

Calibration of a compact gamma-ray spectrometer for an energy range of 4-20 MeV

S. Singh¹, A. Laso Garcia², R. Versaci¹, A. Ferrari², M. Molodtsova², L. Morejon¹, R. Schwengner², D. Kumar,¹ and T. Cowan²

1) *ELI Beamlines, Institute of Physics of the ASCR, Dolni Brezany, Czech Republic*

2) *Institute for radiation physics, Helmholtz-Zentrum Dresden-Rossendorf, Germany*

E-mail: Sushil.Singh@eli-beams.eu

With currently available high intensity lasers and the upcoming multi-PW facility at ELI-Beamlines, copious amounts of gamma rays are expected to be generated in high intensity laser-matter interaction experiments. Measurement of multi-MeV gamma-ray spectra in such experiments provide direct indication of hot electrons generated inside the target. To determine the spectrum of hot electrons and gamma rays, an appropriate spectrometer with absolute calibration is essential. We report on the design of a compact gamma ray spectrometer (GRS) of size 70 cm x 25 cm x 25 cm based on measuring forward Compton scattered electrons by incoming gamma rays.

In this presentation, we describe the design parameters and calibration results of the GRS. The calibration was performed using the bremsstrahlung facility gELBE [1] at the ELBE accelerator of HZDR, Dresden. The calibration was conducted at different electron end point energies, i.e. 11, 13, 15 and 18 MeV. Experimental spectra show systematic increase in the maximum cut-off energy, temperature and flux. These results indicate that the spectrometer is effective for an energy range of 4–20 MeV with 20-30% energy resolution. GRS provides an opening angle of 23 mrad and experiments to measure bremsstrahlung spectrum from laser-solid interaction are currently planned. The preliminary results from the experiment will also be presented at the conference. Our work is supported by Czech Science Foundation project 18-09560S.

References

[1] R. Schwengner et al., Nucl. Instrum. Meth. A: Accelerators, 555.12, pp. 211-219, (2005).