IAEA
International Atomic Energy Agency

Nuclear Data Newsletter

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

ISSN 0257-6376

No. 63, July 2017

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From the Section Head

Greetings from a warm and sunny Vienna!

The IAEA has asked the Nuclear Data Section to explore initiatives of "Crowdsourcing", whereby the assistance of the 'crowd' is sought to help solving challenging problems (not to be confused with "Crowdfunding" – we want your brains not your money).
First initiatives on Atomic and Molecular data for damage simulations are underway, and more ideas are welcome, especially since the IAEA is willing to assist in launching such projects.

We are going to play a larger role in worldwide nuclear data evaluation, as a follow-up of the Collaborative International Evaluated Library Organization (CIELO) initiative. Together with the NEA, who has hosted CIELO as a Working Party on International Nuclear Data Evaluation Co-operation (WPEC) subgroup for years, a further collaboration on nuclear data evaluation and validation will be set up, and a technical meeting will be organized 18-21 December 2017.

One of the challenges we still face for the future of nuclear data evaluation is a good control over the nuclear fission process, based on sound physics. Several nuclear model codes exist which predict cross sections for actinides, but a general methodology seems to be lacking. For that reason, a new Coordinated Research Project (CRP) on the Reference Input Parameter Library (RIPL) has been started, now entirely devoted to the crucial actinide data for better analysis of fission cross sections.

The first half year we also hosted the final Research Coordination Meeting (RCM) on the IRDFF dosimetry library, the Nuclear Reaction Data Centres (NRDC) meeting for the development of the EXFOR database, and the RCM on Beta-delayed neutron emission as well as Consultants' Meeting on Modern R-matrix codes.



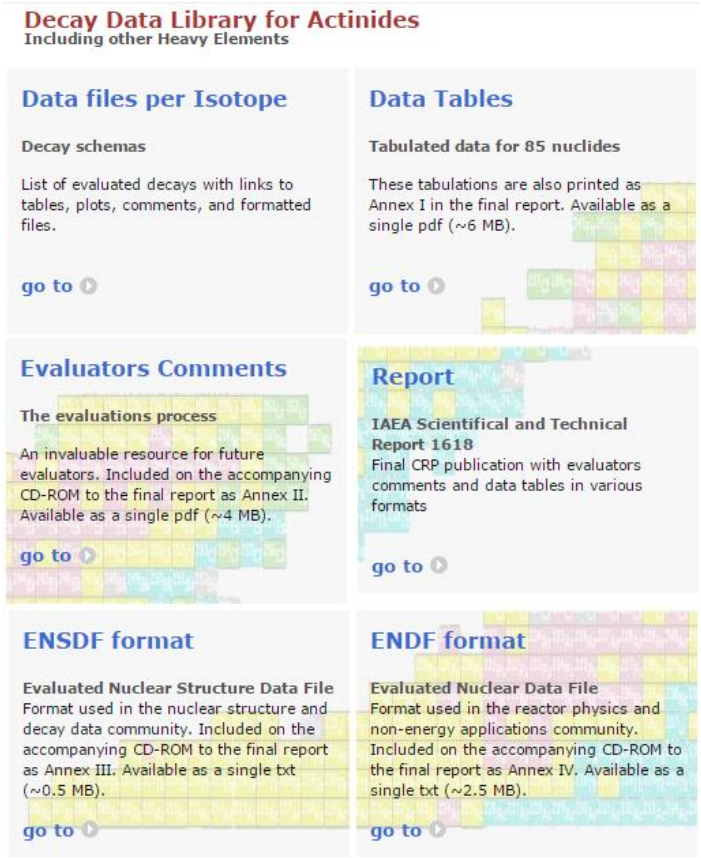
In preparation for the autumn activities

Arjan Koning-Section Head and Rosalinda Rangel Alvarez-Section Secretary, Nuclear Data Section

Computer Codes, Data Libraries and Web News

Decay Data Library for Actinides

The evaluations of decay data of actinides and other heavy elements produced by an IAEA CRP (STI/PUB-1618) are now available on the Web. Data can be downloaded in HTML, ENSDF, and ENDF formats allowing for further processing. In addition to the tabulated data, the user can also view the decay schemes in graphical form. The detailed comments provided by the evaluators are an invaluable resource for the proper understanding of the data, and form the basis for future evaluations. The Decay Data Library for actinides and other heavy elements can be accessed at: https://www-nds.iaea.org/act_ddl/.



