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# EIT<sup>®</sup> LEDCURE™ UV RADIOMETERS

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EIT's LEDCURE™ series of radiometers constitute a new family of highly portable and accurate radiometers designed specifically to measure the irradiance ( $W/cm^2$ ) and energy density ( $J/cm^2$ ) generated by industrial UV LED systems. The instruments take measurements in the same environment as the work pieces undergoing UV curing or treatment.

The LEDCURE™ is easy to use, compact and affordable. With its patented Total Measured Optical Response (TMOR™) the LEDCURE™ provides absolute energy measurements with accuracy and repeatability comparable to larger, cabled, metrology-based instruments that are much more expensive.

# LEDCURE™ FEATURES

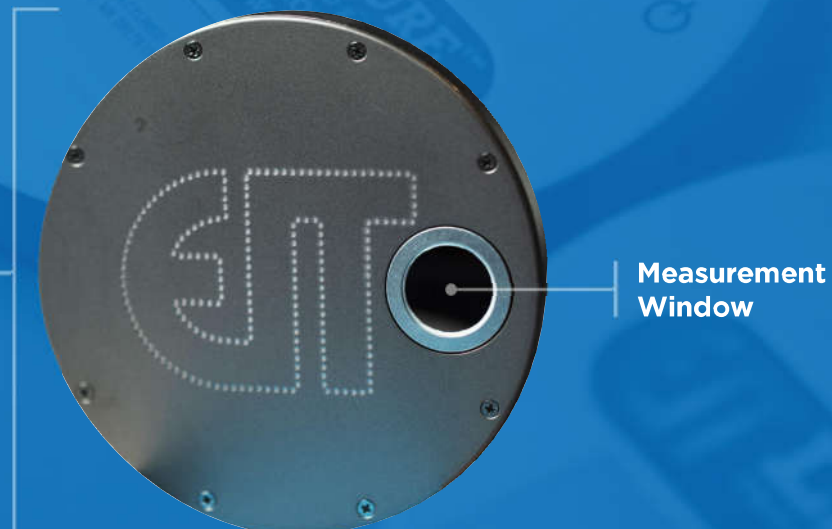
## LEDCURE™ DISPLAY SIDE

(Actual Size)



## LEDCURE™ MEASUREMENT SIDE

**Durable Housing**  
4.6 x 4.6 x 0.5 inches  
117 x 117 x 12.7 mm  
(W x H x D)



# Total Measured Optical Response (TMOR™)

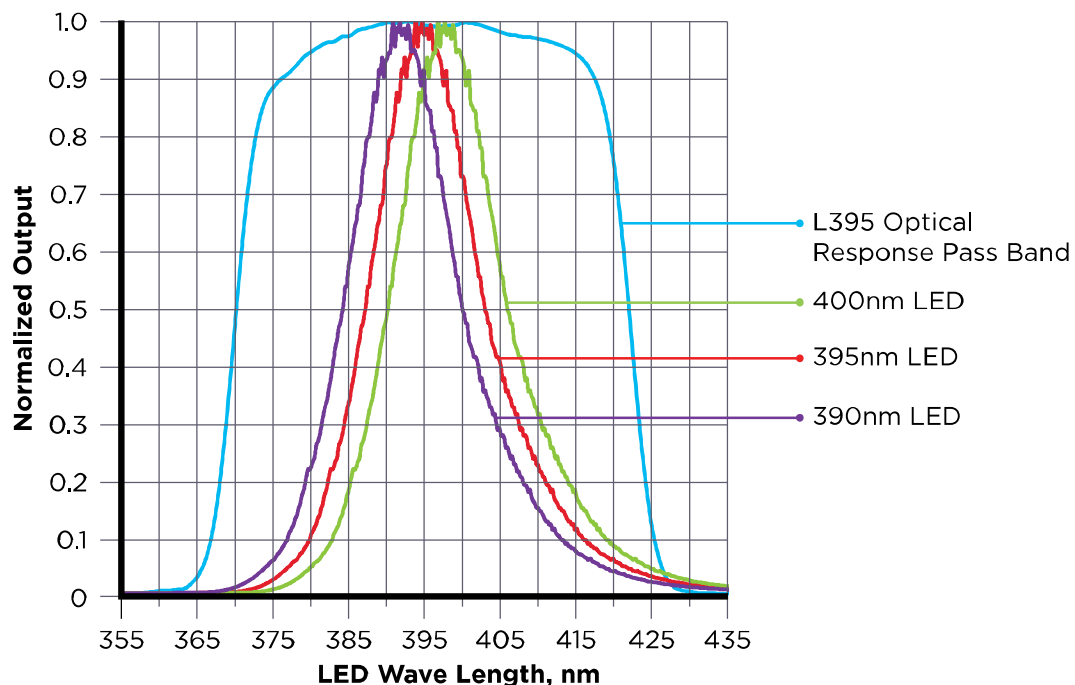
**Patented EIT optics<sup>1</sup> in the LEDCURE™ are designed specifically to support UV LED Measurements. Each L-Band response is nearly flat over the range of its optic response. All optical components in the measurement path characterization (not just the filter) are included in the LEDCURE™ L365, L385, L395 and L405 instrument optical response. The TMOR™ LEDCURE™ is the only portable radiometer that measures absolute LED energy without requiring extraordinary calibration methods.**

