

June, 1996

**NEANSC Working Party on International Evaluation  
Coordination:**

**Subgroup 13: Intermediate Energy Nuclear Data Evaluation**

Status report

Arjan Koning  
Netherlands Energy Research Foundation ECN  
BU - Nuclear Energy  
P.O. Box 1  
1755 ZG Petten  
The Netherlands

## **Meetings**

May 11, 1994 at Park Vista Hotel, Gatlinburg, USA

December 9, 1994 at NEA Data Bank, Paris, France

October 26, 1995, Smolenice, Slovakia

June 4, 1996, Kalmar, Sweden

## **Main topics**

1. Experimental Data
2. Model Intercomparisons
3. Thick Target Benchmark
4. Data Formats
5. Evaluated Files above 20 MeV

## Experimental data

- Coordination of EXFOR update with proton-induced reactions (Nagel):
  - Significant extension in 1995 and 1996.
  - Many Russian contributions (Shubin, Mashnik).
  - Residual production database of Michel (Hannover) added.
  - List of high-priority compilations added (Koning → Nagel).
  - NEXT: add high-energy (n,f) and (p,f) database.
  - Recommendation: CONTINUE THIS ACTIVITY !
- High-priority request list:
  - Future task: Narrow down data request list → Restrict e.g. to data up to 200 MeV for evaluation purposes only.

## Model Intercomparisons

1. NEA thin target code comparison for intermediate energies (1994)
2. NEA thick target code comparison for intermediate energies (1994/1995)

Discussion in SG13:

—→ Benchmark for intermediate energy activation yields; completed - final report by Michel and Nagel this summer.

- No code can predict activation yields better than a factor of 2 on average. The best results are obtained by GNASH (Los Alamos), ALICE (Lawrence Livermore), MINGUS (ECN) and CEM95 (Dubna).
- Needed update in model codes: High-energy fission (heavy nuclides) and fragmentation (light nuclides).

—→ Specialists' Meeting on the Optical model above 20 MeV, CEA, Bruyeres-le-Chatel, France, November 13-15, 1996.

## **Thick Target Benchmark**

Conclusions by N. Sobolevsky (Inst. for Nuc. Res., Moscow):

- Problem: 800 MeV protons on cylindrical W or Pb target of  $D=20$  cm in diameter and  $L=60$  cm in length.
- 12 participants.
- Requested predictions:
  1. Neutron yield
  2. Neutron leakage
  3. Spallation product yields distribution

General conclusion: Neutron yield and leakage are well predicted, product yields prediction gives problems (up to an order of magnitude difference)

→ Activation yields benchmark (Michel) important.

## Data formats

- Consensus on ENDF6-format for high E; see A.J. Koning NEA/NSC/DOC (93) 6 (+ small modifications for incident neutrons):
  - Lumped n, p, d, t,  $^3\text{He}$ ,  $\alpha$  and  $\gamma$  production cross sections with Kalbach angular distribution for light particles. Use MF3/MT5 and MF6/MT5.
  - No specific partial channels ((n,2n), (n,np), etc.) above 20 MeV.
  - Keep fission cross sections separate.
- Russian Activation libraries WIND and MENDL (which use an unnecessary and "illegal" extension of the ENDF6-format) will be transformed to ENDF6 (Koning).
- CRUCIAL TEST: can NJOY process high-E file? Test at ECN with 100 MeV neutron library of Los Alamos (1988) and ECN/CEA 200 MeV proton files:
  - Multi-group format: OK.
  - MCNP library (neutrons only): small problem with absorption cross section (use MT101).
  - JAERI high-energy file (Fukahori and Pearlstein): NJOY processing problems because of use of MT201-207 for light-particle production cross sections.

## Evaluated files

- All existing high-energy data files have been collected by the NEA (Nagel). However, very different sources, formats, energy boundaries, etc..
- Los Alamos program: 150 MeV neutron and proton files for H, He, Li, C, N, O, Na, Mg, Al, Si, P, S, K, Ca, Ti, Cr, Mn, Fe, Ni, Cu, Zr, Nb, Mo, Sn, W, Pb
- Subgroup 13: Add for specific accelerator-driven reactor types:  
F, Cl, Th, U, Pu, Am and Cm
- URGENT ACTION: production of neutron data files up to 150 MeV for the 10-12 most important isotopes in an accelerator-driven system. This will be done by ECN this summer.
  - Sensitivity studies
  - Feedback to evaluator (accuracy and other aspects)

## Information

The WWW homepage for transmutation will be updated within a month:

<http://www.nea.fr/html/trw/index.html>

In particular, Subgroup 13:

<http://www.nea.fr/html/trw/nucdat/iend/iend.html>