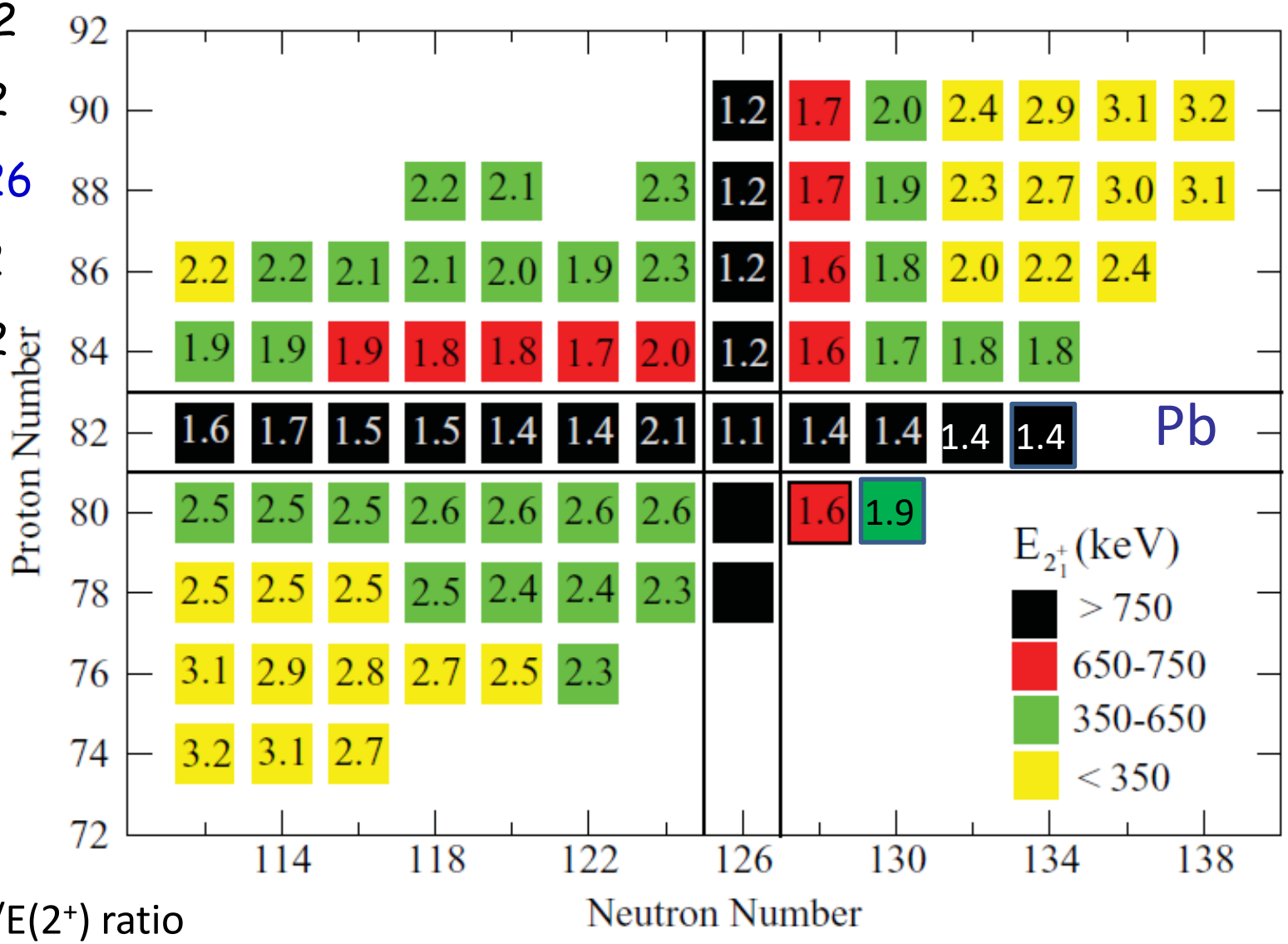
Neutron-rich nuclei with N>=126

Zsolt Podolyák

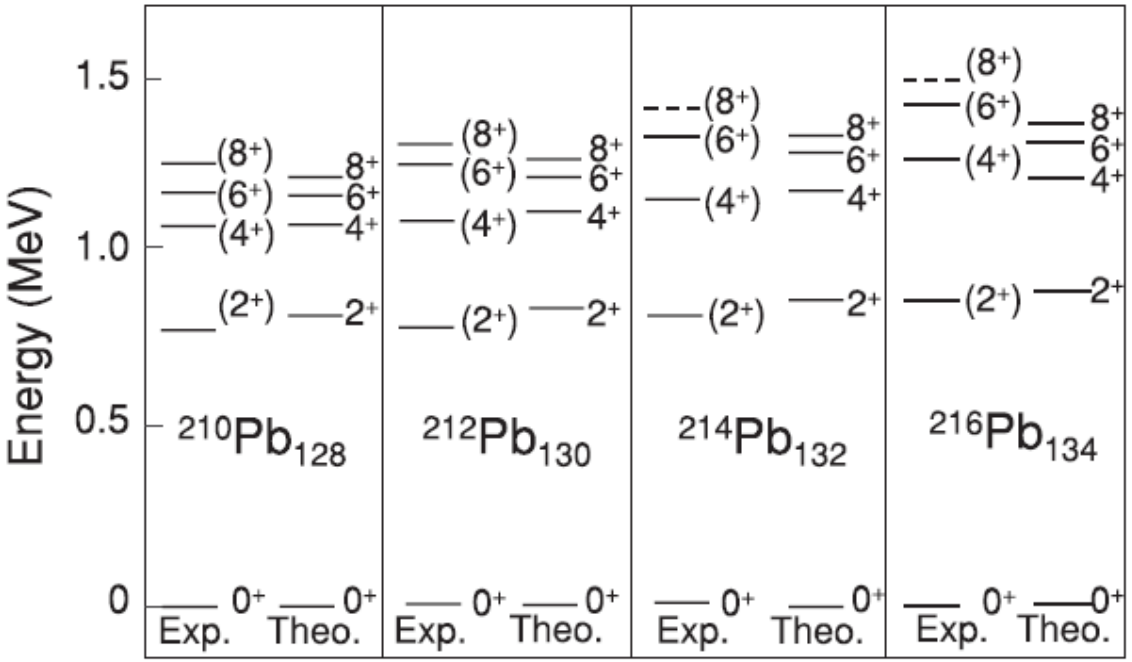
UNIVERSITY OF SURREY

π	ν
i13/2	i11/2
h9/2	g9/2
Z=82	N=126
s1/2	p1/2
d3/2	f5/2
h11/2	

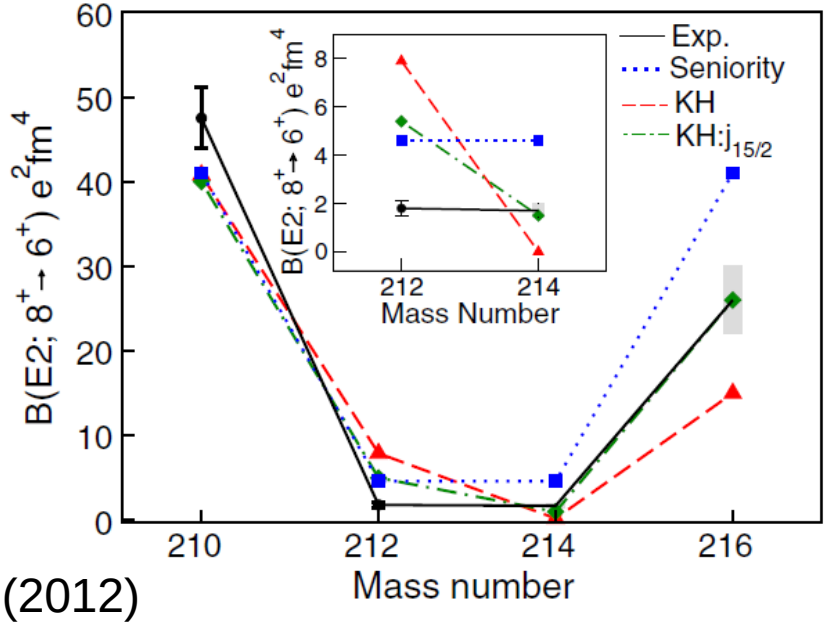


In box: $E(4^+)/E(2^+)$ ratio

Neutron-rich lead isotopes



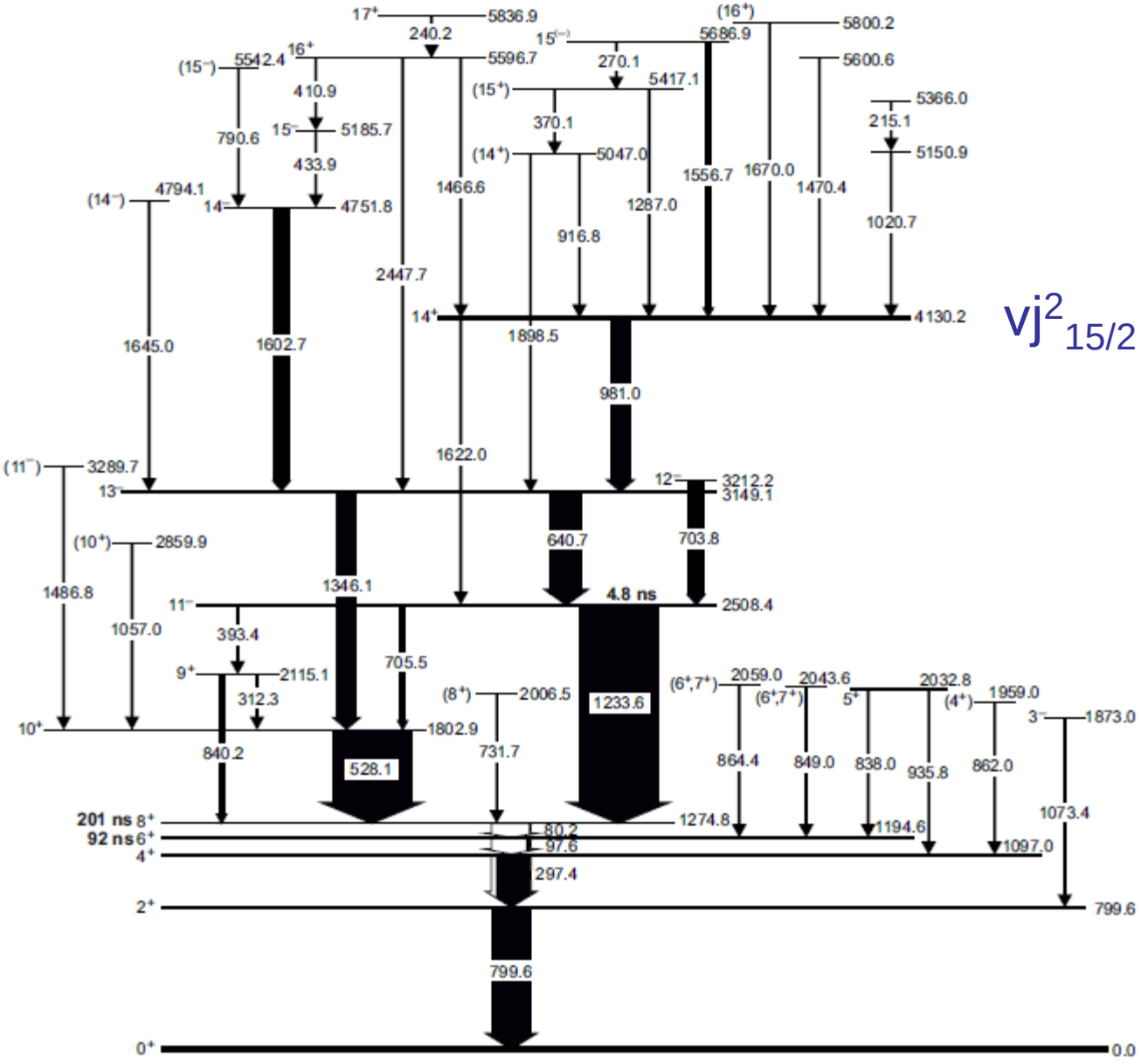
$vg^2_{9/2}$ 8+ isomers