## TMOR™ in the LEDCURE™ provides:

- Highly accurate readings run-to-run
- Highly repeatable results and unit-to-unit matching
- Absolute energy measurement allows easy unit-to-unit and source-to-source comparisons

The TMOR™ optical response curve for a 395nm LEDCURE™ radiometer is shown in the graph. The nearly rectangular optical response curve (blue line) is the characteristic that provides each LEDCURE™ with excellent performance including measuring absolute energy measurement, and outstanding resolution, matching and repeatability.

The TMOR™ response covers a wavelength range that accurately captures all of the energy wavelengths emitted by a nominal 395nm ± 5nm LED (purple, red, green).



<sup>1</sup>May, J.T. and Lawrence, M., inventors, "Radiometry Instruments and Technology." US Patent 9,778,103, issued October 3, 2017.

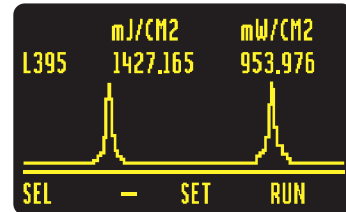
# LEDCURE™ Versions: Standard & Profiler

**EIT's LEDCURE™ instruments function in the high energy UV environment. Two versions, STANDARD and PROFILER are available in L365, L385, L395 and L405. Features of the STANDARD and PROFILER versions are described below.**

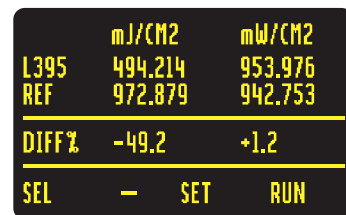
## STANDARD

The STANDARD LEDCURE™ provides peak Irradiance ( $W/cm^2$ ), Energy Density ( $J/cm^2$ ) and a low-resolution Irradiance Profile on the instrument display. EIT's LEDCURE™ features include:

- **SINGLE EIT L-BAND:** Specified at time of order (L365, L385, L395 or L405)
- **EASY TO USE:** Push button operation; displays values and irradiance profile
- **FULL SPECIFICATION OPERATING RANGE**  
400  $mW/cm^2$  to 40  $W/cm^2$ ; 0-250  $J/cm^2$
- **USER SELECTABLE SMOOTH MODES:**  
25/128/2048 equivalent samples/sec
- **USER SELECTABLE SCREEN:**  
Graph or Reference mode
- **USER REPLACEABLE BATTERIES:**  
Two alkaline AAA batteries



*Graphic Mode-collected numerical values and graph of normalized irradiance.*



*Reference Mode allows user to compare present reading with previously recorded values.*

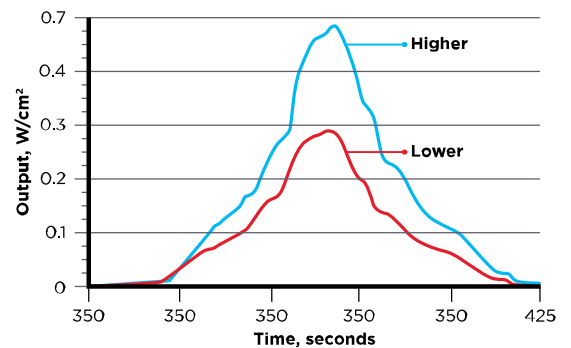
## PROFILER

In addition to all STANDARD features, the PROFILER LEDCURE™ has data download capability via USB for analysis with EIT's UV PowerView Software® III. PROFILER allows characterization of:

