

CLASSIC: Cherenkov Light detection with SiC

Tuesday 16 February 2016 15:15 (20 minutes)

We present the CLASSIC R&D for the development of a Silicon Carbide (SiC) based avalanche photodiode for the detection of Cherenkov light.

SiC is a wide-bandgap semiconductor material, which, thanks to the 3.3 eV bandgap, is insensitive to visible light. A SiC based light detection device has a peak sensitivity in the deep UV, around 280 nm, making it ideal for Cherenkov light. Moreover, the visible blindness allows the use of such a device for the disentanglement of Cherenkov and scintillation light in all those materials that scintillate above 400 nm.

Within CLASSIC, we aim at developing a device with single photon sensitivity, having in mind two main applications. One is the use of the SiC APD in a new generation ToF PET scanners concept, using the Cherenkov light emitted by the electrons following 511 keV gamma ray absorption as a timestamp. Cherenkov is intrinsically faster than scintillation and could provide an unprecedentedly precise timestamp. The second application concerns the use of SiC APD in dual readout crystal based hadronic calorimeter, where the Cherenkov component is used to measure the electromagnetic fraction on an event by event basis.

We will report on our progress towards the realization of the SiC APD devices, the strategies that are being pursued toward the realization of these devices and the preliminary results on prototypes in terms of spectral response, quantum efficiency, noise figures and multiplication.

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Session Classification: Cherenkov

Track Classification: Cherenkov Detectors