High Speed/High Sensitivity Electroluminescence Efficiency Test System: LQ-50X

Introduction

The current challenges of LED development include:

1. New LEDs feature low brightness (< 50000 cd/m2) and fast decay.
2. Light-emitting half-width (FWHM) is smaller than conventional LEDs (OLED~100 nm; PVSK LEDs~50 nm).
3. Non-Lambertian distribution causes big error in converting luminance (cd/m2) to EQE.
4. The luminous wavelength exceeds the visible light range and it cannot be evaluated by luminous flux and luminance.

Among mentioned, "fast decay" and "accurate evaluation of infrared emission" are most closely related to the conversion efficiency measuring. In view of this, Enlitech launches LQ-50X, featuring single-photon detection technology, NIR-enhanced optical design and components, and a compact product design for direct integration with glove boxes.

- Adopt single photon detection technology, overcome the characteristics of traditional spectrometers that require long exposure time (1~3 seconds) at low brightness, and speed up the test to ensure the accuracy and high efficiency of the test.
- Adopt NIR enhanced optical design and components to cover wavelengths up to 1100 nm and is extendable to 1700 nm.
- Design of LQ-50X is compact for direct integration with glove boxes. At the same time, LQ-50X is also suitable for various type of samples.

LQ-50X can quickly test the luminescence spectrum at each voltage, and can obtain multiple parameter values such as irradiance, luminance, CIE coordinates, etc. The measured non-repeatability of the measured inorganic LED test is less than 0.2 %.

Spectrum	Single-point spectral measurement time
High Brightness > 6000 cd/m2	< 20 ms
Low Brightness > 100 cd/m2	< 100 ms
Ultra-low Brightness > 10 cd/m2	< 500 ms

LQ-50X is NIST traceable. Comparing with the calibrated standard white & green LED, the variation is less than 0.5 %.

	Certified Value (lm)	LQ-100 (lm)	Deviation (%)
G-LED	3.426	3.453	0.39%
W-LED	4.625	4.629	0.25%

