ThR1-p25

Fiber generators of super-continuum with enhanced set of controlled parameters in real time scale

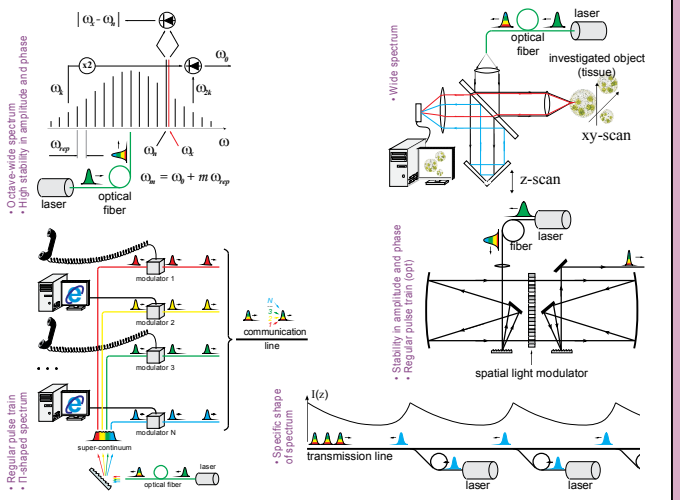
Sergey Kobtsev, Sergey Smirnov

Novosibirsk State University, Laser Systems Laboratory, ul. Pirogova 2, Novosibirsk, 630090, Russia, e-mail: kobtsev@lab.nsu.ru

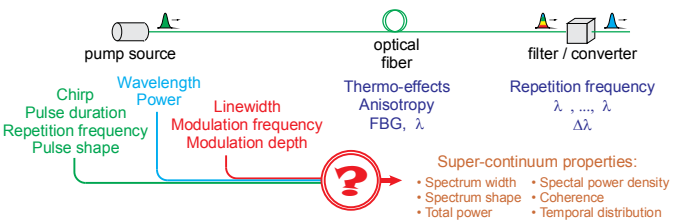
Introduction

Different applications pose different and often opposite requirements to super-continuum properties

Super-continuum generators with controlled parameters are required

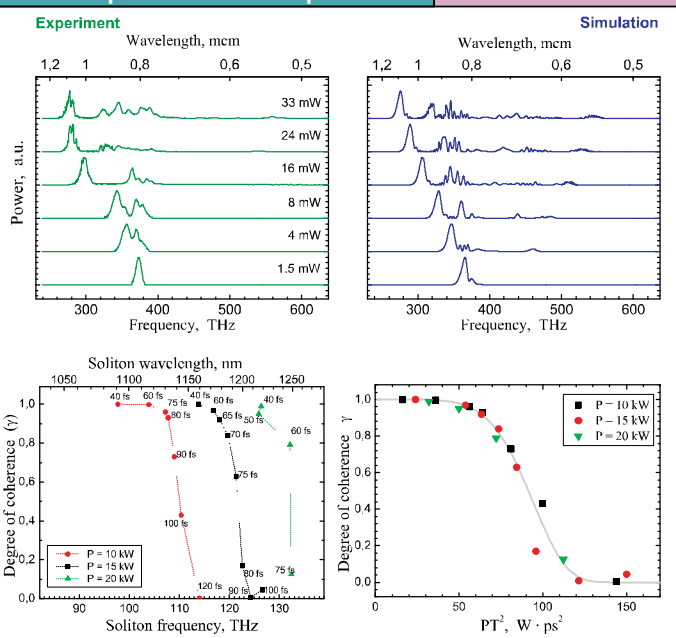


Generator scheme



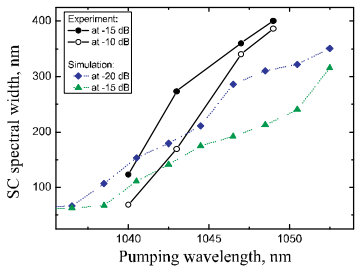
It's essential to know how super-continuum properties depend on the parameters of generation scheme in order to create an universal adjustable super-continuum generator

Power & pulse duration dependence



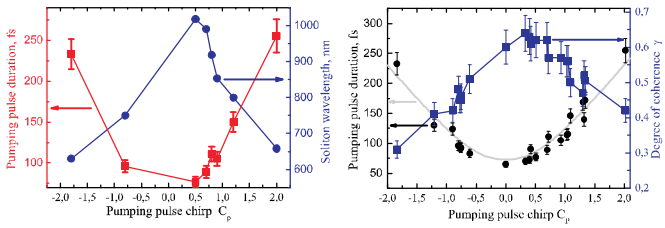
- Increase of pump power results in broadening and smoothing of SC spectrum, increase of exit power and deterioration of pulse-to-pulse coherence
- Increase of pump pulse duration leads to reduction of spectral width, lowering of pulse-to-pulse coherence and smoothing the spectrum

Wavelength dependence



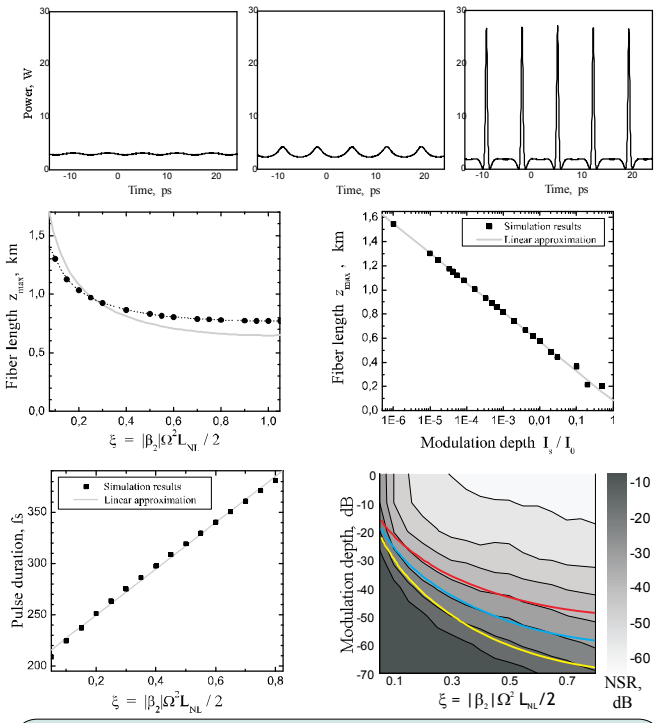
Tuning of pump wavelength in the vicinity of ZDW of the fiber can affect significantly form and width of super-continuum spectrum and consequently the level of its spectral power density

Pulse chirp dependence



Both maximum spectral width and maximum pulse-to-pulse coherence are reached at near-zero chirp of pumping pulses

Modulated CW pumping



Using amplitude modulation of CW pumping it is possible to generate a regular train of ultra-short pulses with repetition frequency equal to the frequency of initial modulation
Varying pump power and initial modulation depth one can adjust duration of generated pulses.

Summary

In this work we have analyzed for the first time a whole set of methods that allow control of super-continuum parameters. In particular we have shown that (i) super-continuum spectral power density can be controlled by means of variation in repetition rate of pumping pulses as well as of pumping wavelength; (ii) one can increase super-continuum coherence by choosing optimal chirp of pumping pulses; (iii) it's possible to control repetition rate and duration of pulses generated with the help of dual-wavelength pumping by means of adjusting input power and frequency difference.