

SciFi – Upgrading LHCb with a 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 new Scintillating Fibre (SciFi) Tracker covers an area of 340 m² by using more than 10'000 km of blue emitting scintillating plastic fibre with 250 µm diameter, enabling a spatial resolution of better than 100 µm for charged particles. Six-layer fibre mats of 2.4 m length are assembled to form individual detector modules (0.5 m x 4.8 m) consisting of 8 fibre mats each. Linear arrays of Silicon Photomultipliers cooled to -40 °C are placed at the fibre ends and read-out by custom designed ASICs. Subsequent digital electronics perform clustering and data compression before the data is sent to the DAQ system.

Series production of components is close to completion and the detector assembly is imminent. In parallel a R&D program on very fast and efficient scintillating fibres is ongoing. We give an overview of the SciFi detector design, test beam results and status of production and fibre R&D.