INVITATION

Department of Condensed Matter Physics

Is pleased to invite you to the lecture

Observation of entangled electron-zone boundary phonon states with transient spectroscopic ellipsometry

by

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Date: **3 December 2025**

Time: **11:00**

Venue: **Lecture room F1, Building 6, Faculty of Science, Kotlářská 2, Brno**

Silicon has three optical phonons. These phonons remain inaccessible with linear optics. Here we demonstrate that time-resolved pump-probe spectroscopic ellipsometry enables the detection of optical phonon responses at both the Brillouin-zone center and edge. Using pump pulses with photon energies below the indirect bandgap of silicon, we leverage two-photon absorption to induce sub-bandgap excitation. Transient optical effects were probed in the 1.9-3.6 eV spectral range with pump-probe time delays from 50 fs to 4.5 ns. We observed distinct features: a structure at the E1 critical point persisting for 4.5 ns; longitudinal optical phonons with an energy spacing of 57±9 meV, lasting approximately 300 fs; and two-phonon replicas, exhibiting a spacing of 81±7 meV.

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