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Nuclear Data Newsletter

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In This Issue

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Nuclear Data Section
International Atomic Energy Agency
P.O. Box 100
A-1400 Vienna, Austria

Internet: http://www-nds.iaea.org
Email: services @iaeand.iaea.org
Fax: +43 (1) 26007
Telephone: +43 (1) 2600-21710

Staff Items

2009 is a year for staff changes in the Nuclear Data Section. Some staff members have already left, a few will be leaving/retiring by the end of the year and several new people have joined.

After 10 years as Head of the A&M Unit, Bob Clark retired from the IAEA at the end of July. During this time, he was responsible for 11 CRPs (three active and eight completed), three joint ICTP-IAEA workshops on Atomic and Molecular Data for Fusion in Trieste and numerous publications. In addition to the usual activities of a data centre, Bob was a forerunner in the development of Web tools in atomic and molecular physics for use in fusion energy research. GENIE, a Web search engine for atomic numerical data, was launched in 2001 and the well-established Web interface to the Los Alamos Atomic Physics Codes performs on line atomic structure calculations and electron impact excitation and ionization cross sections. This work could not have been achieved without the strong help of his team, Denis Humbert (since 2001), and not forgetting Khalid Sheikh, secretary of the Unit for the last 26 years.

With the departure of Denis Humbert at the end of September, rotation policy means that a completely new team is taking over. Bastiaan Braams succeeded Bob Clark as Unit Head and Hyun Chung will take over Dennis Humbert's position at the beginning of October. Welcome and success to the new AMD Unit!

Dennis Humbert, Georgina Bush, Bob Clark and Alberto Mengoni

Alberto Mengoni, Head of Nuclear Data Services Unit left at the end of June to take up the post of Scientific Attache at the Italian Embassy in Tokyo. Since 2005, Alberto was responsible for the availability and provision of nuclear data to all Member States, involved in the organization of ICTP Workshops and was a Scientific Secretary of two CRPs – Minor Actinide Neutron Reaction Data (MANREAD) and Nuclear Data Libraries for Advanced Systems - Fusion Devices (FENDL-3).

After serving the IAEA for over 30 years, Georgina Bush will retire at the end of the year. Her farewell message:

Dear friends and colleagues,
It is really difficult for me to believe that July 30th 2009 marked my 30th anniversary with the IAEA! At the end of this year I shall be joining the ranks of retired staff members. I would like to take this opportunity to say a big and heartfelt "thanks" to you all, both those whom I have met personally over the years, and those of you who have known me via emails and letters. I have so enjoyed my time in the IAEA, have loved my work and have been extremely fortunate to have made some good friends along the way.
I would like to extend my very warmest wishes to you all for the future, wherever that may find you. I will not be hard to find. Most likely on a golf course.
Farewell, and auf Wiedersehen,
Georgina

Georgina Bush

Robin Forrest

Robin Forrest took up the post of Head of NDS at the beginning of July and Vladimir Pronyaev has been employed on a consultant's basis until a replacement for Alberto Mengoni can be recruited.

We warmly welcome all new staff members and wish all the best to the ones who have left or are leaving in the next weeks.

On-line News

Ongoing Service

The Nuclear Data Section is currently compiling an accessible electronic library of all documents produced by the IAEA pertaining to our Nuclear Data Services. These documents include IAEA-NDS, INDC and other NDS technical reports. Many only exist on microfiche or in paper form. Compilation into more readable lists in html format of all currently available electronic versions of the INDC-country reports has been completed. This includes the relatively large set of INDC-CCP documents (where available the English translations of the abstracts have also been compiled). All available documents and reports in the: INDC series, the IAEA-NDS series, the tecdocs, Conference Proceedings and NDS staff publications are now listed in a tabular html form and are searchable (useful for the longer lists). This project is on-going and can be accessed on:

http://www-nds.iaea.org/reports-new/

In Memoriam

We deeply regretted to learn of the death of **Bohumil Ošmera** on 12 August 2009. Dr. Ošmera was a long time chairman of Working Group on Reactor Dosimetry for WWER type reactors, a member of the IAEA INDC and of ASTM. His main activities included neutron and photon spectrometry, reactor dosimetry, experimental reactor physics: fast neutron transport and radiation damage of WWER pressure vessel. He considerably contributed to the Framework Programme of the European Community projects (Reactor Dosimetry: Accurate determination and benchmarking of radiation field parameters, relevant for reactor pressure vessel monitoring and RADE: Use of RPV Dosimetry Benchmark's Results for Determining Radiation Embrittlement Damage). He published more than 100 articles as journal papers, contributions presented at international conferences and symposia.

