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Field-space anisotropy of magnetic phases and excitations in cubic Ce^{3+} compounds

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場　所　先端科学総合研究棟 302S

Cubic f-electron compounds commonly exhibit highly anisotropic magnetic phase diagrams consisting of multiple long-range ordered phases. Field-driven metamagnetic transitions between them may depend not only on the magnitude, but also on the direction of the applied magnetic field. Examples of such behavior are plentiful among rare-earth borides, such as RB_6 or RB_{12} (R = rare earth). In our recent works, we used torque magnetometry and neutron scattering to measure anisotropic field-angular phase diagrams of La-doped cerium hexaborides, $Ce_{1-x}La_xB_6$ [1,2] and $Ce_3Pd_{20}Si_6$ [3]. We proposed a simple qualitative model for the field-space anisotropy that considers a pair of localized Ce ions in a cubic crystal electric field, coupled by a single nearest-neighbor exchange interaction. The field-directional anisotropy in these compounds is also pronounced in the magnetic excitation spectrum, investigated with inelastic neutron scattering (INS) – see Fig. 1. Our work demonstrates that the rotating-field technique at fixed momentum can complement conventional INS measurements of the dispersion at a constant field and holds great promise for identifying the symmetry of multipolar order parameters and the details of intermultipolar interactions that stabilize hidden-order phases in rare-earth compounds.

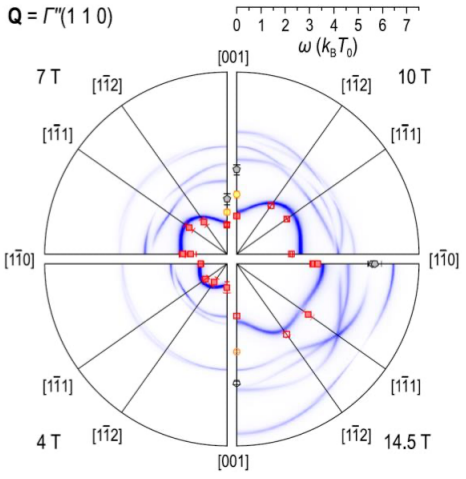

Fig1. Field-angle dependence of the collective multipolar excitations in CeB6 at the zone center, **Q**=Γ(110).

[1] D. S. Inosov *et al.,* Phys. Rev. B **103**, 214415 (2021).
[2] P. Y. Portnichenko *et al.*, Phys. Rev. X **10**, 021010 (2020).
[3] F. Mazza *et al.*, Phys. Rev. B **105**, 174429 (2022).

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