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D. Rochman *et al.*

How TENDL and TALYS can benefit from n_TOF ?

N_TOF collaboration board, Geneva, Switzerland, April 6, 2017

Summary

- What is TENDL ?

- Resonance range,
- How n_TOF data can be implemented,

- Conclusion

The TENDL team

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TENDL nuclear data library: overview 1

- TENDL is in fact a by-product of a series of codes,
- This is one fundamental difference with other libraries (no manual work),
- It allows to perform „TMC“ for Total Monte Carlo (uncertainty propagation)

- Goal: improve simulations (C/E) for any application,

$$\chi^2 = 0 \; or \; 1$$

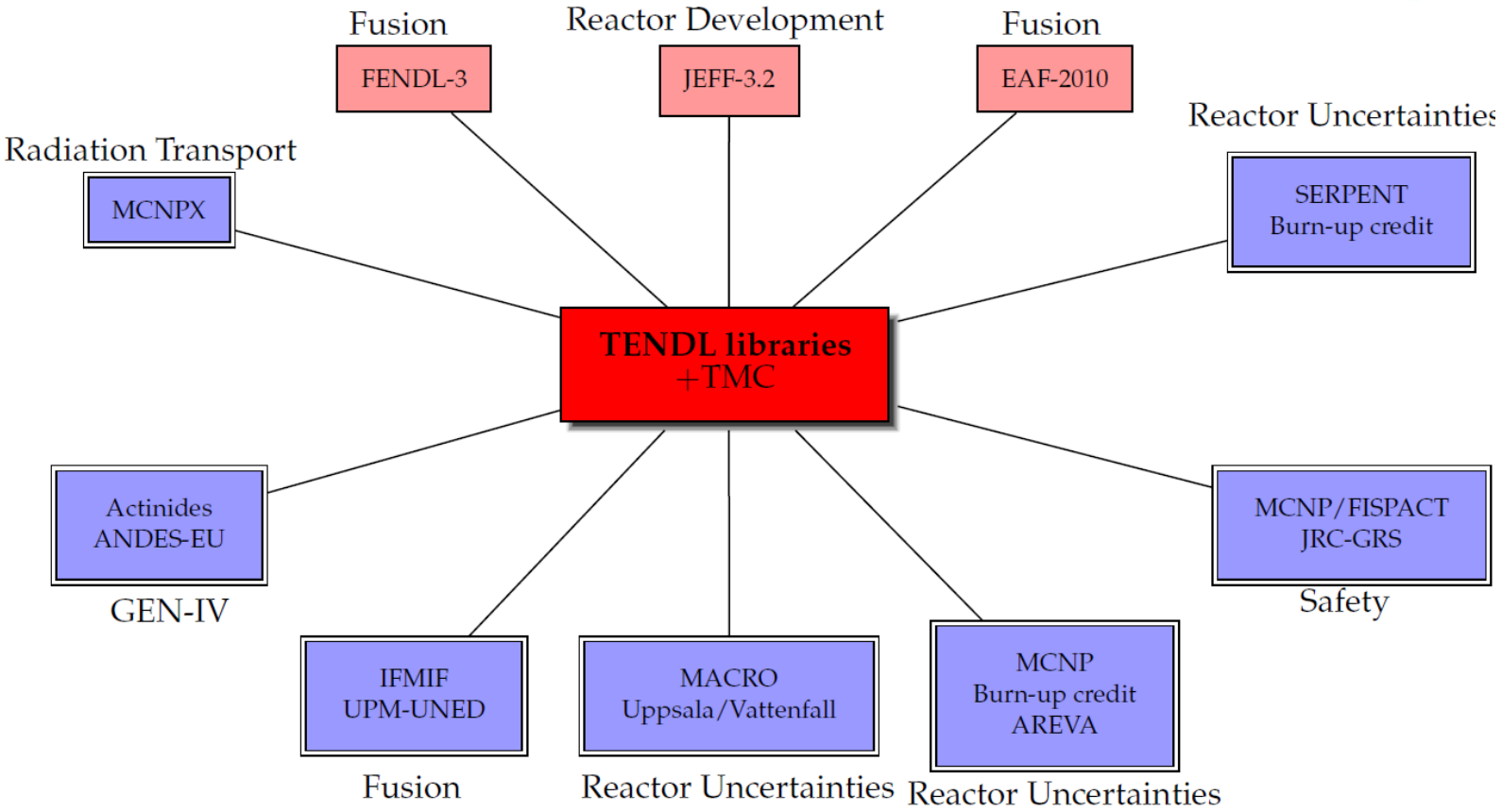
- Methods: reproductibility & completeness, development of a portable system
- Background: theoretical calculations (TALYS) with experimental inputs, with original resonance evaluations,

