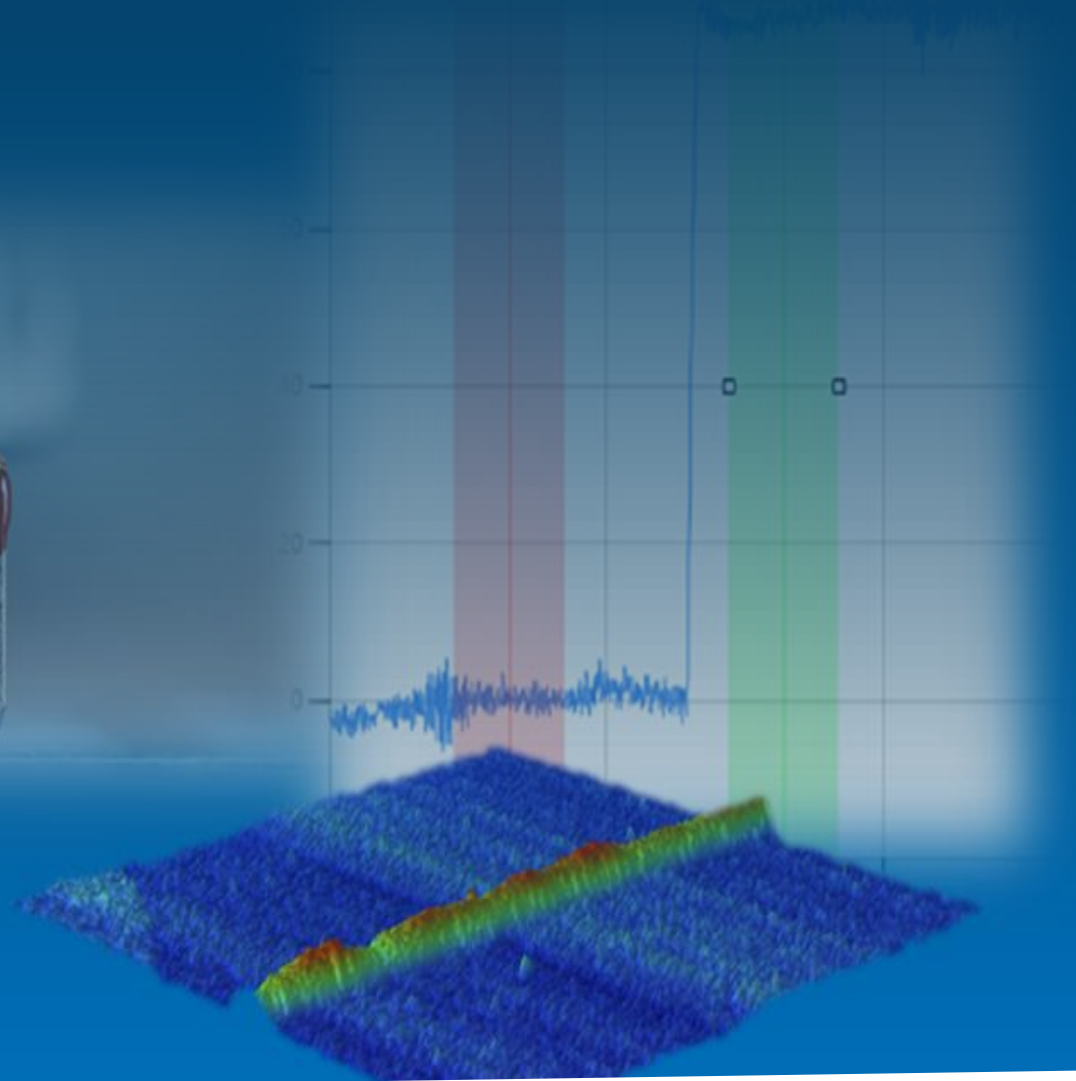


PRODUCT PRESENTATION

DektakXT

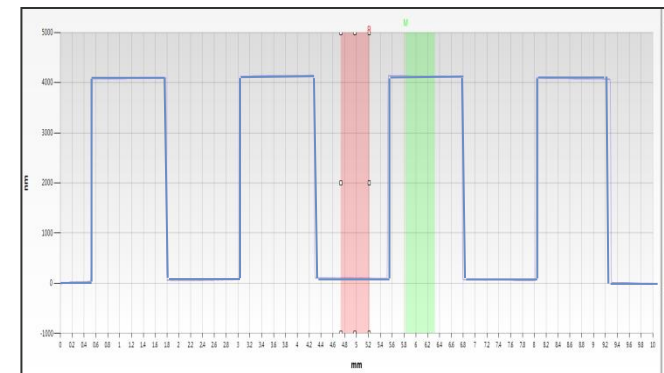
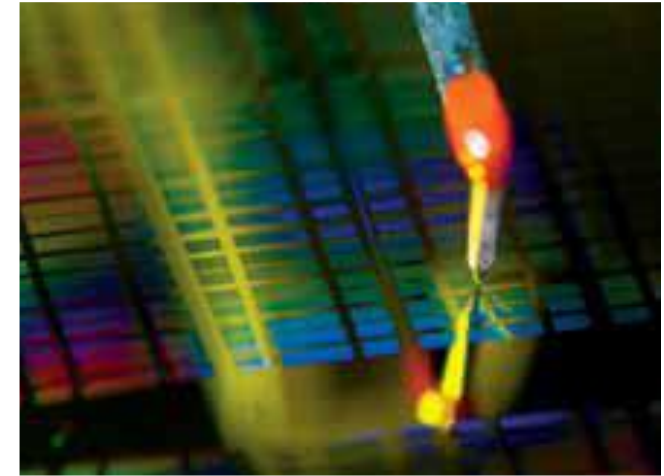
Speaker
email
Date



Advantages of Stylus Profilometry

To Monitor Thin Film Deposition:

- Excellent measurement repeatability
- Measure thin films below 50 Å (5 nm)
- Thin transparent films or dissimilar optical characteristics
- Long scan measurements up to 200mm to analyze thin film stress
- Ease of use (fast, simple, step heights)
- Lower cost, long life, durable and upgradeable



Dekak-XT Stylus Profiler

- Unmatched performance and better than 5 Å repeatability
- Unprecedented efficiency and ease of use
- Incomparable value from the world leader in stylus profilers



DektakXT Technological Advances

- Improved Resolution Through:
 - Lower noise floor achieved with new Single-Arch design for improved stability
 - Built-in vibration isolation
 - “Smart Electronics” establish new low-noise benchmark
 - New environmental enclosure design reduces affects of acoustic noise and air currents
 - Improved baseline stability by referencing all scans to thermally stable, glass optical flat, polished to Lambda-over-ten ($\lambda/10$)
- Enables step height repeatability of better than 5 Å !



DektakXT Configurations

- Configurations to meet your application and budgetary requirements
- Upgradeable for future application needs
- Incomparable value from the world leader in stylus profilers



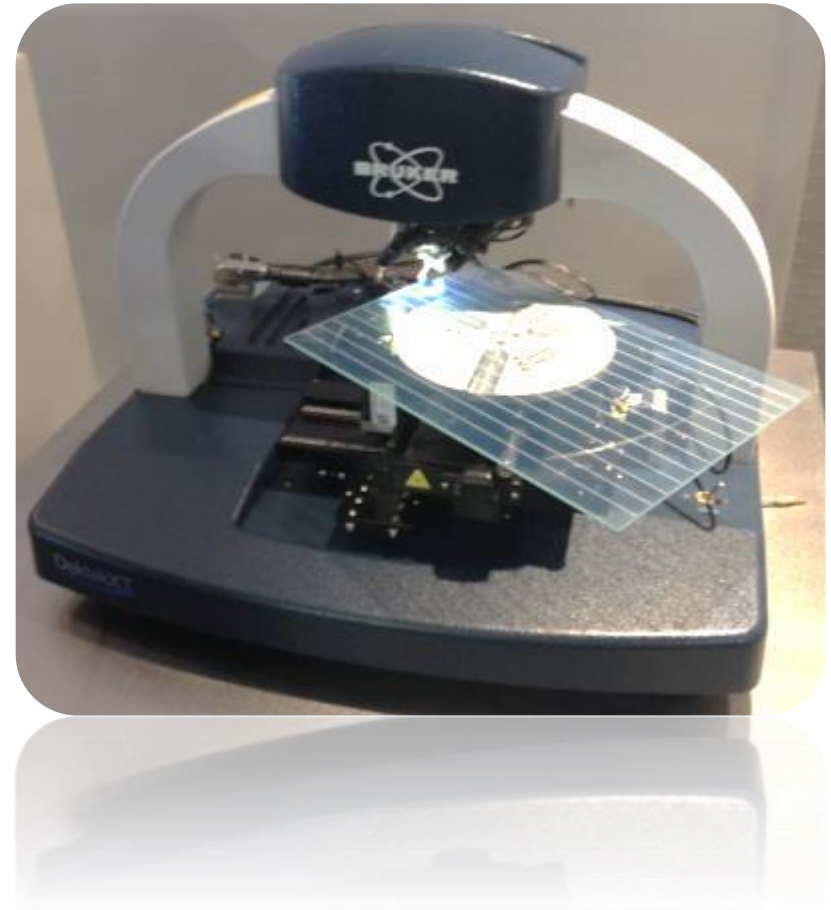
Manual XY Stage Configuration



Auto X-Y-Theta Stage with 8" wafer vacuum chuck

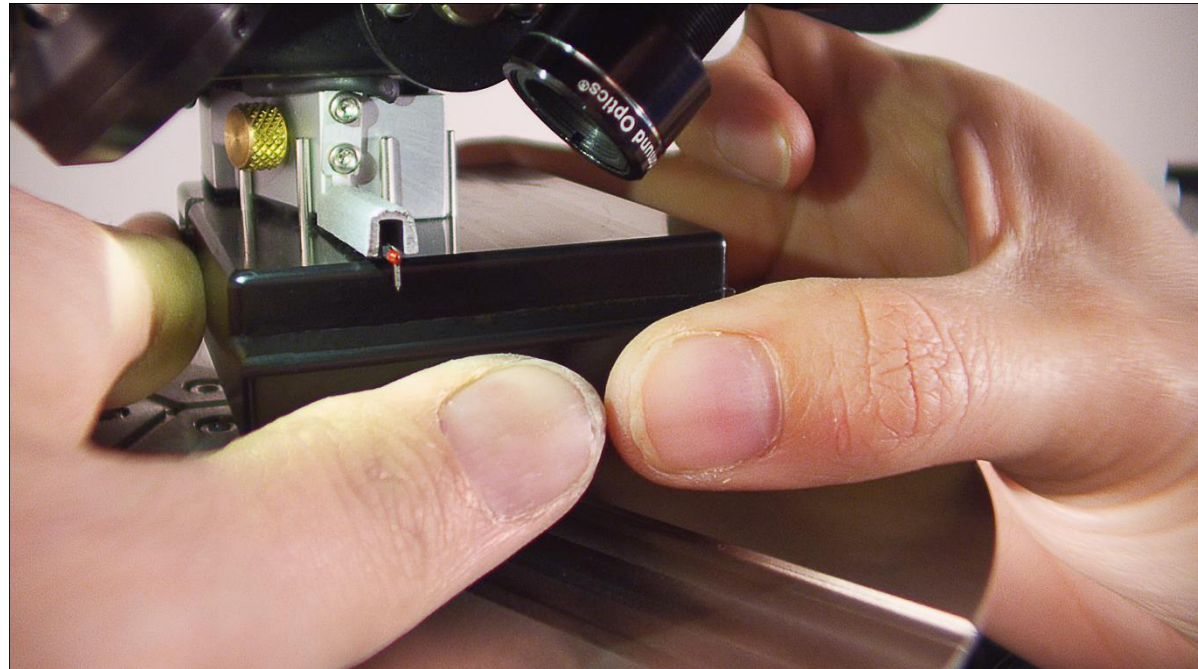
Sample space

- Bridge design accommodate large samples
 - Dektak-XT accommodates up to 8" wafer
 - Bridge design allows flexibility on sample positioning
 - Example of glass panel



