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Spectral-temporal noise-like pulse dynamics in passively mode-locked fiber lasers

O Pottiez[1], Y Bracamontes-Rodriguez[1], H E Ibarra-Villalon[1], J P Lauterio-Cruz[2], J C Hernandez-Garcia[2] and E A Kuzin[3]
[1]Centro de Investigaciones en Óptica (CIO), Mexico
[2]Division de Ingenierias Campus Irapuato-Salamanca (DICIS), Universidad de Guanajuato, Mexico
[3]Instituto Nacional de Astrofísica, Óptica y Electronica (INAOE), Mexico

Passively mode-locked fiber lasers (PML-FLs) are known mainly as stable sources of solitons. In spite of this, the non-stationary regimes of operation of these lasers are currently attracting growing attention. One noticeable example of such regimes corresponds to the generation of noise-like pulses (NLPs). Radically different from solitons, NLPs are chaotic bunches of radiation whose high energy, broad bandwidth and robustness make them attractive for applications (medical imaging, materials processing, sensing etc.). Due to their complex dynamics, NLPs also constitute an ideal benchmark for the study of exotic phenomena, such as optical rogue waves (ORWs). In spite of the growing interest for NLPs, due their complexity and extreme variability, their experimental characterization and their modeling are extremely challenging tasks. In recent years, our group reached several important milestones in the frame of NLP generation from PML-FLs, including record single-pulse energies of 0.3 μJ (~1000 times the energy of a conservative soliton) and spectral bandwidths of several hundreds of nm (~10 times the doped fiber bandwidth). We also developed novel characterization techniques (which allowed in particular the detection of ORWs in NLPs) and precise numerical models that are helping to understand the puzzling dynamics of these complex objects. In this talk, we focus primarily on a particular Q-switched-like quasi-periodic NLP dynamics that is associated with the emergence of wavelength-shifted components, which has been observed by several authors in addition to our group, and for which we propose a numerical model based on gain dynamics.

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Biography

Olivier Pottiez received his PhD from Faculté Polytechnique de Mons (Mons, Belgium) in 2001. His research interests include mode-locked fiber lasers for ultrashort pulse generation, as well as the study of non-stationary dynamics of these sources, in particular noise-like pulsing and optical rogue wave generation. O. Pottiez has authored or coauthored 95 publications in peer-reviewed journals and more than 100 international conference proceedings.

pottiez@cio.mx

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