NUCLEAR SEMINAR SERIES

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4:00 pm - Rm 123 NSH

Towards consistent nuclear physics input for r-process calculations

The rapid neutron capture process (r process) is responsible for the production of half of the elements heavier than iron that we observe in the Universe. The quest to identify its actual astrophysical site is still ongoing, but there are strong indications, including the recent observation of the GW170817 electromagnetic counterpart, that make neutron star mergers (NSM) a likely candidate. Reliable estimates of nucleosynthesis yields on NSM require an accurate description of the relevant nuclear physics inputs including nuclear masses, neutron capture rates, β- and α- decay rates and, for fissioning nuclei, fission rates and fission fragments distributions. Several of these quantities can be computed from a consistent theoretical framework using the energy density functional (EDF) approach.

In this talk I will revise how uncertainties in the nuclear physics properties of neutron-rich nuclei impact nucleosynthesis calculations, with a focus in the fission properties of (super) heavy nuclei. I will present a new set of spontaneous, neutron-induced and beta-delayed fission rates obtained from a microscopic calculation of the fission barriers and collective inertias, which are used as a nuclear input in r-process nucleosynthesis calculations in NSM. I will also introduce recent developments in the estimation of fission yields and the possible extension to r-process nuclei. This constitutes a first step in a systematic exploration of different sets of fission rates and yields on r-process abundance predictions.

PHYSICS

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