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Recent results of diamond radiation tolerance

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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 has been developed as a radiation tolerant material for use very close to the interaction region where detectors must 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. As a result CVD diamond has now been used extensively in beam conditions monitors at every experiment in the LHC. In addition, CVD diamond is now being considered as a sensor material for particle tracking detectors closest to the interaction region where the most extreme radiation conditions exist. We will present the present state-of-the-art of polycrystalline CVD diamond and single crystal CVD diamond and the latest results on the radiation tolerance of these materials for a range of protons, pions and neutrons obtained from strip detectors constructed with these materials.

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