

New NNDC Web Service

Boris Pritychenko

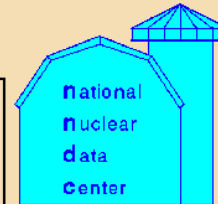
*National Nuclear Data Center, Brookhaven National Laboratory, Upton, U.S.A.
pritychenko@bnl.gov*

NNDC Web Effort - I

National Nuclear Data Center, Brookhaven National Laboratory, Upton, NY 11973-5000

The new NNDC Home Page is [here](#).

Notice: The NNDC will be terminating access to the original database interfaces on October 1, 2004. We would appreciate any comments you may have if you have found that there are options or features in the older versions that are either missing from or easier to use than in the new versions. Please send your comments to [Boris Pritychenko](#).



About the Center

The National Nuclear Data Center (NNDC) is funded by the [U.S. Department of Energy](#) to provide information services in the fields of low and medium energy nuclear physics to users in the United States and Canada. In particular, the Center can provide information on neutron, charged-particle, and photonuclear reactions, nuclear structure, and decay data.

The information available to the users of NNDC services is the product of the combined efforts of the NNDC and [cooperating data centers](#) and other interested groups, both in the United States and worldwide.

General Information

[NNDC General Information](#)
(11/20/2003)

[Data Citation Guidelines](#) (05/8/1997)

[Newsletters](#) (08/27/2003)

[Wallet Cards Centerfold: Electronic Nuclear Data Access](#) (08/03/2001)

[For NMMSS \(Nuclear Material Management and Safeguards System\)
and DOE Nuclear Material Inventory Radioactive Decay Constants](#)

Data Retrievals, Data Files, Manuals, Proceedings, Programs, & Reports

[Nuclear Structure & Decay Data](#) (03/23/2004)

General

[Nuclear Reaction Data](#)
(03/23/2004)

[Evaluated Nuclear Structure Data File \(ENSDF\)](#)
(10/13/2004)

[Atomic Masses](#)

[Computer Index of Neutron Data \(CINDA\)](#)
(09/22/2004)

[Test SQL version of ENSDF/XUNDL](#)

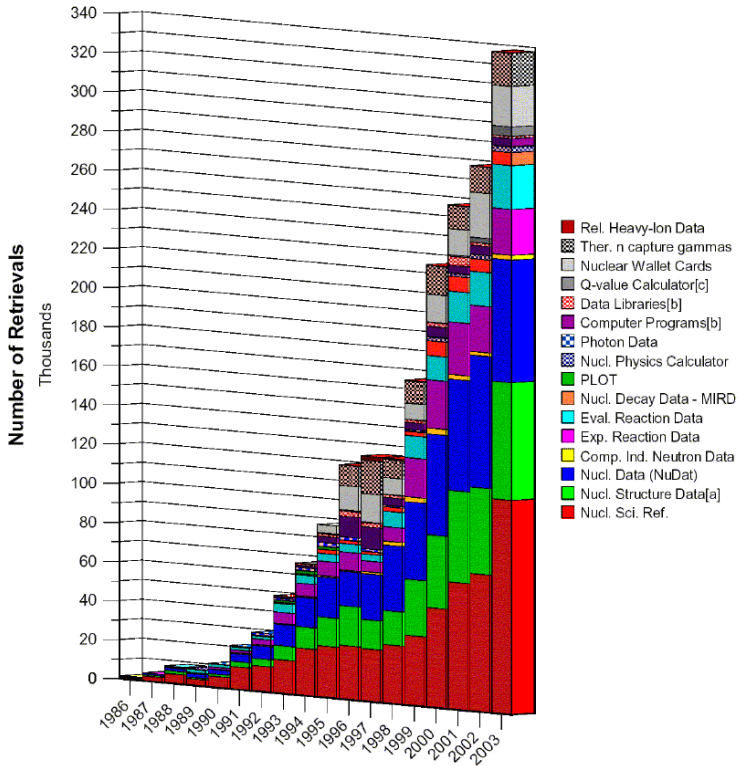
[History of the Origin of the Chemical
Elements](#) (10/11/2001)

[Evaluated Nuclear Data File \(ENDF\)](#)
(07/20/2002)

- NNDC has been providing remote electronic access to its databases and the other information since 1986
- Access via Web started in 1994

NNDC Web Effort - I

NNDC On-Line Data Service, Web, & FTP Retrievals
1986-2003



^a Includes proton emitters (added to Web February 21, 2002).

