



PhasePro™ Datasheet – Initial Release

Resolution:
Applications:

To 500 x 500 pixels
One shot M2
Full Zernike coefficients

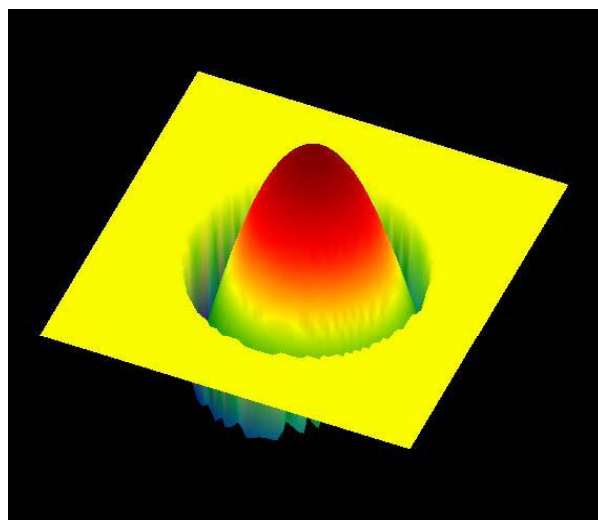
PhasePro™-M2 & -ZN

Applications

- Beam intensity profiling
- Beam M^2
- Beam wavefront measurement: tilt, spherical, focus, astigmatism, coma, Zernike, PSF.

Features

- CW & Single pulse measurement
- Simultaneous Intensity & Phase Profiling
- Higher Resolution than alternative techniques
- M2 measurement, including on single laser pulses
- Zernike coefficients and Point spread function
- Operation at any λ with a working camera
- Port-powered USB 2.0 system
- Windows XP & Vista(32) compatible
- Competitive pricing



Specifications (Standard configuration, best case, subject to change without notice.)

- | | |
|-----------------------|--|
| – Entrance aperture: | 5.9 x 3.1 mm |
| – z separation: | 17.5 mm |
| – Measurement points: | 500 x 500 |
| – Absolute accuracy: | $<0.01\lambda$ |
| – Sensitivity: | $<0.005\lambda$ |
| – Repeatability: | $<0.01\lambda$ rms |
| – Dynamic range: | 500λ |
| – Acquisition rate: | 10 Hz max (Processor dependent) |
| – M2 accuracy: | $\pm 5\%$ |
| – M2 repeatability: | $<2\%$ |
| – λ range: | 350 - 1100 nm (Silicon CCD) |
| | <350 & >1100 nm with other cameras |

Advantages

Primary limitations of other phase measurement technologies:

- Shack-Hartmann: Limited resolution & dynamic range, limiting the resolution on higher order phase information.
- Lateral Shearing Interferometer: Complex Hardware
- Curvature Sensor: Most complex & λ dependent hardware

Primary advantages of this phase measurement technology:

- Direct visualization of intensity *and* wavefront.
- Very high spatial resolution equal to the CCD camera resolution.
- Direct algorithm (non iterative) allows fast measurement
- Optimized sensitivity for detection and precise measurement of both low and high order aberrations
- Wavelength independent allows measurement from UV to IR with suitable cameras.



PhasePro camera shown actual size.
70 x 64 x 45 mm (W x H x D)
C-mount threaded mounting flange



LASER 2000
The Future of Photonics

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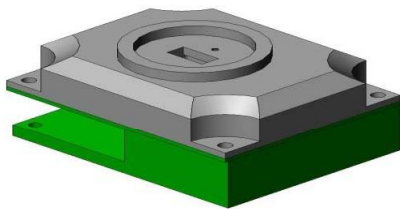
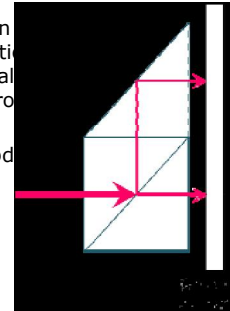
www.laser2000.de

Measurement Principle

As a beam propagates in z , the variation in the beam intensity distribution is, de facto, a reflection distribution in the wavefront. Thus it has always been possible in theory to derive phase distribution from spaced measurements of intensity distribution. However, historically this was a very complex calculation as PC's were too slow to be useful, and therefore there was no real incentive to work on this approach for phase measurement.

