Introduction to the Nuclear Data Section

Paraskevi (Vivian) Dimitriou

Nuclear Data Section

Division of Physical and Chemical Sciences

International Atomic Energy Agency

International Atomic Energy Agency

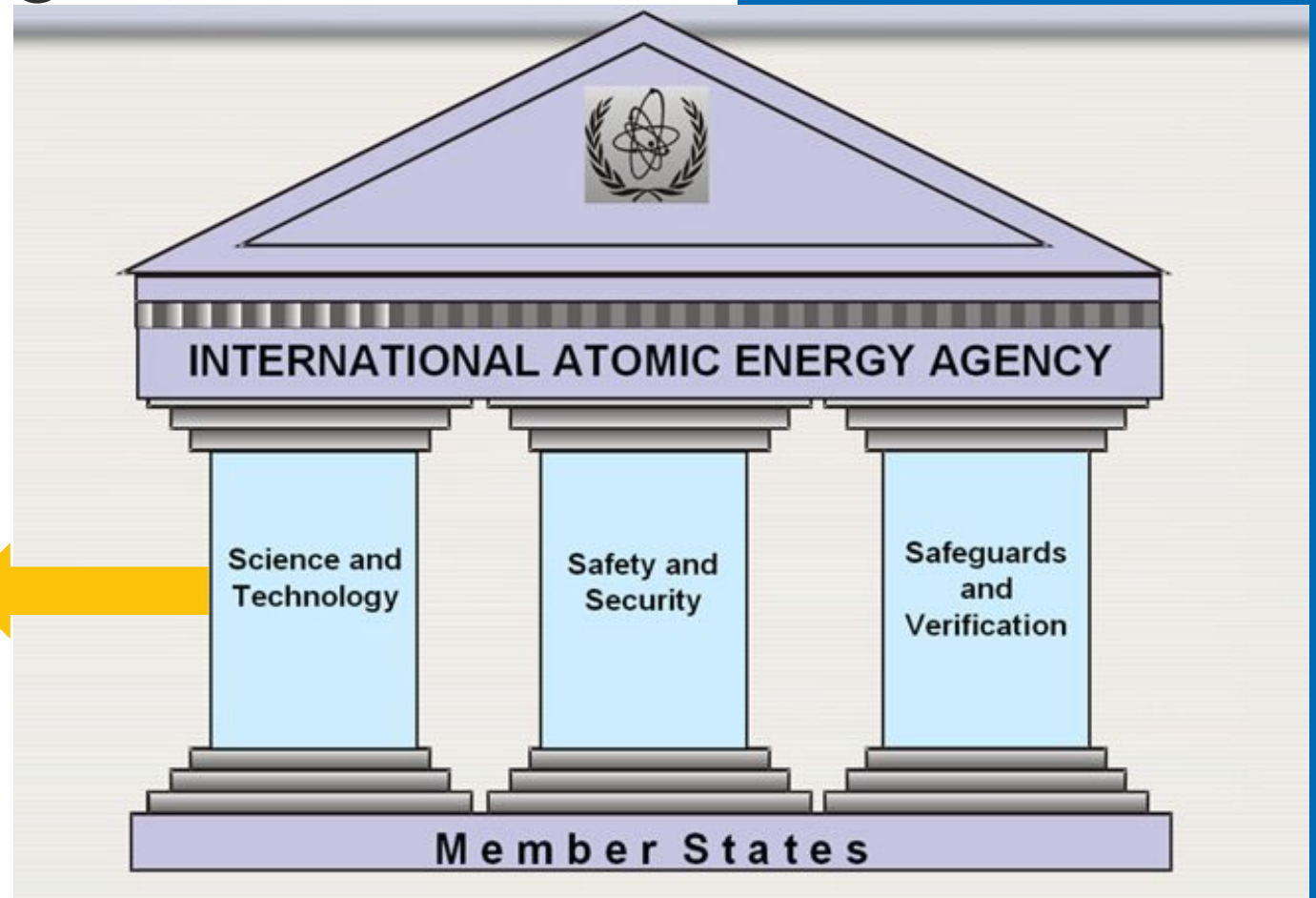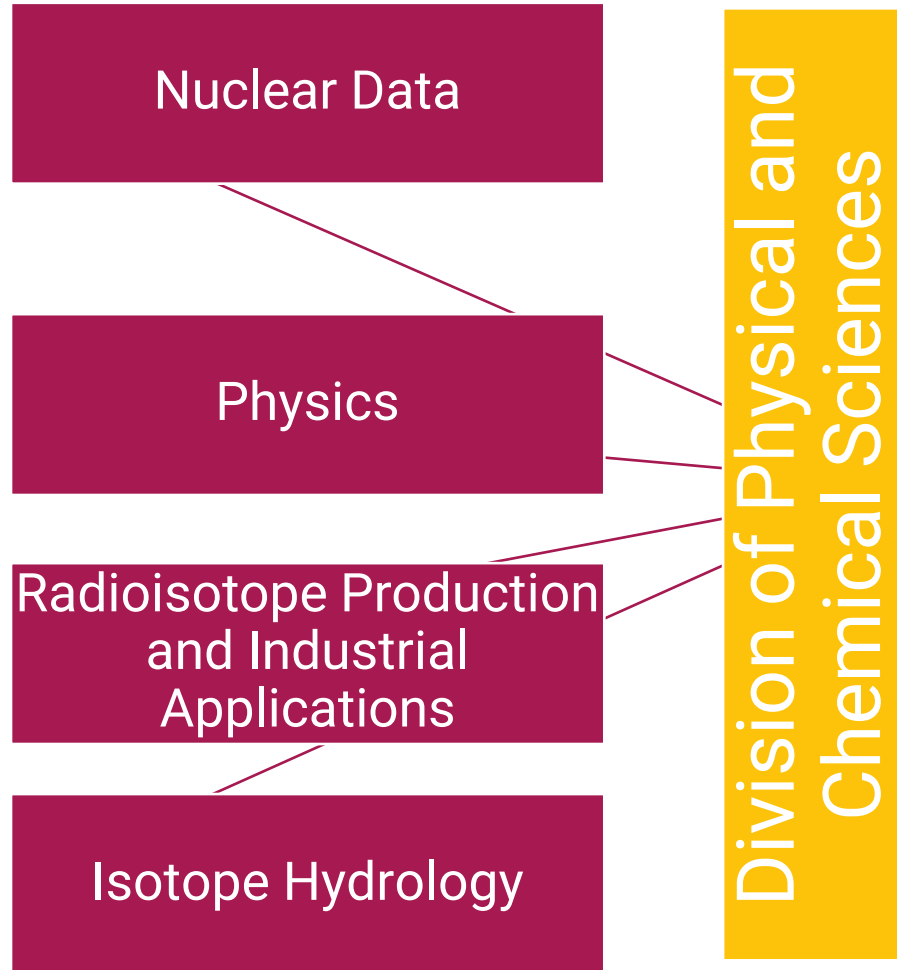Founded in 1957: world centre for cooperation in the nuclear field

