

Intensity Frontier Fellowship (Track 1) : Proposal Summary

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The DUNE long-baseline neutrino experiment is the next leading-edge experiment at Fermilab that will start operating around 2026. The DUNE experiment will have the opportunity to provide precise insights into the neutrino mass hierarchy and will be able to measure the CP violating phase over 75% of the phase space with a precision up to 5σ . The DUNE Near Detector will play an important role to achieve these.

I am applying for the Fermilab Intensity Frontier Fellowship (Track 1) to spend a minimum of one year at Fermilab, in order to provide a leading contribution to the design of the DUNE Near Detector. Being at Fermilab will enable me to work very closely to the MPD group and therefore more efficiently than at DESY, as well it would allow me to make use of the facilities provided at Fermilab such as the computing grid cluster for simulation jobs or testbeam/neutrino facilities. My work will focus, but not limited to, on the following topics:

- **Electromagnetic calorimeter for the Multi-purpose detector (MPD) of the DUNE Near Detector**
 - Optimization studies of the MPD geometry focused on the electromagnetic calorimeter
 - Assessment of the performance of the MPD ECAL and its impact on the oscillation analysis
 - Research and development of precise timing measurement with long scintillator bars readout with SiPM in coordination the CALICE Collaboration and German institutes
 - Possibly start of prototyping of the ECAL for the MPD
- **Core Software for the DUNE Near Detector**
 - Improvement of the current simulation, reconstruction and analysis framework of the MPD
 - Integration of all the near detector components into a common framework
 - Implementation of the PandoraPFA Software package in the MPD reconstruction