International Atomic Energy Agency

IAEA Nuclear Data Section
Nuclear Data Program

Paraskevi (Vivian) Dimitriou

Nuclear Data Section,

Division of Physical and Chemical Sciences,

International Atomic Energy Agency,

Vienna, Austria

IAEA Nuclear Data Section

- provides **nuclear data services** to scientists worldwide (data libraries, bibliographies and related materials) through Internet, CD-ROM and other media
- produces **new databases** and assists developing countries through **technology transfer** activities with its nuclear data programme (Coordinated Research Projects, Data Development Projects, Training Workshops, Technical Meetings)

Nuclear Data Section

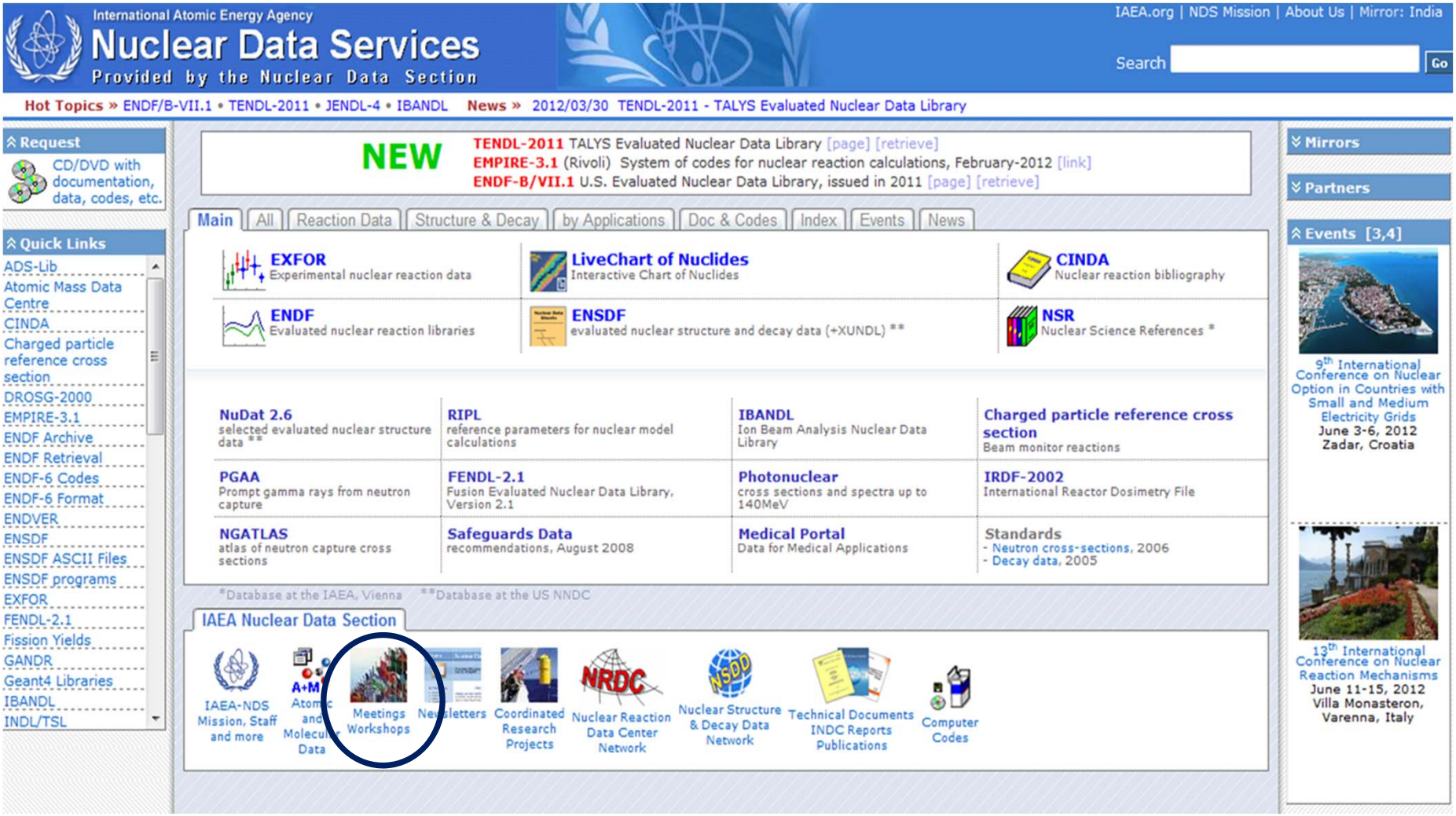
Nuclear Data Services Unit	Nuclear Data Development Unit	Atomic & Molecular Data Unit
S. Simakov Unit Head	R. Capote Noy Unit Head	B.J. Braams Unit Head
V. Zerkin Software Engineer	A. Trkov Nuclear Physicist	H.-K. Chung Atomic Physicist
V. Semkova Nuclear Physicist	P. Dimitriou Nuclear Physicist	Marco Verpelli Systems Analyst/Programmer
N. Otsuka Nuclear Data Physicist	K. Nathani Team Assistant	K. Sheikh Database Assistant
L. Vrapcenjak Nuclear Data Services Assistant		A. Vasaros IT Systems Engineer
A. Oechs Team Assistant		

Section Head: **R.A. Forrest**
Nuclear Data Physicist

Section Secretary: **R. Rangel Alvarez**

Nuclear Data Services Webpage

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



NDS Meetings

International Atomic Energy Agency
Nuclear Data Services
قسم البيانات النووية مقدمة من

IAEA.org | NDS Mission | About Us | Mirrors: India | China

Search Go

Databases » EXFOR | ENDF | CINDA | IBANDL | Medical | PGAA | NGAtlas | RIPL | FENDL | IRDF-2002 | IRDFF

Request

CD/DVD with documentation, data, codes, etc.

