Paper 12143-8

Dissipative solitons and frequency combs in a ring quantum cascade laser

In person: 5 April 2022 • 11:40 - 12:10 CEST | Salon 9, Niveau/Level 0

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Abstract | Authors

We generalized the well-known Lugiato-Lefever Equation to unify the description of combs and localized structures formation in nonlinear optical systems such as Kerr micro-resonators (passive systems) and Quantum Cascade Lasers (QCL) (active systems). In particular this model was applied to the study of pattern formation in a unidirectional ring QCL driven by a coherent injected field. We showed the existence of Dissipative Solitons (DS) and Turing rolls associated to standard and harmonic Optical Frequency Combs (OFC) in the system. We also provided a proof of principle demonstration of the possibility to deterministically control the spectral properties of these OFC by switching-on one or more DS with suitable addressing pulses. These results considerably increase the theoretical insight in chip-scale combs sources in the mid-infrared region of the electromagnetic spectrum for timely applications in the field of e.g. high resolution and/or time resolved molecular spectroscopy, long range and high bit rate wireless communications.

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