UltraFast Innovations

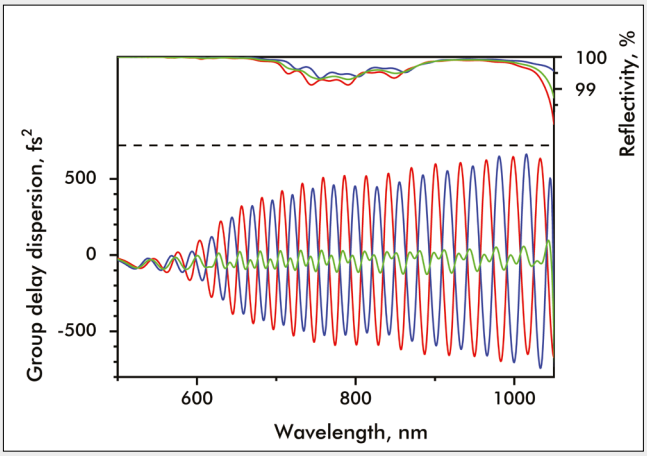
YOUR KEY to innovation and success

Ultra-broadband compression mirrors with double-angle technology (Design PC70)

Our PC70 mirrors are optimized for chirp-compensation of visible/near-infrared spectra spanning more than an optical octave, for example an output of a hollow core fiber compressor. Conventional broadband chirped mirror designs compensate group delay dispersion oscillations by combining two mirrors with complementary coatings. However, the approach suffers from the additivity of manufacturing variations in the two coating runs. We have developed our PC70 design instead to compensate group delay dispersion oscillations by using identical mirrors from the same coating run at two different angles of incidence [1]. The technique not only minimizes the influence of manufacturing errors, but also provides flexibility for fine-tuning.

Key Product Features:

- Bandwidth: 500-1050 nm
- Reflectance: > 99 % per bounce
- Supported pulse duration: < 4 fs (with appropriate input spectrum)
- Angle of incidence: 5°, respectively 19°
- Substrates: 1” diameter, FS, surface flatness λ/10 at 633 nm
- Database link: http://www.ultrafast-innovations.com/product.php?name=PC70



Group Delay Dispersion (bottom panel) and reflectivity (top panel) properties of a mirror pair. The respective dispersion per bounce for 5° (red) and 19°(blue) incidence angle, as well as the average per pair (green), is shown.

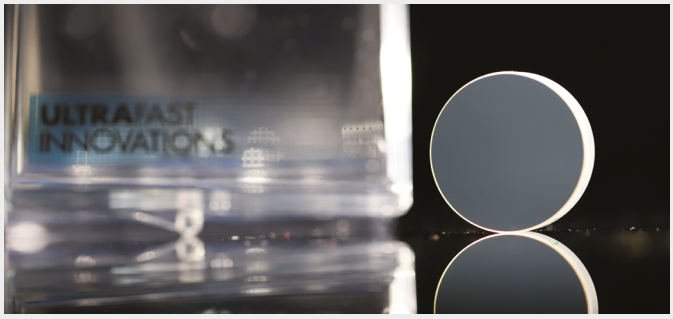
UltraFast Innovations GmbH
Am Coulombwall 1
85748 Garching
Germany

tel. +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.

Compression Measurement:

A typical application for our PC70 mirrors is the compression of a hollow core fiber output to the few-cycle regime. In the current example the output of an argon-filled hollow core fiber was compressed with PC70 mirrors down to 3.2 fs, corresponding to 1.3-cycle pulses at 740 nm [2]. For GDD fine tuning a combination of BK7 wedges and a water cell was used, and the spectral phase was characterized with a D-scan. The measurement demonstrates simultaneous compression over the full spectral bandwidth.



Laser Input:

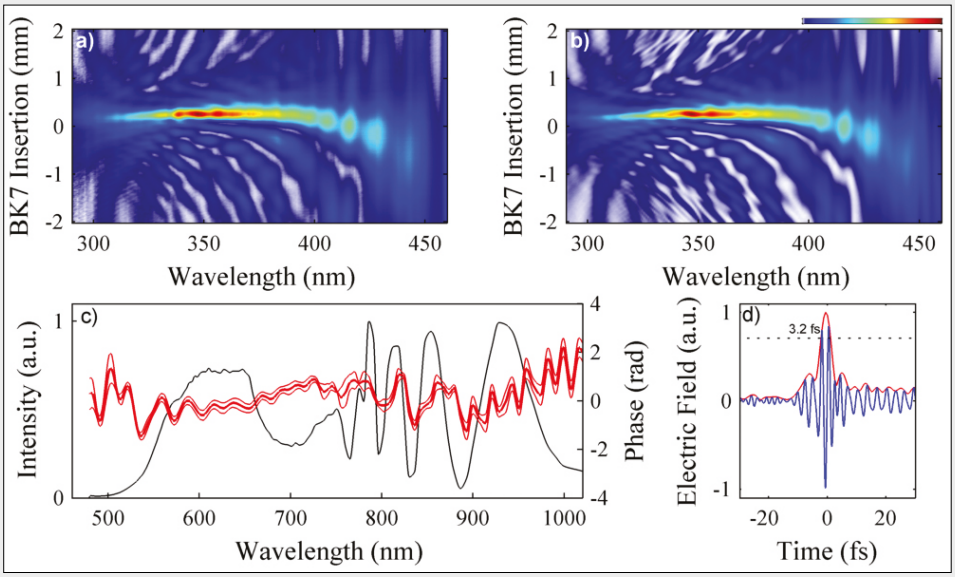
Femtolasers GmbH: FemtoPower Compact HE PRO CEP, 1 kHz repetition rate, 400 µJ, 24 fs

Continuum Generation in a Hollow Core Fiber:

Argon fill gas, 1 bar pressure, 1 m length, 250 µm inner diameter

PC70 mirror compressor:

14 reflections, GDD fine-tuning with BK7 wedges, TOD fine-tuning with a water cell, characterization with D-scan.



Single-cycle hollow-core fiber compressor: Measured (a) and retrieved (b) D-scan traces. (c) Measured spectrum (black) and retrieved spectral phase with standard deviation (red). (d) Retrieved temporal profile for the wedge insertion that minimizes the pulse duration, corresponding to 3.2 fs (1.3 cycles at 740 nm). Figure adapted from [2].

References:

[1] V. Pervak, I. Ahmad, M. K. Trubetskov, A. V. Tikhonravov, F. Krausz, Optics Express **17**(10), 7943-7951 (2009).

[2] F. Silva, M. Miranda, B. Alonso, J. Rauschenberger, V. Pervak, and H. Crespo, Optics Express **22**(9), 10181-10191 (2014).