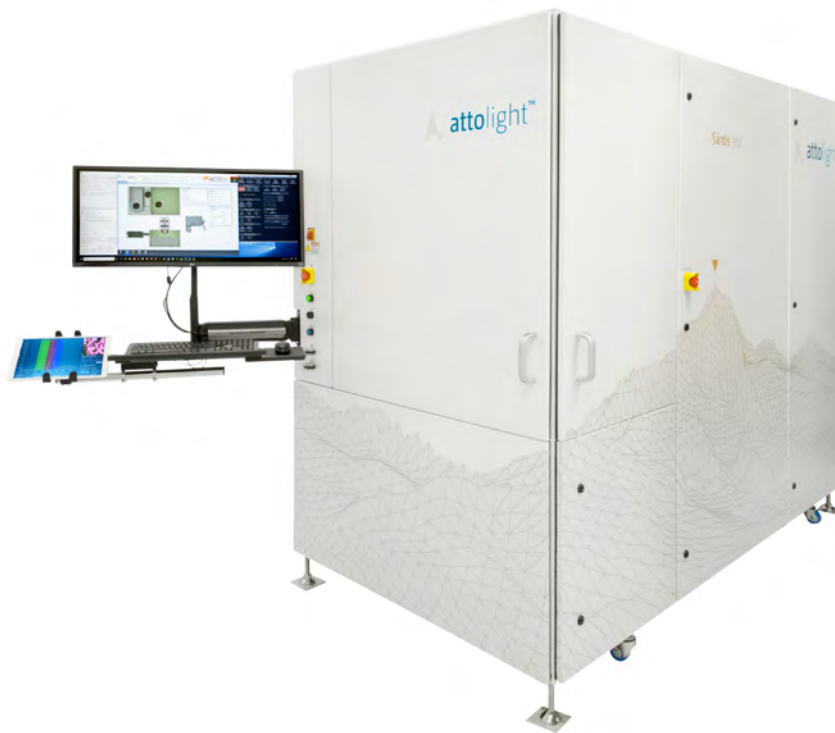


# Säntis 300

## Full wafer cathodoluminescence control up to 300 mm diameter

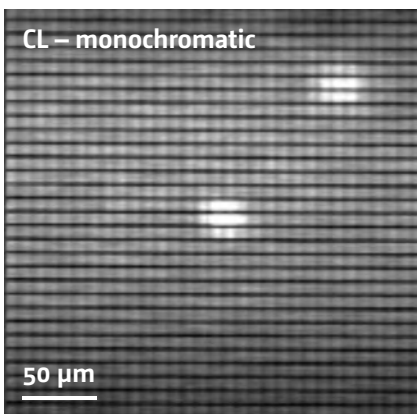
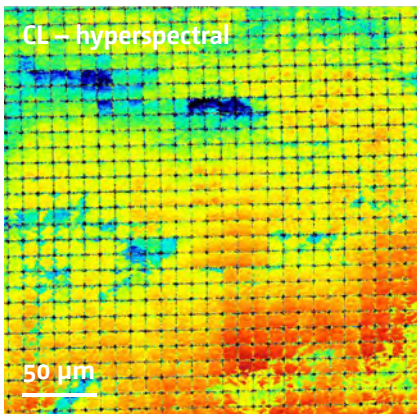
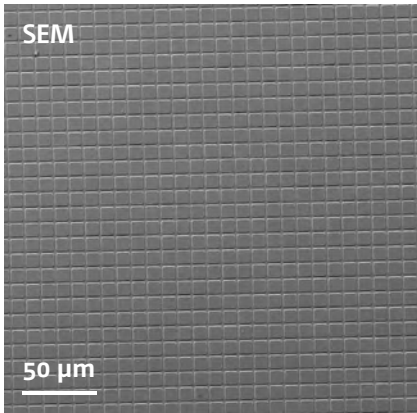


### Overview

The **Säntis 300** system has been designed for fully automated control of 150, 200 and 300 mm wafers. Attolight's Quantitative CL-SEMs offer "No Compromise" large field fast scanning simultaneous acquisition of SEM image, hyperspectral CL maps, and optical spectra. Smaller diameter wafers, or miscellaneous shaped substrates are manually loaded on intermediary 300 mm susceptors subsequently handled automatically by the tool.

The **Säntis 300** system offers 3 distinct acquisition modes: step and repeat (S&R), continuous scanning mode (AWpix), integrative scanning mode (FWbrush).

