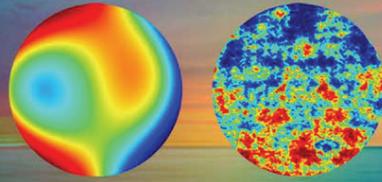# FlatStitch

Large Flat Optic Metrology: Accurate, Fast and Affordable.

Traditional Horizontal "Large Aperture" Interferometers Have Many Problems

Achieving accurate metrology of flat optics larger than 300 mm diameter is difficult and expensive. The massive size of the transmission flat and the extreme cost of the additional optics required for calibration makes the measurement expensive and challenging. Because of these factors the transmission flat (TF) is rarely calibrated. This is made worse as gravity induces a constant, and therefore invisible, astigmatism in the TF and calibration optics further degrades the accuracy by an unknown amount. When considering the TF and calibration optics size, cost, errors due to gravity deformations, and the excessive factory floor space required...an alternative is needed.

FlatStitch

FlatStitch holds the TF to a rational size of either 150 mm or 300 mm. The comparative cost is much improved over a horizontal system since the interferometer optics are the primary cost driver. Äpre's proprietary[4] TF calibration, without user intervention of the TF, assures accuracy and FlatStitch's small footprint occupies minimal manufacturing floor space. The vertical set up also makes positioning the test optic easier as gravity works with you. **Accurate, Fast and Affordable**.

Systems Overview

Stitcher System Size	350 mm	500 mm	800 mm
Measurement Capability	Flat Surfaces Only		
Interferometer Used	S150│4MP	S300│4MP	S300│4MP
Largest Measurable Part	350 mm	500 mm	800 mm
X or Theta Stage Travel Range	X - 300 mm	X - 500 mm	Theta - 360°
Y Stage Travel Range	500mm	800 mm	~800 mm
Part Tip/Tilt Stage	Manual	Motorized	Motorized
Stage Weight Limit	10 kg	160 kg	160 kg
Light Sources	SpectrÄ (SCI) or Ätlas (Wavelength Shifting)		

Accuracy

Accuracy for any area of the part up to the native interferometer aperture size is determined by the native interferometer performance. Accuracy for areas larger than the interferometer aperture can degrade due to the environment, stitching overlap, part fixturing, part geometry, and size and quality of the test surface, all of which are unique to each application. **Theoretical BEST** performance for areas larger than the native aperture are listed in this table to **indicate** how accuracy varies with stitched part size.

Theoretical Best Accuracy[5] of Measured POWER by Stitched Size and Aperture

Size		POWER Term Uc	
Aperture	Test Part	Transmission Flat Calibrated [7]	Measurement [6]
150 mm	150 mm	λ/40, 16 nm	λ/40, 16 nm
	250 mm		λ/14, 44 nm
	350 mm		λ/7, 87 nm
300 mm	300 mm	λ/20, 32 nm	λ/20, 32 nm
	500 mm		λ/7, 88 nm
	800 mm		λ/3, 228 nm

S300│4MP, 500 mm diameter Stitcher

High Performance Work Station

The stages are mounted on a solid granite base, floating on air-isolators to minimize seismic floor vibrations.

The interferometer is mounted on a stiff structure to optimize performance.

Light curtains and other safety options are available.

[1] For more details please refer to the individual specification sheets for these high-performance interferometers
[2] Other interferometer choices are available, inquire at sales@apre-inst.com
[3] Subtracting the calibrated TF shape from subsequent measurements is a standard REVEAL function
[4] Contact Äpre for a copy of the technical paper describing this technique. ÄPRE REVEAL software includes the support software to run this calibration
[5] Measurement Accuracy depends on the entire measurement set up and environment. For instance: test part mounting stresses, test optic thermal equilibrium, stitched area overlaps, air temperature and turbulence stability all require control to optimize accuracy, as in all standard measurement practices
[6] Uc is *Measurement Uncertainty* as defined in the ISO, "International Vocabulary of Basic and General Terms in Metrology", section 3.9.
[7] The calibrated value requires the Transmission Flat to be measured with Apre's patent pending method and the nominal form subtracted by REVEAL software

