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Nuclear Data Libraries for Advanced Systems – Fusion Devices (FENDL 3.0)

Summary Report of the Third Research Coordination Meeting

IAEA, Vienna, Austria
6-9 December 2011

Prepared by
Mohamed E. Sawan
University of Wisconsin, Madison, USA

March 2012

IAEA Nuclear Data Section, Vienna International Centre, A-1400 Vienna, Austria

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Abstract

The third Research Co-ordination Meeting of the Nuclear Data Libraries for Advanced Systems – Fusion Devices (FENDL-3) was held at IAEA Headquarters in Vienna from 6 to 9 December 2011. A summary of the presentations given during meeting is given in this report along with the discussions that took place. A list of actions necessary to complete the library production, processing and testing are given. Details of the documents arising from the CRP were agreed.

March 2012

CONTENTS

1. INTRODUCTION

The participants of the third Research Coordination Meeting (RCM) on Nuclear Data Libraries for Advanced Systems - Fusion Devices (FENDL-3) were welcomed by Robin Forrest, the head of the Nuclear Data Section who stressed the important role of this IAEA CRP for development of nuclear data for fusion applications. Robin Forrest who serves as the Coordination Research Project (CRP) technical officer gave introductory remarks that addressed the CRP history, objectives, scope and schedule. He pointed out that the 3rd RCM is the final RCM for this CRP. The goals of the 3rd RCM were presented. U. Fischer was elected as the chairman of the meeting and M. Sawan as rapporteur. The proposed Agenda, that includes one and half days of presentations and two and half days for discussion was discussed and adopted. The meeting continued with the presentations as follows.

2. PRESENTATIONS

R.A. FORREST – IAEA, Vienna, Austria

Robin Forrest gave a presentation that discussed the status of FENDL-3 and future plans. The neutron-induced general purpose (GP) library includes 180 materials that are listed on the FENDL-3 website. All files have energies up to at least 60 MeV. The covariance data are still limited with only 11 materials having complete covariance data and 135 materials with none. The proton-induced GP library is primarily based on TENDL-2011 for as many as possible of the same 180 materials, with some replaced by files from JENDL-HE and LA-150. The deutron-induced GP library for as many as possible of the 180 materials is based entirely on TENDL-2011. The current status of processing of these three GP libraries was presented. The shadow library is completely based on TENDL-2011 which contains complete (but calculated) covariance data. This library can be used to determine uncertainties for calculations that require complete covariance data.
The n-induced activation library is identical to EAF-2010 but has been converted to ENDF format. The p-induced activation library is based on EAF-2007 and contains data for 67,925 reactions. The d-induced activation library includes 66,864 reactions and is based also on EAF-2007. It was pointed out that no testing or validation has yet been done and several corrections to the GP files need to be made for several materials. It was emphasized that the files should be finalized by the end of June 2012 and a final CRP report that includes validation and testing is needed by the end of September 2012. It was suggested that work continues as a DDP during 2013 to respond to new data and feedback from the community that could lead to a revised version (possibly FENDL-3.1) at the start of 2014.

U. FISCHER– Karlsruhe Institute of Technology, Karlsruhe, Germany

U. Fischer presented application of the FENDL-3 test neutron cross section data library, release 2, to the IFMIF neutron source facility. The applications included neutron and photon transport calculation for the entire Target and Test Cell (TTC) as well as shielding calculations across the 4 m thick concrete wall up to the adjacent access room. The calculations were performed with the latest (2011) version of the McDeLicious Monte Carlo subroutine and a new and very detailed TTC model that was generated by the McCad conversion software from the TTC CAD engineering model. Calculations of neutron and photon fluxes, nuclear heating, gas production, displacement damage and biological dose

rates were successfully performed with the FENDL-3 test library and compared to results obtained with the standard IFMIF library with data mostly coming from LA150. While the neutron and photon fluxes agree well, marked differences are observed in the dpa and gas (deuterium, tritium and helium) production in the irradiation specimens of the High Flux Test Module (HFTM). These differences can be directly traced to deficient Fe-56 cross sections above 20 MeV. In particular, there is an unphysical jump of the displacement cross section at 20 MeV that needs to be fixed. The helium production cross section should be normalized to the LANL measurements of R. Haight to get better agreement. The results of the shielding calculation were affected by the missing high-energy part of the H-1 cross section. When replacing this cross section by the recent ENDF/B-VII.1 data satisfactory agreement was achieved with the results of the calculations using the IFMIF standard library.

