Contribution ID: **169** Type: **Poster presentation**

Influence of electromagnetic interference on the analog part of hybrid pixel detectors

Tuesday 5 July 2011 10:09 (1 minute)

The analog signal from the sensor of hybrid pixel detectors is hindered by electro-magnetic interference. A systematic diagnostics of induced and common electro-magnetic coupling between the analog part and digital part of these devices is required.
An influence of electro-magnetic interference on a detector precision was observed on the setup of a pixel particle detector and a read-out interface. The tested system was composed of a Medipix or Timepix pixel detector connected to a FITPIX readout. To get relevant information about electro-magnetic interference several measurements were undertaken. We focused on measurement of external as well as internal interference. We evaluated the influence of both sources of electro-magnetic interference to the noise recorded by pixels. We measured local spatial intensity distribution and frequency spectrum of electro-magnetic field originating inside of the readout chip during its own operation. In context of this test we exposed detector chip to the locally generated artificial electro-magnetic field evaluating its sensitivity to induced interference. Consequently, whole setup of detector and read-out interface was exposed to a distant source of electro-magnetic radiation, during which we tested efficiency of electro-magnetic shielding of various arrangements. In next tests coupling over power supply lines was measured. Primarily, a noise generated by own detector operation was determined. Secondarily, the detector sensitivity to deliberately induced noise was evaluated.
By means of these tests weak points of the setup sensitive to the intrusion of electro-magnetic interference are revealed. When locations of susceptible places are identified a proper methods can be applied to increase immunity of the detector setup against the electro-magnetic interference. Gained experiences are planed to be used in development of EMI shielded version of FITPIX interface immune to electro-magnetic interference.

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Session Classification: Poster Mini Talks IV

Track Classification: Front-end Electronics and Readout