Simulation of neutron and nuclear fragment productions in nucleus-nucleus interactions using the coupling UrQMD 3.4 + SMM model

T.Q.T. Le (1,2,3) A. Galoyan (3), V. Uzhinsky (3)

(1) Institute of Research and Development, Duy Tan University, Da Nang, 550000, Vietnam; (2) Facility of Environment and Natural Sciences, School of Engineering and Technology, Duy Tan University, Da Nang, 550000, Vietnam; (3) Joint Institute for Nuclear Research, Dubna, Russia

The UrQMD model is widely applied for simulation of nucleus-nucleus interactions at high energies. It allows one to generate multi-particle production in the interactions in the so-called

"cascade" mode [1]. We couple the model with the Statistical Multi-fragmentation Model (SMM) to simulate the neutron and nuclear fragment productions using the EoS mode of the UrQMD model. In the coupling mode, the molecular type propagation of nucleons is used accounting potential interactions, stochastic scatterings and multi-particle productions. The evolution time is chosen to equal to 100 fm/c. At the end of the time evolution, the well-known clusterization algorithm is applied for creation of the nuclear pre-fragments in the equal velocity reference frame (clusterization radius Rc = 3 fm). An excitation energy of a pre-fragment is computed as a difference between sums of the kinetic and potential energies of nucleons, and a ground state mass of the pre-fragment. We check that the combination of UrQMD and SMM allows to describe neutron spectra in the reactions – p+Al, Fe, and Pb [2]. Fragment mass distributions in nucleus-nucleus interactions are also analyzed. The combination can be a good candidate to use at NICA and FAIR facilities.

References:

[1] H. Petersen, M. Bleicher, S. A. Bass and H. Stocker, "UrQMD-2.3 - Changes and Comparisons," http://arxiv.org/abs/0805.0567.

[2] K. Ishibashi et al., J. Nucl. Sci. Technol. 34 (1997) 529.

Presenter: Lê Thị Quỳnh Trang

P.71 – Poster, VCTP-49