AD NUMBER
AD039486
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AUTHORITY
E.O. 10501 dtd 5 Nov 1953; NAVEXOS ltr dtd 1 Apr 1968

[redacted]

THE UNIVERSITY OF TENNESSEE
DEPARTMENT OF ELECTRICAL ENGINEERING

DEVELOPMENT OF A HIGH FREQUENCY STEERABLE ANTENNA

Navy Department
Bureau of Ships
Electronics Divisions

Interim Development
Report No. 13

Contract No. NObsr-57448
Index No. NE-091035 ST7
10 October 1953

A PROJECT OF THE ENGINEERING EXPERIMENT STATION
THE UNIVERSITY OF TENNESSEE COLLEGE OF ENGINEERING
[redacted]
Knoxville 16, Tennessee

[redacted]RICTED

INTERIM DEVELOPMENT REPORT

FOR

DEVELOPMENT OF A HIGH FREQUENCY STEERABLE ANTENNA

This report covers the period
1 September 1953 to 30 September 1953

ENGINEERING EXPERIMENT STATION
THE UNIVERSITY OF TENNESSEE
KNOXVILLE, TENNESSEE

Navy Department — Bureau of Ships
Electronics Divisions

Contract No. NObsr-57448 — Index No. NE-091035 ST7

10 October 1953

Copy No. 10

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ABSTRACT

This report covers work done on Contract No. NObsr-57448 Index No. NE-091035 ST7, at The University of Tennessee during the month of September 1953.

The following was accomplished:

1. The calculation of vertical patterns of the Maypole antenna was continued.

2. The construction of an experimental model of the circular traveling-wave antenna was started.

3. The theoretical work on vertically stacked rhombics was continued.

[redacted]D

PART I

Purpose

This project involves the development of a high frequency steerable antenna having the following characteristics:

1. It shall be operable throughout the frequency range of 4 to 32 megacycles per second.

2. It shall be capable of four, or more, simultaneous transmissions on different frequencies, and at different azimuth and elevation angles.

3. For each transmission, it shall be capable of being directed to any azimuth angle and to any elevation angle between the horizon and 30° above the horizon.

The communication system shall provide reliable 24-hour day-to-day communication with a 20 decibel signal-to-noise ratio. The ranges to be covered are from approximately 500 nautical miles to 4000 nautical miles.

The development consists of two phases:

Phase I. Theoretical and experimental studies.

Phase II. Development of design criteria.

General Factual Data

Personnel:

F. V. Schultz	Project Director	72 1/2	Man-hours
W. O. Leffell*	Assistant Engineer	15	Man-hours
W. J. Bergman	Junior Engineer	112	Man-hours
H. P. Neff	Junior Engineer	176	Man-hours
L. W. Ricketts*	Junior Engineer	104	Man-hours
G. R. Turner	Secy-Draftsman	16	Man-hours
L. Phillips	Technician	44	Man-hours
W. H. Williams	Technician	4	Man-hours
N. Norris	Secretary	2	Man-hours
R. M. Johnson	Student Computer	10	Man-hours
H. W. Knox	Student Computer	124 1/2	Man-hours

* Preparation of antenna test facility.

Detail Factual Data

1. The antenna pattern recorder was received late in the month and its installation was started.

2. The limited investigation of tilted V, or Maypole, antennas was continued. Calculations are being made of the vertical pattern through the plane of symmetry of the antenna to show the variation in this pattern when one of the following three antenna parameters is varied and the other two are held constant: leg length ($\mathcal{L}$), height (h) and included angle (2γ). These calculation have turned out to be more lengthy than at first estimated.

3. Work was started on the construction of models of the circular traveling-wave antenna to be used in determining experimental patterns of this antenna.

4. The investigation was continued of determining the possibilities of steering the antenna beam in the vertical plane by using two rhombics stacked vertically. This work has not progressed far enough to warrant the statement of any results.

5. The requested Signal Corps report on angles-of-arrival was not received so no work was done on this phase of the project.

Conclusions:

None.

