Workshop on XUNDL database

Triangle Universities Nuclear Laboratory, Durham, NC, USA
May 16-17, 2013
Hosted by John Kelley at TUNL

Participants:

John Kelley (TUNL)
Grace Sheu (TUNL)
Aaron Hurst (LBNL)
Christian Iliadis (TUNL,UNC)
Filip Kondev (ANL)
Caroline Nesaraja (ORNL: online participation)
Balraj Singh (McMaster Univ.)
Alejandro Sonzongi (NNDC, BNL)
Jagdish Tuli (NNDC, BNL)

The workshop comprised an introductory talk by Balraj Singh (appendix 1); a presentation by Christian Iliadis on alpha-capture reaction rates leading to Ti-44 and comments on the existence, or non-existence of pertinent nuclear data of astrophysics interest in ENSDF and XUNDL databases; and a detailed informal discussion of the agenda items (appendix 2).

Key points from Balraj's talk (and associated discussion):
- XUNDL activity involves compilation of about 300 current article per year from primary Nuclear Physics (NP) journals into the ENSDF format, checking of basic physics consistency, resolving inconsistencies and other ambiguities in papers, and more importantly requesting authors to provide data in cases of incomplete data presentation in papers.
- XUNDL datasets are timely produced and they are useful in resolving ambiguities while work is still fresh in authors' memory. Response rate from authors has been excellent, 95% or so.
- Presently USNDP activity is centered at McMaster, TUNL and Argonne, with database management at NNDC, BNL.
- Undergraduate student activity at McMaster since 1998, but requires significant input by experienced ENSDF evaluator (Balraj). Balraj says it requires excellent students for this task, of A+ level – not just A or B+.
- Students' participation at ANL did not seem to work out well; never tried at TUNL.
    - Filip Kondev suggested that it can require more effort from the ENSDF evaluator to involve students, than for the experienced evaluators to compile the papers themselves.

- o **Present Effort (Evaluator FTE):**
  - ▪ McMaster: 0.25
  - ▪ TUNL: 0.1
  - ▪ ANL: 0.1
  - ▪ BNL: 0.05 (database management)
  - ▪ Activity has been absorbed by present groups in their ENSDF evaluation programs without obvious increase in support (but XUNDL compilation overall it is a significant effort).
- o XUNDL improves ENSDF and other derivative databases, such as Wallet Card and NuDat for example, by providing thorough and compiled data sets. Improves evaluation efficiency by providing updates and additional data. Note, however, the XUNDL datasets are often incomplete for ENSDF purpose because they lack comparative evaluation with other publications on similar topics.
- o XUNDL is deemed as vital in the future as support for efficient capabilities for ENSDF reviews, and for the use by researchers.
- o After official retirement, effective July 1, 2013, Balraj would like to decrease his overall involvement in ENSDF, XUNDL and NSR to about 60% FTE.

Following this introduction we began discussion following the proposed meeting agenda.

- **Meeting objectives**
  - o No additions were proposed to the agenda as in appendix 2

- **Conversation on role of XUNDL**
  - o Main role is compilation of data captured from current papers in ENSDF format.
  - o Provide an outlet for additional data, for example, not published in journals that require limited pages for a particular article, such as PRL, PLB and PRC-Rapid Communications, and to resolve inconsistencies using ENSDF checking codes.
  - o Corrections to existing data sets in ENSDF, when some discrepancies are found in ENSDF during the compilations for XUNDL.
  - o Estimated 40,000 (fgk- is this an official statistics – I think it is much more?) downloads per year from NNDC webpage.
  - o Frequently used by ENSDF evaluators and by researchers
  - o The value of this database is in its currency

- **Organizational framework**
  - o XUNDL compilers' corner, similar to evaluators' corner, may be useful
  - o A-chain division for TUNL group for A=2-20, but beyond A=20, division by papers amongst groups may be the most reasonable approach.

- ▪ The present division of effort relies on division by journal, but PRC and PRL are the main sources of current publications.

- **Journal coverage**
    - o The covered journals are: **PRC, PRL, PL-B, NP-A, EPJ-A, JP-G**, ARI, CPL, IJMP-E, NIM-A, NIM-B, APP-B (Poland), PAN (Russia), BRAS (Russia), arXiV preprints. The ones in bold are considered primary and covered more thoroughly than others.
    - o Perhaps <5% of ENSDF-related articles are missed in this approach
    - o Missed journals are Medical and Engineering Journals, and some secondary publications, such as conference proceedings, PhD theses, laboratory reports, etc. Current manpower is inadequate to handle these.

- **Compilation policies**
    - o There was some discussion on the time needed to compile data sets. In simple cases the time is mainly spent to read and understand the manuscript, but for complex works the time period can take several days. Communications with authors further complicates the estimate.
    - o Articles should be compiled within a month or so of availability on journal web-pages.
    - o There was further discussion on what measurements/topics should be compiled in XUNDL.
        - ▪ We discussed elastic scattering data, articles with reanalysis of prior data, measurements focused on determining quantities relevant for fundamental symmetry analysis, and hyper-nuclear studies.

