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IMPLEMENTATION OF GLOBAL BETA-DECAY RATES PREDICTIONS TO ASTROPHYSICAL MODELS

Thursday, 14 July 2022 17:10 (20 minutes)

In nucleosynthesis of heavy nuclei, following neutron star merger (NSM) [1], short-lived not experimentally researched nuclei are involved. That is why for their formation modelling the global predictions of different nuclear parameters are needed. The beta-decay rate is one of the main important parameter of such short lived nuclei. Heavy nuclei abundance calculation, taking into account different nuclear parameters predictions, is in fact theoretical integral experiment, in which the opportunities of theoretical models can be compared on the basis of observations and calculations of heavy elements abundances.

Strong dependence of element abundances, produced in NSM scenario on beta-decay rates model [2] have shown strong difference in the abundances with different beta-decay rates predictions used. In present work we considered the role of beta-decay rates predictions in scenario of low neutron mass explosion, emerged at the end of close binary evolution of two neutron stars with different masses [3]. Different beta-decay rates predictions, such as random phase approximation (qRPA) [4], proton-neutron relativistic quasiparticle phase approximation (pn-RQRPA) [5] and finite amplitude method (pnFAM) [5], were applied to the same nucleosynthesis model [6], used earlier for NSM [2].

It was shown that different global beta-decay rates predictions [4-6], applied to nucleosynthesis calculations, leads to formation of realistic structure of the abundance curve of chemical elements during weak r-process. And contrary to nucleosynthesis in NSM-scenario, the formation of heavy elements in the region between first and second peaks weakly depend on beta-decay model.

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The speaker is a student or young scientist

No

Section

1. Neutrino physics and nuclear astrophysics

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