

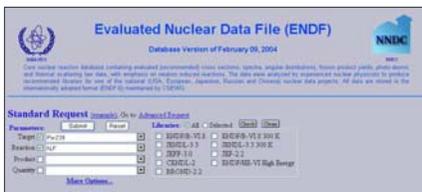
Nuclear Reaction Services of the NNDC



ENDF

www.nndc.bnl.gov/endlf

Sample ENDF retrieval for $^{239}\text{Pu}(n,f)$

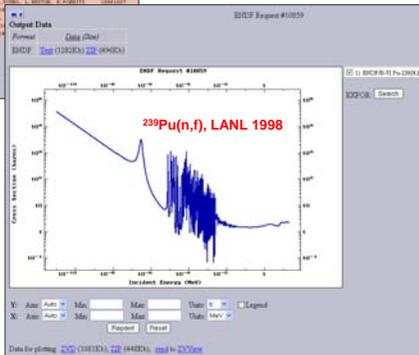


Core Nuclear Reaction Database

- ✓ Evaluated (recommended) cross sections, spectra, angular distributions, fission product yields, decay data, photo-atomic and thermal scattering law data, with emphasis on neutron-induced reactions
- ✓ Covering all nuclides of practical relevance
- ✓ Principal input for neutronics calculations
- ✓ Includes all international libraries

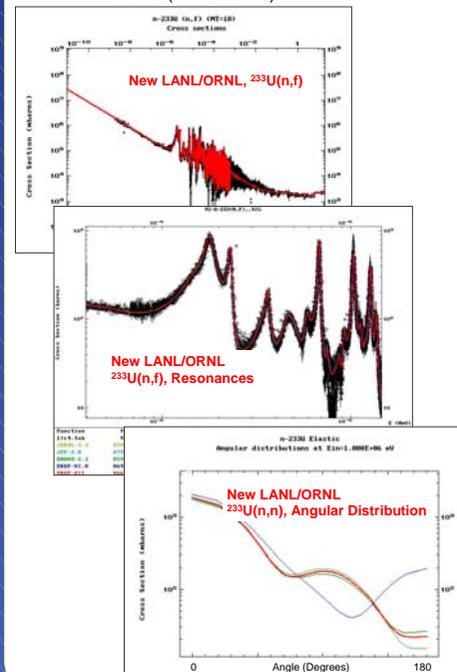
ENDF Graphic User Interface (GUI)

- ✓ Standard request provides a basic search for Target, Reaction, Product and Quantity.
- ✓ Advanced request allows to use Projectile Sub-Libraries, MT and MF quantities, Laboratories, Authors and Target and Product Ranges



Preliminary ENDF/B-VII

Contents: 231 new evaluations (51 neutron, 20 charged particles, 160 γ)
 Example: $^{233}\text{U} + n$, by LANL (fast) + ORNL (resonances)



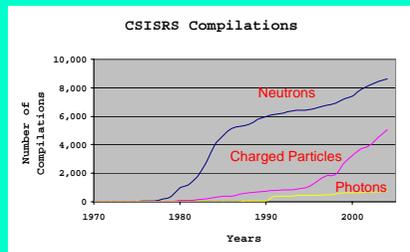
CSISRS

www.nndc.bnl.gov/exfor

Experimental Nuclear Reaction Database

- ✓ Incident neutrons, charged particles, photons
- ✓ More than 14,000 experiments
- ✓ Nearly all of neutron-induced reactions

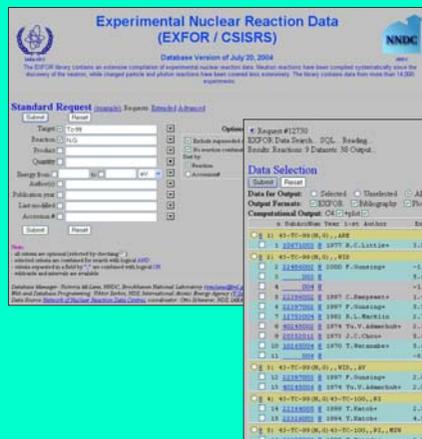
Compilations



In last 10 years neutron data from 435 journal papers were compiled, with 60 % compilations from papers published in 5 out of 263 refereed journals:

