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NUCLEAR ENERGY AGENCY
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Working Party on International Evaluation Co-operation

Summary Record of the Twenty-Sixth Meeting of the Working Party on International Nuclear Data Evaluation Co-operation

15-16 May 2014

NEA Headquarters, Issy-les-Moulineaux, France

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SUMMARY RECORD OF THE TWENTY-SIXTH MEETING OF THE WORKING PARTY ON INTERNATIONAL NUCLEAR DATA EVALUATION CO-OPERATION

15-16 May 2014

NEA Headquarters,
Issy-les-Moulineaux, France

The Head of the Nuclear Science Section, **J. Gulliford**, and the Chair of WPEC, **T. Fukahori**, welcomed participants to this 25th anniversary meeting (a list of participants is given in Annex 1).

Adoption of the agenda **(NEA/SEN/NSC/WPEC(2014)1)**

1. The proposed agenda was adopted with the addition of a presentation of a new subgroup proposal on Thermal Scattering Kernels by **L. Leal** under item 9 of the agenda (Proposals for new subgroups).

Approval of the summary record of the 25th WPEC meeting **(NEA/SEN/NSC/WPEC(2013)2)**

2. The summary record of the twenty-fifth meeting was approved without modification.

Membership and invitees

3. **E. Dupont** reviewed the list of delegates and invitees. He informed participants that the increased co-operation between NEA and China opened up the possibility for the Working Party to directly invite CENDL delegates and thanked the IAEA for having supported Chinese participation until now. Unfortunately, A. Ignatyuk (Russia) could not participate in the meeting and there will be no representative from the BROND/ROSFOND project. Other apologies for absence were received from M. Igashira (Japan), Y.-O. Lee (Korea) and T. Golashvili (Russia).

E. Dupont proposed to have an informal discussion on criteria defining an evaluation project. He suggested that evaluation projects participating in WPEC fulfil a number of requirements, such as (i) being established for a few years; (ii) having a governing board/committee planning future developments; (iii) developing a complete usable library (with both General and Special Purpose files); (iv) containing original work in the GP file (i.e. a number of new evaluations); (v) covering also the fields of nuclear data measurements and/or validation; (vi) responding to the needs of end-users for specific applications.

Participants found these criteria sensible but recommended to continue this discussion when a new evaluation project would submit a formal request to join the Working Party. **E. Dupont** noted that he had the TENDL project in mind when proposing this item on the agenda. **A. Koning** commented that he will be happy to report on TENDL, but there will be no formal request from the TENDL collaboration for the moment. Participants agreed to continue inviting a TENDL representative to give a status report.

Twenty-Fifth Anniversary of the Working Party

4. **E. Dupont** presented a brief overview of WPEC history, achievements and forthcoming challenges. He highlighted the necessity to keep working in close collaboration with non-NEA countries and with IAEA, as well as to further improve the links between measurement activities and evaluation activities (as done in the first long-term Subgroup A), and between evaluation activities and validation activities (in relation with other NSC Working Parties). He reminded participants of the challenging tasks initiated by SG38 to develop a new structure/format for nuclear data and by SG40-CIELO to develop improved joint evaluations for key nuclides. He wished that longer-term subgroups would provide the appropriate framework for these two major initiatives to be successfully continued. Finally, he acknowledged the contributions of all WPEC Chairmen, Subgroup co-ordinators and founding secretary, which made of WPEC a successful framework for international co-operation.

Reports on experimental activities

5. Experimental nuclear data activities of relevance to the evaluation projects were reviewed. Detailed information about the experimental activities is given in the reports and viewgraphs presented at the meeting (see Annex 2).

- *Europe*

  A. Plompen reported on a broad range of experimental activities in Europe, covering differential measurements performed at different facilities from EC-JRC-IRMM (Belgium), CERN/n_TOF (Switzerland), JYU (Finland), ILL, GANIL, CENBG (France), PTB, HZDR, GSI (Germany), NPI (Czech Republic), and integral measurements performed at MINERVE, EOLE (CEA, France) and FNG (ENEA, Italy). The presentation summarized results presented at JEFF meetings held at the NEA in November 2013 and April 2014, and reflected progress in the French NEEDS project, as well as in the European ERINDA, EUFRAT and ANDES/CHANDA projects, amongst others.