Quick Links

- ADS-Lib
- Atomic Mass Data Centre
- CINDA
- Charged particle reference cross section
- DROSG-2000
- EMPIRE-3.1
- ENDF Archive
- ENDF Retrieval
- ENDF-6 Codes
- ENDF-6 Format
- ENDVER
- ENSDF
- ENSDF ASCII Files
- ENSDF programs
- EXFOR
- FENDL 3.0
- Fission Yields
- GANDR
- Geant4 Libraries
- IBANDL
- INDL/TSL

IAEA Nuclear Data Meetings

A comprehensive list of IAEA Nuclear Data Section meetings is available from NA webpage.
Information on Atomic and Molecular Data Unit (AMDU) Meetings is available from AMDU webpage.
Overview and history of the Nuclear Reaction Data Centres (NRDC) Network meetings are available from NRDC meeting (1969-).
Objectives and details of the International Network of Nuclear Structure and Decay Data (NSDD) Evaluators can be obtained from NSDD.

Consultants' and Technical Meetings | Research Coordination Meetings | Training workshops

Consultants' and Technical Meetings

#	Meeting dates	Project Officer	Title	Link
1	4-6 November 2013	P. Dimitriou	CM on Compilation and Evaluation of Gamma-Ray Data	Webpage
2	8-10 October 2013	V. Semkova	CM on EXFOR Data in Resonance Region and Spectrometer Response Function	Webpage
3	8-12 July 2013	R. Capote Noy	TM on Toward a New Evaluation of Neutron Standards	Webpage
4	9-10 May 2013	R. Capote Noy	CM on Auger Electron Emission from Nuclear Decay Data Needs for Medical Applications	Webpage
5	11-13 March 2013	D.H. Abriola	CM on Accuracy of Experimental and Theoretical Nuclear Cross-Section Data for Ion Beam Analysis and Benchmarking	Webpage
6	12-14 November 2012	V. Semkova	CM on Benchmarking of Digitizing Software	Webpage
7	1-4 October 2012	S. Simakov	TM on Primary Radiation Damage: from nuclear reactions to point defects	Webpage
8	6-9 March 2012	S. Simakov	CM on Further Development of EXFOR	Webpage
9	2-4 November 2011	R. Forrest	TM on Long-term Needs for Nuclear Data Developments	Webpage
10	6-9 September 2011	R. Capote Noy	TM on Inelastic Scattering and Capture Cross-section Data of Major Actinides in the Fast Neutron Region	Webpage
11	22-26 August 2011	R. Capote Noy	TM on Intermediate-term Nuclear Data Needs for Medical Applications: Cross Sections and Decay Data	Webpage
12	21-24 June 2011	R. Capote Noy	CM on Improvements in Charged-particle Monitor Reactions and Nuclear Data for Medical Isotope Production	Webpage
13	13-15 April 2011	S. Simakov	CM on Neutron Source Spectra for EXFOR	Webpage
14	13-15 October 2010	R. Capote Noy	CM on International Cross Section Standards: Extending and Updating	Webpage
15	26-30 September 2010	R. Capote Noy	TM on Neutron Cross Section Covariances	Webpage
16	27-28 January 2009	Alan L. Nichols	CM on TAGS: Determination of Beta and Gamma Decay Components of Fission Products for Decay Heat Calculations	Webpage
17	24-27 November 2008	R. Capote Noy et al	CM on Prompt Fission Neutron Spectra of Major Actinides	Webpage