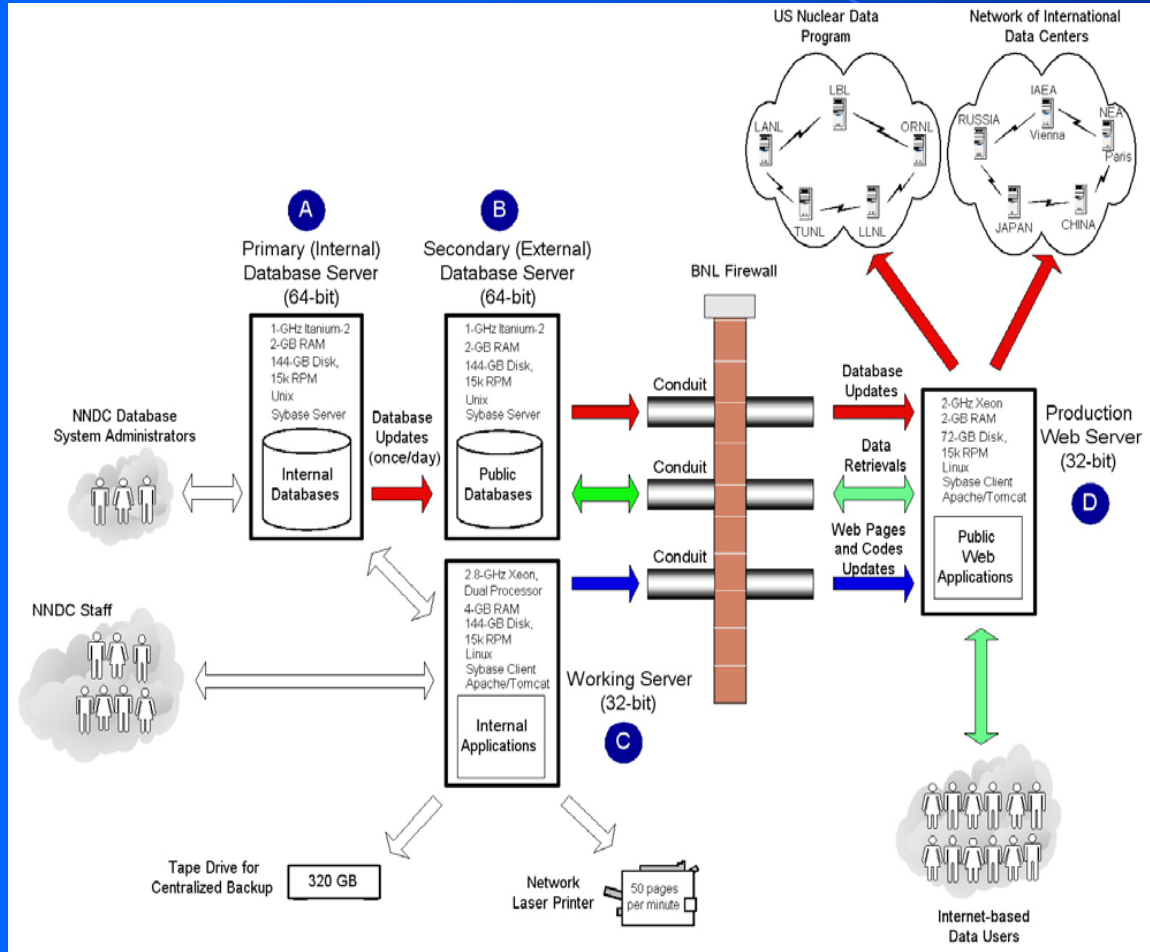
^b Removed from Online Data Services June 25, 2002.

^c Added to Web September 11, 2001.