- *Japan*

  H. Harada reported on nuclear data measurements performed at different facilities across Japan. He highlighted recent results obtained at J-PARC/MLF/ANNRI (neutron radiative capture), JAEA Tandem Facility (fission cross-section and surrogate experiments), KEK (DDX data of proton-, alpha- and carbon-induced fragment emission reactions), Tokyo Tech (neutron capture reaction), Kyoto university (neutron capture cross-section of ^{232}Th), Konan university (photo-neutron cross-section), and Kyushu university (Double-differential neutron yields from thick target irradiated by deuterons, and DDX from heavy-ion interactions). He also reported on integral benchmarking experiments performed at JAEA/FNS to validate titanium data. Finally, he announced the creation of a national project dedicated to the Accuracy Improvement of neutron data of Minor Actinides (AIMAC). This project will involve about 20 scientists from three Japanese organisations until March 2017.

- *USA*

  Y. Danon reported on activities in the US covering experiments carried out at different facilities. The report emphasized neutron reaction data measurements performed or planned by LANL ((n,γ) with DANCE, (n,*x*γ) with GEANIE, (n,f) with ionisation chamber, Chi-Nu, TPC, and fission-fragment yields with SPIDER), ORNL (transmission and capture in the resonance region measured at Geel, Belgium), RPI (transmission, capture and fission in the resonance region, and thermal neutron scattering on compounds), NIST (review of standards), LBNL (status of the Evaluated Gamma-ray Activation File (EGAF) and related thermal neutron cross-section

measurements). Finally, he presented the possibility to use the BNL accelerators to develop time-of-flight capabilities similar to the n_TOF facility at CERN. More details about these activities are available on the CSEWG web page.

- *China*

  X. Ruan reported on China nuclear data measurement activities. He briefly presented the main institutes, universities and associated facilities involved in nuclear data measurements. He reviewed in more details the work performed at CIAE (fission-fragment yields, benchmark experiments), Peking university ((n,α) cross-sections of ^{57}Fe and ^{63}Cu), and using the accelerator complex in Lanzhou (ADS related nuclear data). Two major facilities under construction were presented. The first one is the Chinese Spallation Neutron Source (CSNS), which should be available in 2018. The second one is an electron-linac-based photo-neutron source recently commissioned at the Shanghai Institute of Applied Physics (SINAP) that will be used for the measurement of transmission and capture by time-of-flight.

Brief progress reports from the evaluation projects and discussion of future plans

6. Progress in the major nuclear data evaluation projects was presented. Detailed information about the status of the evaluated nuclear data libraries is given in the reports and viewgraphs presented at the meeting (see Annex 2).

- *ENDF*

  M. Herman reported on post ENDF/B-VII.1 activities: new evaluations (^{236m}Np, ^{63,65}Cu, ^{56}Fe, ^{235}U, and TSL for SiO2), integral validation (Pu-SOL-THERM and VNIITF benchmarks, covariance data for SCALE-6.2), improved infrastructure (Web pages, reaction codes, OMP, PFNS, continuous integration, new XML format) and contributions to CIELO.

- *JEFF*

  R. Jacqmin informed participants of the release of the JEFF-3.2 General Purpose file in March 2014. The initial benchmarking is satisfactory. The good performance for UO2-fuelled LWR systems is preserved, while performances for MOX-fuelled LWR and fast systems are improved. He reviewed ongoing activities and near-term plans to complement JEFF-3.2 GP files with Special Purpose files for Decay Data and Fission Yields. Finally, he presented the long-term vision and milestones that would lead to JEFF-4 in 2020.

- *JENDL*

  O. Iwamoto presented the status of the JENDL project. Updated JENDL-4.0u files are made available to correct minor mistakes in the initial release. New evaluations are continuously developed, especially for fission products in the fast energy range, for ^{16}O (R-Matrix analysis of ^{17}O), for high energy nuclear data (OMP, CCONE), for activation and photonuclear data. Benchmarking activities of JENDL-4.0 together with new measurements/evaluations (^{157}Gd, ^{241}Am, ^{232}Th) are continuing.

- *ROSFOND/BROND*

  There was no presentation of the ROSFOND/BROND project, but **E. Dupont** presented some information sent to the Data Bank by T. Golashvili (Russia). This information essentially covered evaluated nuclear structure data, natural abundances and thermal activation cross-sections. Participants felt that this information would be generally more relevant for the International Network of Nuclear Structure and Decay Data (NSDD). However, the request list for

improvement of decay data proposed by T. Golashvili could be considered in the framework of the new mandate extension of Subgroup C (HPRL).

- *CENDL*

  Zhigang Ge presented the status of the CENDL project and related activities at CNDC. The evaluation work continues in preparation of a new CENDL release (e.g. cross-sections, fission yields, activation and decay data evaluations). Specific efforts are devoted to the evaluation, processing and validation of nuclear data libraries for the Chinese Thorium Molten Salt Reactor (TMSR) project and for the Chinese ADS project. In addition, the CNDC develops models and codes related to fission yields, covariance data, S/U analysis and nuclear data adjustment.

