



Dynamic Behaviors of Exchange Spiral in Fe/CoO Bilayers with Strong Interfacial Exchange Coupling

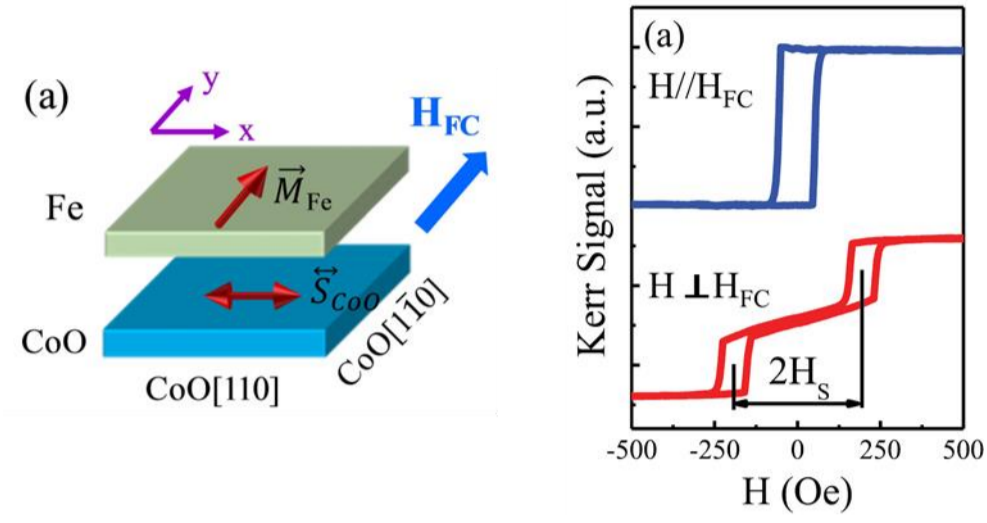


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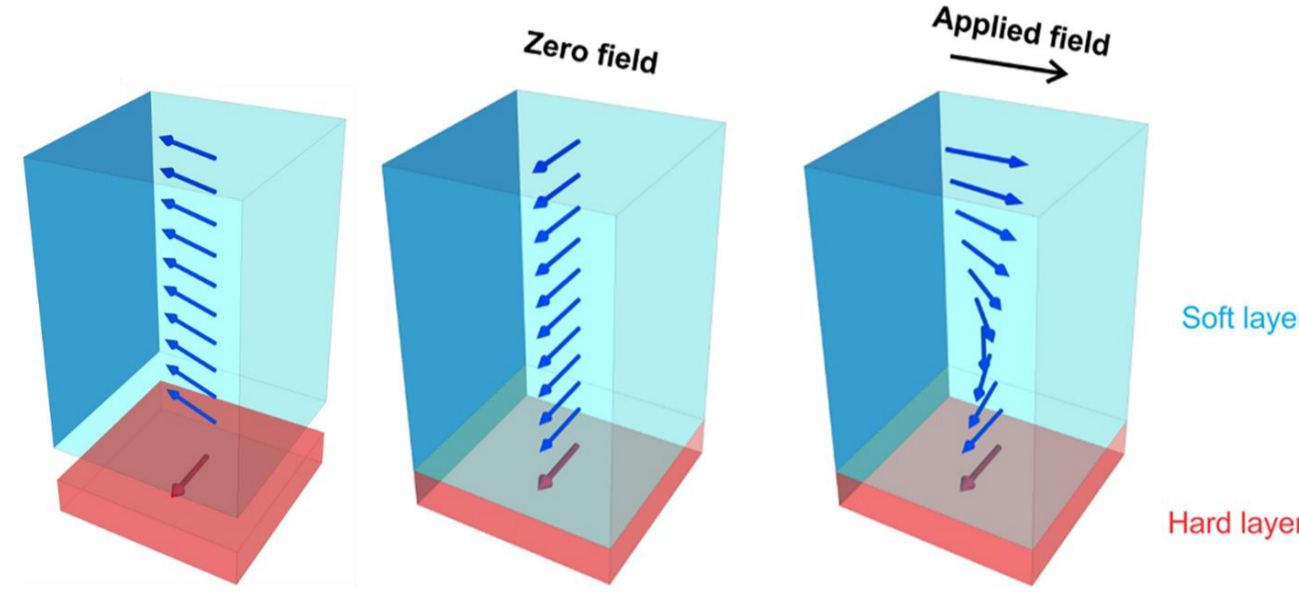
Introduction

