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## NuMI Target and Horn Studies for NOvA

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The NuMI Off-axis  $\nu_e$  Appearance (NOvA) experiment is a long baseline neutrino oscillation experiment designed to measure both  $\nu_e$  appearance and  $\nu_\mu$  disappearance. The Neutrinos at the Main Injector (NuMI) facility produces an intense muon neutrino beam by directing 120 GeV protons onto a 2.5 interaction length graphite target segmented into 48 fins. The secondary particles produced at the target are focused by two magnetic horns and followed by a long decay pipe where most of the short-lived particles (pions and kaons) decay to neutrinos. The NOvA detectors are placed 14.6 m off-axis to the NuMI beam. In this poster we present an update on the target and horn set configuration study for an optimized NOvA neutrino flux. We found that a new target design with 24 fins upstream and 24 fins extended inside of the first horn produces more off-axis neutrino flux than the existing NOvA target that has 48 fins upstream of the first horn. We show also our progress on optimizing the position of the second horn and the prospect to include a third horn (identical to the existing second horn) into the focusing system. Additional studies of material in the beam downstream of the horns are also under study.

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