We deeply regret to inform you that our old friend and colleague **Alex Lorenz**, passed away on Friday, 4 September 2009. Alex was with the Section for many years, in fact before it was a Section and was a small Unit. He was a key figure in the Nuclear Data field and was very active in the early years of a growing demand for an organized and easily accessible body of numerical nuclear information, building up the IAEA's nuclear data programme to provide much needed nuclear and atomic numerical data to the scientific communities in all Member States. He collaborated very closely with the then Section Head, Dr. Joseph Schmidt and they were great allies in the section's work. Alex retired from the Nuclear Data Section in 1989.
Apart from his achievements in this endeavor, he was a very valued colleague and he and his wife Dolores were dear friends to those who were fortunate enough to know them.

With great regret we learnt that **Duane Larson** passed away 8 July 2009. Staff at the Nuclear Data Section knew Duane well, and worked with him over many years for the overall benefit of the international community. His efforts were firmly focused within the fields of cross section measurements and data evaluation, and he achieved high international respect and reputation in both of these important scientific fields. Duane participated in the production of the IAEA FENDL-1 data library, and made appreciable contributions to its success. An important outcome of the early FENDL meetings was the exchange of evaluations between the regional libraries leading to much greater freedom in the use of nuclear data. His knowledge in the field of nuclear data was much appreciated. Amongst others, the IAEA, owe him so much for his fine efforts over a very productive life.

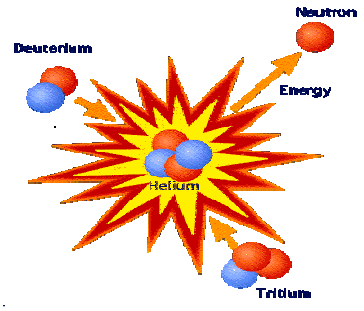
Database News

ENDF April 2007: 14 Evaluated Data Libraries for Nuclear Applications in original and pointwise formats:

- BROND-2.2
- CENDL-2
- ENDF/B-VI-8
- ENDF/B-VII-0
- ENDF/B-VII-0-300
- ENDF/HE-VI
- IAEA-MEDICAL
- IAEA-STANDARDS
- INDL/TSL
- IRDF-2002
- IRDF-2002-G
- JEFF-3.1
- JEFF-3.1/A
- JENDL-3.3

These libraries as well as ENDF6 Manual are available on CD-ROM on request.

Computer Codes and Data Libraries



The following databases and libraries are available cost-free on CD-ROM on request:

EXFOR-CINDA Database and Retrieval System, version 1.99, data updated to March 2009:

- Integrated CINDA and EXFOR
- Advanced interactive search
- Help based on Dictionaries
- Interactive graphics with ZVView
- Does not need installation, can run from CD-ROM
- Works with Local and Remote Databases
- CINDA extended by charged particle and photo-nuclear reactions
- EXFOR and CINDA as MS-Access databases

Developed by V. Zerkin, Nuclear Data Section, IAEA, 1999-2009.

EndVer/GUI and EXFOR-CINDA package, February 2009:

An integrated software package for comparison of evaluated nuclear data files with experimental data from the EXFOR database (also contains interactive plotting).

Features:

- EndVer with Graphic User's Interface
- Integrated EndVer - PrePro-2007 - EXFOR
- PostScript graphics with PlotC4
- Plotting ENDF Files vs. EXFOR:
  MF4 (DA), MF5 (DE), MF6 (DAE), MF3+33 (SIG)
- Interactive graphics with ZVView
- Full EXFOR and CINDA databases
- Test version for Macintosh

Developed by V. Zerkin, Nuclear Data Section, IAEA, 2004-2009.

