IAEA
International Atomic Energy Agency
Atoms for Peace and Development

Nuclear Data Section

Arjan Koning, Head of Section

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NDS members

Section Head: **Arjan Koning**
Team Assistant: **Charisse Monfero**

Nuclear Data Development Unit	Nuclear Data Service Unit	Atomic & Molecular Data Unit
Unit Head: **Roberto Capote Noy**	Unit Head: **Jean-Christophe Sublet (retired)**	Unit Head: **Christian Hill**
Paraskevi Dimitriou (Vivian)	**Viktor Zerkin (retired)**	**Kalle Heinola**
Georg Schnabel	**Naohiko Otsuka**	**Marco Verpelli**
Kira Nathani	**Shin Okumura**	**Ludmila Marian**
	Lidija Vrapcenjak	
	Szende Elias	

- 12 professional (P) and 4 general service (G) staffs (2024)

Special mentioning for EXFOR: Vidya Devi 2022-2023

Some databases & Web applications

Nuclear Structure and Radioactive Decay

Nuclear Reactions

Nuclear Science and energy applications

Nuclear energy

Medical

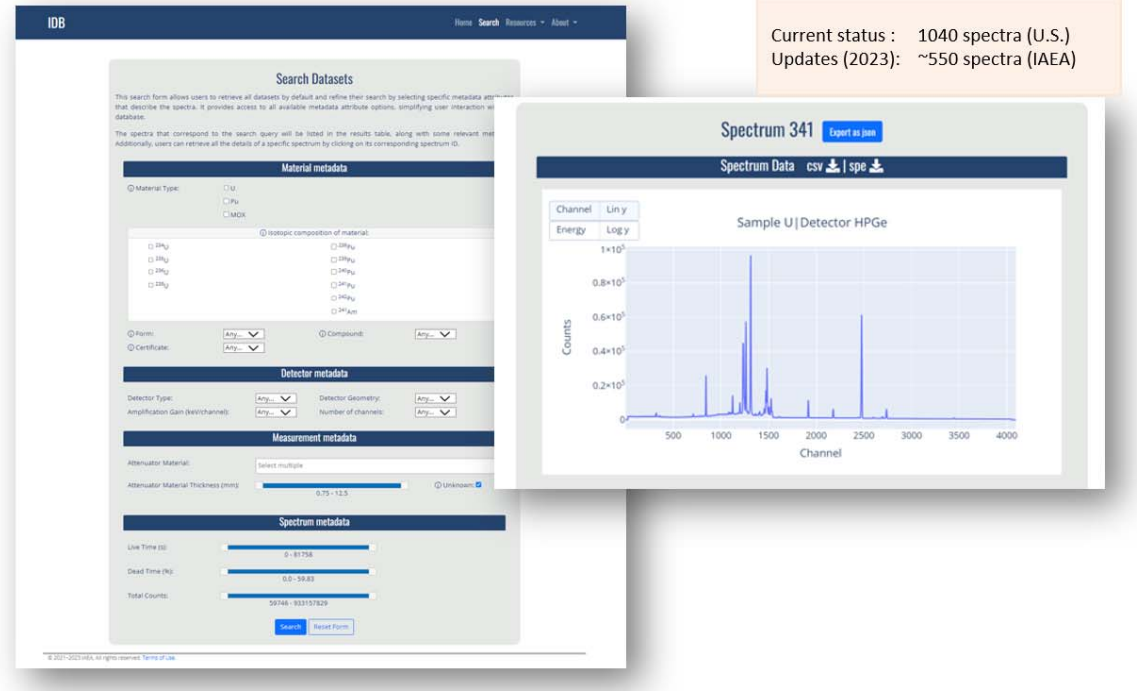
Safeguards

Application	URL	Contents
Live Chart of Nuclides/Isotope browser Mobile App	https://nds.iaea.org/relnsd/vcharthtml	Nuclear structure and decay data, user-friendly graphical interface, Python API, mobile apps
Decay Portal	https://nds.iaea.org/relnsd/vcharthtml/decay_libs.html	Decay Data Library Comparison
Atomic Mass Data, AME & Nubase	https://nds.iaea.org/amdc	Nuclear properties: mass, isomeric excitation energy, half-life, spin, parity, decay modes and intensities
Electronic Stopping Power of Matter for Ions	https://nds.iaea.org/stopping	Collection of stopping power measurements
Nuclear Electromagnetic Moments Database	https://nds.iaea.org/nuclearmoments	experimental information on nuclear magnetic dipole and electric quadrupole moments
Neutron Standards	https://github.com/IAEA-NDS/neutron-standards-database/	The neutron cross section standards
