

## NCSP 2<sup>nd</sup> Qtr 2007 Accomplishments

### **INTERNATIONAL CRITICALITY SAFETY BENCHMARK EVALUATION PROJECT**

#### **INL**

- The ICSBEP is preparing 28 evaluations to put on the agenda for the May meeting.
- Arrangements for the next ICSBEP Working Group Meeting were finalized. The meeting will be held Monday, May 7 through Friday, May 11, 2007 at the Palmer House Hilton Hotel in Chicago, Illinois.
- New experiments at VNIITF were initiated (Interstitial Ti was completed and evaluated, Partially-reflected HEU are in progress). Vanadium experiments are scheduled for August. A Technical Audit of the Program is being arranged during the Vanadium Experiments. LANL researchers should be able to visit VNIITF for two weeks during this Audit.
- Arrangements were made for two LANL Experimenters to participate in French plutonium solution experiments. Efforts to partner with IRSN on their Structural Material Experiment Program continue. A draft Scope of Work is undergoing review by IRSN.
- ICSBEP representatives supported NDAG & NCSP activities, including the March NCSP Review.
- Update of the ICSBEP 5-Year-Plan was initiated.
- Nine ICSBEP related papers were prepared and submitted to ICNC-2007.

#### **NUCLEAR METHODS**

##### **ANL**

- Performing final editing of chapter on Resonance Theory (R. Hwang).
- Producing NS&E paper on Probability Table Treatment of the Unresolved Resonance Range (R. Hwang).
- Completed verification of VIM2MCNP, VIM2KENO and VIM2COG translator codes; produced and delivered a full suite of “as-built” and benchmark MCNP, KENO, and COG decks for ZPR/ZPPR benchmarks in ICSBEP Handbook to LANL, ORNL and LLNL, respectively.
- Continued the intercomparison of ENDF/B-VII.0 VIM and MCNP libraries.

##### **LANL**

- Presented “Criticality Calculations with MCNP5” training class at PNNL in March, with 29 attendees from DOE NCS community (free to attendees through NCSP sponsorship of MCNP).
- Held “Introduction to MCNP5” class at Los Alamos in Feb (25 attendees).
- Updated NJOY in response to user feedback. Major RSICC release later in FY will include covariance processing capability in ERRORJ program.
- Identified five temperatures at which ENDF/B-VII data will be distributed in standard MCNP library and continued to QA processed data tables.
- Prepared paper on convergence testing in MCNP for April M&C Topical.
- Identified four technical paths toward sensitivity / uncertainty analysis with MCNP. Strengths and weaknesses will be summarized before end of FY.
- Forrest Brown was awarded the Gerald C. Pomraning Award by the ANS M&C Division for his work in Monte Carlo methods for criticality.
- Reviewed FY08 proposals and attended NCSP FY08 planning meeting.

##### **ORNL**

## NCSP 2<sup>nd</sup> Qtr 2007 Accomplishments

- SCALE/KENO customer support: Provided 225 responses to SCALE users requesting technical assistance via e-mail and SCALE website.
- January issue of SCALE Newsletter published.
- SCALE/KENO development: Continuous-energy and multigroup versions of KENO merged into a single prototype program.
- SCALE/KENO software maintenance: Updates to SCALE were performed on 11 SCALE modules and program libraries.
- RSICC distributed corrections for SAMMY-7.0.0 release.
- RSICC customer support: Distributed 375 software packages; packaged 11 new software updates; received and maintained electronic notebook entries for SCALE and MCNP; distributed monthly issues of the RSICC newsletters to over 4900 customers.
- Initiated (in March) sensitivity/uncertainty analysis in support of <sup>233</sup>U validation for ISOTEK operations.
- AMPX Maintenance:
  - POLIDENT module that generates CE cross-sections from resonance parameters was updated to Fortran 90.
  - Updated POLIDENT to handle recent ENDF format changes (LRF=7 and negative AJ values).
  - Processed all ENDF/B-VII evaluations with new POLIDENT.
- C. Hopper and C. Parks participated in the Critical-Subcritical Experiment Design Team meeting in Las Vegas.