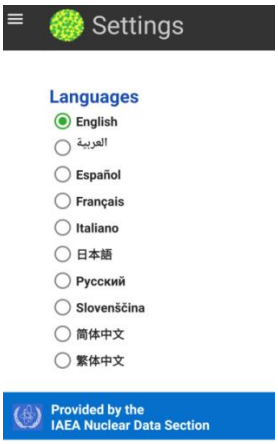
Portable EMPIRE-3.2.3 for Windows-64 - System for nuclear reaction modelling and nuclear data evaluation

Experimental version of the package for MS-Windows (64-bit) includes Empire-3.2.3, Rev. 4600 (2017-02-13), full EXFOR in XC4 format (vers. 2017-04-24), executables for Windows-64, source codes, gfortran (64, 32-bit) compiler, Tcl/Tk binaries, Python, Postscript-viewer, etc. The package does not require installation nor compilation and is available from https://www-nds.iaea.org/cdroms/#EMPIRE-3.2.3.

Web mirror-site in Russian Federation

New Nuclear Data Services mirror-site is established and can be accessed at http://www-nds.atomstandard.ru/. It is hosted at the private institution "Atomstandart" in Moscow. The site will provide EXFOR, ENDF, CINDA, IBANDL Web database retrieval systems, as well as specialized systems for EXFOR compilers, ENDF and ENSDF evaluators.

Isotope Browser Languages



The app for mobile devices on nuclear structure and decay data is now available in 10 languages.

Nuclear data scientists, keen to see the app translated in their mother language, volunteered to do the translation, and this will help the diffusion of the app - particularly among students. Further languages under consideration, following users' feedback, are German and Portuguese.

To broaden the dissemination of nuclear data to Member States, the Section plans to open distribution channels aimed at China. The first platform being contacted is Tencent 腾讯+. If you wish to contribute to this effort, and your language is not yet in the list, please feel free to contact us.

Apple https://itunes.apple.com

Android https://play.google.com

Amazon kindle https://www.amazon.com

BROND-3.1

Russian evaluated neutron data library, issued in 2016 is now available from the IAEA-NDS Web site via Web Retrieval System: http://www-nds.iaea.org/exfor/endf.htm, and for downloading from ENDF Archive: https://www-nds.iaea.org/public/download-endf/BROND-3.1/n-index.htm.

The library contains data of 372 materials with incident energy mostly up to 20 MeV (some up to 150 and 200 MeV). This is the data source: https://vant.ippe.ru/en/brond-3-1.

NDS Meeting Reports

(TM = Technical Meeting, RCM = Research Coordination Meeting, CM = Consultants' Meeting, WS = Workshop, CRP = Coordinated Research Project)

Consultants' Meeting on the Release of Neutron Standards

24-27 July 2017, Vienna, Austria
Scientific Secretary: Roberto Capote Noy
7 participants and IAEA staff



Participants of the CM on Neutron Standards

The meeting was convened to bring together core experts from the neutron standards community with the aim to review the final release of Neutron Standards 2017 and discuss the estimated uncertainties. Dr. Allan Carlson (NIST) served as Chair of the group while Dr. V.G. Pronyaev (Atomstandard) was the rapporteur. The release of Neutron Standards 2017 was agreed, which is a significant milestone of the IAEA Data Development project that has been running since 2008 to update the GMA experimental database and data used in the R-matrix fit. In addition to the existing Neutron Standards (see Neutron Standards), the new evaluation adds the ^{197}Au(n,g) MACS at 30 keV as an important standard for capture cross section measurements for astrophysical applications, and also defines the reference cross sections which are not used as the standards but are included in the combined fit of the standards and are important for reactor applications – the ^{238}U(n,g) cross section between 10 and 100 keV, and the ^{239}Pu fission cross section from thermal to 20 MeV. The other important reference cross sections and spectra which were evaluated are the prompt gamma-production cross sections for neutrons in the energy range from thermal to 15 MeV, the ^{252}Cf spontaneous fission neutron spectrum, the ^{235}U(nth,f) prompt fission neutron spectrum and the high energy reference cross sections for the ^{235}U(n,f), ^{238}U(n,f), ^{209}Bi(n,f) and ^{nat}Pb(n,f) reactions for the neutron energy range 30-1000 MeV.

The official release of the IAEA 2017 standards with full covariance matrices should be completed in December 2017.

