



**International Atomic Energy Agency**

# **NSDD activities at the IAEA**

**D. Abriola**

**Nuclear Data Section**

**Department of Nuclear Sciences and Applications**

**USNDP Meeting, Santa Fe, Nov. 2010**

Nuclear Data SectionOrganization Chart  
(July 2010)

## Section Office (and INDC Secretariat)

Section Head: R.A. Forrest  
Nuclear Data Physicist  
(21709/21710)

Deputy Section Head: D. Abriola  
Nuclear Data Physicist  
(21712/21711)

Section Secretary: L. Vrapcenjak  
(21710)

Nuclear Data Services Unit	Nuclear Data Development Unit	Atomic & Molecular Data Unit
<p><u>S. Simakov</u> Unit Head (21717)</p>	<p><u>D.H. Abriola</u> Unit Head (21712)</p>	<p><u>B.J. Braams</u> Unit Head (21731)</p>
<p><u>V. Zerkin</u> Software Engineer (21714)</p>	<p><u>R. Capote Nov</u> Nuclear Physicist (21713)</p>	<p><u>W.M. Costello</u> (IT Systems Analyst) (21724)</p>
<p><u>S. Dunaeva</u> Nuclear Physicist (21727)</p>	<p><u>M.A. Kellett</u> Nuclear Physicist/Programmer (21708)</p>	<p><u>H.-K. Chung</u> Atomic Physicist (21729)</p>
<p><u>N. Otsuka</u> Nuclear Data Physicist (21715)</p>	<p><u>K. Nathani</u> Clerk (21711)</p>	<p>Systems Analyst/Programmer (21723)</p>
<p><u>J. Roberts</u> Nuclear Data Services Assistant (21725)</p>		<p><u>K. Sheikh</u> Database Assistant (21730)</p>
<p><u>A. Oechs</u> Clerk (21716)</p>		<p><u>M. O'Connell (25%)</u> Applications Programmer (21722)</p>



Valentina Semkova



## IAEA Activities Relating to NSDD

- Coordinated Research Projects (CRPs)
- ENSDF evaluations / NSR compilations
- Financial support for ENSDF evaluators and horizontal evaluation/compilation activities
- Coordination of the NSDD network
- Workshops
- Dissemination

## Nuclear Data Projects – Status, Oct 2010

### Coordinated Research Projects

- 6 completed
- 4 active
- 2 planned

### Data Development Projects + additional tasks

- 10 active

# Completed CRPs

No.	Short title	Duration	Participants (contracts)
1	Nuclear data for Th-U fuel cycle	2002–2007	11 (6)
2	RIPL-3	2003–2008	11 (5)
3	Nuclear data for the production of therapeutic radionuclides	2003–2007	8 (4)
4	Reference database for ion beam analysis	2005–2010	10 (4)
5	Reference database for neutron activation analysis	2005–2010	7 (4)
6	Updated decay data library for actinides	2005–2010	7 (4)

# On-going and Planned CRPs

No .	Short title	Duration	Participants (contracts)
7	<b>Heavy charged-particle interaction data for radiotherapy</b>	<b>2007–2010</b>	<b>12 (2)</b>
8	<b>Minor actinide neutron reaction data (MANREAD)</b>	<b>2007–2011</b>	<b>12 (4)</b>
9	<b>Nuclear data libraries for advanced systems: fusion devices (FENDL-3)</b>	<b>2007–2011</b>	<b>15 (3)</b>
10	<b>Prompt fission neutron spectra for actinides</b>	<b>2009–2012</b>	<b>12 (6)</b>
11	<b>Charged-particle nuclear data for medical isotope production and technological applications</b>	<b>2011–2014</b>	<b>-</b>
12	<b>Nuclear data for Particle Induced Gamma Ray Emission (PIGE) analysis</b>	<b>2011–2014</b>	<b>-</b>

# Updated Decay Data Library for Actinides (2005 - 2010), M.A. Kellett

## Overall objectives:

- Identification of data discrepancies and unfulfilled requirements
- Encouragement of measurements to address these requirements
- Undertake full decay scheme evaluations
- Assembly of a fully updated decay data library

## Specific Objectives:

Recommended decay data for the actinides and their daughters:

- half-lives
- branching fractions/decay modes
- $\gamma$ -ray and  $\alpha$ -particle energies and emission probabilities
- X-rays and conversion electron data, ...

All data to include uncertainties

# Updated Decay Data Library for Actinides (2005 - 2010), M.A. Kellett

## Participants:

<b>M.-M. Bé</b>	<b>LNHB, CEA Saclay, France</b>
<b>V.P. Chechev</b>	<b>VG Khlopin Radium Institute, St. Petersburg, Russian Federation</b>
<b>Huang Xiaolong</b>	<b>China Institute of Atomic Energy, China</b>
<b>F.G. Kondev</b>	<b>Nuclear Engineering Division, Argonne National Laboratory, USA</b>
<b>A. Luca</b>	<b>Institute of R&amp;D for Physics and Nuclear Engineering, Romania</b>
<b>G. Mukherjee</b>	<b>Variable Energy Cyclotron Centre, India</b>
<b>A.L. Nichols</b>	<b>IAEA Nuclear Data Section</b>
<b>A.K. Pearce</b>	<b>National Physical Laboratory, UK</b>
<b>M.A. Kellett</b>	<b>IAEA Nuclear Data Section (Scientific officer)</b>



# Updated Decay Data Library for Actinides (2005 - 2010), M.A. Kellett

## Current status:

- Finalising remaining evaluations
- Completed evaluations in ENSDF format, converted to ENDF format
- Preparation of final report

## Achievements so far:

- ✓ ~75% of actinide evaluations completed
- ✓ ~55% of decay daughter evaluations completed
- ✓ Measurements were undertaken – results published and evaluated
- ✓ A number of evaluations have been published in journals
- ✓ Improvements made to the DDEP methodology and software
  
- ✓ **New evaluators have been trained**
  
- ✓ **Identified data discrepancies leading to recommendations for future measurements**

**The only CRP related to NSDD:  
“Updated Decay Data Library for  
Actinides” is finishing in 2010**

- So far no new requests from Member States for NSDD related activities....
- The funds involved are modest, but it is a way to foster NSDD activities in the international community and provide “visibility”

## ENSDF evaluations (D. Abriola )

- Collaboration with A. Sonzogni,  
A=72 published.
- As part of ENSDF-2009 - evaluation of  $^{84}\text{Nb}$   
A=84 published
- New Mass chain A=144 started Oct. 2009 in  
collaboration with A. Sonzogni  
(17 nuclei, 93 new experimental references,  
21 XUNDL-files)

## NSR compilations (M. Kellett)

Compilation began **September 2005** when IAEA designated **Mark Kellett** as NSR keyword compiler

**Three journals** covered by the IAEA (~20-25% of NSR entries):

**Nuclear Physics A**

**European Physical Journal A**

**Physics Letters B**

**IAEA/NNDC collaborative visits:**

- **M.A. Kellett** one week visit to NNDC, July 2005
- **M.A. Kellett** one week visit to NNDC, Dec. 2005
- **D. Winchell** one week visit to IAEA, June 2006
- **M.A. Kellett** one week visit to NNDC, Oct. 2006
- **M. Bhattacharya** one week visit to IAEA, Oct. 2007
- **B. Pritychenko** one week visits to IAEA, Nov. 2009 (& Nov. 2010)

## NSR compilations (2)

IAEA has compiled [and keyworded] the following papers:

2005: 258 [134] (from Sept to Dec)

2006: 479 [348]

2007: 869 [495]

2008: 529 [298]

2009: 670 [217]

2010: 486 [257] (to mid Oct.)

-----  
Total: 3291 [1749] (in ~5 years)

During 2009/2010, Mark has mentored Emil Betak (consultant compiler), initial training on files of selected NP/A papers (chosen from files previously keyworded) and later reviewing newly keyworded files.

Significant time has been spent explaining and commenting in order to help train Emil.



