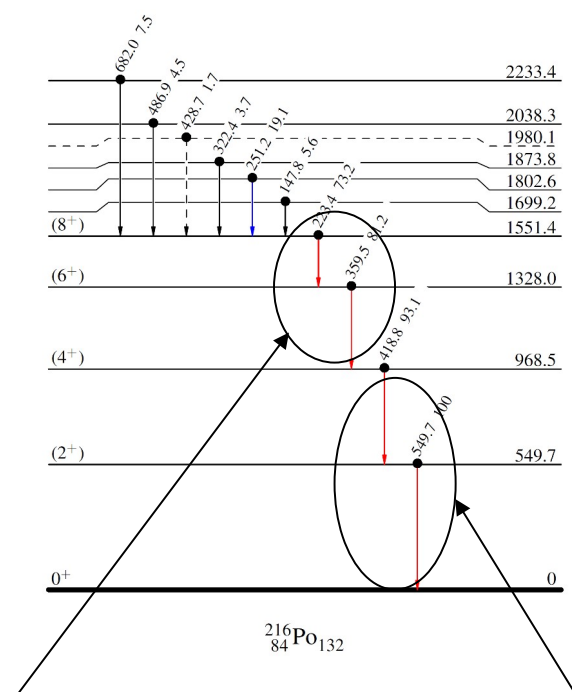
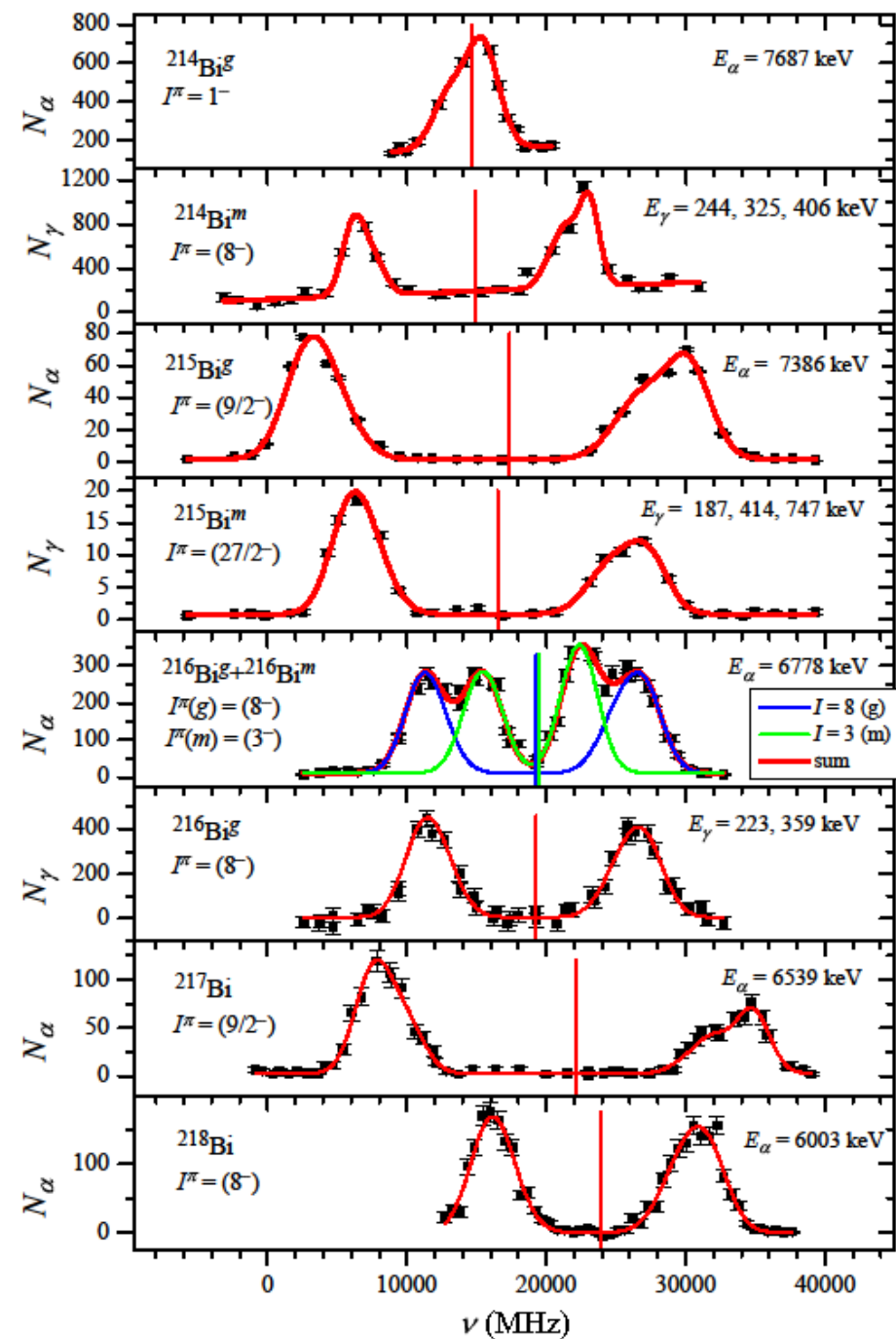


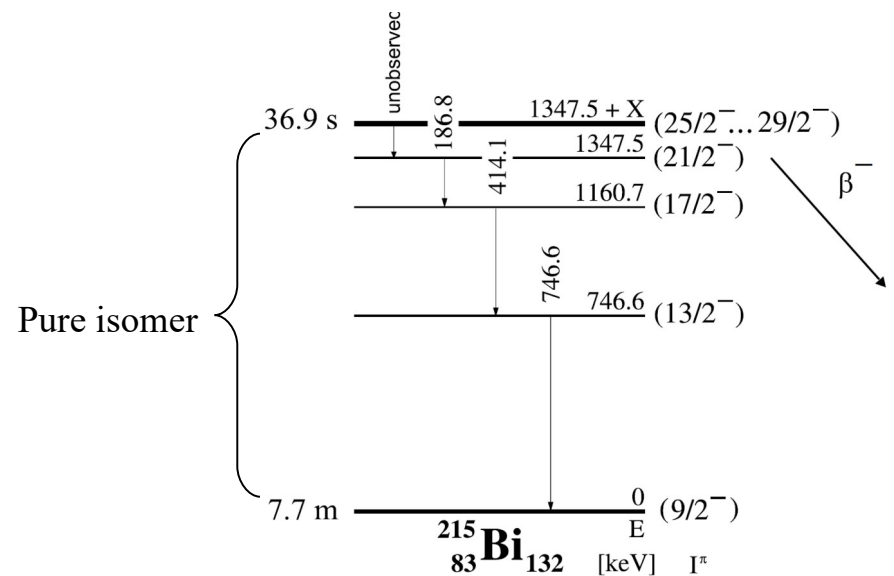
Эксперименты с лазерным ионным источником на
установке ISOLDE (CERN; *RILIS-IDS collaboration*)

