# Signatures of correlations in the $^{132}Sn$ mass region

**Houda NAÏDJA**

LPMPS, Université Constantine 1, Algeria.

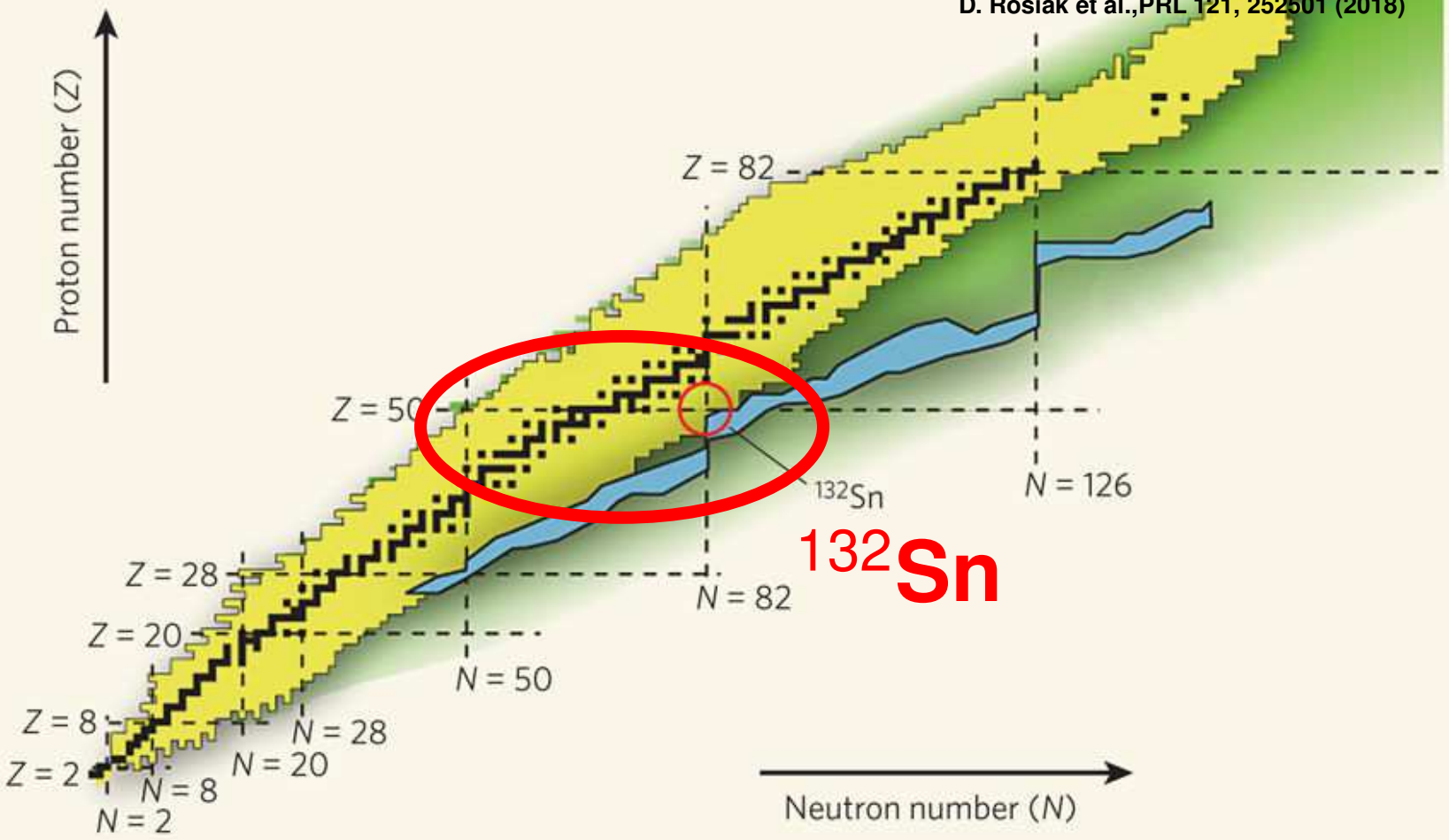
NUSPIN2019

Orsay 23-28 June, 2019

# SM progress in the $^{132}$Sn mass region

H. Naïdja et al., J. Phys. Conf. Series 580, 012030 (2015)
H. Naïdja et al., Acta. Phys. Pol B 46, 669 (2015)
H. Naïdja et al.,PRC 96, 034312 (2017)
H. Naïdja et al., EPJ Web of Conferences 193, 01005 (2018)
H. Naïdja et al., J. Phys. Conf. Series 966, 012061 (2018)

G. S. Simpson et al., PRL 113, 132502 (2014)
R. Lozeva et al., PRC 93,014316 (2016)
R. Lozeva et al., PRC 93,014316 (2016)
U. Urban et al., PRC 93, 034326 (2016)
H. Naïdja et al., PRC 95, 064303 (2017)
R. Lozeva et al. PRC 98, 024323 (2018)
D. Rosiak et al.,PRL 121, 252501 (2018)



# SM progress in the $^{132}$Sn mass region

Spectroscopic properties and collectivity in even-even nuclei

PHYSICAL REVIEW C **96**, 034312 (2017)

**Shell-model investigation of spectroscopic properties and collectivity in the nuclei beyond $^{132}$Sn**

H. Naïdja,[1,2,3] F. Nowacki,[1] and B. Bounthong[1]
[1] *Université de Strasbourg, CNRS, IPHC UMR 7178, F-67000 Strasbourg, France*
[2] *GSI Helmholtzzentrum für Schwerionenforschung GmbH, 64291 Darmstadt, Germany*
[3] *Université Constantine 1, LPMS, route Ain El Bey 25000 Constantine, Algeria*
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EPJ Web of Conferences **193**, 01005 (2018) https://doi.org/10.1051/epjconf/201819301005

**First signs of collectivity in $N = 86$ and $88$ isotones above $^{132}$Sn**

*Houda* NAÏDJA[1,2,⋆] and *Frédéric* NOWACKI[1,⋆⋆]
[1] *Université de Strasbourg, CNRS, IPHC UMR 7178, F-67000 Strasbourg, France*
[2] *Université Constantine 1, LPMPS, route Ain El Bey 25000 Constantine, Algeria*

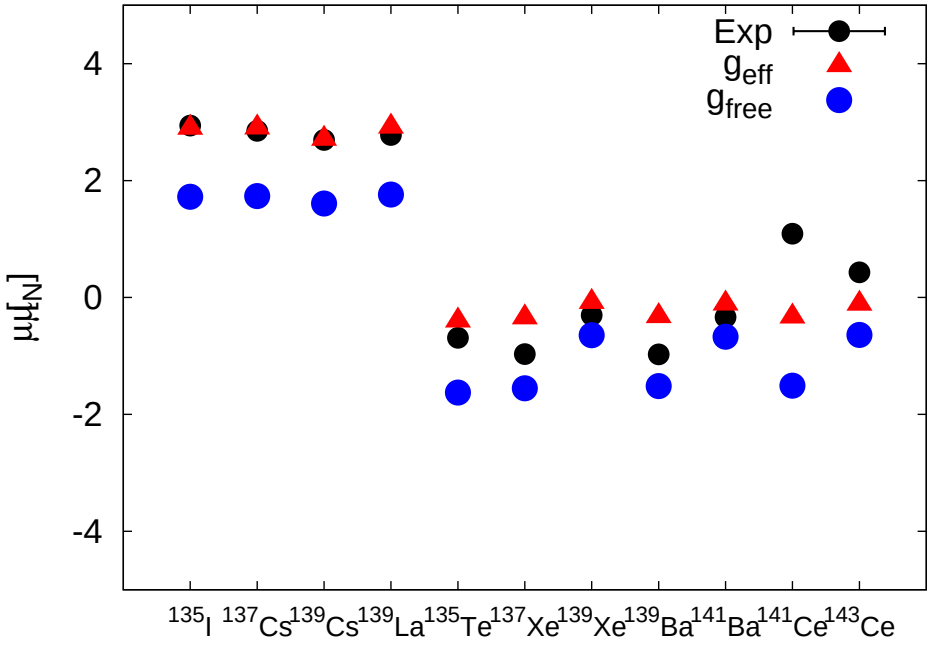
# SM progress in the $^{132}$Sn mass region