EXFOR	http://nds.iaea.org/exfor	Experimental nuclear reaction database
Nuclear Reaction Data Explorer	https://nds.iaea.org/dataexplorer	Experimental and evaluated cross section and fission yield viewer
TALYS World	https://nds.iaea.org/relnsd/talys/talys.html	Nuclear reaction simulation online
Prompt Gamma-ray Neutron Activation Analysis	https://nds.iaea.org/pgaa	Prompt Gamma-ray Neutron Activation Analysis (PGAA) database and evaluated Gamma-ray Activation File (EGAF) for non-destructive nuclear method
Beta-Delayed Neutron Emission Database	https://nds.iaea.org/beta-delayed-neutron	Experimental beta-decay half-lives, beta-delayed neutron emission probabilities, and emission spectra
Compilation of Nuclear Data Experiments for Radiation Characterisation (CoNDERC)	https://nds.iaea.org/conderc/	Decay Heat, incident particle spectra used world-wide, origen Input for shielding calculation, thermal resonane data
Medical Radioisotopes Production Portal	http://nds.iaea.org/medportal	Therapeutic Radionuclides, Gamma Emitters, Positron Emitters
Medical Isotope Browser	http://nds.iaea.org/mib	Medical radioisotopes production simulator
International Database of Reference Gamma Spectra (IDB)	Internal testing	In collaboration with IAEA-SG
IAEA Handbook of Nuclear Data for Safeguards	https://nds.iaea.org/sgnucdat	A set of recommended nuclear data for safeguard (decay data, thermal neutron capture cross section, resonance integrals, fission product yield..etc)

NDS Recent Highlights

IDB: Nuclear Data Support for nuclear safeguards

- Development and deployment of International Database of Reference Gamma Spectra to support "Sustainability and Maintenance of Software for Pu-isotopic and U-Enrichments"



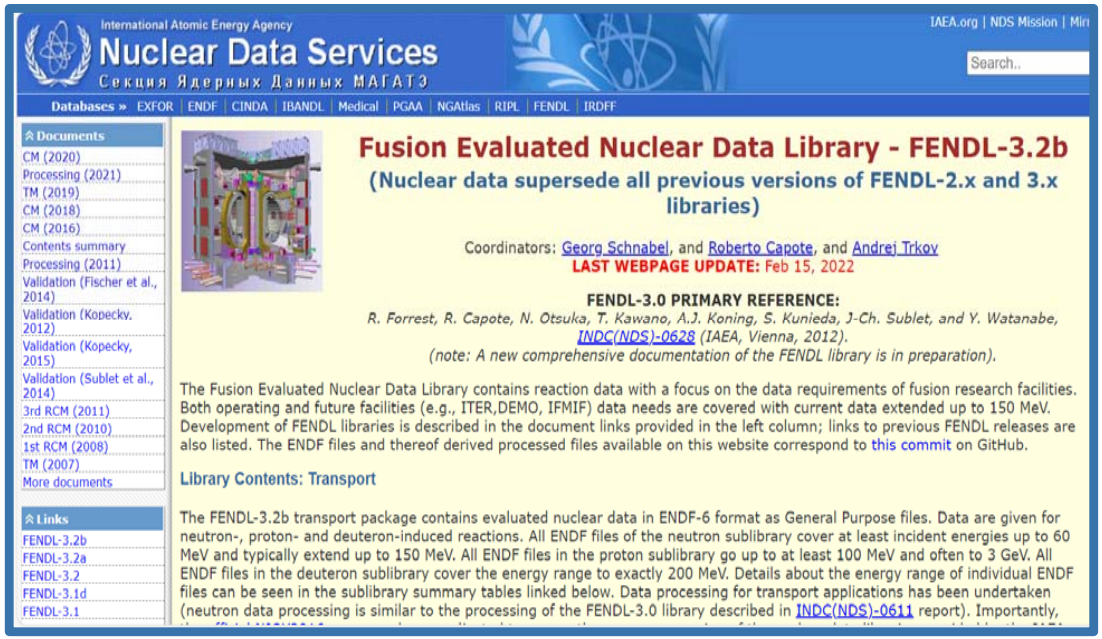
Current status : 1040 spectra (U.S.)
Updates (2023): ~550 spectra (IAEA)

