



Contribution ID: 2

Type: **not specified**

## Neutrino Flux Analysis and Monitoring for Power Improvements in NuMI

*Tuesday, 21 July 2020 12:00 (15 minutes)*

The determination of the neutrino flux from accelerator neutrino beams exhibits a challenge for the current and future short- and long-baseline neutrino experiments. These experiments provide the measurements of the neutrino oscillation parameters, the mass hierarchy, and the CP phase with high sensitivity. The current flux predictions for the on-axis and off-axis NuMI (Neutrinos at the Main Injector) neutrino detector locations depend on GEANT4 based beam simulation code called G4NuMI. The current simulation uses the new NuMI target, which has 1.5 mm spot size and it is expected to get 900-kW and even more in the upcoming years. In this work, for this new target system, we study the neutrino flux corresponding to the muon energy thresholds seen by the Muon Monitors for FTFP\_BERT hadronic model and investigate the neutrino flux predictions at the on-axis and off-axis NuMI neutrino detector locations for FTFP\_BERT and QGSP\_BERT hadronic models by using G4NuMI beam simulation. We also present the application of the PPFX (Package to Predict the Flux) to the neutrino flux at the on-axis and off-axis NuMI detector locations for FTFP\_BERT hadronic model. Finally, we investigate the neutrino spectrum at the NuMI neutrino detector locations that come from  $\pi^+$  through the focusing components. All plots are based on G4NuMI with 50M protons on target (POT).

### Summary

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**Session Classification:** Tuesday Morning 2