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3D diamond detectors for tracking and dosimetry

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Advances in the laser assisted transformation of diamond into amorphous-carbon has enabled the production of a new type of particle detector - 3D diamond.

When compared to conventional planar technologies, previous work has proven a 3D geometry to improve the radiation tolerance of detectors fabricated in silicon.
This work demonstrates the same principle in diamond, with the aim of producing an accurate particle detector tolerant to extreme radiation fields.

We present the latest fabrication methods, including the use of a spatial light modulator to produce a 3D array of ~1um diameter low resistivity electrodes, and discuss the fabrication of several devices in both single-crystal and polycrystalline CVD diamond.
In order to optimise the 3D geometry, devices were fabricated with various cell geometries, and measurements obtained from various beams, all of which shall be presented.

Outside the field of high energy particle physics, a potential application for this technology includes medical dosimetry; where the high resilience to radiation damage, operation at low bias voltage with well defined active volume, in addition to high compatibility to human tissue, makes their use desirable. We shall present results obtained with 3D diamond detectors for dosimetry applications.

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