

Minutes of Structure and Decay Data Working Group Meeting

8:45 am-12:45 pm Wednesday 9 November 2005, and

8:30 am-1:00 pm and 2-2:45 pm Thursday 10 November 2005

C. Baglin, LBNL (Chair)

Present: C. Baglin, S. Basunia, E. Browne, T. Burrows, J. Cameron, R. Haight, J. Kelley, F.G. Kondev, C. Nesaraja, N. Nica, B. Pritychenko, C. Reich, A. Sonzogni, J. Tuli, D. Winchell. Also, M. Carpenter, S. Coon, I.-Y. Lee, P. Page, D. Smith and several others were present for segments of the meetings.

Status Reports

- **ENSDF (J.Tuli):** A summary of literature cut-off dates for $A > 20$ chains was presented. The most recent list of priority nuclides was prepared in February 2005 and contained 150 nuclides. The review process has been further modified so that **all** chains now go back to the reviewer after the evaluator has responded to the review; reviewers should not, at that stage, re-review the work, however. Any reviewers who do not wish to have chains returned to them should inform J. Tuli of that fact.
- **NSR (D. Winchell):** Of the roughly 183,000 entries in this database, 4756 were added during FY2005 and monthly distribution of the database continued. A major update of DOI information was performed. The keyword preparation effort is now being shared with IAEA. An update of the coding manual is ongoing, and subject indexing is being reviewed. The *Recent References* issue of the Nuclear Data Sheets was discontinued this year. It was suggested that it would be beneficial if links to various journal home pages were provided from the NSR page in addition to the links to specific articles.
- **XUNDL (J. Cameron for B. Singh):** This database now contains 1626 datasets. 300 new datasets were added in FY05 and 15 existing ones were revised. These datasets contain information from 1200 primary references and cover ~1100 nuclides spread over ~225 A-chains. Datasets are currently prepared at McMaster by Joel Roediger, an undergraduate student, under the close supervision of Balraj Singh. Communications with authors continue to lead to the correction of many data errors; in fact, many journal errata would become unnecessary if the XUNDL data entry were performed prior to journal publication! Compilation of recent high-spin and low-spin papers is essentially current.
- **ENSDF Analysis and Utility Codes (T. Burrows):** The major effort in FY05 centered on the completion of the BrIcc conversion coefficient utility package (see below), version 2.0 of which was distributed at the end of FY05. In addition, the least-squares fitting program GTOL has been revised and Version 7.1a has been distributed. This is now a double-precision code incorporating several modifications suggested by the St. Petersburg Nuclear Physics Institute. χ^2 values are reported and a warning issued if the value exceeds $\chi^2(\text{critical})$, and additional summary tables have been added. Evaluators should now rerun GTOL for data sets that include high precision E_γ data such as those from 2000He14 because the single-precision program may have provided quite unreliable results in such cases. Several small bugs still need to be removed and the program also needs to remove from consideration any transitions for which the final level is unknown (*e.g.*, those with 'FL=?'). Version 7.2, to be distributed very soon, will deal with these issues. Some BrIcc-related work will be performed soon on FMTCHK, ENSDAT, RadList, GTOL and RULER to enable recognition of partial conversion coefficients and acknowledge the lower uncertainty provided by BrIcc.
- **Update on BrIcc Package (T. Burrows):** This package was developed by an Australian-Russian-US collaboration and Version 2.0 was released to evaluators in October 2005, as detailed elsewhere in the report of this meeting. BrIcc provides conversion coefficients (all shells and/or subshells), electron-positron pair coefficients and electronic factors for E0 transitions for $Z=10-95$ and it now replaces HSICC for future mass-chain submissions. Exhaustive comparisons between measured data (including the new high precision value for the M4 80.24-keV transition from the 10.53 d isomer in ^{193}Ir) have led to the conclusions that calculations must take into account the effect of the electron hole produced in the internal conversion process and that there appears to be a slight preference for the frozen orbital type of calculation. Consequently, it is this type of calculation that is adopted in the present version of BrIcc, in contradistinction to the 'no hole' calculations used for the earlier Version 1.3. The estimated uncertainty in interpolated coefficients is 1.4% compared with 3% for HSICC. Online, interactive calculations of conversion coefficients also can be performed using BrIcc at

<http://www.rsphysse.anu.edu.au/nuclear/bricc/> (or using HSICC at <http://www.nndc.bnl.gov/hsicc/>).

Future plans for BrIcc include an extension of Z to 105, resolution of some platform-dependent numeric differences, implementation of calculations for three mixed multipolarity transitions or for E0 transitions and development of a “silent” BrIcc for web interface use or for calls from other applications. An effort to reassess “How good are the conversion coefficients now?” is nearing completion. (See full report to this meeting *re* BrIcc).

