



kSA MOS Ultra-Scan

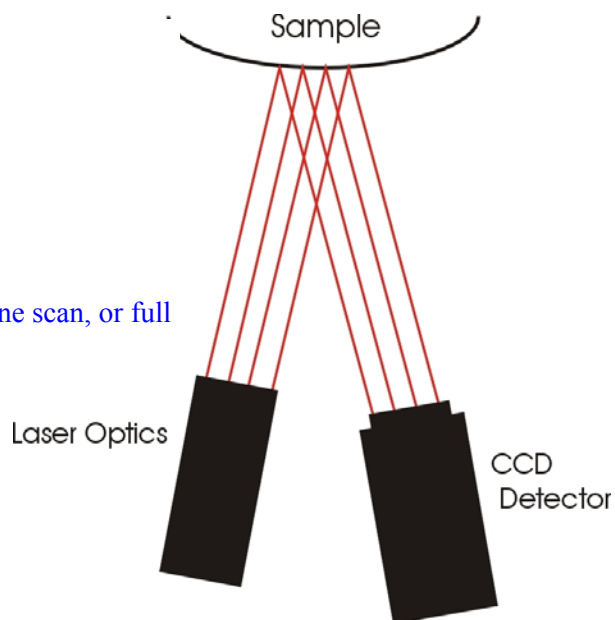
Product Description and Technical Specifications

The kSA MOS Ultra-Scan is a flexible, high-resolution scanning curvature and tilt measurement system. Based on the proven technology of our standard *in-situ* kSA MOS system, the Ultra-Scan uses a two-dimensional laser array to map the two-dimensional curvature of semiconductor wafers, optical mirrors, lenses, or practically any polished surface. The system provides up to 200mm x,y scanning range with 2 μm resolution. Optionally, larger scanning stages (up to 300mm x,y scanning range with 4 μm resolution) are available. Scans are fully programmable for selected area, line scan, or full area map. The system also provides quantitative film stress analysis with full area map for 50-200mm wafers by first scanning the bare substrate and then re-scanning the sample post-process.



Specifications

Scan Range:	200mm (x,y)
Scan Speed:	Max 20mm/sec (x,y)
Scan Resolution:	2 μm
Average Curvature Resolution:	< 2e-5 (1/m) 1-sigma (50km radius) 1-sigma
Average Tilt:	< 5e-6 (radians) 1-sigma
Scan Geometry:	Programmable multi-point line scan, or full area scan





STANDARD HARDWARE

● **High Sensitivity 8-bit Detector**

High resolution, high sensitivity, anti-blooming, monochrome CCD detector and power control board.

Specifications:

<i>CCD format:</i>	<i>3-phase interline transfer CCD, removable IR cut filter, selectable electronic shutter, AGC (On/Off), Gamma(On/Off), on-chip integration capability</i>
<i>Well depth:</i>	<i>100,000 e-</i>
<i>Pixel resolution:</i>	<i>768(H) x 480(V), 11µm x 13µm pixel size</i>
<i>Sensing area:</i>	<i>2/3" format (8.8mm x 6.6mm)</i>
<i>Spectral range:</i>	<i>400-1100 nm (w/ IR filter out)</i>
<i>S/N:</i>	<i>56 dB</i>
<i>Sensitivity:</i>	<i>400 lux, f4, under 3200K lighting</i>
<i>Exposure time:</i>	<i>Variable from 1/10,000 to 1/30 sec (dip switch selectable)</i>
<i>Triggering:</i>	<i>Selectable field-on-demand triggering for synchronization with substrate rotation</i>
<i>Output format:</i>	<i>RS-170</i>
<i>Lens mount:</i>	<i>C-type</i>
<i>Power:</i>	<i>12V DC (internal from computer) or external 120/240V 210mA current consumption</i>
<i>Camera Dimensions:</i>	<i>86mm x 52 mm x 39mm</i>

Optional high-resolution detectors are available at additional cost (see optional hardware.)

