UltraFast Innovations

IFNANO INSTITUT FÜR NANOPHOTONIK

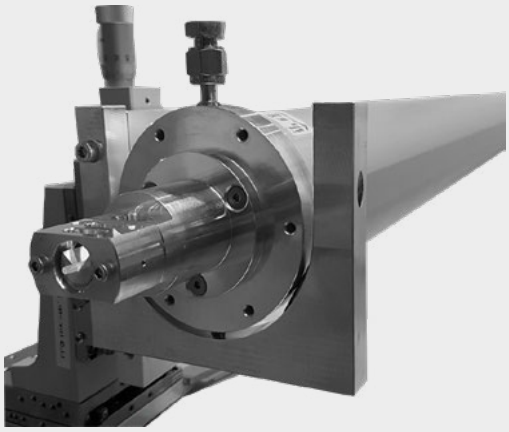
YOUR KEY to innovation and success

High power stretched flexible hollow core fiber pulse compressor

SAVANNA-HP

SAVANNA-HP is the result of a collaboration between UltraFast Innovations (UFI®) and the Institute for Nanophotonics in Göttingen IFNANO. The stretched flexible hollow core fiber (SF-HCF) compressor spectrally broadens high-energy femtosecond input pulses by nonlinear interaction with a noble gas of adjustable gas pressure inside a hollow fiber and subsequently compresses the pulse using chirped mirror technology from UltraFast Innovations.

The state of the art SF-HCF technique from IFNANO allows nearly ideal wave guiding reducing the losses to a minimum and allows accumulation of self-phase modulation over an interaction length of up to 8 m. The incoupling is protected by a high power shield allowing extreme input parameters of few tens of mJ pulses and an average power of up to 20 W (with active cooling up to several hundred Watts). Combining the SF-HCFs from IFNANO and our chirped mirror compression, we provide an unmatched compression unit for today's state of the art lasers.



Key Product Features:

- **Input pulse duration:** <20 fs up to hundreds of fs
- **Input pulse energy:** up to few tens of mJ
- **Typical compression factor:** 5-30 x
- **Fiber transmission:** close to the theoretical limit
- **Fiber length:** up to 8 m
- **Supported input peak power:** Up to 400 GW at 10 W average power
- **Supported input average power:** Up to several hundred Watts at 125 GW peak power
- **Active cooling** for average powers > 20 W
- **Footprint:** 300-1000 cm x 60 cm

Customization options:

- Variable spectrum selection
- Flexible dispersion management
- Custom reflective mirror telescope with astigmatism compensation
- In-coupling / Out-coupling chamber with Z-lock unit
- Pressure-stabilized single / double differentially pumped setup
- Active beam pointing stabilization unit

UltraFast Innovations GmbH
Dieselstr. 5
85748 Garching
Germany

phone: +49 89 36039 - 437
fax: +49 89 36039 - 453
info@ultrafast-innovations.com
www.ultrafast-innovations.com

UltraFast Innovations is a spin-off from the LMU Munich and the Max Planck Society.

UltraFast Innovations

Ultra-broadband Chirped Mirror Technology:

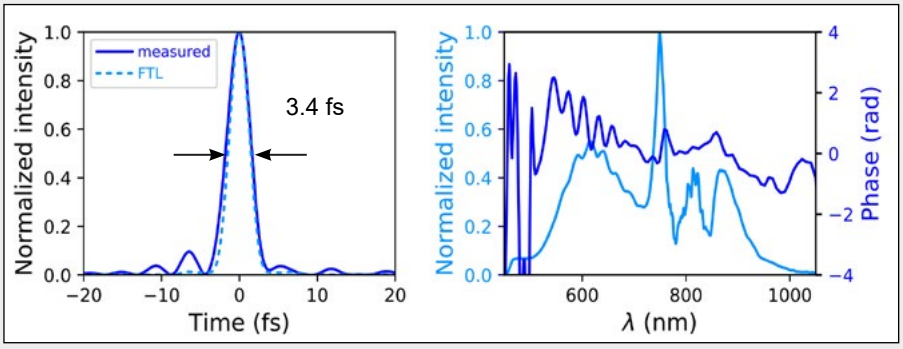
Our double-angle chirped mirrors are a key component of the hollow core fiber compressor, providing unprecedented broadband compression. Our PC70 and PC1332 mirrors have been proven to produce pulses with a duration of < 3 fs. Custom solutions for specific spectral coverage and selection are available.

SF-HCF specifications:

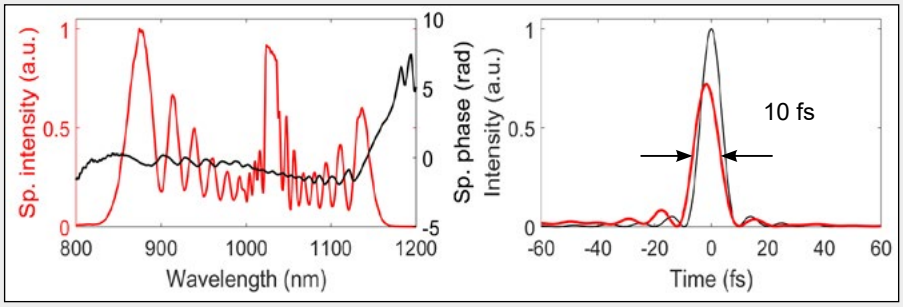
	Standard	Special		Complex		Custom
Max. peak power	125 GW	250 GW	125 GW	400 GW	125 GW	400 GW
Max. average power	10 W	10 W	20 W	10 W	100 W	› 100W
Max fiber length	3 m	4 m		6 m		8 m
Typical transmission*	80 %	75 %		70 %		65 %
Typical spectral broadening	15 x	20 x		30 x		45 x

* at 800 nm with max length, a fiber core of 400 µm and near ideal caustic.

Temporal and spectral pulse characteristics:



Left: Retrieved temporal profile and ideal Fourier transform limited shape (FTL). Right: Fiber output spectrum supporting 2.9 fs pulses. Input: 24 fs & 10 mJ into 2.5 m fiber, reprinted/adapted from [1].



Left: Spectrum (red) after broadening in a 6 m SF-HCF fiber and phase (blue) after compression. Right: Retrieved compressed pulse (red) and Fourier transform limited shape (black). Inset: output beam profile. Results achieved by coupling 300 fs & 580 W pulses into a 6 m fiber. Output: 318 W in compressed 10 fs pulses, reprinted/adapted from [2].

References:

[1] M. Ouillé et. al, Relativistic-Intensity near-Single-Cycle Light Waveforms at KHz Repetition Rate, Light Sci. Appl. **9**, (2020).

[2] T. Nagy et. al, Generation of Three-Cycle Multi-Millijoule Laser Pulses at 318 W Average Power, Optica **6**, (2019).