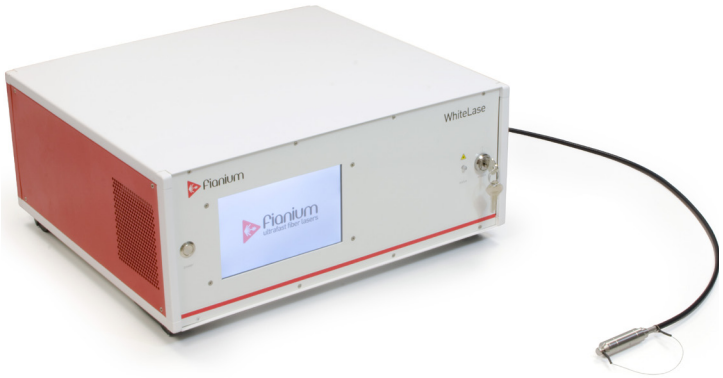
NEW PRODUCT DATASHEET

WhiteLase SC480

Ultra High-Power Supercontinuum Fiber Laser

HIGHEST BRIGHTNESS
WHITE-LIGHT LASER



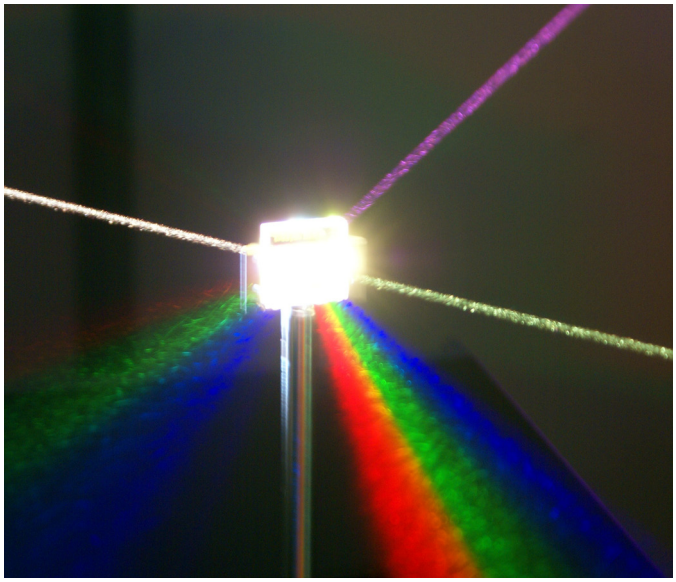
KEY FEATURES

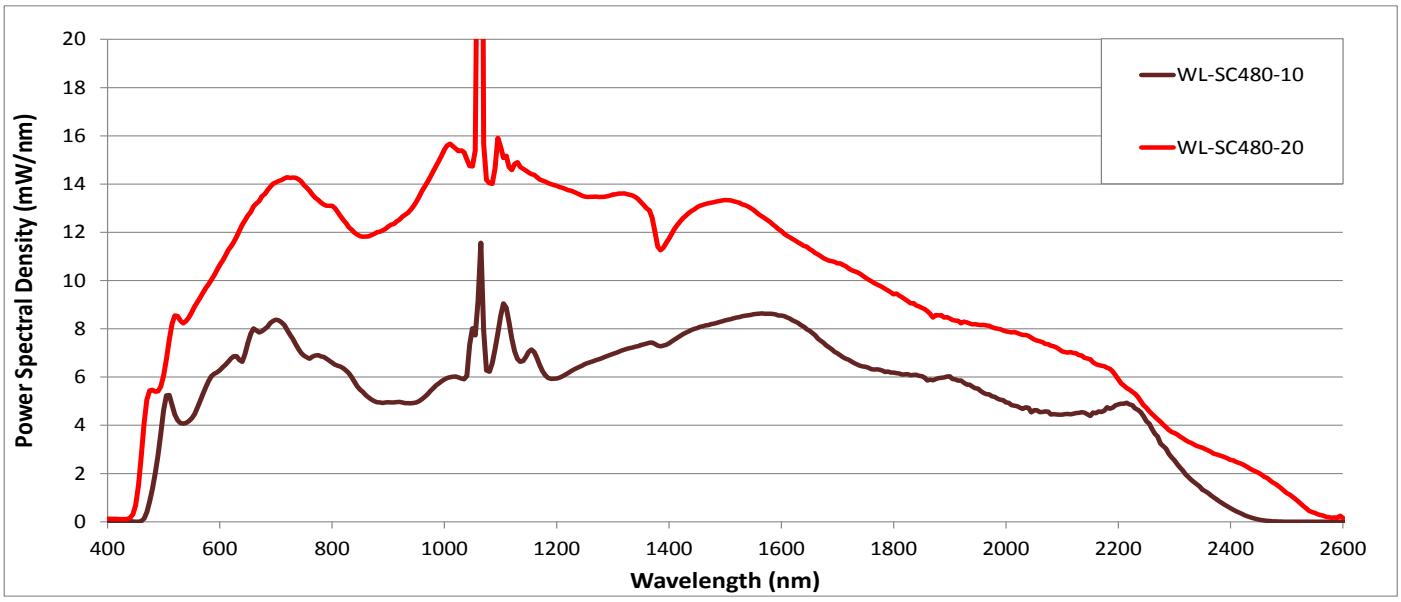
- Highest output power available - up to **20W**
- Visible power (350-750nm) >**3W**
- Continuous output spectrum to **>2400nm**
- Fixed or variable* repetition rate
- Touchscreen control with intuitive operation
- Single spatial mode across the output spectrum
- Advanced triggering options
- Modular and upgradable design
- High reliability and low cost of ownership
- Wide range of Plug-and-Play filter options

The **WhiteLase™ SC480** system is the highest power supercontinuum light source available. Utilising technology unique to Fianium, the system has a output power of up to 20W for applications requiring the maximum brightness. The full spectrum extends from <480nm to beyond 2400nm enabling an unparalleled range of applications from a single laser source.

Like all Fianium supercontinuum fiber lasers the **WhiteLase™ SC480** operates in the MHz repetition rate range, with picosecond pulses, so systems can be utilised effectively for both steady-state and lifetime measurement. The inherently robust all-fiber design provides unsurpassed performance combined with high reliability and ease-of use. The touchscreen interface enables one-touch access to all laser settings, pre-sets, diagnostics and real-time system status.

For visible light applications, also consider the UV & blue enhanced **WhiteLase™ SC-UV** or **WhiteLase™ SC400** systems.





* Patent Pending

STANDARD SPECIFICATIONS

	WhiteLase High Power Supercontinuum	
Model	**WL-SC480-10**	**NEW: WL-SC480-20**
Minimum Wavelength	<480nm	
Maximum Wavelength	≈2400nm	
Total Power (full spectrum)	>10W	>20W
Visible Power (350-750nm)	>1500mW	>3000mW
Extended Visible Power (350-850nm)	≈2200mW	≈4500mW
Average Spectral Power Density	>5mW/nm	>10mW/nm
Fundamental Repetition Rate	80MHz	80MHz
Adjustable Repetition Rate Range (with optional pulse picker)	100kHz - 80MHz	100kHz - 80MHz
Power Stability	<1%	
Fundamental Pulsewidth	≈6ps	
Output Optic	ϕ16 x 50mm Collimator or divergent output optic	
Beam Diameter	≈1.5mm @ 530nm ≈2mm @ 633nm ≈3mm @ 1100nm	
Armoured Fiber Length	1.5m	
State of Polarisation	Unpolarised	
User Interface	1. Integrated touchscreen graphical user interface 2. PC via USB interface	
Sync (trigger) Outputs	1. NIM Compatible trigger with adjustable delay 2. Oscillator monitor photodiode	
NIM Trigger Specifications	>10ns adjustable delay in 10ps steps <10ps timing jitter	
Cooling	Integrated air cooling	
Dimensions (mm)	450 x 390 x 180 (19'' benchtop chassis, 4U height)	

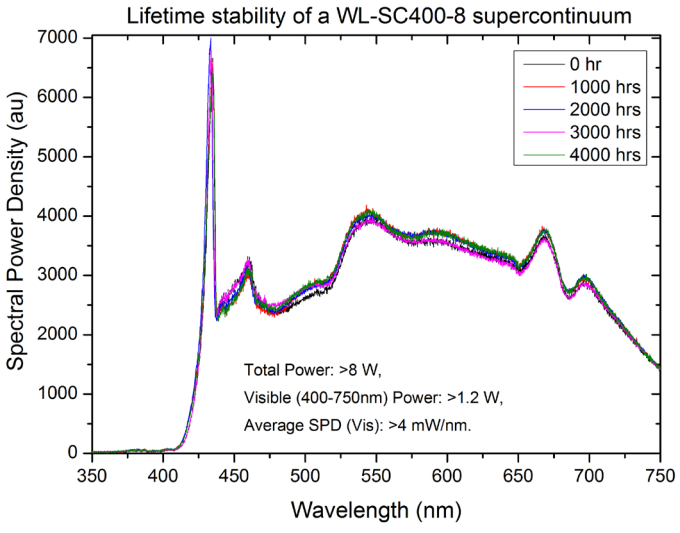
QUALITY AND RELIABILITY

Fianium have over 10 years' experience designing, high power supercontinuum fiber lasers and have supplied over 1000 units to research and industry. The systems are qualified by industry partners based on:

- 100s of systems tested over 1000s of hours
- Ongoing Highly Accelerated Lifetime Testing (HALT)
- Modules rated to over 20,000 hours Mean Time To Failure (MTTF)

Fianium's unique technology enables leading performance without sacrificing reliability or lifetime. Each system supplied is tested on a module and system level for a combined 500 hours and is backed by an unlimited hours warranty.

