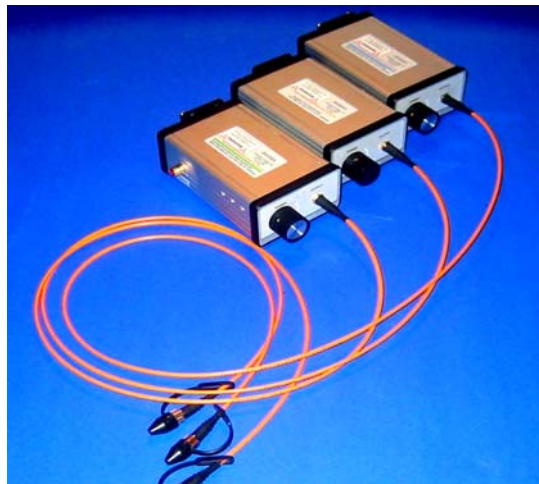


## Compact Fiber Coupled LED Source MODEL QTFS-WHITE-LED

### Instruction Manual



Please read the entire manual prior to use

February 2008



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**QPHOTONICS, L.L.C.**


LASER DIODES: LARGER SELECTION FOR FAST DELIVERY

## 1. Safety Information

The following safety instructions must be observed whenever fiber coupled LED sources are operated, serviced, or repaired. Failure to comply with any of these instructions or with any precaution or warning contained in the Manual is in violation of the standards of design, manufacture and intended use of the instrument. QPhotonics, LLC assumes no liability for the customer's failure to comply with these safety requirements.

### 1.1 Safety Messages

The following messages may appear in the Manual. Please observe all safety instructions that are associated with this message.


<b>WARNING</b>	<b>The procedure can result in serious injury or loss of life if not carried out in proper compliance with all safety instructions. Ensure that all conditions necessary for safe handling and operation are met before proceeding</b>
<b>CAUTION</b>	<b>The procedure can result in serious damage to or destruction of the instrument if not carried out in compliance with all instructions for proper use. Ensure that all conditions necessary for safe handling and operation are met before proceeding</b>
	<b>Refer to the Manual for instructions on handling and operating the instrument safely.</b>



Please contact QPhotonics or your local representative with any questions related to subjects described within this note.

In no case will QPhotonics be liable to the buyer, or to any third parties, for any consequential or indirect damage, which is caused by product failure, malfunction, or any other problem.

### 1.2 Warnings and Cautions

 <b>WARNING</b>
In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.
Connect LED module to 110V/220V AC wall plug socket using original cable.
LED source must be unpacked at ESD protected work station
<b>Never touch fiber connectors with bare hands.</b> Doing so may cause device output

power reduction or damage.
Do not operate equipment that may generate high frequency surge energy near LED source or electronic driver.
Do not disassemble the instrument. The LED modules and driver contains no user serviceable parts.
Avoid soaking the driver module in water or any other liquids. Avoid operating instrument in high humidity environment. Doing so may cause fire, electrical shock, or malfunction.
Do not insert or drop any metal or flammable material into the driver module through any aperture. Doing so may cause fire, electrical shock, or malfunction.
Do not remove any screws or panels. Some parts generate high voltage. Removing screws and panels may cause electrical shock.
If abnormal sound or extra high temperature are observed, turn off the power, disconnect the power cord, and contact QPhotonics or your local representative. Continuing to operate under these conditions may cause fire or electrical shock.
If water or any other liquid is spilled into any LED source, turn off the power switch, disconnect power cords and contact us. Continuing to operate under these conditions may cause fire or electrical shock.
If smoke or strange smells are observed, turn off the power switches, disconnect power cords and contact us. Continuing to operate under these conditions may cause fire or electrical shock.
If source is dropped and damaged, turn off the power switch, disconnect power cords and contact QPhotonics. Continuing to operate under these conditions may cause fire or electrical shock
<b>Do not look into a fiber or optical connectors of the LED source</b> under the microscope during operation. Wearing appropriate protection goggles is recommended. Consult your local safety officer for domestic regulations.