- ✓ Phys. Rev. C 28 %
- ✓ Nuclear Science & Engineering 11 %
- ✓ Nuclear Physics A 8 %
- ✓ Yademaya Fizika 7 %
- ✓ Yademye Konstany 6 %

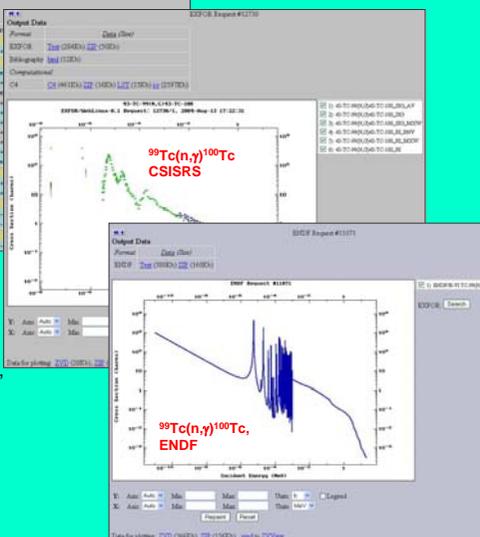
CSISRS retrieval for $^{99}\text{Tc}(n,\gamma)^{100}\text{Tc}$



The reaction is important for radioactive waste transmutation of long-lived fission radionuclides to stable isotopes. ^{99}Tc ($T_{1/2}=2.1 \times 10^5$ y) is converted into ^{100}Tc ($T_{1/2} = 15.8$ s) that decays into stable isotopes of ^{100}Ru and ^{100}Mo .

CSISRS/EXFOR Graphic User Interface (GUI)

- ✓ Standard request is a simple search using the primary search criteria such as Target, Reaction, Product, Quantity, Energy Range, Authors, Publication Year and Accession #
- ✓ Extended request has additional options to search for first author, country, institute, compilation date and references
- ✓ Advanced request includes keywords and reaction subfields search



Web Services of the National Nuclear Data Center



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Nuclear Data Portal

www.nndc.bnl.gov

New Web Service

On April 19, 2004 NNDC launched a Nuclear Data Portal. It integrates internal applications such as database access with external applications in NNDC Web site. It's a Web-based interface that gives users access to all those applications through one screen on their computer.

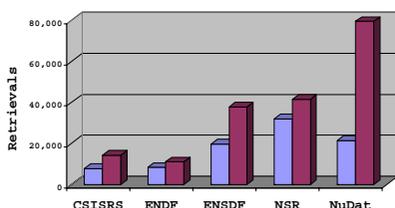
New features of the Nuclear Data Portal:

- ✓ New generation of nuclear data services using a new hardware architecture based on robust and scalable DELL servers running Linux
- ✓ Relational Database Software (Sybase)
- ✓ Includes nuclear structure, decay and reaction data, as well as bibliographical information
- ✓ New Web Interfaces for CINDA, ENDF, CSISRS, ENSDF, NSR, NuDat, XUNDL Databases
- ✓ Java solutions for Web applications
- ✓ Search using optimized query forms; results are presented in tables and interactive plots
- ✓ Number of nuclear science tools, codes, applications, and links are provided

User Response

Launching the Nuclear Data Portal resulted in significant increase of Web retrievals compared with an old product. The preliminary results for five major database retrievals in May-August 2004 vs. May-August 2003 are shown below.

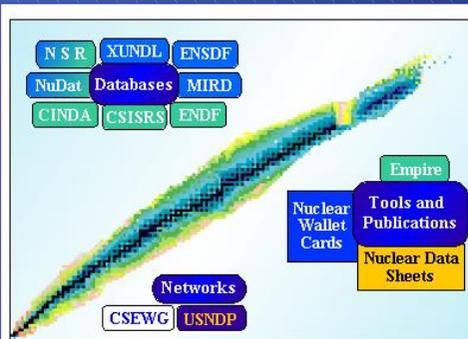
Increase of Database Retrievals, May-August 2004 vs. May-August 2003



Results indicate that data retrievals for four months of 2004 vs. 2003 increased for CSISRS by 83 %, ENDF by 34 %, ENSDF by 91 %, NSR by 30 % and NuDat by 271 %. This allows to make a projection that retrieval rate in year 2005 will be at 600 K retrievals/year.