Displacement Cross Section Files for Structural Materials Irradiated with Neutrons and Protons

Displacement cross sections were obtained for chromium, iron and nickel based on the results of molecular dynamics simulations and calculations using the binary collision approximation model at incident neutron and proton energies from 10^{-5} eV up to 1 GeV. At low energies of incident particles the nuclear recoil spectra were calculated using ENDF/B-VII data and the NJOY code. At higher energies the nuclear recoil spectra were calculated using a model describing the scattering of charged particles in matter, the optical model, the pre-equilibrium model, and the intra-nuclear cascade evaporation model. Displacement cross sections are stored using the ENDF-6 format.

The report is available online on
http://www-nds.iaea.org./reports-new/iaea-nds/iaea-nds-0214.pdf

The data in ENDF-6 format are available on http://www-nds.iaea.org/displacement

POINT 2009 – A Temperature Dependent ENDF/B-VII.0 Cross Section Library:

ENDF/B-VII.0 was released by CSEWG in November 2006 and is frozen for three years until November 2009. As such the original data included in **POINT 2009** is identical to that included in the earlier release **POINT 2007**. However, the processed, temperature dependent results may differ because of improvements in the PREPRO ENDF/B Preprocessing Codes, particularly with regard to accuracy, and correct interpretation of the ENDF/B rules as defined by the ENDF/B formats and procedures manual, ENDF-102.

Available on 3 DVDs on request or on-line:
http://www-nds.iaea.org./point2009/pt2009.htm

Selected Charts, Reports and Documents

Chart of the Nuclides *Prepared by Knolls Atomic Power Laboratory and distributed by Lockheed Martin (16th edition, revised to 2002).* Available cost-free on request only for **teachers and scientists from developing countries.**

Chart of the Nuclides Book *Prepared by Knolls Atomic Power Laboratory and distributed by Lockheed Martin (16th edition, revised to 2002).* This book form of the Nuclides Chart is available cost-free on request only for **teachers and scientists from developing countries.**

Karlsruher Nuklidkarte Desk Chart *of the Nuclides from Karlsruhe, 6th edition (1995). Updates from 1998*. Available cost-free on request only for **teachers and scientists from developing countries**.

Nuclear Data Sheets *Special Issue on Evaluated Nuclear Data File ENDF/B-VII.0*, Volume 107, Number 12 (2006). Special Issue Editors: P. Oblozinsky and M. Herman. Limited hard copies available on request. Also available on CD-ROM.

Nuclear Wallet Cards 2005 7th Edition, by Jagdish K. Tuli, National Nuclear Data Center. These pocket size wallet cards are available as hard copy on request.

Nuclear Physics News Volume 19, No.1, 2009; Editor: Gabriele-Elisabeth Koerner, European Science Foundation, Munich, 2009. Contains Editorial written by A.L. Nichols. Limited number of this issue is available as hard copy on request.

INDC(NDS)-0544 *Summary Report of the Final Research Coordination Meeting on Atomic and Molecular Data for Plasma Modelling,* Vienna, 17-19 November 2008, prepared by D. Humbert, February 2009.

INDC(NDS)-0546 *Evaluation of Cross-section Data from Threshold to 40-60 MeV for Specific Neutron Reactions Important for Neutron Dosimetry Applications,* prepared by K.I. Zolotarev, April 2009.

INDC(NDS)-0548 *Summary Report of an IAEA Technical Meeting International Code Centres Network,* Vienna, 2-3 December 2008, prepared by R.E.H. Clark, February 2009.

INDC(NDS)-0549 *Summary Report of an IAEA Consultants Meeting on XSAMS: XML Schema for Atomic and Molecular Data and Particle Solid Interactions,* Beijing, China, 27 October 2008, prepared by D. Humbert, February 2009.

INDC(NDS)-0550 *Summary Report of the First Research Coordination Meeting on Characterization of Size, Composition and Origins of dust in Fusion Devices,* Vienna, 10-12 December 2008, prepared by R.E.H. Clark, March 2009.

