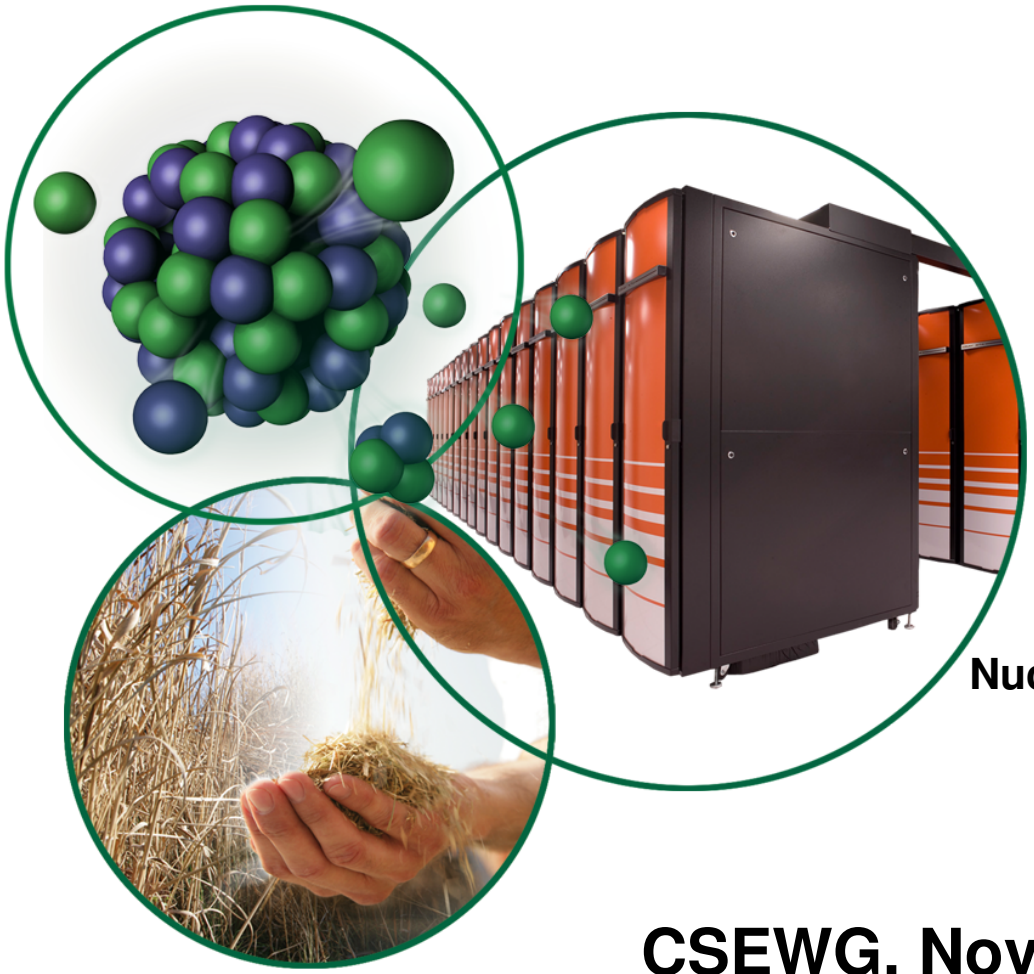
AMPX Cross-Section Processing Status



Dorothea Wiarda,
Michael E. Dunn,
Sedat Goluoglu,
Ian Gauld,
Lester Petrie

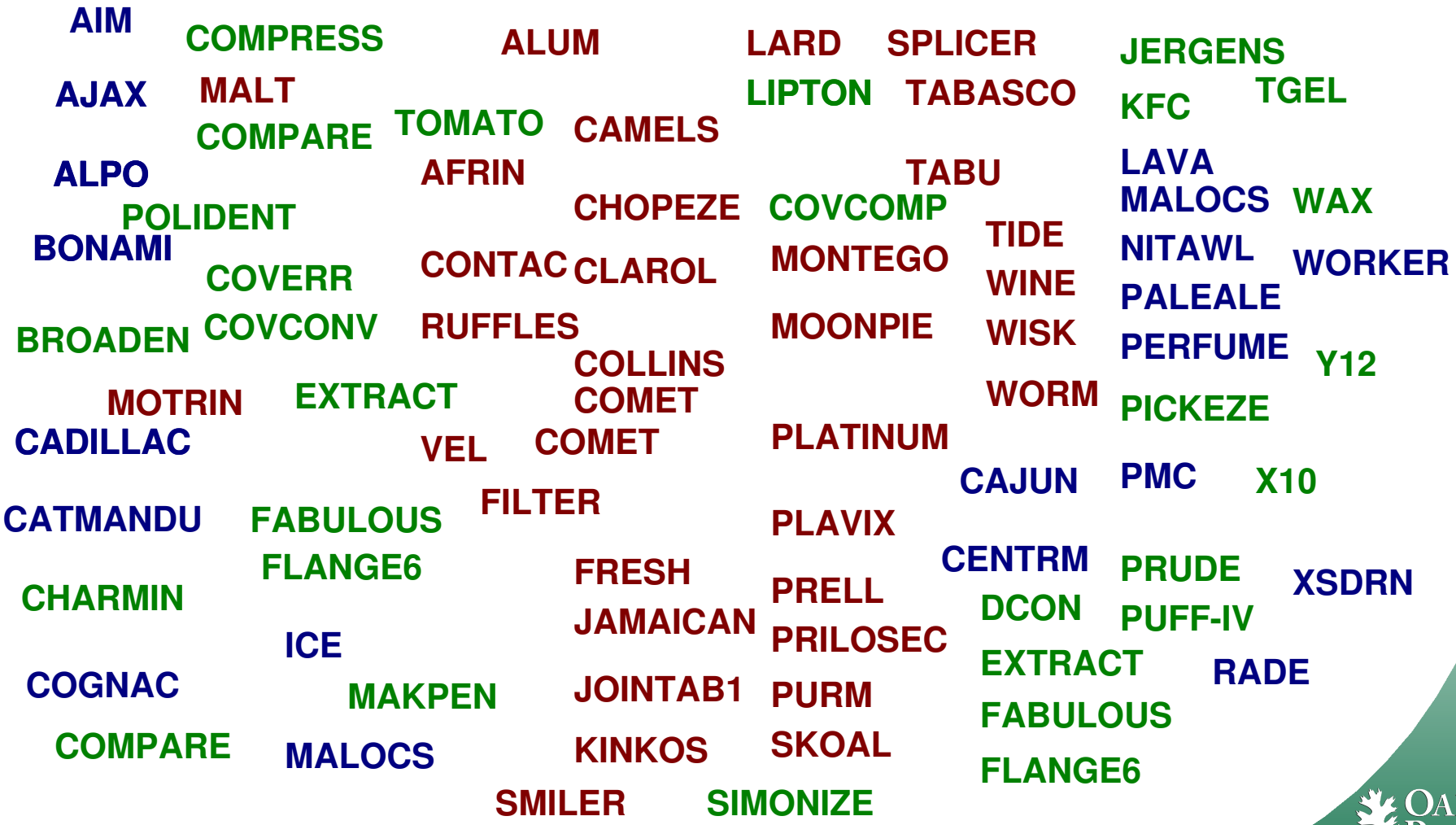
Nuclear Science and Technology Division

Oak Ridge National Laboratory

CSEWG, Nov 3-5, 2009

AMPX conversion to double precision

AMPX is a module code system with many modules to manipulate endf, point-wise, CE, MG and covariance data. Some are also distributed with SCALE



AMPX conversion to double precision

- All the programs needed to create MG libraries have been converted
  - polident, broaden (point-wise cross section)
  - y12, x10, flange6, simonize (scattering matrices, MG libraries)
- Many of the modules needed to create continuous energy libraries have been converted.
- Library functions have been converted to use double precision internally
- Library functions to read/write endf, point-wise data and MG data been written to make file access consistent across modules.