Conclusion

Nuclear Data Portal brings together nuclear structure and reaction Web Services, publications and tools. It creates a single place where nuclear data users can do their work and it provides many useful resources.



- Nuclear Structure and Decay Databases
- Nuclear Structure and Decay Tools
- Nuclear Reaction Databases
- Nuclear Reaction Tools
- Bibliography Databases
- Networks and Links
- About the Center
- Publications
- Meetings

This is our new web page [Nuclear Data Portal](#) Older page is here

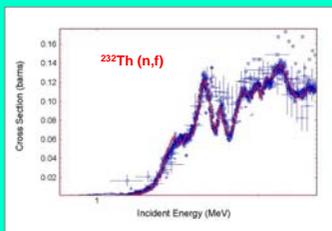
Site Index - Search the NNDC:

CapGam Thermal Neutron Capture Gamma-rays	CINDA Computer Index of Neutron Data	CSEWG Cross Section Evaluation Working Group	CSISRS alias EXFOR Nuclear reaction experimental data
Empire Nuclear reaction model code	ENDF Evaluated Nuclear (reaction) Data File	ENSDF Evaluated Nuclear Structure Data File	For NMMSS and DoE NMIRDC Standards for decay data
IRDF International Reactor Dosimetry File	MIRD Medical Internal Radiation Dose	NSR Nuclear Science References	Nuclear Data Sheets Nuclear structure and decay data journal
Nuclear Wallet Cards Ground and isomeric states properties	NuDat Nuclear structure and decay data	RIPL Reference Input Parameter Library	USNDP U.S. Nuclear Data Program
	XUNDL Experimental Unevaluated Nuclear Data List	New Nuclear Wallet Cards for Homeland Security	

Empire-2.19

www.nndc.bnl.gov/empire

Modular system of nuclear reaction codes for comprehensive modeling of nuclear reactions using various theoretical models. It consists of a number of linked FORTRAN codes, input parameter libraries, and experimental data library (CSISRS/EXFOR).



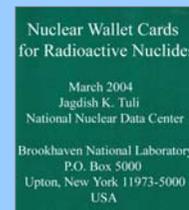
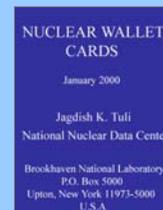
New features of Empire-2.19:

- ✓ Fission with under-barrier effects in terms of optical model
- ✓ Multi-modal fission
- ✓ Photo-nuclear reactions
- ✓ Reactions on excited targets
- ✓ Exact treatment of exclusive spectra
- ✓ Improved algorithm for recoil spectra
- ✓ Suite of gamma-ray strength functions from RIPL-2
- ✓ Exciton model with cluster emission (Iwamoto-Harada)

Nuclear Wallet Cards

www.nndc.bnl.gov/wallet

- ✓ Up-to-date selected properties of 2918 nuclides
- ✓ Distributed as a booklet and in PDA format for Palm Pilot
- ✓ Available as sixth (2000) and radioactive nuclides (2004) editions
- ✓ The sixth edition is used as a decay data standard by DOE Nuclear Materials and Safeguards System



The radioactive nuclides or Homeland Security edition consists of two tables: Nuclide Properties $T_{1/2} > 1$ h and γ -rays, energy (keV) ordered ($I_\gamma > 5\%$). First table provides half-life, major radiations and major γ -rays information for 737 nuclides. Second table contains information on 944 γ -rays and parent nuclides sorted by energy from 101 to 2951 keV.