- Up to 300 mm wafer tool
- High CL-SEM throughput
- Simultaneous SEM imaging and Optical signature acquisition
- Edge detection for accurate blank wafer positioning ( $\pm 5 \mu$ )
- Automated wafer bow mapping and correction



### Microstructured LEDs (MicroLed) Step and Repeat and AWPix modes

#### Step and Repeat

- High resolution cathodoluminescence: individual structures, dislocations, composition fluctuations
- Typical time/image: 60 s, hyperspectral map
- 30 min/wafer @ 20 images/wafer
- FOV 275  $\mu\text{m}$ , 729 MicroLEDs per FOV
- Automated image analysis

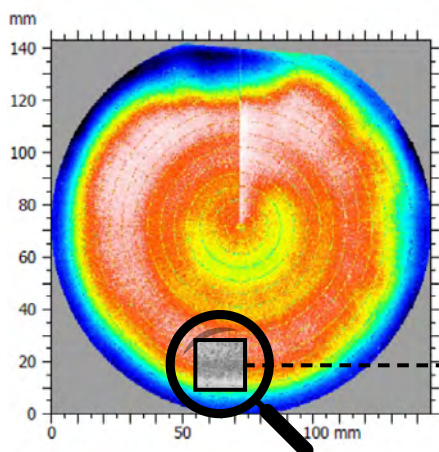
#### AWPix

- CL intensity at a given wavelength: measures each structure on the full wafer
- Typical measurement time per pixel:  $\sim\mu\text{s}$
- $\sim 2$  h for 100% coverage of a 150 mm wafer
- Automated image analysis
- Use case: Wafer final test of MicroLED performance

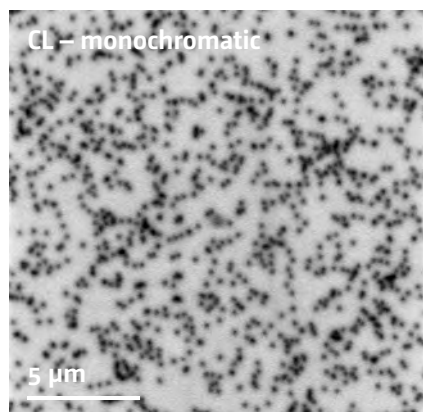
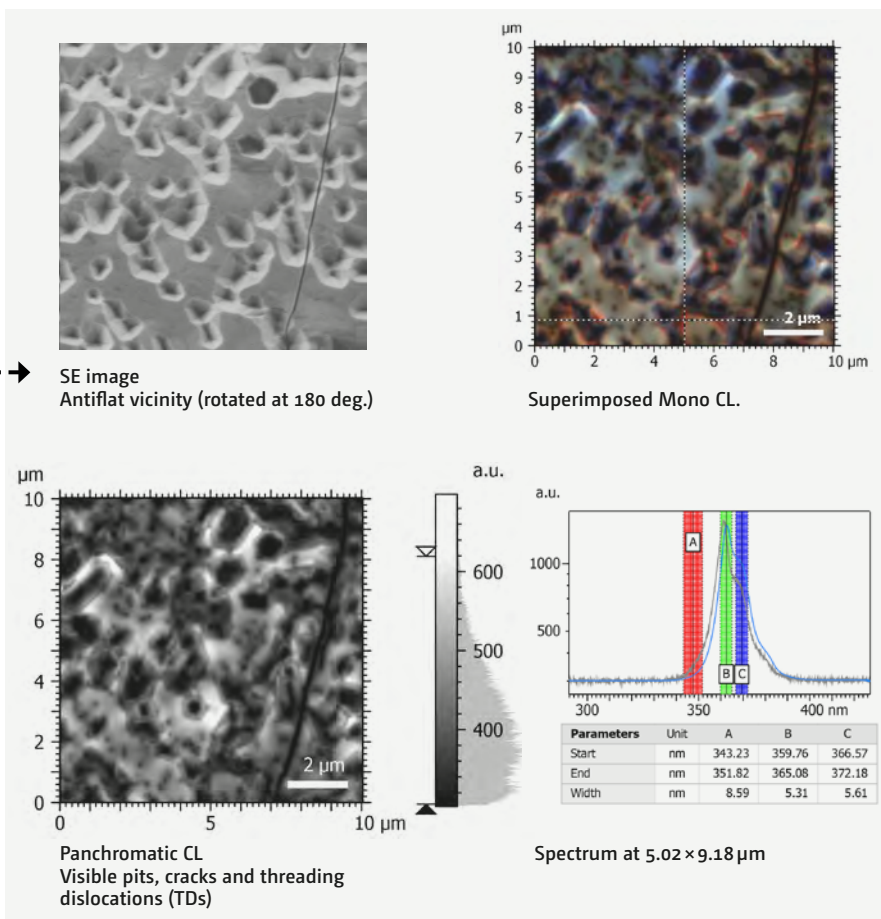
### LED

#### Full wafer brush mode

- Pixel size 300  $\mu\text{m}$
- Full wafer hyperspectral map
- 13 minutes for 100% coverage of a 150 mm wafer