Promotes the safe, secure and peaceful use of nuclear technologies

Total of 179 Member States

Over 2500 personnel

safe, secure and peaceful application of nuclear technologies

Nuclear Data

Physics

Radioisotope Production and Industrial Applications

Isotope Hydrology

Division of Physical and Chemical Sciences

INTERNATIONAL ATOMIC ENERGY AGENCY

Science and Technology

Safety and Security

Safeguards and Verification

Member States

How did it all start?

- Eisenhower's historical speech "Atoms for Peace" on 8 December 1953

- First International Conference on Peaceful Uses of Atomic Energy, Geneva, 1955

- IAEA is founded in 1957

- UK, USSR and US discuss making nuclear data public at Geneva conferences 1955, 1958

- Carl Westcott was hired in 1963 to oversee the Nuclear Data Program at the Agency

- Nuclear Data Section is created in 1965 - International Nuclear Data Committee advises on promoting research and exchange of data among member states

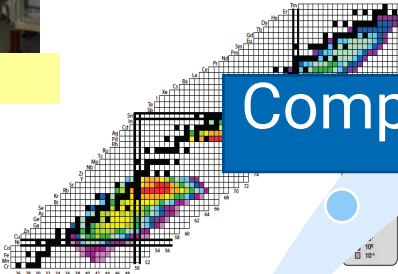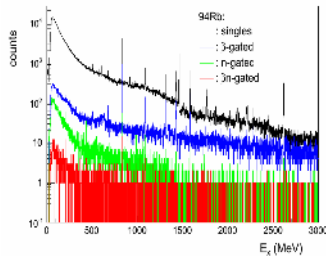
1953 Eisenhower: "Atoms for Peace"
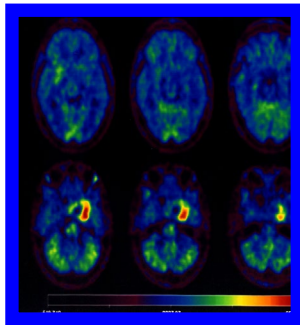
Nuclear physics research: experiment + theory
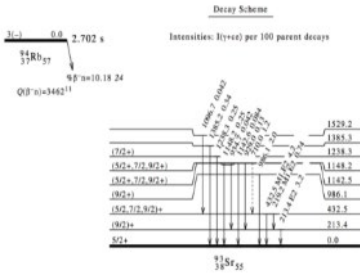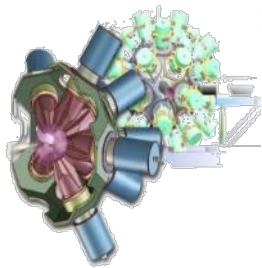
Compilation

Evaluation

Verification/ Validation

Dissemination

JYFLTRAP
Penning trap
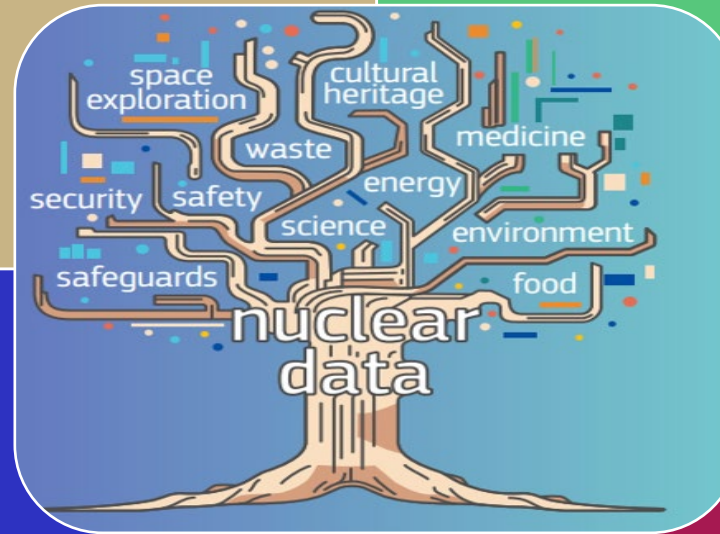
Nuclear Data

Applications:
organised
complete
recommended
traceable
easily retrievable

International Networks

- Nuclear Reactions – EXFOR→ NRDC
- Nuclear Structure and Decay – ENSDF → NSDD
- Nuclear Reactions Evaluation – ENDF/B, JEFF, → INDEN

Coordinated Research Projects

- Beta-delayed neutrons
- Photonuclear data and Photon Strength Functions
- Fission Yields
- Nuclear Level Densities - new

Meetings

- (alpha,n) reactions for basic and applied research
- Nuclear data needs for Reactor Antineutrino Spectra
- Nuclear data needs for medical applications
- Thermal capture and gamma emission
- Neutron capture reactions on short-lived nuclei - new

Training

- Joint IAEA-ICTP workshops on Nuclear Structure and Decay Data
- Joint IAEA-ICTP Workshop on Nuclear Reaction Data
- IAEA Workshops on EXFOR Compilation
- IAEA Workshop on EMPIRE code/Talys code

