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Modeling tritium production and release in high-energy proton accelerators

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Tritium is a well-known byproduct of particle accelerator operations. To keep levels of tritium below regulatory limits, tritium production is actively monitored and managed at Fermilab.

We study tritium production in the targets, beamline components, and shielding elements of the Fermilab facilities such as NuMI, BNB, and MI-65. To facilitate the analysis, we construct a simple model and use several major Monte-Carlo radiation codes, such as FLUKA, MARS, and PHITS, to estimate the amount of tritium produced in these facilities. This analysis could also serve as an intercomparison between these codes related to tritium production. To assess the actual amounts of tritium that would be released from various materials, we employ semi-empirical diffusion models. The results of this analysis are compared to the experimental data whenever possible. This approach also helps to optimize proposed target materials with respect to the tritium production and release.

Scientific Topic 1

Source terms, new accelerator facilities and related topics

Scientific Topic 2

Scientific Topic 3

Code benchmarking and intercomparison

Scientific Topic 4

Scientific Topic 5

Scientific Topic 6

Scientific Topic 7

Scientific Topic 8

Primary author: GEORGOBIANI, Dali (FNAL)

Co-authors: MAKOVEC, Alajos (FNAL); RAKHNO, Igor (FNAL); TROPIN, Igor (FNAL)

Presenter: GEORGOBIANI, Dali (FNAL)

Session Classification: Session 1 - Source terms, new accelerator facilities and related topics

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