

## The Mu3e Scintillating Fiber Timing Detector

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The Mu3e experiment will search for the rare neutrinoless lepton flavor violating  $\mu^+ \rightarrow e^+e^+e^-$  decay and it aims at reaching an ultimate sensitivity of  $10^{-16}$  on this branching ratio. The experiment will be performed at PSI using the most intense continuous surface muon beam in the world (presently  $\sim 1 \times 10^8$  mu/s). In order to reach this sensitivity all backgrounds must be rejected below this level. The Mu3e detector is based on thin monolithic active silicon pixel sensors (HV-MAPS) for very precise tracking in conjunction with scintillating fibers and tiles coupled to Si-PMs for accurate timing measurements and is designed to operate at very high intensities.

To suppress all forms of combinatorial background a very thin (thickness  $< 0.2\%$  of radiation length) Scintillating Fiber (SciFi) detector with few 100 ps time resolution, efficiency in excess of 96%, and spatial resolution of  $\sim 100$   $\mu\text{m}$  has been developed. Moreover the SciFi detector will help to determine the charge of the recurling tracks in the central region of the apparatus. The SciFi arrays are coupled at both ends to Si-PM arrays and are read out with a dedicated mixed mode ASIC, the MuTRiG.

We will report in detail the development of the SciFi detector, from the scintillating fiber through the Si-PM array photo-sensors up to the front end electronics and the data acquisition. We will discuss the performance of the SciFi detector prototypes as observed in our studies.

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