## New Contracts – 2009... (1)

1. Joshi and Jain (India) Evaluation: A=139  
Experiment: mass regions 130 & 180
2. Wang and Audi (China) Atomic Mass  
Evaluation (Horizontal)
3. Zuber (Poland) Evaluation: A=61  
XUNDL:  $^{97}\text{Zr}$ ,  $^{97\text{m}}\text{Y}$ , ...
4. A. Negret (Romania) Evaluation: A=75

## New Contracts – 2009... (2)

5. J. Timar (Hungary) Evaluation: A=129  
XUNDL:  $^{134}\text{Pr}$  and  $^{132}\text{La}$
6. N. Stone (USA)  
Nuclear Moments (Horizontal):  
Compilation and evaluation
7. D. Symochko (Ukraine) Evaluation: A=65
8. Lalkovski (Bulgaria) Evaluation: A=112,  
A=110, A=105

# New Contracts - 2009 (1')

## AME New structure

### Coordinator

AME2013 : G.A.

AME20xx : Wang Meng

### Contributors

- all labs welcome : 20% to 100%
- two times one week at CSNSM-Orsay
- evaluate and check some of the published material

### Presently :

- IMP-Lanzhou : Wang Meng
- CSNSM-Orsay : David Lunney (Ame) + Jean Blachot (Nubase)
- GSI-Darmstadt : Berndt Pfeiffer (Ame)
- ANL-Argonne : Filip Kondev (Nubase + Ame)
- MPI-Heidelberg : N.N. 2-years post-doc (Ame + programming)





# Coordination of the NSDD network

## International Network of Nuclear Structure and Decay Data at IAEA Headquarters, Vienna 4-8 April 2011.

**The 19th Meeting of the International Network of Nuclear Structure and Decay Data (NSDD) Evaluators to be held in spring 2011 (planned venue ANU Canberra).**

**However, a few months ago, when this project came up for final internal IAEA approval it was found that the costs connected with convening the Meeting at ANU would, in the light of the current IAEA budget restrictions, be too high.**

**Despite our efforts, no other financial contributions from NSDD members' institutions could be secured. Consequently it was agreed that this upcoming NSDD meeting should again be held at IAEA headquarters where funding requirements would be much lower.**



# Workshops



## *Workshops in 2009*

- **NSDD Evaluators' Workshop, IFIN-HH, Bucharest, Romania, 30 March-3 April 2009**
- **School on Physics and Technology of Fast Reactors Systems, ICTP, Trieste, 9-20 April 2009**
- **Atomic and Molecular Data for Fusion Energy Research, ICTP, Trieste, 20-30 April 2009**
- **EXFOR editor and digitizing programs for data compilation, IAEA, Vienna, Austria, 27-29 May 2009**
- **EXFOR compilation of Nuclear Data, Univ. of Rajasthan, Janipur, India, 3-7 November 2009**



# Workshops

**2010**



- **Nuclear Reaction Data for Advanced Reactor Technologies, ICTP, Trieste, 3 - 14 May 2010 (TALYS & EMPIRE)**
- **Experimental Nuclear Reaction Data Compilation of EXFOR Database, IAEA, Vienna, Austria, 30 Aug - 3 Sept 2010**
- **Nuclear Structure and Decay Data: Theory and Evaluation, ICTP, Trieste, 11 - 15 Oct 2010**
- **Nuclear Data for Science and Technology: Analytical Applications, ICTP, Trieste, 8 - 12 Nov 2010**



## Workshops

- Support to the **DDEP Workshop**,  
CIEMAT, Madrid, Spain, June 2010
- **ENSDF Theory and Evaluation**,  
ICTP, Trieste, Italy, October 2010

# Workshop Activities

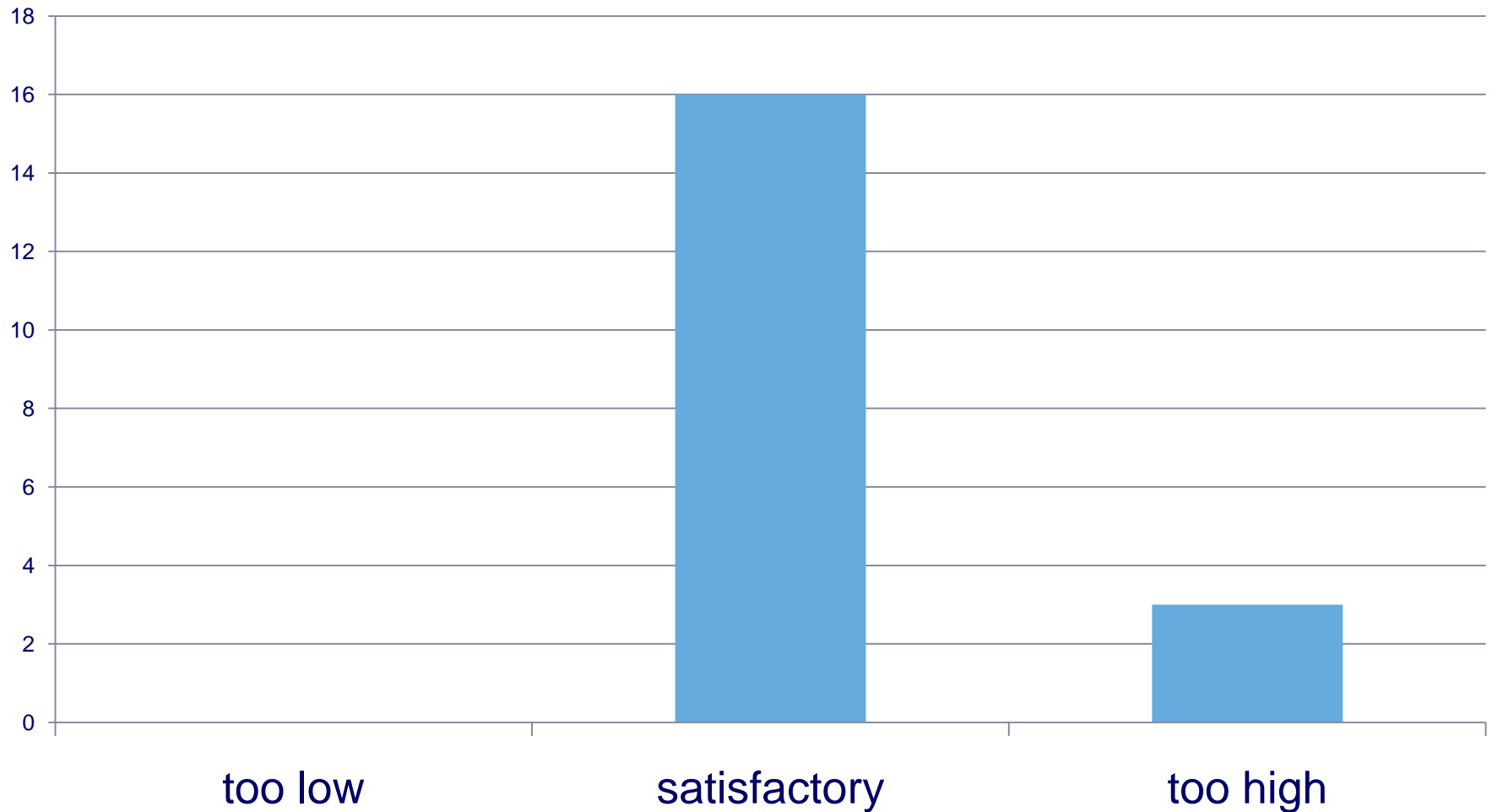
1. Daniel Abriola:  $^{148}\text{Er}$ ,  $^{148}\text{Ho}$ :  
Laxman Danu  
Walid Elagib  
Manssour Fadil (\*)  
Sergey Lisin
2. Eddie Browne:  $^{134}\text{Sb}$ ,  $^{251}\text{Md}$   
Khalifeh Abusaleem (\*)  
Thamer Alharbi  
David Bernard  
Sanhita Chaudhury  
Zhendong Wu
3. Balraj Singh:  $^{189}\text{Pb}$ ,  $^{189}\text{Tl}$ :  
Huda Al-Sulaiti  
Timothy Johnson (\*)  
Doendara Malain  
Haridas Pai  
Abdelfattah Soliman
4. Alejandro Sonzogni:  $^{94}\text{Rb}$ ,  $^{94}\text{Sr}$ :  
Jeong-Yeon Lee  
Alexandru Negret (\*)  
Tadasol Santawamaitre  
Waldemar Urban  
Claire Vaglio Gaudard
5. Jagdish Tuli:  $^{82}\text{Ge}$ ,  $^{86}\text{Br}$ :  
Deepika Choudhury  
Sherif Nafee  
Dmytro Symochko (\*)  
Gizat Tagele