Exchange-coupling-induced uniaxial anisotropy in Fe/CoO



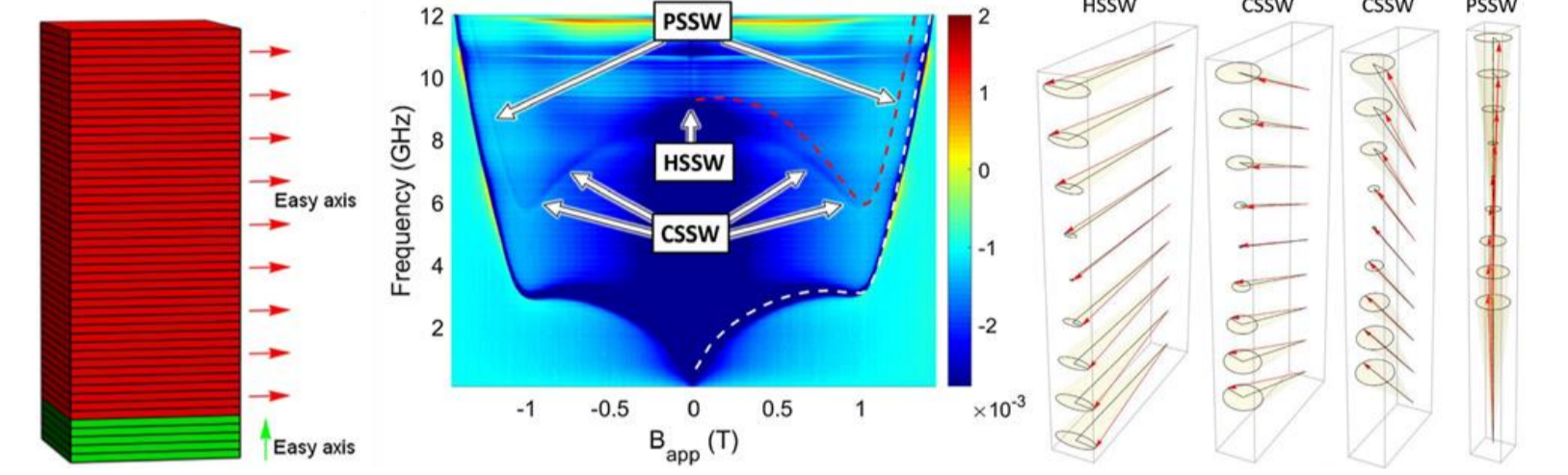
J. Zhu, et al. *J. Appl. Phys.* (2013)

