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Identifying background sources and their impacts at sub-keV energy region for rare event searches with Ge detectors

The TEXONO Collaboration has established a detection system with an ultra-low energy high purity germanium detector at Kuo-Sheng Nuclear Power Plant to monitor neutrino–nucleus coherent scattering and to seek for dark matter. Understanding background origins and their impact to the energy spectrum is crucial in this experiment because of the weak nature and

modest recoil energy of these uncommon events. During detector maintenance in non-operational conditions above ground, high-energy neutron-induced interactions inside the

Germanium crystal yield tritium (3H). The varied Ge isotopes and neutron kinetic energy produced by TENDL2015 determine the generation cross-section of 3H and 68Ge, respectively. Fast cosmic-ray neutrons can form isotopes in Ge that can cause background in dark matter studies. When solar activity is at its lowest, the cosmic ray-induced neutron flux is at its highest, and vice-versa. The observed differential flux of neutrons caused by cosmic rays as a function of neutron energy at the KSNL experimental site and their effects on sub-keV energy domains will be the main focus of this study.

Condensed Matter Physics

High Energy Physics

Author: Dr SINGH, Manoj Kumar (Department of Physics, Institute of Applied Sciences and Humanities, GLA University)

Co-authors: Prof. SINGH, Venktesh (2Department of Physics, School of Physical and Chemical Sciences, Central University of South Bihar, Gaya - 824236, India); Prof. WONG, H. T. (Institute of Physics, Academia Sinica, Taipei -11529, Taiwan)

Presenter: Dr SINGH, Manoj Kumar (Department of Physics, Institute of Applied Sciences and Humanities, GLA University)

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