<div style="border:1px solid black; padding:10px;">

Summary Record of the 9th Meeting of WPEC Subgroup 39 on

Methods and approaches to provide feedback from nuclear and covariance data adjustment for improvement of nuclear data files

OECD/NEA Headquarters, Boulogne-Billancourt, France

16-17 May 2017

</div>

The subgroup co-ordinators, **M. Salvatores** and **G. Palmiotti**, welcomed the participants to the meeting (see list in Appendix 1). **O. Cabellos** acts as secretary. The proposed agenda was adopted (see Appendix 2).

1. Review of actions

G. Palmiotti welcomed the participants and reviewed the actions agreed at the previous meeting.

- **Finalise deliverables**

  o **Action NEA:** To publish the intermediate report on "Summary of Methodology" and "Comments on Covariance Data" before next meeting. To advertise this report within the ND community interested in.
  > Comments/Status-of-the-work: Done.
  (https://www.oecd-nea.org/science/docs/2016/nsc-r2016-6.pdf)

  o **Action NEA:** To prepare H. Wu's report according with the OECD/NEA template.
  > Comments/Status-of-the-work: Done

  o **Action S. Pelloni:** To finalize the report on PIA method utilization.
  > Comments/Status-of-the-work: Draft received 19/05/2017. This is the version of the report prepared for ANE 106 (2017) pp. 33-50

  o **Action E. Ivanov:** To finalize the report on MC sensitivity coefficients. To include in the report the importance of correlations.
  > Comments/Status-of-the-work: On going

- **Current activities: Methodologies and Experimental Benchmarks**

  o **Action NEA:** Rez's Benchmark on neutron spectra measurement in iron assemblies that could be used in SG39 if the complete information of the Benchmark will be available by February 2017. NEA will follow the status of this work.
  > Comments/Status-of-the-work: On going

  o **Action M Hursin:** Update HCLWR-PROTEUS documents and data for SG39 (received 09/01/2017)
  > Comments/Status-of-the-work: Done, already in SG39 website

  o **Action I. Kodeli/E. Ivanov:** Provide MCNP inputs for SNEAK for intercomparison.
  > Comments/Status-of-the-work: Done, already in SG39 website

- **Starting from CIELO new files (without uncertainties) attempt new adjustment:**

  o **Action K. Yokoyama/G. Palmiotti:** Review CIELO adjustments, and more complete feedback for CIELO
  > Comments/Status-of-the-work: See presentations in this meeting. To be continuing.

  o **All:** Final adjustment for CIELO and comments/description to be included in the Final Report
  > Comments/Status-of-the-work: On going.

  o **All/NEA:** Checking/provide NJOY inputs for CIELO files
  > Comments/Status-of-the-work: Done (see presentation SG39-1.pdf)

  o **All/NEA:** Checking/provide inputs used in the SG39 benchmarks
  > Comments/Status-of-the-work: Done (see JEF/DOC-1797 for additional info)

  o **All/NEA:** For any new adjustment it is underlined the importance of updated covariance data (including cross-correlation between isotopes). Update SG39 website with papers or reports on verifying covariance data.
  > Comments/Status-of-the-work: On going

2. Presentations

Session on Methods

- SG39-2: "Comparison of PIA sequences by using the UR U238 capture cross-section as a standard"
  S. Pelloni presented the results of three PIA sequences: 1) the standard PIA reference solution, 2) the case with the UR capture cross-section of ^{238}U with no uncertainty in the energy range between 20keV-149keV using the standard PIA procedure, and 3) ^{238}U/UR's case using a priori variance/covariance matrix at beginning of each incremental step in the PIA procedure.
  G. Palmiotti and K. Yokoyama pointed out that this exercise shows the importance of changes in the sensitivity coefficients, case (2) is the correct one.

- "Preliminary results (a priori and a posteriori) on using the asymptotic PIA methodology in conjunction with data generated on the basis of Total Monte Carlo (TENDL-2014)"
  S. Pelloni also mentioned a second work in collaboration with D. Rochman using the Total Monte Carlo technique for nuclear data adjustment. The study will take into account all nuclear data uncertainties except for the energy-angular distributions. The exercise will focus on Jezebel Benchmark.

- SG39-3: "Continuous Energy Cross Section Adjustment: recent advances in the method development and verification",
  M. Aufiero (given by G. Palmiotti) presented the new methodology for continuous energy cross-section adjustment based on monte-carlo approach. It has been applied for Jezebel experiment for 239Pu adjustment. The comparison with ERANOS results has shown promising results. Ongoing works will be focused on secondary distributions and URR adjustments.
  All. One of the conclusions of this work is the need to leave MF32 in the ENDF files for a correct treatment of shielding covariances. In addition, the methodology of storing MF33 in the form of eigenvalues was also positively welcome.

