

New beam test results of 3D pixel detectors constructed with poly-crystalline CVD diamond

Tuesday 26 February 2019 09:20 (20 minutes)

Detectors based on Chemical Vapor Deposition (CVD) diamond have been used extensively and successfully in beam conditions/beam loss monitors as the innermost detectors in the highest radiation areas of Large Hadron Collider (LHC) experiments. Over the last two years the RD42 collaboration has constructed a series of 3D pixel detectors using CVD diamond as the active material with laser fabricated columns in the bulk and characterized them in test beams. The electrical properties and latest beam test results from 2017 and 2018 of the efficiency and spatial resolution of the most recent 3D pixel detectors constructed with poly-crystalline CVD diamond will be presented. The devices were constructed with $50\ \mu\text{m} \times 50\ \mu\text{m}$ cells with columns $2.6\ \mu\text{m}$ in diameter. In one of the devices the cells were ganged using a surface metalization layer in a 5×1 cell pattern to match the geometry of the ATLAS FE-I4 pixel readout electronics and in the other the cells were ganged using a surface metalization layer in a 3×2 cell pattern to match the geometry of the CMS PSI46digV2.1-respin pixel readout electronics. In beam tests, using tracks reconstructed with a high precision tracking telescope, both devices achieved tracking efficiencies greater than 97%. In the same beam tests, the first pulse height distributions from poly-crystalline CVD diamond 3D pixel devices were measured. Finally, the latest test beam results of irradiated poly-crystalline CVD diamond pad and pixel detectors will be presented.

Primary author: KAGAN, Harris (Ohio State University (US))

Co-author: TRISCHUK, William (University of Toronto (CA))

Presenter: KAGAN, Harris (Ohio State University (US))

Session Classification: Session 4: Technologies and Applications (1)