



June 14th, 2013 – 2 pm
CFEL Seminar room I-III (DESY Bldg. 99)

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Two-dimensional vibrational spectroscopy of DNA and phospholipids

The structure and function of biomolecular systems are strongly influenced by interactions with their aqueous environment. The structure of the DNA double helix depends sensitively on the degree of hydration and the function of phospholipid membranes requires participation of the hydrating water. The fastest processes of hydration occur on the femtosecond time scales of molecular motions and energy exchange. Thus, nonlinear vibrational spectroscopy with a femtosecond time resolution has developed into a major tool for studying hydration phenomena. The talk will combine an introduction into such methods, in particular two-dimensional (2D) infrared spectroscopy, with recent results on the hydration dynamics of DNA and phospholipids. The dynamics and coupling of NH stretching excitations of DNA base pairs and phosphate vibrations in the DNA backbone will be addressed. The first 2D spectra of phosphate stretching vibrations of phospholipids will be presented for different hydration levels. Such results demonstrate a slowing down of hydration shell dynamics compared to bulk water and a highly efficient energy transfer into the water shells. Hydration shells as small as 3 water molecules are shown to function as efficient energy acceptors.