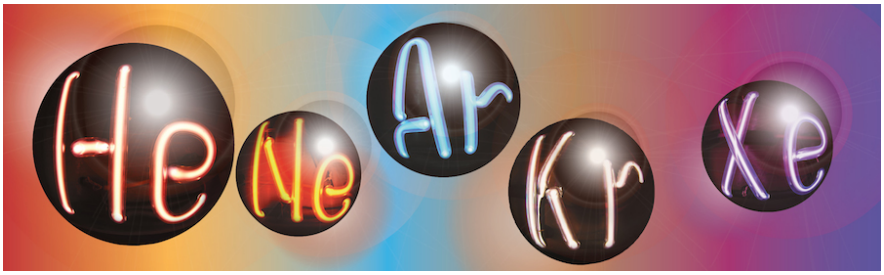

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Xenon doping of Liquid Argon in ProtoDUNE Single Phase

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The Deep Underground Neutrino Experiment (DUNE) will be the next generation long-baseline neutrino experiment. The far detector is designed as a complex of four LAr-TPC (Liquid Argon Time Projection Chamber) modules with 17 t of LAr each. The development and validation of its technology is pursued through ProtoDUNE Single Phase (ProtoDUNE-SP), a 770 t LAr-TPC at CERN Neutrino Platform. Crucial in DUNE is the Photon Detection System that will enable the trigger of non-beam events - proton decay, supernova neutrino burst, solar neutrinos and BSM searches - and will improve the timing and calorimetry for neutrino beam events. Doping Liquid Argon (LAr) with Xenon is a well known technique to shift the light emitted by Argon (128 nm) to a longer wavelength (175 nm) to ease its detection. The largest Xenon doping test ever performed in a LArTPC was carried out in ProtoDUNE-SP. From February to May 2020, a gradually increasing amount of Xenon was injected to compensate for the light loss due to air contamination. The response of such a large TPC (770 t of Liquid Argon and 440 t of fiducial mass) has been studied using the ProtoDUNE-SP Photon Detection System (PDS) and a dedicated setup installed before the run.
Here we introduce the Xenon doping technique as well as the specific detector components developed for this campaign and the results of the study with particular regard to the modification of the scintillation signal, the uniformity of the light collection and the efficiency of the wavelength-shifting mechanism.

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