

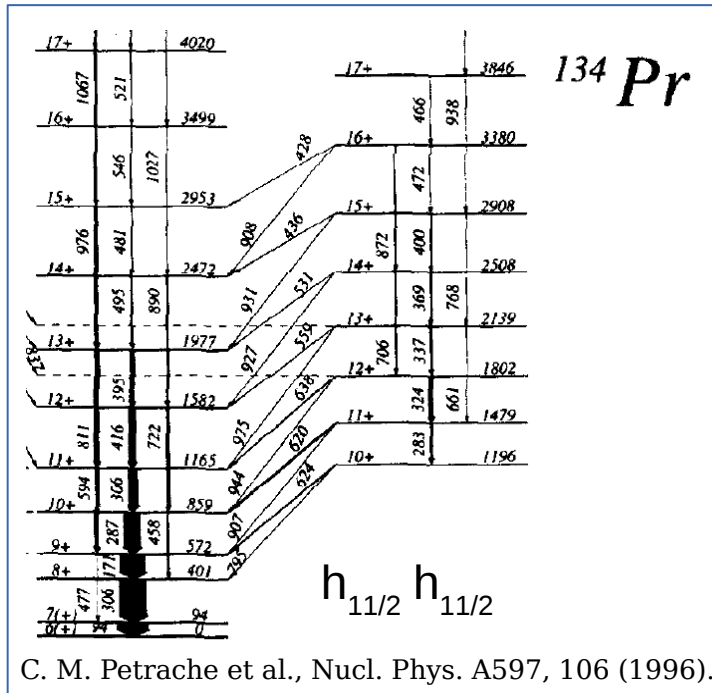
Többszörös királyság kimutatása a ^{104}Rh atommagban

Krakó Attila

HUN-REN ATOMKI, Pf. 51, 4001 Debrecen, Magyarország

Debreceni Egyetem, Fizikai Doktori Iskola, 4032 Debrecen, Egyetem tér 1, Magyarország

Kiralitás az atommagban



Nuclear Physics A 617 (1997) 131–147

NUCLEAR
PHYSICS A

Tilted rotation of triaxial nuclei

S. Frauendorf, Jie Meng¹

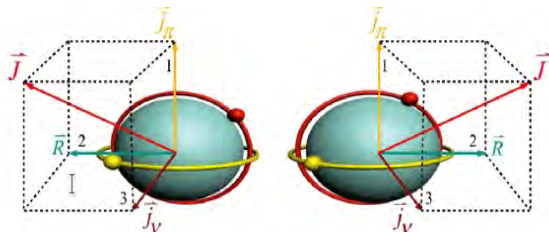
Institut für Kern- und Hadronenphysik, Forschungszentrum Rossendorf e.V.,
PF 510119, 01314 Dresden, Germany

Received 14 November 1996



A kiralitás a háromtengelyűen deformált forgó atommagokban jelenik meg:

- $\Delta I=1$ degenerált párok
- Ugyanolyan konfiguráció
- Ugyanolyan paritás
- Hasonló elektromágneses tulajdonságok



Többszörös királis sávpárok

Possible existence of multiple chiral doublets in ^{106}Rh

J. Meng,^{1,2,3,*} J. Peng,¹ S. Q. Zhang,¹ and S.-G. Zhou^{2,3}

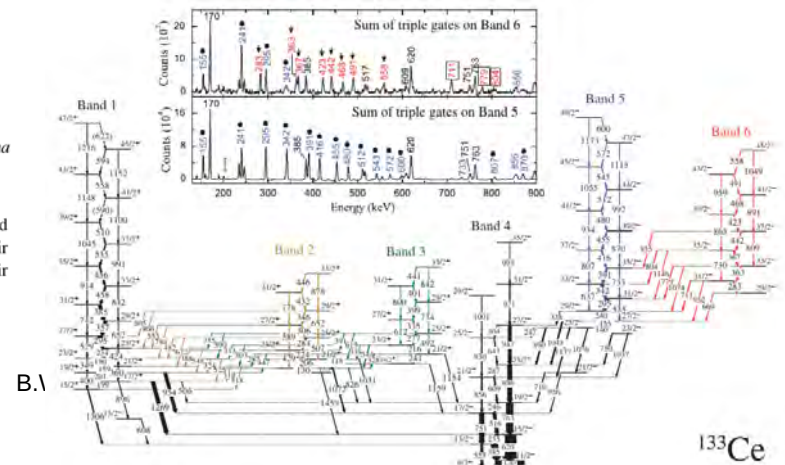
¹School of Physics, Peking University, Beijing 100871, China

²Institute of Theoretical Physics, Chinese Academy of Science, Beijing 100080, China

³Center of Theoretical Nuclear Physics, National Laboratory of Heavy Ion Accelerator, Lanzhou 730000, China

(Received 30 March 2005; published 15 March 2006)

Adiabatic and configuration-fixed constrained triaxial relativistic mean field (RMF) approaches are developed for the first time. A new phenomenon, the existence of multiple chiral doublets ($M\chi D$), i.e., more than one pair of chiral doublet bands in one single nucleus, is suggested for ^{106}Rh based on the triaxial deformations and their corresponding proton and neutron configurations.



