

CM on Evaluation of Photonuclear Cross Sections and
Reviewing the Updated Photonuclear Data Library
25-27 June 2018

Minutes

Welcome address

Participants:

Evaluators:

Reviewers:

Chairman-Rapporteur

Purpose: Review the new evaluations of the photonuclear cross sections that were agreed at the 1st and 2nd RCM of the CRP on Updating the Photonuclear Data Library...[Refs] and make recommendations to the IAEA-NDS for the evaluations that should be considered in the updated library.

The procedure for the review was the following:

A table with the assigned evaluations as well as the reports and/or presentations of the evaluations were circulated to participants of the Review meeting prior to the meeting. Each participant of the Review meeting agreed to review a group of nuclides in more detail.

A joint session was held during the meeting where evaluators presented their evaluations and ample time was given for questions and discussions.

Following the presentations, the reviewers held a separate session to discuss their reviews and agree on recommendations.

A second joint session was subsequently held to discuss the reviewers recommendations together with the evaluators.

Summaries of the evaluators presentations are given in Section 2 while a summary of the technical discussions, reviewers comments and recommendations are provided in Section 3.

Section 2. Presentations

Filipescu: 9 nuclides

- Fits to the data were performed only in those cases where the NewSUBARU data are finalized (209Bi, 148Nd). For 159Tb, 197Au EMPIRE calculations were simply compared with the data. Plan to improve the evaluation of 209Bi.

- QD contribution was increased to reproduce high-energy increase in data for ^{209}Bi - a different approach was recommended (add an extra Lorentzian)
- EMPIRE: not clear how to disentangle the exclusive channels (not containing neutrons) contributing to the residual production cross section
- New GDR parameters (Plujko) need to be corrected for ^{148}Nd (Action on Dimitriou: contact Plujko about this)
- Need to test the production of ENDF-6 files using EMPIRE (EMPEND) with IAEA

Varlamov: 34 nuclides

- GDR parameters are obtained from global systematics not Plujko's or RIPL tables
- Need to check the Fi-corrected results for ^{209}Bi as they do not agree with new Gheorghe et al data
- Action: to provide IAEA with tables of GDR parameters used in the evaluation of experimental data

Iwamoto: 173 nuclides (could provide additional 16)

- Completely new evaluations for Updated IAEA PD for: Cl, Ar, Sc, Ti, Cr, V, Mn, Fe, Co, Ni, Cu
- ^{209}Bi : added an extra Lorentzian at lower energy to reproduce the shoulder in the Gheorghe et al data
- Adopt recommendations for Livermore and Saclay data from Berman et al [Ref]
- Comparison with activation data not straightforward and should be done with caution
- Can also produce files for natural elements (only cross sections)

Cho: 40 nuclides

- Automated method of sampling input model parameters and fitting experimental data; experimental data are prioritized (new CRP data 1st priority; Varlamov corrected data 2nd priority...)
- Need to look into default GDR parameter file in TALYS to check if one or two Lorentzians are used
- Should use Varlamov corrected data published after 2008
- ENDF files can be produced easily

Xu: 12 nuclides+ Sn isotopes

- New GDR parameters table prepared by Y. Tian

- Need more clarification about GDR parameters in table (different multipoles or two Lorentzians at same energy?)
- Beta2 parameters are taken from...? (Ruirui to provide this information)
- Recommendation: introduce constraints on adjustable parameters
- Threshold problem in 51V needs to be checked
- New CENDL-PD library will contain 274 nuclei

Dimitriou:

- medical isotope production needs have been investigated
- Kawano to compare his evaluation for $^{39,41}\text{K}(\gamma,*)$ with JENDL-PD
- $^{187}\text{Re}(\gamma,n)$ and $^{178}\text{Hf}(g,*)$ evaluations already available in JENDL-PD
- Those evaluations where no data available will be taken from TENDL

Section 3. Technical discussions and recommendations

General remarks:

- All evaluations were of extremely high quality
- Model-based evaluations of comparable quality will be recommended for the updated PD library (JENDL, KAERI, CENDL)
- Varlamov's correction of experimental data based on F_i criteria will be used to assess the data but will not be recommended as an evaluated file per se
- Recommendation to IAEA to investigate the following: sorting of the various versions of corrected data in EXFOR, keeping only the latest version and/or investigate transferring all of them into the EXFOR-corrected system
- EMPIRE high-quality fits will be considered in the report and in the case of ^{89}Y an effort to produce an evaluated file is recommended
- In cases where a single evaluation was performed, that evaluation will be recommended
- In cases where more than one evaluation was performed, the evaluations will have to be compared and
 - if evaluations are comparable then the evaluation of KAERI or CENDL will be recommended given that JENDL is already contributing the bulk of the evaluations
 - attention will be given to the comparison of the evaluations with Varlamov corrected data
- Recommendations for experimental data needs should be included in the CRP reports and this meeting report where possible

Specific recommendations: the following nuclides were compared and discussed in more detail at the joint session:

9Be: CENDL evaluation is recommended

14C: KAERI evaluation will be recommended after updating

209Bi: CENDL evaluation will be adopted after it has been improved to fit the low-energy data Gheorghe et al

91,94Zr: KAERI evaluation is recommended

The following list of nuclides still to be reviewed by all members of the review committee:

KAERI-JENDL: 159Tb; 181Ta; 133Cs; 63,65Cu; 197Au; 208Pb

CNDC-JENDL: 51V; 50,52,53,54Cr; Sn isotopes; W isotopes

Action: Iwamoto will prepare complete comparison plots of old IAEA, new JENDL, Varlamov corrected and all the new CRP evaluations. (89Y excluded). By 15th July 2018.

Action: Evaluators will provide the tables of GDR parameters to the IAEA. In the case of TALYS (public code) the complete set of input parameters is advised.

Recommendation: All evaluated files should contain information on the parameters used in the evaluation.

Timeline for review:

The review committee will provide a complete report by the end of August 2018, including recommendations (based on the assignment of nuclides agreed prior to the meeting). The report will be circulated to the evaluators.

Following the recommendations, the evaluators will submit their complete evaluated files (ENDF-6) to the IAEA.

IAEA will assemble files to create the starter library for processing. The conclusions will be presented at the 3rd RCM 17-21 Dec. 2018.

New experimental data using multiplicity counting (Filipescu):

- By the end of July: 169Tm, 165Ho, 159Tb, data will be finalized (Romania).
- Pending: data analysis for 197Au from Japan; 89Y from Russia
- The above data will be considered in updated PD library if available by 3rd RCM.

Can also provide average energy of emitted neutrons. This is useful information to compare with evaluations. Average energy of neutrons can be extracted from inclusive spectra of all neutrons.

Action on Filipescu: provide data on average energy to IAEA for circulation among CRP evaluators.

Also useful for evaluators to estimate fraction of neutrons that are emitted at energies above energy window (0-5 MeV) assumed in determination of flat efficiency of detector.