Consultants' Meeting on R-Matrix Codes for Charged-particle Reactions in the Resolved Resonance Region

28-30 June 2017, Vienna, Austria
Scientific Secretary: Paraskevi Dimitriou
8 participants and IAEA staff



Participants of the CM on R-Matrix Codes

The main purpose of the meeting was to discuss the results of a test exercise that was defined and assigned to all participants at the previous meeting held in December 2016. The aim of the exercise was to compare the R-matrix and fitting algorithms implemented in the codes by comparing the resulting resonance parameters and cross sections with their associated uncertainties. Five codes were used in the exercise: AMUR, AZURE2, RAC, SFRESCO and SAMMY. The results obtained from these codes were compared and further actions were proposed. The details of the presentations and technical discussions, as well as additional actions that were proposed are summarized in the meeting report INDC(NDS)-0737. The presentations are available from https://www-nds.iaea.org/index-meeting-crp/CM-R-matrix-2016/.

Third Research Coordination Meeting on Plasma-wall Interaction with Irradiated Tungsten and Tungsten Alloys in Fusion Devices

27-30 June 2017, Vienna, Austria
Scientific Secretary: Hyun-Kyung Chung
21 participants and IAEA staff



Participants of the RCM on Irradiated Tungsten

Seventeen out of nineteen CRP projects were presented. The participants reviewed their work over the period since the previous meeting, and reported on the coordinated activities of Thermal Desorption Spectroscopy (TDS) Round Robin Experiments and a comparison workshop on TDS modeling codes. Seventeen groups participated in the TDS Round Robin Experiments including three groups outside the CRP. Current status on fundamental modelling and its connection to experiments, production and characterization of damage, and hydrogen (tritium) retention in damaged tungsten were reviewed. The final report of the CRP as well as the databases on molecular dynamics calculations of collisional cascades after irradiation and density functional theory calculations of fusion relevant materials were discussed.
The presentations are available at https://www-amdis.iaea.org/CRP/IrradiatedTungsten/RCM3/.

First Research Coordination Meeting on Data for Atomic Processes Related to Neutral Beams in Fusion Plasma

19-21 June 2017, Vienna, Austria
Scientific Secretary: Hyun-Kyung Chung
13 participants and IAEA staff

Thirteen participants from ten countries (Australia, Canada, China, Germany, France, Hungary, South Korea, Spain, UK and USA) attended this meeting. Neutral beam injection is a standard method to heat and control the plasma in fusion experiments. Neutral beams also have important diagnostic uses, both via photoemission from the beam neutrals due to interaction with the plasma and via photoemission from plasma impurities after interaction with the beam. Modelling of beam penetration into the plasma and of the spectroscopic signals relies on detailed data for atomic processes that involve the neutral beam particles. The CRP is planned to provide evaluated and recommended data for the principal atomic processes relevant to heating and diagnostic neutral beams in fusion plasmas. At the 1st meeting, CRP participants presented their current and future research plans, and discussed coordinated activities to produce and evaluate atomic data needed for neutral beam injection. The presentations are available a
https://www-amdis.iaea.org/CRP/NeutralBeams/RCM1/



Participants of the RCM on Neutral Beams

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Third Research Coordination Meeting on Reference Database for Beta-delayed Neutron Emission Evaluation

12-16 June 2017, Vienna, Austria
Scientific Secretary: Paraskevi Dimitriou
20 participants and IAEA staff



Participants of the RCM on Beta-delayed Neutron Emission Evaluation

Participants reported on and reviewed the overall progress in the objectives and main outputs of the CRP, which consist of a Reference Database of beta-delayed neutron emission data, both microscopic and macroscopic and a comprehensive final technical report. They agreed on the structure of the web interface of the new reference database, as well as on the content, structure and publication of the final document of the CRP. Summary reports of the presentations as well as an outline of the final technical document are given in the meeting report INDC(NDS)-0735. The presentations can be found on http://www-nds.iaea.org/beta-delayed-neutron/index_3rcm.html.

First Research Coordination Meeting on Recommended Input Parameter Library for Fission Cross Section Calculations

6-9 June 2017, Vienna, Austria
Scientific Secretary: Roberto Capote Noy
16 participants and IAEA staff



Participants of the RCM on RIPL

Advanced modelling codes play a significant role in nuclear data evaluation to meet the needs of updated and more reliable data for applications. Modelling codes require substantial numerical input, therefore the IAEA has worked extensively since 1993 to produce a library of validated nuclear-model input parameters, referred to as the Reference Input Parameter Library (RIPL). The RIPL-3 library was released in January 2009, and is available on the Web through http://www-nds.iaea.org/RIPL-3/, becoming a *de-facto* reference for input parameters.

