



Contribution ID: 117 Contribution code: THP13

Type: **Poster Presentation**

Characterization and damping control of mechanical connections to improve performance of horn stripline

Thursday 18 September 2025 16:40 (1 hour)

Magnetic focusing horns are critical components for creating a stable beam of neutrinos for neutrino facilities, such as the Long Baseline Neutrino Facility (LBNF) at Fermilab. The pulsed magnetic horns are powered by high current electricity through long striplines, which must survive in a harsh radiation environment for the operational life of the component. Each stripline assembly consists of four layers of Al 6101-T6. As an electromechanical system, the stripline layers are bolted together with ceramic isolators for electrical insulation and to facilitate passive cooling and mechanical stability. The striplines experience vibrational force in addition to clamping force, repetitive thermal and electro-magnetic loading. The holes of stripline plates for ceramic joints represent one of the weak links for potential failure*, **. By characterizing the behavior of these joints and optimizing their damping properties through finite element analysis and experimental modal analysis, stripline performance and longevity can be improved. This study not only helps predict the behavior of the striplines but also improves their performance to meet the required operational lifetime.

Footnotes

* Kris Anderson, NuMI/NOvA Horn 1 Stripline Vibration Measurements, NBI Workshop 2014

** Patric Hurh, NumI Horn Stripline Failure, Analysis, and Recovery, or the Case of the Cracked Stripline, High Power Targetary Workshop 2016

Funding Agency

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Session Classification: Thursday Poster Session

Track Classification: PRECISION MECHANICS: Stability Issues