Transition strength explained by considering
effective three-body forces

A. Gottardo et al., Phys. Rev. Lett. 109, 162502 (2012)

Deep-inelastic reactions



$vj^2_{15/2}$

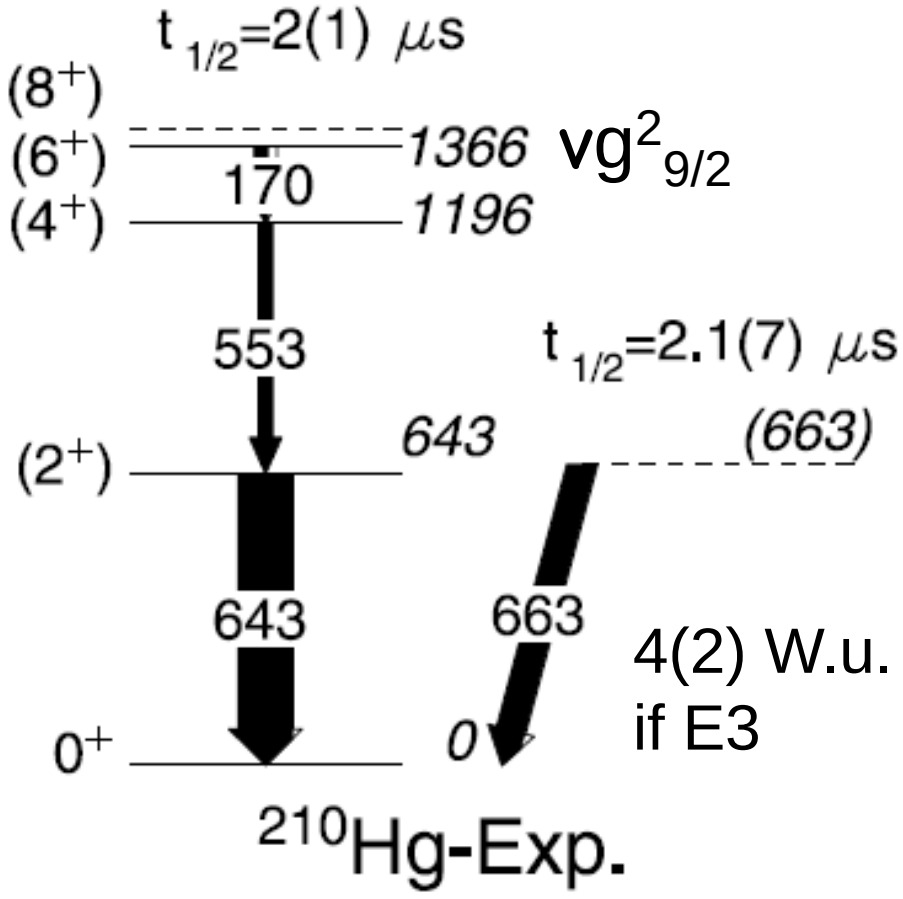
$vg^2_{9/2}$

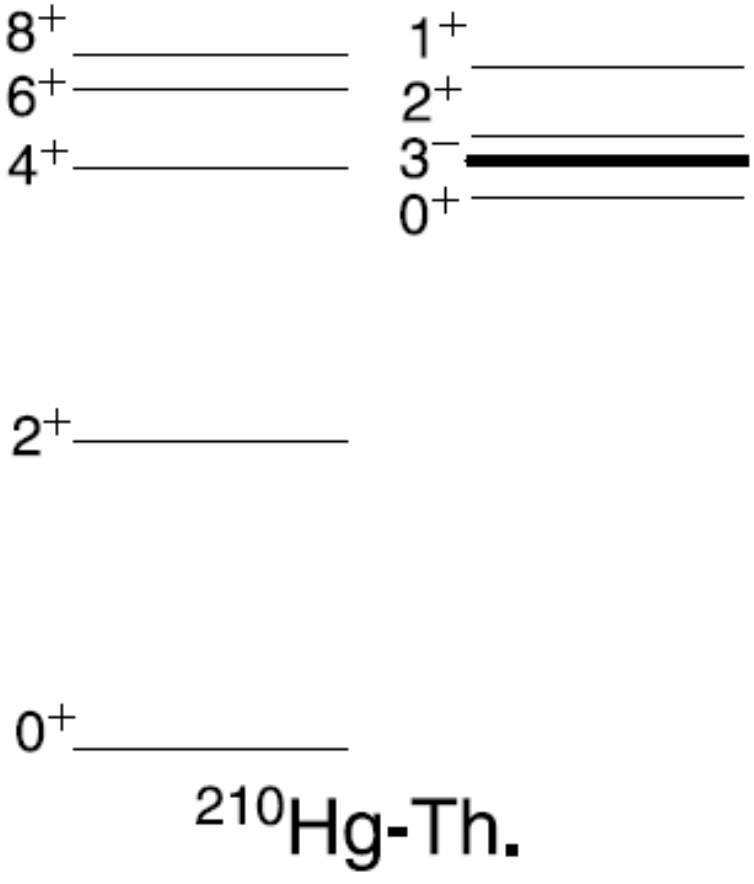
isomer

$^{210}_{82}Pb_{128}$

R. Broda et al., Phys. Rev. C 98, 024324 (2018)

^{210}Hg (N=130)

