Workshop UBA19

"Ultrafast Beams and Applications"
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Solitonic and Resembling Processes for Ultrafast Laser Pulse Registration and Spectral Self –Compression

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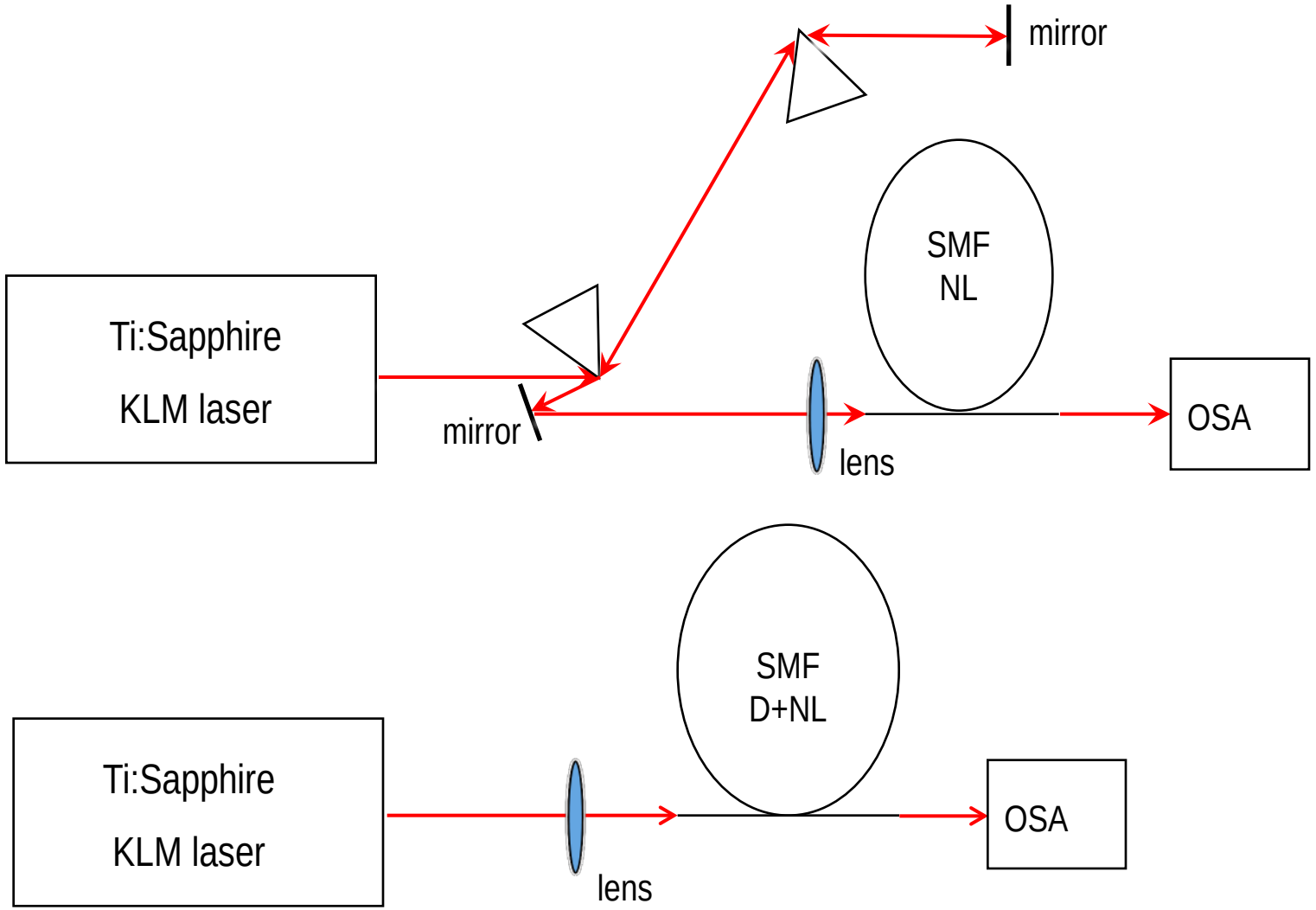
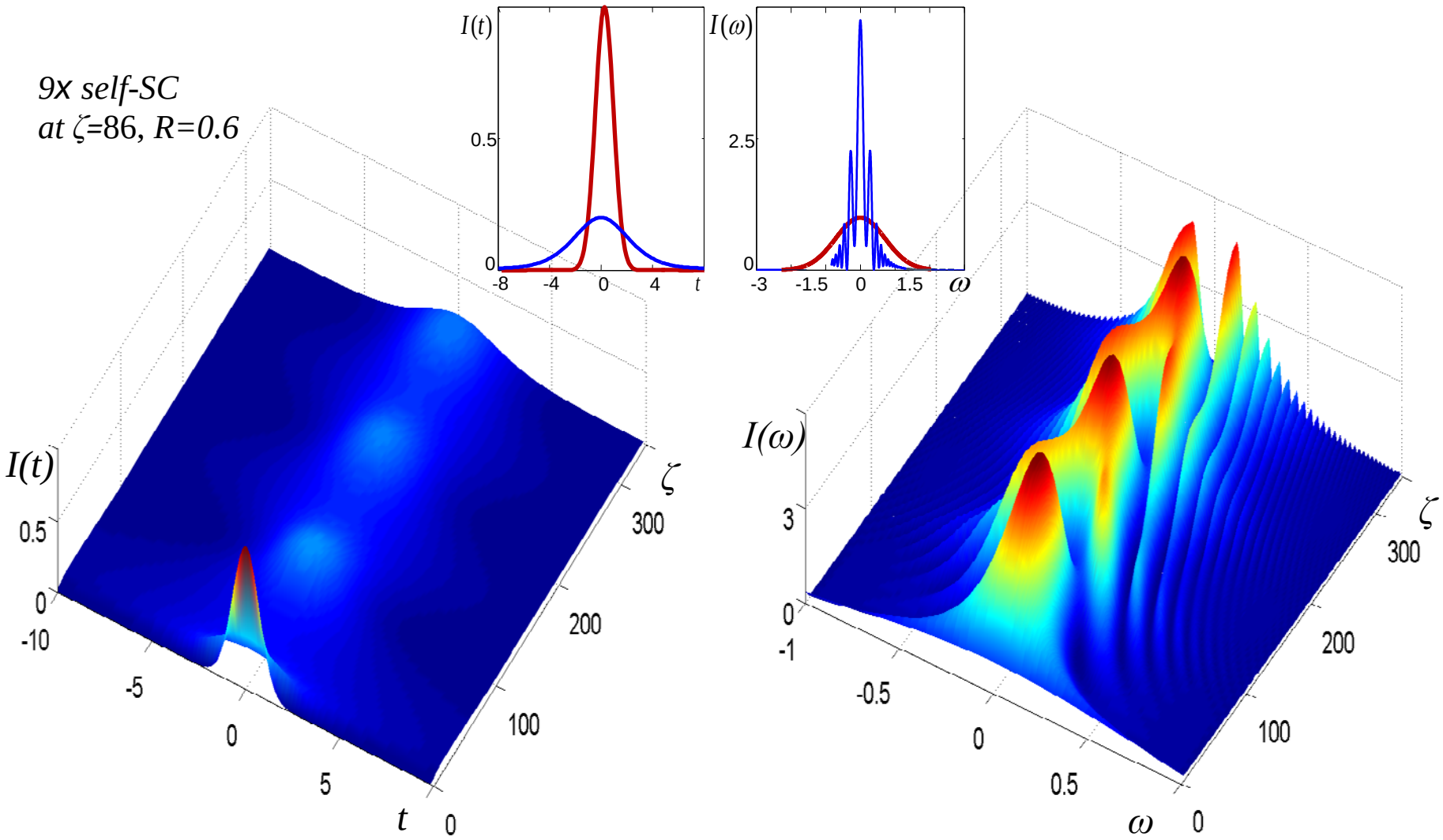
Outline

