



Contribution ID: 4

Type: **Poster**

Characterisation of SiPMs for the LHCb scintillating fibre tracker

Thursday, 3 October 2019 13:02 (4 minutes)

For the future data taking at LHC, the LHCb detector and in particular the tracking system is replaced to cope with the increased luminosity foreseen and a trigger-less read-out scheme. A scintillating fibre tracker with 500K channels and a total surface of (300 m²) was developed, produced and is currently in the installation phase. One of the key components that enables the scintillating fibre tracker technology for this application is the silicon photomultiplier. SiPM technologies from different vendors as Hamamatsu, KETEK, SensL and FBK were evaluated with a characterisation method based on pulse response. The multichannel array S13552 manufactured by Hamamatsu was selected for its high photon detection efficiency, low correlated noise and short recovery time. It was tested for a radiation environment with a fluence of $12 \cdot 10^{11} \text{ MeV n}_{eq}/\text{cm}^2$. We present the characterisation method, the results and comparison between different devices and some statistics of the results of the quality assurance process for the LHCb scintillating fibre tracker production.

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Session Classification: Poster