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Research Result Report
ICRR Inter-University Research Program 2024

Research Subject: Towards a multiphysics liquid Xe TPC with scintillation and charge multiplication

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Summary of Research Result :

We completed the publication of the results from the successful tests in liquid xenon of the prototype electrode structure that were collected during a trip to the Kamioka Observatory (Fig.1 and Fig.2). An ^{241}Am source was used to provide a source of α-particles in the xenon. An S2 signal (Fig. 3) coming from the amplification of ionization electrons from the α-particle interactions observed above 2kV and voltages of up to 6kV were achieved (Fig. 4). This is the first demonstration of proportional amplification in liquid xenon that does not use a thin wire or conventional micropattern detector structure and is the subject of a publication under review. These results were also presented in the 16th Pisa meeting on Advanced Detectors. The scale-up of this electrode design is being investigated, to incorporate needle-like amplification structures into a multielectrode structure, like that used in spherical proportional counters. The design of such

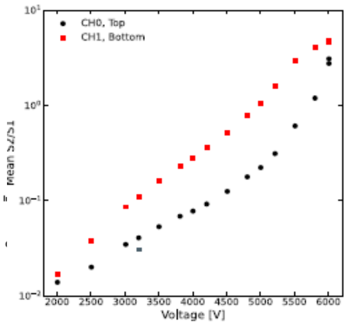

Fig 4: Mean S2/S1 as a function of voltage.

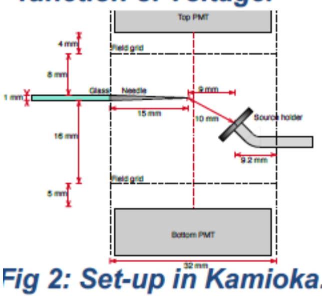

Fig 2: Set-up in Kamioka.

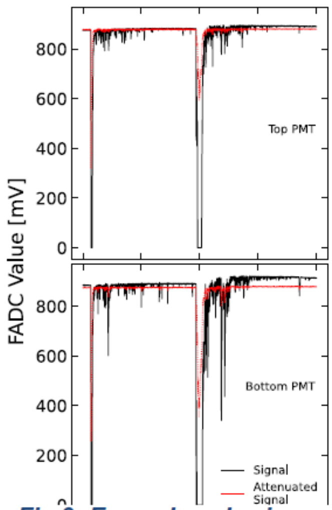

Fig 3: Example pulse in the Top and Bottom PMTs showing S1 and S2, as the first and second principle peaks.

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prototypes is under way.

No. 2024i-B-001