Session on Adjustments, experiment analysis and tools

- SG39-4: "Nuclear data adjustments based on MAESTRO and ERMINE reactivity worth experiments from MINERVE"
  P. Leconte presented the application of EGPT in the analysis of small-sample reactivity worth (SSRW) experiments. Combining independent thermal and fast spectrum experiments was applied for a significant uncertainty reduction on the ^{103}Rh(n,capture) cross section. Several open question of the EGPT methodology applied to SSRWs were also discussed.

- SG39-5: "Correlations between integral experiments in the same series, and the impact of these correlations on adjustments"
  I. Hill presented an attempt to estimate correlations between existing ICSBEP experiments (LCTs benchmarks) and show a strong impact of these estimated correlations on nuclear data adjustments.
  K. Yokoyama and G. Palmiotti encouraged NEA to be continuing in this activity because these correlations are essential for nuclear data adjustment.

- SG39-6: "Status of NEA tools DICE (sensitivity coefficients) and NDaST (propagate proposed adjustments, or ND covariances, to integral experiment results via the DICE sensitivities)"
  J. Dyrda gave an overview of the current status of NDaST tool and some results were presented: 1) NDaST versus direct perturbation (I. Hill's paper in ANS-2017), 2) testing JEFF-3.3 covariances in ICSBEP benchmarks (J. Dyrda's presentation in JEFF-May2017) . A review of new features in NDaST was presented, as well.

- SG39-7: "Updated adjustment result by adding HCLWR-PROTEUS and SNEAK on the basis of the SG33 benchmark "
  K. Yokoyama presented results of JENDL-4.0 based cross-section adjustment on the basis of the SG33 benchmark and investigating the effect of addition of PROTEUS and SNEAK integral experiments. The result presented with the adjustment technique were compared with changes in CIELO evaluation, it is an attempt to use it as a methodology of verification. However, much more comprehensive integral experimental data set would be needed to carefully determine compensation effects.

- SG39-8: "Impact of CIELO evaluation on C/E of a large integral experiments data base"
  G. Palmiotti presented the the impact of the use of the five CIELO isotopes, ^{16}O, ^{56}Fe, ^{235}U, ^{238}U, and ^{239}Pu, on the C/E of a large experiment data base (158 experiments used for previous adjustments) using the linearity hypothesis. Many compensations were observed among reactions and also energy range. After the meeting a problem was detected on the P_1 component. The problem was fixed with the help of NEA (I. Hill and O. Cabelllos). Updated results will be presented at next meeting.

- SG39-9: "Am241 data issues in the frame of criticality safety assessment" (cancelled)
  A. Barnes

- SG39-10: "Some notes on covariance evaluation process for CIELO and ENDF/B-VIII files"
  P. Talou gave an overview of the current activities of CIELO project. The status of the two CIELO options, CIELO-1 (to be used in ENDF/B-VIII) and CIELO-2 (to be used in JEFF-3.3) were reviewed. It was pointed out that integral data has been used for calibration in the files. Regarding criticality and shielding benchmarking, these new files have shown a better performance comparing with previous evaluations. Now, CIELO subgroup is working in

covariance data. CIELO-2 has already delivered covariances for the big-3 files, while CIELO-1 will release covariances by the end of August 2017.

Future Actions and Deliverables

- SG39-11: "Overview of the SG44 kick-off meeting"
  V. Sobes summarized the kick-off meeting of Subgroups 44, working on "Investigation of Covariance Data in General Purpose Nuclear Data Libraries". The overall goal of this group is to provide the guidelines and best practices for nuclear data covariance evaluation and their applications, it will take into account the standards of quality needed and required for nuclear applications.

- SG39-12: "The new subgroup "Efficient and Effective Use of Integral Experiments for Nuclear Data Validation" proposal"
  M. Salvatores gave an overall picture of the subgroup activities emphasizing on the importance to understand the source of the uncertainty in nuclear data and the importance of more realistic, credible and reliable covariances. He said that these covariances can be used in adjustment methodologies which give the evaluators with the guidance to discriminate compensations in the libraries. The selection of integral experiments (and magnitudes) is also an essential part of this work.
  M. Salvatores presented the proposal of a new Subgroup which will give the guidelines to: 1) define a general protocol for the use of sensitivity coefficients and covariances, 2) systematically quantify impact on a list of selected target power reactors, and 3) provide updated target accuracies for nuclear data uncertainty reduction by combining inverse approach and integral experiments. This activity will be in close collaboration with the new WPEC Subgroups 44, working on new Covariance Data, and SG45 VaNDaL that is supposed to create a database of the selected benchmarks along with the respective decks for calculations.

