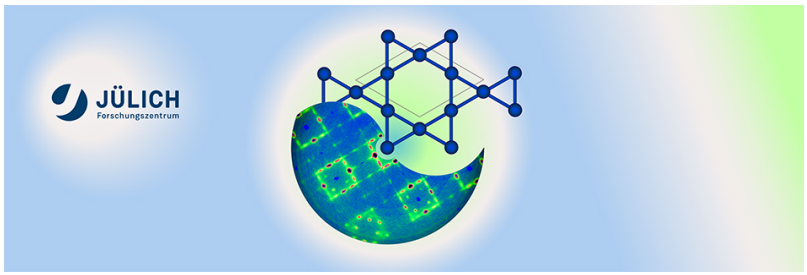

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Magnetic interactions in Nd2PdSi3 and the formation of skyrmion phases in centrosymmetric metals

Mittwoch, 8. Oktober 2025 14:45 (15 Minuten)

We present an X-ray and neutron scattering study of the structure and magnetic excitations of Nd2PdSi3 [1], a sister compound of Gd2PdSi3 which was recently found to host a skyrmion phase despite its centrosymmetric crystal structure. Dispersive magnetic excitations corresponding to the complete crystal field scheme of the Nd atoms were measured throughout the reciprocal space Brillouin zone. The full measured spectrum was modelled by mean-field random-phase approximation (MF-RPA) to determine quantitatively the magnetic interactions between two distinct Nd sites. Our analysis finds that the exchange couplings in this system extend over large distances and are significantly affected by a crystallographic superstructure formed by ordering of the Pd and Si atoms. These results suggest that the skyrmion phase in Gd2PdSi3 is stabilised by long-range RKKY interactions rather than short-range triangular-lattice frustration. First principles theory results corroborate with a long-ranged RKKY interaction scenario, which has its basis in the complex, three-dimensional Fermi surface of this material.

[1] Peçanha-Antonio et al., arXiv:2504.10075v1

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