Evaluated nuclear structure data file (ENSDF) at Texas A&M: *A*=140

N. Nica,[1] and J. C. Hardy
[1]*under contract with Brookhaven National Laboratory*

Work for the *Evaluated Nuclear Structure Data File (ENSDF)* started at the Cyclotron Institute in 2005 and is continuing. After about 1.5 years, our work already makes Texas A&M one of the significant contributors to the U.S. Nuclear Data Program, a national-interest activity sponsored by DOE and maintained by the National Nuclear Data Center (NNDC) at Brookhaven National Laboratory.

Information in the ENSDF files is grouped by *A* number and is obtained through the compilation and evaluation of virtually all data ever published on each nucleus. The data evaluation process depends on individual evaluators, each of whom works on one *A*-chain at a time, and involves painstaking inter-comparison and reconciliation of diverse published measurements. All available measurements are grouped into data sets, one for each nucleus and measurement technique; once reconciled, these sets are gathered into a single comprehensive data set, the *Adopted Levels, Gammas,* the unique repository where the "best known" data for each nucleus are made available for anyone to use. The evaluated results for each *A*-chain are published in the Nuclear Data Sheets by Academic Press, as well as being widely disseminated through the internet. Recently, NNDC reported more than one million database retrievals in FY2006 [1], a success of the entire nuclear-structure data-evaluation network.

Conceived as a service for the nuclear basic science community, ENSDF has become one of the most effective ways through which basic research renders service to society. Its beneficiaries include many other science and technology communities, such as biology, chemistry, environmental studies, pharmaceutical and medical industries, and various industries; recently this group has also included the Department of Homeland Security in its efforts to monitor terrorism-related activities.

Our evaluation work at the Cyclotron continued this past year with the mass chain A=140 which is one of the largest mass chains, comprising sixteen isobars (Te, I, Xe, Cs, Ba, La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho). In the preceding, 1994 evaluation [2] 67 data sets were included. Now there are 81 data sets [3], a 20% increase in the number of ways (different reactions or experimental methods) that the nuclei in this mass chain have been studied in the last 13 years. Most of the 80-character line records in the database (*ens* format) [4] are pure data records; the remaining ones are comment lines, which contain both data and explanations. Overall, the number of ens lines gives an idea about the quantity of data acquired per mass chain. For *A*=140 there are now almost 15000 lines, as compared with less than 7900 lines in 1994. This indicates that there has been a 90% increase in the data or, in other words, almost half of the data on *A*=140 nuclei has been obtained during the last 13 years.

The number of *ens* lines for each *A*=140 nucleus is plotted for both evaluations – 1994 and 2006 – in Figure 1. One can see that ^{140}La, ^{140}Nd, and ^{140}Eu together contribute half of all 2007 data, and they now contain three times more data than they did in 1994. These were not only the biggest data sets, but also the most discrepant ones, the evaluation of which was done in several layers and took about 3000 hours of work by the evaluator.

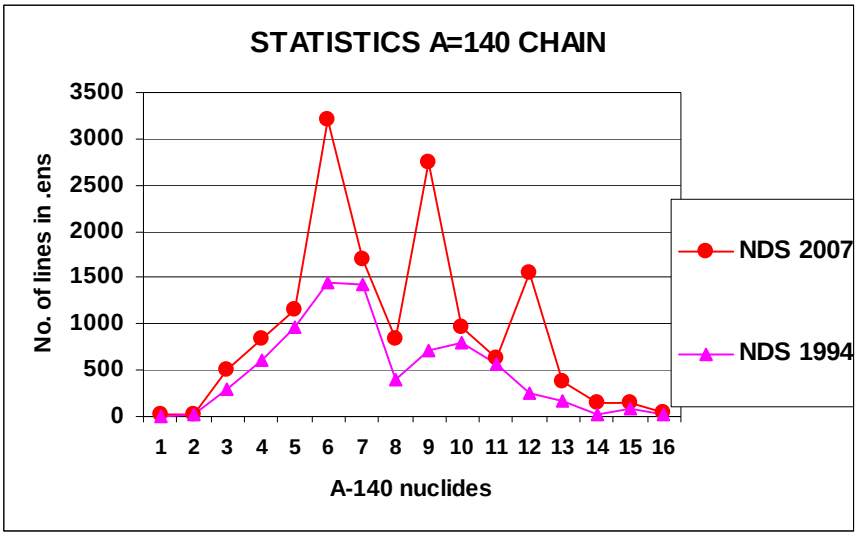

Figure 1. Comparison of A=140 data evaluated for NDS 2007 [3] and NDS 1994 [2], showing the number of ens lines for each nucleus in the mass chain.

[1] The Bulletin, vol. **60**, no. 36, Oct 20, 2006, published by Brookhaven National Laboratory

[2] L.K. Peker, Nucl. Data Sheet **73**, 261 (1994).

[3] N. Nica, Nucl. Data Sheet (to be published).

[4] http://www.nndc.bnl.gov