

HL 33: Invited Talk: Hubert Krenner

Time: Tuesday 9:30–10:00

Location: H13

Invited Talk

HL 33.1 Tue 9:30 H13

Acoustic nanoquakes dynamically control optical nanosystems — •HUBERT KRENNER — Emmy Noether Group at Experimentalphysik 1, Universität Augsburg, 86159 Augsburg, Germany

Radio frequency control of the quantum mechanical, electronic and optical properties of nanostructures lies at the forefront of contemporary nanoscale research. Towards this challenging goal, surface acoustic waves (SAWs) provide a particularly versatile tool to manipulate and probe a broad variety of nanosystems. These "nanoquakes on a chip" promise massively parallel manipulation via acousto-mechanical and acousto-electric couplings. In this presentation I will show that a mechanical deformation induced by a SAW can be directly applied to deform and break the periodicity in two-dimensional photonic crys-

tal membranes (PCMs). In a first experiment we employed this effect to spectrally tune the optical mode spectrum of nanocavities defined in this planar and scalable architecture at radio frequencies exceeding 1.7 GHz with a spectral bandwidth of more than 8 cavity linewidths. Recently, we monitored the coupling between the optical mode and quantum dot nanoemitters under periodic acoustic tuning in the time domain. We observe clear periodic coupling and decoupling between the two constituents of this prototype solid-state cavity-quantum electrodynamic system. This unique real-time control promises for the implementation of dynamic quantum gate operations. In addition, the SAW represents a monochromatic and coherent acoustic phonon field. This property could further allow for coherent acousto-mechanical control of coupled photonic and phononic modes in optomechanical crystals.