

Activities and Challenges Related to Nuclear Data at NEA

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1. Overview of NEA Structure

- Nuclear Science and Data Bank

2. Nuclear Data Services/Activities at NEA

- Compilation and Dissemination of ND
 - EXFOR
 - JANIS
- Integral Databases
 - ICSBEP, IRPHE, SINBAD, SFCOMPO
- Evaluation and Validation
 - JEFF
 - WPEC

3. Challenges & Conclusions

OECD Nuclear Energy Agency

The NEA is a specialised semi-autonomous agency of the OECD



- Founded in 1958, based in Paris (Issy-les-Moulineaux)
- 82 staff (~2500 staff at OECD)
- 31 member countries
- 2013 Budget: 11.1 ME (NEA) + 3.1 ME (DB) + VC
- Reduced staff, relying on member country experts

OECD Nuclear Energy Agency

The NEA is a specialised semi-autonomous agency of the OECD



Many areas of work:

- Nuclear safety and regulation
- Nuclear energy development
- Radioactive waste management
- Radiological protection and public health
- Nuclear law
- **Nuclear Science & The Data Bank**



NEA Nuclear Science Committee and the Data Bank

Nuclear Science Committee

- WPNCS – Nuclear Criticality Safety (incl. **ICSBEP** and **SFCOMPO** database)
- WPRS – Reactor Systems (incl. **IRPhEP** and **SINBAD** databases)
- WPFC – Fuel Cycle
- WPMM – Multi-scale Modelling of Fuels and Structural Materials
- **WPEC – International Nuclear Data Evaluation Cooperation**

The Data Bank is an international centre of reference with respect to basic nuclear tools, such as computer codes and data, used for the analysis and prediction of phenomena in the nuclear field.

- Computer Program Services
- Thermochemical Database (TDB) Project
- **Nuclear Data Services** (e.g. JANIS)
- **Joint Evaluated Fission and Fusion (JEFF) file project**

Main NEA activities related to Nuclear Data

(Differential and integral data)

Collection, compilation, preservation

- Provide up-to-date and reliable data to users (Data Bases, Libraries)

Dissemination

- Provide direct and friendly access to databases (Tools)

Data development, evaluation, validation (WPEC, JEFF)

- Provide a framework for international co-operation
- Provide up-to-date recommended data to users

Workshops, meetings, conferences

- Communicate on activities and services
- Promote international co-operation
- Consolidate an expert community (Nuclear Data Weeks)

ND Compilation & Dissemination (EXFOR)

- Update and maintain the EXFOR database (NEA DB areas)
 - NEA DB is a founding member of the NRDC network
 - Full coverage of experimental results published in open literature
 - Revision of old entries is a significant part of the activity
 - NEA DB contributes about 300 new/updated entries every year

EXFOR	Total	NNDC	NEA DB	IAEA	CJD	CAJaD	CDFE	CNPD	JCPRG	Others
Entries	21176	6544	5143	2075	1572	868	865	1903	1015	1191
%	100%	31%	24%	10%	7%	4%	4%	9%	5%	6%

ND Compilation & Dissemination (EXFOR)

- Verification & Validation
 - Provide feedback to other Data Centres
 - Provide reliable nuclear data to users
- Verification with JANIS Trans Checker
 - Peer-review of all NRDC prelim files (~70 per year)
 - Analysis of JANIS import log of the EXFOR masters (~10 per year)
- Validation using methods initially developed within WPEC SG30
 - Implementation of statistical tests [[NEA News, Vol. 29.1, 2011](#)]
 - Implementation of cross-checking with evaluated data [[NDS 120 \(2014\) 277](#)]
 - Analysis of the results over the whole database (ongoing)
 - In-depth review of all threshold reaction cross-sections [[NEA/DB/DOC\(2014\)3](#)]

ND Compilation & Dissemination (JANIS)

- JANIS : Provides direct and friendly access to NEA DB nuclear databases
- JANIS 1.0 was released in 2001 as a successor of JEF-PC
- JANIS 4.0 was released in November 2013 (available on DVD)
 - Possibility to handle user' s data (provided in simple text format)
 - Possibility to save and restore user' s work (plots, tables, settings)
 - Latest data are available: EXFOR, ENDF/B-VII.1 (2011), NUBASE (2012), IRDFF-1.0 (2012), TENDL-2013, JEFF-3.2 (2014), GEFY-4.2 (2014)
 - Web access is now available (JANIS Web)

More information on JANIS in [NEA News, Vol. 31.2, 2013.](#)

