REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

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1. REPORT DATE *(DD-MM-YYYY)*	2. REPORT TYPE	3. DATES COVERED *(From - To)*
3/31/09	Final report	05/01/2004 - 12/31/2006

4. TITLE AND SUBTITLE

Final Report: High-Frequency Acoustic Billboard Array for High Spatial Resolution Measurements of the Ocean Sound Field

5a. CONTRACT NUMBER

5b. GRANT NUMBER

N00014-04-1-0582

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)

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5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

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8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

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Arlington, VA 22203-1995
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10. SPONSOR/MONITOR'S ACRONYM(S)

ONR

11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT

Distribution unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT

This DURIP/ONR project (N00014-04-1-0582) was to design and construct a 128-element, high-frequency (15 kHz design frequency) billboard array to be used in our High-Frequency/Mid-Frequency Passive Processing (HF/MF) program.

15. SUBJECT TERMS

HF/MF, billboard array, signal processing

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			Anne J. Footer
Unclassified	Unclassified	Unclassified	None	2	19b. TELEPHONE NUMBER *(Include area code)* 858-534-1802

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Standard Form 298 (Rev. 8/98)
Prescribed by ANSI Std. Z39.18

Final Report

High-Frequency Acoustic Billboard Array for High Spatial Resolution Measurements of the Ocean Sound Field

ONR Grant N00014-04-1-0582

Gerald L. D'Spain

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The original purpose of this DURIP grant was to design and construct a 128-element, high-frequency (15 kHz design frequency) billboard array to be used in our High-Frequency/Mid-Frequency Passive Processing (HF/MF) program. However, after the DURIP proposal was submitted but before the winners of the awards were announced, the ONR sponsor of our HF/MF program decided that he had sufficient funds in his core program to pay for the design and construction of the billboard array. Therefore, after consulting with Mike Traweek, the ONR sponsor who encouraged support for this DURIP, we redirected the funds in the grant into three areas 1) redesign and modification of our 128-element mid-frequency billboard array so that its design frequency was increased from 3.75 kHz to 5 kHz and its wet-end data acquisition system was identical to that of the new high-frequency array, 2) acquisition of 60 low-noise, low-power hydrophones from High Tech, Inc for use in our autonomous underwater vehicle program, and 3) acquisition of four 4-component acoustic vector sensors of advanced design from Wilcoxon Research, to be used in various applications including our autonomous underwater vehicle program.

A one-year no-cost extension was requested in the program because of the long lead-time on the acoustic sensors, both the hydrophones and the vector sensors. By the end of the second year of the grant, all funds had been expended on the three areas listed above. The modified mid-frequency array (along with the new high frequency array) were deployed from R/P FLIP in March/April, 2006 as part of our HF/MF Passive Processing program (sponsored by Code 321-US) and together they recorded over 18 TBytes of data during the 10-day period of the experiment. Analyses of these data, ongoing at present, have resulted in some very interesting features in the ocean sound field as well as provided information of direct relevance to the U.S. Navy. In addition, both arrays were taken to the Lake Seneca Calibration Facility in May, 2007 to conduct in-situ calibration measurements. This week-long effort also was highly successful and analyses of these data have just started.

In July, 2007, our prop-driven Bluefin 21 AUV was taken to sea equipped with a set of the High Tech hydrophones and an acoustic vector sensor as part of the ONR-sponsored PLUSNet program, Code 32-SP. Both sensor systems provided high quality

data. More recently, we have been flying our underwater flying wing glider with a 32-element High Tech hydrophone array all along its leading edge and a Wilcoxon acoustic vector sensor in its nose. This effort is part of our Flying Wing Underwater Glider program supported by ONR Code 321-OE. Analyses of these data will continue over the next year.

We expect the modified mid-frequency array, the new High Tech hydrophones, and the Wilcoxon vector sensors to continue to provide unique at-sea data collection opportunities for several years to come.