1. Laser development for seeding of the high power 1 micron laser

   a. Octave-spanning CEP-stable femtosecond oscillator for OPCPA seeding

Octave-spanning femtosecond oscillator

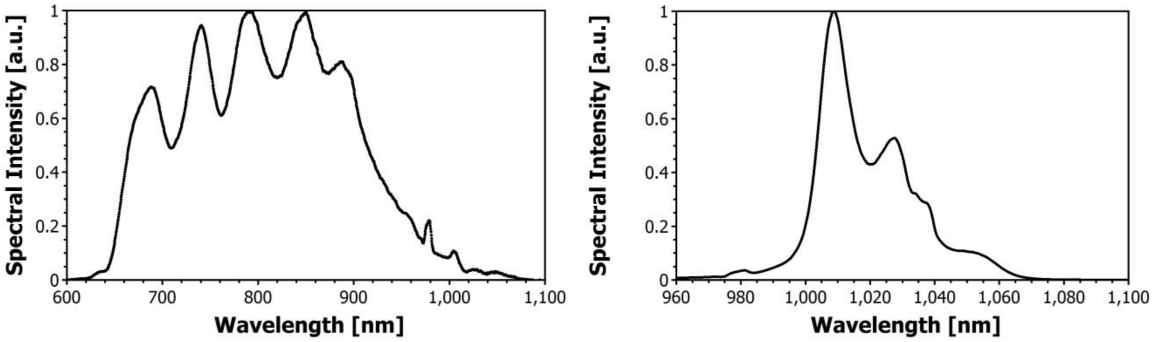

Fig. 1: left: Measured spectrum of a standard ultra-broadband oscillator used for CEP-stabilisation. right: Spectral filtering at 1030 nm

System parameters		
Power	460	mW
Power cw max	880	mW
Bandwidth (-10dB)	370	nm
Pulse Duration	5.9	fs
Rep. Rate	75	MHz
Beatnote	35-40dB	dB
Pump power	4.75	W

Tab. 1: Output parameters of a high pumped ultra-broadband Ti:Sapphire laser

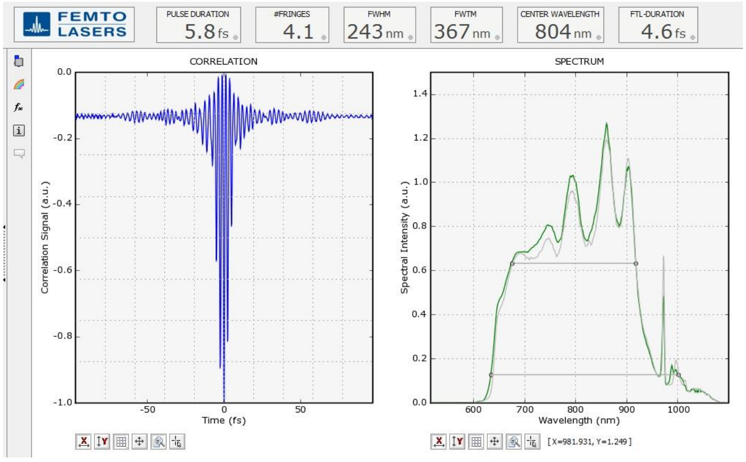

Fig. 2: Measured pulse duration via fringe resolved autocorrelation

CEP-stabilized compact light source for OPCPA seeding

Fig. 3: The laser head contains the Ti:sapphire cavity, the pump laser, adjustable glasss wedges, photo diodes and electronics. It is attached to the CEP module that provides both a free-space and a fiber coupled output.