## CAUTION

Do not place LED's module on unstable or inclined surface. There is a possibility that instrument will fall and cause injury.
Disconnect all cords when moving devices. Failure to do so may damage the cords, which may cause fire or electrical shock.

Do not place the cords around any heating instrument. Doing so may damage the cords, which may cause fire or electrical shock.
Do not connect or disconnect cords with wet hands. Doing so may cause fire or electrical shock.
Do not pull electrical cords to disconnect. Doing so may damage the cords, which may cause fire or electrical shock. Hold the plug portion and disconnect the cords.
Do not put heavy items on the cords. Doing so may damage the cords, which may cause fire or electrical shock.
Ensure that the cords are disconnected when storing LED module. Ensure that optical connectors on LED modules are closed with caps when not in use or when storing.
Do not bend optical patch-cord. Doing so might damage patch-cord fiber or results in reduction of optical power.
Store LED's module in a cool dry place.
<b>LED module can be instantly damaged, if user does not follow proper start-up, shut-down, and external modulation sequences. Please refer to section 4.2 of the notes for details.</b>
<b>Use only original FC-PC (or FC/UPC) optical adapter/connector to extend the length of pigtail fibers.</b> <i>Perform optical connections only when device is powered off.</i> Try to avoid unnecessary disconnections if possible. Keep optical connectors protected with provided caps when the LED modules are not in use.

### 1.3 Power Requirement

The LED source requires 110-240V (AC), 50-60 Hz stabilized power, Please, check voltage rating on the module before connecting to the MAINS.

## 2. GENERAL INFORMATION

QTFS-xxx-LED is a compact single channel enhanced output power LED module, designed for various applications demanding medium-power broadband sources (optical spectroscopy, colorimetry, OCT, telecom. machine vision, etc.). Light emitting diodes, operating at different central wavelength can be installed in the unit on request. Model QTFS-xxx-LED is shipped with “xxx” color LED.

Light from LED module is delivered through FC/PC connectorized multi-mode mode plastic fiber output pigtail and can be collimated or focused at different distances using an optional compact fiber collimators.

QTFS-xxx-LED source unit is fitted with an air cooling system and has internal fuse and short circuit protection. Please contact QPhotonics for broad range of optional accessories for QTFS-xxx-LED modules

The monolithic construction of LED source and good driving current stabilization provides excellent short- and long-term *stability* and low sensitivity to *vibrations* of LED source, significantly improving signal-to-noise ratio for optical sensing and spectroscopy measurement systems.

This design has fewer components providing high stability of the LED sources.

### 2.1 Specifications

Description	Min	Typical	Max	Unit
Output optical power	6	12	32	mW
Power consumption	5	18	35	VA
Output	FC/PC pigtail			
Number of outputs		1		
Operating temperature	15	25	35	°C
Storage temperature	0	25	65	°C
Humidity (non-condensing)			85	%R.H
Voltage, AC	105	110	230	V

Dimensions (X/Y/Z),		8x4.7x16		cm
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## 2.2 Components

<b>Part</b>	<b>Part Number</b>	<b>Quantity</b>
LED module with air-cooling	QTFS-xxx-LED	1
FC/PC connectorized patch-cords	LE-1x-01	0
Getting started Notes	LE-1x-02	1
<b>Optional components</b>		
Cable 1 (power cord)	LE-1x-O-C1	1
Connection cable 2	LE-1x-O-C2	1
FC/PC connectorized collimator (adjustable focus)	Model -014	0
Multi-mode POF pigtailed collimator, FC/PC connectorized	Model-011	0
Measurement fiber U-bench mechanical adapter with magnet holder	Model-U2	0
Mechanical post with sliding arm	Model-P1	0
Small mounting mechanical platform (30x30 cm)	Model-P2S	0
Medium mounting mechanical platform (45x45 cm)	Model-P2M	0
Large mounting mechanical platform (120x65 mm)	Model-P2L	0