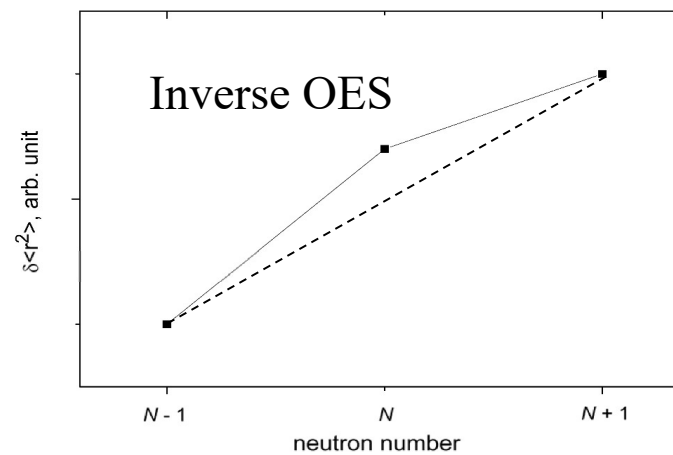
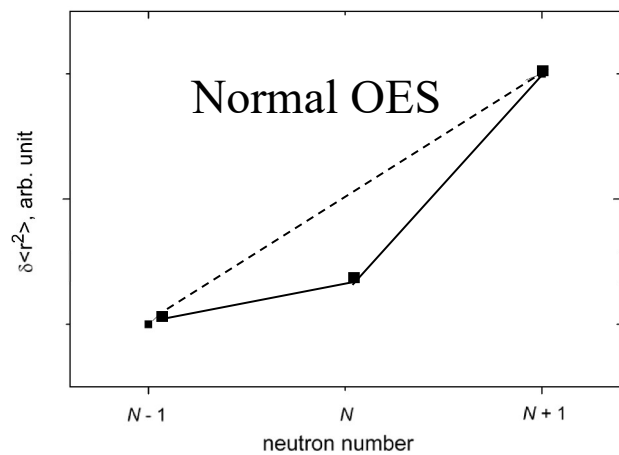
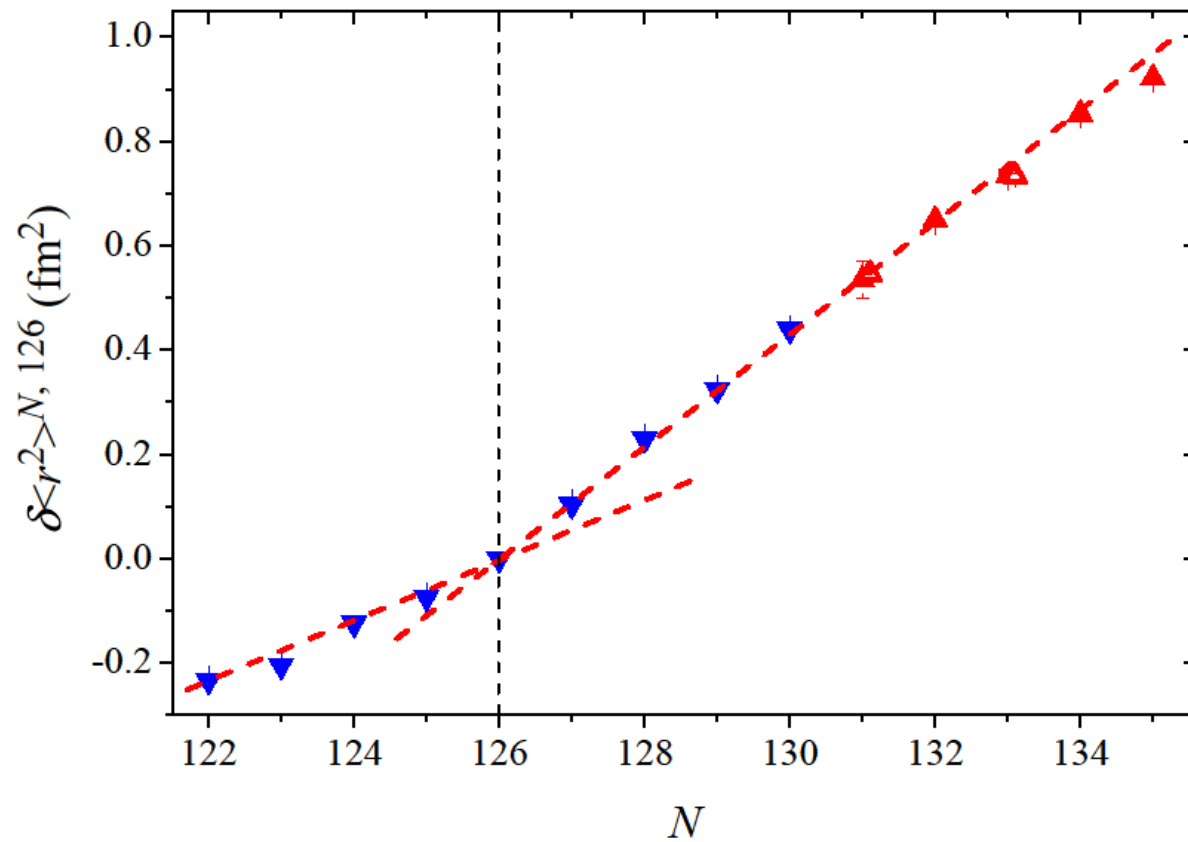
А. Е. Барзах, П. Л. Молканов, В. Н. Пантелеев,
М. Д. Селиверстов, Д. В. Федоров



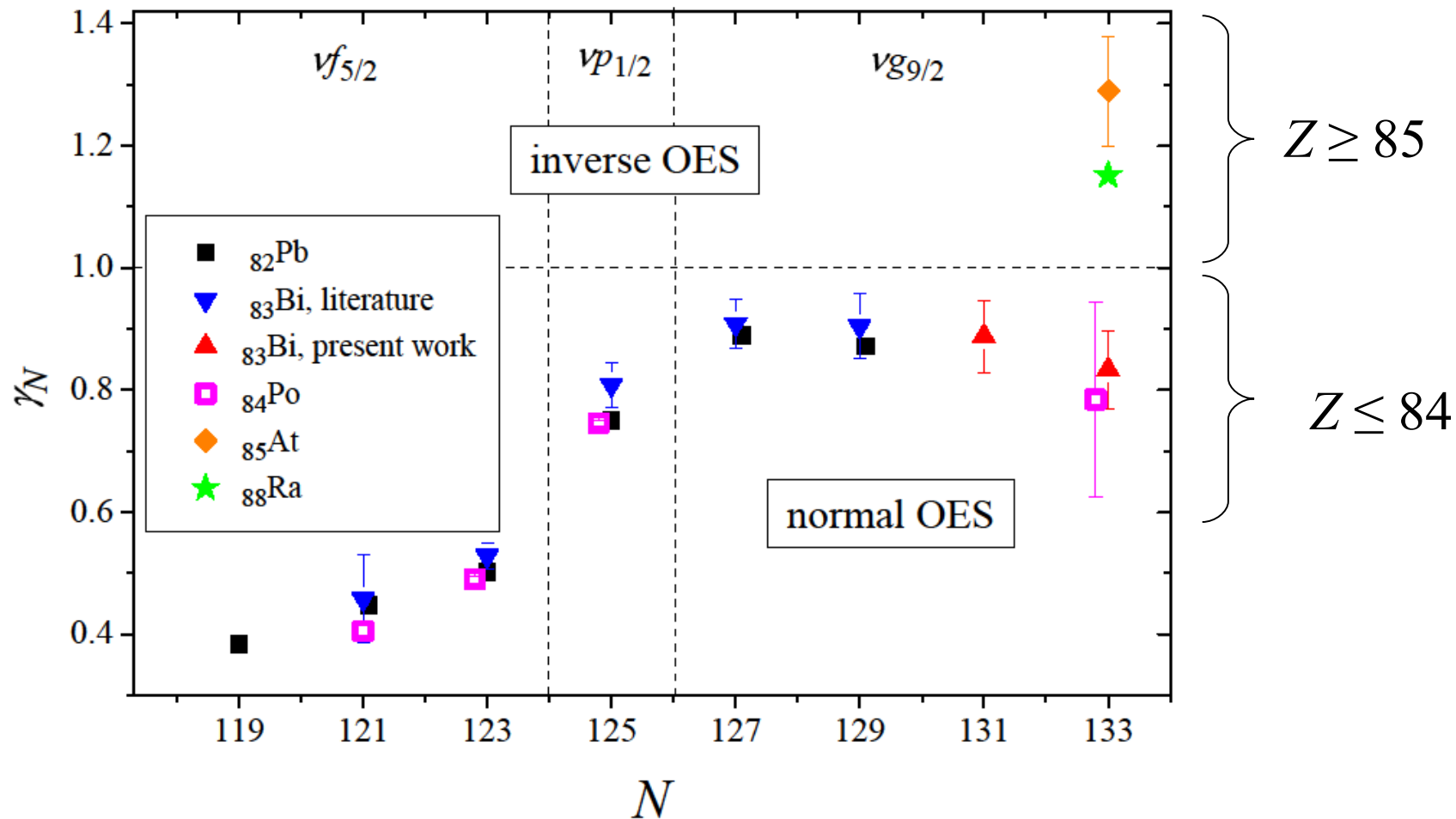
Pure hs ($I = 8^-$)

