



# Walther-Meißner-Seminar

**Seminar Room 143**

**Date:** Friday, 24 July 2026, 11:15 h

**Speaker:** **Dr Seth W. Kurfman**  
*Martin-Luther-Universität Halle-Wittenberg*

**Title:** **Strong coupling between quantized magnon modes in a YIG microstructure and microwaves in a superconducting resonator**

**Abstract:** Strong-coupling experiments based on magnons enable the exploration into on-chip demonstrations involving numerous long-lived excitations. Yttrium iron garnet (YIG) has been considered for decades as a gold standard material for magnonics due to its low-loss magnonic properties. While YIG has successfully demonstrated strong-coupling in macroscopic device geometries, the strong coupling of magnons in truly sub-10 micron YIG structures to date has not yet been realized. This obstacle is due to the difficulty producing large enough effective magnonic mode volume necessary primarily due to thickness limitations of YIG deposition and device fabrication techniques.

Here, I will discuss our recent work [1] wherein we use of a microplatelet of YIG, manufactured from a single crystal of YIG via focused ion beam (FIB) techniques, placed on a constricted inductive line of an optimized superconducting lumped element LC resonator to achieve strong coupling between numerous magnon modes and the LC resonator photons. These experimental findings are qualitatively backed by micromagnetic simulations and quantitatively supported by analytical calculations to identify the magnon modes corresponding to the experimentally observed anti-crossings in the microwave transmission signal. Further, we show that these anti-crossings remain even at incredibly low device input powers ( $\leq 10$  fW). The fabrication techniques and device geometry enable the deterministic use of numerous confined magnon modes in micron-scale YIG structures for various magnetic field strengths and orientations at substantially reduced device powers. The results here establish a foundational path forward to achieving efficient magnon-based strong-coupling experiments in micron-scale YIG magnetic elements for effective on-chip studies.

[1] S. W. Kurfman *et al.*, arXiv:2604.28145v2