INDC(NDS)-0552 *Summary Report of the final Research Coordination Meeting on Atomic Data for Heavy Element Impurities in Fusion Reactors,* Vienna, 4-6 March 2009, prepared by R.E.H. Clark, April 2009.

INDC(NDS)-0553 *Summary Report of the Second Research Coordination Meeting on Data for Surface Composition Dynamics Relevant to Erosion Processes,* Vienna, 11-13 March 2009, prepared by R.E.H. Clark, April 2009.

INDC(NDS)-0554 *Nuclear Level Densities of ^{116}Sb, ^{118}Sb, ^{122}Sb, ^{124}Sb, ^{165}Er and ^{181}W Derived from Neutron Evaporation Spectra in the (p,n) Reaction,* prepared by B.V. Zhuravlev, April 2009.

INDC(NDS)-0556 *Summary Report of Consultants Meeting on IAEA International Database on Irradiated Nuclear Graphite Properties,* Vienna, 25 - 26 March 2009, prepared by D. Humbert and A.J. Wickham, May 2009.

INDC(NDS)-0557 *Summary Report of Second Research Coordination Meeting on Minor Actinide Nuclear Reaction Data (MANREAD),* Vienna, 31 March – 3 April 2009, prepared by Y. Nagai and A. Mengoni, July 2009.

All INDC series reports listed above are available online through:
http://www-nds.iaea.org./reports-new/indc-reports

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Meeting Reports

Consultants Meeting on Phase space Database for External Beam Radiotherapy, 26 – 29 May 2009

An IAEA Consultants Meeeting was organized at IAEA Headquarters, Vienna, Austria on 26-29 May. S. Cora (San Bortolo Hosp., Vicenza, Italy), I. Kawrakow (NRC, Canada), C. Ma (Fox Chase Cancer Center, PA, USA), D. Rogers (NRC, Canada), J. Seuntjens (McGill University, Canada) and R. Capote (IAEA/NDS) discussed the current status and outlook of the phase-space (phsp) database and reviewed the initial set of phsp data submissions. The database includes an Eldorado Co-60 machine, an Accuray CyberKnife and several linear accelerators manufactured by Elekta, Siemens and Varian for photon and electron beams of various field sizes and energies.
New sets of phase-space files have been made available online (http://www-nds.iaea.org/phsp/).

Hospitality event at the Consultants Meeting, 27 May 2009, Vienna

Technical Meeting of the International Network of Nuclear Reaction Data Centres, 25 - 26 May 2009

The IAEA Technical Meeting on the Coordination of the International Network of Nuclear Reaction Data Centres (NRDC) was held at IAEA Headquarters, from 25 to 26 May 2009. Twenty-three participants from thirteen cooperating data centres from China, Hungary, Japan, Republic of Korea, the Russian Federation, Ukraine, USA, NEA and IAEA attended the meeting. S. Kopecky from EC-JRC-IRMM, Geel, Belgium attended the meeting as an observer.
The main topics of the meeting included: EXFOR quality control, with additional input from NEA-DB's JANIS system; EXFOR compilation completeness and transmission statistics and first experiences with modified distribution of compilation responsibilities; updates to the EXFOR/CINDA dictionaries; new formats for reporting experimental uncertainties and covariance information and for bibliographic information; compilation software, including a new EXFOR Wizard and digitizing software. Thirty-one working papers were presented at the meeting. The results of the discussions were summarized in nineteen conclusions and fifty-seven actions.
In the session on general EXFOR topics, quality control issues and corrections in the database were discussed. Progress in corrections requested earlier was presented as well as an analysis of formal errors detected in every database update undertaken by NDS. N. Soppera from NEA Databank (attended the meeting as an observer) presented a new checking method developed at NEA-DB – JANIS EXFOR TRANS checker, and a list of formal errors found in this way.
As of 2008 all activities of the NRDC can be followed at their Website (http://www-nds.iaea.org/nrdc/). Each user can check what is new in compilation, how quickly his remarks on EXFOR/CINDA contents are taken into account, and, also send his remarks and read document with EXFOR Formats Description for Users.

