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The Mu3e Cosmic Run 2022

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The Mu3e experiment will search for the lepton flavour violating decay $\mu^+ \rightarrow e^+e^-e^+$ and is aiming for a sensitivity of one in 10^{16} muon decays. Since this decay is highly suppressed in the Standard Model to a branching ratio of below $\mathcal{O}(10^{-54})$, an observation would be a clear sign for new physics.

In the Mu3e detector, four layers of silicon pixel sensors will be used to track electrons and positrons and a time resolution of $\mathcal{O}(100ps)$ will be provided by scintillating tile and fibre detectors. The overall detector is expected to produce a data rate from 80 Gbit/s (Phase I) to 1 Tbit/s (Phase II), which will be processed in a three-layer, triggerless DAQ system using FPGAs and a GPU filter farm for online event selection.

A prototype of the detector was operated in summer 2022 in the Mu3e cosmic run with the intent to test and validate a variety of systems and identify possible problems. The operated prototype included two layers of pixel sensors, a scintillating fibre module and a vertical slice of the final data acquisition (DAQ) system. The run was also used for commissioning and validation of the DAQ and first tests of the data analysis and track reconstruction with real detector data.

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