Coulomb Excitation of neutron-rich Cd Isotopes

Anna-Lena Hartig

for the IS411/IS477/IS524 collaborations

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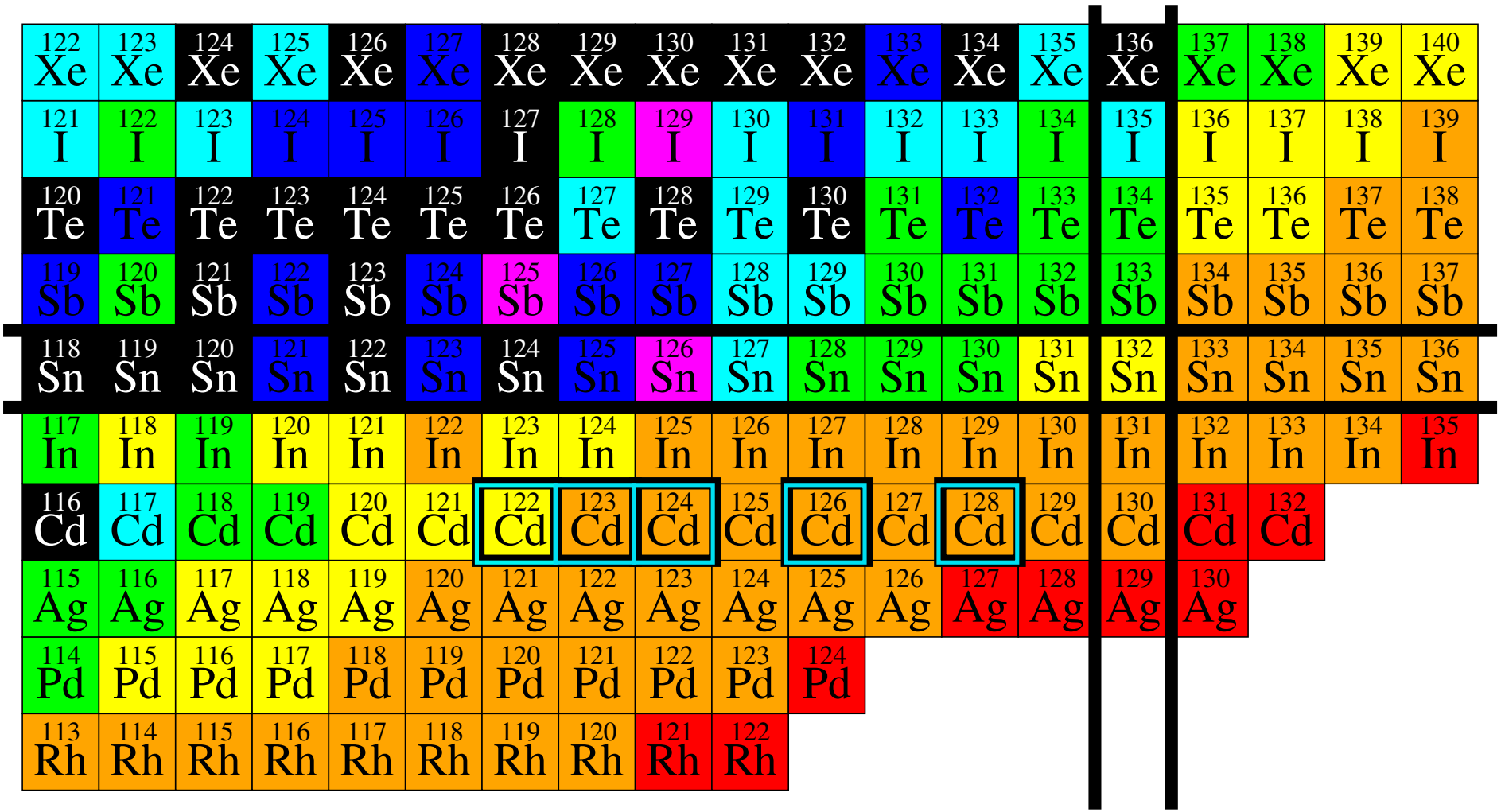

Neutron-rich Cd Isotopes

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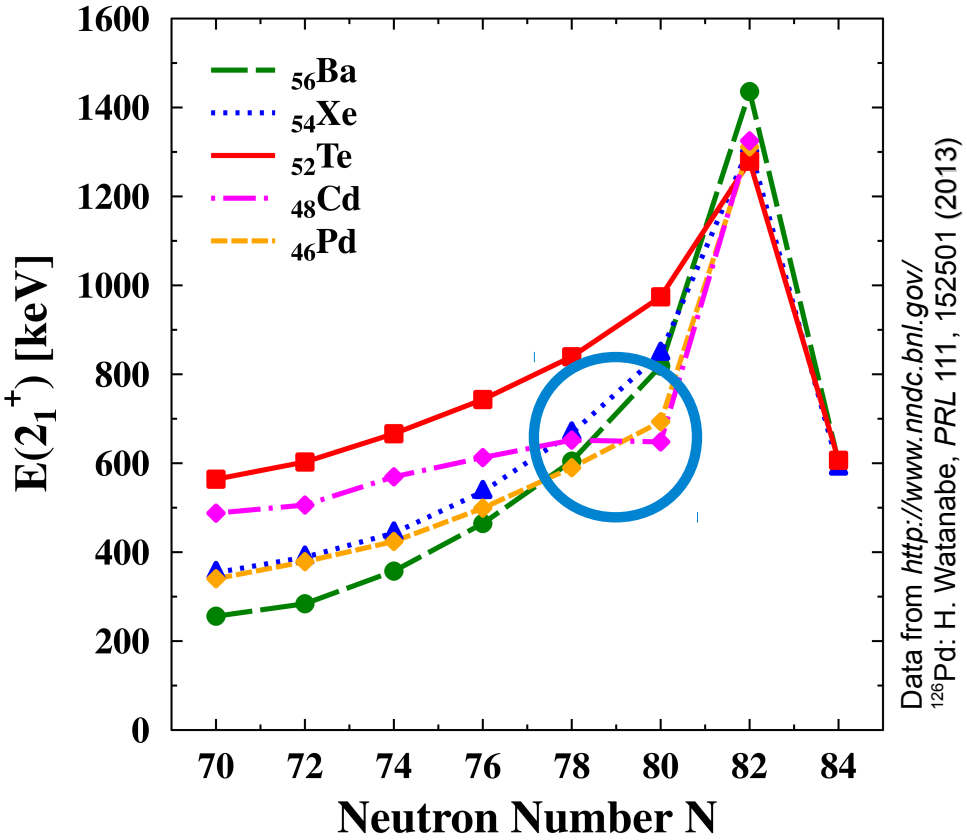
- E(2^+) drops from ^{126}Cd to ^{128}Cd
  - Not reproduced by SM



