INSTRUMENT MARKETS

## The Leader in UV Measurement

**EIT Instruments Feature:**
Robust, industrial design
Reliable, repeatable results
Choice of wavelength response:
UVC 250-260 nm
UVB 280-320 nm
UVA 320-390 nm
UVA2 380-410 nm
UVV 395-445 nm

## Worldwide Support

**Contact information for your local EIT Representative or Distributor:**


**Sales & Technical Support:**
108 Carpenter Drive
Sterling, Virginia 20164
Tel: 703-478-0700
Fax: 703-478-0815

**Service:**
22815 Glenn Drive, Suite 104
Sterling, Virginia 20164
Tel: 703-652-7326
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INSTRUMENT MARKETS


# Instruments for UV Measurement Monitoring & Process Control


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# Introduction

EIT's offers a wide selection of UV Measurement & Process Control Instruments. This guide will help you select the most appropriate EIT instrument for your application. Detailed product information can be found on the EIT website (www.eit.com) or through our worldwide network of representatives and distributors. Product improvements and specifications are subject to change.

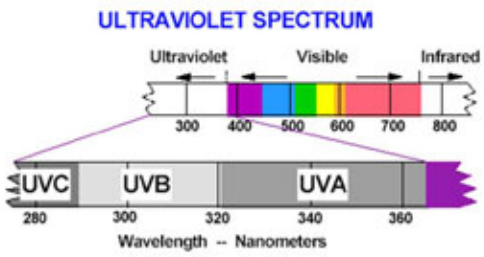
UV energy can be generated from different sources ranging from arc and microwave lamps to pulsed Xenon to LEDs. But regardless of the source, measurement of UV comes down to three parameters often critical to the process - wavelength, peak irradiance and energy density.

*Top: Examples of UV sources*
*Left: A UV source on a robotic arm passing over a dimensional object with multiple EIT 3D sensors embedded in the object to measure the UV*

# Wavelength

The UV spectrum extends from 250 nm to nearly 400 nm. Just as we refer to different parts of the visible spectrum as red or green, common designations (UVA, UVB, UVC, and UVV) are used to describe different bands of the UV spectrum. A UV source needs to match the chemistry and substrate in your application, and your measurement instrument needs to measure the bands which are of importance to your process. The shorter bands (UVC) do not penetrate as far into a coating while the longer UV bands (UVA, UVV) have the ability to move further into a coating.

*The UV spectrum is divided into the UVA, UVB, UVC and UVV bands. An EIT Power Puck II (right) can measure the irradiance and energy density in each of these bands simultaneously.*





# Continuing Education & EIT Product Knowledge

EIT is committed to education and having users understand UV and the fundamentals of UV measurement, UV process control and the proper use of our instruments. EIT generates articles and technical papers and frequently speaks worldwide at seminars, conferences and symposiums on UV and UV measurement. Much of the work that EIT has generated is posted on the EIT website to help educate users and potential users.


EIT's representatives and distributors also have extensive experience with UV, UV applications and UV measurement and should also be used as a resource to help your understanding.

# EIT Resources

## Instrument Services & Technical Support

EIT's Customer Service / Metrology Laboratory services all EIT UV instruments. This includes calibrations, upgrades, warranty and non-warranty repair.

With years of experience, our Metrology Lab technicians understand the design, specifications, and tolerances for all of our instruments. Each device is meticulously calibrated or repaired according to EIT procedures to ensure repeatable results and reliable data. A lifetime historical service and calibration record is maintained and can be accessed for the life of each instrument.

All calibrated EIT UV instruments have NIST traceability. EIT technicians also have access to the specially matched optics and genuine factory components that are used in our radiometers. Customer Service personnel strive to provide quick turn-around time on all services.

EIT has authorized a select number of independent Service Centers throughout the world to calibrate EIT instruments under license from EIT. The staff at these Service Centers have completed training at EIT and work closely with our technicians and engineers to service EIT instruments using procedures, standards and components supplied by EIT.