Web page: by L.Vrapcenjak

Mirrors

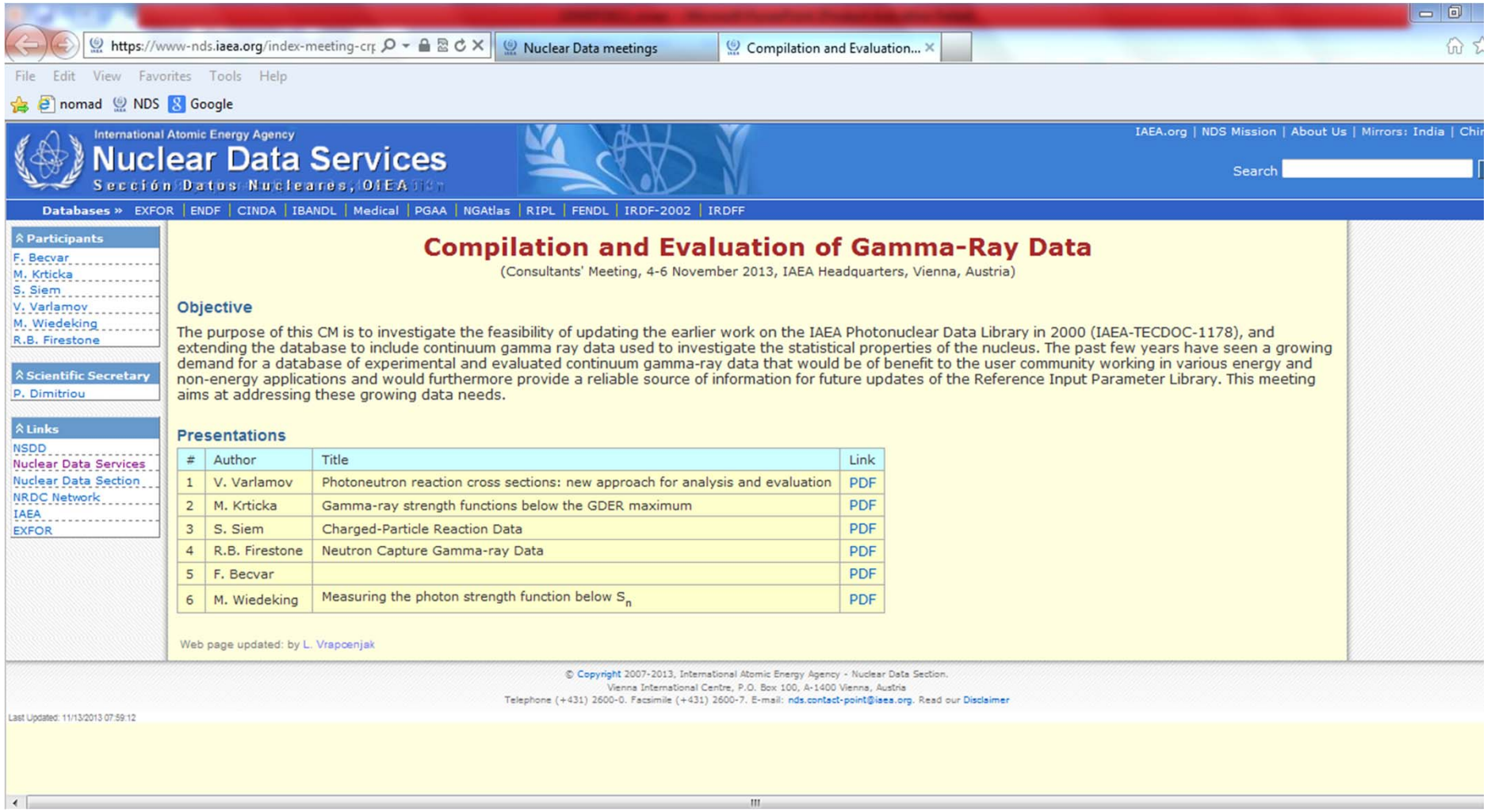
Partners

Events «3:4»

Nuclear Physics and Gamma-ray sources for Nuclear Security and Nonproliferation (NPNSNP)
January 28-30, 2014
Ricotti, Tokai-mura, Japan

International Workshop on Nuclear Data Covariances (CW2014)
April 28 - May 1, 2014
La Fonda on the Plaza, Santa Fe, New Mexico, USA

Last Updated: 11/12/2013 15:03:29


https://www-nds.iaea.org/index-meeting-crp
Nuclear Data meetings
Compilation and Evaluation...
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Participants
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M. Wiedeking
R.B. Firestone
Scientific Secretary
P. Dimitriou
Links
NSDD
Nuclear Data Services
Nuclear Data Section
NRDC Network
IAEA
EXFOR
Compilation and Evaluation of Gamma-Ray Data
(Consultants' Meeting, 4-6 November 2013, IAEA Headquarters, Vienna, Austria)
Objective
The purpose of this CM is to investigate the feasibility of updating the earlier work on the IAEA Photonuclear Data Library in 2000 (IAEA-TECDOC-1178), and extending the database to include continuum gamma ray data used to investigate the statistical properties of the nucleus. The past few years have seen a growing demand for a database of experimental and evaluated continuum gamma-ray data that would be of benefit to the user community working in various energy and non-energy applications and would furthermore provide a reliable source of information for future updates of the Reference Input Parameter Library. This meeting aims at addressing these growing data needs.
Presentations
Author Title Link
1 V. Varlamov Photoneutron reaction cross sections: new approach for analysis and evaluation PDF
2 M. Krticka Gamma-ray strength functions below the GDER maximum PDF
3 S. Siem Charged-Particle Reaction Data PDF
4 R.B. Firestone Neutron Capture Gamma-ray Data PDF
5 F. Becvar PDF
6 M. Wiedeking Measuring the photon strength function below S_n PDF
Web page updated: by L. Vrapcenjak
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Last Updated: 11/13/2013 07:59:12

CRPs running at NDS

CRP Title	Period	Project Officer
Primary Radiation Damage Cross Sections	2013-2017	S. Simakov
Reference Database of beta-delayed neutron emission data	2013-2017	P. Dimitriou
International Reactor Dosimetry Library for Fission and Fusion (IRDFF) Testing and Validation	2013-2017	S. Simakov
Nuclear Data for Charged-particle Monitor Reactions and Medical Isotope Production	2012-2016	R. Capote
Reference Database for Particle-Induced Gamma-ray Emission spectroscopy	2011-2015	P. Dimitriou
Prompt Fission Neutron Spectra of Major Actinides	2010-2014	R. Capote

CRP on International Reactor Dosimetry Library for Fission and Fusion (IRDFF) Testing and Validation

PO: S. Simakov, duration: 2013-2017

Background

The International Reactor Dosimetry and Fusion File (IRDFF) is an extension of the International Reactor Dosimetry File (IRDF-2002) to cover fission, fusion and accelerator driven applications.

This extension includes 4 new reactions (^{67}Zn(n,p)^{67}Cu, ^{113}In(n,n')^{113m}In, ^{169}Tm(n,3n)^{167}Tm, ^{209}Bi(n,3n)^{207}Bi), 32 updated evaluations and increases the end-point energy of the library from 20 to 60 MeV.

Objectives

- to evaluate and eventually add to this library the high threshold reactions with cross-section peaks located between 20 and 100 MeV needed for applications in systems such as ADS, i.e. (n,3-6n) on isotopes ^{197}Au, ^{169}Tm, ^{209}Bi, ^{59}Co, ^{63}Cu, ^{89}Y, ^{93}Nb.
- to stimulate new energy integrated (integral) and point energy (differential) cross section measurements
- to collect all other experimental information suitable for validation which was not used before
- to test and validate the new library (critical assemblies, MACS, 14-MeV fusion D-T spectra etc)

Main Output

Improved, tested and validated International Reactor Dosimetry and Fusion File (IRDFF) with proper decay data and documentation.

RCM-1, 5-9 July 2013, Report INDC(NDS)-0639 https://www-nds.iaea.org/publications/indc/indc-nds-0639.pdf

CRP on Primary Radiation Damage Cross Sections

PO: S. Simakov, duration: 2013-2017

Scientific Background

dpa: displacement cross section used to characterize and compare the radiation damage induced by neutrons and charged particles in crystalline materials. Widely used since 1975 is the **NRT-pda** (the standard pda).

Limitations: it is not applicable to compound materials, does not account for the recombination of atoms during the cascade evolution, cannot be directly validated and has no uncertainties/covariancies.

Research Objectives

To improve the NRT standard by employing recent developments in primary radiation damage simulations.

Expected CRP Outputs

- Numerical database for NRT- and PRD-dpa as well as gas-production cross sections and their uncertainties;
- CRP final document describing the results of the work performed.

All information available at http://www-nds.iaea.org/CRPdpa/

RCM-1 Report INDC(NDS)-0648, in preparation

CRP on Reference Database for beta-delayed neutron emission data

PO: P. Dimitriou, duration 2013-2017

Scientific Background

Delayed neutrons are crucial for reactor kinetics and safety, calculations of the decay heat produced by γ-rays and β-particles, quantification of the antineutrino spectra produced from beta-decaying fission products with possible application in safeguards, nuclear structure and nuclear astrophysics.

