ENSDF Evaluation Proposal

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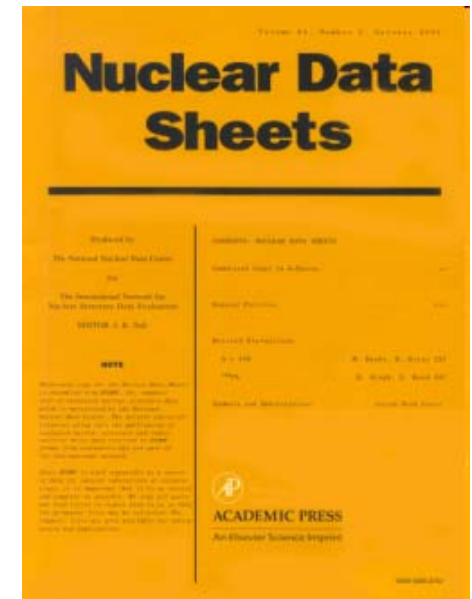
Isotopes Project

Lawrence Berkeley National Laboratory

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ENSDF Evaluation Problems That Need to be Addressed

Manpower – the experienced pool of evaluators is aging out and new efficiencies must be found.

Evaluation cycle – persistent ~12 yr cycle is too long.

NDS Mass chain size - 183 pp/A (2010) is too large. *Tuli proposal*.

ENSDF format - antiquated card image style with intermixed, nonstandard records, lack of indexing, and cryptic field definitions. *XML conversion*

Relevance to applications – no Adopted Decay, (n,γ), astrophysical rates, fission,… datasets. *DDEP, EGAF, JINA efforts*

Insufficient use of nuclear theory – Shell model, statistical model. *RIPL*

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Disappearing ENSDF Evaluators

Near or beyond retirement (red)   Temporary commitment (green).

- No submissions from Western Europe, Asia
- 50% of evaluations involve Balraj Singh

In less than 5 years it may become impossible to evaluate ENSDF

Mass Chain Evaluation Pipeline - November 2, 2011

A	Evaluator(s)	A	Evaluator(s)
31	Ouellet,Singh	110	Gurdal, Kondev
34	Nica,Singh	114	Blachot
35	Chen,Cameron,Singh	115	Blachot
36	Nica,Cameron,Singh	129	Timar,Elekes,Singh
37	Cameron,Chen,Singh,Nica	143	Browne, Tuli
43	Singh, Chen	148	Nica
61	Zuber,Singh	150	Basu,Sonzogni
62	Nichols, Singh, Tuli	152	Martin
69	Nesaraja	159	Reich
75	Negret,Singh	161	Reich
77	Nica,Singh	183	Baglin
85	Singh,Chen	192	Baglin
89	Singh	222	Singh,Jain,Tuli
91	Baglin	228	Abusaleem
92	Baglin		

Nuclides   Evaluator

^{56}K, ^{56}Ca, ^{56}Sc Singh

Mass chains currently being evaluated:

29, 46, 57, 68, 76, 86, 87, 88, 112, 118, 120, 128, 130, 139, 141, 144, 146, 156, 174, 177, 188, 189, 190, 209, 224, 253, 254-259, 260-266

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Current ENSDF/XUNDL Databases

ENSDF

Adopted Levels, Gammas	Supporting data – decay, (n,γ), reactions
• Q-values from Audi not updated • Level – E, J^π, $t_{1/2}$, μ, Q, BR • Gamma – E, RI, Mult+δ • Justification comments • Published *Nuclear Data Sheets* • ~12 year evaluation cycle	• Representative of experimental data • Datasets combined from many references • Not adopted for applications • No longer published in *Nuclear Data Sheets*?

XUNDL

Experimental data from the literature in ENSDF format

- Compiled from recent literature. Not evaluated and checked for correctness
- Maintained independently of ENSDF
- Generally very up to date

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Proposed ENSDF Database

Adopted Levels, Gammas	Adopted Decay Data	Adopted (n,γ) data	Other Adopted Data	XUNDL Data for all experiments

- Combine XUNDL and ENSDF files
- Replace all supporting ENSDF datasets with XUNDL as file is re-evaluated
- Update XUNDL with older references at time of re-evaluation

Adopted Levels, Gammas

- Based on evaluation of all XUNDL data and consistency with other adopted data
- XREF refer to generic reaction type, not individual papers
- Continuously update Q-values and magnetic moments
- Support RIPL file
  - ✓ Recommended J^π for all levels from theory if necessary
  - ✓ Replace I_γ with P_γ

Adopted Decay Data

- Evaluated in collaboration with the DDEP and EGAF efforts
- Level properties, γ-ray energies, multipolarities from Adopted Levels, Gammas
- P_γ, $t_{1/2}$ from DDEP

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Proposed ENSDF Database

<u>Adopted (n,γ) data</u>

- Derived from the IAEA/LBNL EGAF file
- σ_γ, k_0, σ_0, P_γ, S_N values
- Continuum σ_γ data
- B(XL)W values for primary γ-rays
- Recommended statistical model parameters

<u>Other Adopted Data</u>

- Nuclear astrophysics
- Fission
- Dosimetry
- Theoretical isotopes from nuclear models

<u>Ground rules</u>

- Adopted datasets can be updated independently of Adopted Levels, Gammas
- Adopted Levels, Gammas can be modified for consistency with newer evaluations
- The ENSDF file is the responsibility of the evaluator community not individual evaluators
- All Adopted datasets will be published in Nuclear Data Sheets

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Advantages

More efficient Adopted Levels, Gammas evaluation

- No effort to evaluate less important supporting data
- Availability of expert evaluated decay, (n,γ), … data
- Opportunity to get research communities involved

Better use of manpower

- Integration of DDEP into ENSDF effort
- Integration of EGAF into ENSDF effort
- Potential collaboration with other nuclear research communities

Better service to user communities

- Complete literature data coverage in ENSDF
- Higher quality application data
- Opportunity for databases focused on special applications

Closer cooperation with research communities

- Evaluators should join research efforts to hone their physics skills
- Researchers who join the evaluation effort gain valuable data analysis skills
- Collaboration with research provides opportunities to measure important data

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Discussion

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