Nuclear Structure and Decay Data Working Group

U. S. Nuclear Data Network, April 27, 1998

Item: #5

Proposal:

NNDC is asked to continue to provide lists of priority A-chains and priority nuclides.

Purpose:

To provide a continuing method of informing evaluators about the status of those A-chains and nuclides within their area of responsibility. And, to reduce the number of new papers that have to be evaluated after the review is done.

Discussion:

The evaluators should suggest improvements in the way the priority cases are identified.

Proposal from Richard Helmer.

Nuclear Structure and Decay Data Working Group

U. S. Nuclear Data Network, April 27, 1998

Item: #6

Proposal:

All evaluators in this Working Group should advise the Working Group Chair if they agree that they will attempt to carry out any A-chain or similar large review within two months of the date they receive the material, and carry out any nuclide review or similar small review within three weeks. The agreement on the part of the evaluator assumes that the NNDC would send the material to the evaluator only after she/he has agreed to do the review and to the schedule.

Purpose:

To obtain the acknowledgement that reviews should not inordinately delay the publication of evaluations.

Discussion:

None.

Proposal from Richard Helmer.

Nuclear Structure and Decay Data Working Group

U. S. Nuclear Data Network, April 27, 1998

Item: #7

Proposal:

Request that the Coordinating Committee attempt to determine if there are unmet needs of the Astrophysics Community that lie within the current domain of ENSDF, that is, measured data for the specified quantities.

If the Community needs lie outside this domain, would this Community be well served by a file of computed half-lives and Q values within the NNDC, or if such a file would be useful, should it continue to be developed elsewhere?

Purpose:

To ascertain the unmet needs.

Discussion:

None.

Proposal from Richard Helmer.

Nuclear Structure and Decay Data Working Group

U. S. Nuclear Data Network, April 27, 1998

Item: #8

Proposal:

Request that the Coordinating Committee attempt to determine if the "High-Spin Community" wants this Data Network to establish a file of compiled, unevaluated high-spin data in the ENSDF format.

Purpose:

To respond to user community needs if they are well-defined, generally agreed to, and compatible with subsequent data entry into ENSDF.

Discussion:

This Working Group needs to know if the High-Spin Community wants such a file, rather than using their existing files. Would this user Community need to rewrite their calculational codes to use ENSDF data sets, and is this acceptable? Does the desired data already exist in High-Spin Community files? If so, can the user Community provide computer codes to translate their current files into ENSDF data sets?

Proposal from Richard Helmer.

Nuclear Structure and Decay Data Working Group

U. S. Nuclear Data Network, April 27, 1998

Item: #9

Proposal:

Upgrade ENSDF processing and checking codes possibly including:

- Extend the code LOGFT to provide correct results for unique 3rd and 4th forbidden beta decays.
- Redistribute RADLST with up-to-date atomic data.
- Extend the output obtained when extracting decay data from ENSDF to give the absolute gamma-ray intensities and the associated uncertainties.
- Update any PC processing codes that are not as advanced as the VAX codes.
- Make changes in ENSDF that are needed for the year 2000. This involves converting to 8-character keynumbers on Q and ID records. On ID records, 'DATE' changes from YYMMDD to YYYYMM, eliminate 'PUB' field, and expand 'DSREF' to 35 characters. Also, reference data set and 'R' records will be eliminated.
- Improve the plotting of bands and complex level schemes. Goals might be to eliminate cases where the energy of the level at which a gamma terminates is not clear due to the complexity of the scheme and to show high-spin data primarily in the bands.

Purpose:

To improve the evaluation methodology and the usefulness of the data provided the user.

Discussion:

The unique beta decays mentioned do occur, so the correct values should be available.

Currently the extraction of decay data from the ENSDF file give the gamma-ray intensities as they are in ENSDF, which is often relative values that must be multiplied by a scaling factor. For decays with a large number of gamma rays, a lot of hand calculation must be done in order to get the absolute intensities.

