

Overview of the CMS BCML system and the potential of diamond detectors surface modification application

The development of radiation-hard detector sensors is of increasing importance as the luminosity delivered to high-energy particle physics experiments increases. For example, the use of classical silicon detectors to produce an effective beam safety system based on a current measurement, is limited in the conditions of high radiation load of the CMS experiment at the LHC; notably the lack of the ability to provide the required cooling efficiency to achieve operational conditions with a negligible leakage current over the lifetime of the experiment. At the same time, the use of such a radiation-resistant material as a diamond is limited by technological difficulties, one of which is the low adhesion to the materials for the detector metallization plates. This report discusses the performance of the developments made by the CMS BRIL project on sensor choices for the beam safety system (BCML), as well as promising ways of solving problems with adhesion to the detector's plates by using the diamond surface modification by using doped diamond sublayers.

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