Applied SEMVision™ G5

Intelligent. Sharp. Fast.
A New Level of Automated Performance
in Defect Review

November, 2011

Requirements for Advanced Defect Review?

Need automated flow with superb intelligence to find true defects

Full automation

True defects only

Superb imaging capability

<2nm pixel resolution

Defect classification
& root cause identification

The ultimate in defect control

External Use

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Applied's Innovations Enabling Inflections

TRANSISTOR	INTERCONNECT	ADVANCED PATTERNING	WAFER-LEVEL PACKAGING
Centura High-k ALD			
DPN HD			
Versa™ XLR PVD			
SIP™ Co PVD			
Vantage Vulcan™ RTP			
Reflexion® GT™ for W			
Conforma™ Doping	Black Diamond® 3	Tetra™ EUV	
Avenir™ RF PVD Ni	Nanocure™ 3	Centris™ Etch	
Eterna™ FCVD	DFinder™ Inspection	Tetra™ X	Silvia™ Etch
Avenir™ RF PVD Gate	Raider® GT	Aera3™	Avila™ CVD
Siconi™ for Epi	Centinel™ PVD / ALD	Mesa™ Etch	InVia™ CVD
Astra™ DSA Anneal	Reflexion® GT™ for Cu	UVision® 4 Brightfield	Raider-S™ ECD

SEMVision™ G5

External Use

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Introducing Applied SEMVision G5 System
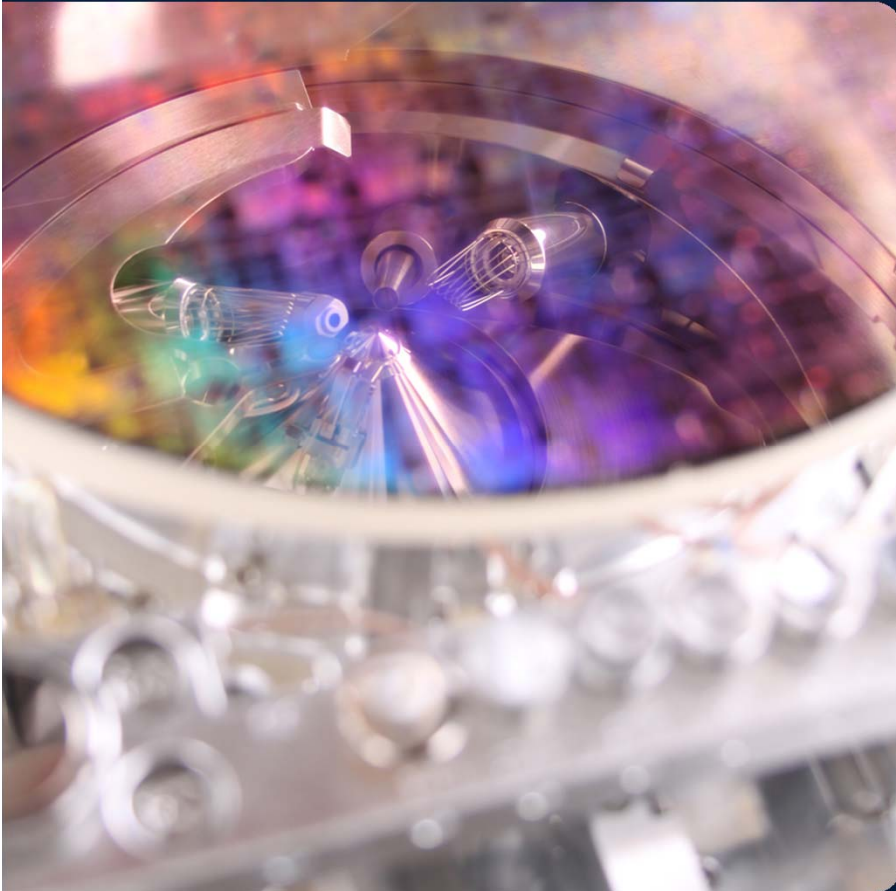
Intelligent, Sharp, Fast

A new level of automated performance in Defect Review

Extends Applied's technology leadership in Defect Review market

External Use

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Challenge #1: Slow Process for Defect Review

Defect Inspection → SEM Review → Classification → **Defect Pareto**
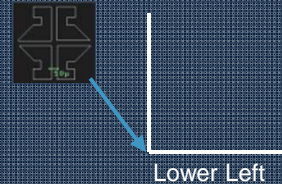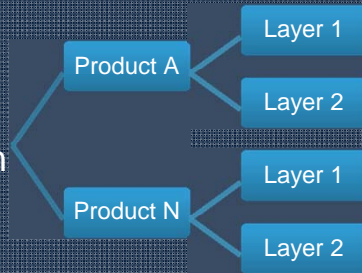
Defect Inspection System

