Intensity Frontier Fellowship Closeout Report

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Overview

My research statement outlined projects to be done on the Mu2e experiment at Fermilab. The research plan was divided into two main parts: (1) development of software algorithms for the software-based trigger and (2) preparation of the calorimeter laboratory at Fermilab for the assembly. This fellowship gave me the opportunity to be based at Fermilab for large periods and thus have the possibility to work with the on-site expertise at Fermilab.

1 Mu2e Trigger

The "heart" of the Mu2e software-based trigger system is the online tracking reconstruction algorithm. During this period I have been working on improving the Mu2e tracking code. This work is the result of continuous interactions with the Mu2e software group and the results I had achieved were showed in a significant number of internal presentations. The final results I accomplished improved the Mu2e Track-trigger rejection capabilities by a factor > 3 and opened a window for another round of future improvements. Along the way, I also had the possibility to engage students from US Universities with interesting side projects aimed to improve our current understanding of the track trigger performance.

2 Mu2e Calorimeter QA laboratory

The calorimeter represents one of the two main detectors that will be employed in Mu2e. The first stage of the construction is represented by the procurement of the single components: scintillating crystals and Silicon Photo-multipliers (SiPM). The calorimeter group has been setting up the laboratory for the Quality-Assurance (QA) checks at Fermilab. The INFN groups from Frascati and Pisa delivered the automated QA stations for testing the crystals and SiPM respectively. The latter is a particularly sophisticated test station that allows to fully characterize the SiPM performance in vacuum at different temperatures. I parteciapted to the installation of the SiPM station at Fermilab and performed all the work needed to qualify the data-acquisition software of the station, which was previously developed by myself when I was in Pisa. Up to September 2018, the group has been successfully tested all the SiPM batches on schedule with no delays.