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13. ABSTRACT (Maximum 200 words)

The goal of this project was to demonstrate that enhanced photovoltaic cell output can be achieved as a function of the physical gap between emitter and receiver in a Micron-gap ThermoPhotoVoltaic (MTPV) system. This was successfully demonstrated. Test specimen assemblies were first built for small gap MTPV testing. Tests were then performed with 0.2 micron gap heater chips on InGaAs photovoltaic cells provided by Dave Wilt of NASA Glenn. Small gap (down) and large gap (up) experiments at 300°C, 400°C, and 500°C were performed. Measurements with 0.2 micron gap heater chips were also made with 0.74 eV GaSb photovoltaic cells supplied by EdTek. In all conditions greater than 100% enhancement was measured. In both small gap ("DOWN") and large gap ("UP") positions heater power was shut off and the short circuit currents did not shut off but thermally decayed demonstrating that the short circuit current enhancement demonstrated were not artifacts of the heater electrical power.

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A Palm Size Micron-gap ThermoPhoto Voltaic (MTPV) Energy Converter

Final Progress Report

Report - 09

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1.0 List of Appendixes, Illustrations and Tables

Illustrations

2.0 Statement of the Problem Studied

The goal of this project was to demonstrate that enhanced photovoltaic cell output can be achieved as a function of the physical gap between emitter and receiver in an MTPV system. This was successfully demonstrated in this project.

2.0 Summary of Most Important Results

Test specimen assemblies were first built for small gap MTPV testing. This fixturing which was used for the testing reported below is shown in Illustration 1.

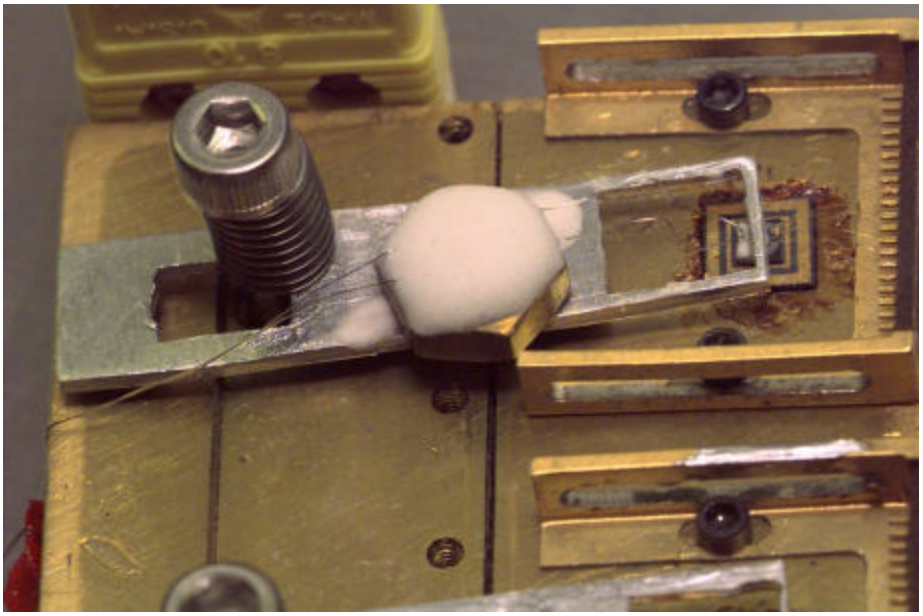

Illustration 1. Experimental Configuration of Heater Chip and PV Cell

Tests were performed with 0.2 micron gap heater chips on InGaAs photovoltaic cells provided by Dave Wilt at NASA Glenn. Results for small gap (down) and large gap (up) experiments at 300°C, 400°C, and 500°C are shown below in Illustrations 2, 3, 4, and 5.