Specific Research Objectives

- Compile the existing beta-delayed neutron data ($T_{1/2}$, P_n , neutron spectra for individual precursors);
- Priority list for evaluations and new measurements;
- Define and document the evaluation methodology and the "Standards" for delayed neutron emission;
- Improve theoretical models and systematics for extrapolating into unknown mass regions ;
- Create a reference database of evaluated data related to beta-delayed neutron emission;
- Re-evaluate the beta-delayed neutron reactor constants in appropriate group format

Expected Research Outputs

- Reference Database of beta-delayed neutron emission properties
- Re-evaluated reactor delayed-neutron constants for fissile actinides
- Technical document describing the evaluation methodology and the new database

RCM-1: 26-30 August 2013, Report INDC(NDS)-0647, in preparation *More details from B. Singh*

11 agreements + 3 contracts

Decisions of 1st RCM om beta-delayed neutron emission

- Database separated into two sections:

  A) Bdn data for individual precursors and related model predictions

  B) Integral Bdn data (measured & produced from summation calculations), as well as decay constants in suitable group format

- Systematics and theoretical predictions of Bdn emission probabilities also available for comparison
- Option of online calculation of integral quantities starting from Bdn data of individual precursors (using summation code)

Work in progress at IAEA NDS:
Provide Gforge common work environment for CRP participants

Preliminary Example of Database

IAEA Nuclear Data Section

IAEA CRP on a Reference Database for Beta-Delayed Neutron Emission Data

≤ Z ≤ ≤ N ≤ Nucid ≤ Half-life [ms] ≤ ≤ P(1n)% ≤ ≤ P(2n)% ≤ ≤ P(3n)% ≤

Search Nuclides found:167 Clear Chart Show/Hide Comments Show/Hide Q values

Nucid	Reference	Half-life	%P(1n)	%P(2n)	%P(3n)	Avg n	Method	Spec	Half-life comments	P(n) Comments
Z 2 N 6 **8HE**	1963Ne07	30 ms (20)					β-	no	"A very rough estimate"	
	1965Po06	122 ms (2)	12 (1)			0.12	n, β-	no	Diffusion loss method to look at only Helium decay activity. From least-squares fits to all of the decay curves, our best value of the half-life...is 122(2) msec.	"Diffusion loss method", poor neutron counter efficie assumed average E(n)=3 MeV (note neutron energy (15) MeV in 1976De31)
	1966Ne07	114 ms (25)					β-γ coin (decay of peak area)	no	"each [β-γ coin] spectrum...was decomposed...into a peak centered at 0.98 MeV and a smooth background. The area under the peak is proportional to the amount of 8He in each spectrum. The half-life of 8He was determined from the decay of the area of this peak, and the average of several runs yielded a value of 114(25) msec."	
	1973An11	120 ms	12 (8)			0.12	ion counting after 235U fission	no	No uncertainty given on half life	
	1981Bj03	117.5 ms (15)	16 (1)			0.16	n, β-, β-n coin	yes	"...measured with the 4PI neutron counter...If there were a diffusion loss of 8He from the aluminized mylar tape the measured half-life would become too short. Such a source of systematic error could, however, be excluded since a measurement with the beta-detector, which due to its small size is much more sensitive to a loss of activity, gave the same half-life within the error limits."	%P(n)=15(1) for β-n coin, %P(n)=18(2) for simulta n singles as well as ratio of neutron to gamma coun
	1991LuZZ	124.6 ms (50)					β-	no	In Russian	
	2008ReZZ 1995ReZZ	116 ms (43)					delayed-coin (ion, β-/n)	no	Half-lives are determined by a delayed coincidence technique based on time-interval histograms using the arrival time of a specific ion as the start time and the arrival time of subsequent betas or neutrons as the stop time...Half-lives reported here are based on a weighted average of the half-lives obtained from beta, neutron, and beta-neutron-coincidence time-interval histograms	determined by two techniques?one involving the ab neutrons relative to the number of ions and the othe the abundance of neutrons relative to the number o Results for Pn values are based on the weighted ave two techniques.
	2010Mi01							no		"The branching ratio for this decay channel is to be
Z 3 N 6 **9LI**	1951Ga30	168 ms (4)					n-counting	no	Excluded as an outlier. "The half-life measurement was made by irradiating the target for several seconds, shutting the cyclotron off, and recording the decaying neutron activity by photographing the pulses displayed on an oscilloscope." Approximately 5 half lives measured	Identified as βn emitter
	1963Al18		75 (15)			0.75	β, β-n coin	no		P(n) from β spectra
	1965Do13	176 ms (1)					n-counting	no	Excluded for little detail of measurement. Least-squares fit to the accumulated neutron counts in the multiscaler	
	1965Sc17	172 ms (25)					n-counting	yes?	In German?	
	1970Ch07	177 ms (3)	35 (4)			0.35	(Li-9)α corr., n	yes	Excluded since half lives of 8Li and 16N have changed. Three	

Nuclear Data for Charged-particle Monitor Reactions and Medical Isotope Production

PO: R. Capote, duration: 2012-2016

Scientific Background

There is a renewed worldwide interest for improved nuclear-data for use in medical applications. The main data areas requiring improvements (measurements and re-evaluation of decay data) are:

i) monitor reactions for charged-particle beams,
ii) removal of data discrepancies in production of diagnostic gamma emitters,
iii) production of novel positron emitters and of positron emitters via generator isotopes,
iv) production of alpha emitters.

Output

-New measurements and evaluations of decay and cross section data for
i) reactions used to monitor charged-particle beams
ii) for production of novel positron and alpha emitters

-Accurate integral yields will also be derived for data validation.

