

PLATO Series

Overview

EtaMax



PLATO (Auto-loading model)



PLATOM (Manual loading model)

Features

- PLATO is a fully automated photoluminescence mapping system and is optimized measurement equipment to evaluate the spectral characteristics of compound semiconductors at the wafer level.
- PLATO can evaluate the spectral characteristics from DUV to NIR range according to the selection of pumping laser and spectroscopy.
- PLATO can be applied to a variety of applications by providing a wide range of customizing options. (LEDs, Power devices, Optical communication, etc.)
- Support for 2", 3", 4", 150 mm, 200 mm wafer.
- **NEW!** PLATO-300 – Auto-loading PL mapping system for measuring 300 mm wafer with FOUP loader.

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Spectrometer options

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High-end spectrometer option

- Research grade spectrometer for higher optical resolution.
- Grating configuration can be customized by combining Groove density and Blazed wavelength to apply to various applications.

Focal length	Gratings			Spectral Range	Optical Resolution
	No.	Groove Density	Blazed Wavelength		
190 mm (UV-VIS)	1	300 ln/mm	500 nm	433 nm	1.21 nm
	2	600 ln/mm	300 nm	215 nm	0.6 nm
330 mm (VIS-NIR)	1	150 ln/mm	1250 nm	491 nm	1.06 nm
	2	300 ln/mm	1200 nm	232 nm	0.51 nm
	3	300 ln/mm	760 nm	289 nm	0.45 nm
	4	600 ln/mm	1000 nm	118 nm	0.25 nm

* Default option: 190mm or 330mm focal length (Selectable)

- TE cooled 2D CCD and InGaAs array CCD detector can be applied.

CCD	Type	Optimized wavelength	Effective range (>QE 30%)	Active pixels (W x H)
2D CCD	UV enhanced	250 nm	200 nm – 950 nm	1024 x 255
	UV enhanced	350 nm	300 nm – 950 nm	1024 x 255
	NIR enhanced	780 nm	350 nm – 1000 nm	2000 x 256
InGaAs array CCD	1.7	1300 nm	900 nm – 1650 nm	1024 x 1
	2.2	1800 nm	1000 nm – 2150 nm	1024 x 1

- Motorized entrance slit.
- Auto wavelength calibration function.

Compact spectrometer option

- Compact type spectrometer for high-speed measurement with lower cost.

Gratings		Spectral Range	Optical Resolution
Groove Density	Blazed Wavelength		
600 ln/mm	500 nm	440 nm	0.9 nm

* Default option: 101mm focal length

- Fixed entrance slit.
- Fixed spectral range.

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Specifications

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General Specifications

General	Wafer Moving for Mapping	• XY-Linear motor stage for wafer moving • Z-stage for compensate the substrate thickness
	Wafer Handling	• 3 Axes servo-controlled Wafer Transfer Robot • Wafer Pre-Aligner
	Detector	• 193mm focal length, dual output imaging spectrograph. • Motorized entrance slit • Dual grating turret - 300 gr/mm, 500 nm blazed - 600 gr/mm, 300 nm blazed • UV enhanced TE cooled CCD detector - Spectral range: 200~1050 nm
	Light source	#1: 266 nm DPSS laser (>10mW) #2: 375 nm CW laser (50mW) #3: 532 nm CW laser (50mW) Halogen lamp for thickness and reflectance measurement
Measurement	Repeatability	Wp, Wd, FWHM: ± 2.5 nm PI, II, Reflectance: ± 2.5 % Thickness: ± 1 % Bowing: ± 2 μ m (>30 μ m)
	Reproducibility	Wp, Wd, FWHM: ± 5 nm PI, II, Reflectance: ± 5 % Thickness: ± 1 % Bowing: ± 5 μ m (>30 μ m)
Operating Software	Programming	C#
	Operation modes	Operator, Engineer, Maintenance
Operating environment	Place	Clean room (class ISO3)
	Temperature	15-35 °C
	Humidity	< 85%RH with no dew condensation
Utility of PLATO (Auto Loading System)	Dimensions	Approx. 1550(W) x 1200(D) x 1600(H) mm
	Weight	Approx. 700 kg
	Input voltage/Curr ent	Single phase 220 V, 30 A
	CDA or N2	0.4-0.6 MPa
	Vacuum	-80 kPa for vacuum

