

Frequency Comb Spectroscopy – from mid-IR to XUV

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Phase controlled optical frequency combs provide revolutionary synergy between precision measurement and ultrafast science. An excellent example is the recently developed direct frequency comb spectroscopy, which provides simultaneous measurements of tens of thousands of molecular spectral features at high spectral resolution and over a wide spectral coverage, thus forming the basis for molecular identification at an unprecedented level of specificity and confidence.

We have recently extended frequency combs into the mid infrared and extreme ultraviolet. With the capability of performing time-resolved absorption, we can now quantitatively track transient chemical species and study reaction kinetics in real time. Combined with the technology of cold molecules, we can unravel complex spectra from large molecules and obtain new insights into molecular structure and dynamics. Finally, with an XUV frequency comb we can directly manipulate molecules and probe the extreme nonlinear physics, opening future high-precision measurements in strong-field phenomena.