Neutron-rich Cd Isotopes

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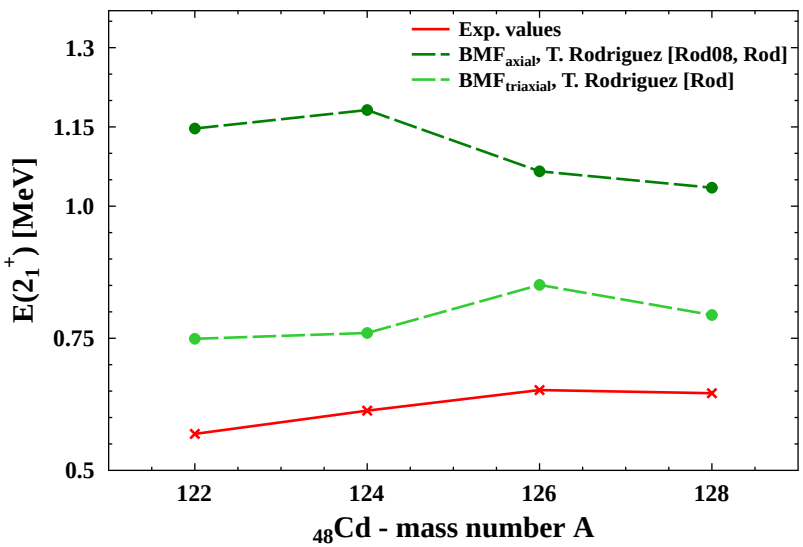
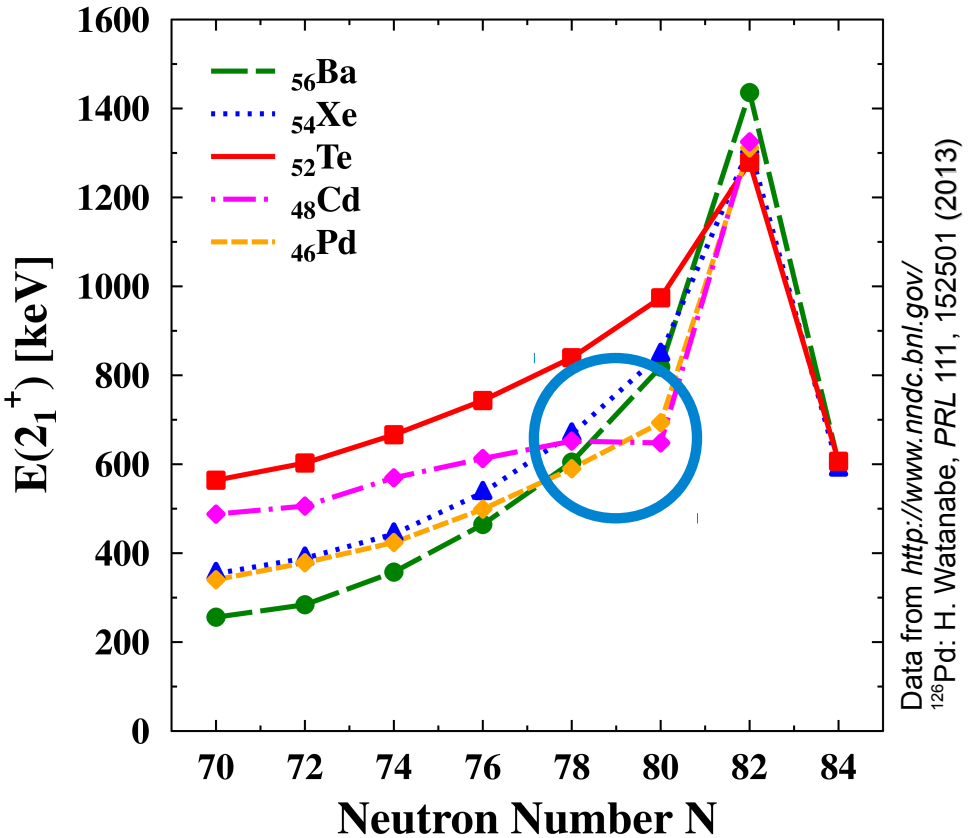
- $E(2^+)$ drops from ^{126}Cd to ^{128}Cd
  - Not reproduced by SM
  - Beyond Mean Field reproduces the trend of $E(2^+)$



T. Rodríguez, then TU Darmstadt



Analysis of ^{128}Cd

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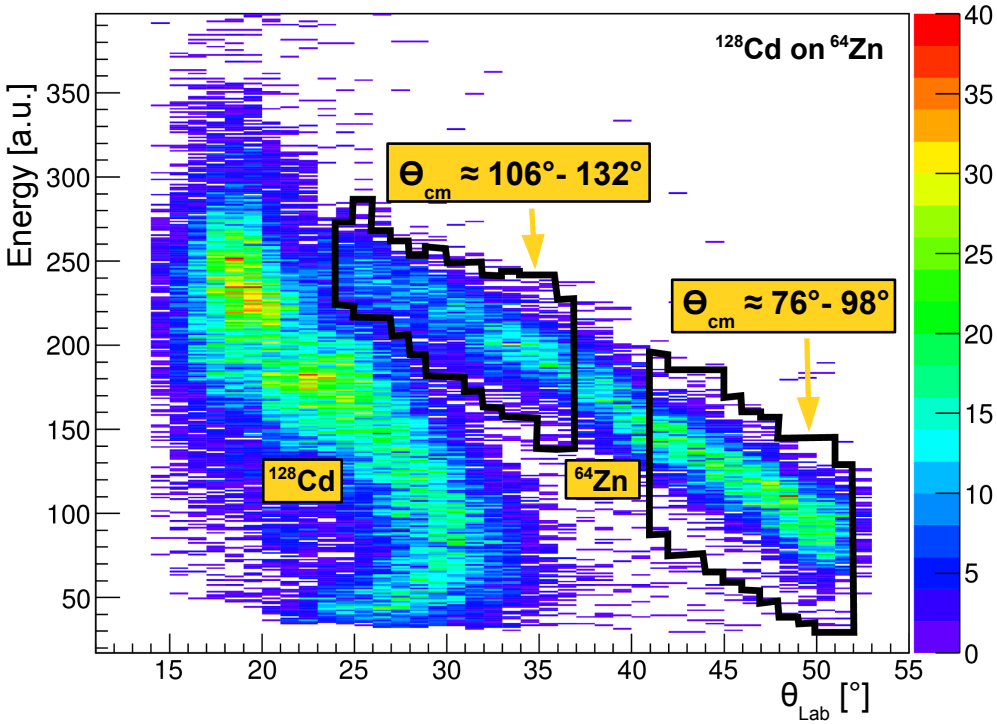