All Fianium lasers are manufactured under our Quality Management System in accordance with the ISO 9001:2008 standard.



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LS300 Series

Features

- Versatile
- Economically priced
- Stable beam quality
- Low Noise
- Compact
- Designed for fiber optic delivery
- Single line or wavelength selector available

Dynamic Laser's LS Series Laser Systems offer a superior solution to those seeking unmatched quality in an ion-gas laser system. The LS series provides exceptional beam quality, low noise, and dependability in a compact and affordable package.

The LS300 is available in 4 models to meet the high demands of our customers.

Output Specifications

Model	Wavelength (nm)										
	Total Power	457.9	476.5	488	496.5	501.7	514.5	520.8	530.9	568.2	647.1
LS300A	500mW	25mW	30mW	185mW	36mW	20mW	185mW				
LS300K1	80mW									40mW	40mW
LS300K2	100mW							25mW	35mW	40mW	
LS300KA	60mW			20mW						20mW	20mW

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LS300 Series

Applications

- Confocal Microscopy
- Flow Cytometry
- Spectroscopy
- Hematology
- Optical Disk Mastering
- Lightshows & Display
- Basic Research
- And more

Product Specifications

Power Stability (>2 hours)	±1%
Spatial Mode	TEM00
Beam Diameter	0.8 mm
Beam Divergence	1.0 mrad
Polarization Ratio	>100:1
Pointing Stability	<100µrad

Operating Parameters

Voltage	209-240VAC Single Phase
Current	16 Amps Max.
Frequency	50/60 Hz
Air Intake Clearance (External Fan Unit)	2.5cm
Operating Temperature / Humidity	4 – 40°C / <90%

Dimensions

Laser Head	53.3cm x 17.8cm x 15.2cm
Power Supply	27.9cm x 15.2cm x 12.7
Controller	12.7cm x 8.9cm x 5cm

Notes
1. Specifications subject to change without notice
2. Measurements in light control mode at 8 Amps
3. For OEM or export use

LED525E

Ultra Bright Green LED

Specifications and Documentation

Part 1. Introduction: LED525E Ultra Bright Green LED

The LED525E emits light with a spectral output centered at 525 nm. The diode is encapsulated in a round clear epoxy casing with a 5 mm diameter.

Part 2. Specifications for an LED525E

2.1. Electrical Specifications

	Typical	Maximum Ratings
Reverse Voltage		5.0 V
DC Forward Current		30 mA
Forward Voltage @ 20 mA	3.3 V	3.85 V
Operating Temperature		-40 ºC to 85 ºC
Storage temperature Range		-40 ºC to 120 ºC

Note: All maximum measurements specified are at 25 ºC.

2.2. Optical Specifications

	Typical
Center Wavelength	525 nm -5 (+15) nm
FWHM	32 nm
Half Viewing Angle	7.5º
Total Optical Power	2.6 mW @ 20 mA

2.3. Soldering Specifications

	Conditions
Manual Soldering	295 ºC ± 5 ºC , for less than 3 seconds
Wave Soldering	260 ºC ± 5 ºC , for less than 5 seconds
Reflow Soldering	**Preheating:** 70 ºC to 80 ºC , for 30 seconds **Soldering:** 245 ºC ± 5 ºC , for less than 5 seconds

2.4. Cleaning Solvents

Solvent	Ethyl Alcohol	Isopropyl Alcohol	Propanol	Acetone	Chloroseen	Tricloroethylene	MKS
Approved	Yes	Yes	Yes	No	No	No	No

2.5. Physical Specifications

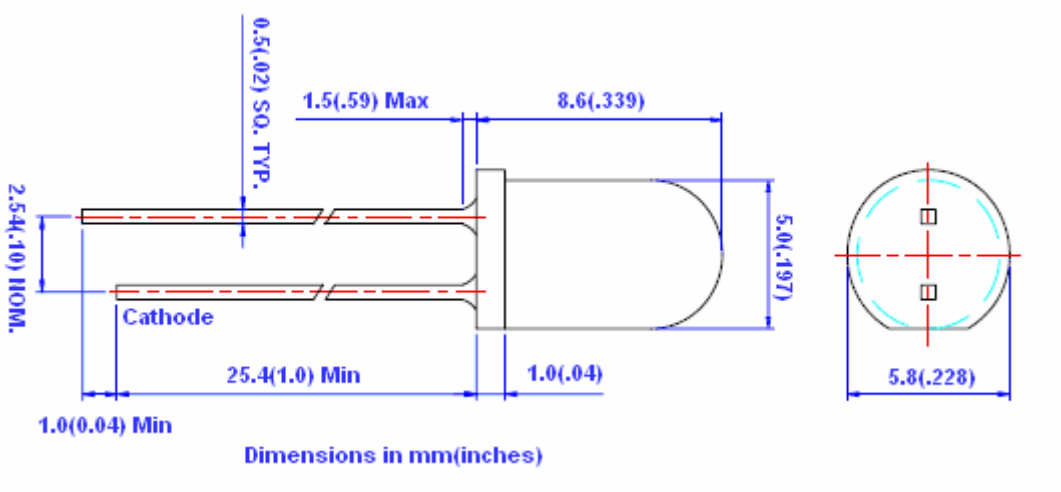
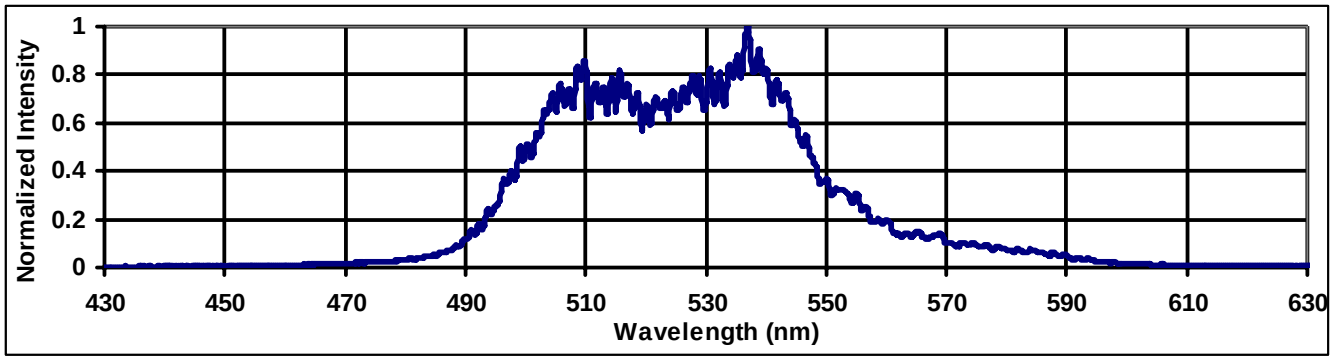
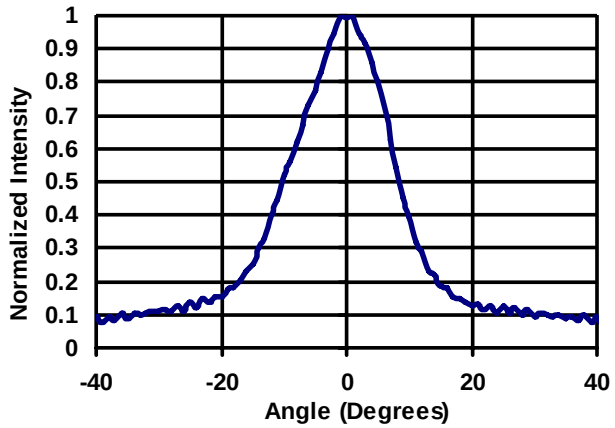


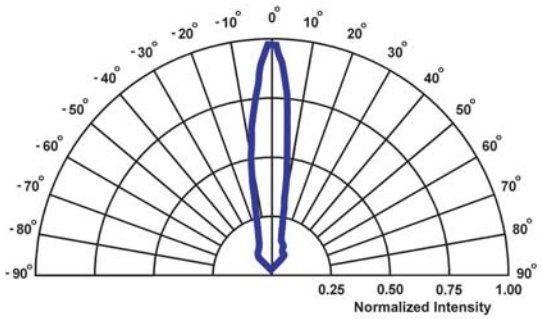
Figure 1: LED525E. The cathode is the short lead and the anode is the long lead.

2.6. Typical Spectral Intensity Distribution



2.7. Typical Radial Intensity Distribution





Part 3. Measurement Techniques

3.1. Measurement Technique for Spectral Distribution Plot and FWHM Specification

A SP1-USB fiber based spectrometer connected to a computer is used to measure the spectral response of each LED in the visible spectrum (390-810 nm). The LED is powered with a LD1255 laser diode driver operating in a constant current mode. The light from the LED is focused by a ∅1″ Bi-convex lens, f = 40 mm, into a multimode fiber, 50 um SMA patch cable, attached to the spectrometer, see figure 2.