During 2003:

- Users from more than 11,000 organizations visited NNDC's Web site
- 338,000 data retrievals
- 17% increase over 2002

Migration Project



Since about 1999, the NNDC in collaboration with the IAEA Nuclear Data Section have been working to migrate the databases from the original CODASYL-DBMS (relational) system. The Web interfaces to these databases have been upgraded to use Structured Query Language (SQL) and Java Web technologies.

NNDC Web Effort - II

Nuclear Data Portal was launched on April 19, 2004. Portal is a Web-based interface that gives users access to all Web and database applications through one screen on their computer.

Major 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/EXFOR, ENSDF, NSR, NuDat, XUNDL Databases
- Java solutions for Web applications
- Search using on-line query forms; results are presented in tables and interactive plots Number of nuclear science tools, codes, applications, and links are provided

NNDC Web Effort - II



National Nuclear Data Center

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- [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](#)

CSWEG: Nov 2-4, 2004
 [Nuclear Data Portal](#)
USNDP: Nov 3-5, 2004

Site Index -

<p>CapGam Thermal Neutron Capture Gamma-rays</p> <p>Empire Nuclear reaction model code</p> <p>IRDF International Reactor Dosimetry File</p> <p>Nuclear Wallet Cards Ground and isomeric states properties</p> <p>USNDP U.S. Nuclear Data Program</p>	<p>CINDA Computer Index of Neutron Data</p> <p>ENDF Evaluated Nuclear (reaction) Data File</p> <p>MIRD Medical Internal Radiation Dose</p> <p>Nuclear Wallet Cards for Homeland Security</p> <p>XUNDL Experimental Unevaluated Nuclear Data List</p>	<p>CSEWG Cross Section Evaluation Working Group</p> <p>ENSDF Evaluated Nuclear Structure Data File</p> <p>NSR Nuclear Science References</p> <p>NuDat Nuclear structure and decay data</p> <p>Coming soon: Atlas of Neutron Resonances</p>	<p>CSISRS alias EXFOR Nuclear reaction experimental data</p> <p>For NMSS and DoE NMIRDC Standards for decay data</p> <p>Nuclear Data Sheets Nuclear structure and decay data journal</p> <p>RIPL Reference Input Parameter Library</p> <p>Coming soon: Empire 2.19</p>
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Links ordered alphabetically
 [Order by category](#)

Sponsored by the [Office of Nuclear Physics](#) - [Office of Science](#) - U.S. Department of Energy
 Acknowledgements - Disclaimer

Evaluated Nuclear Data File (ENDF) - I

Core nuclear reaction database containing evaluated (recommended) data from the ENDF/B-VI library (also other evaluated nuclear reaction libraries: JEFF, JENDL, BROND, CENDL). It uses ENDF-6 format, covering all nuclides of practical relevance (328 in total) for neutrons up to 20 MeV and partly up to 150 MeV. It serves as principal input for neutronics calculations, including nuclear reactor design and operation, national security, criticality safety, accelerator design, radiation protection, radiotherapy, and detector simulation.

ENDF Graphic User Interfaces (GUI) consists of two retrieval options standard and advanced requests:

- 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

Evaluated Nuclear Data File (ENDF) - II



Evaluated Nuclear Data File (ENDF)

Database Version of February 09, 2004



Core nuclear reaction database containing evaluated (recommended) cross sections, spectra, angular distributions, fission product yields, photo-atomic and thermal scattering law data, with emphasis on neutron induced reactions. The data were analyzed by experienced nuclear physicists to produce recommended libraries for one of the national (USA, European, Japanese, Russian and Chinese) or internationally adopted format (ENDF-6) maintained by CSEWG.

Standard Request (example). Go to: [Advanced Request](#)

Parameters:

Libraries: All Selected

Target Pu-239 ENDF/B-VI 8 ENDF/B-VI 8 300 K
 JENDL-3.3 JENDL-3.3 300 K
Reaction N,F JEFF-3.0 JEF-2.2
Product CENDL-2 ENDF/HE-VI High En
Quantity BROND-2.2

[More Options...](#)

Note:

- all criteria are optional (selected by checking)
- selected criteria are combined for search with logical criteria separated in a field by ";" are combined with
- wildcards and intervals are available

See also a temperature dependent ENDF/B-VI

Database Manager: Michal Herman, NNDC, Brookhaven Web and Database Programming; Viktor Zerkov, ND
Data Source: Nuclear Energy Agency International and Cross Section Evaluation Working Group (<http://www.nndc.bnl.gov>)

Request #10859
ENDF Data Search.. SQL... Reading..
Results: Evaluations: 8 Sections: 43 Output...