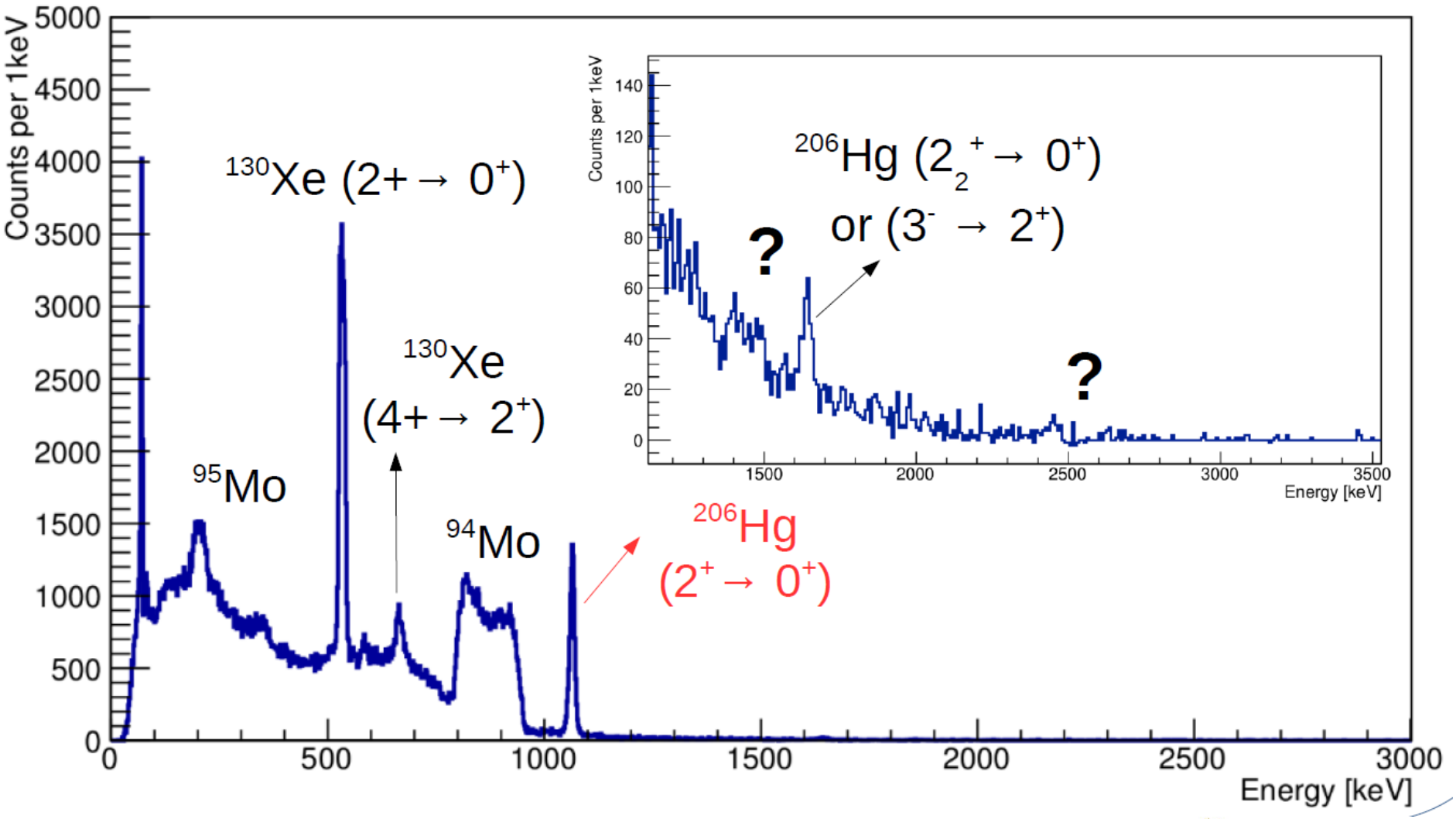




$vg^2_{9/2}$

A. Gottardo et al., Phys. Lett. B 725, 292 (2013)

Coulomb excitation spectrum of ^{206}Hg



Lisa Morrison, Kasia Hadynska-Klek, Zsolt Podolyák et al.

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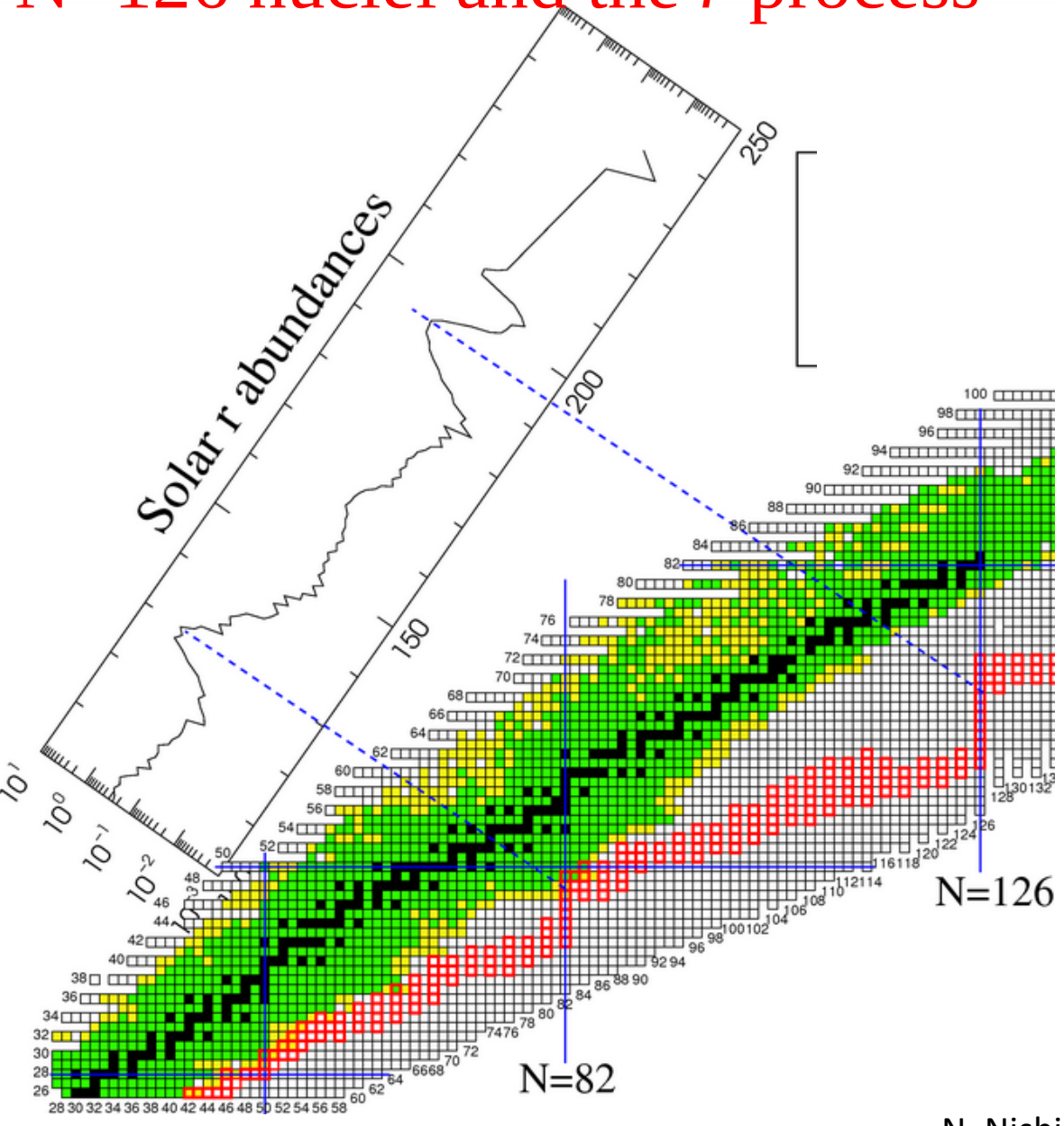
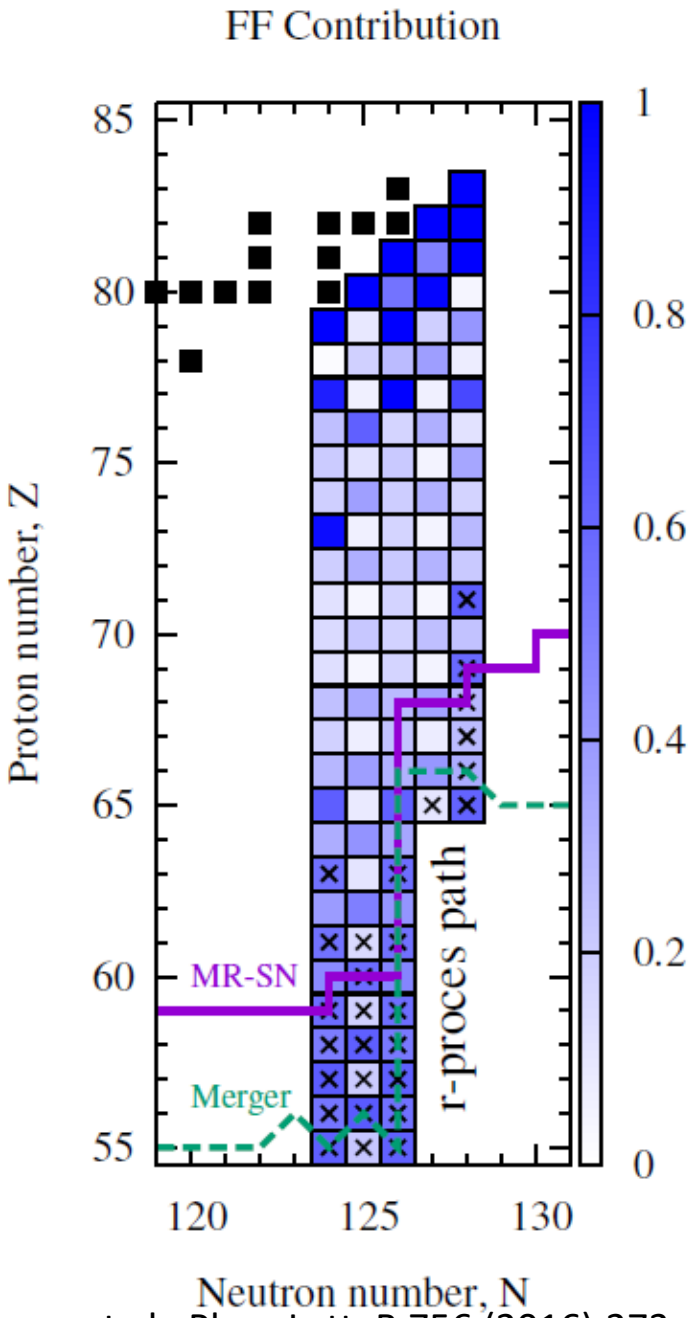
N=126 nuclei and the *r* process

