Prof. Ernesto Kemp / University of Campinas

Brief description of the proposal

The Liquid Argon Time Projection Chambers (LArTPC) have been shown to be the most promising technique to raise the level of quality of data from neutrino interactions in terms of spatial and energy resolutions. The LArTPCs form the basis of the neutrino research program at Fermilab, which strategy is based on have experiments with gradual increase on the detector size/enhancements until reaches the state of the art that will be used in the ambitious DUNE project, a 50 kiloton LArTPC to be installed in the Sunford Underground Facility, 1300 km downstream of the the neutrino beam at Fermilab. The photon detection system (PDS) is an essential part of LArTPCs.

The neutrino group from UNICAMP (Brazil) proposed an innovation in the photon collection system, the ARAPUCA device, based on the combination of wavelength shifters and dichroic filters that trap the Argon scintillation photons, increasing the efficiency in light collection. My project is to work on R&D for ARAPUCA, to find optimal parameters of the optics, geometric configuration, mechanics and readout electronics in order to get maximum performance of the device. Current experiments from Fermilab like LArIAT and protoDUNE should have their PDS instrumented with ARAPUCAs as part of the R&D program. I will work on the integration of new PDS based on ARAPUCA's concept in these experiments. I am also planning to work on other components of LArTPC, such as the anodic plans of the LArIAT experiment, which signals combined with those from the light detection system, provide the information necessary for a good reconstruction of neutrino events in LArTPCs.