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Evidences of Cerenkov light from a TeO_2 Crystal

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Bolometers have proven to be good detectors to search for rare processes because of their excellent energy resolution and for their extremely low intrinsic background.
The CUORE experiment, that aims at studying neutrino-less double beta decay, is building a detector made of 988 TeO_2 crystals, 0.750 kg each, kept at a temperature of 10 mK.
In this kind of experiments, the capability of discriminating the signal produced by the alpha particles emitted by the natural radionuclides contaminating the detector represents an important aspect for the background reduction.
One possibility for obtaining such a discrimination is provided by the detection of the Cerenkov light which, at the low energies of the natural radioactivity, is emitted only by electrons and not by alpha particles.
The results of measurements of the Cerenkov light yield of TeO_2 at room temperature are shown. The signals produced by cosmic rays in the crystal are readout on two opposite faces by two PMTs. They show rise and decay times of few nanoseconds, typical of Cerenkov light. When the crystal is rotated in the direction that allows the Cerenkov photons to reach directly one PMT, this detects three times more light than the other one.
These results represent the first clear indication that Cerenkov light is the main, if not even the only, component of the light signal in a TeO_2 crystal and it opens the possibility to make large improvements in the performance of experiments based on this kind of materials.

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