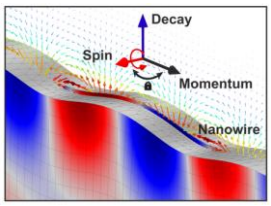
Seminar announcement

Tuesday, January 14, 2025
2:00 pm
WSI, Seminar room S 101
<u>Exclusively in person</u>

"New twists for nanoquakes on a chip – Emerging applications of surface acoustic waves to probe and control quantum nanosystems"

Elastic waves are an indispensable phononic technology finding applications in diverse fields ranging from the life sciences, signal processing to quantum technologies [1]. In my talk, I will show that the unique combination of surface acoustic waves (SAW) and high-resolution optical spectroscopy provides a versatile testbed to sense and manipulate the optical properties and carrier transport processes in novel nanoscale materials.

I will show that the large piezoelectric fields accompanying the sound waves can drive charge carrier dynamics in nanowires and two-dimensional semiconductors giving rise to dynamic modulation of the emission intensity or inducing acousto-electric currents. Optical spectroscopy enables the direct observation of piezo-acoustically driven dynamics on ultrafast time scales in a wide variety of nanomaterials [2-5]. These methods provide insight on fundamental material parameters such as the mobility of electrons and holes, carrier trapping, and for the first time enable the first direct observation of the transverse angular momentum of radio frequency SAWs [6]. Notably, this transverse angular momentum was predicted by Lord Rayleigh in 1885, representing the acoustic analogue of spin-momentum-locking.



[1] P. Delsing *et al.*, J. Phys. D: Appl. Phys. **52**, 353001 (2019).
[2] L. Janker *et al.*, Nano Lett. **19**, 8701 (2019).
[3] E. Preciado *et al.*, Nat. Commun. **6**, 8593 (2015).
[4] M. M. Sonner *et al.*, Phys. Rev. Appl. **16**, 034010 (2021).
[5] E. D. S. Nysten *et al.*, Adv. Mat. **36**, 2402799 (2024).
[6] M. M. Sonner *et al.*, Sci. Adv. **7**, eabf7414 (2021).

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