Studio Software Version 10.1

Contents

- *New Hardware*
- *Profile Gauge Editor*
- *Surface Brightness Mask*
- *Secondary Interference*
- *New Gauges*
- *Core Module Improvements*

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New Hardware

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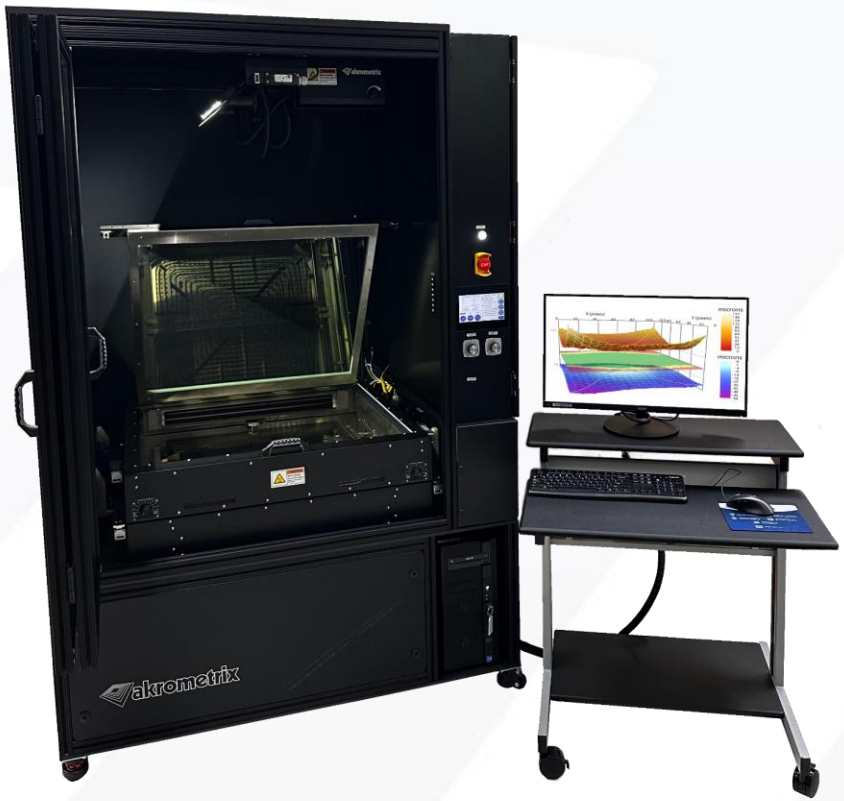
TherMoiré PS600T

Thermal warpage and strain metrology system



- Thermal Warpage and CTE for substrates up to 600mm x 600mm
- Multi-zone top/bottom heating for realistic reflow emulation
- With z resolution down to 1 micron
- Field of View Measurement in 2 seconds
- Automated Part Tracking for multiple samples per measurement cycle
- Optional Capabilities:
  - DFP3
  - DIC3 for CTE Capability

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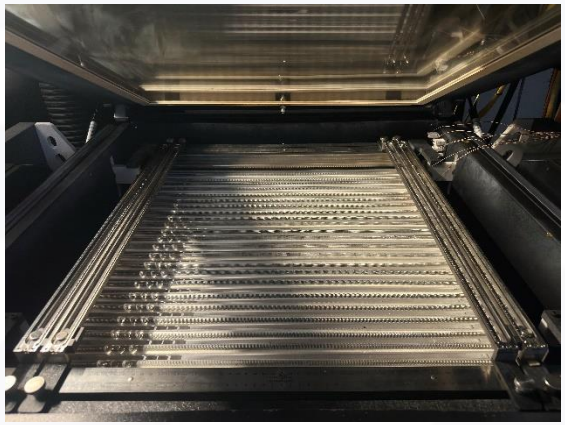
PS600T vs. PS600S

Key Differences



PS600S Oven

- New oven design in PS600T
- 2 zone temperature control on bottom, plus top heater on separate control loop
- Optimized for temperature uniformity

PS600S Oven

	PS600T	PS600S
Thermal Processing Technology	Top: Radiant IR; Bottom: Metal Wire IR	Top: None; Bottom: Radiant IR
Maximum Temperature	300°C	300°C
Maximum Heating Rate °C/sec (from 50°C to 250°C)*	3.5	2
Maximum Cooling Rate °C/sec (from 250°C to 125°C)*	1.25	1.25
Lateral Uniformity	± 6C or better	N/A
Top / Bottom Uniformity	± 3C or better	N/A
HMI Screen Software Control Buttons	Yes	No