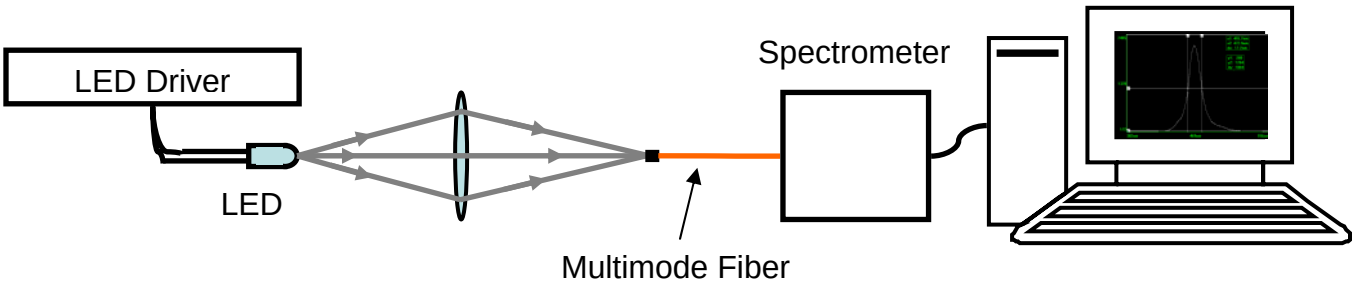


Figure 2: Schematic of the setup used to measure the spectral emission of an LED.

Picture of Setup Depicted in Figure 2

The spectral FWHM is measured using the SP1-USB software; see the screen shot in figure 3. The spectral distribution of the LED is assumed to be Gaussian when determining the FWHM specification. The data is also used to create a typical spectral distribution plot as shown in section 2.5. The central wavelength and shape of the curve vary due to the uniqueness of each LED, as indicated by the deviation column of the optical specifications table.

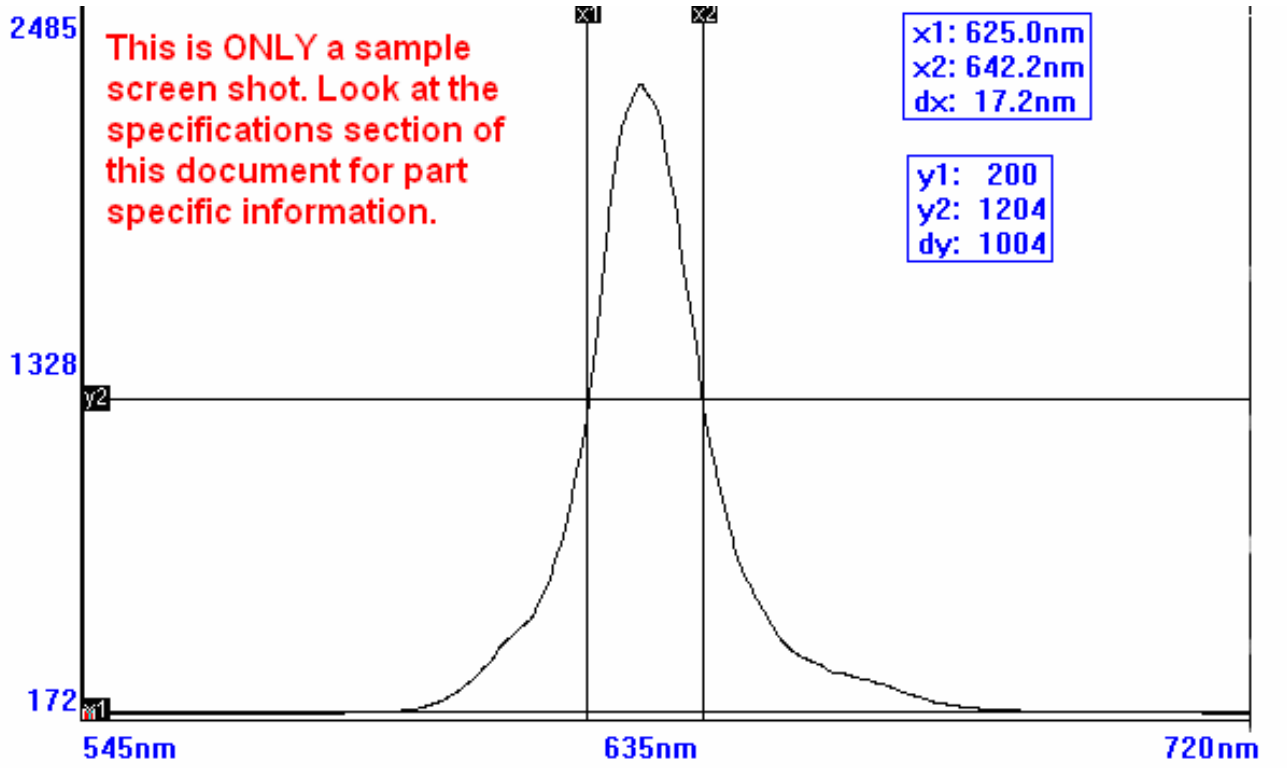


Figure 3: Screen shot of the spectral emission of an LED471E LED measured using an SP1-USB spectrometer.

Part List for Spectral Distribution Measurement

Quantity	Part	Description
1	SP1-USB	400-800 nm USB Spectrometer
1	M14L01	50 um Core SMA Multimode Patch Cable, 0.22 NA
2	UPH2	Swivel Base Post Holder (2″)
3	PH2-ST	Post Holder
5	TR1.5	∅1/2″ Posts 1.5″ Long
3	BA1	Base Plate
2	LMR1	Lens Mount
1	LMR05	Lens Mount
1	SM1SMA	SM1 to SMA Connector Adapter Plate
1	SM1L05	Lens Tube
1	LB1027-B	Bi-Convex Lens (f = 40 mm)
1	MB810	Solid Standard Aluminum Breadboard (8″ x 10″)
1	HW-KIT2	1/4-20 Cap Screw Kit
1	LEDHD05*	LED Socket and Holder

*Product in development.

3.2. Measurement Technique for Radial Intensity Distribution Plot and the Half Viewing Angle Specification

To make a measurement of the intensity pattern as a function of angle, the LED is rotated on an axis perpendicular to the axis along which the emitted light intensity was the greatest. Goniometric rotation of the LED is achieved by mounting the LED on a post attached to a motorized rotation stage (CR1-Z6) so that the rotation axis goes through the light emitting surface of the LED. The CR1-Z6 is powered by an APT TDC001 USB Motor Diver while the LED is powered by an LD1255 Laser Diode Driver. The radiated light is detected using either a Si or InGaAs photodetector, DET100A or DET10C respectively, located approximately 12 inches from the LED. To keep stray or scattered light from hitting the detector a ∅1" lens tube is attached to the detector that extends to just short of the LED. Two iris apertures are placed along the path from the LED to the detector. The iris closer to the LED has an aperture diameter of 10 mm while the aperture nearest the detector has a diameter of 3 mm. The setup is shown in figure 4.

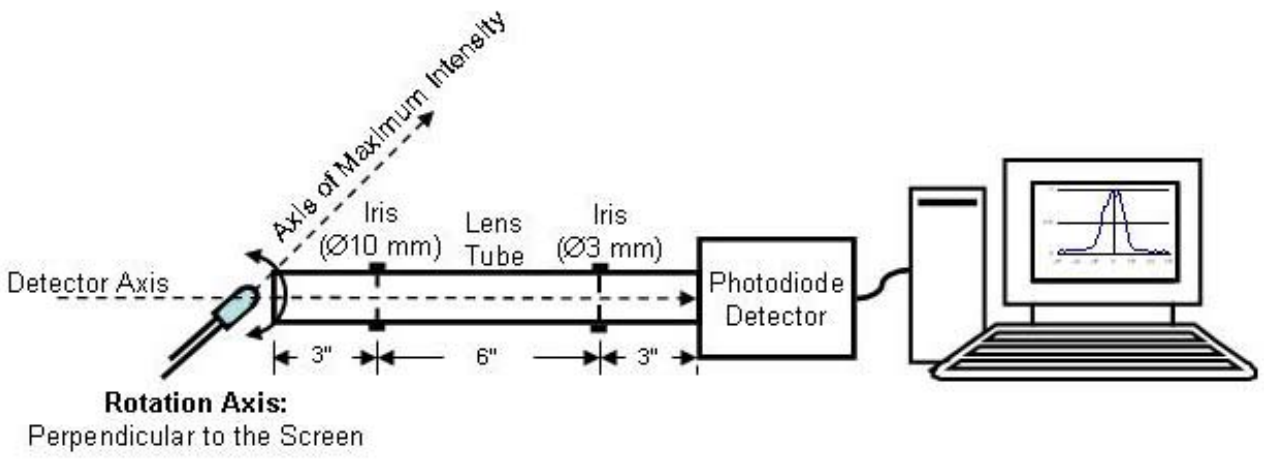


Figure 4: Schematic of the setup used to measure the radial power distribution. The drawing is not to scale.

As the LED rotates, the output of the photodiode detector, which is proportional to the light intensity, is recorded for each angular position using a NI data acquisition card. The LED is rotated from +90° to –90° where 0° approximately corresponds to when the Axis of Maximum Intensity, see figure 5, is parallel to the Detector Axis. The results are displayed in a plot similar to the one shown in figure 6. The half viewing angle specification is determined by the angle that corresponds to a 50% drop in the maximum detector output.