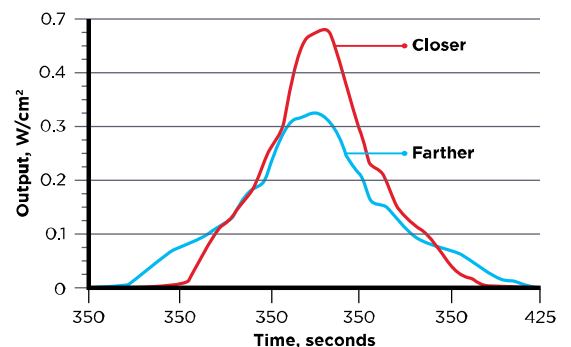
- Different sources, cure conditions, multiple LED arrays and readings over time, including height and power levels of the LED source, and variations in process speed and exposure time
- Performance of individual sources in multi-array systems
- Maintenance needs before they impact product quality

EIT's UV PowerView Software® III enables the user to analyze data collected. The user may:

- Compare, track and align files to analyze system changes over time
- Add notes to files for a permanent record of cure chemistry, operating conditions and operator
- Export UV PowerView Software® III files in \*.tdms file format to Excel



**Changes in LED Lamp Intensity with Power Setting Changes**



**LED Lamp Intensity Changes with Distance from Lamp to Instrument**

# LEDcURE™ Radiometer Performance

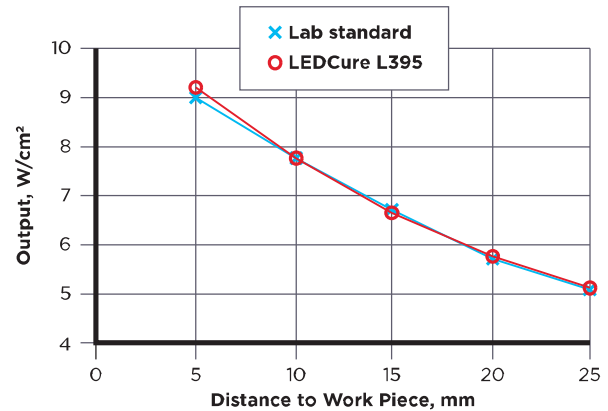
**EIT LEDcURE™ radiometers provide cutting edge electronic and optical performance.**

## Accuracy

A 395nm, 10W LED source was set up so that the source output power could be measured by an L395 LEDcURE™ and the results compared to those obtained from a Laboratory standard with integrating sphere.

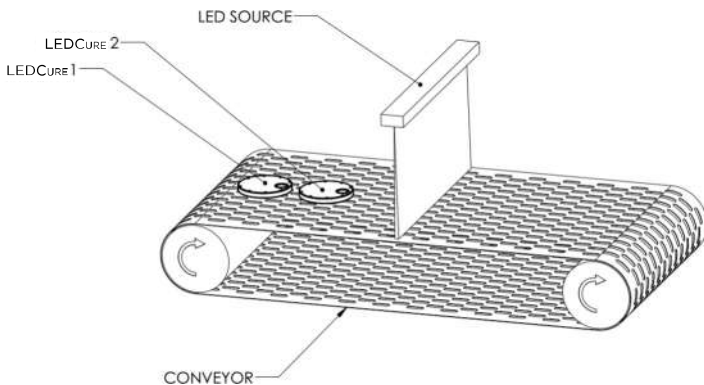
L395 performance is indistinguishable from the larger, less convenient, and more expensive Laboratory standard which cannot be used in a typical UV curing environment.<sup>2</sup>

The source intensity was varied by changing the working distance (*distance between source and workpiece*).



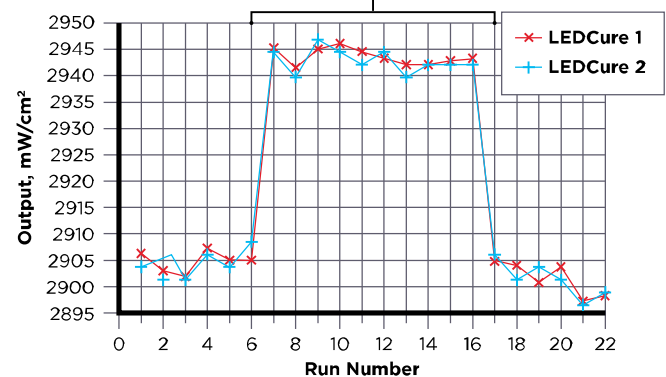
The graphic results are nearly coincident. A detailed examination of the numerical data demonstrated an average difference between Laboratory standard and the L395 of 0.1% with a maximum difference of 2.4%.

## Resolution, Repeatability and Matching



In the test a conveyORIZED UV LED Source was operated with two production LEDcURE™ radiometers, one behind the other, on a conveyor, and passed under the source as shown.

