ID de Contribution: **20** Type: **Non spécifié**

A high resolution scanning set-up for defect detection on electrodes

jeudi 8 juin 2023 14:50 (15 minutes)

The next generation of xenon filled time projection chambers (TPCs) aiming at the direct detection of dark matter (DM), e.g Darwin [1], will be roughly a factor 10 larger than current experiments [2,3]. These TPCs should have as low backgrounds as possible and their high voltage (HV) electrodes should be stable and not induce discharges. It is crucial that the electrode surfaces are defect-free to avoid spurious electron emission, which can mimic backgrounds and trigger breakdowns. The challenges in achieving this are evident from the inability of the two largest dual-phase xenon TPCs currently in operation (XENONnT, LZ) to reach their design electric fields.

At the PRISMA Detector Laboratory we have developed an electrode test set-up featuring a high-re-solution camera (1.4 µm by 1.4 µm object size imaged on one pixel) mounted to a gantry robot system. (See figure.) This arrangement allows for auto-mated optical scans of electrodes, revealing potential microscopic defects. However, the presence of a "defect"does not indicate whether it will enhance electron emission. To assess the defects'nature, we embed the electrode in a gas atmosphere along with a ground plane and employ a separate overview camera to capture images. A defect on the electrode may emit electrons, igniting a corona discharge, which the overview camera records and may latter be used to study the defects'characteristics.

We will present the set-up and report on the feasibility of electrode defect detection by igniting corona discharges in argon gas and how these results may be extrapolated to liquid noble filled TPCs, in particular xenon filled ones.

References

[1] J Aalbers et al, J. Phys. G: Nucl. Part. Phys., 50, 013001 (2023)
[2] XENON collaboration, arXiv: 2303.14729 (2023)
[3] LZ collaboration, arXiv: 2207.03764 (2022)

Auteur principal: DEISTING, Alexander (Johannes Gutenberg-Universität Mainz)

Co-auteurs: M. WENZ, Daniel (Johannes Gutenberg-Universität Mainz); M. PIERMAIER, Fabian (Johannes Gutenberg-Universität Mainz); Dr LOMBARDI, Francesco (Johannes Gutenberg-Universität Mainz); M. LOMMLER, Jan (Johannes Gutenberg-Universität Mainz); Dr WEITZEL, Quirin (Johannes Gutenberg-Universität Mainz); M. MITRA, Shumit (Johannes Gutenberg-Universität Mainz); Prof. OBERLACK, Uwe (Johannes Gutenberg-Universität Mainz)

Orateur: DEISTING, Alexander (Johannes Gutenberg-Universität Mainz)

Classification de Session: R&D, Chair Satoshi Mihara