

### Surface acoustic wave driven magnetization dynamics in transferred YIG microstructures

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Surface acoustic wave (SAW) devices allow to combine spin-wave based functionality with state-of-the-art radio-frequency technology. However, one of the ongoing challenges on the path towards energy efficient SAW-based spintronic applications is the combination of SAWs as excitation mechanism with micro and nanostructures fabricated from low damping yttrium-iron-garnet (YIG). Here, we utilize SAWs to mechanically excite spin waves at GHz frequencies in micron-sized crystalline YIG elements. For this, epitaxially grown YIG platelets are transferred and anchored on piezoelectric LiNbO<sub>3</sub> substrates [1].

We experimentally demonstrate that the nanoscale coupling between the piezoelectric substrate and the YIG elements results in the excitation of standing spin-wave modes. By utilizing SNS-MOKE [2], we map the mechanical strain profile of the propagating SAW and directly image the excited magnon modes. Our results demonstrate that SAW-induced magnetic excitation is possible over a broad range of wavevectors beyond the conventional symmetry of magneto-elastic coupling.

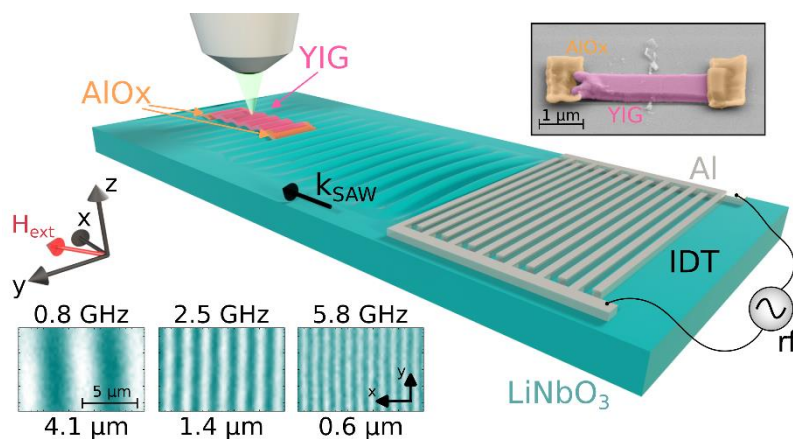


Fig. 1: Sketch of the experimental geometry of local SNS-MOKE detection of SAW-driven dynamics. The upper inset shows the YIG microstructure. The lower insets demonstrate the possibility of direct imaging of the propagating SAW by means of SNS-MOKE

[1] P. Trempler, et al., Appl. Phys. Lett. **117**, 232401 (2020)

[2] R. Dreyer, et al., Nat. Commun. **13**, 4939 (2022)