Networks

Nuclear Reaction Data Centers

Experimental Nuclear Reaction Data

EXFOR

Nuclear Structure and Decay Data evaluators
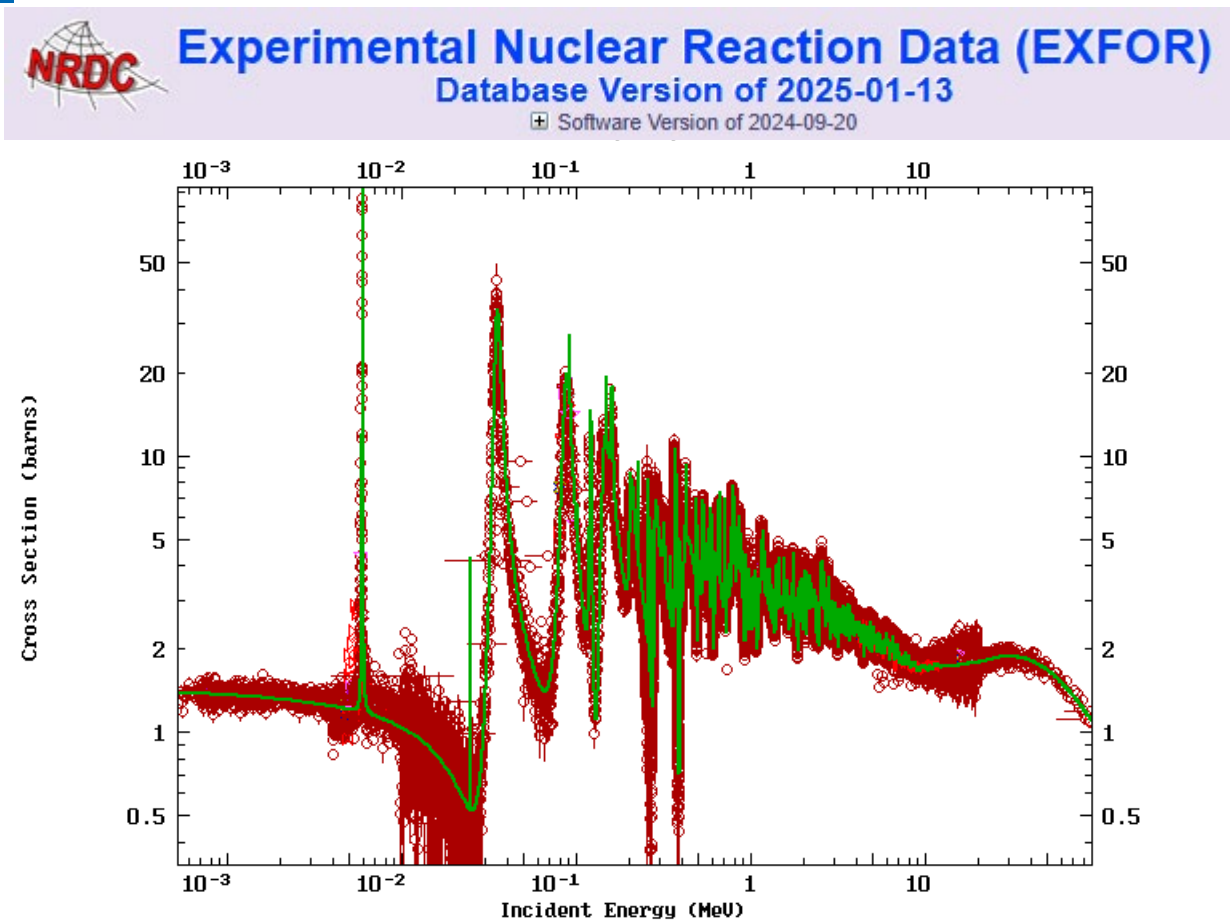
Recommended Nuclear Structure and Decay Data

ENSDF

International Nuclear Data Evaluation Network

Recommended Nuclear Reaction Data

ENDF

EXFOR

nds.iaea.org/endf

EXFOR is a unique and comprehensive low- and intermediate-energy nuclear reaction database

nds.iaea.org/exfor

As of September 2024 EXFOR includes:
25,096 experiments,
167,425 data tables,
184,837 datasets,
and 20,348,339 data points.

Live Chart (ENSDF)

nds.iaea.org/livechart

Evaluated **N**uclear **S**tructure **D**ata **F**ile:
Unique and comprehensive database of all measured nuclear structure properties

- Nuclear levels, energies, spins and parities
- Gamma energies and intensities
- Multipolarities, mixing ratios, and conversion electrons
- Decay modes

Isotope Browser – for Mobile Devices

- ## App for Mobile Devices
  - Properties of over **4,000 isotopes**
  - **No internet** connection needed
  - **~180,000** downloads, **4.8** ⭐
  - **11 languages** (Arabic, Chinese, English, French, Spanish, Russian, Japanese, Slovenian, Italian, Trad. Chinese, German)
  - **Regularly updated** with new features and data

Available for both
- Android
- Apple
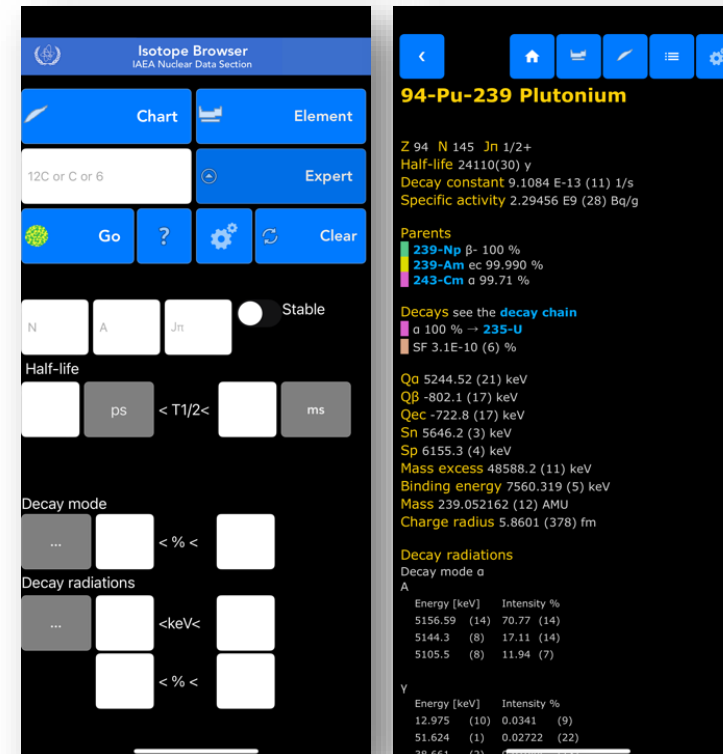
Medical Portal

nds.iaea.org/medportal

Medical Portal

Recommended cross sections for the $^{14}N(p,\alpha)^{11}C$ reaction

$^{14}N(p,\alpha)^{11}C$

- 1980 Bida
- 1952 Blaser
- 1978 Casella
- 1976 Ingalls
- 1974 Jacobs
- 1990 Köhl
- 2003 Kovács
- 1973 Laumer
- Padé 37, N=305

Cross section (mb) — Incident particle energy (MeV) — Uncertainty (%)

Updated: May 2021.

