

Texas A&M University
US Nuclear Data Program

TAMU ENSDF Report
FY2018

N. Nica

J.C. Hardy

Evaluation of Nuclear Structure and Decay Data

OVERVIEW

- *Scope:*

Promote and accomplish mass-chain nuclear structure data evaluation at Texas A&M University - Cyclotron Institute as regular activity and foresee future developments.

- *2005-2017: under contract with BNL/NNDC*

- *67% FTE Mass Chain Evaluation*
- *N. Nica (PI, evaluator), J.C. Hardy (scientific adviser)*

- *FY2018: NSDD Data Center*

- *67% FTE Mass Chain Evaluation*
- *N. Nica (PI, evaluator), J.C. Hardy (scientific adviser)*

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Contributions

- *Major Direct Contribution to USNDP/NSDD: Nuclear Data Evaluation*
 - *13 major publications*
- *Important Contribution to USNDP/NSDD: Precision ICC Measurements*
 - *BrIcc adopted the “Frozen Orbitals” calculations*
 - *^{103}Rh , ^{125}Te , ^{127}Te , ^{111}Cd , ^{119}Sn , ^{134}Cs , ^{137}Ba , ^{197}Pt , ^{191}Os , ^{193}Ir*
 - *14 major publications*
- *Texas A&M Contribution to Precision Nuclear Data Production: Precision β - γ Measurements (Standard Model, CKM matrix)*
 - *$T_{1/2}$, Branching Ratios*
 - *15 major publications*