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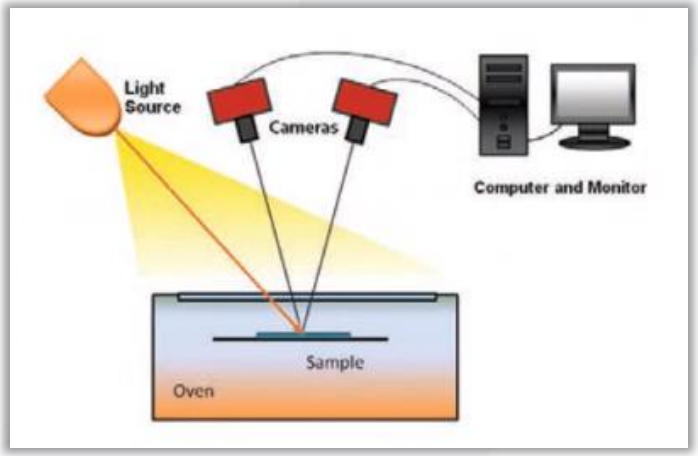
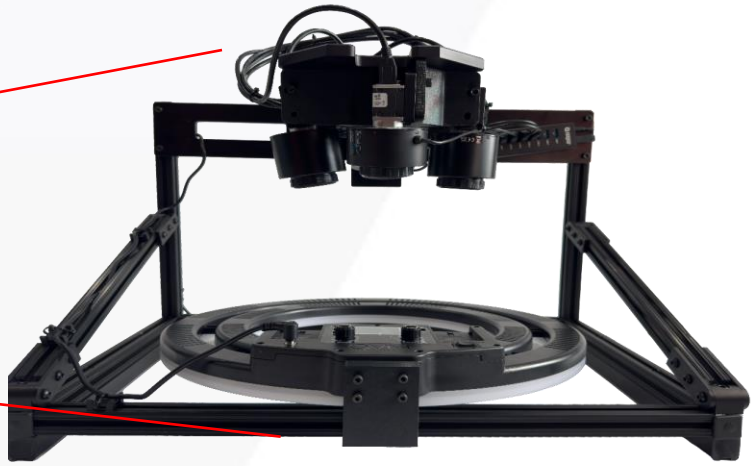
Digital Image Correlation 3 for Thermal Strain and CTE

- Add-on Module to:
  - AXP3 • PS600T • AXP 2.0
- Strain and CTE measurement module
- Data acquisition time < 1 second
- In-Plane Resolution: <0.5 μm
- FOV: 36 x 33 mm to 225 x 205 mm
- Strain Resolution: <100 microstrain (Δ L/L x 10-6)
- Temperature Range: -55°C to 300°C



Base System



Add-On Module

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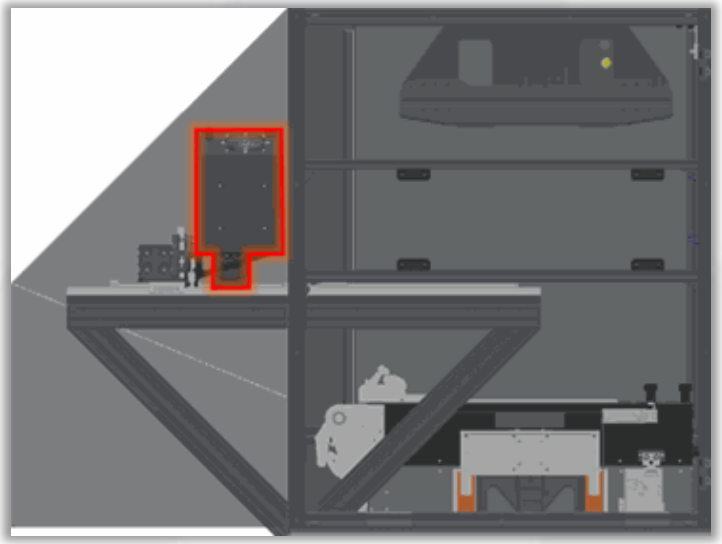
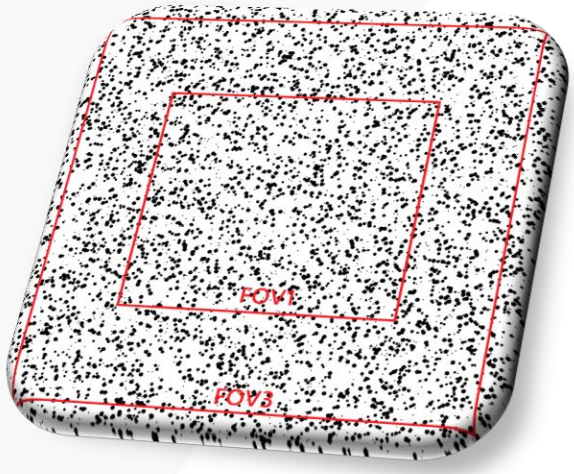
DIC3 – Technical Specs

