



**Proposed UV LED Bands
New Radiometric Methods for Measurement
of Industrial UV LEDS**

**Presented to Council on
Radiation Measurements (CORM)
May 18, 2016**

**Joe T. May
CTO/COB
EIT LLC**

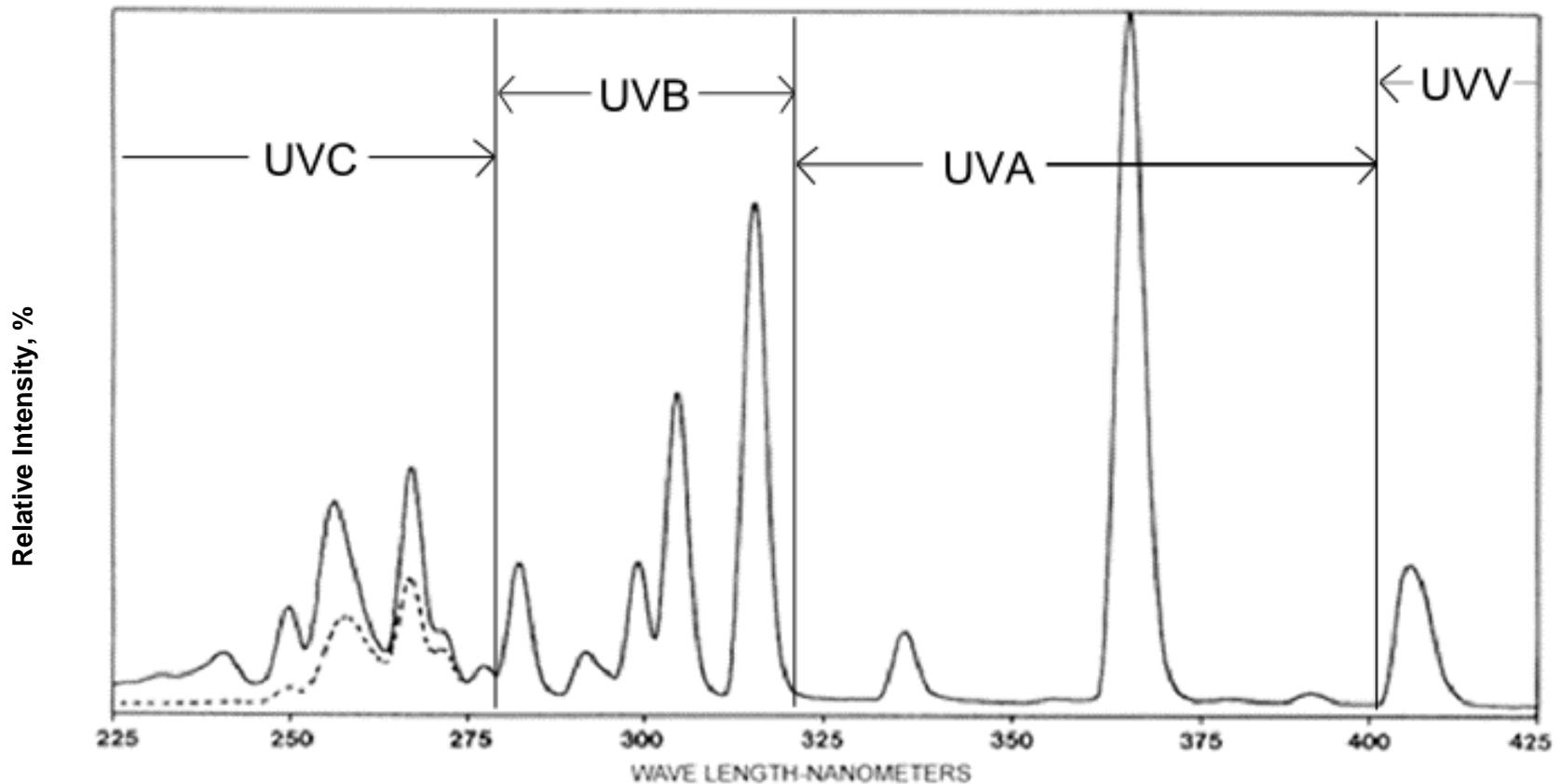


Summary

- 1. This presentation describes proposed new definitions for LED generated UV energy**
- 2. Describes a newly developed radiometric instrument for measuring LED generated UV energy**

