Contribution ID: **10** Type: **Poster**

Optoelectronic properties of High-Flux CdZnTe with optimized electrodes

Wednesday 29 June 2022 17:32 (1 minute)

With the rise of 4th Generation Synchrotron Light Sources such as the Extremely Brilliant Source (EBS) of the ESRF[1], the need for direct X-ray detection under high photon flux with moderate to high energies (30-100keV range) has increased. One of the candidate materials for this application is Cadmium Zinc Telluride (CdZnTe or CZT). In particular, the novel CZT material developed by Redlen for high-flux applications (HF-CZT) seems promising as it limits the polarizing phenomena observed in standard CZT under high photon flux[2], [3]. However, when it comes to electrical contacts, it appears that the standard gold electroless blocking contacts lead to much higher leakage current in HF-CZT than in the standard CZT [4]. The IMEM-CNR laboratory (Parma) has been developing novel contacts more suited to the HF-CZT.
In this work, the optoelectronic and transport properties of Redlen HF-CZT single crystals are studied. The single crystals were processed in IMEM-CNR where electroless gold and sputtered platinum electrodes were deposited. They have then been characterized both in IMEM-CNR and at the ESRF.
From this common work, we report low leakage current under dark conditions (8pA/mm2 at 5.103V/cm), good stability under moderate irradiation (107 to 1010 photons.mm-2.s-1), good linearity with incident flux and reduced transient phenomena (stabilization time, afterglow and polarization effects) as compared to standard CdTe material. The transport properties of the HF-CZT will also be discussed.

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Session Classification: Poster