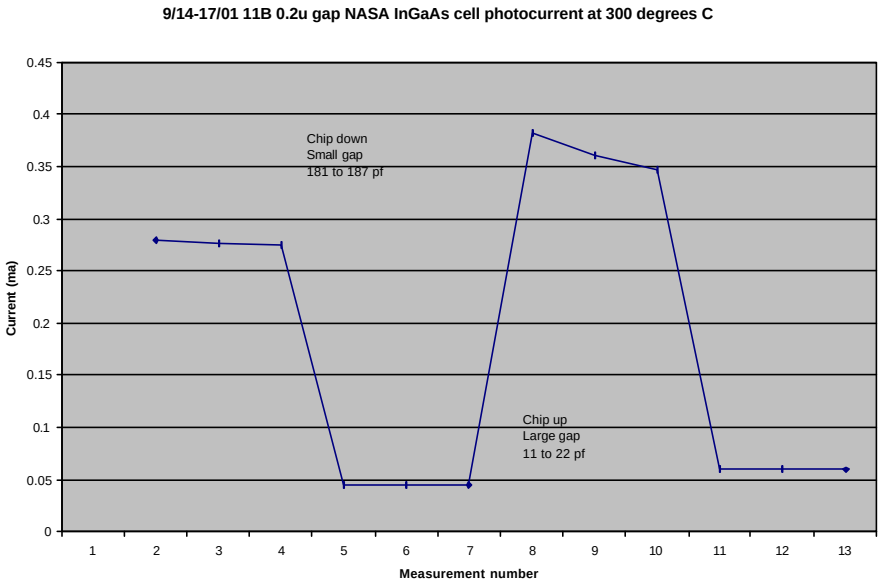

Illustration 2. 0.2 Micron Heater Chip, Large Gap – Small Gap Data – 300°C – on InGaAs Cell

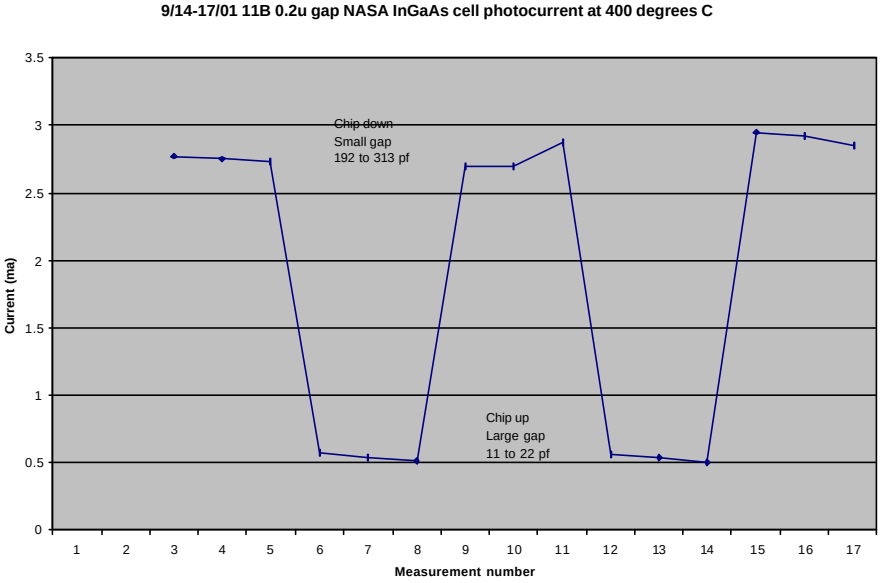

Illustration 3. 0.2 Micron Heater Chip, Large Gap – Small Gap Data – 400°C – on InGaAs Cell