## 2.3 Recommended Consumables

It is recommended to keep the following items with fiber-coupled LED modules:

- IPA and lint-free tissue
- FC/PC connector's cleaner

### 3 External description and connection to external circuits

#### 3.1 Single channel LED module QTFS-xxx-LED



Front-view

Side-view

Back-view

**LED source** is shipped to end-users assembled as shown in the pictures above. Device consists of the QTFS-xxx-LED module with FC/PC connectorized pigtail. Different types of FC/PC connectorized fibers can be plugged in to an optical output fiber of device. All control electronics, medium-power LED assembly, air cooling system are integrated in a compact unit. Device requires universal external wall plug 12V (or 5V) DC power supply. Front and back panels of the LED module are made using electrically-insulating material. The operation mode of the LED source is controlled using 3 position switch at the back panel and power control knob at the front panel. Electrical connection between the LED source and external DC power supply is performed using connector, marked “12V” (or “5V”) at the back panel of the module.

LED module (QTFS-xxx-LED) controls are:

- Enable/Disable/Remote control LED (“ON/OFF/REG”)
- Connect device to external power supply (“DC 12V” or “DC 5V”)
- Control output optical power (“POWER”)
- Optical fiber pigtail output (“OUTPUT”)

#### QTFS-xxx-LED source front panel

LED power control knob

FC/PC pigtail fiber output



## FS-xxx-LED source back panel

LED operation mode control switch



Air cooling

External power supply socket

### 3.2 Optional modules/components

**Remote control option** used to turn “On-Off” module when LED operation mode control switch is in “REM” position. Positive polarity (3.5-5 V) voltage source of remote control signal must be connected to RCA plug on device body marked with “REMOTE” sign. LED source will be OFF-state, when remote control voltage is zero and in “ON-state, when remote control voltage is 3.5-5V. When device is working in remote control mode, output optical power level is set by the power control knob at the front panel.



**Remote control Input. Central electrode: “+5V”. Outer electrode: “ground”**

**FC/PC connectorized patch-cord** used for extension of the module pigtail length, for optical connections between the LED source module and other optional modules

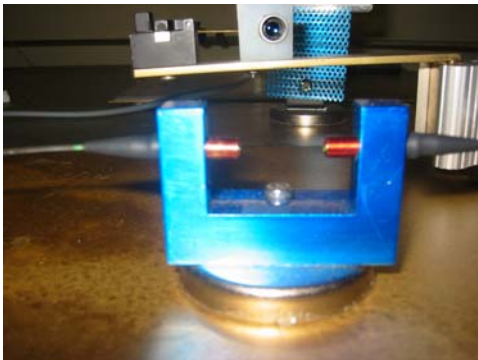
**FC/PC adapter** used for connection between FC/APC connectorized optical cables.



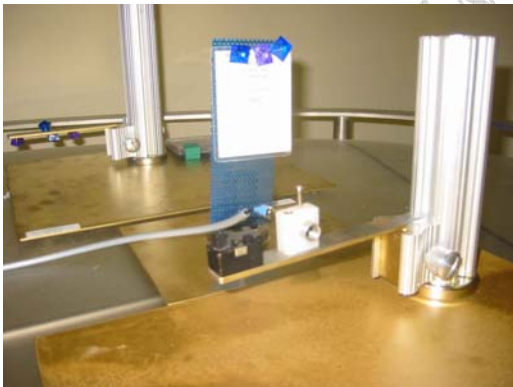
**Miniature snap-on optical fiber collimator** provides collimation or focusing of light emitted from the end of FC/PC connectorized patch-cord/pigtail. Fiber collimator can be directly snapped-on at FC/PC connector.

**Optical fiber collimator or Multi-mode POF pigtailed collimator, FC/PC** connectorized. When plugged into LED output fiber, provides collimation or focusing of light emitted from the end of plastic optical fiber.

