WPEC Expert Group on the High Priority Request List for Nuclear Data

Chair:	Dr. Arjan PLOMPEN
Members:	Representatives of the co-operating nuclear data evaluation projects (ENDF, JEFF, JENDL, ROSFOND/BROND) or NEA member countries
Observers:	International Atomic Energy Agency (IAEA), *By agreement* Chinese Evaluated Nuclear Data Library (CENDL) Project, *By invitation*
Date of creation:	May 1991
Duration:	June 2016

Mandate:

- Agreed at the 16th meeting of the Working Party on International Nuclear Data Evaluation Co-operation [NEA/SEN/NSC/WPEC(2004)2]
- Extended mandate as a part of WPEC activities at the 23rd meeting of the Nuclear Science Committee in June 2012 [NEA/SEN/NSC(2012)3]
- Revised and extended at the meeting of the NEA Nuclear Science Committee in June 2013 NEA/NSC/DOC(2013)2]
- Revised and extended at the 26th meeting of the Working Party on International Nuclear Data Evaluation Co-operation [NEA/SEN/NSC/WPEC(2014)2] and endorsed at the 25th meeting of the NEA Nuclear Science Committee in June 2014 [NEA/SEN/NSC(2014)2]

Purpose, scope and membership

The concept of a nuclear data request list has a long history in applied nuclear science. The concept is that if requests from applied users of data are collected in a convenient location it should provide a stimulus to measurers, modellers, and evaluators to undertake work that could lead to certain requests becoming satisfied.

A revised High Priority Request List (HPRL) for nuclear data needed for applications has been in existence under the auspices of the OECD Nuclear Energy Agency (NEA) for several years. This List provides a point of reference for nuclear data stakeholders and developers and has led to many new initiatives in nuclear data measurement, evaluation and validation. Its effectiveness in stimulating new measurements, evaluations and verification actions required to meet the expressed needs is well established.

A standing expert group is essential to maintain the HPRL as a point of reference in nuclear data research and development. The expert group will consist of at least three representatives from each data project: one from the data user, one from the evaluation and validation community and one from the experimental community. The expert group may have additional representatives from the IAEA Nuclear Data Section, as well as countries not represented in the above mentioned projects.

The HPRL will reflect the actions undertaken by WPEC and will help guide future activities. The expert group will report to WPEC.

Objectives

The expert group is responsible for managing the activities related to the HPRL, in particular for guaranteeing that the entries are up-to-date and well-motivated by current interests in the field of nuclear energy. The group is also responsible for stimulating follow-up to the entries and collecting the feedback provided by any of the related activities that may further the resolution of a request. The expert group will work mainly by electronic mail exchanges. Physical meetings will be held typically once a year.

The HPRL is organized as follows:

1. The List consists of one list with truly high priority requests, a list with general requests and a list with special purpose quantities divided in categories. This third list is an extension to the present List.
2. Stringent criteria are applied for entries on the lists. These will be evaluated by the Expert Group that will take the final decision for adopting a request.
3. A “high priority request” is justified by quantitative sensitivity studies (or the equivalent) and sufficiently documented.
4. A “general request” is well motivated for a specific quantity on a specific nucleus and is documented, but lacks a detailed backing by a sensitivity analysis or an impact study.
5. A “special purpose request” in a well-defined category is of interest to a recognized important subfield of applied nuclear science for which it is essential to stimulate new activity. Such a request may not satisfy the criteria as in the case of points 3. and 4.

The request lists will be subjected to periodic review to monitor progress and determine whether each individual request should continue to be included in these lists.

Deliverables

- A report on the status of all requests describing completed activities and outlook.
- An up-to-date online version of the “High Priority Request List for Nuclear Data”.

Request ID	H464 (NEA=464)		Status of the request	Request to be checked	
Target	Reaction and process	Incident Energy	Secondary energy or angle	Target uncertainty	Covariance
93-NP-237	(n,f) SIG,DE	200KeV-20MeV	0	0	Y
Field	Subfield	Date Request created	Date Request accepted	Ongoing action	
Fission	fast reactors	11-MAY-15			

Requester: Dr Fredrik TOVESSON at LANL, USA
Email: tovesson@lanl.gov

Project (context): Los Alamos National Laboratory

Impact:

- The Np-237 fission cross section has impact for certain fast nuclear reactor designs. A sensitivity study by Aliberti et al. [1] pointed to a target accuracy of 8% for this cross section for Sodium-cooled Fast Reactor of the Gen-IV type (high level waste recycling).
- WPEC Subgroup-26 [2]: Present uncertainty (BOLNA) 6-8% from 0.5-6 MeV. Required uncertainty for an Accelerator Driven Minor Actinide Burner (ADMAB): 1.5-4 %.
- For many measurements the ^{237}Np(n,f) is a reference cross section that is valuable on account of its low fission threshold and moderate activity.

Accuracy:
Uncertainties of 2-3%

Justification document:
There is a discrepancy of about 6-9% between a recent measurement performed by the n_TOF collaboration and ENDF/B-VII (C. Paradela et al. [3]).
The higher n_TOF values are supported by a validation exercise by Leong et al. [4].
A recent independent result in the energy range from 4.8 to 5.6 MeV yields cross sections that in function of energy first agree with ENDF/B-VII and then with the n_TOF result (M. Diakaki et al. [5]).
Independently an issue was recently found when cross sections for Pu-isotopes referred to the ^{238}U(n,f) cross section were compared to the same cross sections referred to the ^{237}Np(n,f) cross section in the same measurement arrangement (P. Salvador et al. [6]).
Comment from requester:
Comments from evaluator/experimentalist:
Comments for achieved accuracy:

Review comment:
The request is well motivated and of some concern also to reactor dosimetry when using spectral indices and/or reaction rates of 237Np fission chambers (IRDFF [7]).

Additional file attached:

References:
[1] G. Aliberti et al., Annals of Nuclear Energy 33 (2006) 700–733.
[2] M. Salvatores et al., Nuclear Science NEA/WPEC-26, www.oecd.org.
[3] C. Paradela et al., Phys. Rev. C 82 (2010) 034601; Korean Physical Society 59 (2011) 1519.
[4] L.S. Leong et al., Annals of Nuclear Energy 54 (2013) 36.

[5] M. Diakaki et al, Nuclear Data Sheets 119 (2014) 52.
[6] P. Salvador et al., Nuclear Data Sheets 119 (2014) 55.
[7] International Reactor Dosimetry and Fusion File, https://www-nds.iaea.org/IRDFF/ (2014).

Proposed Changes in the HPRL Website

1. Background

The High Priority Request List (HPRL) web pages and database are maintained by the Data Bank on behalf of WPEC Subgroup C. The request list is currently divided in two categories of requests: High Priority (HP) and General (G).