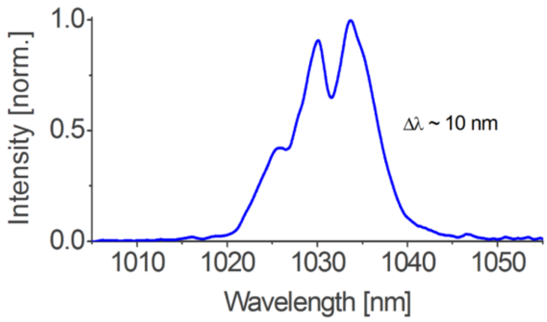

Fig. 4: Spectrum after the fiber amplifier used to seed the pump laser

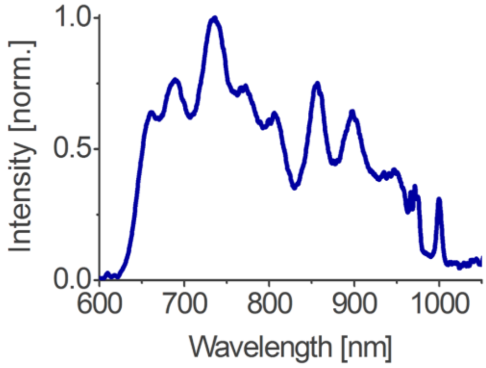

Fig. 5: Spectrum provided to seed the OPCPA

b. High power and high energy pump laser

Fig. 6: High power and high energy pump laser (Amplitude Tangerine Series)

