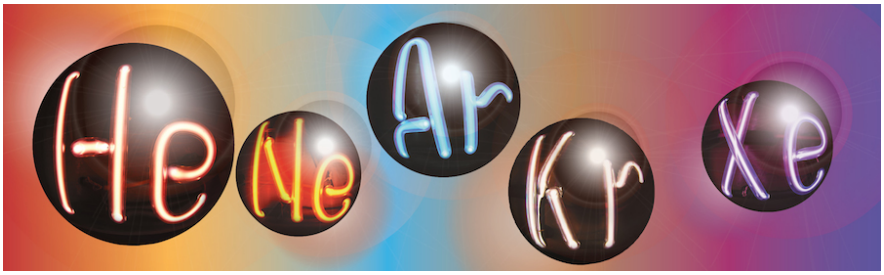

Contribution ID: **31** Type: **Oral Presentation**

High-Voltage Performance Testing in LAr of the PMMA Cathode Connection for the DarkSide-20k Experiment

Wednesday, 22 October 2025 16:30 (20 minutes)

Dual-phase noble liquid time projection chambers (TPCs) are a leading technology in the direct detection of weakly interacting massive particles (WIMPs), one of the most promising dark matter candidates. In such detectors, the strength and uniformity of both the drift and electroluminescence electric fields are critical for maximizing signal sensitivity and minimizing background.
DarkSide-20k (DS-20k) is a dual-phase liquid argon (LAr) TPC filled with 20-tonnes fiducial mass. The active volume is immersed in a uniform electric drift field generated by applying a potential of -73.4 kV to a cathode made of transparent acrylic (PMMA) coated with a conductive material. The high voltage is delivered through a dedicated high-voltage (HV) cable connected to the cathode via a stress cone assembly. The key challenges include delivering such high voltage while minimizing the risk of electrical discharges, verifying the stability of the HV stress cone under cryogenic conditions, and ensuring a reliable connection in such a confined space.
At the University of California, Davis, we developed a dedicated test setup replicating—in terms of local electric fields —the HV connection to the PMMA cathode used in DS-20k. The setup consists of the same HV cable and stress cone, inserted into a PMMA cylinder and connected to an aluminum sphere, all immersed in 20 liters of LAr.
This talk will present the results of the test campaign, which evaluated the long-term stability of the system and HV operation procedures up to -100 kV.

Primary author: LUZZI, Ludovico (University of California Davis)

Co-authors: FLEMING, Dylon (University of California Davis); PANTIC, Emilija (University of California Davis); ERJAVEC, Tyler (University of California Davis)

Presenter: LUZZI, Ludovico (University of California Davis)

Session Classification: Detector techniques

Track Classification: Detector techniques (HV, purification, cryogenics, calibration etc.)