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ENSL82 and CDRL82: The 1982 Version of Evaluated Nuclear Structure Libraries ENSL and CDRL

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Foreword

The UCRL-50400 series, *An Integrated System for Production of Neutronics and Photonics Computational Constants*, describes an integrated, computer-oriented system for the production and application of neutronics and photonics calculational constants.

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The UCRL-50400 series comprises the following volumes:

- Vol. 1, Part A, Rev. 3, *ECSIL: A System for Storage, Retrieval, and Display of Experimental Neutron Data*, September 1976.
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- Vol. 2, Rev. 2, *A Bibliography of the Experimental Data of Neutron-Induced Interactions*, July 1976.
- Vol. 3, Rev. 2, *An Index of the Experimental Data of Neutron-Induced Interactions*, July 1976.
- Vol. 4, Rev. 1, *Evaluated Nuclear Data Library*, September 1981.
- Vol. 4, Rev. 1, Appendix C, *The Neutron Library (ENDL82) in the Transmittal Format*, June 1982.
- Vol. 5, Part A, Rev. 1, *CLYDE: A Code for the Production of Calculational Constants from Nuclear Data*, September 1975.
- Vol. 5, Part B, Rev. 1, *Relativistic Transformations between Center-of-Mass and Laboratory Systems for Two-Body Nuclear Reactions*, April 1978.
- Vol. 6, Rev. 2, *Tables and Graphs of Photon-Interaction Cross Sections from 1 eV to 100 MeV*, December 1978.
- Vol. 7, Part A, Rev. 1, *Major Neutron-Induced Interactions ($Z \leq 55$): Graphical, Experimental Data*, July 1976.
- Vol. 7, Part B, Rev. 1, *Major Neutron-Induced Interactions ($Z > 55$): Graphical, Experimental Data*, July 1976.
- Vol. 8, Part A, Rev. 1, *Supplemental Neutron-Induced Interactions ($Z \leq 35$): Graphical, Experimental Data*, July 1976.
- Vol. 8, Part B, Rev. 1, *Supplemental Neutron-Induced Interactions ($Z > 35$): Graphical, Experimental Data*, July 1976.
- Vol. 9, *Thresholds of Nuclear Reactions Induced by Neutrons, Photons, Deuterons, Tritons, and Alpha Particles*, September 1970.
- Vol. 10, Rev. 1, *Tabulated Experimental Data for Neutron-Induced Interactions*, July 1976.
- Vol. 11, *Experimental Data, Indexes, and Techniques of Obtaining a Selected Set of Neutron Resonance Parameters*, May 1972.
- Vol. 12, *An Atlas of Resolved Neutron Resonance Parameters*, July 1972.
- Vol. 13, *An Atlas of Unresolved Neutron Resonance Parameters*, September 1972.
- Vol. 14, *TARTNP: A Coupled Neutron-Photon Monte Carlo Transport Code*, February 1976.
- Vol. 15, Part A, *The LLL Evaluated-Nuclear-Data Library (ENDL): Evaluation Techniques, Reaction Index, and Descriptions of Individual Evaluations*, September 1975.
- Vol. 15, Part B, Rev. 1, *The LLL Evaluated-Nuclear-Data Library (ENDL): Graphs of Cross Sections from the Library*, October 1978.
- Vol. 15, Part C, *The LLL Evaluated-Nuclear-Data Library (ENDL): Translation of ENDL Neutron-Induced Interaction Data into the ENDF/B Format*, April 1976.
- Vol. 15, Part D, Rev. 1, *The LLL Evaluated-Nuclear-Data Library (ENDL): Descriptions of Individual Evaluations for $Z = 0-98$* , May 1978.
- Vol. 15, Part E, *Data Testing Results for the LLL Nuclear Data Library (ENDL-78)*, August 1979.
- Vol. 15, Part F, *Experimental and Evaluated Elastic Nuclear Plus Interference Cross Sections for Light Charged Particles*, July 1980.
- Vol. 16, Rev. 2, *Tabular and Graphical Presentation of 175 Neutron-Group Constants Derived from the LLL Evaluated-Nuclear-Data Library (ENDL)*, October 1978.
- Vol. 17, Part A, Rev. 2, *Program LINEAR (Version 79-1): Linearize Data in the Evaluated-Nuclear-Data File/Version B (ENDF/B) Format*, October 1979.

