Assistant Professor Johannes Fink
Institute of Science and Technology Austria

From mechanical entanglement generation to microwave quantum illumination

We will present recent experimental progress with micro-machined silicon nanomechanical oscillators. The interplay between parametric driving, interference and dissipation in a multi-mode cavity electro-optomechanical system can either be used to break time reversal symmetry and act as a compact on-chip microwave circulator [1], to deterministically entangle intinerant microwave modes [2], or to realize bidirectional microwave to telecom conversion. Observation of stationary entanglement not only reveals the quantum nature of the mechanical oscillator without measuring it directly, it also represents an important resource for quantum communication and quantum enhanced detection protocols such as quantum illumination [3].

[1] Mechanical On-Chip Microwave Circulator. S. Barzanjeh, et al., Nature Commun. 9, 953 (2017)
[2] Stationary Entangled Radiation from Micromechanical Motion. S. Barzanjeh, et al. Nature 570, 480 (2019)
[3] Experimental microwave quantum illumination. S. Barzanjeh, et al. arXiv:1908.03058