RCM 1 Dec. 2012, Report INDC(NDS)-0630 available at https://www-nds.iaea.org/publications/indc/indc-nds-0630.pdf

More details from F. Kondev

Consultants Meeting on Auger Electron Emission from Nuclear Decay Data Needs for Medical Applications
9-10 May 2013

- New prospects in medical applications: target therapy
- High LET agents such as composite particles and Auger electrons most effective
- Need for reliable data on Auger electrons has emerged
- Exploratory meeting to assess needs and recommend ways of dealing with them

More from F. Kondev

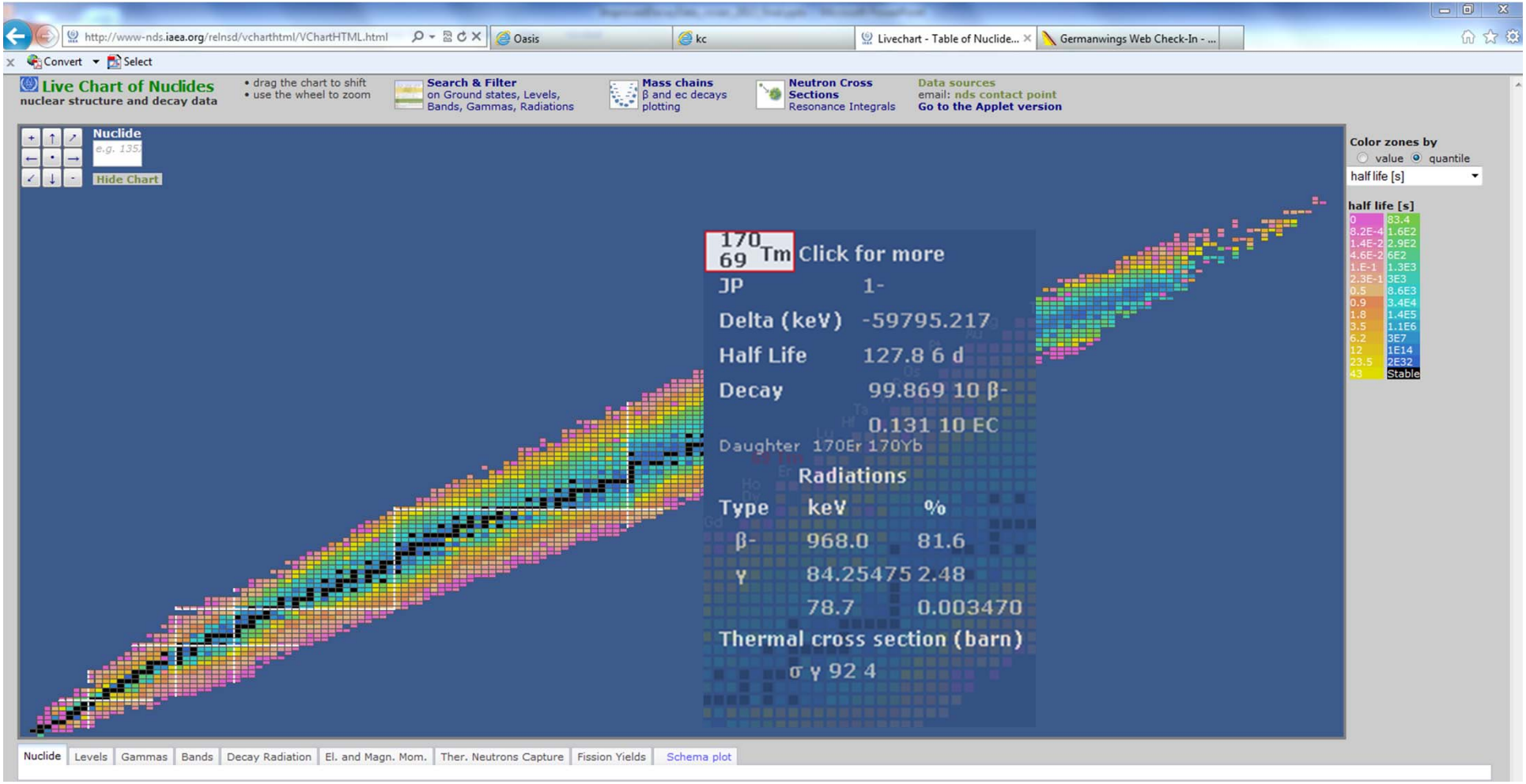
Consultants Meeting on Compilation and Evaluation of Gamma-Ray Data
4-6 Nov. 2013

- Growth in new gamma-ray data
- Inconsistencies/problems in photonuclear data library (2000)
- Different techniques to extract photon strength function
- Consultant's meeting to assess the need for a database dedicated to gamma-ray data: Recommended a new CRP