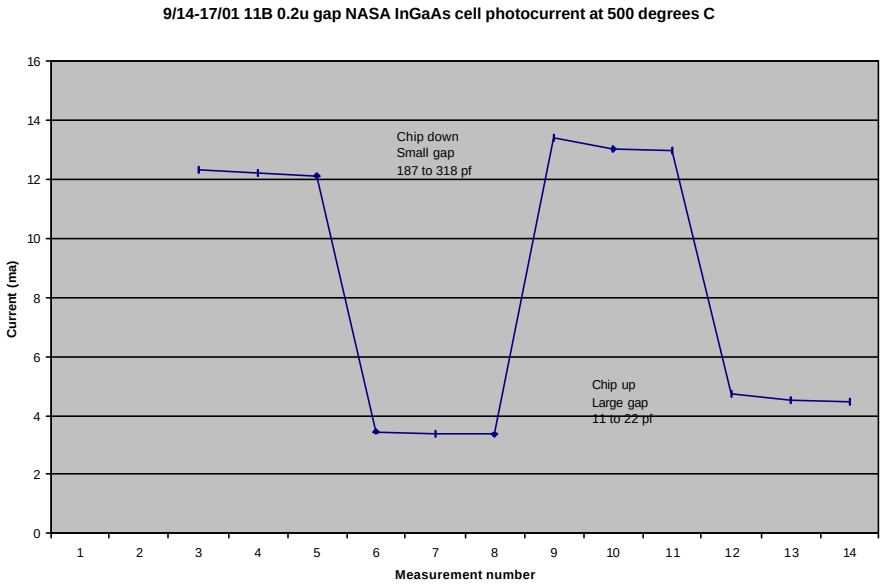

Illustration 4. 0.2 Micron Heater Chip, Large Gap – Small Gap Data – 500°C – on InGaAs Cell

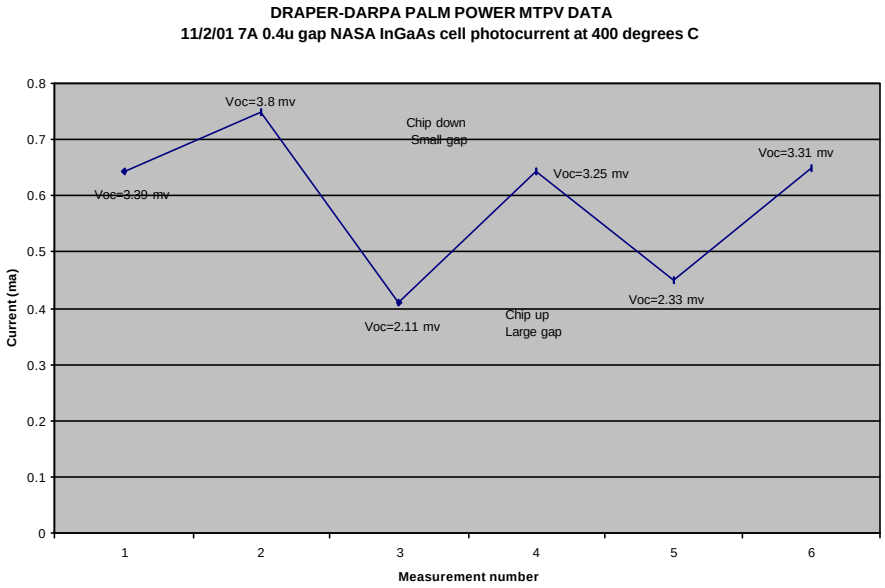

Illustration 5. 0.4 Micron Heater Chip, Large Gap – Small Gap Data – 400°C – on InGaAs Cell

Measurements with 0.2 micron gap heater chips were also made with 0.74 eV GaSb photovoltaic cells supplied by EdTek. The results are shown below in Illustration 6.

