

Attosecond pulse leads to highest molecular level probe resolution

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Attosecond pulses enable physicists to probe dynamic processes in matter with unprecedented time resolution. This means such technology can provide better insights into the dynamics of electrons in molecules. Devising a source of ultra-fast X-ray pulsating in the attosecond range is no mean feat.

Comparing an attosecond is to a second is the equivalent of comparing a second to about 31.71 billion years. Now, a team of physicists from China has exploited an optical phenomenon, opening the door to creating high-order oscillations in existing light [sources](#). This makes it possible to shift the frequency of the original source into X-rays with a laser beam source pulsating in an ultra-fast manner, to reach the attosecond range. The trouble is that yield of such higher order oscillations decreases as the source laser wavelength increases. In a new study published in *EPJ D*, Liqiang Feng and Yi Li from Liaoning University of Technology, Jinzhou, China, have developed a method to select, enhance and extend the higher order emission peak from a laser beam changing from ultraviolet to a mid-infrared.

Ensuring that the oscillation created is of suitable intensity and duration in the [attosecond](#) scale is tricky. In this study, the authors examine various ways of enhancing the efficiency of producing such higher order oscillations by coaxing the oscillations into a single peak instead of multiple peaks.

To achieve this objective, they eliminate the sensitivity of the detector to

the [laser pulse](#) duration and the delay time between pulses by opting for a technology based on a polarisation gate, which involves comparing the arrival time difference of the two polarised pulses from two mid-infrared polarisation fields once they have crossed the polarisation gate.

The authors then show that by adding an additional pulse, the higher order [oscillation](#) can be extended to the X-ray region.

More information: Liqiang Feng et al, High-intensity isolated attosecond X-ray pulse generation by using low-intensity ultraviolet–mid-infrared laser beam, *The European Physical Journal D* (2018). [DOI: 10.1140/epjd/e2018-90268-6](#)

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