

Optics for Extreme Requirements

The ultrashort-time research pursued by the physicists at the Laboratory for Attosecond Physics (LAP) calls for high-precision technology. A special role is played here by the optical mirror components for laser and X-ray pulses. Last year the LAP scientists established the UltraFast Innovations GmbH company for supplying clients with tailor-made mirrors and other optical instruments and systems. For this purpose they can draw on many years of experience in the application of femtosecond and attosecond technology. The company is owned by Ludwig Maximilian's University of Munich and the Max Planck Society.

Electrons are fast. They move back and forth within or between atoms in attoseconds, i.e. billionths of a billionth of a second. Observing them calls for sophisticated optical systems allowing extremely short flashes of light to be produced. Such special optical systems are made to the client's specifications by UltraFast Innovations GmbH.

The company offers everything from one hand – from design of optical systems to coating and the measurement of a product's properties. It optimises coatings to various characteristics such as high reflectivity, large spectral bandwidth and specific filter function. UltraFast Innovations GmbH can enlist the many years of experience gained by the scientists involved in order to develop and manufacture new optical systems: The research groups around Ferenc Krausz, Director at Max Planck institute of Quantum Optics and professor at LMU, and Ulf Kleineberg, likewise professor at LMU, bring together leading experts in the field of special optics. Ferenc Krausz ranks as one of the inventors of chirped mirrors, a special kind of mirror that is a prerequisite to producing ultrashort pulses with very few oscillation cycles.

These mirrors guarantee, for example, compensation of material dispersion. They thus prevent light of different colour from being differently delayed, otherwise light pulses would be temporally broadened. This makes it possible to produce ultrashort light pulses. By means of such mirrors the LAP scientists succeeded in 2008 in producing for the first time laser pulses comprising just a single wave cycle, which in turn opened the door to X-ray pulses lasting just 80 attoseconds.

Such light pulses now allow electron motion within atoms and molecules to be observed in real time. This can be grasped by considering a camera: In order to obtain sharp images of fast motion, one needs extremely short shutter speeds. A better understanding of the processes occurring at the electron level is important to, for example, the further development of microelectronics and contributes to accelerating data processing. Short light pulses in the visible spectral range also have applications in imaging processes used in medicine: Optical coherence tomography, for example, is an important technique in ophthalmology.

The range of optical components supplied are thus suitable for all areas of laser technology. As the development and manufacture of optical systems are integrated in the scientific work at LAP current research results are always directly exploited. Newly developed products are immediately tested in practice. This is of decisive benefit to clients of UltraFast Innovations!

Further information:

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