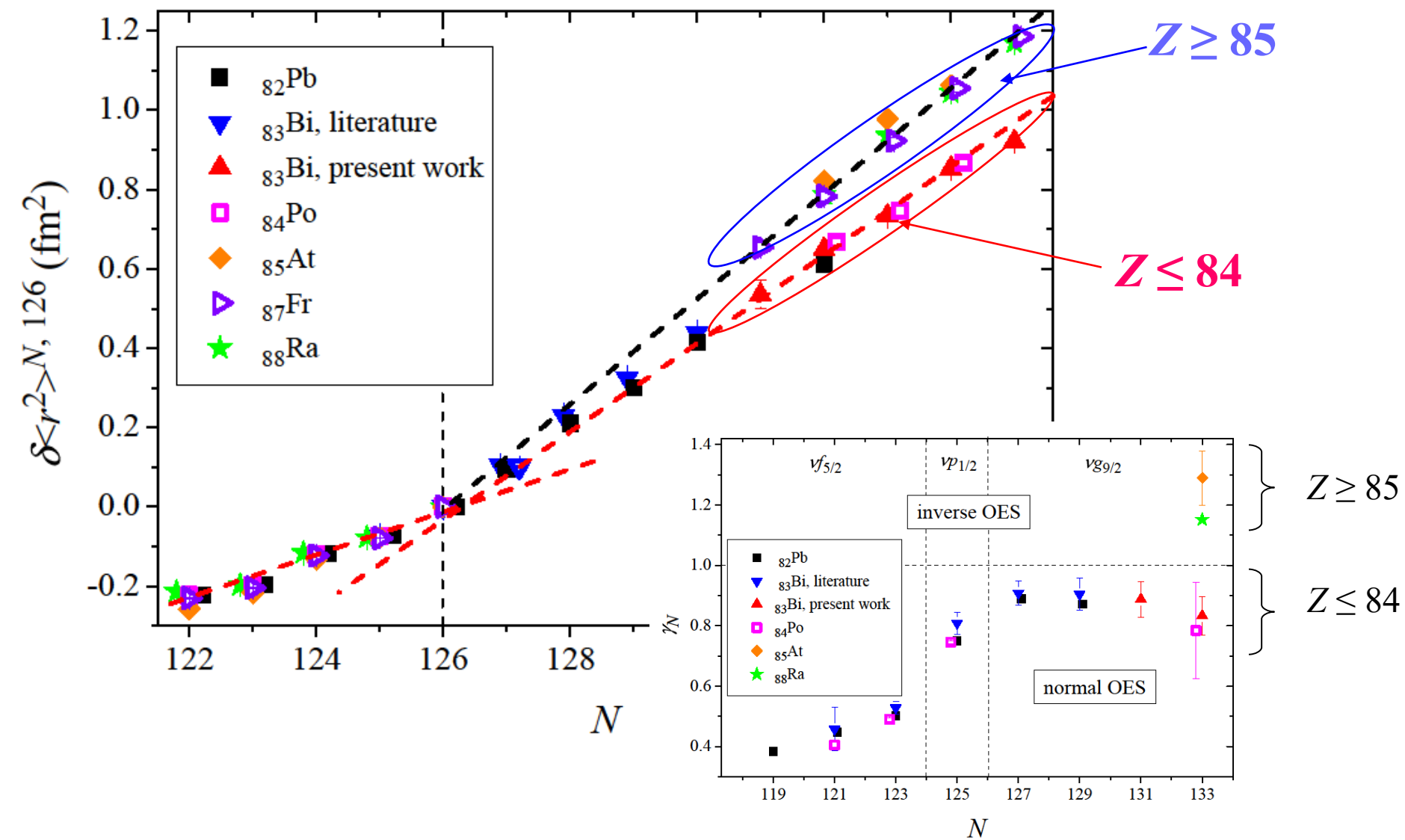
Mixed hs ($I = 8^-$) & ls ($I = 3^-$)

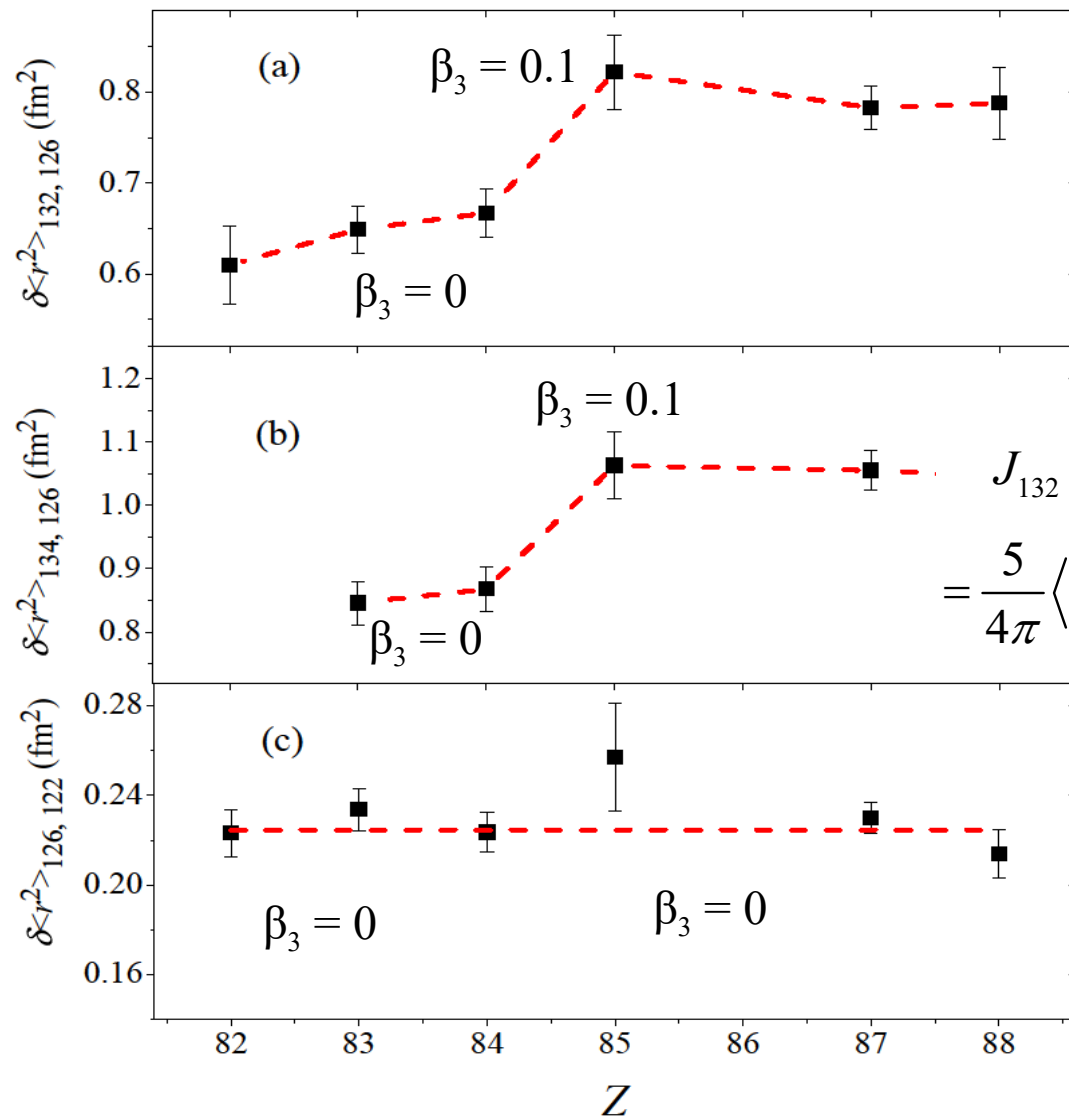




$$\gamma_N = \frac{2\delta\langle r^2\rangle_{N-1, N}}{\delta\langle r^2\rangle_{N-1, N+1}} \quad \gamma < 1 \rightarrow \text{normal OES}; \gamma > 1 \rightarrow \text{inverse OES}$$