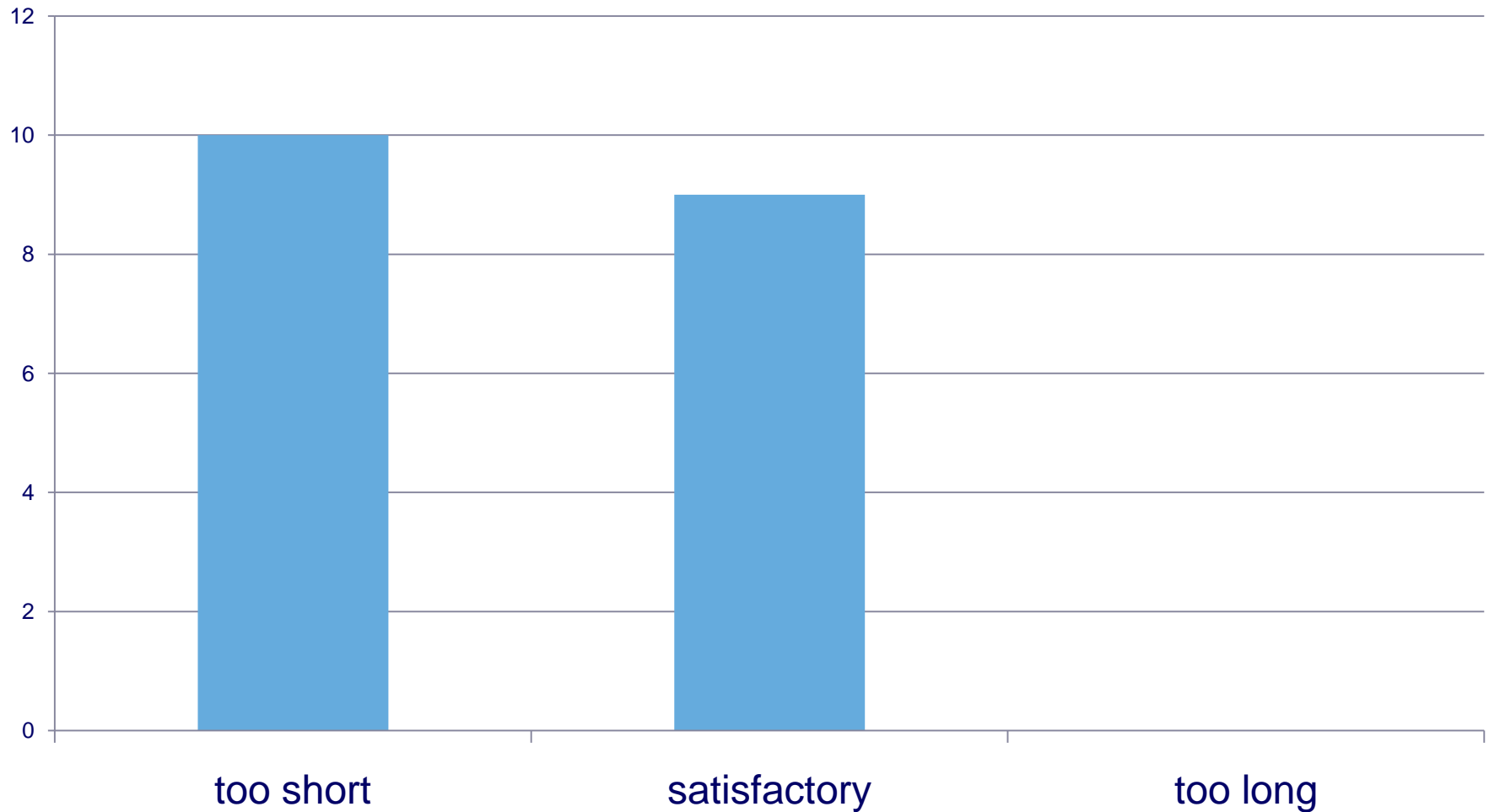
# Workshop Activities

- The students are to finish their part of the evaluation
- The “leader” student is to receive the contributions review and send them to group leader
- Group Leader to review and send to B.Singh by 15<sup>th</sup> January 2011