**Measurement fiber U-bench** mechanical adapter with magnet holder provides way to perform transmission spectra measurements of different samples positioned between two fiber-collimation pigtailed.



**Set of mechanical platforms and holders (magnetic)** is a cost effective solution for setting up basic optical measurement working place. Includes mechanical base (platforms) of different size, long traveling distance stages, holders



## 4 Inspection/connections

### 4.1 Initial Inspection and Electrical Cords Connections

1. Please inspect the shipping container for any indications of excessive shock to the contents.
- 2. Package must be unpacked on ESD protected workstation.**
3. Inspect the contents of shipping container to ensure that shipment is complete
4. Visually inspect delivered parts of the LED source and all accompanying components and cables for structural damage.

Please inform QPhotonics immediately and, if necessary, the carrier, of any damage to shipped components, defective or missing parts, or if the source does not pass initial visual inspection.

<b>WARNING</b>	<b>To avoid electrical shock, do not initialize or operate the source if there is any sign of damage to any of the components.</b>
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### 4.2 Assembly and operation of the LED source.

**WARNING:** Please unpack delivered device on ESD protected workstation. Use all necessary ESD protection measures, when working with device.

- After unpacking, place components of the source on the flat surface and make sure that ventilation FAN and ventilation holes are not obstructed.
- Release fiber pigtail from the shipping container. Remove protection plastic cups Clean FC/PC connectors, using fiber cleaner. Avoid bending and twisting of the fiber pigtail and patch-cord. Keep output and input fibers fixed (using clear weak adhesive tape).
- Connect QTFS-xxx-LED to provided external 5V (or 12V) power supply and plug power supply cord to the wall-plug socket.
- Put back panel switch to “ON” position. Air-cooling fan on the back of the module will start to rotate. LED will start to operate. Allow LED source temperature to stabilize for up to ~60 seconds. When back panel switch is in “ON” position, light output power from the source can be regulated using front panel “POWER” knob.

To perform initial test of the LED module:

- connect output receptacle using connectorized fiber patch-cord to an OSA or Power Meter

-once device testing is finished, disable source output (put switch in “OFF” position, unplug external power supply from MAINS socket.

Operation in REMOTE CONTROL mode:

- Put back panel switch to “REG” position. Connect external remote control positive polarity voltage source to “REMOTE” input using provided RCA connectorized cable. LED will start to operate when +3 to +5V voltage is applied to “REMOTE” input. Allow LED source temperature to stabilize for up to ~45 seconds. When back panel switch is in “REG” position, light output power from the source can be regulated using front panel “POWER” knob. The level of output power set using “POWER” knob is the same in internal and external (remote) control mode. The repetition rate of the remote control signal can be up to 1-2 kHz.
- DAC computer boards, most of pulse generators, computer-controlled 5 V power supplies and other similar devices, providing 3.5-5V positive polarity voltage (up to 15 mA current) can be used to provide remote control signal.

<b>WARNING</b>	<b>LED source emit sufficient optical power. Do not look into FC/PC receptacle directly or under the microscope. Use protective goggles when source is on. Contact local safety officer for safety regulations</b>
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- LED source is in operation

#### 4.3 Switch Source Off

- Put back panel switch into “OFF” position.
- Wait 10-25 seconds. Allow LED diode chip and cooling system to cool down
- **Disconnect mains cable of external power supply from the wall plug.**

#### 4.4 Troubleshooting

**In case if LED source emit low power or don’t operate:**

- Check electrical connections between LED source, external power supply and wall plug socket.
- Clean the fiber FC/PC connectors.
- Check if “source control switch” is in “ON” or “REG” positions.
- For all other problems contact your local sales representative or QPhotonics directly.