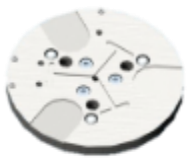
Effortless Tip Exchange

- Self-aligning styli and assembly enables tip exchange in less than a minute
- Removes concern of mistakes in multi-users facilities

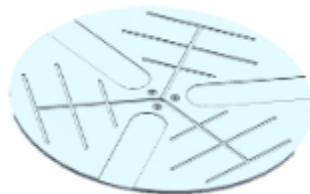


Dektak-XT Options

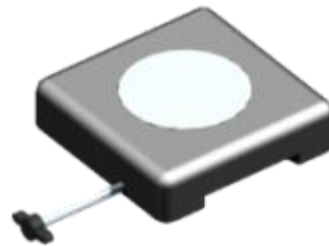
- **Isolation Pads:** Provide additional vibration resistance. 4-pads connect to central air line. Requires ~50psi air
- **Laptop:** Reduces foot-print and increases portability for limited space lab or clean room.
- **Multiple Chuck Options:** A variety of vacuum chucks available for 50mm to 200mm wafers, as well as ceramic vacuum chucks for small, flexible samples, and 6" square solar chuck



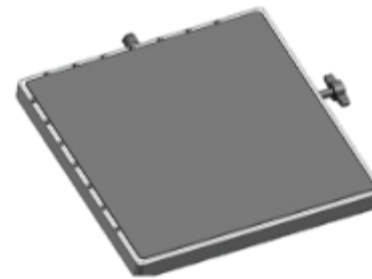
DXT-2-3IN WVC



DXT-8IN WVC



DXT-CVC

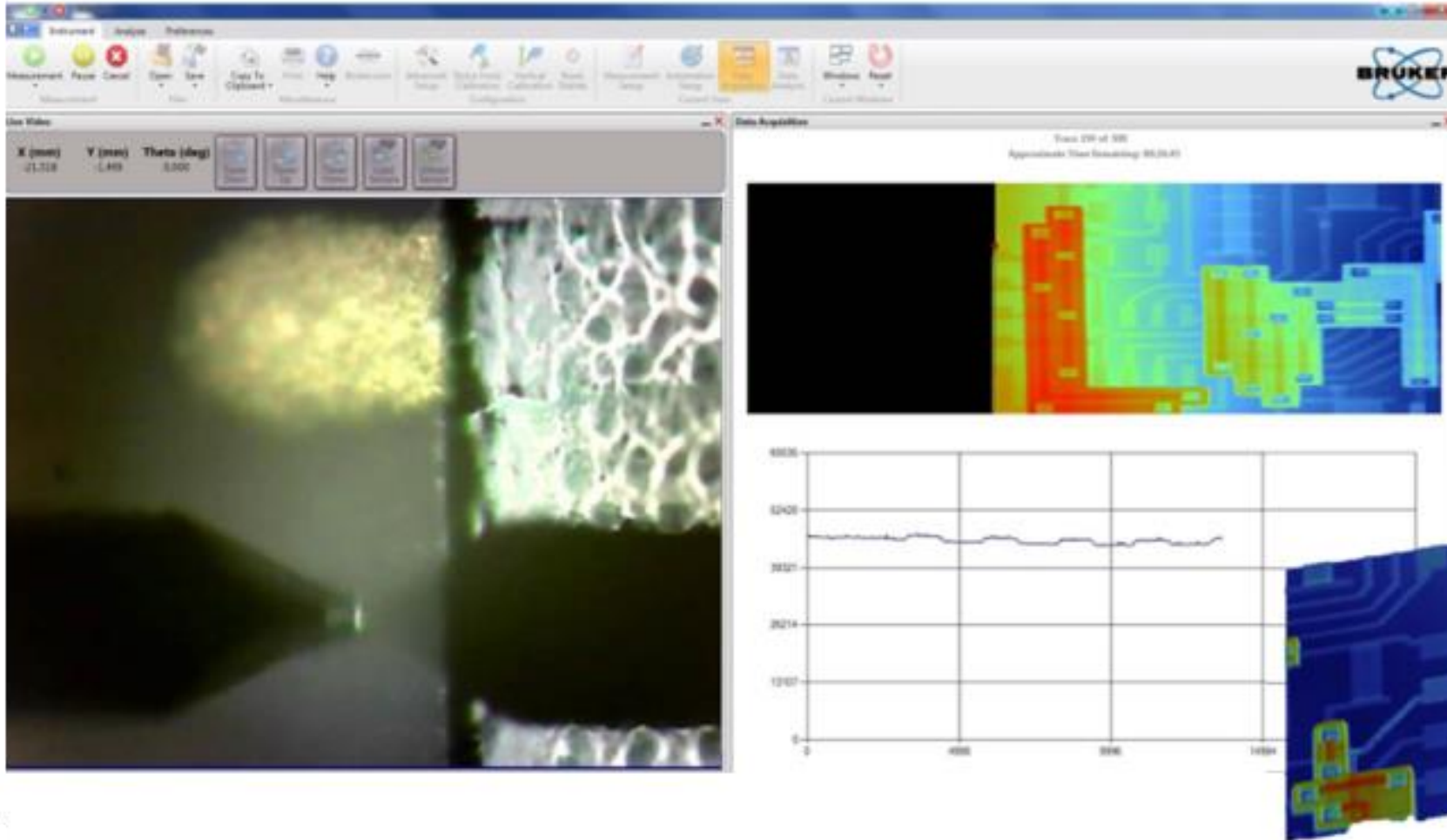


DXT-PV CHUCK



Black Stainless Steel Chuck (6inch)

Dektak-XT Live 3D Mapping



- Progression of 3D map collection, the current line scan, and live tip movement across the sample surface
- Visual features enable a complete and constant understanding

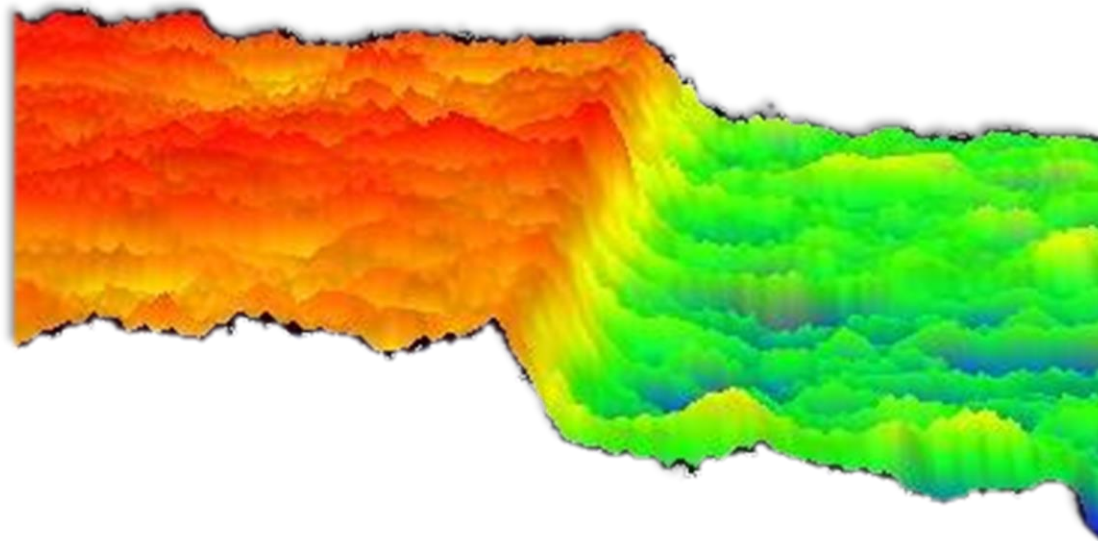
DEKTAK-XT

Vertical & lateral performances

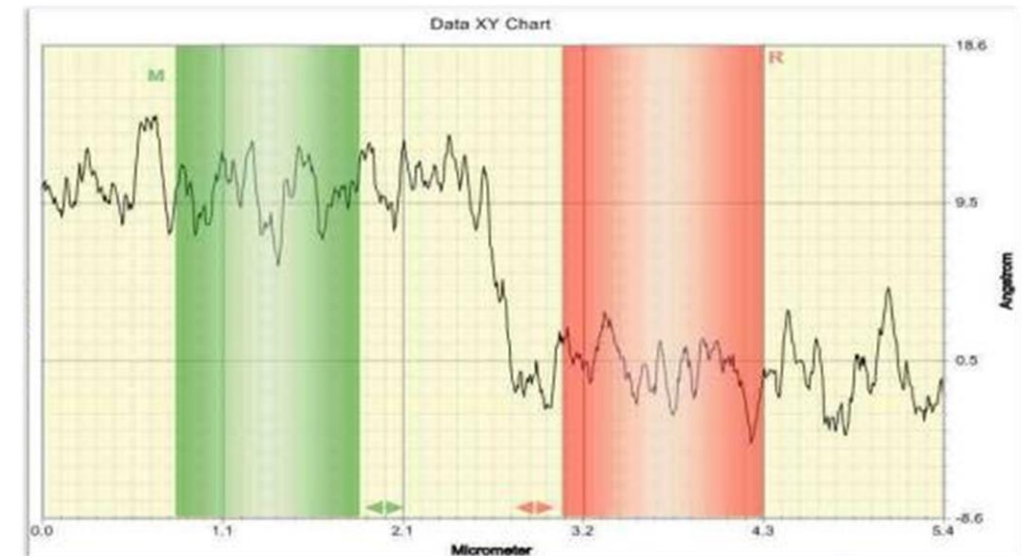
Ultimate vertical resolution Design for stability

- Dektak-XT is the champion for vertical resolution by its rigid bridge design.