IAEA Nuclear Data Section

NDS Fusion Databases and Networks

4300 pageviews & 1300 unique users each month

FENDL Fusion Evaluated Nuclear Data Library



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

Atomic and Molecular Databases and Networks

AMBDAS

ALADDIN

CollisionDB

CascadesDB

DefectDB

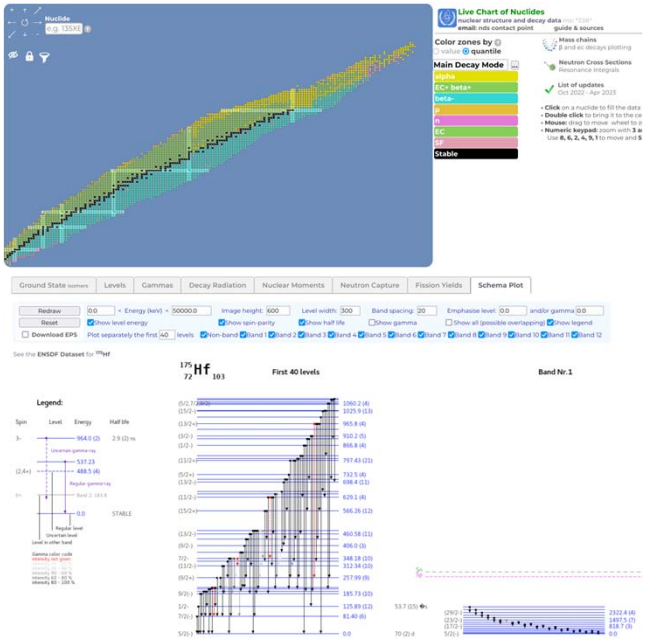
Data Centres Network
Code Centres Network
Global Network for the Atomic and Molecular Physics of Plasmas

https://amdis.iaea.org/

More useful IAEA Web Services

Live Chart of Nuclides

https://nds.iaea.org/relnsd/vcharthtml/VChartHTML.html



- Decay radiation properties (half-lives, branching ratios…)
- Gamma lines
- Nuclear structure properties

Scan me!

Medical Isotope Browser

https://nds.iaea.org/mib/

- Medical isotope production calculation

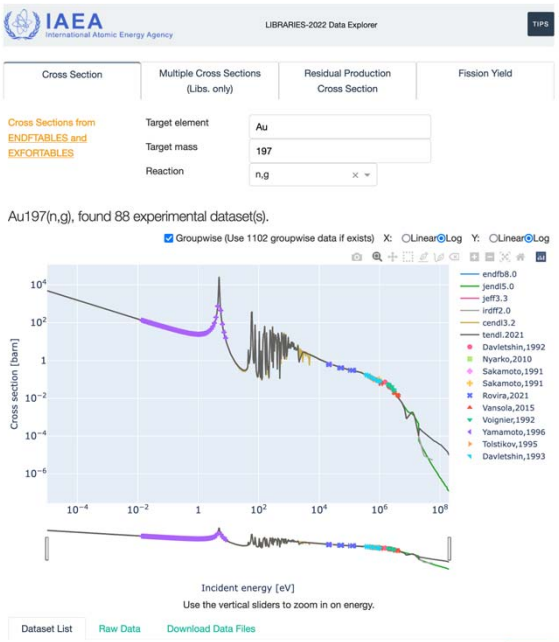
Scan me!