- *IAEA*

  R. Forrest presented the activities of the IAEA Nuclear Data Section (NDS), including the international networks of Nuclear Reaction Data Centres (NRDC) and Nuclear Structure Decay Data (NSDD). Three Co-ordinated Research Projects (CRP) of particular relevance to WPEC are active and another two are planned. The three active CRPs are running over the period 2013-2017 and focus on Beta delayed neutron emission, Validating IRDFF dosimetry file, and Radiation damage standard. The two planned CRPs will focus on RIPL (particularly fission parameters) and a gamma-ray database. In addition, the Nuclear Data Section contributes to the CIELO pilot project and is responsible for neutron cross-section standards.

- *TENDL*

  A. Koning was invited to report on the status of the TENDL project, which relies on TALYS and Total Monte Carlo (TMC) systems to produce, reproduce, improve and validate a complete set of nuclear data evaluations, including covariance data and resonance parameters. He presented the general trends and integral testing for TENDL-2013 and outlined the progress made for the preparation of TENDL-2014, especially on (i) the initial prior cross-sections and new model parameter distributions using weights based on EXFOR data, (ii) a new TMC procedure with weights on integral benchmarks. Finally, the task to release a TALYS-2.0 version using modern Fortran has started. This new version will integrate TASMAN (optimisation, S/U, covariance, TMC) and TEFAL (ENDF formatting).

Review of final or near-final subgroup reports

7. Results and conclusions of completed or near-completed subgroups were discussed. Detailed information about the status of these subgroups is given in the reports and viewgraphs presented at the meeting (see Annex 2). A summary table of all subgroup status is given in Annex 3.

- *Subgroup 27 (Prompt photon production from fission products)*

  This subgroup is closed. **R. Jacqmin** proposed to circulate a draft report during the summer. *The final report would be issued by the end of 2014.*

- *Subgroup 28 (Processing of covariance data)*

  This subgroup is closed. **M. Dunn** circulated a preliminary draft of the report, which should be completed during the summer. *The final report would be issued by the end of 2014.*

- *Subgroup 31 (Meeting nuclear data needs for advanced reactor systems)*

  This subgroup is closed. *The final report was published in February 2014.*

- *Subgroup 33 (Methods and issues for the combined use of integral experiments and covariance)*

  This subgroup is closed. *The final report was published in December 2013.*

- *Subgroup 34 (Coordinated evaluation of ^{239}Pu in the resonance region)*

  This subgroup is closed. *The final report was published in April 2014.*

- *Subgroup 35 (Scattering angular distribution in the fast energy range)*

  This subgroup is closed. **E. Dupont** informed the participants that T. Kawano agreed to circulate a draft report during the summer. *The final report would be issued by the end of 2014.*

- *Subgroup 36 (Reporting and usage of experimental data for evaluation in the resolved resonance* region)

  A. Plompen (on behalf of P. Schillebeeckx) reported on methods and best practices to produce accurate cross-section data together with reliable covariance information in the resonance region (RR). Some members of SG36 contributed to the IAEA Consultant Meeting on EXFOR data in the RR and spectrometers' response function. Some additional works performed at IRMM were reported and a summary of the main conclusions and recommendations was given. The final report is in preparation. *The WPEC agreed to close the subgroup. The final report will be issued by the next meeting.*

E. Dupont reminded participants that Subgroup reports could perfectly complement publications in peer-reviewed journal either by providing more details or simply an overview of subgroup activities. He stressed the importance for the NEA (and for the credibility of WPEC) to have final reports published within reasonable delay after completion of the work.

Status of ongoing subgroups

8. Activities of ongoing subgroups were presented. Detailed information about the status of these subgroups is given in the reports and viewgraphs presented at the meeting (see Annex 2). A summary table of all subgroup status is given in Annex 3.