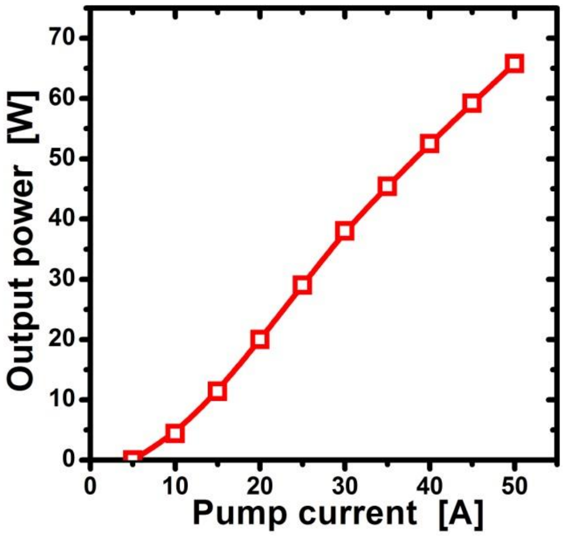

Figure 7(a) : Amplifier charateristics at 400 kHz

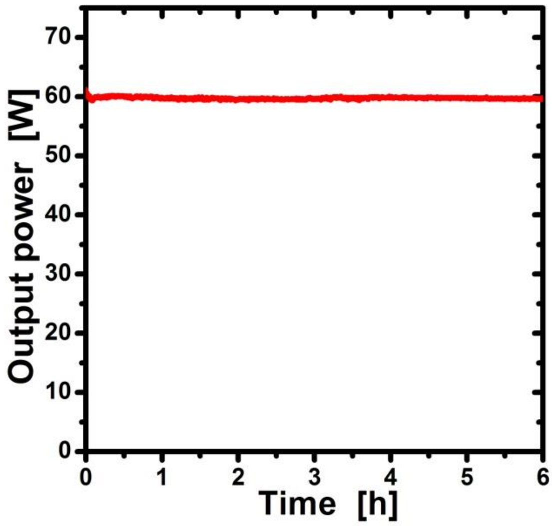

Figure 7(b) : Long term stability test at 60 W and 400 kHz

2. Optical Parametric Amplification Systems

a. High power CEP-stable OPCPA

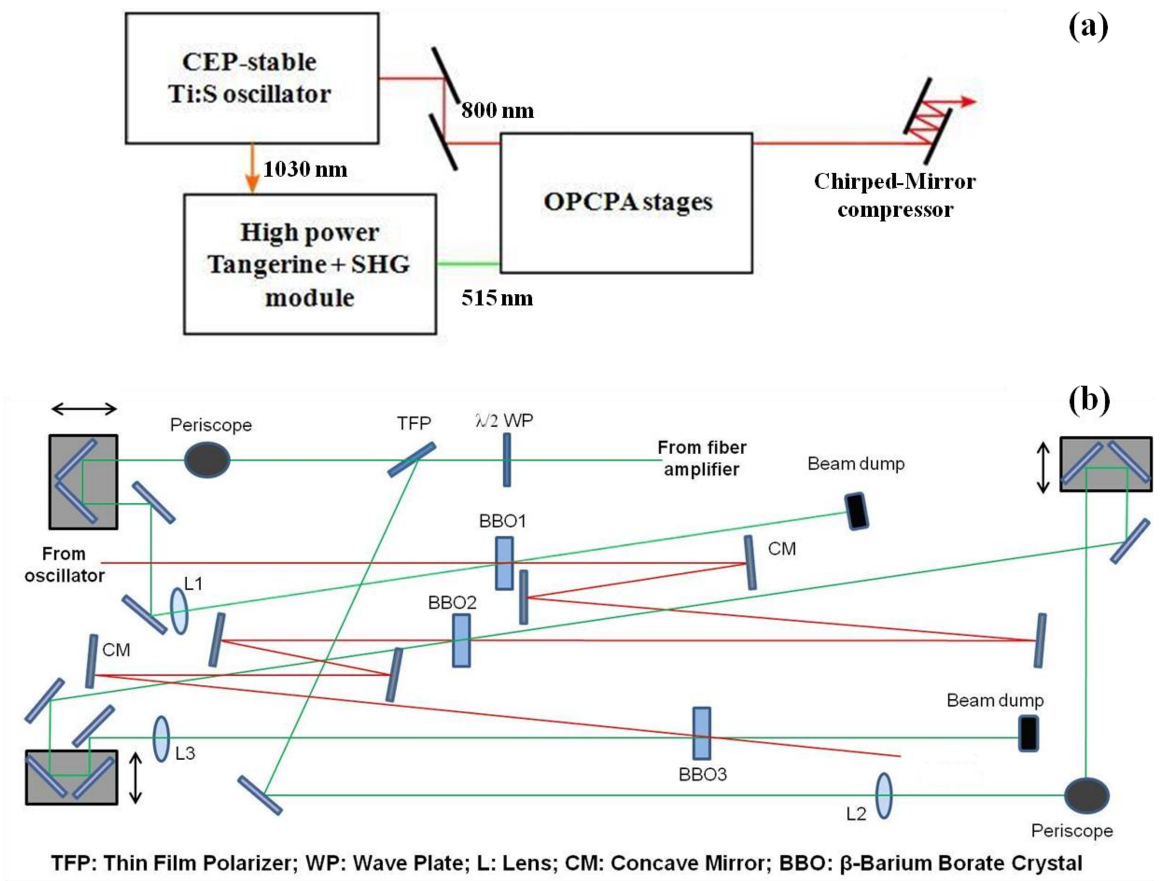

Figure 8: (a) Block diagram of the OPCPA setup. (b) Detail of the parametric amplification stages.

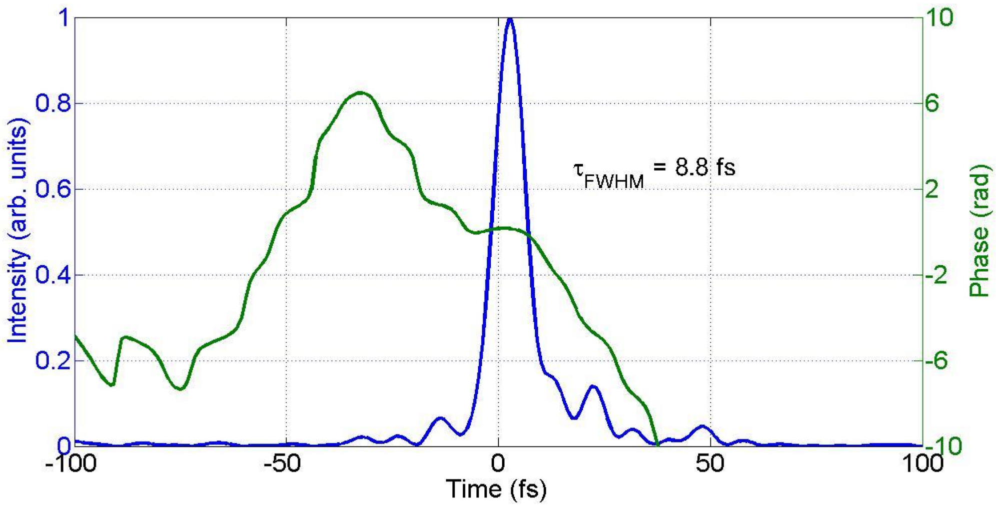

Figure 9: Retrieved temporal shape showing compression below 9 fs at 400 kHz.