IAEA Nuclear Data Section

Useful Nuclear Data Web Services

IAEA Nuclear Data Explorer

https://nds.iaea.org/dataexplorer/

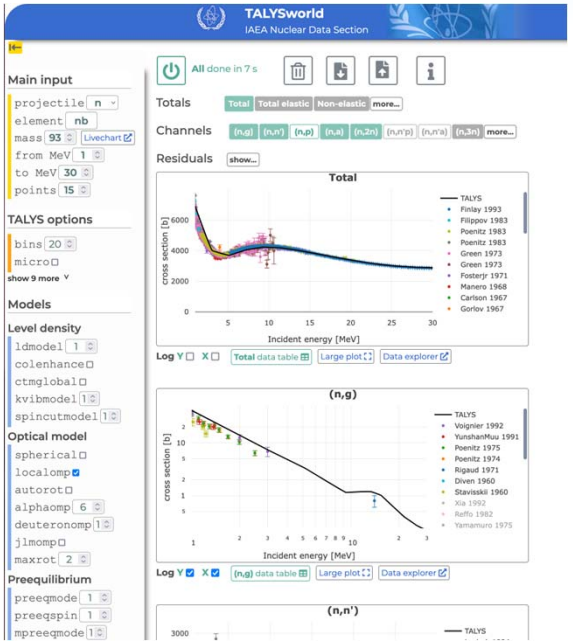


- Nuclear reaction cross section
- Residual production cross section
- Fission product yield
- EXFOR entry viewer

Scan me!

TALYS world

https://nds.iaea.org/relnsd/talys/talys.html



- Run TALYS online
- Direct plots

Scan me!

Viktor's tools

Web-API for EXFOR, ENDF, IBANDL

Web-API (Application Programming Interface) is available via NDS Web Retrieval system and provides a tool for remote access to data by user's programs. Data are sent through Internet using Http connection.

EXFOR-API provides search and downloading data in EXFOR, C4, X5 and C5 with options: automatic re-normalization and generation of correlation matrix as plain text, CSV, XML and JSON files.

ENDF-API provides data search and retrieval mostly in JSON: cross sections, angular distributions, fission yield decay and other data. The ENDF-API is used in X4Pro/Python with a lot of examples for different data types and in EE-Viewer.

IBANDL-API provides database list, individual datasets and grouped data. Data can be converted (Rutherford Ratio to barn per steradian and vice versa) and recalculated to inverse kinematics and finally sent to user as text, CSV, R33, JSON files.

Code example using Web-API in Python:

1. Retrieve cross section covariance data from ENDF in JSON and plot by Plotly (Fig.1)
2. Plot cumulative fission product yield from EXFOR and ENDF as a function of energy
3. Retrieve IBANDL data and plot by Plotly
4. Retrieve and plot IBANDL and Sigmacalc data
5. Retrieve and plot IBANDL and Sigmacalc data in direct and inverse kinematics

Short description, examples, and codes are available from: https://nds.iaea.org/exfor/x4guide/API/

Off-line distribution of whole EXFOR

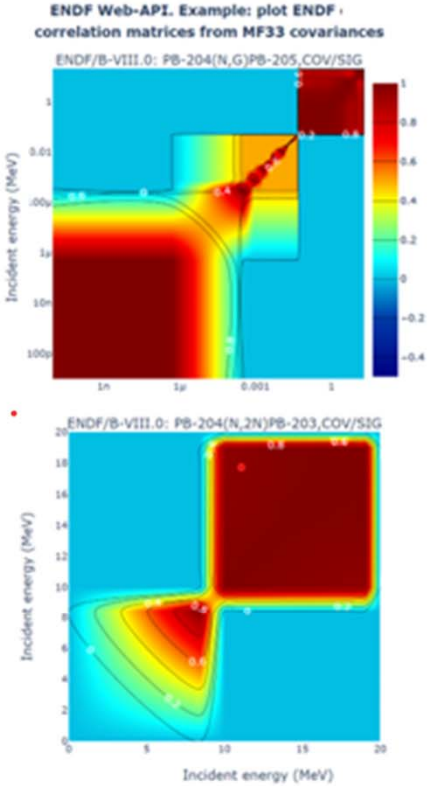
1. X4Pro - universal, fully relational EXFOR database SQLite; includes data points in original and computational forms, data for automatic renormalization by new monitor cross sections and decay data. The package includes examples in Python and Fortran. Now issued for whole EXFOR data library: https://nds.iaea.org/cdroms/#x4pro1.

