

Imaging and Spectroscopy with Modern Silicon Radiation Detectors

Modern silicon radiation detectors are developed and fabricated at the Semiconductor Laboratory of the Max-Planck-Institutes of Physics and Extraterrestrial Physics (MPI/HLL) in Munich since several years, in close cooperation with the company PNSensor. All detector types are used in a wide spectrum of applications in science and industry with focus on ultrafast high-resolution imaging and spectroscopy of X-rays between 150 eV and 30 keV. Optimum operation is aimed at room temperature. The presentation will provide an overview of the different detector types and their common and distinguishing properties. Room temperature pnCCDs operated at -40°C provide fast images up to 1000 frames per second with a spatial resolution down to 20 μm and an energy resolution of 130 eV at MnK. Active pixel sensors (APS) promise the same properties with a high flexibility of the read out area. Silicon Drift Detectors (SDD) with integrated transistor allow high-resolution X-ray spectroscopy at -20°C with 128 eV energy resolution at count rates of 100 kcps. Multielement SDD arrays with scintillators are used for gamma imaging. MACROPIXEL arrays combine the properties of SDDs and APS with arbitrary cell sizes between $100 \mu\text{m}^2$ and 10mm^2 . Diverse examples of new interesting applications will be shown.