INFLUENCE OF EXCITATION RELAXATION ON LSO:CE QUANTUM YIELD

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Discovery of scintillators was crucial for progress in high energy physics. Originally used scintillators to build detectors quickly became inadequate for accurate and fast measurements, thus a high demand of materials with superior qualities, such as faster luminescence rise and decay times, higher density and light yield, is the main force behind current research and development. The leading scintillator's growth technique is called Czochralski method and while it's one of the most refined methods, various parameters can be changed [1] to improve some and deteriorate other the qualities of the grown scintillator.

In this work the influence of excitation relaxation on quantum yield of commercially used LSO:Ce scintillators grown by using Czochralski method was investigated. Photoluminescence excited by various energy photons was measured and quantum yield value was evaluated using an integrating sphere method [2]. Pump-probe technique was used to evaluate charge relaxation constants. The charge was excited using 4.82 eV and 3.46 eV photon energy laser impulses, while a wide (white) spectrum probe was used to measure the relaxation. It was evident that slab (middle) part of the growing crystal had the better and more consistent parameters (fig 1.). It was also shown that higher photon energy excitations tend to have lower quantum yield due to non-radiating relaxation of charge carriers..

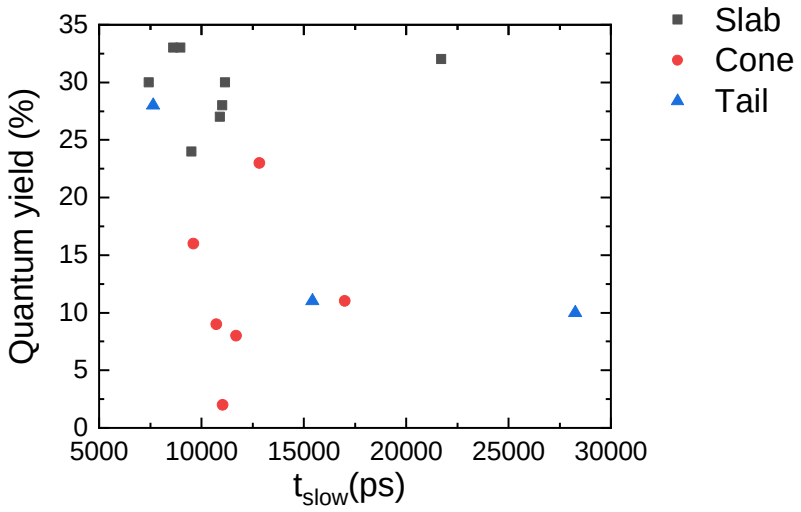

Fig 1. Quantum yield dependency on excitation relaxation constant.

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