*At EIT headquarters, specially trained technicians provide repair, and NIST-traceable calibration services for all EIT instruments.*

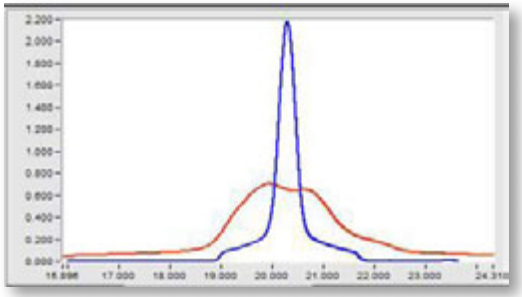
Visit www.eit.com to obtain RMA Service Form

## Why Measure UV?

You cannot establish, maintain, improve or troubleshoot a process without measuring it. EIT provides instruments designed to help manufacturers and suppliers of UV chemistry and equipment measure the important parameters of the curing process. The right instrument helps you communicate with others about your process and to create a specification that can be understood and reproduced.

## Irradiance and Energy Density

While thermal processes frequently rely on temperature and time, UV processes are ordinarily based on irradiance and time. Irradiance may be thought of as how "bright" a UV source is, often determined by the lamp design, optics and the distance between the source and the target. Irradiance is commonly expressed in terms of Watts per square centimeter ($W/cm^2$ or $mW/cm^2$). Energy Density is a measurement of the irradiance over time and is expressed in terms of Joules per square centimeter ($J/cm^2$ or $mJ/cm^2$). One Watt for One second = One Joule. Most UV processes require a minimum level of both irradiance and energy density.



*Above: Data collected with an EIT PowerMAP from two different UV sources. Irradiance is on the Y axis and time on the X axis. Irradiance is depicted by the height of the trace while energy density is represented by the area under each curve.*

## About EIT

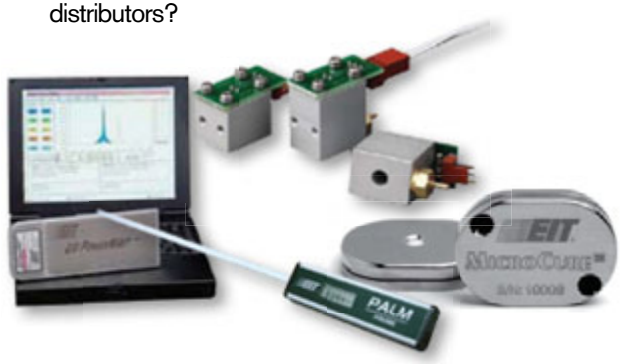
Founded in 1977, EIT provides contract electronic manufacturing & engineering services, providing electronic assemblies for a variety of medical, industrial, analytical instrument and telecommunications customers. Over two hundred EIT employees work to support our customers and to design, manufacture, assemble, calibrate, sell, service and support our UV measurement products. EIT's Quality Management System is ISO 9001 registered and EIT currently operates from three facilities in Virginia.

# Instrument Selection

How do you select the proper EIT instrument for your application? This checklist covers a few of the important considerations. More information is available through EIT, our representatives & distributors, as well as on the EIT web site: www.eit.com

## Instrument Checklist:

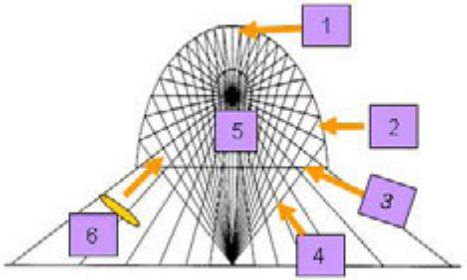
- ✔ **Size** - EIT instruments come in a variety of sizes. Do I have any restrictions in my process? If an instrument will not physically fit, do I have room to install an Online Compact Sensor?
- ✔ **Measurement Process** – Will exposure of the instrument involve movement or will it be a static exposure? How fast is movement? Is the process repeatable?
- ✔ **Ease of Use** - How easy is it to use and get information from the instrument? Does use of the instrument require a process engineer or can production staff use it?
- ✔ **Dynamic Range** - Match the dynamic range of the instrument to the UV source and process.
- ✔ **Spectral Bandwidth** - Match the bandwidth(s) in the instrument to your process. Multiple band instruments such as the PowerMAP and Power Puck II allow the user to monitor both the short wave and long wave UV. Tracking the UV in multiple bands can identify problems such as aging bulbs and reflectors that need cleaning very quickly. Narrow band instruments such as our EIT instruments provide more specific information than a single reading found in broad band instruments .
- ✔ **Absolute vs. Relative values** - How will I use the values obtained from the instrument? Do I need to communicate in absolute (calibrated) values or am I looking for relative changes over time? Do I need a combination of both calibrated and relative readings?
- ✔ **Communication** – Will I be able to share the values obtained from the instrument with suppliers and others in the industry and have them communicate with me?
- ✔ **Stability, Service & Support** - How stable and how much experience does the company have that makes the product? Will I be able to get service and support from the manufacturer? Do they have a worldwide network of representatives and distributors?