- *Subgroup C (High priority request list for nuclear data)*

  A. Plompen reported on SG-C and HPRL status. The purpose of the High Priority Request List is to provide guidance for planning measurement, nuclear theory and evaluation programmes. In addition to the existing "High Priority" and "General" requests, members of subgroup C proposed to add a third list for "Special Purpose Quantities" and to review the status of all requests entered since 2004. A mandate extension is proposed to continue this activity. *The WPEC approved the proposed extension of Subgroup C mandate.*

- *Subgroup 37 (Improved fission product yield evaluation methodologies)*

  R. Mills reported on contributions presented during past Subgroup meetings on the three following tasks: (1) Current evaluation methods and new requirements, (2) Recommendations of new methods and models, (3) Proposal for new fission yield format including covariance. Draft documents summarising the progress made on these tasks will be circulated by the end of 2014. *Subgroup activities will continue until the next meeting with the objective to complete the work in 2015.*

- *Subgroup 38 (A modern nuclear database structure beyond the ENDF format)*

D. McNabb reported on progress made to define a new improved standard structure for storing nuclear reaction data. During the past meetings, the scope of work for SG38 was agreed upon/clarified, the GND prototype developed by LLNL was reviewed, the first drafts of the format requirements/specifications were started, and initial discussions started on possible governance model in the framework of a long-term WPEC Subgroup. *Subgroup activities will continue until the next meeting with the objective to complete the work in 2015.*

- *Subgroup 39 (Methods and approaches to provide feedback from nuclear and covariance data adjustment for improvement of nuclear data files)*

  G. Palmiotti reported on SG39 status. During the first meetings it was discussed how to establish and cope with methodology issues (e.g. compensating effects), and which new experiments sensitive to target nuclides (^{235}U, ^{238}U, ^{239}Pu, ^{56}Fe and ^{23}Na) should be included in the study. First preliminary feedbacks were provided to CIELO from ENDF and JENDL adjustments, but at this stage major concerns remain from existing compensations of different type (reactions, experiments, etc.). The next step is focusing on experiments of elemental type so that compensations can be avoided. In parallel, contributions from CIELO in terms of more complete and reliable covariance data are expected. *Subgroup activities will continue until 2016-2017 depending on progress.*

- *Subgroup 40 (Collaborative International Evaluated Library Organization Pilot Project)*

  M. Chadwick summarised the progress made by the different SG40-CIELO teams for ^{1}H, ^{16}O, ^{56}Fe, ^{235}U, ^{238}U, ^{239}Pu. The ^{1}H standard is being reviewed and extended under the co-ordination of the IAEA. Starter files are in preparation for ^{16}O with changes to (n,α) and (n,tot). New resonance parameter evaluations are available for ^{56}Fe, ^{235}U, ^{238}U, ^{239}Pu. The new LRF7 resonance analysis of ^{56}Fe is performing well. Regarding actinides in the fast range, the focus is on improving inelastic scattering and monitoring the impact of changes proposed in the capture cross-section. The PFNS issues remain open for the moment. Finally, the SG40-CIELO teams are committed to deliver credible data and covariances, and will pay attention to feedback from adjustment results. *Subgroup activities will continue until 2016-2017 depending on progress.*

Proposals for new subgroups

9. The following subgroup proposals were reviewed by WPEC. Detailed information about these proposals is given in the documents and viewgraphs presented at the meeting (see Annex 2).

H. Harada presented a Subgroup proposal on *"Improving nuclear data accuracy of ^{241}Am and ^{237}Np capture cross-sections"*. This new subgroup would provide a framework for discussions between experts on differential data, spectrum averaged data, nuclear structure data and evaluators with the objective to assess and improve the accuracy of ^{241}Am and ^{237}Np capture cross-sections. *The WPEC approved the proposal and established the subgroup as number 41 (SG41).*

L. Leal presented a preliminary Subgroup proposal on *"Thermal Scattering Kernel S(α,β): Measurement, Evaluation and Application"*. The new subgroup would provide a framework for international experts to assess different methodologies for generating S(α,β); examine existing formats for uncertainty (covariance) generation; demonstrate the feasibility of generating S(α,β) and uncertainty in a practical application. *The members of WPEC acknowledged the importance of this proposal and encouraged L. Leal to circulate a final proposal as soon as possible.*

Conferences and meetings of interest to the nuclear data community

10. **M. Herman** informed participants that the three volumes of the ND2013 proceedings were submitted to the publisher (Elsevier) in March, April and May, and they should appear on the *Nuclear Data Sheets* webpage of *ScienceDirect* within a few months.

A. Plompen informed participants that JRC-IRMM will organize the next Nuclear Data conference (ND2016) in Bruges, Belgium, September 2016. The different committees are being established and the conference webpage should be available at the end of 2014.

E. Dupont briefly reviewed with the participants the forthcoming meetings of interest to the nuclear data community. Updated information is available on the WPEC web page at www.oecd-nea.org/science/wpec/calendar.html.

Any other business

11. **E. Dupont** will be leaving the NEA at the end of August 2014 after five years of services and thanked all participants for their kind collaboration during this period.

