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# Nuclear Data Newsletter

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# From the Section Head

Greetings from Vienna! We are halfway through the year 2018 and it is high time to give you an update of our activities.

The Isotope Browser, which you can get in the Apple and Google App stores, has passed the 70 000 downloads, in a period of 4 years. It is hard to believe that there are so many nuclear scientists around, and I assume that there are many students downloading this to see whether a nuclear future is something for them.

The production of a new photonuclear data library is in full flow. As you may know, we are currently running a Coordinated Research Project (CRP) on photon strength functions and photonuclear reactions, which will end early next year, and we invite specialists to Vienna, working in relatively small groups, to help accomplishing this library.

Needs for improved decay data from both, an experimental and evaluation point of view for applications such as decay heat and anti-neutrino spectra calculations were reviewed by an international team of experts at a meeting held in February in Vienna and an updated list of priority nuclides for total and high-resolution gamma-ray spectroscopy measurements is in preparation.

The Nuclear Reaction Data Centre (NRDC) meeting was held in May in Bahadurgarh, India. The meeting principally revolves around the EXFOR database of experimental nuclear reaction data. Besides the division of work, compilation activities and completeness, smart compilation methods were discussed, to reduce the turnaround time between publication of experimental results and adoption of the numerical data in EXFOR.

The Nuclear Data Section is continuing the CIELO activities, and now the evaluation part of this network is called the International Nuclear Data Evaluation Network (INDEN), and the first meeting on developing new evaluations for major actinides in the resonance range has been held. In the rest of 2018 meetings on structural materials and light nuclides will follow. We, and especially Roberto Capote Noy and Andrej Trkov, have been part of several publications related to CIELO, as published now in Nuclear Data Sheets.

The first half year of 2018 ended with the meeting of the International Nuclear Data Committee. The INDC comes together to advise on our programme and to discuss whether we are on the right track. It was an enlightening meeting, which gave rise to many new ideas for the coming years. We will do our best to make that all visible on our website, and provide even more complete databases and data libraries.



*Ready for holidays*

***Arjan Koning-Section Head, Nuclear Data Section***

# Computer Codes, Data Libraries and Web News

## JENDL/AD-2017

JENDL Activation Cross Section File for Nuclear Decommissioning 2017 (JENDL/AD-2017) is designed to meet the needs of radioactive inventory evaluation on decommissioning of nuclear facilities. This file provides the data of neutron-induced nuclear reactions (except for Fe-56 for proton incident one): total production cross sections (MF3) of radioactive and stable nuclides, branching ratios (MF9) and partial production cross sections (MF10) for the ground and isomer states of nuclides. A total of 311 nuclides have been selected, since their nuclear reactions produce 221 nuclides which are important for dose and clearance evaluations. The energy range of incident neutron (proton) is from 1.0e-5 eV (1 MeV) to 20 MeV. The pointwise data are made at temperatures of 0 K and 293.6 K. In addition, the other file expressed by MF10 instead of MF9 is prepared to generate an ACE-format file by the NJOY code. This is the data source: https://wwwndc.jaea.go.jp/ftpnd/jendl/jendl-ad-2017.html.

## GRUCON-Evaluated Data Processing Package

(V.V. Sinitsa, NRC "Kurchatov Institute", Moscow, Russia)

This package (IPPE-NRCKI, 1980-2017) is a system of modules for evaluated nuclear data processing for production of detailed and multi-group working libraries for transport calculations in reactor physics and radiation shielding applications (see INDC(CCP)-344). From this version onwards, it is distributed with the source code. The package can be downloaded from our webpage: https://www-nds.iaea.org/grucon/ .

## Multi-platform Portable EMPIRE-3.2.3

### System for nuclear reaction modelling and nuclear data evaluation

Development version of the package for MS-Windows (64-bit), MacOSX and Linux includes Empire-3.2.3, Rev. 4600 (2017-02-13), full EXFOR in XC4 format (vers. 2017-04-24), executables for each operating system, 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.

