2810 and 2815
Brightfield Patterned Wafer Inspection Systems

Memory manufacturers require high throughput detection of small defects on dense, repetitive patterns and in high vertical structures. Logic manufacturers must find and isolate all critical defects on complex geometries and in dense repetitive patterns which employ new materials and rapidly changing processes. In addition to these distinct inspection requirements, both memory and logic chipmakers need improved sensitivity and speed in order to quickly ramp new processes to high yield. The 2810 and 2815 are the industry’s first memory- and logic-specific full-spectrum brightfield inspectors, helping solve yield issues with features specialized by device type. Part of KLA-Tencor’s comprehensive wafer inspection portfolio, the 281x inspectors provide effective line monitoring and engineering analysis capabilities for ≤55nm memory and ≤45nm logic manufacturing.

The 281x tools are based on the widely adopted 2800 Series full-spectrum DUV/UV/visible brightfield inspectors, utilizing memory- and logic-customized optics modes and algorithms to capture a broad range of yield-critical defects on all process layers. The 281x inspectors include a selectable spectrum illumination source and a pixel-independent high numerical aperture (NA) which maximize material contrast, suppress nuisance and work with advancements in automatic defect binning to produce a meaningful defect Pareto. With nearly double the 2800’s throughput, the 281x inspectors enable engineers to quickly achieve systematic yield improvements and reduced baseline defectivity, for critical etch, CMP and photo line monitoring. The 281x tools offer flexibility for process development, reliability for production, and extendibility for future nodes and emerging device technologies.

Questions about how the 2810 or 2815 can address a specific use case or yield challenge?
Please contact Mark Shirey at mark.shirey@kla-tencor.com.

281x Benefits

- Customized optical modes and selectable full-spectrum DUV/UV/visible illumination produce the highest sensitivity to defects of interest on all process layers
- Highest weighted average throughput in production (WATIP) allows increased sampling, lower cost-of-ownership or higher sensitivity inspections
- Commonality and connectivity with other KLA-Tencor inspectors and review tools optimize inspector capacity and reduce production integration time
- Established, production-proven, highly extendible tool architecture provides reliable line monitoring capability for multiple technology nodes
- Process Window Qualification (PWQ) application enables lithographers to assess designs prior to production

2815 defect Pareto demonstrating a 2x increase in critical bridge defect capture provided by the new 50nm pixel. The industry’s smallest pixel enables improved capture of defects of interest for earlier detection of process excursions.

With increased throughput and new pattern suppression modes customized for memory devices, the 2810 demonstrates improved sensitivity at throughput over the 2800 for three front end memory layers.
Semiconductor device manufacturers must address the yield issues related to shrinking dimensions, new materials and innovative device structures in order to ramp to high yields quickly and profitably. Patterned wafer inspectors help improve yield by enabling engineers to solve defect problems at all stages of the product lifecycle – from process development to production. Part of KLA-Tencor’s comprehensive wafer inspection portfolio, the Puma 9150 darkfield inspector provides effective excursion monitoring capability for 45nm and beyond.

The latest in the Puma family of laser imaging, darkfield inspectors, the Puma 9150 utilizes the revolutionary Streak™ technology and introduces extended capability to capture the broadest range of defect types at high throughputs. New optical modes allow for increased sensitivity to bridging and other pattern defects for non-critical etch applications, deliver improved capture of residue and other defects for CMP, and detect photo defects at high throughputs. In addition to providing benchmark films performance, the Puma 9150 complements higher sensitivity broadband brightfield inspections by offering an improved sampling option for photo-cell monitoring, after-develop inspection, and other tool monitoring applications.

Questions about how the Puma 9150 can address a specific use case or yield challenge? Please contact Amir Azordegan at amir.azordegan@kla-tencor.com.

**Puma 9150 Benefits**

- New optical modes and Streak darkfield imaging technology provide improved capture of defect types across an extended applications space
- Highest production throughputs at required sensitivity enable increased yield sampling or lower cost-of-ownership
- Commonality and connectivity with other KLA-Tencor inspectors and review tools optimize inspector capacity and reduce production integration time
- Ease-of-use improvements and innovative algorithms result in quick and easy recipe setup
- Established tool architecture and production-proven matching produce consistent and reliable inspection results

Signal-to-noise ratios of three defects demonstrating the complementary detection capabilities of the traditional and new optical modes of the Puma 9150. The multiple optical modes enable the broadest darkfield defect type capture across an extended applications space.

The new optical modes of the Puma 9150 provide increased capture of low profile defect types, such as incomplete copper polish (shown), deformed contacts, bridging and residues.
eDR-5200
Electron Beam Review and Classification System

As design rules shrink below 45nm, defect and yield engineers are increasingly concerned about smaller defects and the quality of the defect Pareto coming from their review tools. The eDR-5200 wafer defect review and classification system successfully addresses these concerns by imaging sub-50nm defects and producing a more accurate defect Pareto with dramatically fewer SEM Non-Visual (SNV) defects. A critical piece of KLA-Tencor’s comprehensive defect solutions portfolio, the eDR-5200 leverages advances in resolution and defect re-detection sensitivity, along with unique connectivity with KLA-Tencor inspectors, to enable better review performance, faster yield learning and higher tool productivity for the 45nm node and beyond.

