



Colloquium

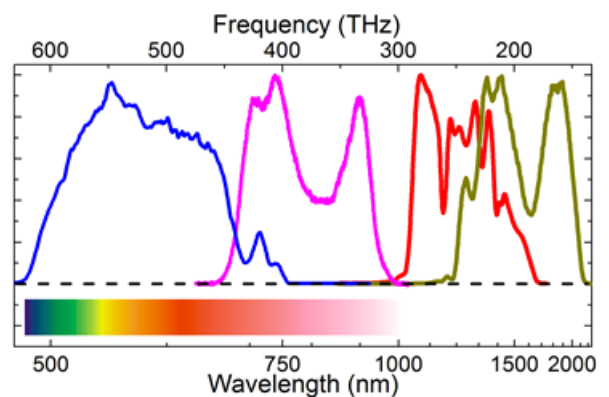
9th November 2012 - 14:00
CFEL-bldg. 99, seminar rooms I, II, III

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Ultrabroadband optical parametric amplifiers: towards single-cycle CEP-controlled pulses

Optical parametric amplifiers (OPAs) are known as flexible tools for the generation of broadly tunable ultrashort pulses. On the other hand, if suitably designed, OPAs can act as broadband amplifiers, which can be used to dramatically shorten, by more than an order of magnitude, the duration of the driving pulse, down to the few-cycle regime [1]. In addition, OPAs can exploit non-linear optical interactions to achieve passive, all-optical carrier-envelope phase (CEP) stabilization [2]. In this presentation I review our research aimed at designing and implementing OPAs for the generation of broadly tunable few-optical-cycle pulses. We have demonstrated different OPA schemes capable of producing 2÷3-cycle pulses with carrier wavelength almost continuously tunable from the visible to the mid-IR [3]. I will also discuss the difference-frequency generation process taking place in OPAs as a powerful tool for passive CEP stabilization of such pulses. Finally, I will show how to coherently combine different ultra-broadband OPAs in order to generate single-cycle CEP-controlled pulses, which will constitute a powerful tool to steer electronic wave-packet dynamics in high-field science.



[1] G. Cerullo and S. De Silvestri, *Rev. Sci. Instrum.* 74, 1 (2003).

[2] G. Cerullo, A. Baltuška, O.D. Mücke, C. Vozzi, *Laser Photonics Rev.* 5, 323 (2011).

[3] D. Brida, C. Manzoni, G. Cirmi, M. Marangoni, S. Bonora, P. Villoresi, S. De Silvestri, and G. Cerullo, *J. Opt.* 12, 013001 (2010).