- Self Spectral Compression: Numerical studies and experiments.
- The spectronic method for the measurement of the ultrashort laser pulses

Scheme of spectral self compression

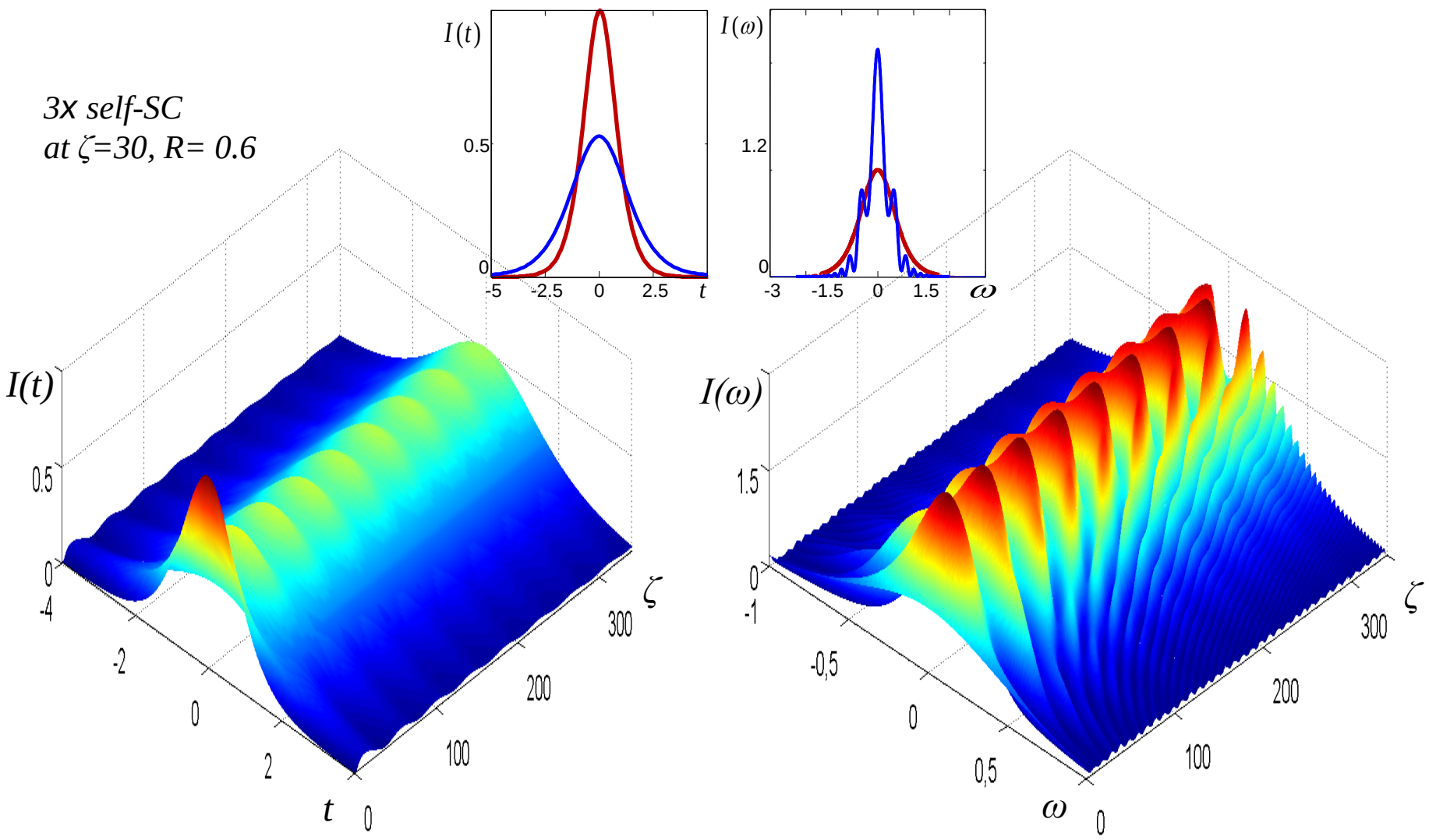


Evolution of a Gaussian pulse



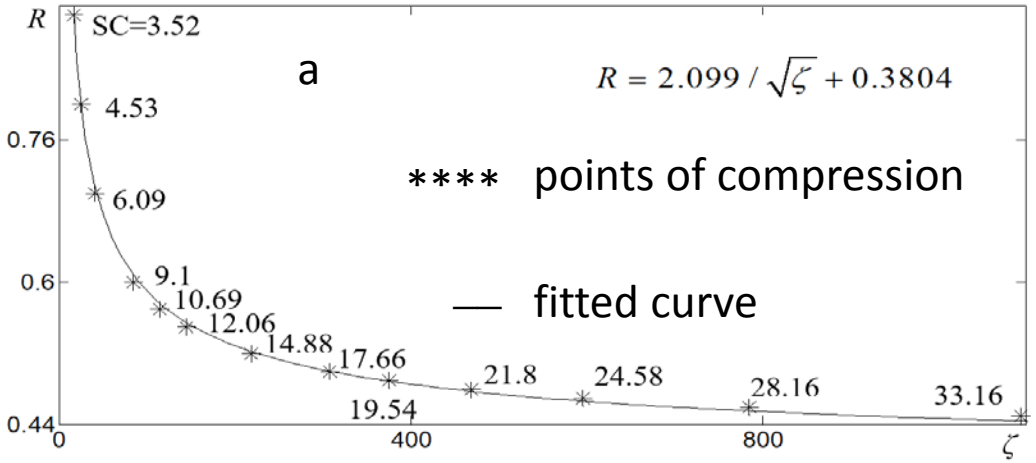