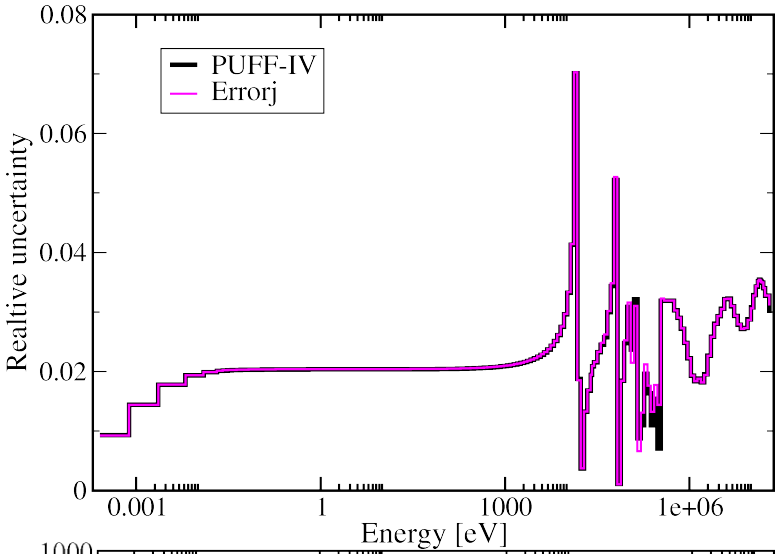
paradigm shift

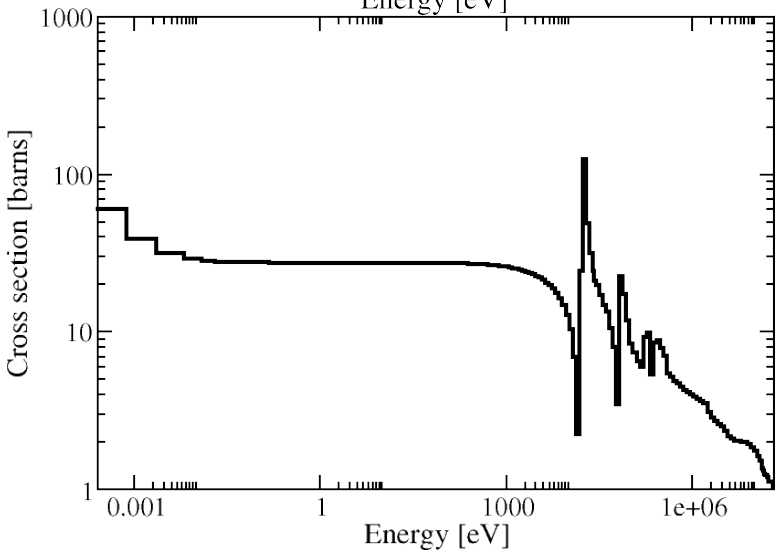
Effective Radius Uncertainty in PUFF-IV

- New format proposal for Radius uncertainty in ENDF
- SAMRML (used in PUFF-IV to generate derivatives) was enhanced to calculate derivatives with respect to the true and effective channel radius
- This allows to use full correlation between radius and resonance parameters – if given in ENDF file.
- PUFF-IV reads and uses the TENDL radius uncertainty using the new format proposal.
- A patched version of PUFF-IV has been prepared and is available upon request.