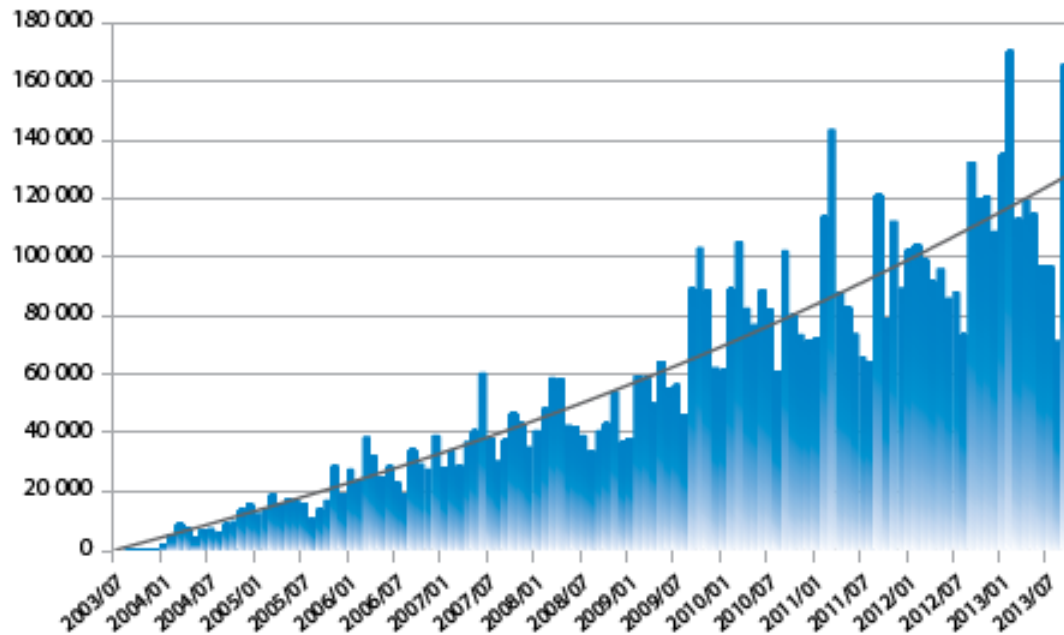


Modern, ND tools and services

Improved nuclear data services based on JANIS

by E. Dupont, N. Soppera and M. Bossant*

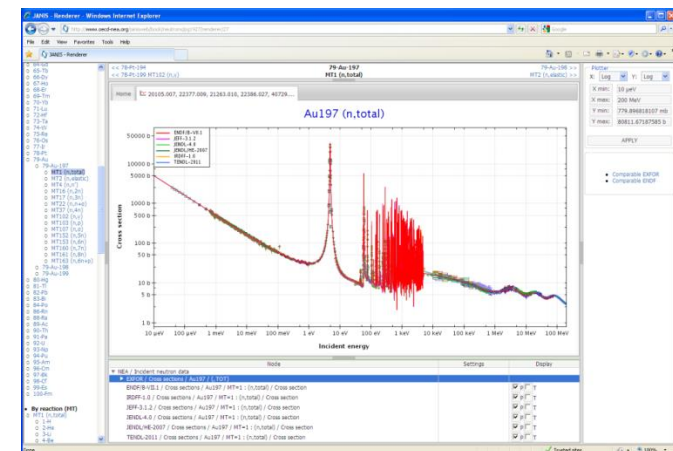
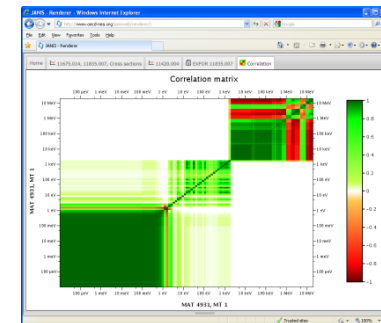
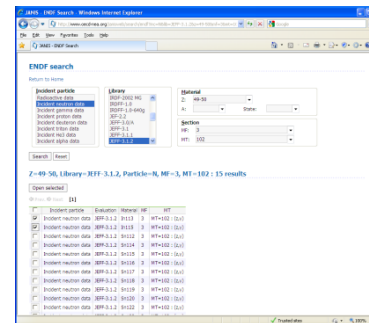
Figure 1: Number of requests per month to the remote database since 2003



JANIS 4.0 : See and retrieve the data

Online www.oecd-nea.org/janisweb

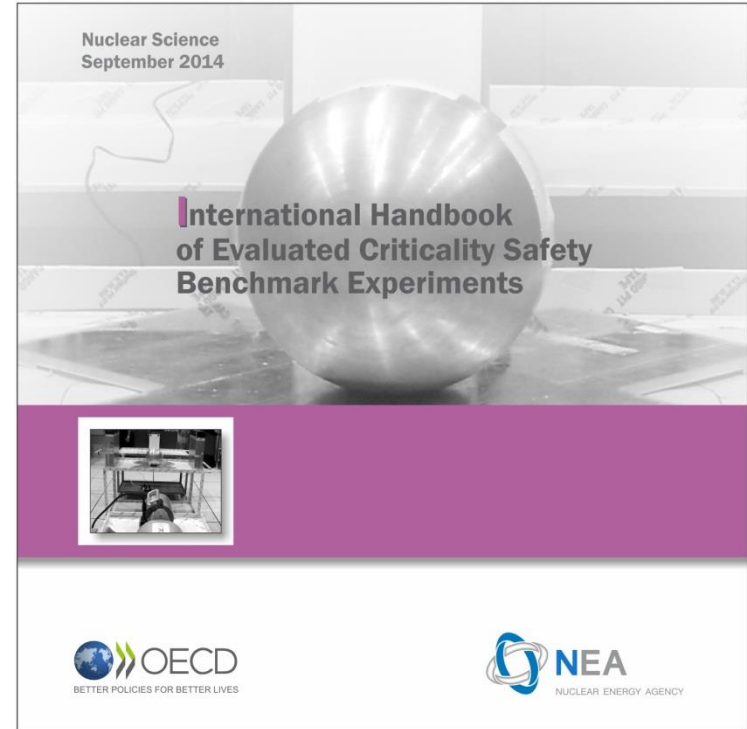
- JANIS Web: Online access to JANIS features through a simple internet browser without any JAVA installation
 - Web interface to the JANIS software
 - Web access to all JANIS databases
- JANIS Books
 - Based on JANIS Web and databases
 - Automated comparison of experimental and evaluated cross section data
 - Incident n, p, d, t, h, α , γ
 - About 5000 plots



