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Cosmic Neutrino Background detection with PTOLEMY

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The Ptolemy experiment aims at the detection of the cosmic neutrino background, which is produced approximately one second after the Big Bang, according to the Standard Cosmology. Due to the extremely low energy of these neutrinos, a reliable experimental detection can be achieved through neutrino captures on beta-unstable nuclides without the need for a specific energy threshold. Among the various isotopes available, tritium implanted on a carbon-based nanostructure appears to be a promising candidate in terms of both cross-section and low-endpoint energy.

The Ptolemy collaboration intends to combine a solid-state tritium source with a novel compact electromagnetic filter, which relies on the dynamic transverse momentum cancellation concept. This filter will be applied in conjunction with an event-based preliminary radio-frequency preselection. The measurement of neutrino mass and the search for light sterile neutrinos are additional outcomes that arise from the Ptolemy experiment's physics potential, even when utilizing smaller or intermediate-scale detectors. To finalize the conceptualization of the detector, a demonstrator prototype is being assembled and tested at LNGS (Laboratori Nazionali del Gran Sasso) in the coming months. This prototype aims at addressing the challenging aspects of the Ptolemy experiment.

Collaboration / Activity

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