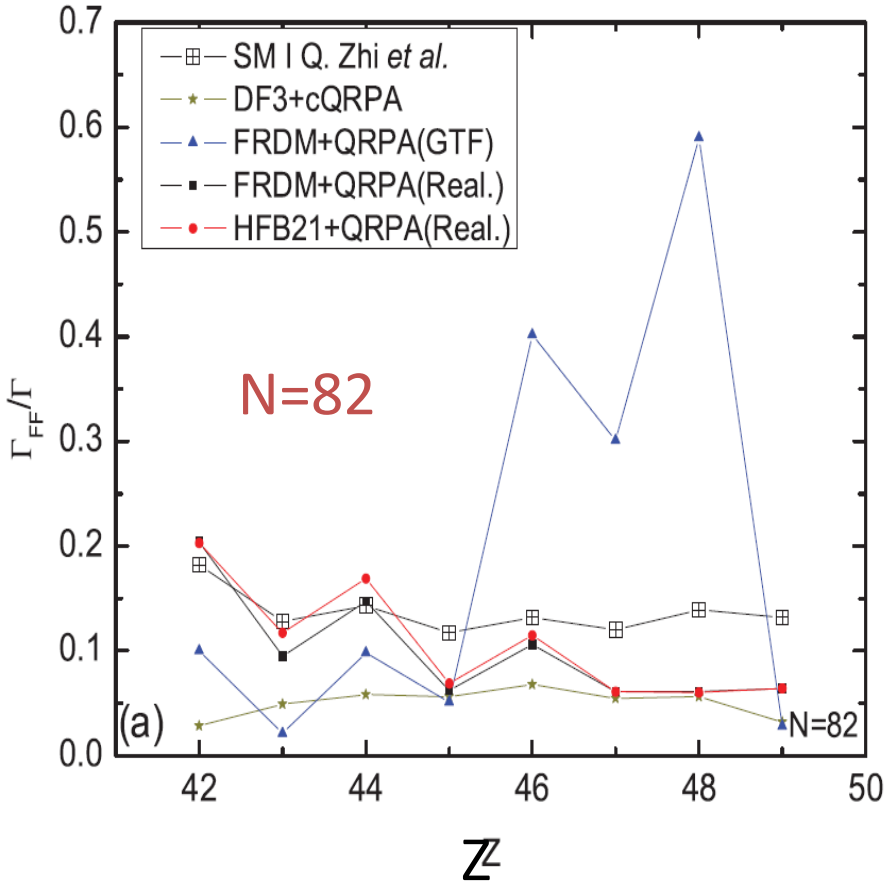


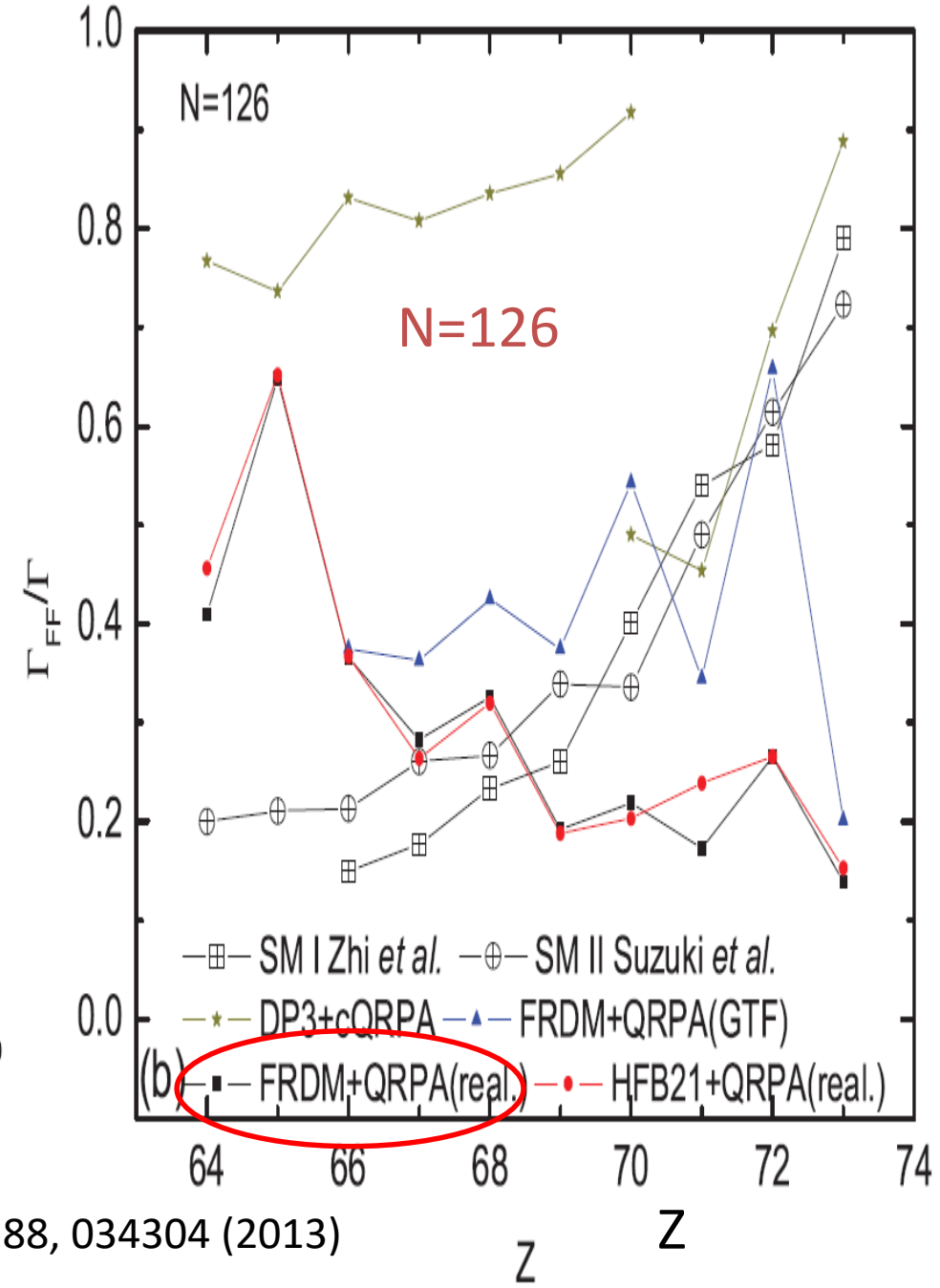


N. Nishimura et al., Phys. Lett. B 756 (2016) 273

D.-L. Fang et al., Phys. Rev. C88 (2013) 034304

First-forbidden β decay

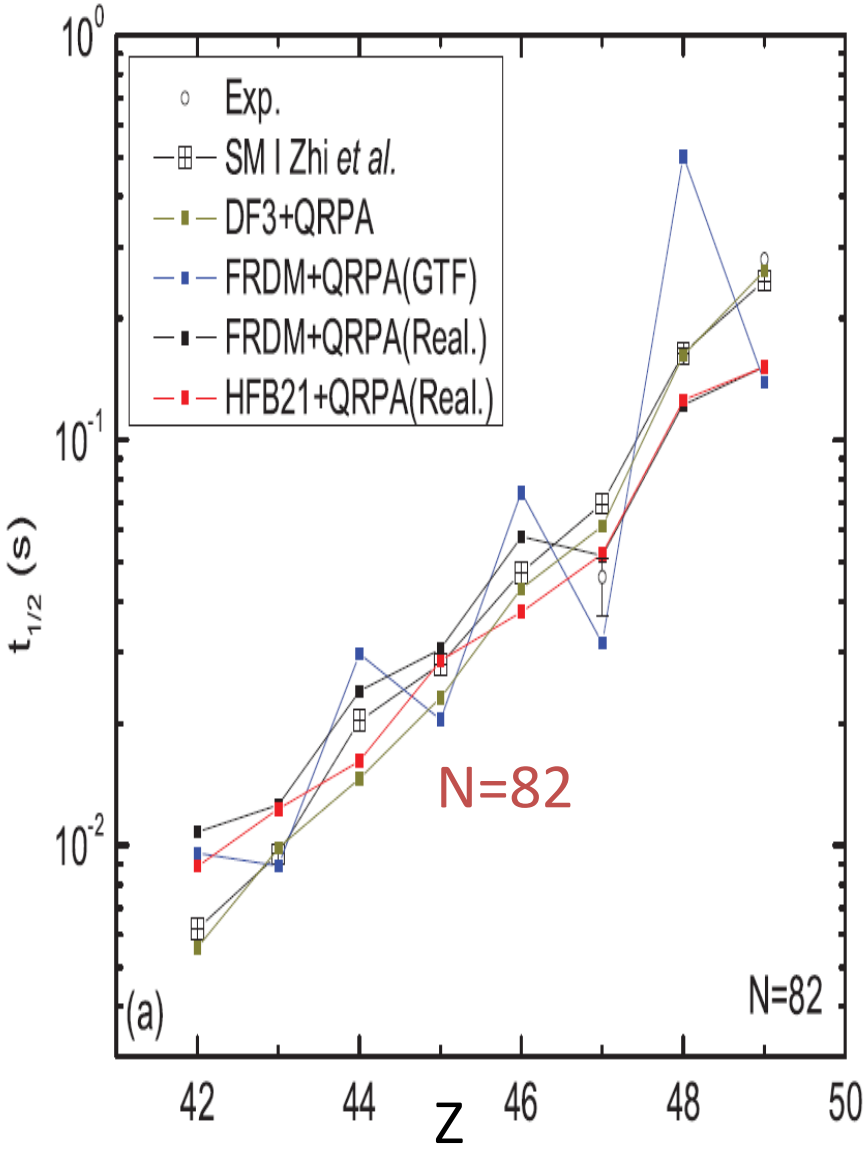


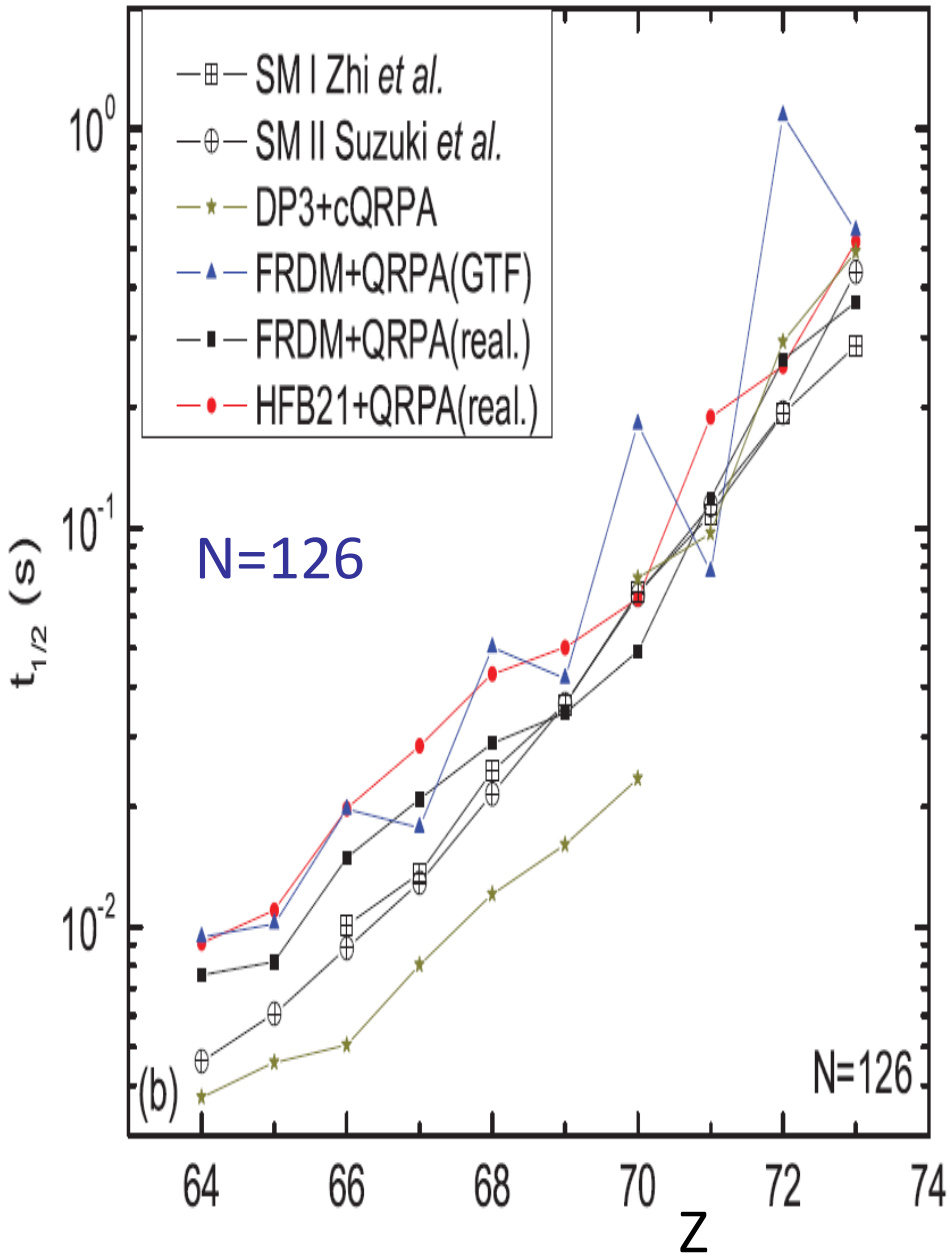


