Nuclear Structure and Decay Data (NSDD) Network
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Decay Data Evaluation Project (DDEP)

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1. Objectives

- Applied Research and Detector Calibration
  - Reactor Materials
  - Nuclear Medicine
  - Astrophysics
- Data Content and Presentation
  - Atomic and Nuclear Properties
  - Measured Values and Evaluation Procedures
- Publication
  - Laboratory reports (Saclay, PTB)
  - WWW (http://www.bnm.fr/bnm-lnhb/DDEP.htm)
  - Bureau Internacional des Poids et Mesures (BIPM)

2. Members of the DDEP Collaboration

- CEA/LNHB (**France**):Dr. Marie-Martine Bé, Dr. Vanessa Chiste, Dr. B. Duchemin
- PTB (**Germany**): Dr. Herbert Janssen, Dr. E. Schönfeld
- LBNL (**USA**): Dr. Edgardo Browne, Dr. Coral Baglin, Dr. Shiu-Chin Wu
- INEEL (**USA**): Dr. Richard G. Helmer, Dr. Charles Reich
- BNL (USA): Dr. Jagdish K. Tuli
- ANL (**USA**): Dr. Filip Kondev
- KRI (**Russia**): Dr. Valery P. Chechev
- NPL (**UK**): Dr. T. Desmond MacMahon
- IAEA (**Vienna**): Dr. Alan L. Nichols
- USP (**Brazil**): Dr. Vito Vanin, Dr. Rui M. Castro

Other collaborators

- CIEMAT (Spain): Dr. Jose M. Los Arcos
- UNED (Spain): Dr. Amalia Williart Torres)
- PTB (Germany): Dr. Rainer Dersch

3. Formation of the DDEP Collaboration

1991 Dick Helmer initiated discussions with members of PTB and Saclay

1991 – 1993 PTB and Saclay had reached a collaborative agreement

1994 Evaluators from the US received approval for participating in this effort. Soon Russian and English evaluators joined them.

1995 First meeting of the DDEP collaboration in Paris

4. Nuclear and Atomic Properties in DDEP Evaluations

Most properties evaluated by the DDEP collaboration are relevant to applied research, such as

- Radionuclide half-life
- Nuclear radiations (α, $\beta^{\pm}$, γ) energies, emission and transition probabilities, and equilibrium emission probabilities.
- Energies and emission probabilities of atomic radiations such as X rays, conversion and Auger electrons, and electron-positron pairs emitted in nuclear disintegrations.

Properties reported, but usually not evaluated, are:

- Q-values (from Audi et al. [3])
- Theoretical internal conversion coefficients (Rösel et al. [4]) and pair creation (Schlüter et al. [14]) coefficients.
- γ-ray multipolarities and mixing ratios (from ENSDF)
- Level schemes: levels spin, parity, and half-life (from ENSDF)
- Auger electron energies (from Schönfeld and Rodloff [5]) and X-ray energies and relative emission probabilities (from Schönfeld and Rodloff [6])
- Atomic data such as K-fluorescence yields (ω_k), mean L-shell fluorescence yields (ω_L), and total number of L vacancies created by a K→ L transfer (η_{KL}) (from Schönfeld and Janssen [7]).
- Log ft's for $\beta^{\pm}$ decay and α-decay hindrance factors (from ENSDF, or calculated with computer programs used for ENSDF evaluations.)

5. Evaluation Procedures and Computer Programs

- *Limitation of Relative Statistical Weight* method (W.L. Zipj, M.U. Rajput, and T.D. Macmahon)
- Program *LWEIGHT* (Developed at NPL and LBNL)
- Program *EMISSION* (Developed at PTB)
- Program *EC-CAPTURE* (Developed at PTB and LBNL)

6. Current Status of Evaluations

- **259** selected radionuclides
- As of October 1, 2003:
  - **99** evaluations have been produced
  - **29** evaluations have been published in the French *Table of Radionuclides*
  - **74** evaluations are available on the WWW (http://www.bnm.fr/bnm-lnhb/DDEP.htm)
  - **5** evaluations are in progress

7. DDEP, IAEA-CRP, and ENSDF

- The DDEP Collaboration has evaluated most of the radionuclides included in the IAEA-CRP list.
- A large fraction of the data presented in DDEP evaluations is from ENSDF
- Very few DDEP evaluations have been included in ENSDF. Main difficulties:

