**TRW SPACE TECHNOLOGY LABORATORIES**
THOMPSON RAMO WOOLDRIDGE INC.
ONE SPACE PARK • REDONDO BEACH, CALIFORNIA

19 February 1965

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National Aeronautics and Space Administration
Goddard Space Flight Center
Glen Dale Road
Greenbelt, Maryland

Attention: Mr. M. Schach
Code 633

Subject: Monthly Progress Report
Period Ending 1 February 1965
Contract NAS5-3805
Report No. 4161-6010-SU-000



## I. Progress in This Report Period

Data have been obtained on the I-V characteristics of the solar cells irradiated in low energy proton experiment using the STL OCLI sun simulator. Comparison of the short circuit current under the sun simulator relative to the short circuit observed under 2800° tungsten illumination yields some interesting observations. It is a well accepted fact that in the case of solar cells with uniform defect densities, the short circuit current degradation rate under 2800° tungsten illumination is approximately $6\frac{1}{4}$ ma/cm$^2$ - decade while under solar illumination the degradation rate is approximately $4\frac{1}{2}$ ma/cm$^2$ - decade. In the case of low energy proton irradiated cells, however, the degradation rates increase considerably as was indicated in last month's progress report. In addition, as the proton energy becomes lower, resulting in defects being produced predominantly near the surface, the percentage degradation in short circuit current gradually becomes greater under solar illumination than under tungsten illumination. At approximately 300 kev the degradation rate under solar illumination is almost twice that observed under 2800° tungsten illumination. Due to the nature of the defect density gradient, this effect was anticipated, but the magnitude of the effect is somewhat startling.

Measurements of the low energy proton irradiated solar cells several weeks after the experiment indicated that considerable annealing had occurred in both the p/n and the n/p specimens, considerably more than had ever been observed before in such a short period of time for any electron or proton irradiations previously performed. Since these

observed high rates of annealing appear inconsistent with previous data, further measurements will be made on these specimens as a function of time to confirm the observations.

Additional specimens have been received for the future low energy proton and electron experiments. Arrangements have been made with the Shell Oil Company to utilize their 3 Mev electron Van de Graaff in Emeryville, California. Experiments will be conducted on this machine in the energy transfer from 1 to 3 Mev in the next report period. In addition, repairs and modifications are continuing on the equipment involved in the low energy proton experiments in order that more data may be obtained in the near future.

## II. Anticipated Activities During the Next Report Period

An experiment will be conducted on the Shell Oil 3 Mev electron Van de Graaff in Emeryville, California. The experiment will consist of irradiating a number of Hall specimens in order to determine the energy dependence of the defect introduction rates of the $E_c$ -0.17, $E_c$ -0.40, and $E_v$ +0.29 levels. In addition, several solar specimens will be irradiated to cross check with previous data obtained on the GA linac.

## III. Manpower Expended in This Report Period

MANPOWER EXPENDITURES
NAS5-3805
Period 3 January - 31 January 1965

| | Total |
|---|---|
| J. R. Carter | 136 |
| R. G. Downing | 46 |
| Total | 182 |

Respectfully submitted,

R. G. Downing

R. G. Downing
Project Manager

Approved:

J. M. Denney, Director
Solid State Physics Laboratory

RGD:mer