D.-L. Fang, B.A. Brown, T. Suzuki, Phys. Rev. C 88, 034304 (2013)

Predicted half-lives

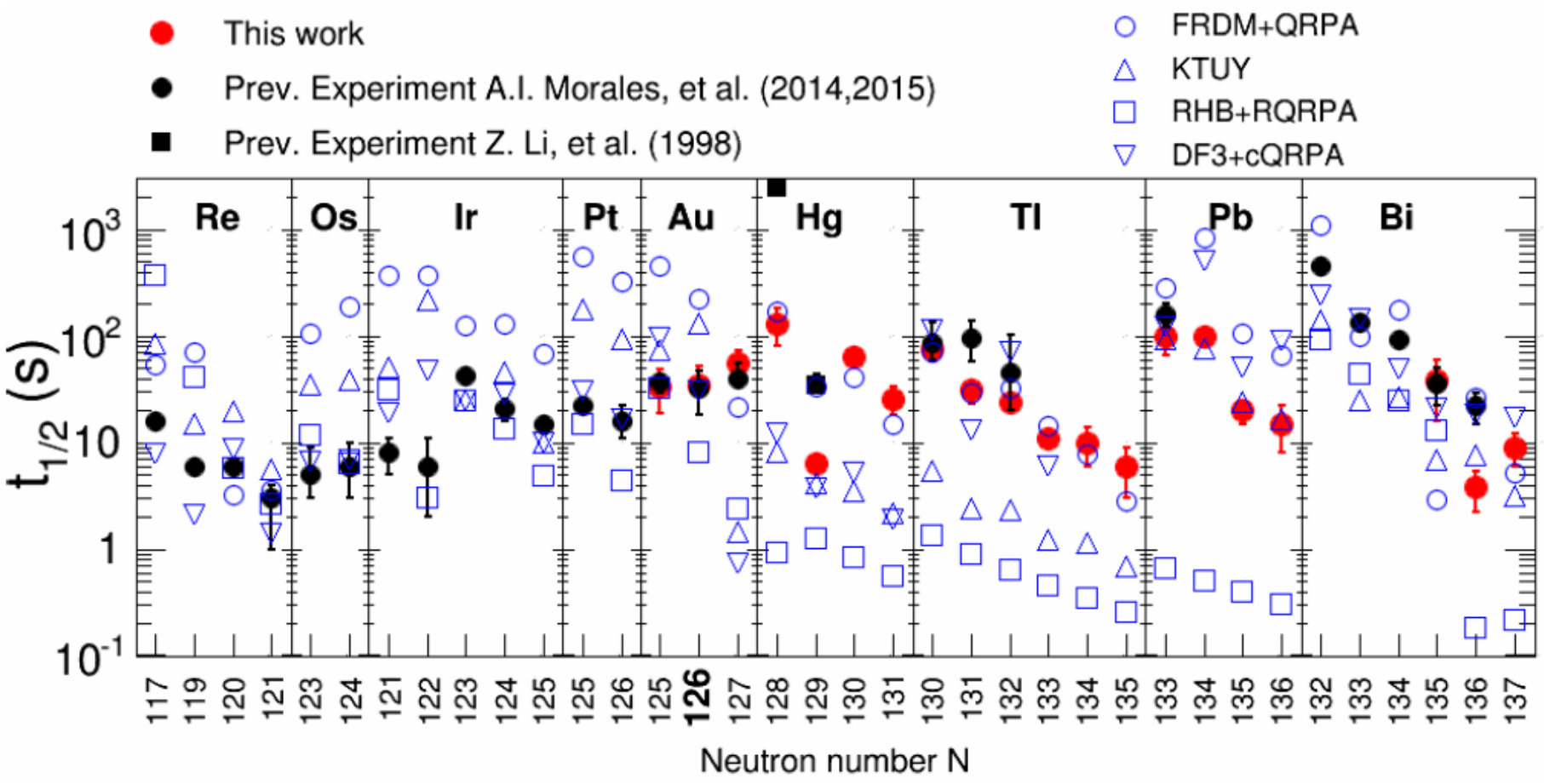
shell-model: only N=126!





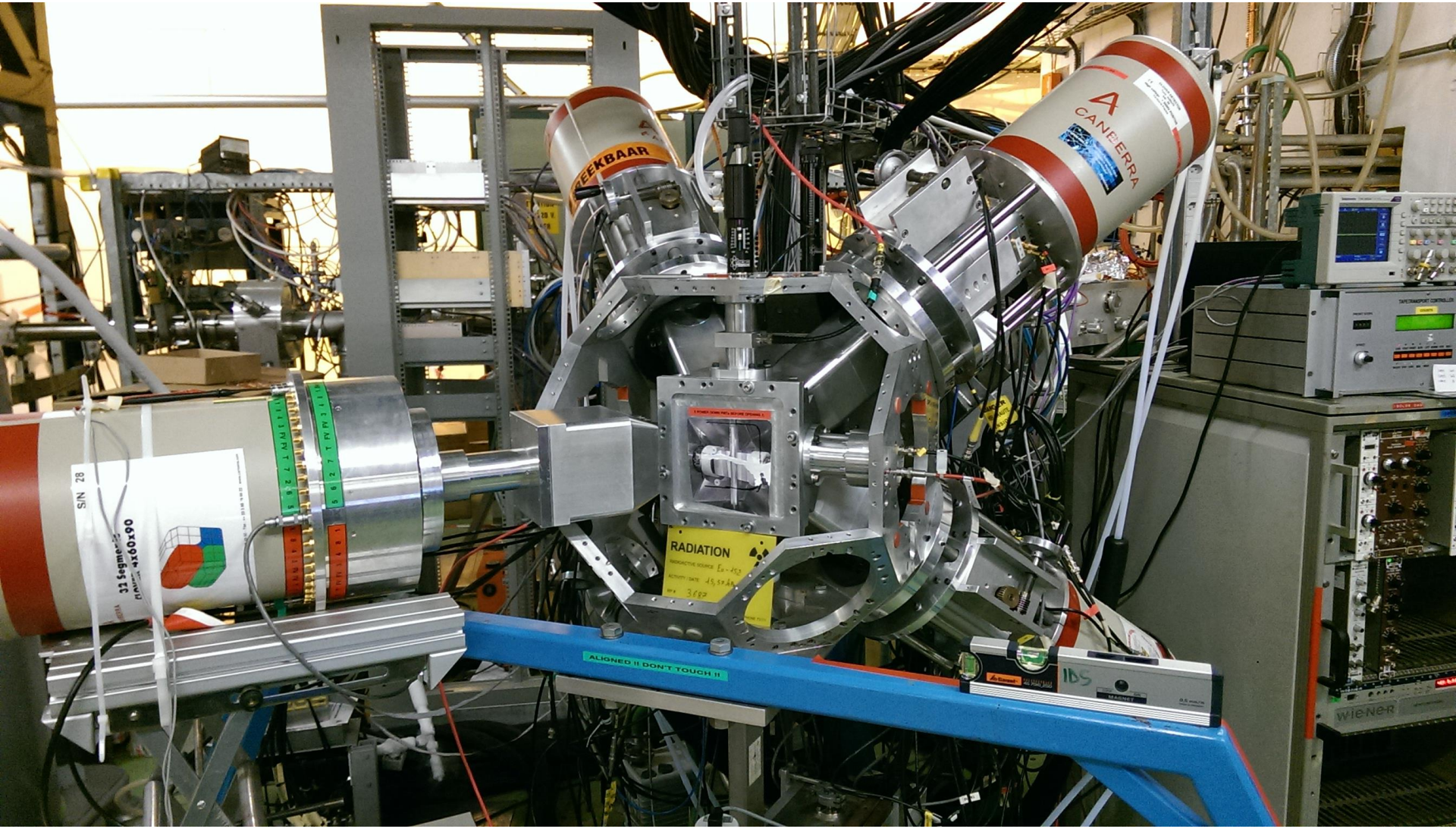
D.-L. Fang, B.A. Brown, T. Suzuki, Phys. Rev. C 88, 034304 (2013)

