CFEL SCIENCE

SEMINAR

_23_ _rd_ February _2018 - 11:00 a.m._

CFEL-bldg. 99, seminar room IV (O1.111)

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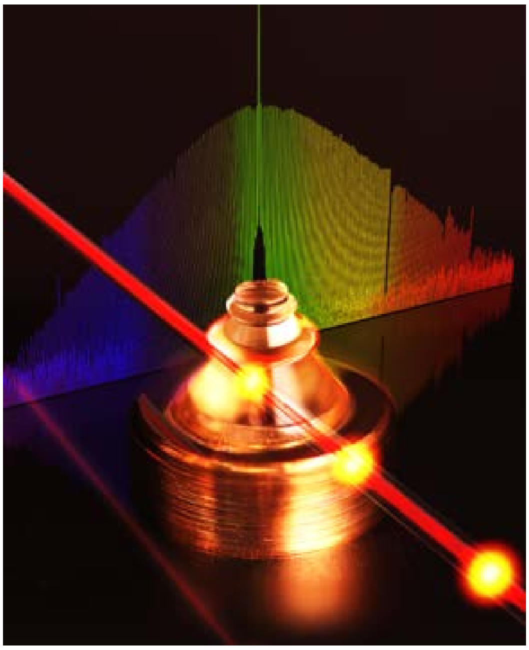
Temporal Microresonator Solitons

Temporal microresonator solitons[1,2] are ultra-short optical pulses that can form in laser-driven Kerr-nonlinear optical microresonators. Besides being fascinating examples of self-organization in dissipative nonlinear systems, microresonator solitons are of high technological relevance. Owing to the short microresonator round-trip time, low-noise optical frequency combs and femto-second pulses can be generated at ultra-high repetition rates ranging from 10 GHz to 1 THz. Moreover, relying on parametric gain, soliton formation does not require broadband laser gain media and can in principle operate across the entire transparency window of the resonator material. Since their discovery a few years ago, a rapidly growing number of demonstrations has illustrated the tremendous potential of high-repetition rate microresonator solitons for ubiquitous applications including radio-frequency to optical links[3], high-bandwidth optical data transfer[4], CMOS chip-based broadband comb generation[5] as well as astronomical spectrometer calibration[6] with relevance to searches for dark matter and life beyond Earth.



Ultra-short soliton pulse generation in a laser-driven Kerr-nonlinear optical microresonator.

1. Herr, T. et al. Temporal solitons in optical microresonators. Nat. Photonics 8, 145–152 (2014).
2. Obrzud, E., Lecomte, S. & Herr, T. Temporal solitons in microresonators driven by optical pulses. Nat. Photonics 11, 600–607 (2017).
3. Jost, J. D. et al. Counting the cycles of light using a self-referenced optical microresonator. Optica 2, (2015).
4. Pfeifle, J. et al. Coherent terabit communications with microresonator Kerr frequency combs. Nat. Photonics 8, 375–380 (2014).
5. Brasch, V. et al. Photonic chip-based optical frequency comb using soliton Cherenkov radiation. Science 351, 357–360 (2015).
6. Obrzud, E. et al. A Microphotonic Astrocomb. arXiv 1712.09526, (2017).

Host: Franz Kärtner – CFEL-DESY Ultrafast Optics