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Displacement damage modelling in the FLUKA Monte Carlo code

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FLUKA is a general-purpose code for the Monte Carlo simulation of coupled hadronic and electromagnetic radiation showers in complex aterial geometries, accounting for the transport, interaction, and decay (where applicable) of over 60 particle species (photons, leptons, hadrons, and ions) at energies up to the PeV and down to the keV (down to 0.01 eV for neutrons). A wide range of radiation-induced observables can be readily estimated with built-in scoring facilities, including energy/dose deposition, particle spectra, radioactive inventories, to name but a few, rendering FLUKA a versatile tool for a quantitative assessment of radiation-matter interaction problems, particularly for the particle accelerator community.

In this talk, focus will be on FLUKA's approach to displacement damage quantities, especially on displacements per atom (DPA), both in terms of the standard Norgett-Robinson-Torrens DPA and of the recently included athermal-recombination-corrected DPA. FLUKA's coherent treatment of various particle species' contributions to DPA will be discussed, highlighting the constraints imposed by FLUKA's condensed-history account of charged-particle tracks.

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