National Nuclear Data Center: Status Report

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Personnel

Personnel changes since the last NRDC meeting in May 2002:

- Mike Herman (PhD, nuclear reaction physics) was hired in March 2003. His duties include ENDF database management, maintenance of the reaction code Empire and nuclear reaction cross-section evaluations for ENDF.
- Yako Sanborn retired in October 2003. Boris Pritychenko (PhD, nuclear structure physics) with strong background in computer programming was hired in September 2004. His duties include responsibility for the new NNDC Web site, Linux management and application development.
- Vicki McLane is expected to retire at the beginning of next year. Dimitri Rochman (PhD, nuclear reaction physics) has been hired and is expected to be starting his term in November 2004.

At present, the NNDC staff represents 12.25 FTE (8.0 scientists, 1.75 professionals, and 2.5 support staff).

In the last fiscal year (Oct 2003 – Sep 2004), 13 scientists visited the NNDC at least for 1 week, 53 weeks in total, see Table 1. This represents a considerable increase over the past, dominated by 9 visits devoted to nuclear reaction modeling and cross-section evaluation, followed by nuclear structure evaluation (2 visits), and database development (2 visits).

The list of NNDC visits to other centers is given in Table 2.

Table 1. Summary of Visitors to NNDC (Oct 2003 - Sep 2004)

No. of visits	Duration	Topic
9	39 weeks	Nuclear reaction modeling and evaluation
2	9 weeks	Nuclear structure evaluation
2	5 weeks	Nuclear reaction database migration
Total: 13	53 weeks	

Table 2. Visits by NNDC Staff to Other Centers (July 2003 - Sep 2004)

Staff Member	Host	Duration	Topic
Alejandro Sonzogni	IAEA/NDS	1 week	Database migration
Michal Herman	IAEA/NDS	3 days	ENDF database migration
Victoria McLane	IAEA/NDS	1 week	EXFOR training session.

Computer Facilities

The NNDC has completed migration from the Compaq Alpha Server to a multi-server Linux system consisting of:
1. Three units of dual-processor Intel Xeon Red Hat Advanced Servers (2.8 GHz) functioning as
     - working server,
     - primary database server, and
     - secondary database server.
2. Intel Xeon single processor (2.0GHz MP) Web server; owned by us, but operated by the BNL Information Technology Division.

All PCs have been replaced with INTEL Pentium 4 processors running Windows XP and using flat panel monitors.

Bibliographies

The NSR compilation activity has continued. Over 4,200 references were entered in FY2004.

The CINDA compilation activity continues with respect to those references associated with the experimental neutron data compiled at the Center. In the period from July 2003 to September 2004, 3 CINDA transmissions were sent (see Table 3) containing a total of 1,184 records.

Table 3. NNDC CINDA Transmissions (July 2003 – Sep 2004)

Transmissions			Lines In database	Blocks in database
Exchange	Date	# lines		
179	20030829	681		
180	20040518	226		
181	20040922	277		
NNDC Totals		1184	91461	40531

Experimental Nuclear Reaction Data

The NNDC continues to compile neutron and charged-particle reaction data produced in the U. S. and Canada. In the period from July 2003 through September 2004, 12 final neutron data transmission tapes and 14 charged-particle transmission tapes were sent containing new and corrected entries; 3 preliminary transmissions have been sent (Tab. 4).

Evaluated Nuclear Reaction Data

CSEWG. The NNDC continues to coordinate the work of the Cross Section Evaluation Working Group. CSEWG is focusing on the development of a new version of the ENDF/B library, ENDF/B-VII. The NNDC contributions:
- Preliminary ENDF/B-VII Web page was developed,
- Assembly of ENDF/B-VII and data verification started, and
- ENDF-6.13 Utility Codes were distributed.

Empire. Improved version of the nuclear reaction model code, Empire-2.19, was developed (collaboration with Uni Bucharest, IAEA and JAERI). In particular,
- Fission channel was considerably improved,
- Pre-equilibrium alpha emission was introduced (Iwamoto-Harada), and
- Photon production capabilities were validated.

Evaluations. The NNDC was involved in several cross-section evaluation projects:
- Collaboration with KAERI on neutron cross-section evaluations for 24 selected fission products was completed. In the last year, remaining 5 isotopes of Dy were finalized and submitted to ENDF/B-VII.
- Review of 218 fission products cross was completed as an international project chaired by the NNDC (WPEC Subgroup 21). The project reviewed all evaluations in the fission products region (Z = 31 - 68) and recommended best evaluations.
- Neutron cross-section evaluations for 5 isotopes of Germanium were completed, focusing on photon production. This was in response to the needs of MCNP community.
- Atlas of Neutron Resonances is under preparation by S. Mughabghab. It represents a complete re-evaluation of "BNL-325" published in 1981 and 1984.
- The NNDC continued to cooperate with Russian Nuclear Data Center VNIIEF on "Compilation and Evaluation of Alpha-Induced Nuclear Reaction Cross Sections for Astrophysics" (grant from the Civilian Research and Development Foundation).

Nuclear Structure Data

NNDC continues to publish the ***Nuclear Data Sheets***, with 12 issues per year. As of September 2004, issues through Volume 102, #4 have been sent to Academic Press.