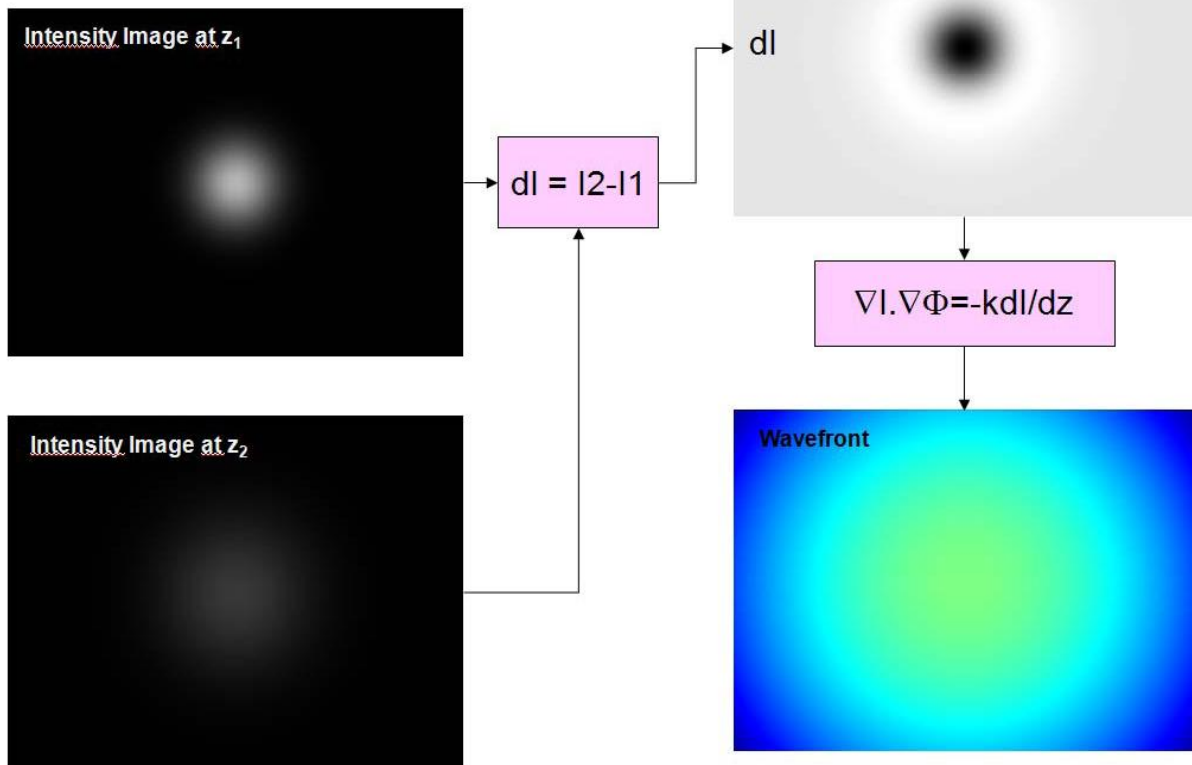
Today, computers are much faster, and new patented* algorithms for efficient calculation allow update rates up to 10 Hz. As (highly) schematically indicated right, PhasePro splits an incoming beam onto the surface of a single 2/3" (8.8 x 6.6 mm) CCD sensor with 6.45 x 6.45 μm pixels.

[*Patents: US 11/883.604; FR 05 01082; WO 2006/082327]



Acquisition module on CCD

PhasePro Measurement Principle/Processing



Processing of the difference between the two intensity images and knowledge of z results in a phase 'image'.

Inevitably successful phase extraction requires minimum image difference requirements:

PhasePro-M2: At least a 5% difference between the 13.5 % beam diameters, around 1 z_R from the waist, and a waist diameter of around 100 μm . DataRay offers C-mount **LNZ** lens assemblies for creating a suitable waist for large beams without additional beam aberration. A simple Excel spreadsheet facilitates the choice of a suitable lens.

PhasePro-ZN: At least a 5% difference between the 13.5 % beam diameters.

Software

Versatile software controls capture, 2D and 3D display, analysis, file saving and data export.

