FOURIER TRANSFORM SPECTROSCOPY WITHOUT MICHELSON INTERFEROMETER

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Michelson interferometers have been for decades the main component of Fourier transform spectrometers. With the advent of femtosecond frequency combs, which exhibit a broadband spectrum made of equidistant frequency markers, this obviousness is called into question.

In this contribution, we report on Fourier transform spectroscopy based on two frequency combs (FC-FTS).

FC-FTS bears on the same physical principle as traditional FTS. It has however some distinct important advantages related to the absence of moving part and to the metrological qualities of laser frequency combs. FC-FT spectrometers are compact and able to provide highly-resolved and sensitive broadband spectra of single events. Acquisition time is of the order of a few tens of microseconds for Doppler-limited resolution. Furthermore, it is now possible to routinely record, within a few seconds, Fourier spectra which typically exhibit kHz optical resolution, improving by one million the standard GHz resolution of Michelson-based FTS. Our technique for multiplex accessing of Hertz-level-self-calibrated spectra with negligible instrumental lineshape opens intriguing perspectives in intermediate metrology of molecular lineshapes and outperforms Fourier transform spectroscopy based on the Michelson interferometer.