However, recently it was recognized at an IAEA consultants meeting that RIPL input parameters for fission have not been comprehensively validated against available experimental data. A large variability in calculated fission cross sections is observed due to the use of different fission formalisms, implementation in the codes, and/or combination of parameters. Due to the increasing importance of modelling in nuclear data evaluation, the improvement of fission input parameters is considered a high priority.

To meet these needs, a new IAEA CRP has started. CRP plans were made for an improved theoretical derivation of fission barriers and associated parameters along the fission path, as well, as to define an unique formulation of level densities that allow direct comparison of fission results between major modelling codes (EMPIRE, Talys, CoH, CCONE, UNF, etc). The summary report INDC(NDS)-0734 is in preparation and all presentations at the meeting are available from: https://www-nds.iaea.org/index-meeting-crp/RIPL-4/RCM1/.

Technical Meeting of the Nuclear Reaction Data Center (NRDC) Network

23-26 May 2017, Vienna, Austria
Scientific Secretary: Naohiko Otsuka
18 participants and IAEA staff



Participants of the TM of NRDC

Twelve cooperating data centres from China, Hungary, India, Japan, Korea, Russia, Ukraine, USA, OECD NEA and IAEA were represented at the meeting. Main topics of the present meeting were the EXFOR transmission statistics, EXFOR coverage and quality control, revision of coding rules and manuals, EXFOR/CINDA dictionaries as well as improved tools for compilation and dissemination. It was reported that a recent literature survey based on CINDA found 585 old journal articles (mainly proton and alpha-induced reaction data) for further compilation. An analysis of the 14 MeV (n,n+x) double differential cross sections from the Osaka University OKTAVIAN facility showed that the existence of several versions of the data sets are mainly due to repetition of measurements with three different sample geometries. Two working papers were presented and discussed for capture yields from the ORELA facility (treatment of capture yield divided by areal density, resonance parameters and cross sections affected by a bug in the computer program processing the ORELA 40 m flight station). Development of a new output format for fission fragment yields (similar to the computational format) was proposed, and was supported by the participants. The data centres were also informed about the major progress in compilation of time-of-flight spectra (transmissions, reaction yields) measured at n_TOF and GELINA since the last meeting. A summary report of the meeting is available as INDC(NDS)-0736. All progress reports, working papers and slides are available on the meeting web page (http://www-nds.iaea.org/nrdc/nrdc_2017/).

Technical Meeting of the International Nuclear Structure and Decay Data (NSDD) Network

22-26 May 2017, Berkeley, CA, USA
Scientific Secretary: Paraskevi Dimitriou
43 participants and IAEA staff

This meeting was attended by 38 scientists from 12 Member States and the IAEA, all of whom are concerned primarily with the dissemination of nuclear structure and decay data. Participants discussed their work as well as problems of common interest, particularly with respect to the active membership of the multinational mass chain evaluation team responsible for ENSDF. Significant segments of the meeting were committed to three parallel sub-committee meetings and subsequent joint sessions devoted to (a) Policies and Procedures, (b) Codes and Formats, and (c) Experimental activities. Sessions were also devoted to an IAEA project to improve specific ENSDF analysis codes, and the development of new codes for application to ENSDF. Other relevant measurements, planned tabulations and new facilities were also discussed. A summary of the meeting, data centre reports, various proposals considered, technical discussions, and actions agreed by the participants, as well as recommendations/conclusions are presented in the summary report INDC(NDS)-0733. Presentations are available on http://www-nds.iaea.org/nsdd/.

Consultants' Meeting on Evaluation of Nuclear Moments

27-30 March 2017, Vienna, Austria
Scientific Secretary: Paraskevi Dimitriou
11 participants and IAEA staff

Participants reviewed the current status of measurements and methods applied to extract the magnetic dipole and electric quadrupole moments of the nucleus, and discussed the corrections necessary to obtain a set of consistent data for evaluation. Agreement on the treatment of diamagnetism, hyperfine anomaly, time-dependent measurements of short-lived states and the electric field gradient for quadrupole moments was reached and a plan of action for producing a table of recommended best values was adopted. The discussions and conclusions as well as summaries of the presentations can be found in the meeting report INDC(NDS)-0732. The meeting presentations are available on https://www-nds.iaea.org/index-meeting-crp/CM-NM_2017/.