<b>WARNING</b>	<b>To avoid electrical shock, do not attempt open the module.</b>
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## 5 Tips on how to keep source stability and output power high

In general, power emitted by LED diodes is reducing with increase of ambient temperature. Do not operate LED source if ambient temperature is outside device operating range. Here some other tips

1. Use only FC/PC connectors to extend the length of an output laser pigtail. Clean connectors before every connection. Do not bend or twist the output fiber pigtails.
2. Try to reduce number of optical connections. Clean optical connectors, using special cleaning tools before every connection. Keep optical connections plugged into your setup all the time, if possible. Use dust cover to protect optical connector when device or extension patch-cords are not in use.
3. Don't bend the optical fiber. Small diameter (<10 cm) bends might affect output power. Keep fiber pigtail straight and adjust its position in space to achieve maximum output power.
4. Do not touch optical connectors with bare hands.
5. Fix position of the fiber in your setup, when maximum power achieved.
6. Make sure that the air-flow ventilation on the module is not obstructed.

The QTFS-xxx-LED source is designed to sustain significant value of the back-reflected light.

## 6 Maintenance Instructions

### 6.1 Fiber Pigtail/Patch-cord Check.

It is recommended to periodically test the quality of the fiber pigtail and patch cords, using back-reflection meter. The level of back-reflected signal must be in the range of -15-18 dB.

### 6.2 Cleaning Fiber Pigtail (FC/PC)

<b>WARNING</b>	<b>To avoid LED source damage, do not perform cleaning of FC/PC receptacles.</b>
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To clean the optical connectors, please use IPA and fiber connector cleaner. Do NOT use acetone or any other solvents.

### **6.3 Storage**

To maintain optimum operating reliability, do not store the QTFS-xxx-LED source in locations where the temperature falls below 0°C or rises above +60°C. Avoid storing module in environmental conditions that can result in internal condensation. Ensure that these temperature and humidity requirements are also met whenever the source is shipped.

### **6.4 LIMITED WARRANTY**

QPhotonics warrants that the products it manufactures and sells will be free from defects and materials and workmanship for a period of thirty days from the date of shipment. If any such product proves defective during the applicable warranty period, QPhotonics, at its option, either will repair the defective product without charge for parts and labor or will provide a replacement in exchange for the defective product. In order to obtain service under this warranty, the customer must notify QPhotonics of the defect before the expiration of the warranty period and make suitable arrangements for the performance of service. In all cases the customer will be responsible for packaging and shipping the defective product back to the service center specified by QPhotonics, with shipping charges prepaid. QPhotonics shall pay for the return of the product to the customer if the shipment is in the USA, otherwise the customer shall be responsible for all shipping charges, insurance, duties and taxes, if the product is returned to any other location.

This warranty shall not apply to any defect, failure or damage caused by improper use of, or failure to observe, proper operating procedures per the product specification or operator's manual, or improper or inadequate maintenance and care. QPhotonics shall not be obligated to furnish service under this warranty 1) to repair damage resulting from attempts by personnel other than QPhotonics' representatives to repair or service the product; 2) to repair damage resulting from improper use or connection to incompatible equipment; 3) to repair damage resulting from operation outside of the operating or environmental specifications of the product.

**QPHOTONICS' LIABILITY FOR THE MERCHANTABILITY AND USE OF THIS PRODUCT IS EXPRESSLY LIMITED TO ITS WARRANTY SET OUT ABOVE. THIS DISCLAIMER AND LIMITED WARRANTY IS EXPRESSLY IN LIEU OF ANY AND ALL REPRESENTATIONS AND WARRANTIES EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OR MERCHANTABILITY OR OF FITNESS FOR PARTICULAR PURPOSE, WHETHER ARISING FROM STATUTE, COMMON LAW, CUSTOM OR OTHERWISE. THE REMEDY SET FORTH IN THIS DISCLAIMER AND LIMITED WARRANTY SHALL BE THE EXCLUSIVE REMEDIES AVAILABLE TO ANY PERSON. QPHOTONICS SHALL NOT BE LIABLE FOR ANY SPECIAL, DIRECT, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES RESULTING FROM THE USE OF THIS PRODUCT, NOR ANY OTHER LOSSES OR INJURIES, WHETHER A CLAIM FOR SUCH DAMAGES, LOSSES OR INJURIES IS BASED UPON WARRANTY, CONTRACT, NEGLIGENCE, OR OTHERWISE. BY ACCEPTING DELIVERY OF THIS PRODUCT, THE PURCHASER EXPRESSLY WAIVES ALL OTHER SUCH POSSIBLE WARRANTIES, LIABILITIES AND REMEDIES.**