## Livechart 3D

A 3D-plotting web application is now part of the Livechart set of tools. Each axis of the plot can be linked to quantities like Q-values, separation energies, fission yields, charge radius, and more will be linked in the future. The so called “adaptive design” of the page, and the plotting technology implemented, make it possible to display LC3D on mobile devices as well. The plotting is interactive, it can be rotated and zoomed using the mouse – or fingers on touch screen. Filter options are present to refine the data sector displayed, and by clicking on a nuclide a detailed page on structure and decay data is opened. Even though some older browser versions do not support the technology adopted, more than 90% of Livechart users are already enabled, a figure that will increase over time. LC3D can be accessed within a link on www-nds.iaea.org/livechart, or directly through https://www-nds.iaea.org/relnsd/vcharthtml/lc3d.html.

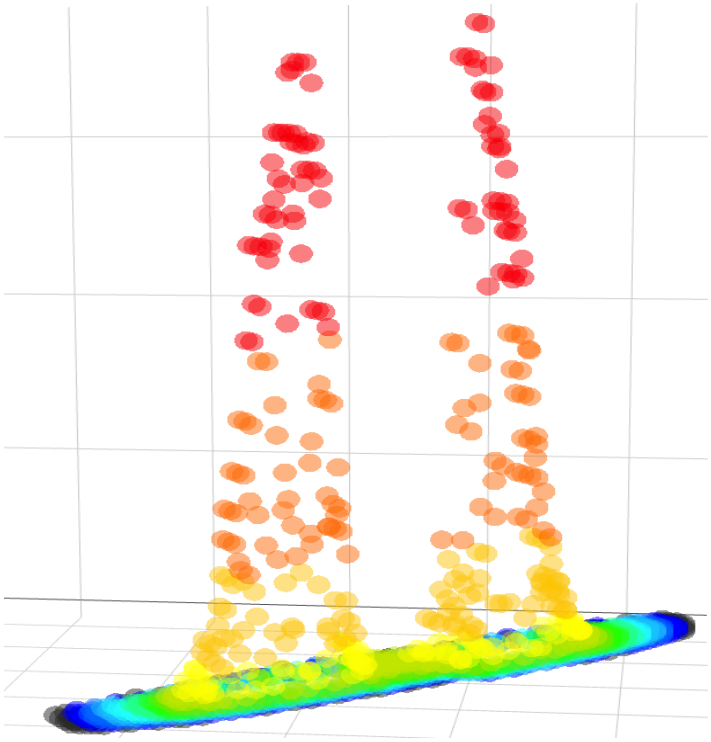


*Image captured fom Livechart:*
*X axis: N, number of neutrons; Y axis: Z, number of protons;*
*Z axis: 239-Pu thermal neutron cumulative fission yield*

**Apple**
https://itunes.apple.com

**Android**
https://play.google.com

**Amazon kindle**
https://www.amazon.com

## TENDL-2017

New release of the TALYS Evaluated Nuclear Data Library, TENDL-2017, is now available from https://tendl.web.psi.ch/tendl_2017/tendl2017.html. and is succeeding TENDL-2015. The collection contains complete ENDF-6 formatted data files, including covariance data, and up to 200 MeV, for 2813 isotopes (all stable or with half-life >1sec) for incident neutrons, photons, protons, deuterons, tritons, Helium-3, and alpha particles.

Specific features of the neutron files:

- All cross-section covariance data are now in MF33, including resonance range, i.e. no MF32 (which are still available in the TENDL special purpose files).
- Revision of the so-called 'best' TALYS input files for many fission products and fusion-relevant materials, performed by N. Dzysiuk at NRG for the European F4E and CHANDA projects.
- Adoption of U235,238, Pu239 from the NEA-WPEC/CIELO collaboration.
- Adoption of all-natural isotopes up to, and including, F-19 from ENDF/B-VIII.
- Up to 300 random files per isotope for Total Monte Carlo analyses.

