Contribution ID: **25** Type: **Poster**

Development of ZnMoO4 scintillating bolometers for the LUMINEU project

Sunday, 8 September 2013 19:30 (0 minutes)

The Luminescent Underground Molybdenum Investigation for NEUtrino mass and nature (LUMINEU), funded by ANR in France, aims at preparing the ground for a next-generation neutrinoless double beta decay experiment employing scintillating bolometers: these devices are in fact very promising tools in rare events search, in terms of efficiency, energy resolution and background control. In particular, they can tag alpha events, which are the dominant residual background for double beta decay candidates with a transition energy higher than 2615 keV. LUMINEU's goal is the operation of a pilot detector, consisting of four 400 g ZnMoO4 scintillating bolometers, probing an active 100Mo mass of about 0.7 kg, the energy transition of this isotope being 3034 keV. This preliminary investigation intends to be feasibility test for a next-generation neutrinoless double beta decay experiment, aiming at probing the inverted hierarchy region of the neutrino mass pattern. LUMINEU will help to fix the detailed structure of the single module of this future large-scale experiment and to develop the protocol for the synthetization of radiopure ZnMoO4 crystals.

The crystals will be grown at the Nikolaev Institute for Inorganic Chemistry in Novosibirsk, Russia. LUMINEU foresees a systematic study of the crystal parameters, in order to optimize the bolometric performance, the light yield, the alpha particle rejection factor and the radiopurity of the scintillating bolometers.

Previous tests with preliminary ZnMoO4 scintillating bolometers demonstrated the feasibility of aboveground tests for detector characterization: despite the dominating pile-up due to cosmic rays, it was possible to operate a 313 g bolometer and determine its sensitivity, energy resolution and particle discrimination power. This test was performed at the Centre de Sciences Nucléaires et de Sciences de la Matière (CSNSM), in Orsay, France, in a LHe dilution refrigerator.

As a follow-up of these encouraging results, in view of future serial runs with LUMINEU's bolometers for a routine quality-control of the grown crystals, a dedicated aboveground facility was set up: this apparatus is based on a cryostat exploiting the Pulse-Tube (PT) technology, which allows to dispense with cryogenic fluids.

In order to pave the way to the final pilot experiment, underground tests will have to be performed: 23.8 g and 313 g crystals have been operated in the EDELWEISS cryostat (where a direct dark matter search is performed with Ge hybrid detectors), at Laboratoire Souterrain de Modane (LSM), France, showing promising results, despite microphonic noise. In the incoming months, the test of the 313 g bolometer with a fully EDELWEISS-compatible holder will take place, looking forward to assess a noise improvement.

Primary author: TENCONI, Margherita (CSNSM)

Presenter: TENCONI, Margherita (CSNSM)