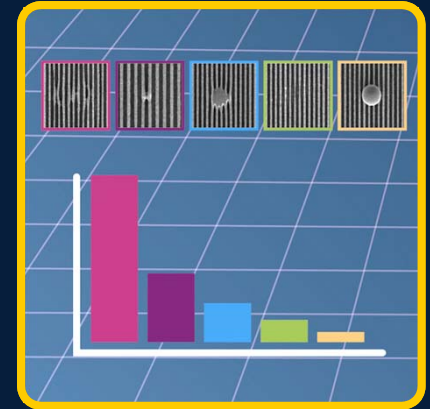Defect Review System

Defect Mapping
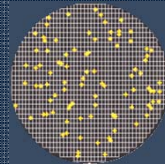
Location Coordinate Identification

Lower Left

Recipe Creation

Product A
- Layer 1
- Layer 2

Product N
- Layer 1
- Layer 2

True/False Map Review

50
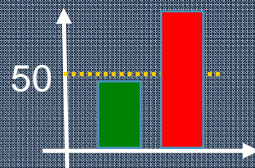
Repeating manual processes for different products and layers

Operator intensive

Extremely slow for Foundries

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SEMVision G5 Automated Flow Saves Time and Money

Current manually intensive flow

| Inspection Global Alignment | Fine SEM Global Alignment | Defect Offset | Run SEM | Classification |

Automated Global Alignment
Product Share
Recipe on Demand
Automatic Calibration
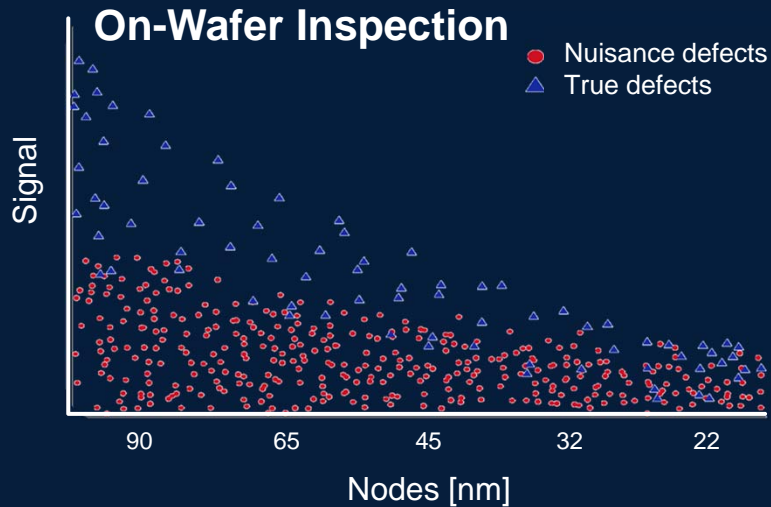
Enables Fast Yield Ramp

SEMVision G5 automated flow

| Global Alignment | Run SEM | True defect Classification |

External Use

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Challenge #2: Identifying True Defects is Getting Harder

On-Wafer Inspection

● Nuisance defects
△ True defects

Signal

Nodes [nm]

90   65   45   32   22

As design rules shrink, separating true defects from nuisance defects is difficult

SEM Review

Nuisance defects
True defects

Nuisance population

Defect Count

Nodes [nm]

90   65   45   32   22
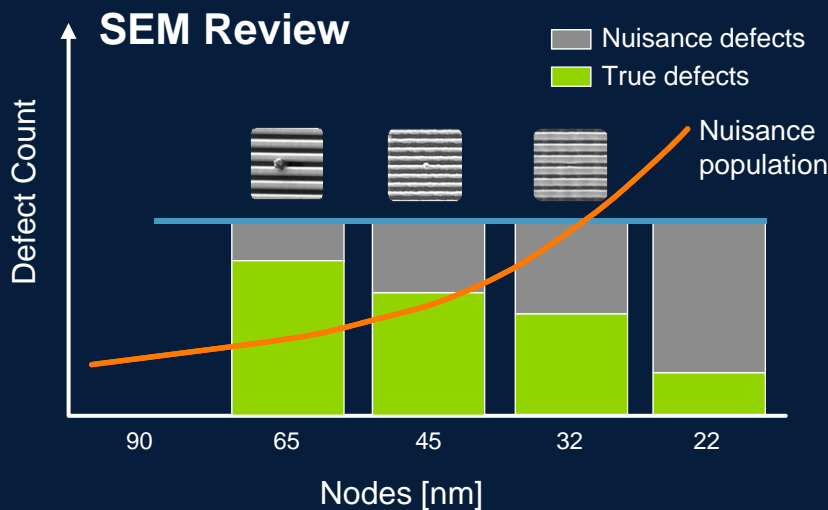
High nuisance rate jeopardizes the ability to provide a meaningful, true defect pareto

External Use

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ADRTrue™ Filters True from Nuisance Defects

