

# PHOTON INTERMEDIATE DIRECT ENERGY CONVERSION USING A SR-90 BETA SOURCE

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## ABSTRACT

This thesis covers an examination of a need for a compact, long lived power source and a proof of concept for one such design. To begin, tests were done dealing with photovoltaics and their lifetime while undergoing radiation damage from the source of interest, Strontium-90 (Sr-90). After completing these tests a system was designed, built, and ultimately tested over a range of pressures in order to test if a Photon Intermediate Direct Energy Conversion (PIDEC) system would be potentially viable.

In brief, the PIDEC system tested for this thesis used two excimer gasses, Argon and Xenon, to produce photons. These gasses were excited into excimer production using a 10 mCi Sr-90 source and held in place at pressures ranging from  $10^{-6}$  to 2400 psi by a pressure vessel. Photons produced were guided towards a photovoltaic by a mirror chamber lined with high efficiency aluminum mirrors. Outside of the pressure vessel a picoammeter read the current off of the photovoltaic and sent the current to a computer for data processing. Of primary interest was how the current changed based on the amount of energy captured by the gas plenum which was related to the pressure of the system.

The overall efficiency of this system was low due to a non-optimized waveguide, much of the beta energy being lost beyond the gas plenum, and other factors. However, the results were sufficient to show that the process was successfully completed and making a new system to optimize for these features is warranted.