Proposal from Richard Helmer in response to several suggestions.

Nuclear Structure and Decay Data Working Group

U. S. Nuclear Data Network, April 27, 1998

Item: #10

Proposal:

Data in neutron-rich nuclei from recent spontaneous fission measurements be treated as a special sub-topic of high-spin data and compiled or evaluated promptly.

Discussion:

The application of large detector arrays to the investigation of prompt gamma rays emitted in the spontaneous fission of ^{252}Cf and ^{248}Cm is yielding a rapidly growing body of nuclear structure data on neutron-rich nuclei in the 90-160 mass range. Over the last five years (1993-1997), the two main collaborations in the field published about 50 papers, identifying and assigning gamma transitions in and elucidating level schemes of, over 70 nuclei, ranging from strontium to samarium. The analysis of a more recent experiment done at Gammasphere with a thin ^{252}Cf source by University of Rochester and collaborators is beginning to generate additional data. Prompt gamma de-excitation of nascent fission fragments samples mainly the yrast level sequence up to spins of 20. The data can therefore be viewed as an extension of high spin data to the neutron excess region, which is not accessible by conventional high spin accelerator experiments.

Only a relatively small fraction of these data has so far been incorporated in ENSDF, and progress is quite slow, relative to the rate at which the data are being generated and published. In the normal course of events it will take many years till all the relevant mass chains come up for re-evaluation. Since this particular body of data represents a substantial extension of available nuclear structure data in the neutron-rich domain (and may be of practical significance to the nuclear power community), its inclusion in ENSDF should be expedited.

Proposal from Jacob Gilat, LBNL

Nuclear Structure and Decay Data Working Group
U. S. Nuclear Data Network, April 27, 1998

Item: #11

Proposal:

Add to NSR database, flags to indicate the "importance" of a paper and its status in relation to ENSDF.

Purpose:

To provide currency by means of NSR to compensate for the lack of manpower to keep ENSDF current.

Discussion:

A frequent criticism leveled against the nuclear data program is the long time lag between the publication of new data and their evaluation and inclusion in the evaluated data files. Given the large amount and increasing complexity of the data on the one hand, and the limited resources for evaluation on the other, the chance of a major improvement of the timeliness of the evaluation process in the foreseeable future is quite low. Different ways to alleviate this situation have been proposed: creating and disseminating an interim file of compiled (but not evaluated) data, selective priority evaluation of partial data sets of special interest to user communities, 'horizontal evaluation' and other variations on the theme. A major shortcoming of these proposed approaches is that their implementation entails a further dilution of available resources, leading to an even longer time lag and eventual impairment of the quality of the end product. The resulting status quo leaves the user in the unsatisfactory position of having to scan a rather large number of Recent References, to evaluate the validity of the data they contain and to assess their importance to his own project.

To partially alleviate the problem, I propose to make more efficient and effective use of the human resources devoted to the generation and maintenance of the NSR database. Instead of operating it as an essentially independent and separate effort, the idea is to integrate and share its resources with the rest of the program. Since highly qualified professional manpower is already being used to scan the literature and enter it in the NSR database, it shouldn't be difficult to generate for each paper a flag or a series of flags, indicating the importance and possible impact of the paper. Such flags, generated as an integral part of the process, would be based on agreed criteria developed by the network . One flag could indicate the "added value" figure of merit, i.e. the fraction of new data added or substantially modified by the paper relative to ENSDF. The network could also use the same figure of merit to assign evaluation priorities. A second useful flag (inserted into NSR in the final stages of the evaluation process) could indicate that the information on this nuclide in a given paper has already been included in ENSDF. (Yet another useful addition to NSR might be a link to an archived electronic copy of the actual paper, especially for less common literature sources.)