This document describes the changes requested by Subgroup C in order:

- To add a third category of requests for Special Purpose Quantities (SPQ),
- To generally improve the appearance and usage of the HPRL web pages.

The request to add a third category affects both the database and the web interface. In this document, the Subgroup C request is translated into changes to the web interface and further discussion may be necessary if the related changes to the database are not straightforward.

The following HPRL webpages are directly affected by the Subgroup C request:

- Main page (www.oecd-nea.org/dbdata/hprl)
- New request form (www.oecd-nea.org/dbdata/hprl/requestform.html)

A few additional web pages may be affected indirectly via e.g., drop-down lists:

- Request editor (www.oecd-nea.org/dbdata/hprl/editdb.pl?submit=Edit+this+record&id=432)
- …

2. Proposed changes to the HPRL Main Page

Replace the menu bar by six tiles (as indicated in the image below together with additional changes):

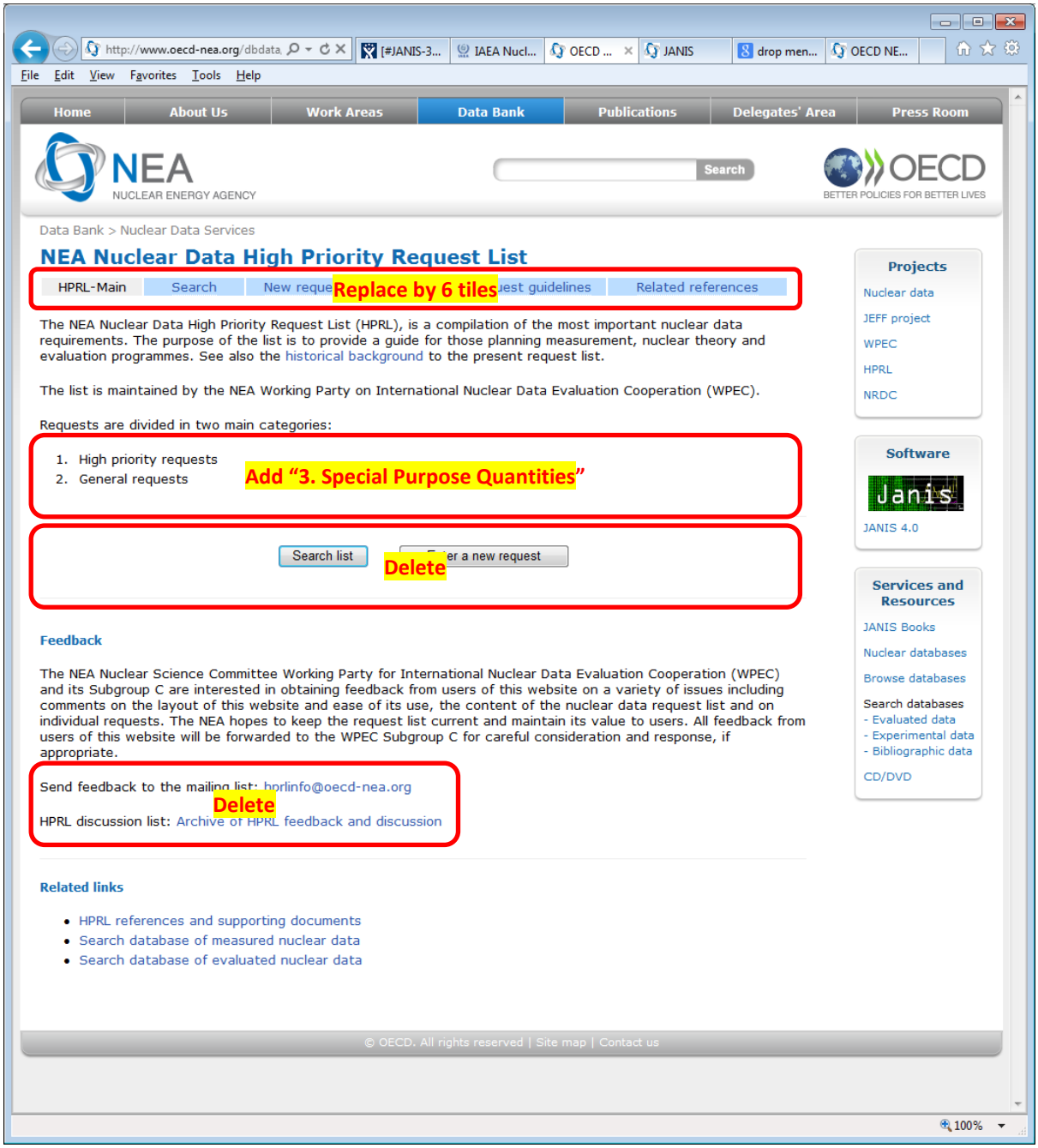
1) HPRL Main
2) High Priority Requests (HPR)
3) General Requests (GR)
4) Special Purpose Quantities (SPQ)
5) New Requests
6) Discussion and Feedback

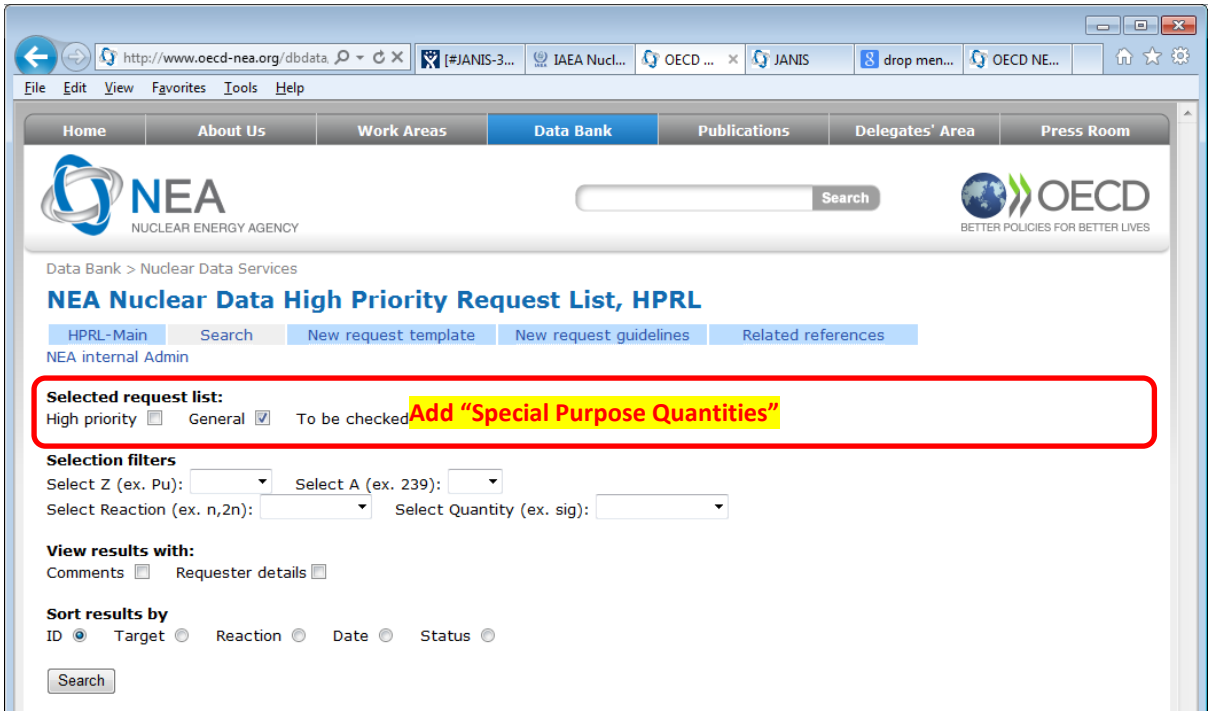
Clicking on “New Requests” should direct to the “New Request Form” (as today) and clicking on “Discussion and Feedback” should direct to the HPRL Mailing List web page, a list of the available feedback documents, and a form allowing new feedback to be entered.

