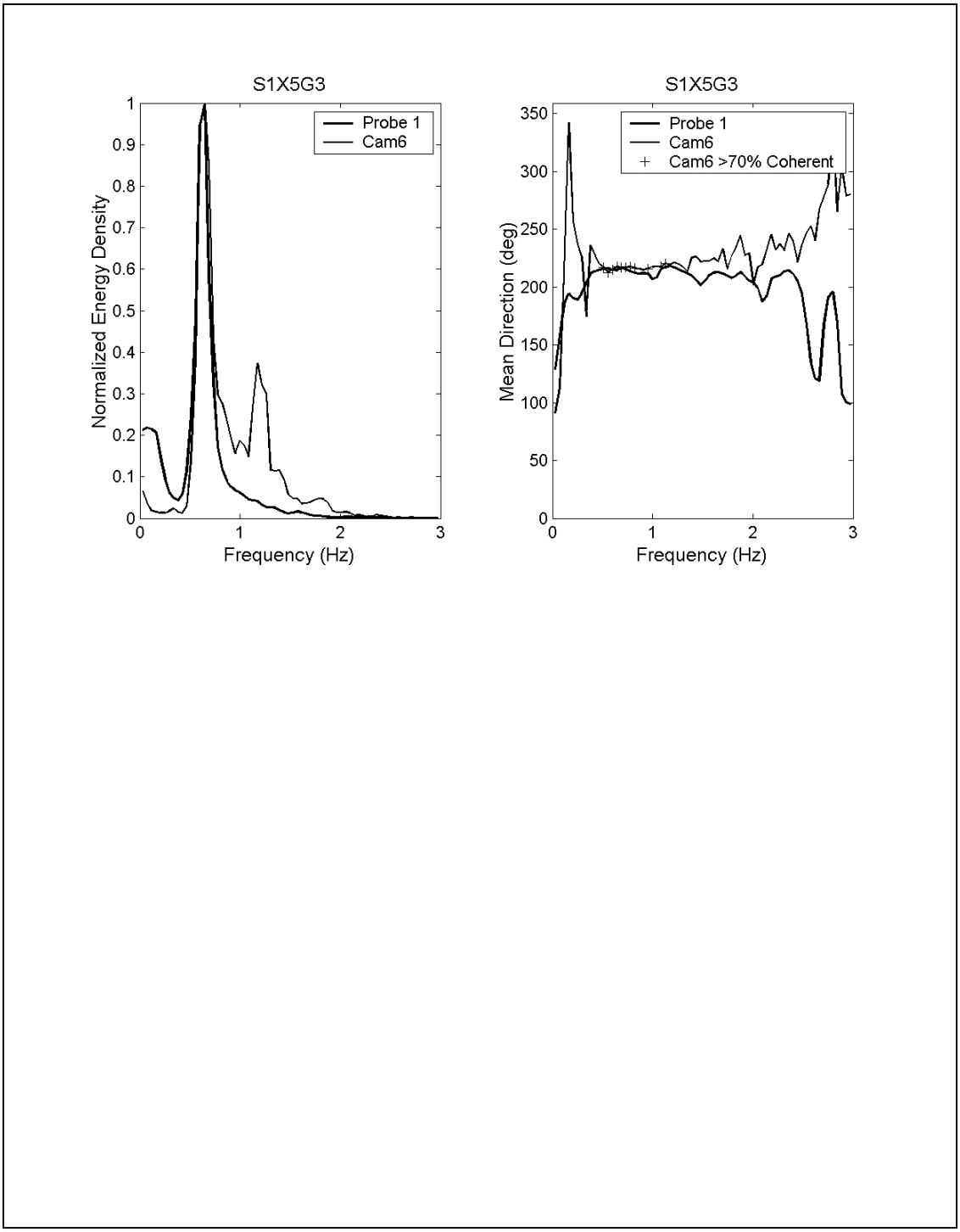

S1X4G5
Probe 1
Cam6
Cam6 >70% Coherent
Mean Direction (deg)
Frequency (Hz)
0
50
100
150
200
250
300
350
0
1
2
3

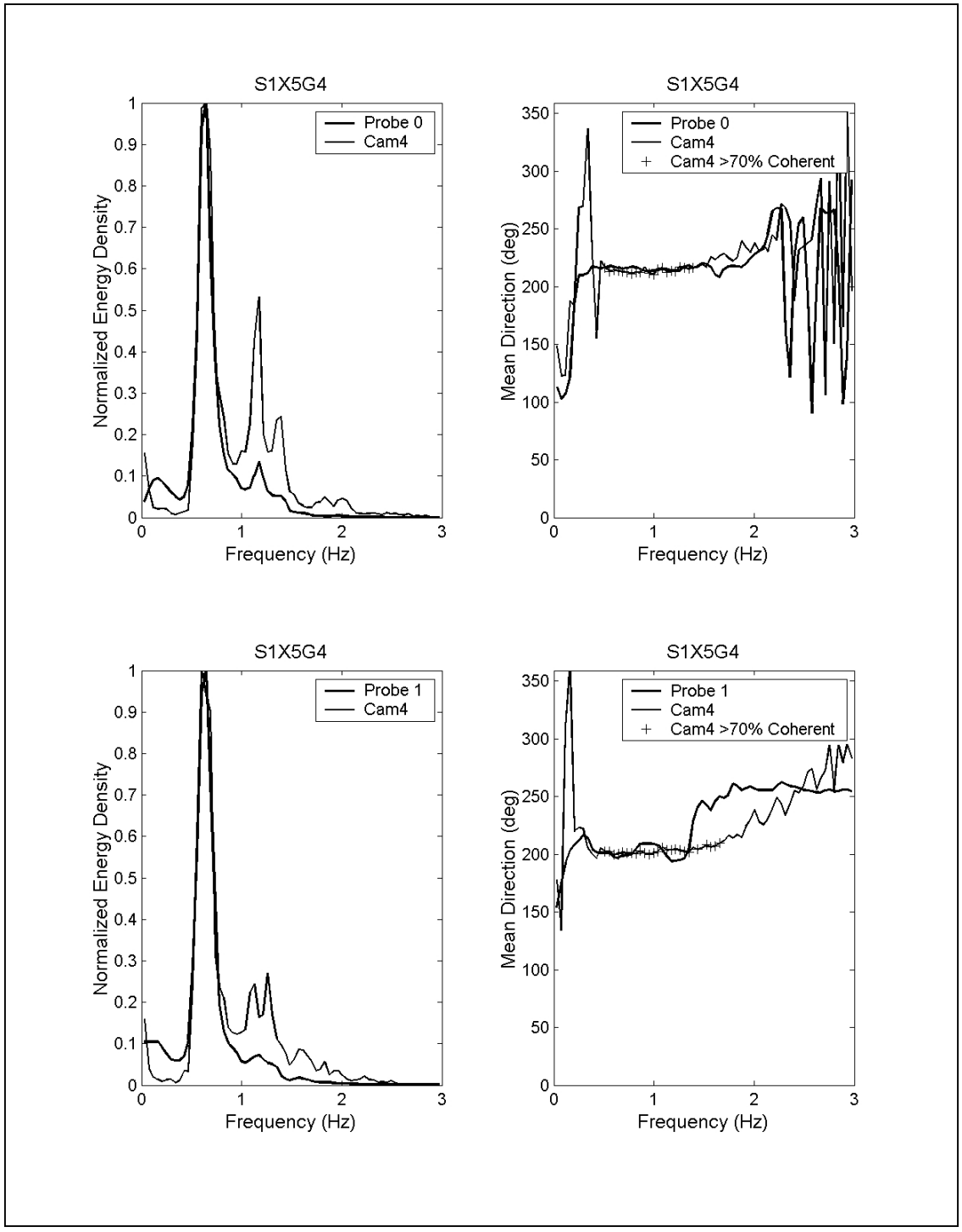

S1X5G1
Probe 0
Cam4
Normalized Energy Density
Frequency (Hz)
S1X5G1
Probe 0
Cam4
Cam4 >70% Coherent
Mean Direction (deg)
Frequency (Hz)
S1X5G1
Probe 1
Cam4
Normalized Energy Density
Frequency (Hz)
S1X5G1
Probe 1
Cam4
Cam4 >70% Coherent
Mean Direction (deg)
Frequency (Hz)

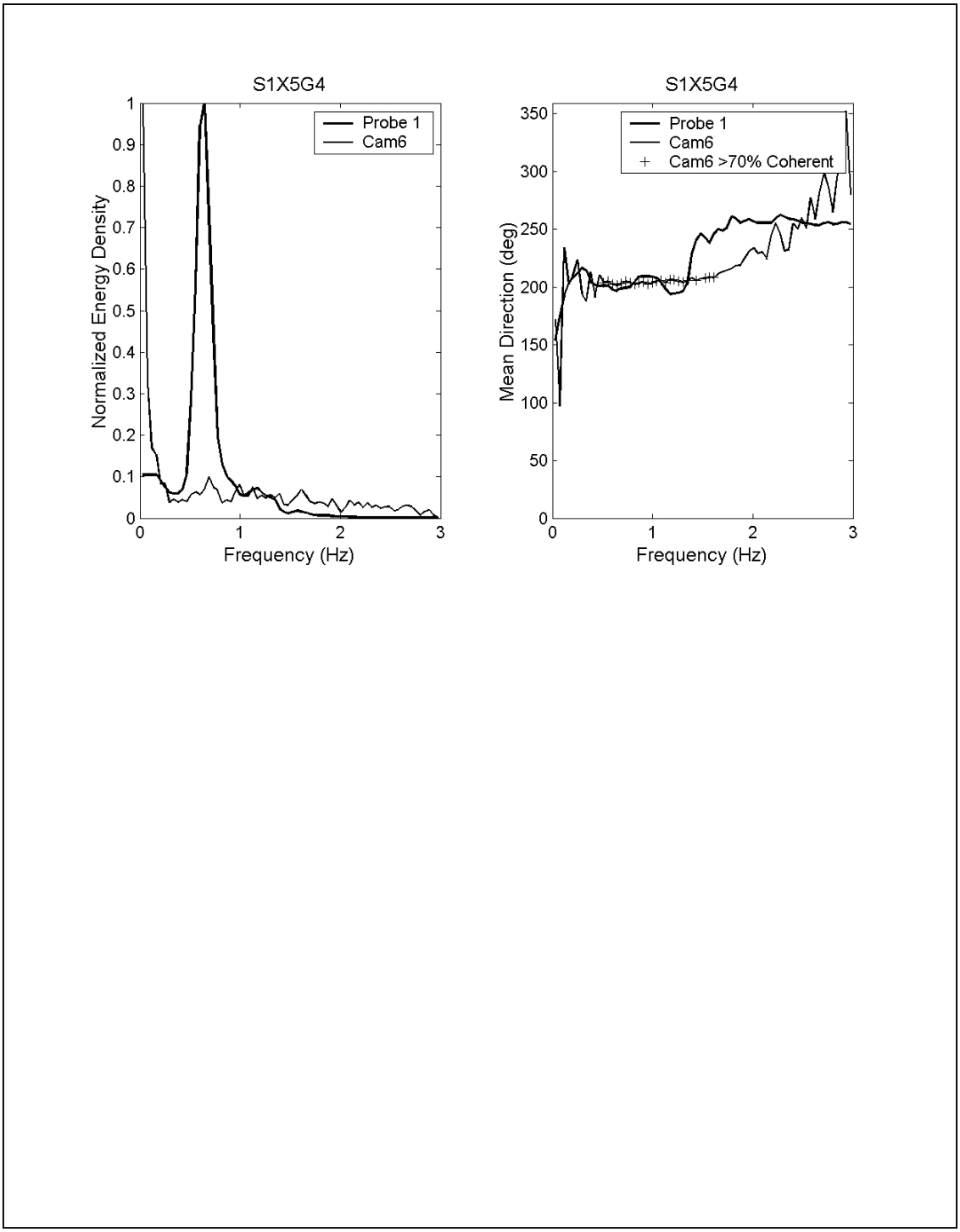

S1X5G2
Probe 0
Cam4
Normalized Energy Density
Frequency (Hz)
S1X5G2
Probe 0
Cam4
Cam4 >70% Coherent
Mean Direction (deg)
Frequency (Hz)
S1X5G2
Probe 1
Cam4
Normalized Energy Density
Frequency (Hz)
S1X5G2
Probe 1
Cam4
Cam4 >70% Coherent
Mean Direction (deg)
Frequency (Hz)

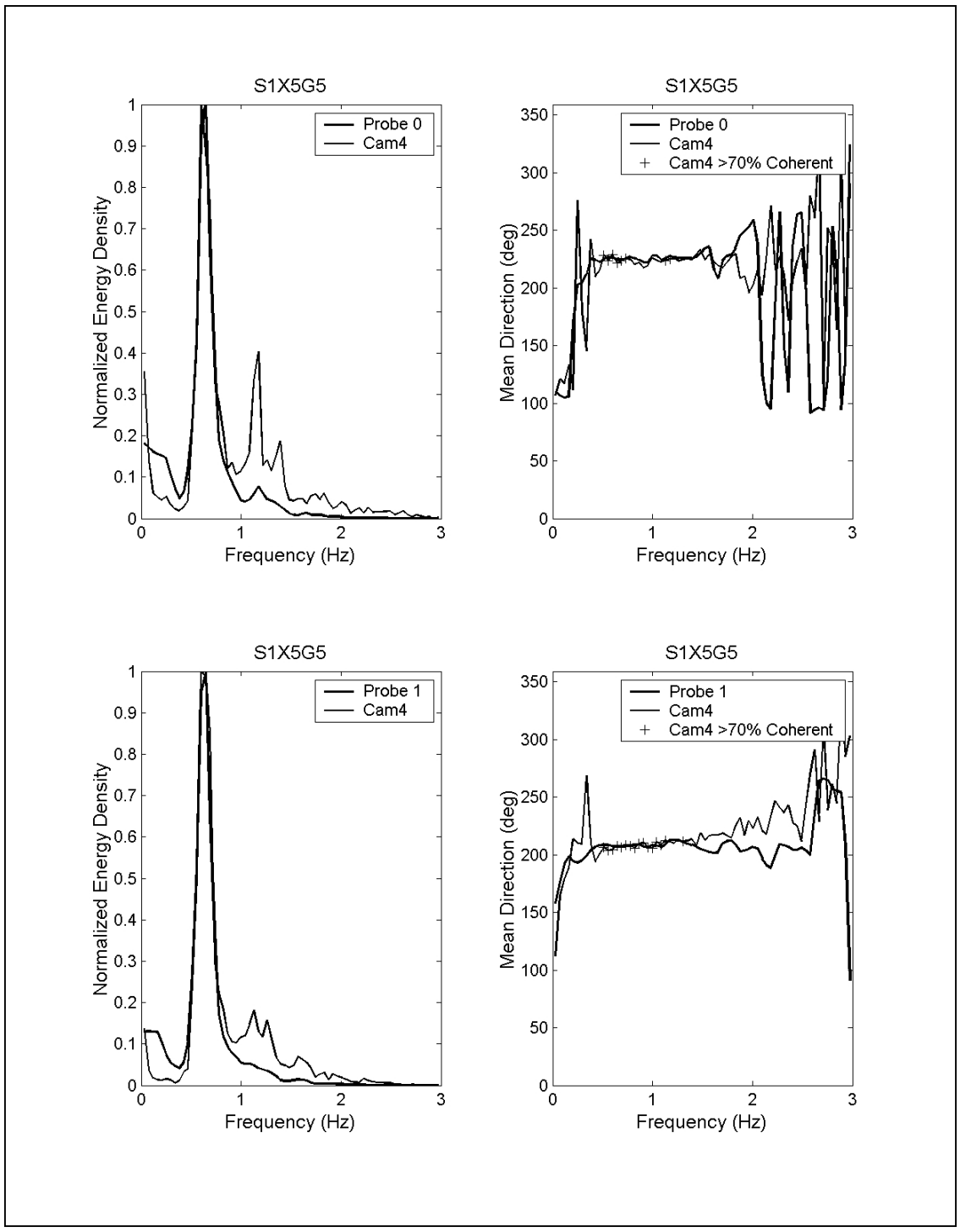

S1X5G2
Probe 1
Cam6
Normalized Energy Density
Frequency (Hz)
S1X5G2
Probe 1
Cam6
Cam6 >70% Coherent
Mean Direction (deg)
Frequency (Hz)

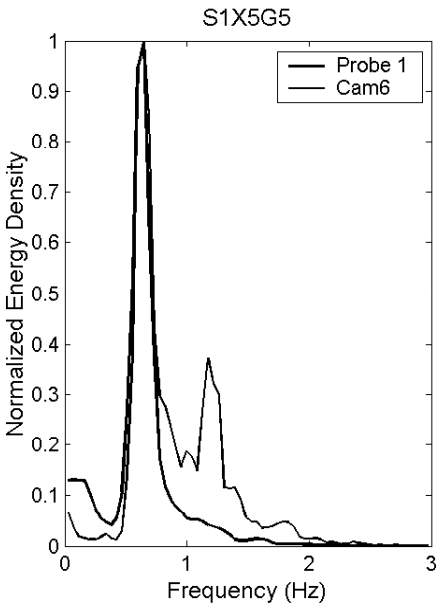

S1X5G3
Probe 0
Cam4
Normalized Energy Density
Frequency (Hz)
S1X5G3
Probe 0
Cam4
Cam4 >70% Coherent
Mean Direction (deg)
Frequency (Hz)
S1X5G3
Probe 1
Cam4
Normalized Energy Density
Frequency (Hz)
S1X5G3
Probe 1
Cam4
Cam4 >70% Coherent
Mean Direction (deg)
Frequency (Hz)

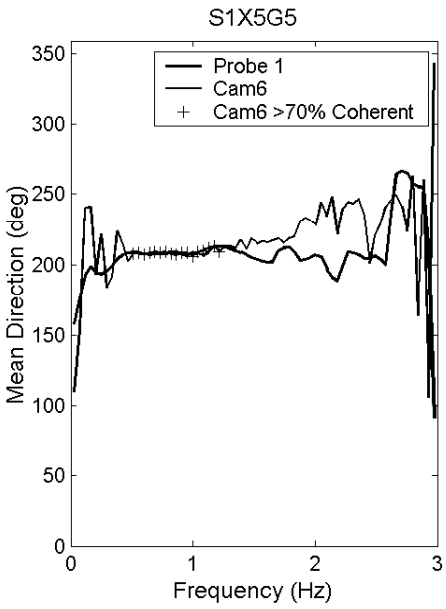

S1X5G3
Probe 1
Cam6
Normalized Energy Density
Frequency (Hz)
S1X5G3
Probe 1
Cam6
Cam6 >70% Coherent
Mean Direction (deg)
Frequency (Hz)

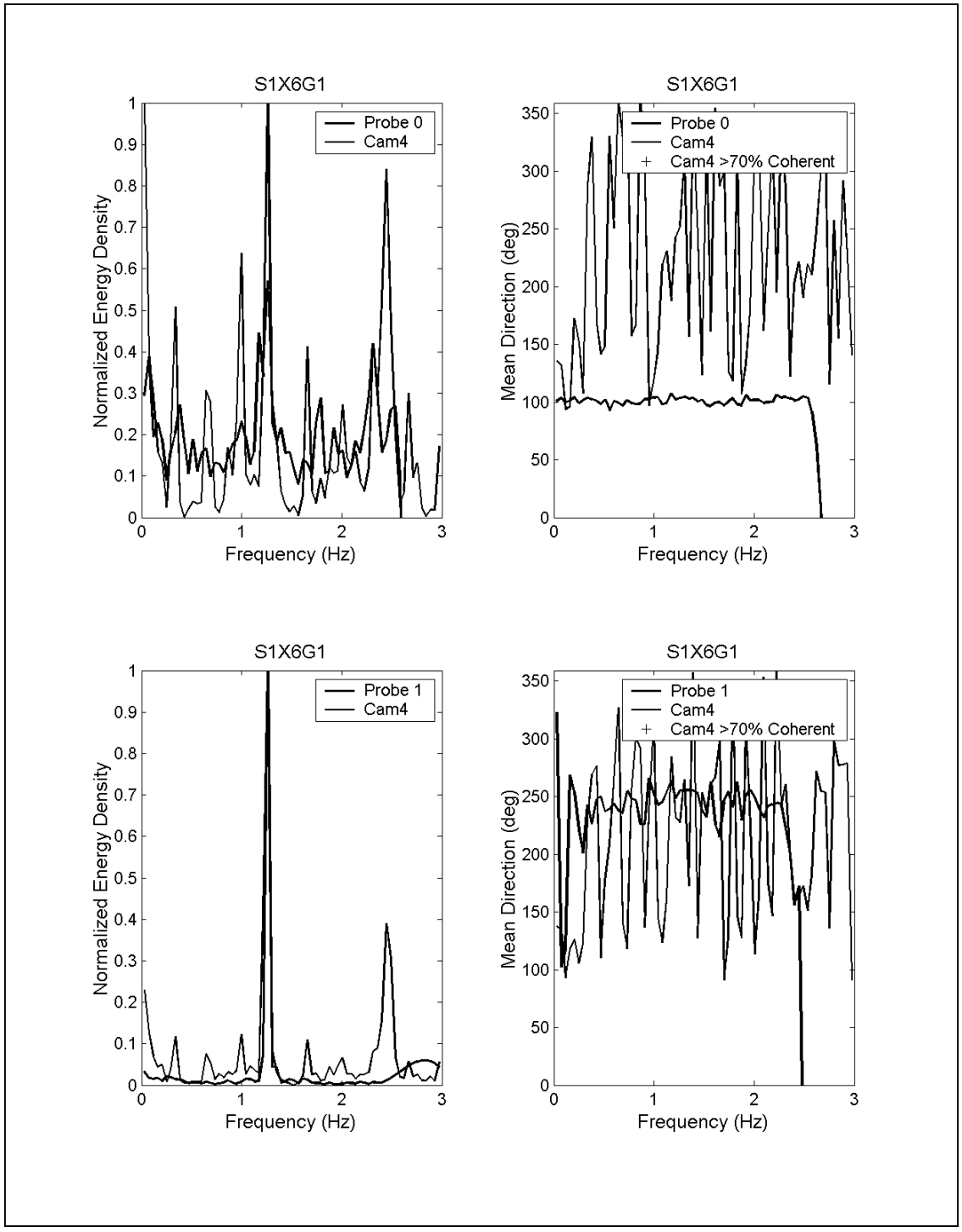

S1X5G4
Probe 0
Cam4
Normalized Energy Density
Frequency (Hz)
S1X5G4
Probe 0
Cam4
Cam4 >70% Coherent
Mean Direction (deg)
Frequency (Hz)
S1X5G4
Probe 1
Cam4
Normalized Energy Density
Frequency (Hz)
S1X5G4
Probe 1
Cam4
Cam4 >70% Coherent
Mean Direction (deg)
Frequency (Hz)

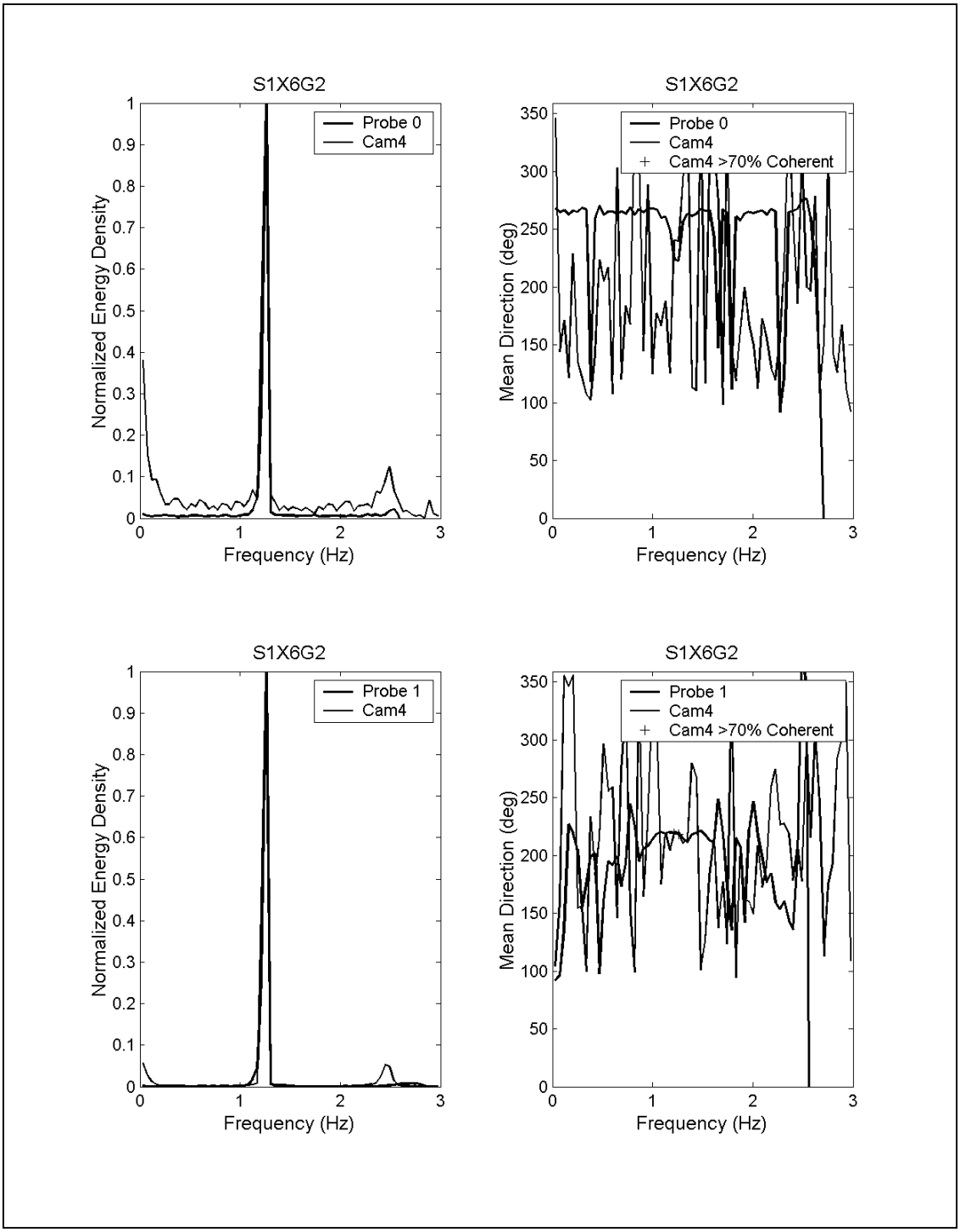

S1X5G4
Probe 1
Cam6
Normalized Energy Density
Frequency (Hz)
S1X5G4
Probe 1
Cam6
Cam6 >70% Coherent
Mean Direction (deg)
Frequency (Hz)

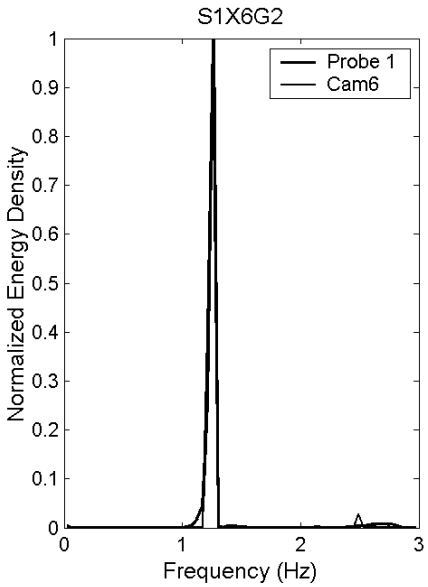

S1X5G5
Probe 0
Cam4
Normalized Energy Density
Frequency (Hz)
S1X5G5
Probe 0
Cam4
Cam4 >70% Coherent
Mean Direction (deg)
Frequency (Hz)
S1X5G5
Probe 1
Cam4
Normalized Energy Density
Frequency (Hz)
S1X5G5
Probe 1
Cam4
Cam4 >70% Coherent
Mean Direction (deg)
Frequency (Hz)

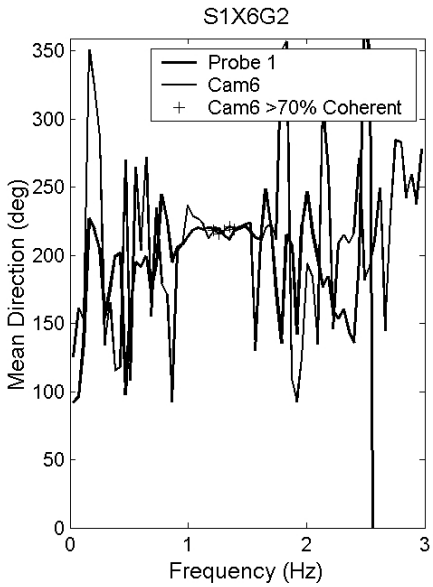

S1X5G5
Probe 1
Cam6
Normalized Energy Density
Frequency (Hz)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0
1
2
3

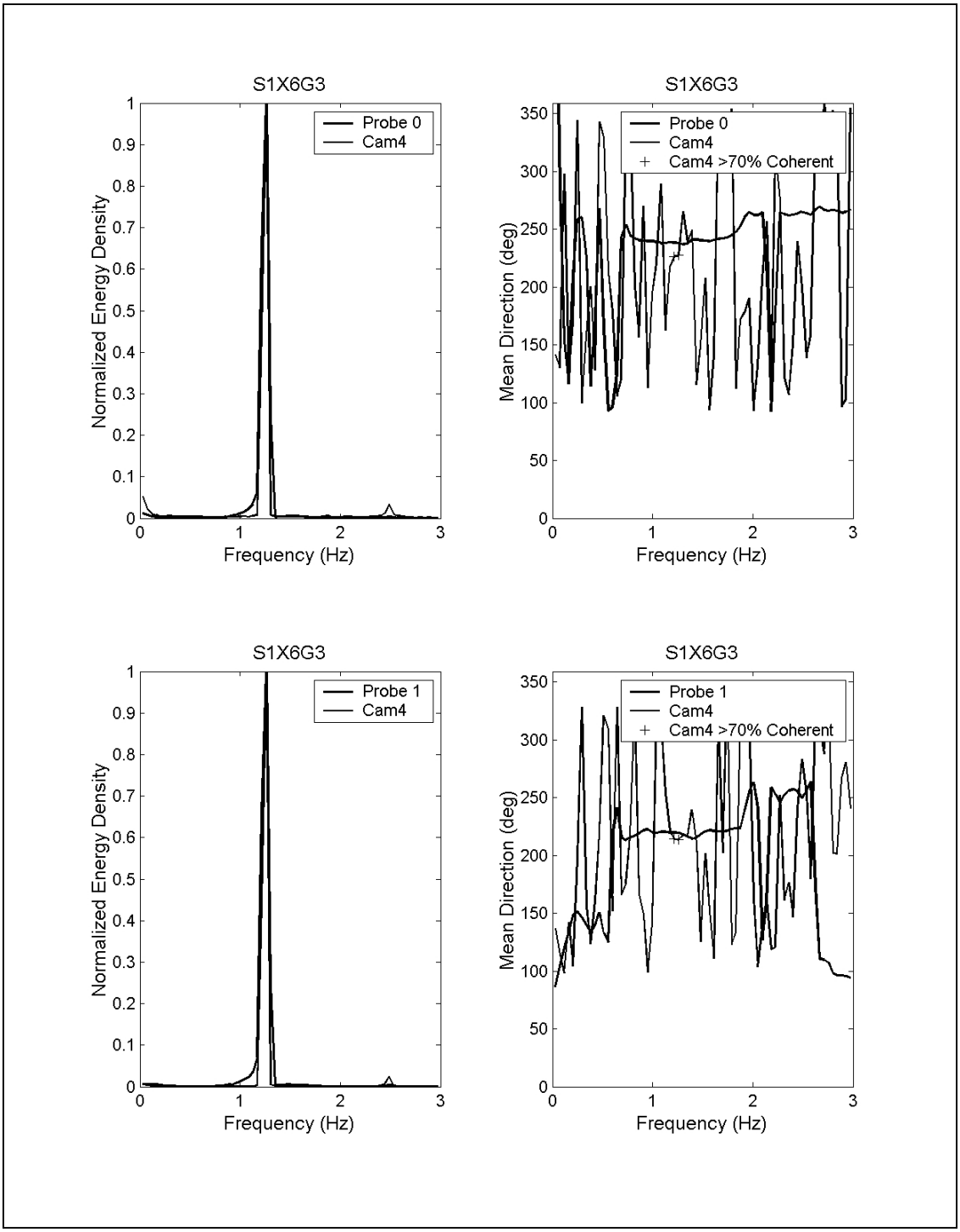

S1X5G5
Probe 1
Cam6
Cam6 >70% Coherent
Mean Direction (deg)
Frequency (Hz)
0
50
100
150
200
250
300
350
0
1
2
3

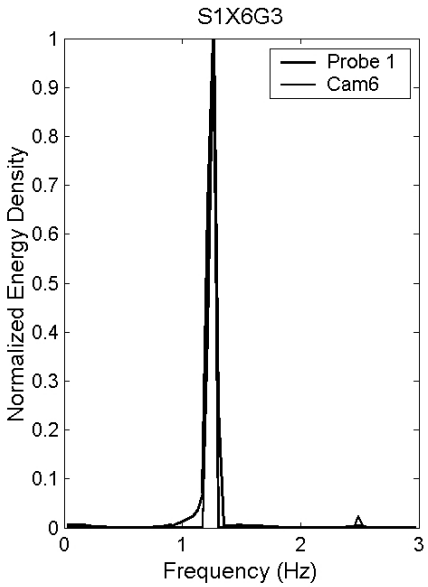

S1X6G1
Probe 0
Cam4
Normalized Energy Density
Frequency (Hz)
S1X6G1
Probe 0
Cam4
Cam4 >70% Coherent
Mean Direction (deg)
Frequency (Hz)
S1X6G1
Probe 1
Cam4
Normalized Energy Density
Frequency (Hz)
S1X6G1
Probe 1
Cam4
Cam4 >70% Coherent
Mean Direction (deg)
Frequency (Hz)

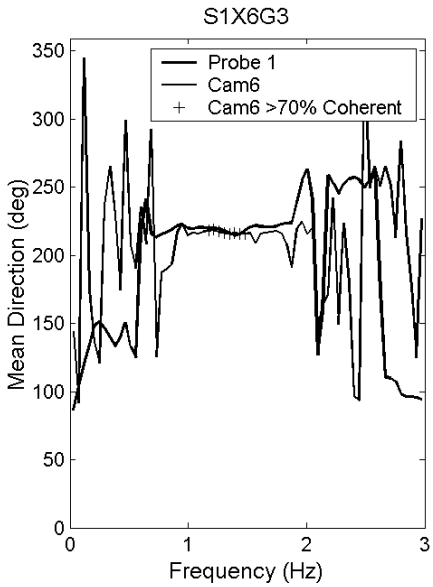

S1X6G2
Probe 0
Cam4
Normalized Energy Density
Frequency (Hz)
S1X6G2
Probe 0
Cam4
Cam4 >70% Coherent
Mean Direction (deg)
Frequency (Hz)
S1X6G2
Probe 1
Cam4
Normalized Energy Density
Frequency (Hz)
S1X6G2
Probe 1
Cam4
Cam4 >70% Coherent
Mean Direction (deg)
Frequency (Hz)

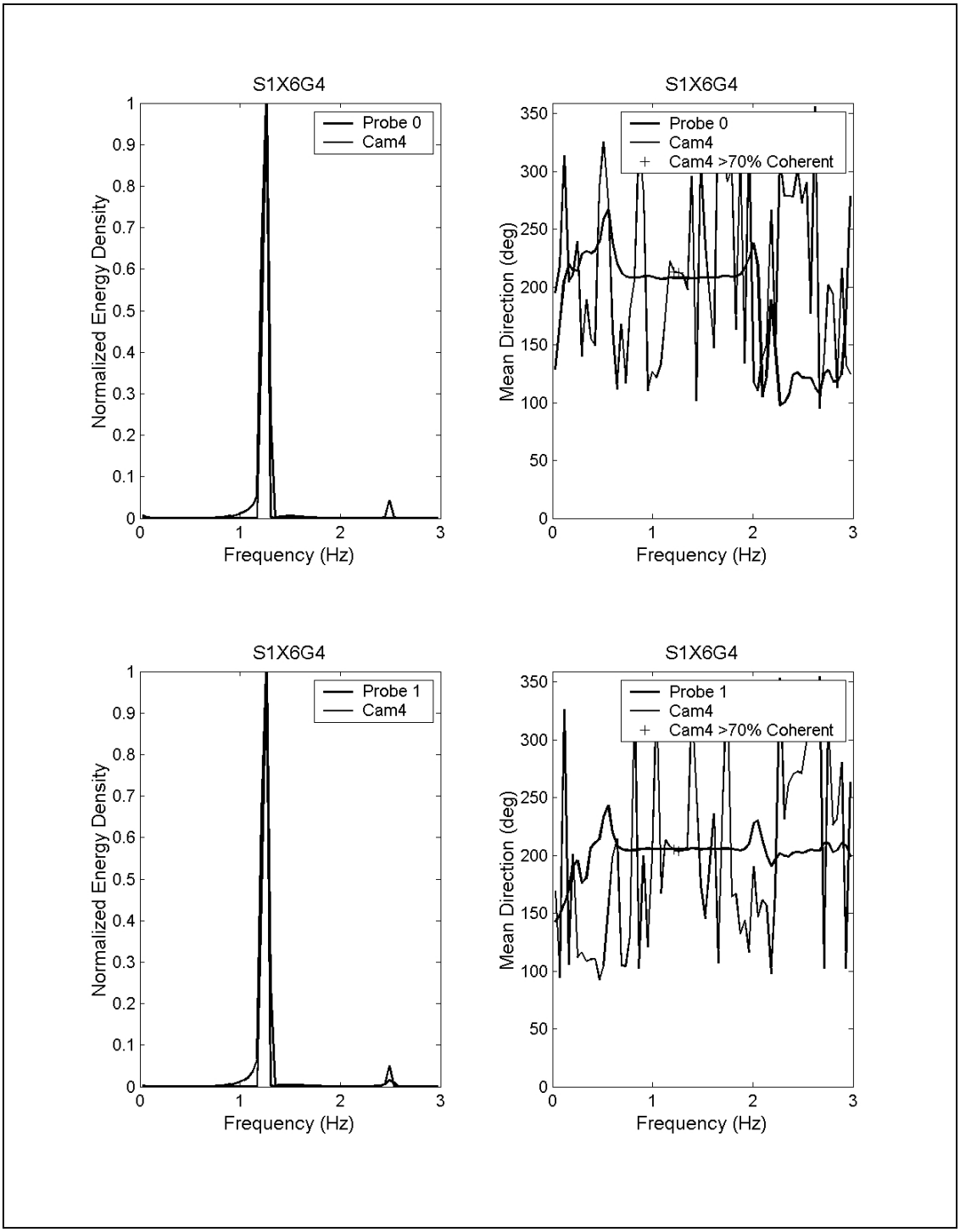

S1X6G2
Probe 1
Cam6
Normalized Energy Density
Frequency (Hz)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0
1
2
3

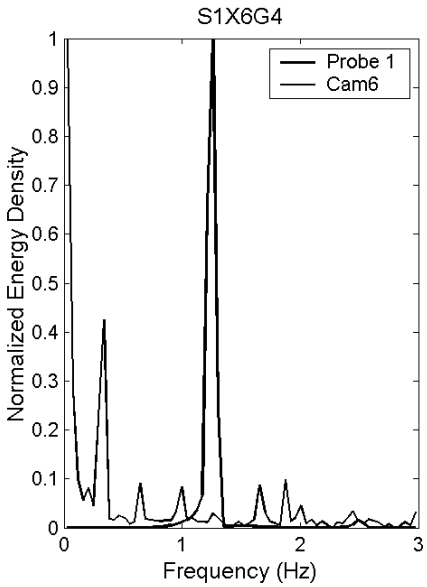

S1X6G2
Probe 1
Cam6
Cam6 >70% Coherent
Mean Direction (deg)
Frequency (Hz)
0
50
100
150
200
250
300
350
0
1
2
3

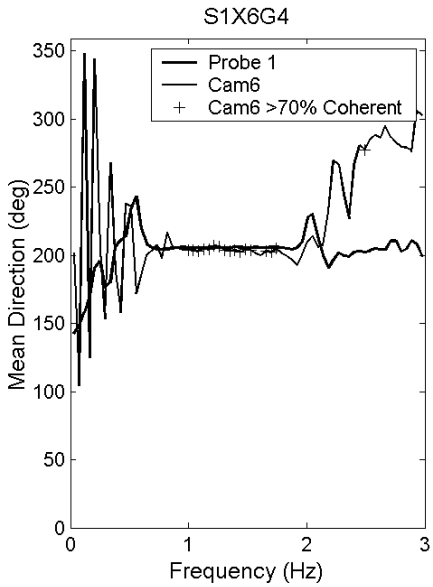

S1X6G3
Probe 0
Cam4
Normalized Energy Density
Frequency (Hz)
S1X6G3
Probe 0
Cam4
Cam4 >70% Coherent
Mean Direction (deg)
Frequency (Hz)
S1X6G3
Probe 1
Cam4
Normalized Energy Density
Frequency (Hz)
S1X6G3
Probe 1
Cam4
Cam4 >70% Coherent
Mean Direction (deg)
Frequency (Hz)

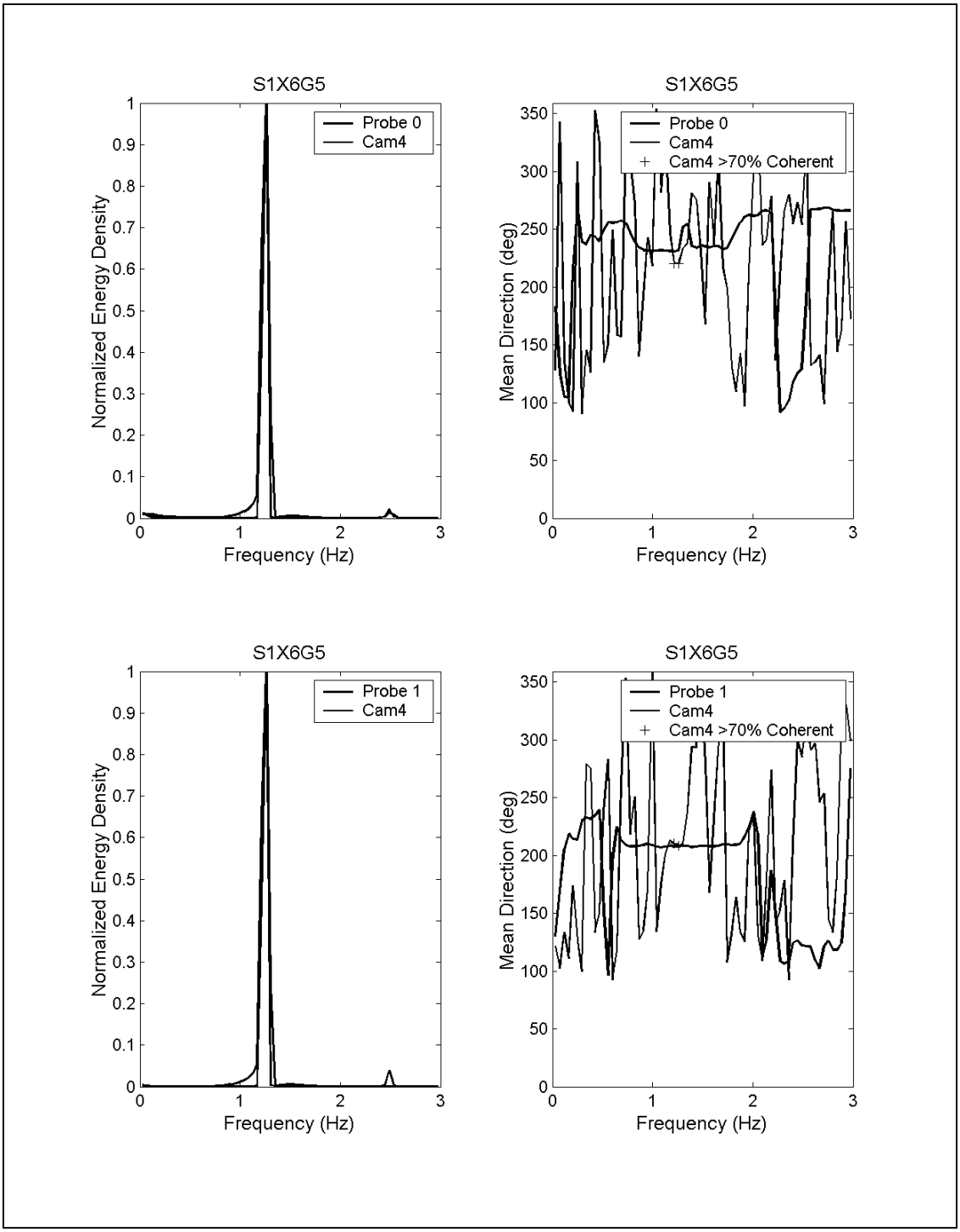

S1X6G3
Probe 1
Cam6
Normalized Energy Density
Frequency (Hz)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0
1
2
3

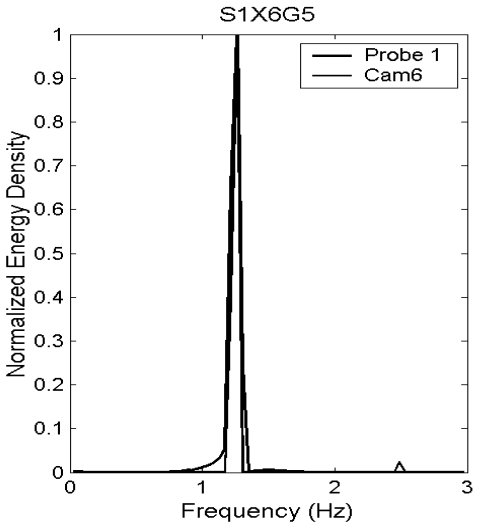

S1X6G3
Probe 1
Cam6
Cam6 >70% Coherent
Mean Direction (deg)
Frequency (Hz)
0
50
100
150
200
250
300
350
0
1
2
3


S1X6G4
Probe 0
Cam4
Normalized Energy Density
Frequency (Hz)
S1X6G4
Probe 0
Cam4
Cam4 >70% Coherent
Mean Direction (deg)
Frequency (Hz)
S1X6G4
Probe 1
Cam4
Normalized Energy Density
Frequency (Hz)
S1X6G4
Probe 1
Cam4
Cam4 >70% Coherent
Mean Direction (deg)
Frequency (Hz)


S1X6G4
Probe 1
Cam6
Normalized Energy Density
Frequency (Hz)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0
1
2
3


S1X6G4
Probe 1
Cam6
Cam6 >70% Coherent
Mean Direction (deg)
Frequency (Hz)
0
50
100
150
200
250
300
350
0
1
2
3


S1X6G5
Probe 0
Cam4
Normalized Energy Density
Frequency (Hz)
S1X6G5
Probe 0
Cam4
Cam4 >70% Coherent
Mean Direction (deg)
Frequency (Hz)
S1X6G5
Probe 1
Cam4
Normalized Energy Density
Frequency (Hz)
S1X6G5
Probe 1
Cam4
Cam4 >70% Coherent
Mean Direction (deg)
Frequency (Hz)


S1X6G5
Probe 1
Cam6
Normalized Energy Density
Frequency (Hz)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0
1
2
3

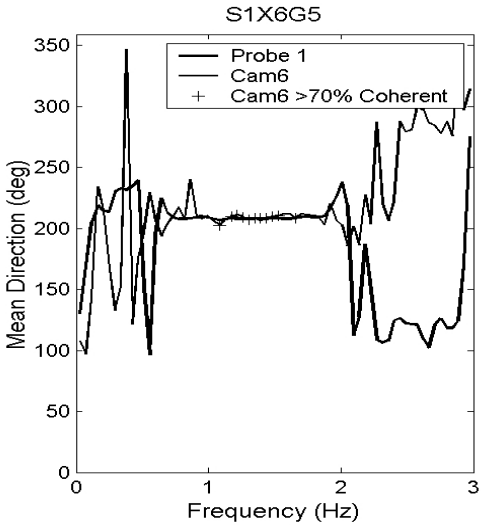

S1X6G5
Probe 1
Cam6
Cam6 >70% Coherent
Mean Direction (deg)
Frequency (Hz)
0
50
100
150
200
250
300
350
0
1
2
3

Table P2
S1X4G1 ADV Spectral Energy Density (m^2/Hz) and Vector-Mean Wave Direction (deg)

	Probe 0		Probe 1	
f (Hz)	*S*(*f*)	θ(*f*)	*S*(*f*)	θ(*f*)
0.0391	0.021523	98.19	0.093169	153.55
0.0781	0.019055	269.71	0.086938	121.04
0.1172	0.038233	245.51	0.14835	172.17
0.1562	0.058077	238.24	0.063683	178.72
0.1953	0.030188	242.15	0.008794	269.49
0.2344	0.029997	241.02	0.012299	254.83
0.2734	0.010173	260.80	0.015168	216.28
0.3125	0.007652	269.56	0.014004	185.91
0.3516	0.005308	93.62	0.008852	183.84
0.3906	0.001877	91.81	0.003612	209.50
0.4297	0.001841	265.34	0.001765	261.84
0.4687	0.002006	268.34	0.002563	227.15
0.5078	0.001353	92.25	0.003028	214.81
0.5469	0.001205	264.33	0.001428	208.36
0.5859	0.002387	258.08	0.001279	100.27
0.6250	0.001822	253.28	0.001872	184.88
0.6641	0.001201	259.40	0.000611	268.54
0.7031	0.001041	265.39	0.001721	233.49
0.7422	0.001515	259.62	0.001959	214.45
0.7813	0.001466	264.26	0.001945	231.81
0.8203	0.001354	265.04	0.002272	227.75
0.8594	0.001163	262.18	0.001954	249.23
0.8984	0.001945	257.97	0.003719	239.46
0.9375	0.001786	255.24	0.006041	235.75
0.9766	0.004218	250.26	0.00747	236.97
1.0156	0.007402	253.52	0.022109	236.10
1.0547	0.008127	250.60	0.017042	237.40
1.0937	0.006683	253.36	0.014523	252.92
1.1328	0.008899	253.54	0.028583	241.07
1.1719	0.018524	251.37	0.0483	236.21
1.2109	0.010047	251.56	0.027364	241.72
1.2500	0.007465	252.20	0.024667	243.44
1.2891	0.003053	255.93	0.021405	241.01
1.3281	0.005615	251.55	0.00902	248.43
1.3672	0.004222	255.91	0.014906	245.94
1.4062	0.003242	258.41	0.011456	234.36
1.4453	0.003534	254.58	0.011704	236.43
1.4844	0.00304	258.95	0.007568	238.02
1.5234	0.004362	256.70	0.004779	242.09
1.5625	0.002474	256.47	0.004136	236.45
1.6016	0.003644	254.83	0.00305	246.13
1.6406	0.002729	259.04	0.002673	253.71

1.6797	0.001104	263.02	0.001955	250.36
1.7188	0.001733	263.07	0.002359	240.98
1.7578	0.001165	261.05	0.001699	257.34
1.7969	0.001168	259.71	0.001583	268.57
1.8359	0.00088	265.58	0.000612	265.66
1.8750	0.000889	263.37	0.00136	259.21
1.9141	0.001179	264.49	0.001396	259.79
1.9531	0.000728	266.43	0.000839	267.01
1.9922	0.001634	259.32	0.001074	258.08
2.0313	0.001205	264.71	0.001337	258.62
2.0703	0.00111	261.58	0.000978	268.64
2.1094	0.001108	259.38	0.000815	267.17
2.1484	0.000898	261.95	0.001427	107.48
2.1875	0.000824	259.92	0.001065	256.60
2.2266	0.000617	259.91	0.000716	266.47
2.2656	0.000481	264.26	0.000758	98.08
2.3047	0.000963	258.51	0.000418	262.60
2.3437	0.000807	260.66	0.00071	96.27
2.3828	0.000895	257.09	0.000581	95.96
2.4219	0.000592	260.15	0.000593	96.88
2.4609	0.000582	261.31	0.000112	92.69

Table P3
S1X4G2 ADV Spectral Energy Density (m^2/Hz) and Vector-Mean Wave Direction (deg)

	Probe 0		Probe 1	
f (Hz)	*S*(*f*)	θ(*f*)	*S*(*f*)	θ(*f*)
0.0391	0.03445482	101.13	0.13099095	174.55
0.0215	0.05471294	103.21	0.19778265	145.70
0.0191	0.06675301	254.49	0.28129894	165.89
0.0382	0.09701074	174.76	0.09148946	163.46
0.0581	0.06477446	211.78	0.02016472	258.86
0.0302	0.05147469	173.02	0.02350023	130.54
0.0300	0.01502057	249.77	0.0286228	186.68
0.0102	0.02452401	222.98	0.02286951	188.47
0.0077	0.01590067	149.08	0.01699194	179.97
0.0053	0.00839967	260.00	0.00558984	199.04
0.0019	0.0023356	266.99	0.00605761	135.85
0.0018	0.00145225	260.41	0.00910346	177.40
0.0020	0.00377142	269.20	0.00695723	180.34
0.0014	0.0044679	101.54	0.00442173	192.83
0.0012	0.00264949	97.14	0.00258771	217.54
0.0024	0.00357902	251.75	0.00401233	166.46
0.0018	0.00436924	265.58	0.00450665	182.11
0.0012	0.00252099	261.93	0.00428713	209.74
0.0010	0.00248656	267.60	0.00352149	200.35
0.0015	0.00249197	97.62	0.00372599	203.41
0.0015	0.00175473	262.94	0.00518768	215.34
0.0014	0.00357349	259.49	0.00722911	220.30
0.0012	0.00755255	249.26	0.00943888	233.37
0.0019	0.00697578	247.44	0.00870873	235.80
0.0018	0.00640571	252.41	0.00976815	241.63
0.0042	0.01196888	248.98	0.0655494	228.57
0.0074	0.01137253	249.47	0.06340794	229.57
0.0081	0.01746702	249.01	0.0361629	238.57
0.0067	0.01821135	247.57	0.0772974	221.58
0.0089	0.02317519	245.71	0.1365103	227.08
0.0185	0.02193329	245.60	0.05586272	225.03
0.0100	0.02440464	246.26	0.08361517	222.71
0.0075	0.0088388	251.46	0.04195947	235.89
0.0031	0.01257666	246.48	0.03125095	228.91
0.0056	0.00971522	250.28	0.05548602	223.69
0.0042	0.00930841	244.22	0.02880592	225.35
0.0032	0.00867483	255.73	0.02217356	230.55
0.0035	0.00513549	261.54	0.02044181	225.39
0.0030	0.0047373	252.89	0.01911452	232.38
0.0044	0.00325096	247.26	0.01722569	223.47
0.0025	0.00215267	267.25	0.01067201	230.00
0.0036	0.0020039	264.36	0.00841888	240.84

