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Magnetic Moment of ^{57}Cu and shell breaking of the ^{56}Ni core

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The nuclear magnetic moment of the ground state of ^{57}Cu was deduced for the first time. Together with a known magnetic moment of the mirror partner, ^{57}Ni, the spin expectation value, which is a contribution of nucleon spins to the magnetic moment, was extracted from the isoscaler part of magnetic moments. In the *sd* shell, a systematic trend of the spin expectation value of isospin $T = 1/2$ mirror nuclei has been observed. On the other hand, in the fp shell, only a few mirror magnetic moments are known and therefore it is essential to measure more magnetic moments to explore the evolution of shell structure. Because ^{57}Cu consists of the closed-shell ^{56}Ni core plus one proton, the single-particle contribution is expected to be strong and any deviation from the shell model is a direct proof of shell breaking at ^{56}Ni, which has been suggested [1] based on a systematic deviation between magnetic moments of odd-mass Cu isotopes and theoretical shell-model predictions. From the resonance frequency, the magnetic moment was derived as $|\mu(^{57}\mathrm{Cu})| = (2.00 \pm 0.05)\mu_\mathrm{N}$ [2]. The $A = 57$, $T = 1/2$ spin expectation value was extracted as $\langle \Sigma\sigma_z \rangle = -0.78 \pm 0.13$. The small $\mu(^{57}\mathrm{Cu})$ results in a large deviation and opposite sign from the shell-model calculations [3,4]. Considering the systematic behavior of the spin expectation value of $T = 1/2$ nuclei in the *sd* shell, the present result indicates a significant shell breaking at ^{56}Ni with the neutron number $N = 28$.

[1] V. V. Golovko *et al.*, Phys. Rev. **C 70**, 014312 (2004).
[2] K. Minamisono *et al.*, Phys. Rev. Lett. **96**, 102501 (2006).
[3] D. R. Semon *et al.*, Phys. Rev. **C 53**, 96 (1996).
[4] M. Honma *et al.*, Phys. Rev. **C 69**, 034335 (2004).