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Development of metallic magnetic calorimeter arrays with embedded ^{163}Ho for the ECHo experiment

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The Electron Capture in ^{163}Ho (ECHo) collaboration plans to reach sub-eV sensitivity level on the effective electron neutrino mass by the analysis of a high energy resolution and high statistics electron capture spectrum of ^{163}Ho . Large arrays, of the order of 100 pixels each, of metallic magnetic calorimeters (MMCs) with enclosed ^{163}Ho , read out utilizing microwave SQUID multiplexing, have been selected to achieve this goal. With first prototypes of MMCs having ^{163}Ho ions implanted in their absorbers and operated at about 15 mK, energy resolutions ΔE_{FWHM} below 5 eV were achieved. . We show results obtained in the characterization of an MMC array in terms of activity, energy resolution and intrinsic background of single pixels. We present the design of next generation MMC arrays for the ECHo experiment and discuss the processes to reliably embed high purity ^{163}Ho source in detector absorbers. . In conclusion, we discuss how the production of MMC arrays, including micro-fabrication and ^{163}Ho enclosing, can be scaled up to cope for the requirement of the up-coming phases of the ECHo experiment.

Less than 5 years of experience since completion of Ph.D

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Student (Ph.D., M.Sc. or B.Sc.)

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Primary author: MANTEGAZZINI, Federica (Kirchhoff Institute for Physics, Heidelberg University)

Co-authors: BARTH, Arnulf (Kirchhoff Institute for Physics, Heidelberg University); DORRER, Holger (Johannes Gutenberg-Universität, Mainz); DÜLLMANN, Christoph E. (Johannes Gutenberg-Universität, Mainz); ENSS, Christian (Kirchhoff Institute for Physics, Heidelberg University); FLEISCHMANN, Andreas (Kirchhoff Institute for Physics, Heidelberg University); GASTALDO, Loredana (Kirchhoff Institute for Physics, Heidelberg University); KEMPF, Sebastian (Kirchhoff Institute for Physics, Heidelberg University); KIECK, Tom (Johannes Gutenberg-Universität, Mainz); KNEIP, Nina (Johannes Gutenberg-Universität, Mainz); KÖSTER, Ulli (Institute Laue-Langevin, Grenoble); REIFENBERGER, Andreas (Kirchhoff Institute for Physics, Heidelberg University); VELTE, Clemens (Kirchhoff Institute for Physics, Heidelberg University); WEGNER, Mathias (Kirchhoff Institute for Physics, Heidelberg University); WENDT, Klaus (Johannes Gutenberg-Universität, Mainz)

Presenter: MANTEGAZZINI, Federica (Kirchhoff Institute for Physics, Heidelberg University)

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