Paper ID: 49966
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IAF SPACE POWER SYMPOSIUM (C3)
Advanced Space Power Technologies (3)

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DIRECT THERMAL ENERGY CONVERSION VIA TUNED THERMAL EMITTER AND PHOTOVOLTAIC BAND GAP

Abstract

This paper describes a conceptual system for direct thermal energy conversion. It provides a system in between thermoelectric generators and mechanical heat engines. The system uses a thermal emitter whose thermal radiation spectrum consists of isolated peaks rather than blackbody or broad-spectrum radiation. This radiation is collected by a photovoltaic panel whose band gap energy is marginally above a strong emission peak, thus minimizing energy wasted in the photovoltaic panel. The system is expected to provide intermediate ranges of efficiency, economy, and mass, between inefficient thermoelectric generators and heavy, complex heat engines. An example of an emitter-PV pair is Carbon Dioxide gas and Lead Selenide semiconductor. The system was designed during research into a direct fusion drive (DFD) rocket. Its first application would likely be to reduce the amount of plutonium in Radioisotope Thermal Generators (RTGs) and increase the economy of small Kilopower-type fission reactors.