ENDF Data Selection

Data Selection: Selected Unselected All

Output Formats: ENDF Plot (MF3 only, others un)

- ++ Open all -- Close all
- [@e](#) 1) MAT=[9437](#) [@i](#) 94-Pu-239 NSUB=10 (N)
 - [@e](#) 2) MAT=[9437](#) [@i](#) 94-Pu-239 NSUB=10 (N)
 - [@e](#) 3) MAT=[9437](#) [@i](#) 94-Pu-239 NSUB=10 (N)
 - [@e](#) 4) MAT=[9437](#) [@i](#) 94-Pu-239 NSUB=10 (N)
 - [@e](#) 5) MAT=[9437](#) [@i](#) 94-Pu-239 NSUB=10 (N)
 - [@e](#) 6) MAT=[9437](#) [@i](#) 94-Pu-239 NSUB=10 (N)
 - [@e](#) 7) MAT=[2941](#) [@i](#) 94-Pu-239 NSUB=10 (N)
 - [@e](#) 8) MAT=[9421](#) [@i](#) 94-Pu-239 NSUB=10 (N)

[@e](#) = Evaluation Summary

[@s](#) = Section Summary and Tabulated Data

[@i](#) = General Information Section (MF=1, MT=451)

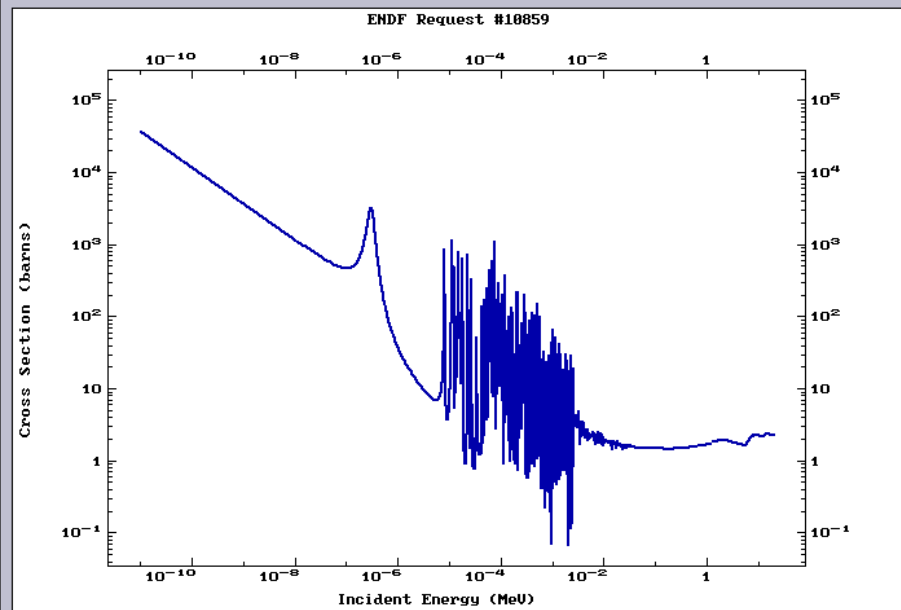
Page generated: Wed Aug 11 11:32:10 EDT 2004 by E4-Web/IAEA
Request from: 130.199.112.80
Server: www.nndc.bnl.gov

ENDF Request #10859

Output Data

Format	Data (Size)
ENDF	Text (1282Kb) ZIP (496Kb)

239Pu(n,f), LANL 1998



1) ENDF/B-VI Pu-239(N,F)

EXFOR:

Y: Axis: Min: Max: Units: Legend

X: Axis: Min: Max: Units:

Data for plotting: [ZVD](#) (1081Kb), [ZIP](#) (448Kb), [send to ZVView](#)

Nuclear Structure & Decay Data (NuDat 2.0)



Evaluated (recommended) 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

Nuclear Structure & Decay Data (NuDat 2.0)



NuDat 2.0

NuDat 2.0 allows to search and plot nuclear structure and nuclear decay data interactively. More...

