



Contribution ID : 268

Type : Oral talk

Code for simulations of light nucleus-nucleus elastic interactions

Friday, 30 October 2026 17:15 (15)

At future NICA/SPD experiment, polarized and un-polarized proton-proton (pp), deuteron-deuteron (dd), and, possible, helium-helium (HeHe) interactions will be investigated. Therefore, Monte Carlo simulations of light nucleus-nucleus inelastic and elastic collisions are needed for designing and physical program development of the SPD experiment. Our work is aimed to create a code for simulations of elastic interactions of light nuclei, especially of dd-scatterings. At the beginning, we used Geant4 models for elastic scattering's modeling – ElasticDIFF and ElasticCHIPS. It was observed that Geant4 elastic models can describe the elastic interactions at low four-momentum transfer (t) and low energies. However, they are not applicable to the elastic dd interactions at higher energies. Then, we have applied codes based on the Glauber theoretical model to elastic dd interactions. Quite good results have been obtained when comparing experimental data on dd elastic interactions at high energies and our calculations based on these codes. Earlier, codes based on Glauber approach were written in FORTRAN. Using these in frameworks of NICA experiments is cumbersome. Thus, we have created a new C++ code based on Glauber model, starting from the old FORTRAN codes. Some results obtained with the new C++ code will be presented in our report. The new code allows also to calculate elastic interactions of light nuclei like pp, dd, HeHe, and pHe.

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Session Classification : High energy physics: theory

Track Classification : High energy physics: theory