Magnetic exchange springs



A. Frisk, et al. *Phys. Rev. Applied* (2023)

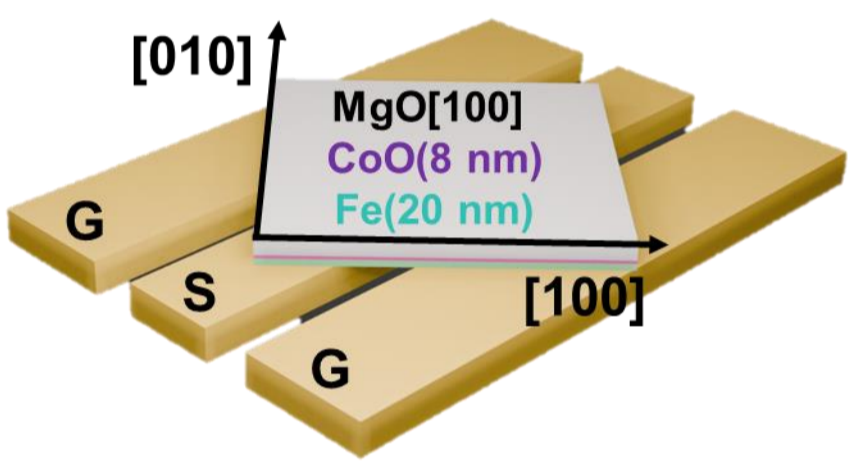
Canted standing spin-wave modes in [Co/Pt]/Pt/Py films



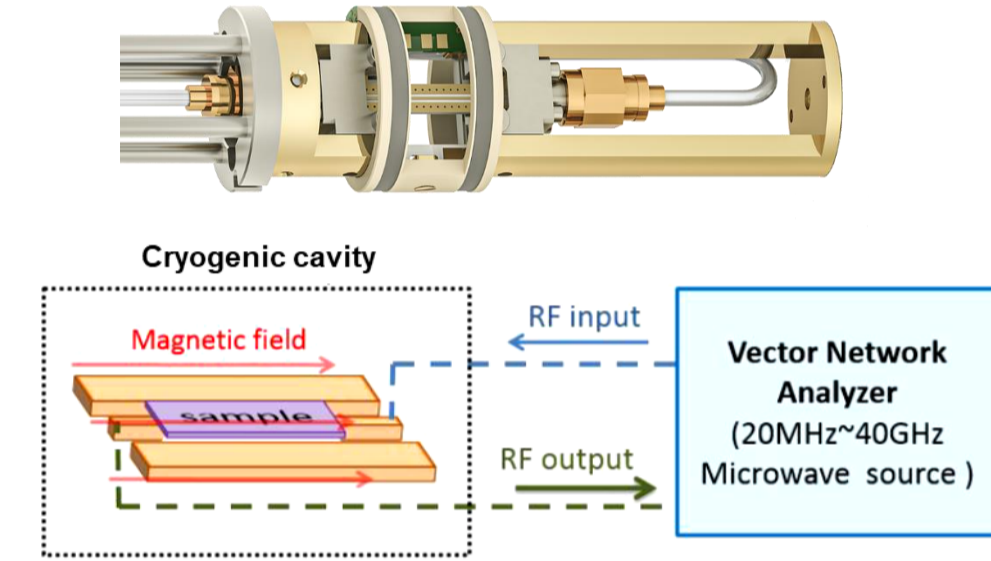
M. Dabrowski, et al. *New J. Phys.* (2021)