- Vol. 17, Part B, Rev. 2, Program SIGMA1 (Version 79-1): Doppler Broadened Evaluated Cross Sections in the Evaluated-Nuclear-Data File/Version B (ENDF/B) Format, October 1979.
- Vol. 17, Part C, Program RECENT: Reconstruction of Energy-Dependent Cross Sections from Resonance Parameters in the ENDF/B Format, October 1979.
- Vol. 17, Part D, Program GROUPIE: Calculation of Self-Shielded Cross Sections and Multiband Parameters from Evaluated Data in the ENDF/B Format, 1980.
- Vol. 17, Part E, Program EVALPLOT: Plot Data in the Evaluated-Nuclear-Data File/Version B (ENDF/B) Format, February 1979.
- Vol. 17, Part F, DOWNER (Version 79-1): Group Collapse Cross Section and Transfer Matrices, January 1979.
- Vol. 18, ACTL: Evaluated Neutron Activation Cross-Section Library, October 1978.
- Vol. 19, Neutron-Induced Angular and Energy Distributions: Graphical Experimental Data, April 1977.
- Vol. 20, Bondarenko Self-Shielded Cross Sections and Multiband Parameters Derived from the LLL Evaluated-Nuclear-Data Library (ENDL), July 1978.
- Vol. 21, Part A, Maxwell-Averaged Reactions Rates (σv) for Selected Reactions between Ions with Atomic Mass ≤ 11 , February 1979.
- Vol. 21, Part C, Program SIGMAL (Version 79-1): Doppler-Broadened Evaluated Cross Sections in the Livermore-Evaluated Nuclear Data Library (ENDL) Format, March 1979.
- Vol. 22, Rev. 1, GAMIDEN: A Program to Aid in the Identification of Unknown Materials by Gamma-Ray Spectroscopy, June 1982.
- Vol. 23, ENSL and CDRL: Evaluated Nuclear Structure Libraries, February 1981.
- Vol. 23, Addendum, ENSL82 and CDRL82: The 1982 Version of Evaluated Nuclear Structure Libraries, January 1983.
- Vol. 24, Thresholds and Q Values of Nuclear Reactions Induced by Neutrons, Protons, Deuterons, Tritons, He Ions, Alpha Particles, and Photons, March 1981.

**ENSL82 and CDRL82:
The 1982 Version of Evaluated
Nuclear Structure Libraries
ENSL and CDKL**

Since the issuance of UCRL 50400 Vol. 23, *ENSL and CDRL: Evaluated Nuclear Structure Libraries*, errors have been noted in half-lives. Most of these errors were for half-lives represented in exponential form, where the exponent is positive. This situation occurs only when the unit for half-life is "years." A few errors were associated with ground states having unknown half-lives. These were incorrectly labeled as stable (i.e., a value of $1.0 \text{ E} + 50 \text{ s}$ was entered). Such ground states are assigned half-lives of $1.0 \text{ E} - 20 \text{ s}$ in the new version of the two data files. In all, we found a total of 65 levels that had incorrect half-lives. These levels and the corrected half-lives are listed in Table 1.

Those who have microfiche listings of the data files may wish to consult Table 1 as a check before using the microfiche.

Those who wish to have computer-readable files may obtain ENSL82 and CDRL82 on magnetic tape, on request. On magnetic tape, ENSL82 and CDRL82 are available as one blocked file each or as four and five blocked files, respectively. In the latter case, each blocked file corresponds to the Z ranges in Table 2, which shows the appropriate statistical data for each file. Request for magnetic tape of the data may be directed to the National Nuclear Data Center, Brookhaven National Laboratory, Upton, New York; to the Radiation Shielding Information Center, Oak Ridge National Laboratory, Oak Ridge, Tennessee; or to the Nuclear Data Section, International Atomic Energy Agency, Vienna, Austria.