0.0027	0.00291671	254.15	0.0076144	232.58
0.0011	0.00201669	255.73	0.00423808	241.15
0.0017	0.00112114	259.24	0.00559971	232.14
0.0012	0.00130411	256.57	0.00693844	236.49
0.0012	0.0009971	259.60	0.0032992	244.93
0.0009	0.00069682	262.09	0.00224976	251.55
0.0009	0.00108744	264.46	0.00208878	244.46
0.0012	0.00135596	262.28	0.00358847	245.40
0.0007	0.00065821	266.58	0.00261582	251.78
0.0016	0.0007325	266.33	0.00338564	245.60
0.0012	0.00045869	267.30	0.00126073	258.92
0.0011	0.00060322	268.98	0.00148615	260.38
0.0011	0.00057753	268.64	0.00213691	253.19
0.0009	0.00078414	266.13	0.00169482	254.04
0.0008	0.00053371	264.84	0.00089908	258.46
0.0006	0.00076579	254.50	0.00266235	258.97
0.0005	0.00037473	266.30	0.00094312	265.95
0.0010	0.00040983	263.70	0.00100212	257.45
0.0008	0.00051273	262.20	0.00097705	91.79
0.0009	0.00082113	258.11	0.00104302	99.96
0.0006	0.00053411	259.40	0.00086413	106.07

Table P4
S1X4G3 ADV Spectral Energy Density (m^2/Hz) and Vector-Mean Wave Direction (deg)

	Probe 0		Probe 1	
f (Hz)	*S*(*f*)	θ(*f*)	*S*(*f*)	θ(*f*)
0.0781	0.066495	233.00	0.213584	172.37
0.1562	0.06882	239.43	0.151485	179.93
0.2344	0.046177	214.83	0.070577	181.11
0.3125	0.015764	213.34	0.027539	181.24
0.3906	0.003493	252.55	0.013463	198.87
0.4687	0.003265	254.95	0.011862	196.03
0.5469	0.003013	245.11	0.006367	225.23
0.6250	0.004798	237.24	0.010069	197.66
0.7031	0.003831	240.70	0.01186	213.73
0.7813	0.002884	243.67	0.013116	213.75
0.8594	0.004946	239.86	0.032761	213.02
0.9375	0.011527	241.50	0.064435	219.26
1.0156	0.045014	239.78	0.261972	215.21
1.0937	0.065384	238.38	0.416578	214.78
1.1719	0.128717	236.27	0.926184	213.64
1.2500	0.07885	240.84	0.515899	218.42
1.3281	0.037338	241.40	0.399689	216.01
1.4062	0.032934	240.51	0.256067	219.21
1.4844	0.013901	240.57	0.123946	222.23
1.5625	0.006146	245.01	0.077475	223.65
1.6406	0.005321	246.32	0.043887	222.98
1.7188	0.004273	246.00	0.049288	228.47
1.7969	0.002992	249.09	0.04515	228.33
1.8750	0.002083	251.59	0.024464	228.29
1.9531	0.0022	251.63	0.013193	237.76
2.0313	0.001447	255.07	0.010576	250.28
2.1094	0.000877	265.75	0.009011	249.29
2.1875	0.000958	254.19	0.007225	250.94
2.2656	0.000694	259.36	0.005663	250.68
2.3437	0.000638	258.80	0.008008	243.99
2.4219	0.000599	258.08	0.003957	244.40
2.5000	0.000608	259.01	0.002323	264.21
2.5781	0.000265	263.24	0.001676	255.47
2.6562	0.000295	268.18	0.001015	259.64
2.7344	0.000198	267.41	0.000714	264.04
2.8125	0.000188	265.32	0.000381	92.10
2.8906	0.000142	267.55	0.00027	92.70
2.9687	0.000124	266.57	0.000225	95.78
3.0469	0.000129	266.28	0.000177	268.63
3.1250	9.43E-05	266.89	0.000173	97.41
3.2031	5.84E-05	267.25	0.000171	96.58
3.2812	9.86E-05	263.06	0.000106	99.48
3.3594	8.08E-05	267.58	7.61E-05	92.43
3.4375	6.88E-05	265.23	7.42E-05	268.10

3.5156	0.000133	264.40	7.28E-05	92.55
3.5938	6.17E-05	264.43	6.52E-05	260.87
3.6719	0.000101	265.01	4.2E-05	264.68
3.7500	7.21E-05	266.00	2.04E-05	268.44
3.8281	9.12E-05	266.41	2.67E-05	265.67
3.9062	8.53E-05	268.79	2.66E-05	267.52
3.9844	0.000106	265.85	2.66E-05	263.84
4.0625	5.01E-05	268.13	2.44E-05	91.41
4.1406	7.15E-05	269.33	1.86E-05	266.85
4.2188	0.000104	266.83	1.95E-05	266.01
4.2969	8.86E-05	267.24	2.23E-05	268.67
4.3750	7.57E-05	90.29	3.23E-05	268.57
4.4531	7.97E-05	268.17	2.54E-05	92.61
4.5313	8.85E-05	267.97	2.71E-05	92.79
4.6094	9.18E-05	268.56	1.98E-05	265.75
4.6875	0.000112	263.62	1.79E-05	263.93
4.7656	6.66E-05	90.95	1.87E-05	268.79
4.8438	6.98E-05	268.20	2.08E-05	268.59
4.9219	8.85E-05	265.94	2.4E-05	263.89

Table P5
S1X4G4 ADV Spectral Energy Density (m^2/Hz) and Vector-Mean Wave Direction (deg)

	Probe 0		Probe 1	
f (Hz)	*S*(*f*)	θ(*f*)	*S*(*f*)	θ(*f*)
0.0781	0.161702	218.029	0.355935	172.7962
0.1562	0.113587	221.0576	0.24046	194.798
0.2344	0.099495	205.0663	0.127266	191.8683
0.3125	0.042379	205.5786	0.107298	204.1039
0.3906	0.011258	220.0874	0.056236	208.5775
0.4687	0.010366	225.793	0.040979	215.8141
0.5469	0.012152	222.8013	0.053457	203.9567
0.6250	0.009222	226.8904	0.058075	205.4804
0.7031	0.011775	219.4315	0.056384	205.3508
0.7813	0.01183	216.4907	0.065651	203.896
0.8594	0.02103	219.4335	0.083877	208.1083
0.9375	0.058284	217.2191	0.146668	205.5445
1.0156	0.356288	218.2264	0.861829	207.2616
1.0937	0.608525	214.3817	2.152544	206.0725
1.1719	1.122357	218.3602	3.233407	203.7964
1.2500	0.817895	215.2836	2.28281	207.8569
1.3281	0.515434	217.2564	1.486633	203.0902
1.4062	0.262644	216.0761	1.224026	205.1502
1.4844	0.111868	219.517	0.554863	207.6045
1.5625	0.091919	218.6946	0.339318	206.0516
1.6406	0.049354	225.2544	0.301607	208.564
1.7188	0.05357	223	0.167135	209.1957
1.7969	0.029996	226.2123	0.184771	209.1286
1.8750	0.022731	223.6303	0.147796	213.6653
1.9531	0.013453	234.0686	0.075127	217.9105
2.0313	0.011496	234.4468	0.059303	215.958
2.1094	0.008742	233.7747	0.070247	211.9752
2.1875	0.004809	236.7447	0.085573	213.7454
2.2656	0.003546	243.1961	0.103862	214.6481
2.3437	0.005986	231.35	0.087982	209.2302
2.4219	0.003095	234.3812	0.10437	210.3399
2.5000	0.003362	243.7702	0.080475	206.1722
2.5781	0.001262	255.3192	0.03611	208.5348
2.6562	0.001101	257.8784	0.027893	208.9239
2.7344	0.001023	257.0066	0.025148	210.7094
2.8125	0.000802	265.753	0.03024	210.4723
2.8906	0.000294	268.6873	0.024029	213.7128
2.9687	0.000338	266.14	0.016727	214.7652
3.0469	0.000208	91.2426	0.014543	207.7932
3.1250	0.000299	266.5583	0.011952	209.2378
3.2031	0.00024	92.73901	0.013231	212.8703
3.2812	0.000195	268.7614	0.009562	210.1637
3.3594	0.000185	90.90517	0.007044	207.4947
3.4375	9.82E-05	90.80507	0.00645	210.5502

3.5156	0.000114	91.05334	0.003953	215.9555
3.5938	0.000143	269.4681	0.003959	211.1927
3.6719	0.000196	94.13344	0.003047	212.5955
3.7500	0.000206	92.16541	0.00449	213.1937
3.8281	0.000197	268.6282	0.003541	217.0617
3.9062	0.000155	267.8328	0.002299	214.4404
3.9844	0.00016	269.7751	0.002065	218.7803
4.0625	0.000159	269.4046	0.001393	217.4333
4.1406	0.000108	268.7708	0.00188	211.5534
4.2188	0.000123	268.2699	0.00186	214.7302
4.2969	0.000154	264.9103	0.002439	215.3691
4.3750	0.000174	264.1976	0.002433	220.2217
4.4531	0.000131	91.03838	0.001864	219.8108
4.5313	0.000145	91.07598	0.001619	221.7455
4.6094	0.00016	266.9077	0.001266	219.1658
4.6875	0.000131	269.4712	0.001534	224.9879
4.7656	0.000127	91.03416	0.00157	220.3092
4.8438	0.000113	91.32558	0.001654	225.2308
4.9219	0.000127	269.8318	0.001814	217.4631

Table P6
S1X4G5 ADV Spectral Energy Density (m^2/Hz) and Vector-Mean Wave Direction (deg)

	Probe 0		Probe 1	
f (Hz)	*S*(*f*)	θ(*f*)	*S*(*f*)	θ(*f*)
0.0781	0.079919	256.94	0.286456	190.98
0.1562	0.084049	256.20	0.230138	190.76
0.2344	0.058207	194.75	0.092467	182.97
0.3125	0.02576	202.19	0.058437	196.01
0.3906	0.006779	257.64	0.017649	211.11
0.4687	0.003382	267.37	0.015861	211.85
0.5469	0.005157	252.62	0.009205	220.29
0.6250	0.006553	242.59	0.013161	206.27
0.7031	0.005016	237.64	0.015841	203.63
0.7813	0.005474	238.45	0.019415	217.98
0.8594	0.013461	235.87	0.065355	211.49
0.9375	0.034607	228.08	0.142073	213.16
1.0156	0.109912	230.74	0.691395	214.42
1.0937	0.183922	228.40	0.887037	210.15
1.1719	0.341438	230.61	1.573185	209.91
1.2500	0.219363	231.08	0.981301	207.35
1.3281	0.125435	229.03	0.788252	209.82
1.4062	0.093682	229.21	0.530444	213.22
1.4844	0.032933	234.95	0.258796	214.29
1.5625	0.022666	234.54	0.226543	216.31
1.6406	0.016861	236.89	0.105203	221.68
1.7188	0.007666	241.35	0.084282	220.91
1.7969	0.007083	242.22	0.102589	220.70
1.8750	0.006385	245.10	0.057445	230.02
1.9531	0.003625	254.80	0.023661	230.62
2.0313	0.003339	250.17	0.025682	230.04
2.1094	0.002967	255.53	0.017046	239.21
2.1875	0.00218	253.01	0.012036	237.05
2.2656	0.001989	256.10	0.011855	224.78
2.3437	0.001806	263.13	0.013112	218.95
2.4219	0.001203	260.01	0.010944	229.43
2.5000	0.001176	265.64	0.011108	222.27
2.5781	0.000775	266.00	0.005758	228.71
2.6562	0.000608	268.07	0.003843	218.15
2.7344	0.000421	265.55	0.001482	247.34
2.8125	0.000303	268.93	0.000944	250.65
2.8906	0.000331	267.76	0.00085	243.75
2.9687	0.00026	90.82	0.000984	243.37
3.0469	0.000229	267.35	0.000641	269.72
3.1250	0.000158	269.36	0.000443	246.00
3.2031	0.000153	267.86	0.000265	95.99
3.2812	0.000133	90.39	0.000241	254.69
3.3594	0.00014	92.47	0.000151	267.42
3.4375	0.000137	269.69	0.000145	256.44

3.5156	0.000131	269.65	0.000149	265.60
3.5938	0.000137	91.01	0.000117	91.12
3.6719	0.000145	92.23	0.000109	251.64
3.7500	0.000141	90.25	0.000125	265.91
3.8281	0.000128	94.41	9.93E-05	265.85
3.9062	7.94E-05	269.32	6.01E-05	93.23
3.9844	0.000155	92.26	7.83E-05	92.14
4.0625	0.000127	90.10	6.64E-05	93.82
4.1406	0.000128	268.70	4.83E-05	98.28
4.2188	0.000114	264.47	4.46E-05	94.03
4.2969	0.000154	266.29	4.15E-05	93.84
4.3750	0.000166	267.29	5.68E-05	264.11
4.4531	0.000177	268.73	5.3E-05	269.07
4.5313	0.000157	269.80	2.84E-05	94.64
4.6094	0.000152	268.04	3.46E-05	94.19
4.6875	0.000123	269.50	3.33E-05	92.07
4.7656	0.000126	267.79	5.04E-05	93.34
4.8438	0.000159	90.50	3.72E-05	269.43
4.9219	0.000122	92.74	2.11E-05	91.53

Table P7
S1X5G1 ADV Spectral Energy Density (m^2/Hz) and Vector-Mean Wave Direction (deg)

	Probe 0		Probe 1	
f (Hz)	*S*(*f*)	θ(*f*)	*S*(*f*)	θ(*f*)
0.0391	0.02195	109.340	0.118056	145.443
0.0215	0.043559	96.584	0.191416	121.760
0.0191	0.201596	241.884	0.602412	183.926
0.0382	0.102881	205.670	0.127428	200.900
0.0581	0.104292	151.729	0.035478	243.867
0.0302	0.088665	225.447	0.035995	222.809
0.0300	0.064911	212.167	0.057236	205.501
0.0102	0.025807	203.059	0.042016	209.410
0.0077	0.034921	224.055	0.019765	218.796
0.0053	0.011716	251.748	0.012302	234.719
0.0019	0.004506	265.649	0.025436	223.621
0.0018	0.011689	248.890	0.019797	233.230
0.0020	0.016077	250.813	0.056957	223.876
0.0014	0.019738	251.249	0.062982	231.852
0.0012	0.035627	246.456	0.10361	232.830
0.0024	0.028344	249.189	0.130886	229.416
0.0018	0.017258	249.690	0.065256	224.449
0.0012	0.047338	235.340	0.048236	232.278
0.0010	0.012769	256.033	0.023528	234.900
0.0015	0.008926	257.890	0.021225	232.075
0.0015	0.007539	255.414	0.009991	234.816
0.0014	0.009957	245.381	0.013168	232.381
0.0012	0.008198	246.982	0.010023	232.666
0.0019	0.006843	266.876	0.013843	234.276
0.0018	0.006979	258.912	0.007107	239.486
0.0042	0.005026	90.324	0.00749	226.748
0.0074	0.004912	263.936	0.010175	225.289
0.0081	0.003579	255.658	0.010052	218.766
0.0067	0.003997	255.843	0.009041	233.235
0.0089	0.003124	265.911	0.004819	241.812
0.0185	0.002927	266.336	0.005204	236.610
0.0100	0.002762	253.787	0.003278	245.070
0.0075	0.003117	264.178	0.003544	242.869
0.0031	0.002384	266.203	0.003526	239.422
0.0056	0.001992	267.379	0.003851	243.601
0.0042	0.002198	266.832	0.003836	227.588
0.0032	0.002418	266.681	0.004357	209.419
0.0035	0.002047	94.883	0.005286	217.944
0.0030	0.001108	92.818	0.004464	223.776
0.0044	0.001646	92.970	0.004035	206.195
0.0025	0.001466	94.858	0.003656	214.536
0.0036	0.002283	105.631	0.00166	239.192

0.0027	0.002365	268.282	0.002429	230.774
0.0011	0.002607	95.100	0.002144	232.221
0.0017	0.001364	269.269	0.001829	203.312
0.0012	0.001217	90.956	0.002864	172.194
0.0012	0.001074	96.008	0.002458	190.023
0.0009	0.000679	269.320	0.000934	197.595
0.0009	0.001435	269.648	0.001658	236.170
0.0012	0.001425	265.556	0.001679	213.239
0.0007	0.001632	90.880	0.000532	92.018
0.0016	0.0008	95.001	0.000607	124.686
0.0012	0.001271	97.138	0.000587	137.608
0.0011	0.000914	95.783	0.000581	133.690
0.0011	0.000628	92.732	0.000984	214.011
0.0009	0.000711	269.178	0.000333	112.462
0.0008	0.001028	91.694	0.000388	228.867
0.0006	0.000707	93.041	0.000502	139.923
0.0005	0.000816	90.963	0.000393	130.152
0.0010	0.000965	92.589	0.000325	138.665
0.0008	0.000746	266.617	0.000317	137.820
0.0009	0.00051	266.077	0.000188	127.560
0.0006	0.000598	92.046	0.000243	136.332

Table P8
S1X5G2 ADV Spectral Energy Density (m^2/Hz) and Vector-Mean Wave Direction (deg)

	Probe 0		Probe 1	
f (Hz)	*S*(*f*)	θ(*f*)	*S*(*f*)	θ(*f*)
0.0391	0.02403169	269.25	0.10820127	116.86
0.0215	0.0616812	99.81	0.22645001	119.68
0.0191	0.12843475	100.63	0.55799025	176.30
0.0382	0.12267646	210.26	0.1150023	191.55
0.0581	0.11466369	193.36	0.03035709	96.76
0.0302	0.07195064	191.75	0.03441614	251.71
0.0300	0.08569571	163.76	0.07362524	199.94
0.0102	0.0333722	219.13	0.05033776	198.22
0.0077	0.01393474	245.56	0.01265053	207.89
0.0053	0.01036181	255.63	0.01481343	222.39
0.0019	0.01326472	263.13	0.03251749	217.32
0.0018	0.00919004	250.04	0.02478361	219.41
0.0020	0.01333985	251.16	0.06190071	222.94
0.0014	0.03329607	244.16	0.09943315	226.79
0.0012	0.06617365	232.47	0.15216093	228.79
0.0024	0.09693637	242.63	0.41223043	223.35
0.0018	0.05852322	237.32	0.18392247	225.84
0.0012	0.03909934	243.03	0.08887622	228.72
0.0010	0.01774055	248.99	0.08721633	221.72
0.0015	0.01909152	243.71	0.05540651	217.01
0.0015	0.00715194	245.25	0.02013553	219.93
0.0014	0.00357476	258.82	0.01701161	224.51
0.0012	0.00557621	247.54	0.01883516	224.00
0.0019	0.00814482	256.43	0.01929386	227.97
0.0018	0.00860208	99.68	0.01159447	234.23
0.0042	0.00540127	260.59	0.00621375	228.09
0.0074	0.00355626	260.96	0.01494272	227.72
0.0081	0.00178281	261.63	0.01051769	222.57
0.0067	0.00659238	245.33	0.01944337	221.37
0.0089	0.0038491	257.85	0.01439343	223.08
0.0185	0.00428791	251.53	0.00807777	234.36
0.0100	0.00610988	245.85	0.00617507	251.97
0.0075	0.0045165	251.73	0.00740187	231.92
0.0031	0.0040079	254.18	0.00552539	225.01
0.0056	0.0025437	264.88	0.00684994	223.00
0.0042	0.00395373	254.09	0.00836442	228.19
0.0032	0.00296172	246.60	0.00209391	248.07
0.0035	0.00238767	262.87	0.00655782	228.47
0.0030	0.00236166	259.62	0.00307359	240.35
0.0044	0.00110688	267.88	0.00419661	232.74
0.0025	0.00151368	260.02	0.00224147	254.14
0.0036	0.00155247	267.20	0.00376042	204.36

0.0027	0.00225155	256.77	0.00390403	190.48
0.0011	0.00108052	268.55	0.00313654	231.15
0.0017	0.00106998	268.27	0.00220972	234.44
0.0012	0.00095654	260.58	0.003559	208.01
0.0012	0.00163671	262.67	0.002248	216.32
0.0009	0.0013848	267.59	0.00195159	200.36
0.0009	0.00061723	261.31	0.00150052	151.23
0.0012	0.00061616	264.18	0.00223618	191.91
0.0007	0.00074012	261.96	0.00075384	204.14
0.0016	0.00055622	265.17	0.0010941	161.88
0.0012	0.00062611	262.69	0.00072145	193.42
0.0011	0.00106326	93.12	0.00094838	209.73
0.0011	0.00072557	266.59	0.00094632	166.16
0.0009	0.0003099	268.23	0.00039816	108.54
0.0008	0.00063402	265.43	0.00052445	135.63
0.0006	0.00045025	265.19	0.00084634	200.05
0.0005	0.00048074	266.38	0.00032989	146.88
0.0010	0.00043923	269.77	0.00048257	161.90
0.0008	0.0004689	265.96	0.00030382	147.83
0.0009	0.00050419	267.69	0.00015317	261.57
0.0006	0.00038834	261.87	0.00031982	172.39

Table P9
S1X5G3 ADV Spectral Energy Density (m^2/Hz) and Vector-Mean Wave Direction (deg)

	Probe 0		Probe 1	
f (Hz)	*S*(*f*)	θ(*f*)	*S*(*f*)	θ(*f*)
0.0781	0.109499	107.18	0.335505	160.98
0.1562	0.118501	115.35	0.32024	194.25
0.2344	0.10713	198.08	0.167897	188.05
0.3125	0.055454	209.91	0.082699	198.09
0.3906	0.020237	240.68	0.064486	212.27
0.4687	0.053363	229.28	0.177568	215.09
0.5469	0.14368	233.99	0.638556	216.19
0.6250	0.367813	233.11	1.654188	214.13
0.7031	0.179982	232.40	0.739428	216.24
0.7813	0.059567	234.24	0.251805	213.22
0.8594	0.040104	230.96	0.142501	211.61
0.9375	0.022992	231.35	0.107138	211.90
1.0156	0.017949	230.82	0.091199	205.85
1.0937	0.018873	231.67	0.068795	215.92
1.1719	0.035476	232.58	0.062719	217.94
1.2500	0.019387	233.43	0.040804	215.22
1.3281	0.015307	234.89	0.040616	212.28
1.4062	0.013393	232.82	0.02657	208.40
1.4844	0.005469	236.78	0.017957	201.75
1.5625	0.002785	254.09	0.024552	210.02
1.6406	0.005174	239.86	0.019976	213.04
1.7188	0.004274	238.63	0.010474	210.53
1.7969	0.003825	247.30	0.008385	207.26
1.8750	0.001475	260.47	0.005084	212.63
1.9531	0.002353	261.97	0.003849	205.77
2.0313	0.001827	244.70	0.004413	202.30
2.1094	0.002421	101.25	0.004541	186.08
2.1875	0.001548	245.10	0.002829	206.97
2.2656	0.001487	229.98	0.003032	209.65
2.3437	0.00089	245.67	0.002223	214.63
2.4219	0.000503	265.74	0.001441	209.18
2.5000	0.000396	268.54	0.001449	190.66
2.5781	0.00028	92.57	0.000944	135.60
2.6562	0.00039	261.84	0.000469	115.91
2.7344	0.000385	255.25	0.000639	187.05
2.8125	0.000207	269.28	0.000455	196.42
2.8906	0.000152	268.41	0.000341	105.46
2.9687	0.000121	268.29	0.000295	98.41
3.0469	0.000142	92.27	0.000195	248.86
3.1250	7.73E-05	268.83	0.000145	265.20
3.2031	0.000121	267.13	0.000123	98.67
3.2812	9.10E-05	266.48	8.20E-05	107.29
3.3594	6.54E-05	267.08	6.53E-05	101.17
3.4375	8.81E-05	266.94	6.82E-05	92.59

3.5156	0.00012	268.10	5.02E-05	100.96
3.5938	0.000144	267.21	2.63E-05	94.22
3.6719	0.000102	91.29	4.33E-05	98.45
3.7500	0.000084	269.81	5.11E-05	97.27
3.8281	7.33E-05	268.68	5.67E-05	93.19
3.9062	7.82E-05	262.10	5.00E-05	101.02
3.9844	7.55E-05	92.63	4.04E-05	100.43
4.0625	8.38E-05	269.80	5.44E-05	99.19
4.1406	0.000117	269.65	3.44E-05	96.98
4.2188	7.89E-05	269.87	1.84E-05	93.57
4.2969	0.000102	94.76	2.19E-05	269.08
4.3750	8.58E-05	93.84	1.58E-05	90.27
4.4531	7.32E-05	91.67	1.98E-05	266.20
4.5313	8.13E-05	91.45	0.00002	90.31
4.6094	8.56E-05	90.53	1.69E-05	91.72
4.6875	8.39E-05	266.96	1.17E-05	90.52
4.7656	6.65E-05	268.38	1.73E-05	264.05
4.8438	0.000108	265.91	0.000026	269.84
4.9219	7.77E-05	269.75	1.81E-05	91.73

Table P10
S1X5G4 ADV Spectral Energy Density (m^2/Hz) and Vector-Mean Wave Direction (deg)

	Probe 0		Probe 1	
f (Hz)	*S*(*f*)	θ(*f*)	*S*(*f*)	θ(*f*)
0.0781	0.116211	102.57	0.416599	176.45
0.1562	0.15458	119.89	0.416888	202.29
0.2344	0.12719	209.76	0.324017	210.37
0.3125	0.09197	209.82	0.237076	217.11
0.3906	0.070552	217.25	0.235453	203.34
0.4687	0.126828	215.89	0.43389	201.01
0.5469	0.654911	217.85	1.971558	201.21
0.6250	1.724267	216.69	4.154593	196.32
0.7031	0.874295	215.52	2.544959	198.90
0.7813	0.346891	217.09	0.730585	199.82
0.8594	0.188602	215.10	0.410415	208.78
0.9375	0.159889	213.12	0.332932	209.05
1.0156	0.108721	213.91	0.210589	208.88
1.0937	0.120743	215.11	0.2523	202.76
1.1719	0.219417	214.22	0.289874	193.90
1.2500	0.108205	213.72	0.214512	194.80
1.3281	0.083688	218.58	0.197073	197.52
1.4062	0.084435	216.09	0.076545	233.95
1.4844	0.02503	220.59	0.048781	246.41
1.5625	0.019615	217.03	0.070841	237.78
1.6406	0.016214	207.28	0.059558	249.94
1.7188	0.006164	216.72	0.033389	248.41
1.7969	0.006606	217.83	0.025959	261.52
1.8750	0.004659	216.87	0.027666	255.08
1.9531	0.007995	223.42	0.015379	258.64
2.0313	0.004987	229.72	0.015698	255.74
2.1094	0.003979	234.30	0.013837	255.52
2.1875	0.002288	266.20	0.010779	255.44
2.2656	0.001661	269.01	0.006485	262.19
2.3437	0.001879	109.04	0.005082	259.23
2.4219	0.001451	248.80	0.007415	258.00
2.5000	0.001106	259.99	0.007131	255.45
2.5781	0.000676	90.57	0.01044	254.62
2.6562	0.000469	268.19	0.00868	252.94
2.7344	0.000831	262.53	0.006906	256.04
2.8125	0.000383	267.20	0.007222	254.03
2.8906	0.000402	96.38	0.006973	255.89
2.9687	0.000312	269.84	0.006243	255.06
3.0469	0.000318	90.67	0.006825	255.05
3.1250	0.000279	92.22	0.006031	254.65
3.2031	0.000209	267.22	0.006622	253.81
3.2812	0.000231	92.68	0.006017	254.56
3.3594	0.000186	92.21	0.005821	254.85
3.4375	0.000215	96.10	0.006278	254.09

3.5156	0.000248	94.23	0.005534	254.48
3.5938	0.000255	93.43	0.006251	253.48
3.6719	0.000163	91.59	0.004742	254.50
3.7500	0.000242	93.84	0.005566	254.54
3.8281	0.000205	91.90	0.004169	254.97
3.9062	0.000156	95.68	0.004773	255.73
3.9844	0.00011	90.62	0.004138	254.47
4.0625	0.000148	90.65	0.005331	254.32
4.1406	0.000194	268.66	0.004398	253.07
4.2188	0.000173	268.61	0.00518	253.78
4.2969	0.000161	90.51	0.003625	254.26
4.3750	0.000179	93.59	0.004748	253.88
4.4531	0.000151	268.20	0.003248	254.66
4.5313	0.00013	267.68	0.004589	254.36
4.6094	0.000117	90.90	0.003137	254.66
4.6875	0.000186	92.28	0.004279	254.57
4.7656	0.000112	92.84	0.002809	254.90
4.8438	0.000111	91.86	0.00357	254.60
4.9219	0.000162	92.30	0.002933	253.77

Table P11
S1X5G5 ADV Spectral Energy Density (m^2/Hz) and Vector-Mean Wave Direction (deg)

	Probe 0		Probe 1	
f (Hz)	*S*(*f*)	θ(*f*)	*S*(*f*)	θ(*f*)
0.0781	0.128876	106.07	0.340505	178.55
0.1562	0.118486	104.81	0.337158	198.23
0.2344	0.113825	201.66	0.209147	192.62
0.3125	0.067602	205.42	0.131892	196.53
0.3906	0.03559	225.67	0.106901	204.54
0.4687	0.088674	222.23	0.283404	208.23
0.5469	0.273304	226.82	1.211309	208.51
0.6250	0.802271	225.38	2.76815	207.12
0.7031	0.420233	224.41	1.445699	207.69
0.7813	0.138087	227.01	0.42484	207.79
0.8594	0.085495	223.84	0.244368	208.92
0.9375	0.05439	221.50	0.18971	206.02
1.0156	0.030499	229.03	0.137775	208.13
1.0937	0.035364	224.20	0.135715	206.29
1.1719	0.058454	227.30	0.110137	212.91
1.2500	0.036357	226.18	0.093485	212.45
1.3281	0.030349	226.09	0.070322	209.95
1.4062	0.020306	225.50	0.029802	207.97
1.4844	0.009179	230.24	0.027181	204.78
1.5625	0.005632	236.09	0.038275	202.75
1.6406	0.010373	206.41	0.033378	201.07
1.7188	0.006321	227.12	0.0116	211.30
1.7969	0.006317	228.65	0.009944	212.29
1.8750	0.003512	244.83	0.010696	202.94
1.9531	0.003617	251.72	0.0092	204.52
2.0313	0.001744	260.53	0.008037	207.00
2.1094	0.001706	108.12	0.003583	194.23
2.1875	0.001505	94.84	0.004573	188.16
2.2656	0.001376	267.89	0.002432	209.04
2.3437	0.001044	94.36	0.002123	207.38
2.4219	0.001112	262.70	0.002193	203.62
2.5000	0.000533	265.36	0.001959	206.28
2.5781	0.000515	91.70	0.001101	199.57
2.6562	0.000357	95.93	0.000705	262.99
2.7344	0.000317	93.18	0.000706	266.12
2.8125	0.000233	269.35	0.000509	255.59
2.8906	0.000185	92.17	0.000415	254.04
2.9687	0.000172	267.92	0.000216	105.05
3.0469	0.000235	91.15	0.000275	104.17
3.1250	0.000155	94.35	0.000178	97.66
3.2031	0.000175	91.91	0.000201	110.62
3.2812	0.000222	90.33	0.000198	93.85
3.3594	0.000155	268.43	0.000139	262.20
3.4375	0.00013	90.63	9.01E-05	97.40

3.5156	0.000135	267.99	9.97E-05	93.30
3.5938	0.000126	91.01	0.000133	94.27
3.6719	0.000227	91.37	0.000101	103.14
3.7500	0.000131	269.50	0.000102	97.71
3.8281	0.000105	268.54	6.36E-05	94.43
3.9062	0.000115	268.18	7.23E-05	95.26
3.9844	0.000139	269.47	5.94E-05	91.63
4.0625	9.16E-05	265.19	4.73E-05	267.57
4.1406	0.000135	265.25	5.62E-05	267.08
4.2188	0.000148	267.96	4.11E-05	91.96
4.2969	0.000132	267.75	4.99E-05	95.85
4.3750	0.000157	262.64	4.92E-05	269.94
4.4531	0.000179	91.32	4.79E-05	98.96
4.5313	0.000147	90.46	3.53E-05	90.22
4.6094	0.000147	266.13	4.97E-05	90.82
4.6875	0.00011	267.68	4.67E-05	90.13
4.7656	0.000117	91.25	4.15E-05	93.72
4.8438	0.000114	95.66	3.35E-05	269.59
4.9219	8.65E-05	91.65	2.8E-05	268.10

Table P12
S1X6G1 ADV Spectral Energy Density (m^2/Hz) and Vector-Mean Wave Direction (deg)

	Probe 0		Probe 1	
f (Hz)	*S*(*f*)	θ(*f*)	*S*(*f*)	θ(*f*)
0.0391	0.004735	102.291	0.003713	260.181
0.0215	0.005411	103.694	0.002172	98.902
0.0191	0.002704	99.247	0.001919	116.993
0.0382	0.003177	100.681	0.002404	268.993
0.0581	0.002968	105.338	0.001158	256.881
0.0302	0.001089	99.531	0.002186	243.648
0.0300	0.001784	98.943	0.00337	181.813
0.0102	0.002625	104.284	0.001533	226.780
0.0077	0.002993	102.941	0.00189	246.539
0.0053	0.003912	102.113	0.001571	222.639
0.0019	0.002399	100.661	0.000833	248.741
0.0018	0.001482	98.107	0.000709	249.528
0.0020	0.002675	102.353	0.000869	236.825
0.0014	0.001503	90.903	0.000853	237.037
0.0012	0.001978	102.026	0.000339	248.928
0.0024	0.002384	97.695	0.00123	232.845
0.0018	0.002138	100.865	0.000676	242.906
0.0012	0.001084	95.151	0.000721	231.707
0.0010	0.001973	102.700	0.000276	258.974
0.0015	0.001771	98.894	0.000621	247.361
0.0015	0.001522	98.161	0.000781	246.181
0.0014	0.001958	98.258	0.001345	227.965
0.0012	0.00248	102.216	0.000845	218.417
0.0019	0.002271	102.675	0.000415	268.200
0.0018	0.003375	102.405	0.000441	258.160
0.0042	0.00297	105.533	0.001648	247.114
0.0074	0.002512	102.547	0.001952	241.365
0.0081	0.001691	97.671	0.001739	247.069
0.0067	0.002364	99.538	0.001085	254.463
0.0089	0.006198	107.102	0.001285	264.260
0.0185	0.004251	102.248	0.002804	248.011
0.0100	0.015364	103.096	0.147449	255.156
0.0075	0.004689	105.169	0.017476	255.262
0.0031	0.001985	103.142	0.005371	255.406
0.0056	0.003045	102.582	0.002907	255.234
0.0042	0.002953	104.049	0.000955	254.871
0.0032	0.002022	99.489	0.001304	251.191
0.0035	0.002197	101.771	0.00189	236.515
0.0030	0.001563	97.088	0.001486	232.332
0.0044	0.001073	96.576	0.000378	263.273
0.0025	0.001884	99.031	0.001998	235.198
0.0036	0.002008	100.493	0.002138	199.931

0.0027	0.001409	98.274	0.000733	247.890
0.0011	0.00157	96.568	0.000872	243.546
0.0017	0.003908	102.171	0.000539	259.036
0.0012	0.004033	103.525	0.000653	237.656
0.0012	0.00136	97.520	0.000196	263.622
0.0009	0.001537	97.256	0.000784	229.644
0.0009	0.003042	106.209	0.000333	250.026
0.0012	0.002075	101.436	0.00033	255.836
0.0007	0.002453	101.664	0.000307	254.709
0.0016	0.001644	101.835	0.000724	237.870
0.0012	0.001181	101.687	0.000733	239.475
0.0011	0.002139	98.243	0.000575	228.281
0.0011	0.002619	100.230	0.000438	243.316
0.0009	0.002146	100.234	0.001049	243.007
0.0008	0.002998	106.246	0.000812	244.253
0.0006	0.003916	103.845	0.000357	243.982
0.0005	0.005914	104.341	0.000907	218.280
0.0010	0.00502	104.268	0.000944	241.931
0.0008	0.002146	101.158	0.000532	107.932
0.0009	0.002267	101.301	0.001047	204.563
0.0006	0.002932	103.265	0.001686	119.802

Table P13
S1X6G2 ADV Spectral Energy Density (m^2/Hz) and Vector-Mean Wave Direction (deg)

	Probe 0		Probe 1	
f (Hz)	*S*(*f*)	θ(*f*)	*S*(*f*)	θ(*f*)
0.0391	0.001459	266.45	0.001311	91.27
0.0215	0.001037	264.28	0.000509	97.45
0.0191	0.000746	266.58	0.000262	135.30
0.0382	0.000943	262.20	0.000171	227.35
0.0581	0.000813	266.49	0.000172	220.64
0.0302	0.001726	263.29	0.000194	213.72
0.0300	0.001006	268.49	0.000257	180.40
0.0102	0.001068	267.58	0.000172	136.75
0.0077	0.0009	265.82	0.000221	194.52
0.0053	0.000531	91.31	0.000205	199.56
0.0019	0.000838	267.27	0.000106	201.65
0.0018	0.000696	269.93	0.000101	97.51
0.0020	0.001178	262.18	0.000128	153.77
0.0014	0.001223	265.03	0.00016	195.61
0.0012	0.001098	265.50	0.000233	191.85
0.0024	0.000673	263.57	0.000156	190.44
0.0018	0.000816	262.57	0.000149	208.19
0.0012	0.000838	266.03	0.000224	157.13
0.0010	0.001087	262.70	0.000172	207.70
0.0015	0.000724	268.93	0.000105	245.76
0.0015	0.001199	262.21	0.000181	225.04
0.0014	0.001352	267.10	0.000451	194.42
0.0012	0.000666	264.53	0.000395	204.83
0.0019	0.000714	266.08	0.000195	207.34
0.0018	0.000564	269.30	0.000372	209.94
0.0042	0.001382	266.17	0.000737	216.83
0.0074	0.001536	267.31	0.003043	218.90
0.0081	0.001465	258.28	0.007353	220.22
0.0067	0.003842	260.50	0.018553	219.17
0.0089	0.008713	248.39	0.042304	220.43
0.0185	0.031808	224.83	0.176248	219.60
0.0100	0.199193	217.50	1.125575	219.53
0.0075	0.004111	253.63	0.010756	219.61
0.0031	0.001695	259.85	0.001078	203.94
0.0056	0.001193	265.07	0.00204	218.92
0.0042	0.001486	259.27	0.002956	217.59
0.0032	0.001143	264.47	0.002813	219.99
0.0035	0.001205	267.36	0.00191	221.42
0.0030	0.001153	265.80	0.001401	217.34
0.0044	0.000835	266.37	0.000536	213.35
0.0025	0.001002	268.10	0.000457	208.75
0.0036	0.000933	91.56	0.000177	233.67

0.0027	0.001122	263.31	0.000132	265.20
0.0011	0.000946	268.27	0.000171	169.70
0.0017	0.001475	258.61	0.000154	173.39
0.0012	0.000512	91.78	0.000145	130.35
0.0012	0.000913	265.44	0.000196	217.47
0.0009	0.000865	257.46	0.000213	206.82
0.0009	0.001068	263.09	0.000201	141.33
0.0012	0.001	265.21	0.000244	207.56
0.0007	0.000724	262.91	0.000139	251.00
0.0016	0.000981	265.76	0.000104	230.08
0.0012	0.000587	264.67	0.000294	204.47
0.0011	0.001423	266.54	0.000617	193.03
0.0011	0.000794	261.44	0.001057	173.49
0.0009	0.000679	267.71	0.000314	185.05
0.0008	0.000846	264.89	0.000262	158.99
0.0006	0.001577	91.80	0.000351	153.28
0.0005	0.001049	90.91	0.000466	161.53
0.0010	0.001514	261.92	0.000388	152.28
0.0008	0.00119	266.25	0.000634	134.12
0.0009	0.000943	265.41	0.001269	139.96
0.0006	0.001829	269.91	0.002234	268.85

Table P14
S1X6G3 ADV Spectral Energy Density (m^2/Hz) and Vector-Mean Wave Direction (deg)

	Probe 0		Probe 1	
f (Hz)	*S*(*f*)	θ(*f*)	*S*(*f*)	θ(*f*)
0.0781	0.005906	265.96	0.015489	106.19
0.1562	0.00247	114.76	0.014754	132.77
0.2344	0.001959	257.36	0.007891	152.02
0.3125	0.001532	260.48	0.003442	143.67
0.3906	0.000984	107.96	0.002116	132.66
0.4687	0.000474	267.79	0.001809	150.64
0.5469	0.000502	92.84	0.000979	119.48
0.6250	0.000517	98.30	0.000408	246.50
0.7031	0.000587	257.08	0.001465	212.55
0.7813	0.001103	244.26	0.004442	215.28
0.8594	0.002533	240.40	0.008856	218.47
0.9375	0.005579	239.83	0.016697	222.86
1.0156	0.009737	239.58	0.035518	219.26
1.0937	0.01851	237.58	0.062823	220.50
1.1719	0.045539	238.68	0.18329	219.79
1.2500	0.792605	238.01	2.719602	219.63
1.3281	0.001697	236.68	0.009637	216.93
1.4062	0.003105	241.27	0.011147	214.22
1.4844	0.003552	240.32	0.01268	218.56
1.5625	0.003709	239.52	0.010681	221.87
1.6406	0.002344	241.45	0.007846	220.79
1.7188	0.001342	242.19	0.004557	220.78
1.7969	0.000725	244.98	0.002308	222.93
1.8750	0.000368	252.43	0.001271	223.69
1.9531	0.000165	264.44	0.000469	252.69
2.0313	0.000141	261.52	0.000305	264.70
2.1094	0.000286	264.76	0.00037	112.56
2.1875	0.000273	90.37	0.000365	260.46
2.2656	0.000268	264.31	0.000475	244.62
2.3437	0.00049	261.90	0.000881	255.95
2.4219	0.001428	262.69	0.003373	256.97
2.5000	0.00236	264.92	0.008479	249.60
2.5781	0.000299	261.99	0.000639	263.72
2.6562	0.000117	269.68	0.000379	110.60
2.7344	0.000102	265.73	0.000205	109.46
2.8125	9.74E-05	266.55	9.91E-05	96.56
2.8906	9.68E-05	264.14	8.78E-05	96.15
2.9687	6.98E-05	266.38	9.73E-05	94.72
3.0469	6.3E-05	269.82	7.9E-05	92.18
3.1250	5.78E-05	268.25	4.44E-05	90.62
3.2031	7.55E-05	268.94	5.18E-05	268.51
3.2812	7.18E-05	268.14	4.59E-05	95.56
3.3594	9.53E-05	260.93	4.56E-05	264.68
3.4375	6.25E-05	265.18	2.35E-05	268.31

3.5156	6.25E-05	263.96	3.41E-05	91.82
3.5938	7.15E-05	266.12	3.37E-05	267.78
3.6719	0.00011	263.63	6.95E-05	93.06
3.7500	0.000217	261.69	6.72E-05	269.05
3.8281	7.64E-05	264.38	2.35E-05	267.65
3.9062	5.64E-05	265.24	2.29E-05	267.25
3.9844	6.49E-05	267.97	2.7E-05	267.10
4.0625	5.3E-05	90.85	2.2E-05	266.23
4.1406	4.94E-05	90.63	1.97E-05	265.99
4.2188	4.51E-05	266.37	2.28E-05	260.05
4.2969	7.45E-05	264.46	1.71E-05	269.06
4.3750	4.79E-05	268.61	1.42E-05	263.94
4.4531	4.62E-05	269.81	2.77E-05	265.68
4.5313	4.23E-05	267.06	2.24E-05	268.01
4.6094	5.63E-05	265.61	1.3E-05	266.45
4.6875	6.72E-05	266.49	1.54E-05	263.54
4.7656	5.57E-05	91.24	1.71E-05	266.43
4.8438	5.84E-05	265.00	1.42E-05	268.60
4.9219	9.02E-05	261.69	2.13E-05	269.19

Table P15
S1X6G4 ADV Spectral Energy Density (m^2/Hz) and Vector-Mean Wave Direction (deg)

	Probe 0		Probe 1	
f (Hz)	*S*(*f*)	θ(*f*)	*S*(*f*)	θ(*f*)
0.0391	0.011804	266.88	0.077916	200.41
0.0781	0.005058	268.31	0.047539	205.69
0.1172	0.005451	90.35	0.036261	194.17
0.1562	0.007324	268.75	0.053275	204.59
0.1953	0.004185	266.77	0.025261	197.07
0.2344	0.008464	265.25	0.046414	201.86
0.2734	0.013225	253.59	0.024744	199.09
0.3125	0.007241	261.58	0.020623	203.36
0.3516	0.009907	263.44	0.05346	200.52
0.3906	0.005882	265.04	0.02625	207.35
0.4297	0.006766	93.85	0.027161	202.46
0.4687	0.004424	268.45	0.042407	199.67
0.5078	0.007089	264.31	0.044796	201.31
0.5469	0.003385	264.89	0.068497	200.52
0.5859	0.006034	262.67	0.063369	203.51
0.6250	0.003368	266.68	0.037466	198.92
0.6641	0.005262	268.21	0.055246	191.36
0.7031	0.003483	267.41	0.096897	198.37
0.7422	0.003241	265.36	0.060402	197.71
0.7813	0.004027	268.34	0.049132	207.01
0.8203	0.004869	268.57	0.04314	205.57
0.8594	0.006048	266.68	0.04929	206.70
0.8984	0.00673	266.72	0.024361	196.72
0.9375	0.005249	267.12	0.028122	208.23
0.9766	0.00492	262.52	0.030581	201.44
1.0156	0.003825	266.28	0.032865	209.80
1.0547	0.004221	95.14	0.064123	207.08
1.0937	0.005438	96.10	0.127174	208.64
1.1328	0.004782	268.16	0.257077	206.59
1.1719	0.012883	261.19	0.383349	209.73
1.2109	0.020702	260.19	1.538033	208.41
1.2500	0.157672	232.01	14.75434	208.05
1.2891	0.009223	269.89	0.092797	205.75
1.3281	0.004914	268.13	0.102796	207.30
1.3672	0.007799	90.73	0.088613	201.63
1.4062	0.006247	92.06	0.087948	202.72
1.4453	0.005153	266.69	0.06689	206.51
1.4844	0.005115	266.19	0.042351	207.58
1.5234	0.005165	267.61	0.044755	206.84
1.5625	0.004203	263.11	0.032711	202.93
1.6016	0.006083	263.82	0.047569	195.87
1.6406	0.004445	90.25	0.022143	202.45
1.6797	0.00605	267.78	0.027625	198.95
1.7188	0.007477	265.38	0.054012	189.57

1.7578	0.00686	263.43	0.041863	192.81
1.7969	0.007249	257.54	0.02621	209.78
1.8359	0.004975	260.37	0.033937	200.62
1.8750	0.005657	269.80	0.038711	204.24
1.9141	0.004319	268.01	0.052198	203.35
1.9531	0.005853	269.21	0.03946	203.82
1.9922	0.007497	263.56	0.037973	201.35
2.0313	0.007253	267.60	0.040594	194.42
2.0703	0.008117	262.77	0.052448	196.74
2.1094	0.009497	258.85	0.038367	193.27
2.1484	0.005115	263.71	0.039216	199.39
2.1875	0.006412	265.75	0.025568	209.92
2.2266	0.004526	263.39	0.03661	201.97
2.2656	0.004437	265.16	0.023938	207.69
2.3047	0.005872	265.74	0.018474	201.65
2.3437	0.009315	90.97	0.027831	196.20
2.3828	0.005342	90.20	0.018049	211.62
2.4219	0.007108	93.58	0.050353	207.25
2.4609	0.016379	261.27	0.076763	203.79

Table P16
S1X6G5 ADV Spectral Energy Density (m^2/Hz) and Vector-Mean Wave Direction (deg)

	Probe 0		Probe 1	
f (Hz)	*S*(*f*)	θ(*f*)	*S*(*f*)	θ(*f*)
0.0781	0.012721	121.3115	0.01146	173.4845
0.1562	0.009763	102.5406	0.002052	218.9391
0.2344	0.005145	268.2848	0.000654	211.6658
0.3125	0.005238	233.8507	0.000257	233.2808
0.3906	0.003075	245.3194	0.000274	231.5696
0.4687	0.002852	239.459	0.000226	239.1354
0.5469	0.001569	255.6973	5.24E-05	90.75449
0.6250	0.002644	255.3732	0.000314	226.8586
0.7031	0.001265	257.5317	0.002369	210.6751
0.7813	0.002156	246.2676	0.008789	207.7605
0.8594	0.005199	234.1324	0.022636	208.0969
0.9375	0.008888	231.1796	0.047681	209.7536
1.0156	0.017	231.2964	0.089765	208.3122
1.0937	0.031562	231.7	0.174169	206.8638
1.1719	0.070988	230.8474	0.391897	207.9927
1.2500	1.333277	230.4859	7.618247	207.8723
1.3281	0.000995	258.5081	0.002421	208.2049
1.4062	0.004845	232.565	0.028355	207.1259
1.4844	0.006366	235.8379	0.035147	208.1021
1.5625	0.006347	234.3236	0.031613	207.9384
1.6406	0.004137	235.7151	0.022083	208.0062
1.7188	0.002651	231.911	0.012139	209.6569
1.7969	0.001317	242.6893	0.005932	208.8113
1.8750	0.000758	255.4918	0.002003	210.4214
1.9531	0.000443	262.1154	0.000567	223.0623
2.0313	0.000371	261.1269	0.000261	241.334
2.1094	0.000358	266.2573	0.00031	99.43492
2.1875	0.000584	264.0416	0.000436	188.2447
2.2656	0.000907	91.88524	0.000625	108.7736
2.3437	0.0007	98.20978	0.000704	105.8564
2.4219	0.002645	122.7324	0.001776	127.59
2.5000	0.017261	131.1887	0.005853	121.6623
2.5781	0.000515	267.2556	0.000497	121.2015
2.6562	0.00027	267.2147	0.000192	101.0334
2.7344	0.000228	268.7393	0.000288	127.4843
2.8125	0.000203	266.0627	0.000181	117.3046
2.8906	0.000212	265.8731	0.000158	125.3354
2.9687	0.000138	266.2043	9.15E-05	262.5487
3.0469	0.000143	267.24	8.79E-05	95.50989
3.1250	0.000211	264.4524	5.38E-05	264.2059
3.2031	0.000168	93.18481	3.75E-05	266.5185
3.2812	0.000152	268.31	2.65E-05	93.81686
3.3594	0.000139	265.0042	6.93E-05	267.9033
3.4375	0.000145	269.9534	2.84E-05	265.5441

3.5156	0.000122	263.4192	2.41E-05	266.9002
3.5938	0.000145	261.9556	4.74E-05	257.6164
3.6719	0.000476	256.6807	9.91E-05	267.9223
3.7500	0.001479	251.012	0.000228	269.644
3.8281	0.000143	265.7334	2.91E-05	269.5657
3.9062	8.11E-05	268.9602	1.57E-05	264.217
3.9844	9.12E-05	93.19602	2.6E-05	265.6068
4.0625	0.000118	268.2186	2.59E-05	91.04005
4.1406	0.000108	91.16197	2.69E-05	267.8882
4.2188	8.18E-05	267.7369	1.93E-05	268.7865
4.2969	0.000115	268.4759	3.15E-05	261.1964
4.3750	0.000112	268.0789	1.87E-05	264.6097
4.4531	7.63E-05	268.2567	4.58E-05	262.6454
4.5313	0.00012	91.64367	1.94E-05	266.4846
4.6094	9.39E-05	91.42663	2.02E-05	267.8297
4.6875	0.000177	90.16187	1.27E-05	265.0226
4.7656	0.000139	269.8907	1.28E-05	267.9756
4.8438	9.96E-05	268.2692	2.78E-05	268.8632
4.9219	0.000171	263.8372	1.92E-05	267.4883

Table P17
S1X4G1 CIIS Spectral Pixel Intensity Energy Density (I^2/Hz) and Vector-Mean Wave Direction (deg)

	Camera 4						Camera 6		
	Probe 0 (CIIS Location ID=31)			Probe 1 (CIIS Location ID= 81)			Probe 1 (Not in view)		
Location	X (m)	Y (m)		X (m)	Y (m)		X (m)	Y (m)	
	13.29	18.35		12.68	20.18		NaN	NaN	
f (Hz)	$S(f)$	$\theta_m(f)$	$\theta_m(f)_c$	$S(f)$	$\theta_m(f)$	$\theta_m(f)_c$	$S(f)$	$\theta_m(f)$	$\theta_m(f)_c$
0.0293	6.0368	21.15	NaN	12.7873	39.9	NaN	NaN	NaN	NaN
0.0732	3.6149	5.4	NaN	5.0071	68.91	NaN	NaN	NaN	NaN
0.1172	2.8913	1.88	NaN	3.3887	221.91	NaN	NaN	NaN	NaN
0.1611	2.3872	59.4	NaN	2.8329	82.23	NaN	NaN	NaN	NaN
0.2051	2.6001	120.02	NaN	2.1786	72.83	NaN	NaN	NaN	NaN
0.249	2.1781	55.26	NaN	2.1224	40.24	NaN	NaN	NaN	NaN
0.293	2.0661	127.11	NaN	2.1377	235.66	NaN	NaN	NaN	NaN
0.3369	1.8288	246.59	NaN	1.7994	226.55	NaN	NaN	NaN	NaN
0.3809	1.5478	252.34	NaN	1.7093	265.25	NaN	NaN	NaN	NaN
0.4248	1.6557	201.88	NaN	1.8409	61.56	NaN	NaN	NaN	NaN
0.4688	1.9451	269.65	NaN	2.0824	3.48	NaN	NaN	NaN	NaN
0.5127	1.9877	209.92	NaN	1.7644	192.06	NaN	NaN	NaN	NaN
0.5566	1.7299	155.19	NaN	1.8474	253.87	NaN	NaN	NaN	NaN
0.6006	1.7087	40	NaN	1.7067	44.92	NaN	NaN	NaN	NaN
0.6445	1.8899	103.35	NaN	2.029	229.61	NaN	NaN	NaN	NaN
0.6885	1.6531	219.62	NaN	1.9432	24.2	NaN	NaN	NaN	NaN
0.7324	1.7295	260.46	NaN	1.6663	1.54	NaN	NaN	NaN	NaN
0.7764	1.8491	76.54	NaN	1.7532	142.47	NaN	NaN	NaN	NaN
0.8203	1.9309	178.05	NaN	2.016	159.51	NaN	NaN	NaN	NaN
0.8643	1.9412	202.49	NaN	1.9768	132.47	NaN	NaN	NaN	NaN
0.9082	1.5963	224.65	NaN	2.1522	113.32	NaN	NaN	NaN	NaN
0.9521	1.8703	210.4	NaN	2.2811	151.98	NaN	NaN	NaN	NaN
0.9961	2.3301	160.92	NaN	4.049	140.11	NaN	NaN	NaN	NaN
1.04	2.6808	158.08	NaN	7.8166	135.46	NaN	NaN	NaN	NaN
1.084	2.9427	161.99	NaN	6.2726	150.2	NaN	NaN	NaN	NaN
1.1279	3.1243	156.44	NaN	9.1551	145.21	NaN	NaN	NaN	NaN
1.1719	4.2785	155.55	NaN	12.6108	137.54	NaN	NaN	NaN	NaN
1.2158	3.2932	154.88	NaN	9.7085	139.86	NaN	NaN	NaN	NaN
1.2598	2.8358	154.49	NaN	10.0156	138.15	NaN	NaN	NaN	NaN
1.3037	2.9434	145.99	NaN	7.1706	130.97	NaN	NaN	NaN	NaN
1.3477	2.9802	134.87	NaN	7.3286	135.8	NaN	NaN	NaN	NaN
1.3916	2.1637	128.13	NaN	5.0216	136.13	NaN	NaN	NaN	NaN
1.4355	2.0932	185.19	NaN	4.7318	133.18	NaN	NaN	NaN	NaN
1.4795	2.1378	129.33	NaN	4.3665	137.47	NaN	NaN	NaN	NaN
1.5234	1.931	148.64	NaN	3.2192	139.83	NaN	NaN	NaN	NaN
1.5674	2.0892	196.28	NaN	3.5565	128.91	NaN	NaN	NaN	NaN
1.6113	1.9163	75.69	NaN	2.6923	133.44	NaN	NaN	NaN	NaN
1.6553	1.8613	112.33	NaN	2.5071	143.1	NaN	NaN	NaN	NaN