3. Perspectives and review of pending actions.

- o **NEA:** To announce news/updates in SG39 website via mailing list.

- **Finalise deliverables**

  - o **Action NEA:** To announce the intermediate report on "Summary of Methodology" and "Comments on Covariance Data" once it is published. To advertise this report within the ND community interested in.

  - o **Action NEA:** To prepare H. Wu and S. Pelloni's reports according with the OECD/NEA template to be included in the Final Report.

  - o **Action E. Ivanov:** To finalize the report on MC sensitivity coefficients. To include in the report on the importance of correlations.

  - o **Action All:** Final Deliverable in May 2018.

- **Current activities: Methodologies and Experimental Benchmarks**

  - o **Action M Hursin/G. Palmiotti:** To clarify some issues in HCLWR-PROTEUS documents and data

- o **Action G. Palmiotti, I. Kodeli:** Comments by Pino to PROTEUS sensitivity profiles.

- o **Action NEA:** To check the status of IPPE iron-shielding benchmark in SINBAD package.

- o **Action I.Hill/G.Palmiotti:** To review P1-elastic and inelastic sensitivities.

- **Starting from CIELO new files (without uncertainties) attempt new adjustment:**

- o **O.Cabellos:** To provide covariances and evaluated JEFF-3.3T3 files.

- o **Action K. Yokoyama/G. Palmiotti/S. Pelloni:** Final adjustment for CIELO and comments/description to be included in the Final Report using the covariances provided by CIELO-September 2017.

- **New proposal SG46:**

- o **NEA:** Kick-off SG46 meeting **20-21 November 2017** within JEFF Nuclear Data Week

- o **NEA:** To accommodate Joint Sessions with other WPEC/SGs (44 and 45)

8. Next meeting

It is proposed to hold the next SG39 meeting **November 20-21, 2017,** in conjunction with JEFF/CHANDA meetings during the next JEFF Nuclear Data Week at the OECD/NEA Headquarters.

Finally, the participants in the meeting agree to extend the technical activities of SG39 during 2017, in close collaboration with SG40, and to present the Final Report in May 2018.

Appendix 1

Participants to the 8th meeting of WPEC subgroup 39

OECD/NEA, Headquarters, Boulogne-Billancourt, France
16-17 May 2017

```
WPEC-2017 (Participants in the WPEC meeting 2017)
```

_____

CHINA
   WU, Haicheng   Tel: +86 10 69358562
   China Nuclear Data Center   Eml: haicheng@ciae.ac.cn
   China Institute of Atomic Energy
   PO Box 275-41
   102413 Beijing

FRANCE
   LECONTE, Pierre   Tel: +33 4 42 25 48 94
   CEA Cadarache   Eml: pierre.leconte@cea.fr
   Bat. 230
   13108 Saint-Paul-lez-Durance cedex

JAPAN
   YOKOYAMA, Kenji   Tel: +81 29 284 3952
   Japan Atomic Energy Agency   Eml: yokoyama.kenji09@jaea.go.jp
   2-4 Shirakata-Shirane
   Tokai-mura, Ibaraki 319-1195

RUSSIA
   ROZHIKHIN, Evgeny   Tel: +7 484 399 5154
   Institute of Physics and Power Engineerin Eml: rev@ippe.ru
   1, Bondarenko Square
   249033 Obninsk

SWITZERLAND
   PELLONI, Sandro   Tel: +41 (0) 56 310 20 75
   Paul Scherrer Institut   Eml: sandro.pelloni@psi.ch
   CH-5232 Villigen PSI

UNITED KINGDOM
   BARNES, Andrew   Tel: +44 1946779237
   National Nuclear Laboratory   Eml: andrew.x.barnes@nnl.co.uk
   Sellafield
   Seascale CA20 1PG

UNITED STATES

PALMIOTTI, Giuseppe
INL/EROB
2525 Fremont Ave
PO Box 1625
Idaho Falls, ID 83415-3860

Tel: +1 208 360 3544
Eml: giuseppe.palmiotti@inl.gov

SALVATORES, Massimo
Idaho National Laboratory /EROB
Idaho Falls, ID 83415-3860

Tel: +1 +33 6 43 85 25 04
Eml: salvatoresmassimo@orange.fr

SOBES, Vladimir
Oak Ridge National Laboratory
1 Bethel Valley Rd
P.O. Box 2008
Oak Ridge, TN 37831-6170

Tel: +1 8572098287
Eml: sobesv@ornl.gov

TALOU, Patrick
Los Alamos National Laboratory
T-16, Nuclear Physics Group
Mail Stop B283
Theoretical Division
Los Alamos, NM 87545

