



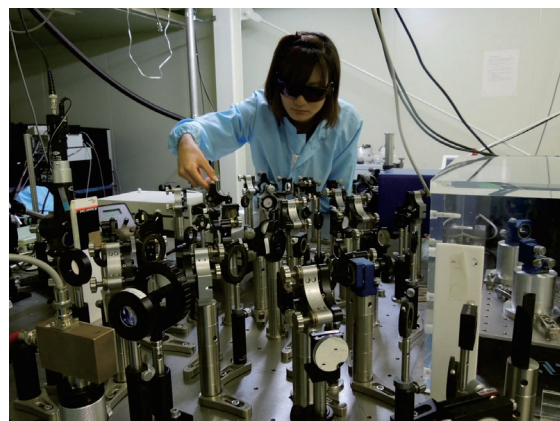
Quantum Coherence in Solid Materials

Laboratory for Materials and Structures, Division of Materials Design

<http://www.knlab.msl.titech.ac.jp>

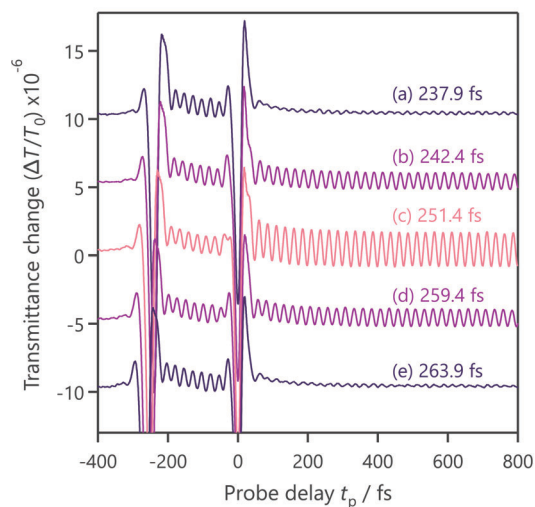
- Coherent control of electron-phonon coupled state
- THz quantum memory using optical phonons
- Ultrafast dynamics in solid materials
- Quantum-classical boundary and decoherence

Our objective is to measure and control of quantum coherence in bulk solid materials using ultrashort laser pulses. The coherence is a key issue for future quantum devices and quantum technologies and is easily lost in bulk materials. We are studying how long the quantum coherence is kept in solids using phase-locked femtosecond optical pulses via an interference technique.



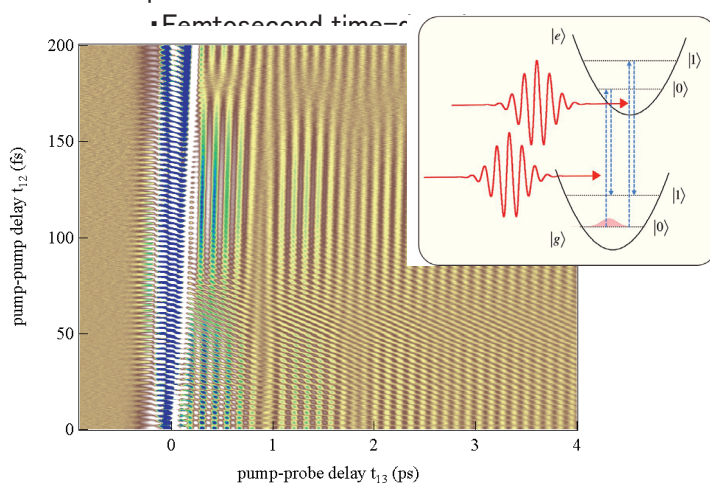
Femtosecond time-domain interference measurement system

- Generation of phase-locked femtosecond pulses
- Femtosecond time-domain interference measurement



THz quantum memory using optical phonons in diamond

- Measuring coherent optical phonons with 40 THz
- Write and read of phonon quantum state
- Coherent control of phonon amplitudes by optical pulses



Interferometric time resolved transient reflectivity measurement of semiconductors

- Coherent control of electron-phonon coupled states in GaAs single crystal
- Establishing quantum theory for coherent control of coherent optical phonons