- Two ranges on kinematic plot
- Maximum likelihood analysis

- $M_{02} \longrightarrow B(E2)=0.19\ e^2b^2$

- $M_{22} \longrightarrow Q_s=-0.5$ eb

Beam energy	2.82 MeV/u
Particles on target	10^3 pps
^{128}Cd in beam	47(5)%

S. Bönig, PhD thesis, TU Darmstadt, 2014

Analysis of ^{128}Cd

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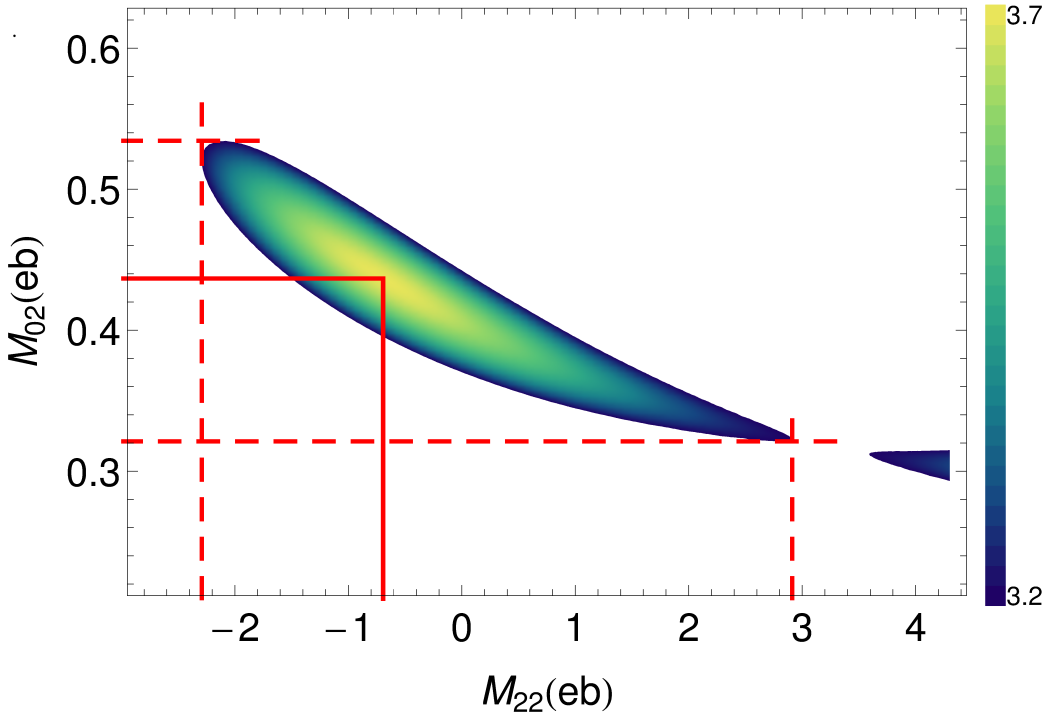

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S. Bönig, PhD thesis, TU Darmstadt, 2014

Results for the even-A Cd Isotopes

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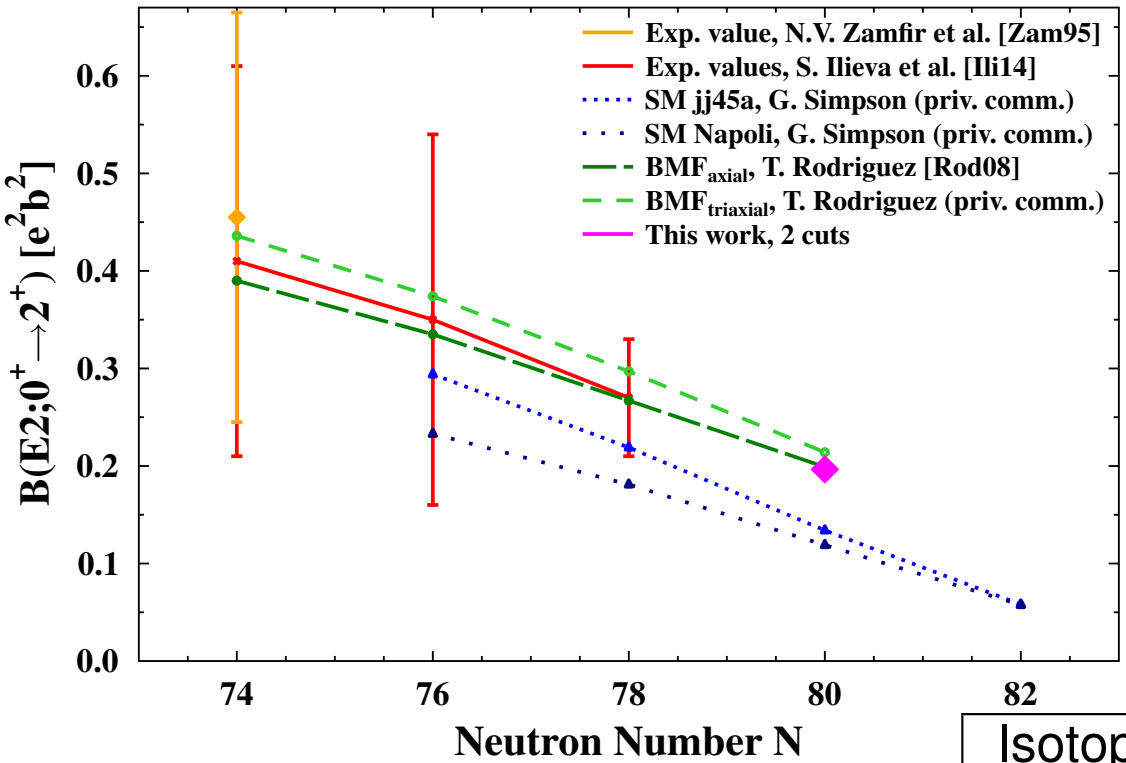

Isotope	B(E2)[e^{2}b^2]	Q_s[eb]
^{122}Cd	0.41(20)	$-0.03^{+3.0}_{-1.6}$
^{124}Cd	0.35(19)	$0.07^{+2.9}_{-1.5}$
^{126}Cd	0.27(6)	$0.27^{+1.1}_{-0.7}$
^{128}Cd	0.19	-0.5

S. Ilieva, Phys. Rev. C, 89:014313, Jan 2014
S. Bönig, PhD thesis, TU Darmstadt, 2014

Adopted Level Scheme for ^{123}Cd (Excerpt)