Third Research Coordination Meeting on Testing and Improving the IAEA's International Reactor Dosimetry and Fusion File

20-24 March 2017, Vienna, Austria
Scientific Secretary: Andrej Trkov
12 participants and IAEA staff



Participants of the RCM on IRDFF

The purpose of the Meeting was to review the developments since the previous Meeting, reflected in the contributions by the participants. A number of reactions were added for neutron dosimetry up to 100 MeV and new integral experiments were performed for the validation of the library. It was decided to include all the corrections and extensions to the IRDFF library in a new release named IRDFF-2.0.
Further information can be found on the CRP web page https://www-nds.iaea.org/IRDFFtest/
and on the RCM web page
https://www-nds.iaea.org/IRDFFtest/RCM3/index.htm.

Joint ICTP-IAEA School on Atomic Processes in Plasmas

27 February-3 March 2017, ICTP, Trieste, Italy
Directors: Hyun-Kyung Chung (IAEA), Bastiaan J. Braams (IAEA), Yuri Ralchenko (NIST, USA)
56 participants and IAEA staff



Participants of the School on Atomic Processes in Plasmas

Fifty-six participants from 19 Member States attended the event held at the Abdus Salam International Centre for Theoretical Physics (ICTP) in Trieste, Italy. The purpose of the School was to provide lectures, computer code training and information exchange for young students and early career plasma physicists, plasma spectroscopists, users of atomic data for fusion, astrophysics and laser and plasma applications, and atomic and molecular physicists interested in plasma spectroscopy to expand their knowledge of plasma spectroscopy and atomic processes in plasmas.
The lectures and poster presentations are available at https://www-amdis.iaea.org/Workshops/ICTP2017/

In Memoriam

Anatoliy Borisovich Pashchenko



Anatoliy passed away on 25 April 2017. He devoted much of his professional effort to activation data and as an IAEA employee in early 1990' organized a number of meetings and several CRPs dedicated to this important topic. Anatoly will be greatly missed by all international nuclear data community.

Selected Charts, Reports and Documents

INDC(ARG)-0014 Cross Sections and Thick Target Yields of Alpha-Induced Reactions, prepared by O. Bonesso, *et al.*, February 2017.

INDC(CPR)-0062 Proceedings of the Seventh AASPP Workshop on Asian Nuclear Reaction Database Development , edited by G. Chen and N. Otuka, June 2017.

INDC(FR)-0073 Mesures des Sections Efficaces Totale et (n,2n) sur ^{241}Am, Doctor Thesis C. Sage, March 2017.

INDC(IND)-0049 Measurements of Neutron Capture Cross Sections on ^{70}Zn at 0.96 and 1.69 MeV, prepared by B. Lalremruata, *et al.*, March 2017.

INDC(NDS)-0720 Summary Report from the Third Research Coordination Meeting on Data for Erosion and Tritium Retention in Beryllium Plasma-facing Materials, 15-17 June 2017, Vienna, prepared by H.-K. Chung and B.J. Braams, May 2017.

INDC(NDS)-0723 Summary Report from the Joint ICTP-IAEA School on Atomic Processes in Plasmas, 27 February-3 March 2017, Trieste, Italy, prepared by H.-K. Chung and Y. Ralchenko, June 2017.

INDC(NDS)-0728 Summary Report from the Technical Meeting on Uncertainty Assessment and Benchmark Experiments for Atomic and Molecular Data for Fusion Applications, 19-21 December 2016, Vienna, prepared by H.-K. Chung, *et al*., February 2017.

INDC(NDS)-0729 Testing the Goodness of Gaussian and Lognormal Emulators via Their Statistically Converged Probability Distribution Moments, prepared by D.L. Smith, D. Neudecker and R. Capote Noy, March 2017.

INDC(NDS)-0730 Summary Report from the Third Research Coordination Meeting on Atomic and Molecular Data for State-Resolved Modelling of Hydrogen and Helium and Their Isotopes in Fusion Plasma, 14-16 March 2016, Vienna, prepared by B.J. Braams, *et al*., March 2017.

INDC(NDS)-0732 Summary Report from the Consultants' Meeting on Evaluation of Nuclear Moments, 27-30 March 2017, Vienna, prepared by N.J. Stone, A.E. Stuchbery and P. Dimitriou, June 2017.

INDC(NDS)-0736 Summary Report from the Technical Meeting on International Network of Nuclear Reaction Data Centres, 23-26 May 2017, prepared by N. Otuka and O. Cabellos, July 2017.