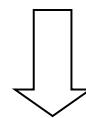


Jump at $Z_1=85$, $Z_2=84$:

$$J_{132}(\text{expt}) = 0.15(5) \text{ fm}^2$$

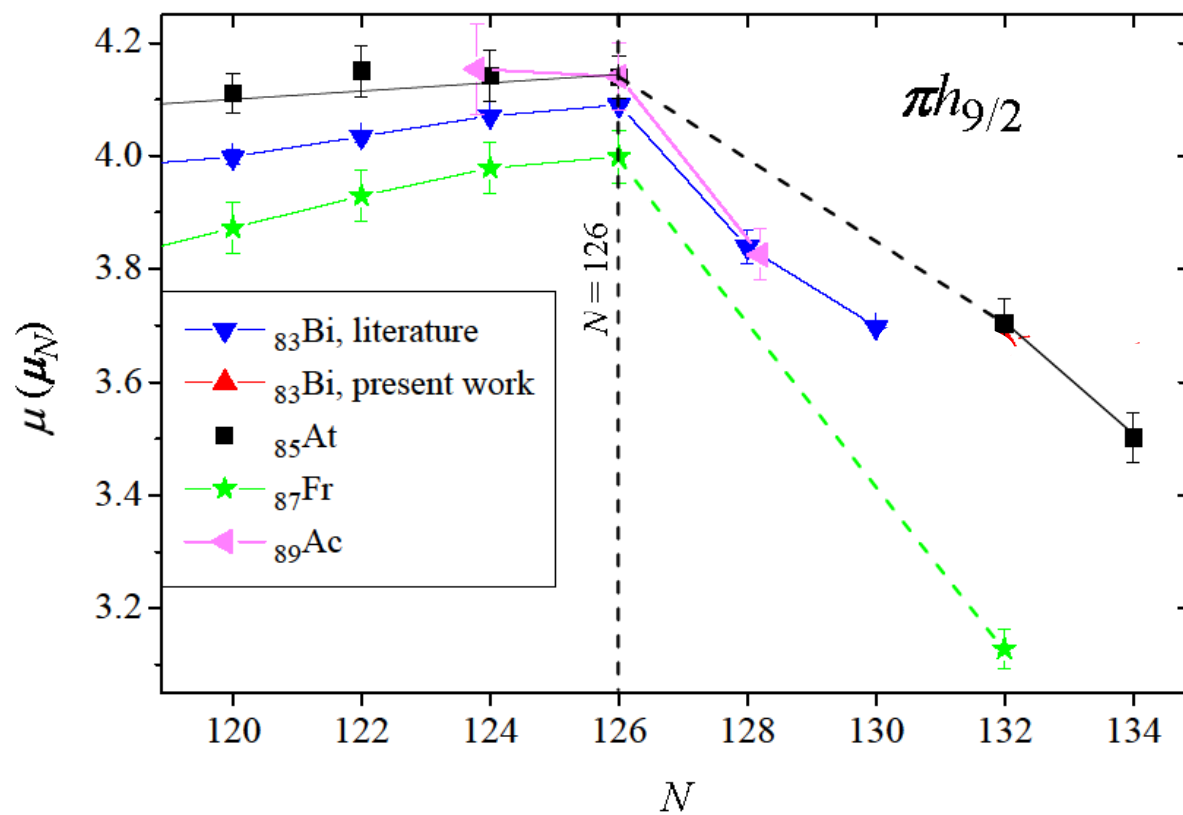
$$J_{132} = \delta \langle r^2 \rangle_{132,126}(Z_1) - \delta \langle r^2 \rangle_{132,126}(Z_2) =$$

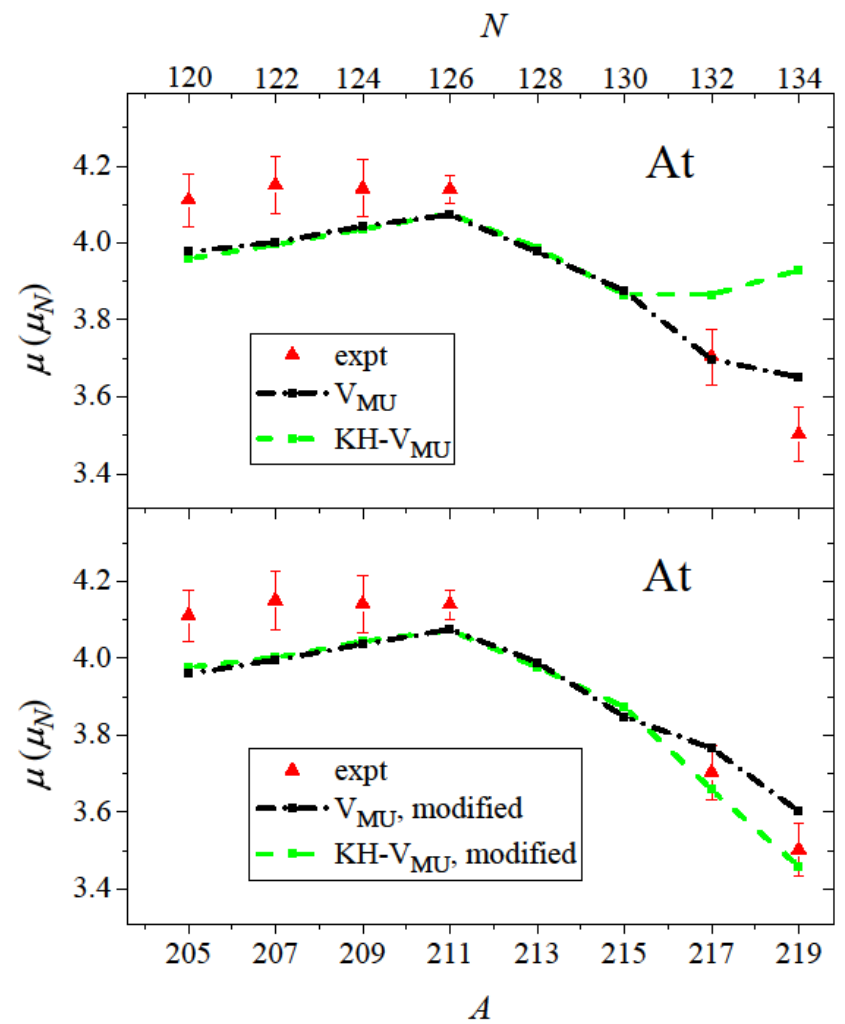
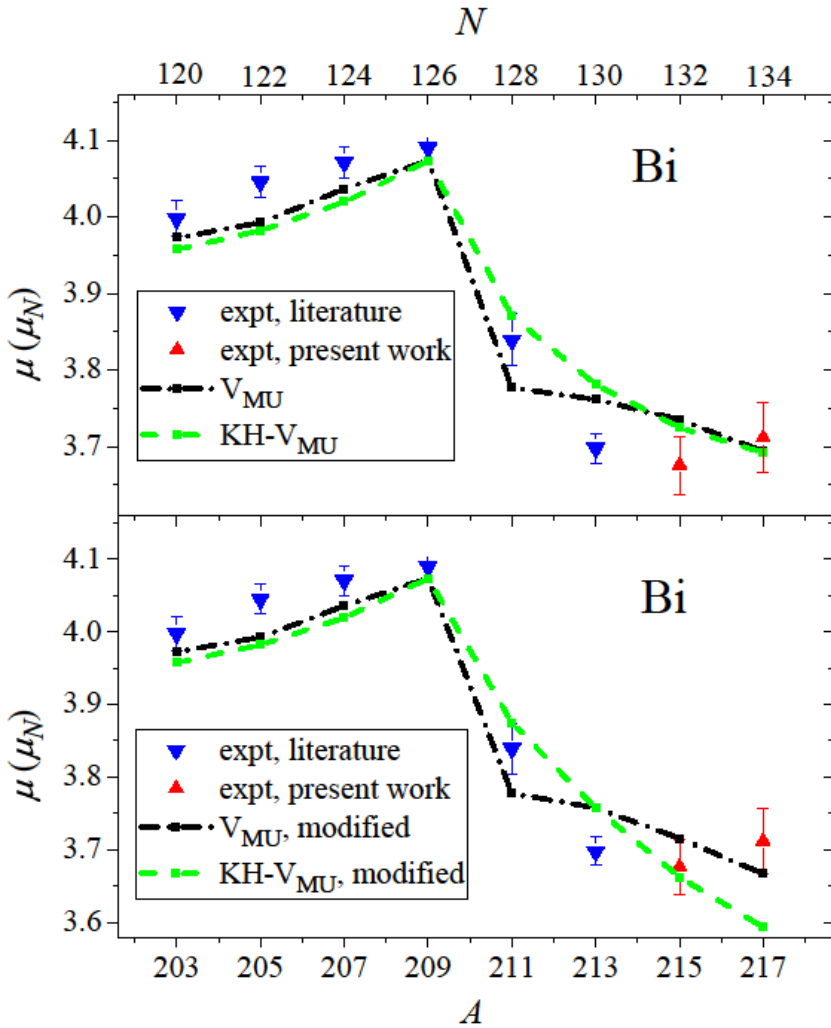
$$= \frac{5}{4\pi} \langle r^2 \rangle \left(\delta \langle \beta_3^2 \rangle_{132,126}(Z_1) - \delta \langle \beta_3^2 \rangle_{132,126}(Z_2) \right)$$