B.1

Evidence for Multiple Chiral Doublet Bands in ^{133}Ce

A. D. Ayangeekaa,¹ U. Garg,¹ M. D. Anthony,¹ S. Frauenthor,¹ J. T. Matta,¹ B. K. Nayak,^{1,8} D. Patel,¹ Q. B. Chen (陈启博),² S. Q. Zhang (张双全),² P. W. Zhao (赵鹏帆),² B. Qi (齐斌),³ J. Meng (孟杰),^{2,4,5} R. V. F. Janssens,⁶ M. P. Carpenter,⁶ C. J. Chiara,^{6,7} F. G. Kondev,⁸ T. Lauritsen,⁶ D. Seweryniak,⁶ S. Zhu,⁶ S. S. Ghugre,⁹ and R. Palit^{10,11}

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²State Key Laboratory of Nuclear Physics and Technology, School of Physics, Peking University, Beijing 100871, China

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⁴School of Physics and Nuclear Energy Engineering, Beihang University, Beijing 100191, China

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⁶Physics Division, Argonne National Laboratory, Argonne, Illinois 60439, USA

⁷Department of Chemistry and Biochemistry, University of Maryland, College Park, Maryland 20742, USA

⁸Nuclear Engineering Division, Argonne National Laboratory, Argonne, Illinois 60439, USA

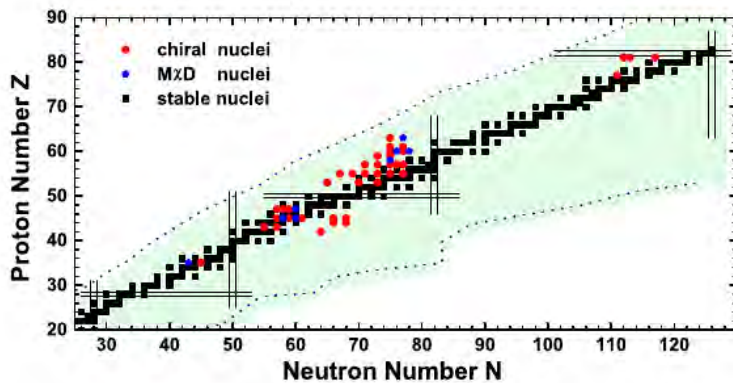
⁹UGC-DAE Consortium for Science Research, Kolkata 700 095, India

¹⁰Tata Institute of Fundamental Research, Mumbai 400 005, India

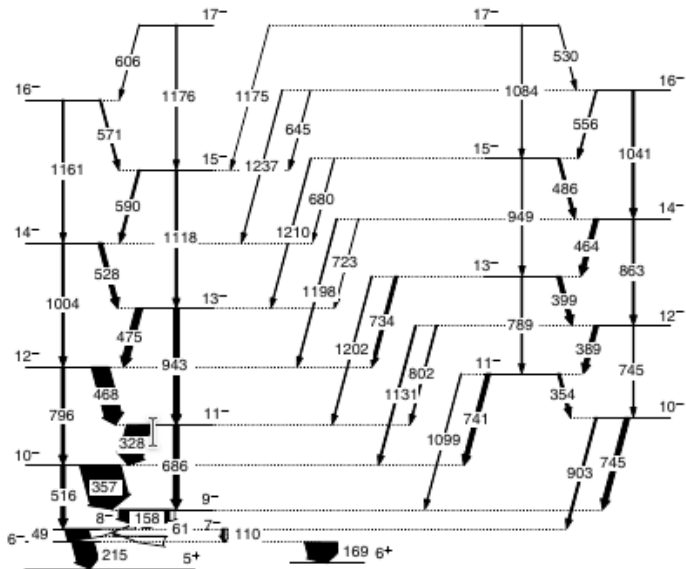
¹¹The Joint Institute for Nuclear Astrophysics, University of Notre Dame, Notre Dame, Indiana 46556, USA

(Received 31 January 2013; published 24 April 2013)

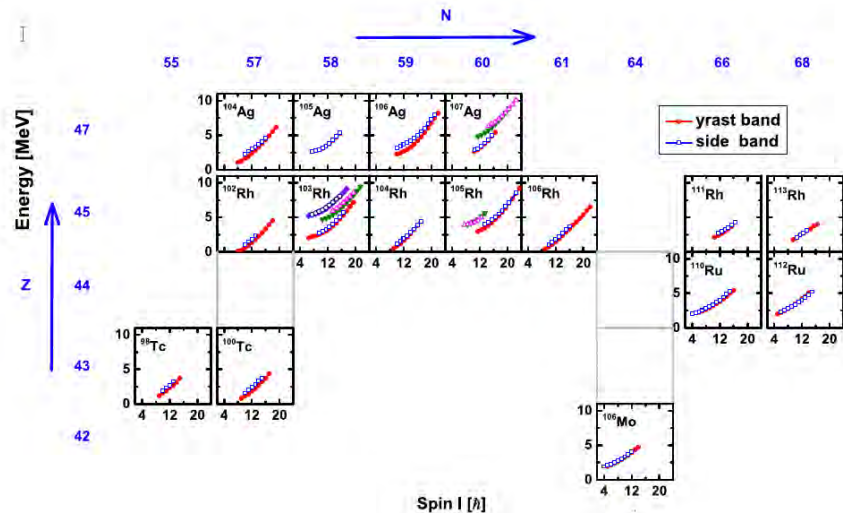
Two distinct sets of chiral-partner bands have been identified in the nucleus ^{133}Ce . They constitute a multiple chiral doublet, a phenomenon predicted by relativistic mean field (RMF) calculations and observed experimentally here for the first time. The properties of these chiral bands are in good agreement with results of calculations based on a combination of the constrained triaxial RMF theory and the particle-rotor model.