INDC(SPN)-0003 New Radiative Neutron Capture Measurements of ^{207}Pb and ^{209}Bi, Doctor Thesis C. Domingo Pardo, February 2017.

NEW RELEASE:

Chart of the Nuclides 2014 JAEA Nuclear Data Centre. Available cost-free on request only for **teachers and scientists from developing countries.**

Karlsruher Nuklidkarte *Wall chart of the nuclides and folding chart with booklet, 9th edition (2015).* Available cost-free on request only for **teachers and scientists from developing countries.**

Also Available:

Chart of the Nuclides 2010 JAEA Nuclear Data Centre.

Chart of the Nuclides *(Wall chart) prepared by Knolls Atomic Power Laboratory (KAPL) and distributed by Lockheed Martin (17th edition, revised 2009).* Available cost-free on request only for **teachers and scientists from developing countries.**

Karlsruher Nuklidkarte *Wall chart of the nuclides, 7th edition (2006).* Available cost-free on request only for **teachers and scientists from developing countries.**

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Feedback
Your comments, suggestions and questions can be sent to:
NDS.Contact-Point@iaea.org

NDS Staff Items

More details about the Nuclear Data Section Staff can be found at: http://www-naweb.iaea.org/napc/nd/aboutus.asp.

We welcome **Jean-Christophe Sublet** who joined the Nuclear Data Section on 19 March 2017 as the Unit Head of the Nuclear Data Services Unit. He has had a long career in nuclear data for both fission and fusion, and was working for CEA, Cadarache and CCFE, Culham, among others. He has developed activation data for the FISPACT code which is used worldwide for activation calculations, and is also well experienced in ENDF data formats and its processing. As the new Unit Head, he will be responsible for the management of our computational data services which includes the EXFOR database, all nuclear structure and reaction databases that the IAEA hosts, and our website. He will also technically contribute to the development of radiation damage data and the TENDL database.



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

For services to customers in OECD/NEA Data Bank member countries:
NEA Data Bank, OECD Nuclear Energy Agency, Le Seine Saint-Germain, 12 blvd des Iles,
F-92130 Issy-les-Moulineaux, France.
Tel. +33 1 4524 (plus extension); Fax +33 1 45241110;
Email: Oscar.cabellos@oecd.org; data@oecd-nea.org; Worldwide Web: http://www.oecd-nea.org/databank/ contact: O. Cabellos, ext. 1084.

For services to the customers from the former USSR:
Neutron data: Russia Nuclear Data Center, Centr Jadernykh Dannykh (CJD), Fiziko-Energeticheskij Institut, Ploschad Bondarenko,1,
249033 Obninsk, Kaluga Region, Russian Federation.
Tel. +7 08439-9-5803; Fax +7 08439-68235;
Email: dvoytenkov@ippe.ru; Worldwide Web: http://www.ippe.ru/podr/cjd; contact: D.A.Voitenkov.
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. +7 495-939-3483; Fax +7 495-939-0896;
Email: varlamov@depni.sinp.msu.ru; Worldwide Web: http://cdfe.sinp.msu.ru/; 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 10-6935-8119; Email: gezg@ciae.ac.cn; contact: Ge Zhigang.

Computer codes of US origin to all countries (there are charges and release restrictions):
Radiation Safety Information Computational Center (RSICC), Oak Ridge National Laboratory,
P.O. Box 2008, Oak Ridge, TN 37831-6003, USA.
Tel. +1 865-574-6176; Fax +1 865-241-4046;
Email: pdc@ornl.gov

Computer codes of non-US origin to all countries (there may be release restrictions):
NEA Data Bank (see above)
Email: Juan.Galan@oecd.org; contact: J. Galan, ext. 1008.

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, IAEANDS documents, etc., are provided upon request to customers in all countries.
IAEA-NDS on-line services at Worldwide Web: http://www-nds.iaea.org/
Users in India, China, Russia and neighbouring countries may use
IAEA-NDS mirror at Worldwide Web:
http://www-nds.indcentre.org.in (India); http://www-nds.ciae.ac.cn/ (China); http://www-nds.atomstandard.ru/ (Russia).

Impressum

Nuclear Data Newsletter No. 63, July 2017

The Nuclear Data Newsletter is prepared by
the Division of Physical and Chemical Sciences,
Department of Nuclear Sciences and Applications

International Atomic Energy Agency
Vienna International Centre, PO Box 100, 1400 Vienna, Austria
Printed by the IAEA in Austria, August 2017

17-2434

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