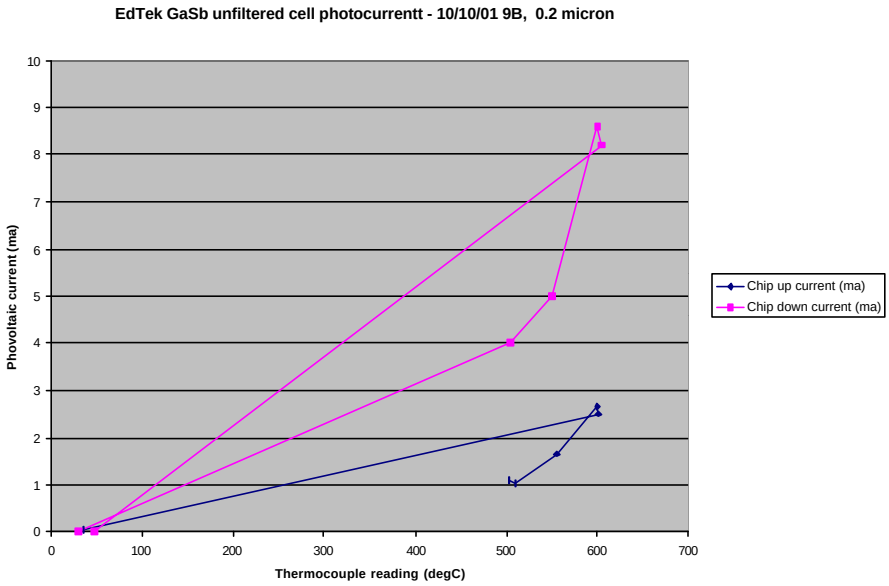

Illustration 6. 0.2 Micron Heater Chip, Large Gap – Small Gap Data – 500-600^{o}C– on GaSb Cell

Illustrations 7 and 8 show the results of Heater Chip Power Off testing. In both small gap ("DOWN") and large gap ("UP") positions heater power (yellow lines) was shut off and the short circuit currents (green lines) did not shut off but thermally decayed demonstrating that the short circuit current enhancement demonstrated in Illustrations 2-6 were not artifacts of the heater electrical power.

DOWN

3.1 ma -

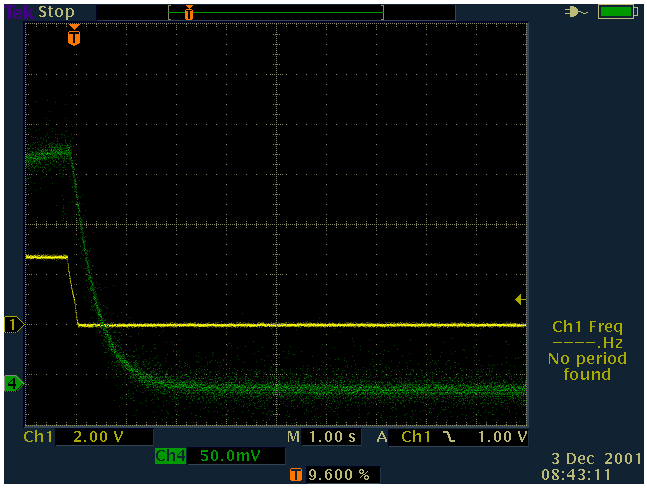

Illustration 7. Heater Power Off Test – Small Gap

UP

1.14 ma-

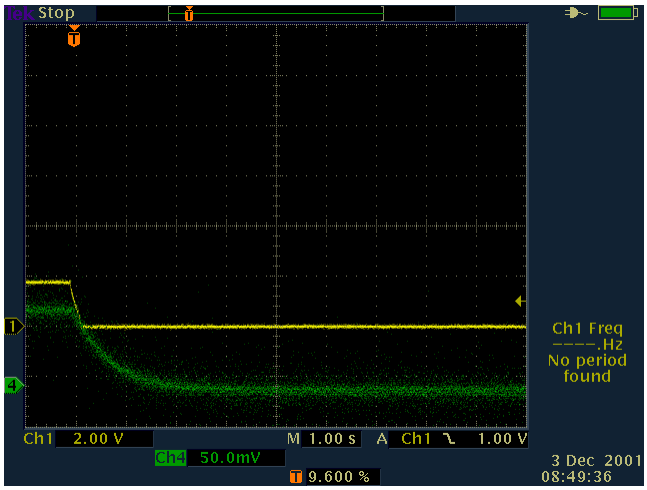

Illustration 8. Heater Power Off Test – Large Gap

4.0 Listing of Publications

A paper summarizing these results is being considered for submission to Applied Physics Letters for publication.

5.0 List of all participating scientific personnel etc.

6.0 Report of inventions

None were made under this contract.

7.0 Bibliography

None

8.0 Appendixes

None