- Impact:
  - TENDL-2008 to 2015 (2800 isotopes),
  - Neutrons, protons, deuterons, tritons, He3, alpha and gamma induced,
  - all isotopes, all cross sections with covariances, 0-200 MeV,
  - more than 300 isotopes in the NEA JEFF-3.3,
  - more than 450 publications using TENDL

$$\chi^2 = \frac{1}{n}\sum_{i=1}^{n}\left(\frac{C_i - E_i}{\Delta E_i}\right)^2$$

TENDL nuclear data library: overview 2

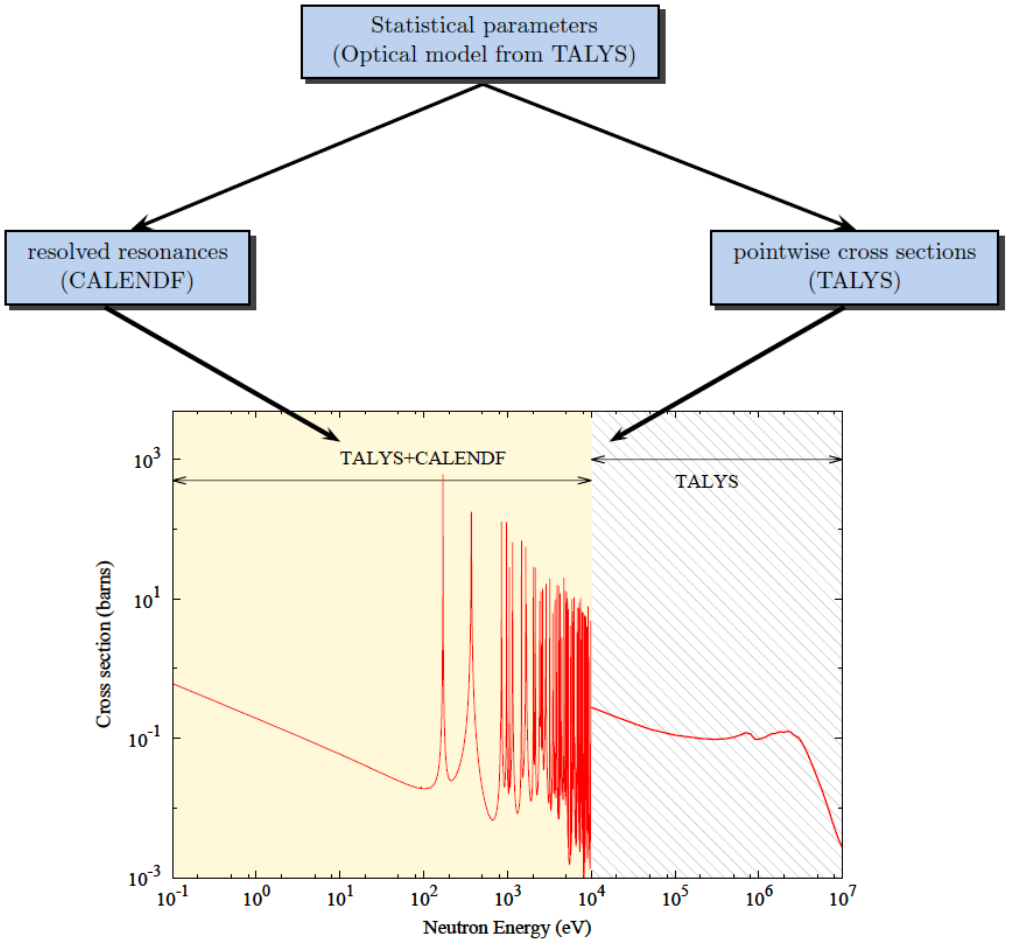
- Fully implemented in FISPACT-II, part of GEANT, commercial codes…,
- Used in fission, fusion applications, medical isotope productions