Post-Inspection Results

- True defects
- Nuisance defects

Post-SEM Filter Results
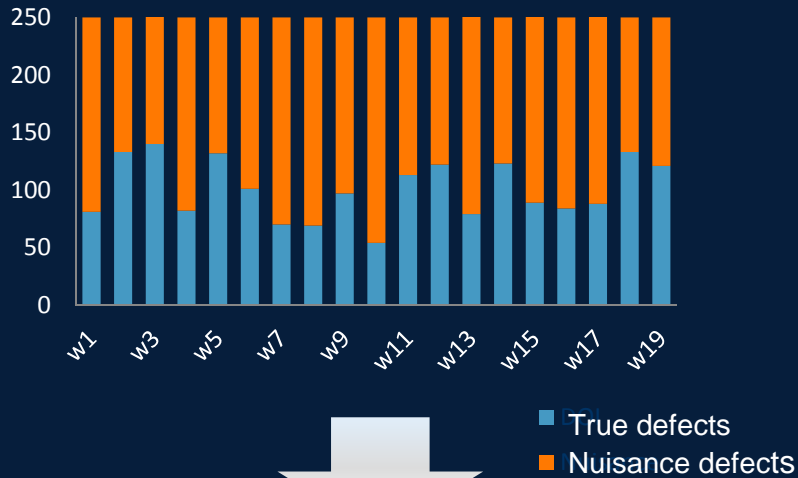
- True defects
- Nuisance defects
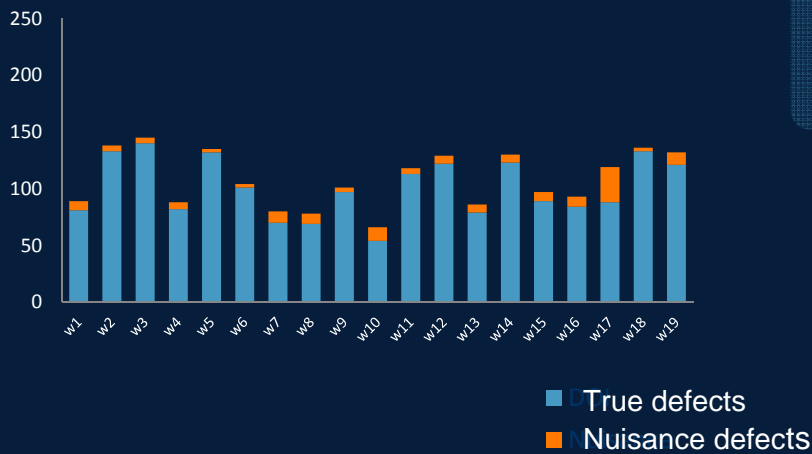
Enables much richer true defect Pareto

Captures true defect excursions which could not be monitored before

External Use

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Challenge #3: High Image Quality for Advanced Nodes

New process introduces new challenges
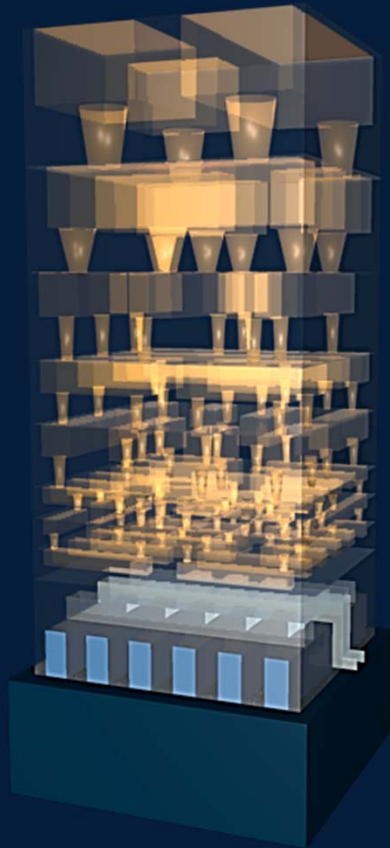
Lithography	Damage, Charging
High-k/ Metal Gate	Image Optimization
Ultra Low-k	Low Voltage
Etch	High Aspect Ratio
Topography	Contrast for shallow defect
Materials Analysis	Small Defect

External Use

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SEMVision G5 Enables Superb Image Quality

New features enable higher tool performance
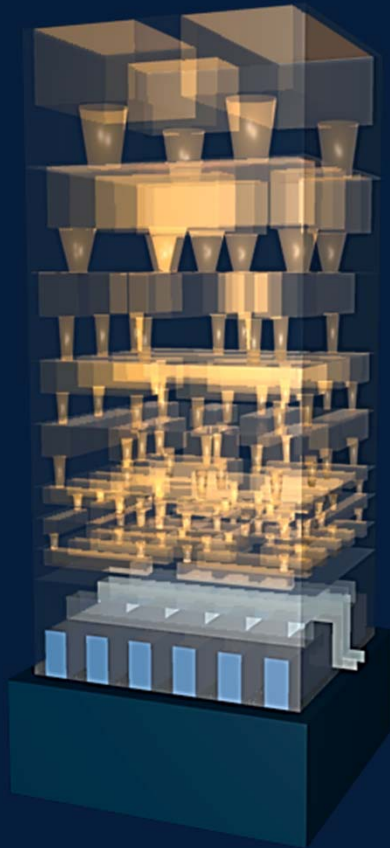
| Feature	Description
Class Image	Robust 0.5um Field of view with 1nm pixel
Charger Suppressor	Overcome new materials charging
Bottom Pump	Better extraction of bottom of trench
Ultra Low Landing Energy	No damage on Ultra Low-k, EUV resist
Topography	Enhanced contrast
Materials Analysis	Capable of 30nm