- **Dissemination**
    - o There was significant discussion on the need for an updated and searchable XUNDL interface on the NNDC website.
        - ▪ A clear need for some searchable function was suggested
            - • N,Z,A,T1/2, γ-ray energy
            - • γ–γ coincidence searches
        - ▪ Some thought was given to a NuDat-type interface, but serious complications were acknowledged. Alejandro suggested an action item on NNDC to look into the possibility of developing a code for retrieval of data of interest from XUNDL database. It would be also useful to consult with the development made at IAEA-NDS.

- **Software development and Enhancement of XUNDL:**
    - o The ENSDF-related codes are sufficient, but some are out of date.

- o Could benefit from further development in codes that capture data from the manuscripts, and further translate tabular data in ENSDF format.

- **Future activities**
  - o General consensus was to continue the XUNDL activity in foreseeable future.

- **Future contributing centers**
  - o The present compilation centers (McMaster, TUNL, ANL) indicated that their involvement is motivated by support for ENSDF evaluations and end users (mostly researchers in the low-energy nuclear physics area)
  - o At this point there was further discussion on how the literature is scanned and how the workload is distributed.
    - ▪ The present approach involves scanning journal tables of contents.
    - ▪ Physical Rev C accounts for 50% of articles
    - ▪ Physical Rev Letters accounts for 15% of articles
    - ▪ Conversation led to a thought that the workload should be distributed by A-chain (as with TUNL presently) or by division of published papers.
      - • Any changes would require more administrative effort for a coordinator of XUNDL work via a centralized distribution of work.
      - • Perhaps requires an XUNDL evaluators' corner.
      - • Requires a coordinator (currently Balraj).
  - o About 300 articles are compiled each year
    - ▪ Present (McMaster: 200, TUNL: 65, ANL: 35), estimates
    - ▪ TUNL agreed to continue compiling A=2-20. (about 65/year).
    - ▪ ANL agreed to increase to 1 article per week (about 50/yr), but agreed to increase to 2-3 papers/week if Jun Chen's position at ANL is made regular.
    - ▪ ORNL agreed to compile 1-2 articles per week (70/yr).
    - ▪ For the time being McMaster will carry the rest. This effort will be counted as NNDC effort if the intended contract between NNDC and Balraj goes through after July 1, 2013.
  - o LBNL indicated plans for involvement in XUNDL through a new UC Berkeley engineering department grant proposal to DOE. No details or a work plan nor details about their proposal were presented for discussion. It appears that LBNL contribution to XUNDL will depend on the outcome of the grant proposal. During the discussion, it was emphasized that XUNDL is a collaborative effort and any actions regarding changes in the present arrangements should be made on a consensus principle.

We revisited an earlier point and considered '**how XUNDL relates to ENSDF**'.

- o We found that XUNDL comprises reasonable evaluated good works, but the data sets are incomplete in contrast with the ENSDF, because they lack an overall comparative evaluation of the data.
- o The ENSDF results from 40+ years of evaluation and refinement. The XUNDL data sets mainly stand alone.
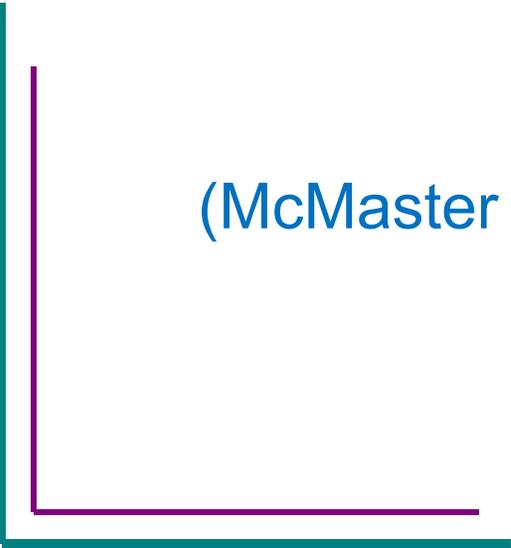
Adjournment:

In closing, Jag Tuli thanked John Kelley for hosting a productive meeting, and the participants for sharing an open and focused discussion. Thereafter, the meeting was adjourned about 12:30 pm on May 17, 2013.

Appendix 1: Introductory talk by Balraj Singh.

