CRP benchmark exercise

Purpose: inter-comparison of calculational methods

1. Comparison (A) of calculations with experimental mass distributions

Thermal neutrons: ^{233}U (also 1 MeV), ^{237}Np, ^{245}Cm;

^{238}U: (n,f) at E_n = 8, 10, 14-15, 21 MeV: comparison with evaluated experimental data;
1.6, 5.5, 13, 28, 50, 100, 160 MeV: comparison with Zöller's and Hambsch's measurements;
(p,f) at E_p = 20 and 60 MeV;

^{237}Np: (n,f) at E_n = 5.0 + 5.5, 16.5 MeV;

^{239}Pu: (n,f) at E_n = 0.17, 7.9 and 14-15 MeV;

^{242}Pu: (n,f) at E_n = 15.1 MeV;

calculation of post-neutron emission yields (or pre-neutron emission if this only is given).

2. Comparison (B) of calculations only amongst themselves

^{237}Np, ^{241}Am, ^{244}Cm (n,f) at E_n = 13, 28, 50, 100, 160 MeV;

pre- and post neutron emission mass distribution with yields greater than 10^{-3} % relative to 200% mass distribution;

all calculation results in plain ASCII files.

3. Other calculations

It was proposed to attempt the following calculations until the next RCM and present results (without comparison) for reactions included in (A+B):

- charge distributions;
- independent and cumulative yields;
- cumulative yields of ^{93}Zr, ^{99}Tc, ^{126}Sn, ^{129}I, ^{135}Cs (very long lived and toxic fission products)
- cumulative yields of ^{135,137}Cs, ^{148}Nd (burnup monitors)

4. Distribution of workload

Calculations will be made by **Duijvestijn, Goverdovski, Katatkura, Kibkalo, Wahl, Zhdanov** (if ready) – called "**group C**".

It was decided that in principle the comparison (A) will be performed as a co-operation between:
- **Mills**: collect and distribute experimental data;
- **Liu**: perform the evaluation of experimental data;
- **Lammer**: do the comparison of evaluated experimental data with calculation results and present it as ratios of calculation to experiments in graphical form.

Later, some comparisons (including data collection and evaluation) were taken over by:
- **Storrer**: thermal neutrons for ^{233}U (also 1 MeV), ^{245}Cm;

- **Goverdovski**: ^{237}Np yields.

5. Dates

By the end of December 2001: all experimental data to be sent to **Liu**;
April 2002: **Liu** to send evaluated experimental data to **all**;
June 2002: **group C** send calculation (A) results to **Lammer**;
September 2002: **group C** send calculation (B) results to **all**;
Distribute*) comparisons (A+B) to **all**;
October/November 2002: next meeting

*) Lammer, Goverdovski, Storrer for comparison (A), group C for comparison (B)

6. Participants and tasks

Storrer: provide experimental data and perform the comparisons for thermal neutrons for ^{233}U (also 1 MeV), ^{245}Cm

Duijvestijn: provide experimental data for ^{238}U (p,f) at 20 and 60 MeV;
(n,f) at 1.6, 5.5, 13, 28, 50, 100, 160 MeV;
^{242}Pu (n,f) at 15.51 MeV
prepare TALYS code and perform all suggested calculations.

Liu: prepare file of all experimental data included in comparison (A);
evaluate experimental data (except ^{233}U, ^{237}Np, ^{245}Cm);

Zhdanov: participate in yield calculations above 30 MeV and produce results before end of September 2002;

Katakura: perform benchmark calculations with modified model and try to get usable results;

Maslov: provide emissive fission cross-section data for all minor actinides;
supply estimate of yield from super-long channel up to 200 MeV;

Goverdovski: ^{238}U: analyze and correct Zöller's data, evaluate mass distributions and perform comparison (A) (for Zöller, Hambsch data) up to 200 MeV;
^{237}Np: evaluate yields using experiments up to 16.5 MeV and model up to 200 MeV; perform comparison (A) for ^{237}Np;
perform predictions for these 2 nuclides according to comparisons (A+B);

Kibkalo: perform some evaluation of experimental data;
repeat model fits taking comments made at this RCM into consideration;
make some pure model predictions;

Lammer: perform comparison (A) and present results in graphical form;
contact Denschlag for his contribution;

Mills: supply experimental data; help with inter-comparison;

Wahl: prepare PC version of his CFY code;
will participate in benchmark calculations (A+B).