More from R. Firestone

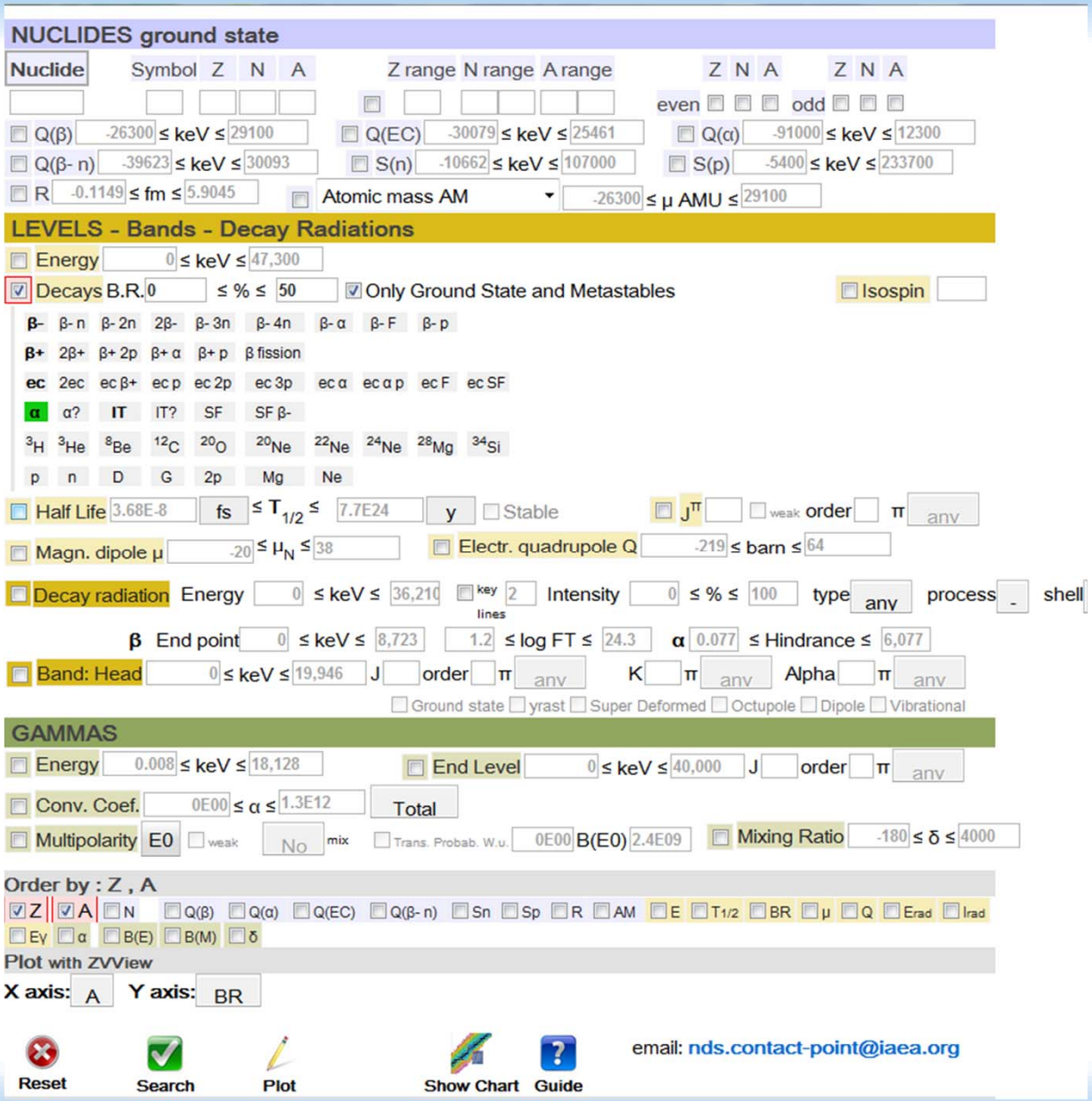
LiveChart of Nuclides

(http://www-nds.iaea.org/livechart/)



Developed by M. Verpelli

Search and Filter on ground states, levels, bands, gammas, radiations



Radiation spectra

Nuclide | Levels | Gammas | Bands | Decay Radiation | El. and Magn. Mom. | Ther. Neutrons Capture | Fission Yields | Scher

Parent	$T_{1/2}$	E [keV]	Jp order	Decay	$Q_{gs \rightarrow gs}$	Daughter	Deposited Energy [keV]		
							Alpha	Beta	CE & Auge
$^{135}_{54}Xe_{81}$	9.14 h *2*	0.0	3/2+	β- 100 %	1164.218 *4456*	$^{135}_{55}Cs_{80}$	0.000 *0.000*	304.716 *12.505*	14.988 *0.7*

see the ENSDF source

Beta -

Fed level	Jp	End Point	Avg Energy	Intensity	LogFT	Unforb.
1062.420 *14*		(101.7980) *4*	26.9 *11*	0.123 *6*	5.71 *6*	
981.315 *22*		(182.9030) *45000*	50.0 *12*	0.075 *5*	6.71 *5*	
608.186 *14*	5/2+	(556.032) *4*	173.3 *15*	3.11 *14*	6.67 *3*	
407.989 *13*		(756.229) *4*	248.1 *16*	0.59 *3*	7.86 *3*	
249.793 *12*	5/2+	910 *10*	310.2 *16*	**96 *4***	5.94 *2*	

Highligh

Gamma

Start level	Jp	Final Level	Jp	Energy	Intensity	Mixing	Multipol.	Tot. Conv. Coeff.
407.989 *13*		249.793	5/2+	158.197 *18*	0.289 *14*			
608.186 *14*	5/2+	407.989		200.19 *10*	0.012 *50*			
249.793 *12*	5/2+	0.0	7/2+	249.794 *15*	**90**	1.0	M1(+E2)	0.0737 *20*
608.186 *14*	5/2+	249.793	5/2+	358.39 *3*	0.221 *11*		M1,E2	0.0265 *17*
981.315 *22*		608.186	5/2+	373.13 *10*	0.015 *30*			
407.989 *13*		0.0	7/2+	407.99 *2*	0.358 *17*			
1062.420 *14*		608.186	5/2+	454.2 *2*	0.0040 *8*			
981.315 *22*		407.989		573.32 *9*	0.0048 *7*			
608.186 *14*	5/2+	0.0	7/2+	608.185 *15*	2.90 *13*	0.5	M1(+E2)	0.0073 *22*
1062.420 *14*		407.989		654.432 *16*	0.05 *0*			
981.315 *22*		249.793	5/2+	731.52 *2*	0.055 *30*			
1062.420 *14*		249.793	5/2+	812.63 *3*	0.070 *30*			
1062.420 *14*		0.0	7/2+	1062.41 *2*	0.0041 *8*			

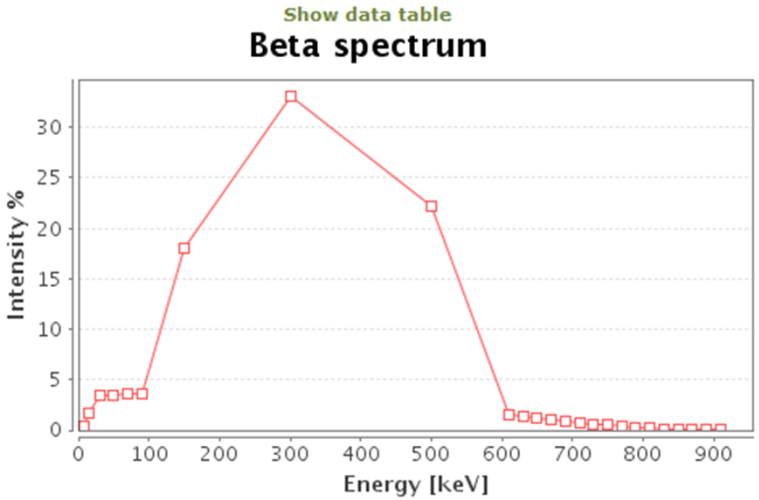
X-rays

Type	Energy	Intensity
X L	4.290	0.61 *3*
X KA2	30.6251 *3*	1.43 *7*
X KA1	30.9728 *3*	2.64 *13*
X KB3	34.92	0.25 *1*
X KB1	34.987	0.482 *28*
X KB	35.00	0.96 *5*
X KB2	35.818	0.149 *9*