Kiralitás az $A \sim 100$ tömegszámtartományban



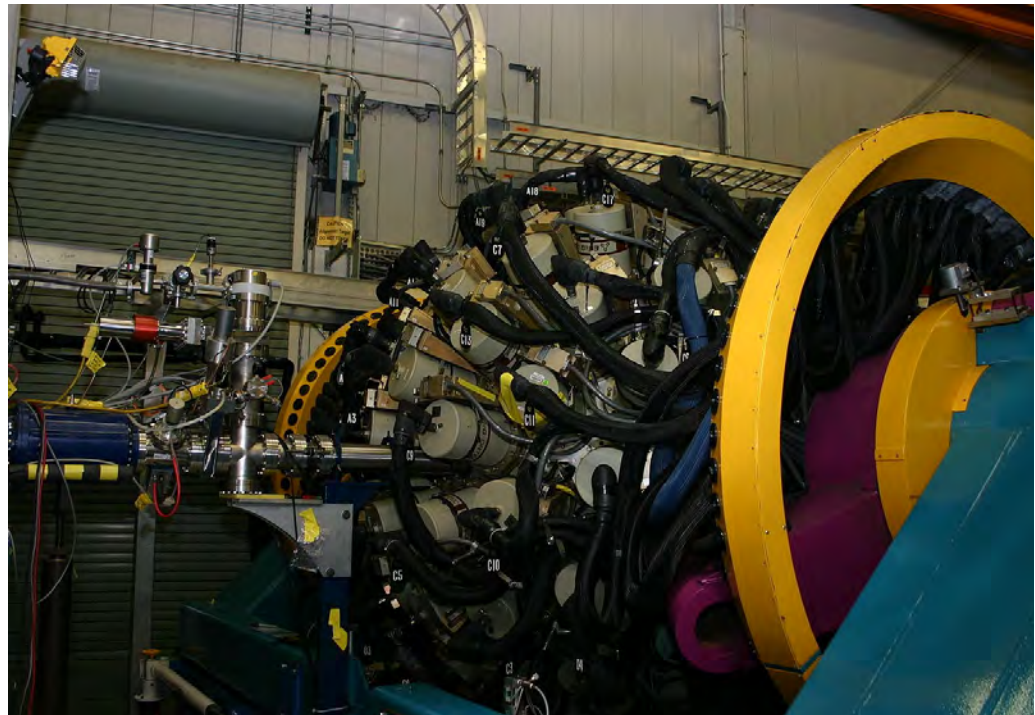
Vaman et al., Phys. Rev. Lett. 92 (2004)



B.W. Xiong, Y.Y. Wang./Atomic Data and Nuclear Data Tables 125 (2019)

Kisérlet

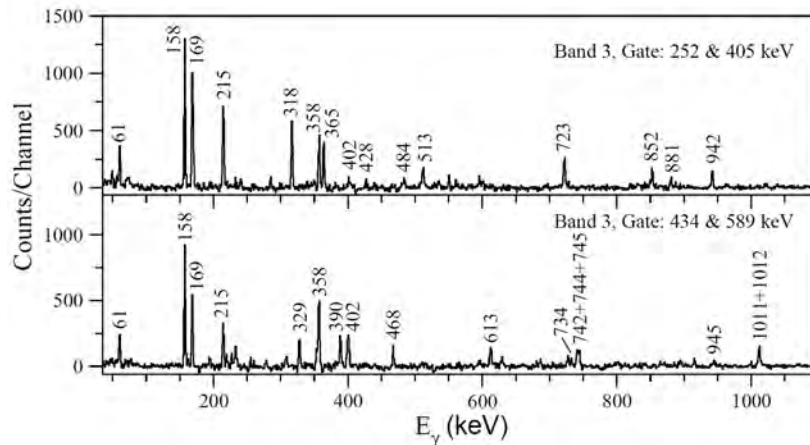
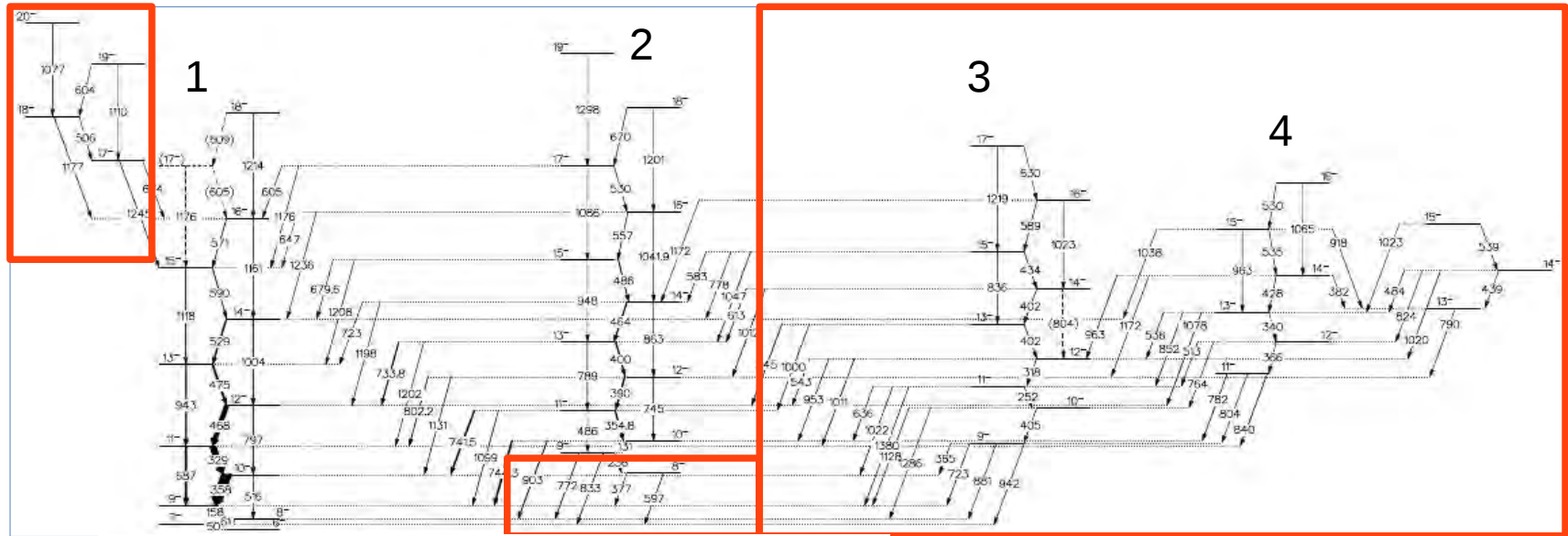
- Nehéz-ion fúzió-evaporációs reakció: 40 MeV energiájú ^{11}B nyaláb ütközött ^{96}Zr céltárgyon
- Trigger: gggg-koincidencia, $\sim 9 \times 10^8$ esemény
- GAMMASPHERE: több mint 100 HPGe detektor gömbszerű szimmetriában elrendezve