- **New Evaluator Recruitment, Training, and Assimilation (J. Tuli):** With a view to bolstering a waning non-US evaluation effort, a one-week training workshop was held as a pilot project in Vienna in 2002, and this was followed by two-week workshops co-organized by IAEA and ICTP (Trieste) held in November 2003 and April 2005, with the final workshop of this series scheduled for February 2006. Four USNDP evaluators conduct the ENSDF training and approximately five other professionals provide nuclear theory and experimental techniques lectures. All participants in the pilot program continue to be actively involved in structure and decay data evaluation work and new data evaluation efforts now exist in Argentina, Australia, Brazil, Bulgaria, India and Russia. A number of participants in the subsequent two workshops have also been involved in mass chain evaluations. Mentoring of new evaluators is very important and, in FY05, NNDC and McMaster have contributed greatly to this effort. The challenge that remains is to have the pool of newly trained evaluators funded to do evaluation work. It was noted that young faculty tend to receive very heavy teaching loads and sometimes the credit received for evaluation publications is lower than that for research publications. Combined research+evaluation appointments might solve the first problem. However, there needs to be a greater realization of the importance of evaluations on the part of the people in the international community who control funding. J. Tuli is working with IAEA to start addressing this in Europe.
- **IAEA-CRP on “Updated Decay Data Library for Actinides” (F.G. Kondev):** The objective is to produce improved decay data files for actinides of relevance to nuclear facilities, waste management, safety assessment, safeguards/proliferation issues as well as non-energy applications. Participants from eight countries, together with the program officer M. Kellett (IAEA), met at the IAEA headquarters in Vienna on October 17-19, 2005 and decided on evaluation methodology (to be based on that used by the Decay Data Evaluation Project, but using BrIcc for conversion coefficients), which nuclides should be evaluated and/or measured and by whom. Evaluation assignments were made for 58 decays and an extended list of 94 additional nuclides was drawn up. Measurements on 14 nuclides were assigned also. The evaluated data will be made available in ENSDF and ENDF formats.

ENSDF Editor Software (A. Sonzogni): The ENSDF-format editor described at the last USNDP meeting has undergone further testing and refinement and the β release zip file became available in September 2005 from <http://www.nndc.bnl.gov/nudat2/evp>. The editor is designed to minimize the impact of the ENSDF format on ENSDF evaluation work and the data input function has been integrated with ENSDF checking and calculation codes and the NuDat interactive level and decay-scheme plotting tool. The release of Version 1.0 is scheduled for 1 December 2005. Future plans include a search capability and the ability to hide unused text boxes and areas.

Formats/Procedures/J π Rule Topics:

- **Clarification of B($\sigma\lambda$) Entries in ENSDF:** Some users would like transition probability entries in ENSDF to include an indication of whether they are for excitation or deexcitation. T. Burrows will look into the possibility of modifying the production programs so that this is automatically indicated for values outputted from B($\sigma\lambda$) fields in ENSDF. Evaluators would still need to ensure that values in comments clearly indicate the transition direction.
- **Nomenclature for Rotational Bands and Configurations and J π Rule for Strongly-Coupled Bands (F.G. Kondev):** F.G. Kondev and B. Singh are working on a document on these topics. When completed, it will be circulated among evaluators for comment well ahead of the next USNDP meeting.
- **Quality/Legibility of Level Scheme and Band Drawings:** As has been noted in the past, these drawings often are less legible and informative that might be desired. The RadWare style band drawings, in particular, are usually inferior to those in journal publications and evaluators frequently opt for the old-style drawing instead; however, it was judged that, in order to do better, it would take more human intervention in each drawing than we have manpower to support.

At 12:45 am, the meeting was adjourned until 8:35 am the following morning.

New Web Interface for Evaluated B(E2) Data (B. Pritychenko): A newly-constructed web interface providing online access to evaluated B(E2) data from 2001Ra27 was described. It is accessible at <http://www.nndc.bnl.gov/be2>. It is integrated with the NSR database. Future plans include an expansion of scope to include all nuclides, not just the even-even ones, along with other B(E λ) data. This is seen as a nuclear structure help tool; another topic which might be addressed similarly in the future is double β decay.

Nuclear Data Sheets – Impact Factors (A. Sonzogni): This report followed on from one at the USNDP meeting in 2003 which showed a rather low and decreasing impact factor (see definition in detailed report to this meeting) for the journal Nuclear Data Sheets. The impact factor is currently much higher, and this may be attributable to (i) the impact from papers that cover a range of masses (*e.g.*, the superdeformed band or proton emitter publications) and (ii) increased web visibility of the journal *via* its page on the NNDC website that provides an up-to-date index and direct links to articles.

