

Signal to noise ratio of Low Gain Avalanche Detector

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Low gain avalanche detectors (LGAD) were attracted considerable attention as a new concept of silicon radiation detectors. These devices are based on reach-through avalanche photodiodes and provide a moderate gain (gain \sim 10). Compared with general avalanche photodiodes (APD), LGAD have a remarkable improvement of the signal-to-noise ratio (SNR) which makes them more suitable to detect high energy charged particles. Moreover, LGAD have good time resolution so that they can be used as sensors for tracking. In this paper, the SNR of LGAD was proved to be better than APD and PIN by theoretical methods. Our LGAD were measured. The punch-through voltage is 45V and the breakdown voltage is 65V. The gain is almost not changed with the biased voltage and temperature under the breakdown voltage. The SNR reaches the maximum 320 while the bias voltage is 64V and the gain is 4.

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