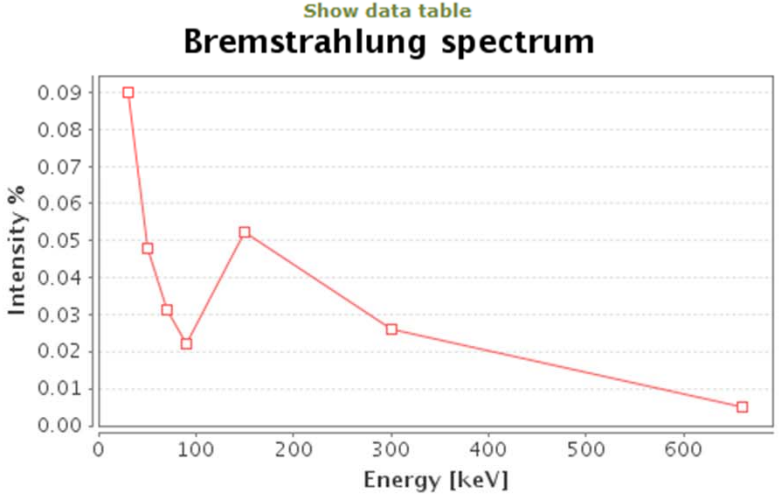
Electrons

Type	Energy	Intensity
AU L	3.550	5.25 *24*
AU K	25.50	0.59 *3*
CE K	213.809 *15*	**5.6 *4***
CE L	244.080 *15*	0.82 *11*
CE M	248.577 *15*	0.169 *23*
CE N+	249.563 *15*	0.041 *5*
CE K	322.41 *3*	0.004939
CE L	352.68 *3*	0.000717
CE M	357.17 *3*	0.000148
CE N+	358.16 *3*	0
CE K	572.200 *15*	0.01823
CE L	602.471 *15*	0.002327
CE M	606.968 *15*	0.000475
CE N+	607.954 *15*	0.000115