### NUCLEAR DATA

#### **ANL**

- Contributed/coordinated NDAG response to NCSP Manager on NDAG Taskings 2007-1 (<sup>233</sup>U Dilution Report) and 2007-2 (Ranking of NCSP Tasks).
- Lead authors for ND2007 papers “Nuclear Data Needs within the U. S. Nuclear Criticality Safety Program” and “A Survey of the Status of Nuclear Cross Section Data for Criticality Safety”.
- Participated in the February 26<sup>th</sup> planning meeting at BNL for the “Low-Fi” covariance data.
- Participated in the initial meeting of Critical subcritical Experiments Design Team at NSO March 13-14.
- Participated in NCSP budget meeting at ORNL March 26-29.
- Continued testing of ENDF/B-VII.0 data evaluations.
- Continued development and support of covariance data methodologies by D. Smith

#### **BNL**

- Processed several evaluations submitted for inclusion to future ENDF/B-VII.1 library. These evaluations are being stored in ENDF/A.
- Attended CSSG meeting at ORNL, March 2007.
- Prepared and hosted 1-day meeting of four laboratories participating in the Low-Fidelity Covariance project at BNL, March 2007, to discuss technical and organizational aspects of the project.
- Started development of the computerized method for massive production of low fidelity covariances in the fast neutron region (5 keV – 20 MeV).

## NCSP 2<sup>nd</sup> Qtr 2007 Accomplishments

### LANL

- Assessment of U-235 scattering angular distributions underway through comparisons of ENDF/B-VII with experimental data.
- Modified Np-237 radiative width to produce better agreement with recent measured data from LANSCE (DANCE detector).
- Initiated inter-comparison of evaluated data files for Ti isotopes. Problem to resolve is calculational trend of increasing k as Ti reflector thickness increased in VNIITF benchmarks.
- Agreed to accelerate high-energy, high-fidelity U-233 covariance data to July in response to urgent request from ORNL.
- Participated in Low-Fidelity planning meeting at BNL in February. Summarized decisions and plans in subsequent document. Los Alamos is responsible for  $Z < 20$  and  $Z > 229$ . EDA R-Matrix code will be adapted for generation of sensitivity matrices for low-Z targets.
- Reviewed FY08 proposals and attended NCSP FY08 planning meeting.

### ORNL

- Developed and provided corrections/features to RSICC for SAMMY-7.0.0 release.
  - Corrected formatting error related to processing ENDF File 32 covariance matrix.
  - Added energy-dependent  $\_$  (for  $\_$  calculations).
  - Added resolution function option for a Gaussian width constant in energy.
  - Added options to improve fidelity in resonance descriptions.
- Published "SAMMY User Guidance for ENDF-Formats" document: ORNL/TM-2007/23 (ENDF-367).
- Enhanced  $^{239}\text{Pu}$  preliminary evaluation.
  - Adopted new nu-bar value (up to 10 eV) as presented at Nov 2006 JEFF meeting.
  - Performed benchmark testing with new  $^{239}\text{Pu}$  evaluation using KENO and MCNP - pre-release TSURFER module applied to identify evaluation corrections.
  - Re-generated resonance parameter covariance matrix (with corrected SAMMY version) and initiated conversion to ENDF/B format.
- Re-generated  $^{235}\text{U}$  and  $^{238}\text{U}$  resonance parameter covariance files and combined with high-energy covariance data provided by LANL.
- Prepared preliminary set of  $^{55}\text{Mn}$  resonance parameters with resolved resonance covariance matrix.
- Revised chlorine evaluations have been submitted to NNDC at BNL.
  - $^{35,37}\text{Cl}$  resonance covariance evaluations updated and tested with PUFF and SAMMY prior to submission.

## DIFFERENTIAL MEASUREMENTS

### ORNL-ORELA

- Completed reliable ORELA operation for >300 hours with power levels between 4.5-6 kW, 525 Hz frequency, and 8 ns pulse width.
  - Stable accelerator vacuum maintained at  $10^{-8}$  torr.
- Completed  $^{41}\text{K}$  transmission measurement (using  $^{41}\text{KCl}$  sample) on Flight Path 1 using modernized data acquisition system.