Picture of Setup Depicted in Figure 4

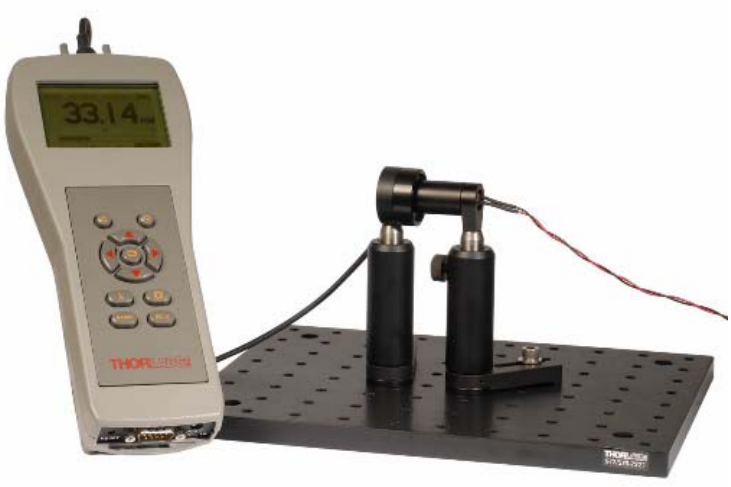
Parts List for Radial Intensity Distribution Measurement

Quantity	Part	Description
1	DET100A or DET10C	Si Photodiode Detector or InGaAs Photodiode Detector
1	CR1-Z6	Motorized Rotational Stage
1	CR1A	CR1 to Post AdapterPlate
1	TDC001	T-Cube Single Channel USB DC Servo Controller/Driver
3	SM1L30	1″ Lens Tube 3″ Long
2	SM1D12C	SM1 Lever Actuated Iris Diaphragm
2	UPH3	Swivel Base Post Holder
1	PH2-ST	Post Holder
1	PH1-ST	Post Holder
2	TR3	∅1/2″ Post 3″ Long
2	TR1	∅1/2″ Post 1″ Long
1	RLA0300	Dovetail Optical Rail 3″ Long
1	RC1	Rail Carrier
1	MB612	Solid Standard Aluminum Breadboard (6″ x 24″)
1	2249-C-36	BNC Coaxial Cable
1	HW-KIT2	1/4-20 Cap Screw Kit
1	LEDHD05*	LED Socket and Holder

*Product in development.

3.3. Measurement Technique for Determining the Forward Radiated Optical Power Specification

The total forward radiated power of the LED is measured using a PM120 with a S120B Power Head. See the picture below.



Forward Radiating Power Setup

Parts List for the Forward Radiated Optical Power Measurement

Quantity	Part	Description
1	PM121	Digital Optical Power Meter with S121B optical sensor
2	UPH3	Swivel base post holder 3″ Long
2	TR2	∅1/2″ Post 2″ Long
1	MB810	Solid Standard Aluminum Breadboard (8″ x 10″)
1	HW-KIT2	1/4-20 Cap Screw Kit
1	LEDHD05*	LED Socket and Holder

*Product in development.

3.4. Measurement Technique for Determining the Total Optical Power Specification

The total optical output power of an LED is measured using an integrating sphere. The radiated light is detected using either a Si or InGaAs integrating sphere, IS236A or IS210C respectively. The sphere is calibrated with a known laser power source such as the Thorlabs CPS180 laser diode module. The output of the integrating sphere is digitized using our PDA200C benchtop photodiode amplifier.

Total Radiated Power Setup

Part List for the Total Radiated Optical Power Measurement

Quantity	Part	Description
1	IS236A or IS210C	2″ Integrating Sphere with a Si Detector or 2″ Integrating Sphere with a InGaAs Detector
1	PDA200C	Benchtop Photodiode Amplifier
2	UPH3	Swivel Base Post Holder 3″ Long
2	TR2	∅1/2″ Post 2″ Long
1	HW-KIT2	1/4-20 Cap Screw Kit
1	LEDHD05*	LED Socket and Holder

*Product in development.

Part 4. Precautions and Warranty Information

These products are ESD (electro static discharge) sensitive and as a result are not covered under warranty. In order to ensure the proper functioning of an LED care must be given to maintain the highest standards of compliance to the maximum electrical specifications when handling such devices. The LEDs are particularly sensitive to any voltage that exceeds the absolute maximum ratings of the product. Any applied voltage in excess of the maximum specification will cause damage and possible complete failure to the product. The user must use handling procedures that prevent any electro static discharges or other voltage surges when handling or using these devices.

Thorlabs, Inc. Life Support and Military Use Application Policy is stated below:

THORLABS' PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS OR IN ANY MILITARY APPLICATION WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF THORLABS, INC. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform, when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.

2. A critical component is any component in a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system or to affect its safety or effectiveness.

3. The Thorlabs products described in this document are not intended nor warranted for usage in Military Applications.

Part 5. Contact Information

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email: scandinavia@thorlabs.com

LED405E

Ultra Bright Violet LED

Specifications and Documentation

Part 1. Introduction: LED405E Ultra Bright Violet LED

The LED405E emits light with a spectral output centered at 405 nm. This LED is composed of heterostructures (HS) grown on an InGaN substrate. The diode is encapsulated in a round clear epoxy casing with a 5 mm diameter.

Part 2. Specifications for an LED405E

2.1. Electrical Specifications

	Typical	Maximum Ratings
Power Dissipation		120 mW
Reverse Voltage		5.0 V
DC Forward Current		30 mA
Forward Voltage @ 20 mA	3.8 V	4.3 V
Reverse Current V_r = -5 V		10 µA
Operating Temperature		-30 ºC to 85 ºC
Storage temperature Range		-30 ºC to 100 ºC

Note: All maximum measurements specified are at 25 ºC.

2.2. Optical Specifications

	Typical
Center Wavelength	405 nm (±10 nm)
FWHM	15 nm
Half Viewing Angle	5º
Forward Optical Power	8.4 mW @ 20mA
Total Optical Power	10 mW @ 20mA

2.3. Soldering Specifications

	Conditions
Manual Soldering	295 ºC ± 5 ºC , for less than 3 seconds
Wave Soldering	260 ºC ± 5 ºC , for less than 5 seconds
Reflow Soldering	**Preheating:** 70 ºC to 80 ºC , for 30 seconds **Soldering:** 245 ºC ± 5 ºC , for less than 5 seconds

2.4. Cleaning Solvents

Solvent	Ethyl Alcohol	Isopropyl Alcohol	Propanol	Acetone	Chloroseen	Tricloroethylene	MKS
Approved	Yes	Yes	Yes	No	No	No	No

2.5. Physical Specifications

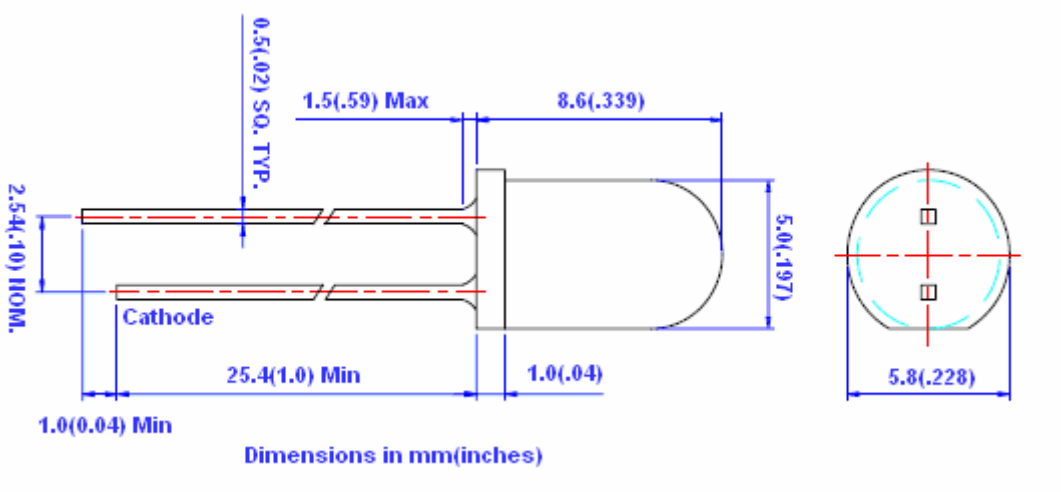
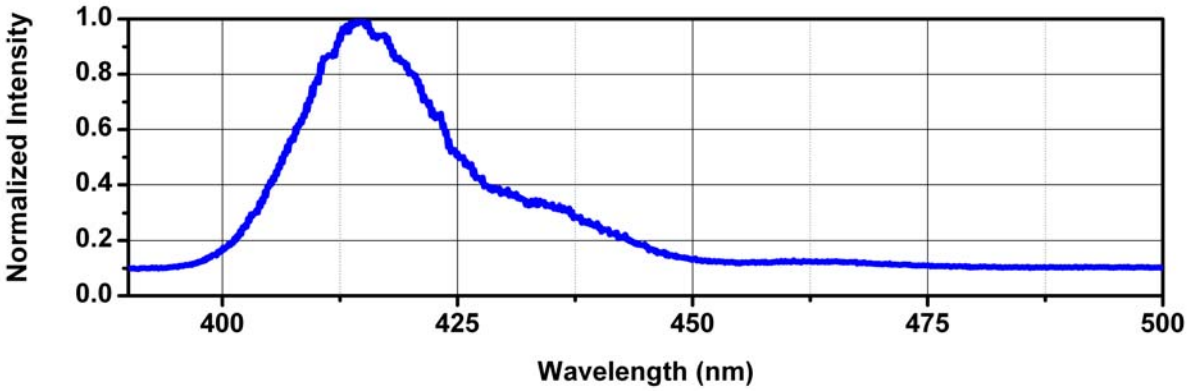
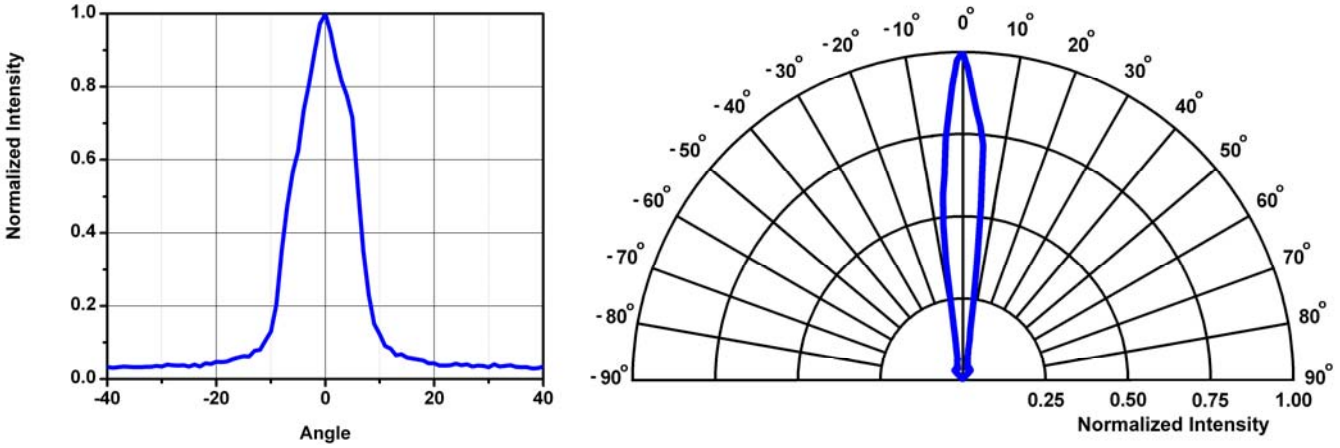


Figure 1: LED401E. The cathode is the short lead and the anode is the long lead.