Lifetime measurements

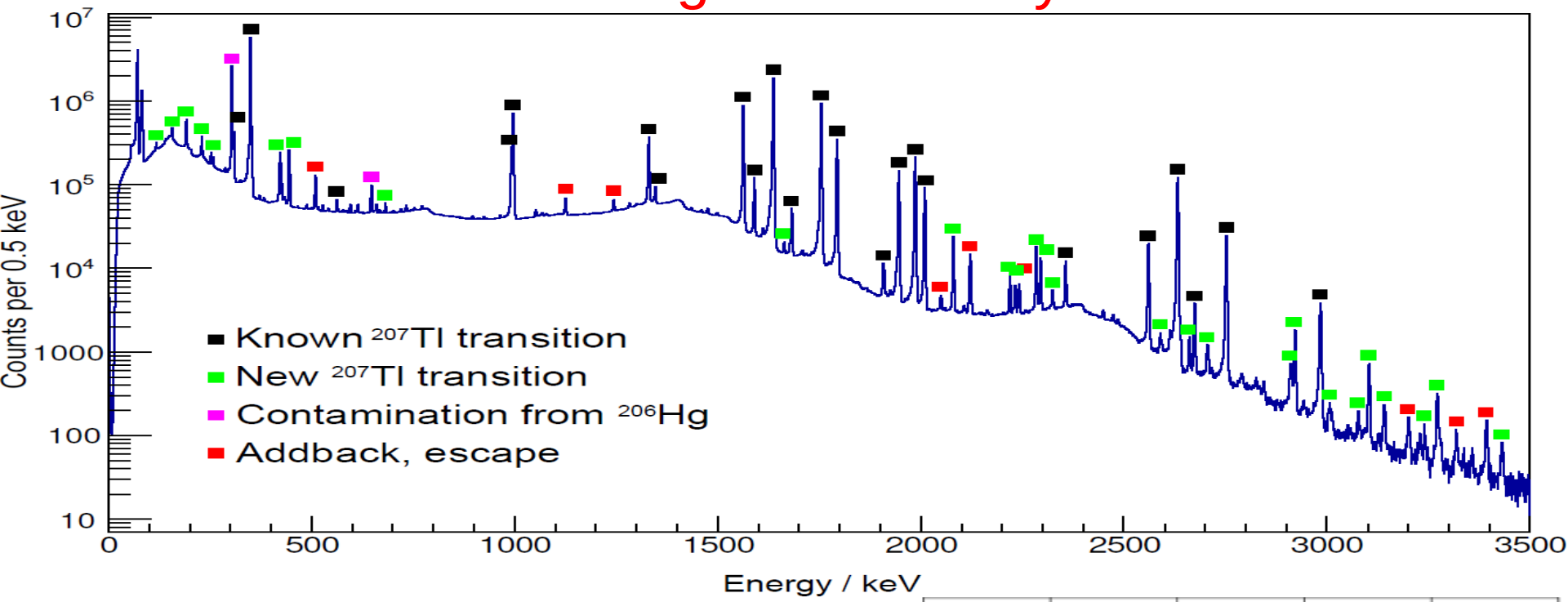


R. Caballero-Folch et al., Phys. Rev. Lett. 17, 012501 (2016)

ISOLDE decay station

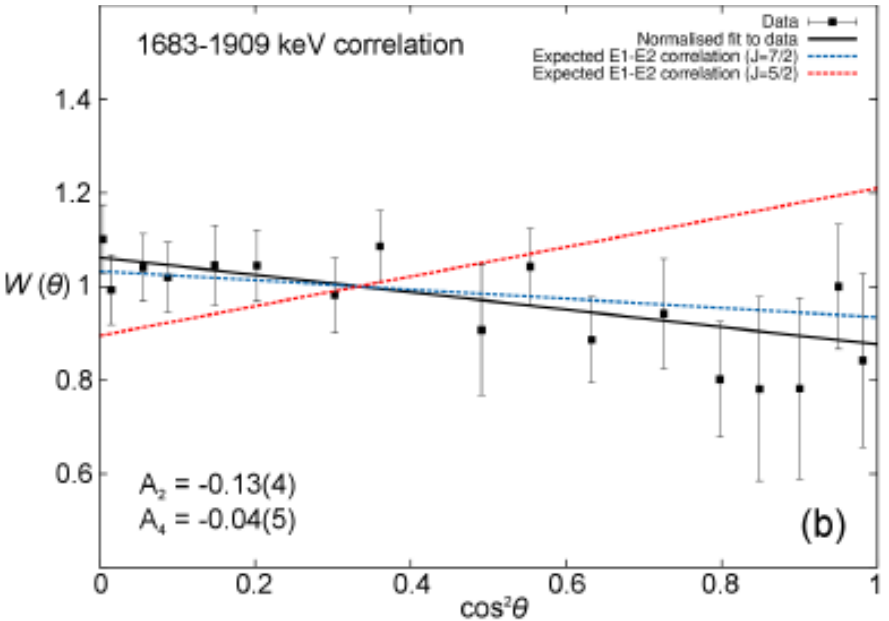


The ^{207}Hg->^{207}Tl decay

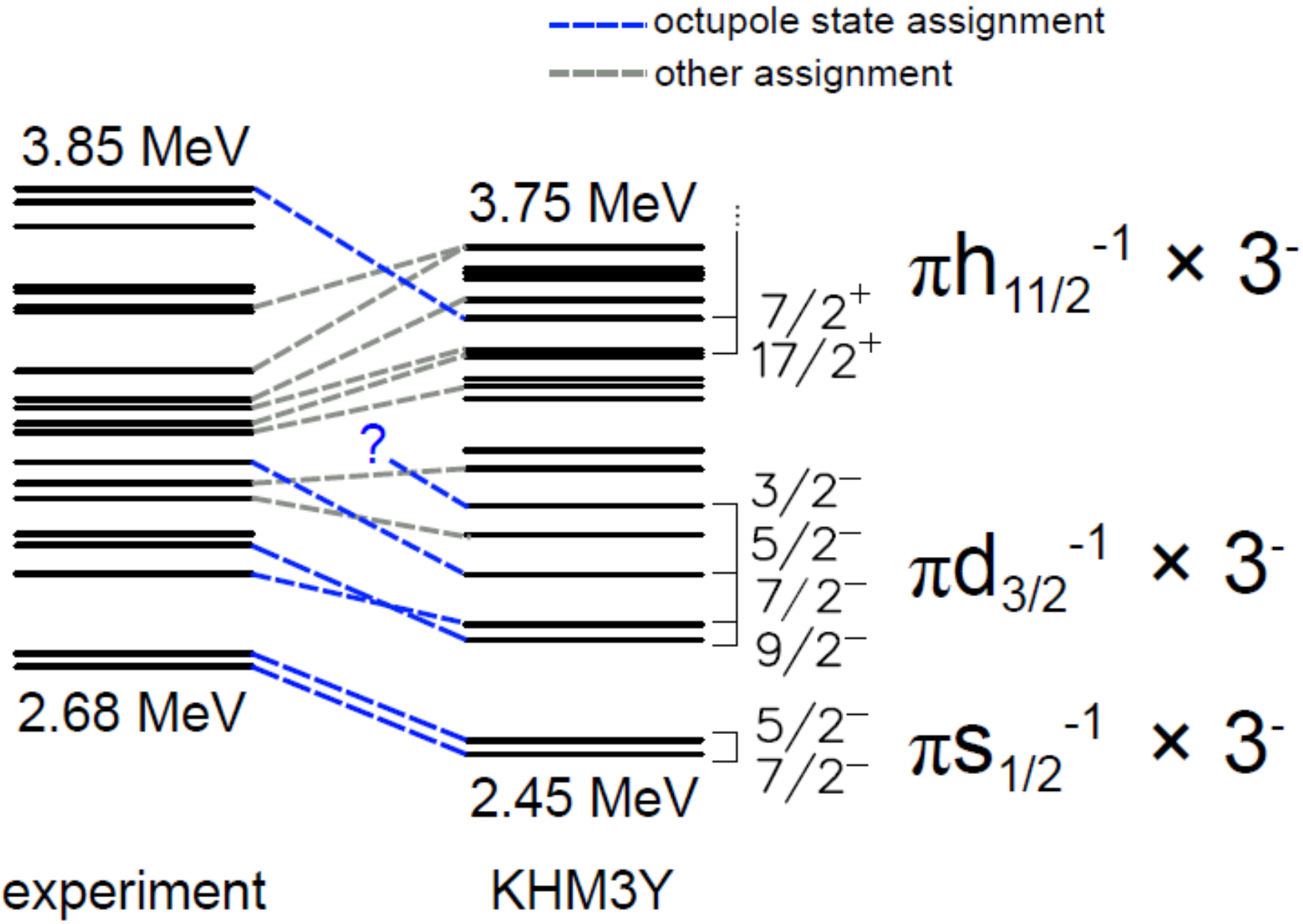


High statistics

=> γγ angular correlations



$^{207}Tl_{126}$ from beta decay



ISOLDE exps. in 2014, 2016

SM: B.A. Brown

T. Berry et al, to be published

Future: along N=126 (and N>126)

