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A new Transition Radiation detection technique based on DEPFET silicon pixel matrices.

Transition Radiation Detectors (TRD) has the attractive features of being able to separate particles by their gamma factor. Typically in high energy physics TRD are used for electron identification and to reject hadron background. The basic problem in detection of transition radiation photons (TR) is the discrimination of TR from dE/dX energy loss of charged particles. The classical TRD is based on gaseous detectors filled with Xenon gas mixture to efficiently absorb transition radiation photons, with energy 6-20 keV over a background of dE/dX with energy about 2-3 keV. Replacing the Xenon based gaseous detectors with modern silicon detectors is complicated by the huge dE/dX of particles in 300-700um of silicon - about 100-300keV.
A new silicon pixel detector - DEPFET has features which allows to use another detection technique to overcome the existing limitation on detecting TR photons with particles in the same pixel. The DEPFET pixel detector is based on a fully depleted high resistivity silicon substrate, and offers first stage in-pixel amplification by incorporating a field effect transistor in the sensor substrate. In this concept, a very small input capacitance can be realized thus allowing for low noise measurements. The first tests of DEPFET with fiber radiator have been carried out in August 2009 at the CERN SPS.
Monte Carlo simulation is based on GEANT3 tools - ATLSIM.
The first results of test beam measurements and comparison with MC will be presented.

Summary (Additional text describing your work. Can be pasted here or give an URL to a PDF document):

http://cern.ch/fourl/vci2009_trd_summary.pdf

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