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VLF SONAR COMMUNICATION '67 STATUS.(U)
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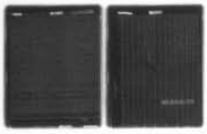

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U. S. NAVY ELECTRONICS LABORATORY, SAN DIEGO, CALIFORNIA

This is a working paper giving tentative information about some work in progress at NEL. If cited in the literature the information is to be identified as tentative and unpublished.

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V L F S O N A R C O M M U N I C A T I O N

'67 S T A T U S.

by

F. R. Abbott
Code 3130

(NEL Problem B20761)
(NEL Problem L30861)

U. S. NAVY ELECTRONICS LABORATORY
San Diego, California 92152

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ILLUSTRATIONS

THE PROBLEM is to,

Develop a compact V L F Sonar Kit to provide remotely deployed submerged submarines with a communication link to shore.

RESULTS

Two types of projectors have been built and calibrated. Operational sea trials are beginning. Both are intended for quick installation in an empty torpedo tube whenever operationally required. The lower power, light weight version transmits in the 140 to 2000 cps band. The heavier, high power unit is primarily for use in the 25 to 50 cps band. It yields strong signals to shore based listening arrays at 3000 miles range or farther. The smaller, higher frequency unit is limited to about 100 miles usable range at present.

PLANS

Extensive operational sea trials are planned for fiscal 67. Towable hydrophone arrays will be used to appraise the practicability of two way VLF sonar communication by submarines.

ADMINISTRATIVE INFORMATION

This project was carried through by the Electrodynamics Division of NEL. Transducer and power supply development was a part of the effort under SF 106 04 01, Task 8277 and SF 101 03 16, Task 11314, NEL Problems 20761 and L30861, respectively.

THE SONIC PROJECTORS

The ceramic folded horn source shown in figure 1 weighs 67 lbs. and is fed from a 250 watt commercial "Optimation" power amplifier. It consists of a ceramic stack housed in a metal shell providing a long mechanical path to the mutually facing, flared sections that form the primary sound projecting pistons. This assemblage delivers about 10 acoustic watts throughout the voice frequency range. It is more completely described in a report now in preparation. Figure 2 shows a typical source level response at normal 100 volt working level.

The Torpedo Tube BK shown in figures 3 and 4, with shell removed is a linear motor type of device also described more fully in a report nearing publication.

The cycle converter, power amplifier shown in figure 5 is normally fed from the submarine 3-phase power supply. It converts about 20KVA under normal operation from the input 3-phase to the single phase frequency desired.

Figure 6 shows the power lead fitting which replaces the standard "B" fitting.

Internal air pressure in each type of projector must be controlled. The folded horn uses one or more aircraft type inner tubes. The BK requires suitable pressure and exhaust leads through the special replacement "B" fitting.

Figure 7 is a reproduction of 30 cycle pulses transmitted 3600 miles from a BK Model III at 150 foot depth to a listening array on the Southern California Coast. Correspondingly equal or better copy was obtained at all U. S. Sonar Surveillance Stations surrounding the north Pacific basin. Such

other stations were all at somewhat closer range. At reduced range, higher frequency harmonic components were sometimes evident. Figure 8 shows the source level curve for the BK at 400 amperes current at favorable positions in the torpedo tube.

C O N C L U S I O N

V L F sonic source components are now in satisfactory state of development for extensive operational sea trials by submarines.