M. SAWAN – University of Wisconsin, Madison, WI, USA

M. Sawan provided several observations from a user's perspective about the current status of the FENDL-3.0 neutron GP library and discussed the plans for validating the library. It was pointed out that the library includes all 180 materials identified by users compared to only 71 materials in FENDL-2.1. It was pointed out that while most materials have data to 150 or 200 MeV, the Mn-55 and Th-232 data extend only to 60 MeV. ACE formatted processed data are not yet available for all materials and validation could not be done at that time. Once the processed files are available, calculations will be performed for both the simple ITER calculational benchmark and mock-ups used in integral 14 MeV experiments (FNG, FNS). Such calculations are important to uncover possible processing issues as were revealed by calculations with the FENDL-3.0 starter library. These calculations will be helpful in identifying safety margins to be applied to results for ITER and other fusion systems using the current FENDL-2.1 reference library. In addition, to the ACE files, a processed multi-group library is needed. It was pointed out that existing benchmarks (calculational and experimental) use materials included in FENDL-2.1 and we need to identify a new set of benchmarks to validate data for the new materials included for FENDL-3.0.

Y. WATANABE– Kyushu University, Fukuoka, Japan

Y. Watanabe presented the results of his actions for Si and Sn isotopes in the neutron GP file from the 2nd RCM. Based on Si benchmark testing with FNS/JAEA data, it was recommended that ENDF/B-VII.0 should be kept because there is no reasonable justification to use JENDL-4.0 instead of ENDF/B-VII. For Sn isotopes, it was recommended that JENDL-4.0 be adopted instead of RUSFOND at energies below 20 MeV, based on comparison of gamma production cross sections between RUSFOND, ENDV/B-VII.0, TENDL-2010, and JENDL-4.0 Since there are no high energy data in JENDL-4.0 for Sn isotopes, TENDL-2010 should be connected with JENDL-4.0 at 20 MeV. Preliminary results of benchmark testing with OKTAVIAN data for JENDL-3.3, JENDL-4.0, JEFF-3.1 and ENDF/B-VII were also reported for Si, Cu, Zr, Nb, Mo, and W. It was shown that JENDL-4.0 gave better results for these materials compared to JENDL-3.3. The KERMAs in FENDL/MC-2.1 and FENDL/MG-2.1 were carefully checked by C. Konno (FNS/JAEA). It was found that the KERMAs in FENDL/MC-2.1 were given using the energy balance method and 28 nuclei have unphysical KERMAs, such as negative values, due to lack of energy conservation in their nuclear data. It was pointed out that this problem should be resolved in FENDL/MC-3.0.

S. KUNIEDA– Japan Atomic Energy Agency (JAEA), Tokai-mura, Japan

S. Kunieda gave a presentation about data compilation for the neutron library (SLIB2). The high-energy extension was made with JENDL/HE-2007 and TENDL-2010 for materials with original data given only up to 20 or 30 MeV. For JENDL/HE-2007, data above 150 MeV were removed. For TENDL-2010, no 150 MeV cut was performed. The cross-sections for Gd and Hf isotopes were compared between the experimental data and the libraries. It was concluded that JENDL-4.0 is the best evaluation below 20 MeV for these materials.

