



CEITEC
BRNO UNIVERSITY
OF TECHNOLOGY

ADVANCED MATERIALS AND NANOTECHNOLOGY

SEMINAR SERIES 2018

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High-resolution terahertz spectroscopy of molecules of astrophysical interest

APRIL, 17

Tuesday, 10:00

Seminar room 52.02
CEITEC BUT, Purkynova 123

The terahertz domain which extends between 100 GHz and 30 THz is known for difficulties to generate and control the radiation, especially in the range below 3 THz. This frequency range is of particular interest for detection of molecules in the gas phase due to their rotational spectra. Moreover, the range up to 1 THz is rich in rotational lines of molecules present in the interstellar medium (ISM). The detection of such lines is important to understand physical and chemical processes in the ISM, and formation of stars and galaxies. It should be noted that the detection of new molecular species in the ISM is very difficult without preliminary studies of their spectra in the laboratory with high resolution and precision.

This seminar is devoted to experimental aspects of high-resolution terahertz molecular spectroscopy. Historically, the most efficient sources in terms of bandwidth, power and spectral purity in the terahertz domain were electronic tubes backward wave oscillators. However, in the last decade considerable progress has been made in the development of new solid sources based on the principle of harmonic generation. The main topic of the seminar is the Lille terahertz spectrometer in the range 0.05 – 1.5 THz. The spectrometer uses frequency multiplication chains based on Schottky diodes as radiation sources. The coupling of THz source with a reference synthesizer based on direct digital synthesis (DDS) technique allowed the development of the fast-scan feature with the ability of precise frequency measurement. Recently, the DDS technique was also used to generate short pulses including chirped pulse feature, and thus to develop a Fourier-transform terahertz spectrometer. The design and performances of the spectrometer will be presented.