



SPEAKER: Sebastien Murphy
TITLE: **Development and operation of a large dual phase liquid argon TPC**
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ABSTRACT

Giant Liquid argon TPCs (LAr-TPCs) represent unique setups to detect and study neutrinos and other rare phenomena such as proton decay. The technology has been under development for many decades and provides a dense target with unprecedented 3D imaging capabilities and a homogeneous full sampling calorimeter that can be operated over a wide range of energies.

The Deep Underground Neutrino Experiment (DUNE) envisages to deploy up to four 10 kt LAr TPC modules in a mine in South Dakota (USA). The DUNE underground neutrino observatory coupled to a powerful neutrino beam from Fermilab has huge scientific discovery potential including the conclusive discovery of leptonic CP violation and the determination of the neutrino mass ordering. DUNE will extend the sensitivity to proton decay while simultaneously studying atmospheric and astrophysical neutrinos with very high statistics.

The major technological advancement proposed by the dual phase LAr-TPC relies on the charge amplification in argon vapour which provides excellent signal-to-noise ratio. Electrons produced in the liquid argon are extracted to the gas phase where they are multiplied by large area LEMs (Large Electron Multipliers) and collected on an anode plane with strip readout. The charge amplification enables constructing giant LAr-TPCs with drift lengths of over 10m without deteriorating its imaging performance.

In recent years the WA105 collaboration has undertaken an intensive R&D activity to demonstrate the technology at the tens of kiloton scale. CERN is playing a very active role in LAr-TPC prototyping for DUNE and other experiments. A TPC with 5 ton (3m x 1m x 1m) of active mass has been constructed and provided recently its first cosmic ray data. In parallel a much larger 300 ton (6m x 6m x 6m) detector is being assembled in the North Area and is foreseen to take data in 2018 with a charged particle beam. The seminar will review in detail the status and advancement of both those detectors and how they fit in the general context of DUNE.