Handbooks
IAEA TRS 473
IAEA TECDOC 1211

Reference Data
Monitor Reactions
MIRD

Production Data

Nuclide e.g.135XE

Hide Chart

- Use the numeric keypad to zoom and move
- Use the mouse wheel to zoom

Parent	T₁/₂ or Width	E_x [keV]	Jp order	Decay	Q_decay[keV] see the note	Daughter	Comments		Alpha	Beta	CE & Auger	γ & X	Recoil	Neutrino	Total	Q * BR	Delta	Unplaced
$^{11}_{6}C_5$	1221.8 s 8	0.0	3/2-	ec β+ 100 %	1982.4 10	$^{11}_{5}B_6$				384.8 4		1019.62 3		578.3 6	1982.7 7	1982.4 10	0 %	

ENSDF source | Compare decay libraries (allow pop-up)

Electron Capture and Beta+

#	<E_β+> [keV]	Iβ+(abs) [%]	E_EC [keV]	I_EC(abs) [%]	Daughter level [keV]	Jπ	Logft	Transition type	Comments
1	385.7 4	99.767 3	(1982.3)	0.233 3	0	3/2-	3.5921 19	allowed	

511 keV 199.534 5 % γ± annihilation radiation

Large plot with each transition
Beta spectrum
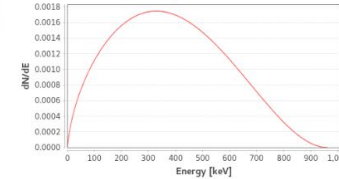
Large plot with each transition
Neutrino spectrum

3/2- $^{11}_{6}C_5$ 0.0   1221.8 s 8
Q⁺ 1982.4 keV 10
B+ : 100.0 % 0--> $^{11}_{5}B_6$

Iγ%   Iβ %   Log ft   #   Jp   En [keV]

100 99.7669 3.5921 0   3/2-

$^{11}_{5}B_6$ STABLE

within IAEA CRPs.

| Main | Monitor Reactions | Gamma Emitters | Positron Emitters | Therapeutic Isotopes |

Nuclide	Half-life	Decay %	Emission	Target	Reaction	Product	MIRD	Production Yield
$^{11}_{6}C_5$	20.364 min 14	ec β+ 100 (β+ ≈ 99.8)	e⁺	$^{14}_{7}N_7$	$^{14}N(p,\alpha)^{11}C$	$^{11}_{6}C_5$	mird	MIB
$^{13}_{7}N_6$	9.965 min 4	ec β+ 100 (β+ ≈ 99.8)	e⁺	$^{16}_{8}O_8$	O(p,a) N	$^{13}_{7}N_6$	mird	MIB
$^{15}_{8}O_7$	122.24 s 16	ec β+ 100 (β+ ≈ 99.9)	e⁺	$^{15}_{7}N_8$	$^{15}N(p,n)^{15}O$	$^{15}_{8}O_7$	mird	MIB
				$^{14}_{7}N_7$	$^{14}N(d,n)^{15}O$	$^{15}_{8}O_7$	mird	MIB
$^{18}_{9}F_9$	109.77 min 5	ec β+ 100 (β+ ≈ 96.7)	e⁺	natNe	$natNe(d,x)^{18}F$	$^{18}_{9}F_9$	mird	MIB
				$^{18}_{8}O_{10}$	$^{18}O(p,n)^{18}F$	$^{18}_{9}F_9$	mird	MIB
$^{22}_{11}Na_{11}$	2.6018 y 22	ec β+ 100 (β+ ≈ 90.0)	e⁺	$^{27}_{13}Al_{14}$	$^{27}Al(p,x)^{22}Na$	$^{22}_{11}Na_{11}$	mird	MIB
				$^{27}_{13}Al_{14}$	$^{27}Al(^3He,x)^{22}Na$	$^{22}_{11}Na_{11}$	mird	MIB
				^{27}Al	$^{27}Al(d,x)^{22}Na$	^{22}Na	mird	MIB

The **MIB** link opens the Medical Isotope Browser for the calculation of production yields

