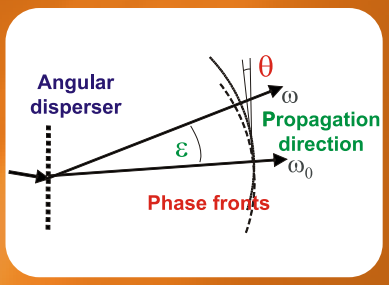
PhADIM

for measurement of phase front angular dispersion of Gaussian laser beams

Side effects of Phase Front Angular Dispersion (PFAD)

- Spectral phase modulation (Chirping)
- Temporal pulse broadening
- Spatial chirp
- Tilted pulse front

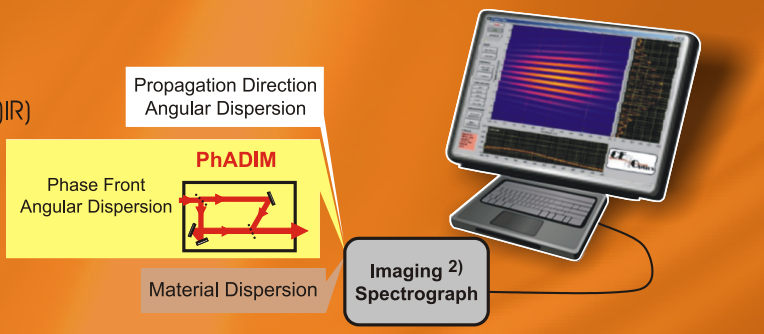


Phase front ($d\theta/d\omega$) and propagation direction angular dispersion ($d\varepsilon/d\omega$).
For plane waves: $\theta=\varepsilon$, for Gaussian beams: $\theta\neq\varepsilon$

Our solution for PFAD measurement: PhADIM

Features

- All linear optical solution
- Independent of wavelength (suitable for (V)UV- (N)IR)
- Requires low input power / pulse energy
- High precision
- Real time operation
- Simple to align and operate



Specifications

Accuracy of phase front angular dispersion[1]:	< 0.1 μrad/nm
Spectral range[1], [2]:	150 nm – 20 μm
Dimension in mm (L×W×H):	290 × 200 × 110

[1]: The range and accuracy depend on the specifications of the imaging spectrograph and the software. The displayed values are for color depth of 10 bit, spectral resolution of 0.1 nm, spatial resolution of 3.3 μm and around 800 nm and for FRINGER.

[2]: Accessible spectral range is determined by the available mirrors and imaging spectrograph. (e.g. CEO-2D-800 by CEOptics)

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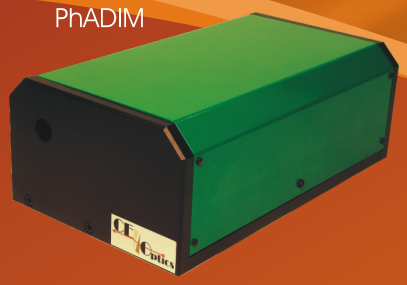

Accessories (optional)

- FRINGER software for evaluation
- MePS, high accuracy beam rotator for 2D characterisation of the beam

Propagation of laser pulses through any prisms and wedges diverts the propagation direction of different spectral components and hence spectrally disperses the beam. If the spectral components are plane waves, then the propagation direction angular dispersion determined by the angle between the propagation directions of the components equals the phase front angular dispersion (PFAD) determined by the angle between their phase fronts. In case of Gaussian-beams, however, the phase fronts may be curved therefore the two definitions can give different values. The PFAD is the more relevant definition because if it is nonzero it results in a chirping and consequently temporal lengthening of the pulse along with deterioration of the temporal contrast, as well. In the spatial domain, the beam profile becomes spectrally asymmetric along the plane of angular dispersion.

Our solution for its diagnostics, the PhADIM (Phase Front Angular Dispersion by Inverted Mach-Zehnder Interferometer), combined with a CEOptics CEO-2D-800 / CEO-2D-800-V imaging spectrograph is a powerful tool to measure the PFAD of ultrashort laser pulses with an extreme accuracy better than 0.1 μrad/nm. Due to the simple realization it is easy to handle, does not require advanced skills, the alignment and measurement only take a few moments. Our device is capable of real-time diagnostics also and independent of most pulse parameters including duration, energy, wavelength and polarization.

Gábor Baross programme
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