

Workshop on Xenon Detector $0\nu\beta\beta$ Searches: Steps Towards the Kilotonne Scale

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Status and prospects of the AXEL experiment

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A Xenon Electroluminescence (AXEL) experiment is a $0\nu\beta\beta$ search experiment using high pressure xenon gas TPC. This TPC has a unique pixelized structure (ELCC) to read out Electroluminescence (EL) light from ionized electrons.

ELCC has a rigid, pixelized structure, that can be easily scaled to larger sizes, and have the ability to reconstruct 3D tracks. EL is a linear amplification process, which reduces fluctuation associated with amplification. We constructed a 180L sized prototype detector with 12 ELCC units and acquired data in 7.6 bar xenon. The obtained energy resolution at 7.6bar is $(0.82\pm 0.11)\%$ (FWHM) at 1836keV.

This corresponds to $(0.64\pm 0.02)\%$ (FWHM) to $(0.78\pm 0.18)\%$ (FWHM) of energy resolution at the Q value of $^{136}\text{Xe } 0\nu\beta\beta$. We are now developing ELCC using diamond like carbon (DLC) as electrode, Cockcroft-Walton multiplier for drift electric field, quartz glass plate coated with wave length shifter for efficient detection of scintillation light, etc. And we are preparing for our first physics search with 1000L detector at Kamioka observatory.

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