You can adjust the parameters, e.g. beam energy, to test different scenarios

Medical Isotope Browser   nds.iaea.org/mib
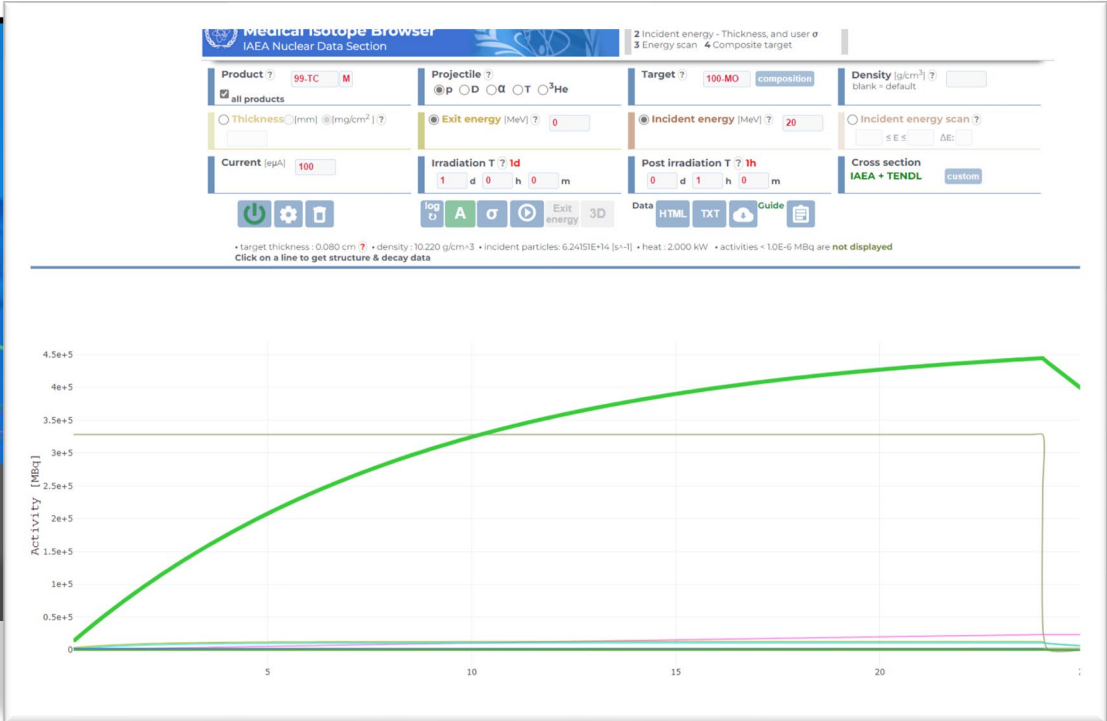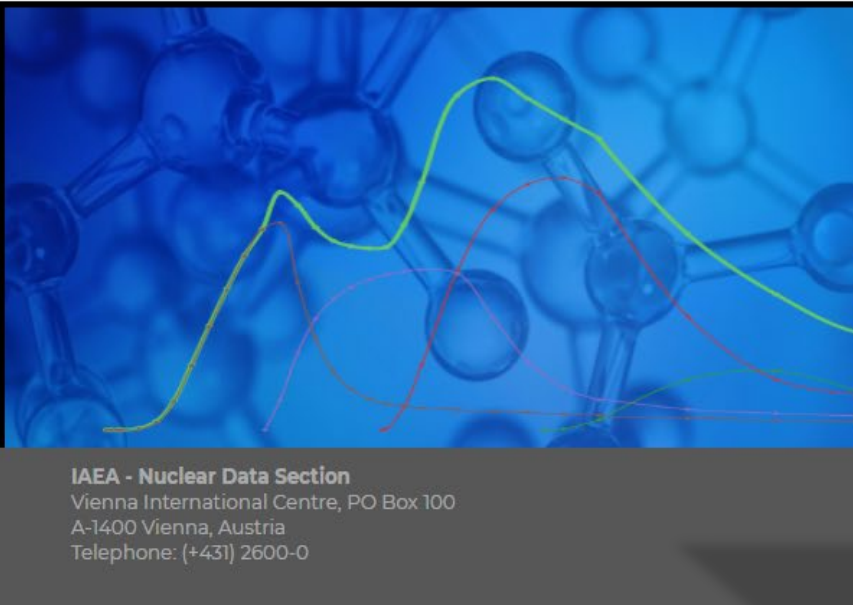
Beta-delayed neutron database

IAEA Nuclear Data Section

Reference Database for Beta-Delayed Neutron Emission Data

Search Nuclide `8he or h`

≤ Z ≤		≤ N ≤	≤ T$_{1/2}$ [ms] ≤
≤ P(1n)% ≤		≤ P(2n)% ≤	≤ P(3n)% ≤

Search Nuclides found:665

Clear

Data plotting

X Axis ○ A ○ Z ○ N ○ T$_{1/2}$ ○ P1n ○ P2n ● Qβ⁻n

Y Axis ○ A ○ Z ○ N ● T$_{1/2}$ ○ P1n ○ P2n ○ Qβ⁻n

Numerical data

↓CSV Evaluation   ↓CSV Theory   Spectra

Published tables

Range	Evaluation	Compilation
Z ≤ 28	XLS	XLS
29 ≤ Z ≤ 87	XLS	XLS

Copyright
Disclaimer

nds.contact-point@iaea.org

Tables with all the comments on the evaluation method

Click a label to show/hide table columns   ⓘ Legend & References   Last updated February 2022

Compilations Comments Qvalues	Systematics	Miernik 14		
	Theory	Moeller et al. 03	Marketin et al. 16	Moeller et al. 19

Recommended values

Nuclide	Isomer	T$_{1/2}$	%P(1n)	%P(2n)	%P(3n)	# of neutrons per decay	Reference	Spectra
$^{8}_{2}$He$_{6}$		119.4(15) ms	16 (1)	—	—	0.16	2015BI05	1
$^{9}_{3}$Li*$_{6}$		178.2(4) ms	50.5 (10)^a			0.505	2015BI05	2
$^{11}_{3}$Li$_{8}$		8.58(32) ms	86.6 (13)	4.2 (4)	1.9 (2)	1.007	2015BI05	5
$^{11}_{4}$Be$_{7}$		13740(80) ms	—				2015BI05	—
$^{12}_{4}$Be$_{8}$		21.47(4) ms	0.50 (3)			0.005	2015BI05	—
$^{14}_{4}$Be$_{10}$		4.53(27) ms	86 (6)	5 (2)	—	0.96	2015BI05	1
$^{13}_{5}$B$_{8}$		17.16(18) ms	0.266 (36)			0.00266	2015BI05	—
$^{14}_{5}$B$_{9}$		12.36(29) ms	6.04 (23)	—		0.0604	2015BI05	—
$^{15}_{5}$B$_{10}$		10.18(35) ms	99.68 (+8-158)	<1.5	—		2015BI05	2

Numerical data file for computational use

T1/2 vs QBn
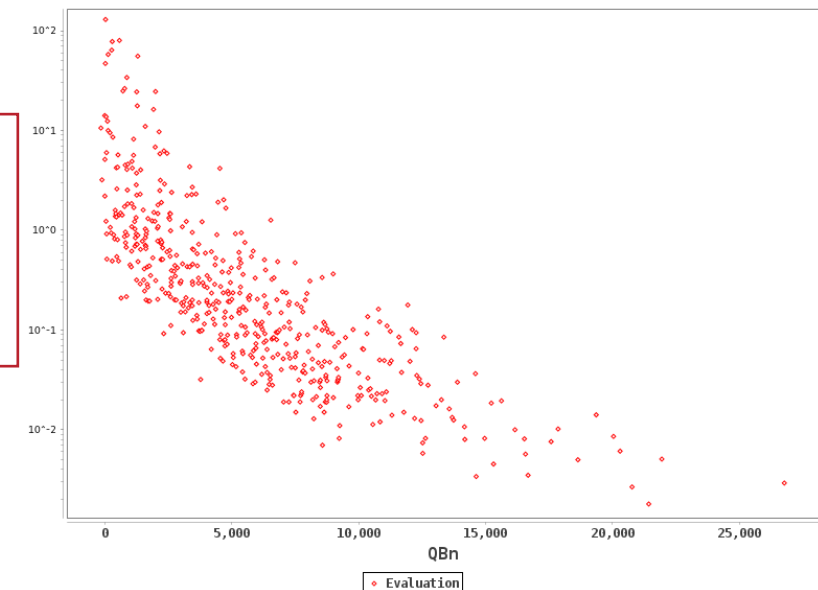
nds.iaea.org/beta-delayed-neutrons/database.html

This is the new website for the Stopping Power Database. The legacy website is still available for a limited time here.