Proposal from Jacob Gilat, LBNL

Nuclear Structure and Decay Data Working Group

U. S. Nuclear Data Network, April 27, 1998

Item: # 12

Proposal:

A standard practice for incorporating horizontal evaluations into ENSDF shall be established. The data from the horizontal evaluation shall be provided to the evaluator of the corresponding mass-chain. This evaluator shall decide whether to incorporate these data into ENSDF as is, or after modifying it. If the mass-chain does not have a regular evaluator, or that evaluator is not available for this task, this authority shall be exercised by the NNDC.

Purpose:

To provide a mechanism for the orderly incorporation into ENSDF data from all horizontal evaluations.

Discussion:

A set of data from a horizontal evaluation will usually require changes in the corresponding Adopted Levels, Gammas data set. Sometimes, the person doing the horizontal evaluation will not be in a position to up-date the corresponding Adopted Data set. This would route the super-deformed band evaluations and decay-data evaluations through the A-chain evaluators rather than through a single reviewer. This would in principle, but probably not in practice, route some decay-data evaluations through the Utrecht group.

Proposal from Richard Helmer in response to issues raised by others.

Nuclear Structure and Decay Data Working Group

U. S. Nuclear Data Network, April 27, 1998

Item: # 13

Proposal:

The Network shall support the development of a code for simultaneously interpolating internal-conversion coefficients from the tables of Hager and Seltzer, Rösel et al., and Band for ENSDF format data sets. The evaluator will then use her/his preferred values and identify the table used. The difference between the values from the first two tables can be used as an additional indication of the uncertainty in the theoretical values.

Purpose:

To improve the evaluation methodology of the Network.

Discussion:

The French participants in the Decay Data Evaluation Project are supporting an effort by Russian theorists to produce an interpolation code that incorporates all three of these tables. By combining this code with a routine to read ENSDF data sets, it will be possible to interpolate ICC's for extended Z and energy ranges, and use the differences in the values as an indication of the uncertainty in the theoretical values. (There is a possibility that the French will also support the calculation of a new set of theoretical values.)

Proposal from Richard Helmer.

Nuclear Structure and Decay Data Working Group

U. S. Nuclear Data Network, April 27, 1998

Item: # 14

Proposal:

To make available a new set of measured distributions of log ft values for allowed and 1st forbidden beta transitions.

To use the most probable values from these distributions for estimating the intensity of beta transitions that can not be determined from direct measurements or intensity balances. The widths of these distributions can be used to estimate the uncertainty of the deduced beta intensities.

Purpose:

To improve the evaluation methodology.

Discussion:

These distribution are based on retrieval of about 8000 log ft values from the ENSDF database.

The current practice is to use the existing log ft systematics to determine a limit on the beta transition intensity when the intensity can not be determined otherwise. These new log ft distributions provide sufficient data to determine the most probably log ft value and the uncertainty thereof.

Proposal from Balraj Singh and Richard Helmer.

Nuclear Structure and Decay Data Working Group

U. S. Nuclear Data Network, April 27, 1998

Item: #15

<u>Proposal</u>:

The Network shall promote the use of the Limitation of Relative Statistical Weight, LRSW, method for averaging data and shall provide a computer program for this purpose. The Network shall also provide codes to average data by means of the Normalized Residual and RAJEVAL methods which provide aggressive treatments for the more discrepant values.

<u>Purpose</u>:

Promotion of more critical, and more uniform, evaluation of sets of measured values, especially where the values are discrepant.

<u>Discussion</u>:

The US NDN Subcommittee of Formats and Procedures endorse the recommendation of the Limitation of Relative Statistical Weights method in March 1996, and the international Decay Data Evaluation Project has adopted this method and is using it.

The IAEA Nuclear Data Section used this method in the "Co-ordinated Research Programme (CRP) on the Measurement and Evaluation of X- and Gamma-ray Standards for Detector Efficiency Calibration". It has been extensively used by the National Physical Laboratory (NPL), Teddington, for the evaluation of half-life results, and at the AEA Technology, Harwell, for the evaluation of half-life and gamma-ray emission probability data.

