PRODUCT DATA

FEI COMPANY™

Altura™ 855 DualBeam™

for Defect Characterization, Failure Analysis, and Process Monitoring

FEI's Altura™ 855 offers the ultimate tools for defect characterization, failure analysis, and TEM sample preparation on patterned and unpatterned wafers, as well as piece parts. Advanced software automation enables automated TEM sample preparation and high throughput ion milling, all designed to increase productivity and provide rapid feedback to the manufacturing process.

- *Rapid time-to-data and root cause analysis of yield excursions from common process steps: etch, metal deposition, patterning, CMP or inter-layer dielectrics*
- *Turnkey defect navigation with files retrieved from optical and SEM detection and review tools*
- *Superior "search" mode for defect navigation on unpatterned wafers*
- *Analyze subsurface structures made visible by FIB cross-sectioning with enhanced beam chemistries.*
- *"Slice and View" automation software for high precision SEM cross sectioning*
- *High throughput TEM sample preparation with optional* in situ *lift out capabilities*
- *Optional OmniProbe™ system for* in-situ *TEM sample lift-out*

As device geometries continue to shrink, the need for high resolution analytical capabilities increases. The Altura 855 meets this demand by delivering fast and accurate three-dimensional defect characterization—providing the most accurate picture of your process for increased control and improved yield. Introduced in 2004, the Altura 855 employs FEI's most advanced electron and ion columns for unmatched defect analysis, high throughput TEM sample preparation, and optional EDS spectrum analysis.

FEI's new Sirion™ scanning electron microscope (SEM) column has been optimized for low voltage operation—below 1 kV, without sacrificing performance at higher voltages. With higher angular intensity and a more finely- controlled spot size, the column offers superior "search" mode capabilities on bare wafers for defect navigation, as well as better performance imaging on charging materials such as low-K dielectrics and copper.

The Altura 855 also utilizes FEI's new Sidewinder™ focused ion beam (FIB) column with improved beam profile and higher angular intensity - delivering almost 80% more current into the same spot size than other columns. The result is faster milling and TEM sample preparation plus consistent performance throughout the entire voltage range. This high resolution SEM imaging, complemented by FIB milling, lets you investigate below the surface to reveal buried defects, process anomalies, and device failures—all of which are invisible to conventional wafer SEMs.

Superb SEM Imaging for Every Application

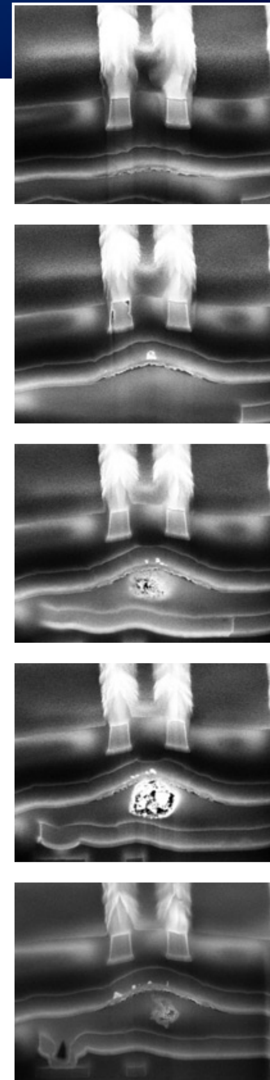
Determining the root cause of a process problem requires clear, accurate images. Altura's advanced electron optics offer a number of imaging refinements–immersion lens ultra-high resolution imaging, enhanced down-hole visibility, a unique method of charge compensation–all designed to provide top quality images. Altura's imaging capabilities support design rules at 0.13 µm and beyond.

3D Analytical Capabilities

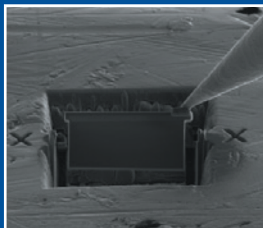
The high resolution SEM imaging capabilities of the Altura Series are complemented by Focused Ion Beam (FIB) milling, which takes you below the surface to reveal buried defects, process anomalies, and device failures, all of which are invisible to a conventional wafer SEM. This third dimension enables a comprehensive view of a process problem and possible culprits.

Automation Adds Efficiency

Routine functions and sample preparation can be automated through the used of optional automation software, such as FEI's AutoTEM™ Wizard, enabling easy and reliable unattended preparation of multiple TEM specimens. It can be configured to prepare samples on either standard TEM grids or for *in situ* extraction, ensuring samples are more precise, more accurate, and are completed faster than conventional methods. The OmniProbe lift-out system then provides a secure means for transfering your sample from the Altura 855 to a TEM for ultra high resolution analysis.



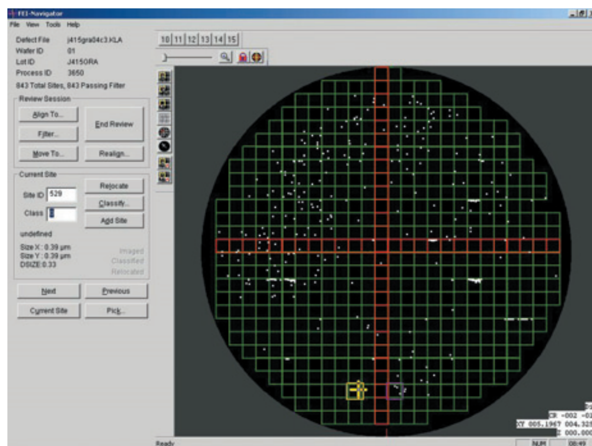
Auto(Slice and View)™ provides 3D cross-sectional defect images.