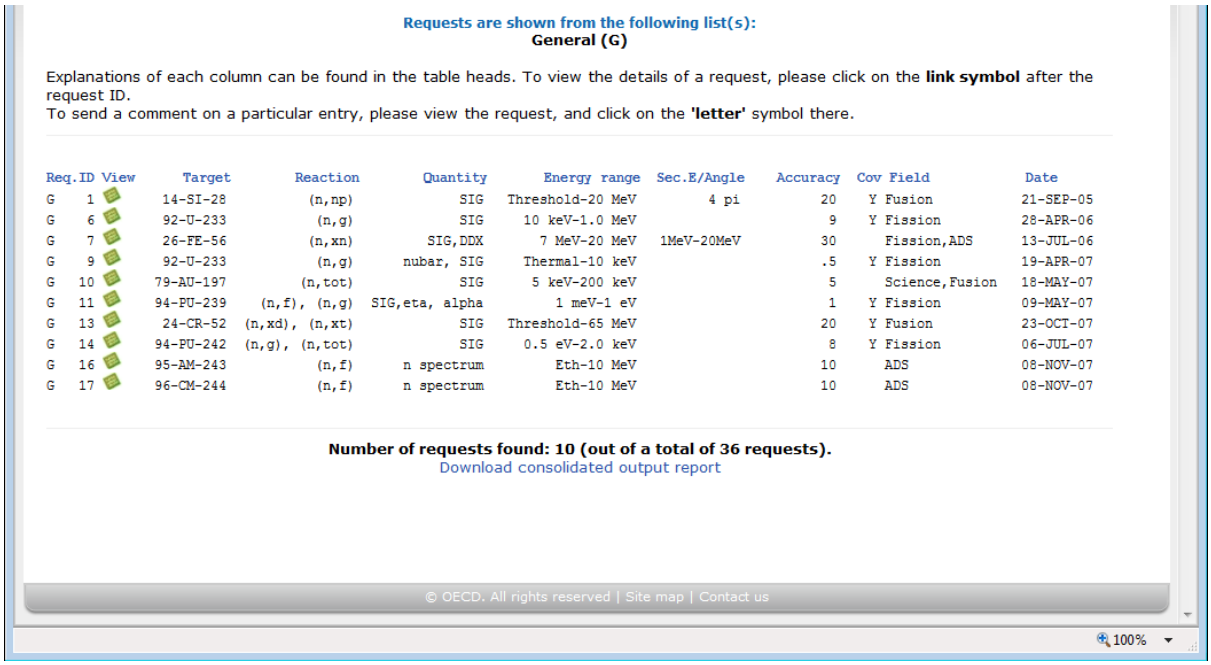
Clicking on the tile of HPR or GR should direct to the corresponding list (as it would come out of the search form without selecting anything, except HPR or GR). Clicking on the tile of SPQ should direct to another page with tiles for the various SPQ (e.g. Spectrum averaged dosimetry cross-sections or

Decay data, to the extent they are established) and after that to the list of requests as for HPR and GR, but then only for one of the SPQ category. On each of these pages the search facility could appear on top of it (ideally in a compact mode, so just a button, that expands the search form only when it is needed and leaving the list visible). See the example below for GR (assembled from two screenshots).

The search function to simultaneously query all lists should remain available (e.g. to find anything Pu-239, or everything fission).







Requests are shown from the following list(s):
General (G)

