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Solid-State Avalanche Photodetector for Operation at 4 K ERIK JOHNSON, JAMES CHRISTIAN, CHRISTOPHER STAPELS, SHARMISTHA MUKHOPADHYAY, XIAO JIE CHEN, Radiation Monitoring Devices, RORY MISKIMEN, University of Massachusetts — Physics experiments that are conducted at low temperatures and within high magnetic fields require improved optical detectors that operate under these conditions to provide the critical data for new discoveries. One experiment that will push the limits of existing photodetectors is the HIFROST target at the HIγS facility at TUNL, where a photodetector is required to readout scintillation material with embedded polarized protons. The readout of the scintillation material with a photodetector is used to reject coherent Compton scattering from ^{12}C in comparison to scattering of free polarized protons. To ensure proper readout of the scintillation material, a photodetector will be operated at 4 K, and to maintain the polarization of the target, the region will be under a 5T magnet field. We have verified an avalanche photodiode structure that can provide a quantum efficiency of $\sim$20% at 5 K for 532-nm optical photons, even with an onset of carrier freeze out. The solid-state device is fabricated using a commercially available CMOS process, providing a low-cost means for fabrication. The electrical and optical properties of the photodetector are presented.

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