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Attosecond pulses 'see' light waves

By Rob van den Berg

Researchers in Austria have for the first time produced and used isolated attosecond (as) pulses in the XUV region of the spectrum (*Nature* **414** 509).

Ferenc Krausz and colleagues from Vienna's University of Technology have demonstrated 650 as pulses by improving on their measurement technique (*OLE* September p33). The group, which also included researchers from the Steacie Institute of Molecular Sciences in Canada and the University of Bielefeld, Germany, then used these pulses to resolve the field oscillations of a visible light wave with a resolution of 150 as.

Krausz told *OLE*: "For the first time, it has been possible to 'see' the oscillations of a light wave. This is the time scale on which the electronic wave functions in atoms evolve, so these pulses could be used to take freeze-frame shots of electronic motion in atoms."

To generate the pulses, the researchers focused ultrashort femtosecond pulses into a jet of neon atoms, generating high harmonics, which together form what is essentially a single sub-femtosecond pulse. They then used this to ionize krypton atoms and modulated the energy of the photoelectrons with a well-characterized femtosecond laser pulse at various delay times. Based on this correlation experiment, the duration of the X-ray pulse was found to be around 650 as.

Costas Fotakis, director of the Institute of Electronic Structure and Lasers in Crete, Greece, told *OLE*: "[This work] represents exciting developments towards the generation of isolated attosecond pulses. In my understanding, a train [of pulses] could also lead to similar good agreement with model results shown [in the work]. Some points need further elaboration before attosecond metrology can be considered as established."

Krausz, however, passionately defends his claims and says he has proved that isolated attosecond pulses have been generated.