

Recent results of diamond radiation tolerance

Monday, September 2, 2013 3:10 PM (20 minutes)

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 and hadron colliders. 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 and single-crystal CVD diamond and the latest results on the radiation tolerance of the highest quality material for a range of proton energies, pions and neutrons obtained from strip detectors constructed with this material. We will also discuss the use of diamond detectors and their survivability in the highest radiation environments.

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Session Classification: Session 2

Track Classification: New materials, new technologies associated