Lamp power increased by 1.4% between runs 6 and 17



The measurements, in mW/cm², were recorded and plotted for each radiometer in each of 22 runs through the system.<sup>3</sup> In the graph, the red line represents absolute energy readings from the LEDcURE™ 1, and the blue, LEDcURE™ 2.

### Analysis of data demonstrates:

- **RESOLUTION** - LEDcURE™ resolution for a 40W unit is 3mW (0.0075%)
- **MATCHING** - Readings from the two LEDcURE™ radiometers compared show that the units matched to within  $\pm 0.021\%$  of standard deviation
- **REPEATABILITY** - The two curves change in magnitude run to run. They track each other closely but vary in amplitude as a result of changes in the power of the UV source. The LEDcURE™ design is sufficiently stable to allow tracking of small changes in the UV LED system. Repeatability is typically better than  $\pm 0.2\%$ .

<sup>2</sup>Testing performed by Excelitas-Lumen Dynamics Group.

<sup>3</sup>Testing performed by EIT LLC.



## LEDCURE™ Products

|                               |   |
|-------------------------------|---|
| <b>L365 Spectral Response</b> | 340-392nm; ±2nm (FWHM, 52nm); 4 OD Blocking |
| <b>L385 Spectral Response</b> | 360-412nm; ±2nm (FWHM, 52nm); 4 OD Blocking |
| <b>L395 Spectral Response</b> | 370-422nm; ±2nm (FWHM, 52nm); 4 OD Blocking |
| <b>L405 Spectral Response</b> | 380-432nm; ±2nm (FWHM, 52nm); 4 OD Blocking |

## LEDCURE™ Specifications

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|--|--|
| <b>Full Specification Operating Range</b>          | 400 mW/cm <sup>2</sup> -40 W/cm <sup>2</sup> ; 0-250 J/cm <sup>2</sup>   |
| <b>Resolution</b>                                  | 3 mW/cm <sup>2</sup>   |
| <b>Spatial Response</b>                            | Approximately Lambertian (cosine)  |
| <b>Accuracy</b>                                    | Typically ±2% or better; ±10% of reading plus ±0.2% of full scale  |
| <b>Repeatability</b>                               | Typically better than 0.2% (unit alone); ≤ 1% max  |
| <b>Calibration</b>                                 | Units are supplied with NIST compliant calibration certificate   |
| <b>Smooth Modes</b>                                | Smooth ON: Sample rate 25 equivalent samples/sec<br>Smooth PROFILER: Sample rate 128 equivalent samples/sec*<br>Smooth OFF: Sample rate 2048 equivalent samples/sec<br><i>*recommended for most applications</i> |
| <b>Sample Rate for Profiling</b>                   | LEDCURE™ PROFILER has a fixed sample rate of 128 eq. samples/sec profiling. For best matching between instrument display and PowerView Software® III values, use Smooth PROFILER mode                            |
| <b>Memory Capacity for Profiling</b>               | LEDCURE™ PROFILER memory supports data collection for ≥ 100 minutes  |
| <b>PowerView Software® III</b>                     | National Instruments LabVIEW based programming accommodates Windows 7 and 10 collected data stored LabVIEW based *.tdms files  |
| <b>Display</b>                                     | OLED-Yellow Text, Black Background; User Adjustable Display Brightness<br>2 mins. time out   |
| <b>Operating Temperature</b>                       | 0-75 °C Internal temperature; higher external temperatures for short periods (audible alarm when temperature exceeds limit )   |
| <b>Battery / Battery Life</b>                      | 2 user-replaceable AAA Alkaline Cells, Approx 20 hrs display on  |
| <b>Instrument Dimensions, Materials and Weight</b> | 4.60 x 0.50 inches; 117 x 12.7 mm (D x H), Aluminum & Stainless Steel;<br>10.1 ounces (289 gm)   |
| <b>Carrying Case</b>                               | Material: Scuff resistant nylon exterior, cut polyurethane foam interior<br>Size: 10.75 x 3.5 x 7.75 inches; 274 x 89 x 197 mm (W x H x D), Weight: 9 oz (260 g)   |



*This equipment is in conformity with the following standards and therefore bears CE marking: IEC 61326-1:2005, EN55011: 1998, EN61000-4-2: 1995, A1: 1998, A2: 2001; EN 61000-4-3: 2002, A1: 2002, following the provisions of the applicable directives: 98/34/EEC and amendments, 89/336/EEC and amendments.*

*Specifications subject to change without notice*

*P/N IM-0104; Rev B, LEDCURE Brochure August 2019*

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