Search the database

The database can be searched only by Ion, or only by Target, or by both an Ion and a Target.

| He | × ▾ |

| Search by Target (E.g: Au, Air, Polyvinyl toluene, ..) | ▾ |

Check the Target Glossary for a full list of Target names and formulas.

🔍

Results for Ion: He

Download data for Ion: He ⬇
Version 2023-11
206 Targets | 826 Experiments | 13,898 Datapoint

Show [10 ▾] entries   Search: [   ]

Ion ▲	Target ▲	Datapoints Measured ⬍	Experiments ⬍	Last Publication Year ⬍	Detailed Information
He	2-Butanone	18	1	1978	📊 He - 2-Butanone
He	3-Pentanone	54	3	1985	📊 He - 3-Pentanone
He	Acetaldehyde	18	1	1978	📊 He - Acetaldehyde
He	Acetone	18	1	1978	📊 He - Acetone
He	Acetylene	60	4	1984	📊 He - Acetylene
He	Ag	609	43	2018	📊 He - Ag
He	Air	118	7	2022	📊 He - Air
He	Al	606	44	2018	📊 He - Al
He	Al2O3	221	9	2012	📊 He - Al2O3
He	Allene	33	2	1974	📊 He - Allene

Energy unit:
○ MeV
● MeV/amu

Stopping unit:
● MeV/(mg/cm2)
○ E-15eV cm2/atom

▾ Solid
▲ Gas
◀ Liquid

Reload graph
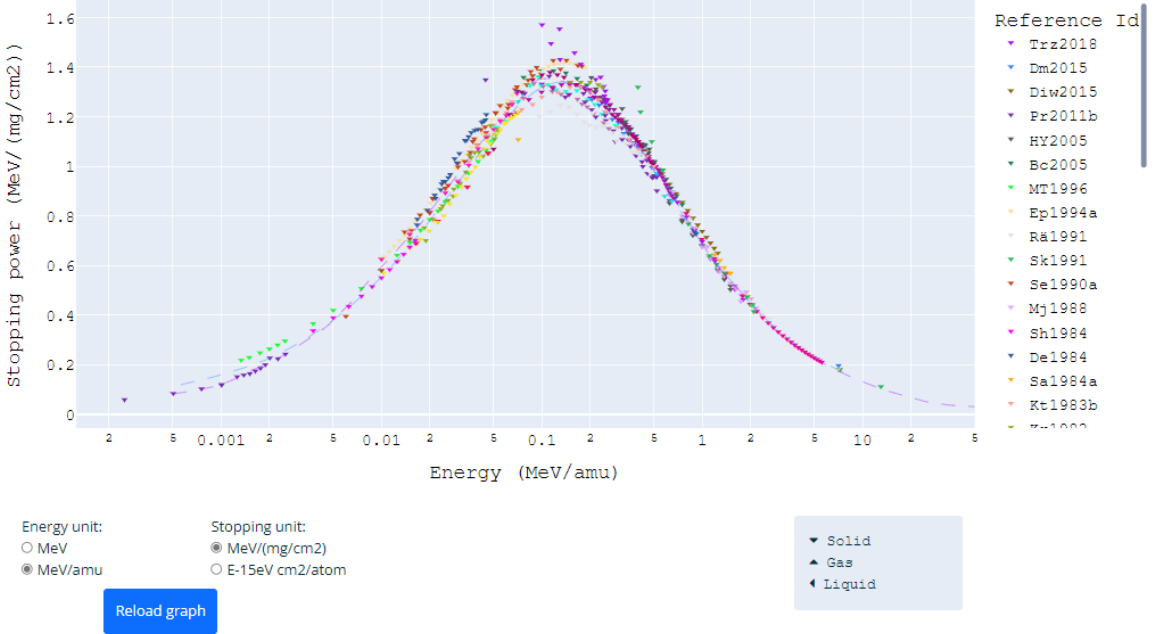
*Data has been converted to the same units for plotting purposes.

Data last updated: Nov. 27, 2023, 12:18 p.m.

Experimental Data 43   Download all ⬇

📄 Trz2018	W.H.Trzaska,G.N.Knyazheva,J.Perkowski,J.Andrzejewski,S.V.Khlebnikov, E.M.Kozulin,T.Malkiewicz,M.Mutterer, E.O.Savelieva Nucl.Instrum.Methods Phys.Res. B 418, 1-12 (2018).	[csv] [txt]
📄 Diw2015	P.K.Diwan,S.Kumar, Nucl. Instrum. Methods B 359 (2015) 78	[csv] [txt]
📄 Dm2015	D.Moussa, S.Damache, S.Ouichaoui Nucl. Instrum. Methods B 343, 44-47 (2015)	[csv] [txt]
📄 Pr2011b	D.Primetzhofer,S.Rund,D.Roth,D.Goebl,P.Bauer Phys. Rev. Lett. 107, 163201	[csv] [txt]
📄 Bc2005	M.Bianconi,N.P.Barradas,L.Correra Nucl.Instrum.Methods B239, 127	[csv] [txt]
📄 HY2005	J.Y.Hsu,Y.C.Yu,J.H.Liang,K.M.Chen Nucl.Instrum.Methods B 241, 155 (2005)	[csv] [txt]
📄 MT1996	G.Martinez-Tamayo,J.C.Eckardt,G.H.Lantscher,N.R.Arista Phys.Rev. A54, 3131	[csv] [txt]
📄 Ep1994a	Chr. Eppacher Ph.D.Thesis, Univ. of Linz, Austria, Schriften der Johannes-Kepler- Universität Linz, Universitätsverlag Rudolf Trauner (1995),	[csv] [txt]

Theoretical Data 2

📄 ESPNN	Electronic Stopping Power Neural Network (ESPNN). Part I: atomic targets, https://pypi.org/project/ESPNN/, J. Appl. Phys. 132, 245103 (2022)	
📄 SRIM2013	The stopping and range of ions in matter, J.F. Ziegler, M.D. Ziegler, J.P. Biersack, Nucl. Instr. and Meth. B 268 (2010) 1818–1823	