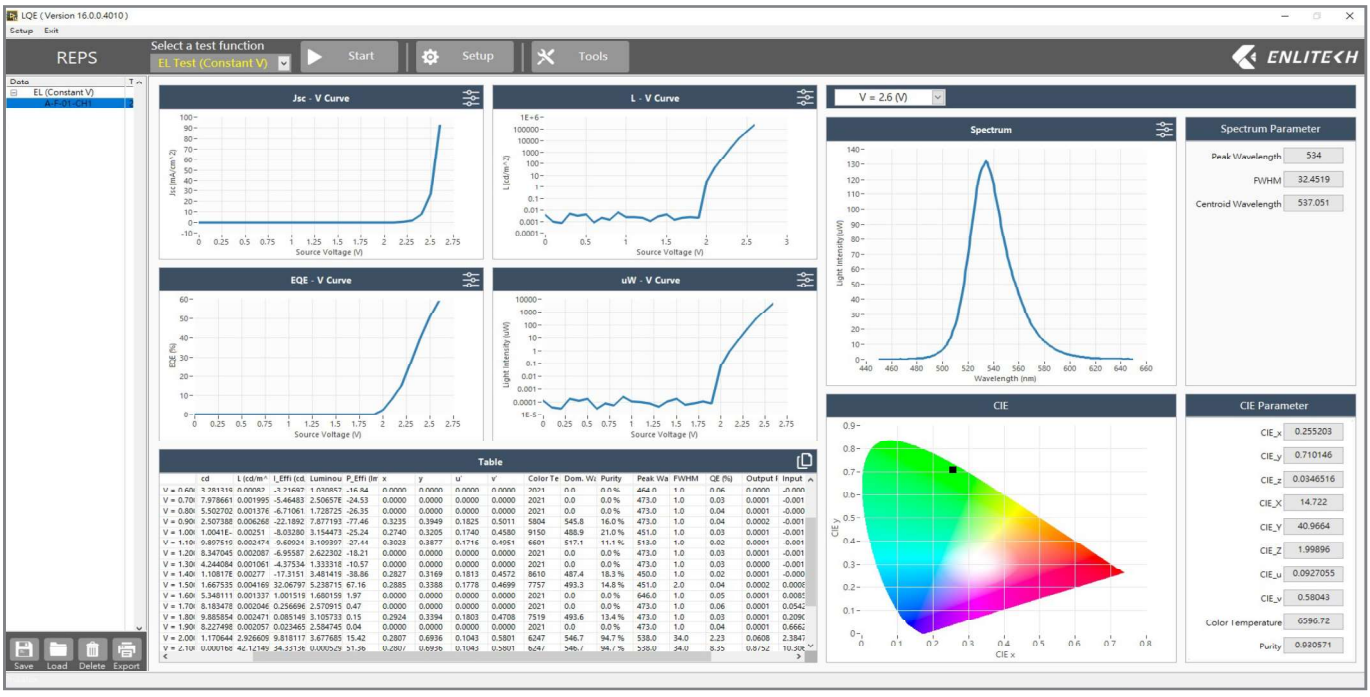
Application

- Perovskite LED / Perovskite Laser Diode
- Organic IR LED
- QD LED / QD Laser Diode
- VCSEL Laser Diode

