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The trigger system for the MEG II experiment

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Intending to improve the current sensitivity on $\mu^+ \rightarrow e^+ \gamma$ decay by one order of magnitude, the MEG II experiment at Paul Scherrer Institute completed the integration phase in 2021 with all detectors successfully operated throughout the subsequent beamtime.

Earlier in 2021, the WaveDAQ integrated Trigger and Data Acquisition System for the complete readout of the experiment was commissioned.

Receiving almost 9000 channels from the detectors, the MEG II TDAQ system is the largest WaveDAQ deployment so far, proving the scalability of the overall design, from bench-top setup through various smaller-size experiments.

In this contribution, I will describe how MEG II trigger system reduces the $\sim 10^7$ muons decays at the experiment target down to a 10 Hz event rate by exploiting the signal event characteristics at the online level.

The trigger system performs the calorimetric reconstruction of the photon shower and then compares the timing and direction with positron candidates within a 600 ns hard latency time.

The first release of the online reconstruction, deployed in 2021, achieved a 2.5% photon energy resolution at the signal energy of 52.8 MeV and a 4 ns coincidence time resolution among the child particles.

I will show the trigger performances and limiting factors in the last beamtime and how a progressively better understanding of the experiment behaviour will improve them through the three-year-long MEG II data taking campaign.

Collaboration

Primary author: FRANCESCONI, Marco (Istituto Nazionale di Fisica Nucleare)

Presenter: FRANCESCONI, Marco (Istituto Nazionale di Fisica Nucleare)

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