1.6992	1.8169	104.7	NaN	2.6018	99.04	NaN	NaN	NaN	NaN
1.7432	1.8328	29.87	NaN	2.6618	88.27	NaN	NaN	NaN	NaN
1.7871	1.7388	5.4	NaN	2.0321	55.25	NaN	NaN	NaN	NaN
1.8311	1.7938	57.58	NaN	2.8822	56.36	NaN	NaN	NaN	NaN
1.875	1.6354	77.08	NaN	2.6344	51.44	NaN	NaN	NaN	NaN
1.9189	1.646	108.18	NaN	3.0105	32.5	NaN	NaN	NaN	NaN
1.9629	1.6363	144.03	NaN	3.1362	158.11	NaN	NaN	NaN	NaN
2.0068	1.7949	90.38	NaN	3.4501	64.76	NaN	NaN	NaN	NaN
2.0508	1.5597	138.48	NaN	4.4817	78.01	NaN	NaN	NaN	NaN
2.0947	1.705	220.29	NaN	2.5467	56.82	NaN	NaN	NaN	NaN
2.1387	1.6417	34.99	NaN	3.1384	68.84	NaN	NaN	NaN	NaN
2.1826	1.8288	78.49	NaN	2.7111	85.11	NaN	NaN	NaN	NaN
2.2266	2.1145	173.95	NaN	4.16	262.6	NaN	NaN	NaN	NaN
2.2705	1.8574	167.56	NaN	3.5883	63.7	NaN	NaN	NaN	NaN
2.3145	2.0726	143.98	NaN	3.4263	83.56	NaN	NaN	NaN	NaN
2.3584	1.8415	202.85	NaN	3.0447	84.17	NaN	NaN	NaN	NaN
2.4023	2.2079	247.68	NaN	2.9692	265.62	NaN	NaN	NaN	NaN
2.4463	2.1384	206.2	NaN	2.5236	235.97	NaN	NaN	NaN	NaN
2.4902	2.0791	234.44	NaN	2.4098	156.8	NaN	NaN	NaN	NaN
2.5342	1.5985	134.33	NaN	2.7968	216.49	NaN	NaN	NaN	NaN
2.5781	1.6121	211.94	NaN	2.4871	105.22	NaN	NaN	NaN	NaN
2.6221	1.6208	180.36	NaN	2.781	189.38	NaN	NaN	NaN	NaN
2.666	1.5626	164.87	NaN	2.0713	43.71	NaN	NaN	NaN	NaN
2.71	1.553	141.58	NaN	2.3209	81.32	NaN	NaN	NaN	NaN
2.7539	1.7807	130.04	NaN	2.5602	222.14	NaN	NaN	NaN	NaN
2.7979	1.374	30.14	NaN	2.2348	10.02	NaN	NaN	NaN	NaN
2.8418	1.4437	76.1	NaN	1.8172	154.05	NaN	NaN	NaN	NaN
2.8857	1.4559	195.96	NaN	1.6944	23.51	NaN	NaN	NaN	NaN
2.9297	1.4092	231.27	NaN	1.7504	55.87	NaN	NaN	NaN	NaN
2.9736	1.5901	37.07	NaN	1.7234	31.8	NaN	NaN	NaN	NaN

Table P18
S1X4G2 CIIS Spectral Pixel Intensity Energy Density (I^2/Hz) and Vector-Mean Wave Direction (deg)

	Camera 4						Camera 6		
	Probe 0 (CIIS Location ID=32)			Probe 1 (CIIS Location ID= 83)			Probe 1 (CIIS Location ID=12)		
Location	X (m)	Y (m)		X (m)	Y (m)		X (m)	Y (m)	
	13.9	18.35		13.9	20.18		13.88	20.16	
f (Hz)	$S(f)$	$\theta_m(f)$	$\theta_m(f)_c$	$S(f)$	$\theta_m(f)$	$\theta_m(f)_c$	$S(f)$	$\theta_m(f)$	$\theta_m(f)_c$
0.0293	7.6658	13.69	NaN	17.01	84.38	NaN	17.0489	78.17	NaN
0.0732	3.4799	40.8	NaN	7.0888	69.32	NaN	6.1296	36.72	NaN
0.1172	3.4743	67.16	NaN	4.0791	18.74	NaN	4.8688	22.09	NaN
0.1611	2.5627	201.78	NaN	2.3584	267.94	NaN	3.396	6.04	NaN
0.2051	1.8898	175.1	NaN	2.202	216.22	NaN	2.8555	190.44	NaN
0.249	2.0087	218.76	NaN	2.1453	179.09	NaN	2.4559	235.75	NaN
0.293	2.0402	70.89	NaN	2.4958	250.62	NaN	2.4992	164.63	NaN
0.3369	1.7118	213.29	NaN	2.4112	82.84	NaN	2.1425	143.56	NaN
0.3809	1.6919	89.57	NaN	2.2483	200	NaN	2.5443	246.76	NaN
0.4248	1.756	32.56	NaN	2.0252	66.39	NaN	2.3104	46.99	NaN
0.4688	1.8703	41.92	NaN	2.0411	159.14	NaN	2.3497	112.89	NaN
0.5127	1.5978	221.7	NaN	1.9794	190.99	NaN	1.8882	165.86	NaN
0.5566	1.6171	178.94	NaN	1.9883	234.9	NaN	1.8584	55.8	NaN
0.6006	1.7046	185.24	NaN	2.1308	99.96	NaN	1.7692	143.72	NaN
0.6445	1.7951	254.14	NaN	1.9223	240.23	NaN	1.9632	44.68	NaN
0.6885	1.6997	143.25	NaN	2.0211	18.55	NaN	2.3117	110.13	NaN
0.7324	1.6044	50.72	NaN	2.2083	235.1	NaN	2.3405	99.63	NaN
0.7764	1.6267	33.56	NaN	2.6054	115.9	NaN	2.6573	132.36	NaN
0.8203	1.9235	214.09	NaN	2.49	162.11	NaN	2.3996	183.21	NaN
0.8643	1.6334	145.58	NaN	2.8681	148.69	NaN	3.1642	136.37	NaN
0.9082	1.9365	182.81	NaN	3.922	145.01	NaN	3.8909	154.82	NaN
0.9521	1.7223	228.69	NaN	3.6588	132.48	NaN	3.8938	125.31	NaN
0.9961	2.5915	176.77	NaN	11.9509	127.49	127.49	10.9553	128.47	128.47
1.04	3.8836	143.41	NaN	23.8464	130.98	130.98	23.3942	131.37	131.37
1.084	3.8819	160.74	NaN	18.7225	129.85	129.85	16.207	132.26	NaN
1.1279	3.8868	155.15	NaN	28.5404	129.18	129.18	24.5989	128.99	128.99
1.1719	6.3317	145.25	NaN	54.1518	130.77	130.77	49.9271	129.4	129.4
1.2158	4.9519	153.09	NaN	31.3525	130.76	130.76	29.6334	128.56	128.56
1.2598	4.968	138.31	NaN	44.5939	128.37	128.37	39.4424	127.39	127.39
1.3037	4.7662	146.18	NaN	38.7686	131.52	131.52	32.634	129.49	129.49
1.3477	4.1428	148.84	NaN	30.1166	131.49	131.49	25.8365	129.05	129.05
1.3916	2.9258	145.58	NaN	21.3381	133.06	NaN	18.4237	131.79	131.79
1.4355	2.9442	131.46	NaN	19.109	129.96	NaN	17.4716	131.82	NaN
1.4795	2.7821	116.23	NaN	18.207	133.54	NaN	17.504	130.11	130.11
1.5234	2.6104	120.51	NaN	10.6135	128.99	NaN	10.1778	129.73	NaN
1.5674	2.413	133.09	NaN	13.2591	130.44	NaN	11.9182	125.94	NaN
1.6113	1.9526	166.75	NaN	10.1439	127.19	NaN	8.8976	122.71	NaN
1.6553	1.5861	119.25	NaN	7.3933	127.93	NaN	6.2387	121.35	NaN

1.6992	1.5823	38.42	NaN	6.7919	126.09	NaN	6.5152	115.13	NaN
1.7432	2.0442	192.23	NaN	6.8867	122.38	NaN	6.0845	111.22	NaN
1.7871	1.4517	42.3	NaN	5.2224	109.9	NaN	4.9945	97.27	NaN
1.8311	1.7358	229.71	NaN	5.4274	96.52	NaN	5.7902	99.56	NaN
1.875	1.8226	241.19	NaN	4.8546	88.52	NaN	4.7372	105.29	NaN
1.9189	1.7136	67.95	NaN	5.3881	64.12	NaN	5.0613	120.71	NaN
1.9629	1.563	263.86	NaN	5.1052	81.64	NaN	4.5368	92.18	NaN
2.0068	1.7898	60.5	NaN	4.147	68.86	NaN	4.016	55.83	NaN
2.0508	1.8572	54.64	NaN	4.9204	52.01	NaN	5.0811	55	NaN
2.0947	1.7707	83.05	NaN	4.4061	71.97	NaN	4.2591	149.65	NaN
2.1387	1.9003	141.86	NaN	4.161	98.41	NaN	4.1471	87.94	NaN
2.1826	1.9507	122.69	NaN	3.566	55.8	NaN	4.0449	0.15	NaN
2.2266	1.7182	65.23	NaN	4.1789	66.73	NaN	4.3483	88.37	NaN
2.2705	1.5346	175.09	NaN	3.9386	258.73	NaN	4.8376	81.08	NaN
2.3145	1.8888	118.51	NaN	4.149	234.89	NaN	4.6359	59.06	NaN
2.3584	2.0067	147.46	NaN	3.6176	23.57	NaN	3.4347	78.18	NaN
2.4023	1.7972	256.02	NaN	3.3494	265.7	NaN	4.0846	269.82	NaN
2.4463	1.9867	42.33	NaN	3.8488	68.64	NaN	4.1523	79.64	NaN
2.4902	1.7291	135.56	NaN	2.7256	113.41	NaN	2.9963	199.48	NaN
2.5342	1.67	264.31	NaN	3.665	62.63	NaN	3.2041	223.38	NaN
2.5781	1.5337	35.34	NaN	2.7644	190.11	NaN	3.0092	207.3	NaN
2.6221	1.648	245.08	NaN	2.5405	247.46	NaN	3.3379	197.98	NaN
2.666	1.8325	151.24	NaN	3.2012	74	NaN	2.9263	219.34	NaN
2.71	1.7352	265.64	NaN	2.6449	32.73	NaN	2.5673	225.49	NaN
2.7539	1.4534	113.46	NaN	2.1546	53.46	NaN	2.57	69.25	NaN
2.7979	1.4864	172.11	NaN	2.4582	10.19	NaN	2.2974	22.43	NaN
2.8418	1.4481	74.82	NaN	2.1228	139.31	NaN	2.1921	52.67	NaN
2.8857	1.278	16.1	NaN	2.5455	12.22	NaN	2.457	12.2	NaN
2.9297	1.3966	20.4	NaN	2.1733	103.35	NaN	2.2055	56.89	NaN
2.9736	1.2556	55.6	NaN	2.173	27.73	NaN	2.6776	118	NaN

Table P19
S1X4G3 CIIS Spectral Pixel Intensity Energy Density (I^2/Hz) and Vector-Mean Wave Direction (deg)

	Camera 4						Camera 6		
	Probe 0 (CIIS Location ID=34)			Probe 1 (CIIS Location ID= 85)			Probe 1 (CIIS Location ID=14)		
Location	X (m)	Y (m)		X (m)	Y (m)		X (m)	Y (m)	
	15.12	18.35		15.12	20.18		15.1	20.17	
f (Hz)	$S(f)$	$\theta_m(f)$	$\theta_m(f)_c$	$S(f)$	$\theta_m(f)$	$\theta_m(f)_c$	$S(f)$	$\theta_m(f)$	$\theta_m(f)_c$
0.0293	10.0046	0.46	NaN	19.2269	50.96	NaN	16.491	55.39	NaN
0.0732	5.1593	16	NaN	9.8564	19.11	NaN	8.7459	5.4	NaN
0.1172	3.1984	26.75	NaN	6.7617	33.46	NaN	7.1503	3.71	NaN
0.1611	2.6496	4.5	NaN	6.0582	143.89	NaN	6.1843	144.41	NaN
0.2051	2.1968	221.4	NaN	5.384	169.87	NaN	5.4167	147.89	NaN
0.249	2.2532	41.86	NaN	4.5051	133.79	NaN	4.4955	118.48	NaN
0.293	1.9253	219.81	NaN	5.3452	146.65	NaN	4.5254	186.13	NaN
0.3369	1.7718	41.95	NaN	4.0994	139.96	NaN	3.9014	179.03	NaN
0.3809	1.9626	183.04	NaN	2.7985	113.48	NaN	3.2189	258.89	NaN
0.4248	1.6446	145.16	NaN	2.8027	163.12	NaN	2.9806	17.28	NaN
0.4688	1.6004	110	NaN	3.0687	159.21	NaN	3.0762	148.52	NaN
0.5127	1.4527	13.07	NaN	3.0697	140.21	NaN	3.24	156.51	NaN
0.5566	1.549	241.9	NaN	2.6003	154.19	NaN	2.664	117.98	NaN
0.6006	1.5628	198.95	NaN	2.606	173.35	NaN	2.6236	165.36	NaN
0.6445	1.8317	81.7	NaN	2.2921	155.47	NaN	2.6758	166.33	NaN
0.6885	1.4916	107.19	NaN	2.6006	129.27	NaN	2.6767	156.68	NaN
0.7324	1.6624	178.86	NaN	2.9521	138.04	NaN	2.6375	137.59	NaN
0.7764	1.5493	118.71	NaN	3.1222	118.19	NaN	3.718	151.03	NaN
0.8203	1.6851	208.68	NaN	3.7863	140.24	NaN	3.9024	134.14	NaN
0.8643	2.0858	161.8	NaN	5.1106	125.46	NaN	5.057	125.33	NaN
0.9082	2.0211	160.44	NaN	8.5264	128.08	NaN	9.1873	128.9	NaN
0.9521	2.1893	132.87	NaN	7.6875	123.66	NaN	7.4266	127.03	NaN
0.9961	7.0731	141.56	NaN	38.4094	120.33	120.33	34.7188	125.48	125.48
1.04	12.7715	138.94	138.94	81.23	117.59	117.59	69.7209	123.16	123.16
1.084	11.8524	138.43	138.43	73.5745	118.92	118.92	68.1157	124.26	124.26
1.1279	19.1646	140.72	140.72	111.4381	121.02	121.02	100.563	126.69	126.69
1.1719	27.6937	135.89	135.89	149.5039	119.11	119.11	132.5904	123.77	123.77
1.2158	19.2481	141.09	141.09	112.6373	121.25	121.25	104.5972	125.45	125.45
1.2598	25.2176	139.05	139.05	170.5232	121.56	121.56	154.0516	126.22	126.22
1.3037	16.2501	134.84	134.84	145.471	121.89	121.89	124.4849	126.88	126.88
1.3477	16.2668	134.43	134.43	87.7998	122.47	122.47	78.4485	126.73	126.73
1.3916	9.3601	137.71	NaN	65.3603	124.09	124.09	59.0372	127.29	127.29
1.4355	9.5643	138.01	NaN	77.1719	125.29	125.29	66.1259	128.01	128.01
1.4795	9.204	135.05	NaN	48.9953	126.91	126.91	44.6599	129.02	129.02
1.5234	6.1165	130.96	NaN	40.6941	126.9	126.9	35.799	130.27	NaN
1.5674	7.7761	127.12	NaN	30.6892	127.71	NaN	28.7681	129.89	129.89
1.6113	4.063	121.73	NaN	18.4564	130.2	NaN	16.927	132	NaN
1.6553	4.049	121.29	NaN	29.337	130.69	NaN	25.4081	128.48	NaN

1.6992	3.4243	120.06	NaN	23.9584	132.77	NaN	20.7464	130.19	NaN
1.7432	3.4061	107.66	NaN	24.8365	133.49	NaN	21.0721	131.6	NaN
1.7871	2.8017	93.98	NaN	24.2604	131.13	NaN	21.0966	128.46	NaN
1.8311	2.8478	96.05	NaN	14.3445	130.49	NaN	13.9646	127.15	NaN
1.875	2.7024	102.82	NaN	12.6476	128.91	NaN	12.3527	119.51	NaN
1.9189	2.5928	93.9	NaN	8.2738	132.82	NaN	7.3102	126.35	NaN
1.9629	2.0279	84.75	NaN	11.6092	144.25	NaN	10.7215	134.65	NaN
2.0068	2.3074	104.64	NaN	7.0146	140.31	NaN	6.6737	111.25	NaN
2.0508	2.4252	74.88	NaN	6.3125	125.58	NaN	6.3392	95.17	NaN
2.0947	2.0585	83.13	NaN	8.487	120.99	NaN	7.817	86.28	NaN
2.1387	2.476	110.96	NaN	7.3109	160.75	NaN	7.8103	77.61	NaN
2.1826	2.541	82.13	NaN	6.4547	86.35	NaN	7.1239	53.77	NaN
2.2266	2.4603	122.52	NaN	6.7089	222.25	NaN	6.1455	124.94	NaN
2.2705	1.9657	118.7	NaN	6.2488	151.86	NaN	6.565	114.85	NaN
2.3145	2.111	101.24	NaN	6.6897	128.99	NaN	5.8887	114.7	NaN
2.3584	2.1807	94.91	NaN	6.8011	172.51	NaN	6.3587	57.01	NaN
2.4023	2.0649	87.53	NaN	6.2495	205.16	NaN	6.0962	181.43	NaN
2.4463	2.345	64.66	NaN	4.8599	252.38	NaN	5.6384	206.27	NaN
2.4902	2.1282	127.54	NaN	5.0755	206.08	NaN	4.9201	197.32	NaN
2.5342	2.059	25.64	NaN	6.1184	202.31	NaN	5.3774	236.65	NaN
2.5781	1.7528	139.33	NaN	3.4925	215.47	NaN	3.9455	238.86	NaN
2.6221	1.4952	66.64	NaN	4.8792	227.93	NaN	4.8698	239.12	NaN
2.666	1.5108	205.38	NaN	3.2573	168.05	NaN	3.7301	258.62	NaN
2.71	1.507	56.22	NaN	3.4103	49.29	NaN	3.637	175.52	NaN
2.7539	1.5802	99.44	NaN	3.5323	68.2	NaN	2.9802	41.21	NaN
2.7979	1.3851	9.63	NaN	2.918	258.05	NaN	3.1156	48.14	NaN
2.8418	1.5107	251.81	NaN	2.887	219.84	NaN	2.9393	260.64	NaN
2.8857	1.4968	62.58	NaN	2.8127	249.87	NaN	3.1667	42.27	NaN
2.9297	1.397	240.96	NaN	2.5206	35.95	NaN	2.9666	51.1	NaN
2.9736	1.3832	91.22	NaN	2.2646	49.96	NaN	2.8478	46.63	NaN

Table P20
S1X4G4 CIIS Spectral Pixel Intensity Energy Density (I^2/Hz) and Vector-Mean Wave Direction (deg)

	Camera 4						Camera 6		
	Probe 0 (CIIS Location ID=36)			Probe 1 (CIIS Location ID= 87)			Probe 1 (CIIS Location ID=16)		
Location	X (m)	Y (m)		X (m)	Y (m)		X (m)	Y (m)	
	16.34	18.35		16.34	20.18		16.32	20.18	
f (Hz)	$S(f)$	$\theta_m(f)$	$\theta_m(f)_C$	$S(f)$	$\theta_m(f)$	$\theta_m(f)_C$	$S(f)$	$\theta_m(f)$	$\theta_m(f)_C$
0.0293	16.3898	14.36	NaN	31.8902	86.3	NaN	27.6045	98.63	NaN
0.0732	9.3714	49.21	NaN	15.6716	47.56	NaN	15.5873	78.61	NaN
0.1172	9.3458	162.72	NaN	20.379	118.71	NaN	19.4648	99.98	NaN
0.1611	9.8206	168.5	NaN	18.2284	121.42	NaN	16.3853	136.44	NaN
0.2051	6.9919	163.5	NaN	19.8938	114.87	NaN	17.4291	118.94	NaN
0.249	9.6106	130.54	NaN	22.7494	128.83	128.83	20.6614	116.32	NaN
0.293	9.7972	131.91	NaN	20.6806	131.36	NaN	19.1788	132.08	NaN
0.3369	9.639	129.61	NaN	21.3975	131.41	131.41	20.7301	130.12	130.12
0.3809	6.7335	126.17	NaN	11.9437	125.44	NaN	11.9523	138.78	NaN
0.4248	5.9572	124.22	NaN	9.9101	120.85	NaN	10.1691	120.99	NaN
0.4688	5.6704	128.66	NaN	11.5455	123.08	NaN	11.7588	127.29	NaN
0.5127	5.8342	104.81	NaN	13.0838	123.48	NaN	12.1167	131.07	NaN
0.5566	5.0782	139.4	NaN	8.7098	119.08	NaN	7.664	115.17	NaN
0.6006	3.4532	136.03	NaN	8.7401	119.55	NaN	8.6724	120.76	NaN
0.6445	3.2096	140.28	NaN	7.0007	114.77	NaN	7.9133	120.39	NaN
0.6885	3.7868	137.1	NaN	8.0193	124.68	NaN	7.4462	114.57	NaN
0.7324	3.2	129.56	NaN	7.8862	122.42	NaN	7.4138	118.1	NaN
0.7764	3.4725	120.13	NaN	8.6657	120.68	NaN	7.453	121.96	NaN
0.8203	3.2287	113.48	NaN	11.2947	120.83	NaN	10.1134	116.5	NaN
0.8643	4.0826	127.21	NaN	13.7257	110.89	NaN	14.1161	111.24	NaN
0.9082	7.7754	120.98	NaN	27.8318	109.98	109.98	26.1349	111.42	111.42
0.9521	6.785	125.23	NaN	19.7271	113.72	NaN	19.039	115.82	115.82
0.9961	43.7914	121.67	121.67	112.1823	111.23	111.23	111.67	112.78	112.78
1.04	91.3893	121.21	121.21	301.429	111.95	111.95	284.4934	113.99	113.99
1.084	112.6799	119.55	119.55	372.1316	112.22	112.22	350.8783	114.05	114.05
1.1279	150.555	120.1	120.1	467.5076	113.28	113.28	429.1794	114.95	114.95
1.1719	226.8049	120.61	120.61	667.3945	112.63	112.63	631.2914	114.34	114.34
1.2158	176.3005	120.6	120.6	506.4106	113.51	113.51	480.8343	115.09	115.09
1.2598	253.7607	121.96	121.96	725.3339	116.14	116.14	706.0235	117.22	117.22
1.3037	187.1198	123.7	123.7	561.6443	114.94	114.94	514.1211	116.41	116.41
1.3477	143.4453	122.53	122.53	470.8474	117.24	117.24	441.2409	118.3	118.3
1.3916	88.1928	124.23	124.23	248.4139	116.45	116.45	234.2304	117.93	117.93
1.4355	97.0058	123.9	123.9	328.6329	117.98	117.98	308.68	119.26	119.26
1.4795	50.8017	124.46	124.46	191.8583	119.17	119.17	180.9874	120.33	120.33
1.5234	39.4728	125.6	125.6	193.8172	121.61	121.61	184.8775	122.99	122.99
1.5674	43.1141	126.35	126.35	134.0798	122.28	122.28	126.8095	123.18	123.18
1.6113	31.0846	128.22	NaN	81.0139	125.2	NaN	75.8218	125.47	125.47
1.6553	34.0798	129.18	129.18	85.4626	126.57	126.57	82.5447	129.51	NaN

1.6992	37.5813	129.29	129.29	83.4775	129.5	129.5	80.2222	130.7	130.7
1.7432	33.729	130.62	NaN	93.9884	131.21	131.21	88.1747	133.25	133.25
1.7871	26.3089	131.32	NaN	72.1602	137.16	NaN	69.0376	139.62	NaN
1.8311	18.3161	132.29	NaN	50.2516	143.64	143.64	46.2647	140.8	NaN
1.875	14.2185	128.98	NaN	38.8785	146.15	NaN	38.0441	148.67	NaN
1.9189	14.3209	134.79	NaN	25.0194	153.42	NaN	25.2815	162.57	NaN
1.9629	13.0416	127.75	NaN	30.9446	149.94	NaN	30.6365	151.11	NaN
2.0068	10.6893	132.54	NaN	22.9261	157.29	NaN	22.9254	160.28	NaN
2.0508	9.967	126.96	NaN	15.9463	160.65	NaN	16.0759	155.31	NaN
2.0947	9.435	133.47	NaN	27.202	158.44	NaN	26.5381	162.84	NaN
2.1387	7.7999	129.47	NaN	23.8266	163.93	NaN	24.0682	165.44	NaN
2.1826	7.0703	75.44	NaN	20.2717	156.18	NaN	19.1277	160.25	NaN
2.2266	7.9126	175.07	NaN	24.2788	161.82	NaN	24.7213	163.46	NaN
2.2705	9.0544	170.91	NaN	28.6685	166.94	NaN	30.4428	169.52	NaN
2.3145	10.095	197.84	NaN	24.579	180.26	NaN	23.1727	184.32	NaN
2.3584	8.7351	185.17	NaN	22.2599	165.16	NaN	20.8621	175.32	NaN
2.4023	8.3349	175.79	NaN	27.1759	181.49	NaN	24.4963	184.62	NaN
2.4463	5.3995	141.52	NaN	17.5053	203.98	NaN	17.8608	213.84	NaN
2.4902	7.2491	172.98	NaN	22.3779	188.2	NaN	22.1904	193.07	NaN
2.5342	6.1704	153.13	NaN	23.3504	195.64	NaN	22.7981	200.65	NaN
2.5781	4.2548	183.39	NaN	12.8268	204.38	NaN	11.806	201.52	NaN
2.6221	4.5154	178.24	NaN	18.7107	198.2	NaN	16.8106	197.85	NaN
2.666	4.0637	186.95	NaN	11.0921	199.05	NaN	10.4294	203.6	NaN
2.71	4.1243	205.61	NaN	10.4465	209.86	NaN	10.1345	203.12	NaN
2.7539	3.4429	40.38	NaN	8.5533	213.21	NaN	7.6154	202.04	NaN
2.7979	3.3831	259.07	NaN	5.7943	208.01	NaN	5.101	214.75	NaN
2.8418	3.2045	267.89	NaN	6.4216	214.2	NaN	5.9746	227.01	NaN
2.8857	2.8306	72.08	NaN	5.391	213.62	NaN	5.204	221.78	NaN
2.9297	2.6315	57.49	NaN	5.516	211.24	NaN	5.7853	201.24	NaN
2.9736	2.6551	254.54	NaN	6.25	208.09	NaN	5.5465	201.64	NaN

Table P21
S1X4G5 CIIS Spectral Pixel Intensity Energy Density (I^2/Hz) and Vector-Mean Wave Direction (deg)

	Camera 4						Camera 6		
	Probe 0 (CIIS Location ID=35)			Probe 1 (CIIS Location ID= 86)			Probe 1 (CIIS Location ID=15)		
Location	X (m)	Y (m)		X (m)	Y (m)		X (m)	Y (m)	
	15.73	18.35		15.73	20.18		15.71	20.17	
f (Hz)	$S(f)$	$\theta_m(f)$	$\theta_m(f)_c$	$S(f)$	$\theta_m(f)$	$\theta_m(f)_c$	$S(f)$	$\theta_m(f)$	$\theta_m(f)_c$
0.0293	12.5118	14.06	NaN	16.9704	51.17	NaN	16.0822	45.44	NaN
0.0732	6.0051	41.48	NaN	9.6757	76.27	NaN	9.7567	83.4	NaN
0.1172	3.9407	78.53	NaN	9.8619	163.06	NaN	9.4397	153.07	NaN
0.1611	3.8531	91.74	NaN	8.4019	150.96	NaN	8.7997	127.5	NaN
0.2051	3.3379	152.35	NaN	9.6614	132.5	NaN	9.4952	136.05	NaN
0.249	3.2248	96.71	NaN	9.8899	127.93	NaN	9.4046	130.96	NaN
0.293	2.6557	53.1	NaN	9.6206	145.92	NaN	8.7084	138.18	NaN
0.3369	2.3815	133.91	NaN	8.6909	133.95	NaN	8.8206	147.35	NaN
0.3809	2.0945	228.44	NaN	5.8058	137.21	NaN	6.1124	132.52	NaN
0.4248	2.0429	54.37	NaN	4.6211	147.46	NaN	5.1189	138.95	NaN
0.4688	1.8069	207.7	NaN	5.1065	139.83	NaN	5.7381	133.23	NaN
0.5127	1.8453	117.86	NaN	6.2049	125.13	NaN	6.3978	127.99	NaN
0.5566	1.7551	149.18	NaN	3.8173	118.92	NaN	3.8566	126.21	NaN
0.6006	1.754	188.99	NaN	3.3597	134.18	NaN	4.3398	121.63	NaN
0.6445	1.6433	109.97	NaN	3.9944	120.56	NaN	3.7595	117.81	NaN
0.6885	1.7697	107.83	NaN	3.6501	134.77	NaN	4.121	123.15	NaN
0.7324	1.756	166.51	NaN	4.1833	127.05	NaN	3.8182	112.67	NaN
0.7764	1.7754	189.14	NaN	4.374	117.6	NaN	4.4956	126.66	NaN
0.8203	2.1007	147.45	NaN	5.3417	119.99	NaN	5.682	126.23	NaN
0.8643	2.4373	141.45	NaN	6.7037	115.62	NaN	7.3899	118.3	NaN
0.9082	3.1594	144.06	NaN	12.9739	117.74	117.74	13.5781	115.8	NaN
0.9521	3.0246	139.86	NaN	9.9077	118.99	NaN	9.7546	123.03	NaN
0.9961	15.1062	134.57	134.57	56.9745	118.37	118.37	59.3	120.22	120.22
1.04	28.3263	133.13	133.13	139.6925	117.31	117.31	137.3584	117.29	117.29
1.084	29.9027	126.99	126.99	140.9081	116.29	116.29	134.0437	116.79	116.79
1.1279	45.8564	130.29	130.29	179.5282	115.59	115.59	178.6231	116.32	116.32
1.1719	67.3955	130.63	130.63	267.7801	118.44	118.44	259.8184	118.03	118.03
1.2158	45.4727	130	130	196.1475	118.15	118.15	194.8944	118.24	118.24
1.2598	72.4016	130.53	130.53	294.595	118.39	118.39	297.0247	118.46	118.46
1.3037	45.669	128.75	128.75	234.7517	119.88	119.88	224.3603	119.72	119.72
1.3477	36.3116	129.88	129.88	175.743	120.84	120.84	163.2812	120.65	120.65
1.3916	24.9875	130.62	130.62	105.8215	120.82	120.82	100.6903	121.33	121.33
1.4355	20.6919	126.78	126.78	139.6505	122.16	122.16	136.4958	122.28	122.28
1.4795	13.8001	128.21	128.21	80.5758	123.26	123.26	80.3829	123.97	123.97
1.5234	10.523	127.66	NaN	73.9497	122.14	122.14	71.2167	124.01	124.01
1.5674	15.4889	126.83	126.83	51.6938	123.85	123.85	50.8247	124.89	124.89
1.6113	10.5023	127.39	NaN	33.7365	126.86	NaN	34.2436	127.51	NaN
1.6553	8.6605	124.87	NaN	41.3589	128.17	NaN	40.5765	129.36	NaN

1.6992	9.6797	123.37	NaN	35.0722	129.08	NaN	34.7484	131.27	131.27
1.7432	9.3237	121.04	NaN	37.0009	131.6	NaN	37.0842	131.87	NaN
1.7871	5.3579	119.86	NaN	35.8343	132.02	NaN	37.1575	134.1	NaN
1.8311	5.0466	113.41	NaN	22.504	130.2	NaN	22.5913	133.76	NaN
1.875	4.2815	109.96	NaN	18.8579	134.67	NaN	18.3647	135.21	NaN
1.9189	4.46	101.48	NaN	12.6916	139.2	NaN	12.5494	138.36	NaN
1.9629	4.5507	105.7	NaN	14.4612	143.12	NaN	15.1072	150.36	NaN
2.0068	4.0228	83.9	NaN	10.629	140.14	NaN	11.7424	143.33	NaN
2.0508	3.5576	81.07	NaN	7.7105	136.67	NaN	8.1609	140.94	NaN
2.0947	3.0785	73.2	NaN	13.2522	143.13	NaN	13.7181	151.27	NaN
2.1387	3.0675	113.1	NaN	11.1213	134.57	NaN	11.6593	132.19	NaN
2.1826	2.7502	113.43	NaN	10.0398	142.77	NaN	10.3123	155.95	NaN
2.2266	3.1192	60.46	NaN	8.1436	150.23	NaN	8.5904	145.51	NaN
2.2705	3.1378	108.41	NaN	9.8793	151.27	NaN	10.461	132.47	NaN
2.3145	3.3456	206.13	NaN	9.2171	152.21	NaN	9.2637	156.97	NaN
2.3584	3.5722	185.28	NaN	9.1592	153.44	NaN	8.1101	165	NaN
2.4023	3.1377	228.94	NaN	8.8223	195.77	NaN	8.8016	202.95	NaN
2.4463	2.5785	80.23	NaN	6.8805	259.78	NaN	6.7017	247.99	NaN
2.4902	2.9322	65.35	NaN	8.0333	160.44	NaN	8.4697	172.98	NaN
2.5342	2.4835	26.99	NaN	9.2152	176.64	NaN	9.1445	166.29	NaN
2.5781	2.559	91.81	NaN	5.7925	243.81	NaN	5.6586	202.12	NaN
2.6221	2.1367	68.12	NaN	6.8018	224.21	NaN	6.7613	223.31	NaN
2.666	1.9704	162.26	NaN	4.8321	30.49	NaN	5.1403	266.1	NaN
2.71	2.0253	58.29	NaN	5.4833	163.04	NaN	5.3239	177.54	NaN
2.7539	1.8007	249.8	NaN	3.9923	156.18	NaN	4.4476	238.93	NaN
2.7979	1.5669	0.41	NaN	3.7468	246.61	NaN	3.4422	225.12	NaN
2.8418	1.7285	82.35	NaN	3.6852	257.48	NaN	4.4045	242.47	NaN
2.8857	1.5298	70.21	NaN	3.1222	261.18	NaN	3.7578	231.39	NaN
2.9297	1.2957	38.66	NaN	3.602	76.62	NaN	3.4225	267.2	NaN
2.9736	1.4495	177.45	NaN	3.2577	214.79	NaN	2.9915	48.47	NaN

Table P22
S1X5G1 CIIS Spectral Pixel Intensity Energy Density (I^2/Hz) and Vector-Mean Wave Direction (deg)

	Camera 4						Camera 6		
	Probe 0 (CIIS Location ID=31)			Probe 1 (CIIS Location ID= 81)			Probe 1 (Not in view)		
Location	X (m)	Y (m)		X (m)	Y (m)		X (m)	Y (m)	
	13.29	18.35		12.68	20.18		NaN	NaN	
f (Hz)	$S(f)$	$\theta_m(f)$	$\theta_m(f)_c$	$S(f)$	$\theta_m(f)$	$\theta_m(f)_c$	$S(f)$	$\theta_m(f)$	$\theta_m(f)_c$
0.0293	12.7316	1.35	NaN	11.8591	4.57	NaN	NaN	NaN	NaN
0.0732	4.6132	18.92	NaN	4.3398	138.64	NaN	NaN	NaN	NaN
0.1172	4.3041	105.25	NaN	4.3028	26.42	NaN	NaN	NaN	NaN
0.1611	3.4512	87.82	NaN	2.5639	200.63	NaN	NaN	NaN	NaN
0.2051	3.2127	194.54	NaN	2.3786	37.75	NaN	NaN	NaN	NaN
0.249	2.7995	143.22	NaN	3.5759	167.85	NaN	NaN	NaN	NaN
0.293	2.0793	78.01	NaN	2.2868	184.48	NaN	NaN	NaN	NaN
0.3369	2.1588	15.86	NaN	2.0244	221.86	NaN	NaN	NaN	NaN
0.3809	1.8996	62.1	NaN	2.3653	206.03	NaN	NaN	NaN	NaN
0.4248	1.7895	66.12	NaN	2.6237	192.45	NaN	NaN	NaN	NaN
0.4688	1.7021	72.19	NaN	2.7591	192.6	NaN	NaN	NaN	NaN
0.5127	2.4846	173.15	NaN	4.5107	152.66	NaN	NaN	NaN	NaN
0.5566	2.8648	169.89	NaN	7.9626	144	NaN	NaN	NaN	NaN
0.6006	3.8169	177.29	NaN	13.5222	138.96	NaN	NaN	NaN	NaN
0.6445	2.7798	200.72	NaN	9.9735	129.28	NaN	NaN	NaN	NaN
0.6885	2.9497	158.15	NaN	9.0397	140.39	NaN	NaN	NaN	NaN
0.7324	2.3397	177.55	NaN	6.2252	153.73	NaN	NaN	NaN	NaN
0.7764	2.5881	151.63	NaN	4.8409	141.03	NaN	NaN	NaN	NaN
0.8203	2.7012	152.54	NaN	3.4396	159.31	NaN	NaN	NaN	NaN
0.8643	2.5601	263.38	NaN	2.6715	128.51	NaN	NaN	NaN	NaN
0.9082	2.5888	140.17	NaN	2.9005	130.67	NaN	NaN	NaN	NaN
0.9521	2.46	160.31	NaN	3.0155	150.4	NaN	NaN	NaN	NaN
0.9961	2.1523	249.91	NaN	2.7076	142.62	NaN	NaN	NaN	NaN
1.04	1.9573	154.58	NaN	3.1586	132.17	NaN	NaN	NaN	NaN
1.084	2.2244	135.81	NaN	2.8795	161.15	NaN	NaN	NaN	NaN
1.1279	2.397	139.55	NaN	3.1235	168.45	NaN	NaN	NaN	NaN
1.1719	2.4605	186.76	NaN	2.9016	159.27	NaN	NaN	NaN	NaN
1.2158	2.1335	193.44	NaN	2.6757	151.33	NaN	NaN	NaN	NaN
1.2598	1.983	238.34	NaN	3.1451	142.38	NaN	NaN	NaN	NaN
1.3037	2.0335	61.07	NaN	2.9444	144.1	NaN	NaN	NaN	NaN
1.3477	2.1862	204.69	NaN	3.0052	155.95	NaN	NaN	NaN	NaN
1.3916	2.9622	199.18	NaN	3.2824	158.5	NaN	NaN	NaN	NaN
1.4355	1.8146	188.82	NaN	2.8364	148.58	NaN	NaN	NaN	NaN
1.4795	1.9677	143.79	NaN	2.9018	143.01	NaN	NaN	NaN	NaN
1.5234	2.2546	232.27	NaN	2.5147	153.72	NaN	NaN	NaN	NaN
1.5674	2.4568	179.05	NaN	2.5292	120.37	NaN	NaN	NaN	NaN
1.6113	2.085	192.29	NaN	2.0601	233.73	NaN	NaN	NaN	NaN
1.6553	1.9042	214.51	NaN	1.9894	115.01	NaN	NaN	NaN	NaN

1.6992	2.5207	244.21	NaN	2.3214	156.17	NaN	NaN	NaN	NaN
1.7432	2.2697	215.58	NaN	2.128	153.87	NaN	NaN	NaN	NaN
1.7871	1.8818	167.04	NaN	1.8753	80.97	NaN	NaN	NaN	NaN
1.8311	1.8456	253.97	NaN	2.5411	169.96	NaN	NaN	NaN	NaN
1.875	2.1631	156.12	NaN	2.3354	169.71	NaN	NaN	NaN	NaN
1.9189	1.9976	181.08	NaN	1.87	147.39	NaN	NaN	NaN	NaN
1.9629	1.7329	206.38	NaN	1.7177	182.96	NaN	NaN	NaN	NaN
2.0068	1.9292	163.29	NaN	1.8891	144.47	NaN	NaN	NaN	NaN
2.0508	2.0416	167.35	NaN	1.8834	149.57	NaN	NaN	NaN	NaN
2.0947	1.7352	20.46	NaN	1.822	156.23	NaN	NaN	NaN	NaN
2.1387	1.9225	215.24	NaN	1.4707	99.62	NaN	NaN	NaN	NaN
2.1826	1.7942	217.95	NaN	1.6432	120.56	NaN	NaN	NaN	NaN
2.2266	1.7907	174.53	NaN	1.6405	38.49	NaN	NaN	NaN	NaN
2.2705	1.6634	7.54	NaN	1.7006	217.29	NaN	NaN	NaN	NaN
2.3145	1.5979	22.58	NaN	1.6368	156.42	NaN	NaN	NaN	NaN
2.3584	1.8364	201.97	NaN	1.6852	143.24	NaN	NaN	NaN	NaN
2.4023	1.654	214.36	NaN	1.4382	70.13	NaN	NaN	NaN	NaN
2.4463	1.5029	157.95	NaN	1.5861	169.14	NaN	NaN	NaN	NaN
2.4902	1.7572	106.34	NaN	1.6717	92.75	NaN	NaN	NaN	NaN
2.5342	1.5771	117.76	NaN	1.7745	219.78	NaN	NaN	NaN	NaN
2.5781	1.6602	153.47	NaN	1.5506	171.13	NaN	NaN	NaN	NaN
2.6221	1.5591	2.36	NaN	1.5501	153.84	NaN	NaN	NaN	NaN
2.666	1.5367	208.82	NaN	1.6621	123.31	NaN	NaN	NaN	NaN
2.71	1.6552	56.44	NaN	1.3675	194.64	NaN	NaN	NaN	NaN
2.7539	1.4533	243.28	NaN	1.4306	15.15	NaN	NaN	NaN	NaN
2.7979	1.5507	33.91	NaN	1.4261	90.94	NaN	NaN	NaN	NaN
2.8418	1.4818	32.43	NaN	1.4267	69.3	NaN	NaN	NaN	NaN
2.8857	1.4395	237.56	NaN	1.4033	215.35	NaN	NaN	NaN	NaN
2.9297	1.4093	85.88	NaN	1.4213	0.45	NaN	NaN	NaN	NaN
2.9736	1.2176	77.39	NaN	1.4155	139.86	NaN	NaN	NaN	NaN

Table P23
S1X5G2 CIIS Spectral Pixel Intensity Energy Density (I^2/Hz) and Vector-Mean Wave Direction (deg)

	Camera 4						Camera 6		
	Probe 0 (CIIS Location ID=32)			Probe 1 (CIIS Location ID= 83)			Probe 1 (CIIS Location ID=12)		
Location	X (m)	Y (m)		X (m)	Y (m)		X (m)	Y (m)	
	13.9	18.35		13.9	20.18		13.88	20.16	
f (Hz)	$S(f)$	$\theta_m(f)$	$\theta_m(f)_c$	$S(f)$	$\theta_m(f)$	$\theta_m(f)_c$	$S(f)$	$\theta_m(f)$	$\theta_m(f)_c$
0.0293	13.7364	20.99	NaN	21.2577	5.99	NaN	21.4426	14.07	NaN
0.0732	4.6469	35.63	NaN	5.3838	135.1	NaN	5.7233	38.85	NaN
0.1172	3.9605	15.03	NaN	5.2419	66.77	NaN	5.429	86.71	NaN
0.1611	3.1579	45.21	NaN	3.329	178.87	NaN	2.9489	111.28	NaN
0.2051	2.391	87.3	NaN	2.8064	192.26	NaN	3.4274	143.48	NaN
0.249	2.6671	139.28	NaN	3.3783	142.94	NaN	3.4171	173.53	NaN
0.293	2.0764	176.21	NaN	3.2635	179.88	NaN	2.9982	152.05	NaN
0.3369	2.1875	133.8	NaN	2.4103	119.59	NaN	2.2301	216.04	NaN
0.3809	1.7783	19.71	NaN	3.4219	166.25	NaN	3.3416	195.96	NaN
0.4248	1.8363	143.31	NaN	4.1939	165.02	NaN	3.9404	129.54	NaN
0.4688	2.0543	267.68	NaN	4.1982	116.84	NaN	4.0268	132.14	NaN
0.5127	2.4619	88.67	NaN	16.7891	130.6	NaN	16.2433	128.42	NaN
0.5566	3.4565	150.18	NaN	22.3436	128.84	128.84	22.7644	128.46	128.46
0.6006	6.2337	161.19	NaN	52.2923	126.89	126.89	48.7125	124.68	124.68
0.6445	4.88	142.5	NaN	44.9774	127.54	127.54	42.3418	126.27	126.27
0.6885	4.6089	156.6	NaN	30.4607	135.71	135.71	29.1529	130.85	130.85
0.7324	2.9224	178.69	NaN	16.4273	132.5	NaN	16.5215	128.5	NaN
0.7764	2.8709	165.43	NaN	13.0815	126.28	NaN	13.0819	125.71	NaN
0.8203	2.8369	168.73	NaN	10.1675	129.33	NaN	9.9689	128.31	NaN
0.8643	2.7128	170.76	NaN	7.1326	134.04	NaN	6.6311	138.18	NaN
0.9082	2.4472	162.5	NaN	6.7748	132.24	NaN	6.3239	137.93	NaN
0.9521	2.4138	164.72	NaN	6.6851	133.64	NaN	6.8245	138.26	NaN
0.9961	2.2149	191.44	NaN	6.0913	135.51	NaN	6.448	130.57	NaN
1.04	2.017	181.19	NaN	6.0131	136.23	NaN	6.3643	138.2	NaN
1.084	2.3164	162.87	NaN	5.2818	143.05	NaN	5.7738	137.52	NaN
1.1279	3.2609	205.54	NaN	7.967	136.78	NaN	8.1946	136.99	NaN
1.1719	2.7821	190.86	NaN	6.5849	138.14	NaN	6.8641	135.35	NaN
1.2158	2.4787	165.57	NaN	3.9946	133.59	NaN	3.8368	146.7	NaN
1.2598	2.4954	138.76	NaN	5.139	140.9	NaN	5.443	147.75	NaN
1.3037	2.3009	201	NaN	6.4603	131.79	NaN	6.0397	127.48	NaN
1.3477	2.2646	195.77	NaN	4.9839	127.13	NaN	5.4435	129.31	NaN
1.3916	2.563	219.26	NaN	6.4887	133.24	NaN	6.8227	131.82	NaN
1.4355	2.2088	249.15	NaN	4.766	146.87	NaN	5.0775	133.74	NaN
1.4795	2.0856	235.02	NaN	4.4145	131.25	NaN	5.3154	134.51	NaN
1.5234	2.2397	210.46	NaN	4.1414	140.31	NaN	4.2386	145.88	NaN
1.5674	3.0115	220	NaN	4.6256	148.13	NaN	4.4375	137.34	NaN
1.6113	2.3116	191.21	NaN	3.9246	140.1	NaN	4.1155	132.33	NaN
1.6553	1.7136	263.3	NaN	2.9493	138.07	NaN	3.1991	141.2	NaN

1.6992	2.5481	181.4	NaN	4.0749	144.6	NaN	4.2528	130.65	NaN
1.7432	2.5457	146.14	NaN	3.8979	125.23	NaN	3.7188	122.63	NaN
1.7871	1.8865	178.41	NaN	3.3618	114.8	NaN	3.5077	126.68	NaN
1.8311	2.1467	173.93	NaN	3.4802	165.71	NaN	3.3328	166.28	NaN
1.875	2.1913	174.56	NaN	2.9583	137.07	NaN	2.3232	167.65	NaN
1.9189	2.113	158.14	NaN	3.1837	151.13	NaN	3.6156	136.65	NaN
1.9629	1.6574	97.71	NaN	3.1138	135.45	NaN	3.1518	130.33	NaN
2.0068	2.0407	137.21	NaN	2.8257	150.89	NaN	3.0524	144.37	NaN
2.0508	2.5981	146.92	NaN	2.6454	164.77	NaN	2.8162	148.76	NaN
2.0947	1.7645	202.36	NaN	2.407	189.31	NaN	2.5904	135.91	NaN
2.1387	2.102	169.71	NaN	2.3664	214.76	NaN	2.6086	186.62	NaN
2.1826	1.9262	207.55	NaN	2.4497	171.67	NaN	2.3826	188.8	NaN
2.2266	1.6847	171.53	NaN	2.8109	155.35	NaN	2.1937	209.75	NaN
2.2705	2.0723	132.98	NaN	2.946	121.65	NaN	2.8439	177.17	NaN
2.3145	1.7203	57.57	NaN	3.051	161.52	NaN	3.1042	152.43	NaN
2.3584	1.9697	172.6	NaN	2.3169	145.91	NaN	2.5789	135.76	NaN
2.4023	1.7484	199.56	NaN	2.2627	166.04	NaN	2.3118	169.16	NaN
2.4463	1.7928	167.18	NaN	2.1009	175.74	NaN	2.05	149.29	NaN
2.4902	2.0019	134.44	NaN	2.1722	188.22	NaN	2.1978	153.92	NaN
2.5342	1.8622	203.52	NaN	1.9383	178.72	NaN	1.8898	77.8	NaN
2.5781	1.6886	141.92	NaN	2.1982	181.06	NaN	2.3259	156.88	NaN
2.6221	1.73	148.14	NaN	1.9423	143.8	NaN	2.1459	157.05	NaN
2.666	1.572	178.73	NaN	1.8763	194.32	NaN	2.3156	227.24	NaN
2.71	1.6589	18.54	NaN	1.9046	211.65	NaN	1.843	126.83	NaN
2.7539	1.6738	105.43	NaN	1.9966	168.26	NaN	1.7405	109.89	NaN
2.7979	1.6508	72.35	NaN	1.5741	21.89	NaN	1.7584	143.18	NaN
2.8418	1.6801	150.79	NaN	1.7717	199.14	NaN	1.9104	195.43	NaN
2.8857	1.6451	14.81	NaN	1.7896	257.14	NaN	1.8838	20.82	NaN
2.9297	1.3307	131.98	NaN	1.7628	111.03	NaN	1.8535	224	NaN
2.9736	1.2741	63.31	NaN	1.4037	114.95	NaN	1.7358	77.88	NaN

Table P24
S1X5G3 CIIS Spectral Pixel Intensity Energy Density (I^2/Hz) and Vector-Mean Wave Direction (deg)

	Camera 4						Camera 6		
	Probe 0 (CIIS Location ID=34)			Probe 1 (CIIS Location ID= 85)			Probe 1 (CIIS Location ID=14)		
Location	X (m)	Y (m)		X (m)	Y (m)		X (m)	Y (m)	
	15.12	18.35		15.12	20.18		15.1	20.17	
f (Hz)	$S(f)$	$\theta_m(f)$	$\theta_m(f)_C$	$S(f)$	$\theta_m(f)$	$\theta_m(f)_C$	$S(f)$	$\theta_m(f)$	$\theta_m(f)_C$
0.0293	19.6723	22.35	NaN	27.235	0.58	NaN	26.125	1.15	NaN
0.0732	6.6957	2.2	NaN	7.57	195.57	NaN	8.0897	22.88	NaN
0.1172	5.0495	2.39	NaN	6.9566	70.55	NaN	6.9184	121.73	NaN
0.1611	3.9942	65.07	NaN	4.3648	176	NaN	4.6222	252.16	NaN
0.2051	3.5327	264.85	NaN	4.1357	130.16	NaN	4.404	166.45	NaN
0.249	2.8406	193.73	NaN	4.0179	165.36	NaN	4.006	146.82	NaN
0.293	2.3668	135.41	NaN	3.7228	172.76	NaN	4.355	136.43	NaN
0.3369	1.9993	72.02	NaN	2.858	119.69	NaN	2.5666	84.81	NaN
0.3809	2.1033	182.32	NaN	4.3042	83.38	NaN	4.2073	145.9	NaN
0.4248	2.32	156.97	NaN	7.4153	125.73	NaN	7.1356	136.66	NaN
0.4688	2.6115	186.77	NaN	8.2015	97.59	NaN	7.5914	129.99	NaN
0.5127	6.772	150.37	NaN	40.8269	120.06	120.06	39.9576	126.88	126.88
0.5566	10.6006	150.75	150.75	67.9876	118.98	118.98	60.0704	122.47	122.47
0.6006	22.8074	145.74	145.74	151.0261	118	118	138.7202	124.99	124.99
0.6445	17.1613	141.95	141.95	151.9818	120.81	120.81	141.6012	127.51	127.51
0.6885	15.1392	143.32	143.32	109.0537	119.57	119.57	100.3208	127.05	127.05
0.7324	8.3024	139.22	NaN	41.1397	119	119	36.9844	126.85	126.85
0.7764	6.6701	144.01	NaN	36.6855	120.04	120.04	33.2847	127.87	127.87
0.8203	6.4254	148.02	NaN	24.8227	118.65	118.65	23.5596	125.99	125.99
0.8643	4.3366	139.05	NaN	16.5575	122.44	122.44	15.8155	125.79	NaN
0.9082	4.3144	140.13	NaN	15.1279	120.52	NaN	14.8177	124.88	NaN
0.9521	3.3802	149.63	NaN	16.1054	120.08	120.08	15.5044	125.68	125.68
0.9961	2.966	171.21	NaN	16.4074	119.95	119.95	16.8813	127.57	NaN
1.04	3.844	148.75	NaN	17.4775	120.69	NaN	17.9831	127.68	NaN
1.084	4.3892	143.53	NaN	19.8181	120.66	120.66	18.3072	127.34	127.34
1.1279	7.7579	141.75	NaN	31.2266	125.09	NaN	27.896	130.29	130.29
1.1719	7.5542	139.33	NaN	18.3314	121.44	NaN	17.1684	129.15	NaN
1.2158	3.8864	142.17	NaN	15.356	124.23	NaN	13.8194	131.33	NaN
1.2598	3.7346	140.94	NaN	14.5396	123.85	NaN	13.8846	129.95	NaN
1.3037	3.1251	143.93	NaN	15.7366	121.9	NaN	13.7036	127.09	NaN
1.3477	4.3758	145.67	NaN	9.5798	122.96	NaN	8.9633	123.3	NaN
1.3916	4.1781	148.89	NaN	9.0648	131.16	NaN	8.5164	135.41	NaN
1.4355	3.0654	144.56	NaN	8.2222	134.33	NaN	7.8216	135.87	NaN
1.4795	2.4191	158.28	NaN	9.4908	132.2	NaN	9.813	131.75	NaN
1.5234	2.5473	159.26	NaN	9.2209	128.05	NaN	7.9227	132.45	NaN
1.5674	2.8639	140.25	NaN	11.5765	125.46	NaN	10.9881	132.42	NaN
1.6113	2.4938	149.54	NaN	10.0829	131	NaN	9.1083	134.78	NaN
1.6553	2.7872	125.76	NaN	8.635	129.32	NaN	8.1914	132.02	NaN

