Contribution ID: **52** Type: **Poster**

Advanced testing of the DEPFET minimatrix particle detector

Thursday 29 September 2011 16:00 (2h 30m)

The DEPFET is an active pixel particle detector, in which a MOSFET is integrated in each pixel, providing first amplification stage of readout electronics. Excellent signal over noise performance is provided this way. The DEPFET sensor will be used as an inner pixel detector in the BELLE II experiment at electron-positron SuperKEKB collider in Japan. The DEPFET sensor requires switching and current readout circuits for its operation. These circuits have been designed as ASICs in several different versions, but they didn't provide enough flexibility for precise detector testing. Therefore, a measuring system with a flexible control cycle range and minimal noise was designed for testing and characterization of small detector prototypes. Sensors with different design layouts and thicknesses are produced in order to evaluate and select the best performance for the Belle II application. Description of the test system as well as the first measurement results will be presented.

Summary 500 words

The DEPFET is an active pixel particle detector, which is going to be used as an inner pixel detector in the BELLE II experiment at electron-positron SuperKEKB collider in Japan.
Versatile measuring system was designed to measure and characterize small prototypes of the DEPFET with 48 active pixels. The system is composed of commercial and custom-made blocks as a PC with an 8-channel PCI data acquisition card, FPGA control card, current readout and switching circuit. The specially designed current readout circuit consists of 8 low noise trans-impedance amplifiers and the control circuit with 12 individual analogue switches that are necessary for control of the gate and clear electrodes of the DEPFET sensor.
The control electronics gives timing resolution of 7.5 ns for both gate and clear voltages. Subtraction of pedestal current, is individually configurable for each readout node. The measuring system is controlled by the PC and steering and evaluation software were programmed.
Red and infrared laser and 3-axis position stage with spatial resolution of 1.75 um was integrated into the system. DAQ software allows automatic positioning and scanning of the DEPFET array with the laser beam. These scans are used for optimization of the operational voltages and evaluation of the spatial response of the matrix.
In addition, the system allows calibration and a study of the sensor response using different radioactive sources (e.g. 109Cd, 55Fe, 241Am$\cdots$). Noise levels as low as 8 electrons can be achieved using the described system which allows detailed performance study of the sensors.
Selectable output format (full waveform or sampling window) gives high flexibility and enables monitoring of signal changes during the switching processes, optimization of timing and control pulses overlap.
Results from the first evaluation studies from the system will be presented.

Primary author: SCHEIRICH, Jan (Czech Technical University in Prague, Faculty of Electrical Engineering)

Co-authors: RITTER, Andreas (MPI fur Physik, Munich, Germany); WASSATSCH, Andreas (MPI fur Physik, Munich, Germany); KOFFMANE, Christian (MPI fur Physik, Munich, Germany); OSWALD, Christian (Charles University, Prague, Czech Republic); NINKOVIC, Jelena (MPI fur Physik, Munich, Germany); ANDRICEK, Ladislav (MPI fur Physik, Munich, Germany); KODYS, Peter (Charles University, Prague, Czech Republic); RICHTER, Rainer (MPI fur Physik, Munich, Germany); RUMMEL, Stefan (LMU Muenchen, Excellence Cluster Universe, Germany)

Presenter: SCHEIRICH, Jan (Czech Technical University in Prague, Faculty of Electrical Engineering)

Session Classification: Posters

Track Classification: ASICs