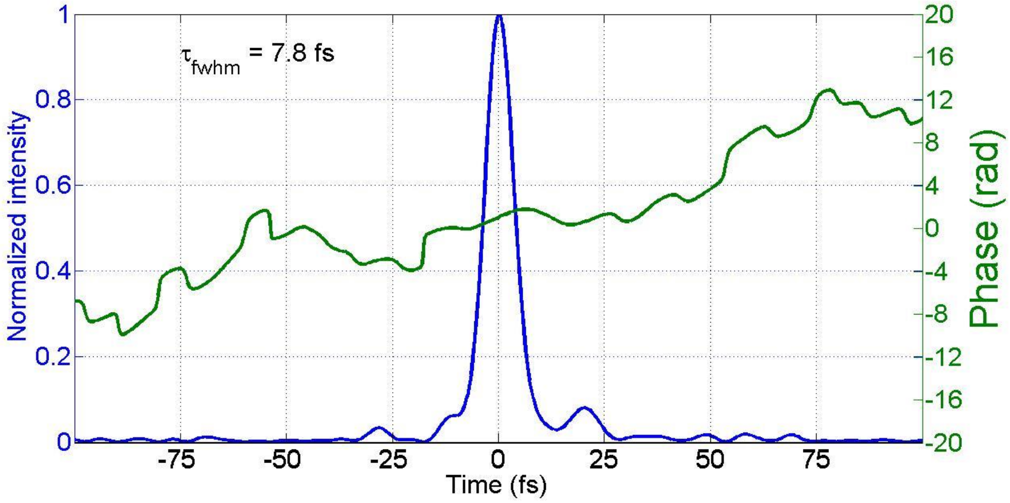

Figure 1: Compressed pulses at 800 kHz.

b. High power UV/visible OPA

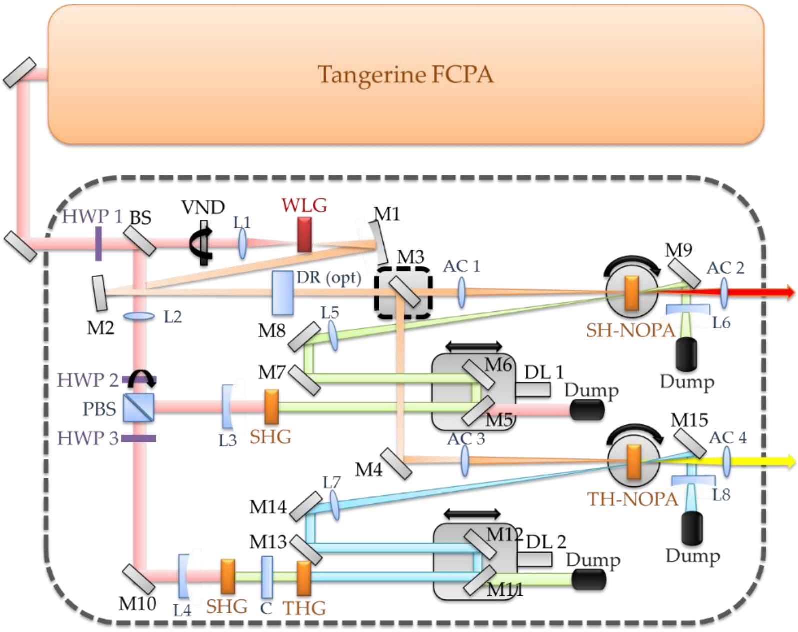

Fig. 11. Experimental setup of the 2 MHz NOPA prototype.

Tunable amplification results

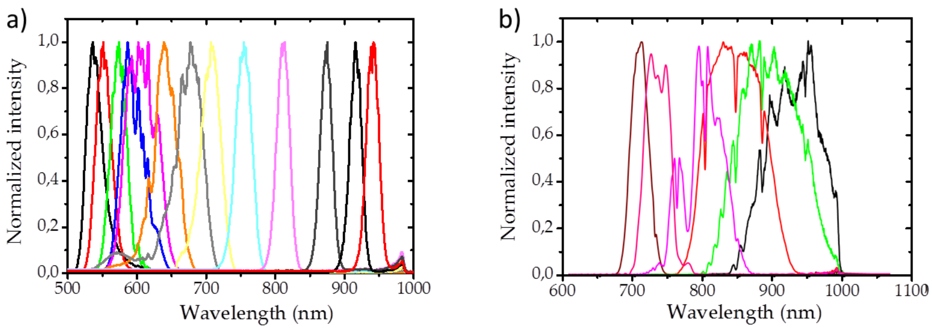

Fig. 12. Spectral tunability of the TH (a) and SH-pumped NOPA (b).

