United States Nuclear Structure Data Program (USNDP) and Evaluated Nuclear Structure Data File (ENSDF) at Texas A&M University Evaluation Center of Cyclotron Institute

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Nuclear data evaluation fills a century-long chapter of nuclear science. A search in the *Nuclear Science Reference* (NSR) database maintained at the National Nuclear Data Center (https://www.nndc.bnl.gov/nsr/) on the author "M. Curie" produces a paper titled "*The Radioactive Constants as of 1930*" [1]. The introduction to this paper states that "*the need has arisen for the publication of special Tables of the Radioactive Constants*" and continues, "*This responsibility has been assumed by the International Radium Standards Commission chosen in Brussels in 1910 (...)*". Here we have the origin of what today is known as nuclear data evaluation.

Starting with the first generation of nuclear chemists and physicists, when measurements were already producing diverse and sometimes conflicting data, it became evident that assembling and reconciling the data from all across the published literature was a tedious and difficult task. Nevertheless, only after such a systematic analysis could the community arrive at recommended "practical standards," which could then be updated periodically to reflect the continuous improvements in knowledge and technology. Soon nuclear data evaluation became a specialized branch of research in its own right.

After the Second World War most of this activity was taken across the Atlantic and hosted by the United States Nuclear Structure Data Program (USNDP), which maintains the Evaluated Nuclear Structure Data File (ENSDF) database. While mostly undertaken by U.S. national laboratories, it has expanded to a relatively small number of university research labs, which has included the Texas A&M Cyclotron Institute since 2005. For more than a decade, the Texas A&M effort was financed by a contract with Brookhaven National Laboratory, but in 2017 it started to receive direct financing through the DOE Grant DE-FG03-93ER40773, "Cyclotron-based Nuclear Science". Moreover, since May 2017 Texas A&M Cyclotron Institute has been recognized and invested as an independent ENSDF Data Evaluation Center included within the Nuclear Structure and Decay Data international network.

Since 2005 we have completed and published the following full mass chain evaluations: the superheavy A=252 mass chain [2]; the very data-rich mid-mass chains, A=140 [3], A=141 [4], A=147 [5], and A=148 [6]; the relatively lighter chains, A=97 [7] and A=84 [8], the latter in a large international collaboration. In collaboration with B. Singh and a group of authors from McMaster University, Canada, we also published the A=77 [9], A=37 [10], A=36 [11], and A=34 [12] mass chains. At the beginning of 2016 another of our large mass chains, A=157, was published in Nuclear Data Sheets [13], followed by A=158 in 2017 [14], and the renewed full evaluation of A=140 in 2018 [15]. Finally, after its initial submission in September 2016, A=155 was corrected and updated after a long review process, and published after more than three years toward the end of 2019 [16]. In August 2019 we finalized and successfully first submitted A=147 which was our commitment for the USNDP data effort for FY 2019.

After the last decade crisis of new ENSDF evaluators, now it appears that the generational crisis moved to the ENSDF reviewers, which became critical in the last couple of years. This came by the retirement of many senior evaluators as well as by promoting an increased quality standard for the ENSDF published and on-line database data. The new standard consists of a pre-review process immediately after the first submission of a newly evaluated mass chain, which establishes whether the mass chain is admitted in the review pipe, followed by the review process itself, and by an editorial review before publication at the end. When combined with the large size mass chains as those in our responsibility, this generates typical intervals of more than three years spent by a mass chain in the publication pipe. This explains why the mass chains A=160, A=153, and A=147 submitted respectively in 2017, 2018, and 2019 are all in the publication process.

In September 2019 we started a new full evaluation for the mass chain A=141, covering all publications since January 2012. The mass chain consists of the following isobars, in total, 17 nuclei: Sb, Te, I, Xe, Cs, Ba, La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, and Ho. Our bibliographical searches found that in the interval since January 2012, 206 papers have been published relating to this mass chain, of which 176 are primary references (most important). In all, 111 are experimental. This work is in progress.

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