1.6992	3.1855	141.41	NaN	6.1395	145.16	NaN	6.3415	143.09	NaN
1.7432	3.296	143.28	NaN	4.1134	145.32	NaN	4.4473	125.49	NaN
1.7871	2.7487	116.52	NaN	5.9719	139.37	NaN	5.8952	136.88	NaN
1.8311	2.421	136.54	NaN	6.3607	151.52	NaN	6.6019	143.66	NaN
1.875	2.6355	119.23	NaN	4.2799	151.39	NaN	4.7955	154.76	NaN
1.9189	2.4945	111.82	NaN	5.2319	142.93	NaN	5.2608	137.27	NaN
1.9629	2.5074	129.19	NaN	4.7021	145.8	NaN	4.2934	139.46	NaN
2.0068	2.7597	151.12	NaN	4.0228	133.31	NaN	3.8833	111.58	NaN
2.0508	2.4698	144.75	NaN	4.9476	147.94	NaN	4.2197	127.22	NaN
2.0947	2.0084	153.72	NaN	4.9417	142.18	NaN	5.128	129.37	NaN
2.1387	2.2545	122.32	NaN	4.0753	130.07	NaN	4.0266	141.66	NaN
2.1826	2.299	108.76	NaN	4.0018	123.16	NaN	4.1161	155.2	NaN
2.2266	2.1218	138.27	NaN	3.9243	127.91	NaN	4.0503	141.83	NaN
2.2705	2.5749	141.51	NaN	4.5723	117.11	NaN	4.4563	146.84	NaN
2.3145	1.8041	166.08	NaN	3.202	117.91	NaN	3.0006	141.41	NaN
2.3584	1.9339	161.58	NaN	3.3497	101.36	NaN	3.3486	156.24	NaN
2.4023	1.834	159.11	NaN	3.8018	109	NaN	4.0082	149.65	NaN
2.4463	1.8762	194.35	NaN	3.308	118.92	NaN	3.2746	131.55	NaN
2.4902	2.1886	143.27	NaN	2.9058	132.77	NaN	2.9996	146.13	NaN
2.5342	1.7897	121.76	NaN	2.5897	143.25	NaN	2.9135	156.51	NaN
2.5781	2.0834	154.94	NaN	3.1312	122.21	NaN	3.2042	162.38	NaN
2.6221	1.6496	102.7	NaN	3.1045	158.45	NaN	3.0927	149.9	NaN
2.666	1.8654	194.43	NaN	2.8922	158.99	NaN	2.9433	176.99	NaN
2.71	1.7656	113.83	NaN	2.9754	109.53	NaN	2.791	188.61	NaN
2.7539	1.881	163.07	NaN	2.7042	230.57	NaN	2.8087	199.16	NaN
2.7979	1.5037	164.14	NaN	2.2508	138.72	NaN	2.4787	246	NaN
2.8418	1.6256	189.74	NaN	2.3746	218.92	NaN	2.3539	175.01	NaN
2.8857	1.5933	224.85	NaN	2.122	89.04	NaN	2.3352	213.43	NaN
2.9297	1.5258	168.38	NaN	2.2063	50.07	NaN	2.2238	188.91	NaN
2.9736	1.5146	20.1	NaN	2.1185	84.56	NaN	2.1357	190.44	NaN

Table P25
S1X5G4 CIIS Spectral Pixel Intensity Energy Density (I^2/Hz) and Vector-Mean Wave Direction (deg)

	Camera 4						Camera 6		
	Probe 0 (CIIS Location ID=36)			Probe 1 (CIIS Location ID= 87)			Probe 1 (CIIS Location ID=16)		
Location	X (m)	Y (m)		X (m)	Y (m)		X (m)	Y (m)	
	16.34	18.35		16.34	20.18		16.32	20.18	
f (Hz)	$S(f)$	$\theta_m(f)$	$\theta_m(f)_C$	$S(f)$	$\theta_m(f)$	$\theta_m(f)_C$	$S(f)$	$\theta_m(f)$	$\theta_m(f)_C$
0.0293	18.2203	58.61	NaN	61.99	88.06	NaN	65.6701	81.92	NaN
0.0732	8.9288	32.77	NaN	18.0721	44.15	NaN	18.7692	6.75	NaN
0.1172	4.2214	33	NaN	10.1982	219.53	NaN	10.7851	144.04	NaN
0.1611	3.9837	97.73	NaN	7.8752	269.5	NaN	7.2553	112.11	NaN
0.2051	4.022	93	NaN	6.7101	129.69	NaN	6.9977	120.55	NaN
0.249	3.9617	178.46	NaN	8.0823	133.16	NaN	7.2031	133.82	NaN
0.293	2.8541	179.28	NaN	8.2564	131.93	NaN	7.059	104.27	NaN
0.3369	2.5112	246.84	NaN	4.7709	115.84	NaN	5.0355	97.66	NaN
0.3809	2.9282	139.6	NaN	7.2552	110.06	NaN	8.2692	123.02	NaN
0.4248	3.3908	65.24	NaN	15.8367	106.25	NaN	15.5723	100.92	NaN
0.4688	3.7977	131.99	NaN	15.6314	115.21	NaN	15.1705	120.11	NaN
0.5127	20.9513	126.44	126.44	94.22	112.48	112.48	92.2519	113.77	113.77
0.5566	48.2863	122.92	122.92	226.9442	112.52	112.52	222.1392	114.73	114.73
0.6006	105.0781	124.45	124.45	374.3094	109.4	109.4	372.7609	112.07	112.07
0.6445	106.5183	123.64	123.64	351.7236	110.41	110.41	341.3504	111.6	111.6
0.6885	93.7823	122.75	122.75	337.8745	111.46	111.46	330.8158	112.74	112.74
0.7324	40.2374	122.52	122.52	120.1265	110.95	110.95	117.2719	114.87	114.87
0.7764	33.2639	121.16	121.16	92.5494	110.72	110.72	92.7699	113.78	113.78
0.8203	27.0115	122.61	122.61	81.2274	110.6	110.6	78.6939	112.11	112.11
0.8643	17.9708	122.01	122.01	54.397	112.81	112.81	54.7511	113.63	113.63
0.9082	15.3255	126.8	NaN	49.9232	110.7	110.7	47.5448	114.09	114.09
0.9521	15.323	121.46	121.46	48.6821	109.93	109.93	46.5198	112.66	112.66
0.9961	18.5497	120.5	120.5	50.0177	110.84	110.84	50.5916	113.61	113.61
1.04	18.3576	124.83	124.83	52.7739	112.35	112.35	52.8584	115.04	115.04
1.084	25.5769	126.08	126.08	86.5567	115.68	115.68	82.3558	115.64	115.64
1.1279	46.3064	122.6	122.6	93.4813	113.66	113.66	87.8546	113.71	113.71
1.1719	57.5781	123.88	123.88	63.9673	113.97	113.97	60.6877	116.27	116.27
1.2158	22.6755	123.21	123.21	66.1821	114.07	114.07	64.8626	116.14	116.14
1.2598	18.3406	127.03	127.03	103.1487	113.38	113.38	98.3001	114.74	114.74
1.3037	18.5864	126.1	126.1	66.6921	112.27	112.27	63.0991	114.06	114.06
1.3477	26.3069	125.46	125.46	45.0793	111.6	111.6	44.7232	115.36	115.36
1.3916	27.3103	126.49	126.49	39.0108	115.97	NaN	39.8473	117.9	NaN
1.4355	14.0713	126.42	NaN	31.8649	114.3	114.3	31.5123	115.35	115.35
1.4795	8.3544	129.25	NaN	21.0012	115.15	NaN	20.0112	117.07	NaN
1.5234	7.6219	126.75	NaN	25.6505	118.1	118.1	24.352	117.55	117.55
1.5674	5.4608	135.62	NaN	35.0769	116.12	116.12	34.5442	118.34	118.34
1.6113	4.7502	133.21	NaN	34.1979	117.2	117.2	33.0673	117.99	117.99
1.6553	4.3732	136.61	NaN	29.1522	119.33	119.33	29.6004	121.38	NaN

1.6992	4.3885	138.41	NaN	24.4429	121.62	NaN	23.6706	123.09	NaN
1.7432	5.6085	134.78	NaN	15.7023	126.26	NaN	14.8678	124.58	NaN
1.7871	5.6684	132.02	NaN	17.3791	123.66	NaN	17.2605	126.19	NaN
1.8311	6.9539	134.91	NaN	23.9031	126.76	NaN	22.1377	128.35	NaN
1.875	5.7905	149.53	NaN	11.9493	124.28	NaN	13.2437	128.71	NaN
1.9189	4.5493	143.51	NaN	15.8974	134.37	NaN	16.6251	134.56	NaN
1.9629	6.2333	139.49	NaN	15.7828	139.44	NaN	15.9882	140.22	NaN
2.0068	6.636	147.61	NaN	11.5979	148.8	NaN	11.8268	143.79	NaN
2.0508	6.0042	140.72	NaN	8.4942	137.78	NaN	8.8388	138.87	NaN
2.0947	4.089	145.32	NaN	6.8296	135.4	NaN	7.2384	139.87	NaN
2.1387	2.9595	140.28	NaN	7.5576	140.44	NaN	7.3164	134.18	NaN
2.1826	2.7816	154.47	NaN	8.3732	149.34	NaN	8.4119	153.88	NaN
2.2266	2.687	150.3	NaN	10.8952	159.24	NaN	10.08	165.1	NaN
2.2705	2.8037	181.5	NaN	7.8034	153.48	NaN	7.6785	155.87	NaN
2.3145	2.8754	177.96	NaN	7.5901	143.72	NaN	7.164	141.39	NaN
2.3584	2.7182	165.94	NaN	5.6825	153.53	NaN	5.3402	142.04	NaN
2.4023	2.5408	97.96	NaN	5.8667	164.88	NaN	5.4843	164.74	NaN
2.4463	2.9742	141.46	NaN	5.3653	163.03	NaN	5.2338	160.18	NaN
2.4902	2.6688	144.25	NaN	6.979	168.06	NaN	6.2545	170.03	NaN
2.5342	2.8277	147.4	NaN	4.7673	180.57	NaN	5.4614	160.84	NaN
2.5781	2.5406	150.55	NaN	4.0842	183.97	NaN	4.693	187	NaN
2.6221	2.4567	180.33	NaN	4.0026	166.01	NaN	4.273	168.46	NaN
2.666	2.7007	203.62	NaN	3.5656	175.42	NaN	3.7791	191.24	NaN
2.71	2.0328	16.64	NaN	4.3521	182.04	NaN	4.3216	208.7	NaN
2.7539	2.2418	200.84	NaN	3.949	204.44	NaN	3.9982	196.67	NaN
2.7979	2.1463	60.9	NaN	3.7011	165.92	NaN	3.9651	174.61	NaN
2.8418	2.3373	261.12	NaN	3.6527	204.15	NaN	3.7252	204.74	NaN
2.8857	1.9395	75.49	NaN	3.369	188.88	NaN	3.5427	228.12	NaN
2.9297	1.8726	261.07	NaN	3.004	204.81	NaN	2.8994	261.76	NaN
2.9736	1.7997	106.56	NaN	3.054	193.01	NaN	2.8713	189.8	NaN

Table P26
S1X5G5 CIIS Spectral Pixel Intensity Energy Density (I^2/Hz) and Vector-Mean Wave Direction (deg)

	Camera 4						Camera 6		
	Probe 0 (CIIS Location ID=35)			Probe 1 (CIIS Location ID= 86)			Probe 1 (CIIS Location ID=15)		
Location	X (m)	Y (m)		X (m)	Y (m)		X (m)	Y (m)	
	15.73	18.35		15.73	20.18		15.71	20.17	
f (Hz)	$S(f)$	$\theta_m(f)$	$\theta_m(f)_C$	$S(f)$	$\theta_m(f)$	$\theta_m(f)_C$	$S(f)$	$\theta_m(f)$	$\theta_m(f)_C$
0.0293	16.8895	17.27	NaN	30.0568	22.39	NaN	30.3933	19.41	NaN
0.0732	7.6008	31.05	NaN	9.7896	74.51	NaN	9.1222	63.85	NaN
0.1172	4.1576	27.1	NaN	5.8774	88.3	NaN	7.3039	150.27	NaN
0.1611	3.7292	43.48	NaN	4.9695	98.64	NaN	4.9279	150.63	NaN
0.2051	3.3717	21.76	NaN	4.7266	123.75	NaN	4.0854	102.99	NaN
0.249	3.7946	185.92	NaN	5.3187	119.75	NaN	4.9316	131.86	NaN
0.293	2.951	89.31	NaN	5.0245	119.36	NaN	5.038	93.52	NaN
0.3369	2.4593	55.17	NaN	3.2487	178.69	NaN	3.4301	100.97	NaN
0.3809	2.31	151.92	NaN	4.6689	119.15	NaN	4.7954	133.68	NaN
0.4248	2.6688	119.7	NaN	8.9404	103.51	NaN	9.3928	123.33	NaN
0.4688	3.3305	124.82	NaN	10.5899	110.6	NaN	9.9006	112.03	NaN
0.5127	11.2008	138.26	138.26	52.036	116.18	116.18	51.866	117.82	117.82
0.5566	20.4347	133.78	133.78	103.9414	113.75	113.75	101.7037	118.34	118.34
0.6006	44.9357	139.12	139.12	204.8114	114.53	114.53	199.0617	117.17	117.17
0.6445	39.9166	131.47	131.47	201.8819	117.62	117.62	198.4304	117.99	117.99
0.6885	34.4653	133.37	133.37	174.7797	116.58	116.58	170.9807	119.02	119.02
0.7324	15.7917	135.3	135.3	63.0072	118.05	118.05	59.7014	118.35	118.35
0.7764	13.622	134.82	NaN	47.1899	117.65	117.65	48.7134	118.65	118.65
0.8203	10.4359	130.37	NaN	39.5748	115.71	115.71	38.7544	117.56	117.56
0.8643	6.7661	131.81	NaN	27.3793	119.96	119.96	25.6522	116.97	116.97
0.9082	7.3218	127.3	NaN	23.4891	120.58	120.58	22.4994	118.23	118.23
0.9521	6.0935	129.43	NaN	23.0595	116.07	116.07	21.7533	118.02	118.02
0.9961	6.4577	136.05	NaN	25.8598	115.96	115.96	24.3638	115.71	115.71
1.04	7.2555	133.86	NaN	26.4903	121.06	121.06	26.5935	119	119
1.084	8.5833	132.45	NaN	32.3478	118.57	118.57	32.9561	119.45	119.45
1.1279	15.8559	133.56	133.56	39.2619	122.19	122.19	39.9284	121.94	121.94
1.1719	18.9827	134.9	134.9	28.4902	121.23	NaN	29.9987	122.77	122.77
1.2158	7.0795	136.01	NaN	26.1278	119.74	NaN	25.3425	118.97	118.97
1.2598	7.5969	133.46	NaN	34.0951	123.15	NaN	34.4331	123.09	NaN
1.3037	6.4785	134.23	NaN	24.8716	121.44	121.44	23.2007	122.68	NaN
1.3477	8.0205	135.04	NaN	16.1576	122.09	NaN	16.6581	121.59	NaN
1.3916	9.5889	134.4	NaN	12.8825	123.36	NaN	13.804	127.46	NaN
1.4355	4.9187	138.45	NaN	12.1879	118.26	NaN	12.3359	120.81	NaN
1.4795	3.4355	143.26	NaN	10.7467	128.68	NaN	9.9557	128.46	NaN
1.5234	3.3541	134.48	NaN	11.9079	122.75	NaN	11.0757	124.9	NaN
1.5674	3.5552	139.3	NaN	16.3176	126.43	NaN	16.1066	126.34	NaN
1.6113	3.5433	132.63	NaN	14.9474	126.97	NaN	15.0942	125.71	NaN
1.6553	3.0193	129.21	NaN	13.4439	127	NaN	14.1467	127.25	NaN

1.6992	3.8552	127.4	NaN	10.7504	128.69	NaN	11.562	128.67	NaN
1.7432	4.0229	132.02	NaN	6.2418	126.31	NaN	6.2661	125.07	NaN
1.7871	3.4692	136.27	NaN	7.7072	124.5	NaN	7.5513	128.81	NaN
1.8311	4.1429	139.45	NaN	8.6472	135.16	NaN	8.044	130.2	NaN
1.875	3.1675	118.28	NaN	5.0433	141.94	NaN	5.3761	140.11	NaN
1.9189	2.5631	120.2	NaN	7.7844	127.11	NaN	7.0857	143.06	NaN
1.9629	2.7702	105.71	NaN	6.673	139.42	NaN	6.3253	141.08	NaN
2.0068	3.2401	112.3	NaN	6.0853	132.58	NaN	6.8911	137.92	NaN
2.0508	2.8802	126.26	NaN	5.2876	142.82	NaN	5.8639	153.79	NaN
2.0947	2.0267	103.93	NaN	4.01	130.76	NaN	4.0942	144	NaN
2.1387	2.3753	134.3	NaN	3.8137	127.68	NaN	3.6288	158.38	NaN
2.1826	2.5732	181.5	NaN	3.7662	143.7	NaN	4.0071	131.44	NaN
2.2266	2.0518	125.81	NaN	5.5756	156.41	NaN	5.4014	149.64	NaN
2.2705	2.6295	137.11	NaN	4.6829	150.51	NaN	4.4976	153.84	NaN
2.3145	2.1654	121.88	NaN	4.1037	146.17	NaN	3.8543	152.94	NaN
2.3584	2.2033	81.66	NaN	3.7409	153.04	NaN	3.7265	156.11	NaN
2.4023	2.1739	116.04	NaN	3.7634	138	NaN	4.0978	144.71	NaN
2.4463	2.2398	133.61	NaN	3.4796	134.52	NaN	3.8997	110.94	NaN
2.4902	2.2647	144.07	NaN	3.4324	121.47	NaN	4.3723	130.12	NaN
2.5342	1.8929	105.43	NaN	2.9785	152.72	NaN	2.9729	139.1	NaN
2.5781	2.0371	190.16	NaN	2.7802	179.63	NaN	2.8419	151.05	NaN
2.6221	2.2761	170.44	NaN	2.5604	201.33	NaN	2.9251	155.09	NaN
2.666	1.8645	232.04	NaN	2.297	138.86	NaN	2.8816	159.2	NaN
2.71	1.6694	7.52	NaN	2.8446	219.96	NaN	2.6728	151.21	NaN
2.7539	1.8699	161.73	NaN	2.5387	148.81	NaN	2.8793	133.28	NaN
2.7979	1.7503	151.24	NaN	2.525	171.33	NaN	2.7439	172.35	NaN
2.8418	1.611	73.93	NaN	2.662	154.45	NaN	2.4598	74.16	NaN
2.8857	1.655	220.7	NaN	2.5484	238.82	NaN	2.3309	169.98	NaN
2.9297	1.4859	51.96	NaN	2.4323	195.26	NaN	2.1721	15.61	NaN
2.9736	1.5921	234.11	NaN	2.4729	212.96	NaN	2.4167	253.18	NaN

Table P27
S1X6G1 CIIS Spectral Pixel Intensity Energy Density (I^2/Hz) and Vector-Mean Wave Direction (deg)

	Camera 4						Camera 6		
	Probe 0 (CIIS Location ID=31)			Probe 1 (CIIS Location ID= 81)			Probe 1 (Not in view)		
Location	X (m)	Y (m)		X (m)	Y (m)		X (m)	Y (m)	
	13.29	18.35		12.68	20.18		NaN	NaN	
f (Hz)	$S(f)$	$\theta_m(f)$	$\theta_m(f)_c$	$S(f)$	$\theta_m(f)$	$\theta_m(f)_c$	$S(f)$	$\theta_m(f)$	$\theta_m(f)_c$
0.0293	8.2934	4.58	NaN	10.8409	47.38	NaN	NaN	NaN	NaN
0.0732	4.3941	33.81	NaN	6.8507	44.55	NaN	NaN	NaN	NaN
0.1172	3.1924	31.41	NaN	4.7002	2.79	NaN	NaN	NaN	NaN
0.1611	2.4385	152.4	NaN	3.6656	28.37	NaN	NaN	NaN	NaN
0.2051	2.0699	212.06	NaN	3.876	36.44	NaN	NaN	NaN	NaN
0.249	2.1837	14.66	NaN	2.3092	15.96	NaN	NaN	NaN	NaN
0.293	2.1566	39.14	NaN	3.4381	32.58	NaN	NaN	NaN	NaN
0.3369	1.8497	194.88	NaN	6.462	142.18	NaN	NaN	NaN	NaN
0.3809	2.2187	38.1	NaN	2.6318	179.13	NaN	NaN	NaN	NaN
0.4248	1.8368	42.58	NaN	2.4104	186.29	NaN	NaN	NaN	NaN
0.4688	1.8701	257.35	NaN	2.0954	20.37	NaN	NaN	NaN	NaN
0.5127	1.753	76.25	NaN	2.2739	87.25	NaN	NaN	NaN	NaN
0.5566	1.8695	53.46	NaN	2.3042	118.92	NaN	NaN	NaN	NaN
0.6006	2.1774	149.04	NaN	2.3194	171.78	NaN	NaN	NaN	NaN
0.6445	1.7412	28.44	NaN	4.874	237.15	NaN	NaN	NaN	NaN
0.6885	1.8626	125.21	NaN	4.1056	50.17	NaN	NaN	NaN	NaN
0.7324	1.9993	184.33	NaN	2.4916	28.24	NaN	NaN	NaN	NaN
0.7764	1.9233	87.45	NaN	3.0129	164.3	NaN	NaN	NaN	NaN
0.8203	2.1527	2.5	NaN	2.6846	211.16	NaN	NaN	NaN	NaN
0.8643	1.9745	157.67	NaN	3.204	201.4	NaN	NaN	NaN	NaN
0.9082	2.0042	125.53	NaN	2.9453	46.56	NaN	NaN	NaN	NaN
0.9521	2.0097	116.69	NaN	3.3523	146.07	NaN	NaN	NaN	NaN
0.9961	2.297	207.09	NaN	6.6751	223.18	NaN	NaN	NaN	NaN
1.04	2.0688	40.89	NaN	3.0042	54.69	NaN	NaN	NaN	NaN
1.084	2.2736	83.33	NaN	3.7642	33.24	NaN	NaN	NaN	NaN
1.1279	3.1257	70.54	NaN	3.3868	70.65	NaN	NaN	NaN	NaN
1.1719	2.2502	242.25	NaN	3.0012	194.35	NaN	NaN	NaN	NaN
1.2158	5.5064	151.51	NaN	17.7307	141.53	NaN	NaN	NaN	NaN
1.2598	8.8588	151.96	NaN	40.4384	137.63	NaN	NaN	NaN	NaN
1.3037	2.0284	99.01	NaN	3.6781	174.68	NaN	NaN	NaN	NaN
1.3477	1.8143	85.69	NaN	3.6264	82.84	NaN	NaN	NaN	NaN
1.3916	1.849	156.16	NaN	2.2001	267.59	NaN	NaN	NaN	NaN
1.4355	1.9473	137.56	NaN	2.2722	37.59	NaN	NaN	NaN	NaN
.4795	1.8722	48.86	NaN	2.1422	163.57	NaN	NaN	NaN	NaN
1.5234	1.5445	25.84	NaN	1.9811	146.36	NaN	NaN	NaN	NaN
1.5674	1.8006	127.76	NaN	2.2687	170.58	NaN	NaN	NaN	NaN
1.6113	1.7988	148.55	NaN	2.7997	176.11	NaN	NaN	NaN	NaN
1.6553	1.6485	170.78	NaN	6.2129	208.32	NaN	NaN	NaN	NaN

1.6992	1.8014	76.05	NaN	2.947	0.88	NaN	NaN	NaN	NaN
1.7432	1.8971	18.88	NaN	3.0784	38.04	NaN	NaN	NaN	NaN
1.7871	1.8057	66.27	NaN	2.3719	252.36	NaN	NaN	NaN	NaN
1.8311	1.9654	237.8	NaN	2.4968	56.69	NaN	NaN	NaN	NaN
1.875	2.0394	38.96	NaN	3.6895	37.3	NaN	NaN	NaN	NaN
1.9189	1.9167	6.65	NaN	2.9213	221.02	NaN	NaN	NaN	NaN
1.9629	1.7837	258.67	NaN	3.7794	135.02	NaN	NaN	NaN	NaN
2.0068	1.9183	174.69	NaN	4.5245	23.65	NaN	NaN	NaN	NaN
2.0508	2.0319	246.51	NaN	3.0311	73.63	NaN	NaN	NaN	NaN
2.0947	2.1076	87.98	NaN	3.038	263.27	NaN	NaN	NaN	NaN
2.1387	1.8952	30.99	NaN	2.5591	85.27	NaN	NaN	NaN	NaN
2.1826	2.2338	28.65	NaN	2.9721	56.68	NaN	NaN	NaN	NaN
2.2266	1.9336	71.55	NaN	2.9517	269.97	NaN	NaN	NaN	NaN
2.2705	1.8981	195.06	NaN	3.1776	150.96	NaN	NaN	NaN	NaN
2.3145	1.7097	65.11	NaN	5.1109	170.58	NaN	NaN	NaN	NaN
2.3584	2.2357	195.28	NaN	5.4668	107.16	NaN	NaN	NaN	NaN
2.4023	4.226	131.08	NaN	7.9784	68.11	NaN	NaN	NaN	NaN
2.4463	4.6477	135.15	NaN	16.9588	73.94	NaN	NaN	NaN	NaN
2.4902	4.1425	119.41	NaN	13.7464	82.3	NaN	NaN	NaN	NaN
2.5342	3.0176	98.86	NaN	4.5741	61.63	NaN	NaN	NaN	NaN
2.5781	1.88	223.97	NaN	2.7732	92.03	NaN	NaN	NaN	NaN
2.6221	1.8779	231.83	NaN	2.6437	182.13	NaN	NaN	NaN	NaN
2.666	1.9717	96.42	NaN	4.2382	164.43	NaN	NaN	NaN	NaN
2.71	1.8426	60.72	NaN	2.7775	163.56	NaN	NaN	NaN	NaN
2.7539	1.504	230.43	NaN	2.9471	46.29	NaN	NaN	NaN	NaN
2.7979	1.7326	239.43	NaN	2.4271	208.26	NaN	NaN	NaN	NaN
2.8418	1.6703	91.66	NaN	2.3997	186.88	NaN	NaN	NaN	NaN
2.8857	1.5935	73.57	NaN	2.7953	187.47	NaN	NaN	NaN	NaN
2.9297	1.7596	248.42	NaN	2.3601	188.85	NaN	NaN	NaN	NaN
2.9736	1.6154	124.6	NaN	4.1393	0.99	NaN	NaN	NaN	NaN

Table P28
S1X6G2 CIIS Spectral Pixel Intensity Energy Density (I^2/Hz) and Vector-Mean Wave Direction (deg)

	Camera 4						Camera 6		
	Probe 0 (CIIS Location ID=32)			Probe 1 (CIIS Location ID= 83)			Probe 1 (CIIS Location ID=12)		
Location	X (m)	Y (m)		X (m)	Y (m)		X (m)	Y (m)	
	13.9	18.35		13.9	20.18		13.88	20.16	
f (Hz)	$S(f)$	$\theta_m(f)$	$\theta_m(f)_C$	$S(f)$	$\theta_m(f)$	$\theta_m(f)_C$	$S(f)$	$\theta_m(f)$	$\theta_m(f)_C$
0.0293	6.709	255.95	NaN	13.0392	14.43	NaN	15.3738	35.38	NaN
0.0732	3.4702	53.91	NaN	6.9365	68.98	NaN	7.236	71.26	NaN
0.1172	2.5809	81.5	NaN	3.9002	265.48	NaN	3.5144	62.39	NaN
0.1611	2.604	31.84	NaN	2.4867	256	NaN	2.5468	260.7	NaN
0.2051	2.1316	138.79	NaN	2.1314	266.01	NaN	2.6036	233.32	NaN
0.249	1.7466	45.21	NaN	2.1332	64.49	NaN	2.1705	196.36	NaN
0.293	1.7388	31.91	NaN	1.9486	66.24	NaN	1.9287	44.12	NaN
0.3369	1.9258	17.46	NaN	1.919	9.81	NaN	1.8976	75.13	NaN
0.3809	1.9261	12.15	NaN	2.1211	143.21	NaN	2.1203	25.26	NaN
0.4248	1.6764	51.8	NaN	1.8812	92.82	NaN	1.6783	28.15	NaN
0.4688	1.5572	133.55	NaN	1.8162	124.85	NaN	1.7413	180.1	NaN
0.5127	1.7524	114.86	NaN	1.8123	206.42	NaN	1.8794	18.06	NaN
0.5566	1.6694	126.93	NaN	1.7794	165.62	NaN	1.7969	174.39	NaN
0.6006	1.8952	17.63	NaN	1.9148	169.04	NaN	1.8736	113.57	NaN
0.6445	1.7851	213.2	NaN	1.8996	56.27	NaN	1.9761	182.1	NaN
0.6885	1.5789	30.53	NaN	1.6754	184.11	NaN	1.9277	65.17	NaN
0.7324	1.6832	93.67	NaN	1.9768	238.51	NaN	1.77	144.96	NaN
0.7764	1.5436	77.85	NaN	1.6389	62.22	NaN	1.7072	89.7	NaN
0.8203	1.764	249.98	NaN	1.9896	8.83	NaN	1.7729	81.5	NaN
0.8643	1.7284	221	NaN	1.9347	250.66	NaN	1.8717	2.34	NaN
0.9082	1.5524	55.03	NaN	1.6617	74.87	NaN	1.7855	112.85	NaN
0.9521	1.823	198.41	NaN	1.9046	137.1	NaN	1.8134	117.61	NaN
0.9961	1.8052	34.76	NaN	2.102	245.43	NaN	2.2501	146.46	NaN
1.04	1.6658	87.46	NaN	2.1499	227.24	NaN	2.868	138.6	NaN
1.084	1.8578	76.66	NaN	2.032	85.02	NaN	3.1305	136.63	NaN
1.1279	2.2441	97.93	NaN	2.5236	129.39	NaN	3.3175	132.37	NaN
1.1719	1.9189	35.5	NaN	3.2249	114.52	NaN	6.4951	122.44	NaN
1.2158	8.2975	150.17	NaN	90.3124	129.04	129.04	64.3013	128.08	128.08
1.2598	15.5237	149.65	NaN	206.0001	127.95	127.95	137.8575	125.87	125.87
1.3037	2.0457	201.01	NaN	3.3179	120.45	NaN	39.2533	127.92	127.92
1.3477	1.8365	259.82	NaN	2.2726	123.58	NaN	39.7334	131.12	131.12
1.3916	1.5294	23.38	NaN	1.8315	189.78	NaN	16.5532	129.03	129.03
1.4355	1.6714	20.45	NaN	1.6602	177.57	NaN	5.2023	131	NaN
1.4795	1.5342	261.55	NaN	1.7809	11.02	NaN	3.3955	132.79	NaN
1.5234	1.6434	26.61	NaN	1.6719	36.08	NaN	2.5291	133.46	NaN
1.5674	1.5944	213.83	NaN	1.6504	91.87	NaN	1.8367	40.37	NaN
1.6113	1.5195	229.58	NaN	1.7164	124.47	NaN	2.1231	119.44	NaN
1.6553	1.6352	183.26	NaN	1.7021	47.12	NaN	2.8784	129.54	NaN

1.6992	1.5212	8.44	NaN	1.5395	87.08	NaN	2.3201	133.3	NaN
1.7432	1.4169	243.14	NaN	1.505	33.34	NaN	1.8338	121.85	NaN
1.7871	1.6619	54.75	NaN	1.4436	258.01	NaN	1.5418	260.01	NaN
1.8311	1.5612	29.1	NaN	1.62	4.23	NaN	1.6434	266.82	NaN
1.875	1.7451	72.87	NaN	1.6165	118.79	NaN	1.4948	19.43	NaN
1.9189	1.731	109.57	NaN	1.7843	71.29	NaN	1.5743	2.42	NaN
1.9629	1.5009	78.2	NaN	1.7259	70.1	NaN	1.6177	34.85	NaN
2.0068	1.6789	59.09	NaN	1.7005	59.06	NaN	1.7232	103.93	NaN
2.0508	1.8369	22.09	NaN	1.8744	118.58	NaN	1.6373	93.94	NaN
2.0947	1.8269	82.62	NaN	1.6344	82.58	NaN	1.7791	44.48	NaN
2.1387	1.5075	65.46	NaN	1.7734	100.56	NaN	1.6985	220.54	NaN
2.1826	1.6899	40.01	NaN	2.1915	169.05	NaN	1.8185	171.99	NaN
2.2266	1.7104	29.43	NaN	1.905	184.39	NaN	1.6818	55.74	NaN
2.2705	1.7489	64.34	NaN	2.2236	136.32	NaN	1.9543	118.77	NaN
2.3145	1.6188	128.92	NaN	2.5965	137.63	NaN	2.8791	124.29	NaN
2.3584	2.1712	258.85	NaN	3.359	129.21	NaN	3.6786	118.71	NaN
2.4023	2.139	163.99	NaN	6.4187	88.76	NaN	4.7724	126.29	NaN
2.4463	2.5462	95.96	NaN	12.1621	117.87	NaN	7.2588	181.15	NaN
2.4902	3.0498	223.93	NaN	11.5194	87.71	NaN	11.3223	91.89	NaN
2.5342	2.2333	109.9	NaN	4.2895	205.09	NaN	4.6369	101.58	NaN
2.5781	1.8623	106.69	NaN	2.202	125.61	NaN	3.5741	121	NaN
2.6221	1.4973	188.71	NaN	1.7317	214.75	NaN	3.3918	159.61	NaN
2.666	1.5204	18.49	NaN	1.9292	154.85	NaN	2.791	54.84	NaN
2.71	1.3905	62.13	NaN	1.629	22.61	NaN	2.4614	138.74	NaN
2.7539	1.3308	219.31	NaN	1.6046	85.36	NaN	2.3385	194.19	NaN
2.7979	1.3687	52.44	NaN	1.5689	103.92	NaN	2.0486	192.96	NaN
2.8418	1.2634	36.03	NaN	1.5515	192.92	NaN	2.1426	151.99	NaN
2.8857	1.8883	77.01	NaN	1.674	210.67	NaN	1.8427	169.13	NaN
2.9297	1.4113	22.4	NaN	1.7158	259.46	NaN	1.8529	147.34	NaN
2.9736	1.3305	2.54	NaN	1.5073	18.93	NaN	1.5285	187.97	NaN

Table P29
S1X6G3 CIIS Spectral Pixel Intensity Energy Density (I^2/Hz) and Vector-Mean Wave Direction (deg)

	Camera 4						Camera 6		
	Probe 0 (CIIS Location ID=34)			Probe 1 (CIIS Location ID= 85)			Probe 1 (CIIS Location ID=14)		
Location	X (m)	Y (m)		X (m)	Y (m)		X (m)	Y (m)	
	15.12	18.35		15.12	20.18		15.1	20.17	
f (Hz)	$S(f)$	$\theta_m(f)$	$\theta_m(f)_c$	$S(f)$	$\theta_m(f)$	$\theta_m(f)_c$	$S(f)$	$\theta_m(f)$	$\theta_m(f)_c$
0.0293	7.5493	51.66	NaN	7.4981	46.99	NaN	11.2016	54.17	NaN
0.0732	3.8235	39.85	NaN	4.6893	23.94	NaN	4.63	1.64	NaN
0.1172	2.6225	207.89	NaN	3.436	8.35	NaN	3.2092	254.69	NaN
0.1611	2.179	31.93	NaN	2.5925	52.4	NaN	3.0447	84.21	NaN
0.2051	1.8	78.95	NaN	2.127	14.56	NaN	2.8451	45.81	NaN
0.249	1.8355	253.94	NaN	1.9824	107.68	NaN	2.3601	31.19	NaN
0.293	2.0024	9.82	NaN	1.8315	237.99	NaN	1.932	147.08	NaN
0.3369	1.7601	68.15	NaN	1.7412	66.27	NaN	1.9867	174.95	NaN
0.3809	1.8197	110.69	NaN	1.6825	33.58	NaN	1.8165	139.33	NaN
0.4248	1.7117	38.21	NaN	2.0125	70.31	NaN	1.8422	84.22	NaN
0.4688	1.7039	252.64	NaN	1.602	129.05	NaN	1.8152	209.32	NaN
0.5127	1.7993	239.25	NaN	1.5427	230.76	NaN	2.0722	117.81	NaN
0.5566	1.8382	122.98	NaN	1.6677	218.99	NaN	2.0259	100.68	NaN
0.6006	1.7898	88.82	NaN	1.6228	62.31	NaN	1.7467	145.36	NaN
0.6445	1.594	15.41	NaN	1.8006	238.46	NaN	2.0204	118.42	NaN
0.6885	1.5046	29.9	NaN	1.8203	76.09	NaN	1.6843	202.6	NaN
0.7324	1.6362	240.17	NaN	1.596	85.89	NaN	1.8087	35.19	NaN
0.7764	1.4945	250.4	NaN	1.7976	126.82	NaN	1.6654	97.06	NaN
0.8203	1.6273	110.81	NaN	1.8331	237.37	NaN	1.845	100.19	NaN
0.8643	1.6155	66.6	NaN	1.6463	76.51	NaN	1.6916	103.46	NaN
0.9082	1.6852	179.8	NaN	1.6741	58.81	NaN	2.2924	127.11	NaN
0.9521	1.5671	22.68	NaN	1.7782	8.86	NaN	2.7171	133.09	NaN
0.9961	1.6589	104.73	NaN	1.9001	51.21	NaN	4.6366	124.56	NaN
1.04	1.7863	130.77	NaN	1.6376	228.57	NaN	4.8315	126.6	NaN
1.084	1.5361	199.2	NaN	2.0892	223.34	NaN	9.438	125.77	NaN
1.1279	1.9249	72.79	NaN	2.041	163.73	NaN	7.5405	127.18	NaN
1.1719	2.1126	127.04	NaN	4.9621	130.79	NaN	18.7465	128.06	128.06
1.2158	56.7962	136.53	136.53	443.3075	124.42	124.42	298.6148	128.75	128.75
1.2598	124.3201	137.34	137.34	1003.067	123.28	123.28	612.546	127.28	127.28
1.3037	2.1432	175.28	NaN	5.9585	127.11	NaN	175.8736	126.39	126.39
1.3477	1.7361	148.25	NaN	2.7747	127.02	NaN	181.7338	125.82	125.82
1.3916	1.6504	159.16	NaN	1.9389	149.56	NaN	64.1462	126.39	126.39
1.4355	1.5936	25.79	NaN	1.7902	120.68	NaN	17.1221	125.87	125.87
1.4795	1.5681	59.18	NaN	1.45	35.23	NaN	10.357	125.61	125.61
1.5234	1.6414	117.55	NaN	1.5921	111.84	NaN	5.6253	126.09	NaN
1.5674	1.9347	3.82	NaN	1.5367	61.9	NaN	2.753	118.77	NaN
1.6113	1.5789	50.6	NaN	1.5655	20.75	NaN	2.564	125.83	NaN
1.6553	1.5168	252.35	NaN	1.5496	223.02	NaN	5.8681	126.38	NaN

1.6992	1.4904	220.46	NaN	1.4224	112.39	NaN	5.1465	127.17	NaN
1.7432	1.4457	211.82	NaN	1.5638	257.64	NaN	4.43	127.92	NaN
1.7871	1.4244	264.35	NaN	1.5853	32.62	NaN	2.3255	126.17	NaN
1.8311	1.6496	22.4	NaN	1.6684	43.27	NaN	2.301	118.09	NaN
1.875	1.8885	82.02	NaN	1.7047	231.65	NaN	1.938	100.83	NaN
1.9189	1.4697	87.86	NaN	1.5153	231.71	NaN	1.8384	129.31	NaN
1.9629	1.4691	100.41	NaN	1.5721	233.77	NaN	1.9777	134.49	NaN
2.0068	1.5779	2.97	NaN	1.5449	73.33	NaN	1.9585	125.34	NaN
2.0508	1.6526	41.29	NaN	1.6706	13.75	NaN	2.1179	129.95	NaN
2.0947	1.8607	116.8	NaN	1.5736	47.57	NaN	1.6344	55.53	NaN
2.1387	1.4576	166.93	NaN	1.4389	71.23	NaN	1.548	73.52	NaN
2.1826	1.4892	28.53	NaN	1.5404	28.57	NaN	1.8874	80.79	NaN
2.2266	1.6196	223.89	NaN	1.5116	30.61	NaN	1.7869	151.85	NaN
2.2705	1.5423	185.38	NaN	1.6854	162.15	NaN	1.9528	59.53	NaN
2.3145	1.8298	31.27	NaN	2.0428	70.98	NaN	2.2392	133.76	NaN
2.3584	1.7742	17.09	NaN	2.5624	86.65	NaN	2.6225	89.8	NaN
2.4023	1.8677	60.99	NaN	4.4087	56.58	NaN	4.2757	6.68	NaN
2.4463	2.76	149.38	NaN	8.7793	150.23	NaN	7.3016	3.46	NaN
2.4902	5.3595	109.81	NaN	25.961	192.84	NaN	15.3257	244.26	NaN
2.5342	2.4206	48.96	NaN	4.0407	163.18	NaN	5.6255	159.69	NaN
2.5781	1.8803	68.14	NaN	3.0377	89.93	NaN	4.5006	175.56	NaN
2.6221	1.6533	235.43	NaN	2.5788	220.44	NaN	3.6048	160.4	NaN
2.666	1.5375	215.32	NaN	1.5974	223.39	NaN	2.8073	175.36	NaN
2.71	1.4857	267.91	NaN	1.5336	197.51	NaN	3.8208	161.62	NaN
2.7539	1.3983	242.97	NaN	1.8387	246.79	NaN	2.6789	123.07	NaN
2.7979	1.4787	262.77	NaN	1.5394	111.73	NaN	2.2872	193.73	NaN
2.8418	1.2221	244.46	NaN	1.3541	111.36	NaN	2.1697	126.41	NaN
2.8857	1.4323	6.61	NaN	1.3807	177.02	NaN	1.8242	87.25	NaN
2.9297	1.2658	12.39	NaN	1.3585	190.74	NaN	1.7473	34.69	NaN
2.9736	1.1808	264.39	NaN	1.5732	151.05	NaN	1.602	136.77	NaN

Table P30
S1X6G4 CIIS Spectral Pixel Intensity Energy Density (I^2/Hz) and Vector-Mean Wave Direction (deg)

	Camera 4						Camera 6		
	Probe 0 (CIIS Location ID=36)			Probe 1 (CIIS Location ID= 87)			Probe 1 (CIIS Location ID=16)		
Location	X (m)	Y (m)		X (m)	Y (m)		X (m)	Y (m)	
	16.34	18.35		16.34	20.18		16.32	20.18	
f (Hz)	$S(f)$	$\theta_m(f)$	$\theta_m(f)_c$	$S(f)$	$\theta_m(f)$	$\theta_m(f)_c$	$S(f)$	$\theta_m(f)$	$\theta_m(f)_c$
0.0293	10.7236	105.38	NaN	10.6129	79.05	NaN	13.3242	111.49	NaN
0.0732	3.6967	128.17	NaN	5.4793	4.27	NaN	5.8025	14.24	NaN
0.1172	3.1776	223.63	NaN	3.6807	236.23	NaN	4.2862	258.08	NaN
0.1611	2.2119	114.61	NaN	2.7383	15.86	NaN	3.1886	34.74	NaN
0.2051	1.9963	120.28	NaN	2.5579	110.97	NaN	2.4989	253.91	NaN
0.249	1.6735	149.25	NaN	2.5093	21.78	NaN	2.6712	113.64	NaN
0.293	1.5666	50.34	NaN	2.517	25.94	NaN	2.4362	63.21	NaN
0.3369	1.5416	98.9	NaN	1.84	18.76	NaN	2.2713	178.21	NaN
0.3809	1.362	65.07	NaN	1.9582	20.13	NaN	2.2613	97.47	NaN
0.4248	1.2637	59.17	NaN	2.0752	20.31	NaN	2.3127	68.03	NaN
0.4688	1.4007	196.08	NaN	2.0012	2.35	NaN	2.2428	147.96	NaN
0.5127	1.5068	235.61	NaN	1.7913	15.08	NaN	2.1719	145.93	NaN
0.5566	1.6251	182.58	NaN	1.6099	61.88	NaN	2.2095	81.69	NaN
0.6006	1.577	72.53	NaN	1.8404	107.82	NaN	2.5855	94.89	NaN
0.6445	1.645	21.89	NaN	1.5814	124	NaN	3.598	109.94	NaN
0.6885	1.5453	78.12	NaN	1.6251	14.74	NaN	2.6683	113.12	NaN
0.7324	1.5601	26.96	NaN	1.9046	14.23	NaN	2.3787	117.16	NaN
0.7764	1.389	90.14	NaN	1.9317	40.67	NaN	2.3384	107.86	NaN
0.8203	1.5139	116.57	NaN	1.7637	243.62	NaN	2.9423	126.86	NaN
0.8643	1.6107	234.57	NaN	1.8481	12.58	NaN	2.7903	116.14	NaN
0.9082	1.5863	190.51	NaN	1.8891	109.55	NaN	4.1715	115.06	NaN
0.9521	1.5513	20.46	NaN	1.7999	30.62	NaN	6.6134	113.76	NaN
0.9961	1.8162	36.66	NaN	2.0748	108.9	NaN	15.0589	113.94	113.94
1.04	1.607	31.29	NaN	1.8289	245.13	NaN	17.7949	113.58	113.58
1.084	1.762	43.22	NaN	1.9439	77.57	NaN	40.2257	112.71	112.71
1.1279	1.9867	84.01	NaN	2.8286	123.09	NaN	26.2	114.37	114.37
1.1719	2.9176	132.53	NaN	7.4868	117.8	NaN	66.5731	114.07	114.07
1.2158	563.3696	122.85	122.85	2140.3252	114.68	114.68	1555.1704	116.71	116.71
1.2598	1323.1361	122.29	122.29	4704.7453	113.52	113.52	3052.4142	116.28	116.28
1.3037	3.6621	120.34	NaN	12.2857	114.54	NaN	870.2533	113.98	113.98
1.3477	2.3935	107.88	NaN	3.3844	117.45	NaN	868.954	113.18	113.18
1.3916	1.7464	205.98	NaN	2.162	240.5	NaN	313.206	113.97	113.97
1.4355	1.5465	11.5	NaN	1.988	161.92	NaN	87.5433	112.17	112.17
1.4795	1.3943	215.46	NaN	1.7769	84.13	NaN	38.3007	114.22	114.22
1.5234	1.2937	145.62	NaN	1.7048	55.37	NaN	23.8646	113.79	113.79
1.5674	1.4512	101.02	NaN	1.8367	98.04	NaN	6.3006	111.41	NaN
1.6113	1.5249	57.34	NaN	1.7561	146.2	NaN	8.018	109.79	NaN
1.6553	1.295	261.64	NaN	1.6346	17.12	NaN	25.3025	112.85	112.85

1.6992	1.5175	228.6	NaN	1.6237	156.89	NaN	17.5438	112.19	112.19
1.7432	1.4213	200.83	NaN	1.6077	260.02	NaN	13.1855	114.7	114.7
1.7871	1.3361	211.25	NaN	1.5825	74.34	NaN	5.9428	111.11	NaN
1.8311	1.4705	73.59	NaN	1.6162	76.71	NaN	3.4875	109.51	NaN
1.875	1.4026	226.66	NaN	1.3451	42.45	NaN	3.3253	106.25	NaN
1.9189	1.294	44.18	NaN	1.6192	53.81	NaN	2.5737	102.86	NaN
1.9629	1.3846	235.66	NaN	1.7342	26.13	NaN	3.104	110.07	NaN
2.0068	1.4956	28.49	NaN	1.5834	100.62	NaN	2.9041	120.04	NaN
2.0508	1.3716	20.27	NaN	1.6393	56.86	NaN	2.4315	123.68	NaN
2.0947	1.4088	49.13	NaN	1.6707	71.57	NaN	2.3868	116.17	NaN
2.1387	1.2884	59.97	NaN	1.7077	66.21	NaN	2.6092	117.28	NaN
2.1826	1.4652	176.41	NaN	1.7408	8	NaN	2.7328	142.47	NaN
2.2266	1.493	55.69	NaN	1.6659	78.73	NaN	2.3628	179.38	NaN
2.2705	1.4617	220.48	NaN	1.8726	263.34	NaN	3.5665	176.3	NaN
2.3145	1.45	188.68	NaN	2.0605	141.65	NaN	3.1082	154.94	NaN
2.3584	1.7534	188.7	NaN	2.368	172.45	NaN	4.0189	137.11	NaN
2.4023	1.8873	187.95	NaN	3.7433	179.93	NaN	8.0827	176.72	NaN
2.4463	5.5241	210.89	NaN	23.6756	182.28	NaN	27.7281	190.49	NaN
2.4902	59.6702	182.35	NaN	240.5549	181.12	NaN	142.8051	187.27	187.27
2.5342	3.6868	200.68	NaN	8.4705	206.78	NaN	25.8626	194.4	NaN
2.5781	1.4292	87.13	NaN	2.58	223.18	NaN	10.1697	198.01	NaN
2.6221	1.304	265.76	NaN	1.9402	227.48	NaN	15.0539	196.36	NaN
2.666	1.5041	5.22	NaN	1.8355	264.47	NaN	7.2906	204.81	NaN
2.71	1.2906	46.25	NaN	1.7243	12.42	NaN	12.3078	196.51	NaN
2.7539	1.4197	111.91	NaN	1.7437	223.64	NaN	12.361	192.96	NaN
2.7979	1.2999	103.39	NaN	1.8	136.4	NaN	6.0619	189.23	NaN
2.8418	1.2693	22.72	NaN	1.5008	140.89	NaN	4.9137	189.18	NaN
2.8857	1.3465	126.03	NaN	1.6727	190.41	NaN	3.4068	186.09	NaN
2.9297	1.2014	41.83	NaN	1.6733	12.09	NaN	2.3796	215.99	NaN
2.9736	1.3168	34.81	NaN	1.594	173.48	NaN	3.637	212.62	NaN

Table P31
S1X6G5 CIIS Spectral Pixel Intensity Energy Density (I^2/Hz) and Vector-Mean Wave Direction (deg)

	Camera 4						Camera 6		
	Probe 0 (CIIS Location ID=35)			Probe 1 (CIIS Location ID= 86)			Probe 1 (CIIS Location ID=15)		
Location	X (m)	Y (m)		X (m)	Y (m)		X (m)	Y (m)	
	15.73	18.35		15.73	20.18		15.71	20.17	
f (Hz)	$S(f)$	$\theta_m(f)$	$\theta_m(f)_C$	$S(f)$	$\theta_m(f)$	$\theta_m(f)_C$	$S(f)$	$\theta_m(f)$	$\theta_m(f)_C$
0.0293	5.895	37.97	NaN	9.0262	31.68	NaN	10.4717	17.35	NaN
0.0732	3.134	252.99	NaN	4.1142	12.01	NaN	5.7099	6.74	NaN
0.1172	2.1505	46.02	NaN	3.3985	43.5	NaN	3.2354	53.02	NaN
0.1611	1.9681	10.08	NaN	2.3091	20.9	NaN	3.0523	143.93	NaN
0.2051	1.9474	2.71	NaN	2.0644	83.8	NaN	2.5378	124.68	NaN
0.249	1.7729	218.51	NaN	1.9335	36.47	NaN	2.2654	77.13	NaN
0.293	1.782	0.35	NaN	1.9813	9.78	NaN	2.0314	43.07	NaN
0.3369	1.5806	55.35	NaN	1.6484	188.99	NaN	1.9428	62.53	NaN
0.3809	1.5695	35.98	NaN	1.6838	185.02	NaN	2.2855	256.66	NaN
0.4248	1.4239	262.39	NaN	1.7473	43.7	NaN	2.2848	31.53	NaN
0.4688	1.627	233.41	NaN	1.8831	60.06	NaN	1.8429	85.81	NaN
0.5127	1.726	44.53	NaN	1.7487	148.42	NaN	1.9594	106.66	NaN
0.5566	1.6732	61.01	NaN	1.4073	193.22	NaN	2.0773	139.39	NaN
0.6006	1.647	159.58	NaN	1.6697	2.13	NaN	1.8617	115.95	NaN
0.6445	1.4246	68.02	NaN	1.9383	27.99	NaN	2.1404	103.98	NaN
0.6885	1.4835	67.21	NaN	1.7459	171.64	NaN	2.0557	113.93	NaN
0.7324	1.6676	228.1	NaN	1.689	263.65	NaN	1.926	119.91	NaN
0.7764	1.7093	219.21	NaN	1.6875	128.05	NaN	2.0432	127.39	NaN
0.8203	1.5416	181.7	NaN	1.9812	161.02	NaN	2.1579	117.58	NaN
0.8643	1.6041	50.11	NaN	1.6816	37.35	NaN	1.9909	150.42	NaN
0.9082	1.5417	102.63	NaN	1.7033	45.46	NaN	2.4342	119.54	NaN
0.9521	1.6648	152.47	NaN	1.615	80.66	NaN	3.6258	117.86	NaN
0.9961	1.3717	128.51	NaN	1.7862	268.22	NaN	7.9126	120.16	NaN
1.04	1.6685	263.82	NaN	1.7309	44.43	NaN	8.2859	115.67	NaN
1.084	1.5494	191.51	NaN	1.978	85.31	NaN	17.8216	112.47	112.47
1.1279	1.8005	239.28	NaN	2.3853	111.14	NaN	11.6362	117.19	NaN
1.1719	2.2414	156.47	NaN	5.3326	122.77	NaN	29.2318	119.52	119.52
1.2158	170.6472	130.43	130.43	803.7761	120	120	598.4898	121.15	121.15
1.2598	404.9904	130.27	130.27	1793.687	118.35	118.35	1212.2415	119.23	119.23
1.3037	2.2547	143.35	NaN	6.6185	120.13	NaN	349.8994	117.3	117.3
1.3477	1.5524	147.59	NaN	3.185	147.82	NaN	361.1463	118.27	118.27
1.3916	1.4693	190.9	NaN	2.0667	203.66	NaN	127.9757	118.09	118.09
1.4355	1.4901	184.96	NaN	1.943	203.31	NaN	35.8836	118.05	118.05
1.4795	1.5187	140.56	NaN	1.7628	260.4	NaN	17.7841	119.75	119.75
1.5234	1.3758	78.19	NaN	1.6292	190.13	NaN	9.6398	120.25	120.25
1.5674	1.4512	200.71	NaN	1.6394	77.89	NaN	3.7586	121.67	NaN
1.6113	1.4428	147.01	NaN	1.9061	142.04	NaN	4.1381	121.87	NaN
1.6553	1.4497	220.89	NaN	1.7178	201.24	NaN	11.2543	118.2	118.2

1.6992	1.5593	126.62	NaN	1.73	242.49	NaN	8.1056	121.87	NaN
1.7432	1.5266	108.16	NaN	1.5591	17.91	NaN	6.3672	121.23	NaN
1.7871	1.4412	40.64	NaN	1.5483	42.39	NaN	3.3069	120.51	NaN
1.8311	1.4565	19.38	NaN	1.4107	74.12	NaN	2.6035	119.64	NaN
1.875	1.4768	52.78	NaN	1.5718	43.66	NaN	1.9726	112.78	NaN
1.9189	1.4484	6.96	NaN	1.7553	35.19	NaN	2.1261	130.38	NaN
1.9629	1.5462	123.85	NaN	1.4685	130.69	NaN	2.0106	116.31	NaN
2.0068	1.4264	207.11	NaN	1.5458	144.31	NaN	2.1202	112.85	NaN
2.0508	1.5745	250.3	NaN	1.5867	40.76	NaN	1.9502	95.7	NaN
2.0947	1.417	146.31	NaN	1.8793	19.18	NaN	1.8431	111.4	NaN
2.1387	1.5406	150.74	NaN	1.7098	88.49	NaN	1.8377	96.15	NaN
2.1826	1.5994	188.42	NaN	1.7012	183.9	NaN	2.092	137.74	NaN
2.2266	1.343	46.81	NaN	1.5353	51.45	NaN	1.856	113.76	NaN
2.2705	1.5377	118.47	NaN	1.6374	62.73	NaN	2.128	196.95	NaN
2.3145	1.7628	175.1	NaN	1.9087	88.4	NaN	2.418	130.51	NaN
2.3584	1.7234	189.7	NaN	2.5723	2.52	NaN	3.1462	116.37	NaN
2.4023	1.8637	164.47	NaN	3.3835	120.16	NaN	4.7175	132.04	NaN
2.4463	2.9376	183.48	NaN	10.6436	209.52	NaN	10.3804	197.74	NaN
2.4902	9.9124	164.25	NaN	70.9633	195.18	NaN	40.6258	189.24	NaN
2.5342	2.3679	234.68	NaN	4.9228	225.11	NaN	9.6687	190.53	NaN
2.5781	1.6116	42.4	NaN	2.721	201.25	NaN	5.9675	209.4	NaN
2.6221	1.3349	44.96	NaN	2.0534	206.63	NaN	6.1855	206.86	NaN
2.666	1.3502	51.41	NaN	1.6354	156.21	NaN	4.2689	196.33	NaN
2.71	1.272	8.95	NaN	1.5429	163.62	NaN	5.8904	194.12	NaN
2.7539	1.3531	111.64	NaN	1.6379	54.87	NaN	4.4366	187.76	NaN
2.7979	1.2307	175.47	NaN	1.4017	43.39	NaN	3.7832	197.72	NaN
2.8418	1.1454	54.02	NaN	1.6556	93.72	NaN	2.4391	185.84	NaN
2.8857	1.2299	73.28	NaN	1.3397	232.38	NaN	2.1371	243.02	NaN
2.9297	1.2731	166.67	NaN	1.4545	240.19	NaN	1.7881	207.02	NaN
2.9736	1.2539	82.65	NaN	1.5121	208.78	NaN	2.0287	224.53	NaN

Appendix Q
CIIS Measurement Results

Spectral Peak Vector-Mean Wave Direction Plots

Presented in this appendix are rectified snapshot images for each structure and experiment. Superimposed on each image are wave direction vectors that represent the vector-mean wave direction at the peak of the measured spectrum for each Coastal Inlets Imaging System (CIIS) output location in a given camera view. In the physical model coordinate system, alongshore and cross-shore image axis labels correspond to y- and x-axes, respectively.

