FAKULTÄT für PHYSIK
LUDWIG-MAXIMILIANS-UNIVERSITÄT
MÜNCHEN/GARCHING

PHYSIK-DEPARTMENT
TECHNISCHE UNIVERSITÄT MÜNCHEN
MÜNCHEN/GARCHING

MLL-KOLLOQUIUM

Donnerstag, 24.01.2019, 16^{15} Uhr

Hörsaal der LMU in Garching, Am Coulombwall 1
Treffen zum gemeinsamen Kaffee 16 Uhr

Dr. Mihaela Zigman & **Prof. Ferenc Krausz**

(MPI f. Quantum Optics (Garching) and LMU Munich)

Could infrared molecular fingerprinting contribute to disease detection? Lessons from spectroscopic analysis of human blood

Although many diseases are thought to leave their traces in blood, as of yet, few disease-linked molecular changes are known. One obstacle is that physiological phenotypes (health or disease) are driven by minor but coinciding changes in concentration of thousands of different molecules. A technology that profiles all molecular constituents of blood simultaneously (DNA, proteins, sugars, lipids and metabolites), and does not require prior knowledge of disease-causing primary triggers, would be advantageous. A further key challenge is to make such a technology sufficiently robust, in the face of very high dynamic range of the different types of molecules in blood. Infrared molecular spectra can be obtained in a non-invasive, time- and cost-efficient manner, delivering information from all molecular species within highly complex samples, but conventional Fourier-Transform Infrared (FTIR) spectroscopy is often unable to detect low-abundance molecules, because of lack of sensitivity and specificity. Here, it will be showcased how field-resolved spectroscopy (FRS) of few-cycle-excited molecular vibrations can be utilized to establish a high-throughput, sensitive and specific method for molecular blood profiling: Infrared molecular fingerprinting was performed in blood serum/plasma samples of a healthy human cohort over time, and revealed that the variability of infrared fingerprints of a person over time is significantly lower as compared to the differences between individuals. Thus, we used infrared spectroscopy for distinguishing patients with resectable solid tumors in lung, breast or prostate from respective non-cancer individuals. We find that infrared molecular fingerprinting reproducibly detected lung cancer patients. Together, our results show the conceptual feasibility of infrared fingerprinting for physiological phenotype detection and indicate that the next-generation FRS holds promise for future biomedical settings.

gez. Peter Thirolf
Tel. 289-14064

gez. Norbert Kaiser
Tel. 289-12367