EXFOR Editor Workshop, 27 - 29 May 2009

The EXFOR - Editor Workshop was held at IAEA Headquarters, Vienna, Austria, from 27 to 29 May 2009. Sixteen compilers from eleven countries attended this Workshop and six of them were new compilers.
Compilers were introduced to:

- new features of the EXFOR-Editor software,
- techniques of compiling various experimental nuclear data in EXFOR format, and
- codes for digitizing data from figures which are given in scientific articles.

EXFOR-Editor was designed for accelerating article compilation. This software was created and developed at the Russian Nuclear Federal Center, Sarov, Russian Federation, in collaboration with the IAEA Nuclear Data Section. It works under the Windows operating system (Windows 2000 or higher), and possesses a general easy-to-use interface purpose. Major features of the program are:

- creation of new file in EXFOR format with the help of a template and wizard,
- production of the EXFOR file by means of a specialized editor,
- entering of numerical data from tables,
- sorting and ordering of the numerical data,
- present numerical data in graphical form,
- checking the edited file against EXFOR rules,
- it contains information from the EXFOR and LEXFOR dictionaries and manuals to assist in the data file assembly process.

EXFOR Editor Workshop, Vienna, Austria, 27-29 May 2009

3rd Research Coordination Meeting on Development of a Reference Nuclear Database for Ion Beam Analysis, 27 - 30 April 2009

This Coordinated Research Project (CRP) focused on the measurement, evaluation and compilation of cross section data for analytical techniques like Elastic Backscattering, and Nuclear Reaction Analysis using Ion Beams.

Participants presented the results of their work and identified and assigned key tasks required to ensure that the final output of the CRP is achieved. In addition, there were a number of productive discussions concerning issues such as measurements, assessments, evaluations and recommendations. The progress towards the final report is good and the

IBANDL database has been updated with the latest experimental results and evaluations. Recommendations were made to consider a future CRP on Particle-Induced gamma ray emission (PIGE).

IAEA/ICTP Workshop on A&M Data for Fusion Applications, Trieste, Italy, 20 - 30 April 2009

The success of nuclear fusion relies strongly on atomic and molecular data to predict the behaviour of the plasma as well as the interaction of the plasma with the wall materials. Atomic data are essential for spectroscopic diagnosis of the plasma during operation of fusion devices. The diverter region is of critical importance in the extraction of energy as well as the recycling of the tritium fuel. The plasma in this region cools to temperatures at which the formation of molecules has a significant effect on the plasma. Furthermore, particle interactions with wall materials produce atomic and molecular impurities which alter the plasma behaviour. A wealth of new data is available on these topics and these data are essential in the design, modelling and diagnostics of fusion plasma devices.

The purpose of the Workshop was to train potential new researchers in fusion energy in the basics of atomic, molecular and plasma-material interaction data. The Workshop participants were guided through the use of data in fusion-relevant plasma situations and introduced to a variety of sources of data. Workshop exercises made use of specific modelling codes using data from sources available on the Web.

The Workshop was attended by twenty-three students, representing ten Member States. A total of eight lecturers, including IAEA NDS staff participated. All students were invited to give brief oral presentations and one afternoon was devoted to poster presentations. All lecture notes as well as the student presentations are posted on the NDS Atomic and Molecular Data Unit Website at: http://www-amdis.iaea.org/ICTP2009

2nd Research Coordination Meeting of the MANREAD Coordinated Research Project 31 March – 3 April 2009

The 2nd Research Coordination Meeting (RCM) of the Minor Actinides Neutron Reaction Data project (MANREAD) was held at IAEA Headquarters in Vienna from 31 March to 3 April 2009. The main purpose of the meeting was to review the status of this experimental data assessment initiative. Major objectives of these studies were an assessment of the status and availability of the measured nuclear reaction data and an evaluation of the accuracy of the resulting data for the minor actinide isotopes agreed by the MANREAD participants. The list includes data for Np-237, minor U and Pu isotopes, major Am isotopes, and all relevant Cm isotopes. The task assignments decided at the first RCM were reviewed at the meeting, and preliminary discussions on the data assessment format and methodology took place.