ICSBEP International Handbook of Evaluated Criticality Safety Benchmark Experiments

September 2014 Edition

- 20 Contributing Countries
- ~67,000 Pages
- 561 Evaluations
 - 4,839 Critical, Near-Critical, or Subcritical Configurations
 - 24 Criticality Alarm Placement/Shielding Configurations
 - 207 Configurations with Fundamental Physics Measurements
 - 829 Unacceptable Experiment Configurations



<https://www.oecd-nea.org/science/wpncs/icsbep/>

Searching by Sensitivity in DICE

3 GROUP SEARCH, FULL 238 GROUP SDF'S ARE NOW

DICE **STORED**

File Database=NEA Window Help

Critical / Subcritical | Alarm / Shielding | Fundamental Physics | Correlation Matrix | Rank Similar | Keff trends plots

- General items
 - Identification
 - Evaluator
 - Internal reviewer
 - Independent reviewer
 - Varying parameter(s) across cases
 - Laboratory
 - Main purpose
 - Title
 - Keywords
 - Dates (evaluation and experiment)
 - References
- Fuel
 - Fuel form/Fissile material
 - Fuel region
 - U and Pu weight percent
 - Pu/(U+Pu) ratio
 - Moderator/coolant material
 - Cladding material
 - Reflector material
 - Neutron absorbing material
 - Separation material
 - Geometry
 - Benchmark Keff and Calculations
- Energy, spectra, sensitivities
 - Energy of Average Neutron Lethargy causing Fission
 - Average Fission Group Energy
 - Flux distribution (3-g)
 - Fission distribution (3-q)
 - Capture distribution (3-q)
 - Neutron balance
 - Neutron gas temperature
 - Average fission neutrons per neutron absorbed in the core
 - **Keff Sensitivities**

Isotope

- None selected
- 1 - H - Hydrogen
 - H1
 - H2
- 3 - Li - Lithium
- 4 - Be - Beryllium
- 5 - B - Boron
- 6 - C - Carbon
- 7 - N - Nitrogen
- 8 - O - Oxygen
- 9 - F - Fluorine
- 11 - Na - Sodium
- 12 - Mg - Magnesium

Combine with AND Combine with OR

Reaction

- None selected
- capture
- elastic
- fission
- inelastic
- neubar
- scatter
- total

Combine with AND Combine with OR

Total Keff sensitivity over all energy range

Value : +/- :

Set Threshold → OR >= <=

<p>Keff sens. < 0.625 eV</p> <p>Value : <input type="text"/> +/- : <input type="text"/></p> <p>OR >= <input type="text"/> <= <input type="text"/></p>	<p>Keff sens. 0.625 eV - 100 keV</p> <p>Value : <input type="text"/> +/- : <input type="text"/></p> <p>OR >= <input type="text"/> <= <input type="text"/></p>	<p>Keff sens. > 100 keV</p> <p>Value : <input type="text"/> +/- : <input type="text"/></p> <p>OR >= <input type="text"/> <= <input type="text"/></p>
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Values between -1 and 1, in %dk/%Σ

Keff Sensitivities are currently available for about 75% of cases

Also used!