-fragmentation/spallation of ^{238}U, ^{208}Pb (or ^{209}Bi)

fragmentation:

GSI/FAIR: FRS, ESR

RIKEN: BigRIPS, SLOW-RI, Rare RI ring

spallation: ISOLDE

-multi-nucleon transfer on ^{208}Pb (and ^{198}Pt)

with particle identification (thin target)

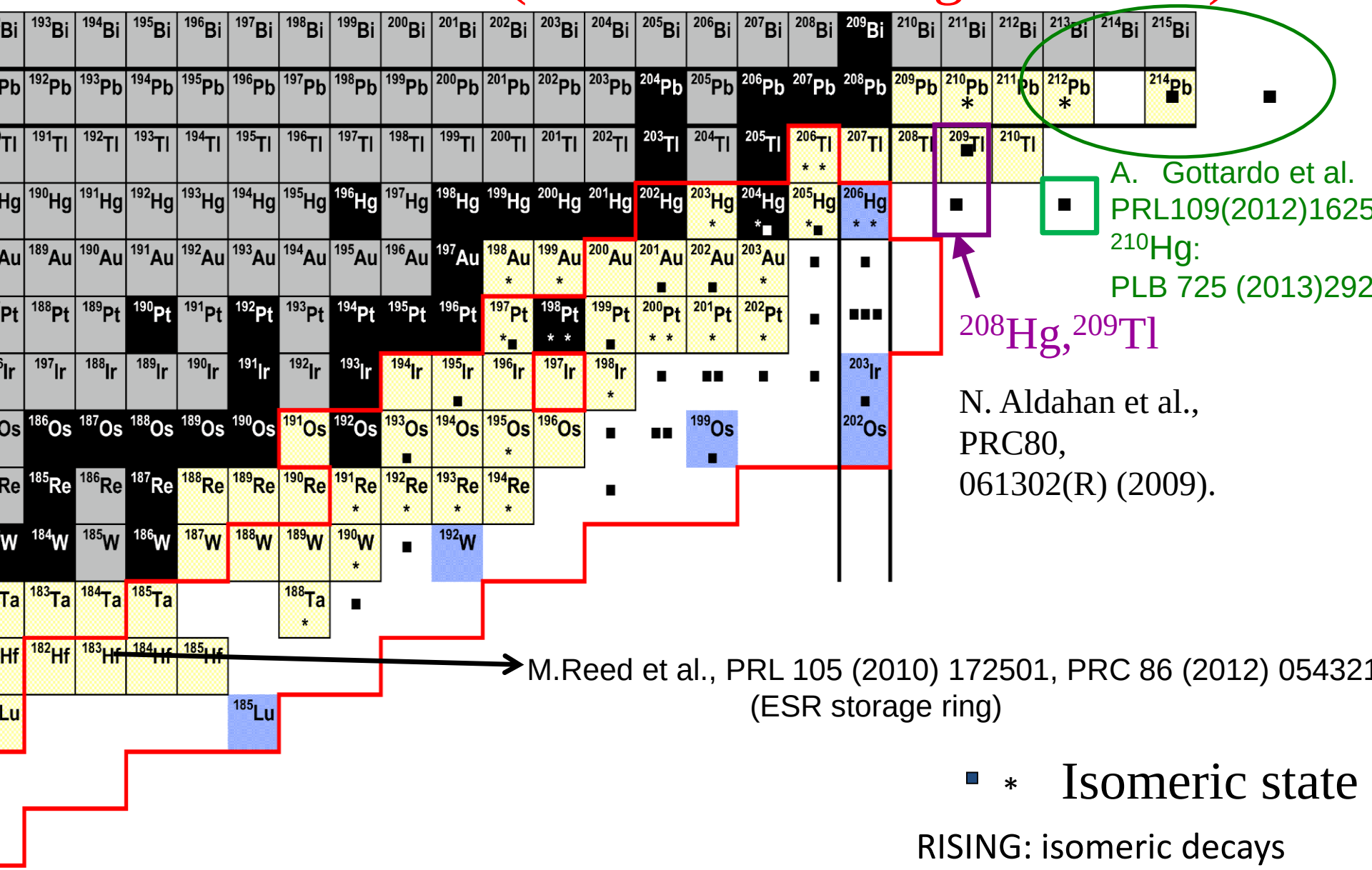
RIKEN: KISS

GANIL

ANL

Jyväskylä: IGISOL

Excited states (isomers from fragmentation)



S. Steer et al., Phys. Rev. C 84 (2011) 044313

Multinucleon transfer reactions: theory

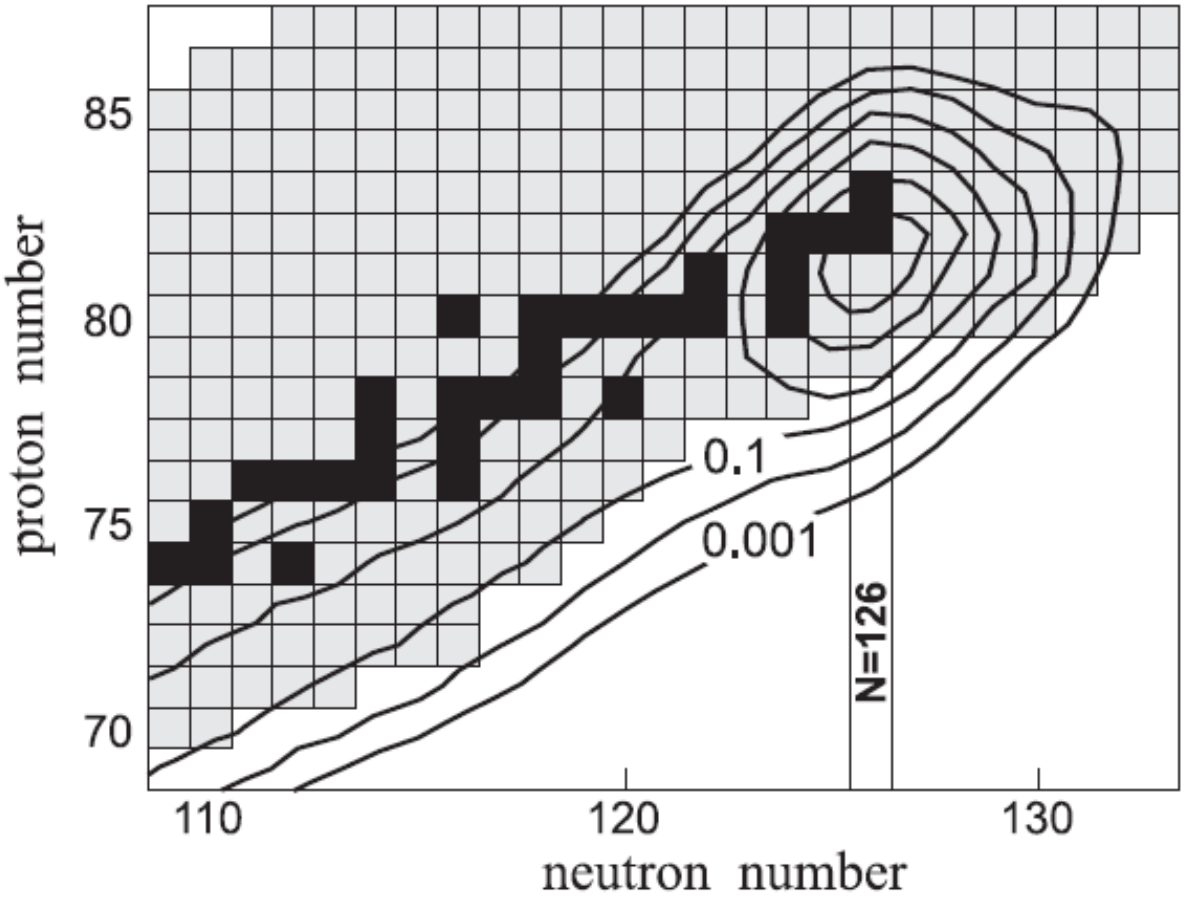


FIG. 4. Landscape of the total cross section $d^2\sigma/dZdN$ (mb, numbers near the curves) for production of heavy fragments in collisions of ^{136}Xe with ^{208}Pb at $E_{\text{c.m.}} = 450$ MeV. Contour lines are drawn over 1 order of magnitude.

