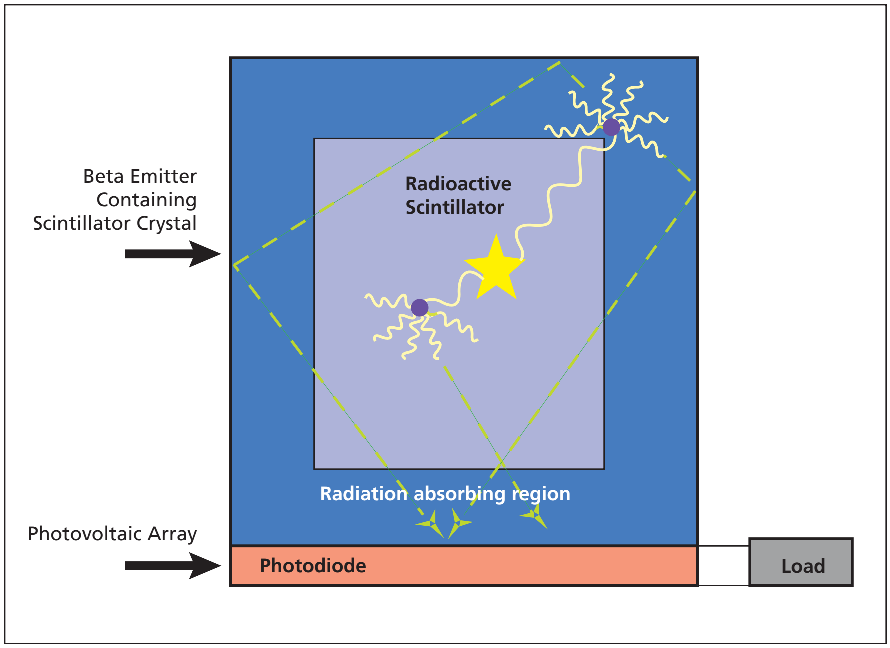
face of a solar cell or even to the surface of a scintillator, much of the radiation escapes due to the geometry, and some is absorbed within the layer itself, leading to inefficient harvesting of the energy. In contrast, if the emitting atoms are incorporated within the scintillator, the geometry allows for the capture and efficient conversion of the energy of particles emitted in any direction. Any gamma rays associated with secondary decays or Bremsstrahlung photons may also be absorbed within the scintillator, and converted to lower energy photons, which will in turn be captured by the photocell or photodiode.

Some energy will be lost in this two-stage conversion process (high-energy particle to low-energy photons to electric current). The geometric advantage partially offsets this as well, since the absorption depth of high-energy beta radiation is much larger than the depth of a p-n junction. Thus, in a p-n junction device, much of the radiation is absorbed far away from the junction, and the electron-hole pairs are not all effectively collected. In contrast, with a transparent scintillator the radiation can be converted to light in a larger volume, and all of the light can be collected in the active region of the photodiode.

Finally, the new device is more practical because it can be used at much higher power levels without unduly shortening its lifetime. While the crystal structure of scintillators is also subject to radiation damage, their performance is far more tolerant of defects than that of semiconductor junctions. This allows the scintillator-based approach to use both higher energy isotopes and larger quantities of the isotopes. It is projected that this technology has the potential to produce a radioisotope battery with up to twice the efficiency of presently used systems.



The **Scintillator-Based Beta Battery**: Isotope containing scintillator and surrounding scintillator captures virtually all of the energy emitted by the beta emitter.

This work was done by Noa M. Rensing, Michael R. Squillante, Timothy C. Tiernan, William Higgins, and Urmila Shirwadkar of Radiation Monitoring Devices, Inc. for Glenn Research Center. Further information is contained in a TSP (see page 1). LEW-18871-1

Inquiries concerning rights for the commercial use of this invention should be addressed to NASA Glenn Research Center, Innovative Partnerships Office, Attn: Steven Fedor, Mail Stop 4–8, 21000 Brookpark Road, Cleveland, Ohio 44135. Refer to LEW-18871-1.

Magnetic Shield for Adiabatic Demagnetization Refrigerators (ADR)

NASA's Jet Propulsion Laboratory, Pasadena, California

A new method was developed for creating a less expensive shield for ADRs using 1018 carbon steel. This shield has been designed to have similar performance to the expensive vanadium permendur shields, but the cost is 30 to 50% less. Also, these shields can be stocked in a variety of sizes, eliminating the need for special forgings, which also greatly reduces cost.

This work was done by Talso C. Chui and Nicolas E. Haddad of Caltech for NASA's Jet Propulsion Laboratory. For more information, contact iaoffice@jpl.nasa.gov. NPO-48732