THE UNIVERSITY OF MICHIGAN RADIATION LABORATORY

2455 Hayward Street
Ann Arbor, Michigan 48105

(313) 764-0500

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Air Force Avionics Laboratory
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4950 Test Wing (Technical)
ATTENTION: AFAL-WRP
Wright-Patterson AFB, Ohio 45433

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| SUBJECT | Monthly Progress Letter No. 2 |
| PERIOD COVERED | 15 April - 15 May 1973 |
| CONTRACT NR, PROJECT and TITLE | F 33615-73-C-1174, 7633<br>"Non-Specular Radar Cross Section Study" |
| CONTRACTING OFFICER | George E. Himes |
| REPORT SUBMITTED BY | Thomas B.A. Senior and Eugene F. Knott |

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This is the second monthly progress letter on Contract F 33615-73-C-1174 and covers the period 15 April - 15 May 1973.

During this reporting period further experimental work was done, program RAM1B was examined for its failure for E-polarization for edged bodies and program REST was modified.

Taking the last first, we found that the input format written into program REST unduly restricted the range of resistance variation that could be specified over relatively short resistive sheets. Moreover, in order to obtain backscattering data, the program had to be run in a bistatic "mode" for as many scattering angles as were desired, thus generating large quantities of output for but a few cross section values. These two deficiencies were corrected and a copy of the revised program was sent to AFAL in April, 1973.

The program was then run for several surface sampling rates for a perfectly conducting ogival cylinder in order to establish the loss of accuracy that might be expected for reduced sampling. This is an important consideration if resistive sheets are to be added to the body, since sampling points must then be reassigned over more total surface and are consequently more thinly distributed. The results show that 10 samples per wavelength give an accuracy better than 0.5 dB and that 6 samples per wavelength may be acceptable if an error of 2.0 dB is acceptable.

A disturbing discovery was that REST gives quite acceptable results for E-polarization when used for edged structures, while RAM1B does not. The difference between the two programs is that REST is based on the integral equation in which the incident field is taken to be the axial component of the electric field, while RAM1B is based on that involving the transverse components of the magnetic field. However, because of the duality of the E and H integral equations, we were able to "fool" RAM1B into producing the correct results for E-polarization by imposing a high surface impedance of 377,000 ohms. The resulting surface currents must be multiplied by 1000, of course, but the test demonstrated that RAM1B will indeed work for E-polarization. A modification of the program is currently being worked out and a copy should be on its way to AFAL within the week.

The interpolation scheme mentioned in our last monthly progress letter has now been implemented in a pair of subroutines which may be inserted into RAM1B. Because the interpolation procedure represents a more accurate prescription of surface field behavior near an edge, it should be an efficient scheme requiring fewer sampling points than necessary in the present program. Although the scheme will not now be required immediately, we feel that it will be useful in other programs (i.e., TWOD) in which the number of available sampling points is at a premium.

The experimental work consisted of a handful of surface field and coaxial line measurements repeating some earlier ones. We found that our coaxial line measurements of the reflection coefficient of samples of SFT-2.5 absorber were degraded because of improperly sized samples and, using those supplied by AFAL, we now duplicate the AFAL measurements. Surface field measurements on the ogival cylinder and a rectangular flat plate show that reflectivity values of about -12dB can be obtained consistently, and these agree with previous far field measurements. However, we have not been able to obtain the -16 to -18dB values predicted on the basis of the material properties, and we have not yet resolved the discrepancy.