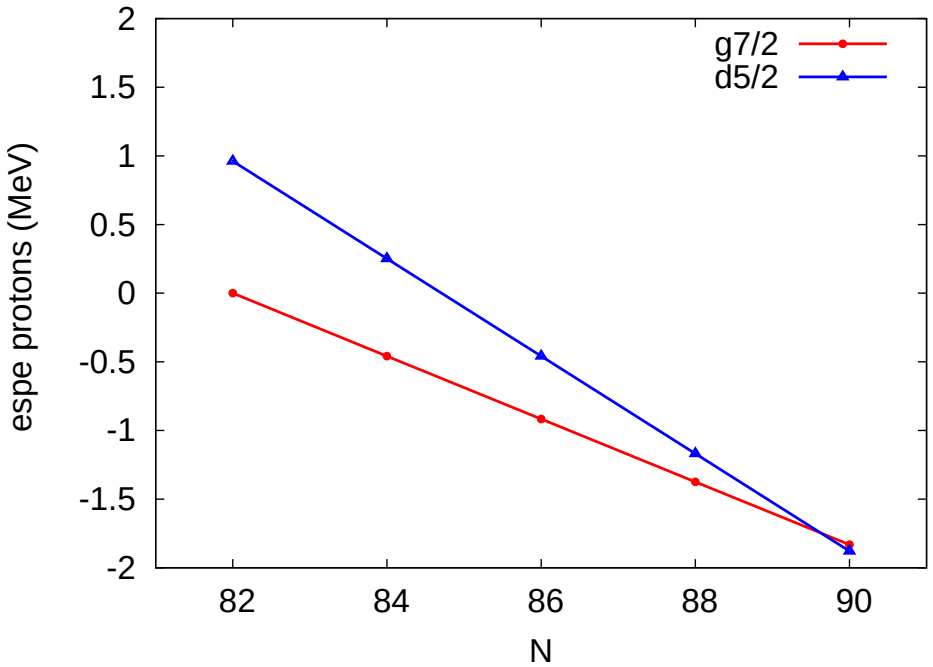
Spectrscopic properties of odd-mass nuclei

12th International Spring Seminar on Nuclear Physics IOP Publishing
IOP Conf. Series: Journal of Physics: Conf. Series **966** (2018) 012061 doi:10.1088/1742-6596/966/1/012061

**Shell-model investigation of odd-mass nuclei in the $^{132}$Sn region**

H. Naïdja[†,⋆], F. Nowacki[†]



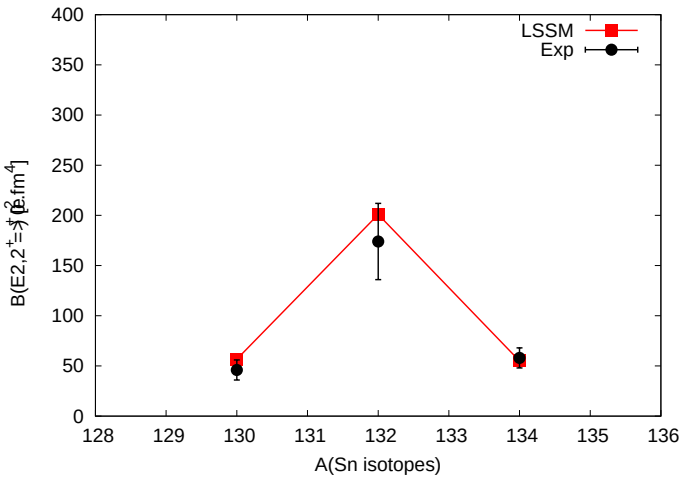
# SM progress in the $^{132}$Sn mass region

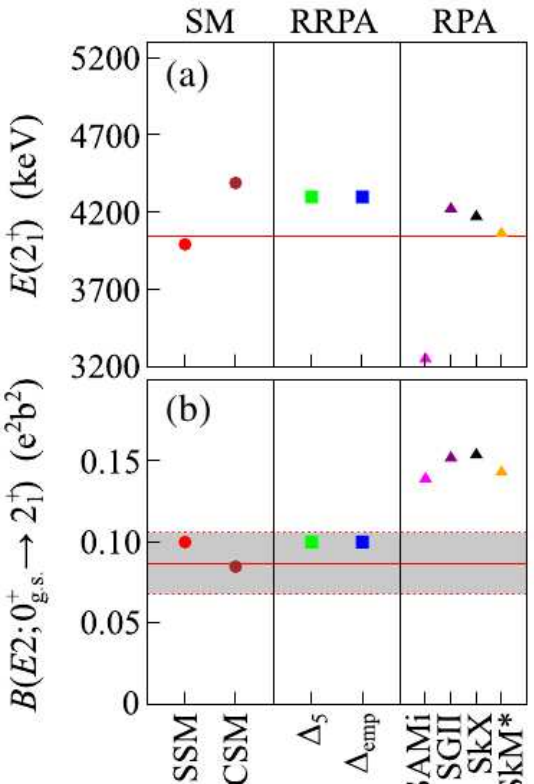
The first Shell-model investigation of doubly magic nucleus $^{132}$Sn

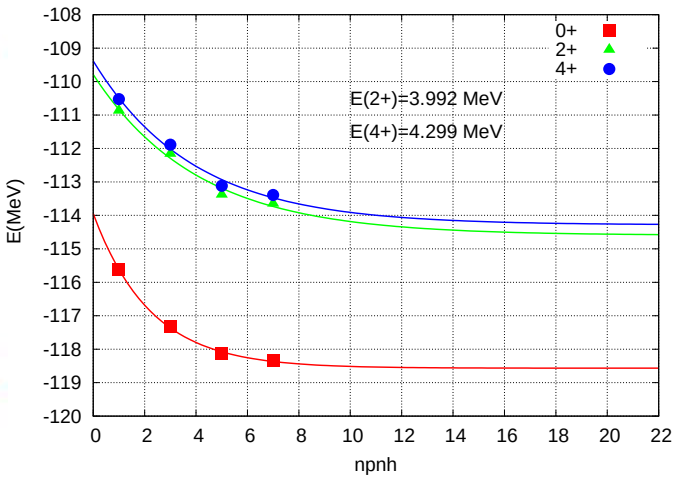
PHYSICAL REVIEW LETTERS **121**, 252501 (2018)