Evolution of a sech pulse

3x self-SC
at ζ=30, R= 0.6

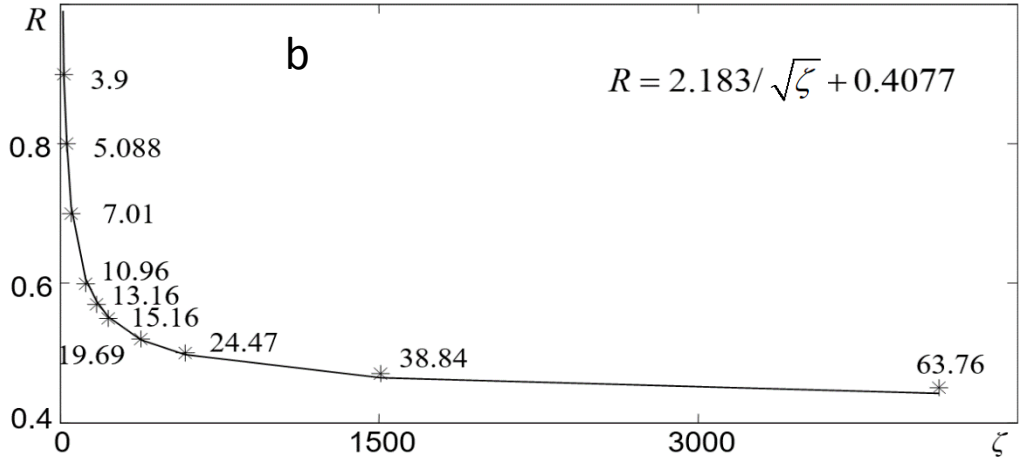


Optimization curves of self-SC

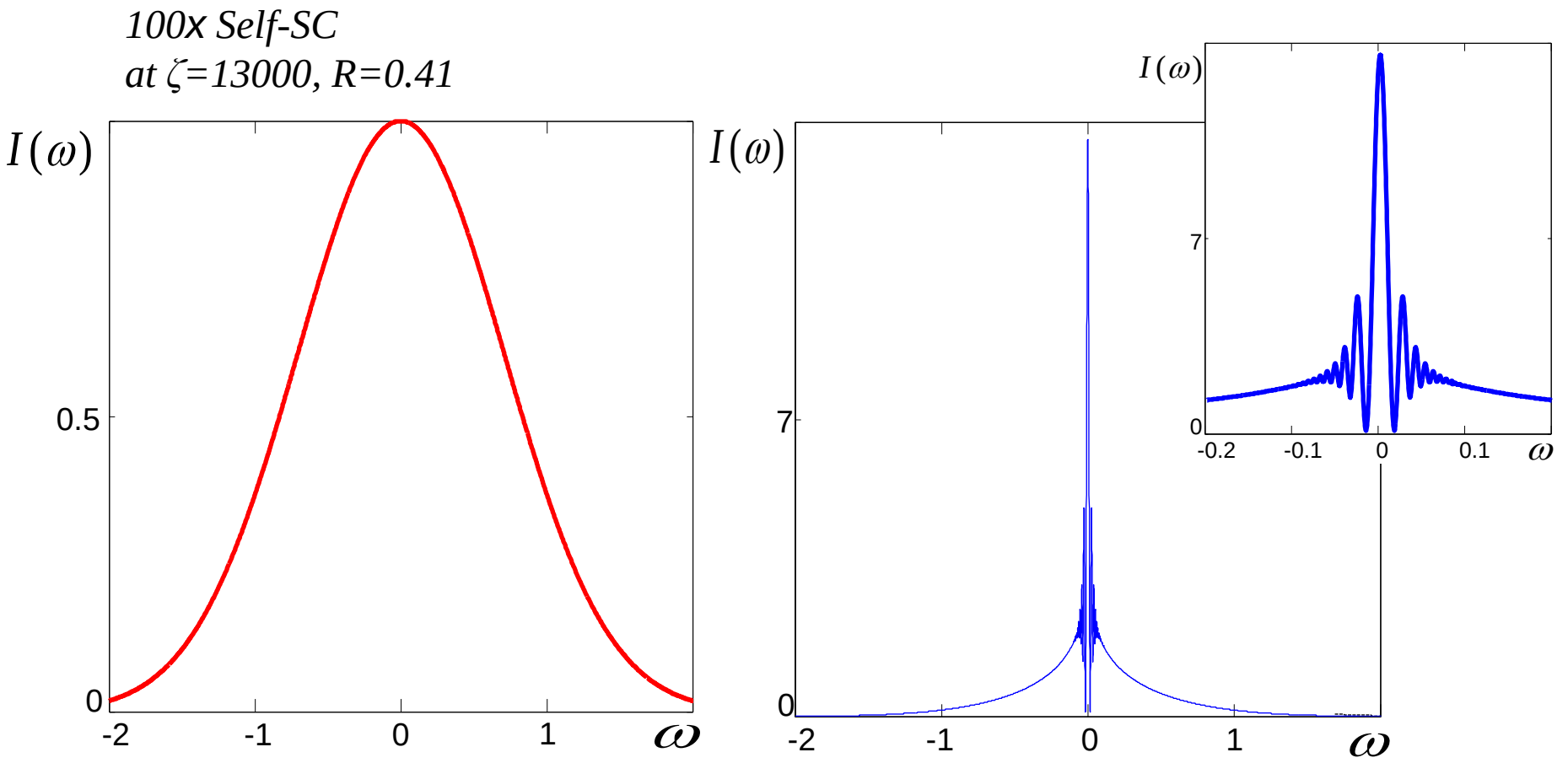
For Gaussian pulse



For sech pulse



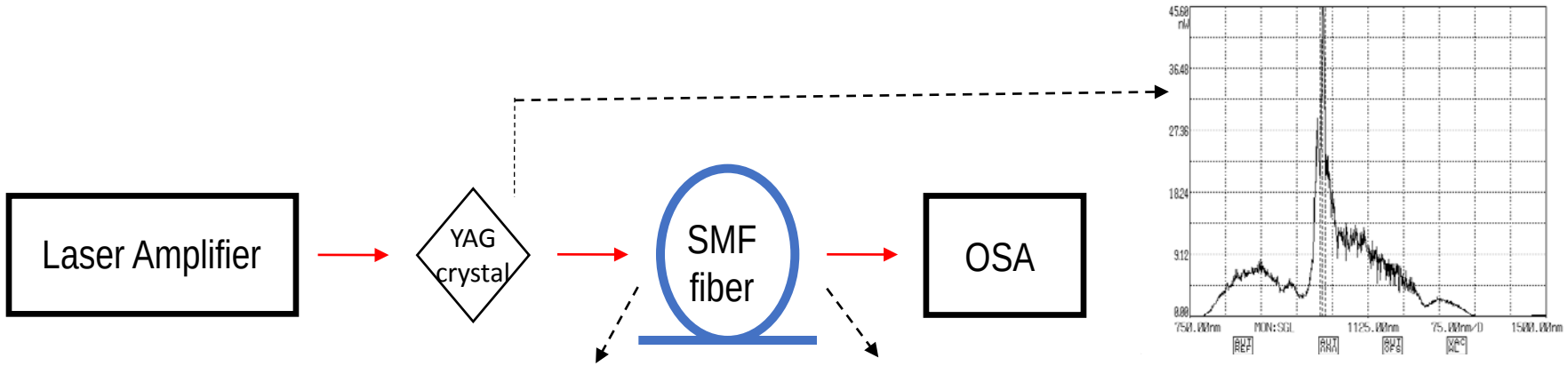
A high-ratio SSC (≈100X) for Gaussian pulse