A. TRKOV – Jozef Stefan Institute, Ljubljana, Slovenia

A. Trkov discussed FENDL-3 Activities at JSI. The activities were based on the list of actions from the 2nd RCM and communications with R. Forrest. They include support in the processing of FENDL-3 library into ACE and multi-group forms and the extension of the H-3, He-3 and He-4 evaluations to 60 MeV. The library processing activity was a continuation of the work done for the starter library. The bulk of the work was done by the consultant D.L. Aldama. Improved processing scripts were supplied and help was provided to resolve a few processing issues. The H-3 starter file was replaced by data from ENDF/B-VII.1b4. Reactions with threshold energies above 20 MeV were added and existing reactions were extrapolated to 60 MeV for as many cases as possible. The He-3 starter file from JENDL-4.0 was kept, although the new ENDF/B-VII.1 evaluation might be slightly better. The He-4 starter file was replaced by ENDF/B-VII.1b4. Reactions with threshold energies above 20 MeV were added and existing reactions were extrapolated to 60 MeV for as many cases as possible. The elastic cross section angular distribution at 60 MeV was fitted to experimental data.

T. KAWANO– Los Alamos National Laboratory, Los Alamos, NM, USA

T. Kawano summarized the evaluated files in the most recent nuclear data library, ENDF/B-VII.1, which are relevant to FENDL-3. The reviewed files include the evaluations for light elements, structural materials, fission products, and major actinides. It was confirmed that many of them are the same as the files in ENDF/B-VII.1 beta, and those have already been used in the FENDL-3 starter file. However for seven light elements, nine structural materials, nine fission products, one heavy material (Au), and two uranium isotopes the data have been modified after the starter file was assembled. It was reported that the modifications were relatively modest, and it is straightforward to update the files in FENDL. These updated files were combined with the high energy part taken from JENDL-HE or TENDL by S. Kunieda, and submitted to IAEA. They will be reprocessed. ENDF/B-VII.1 includes newly evaluated files of titanium isotopes, which contain new resonance parameters from ORNL and full covariance matrices. Kawano proposed to also replace the current Ti isotopes in FENDL by those in ENDF/B-VII.1.

A. KONING– Nuclear Research and Consultancy Group (NRG), Petten, the Netherlands

A. Koning gave a presentation entitled “TENDL for FENDL”. The contributions of the nuclear model code TALYS and the TENDL general purpose files to the FENDL-3 project were outlined. Out of the 180 neutron files in FENDL-3, 40 originate from TALYS or TENDL. The FENDL proton library is mostly from TENDL. For the deuteron library the entire TENDL library was adopted. Moreover, TENDL is used in FENDL to fill gaps in the fusion material chart, to add complete covariance data, for both transport and activation

libraries, and to extend data to high-energies. It was mentioned that proton and deuteron libraries can now be handled by FISPACT-II. Proton libraries can be used with MCNPX and deuteron libraries can be used with MCUNED. The latest improvements in TALYS were outlined, such as a new phenomenological break-up model from Connie Kalbach (FENDL-3 report 2010), more alpha OMP's (e.g., Demetriou-Goriely double-folding) and more deuteron OMP's (e.g. Y. Han, Haixia An). Finally, a glimpse into the future was provided by showing some of the possibilities of the entire TALYS-based evaluation system developed at NRG. It is now possible to generate random nuclear data libraries and to adopt the best one on the basis of both differential and integral data. An example from the Cu isotopes was given.

L. LEAL - Oak Ridge National Laboratory, Oak Ridge, TN, USA

L. Leal gave a presentation about the resonance-parameter and covariance evaluations in the resolved resonance region carried out at the Oak Ridge National Laboratory. The evaluations made for the chromium isotopes, titanium isotopes, Ni-58, Ni-60, Cl-35, Cl-37, K-39, K-41, and Mn-55 were briefly discussed. The results of these evaluations represent an improvement over previous evaluations in the sense that the upper resolved energy limits for many of the isotopes were extended and resonance parameter covariance data for all the evaluations were developed. The evaluations were made using the computer code SAMMY.

S. KUNIEDA– Japan Atomic Energy Agency (JAEA), Tokai-mura, Japan

S. Kunieda gave a talk about calculation of alpha-particle emission cross sections from the pre-equilibrium process with the Iwamoto and Harada model. In this approach the overlap-integrals of wave functions were obtained exactly while these were obtained with an approximation in the original model. The multiple emission cross sections were also calculated. With a simple parameter set, the calculations describe well the experimental spectra. He also reported that they performed the evaluation for (n,xα) cross sections with their calculations for the important structural materials. Their evaluations reproduce not only experimental spectra but also the measured absolute values of the cross sections. He proposed that their evaluation would be useful for FENDL-3.