DIC2 vs. DIC3 Specifications

	DIC2	DIC3
Camera	5.3MP	18MP
FOV 1	72mm x 90mm (50mm lens)	45 x 41mm to 36 x 33mm (100mm lens)
FOV 2	115mm x 150mm (35mm lens)	105 x 96mm to 87 x 80mm (50mm lens)
FOV 3	N/A	225 x 205mm to 205 x 188mm (25mm lens)
Module Changeover Automation	No	Optional





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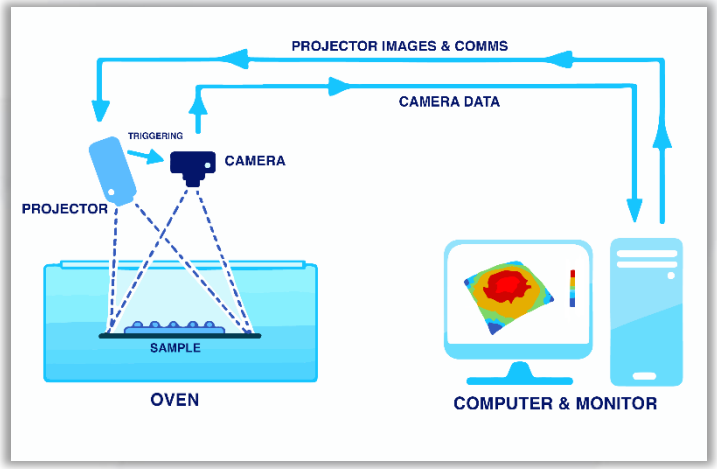
Digital Fringe Projection (DFP3)

- Add on module to the AXP 2.0, AXP3, and PS600T
- Provides warpage measurements for discontinuous surfaces
- 16MP Camera with variable zoom and high zoom macro lenses
- Data acquisition time < 2 second
- Pixel size: down to 10.5um pixels
- Out-of-Plane Resolution: 1.5 μm (depending on field of view)
- Temperature Range: 26°C to 300°C
- Field of View: 240x192mm; 47.5x38
- Minimum Sample Size: 0.5x0.5mm
- Maximum Measured Surface Coplanarity: 50mm



Base System

Add-On Module

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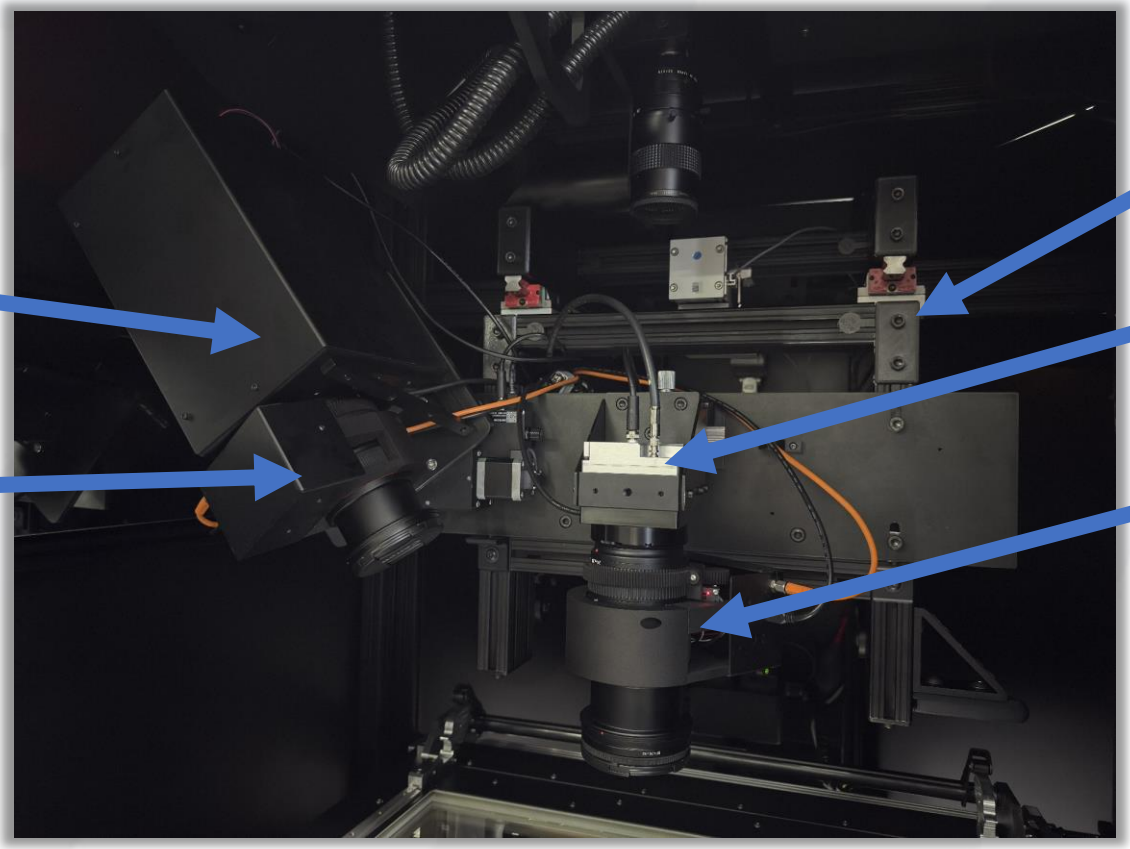
DFP3 Module installed

