



SFB1242

Nichtgleichgewichtsdynamik kondensierter
Materie in der Zeitdomäne

UNIVERSITÄT
DUISBURG
ESSEN

Open-Minded

**30.4.2024 / 10 Uhr c.t., Raum MG 272
Campus Duisburg**

Integrated Quantum Dot Optomechanics

Prof. Dr. Hubert Krenner

Universität Münster

Elastic waves are an indispensable phononic technology finding applications in diverse fields ranging from the life sciences to quantum technologies [1]. In my talk, I will introduce surface acoustic wave (SAW) control of the optical properties of epitaxial semiconductor quantum dots (QDs). On this platform, QDs provide a unique ultrafast nanoscale strain sensor to map acoustic fields and an optically active two-level system for phononic frequency transduction of single photons [2,3]. I will show how the underlying optomechanical interaction can be deliberately exploited for three-wave mixing of near infrared photons and gigahertz phonons by the optical dipole of the QD [3,4]. Finally, I will discuss directions to exploit the universal coupling of phonons to both electronic (QD) and photonic degrees of freedom in integrated device platforms [5] for future hybrid information processing technologies.

- [1] P. Delsing et al., J. Phys. D: Appl. Phys. **52**, 353001 (2019).
- [2] M. Weiß & H. J. Krenner, J. Phys. D: Appl. Phys. **51**, 373001 (2018).
- [3] M. Weiß et al., Optica **8**, 291 (2021).
- [4] D. Wigger et al., Phys. Rev. Research **3**, 033197 (2021).
- [5] D. D. Bühler et al., Nat. Commun. **13**, 6998 (2022).

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