

TRR Guest Scientist Lecture / Seminar

Date/Time: 24.10.2017 / 11:00 Uhr
Location: TU Dortmund
CP-01-186 (seminar room e2)



Prof. Dr. Roman V. Pisarev

*Ioffe Physical-Technical Institute, Russian Academy of Sciences,
St. Petersburg, Russia*

"Excitation of multiple phonon modes in copper metaborate CuB_2O_4 via non-resonant impulsive stimulated Raman scattering"

Abstract:

Copper metaborate CuB_2O_4 is a material with a unique crystallographic structure, space group $42m$ ($Z=12$), in which magnetic Cu^{2+} ions occupy two types of nonequivalent positions $4b$ and $8d$. Below the antiferromagnetic ordering at $T_N = 21$ K this material demonstrates a very complicated magnetic phase diagram with commensurate and incommensurate phases [1]. This material also demonstrates very interesting optical and magneto-optical effects [2-4]. The present talk is devoted to experimental and theoretical study of excitation and detection of coherent phonons in CuB_2O_4 using the femtosecond pump-probe spectroscopy [5]. Excitation of phonons was realized via impulsive stimulated Raman scattering and the detection was based on the measurements of the pump-induced linear optical birefringence.

Several stimulated coherent phonons were detected in the frequency range of 4-14 THz and compared with the results of spontaneous Raman scattering [3]. This comparative analysis highlighted the importance of the ratio between the frequency of a particular phonon mode and the pump and probe spectral widths. It was shown analytically that the used in our experiments pump and probe pulses with durations of 90 and 50 fs, respectively, limit the highest frequency of the excited and detected coherent phonons to 12 THz and determine the relative amplitudes of the phonon modes in the lower frequency range.

- [1] M. Boehm et al, Phys. Rev. B **68**, 024405 (2003)
- [2] R. V. Pisarev et al, Phys. Rev. Lett. **93**, 037204 (2004)
- [3] R. V. Pisarev et al, Phys. Rev. B **88**, 024301 (2013)
- [4] K. N. Boldyrev et al, Phys. Rev. Lett. **114**, 247210 (2015)
- [5] K. Imasaka et al, (submitted)

Contact: Prof. Dr. Dmitri Yakovlev
dmitri.yakovlev@tu-dortmund.de