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Status of 3D double sided detector fabrications and their applications at CNM-IMB

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Silicon detectors cylindrical electrodes (so called 3D detectors) offer advantages over standard planar photodiodes as more radiation hard radiation sensors. 3D detectors with the double sided geometry have been fabricated at CNM clean room facilities. Different geometries including pixel detectors for high energy physics experiment and synchrotron imaging , short strip detectors with the same inter-column spacing as proposed for the ATLAS pixel detector upgrade and standard pad for radiation hardness studies
The detectors have been irradiated to a fluence of 2 x 1016 cm−2 1 MeV equivalent neutrons, which is twice the expected dose of the inner pixel layer of the ATLAS detector for super-LHC operation. Charge collection studies have been performed with analogue readout with 25ns shaping time, as required for (super)LHC experiments. The response of the detectors to Sr-90 electrons and laser scanning are shown and compared with planar devices.
The 3D detector is shown to have superior charge collection characteristics even at the highest fluences even when compared to planar devices operating at 1000V, which is in excess of that presently possible in the ATLAS experiment. Annealing studies of the collection efficiency and the main electrical characteristics of the detectors are also investigated. The experimental results are compared to the simulation of charge transport in the devices.

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