Specifications subject to change without notice

CAUTION
LASER 2M

REVEAL

Stitching Metrology Software

REVEAL 25: Stitching Software

REVEAL's stitching application controls the entire process:
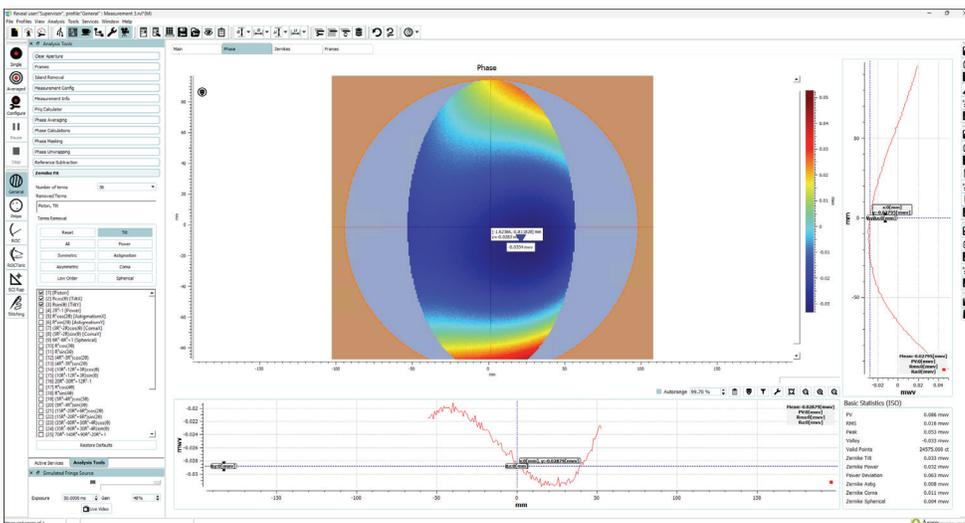
1) Click to move to the load position
2) Click to move to the measurement position
3) Set up the stitching pattern with user selected overlaps and patterns[8]
4) Launch the measurement which automatically follows the stitching pattern
5) Automatically combines the results into a single map for normal analysis
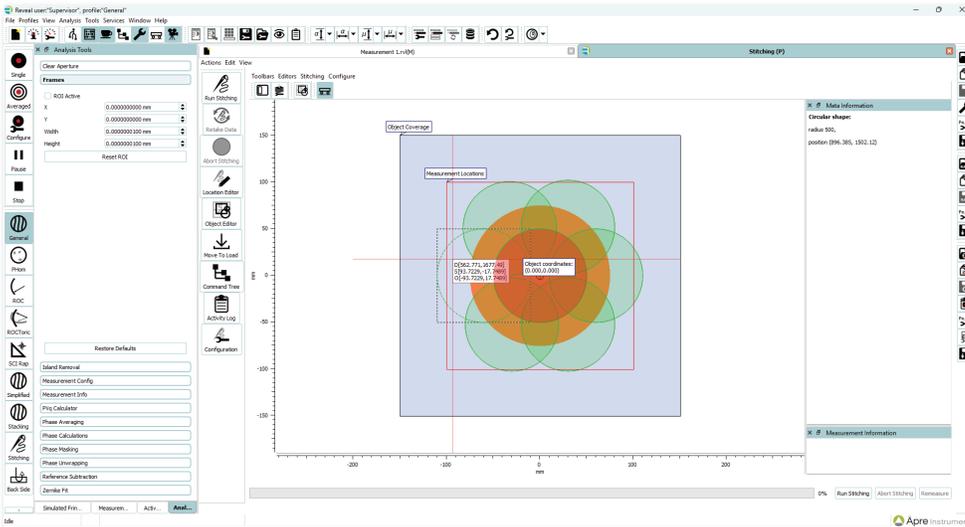
Stitch…

Analyze

Over ten years ago REVEAL innovated interferometer software

- *Traceable metrology via the analysis tree, saved with as-measured (.rvl) data*
- *Data analysis based on international standards and leading laboratories worldwide*
- *Apply filters/masks to data along the entire analysis tree*
- *Fast, consistent reporting via a default, and customizable report library*
- *64-bit operation to handle modern 9-Megapixel and larger cameras without crashing*
- *Remote training and debugging via TeamViewer*
- *Clean, browser like, non-overlapping screens*
- *Compatible with historical .dat data files*

Now REVEAL 25 tightens QC with enterprise control, increases security, and lets you customize screens

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[8] Stitching patterns are designed to optimize the number of measurements needed to cover the measured surface. The maximum dimensions of the measured parts and the aperture of the interferometer will dictate the physical requirements of the system, including the required range of motion for the stages and physical space needed to move the parts safely.