Broad Band UV Source

Typical Mercury Spectra and associated band definitions



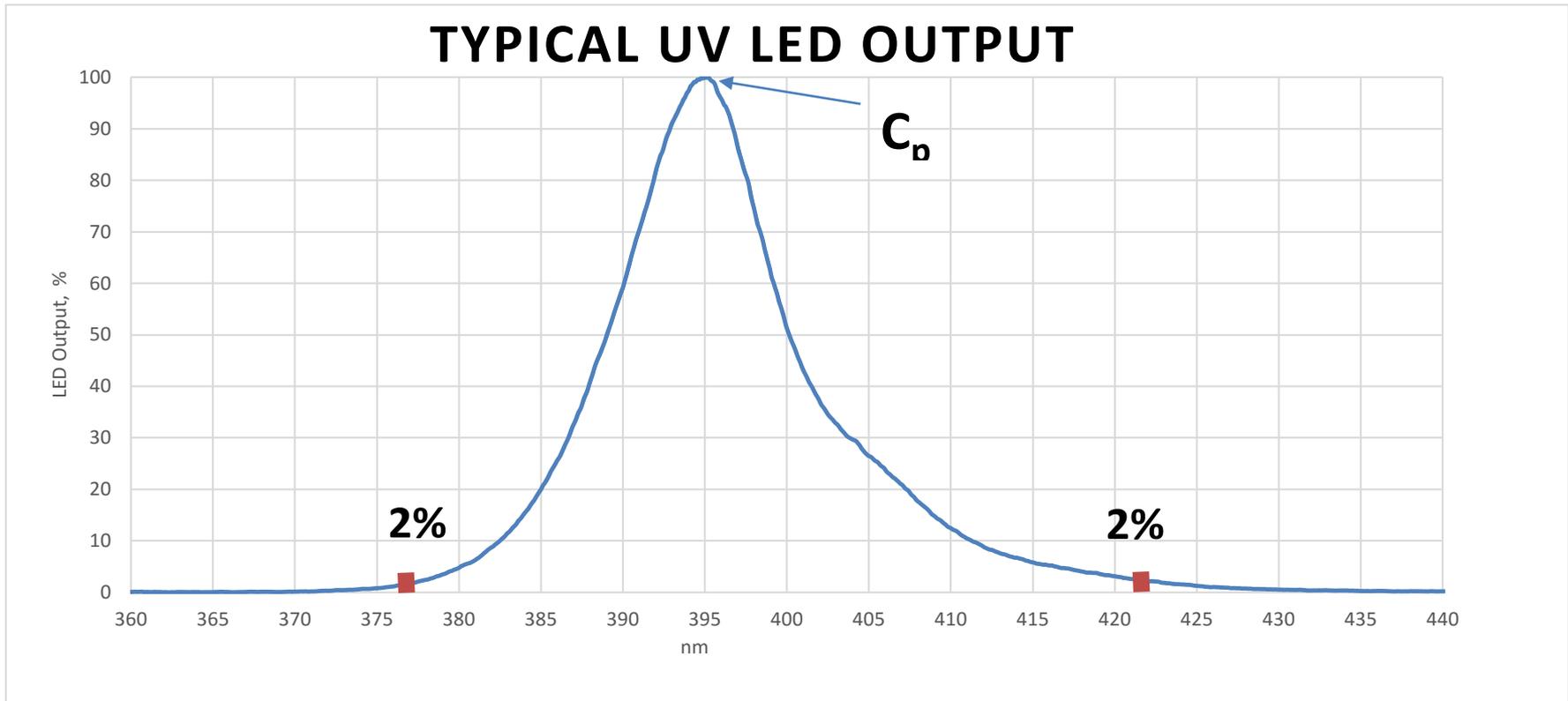
Broad Band Measurement

Hg Bands Somewhat Arbitrarily Defined

Band Name Identifier	Wavelength Range
UVA	315-400 nm
UVB	280-315 nm
UVC	200-280 nm
UVV	400-450 nm