Mass Chain Evaluation: 220+ nuclei, 17 A-chains

- 1. [N.Nica](#), *Nuclear Data Sheets for A = 252*, Nucl.Data Sheets 106, 813 (2005)
8 nuclei: ^{252}Cm , ^{252}Bk , ^{252}Cf , ^{252}Es , ^{252}Fm , ^{252}Md , ^{252}No , ^{252}Lr
- 2. [N.Nica](#), *Nuclear Data Sheets for A = 140*, Nucl.Data Sheets 108, 1287 (2007)
16 nuclei: ^{140}Te , ^{140}I , ^{140}Xe , ^{140}Cs , ^{140}Ba , ^{140}La , ^{140}Ce , ^{140}Pr , ^{140}Nd , ^{140}Pm , ^{140}Sm , ^{140}Eu , ^{140}Gd , ^{140}Tb , ^{140}Dy , ^{140}Ho
- 3. [D.Abriola et al.](#), *Nuclear Data Sheets for A = 84*, Nucl.Data Sheets 110, 2815 (2009)
1 nucleus: ^{84}Y
- 4. [N.Nica](#), *Nuclear Data Sheets for A = 147*, Nucl.Data Sheets 110, 749 (2009)
16 nuclei: ^{147}Xe , ^{147}Cs , ^{147}Ba , ^{147}La , ^{147}Ce , ^{147}Pr , ^{147}Nd , ^{147}Pm , ^{147}Sm , ^{147}Eu , ^{147}Gd , ^{147}Tb , ^{147}Dy , ^{147}Ho , ^{147}Er , ^{147}Tm
- 5. [N.Nica](#), *Nuclear Data Sheets for A = 97*, Nucl.Data Sheets 111, 525 (2010)
14 nuclei: ^{97}Br , ^{97}Kr , ^{97}Rb , ^{97}Sr , ^{97}Y , ^{97}Zr , ^{97}Nb , ^{97}Mo , ^{97}Tc , ^{97}Ru , ^{97}Rh , ^{97}Pd , ^{97}Ag , ^{97}Cd
- 6. [J.Cameron](#), [J.Chen](#), [B.Singh](#), [N.Nica](#), *Nuclear Data Sheets for A = 37*, Nucl.Data Sheets 113, 365 (2012)
10 nuclei: ^{37}Na , ^{37}Mg , ^{37}Al , ^{37}Si , ^{37}P , ^{37}S , ^{37}Cl , ^{37}Ar , ^{37}K , ^{37}Ca
- 7. [N.Nica](#), [J.Cameron](#), [B.Singh](#), *Nuclear Data Sheets for A = 36*, Nucl.Data Sheets 113, 1 (2012)
10 nuclei: ^{36}Na , ^{36}Mg , ^{36}Al , ^{36}Si , ^{36}P , ^{36}S , ^{36}Cl , ^{36}Ar , ^{36}K , ^{36}Ca
- 8. [N.Nica](#), [B.Singh](#), *Nuclear Data Sheets for A = 34*, Nucl.Data Sheets 113, 1563 (2012)
11 nuclei: ^{34}Ne , ^{34}Na , ^{34}Mg , ^{34}Al , ^{34}Si , ^{34}P , ^{34}S , ^{34}Cl , ^{34}Ar , ^{34}K , ^{34}Ca
- 9. [B.Singh](#), [N.Nica](#), *Nuclear Data Sheets for A = 77*, Nucl.Data Sheets 113, 1115 (2012)
12 nuclei: ^{77}Ni , ^{77}Cu , ^{77}Zn , ^{77}Ga , ^{77}Ge , ^{77}As , ^{77}Se , ^{77}Br , ^{77}Kr , ^{77}Rb , ^{77}Sr , ^{77}Y
- 10. [N.Nica](#), *Nuclear Data Sheets for A = 148*, Nucl.Data Sheets 117, 1 (2014)
16 nuclei: ^{148}Xe , ^{148}Cs , ^{148}Ba , ^{148}La , ^{148}Ce , ^{148}Pr , ^{148}Nd , ^{148}Pm , ^{148}Sm , ^{148}Eu , ^{148}Gd , ^{148}Tb , ^{148}Dy , ^{148}Ho , ^{148}Er , ^{148}Tm
- 11. [N.Nica](#), *Nuclear Data Sheets for A = 141*, Nucl.Data Sheets 122, 1 (2014)
16 nuclei: ^{141}Te , ^{141}I , ^{141}Xe , ^{141}Cs , ^{141}Ba , ^{141}La , ^{141}Ce , ^{141}Pr , ^{141}Nd , ^{141}Pm , ^{141}Sm , ^{141}Eu , ^{141}Gd , ^{141}Tb , ^{141}Dy , ^{141}Ho
- 12. [N.Nica](#), *Nuclear Data Sheets for A = 157*, Nucl.Data Sheets 132, 1 (2016)
15 nuclei: ^{157}Nd , ^{157}Pm , ^{157}Sm , ^{157}Eu , ^{157}Gd , ^{157}Tb , ^{157}Dy , ^{157}Ho , ^{157}Er , ^{157}Tm , ^{157}Yb , ^{157}Lu , ^{157}Hf , ^{157}Ta , ^{157}W
- 13. [N.Nica](#), *Nuclear Data Sheets for A = 158*, Nucl.Data Sheets 141, 1 (2017)
15 nuclei: ^{158}Nd , ^{158}Pm , ^{158}Sm , ^{158}Eu , ^{158}Gd , ^{158}Tb , ^{158}Dy , ^{158}Ho , ^{158}Er , ^{158}Tm , ^{158}Yb , ^{158}Lu , ^{158}Hf , ^{158}Ta , ^{158}W
- 14. [N.Nica](#), *Nuclear Data Sheets for A = 140*, Nucl.Data Sheets – *to be published*
17 nuclei: ^{140}Sb , ^{140}Te , ^{140}I , ^{140}Xe , ^{140}Cs , ^{140}Ba , ^{140}La , ^{140}Ce , ^{140}Pr , ^{140}Nd , ^{140}Pm , ^{140}Sm , ^{140}Eu , ^{140}Gd , ^{140}Tb , ^{140}Dy , ^{140}Ho
- 15. [N.Nica](#), *A=155, Nuclear Data Sheets for A = 155, Nucl.Data Sheets – to be published*
16 nuclei: ^{155}Ce , ^{155}Pr , ^{155}Nd , ^{155}Pm , ^{155}Sm , ^{155}Eu , ^{155}Gd , ^{155}Tb , ^{155}Dy , ^{155}Ho , ^{155}Er , ^{155}Tm , ^{155}Yb , ^{155}Lu , ^{155}Hf , ^{155}Ta
- 16. [N.Nica](#), *A=160, Nuclear Data Sheets for A = 160, Nucl.Data Sheets – to be published*
17 nuclei: ^{160}Pr , ^{160}Nd , ^{160}Pm , ^{160}Sm , ^{160}Eu , ^{160}Gd , ^{160}Tb , ^{160}Dy , ^{160}Ho , ^{160}Er , ^{160}Tm , ^{160}Yb , ^{160}Lu , ^{160}Hf , ^{160}Ta , ^{160}W , ^{160}Re
- 17. [N.Nica](#), *A=153, submitted to NNDC*
16 nuclei: ^{153}La , ^{153}Ce , ^{153}Pr , ^{153}Nd , ^{153}Pm , ^{153}Sm , ^{153}Eu , ^{153}Gd , ^{153}Tb , ^{153}Dy , ^{153}Ho , ^{153}Er , ^{153}Tm , ^{153}Yb , ^{153}Lu , ^{153}Hf

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FY2018 Highlights

EVENT OF THE YEAR:

John Hardy's retirement!

