UltraFast Innovations

YOUR KEY to innovation and success

Double-angle ultra-broadband compression mirrors

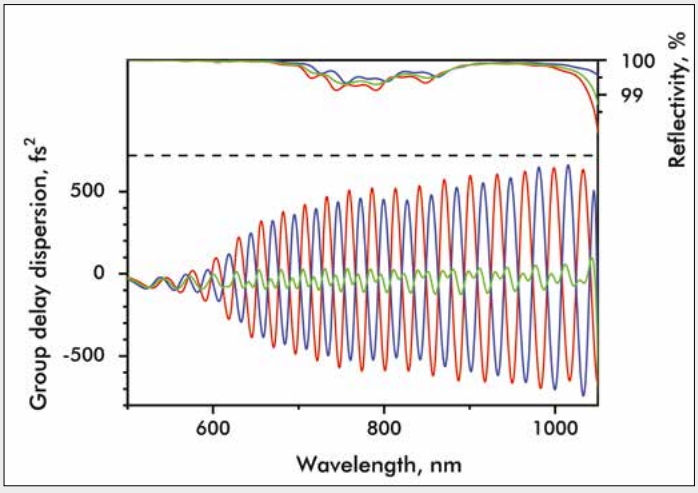
PC70

PC70 mirrors are optimized for chirp compensation in a spectral bandwidth that spans more than an optical octave through visible and near infrared. This makes them ideal to, for example, compress the white light emerging from a gas-filled hollow-core fiber. Conventional broadband chirped mirror designs compensate group delay dispersion (GDD) oscillations by combining two mirrors with complementary coatings.
However, this approach suffers from the accumulation of manufacturing errors from both coating runs. Instead, PC70 is designed to compensate GDD oscillations by using 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 enables fine-tuning of the sum GDD curve.

Key Product Features:

- Bandwidth: 500-1050 nm
- Reflectance: > 99 % per bounce
- Supported pulse duration: < 4 fs (with appropriate input spectrum)
- Recommended fluence < 0,1 J/cm² at < 10 fs pulses*

**recommended fluence to avoid nonlinear effects in the multilayer coating.*



Group Delay Dispersion (left axis) and reflectivity (right axis) 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. The central wavelength of the pair is 775 nm.

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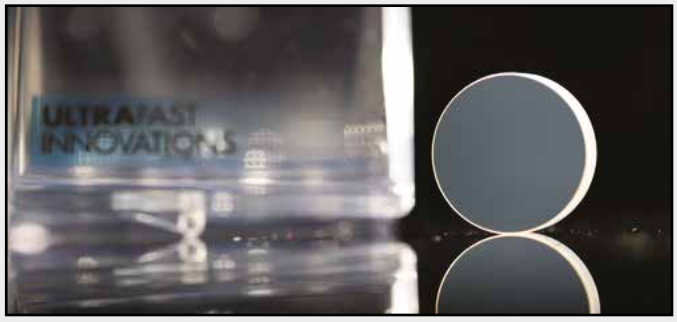
Compression measurement:

A typical application for PC70 mirrors is post-compression of an output of a hollow-core fiber. 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. For GDD fine-tuning a combination of BK7 wedges and a water cell was used. The spectral phase was characterized with a D-scan [2]. The measurement demonstrates simultaneous compression over the full spectral bandwidth.



Laser input:

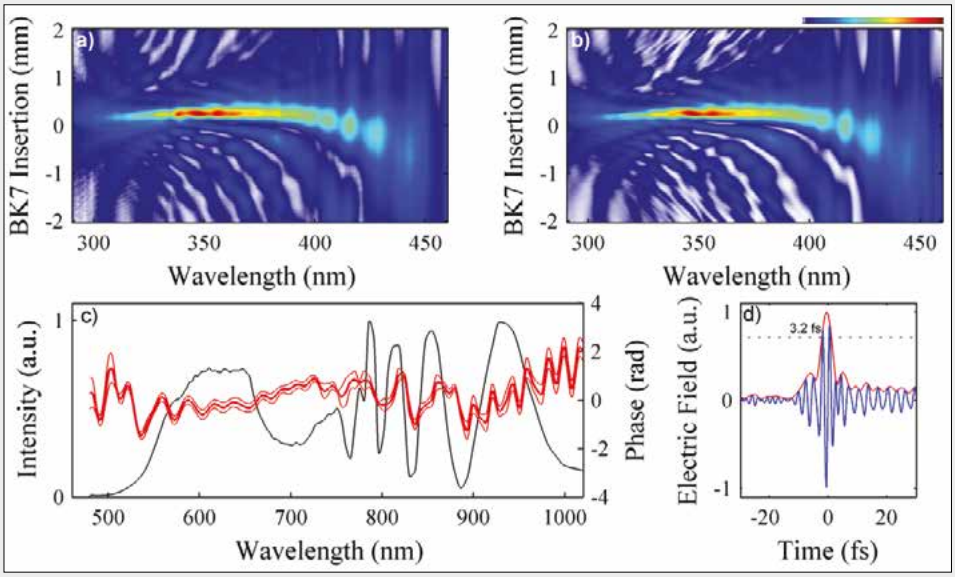
Femtolasers GmbH: FemtoPower Compact HE PRO CEP, 1 kHz repetition rate, 400 µJ, 24 fs

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 (HCF) 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 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).