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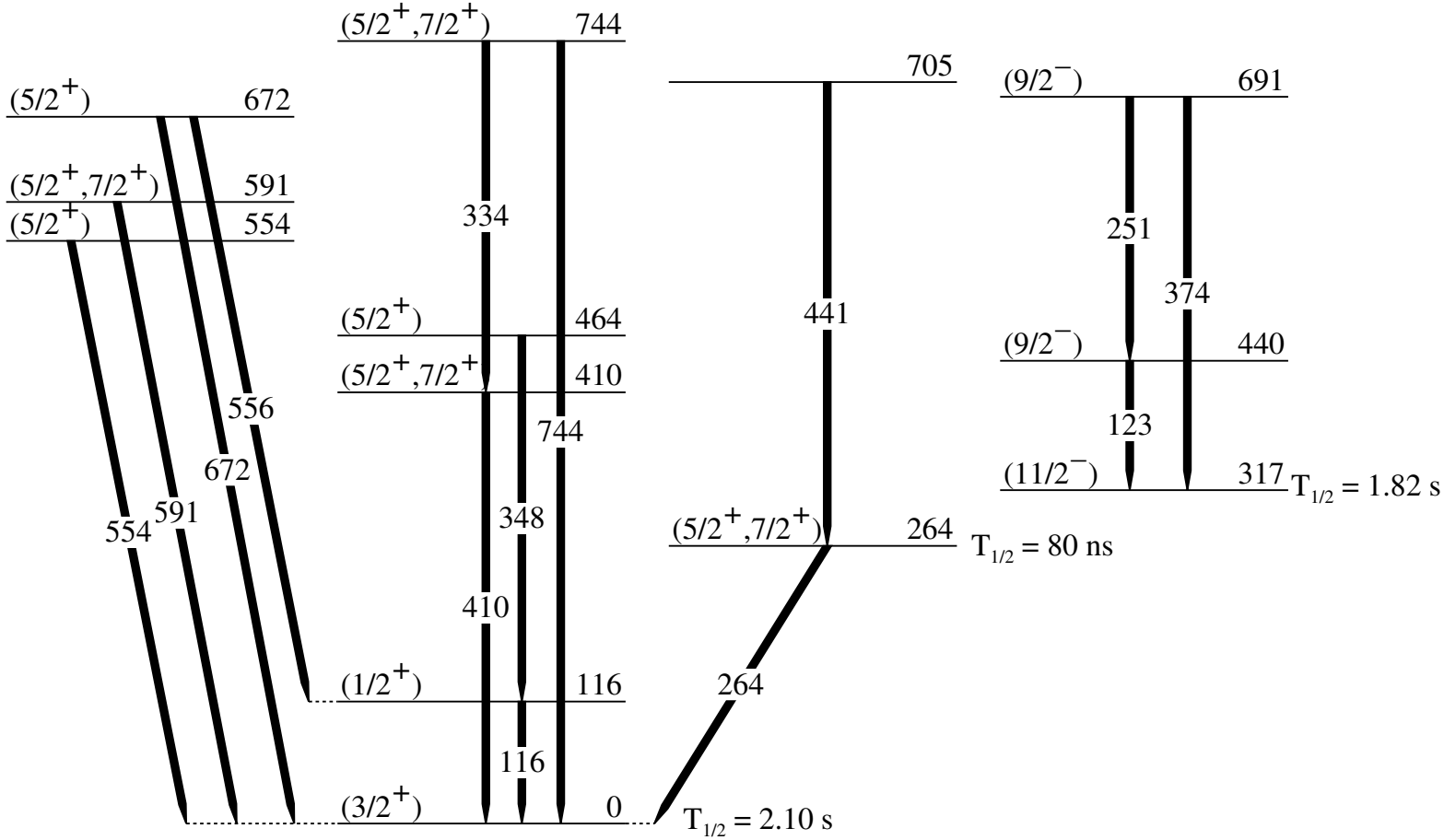
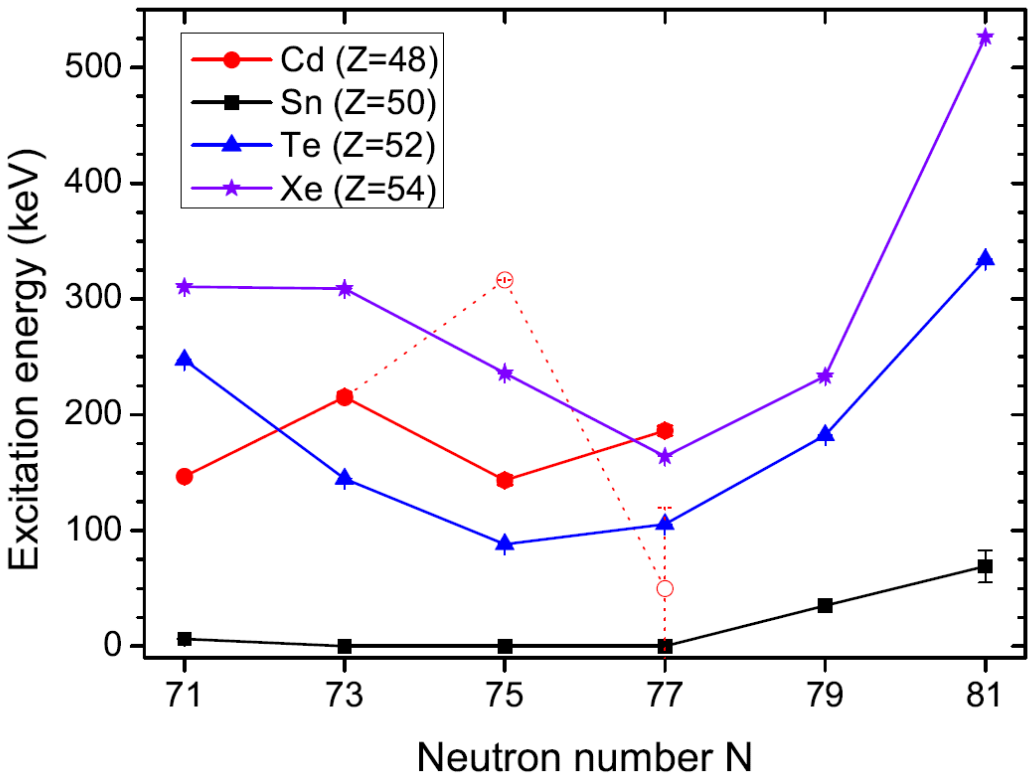


H. Huck, Phys. Rev. C 40, 1384 (1989)
http://www.nndc.bnl.gov/ensdf/

Mass Measurement of the Isomeric State



A. Kankainen, Phys. Rev. C, 87:024307, Feb 2013

- Mass measurement with JYFLTRAP
  - Time-of-Flight Ion Cyclotron Resonance Technique
  - New value for the $11/2^-$-state **144(4) keV**
    A. Kankainen, Phys. Rev. C, 87:024307, Feb 2013
- Conflict with **316.52 keV**
  H. Huck, Phys. Rev. C 40, 1384 (1989)

γ-Spectrum with Doppler Correction for Projectile and Target

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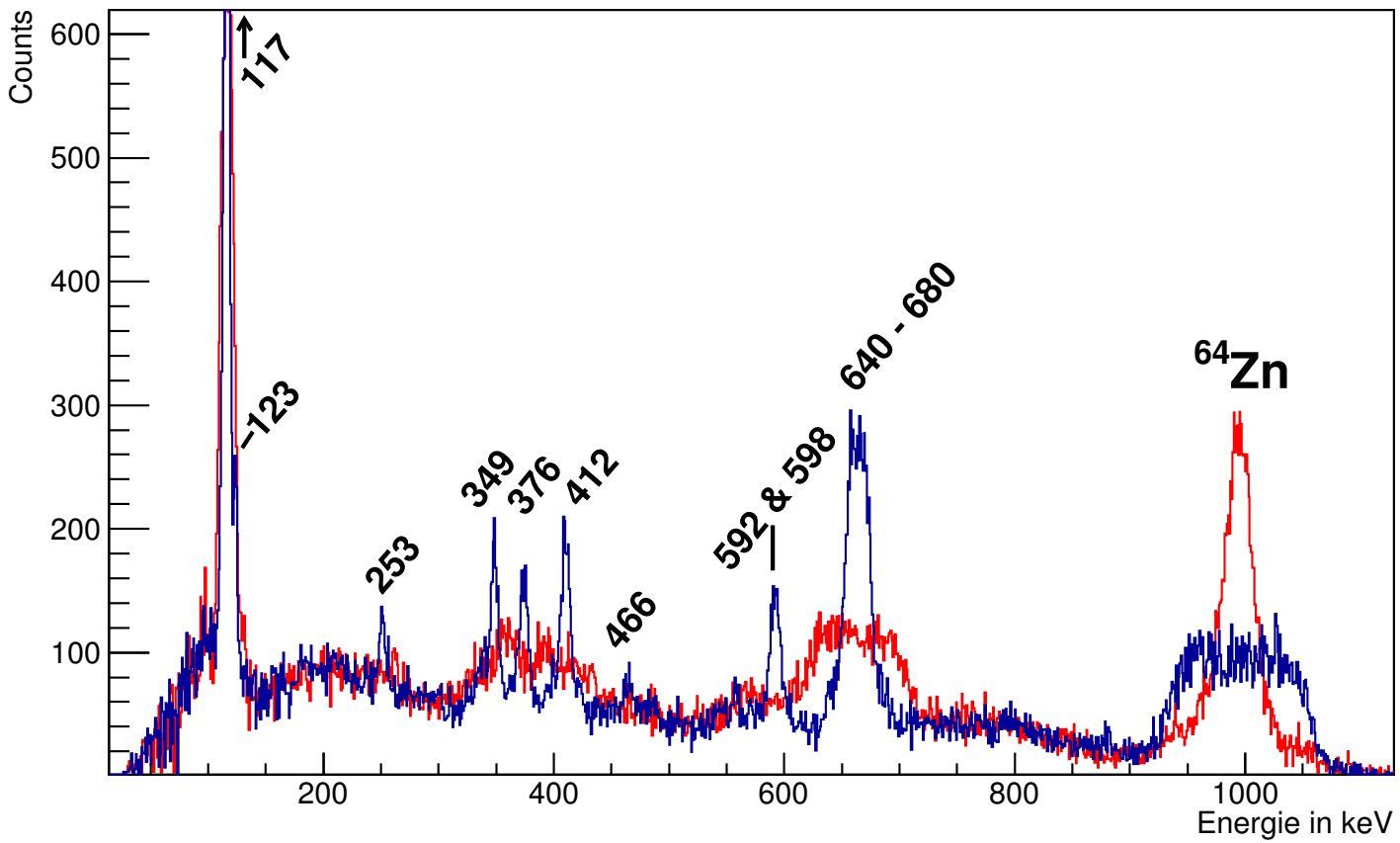
Beam energy	2.85 MeV/u
^{123}Cd in beam	29%