UV LED Source

LED Source Spectra Presently Defined by Central Wavelength, C_p

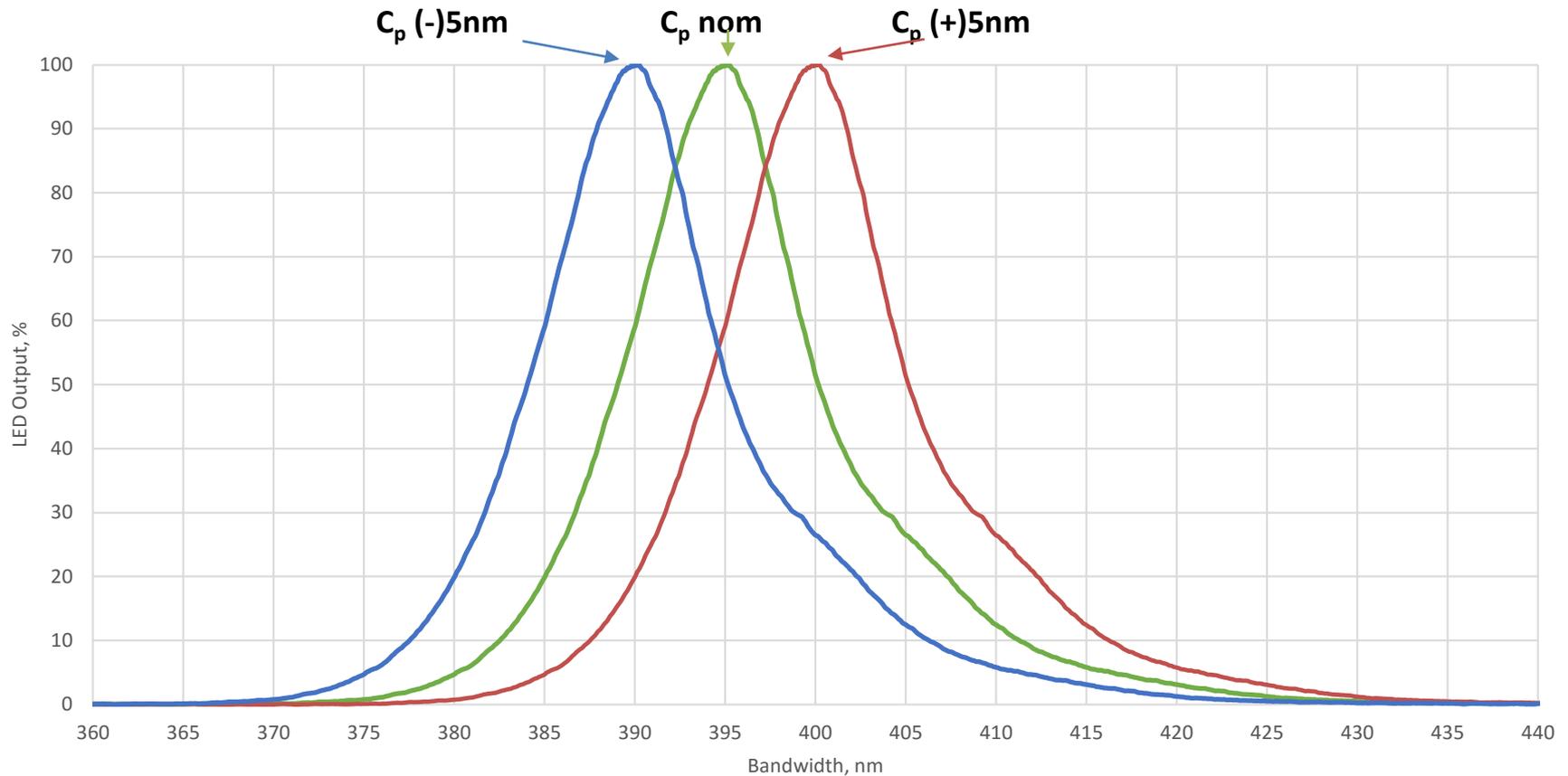


LED spectrum geometry similar for wavelengths under consideration - $C_p \pm 25\text{nm}$

