Contribution ID: **165** Type: **Oral Presentations**

Optimization of the Efficiency of the DUNE FD1 and FD2 photon detection system.

Tuesday, 5 September 2023 17:40 (20 minutes)

DUNE is a long-baseline accelerator experiment in construction at Fermilab and SURF (South Dakota) aiming to probe CP violation in the neutrino sector and to identify the neutrino mass hierarchy.
The DUNE physics reach on the observation of supernova neutrino bursts and proton decay is remarkably enhanced by the DUNE Photon Detection System (PDS) and strictly related to the Photon Detection Efficiency (PDE) of its fundamental unit, which is based on a light concentration technology named X-Arapuca.

In this contribution, we will present the latest results achieved in the framework of DUNE PDS Consortium activities on the optimization of the PDE of the X-Arapuca device, to reach and surpass the baseline value of 3%, allowing to target the FD1 physics reach. This thanks to the new engineering of the relevant components embedded in the XA device i.e. the Dichroic Filters and the secondary downshifting (WLS) lightguide slab. The latter is now the baseline product for both Dune FD1 and FD2 modules: thanks to the manufacturing process, it shows high performances at low cost and can be shaped in slabs sizing one square meter or more. This will allow to cover the large surfaces required for DUNE.
Accurate PDE measurements and simulations of the X-Arapuca cells will be presented, showing how the new WLS material in synergy with improved SiPMs-to-WLS coupling and light trapping of the WLS device, enhances the PDE up to 3% and greater. The cryo-reliability, cryo-aging tests and radiopurity assessment of the WLS material will be also presented.
This material may found application in any project aiming to enhance the down conversion and collection of NUV light, as in SBND, SOLAR, LEGEND-200, LEGEND-1000.

Primary author: CATTADORI, Carla Maria (INFN Milano Bicocca)

Presenter: CATTADORI, Carla Maria (INFN Milano Bicocca)

Session Classification: C2