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Simulations of High Current NuMI Magnetic Horn Striplines at FNAL

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Both the NuMI beam line that has been providing intense neutrino beams for several experiments (MINOS, MINERVA, NOVA) and the newly proposed LBNF beam line which plans to produce the highest power neutrino beam in the world for the DUNE experiment need pulsed magnetic horns to focus the mesons which decay to produce the neutrinos. The high current horn and stripline design has been evolving as NuMI reconfigures for higher beam power and as LBNF produces designs for even higher beam power and horn current. The CSU particle accelerator group has aided the neutrino physics experiments at Fermilab by producing EM simulations of magnetic horns and high current striplines as part of URA in 2015. In this paper, we present calculations of the EM interaction of the stripline plates of the NuMI horns at critical stress points, using POISSON and ANSYS MAXWELL 3D codes for 200 kA of current to the horns. In addition, we give the thermal and electrical simulation results using ANSYS Electrical code. These results are being used to support the development of evolving horn stripline designs to handle increased electrical current and higher beam power for NuMI upgrades and for LBNF.

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