Oak Ridge National Laboratory

STATUS REPORT ON NUCLEAR STRUCTURE AND DECAY DATA ACTIVITIES AT OAK RIDGE NATIONAL LABORATORY

24th Technical Meeting of the Nuclear Structure and Decay Data (NSDD) Network

Caroline Nesaraja, Michael Smith

U.S. DEPARTMENT OF ENERGY

Members:

- Michael Smith: PI Nuclear Data Program – Nuclear astrophysics experiment and data
- Caroline Nesaraja: Research Staff - ENSDF evaluator
- Larry Zhang : Student - nuclear astrophysics data

Activities:

- Nuclear Structure Data (ENSDF)
- Nuclear Astrophysics Data

Nuclear Structure Data:

Mass Chain Evaluation

ORNL responsibility: A=241-249, A=69

Nuclear Structure and Nuclear Astrophysics Group

Nuclear Data Group

About Research Areas Staff Publications

Mass Chain	Current ENSDF Database (from NNDC website)	
241	C.D. Nesaraja. NDS 130, 183 (2015)	(Lit cut-off Sept, 2015)
242	Y. A. Akovali. NDS 96, 177 (2002)	(Lit cut-off Sept., 2001)
243	C.D. Nesaraja & E.A. McCutchan. NDS 121, 695 (2014)	(Lit cut-off Sept., 2013)
244	C.D. Nesaraja : NDS 146, 387 (2017)	(Lit cut-off August, 2017)
245	E. Browne & J.K. Tuli. NDS 112, 447 (2011)	(Lit. cut-off June, 2010)
246	E. Browne & J.K. Tuli. NDS 112, 1833 (2011)	(Lit. cut-off Jan., 2011)
247	C. D. Nesaraja : NDS 125, 395 (2015)	(Lit. cut-off March, 2014)
248	M.J. Martin :NDS 122, 377 (2014)	(Lit. cut-off Sept., 2014)
249	K. Abusaleem: NDS 112, 2129 (2011)	(Lit. cut-off Dec. 2010)
69	C.D. Nesaraja : NDS 115, 1 (2014)	(Lit. cut-off July, 2013)

FTE (ENSDF) : 0.8

Mass Chain	Evaluator	#Nuclides	Status
*137	Nesaraja	16	Editorial Review
246	Nesaraja	9	Submitted to NNDC
242	Martin/Nesaraja	9	Editorial Review

NUCLEAR DATA SHEETS

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$^{137}_{49}In_{88}$		8
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$^{137}_{50}Sn_{87}$		9
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$^{137}_{51}Sb_{86}$		10
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	$^{9}Be(^{238}U,X)$...	16
$^{137}_{52}Te_{85}$		17
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	^{137}Sb β^- decay...	22
	^{138}Sb β^-n decay	26
	^{248}Cm SF decay	29
	$^{9}Be(^{238}U,F)$	32
$^{137}_{53}I_{84}$		33
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	^{239}Np SF decay	47
	^{248}Cm SF decay	49
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	$^{136}Xe(\alpha,3n\gamma)$...	197
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	^{137}Ce ε decay (34.80 h)...	245
	$^{130}Te(^{11}B,4n\gamma)$...	249
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	$^{136}Ce(n,\gamma)$ E=thermal...	317
	$^{136}Ce(n,\gamma)$ E=66 eV res...	321
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	$^{136}Ce(n,\gamma)$: E≈2 keV...	325
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$^{246}_{97}Bk_{149}$		80
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NUCLEAR DATA SHEETS

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$^{242}_{93}Np_{149}$		11
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	^{242}U β^- decay	14
$^{242}_{94}Pu_{148}$		17
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	^{242}Np β^- decay (2.2 min)	33
	^{242}Np β^- decay (5.5 min)	37
	^{242}Am ε decay (16.01 h)	40
	^{246}Cm α decay	43
	$^{241}Pu(n,\gamma)$ E=th:primary γ's	45
	$^{241}Pu(n,\gamma)$ E=th:secondary γ's	47
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	^{242}Es ε decay	169
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A=242

A=137

September 2018: Submitted A=137

December 2019: Reviewer's comments received for A=137

August 2022:   Resubmitted A=137

Between September 2019- August 2022 (3 years lag time)

- Extensive changes made to previous evaluation as requested by reviewer.
- Included numerical MTAS data from previous paper that was not available at initial submission
- New papers (~24 papers) have come out within the 3 years.

Lag time is due to the strict productivity matrix requirement by NNDC for new submission every year.