In TherMoiré AXP 3



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New Features

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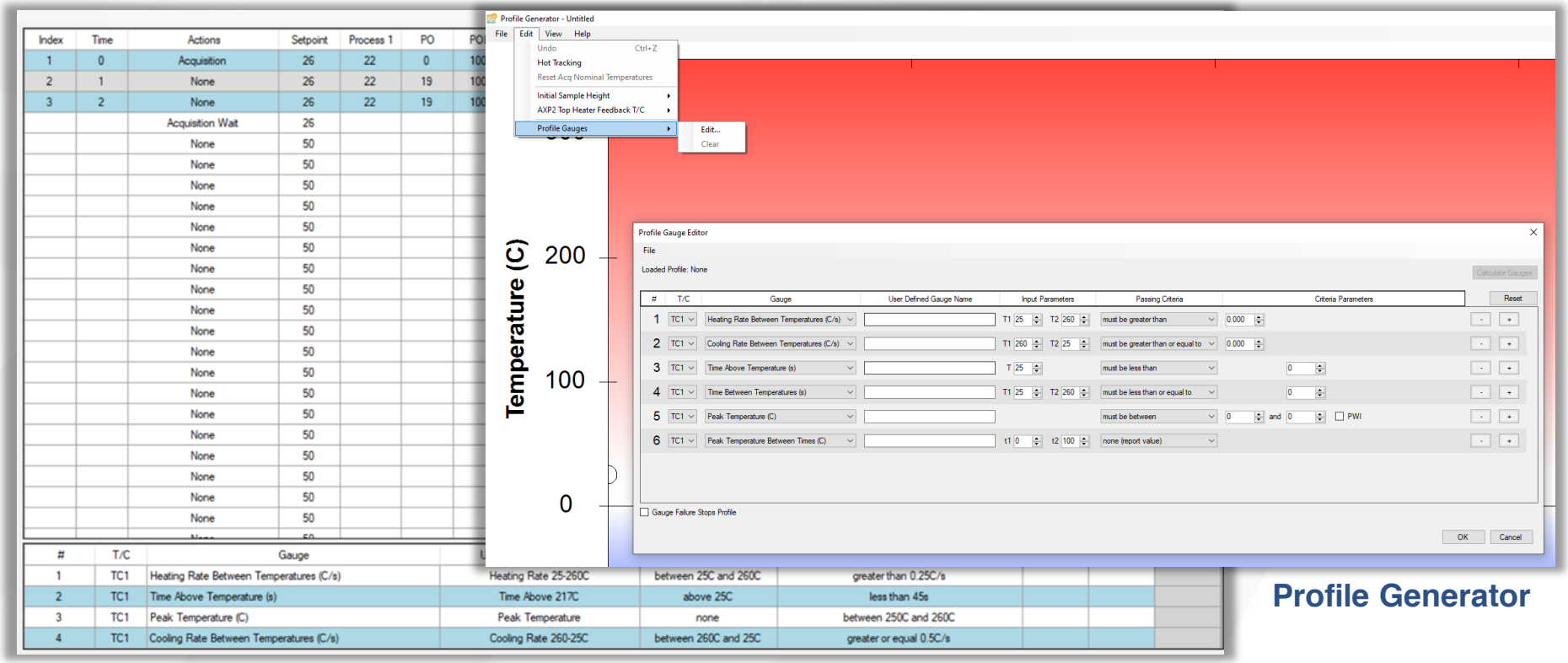
Profile Gauge Editor



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3	2	None	26	22	19
		Acquisition Wait	26		
		None	50		
		None	50		
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#	T/C	Gauge					
1	TC1	Heating Rate Between Temperatures (C/s)	Heating Rate 25-260C	between 25C and 260C	greater than 0.25C/s		
2	TC1	Time Above Temperature (s)	Time Above 217C	above 25C	less than 45s		
3	TC1	Peak Temperature (C)	Peak Temperature	none	between 250C and 260C		
4	TC1	Cooling Rate Between Temperatures (C/s)	Cooling Rate 260-25C	between 260C and 25C	greater or equal 0.5C/s		

Profile Generator

Thermal Profiler

- Users can set conditions for monitoring: Heating rate between temperatures, Cooling rate between temperatures, Time above temperature, Time between temperatures, Peak temperature, Peak temperature between times
- When profile gauges are enabled, a new panel will appear to the right of the profile table, displaying the results.
- Results are displayed as either passing or failing and can be configured to stop the profile on failure.