Tilted view of TEM sample prepared by AutoTEM Wizard software with OmniProbe needle attached.

TEM sample moved to waiting TEM grid.

AutoTEM™ Wizard provides a fast and efficient way to prepare TEM samples for analysis. Following automated preparation, the trimmed sample is removed from the wafer using the OmniProbe system and transferred to a waiting TEM grid.



FEI-Navigator™

- *Simple, software-guided wafer alignment*
- *Automatic wafer map generation*
- *Optimized align ment routine for patterned and bare wafers*

FEI-Navigator software translates data obtained from optical and SEM detection and review tools, then directs Altura's high accuracy stage to the precise defect locations identified for 3D characterization.

Full-Featured Defect Characterization

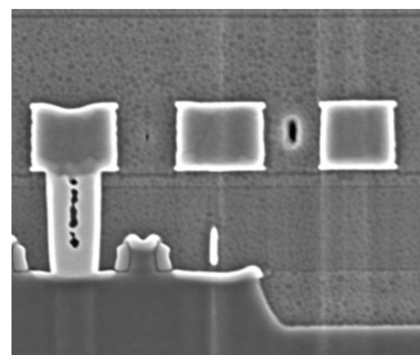
From defect navigation to imaging, cross-sectioning, and materials analysis, the Altura Series has an array of features designed to make defect characterization more accurate and productive. Integrated backscattered electron (BSE) detection allows you to relate image contrast to average atomic number, making it easy to differentiate metallic contamination from oxide or organic contamination, particularly on bare wafers. An EDS (energy dispersive x-ray microanalysis) package is an option for providing more detailed compositional analysis.

On-Target Navigation

The Altura Series offers the highest accuracy 5-axis, 200 mm stage available. With accuracy of <1.5 µm across a 200 mm wafer, you can confidently navigate directly to the desired location. Our software automatically adjusts focus with changes in sample working distance.

Optimized Beam Chemistries

The Altura's capabilities are further enhanced by adding optional beam chemistries to enable localized deprocessing and *in situ* delineation of cross-section faces. Available beam chemistries are conductor and insulator deposition materials, as well as a range of enhanced etch gases. These gases significantly extend the capabilities of the system, allowing localized deprocessing and in situ delineation of cross-section faces. In particular, Delineation Etch reveals oxide and other layers within a cross section, eliminating the need to use wet chemical etches outside the system before acquiring the final SEM image.



Delineation Etch™ provides the necessary contrast between layers in this FIB cross section, revealing structural information.

Complete Life Cycle Support

The Altura 855 is designed to meet the needs of today's wafer fabs and is supported by FEI's global network of application experts and service personnel ready to assist. Our customers are our number one focus at FEI, and we are continually working to add value to your purchase through an aggressive program of product enhancements and training—all to ensure the Altura 855 continues to meet your needs for years to come.

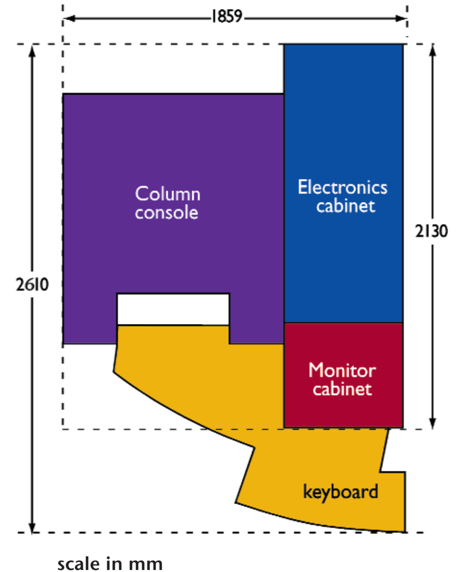
Our Nanotechnology Solution Centers in Oregon, Massachusetts, The Netherlands, Singapore and Japan, welcome you for demonstrations, training and application support.

Visit FEI's Website

To learn more about FEI, its products, and advanced Tools for Nanotech for semiconductor processing visit FEI's website at www.feicompany.com.

Specifications

Electron optics	FEI Sirion™ Electron Column, Schottky emitter source, 12-month lifetime
Ion optics	FEI Sidewinder™ Ion Column, Gallium liquid metal ion source, 1500 hours guaranteed
Beam voltage	SEM: 200 V - 30 kV; FIB: 5 kV - 30 kV
FIB beam current	2 pA - 20 nA
Image resolution	SEM: 3 nm (1 kV - 30 kV); FIB: 7 nm (5 nm achievable)
Stage	5-axis motorized (tilt eucentric); XY: 200 x 200 mm Tilt: -5° to +60°
Operating Software	FEI xP
Optional Software	AutoFIB AutoTEM Auto(Slice and View) FEI Navigator CoppeRx™ CAD-based Navigation



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