# Did you find the level of the Workshop

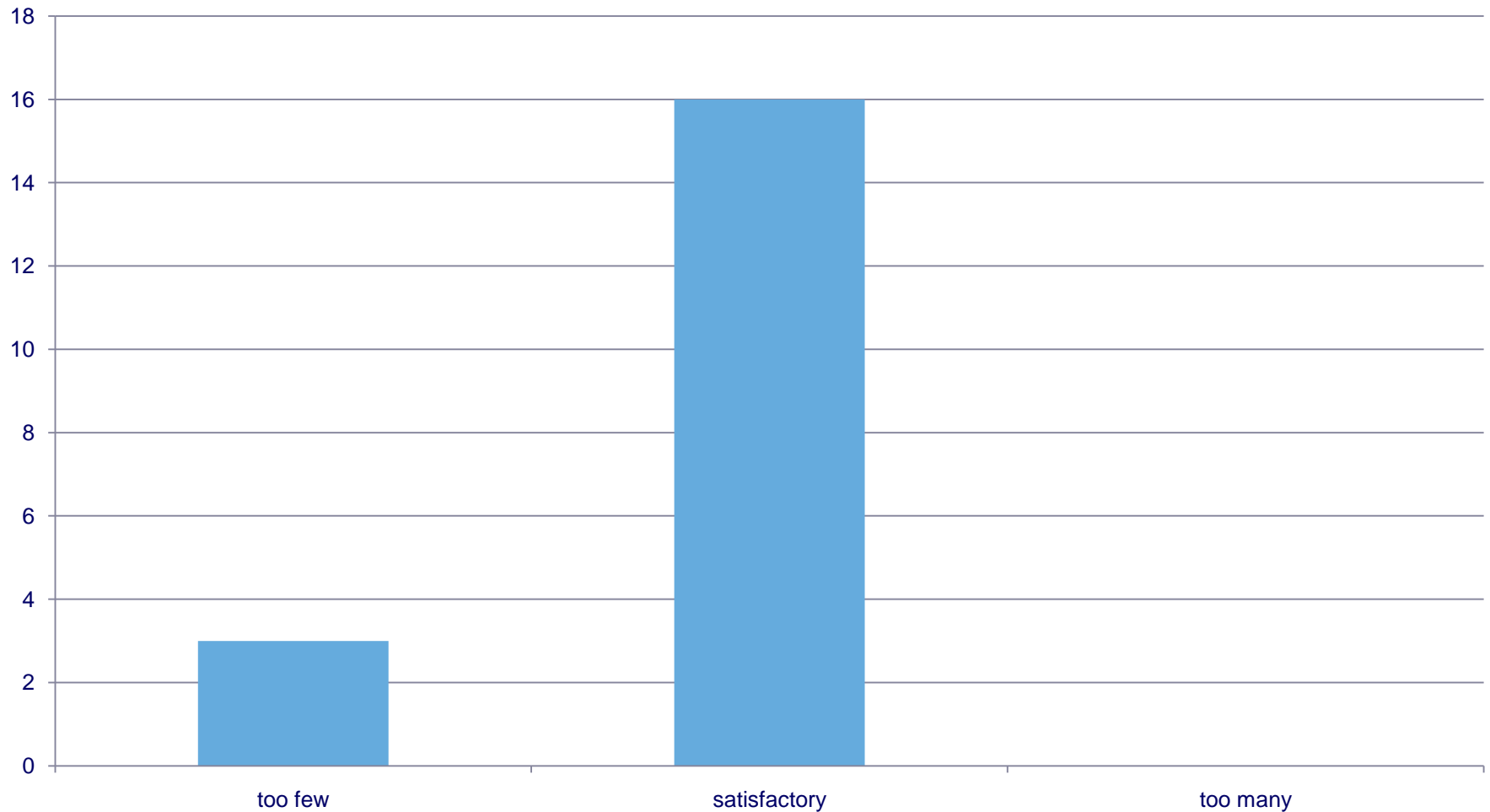


# Was the duration of the Workshop

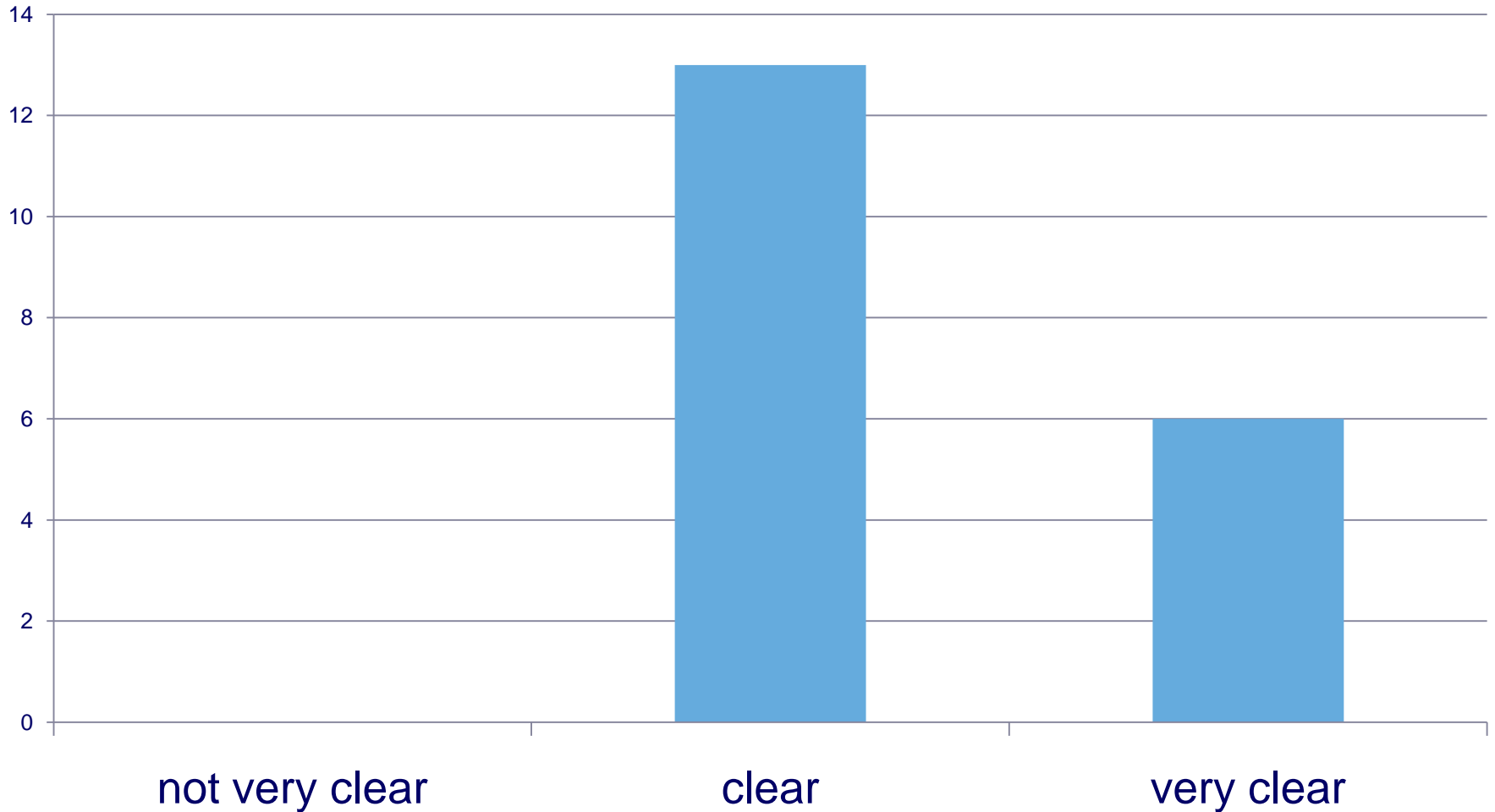




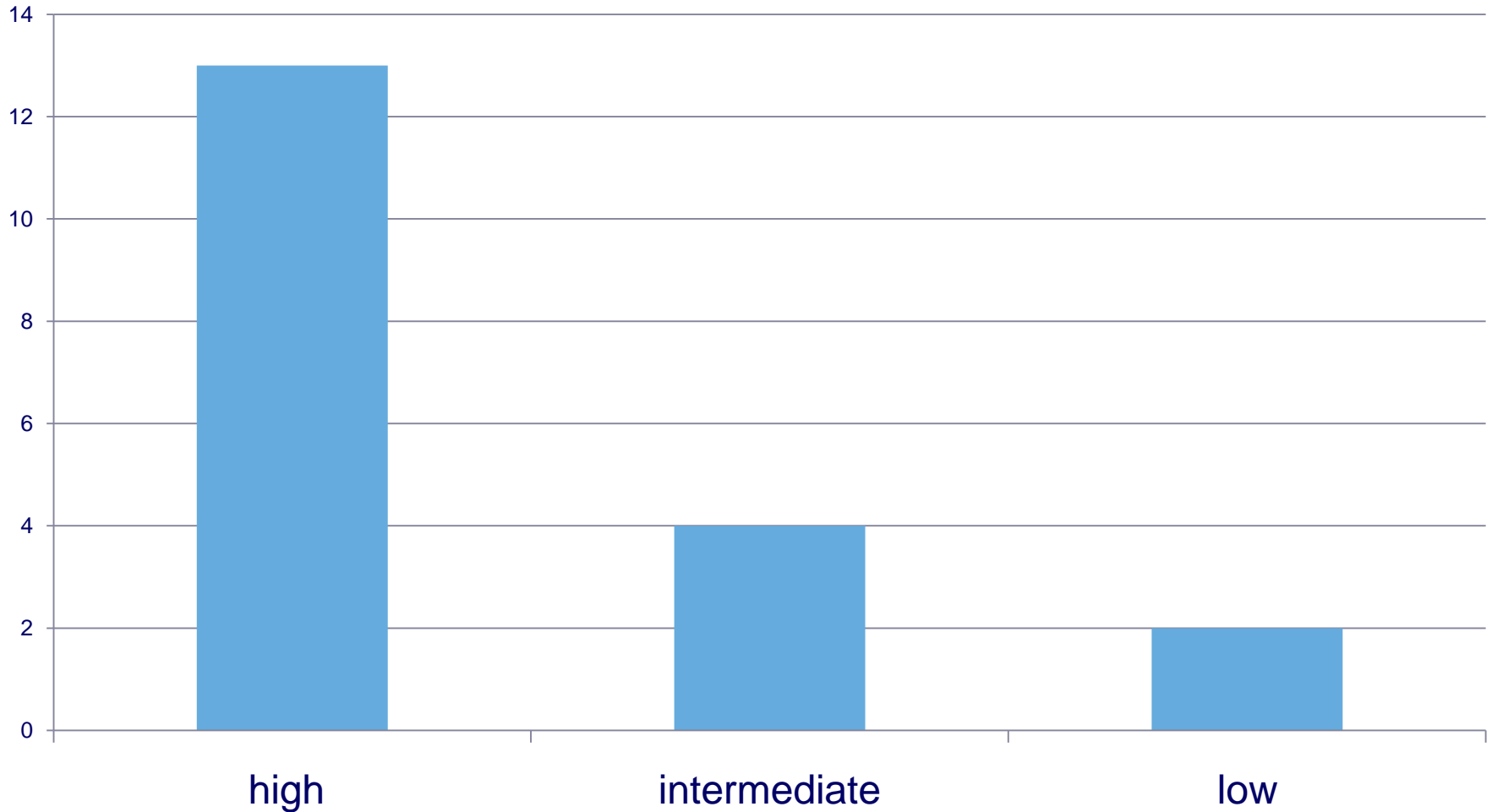
# Was the number of lectures per day



# Was the clarity of the majority of speakers



# Was the overlap of the topics covered with your research interests



# Dissemination

## How to find us?

The image shows a screenshot of the iGoogle homepage. At the top, a search bar contains the text "nds iaea". A red arrow points from the text "How to find us?" above to the search bar. Below the search bar are buttons for "Google Search" and "I'm Feeling Lucky". To the right of the search bar are links for "Advanced Search" and "Language Tools". Below the search bar is a checkbox that says "Show this page every time I start to browse the web. Make iGoogle my homepage". To the right of the search bar is a link that says "Change theme from Sony | Vaio | Add stuff".