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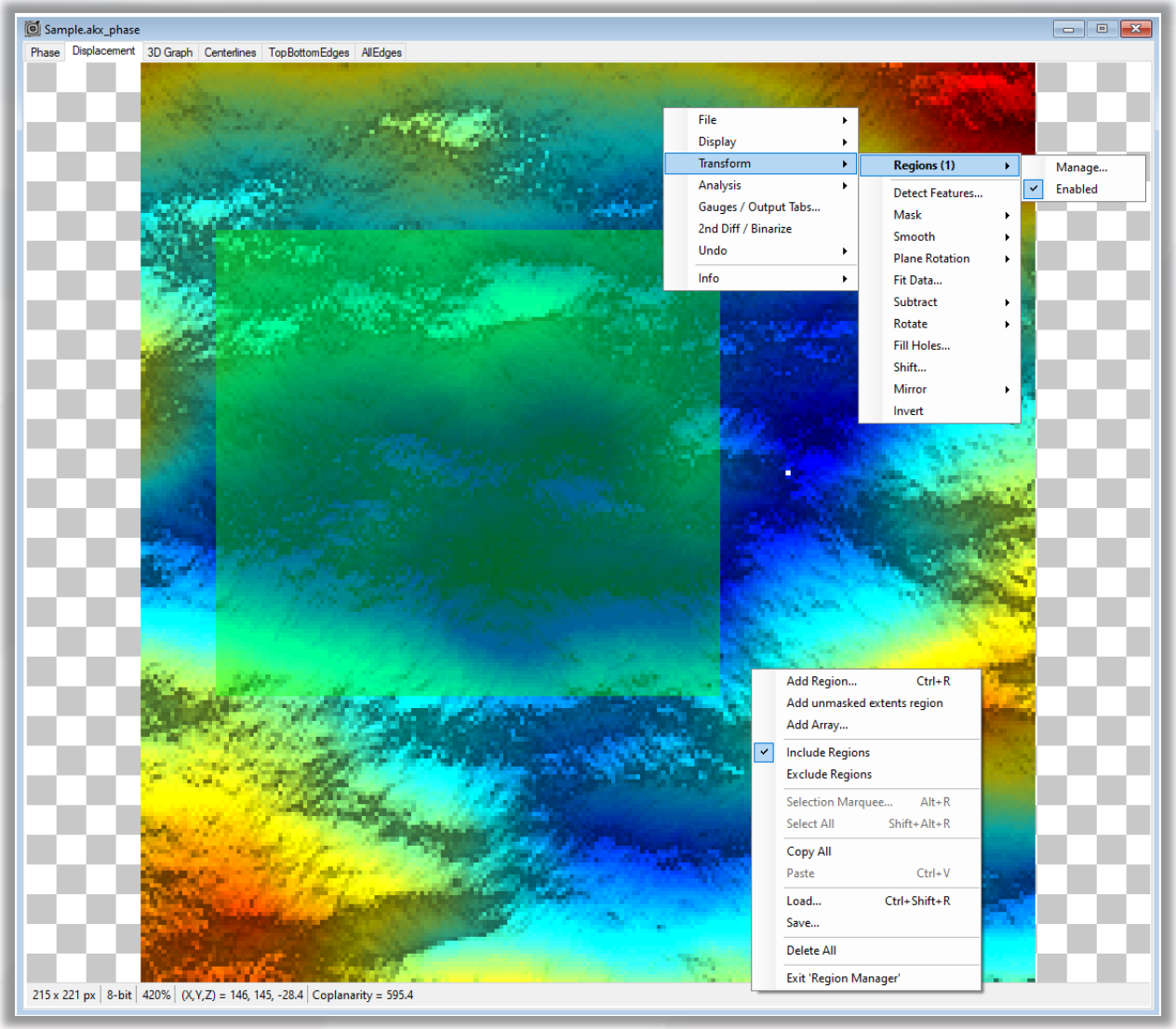
Regions



- Regions can be defined for both Displacements and Phases, then saved and loaded for convenience
- Once the desired regions have been defined, subsequent processing will be restricted either within or outside the defined regions

