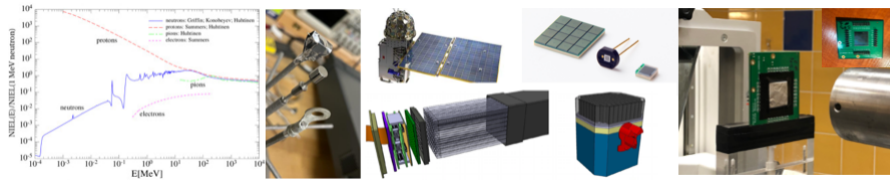


# SiPM Radiation: Quantifying Light for Nuclear, Space and Medical Instruments under Harsh Radiation Conditions



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## The SiPM for LHCb SciFi Tracker

*Tuesday, 26 April 2022 14:55 (25 minutes)*

The LHCb SciFi (Scintillating fibre) Tracker with an active area of  $320\text{ m}^2$  features over 500'000 SiPM channels in a high radiation environment. Unlike other SiPM applications exposed to radiation, the SciFi SiPM is required to provide single photon amplitude resolution throughout the detector lifetime. With a light yield of  $18\text{ pe}$  decreasing to  $12\text{ pe}$  over the lifetime of the detector, low noise cut thresholds are crucial to maintain high hit detection efficiency. The major factors to achieve this are fast shaping, short integration time ( $20\text{ ns}$ ), small active channel area ( $0.3\text{ mm}^2$ ), low correlated noise and cold operation at  $-40^\circ\text{C}$ . The photo-detector was characterised after the exposure to a neutron fluence of  $6 \times 10^{11}\text{ 1MeV n}_{\text{eq}}/\text{cm}^2$  at various temperatures and over-voltages. In this talk I will concentrate on the chosen optimisation process, discuss the production quality assurance procedure and show some statistics on the production parameter spread. The 128 channel detector array was produced and delivered in 2018 by Hamamatsu. They were mounted on Kapton flex PCBs and installed in the detector modules during 2019-2020 and the final detector installation was finalised in April 2022, just in time for the Run 3 start of the LHC accelerator.\

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