

Linearity performance of small-cell SiPMs for prompt gamma imaging application

In this work, we present the linearity characterization of the ultra-high density SiPM technology (RGB UHD), recently developed at Fondazione Bruno Kessler (FBK). This technology features a very small cell pitch ranging from 7.5 to 12.5 μm giving a cell density from 20530 to 7400 cells/mm². The high SPAD density is very important to improve the linearity of the SiPM in applications such as high-energy Gamma-ray spectroscopy and prompt gamma imaging (PGI) in proton therapy. Moreover, the small cell size provides a n ultra-fast recovery time, in the order of a few of ns for the smallest cells. A short recovery time reduces pile-up in high-rate application such as PGI. Using a ²²Na source, we have measured a non-linearity (NL) of less than 0.5% at 1.274 MeV, for all the cell sizes. In this work, we will present the measurement of the NL of the UHD SiPMs for the PGI application, using a pulsed light source to simulate an energy range from 0.5 MeV to 20 MeV.

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