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SiPMs as Photo-Sensors in a Liquid Xenon Time Projection Chamber (TPC)

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Liquid Xenon Time Projection Chambers (LXeTPC) are used in rare event searches for Dark Matter, neutrinoless double beta decay or in applications as Compton telescope or camera where the noble medium offers a combination of scintillation light and ionization that can be used to build large, uniform 3D position sensitive detectors. We test the feasibility of replacing the common used photomultiplier tubes (PMTs) by SiPMs in such a detector. As most commercially available SiPMs are not sensitive to the scintillation light of xenon in the VUV regime at 178nm, a special construction of the SiPMs, or a special treatment of commercial devices is neccesary. We operate a test stand to observe the operational stability and to measure the sensitivity, crosstalk and afterpulse properties of three VUV-sensitive SiPM samples in liquid xenon at -100℃.
A 1" PMT is operated simultaneously for reference while scintillation light is provided by a ^{241}Am source immersed in liquid xenon.

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