DICE Plotting of Be Sensitivity > 0.005 for HMF

Can also read as 100 pcm/1% change in Σ

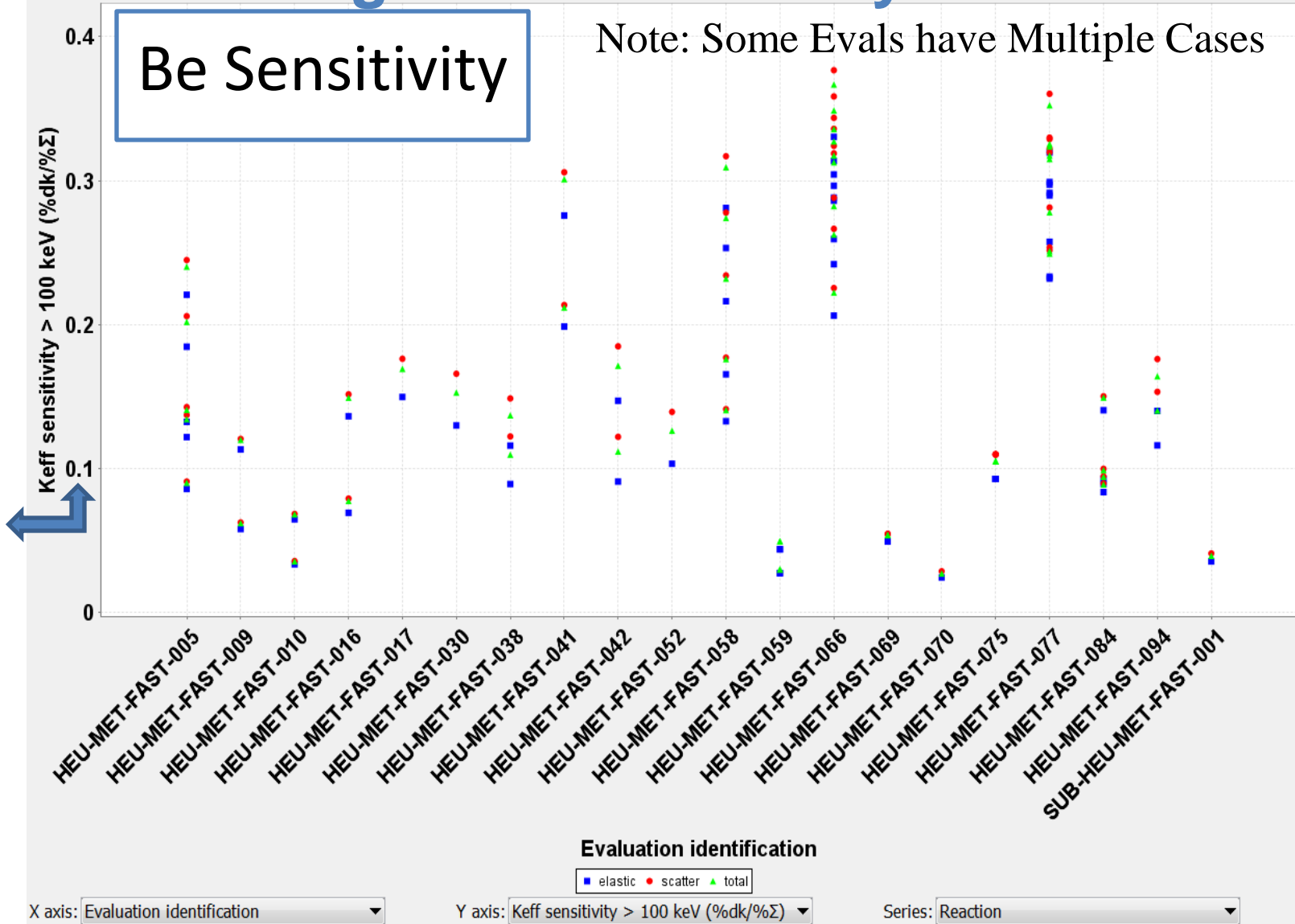
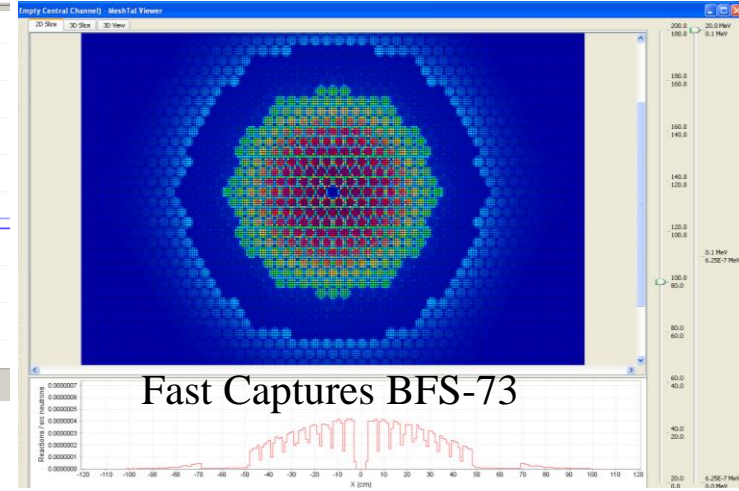
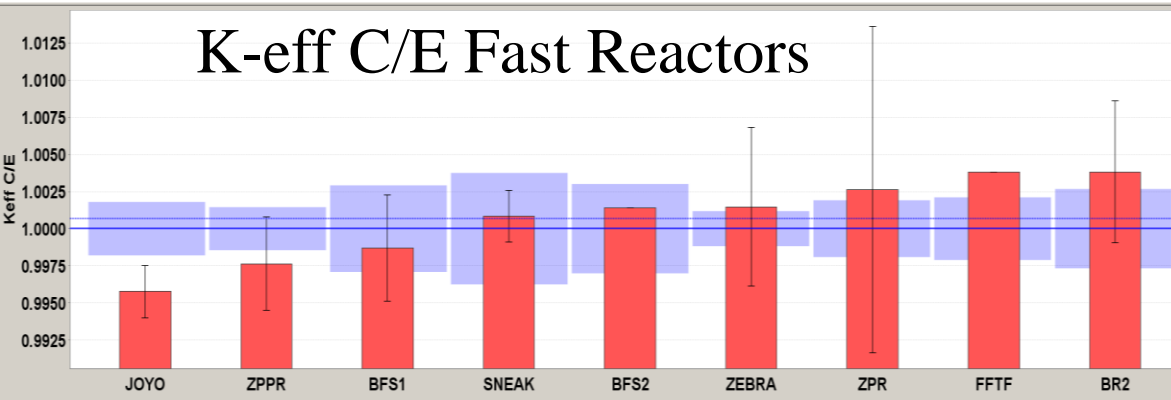