Other Activities related to Nuclear Data

1. Workshop for Applied Nuclear Data Activities (WANDA)

Workshop for Applied Nuclear Data Activities (WANDA 2022) [FINAL]

28 Feb 2022, 07:30 → 4 Mar 2022, 18:15 US/Pacific

Cisco WebEx (Virtually)

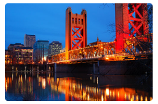
Bruce Pierson (Pacific Northwest National Laboratory), Karolina (Kay) Kolos (Lawrence Livermore National Laboratory)

M. Smith: Co-Organizer and Chaired a session

200 registered participants

2. 15th International Conference on Nuclear Data for Science and Technology (ND2022)

15th International Conference on Nuclear Data for Science and Technology (ND2022)



ND2022 is the latest in a series of conferences on nuclear data held every three years since 1978. This conference brings together international experts involved in generating and using nuclear data for a week of presentations and in-depth discussion.

ND2022 is being organized by LLNL and will be held July 24–29, 2022. The conference was originally scheduled to be held at the SAFE Credit Union Convention Center in Sacramento, California, but has been converted to a virtual event due to ongoing COVID-19 uncertainty.

More information about the conference is available at the ND2022 website.

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Operated by Lawrence Livermore National Security, LLC, for the Department of Energy's National Nuclear Security Administration.

C. Nesaraja: International Program Committee

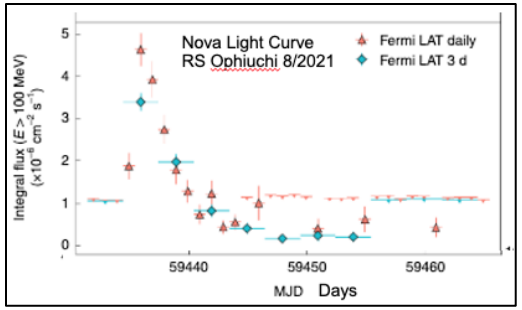
418 registered participants

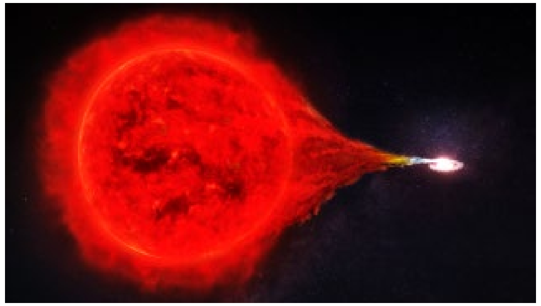
3. Nuclear Science Advisory- Nuclear Data Subcommittee

DOE/NSF Nuclear Science Advisory Committee

C. Nesaraja: NSAC-ND Subcommittee

Nuclear Astrophysics Data:





Nova RS Ophiuchi erupted in 8/2021

Assessing uncertainties of reactions
critical for nucleosynthesis in Stellar Explosions

Thermonuclear Reaction Rate Uncertainties

- uncertainties of some reaction rates in STARLIB library were temperature averaged to work with a set of thermal profiles for nova outbursts

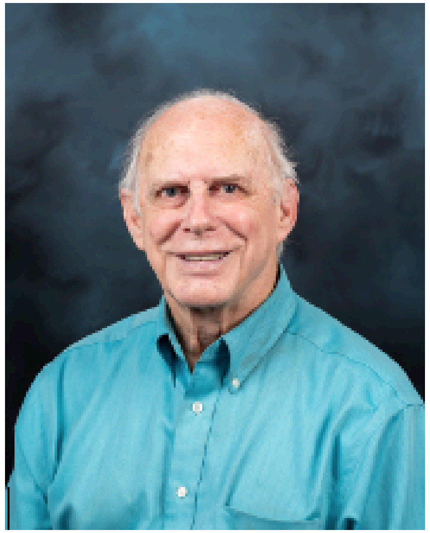
- these new rate uncertainties are currently being tested in an uncertainty quantification (UQ) analysis of nova nucleosynthesis

- a scheme to incorporate these uncertainties into the REACLIB standardized reaction rate library is being developed

Nuclear Astrophysics Data Needs Summarized

- nuclear data needs for nuclear astrophysics research were itemized and presented to
  - NSAC-Nuclear Data subcommittee (June 2022)
  - 2022 Low Energy Community Meeting (ANL, Aug 2022)
  - Workshop on Uncertainty Quantification and Covariances (LANL, Oct 2022)

Murray Martin – Pioneer of Nuclear Data



In Memoriam
Murray J. Martin, 1935-2022

The field of nuclear data lost a pioneer with the passing of Murray Martin on March 9, 2022.

Born in Regina, Canada in 1935, Murray Martin received his B.A. and M.A. in experimental physics from the University of Saskatchewan and his PhD in theoretical nuclear physics in 1962 from McMaster Univ. His thesis was entitled “A Study of the Low-Lying Excited Levels in the Even Lead Isotopes”. He joined the NSF Data Project in 1962 in Washington, DC, and then followed that project as it moved to ORNL in 1964 as the Nuclear Data Project (NDP). Murray stayed with the NDP until his retirement in 1997 but resumed his work on a part-time basis in 2004 as a subcontractor to ORNL, which he continued until his last days.