**Enhanced Quadrupole and Octupole Strength in Doubly Magic $^{132}$Sn**

D. Rosiak,[1] M. Seidlitz,[1,*] P. Reiter,[1] H. Naïdja,[2,3,4] Y. Tsunoda,[5] T. Togashi,[5] F. Nowacki,[2,3] T. Otsuka,[6,5,7,8,9] G. Colò,[10,11] K. Arnswald,[1] T. Berry,[12] A. Blazhev,[1] M. J. G. Borge,[13,†] J. Cederkäll,[14] D. M. Cox,[15,16] H. De Witte,[8] L. P. Gaffney,[13] C. Henrich,[17] R. Hirsch,[1] M. Huyse,[8] A. Illana,[8] K. Johnston,[13] L. Kaya,[1] Th. Kröll,[17] M. L. Lozano Benito,[13] J. Ojala,[15,16] J. Pakarinen,[15,16] M. Queiser,[1] G. Rai esling,[13] J. Snäll,[14] P. Van Duppen,[8] A. Vogt,[1] M. K. O. Zell[1]



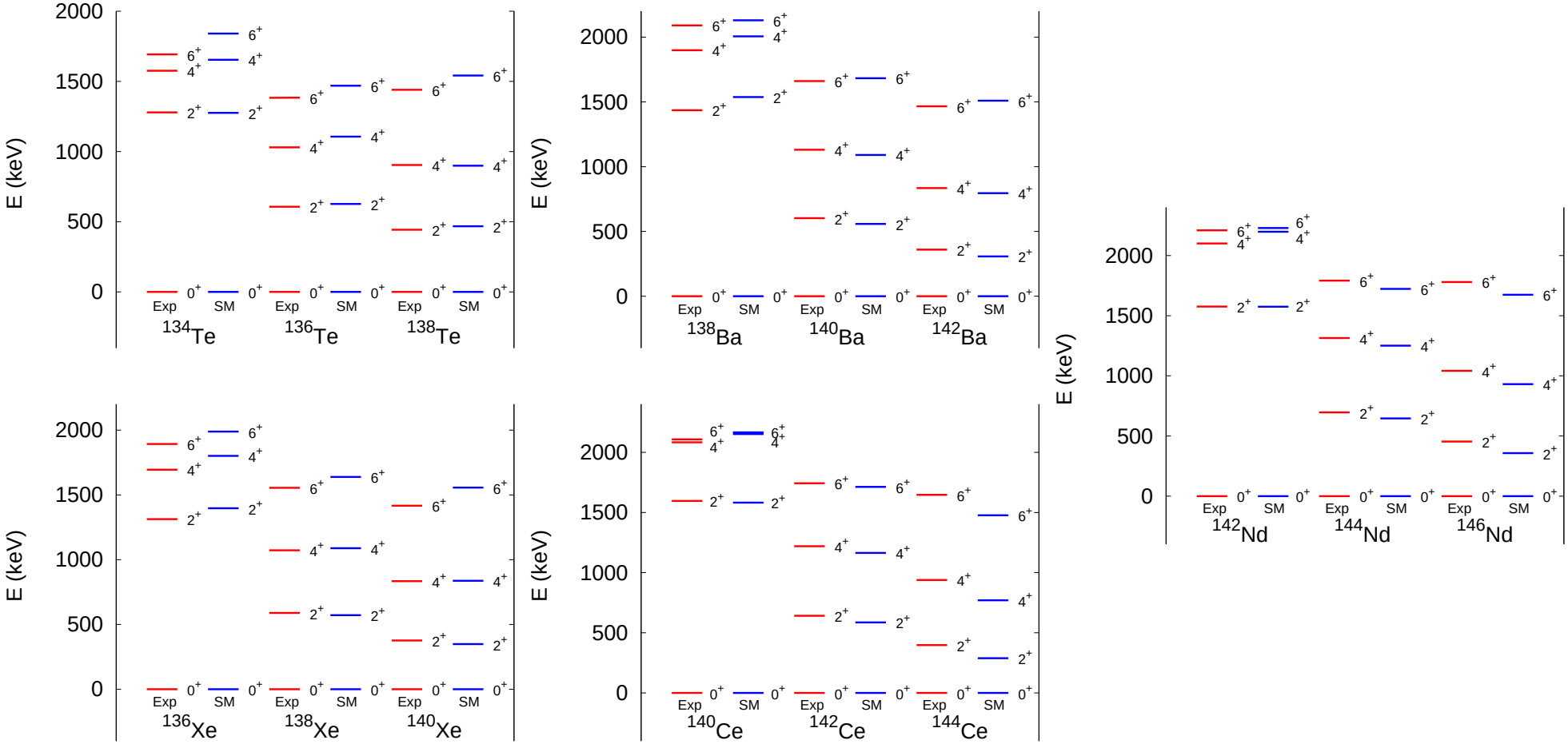
## Part I : Quadrupole correlations in even-even nuclei

*Te*, *Xe*, *Ba*, *Ce*, *Nd* with $82 \leq N \leq 88$

**In Collaboration with F. Nowacki (IPHC)**

# Energy levels of Te, Xe, Ba, Ce, Nd

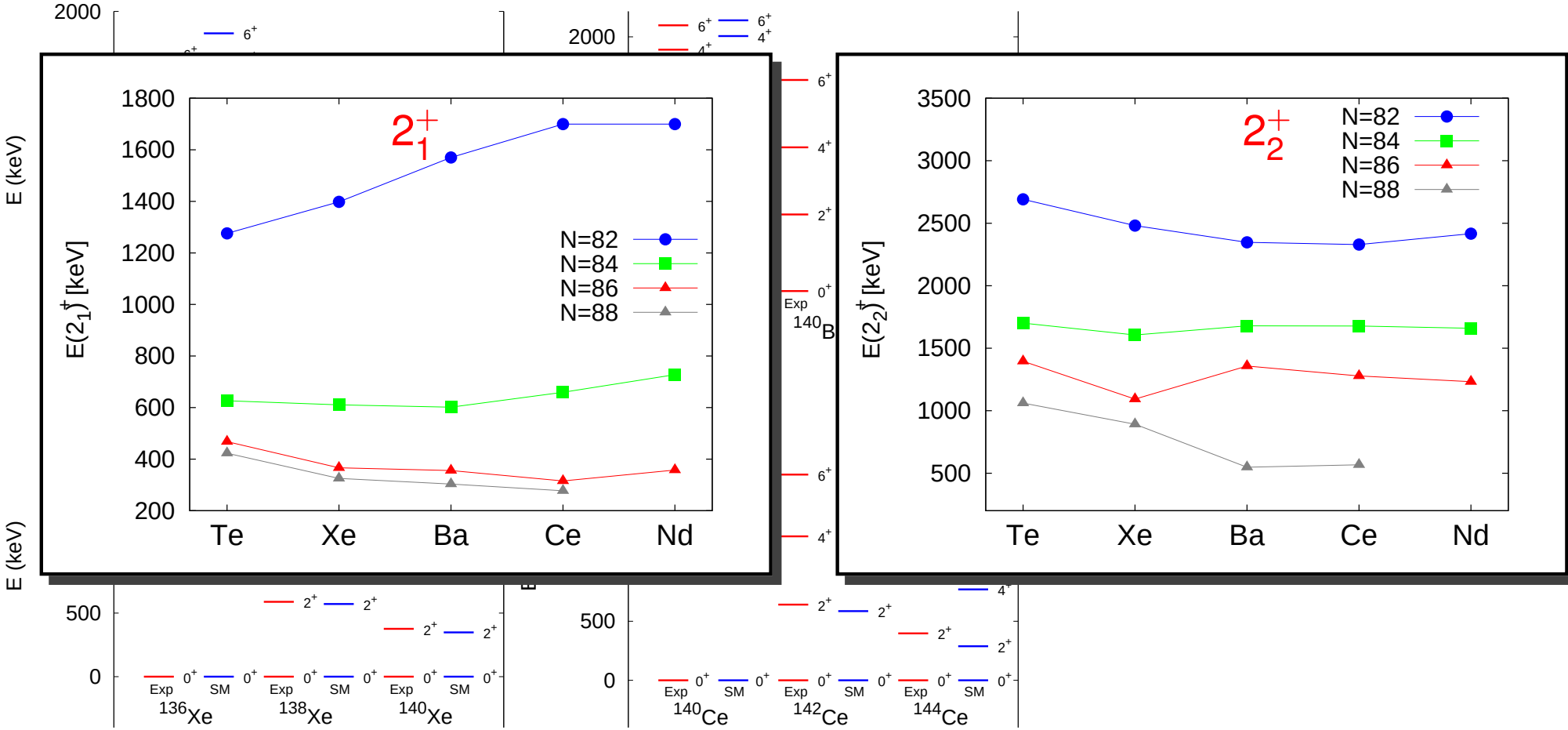
**H. Naïdja, F. Nowacki and B. Bounthong, PRC 96, 034312 (2017).**