Determined Level Scheme for ^{123}Cd

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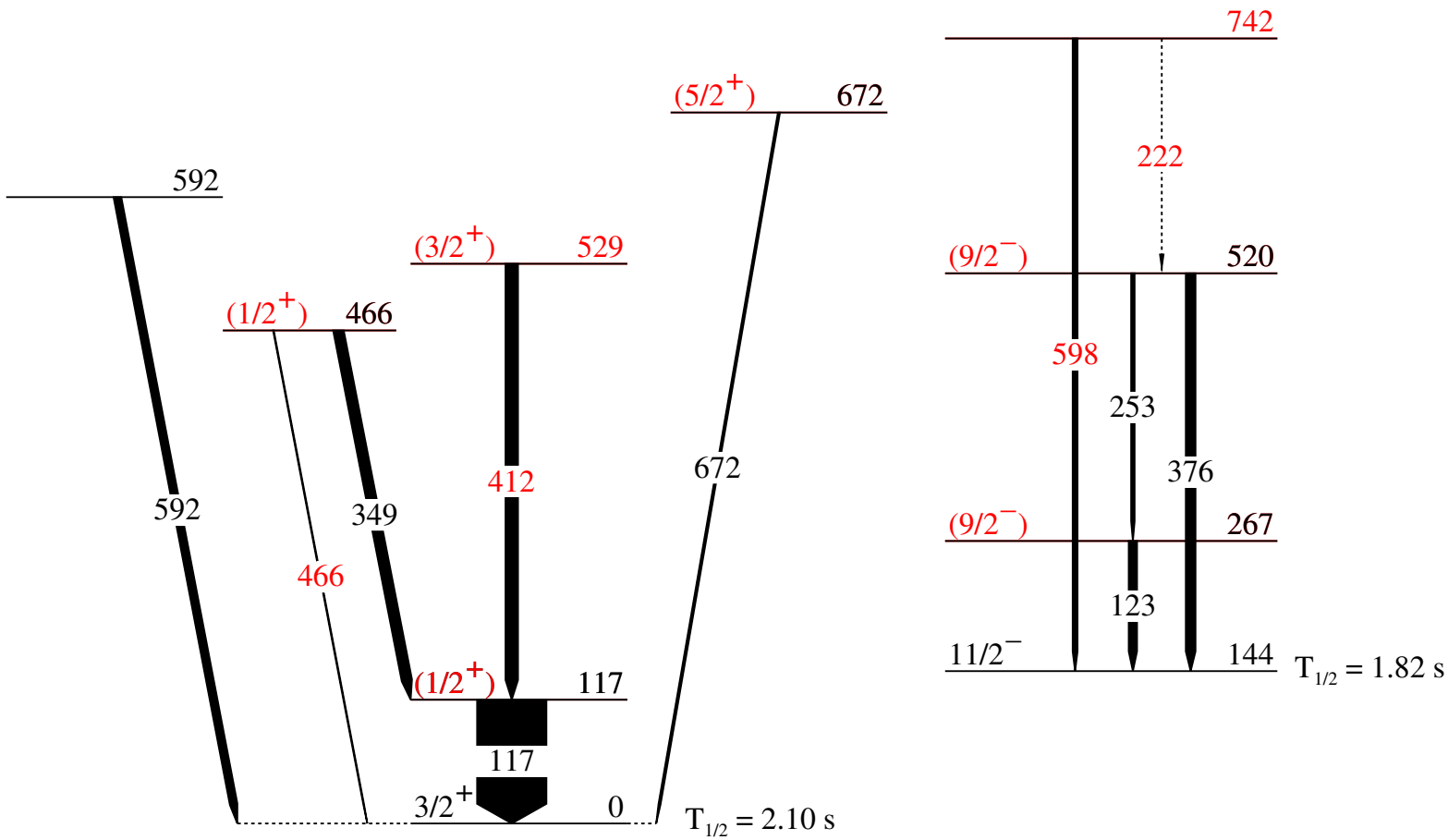

