

## Evolution of neutron shell structure of N = 14, 16 isotones

Wednesday 3 July 2024 13:00 (20 minutes)

The evolution of neutron single-particle characteristics of isotones with N = 14, 16 was studied in the dispersive optical model /1/ in Z region from 7 to 20. The calculation was performed with the parameters both extrapolated in accordance with the global parameters KD (KDUQ) /2, 3/ and with the diffuseness parameter  $a_{HF}$  depending on the neutron excess. With an increase in the neutron excess, the energy gap N = 14 and N = 16 is reduced and widens respectively. In addition, the deviation  $\Delta_F = |\langle E_{1d_{5/2}}, E_{2s_{1/2}} \rangle - E_F|$  of the middle between the  $1d_{5/2}$  and  $2s_{1/2}$  energies from the Fermi energy  $E_F$  increases for N = 14 isotones. It reflects the disappearance of N = 14 magicity when approaching the neutron drip line. While, the deviation  $\Delta_F = |\langle E_{2s_{1/2}}, E_{1d_{3/2}} \rangle - E_F|$  for isotones with N = 16 decreases. An increase in the  $a_{HF}$  parameter for unstable isotones enhances this effect. The obtained results are consistent with the double magicity of  $^{24}\text{O}$  (N = 16) and  $^{34}\text{Ca}$  (N = 14) nuclei. As an example, Fig.1 shows the evolution of neutron single-particle energies  $E_{n,l,j}$  near the Fermi energy of isotones with N = 14. The deviation  $\Delta_F$  is represented relative to the value of particle-hole energy gap  $G$ .

Indico rendering error

Could not include image: Cannot read image data. Maybe not an image file?

### References

1. C. Mahaux, R. Sartor Adv. Nucl. Phys. 1991. V.20. P.1.
2. A.J. Koning, J.P. Delaroche. Nucl. Phys. A. 2003. V. 713. P. 231.
3. C. D. Pruitt J. E. Escher, and R. Rahman, Phys. Rev. C. 107, 014602 (2023).

### Section

Nuclear structure: theory and experiment

**Primary author:** BESPALOVA, Olga (Scobeltsyn Institute of Nuclear Physics, Lomonosov Moscow State University)

**Co-authors:** KLIMOCHKINA, Anna (Physics Department of Lomonosov Moscow State University; Scobeltsyn Institute of Nuclear Physics of Lomonosov Moscow State University); MOSUNOV, Maxim (Physics Department of Lomonosov Moscow State University; Scobeltsyn Institute of Nuclear Physics of Lomonosov Moscow State University)

**Presenter:** BESPALOVA, Olga (Scobeltsyn Institute of Nuclear Physics, Lomonosov Moscow State University)

**Session Classification:** Nuclear structure: theory and experiment