[illegible]

- I. Kuti et al., PRL 113, 032501 (2014)

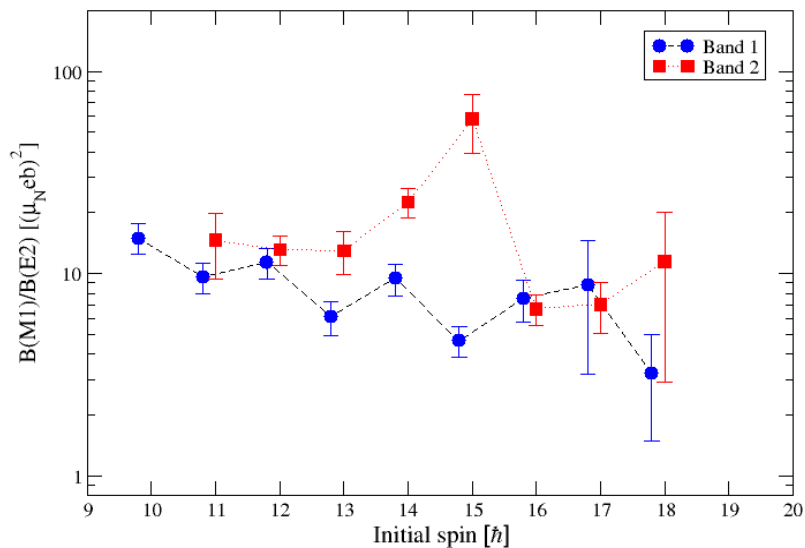
A ^{104}Rh atommag negatív paritású nívósémája



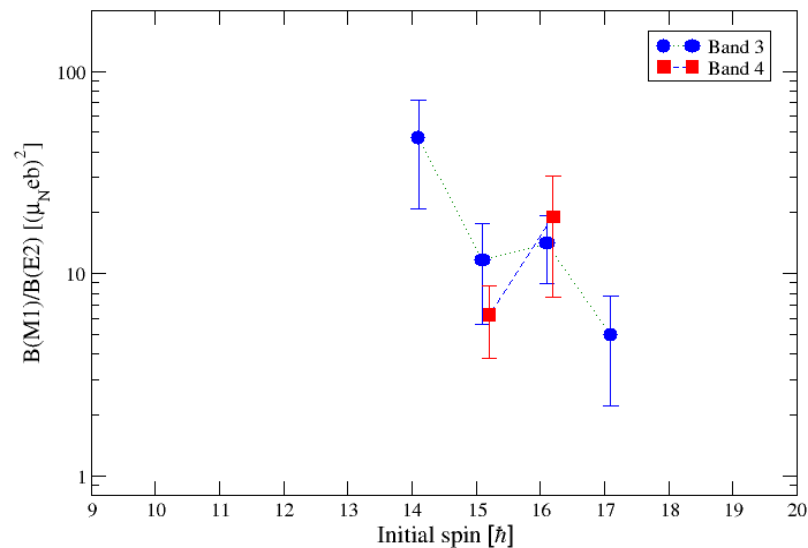
- A forgó állapotokat a γ -koincidenciák alapján határoztuk meg
- A spin-paritás értékeket DCO analízis segítségével határoztuk meg

