

Plenary Talk PV X Th 9:15 E 415 und E 214
“Molecular spectrometers” in the condensed phase: local THz-FIR response from femtosecond fluorescence —
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A molecular probe functions as a microscopic THz light source when its charge distribution is suddenly altered by femtosecond optical excitation. For example consider the zwitterionic molecule N-Methyl-Quinolone. Excitation at 400 nm reduces its dipole moment and the local electric field is switched down instantaneously. As the new field

acts on nearby groups with partial charges, these reorient and collectively create the reaction field $R(t)$. The latter is reported by the polar probe molecule through an emission frequency which depends linearly on $R(t)$. The probe is therefore not only light source but also detector. Thus, by time- and frequency-resolving the fluorescence, a local THz-FIR spectrum can be obtained.

This concept is first demonstrated with aqueous solution of trehalose, a disaccharide which strongly influences water dynamics. Then we focus on the observation of low-frequency vibrational modes of DNA double helices. For this purpose, suitable probe molecules are linked and embedded into the supramolecular structure.