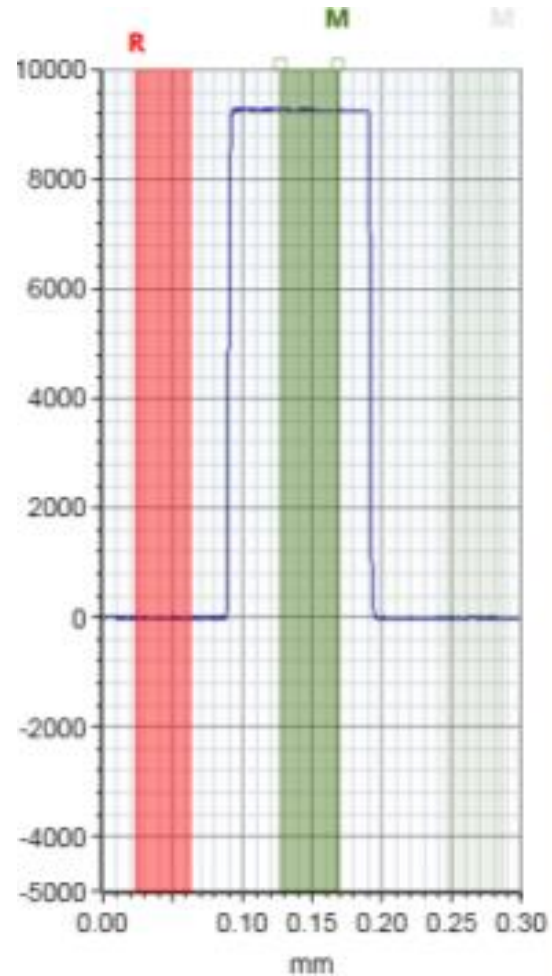
3D of 1 nm step



Profile on 1 nm step



Ultimate proven vertical repeatability < 0.5 nm repeatability on 1 μm step



Analytical Results						
Label	Value	R Pos	R Width	M Pos	M Width	ID
Total_ASH	9268.57 Å	24.46 μm	38.205 μm	0.168 mm	-41.18 μm	Segment 2

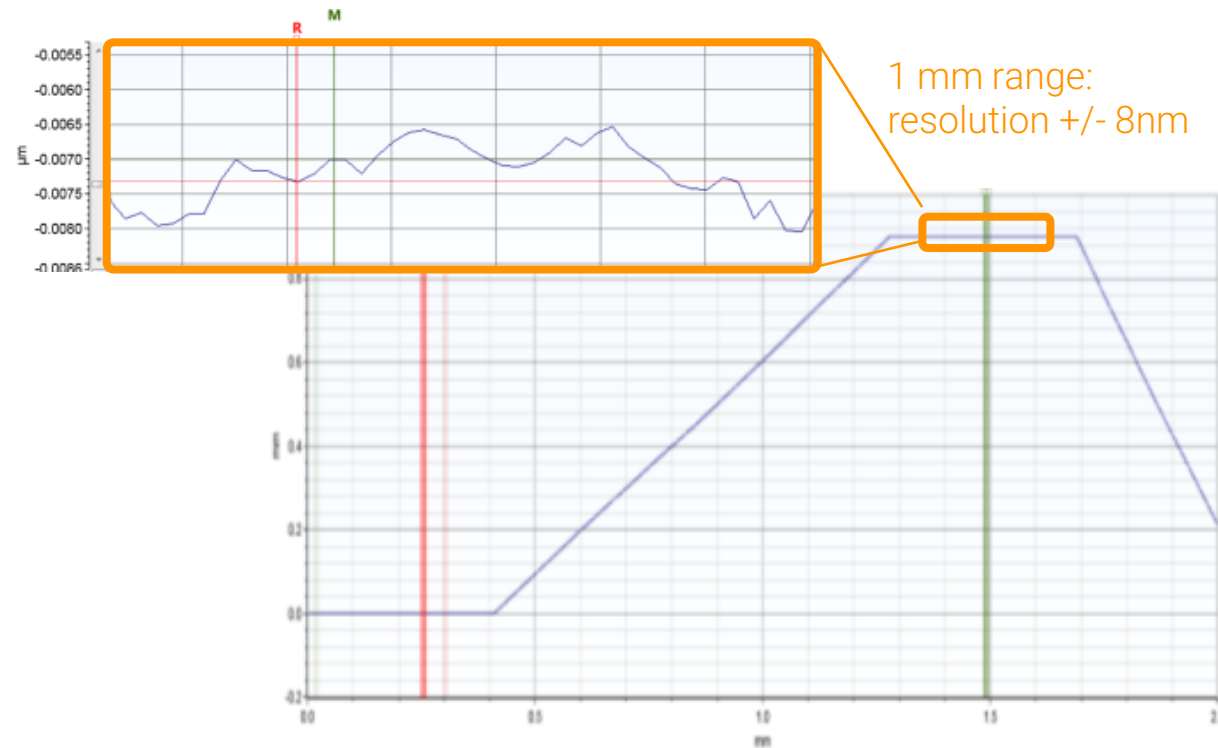
Meta Data	
Label	Value
Date	11/4/2012
Profile	HillsAndValleys
ScanDuration	7 s
ScanLength	300 μm
ScanResolution	0.142721 μm
ScanType	Standard Scan
StylusForce	3 mg
StylusScanRange	6.5 μm
StylusType	Radius: 2 μm
Time	9:23:47 PM

Fast scanning
& low force

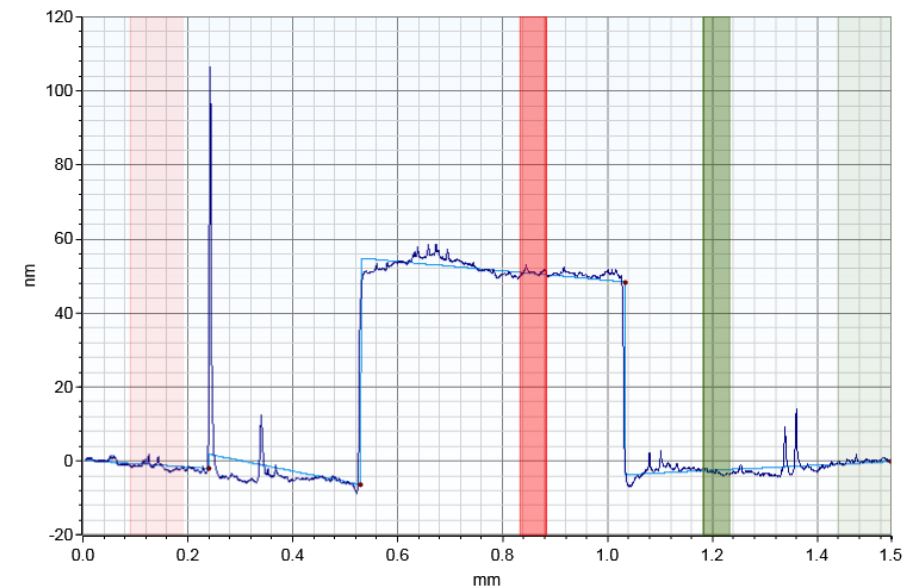
Database	
Measurement Number	Total_ASH Å
	R: 0.0244599 mm M: 0.168157 mm Always Always
13	9263.985
14	9268.909
15	9267.659
16	9270.775
17	9270.314
18	9267.495
19	9266.934
20	9255.471
21	9260.271
22	9264.278
23	9267.930
24	9270.673
25	9268.644
26	9256.782
27	9261.889
28	9257.183
29	9263.208
30	9265.689
31	9266.923
32	9268.573
Avg:	9266.586
Std:	4.458
Max:	9272.771
Min:	9255.471
Range:	17.301

From nanometer till millimeter Single head

- Cover wider range of application in seamless manner: click & measure!
- One single measurement head covers from 1 nm till 1 mm step height as well as load from 0.03 up to 15 mg



0.9 mm step @ 15 mg

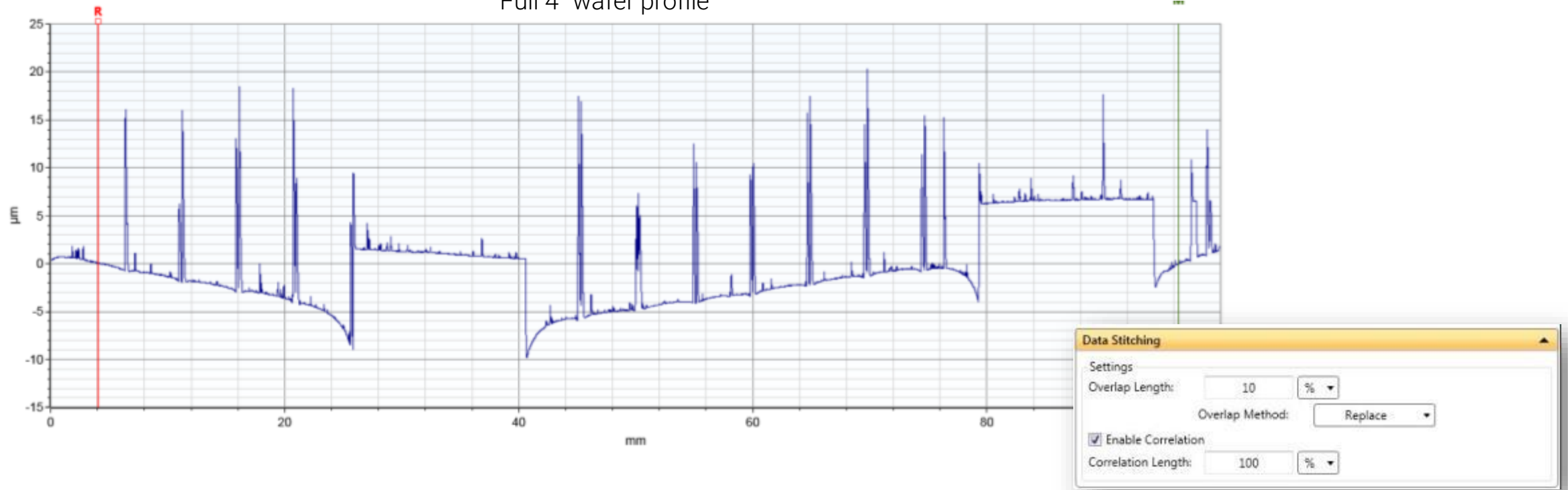


54 nm step @ 0.03 mg

160 mm scan length Flatness and Stress up to 8" Wafer

- Advanced algorithm ensures slope & feature continuity to extend scan length up to 160 mm

Full 4" wafer profile



DEKTAK-XT

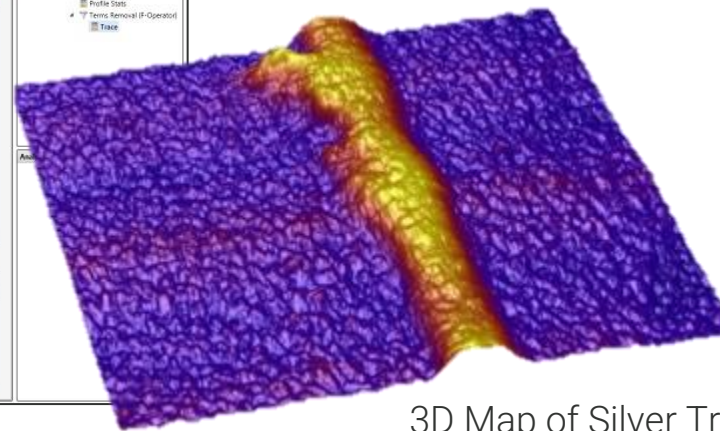
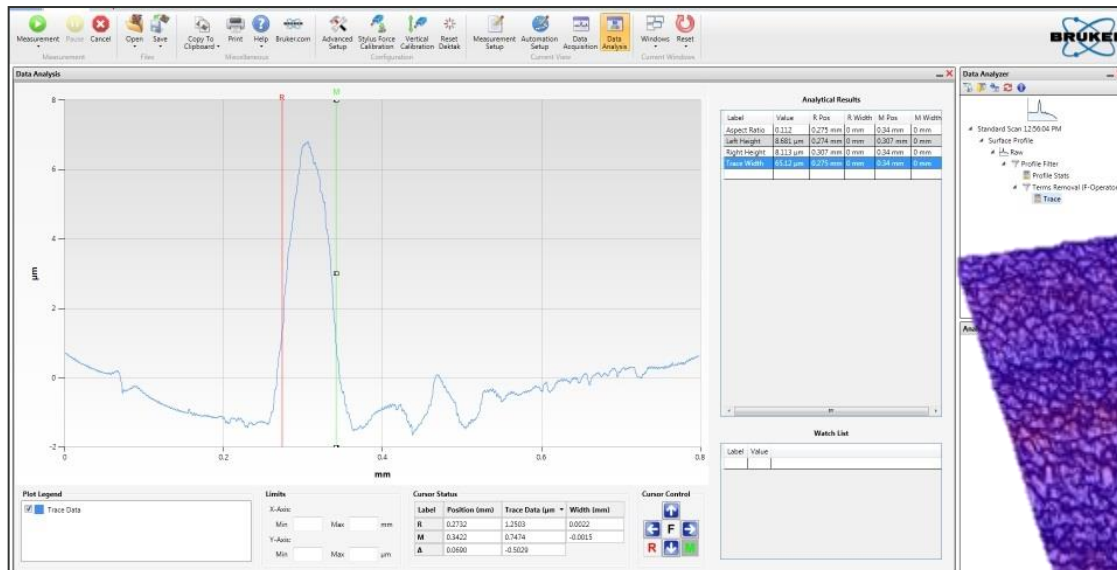
Applications

