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The Noble Liquid Test Facility at Fermilab

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The **Noble Liquid Test Facility (NLTF)** at Fermilab is a liquid argon detector R&D facility open to the national and international HEP community. The facility consists of 4 permanent cryostats, ranging from 250L up to 3000L, open space for small open dewar testing and an optical test stand facility capable of measuring the optical properties of materials and characterizing photon detectors. NLTF's strongest advantage is its capability to provide ultra-pure LAr in a reliable manner. Its inline filters are capable of filtering all of the three biggest contaminants for standard LAr detectors, O₂ and H₂O down to < 1ppb and N₂ < 1ppm. This is critical for the users of the test stands as small levels of impurities can dramatically change the efficiency of LArTPCs for the collection of charge and light. The smallest cryostat is mainly used for material testing, a service provided to the international HEP community interested in understanding how the introduction of a specific material might affect the electron lifetime in LAr. The test stands can be equipped with a purity monitor, which allows measuring the electron lifetime in real time, as well as gas sampling and analyzing, and in the near future, local recirculation and filtering.

The facility has hosted many successful R&D projects, which have published their results in well-known journals and talks. A few examples of such projects are the NIR light production in LAr and GAr, the characterization of VUV metalenses, the testing of new filter media capable of filtering N₂ from LAr, high voltage studies and direct charge amplification in LAr, and various doping studies.

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