UV LED Source

C_p Has Permissible Variation of $\pm 5\text{nm}$ around C_p

VARIABLE CENTER WAVELENGTHS



Proposed UV LED Bands

Propose Defining New Measurement Bands

Band Name Identifier	C_p Wavelength Range
L 415	410-420nm
L 405	400-410nm
L 395	390-400nm
L 385	380-390nm
L 375	370-380nm
L 365	360-370nm

- “L” - Denotes LED generated UV
- “NNN” – Denotes Nominal C_p (typical)

Proposed UV LED Bands

Arguments for Definitions

- Allows end user to choose optimal wavelengths for most efficient curing
- Make absolute energy measurements easier
- Provides buyers of LED source ability to make informed purchase
- Help ensure the LED sources provide advertised wavelengths
- Standardize communications

Proposed UV LED Bands

Arguments for Definitions Continued

- New LED bands provide an opportunity to improve measurement accuracy of the UV energy in these bands
- Accurate measurement of UV energy requires a nearly rectangular response in and out of passband
- Existing radiometric designs usually provide good repeatability of measurements but do not provide ability to make accurate absolute energy measurements

- New UV LED bands make it highly desirable to improve UV radiometry methods
- Existing methods do not make absolute energy measurement over a specific wavelength range. Useful but not ideal
- Description of Band: Filter only or Total Optical Response

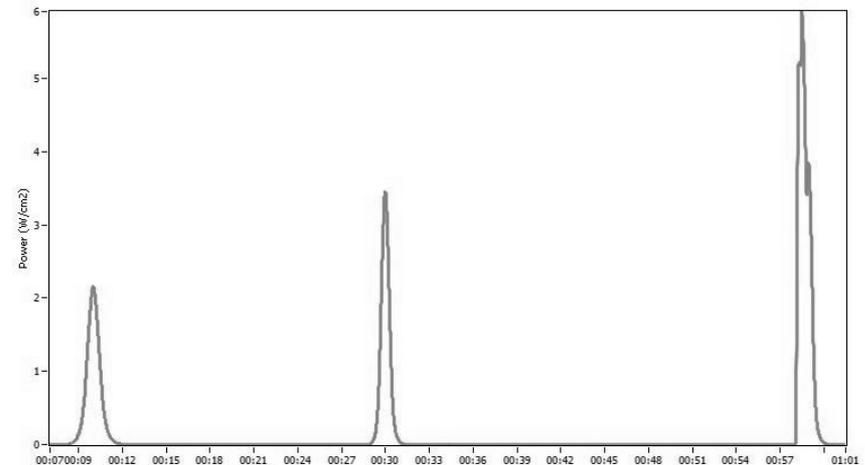
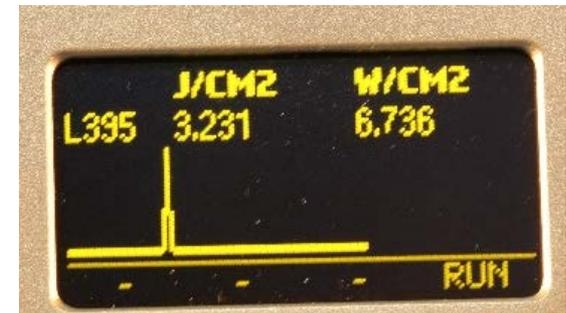
Instrument Challenges



- Industrial LED sources have exceeded **50W/cm²**
- Typical irradiance levels, sources and standards that NIST has worked with are much lower (mW/cm²-μW/cm²)
- Reduce variation and errors introduced in transfer process
- Uniformity of UV LED source used with working standard and unit under test
- Band “width” narrow enough to maintain flatness

