Oggetto: Xenon doping paper
Mittente: "Wilson,Robert" <Bob.Wilson@ColoState.EDU>
Data: 06/05/2021, 20:40
A: Francesco Terranova <francesco.terranova@cern.ch>, Francesco Pietropaolo <Francesco.Pietropaolo@cern.ch>
CC: Flavio Cavanna <cavanna@fnal.gov>

Dear Francesco T&P,
We began to do a careful read of the xenon-doping paper. There is a lot of great information in the paper but we both independently ground to a halt at about the same point around page 18-20. We met yesterday for quite a long discussion and concluded that it would be best if we share our recommendations for the first four sections before moving on to the rest of the paper.
Here is a summary:

1. The abstract indicates that the reason for the doping run was to compensate for the impurities. However, the original motivation was to investigate xenon as a way to improve the spatial uniformity of the PDS across the DUNE module volume; this was described as one of two alternatives in the DUNE TDR (the other being coated cathode). The compensation effect has become an important additional feature and the result we report is significant, but not a first measurement (there is an arXiv paper that FP brought to Flavio's attention). We suggestion a revision of the abstract and introduction to make clearer the motivation for the measurement.
2. It takes 18 pages of the 26 to reach the analysis section. We feel these first four sections could be reduced and reorganized for clarity in the following ways:
    a. Introduction reduced but with a clearer statement of the goals for the paper.
    b. Some text and figures could be removed by explicit reference to the ProtoDUNE paper. Some have information that is not "new" or unexpected e.g. the stability of the SiPMs is certainly part of due diligence we have to check, but stability of SiPM response is not surprising or newsworthy (Figs. 13 & 14), we could just state that we monitored and calibrated using now standard techniques and verifies the stability over the entire period. The rate of data collection (Fig. 11) is perhaps useful internally (a tech note?) but not so interesting to an external reader. Fig. 10 is not so clear, the overlapping of so many lines obscures the position information.
    c. Need schematic of the xenon injection.
    d. The X-ARAPUCA telescope…isn't really a telescope, so the term is a bit confusing/misleading.
    e. Proposed reorganization of the detector description:
        Sec.1 Introduction (goals of the paper)
        Sec.2 ProtoDUNE
        TPC layout, dimensions … ref. to pDUNE tech paper
            Sec.2.1 pDUNE PDS (3 technologies) and Calibration [ADC*tt —> Detected Ph (PE)]
        Sec.2.2 Cryogenic System (including Xe injection system in Fig.3)
            Sec.2.3 CRT
            Sec.2.4 Nitrogen accidental contamination
        Sec.3 Xe-doping Test
            Intro to goals
            Sec.3.1 injection procedure
            Sec.3.2 Dedicated detector (xARAPUCA) + external CR telescope
            Sec.3.3 Data Collection and event reconstruction (ie single PE spectrum and deconvolution)
        Sec.4 Data Analysis and Results
            Sec.4.1 - Light collection and Time emission profile as fcn of Xe doping level (from dedicated detector)
            Sec.4.2 ….
            Sec.4.3 …. … from protoDUNE PDS
3. Several figures have text/labels that are too small to read; some captions are incomplete (e.g. do not define key aspects of the figure such as the meaning of different color points or the legend.
4. There are a number of inconsistencies in terminology throughout (e.g. Xe, Xenon, xenon (correct); ARAPUCA, Arapuca; Argon, argon, Ar) and a need for general editing that could occur after the sections reorganization.

Regards,
Bob and Flavio