Contribution ID: **242** Contribution code: **MOP61** Type: **Contributed Poster**

Nonlinear Spectroscopy at the THz-Beamline TeraFERMI

Monday, 22 August 2022 17:10 (20 minutes)

TeraFERMI is a THz beamline at the free-electron laser (FEL) FERMI. After passing the FEL's undulator, the electron bunches are refocused on a thin dielectric slab and generate coherent transition radiation (CTR), namely strong THz pulses. TeraFERMI provides single-cycle pulses with a broadband spectrum in the range from 0.1 THz to 6 THz and strong peak electric fields with up to 4 MV/cm or peak magnetic fields of up to 1 T well-suited for nonlinear experiments driving systems out of equilibrium. The low repetition rate of 50 Hz allows the systems under study to fully relax to their equilibrium state between consecutive pulses, thereby avoiding unwanted thermal effects, a feature which is particularly requested in interdisciplinary experiments in biophysics or chemical physics. A particular property of the THz radiation (CTR-sources) is the radial polarization, which allows for studies with longitudinal spectroscopy exploiting an electric field polarization parallel to the propagation direction of focused beams. Furthermore, all time-resolved experiments benefit from the excellent synchronization between THz-pulses and a local near-infrared laser with a low timing jitter of 66 fs. In this contribution we report about the latest progress at TeraFERMI including a recently implemented diagnostic station as well as experimental setups we provide at TeraFERMI.

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Session Classification: Monday posters

Track Classification: User experiments