The calculations are achieved using **N3LOP** effective interaction

# Energy levels of Te, Xe, Ba, Ce, Nd

H. Naïdja, F. Nowacki and B. Bounthong, PRC 96, 034312 (2017).



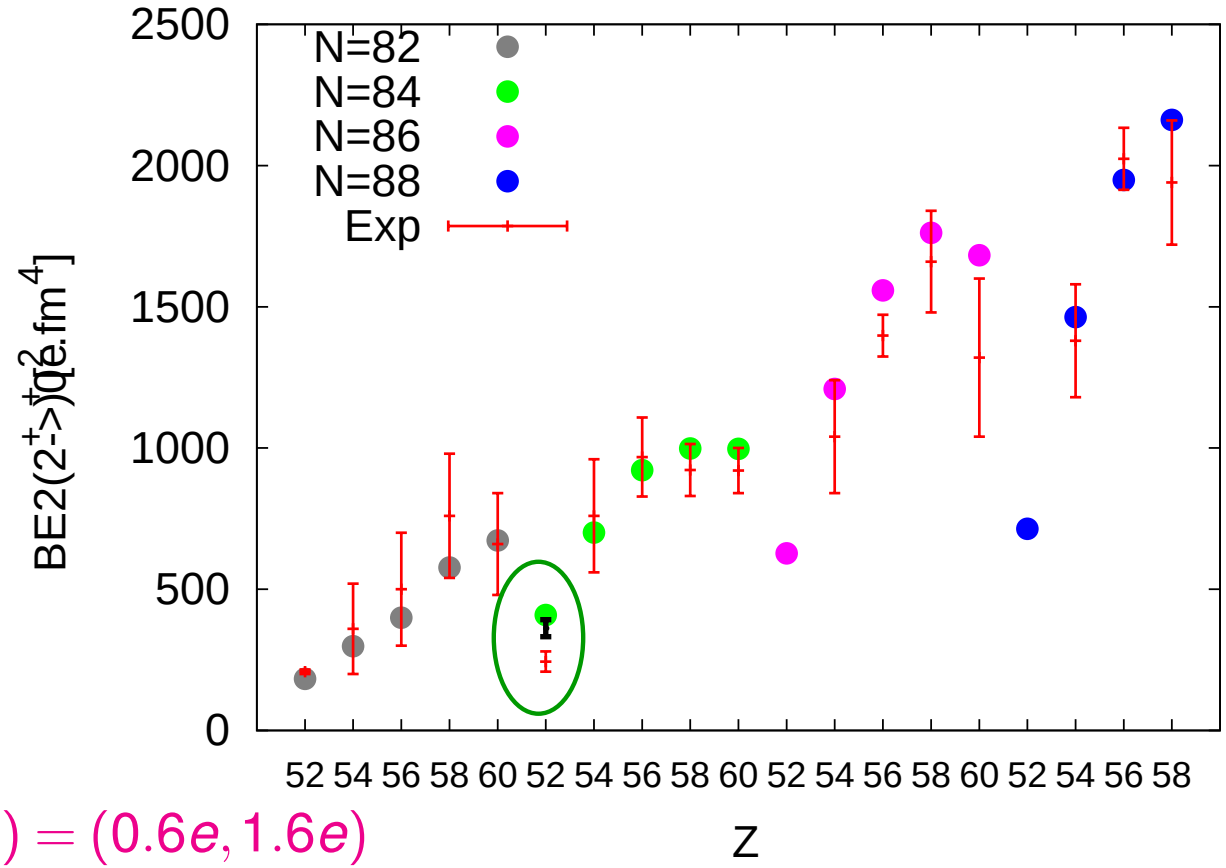

A decrease of $E(2_1^+)$ and $E(2_2^+)$ from N=82 to N=88 isotones

$\Downarrow$

**sign of collectivity**

# E2 Transitions

H. Naïdja, F. Nowacki EPJ Web of Conferences 193, 01005 (2018).

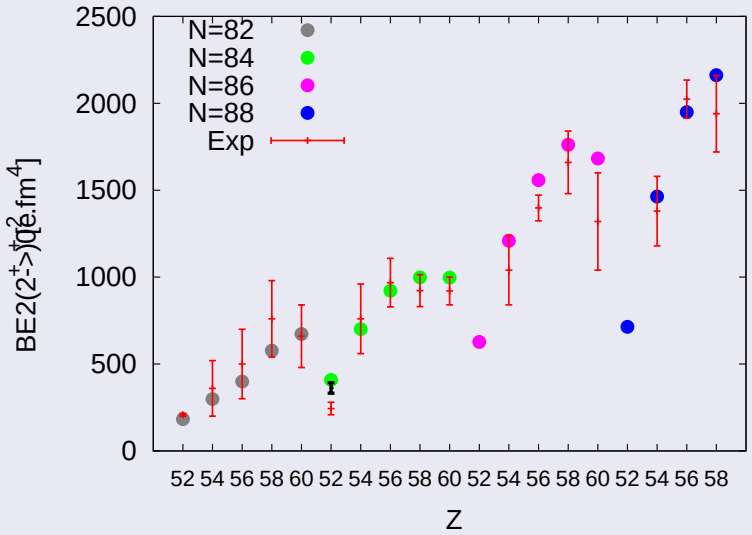


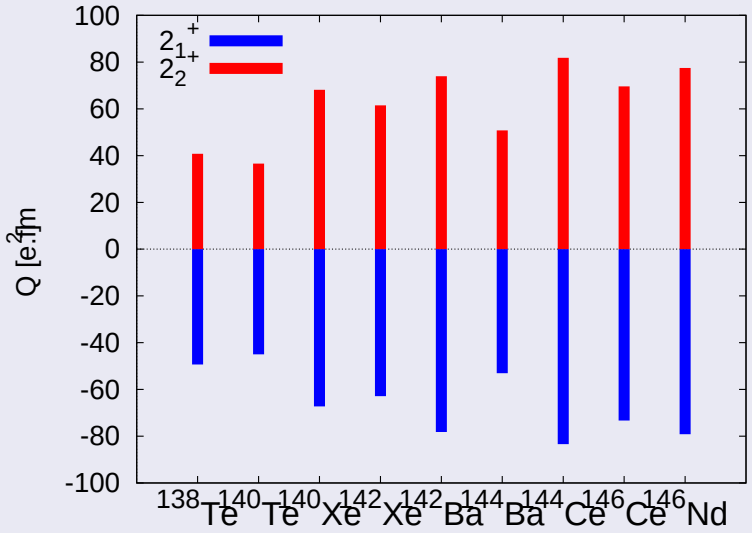

$(e_{eff(\nu)}, e_{eff(\pi)}) = (0.6e, 1.6e)$

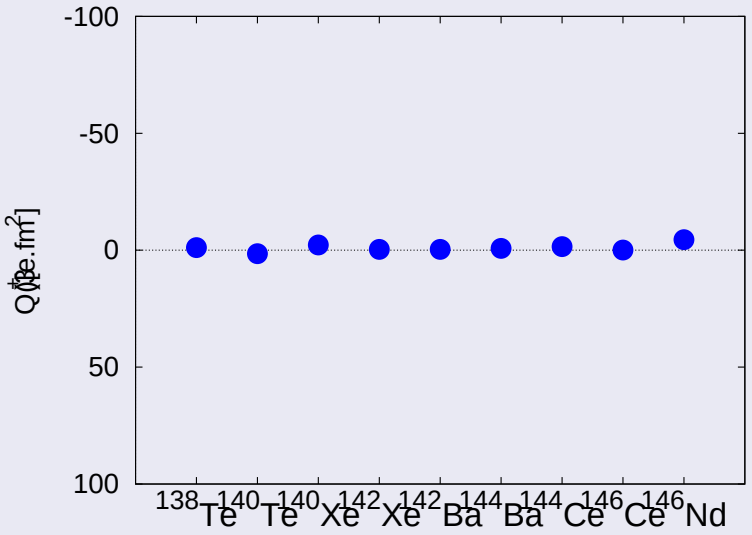
- ✓ The overestimated $^{136}$Te strength is now consistent with the new measurement
- ✓ small B(E2) in N=82 isotones, due to spherical character
- ✓ strong B(E2) in N=86 and 88 isotones, reflecting the presence of collective character

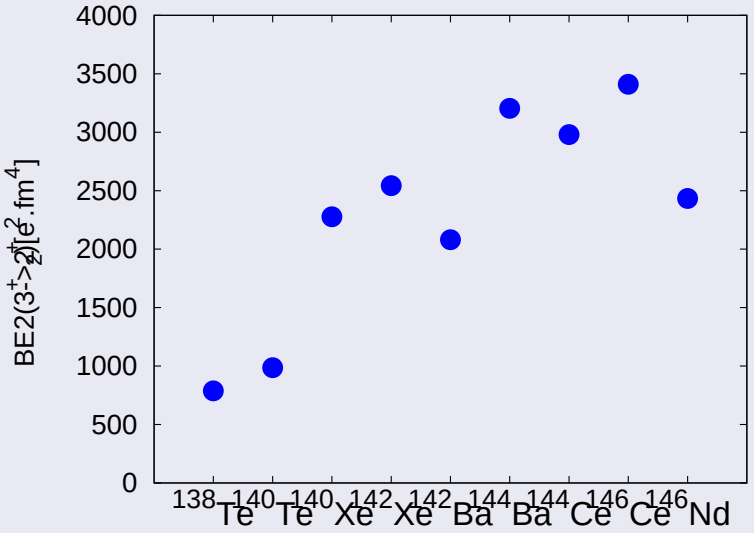
# Signs of Collectivity in N=86, 88 isotones