Matrix Elements

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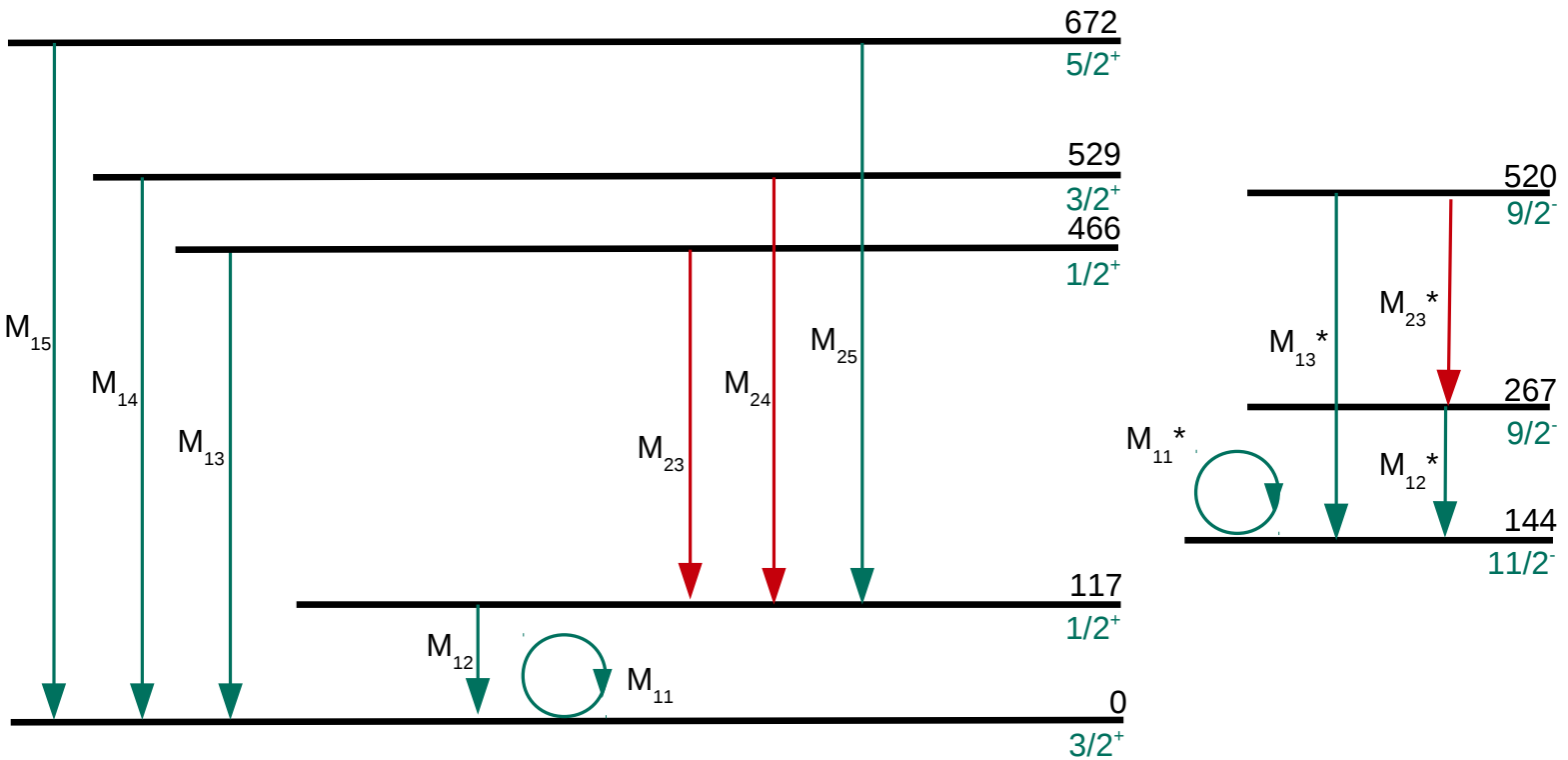
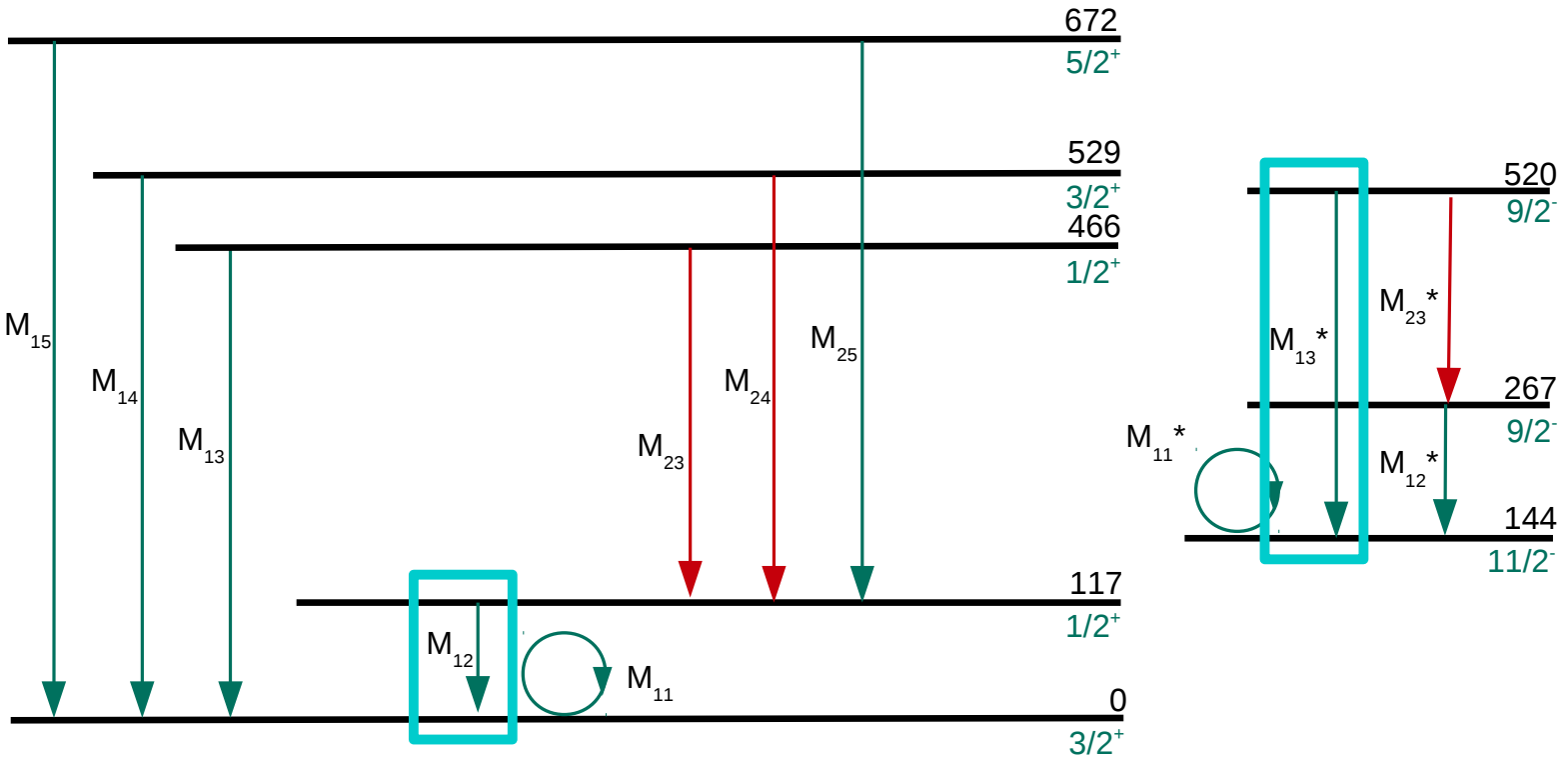


- Quadrupole moments from
  D. T. Yordanov, Phys. Rev. Lett., 110:192501, May 2013

Matrix Elements



- 117 keV $\longrightarrow$ $M_{3/2\rightarrow1/2}$= 0.95(4) eb
- 376 keV $\longrightarrow$ $M_{11/2\rightarrow9/2}$=0.50(4) eb

Summary

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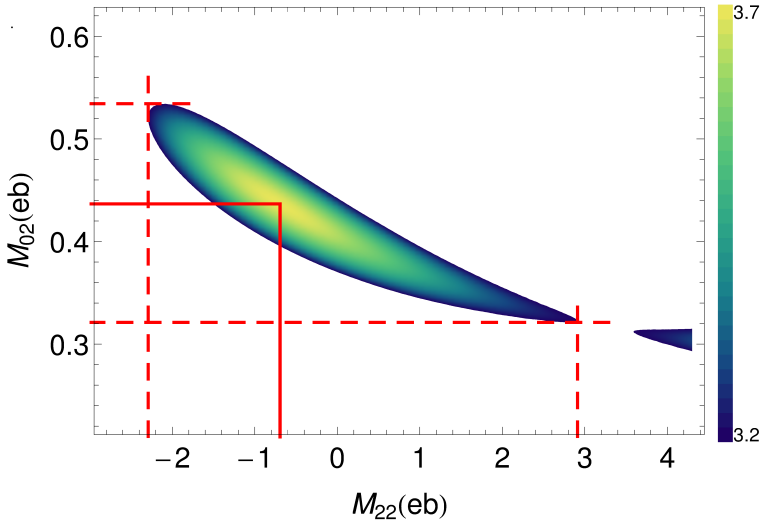
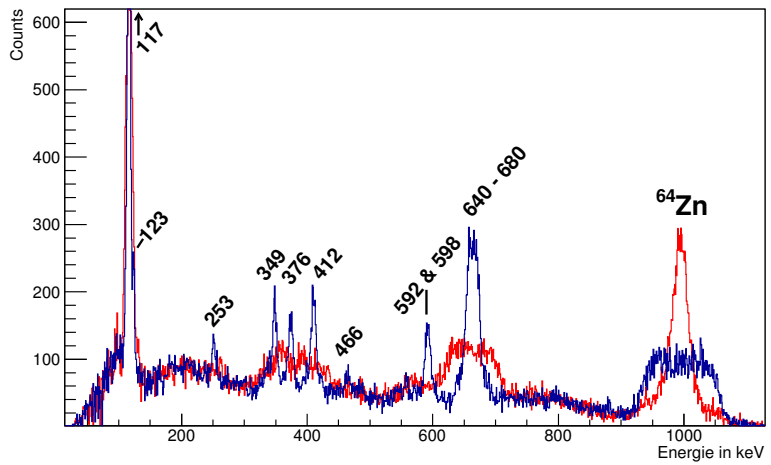


- Revision of adopted level scheme
- Negative and positive parity orbitals contribute to collectivity

- B(E2) values larger than expected from SM
- Better agreement with BMF
- No clear conclusion due to Q(2^+)



- Decay spectroscopy with IDS to determine level scheme
- Narrow-band laser scans in future experiments

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Thank you for your attention!

