



Contribution ID: 154

Type: **Poster**

P2.40: Spectral response of the iLGAD sensors to soft X-rays

Wednesday, 28 June 2023 17:21 (1 minute)

Single photon detection of fluorescent X-rays down to 452 eV with a signal-to-noise ratio greater than 20 has been demonstrated using 25 um pitch iLGAD sensors, bump-bonded to a charge-integrating readout chip Moench. These iLGAD sensors combined with a thin entrance window developed in collaboration with FBK are optimized for soft X-ray detection by having an excellent quantum efficiency in the corresponding energy range. Additional measurements using monochromatic X-ray photons from 390 eV to 900 eV have been performed recently at the SIM beamline of the Swiss Light Source. The spectral response features double peaks at each photon energy, corresponding to the signals generated by electron- and hole-initiated charge multiplication. It has been found that the ratio of the signals height depends on the design of the gain layer of the iLGAD sensor and the counts under the peaks change with photon energy. To understand this behavior, a customized simulation program has been developed: it takes into account the impact ionization process, carrier drift and diffusion, charge collection by the readout electrodes as well as the electronic and shot noise. The simulation results have been compared to the measurements, which show good agreement to a large extent. The measurement and simulation results will be discussed.

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Session Classification: Poster (incl. coffee)