Contribution ID: **114** Type: **Poster report**

Sensitivity of r-process simulation to choice of the mass model

Monday, 20 September 2021 19:05 (5 minutes)

Astrophysical r-process is considered to be the main source of neutron-rich isotopes beyond the iron peak and, therefore, poses a great interest to modern nuclear physics. It takes place in stellar medium at temperatures above 1 GK and very high densities that can be reached in extreme scenarios,such as supernova explosions or neutron star and black hole collisions. Computer simulations of the r-process depend on a very large number of nuclear parameters.

In this study we have calculated r-process nucleosynthesis using numeric model [1], based on the SkyNet library [2], and obtained final mass distributions of r-process products at the temperature of 1.2 GK. One of the most important parameters that impacts neutron capture rates in r-process are masses of participating nuclei, especially in the little-studied exotic isotope regions of the nuclide chart. Sensitivity of the calculation to different nuclear mass models has been studied by substitution of complete astrophysical neutron capture rate libraries, that were used during the calculation. Several reaction rate libraries with different parameters were obtained via TALYS package [3] and their results were compared to each other in the interval $A = 60 \div 220$.

Calculations were performed using the macro-microscopic models FRDM [4] and WS4 [6], the Skyrme interaction-based HFB mass model [5], and the new mass evaluation based on local mass relations [7]. Calculated r-process yields illustrate the differences of the considered mass models.

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Session Classification: Poster session (Mixed)

Track Classification: Section 5. Neutrino physics and astrophysics.