2.6. Typical Spectral Intensity Distribution



2.7. Typical Radial Intensity Distribution



Part 3. Measurement Techniques

3.1. Measurement Technique for Spectral Distribution Plot and FWHM Specification

A SP1-USB fiber based spectrometer connected to a computer is used to measure the spectral response of each LED in the visible spectrum (390-810 nm). The LED is powered with a LD1255 laser diode driver operating in a constant current mode. The light from the LED is focused by a ∅1″ Bi-convex lens, f = 40 mm, into a multimode fiber, 50 um SMA patch cable, attached to the spectrometer, see figure 2.

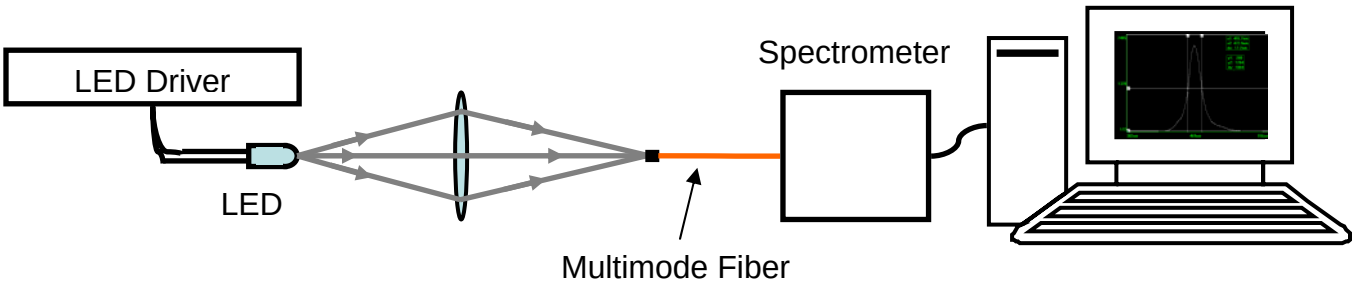


Figure 2: Schematic of the setup used to measure the spectral emission of an LED.

Picture of Setup Depicted in Figure 2

The spectral FWHM is measured using the SP1-USB software; see the screen shot in figure 3. The spectral distribution of the LED is assumed to be Gaussian when determining the FWHM specification. The data is also used to create a typical spectral distribution plot as shown in section 2.5. The central wavelength and shape of the curve vary due to the uniqueness of each LED, as indicated by the deviation column of the optical specifications table.

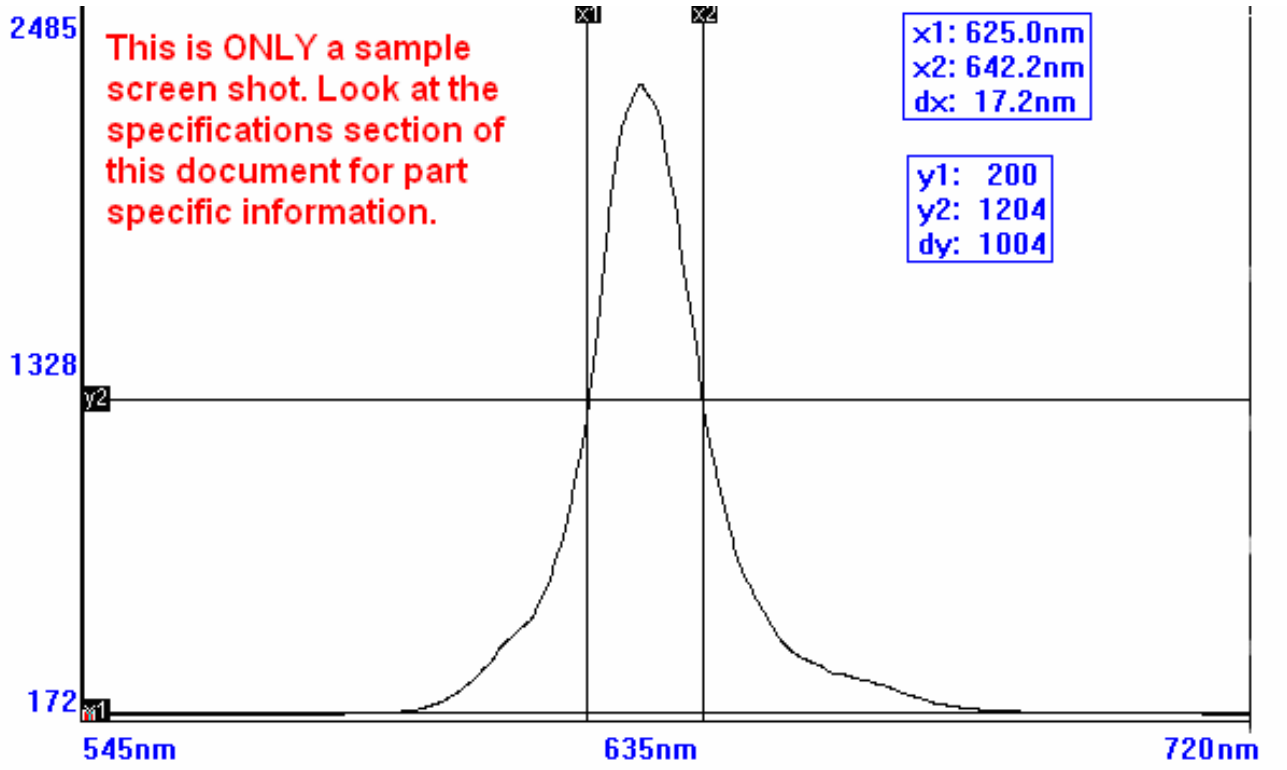


Figure 3: Screen shot of the spectral emission of an LED471E LED measured using an SP1-USB spectrometer.

Part List for Spectral Distribution Measurement

Quantity	Part	Description
1	SP1-USB	400-800 nm USB Spectrometer
1	M14L01	50 um Core SMA Multimode Patch Cable, 0.22 NA
2	UPH2	Swivel Base Post Holder (2″)
3	PH2-ST	Post Holder
5	TR1.5	∅1/2″ Posts 1.5″ Long
3	BA1	Base Plate
2	LMR1	Lens Mount
1	LMR05	Lens Mount
1	SM1SMA	SM1 to SMA Connector Adapter Plate
1	SM1L05	Lens Tube
1	LB1027-B	Bi-Convex Lens (f = 40 mm)
1	MB810	Solid Standard Aluminum Breadboard (8″ x 10″)
1	HW-KIT2	1/4-20 Cap Screw Kit
1	LEDMF	LED Socket and Holder

3.2. Measurement Technique for Radial Intensity Distribution Plot and the Half Viewing Angle Specification

To make a measurement of the intensity pattern as a function of angle, the LED is rotated on an axis perpendicular to the axis along which the emitted light intensity was the greatest. Goniometric rotation of the LED is achieved by mounting the LED on a post attached to a motorized rotation stage (CR1-Z6) so that the rotation axis goes through the light emitting surface of the LED. The CR1-Z6 is powered by an APT TDC001 USB Motor Diver while the LED is powered by an LD1255 Laser Diode Driver. The radiated light is detected using either a Si or InGaAs photodetector, DET100A or DET10C respectively, located approximately 12 inches from the LED. To keep stray or scattered light from hitting the detector a ∅1" lens tube is attached to the detector that extends to just short of the LED. Two iris apertures are placed along the path from the LED to the detector. The iris closer to the LED has an aperture diameter of 10 mm while the aperture nearest the detector has a diameter of 3 mm. The setup is shown in figure 4.

