

AD-A066 831

TRACOR INC SAN DIEGO CA SAN DIEGO LAB
MEASUREMENT OF ECHO ENERGY SPLITTING OF HIGH RESOLUTION SONAR T--ETC(U)
MAR 68 D M HORTON
TRACOR-SD-68-005-C

F/G 17/1

N123(953)43996A
NL

UNCLASSIFIED

1 OF 1
AD
AD 66831



END
DATE
FILMED
'5--79
DDC

K2174

Contract No. N123(953)54996A
TRACOR Project No. 002-009-26
Document No. SD-68-005-C

UNCLASSIFIED

~~CONFIDENTIAL~~

Copy # 3

MON 11 MAR 1968

LEVEL II

MOST Project - 3

①

R

OGW LIBRARY COPY

00268

ADA066831

TECHNICAL NOTE

MEASUREMENT OF ECHO ENERGY SPLITTING OF HIGH RESOLUTION SONAR TRANSMISSIONS (U)

Good

DDC FILE COPY

Submitted to

U. S. Naval Undersea Warfare Center
San Diego, California 92152

Attention: Code D551

8 March 1968

DDC
RECEIVED
APR 4 1979
F

DISTRIBUTION STATEMENT A

Approved for public release;
Distribution Unlimited

SCIENCES AND SYSTEMS DIVISION • SAN DIEGO LABORATORY

3065 Rosecrans Place, San Diego, California 92110, AC 714/222-6692
Home Office: TRACOR Inc., 6400 Tracor Lane, Austin, Texas 78721, AC 512-926-2800



UNCLASSIFIED

~~CONFIDENTIAL~~

GROUP - 4
DOWNGRADED AT 3 YEAR INTERVALS
DECLASSIFIED AFTER 12 YEARS.

"This document contains information affecting the national defense of the United States within the meaning of the Espionage Laws, Title 18, U.S.C., Sections 793 and 794, and the transmission or revelation of which in any manner to an unauthorized person is prohibited by law."

AS-14

UNCLASSIFIED
~~CONFIDENTIAL~~

TRACOR 3006 ROSECRANS PLACE, SAN DIEGO, CALIFORNIA 92110

Contract No. 15 N123(953)54996A
TRACOR Project No. 002-009-26
Document No. SD-68-005-C

14 TRACOR-SD-68-005-C

9 TECHNICAL NOTE

6 MEASUREMENT OF ECHO ENERGY SPLITTING
OF HIGH RESOLUTION SONAR TRANSMISSIONS

12 7p.

Submitted to
U. S. Naval Undersea Warfare Center
San Diego, California 92152

ATTENTION: Code D551

11 8 March 1968

| | | |
|---------------------------------|-----------------------|-------------------------------------|
| ADDITION BY | | |
| WES | White Section | <input checked="" type="checkbox"/> |
| DSB | Buff Section | <input type="checkbox"/> |
| UNANNOUNCED | | <input type="checkbox"/> |
| AUTHORIZATION | | |
| <i>[Signature]</i> | | |
| BY | | |
| DISTRIBUTION/AVAILABILITY CODES | | |
| Gen. | AVAIL. and/or SPECIAL | |
| A | | |

Approved:

D.V. Holliday
D. V. Holliday
Project Director

Prepared by:

10 *D.M. Horton*
David M./Horton
Asst. Project Director

411 120 Gen

"This document contains information affecting the national defense of the United States within the meaning of the Espionage Laws, Title 18, U. S. C., Sections 793 and 794, the transmission or revelation of which in any manner to an unauthorized person is prohibited by law."

UNCLASSIFIED

~~CONFIDENTIAL~~

GROUP - 4
DOWNGRADED AT 3 YEAR INTERVALS:
DECLASSIFIED AFTER 12 YEARS.



3065 ROSECRANS PLACE, SAN DIEGO, CALIFORNIA 92110

ABSTRACT

This report describes the technique used to measure the extent of echo energy splitting as a result of multiple arrivals of a returning sonar transmission. Graphs of a typical correlogram obtained from correlation of the returned signal, and the plot of density function of the measurements of energy splitting are included.

CONFIDENTIAL



3065 ROSECRANS PLACE, SAN DIEGO, CALIFORNIA 92110

**MEASUREMENT OF ECHO ENERGY SPLITTING
USING HIGH RESOLUTION TRANSMISSIONS**

(C) Recent availability of high resolution sonar data consisting of 1000 Hz bandwidth LFM and PRN transmissions of up to 5 second duration has enabled the extension of echo energy splitting investigation beyond previous studies. This report covers only a portion of the available data with more extensive investigations to follow. The specific portion of data analyzed used a one second, 1000 Hz, LFM transmission with the array in the bottom bounce mode at a forty degree depression angle.

(C) From previous studies it has been determined that echo energy splitting accounts for a significant amount of performance degradation in sonar applications using large time-bandwidth product transmissions.