Search Options:

Levels and Gammas

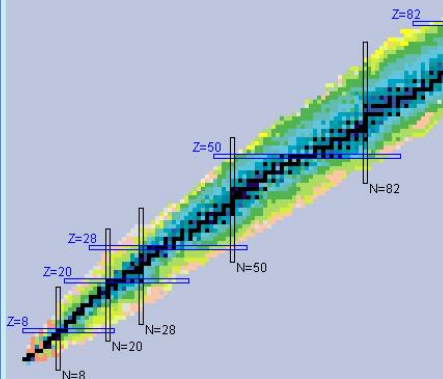
Search on ground and excited states level properties (energy, half-life, spin and parity, decay modes) and gamma-ray information (energy, branching ratio, multipolarity)

Nuclear Wallet Cards

Search on ground and isomeric states level properties, neutron resonance parameters and thermal cross sections

Decay Radiation

Search on radiation type, energy, intensity and dose following nuclear decay

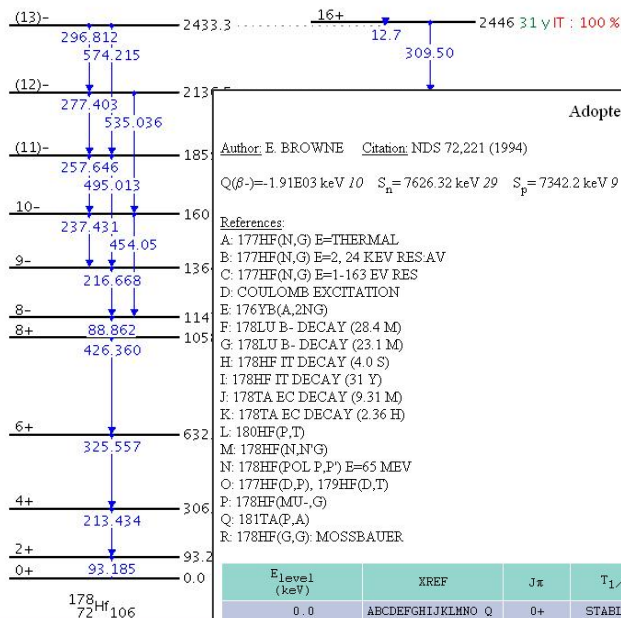


Ground and isomeric state information
A full list of levels and a level scheme

Nucleus	E(level) (MeV)	J π	Δ (MeV)	T _{1/2}
¹⁷⁸ Hf ₇₂	0.0000	0+	-52.4452	STABLE
¹⁷⁸ Hf ₇₂	1.1470	8-	-51.2982	4.0 s 2
¹⁷⁸ Hf ₇₂	2.4460	16+	-49.9992	31 y 1



0.0 < E(level) < 2691.0	<input checked="" type="checkbox"/> Level Energy	<input checked="" type="checkbox"/> Level T1/2	<input checked="" type="checkbox"/> Level Spin-parity	<input checked="" type="checkbox"/> Final Level
Highlight: <input type="text"/> Level	<input checked="" type="checkbox"/> Gamma Energy	<input type="checkbox"/> Gamma Intensity	<input type="checkbox"/> Gamma Multipolarity	<input checked="" type="checkbox"/> Decay Information
Image Height: 650	Level Width: 115	Band Spacing: 20	<input type="button" value="Plot"/>	<input type="button" value="Clear"/>



Adopted Levels, Gammas for ¹⁷⁸Hf

Author: E. BROWNE Citation: NDS 72,221 (1994)

Q(β^-) = -1.91E03 keV 10 S_n = 7626.32 keV 29 S_p = 7342.2 keV 9 Q α = 2083.3 keV 17

References:

- A: 177HF(N,G) E= THERMAL
- B: 177HF(N,G) E=2.24 KEV RES AV
- C: 177HF(N,G) E=1.163 EV RES
- D: COULOMB EXCITATION
- E: 176YB(A,2NG)
- F: 178LU B- DECAY (28.4 M)
- G: 178LU B- DECAY (23.1 M)
- H: 178HF IT DECAY (4.0 S)
- I: 178HF IT DECAY (31 Y)
- J: 178TA EC DECAY (9.31 M)
- K: 178TA EC DECAY (2.36 H)
- L: 180HF(P,T)
- M: 178HF(N,N'G)
- N: 178HF(POL P,P') E=65 MEV
- O: 177HF(D,P), 179HF(D,T)
- P: 178HF(MU-,G)
- Q: 181TA(P,A)
- R: 178HF(G,G): MOSSBAUER

178Hf

E _{level} (keV)	XREF	J π	T _{1/2}	E _{γ} (keV)	I _{γ}	γ mult.	Final level
0.0	ABCDEFGHIJKLMNO Q	0+	STABLE				
93.180 1	ABCDEFGHIJKLMNO P Q	2+	1.48 ns 2	93.180 1	100	E2	0.0 0+
306.619 3	ABCDEFGHIJKLMNO Q	4+		213.440 3	100	E2	93.180 2+
632.177 4	A DE GHI KLMO Q	6+	11.2 ps 6	325.562 4	100	E2	306.619 4+
1058.556 5	A DE GHI K M	8+	2.77 ps 6	426.383 6	100	E2	632.177 6+
1147.423 5	A DE GHI K Q	8-	4.0 s 2 % IT = 100	88.867 1	100	E1	1058.556 8+
1174.630 4	ABCD F J LM O	2+	0.62 ps 2	867.990 16 1081.45 2 1174.66 3	1.47 9 75.0 3 100 9	(E2) (E2) (E2)	306.619 4+ 93.180 2+ 0.0 0+
1199.388 1 3	A F J M Q	0+		1106.19 2 1199.27 5	100 3	E2 E0	93.180 2+ 0.0 0+
1260.250 4	AB F LM O	2-		85.621 11 1167.06 2	7.7 5 100.0 10	E1 E1	1174.630 2+ 93.180 2+

Nuclear Science References (NSR)



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

Nuclear Science References (NSR)



Nuclear Science References (NSR)



NSR Query Results

NSR Indexed Search

[\[NSR Home\]](#) [\[Indexed Search\]](#) [\[Text Search\]](#)

Initialization Parameters:

Publication year range: 1910 to 2004
Primary only: Require measured quantity:
Output year order: Ascending
Output format: Normal
 Search all entries Search entries added since

Search parameters

Author

AND
Nuclide

AND
Keynumber

Instructions: Choose a category from the drop allowed values. For more information, see the help page.

Publication year range : 1910 to 2004
Primary references only.

Output year order : Ascending
Format : Normal

NSR database version of Aug 06, 2004.

Indexed quantity search: Author=S. Coon AND

Found 3 matches.

[Back to query form](#)

1962BE07

Bull. Am. Phys. Soc. 7, No. 4, 335, TB2 (1962)

E. Berkowitz, S. Bashkin, R. R. Carlson, S. A. Coon, and E. Norbeck

gamma-Radiation from Nuclear Reactions

NUCLEAR STRUCTURE ${}^7\text{Li}$, ${}^6\text{Li}$; measur

1962BE24

Phys. Rev. 128, 247 (1962)

E. Berkowitz, S. Bashkin, R. R. Carlson, S. A. Coon, and E. Norbeck

Gamma Radiation from Lithium-Lithium

NUCLEAR STRUCTURE ${}^7\text{Li}$, ${}^6\text{Li}$; measur

doi: [10.1103/PhysRev.128.247](https://doi.org/10.1103/PhysRev.128.247)

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Phys. Rev. 128, 247–251 (1962)

[Issue 1 – 1 October 1962]

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Gamma Radiation from Lithium-Lithium Nuclear Reactions

E. Berkowitz, S. Bashkin, R. R. Carlson, S. A. Coon, and E. Norbeck
Department of Physics and Astronomy, State University of Iowa, Iowa City, Iowa

Received 31 May 1962

A three crystal pair spectrometer was used to determine the relative intensities of gamma radiation produced in the bombardment of separated Li^6 and Li^7 targets by Li^6 and Li^7 ions at energies of 2.6 and 3.6 MeV. The observed gamma radiation arises from excited states of residual nuclei. These include Be^{10} , B^{10} , B^{11} , B^{12} , B^{13} , C^{11} , and C^{12} in the present experiment. Relative populations deduced from the data indicate that a difference of one unit of charge for the matter transferred in the reaction does not strongly influence the relative cross sections. In particular, the production of B^{12} (ground state) and the equivalent state in C^{12} (15.11 MeV) in the bombardment of Li^7 by Li^6 were in the ratio 2:1. A value of 2.3:1 is predicted for this ratio on the basis of simple stripping theory and cluster breakup in this reaction. The relative populations of the excited states of B^{11} produced in the three reactions show systematic variations as a function of excitation.