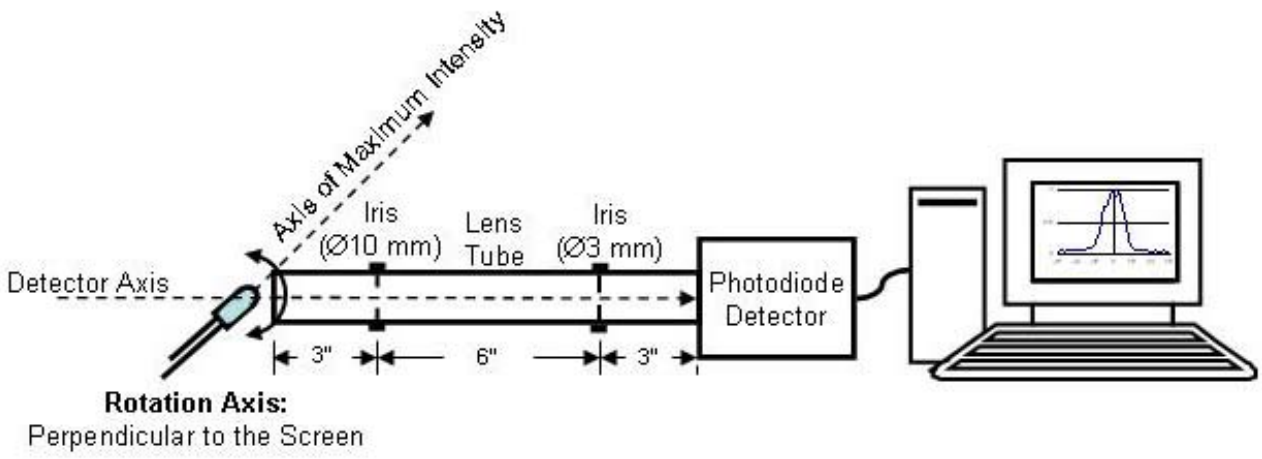


Figure 4: Schematic of the setup used to measure the radial power distribution. The drawing is not to scale.

As the LED rotates, the output of the photodiode detector, which is proportional to the light intensity, is recorded for each angular position using a NI data acquisition card. The LED is rotated from +90° to –90° where 0° approximately corresponds to when the Axis of Maximum Intensity, see figure 5, is parallel to the Detector Axis. The results are displayed in a plot similar to the one shown in figure 6. The half viewing angle specification is determined by the angle that corresponds to a 50% drop in the maximum detector output.

Picture of Setup Depicted in Figure 4

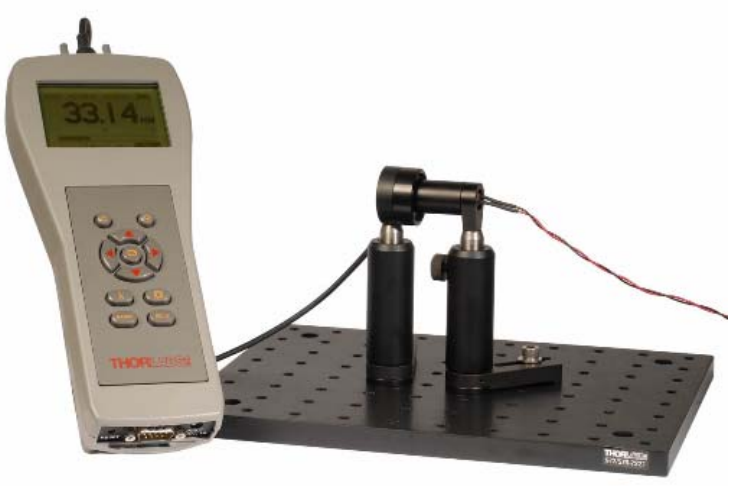
Parts List for Radial Intensity Distribution Measurement

Quantity	Part	Description
1	DET100A or DET10C	Si Photodiode Detector or InGaAs Photodiode Detector
1	CR1-Z6	Motorized Rotational Stage
1	CR1A	CR1 to Post AdapterPlate
1	TDC001	T-Cube Single Channel USB DC Servo Controller/Driver
3	SM1L30	1″ Lens Tube 3″ Long
2	SM1D12C	SM1 Lever Actuated Iris Diaphragm
2	UPH3	Swivel Base Post Holder
1	PH2-ST	Post Holder
1	PH1-ST	Post Holder
2	TR3	∅1/2″ Post 3″ Long
2	TR1	∅1/2″ Post 1″ Long
1	RLA0300	Dovetail Optical Rail 3″ Long
1	RC1	Rail Carrier
1	MB612	Solid Standard Aluminum Breadboard (6″ x 24″)
1	2249-C-36	BNC Coaxial Cable
1	HW-KIT2	1/4-20 Cap Screw Kit
1	LEDMF	LED Socket and Holder

*Product in development.

3.3. Measurement Technique for Determining the Forward Radiated Optical Power Specification

The total forward radiated power of the LED is measured using a PM120 with a S120B Power Head. See the picture below.



Forward Radiating Power Setup

Parts List for the Forward Radiated Optical Power Measurement

Quantity	Part	Description
1	PM121	Digital Optical Power Meter with S121B optical sensor
2	UPH3	Swivel base post holder 3″ Long
2	TR2	∅1/2″ Post 2″ Long
1	MB810	Solid Standard Aluminum Breadboard (8″ x 10″)
1	HW-KIT2	1/4-20 Cap Screw Kit
1	LEDMF	LED Socket and Holder

*Product in development.

3.4. Measurement Technique for Determining the Total Optical Power Specification

The total optical output power of an LED is measured using an integrating sphere. The radiated light is detected using either a Si or InGaAs integrating sphere, IS236A or IS210C respectively. The sphere is calibrated with a known laser power source such as the Thorlabs CPS180 laser diode module. The output of the integrating sphere is digitized using our PDA200C benchtop photodiode amplifier.

Total Radiated Power Setup

Part List for the Total Radiated Optical Power Measurement

Quantity	Part	Description
1	IS236A or IS210C	2″ Integrating Sphere with a Si Detector or 2″ Integrating Sphere with a InGaAs Detector
1	PDA200C	Benchtop Photodiode Amplifier
2	UPH3	Swivel Base Post Holder 3″ Long
2	TR2	∅1/2″ Post 2″ Long
1	HW-KIT2	1/4-20 Cap Screw Kit
1	LEDMF	LED Socket and Holder

*Product in development.

Part 4. Precautions and Warranty Information

These products are ESD (electro static discharge) sensitive and as a result are not covered under warranty. In order to ensure the proper functioning of an LED care must be given to maintain the highest standards of compliance to the maximum electrical specifications when handling such devices. The LEDs are particularly sensitive to any voltage that exceeds the absolute maximum ratings of the product. Any applied voltage in excess of the maximum specification will cause damage and possible complete failure to the product. The user must use handling procedures that prevent any electro static discharges or other voltage surges when handling or using these devices.

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1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform, when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.

2. A critical component is any component in a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system or to affect its safety or effectiveness.

3. The Thorlabs products described in this document are not intended nor warranted for usage in Military Applications.

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LED370E

Ultra Bright Deep Violet

LED

Specifications and Documentation

Part 1. Introduction: LED370E Ultra Bright Deep Violet LED

The LED370E emits light with a spectral output centered at 375 nm. This LED is composed of heterostructures (HS) grown on an InGaN substrate. The diode is encapsulated in a round clear epoxy casing with a 5 mm diameter.

Part 2. Specifications for an LED370E

2.1. Electrical Specifications

	Typical	Maximum Ratings
Power Dissipation		110 mW
Reverse Voltage		3.0 V
DC Forward Current		30 mA
Forward Voltage @ 20 mA	3.5 V	4.3 V
Reverse Current V_r = -5 V		10 µA
Operating Temperature		-30 ºC to 85 ºC
Storage temperature Range		-30 ºC to 100 ºC

Note: All maximum measurements specified are at 25 ºC.

2.2. Optical Specifications

	Typical
Center Wavelength	375 nm (±10 nm)
FWHM	10 nm
Half Viewing Angle	19º
Forward Optical Power	2.0 mW @ 20 mA
Total Optical Power	2.5 mW @ 20mA

2.3. Soldering Specifications

	Conditions
Manual Soldering	295 ºC ± 5 ºC , for less than 3 seconds
Wave Soldering	260 ºC ± 5 ºC , for less than 5 seconds
Reflow Soldering	**Preheating:** 70 ºC to 80 ºC , for 30 seconds **Soldering:** 245 ºC ± 5 ºC , for less than 5 seconds

2.4. Cleaning Solvents

Solvent	Ethyl Alcohol	Isopropyl Alcohol	Propanol	Acetone	Chloroseen	Tricloroethylene	MKS
Approved	Yes	Yes	Yes	No	No	No	No