**QPHOTONICS AND PURCHASER EXPRESSLY AGREE THAT THE SALE HEREUNDER IS FOR RESEARCH USE ONLY AND NOT FOR CONSUMER USES AS DEFINED BY THE MAGNUSON-MOSS WARRANTY ACT OR SIMILAR STATE CONSUMER WARRANTY STATUTE.**

## **6.5 Return shipments to QPhotonics, LLC.**

Please contact QPhotonics to obtain return authorization prior to shipping any modules back to us. The owner's name, and address, the model number and serial number of the module, return authorization number, and an itemized statement of defects must be included with the device returned for repair.

Pack the item in original transportation container and suitable protective box to prevent damage to the delicate instrument. Seal the shipping container securely and clearly mark FRAGILE on its surface.

### **Contact information: QPhotonics, LLC**

3830 Packard Road, Suite 280  
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SAMPLE WWW.QPHOTONICS.COM

# QTFS-WHITE-LED DATASHEET

Date: 2.12.2008  
Project: SAMPLE

## Compact Fiber Coupled LED Source

Model QTFS-WHITE-LED  
S/N N/A

(With power control and external analog modulation options)

### Test data

Part Number:	LE-1W-C
Unit Number:	WLE1G076
Package type	OEM
Temperature stabilization	active
Output	~ 1m long Fiber pigtail, 980 um POF, N.A.~0.47; 3 mm jacketed
Connector	FC/PC
Dimensions (X*Y*Z), cm	8x4.7x16
Length of output fiber pigtail, m	~1
Operating wavelength, nm	"white light"
Spectral width, (-15dB), nm	~ 270
Cold start central wavelength shift, nm	<0.8
Long-term (10 hrs) operating wavelength drift, nm	<±0.5
Short term power instability, dB	<0.01
Min/Max output power in "ON" mode, mW*	~3/11
Remote control voltage (RCA-connector) , V**	+ (4 to 5)
Ambient temperature, °C	24
Operating voltage:	5.0V DC

\*Power measured at the output of the module POF fiber pigtail

\*\* Impedance of remote control input is ~ 450 Ohm. Max repetition rate:~ 1.2 kHz (square pulses)

**WARNING:** DEVICE IS PRODUCING SUBSTANTIAL OUTPUT POWER. Do not look into fiber (directly or under microscope) outputs when device is in operation.

**WARNING:** USE ONLY FC/PC CONNECTORIZED OPTICAL PATCH-CORD FOR EXTENSION OF THE MODULE FIBER OUTPUTS. DO NOT PULL OR TWIST OPTICAL FIBER PIGTAILS!