*EIT offers the right instrument for every application. Shown are (from left) the EIT PowerMAP and PowerView analysis software, PALM Probe, online Compact Sensors, and MicroCure)*

## Suggested Sensor Locations

1. Behind reflector looking at bulb
2. Behind reflector looking at bulb and reflected energy
3. Below reflector angled up toward bulb and reflected energy
4. From cure surface looking at bulb and reflector
5. From end of lamp housing
6. Through quartz plate, filter materials or with quartz rod pick up




*UV lamp systems vary in design and installation, The above locations are suggestions only.*


## Online UV Intensity Display

**Features**

- Monitors a single UV lamp; LED display of lamp's relative intensity from 0-199%
- 0-10V analog output proportional to UV
- User settable alarms & relay contacts
- 24V AC/DC power, panel mount convenience

## UV Intensity Monitor (DIN Rail)

**Features**

- Monitors a single UV lamp, 0-10V analog output proportional to UV
- Designed for PLC feedback with maximum flexibility
- User settable alarms & relay contacts
- 24V AC/DC power, DIN Rail panel mountable

## Multibrite®

**Features**

- Monitors up to 4 UV lamps simultaneously
- LED display of lamps' relative intensity from 0-199%
- Adjustable audible and visible alarms; external alarm outputs
- 4-20 mA and 0-10V analog output proportional to UV on each channel

# Online UV Measurement Systems

EIT Online Monitoring Systems provide continuous monitoring of UV lamp intensity. Online Monitoring Systems are used in:

- Processes where a radiometer will not fit or it is difficult to easily reach the UV source
- High speed or high product value applications where a tremendous amount of expensive scrap can be generated before a problem might ordinarily be detected
- Applications where the process window is narrow and requires close attention
- As a complement to radiometers to correlate absolute to relative readings
- Applications requiring full-time monitoring to generate quality, conformance or compliance documentation

There are two basic building blocks to continuous monitoring; a Compact Sensor and a means to display real-time data. EIT offers a number of Compact Sensor and display options. Results are presented as a percentage of the original output, usually set to 100% when the lamp is new.

## Compact Sensor

The key to the success of EIT's Online Monitoring Systems is the durable, long lasting Compact Sensor. Features include:

- High resistance to solarization (degradation)
- Compact profile for installation in tight spaces
- Square body design for easy mounting
- Optional port for air/nitrogen purge to keep the sensor clean and cool
- Sealed optics to prevent fouling
- Signal provided that is proportional to the UV intensity
- Choice of several bandwidths to fit application
- Multiple Mounting options

*The small Compact Sensor is robust, and provides accurate real-time lamp monitoring.*

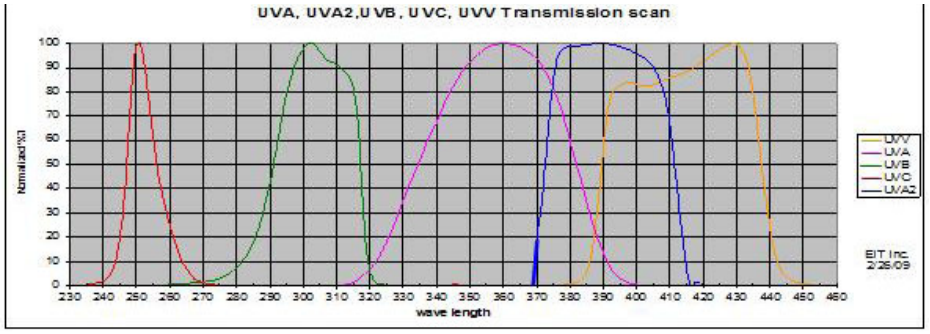
*Examples of Compact Sensor Mounting Locations Left to Right: Mounted behind the reflector looking at bulb, mounted behind reflector looking at reflected UV, mounted near cure surface and using quartz rod to pick up UV*