Schematic illustration of experiment

Structure of sample and CPW

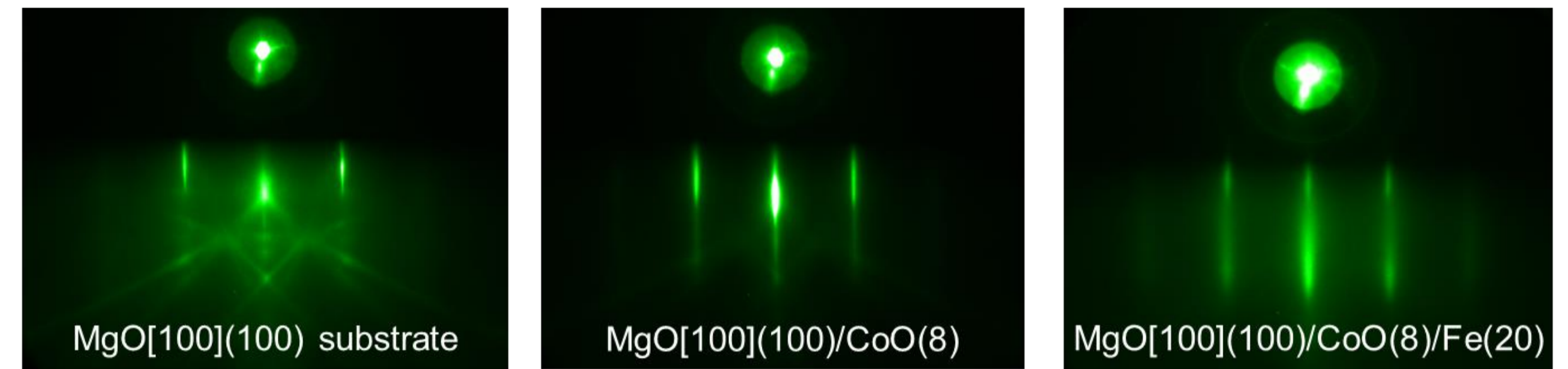


FMR sample rods



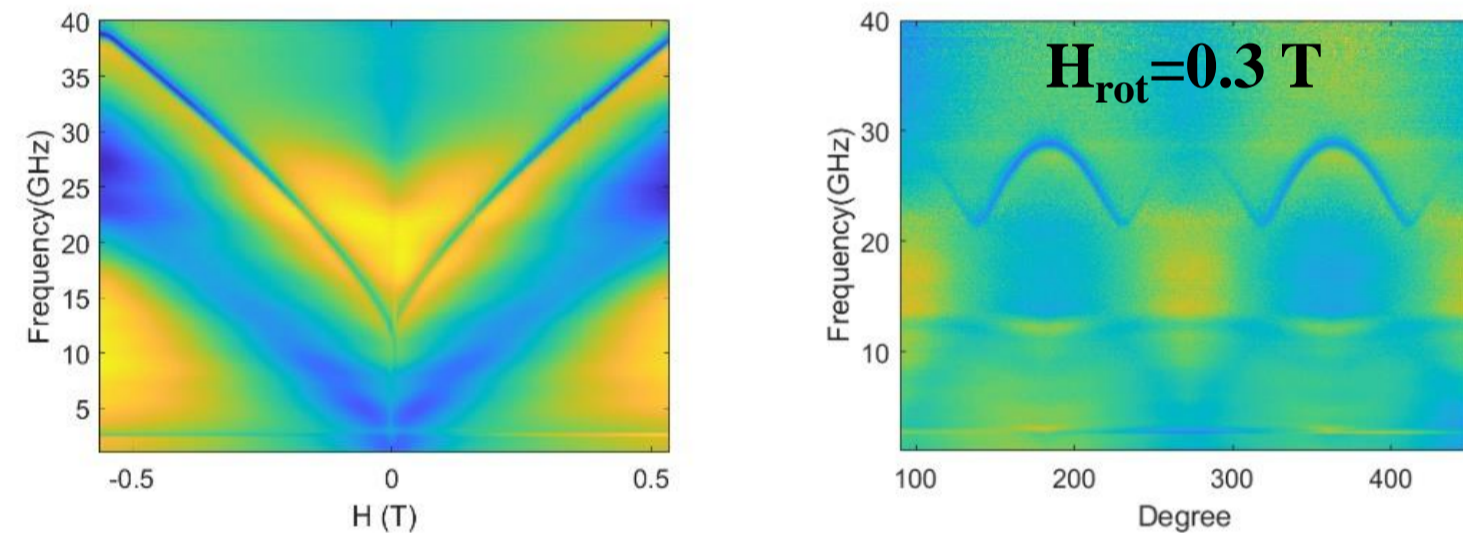
