Precision neutrino physics has entered a new era both with pressing questions to be addressed at short and long baselines, and with stringent performance requirements to be fulfilled by the detectors. In the US, the technology choice for a state-of-the-art fine-grained, high-resolution neutrino detection method has been recently made for the future Long Baseline Neutrino Experiment: a *Liquid Argon Time Projection Chamber* (LArTPC). Developments in LAr technology are continuously progressing and actively pursued. Most important among these is currently considered the precise characterization of LAr response via charged particles beam tests. A phased program is currently being proposed to FNAL for a precise calibration of the LArTPC detector at the Fermilab Test Beam Facility (FTBF):

- Motivation/Goals: reaching the as-yet-unexplored limits of LArTPC technology in particle identification (PID) capability and in calorimetric energy reconstruction.
  *Phase-I* of the proposed test beam program aims at a detailed study of proton identification and $p$ to $K$ separation, kaon identification and $K$ to $\pi/\mu$ separation, as well as the direct (experimental) measurement of electron to $\gamma$ ($\rightarrow e^+e^-$ pair) separation.
  *Phase-II* will address studies of $e \rightarrow$ electromagnetic cascades and the contribution of soft gammas down to low energy thresholds, $\pi \rightarrow$ hadronic cascades and the "invisible" components which would bias a calorimetric energy reconstruction, and determination of the $e/\pi$ ratio in LAr.

- Method and Scope of Effort: in the first phase, measurements of dE/dx *vs.* residual range along tracks of stopping particles of given type inside the LArTPC volume will provide a calibration of the *charge to energy* conversion and unprecedented precision in determination of the recombination factors. The second phase will extend the program to cover the other essential category of calibration, *detected energy to incident energy*, by ∼fully containing electromagnetic and hadronic showers.

- Required Resources (equipment, beam, manpower): The first configuration capitalizes on the availability of the existing ArgoNeuT detector (TPC, read-out electronics, and cryostat). The active volume of the ArgoNeuT TPC is just appropriate for the proposed physics program of Phase-I. A larger detector 3-4 $\lambda_{int}$ long and 2 $\lambda_{int}$ wide is required with Phase-II to offer good containment ($\lambda_{int} \simeq 80$ cm in LAr)
  The entire program is based on the availability and semi-permanent use of a pure low momentum tertiary beam of muons, pions, kaons, and protons (both signs) at the FTBF in the M-Center beamline. FNAL is expected to provide the beam and the cryo-system (for both phases) based on current experience with LAPD and MicroBooNE, users will provide detectors.

- Timescale: the availability of the ArgoNeuT equipment facilitates quick turnaround so that the detector, after some modifications (upgraded Ar purification loop, beam-window, and scintillation light read-out), will be ready for data-taking on a short timescale.

An international collaboration has been formed and already includes more than fifteen groups, presently active with detector design, upgrade of existing components, and MC simulations. Detector assembly for Phase-I is underway.