

RPMBlue

Photoluminescence Mapping System

- RPMBlue is a new member of the Nanometrics RPM/VerteX family of photoluminescence mapping systems for III-V compound semiconductors.
- RPMBlue is specifically designed and optimized for high-volume manufacturing of Blue LED's based on the GaN/InGaN materials system.
- It incorporates a sub-set of the capabilities and options of the VerteX product – eliminating all unnecessary features and options. For applications that do not require the flexibility and versatility of VerteX – RPMBlue is the answer.
- RPMBlue is optimized for throughput – to maximize productivity at the lowest possible cost.
- RPMBlue introduces a number of innovative software features specifically for HB-LEDs.



Specifications/Features

- Choice of 405nm CW or 375nm CW standard. Others lasers on request
- High speed r-q stage supporting 2", 2.5", 3", 4", 5" and 6" wafers
- Spatial resolution is operator selectable from 0.1mm to 5mm
- Industry standard Genmark robot and pre-aligner
- Up to three cassette stations for robotic loading and supports both H-bar cassette or ePak wafer carrier
- Pipeline mode running cassette stations in succession for non-stop measurement
- 300mm focal length Research Grade Spectrometer
 - High performance grating (150g/mm, 300g/mm or 600g/mm)
 - High Sensitivity 1024 pixel high-end back-thinned, TE cooled UV enhanced CCD detector
- Fixed spectrometer entrance slit
- Fixed center wavelength
- Thickness measurement, better than 1% accuracy
- New FPGA electronics board enables data acquisition speeds up to 80 full spectral per second saved to disk
- Data acquisition and analysis software based on the famous RPM/VerteX software with enhancements for HB-LED manufacturing

Throughput

| Wafer Size | Spectra/second | Spatial Resolution | Edge Exclusion | Throughput (WPH) |
|------------|----------------|--------------------|----------------|------------------|
| 50 mm | 80 | 2 mm | 2 mm | >75 |
| 75 mm | 80 | 2 mm | 2 mm | >60 |
| 100 mm | 80 | 2 mm | 2 mm | >50 |
| 150 mm | 80 | 2 mm | 2 mm | >30 |

* Assumes the use of a sample wafer that is typical of current Blue LED production in terms of brightness, FWHM, Uniformity, flatness etc. If the customer's wafers are not typical Nanometrics will demonstrate throughput using a Nanometrics wafer.

Spectrometer Specifications

Laser: 375 nm or 405 nm diode

Detector: 1024 BT TE UV enhanced CCD

| Grating | Spectral Range | Resolution/ Pixel | Accuracy nm | Reproducibility nm | Repeatability nm |
|----------|----------------|-------------------|-------------|--------------------|------------------|
| 150 g/mm | 512 nm | 0.52 nm | +/-1.6 nm | +/-1 nm | +/-1 nm |
| 300 g/mm | 256 nm | 0.26 nm | +/-0.8 nm | +/-0.75 nm | +/-0.75 nm |
| 600 g/mm | 128 nm | 0.13 nm | +/-0.4 nm | +/- 0.52 nm | +/- 0.52 nm |

1. Reproducibility data is determined from cycling: wafer load, measurement, wafer unload, power tool down and then powering up the tool
2. For PL applications all wavelength reproducibility data is calculated using the 'Threshold Method'
3. Reproducibility is calculated from the mean parameter values measured over a 5mm diameter in the centre of a uniform wafer
4. Assumes measurements are carried out within a temperature excursion of $< \pm 1^{\circ}\text{C}$
5. All specifications are $1-\sigma$

Photoluminescence Intensity Specifications

Intensity Reproducibility $\pm 5\%$

Intensity Repeatability $\pm 2.5\%$

1. Assumes laser stability is better than $\pm 2\%$
2. Notes 1 & 2 above apply
3. System is allowed to warm up for >30 mins after complete shut down
4. The in-situ laser power monitor on the RPM is intended only as a guide and is not to be used as an accurate measure of laser power
5. Results do not consider long term laser drift, the characteristics of which is highly laser type dependent
6. All specifications are $1-\sigma$

Software Features

The RPMBlue Software is based on the well-known RPM/VerteX software version 8.0.

Additional features of version 8.0 include:

Edge scan

- User programmable high-resolution ring scan to more accurately measure edge effects
- Dual resolution scan enables mapping the edge of the wafer at high resolution and the center at lower resolution.

FFT filter

Fourier filtering removes interference fringes in GaN LED data allowing more accurate determination of wavelength and FWHM without interference artifacts.

Optional software packages include:

Optimization of reactor platter uniformity

- Displays multiple PL wafer maps in platter layout
- Supports all popular reactor layouts
- Displays multiple platters side by side for easy comparison
- Detailed Statistics for Within Wafer, Wafer to Wafer, Platter to Platter, Run to Run
- Line profile in any arbitrary direction across the platter for data exploring

Accucolor

Calculates and displays maps of Dominant Wavelength

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