## NCSP 2<sup>nd</sup> Qtr 2007 Accomplishments

- This additional measurement performed to provide needed information identified during evaluation process.
- Completed first simultaneous measurements since 2006 restart.
  - 55Mn capture measurement performed on Flight Path 7 in concert with 41KCl transmission measurement.
- Identified sample material needs for the upcoming NCSP measurements involving Ni, Cr, and Cu.
- ORELA officially recognized as ANS Nuclear Historic Landmark.
  - NCSP task managers and the CSSG toured ORELA during recognition ceremony.
  - Equipment and visual displays prepared (ORNL-funded) to communicate details of accelerator capabilities and operation.

### **INTEGRAL EXPERIMENTS**

#### **LANL**

- Completed readiness assessments for nuclear material handling and measurement project (which facilitates performing subcritical experiments).
- Shipped/received all equipment and sources necessary to perform subcritical measurements.
- Successfully supported all required DAF TSR surveillances, maintenance activities.
- Opened dialog with Valduc regarding possible collaboration.
- Opened dialog with SNL and Rensselaer regarding operator training.
- Initiated JTA for Crew Chief and Crew Member training.

### **INFORMATION PRESERVATION AND DISSEMINATION**

#### **Hanford ARH-600**

- Discussions continue to define what is needed to place CritView on the web for beta testing. Limited release may be available by the end of the current quarter.
- Documentation of CritView features is progressing.

#### **LLNL**

- Implemented DOE NCSP FY 2006 Activities and Accomplishments section of web pages.
- Worked with DOE HQ Tech support on resolving NCSP web page cache timeout problem.
- Created new DOE NCSP FY 2007 Activities and Accomplishments section of web pages.
- Processed ENDF/B-VII (Release 0) data into pointwise (continuous) cross-sections (POINT2007) at several temperatures using PREPRO as described in UCRL-TR-228089 and released to IAEA and RSICC.
- Updated PREPRO as described in IAEA-NDS-39, Rev. 13, and provided version PREPRO2007 to IAEA.

#### **ORNL**

## NCSP 2<sup>nd</sup> Qtr 2007 Accomplishments

- Dr. Ray Murray, one of the principal Oak Ridge Critical Experiments Facility (ORCEF) Heritage participants, and Calvin Hopper performed preliminary editing of the DVD versions of the ORCEF Heritage sessions.
- Dr. Duane Larson, former Oak Ridge Electron Linear Accelerator (ORELA) Director, organized and conducted six sessions of recording for the ORELA Heritage.
- On March 27, ceremonies were conducted recognizing ORELA as an American Nuclear Society Historic Landmark. DOE/NCSP management recognized the six members of the ORELA Refurbishment Team for their successful efforts in ORELA restart.

### **TRAINING AND QUALIFICATIONS**

#### **LLNL**

- Completed a class on 02/07/2007 (ICSBEP)
- Completed a class on 03/07/2007 (NNSA/NA-40)
- Completed a class on 03/22/2007

#### **ANL**

- Participated in the CSSG program review meeting at ORNL; prepared summary notes from this meeting and other CSSG conference calls during the quarter.
- Completed the NCSET module on cross section measurements and dataset preparation; published it via the NCSP web site.
- Continued development of the NDA NCSET module.
- Continued discussions with LLNL staff to finalize NCSET module on hand calculations and multimedia prototype module.

#### **ORNL**

- Draft outline of the TSUNAMI primer completed.

### **NUCLEAR CRITICALITY SAFETY PROGRAM SUPPORT**

#### **ORNL**

- Planned, hosted, and participated in March CSSG and NCSP meetings at ORNL.
- Planned and conducted tours and presentations on 6 ORNL facilities and special capabilities for the CSSG, NCSP Task Managers, and NCSP administrative staff.
- Participated in review and ranking of FY08 NCSP proposals as members of CSSG and NDAG (Hopper and Westfall).
- Participated in scheduled teleconferences of CSSG