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AXEL: development of a high-voltage distribution system and low-mass field cage for construction of a next large detector

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A Xenon ElectroLuminescence (AXEL) experiment, which is aimed at detecting neutrinoless double beta decay ($0\nu\beta\beta$) with a high-pressure xenon gas time projection chamber, is on progress. Construction of a 1000L-size detector for a demonstration of AXEL detector performance is currently underway, and some new technologies are needed to operate this large-size detector. Our detector employs a modular structure for ionization electron detection, allowing for scalability by adding additional modules. However, the attached anode electrode consists of a single copper plate covering all of the modules now. For larger detectors, it is preferable to supply high voltage to each module independently to minimize power of a discharge and risk of detector failure due to part of low discharge endurance. So, a novel distribution system, which can supply and adjust high voltage module by module is being developed. Another subject is about the field cage. Since reduction of background contamination is essential for searching $0\nu\beta\beta$, we are developing a field cage made of flexible print circuits with a structure that prevent discharges between electrodes and charging-up on the surface. These techniques allow AXEL detector to have large mass of double beta decay nuclei and then become the world's most sensitive experiment on $0\nu\beta\beta$ search.

Collaboration you are representing

AXEL experiment

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