The work performed by participants of the RCM was immediately made available online, using a tool based on the 'MediaWiki' software platform. All information related to MANREAD can be accessed on the NDS Website at the link: http://www-nds.iaea.org/manread.

List of participants included:

Anton Wallner (Vera Laboratory, Vienna, Austria),
Vladimir Maslov (National Academy of Sciences of Belarus, Minsk Sosny, Belarus),
Han Yinlu (China Institue of Atomic Energy, Beijing, China),
Frank Gunsing (CEA Saclay, Gif-sur-Yvette, France),
Franz Kaeppeler (Forschungszentrum Karlsruhe, Germany),
Rosa Vlastou-Zanni (National Technical University of Athens, Greece),
Tamas Belgya (Hungarian Academy of Sciences, Budapest, Hungary),
Nicola Colonna (INFN-Sezione di Bari, Bari, Italy),
Yasuki Nagai (Japan Atomic Energy Agency, Ibaraki, Japan),
Boris Fursov (IPPE, Obninsk, Russia),
Rene Reifarth (Gesellschaft fuer Schwerionenforschung, Darmstadt, Germany),
Arjan Plompen (EC-JRC-IRMM, Geel, Belgium),
Alberto Mengoni, Alan L. Nichols and Roberto Capote Noy, Nuclear Data Section, IAEA.

The MANREAD Coordinated Research Project is expected to remain active up to 2011, when the final report will be prepared and issued.

Consultants Meeting on International Database for Irradiated Graphite, 25 – 26 March 2009

The Technical Steering Committee for the International Database on Irradiated Nuclear Graphite Properties held its 11th Meeting from 25 to 26 March 2009 at IAEA Headquarters, Vienna, Austria. The database consists of data on the physical, chemical, mechanical and other relevant properties of irradiated nuclear graphites contributed by Member States and organizations from the Graphite Database Members.

The process of gathering data on the properties of irradiated graphites was completed in summer 2009. This ended the Phase 1 Programme, and in order to fulfil the remaining needs of Member States (Phase 2 Programme) it is proposed to extend the project beyond summer 2009. The success of Phase 1 is evident, and the quality of the Database and its associated QA procedures has met with general approval from its users. The previous Technical Committee Meeting had confirmed that there was significant interest in utilisation of the data for assisting work programmes and interests in various participating Member States. The value of continuing the project as Phase 2 was clearly demonstrated and a rigorous approach to manage the programme adopted. In summary, the Meeting defined Phase 1's output as a Database, and that of Phase 2 would be a Knowledge Base associated with a maintained and possibly further-developed Database. Working arrangements for Phase 2 will be presented for approval at the next Meeting to be held in November 2009.

As of 2010, the Graphite project, will no longer be hosted by the NDS and will move under the auspices of the Nuclear Energy Department, Nuclear Power Division.

Technical Meeting of International Network of Nuclear Structure and Decay Data Evaluators, 23 - 27 March 2009

The 18th meeting of the International Network of Nuclear Structure and Decay Data Evaluators was held at IAEA Headquarters, Vienna, from 23 to 27 March 2009.

This meeting was attended by twenty-two scientists from fourteen Member States, together with IAEA staff involved in

the compilation, evaluation and dissemination of nuclear structure and decay data. The first two days were dedicated to a combination of technical reviews and discussion of papers, addressing particular topics in which progress has been made and problems have been encountered over the previous two years. Specific mass chain activities and administrative issues were debated in the last three days. Problems are being experienced in maintaining suitable numbers of mass chain evaluators (expressed as FTE – Full Time Effort), and these difficulties were extensively discussed at the meeting (particularly with respect to shrinking European involvement). In this connection the efforts of Alan Nichols and Dimitri Balabanski to increase European participation were recognized. A number of talks were presented thanking A. Nichols for his coordination of the Network and wishing him well for his retirement.

