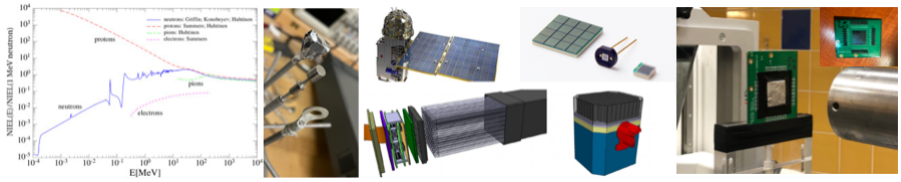

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Self-heating Effect in Silicon-Photomultipliers

Wednesday 27 April 2022 09:50 (25 minutes)

The main effect of radiation damage in a Silicon-Photolumtiplier (SiPM) is a dramatic increase in the dark current. The power dissipated, if not properly cooled, heats the SiPM, whose performance parameters depend on temperature. Heating studies were performed with a KETEK SiPM, glued on an alumina substrate, which is either directly connected to a temperature-controlled chuck of a probe station, or through layers of material with well-known thermal resistance. The SiPM is illuminated by a LED operated in DC-mode. The SiPM current is measured and used to determine the steady-state temperature as a function of power dissipated in the multiplication region of the SiPM and thermal resistance, as well as the time dependencies for heating and cooling. This information can be used to correct the parameters determined for radiation-damaged SiPM for the effects of self-heating. The method can also be employed for packaged SiPMs with unknown thermal contact to a heat sink. The results presented in this presentation are preliminary.

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