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FAKULTÄT FÜR PHYSIK
Lehrstuhl für Experimentelle und Angewandte Physik

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Seminar

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THz Generation Based on Cr:ZnS Oscillator for Blood Spectroscopy

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Radiation in the terahertz (THz) frequency range, spanning from 100 GHz to 30 THz, is increasingly applied in fields such as security, imaging, spectroscopy, and biomedical diagnostics due to its sensitivity to water content and molecular vibrations in biological tissues [1,2,3]. Various THz generation techniques, including photoconductive antennas, quantum cascade lasers, and optical rectification, have advanced, enabling higher power outputs and expanding applications in spectroscopy and imaging [4,5,6,7]. The focus of this project is to utilize a mid-infrared oscillator to generate broadband THz radiation for spectroscopy, with the goal of improving disease detection via blood sample fingerprinting [8,9,10].
The study investigates the generation of terahertz (THz) radiation using a mid-infrared oscillator and nonlinear crystals, with a focus on optimizing THz output through phase-matching conditions in various electro-optic crystals. The findings reveal that THz performance varies depending on the crystal used, with significant implications for applications such as 'blood fingerprinting', where electro-optic sampling is employed to measure THz electric-field waveforms. The research highlights potential advancements in medical diagnostics and spectroscopy. Additionally, the study acknowledges the need to investigate alternative THz generation methods, including wave-front tilting, spintronic emitters, and specially designed crystals that achieve phase matching through techniques like quasi-phase matching.

Host: Rupert Huber