J-Ch. SUBLET - Culham Centre for Fusion Energy, Abingdon, United Kingdom

J-Ch Sublet discussed the status of the European Activation file 2010. The European Activation File (EAF) project has been an ongoing process performed through a European and world-wide cooperation that has lead to the creation of the EAF-2010 library version. This latest version is provided in an ENDF compliant format that includes covariance information and which is made available for the FENDL-3 project. The point-wise version of the same file has also been made available in the Lawrence Livermore National Laboratory (LLNL) Generalized Nuclear Data (GND) format, a new XML based format, designed to replace LLNL's ENDL and possibly the ENDF formats. Details on the complex processing sequences necessary to produce files in a form suitable for applications were also made available. It is also worth noticing that all the Validation and Verification (V&V) processes carried out on the different parts of the EAF-2010 libraries will fully benefit the FENDL-3 project. Concerning the proton and deuteron libraries originally based on earlier version of the TALYS code, a proposal was made to replace the earlier EAF-2007 version with the latest TENDL-2011-p and TENDL-2011-d evaluated data files so as to directly benefit from their new format and increased quality. This new fully ENDF compliant file will simplify and streamline the usage and interpretation of these evaluated files by various communities.

J. KOPECKY– JUKO Research, Alkmaar, Netherlands

J. Kopecky gave a presentation on the extension of the integral validation tools. It dealt with the 30 keV capture cross section in the EAF-2010 library. The performance of the 30 keV (n,γ) cross sections, which have been considered for several versions of EAF libraries, was discussed. The use of the 30 keV capture cross section was included in EAF validation for the first time in 1992 as relevant information on the predictive quality of the statistical component of the excitation function just above the resolved resonance region (especially for targets with A > 50). Currently, the use of 30 keV cross sections has been extended by a new development, primarily involving the use of the recommended spectrum averaged cross sections treated as integral data. Two features, namely the C/E comparison with experimental data from astrophysics and the novel use of the ratio of point-wise against integral cross sections at 30 keV, were discussed and demonstrated to be useful tools for validation of the EAF-2010, FENDL-3 and future libraries.

F. TARKANYI– Hungarian Academy of Science, Debrecen, Hungary

F. Tarkanyi gave a presentation entitled "Contribution to the experimental activation cross section database of proton and deuteron induced reactions". The results of the experimental and compilation work of the ATOMKI Group, performed in 2010-2011 were presented with the aim to prepare an evaluated General Purpose activation data file for FENDL-3. In the experimental work, collaborating partners from Belgium and Japan also participated. Details of the co-authors from the collaborating institutes can be found in the relevant new publications. The compilation of the literature data for all reaction assigned to the ATOMKI Group have been completed for proton-induced reactions. The compiled experimental data were compared to the TENDL-2010 library and also the ALICE and EMPIRE calculated curves in some cases. New measurements for FENDL relevant proton- and deuteron-induced reactions made by the ATOMKI group during 2010 and 2011 in collaboration with partner institutes from Belgium and Japan were summarized together with the FENDL-3 relevant publications.

M. AVRIGEANU– National Institute of Physics and Nuclear Engineering, Bucharest, Romania

M. Avrigeanu discussed the theoretical analysis of the deuteron-induced activation at low and medium energies. The weak binding energy of the deuteron (2.224 MeV), is responsible for the high complexity of the interaction process that involves a variety of reactions initiated by the neutrons and protons coming from deuteron breakup. Increased attention has been devoted to the breakup mechanism with all its components being carefully considered. The extension of the empirical parameterization of the elastic breakup cross sections beyond the energies considered has been checked by microscopic calculations in the frame of the Continuum-Discretized Coupled-Channels formalism. On the other hand, the usually neglected or very poorly studied mechanisms, such as stripping, (d,p) and (d,n), as well as the pick-up, (d,t) reactions have been demonstrated to give contributions that are important at low incident energies and so require an appropriate treatment. The reaction mechanisms pre-equilibrium (PE) and compound-nucleus (CN) become important when the incident energy is increased above the Coulomb barrier. The related cross sections have been analysed by using the default model parameters of TALYS as well as a local consistent parameter set. The