DEPARTMENT OF ELECTRICAL ENGINEERING
ENGINEERING EXPERIMENT STATION
THE UNIVERSITY OF TENNESSEE

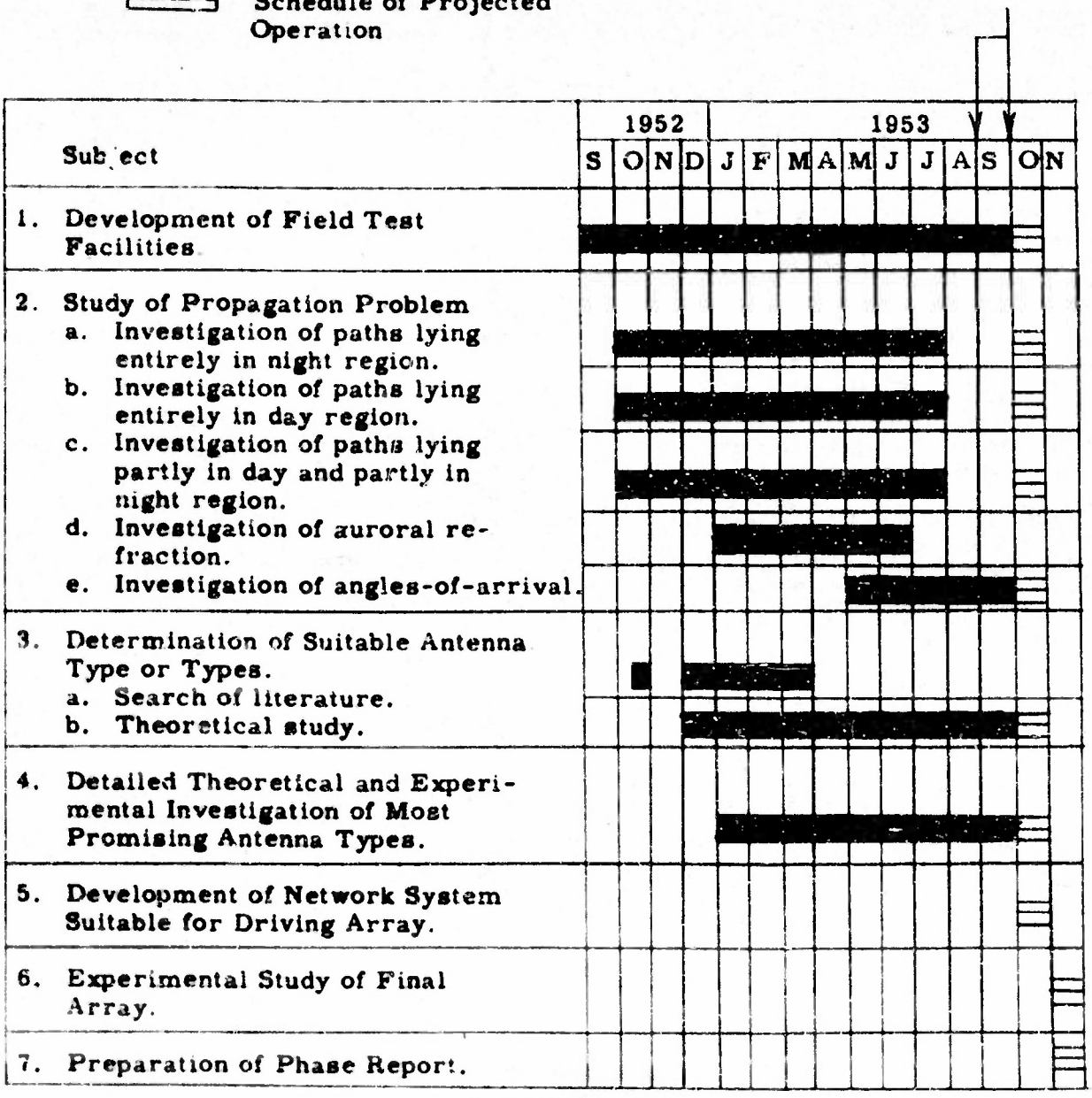
PROJECT PERFORMANCE AND SCHEDULE

Index No. NE-091035 ST7

Contract No. NObsr-57448 Date: 10 October 1953

Legend: ■ Work Performed Period Covered: 1/9/53 to 30/9/53

▭ Schedule of Projected Operation



PART II

Program for Next Interval

1. The antenna pattern recorder will be installed.

2. The calculations of antenna patterns of a Mayple antenna will be continued.

3. Experimental work will be continued on the circular traveling wave antenna. The first task will be that of correctly terminating the antenna in order to reduce the reflected wave as much as possible.

4. The investigation of the possibility of accomplishing vertical steering of the antenna beam by using two rhombics stacked vertically will be continued.

5. Work will be started to determine the characteristics of a vertical half-rhombic mounted over an earth of finite conductivity.