(C) TRACOR document number TRACOR SD-67-023 (U), "Measurement of Echo Energy Splitting", describes a technique of measuring the extent of echo energy splitting for a high resolution sonar system. As described in the referenced document, the ratio of signal energy in the highest resolvable peak of the echo to the signal energy in the total echo arrival gives the desired measure of energy splitting.

(C) This technique has been applied to the VERULAM data on a limited basis. Thirty seven bottom bounce echoes resulting from 1000 Hz bandwidth, 1 second duration LFM transmissions were processed through a linear, quadrature correlator. A typical correlogram of the analyzed data appears in Figure A-1.

CONFIDENTIAL

CONFIDENTIAL



3065 ROSECRANS PLACE, SAN DIEGO, CALIFORNIA 92110

As evidenced by the correlogram, the echo shows a highly structured splitting with the one millisecond resolution fairly obvious.

(C) Measurements of energy splitting were made on each of the correlograms referenced above. Results were obtained ranging from -5.8 dB to -11.3 dB. The mean echo energy splitting was calculated to be -8.7 dB. Further investigation has revealed that deficiencies in the transmit beamformer resulted in approximately 3 dB of energy splitting of the transmitted signal at this depression angle. With the results (measured in dB) plotted on a probability grid, as in Figure A-2, two interesting aspects of the examination appear. Within the accuracy of the tests, the calculated mean is in agreement with the mean at the 50% probability axis of the graph and the form of the results obtained follow a normal law.