Panchromatic CL  
3 mm exclusion zone



CL - monochromatic

5  $\mu\text{m}$

### GaN on Sapphire wafer

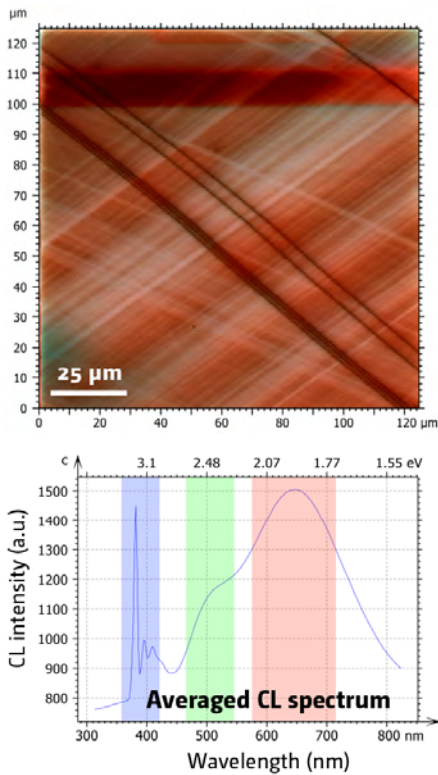
#### Threading dislocation density

##### Step and Repeat mode

- High resolution cathodoluminescence: individual structures, dislocations
- Typical time/image: 2 s, monochromatic map
- <10 min per 150 mm wafer at 50 images/wafer

##### Automated image analysis

- Threading dislocation density -  $3.1 \times 10^8 \text{ cm}^{-2}$
- Use case: MOCVD deposition control



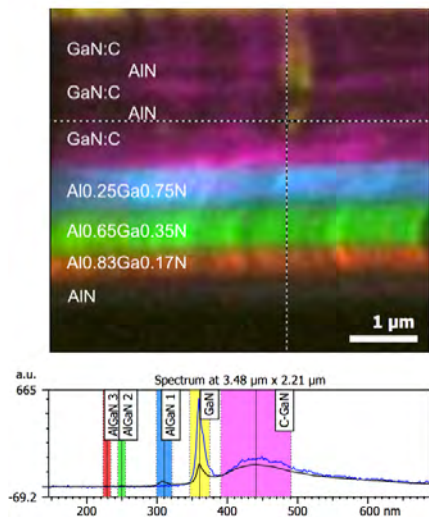
**SiC substrate**  
**Defect inspection & classification**

**Main advantages of Attolight CL**

- High resolution cathodoluminescence: defects
- Typical time/image: 3 minutes, hyperspectral map
- 40 min/150 mm wafer for 10 images/wafer

**Detected defects**

- Green band: 3C-SiC inclusions in 4H-SiC
- Blue band: point defects
- Red band: basal plane dislocation sheet (dark zone)
- Dark lines: stacking faults
- Dark points: dislocations
- Automated defect classification



**GaN HEMT**  
**Step & Repeat mode, cross-section**

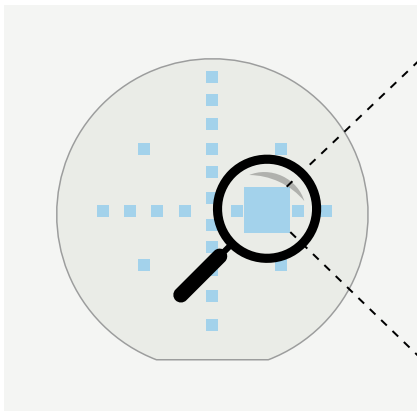
- Each alloy has a distinct spectral signature: band edge emission
- C-compensated GaN easily distinguished
- Growth defect in GaN:C leads to GaN:UID punch-through defect
- Threading dislocation signature visible
- Pixel size 40 nm, acquisition time 160s

### Acquisition Modes

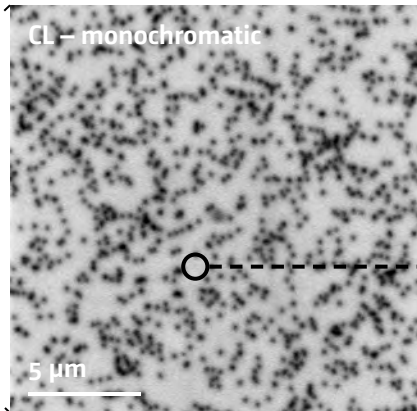
Attolight **Santis 300** system offers 3 distinctive acquisition modes, tailored for different needs and applications:

#### Step and repeat

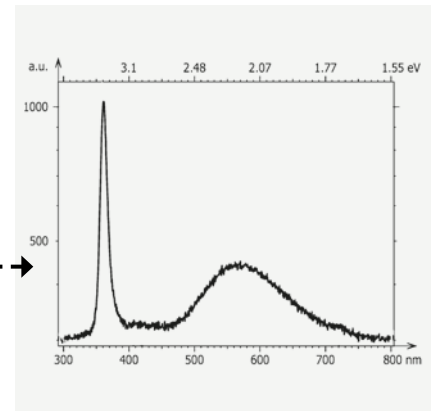
Traditional frozen mapping allowing repetitive acquisitions at fixed locations spread over the wafer. Measurements and analysis parameters can be defined and stored in a recipe database.



