

Monte Carlo simulations of long-lived particles

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Beyond Standard Model (BSM) scenarios often involve particles with significantly longer lifetimes compared to the particles in the Standard Model. Reliable Monte Carlo tools for simulation of processes involving such long-lived particles (LLPs) are essential for BSM searches and a variety of frameworks already exists (such as MadGraph accompanied by MadSpin, to name a few).

However, a fully accurate simulation of LLPs, with production and decay treated as a single process (with the LLP as an intermediate resonance) can be problematic due to various numerical instabilities caused by the narrow peaks in the amplitudes, and one often has to rely on some approximation to efficiently perform the simulations.

In this talk, I will discuss a specific solution to the numerical inefficiencies in the LLP simulations, with the custom event generator for long-lived neutrino production in the Left-Right Symmetric Model (KSEG) as an example. A more general approach to such simulations (inspired by some already existing specialized event generators) with the potential interface with well established Monte Carlo tools will also be discussed.

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