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Recent results from the neutrino mass experiment ECHO using the new detectors with Ho-163 implanted at ISOLDE

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The Electron Capture in Ho-163 experiment, ECHO is designed to investigate the electron neutrino mass in the sub-eV region using high-precision measurements of the Ho-163 electron capture spectrum. The very good results obtained from the first prototypes of metallic magnetic calorimeters with ion-implanted Ho-163, among which the calorimetric measurement of the Ho-163 spectrum with the best energy resolution to date, have renewed the interest in Ho-163 based experiments. The production of the Ho-163 atoms as well as its implantation was carried out at the ISOLDE facility, CERN.

During the spectrum measurements in Heidelberg, we have identified several aspects of the detectors that could be significantly improved. In particular we aimed at developing a new detector design for which the probability to lose energy to the substrate is reduced and at increasing the purity of the implanted Ho-163 beam.

In December 2014 an off-line ion implantation was performed onto detectors with an optimized design. The Ho-163 source used in the experiment was produced by neutron activation of an enriched Er-162 target at ILL and chemically purified at PSI and at the Institute for Nuclear Chemistry at Mainz University.

We present the preliminary results obtained with the implanted detectors and a first characterization of the purity of the implanted beam.

The achieved results demonstrate that we succeeded in improving the detector response and the purity of the implanted beam with respect to the first experiment.

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