Table of Benchmarks With Sensitivity Above Threshold

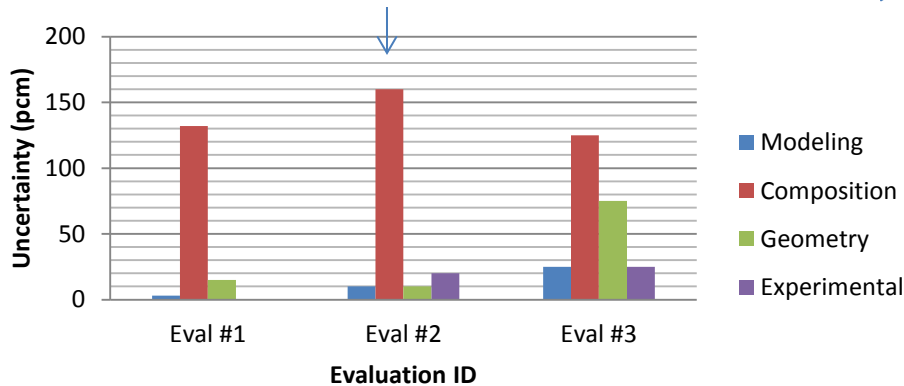
Element or Isotope	Threshold (pcm/%Σ)	Benchmark Cases
Deuterium	>100	HST001(1-2), HST004(3-6), HST020(1-5), HCI006(6), HCT017(1-9), HCM002(7,10,11,20), LMT001(1), LMT002(1-12), LMT015(1-22)
Fe	<-100 >100	PMF015(1), PMF026(1), PMF028(1), PMI002(1), HMF021(1), HMF085(3), HMI001(1), IMF005(1), MMI003(1), SPECMF014(1), HMI001(1)
Cu	>100	PMF013(1), HMF072(1-3), HMF073(1), HMF085(1-2), HMI006(1-4), IMF020(2,4-5)
Gd ¹⁵⁷	<-100	PST034(3-6), HST014(3), HST016(2,3), LCT005(3,4,9-11), LCT052(1-6), MST006(4-6), MST007(3-7), MMCT004(4-6)
W	<-50 and >50	HMF060(1), HMF067(1-2), HMF070(1-3), IMF014(2) , PMF005(1), HMF003(8-11), HMF049(3), HMF050(1), HMF084(14), HMF085(6)

IRPhEP Database And Analysis Tool (IDAT est. 2013)



New Features Include:

- Model Mesh Plots
- Automatic Similarity Assessment
- Uncertainty Information



3-groups percent fission

Thermal: Intermediate: Fast: (in %)

Neutron balance

$$1 - \frac{\sqrt{(p_1 - q_1)^2 + (p_2 - q_2)^2 + \dots + (p_N - q_N)^2}}{\sqrt{2|p||q|}}$$

Case ID	3-groups	Code
SCCA-SPACE-EXP-001-002	0.921 MCNP	
SCCA-SPACE-EXP-001-001	0.913 MCNP	
ZPR-FUND-EXP-014-001	0.913 MCNP	
SNEAK-LMFR-EXP-001-001	0.913 MCNP	
ZPPR-LMFR-EXP-007-001	0.91 MCNP	
ZEBRA-LMFR-EXP-002-001	0.909 MCNP	
ZPR-FUND-EXP-003-001	0.909 MCNP	
BFS1-FUND-EXP-003-001	0.904 MCNP	

SINBAD

Shielding Integral Benchmark Archive and Database

- Under NEA/NSC WPRS
- Validation and Benchmarking Of codes and data used for Radiation transport and Shielding
- Preservation of benchmark experiments
- Online :

www.oecd-nea.org/science/wprs/shielding/sinbad/

SINBAD INDEX - Sorted by Shielding

Reactor Shielding (46)

Winfrith Iron Benchmark (ASPIS)
Winfrith Iron 88 Benchmark (ASPIS)
Winfrith Graphite Benchmark (ASPIS)
Winfrith Water/Iron Benchmark (ASPIS-PCA REPLICA)
Winfrith Water Benchmark
Winfrith Neutron-Gamma Ray Transport through Water/Steel Arrays (ASPIS)
NESDIP-2 Benchmark (ASPIS)
NESDIP-3 Benchmark (ASPIS)
JANUS Phase I (Neutron Transport Through Mild and Stainless Steel)
JANUS Phase VIII (Neutron Transport Through Sodium and Mild Steel)
Ispra Sodium Benchmark (EURACOS)
Ispra Iron Benchmark (EURACOS)
Cadarache Sodium (HARMONIE)
Karlsruhe Iron Sphere
Wuerenlingen Iron Benchmark (PROTEUS)
Neutron Leakage from Water Spheres (NIST)
Streaming Through Ducts (IRI-TUB)
Gamma-ray Production Cross Sections from Thermal Neutron Capture in 14 elements and SS
Averaged Gamma-ray Production Cross Sections from Fast Neutron Capture in 14 ele. & SS
JASPER Advanced Reactor Axial Shield Measurements
JASPER Advanced Reactor Intermediate Heat Exchanger Measurements
JASPER Advanced Reactor Radial Shield Measurements
ORNL TSF Iron Broomstick
ORNL TSF Oxygen Broomstick
ORNL TSF Nitrogen Broomstick
ORNL TSF Sodium Broomstick
ORNL TSF Stainless Steel Broomstick
ORNL Neutron Transport Through Iron and SS - Part I
ORNL Neutron Transport in Thick Sodium
Pool Critical Assembly-Pressure Vessel Facility Benchmark
University of Illinois Iron Sphere (CF-252)
University of Tokyo-YAYOI Iron Slab
Radiation field parameters for pressure vessel monitoring in NRI LR-0 VVER-440 reactor
Radiation field parameters for pressure vessel monitoring in NRI LR-0 VVER-1000 reactor
Balakovo-3 VVER-1000 Ex-vessel Neutron Dosimetry Benchmark
VENUS-3 LWR-PVS Benchmark
H.B. Robinson-2 Pressure Vessel

Useful Links of some NEA databases/tools

JANIS (Nuclear Data Visualization and Retrieval)