The main content area is divided into several sections:

- Home:** A sidebar on the left with a dropdown menu containing: YouTube, Date & Time, Weather, Gmail, CNN.com, Official Sony VAIO G..., NPR: News, Music, ..., NYTimes.com - Top ..., GoComics from Uni..., Comedy Central's J..., CNET News.com, Wired Top Stories, and Celebs by Access H.
- Official Sony VAIO Gadget:** A large advertisement for Sony Extended Service Plans. It features a clock face with "2 yrs" in the center and the text "Protect your investment: Sony Extended Service Plans". Below the clock are links for "Get your Peace of Mind", "GET SONY CUSTOMER SUPPORT", and "SONY WEEKLY DEALS".
- Date & Time:** A widget showing a clock face, the date "Sat OCT 30", and a calendar grid for the month of October. The calendar grid shows the days of the week (S M T W T F S) and the dates (1-31).
- CNN.com:** A widget showing a news headline: "Dems make a mess of Florida U.S." with a small thumbnail image.
- YouTube:** A widget with a search bar, a "Search" button, and a section for "Today's Spotlight Videos" featuring a video thumbnail of a man's face.



nds iaea

About 672,000 results (0.19 seconds)



Adva



▶ [IAEA Nuclear Data Services](#)

Provides access to databases, documents, programs and files. Maintained by the **IAEA's** Nuclear Data Centre.

[www-nds.iaea.org/](http://www-nds.iaea.org/) - Cached - Similar

[RIPL-2 \(Index\)](#)

Handbook for calculations of nuclear reaction data, RIPL-2. IAEA-TECDOC-1506 (IAEA, Vienna, 2006). Available online at <http://www-nds.iaea.org/RIPL-2/> ...

[www-nds.iaea.org/ripl2/](http://www-nds.iaea.org/ripl2/) - Cached

[Cross-Section database for medical radioisotope production: IAEA-CRP](#)

A description of the formatting procedure is given in the report **IAEA-NDS-210** (pdf, 68 KB). Complete documentation is available, including evaluation ...

[www-nds.iaea.org/medical/](http://www-nds.iaea.org/medical/) - Cached - Similar

[IBANDL](#)

Sep 27, 2010 ... This is the Ion Beam Analysis Nuclear Data Library produced according to the recommendations of the **IAEA** Technical Meeting held at the **IAEA** ...

[www-nds.iaea.org/ibandl/](http://www-nds.iaea.org/ibandl/) - Cached - Similar

Everything

Images

Videos

More

New York, NY

Change location

Show search tools



# NSDD activities in the IAEA

Hot Topics » ENDF/B-VII.0 • Safeguards data • WIMS-D Library • Fission Yields • ADS News » June 2009, POINT2009 Released

- Request
- CD/DVD with documentation, data, codes, etc.
- Quick Links
- ADS-Lib
- Atomic Mass Data Centre
- CINDA
- Charged particles XS
- DROSG-2000
- EMPIRE-II
- ENDF
- ENDF Archive
- ENDF Utility Codes
- ENDVER
- ENSDF
- ENSDF ASCII Files
- ENSDF programs
- EXFOR
- FENDL-2.1
- Fission Yields
- GANDR

**NEW** **RIPL-3** reference parameters for nuclear model calculations, 2010 [page]  
**JENDL-4.0** Japanese evaluated nuclear data library, 2010 [page] [list] [retrieve]  
**ROSFOND-2010** Russian Library of Evaluated Neutron Data [page] [list]

Main | All | Reaction Data | Structure & Decay | by Applications | Doc & Codes | Index | Events

**EXFOR** Experimental nuclear reaction data  
**LiveChart of Nuclides** Interactive Chart of Nuclides: Advanced and Basic  
**CINDA** neutron reaction bibliography  
**ENDF** Evaluated nuclear reaction libraries  
**ENSDF** evaluated nuclear structure and decay data (+XUNDL) \*\*  
**NSR** Nuclear Science References \*

<b>NuDat 2.5</b> selected evaluated nuclear structure data	<b>RIPL</b> reference parameters for nuclear model calculations	<b>IBANDL</b> Ion Beam Analysis Nuclear Data Library	<b>Charged particles XS</b> Beam monitor & radionuclide production cross sections
<b>PGAA</b> Prompt gamma rays from neutron capture	<b>FENDL-2.1</b> Fusion Evaluated Nuclear Data Library, Version 2.1	<b>Photonuclear</b> cross sections and spectra up to 140MeV	<b>IRDF-2002</b> International Reactor Dosimetry File
<b>NGATLAS</b> atlas of neutron capture cross sections	<b>Safeguards Data</b> recommendations, August 2008	<b>Medical Portal</b> Data for Medical Applications	<b>Standards</b> - Neutron cross-sections, 2006 - Decay data, 2005

\*Database at the IAEA, Vienna    \*\*Database at the US NNDC

**IAEA Nuclear Data Section**

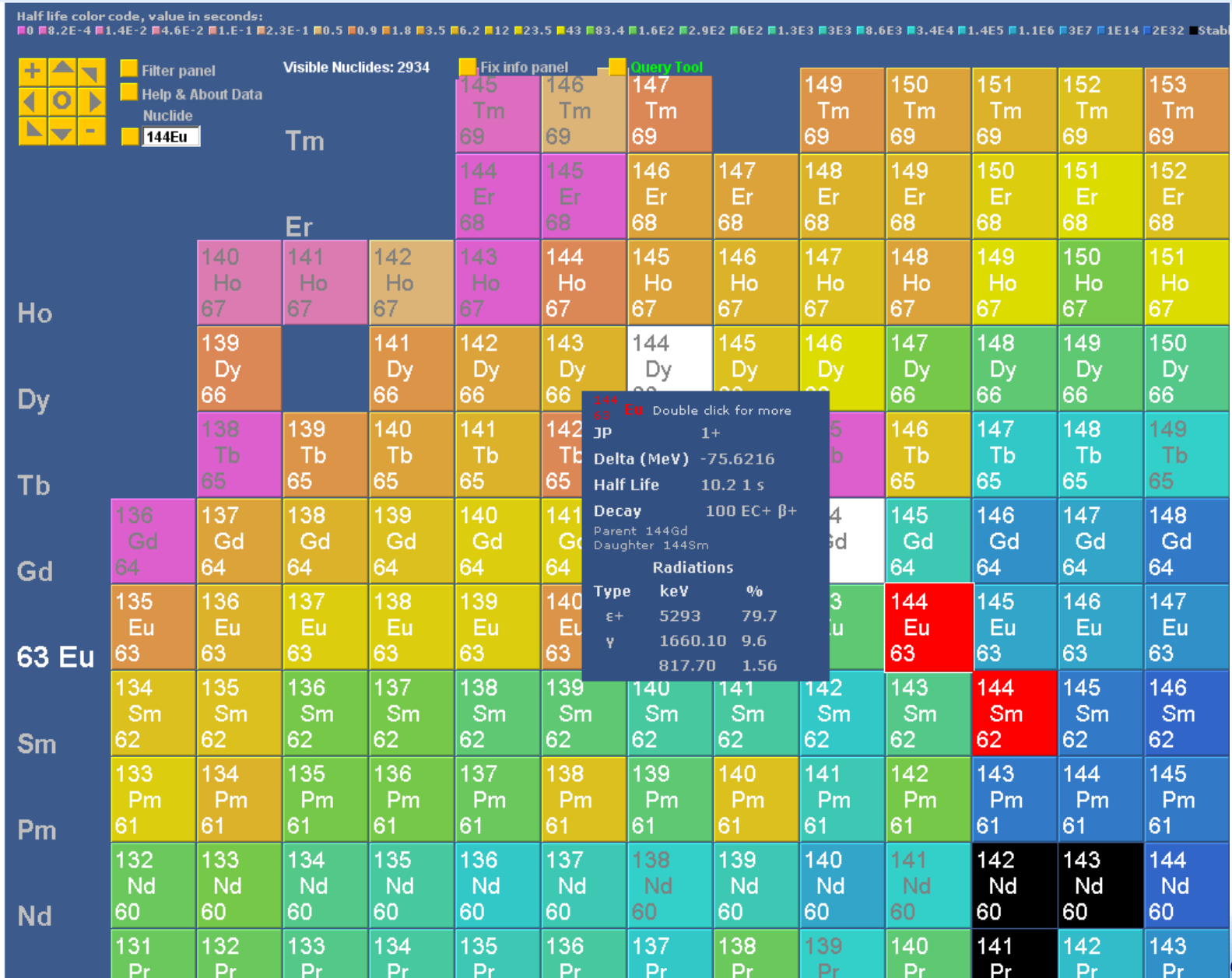
- IAEA-NDS Mission, Staff and more
- Atomic and Molecular Data
- Meetings Workshops
- Newsletters
- Coordinated Research Projects
- Nuclear Reaction Data Center Network
- Nuclear Structure & Decay Data Network
- Technical Reports, TECDOCs
- INDC(NDS) Reports
- Computer Codes