## Product Selection Chart

How do you select the proper EIT instrument for your application? This checklist covers a few of the important considerations. More information is available through EIT, our representatives & distributors, as well as on the EIT web site: www.eit.com

| Product ▶ / Features ▼ | Power MAP | Map Plus | Power Puck II | UviCure Plus II | Micro Cure | Power Puck Flash | Spot Cure | 3D Cure | PALM Probe | Compact Sensor |
|---|---|---|---|---|---|---|---|---|---|---|
| Energy Density Reading | • | • | • | • | • | • | | • | • | |
| Peak Irradiance Reading | • | • | • | • | • | | • | • | • | |
| Relative Intensity Reading | | | | | | | | | | • |
| High Intensity Applications | • | • | • | • | • | • | • | • | • | • |
| Low Intensity Applications | • | • | • | • | | | | • | • | • |
| Download to PC | • | • | • | • | | | | • | | |
| Single Band | | • | | • | • | | • | • | • | • |
| Multiple Band (4) | • | | • | | | • | | • | | |
| Exposure/Plate Making | | | • (LP) | • (LP) | | | | | | |
| Spot-curing Applications | | | | | | | • | | | |
| Small Batch Curing | | | • | • | • | | | • | | |
| Web Press Application | | | | | | | | | • | • |
| Small Container Curing | | | | | • | | | • | | • |
| Dimensional Objects (3D) | | | | | • | | | • | | |
| Inkjet | • | • | • | • | • | | | | • | • |
| Pulsed Xenon Sources | | | | | | • | | | | |
| LED | • | • | • | • | | | | | | |

## UV Bandwidth Choices:




EIT offers instruments in the following bandwidths :

- UVC: 250-260nm
- UVB: 280-320 nm
- UVA: 320-390nm
- UVA2: 380-410nm
- UVV: 395-445nm

Contact EIT for current offerings

# Profiling Radiometers

**The Advantages of a Profiling Radiometer**

EIT Profiling Radiometers provide the most complete picture of the curing process by providing a profile of the UV irradiance and temperature over time. They report numerical energy density (J/cm$^2$) & irradiance values (W/cm$^2$) similar to standard radiometers, but offer the following advantages:

- Ideal for multi-lamp systems. While standard radiometers only report aggregate data, profiling radiometers show the performance of each individual lamp.
- Save previous measurements as a benchmark for comparison. The software allows you to display and compare a series of measurements to help identify changes in system performance rapidly and graphically.
- See how UV is being delivered to the cure surface. Each lamp's focus characteristics & performance can be easily tracked and analyzed over time.
- Monitor the temperatures to which the work piece is exposed.

Multiple bands (PowerMAP®) allow the user to identify the bulb type installed in each system, and to look for aging, reflector and lamp condition of each UV station.

## UV PowerMAP® and UV MAP Plus™ Systems™

**Features:**

- UV PowerMAP® measures peak irradiance (W/cm$^2$) and energy density (J/cm$^2$) simultaneously on four spectral bandwidths and the UV MAP Plus™ provides this information on one spectral bandwidth
- Detachable Optics Block (DOB) allows users to switch between high power and low power heads for different applications
- Adjustable sampling rate that can be adjusted up to 2048 samples per second


## 3DCure™ System–guaranteed uniformity.

Quickly and easily profile dimensional and shaped objects of any size with EIT's 3DCure™ Multi-Dimensional Measurement System. The system can produce up to 32 simultaneous measurements – perfect for setup and process verification of your UV lamp system. 3DCure™ can be used with UV lamps mounted in a fixed bank or on a robotic arm. The collected exposure data (W/cm$^2$ and J/cm$^2$) for each sensor is displayed on your computer with the included Cure 3D™ software. The software supports ActiveX® controls and allows customization and export of the data into other programs.

