

Magnetic Resonance at High Fields in the Layered Magnetic Metal YMn_6Sn_6

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Funding Grants: K. M. Amm (NSF DMR-2128556); S.R. Singamaneni (NSF DMR-2105109)

The "166" Kagome metals represent a versatile class of quantum materials where the interplay of lattice geometry, topology, and magnetism yields exceptional electronic phenomena, including flat bands, Dirac cones, and van Hove singularities. This customizable crystal structure serves as a unified platform for nearly every exotic electronic property discovered over the last two decades, many of which are magnetically tunable.

YMn_6Sn_6 was investigated using high-frequency electron magnetic resonance (EMR) at the National High Magnetic Field Laboratory (NHMFL). As the external magnetic field increases, YMn_6Sn_6 transitions through several magnetic phases: a distorted spiral (DS), a transverse conical spiral (TCS), a fan-like (FL), and a forced ferromagnetic (FF) phase, along with several unidentified intermediate regions. Using several high microwave frequencies in the quasi-optical spectrometer at the NHMFL, and despite the metallicity of the sample, distinct magnetic resonance signals were observed in the TCS, FL, and FF phases, reflecting the local magnetic moments and planar anisotropies. In the intermediate regions, the simultaneous observation of signals from adjacent magnetic phases suggests the existence of mixed-phase regimes (Fig.1).

These findings complement bulk magnetometry and inelastic neutron scattering data, providing critical insights for the development of future applications in spintronics and topological quantum computing..

Facilities and instrumentation used: EMR facility, quasi-optical heterodyne spectrometer.

Citation: Ofori, L.; van Tol, J.; Tolva, N.; Bhandari, H.; Ghimire, N.; Singamaneni, S., *High-frequency electron spin resonance in Kagome-Lattice YMn_6Sn_6* , **Journal of Physics: Condensed Matter**, 38 (9), 095801 (2026) <https://doi.org/10.1088/1361-648X/ae4867> - [Data Set](#);

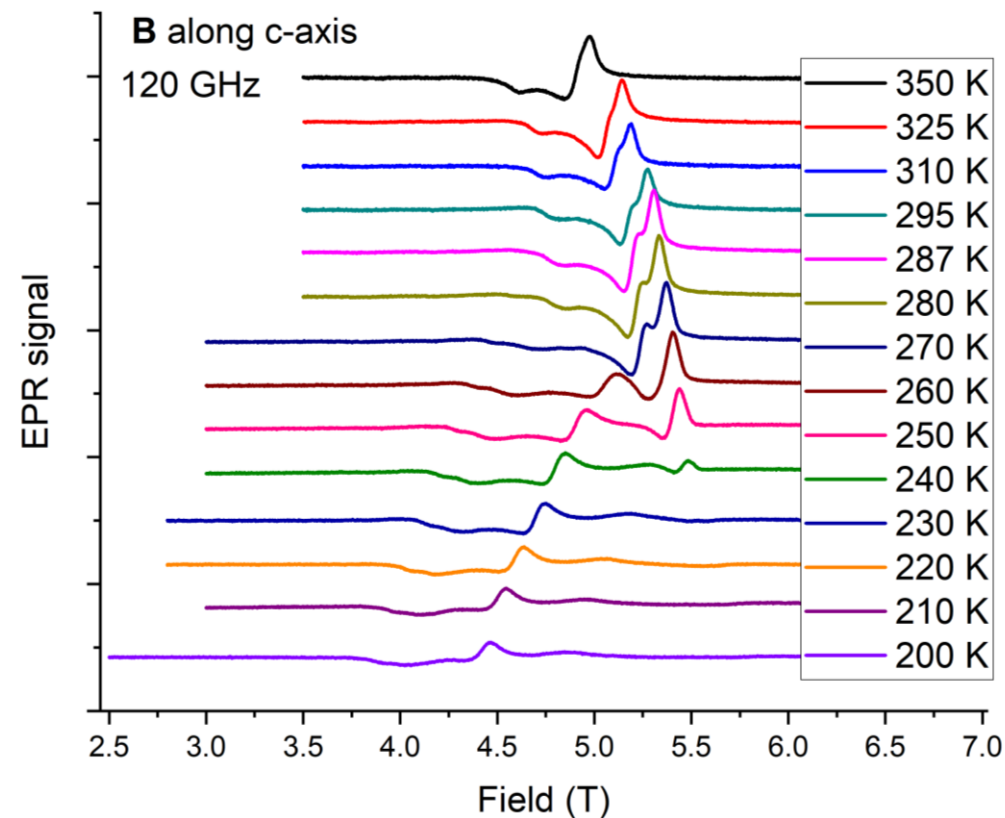


Fig 1. Transition between FF (higher temp.) and TCS phase (lower temp.) in YMn_6Sn_6 observed with field-modulated ferromagnetic resonance at 120 GHz with the field oriented out of plane.