RHEED patterns of sample

Single-crystalline films prepared by MBE

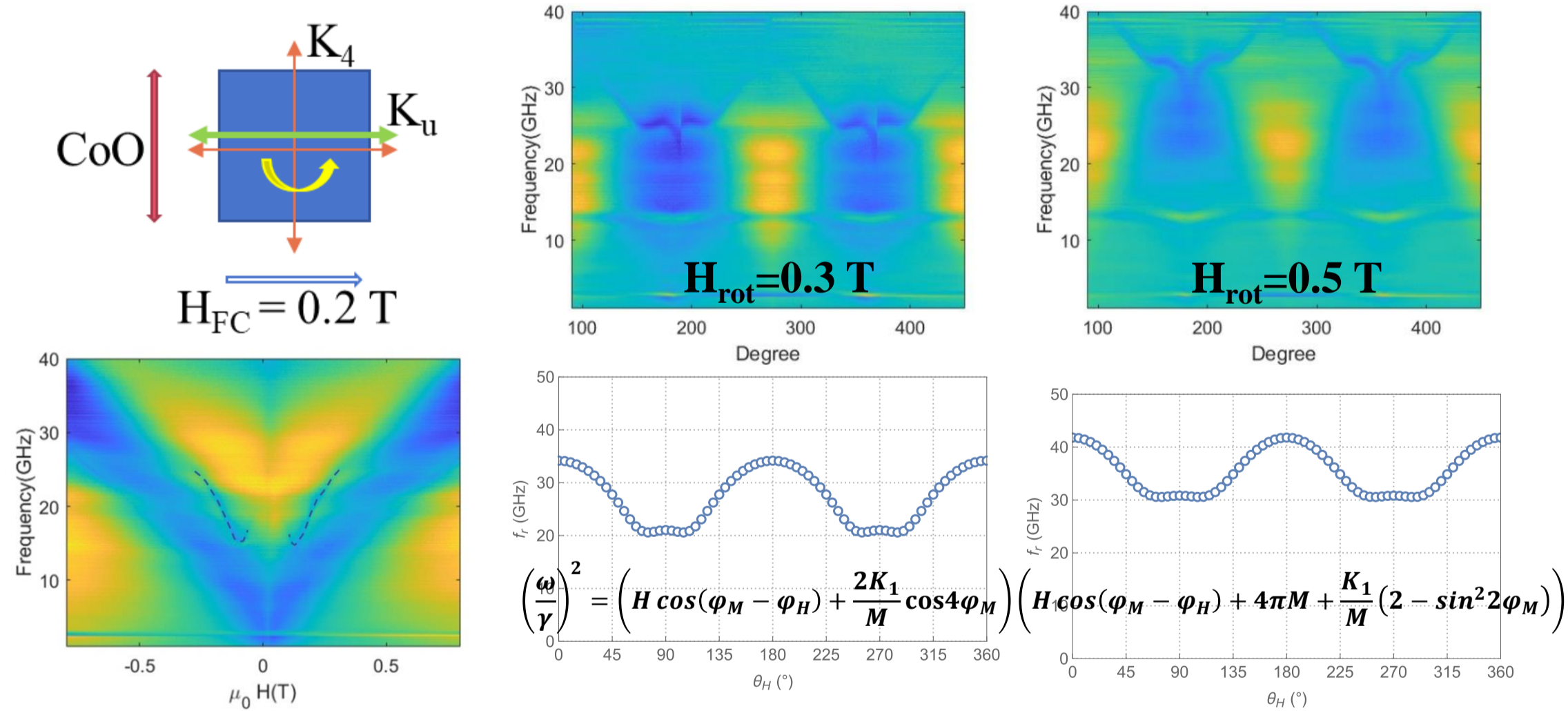


In-plane FMR measurement result