For each CIIS array location, a wide band about the theoretical spectral peak was searched for a value of maximum energy density and corresponding frequency. Then the corresponding wave direction vector was plotted. For Experiments 1 and 4 the band about the spectral peak ranged between 0.5 and 2 Hz. For Experiments 2 and 5, the band about the spectral peak ranged between 0.3 and 0.7 Hz. For Experiments 3 and 6, the band about the spectral peak ranged between 1.0 and 1.5 Hz.

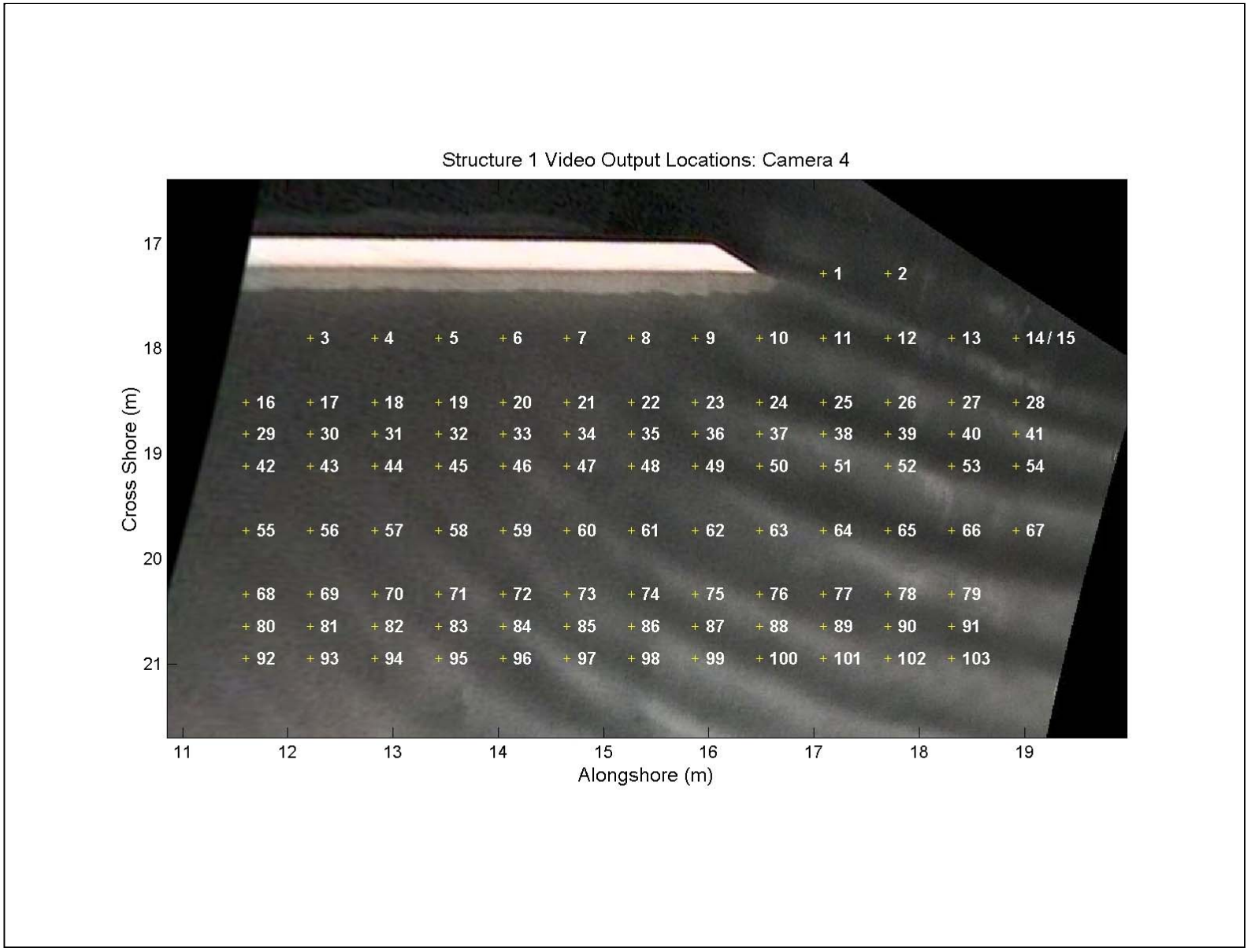
Vectors without a circled tail represent wave directions that do not meet the coherence cutoff criteria discussed in Chapter 5. Vectors with a circled tail represent wave directions that meet the cutoff criteria. For the sake of graphical visual representation, wave direction vectors are scaled by wave celerity:

$$k = \sqrt{k_x^{\,2} + k_y^{\,2}}$$

$$c = \frac{f}{k}$$

where k = wave number and f = frequency.

Plot titles have either 4- or 5-digit strings that indicate structure (characters 1-2) and experiment (characters 3-4), and c indicates whether a 15-cm/sec current was present in channel (character 5), as well as camera number. For example, "S1X1" represents Structure 1, Experiment 1. "S3X1c" represents Structure 1, Experiment 1, current in channel.


Structure 1 Video Output Locations: Camera 4
Cross Shore (m)
Alongshore (m)
17
18
19
20
21
11
12
13
14
15
16
17
18
19
+ 1
+ 2
+ 3
+ 4
+ 5
+ 6
+ 7
+ 8
+ 9
+ 10
+ 11
+ 12
+ 13
+ 14 / 15
+ 16
+ 17
+ 18
+ 19
+ 20
+ 21
+ 22
+ 23
+ 24
+ 25
+ 26
+ 27
+ 28
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+ 31
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+ 89
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+ 96
+ 97
+ 98
+ 99
+ 100
+ 101
+ 102
+ 103

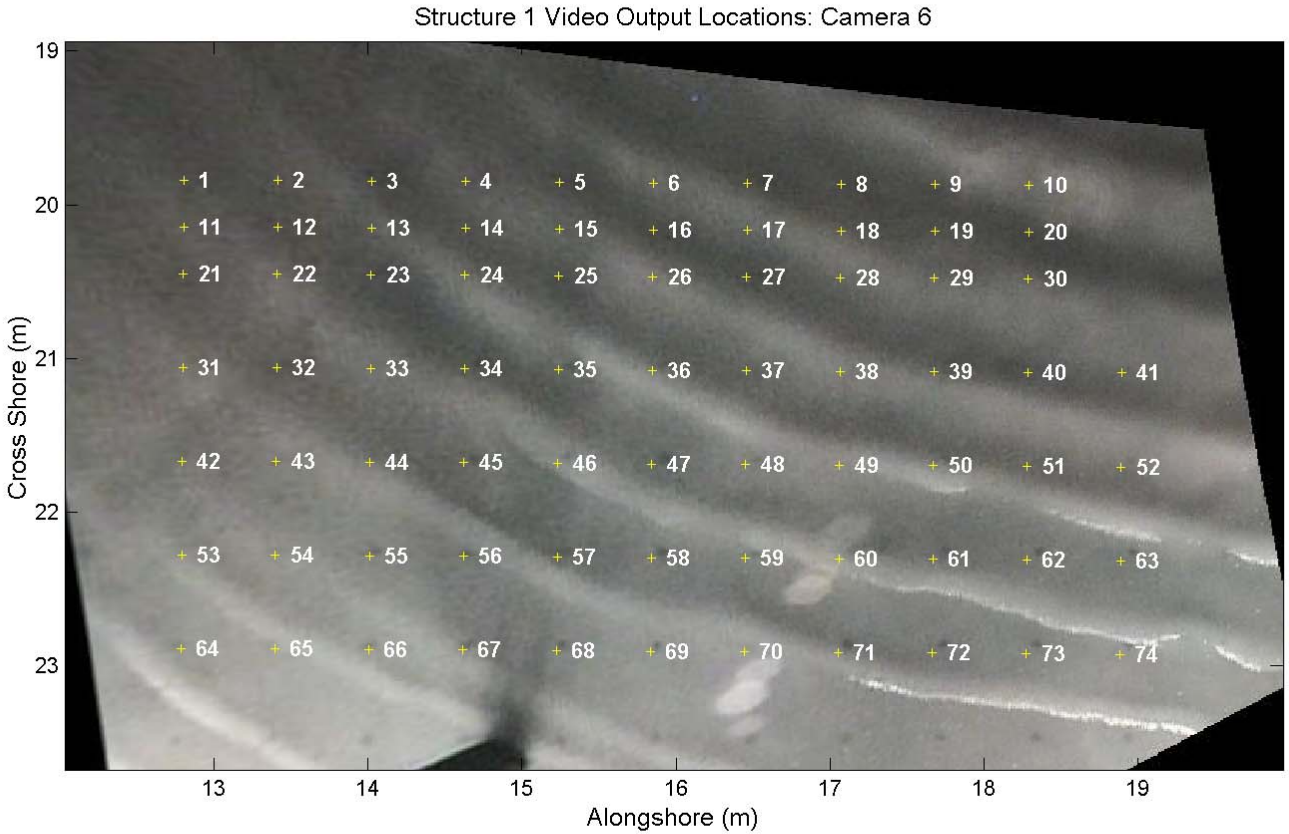
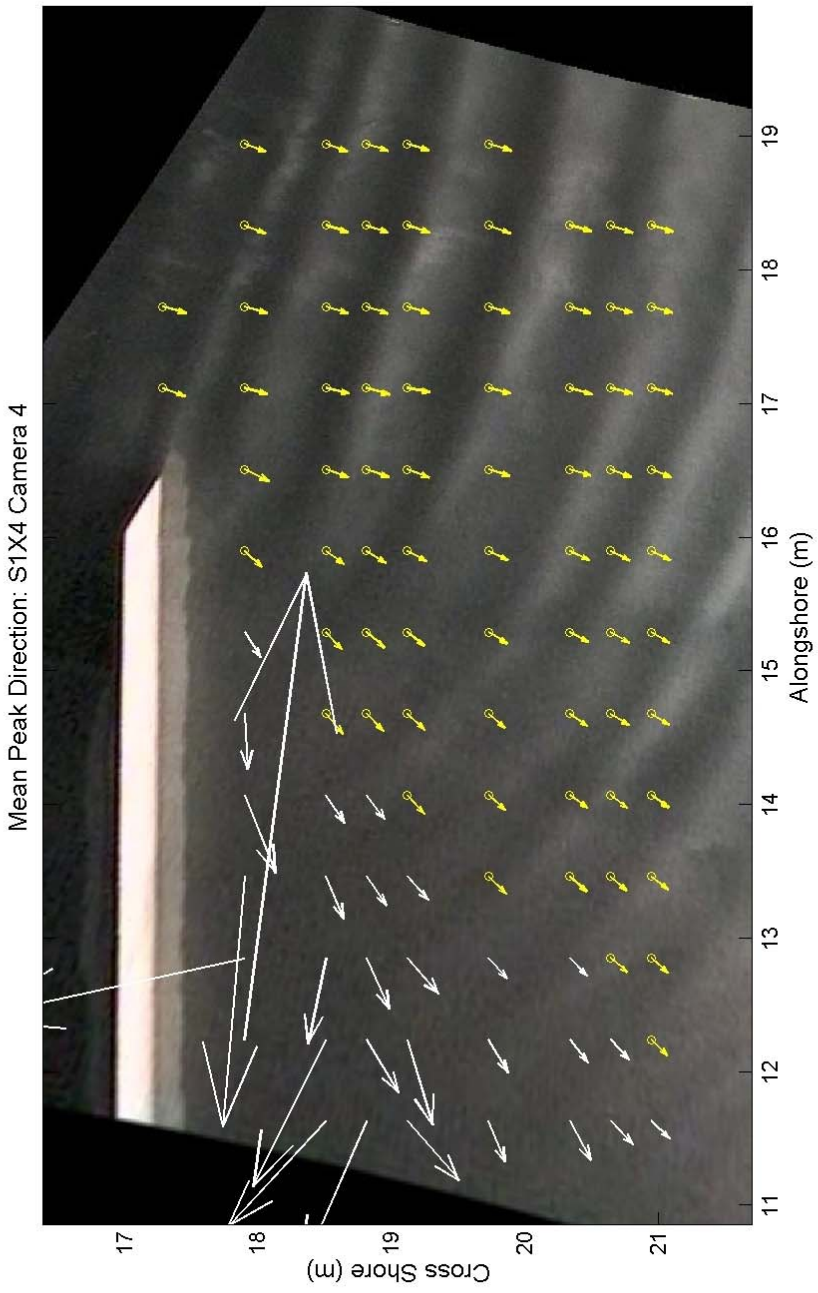

Structure 1 Video Output Locations: Camera 6
Cross Shore (m)
Alongshore (m)
19
20
21
22
23
13
14
15
16
17
18
19
1 2 3 4 5 6 7 8 9 10
11 12 13 14 15 16 17 18 19 20
21 22 23 24 25 26 27 28 29 30
31 32 33 34 35 36 37 38 39 40 41
42 43 44 45 46 47 48 49 50 51 52
53 54 55 56 57 58 59 60 61 62 63
64 65 66 67 68 69 70 71 72 73 74

Table Q1
Structure 1, Camera 4 CIIS Array Analysis Output Locations

Location Number	Y (m)	X (m)	Location Number	Y (m)	X (m)	Location Number	Y (m)	X (m)
1	17.557	16.829	36	16.338	18.353	71	13.9	19.877
2	18.167	16.829	37	16.948	18.353	72	14.509	19.877
3	12.681	17.439	38	17.557	18.353	73	15.119	19.877
4	13.29	17.439	39	18.167	18.353	74	15.728	19.877
5	13.9	17.439	40	18.776	18.353	75	16.338	19.877
6	14.509	17.439	41	19.386	18.353	76	16.948	19.877
7	15.119	17.439	42	12.071	18.658	77	17.557	19.877
8	15.728	17.439	43	12.681	18.658	78	18.167	19.877
9	16.338	17.439	44	13.29	18.658	79	18.776	19.877
10	16.948	17.439	45	13.9	18.658	80	12.071	20.182
11	17.557	17.439	46	14.509	18.658	81	12.681	20.182
12	18.167	17.439	47	15.119	18.658	82	13.29	20.182
13	18.776	17.439	48	15.728	18.658	83	13.9	20.182
14	19.386	17.439	49	16.338	18.658	84	14.509	20.182
15	19.386	17.439	50	16.948	18.658	85	15.119	20.182
16	12.071	18.048	51	17.557	18.658	86	15.728	20.182
17	12.681	18.048	52	18.167	18.658	87	16.338	20.182
18	13.29	18.048	53	18.776	18.658	88	16.948	20.182
19	13.9	18.048	54	19.386	18.658	89	17.557	20.182
20	14.509	18.048	55	12.071	19.267	90	18.167	20.182
21	15.119	18.048	56	12.681	19.267	91	18.776	20.182
22	15.728	18.048	57	13.29	19.267	92	12.071	20.486
23	16.338	18.048	58	13.9	19.267	93	12.681	20.486
24	16.948	18.048	59	14.509	19.267	94	13.29	20.486
25	17.557	18.048	60	15.119	19.267	95	13.9	20.486
26	18.167	18.048	61	15.728	19.267	96	14.509	20.486
27	18.776	18.048	62	16.338	19.267	97	15.119	20.486
28	19.386	18.048	63	16.948	19.267	98	15.728	20.486
29	12.071	18.353	64	17.557	19.267	99	16.338	20.486
30	12.681	18.353	65	18.167	19.267	100	16.948	20.486
31	13.29	18.353	66	18.776	19.267	101	17.557	20.486
32	13.9	18.353	67	19.386	19.267	102	18.167	20.486
33	14.509	18.353	68	12.071	19.877	103	18.776	20.486
34	15.119	18.353	69	12.681	19.877			
35	15.728	18.353	70	13.29	19.877			

Table Q2
Structure 1, Camera 6 CIIS Array Analysis Output Locations

Location Number	Y (m)	X (m)	Location Number	Y (m)	X (m)	Location Number	Y (m)	X (m)
1	13.271	19.854	26	16.315	20.483	51	18.746	21.717
2	13.881	19.858	27	16.925	20.487	52	19.355	21.721
3	14.49	19.862	28	17.534	20.49	53	13.256	22.292
4	15.1	19.865	29	18.144	20.494	54	13.865	22.296
5	15.709	19.869	30	18.753	20.498	55	14.475	22.3
6	16.319	19.873	31	13.263	21.073	56	15.084	22.304
7	16.928	19.877	32	13.873	21.077	57	15.694	22.308
8	17.538	19.881	33	14.482	21.081	58	16.303	22.311
9	18.147	19.885	34	15.092	21.085	59	16.913	22.315
10	18.757	19.889	35	15.702	21.088	60	17.523	22.319
11	13.269	20.159	36	16.311	21.092	61	18.132	22.323
12	13.879	20.163	37	16.921	21.096	62	18.742	22.327
13	14.488	20.166	38	17.53	21.1	63	19.351	22.331
14	15.098	20.17	39	18.14	21.104	64	13.252	22.902
15	15.707	20.174	40	18.749	21.108	65	13.861	22.906
16	16.317	20.178	41	19.359	21.111	66	14.471	22.909
17	16.926	20.182	42	13.259	21.683	67	15.08	22.913
18	17.536	20.186	43	13.869	21.686	68	15.69	22.917
19	18.146	20.189	44	14.479	21.69	69	16.3	22.921
20	18.755	20.193	45	15.088	21.694	70	16.909	22.925
21	13.267	20.464	46	15.698	21.698	71	17.519	22.929
22	13.877	20.467	47	16.307	21.702	72	18.128	22.932
23	14.486	20.471	48	16.917	21.706	73	18.738	22.936
24	15.096	20.475	49	17.526	21.71	74	19.347	22.94
25	15.705	20.479	50	18.136	21.713			


Mean Peak Direction: S1X4 Camera 4
Cross Shore (m)
17
18
19
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Alongshore (m)
11
12
13
14
15
16
17
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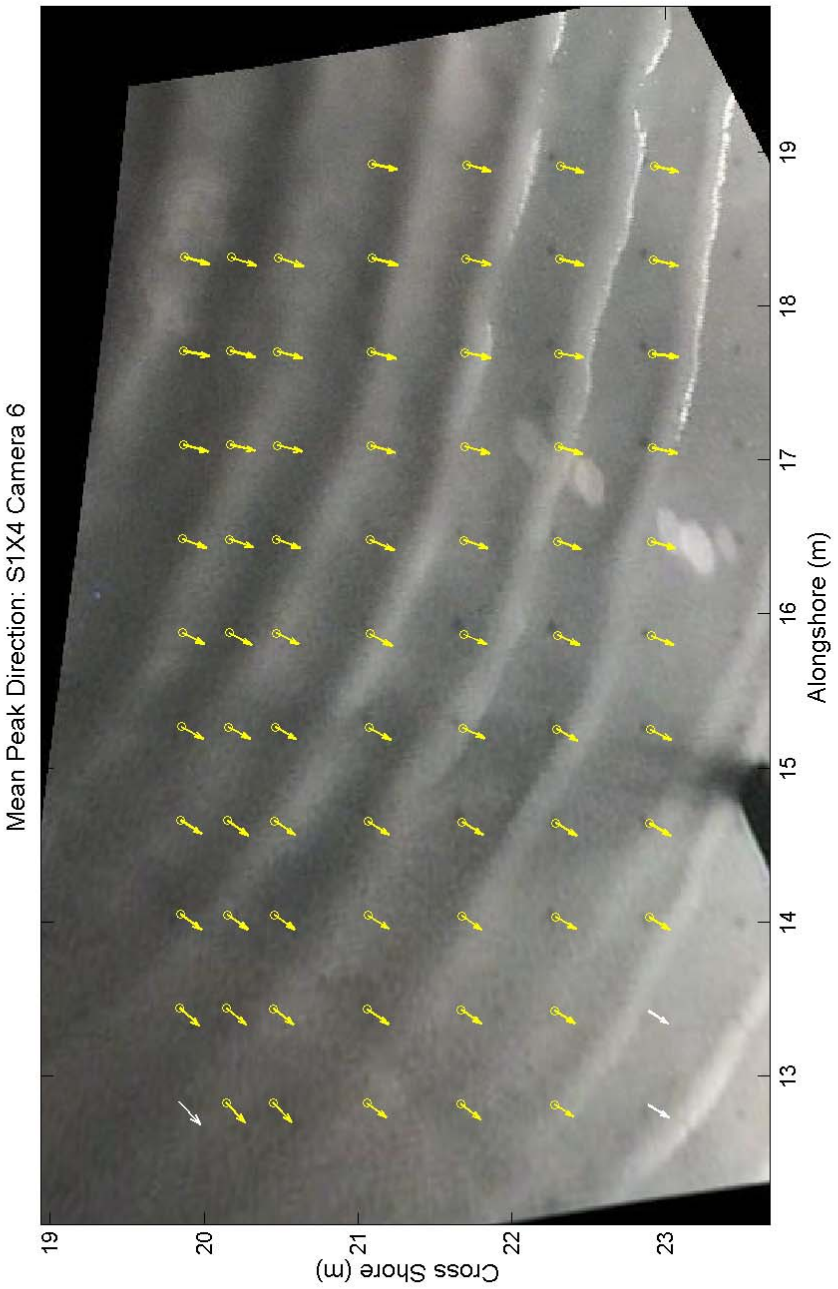
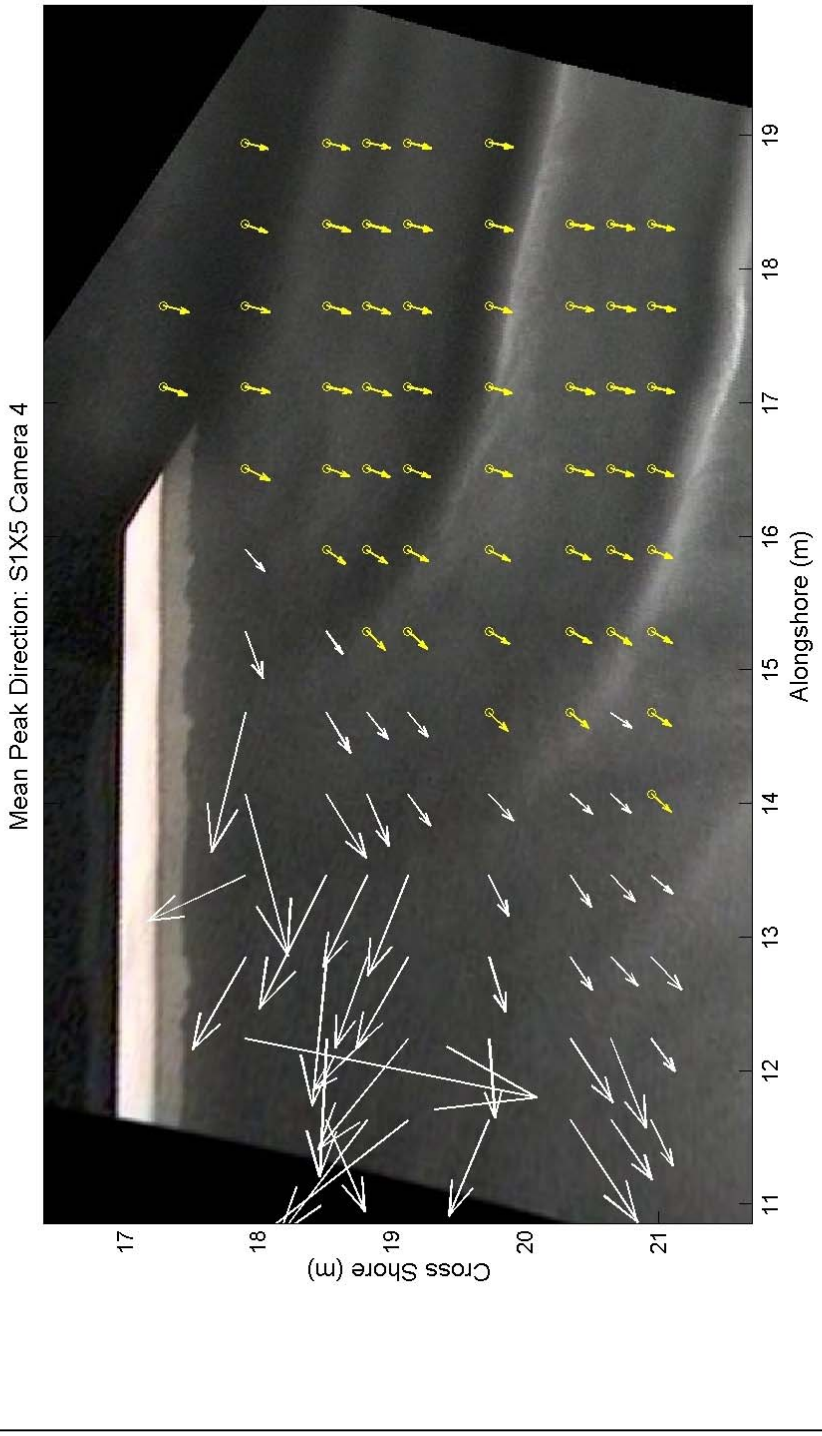
19


Mean Peak Direction: S1X4 Camera 6
Cross Shore (m)
19
20
21
22
23
Alongshore (m)
13
14
15
16
17
18
19


Mean Peak Direction: S1X5 Camera 4
Cross Shore (m)
17
18
19
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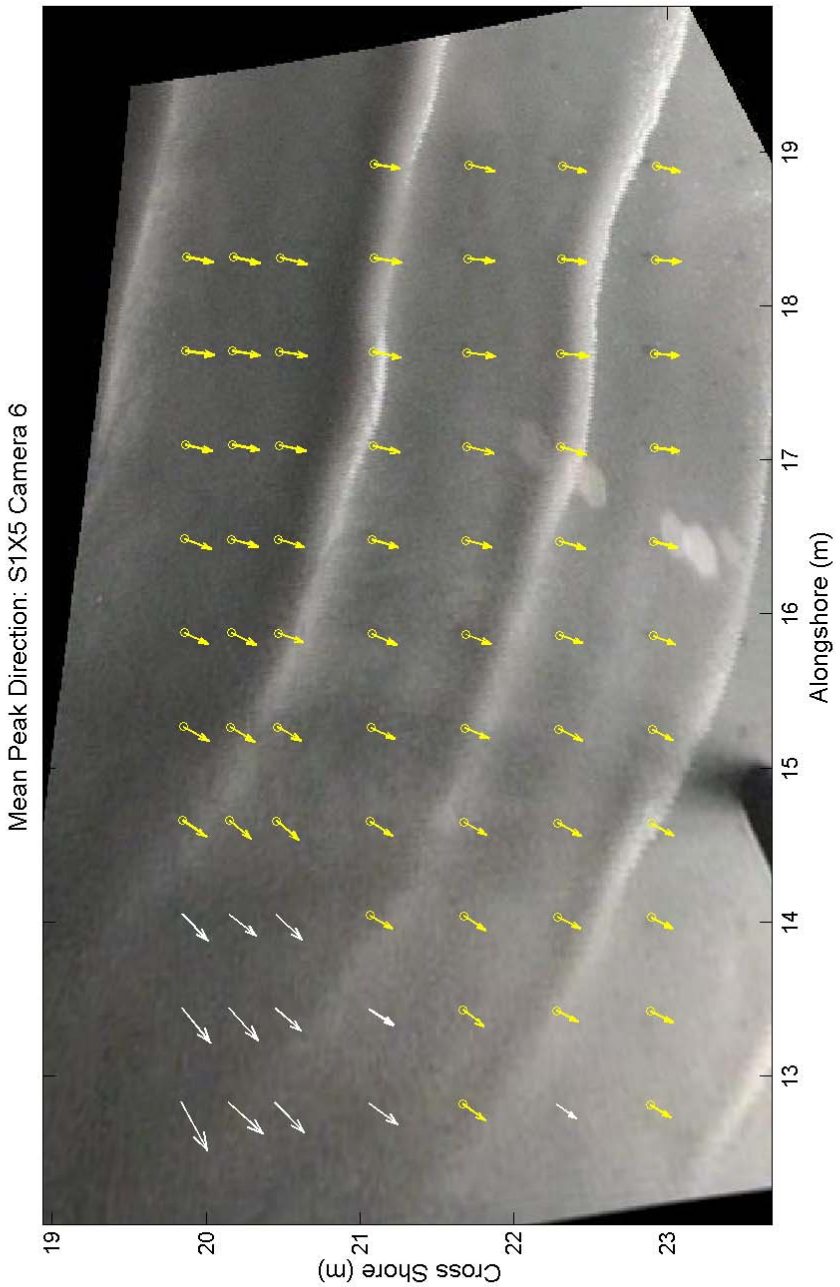
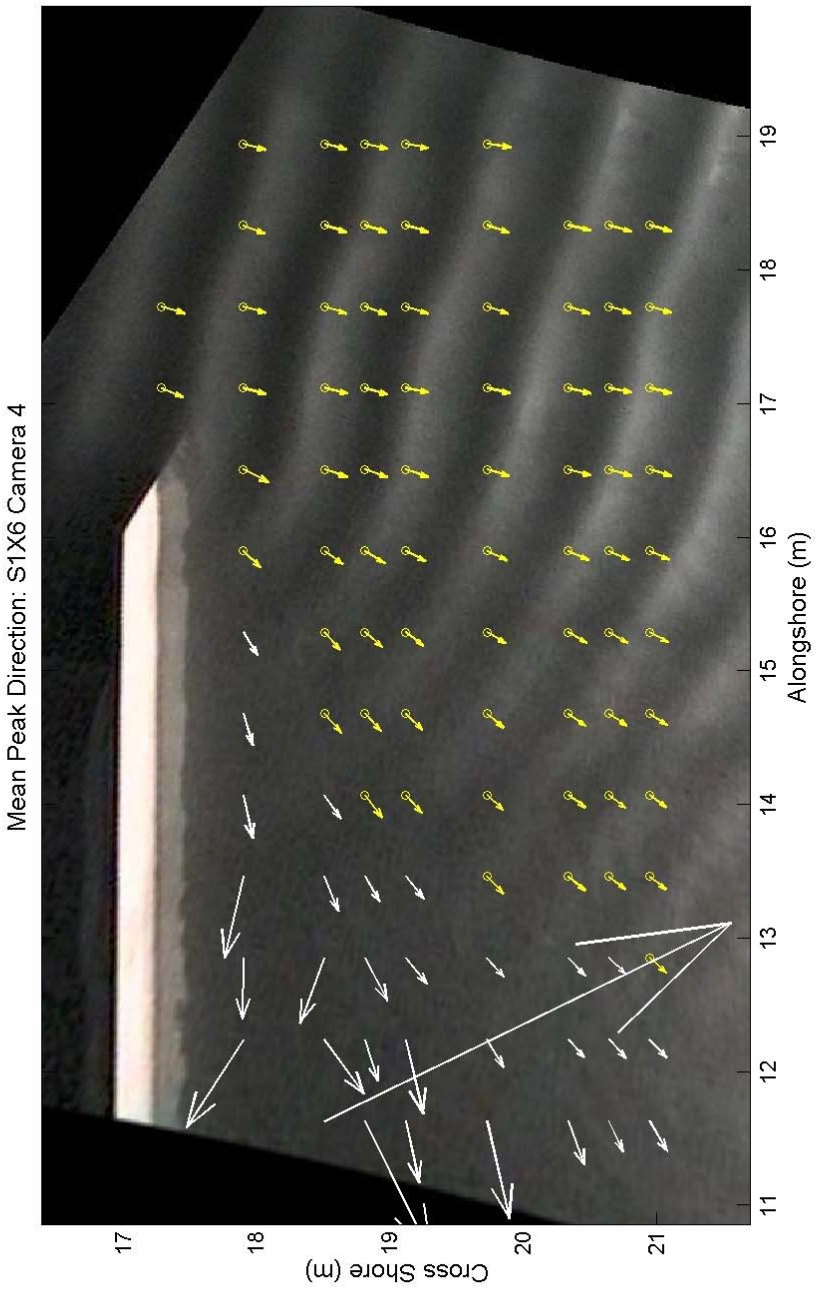
21
Alongshore (m)
11
12
13
14
15
16
17
18
19


Mean Peak Direction: S1X5 Camera 6
Cross Shore (m)
19
20
21
22
23
Alongshore (m)
13
14
15
16
17
18
19


Mean Peak Direction: S1X6 Camera 4
Cross Shore (m)
17
18
19
20
21
Alongshore (m)
11
12
13
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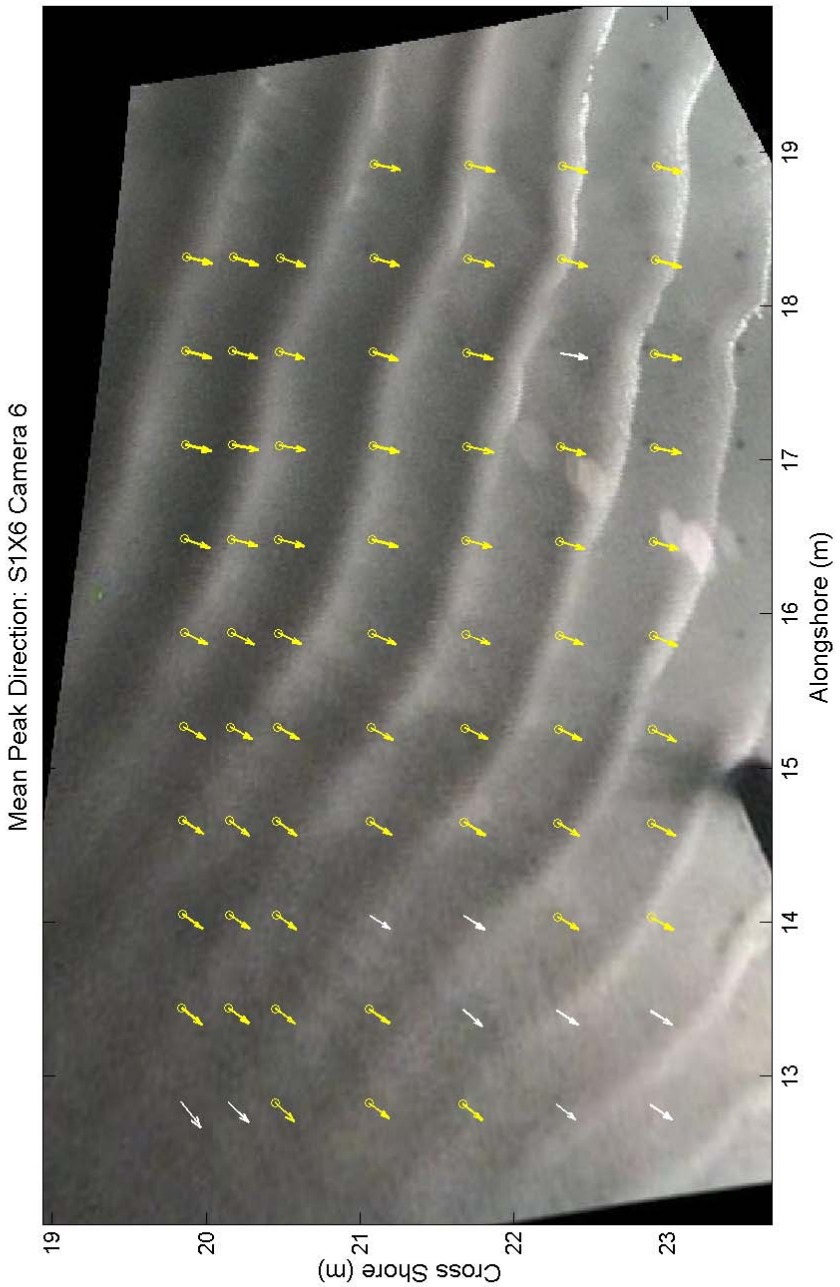
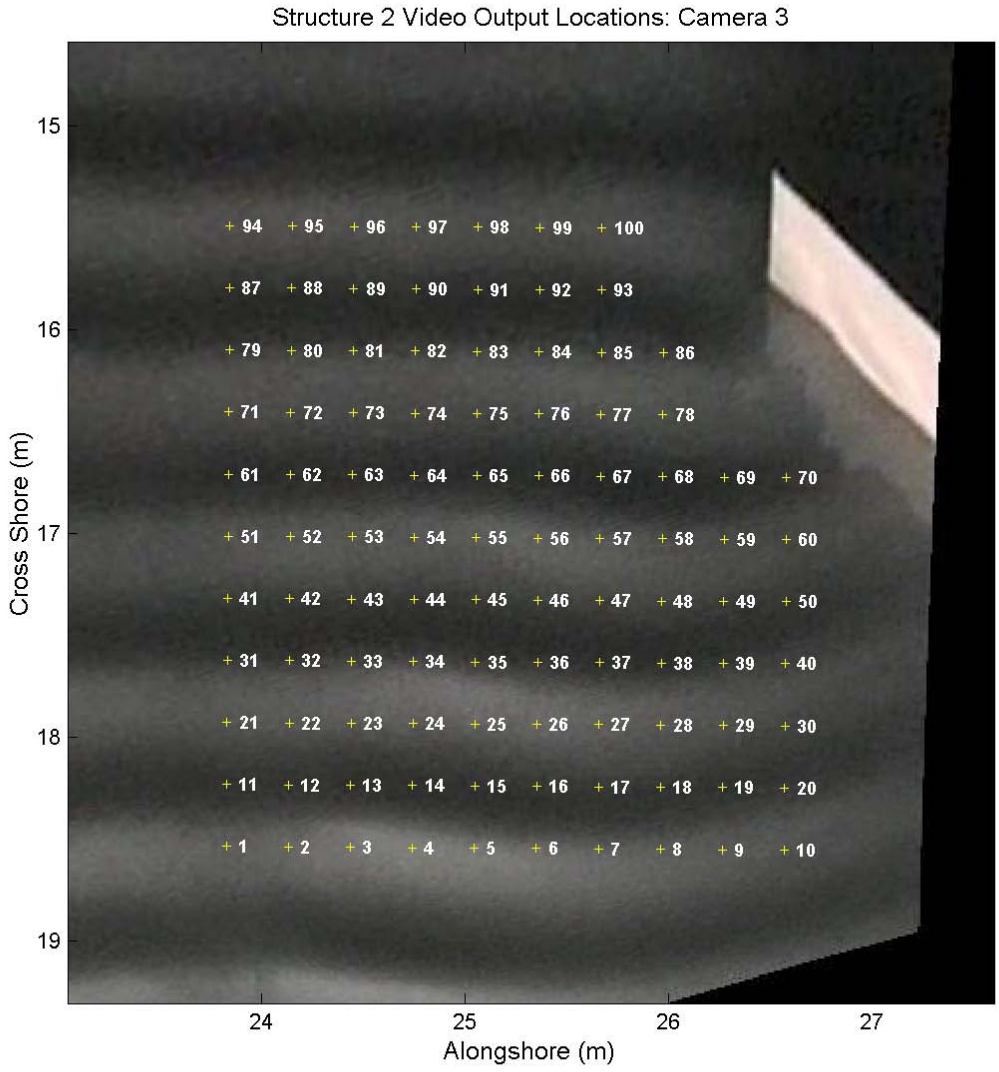
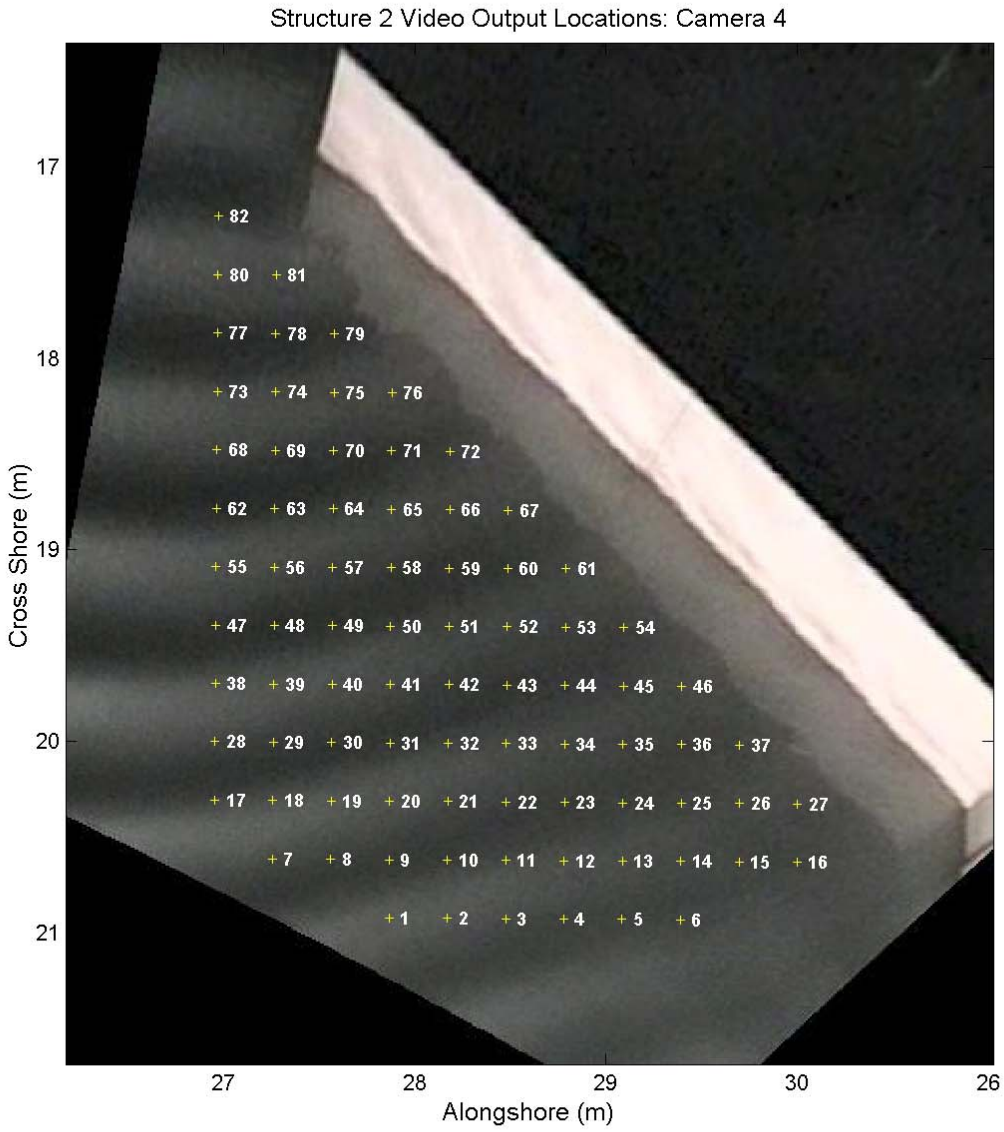
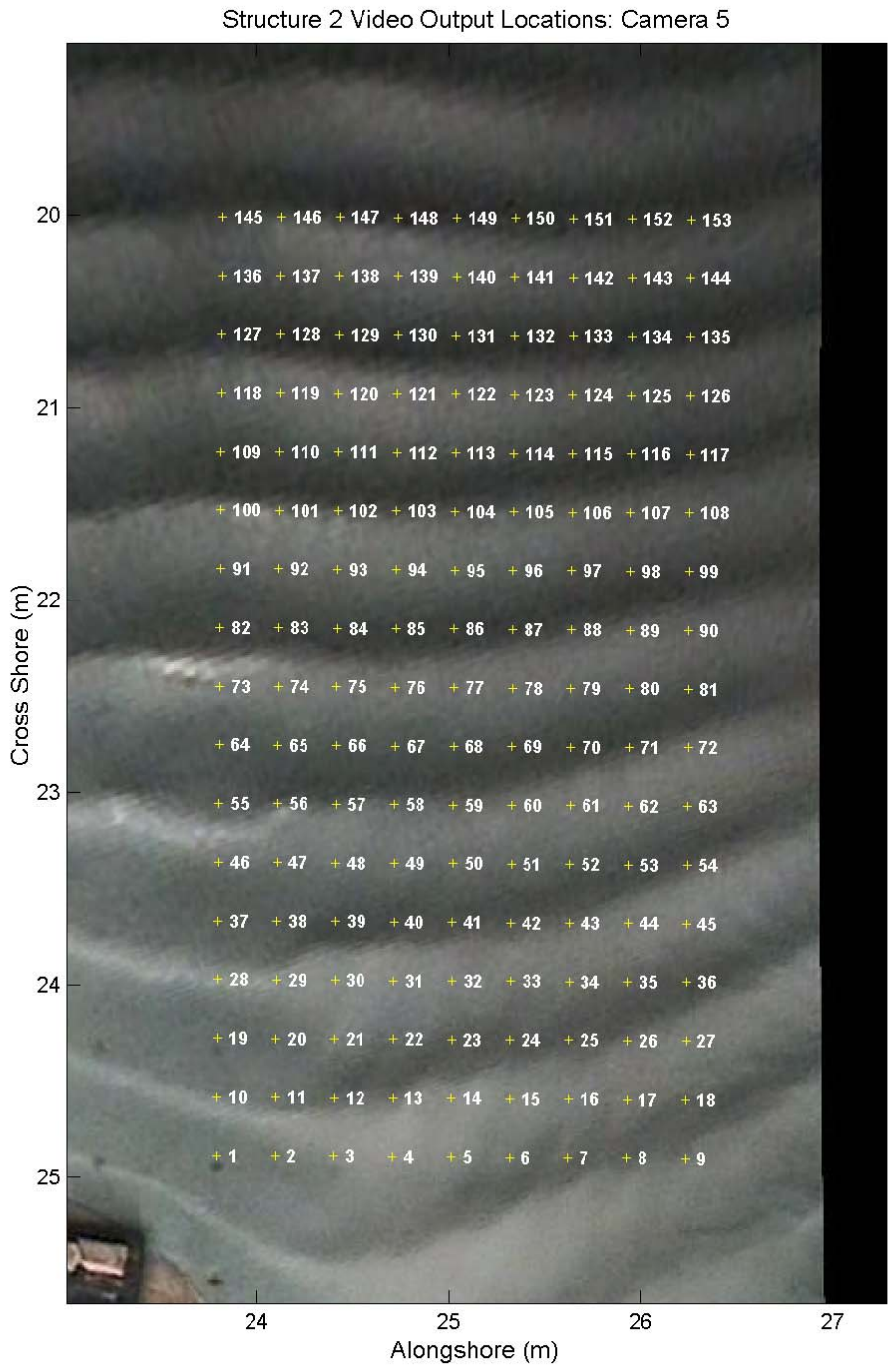
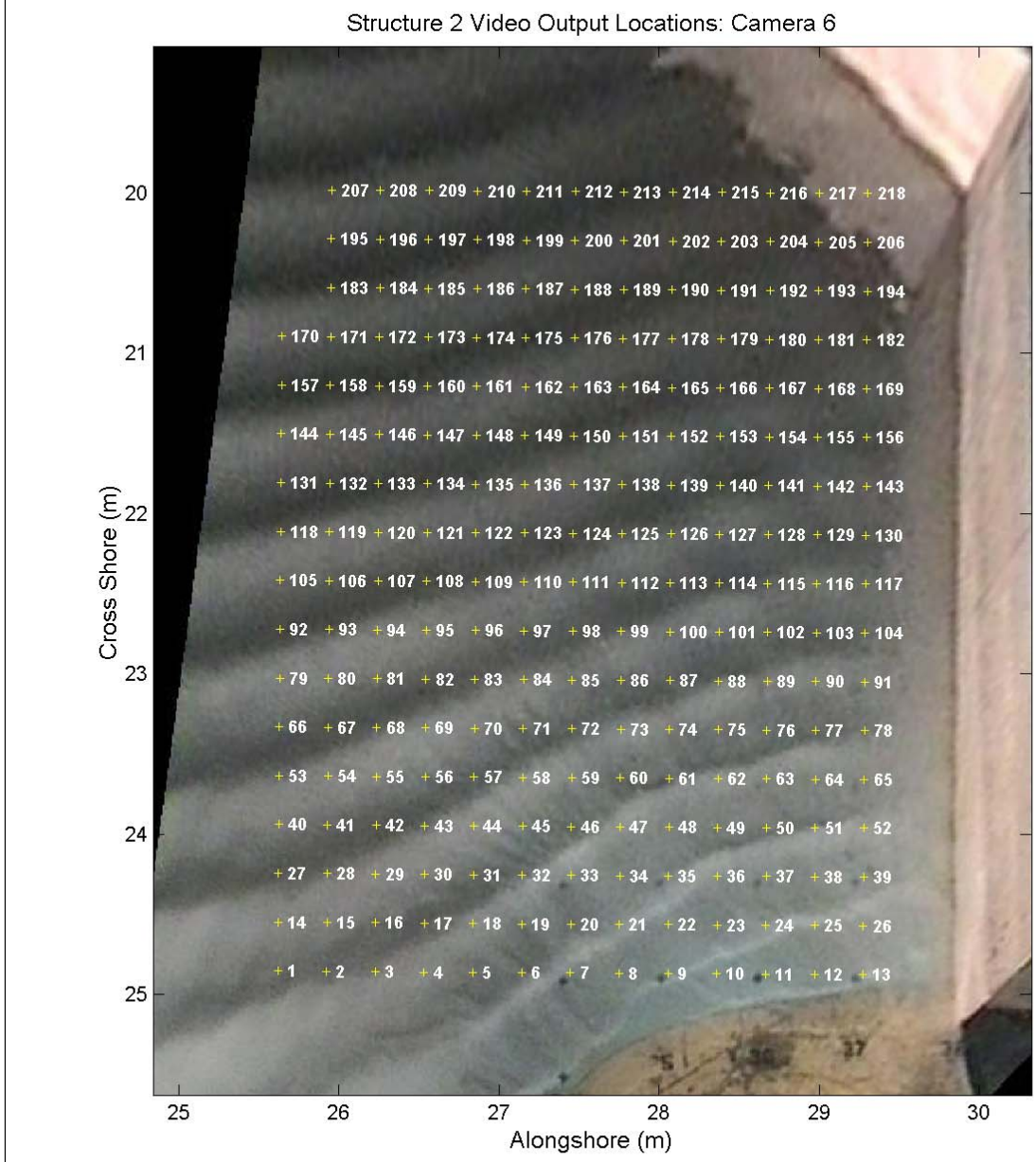

Mean Peak Direction: S1X6 Camera 6
Cross Shore (m)
19
20
21
22
23
Alongshore (m)
13
14
15
16
17
18
19


Structure 2 Video Output Locations: Camera 3
Cross Shore (m)
Alongshore (m)
15
16
17
18
19
24
25
26
27
+ 94 + 95 + 96 + 97 + 98 + 99 + 100
+ 87 + 88 + 89 + 90 + 91 + 92 + 93
+ 79 + 80 + 81 + 82 + 83 + 84 + 85 + 86
+ 71 + 72 + 73 + 74 + 75 + 76 + 77 + 78
+ 61 + 62 + 63 + 64 + 65 + 66 + 67 + 68 + 69 + 70
+ 51 + 52 + 53 + 54 + 55 + 56 + 57 + 58 + 59 + 60
+ 41 + 42 + 43 + 44 + 45 + 46 + 47 + 48 + 49 + 50
+ 31 + 32 + 33 + 34 + 35 + 36 + 37 + 38 + 39 + 40
+ 21 + 22 + 23 + 24 + 25 + 26 + 27 + 28 + 29 + 30
+ 11 + 12 + 13 + 14 + 15 + 16 + 17 + 18 + 19 + 20
+ 1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + 9 + 10


Structure 2 Video Output Locations: Camera 4
Cross Shore (m)
Alongshore (m)
17
18
19
20
21
27
28
29
30
26
82
80 81
77 78 79
73 74 75 76
68 69 70 71 72
62 63 64 65 66 67
55 56 57 58 59 60 61
47 48 49 50 51 52 53 54
38 39 40 41 42 43 44 45 46
28 29 30 31 32 33 34 35 36 37
17 18 19 20 21 22 23 24 25 26 27
7 8 9 10 11 12 13 14 15 16
1 2 3 4 5 6