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Image Quality Improvements

Topography
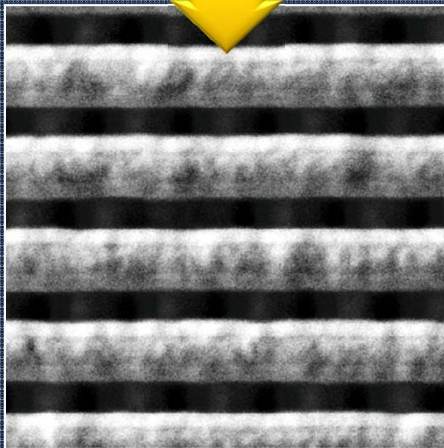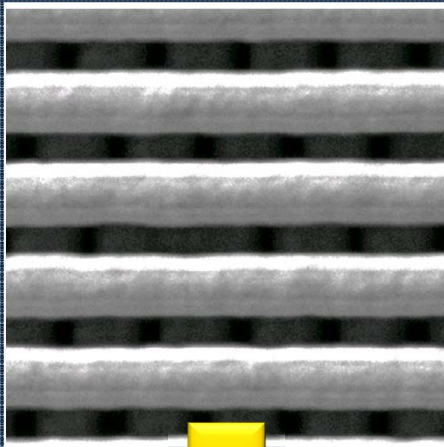
Bottom Extraction
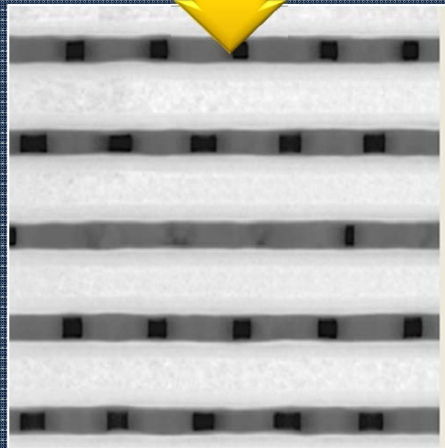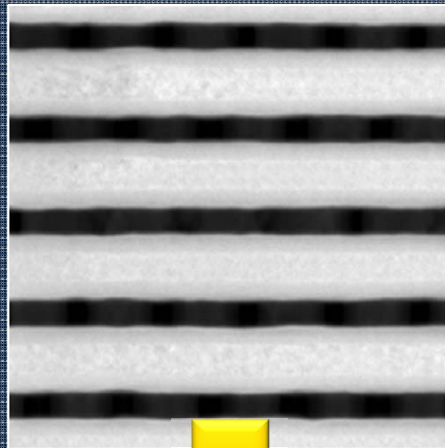
Small FOV & Pixel

FOV 2um; Pixel 4nm

FOV .5um; Pixel 1nm

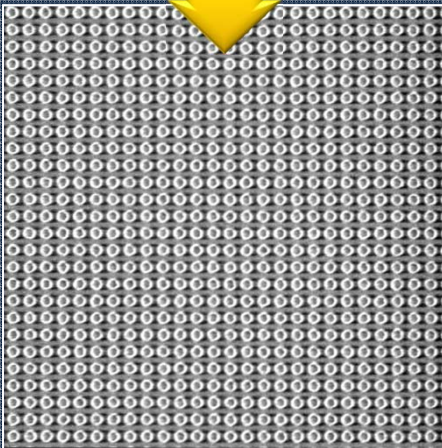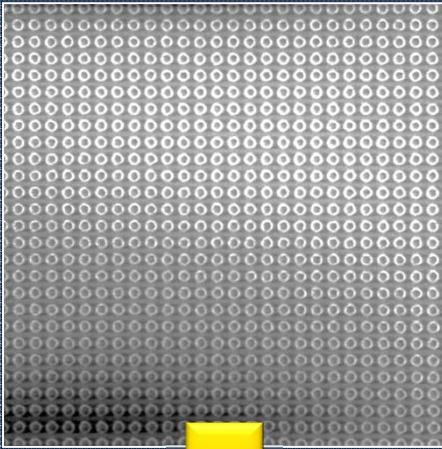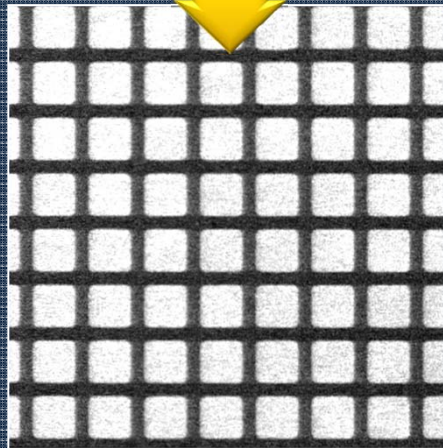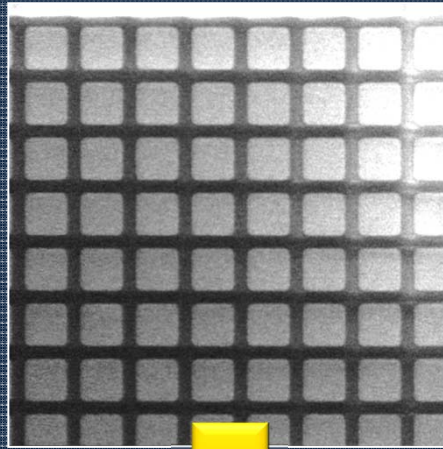SILICON SYSTEMS GROUP