Specific features of the photon and charged particle files:

- Correction of a major bug in the TENDL production system which led to some large anomalies for several important nuclides.
- Construction of 'best' input files for photonuclear reactions, leading to a TENDL-2017 photonuclear data with cross sections closer to experimental data.
- Covariance data, MF33-40, for incident photons, protons, as well as the corresponding random ENDF-6 files for Total Monte Carlo.

First validation has already taken place, like comparison (and adjustment) to thermal cross-sections, MACS, Resonance Integral, and integral activation measurements, while more extensive validation will follow in 2018.

## TALYS-1.9

The current release of this nuclear model code is called TALYS-1.9. The number of this version is a deviation from the usual 0.2 increase, since TALYS-2.0 is reserved for the upcoming major release which has extensive capabilities (uncertainty quantification and ENDF-6 formatting) that the TALYS-1.x series lacks.

You may want to read the Introduction of the TALYS-1.9 manual for the new features compared to the TALYS-1.8 version. You can find the new version of TALYS at www.talys.eu or directly via this link ftp://ftp.nrg.eu/pub/www/talys/talys.tar.

# NDS Meeting Reports

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

### Consultants' Meeting on Nuclear Data Portal Web Tools

30 July-1 August 2018, Vienna, Austria
Scientific Secretary: J.C. Sublet
11 participants and IAEA staff



*Participants of the CM on Web tools*

The main purpose of the meeting was to evaluate the actual capabilities, successfully deployed tools to establish best practices, efficiency rating and user satisfaction. It was agreed that the second phase will be to step away from the actual frameworks with the intention to propose/test/deploy new tools: data analytics, visualization and imaging physics capable of better answering the challenges faced in the modelling, access and testing of nuclear data databases for the many applications that need them. The details of the presentations and technical discussions, as well as additional actions that were proposed will be summarized in the meeting report INDC(NDS)-0763. The presentations are available from https://www-nds.iaea.org/index-meeting-crp/WebToolsCM/.

## Technical Meeting of the International Nuclear Data Committee (INDC)

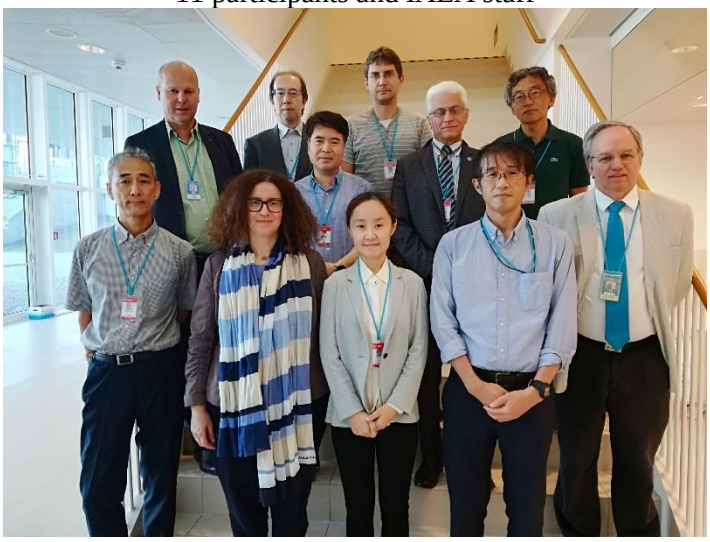
18-21 June 2018, Vienna, Austria
Scientific Secretary: Arjan Koning
15 participants and IAEA staff



Every two years, the International Nuclear Data Committee meets in Vienna to advise the Nuclear Data Section (NDS) on their programme. After one and a half days of presentations by staff from NDS, delegates of 16 Member States discussed Section's work for the remaining two days of the meeting. This resulted in a list of recommendations for NDS to use as guidelines in the coming two years. Some new ideas for CRPs on fission product yields and nuclear data related to the new INDEN project were discussed and endorsed, as well as further modernization of our methods for data dissemination.