Supported by:

Bundesministerium für Bildung und Forschung

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ISOLDE

and the IS524-Miniball Collaboration

Selective Laser Ionization

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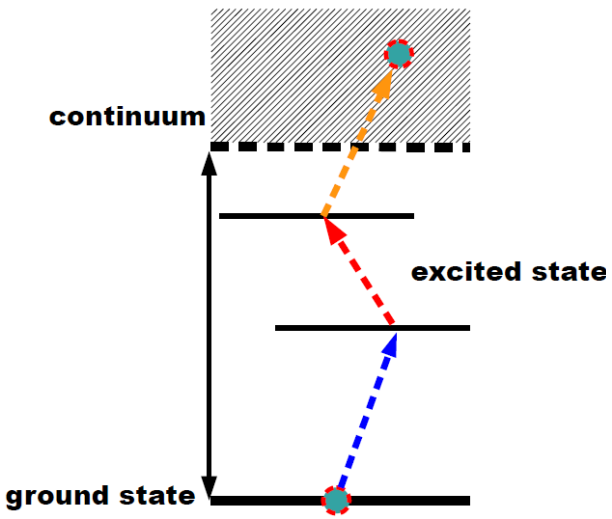

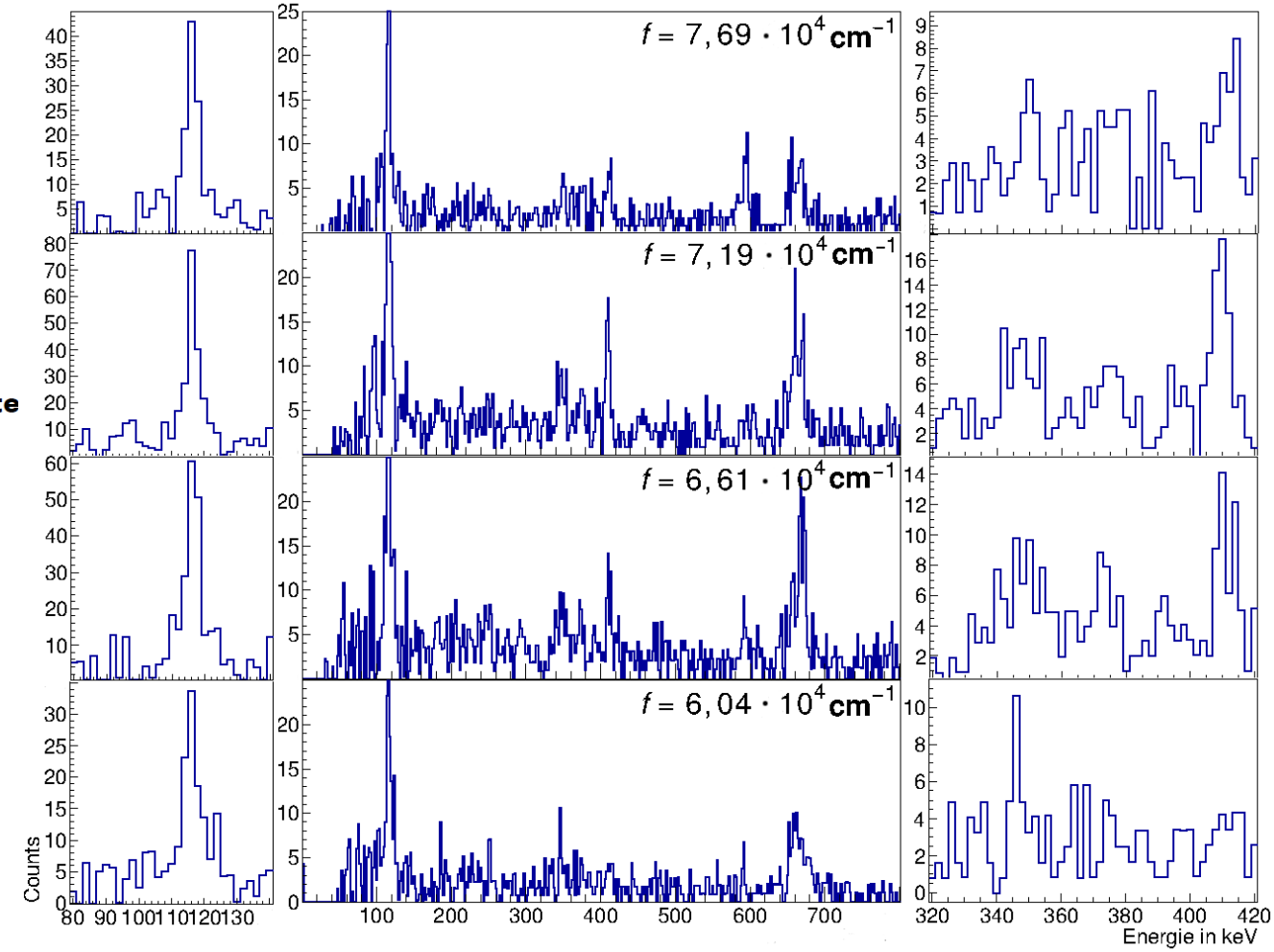

Determination of Isomeric Concentration

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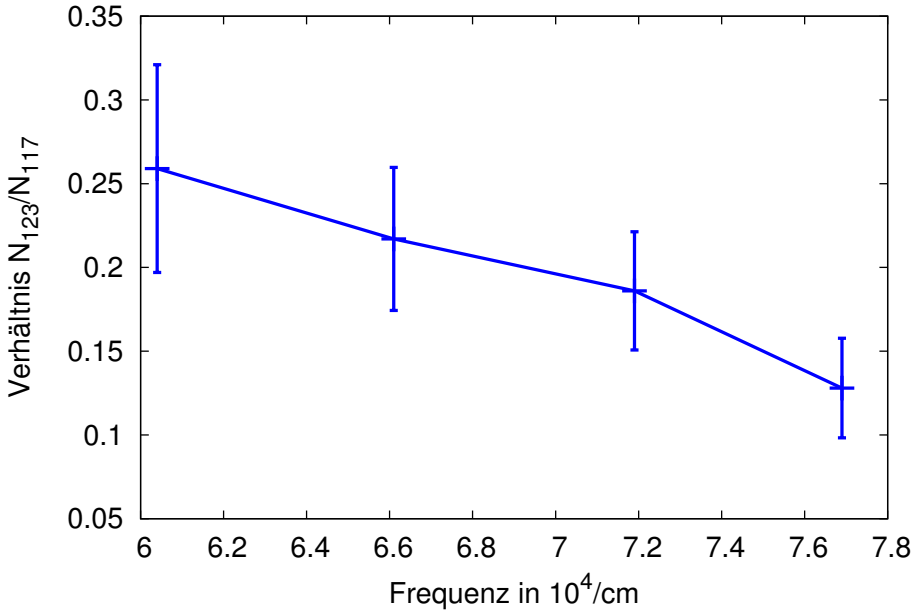
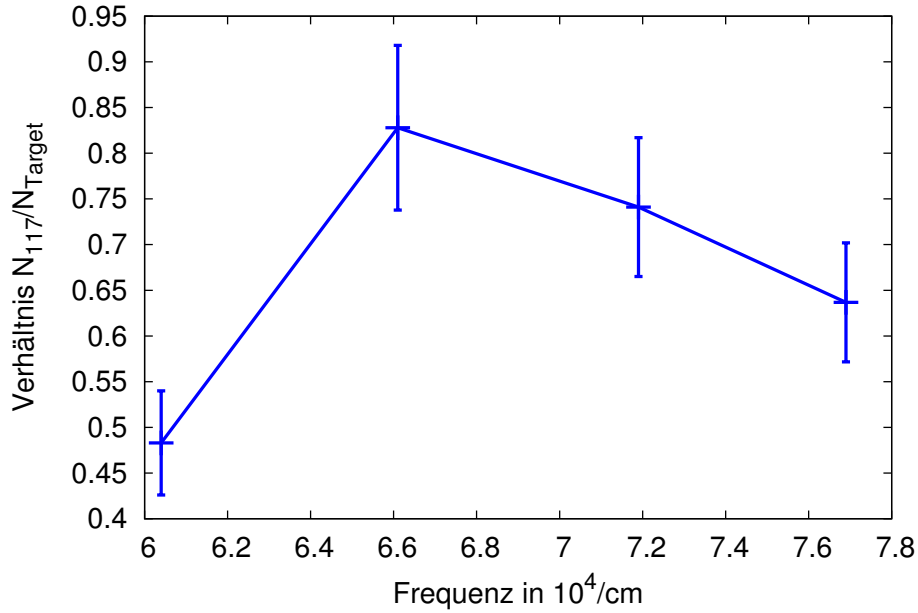


Ratio of isomeric to ground state



Share of ground state in all events

Calculated Transition Strengths

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E_γ in keV	Matrix element	reduced transition probability	
117	0,92 eb	$B(E2, 3/2^+ \rightarrow 1/2^+)$	0,212(19) e^2b^2