present analysis reveals the dominance of the deuteron breakup mechanism unlike the conclusions of a former assessment of the deuteron-induced fission process. The overall agreement between the measured data and model calculations performed for deuteron interaction with Al, Cu, Co, Nb and Pa supports the correctness of including the breakup nuclear mechanism description for deuteron-nucleus interactions. Finally, to improve the deuteron breakup effect estimates requires complementary experimental studies of neutron and proton induced reactions on a common target compared to deuteron interaction processes and within correlated incident-energy ranges.

A. IGNATYUK- Institute of Physics and Power Engineering, Obninsk, Russia

A. Ignatyuk gave a presentation on the phenomenological systematics of the (d,p) cross sections. The TENDL-2010 libraries for protons and deuterons were tested against the available experimental data for the most important materials related to the IFMIF project. Additional calculations with the ALICE-D and EMPIRE-D codes were performed to study the effects of input model parameters on the analyzed data. For the deuteron-induced reactions the TENDL-2010 evaluations typically underestimate the (d,p) reaction cross sections for most of the nuclei. There are also unphysical jumps of the cross sections at low energies. So, the corresponding cross sections of the TENDL-2010 files should certainly be corrected in the process of FENDL-3 library formation. The phenomenological systematics of the (d,p) cross sections, proposed in the this presentation, can be recommended as an optimal method to improve such data for all nuclei and the whole energy region.

R. CAPOTE – IAEA, Vienna, Austria

R. Capote discussed the FENDL-3 NJOY processing. This was primarily carried out by D.L. Aldama. The FENDL/E-3.0 evaluated nuclear data files were processed using the NJOY-99.364+ modular code system with two local updates to the ACER and HEATR routines at the IAEA-NDS. Verification of the ACE files was carried out. Problems were found with fission cross sections for U-235 and U-238. These involved inconsistencies between MT=18 and MT=19, 20, 21, 38 which are different representations of the fission process. Derived cross section data from MT=200-208 were found for all the isotopes of Ti, Br, Zr, Nb, Mo, and Hf. It is not recommended to include these derived data into primary evaluations and, therefore, derived reaction data from MT=200 up to MT=450 were deleted in the final version. It was noted that the transition probability data in case of Nb-93 were omitted for MT = 51 in File 12 (MF=12). The data were included using the code chmf35. Several processing warnings were noted and investigated. The evaluations for H-3 and He-4 do not have photon production data. For several evaluations, File 6 (MF = 6) is used, although the data are incomplete. The energy distribution is not given for the recoil nucleus and NJOY-99 applied the one particle approximation for these cases. For Br-81, Mo isotopes, and Hf-180, problems were found with the sum of the photon production and re-normalization was applied as a corrective action using NJOY-99.

3. DISCUSSION

An extensive discussion took place after the presentations. This covered the status and additional work needed to complete the general purpose neutron and charged particle libraries, as well as the activation libraries. Plans for validation and testing of FENDL-3.0 were discussed. Several action items were identified and agreed to along with a schedule for

finishing the work and plans for report writing. Details of the decisions made and action items are given below.

4. ACTION ITEMS

4.1 Neutron General Purpose Library:

Finish library preparation and processing by end December 2011 to allow time for testing and validation.

List of materials that require work, with the details of persons responsible for the action.

