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Monte-Carlo simulations of the ESS accelerator radiation environment using kernel density estimation techniques

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The Spallation Physics Group at the European Spallation Source (ESS) maintains a detailed model of the ESS accelerator for Monte-Carlo simulations. This model can be used together with the codes PHITS, MCNP6, and FLUKA for calculations of prompt dose rates and nuclide inventories produced around the accelerator. This includes problems involving for example deep-penetration of neutrons through the berm, skyshine at the boundary of the facility, activation of cooling water, and streaming of radiation through chicanes and ducts. These types of simulations are however computationally challenging and require the application of variance reduction techniques to make them possible. One approach is to divide the full simulation into smaller simulations by creating intermediate source terms at specified locations in the geometry. This approach can however suffer from simplifications made in the production of the intermediate source terms. In this work we highlight results of investigating the usage of kernel density estimation techniques with the software package KDSource for intermediate source term creation for accelerator radiation transport applications at the ESS.

Scientific Topic 1

Source terms, new accelerator facilities and related topics

Scientific Topic 2

Scientific Topic 3

Scientific Topic 4

Shielding and dosimetry

Scientific Topic 5

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Primary authors: DI JULIO, Douglas (European Spallation Source ERIC); SJÖÖ, Rasmus (European Spallation Source ERIC, Lund University); MARQUEZ DAMIAN, Jose Ignacio (European Spallation Source ERIC); CEDERKALL, Joakim (Lund University); MUHRER, Gunter (European Spallation Source ERIC)

Presenter: DI JULIO, Douglas (European Spallation Source ERIC)

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