CONFIDENTIAL

CONFIDENTIAL

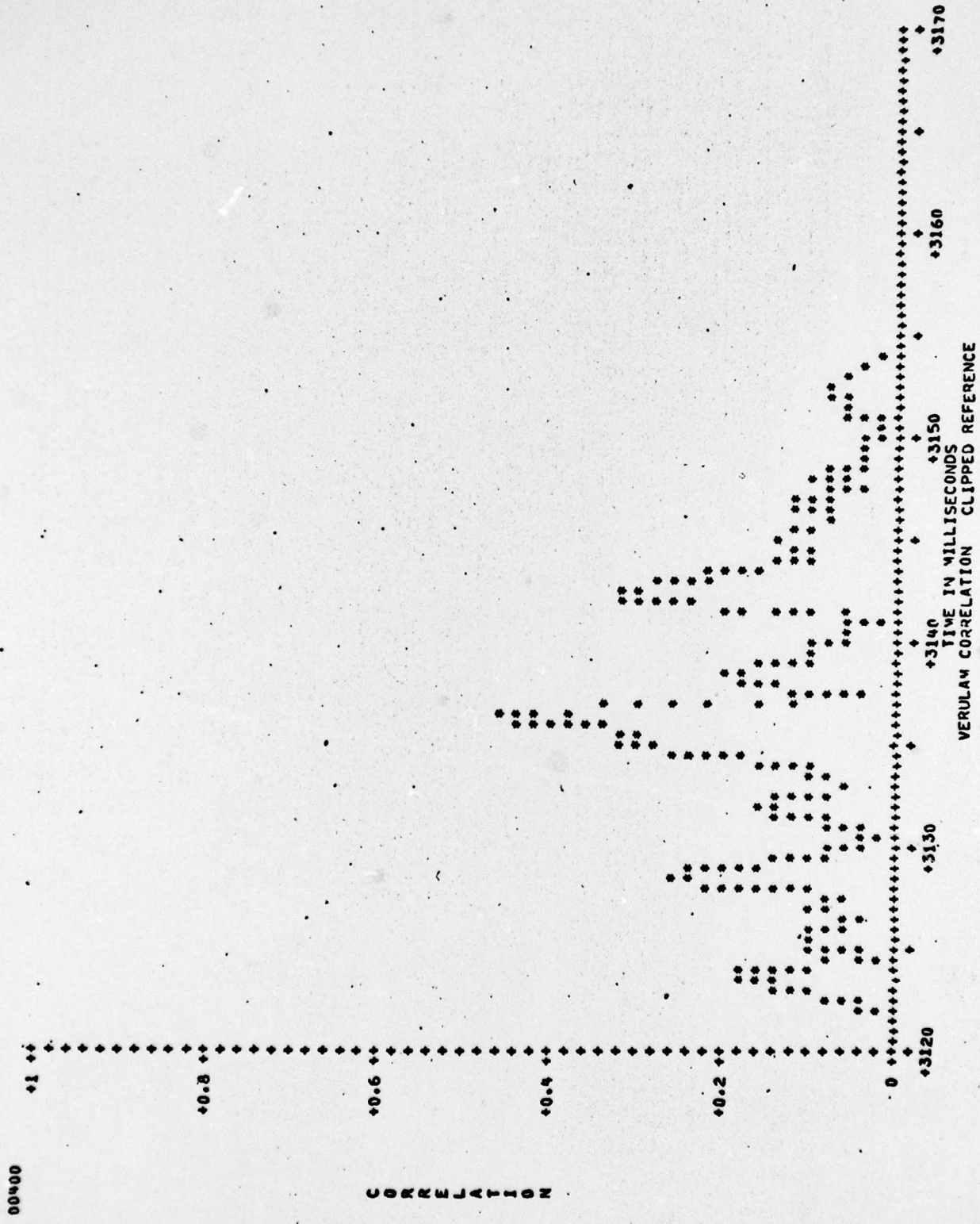


Figure A-1
CORRELOGRAM FOR A 1000 Hz, 1 SEC, LFM ECHO

CONFIDENTIAL

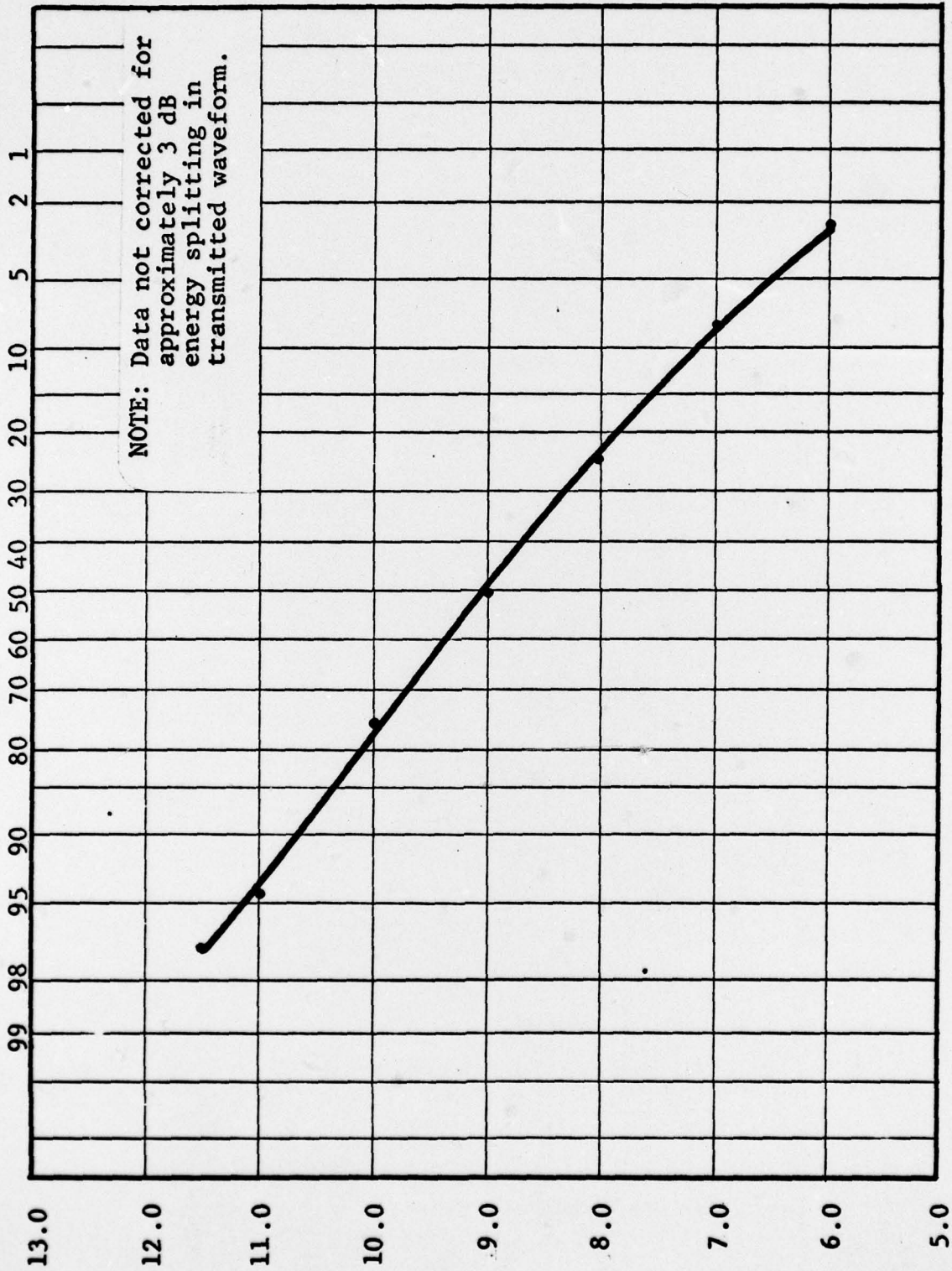


FIGURE A-2 DENSITY FUNCTION OF ECHO ENERGY SPLITTING MEASUREMENTS