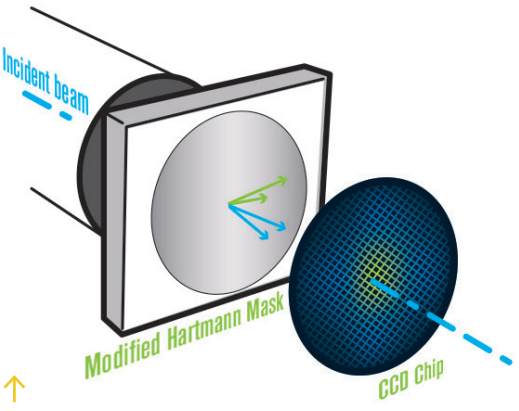
SID4
for metrology & high energy physics

PHASICS
the phase control company

"ONE SINGLE VERSATILE WAVEFRONT SENSOR…

PHASICS wavefront sensors stand out for both their unrivalled **high resolution** and their **ease of use.** As they cover beam testing, adaptive optics and plasma characterization, PHASICS instruments offer full **versatility** to engineers and researchers in high power laser facilities (Petawatt, Terawatt…).

EXCLUSIVE TECHNOLOGY: 4-WAVE LATERAL SHEARING INTERFEROMETRY



PHASICS technology was introduced to overcome the Shack-Hartmann sensor limitations, especially resolution. This ultra-high resolution enables accurate wavefront measurement for robust calculations of beam parameters.

1 **HIGH RESOLUTION**
- Up to 120 000 measurement points
- High repeatability
- Robust calculations

2 **HIGH DYNAMIC RANGE**
- Measurement of strong aberrations

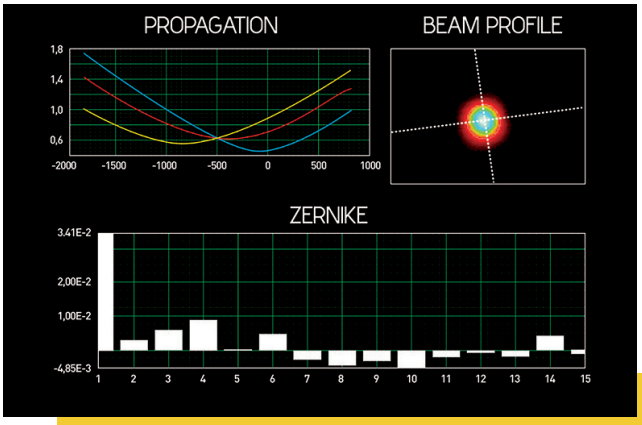
3 **DIRECT MEASUREMENT OF DIVERGING BEAM**
- Easy set-up & alignment
- High NA with no relay lens
- The after last parabola wavefront measurement

4 **SELF REFERENCED**
- Compact
- Insensitive to vibration

5 **ACHROMATIC**
- Compatible with broadband sources: Femtosecond laser, white light or LED
- Cost-effective multi-wavelength solution

...TO MEET ALL YOUR CHALLENGES

I - ACCURATE BEAM CHARACTERIZATION
AT ANY POINT OF THE LASER CHAIN



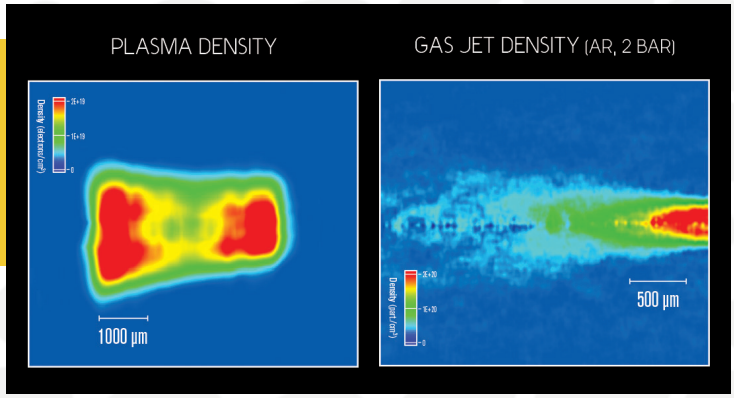
- High resolution of both phase & intensity for robust calculations of all laser beam parameters
- Set-up with no relay lens at any point of the laser chain
- Easy parabola and optics alignment

Aberrations: Zernike, Legendre
Beam propagation: M^2 (ISO 11146), waist, Rayleigh length, divergence
PSF: Strehl ratio, encircled energy
Advanced measurements: Annular or rectangular pupils, multiple pupils, piston, tilt
Beam profile: Energy distribution, intensity centroid

II - GAS & PLASMA DENSITY
HIGH SENSITIVITY & REPEATABLE MEASUREMENT

- High sensitivity (8x lower noise than Mach-Zender interferometer)
- Accurate at low gas pressure
- Repeatable shot-to-shot measurements to compare homogeneity (nozzle selection, laser pulse illumination...)