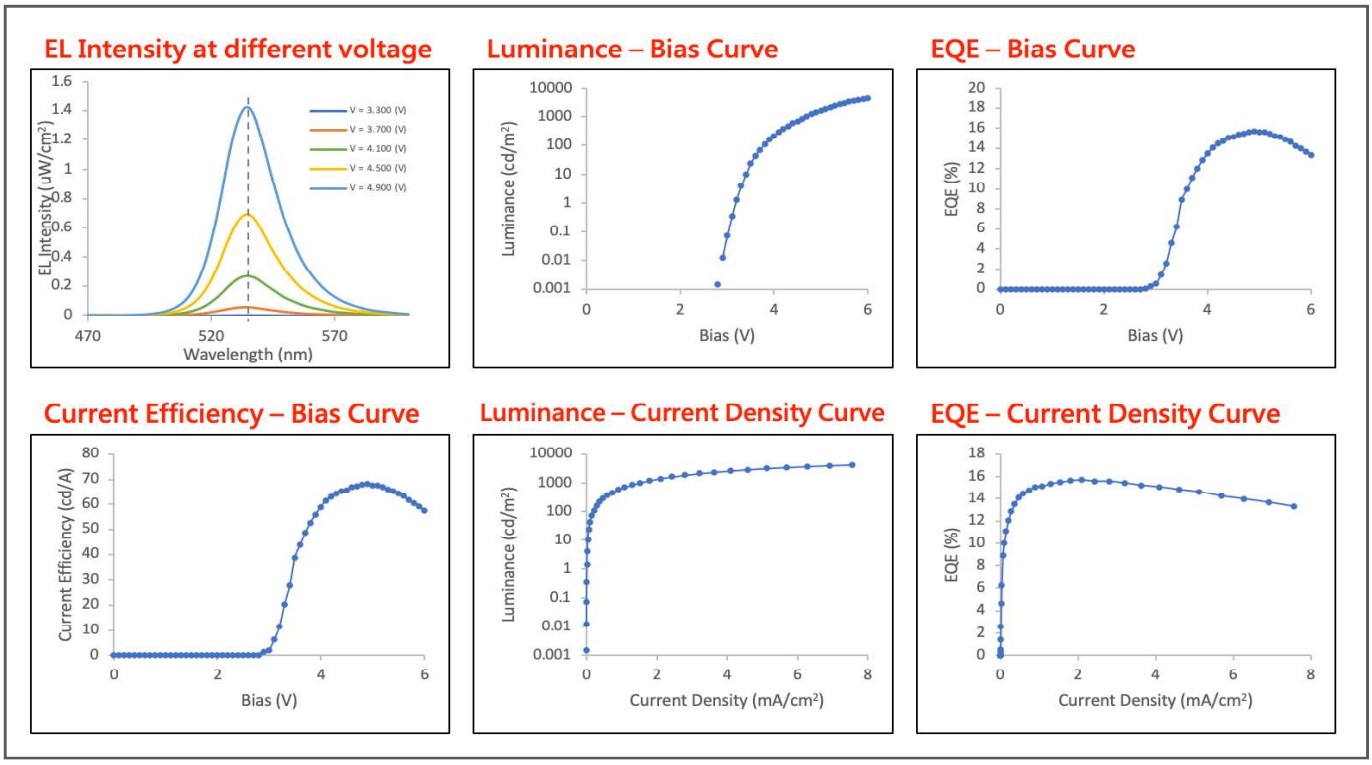
Specification / Product Selection Guide

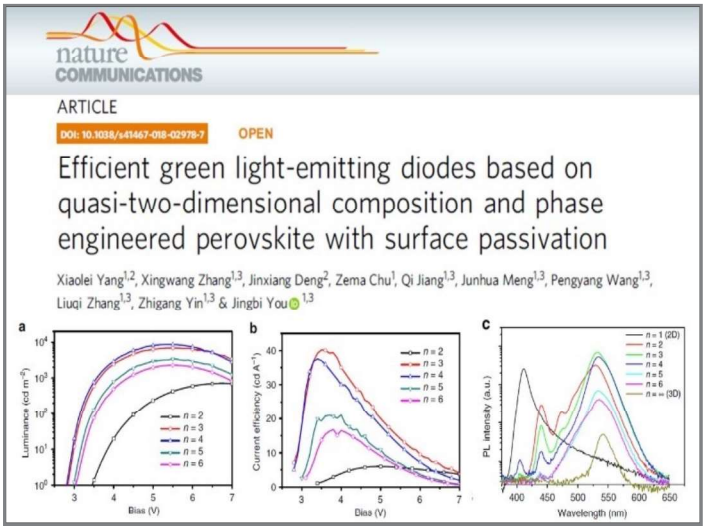
The standard configuration	–Omnidirectional light receiving system (50 mm integrating sphere) –Enhanced Multi–Channel Spectrometer Test System –Probe System –Software –IPC & monitor
Options	–Infrared Spectrum Expansion Module (900 – 1700 nm) –Glovebox integration kit

Testing Results / Publications



Overview of Measurement Results





nature COMMUNICATIONS

ARTICLE

DOI: 10.1038/s41467-018-02978-7 OPEN

Efficient green light-emitting diodes based on quasi-two-dimensional composition and phase engineered perovskite with surface passivation

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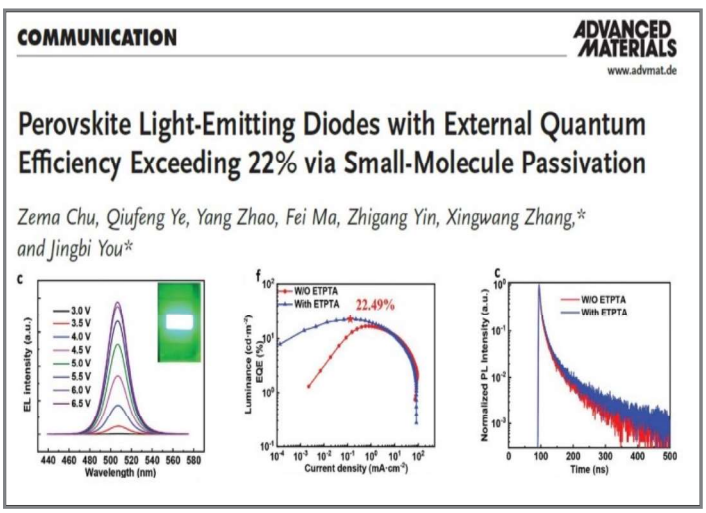
Perovskite light–emitting diodes (LEDs) are promising due to their high efficiency and narrow emission. Quasi–2D perovskites with layered structures can expand exciton binding energy and confinement of charge carriers, considered as a good candidate of high–efficiency LEDs material. However, these materials usually contain a mixture of phases compound, and phase impurities can lead to low emission efficiency.

In this paper, through compositional and phase engineering, selection of the best quasi–2D perovskites structure, and the green quasi–2D perovskite was verified using the LQ test system. LEDs achieve a current efficiency of 62.4 cd A^{-1} and 14.36% external quantum efficiency.



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Perovskite Light-Emitting Diodes with External Quantum Efficiency Exceeding 22% via Small-Molecule Passivation

Zema Chu, Qiufeng Ye, Yang Zhao, Fei Ma, Zhigang Yin, Xingwang Zhang, and Jingbi You**

Most PeLEDs are fabricated from polycrystalline perovskite films, which contain high concentrations of defects, including point and extended defects.

Reducing and mitigating nonradiative cladding defects in perovskite materials remains a key prerequisite for achieving high performance in luminescent applications. In this paper, ethoxylated trimethylolpropane triacrylate (ETPTA) was used as a functional additive dissolved in antisolvent.

PeLEDs with ETPTA can effectively reduce the charge trapping state by passivating and/or suppressing defects. The LQ test system verified that the perovskite film was fully passivated by ETPTA, enableing the device to achieve a maximum external quantum efficiency (EQE) of 22.49%.