**Applications**

- Measure UV exposure on complex surfaces such as fenders, hoods, doors and head lamps, wood cabinets, doors, frames, furniture, musical instruments, and large dimensional objects such as airplane canopies, composite parts, shower stalls, and boat hulls
- Use for both process design (allowing for uniform lamp positioning or robotic programming) and process verification during production

**3DCure™ Sensor Features:**

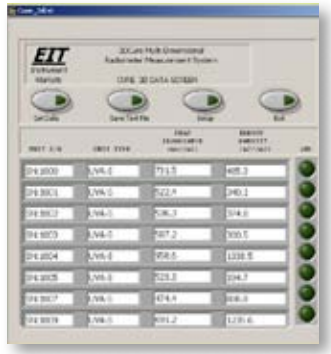
- Low profile Sensors: 1.75" (4.5cm) diameter x 0.5"(1.27cm)H, up to 32 per system
- Each sensor calibrated and serialized, connected via flexible daisy-chain quick connector system

**Data Collection Module Features:**

- Small, durable & portable, uses rechargeable batteries that provide power to the sensors
- Transfers collected data to a computer via a standard USB interface

**Cure 3D™ Software Features:**

- Supplied with each 3DCure™ System. Displays collected data from each sensor
- Allows operator to 'ping' each sensor to activate LED locator
- Supports ActiveX and export of the data to other programs



## PALM Probe® (Production Ambient Light Measurement)

### Applications

- Use to measure system performance in applications where space is limited or the UV source is difficult to access (such as label, web & converting applications)
- Establish and maintain a UV process window, coordinate readings from online sensors and online displays
- Measure irradiance in production (high level) and stray hazard (low level) environments

### Features

- Measure and display peak irradiance, energy density and exposure time
- Wide dynamic range, auto-ranging and zeroing
- Electrically isolated and insulated probe. Contains no fiber which can break
- Locator kits for exact positioning are available


## Spot Cure®

### Applications

- Monitor spot curing system performance
- Measure light guide degradation
- Determine optimum positioning of light guide
- Compare spot cure systems

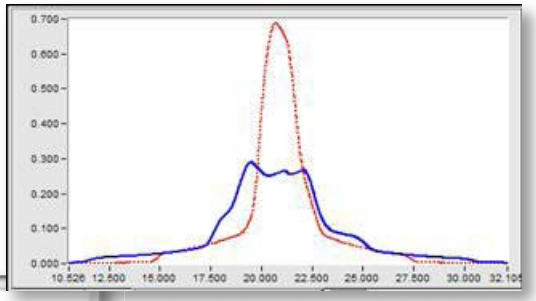
### Features

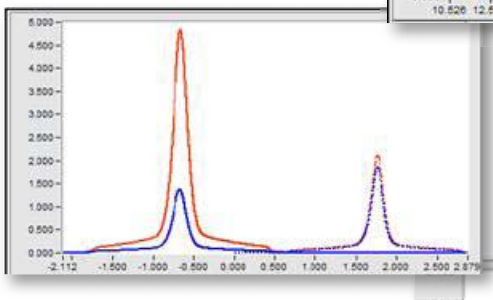
- Measures UV irradiance
- Small size 6.4"L x 1.74" diameter
- Easy to use, extremely long battery life (100,000 measurements)
- Adaptors support different size light guides and allow repeatable measurements

## PowerView® Software

PowerView® Software allows you to view, analyze, manipulate, store and share data collected with the UV PowerMAP® and UV Map Plus™ Systems. Some examples of actual data collected with the instruments are shown below. Irradiance ($W/cm^2$) is shown on the Y-axis and time on the X-axis (seconds). Energy Density ($J/cm^2$) values are provided on the DataView screen.

