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Direct detection of electrons in the 0.1-20 keV energy range using a delta-doped high purity silicon p-i-n diode array SHOULEH NIKZAD, THOMAS J. CUNNINGHAM, DAVID SOULES, RON RUIZ, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA, STEVE HOLLAND, Lawrence Berkeley National Laboratory, Berkeley, CA — We have demonstrated the direct detection of 0.1-20 keV electrons using a boron delta-doped high purity silicon p-i-n diode array. Full depletion allows the high-gain detection of incident electrons. Delta-doping enables the detection of low-energy electrons with high efficiency, and also allows the determination of device gain as a function of the incident energy over a wide energy range. Using a low-temperature process developed in our laboratory, we formed a thin electrode on the back surface of the pin diode arrays to enable full depletion and transparency to shallow-penetrating ionizing radiation. The electrode consists of a 1.5 nm boron delta layer grown by molecular beam epitaxy. In this talk, we will discuss the device structure, processing, and characterization methods used to demonstrate the direct detection of low-energy electrons. We will also discuss the use of this detector for making more accurate measurements of the silicon quantum yield for low-energy electrons.

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