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Nuclear structure calculations for astrophysics

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Nuclear physics is key to address fundamental questions related to the origin of the elements, the structure of matter, as well as fundamental symmetries of nature. The advent of new radioactive-beam facilities such as FAIR, together with the urgent need to interpret recent astrophysical observations, now make it essential to provide a predictive description of nuclear properties across the chart. In particular, precise and consistent calculations of masses, excitation energies, decay and reaction rates of a large range of nuclei, including those far from stability, are needed in order to advance our comprehension of the formation of the elements. Such a theoretical description is however still lacking and represents a formidable task for nuclear theory. In this talk I will discuss recent theoretical developments to address this challenge. In particular, I will highlight calculations of weak-interaction process.

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