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Optical Characterization of Low-Gain Avalanche Diodes

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We characterized a type of Low-Gain Avalanche Diode (LGAD) fabricated at the Brookhaven National Laboratory. LGADs are a type of silicon avalanche photodiodes originally developed for the fast detection of minimum ionizing particles for high-energy particle detectors. We study its detection capability on different types of ionization particles, such as X-rays, gamma-rays, alphas, and examine its intrinsic quantum efficiency with non-ionization optical photons. Here, using near infrared photon pulses, we demonstrated LGAD can accurately measure a nearly 1-MIP equivalent minimum ionizing particles with picosecond timing resolution. Furthermore, we perform some tests at cryogenic temperatures too.

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