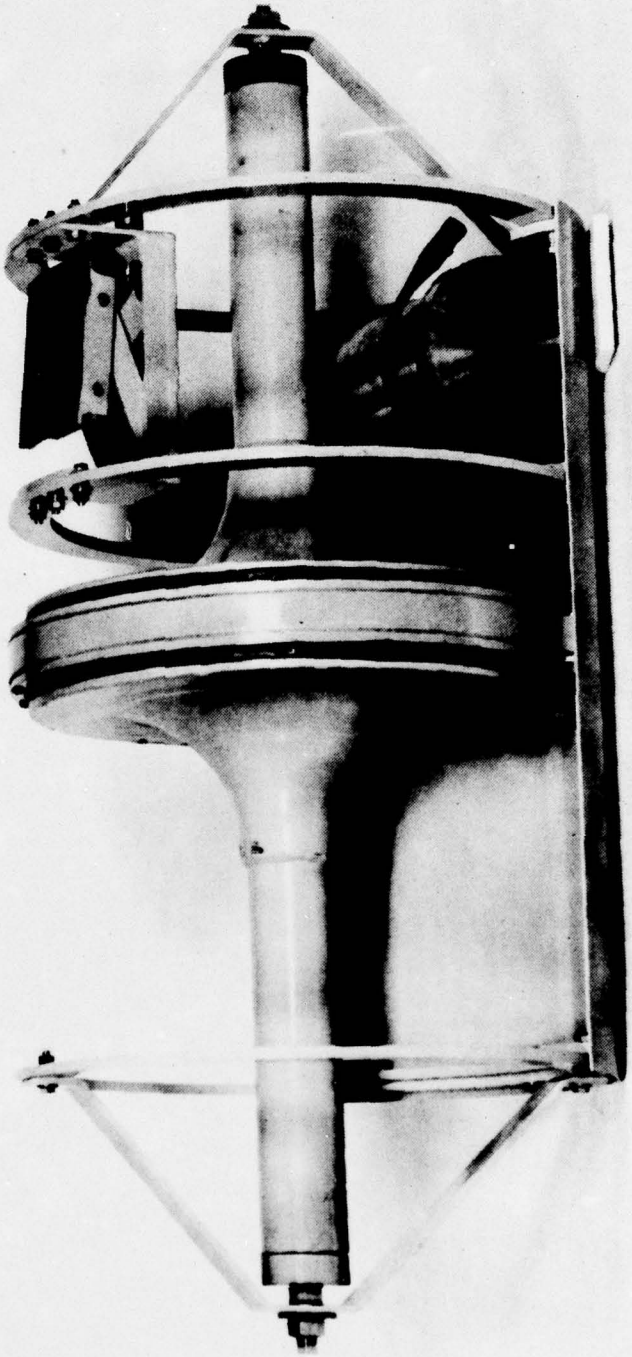

Figure 1. Transducer Folded Horn.

K&E 10 X 10 TO THE INCH 359-5
KEUFFEL & ESSER CO. MADE IN U. S. A.

100 Volt input

18" Folded Horn CIS&T #5

Nominal Input Reactance 20 Ω
" " Resistance 2 Ω

90

80

70

60

100 200 300 400 500 600 700 800 900 1000 1100

CPS

20 Feb 66
Transducer

FIGURE 2.