External Use

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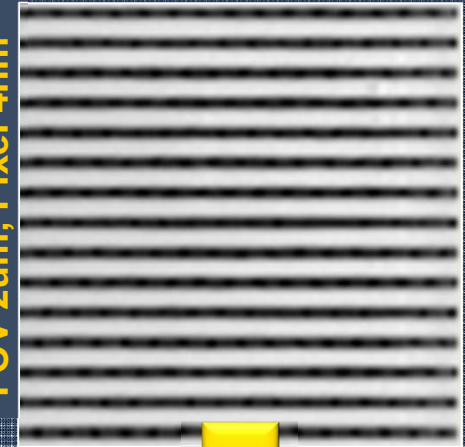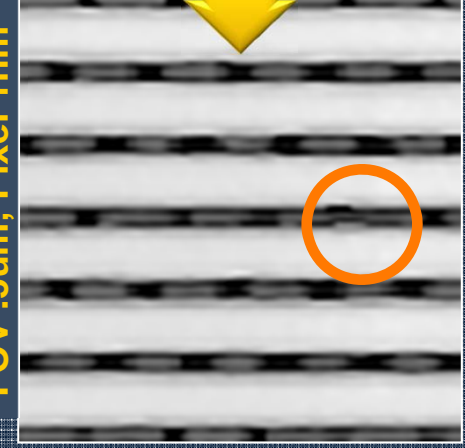
Image Quality: Charge Suppression

on Resist

on Ultra low-*k*

High-*k* Metal Gate

External Use

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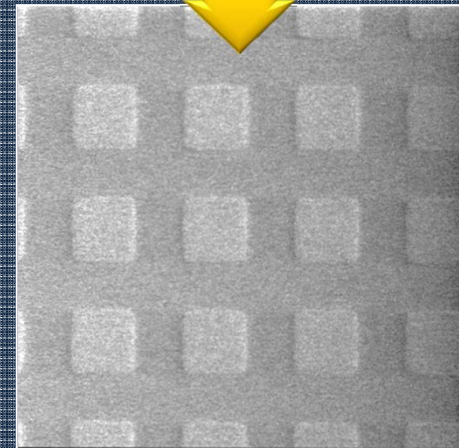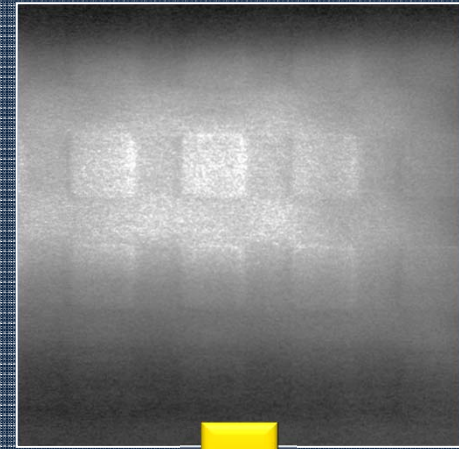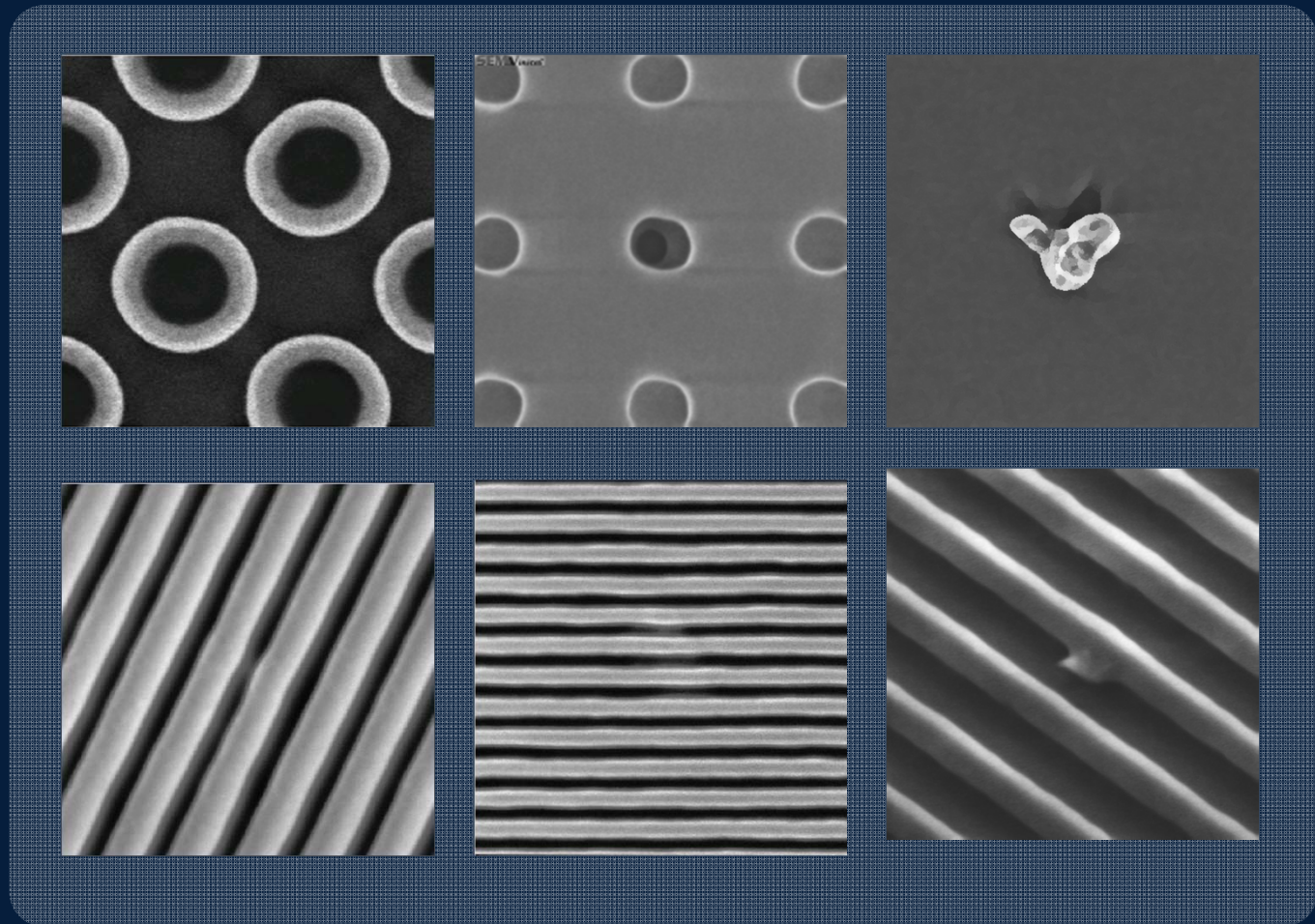
G5 Delivers Robust Class Image at 0.5um

