**Terahertz- and Ultrafast Spectroscopy Laboratory**

Professor Ingrid Wilke

Research participation

Time-domain Terahertz-transmission / reflection spectroscopy

**Topic:** Time-domain Terahertz (THz) spectroscopy employs sub-picosecond pulses of electromagnetic radiation to investigate the properties of materials at THz-frequencies. THz-radiation pulses are generated by femtosecond Titan-Sapphire laser pulses from the surface of semiconductors or electro-optic crystals. The amplitude and phase of the transmitted or reflected THz-electric field is detected with photo conducting antennas or electro-optic crystals.

Time-domain THz-spectroscopy is highly important because it bridges a large frequency gap between microwave and conventional infrared spectroscopy. It therefore enables the research of fundamental physics in this historically inaccessible part of the frequency spectrum. From the applied physics point of view time-domain THz-spectroscopy advances the understanding of materials for THz-electronic devices.

**Research:** Currently the following research projects are available: Investigation of THz-conductivity of thin superconducting films, investigation of the THz-dielectric properties of ferro and paraelectric thin films, investigation of THz optical properties of plastics and ceramics, development of time-domain THz-ellipsometer.


**Requirements:** Interest in experimental physics, optics, laser application, spectroscopy of materials properties at THz-frequencies.

**Training:** The research project provides training in femtosecond Titan-sapphire laser operation, lock-in detection, operation of high-voltage supply, current amplifier, photo diode detector, motorized mechanical delay lines, closed-cycle cooling (10-300K), generation of THz-radiation pulses with photo conducting antennas, detection of THz-radiation pulses with photo conducting antennas and electro-optic crystals.

**Financial support:** Research assistantships are available for qualified students.

**Contact:** Professor Ingrid Wilke, x6318, wilkei@rpi.edu, http://www.rpi.edu/~wilkei/, office 1C08 Science Center.