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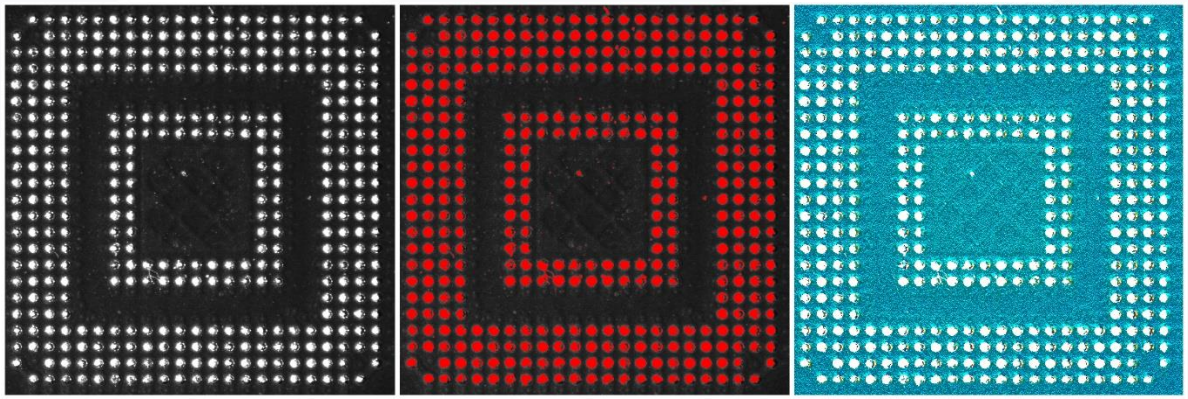
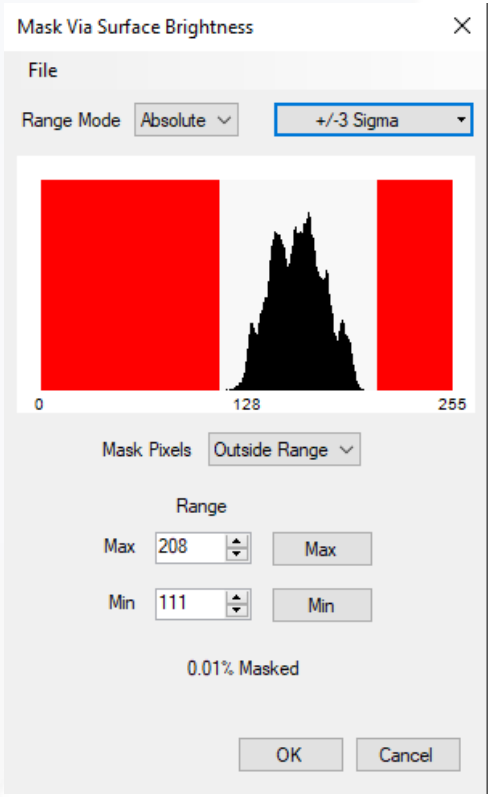
Surface Brightness Mask

- The surface brightness mask filters data based on grayscale intensity values to exclude areas that are relatively bright or dark.
- Users can define manual min and max values(left- or right-clicking on the histogram), or choose a preset range of standard deviations

Unpainted BGA can be illuminated so that solderballs saturate, making it easy to isolate and remove the ball regions.



