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Evaluation of Landau contribution of a single cell 3D 50 μ m pixel under SPS 120 GeV pion beam

The proven potential of higher than 10^{16} n_{eq}/cm^2 radiation tolerance that 3D geometries offer, in combination with a small cell approach, makes them an excellent choice for combined precision timing and tracking applications. In this study, timing resolution of a single $50 \times 50 \mu\text{m}$ 3D pixel cell is presented in various temperatures through charged collection measurements in a laboratory setting. The series is complemented by an extensive test-beam campaign using 160 GeV SPS pions. A multi-plane timing telescope with integrated pixel tracker is used. Field uniformity, Landau contribution and collected charge are treated using varied incidence angles in the range of $\pm 12^\circ$. Relying on state-of-the-art numerical methods, the choice of instrumentation and subsequent bandwidth limitations are discussed as well as their effects on signal composition and biasing. With the introduction of $7 \mu\text{m}$ resolution tracking, a detailed cartography of the cell is performed, and the field uniformity hypothesis is evaluated.

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