
TALYS: COMPREHENSIVE NUCLEAR REACTION MODELING

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The advent of fast computers has enabled the numerical implementation of even the most sophisticated nuclear models. TALYS is a nuclear reaction program created at NRG Petten, the Netherlands and CEA Bruyères-le-Châtel, France, which simulates nuclear reactions that involve neutrons, gamma-rays, protons, deuterons, tritons, helions and α -particles, in the 1 keV – 200 MeV energy range. A suite of nuclear reaction models has been implemented into a single code system, enabling us to evaluate basically all nuclear reactions beyond the unresolved resonance range. An overview is given of the main nuclear models used, which includes among others our newly developed optical models, various compound nucleus models, fission and the pre-equilibrium model, all driven by a comprehensive database of nuclear structure parameters. The predictive power of the code is demonstrated by comparing the calculated results with a very diverse set of experimental observables. The production of nuclear data libraries, using a single standard ENDF-6 formatting procedure, is briefly mentioned. Our aim is to show that TALYS represents a robust computational approach to cover the whole path from fundamental nuclear reaction models to the creation of complete data libraries for nuclear applications. We will also present our views on future theory developments needed to more accurately model various phenomena.