BGA Surface | **Surface Brightness Mask** | **Substrate w/ mask applied**



Surface Brightness Parameter Window

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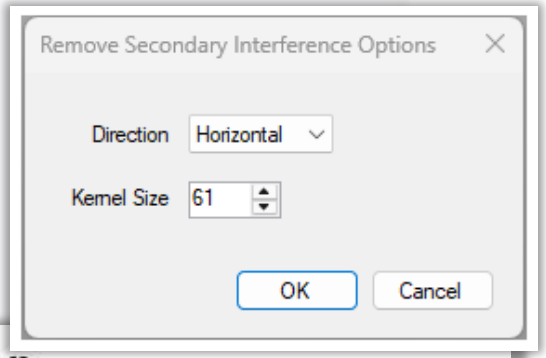
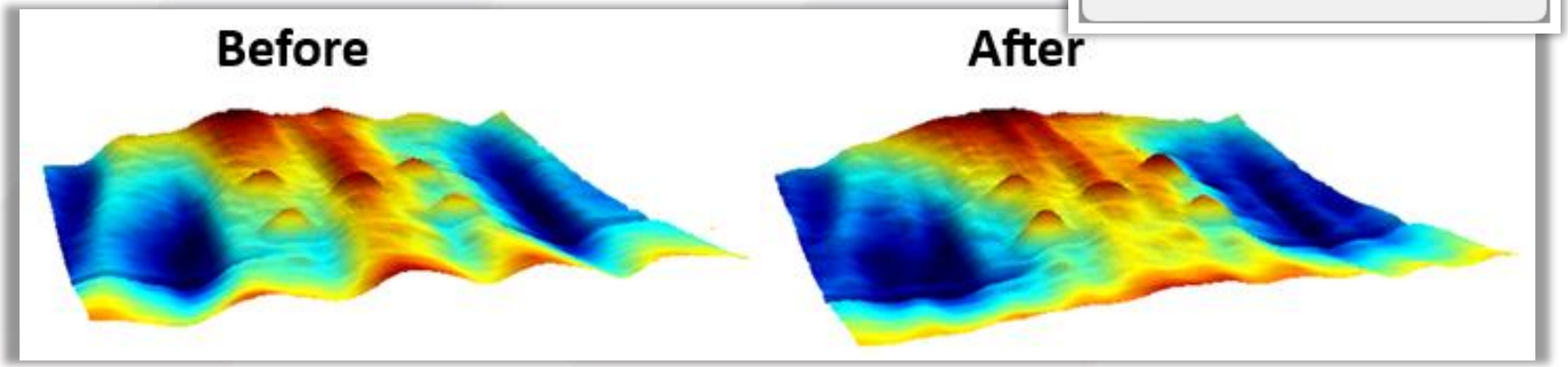
Secondary Interference Removal

- Shadow Moiré measurements can show unwanted secondary interference patterns caused by repetitive surface features; traditionally, this is reduced by rotating or painting the sample.
- A new post-processing option, **Remove Secondary Interference**, reduces this rippling without altering the sample by subtracting a best-fit sine function from the data.
- Users can choose the ripple direction (horizontal or vertical) and tune the kernel size to better fit complex surface patterns.





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New Gauges

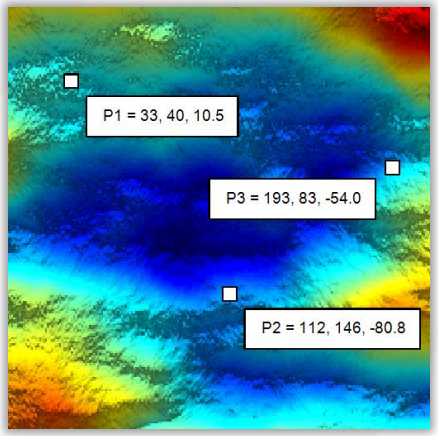
More Signal Strength Signed Warpage Options

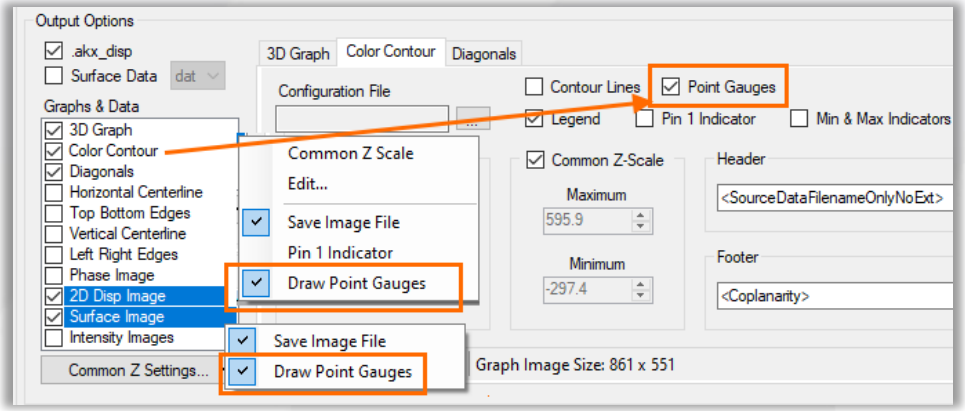
- 3SP warpage: Calculates same numerical value as 3S warpage, but forces the transition results to be positive
- 3SP warpage DB: Calculates same numerical value as 3S DB warpage, but forces the transition results to be positive
- 3SN warpage: Calculates same numerical value as 3S warpage, but forces the transition results to be negative
- 3SN warpage DB: Calculates same numerical value as 3S warpage DB, but forces the transition results to be negative

Point Gauge

Determine z-value at user specified point(s)

- Support for both individual displacement files and batch processing
- Tables and plots for each point are available in reports
- The point gauges can also be added to Color Contour, 2D Disp Image, and Surface Image





