



ZYGO CORPORATION'S

FlashPhase™ Data Acquisition System interferometry in unstable environments

Unstable Environments

Standard phase shifting interferometry provides the highest precision and lowest mainframe uncertainty available.

However, vibration and turbulence severely affect interferometric measurements, especially for applications with large air volumes such as long cavities or large test parts.

Typical solutions have included moving the test to the stable environment of R&D or QC, waiting until the lab is quiet on weekends or at night, or rigging elaborate test set ups to minimize environmentally-induced measurement noise.

Frame Rate Solutions

A better solution uses short bursts of phase data collection followed by frame averaging. This approach freezes the effects of the unstable environment. Technically this can be accomplished in several ways. Most of the solutions are hardware based to reduce the computational load on the PC. These systems use multiple cameras or optical paths to segment the interferogram into three or more phase-shifted images. As a result, they are optically complex and very expensive.

Enter FlashPhase™

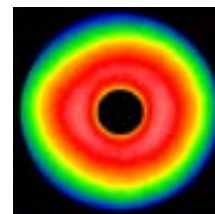
FlashPhase™ is a revolutionary computer-based solution that adds high-speed data acquisition to ZYGO's standard MetroPro™ software. By coupling simple Fizeau geometry with an easy-to-use software enhancement, it achieves the same performance as the expensive, complicated hardware approaches, at a fraction of the cost. Since FlashPhase™ does not modify the interferometer, it does not affect the standard high performance of conventional PMI data

acquisition. Application by application and test by test: FlashPhase™ speed or PMI precision. You choose.

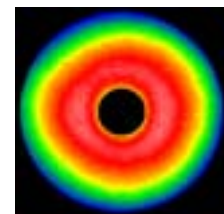
Compare for Yourself

PSI is the standard of performance. But when vibration and turbulence limit your ability to measure, FlashPhase™ gets you the data.

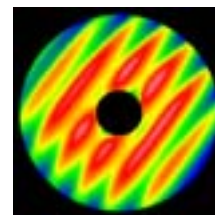
All frame rate systems trade speed for uncertainty, but a quick comparison of the plots below show the high correlation between FlashPhase™ and standard PMI data. FlashPhase™ data is highly repeatable.



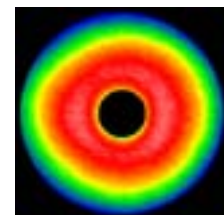
Phase - Stable



FlashPhase™ - Stable



Phase w/Vibration



FlashPhase™
w/Vibration

Frame Averaging Minimizes Noise

Noise tends to be random. When N number of sequentially acquired frames are averaged, the amplitude of random noise

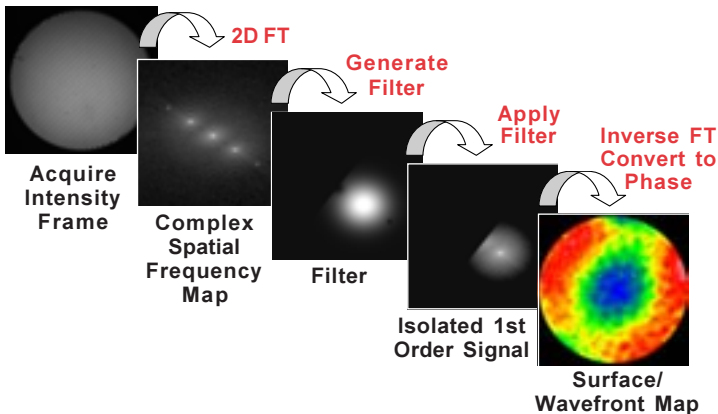
The ZYGO logo, consisting of the word "zygo" in a bold, lowercase, sans-serif font, with a red horizontal bar underneath it.

decreases by $1/\sqrt{N}$). To cut the noise by half, four data sets are averaged. In MetroPro™, you select the number of averages to optimize your measurement. The system then takes over, acquiring all the data sets and averaging the data, giving you the results you need.

How it Works

Traditional PMI methods determine phase by modulating the cavity and capturing multiple intensity frames. Unfortunately, this method takes too long to make measurements in an unstable environment. FlashPhase™ solves this problem by capturing data at high speed, then averaging the phase information extracted from each individual intensity frame.

- Acquire** a single frame of intensity.
- Apply** a 2D Fourier Transform.
- Isolate** the 1st order signal
- Perform** an inverse 2D Fourier Transform
- Convert** to phase heights



Easy to Set Up

ZYGO interferometer's set up and measurement are easy.

- Focus** on the surface of the sample
- Null** the interferometer using the alignment stage
- Set** the cavity tilt with the aid of a software generated alignment target (Nominally, 30 fringes)
- Measure**
- Analyze** using the power of MetroPro™

Data subject to change without notice.

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Easy to Calibrate

As noted above, FlashPhase™ requires the interferometer wavefront to be tilted. Calibration easily removes any resulting wavefront errors. In many instances no calibration is required. For example, tilt-induced wavefront error for large aperture systems (>300 mm) are negligible ($<\lambda/20$).

Other surfaces, such as fast transmission spheres, ($< f/1$) can have errors larger than this value. To remove these errors, calibration is simple:

Insert a reference surface and align to the same tilt as the test part set up.

Measure the part,

Save the wavefront in the SysErr.dat file,

Click on "system error subtract".

Your system is now calibrated.

Shuttering - the Next Level

In extreme environments FlashPhase™ gives GPI HS™ and VeriFire™ AT a real boost. Camera shuttering, available in these systems, is software-controlled and user-selectable. Shuttering down to 30 microseconds freezes even the most severe environments. Once the fringes are frozen, FlashPhase™ measurement proceeds as normal.

Why FlashPhase™?

FlashPhase™ is the right solution. No other option gives you the flexibility of FlashPhase™ speed and PSI precision, the best of both worlds.

FlashPhase™ is easy to use, easy to calibrate, easy to upgrade, and backed by Zygo Corporation's worldwide sales and service.

To schedule a demo, visit www.zygo.com or call 1-800-ZYGO NOW.

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