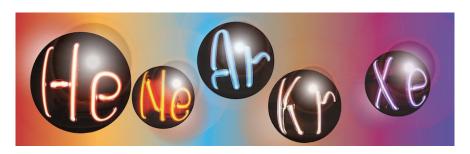
## **LIDINE 2025: Light Detection In Noble Elements**



Contribution ID: 10 Type: Oral Presentation

## Low-Background Multi-Channel PMT for Next-Generation Xenon Detectors

Wednesday, 22 October 2025 13:50 (20 minutes)

In the PandaX-4T experiment, R11410 photomultiplier tubes (PMTs) account for approximately 47% of the detector's material-induced electron recoil background, representing a major limitation in background reduction. As future liquid xenon detectors, such as the proposed PandaX-20T with a 20-tonne target, aim to reach sensitivities  $3.5\times10^{-49}~cm^2$  at  $40~GeV/c^2$  near the irreducible neutrino floor, further suppression of internal backgrounds underscores the need for improved photon sensors.

To address this challenge, we present the development of a low-radioactivity, multi-channel 2-inch PMT (R12699), co-developed with Hamamatsu. Radiopurity screening shows significantly reduced  $^{60}$ Co and U/Th chain activities compared to R11410. Cryogenic characterization at -100°C demonstrates stable operation with a gain of  $4.2\times10^6$ , a dark count rate of  $2.5\,\mathrm{Hz/channel}$ , and an afterpulse probability of 0.5%. These results position R12699 as a promising candidate for future xenon-based rare event searches.

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Track Classification: Light/charge readout (PMT, SiPM, WLS, electronics etc.)