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Vienna International Centre, P.O. Box 100, A-1400 Vienna, Austria  
Telephone (+431) 2600-0. Facsimile (+431) 2600-7. E-mail: [online@iaea.org](mailto:online@iaea.org). Read our [Disclaimer](#)

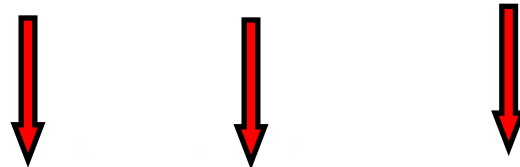
Last Updated: 22-October-2010

Web design: V.

# LiveChart: M.Verpeli & A.Vasaros



## Main data of the nuclide:



Nuclide	$J^\pi$	Mass excess (MeV)	Natural abundance or half life	Decay modes mode branch	Major radiations E(keV) intensity	$\sigma$ (barn)	Nuclear Charge Radii $R^*$	$\mu^{**}$ (nm)	$Q^{**}$ (b)
$^{144}_{63}\text{Eu}$	1+	-75.6216	10.2 s 1	ec $\beta^+$ 100%	$\beta^+$ 5293 79.7% $\gamma$ 1660.1 9.6% 817.7 1.56%		4.9632(91)	1 +1.893(13) +1.893(13) <a href="#">1985Ah02</a>	2 +0.1(3) +0.10(3) <a href="#">1985Ah02</a>

\* - The reference of nuclear charge radii data is [2010anxx](#).

\*\* - ENSDF is the source for all data retrieved, except marked with the original reference from [2005st26](#).

## Chain of Parents and Daughters:

144DY 144TB 144GD **144EU** 144SM

## Level scheme of the nuclide:



Open level scheme

## Level table of the nuclide:



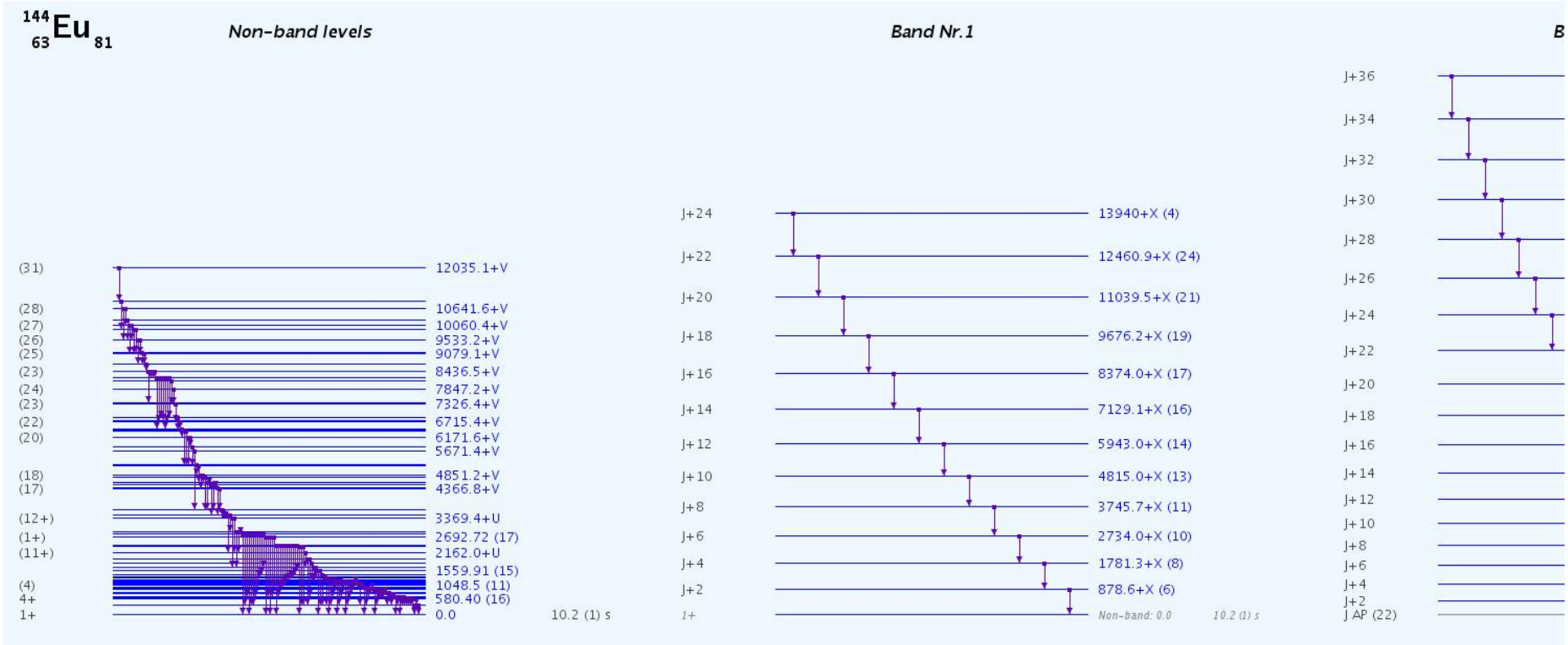


# LiveChart

0.0 < Energy < 50000.0 Image height: 600 Level width: 300 Band spacing: 20 Emphasise level: 0 and/or gamma 0.0

Show level energy  Show spin-parity  Show half life  Show gamma  Show all (possible overlapping)  Show legend

Non-band  Band 1  Band 2  Band 3  Band 4  Download



See extract from [ENSDF Datasets](#) of <sup>144</sup>Eu (snapshot October 2009).

Atoms for Peace



# LiveChart

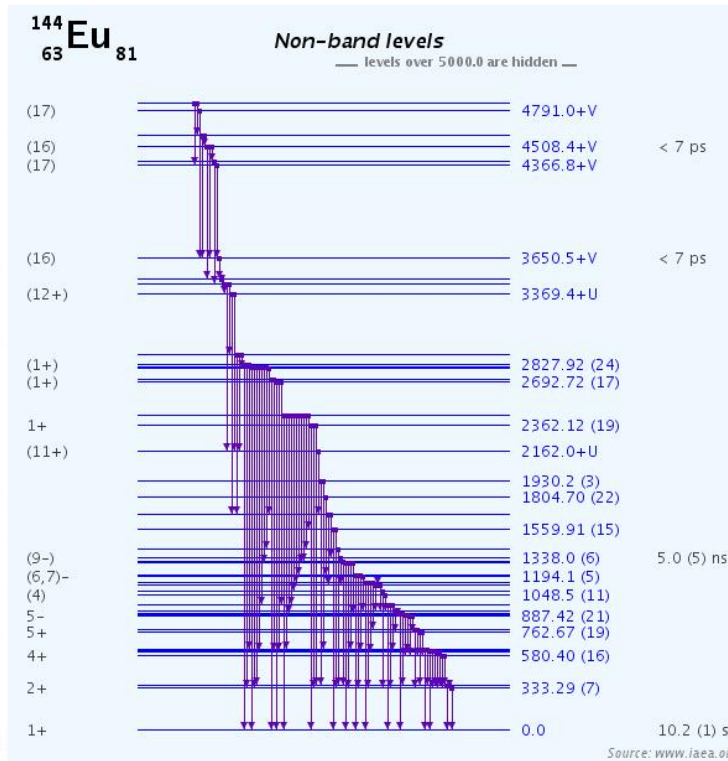


0.0 < Energy < 5000.0 Image height: 600 Level width: 300 Band spacing: 20 Emphasise level: 0.0 and/or gamma 0.0

Show level energy  Show spin-parity  Show half life  Show gamma  Show all (possible overlapping)  Show legend

Non-band  Band 1  Band 2  Band 3  Band 4  Download as

Redraw Reset



See extract from [ENSDF Datasets](#) of <sup>144</sup>Eu (snapshot October 2009).