H. Naïdja, F. Nowacki and B. Bounthong, PRC 96, 034312 (2017).



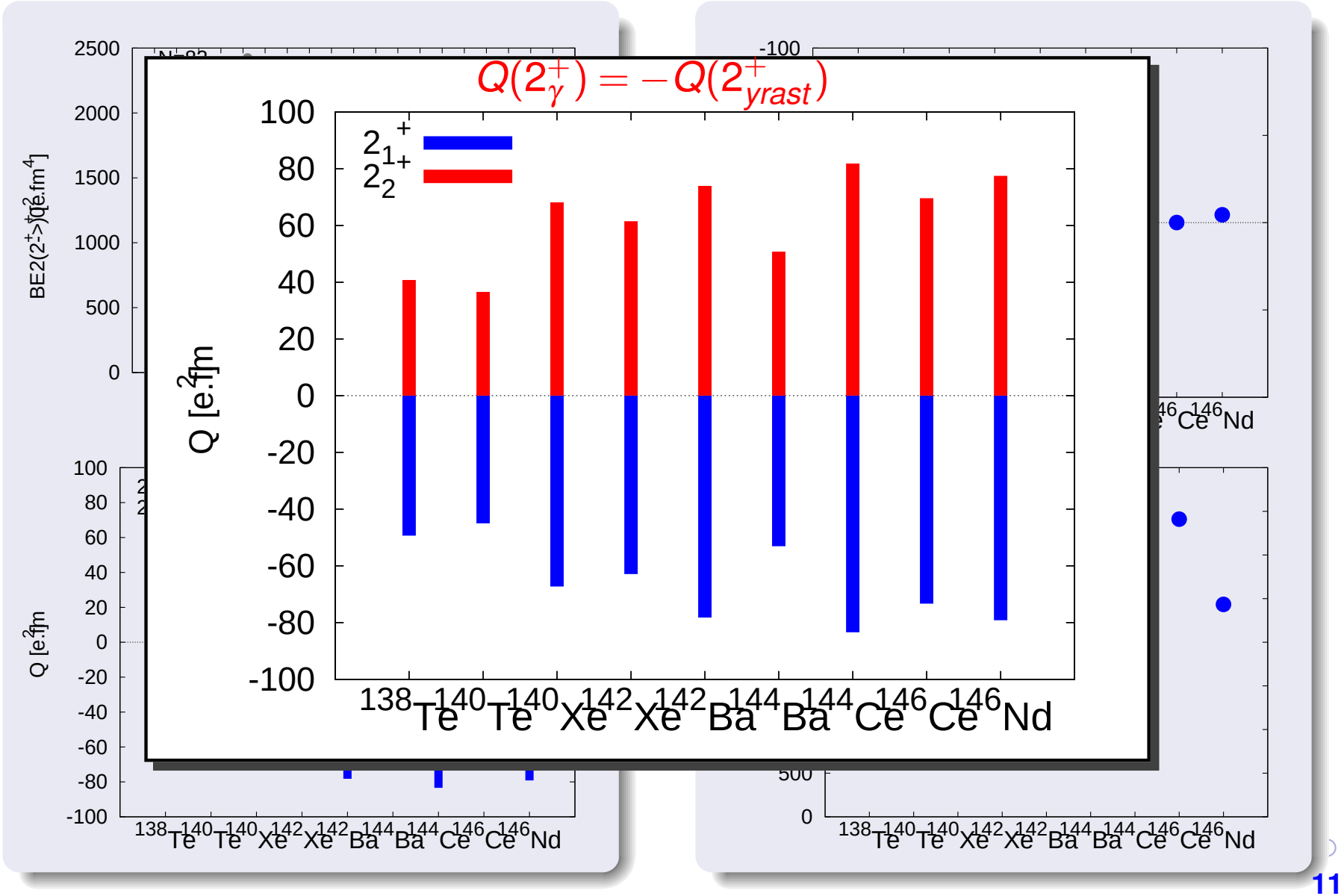



# Signs of Collectivity in N=86, 88 isotones

H. Naïdja, F. Nowacki and B. Bounthong, PRC 96, 034312 (2017).



