MPI Halbleiterlabor

The MPI Halbleiterlabor (semiconductor laboratory) is a joint research facility of the Max-Planck institutes for physics and for extraterrestrial physics. In a 1000 m^2 large clean room, silicon detectors are produced and tested for research activities. The XMM-Newton PN-CCD detector and the Silicon Drift Detectors used on the Mars Rovers 'Spirit' and 'Opportunity' have been fabricated there. Presently, detectors for the future DUO and XEUS mission are developed.

The Halbleiterlabor has a highly flexible production line, which can process ultra-pure silicon wafers on both sides. The devices can be produced (Fig. 1), mounted (Fig. 2) and tested without even leaving the cleanroom area.
The technology is continuously being optimized and extended. These optimizations are aimed towards low noise performance (by minimizing leakage current and integrating electronics on-chip), low-energy response (by ultra-thin entrance windows), and large area devices (by tight process control).
The Laboratory routinely produces several detector types which have been invented by its members:

Fig 1: The part of the production area, shown here, contains an 8-tube furnace (back left), inspection (front) and wet etching equipment (back right).

•**Silicon strip detectors** are used in high energy physics experiments like the HERA-B experiment at DESY or the future ATLAS detector at CERN.
•**Fully depleted charge coupled devices** with parallel readout are used onboard the X-ray satellite XMM-Newton. New flight CCDs with frame store are currently produced for the DUO mission .
•**Silicon drift detectors** are used for high-resolution, high-rate spectroscopy at synchrotron light sources like ESRF or DESY, for X-ray microscopy at BESSY and for the hadron physics experiment SIDDHARTA. They also work in the NASA Mars rovers and are foreseen for the ESA mission XEUS.
•**Active pixel devices** with **DEPFET** amplifiers are developed for XEUS and TESLA (Fig. 3). High position resolution, thinned material and fast readout are key items for this next detector generation.

The activities of the MPI Halbleiterlabor also find interest in industry. In particular, products based on silicon drift diodes originally designed and fabricated for scientific experiments have been successfully introduced as X-ray detectors in scanning electron microscopes.

Fig. 2: The mounting area includes a water-guided laser dicer (back left) and an automatic bonder.

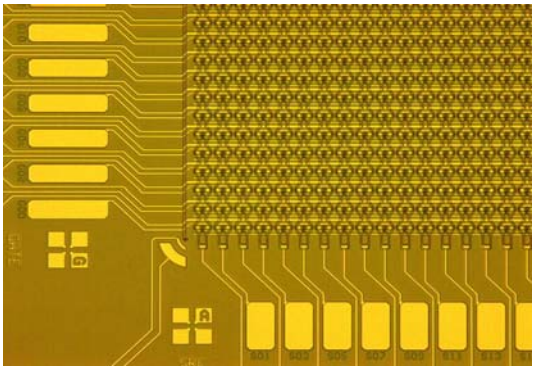

Fig. 3: Recently processed active pixel matrix with DEPFET amplifiers for the ESA mission XEUS.