

10×10^{-18} of a second = 1 attosecond

Scientists from the Institute of Physics are working in a new laboratory and using cutting-edge laser technology to create inconceivably short light pulses lasting less than 150 attoseconds. One attosecond is equal to a billionth of a billionth of a second. With these ultra-fast light flashes, the researchers plan to study and ultimately control the movement of electrons in atoms. The goal is to gain a better understanding of ultra-fast processes such as those involved in the generation of charges in the nanostructured materials of future generations of solar cells.

To turn femtosecond pulses into the even shorter attosecond laser pulses, the researchers focus the laser light with the

help of a beam of noble gas. This creates light waves with an integer multiple of the original frequency in the extreme ultraviolet part of the light spectrum. „The way it works is similar to playing a stringed instrument that, as well as fundamental frequency, also produces higher tones, so-called overtones,“ explains Prof. Dr. Matthias Wollenhaupt. With these light pulses of less than 150 attoseconds, far smaller structures can be captured than would be possible with a light microscope. The construction of the laboratory cost around two million euros and was funded by the German Research Foundation (DFG), the Lower Saxony Ministry of Science and Culture (MWK) and the university's own resources.

Light takes about **one attosecond** to travel a distance that corresponds to the size of a hydrogen atom.



The main discharge of a lightning flash during a thunderstorm lasts about **30 microseconds**, or 0.00003 seconds.



The blink of a human eye lasts a tenth of a second, or about **0.1 seconds** – a long time by comparison.

