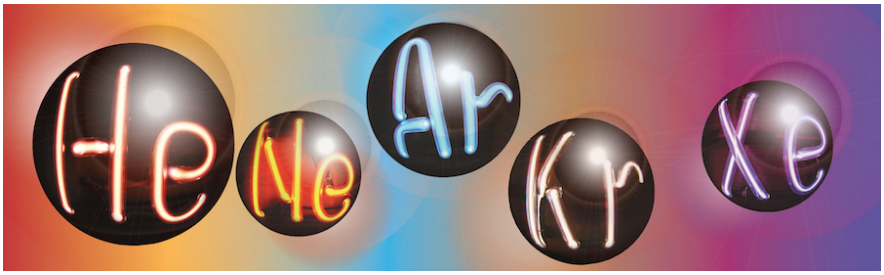

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Floating Hole Multiplier –a novel concept for dual-phase noble liquid detectors

Wednesday, 21 September 2022 14:10 (15 minutes)

We describe a novel concept for dual-phase noble liquid detectors, the Floating Hole Multiplier (FHM). It consists of a perforated electrode freely floating on the surface of the liquid. The concept has been validated with a Thick Gas Electron Multiplier (THGEM) on the surface of liquid xenon. First experimental results will be reported showing that the electrons, liberated in liquid xenon due to ionization by alpha-particles, are focused into the THGEM holes, extracted under the electric field from liquid to gas and generate electroluminescence of the gas in the hole and its vicinity. Both primary scintillation of the liquid and secondary scintillation in the gas were measured with a quartz window photomultiplier thus showing the potentiality of operation of this configuration in the regime used in the noble liquid dual-phase time projection chambers for low background experiments such as WIMP search and neutrino physics. The advantages of the new concept of floating electrodes will be discussed in view of its application in both liquid xenon and liquid argon detectors, among which are the complete absence of the electrode sagging (critical for large detectors), no need for a fine tilt and liquid level control, significant reduction of surface mechanical and electrical instabilities, reduction of single electron noise from the surface.

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