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Core Module Improvements

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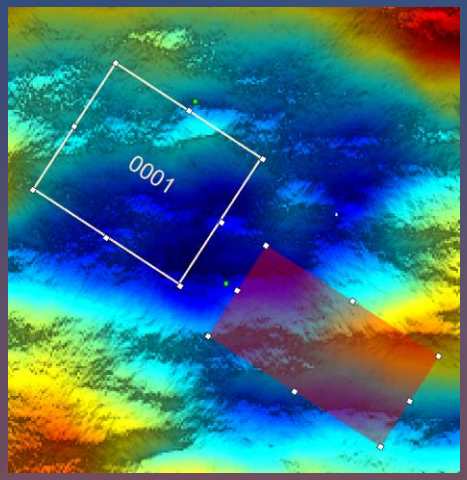
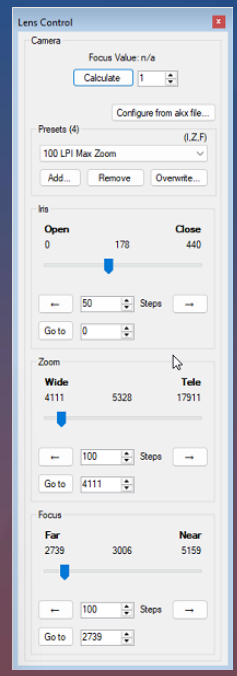
Core Module Improvements

Surface Measurements

- Regions of interest can now be rotated
- Improved interface by moving lens control options to a separate window
- Independent left/right camera focus, Lens Control focus adjustment, and target dot info for DIC
- Faster DFP startup with initialization progress bar and quicker .akx_disp saves





Thermal Profiler

- Profile Gauges
- More profile data is available, with user-configurable reporting options
- Improved safety with sliding door interlock and autosaving profile outputs.

#	T/C	Gauge	User Defined Gauge Name	Input Parameters	Passing Criteria	Value	Result	PWI (%)
1	TC1	Heating Rate Between Temperatures (C/s)	Heating Rate 25-260C	between 25C and 260C	greater than 0.25C/s			
2	TC1	Time Above Temperature (s)	Time Above 217C	above 25C	less than 45s			
3	TC1	Peak Temperature (C)	Peak Temperature					
4	TC1	Cooling Rate Between Temperatures (C/s)	Cooling Rate 260-25C					

Output Settings

Data File

akx_phase akx_disp

Profile Gauges (2)...

Metadata...

Index	Time	Actions	Setpoint	Process 1	PO	POL	CM	BS	POL
1	0	Acquisition	26	22	0	100	Cool	Off	100
2	1	None	26	22	19	100	Heat	Off	100
3	2	None	26	22	19	100	Heat	Off	100
		Acquisition Wait	26						
		None	50						
		None	50						
		None	50						

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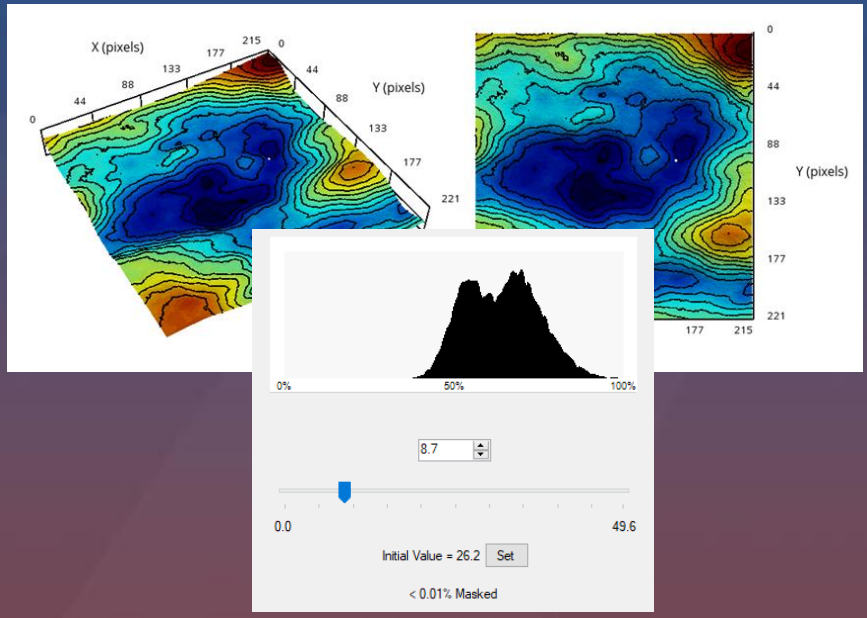
Core Module Improvements

Surface Analysis

- Histogram for phase amplitude value selection
- Regions of interest can now be rotated
- Added contour lines feature for 2D and 3D plots
- Displacement data can now be saved in .csv format
- Added Help menu access to the Optical Techniques and Analyses 101 document



License Utility

- Users are notified if a key update file contains no changes

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