Sweep field and rotate field FMR at 300 K



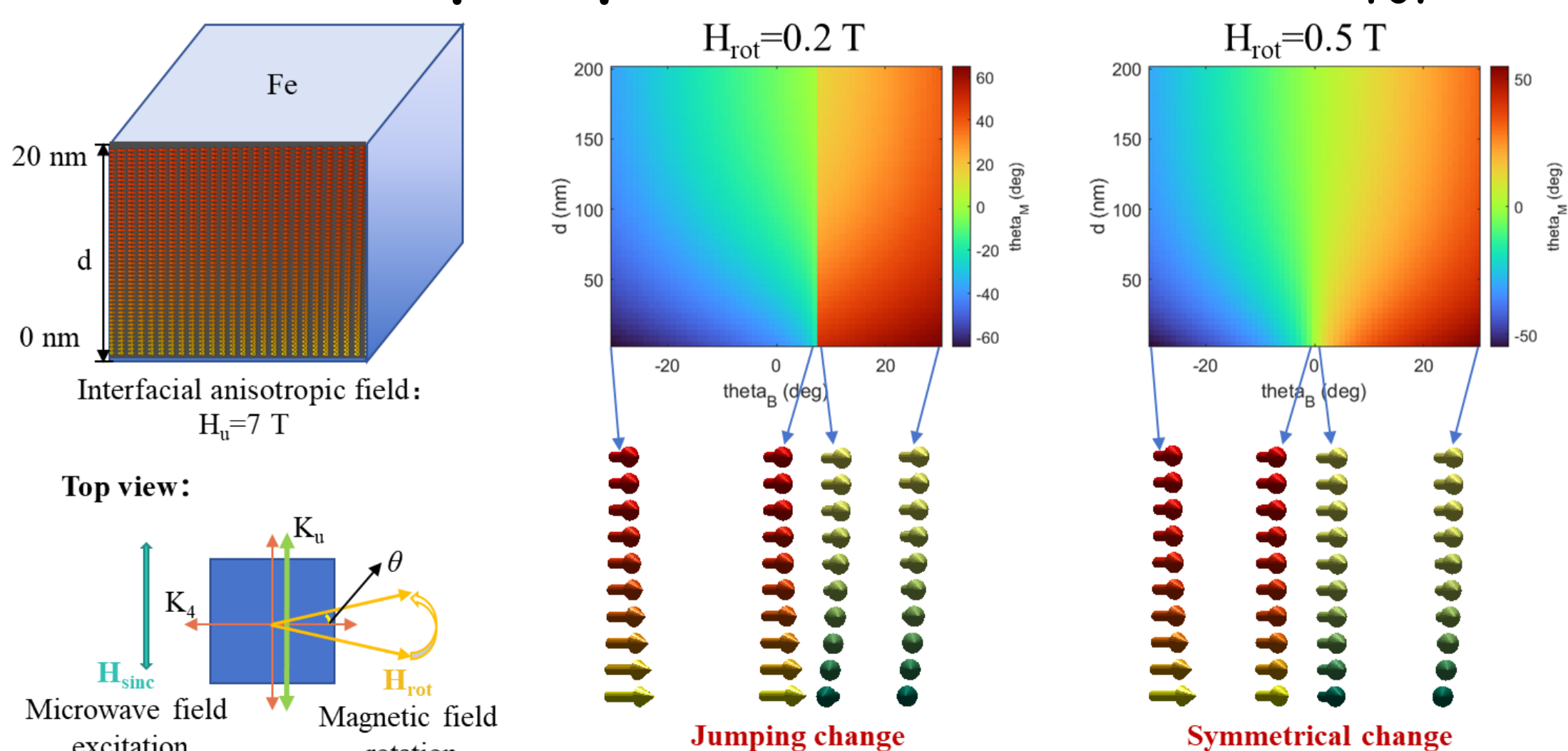
Sweep field and rotate field FMR at 5 K



Inconsistent with the FMR theory with uniaxial anisotropy!