Nuclear Structure Services of the NNDC



ENSDF

www.nndc.bnl.gov/ensdf

Core Nuclear Structure and Decay Database

- ✓ Evaluated nuclear structure and decay data for over 2916 nuclides, 15,000 individual datasets
- ✓ Considers all known experimental data for each nuclide
- ✓ Principal source of nuclear structure data for research, nuclear spectroscopy applications, databases MIRD and NuDat, and publications such as Nuclear Data Sheets and Table of Isotopes

New Features

- ✓ Combined data searches between ENSDF and XUNDL
- ✓ Web retrievals for Reaction Search are based on indexed reaction quantities
- ✓ Web retrievals for Decay Search are based on indexed decay quantities

ENSDF retrieval for ¹⁷⁸Hf

The screenshot shows the 'Evaluated Nuclear Structure Data File (ENSDF)' and 'Experimental Unevaluated Nuclear Data List (XUNDL)' search interface. It includes sections for 'Dataset retrieval by Z, A, or Nuclide', 'Dataset for ¹⁷⁸Hf', and 'Data from AR_24190_1.cmn'. The interface allows users to filter datasets by reaction type (e.g., Alpha, Beta, Gamma) and provides a list of search results with columns for 'Type', 'Index', 'Level', and 'Comment'.

Per gram, the energy store in ¹⁷⁸Hf isomer (2.5 MeV/nucleus) is intermediate between those from chemical explosives and those from fissile materials.

ENSDF Applications

Ongoing research on 10-keV X-ray induced decay of long-lived ¹⁷⁸Hf isomer ($T_{1/2} = 31$ y) (www.physicstoday.org/vol-57/iss-5/p21.html) indicates possible applications for a prompt 2.45-MeV γ -ray cascade if such transition exists.

NuDat 2.0

www.nndc.bnl.gov/nudat2

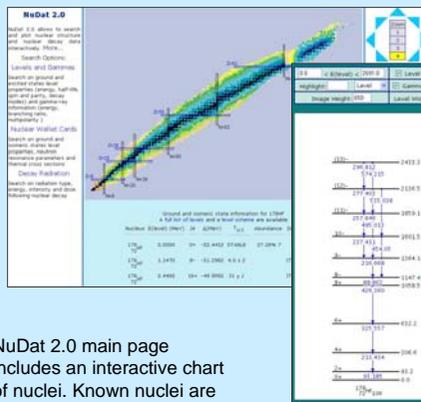
Nuclear Structure and Decay Database

- ✓ Search for levels energy, half-life, J^π and decay modes; γ -rays energy, intensity, multipolarity and coincidences; radiation energy and intensity following nuclear decay
- ✓ It stores information for more than 2,900 nuclei, containing about 136,000 levels and 197,000 γ -rays

New Features

- ✓ Interactive level and decay schemes
- ✓ γ - γ coincidence search

NuDat 2.0 retrieval for ¹⁷⁸Hf



The color of the cell indicates the ground state half-life or predominant decay mode.

NuDat 2.0 main page includes an interactive chart of nuclei. Known nuclei are represented by a cell in a chart with the number of neutrons on the horizontal axis and the number of protons on the vertical axis.

NSR

www.nndc.bnl.gov/nsr

Nuclear Science References

- ✓ Indexed bibliography of 175,000 nuclear science articles
- ✓ About 75 journals are regularly scanned for articles
- ✓ Recent references are added on a weekly basis
- ✓ Approximately 4500 entries are added to the database annually
- ✓ Search on indexed quantities such as nuclide, author, and subject

NSR retrieval for S. Coon and ⁶Li

The screenshot shows the 'Nuclear Science References (NSR)' search interface. It includes a search box, filters for 'Author' and 'Subject', and a list of search results. The results table shows columns for 'Author', 'Title', 'Journal', and 'Year'.

Where available, digital object identifier (doi) links to publishers pages are provided.

Indexed search for S. Coon and ⁶Li (Indexed retrieval allows a boolean "and" search over indexed categories) produces 3 matches.

The screenshot shows a search result from the 'APS Physical Review Online Archive'. It displays the title 'The structure of the nucleus ⁶Li', the authors 'S. Coon, B. S. Chinn, J. A. Coon, & B. S. Chinn', and the journal 'Physical Review Letters'.