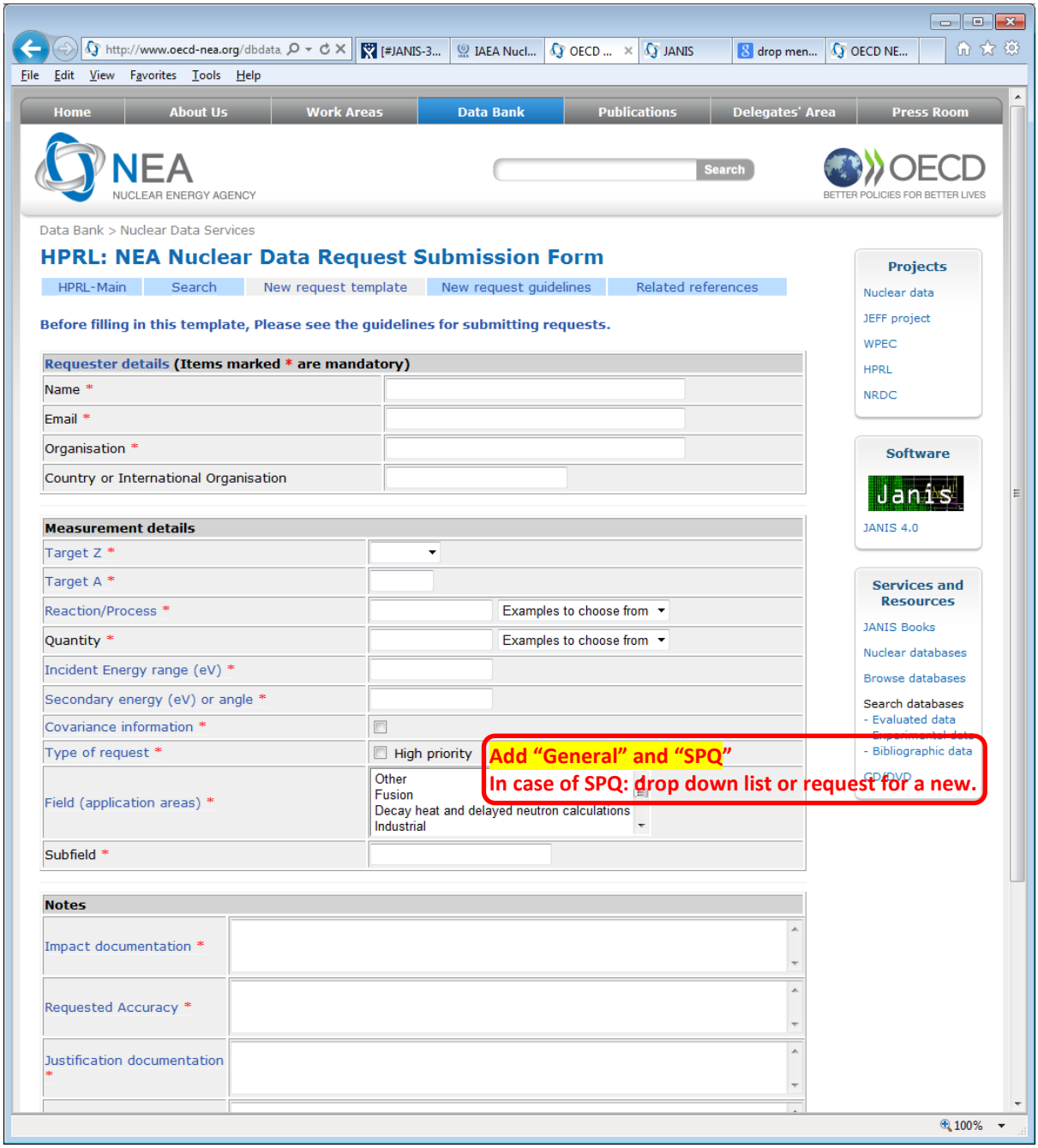
Explanations of each column can be found in the table heads. To view the details of a request, please click on the **link symbol** after the request ID.
To send a comment on a particular entry, please view the request, and click on the **'letter'** symbol there.

Req.ID	View	Target	Reaction	Quantity	Energy range	Sec.E/Angle	Accuracy	Cov	Field	Date
G 1		14-SI-28	(n,np)	SIG	Threshold-20 MeV	4 pi	20	Y	Fusion	21-SEP-05
G 6		92-U-233	(n,g)	SIG	10 keV-1.0 MeV		9	Y	Fission	28-APR-06
G 7		26-FE-56	(n,xn)	SIG,DDX	7 MeV-20 MeV	1MeV-20MeV	30		Fission,ADS	13-JUL-06
G 9		92-U-233	(n,g)	nubar, SIG	Thermal-10 keV		.5	Y	Fission	19-APR-07
G 10		79-AU-197	(n,tot)	SIG	5 keV-200 keV		5		Science,Fusion	18-MAY-07
G 11		94-PU-239	(n,f), (n,g)	SIG,eta, alpha	1 meV-1 eV		1	Y	Fission	09-MAY-07
G 13		24-CR-52	(n,xd), (n,xt)	SIG	Threshold-65 MeV		20	Y	Fusion	23-OCT-07
G 14		94-PU-242	(n,g), (n,tot)	SIG	0.5 eV-2.0 keV		8	Y	Fission	06-JUL-07
G 16		95-AM-243	(n,f)	n spectrum	Eth-10 MeV		10		ADS	08-NOV-07
G 17		96-CM-244	(n,f)	n spectrum	Eth-10 MeV		10		ADS	08-NOV-07

Number of requests found: 10 (out of a total of 36 requests).
Download consolidated output report

3. Proposed changes to the New Request Form

The "Type of request" field should be updated with additional categories ("General" and "Special Purpose Quantities")



3. Proposed changes to drop-down lists

The following drop-down lists are available in various forms:

- Z of the target from www.oecd-nea.org/dbdata/hprl/zsym.htm (and hardcoded in `hprl.pl')
- A of the target from the database table `hprlzaq'
- Reaction (including entrance channel) from www.oecd-nea.org/dbdata/hprl/rlist.htm
- Quantity (cross-section, etc.) from www.oecd-nea.org/dbdata/hprl/qlist.htm
- Field (application areas) from the database table `hprlpurpose'
- Priority (H, G, SP) is hardcoded in the "Request Editor". There are to be several lists of SPQ. NEA should provide a coding system to distinguish.

These lists should be reviewed, made consistent and complemented in order to allow Special Purpose requests, e.g. Thermal Scattering Law data on a compound. One may use EXFOR dictionary for that purpose.

4. Example of Special Purpose Quantities

(For implementation refer to the note of SG-C for this example,).

It is proposed to create a specific request list in the category of Special Purpose Quantities for spectrum averaged dosimetry cross-sections. The new measurements should make effort to reach uncertainty 2-5% (E50% < 15 MeV) or 5-10% (E50% > 15 MeV), as in the best previous experiments.

Cf-252(SF) spectra

Not measured yet (26 reactions):
Sc-45(n,g), Nb-93(n,g), Li-6(n,t)He-4, Fe-58(n,g), Ag-109(n,g), U-235(n,g), B-10(n,a), U-238(n,g), W-186(n,g), Am-241(n,f), P-31(n,p), Zn-67(n,p), Fe-54(n,a), In-115(n,2n), Pr-141(n,2n), As-75(n,2n), Y-89(n,2n) , Ti-47(n,np), Na-23(n,2n), Ti-49(n,np), Ti-48(n,np), Fe-54(n,2n), Bi-209(n,3n) ,Tm-169(n,3n), Co-59(n,3n)

Outliers (4 reactions): Co-59(n,γ), Mo-92(n,p), Ni-60(n,p), Ti-46(n,2n)
Large discrepancies or uncertainties: Th-232(n,f)

U-235(n_{th},f) spectra

Not measured yet (25 reactions):
Sc-45(n,g), Nb-93(n,g), Fe-58(n,g), Ag-109(n,g), U-235(n,g), Ta-181(n,g), Th-232(n,g), U-238(n,g), Cu-63(n,g), In-115(n,g), W-186(n,g), Am-241(n,f), In-115(n,2n), Pr-141(n,2n), Cu-65(n,2n), Cr-52(n,2n), Ti-47(n,np), Na-23(n,2n), Ti-49(n,np), Ti-48(n,np), Ti-46(n,2n), Fe-54(n,2n), Bi-209(n,3n), Tm-169(n,3n), Co-59(n,3n)

Outliers (4 reactions):
Li-6(n,t)He-4, B-10(n,a)Li-7 – outlier (due to 12% contribution of (n,a)ta ?), La-139(n,g), P-31(n,p)

Large discrepancies or uncertainties: Rh-103(n,n'), Tm-169(n2n), Mn-55(n,2n)

Date: Dec 2013 - Mar 2015 *back to CRP-web*

Proposals for new measurements for IRDFF community and HPRL.

