# High-spin Task-Force / XUNDL Status Report (April 2000- April 2001)

(Prepared by B. Singh, McMaster, April 9, 2001)

## XUNDL database: purpose and scope

Provides prompt Internet access to recently published, primarily high-spin level-scheme data that are not yet available in ENSDF database.

The database is organized and managed by David Winchell and Tom Burrows at NNDC, BNL. The compilation and submission of datasets for XUNDL database is coordinated by B. Singh at McMaster.

The datasets in XUNDL are available at NNDC's web page and can also be viewed by LBNL's Isotope explorer and ORNL's RADWARE. Direct links (through NSR keynumber) are available to the published articles on journal web pages (provided the user has valid internet access to such journals).

Semi-automated procedures, as described in appendix #1, are routinely used to translate tabular data in journal web pages into ENSDF formatted datasets. The bulk of the initial compilation work is done by a trained under-graduate student at McMaster. Prior to submission of a dataset to XUNDL database, each dataset is checked for level-scheme consistency through BNL codes such as GTOL and FMTCHK, and also checked for band-structure annotations through LBNL's 'Isotope Explorer'.

Data errors found in original articles are routinely communicated by e-mail to the authors of these papers for their comments and subsequent corrections. Most common types of errors found in the papers are: 1. Quoted gamma-ray energy fails to match the level-energy difference; sometimes the deviations are several keV.
2. Spins and parities for some of the levels quoted in tables differ from those in figures. Generally, we get good cooperation and prompt response from the authors.

It seems that ENSDF evaluators are also making use of some of the datasets in XUNDL database in their recent evaluations.

**STATUS:**

Since the start of this project in Jan. 1999, a total of about 635 datasets have been added to XUNDL, covering mainly high-spin level-scheme structures for about 515 nuclides ranging from $^{36}$Ar to $^{254}$No (spread over 176 A-chains). The data were extracted from about 560 primary publications published primarily during 1996-2001, but also from some earlier ones in 1990-1995. About 80% contribution is from McMaster, while the other 20% datasets received from other centers were reviewed/edited at McMaster prior to inclusion in XUNDL.

The total number given above includes about 210 datasets which have been added since April 2000, about half of which were compiled since October 1, 2001 (i.e. FY 2001). Since May 2000, George Reed, an undergraduate student at McMaster has been involved in most of the initial compilation work. He will continue to work this summer, but then we have to find and train another student. The students are trained in basic nuclear physics, ENSDF formats, semi-automatic translation codes, consistency checking codes such as FMTCHK, GTOL, etc.

In the current literature on experimental nuclear structure, the high-spin publications still continue to dominate with about 75% publications in this field, as judged from our regular scanning of web pages of primary nuclear physics journals (PRL, PR-C, NP-A, PL-B, EPJ-A, JP-G) for new data. As of April 9, 2001, we are almost current on the compilation of current high-spin publications, except for about 8 papers published during March-April. These papers are presently being compiled. Last summer we also compiled main high-spin papers for some of the outdated (>10 years or so) A-chains in ENSDF. As time permits, we plan to do the same this summer as well.

## Other high-spin data:

### Superdeformed structures:

Full update of SD band data for ENSDF was completed at McMaster in October 2000, and another one in March 2001. As of April 9, 2001, all the published SD band data have been included in ENSDF, both in the reaction datasets and adopted datasets.

### Magnetic rotational bands:

A compilation of all the known magnetic dipole rotational bands (about 120 bands) with literature coverage up to August 99 was published in Atomic and Nuclear Data Tables (March 2000 issue). This work was initiated and guided by B. Singh and carried out in collaboration with a nuclear theory group in India.

Another update of these bands has just been completed to contain all data published as of the present date. We plan to submit the current update for publication in ADNDT journal.

## CONCLUSION:

We think that amongst the two databases: ENSDF and XUNDL, the experimentally known/published high-spin level structures are now adequately and conveniently available to the research community. There may be a few primary papers (perhaps no more than 150 or so) published during 1990-1997 which are probably still not included in the two databases mentioned above, but we expect that within one or two years, the coverage of such data should almost be complete.

**Appendix 1:**

**Semi-automated Procedures to Translate Tabular data in journals into ENSDF format:**

## • Step 1: Create text file of tabular data.

In the literature the level-scheme data are generally presented in one of the three styles:

1. Complete Tabular data: $E_\gamma$, $I_\gamma$, $E_{initial}$, $J_{initial}$, $A_2$, $A_4$, DCO, Multipolarity, Mixing ratio, Band label, etc.

   (Almost fully automatic; takes ~ 30 minutes to get a first draft of a dataset in ENSDF format, irrespective of the complexity of level scheme and number of gamma rays and levels involved).

2. Partial Tabular data (No $E_{initial}$, $J_{initial}$, Band label, etc.): (Partially automatic).

3. No Tabular data, only the level-scheme figure in paper: (<50% automatic).

For style #1: Create text file by extracting tabular data, using:
Adobe Acrobat for PDF files from web; OR
Scanner for hard-copy tables from LATEX or Postscript Files, followed by the use of OCR software.

For style #2: Create text file #1 as above for style #1.
Create text file #2, by entering $E_{initial}$ and Eγ's, as read from the level-scheme figure in a spreadsheet program such as EXCEL. Combine the two text files in EXCEL to get a final text file.

For style #3: Create text file by entering $E_{initial}$ and Eγ's, as read from the level-scheme figure in a spreadsheet program such as EXCEL.

For styles #2 and #3, it may take up to 3-4 hours, depending upon the complexity of the level scheme.

- **Step 2: Edit the text file created in step 1, using a text editor**.

  Arrange the data in columns with appropriate headings: (Ei, Eg, Ig, Ji, A2, MR, MU, DCO). At present T1/2 and A4 headings are not allowed in the code. The file must be free of any tabs (i.e. there should be spaces only).

  Use Radford's **TXT2ENSDF** (PC) code to convert the text file in step #1 to ENSDF format.

- **Step 3: Check the ENSDF formatted dataset for level-scheme consistency and possible data problems in publications**:

  Use BNL's **GTOL** code to perform a least-squares adjustment of the level-scheme and check for poorly fitted Eγ's. Use BNL's FMTCHK to check the formatting of the dataset. (Communicate with original authors if there are data problems in a paper).

- **Step 4: Check the final ENSDF formatted dataset using LBNL's viewer 'Isotope Explorer' to verify that the level scheme and the band assignments, correctly, match the publication.**