Micromagnetic simulation of exchange spiral

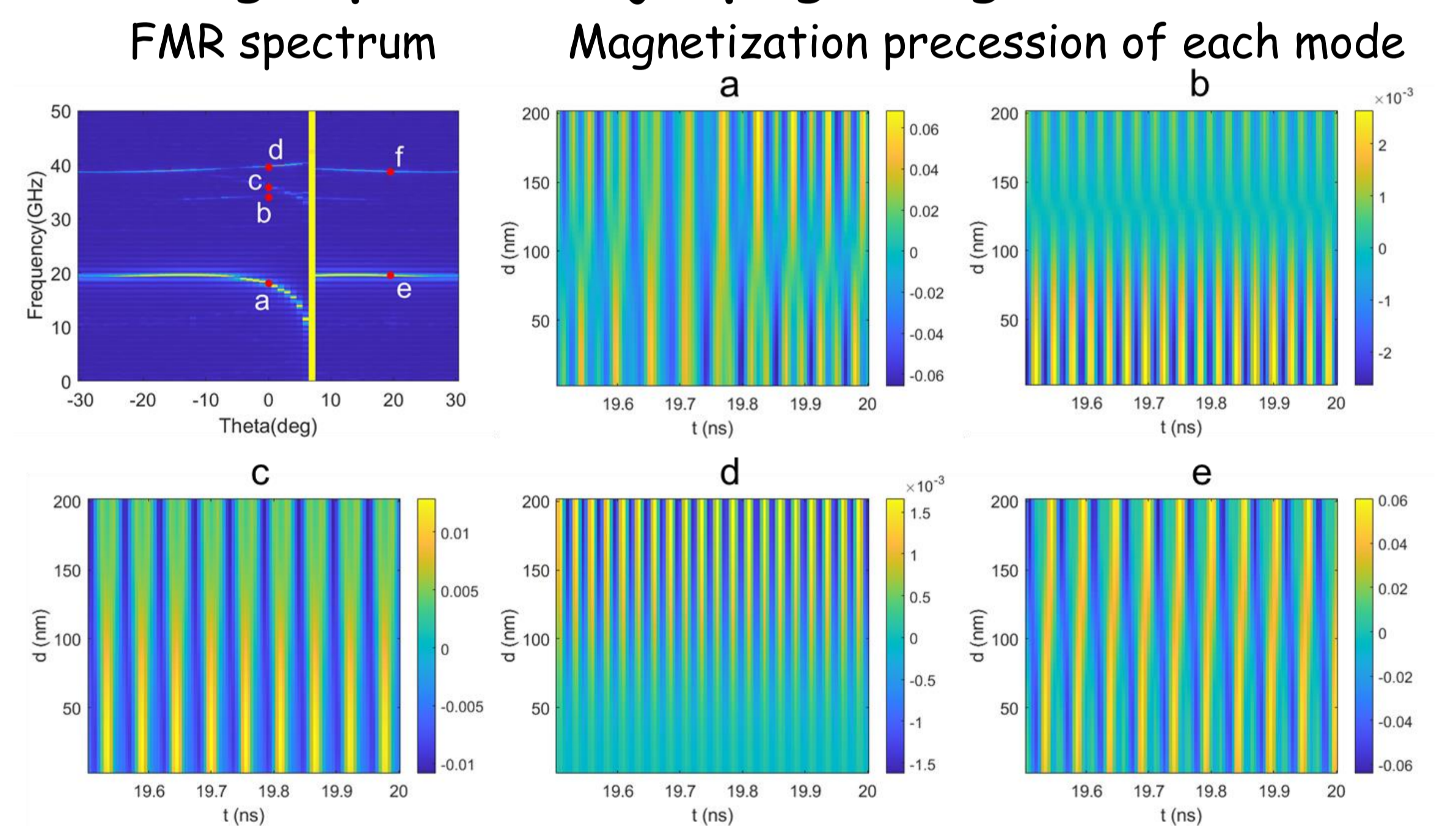
Structure of spin spirals under different H_{rot}



