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Diamond for high energy radiation and particle detection

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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 is being developed as a radiation tolerant material 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. As a result CVD diamond now has been used extensively in beam conditions monitors as the innermost detectors in the highest radiation areas of e+e- colliders (BaBar and Belle experiments) and hadron colliders (CDF and every experiment at the recently commissioned CERN Large Hadron Collider). In addition, CVD diamond is now being considered as a sensor material for the 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 the latest results obtained from detectors constructed with this
material. Recently single crystal CVD diamond material has been
developed which resolves many of the issues associated with
polycrystalline material. 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 present and future experiments and their survivability in the highest radiation environments.

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Classification de Session: Detector R & D and Data Handling

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