Databases and Web Applications

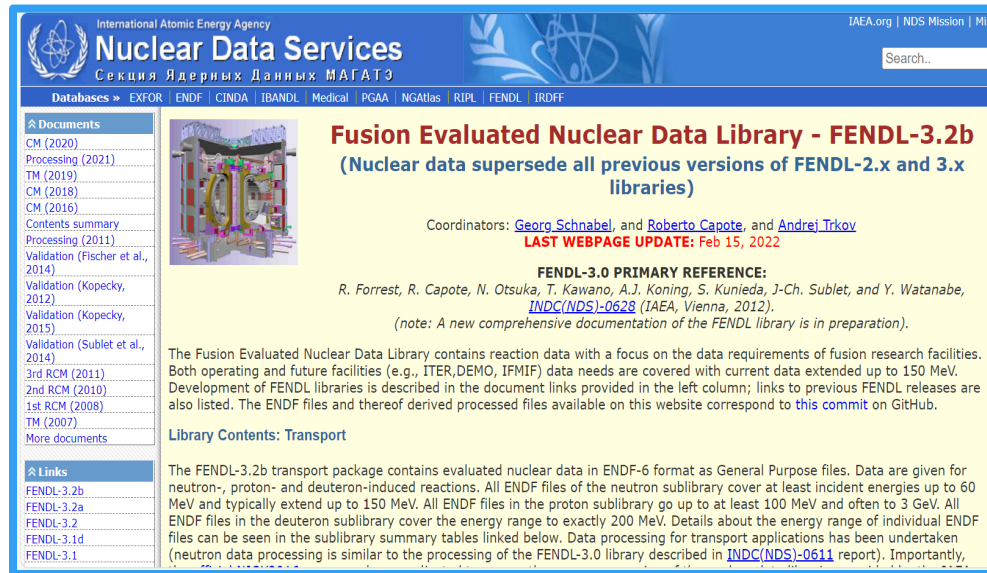| Application	Content
Live Chart of Nuclides/Isotope Browser Mobile App	Recommended nuclear structure and decay data (ENSDF), graphical interface, Pyhton API, mobile app
Atomic Mass Data (AME & Nubase)	Basic nuclear properties (masses, spins, parities, half-lives, isomers, decay modes)
Nuclear Electromagnetic Moments	Compiled and evaluated experimental nuclear magnetic and electric quadrupole moments
EXFOR	Experimental nuclear reaction database
Neutron Standards	Neutron cross-section standards
Photonuclear Data Library	Recommended photonuclear reaction data
ENDF	Interface to evaluated nuclear reaction data: ENDF/B, JEFF, JENDL, CENDL, ROSFOND
Neutron Activation Analysis	Neutron activation and Prompt-Gamma Activation Analysis (PGAA) database and Evaluated Gamma Activation File (EGAF) for non-destructive analytical methods
Ion Beam Nuclear Data Library (IBANL)	Experimental charged-induced cross sections for ion beam analytical methods
Electronic Stopping Power of Ions in Matter	Compilation of stopping power experiments
International Reactor Dosimetry and Fusion File (IRDFF)	Reaction cross sections, fission yields and decay data for dosimetry applications
Beta-Delayed Neutron Emission Database	Experimental beta-decay half-lives, beta-delayed neutron emission probabilities, and emission spectra
Compilation of Nuclear Data Experiments for Radiation Characterisation (CoNDERC)	Decay Heat, incident particle spectra used world-wide, origen Input for shielding calculation, thermal resonane data
Medical Radioisotopes Production Portal	Therapeutic Radionuclides, Gamma Emitters, Positron Emitters
Medical Isotope Browser	Medical radioisotopes production simulator
International Database of Reference Gamma Spectra (IDB)	In collaboration with IAEA-SG
IAEA Handbook of Nuclear Data for Safeguards	A set of recommended nuclear data for safeguard (decay data, thermal neutron capture cross section, resonance integrals, fission product yield ..etc)

Meetings - Reports

📄 INDC(NDS)-0903	The Upbend in the (n,gamma) ^{57}Fe Photon Strength Function Data Revisited	J. Kopecky, I. Tomandl	Aug 2024
📄 INDC(NDS)-0902	**International Network of Nuclear Reaction Data Centres** Summary report of the Technical Meeting, 14-17 May 2024, Vienna, Austria	Naohiko Otuka and Boris Pritychenko	Aug 2024
📄 INDC(NDS)-0901	**International Network of Nuclear Structure and Decay Data (NSDD) Evaluators** Summary Report of the 25th Technical Meeting, 15-19 April 2024, Vienna, Austria	J. Chen, A. Negret, P. Dimitriou	Dec 2024
📄 INDC(NDS)-0900	**Updating of the ENDF/B-VIII.1b2 Candidate Evaluations with Reaction Cross Sections from IRDFF-II**	A. Trkov, R. Capote	Feb 2024

1	11-15 November 2024	S. Okumura and A. Koning	TM on Nuclear Data Retrieval, Dissemination and Data Portals	Webpage
2	7-11 October 2024	R. Capote Noy	TM on Thermal Capture and Gamma Emission	Webpage
3	8-12 July 2024	P. Dimitriou	TM on Compound Nuclear Reactions and Related Topics (CNR*24)	Webpage
4	14-17 May 2024	N.Otsuka	TM of the International Network of Nuclear Reaction Data Centres (NRDC)	Webpage
5	15-19 April 2024	P. Dimitriou	25th TM of the Nuclear Structure and Decay Data (NSDD) Network	Webpage
6	16-18 January 2024	P. Dimitriou	CM on Inter-comparison of PIGE codes (Phase II): depth-profiling	Webpage
7	15-18 January 2024	S. Okumura	CM on Information Exchange on Developments and Operations of Nuclear Data Dissemination Services	
8	18-21 December 2023	G. Schnabel	CM of INDEN on Structural Materials (VI)	Webpage
9	27 November - 1 December 2023	P. Dimitriou	TM on (alpha,n) Reaction Nuclear Data Evaluations and Data Needs	Webpage
10	20-23 November 2023	R. Capote Noy	TM of of INDEN on Nuclear Data Evaluation of Fissile Actinides	Webpage
11	30 October - 2 November 2023	G. Schnabel	CM on Further Development of the Fusion Evaluated Nuclear Data Library (FENDL)	Webpage
12	23-25 October 2023	R. Capote Noy	CM on Thermal Capture and Gamma Emission	Webpage
13	23-25 October 2023	P. Dimitriou	TM on Decay Data for Monitoring Applications	INDC(NDS)-0890
14	9-13 October 2023	G. Schnabel	TM on Neutron Data Standards	Webpage
15	9-11 October 2023	P. Dimitriou	CM on the Evaluation of Photon Strength Function Data	Webpage
16	20-22 September 2023	R. Capote Noy	CM on the Improvement of Major Actinide Evaluations	Webpage
17	29 August - 1 September 2023	P. Dimitriou	CM of INDEN on Light Elements (V)	Webpage

