

Design of the AGIPD Sensor for the European XFEL

Tuesday, 4 September 2012 15:20 (1 hour)

For experiments at the European X-Ray Free-Electron Laser (XFEL), an Adaptive Gain Integrating Pixel Detector (AGIPD) system is under development. The particular requirements for the detector are a high dynamic range of 0, 1 - to more than $1E4$ 12.4 keV photons per pixel within a XFEL pulse duration of < 100 fs and a radiation tolerance of doses up to 1 GGy for 3 years of operation.

The sensor will have 1024×1024 p+-pixels with a pixel size of $200 \mu\text{m} \times 200 \mu\text{m}$ and will be manufactured on $500 \mu\text{m}$ thick n-type silicon. The design value for the operating voltage is 500 V, however for special applications an operation at above 900 V should be possible.

Experimental data on the dose dependence of the oxide-charge density N_{ox} at the Si-SiO₂ interface and the surface-current density J_{surf} have been implemented in the SYNOPSIS TCAD simulation program in order to optimize the design of the pixel and guard ring layout. The methodology of the sensor design, the optimization of the most relevant parameters and the layout are discussed. Finally the simulated performance, in particular the breakdown voltage, dark current and inter-pixel capacitance as function of the X-ray dose will be presented.

Primary author: SCHWANDT, Joern (Hamburg University - Institute for Experimental Physics)

Co-authors: FRETWURST, Eckhart (Hamburg University - Institute for Experimental Physics); ZHANG, Jiaguo (Hamburg University - Institute for Experimental Physics); KLANNER, Robert (Hamburg University - Institute for Experimental Physics)

Presenter: POEHLSEN, Thomas (University of Hamburg)

Session Classification: Poster session

Track Classification: Pixel technologies - Hybrid pixels