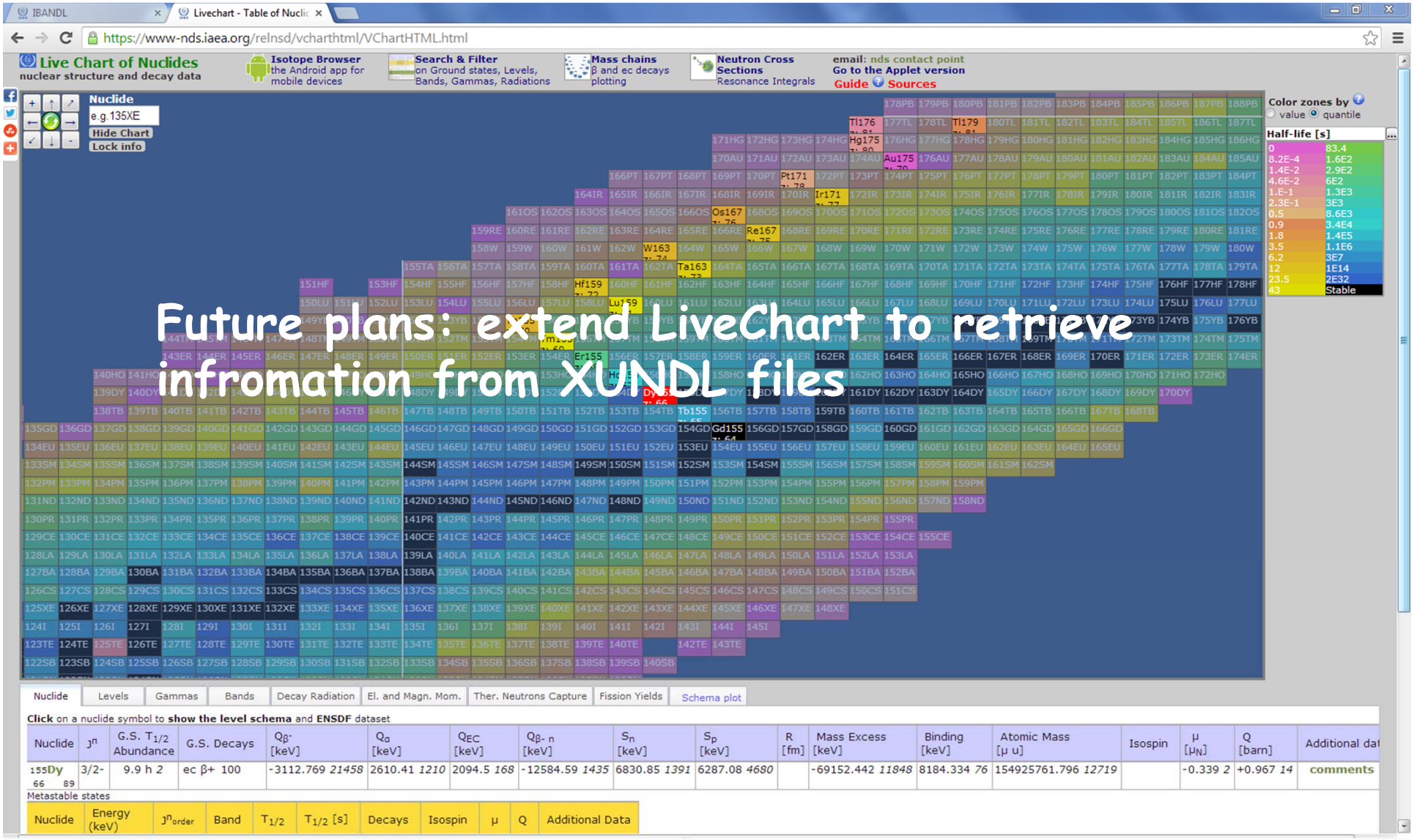
Show data table



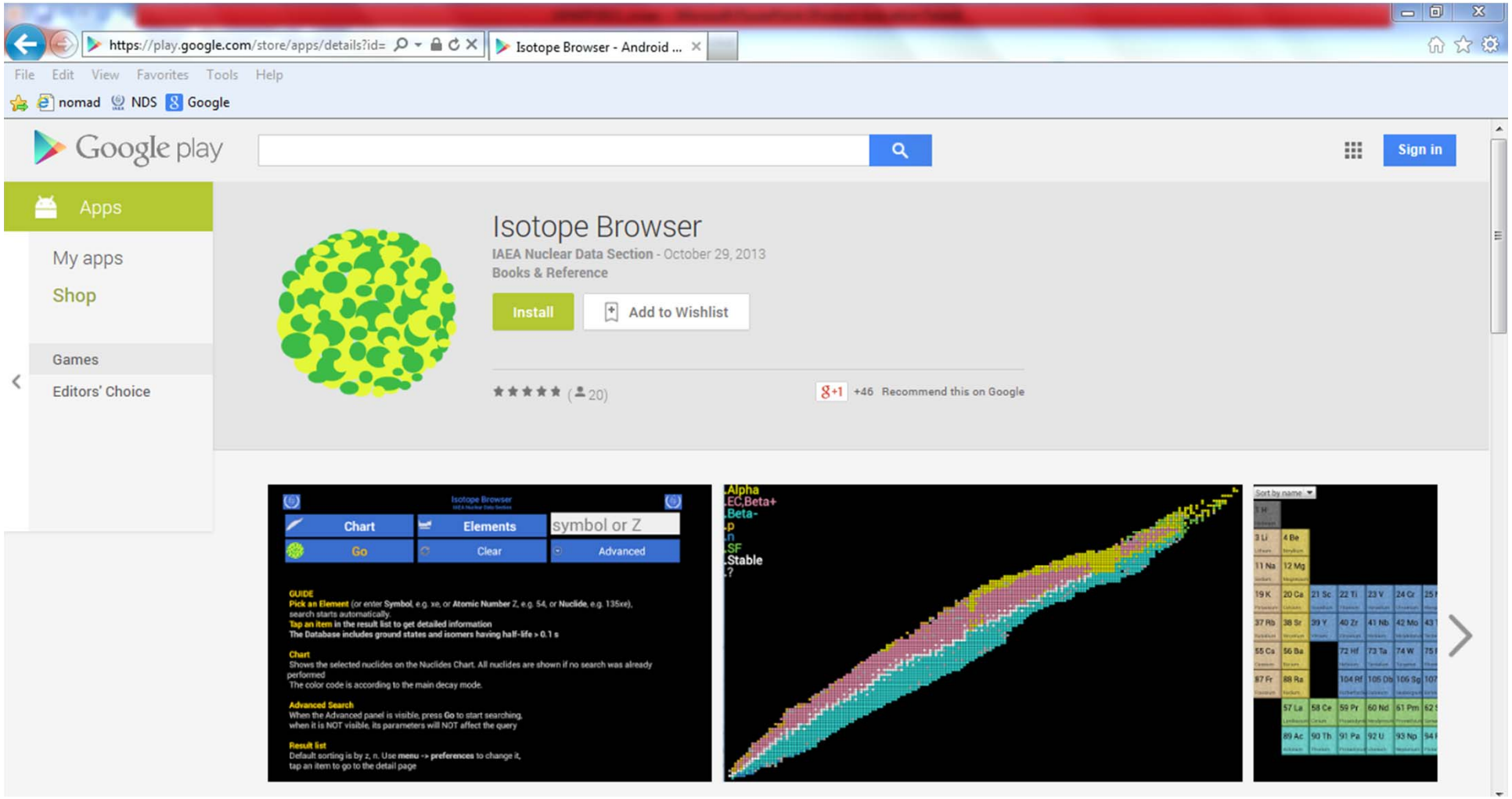
Show data table



LiveChart new feature: genetic relationships (20th NSDD Action)



IAEA NDS ANDROID app: Browse Structure and Decay Data on your mobile device



Nuclear Structure and Decay Data Network

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

IAEA Role: Coordination

-Organizes NSDD Biennial Meetings

Last one: 20th Technical Meeting of the NSDD Network, Kuwait, 27-31 January 2013

36 participants from 17 countries

Summary Report **INDC(NDS)-0635** (available online)

Presentations, Photos, List of Actions etc: http://www-nds.iaea.org/nsdd/

Next: IAEA, Vienna, 2015

-Biennial IAEA/ICTP Workshops on "Nuclear Structure and Decay Data: Theory and Evaluation"

Last one: 6 -12 August 2012. OUTCOME: Evaluation of A=211 mass chain (NDS)

Next workshop: 24-28 March 2014:

effort to attract knowledgeable nuclear physicists and existing NSDD evaluators for specialized training

NSDD evaluators are encouraged to apply-participation costs are reasonable

-Support of mass-chain evaluations (6 individual contracts lasting 3 years: some approaching end)

-Support of horizontal evaluations: 1 one-year contract on Magnetic moments update and recommendations (N. Stone): tables available at http://www-nds.iaea.org/nsdd, INDC(NDS) report in preparation

Nuclear Structure and Decay Data

- **Future funding:** coordinate and support regional efforts to secure funding from **other sources**

  recent attempt to apply for **EU funds** (Action from 20th NSDD Meeting):
  proposal for nuclear data network was submitted to ENSAR2 steering committee: rejected
  (Institutes from Bulgaria, Romania, Norway, France, Germany, IAEA)

  efforts to access IAEA Technical Cooperation funds*: get Nuclear Data included as thematic area in regional TC projects- but local groups need to get organized and request for IAEA TC help*

- **Future efforts (from 20th NSDD meeting):**
  - Technical Meeting to address the need for updating analysis codes
  - initiate Data Development project following conclusions and recommendations of TM
  - create online platform to test and validate improved codes

- **Future efforts on training (from 20th NSDD meeting)**
  - help organize specialized training workshops to improve evaluators skills