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Optimization of the LBNF Neutrino Beam

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The Long Baseline Neutrino Facility (LBNF) will use high energy protons impinging on a graphite target to produce kaons and pions, which will be focused by a set of magnetized focusing horns and directed into a decay pipe where they will decay, producing an intense neutrino beam. The neutrino energy spectrum can be tuned by changing a variety of parameters in the beamline such as horn and target shapes. Recent advances in computing power coupled with the development of complex optimization algorithms enable identification of parameters that are precisely tuned to optimize physics parameter sensitivity. An optimization of the LBNF beam parameters for sensitivity to CP violation has been performed. The resulting beam design and its physics performance will be discussed, as well as engineering modifications to that design and re-optimization incorporating these engineering constraints.

Primary author: FIELDS, Laura

Presenter: FIELDS, Laura

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