H-1: Needs processing.
H-2: Needs processing.
H-3: Add improved angular distribution (A. Koning, R. Capote, A. Trkov), needs processing.
He-3: Extension to be replaced by ENDF/B-VII.1, add improved angular distribution (A. Koning, R. Capote, A. Trkov). Needs processing.
He-4: Include improved angular distribution from optical models (A. Koning, R. Capote, A. Trkov). Include data up to 30 MeV from G. Hale (T. Kawano, A. Trkov). Needs processing.
Li-6: Needs processing.
Be-9: Needs processing.
N-15: Change MAT number to 728 (A. Trkov), needs processing.
O-16: Needs processing.
K-39: Change resonance data from ORNL and process (A. Koning).
K-41: Change resonance data from ORNL and process (A. Koning).
Ti isotopes: Needs processing.
Fe-54: Needs processing.
Fe-56: JEFF-3.1 to be replaced above 20 MeV with TENDL-2011. Afterwards alpha production to be replaced (S. Kunieda, T. Kawano). Needs processing.
Fe-57: Needs processing.
Ni isotopes: Needs processing.
Y-89: Needs processing.
Rh-103: Correct merging (S. Kunieda), needs processing.
Cd isotopes: Needs processing.
I-127: Change to ENDF/B-VII.1+ TENDL-2011 (S. Kunieda), needs processing.
Au-197: Needs processing.
U-235: Needs processing.
U-238: Correct merging (S. Kunieda), needs processing.

4.2 Processing:

Possible confusion with multiple KERMA values in ACE files. To avoid this all files will be reprocessed with the NJOY input files changed so that only the kimematics option is used (A. Trkov, R. Capote).
All processing to be done or organized by IAEA/NDS.

4.3 Covariance Data:

All existing files where the upper energy limits for cross sections and covariances do not agree will be modified so that the covariance data are extended assuming 50% on the diagonal. This is required for about 25 materials (A. Trkov).

For all materials with covariance in the General Purpose neutron library (about 45) produce processed covaraiance file in the same 211 groups as the multi-group library (A. Trkov, R. Capote). Use this processed library to make calculations in four well defined spectra (thermal, Cf-252, ITER and IFMIF) starting with the Cf-252 spectrum. The ITER and IFMIF spectra and documentation are to be provided by U. Fischer (A. Trkov, R. Capote).

4.4 General Purpose Charged Particles Library:

Deuteron general purpose files: Use TENDL-2011 with no modifications for all materials available from the standard list of 180, this means that probably data for 175 materials will be available. The ACE processed files from NRG Petten will be used.

Proton general purpose files: Use TENDL-2011 with some replacements using LA-150 and JENDL-HE (R. Capote), processing will be organised by NDS.

4.5 Activation Files:

Neutrons:
EAF-2010 neutron-induced activation files available in both ENDF and processed format. J-Ch. Sublet to produce ACE files (no uncertainty) and 211- group data in ENDF and EAF format (with uncertainty). In addition a script for users to process the library to produce other group structures will be provided. To be done by end of January 2012.

Proton and deuteron:
Extract from the complete TENDL-2011 library the same targets (about 816) as used for the neutron-induced file. Supply as ENDF files with the processed 162-group library. To be produced and processed by J-Ch. Sublet by end of January 2012.

The (d,p) reaction channels will be reviewed and improved by A. Ignatyuk, J-Ch. Sublet by end of May 2012.

4.6 Validation:

Calculations will be performed for the same set of ITER calculational benchmarks as previously used for FENDL-2.1 and FENDL-3 Starter libraries. Carry out a similar set of calculations for IFMIF and experimental benchmarks. Check if any other benchmarks are available that test the wider range of materials in the FENDL-3 library. U. Fischer will lead and coordinate the effort with contributions from M. Sawan and C. Kalbach-Walker. To be finished by end of May 2012.

Validation has been done for EAF-2010 and this will also be applicable to the FENDL-3.0 activation files. Any additional validation will be completed (J. Kopecky) by end of May 2012.