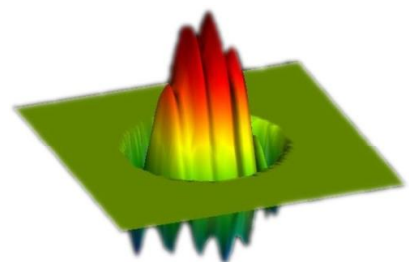
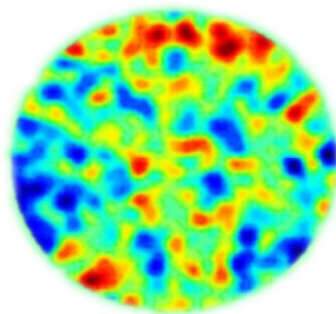
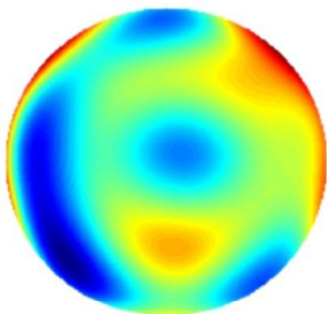
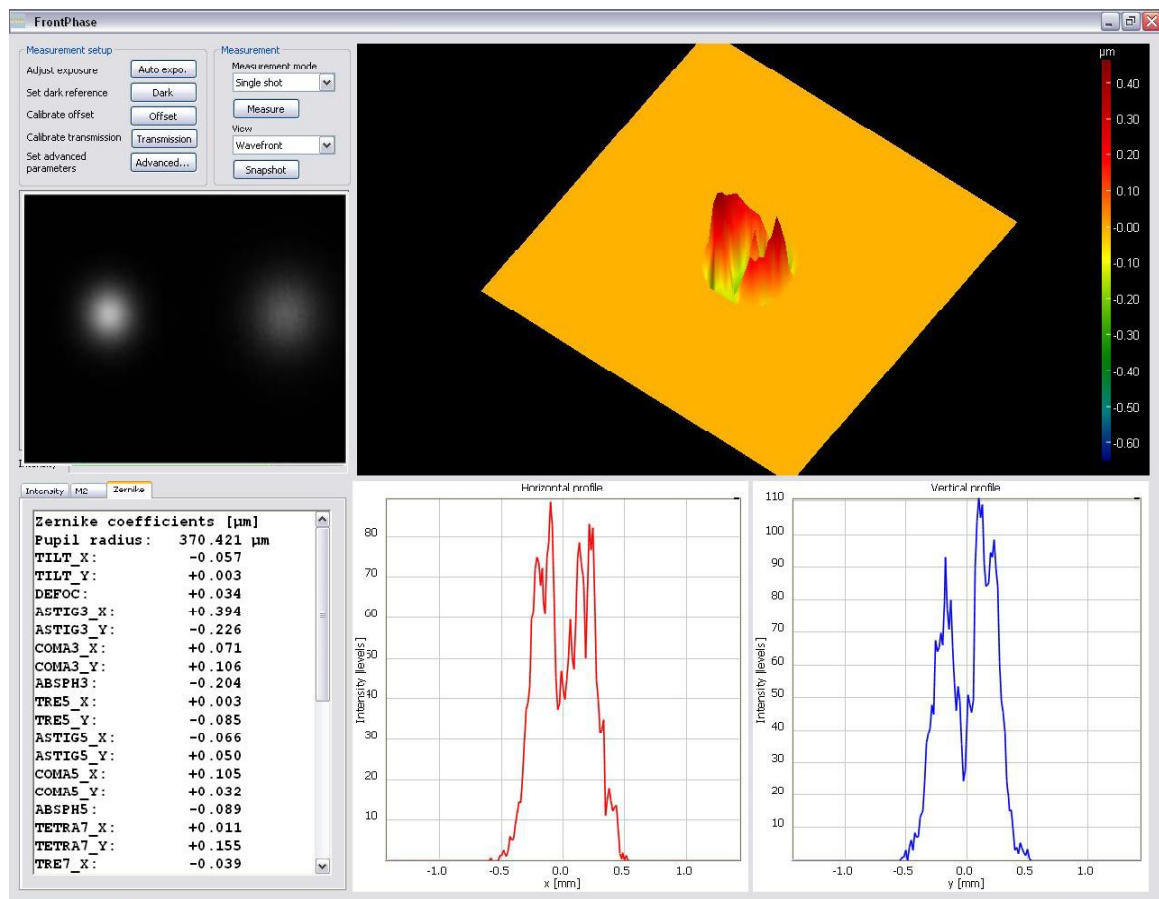
- **PhasePro-M2** offers one-shot simultaneous beam intensity profiling and M2 analysis
- **PhasePro-ZN** adds full wavefront analysis: tilt, spherical, focus, astigmatism, coma, Zernike coefficients, PSF.

Acquisition

- Automatic calibration & acquisition
- Auto-trigger on pulsed lasers
- Live display of 2D & 3D intensity and 3D wavefront
- Live display of camera image

Export & Report

- M2 analysis
- Wavefront, slope and Zernike data



Configuration

- Camera head with integral acquisition module, ND 4.0 filter – port-powered USB 2.0
- 3 m cable
- Software
- USB 2.0 Dongle
- User Manual
- LNZ series lens accessory if and as required for M2 measurement

Part #'s Questions & ordering

PhasePro-M2-Si23 M2 system with 2/3" CCD camera

PhasePro-ZN-Si23 full phase measurement system with 2/3" CCD camera

Contact DataRay at 303-543-8235 or email: phasepro@dataray.com

- ❖ 3-year warranty
- ❖ 30-day Evaluation PO's
- ❖ Free software upgrades