Proposal from Edgardo Browne, amended, by Richard Helmer

Nuclear Structure and Decay Data Working Group

U. S. Nuclear Data Network, April 27, 1998

Item: #16

Proposal:

Do evaluations only for Adopted Levels and Adopted Gammas. For all other data sets, only compilations will be done, or just provide directions to the appropriate references.

Purpose:

To reduce the work to be done to the available manpower.

Discussion:

None available.

Proposal from European evaluator

Nuclear Structure and Decay Data Working Group

U. S. Nuclear Data Network, April 27, 1998

Item: #17

Proposal:

Create a new type of ENSDF data set called IONIZED ATOM.

Purpose:

To provide retrievable storage of data related to ionized atoms, especially fully stripped atoms.

Discussion:

An example of this case is ^{163}Dy.

A new dataset should exist of the 163Ho with the following name: 163Dy B- DECAY (47D): IONIZED ATOM. In the next record a comment should appear that it is the 66+ ionic (fully stripped of electrons) state of 163Dy. The parent card should be 163Dy with an energy level that of the ionized atom, in this case a few keV or so. The daughter level populated in this decay should be just 163Ho gs. I do not know whether logft values can be calculated easily for such cases, since screening corrections will be different.

In 163Dy adopted level dataset, a level should be added near gs, such as a few keV for 163Dy with a %B-=100, T1/2=47 D +4-5 and a comment that this is an atomic excited state of 163Dy gs with all the 66 electrons stripped.

In 163Ho adopted level dataset, 163Dy B- decay (47 D) dataset should be listed under XREF and gs population from this decay should be indicated.

Proposal from Balraj Singh

Nuclear Structure and Decay Data Working Group

U. S. Nuclear Data Network, April 27, 1998

Item: #18

Proposal:

This Working Group suggests that the attendance of evaluators at the international meeting in December be limited to approximately four, unless DOE requests that more attend.

It is recommended that all technical proposals to be offered at that meeting by U. S. evaluators be conveyed in advance to the NNDC and that they be organized by the NNDC into a coherent group.

Purpose:

To limit the financial expenditure related to this meeting and to coordinate the technical discussions.

Discussion:

None

Proposal from Richard Helmer.

Nuclear Structure and Decay Data Working Group

U. S. Nuclear Data Network, April 27, 1998

Item: #19

Proposal:

This Working Group authorizes its Chair to pursue, during the period before the next Working Group meeting, with the appropriate members of this Group, any items from this agenda, and if necessary to accumulate information on these items to promote future decisions.

Purpose:

To promote action between meetings.

Discussion:

None.

Proposal from Richard Helmer.

Nuclear Structure and Decay Data Working Group

U. S. Nuclear Data Network, April 27, 1998

Item: #20

Proposal:

Promote comments from the community that currently uses the Internet and WWW access to ENSDF by adding an option in the exit ritual that solicits comments on possible errors in the file and suggested improvements

Purpose:

To increase interaction with users.

Discussion:

None.

Proposal from Richard Helmer.

Nuclear Structure and Decay Data Working Group

U. S. Nuclear Data Network, April 27, 1998

.

Item #21:

Proposal:

To establish a joint effort with the NuBASE group to horizontally evaluate new nuclides as follows.

1) Audi et al. and the Isotopes Project would track new nuclides as they appear in the literature.
2) The Isotopes Project would prepare ENSDF datasets for these nuclides on a priority basis.
3) The NuBASE group would review these evaluations.
4) ENSDF datasets would be submitted to the NNDC.

Purpose:

To update ENSDF, on a priority basis, new nuclides as they appear in the literature.

Discussion:

The Isotopes Project has been compiling and evaluating new nuclides on a priority basis[1] for over a year. These nuclides are also contunuously tracked by the NuBASE group (G. Audi et al)[2]. New nuclides are an important focus of interest in several research communities including nuclear structure, astrophysics, and radioactive beams. Coordination of the two parallel efforts will reduce potential duplication of effort.

