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The Electron Capture in ^{163}Ho experiment –ECHo

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Direct determination of the electron neutrino $m(\nu_e)$ and anti-neutrino mass $m(\bar{\nu}_e)$ can be obtained by the analysis of electron capture and beta spectra respectively. In the last years experiments analyzing the ^{3}H beta spectrum reached a limit on $m(\bar{\nu}_e)$ of 2 eV. The upper limit on $m(\nu_e)$ is still two orders of magnitudes higher, at 225 eV.
The Electron Capture in ^{163}Ho experiment, ECHo, is designed to investigate $m(\nu_e)$ in the sub-eV region. In ECHo, high sensitivity on a finite $m(\nu_e)$ will be reached by the analysis of the endpoint region in high statistics and high resolution calorimetrically measured ^{163}Ho spectra. To perform this experiment, high purity ^{163}Ho sources will be enclosed in a large number of low temperature metallic magnetic micro-calorimeters which are readout using the microwave multiplexing technique. This approach allows for a very good energy resolution, below $\Delta E_{\mathrm{FWHM}} < 5$ eV and for a fast time resolution well below 1 ⊠s.
Thanks to the modular approach, the ECHo experiment is designed to be stepwise up-graded. The first ongoing phase, ECHo-1k, is characterized by a ^{163}Ho activity of about 1 kBq enclosed in about 100 pixels. The statistics of 10^{10} events in the ^{163}Ho spectrum will allow for improving the limit on $m(\nu_e)$ by more than one order of magnitude.
In this talk, the present status of the ECHo-1k experiment will be discussed as well as the plans for the next phase, ECHo-100k.

Co-Authors (Collaboration)

ECHo Collaboration

Primary author: Prof. GASTALDO, Loredana (Heidelberg University, Kirchhoff Institute for Physics)

Presenter: Prof. GASTALDO, Loredana (Heidelberg University, Kirchhoff Institute for Physics)

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