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Beam Test Results of the Dependence of Signal Size on Incident Particle Rate in Diamond Pixel and Pad Detectors

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For two decades the CERN-based RD42 collaboration has investigated Chemical Vapor Deposition (CVD) diamond as a radiation tolerant alternative for precision tracking detectors. I will present beam test results of charged particle detectors based on single-crystal and poly-crystalline CVD diamond. The detectors were tested over a range of particle fluxes from 2 kHz/cmˆ2 to 2 MHz/cmˆ2. The pulse height of the sensors was measured with pad and pixel readout electronics. The pulse height of the non-irradiated single-crystal CVD diamond sensors was stable with respect to flux, while the pulse height of irradiated single-crystal CVD diamond sensors decreased with increasing particle flux. The observed sensitivity to flux is similar in both the diamond pad sensors constructed using diamonds from the Pixel Luminosity Telescope (PLT) irradiated during its pilot run in CMS detector and in neutron irradiated diamond pad sensors from the same manufacturer irradiated to the same fluence of neutrons. The pulse height for irradiated poly-crystalline CVD diamond pad sensors proved to be stable with respect to particle flux. This work will be extended this summer with rates up to 20MHz/cmˆ2 in both polycrystalline and single-crystal CVD diamond. The results from the latest beam tests of the dependence of signal size on incident particle rate in charged particle detectors based on single-crystal and poly-crystalline CVD diamond will be shown.

Oral or Poster Presentation

Oral

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