



Contribution ID: 77

Type: **Poster Presentation**

## **BALOO, A BASEMENT CdWO<sub>4</sub> SCINTILLATION LOW BACKGROUND DETECTOR**

*Tuesday, 3 May 2022 16:50 (20 minutes)*

BALOO (BAsement scintillation LOw-backgROund detector) is a low-background scintillation set-up constructed in a basement room at the Institute for Nuclear Research of NASU for assessment of materials radiopurity, R&D of radiopure scintillation materials and small scale low counting experiments. A CdWO<sub>4</sub> crystal scintillator 7 cm in diameter and 7 cm height is viewed by a low-background photomultiplier through a high-purity quartz light-guide 10 cm length. The detector is shielded by layers of OFHC copper (6-12 cm) and low radioactive lead (15 cm). The set-up construction allows an easy access to the sample volume of the detector by shift of the passive-shield upper part. A plastic scintillator counter 100 × 100 × 12 cm is placed above the set-up to veto cosmic muons. The detector background counting rate is reduced by 3 orders of magnitude in the energy interval 0.5 –2.6 MeV and by an order of magnitude above 3 MeV in comparison with the unshielded detector at the Earth surface. Thanks to the low level of background and a very high gamma-ray quanta detection efficiency of the CdWO<sub>4</sub> scintillator, the sensitivity of the detector is comparable to the characteristics of low-background HPGe detectors located underground: for instance, 90% C.L. activity upper limits are on the level of 5 mBq/kg (40K), 1 mBq/kg (137Cs), 3 mBq/kg (226Ra), and 0.8 mBq/kg (228Th) for a 3-kg titanium sample in the Marinelli geometry over 30 days of measurements. Assembling of anti-radon system and additional muon-veto counters is in progress to improve the set-up sensitivity further.

**Primary author:** Prof. DANEVICH, Fedor (Institute for Nuclear Research of NASU, Kyiv, Ukraine)

**Co-authors:** Mr KLAVDIENKO, Volodymyr (Institute for Nuclear Research of NASU, Kyiv, Ukraine); Dr KASPEROVYCH, Dmytro (Institute for Nuclear Research of NASU, Kyiv, Ukraine); Dr KOBYCHEV, Vladislav (Institute for Nuclear Research of NASU, Kyiv, Ukraine); Mr KROPIVYANSKY, Boris (Institute for Nuclear Research of NASU, Kyiv, Ukraine); Dr POLISCHUK, Oksana (Institute for Nuclear Research of NASU, Kyiv, Ukraine); Mr SHKURUPII, Oleg (Institute for Nuclear Research of NASU, Kyiv, Ukraine); Mr SOKUR, Nazar (Institute for Nuclear Research of NASU, Prospekt Nauky 47, 03028 Kyiv, Ukraine); Dr TRETYAK, Vladimir (Institute for Nuclear Research of NASU, Kyiv, Ukraine)

**Presenter:** Prof. DANEVICH, Fedor (Institute for Nuclear Research of NASU, Kyiv, Ukraine)

**Session Classification:** Techniques for low-level  $\alpha$ -particle,  $\beta$ -particle and  $\gamma$ -ray measurements

**Track Classification:** Techniques for low-level  $\alpha$ -particle,  $\beta$ -particle and  $\gamma$ -ray measurements