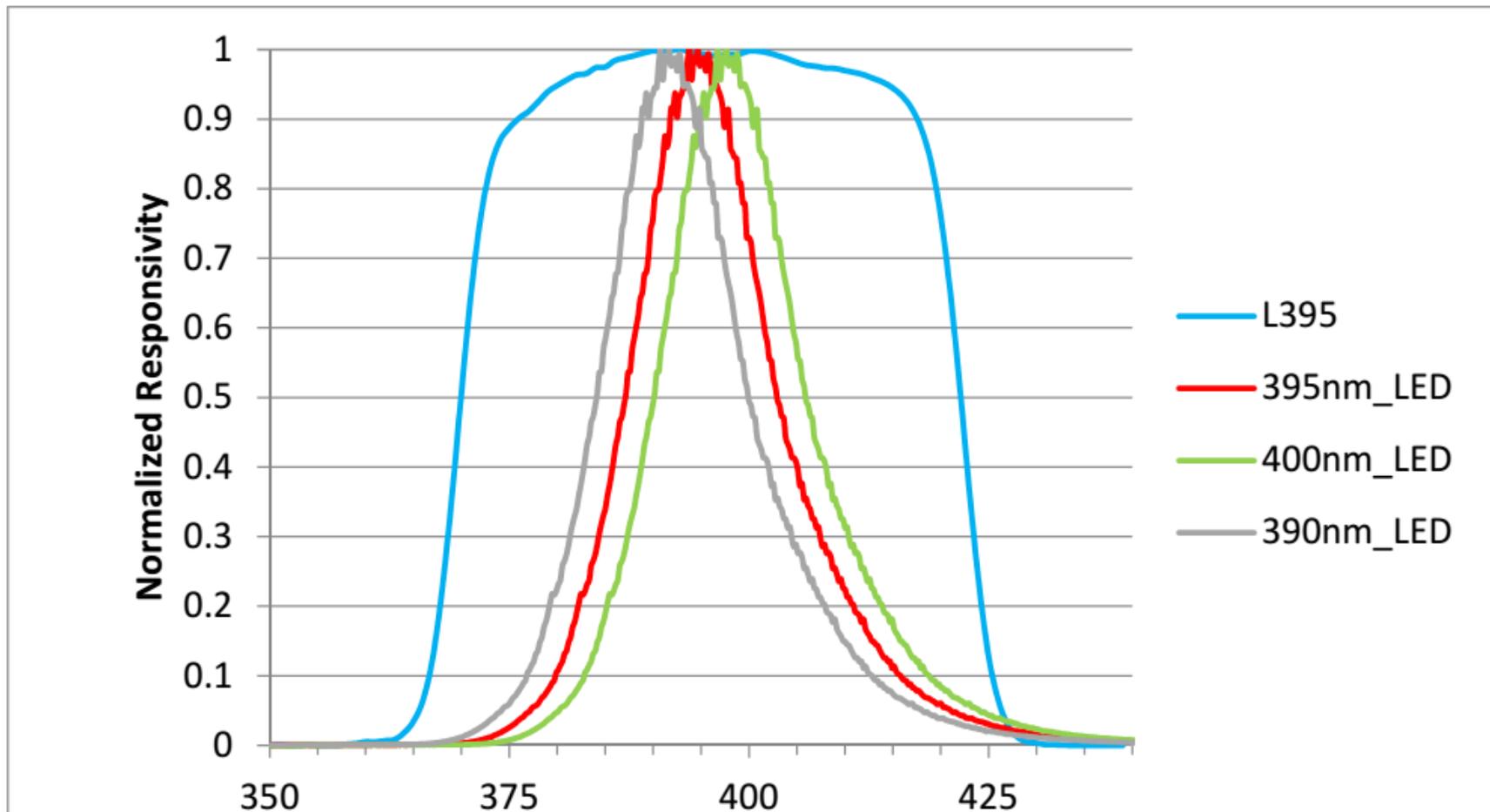
LED-R™ Series LEDcure™ Profiling Radiometer

- 40 Watt Dynamic Range
- Display Plus Profiler Option
- L395 Total Optics Response



Total Measured Optics Response

ALL Optical Components NOT just the filter



EIT Approach

- Provides nearly rectangular optical response over recently defined “L” bands
- Excellent out of band response
- Makes stable, repeatable absolute UV energy measurements over specified band(s). Allows comparison of results from multiple instruments at multiple sources

Patent Applied For

L395 band commercially available June 2016

Additional bands to follow shortly

BAND	STATUS
L365	9/2016
L385	1/2017
L395	AVAILABLE
L405	3/2017
L415	—
OTHERS	AS NEEDED

Thank You



EIT Instrument Markets

108 Carpenter Drive
Sterling, VA 20164 USA
Phone: 703-478-0700

[**jmay@eit.com**](mailto:jmay@eit.com)

[**uv@eit.com**](mailto:uv@eit.com)

[**www.eit.com**](http://www.eit.com)