$$J_{132} = 0.12 \text{ fm}^2$$

Magnetic moments of even-N Bi isotopes at $N > 126$

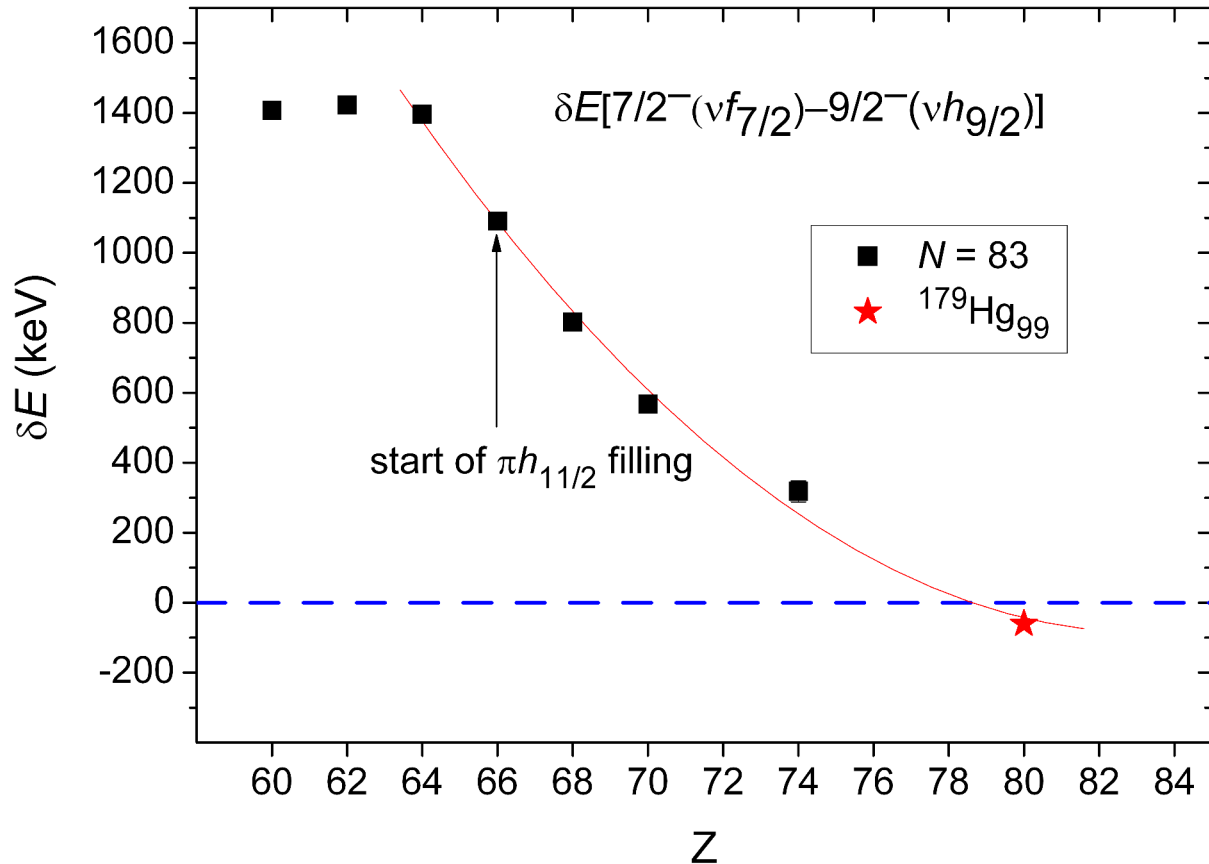




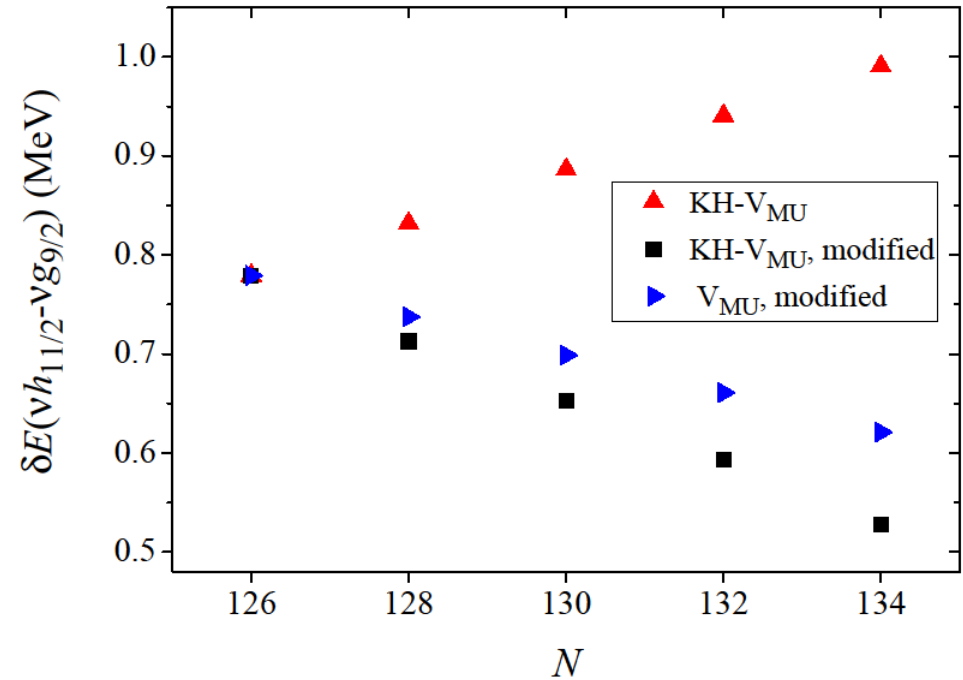
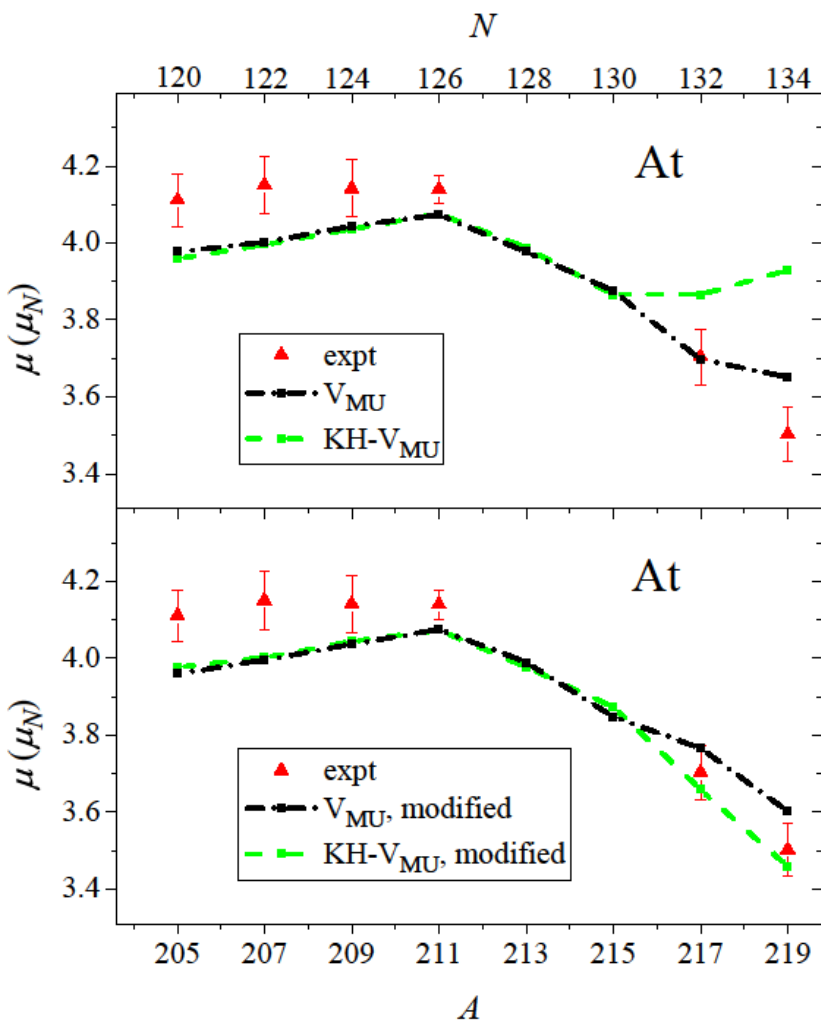
V_{MU} — monopole-based universal interaction