Information in every zone:  
Defect Density, peak wavelength, FWHM

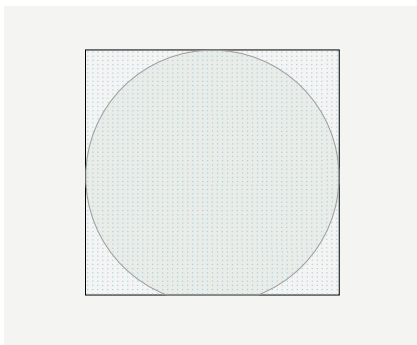


Dislocation on panchromatic map



Full emission spectrum from every pixel on hyperspectral map

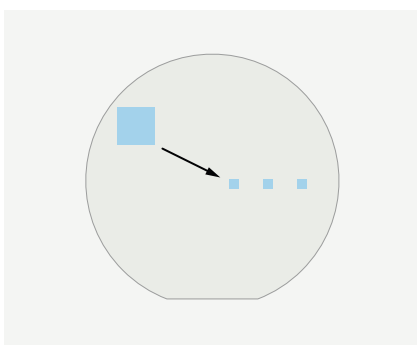
### AWpix (across wafer pixel) imaging (patent pending)



Innovative full measurement of the wafer area allowing medium resolution imaging of the whole wafer. Partial wafer imaging possible. Measurements and analysis parameters can be defined and stored in a recipe database.

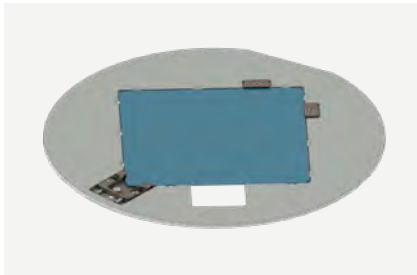
Down to 0.1  $\mu$ sec per pixel (intensity at given wavelength)  
0.5 to 2.5  $\mu$ m beam spot size Simultaneous SE image  
<2.5 h per wafer for 100% coverage of a 150 mm diameter wafer

### FWbrush (full wafer brush) imaging (patent pending)



Innovative high speed measurement of the wafer area allowing low resolution imaging of the whole wafer. Partial wafer imaging possible. Measurements and analysis parameters can be defined and stored in a recipe database.

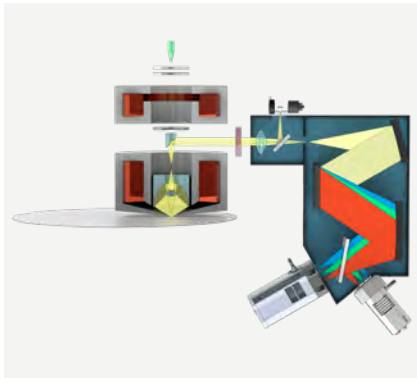
Down to 0.1  $\mu$ sec per pixel (intensity at given wavelength) Down to 1 msec per pixel (Full spectra)  
300  $\mu$ m pixel Simultaneous SE image  
Up to 4 wafers per hour for 100% coverage of 150 mm diameter wafers



### System configurations

Various system configurations are available, the system is fully upgradeable from P1 to P3:

- P1: Manual loading system, no loadlock
- P2: Manual loading system, loadlock
- P3c: Open cassette system
- P3e: EFEM system



### Attolight Quantitative Cathodoluminescence

The Attolight Quantitative Cathodoluminescence comprises a custom designed electron column with tightly integrated light collection optics.

The light collection optics featured a field of view of up to 300  $\mu\text{m}$ . The light detection path is carefully optimized and fully aperture matched to guarantee highest light collection uniformity ( $\pm 1\%$ ) over the FOV. The carefully integrated design and optimization of light and electron optics make high measurement speeds, accuracy and repeatability possible.

Quantitative CL produces UV-Visible and NIR hyperspectral maps (full emission spectrum in every pixel) or panchromatic maps (intensity of defined wavelength in every pixel).



### System lay-out and facilities

#### Dimensions

- Dimensions: (length) 2425 mm  $\times$  1300 mm (width)  $\times$  2055 mm (height)

#### Tool weight

- Main unit:  $\sim$ 2750 kg
- Delivered linked together with caster to allow rolling in place.

#### Facilities

- Dry nitrogen
- Compressed air
- Power
- Exhaust
- Primary pump can be remotely located

Operator manually loading wafer into the loadlock of a Sántis 300 P2 tool