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Specifications

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General Specifications

- Measurement items
Peak wavelength, Peak intensity, Integrated intensity, FWHM, Dominant wavelength, Center wavelength, Alloy content^{*1}, Yellow luminescence/Bound exciton, Reflectance, Epi-layer thickness, DBR^{*2}, Wafer bow
- High speed^{*3}, High precision^{*4} XY-stage.
- Z-stage and auto focus function for measuring wafers with a thickness of 0.3-2 mm.
- Minimum spatial resolution: 0.5 mm^{*5}
- 3 or more pumping lasers can be selected.
213, 266, 325, 355, 375, 405, 532, 980, 1064 nm lasers are available.
- Laser spot size: 0.35-0.5 mm
- Epi-layer thickness measurement: 1-10 μm ^{*6}
- 0.3-1 μm ^{*6} thickness can be measured by applying nonlinear fitting algorithm through reprocessing in the separate data viewer.

*1 Al in AlGaIn layer

*2 Dip, Stopband, Reflectance

*3 max. 130 mm/s

*4 1 μm /pulse

*5 50-200 mm wafer.

*6 GaN, AlN layer

Throughput

- Throughput

Wafer size	PL	PL > Thickness	PL > Thickness > Bow
100 mm	>50 WPH	>30 WPH	>20 WPH
150 mm	>30 WPH	>20 WPH	>10 WPH
200 mm	>15 WPH	>10 WPH	>5 WPH
300 mm	>6 WPH	>4 WPH	>2 WPH

*Measurement condition: 2 mm step, 2 mm edge exclusion, 10 ms exposure time

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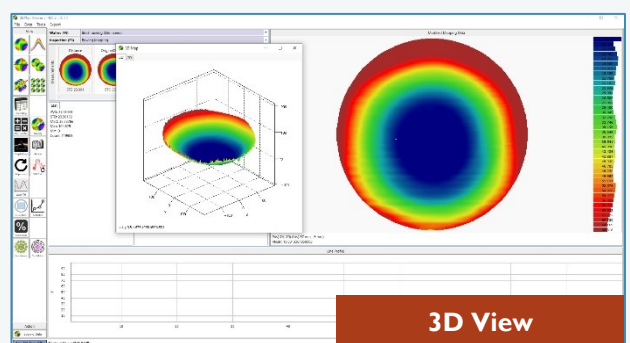
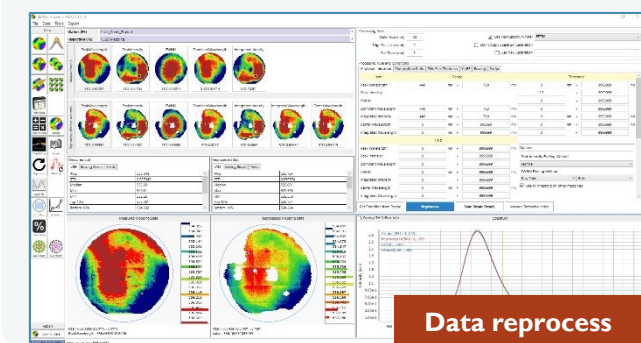
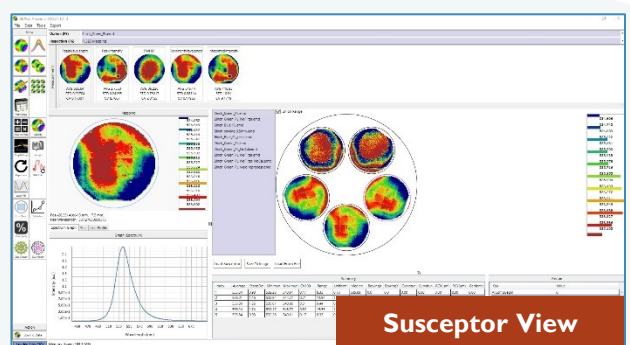
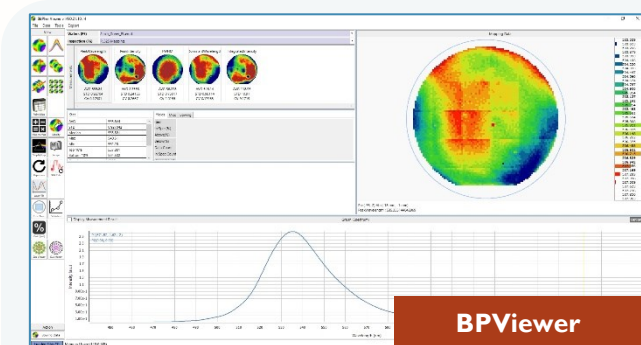
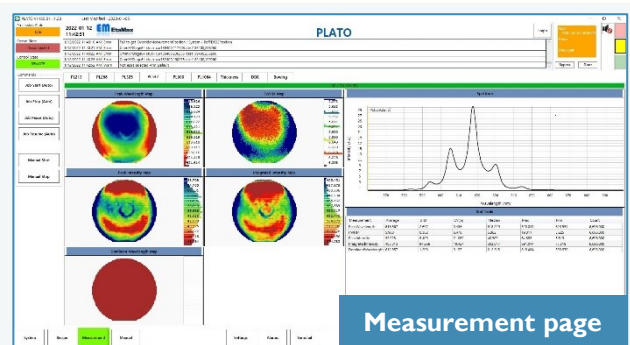
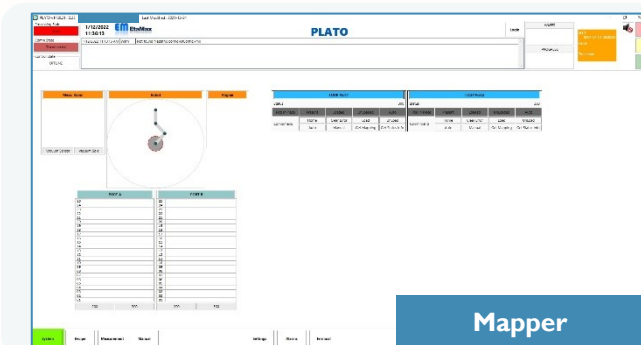
Software

