

Absorber characterization
COMPASS thesis

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Chapter 1

Absorber characterization

We investigated luminescence and scintillation properties of the $Gd_3Al_2Ga_3O_{12} : Ce$ (GAGG) produced by *Furukawa* company. The GAGG crystal has the highest light yield among oxide crystal at room temperature [1] and fast decay time for the detection of radioactivity and in nuclear and particle physics experiments.

A list of the most important parameters for GAGG is reported in Table 1.1.

Some fundamental features of this crystal are that it has no intrinsic radioactivity and it is a non-hygroscopic material. This allows a better usage for experimentation with low risk of contamination from ambient.

The measurements have been carried out by illuminating the scintillation rod with a X-ray beam.

SiPM and electronic chain parameters was varied measuring the relative position of the photo-peak in the spectrum produced by the scintillator.

Density [g/cm^3]	Light yield [photon/MeV]	Decay time [ns]	Peak emission [nm]	Energy resolution [% @662 keV]	Hygroscopicity
6.63	57000	88 (91%) 258 (9%)	520	5.2	No

Table 1.1: Physical and scintillation properties of GAGG

1.1 Experimental set-up

Laboratory measurements have been carried out using a single rod made of GAGG produced by *Furukawa* company.

The rod has a square-base parallelepipedale shape with a height of 30mm and a side of 3mm , thus their dimension results 2/3 lower to the one expected for the polarimeter bars ($\sim 10mm$).

To minimize the loss of photons during scintillation, the bar was *wrapped* with

Teflon Fig 1.1, that has a high reflection coefficient for small incident angles.

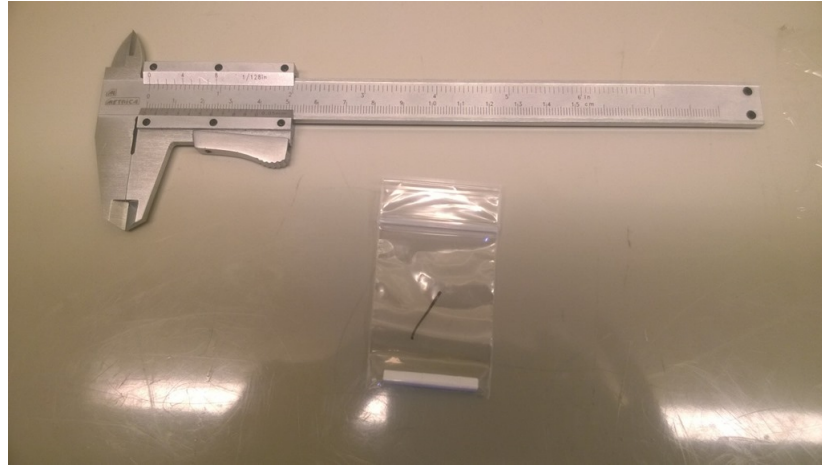


Figure 1.1: Scintillation rod made of GAGG wrapped with teflon

1.2 Definition of the operative range

1.3 Circuit calibration with X-ray sources

1.4 Energy resolution measurement

Bibliography

- [1] Hye-Lim Kim et al. Journal of Ceramic Processing Research. Vol. 16, No. 1, pp. 124-128, 2015