PAUL SCHERRER INSTITUT

PSI

D. Rochman

Work status and possibilities for 2019

EFFDOC-1388

EUROfusion meeting, 25 April 2019, OECD/NEA, Paris, France

Contents

- 2018 achievements
- PPPT Task specifications 2019
- Status and plans

2018 achievements

- 2 reports sent:
  - PMI-3.3-T032-D001 "*EPFL/PSI contribution to PPPT nuclear data development: Updating of evaluation methods and improvement of activation cross sections*"
  - PMI-3.3-T032-D002 "*EPFL/PSI contribution to PPPT nuclear data development: Updating of evaluation methods and improvement of activation cross sections*."

2018 achievements

- PMI-3.3-T032-D001 "*EPFL/PSI contribution to PPPT nuclear data development: Updating of evaluation methods and improvement of activation cross sections*"

  – Applied to ^{56}Fe with the T6 tool + EMPIRE
  – Based on the production of random files varying parameters and models (TALYS, EMPIRE)
  – First time performed, increase the range of possibilities
  – Application of BMC and BFMC
  – Validation with criticality and shielding benchmarks.

2018 achievements

- PMI-3.3-T032-D001 "*EPFL/PSI contribution to PPPT nuclear data development: Updating of evaluation methods and improvement of activation cross sections*"

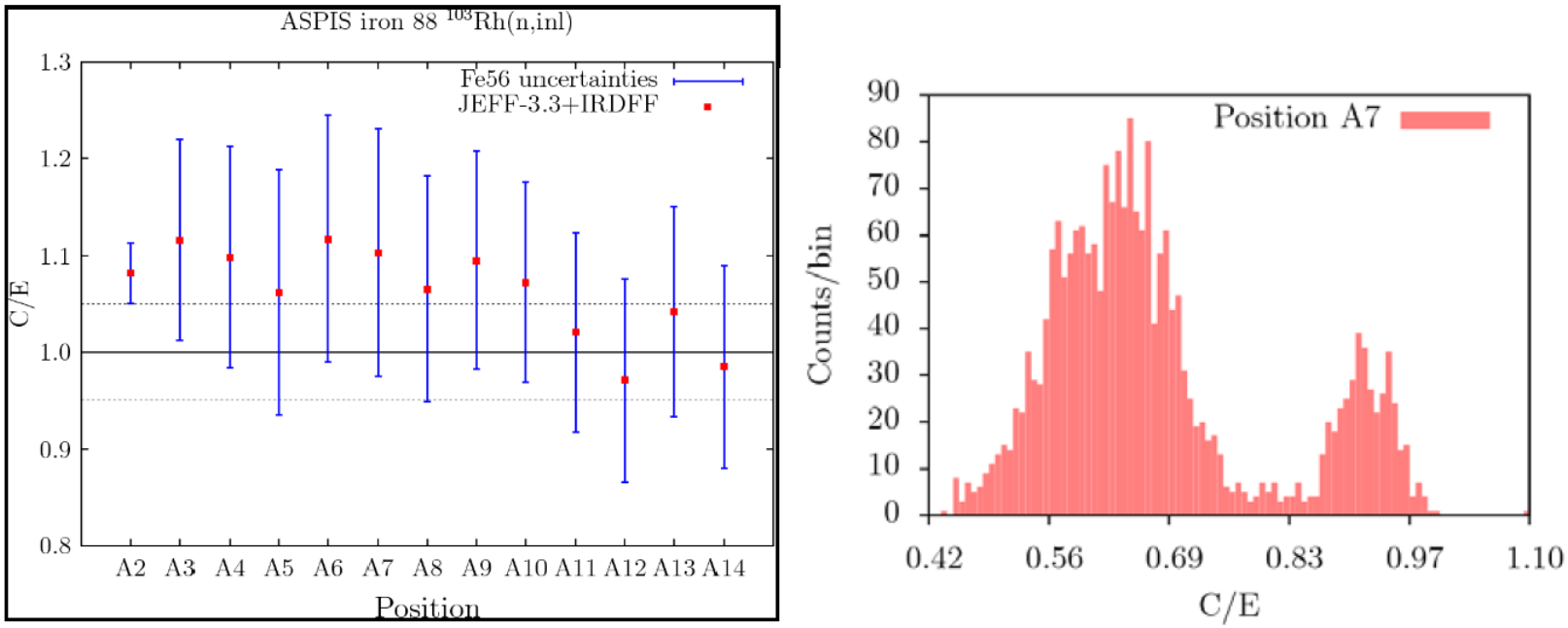
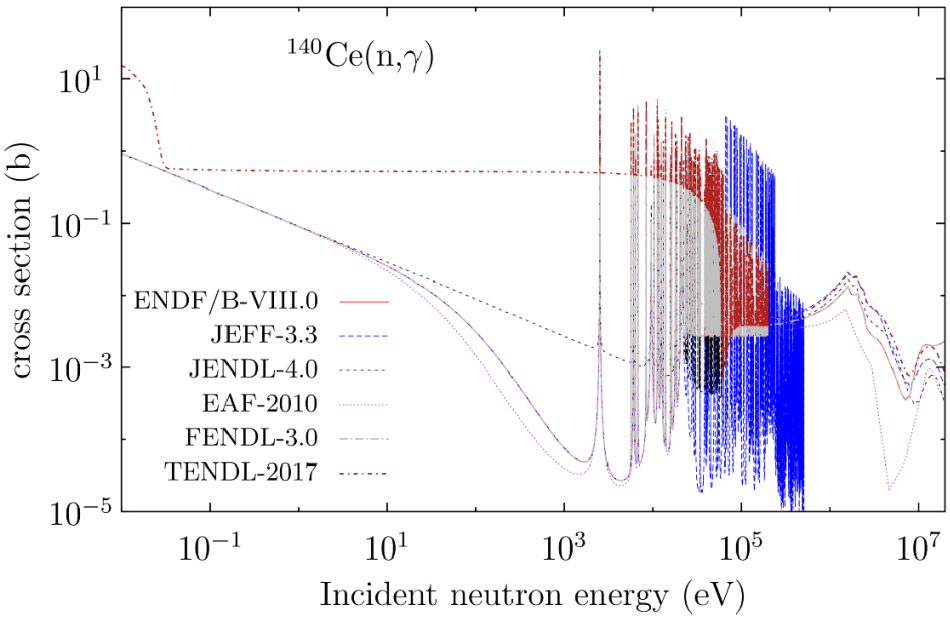