2. X5 - comprehensive EXFOR in JSON. X5 presents EXFOR meta-data (codes and free text), information from EXFOR dictionaries, data in original and computational forms, data for automatic renormalization, reaction definition in ENDF MF.MT terms. X5 files are stored in sub-directory structure: one JSON file per EXFOR Entry, and do not require any database support. The package includes examples of Python codes to build data indices, plot using Plotly package, and JS-interpreter presenting JSON files as interactive tree in user's Web-browser.
Download: https://nds.iaea.org/cdroms/#x5json.

3. C5 - full EXFOR translated to C5. Computational format C5 extends C4 format which was designed for comparison of experimental data with evaluations and therefore uses ENDF coding (MF-MT-ZA). C5 is generated by a code "x4toc5.java", based on universal EXFOR-Java parser using EXFOR Dictionaries, EXFOR-ENDF translation Dictionaries, Archive of Monitors, Decay-Data from ENSDF and other supplementary data. C5 extensions include statistical and systematic uncertainties, optionally may include monitor data, renormalized data, results of some operations. Five versions of data are available:

- EXFOR-C5v0: (using the default from C4)
  - converted incident energy from C.M. to Lab
  - converted Rutherford-Ratio to B/SR
- EXFOR-C5v1: options from EXFOR-C5v0 +
  - datasets with unknown MT are included (MT=0)
- EXFOR-C5v2: options from EXFOR-C5v0 +
  - angle and data: C.M. to Lab. (for MT4)
  - replaced Q-Value by E-Level
  - reset MT51, 601, 651, etc. by MT+iLevel
  - sorted data
- EXFOR-C5v3: options from EXFOR-C5v2 +
  - auto-renormalized by modern monitor CS data
- EXFOR-C5v4: options from EXFOR-C5v3 +
  - auto-renormalized using modern Decay-data.

The package include script for creating single C5 file to provide backward compatibility with XC4 data distributions for WPEC-SG30 members, Empire and TALYS codes, examples in Python creating data index and cross section plot with Plotly.
Download: https://nds.iaea.org/cdroms/#c5.



Prizes!

Dr Roberto Capote Noy honored with Oppenheimer Coin

ard Tobey and Dr Roberto Capote Noy with Oppenheimer coin

ARJAN KONING HONORED WITH OPPENHEIMER COIN

Arjan Koning's groundbreaking work in nuclear theory and data has earned him the prestigious Los Alamos Oppenheimer Coin, a significant acknowledgment of his exceptional achievements in nuclear simulation and data analysis. This recognition highlights Koning's invaluable contributions to enhancing the capabilities of Los Alamos National Laboratory in applied nuclear science.

Koning has played a pivotal role in fostering global collaboration through initiatives like CIELO and INDEN. These efforts have not only advanced the capabilities of the US Department of Energy in nuclear data libraries but have also facilitated more precise neutron transport simulations with far-reaching implications for nuclear energy, nonproliferation, and nuclear safety.

A key milestone in Koning's illustrious career is the development of TALYS, a sophisticated nuclear cross-section modeling code system renowned for its accuracy in predicting nuclear reactions. This achievement, coupled with Koning's lifelong commitment to nuclear reaction physics, has established TALYS as an indispensable tool used worldwide, including extensively in the United States.

The Los Alamos Oppenheimer Coin underscores Koning's exceptional contributions to advancing the field of nuclear science, serving as a

Nuclear Data Section Outlook for 2024-2025

- Technical Meeting on (alpha,n) reactions for spent fuel and criticality-safety
- New CRP on nuclear level densities, for better nuclear reaction simulations (model codes)
- Further modernization on web interfaces for nuclear data retrieval, using a combination of Python and JSON tools
- Large (60-100 participants) Technical Meeting on Compound Nuclear Reactions and Related Areas
- Finalization and continuation of CRPs on atomic and molecular data for nuclear fusion
- Joint ICTP-IAEA workshop on Monte Carlo Radiation Transport Codes and Associated Data Needs for Medical Applications
- Finalize CRP on fission product yield nuclear data

Thank you!

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