Time and place of next meeting

12. The next WPEC meeting will be held at the NEA Headquarters, Issy-les-Moulineaux, France, on 21-22 May 2015. Subgroup coordinators will have the opportunity to hold short technical meetings the same week on 18-22 May. However, subgroup meetings in parallel with the WPEC meeting on 21-22 May should be limited to in-depth technical discussions on specific topics.

ANNEX 1

Participation at the Twenty-Sixth WPEC meeting

NEA Headquarters, Issy-les-Moulineaux, France, 15-16 May 2014

Representatives from evaluation projects

Mark CHADWICK	ENDF / SG40-CIELO	
Yaron DANON	ENDF	
Mike DUNN	ENDF / SG28	
Mike HERMAN	ENDF	
Albert (Skip) KAHLER	ENDF	
Ulrich FISCHER	JEFF	
Robert JACQMIN	JEFF / SG27	
Arjan KONING	JEFF (/ TENDL by invitation)	
Arjan PLOMPEN	JEFF / SG C	
Tokio FUKAHORI	JENDL / WPEC Chair	
Hideo HARADA	JENDL / SG31	
Masayuki IGASHIRA	JENDL	(excused)
Osamu IWAMOTO	JENDL	
Kenji YOKOYAMA	JENDL	
Tengiz GOLASHVILI	ROSFOND/BROND	(excused)
Eugenia SUKHINO-KHOMENKO	ROSFOND/BROND	(on behalf of Viktor IGNATIEV)
Anatoly IGNATYUK	ROSFOND/BROND	(excused)
Valentin SINITSA	ROSFOND/BROND	
Zhigang GE	CENDL (by invitation)	
Xichao RUAN	CENDL (by invitation)	
Robin FORREST	IAEA (by agreement)	

Subgroup coordinators

Cyrille DE SAINT JEAN	SG34 / JEFF	
Dennis MCNABB	SG38 / ENDF	
Robert MILLS	SG37 / JEFF	
Giuseppe PALMIOTTI	SG39 / ENDF	
Arjan PLOMPEN	SG36 / JEFF	(on behalf of Peter SCHILLEBEECKX)

Secretariat

Emmeric DUPONT	NEA

ANNEX 2

Documents presented at the Twenty-Sixth WPEC meeting

NEA Headquarters, Issy-les-Moulineaux, France, 15-16 May 2014

The following reports, presented at this meeting, can be found on the WPEC webpage (*www.oecd-nea.org/science/wpec*) and the subsequent link to the "List of WPEC documents". The documents will have the identification NEA/NSC/WPEC/DOC(2014)XXX, where XXX correspond to the number below. The viewgraphs presented at the meeting have not been given an official number; they can be found on the webpage *www.oecd-nea.org/science/wpec/meeting2014.*

448 Progress of Nuclear Data Measurement in China during 2013; Ge Zhigang, Ruan Xichao

449 Present status of the JENDL project (May 2014); O. Iwamoto, K. Yokoyama

450 Requirements for a new nuclear data structure - Part 2: Implementation Plan; D. McNabb on behalf of WPEC Subgroup 38

451 WPEC Subgroup proposal on "Improving nuclear data accuracy of Am-241 and Np-237 capture cross-sections"; H. Harada, P. Schillebeeckx

452 WPEC Subgroup C (HPRL) mandate proposal (2014-2016)

ANNEX 3

Subgroups Status

Short-term subgroups

	Topic	Co-ordinator	Status in May 2014
27	Prompt photon production from fission products	R. Jacqmin, JEFF	Closed; final report to be issued by the end of 2014
28	Processing of covariance data	M. Dunn, ENDF	Closed; final report to be issued by the end of 2014
35	Scattering angular distribution in the fast energy range	T. Kawano, ENDF	Closed; final report to be issued by the end of 2014
36	Reporting and usage of experimental data for evaluation in the resolved resonance region	P. Schillebeeckx, JEFF	Closed; final report to be issued by the next meeting
37	Improved fission product yield evaluation methodologies	R.W. Mills, JEFF	Ongoing (effective start in 2013)
38	Beyond the ENDF format: A modern nuclear database structure	D. McNabb, ENDF	Ongoing (started in 2012)
39	Methods and approaches to provide feedback from nuclear and covariance data adjustment for improvement of nuclear data files	G. Palmiotti, ENDF M. Salvatores, JEFF	Ongoing (started in 2013)
40	CIELO pilot project	M. Chadwick, ENDF	Ongoing (started in 2013)
41	Improving nuclear data accuracy of ^{241}Am and ^{237}Np capture cross-sections	H. Harada, JENDL	Approved

Long-term subgroups

C	High Priority Request List	A. Plompen, JEFF	Ongoing