Eleventh International Workshop on Semiconductor Pixel Detectors for Particles and Imaging

ID de Contribution: **119** Type: **Invited**

Wide band-gap material sensors for applications in high energy physics experiments

mercredi 20 novembre 2024 08:30 (40 minutes)

In this presentation the latest developments on detectors made of wide-band-gap materials for applications in high energy physics experiments will be discussed. In particular the status of SiC, GaN and Diamond based detector developments will be reviewed and the plans of the newly formed DRD3 collaboration with it's focus on wide-bandgap materials in working group 6 will be presented.

Silicon Carbide (SiC) is a wide bandgap semiconductor known for its exceptional properties, making it a promising material for radiation particle detection. The presentation will give an overview of the advantages of SiC detectors and the current research progress in this area, with emphasis on the latest experimental results on SiC diodes for detecting ionising radiation and the status of developing LGAD structures to increase the signal yield. The status of radiation damage on detector performance and simulation effort will be also discussed.

GaN is wide-bandgap semiconductor which is overcoming Si in high-power, high-temperature switching applications and thus is of great interest to industry. It offers a large bandgap and high atomic bond energy which makes it an attractive candidate for a sensor material at extreme fluences. First studies with GaN Schottky diodes in the framework of the RD50 collaboration have been undertaken and are presented.

Diamond has the largest band-gap with about 5.5eV of the wide-bandgap materials discussed here. There is no need to create a depletion zone by doping and reverse-biasing as in the case for e.g. Silicon. Diamond as sensor material is well established and used in the experiments at Tevatron and LHC, and the LHC itself primarily for beam monitoring applications. The radiation tolerance was tested with protons, pions and neutrons, and a radiation damage model was developed. The radiation studies indicate that the 3D diamond detector shows superior radiation hardness compared to planar diamond detectors. The recent progress in planar diamond and 3D diamond detectors and future applications will be discussed, primarily based on the effort of the RD42 collaboration.

Acknowledgements: The majority of the work presented has been conducted within the context of the CERN Detector R&D collaboration RD42 and RD50.

Auteur principal: OH, Alexander (University of Manchester)

Orateur: OH, Alexander (University of Manchester)

Classification de Session: Sensing materials & Radiaiton tolerance

Classification de thématique: Invited speakers