The experimental nuclear structure and decay data database (XUNDL) now contains more than 1,300 data sets, compared to about 1,000 one year ago. The compilation is done in a very efficient way by McMater University, Canada. The NNDC maintains and distributes the database.

Database Migration

The database migration project, conducted in 2000 – 2004, has been essentially completed in April 2004.

The administrative functions for CSISRS (EXFOR), CINDA, ENDF, ENSDF, NUDAT, and NSR have been transferred to the new Linux/Sybase system. This involves installation of new software and modification of legacy codes, where appropriate, to work with the relational database. The VMS-based version of the database has been shut down as of October 1, 2004. The CINDA database will be fully installed by V. Zerkin in November 2004.

Customer Services

As a part of the migration project, the NNDC launched its completely re-designed Web site in April 2004. At the same time, Online Service was shut down.

The number of retrievals continues to increase. There was a large jump in retrievals at the time of the inauguration of the new Web site in April. A figure below shows ratio of monthly retrievals for respective months in 2004 and 2003. It is seen that new Web Portal resulted in almost 100% increase of retrievals. In absolute terms, currently there are about 50,000 retrievals per month.
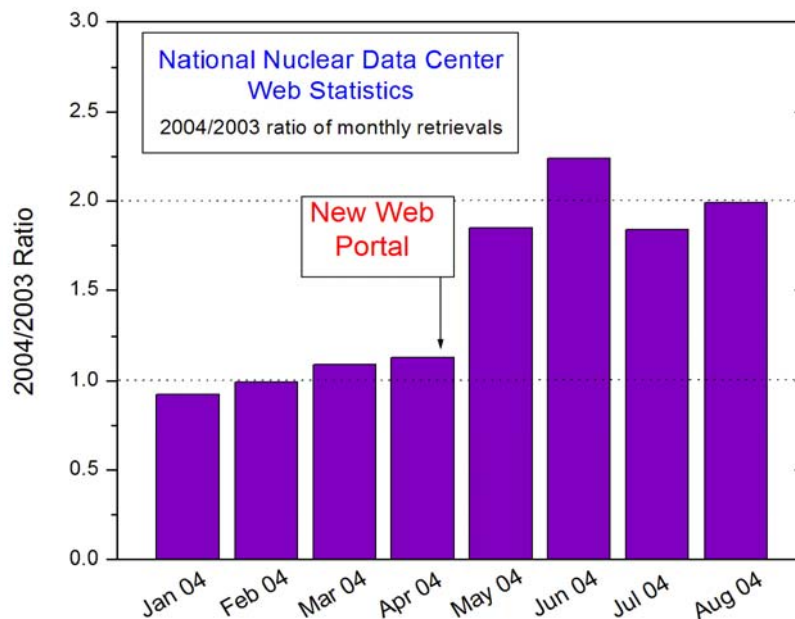
The most popular databases are NuDat, NSR and ENSDF, followed by CSISRS and ENDF. CINDA continues to show fairly low retrieval statistics.

The NNDC continues to host the USNDP Web site and CSEWG Web site.

Table 4. NNDC Transmissions (July 2003 – Sep 2004)

Tape	Preliminary posted	Final			Change in*	
		Posted	# data points	# entries	# data points	# subentries
Area 1 (neutron)						
1315	20030530	20030729	19,320	19	7,419	3
1316	20030910	20031023	8,001	13	0	0
1317	20031105	20031219	19,288	28	881	5
1318	20040115	20040406	12,666	21	171	1
1319	20040426	20040514	137,863	10	10,638	7
1320	20040427	20040514	241,189	1	80,012	0
1321	20040510	20040517	96,002	25		
1322	20040512	20040517	182,329	14	175,051	0
1323	20040517	20040602	18,191	23	4,741	2
1324	20040602	20040702	187,077	14	176,722	2
1325	20040702	20040722	107,443	19	1342	5
1326	20040727	20040826	83,713	24	55823	2
1327	20040830					
Area 1 Total			5192	211	57165	27
Area C (charged particle_						
C057	20020827	20021018	7,919	19	716	11
C058	20030225	20030328	4,924	10	964	7
C059	20030605	20030729	5,965	21	(382)	3
C060	20030819	20030919	3,515	26	2,837	19
C061	20030929	20040112	6,017	28	890	16
C062	20040112	20040223	4,850	20	6,549	25
C063	20040225	20040405	4,027	23	23,915	26
C064	20040406	20040510	10,497	42	8,447	7
C065	20040420	20040513	27,707	26	13,376	10
C066	20040601	20040701	11,529	12	716	11
C067	20040722	20040830	6,526	17	964	7
C068	20040903					
Area C Total			11755	244	1680	142
Area T (charged particle - originally compiled at another center)						
T013	20030806	20030908	22,536	27	18,067	18
T014	20031009	20031218	11,172	14	7,152	5
T015	20040120	20040318	43,036	14	41,478	8
T016	20040322	20040422	8,051	20	5,832	14
T017	20040625	20040730	9,007	20	6,851	18
T018	20040903					
Area T Total			12650	95	4137	63
NNDC Total					649,492	232

* Change takes into account deletions vs. insertions.