TENDL in the resonance range

- In TENDL, all 2800 isotopes have unique resonances
  - Only about 10 % of the resonances are measured,
  - The rest comes from the HFR method (statistical resonances),

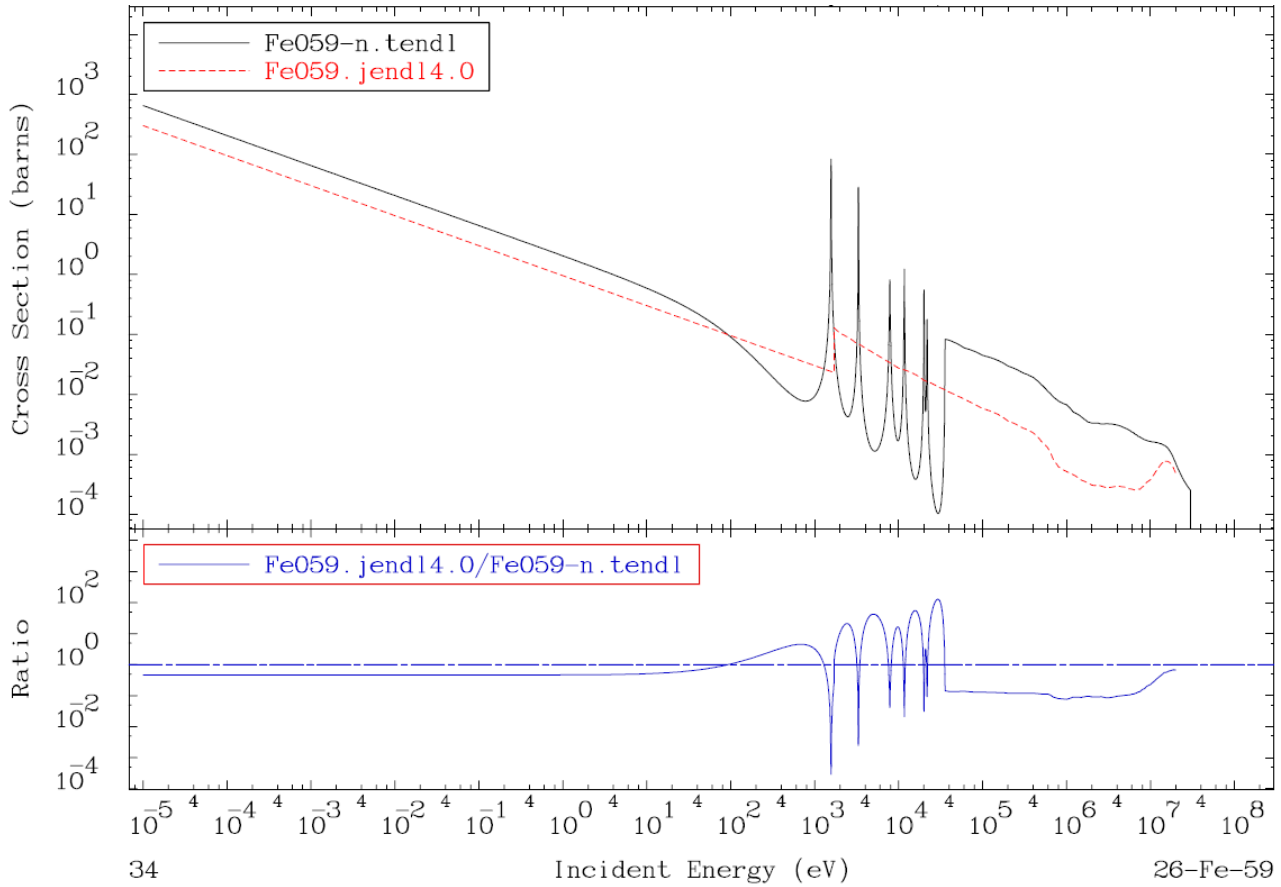
- Presented in ANE 50 (2013) 60
  - Combine the 3 previous models (ld, omp and γ-str) to produce statistical resonances
- Uses the following scheme:
  - TALYS (input: ld + omp + γ-str)
  - CALENDF (input: TALYS output)
  - Output: statistical resonances



