

## Multichannel SiPM arrays for the LHCb scintillating fibre tracker

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LHCb will undergo a major upgrade during LHC LS2 in 2019/2020 to cope with increased instantaneous luminosities and a trigger-less 40 MHz read-out. The current inner and outer tracking detectors will be replaced by a single homogeneous detector based on scintillating fibres.

The Scintillating Fibre (SciFi) tracker covers an area of  $340 \text{ m}^2$  by using more than 10,000 km of scintillating fibre with  $250 \mu\text{m}$  diameter, read-out by customised Hamamatsu Silicon Photomultipliers (SiPMs) with 524k channels in total. The 128-channel linear SiPM arrays are optimised for high photon detection efficiency (PDE), low correlated noise, short recovery time and dense packaging. During the operation the SiPMs will be exposed to a neutron fluence of  $6 \times 10^{11} \text{ neq/cm}^2$ . In order to maintain single photon detection capability, the detectors are cooled to  $-40^\circ\text{C}$  reducing the dark count rate (DCR) by order of a factor 100 compared to room temperature operation.

In this presentation we give a short overview of the detector design and status of production and focus on the extensive studies of the SiPM parameters in the context of the SciFi tracker, including PDE, correlated noise probabilities, breakdown voltage, DCR and photon counting capability. The SiPM performance after irradiation will be also discussed.