KH modification to check the influence of monopole interaction: all two-body monopole matrix elements of type $\langle \nu 1g_{9/2}, \nu 1g_{9/2} | V | \nu 1g_{9/2}, \nu 1g_{9/2} \rangle$ has been shifted by 0.1 MeV (for V_{MU} — 0.03 MeV)

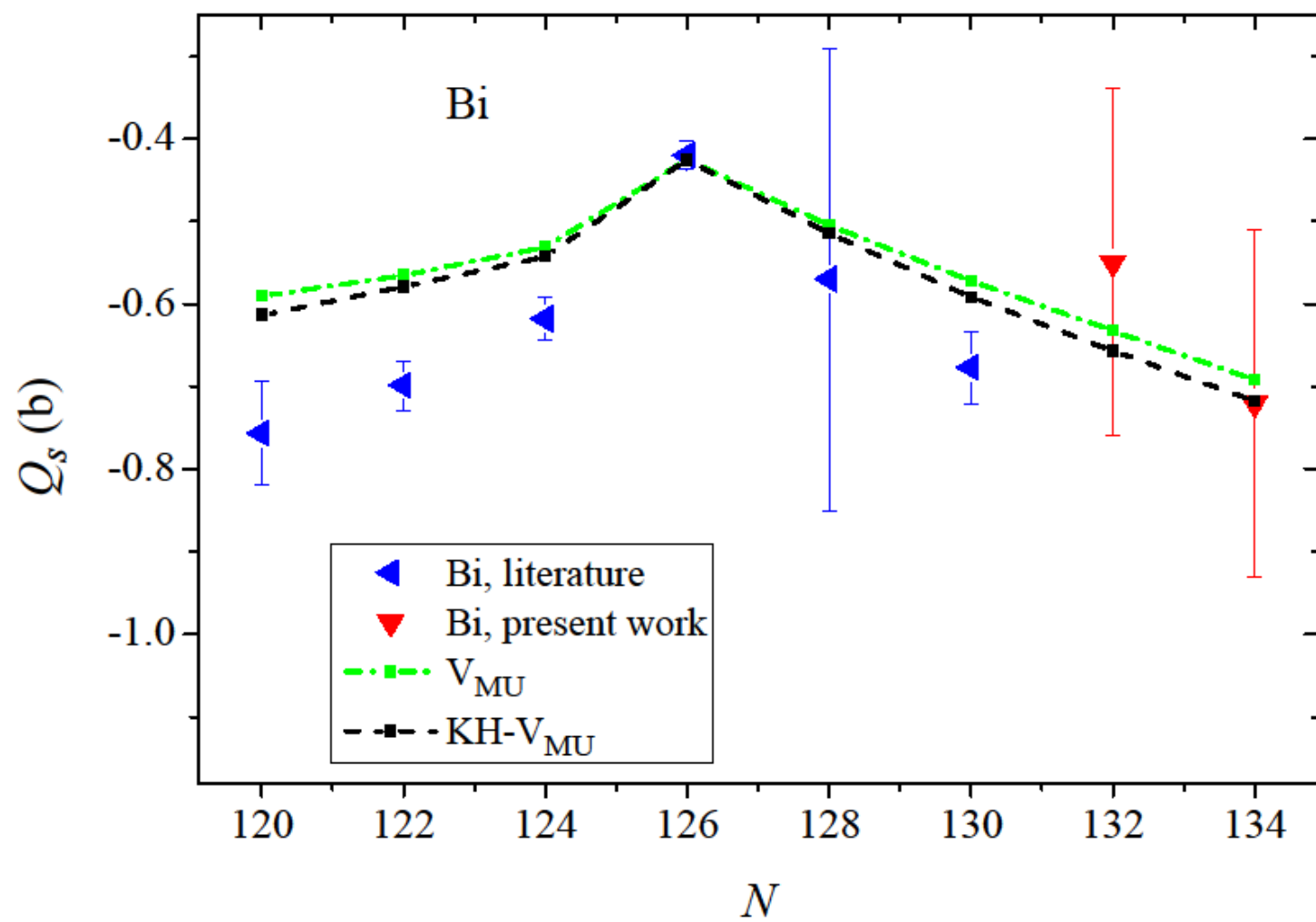
Shell evolution



See also swap of $\nu f_{7/2}$ and $\nu p_{3/2}$ when going from ^{48}Ca to ^{42}Si , inversion of the $\pi 2p_{3/2}$ and $\pi 1f_{5/2}$ in the $g_{9/2}$ midshell for ^{75}Cu ($N = 46$), etc