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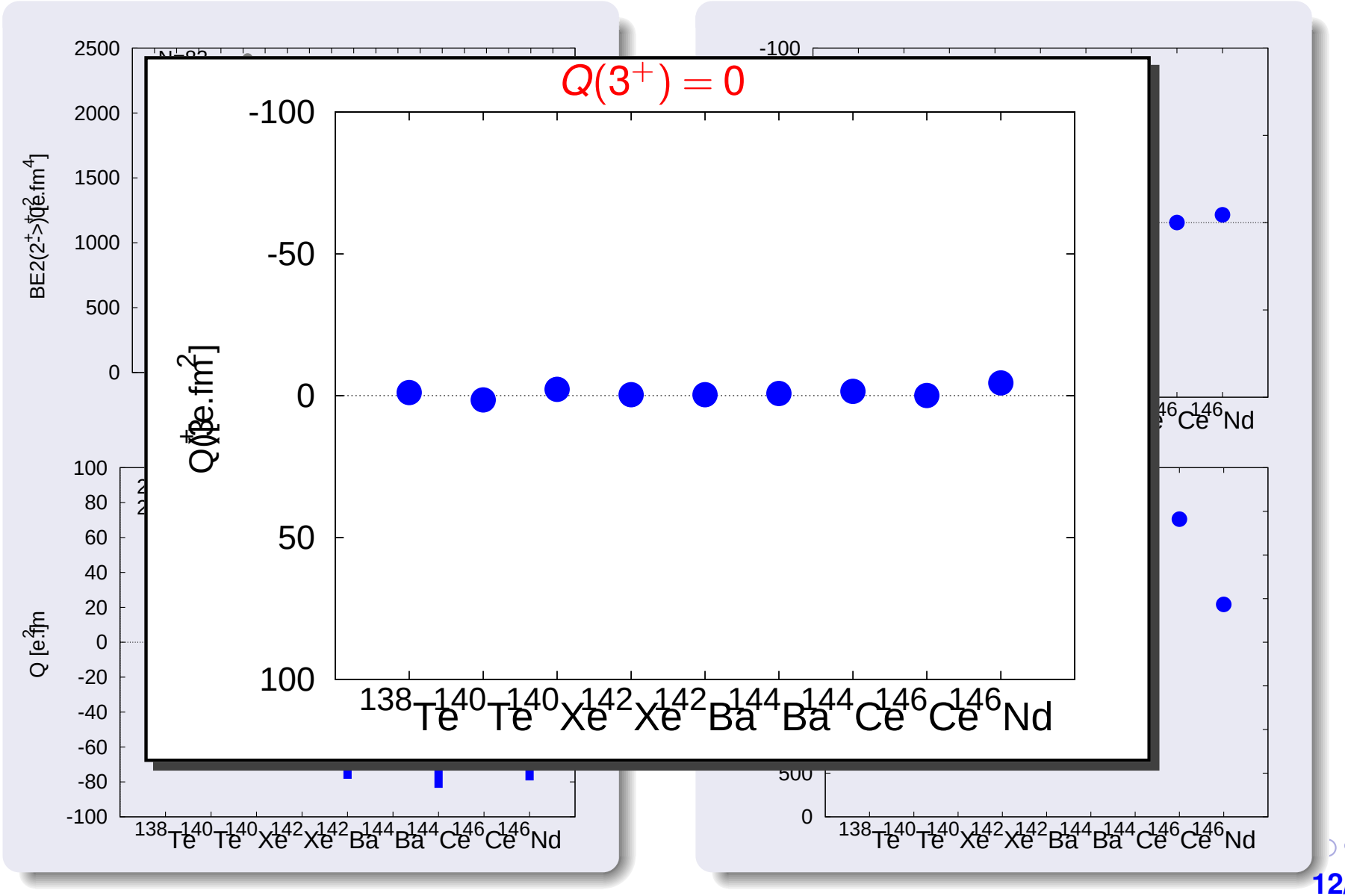

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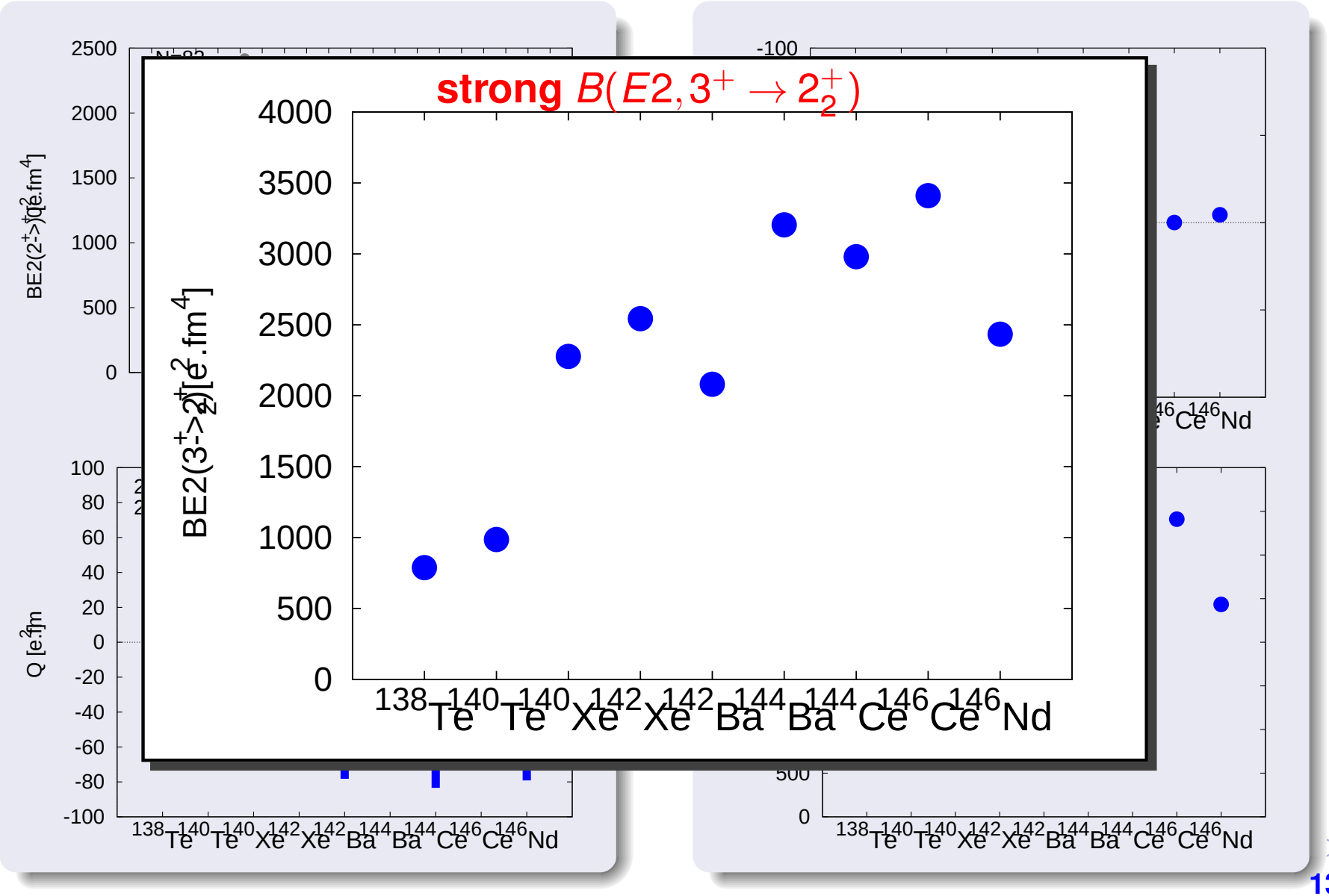

