

UNPUBLISHED PRELIMINARY DATA

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I. INTRODUCTION

This report briefly summarizes the work carried out during the past six months on studies of the relations between the radar scattering properties of "moon-like" surfaces (including the lunar surface) and their surface features. Three areas of study have been pursued to provide fundamental data concerning the determination of the physical characteristics of a surface with emphasis on the lunar type surfaces from the electromagnetic scattering characteristics. These areas of study are (1) Theoretical studies of the two-frequency radar experiment and other experiments that might prove of value, (2) Measurement of the complete scattering properties of "moon-like" surfaces on the model range, and (3) Measurement of the scattering properties of the moon.

II. THEORETICAL STUDIES

The principal effort has been directed toward the interpretation of the results of the doppler spectrum experiment. Initially considerable difficulty was experienced in the interpretation of the results from this experiment. It was found that the analog data reduction equipment was not capable of giving the required resolution and the filter characteristics of the

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narrow-band filter contained in the equipment was being injected into the doppler spectrum characteristics. A computer program has been completed in which the basic analog data is converted into digital format and the results processed by an IBM 7090 computer. The initial results from this program show considerable improvement and the few additional problems are expected to be resolved within the next few weeks.

Studies have been initiated on extending the analysis of the two-frequency radar experiment from the simple flat surface¹ to the curved surface of the moon. A computer program has been completed from which it is possible to track the moon on a programmed track.² This is required for the transmitter facility since the only means of tracking is by an optical telescope.

III. EXPERIMENTAL STUDIES

A. Bistatic Measurements

The complete radar scattering characteristics of a number of "lunar-like" surfaces have been completed. These scattering measurements were made at a frequency of 10 kmc using both direct and cross polarization. The results of these measurements will be presented in a future technical report.

B. Lunar Radar Experiments

The measurements of the scattering properties of the moon by the doppler spectrum technique utilizing the Ohio State University "Saucer Field" and the transmitting facilities of Ohio University are well underway. The measurement effort was temporarily reduced due to the difficulties encountered in the data reduction program. However, since this difficulty has been resolved the measurement effort is being increased. The scope of the experiments on the lunar surface have been increased as referenced in the program for the coming year.

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IV. PROPOSED PROGRAM FOR THE COMING YEAR:
NOVEMBER 1964 - OCTOBER 1965

The proposed program for the coming year will involve principally the lunar radar experiments.

A. Lunar Radar Experiments

The measurement of the scattering properties of the moon will be continued. The following series of experiments will be performed:

1. absolute radar cross section of the moon at 2270 mc
2. the continuation of the mapping of the moon by the doppler spectrum technique
3. the measurement of the scattering characteristics as obtained from the direct and cross polarization received return
4. the use of the adjacent frequency technique to obtain increased information concerning surface roughness.
5. the effects of base line separation upon multiple receiving sites.
(This experiment will be performed if time permits).

B. Theoretical Studies

Theoretical studies would be continued with the major emphasis being placed upon the interpretation of the results of the lunar radar experiment. The analysis of the two-frequency radar experiment would be continued with emphasis on the extension to the moon's surface.

Very truly yours,

Robert C Taylor

Robert C. Taylor
Assistant Supervisor

RCT/cld

REFERENCES

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2. Zolnay, S. L., "Look Angles for a Celestial Body", report number 1388-15, 6 October, 1964, Antenna Laboratory, Ohio State University Research Foundation, prepared under Grant number NsG-213-61 with National Aeronautics and Space Administration, Washington, D. C.