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Gamma beam monitoring instruments at ELI-NP

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The Extreme Light Infrastructure – Nuclear Physics (ELI-NP) facility will come online in Bucharest-Magurele, Romania in 2017 and will consist of two components: a very high intensity laser and a very intense gamma beam. ELI-NP will allow either combined or stand-alone experiments using the high-power laser and the gamma beam. The high brilliance Gamma Beam System (GBS) at ELI-NP will deliver quasi-monochromatic gamma-ray beams (bandwidth < 0.5%) with a high spectral density (>10000 photons/s/eV) and high degree of linear polarization (> 99%). The GBS will be delivered in two phases with two separate beam lines: a low-energy gamma-ray line with gamma energies up to 3.5 MeV and a high-energy gamma line with energies up to 19.5 MeV. Optimization and monitoring of the gamma beam with these characteristics is challenging and requires the proper means for accurately measuring the spatial, spectral and temporal characteristics of the gamma-ray beams. The gamma beam energy spread will be monitored using a large volume HPGe detector with anti-Compton shield placed in an attenuated beam. An intensity and polarization monitor is proposed based on the $d(\gamma, n)$ reaction which could be placed in either the low-energy or the high-energy experimental areas. Several additional instruments using Compton scattering and photo-fission are envisioned for measuring the time structure, intensity, and polarization of the beam. Preliminary conceptual designs of these devices will be presented.

Primary author: MATEI, Catalin (Extreme Light Infrastructure – Nuclear Physics (ELI-NP) / Horia Hulubei National Institute for R&D in Physics and Nuclear Engineering (IFIN-HH) 30 Reactorului St., Bucharest-Magurele, P.O.B. MG-6, RO-077125, ROMANIA)

Co-authors: Dr UR, C.A. (Extreme Light Infrastructure – Nuclear Physics (ELI-NP) / Horia Hulubei National Institute for R&D in Physics and Nuclear Engineering (IFIN-HH) 30 Reactorului St., Bucharest-Magurele, P.O.B. MG-6, RO-077125, ROMANIA); Dr SULIMAN, G. (Extreme Light Infrastructure – Nuclear Physics (ELI-NP) / Horia Hulubei National Institute for R&D in Physics and Nuclear Engineering (IFIN-HH) 30 Reactorului St., Bucharest-Magurele, P.O.B. MG-6, RO-077125, ROMANIA); Prof. WELLER, H.R. (Triangle Universities Nuclear Laboratory / Department of Physics, Duke University, Durham, North Carolina 27708, USA); Dr MUELLER, J.M. (Department of Nuclear Engineering, North Carolina State University, Raleigh, North Carolina 27695, USA)

Presenter: MATEI, Catalin (Extreme Light Infrastructure – Nuclear Physics (ELI-NP) / Horia Hulubei National Institute for R&D in Physics and Nuclear Engineering (IFIN-HH) 30 Reactorului St., Bucharest-Magurele, P.O.B. MG-6, RO-077125, ROMANIA)

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