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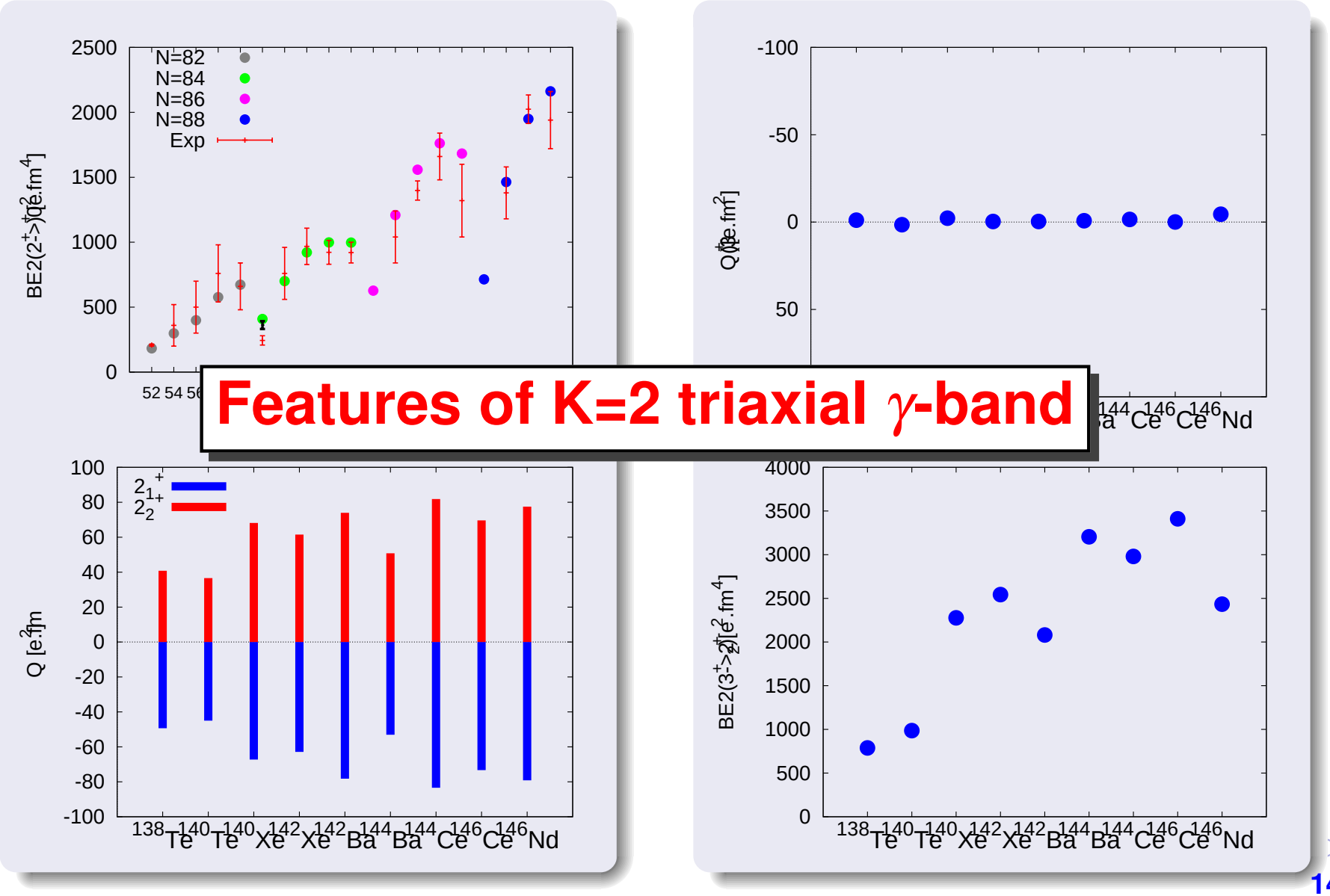
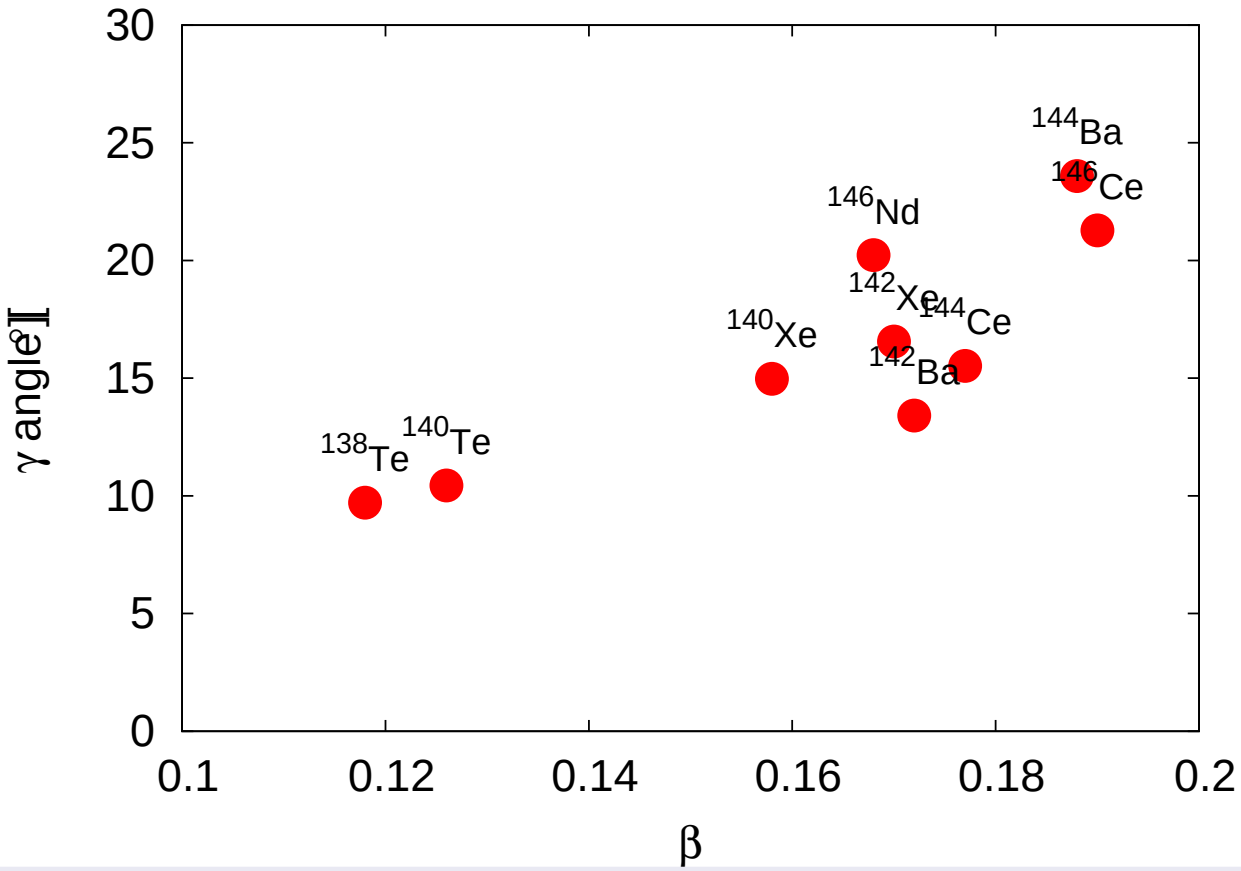