Atoms for Peace

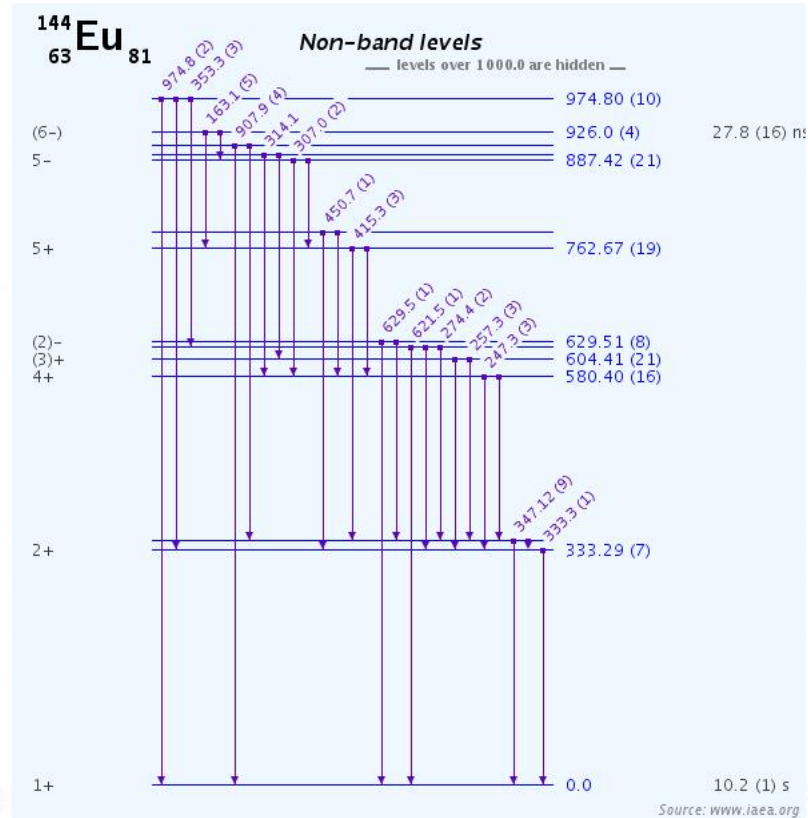
# LiveChart



< Energy < 
 Image height: 
 Level width: 
 Band spacing: 
 Emphasise level:  and/or gamma

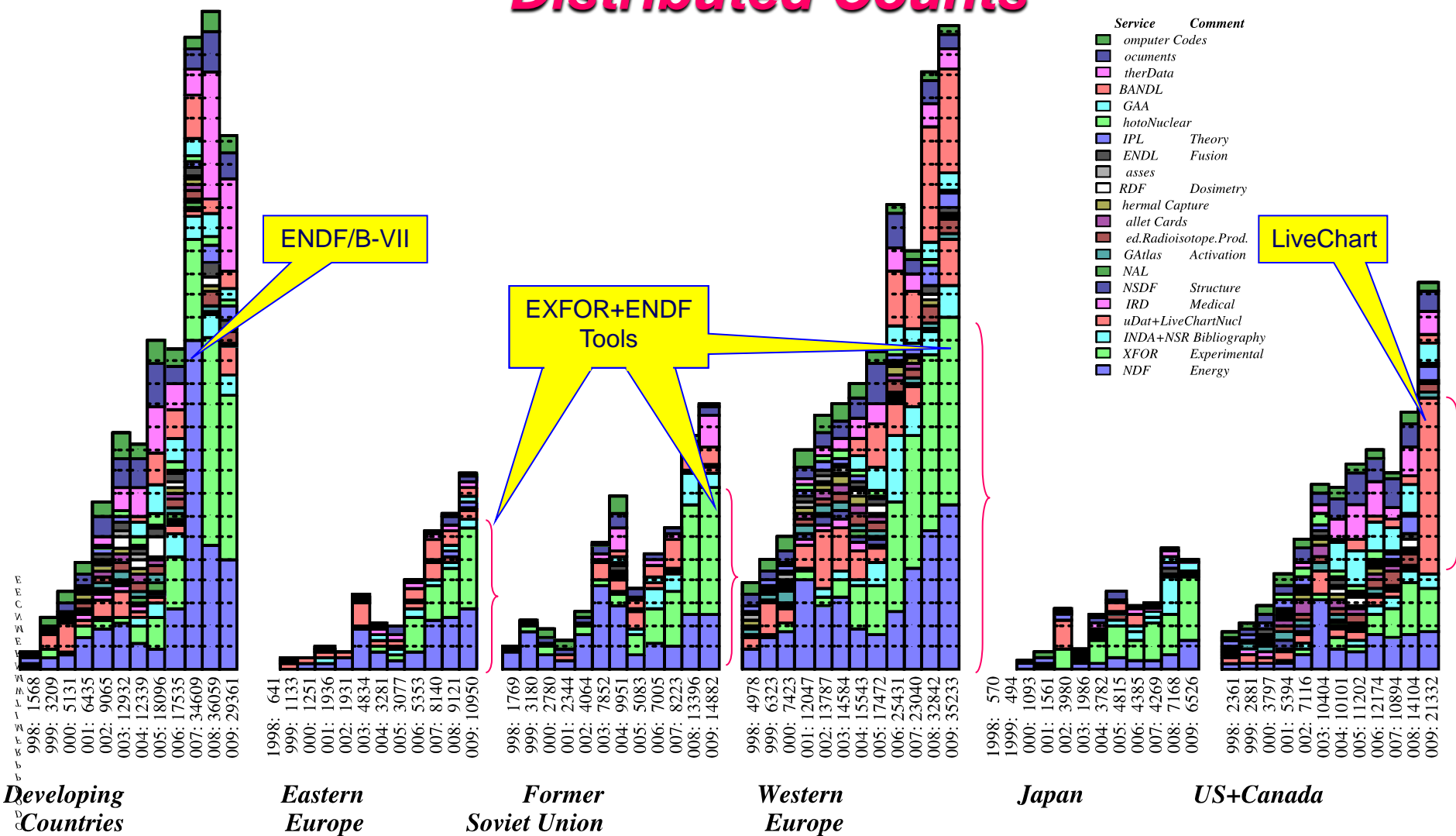
Show level energy
  Show spin-parity
  Show half life
  Show gamma
  Show all (possible overlapping)
  Show legend