Tel:
Eml: talou@lanl.gov

International Organisations

CABELLOS DE FRANCISCO, Oscar
OECD/NEA Data Bank
46, quai Alphonse Le Gallo
92100 Boulogne-Billancourt

Tel: +33 (0) 1 45 24 10 84
Eml: oscar.cabellos@oecd.org

DYRDA, James
OECD-NEA
46 quai Alphonse Le Gallo
92100 Boulogne-Billancourt

Tel: +33 (0) 1 45 24 11 72
Eml: james.dyrda@oecd.org

HILL, Ian
OECD/NEA Nuclear Science
46, quai Alphonse Le Gallo
92100 Boulogne-Billancourt

Tel: +33 (0) 1 45 24 10 94
Eml: ian.hill@oecd.org

Appendix 2

<div style="border:1px solid">

Preliminary Agenda

Methods and approaches to provide feedback from nuclear and covariance data adjustment for improvement of nuclear data files

<u>SG-39</u>

OECD Headquarters
Conference Center
2 Rue André Pascal,
Paris 75016

Room CC 18

</div>

Please note: Only registered participants with a valid ID card or passport will be allowed access to OECD premises.

Tuesday, May 16, 2017

12:40 – 14:00	**Lunch Break**	
14:00 – 14:45	"Welcome and actions review"	Giuseppe PALMIOTTI Massimo SALVATORES Oscar CABELLOS
	Methods	
14:45 – 15:20	"Comparison of PIA sequences by using the UR U238 capture cross-section as a standard"	Sandro PELLONI
15:20 – 15:30	"Preliminary results (a priori and a posteriori) on using the asymptotic PIA methodology in conjunction with data generated on the basis of Total Monte Carlo (TENDL-2014)"	Sandro PELLONI
15:30 – 16:15	Continuous Energy Cross Section Adjustment: recent advances in the method development and verification	Manuel AUFIERO (presented by G. Palmiotti)
16:15 – 16:30	**Coffee Break**	
	Adjustments, experiment analysis and tools	
16:30 – 16:50	"Nuclear data adjustments based on MAESTRO and ERMINE reactivity worth experiments from MINERVE"	Pierre LECONTE
16:50 – 17:10	"Correlations between integral experiments in the same series, and the impact of these correlations on adjustments"	Ian HILL

17:10 – 17:30	"Status of NEA tools DICE (sensitivity coefficients) and NDaST (propagate proposed adjustments, or ND covariances, to integral experiment results via the DICE sensitivities)"	Ian HILL James DYRDA
17:30	**Adjourn**	

Wednesday, May 17, 2017		
	Adjustments, experiment analysis and tools	
9:30 – 10:00	Updated adjustment result by adding HCLWR-PROTEUS and SNEAK on the basis of the SG33 benchmark)	Kenji YOKOYAMA
10:00 – 10:45	Impact of CIELO evaluation on C/E of a large integral experiments data base	Giuseppe PALMIOTTI
10:45 – 11:00	**Coffee Break**	
11:00 – 11:20	"Am241 data issues in the frame of criticality safety assessment"	Andrew BARNES
11:20 – 11:30	"Some notes on covariance evaluation process for CIELO and ENDF/B-VIII files"	Patrick TALOU
	Discussion on perspectives and actions	
11:30 – 10:45	"Overview of the SG44 kick-off meeting"	Vladimir SOBES
11:45 – 12:00	The new subgroup "Efficient and Effective Use of Integral Experiments for Nuclear Data Validation" proposal	Massimo SALVATORES Giuseppe PALMIOTTI
12:00 – 12:30	Discussion	All
12:30- 12:35	Deliverables	Oscar CABELLOS
12:35- 13:00	Future actions and next meeting	All
13: 00	**End of the Meeting**	
15:00 – 18:00	**WPEC Joint Session:** **Conference on** **"Perspective and Future of WPEC"**	**D. Brown** **M. Chadwick** **M. Salvatores**

	Friday, December 2, 2016	
	Adjustments	
9:00 – 9:30	Cross-section adjustment based on JENDL-4.0 using new experiments on the basis of the SG33 benchmark	Kenji YOKOYAMA
9:30 – 10:00	Comparison of adjustment trends with the Cielo evaluation	Sandro PELLONI
10:00 – 10:45	Expanded adjustment in support of CIELO initiative	Giuseppe PALMIOTTI
10:45 – 11:15	**Coffee Break**	
	Discussion on perspectives and actions	
11:15 – 11:45	WPEC sub-group proposal: "Investigation of Covariance Data in General Purpose Nuclear Data Libraries"	Vladimir SOBES
11:45- 13:15	**Lunch Break**	
13:15 – 14:00	Date and place of the next meeting, any other business	
14:00	Meeting closing	