femtoControl

Compact Motorized Dispersion Control for Optimizing Femtosecond Laser Pulse Duration

Dispersion Compensation

Femtosecond pulses which pass through any kind of optical material experience dispersion that can lead to temporal broadening the ultrashort pulses with a corresponding reduction in peak power. This changes and degrades the experimental conditions.

APE's femtoControl is a motorized dispersion compensation unit for the optimization of femtosecond laser pulse durations. Different femtoControl versions are available for the Ti:Sapphire laser wavelength range as well as for OPA/OPO systems in the NIR and IR wavelength range. For applications that require extreme GDD (Group Delay Dispersion) compensation or other wavelength ranges, customized solutions are available.

A pair of prisms on motorized translation stages inside femtoControl generate dispersion that is inverse to the detrimental material dispersion and thus compensates it. The generated dispersion, i.e. the pulse length, can be adjusted continuously.

- Ideal for multi-photon microscopy
- Wide range of dispersion
- User-friendly adjustment and operation
- Zero GDD (Group Delay Dispersion) function
- Automated prism drive corresponding to calibrated GDD curves

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Specifications

femtoControl	NIR - Ti:Sapphire	NIR - Broadband	IR
Wavelength range (others on request)	680 nm … 1080 nm	650 nm … up to 1320 nm	1150 nm … up to 2500 nm
GDD range	-13,000 fs² … 0 fs² at 800 nm	-5,000 fs² … 5,000 fs² at 800 nm	-5,500 fs² … 13,000 fs² at 1300 nm 0 fs² … 14,000 fs² at 1700 nm
Input polarization	Linear, horizontal		
Input beam diameter ($1/e^2$)	<4 mm		
Transmission	>90% at 800 nm	>85% at 800 nm	>65% at 1300 nm >70% at 1700 nm

Dispersion Correction for Multi-Photon Microscopy

Dispersion compensation and pulse compression is essential wherever short pulses are passing through optical material, e.g. in a microscope for Multi-Photon-Excitation (MPE) microscopy. Positive GDD (Group Delay Dispersion) in a MPE microscope of e.g. 13 000 fs² causes a 100 fs pulse to broaden to 375 fs. The multi-photon absorption cross-section depends on the pulse width, therefore the temporal broadening of the pulse caused by dispersion in the microscope's optics deteriorates the measurement conditions.

The measurement signal in multi-photon-excitation microscopy is strongly related to the pulse duration. Shortest pulses provide the best signal-to-noise ratio and can also extend the sample's life span, since they yield the measurement signal at the lowest possible energy.

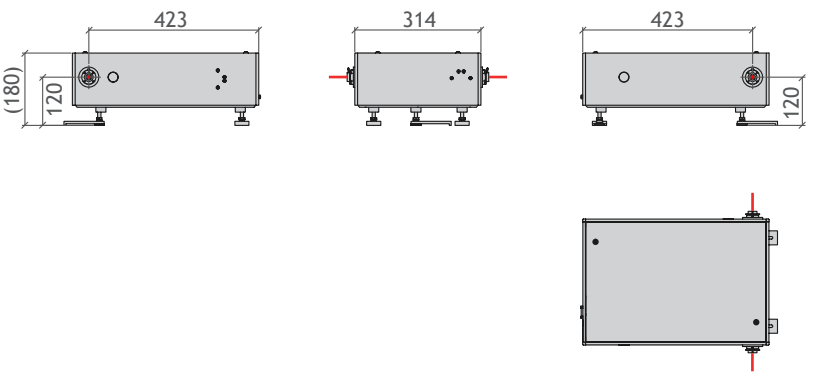
Inside femtoControl, optical prims are positioned by motors such that negative dispersion is applied to the pulse, compensating the positive GDD of the microscope optics and compressing the pulse. At the sample, instead of being stretched, the pulse has its shortest duration.

Appendix Technical Drawings

All dimensions in mm

femtoControl NIR - Ti:Sapphire

- dispersion control



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APE follows a policy of continued product improvement.
Therefore, specifications are subject to change without notice.