Contribution ID: **108** Type: **Contributed Talk**

Fabrication of 3D detectors with columnar electrodes of the same doping type

Thursday 15 September 2005 14:45 (15 minutes)

Recently, increased attention has been given to 3D detectors owing to their capability to control the depletion mechanism by acting on the layout of the vertical electrodes only. Depletion voltages two orders of magnitude lower and collection times one order of magnitude lower than those of standard planar detectors [ ] can be obtained, by properly designing the electrodes width and pitch. This feature is of particular interest for detectors to be employed in extremely hard radiation environments, as the one foreseen for the Super-LHC.

In the 3D architecture proposed by S.I. Parker et al. [1], columnar electrodes of both doping types are arranged in adjacent cells. The path of the electric field lines begins at one electrode type and ends at the closest electrode of the opposite type in parallel with the detector surface. Acting on the bias voltage the strength of the electric field can be tuned. The fabrication process of 3D detectors is rather long and requires several steps that are not commonly used in standard detector technology. This makes future mass production of 3D devices very critical as far as the fabrication yield and the costs are concerned.

In a previous work [ ] we presented a new 3D detector architecture (3D-stc) aimed at simplifying the manufacturing process making it more suitable for high volume production. In particular, the proposed device features electrodes of one doping type only, e.g., n+ columns in a p-type substrate. The main advantage is that the column etching and doping are performed only once, a fact that provides a considerable process simplification. A drawback of the proposed structure is that it prevents from controlling the electric field strength with the applied voltage when full depletion is reached. The only way to control the electric field is by selecting the appropriate substrate doping concentration. As a result, the low-field regions may have a larger extension with respect to the original 3D detector design. Several tests have been performed to verify the feasibility of single process steps.

In this work we present the layout and the fabrication process used to realize the first prototypes of 3D-stc.

The device process is going to be completed in June 2005, therefore preliminary results of the electrical characterization will be presented at the conference.

Author: Dr RONCHIN, Sabina (ITC-irst, Trento, Italy)

Presenter: Dr RONCHIN, Sabina (ITC-irst, Trento, Italy)

Session Classification: S12 : New Solid-State Detector Technologies

Track Classification: New Solid-State Detector Technology