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Features

- Template based Excel, CSV export.
- SECS/GEM compatible.
- Windows 10 64-bit operating system.
- Stand-alone data viewer with no license restrictions.
- Data reprocessing function using data viewer.
- User editable susceptor layout.
- 3D view function for all mapping data.

Measurement Program



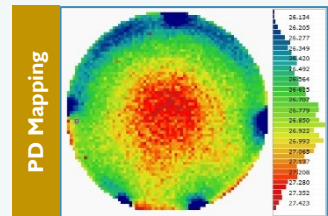
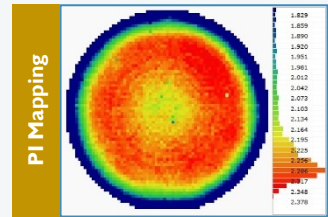
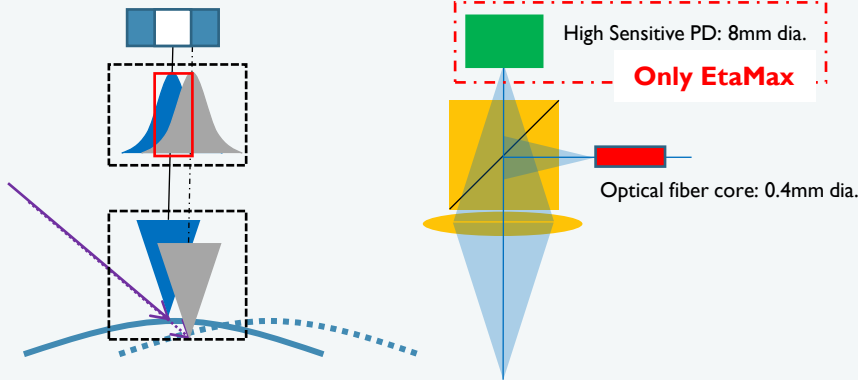
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PLATO-LED

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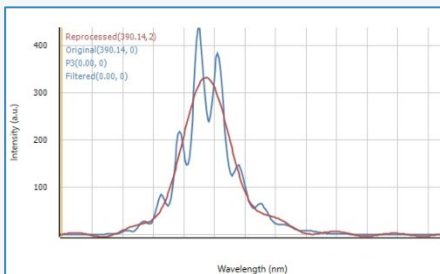
LEDs

PD mapping

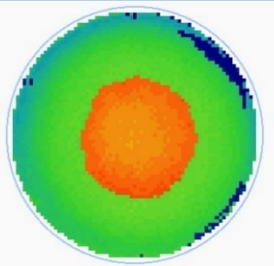


- Through a high sensitive photo detector with a diameter of 8mm, the bow element of the wafer can be removed from the intensity mapping.