4.7 Reports:

Two reports will be prepared:

- **Library Description Report**: Brief report describing the library, the sources of evaluations, and processing that was used. This is to be released with the library in June 2012. To be prepared by IAEA/NDS staff and A. Koning, T. Kawano, Y. Watanabe, S. Kunieda by end of March 2012. This includes the following contributions (in Word format):

  - Introduction: NDS
  - ENDF/B contributions to FENDL: T. Kawano
  - TENDL and JEFF contributions: A. Koning
  - JENDL-HE: Y. Watanabe
  - Merging of high and low energy parts of the data files: S. Kunieda
  - EAF content: J-Ch. Sublet

- **Technical CRP Final Report**: Contributions to be produced by end of May 2012 and the the final report will be completed by September 2012. This includes the following contributions (in Word format):

  - Introduction: NDS
  - Neutron-induced general purpose file testing and validation: U. Fischer
  - Neutron-induced activation file validation: J. Kopecky
  - Summary on p- and d-induced cross sections comparisons: F. Tarkanyi
  - Parameterization of d-induced data: A. Ignatyuk
  - d interaction modelling: M. Avrigeanu
  - Resonance parameter evaluation: L. Leal
  - Covariance validation through uncertainty comparisons with different spectra: A. Trkov, R. Capote.

IAEA's 3rd Research Co-ordination Meeting (RCM) on

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Room F0817, IAEA Headquarters, Vienna, Austria

6 – 9 December 2011

AGENDA

Tuesday, 6 December

08:30 - 09:30 **Registration** (IAEA Registration desk, Gate 1)

09:30 - 10:30 **Opening Session**

- Welcoming address — R.A. Forrest
- Election of Chairman and Rapporteur
- Acceptance of Agenda
- *Status of FENDL-3 and the future* — R.A. Forrest

10:30 – 11:00 **Break for administrative matters**

11:00 – 12:30 **Presentations** (approx. 30' each)

- *Application of the FENDL-3 Test Data Library to IFMIF* — U. Fischer
- *Plans for validation and general observations* — M. Sawan
- *Benchmark test with OKTAVIAN data and comment on kerma factor* — Y. Watanabe

12:30 - 14:00 **Lunch break**

14:00 - 17:30 **Presentations - cont'd**

- *Data Compilation for Neutron Library (SLIB2)* — S. Kunieda
- *Activities on FENDL-3 at JSI* — A. Trkov
- *ENDF/B-VII.1 upgrade - relevance to FENDL-3* — T. Kawano
- *TENDL for FENDL-3* — A. Koning
- *Resonance Evaluation for FENDL-3 at ORNL* — L. Leal
- *(n,xα) Cross Section Evaluation with Clustering Pre-equilibrium Model* — S. Kunieda

(Coffee break as appropriate)

Wednesday, 7 December

9:00 - 12:30 **Presentations - cont'd**

- *Neutron, Proton, Deuteron activation-transmutation files: n,p,d-FENDL-3/A*

J-C. Sublet

- *Extension of integral validation tools* J. Kopecky
- *Contribution to the experimental activation cross section database of proton and deuteron induced reactions* F. Tarkanyi
- *Theoretical analysis of the deuteron-induced activation at low and medium energies* M. Avrigeanu
- *Phenomenological systematics of the (d,p) cross sections* A. Ignatyuk
- *Processing of FENDL-3* R. Capote

(Coffee break as appropriate)

12:30 - 14:00 Lunch break

14:00 - 17:30 Discussions on FENDL-3

- *General purpose library*
- *Activation library*
- *Processing*
- *Covariances*
- *FENDL-3 library*
- *Final Report*
- *Future Work*

(Coffee break as appropriate)

19:00 Social event – Restaurant Purstner

Thursday, 8 December

9:00 - 12:30 Discussions - cont'd

(Coffee break as appropriate)

12:30 - 14:00 Lunch break

14:00 - 17:30 Discussions - cont'd

(Coffee break as appropriate)

Friday, 9 December

9:00 - 12:30 Discussions - cont'd

(Coffee break as appropriate)

12:30 – 13:30 Lunch break

13:30 – 15:00 Report Summary

15:00 Closing

IAEA 3rd Research Coordination Meeting on

"Nuclear Data Libraries for Advanced Systems – Fusion Devices"

06-09 December 2011
IAEA Headquarters, F 0817
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