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Correlated noises for NUV-HD-Cryo SiPMs

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Silicon Photomultipliers (SiPM) represent an established solution for the light detection of large particle detectors. The NUV-HD-Cryo family from Fondazione Bruno Kessler exhibits a very attractive solution at liquid argon temperature, being stable with large overvoltages with a primary dark count rate below a few count per second per square centimeter. On the other hand, for those SiPMs the optical cross-talk (oCT) can reach very high values. Part of the oCT remains confined in the silicon bulk and accounts for the internal cross-talk (iCT). Escaping photons can be detected by other SiPM in the particle detector, in a process named external cross-talk (eCT). The interaction between iCT and eCT creates a positive feedback that leads to a noisy photon-detection gain extended to the full experiment, which can easily exceed 1.5-3.

In this contribution, measurements and models of the internal and external cross-talk will be presented. Furthermore, the effects on broadening resolution of the photon-detection for cryogenic experiments will be discussed.

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