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Capabilities of the FLUKA particle transport code for the design and operation of high-power targetry systems

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FLUKA [1-3], developed and maintained by the FLUKA.CERN Collaboration, is a general-purpose code for the Monte Carlo (MC) simulation of radiation transport. It is capable of accurately accounting for the transport and interaction of over 60 particle species (photons, leptons, hadrons, and ions) in complex material geometries on a broad energy range, from the keV (meV for neutrons) up to the TeV, and even up to the PeV if linked to DPMJET III [4]. FLUKA is applicable to problems in radiotherapy, cosmic ray physics, dosimetry, neutronics and, especially, to the design and operation of particle accelerators. Specifically, FLUKA has been extensively used to assess radiation effects in the design and operation of high-power targetry systems, and in general of beam-intercepting devices under energetic and intense radiation fields at CERN and other labs, in the course of which regular benchmarks against experimental data and other MC codes have been performed [5].

In this contribution, the capabilities of FLUKA to assess radiation effects in materials shall be demonstrated, showing by way of example its scoring capabilities for physical observables of relevance for short- and long-term radiation damage effects, including dose deposition, the production of H and He, as well as displacements per atom (DPA), employing a recent implementation of a state-of-the-art athermal recombination efficiency [6]. Finally, the capabilities of FLUKA to assess the production of single-event effects in electronics under intense radiation fields shall be showcased.

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Themes for the contribution

2 Radiation damage in target material and related simulations:

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