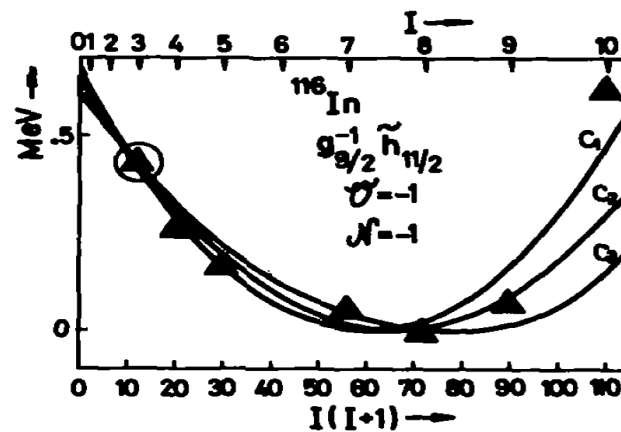
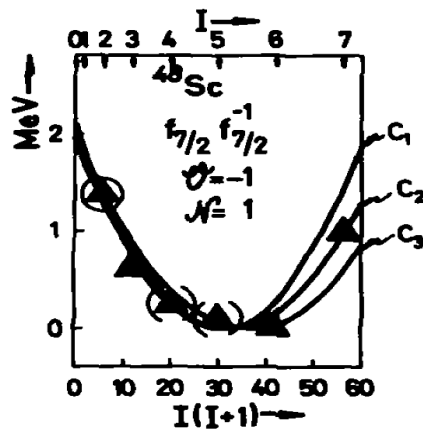
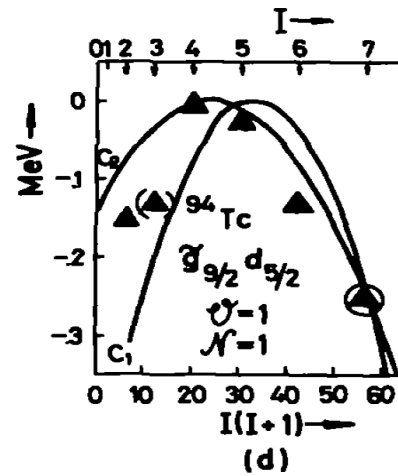
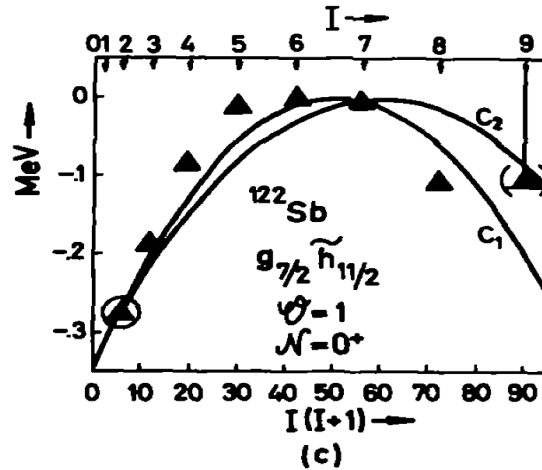


KH modification to check the influence of monopole interaction: all two-body monopole matrix elements of type $\langle v1g_{9/2}, v1g_{9/2} | V | v1g_{9/2}, v1g_{9/2} \rangle$ has been shifted by 0.1 MeV (for $V_{\text{MU}} = 0.03$ MeV)



Odd-odd Bi's: $\pi h_{9/2} \otimes \nu g_{9/2}$ multiplet

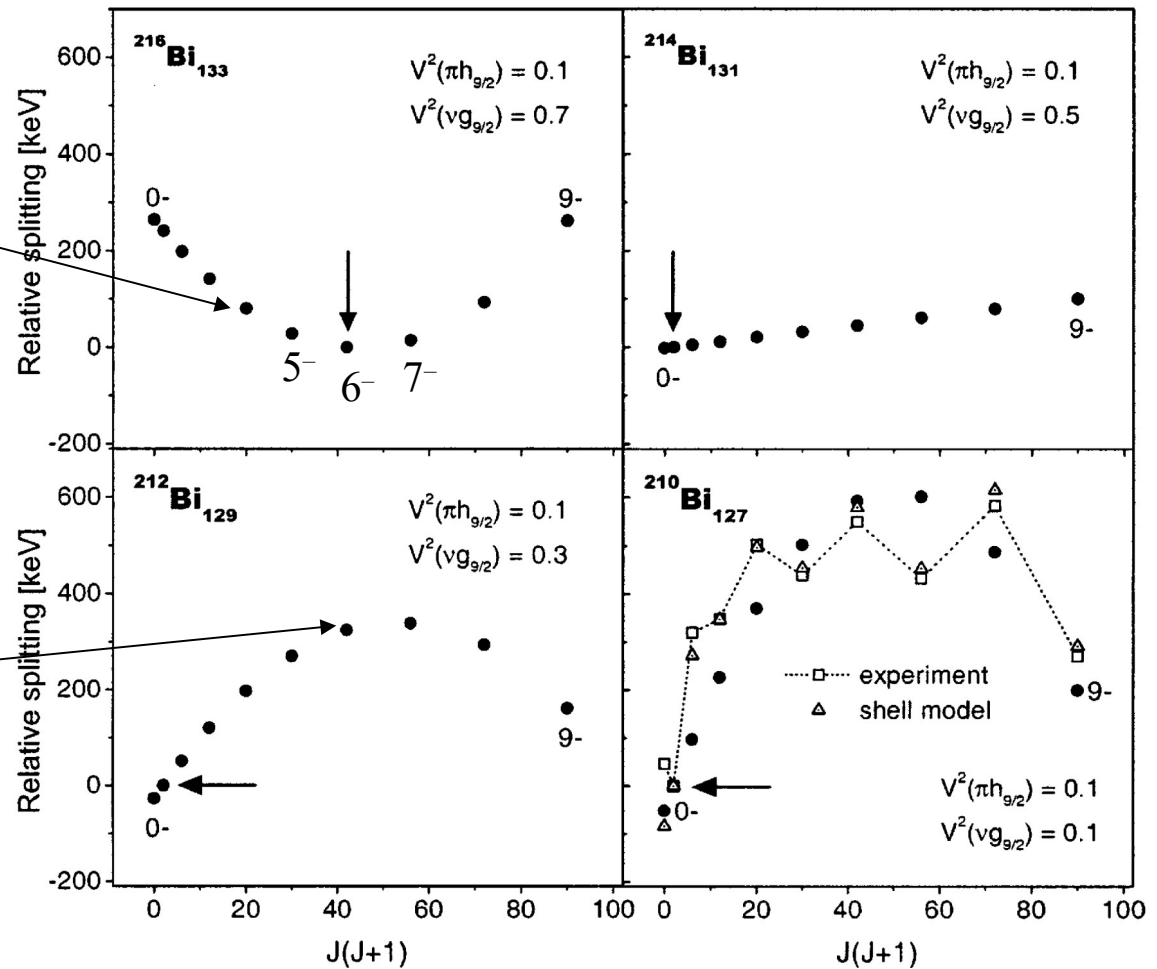
Pair parabola (exchange of the 2+ and 1+ phonons): see Sb, In, Sc, Ag



