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Monte Carlo simulations for nuclear physics experiments using NPTool

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In recent times, experiments with rare isotope beams at accelerators around the world have provided several exciting results in nuclear physics and astrophysics. The experiments involve unstable and even unbound nuclei, low beam intensities, highly granular and efficient detectors arrays. Monte Carlo simulations play a pivotal role in the successful planning as well as data analysis of such experiments. We have used the NPTool (Nuclear Physics Tool) package to carry out the simulations for our experiment at the HIE-ISOLDE radioactive ion beam facility of CERN. The experiment involved a 5 MeV/A ^{7}Be radioactive beam impinging on a CD_2 target. The charged particles emitted from the reaction were detected by an efficient detector array consisting of annular and double sided silicon strip detectors backed by silicon pads covering an angle of $8° − 165°$ in laboratory. NPTool is an open source and freely distributed package for Monte Carlo simulation and data analysis of nuclear physics experiments. It offers a unified framework for designing, preparing and analyzing complex experiments consisting of multiple detectors using GEANT4 and CERN ROOT tool kits. We discuss the NPTool simulations carried out to study scattering and reactions involving the ^{7}Be radioactive beam and its comparison to our experimental data.

What is your experiment?

Study of nuclear reaction involving 7Be on a CD2 target at HIE-ISOLDE, CERN.

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