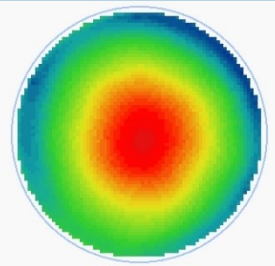
FFT Filter



Original PW Mapping



FFT filter applied



- FFT filter can remove interference pattern from the PL spectrum so that more accurate PW and FWHM mapping can be obtained.

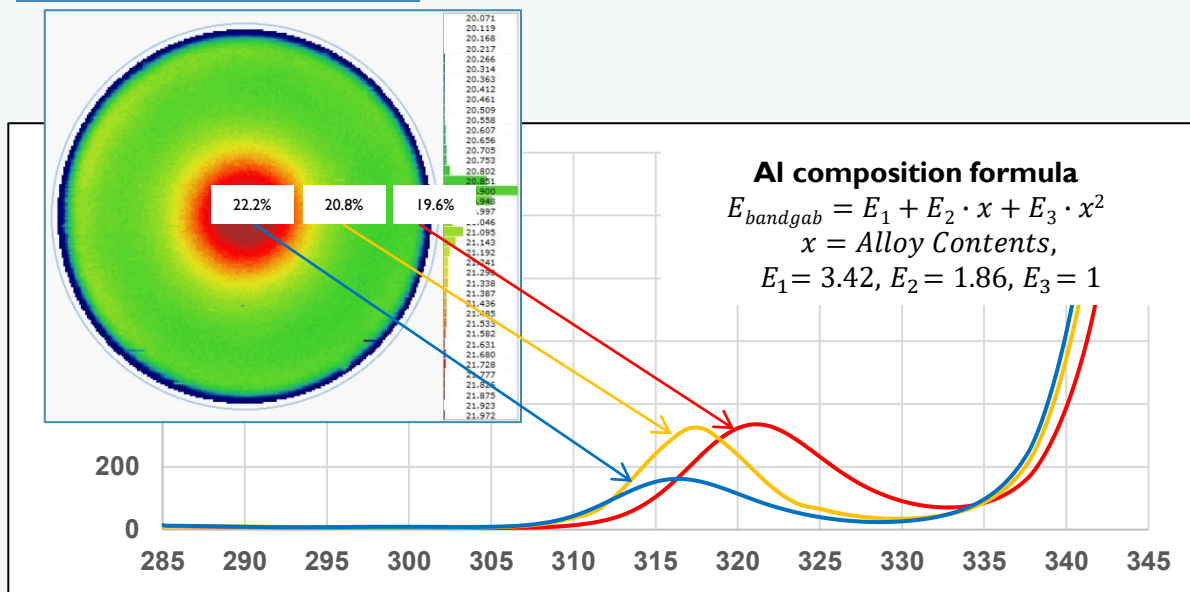
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PLATO-GaN Power device

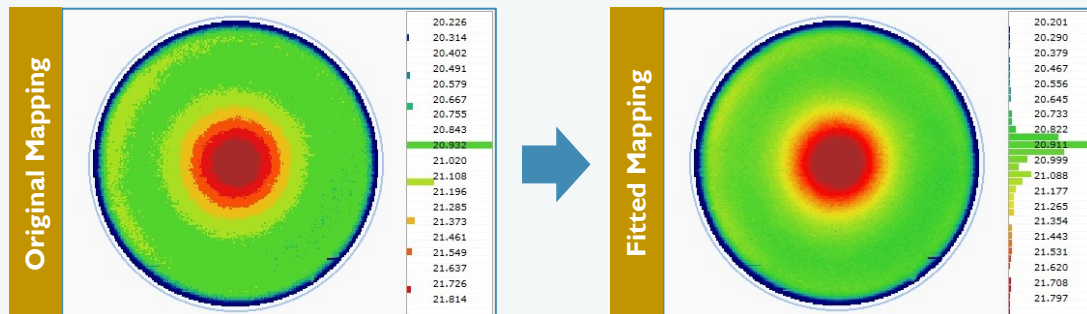
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GaN Power Devices