Consultants Meeting on Spallation Reactions, 12 – 13 March 2009

The main purpose of this two-day meeting was the preparation of the Satellite Meeting to be held in conjunction with the International Topical Meeting on 'Nuclear Research Applications and Utilization of Accelerators' (AccApp'09, Vienna, 4-8 May 2009), and follow-up activities initiated at the Consultants Meeting on 'Benchmark of Nuclear Spallation Models' held in Vienna on 8 December 2008. The most important features of the Benchmark on Spallation Reactions were agreed and finalized. In addition, a detailed Agenda for the Satellite Meeting of the AccApp'09 Conference was prepared. Meeting was attended by: S. Leray, Y. Yariv, J.-C. David, M. Khandaker, F. Mullhauser (part time) and A. Mengoni.

M. Khandaker presented an overview of the data submitted for the Benchmark by five groups and the tools used for plotting calculated and experimental data. The full list of participants to the Benchmark has been discussed and updated. Various aspects of the organization of the Satellite Meeting on Spallation (SatMeet-SR) reactions have been discussed. F. Mullhauser clarified the organizational aspects for participants in the main Conference and of the SatMeet-SR. A draft of the program of the SatMeet-SR has been prepared. It has been proposed to prepare an 'Evaluation Sheet' which will contain information on the codes and models used by each participant in the Benchmark. This Evaluation Sheet will be discussed at the SatMeet-SR. A discussion on the plan for activities necessary to complete the Benchmark objectives took place.

It was proposed to hold a meeting of a peer-review panel (small consultants' meeting, approximately 5 participants) in October 2009. Additionally, a proposal for a Workshop/Specialist Meeting to conclude on physics outcome of the Benchmark at the beginning of 2010 was discussed.

2nd Research Coordination Meeting on Data for Surface Composition Dynamics Relevant to Erosion Processes, 11 - 13 March 2009

The Coordinated Research Project (CRP) on 'Data for Surface Composition Dynamics Relevant to Erosion Processes' held its second RCM from 11 to 13 March 2009. This CRP is organized to increase understanding of erosion processes in fusion devices, such as ITER. Plasma constituents, such as ions and electrons interact with the solid wall materials of fusion devices, leading to erosion of wall materials and later re-deposition of those materials. Several different processes can take place in such interactions, such as physical sputtering, reflection, and various chemical reactions. Often, the details of such interactions are not well enough known to understand and predict erosion processes in fusion devices. In many cases even the pathways of eroded materials are not well known. This CRP uses experimental and theoretical techniques to address these issues, resulting in a better overall understanding of erosion processes and possible methods to mitigate such effects in future fusion devices.

Nine experts on particle surface interaction attended the meeting. All participants presented progress reports detailing active research on the data needs identified at the first research coordination meeting. A very good cooperation between theoretical and experimental researchers has been achieved and a large amount of new data has been generated. These data are being incorporated into the ALADDIN database of the IAEA A+M Data Unit. The collaboration with the CRP participants has been very useful in the new design of the ALADDIN Web interface for Particle Surface Interactions. Since the CRP is well on the way to fulfilling the goals as set forth in the original proposal, a successful conclusion to the CRP can be anticipated in 2011.

3rd Research Coordination Meeting on Atomic Data for Heavy Element Impurities in Fusion Reactors, 4 - 6 March 2009

The Coordinated Research Project (CRP) on 'Atomic Data for Heavy Element Impurities in Fusion Reactors' held its final RCM on 4-6 March 2009. The objective of this CRP is to gather and generate new data relevant to heavy element modelling in fusion reactors. These data are needed to give a better description of collisional and radiative processes and to provide new data to calculate total radiated power as well as undertake spectral analysis.

Eleven experts on the properties of heavy elements of relevance to fusion energy research attended the meeting. Participants summarized their accomplishments with respect to the revised work plan formulated at the second RCM. The work plan for the CRP has been substantially completed. Large quantities of data were measured and calculated, and have been tabulated in electronic form – these data are already available on several databases, and will be included in the IAEA A+M database. A number of very important comparisons were made between experiment and theory and among different theories in order to assess the validity of the different techniques. Data have been applied to collisional-radiative models and used in analysis of spectra observed in different plasma devices. As planned, the overall result of the CRP is a significant increase in the available data for heavy element impurities in fusion devices.

