NASA SBIR/STTR Technologies

Efficient, Long-Lived Radioisotope Power Generator

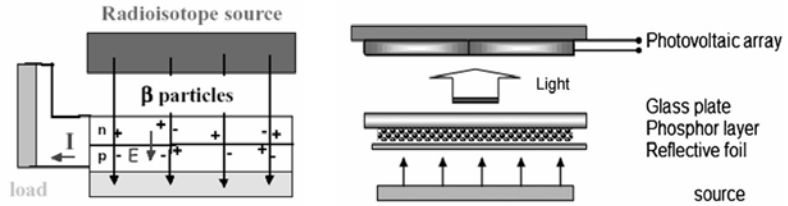
Radiation Monitoring Devices, Inc., Watertown, MA
Proposal No: S3.03-8924

Identification and Significance of Innovation

- **Thermoelectric RTGs are inefficient (<7%)**
- **Beta-voltaic generators are potentially more efficient but this has not been realized**
- **Beta-voltaic generators suffer from limited lifetime due to materials degradation**
- **A new concept based on new materials has the potential for long life and >20% efficiency**

Comparison of RTG and betavoltaic generators

Generator	We/Kg	Efficiency	Half life
Sr-90 RTG	10	4-5%	29 years
Sr-90 BV	50	~20%	29 years
Pu-238 RTG	25	6-7%	88 years



Betavoltaic generators are analogous to photvoltaic solar cells. Visible light photons absorbed by a solar cell generate electric current. A betavoltaic cell operates in a similar manner, but the electron-hole pairs are created either directly by the particles striking the cell or indirectly after conversion to visible photons. In this program we investigate a large volume indirect conversion approach.

Technical Objectives

Phase I: **Demonstrate feasibility and potential efficiency advantage of a large volume betavoltaic generator**

Phase II: **Demonstrate small scale prototype generator with greater than 10% efficiency.**
Develop manufacturing documentation.

Work Plan

Model performance of indirect conversion betavoltaic generator.

Evaluate potential radioisotopes (beta and alpha)

Demonstrate feasibility by fabricating small scale prototype components of a betavoltaic generator

NASA Applications

- **Satellites**
- **Balloons**
- **Remote terrestrial locations**
- **Planetary rovers**

Non-NASA Applications

- **Remote instrumentation**
- **Remote sensors for Homeland Security**
- **Remote terrestrial commercial applications**
- **Implantable medical devices**

Firm Contacts

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NON-PROPRIETARY DATA