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Research potential of the PolFEL facility for THz studies.

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Polish Free Electron Laser (PolFEL) will be an accelerator based facility, which will provide researchers THz laser pulses with constant repetition rate of 50kHz. Maximum peak energy of these THz pulse (30μJ) and pulse duration (about 30ps) for such repetition rates are usually not achievable by typical optical laser sources. This parameters of PolFEL laser THz beam give big research potential in area of THz studies. To help scientists discover this potential, experimental station will be equipped with femtosecond pulse laser system: oscillator, amplifier and two Optical Parametric Amplifiers (OPA), and two research station: pump-probe (PP) spectrometer and Scattering Nearfield Optical Microscope (SNOM). PP spectrometer with aid of two OPA will allow for time-resolved measurements of THz spectra with picosecond time resolution. Synchronization between two lasers: experimental station and photocathode laser, will allow jitter limitation between THz pulses and optical laser pulses in PP spectrometer. SNOM will allow visualization of specimen in THz beam with sub-micrometer spatial resolution. Together with AFM and FTIR module and with help of IR laser beam from OPA, SNOM will give researchers a grate multi-tool for visualization of specimen surface with sub-micron spatial resolution in spectral range from mid IR to 1THz. PolFEL facility will also provide additional space for scientists with their own equipment. PolFEL scientists and engineers will help with integration of such equipment with laser beams available in PolFEL.

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