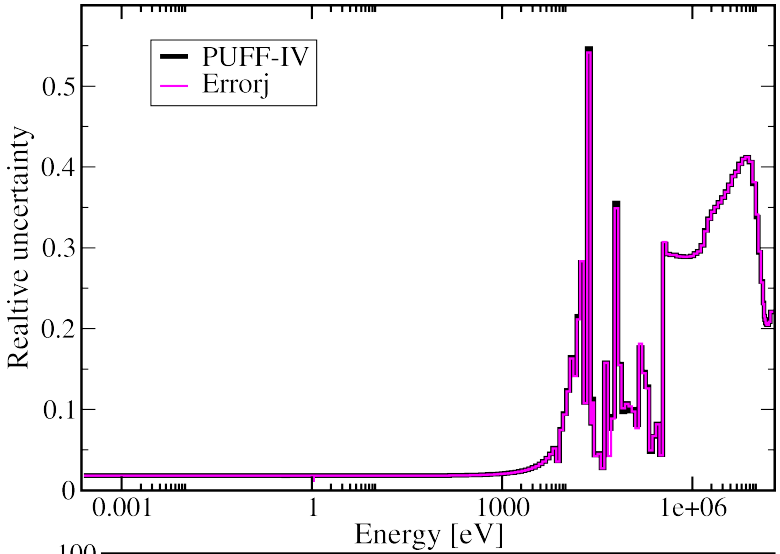
Ni58 Tendl-2008 endf files

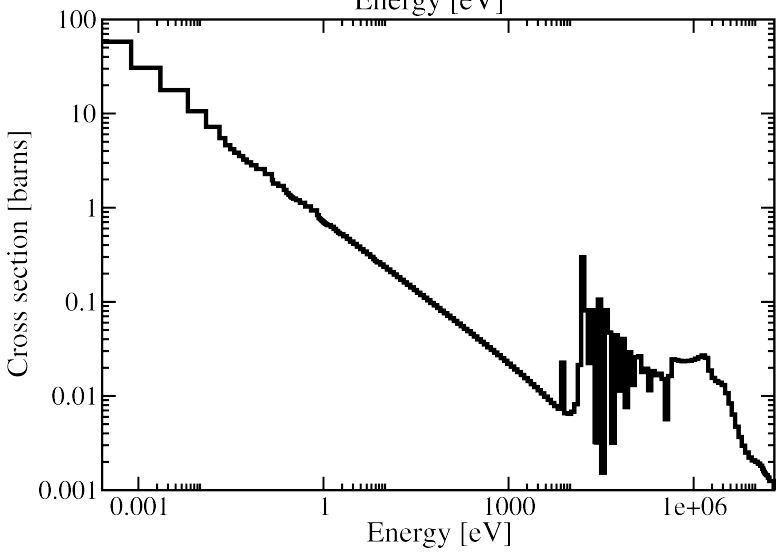
Elastic





Capture





paradigm shift

AMPX Nuclear Data for SCALE 6

- ENDF/B-VI.8 238 neutron group general purpose library
- ENDF/B-VII.0 238 neutron group general purpose library
- ENDF/B-VI.8 200 neutron/47 gamma coupled shielding library
- ENDF/B-VII.0 200 neutron/47 gamma coupled shielding library
- ENDF/B-VII.0 27 neutron/19 gamma coupled library primarily to perform adjoint discrete ordinance calculations.
- ENDF/B-V, ENDF/B-VI.8 and ENDF/B-VII.0 continuous energy libraries
- Comprehensive Covariance library for use with all libraries. Low-fidelity data are used if no other data are available.

Library features

- Full range Bondarenko factors for multi-group libraries
- CE Data for Resonance Region self shielding

New ORIGEN Depletion Data libraries for SCALE

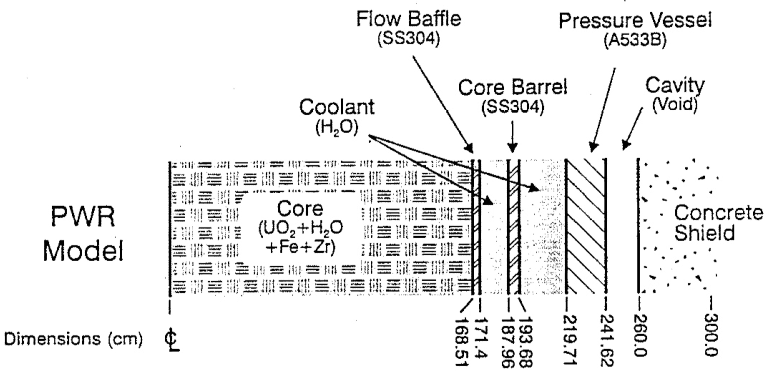
- **Decay and fission product libraries are update using ENDF/B-VII.0 data.**
- **Cross section libraries are generated from the JEFF-3.0/A Joint Evaluated Fission and Fusion File special purpose activation files.**
  - **JEFF data are processed with AMPX modules LIPTON, BROADEN and PRILOSEC using a LWR fuel pin flux.**
  - **Cross section data are generated for**
    - **238-group neutron (thermal applications)**
    - **200-group neutron (fast applications and shielding)**
    - **44-group neutron (collapsed version of 238-group)**
    - **47-group neutron (BUGLE shielding library structure)**
    - **199-group neutron (VITAMIN-B6 library structure)**