Photovoltaics

- Inspection of conductive streets
- Monitoring deposition process of thin film
- Laser scribing control and monitoring
- Thin film stress measurements



Mono & Poly Crystalline Cells



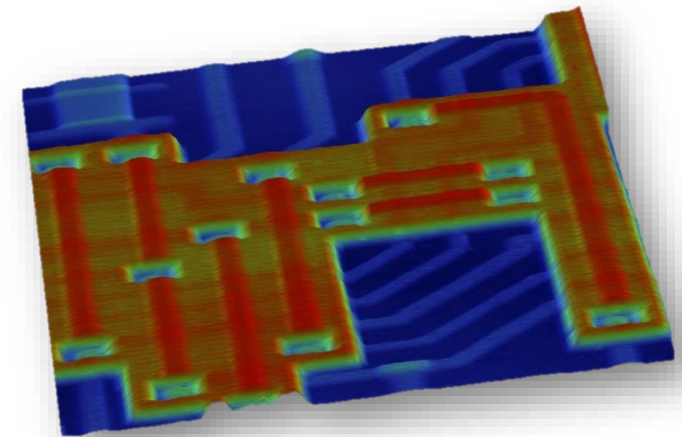
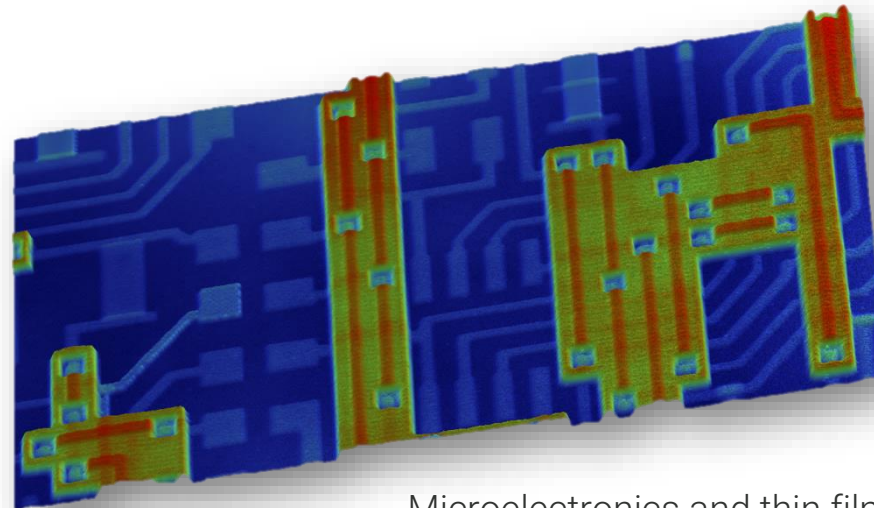
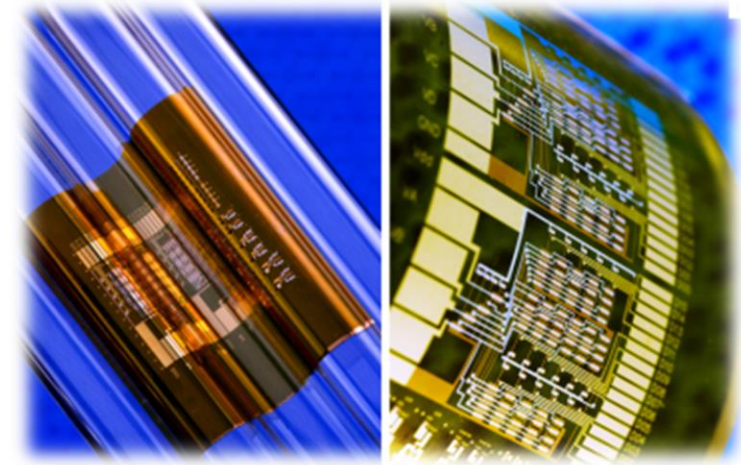
3D Map of Silver Trace



Flexible Solar Cell

Microelectronics Applications

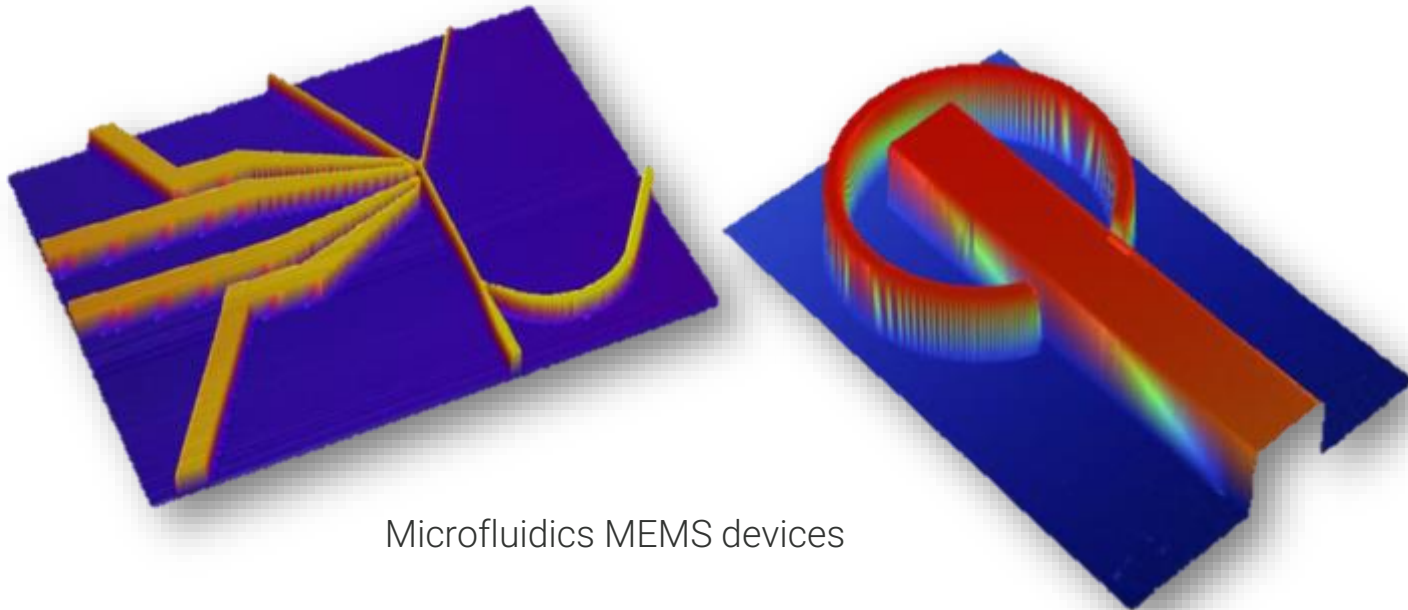
- Monitoring deposition and etching processes
- Measuring trench depth dimensions
- Microelectronics extend into aerospace, medical, automotive
 - Sensors in demanding environments
 - Rigid ceramics to flexible circuits



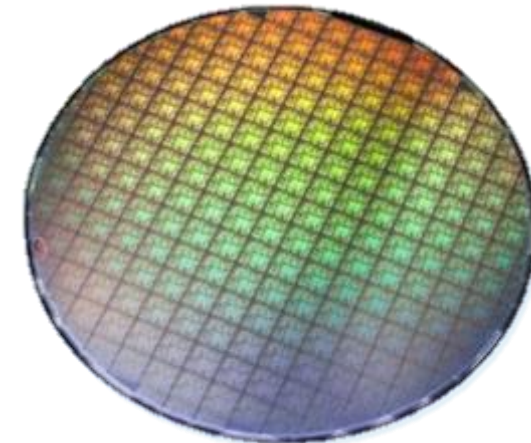
Microelectronics and thin film step heights

MEMS Applications

- Measure large vertical features of sensitive materials (up to 1 mm tall)
- Low force measurement capability applies a light touch on sensitive materials to measure vertical steps and roughness without damaging the sample's surface

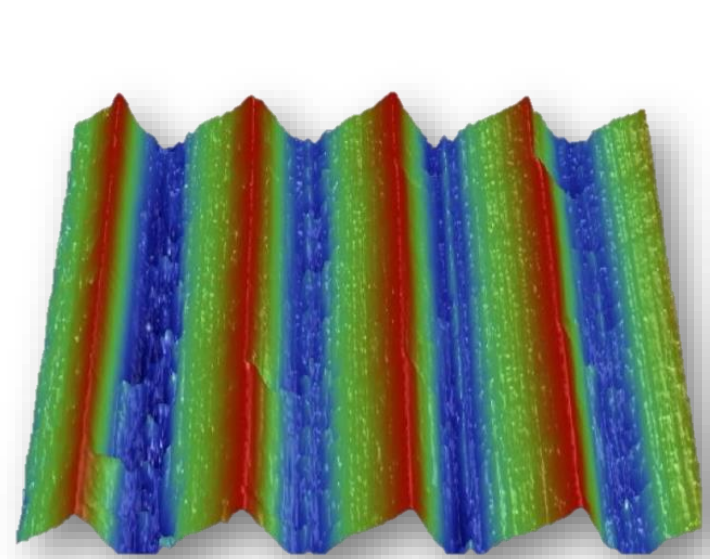
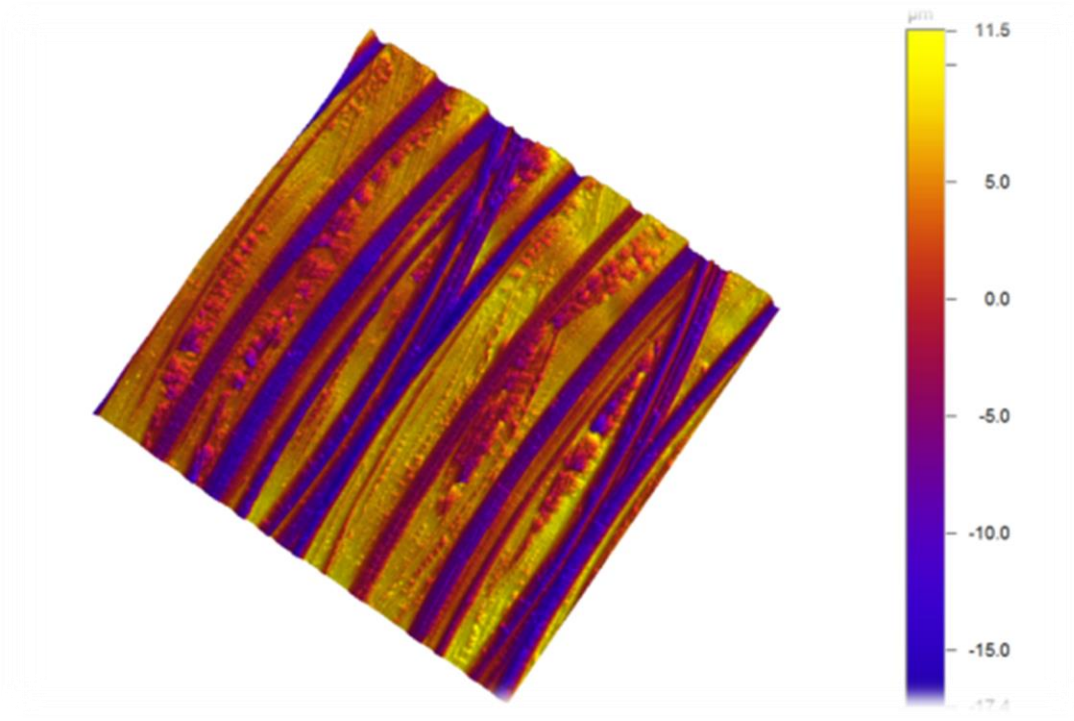


