Texas A&M University
US Nuclear Data Program

TAMU NSDD CENTER
Report 2019

N. Nica

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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)*
- ***2018-2019: NSDD Data Center***
  - *67% FTE Mass Chain Evaluation*
  - *N. Nica (PI, evaluator), J.C. Hardy (scientific adviser)*

Texas A&M - Cyclotron Institute Contributions

- ***Major Direct Contribution to USNDP/NSDD: Nuclear Data Evaluation***
  - ***14 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***
  - ***15 major publications***
- ***Texas A&M Contribution to Precision Nuclear Data Production: Precision β-γ Measurements (Standard Model, CKM matrix)***
  - ***$T_{1/2}$, Branching Ratios, Efficiency calibration***
  - ***19 major publications***

Mass Chain Evaluation: *240+ nuclei, 18 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 – Nucl.Data Sheets 154, 1 (2018)
  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
- 18. N.Nica, *Nuclear Data Sheets for A = 147 – in progress*
  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

Texas A&M - Cyclotron Institute

- ***ICC and β-γ Precision Measurements (33% FTE)***
  - ***ICC: ^{103m}Rh case***
  - ***Prepare RuCu source, activate and run HPGe RuCu source for ^{103}Ru(β^-) -> ^{103m}Rh ICC measurement for (4 months)***
  - ***Prepare, test, and run ^{93m}Nb ICC source on HPGe and Si(Li) for (6 months)***
  - ***Mentor REU Summer Program Student (4 months)***
  - ***Analyze RuCu data and reanalyze RuO_2 and Pd sources***
  - ***Published PRC paper for ^{103m}Rh ICC***
  - ***Analyze Nb data***

Texas A&M - Cyclotron Institute

- ***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), ^{26}Si (BR)***
    - ***^{30}S ($T_{1/2}$)***
  - ***Medical Isotopes***
    - ***K500 Cyclotron - MARS : ^{67}Cu (in house group)***
    - ***K150 Cyclotron: Terbium isotopes production (external group)***

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- 15. N.Nica, A =155 – 2018: *After Review 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

- 18. N.Nica, *A = 147* – 2019: *In progress FY2019*

  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

Texas A&M - Cyclotron Institute

- *A-chain evaluation FTE: 2019 -> 100%*
- *Review A=177*
- *Xundl ?*
- *3 big A-chains in the publication pipe!*

A-Chain Evaluation Responsibility @Texas A&M University

- ***Responsibility:***

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

- ***Status:***

155 (Jan 2004), 160 (Jun 2005), 153 (Dec 2005)

✓ ***140 (Nov 2018)***

✓ ***158 (Feb 2017)***

✓ ***157 (Dec 2015)***

✓ ***148 (Oct 2013)***

✓ ***141 (Jun 2012)***

➢ ***147 (Nov 2008)***

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*