

Abstract Submitted  
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**low temperature performance of a silicon photomultiplier and an avalanche photodiode**<sup>1</sup> JIN JEGAL, HYEOUNGWOO PARK, Kyungpook Natl Univ, EUNSUK SEO, University of Maryland, HONGJOO KIM<sup>2</sup>, Kyungpook Natl Univ — In direct dark matter searches, it is important to reduce the thermal noise which can significantly impact detection of relatively low intensity light of scintillators. There are many experiments utilizing scintillators, but it has not been studied much about a combination of a low temperature semiconductor detector with a scintillator. We studied dependency of the dark current and breakdown voltage on temperature for a silicon photomultiplier and an avalanche photodiode by changing the temperature from 4 K to 300 K in cryostat. The thermal noise of semiconductor can be decreased at low temperature, but electrical characterization of detectors has to be optimized for the best performance at the specific temperature, since the electron mobility reduction has to be considered as temperature decreases. The dark current was decreased from a few nA to several tens of pA and the breakdown voltage was shifted as the temperature decreases. This shift in the breakdown voltage influenced the gain. We will report our test results and discuss a possibility of utilizing low temperature semiconductor detectors in combination with scintillators.

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