## Consultants' Meeting on Evaluation of Photonuclear Cross Sections and Review of Updated Photonuclear Data Library

25-27 June 2018, Vienna, Austria
Scientific Secretaries:
Paraskevi Dimitriou and Roberto Capote Noy
11 participants and IAEA staff



*Participants of the two CMs*

The purpose of both meetings was to present, discuss and review the model-based evaluations of photonuclear cross sections undertaken under the CRP F41032 on Updating the Photonuclear Data Library. Almost 200 new evaluations were submitted to the review panel prior to the meeting while at the meeting itself discussions focused on those evaluations that had been performed by more than one group. A detailed inter-comparison of the different evaluations was performed and recommendations were made for the Updated Photonuclear Data Library. The new technique of assessing partial photoneutron cross sections was also discussed in depth. The presentations and minutes of the meeting are available at: https://www-nds.iaea.org/index-meeting-crp/CMPhotonuclear/.

## Consultants' Meeting of INDEN - International Nuclear Data Evaluation Network I - on the Resonance Parameter Evaluation of the Fissile Actinides

8-11 May 2018, Vienna, Austria
Scientific Secretary: A. Trkov
7 participants and IAEA staff



*Participants of the CM on INDEN*

International Nuclear Data Evaluation Network is an activity aimed at streamlining evaluation activities, taking advantage of expertise in different laboratories in Member States, following the pattern of the highly successful CIELO project, organized through the NEA Data Bank.
The main objective was to: review the current status of the resonance parameter evaluations of the fissile actinides; check the impact of the new Standards-2017 and the softer Prompt Fission Neutron Spectrum (PFNS) of the fissile actinides on the criticality of thermal systems; and define strategies to use new PFNS combined with new RP evaluations for U-233 and Pu-239.
The overall objective is to co-ordinate the activities in different laboratories with the final goal of obtaining consistent evaluated data files that respect the differential data. Further information is available on the web:
https://www-nds.iaea.org/index-meeting-crp/CM-INDEN-2018/
The Meeting summary report is also available on-line:
https://www-nds.iaea.org/publications/indc/indc-nds-0760/

## Technical Meeting of the International Fusion Research Council's Subcommittee on Atomic and Molecular Data for Fusion

3-4 May 2018, Vienna, Austria
Scientific Secretary: Christian Hill
11 participants and IAEA staff



*Participants of the IFRC meeting*

The International Fusion Research Council's (IFRC) Subcommittee on Atomic and Molecular Data is a standing committee which oversees and reviews the Atomic and Molecular Data (AMD) Unit's activities. It meets once every two years, this occasion being the first in which the new staff, Christian Hill and Kalle Heinola represented the Unit.

Over two days, the Technical Meetings, Consultancies, Coordinated Research Projects (CRPs), Workshops and database activities that the AMD Unit has been involved in, were described and discussed. Priorities for future projects were recommended and agreed, and the outgoing staff, Bas Braams and Hyun Chung, praised for their hard work and success over the last eight years.

More details about the IFRC A+M Data Subcommittee can be found at the URL https://www-amdis.iaea.org/IFRC/.

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

1-4 May 2018, Bahadurgarh, India
Scientific Secretary: Naohiko Otsuka
21 participants and IAEA staff



*Participants of the NRDC meeting*

Twenty participants representing thirteen cooperative Centres from eight Member States (China, Hungary, India, Japan, Korea, Russia, Ukraine and USA) and two International Organizations (NEA, IAEA) as well as a participant from Kazakhstan 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.

