Contribution submission to the conference Regensburg 2025

Towards Detection of Spin Resonance Excitations with TEM

— •Antonín Jaroš, Johann Toyfl, Benjamin Czasch, Michael Stanislaus Seifner, Isobel Claire Bicket, Santiago Belrán-Romero, and Philipp Haslinger — VCQ, Atominstitut, TU Wien, USTEM, Stadionallee 2, 1020 Vienna, Austria

Microwave (MW) excitations of spin systems induce precessional spin motion at GHz frequencies. Traditional spin resonance spectroscopy techniques, such as Electron Spin Resonance (ESR) and Ferromagnetic Resonance (FMR), are employed to determine key parameters like gyromagnetic ratios and damping constants in magnetic materials. However, these methods often lack the spin sensitivity and spatial resolution required for spin studies at the atomic level. We present a novel approach that synergistically combines spin resonance techniques with Transmission Electron Microscopy (TEM). Spin state polarization is induced by the magnetic field of the TEM pole piece, while spin system excitation is achieved through an impedance-matched micro-resonator integrated into a custom-designed sample holder. The detection of spin resonance excitations in TEM might represent an important step towards MW driven spin studies with highly controlled electron probe at the nanoscale.

Part:	O
Type:	Vortrag;Talk
Topic:	Focus Session: Ultrafast electron microscopy at the space-time limit
Keywords:	transmission electron microscopy; electron spin resonance; ferromagnetic resonacne; spin dynamics
Email:	antonin.jaros@tuwien.ac.at