Odd-odd Bi's: $\pi h_{9/2} \otimes \nu g_{9/2}$ multiplet

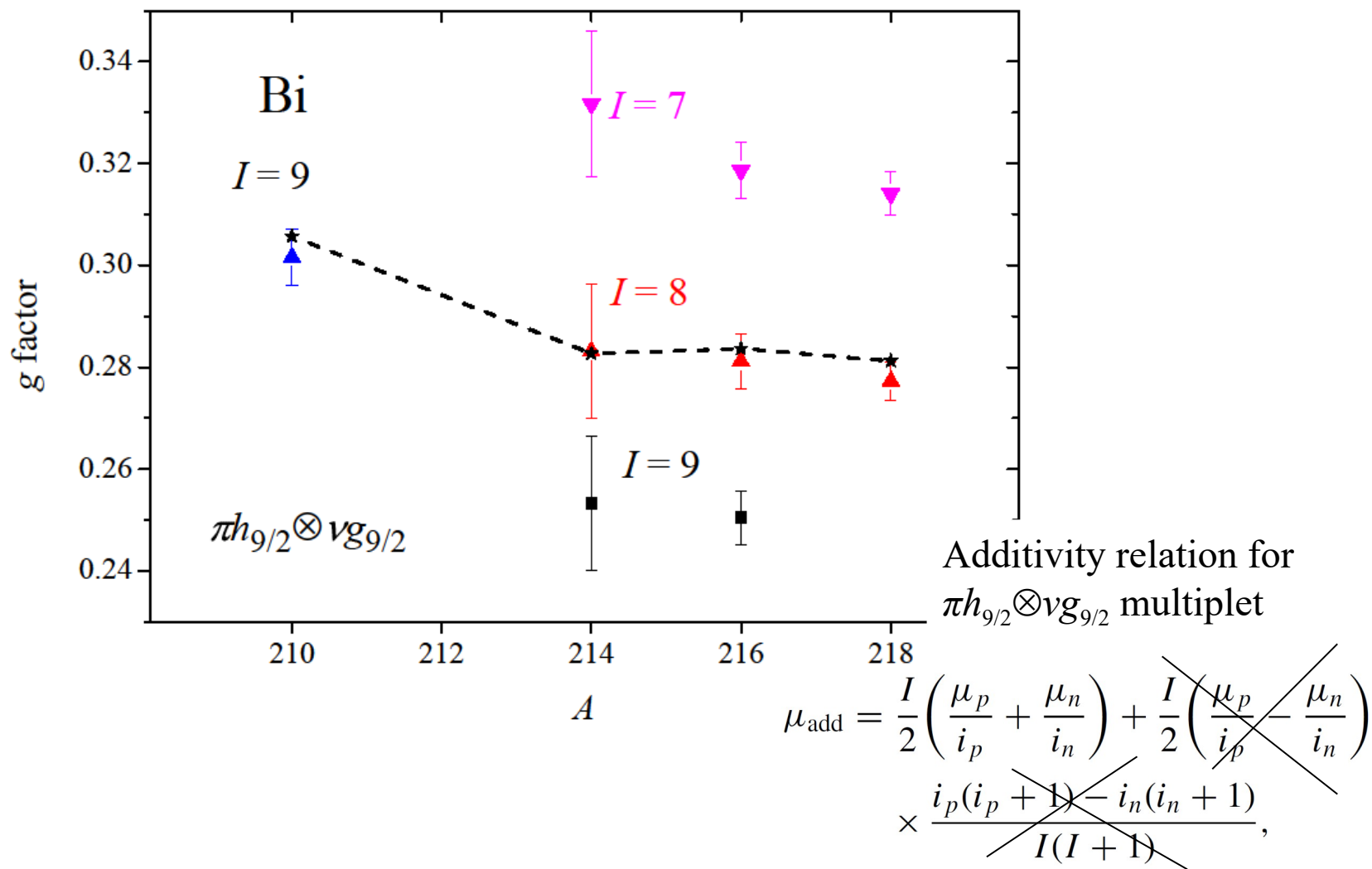
upward concave parabola
corresponds to particle-hole
character of multiplet
(more than half-filled $g_{9/2}$) and
medium (5 ... 7) gs
(lowest in energy) spin

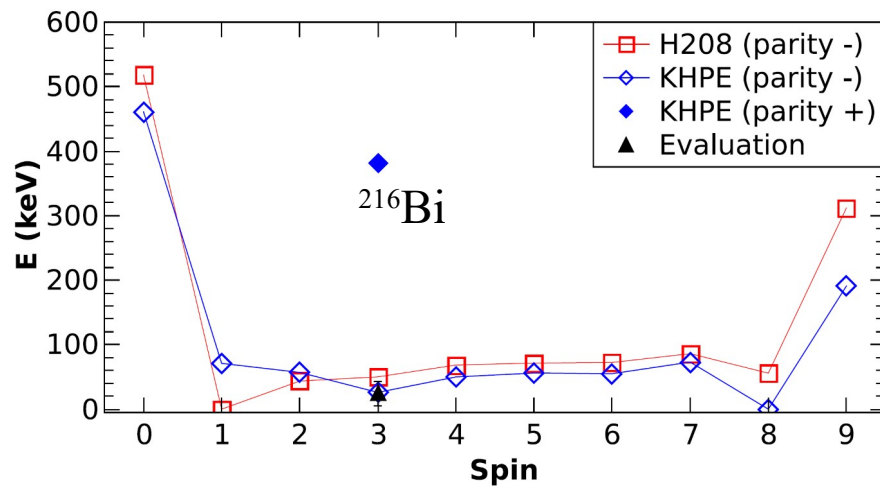
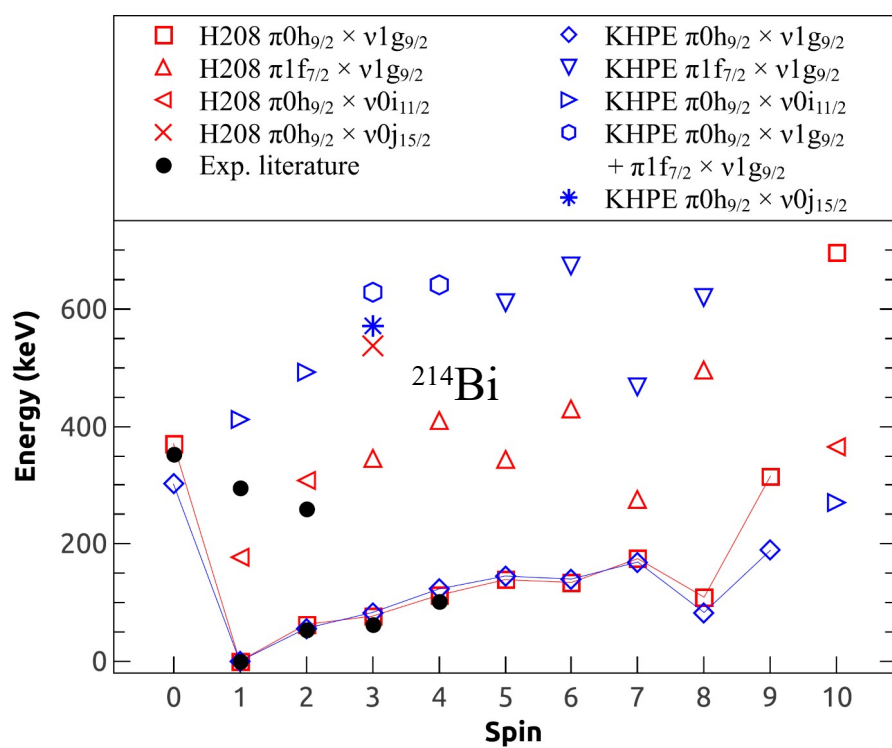
downward concave parabola
corresponds to particle-
particle character of multiplet and
presence of high-spin isomer



Pair parabola prediction:
no hs isomer in $^{214,216}\text{Bi}$;
 $I = 5, 6, 7$ for $^{216}\text{Bi}^g$

μ for hs states in odd-odd Bi nuclei $(^{214}\text{Bi}^m, ^{216, 218}\text{Bi}^g)$





Experiment and SM calculation
(with shell evolution):
 $I = 8$ for $^{216}, ^{218}\text{Bi}^g$ and $^{214}\text{Bi}^m$
 — violation of “parabola rule”

Публикации

1. Z. Yue, A.N. Andreyev, A.E. Barzakh, I.N. Borzov, et al. *Magnetic moments of thallium isotopes in the vicinity of magic $Z = 126$* . Phys. Lett. B **849**, 138452 (2024).
2. L. V. Skripnikov, and A. E. Barzakh. *Reexamination of nuclear magnetic dipole and electric quadrupole moments of polonium isotopes*. Phys. Rev. C **109**, 024315 (2024).
3. B. Andel, A. N. Andreyev, A. Barzakh et al. (IDS Collaboration). *β decay of the ground state and of a low-lying isomer in ^{216}Bi* . Phys. Rev. C **109**, 064321 (2024)
4. J. Benito, L. M. Fraile, A.E. Barzakh, D. V. Fedorov et al. (IDS and IGISOL Collaboration). *Detailed structure of ^{131}Sn populated in the β decay of isomerically purified ^{131}In states*. Phys. Rev. C **110**, 014328 (2024).
5. C. Y. Guo, A. E. Barzakh, et al., *Spectroscopy of ^{187}Tl : shape coexistence*. Eur. Phys. J. A **60**, 165 (2024).
6. Z. Yue, A.E. Barzakh, A.N. Andreyev, I.N. Borzov, et al. *Charge radii of thallium isotopes near the $N = 126$ shell closure*, Phys. Rev. C **110**, 034315 (2024)