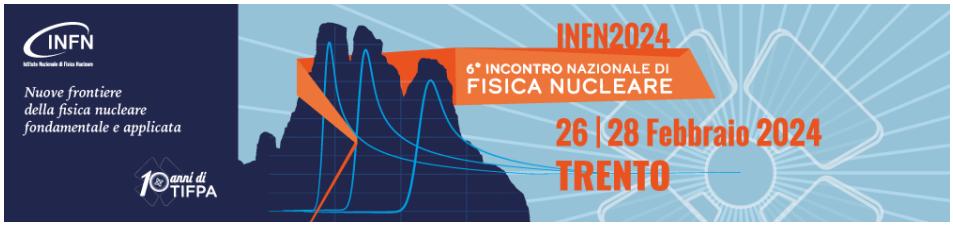

Contribution ID: **52** Type: **flash talk**

SiPMs in direct detection of charged particles: response and timing performance for the future ALICE 3 at LHC

Tuesday, 27 February 2024 10:00 (5 minutes)

Silicon PhotoMultipliers (SiPMs) are established photon detectors for a variety of applications because of their high efficiency, insensitivity to magnetic fields and low cost. In High Energy Physics (HEP) applications, SiPMs are usually coupled to scintillators or Cherenkov radiators. Nonetheless, it has been observed that SiPMs are able to directly detect charged particles: at the passage of a single charged particle, several SPADs (Single Photon Avalanche Diode), i.e. the SiPM unit microcell, are firing at the same time.

This effect has been explained through Cherenkov light emission in the protection layer normally placed above the sensor, as observed by comparing the response of SiPMs exposed to a beam of charged particles and with different, in thickness and material, protection layers and one SiPM without protection.

In this contribution, beam test results on SiPMs are reported. SiPMs with the protection layer feature an increased detection efficiency, if compared with a simple geometrical fill factor, reaching values >99%; moreover, the time resolution dramatically improves with increasing number of fired cells. An intrinsic time resolution around 20 ps has been measured considering the events when more than 5 SPADs are firing, corresponding to >80% of the total events.

These results pave the way for moving SiPMs from simple photosensors to combined charged particle detectors. This possibility would open to applications of SiPMs in many areas, from space experiments to colliders detectors, as for the TOF of ALICE 3 experiment, in which context this research is conducted.

Primary author: SABIU, Bianca (Istituto Nazionale di Fisica Nucleare)

Presenter: SABIU, Bianca (Istituto Nazionale di Fisica Nucleare)

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