XUNDL Working Group Meeting
TUNL, Duke University, May 16-17, 2013

Balraj Singh
(McMaster University, Hamilton, ON, Caanda)

Topics for Discussion

- Meeting objectives
- Conversation on role of XUNDL
- Organizational framework
- Journal coverage
- Compilation policies
- Dissemination
- Software development
- Future activities
- Future contributing centers

Aim and Role of XUNDL

- Provides prompt and convenient web access to current publications in experimental nuclear-structure data through on-line retrieval systems at BNL, ORNL and LBNL. Aim is the same as defined in 1998 after deliberations with several researchers at different labs in the U.S.

- Complements ENSDF database since data for many nuclides in ENSDF are quite outdated (i.e. more than 10 years old).

- Corrections in existing datasets in ENSDF database based on compilations. Prompt inclusion of data in ENSDF for newly discovered nuclides and for those nuclides for which excited-state data have become available

- Frequent communications with authors of papers to resolve inconsistencies in data, and to obtain additional details of data. Some authors send submissions to XUNDL database for repository of data, which do not appear in their papers, but are referred to XUNDL. Ultimately it enhances ENSDF.

Journals covered

Regular scanning (independent of NSR work)   Jan 1-May 15, 2013 data below

Physical Review Letters: 21

Physics Letters B: 8

Physical Review C: 76

Nuclear Physics A: 6 (+4 on HYP-NUC)

European Physical Journal-A: 2 (+1 on ββ decay)

Journal of Physics-G: 1(+1 on ββ decay)

PRIMARY NUCLEAR STRUCTURE JOURNALS

Nuclear Instruments & Methods A&B: 0

Applied Radiation and isotopes: 3 ($T_{1/2}$)

Chinese Physics Letters: 1

Chinese Physics C: 1

Acta Physica Polonica B: 12 (conference articles: likely to appear elsewhere)

International Journal of Modern Physics-E: 0

Physics of Atomic Nuclei: 1

Bulletin Russian Academy of Sciences-Physics: 0

ArXiv Preprints: 3 (likely to appear in journals)

PRC: 63% + PRL 18%. Others: 19%. May be missing <5%

Organization and FTE effort

- McMaster: Ervin Thiagalingam (*)(since March 2012),
  Elaine McNeice (*)(since March 2013)
  Balraj Singh (XUNDL compiler and coordinator):   0.25 FTE

- TUNL: John Kelley, Grace Sheu, Jim Purcell :   A=2-20 mass region: 0.1 FTE

- ANL   :   Filip Kondev, Jun Chen (since April 2012)
  NP-A, PL-B, JP-G journals: 0.1 FTE
  Others: occasional contributions from different ENSDF evaluators

- BNL: Database management: Jagdish Tuli: 0.05 FTE

  (*): undergraduate student
  TOTAL EVALUATOR EFFORT: 0.50 FTE (>0.25 FTE probably gets back to ENSDF)

Compilation Policies

- Critical in-depth compilation of a paper, but not evaluation i.e. no comparisons made with previous papers on the same topic.

- For completeness, sometimes data taken from ENSDF.

- Requests to the original authors for additional data details, clarification of data inconsistencies, etc.

- Semi-automatic procedures whenever possible.

- Compiled datasets run through network codes as needed, such as FMTCHK, GTOL, BrIcc, LOGFT, RULER, PANDORA, ENSDAT.

- Manual checking with data in the original papers.

Current Contents of XUNDL

- Since the start in December 1998,
  5200 compiled datasets added up to May 14, 2013.

- Covers mainly high-spin structures up to 2004.

- Almost all experimental structure papers from journals between 2005 - 2013.

- **2160** nuclides: ^{1}H to ^{294}118, spread over **273** A-chains;

- Data from 3300 primary journal articles published during 1995 – 2013

- About 650 communications with the original authors to resolve data inconsistencies and to obtain additional data details. Records archived.

- Also several XUNDL submission papers by authors in support of their main publication in PRL/PRC

Appendix 2: <u>Meeting Agenda</u>

Meeting objectives
- o Additions to the agenda
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- Conversation on role of XUNDL
  - o Functionality for error correction
  - o Who are the users
  - o What is the usage
-
- Organizational framework
  - o How can we stay current?
  - o Accountability to compile timely in good order
  - o Xundl evaluators corner
  - o Responsibilities by A-chain or journal?
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- Journal coverage
  - o What is covered?
  - o Is it enough?
  - o Should we be as inclusive as ENSDF?
  - o What is missed?
  - o How to improve?
-
- Compilation policies
  - o How much effort in compiling complex sets?
  - o How much information warrants a data set?
    - ▪ Elastic scattering?
    - ▪ Re-analysis of existing data?
    - ▪ Fundamental symmetries measurements?
-
- Is it time to compile hypernuclei?
  - o Provide framework for users in hyper community to contribute?
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- Dissemination
  - o Present system OK
  - o Useful improvements?
  - o Can/should XUNDL merge with ENSDF?
    - ▪ Are individual data sets misleading?

- Software development
  - o Is current support sufficient?
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- Future activities
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- Future contributing centers
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