Kísérleti $B(M1)/B(E2)$ arányok

$B(M1)/B(E2)$ arányok a 1 és 2

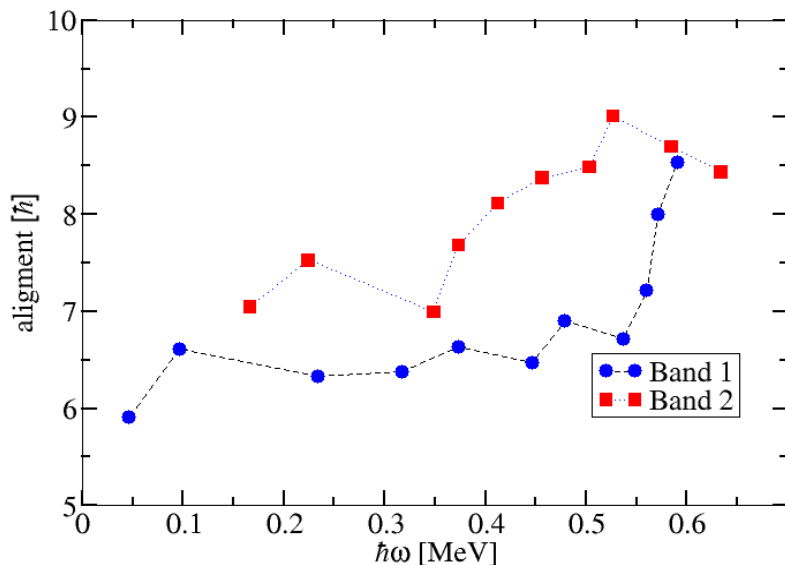


$B(M1)/B(E2)$ arányok a 3 és 4

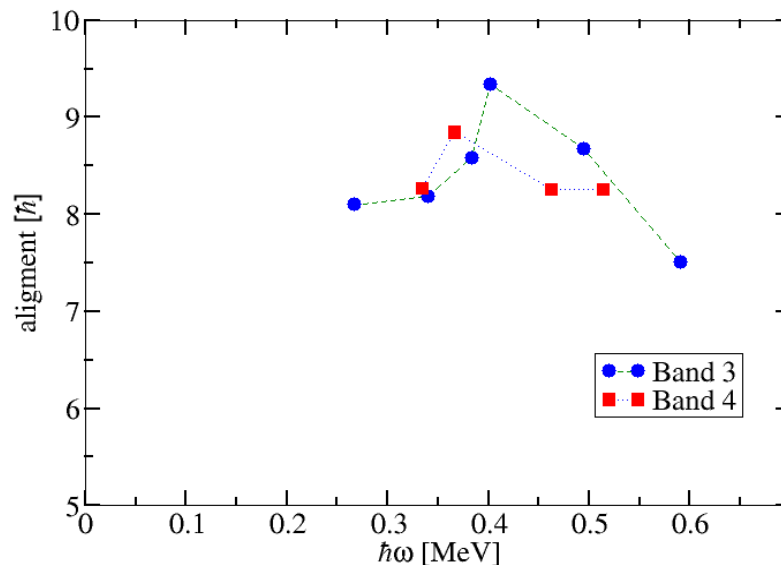


Kísérleti alignement értékek

Alignement értékek az 1-2 sávokra



Alignement értékek a 3-4 sávokra



Harris formula $\mathcal{J} = \mathcal{J}_0 + \mathcal{J}_1\omega^2$, $\mathcal{J}_0 = 8.9 \hbar^2/\text{MeV}$, $\mathcal{J}_1 = 15.7 \hbar^4/\text{MeV}^3$
 K=4 (K: a perdület szimmetriatengelyre vett vetülete a belső vonatkoztatási rendszerben)