Much more data are needed for the modelling of fusion plasmas, and a single coordinated research project cannot be expected to completely fulfil all such data needs. Significant additional data are needed for many ionization stages of elements such as the inert gases and tungsten. The participants agree that additional benefit would be gained from initiating another CRP at a future date to concentrate on tungsten, in light of the importance of this element in future fusion devices and the extreme complexity of the energy levels of the numerous tungsten ions.

Coordinated Research Projects

IAEA Coordinated Research Projects (CRPs) are a valuable mechanism for stimulating research in IAEA Member States of relevance to the IAEA programmes. Details of the CRPs of the Nuclear Data Section, both active and recently completed, can be found at: http://www-naweb.iaea.org/napc/nd/crps.asp

Nuclear Data Services – contact points

For services to customers in USA and Canada:
US National Nuclear Data Center, Bldg. 197D, Brookhaven National Laboratory, P.O. Box 5000, Upton, NY 11973-5000, USA. Tel. +1 631-344-2902; Fax +1 631-344-2806; Email: nndc@bnl.gov; Worldwide Web: http//www.nndc.bnl.gov/ For information regarding on-line services, contact: B. Pritychenko: pritychenko@bnl.gov. For information regarding general NNDC services, contact M. Blennau: blennau@bnl.gov

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Neutron data: Russia Nuclear Data Center, Centr Jadernykh Dannykh (CJD), Fiziko-Energeticheskij Institut, Ploschad Bondarenko, 249020 Obninsk, Kaluga Region, Russian Federation. Tel. +7 08439-9-8982; Fax +7 095-230-2326; E-mail: manokhin@ippe.obninsk.ru. Worldwide Web http://rndc.ippe.obninsk.ru/ Contact: V.N. Manokhin.
Charged-particle data: Russia Nuclear Structure and Reaction Data Center (CAJAD), Kurchatov Institute, Kurchatov Square 1, 123 182 Moscow, Russian Federation. Tel. +7 095-196-9968; Fax +7 095-882-5804; Email: chukreev@polyn.kiae.su Contact: F.E. Chukreev.
Photonuclear data: Centre for Photonuclear Experiments Data, Centr Dannykh Fotoyadernykh Eksperimentov (CDFE), Skobeltsyn Institute of Nuclear Physics, Lomonosov Moscow State University, Leninskie Gory, 119 922 Moscow, Russian Federation. Tel. +7 095-939-3483; Fax +7 095-939-0896; Email: varlamov@depni.sinp.msu.ru or varlamov@depni.npi.msu.su. Worldwide Web http://depni.sinp.msu.ru/cdfe/ Contact: V.V. Varlamov.

For services to customers in China:
China Nuclear Data Center, China Institute of Atomic Energy, P.O. Box 275(41), Beijing 102413, China. Tel. +86 10-6935-7275; Fax +86 10-6935-7008; Email: gezg@iris.ciae.ac.cn Contact: Ge Zhigang.

Computer codes of US origin to all countries:
Radiation Safety Information Computational Center (RSICC), Oak Ridge National Laboratory, P.O. Box 2008, Oak Ridge, TN 37831-6362, USA. Tel. +1 865-574-6176; Fax +1 865-574-6182; Email: pdc@ornl.gov. Worldwide Web http://epicws.epm.ornl.gov/ (there are charges and release restrictions)

Computer codes of non-US origin to all countries:
NEA Data Bank, see above, contact: E. Sartori, ext. 1072; Email: sartori@nea.fr (there may be release restrictions)
IAEA Nuclear Data Section offers data centre services primarily to non-OECD countries (except Russian Federation and China, see above). However, most products advertised in this Newsletter, specifically INDC reports, IAEA-NDS-documents, etc., are provided upon request to customers in all countries. For on-line services see the first page of this Newsletter. Users of countries in Latin America and Caribbean may use IAEA-NDS mirror at Worldwide Web http://www-nds.ipen.br
Users in India and neighbouring countries may use IAEA-NDS mirror at Worldwide Web http://www-nds.indcentre.org.in

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