

Recent development in the GALILÉE-1 processing code

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Abstract: GALILÉE-1 is the new verification and processing system for evaluated data, developed at CEA. The main features of GALILÉE-1 are the following ones. We have already presented in the past the reconstruction and Doppler broadening of cross-sections implemented in the GTREND module of GALILÉE-1. The results obtained are of very good quality and we can explain the discrepancies observed with respect to other processing codes such as NJOY and PREPRO. This intensive comparison phase has increased the reliability of the GTREND module. GTREND is also able to handle the R-Matrix Limited format (LRF=7) with a large number of channels in the Resolved Resonance Region (RRR) and to calculate the angular distributions from the resonance parameters in this energy range.

The treatment of the Unsolved Resonance Range is a more complex problem because it is difficult to obtain experimental or theoretical references to evaluate the different results of the various processing codes. We have chosen to implement two approaches in order to produce usable data for the deterministic and Monte Carlo transport codes, APOLLO3® and TRIPOLI-4® developed at CEA, respectively. These transport codes use URR cross-section data in the form of multi-group probability tables on an energy mesh chosen by the user. This was previously done by the CALENDF code. The description of these probability tables is different from that of the NJOY PURR module which produces pointwise probability tables on a coarse energy mesh.

GALILÉE-1 has the capability to generate probability tables for all reactions. The competitive reaction given in resonance parameters section may be taken into account and that can have a significant influence on certain calculations. In order to generate probability tables for transport codes, such as MCNP or TRIPOLI-5, GALILÉE-1 can also produce pointwise TPs and thus replace the PURR module of NJOY. In the thermal energy range, GALILÉE-1 produces double differential sections, like NJOY's THERMR module, with refinement adjustment options on the energy grids.

In this paper we will focus on the following points. The R-Matrix Limited format is increasingly used for resolved domain resonance parameters. In particular, it allows several reaction channels to be specified, such as inelastic scattering, (n,2n), (n,alpha) or (n,p) reactions. We have analysed the different cases and more particularly those for which charged particles are produced. Comparisons with NJOY2016 and PREPRO21 will be presented for these cases. We will also look at the reconstruction of the anisotropies of the particles on the exit channel for these reactions and we will present the method developed in GALILÉE-1 to define a linearization grid of the anisotropy. We will show results comparing the reconstructed anisotropies to those available in the initial evaluation files.

We will present analyses of the normalisation of cross-sections in URR according to the options declared in the evaluations. GALILÉE-1, in order to process evaluated, performs many tests on the evaluations. We will finally present these tests and those dealing with the coherence of the reaction thresholds considered.