TENDL related projects

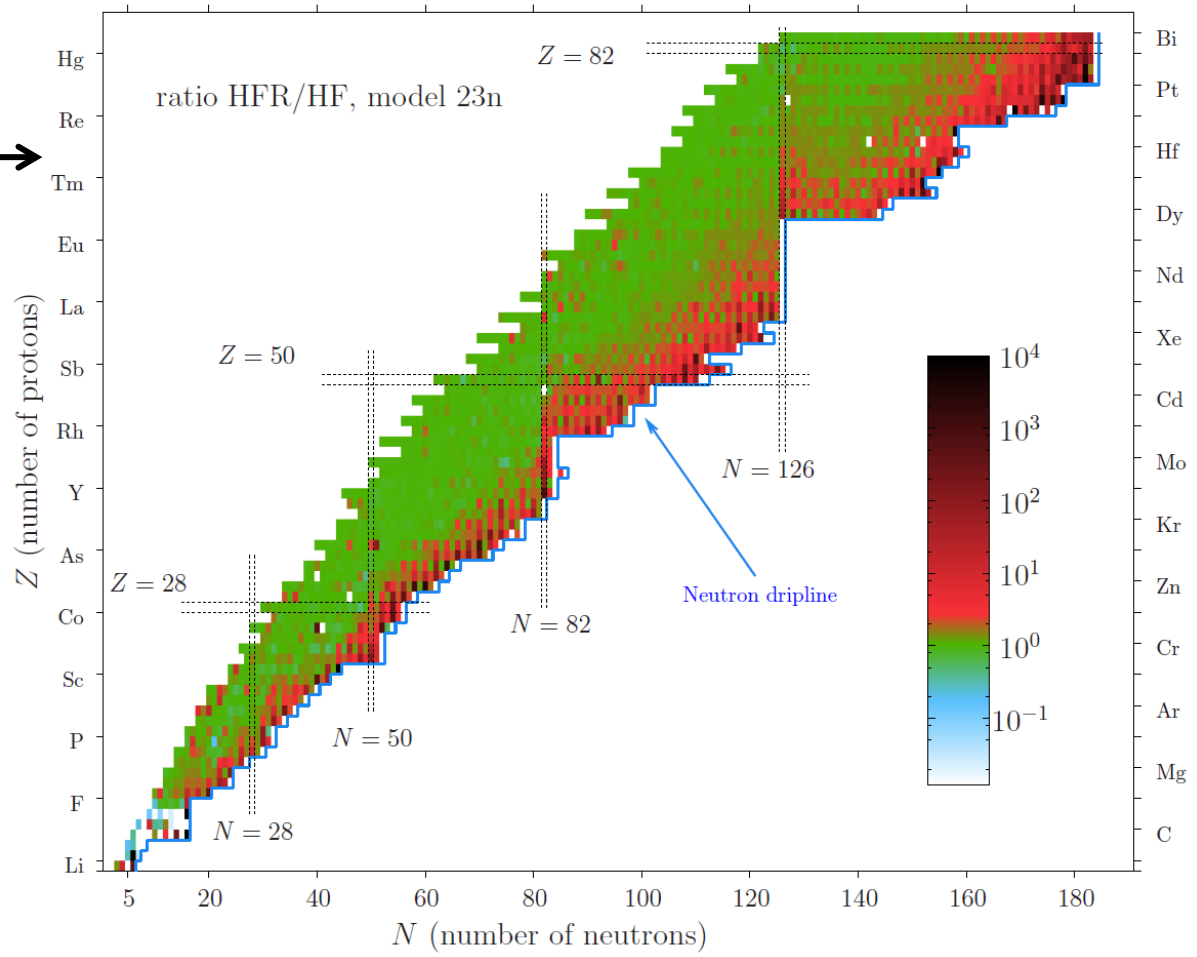
HFR: When no measured resonances: consistency from 0 to 200 MeV

- A single OMP,
- A single γ-strength function,
- A single level density model,
- All using SAMMY retro-active method,
- All with MF-33 from 0 to 200 MeV,