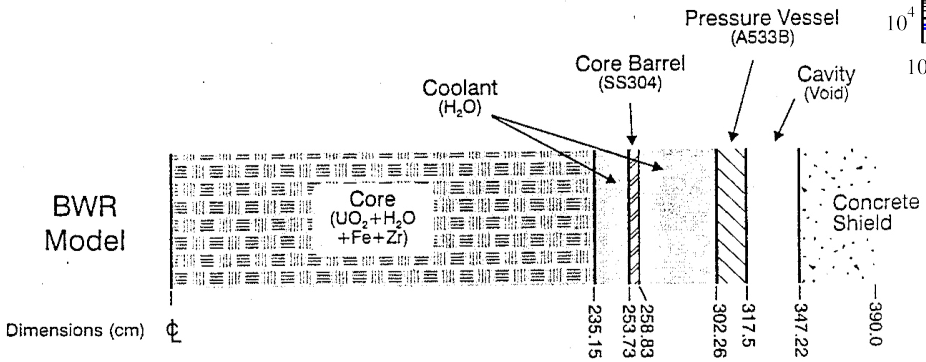
Creating new VITAMIN-B6 and Bugle library

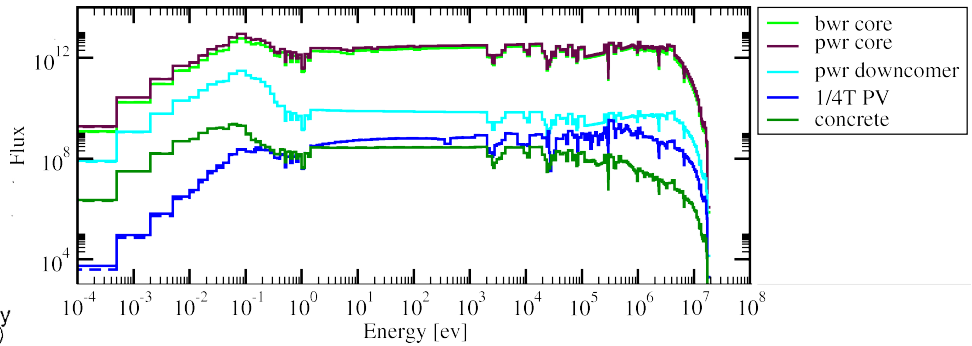
- **ORNL is preparing a new VITAMIN-B6 library based on ENDF/B-VII.0**
- **199n/42g**
  (neutron groups are similar to 200n/47g group library
  gamma groups differ)
- **Weighting is different from 200n/47g library to closely mirror the previous VITAMIN-B6 library**
- **KERMA factors will be produced using NJOY**