Al content calculation



Polynomial fitting algorithm



- Laser for Al composition
 - Pulsed 266 nm laser: 10-30 % Al content
 - Pulsed 213 nm laser: >50 % Al content
- User editable composition calculation formula.
- The formula can be registered in the preset and easily applied or changed in the Measurement Recipe Setting tab.
- The polynomial fitting algorithm is applied to show high resolution mapping even it is measured with a spectrometer that has low pixel resolution.

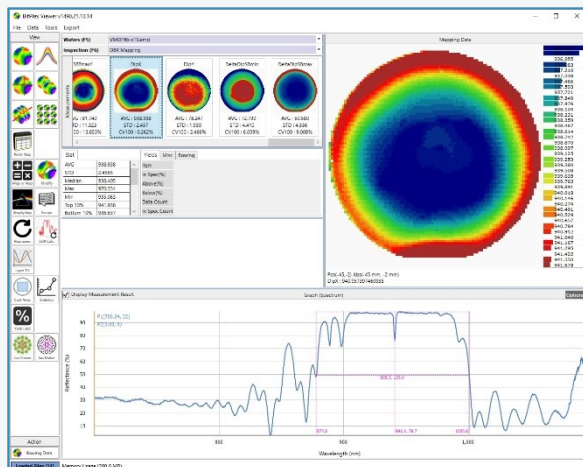
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PLATO-NIR

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VCSEL

DBR measurement

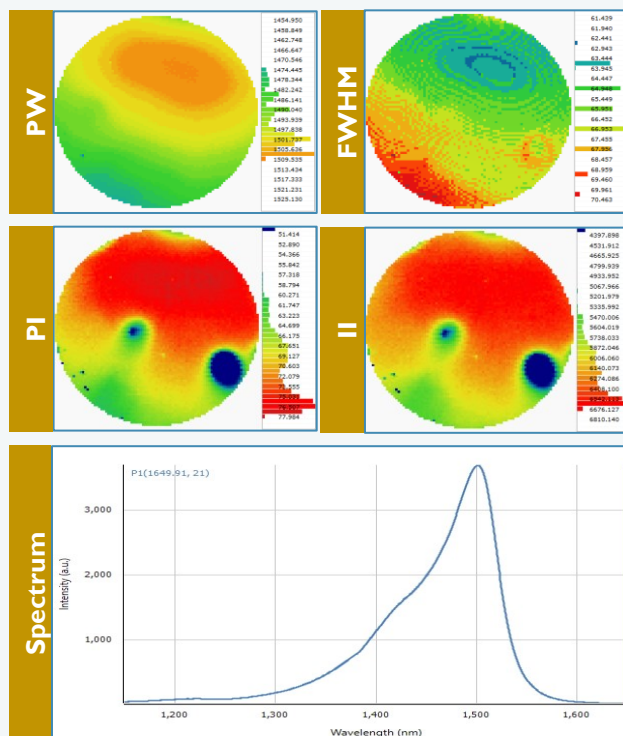


- Laser for PL
 - CW 532 nm laser
- Light source for DBR
 - Halogen lamp
- Reference check is performed for each measurement using the absolute reflective mirror, to minimize the effect of light source degradation.

InGaAsP & Gas sensor

- Laser for PL
 - CW 532, 980 nm laser
 - Pulsed 532, 1064 nm laser
- Wavelength range
 - InGaAs array CCD 1.7: 900-1700 nm
 - InGaAs array CCD 2.2: 1200-2200 nm
 - InAs PD with LIA: 1000-3000 nm
- Minimize the effect of water vapor in the atmosphere with the N2 purge system of spectrometer.

NIR PL mapping data



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PLATO-300/Contact

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PLATO-300



- PLATO with 300 mm wafer Auto-loading system added.
- Can select single or dual load port.
- Can select 150 or 200 mm wafer loading system.
- FOUP, SMIF, and Open cassette are available.

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