Form B1_EN - Project Summary

Programme / Sub-programme / Module	5/5.1/ELI-RO
Project type	RDI
ELI-NP thematic	RA1/III.3/Human safety, RA1/III.2/Machine safety, RA2/I.4/Beam dumps and shielding
Project title / Acronym	FLUKA-based radiation shielding and monitoring optimization at ELI-NP /ELIFLUKA
Project duration	26.5 months

PROJECT SUMMARY

This project proposes the development of the preliminary studies on radiation shielding at the core of the High Power Laser System (HPLS) experimental areas (E1, E6 & E5) and at the very challenging (from a radioprotection point of view) dumping areas of the Gamma Beam System (GBS), in an *experiment focused approach*, by using Monte Carlo (FLUKA) calculations, in a close-to-reality geometrical representation which, to our knowledge, has not been achieved yet. The ultimate goals of this project concern an optimized version of the existent shielding and a proposal of an optimized detection/monitoring system in the targeted areas.

The project will comprise:

1. A realistic modeling of the above mentioned experimental areas, by using data from the latest version of the AutoCAD drawing files of the ELI-NP building in FLUKA Monte Carlo radiation transport code. We will include in the FLUKA geometry elements which were neglected in the preliminary studies like: the laser beam transport line (according to the current project), the cranes necessary to move the massive elements of shielding system, latest versions of beamdumps, the new geometry of the interaction chambers and their contents (mirrors, support plates, detection/measuring devices, and others), in a close collaboration with the radioprotection team at ELI-NP.
2. FLUKA transport code calculations of the dose, dose equivalent due to all particles, primary and secondary particles, their fluence and spectral energy distribution. The source terms described in the Technical Design Reports are going to be used, covering all the ranges of primary types and energy values, not only "the worst" ones. Activation calculations will concern ambiental air and the components of the individual experimental setups. Where necessary, radiation induced damage to the semiconductor detectors will be evaluated.
3. Design of a monitoring system of ionizing radiation, optimized for typical experiments in the targeted areas. Selection of monitoring points will be done according to FLUKA results and adequate types of detectors will be proposed. In the case of the high energy detector response, the modelling will start from the known response (up to 4 MeV for most detectors) and we will investigate the possibility to evaluate supplementary errors occuring at hig energy values.
4. Design of beamdumps and local shielding components in the dumping areas of the Gamma Beam System to get compliance with the very strict constraints.
5. Collaboration with at least 2 students, who will be invited to take part in the project, and possibly make this participation a starting point for their dissertation work, in an attempt to encourage young researchers to work in the field of radiation protection and dosimetry at ELI-NP and to acquire Monte Carlo (FLUKA) calculation skills.
6. Organizing an international workshop on radiation protection and dosimetry at high power laser facilities. We consider that this objective is very important since it would give specialists working at the three ELI pillars and at other European high power laser facilities the opportunity for a necessary and hopefully valuable exchange of experience.