Structure 2 Video Output Locations: Camera 5
+ 145 + 146 + 147 + 148 + 149 + 150 + 151 + 152 + 153
+ 136 + 137 + 138 + 139 + 140 + 141 + 142 + 143 + 144
+ 127 + 128 + 129 + 130 + 131 + 132 + 133 + 134 + 135
+ 118 + 119 + 120 + 121 + 122 + 123 + 124 + 125 + 126
+ 109 + 110 + 111 + 112 + 113 + 114 + 115 + 116 + 117
+ 100 + 101 + 102 + 103 + 104 + 105 + 106 + 107 + 108
+ 91 + 92 + 93 + 94 + 95 + 96 + 97 + 98 + 99
+ 82 + 83 + 84 + 85 + 86 + 87 + 88 + 89 + 90
+ 73 + 74 + 75 + 76 + 77 + 78 + 79 + 80 + 81
+ 64 + 65 + 66 + 67 + 68 + 69 + 70 + 71 + 72
+ 55 + 56 + 57 + 58 + 59 + 60 + 61 + 62 + 63
+ 46 + 47 + 48 + 49 + 50 + 51 + 52 + 53 + 54
+ 37 + 38 + 39 + 40 + 41 + 42 + 43 + 44 + 45
+ 28 + 29 + 30 + 31 + 32 + 33 + 34 + 35 + 36
+ 19 + 20 + 21 + 22 + 23 + 24 + 25 + 26 + 27
+ 10 + 11 + 12 + 13 + 14 + 15 + 16 + 17 + 18
+ 1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + 9
20
21
22
23
24
25
Cross Shore (m)
24
25
26
27
Alongshore (m)


Structure 2 Video Output Locations: Camera 6
+207 +208 +209 +210 +211 +212 +213 +214 +215 +216 +217 +218
+195 +196 +197 +198 +199 +200 +201 +202 +203 +204 +205 +206
+183 +184 +185 +186 +187 +188 +189 +190 +191 +192 +193 +194
+170 +171 +172 +173 +174 +175 +176 +177 +178 +179 +180 +181 +182
+157 +158 +159 +160 +161 +162 +163 +164 +165 +166 +167 +168 +169
+144 +145 +146 +147 +148 +149 +150 +151 +152 +153 +154 +155 +156
+131 +132 +133 +134 +135 +136 +137 +138 +139 +140 +141 +142 +143
+118 +119 +120 +121 +122 +123 +124 +125 +126 +127 +128 +129 +130
+105 +106 +107 +108 +109 +110 +111 +112 +113 +114 +115 +116 +117
+92 +93 +94 +95 +96 +97 +98 +99 +100 +101 +102 +103 +104
+79 +80 +81 +82 +83 +84 +85 +86 +87 +88 +89 +90 +91
+66 +67 +68 +69 +70 +71 +72 +73 +74 +75 +76 +77 +78
+53 +54 +55 +56 +57 +58 +59 +60 +61 +62 +63 +64 +65
+40 +41 +42 +43 +44 +45 +46 +47 +48 +49 +50 +51 +52
+27 +28 +29 +30 +31 +32 +33 +34 +35 +36 +37 +38 +39
+14 +15 +16 +17 +18 +19 +20 +21 +22 +23 +24 +25 +26
+1 +2 +3 +4 +5 +6 +7 +8 +9 +10 +11 +12 +13
20
21
22
23
24
25
Cross Shore (m)
25
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27
28
29
30
Alongshore (m)

Table Q3
Structure 2, Camera 3 CIIS Array Analysis Output Locations

Location Number	Y (m)	X (m)	Location Number	Y (m)	X (m)	Location Number	Y (m)	X (m)
1	24.265	19.275	35	25.49	18.369	69	26.715	17.462
2	24.57	19.277	36	25.795	18.37	70	27.019	17.464
3	24.875	19.279	37	26.099	18.372	71	24.278	17.142
4	25.179	19.281	38	26.404	18.374	72	24.583	17.144
5	25.484	19.283	39	26.709	18.376	73	24.888	17.146
6	25.789	19.285	40	27.014	18.378	74	25.193	17.148
7	26.094	19.287	41	24.273	18.056	75	25.498	17.149
8	26.398	19.289	42	24.577	18.058	76	25.802	17.151
9	26.703	19.291	43	24.882	18.06	77	26.107	17.153
10	27.008	19.293	44	25.187	18.062	78	26.412	17.155
11	24.267	18.97	45	25.492	18.064	79	24.28	16.837
12	24.572	18.972	46	25.797	18.066	80	24.585	16.839
13	24.876	18.974	47	26.101	18.068	81	24.89	16.841
14	25.181	18.976	48	26.406	18.07	82	25.195	16.843
15	25.486	18.978	49	26.711	18.071	83	25.499	16.845
16	25.791	18.98	50	27.016	18.073	84	25.804	16.847
17	26.096	18.982	51	24.275	17.751	85	26.109	16.849
18	26.4	18.984	52	24.579	17.753	86	26.414	16.85
19	26.705	18.986	53	24.884	17.755	87	24.282	16.532
20	27.01	18.988	54	25.189	17.757	88	24.587	16.534
21	24.269	18.666	55	25.494	17.759	89	24.892	16.536
22	24.574	18.668	56	25.798	17.761	90	25.197	16.538
23	24.878	18.67	57	26.103	17.763	91	25.501	16.54
24	25.183	18.671	58	26.408	17.765	92	25.806	16.542
25	25.488	18.673	59	26.713	17.767	93	26.111	16.544
26	25.793	18.675	60	27.018	17.769	94	24.284	16.227
27	26.097	18.677	61	24.276	17.447	95	24.589	16.229
28	26.402	18.679	62	24.581	17.448	96	24.894	16.231
29	26.707	18.681	63	24.886	17.45	97	25.199	16.233
30	27.012	18.683	64	25.191	17.452	98	25.503	16.235
31	24.271	18.361	65	25.496	17.454	99	25.808	16.237
32	24.576	18.363	66	25.8	17.456	100	26.113	16.239
33	24.88	18.365	67	26.105	17.458			
34	25.185	18.367	68	26.41	17.46			

Table Q4
Structure 2, Camera 4 CIIS Array Analysis Output Locations

Location Number	Y (m)	X (m)	Location Number	Y (m)	X (m)	Location Number	Y (m)	X (m)
1	27.305	20.514	29	26.701	19.595	57	27.012	18.683
2	27.61	20.515	30	27.006	19.597	58	27.317	18.685
3	27.915	20.517	31	27.311	19.599	59	27.621	18.687
4	28.219	20.519	32	27.616	19.601	60	27.926	18.689
5	28.524	20.521	33	27.92	19.603	61	28.231	18.691
6	28.829	20.523	34	28.225	19.605	62	26.404	18.374
7	26.697	20.205	35	28.53	19.607	63	26.709	18.376
8	27.002	20.207	36	28.835	19.609	64	27.014	18.378
9	27.307	20.209	37	29.14	19.611	65	27.319	18.38
10	27.612	20.211	38	26.398	19.289	66	27.623	18.382
11	27.917	20.213	39	26.703	19.291	67	27.928	18.384
12	28.221	20.215	40	27.008	19.293	68	26.406	18.07
13	28.526	20.216	41	27.313	19.294	69	26.711	18.071
14	28.831	20.218	42	27.618	19.296	70	27.016	18.073
15	29.136	20.22	43	27.922	19.298	71	27.32	18.075
16	29.44	20.222	44	28.227	19.3	72	27.625	18.077
17	26.395	19.898	45	28.532	19.302	73	26.408	17.765
18	26.699	19.9	46	28.837	19.304	74	26.713	17.767
19	27.004	19.902	47	26.4	18.984	75	27.018	17.769
20	27.309	19.904	48	26.705	18.986	76	27.322	17.771
21	27.614	19.906	49	27.01	18.988	77	26.41	17.46
22	27.918	19.908	50	27.315	18.99	78	26.715	17.462
23	28.223	19.91	51	27.619	18.992	79	27.019	17.464
24	28.528	19.912	52	27.924	18.993	80	26.412	17.155
25	28.833	19.914	53	28.229	18.995	81	26.717	17.157
26	29.138	19.916	54	28.534	18.997	82	26.414	16.85
27	29.442	19.917	55	26.402	18.679			
28	26.396	19.593	56	26.707	18.681			

Table Q5
Structure 2, Camera 5 CIIS Array Analysis Output Locations

Location Number	Y (m)	X (m)	Location Number	Y (m)	X (m)	Location Number	Y (m)	X (m)
1	24.23	24.761	44	26.372	23.556	87	25.772	22.028
2	24.535	24.763	45	26.676	23.557	88	26.076	22.03
3	24.84	24.765	46	24.24	23.237	89	26.381	22.032
4	25.145	24.767	47	24.545	23.239	90	26.686	22.034
5	25.45	24.769	48	24.85	23.241	91	24.25	21.713
6	25.754	24.771	49	25.154	23.243	92	24.554	21.715
7	26.059	24.773	50	25.459	23.245	93	24.859	21.717
8	26.364	24.775	51	25.764	23.247	94	25.164	21.719
9	26.669	24.777	52	26.069	23.249	95	25.469	21.721
10	24.232	24.456	53	26.373	23.251	96	25.773	21.723
11	24.537	24.458	54	26.678	23.253	97	26.078	21.725
12	24.842	24.46	55	24.242	22.933	98	26.383	21.727
13	25.147	24.462	56	24.547	22.934	99	26.688	21.729
14	25.451	24.464	57	24.851	22.936	100	24.252	21.409
15	25.756	24.466	58	25.156	22.938	101	24.556	21.411
16	26.061	24.468	59	25.461	22.94	102	24.861	21.413
17	26.366	24.47	60	25.766	22.942	103	25.166	21.414
18	26.671	24.472	61	26.071	22.944	104	25.471	21.416
19	24.234	24.152	62	26.375	22.946	105	25.775	21.418
20	24.539	24.154	63	26.68	22.948	106	26.08	21.42
21	24.844	24.156	64	24.244	22.628	107	26.385	21.422
22	25.149	24.157	65	24.549	22.63	108	26.69	21.424
23	25.453	24.159	66	24.853	22.632	109	24.253	21.104
24	25.758	24.161	67	25.158	22.634	110	24.558	21.106
25	26.063	24.163	68	25.463	22.635	111	24.863	21.108
26	26.368	24.165	69	25.768	22.637	112	25.168	21.11
27	26.672	24.167	70	26.073	22.639	113	25.473	21.112
28	24.236	23.847	71	26.377	22.641	114	25.777	21.114
29	24.541	23.849	72	26.682	22.643	115	26.082	21.115
30	24.846	23.851	73	24.246	22.323	116	26.387	21.117
31	25.15	23.853	74	24.551	22.325	117	26.692	21.119
32	25.455	23.855	75	24.855	22.327	118	24.255	20.799
33	25.76	23.857	76	25.16	22.329	119	24.56	20.801
34	26.065	23.858	77	25.465	22.331	120	24.865	20.803
35	26.37	23.86	78	25.77	22.333	121	25.17	20.805
36	26.674	23.862	79	26.074	22.335	122	25.474	20.807
37	24.238	23.542	80	26.379	22.336	123	25.779	20.809
38	24.543	23.544	81	26.684	22.338	124	26.084	20.811
39	24.848	23.546	82	24.248	22.018	125	26.389	20.813
40	25.152	23.548	83	24.552	22.02	126	26.694	20.814
41	25.457	23.55	84	24.857	22.022	127	24.257	20.494
42	25.762	23.552	85	25.162	22.024	128	24.562	20.496
43	26.067	23.554	86	25.467	22.026	129	24.867	20.498

(Continued)

Table Q5 (Concluded) Structure 2, Camera 5 CIIS Array Analysis Output Locations		
Location Number	**Y (m)**	**X (m)**
130	25.172	20.5
131	25.476	20.502
132	25.781	20.504
133	26.086	20.506
134	26.391	20.508
135	26.696	20.51
136	24.259	20.19
137	24.564	20.191
138	24.869	20.193
139	25.174	20.195
140	25.478	20.197
141	25.783	20.199
142	26.088	20.201
143	26.393	20.203
144	26.697	20.205
145	24.261	19.885
146	24.566	19.887
147	24.871	19.889
148	25.175	19.891
149	25.48	19.892
150	25.785	19.894
151	26.09	19.896
152	26.395	19.898
153	26.699	19.9

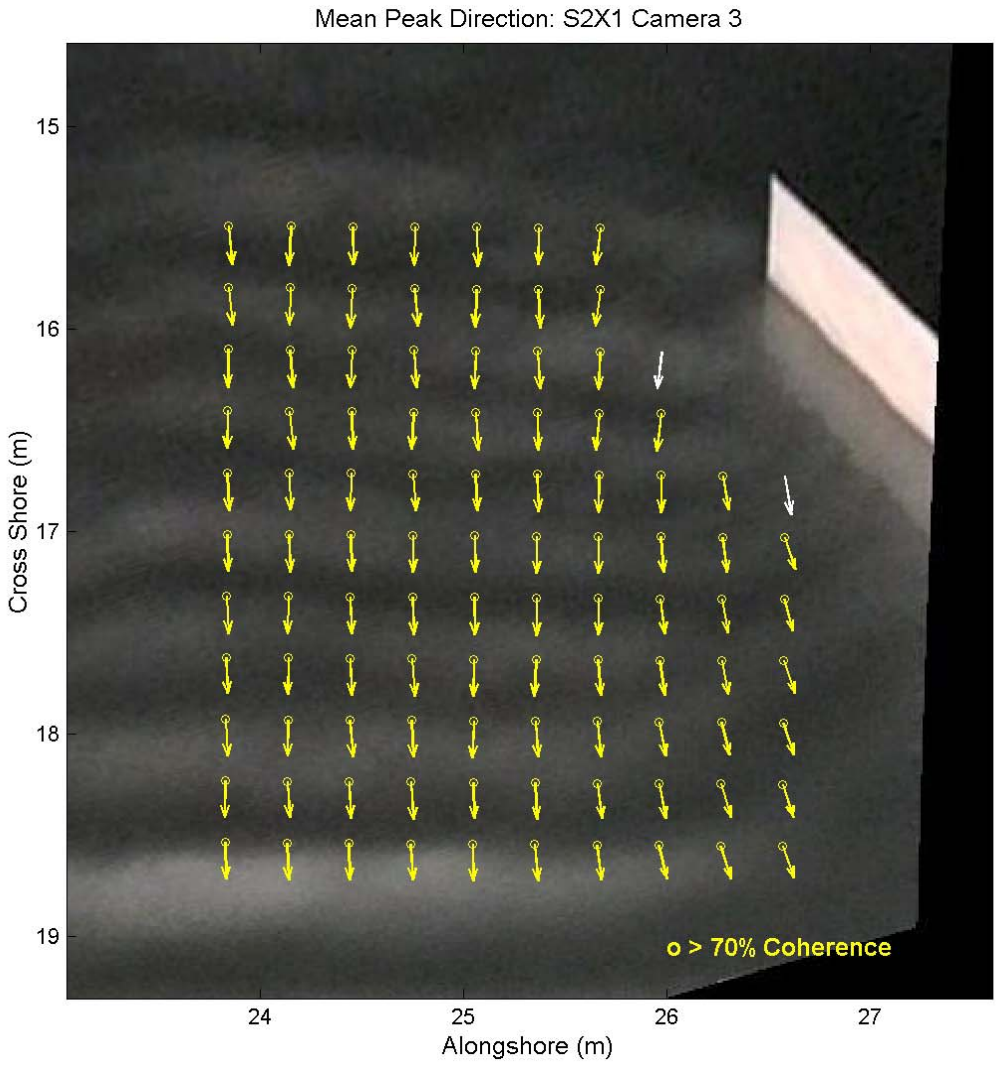
Table Q6
Structure 2, Camera 6 CIIS Array Analysis Output Locations

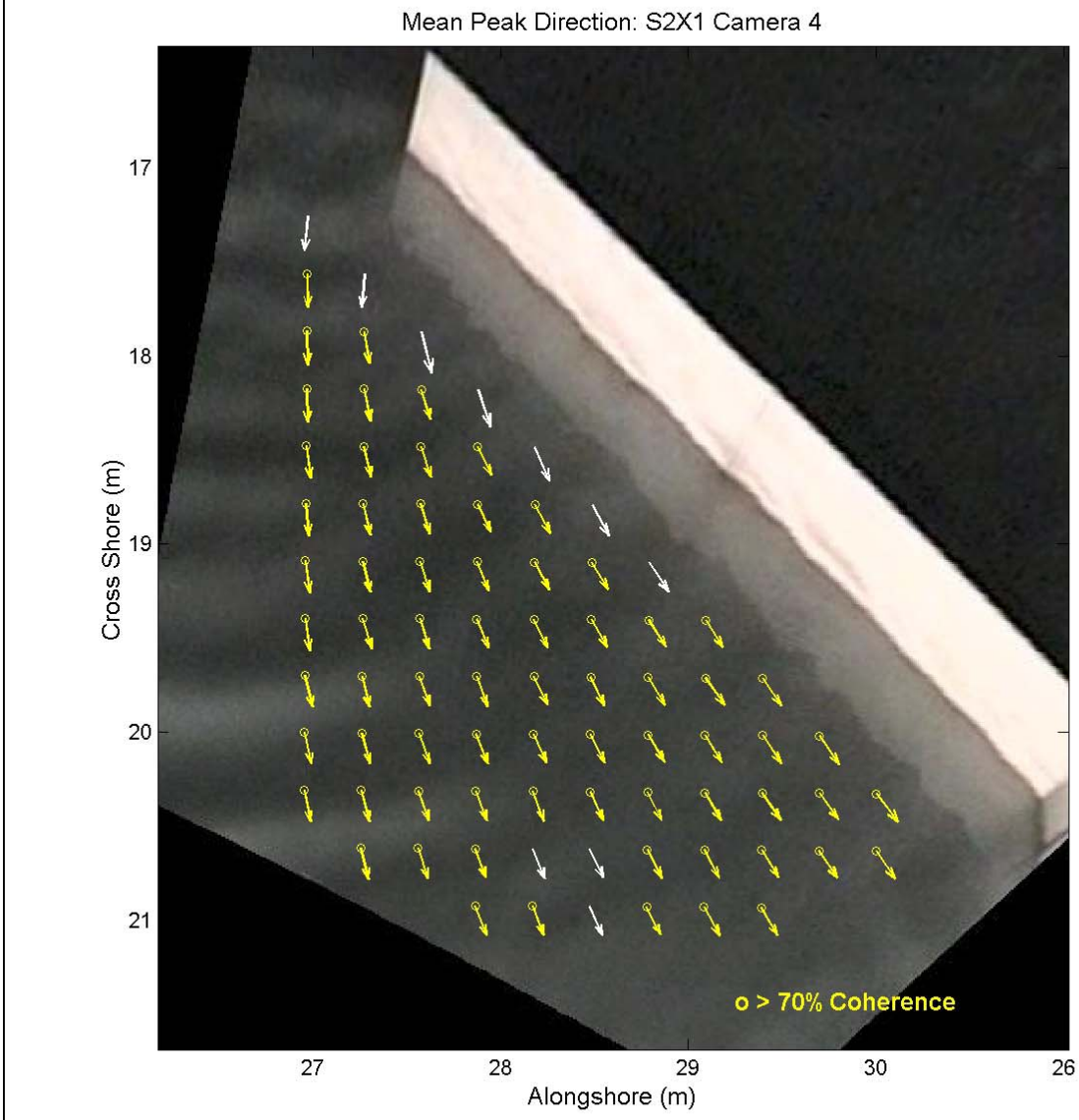
Location Number	Y (m)	X (m)	Location Number	Y (m)	X (m)	Location Number	Y (m)	X (m)
1	26.059	24.773	44	27.284	23.866	87	28.509	22.959
2	26.364	24.775	45	27.589	23.868	88	28.814	22.961
3	26.669	24.777	46	27.894	23.87	89	29.118	22.963
4	26.973	24.779	47	28.198	23.872	90	29.423	22.965
5	27.278	24.78	48	28.503	23.874	91	29.728	22.967
6	27.583	24.782	49	28.808	23.876	92	26.073	22.639
7	27.888	24.784	50	29.113	23.878	93	26.377	22.641
8	28.193	24.786	51	29.417	23.88	94	26.682	22.643
9	28.497	24.788	52	29.722	23.881	95	26.987	22.645
10	28.802	24.79	53	26.067	23.554	96	27.292	22.647
11	29.107	24.792	54	26.372	23.556	97	27.596	22.649
12	29.412	24.794	55	26.676	23.557	98	27.901	22.651
13	29.716	24.796	56	26.981	23.559	99	28.206	22.653
14	26.061	24.468	57	27.286	23.561	100	28.511	22.655
15	26.366	24.47	58	27.591	23.563	101	28.816	22.657
16	26.671	24.472	59	27.895	23.565	102	29.12	22.659
17	26.975	24.474	60	28.2	23.567	103	29.425	22.66
18	27.28	24.476	61	28.505	23.569	104	29.73	22.662
19	27.585	24.478	62	28.81	23.571	105	26.074	22.335
20	27.89	24.48	63	29.115	23.573	106	26.379	22.336
21	28.194	24.481	64	29.419	23.575	107	26.684	22.338
22	28.499	24.483	65	29.724	23.577	108	26.989	22.34
23	28.804	24.485	66	26.069	23.249	109	27.294	22.342
24	29.109	24.487	67	26.373	23.251	110	27.598	22.344
25	29.414	24.489	68	26.678	23.253	111	27.903	22.346
26	29.718	24.491	69	26.983	23.255	112	28.208	22.348
27	26.063	24.163	70	27.288	23.257	113	28.513	22.35
28	26.368	24.165	71	27.593	23.258	114	28.817	22.352
29	26.672	24.167	72	27.897	23.26	115	29.122	22.354
30	26.977	24.169	73	28.202	23.262	116	29.427	22.356
31	27.282	24.171	74	28.507	23.264	117	29.732	22.358
32	27.587	24.173	75	28.812	23.266	118	26.076	22.03
33	27.892	24.175	76	29.116	23.268	119	26.381	22.032
34	28.196	24.177	77	29.421	23.27	120	26.686	22.034
35	28.501	24.179	78	29.726	23.272	121	26.991	22.036
36	28.806	24.18	79	26.071	22.944	122	27.295	22.037
37	29.111	24.182	80	26.375	22.946	123	27.6	22.039
38	29.415	24.184	81	26.68	22.948	124	27.905	22.041
39	29.72	24.186	82	26.985	22.95	125	28.21	22.043
40	26.065	23.858	83	27.29	22.952	126	28.515	22.045
41	26.37	23.86	84	27.594	22.954	127	28.819	22.047
42	26.674	23.862	85	27.899	22.956	128	29.124	22.049
43	26.979	23.864	86	28.204	22.958	129	29.429	22.051

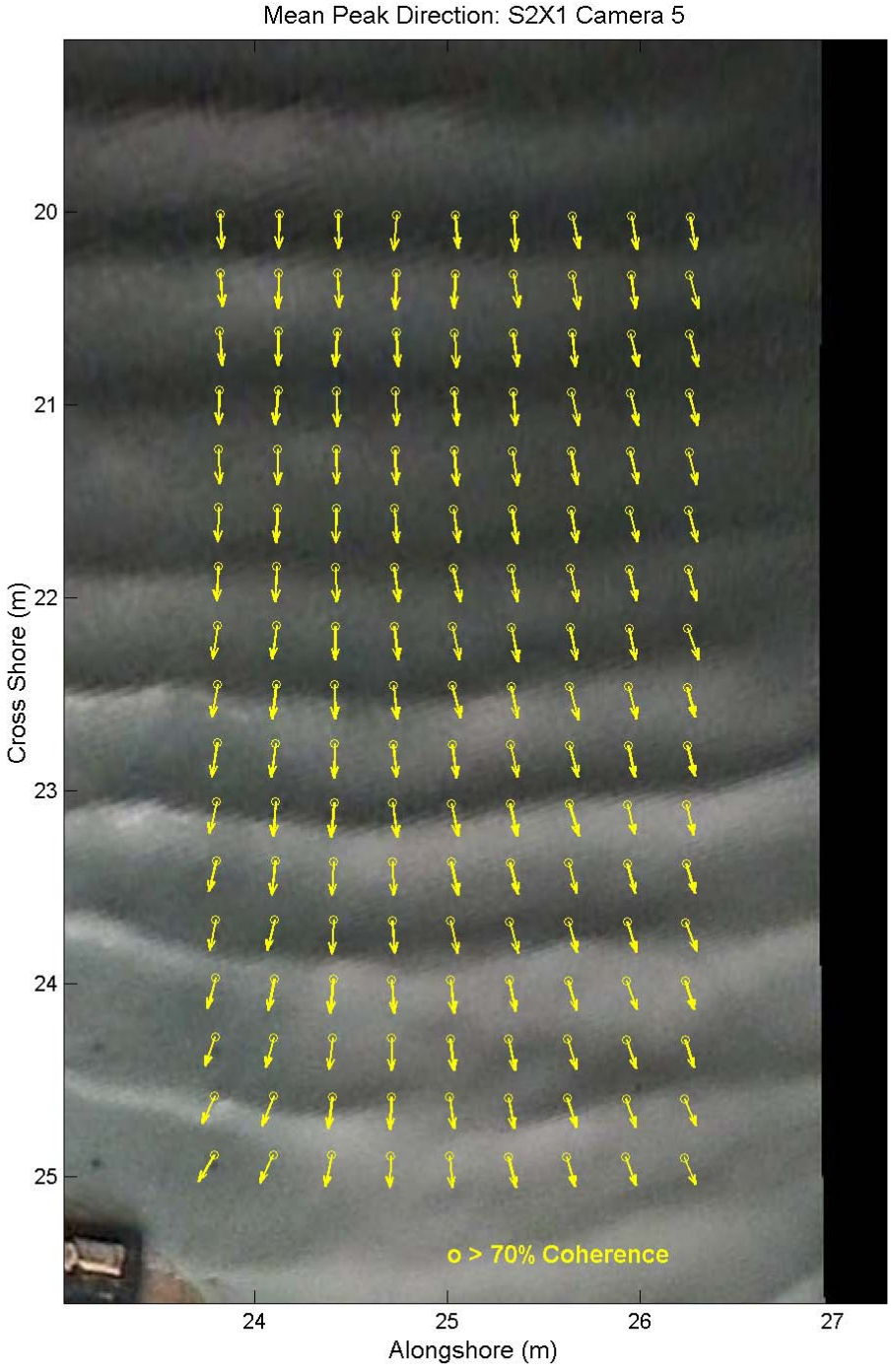
(Continued)

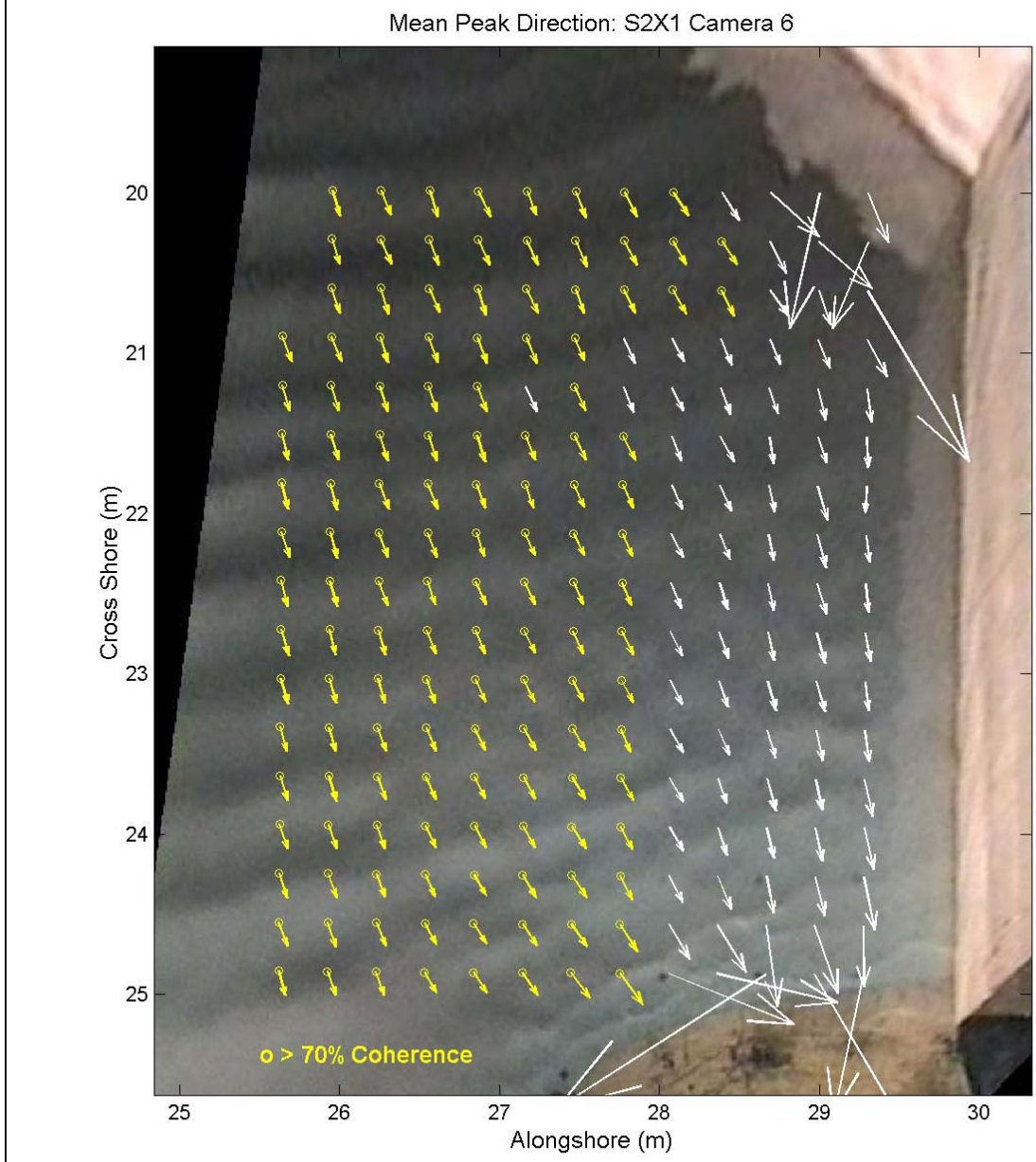
Table Q6 (Concluded)
Structure 2, Camera 6 CIIS Array Analysis Output Locations

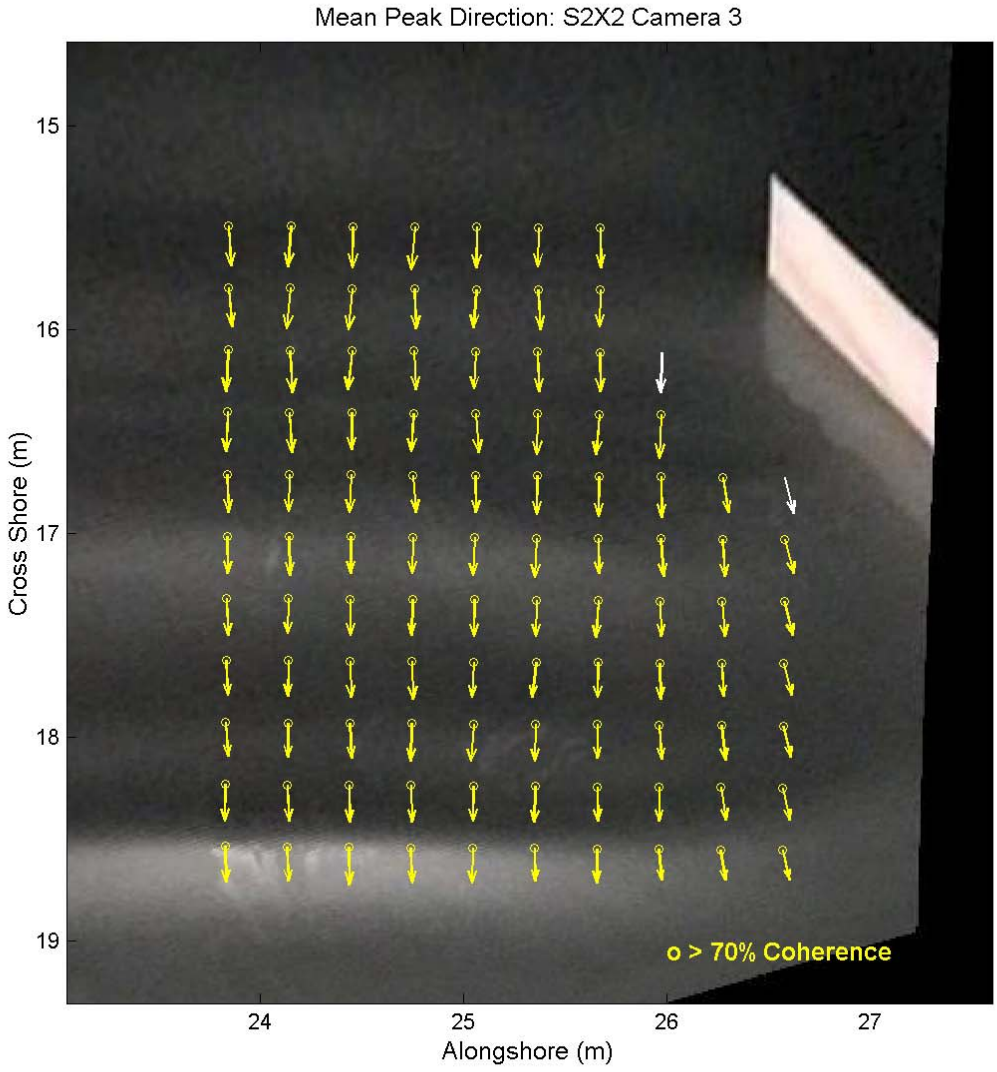
Location Number	Y (m)	X (m)	Location Number	Y (m)	X (m)	Location Number	Y (m)	X (m)
130	29.734	22.053	172	26.694	20.814	214	28.528	19.912
131	26.078	21.725	173	26.998	20.816	215	28.833	19.914
132	26.383	21.727	174	27.303	20.818	216	29.138	19.916
133	26.688	21.729	175	27.608	20.82	217	29.442	19.917
134	26.993	21.731	176	27.913	20.822	218	29.747	19.919
135	27.297	21.733	177	28.217	20.824			
136	27.602	21.735	178	28.522	20.826			
137	27.907	21.737	179	28.827	20.828			
138	28.212	21.738	180	29.132	20.83			
139	28.517	21.74	181	29.437	20.832			
140	28.821	21.742	182	29.741	20.834			
141	29.126	21.744	183	26.391	20.508			
142	29.431	21.746	184	26.696	20.51			
143	29.736	21.748	185	27	20.512			
144	26.08	21.42	186	27.305	20.514			
145	26.385	21.422	187	27.61	20.515			
146	26.69	21.424	188	27.915	20.517			
147	26.995	21.426	189	28.219	20.519			
148	27.299	21.428	190	28.524	20.521			
149	27.604	21.43	191	28.829	20.523			
150	27.909	21.432	192	29.134	20.525			
151	28.214	21.434	193	29.439	20.527			
152	28.518	21.436	194	29.743	20.529			
153	28.823	21.437	195	26.393	20.203			
154	29.128	21.439	196	26.697	20.205			
155	29.433	21.441	197	27.002	20.207			
156	29.738	21.443	198	27.307	20.209			
157	26.082	21.115	199	27.612	20.211			
158	26.387	21.117	200	27.917	20.213			
159	26.692	21.119	201	28.221	20.215			
160	26.996	21.121	202	28.526	20.216			
161	27.301	21.123	203	28.831	20.218			
162	27.606	21.125	204	29.136	20.22			
163	27.911	21.127	205	29.44	20.222			
164	28.216	21.129	206	29.745	20.224			
165	28.52	21.131	207	26.395	19.898			
166	28.825	21.133	208	26.699	19.9			
167	29.13	21.135	209	27.004	19.902			
168	29.435	21.137	210	27.309	19.904			
169	29.739	21.138	211	27.614	19.906			
170	26.084	20.811	212	27.918	19.908			
171	26.389	20.813	213	28.223	19.91			

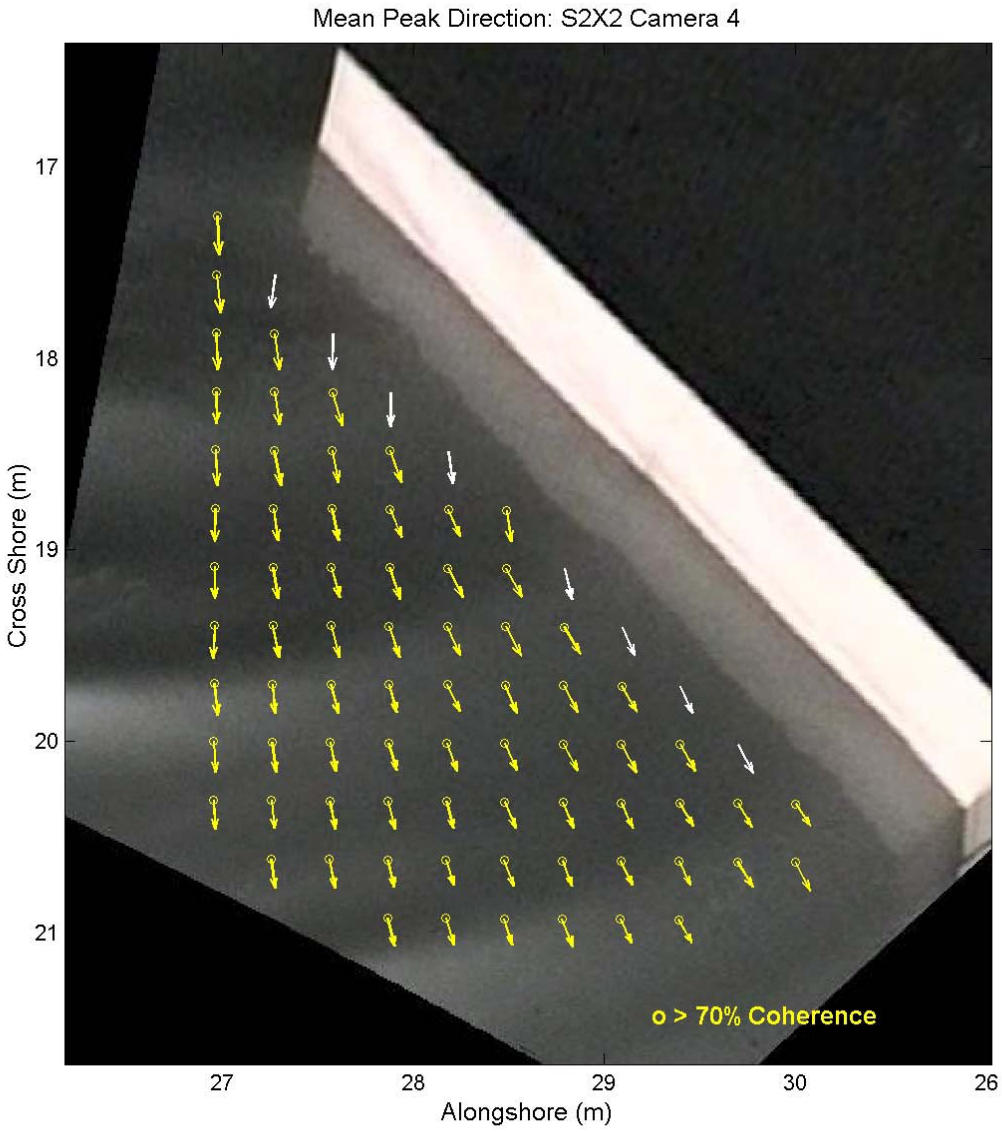

Mean Peak Direction: S2X1 Camera 3
Cross Shore (m)
15
16
17
18
19
24
25
26
27
Alongshore (m)
o > 70% Coherence

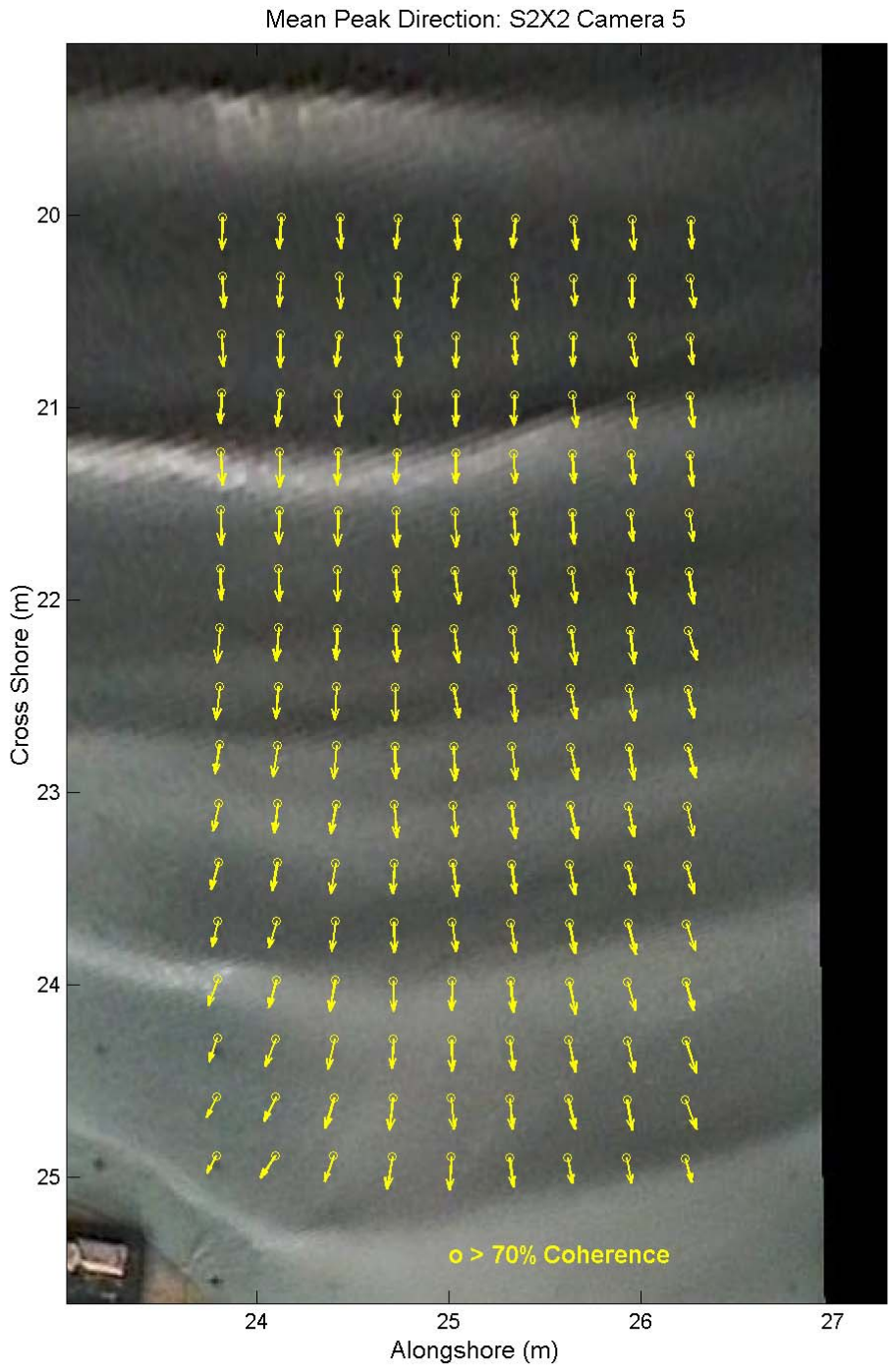

Mean Peak Direction: S2X1 Camera 4
Cross Shore (m)
17
18
19
20
21
27
28
29
30
26
Alongshore (m)
o > 70% Coherence

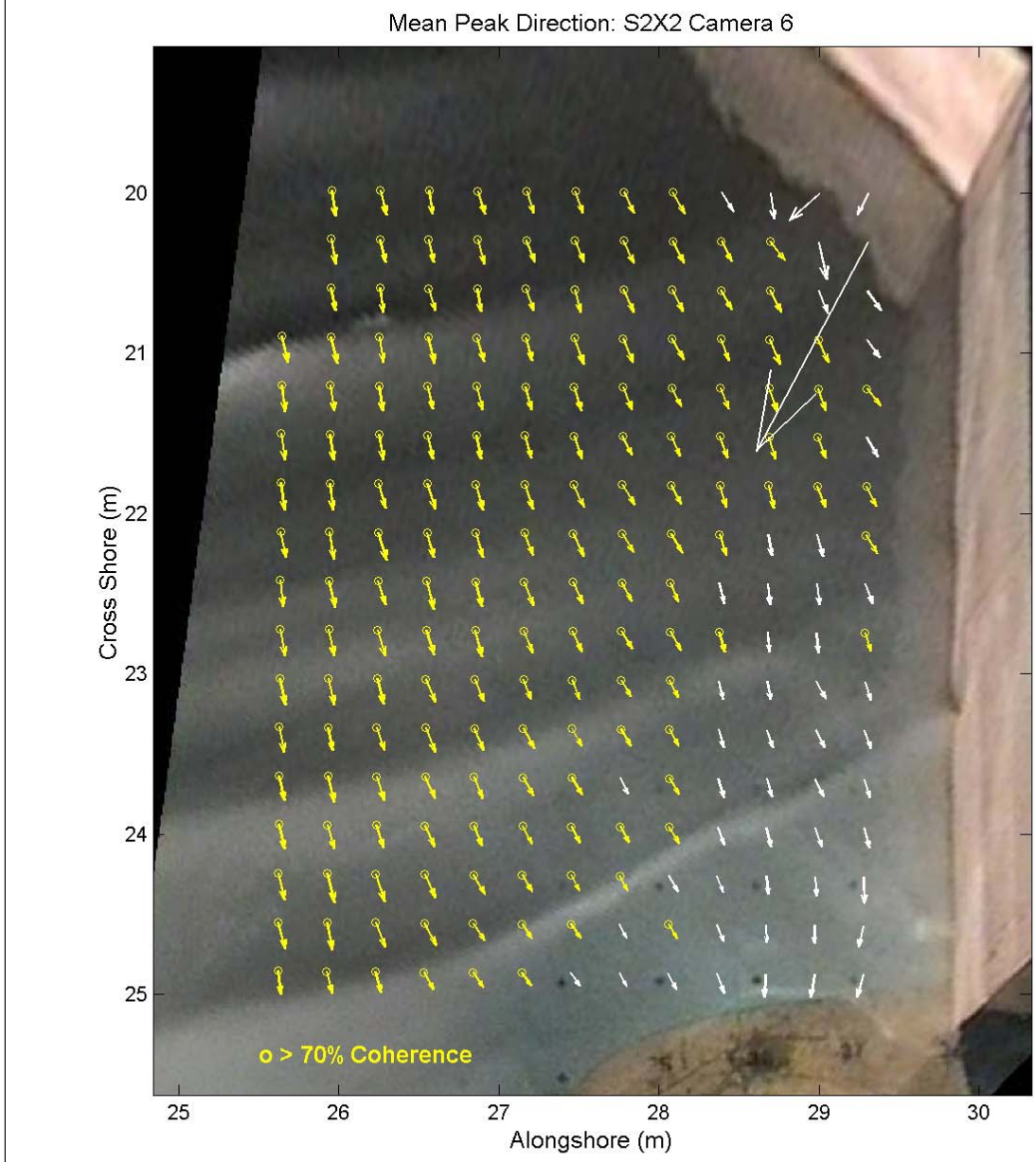

Mean Peak Direction: S2X1 Camera 5
Cross Shore (m)
20
21
22
23
24
25
o > 70% Coherence
24
25
26
27
Alongshore (m)

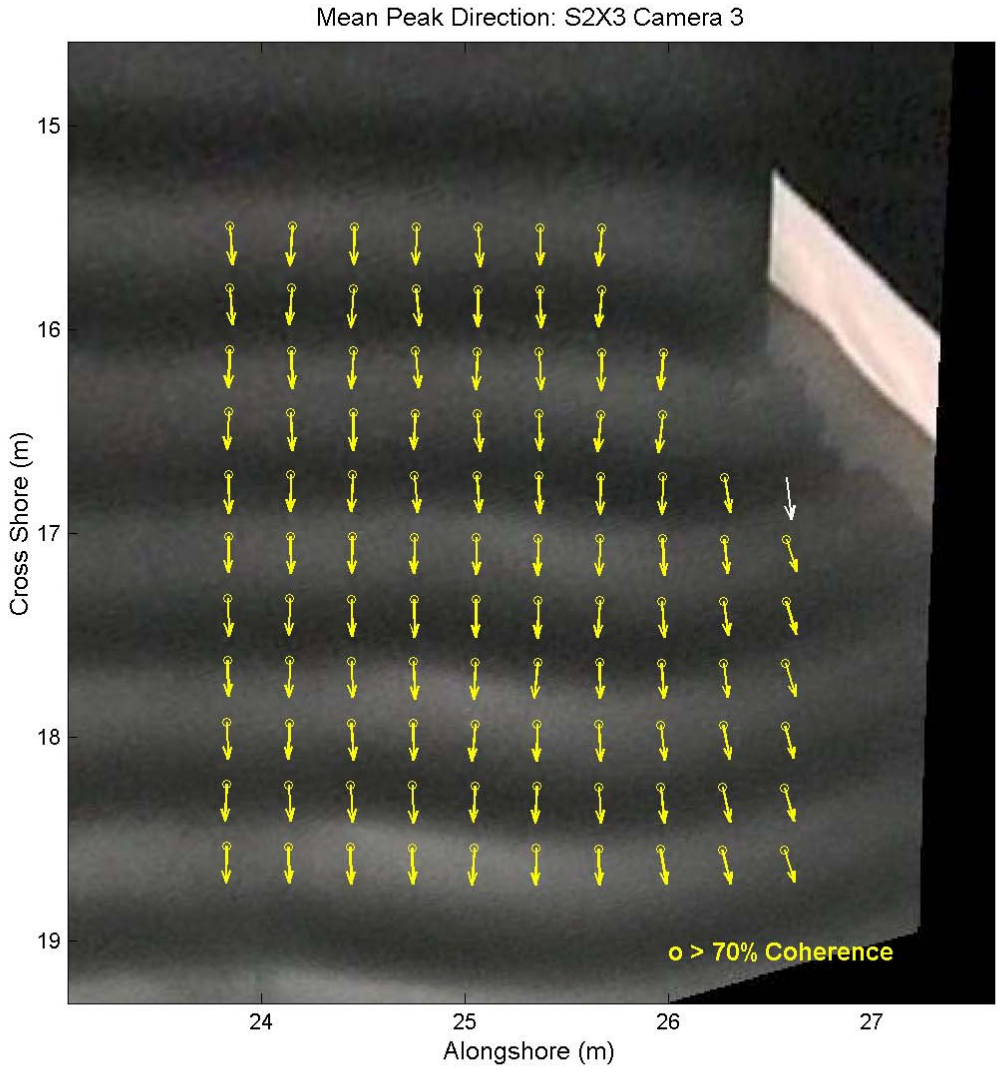

Mean Peak Direction: S2X1 Camera 6
Cross Shore (m)
20
21
22
23
24
25
o > 70% Coherence
25
26
27
28
29
30
Alongshore (m)

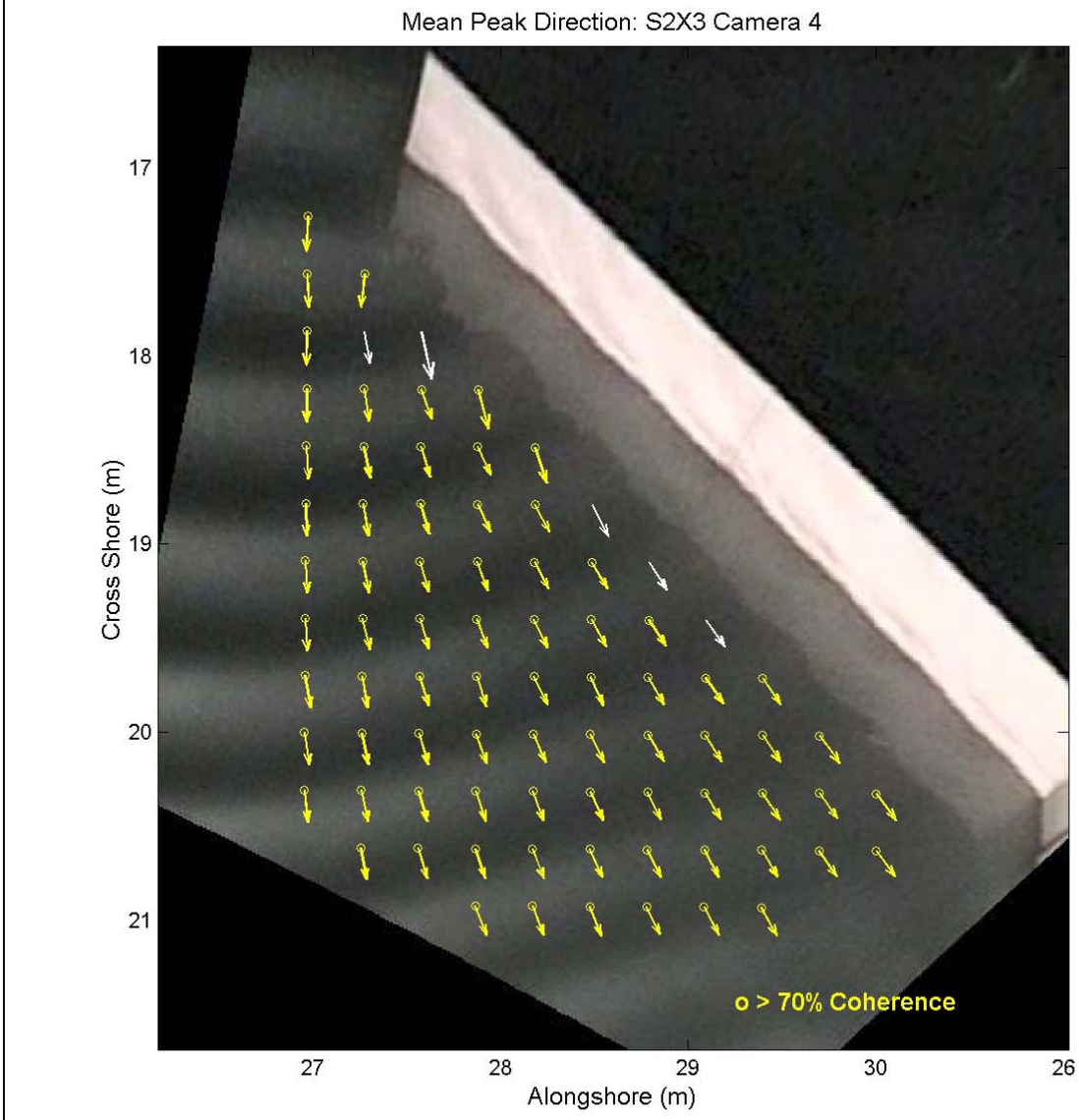

Mean Peak Direction: S2X2 Camera 3
Cross Shore (m)
15
16
17
18
19
24
25
26
27
Alongshore (m)
o > 70% Coherence

