Progress Report on Nuclear Structure and Decay Data Activities at Argonne National Laboratory*

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I. Program overview

The Argonne Nuclear Data Program is involved in a number of scientific activities carried out within the broad framework of the U.S. Nuclear Data Program (USNDP) Coordinated Work Plan. The main emphasis is on nuclear structure and decay data, and their applications in nuclear physics research, and in applied nuclear technologies. Compiled and evaluated data are made available to the National Nuclear Data Center (NNDC) for inclusion in the Evaluated Nuclear Structure Data File (ENSDF) database or the results are published directly in peer-reviewed scientific journals. Contributions are also made to various specialized databases that serve specific needs in the fields of nuclear structure, nuclear astrophysics and applied nuclear physics. This effort includes evaluations of atomic masses and complementary nuclear structure data for the Atomic Mass Evaluation (AME) and NUBASE databases, and compilations of recently published nuclear structure data for the Unevaluated Nuclear Data List (XUNDL) database. Measurements aimed at providing answers to specific questions and at improving the quality of existing databases in specific areas are also performed. The experiments are carried out at the U.S. Department of Energy nuclear physics user facilities and at leading nuclear physics laboratories elsewhere through collaborative arrangements.

II. Nuclear Data Evaluations Activities for ENSDF and XUNDL

The main emphasis of the nuclear data evaluation activities at Argonne National Laboratory is on nuclear structure and decay data evaluations for the ENSDF database. The ANL nuclear data center has responsibilities for evaluating nuclei within the **A=106-112, 176-179** and **199-209** mass chains. The up-to-date status of the evaluations under the ANL responsibility is presented in Table 1. During the period of time covered by this report, evaluations of the **A=109** (with S. Kumar, University of Delhi and Jun Chen,

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ANL) and **188** (with Prof. S. Juutinen, Jyvaskyla University and Prof. D. Hartley, US Naval Academy) mass chains were completed. Work on **A=177** mass chain is continuing. Compilations for the XUNDL database, as well as ENSDF evaluations for nuclides where the first experimental results about their properties become available, were also carried out.

Table 1. Status of mass chain evaluations assigned to the ANL nuclear data center

Mass Chain	**NDS publication**	**Evaluator**	**Current Status**
176	NDS **107** (2006) 791	M.S. Basunia	completed/**LBNL**
177	NDS **98** (2003) 801	F.G. Kondev	completed/**under revision**
178	NDS **110** (2009) 1473	E. Browne	completed/**Argentina**
179	NDS **110** (2009) 265	C.M. Baglin	completed/**LBNL**
199	NDS **108** (2007) 79	B. Singh	completed/**McMaster**
200	NDS **108** (2007) 1471	F.G. Kondev & S. Lalkovski	completed
201	NDS **108** (2007) 365	F.G. Kondev	completed
202	NDS **109** (2008) 699	S. Zhu & F.G. Kondev	completed
203	NDS **105** (2005) 1	F.G. Kondev	completed
204	NDS **111** (2010) 141	C.J. Chiara & F.G. Kondev	completed
205	NDS **101** (2004) 521	F.G. Kondev	completed
206	NDS **109** (2008) 1527	F.G. Kondev	completed
207	NDS **112** (2011) 707	F.G. Kondev & S. Lalkovski	completed
208	NDS **108** (2007) 1583	M. Martin	completed/**ORNL**
209	NDS **126** (2015) 373	J. Chen & F.G. Kondev	completed

Mass Chain	**NDS publication**	**Evaluator**	**Current Status**
106	NDS **109** (2008) 943	D. De Frenne & A. Negret	completed
107	NDS **109** (2008) 1383	J. Blachot	completed
108	updated online 2008	J. Blachot	completed
109	NDS **137** (2016) 1	S.Kumar, J.Chen & F.Kondev	completed
110	NDS **113** (2012) 1315	G. Gurdal & F.G. Kondev	completed
111	NDS **110** (2009) 1239	J. Blachot	completed
112	NDS **124** (2015) 157	S. Lalkovski & F.G. Kondev	completed

Evaluated mass chains not assigned to the ANL region of responsibilities

188	submitted in 2016	S.Juutinen,D.Hartley,F.Kondev	completed/under review

III. Other Activities

The Argonne nuclear data program continued contributing to ongoing evaluations of atomic masses in collaboration with scientists from CSNSM (Orsay, France), IMP (Lanzhou, China) and RIKEN (Japan).

Our program is also involved in complementary Nuclear Data related research activities. This effort complemented the main ANL evaluation activities by providing training experience to the evaluator on modern experimental techniques and instruments that are used in nuclear data production. It also allowed maintaining contacts with a broad range of nuclear data users and with the FRIB and GRETINA research communities, in particular. Contributions were made to collaborative nuclear structure and decay research activities at the ATLAS and CARIBU facilities aimed at providing answers to specific questions and at improving the quality of existing USNDP databases in specific areas. Decay data measurements aimed at improving decay data in the actinide region continued. The main emphasis was on properties of nuclei far from the line of stability and nuclear isomers in heavy Pu, Cm, No and Rf nuclei. Decay studies of neutron-rich nuclei in the deformed A~160 fission product region were also initiated at the CARIBU facility.