

Short-pulsed solid-state lasers enable an exciting journey from ultrafast laser physics to frequency metrology and attosecond science

Ursula Keller

ETH Zurich, Physics Department, Zürich, Switzerland

Master Class, 20. January 2014, 7:30 to 10 pm

There has been a long-standing, ongoing effort in the ultrafast laser field to reduce the pulse duration and increase the power to continue to empower existing and new applications. After 1990, new techniques such as semiconductor saturable absorber mirrors (SESAMs) and Kerr lens mode locking (KLM) allowed for the generation of stable pulse trains from diode-pumped solid-state lasers for the first time, and enabled the performance of such lasers to improve by several orders of magnitude with regards to pulse duration, pulse energy and pulse repetition rates. This master course will give an introduction to some key topics such as passive modelocking based on SESAMs, KLM, and soliton modelocking; frequency comb generation and parameters such as carrier envelope offset frequency and pulse repetition rate; and some selected topics in attosecond science.

Recommended reading before lecture:

U. Keller, "Ultrafast solid-state laser oscillators: a success story for the last 20 years with no end in sight," *Appl. Phys. B*, vol. 100, pp. 15-28, 2010

H. R. Telle, G. Steinmeyer, A. E. Dunlop, J. Stenger, D. H. Sutter, U. Keller, "Carrier-envelope offset phase control: A novel concept for absolute optical frequency measurement and ultrashort pulse generation," *Appl. Phys. B*, vol. 69, pp. 327-332, 1999

P. Eckle, A. Pfeiffer, C. Cirelli, A. Staudte, R. Dörner, H. G. Muller, M. Büttiker, U. Keller, "Attosecond ionization and tunneling delay time measurements", *Science*, vol. 322, pp. 1525-1529, 2008