Adiabatikus és konfiguráció rögzített relativisztikus átlagtér modell számítások

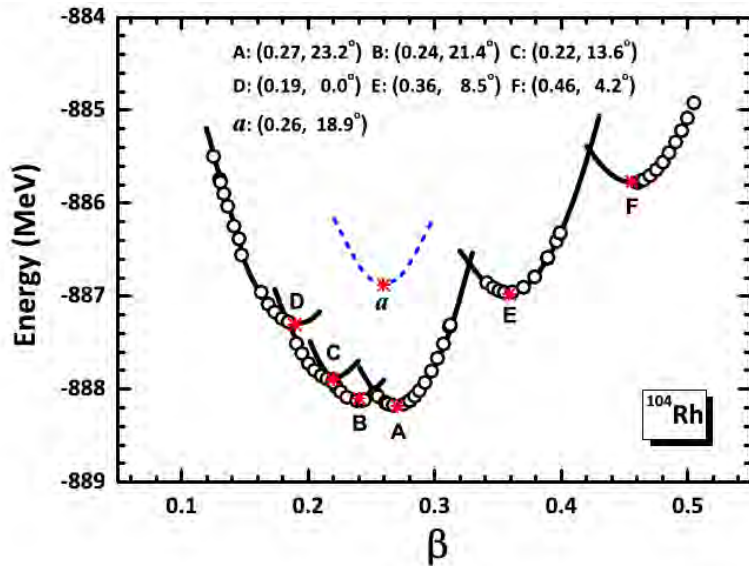
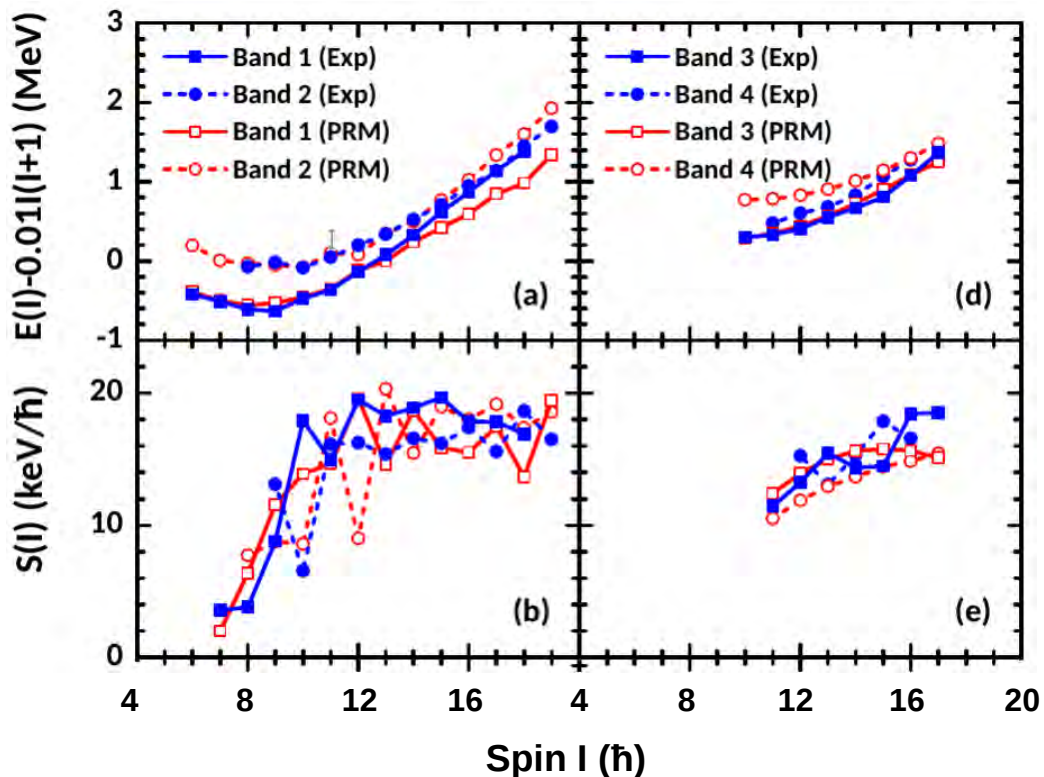


Table 1

The excitation energies E_x , deformation parameters β and γ , and their corresponding configurations (valence nucleon and unpaired nucleon) as well as the parities of minima for states A-F and a in the configuration-fixed constrained triaxial CDFT calculations.

State	E_x	(β, γ)	Unpaired configuration	π
A	0.00	(0.27, 23.2°)	$\pi(1g_{9/2})^{-1} \otimes \nu(1h_{11/2})^1$	–
B	0.08	(0.24, 21.4°)	$\pi(1g_{9/2})^{-1} \otimes \nu(1g_{7/2})^{-1}$	+
C	0.29	(0.22, 13.6°)	$\pi(2p_{1/2})^1 \otimes \nu(1g_{7/2})^{-1}$	–
D	0.87	(0.19, 0.0°)	$\pi(1g_{9/2})^1 \otimes \nu(1g_{7/2})^{-1}$	+
E	1.21	(0.36, 8.5°)	$\pi(1g_{7/2})^1 \otimes \nu(1h_{11/2})^1$	–
F	2.41	(0.46, 4.2°)	$\pi(2p_{3/2})^{-1} \otimes \nu(1g_{9/2})^{-1}$	–
a	1.30	(0.26, 18.9°)	$\pi(1g_{9/2})^{-1} \otimes \nu(1g_{7/2})^{-2}(1h_{11/2})^1$	–