● **Integrated Laser and Optics System**

The MOS system utilizes a pair of etalons to generate a 2-D array of parallel laser beams from a single beam laser source. All optics are rigidly mounted to reduce vibrational noise. The laser system is stabilized and temperature controlled to maximize lifetime.

Diode Laser Module and Custom Optics

Specifications:

Fiber coupled, Peltier cooled laser diode package with integrated current controller and temperature controller.

<i>Laser Wavelength:</i>	<i>660nm nominal (other wavelengths available upon request.)</i>
<i>Laser Output Power:</i>	<i>>20 mW, measured directly at laser output. Note: All high-power beams are confined within the MOS housing even when the cover is removed for alignment. Direct access to the main beam is necessary during alignment. The total output power in the sample compartment is typically less than 50 microwatts.</i>
<i>Beam Geometry:</i>	<i>Circular Gaussian output with integrated long focal length lens cell</i>
<i>Operation Mode:</i>	<i>Constant current output</i>
<i>Stability:</i>	<i>≤ 0.2%</i>

High Performance Diode Laser Controller

Linear, low-noise diode laser controller operates in constant current mode with output power stability ≤ 0.2% typical (24 hours). Output power is current limited with slow start circuitry for extended diode laser life. Output power is computer controlled from threshold power to full rated output. Temperature control is factory set for 13°C and has an absolute stability of <0.2°C.



kSA MOS Ultra-Scan

● **Automated Mirror Tracking with Servo Control**

A dual-axis, servo-controlled, optical flat mirror is used for tracking the reflected laser array as the wafer is scanned.

● **Linear XY Stage and 5-Phase Stepper Controller**

200mm XY scanning stage, driven by 5-phase stepper controller. Resolution better than 5 μ m, with maximum scan speed of 20mm/sec. Full stage control via kSA MOS Ultra-Scan software. Up to 300mm XY scanning stage available.

● **Enclosure**

0.91m (L) x 0.61m (W) x 1.96m (H) robust steel and aluminum frame enclosure. Scanning stage and sample area are enclosed with tinted plexiglass. Enclosure doors are interlocked for laser safety. Approximate system weight: 115 kg.

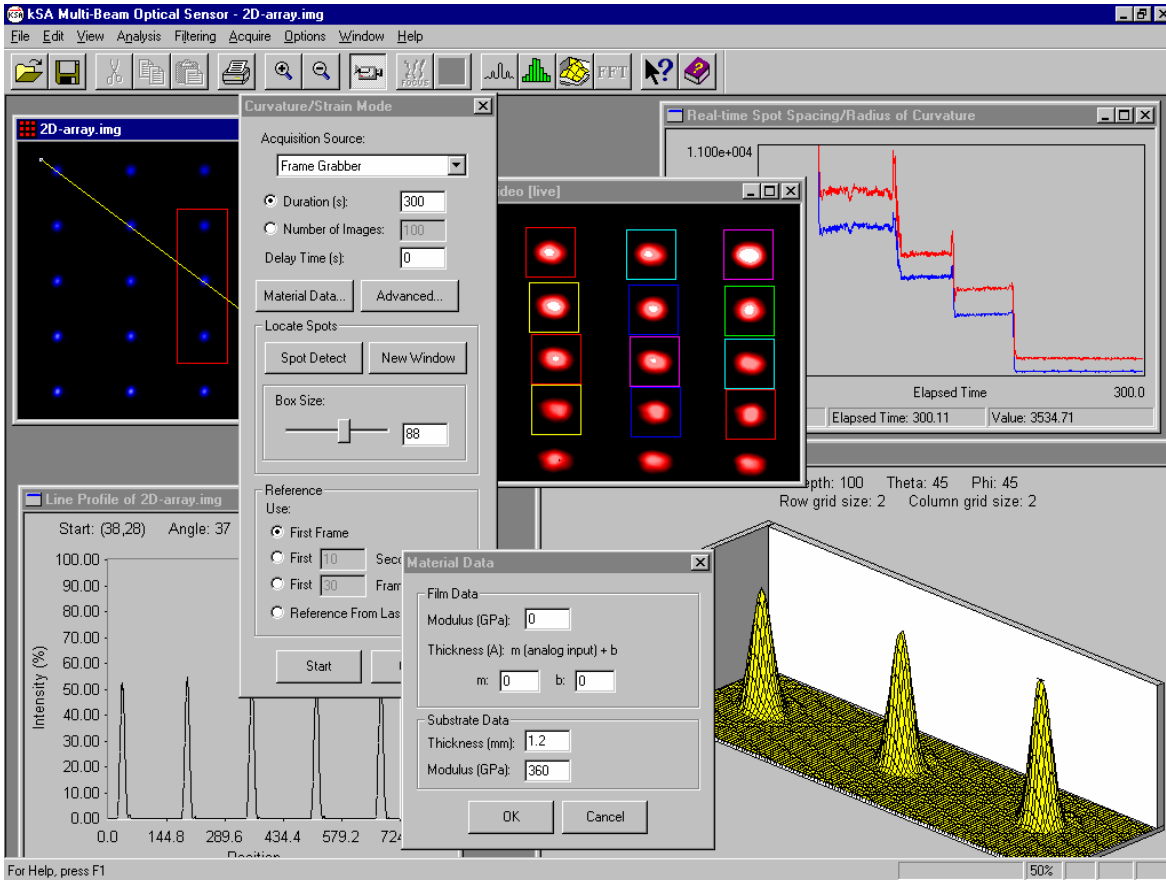
● **DELL Pentium Computer System and Control Boards**

