Diamond Tracking Detectors

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Progress in experimental particle physics in the coming decade depends crucially upon the ability to carry out experiments at high energies and high luminosities. These two conditions imply that future experiments will take place in very high radiation areas. In order to perform these complex and perhaps expensive experiments new radiation hard technologies will have to be developed. Chemical Vapor Deposition (CVD) diamond detectors are being developed as a radiation tolerant alternative for use very close to the interaction region where detectors may have to operate in extreme radiation conditions. During the past few years many CVD diamond devices have been manufactured and tested. As a detector for high radiation environments CVD diamond benefits substantially from its radiation hardness, very low leakage current, low dielectric constant, fast signal collection and ability to operate at room temperature. We will present the present state-of-the-art of polycrystalline CVD diamond and the latest results obtained from detectors constructed with this material. In particular we will present test-beam results from the first full diamond ATLAS pixel module. This device has an active area of 6 x 2 cm^2, pixelated with 46080 sensitive elements. The module is readout with sixteen ATLAS pixel front-end electronic chips that were bump-bonded by IZM (Berlin). Recently a new type of diamond has been developed: single crystal CVD diamond. We will also present recent results obtained from devices constructed from this new diamond material. Finally, we will discuss the use of diamond detectors in future applications and their survivability in the highest radiation environments.