<http://www.oecd-nea.org/janis/>

ICSBEP/DICE (Criticality Safety)

<https://www.oecd-nea.org/science/wpncs/icsbep/>

IRPHEP/IDAT (Reactor Physics)

<https://www.oecd-nea.org/science/wprs/irphe/irphe-handbook/>

SINBAD (Radiation Shielding)

<https://www.oecd-nea.org/science/wprs/shielding/sinbad/>

SFCOMPO (Assay Data of Spent Fuel)

<https://www.oecd-nea.org/science/wpncs/ADSNF/>

Nuclear Data Evaluation and Validation Activities

*The Joint Evaluated Fission and Fusion File Project
(JEFF)*

*The Working Party on International Nuclear Data Evaluation Co-operation
(WPEC)*

JEFF : Scope and Objectives

- The objective of the Joint Evaluated Fusion and Fission (JEFF) file Project is to **develop and promote** the use of high quality evaluated nuclear data sets in standard formats for a wide range of scientific and technical applications.
- The Project members **assess the needs for nuclear data improvements** and address those needs by initiating the necessary measurements and evaluation efforts in their respective institutions or collaborations.
 - **Driven by nuclear application needs**, fission and fusion
 - Major emphasis on **electro-nuclear applications**

Joint Evaluated Fission and Fusion File (JEFF) Project

3 year Mandate (2010 – 2013 / Extended to 2015 pending new PoW)

- ❑ *The JEFF Project* and its Working Groups **meet bi-annually**
 - JEFF **Scientific Co-ordination Group** (~12 members, Austria, UK, France, The Netherlands, Korea, Italy, Germany, **Russia**, EC, IAEA observers)
 - Experimental Working Group (A. Plompen, EC-JRC)
 - Covariance Data Working Group (C. de Saint Jean, CEA)
 - Evaluation, Process and Benchmarking Working Group (R. Jacqmin, CEA)
 - Decay Data and Fission Yields Working Group (R. Mills, UKNNL)
 - Fusion Working Group (U. Fischer, KIT)

- ❑ Called “Project”, but actually consists of **volunteer contributions** with EC official support of some activities : **A collective work**

NEA Nuclear Data Weeks (*since 2010*)

NEA Nuclear Data Weeks are organized yearly, bringing together Nuclear Data experimentalists, evaluators and users from different communities. Usually a 2 day Nuclear Data Workshop followed by 3 day JEFF WG meetings. Cross participation in both is encouraged.

Nov 2010	JEFF + GEDEPEON
Nov 2011	JEFF + GEDEPEON
April 2012	JEFF + ANDES (EC FP7)
Nov 2012	JEFF + GEDEPEON
Nov 2013	JEFF + NEEDS
Nov 2014	JEFF + NEEDS
April 2015	JEFF + CHANDA

➤ JEFF project has consolidated a strong users/experts community with regular participation

Timeline of JEFF Releases

JEFF-3.1 (2005)

- Radioactive decay data (incl. spontaneous fission yields)
- Neutron data (incl. Thermal scattering law data)
- Fission yields (neutron)
- Activation data (neutron)
- Proton data

JEFF-3.1.x (2007, 2009, 2012)

- Minor updates of fission yields (2007) and neutron data (2009, 2012)

JEFF-3.2



- New neutron data (2014)
- New radioactive decay data (by the end of 2014)
- New fission yields data (by the end of 2014?)
- New special purpose files (based on EAF-2010, TENDL)

JEFF-3.2 (March 2014)

Neutron data contains

- 472 nuclides (91 newly included)
- **New actinide evaluations**
- Added gamma production,
- Covariance data when available
- **150 files adopted from TENDL 2012**
- **~50 updates from ENDF-BVII.1**
- Corrections and updates thanks to feedback from users

Home
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Data Bank
Publications
Delegates' Area
Press Room



Nuclear Data Services

JEFF-3.2 evaluated data library - Neutron data

Latest release

The Joint Evaluated Fission and Fusion File is an evaluated library produced via an international collaboration of Data Bank member countries co-ordinated by the JEFF Scientific Co-ordination Group, under the auspices of the NEA Data Bank.

The new JEFF-3.2 general purpose library has been released on March 5, 2014 in ENDF-6 format and contains incident **neutron data for 472 nuclides** or elements from 1-H-1 to 100-Fm-255.

JEFF-3.2 is also available through the JANIS database.

General Purpose

Incident Neutron Data

Download ACE format files processed at different temperatures (compressed files, each around 700MB):

- ▶ 293K | 300K | 400K | 500K | 600K | 700K | 800K | 900K | 1000K | 1200K | 1500K | 1800K
- ▶ Processing input files and documentation

Download Thermal Scattering Law data processed at different temperatures for various compounds :

- ▶ TSL data for CH₂, H₂O, H₂Zr, Graphite, D₂O, Be, BeO, Mg, H in CaH₂, Ca in CaH₂ (57 MB)

Download ENDF-6 format files (incident neutron data only: 472 individual MAT files, one .tar.gz file):

- ▶ JEFF32N.tar.gz (304 MB)

Access each file individually (ASCII format) :