[1] R.B. Firestone, Over 200 isotopes published in the ENSDF file in 1997.

[2] G. Audi, O. Bersillon, J, Blachot, and A.H. Wapstra, "The Nubase evaluation of nuclear and decay properties", Nucl. Phys. A6224, 1(1997).

Proposal presented by R.B. Firestone and G. Audi.

Nuclear Structure and Decay Data Working Group

U. S. Nuclear Data Network, April 27, 1998

.

Item #22

Proposal:

To modify the ENSDF format for spontaneous fission data as follows.

1) The "NR" normalization field should be used to normalize transition intensities so that the total intensity feeding the ground state is 100.
2) The "BR" normalization field should contain the fission yield so that Ig*NR*BR gives the gamma-ray yield per 100 fissions of the precursor.
3) A parent record should be provided for the fissioning nucleus.

Purpose:

To provide complete information with spontaneous fission decay datasets for normalizing the transition intensities to per 100 fissions.

Discussion:

Several recent experiments at the large Ge detector arrays have provided a large amount of new data for neutron-deficient isotopes. These data are being compiled by the Isotopes Project in ENSDF format. Minor modifications to ENSDF format and policy are proposed to normalize this data in a similar manner to other decay datasets. (Fission yields are available from the Spontaneous Fission home page at http://ie.lbl.gov/fission.html.)

Proposal presented by R.B. Firestone and J. Gilat on behalf of the GANDS collaboration.

Nuclear Structure and Decay Data Working Group
U. S. Nuclear Data Network, April 27, 1998

Item #23:

Proposal:

To make minor modifications to ENSDF format and policy as follows:
1) There should be a single (n,g) E=thermal dataset containing both primary and secondary gammas normalized per 100 neutron captures by the NR normalization. Separate datasets for primary and secondary transitions would be phased out.
2) The "BR" normalization field should contain the thermal neutron capture cross-section in barn units.
3) The Westcott g-factor should be included in a new field, possibly columns 65-76 on the normalization record.
4) The "NB" field should contain the isotopic abundance of the capture nucleus.
5) Multipolarities and mixing ratios should be taken from the Adopted Levels, Gammas dataset. Internal conversion coefficients should be included when appreciable.
6) Evaluators should typically normalize the gamma-ray data in such a way that the total intensity populating the ground state is 100. Gammas from Adopted Levels, Gammas dataset, missed in the measurements, should be added before this normalization. If either the total intensity deexciting the capture state is less than 100 or the energy-weighted sum of normalized intensities is lower than the Q-value it should be reported in a comment.
7) The capture state energy should be taken from the most recent mass evaluation.
8) New capture gamma-ray data measured with natural targets on thermal or cold neutron guides will be included whenever the isotope identification is unambiguous, as separate sets marked E=cold. These data will also be considered for the normalization of E=thermal datasets whenever the cross section is verified to obey the 1/v law.

Purpose:
To provide a uniform method of incorporating capture gamma data into ENSDF so that it will be complete and useful for applications.

Discussion:

An IAEA CRP has been funded for 1999-2001 to compile a database for Prompt Gamma-Ray Neutron Activation Analysis. Both the LBNL Isotopes Project and the Institute of Isotope and Surface Chemistry, Budapest plan to participate. The goal of the CRP is to create a new library of experimental data for thermal and cold neutron capture. LBNL will participate in the compilation and reevaluation, including a set of new data measured with natural targets for all stable elements at Budapest. The data will be compiled in ENSDF format and will be made available over the Internet at http://ie.lbl.gov/ng.html for those interested in the progress.
The final dataset will be offered to the evaluators' network for inclusion in the ENSDF file after proper checks are made.

Proposal presented by R.B. Firestone and G. Molnar