Részecske rotor modell számolások



$$S(I) = [E(I) - E(I-1)]/2I$$

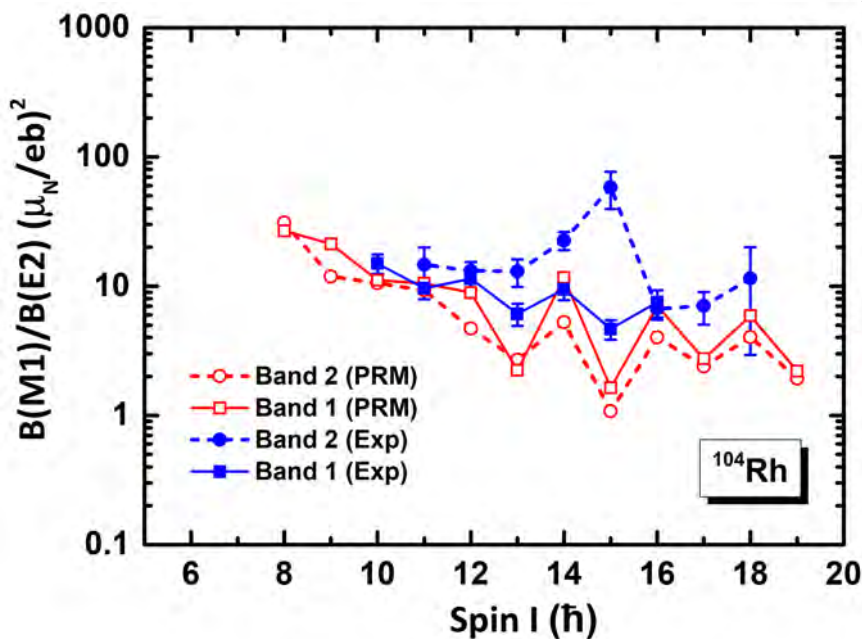
staggering paraméter

$\beta=0.27, \gamma=23.2^\circ$
 $\pi(1g_{9/2})^{-1} \otimes \nu(1h_{11/2})^1$
 konfiguráció

$\beta=0.26, \gamma=18.9^\circ$
 $\pi(1g_{9/2})^{-1} \otimes \nu(1g_{7/2})^{-2} (1h_{11/2})^1$ konfiguráció