MAT number	Nuclide	File	CHECKR	FIZCON	PSYCHE
125	1-H - 1	n-1-H-001.jeff32	checkr	fizcon	psyche
128	1-H - 2	n-1-H-002.jeff32	checkr	fizcon	psyche
131	1-H - 3	n-1-H-003.jeff32	checkr	fizcon	psyche
225	2-He- 3	n-2-He-003.jeff32	checkr	fizcon	psyche
228	2-He- 4	n-2-He-004.jeff32	checkr	fizcon	psyche
325	3-Li - 6	n-3-Li-006.jeff32	checkr	fizcon	psyche
328	3-Li- 7	n-3-Li-007.jeff32	checkr	fizcon	psyche
425	4-Be- 9	n-4-Be-009.jeff32	checkr	fizcon	psyche
525	5-B - 10	n-5-B-010.jeff32	checkr	fizcon	psyche
528	5-B - 11	n-5-B-011.jeff32	checkr	fizcon	psyche
600	6-C - 0	n-6-C-000.jeff32	checkr	fizcon	psyche
628	6-C - 13	n-6-C-013.jeff32	checkr	fizcon	psyche
725	7-N - 14	n-7-N-014.jeff32	checkr	fizcon	psyche

Libraries

JEFF-3.2 (New release)

JEFF-3.1.2

JEFF-3.1.1

JEFF-3.1

JEFF-3.0

JEFF-2.2

Submit new feedback

View feedback

Documentation

JEFF Reports

JEFF Docs

EFF Docs

References

Meetings

April 2014, NEA

November 2013, NEA

The NEA / NSC Working Party on International Nuclear Data Evaluation Co-operation (WPEC)

A forum to exchange information and a framework for co-operating activities between nuclear data file evaluation projects, aiming to

- Improve the quality and completeness of evaluated nuclear data libraries
- Promote the exchange of information on nuclear data measurement, evaluation, theory and model developments, validation and related topics

WPEC

- WPEC was established in 1989
- 25 years of co-operation between major evaluation projects: ENDF, JENDL, JEFF (JEF, EFF/EAF), BROND, CENDL, TENDL, FENDL (& other IAEA projects)
- Close collaboration with the IAEA Nuclear Data Section and non-NEA evaluation projects is valuable
- Hundreds of participants from Europe, US, Japan, Korea, Russia, China
- Over 40 [short-term Subgroups](#): SG1, SG2, ..., SG40-CIELO
- 3 longer term Subgroups: A (Nuclear Model Codes), B (Formats & Processing) and **C (HPRL)**
- 31 Subgroup reports on key issues (and more to come...)

WPEC – Ongoing activities

Subgroups

- SG C High Priority Request List – HPRL
- SG 37 Improved fission yield evaluation methodologies
- SG 38 A modern nuclear database structure beyond the ENDF format
- SG 39 Methods and approaches to provide feedback from nuclear and covariance data adjustment for improvement of nuclear data files
- SG 40 CIELO Pilot Project

WPEC – Ongoing activities – SG C (long term)

High Priority Request List (www.oecd-nea.org/dbdata/hpri)

Coordinator: A. Plompen, JEFF

Tasks

- Review requests for nuclear data improvement
 - 26 High priority requests with quantitative justification
 - 10 General requests with qualitative justification

Status

- Considerable efforts initiated to respond to High priority requests
- Mandate extension/revision proposed by WPEC
 - To review/update all requests entered since 2004
 - To add a third list for Special Purpose Quantities (e.g. DD, FY)

WPEC – Ongoing activities – SG 37

Improved fission yield evaluation methodologies

Coordinator: R.W. Mills, JEFF

Tasks

- Document and compare the current evaluation methodologies
- Consider recent measurements and new theoretical developments
- **Proposal for new fission yield format including covariance**

Status

- Second meeting held in May 2014

WPEC – Ongoing activities – SG 38

A modern nuclear data structure beyond the ENDF format

Coordinator: D. McNabb, ENDF (Talk by C. Mattoon on Thursday)

Tasks

- Define a new structure for nuclear data (based on GND format)
- Define a process to publish and update the new format

Status

- 4th Workshop/Meeting at NEA HQ, May 13-14, 2014
- Requirements documents are available
- SG 38 project Web pages:
 - <https://ndclx4.bnl.gov/gf/project/sg38>
 - www.oecd-nea.org/science/wpec/sg38

WPEC – Ongoing activities – SG 39

Methods and approaches to provide feedback from nuclear and covariance data adjustment

M. Salvatores, G. Palmiotti, ENDF

Tasks

- In the logical continuity of previous SG 26 and SG 33 activities
- Provide criteria and practical approaches to use effectively the results of sensitivity analyses and cross section adjustments for feedback to ND evaluators and experimentalists

Status

- 2nd meeting on May 13, 2014 (+ meeting with CIELO on May 14)
- Several topics under way
 - Establishing and coping with methodology issues (e.g. compensating effects)
 - Identifying new experiments sensitive to target isotopes (Big 3, ⁵⁶Fe and ²³Na)

WPEC – Ongoing activities – SG 40-CIELO

Pilot project of a Collaborative International Evaluated Library Organization (CIELO) – 1/2

M.B. Chadwick, ENDF

Tasks

- Bring together the world's experts to investigate the reasons for the disc. between the latest evaluated files, and document the findings. Focus on 6 important nuclides: ^{235}U , ^{238}U , ^{239}Pu , ^{56}Fe , ^{16}O and ^1H
- Provide recommendations on how to resolve these discrepancies, produce working files for testing
- Produce improved evaluations whenever possible + covariances
- Document the lessons learned from the collaborative work in the pilot project and recommendations on a possible extension

WPEC – Ongoing activities – SG 40-CIELO

Pilot project of a Collaborative International Evaluated Library Organization (CIELO) – 2/2

