Nuclear Experiment

Performance of a large TeO2 crystal as a cryogenic bolometer in searching for neutrinoless double beta decay

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(Submitted on 3 Jun 2011)

Bolometers are ideal devices in the search for neutrinoless Double Beta Decay. Enlarging the mass of individual detectors would simplify the construction of a large experiment, but would also decrease the background per unit mass induced by alpha-emitters located close to the surfaces and background arising from external and internal gamma's. We present the very promising results obtained with a 2.13 kg TeO2 crystal. This bolometer, cooled down to a temperature of 10.5 mK in a dilution refrigerator located deep underground in the Gran Sasso National Laboratories, represents the largest thermal detector ever operated. The detector exhibited an energy resolution spanning a range from 3.9 keV (at 145 keV) to 7.8 keV (at the 2615 gamma-line of 208Tl) FWHM. We discuss the decrease in the background per unit mass that can be achieved increasing the mass of a bolometer.

Comments: 6 pages, 6 figures
Subjects: **Nuclear Experiment (nucl-ex)**
Cite as: **arXiv:1106.0568 [nucl-ex]**
(or **arXiv:1106.0568v1 [nucl-ex]** for this version)

Submission history

From: Stefano Pirro [view email]
[v1] Fri, 3 Jun 2011 06:16:52 GMT (482kb,D)

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