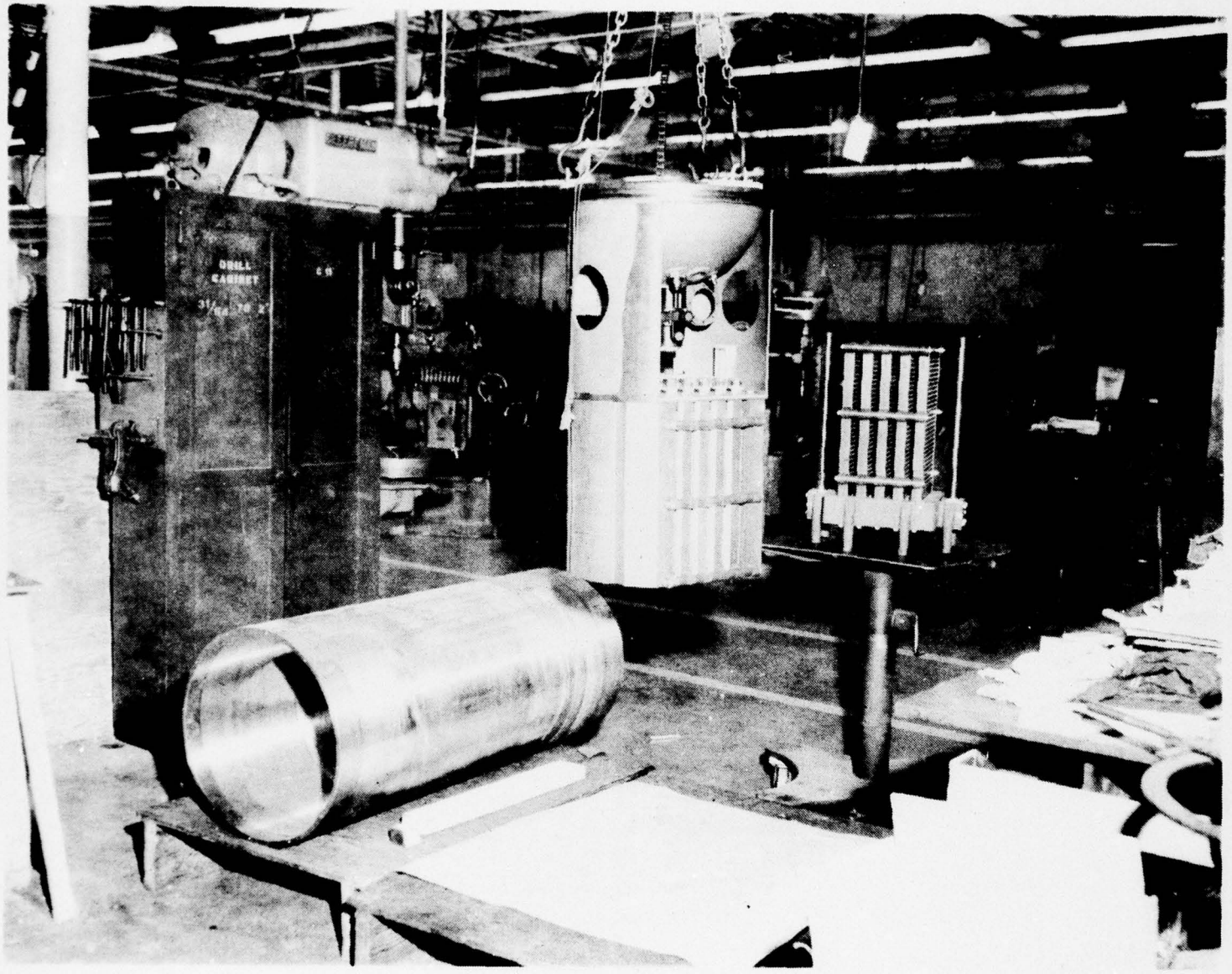

Figure 3. Transducer BK M-9

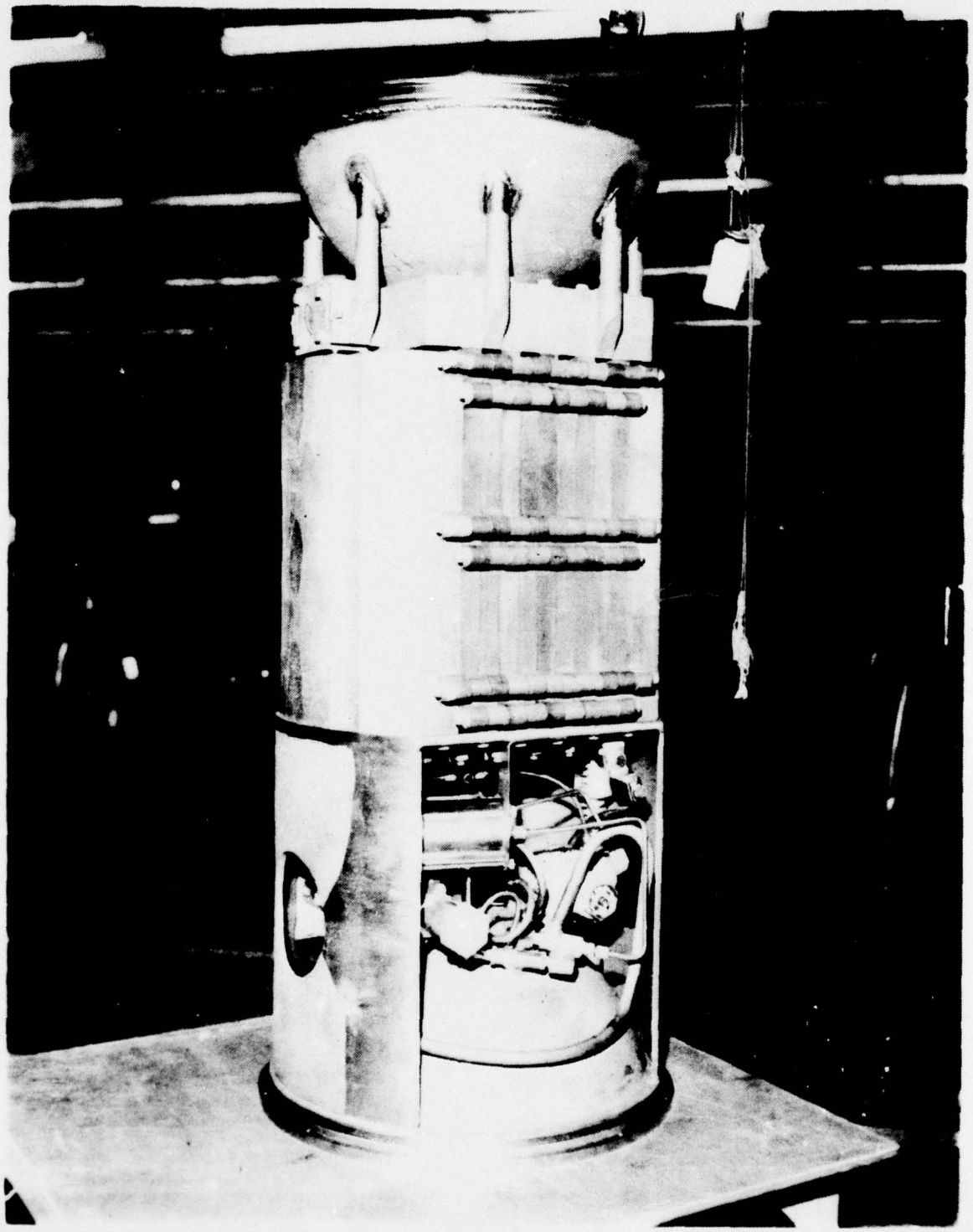