**Features of K=2 triaxial $\gamma$-band**

# Deformation parameters

$\beta$ deformation parameter and $\gamma$ angle*




- Mild deformation in $^{138}$Te and $^{140}$Te.
- Increase in deformation with non-axiality from $^{140}$Xe to $^{146}$Nd.
- The maximum of the collectivity in $^{144}$Ba and $^{146}$Ce

(*) K. Kumar, PRL 28, 249 (1972)

# M1 Moments

H. Naïdja, F. Nowacki and B. Bounthong, PRC 96, 034312 (2017).

## FREE $g-$FACTORS

$(g_\pi^s, g_\pi^l) = (5.5857, 1.0)$
$(g_\nu^s, g_\nu^l) = (-3.8263, 0.0)$

☞ overall bad agreement with the data

## EFFECTIVE $g$-FACTORS

$(g_\pi^s, g_\pi^l) = (3.250, 1.069)$
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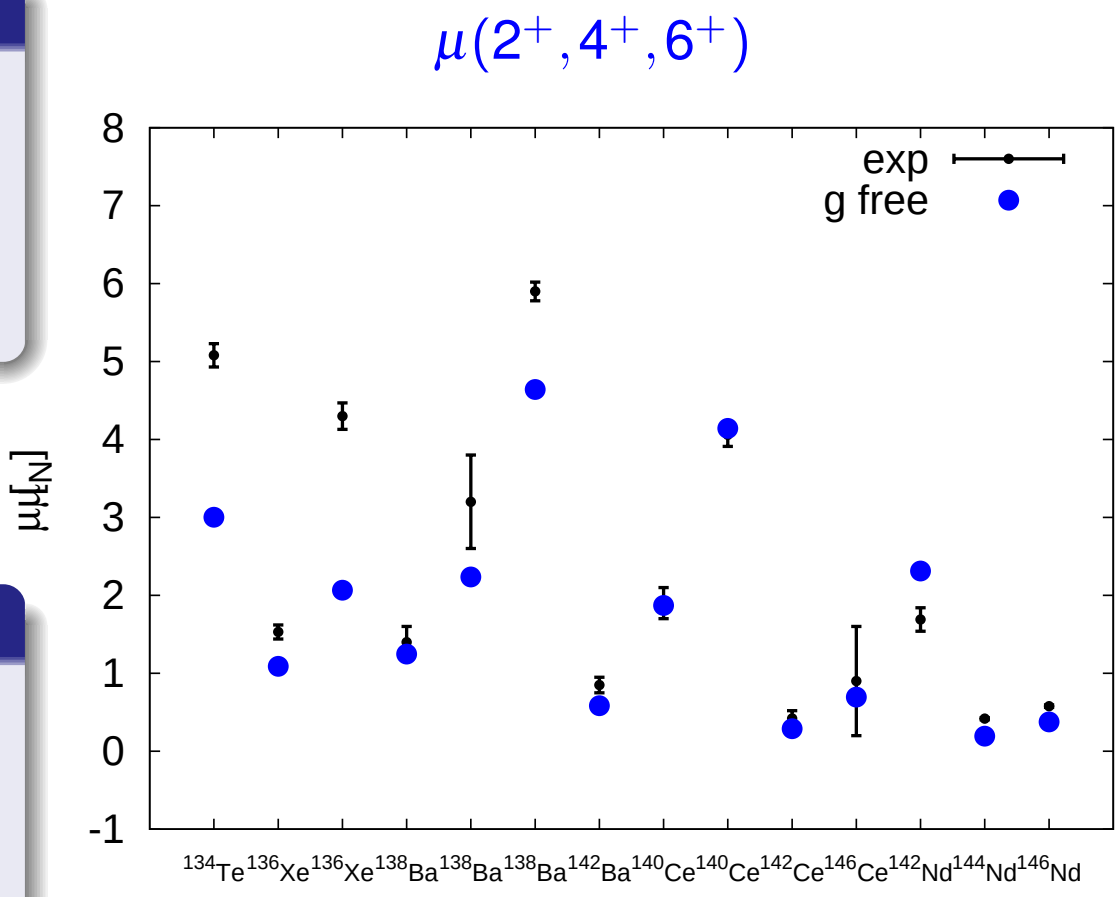

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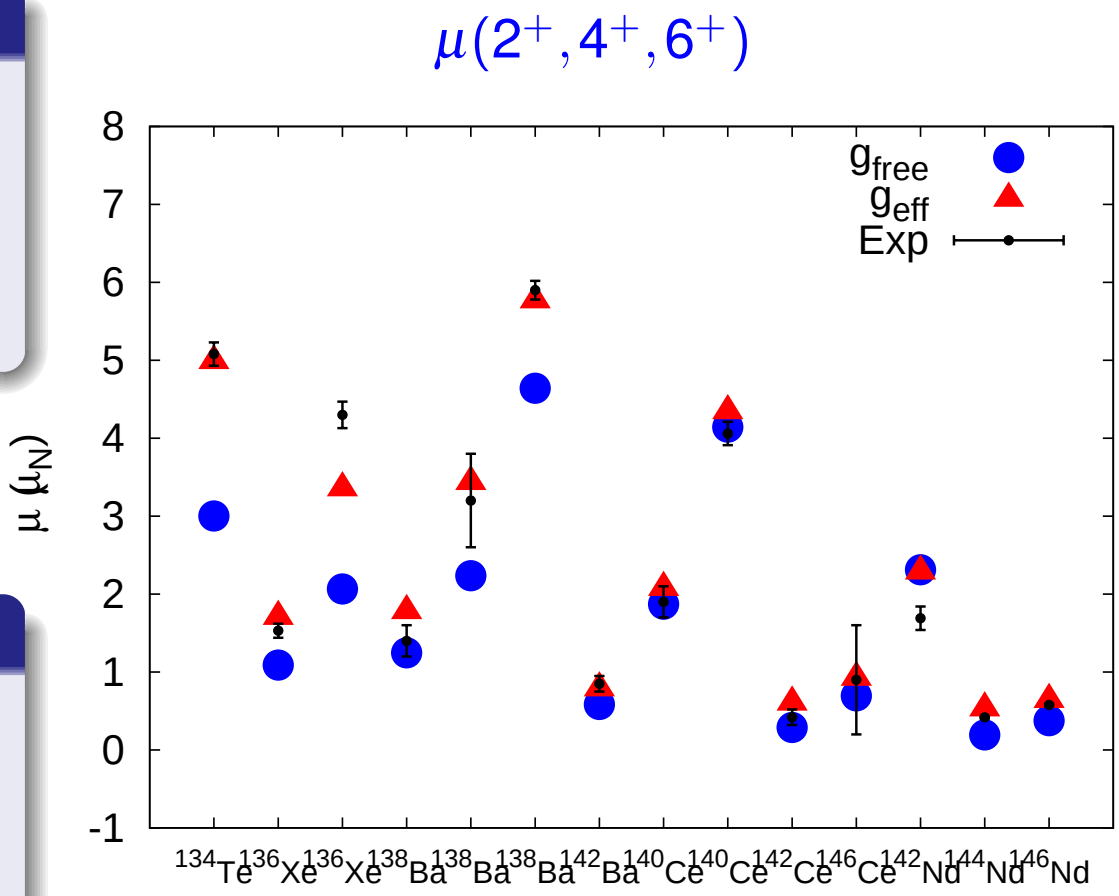

## Part II : Octupole correlations : (Preliminary results)