Microfluidics MEMS devices



Machined Surfaces Applications

- Medical application: Verification of hydroxyapatite growth on implant backside
- Inspection of polished surfaces



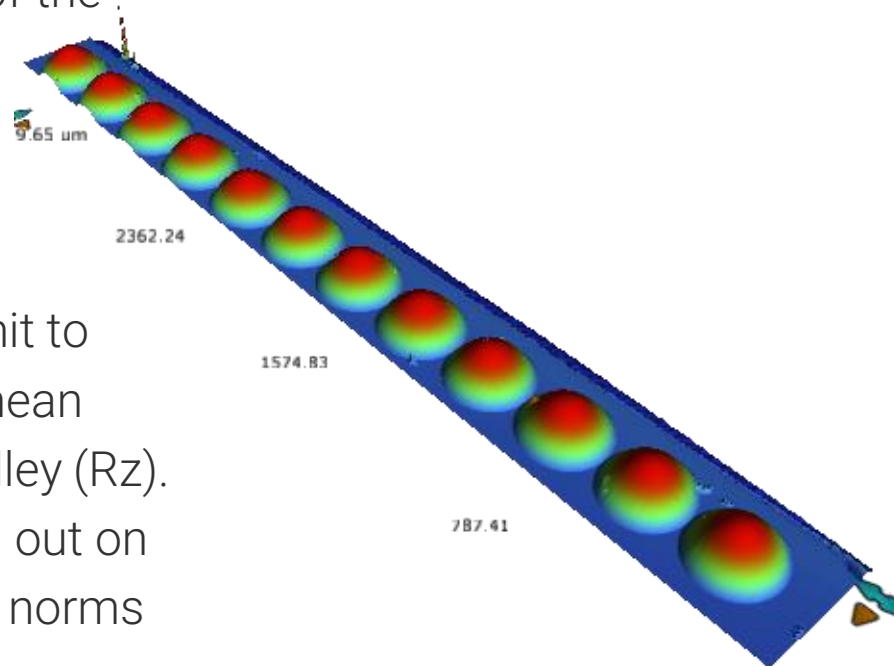
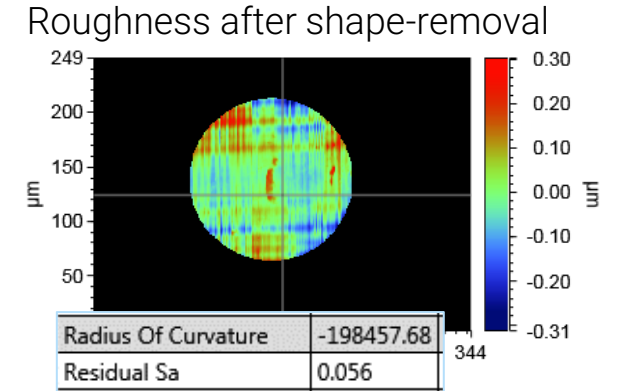
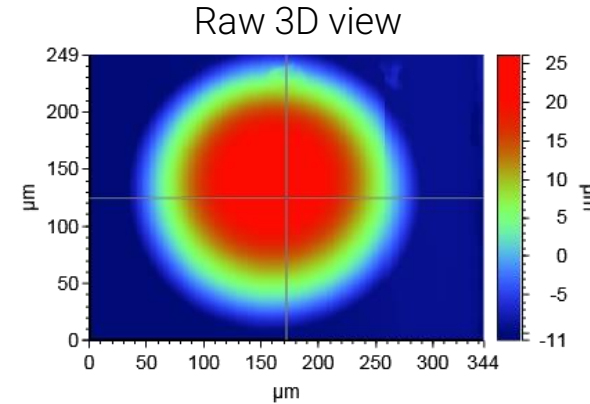
Thin Film Applications

- Microelectronics and Semiconductor devices
- Thin film coatings on glass for buildings, automobiles or aircraft
- UV or hardness coatings on eye glasses or sun glasses
- Decorative coatings on faucets and fixtures (gold plating or other precious metals)
- Paint coatings and ink thickness and finishes
- Pressure sensors for automotive or aerospace applications

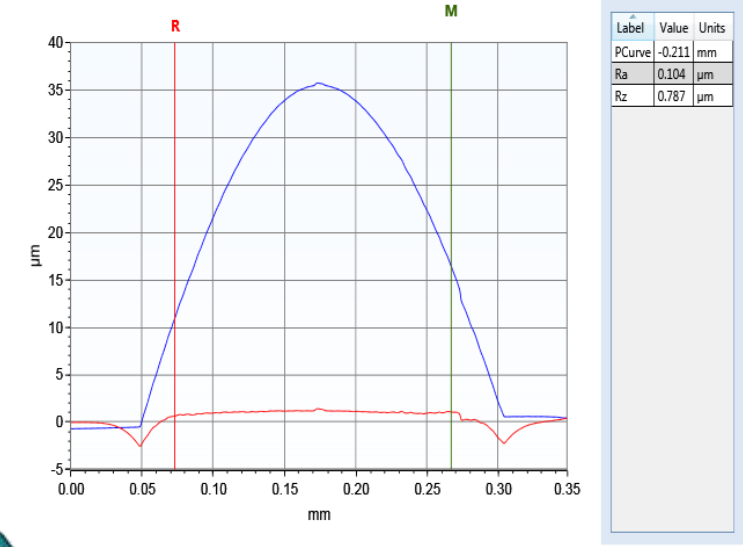


Microlenses Applications

- Advanced Zernike analysis allows automatic location of lens and automatic fit with 8 order polynomial. Roughness represents deviation versus this fit. Zernike coefficients fully characterize optical behavior of the microlens

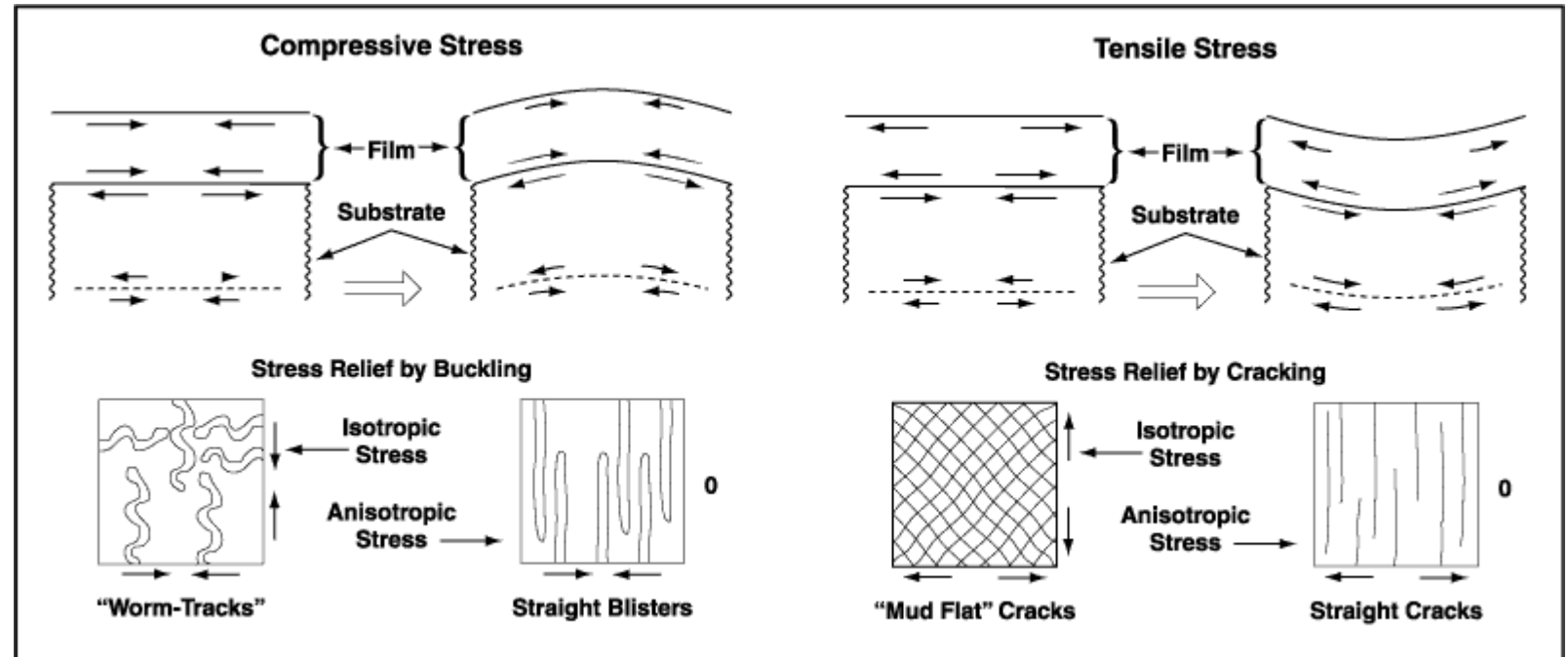


- Section analysis through the summit to extract mean curvature (Pcurve), mean roughness (Ra) and mean Peak Valley (Rz). Roughness parameters are worked out on filtered trace according to ISO filter norms