Figure 4. Transducer

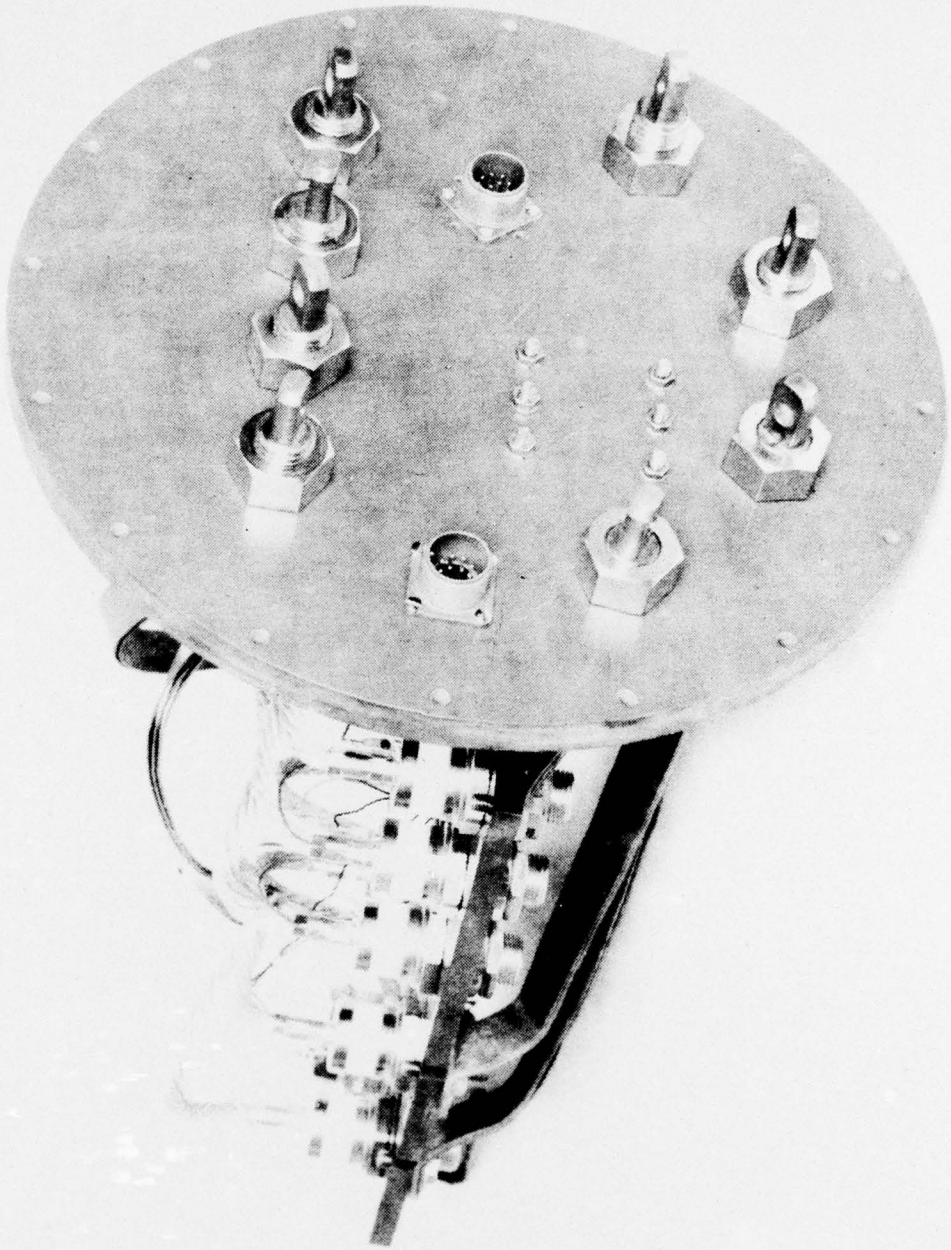

Figure 5. Inverter, Rectifier

