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Low temperature magnetic calorimeters for high precision measurements of 163-Ho and 187-Re spectra

The analysis of calorimetric spectra of beta or electron-capture decay isotopes with especially low Q-value represents a very attractive method to determine the electron neutrino and antineutrino mass. The most suitable isotope in the beta decay branch is the 187-Re (Q about 2.5 keV) while, on the electron capture side, the 163-Ho (Q about 2.5 keV) is the best candidate known. Extremely precise detector arrays are needed to reach a sub-eV sensitivity for the neutrino mass. We present results obtained with low temperature magnetic calorimeters designed for measuring respectively the low energy calorimetric spectrum of 187-Re and 163-Ho. Metallic magnetic calorimeters are low temperature energy dispersive detectors composed of an energy absorber in tight thermal contact with a paramagnetic temperature sensor which resides in a small magnetic field. The change of magnetization following the absorption of energy is measured as a change of flux in a low noise high bandwidth dc-SQUID. The performance achieved in response time and energy resolution together with the possibility to run thousands of channels by means of microwave multiplexing show that magnetic calorimeters are an interesting choice for a large scale experiment as MARE.

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