



Halbleiter-Nanophotonik

SFB 787

Einladung

Es spricht: **Dr. Julien Javaloyes**
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Zeit: **Dienstag, 27. September 2016, 10:00 Uhr**

Ort: **Technische Universität Berlin
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Hardenbergstraße 36, 10623 Berlin
Raum EW 731**

Thema: **„Temporal Localized Structures and Light Bullets in Passively mode-locked Lasers“**

Abstract:

Localized structures (LS) are nonlinear states of dissipative extended systems characterized by a correlation range much shorter than the size of the system, thus allowing for individual addressing. They appear ubiquitously in nature and they are very appealing in optical systems for applications to information processing, especially in semiconductor lasers which are fast, scalable and cheap devices. We investigate the relationship between passive mode-locking and the formation of temporal localized structures in the output intensity of a laser coupled to a saturable absorber, in the framework of time delayed dynamical systems. We present experimental and theoretical evidences [1] regarding how the mode-locked pulses transform into lasing localized structures, allowing for individual addressing and arbitrary low repetition rates. Our analysis reveals that this occurs when i) the cavity round-trip is much larger than the slowest medium timescale, namely the gain recovery time and ii) the mode-locked solution coexists with the stable off solution. These conditions enable the coexistence of a large quantity of stable solutions, each of them being characterized by a different number of pulses per round-trip and with different arrangements. A modulation of the bias current allows controlling the number and the location of the pulses traveling within the cavity [2, 3]. These results formed the basis for a very recent prediction [4] as we theoretically demonstrated the existence of three dimensional dissipative localized structures in the output of a broad area passively mode-locked laser coupled to a saturable absorber in self-imaging conditions. These phase invariant light bullets are individually addressable and can be envisioned for three dimensional optical information storage. An effective theory provides for an intuitive picture and allows to relate their formation to static auto-solitons.

References:

- [1] M. Marconi, J. Javaloyes, S. Balle, and M. Giudici. How lasing localized structures evolve out of passive mode locking. Phys. Rev. Lett., 112:223901, Jun 2014.
- [2] M. Marconi, J. Javaloyes, P. Camelin, D.C. Gonzalez, S. Balle, and M. Giudici. Control and generation of localized pulses in passively mode-locked semiconductor lasers. Selected Topics in Quantum Electronics, IEEE Journal of, 21(6):1_10, Nov 2015.
- [3] J. Javaloyes, P. Camelin, M. Marconi, and M. Giudici. Dynamics of localized structures in systems with broken parity symmetry. Phys. Rev. Lett., 116:133901, Mar 2016.
- [4] J. Javaloyes. Cavity light bullets in passively mode-locked semiconductor lasers. Phys. Rev. Lett., 116:043901, Jan 2016.

Gäste sind herzlich willkommen!

Prof. Dr. K. Lüdge