Figure 6. Torpedo tube Stuffing Gland

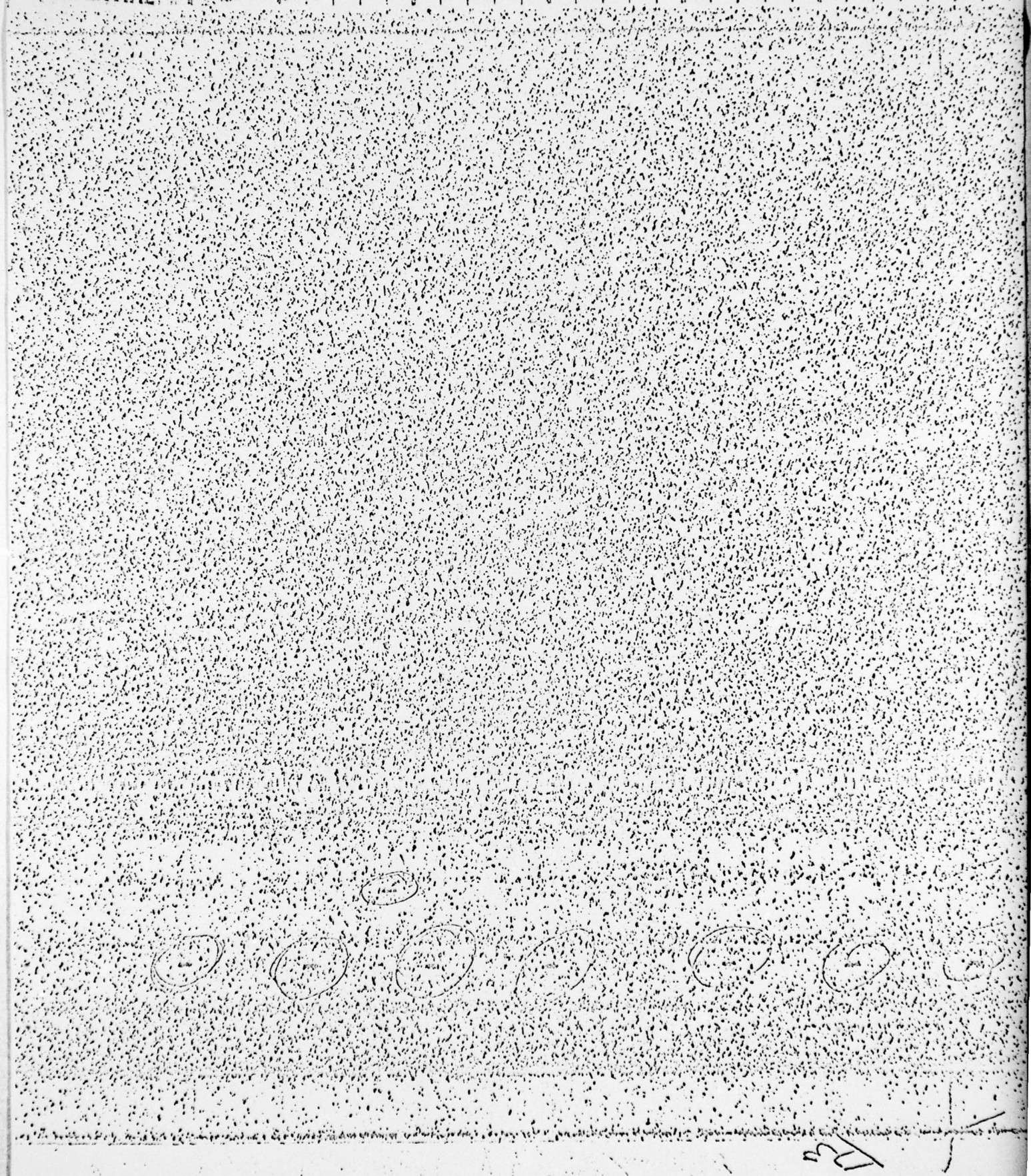

FIGURE 7. Lofargram