Collapse VITAMIN-B6 to BUGLE

199n/42g → 47n/20g





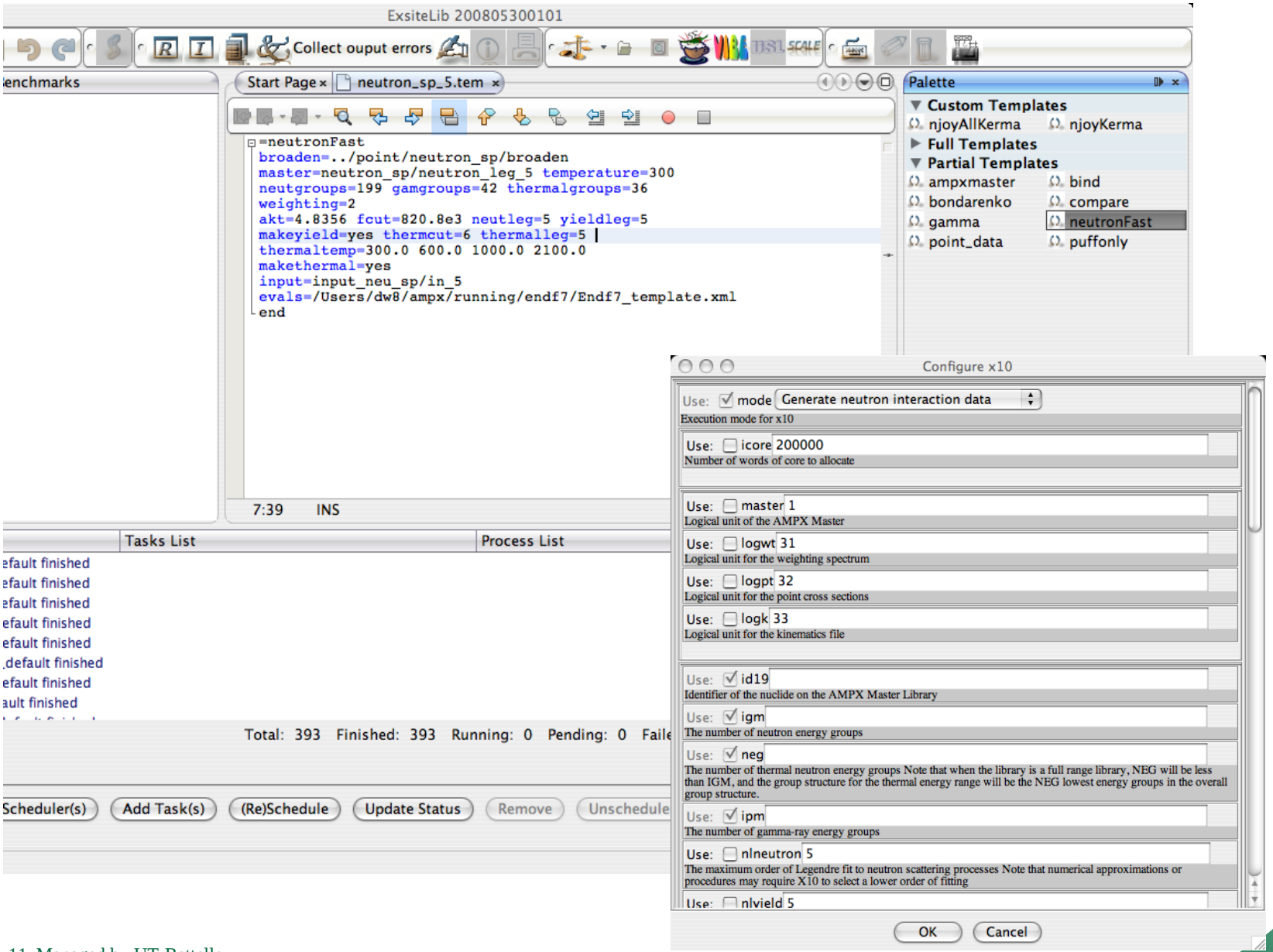


Anticipated release of new BUGLE library is 2011

Consistency checks

- **ENDF files created at ORNL are checked in the AMPX code system**
  - **MG libraries are created**
  - **Covariance matrices are produced and plotted.**
- **New endf files checked and sent to NNDC are:**
  - **Ti46, Ti47, Ti49, Ti50**
  - **Cr52 Cr53**
  - **Ni58, Ni60**

Template engine in ExSite



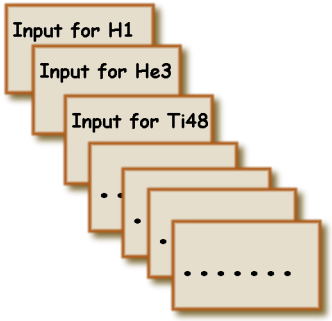
paradigm shift

```
<Materials>
   <Material tag="h1"
             endf="125"
             za="1001"
             tape="n-001_H_001.endf"
             ...
      <Material tag="u238"
             endf="9237"
             za="92238"
             tape="n-092_U_238.endf"
   ...
</Material
```