The eDR-5200 introduces an electromagnetic immersion column design, delivering the resolution required to image <50nm defects. In addition, a high precision stage, innovative defect deskew algorithms, and advanced re-detection methods provide the capabilities necessary to find low contrast or tiny defects, effectively reducing the number of reported SNVs. Further improvements in the defect Pareto are obtained with novel approaches to defect classification, including power assisted classification (ePAC™) and fully automated defect classification (eADC™). In order to address the inspection-review cycle as a single use case, the eDR–5200 offers seamless connectivity to KLA-Tencor optical inspectors. This produces a greater number of higher quality defect Paretos per hour, allowing engineers to rapidly resolve yield issues for even the smallest critical defects on 45nm node devices.

Questions about how the eDR-5200 can address a specific use case or yield challenge? Please contact Christophe Fouquet at christophe.fouquet@kla-tencor.com.

eDR-5200 Benefits

Higher stage accuracy and image resolution allow detection and imaging of <50nm defects
Production-worthy manual, power-assisted, and fully automated defect classification achieve the fastest time to the best defect Pareto
Proprietary connectivity to KLA-Tencor inspectors produces faster, more accurate recipe setup on the SEM, plus a lower percentage of SEM non-visuals and other nuisance defects
Innovative EDX design enables analysis and classification of defects <100nm, based on their composition
Connectivity between KLA-Tencor inspection and review tools offers a significant reduction in Process Window Qualification (PWQ) time

With an immersion column design and higher stage accuracy, the eDR-5200 detects and images <50nm defects.

The eDR-5200 includes improved coordinate accuracy and connectivity with KLA-Tencor inspectors, resulting in a dramatic reduction in the number of reported SEM nonvisuals.
The SURFmonitor system extends the industry-leading Surfscan SP2 unpatterned surface inspection system beyond traditional defect inspection into the realm of metrology. SURFmonitor can measure variations in surface morphology on bare wafers or blanket films, which correlate to a broad array of process parameters such as surface roughness, grain size, and process temperature. With sub-Ångstrom repeatability, the SURFmonitor system creates detailed parametric maps while defect information is being collected, enabling fabs to monitor both process drift and defectivity simultaneously with no impact on inspection throughput. SURFmonitor also extends the defect detection capability of the SP2 into the “sub-threshold” region, identifying process anomalies and defect signatures that are not typically captured in the defect channels.

The SURFmonitor module uses the low spatial-frequency, low amplitude scattering signals from the defect scan to generate high resolution, full wafer maps with sub-Ångstrom height resolution. SURFmonitor then analyzes these maps for within-wafer or wafer-to-wafer parametric spatial variations, and can apply the results for statistical process control. SURFmonitor data have shown excellent correlation to several parameters such as surface roughness for copper, tungsten and poly-silicon films, transparent film thickness, surface damage and surface temperature variations. SURFmonitor also provides the ability to detect defects with low signal-to-noise ratio, such as watermarks and stains that are difficult to detect in traditional defect channels. Built on the Surfscan SP2 platform, SURFmonitor results demonstrate unparalleled repeatability and matching.

Questions about how the SURFmonitor can address a specific use case or yield challenge?
Please contact Andy Steinbach at andy.steinbach@kla-tencor.com.
HRP-350

Advanced 45nm semiconductor profiling technology at production throughputs

With profile control requirements for critical etch and CMP processes becoming much tighter every device generation, customers require a single-system solution that will support yield critical nano-scale applications, as well as control macro-scale topography on the wafer.

The HRP-350 is the industry’s most advanced high-resolution surface topography profiling system, offering chipmakers the ability to monitor significantly smaller lateral and vertical dimensions. Featuring diamond styli down to 20nm radius and a lower-noise platform for enhanced measurement sensitivity, the HRP-350 system offers nanometer-scale stylus technology which matches AFM resolution — without modeling requirements. The system’s high-resolution mode enables accurate control of nano-scale features for applications that directly impact device performance, such as Shallow Trench Isolation, CMP in the interconnect, metal film roughness and tungsten plug recess. For larger scale features, the system’s long-scan mode operates at high throughput to measure Cu CMP dishing and erosion, copper plating, die planarity, and C4 bump height in packaging. Higher scan speeds elevate the HRP-350’s production worthiness across a wide range of critical transistor and interconnect applications.

The system’s broad portfolio of styli, including the proprietary 20nm UltraSharp™ stylus, are based on diamond materials to offer the longest operating lifetimes, typically up to 100 times longer than AFM tips. New stylus developments further advance the technology not only by shrinking the stylus dimensions, but also enhancing the robustness to enable scanning up to five times faster than the previous HRP-340 system. Other system productivity enhancements contribute up to 40% higher system throughput while profiling critical structures in advanced 65nm and 45nm devices. In addition to the 300mm HRP-350 system, a 200mm or less HRP-250 is also available for IC semiconductor and disk drive manufacturing applications.

Questions about how the HRP-350 can address your surface profiling challenges?
Please contact Petrie Yam at petrie.yam@kla-tencor.com.

HRP-350 Benefits

- Extends the measurement capability to support advanced requirements for 65nm and beyond
- Smaller styli and improved noise performance enable topography measurements of advanced nano-scale features (e.g., recess)
- Provides 33% tighter gauge performance for the most stringent process control
- Novel processing abilities enable small styli to scan at 5X higher scan speeds to support both macro- and micro-topography without stylus exchange
- Up to 40% higher throughput and a more reliable isolation system make for the most production worthy surface metrology solution

Stylus Lifetime Step Height Measurement

Featuring proprietary 20nm UltraSharp™ diamond styli and a lower-noise platform for enhanced lateral resolution.

Diamond based styli offering the longest operating lifetimes, typically up to 100 times longer than AFM tips.