US-Japan Proposal: Research and Development for Current and Future Long Baseline Neutrino Detectors

The current (NOvA and T2K) and future (DUNE and HyperK) long-baseline neutrino programs are focused on measuring the oscillation probabilities for υ_μ to υ_e and υ_μ to υ_μ and their antineutrino counterparts to comprehensively explore neutrino mixing.

This proposal comprises three thrusts that advance the full exploitation of the current detectors and further the optimal design of the future detectors.

1. NOvA-T2K joint analysis: Enabling the eventual combined analysis of these two collaborations oscillation datasets with workshops on neutrino interaction modeling and exchange visits of the relevant domain experts.

2. Hadro-Production: In a stepwise fashion, work towards a new hadro-production experiment at Fermilab in service of both DUNE and HyperK

3. Liquid Argon TPC development: R&D on LArTPC technology and light collection

$435k DOE budget request

(~20% travel, ~20% engineer & technician labor, ~60% M&S)

Last Year's Accomplishments and Next Year's Requests

1. NOvA-T2K joint analysis:
   - Last Year: Successful 3 day workshop held at KEK in October 2017. Detailed reports for each experiment on that focused on future physics sensitivity projections and the influence of neutrino cross-section uncertainties. A report describing the workshop and its outcomes is in draft
   - Next Year: Next workshop in the series will be in the US

2. Hadro-Production:
   - Last Year: Construction of an emulsion handling facility at Fermilab and a testbeam run with emulsion
   - Next Year: Augment the emulsion with a large aperture magnet and high resolution, large acceptance detectors and conduct a 2nd run

3. Liquid Argon TPC development:
   - Last Year: Development of a new light read-out concept based on SiPM arrays with an active operational amplifier ganging method to reduce the degradation of the signal when increasing the active surface.
   - Next Year: Development of Dual Phase TPC charge read-out, development of HV feedthrough, and completion of the scintillation light read-out concept.