I. Spectrum Averaged (SPA) cross sections

Following the action of 1st RCM (see Report INDC(NDS)-0639, page 15) and analysing the available SPA data measured in fields:

Cf-252(s.f.) - available measured data and C/E plots
U-235(n_{th},f) - available measured data and C/E plots
MACS(30 keV) - available measured data and C/E plots

we formulate a list of Not-Measured, Outliers or "Discrepant" data for IRDFF community and for submission to HPRL:

NB.1. Since it is difficult to measure the (n,γ) cross sections due to impact of room and set-up returned neutrons, only the threshold reactions from Not-Measured (marked as **bold)**, Outliers and Discrepant reactions we primarily recommend to measure and to include in HPRL.

NB.2. SPA for **high threshold (above ≈ 10 MeV) dosimetry reactions**, which may serve to "measure" the unknown high energy part of ^{252}Cf(s.f.) and ^{235}U(n_{th},f) spectra, will require intensive source and probably new detection techniques (e.g. AMS) alternative to the conventional activation one. For more details see proper information .

1. SPA in Cf-252(s.f.) field

Not Measured yet (26 reactions):

Sc-45(n,γ), Li-6(n,t)He-4, Nb-93(n,γ), Fe-58(n, γ), Ag-109(n, γ), U-235(n, γ), B-10(n,a), U-238(n, γ), W-186(n, γ), **Am-241(n,f), P-31(n,p), Zn-67(n,p), Fe-54(n,α), In-115(n,2n), Pr-141(n,2n), As-75(n,2n), Y-89(n,2n), Cr-52(n,2n), Ti-47(n,np), Na-23(n,2n), Ti-49(n,np), Ti-48(n,np), Fe-54(n,2n), Bi-209(n,3n), Tm-169(n,3n), Co-59(n,3n), ^{117}Sn(n,n')^{117m}Sn**

Outliers (4 reactions):

Co-59(n,γ), Mo-92(n,p), Ni-60(n,p), Ti-46(n,2n)

Large Discrepancies or Uncertainties (2 reactions):

Th-232(n,f), U-238(n,2n)

2. SPA in U-235(n_{th},f) field

Not Measured yet (22 reactions):

Sc-45(n,γ), Nb-93(n,γ), Fe-58(n, γ), Ag-109(n,γ), U-235(n,γ), Ta-181(n,γ), Th-232(n,γ), W-186(n,γ), **Am-241(n,f), In-115(n,2n), Pr-141(n,2n), Cu-65(n,2n), Cr-52(n,2n), Ti-47(n,np), Na-23(n,2n), Ti-49(n,np), Ti-48(n,np), Ti-46(n,2n), Fe-54(n,2n), Bi-209(n,3n), Tm-169(n,3n), Co-59(n,3n), ^{117}Sn(n,n')^{117m}Sn**

Outliers (5 reactions):

Mn-55(n,γ), U-238(n, γ), La-139(n, γ), P-31(n,p), U-238(n,2n)

P.S.: Li-6(n,t)He-4, B-10(n,α)Li-7 are not outliers due to ≈30-20% contribution from (n,n'α) and (n,t2α)

Large Discrepancies or Uncertainties (6 reactions):

Rh-103(n,n'), U-238(n,γ), Cu-63(n,γ), Tm-169(n,2n), Mn-55(n,2n), Ni-58(n,2n)

3. MACS (30 keV) field

Not Measured yet (4 reactions):

Ag-109(n,γ)Ag-110m, Th-232(n,γ)Th-233, U-235(n,γ)U-236, U-238(n,γ)U-239

II. Mono-energy cross sections

1. Low threshold reactions

The new reaction ^{117}Sn(n,n')^{117m}Sn was proposed for inclusion IRDFF by RCM-2 (no one measurement on plateau !)

^{117}Sn(n,n')^{117m}Sn https://www-nds.iaea.org/IRDFFtest/Sn117(n,n)Sn117m.pdf

This dosimeter has been already experimentally tested (irradiated) employing the inreached Tin foil (93% at. ^{117}Sn) in different reactor spectra at CEA. However, the microscopic nuclear data for this reaction suffer of lack measurements on plateau (5 - 10 MeV), discrepancies between library evaluations, lack of uncertainties … prevent this reaction to be used.

2. High threshold (n,xn) reactions (point and energy-integrated cross sections)

CRP strives to evaluate and eventually add to the IRDFF library the high threshold reactions with cross section plateaus located between 20 and 100-200 MeV to meet the requirements of the high neutron energy accelerator driven sources such as ADS.
Often it happens to be a set of several reactions of (n,xn) type on one of isotope: ^{89}Y, ^{59}Co, ^{169}Tm, ^{197}Au, ^{209}Bi, ^{175}Lu, ^{169}Tm, ^{139}La, ^{139}Rh, ^{63}Cu, ^{93}Nb .... Due to this, already one foil can serve for neutron fluence monitoring and spectrum unfolding.

Figures/materials illustrating the status of such reactions:

^{209}Bi(n,3-8n)	https://www-nds.iaea.org/IRDFFtest/Bi(n,xn).pdf
^{89}Y(n,2-4n) & (n,p)	https://www-nds.iaea.org/IRDFFtest/Y89(n,xn).pdf
^{59}Co(n,3-5n)	https://www-nds.iaea.org/IRDFFtest/Co(n,xn).pdf
^{197}Au(n,3-5n)	https://www-nds.iaea.org/IRDFFtest/Au(n,xn).pdf
^{175}Lu(n,2-4n)	https://www-nds.iaea.org/IRDFFtest/Lu(n,xn).pdf
^{169}Tm(n,2-3n)	https://www-nds.iaea.org/IRDFFtest/Tm(n,xn).pdf
^{54}Fe(n,2n)	https://www-nds.iaea.org/IRDFFtest/Fe54n2n.pdf
^{139}La(n,4-10n)	…...
^{103}Rh(n,4-8n)	……
^{nat}Fe(n,x)^{54}Mn	……
^{nat}Ti(n,x)^{46}Sc, ^{47}Sc, ^{48}Sc	……..

see also on of the overview https://www-nds.iaea.org/IRDFFtest/RCM1/Pronyaev-nxn-high-en-dos.pdf

III. Common Request on experimental UNCERTAINTIES for reactions listed above

The new measurements should make effort **to reach uncertainty 2-5% ($E_{50\%}$ < 15 MeV) or 5-10% ($E_{50\%}$ > 15 MeV)**, as in the best previous experiments.