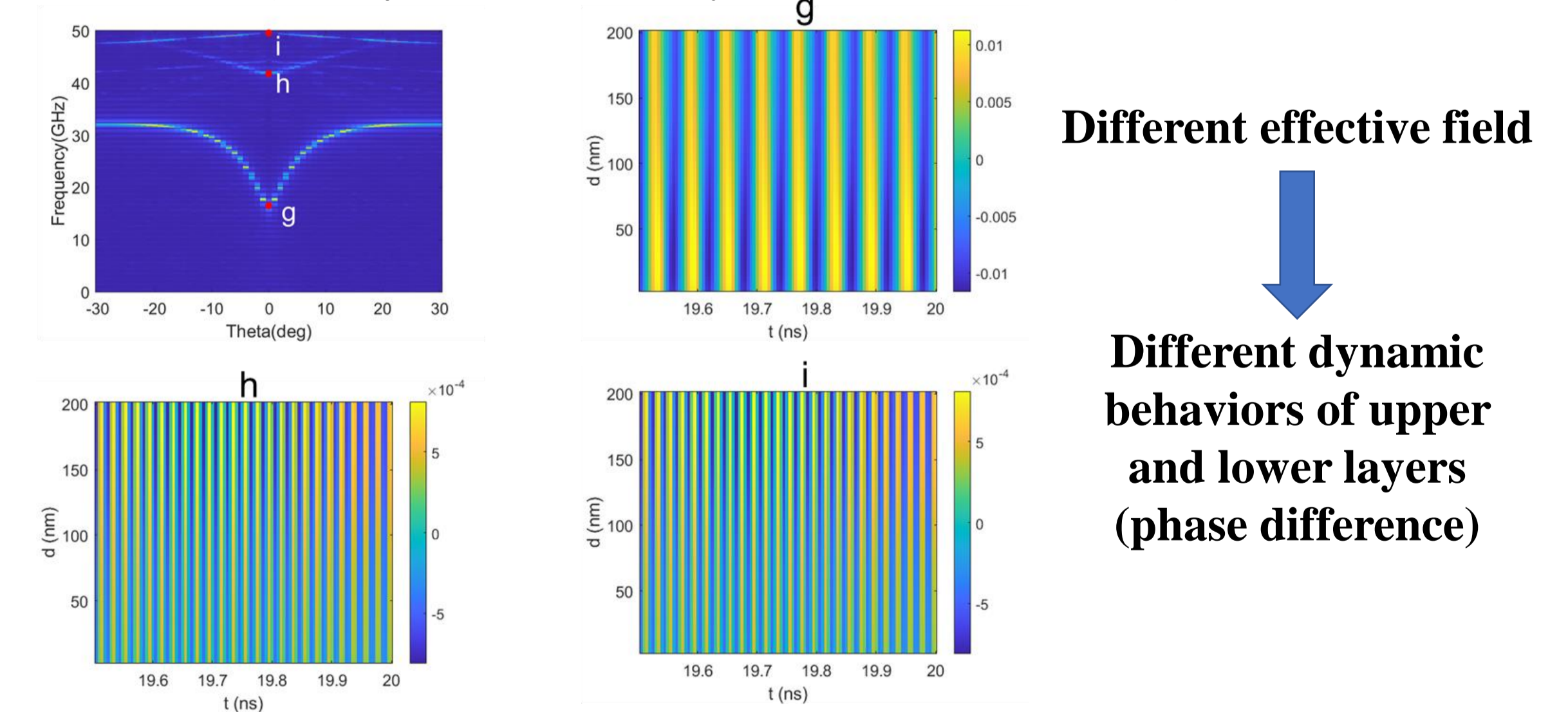
Exchange spiral appears in the system with interfacial anisotropy.

Simulation of dynamic behaviors

Exchange spiral with jumping change



Exchange spiral with symmetrical change



Different effective field

Different dynamic behaviors of upper and lower layers (phase difference)

Conclusion

- Ferromagnetic resonance of exchange spiral was studied experimentally.
- The existence and structural changes of exchange spiral were confirmed by micromagnetic simulation.
- The FMR spectra and the spin wave excitation modes of spiral with different structures were calculated.