NDS Fusion Databases and Networks

FENDL Fusion Evaluated Nuclear Data Library

https://nds.iaea.org/fendl/

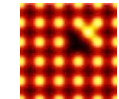## Atomic and Molecular Databases and Networks

 AMBDAS

ALADDIN

CollisionDB

CascadesDB

DefectDB

**Data Centres Network
Code Centres Network
Global Network for the Atomic and Molecular Physics of Plasmas**

https://amdis.iaea.org/

NEW

Data Explorer - Nuclear Reaction Data Explorer [page]
TALYS-2.0 - Nuclear reaction model code and related packages [page]
IDB - An International Database of Reference Gamma Spectra [page]
Stopping Power - Electronic Stopping Power of Matter for Ions [page]
Web-API for EXFOR/ENDF/IBANDL - software search/download for EXFOR/ENDF/IBANDL [page]

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

EXFOR
Experimental nuclear reaction data

LiveChart of Nuclides
Interactive Chart of Nuclides
Mobile App: Isotope Browser

CINDA
Nuclear reaction bibliography

ENDF
Evaluated nuclear reaction libraries

ENSDF
evaluated nuclear structure and decay data (+XUNDL) **

NSR
Nuclear Science References *

NuDat-3
selected evaluated nuclear structure data **

RIPL
reference parameters for nuclear model calculations

IBANDL
Ion Beam Analysis Nuclear Data Library

Charged particle reference cross section
Beam monitor reactions

PGAA
Prompt gamma rays from neutron capture

FENDL
Fusion Evaluated Nuclear Data Library

Photonuclear
- IAEA Photonuclear Data Library, 2019
- EPICS Electron & Photon Interaction Data, 2017

IRDFF-II
International Reactor Dosimetry and Fusion File

NAA
Neutron Activation Analysis Portal

Safeguards Data
Last updated: May 2021

Medical Portal
Medical Portal

Standards
- Neutron cross-sections, 2017
- Decay data, 2005

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

IAEA Nuclear Data Section

A+M Atomic

Meetings Workshops

Newsletters

Coordinated Research Projects

Nuclear Reaction Data Center Network

Nuclear Structure & Decay Data Network

International Network of Nuclear Data Evaluators

Technical Documents INDC Reports

nds.iaea.org

Left sidebar (partial):
Mass Data
-delayed neutrons
NDA
charged particle reference cross section
CoNDERC
DICEBOX
DROSG-2000
DXS
Decay Data Library for Actinides
EE-View
EMPIRE-3.2
NDF Archive
DF Retrieval
-6 Codes
Format

Nuclear data needs for reactor antineutrino research and applications

Purpose:

- Bring together experts from different fields associated with reactor antineutrino research and applications

- Discuss cross-cutting needs in measurements, models-methods, nuclear data, reactor data

- Promote joint analyses, standardization of information, open and easy access to nuclear data and web applications

- Recommend priorities and future a

1st IAEA Technical Meeting

23-26 April 2019, IAEA; Summary report INDC(NDS)-0786

In person only - 37 participants – 11 countries

- Neutrino experiments : anomalies and sterile hypothesis; uncertainties-systematic-non-linearity; short vs long-baseline exps; agreement and discrepancies; perspectives

- Conversion method: uncertainties of integral beta spectra; impact of forbidden transitions; impact of weak magnetism; recommendations for uncertainties; corrections; new measurements

- Summation method : impact of latest decay data measurements; uncertainties from experiment and theory; uncertainties in TAGS data; evaluated nuclear data libraries

- Reactor monitoring: data needs and perspectives

- Recommendations : what neutrino experimental data to trust; what nuclear models and corrections to adopt; what nuclear data to use; what needs to be done to solve the outstanding issues;

INDC(NDS)-0786
Distr.

IAEA
International Atomic Energy Agency
INDC International Nuclear Data Committee

Antineutrino spectra and their applications
Summary of the Technical Meeting
IAEA Headquarters, Vienna, Austria
23-26 April 2019

Prepared by

M. Fallot
Laboratoire SUBATECH-University of Nantes
Nantes, France

B. Littlejohn
Illinois Institute of Technology
Chicago, USA

Paraskevi Dimitriou
IAEA
Vienna, Austria

June 2019

2nd IAEA Technical Meeting

16 – 20 January 2023, IAEA

In person only - 56 participants/18 in person – 8 countries

Purpose:

- follow up on progress

- revise status and data needs

- address data preservation and dissemination

- needs for coordination – working group

- Summary report: draft available on
  https://conferences.iaea.org/event/402/

2nd IAEA TM: conclusions

Basic science goals: high precision data - almost there

Applications: identify use cases – R&D needed – resources limited

Modeling: improve nuclear theory (beta decay) – validation by new integral data – open computational tools

Nuclear data: more TAGS – uncertainty quantification/covariances – beta spectra – beta-delayed neutrons

Data preservation and dissemination: standardisation of information – centralised repository

Working Group (under the auspices of the IAEA)
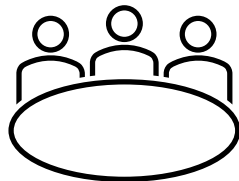
3rd IAEA Hosted TM

7 – 11 April 2025, Seoul National University, Korea

52 participants – 23 in person - 11 countries

Main goals:

- Review status of reactor antineutrino experiments – new and completed

- Review status of reactor antineutrino developments for applications

- Review status of calculation methods (Summation method, Conversion method)

- Assess status and needs for nuclear theory and nuclear data

- Assess needs for standardization of information, central repositories

- Review needs for coordination (Working Group or IAEA meetings etc)

Talks

Experiments	Models/methods	Nuclear data
RENO, RENE, NEON	SUMMATION METHOD	BETA DECAY – TAGS
JUNO, TAO	NEW MODEL GEO-NEUTRINOS	BETA SPECTRA
PROSPECT	NUCLEAR THEORY	FISSION YIELDS
DOUBLE CHOOZ, Antimatter-Ocloud	CONFLUX	
DANSS		
CONUS+		
ANGRA		

Thank you!