Simakov requests translated to request form

Example: 45Sc(n,g) in the 252Cf(SF) SPA.

- In reality this example needs to be repeated 32 times for Cf252 SPA, 32 times for 235U(n,f) SPA, 4 times for 30 keV MACS.
- For 117Sn(n,n')117mSn the request is for the first measurements at the cross section plateau, i.e. from 5 to 10 MeV (*de facto - requested by C. Destouches, CEA)* .
- For 20-100 MeV the request is for any good data on (n,3-6n) reactions on 197Au, 169Tm, 209Bi, 59Co, 63Cu, 89Y, 93Nb, 139La, 103Rh, 175Lu, natFe(n,x)54Mn, natTi(n,x)46,47,48Sc.

Main messages:

1. we need IT support to start with SPQ,
2. we need secretarial support with the Simakov requests, once (After 1 is completed).

Example request form

(form field names left, form entries right, additions SG-C in purple, to do in red)**:**

Requester details	
Name	Simakov
Email	s.simakov@iaea.org
Organisation	IAEA
Country or international organization	IAEA
Measurement details (this field should be **Request details, action NEA**)	
Target Z	Sc
Target A	45
Reaction/process	(n,g)
Quantity	SPA
Incident energy range	FNS 252Cf(SF)
Secondary energy (eV) or angle	NA
Covariance information	Y
Type of request	SPQ
Field (application areas)	Reactor Dosimetry (to be defined)
Subfield	Validation
Notes	
Impact documentation	IRDFF webpage https://www-nds.iaea.org/IRDFF/ IRDFF test CRP page https://www-nds.iaea.org/IRDFFtest/ <link to pdf proposal of Simakov, action NEA> <link to pdfs refs in the proposal of Simakov, action NEA>
Requested Accuracy	New measurements must make an effort to reach 2-5% uncertainty for E50%<15 MeV or 5-10% for E50%>15 MeV).
Justification documentation	As impact documentation.
General comments	The International Reactor Dosimetry and Fusion File aims at providing validated evaluated neutron dosimetry reactions for all applications in reactors and fusion technology development. Spectrum averaged cross sections in well characterized fields such as the 252Cf(SF), 235U(n-th,f) fission neutron spectra and the quasi-maxwellian 30 keV spectrum are essential to validation of the proposed cross sections in fields that are close to the interest in applications.
Attached files:	Proposal Simakov and the documents referred in his text.

Reviewer comment:

Reactions without threshold measured in fast spectra such as the ^{252}Cf(SF) and ^{235}U(n-th,f) spectrum tend to have their spectrum averaged cross section dominated by scattering contributions and 'room-return' neutrons.
In all cases experiments should be careful to minimize these contributions and maximize the reaction rate of the target spectrum. For new experiments best estimates must be provided by detailed Monte Carlo calculation of the spectrum realized in the experiment and the Monte Carlo model must be made available to IRDFF to facilitate validation of new proposals for the cross section. In all cases it is advised to publish both the fully corrected SPA and the measured reaction rates of the primary reaction and the monitor reactions used for normalization and validation of the model. The measured reaction rates must be provided with a full covariance matrix.

I am sending you a list of activities you can offer to the international working group for nuclear data evaluation (WPEC, Secretariat - Emmeric Dupont), the Russian member of which is T.V. Golashvili, Director of the Head Scientific and Methodological Data Center (HSMDC) in the field of utilization of atomic energy affiliated to Research Nuclear University MEPhI and attributed to the State Service of Standard Reference Data (SSSRD):

1) The needs in nuclear-physical data to be evaluated for nuclear science and technology. When analyzing the needs in nuclear-physical data we have received the desired needs while there were no experiments. Therefore there is a need to carry out experiments of the data as follows (see appendix 2 – experimental data list).
2) The basic nuclear-physical characteristics required for use in nuclear facilities including the evaluated nuclear data. This is the evaluated data on the nuclide mass, mass excess, magnetic and quadrupole moments of nuclei ground states, the nuclei half-life, the percentage of stable isotope in natural mixture of isotopes of a chemical element, decay modes and branching ratios, modes and average values of energy radiations, the energies of prominent gamma-rays and yields thereof, activation cross sections in the thermal point for stable nuclei. Values of many characteristics are given with mean-square uncertainties (standard deviations). See enclosure.
3) Nuclear Data Reference Book (4th edition, revised) comprising the evaluated nuclear data. It is released at the national and international levels. This reference Book is the winner of All-Russian Competition among the educational and reference books on nuclear power held by Rosatom in 2009. Nuclide Guide-3 (3-rd edition, revised) in 3 languages (Russian, English, Chinese) was issued also.
4) Wall-type nuclear-physical charts developed on the basis of these guides at the national and international levels.
5) National Standard under development comprising required criteria taking into account in evaluation of standard reference data.

Enclosed:
1 - A list of nuclear-physical characteristics – 5 pp.
2 - A list of experimental data – 4 pp.

HSMDC Director, Atomic Energy SSSRD, Scientific Head, Interdepartmental Standard Reference Data Qualification Commission, Chairman Professor Golashvili T.V.

Summary Request_list.pdf by Golashvili:

1. Standards for detector calibration (67Ga, 111In, 129I, 153Sm, 155Eu, 170Tm, 228Th decay chain, 234mPa, 241Am). Each comes with a comment and the required method of measurement.
2. Actinide decay data (233Th, 231Pa, 233Pa, 235U, 236U, 237U, 236Np, 237 Np, 238Np, 236Pu, 242mAm, 243Am, 243Cm, 246Cm, 248Cm). Each with required quantity, achieved accuracy and request for improvement (but not quantified how much).
3. Radionuclides for activation in reactor neutron fluence (59Fe, 72Ga, 94Nb, 111mCd, 115mIn, 116m1,m2In, 165Dy, 199mHg and 204mPb). P(g) is needed better than 1%.
4. Nuclei far from stability (nuclear science: nuclear physics and astrophysics; 80,81Y, 80-83Zr, 82-86Nb, 84-87Mo)
5. Nuclear isomers for applications (decay schemes of 178m1,2Hf, 180mHf, 180mTa, 177mLu)