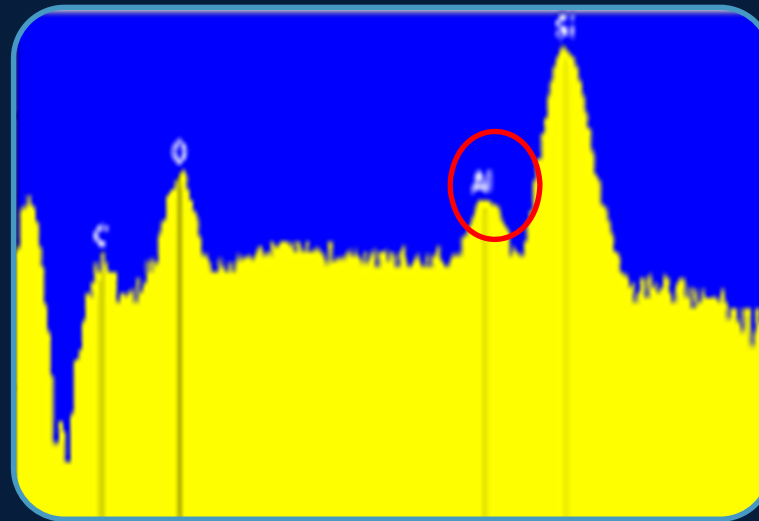## Accurate Identification of All Defect of Interests