2.5. Physical Specifications

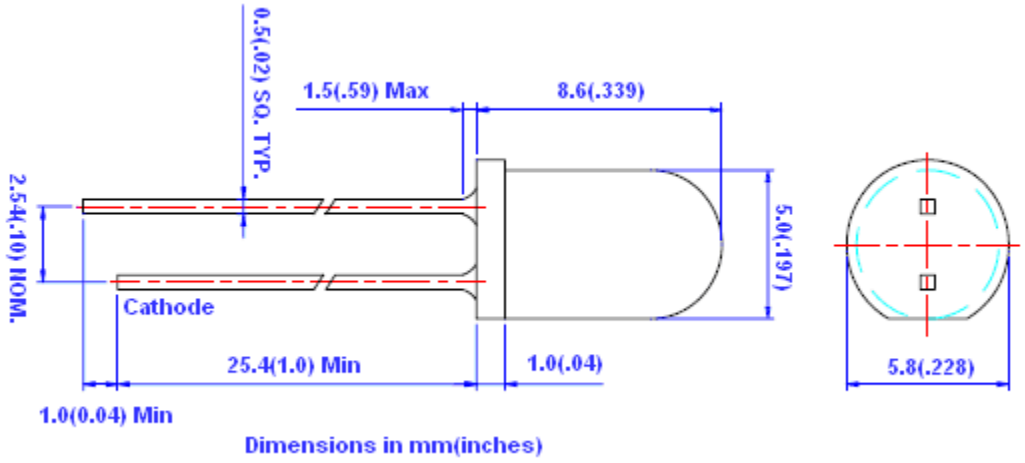
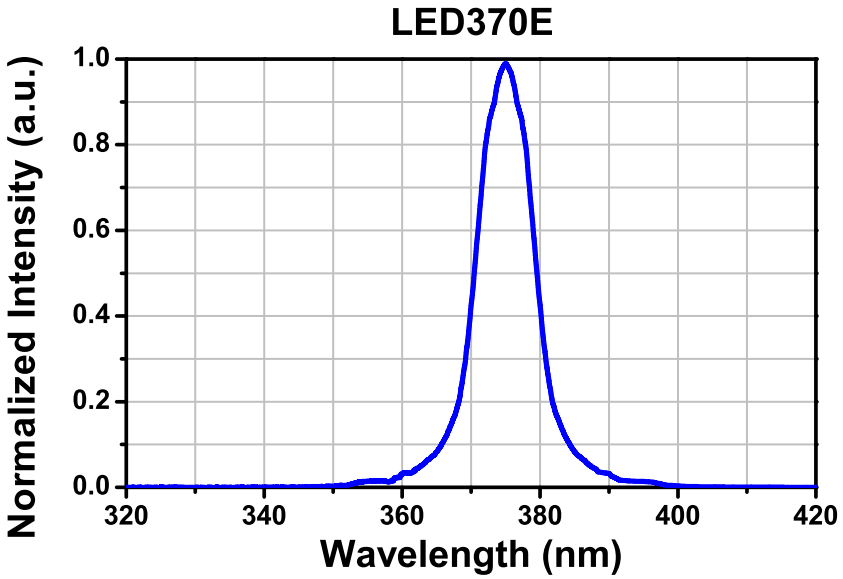


Figure 1: LED370E. The cathode is the short lead and the anode is the long lead.

2.6. Typical Spectral Intensity Distribution



Part 3. Measurement Techniques

3.1. Measurement Technique for Spectral Distribution Plot and FWHM Specification

A SP1-USB fiber based spectrometer connected to a computer is used to measure the spectral response of each LED in the visible spectrum (390-810 nm). The LED is powered with a LD1255 laser diode driver operating in a constant current mode. The light from the LED is focused by a ∅1″ Bi-convex lens, f = 40 mm, into a multimode fiber, 50 um SMA patch cable, attached to the spectrometer, see figure 2.

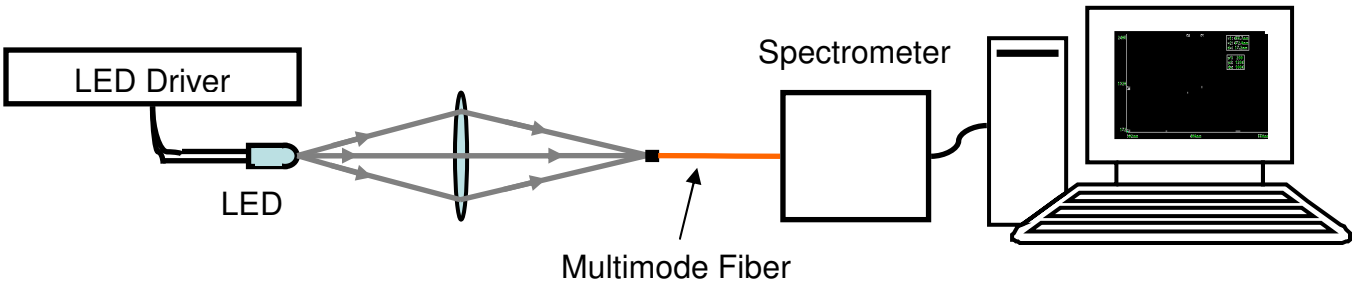


Figure 2: Schematic of the setup used to measure the spectral emission of an LED.

Picture of Setup Depicted in Figure 2

The spectral FWHM is measured using the SP1-USB software; see the screen shot in figure 3. The spectral distribution of the LED is assumed to be Gaussian when determining the FWHM specification. The data is also used to create a typical spectral distribution plot as shown in section 2.5. The central wavelength and shape of the curve vary due to the uniqueness of each LED, as indicated by the deviation column of the optical specifications table.

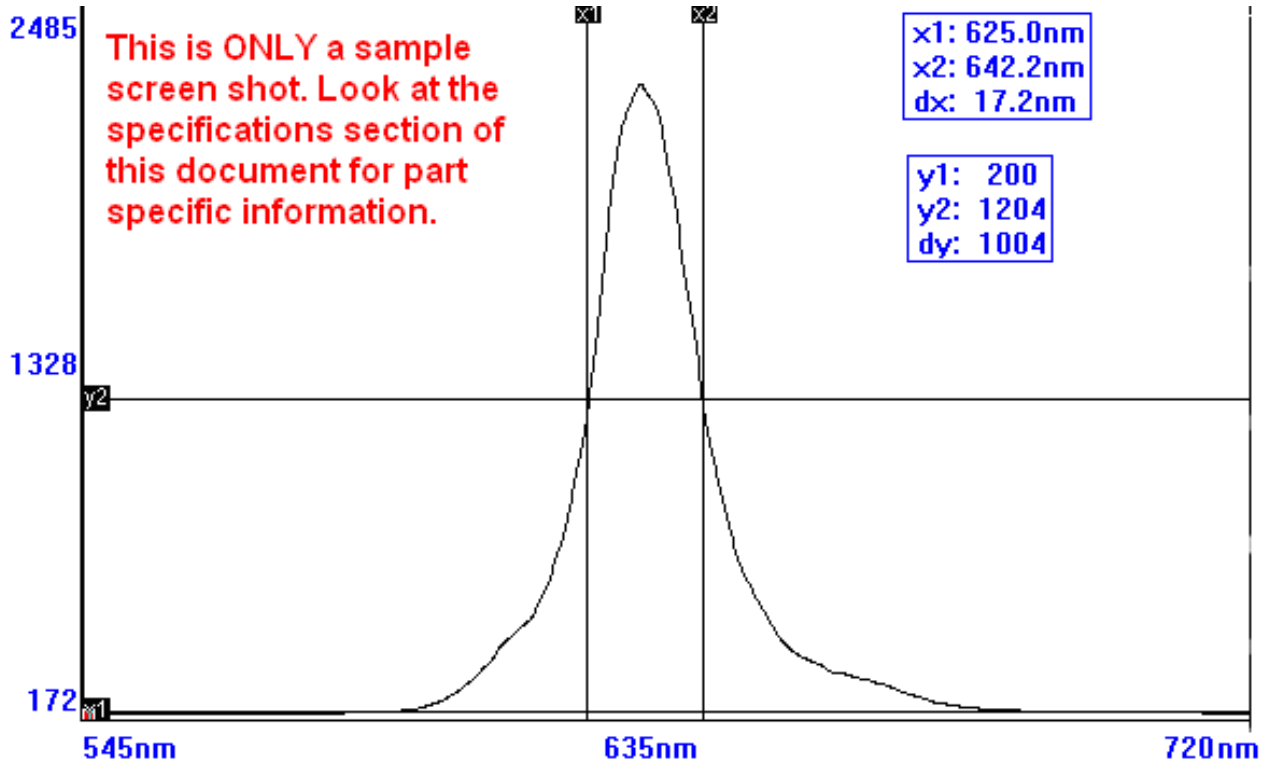


Figure 3: Screen shot of the spectral emission of an LED471E LED measured using an SP1-USB spectrometer.

Part List for Spectral Distribution Measurement

Quantity	Part	Description
1	SP1-USB	400-800 nm USB Spectrometer
1	M14L01	50 um Core SMA Multimode Patch Cable, 0.22 NA
2	UPH2	Swivel Base Post Holder (2″)
3	PH2-ST	Post Holder
5	TR1.5	∅1/2″ Posts 1.5″ Long
3	BA1	Base Plate
2	LMR1	Lens Mount
1	LMR05	Lens Mount
1	SM1SMA	SM1 to SMA Connector Adapter Plate
1	SM1L05	Lens Tube
1	LB1027-B	Bi-Convex Lens (f = 40 mm)
1	MB810	Solid Standard Aluminum Breadboard (8″ x 10″)
1	HW-KIT2	1/4-20 Cap Screw Kit
1	LEDMF	LED Socket and Holder

*Product in development.

3.2. Measurement Technique for Radial Intensity Distribution Plot and the Half Viewing Angle Specification

To make a measurement of the intensity pattern as a function of angle, the LED is rotated on an axis perpendicular to the axis along which the emitted light intensity was the greatest. Goniometric rotation of the LED is achieved by mounting the LED on a post attached to a motorized rotation stage (CR1-Z6) so that the rotation axis goes through the light emitting surface of the LED. The CR1-Z6 is powered by an APT TDC001 USB Motor Diver while the LED is powered by an LD1255 Laser Diode Driver. The radiated light is detected using either a Si or InGaAs photodetector, DET100A or DET10C respectively, located approximately 12 inches from the LED. To keep stray or scattered light from hitting the detector a ∅1" lens tube is attached to the detector that extends to just short of the LED. Two iris apertures are placed along the path from the LED to the detector. The iris closer to the LED has an aperture diameter of 10 mm while the aperture nearest the detector has a diameter of 3 mm. The setup is shown in figure 4.

