

The Measurement of the Shortest Events Ever Created

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The field of ultrashort laser pulse measurement is based on a dilemma: "In order to measure an event in time, you need a shorter one. Then how can one measure the shortest event ever generated?"

Ultrashort laser pulses, on the order of femtoseconds (10^{-15} sec!), are the shortest events ever generated by human beings, wherein lies the challenge. They cannot be "photographed" by electronic detectors, which are several orders of magnitude slower. Since there is no shorter event available to measure ultrashort pulses, the shortest possible event that can be used is the pulses themselves. A variety of solutions that implement this idea, together with nonlinear optics, exist but the clearly best technique is Frequency-Resolved Optical Gating, or FROG. FROG determines not on the pulse intensity envelope, but the *phase* of the pulse as well. After its invention, FROG has been used in many laboratories worldwide, allowing the researchers to obtain much useful information about their pulses. This talk will be an overview of the recent advances in the manipulations and applications of FROG.