In addition to mass chain evaluations, it is anticipated that some articles on topics that directly impact ENSDF will be published in Nuclear Data Sheets in the future; possibilities include a shape-isomer evaluation and some decay evaluations that are in progress.

The increasing inaccessibility of the journal due to the escalating costs of Elsevier publications was noted, but it is unclear what can be done about the situation.

J. Tuli noted that we need to publicize a consistent way of citing ENSDF data, from the journal or from the web. Vicki McLane's version of several years back probably could benefit from revision by now.

Continuation of Formats/Procedures/J π Rule Topics:

- **Revision of Segments of Nuclear Data Sheets Introductory Material (C. Baglin):** It was noted that items 1 and 2 in the left-hand column of page ν of the Introductory Material in NDS describing default practices are not consistent with reality and changes were suggested to remedy this:

“The following policies apply to the presentation of data in reaction and decay datasets. Any deviation from these policies will be noted by the evaluator.

1. The J π values in [the] decay data sets [and reaction data sets with gammas] are taken from the associated Adopted Levels, Gammas data set. For [other] reaction data sets the J π values are from the reaction data. The J π value to the capture state in thermal-neutron capture is assigned assuming s-wave capture.
2. The ~~character~~ *multipolarity* of a γ ray and its mixing ratio *given in a decay data set* are from the associated Adopted γ radiation table.”

For item 1, it was proposed that we **remove** the text shown above in square brackets. After discussion, this was accepted without objection (moved: J. Cameron; seconded: T. Burrows).

For item 2, it was proposed that the words shown in italics be **added**. After considerable discussion, this too was accepted without objection (moved: F.G. Kondev; seconded: J. Kelley). However, the long-term practice of treating decay data sets differently from all others was debated. Regardless of whether more or less material were to be imported into decay data sets from Adopted Levels, Gammas datasets, such a change would represent a significant alteration of established policy. Since the meeting had no prior preparation for such a discussion, no carefully considered proposal was on the table and the time for discussion was limited, the Chair asked that further discussion be deferred until after this meeting. Some progress should be possible *via* email during the year and the question can be revisited at next year's USNDP meeting.

While on the topic of Introductory Material for NDS, J. Tuli referred to the document on classification of β decays prepared by B. Singh and Y. Akovali and accepted at the USNDP and IAEA-NSDD meetings in 2003. It had been noted recently that this document had not been added to the NDS Introductory Material. He proposed that the entire document be incorporated in the Guidelines for Evaluators but that only the (minor) revisions to the rules be added to the NDS Introductory Material. These actions were considered reasonable assuming they satisfy the IAEA-NSDD's intent for the document.

- **Nuclear Moments:** Nick Stone's compilation of nuclear moment measurements has now been published (2005St24). However, his evaluation is not yet available, so 1989Ra17 is still the latest evaluation. Evaluators could confer with Nick on a case-by-case basis; otherwise they should check the numbers in the compilation and probably should avoid using weighted averages when several measurements of the same quantity are available.
- **Need for Mixing Ratio Calculation Program:** In the VAX-computer era, some evaluators had access to programs which calculated mixing ratios from a set of subshell ratio measurements; the need for such calculations remains, but the program does not. E. Browne will provide the citation for a published code and A. Sonzogni has agreed to prepare a suitable program for evaluators to use.

The meeting was adjourned at 10:30 am until 2 pm.

Proposal to Prepare a "Table of Nuclides" Type of Product Drawn Directly From ENSDF (J. Tuli):

With relatively little effort, it should be possible to modify the present NDS production codes to extract adopted and decay data from ENSDF, devoid of all comments and keynumbers, and provide this summary information for all nuclides both on the web, on CD-ROM and in several hard-copy volumes. Work could start in Spring 2006 and continue through Fall 2007. For the hard copy, it was proposed that an entire volume or two (*i.e.*, 4 or 8 issues/months) of Nuclear Data Sheets could be devoted to it.

The ensuing discussion noted that many users liked to have information for all nuclides in a single publication through which they could riffle, even though hard copy is not searchable. Concerns centered on (i) how much manpower would be diverted from evaluation work, since experience teaches that preparation of such a product cannot be a push-button operation, (ii) how many volumes of NDS would be needed to accommodate the amount of material generated and, consequently, how many mass chain publications would be significantly delayed as a result of this publication, and (iii) who constitutes the target audience, since structure researchers and the applied community will want different features in order to be satisfied.

Next Meeting: The USNDP meeting in 2006 has been scheduled to run from Tuesday 7 November through lunch time Thursday 9 November in order to avoid the Veteran's Day holiday to be observed at BNL on Friday 10th.

The meeting closed at 2:45 pm.