349	0,787 μ_N	$B(M1, 1/2^+ \rightarrow 1/2^+)$	0,309(30) μ_N^2
466	0,54 eb	$B(E2, 3/2^+ \rightarrow 1/2^+)$	0,0729(116) e^2b^2
412	0,85 μ_N	$B(M1, 1/2^+ \rightarrow 3/2^+)$	0,361(36) μ_N^2
529	0,55 eb	$B(E2, 3/2^+ \rightarrow 3/2^+)$	0,0756(214) e^2b^2
555	0,271 eb	$B(E2, 1/2^+ \rightarrow 3/2^+)$	0,0367(81) e^2b^2
672	0,71 eb	$B(E2, 3/2^+ \rightarrow 5/2^+)$	0,126(19) e^2b^2
123	0,182 eb	$B(E2, 11/2^- \rightarrow 9/2^-)$	0,00279(24) e^2b^2
253	0,208 μ_N	$B(M1, 9/2^- \rightarrow 9/2^-)$	0,00433(41) μ_N^2
376	0,501 eb	$B(E2, 11/2^- \rightarrow 9/2^-)$	0,0209(17) e^2b^2

Determination of Isomeric Concentration

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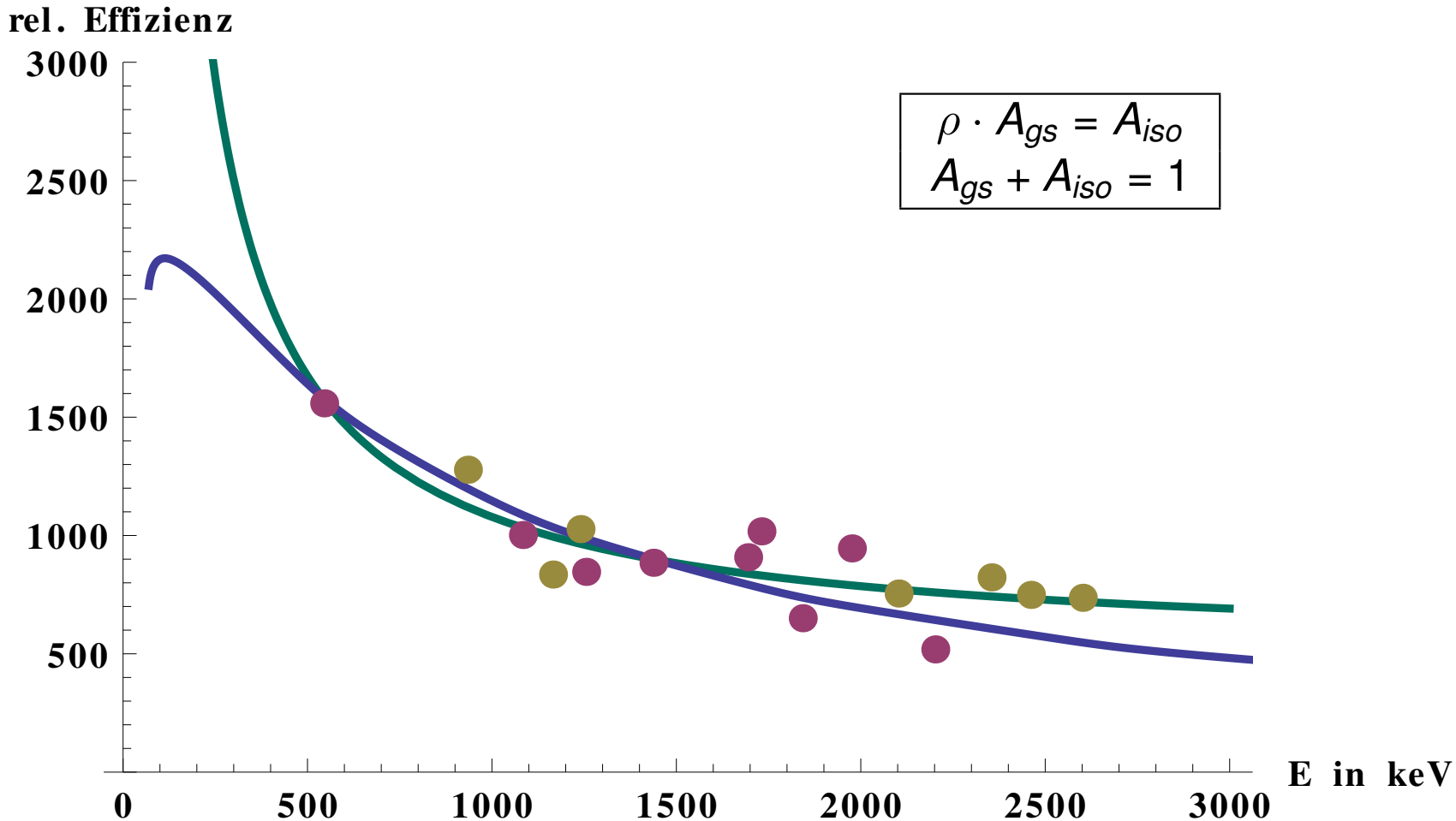

Koinzidenz mit 117 keV

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