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U. S. NAVY UNDERWATER SOUND LABORATORY
FORT TRUMBULL, NEW LONDON, CONNECTICUT

MONTHLY PROGRESS REPORT OF THE OPTICAL SYSTEMS BRANCH
FOR DECEMBER 1966

by

Louis J. Free

USL Technical Memorandum No. 2121-05-67

30 January 1967

STUDIES OF ADVANCED CONCEPTS IN ELECTRO-OPTICS
(G. Motin and H. Ruhlmann)

1-026-00-00
SF001 01 02-11276

Objective: Study the characteristics and capabilities of new develop-
ments in electro-optical devices.

A precision lathe bed type optical bench, carriers and accessories
manufactured by Ealing Corporation have been ordered. These will be used
for contrast transfer and optical resolution experiments.

A preliminary test procedure has been established for testing
various night vision devices and infrared viewers.

UNDERWATER AND ATMOSPHERIC PROPAGATION
(L. Free and R. Polley)

1-053-00-00
SRO11 01 01-0401

Objective: Conduct propagation and noise investigations in the at-
mosphere and underwater in spectral regions useful to
Navy programs.

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No. 2121-05-67

Measurements of the comparative laser calibration performance of the EG & G Model 585 radiometer and the Korad KJ-2 calorimeter was concluded.

Final measurements closely confirmed earlier results showing that, for energy values in the 0.1 joule region, calorimeter readings average 23% above those of the radiometer.

During the months of November and December, H. Ruhlmann participated in Project Ears aboard the USNS SANDS and performed optical measurements in the North Atlantic. The measurements were made with the USL self-contained 4 meter transmissometer. Continuous transmission recordings were obtained from the surface to approximately 12 ft. from the bottom, which at its deepest was 15,500 feet. Data from four successful lowerings of the instrument has not been fully analyzed, but is expected to provide absolute measurements of ocean water transmission in the 5000-6000 A° region. The data shows that at certain depths a decrease in transmission occurs due to an increase in light scattering, and gives a plot of the various scattering layers.

ELECTROMAGNETIC NOISE MEASUREMENTS IN THE SEA
(M. Finkle and E. Soderberg)

1-400-01-00
SR104 03 01-0592

Objective: Measure electromagnetic characteristics of ocean affecting the design, predicted performance and operational use of Navy equipments.

SURFACE SHIP MEASUREMENTS

The shipboard data acquisition system is now completed except for the environmental chassis (temperature and pressure sensor readouts). The system has been checked out in the Laboratory and will be tested at sea during a two week, EM measurement cruise aboard AGOR-7 scheduled for February.

A power spectrum analysis has been made for the EM data obtained during two morning runs on the April 1966 cruise on AGOR-4.

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GENERAL:

Work has started on the design and fabrication of a small, portable field set with which to make measurements of EM noise in the sea at remote sites.

INFRARED SUPPORTING INVESTIGATIONS
(P. Solarz)

1-950-00-00
SF006 05 02-7009

Objective: Investigations in support of infrared communication, detection, surveillance and reconnaissance system development. Major effort is directed toward support of IR communications.

Lamps:

The life test on the 1000-watt, 3-electrode lamp #R-78 developed by Westinghouse ended when the lamp exploded after a total operating time of 1593 hours. The lamp had been inspected approximately 10 hours earlier and appeared to be in good condition. Operating conditions were: lamp current 50 amperes D.C., lamp voltage 22 VDC, air flow across lamp 60 CFM, approximate number of start 350, maximum "on" time per day- 8 hours, temperature at top seal 246° C, temperature at bottom seal 186° C.

The life test of a new 1000-watt, 3-electrode lamp (#R-82) was begun. The purpose of this test is to determine lamp performance when operated at a simmer current of 15 amperes D.C. This test has been temporarily discontinued after 30 hours of operation because the associated equipment was needed for another project.

Preliminary design of a 300-watt omni-directional beacon has begun. This beacon will be used in conjunction with the AN/SAC-7(XU-1) Directional Optical Communication Sets being fabricated by the Espey Corporation.

Modulation:

An intermediate design of a modulator for the 1000 watt Xenon lamp utilizing a commercially available Christie power supply is 95 percent complete. Although modulating this type of supply (constant current)

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presents some unusual design problems, full modulation of the lamp is possible. An attempt will be made with some power supply modifications to improve the line power factor.

ELECTRO-OPTICAL SURVEILLANCE
(M. Hillsman)

1-955-00-00
SF001 05 01-10764

Objective: Determine and measure parameters affecting Naval usefulness of electro-optical devices for night surveillance.

A "photometer" (radiometer) was assembled using a new power supply, picoammeter, and a photomultiplier cooling chamber. A significant improvement in signal-to-noise ratio at low light levels has been achieved. This system is to be used in obtaining information on the spectral distribution of night sky radiation in the S-20 region.

Another radiometer, battery-operated for field use, has been received. This unit will be used to measure integrated S-20 response to ambient night sky radiation.

SUPPORT TO TDP
(A. Middleton)

1-955-01-00
S 36-41-11633

Objective: Develop, test and evaluate night viewing equipment service test models for Fleet use.

During the period from 28 November through 10 December, L. Free, A. Middleton and F. Allard participated in LLLTV Direct View evaluation tests conducted at NOLTF, Solomons Island, Maryland. The night viewing device mounts were also evaluated during this period and were found to be adequate for PBR installations. Design changes to incorporate an azimuth locking device and teflon thrust bearing are in progress.

On 14 December A. Middleton delivered two NOD units, two NOD yokes and power supplies designed at USL to the Philadelphia Naval Shipyard for installation aboard the PAB-35 and APB-36. Arrangements will be made to perform a technical evaluation of the NOD yokes aboard the APBs during February 1967.

Two prototype yokes for use on a ship's binocular mount have been fabricated and will undergo laboratory tests during January.

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During the period 22 November to 22 December, M. Hillsman accompanied the COMPHIBTRAPAC Mobile Training Team to South East Asia to provide technical assistance to the team and to observe and note problems related to the use of Night Vision Equipment.

Six letter reports were generated detailing these and other Laboratory related problems.

INFRARED FLEET SUPPORT
(P. Solarz)

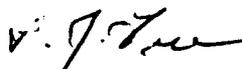
1-956-00-00
S 46-14-006-7700

Objective: Provide assistance to Naval operating forces in support of need for optical techniques and equipment to accomplish operational objectives.

On 13 December 1966, J. Flatley, F. Miskiewicz and R. Rasi visited the Espey Company, Saratoga Springs, N. Y. to check on the progress of Contract NO0140-67-C-0120 (Infrared Communication Set, 300-watt, Hand-Trained, AN/SAC-7(XU-1)). Espey had breadboarded and demonstrated the 300 watt Xenon lamp modulator and lamp start circuitry. The lamp starter is small in size and performs exceptionally well. Design of the transceiver head will not begin until the optical components for the transmitter and receiver are selected.

The design and construction of a standard source (2 units) for making AN/SAC-7(XU-1) relative receiver sensitivity measurements is continuing. An internal 10 X 10 mm silicon detector will be used to monitor the signal amplitude of the source. The source will be modulated with either 935 Hz or 1275 Hz which are the two frequencies which will be used in the AN/SAC-7 sets.

The construction of the Type "W" Portable Infrared Communication Sets utilizing the 15 watt sealed beam cesium lamp has been completed. Laboratory testing of these units will commence in January 1967.


L./J. FREE

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