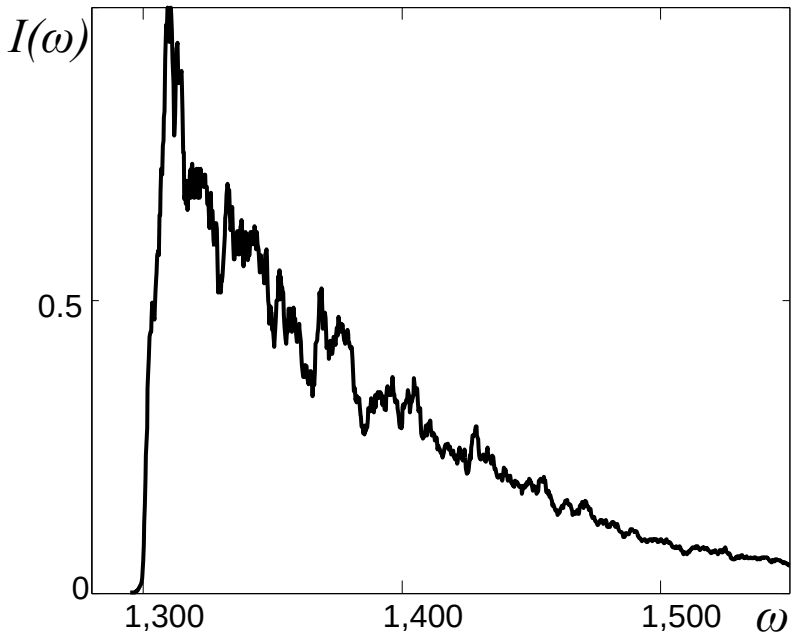


initial spectrum

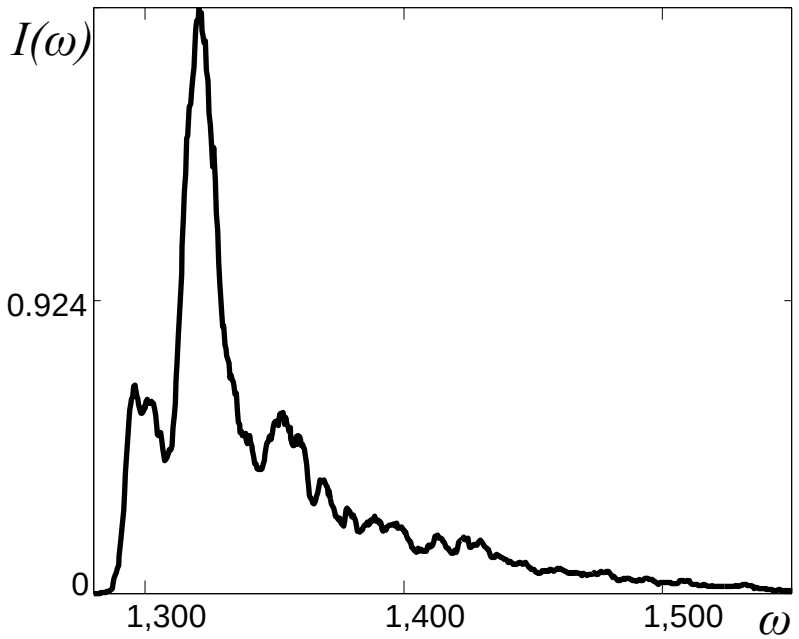
self-compressed spectrum

Self-SC of partially coherent pulses: experiment





supercontinuum spectrum

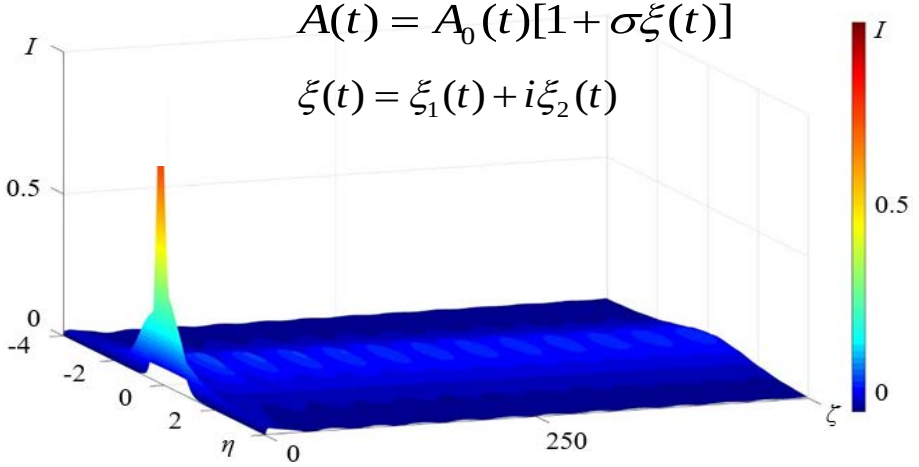


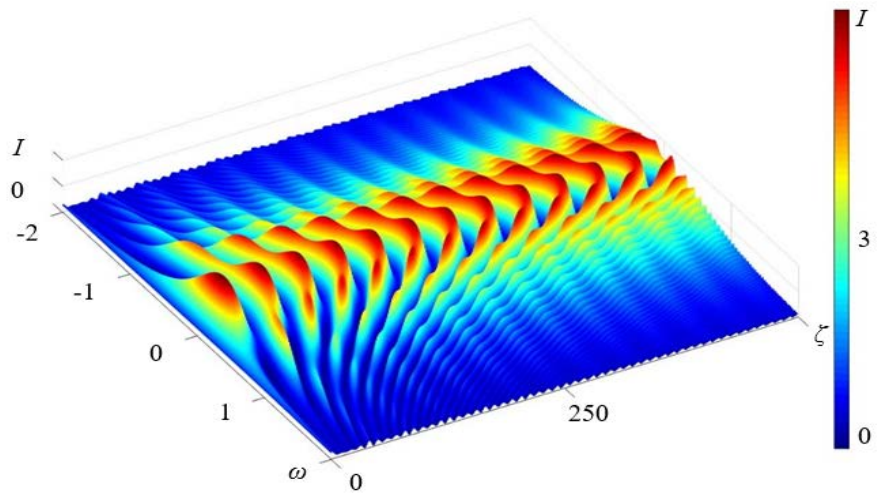
self-compressed spectrum

Evolution of a pulse with random APM

$$A(t) = A_0(t)[1 + \sigma\xi(t)]$$