M.B. Chadwick, ENDF

Status

- Output of the ad-hoc review group established in 2012 to guide the work of CIELO is available in [Nuclear Data Sheets 118 \(2014\) 1](#)
- 2nd meeting at NEA HQ in May 2014 and next one planned in conjunction with CSEWG, Brookhaven, USA, Nov. 3-7, 2014
- Large subgroup with sub-subgroups for every pilot isotope
- Many valuable contributions from LANL, ORNL, BNL, RPI, CEA, IRMM, JAEA, IAEA, CNDC... + SG39 (and ex-SG34) : See NEMEA/CIELO Workshop Proceedings (<http://oe.cd/GB>)

WPEC – New SG 41 - INDA

Improving ND accuracy of ^{241}Am and ^{237}Np capture cross-sections

H. Harada, JENDL

Tasks

- Assessment of cross-sections and covariance evaluations
- Assessment of cross-sections by differential methods
- Assessment of cross-sections by spectrum averaged methods
- Assessment of relevant nuclear structure data
- Update of cross-sections and covariances
- Recommendation of best practices, methods and international framework for improving nuclear data accuracy

Just started.

WPEC – Proposed new subgroup – TS Data

Thermal Scattering Kernel $S(\alpha,\beta)$: Measurement, Evaluation and Application

Proposal under preparation by L. Leal & G. Noguere, ENDF

Tasks

- Assess standard and innovative methodologies for generating $S(\alpha,\beta)$
- Examine existing formats for uncertainty (covariance) generation
- Demonstrate the feasibility of generating $S(\alpha,\beta)$ and uncertainty in a practical application

Aim to start activities in 2015.

Challenges

Nuclear Data Challenges

WPEC

- Further improve the link between Measurement, Evaluation and Validation activities.
 - Re-establish long-term WPEC Subgroup A on measurement activities?
 - Better Horizontality: WPEC-SG39, SG40/CIELO and other NEA activities: WPRS (IRPhEP and SINBAD), WPNCS (ICSBEP, SFCOMPO)
- Succeed in developing/implementing a new structure/format for nuclear data (SG38 and beyond: re-establish long-term Subgroup B?)
- Succeed in developing new improved files for CIELO isotopes (SG40 and beyond)

Nuclear Data Challenges

JEFF after JEFF-3.2

JEF(F) has been successful for 30+ years.

The evolving context calls for rethinking the “business model” of JEFF to better address member country priorities and step up to challenges ahead in a general context of wavering support to ND activities.

- *JEFF must place itself in position to take advantage of favourable conditions ahead :*
 - Many new high-quality differential measurements in coming years
 - JEFF is already the formally designated repository for a number of these (EC, ANDES, CHANDA, NEEDS...)
- *New tools and methodologies have emerged, and JEFF must adapt*
 - Continuous feedback, fix, verification in a versioning system
 - Semi automated validation of evaluated files
 - Ongoing progress will continue in nuclear models and codes, TALYS, GEF, CONRAD...
 - New methodologies for systematic & consistent ND production exist (TENDL, GEFY)
 - New methodologies for validation of new data (e.g: covariances) are needed too

Motivations for “JEFF-4”

- JEFF-4 (4Cs?): *Completeness, Consistency, Covariance and Credibility*
- “Next decade” : JEFF-4 after 2020 ?
- Leap forward warrants a change : JEFF “Business as usual” practices will not meet the qualitative leap needed.
- JEFF’s major stake is to meet its users long-time expectations of a high quality ND library which can be reliably used in uncertainty assessment studies.*

Motivations for “JEFF-4”

- Challenges are a reality :
 - General funding issue for ND
 - Expert evaluator manpower bottleneck (JEFF DD, FY, XS Resonances ...)
 - International collaboration is challenging : different groups have different objectives, priorities and timescales (e.g Industry vs R&D, national vs international priorities, etc)
- JEFF stake-holders need to identify common drivers to develop a long-term vision substantiated with a programme of work compatible with these challenges to *progressively* meet them.

Challenges and Opportunities for JEFF @ The DataBank

- Streamline and centralize the process of integration of information at NEA DB by creating the conditions for the library to be regularly and consistently updated
 - Systematize
 - In-house differential validation (comparison) with JANIS/EXFOR
 - In-house Integral validation suite (benchmarking) with NEA's integral benchmark databases (ICSBEP/IRPHE)
 - Automated versioning system of evaluated files
 - Efficient incorporation of user feedback (Modern management of data files)
 - Facilitate
 - The analyses of benchmarking/ trends / setting up priorities
 - The production of well-documented libraries,
 - Secure
 - Expertise of JEFF users/evaluators
 - Minimal technical manpower fully dedicated to JEFF and Nuclear Data at DB
- This will allow to
 - Progressively remove legacy errors / error compensations
 - Progressively Assimilate new high-quality differential and integral measurements
 - Prepare the way to build upon progress made in methodologies/models/codes: TALYS, GEF, CONRAD, ...

Opportunities

- Strong expert community of “users and producers” of ND is consolidated at NEA
 - Continued Support from NEA DB to targeted actions for ND/JEFF
 - Taking profit from horizontal activities and tools developed at NEA
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- NEA Data Bank member countries have recognized and voiced the importance to strengthen ND activities at NEA (NEA DBTF)
 - Flexibility of NEA/DB framework to consider new approaches to these challenges (*A JEFF separately funded project?*)

Thank you for your attention