bandgap complementary barriers suppress G-R dark current. The barriers also block diffusion dark currents generated in the diffusion wings in the neutral regions. In addition, the wider gap barriers serve to reduce tunneling dark currents. In the case of a superlattice-based absorber, the superlattice itself can be designed to suppress dark currents due to Auger processes. At the same time, the barriers actually help to enhance the collection of photo-generated carriers by deflecting the photo-carriers that are diffusing in the "wrong" direction (i.e., away from collectors) and redirecting them toward the collecting contacts. The contact layers are made from materials with narrower bandgaps than the barriers. This allows good ohmic contacts to be made, resulting in lower contact resistances.

Previously, THALES Research and Technology (France) demonstrated detectors with bulk InAsSb (specifically $InAs_{0.91}Sb_{0.09}$) absorber lattice-matched to GaSb substrates. The absorber is surrounded by two wider bandgap layers designed to minimize impedance to photocurrent flow. The wide bandgap materials also serve as contacts. The cutoff wavelength of the InAsSb absorber is fixed. CBIRD may be considered as a modified version of the THALES double heterostructure (DH) p-i-n device, but with even wider bandgap barriers inserted at the contact layer/absorber layer interfaces. It is designed to work with either bulk semiconductors or superlattices as the absorber material. The superlattice bandgap can be adjusted to match the desired absorption cutoff wavelength.

This infrared detector has the potential of high-sensitivity operation at higher operating temperatures. This would reduce cooling requirements, thereby reducing the power, mass, and volume of the equipment and allowing an increased mission science return.

This work was done by David Z. Ting, Sumith V. Bandara, Cory J. Hill, and Sarath D. Gunapala of Caltech for NASA's Jet Propulsion Laboratory. Further information is contained in a TSP (see page 1).

In accordance with Public Law 96-517, the contractor has elected to retain title to this invention. Inquiries concerning rights for its commercial use should be addressed to:

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Refer to NPO-46207, volume and number of this NASA Tech Briefs *issue, and the page number.*

JPL Greenland Moulin Exploration Probe

NASA's Jet Propulsion Laboratory, Pasadena, California

A probe was designed to investigate the moulins (melt water drainage channels on an ice cap) and ice-hydrology interaction in the Greenland Ice Cap. By using commercially available components, the strong and reliable system has been developed that has a high-definition video recording element, is lightweight, and has buoyancy that is easily adjustable for neutrality or to be slightly positive in the water, enabling different deployment scenarios.

The system is in a small (20×20×20-cm), watertight Lexan box that can follow the water into the ice, but then be retrieved by tether. The system is rated for a water depth of 100 meters. The purpose of this system is to gain understanding about the interaction between the ice and the melt water and how this interaction may be accelerating the melting of glaciers and, in general, an overall better understanding of global warming.

This work was done by Alberto Behar and Victor Zlotnicki of Caltech; Huan Wang of Stanford; Henrik Karlsson of the International Space University; Jonas Jonsson of Angstrom Space Laboratory; and Konrad Steffen and Russell Huff of the University of Colorado, Boulder, for NASA's Jet Propulsion Laboratory. For more information, contact iaoffice@jpl.nasa.gov. NPO-45464