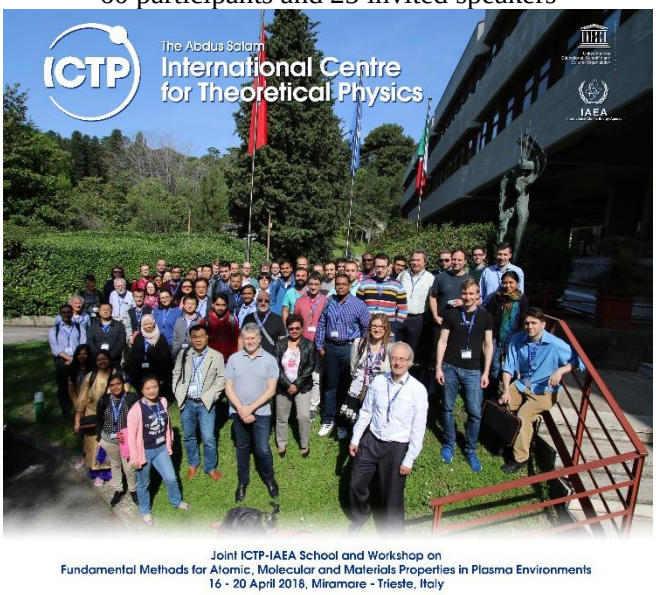
It was reported that the result of completeness checking of EXFOR has been performed for neutron, proton and alpha induced reaction data by comparing journal articles compiled in EXFOR and NSR retrieved on the CINDA web interface. The assessment showed that at least 3% of proton induced reaction experimental works and 20% of alpha induced reaction experimental works published in journal articles are still missing in EXFOR.

Centres started to compile tables of supplemental numerical data such as neutron source spectra and neutron resolutions functions following recommendations from EXFOR related Consultant Meetings. They are currently compiled in EXFOR BIB sections, and sometimes they make other BIB section records less visible. The participants discussed more suitable ways to archive them in EXFOR entries.

A summary report of the meeting is available as INDC(NDS)-0762. All progress reports, working papers and slides are available on the meeting web page (http://www-nds.iaea.org/nrdc/nrdc_2018/).

## Joint ICTP-IAEA Workshop on the Fundamental Methods for Atomic, Molecular and Materials Properties in Plasma Environments

16-20 April 2018, ICTP, Trieste, Italy
Directors: Bastiaan Braams (CWI, Amsterdam, Netherlands), Hyun-Kyung Chung (Gwangju Institute, Korea), Gábor Csányi (University of Cambridge, UK), Attila G. Császár (MTA-ELTE, Budapest, Hungary) and Anna I. Krylov (University of Southern California, Los Angeles, USA) and Christian Hill (IAEA)
60 participants and 25 invited speakers




This popular ICTP-IAEA event, initiated by the Atomic and Molecular Data Unit, focussed on providing training, information exchange and networking opportunities for computational scientists working on models and data for atomic, molecular and materials processes relevant to fusion energy research and other high-energy plasma applications. Some 60 students (graduate students, postdocs, and early-career scientists), many from developing IAEA Member State countries attended the workshop, and presented posters or contributed oral presentations. The ICTP and IAEA provided full or partial financial support for about 25 participants and lecturers.
More information about the Workshop is available at the URL https://www-amdis.iaea.org/Workshops/ICTP2018/.

## Consultants' Meeting for a proposed Coordinated Research Project on Vapour Shielding

19-20 March 2018, Vienna, Austria
Scientific Secretary: Christian Hill
7 participants and IAEA staff



*Participants of the CM on Vapour Shielding*

This meeting brought together six experts to discuss the scope, objectives and timeline of a new CRP on Atomic Data for Vapour Shielding in Fusion Devices, to be initiated within the Atomic and Molecular Data Unit later this year.
"Vapour shielding" occurs when a surface exposed to particles from a highly-energetic plasma is ablated, creating an expanding cloud of secondary plasma in front of it which can, in certain circumstances, protect the surface from being further damaged by the incoming energy flux. With the recent growth of interest in liquid metal plasma-facing components and novel approaches to tokamak divertor designs such as the continuously-shielded "lithium vapour box divertor" being explored at the Princeton Plasma Physics Laboratory, there has been a resurgence of interest in modelling vapour shielding. However, it is recognized that there are major gaps in the fundamental atomic and molecular data required for such modelling.
This consultancy made recommendations about how this planned CRP can address these gaps and was responsible for the report which informed the proposal, now accepted by the Committee on Coordinated Research Activities (CCRA), for initiating the project. Further details, including presentations are available on the Unit's website at https://www-amdis.iaea.org/CRP/VapourShielding/CM/.