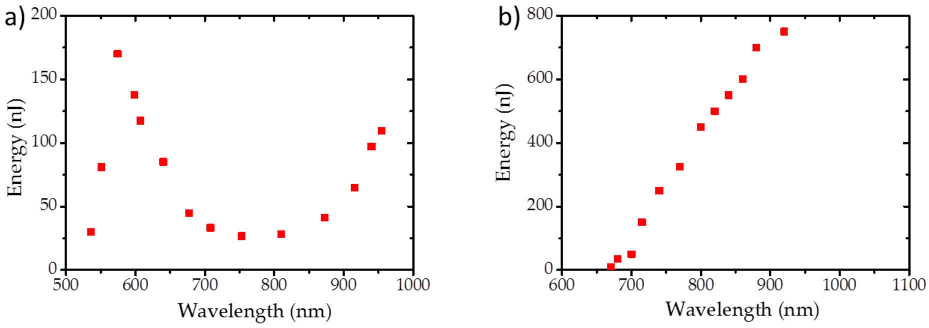

Fig. 13. Output energy of the TH (a) and SH-pumped NOPA (b).

Broadband amplification results

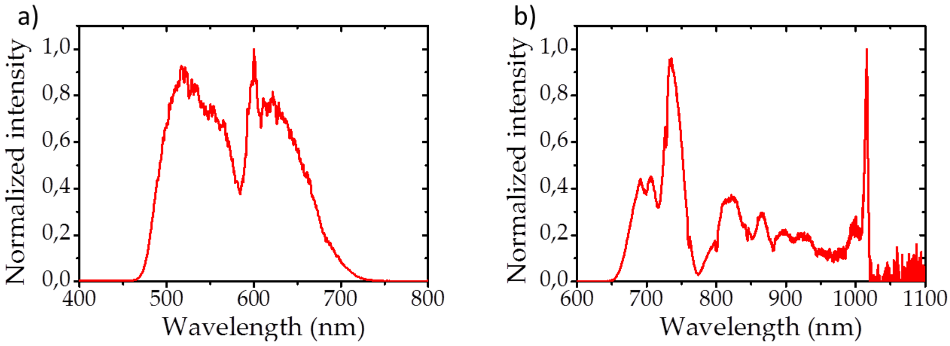

Fig. 14. Ultra-broadband spectrum generated in the TH (a) and SH pumped NOPA (b) at magic angle.

NOPA compression

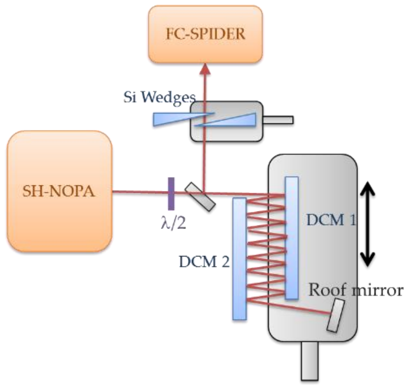

Fig. 15. SH-NOPA chirped mirrors compression setup.

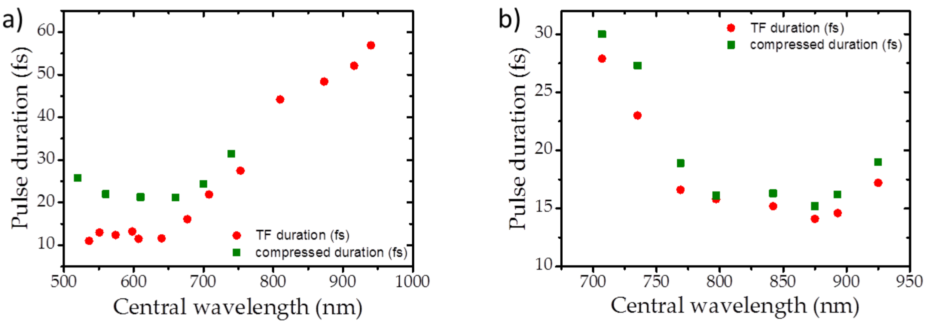

Fig. 16. Transform limited (red dots) compared to measured pulse duration (green squares) after compression of the TH-NOPA with a fused silica prism compressor (a) and SH-pumped NOPA with a chirped mirrors compressor (b).