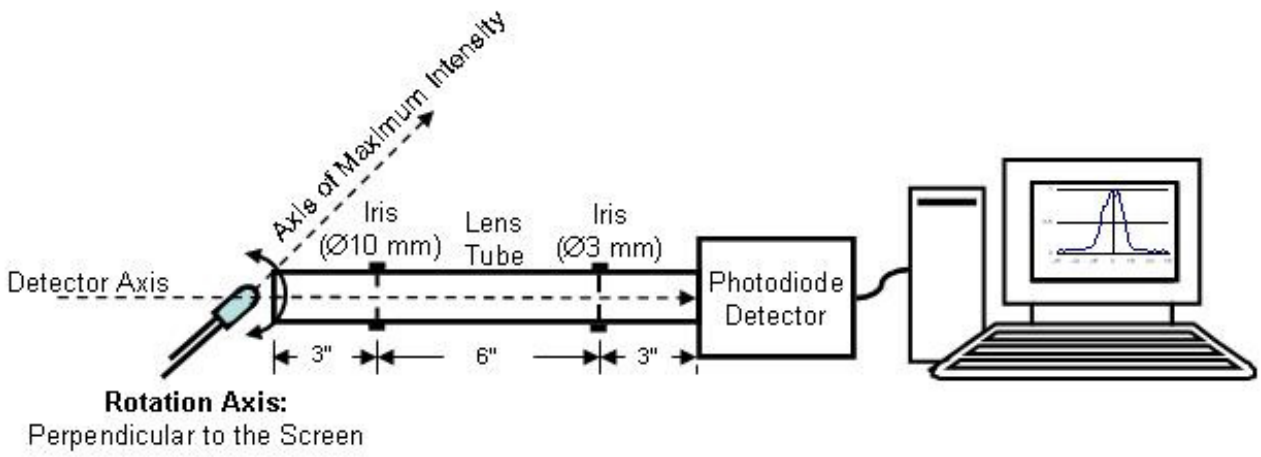
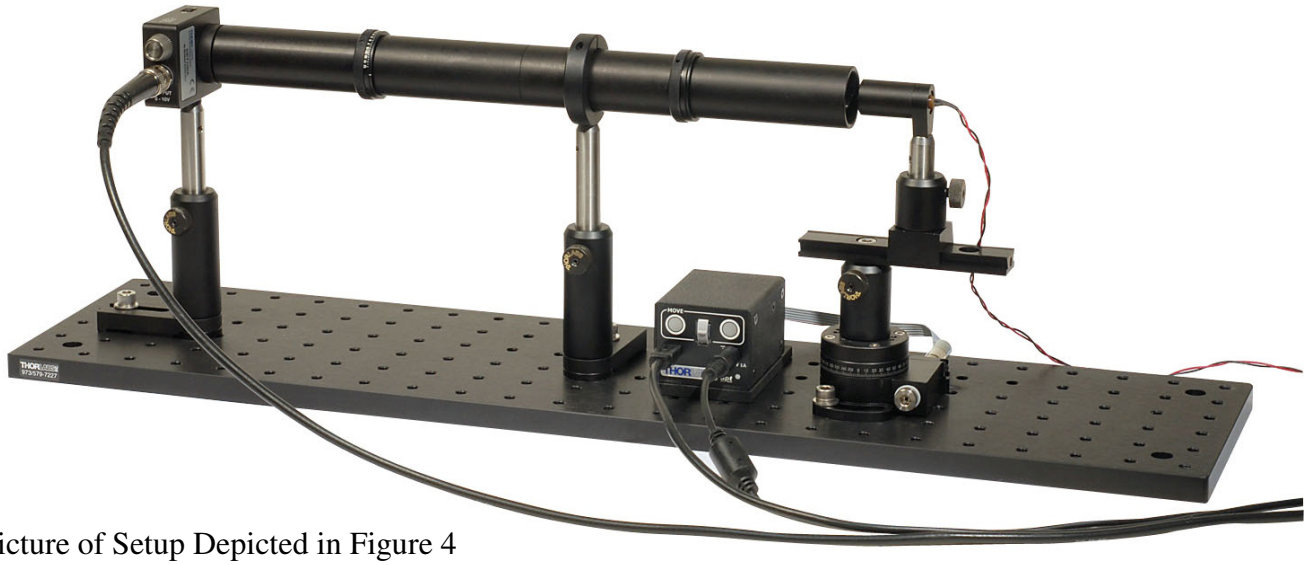


Figure 4: Schematic of the setup used to measure the radial power distribution. The drawing is not to scale.

As the LED rotates, the output of the photodiode detector, which is proportional to the light intensity, is recorded for each angular position using a NI data acquisition card. The LED is rotated from +90° to –90° where 0° approximately corresponds to when the Axis of Maximum Intensity, see figure 5, is parallel to the Detector Axis. The results are displayed in a plot similar to the one shown in figure 6. The half viewing angle specification is determined by the angle that corresponds to a 50% drop in the maximum detector output.



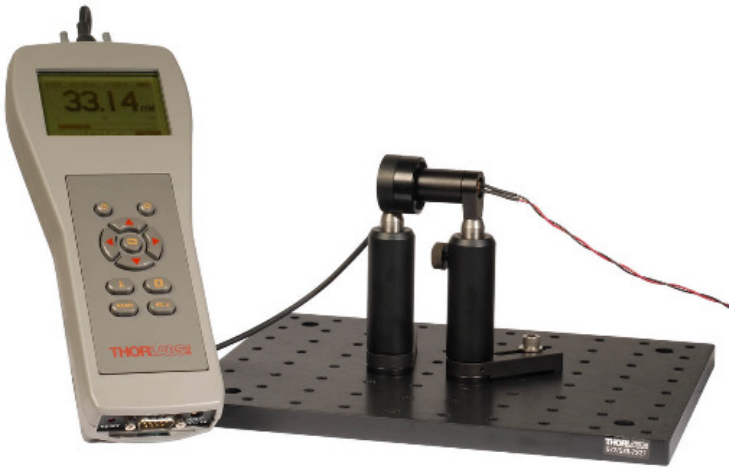
Picture of Setup Depicted in Figure 4

Parts List for Radial Intensity Distribution Measurement

Quantity	Part	Description
1	DET100A or DET10C	Si Photodiode Detector or InGaAs Photodiode Detector
1	CR1-Z6	Motorized Rotational Stage
1	CR1A	CR1 to Post AdapterPlate
1	TDC001	T-Cube Single Channel USB DC Servo Controller/Driver
3	SM1L30	1″ Lens Tube 3″ Long
2	SM1D12C	SM1 Lever Actuated Iris Diaphragm
2	UPH3	Swivel Base Post Holder
1	PH2-ST	Post Holder
1	PH1-ST	Post Holder
2	TR3	∅1/2″ Post 3″ Long
2	TR1	∅1/2″ Post 1″ Long
1	RLA0300	Dovetail Optical Rail 3″ Long
1	RC1	Rail Carrier
1	MB612	Solid Standard Aluminum Breadboard (6″ x 24″)
1	2249-C-36	BNC Coaxial Cable
1	HW-KIT2	1/4-20 Cap Screw Kit
1	LEDMF	LED Holder

3.3. Measurement Technique for Determining the Forward Radiated Optical Power Specification

The total forward radiated power of the LED is measured using a PM120 with a S120B Power Head. See the picture below.



Forward Radiating Power Setup

Parts List for the Forward Radiated Optical Power Measurement

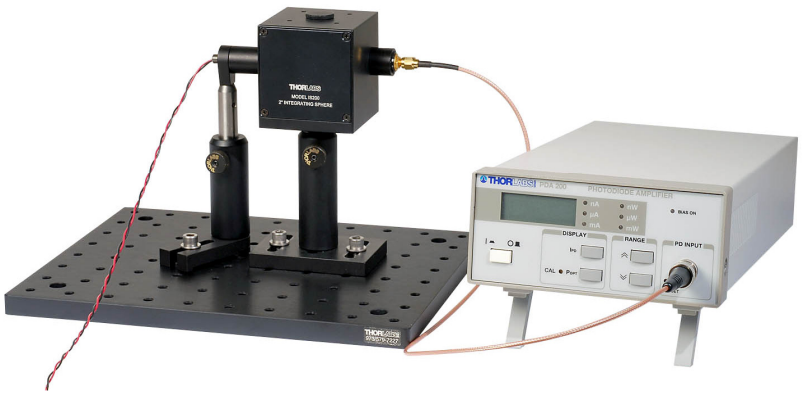
Quantity	Part	Description
1	PM121	Digital Optical Power Meter with S121B optical sensor
2	UPH3	Swivel base post holder 3″ Long
2	TR2	∅1/2″ Post 2″ Long
1	MB810	Solid Standard Aluminum Breadboard (8″ x 10″)
1	HW-KIT2	1/4-20 Cap Screw Kit
1	LEDMF	LED Socket and Holder

*Product in development.

3.4. Measurement Technique for Determining the Total Optical Power Specification

The total optical output power of an LED is measured using an integrating sphere. The radiated light is detected using either a Si or InGaAs integrating sphere, IS236A or IS210C respectively. The sphere is calibrated with a known laser power source such as the Thorlabs CPS180 laser diode module. The output of the integrating

Total Radiated Power Setup



sphere is digitized using our PDA200C benchtop photodiode amplifier.

Part List for the Total Radiated Optical Power Measurement

Quantity	Part	Description
1	IS236A or IS210C	2″ Integrating Sphere with a Si Detector or 2″ Integrating Sphere with a InGaAs Detector
1	PDA200C	Benchtop Photodiode Amplifier
2	UPH3	Swivel Base Post Holder 3″ Long
2	TR2	∅1/2″ Post 2″ Long
1	HW-KIT2	1/4-20 Cap Screw Kit
1	LEDMF	LED Socket and Holder

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