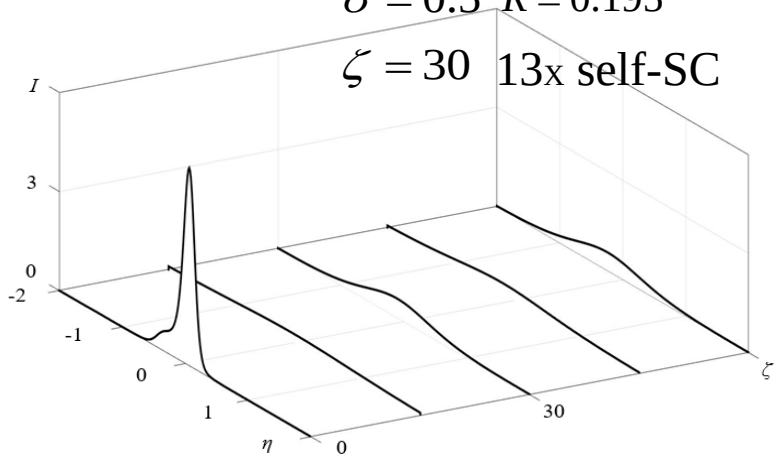
$$\xi(t) = \xi_1(t) + i\xi_2(t)$$

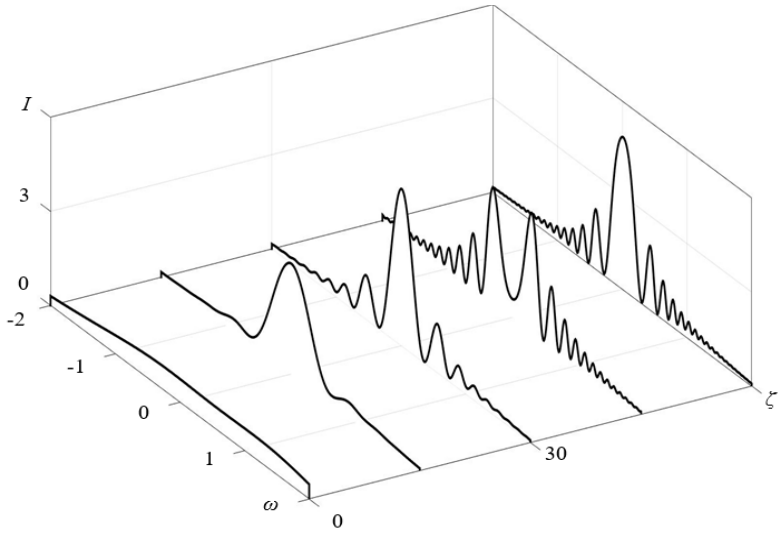




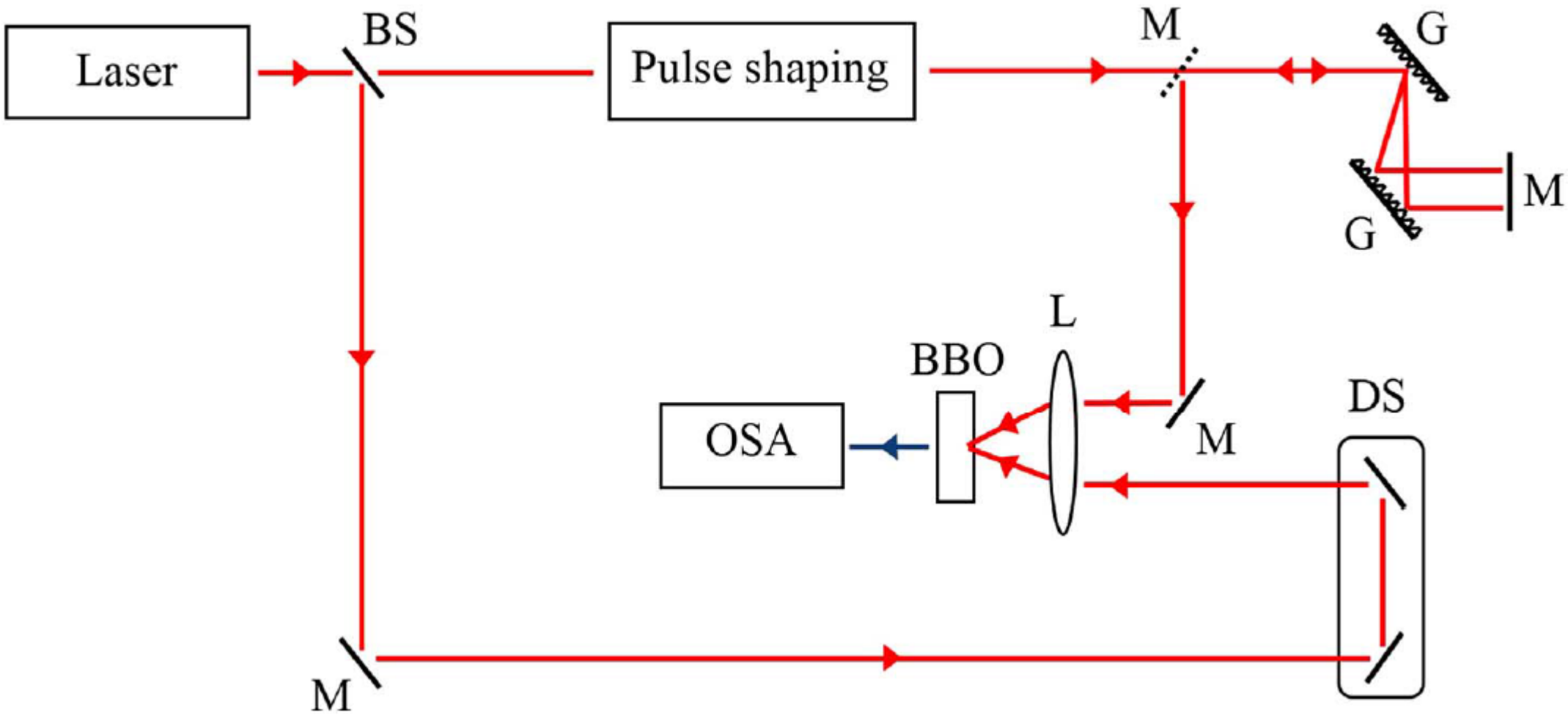
$\sigma = 0.5$ $R = 0.195$

$\zeta = 30$ 13x self-SC

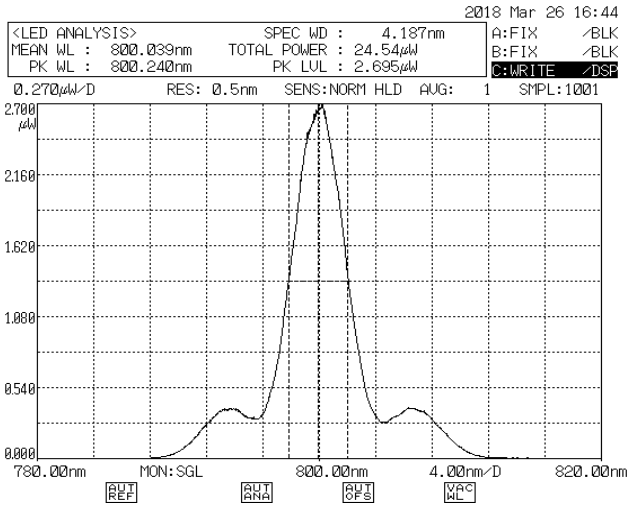




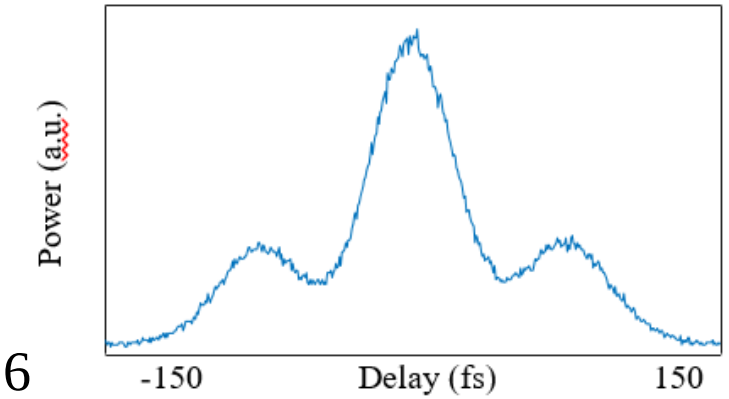
Experimental setup

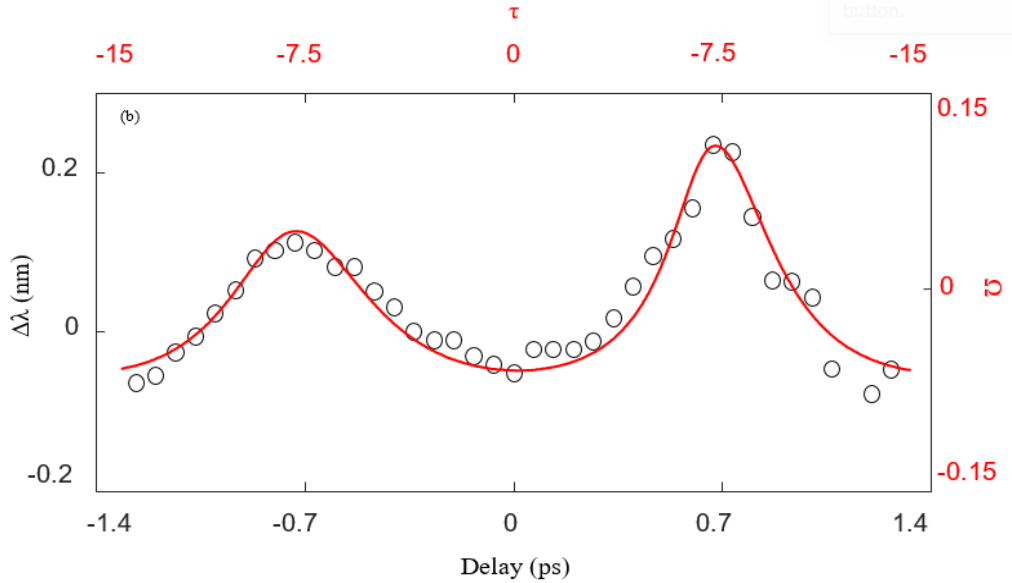


Chirp measurement for the dual-peak pulse