Non-band
  Band 1
  Band 2
  Band 3
  Band 4

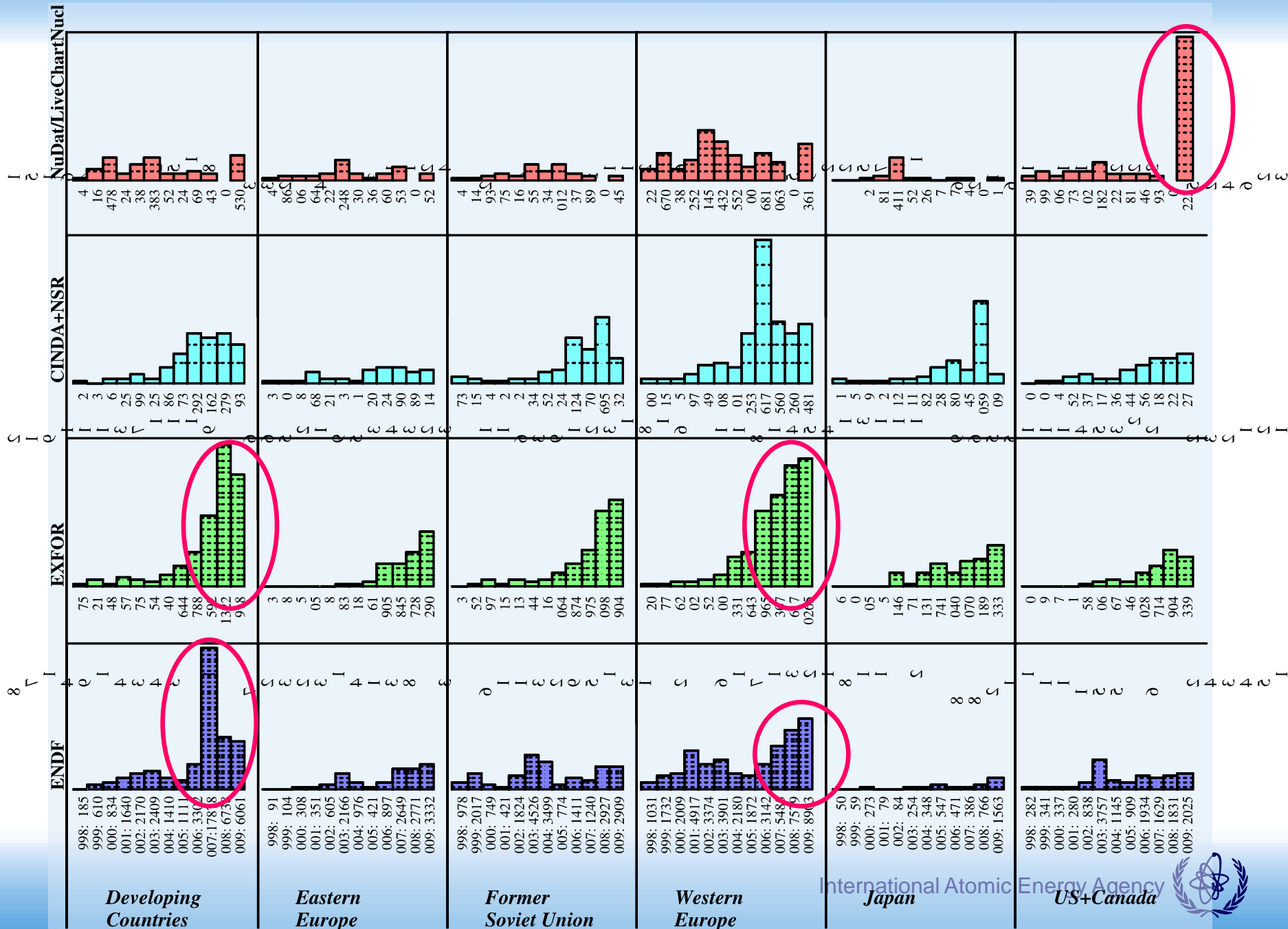


See extract from [ENSDF Datasets](#) of <sup>144</sup>Eu (snapshot October 2009).

## Geographically Distributed Counts



# IAEA-NDS Nuclear Data Services: Web Statistics



# IAEA Commitment to NSDD Activities

CRPs, DDPs...

Individual contracts supporting 6 mass chains  
and 2 horizontal evaluations

Continual running of ICTP and related  
workshops

2 staff members dedicating time to ENSDF  
evaluation, NSDD coordination and NSR  
keywording

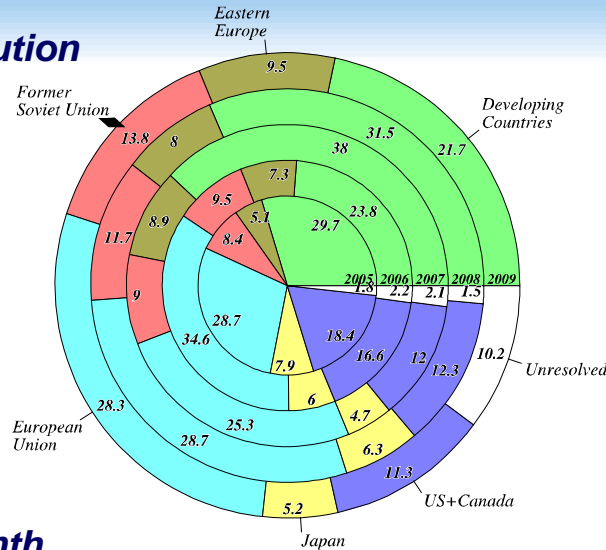


# Thank you

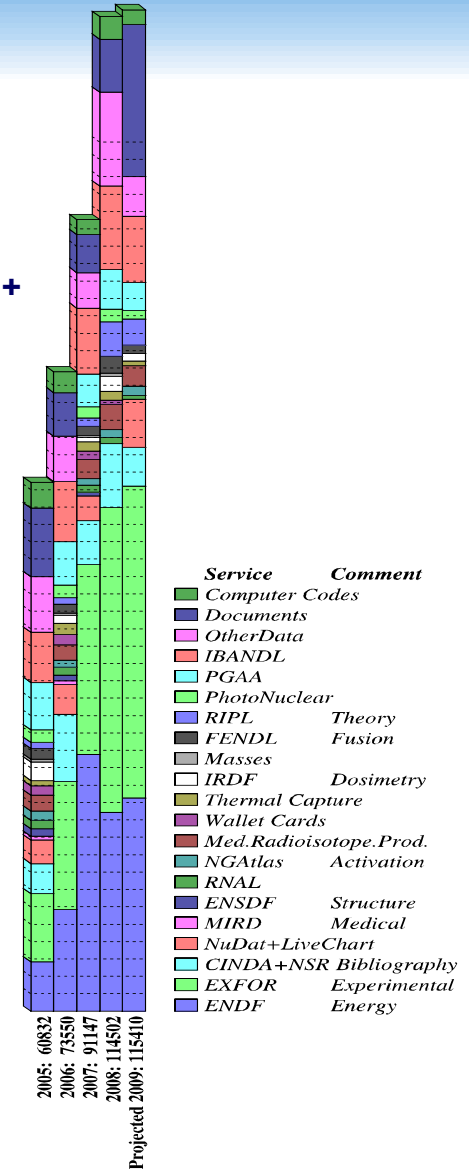


# NSDD activities in the IAEA

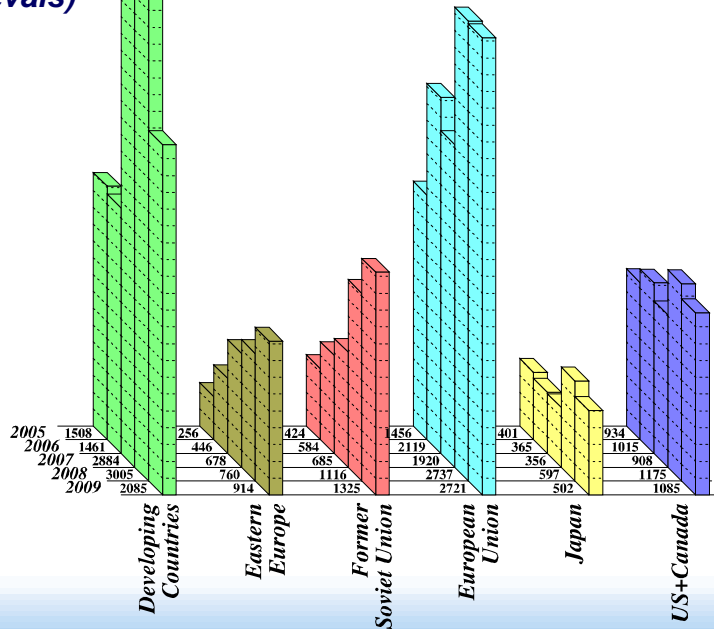
**Geographical Distribution (%)**



**Total per Year (Number of accesses + retrievals)**



**Average per Month (Number of accesses + retrievals)**



- | Service                | Comment      |
|------------------------|--------------|
| Computer Codes         |              |
| Documents              |              |
| OtherData              |              |
| IBANDL                 |              |
| PGAA                   |              |
| PhotoNuclear           |              |
| RIPL                   | Theory       |
| FENDL                  | Fusion       |
| Masses                 |              |
| IRDF                   | Dosimetry    |
| Thermal Capture        |              |
| Wallet Cards           |              |
| Med.Radioisotope.Prod. |              |
| NGAtlas                | Activation   |
| RNAL                   |              |
| ENSDF                  | Structure    |
| MIRD                   | Medical      |
| NuDat+LiveChart        |              |
| CINDA+NSR Bibliography |              |
| EXFOR                  | Experimental |
| ENDF                   | Energy       |