RADIONUCLIDES AND DECAY DATA FOR EXPERIMENTAL IMPROVEMENT

1. Standards for detector calibration.

Nuclide	Comments	Methods
^{67}Ga	The evaluation is based on the value of the absolute emission probability of conversion electrons from the gamma transition of 93.3 keV $P(ec_{1,0})$=0.325(4). It is obtained from the two discrepant measurement results of 0.3206(23) and 0.329(4). Further measurements of this key value are required.	4π(LS)e, X-γ coincidences
^{111}In	More accurate measurements of gamma-ray energies are recommended.	Ge detectors, curved-crystal spectrometers
^{129}I	The 2nd unique forbidden β^--transition to the $1/2^+$ ground state of ^{129}Xe was not observed. The experimental limit on this β^- branch intensity was obtained in 1954. Its refinement is required as the evaluation of the Pγ (39.58 keV) depends on this value.	β-γ anti-coincidences Precise measurement of ICC (α_K)
^{153}Sm	Significant uncertainties exist in the detail and accuracy of the proposed decay scheme. Therefore, γ-ray measurements are recommended to help resolve these issues, particularly with respect to the lower-energy transitions (< 100 keV).	Ge, Si(Li) detectors, β-γ coincidences
^{155}Eu	Weak overlapping of the two most accurate measurement results of the key value for the evaluation of ^{155}Eu decay data [Pγ (86.548 keV) = 0.305(3) and 0.311(4)] does not allow to obtain a good accuracy for the absolute X- and gamma-ray emission probabilities. Further measurements are merited to aid in making Pγ (86.548 keV) more precise.	Ge, Si(Li) detectors, β-γ coincidences
^{170}Tm	Discrepancy of the half-life measurement results obtained before 1970 does not allow to give a reliable recommended value for the ^{170}Tm half-life and requires new additional measurement of this half-life.	High isotopic purification, ionisation camera

Nuclide	Comments	Methods
^{228}Th decay chain	^{224}Ra decay: P_γ(240.986 keV) of 0.0412 (4) was derived from the relatively large number of direct γ-ray measurements. However, α-particle measurements and their adoption in decay scheme calculations gave P_γ(240.986 keV) of 0.0390 (3). While the γ-ray measurements were assumed to be more reliable in the evaluation, further α-particle and γ-ray studies are required to resolve this significant discrepancy between the two spectroscopic techniques.	α-γ coincidences α-spectrometry γ-spectrometry
^{234m}Pa	Recommended P_γ(1001 keV) of 0.00832 (10) was based on a series of extensive measurements in 1980/90s. However, three of these studies gave significantly higher values (by ~10%, at approximately 0.0091) than the other six measurements. Further studies are merited to aid in the resolution of this discrepancy.	β-γ coincidences
^{241}Am	There are some gamma-transitions scarcely studied and expected but not certainly observed: 27,03; 54,1; 95,0 keV. This leads to the not very good intensity balance for some levels. Further measurements of gamma-ray and conversion electron emission probabilities are required for these gamma transitions.	Ge, Si(Li) detectors α-e coincidences

2. Actinide decay data

Nuclide	Data type [a]	Accuracy achieved (%)	Comments
^{233}Th	P(β), P(γ)	~10	More precise P(β), P(γ) measurements are required
^{231}Pa	P(α), P(γ)	2-5	More precise P(α), P(γ) measurements are required
^{233}Pa	P(β)	~10	More precise P(β) measurements are required
^{235}U	P(α) P(γ)	5-12 1	More precise P(α), P(γ) (<120 keV) measurements are required
^{236}U	P(α) P(γ)	5-15 10	More precise P(α), P(γ) measurements are required
^{237}U	P(γ)	2-3	More precise P(γ) measurements for the main transitions are required

Nuclide	Data type [a]	Accuracy achieved (%)	Comments
^{236}**Np**	$T_{1/2}$ P(β)	10 -	P(β) and more precise $T_{1/2}$ measurements are required
^{237}**Np**	P(α) P(γ)	20 1-2	More precise P(α), P(γ), P(LX), P(e) measurements are required
^{238}**Np**	P(γ)	5	More precise P(γ) measurements are required
^{236}**Pu**	P(α) P(γ)	1-3 30	More precise P(α), P(γ) measurements are required
^{242m}**Am**	P(LX)	-	P(LX) measurements are required
^{243}**Am**	P(LX)	-	P(LX) measurements are required
^{243}**Cm**	P(LX)	-	P(LX) measurements are required
^{245}**Cm**	P(LX) P(γ)	- 10	P(LX) and more precise P(γ) measurements are required
^{246}**Cm**	$T_{1/2}$ P(LX) P(γ)	2 - ~10	P(LX) and more precise $T_{1/2}$, P(γ) measurements are required
^{248}**Cm**	P(LX) P(γ)	- ~5	P(LX) and more precise P(γ) measurements are required

[a] P(α), P(β), P(γ), P(LX) – alpha-particle, beta-particle, gamma-ray, X-ray emission probability, respectively; $T_{1/2}$ – total half-life.

3. Radionuclides important for activation measurements of reactor neutron fluencies.

The precise (<~1%) P(γ) measurements are required for the following radionuclides:
^{59}Fe, ^{72}Ga, ^{94}Nb, ^{111m}Cd, ^{115m}In, ^{116m1,m2}In, ^{165}Dy, ^{199m}Hg, ^{204m}Pb.

4. Nuclei far from stability line, important for nuclear physics and astrophysics.

Complex nuclear equipment is required for obtaining these nuclei and measurements of their decay data: accelerator, on-line electromagnetic mass-separator and different spectrometric apparatus. The following nuclei are of great interest for nuclear physics and astrophysics: **^{80}Y, ^{81}Y, $^{80-83}$Zr, $^{82-86}$Nb, $^{84-87}$Mo.**

5. Nuclear isomers important for applications.

The additional experimental investigations of decay schemes, particularly, high energetic levels (~ 2MeV) are required for **^{178m1,2}Hf, ^{180m}Hf, ^{180m}Ta,** ^{177m}Lu.

Feedback Form for the High Priority Request List for nuclear data.

Description of the Entry

Entry number	29
Nuclide	23Na
Quantity	(n,inel)
Target uncertainty	4-10%, depending on system
Date issued	12 Sep 2008

Compilers

David Brown (dbrown@bnl.gov)

Short summary.

The request as currently stated is resolved by the evaluation work of Archier et al. [1][2] and the testing of Salvatores et al. [3] as the target accuracy of the (n,inel) cross section was met in the requested energy ranges. That said, the testing by Lee and Brun [4] and in [3] only address the inelastic cross section. Below 2 MeV, the Archier et al. evaluation is based on an R-matrix fit to [5]. We comment that the experimental work reported in [5] requires confirmation since the reanalysis of experimental data in [7] call into question older experiments that [5] was meant to confirm .

However, it is known from the study of other critical assemblies [8] and from the work of WPEC Subgroup 35 that the angular distributions from (n,inel) play a disproportionate role in the leakage from small systems and the impact of the (n,inel) angular distributions in critical assemblies has not been addressed. The experimental work in [9] is addressing this need.

Table with the overview of activities since the request was issued.