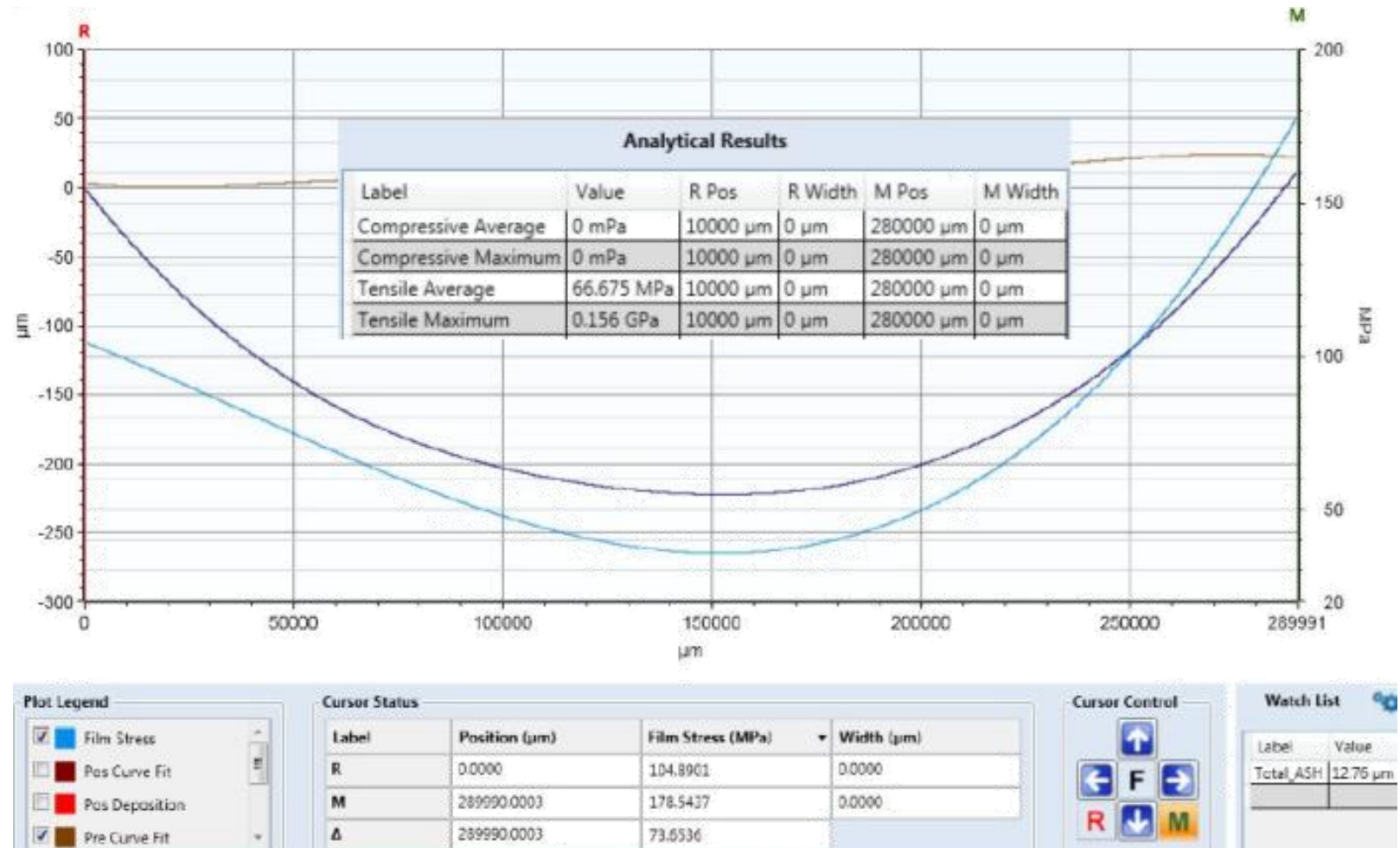
Film Stress Applications

- Stress causes bowing or warping of substrate leading to de-lamination of layers, cracking or lithography problems
- Less stress is therefore USUALLY desirable.
- Engineers' goal is to minimize stress. But to minimize it, you need to know it!



Film Stress Applications – 2D Example

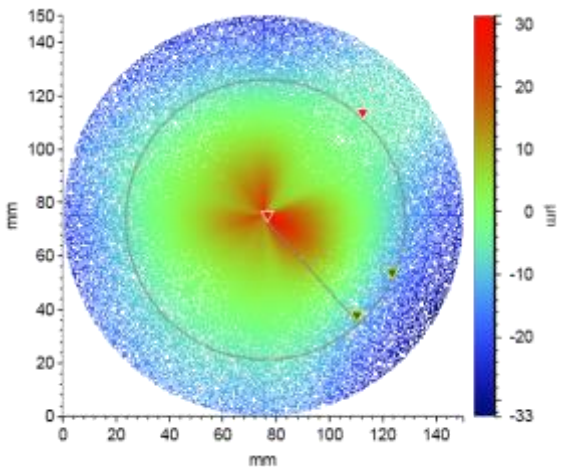
- Example: 2D stress analysis on Ni coated 300 mm Si wafer
- Stitching enables longer trace so stress measurement on larger wafers is possible. Example shown here arises from Dektak-XTL which has 300mm stage. Dektak-XT only reaches 8" trace capability.



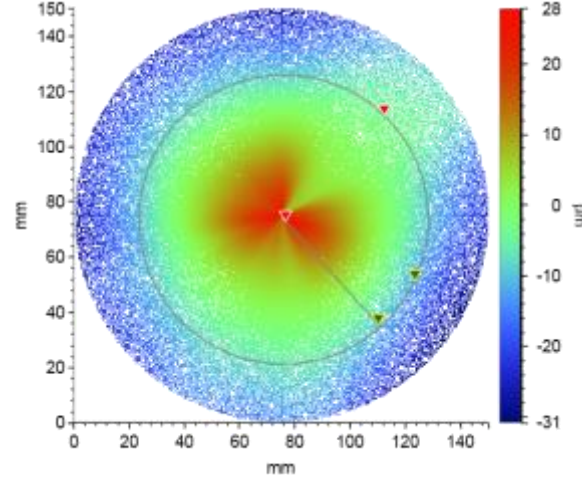
Film Stress Applications – 3D Example

- 3D Stress on 8" wafer (on DektakXT-A using radial mapping)

Before deposition



After deposition



Thin Film Substrate

Name Si[111]
Material Si
Orientation 111
Elasticity 229000 Mpa

Thickness

Substrate μm
Film μm

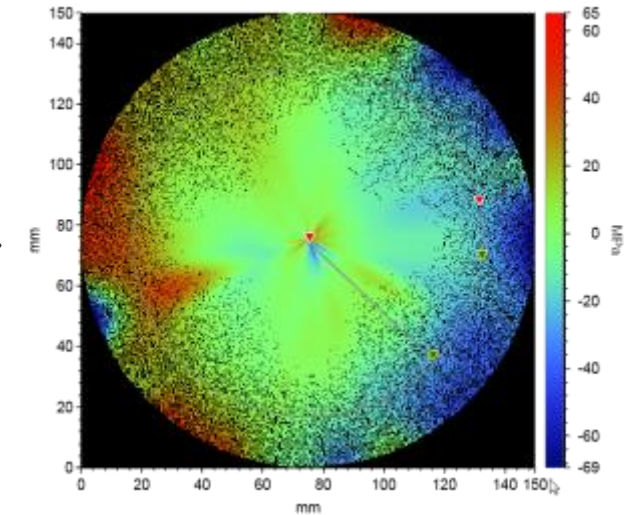
Display Data

Raw Pre-Dep Stress
 Pre-Dep Curve Fit Post-Dep Stress
 Post-Dep Curve Fit Film Stress

Remove Tilt on Post and Pre Deposition Data
 Display Interpolated Data

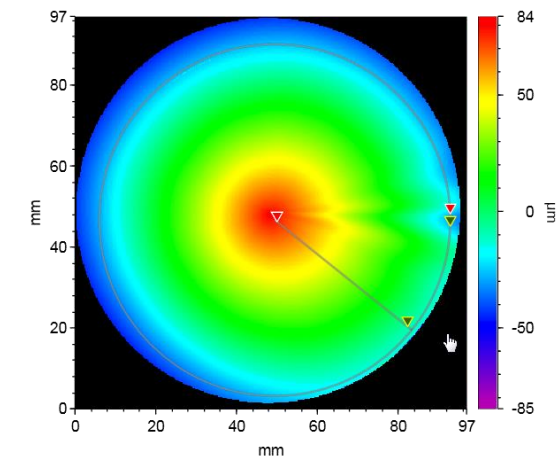
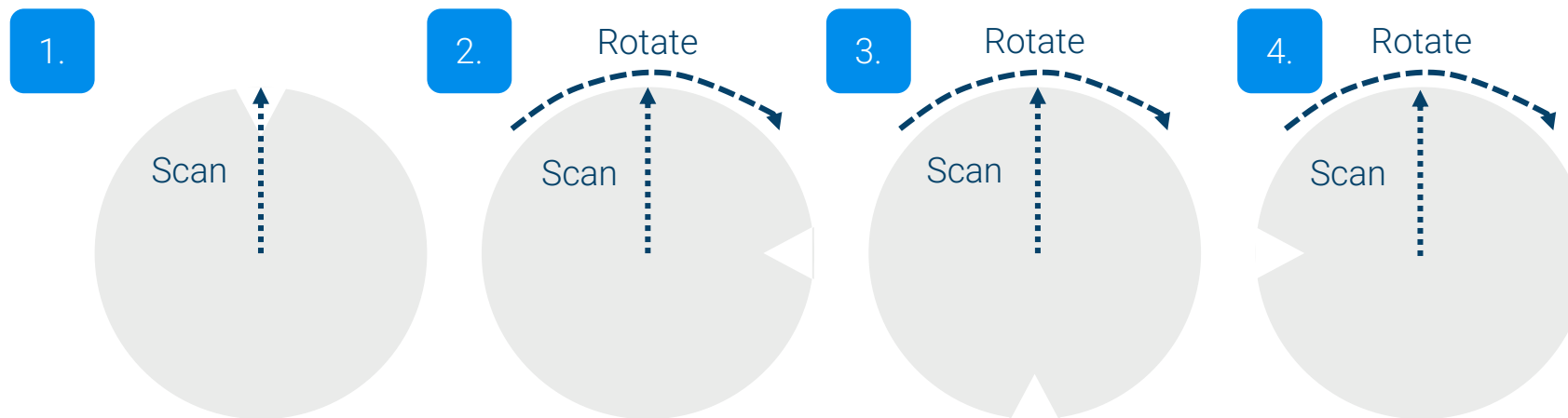
Pre-Deposition Data File

Stress map result



3D Radial Mapping

- Allows one to cover up to 8" wafers on a DektakXT-A
 - 360° Roll-off
 - 3D Stress
 - Full 3D shape
- Sample courtesy from XUV, Twente U.



3D Radial Mapping

- Repeatability test on radius of curvature: The 4" wafer shown in previous slide was measured 10x times with automatic extraction of average sphere radius from full 3D image
- Results:
 - ROC: 1 sigma = 10 mm (known within 0.1%)
 - Flatness (Rz): 1 sigma = 1 μm (known within 1%)

TimeStamp	Name	Radius of Curvature (mm)	Rz (μm)
16:32:02	Repeat1	-11736	125.5
17:01:34	Repeat2	-11719	126.5
17:01:34	Repeat2	-11719	126.5
17:31:05	Repeat3	-11718	127.2
17:31:05	Repeat3	-11718	127.2
18:00:37	Repeat4	-11707	128.0
18:00:37	Repeat4	-11707	128.0
18:30:08	Repeat5	-11706	128.7
18:30:08	Repeat5	-11706	128.7
18:59:40	Repeat6	-11704	129.6

Value	Radius of Curvature (mm)	Rz (μm)
Average	-11714	128
1 sigma Std	10	1.2
% variation	-0.09%	0.95%