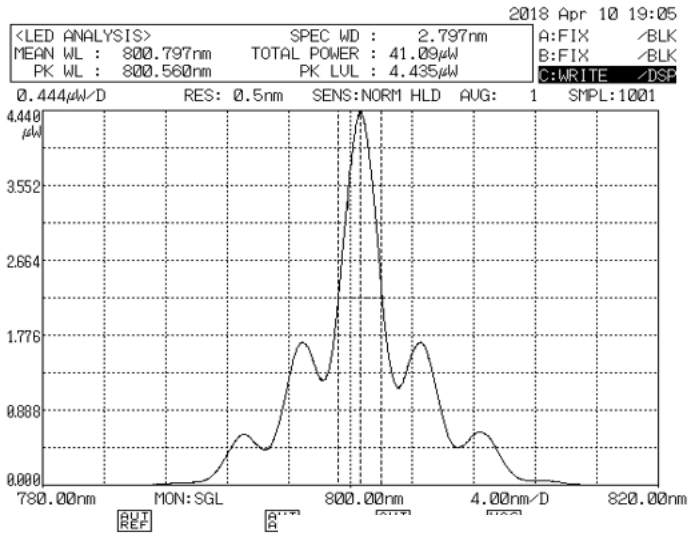


$\zeta = 16$

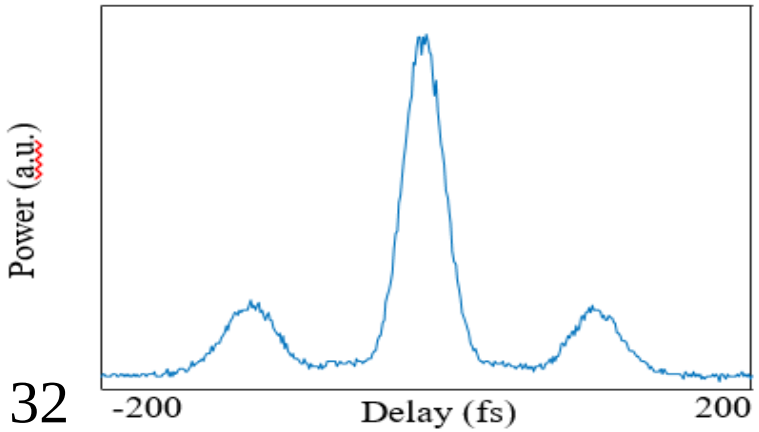


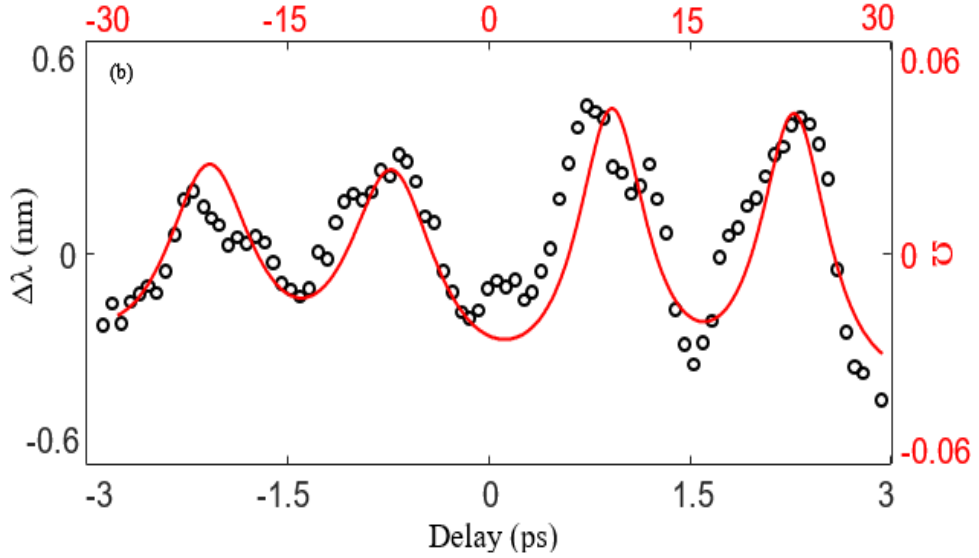


Chirp measurement for the triple-peak pulse



$\zeta = 32$





Conclusion

- self-SC of coherent and partially coherent pulses has studied experimentally and numerically and received their optimization curves
- 4x self-SC has received experimentally
- 100x self-SC for Gaussian pulse has demonstrated numerically
- the process of self-SC suppresses the noise has shown
- the simple method for measuring the spectral phase of pulse is presented and it is tested for dual- and triple-peak pulses.

Thank you!

Evolution of a pulse with random AM

$A(t)=A_0(t)[1+\sigma\xi(t)]$

$A_0(t)= exp(-t^2/2)$

9x self-SC

at $\zeta=48, R=0.015$