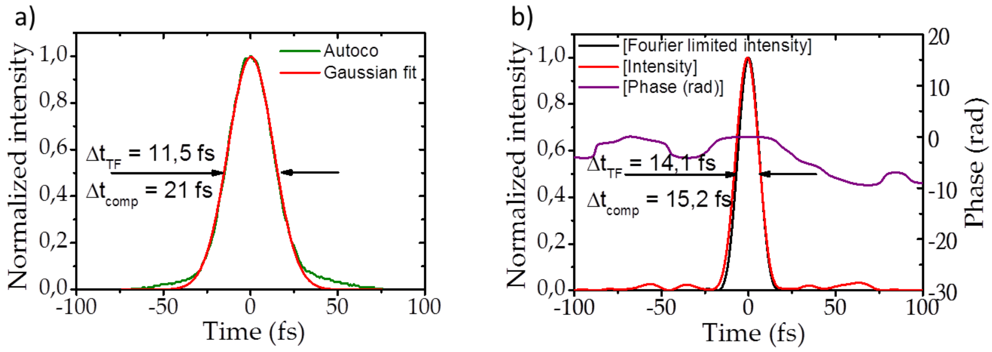

Fig. 17. a) Shortest autocorrelation traces (green) and Gaussian fits (red) of the TH-NOPA. b) FC-SPIDER temporal profile reconstruction of the shortest SH-NOPA compressed pulses at 875 nm for the on-purpose limited spectral bandwidth obtained in the tunable operation mode.

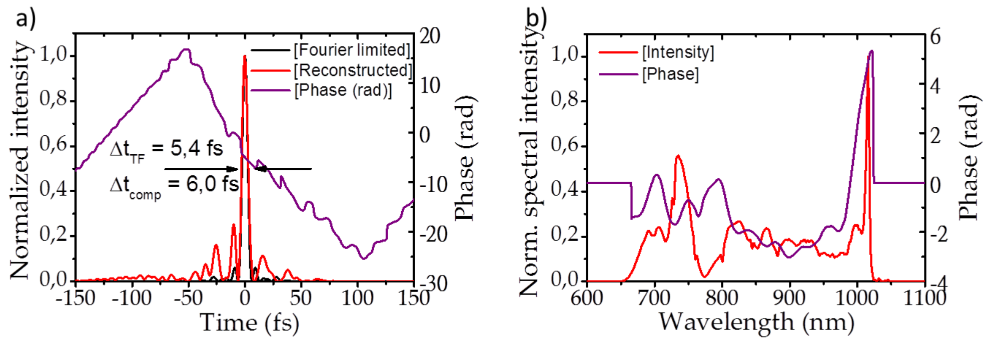

Fig. 18. FC-SPIDER temporal and spectral characterization of the ultrashort 6,0 fs pulses at 840 nm.

UV wavelength extension

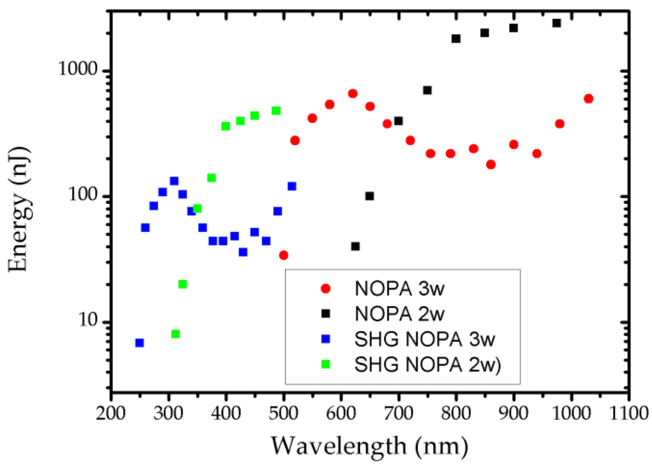

Fig. 19. Output energy of the 500 kHz NOPA prototype fitted with an optional second harmonic generator.

3. Detection Technology