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Update on the ECHo experiment

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In the ECHo experiment large arrays of low temperature metallic magnetic calorimeters enclosing ^{163}Ho are used for the high resolution measurement of the electron capture spectrum. The goal of the experiment is to achieve the sensitivity to detect an extremely small spectral shape distortion in the end point region due to an effective electron neutrino mass smaller than 1 eV/c^2.
The first ECHo-1k phase was designed to test the properties and reproducibility of detectors enclosing ^{163}Ho. In a proof-of-principle experiment, we acquired about 10^8 ^{163}Ho events allowing to reach a sensitivity below 20 eV/c^2. For this and, in particular, to achieve sub-eV sensitivity in future stages of ECHo, systematic uncertainties have to be identified and reduced. We discuss the progress in the understanding the ^{163}Ho electron capture spectrum, including the newly determined Q-value, and in the description of background. We present methods we have developed for the analysis of data acquired in ECHo-1k and the results we have obtained so far.
At the same time, preparation of large detector arrays and multiplexed readout for the ECHo-100k phase is progressing. Important milestones related to ^{163}Ho implantation in MMC arrays on wafer scale and multiplexing have been reached. We present the status of ECHo-100k and discuss our perspectives for achieving a sensitivity at the 1 eV/c^2 level for the effective electron neutrino mass in the coming phase.

Submitted on behalf of a Collaboration?

Yes

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