# Consultants' Meeting on Revising Nuclear Data Needs for TAGS

19-21 February 2018, Vienna, Austria
Scientific Secretary: Paraskevi Dimitriou
8 participants and IAEA staff



*Participants of the CM on TAGS*

The objective of the meeting was to review the current status of total absorption gamma-ray spectroscopy (TAGS) facilities & measurements, establish the extent to which TAGS data are incorporated into the available decay data libraries, investigate the impact of the new TAGS data on decay heat and anti-neutrino spectra calculations, discuss new emerging data needs and make recommendations for the future. A detailed assessment of the decay data of the main fission product contributors to decay heat for a wide range of fuel systems has led to updated priority tables for total absorption and high-resolution gamma-ray spectroscopy measurements. The presentations and minutes of the meeting are available at: https://www-nds.iaea.org/index-meeting-crp/TAGS2018/.

# In Memoriam

## Valerii Pavlovich Chechev

Dr.Sc. Director Radionuclide Nuclear Data Center, V. G. Khlopin Radium Institute, St Petersburg, Russia Leading Specialist on Nuclear Spectroscopy passed away on 5 March 2018. His scientific interests were focused on nuclear physics and astrophysics. Some of his astrophysics-related work on nuclear fusion and the evolution of the Universe are well known and acknowledged by the community.

He was one of the pioneers who created a new scientific discipline - nuclear data evaluation. He developed several evaluation and verification methods, which are still broadly used. Under his direction several Russian radionuclidic standards have been developed.

V.P. Chechev was highly regarded among the international nuclear data community, in particular for his close collaboration with the IAEA Nuclear Data Section and Decay Data .Evaluation Project (DDEP).

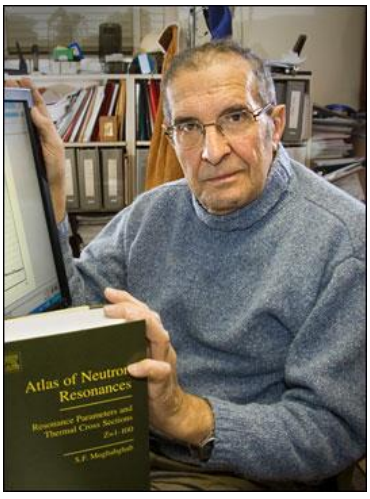
## Said Mughabghab

On 6 July 2018 Said Mughabghab passed away.

Said is well known for his truly encyclopedic knowledge of neutron resonances. We all know the famous Atlas of the Resonance Parameters, but when you talked to Said, you got the impression that he knew all the resonances of each nuclide by heart. The last version of his Atlas, was just published in two volumes by Elsevier this year, see https://www.elsevier.com/books/atlas-of-neutron-resonances/mughabghab/978-0-444-63769-7.

Said obtained his Ph.D. from the University of Pennsylvania in 1964, started his career in BNL in 1963 and retired in 2000. At the time of his passing, Said was a senior physicist emeritus at BNL.

He will be truly missed by the whole nuclear data community.




## Mark Lane Williams

Dr. Mark Lane Williams, 67, passed away in Knoxville, Tennessee on 18 July 2018. He received his Bachelor of Science in Engineering Science in 1972 from Louisiana State University (LSU) and his Master of Science in Nuclear Engineering from Georgia Tech in 1974. From 1974-1979, Dr. Williams worked toward and received his PhD in Nuclear Engineering from the University of Tennessee while serving as a research scientist in the Neutron Physics Division at Oak Ridge National Laboratory. Dr. Williams developed methods for "contributon" transport theory, sensitivity and depletion perturbation theories, and thermal reactor physics. He worked at LSU as Professor of Nuclear Science and Professor of Physics and as Director of the Nuclear Science Center as well as the Medical Physics Program. During his time there, he patented a radiation emitter for cancer therapy. He returned to ORNL in 2003 as a distinguished researcher in the Reactor and Nuclear Systems Division. He worked on methods development for the internationally distributed SCALE nuclear analysis code system, contributed to resonance self-shielding theory, and developed calculations for lattice physics applications and sensitivity and uncertainty methods. Dr. Williams received the prestigious Eugene Wigner Reactor Physicist Award in 2016.