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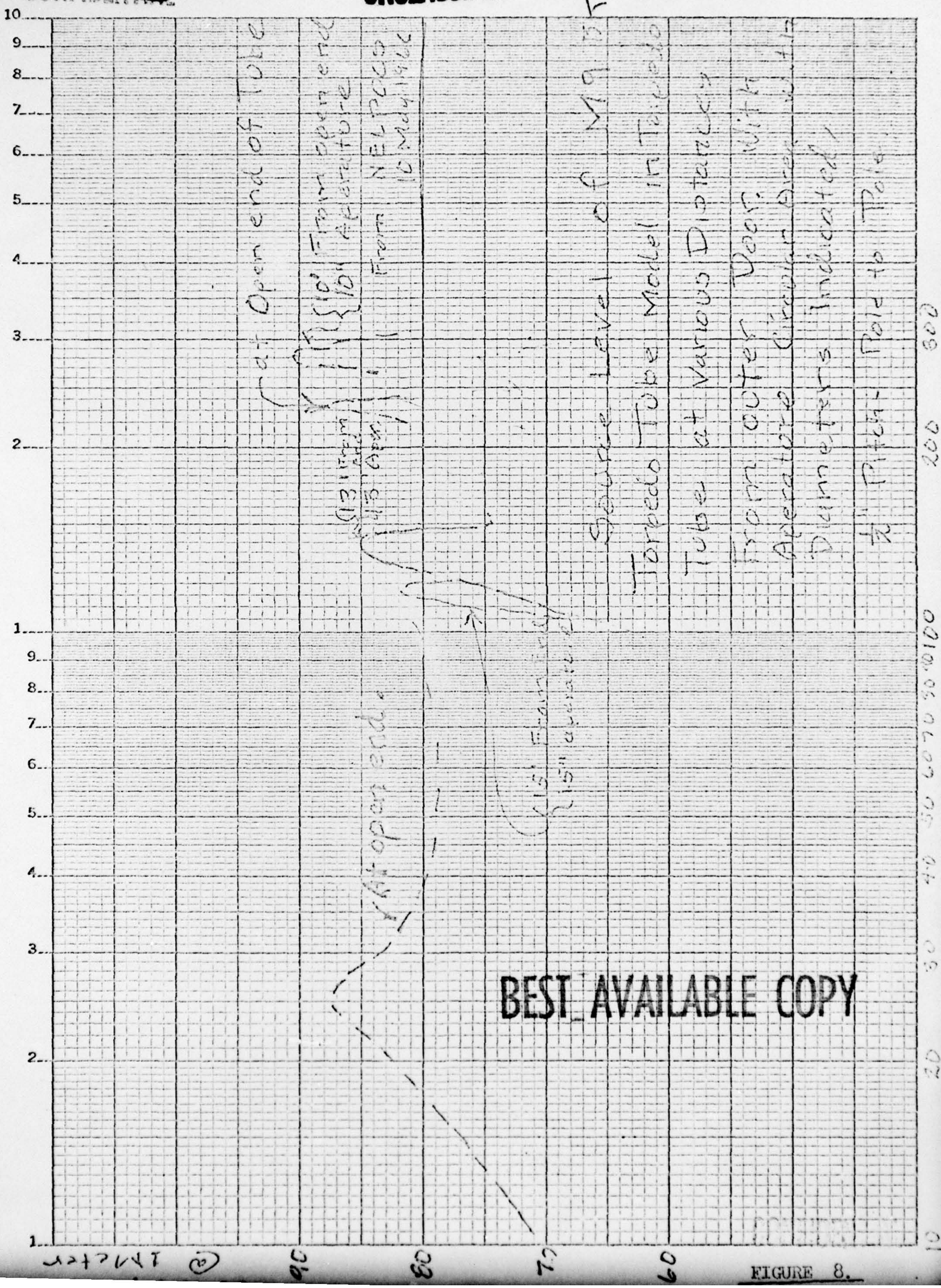

FIGURE 8.