

Abstract:

For experiments at the present and future X-ray lasers (FLASH, LCLS, XFEL) we are developing large format backside illuminated fully depleted pnCCDs with column parallel readout. In a first phase a 1024 x 1024 format detector with $75 \times 75 \mu\text{m}^2$ pixels will be ready for use in 2009. The detector chip has recently been fabricated. First basic properties are actually being measured. The full system will be described in detail and its prospects will be discussed in the light of the potential applications. In phase II a 2048 x 2048 format system will be made available. The design of the pnCCD is being finished, fabrication starts in early 2008; the system could be ready for use in 2011 for phase II.

Recently we have performed two demonstrator experiments with a 256 x 512 format pnCCD system (a) at the white X-ray beam of BESSY with energies up to 30 keV and (b) with monochromatic radiation of 90 eV at the FLASH X-ray (VUV) laser. Due to the high frame rate of the pnCCDs the measurements were made in a full frame mode with up to 500 frames per second. The results of both experiments will be presented, the prospects of future experiments will be discussed. The results obtained at the synchrotrons are in good agreement with the pnCCDs performance in the laboratory.

In addition, we have proposed to XFEL GmbH a novel high speed active pixel detector system based on the concept of Depleted p-channel MOSFETs, the DePMOS device. It is capable to record images as fast as 5 MHz with a dynamic range of 10.000 X-rays of 10 keV. The sensor itself includes a non-linear compression scheme which enables the following ASIC electronics to comply with the heavily varying number of signal charges. The system and its expected performance figures will be discussed in detail.

The talk will conclude with an outlook on the potential of Silicon detectors for position resolved X-ray spectroscopy for applications in Heaven and on Earth.