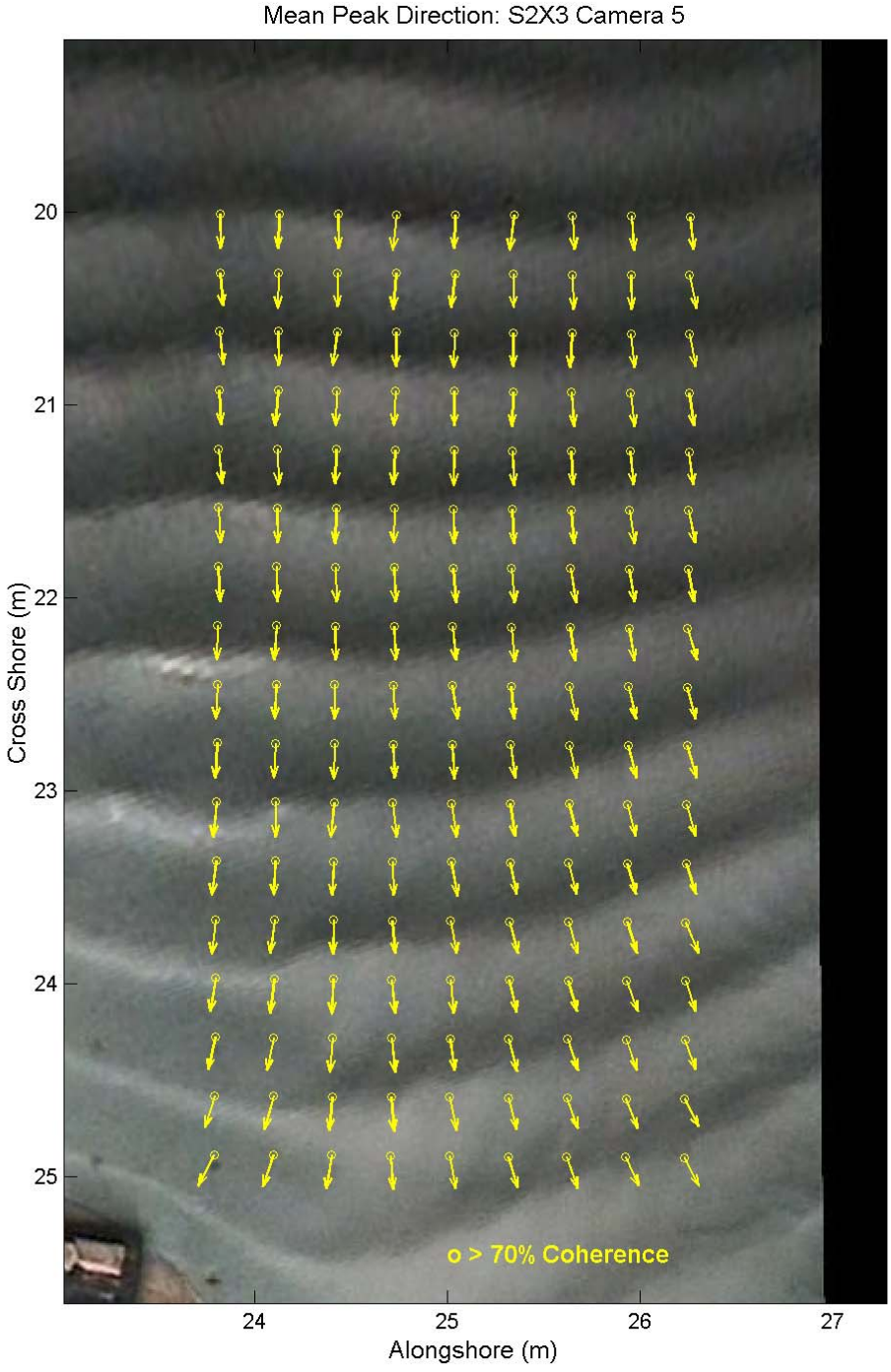

Mean Peak Direction: S2X2 Camera 4
Cross Shore (m)
17
18
19
20
21
27
28
29
30
26
Alongshore (m)
o > 70% Coherence

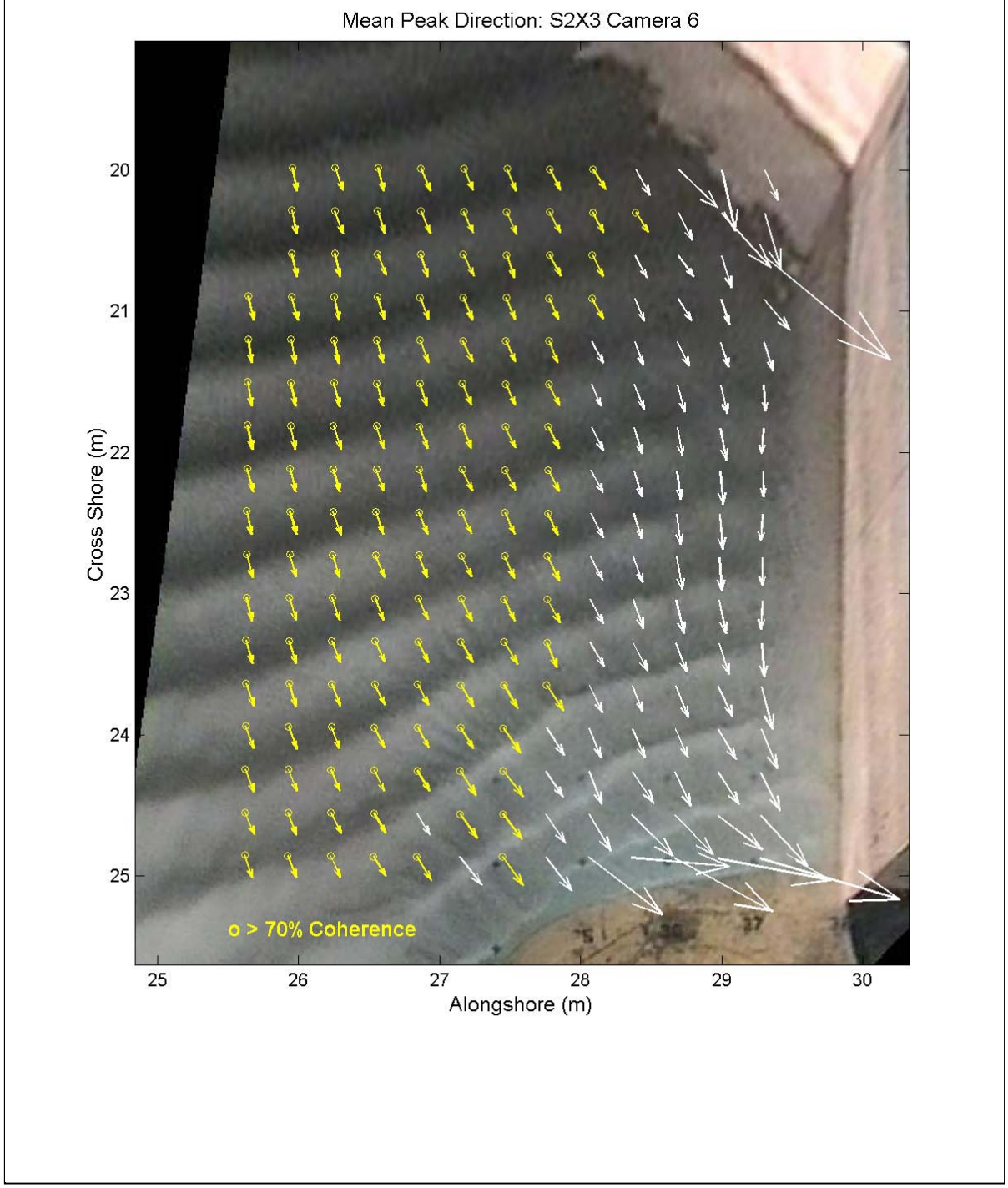

Mean Peak Direction: S2X2 Camera 5
Cross Shore (m)
20
21
22
23
24
25
o > 70% Coherence
24
25
26
27
Alongshore (m)

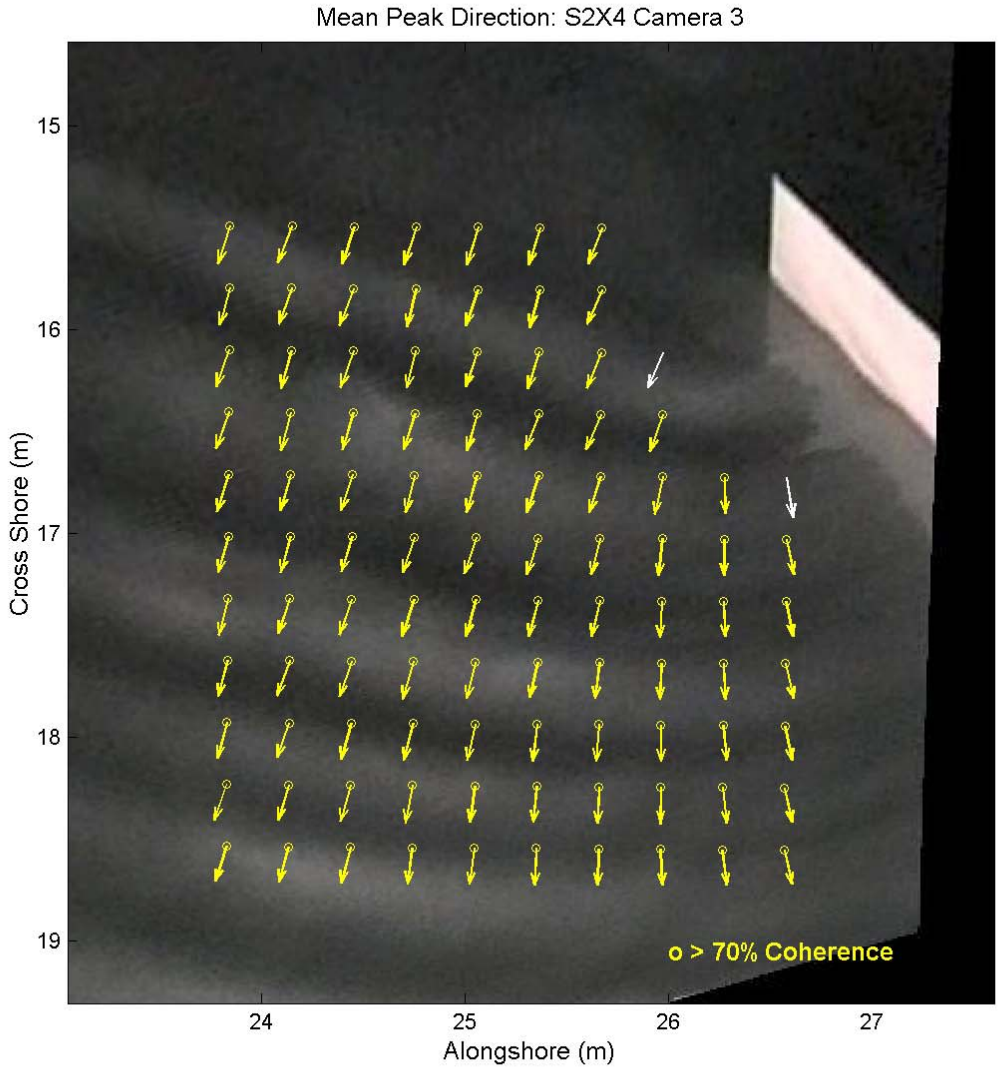

Mean Peak Direction: S2X2 Camera 6
Cross Shore (m)
20
21
22
23
24
25
o > 70% Coherence
25
26
27
28
29
30
Alongshore (m)

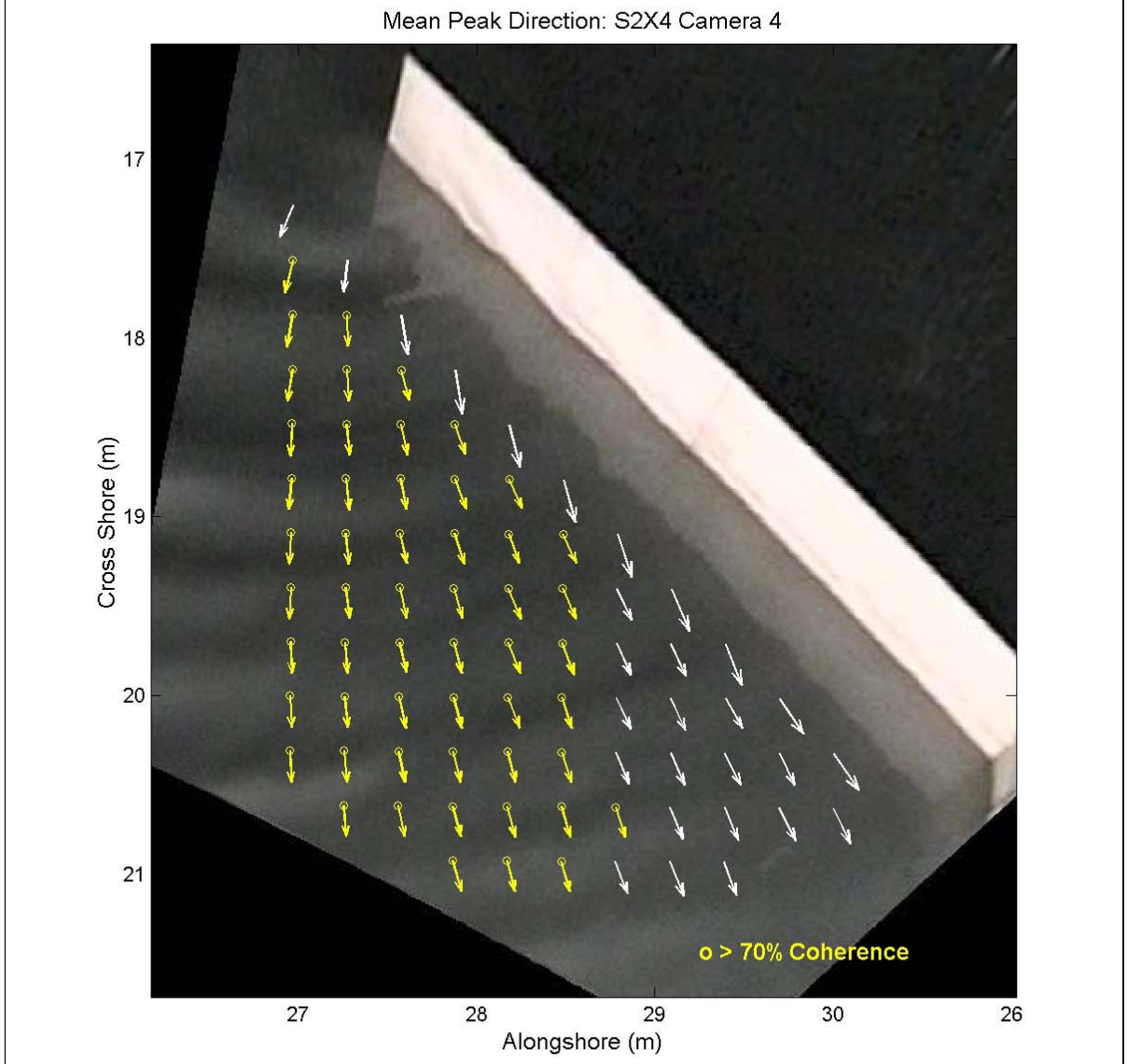

Mean Peak Direction: S2X3 Camera 3
Cross Shore (m)
15
16
17
18
19
24
25
26
27
Alongshore (m)
o > 70% Coherence

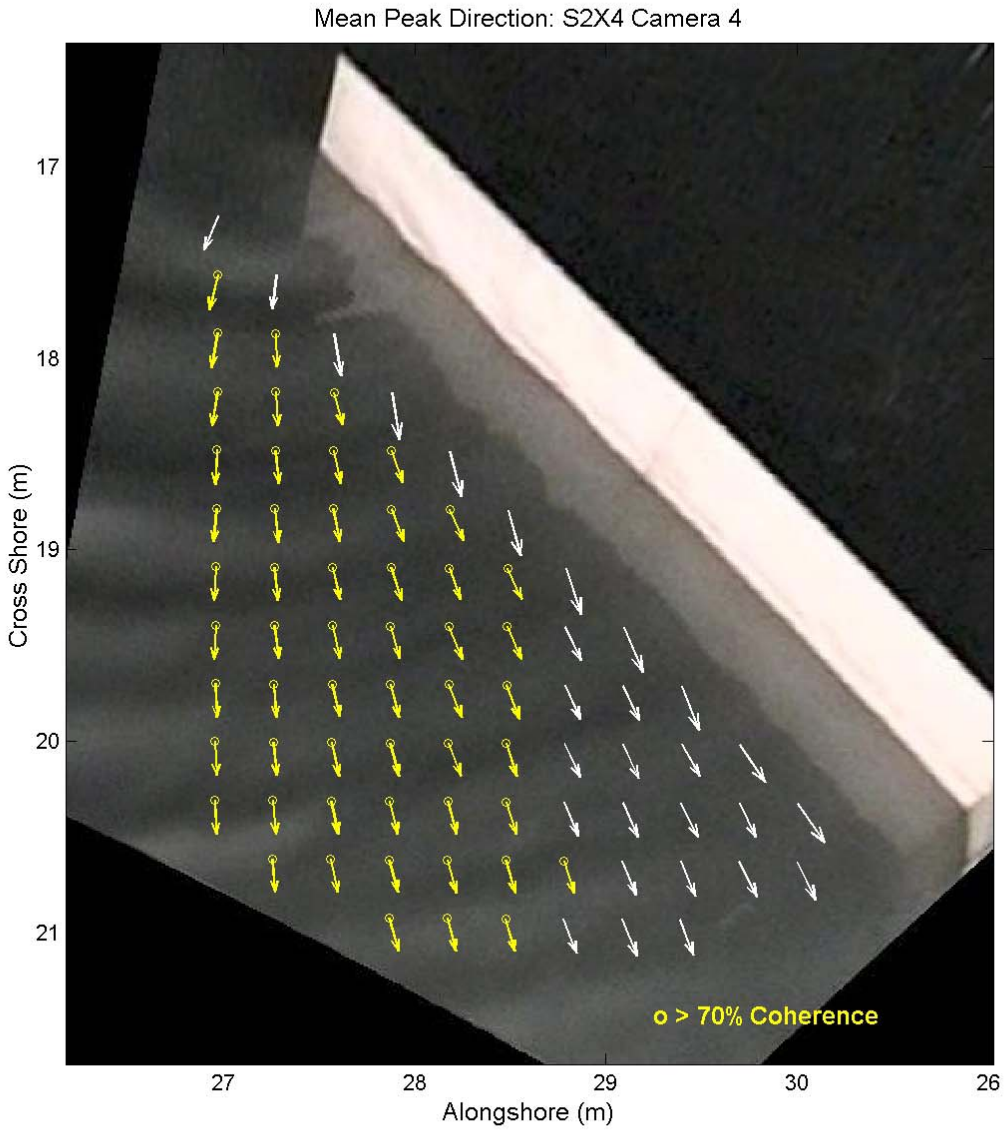

Mean Peak Direction: S2X3 Camera 4
Cross Shore (m)
17
18
19
20
21
27
28
29
30
26
Alongshore (m)
o > 70% Coherence

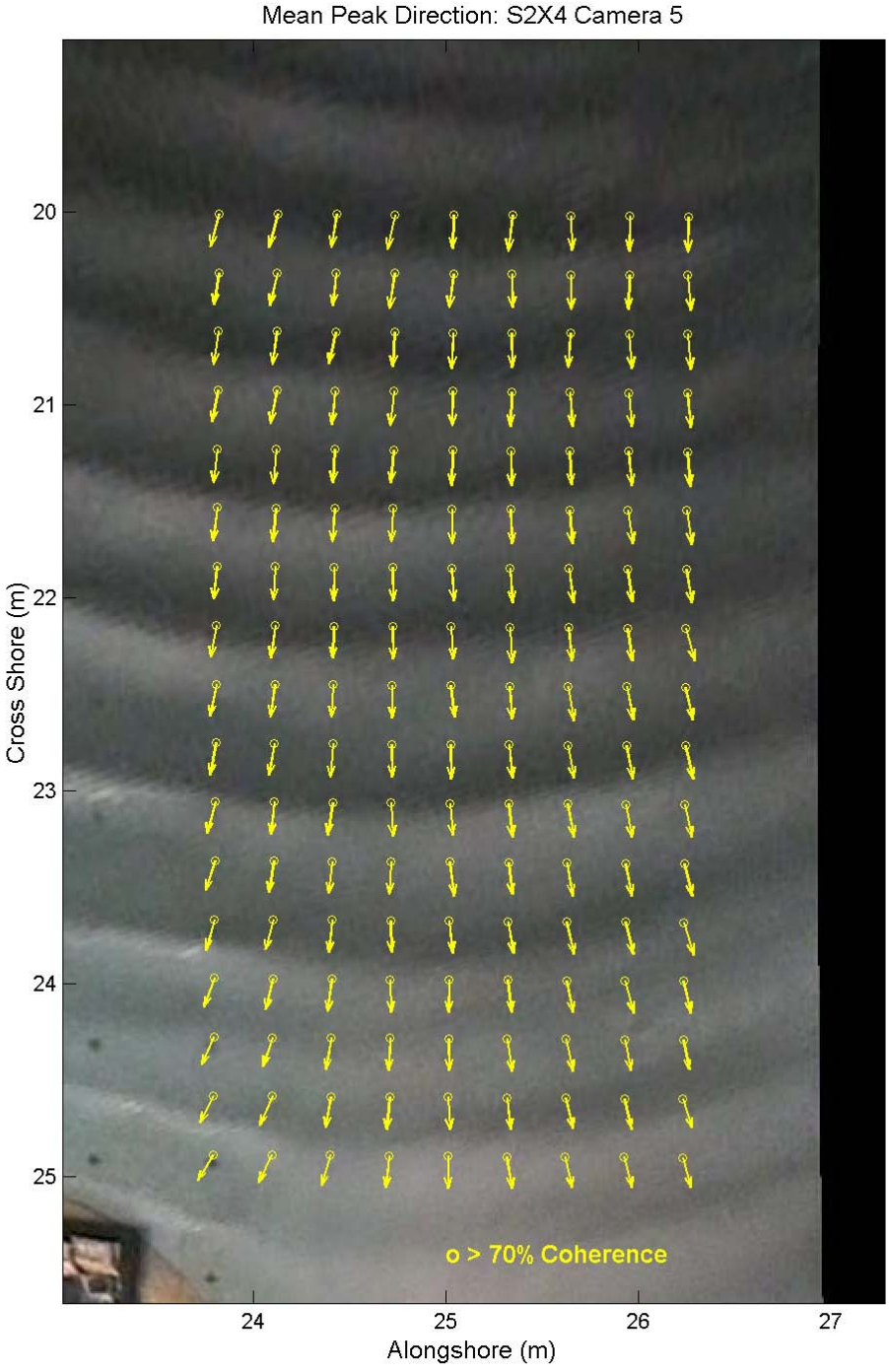

Mean Peak Direction: S2X3 Camera 5
Cross Shore (m)
20
21
22
23
24
25
o > 70% Coherence
24
25
26
27
Alongshore (m)

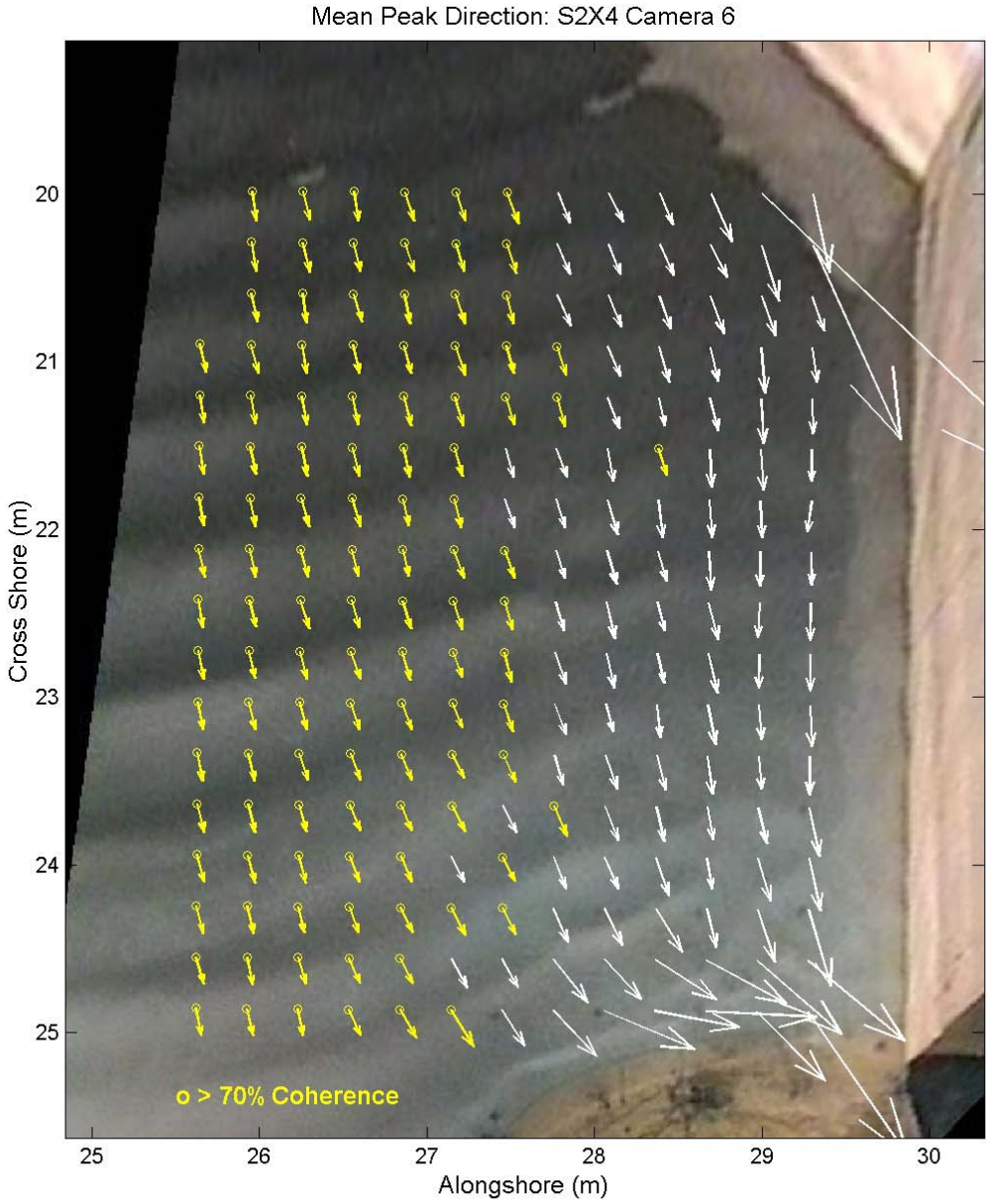

Mean Peak Direction: S2X3 Camera 6
Cross Shore (m)
20
21
22
23
24
25
o > 70% Coherence
25
26
27
28
29
30
Alongshore (m)

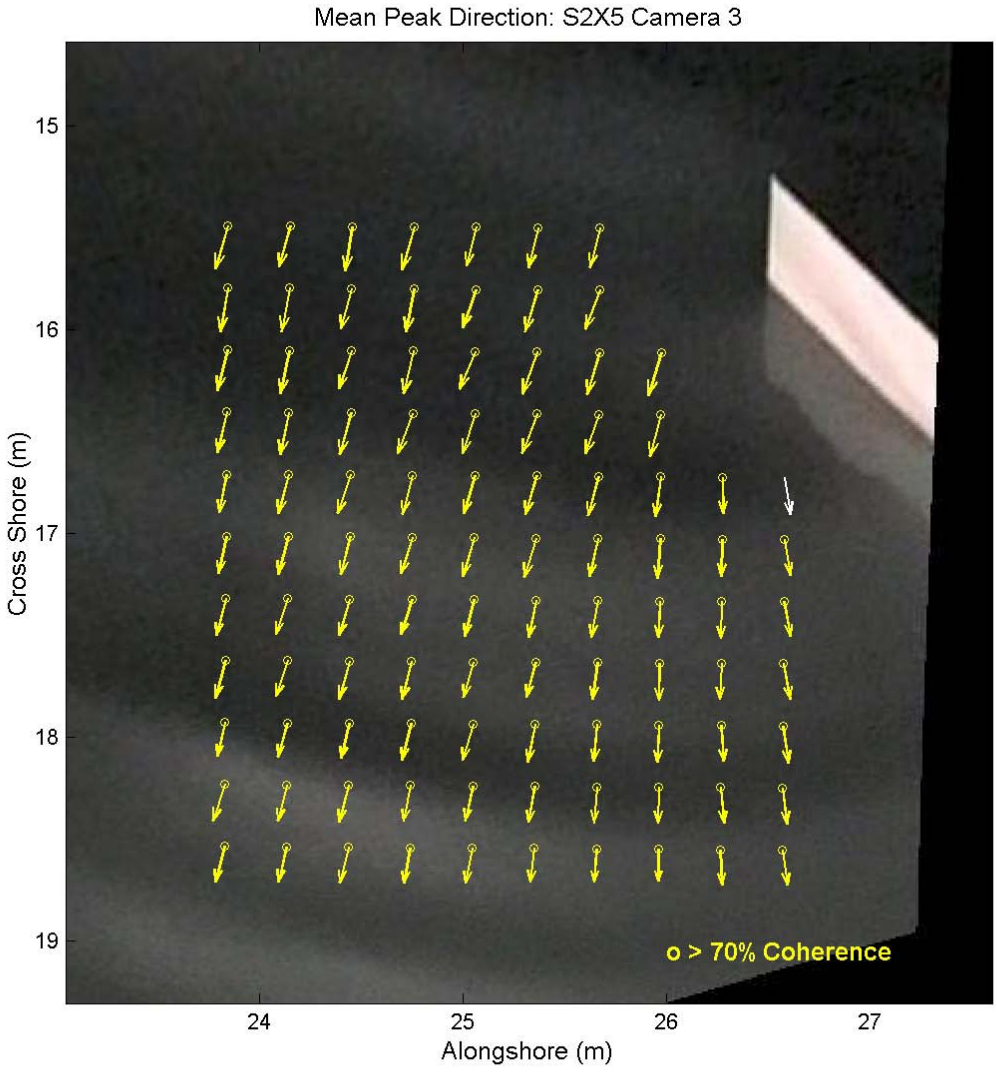

Mean Peak Direction: S2X4 Camera 3
Cross Shore (m)
15
16
17
18
19
24
25
26
27
Alongshore (m)
o > 70% Coherence

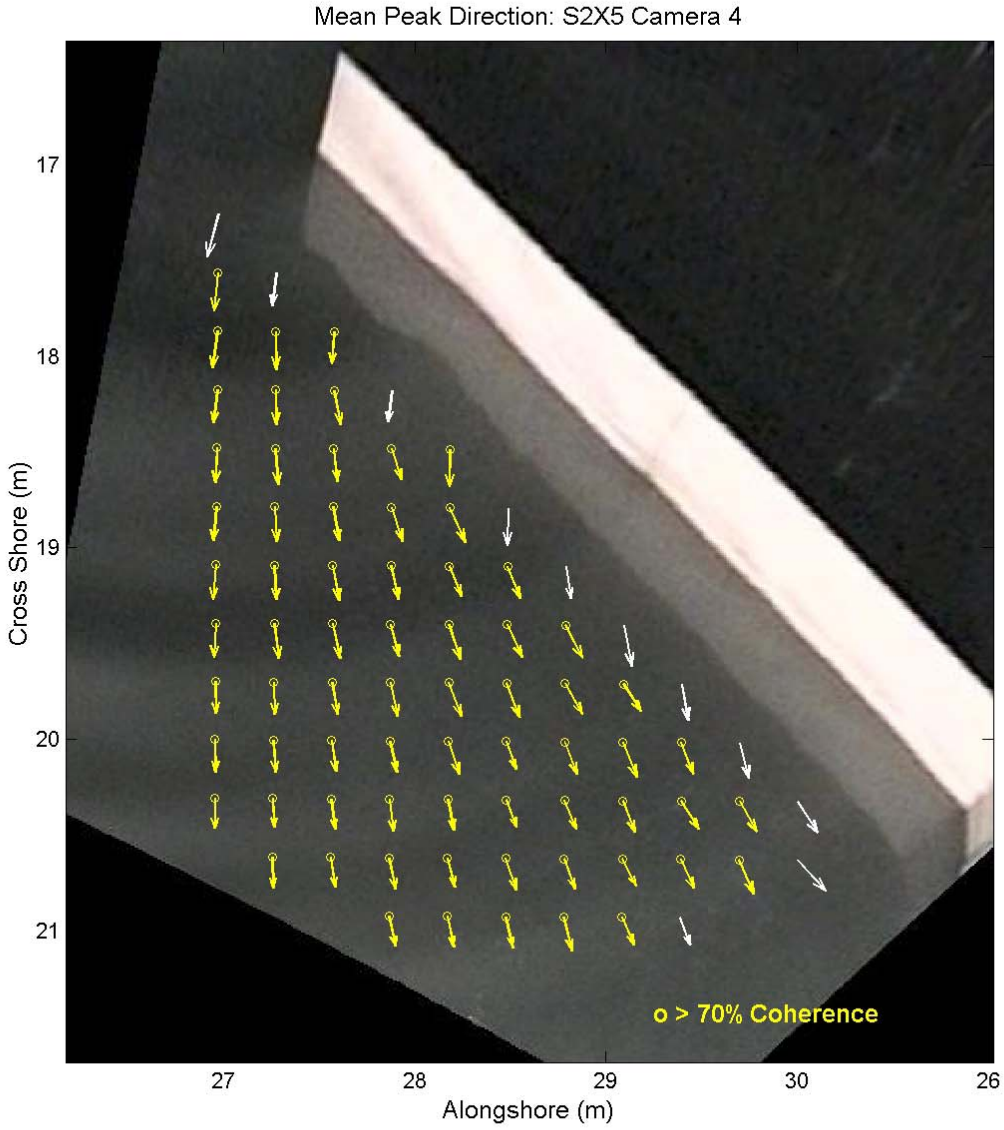

Mean Peak Direction: S2X4 Camera 4
Cross Shore (m)
17
18
19
20
21
27
28
29
30
26
Alongshore (m)
o > 70% Coherence

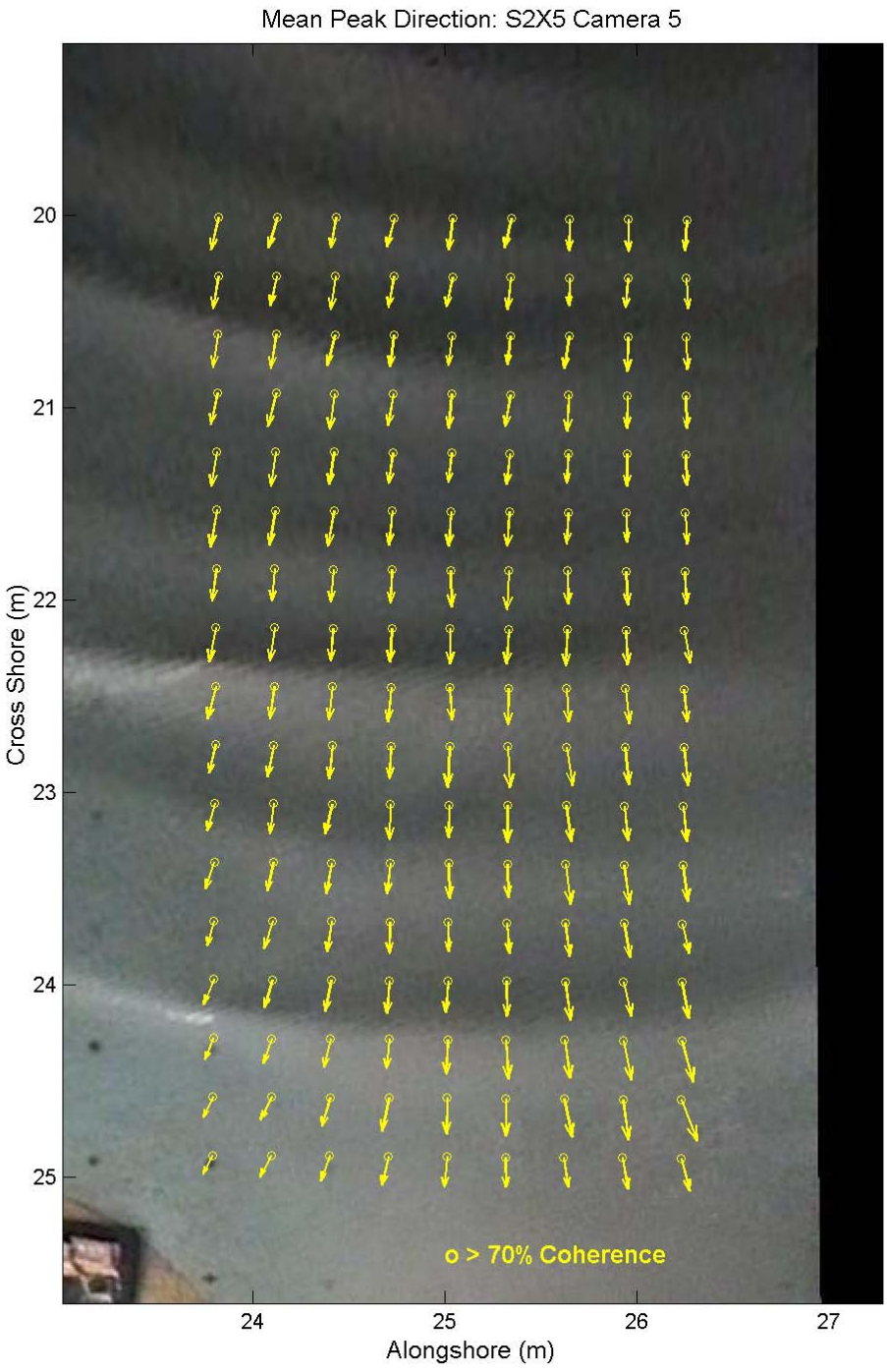

Mean Peak Direction: S2X4 Camera 4
Cross Shore (m)
17
18
19
20
21
27
28
29
30
26
Alongshore (m)
o > 70% Coherence

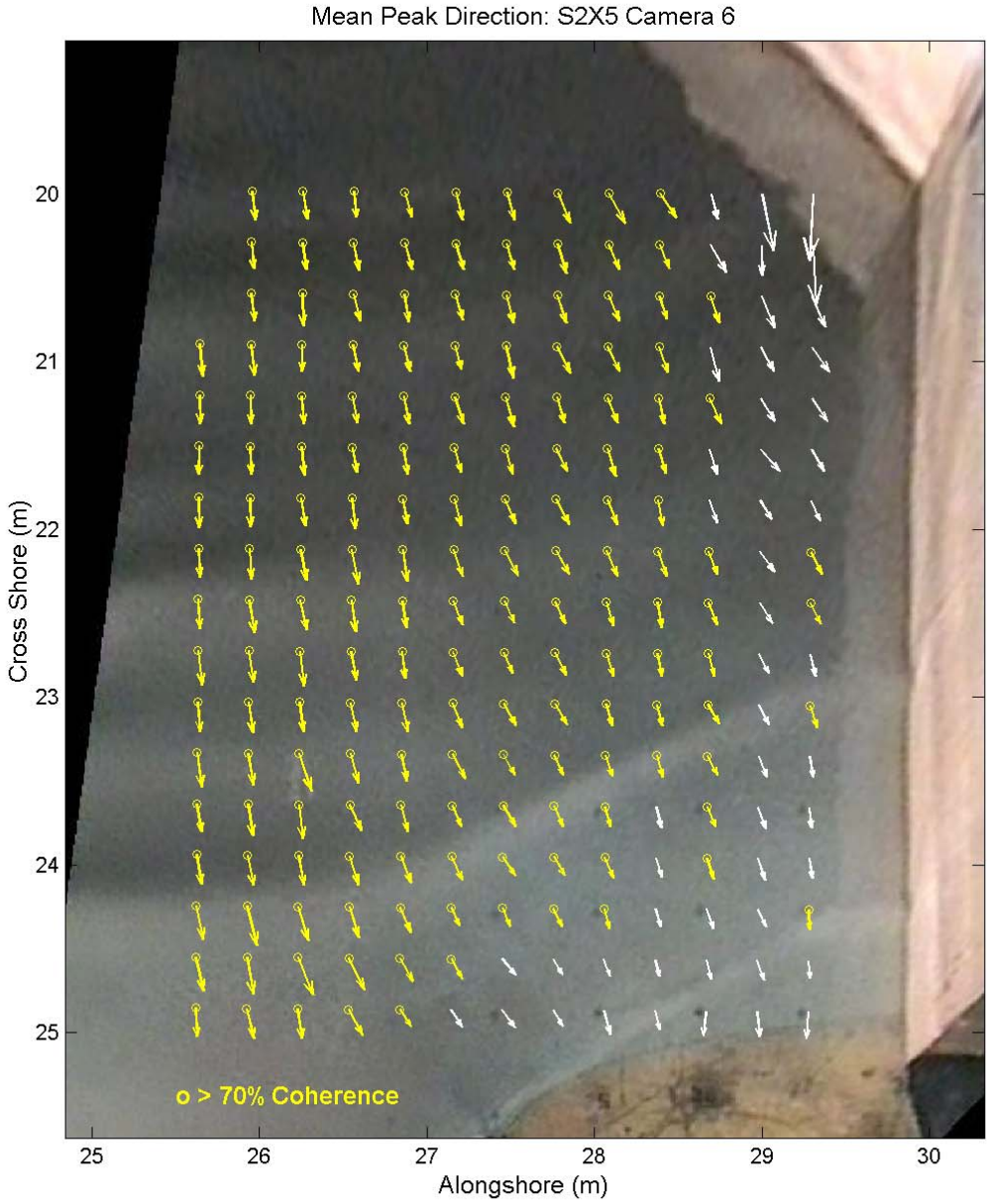

Mean Peak Direction: S2X4 Camera 5
20
21
22
23
24
25
Cross Shore (m)
o > 70% Coherence
24
25
26
27
Alongshore (m)

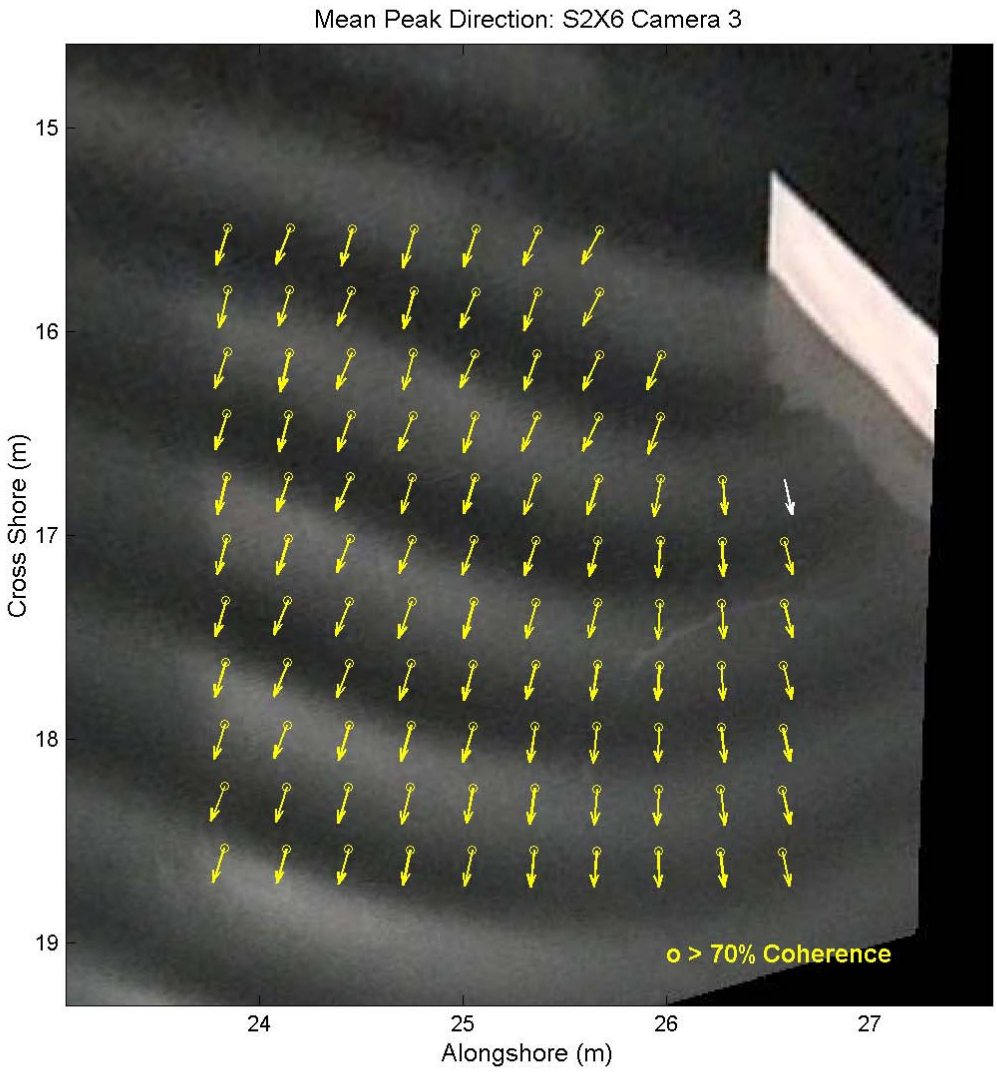

Mean Peak Direction: S2X4 Camera 6
Cross Shore (m)
20
21
22
23
24
25
o > 70% Coherence
25
26
27
28
29
30
Alongshore (m)

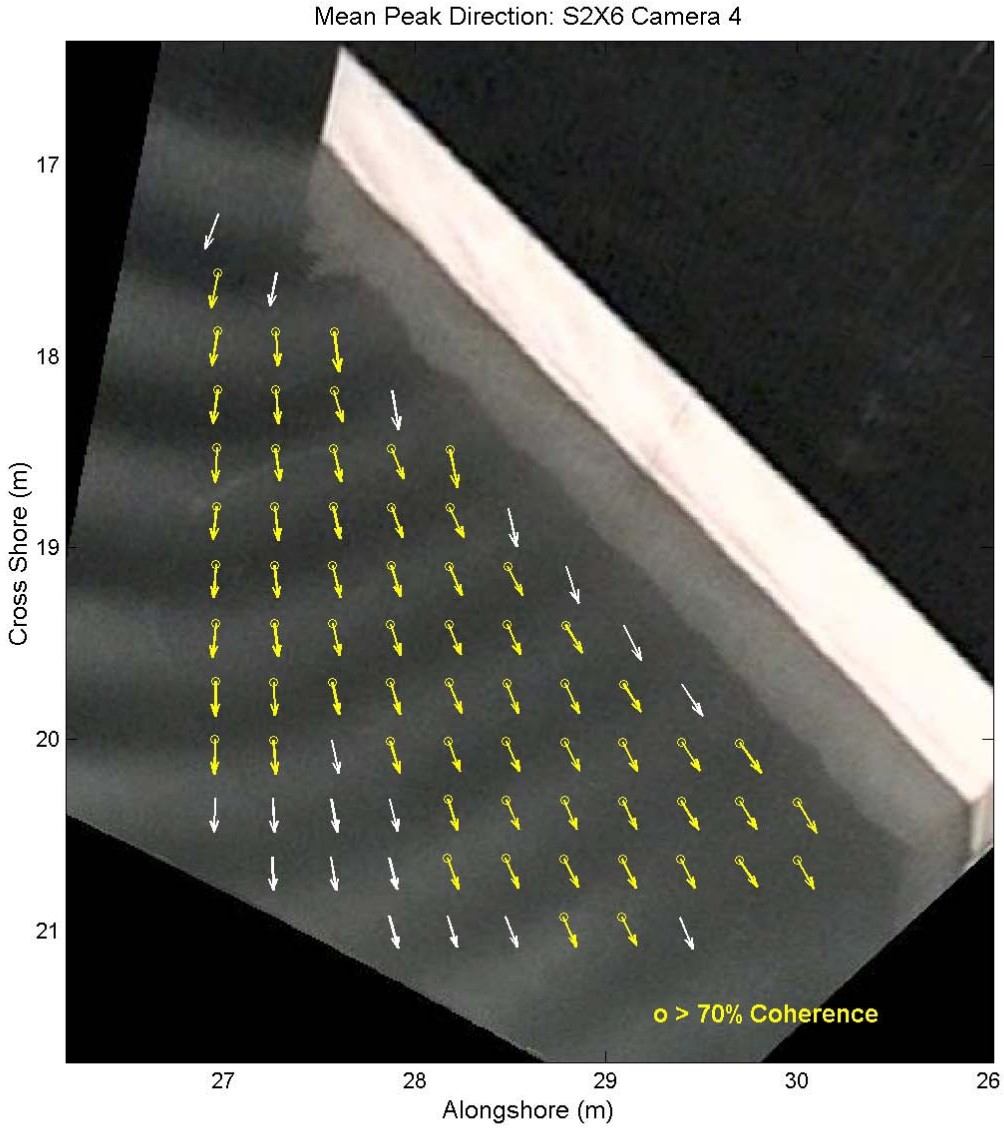

Mean Peak Direction: S2X5 Camera 3
Cross Shore (m)
15
16
17
18
19
24
25
26
27
Alongshore (m)
o > 70% Coherence

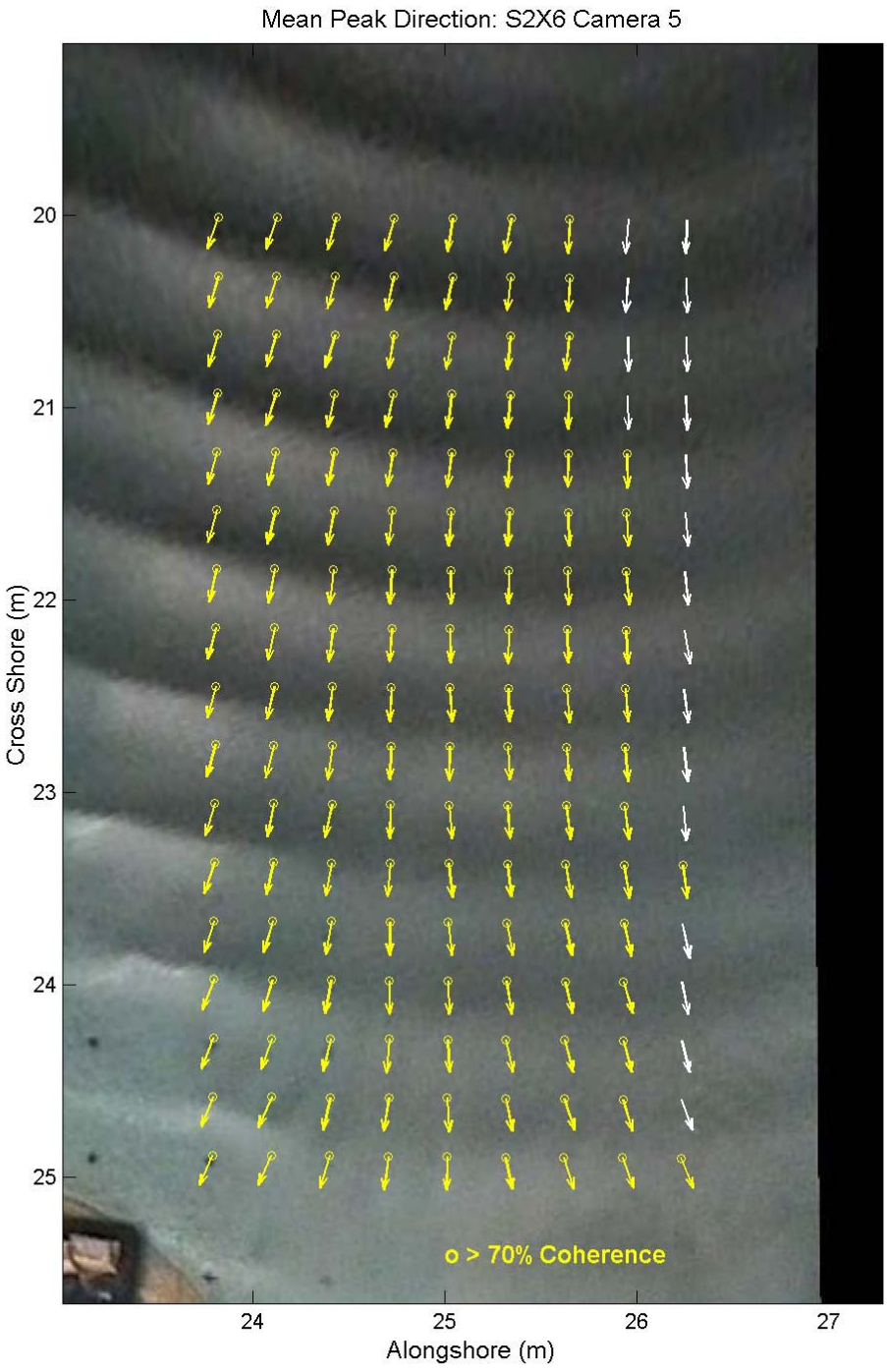

Mean Peak Direction: S2X5 Camera 4
Cross Shore (m)
17
18
19
20
21
27
28
29
30
26
Alongshore (m)
o > 70% Coherence

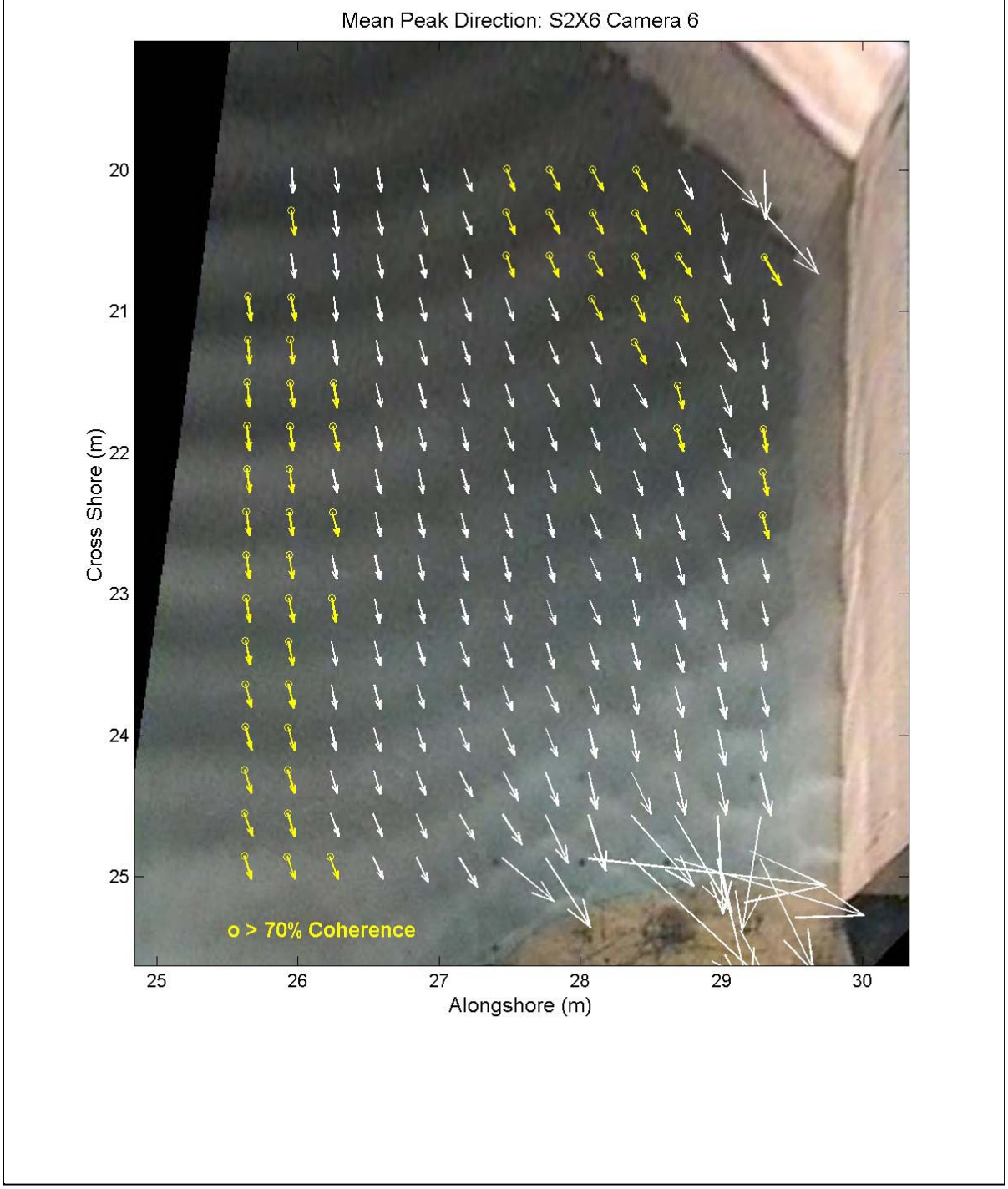

Mean Peak Direction: S2X5 Camera 5
Cross Shore (m)
20
21
22
23
24
25
o > 70% Coherence
24
25
26
27
Alongshore (m)