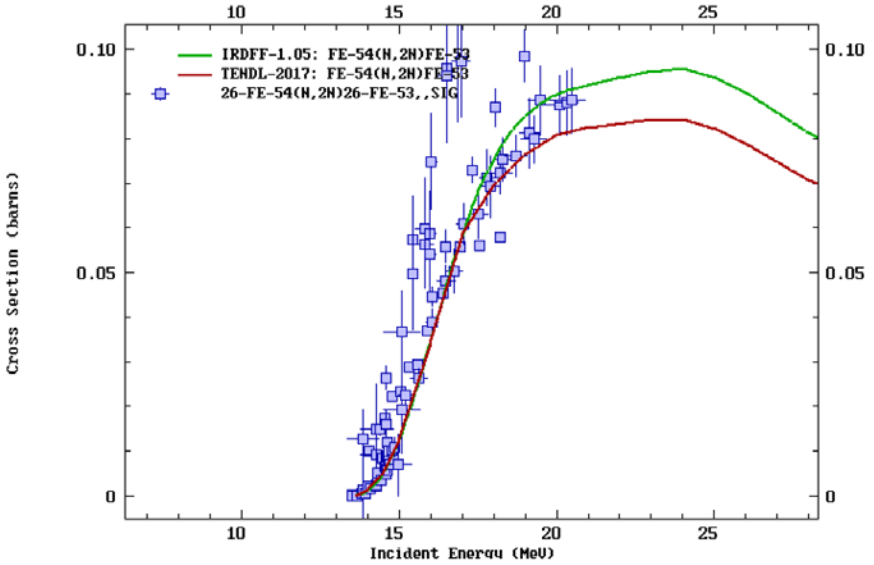
Figure 6 – Left: Uncertainties for the ASPIS benchmark and the Rh activation measurements as a function of the foil position (A2: close to the neutron entrance, A14: end of the steel block). Right: probability density function for the position A7.