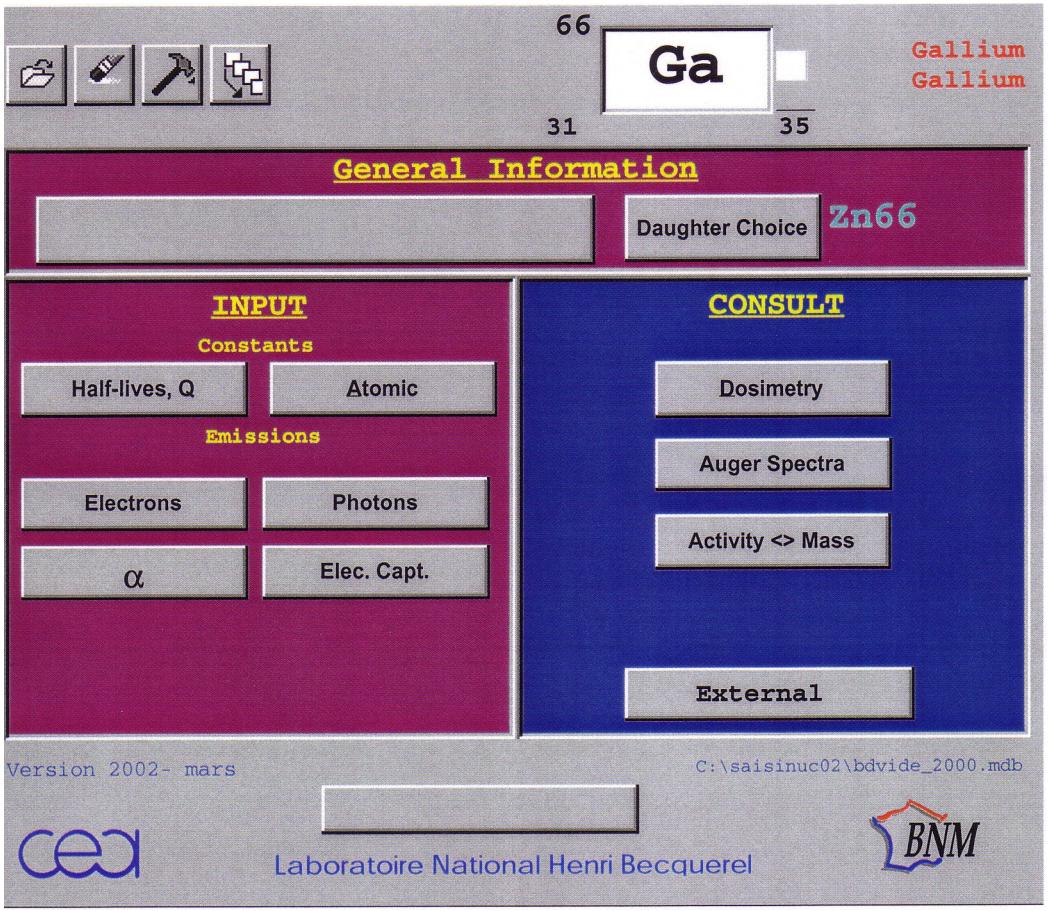
  Different data formats: Microsoft Access for DDEP, 80-character ASCII records for ENSDF

  Different theoretical conversion coefficients: Rösel values in DDEP, Hager and Seltzer values in ENSDF

Integrating DDEP and ENSDF

- Using the same theoretical internal conversion coefficients ("Dirac-Fock Internal Conversion Coefficients", I.M. Band et al., *Atom. Data and Nucl. Data Tables* ***81****, 1 (2002)****?****)*
- Using new software (from Saclay) to produce ENSDF data sets from DDEP evaluations
- Establishing a new database (similar to XUNDL) in Brookhaven for DDEP evaluations in ENSDF format

Nucleide


66
Ga
31
35
Gallium
Gallium
General Information
Daughter Choice
Zn66
INPUT
Constants
Half-lives, Q
Atomic
Emissions
Electrons
Photons
α
Elec. Capt.
CONSULT
Dosimetry
Auger Spectra
Activity <> Mass
External
Version 2002- mars
C:\saisinuc02\bdvide_2000.mdb
Laboratoire National Henri Becquerel
BNM

ENSDF Data set

```
66ZN    66GA EC DECAY                    2002BA38,1994EN02
66ZN C  Others: 2002Ga20, 1971Ca14, 1970Ph01.
66ZN  N 1.0           1.0        1.0         1.0
66ZN   L0             0                     STABLE
66ZN   E               50       4 0.47     4 7.88
66ZN 2 E CK=0.8850 15$CL=0.0978 12$CM+=0.0161 4
66ZN   L1039.2268 212                    1.65 PS    6
66ZN   G 1039.220  3 37       3 E2
66ZN   L1872.7633 242                    0.19 PS    7
66ZN   G 833.5324  215.9      5 M1+E2      -1.6     2
66ZN   G 1872.740  6 0.0229   24[E2]
66ZN   L2372.352  4 0
66ZN   E               0.30     3 0.038    3 8.46
66ZN 2 E CK=0.8847 15$CL=0.0980 12$CM+=0.0162 4
66ZN   G 499.590    6 0.0048   12E2+M3
66ZN   G 1333.112  5 1.17     9 E2
```