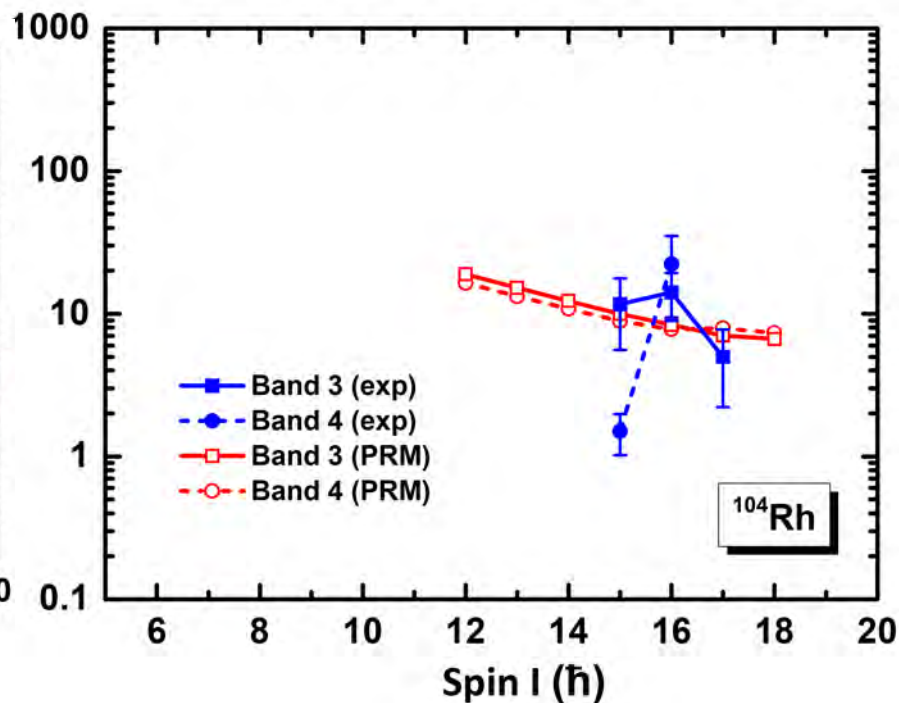
Elektromágneses tulajdonságok

B(M1)/B(E2) arányok az 1-2 sávokra



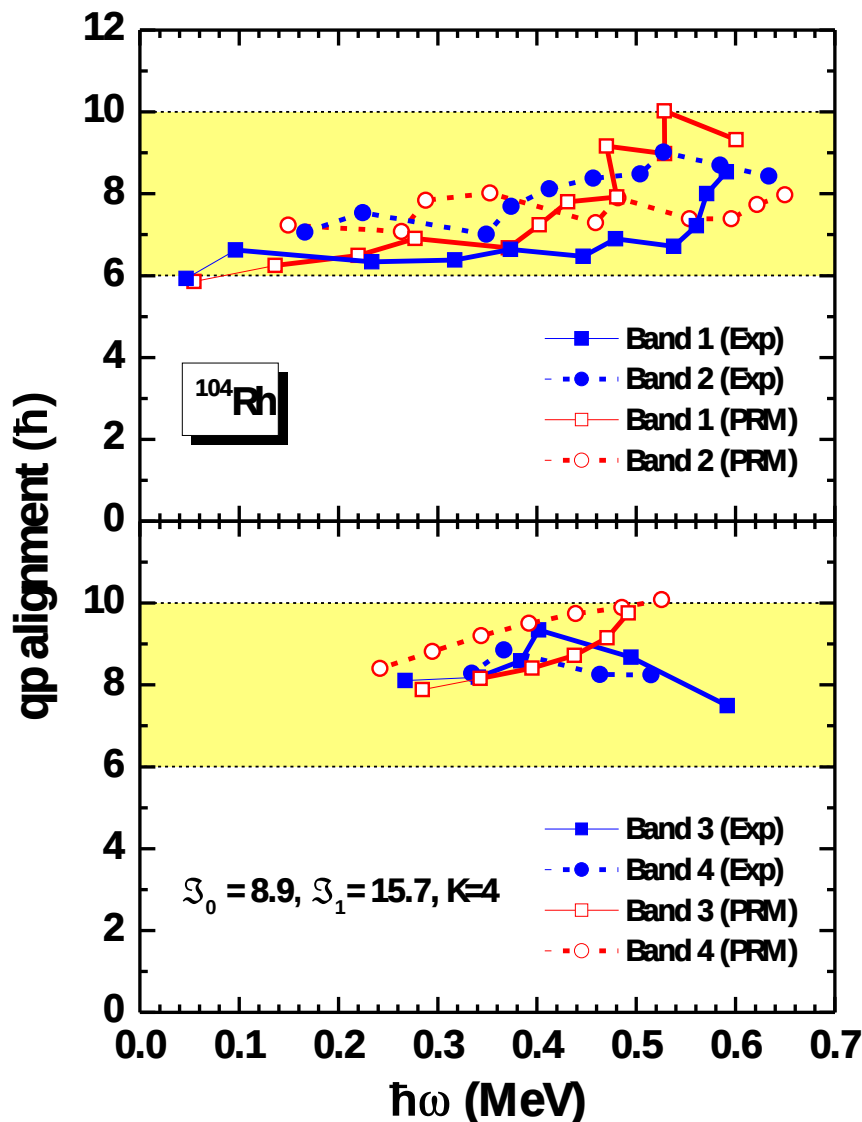
$\beta=0.27$, $\gamma=23.2^\circ$

B(M1)/B(E2) arányok a 3-4 sávokra



$\beta=0.26$, $\gamma=18.9^\circ$

Elméleti és kísérleti alignement értékek



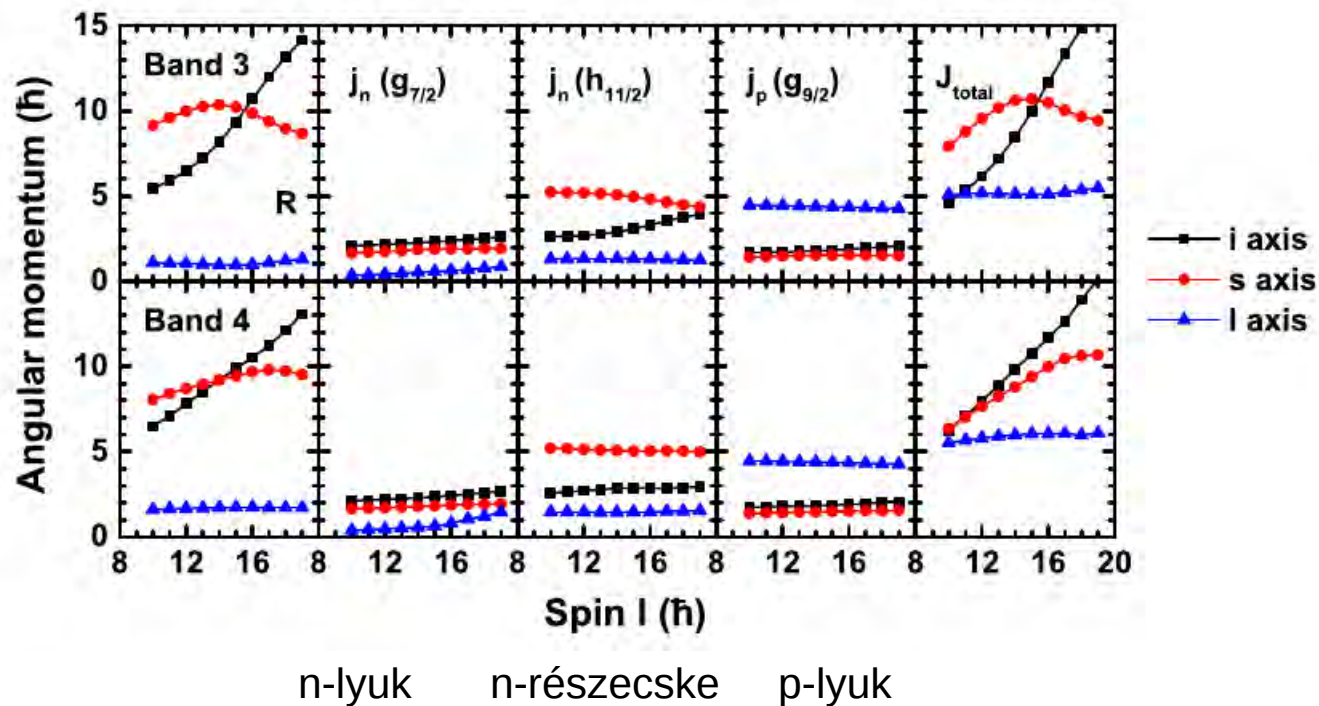
Az 1. és 2. sávok
 $\pi(1g_{9/2})^{-1} \otimes \nu(1h_{11/2})^1$ konfigurációval
 rendelkeznek

$\beta=0.27, \gamma=23.2^\circ$

A 3. és 4. sávok
 $\pi(1g_{9/2})^{-1} \otimes \nu(1g_{7/2})^{-2} (1h_{11/2})^1$
 konfigurációval rendelkeznek

$\beta=0.26, \gamma=18.9^\circ$

Perdület komponensek





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Letter

Multiple chiral doublet bands in ^{104}Rh

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