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The 35-Ton Liquid Argon TPC Prototype for the Long-Baseline Neutrino Experiment

The Long-Baseline Neutrino Experiment will employ a multi-kTon Liquid Argon Time Projection Chamber (LArTPC) as its far detector located at the Homestake mine in South Dakota. This will require a volume scale-up of roughly a factor of 50 compared to the Icarus T600, which is the largest LArTPC built to date. To achieve this scale-up, a number of novel design elements will need to be employed. Rather than using a conventional cryostat that is built in a factory and shipped to the site, LBNE will use a modular "membrane" cryostat with factory-built pieces that are assembled in place onto the walls of the underground cavern. This yields a low-cost structure with high fiducial volume. Similarly, the wire-plane arrays will be factory-built as modules that are then installed into the cryostat. The analog and digital electronics will be both mounted on the wire planes inside the cryostat in order to reduce the electronic noise and the number of signal cables needed. The scintillation photon detectors will employ light collection paddles to reduce the required photo-cathode area. Since each of these new elements has not yet been tested in a large-scale TPC, a prototype is needed to demonstrate their viability. In the recently completed "Phase 1", the 35-ton prototype was filled with LAr and successfully demonstrated the suitability of membrane cryostat technology for use with LArTPC's. "Phase 2" will install an actual TPC into the volume and test each of the other new design elements with a cosmic ray run in 2015. This poster presents the results of Phase 1 and status and plans for Phase 2.

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