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Characterization of iLGAD with soft X-ray

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Hybrid detectors are highly attractive due to their high frame rate, large area coverage, and good radiation tolerance. However, for experiments with soft X-rays (200 eV - 2 keV) they are limited by the poor quantum efficiency of standard silicon sensors and by the low signal-to-noise ratio due to the small signal created by the soft X-ray photons. To overcome these limitations, inverse Low-Gain Avalanche Diode (iLGAD) sensors with a thin entrance window are being developed at Paul Scherrer Institute, in collaboration with Fondazione Bruno Kessler. iLGAD sensors bump-bonded to the 25 um pitch charge-integrating Mönch readout ASIC have been characterized using soft X-rays at 4th generation synchrotron radiation source MAX IV in Sweden. In this contribution, we will present the beam tests result, focusing on the spectral response of the iLGAD at different photon energies and temperatures. From the measurements, we have observed a reduction of signal amplitude above the silicon K-edge at 1825 eV, very likely caused by the gain suppression when photons are absorbed within/close to the gain layer. In order to verify the observation, the iLGAD module was titled with an angle of 55 degrees and measured with X-ray photons below the silicon K-edge. The spectral responses of both flat and tilted measurement configurations will be discussed, along with plans for further testing and improvements on iLGADs.

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