Contribution ID: **11** Type: **Poster presentation**

Light pulse decays and non-proportionality characteristics of CsI:Tl at temperatures down to -70°C

Thursday 21 September 2017 10:02 (1 minute)

Caesium iodides doped by thallium are one of the most popular scintillators used as gamma ray detectors whether in the scientific or application side. Despite such widespread use it is still ongoing work aimed at understanding the mechanism of light emission in these crystals. Some theoretical interpretation supported by experimental measurements have been already done and were presented in publications of A. Syntfeld-Kazuch et al., S.Gridin et al. or X.Lu et al. (see 1-3). But the theoretical models of light emission are still under development and experimental works are still needed. One of the crucial and unresolved questions are how light emission changed with:

- energy deposited,
- temperature changing,
- thallium concentration.

For that reason light pulses of CsI:Tl crystals straight from the PMT anode were collected and analysed. These pulses appears as a result of excitation of scintillators with gamma sources with energy from 17keV to 1274keV. Tested scintillators with variable thallium amount from 0.0008mole% till to 0.081mole% were checked. Additionally temperature dependence in a range from -70°C to +30°C was achieved. For quantitative description of light emission sum of exponential functions were fitted to experimental data.
In the present talk we will focus on the scintillator with Tl concentration equal to 0.053mole%. It is the crystal with the energy resolution equal to 5.15% and light output equal to 10000Phe/MeV (at 20°C and for 662keV). Decay time constants and a relationship between intensities of each of light component will be presented as temperature and gamma ray energy functions.

References:
[1] A. Syntfeld-Kazuch et al., IEEE Transactions on Nuclear Science 54, 1836 (2007).
[2] S. Gridin et al., Journal of Physical Chemistry C 119, 20578 (2015).
[3] X. Lu et al., Physical Review Applied 7, 23, 014007 (2017).

Has accepted

Authors: MIANOWSKA, Zuzanna (National Centre for Nuclear Research); Prof. MOSZYNSKI, Marek (National Centre for Nuclear Research); Dr SWIDERSKI, Lukasz (National Centre for Nuclear Research); SYNTFELD-KAZUCH, Agnieszka (National Centre for Nuclear Research); Dr GEKTIN, Aleksander (Institute for Scintillation Materials); Dr VASYUKOV, Sergey (Institute for Scintillation Materials); Prof. WILLIAMS, Richard (Wake Forest University); GRIDIN, Sergey (Wake Forest University); MAYHUGH, Mike (Faceted Development)

Presenter: MIANOWSKA, Zuzanna (National Centre for Nuclear Research)

Session Classification: Poster Session 3

Track Classification: P5_characterization