V. Zagrebaev, W. Greiner, Phys. Rev. Lett. 101, 122701 (2008)

Neutron-rich nuclei from ^{136}Xe+^{198}Pt

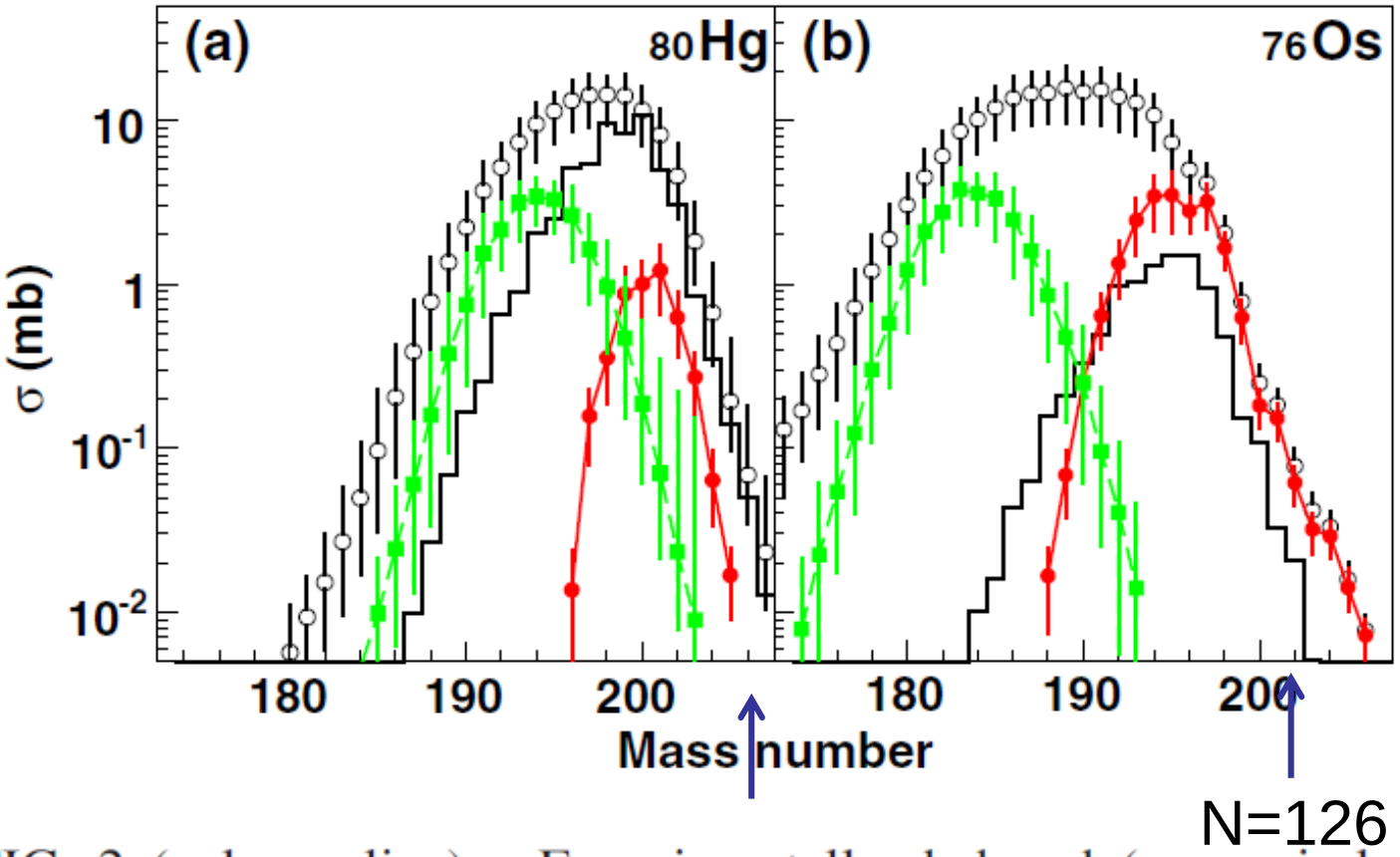
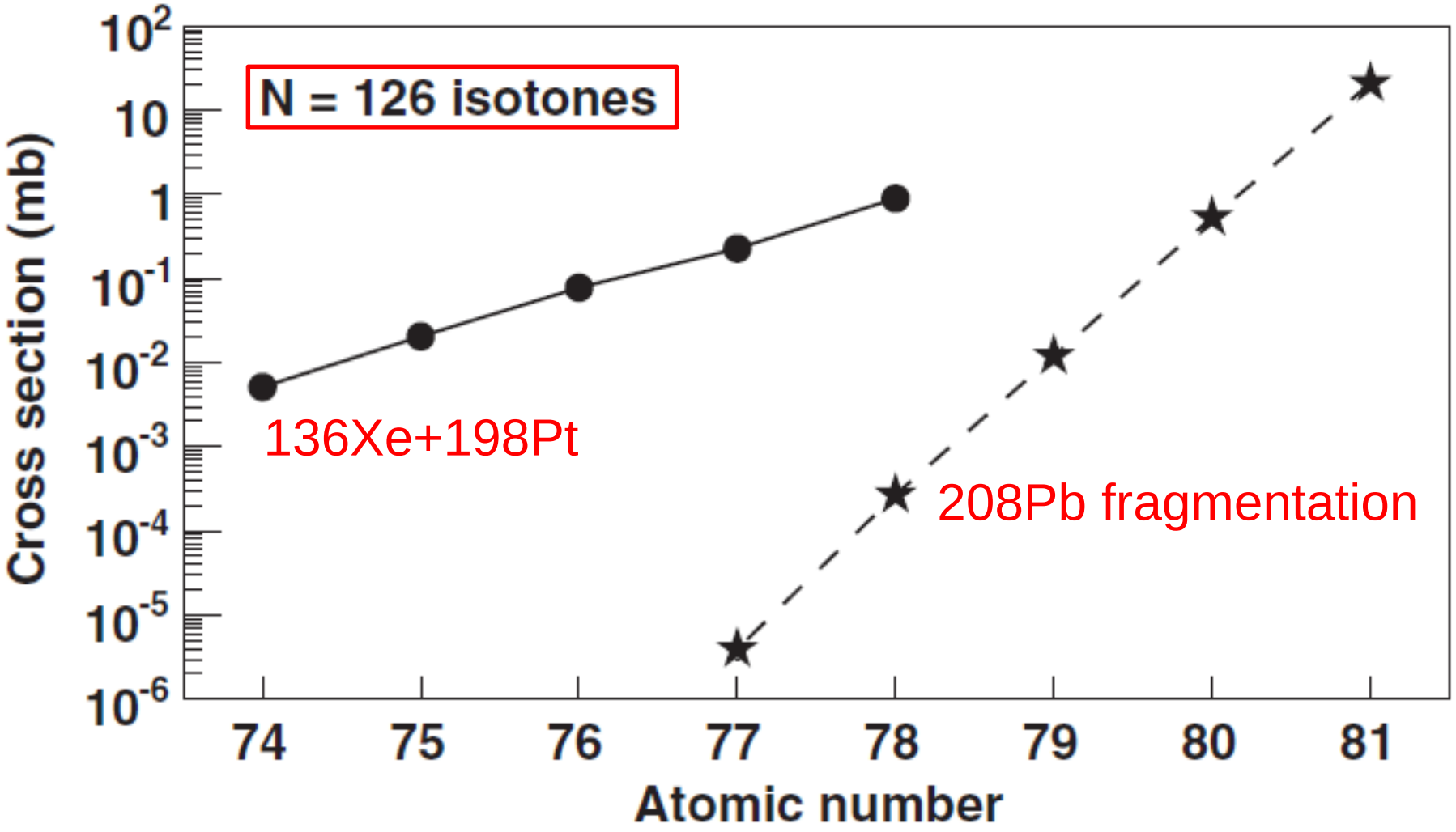


FIG. 2 (color online). Experimentally deduced (open circles) and calculated by GRAZING (histograms) cross sections for Hg (left) and Os (right) isotopes. Isotopic distributions for different windows of total kinetic energy loss from −25 to 25 MeV and from 175 to 225 MeV are indicated by different filled symbols of circles and squares, respectively.

Y.X. Watanabe et al., Phys. Rev. Lett. 115, 172503 (2015)

GANIL exp.

Deep-inelastic or fragmentation?



Deep-inelastic: Y.X. Watanabe et al., Phys. Rev. Lett. 115, 172503 (2015);
Fragmentation: T. Kurtukian-Nieto et al., Phys. Rev. C89, 024616 (2014)

Summary

High interest in N=126 (fragmentation and deep-inelastic)

Shell-model has high predictive power
(structure calculations)

First-forbidden – allowed β-decay competition: ^{208}Tl

First-forbidden β-decay calculations?

Δn=0 selection rule for 'allowed' β decay

T. A. Berry,[1] Zs. Podolyák,[1] R. J. Carroll,[1] R. Lică,[2,3] H. Grawe,[4] N. K. Timofeyuk,[1] T. Alexander,[1] A. N. Andreyev,[5] S. Ansari,[6] M. Borge,[2] J. Creswell,[7] L. M. Fraile,[8] C. Fahlander,[9] H. O. U. Fynbo,[10] W. Gelletly,[1] R.-B. Gerst,[6] A. Gredley,[7] P. Greenlees,[11] L. J. Harkness-Brennan,[7] M. Huyse,[12] S. M. Judge,[13] D. S. Judson,[7] J. Konki,[11] M. Kowalska,[2] J. Kurcewicz,[2] I. Kuti,[14] S. Lalkovski,[1] I. Lazarus,[15] M. Lund,[10] M. Madurga,[2] N. Marginean,[3] R. Marginean,[3] I. Marroquin,[16] C. Mihai,[3] R. E. Mihai,[3] M. Madurga,[2] E. Nácher,[16] A. Negret,[3] S. Noe,[3] C. Nita,[3,17] S. Pascu,[3] R. D. Page,[7] Z. Patel,[1] A. Perea,[16] V. Pucknell,[15] P. Rahkila,[11] E. Rapisarda,[2] P. H. Regan,[1,13] F. Rotaru,[3] C. M. Shand,[1] E. C. Simpson,[18] S. Stegmann,[6] T. Stora,[2] Ch. Sotty,[12,3] O. Tengblad,[16] P. Van Duppen,[12] V. Vedia,[8] R. Wadsworth,[5] P. M. Walker,[1] N. Warr,[6] F. Wearing,[7] and H. De Witte[12]

Thanks!