*PowerView® GraphView screen showing the same single lamp in focused (red) and non focused (blue) positions*

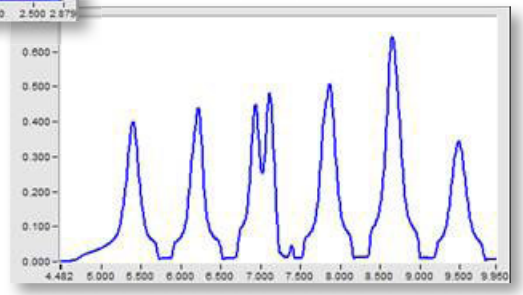


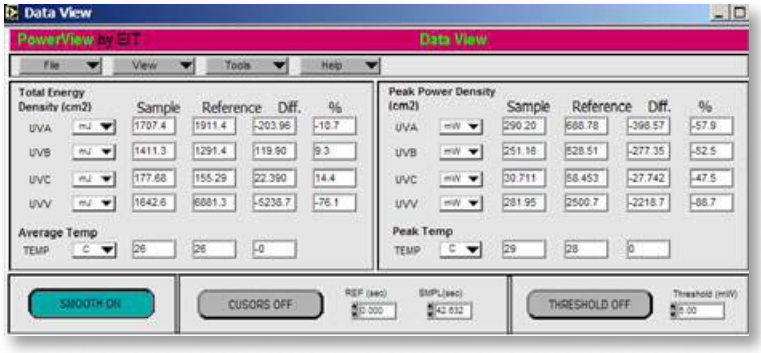


*PowerView® GraphView screen showing two different lamp types. UVA is shown in blue and UVV in red. Note the differences between the two . The first lamp is a mercury-gallium additive (V) bulb and the second lamp is a mercury (Hg) bulb*

*Right: PowerView® GraphView screen showing wide differences in the UVA output on a multi-lamp (six) line. Lamp three is out of focus; other lamps vary in irradiance values.*

*Below: DataView screen below shows actual energy density ($J/cm^2$) and peak power density values ($W/cm^2$)*





# Radiometers

EIT radiometers are intended to measure the process just as the product does, by moving past the UV sources. These logging radiometers record the total UV energy density and/or UV peak irradiance. Each radiometer is calibrated to a NIST traceable source.

## Power Puck® II & UVICURE® Plus II


**Applications:**

- Ideal for all UV curing applications including inks, adhesives, coatings and resins
- Establish the optimum level for curing; then measure and maintain this level for production
- **Available in:**
  **Standard Version–**100mW-10W/cm$^2$; UVC 10mW-1W/cm$^2$
  **Mid Range Version–**10mW-1W/cm$^2$; UVC 1mW-100mW/cm$^2$
  **Low Power Range–**1mW-100mW/cm$^2$

**Features:**

- The UV Power Puck II measures 4 different UV bands simultaneously. The UVICURE Plus II is a single band instrument (choose UVA, UVB, UVC or UVV at time of purchase).
  The UVA2 Power Puck II version for capturing LED sources in the 380-410 nm range is configured: UVA, UVA2, UVB & UVV.
- Robust, easy to use with user replaceable AAA batteries
- Set up menu allows user to display data screen mode, graph screen mode or reference mode, select units and instrument sample rates
- Includes communications package for transferring data to a computer


*Left to Right: Data Screen Mode, Graph Screen Mode and Reference Mode from UV Power Puck® II and UVICURE® Plus II screens*

## Power Puck® FLASH

EIT's Power Puck® FLASH is a four channel instrument that was developed specifically for rapidly-pulsed UV sources with a frequency of 100-120 times per second. The ideal instrument for short duration, high intensity sources. Contact EIT for more information.


## MicroCure®

**Applications:**

- Use in applications that cannot be accessed by EIT's puck-size radiometers including small piece, small conveyor, exposure systems, batch applications and small dimensional objects
- Use to establish UV curing levels and monitor UV lamp performance
- Available in 2W and 10W versions

**Features:**

- Miniature radiometer: 1.3"L x 0.95" H x 0.25"T (33.00 mm x 24.13 mm x 6.35 mm)
- High sampling rate of 2000 samples per second
- MicroCure® is exposed to UV and inserted into the battery powered DataReader to display peak irradiance and energy density values.


*The compact MicroCure data collection unit*


*The battery operated MicroCure Data Reader provides a simple, easy to operate user interface.*