Mean Peak Direction: S2X5 Camera 6
Cross Shore (m)
20
21
22
23
24
25
o > 70% Coherence
25
26
27
28
29
30
Alongshore (m)


Mean Peak Direction: S2X6 Camera 3
Cross Shore (m)
15
16
17
18
19
24
25
26
27
Alongshore (m)
o > 70% Coherence


Mean Peak Direction: S2X6 Camera 4
Cross Shore (m)
17
18
19
20
21
27
28
29
30
26
Alongshore (m)
o > 70% Coherence


Mean Peak Direction: S2X6 Camera 5
Cross Shore (m)
20
21
22
23
24
25
o > 70% Coherence
24
25
26
27
Alongshore (m)


Mean Peak Direction: S2X6 Camera 6
Cross Shore (m)
20
21
22
23
24
25
o > 70% Coherence
25
26
27
28
29
30
Alongshore (m)

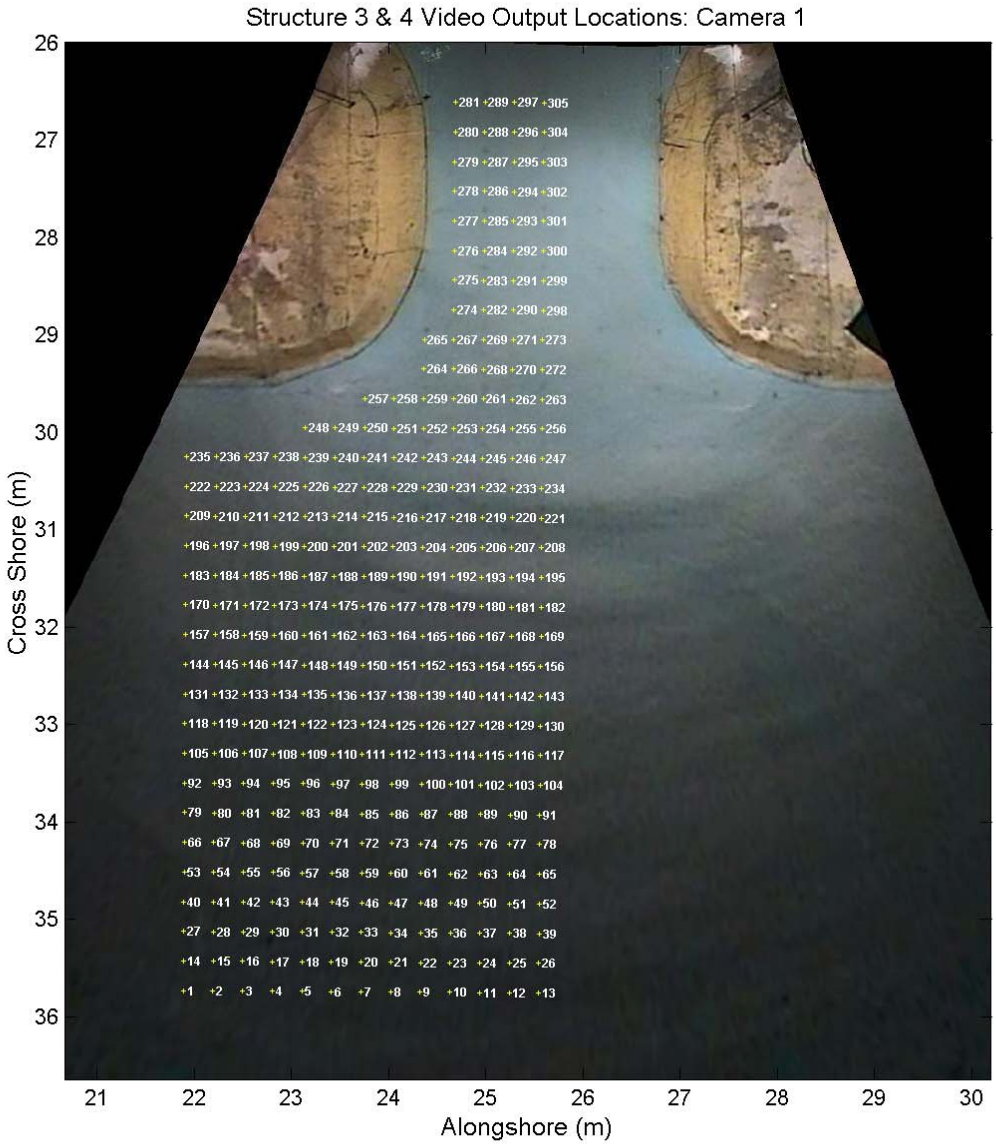

Structure 3 & 4 Video Output Locations: Camera 1
Cross Shore (m)
Alongshore (m)
26
27
28
29
30
31
32
33
34
35
36
21
22
23
24
25
26
27
28
29
30
+281 +289 +297 +305
+280 +288 +296 +304
+279 +287 +295 +303
+278 +286 +294 +302
+277 +285 +293 +301
+276 +284 +292 +300
+275 +283 +291 +299
+274 +282 +290 +298
+265 +267 +269 +271 +273
+264 +266 +268 +270 +272
+257 +258 +259 +260 +261 +262 +263
+248 +249 +250 +251 +252 +253 +254 +255 +256
+235 +236 +237 +238 +239 +240 +241 +242 +243 +244 +245 +246 +247
+222 +223 +224 +225 +226 +227 +228 +229 +230 +231 +232 +233 +234
+209 +210 +211 +212 +213 +214 +215 +216 +217 +218 +219 +220 +221
+196 +197 +198 +199 +200 +201 +202 +203 +204 +205 +206 +207 +208
+183 +184 +185 +186 +187 +188 +189 +190 +191 +192 +193 +194 +195
+170 +171 +172 +173 +174 +175 +176 +177 +178 +179 +180 +181 +182
+157 +158 +159 +160 +161 +162 +163 +164 +165 +166 +167 +168 +169
+144 +145 +146 +147 +148 +149 +150 +151 +152 +153 +154 +155 +156
+131 +132 +133 +134 +135 +136 +137 +138 +139 +140 +141 +142 +143
+118 +119 +120 +121 +122 +123 +124 +125 +126 +127 +128 +129 +130
+105 +106 +107 +108 +109 +110 +111 +112 +113 +114 +115 +116 +117
+92 +93 +94 +95 +96 +97 +98 +99 +100 +101 +102 +103 +104
+79 +80 +81 +82 +83 +84 +85 +86 +87 +88 +89 +90 +91
+66 +67 +68 +69 +70 +71 +72 +73 +74 +75 +76 +77 +78
+53 +54 +55 +56 +57 +58 +59 +60 +61 +62 +63 +64 +65
+40 +41 +42 +43 +44 +45 +46 +47 +48 +49 +50 +51 +52
+27 +28 +29 +30 +31 +32 +33 +34 +35 +36 +37 +38 +39
+14 +15 +16 +17 +18 +19 +20 +21 +22 +23 +24 +25 +26
+1 +2 +3 +4 +5 +6 +7 +8 +9 +10 +11 +12 +13

Table Q7
Structures 3 & 4, Camera 1 CIIS Array Analysis Output Locations

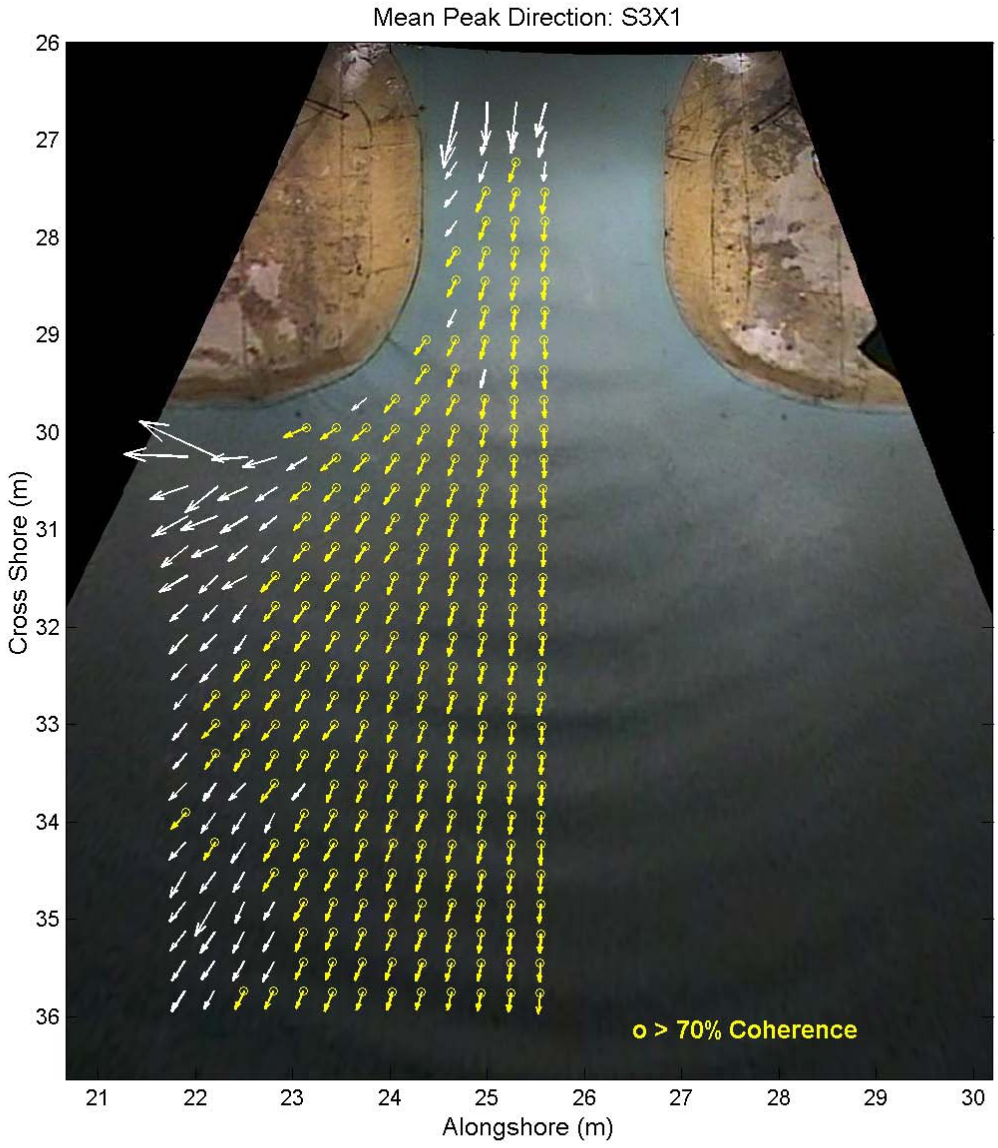
Location Number	Y (m)	X (m)	Location Number	Y (m)	X (m)	Location Number	Y (m)	X (m)
1	22.329	35.727	44	23.554	34.821	87	24.779	33.914
2	22.634	35.729	45	23.859	34.822	88	25.084	33.916
3	22.939	35.731	46	24.164	34.824	89	25.389	33.918
4	23.244	35.733	47	24.468	34.826	90	25.693	33.92
5	23.548	35.735	48	24.773	34.828	91	25.998	33.922
6	23.853	35.737	49	25.078	34.83	92	22.343	33.594
7	24.158	35.739	50	25.383	34.832	93	22.647	33.596
8	24.463	35.741	51	25.688	34.834	94	22.952	33.598
9	24.767	35.743	52	25.992	34.836	95	23.257	33.599
10	25.072	35.744	53	22.337	34.508	96	23.562	33.601
11	25.377	35.746	54	22.642	34.51	97	23.867	33.603
12	25.682	35.748	55	22.946	34.512	98	24.171	33.605
13	25.987	35.75	56	23.251	34.514	99	24.476	33.607
14	22.331	35.422	57	23.556	34.516	100	24.781	33.609
15	22.636	35.424	58	23.861	34.518	101	25.086	33.611
16	22.941	35.426	59	24.166	34.52	102	25.39	33.613
17	23.245	35.428	60	24.47	34.522	103	25.695	33.615
18	23.55	35.43	61	24.775	34.523	104	26	33.617
19	23.855	35.432	62	25.08	34.525	105	22.345	33.289
20	24.16	35.434	63	25.385	34.527	106	22.649	33.291
21	24.465	35.436	64	25.689	34.529	107	22.954	33.293
22	24.769	35.438	65	25.994	34.531	108	23.259	33.295
23	25.074	35.44	66	22.339	34.203	109	23.564	33.297
24	25.379	35.442	67	22.644	34.205	110	23.868	33.299
25	25.684	35.444	68	22.948	34.207	111	24.173	33.3
26	25.988	35.445	69	23.253	34.209	112	24.478	33.302
27	22.333	35.118	70	23.558	34.211	113	24.783	33.304
28	22.638	35.12	71	23.863	34.213	114	25.088	33.306
29	22.943	35.121	72	24.167	34.215	115	25.392	33.308
30	23.247	35.123	73	24.472	34.217	116	25.697	33.31
31	23.552	35.125	74	24.777	34.219	117	26.002	33.312
32	23.857	35.127	75	25.082	34.221	118	22.347	32.984
33	24.162	35.129	76	25.387	34.222	119	22.651	32.986
34	24.467	35.131	77	25.691	34.224	120	22.956	32.988
35	24.771	35.133	78	25.996	34.226	121	23.261	32.99
36	25.076	35.135	79	22.341	33.899	122	23.566	32.992
37	25.381	35.137	80	22.646	33.9	123	23.87	32.994
38	25.686	35.139	81	22.95	33.902	124	24.175	32.996
39	25.99	35.141	82	23.255	33.904	125	24.48	32.998
40	22.335	34.813	83	23.56	33.906	126	24.785	33
41	22.64	34.815	84	23.865	33.908	127	25.09	33.001
42	22.945	34.817	85	24.169	33.91	128	25.394	33.003
43	23.249	34.819	86	24.474	33.912	129	25.699	33.005

Table Q7 (Continued)
Structures 3 & 4, Camera 1 CIIS Array Analysis Output Locations

Location Number	Y (m)	X (m)	Location Number	Y (m)	X (m)	Location Number	Y (m)	X (m)
130	26.004	33.007	173	23.269	31.771	216	24.493	30.864
131	22.348	32.679	174	23.573	31.773	217	24.798	30.866
132	22.653	32.681	175	23.878	31.775	218	25.103	30.868
133	22.958	32.683	176	24.183	31.777	219	25.408	30.87
134	23.263	32.685	177	24.488	31.778	220	25.713	30.872
135	23.568	32.687	178	24.792	31.78	221	26.017	30.874
136	23.872	32.689	179	25.097	31.782	222	22.362	30.546
137	24.177	32.691	180	25.402	31.784	223	22.667	30.548
138	24.482	32.693	181	25.707	31.786	224	22.971	30.55
139	24.787	32.695	182	26.012	31.788	225	23.276	30.552
140	25.091	32.697	183	22.356	31.46	226	23.581	30.554
141	25.396	32.699	184	22.661	31.462	227	23.886	30.556
142	25.701	32.701	185	22.966	31.464	228	24.191	30.557
143	26.006	32.702	186	23.27	31.466	229	24.495	30.559
144	22.35	32.375	187	23.575	31.468	230	24.8	30.561
145	22.655	32.377	188	23.88	31.47	231	25.105	30.563
146	22.96	32.378	189	24.185	31.472	232	25.41	30.565
147	23.265	32.38	190	24.49	31.474	233	25.714	30.567
148	23.569	32.382	191	24.794	31.476	234	26.019	30.569
149	23.874	32.384	192	25.099	31.478	235	22.364	30.241
150	24.179	32.386	193	25.404	31.479	236	22.669	30.243
151	24.484	32.388	194	25.709	31.481	237	22.973	30.245
152	24.789	32.39	195	26.013	31.483	238	23.278	30.247
153	25.093	32.392	196	22.358	31.155	239	23.583	30.249
154	25.398	32.394	197	22.663	31.157	240	23.888	30.251
155	25.703	32.396	198	22.968	31.159	241	24.192	30.253
156	26.008	32.398	199	23.272	31.161	242	24.497	30.255
157	22.352	32.07	200	23.577	31.163	243	24.802	30.257
158	22.657	32.072	201	23.882	31.165	244	25.107	30.258
159	22.962	32.074	202	24.187	31.167	245	25.412	30.26
160	23.267	32.076	203	24.491	31.169	246	25.716	30.262
161	23.571	32.078	204	24.796	31.171	247	26.021	30.264
162	23.876	32.079	205	25.101	31.173	248	23.585	29.944
163	24.181	32.081	206	25.406	31.175	249	23.89	29.946
164	24.486	32.083	207	25.711	31.177	250	24.194	29.948
165	24.79	32.085	208	26.015	31.179	251	24.499	29.95
166	25.095	32.087	209	22.36	30.851	252	24.804	29.952
167	25.4	32.089	210	22.665	30.853	253	25.109	29.954
168	25.705	32.091	211	22.97	30.855	254	25.413	29.956
169	26.01	32.093	212	23.274	30.856	255	25.718	29.957
170	22.354	31.765	213	23.579	30.858	256	26.023	29.959
171	22.659	31.767	214	23.884	30.86	257	24.196	29.643
172	22.964	31.769	215	24.189	30.862	258	24.501	29.645

Table Q7 (Concluded)
Structures 3 & 4, Camera 1 CIIS Array
Analysis Output Locations

Location Number	Y (m)	X (m)	Location Number	Y (m)	X (m)
259	24.806	29.647	302	26.038	27.521
260	25.111	29.649	303	26.04	27.216
261	25.415	29.651	304	26.042	26.912
262	25.72	29.653	305	26.044	26.607
263	26.025	29.655			
264	24.808	29.342			
265	24.81	29.037			
266	25.113	29.344			
267	25.114	29.039			
268	25.417	29.346			
269	25.419	29.041			
270	25.722	29.348			
271	25.724	29.043			
272	26.027	29.35			
273	26.029	29.045			
274	25.116	28.735			
275	25.118	28.43			
276	25.12	28.125			
277	25.122	27.82			
278	25.124	27.515			
279	25.126	27.211			
280	25.128	26.906			
281	25.13	26.601			
282	25.421	28.736			
283	25.423	28.432			
284	25.425	28.127			
285	25.427	27.822			
286	25.429	27.517			
287	25.431	27.213			
288	25.433	26.908			
289	25.435	26.603			
290	25.726	28.738			
291	25.728	28.434			
292	25.73	28.129			
293	25.732	27.824			
294	25.734	27.519			
295	25.736	27.214			
296	25.737	26.91			
297	25.739	26.605			
298	26.031	28.74			
299	26.033	28.436			
300	26.035	28.131			
301	26.036	27.826			


Mean Peak Direction: S3X1
Cross Shore (m)
Alongshore (m)
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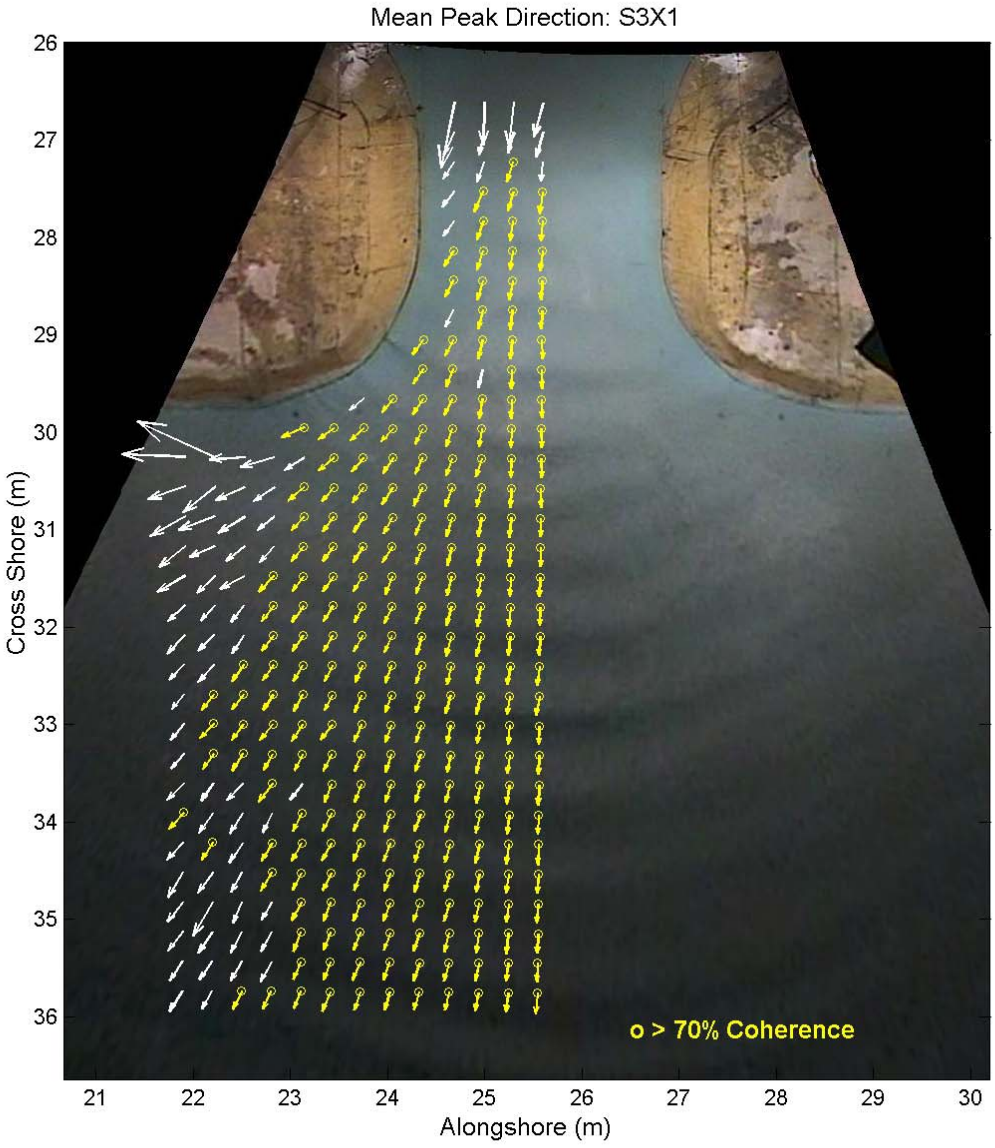
Mean Peak Direction: S3X1
Cross Shore (m)
Alongshore (m)
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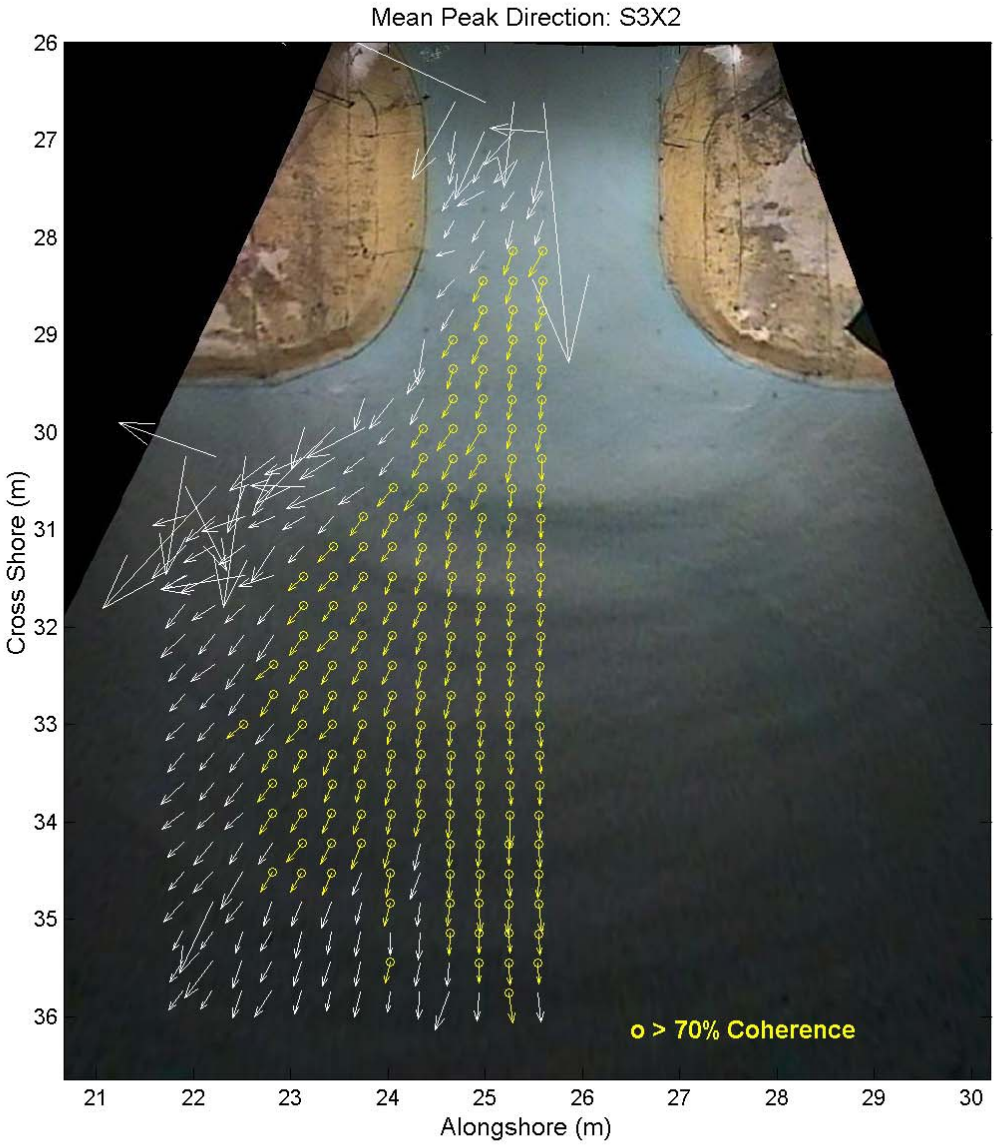
Mean Peak Direction: S3X2
Cross Shore (m)
Alongshore (m)
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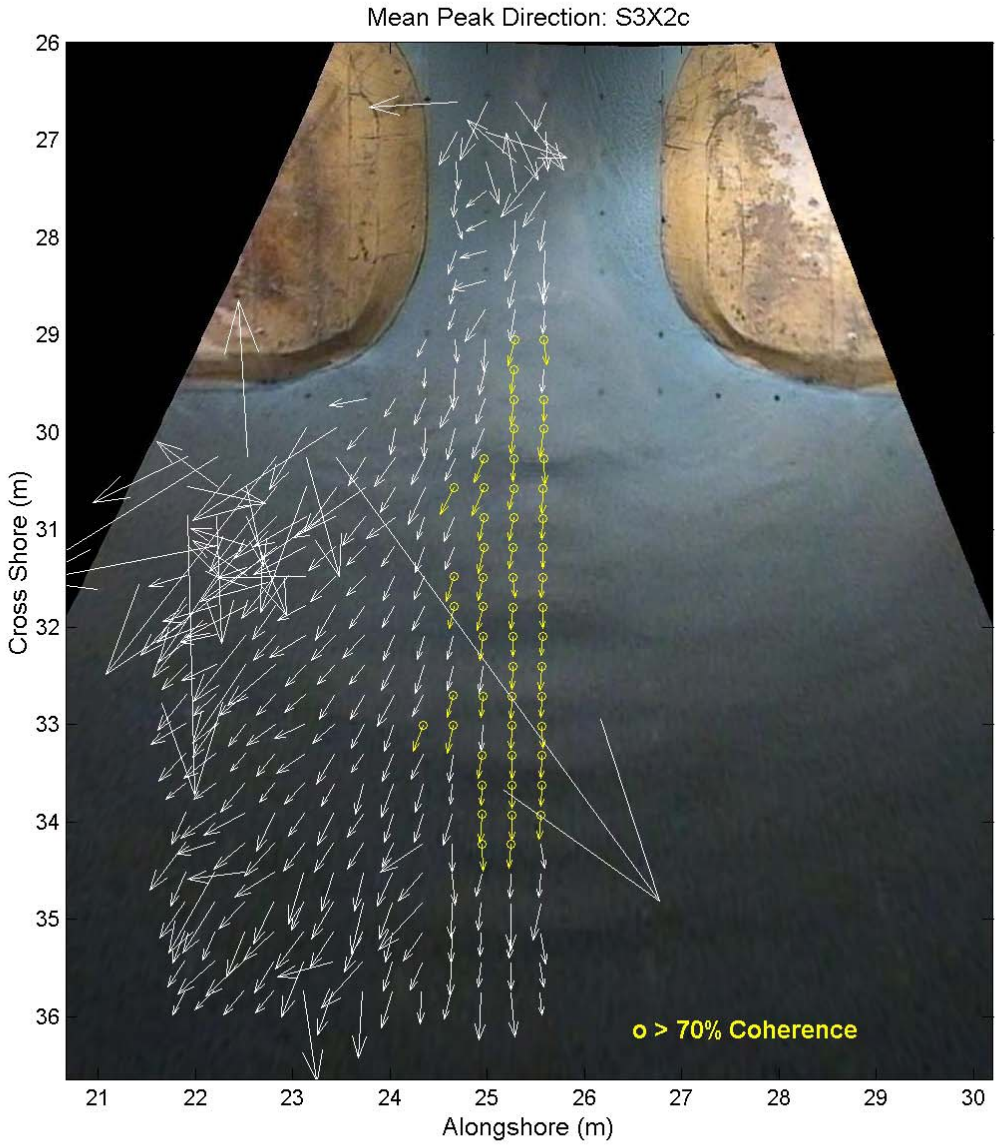
Mean Peak Direction: S3X2c
Cross Shore (m)
Alongshore (m)
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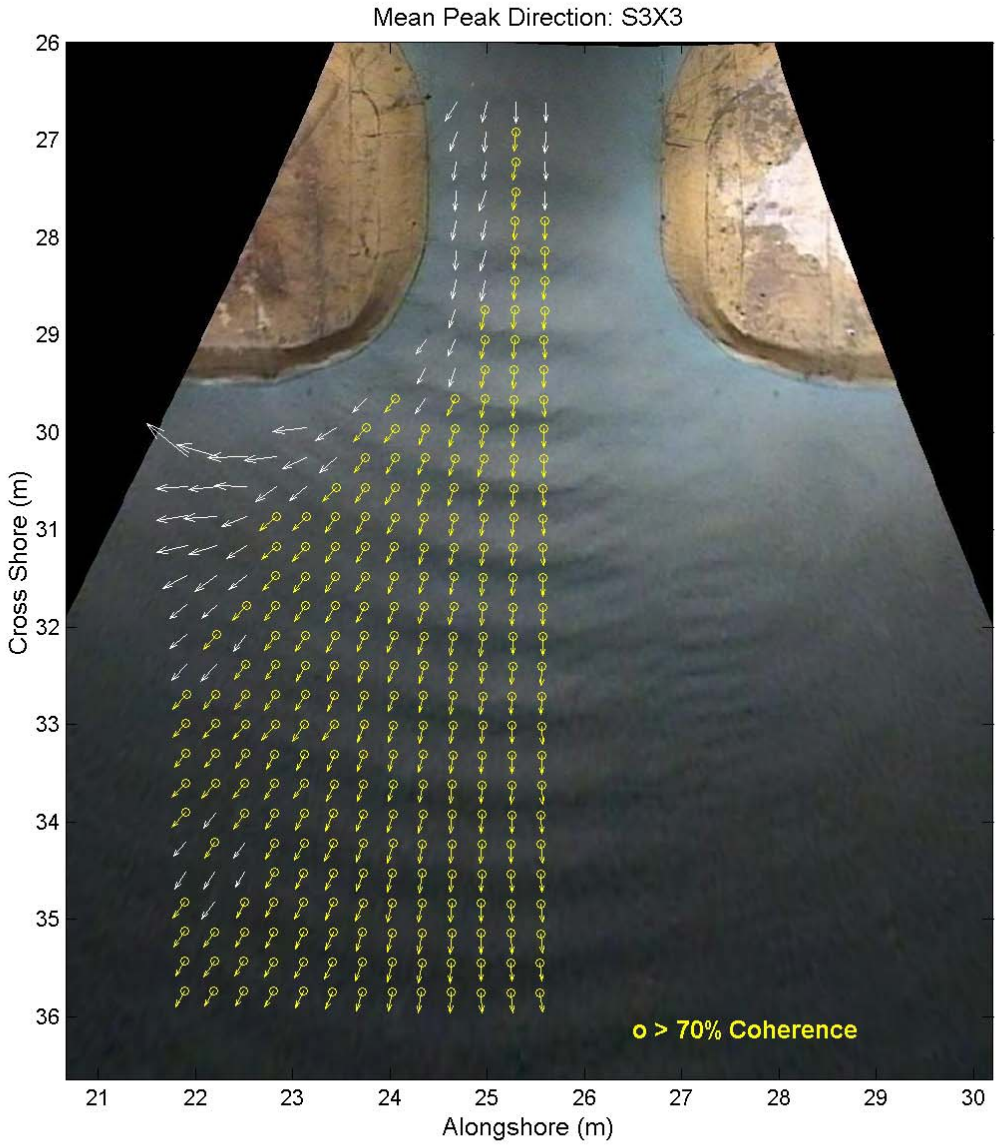
Mean Peak Direction: S3X3
Cross Shore (m)
Alongshore (m)
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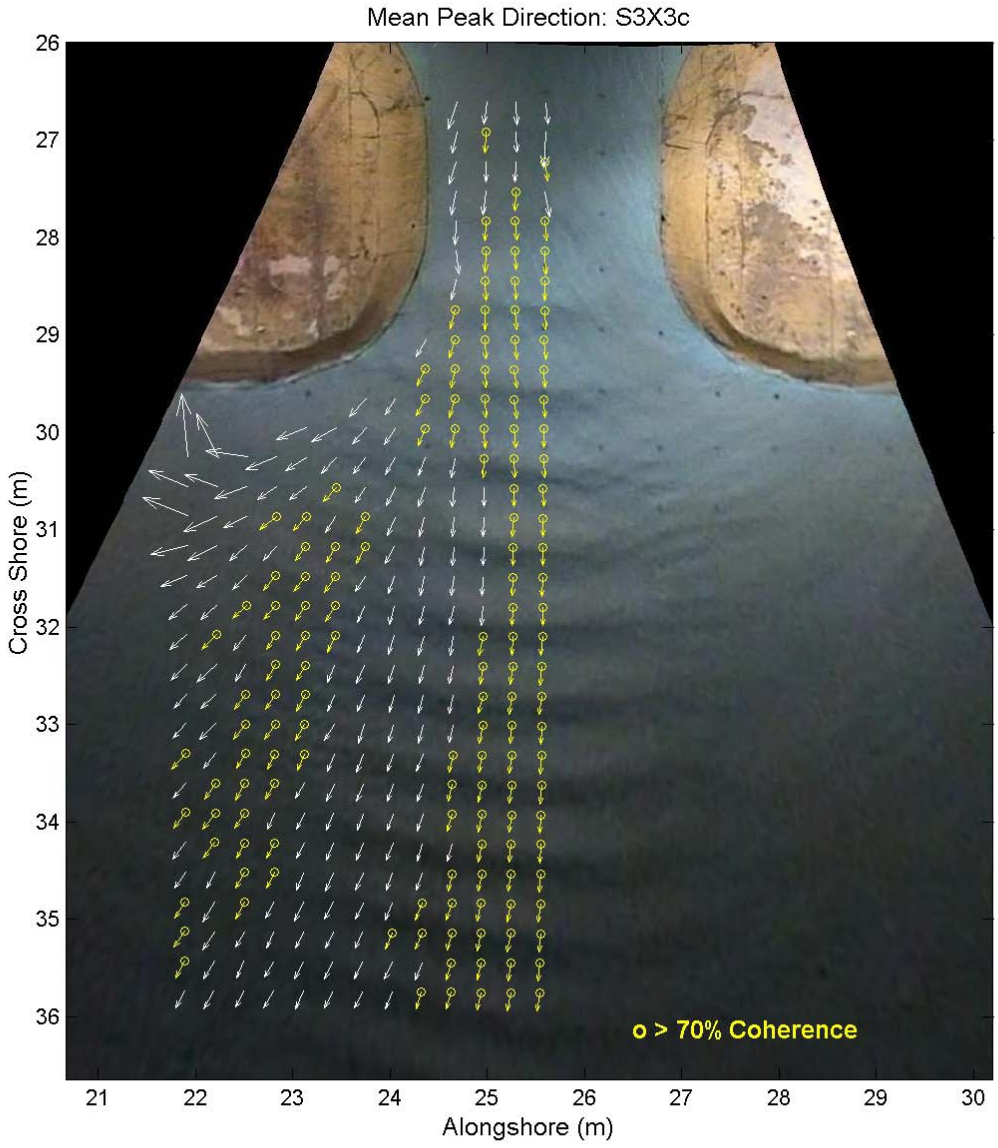
Mean Peak Direction: S3X3c
Cross Shore (m)
Alongshore (m)
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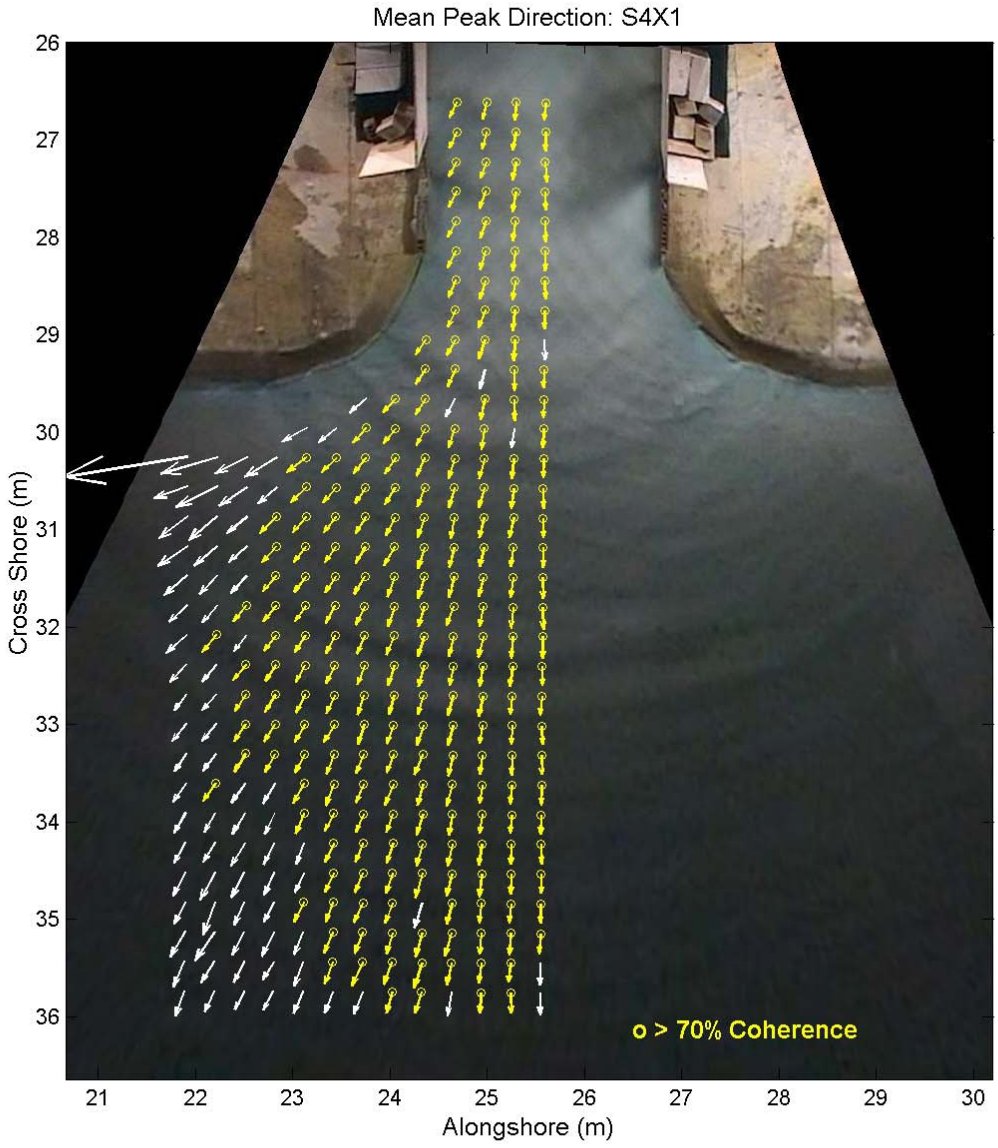
Mean Peak Direction: S4X1
Cross Shore (m)
Alongshore (m)
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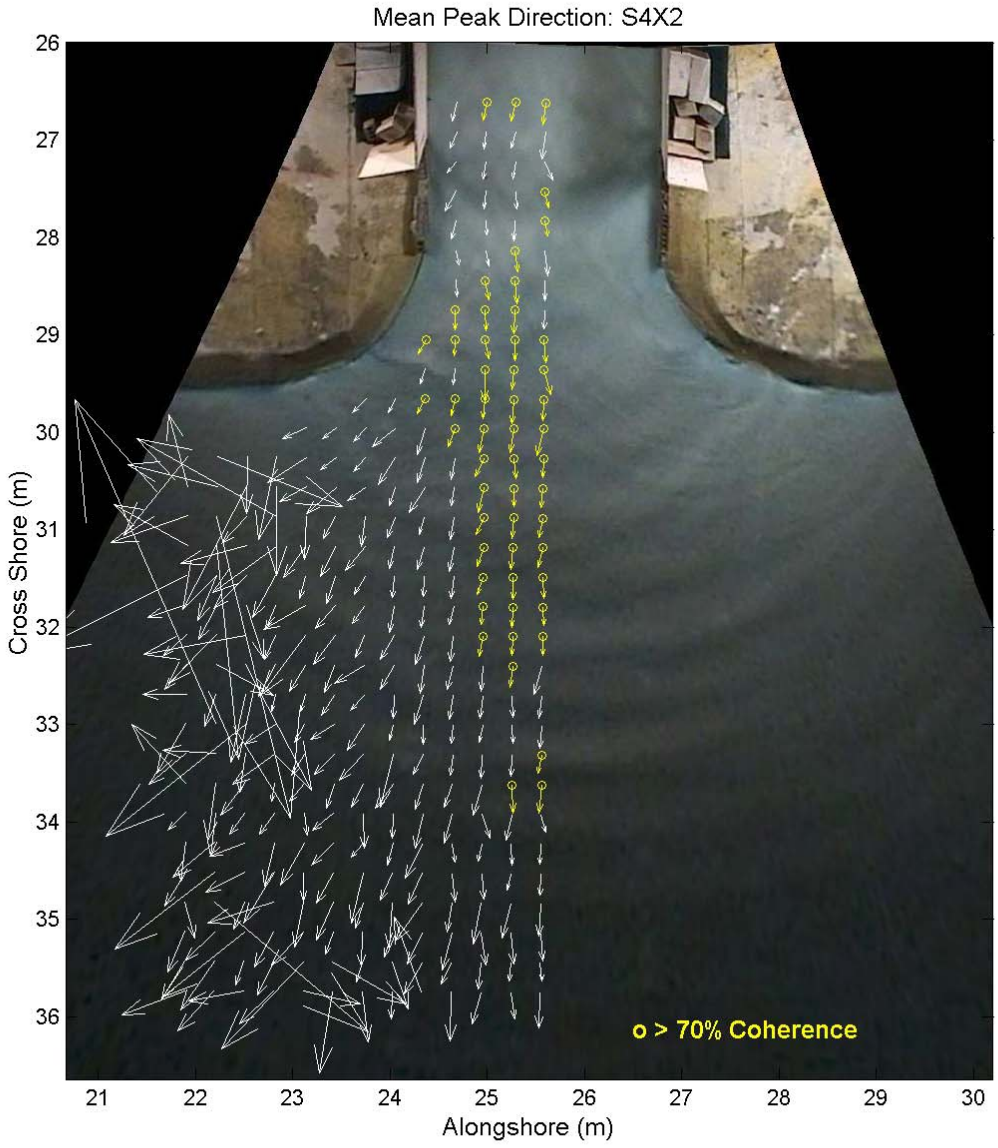
o > 70% Coherence


Mean Peak Direction: S4X2
Cross Shore (m)
Alongshore (m)
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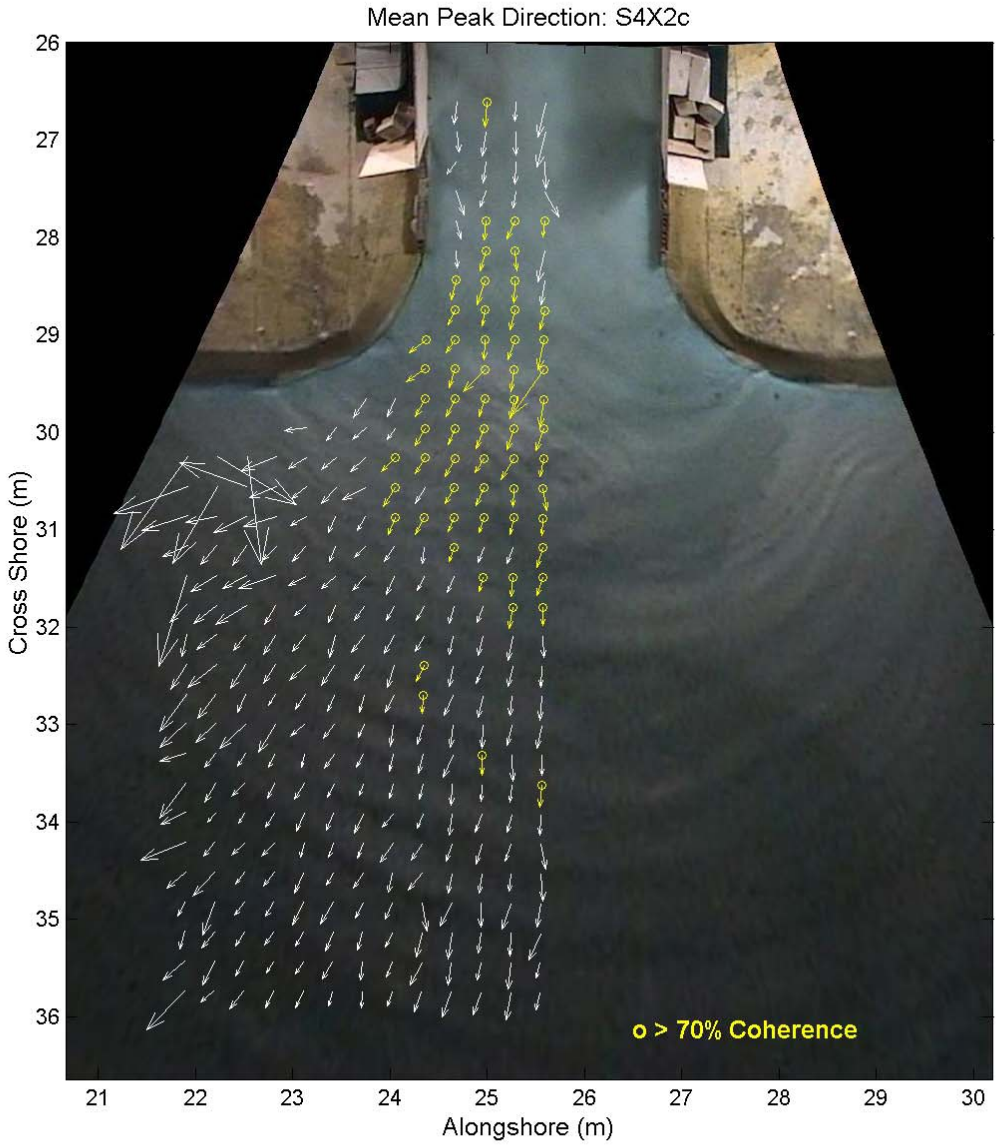
Mean Peak Direction: S4X2c
Cross Shore (m)
Alongshore (m)
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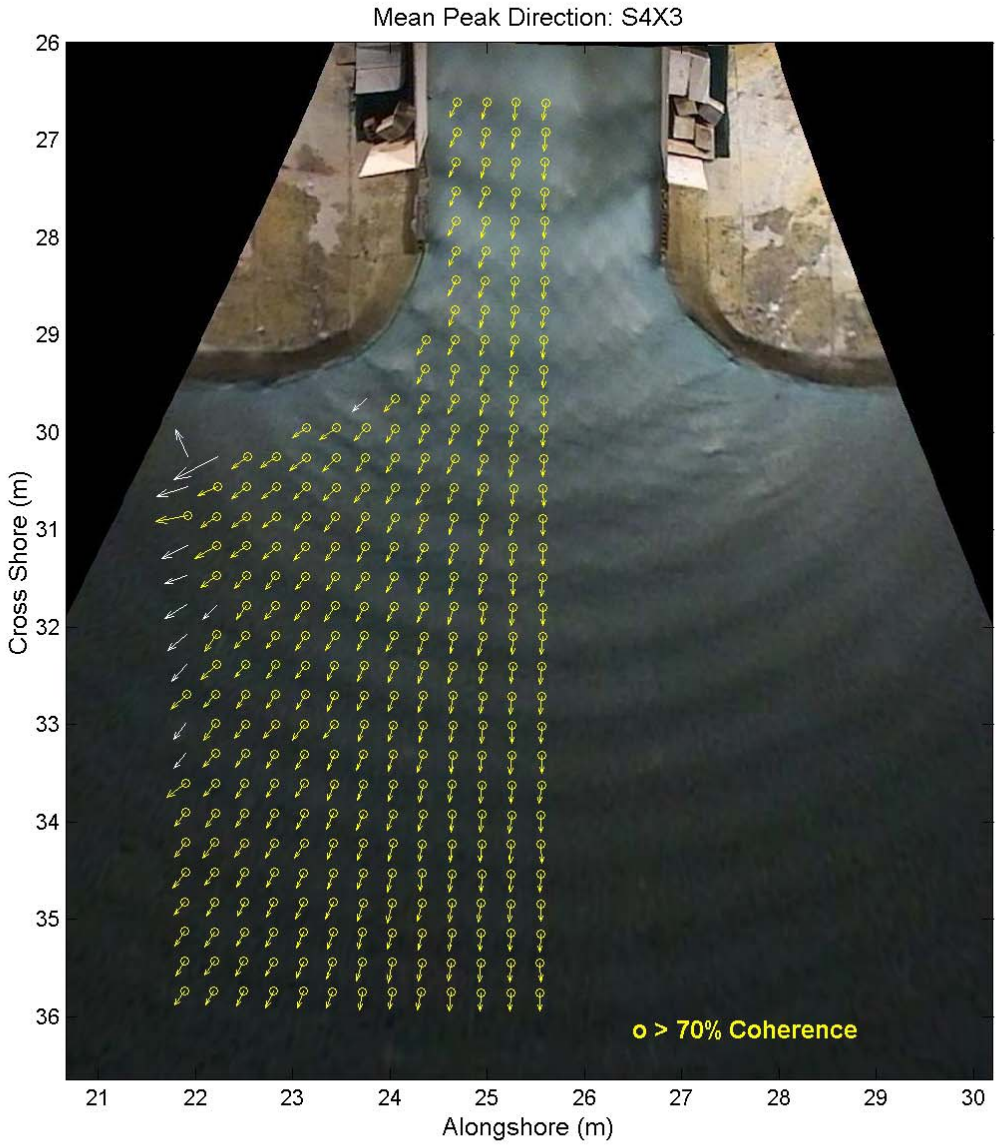
Mean Peak Direction: S4X3
Cross Shore (m)
Alongshore (m)
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REPORT DOCUMENTATION PAGE

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Physical Model Study of Wave Diffraction-Refraction at an Idealized Inlet

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5c. PROGRAM ELEMENT NUMBER

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A CD containing analyzed ASCII text data and model bathymetry obtained from the model configurations studied accompanies this report.

14. ABSTRACT

This physical model study of wave refraction-diffraction at structures typically present at coastal inlets was conducted to provide data sets that would aid in the calibration and verification of numerical wave models. The study was performed in the Coastal Inlet Research Program's (CIRP) idealized inlet experimental basin at the U.S. Army Engineer Research and Development Center (ERDC), Coastal and Hydraulics Laboratory (CHL).

Safe navigation, sediment transport into navigation channels, and shoreline erosion are all concerns at coastal inlets and are related to the transformation of waves as they change direction and height due to complex bathymetry and coastal inlet structures. The idealized inlet physical model, created for inlet studies, provided a facility in which to make wave measurements of height and direction in enough detail to document wave diffraction and refraction. Measurements of wave information included use of capacitive wave rods for wave height, acoustic-Doppler velocity sensors for wave direction, and new video-based wave direction measurement system.

Four idealized structural configurations were examined with two irregular waves, 0.8 sec, 0.2 ft (6.1 cm), and 1.6 sec, 0.15 ft (4.6 cm), and one regular wave, 0.8 sec, 0.15 ft (4.6 cm). Structure 1 consisted of a shore-parallel breakwater with the wave generator creating shore-normal and 20-deg-angle waves. Structure 2 was a typical dogleg jetty with shore-normal and 20-deg-angle waves. Structure 3 was an unjettied inlet but included flood currents. Structure 4 had parallel jetties at the inlet. Structures 3 and 4 were concerned with wave transportation into the bay. A total of 30 wave gauges were used to acquire data with 20 gauges placed on two movable racks for deployment into specified gauge arrangements. This study also introduced the use of a new technique for acquiring video-based measurements of wave angle, the Coastal Inlets Imaging System (CIIS).

15. SUBJECT TERMS

Inlet	Shoaling	Wave refraction
Jetty	Wave diffraction	
Model study	Wave direction measurement	

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