**FOV 0.5um,
1 nm Pixel**

External Use

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New Material Analysis Technology
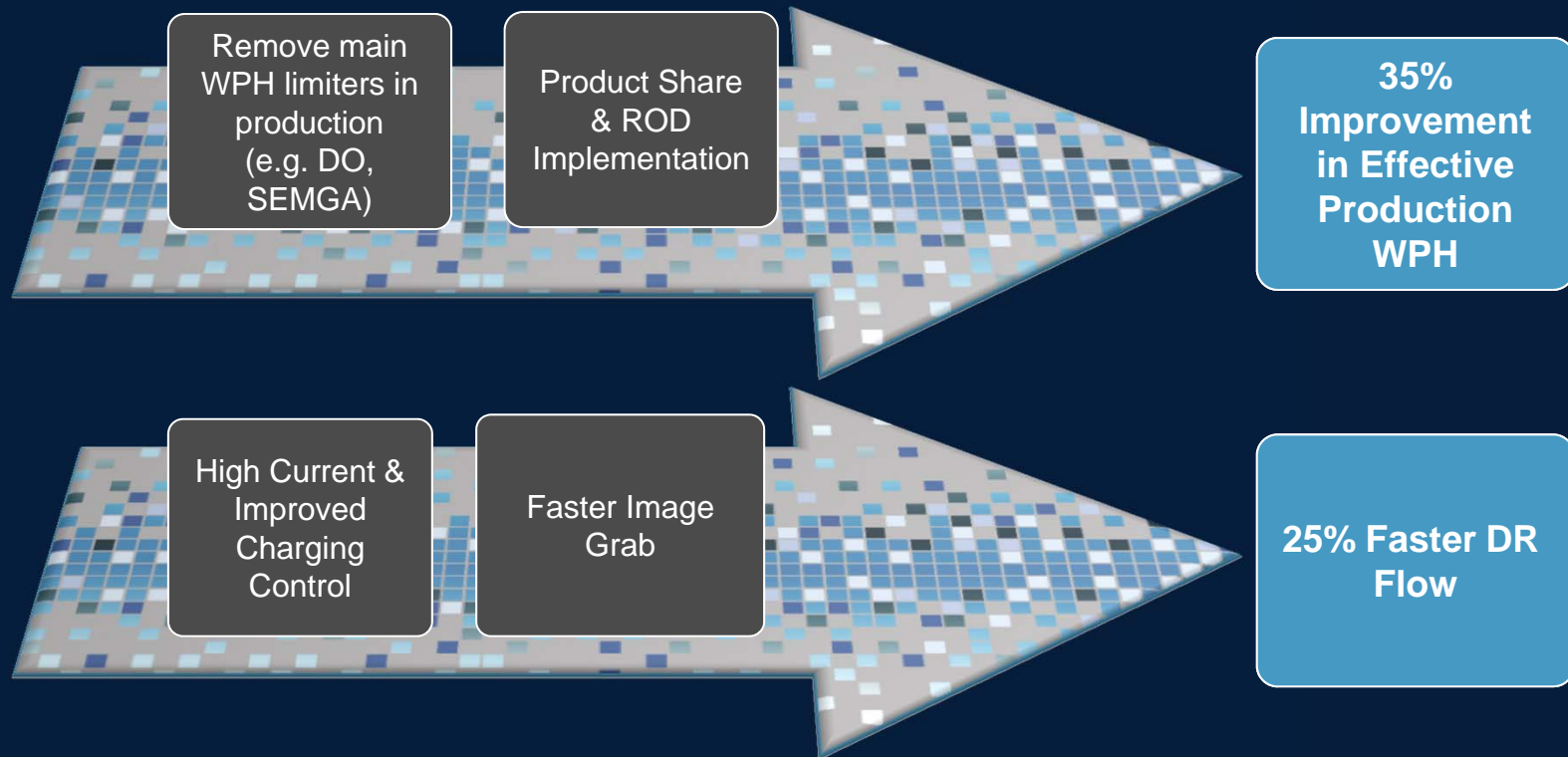
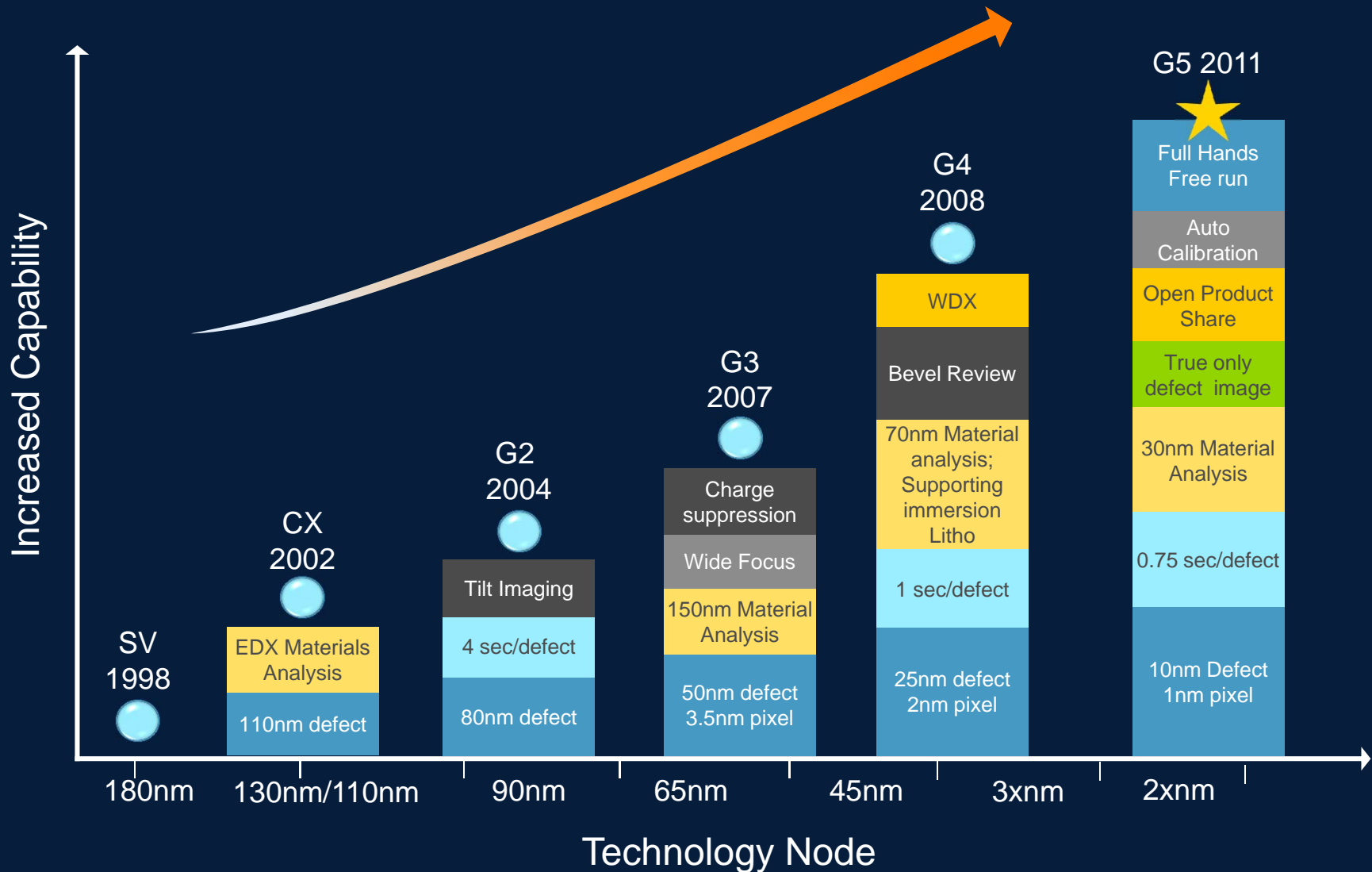| SEMVision G5 Capability	
Sensitivity & TPT	30nm ~5sec
SEM Operation	Tilt 0º & 45º
Spectrum	Improved material separation & sum Peak removal
Maintenance	None