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FY2018 Highlights

- *ICC and β - γ Precision Measurements (33% FTE)*
 - *ICC: ^{103m}Rh case*
 - *Prepare RuCu source, activate and run HPGe RuCu source for $^{103}\text{Ru}(\beta^-) \rightarrow ^{103m}\text{Rh}$ ICC measurement for (4 months)*
 - *Prepare and test ^{93m}Nb ICC source on HPGe and Si(Li) for (2 months)*
 - *Mentor REU Summer Program Student (2 months)*
 - *Analyze RuCu source and reanalyze RuO_2 and Pd sources*
 - *Write paper data draft and submit PRC paper for ^{103m}Rh ICC*

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FY2018 Highlights

- *ICC and β - γ Precision Measurements (33% FTE)*
 - *β - γ Precision Measurements*
 - *K500 Cyclotron - MARS one week runs*
 - *^{42}Ti ($T_{1/2}$, BR)*
 - *^{10}C (BR)*
 - *Medical Isotopes*
 - *K500 Cyclotron - MARS : ^{67}Cu (in house group)*
 - *K150 Cyclotron: Terbium isotopes production (external group)*

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FY2018 Highlights

- *A-chain ENSDF evaluation (67% FTE)*
 - *A=153 Completed full evaluation*
 - *CUT=31-Dec-2005*
 - *17 nuclei*
 - *20,000 ->24,000 ens lines*
 - *First Submitted + Resubmitted after Prereview*
 - *A=160 Resubmitted after Prereview*
 - *CUT=1-Jun-2005*
 - *17 nuclei*
 - *15,000 -> 21,000 ens lines*

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FY2018 Highlights

- 14. N.Nica, A = 140 – 2018: *After Review with Evaluator, FY2015!!!*
17 nuclei: ^{140}Sb , ^{140}Te , ^{140}I , ^{140}Xe , ^{140}Cs , ^{140}Ba , ^{140}La , ^{140}Ce , ^{140}Pr ,
 ^{140}Nd , ^{140}Pm , ^{140}Sm , ^{140}Eu , ^{140}Gd , ^{140}Tb , ^{140}Dy , ^{140}Ho
- 15. N.Nica, A = 155 – 2018: *In Review with NNDC 2+ years, FY2016!!!*
16 nuclei: ^{155}Ce , ^{155}Pr , ^{155}Nd , ^{155}Pm , ^{155}Sm , ^{155}Eu , ^{155}Gd ,
 ^{155}Tb , ^{155}Dy , ^{155}Ho , ^{155}Er , ^{155}Tm , ^{155}Yb , ^{155}Lu , ^{155}Hf , ^{155}Ta
- 16. N.Nica, A = 160 – 2018: *Submitted to NNDC, FY2017!!!*
17 nuclei: ^{160}Pr , ^{160}Nd , ^{160}Pm , ^{160}Sm , ^{160}Eu , ^{160}Gd , ^{160}Tb , ^{160}Dy ,
 ^{160}Ho , ^{160}Er , ^{160}Tm , ^{160}Yb , ^{160}Lu , ^{160}Hf , ^{160}Ta , ^{160}W , ^{160}Re
- 17. N.Nica, A = 153 – 2018: *Submitted to NNDC, FY2018*
17 nuclei: ^{153}La , ^{153}Ce , ^{153}Pr , ^{153}Nd , ^{153}Pm , ^{153}Sm , ^{153}Eu , ^{153}Gd ,
 ^{153}Tb , ^{153}Dy , ^{153}Ho , ^{153}Er , ^{153}Tm , ^{153}Yb , ^{153}Lu , ^{153}Hf

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FY2019 Perspectives

- *A-chain evaluation FTE: 66% -> 100% ?*
- *Funding ?*
- *New A-chain for FY19 ?*
- *Review ?*
- *Xundl ?*

*All depends critically of the 4 big A-chains
backlog!*

A-Chain Evaluation Responsibility @Texas A&M University

- ***Responsibility:***

140, 141, 147, 148, 153, 155, 157, 158, 160

- ***Review:***

140 (Feb 2006), 155 (Jan 2004), 160 (Jun 2005), 153 (Dec 2005)

✓ 158 (Feb 2017)

✓ 157 (Dec 2015)

✓ 148 (Oct 2013)

✓ 141 (Jun 2012)

➤ 147 (Nov 2008)

***All depends critically of the 4 big A-chains
backlog!***

*II. New Project:
Texas A&M Nuclear Data Program
under DOE Grant and NSDD Data Center*

*Promoting Scientific Research Programs
related to data evaluation:*

- Continuing the Internal Conversion Coefficients precision measurements program*
- Promoting original research ideas from reevaluating existing data*

ENSDF DATA EVALUATION CENTERS

- a. National Nuclear Data Center
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