DF 6: Nonlinear dielectrics, phase transitions, relaxors

Time: Monday 16:05–16:25 Location: H11

DF 6.1 Mon 16:05 H11

Damping of longitudinal acoustic phonons in $SrTiO_3$ - coupling to a soft mode and the role of anharmonicity — •Lena Maerten, André Bojahr, Marc Herzog, and Matias Bargheer — Universität Potsdam, Deutschland

$SrTiO_3$ shows a structural phase transition at 110K that is accompanied by the softening of a phonon mode at the zone boundary. This leads to an increased damping of the longitudinal phonons and an abrupt change in sound velocity at T_c. We use time resolved Brillouin scattering experiments to monitor the propagation of longitudinal acoustic phonons in bulk $SrTiO_3$. A metallic transducer film is excited by an infrared pump pulse generating a spectrally broad sound pulse travelling into the $SrTiO_3$ substrate. A broadband probe pulse is scattered from the propagating phonons leading to an oscillating signal in the time domain. We determine the damping and oscillation frequency of these phonons across the phase transition, compare the frequency dependence of the damping with theoretical models and experimental results from other groups. A fluence-dependent series of experiments at different temperatures highlights the important role of anharmonicity, which was observed in room temperature experiments [1].

[1] Bojahr et al. Phys. Rev. B 86 (144306) 2012