

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

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Detectors based on Chemical Vapor Deposition (CVD) diamond have been used successfully in beam conditions monitors in the highest radiation areas of the LHC. Future experiments at CERN will accumulate an order of magnitude larger fluence. As a result, an enormous effort is underway to identify detector materials that will operate after fluences of $>10^{16}/\text{cm}^2$.

Diamond is one candidate due to its large displacement energy that enhances its radiation tolerance. Over the last 2 years the RD42 collaboration has constructed 3D CVD diamond pixel detectors that use laser fabricated electrodes to enhance radiation tolerance. We will present beam test results of these devices. The cells in these detectors had a size of $50\mu\text{m} \times 50\mu\text{m}$ with columns $2.6\mu\text{m}$ in diameter ganged in 1×5 and 3×2 patterns to match the ATLAS and CMS pixel read-out electronics. In beam tests, a tracking efficiency of 99.3% was achieved. The efficiency of both devices plateaus at a bias voltage of 30V.

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