+

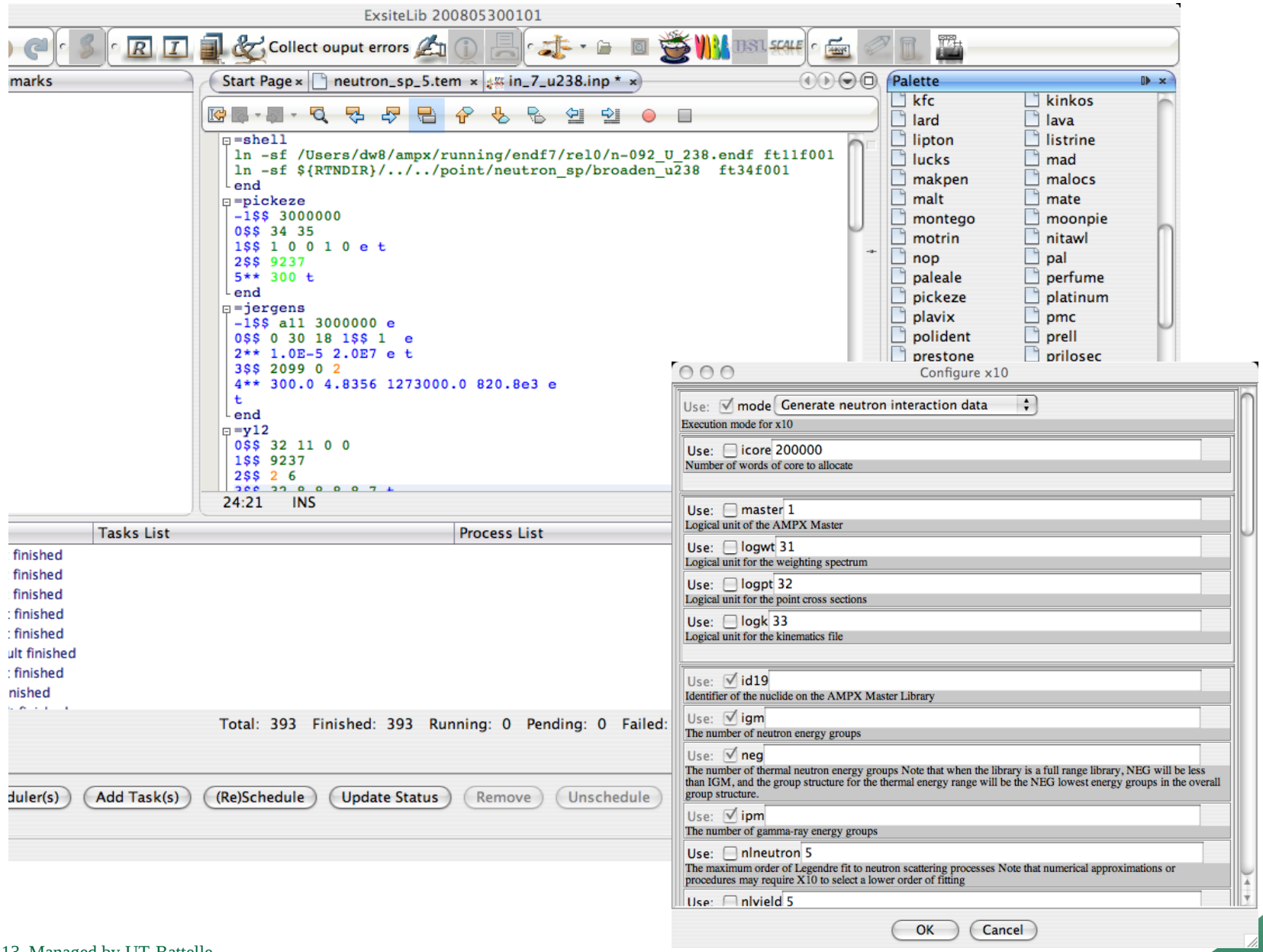
```
<InputData>
  <openFile name="&batch;"/>
<loop restrict="+neutron(yes)">
   <openFile name="&case;"/>
    <writeFile name="&case;">

<text>=shell
ln -sf &broaden_file; ft34f001
end
=pickeze              <!-- pickeze -->
-1$$ 3000000
0$$ 34 35
```



List of endf related information.
Retrieved automatically from a directory containing endf files

Defines sequence
Uses a few user defined parameters



paradigm shift

Future Development Activities

- Convert remaining modules to FORTRAN 90 and double precision
- Develop the capability to produce a continuous energy gamma library
- Expand ExSite capabilities
- Continue work on a 999 group fine group library
- Frame work for test suite in AMPX exists, but test cases need to be selected and added.
- Package and release AMPX by 2011

paradigm shift