The MOS Ultra-Scan system is supplied with a fully configured DELL computer system, populated with the MOS Ultra-Scan data acquisition and control boards. The current specifications are listed below.

- *Dell Precision Workstation 380 Desktop Computer*
- *3.4 GHz Processor with 2MB Cache, Pentium 4*
- *800 MHz Front Side Bus*
- *19" Flat Panel Monitor*
- *1GB, 400MHz, Double Data Rate SDRAM, ECC, 2 x 512 Memory*
- *128MB PCIe x 16 ATI FireGL V3100, Dual Monitor VGA or DVI*
- *80 GB, SATA, 7200 RPM Hard Drive*
- *48X CD-RW*
- *Built-in 1394-a Firewire Capability*
- *MS Windows XP Professional Operating System*



kSA MOS ULTRA SCAN INTEGRATED SOFTWARE DESCRIPTION (VERSION 6.0)



Summary of capabilities:

- Complete data acquisition and analysis control.
- Automatic laser spot detection.
- Automatic laser power control to ensure no saturation of detector as surface reflectivity changes.
- Real-time plotting of curvature, radius of curvature, stress-thickness product, stress, and tilt.
- Data acquisition modes:
 - 1) **Focus mode:** for facilitating laser alignment and optics focusing by simultaneously monitoring the image and a line profile of the laser spot array.



kSA MOS Ultra-Scan

- 2) **Scan Mode:** An arbitrary number of laser spots, user configured, are tracked simultaneously, yielding two-dimensional curvature, radius of curvature, tilt, and stress. Completely programmable scanning over entire range or any sub-range, with programmable step size in both x and y.

- Analysis Capabilities:

- 1) Standard line profile, statistical analysis, and contour plotting.
 - 2) Full surface and polar plots of curvature, tilt, and stress. Alternatively, simple centroid position and spot separation distance may be plotted.
- User-friendly Windows-standard environment with extensive error checking and file handling. Data storage in ASCII and binary file formats facilitate alternative data analysis by user. Direct printing of images or graphics using currently loaded Windows printer drivers. Cut-and-paste directly to clipboard, or into other applications such as MS Word.
 - High-quality 2D and 3D graphics for data display. Numerous image and graphics editing capabilities, including false coloring using pre-loaded or user-defined color palettes, and label editing. Transport of graphics directly to Windows clipboard or exported to Windows Metafile or Tiff format.