DEKTAK-XT

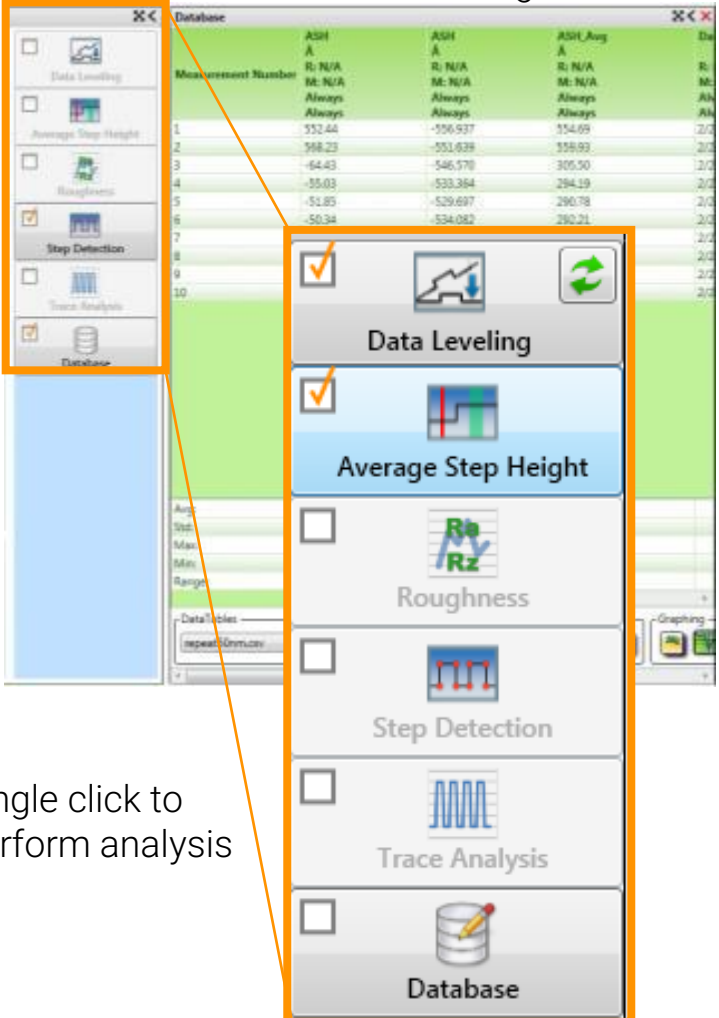
Flexible Analysis

Simplified Analysis interface

Efficiency & Statistics

- All key analysis are present in clear & graphical interface
- Leveling includes:
 - 2 points
 - Polynomial order up to 4th order
 - Exclusion of region & by histogram
- Step & Trace analysis allows automatic calculation of step height, spacing, width
- Once analysis is selected, check on database directly creates all columns with analysis results & experimental parameters

Automatic recording in database



The screenshot shows the software interface with a sidebar on the left containing analysis options: Data Leveling, Average Step Height, Roughness, Step Detection, Trace Analysis, and Database. The 'Database' option is checked. A larger panel on the right shows a detailed view of these options, with 'Data Leveling' and 'Average Step Height' also checked. The 'Database' option is highlighted with a red box and a red arrow pointing to the text 'Single click to perform analysis'. In the background, a data table is visible with columns for 'Measurement Number', 'ASH', 'R', 'M', 'Rz', 'Rq', 'Ra', 'Avg', 'Std', 'Max', 'Min', and 'Range'.

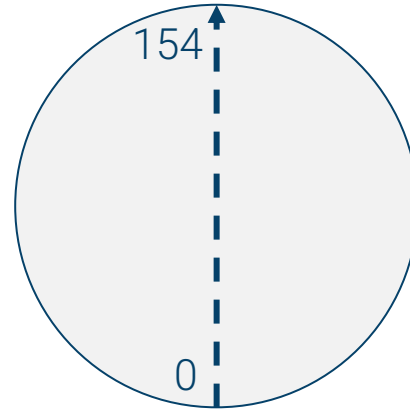
Measurement Number	ASH	R	M	Rz	Rq	Ra	Avg	Std	Max	Min	Range
1	552.44	-556.937	554.09	2/3							
2	568.23	-551.638	558.93	2/3							
3	-64.43	-546.570	305.50	2/3							
4	-35.03	-533.364	294.19	2/3							
5	-51.85	-529.697	296.78	2/3							
6	-50.34	-534.082	280.21	2/3							

Single click to perform analysis

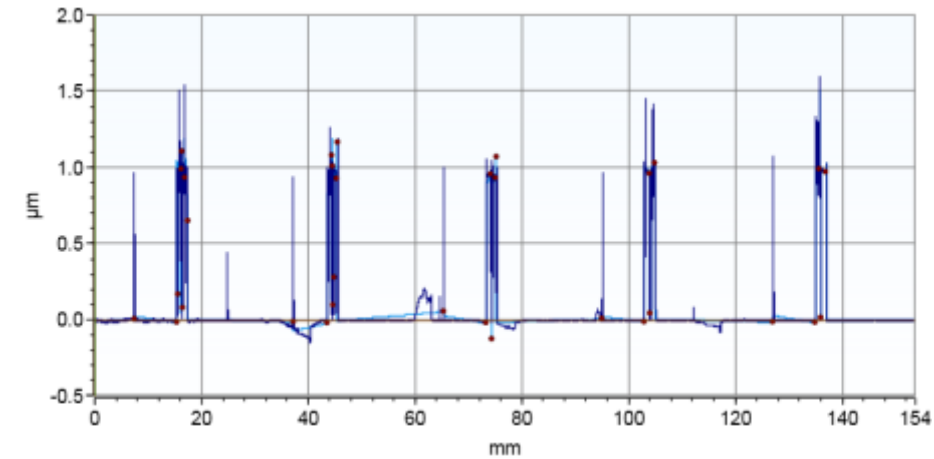
Advanced interface

Multiple analysis capability

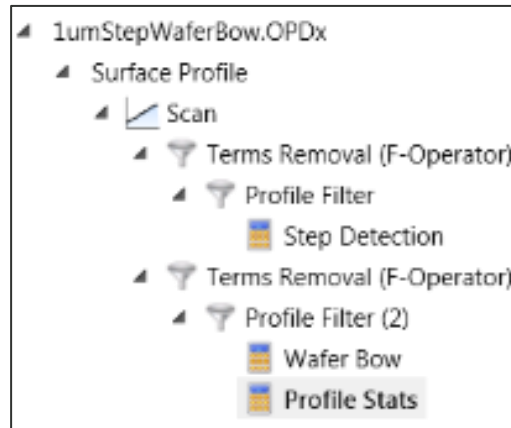
- 1 single trace: 154 mm
- 3 stitched traces
- 2 combined analysis
- ALL results



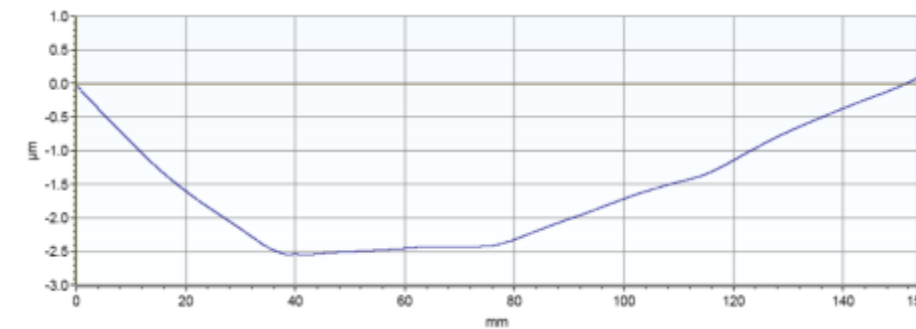
Step analysis



Analysis tree



Wafer shape analysis



Analytical Results

Label	Value	Units
Pt (Fitted)	2.661	µm
Pt (Raw)	2.627	µm

Label	Value
Total_Radius	1013163.2 mm

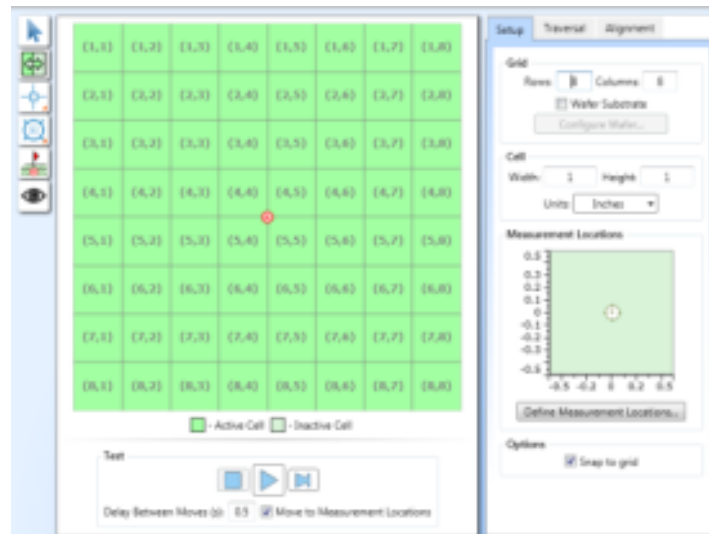
DEKTAK-XT

Automation

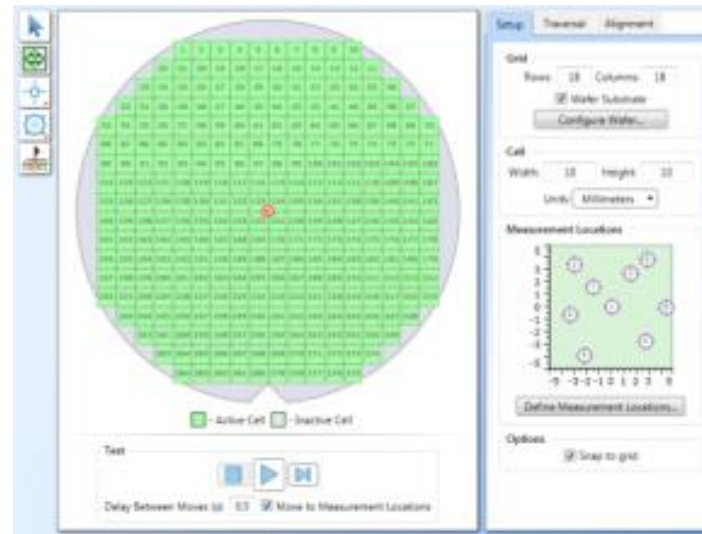
Automation programming

Full suite

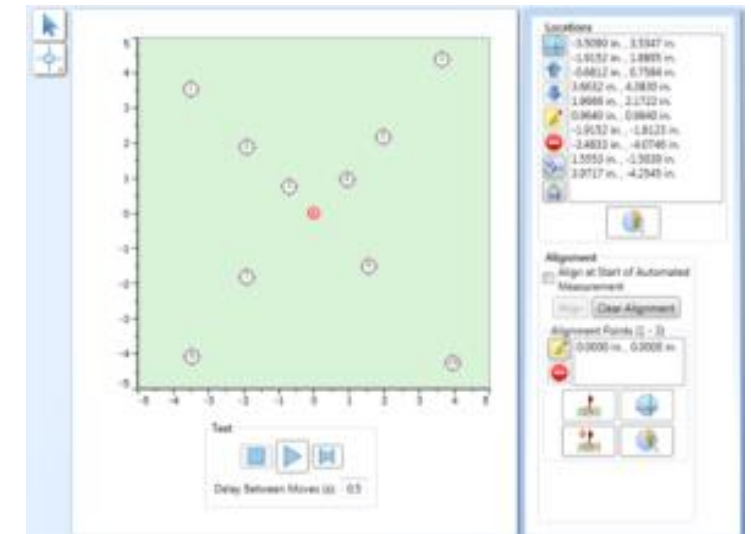
- Extremely simply GUI for the operator
- All included par default!