TENDL: example in MACS calculations

- Presented in PL/B 764 (2017) 109,
- Systematic approach to the neutron drip line
- Show the impact of the traditional method (Hauser feshbach) compared to resonances
- MACS 30keV →
- Needs of data
- Needs of model parameters



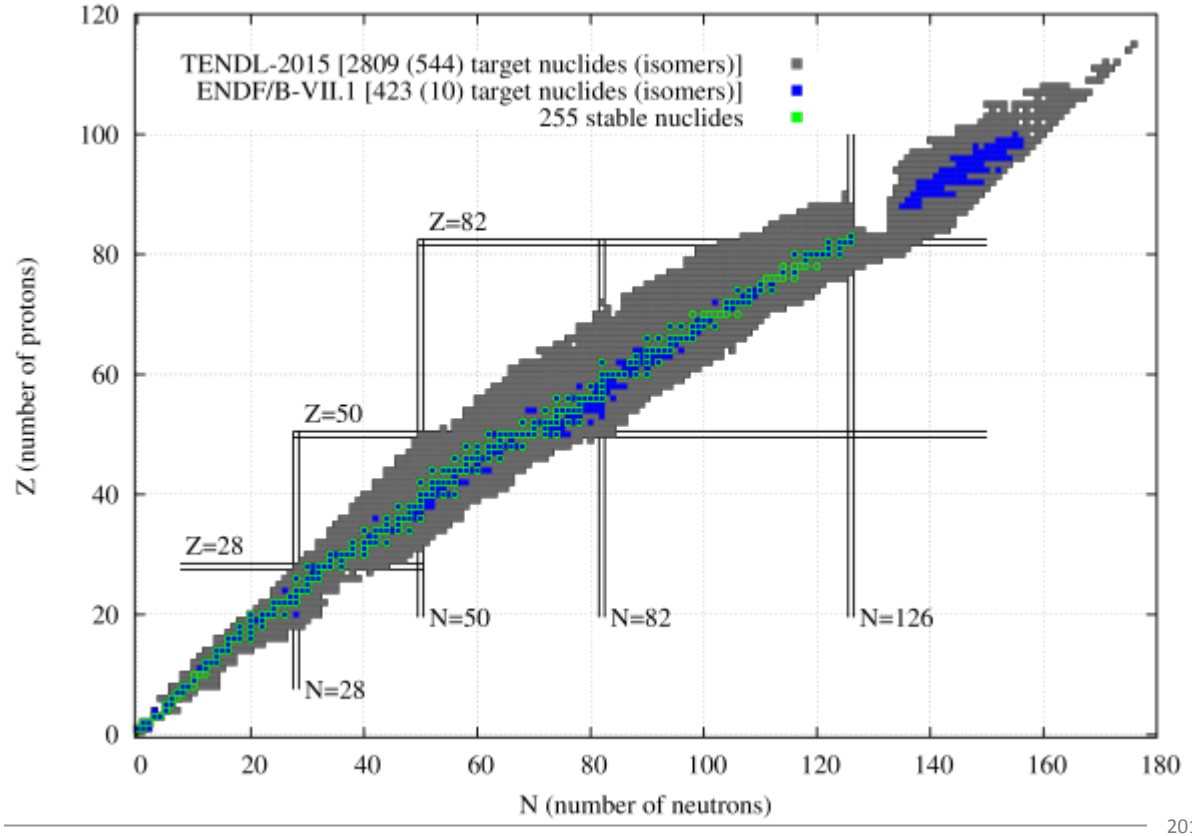
TENDL: how to use n_TOF neutron data

- We perform SAMMY analysis of the data,
- We can include the measured resonance parameters in TENDL,

  (n_TOF data used in TENDL and other libraries/codes as JEFF=TENDL for some isotopes)
- From high energy measurements (keV to MeV), model parameters can be extracted (level densities, gamma-strength function or optical model) with TALYS,
- Existing TENDL resonances can be fitted to n_TOF MACS,
- Needs of data, for applied and less-applied research,
- We can provide training on nuclear data evaluation, which will go into TENDL.

Conclusion

- n_TOF data are welcome in TENDL (resonance parameters, integral quantities),
- Because TENDL is used in many different applications, so will be the n_TOF data.
- The TENDL project can help student to perform full-size evaluations.



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