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A Comprehensive Comparison for Simulations of Cosmic Ray Muons Underground

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The two leading simulation frameworks used for the simulation of cosmic ray muons underground are Geant4 and FLUKA. There have been in the past various questions raised as to the equivalence of these codes regarding cosmogenically produced neutrons and radioactivity in an underground environment. Many experiments choose one of these frameworks and because they typically have different geometries and are located at different underground sites the issues relating to code comparison are compounded.
We report on an effort to compare the results of each of these codes in simulations which have simple geometry which is consistent between the two codes. This comparison results in a way to get good constraints on how the physics of each of the simulation packages differ. The methodology employed lends itself to easier benchmarking in the future and the comparisons suggest the most important observables to consider of
the many possible observables in the simulations.

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