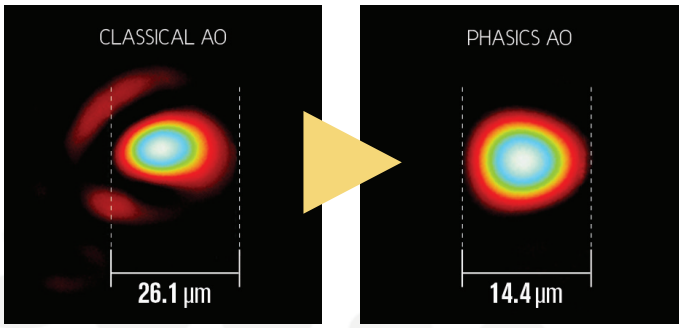
EASY & COST-EFFECTIVE SET-UP
- **No reference arm**
- **Any probe source :** fs-laser, LED, halogen…



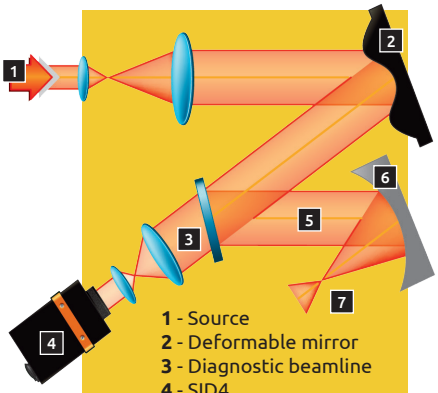
IN LASER EXPERIMENTS"

III - ADVANCED ADAPTIVE OPTICS
WITH ANY DEFORMABLE MIRROR

- Telescope aberrations removal
- 3D dynamic pointing



↑ Correction after the last parabola without any additional device to achieve the best possible focal spot



1 - Source
2 - Deformable mirror
3 - Diagnostic beamline
4 - SID4
5 - Interaction beamline
6 - Parabola
7 - Focal spot

PHASICS® expert team provides insightful support for deformable mirror selection: technology, size, number of actuators, deformable optics and wavefront sensor location, angle of incidence, coating, vacuum...

IV - OPTICS ALIGNMENT & TESTING
EASY DOUBLE PASS MEASUREMENT WITH R-CUBE INTEGRATED ILLUMINATION ADD-ON

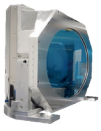
- Large mirror measurement in the laser chain
- Telescope aberrations removal
- Lens test and alignment in all the laser chain
- Diagnostic beamline calibration

HIGH RESOLUTION
WAVEFRONT SENSORS

SID4 RANGE FROM UV TO IR

	Spectral range	Aperture dimension (mm²)	Spatial resolution	Phase sampling (pixels)	Phase accuracy (Absolute)	Phase resolution	Vacuum compatibility
UV	250-400 nm	7.4 x 7.4	29.6 µm	250 x 250	10 nm RMS	2 nm RMS	-
UV HR	190-400 nm	13.84 x 10.89	38.88 µm	355 x 280	10 nm RMS	1 nm RMS	-
SID4 V	400-1100 nm	4.73 x 3.55	29.6 µm	160 x 120	10 nm RMS	<2 nm RMS	> 10^{-6} mbar
SID4	400-1100 nm	5.02 x 3.75	27.6 µm	182 x 136	10 nm RMS	<2 nm RMS	-
SID4 HR	400-1100 nm	9.98 x 8.64	24 µm	416 x 360	20 nm RMS	<2 nm RMS	-
SID4 UHR	400-1100 nm	15.16 x 15.16	29.6 µm	512 x 512	-	<2 nm RMS	-
SWIR	0.9-1.7 µm	9.6 x 7.68	120 µm	80 x 64	15 nm RMS	<2 nm RMS	-
SWIR HR	0.9-1.7 µm	9.6 x 7.68	60 µm	160 x 128	15 nm RMS	<2 nm RMS	-
eSWIR	0.9-2.35 µm	9.6 x 7.68	120 µm	80 x 64	<40 nm RMS*	<6 nm RMS*	-
DWIR	3-5 µm & 8-14 µm	10.08 x 8.16	68 µm	160 x 120	75 nm RMS	25 nm RMS	-
LWIR	8-14 µm	16 x 12	100 µm	160 x 120	75 nm RMS	25 nm RMS	-

** For coherent sources*

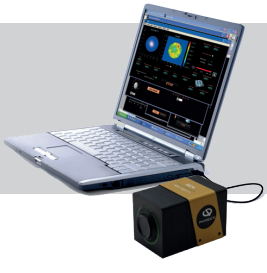


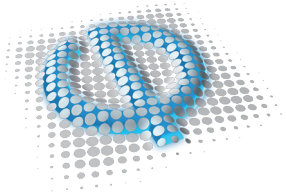
WITH ANY DEFORMABLE MIRROR

	High Power Laser			Imaging correction	Imaging correction & beam shaping
Technology	Piezo electric (small diameter)	Piezo electric (large diameter)	Mechanical of the latest generation (stepper motor)	Membrane	SLM
Number of actuators	up to 36	up to 150	up to 60	up to 80	800 x 800 or 1080 x 1920
Diameter	15-25 mm	300-400 mm	22-500 mm	10-30 mm	7-16 mm
Damage threshold	Very high (on-demand coating)			High	Medium
Loop speed	5-10 Hz	5-10 Hz	1 Hz	5-10 Hz	5-10 Hz

DEDICATED SOFTWARE PACKAGES

- SID4 **Density module** for plasma diagnosis
- **OASys module** for adaptive optics
- **SID4** for beam analysis





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