# Selected Charts, Reports and Documents

**INDC(NDS)-0739** Evaluation of the $^{7}Li(n,n'\gamma_{478keV})$ γ-ray production cross section for standards, prepared by S.P. Simakov, R. Capote, R.O. Nelson and V.G. Pronyaev, June 2018.

**INDC(NDS)-0751** On the Benchmarking of New Evaluated Nuclear Data Libraries, prepared by A. Trkov, March 2018.

**INDC(NDS)-0754** Summary Report from the Second Research Coordination Meeting on Plasma-wall Interaction with Reduced-activation Steel Surfaces in Fusion Devices, 16-18 October 2017, Vienna, prepared by B.J. Braams and C. Hill, March 2018.

**INDC(NDS)-0755** Summary Report from the Consultants Meeting on Atomic Data for Vapour Shielding in Fusion Devices, 19-20 March 2018, Vienna, prepared by C. Hill, July 2018.

**INDC(NDS)-0757** On the Benchmarking of INDEN Improved Iron Evaluations, prepared by A. Trkov and R. Capote Noy, May 2018.

**INDC(NDS)-0758** Update of the Evaluated Neutron Cross Section Libraries for the Geant4 Code, prepared by E. Mendoza and D. Cano-Ott, June 2018.

**INDC(NDS)-0759** ENDF/B-VIII versus ENDF/B-VII: What's Different, prepared by D.E. Cullen, May 2018.

**INDC(NDS)-0760** Summary Report of the First IAEA Consultants Meeting on the International Nuclear Data Evaluation Network (INDEN), 8-11 May 2018, Vienna, prepared by G. Noguere and A. Trkov, July 2018.

**INDC(NDS)-0761** Investigation of the Effects of Probability Density Function Kurtosis on Evaluated Data Results, prepared by D.L. Smith, D. Neudecker and R. Capote Noy, May 2018.

**INDC(NDS)-0762** Summary Report of the Technical Meeting on International Network of Nuclear Reaction Data Centres, 1-4 May 2018, Vienna, prepared by N. Otuka and A. Saxena, June 2018.

Available cost-free on request only for **teachers and scientists from developing countries:**

**Chart of the Nuclides 2014** JAEA Nuclear Data Centre.

**Karlsruher Nuklidkarte** *Wall chart of the nuclides and folding chart with booklet, 9th edition (2015).*

**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).*

**Karlsruher Nuklidkarte** *Wall chart of the nuclides, 7th edition (2006).*

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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 **Kalle Heinola** who joined the Nuclear Data Section as the Atomic Physicist of the Atomic and Molecular Data Unit on 1 May 2018. Kalle works on the provision of atomic, molecular and plasma-material interaction data relevant for nuclear fusion. He contributes to the Unit's publications and websites, and coordinates meetings and research efforts in atomic, molecular and plasma-material interaction physics for nuclear fusion.

Kalle's research interests comprise of plasma-material interactions and its effects on the plasma fuel retention in the plasma-facing components of nuclear fusion reactors. For the last seven years Kalle has been a plasma-wall interaction physicist at Joint European Torus JET in United Kingdom. His research combines experimental work at laboratory and tokamak scales, and applies computational methodologies from first-principles calculations to multi-scale simulations of plasma-material interaction effects in fusion armour materials.

Kalle has taken part in JET operations and experimental campaigns through various responsibilities in the JET control room activities. Kalle has been a member and a specialist in many EU-funded fusion projects coordinated by EUROfusion. For 2014-2018 he was the Subproject Leader for a EUROfusion Work Package responsible for the JET tokamak sample analyses on fuel retention.

Since 2017 he has been the Academy Research Fellow of Academy of Finland.

# Nuclear Data Services – Contact Points

For services to customers in USA and Canada:
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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: michael.fleming@oecd.org; data@oecd-nea.org; Worldwide Web: http://www.oecd-nea.org/databank/ contact: M. Fleming, ext. 1072.

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;
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:
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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: is Alice.DUFRESNE@oecd.org; contact: A. Dufresne, 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

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