2018 achievements

– PMI-3.3-T032-D002 "*EPFL/PSI contribution to PPPT nuclear data development: Updating of evaluation methods and improvement of activation cross sections*."

– Review of existing reactions in TENDL-2017 and list reactions to be improved (see task specifications for 2019)





PPPT Task specifications 2019

1. **Improvement of neutron induced activation cross-section data for 25 reactions** which have been identified to require specific improvements in the TENDL library. The improved cross-sections will be included in the new release TENDL-2019. A dedicated activation data library, based on the TENDL-2019 general purpose data library, will be produced in EAF- data format in collaboration with CCFE (WPPMI-7.4-T001).

2. **Investigations on the improvement of deuteron induced cross-sections** in TENDL as required for IFMIF-DONES transport and activation calculations.

3. **Advanced evaluation study of Fe-56 general purpose neutron cross-section data for TENDL**, based on model deficiencies. The method and tools developed by VR, University of Uppsala, within sub-task PMI-7.4-T008, will be applied to the TENDL methodology to assess the advantages and limits of such approach. This work is performed in close collaboration with the University of Uppsala (model defects), and JSI Ljubljana (benchmarking).

PPPT Task deliverables 2019

ID	Title	Start Date	End Date	RU	Del. Owner	AWP2019
						PM 50%
PMI-7.4-T003 - D001	Report on updated neutron activation data library based on TENDL-2019	01-Jan-19	31-Dec-19	EPFL	Dimitri Rochman	3.000
PMI-7.4-T003 - D002	Report on advanced evaluation methodology for n + Fe-56 cross-section data	01-Jan-19	31-Dec-19	EPFL	Dimitri Rochman	3.000

Status and plans 2019

1. Improvement of neutron induced activation cross-section data for 25 reactions

- Improved resonance integrals for ^{140}Ce, ^{154}Eu, ^{76}Ge, ^{85}Kr, ^{95}Nb, ^{164}Er, ^{119}Sn, ^{88}Sr, ^{130}Te
- Improved high energy reaction rates: ^{165}Ho(n,t), ^{150}Nd(n,2n), ^{141}Pr(n,2n), ^{159}Tb(n,t)
- and

Reaction	Remarks on TENDL-2017 compared to IRDFF-1.05
^{23}Na(n,2n)	XS probably too high between 19 and 30 MeV
^{24}Mg(n,p), ^{27}Al(n,p), ^{31}P(n,p)	Energy grid not dense enough
^{28}Si(n,p)	Autonorm needed on a dense energy grid
^{45}Sc(n,g)	XS too low between 100 and 200 keV Wrong shape above 14 MeV
^{52}Cr(n,2n), ^{54}Fe(n,2n), ^{58}Ni(n,2n), ^{90}Zr(n,2n), ^{56}Fe(n,p)	XS too low above 18 MeV
^{54}Fe(n,a)	Resonances missing
^{67}Zn(n,p)	Thermal 10^{18} too low

Status and plans 2019

2. **Investigations on the improvement of deuteron induced cross-sections**
   - Depends on IFIN-HH and IAEA
   - How to address the issues ?

3. **Advanced evaluation study of Fe-56 general purpose neutron cross-section data for TENDL**
   - Depends on UU and the availability of the tool for “model deficiency”

Conclusion

- Review of 2018 tasks.
- Task 1 for 2019:
  - Can be done for TENDL-2019 as all tools are ready
- Tasks 2 & 3 for 2019:
  - Needs coordination with other groups and tool availability

PAUL SCHERRER INSTITUT

PSI

Wir schaffen Wissen – heute für morgen