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Noise-like pulse dynamics in passively mode-locked fiber lasers

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Due to their unique properties, noise-like pulses (NLPs) are currently attracting increasing interest for both fundamental research and applications. NLPs are chaotic bunches of optical pulses whose formation corresponds to a not-so-stable mode of operation of passively mode-locked fiber lasers. Due to their extremely complex fine structure dynamics, NLPs constitute an ideal benchmark for the study of extreme events known as optical rogue waves. On the other hand, their high pulse energy, wide bandwidth and short coherence time makes them attractive for applications including nonlinear frequency conversion, supercontinuum generation, materials processing and sensing. However, their puzzling dynamics and the difficulty to characterize them precisely make their study extremely challenging. During this talk we will present some recent advances of our group in the study of NLP generation in the 1500 nm region. Different fiber laser architectures will be considered. 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) are reported. Besides, using an original measurement technique, we retrieve information on the intimate inner structure of NLPs and confirm their connection with optical rogue waves. We also report the observation of a series of very intriguing NLP dynamics which bears some analogy with the soliton rain dynamics.

Biography

O Pottiez received his PhD from FaculténPolytechnique 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. He has authored or coauthored 75 publications in peer-reviewed journals and 100 international conference proceedings.

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