©1962 The American Physical Society

URL: <http://link.aps.org/abstract/PR/v128/p247>

DOI: [10.1103/PhysRev.128.247](https://doi.org/10.1103/PhysRev.128.247)

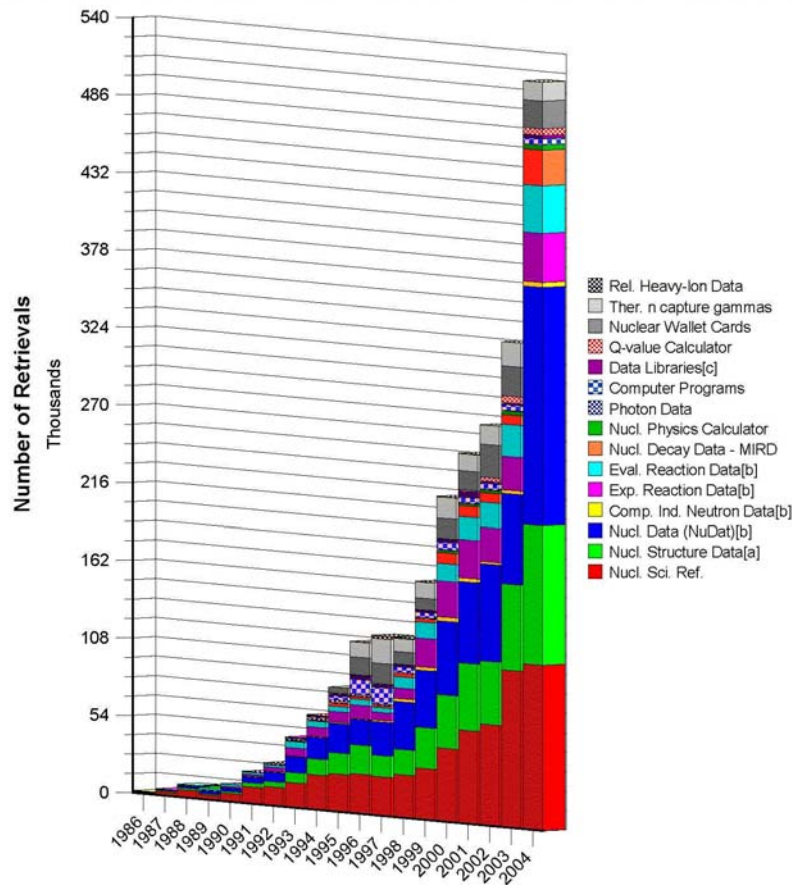
View [Page Images](#) or [PDF](#) (700 kB)

${}^6\text{Li}$ & S. Coon

NNDC Web Effort - II



NNDC Nuclear Data Portal Retrievals 1986-2004*



Nuclear Data Portal was launched on April 19, 2004.

Web retrieval rate is almost doubled, expected retrievals for 2005 is approximately 600 K.

* Extrapolated as of September 30, 2004. TELNET and FTP services terminated March 1, 2004.

^a SQL ENSDF/XUNDL added February 2004.

^b SQL interfaces added April 18, 2004.

^c Point 2004 ENDF library added April 18, 2004.

Summary

- NNDC successfully migrated USNDP databases from an Oracle/CODASYL to Sybase RDBMS
- NNDC Web site is based on Java Web technologies (Apache/Tomcat/JSP)
- Web retrievals increase: CSISRS by 83 %, ENDF by 34 %, ENSDF by 91 %, NSR by 30 % and NuDat by 271 %.
- Team Effort
- Contribution from NDS IAEA