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Comparison of new SiPM models for applications in High-Energy physics

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Silicon Photo-Multipliers (SiPMs) are widely used as light detectors for the new generation of experiments dedicated to high energy physics. For these reason, we tested several recent devices from different manufacturers: Hamamatsu 13xxx and 14xxx series; Ketek; SensL ONsemiconductors; AdvanSid; Broadcom. Particular emphasis has been put on measurements of breakdown voltage, dark counts and dark current and gain, performed at different temperatures by means of a climatic chamber (F.lli Galli model Genviro-030LC) with a temperature range from $-60\text{ }^{\circ}\text{C}$ to $+60\text{ }^{\circ}\text{C}$, housing the SiPM under test and of a cryo-pump with a cold head, allowing to scan the temperature from 300 K down to 50 K. In this way it was also possible evaluating the temperature coefficient of all models. Moreover, all devices have been successfully tested in a Liquid Nitrogen bath (77 K), having in mind possible applications to detectors for neutrino and dark matter searches using liquefied noble gases such as Xenon and Argon as a target medium. In this case, the thermal component of the noise decreases at low temperature, thus allowing the use of the device at higher overvoltage.

Collaboration

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