UltraFast Innovations

YOUR KEY to innovation and success

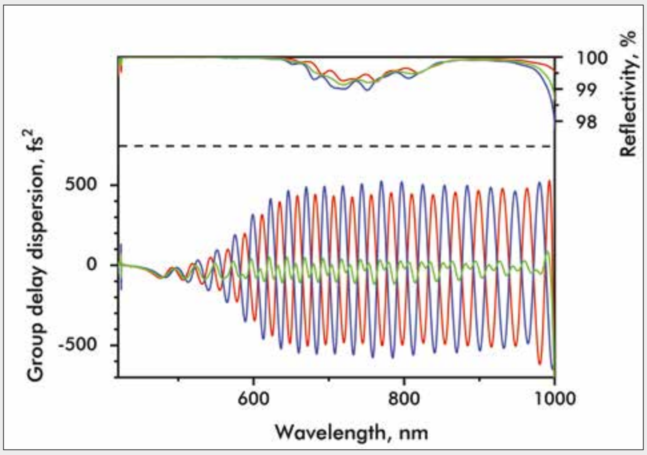
Double-angle ultra-broadband compression mirrors PC1332

Our PC1332 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, PC1332 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. The spectral coverage of PC1332 is shifted to the blue compared to our well-established PC70 mirrors thus, supporting generation of shorter pulses: 2.2 fs (PC1332) compared to 3 fs (PC70).

Key Product Features:

- Bandwidth: 450-1000 nm
- Reflectance: > 99 % per bounce
- Supported pulse duration: < 3 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 725 nm.

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Compression measurement:

A typical application for PC1332 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 PC1332 mirrors down to 2.2 fs, corresponding to 1.04-cycle pulses at 760 nm [2]. For GDD fine-tuning a combination of BK7 wedges and a water cell was used. The spectral phase was characterized with a D-scan. The measurement demonstrates simultaneous compression over the full spectral bandwidth whereas PC70 mirrors could only compress down to ~3 fs.

Laser input:

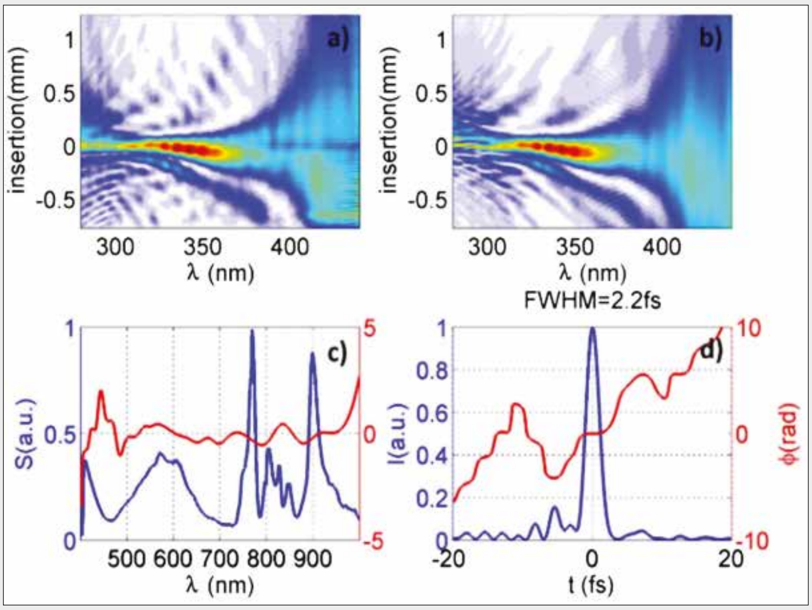
Femtolasers GmbH: FemtoPower Compact HE PRO CEP, 1 kHz repetition rate, 420 μJ, 24 fs

Continuum generation in a hollow-core fiber:

Argon fill gas, 409 mbar pressure, 1 m length, 250 μm inner diameter

PC1332 mirror compressor:

14 reflections, GDD fine-tuning with BK7 wedges, TOD fine-tuning with a water cell, characterization with D-scan [2]



Single-cycle hollow-core fiber (HCF) compressor: Measured (a) and retrieved (b) SHG D-scan traces. (c) Measured spectrum (blue) and retrieved spectral phase (red). (d) Reconstructed temporal profile for a post-compressed pulse in an Ar-filled HCF (P=409 mbar) with PC1332 spectral phase compensation, corresponding to 2.2 fs (1.04 cycles at 760 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, B. Alonso, W. Holgado, R. Romero, J. S. Román, E. C. Jarque, H. Koop, V. Pervak, H. Crespo, and I. J. Sola, Optics Letters **43**(2), 337-340 (2018).