Nature of feedback[1)]	Quantity addressed[2)]	Achieved Uncertainty[3)]	Organisation	Contact person[4)]	Reference[5)]
Experiments resulting in new microscopic data	(n,inel)	5% for E < 2MeV, 10% for E > 2MeV	JRC-Geel, Retieseweg, 2440 Geel, Belgium	A.J.M. Plompen, C. Rouki	[5]
	(n,inel) cross section and angular distribution		U. Kentucky, Lexington, Kentucky, USA	J.R. Vanhoy	[8]

Integral experiments providing new benchmark data					
Validation feedback	keff in 2 ABR-1000 MOX core assemblies	N/A	CEA-Saclay	Y.-K. Lee, E. Brun	[4]
	Na void reactivity, ZPPR-9 assemblies	N/A	CEA-Cadarache, INL, ANL, BNL, many others	M. Salvatores, et al.	[3]
New evaluations	(n,inel), full evaluation	5% for E < 2MeV; 10% for E > 2 MeV	CEA-Cadarache	P. Archier, G. Noguère, C. De Saint Jean	[1], [2]
	(n,inel), covariance only	10-20% for E < 2 MeV; 8% for E > 2 MeV	BNL, LANL	M. Herman	[9]
Current interest[6)]	Sensitivities	N/A	INL, CEA-Cadarache, ANL, BNL, many others	G. Palmiotti, et al.	[7]
	(n,inel), (n,tot) cross section	N/A	JRC-IRMM, Retieseweg, 2440 Geel, Belgium	S. Kopecky and A.J.M. Plompen	[6]

Notes

1) *Nature of feedback. Please provide one line per new activity. Order the activities according to the four headings indicated in this column.*
2) *Quantity addressed. The quantity may differ from the target quantity of the entry on the HPRL but should have a well-established link with the target quantity of the entry. The aim is to provide a complete set of references to all works of interest to new evaluations of the target quantity.*
3) *Achieved uncertainty. Give the best number obtained by the activity. It is for the evaluator to sort out the details concerning the best use of the results of the activity. If important, provide further details in the short summary.*
4) *Contact person. Ideally we have a name and email address here. Please consult with the person concerned to obtain his consent to advertising these personal details on the NEA webpage and this form.*
5) *Reference. A citation referring to the list of references below.*
6) *Current interest. If new support for the request from sensitivity analysis, feedback from validation or otherwise is available this should be mentioned and it should be indicated whether the request must be modi-*

fied in the short summary (ie tighter uncertainty, different energy range, emphasis on associated quantities...).

References

[1] P. Archier, G. Noguère, C. De Saint Jean, A.J.M. Plompen, C. Rouki, "New JEFF-3.2 Sodium Neutron Induced Cross-sections Evaluation for Neutron Fast Reactors Applications: from 0 to 20 MeV", Nuclear Data Sheets 118 (2014) 140–143.

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Feedback Form for the High Priority Request List for nuclear data.

Description of the Entry

Entry number	7,34
Nuclide	^{56}Fe
Quantity	(n,Xn) DDX, (n,n') cross section
Target uncertainty	2-15% (#34), 33% (#7)
Date issued	16 Apr 2007 (#7) 12 Sep 2008 (#34)

Compilers

David Brown (dbrown@bnl.gov), Arjan Plompen (arjan.plompen@ec.europa.eu).

Short summary.

^{56}Fe evaluation is an ongoing activity under WPEC Subgroup 40 (CIELO). The request has not yet been resolved and neither target accuracy has been reached. New experimental results are under way for cross section and angular distributions [1] and are already available for the cross section from Refs. [2] and [3]. Reference [4] has an important comment about the level structure of the nucleus. Semi-integral and validation experiments were carried out in Refs. []. The sensitivity studies in Ref. [10]-[12] should help guide evaluators.

Table with the overview of activities since the request was issued.

Nature of feedback[1)]	Quantity addressed[2)]	Achieved Uncertainty[3)]	Organisation	Contact person[4)]	Reference[5)]
Experiments resulting in new microscopic data	(n,inel) cross section and angular distribution		U. Kentucky, Lexington, Kentucky, USA	J. Vanhoy	[1]
	(n,inel) cross section		HZDR	A. Junghans	[2]
	(n,inel) cross section	5%	JRC-Geel, IFIN-HH	A. Negret, A.J.M. Plompen	[3]
	Level scheme	N/A	LANL	N. Fotiades	[4]
Integral experiments providing new	Semi-integral scattering data. (elas-	3%	RPI	Y. Danon	[5]

benchmark data	tic+inelastic)				
	PERLE Experiment	3% on data 2-6% adj. inel. 5-8% adj. elast. 3-20% adj. cap.	CEA Cadarache	C. Vaglio-Gaudard	[6][7]
Validation feedback	Reaction rates in ASPIS shielding benchmark	N/A	CEA Saclay	C. Jouanne	[8]
	Various metrics in SINBAD (shielding) and ICSBEP benchmarks	N/A	Jožef Stefan Institute	I. Kodeli	[9]
	keff, reaction rates in variety of assemblies	N/A	CEA-Cadarache, INL, ANL, BNL, many others	M. Salvatores	[10]
New evaluations	(n,inel) cross section covariance	10-12% for E < 2 MeV; 5% for 2 MeV < E < 10 MeV; 8% for E > 10 MeV	BNL, LANL	M. Herman	[11]
	(n,inel) cross section and angular distribution	N/A	ORNL	L. Leal	[12]
Current interest[6)]	Sensitivities of model parameters to variety of critical assemblies	N/A	INL, CEA-Cadarache, ANL, BNL, many others	G. Palmiotti	[13]
	Sensitivities of model parameters to variety of critical assemblies	N/A	SCK-CEN, Mol, Belgium	A. Stankovskiy	[14]
	Sensitivities of model parameters to variety of critical assemblies	N/A	Uppsala University	J. Duan	[15]

Notes

1) *Nature of feedback. Please provide one line per new activity. Order the activities according to the four headings indicated in this column.*
2) *Quantity addressed. The quantity may differ from the target quantity of the entry on the HPRL but should have a well-established link with the target quantity of the entry. The aim is to provide a complete set of references to all works of interest to new evaluations of the target quantity.*
3) *Achieved uncertainty. Give the best number obtained by the activity. It is for the evaluator to sort out the details concerning the best use of the results of the activity. If important, provide further details in the short summary.*
4) *Contact person. Ideally we have a name and email address here. Please consult with the person concerned to obtain his consent to advertising these personal details on the NEA webpage and this form.*
5) *Reference. A citation referring to the list of references below.*
6) *Current interest. If new support for the request from sensitivity analysis, feedback from validation or otherwise is available this should be mentioned and it should be indicated whether the request must be modified in the short summary (ie tighter uncertainty, different energy range, emphasis on associated quantities...).*

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