

PDE and Jitter simulation in 3D SPAD Devices.

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Abstract

In this paper we present a full 3D simulation methodology to extract Photon Detection Probability (PDP) and Jitter of Single-Photon Avalanche Diode (SPAD) Devices. The simulation results are compared with measurements on devices and show good agreement with the experiments.

Keywords— single-photon avalanche diode (SPAD), photon detection probability (PDP), jitter, avalanche breakdown probability, breakdown voltage

1 Introduction

A single-photon avalanche diode (SPAD) is a solid-state photodetector within the same family as photodiodes and avalanche photodiodes (APDs), while also being fundamentally linked with basic diode behaviours. As with photodiodes and APDs, a SPAD is based around a semi-conductor p-n junction that can be illuminated with ionizing radiation such as gamma, x-rays, beta and alpha particles along with a wide portion of the electromagnetic spectrum from ultraviolet (UV) through the visible wavelengths and into the infrared (IR).