Al is well resolved from Si

in 28nm Al_2O_3

External Use

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Cost of Ownership Improvements

SEMVision G5 addresses CoO by throughput improvement

Remove main WPH limiters in production (e.g. DO, SEMGA)

Product Share & ROD Implementation

35% Improvement in Effective Production WPH

High Current & Improved Charging Control

Faster Image Grab

25% Faster DR Flow

External Use

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Applied SEMVision G5
Continuing Defect Review Leadership for the Next Decade
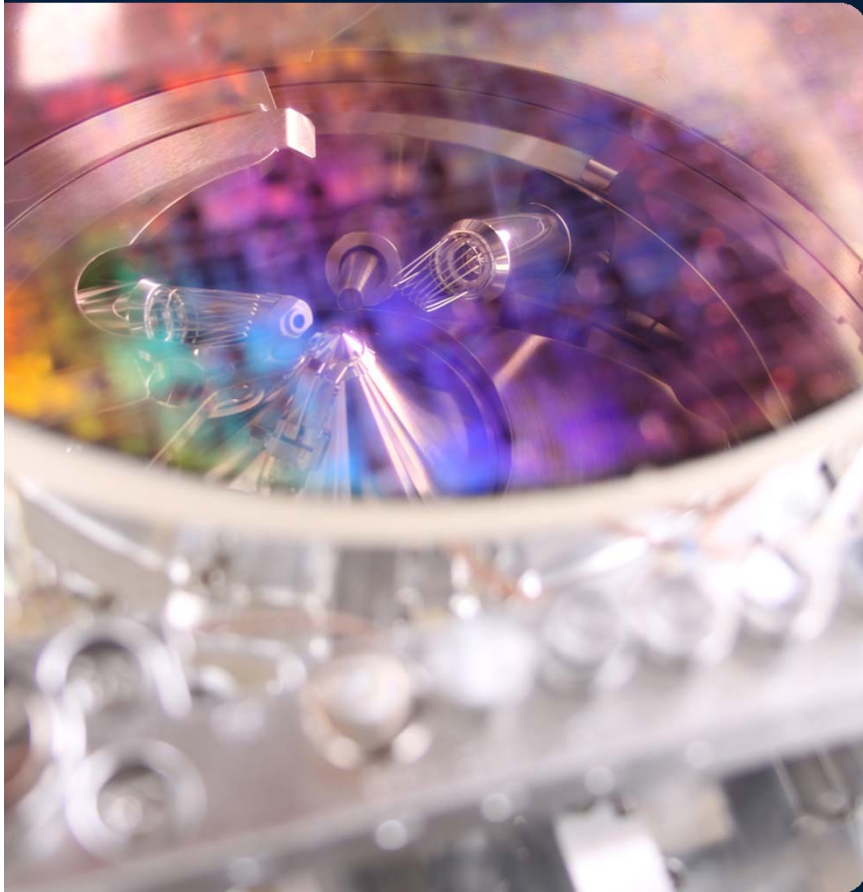
"Hands-Free" Automated SEM flow

True defect imaging with easy classification

Superb image quality at 1nm pixel

Enabling 2xnm process yield

External Use

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Turning innovations
into industries.™