It is certainly possible, and even likely, that there are still errors in these files. I shall be grateful to any user who informs me of such errors so they may be corrected for the next version. I am pleased to thank Dr. Fred Mann, of the Hanford Engineering Development Laboratory (HEDL), who told me of one such error in the previous version.

Table 1. Corrected half-lives in ENSL82 and CDRL82.

Nucleus	State (MeV)	Half-life (s)
4010	0.	5.0492 + 13
13036	0.	2.2721 + 13
17036	0.	9.4673 + 12
19040	0.	4.0394 + 16
20041	0.	3.1538 + 12
23045	0.	1.0000 - 20
23050	0.	1.0000 + 50
25049	0.	1.0000 - 20
25053	0.	1.1676 + 14
26060	0.	9.4673 + 12
28059	0.	2.3668 + 12
28063	0.	3.1558 + 09
36081	0.	6.6271 + 12
40093	0.	4.7336 + 13
41092	0.	1.0050 + 15
41094	0.	6.3115 + 11
42093	0.	2.6981 + 10
43097	0.	8.2050 + 13
43098	0.	1.3254 + 14
43099	0.	6.7533 + 12
46107	0.	2.0512 + 14
48113	0.	2.8402 + 23
53129	0.	5.0492 + 14
55135	0.	9.4673 + 13
56131	0.	1.0368 + 06
57137	0.	1.8935 + 12
57138	0.	3.4713 + 18
62148	0.	2.5246 + 23
66147	0.	1.0000 - 20
67166	0.005	3.7869 + 10
71176	0.	1.1361 + 18
72182	0.	2.8402 + 14
75186	0.150	6.3115 + 12
75187	0.	1.2623 + 18
78190	0.	1.8935 + 19
81185	0.	1.0000 - 20
81187	0.	1.0000 - 20
82197	0.	1.0000 - 20
82202	0.	9.4673 + 12
82205	0.	4.4181 + 14
83208	0.	1.1613 + 13
83210	0.271	9.4673 + 13
88226	0.	5.0492 + 10
90229	0.	2.3037 + 11
90230	0.	2.5246 + 12
90232	0.	4.4496 + 17
91231	0.	1.0351 + 12
92233	0.	5.0240 + 12
92234	0.	7.7316 + 12
92235	0.	2.2210 + 16
92236	0.	7.3908 + 14
92238	0.	1.4100 + 17

Table 1. Continued.

Nucleus	State (MeV)	Half-life (s)
93236	0.001	3.8713 + 12
93237	0.	6.7533 + 13
94239	0.	7.6054 + 11
94240	0.	2.0733 + 11
94242	0.	1.1066 + 13
94244	0.	2.5562 + 15
95243	0.	2.3258 + 11
96245	0.	2.6824 + 11
96246	0.	1.4832 + 11
96247	0.	5.0492 + 14
96248	0.	1.1045 + 13
97247	0.	4.4181 + 10
98251	0.	2.8402 + 10

Table 2. Statistical data for each evaluated nuclear structure file.

	CDRL82	ENSL82
Number of isotopes	1553	1481
Number of levels	41209	15378
Maximum number of decays for a level	72	72
Maximum number of levels for an isotope	142	86

File	Z-Range	Number of records
CDRL82-1	1 - 19	11521
CDRL82-2	20 - 39	25526
CDRL82-3	40 - 59	32039
CDRL82-4	60 - 79	38615
CDRL82-5	80 - 105	18216
ENSL82-1	1 - 24	2767
ENSL82-2	25 - 49	17746
ENSL82-3	50 - 74	27429
ENSL82-4	75 - 105	15443
CDRL82	1 - 105	125913
ENSL82	1 - 105	63382