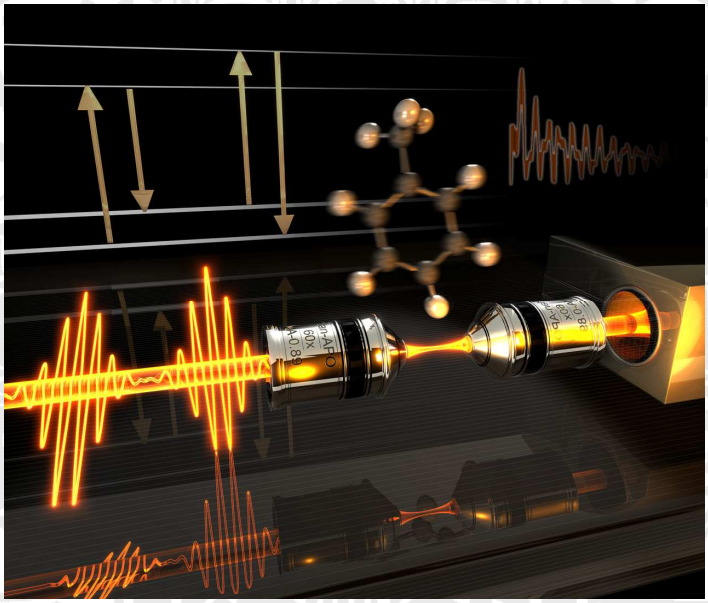
PHYSIKALISCHES KOLLOQUIUM

AM 10. JUNI 2013 UM 17 UHR C.T.

IM GROßEN HÖRSAAL



NONLINEAR SPECTROSCOPY WITH TAILORED ULTRASHORT PULSES

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Nonlinear spectroscopy has seen a tremendous development over the recent years. One main reason is the availability of powerful ultrashort laser pulses which easily produce appreciable nonlinear light-matter interactions. The efficient generation of four-wave mixing processes in molecular quantum systems for example can be exploited for applications in physics, chemistry or biology. It can be used for frequency domain spectroscopy where it gives access to hidden electronic states due to other selection rules as well as for the investigation of time-resolved dynamics with unmatched temporal resolution. Another intensively studied application is microscopy where the nonlinear interactions provide chemical and structural contrast due to different molecular responses and their accompanying strong phase matching conditions.

In my presentation I will address two aspects of current research in nonlinear spectroscopy. Nonlinear microscopy will be discussed where sophisticated pulse shaping techniques can be used to select a variety of nonlinear processes offering a simple route for multimodal microscopy. Furthermore I will present experiments on time-resolved multidimensional four-wave-mixing spectroscopy. In these experiments sequences of several excitations are used to decipher the dynamics in the complex energy network of biological chromophores, allowing, for example, to control and extract the coherence and population dynamics of vibrational modes in excited electronic states of molecules.