Rectangular grid
Application: defect review



Wafer Type (2", 4", 6", 8", 12")
Application: multi-sites on different dies

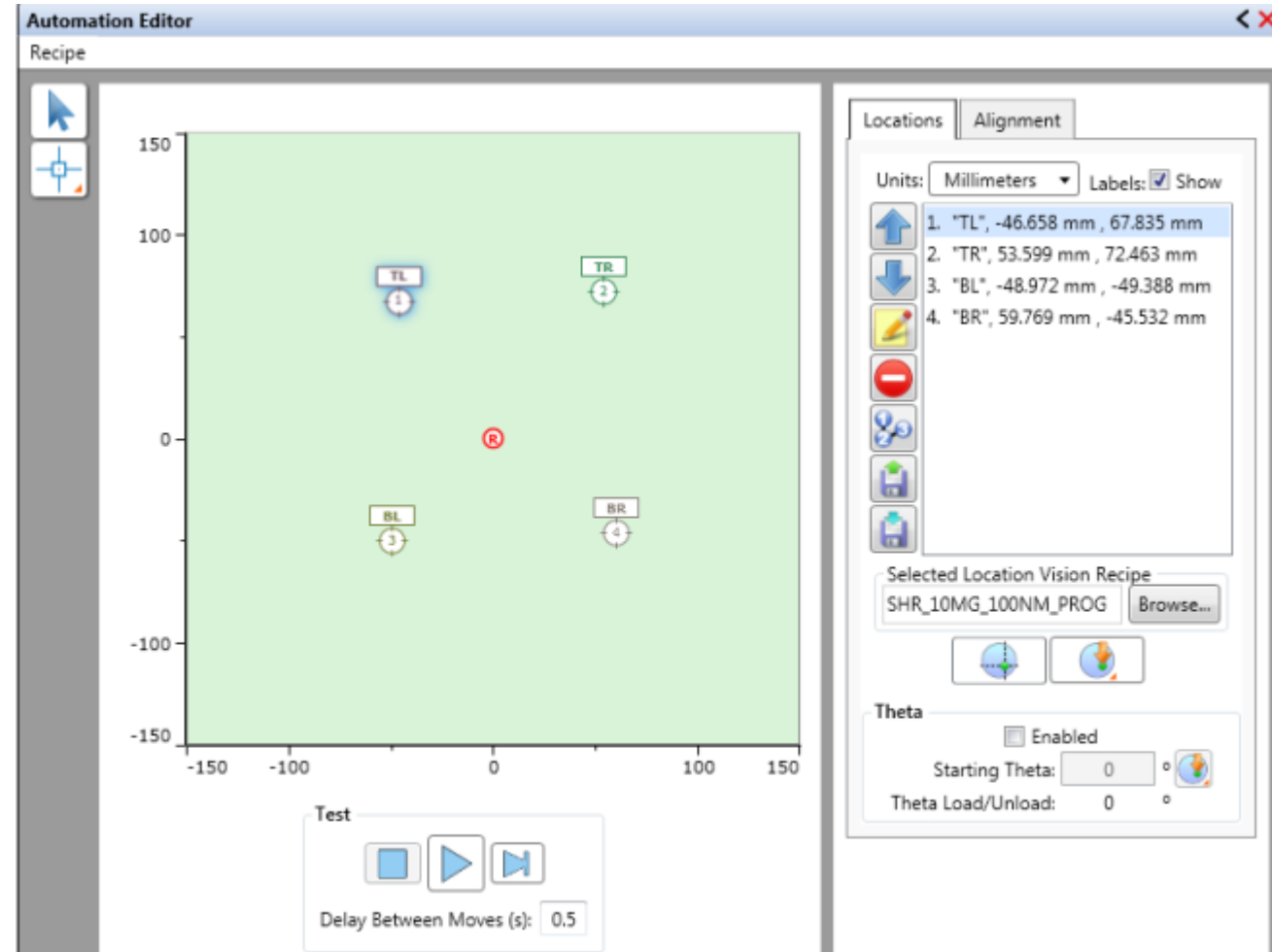


User Defined Random Location
Application: complex surface

Automation programming

Many features for QA/QC

- Site Naming
- Log site name to database
- Link unique Vision recipes to sites
- Program Load/Unload theta Positions
- Fool-Proof Automation Setup
- Prompt Vision to run a user defined executable after automation



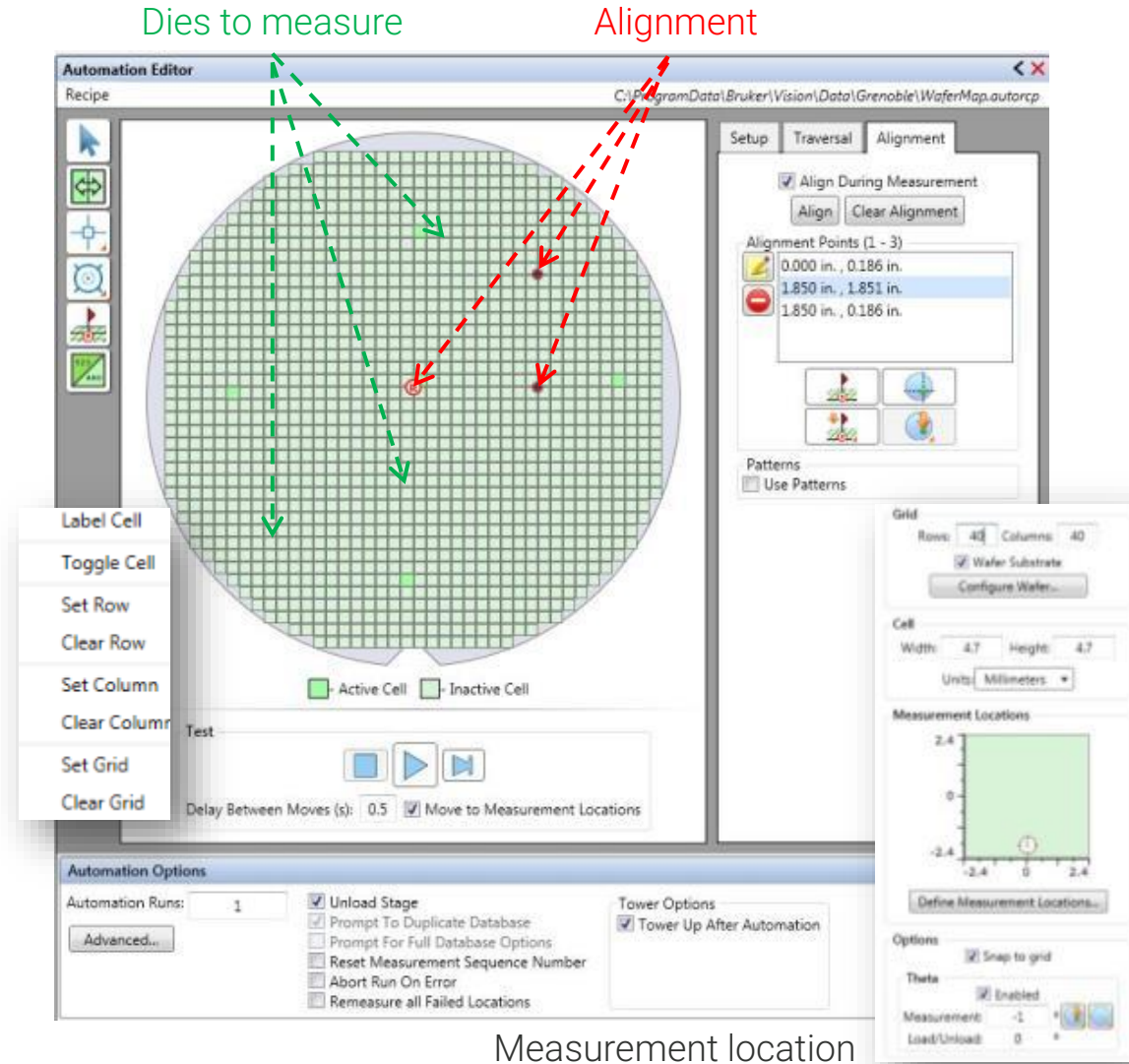
The screenshot displays the Automation Editor software interface. The main window shows a 2D plot with a green background and a red center point labeled 'R'. Four locations are marked: TL (1), TR (2), BL (3), and BR (4). The plot axes range from -150 to 150 on both X and Y. The right-hand panel is titled 'Locations' and 'Alignment'. It shows a list of locations with their coordinates in millimeters:

Location	X (mm)	Y (mm)
1. "TL"	-46.658	67.835
2. "TR"	53.599	72.463
3. "BL"	-48.972	-49.388
4. "BR"	59.769	-45.532

The panel also includes a 'Selected Location Vision Recipe' field with the value 'SHR_10MG_100NM_PROG' and a 'Browse...' button. Below this, there are 'Theta' settings: 'Enabled' (checked), 'Starting Theta: 0', and 'Theta Load/Unload: 0'. At the bottom, there is a 'Test' section with a play button and a 'Delay Between Moves (s): 0.5' input field.

Real-time setup of automation Full 8" wafer map

- Direct selection of wafer type and notch orientation
- Automatic population of dies after input of XY die size
- User graphically selects positions for fiducials
- User graphically selects dies to measure (plain green)
- User select position inside one die: all other dies are automatically populated
- Once aligned on fiducials, user can freely navigate all through the wafer
- Once automation is done, system automatically unload sample and place stylus in safe position

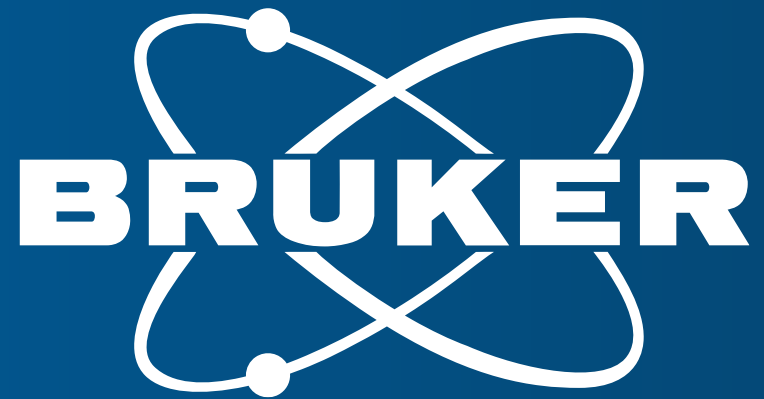


The screenshot displays the Bruker Automation Editor software interface. The main window shows a circular wafer map with a grid overlay. Several dies are highlighted in plain green, indicating they are selected for measurement. Red dashed arrows point to specific locations on the wafer, labeled "Alignment". A green dashed arrow points to a specific die, labeled "Dies to measure".

The interface includes several panels and controls:

- Automation Editor** (Title Bar): Shows the recipe name and file path.
- Setup Panel**: Contains tabs for Setup, Traversal, and Alignment. The Alignment tab is active, showing options for "Align During Measurement" and "Align" buttons. It also displays "Alignment Points (1 - 3)" with coordinates in inches.
- Grid Panel**: Shows grid settings such as "Rows: 40", "Columns: 40", and "Wafer Substrate" options.
- Cell Panel**: Shows cell dimensions: "Width: 4.7", "Height: 4.7", and "Units: Millimeters".
- Measurement Locations Panel**: Shows a small graph of the wafer map with a measurement location marked.
- Automation Options Panel**: Shows settings for "Automation Runs" (1), "Unload Stage", and "Tower Options" (Tower Up After Automation).
- Test Panel**: Contains a "Delay Between Moves (s): 0.5" and a "Move to Measurement Locations" checkbox.
- Context Menu**: A menu is open over the wafer map, listing actions like "Label Cell", "Toggle Cell", "Set Row", "Clear Row", "Set Column", "Clear Column", "Set Grid", and "Clear Grid".

Labels "Dies to measure" and "Alignment" are placed above the wafer map. A label "Measurement location" is placed below the Measurement Locations panel.



Innovation with Integrity