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The fibre tracker R&D for the Mu3e experiment

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The Mu3e Scintillating Fibre (SciFi) detector is a cylindrical time of flight (ToF) device which complements the central silicon tracking system. It consists of a scintillating fibre (SciFi) hodoscope with a radius of 6 cm and a length of 36 cm. The expected time resolution is of several 100 ps and a detection efficiency close to 100% is foreseen. The main purpose of the ToF system is to measure precisely the arrival time of particles in order to allow for the matching with hits detected in the silicon detectors. This will help to reject pile-up events (accidental backgrounds) and allow for a charge (direction of propagation) measurement for tracks passing through the silicon tracker more than once (re-curling tracks). The ToF system will operate at very high particle rates up to several MHz per channel. The status of the detector R&D will be presented. Current measurements show very promising results which well fulfill the requests of the experiment: A very high detection efficiency for minimum ionizing particles with a single fiber layer (> 95%), and a full efficiency for multilayer configurations (> 99%); timing resolutions of the order of 500 ps (multilayer configuration); optical cross-talk between fibers at a negligible level (< 1%), for which spatial resolutions < 50 μm are foreseen (multilayer configuration).

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