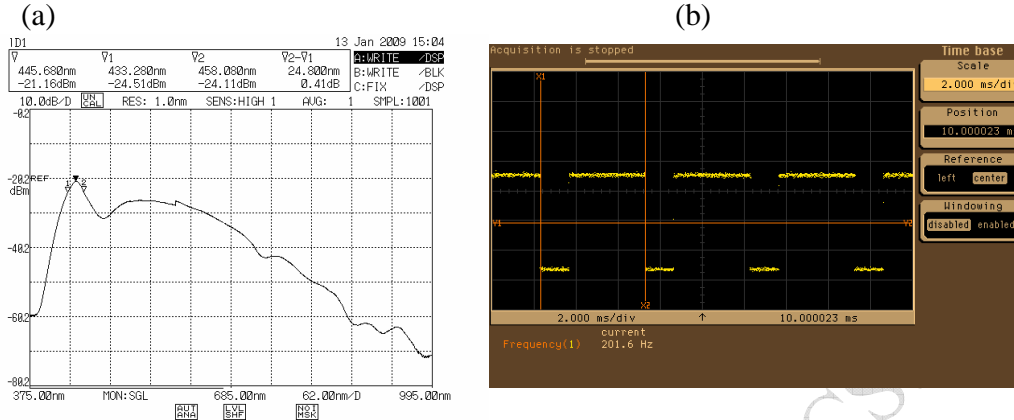
Please clean FC/PC connectorized patch-cord ends before making connections (when applicable). If coiling, keep fiber coil radius larger than 6 cm.

Keep LED output connector clean and covered with dust cap to avoid optical damage.

**STATICS SENSITIVE DEVICE!**

# QTFS-WHITE-LED DATASHEET

## Spectra and « On/Off » remote control

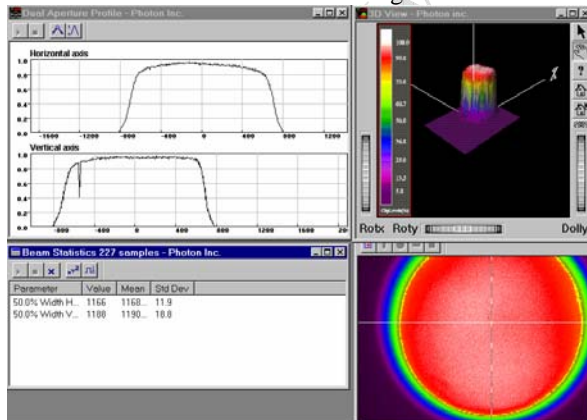


(a) LED source (Model LE-1W-C) spectra (log scale, uncalibrated power), measured through ~1.5 m long POF (FC to FC extension jumper) 980/1000  $\mu$ m core size fiber using an OSA. OSA resolution is 5.0 nm. (b) Optical waveform of LED source (Model LE-1W-C) operating in remote control mode, measured through ~1.5 m long POF 980/1000  $\mu$ m core size extension fiber using an oscilloscope and Si detector. Remote control pulses voltage is ~4V,  $f \sim 220$  Hz.

## Near field profile

Typical Near optical field profile, measured using Model 011S snap-on objective and LE-1W-C broadband source, connected to POF 980/1000 FC/PC-connectorized fiber extension patch-cord.

POF 980/1000 multi-mode fiber. Magnification factor: ~1.2 (distance from objective lens ~ 8 mm)





## QTFS-WHITE-LED DATASHEET

### Customized fiber patch-cord (Optional)

<b>Part Number:</b>	Patch-cord, mm fiber
<b>Unit Number:</b>	N/A
<b>Q-ty</b>	2
<b>Fiber type</b>	POF980/1000 primary-coated /3mm jacketed
<b>Connector</b>	FC/PC
<b>Length of fiber , cm</b>	~100
<b>Test power, dBm</b>	17
<b>Max power , dBm</b>	~27
<b>Return loss* (@630 nm, dB)</b>	~16.8
<b>Insertion loss (ch1/ch2) dB</b>	~1.1/1.2
<b>Max bending radius</b>	15 cm
<b>Test temperature</b>	21C

Measured return loss value includes loss on FC/APC connector/adaptor

#### **Components were tested using following equipment:**

OSA:	AQ-6315A (ANDO)
Oscilloscope:	54750A (Agilent)
Optical power meter:	ML910B (Anritsu)
Temperature measurement	Multiscan 1200 (Omega)
Pulse generator	9100 (LeCroy)
Optical splitter	ODB-1 (WT&T)
Photo receiver:	TIA-500 (TTI)
Objective:	Model-011 (WT&T)
Optical field measurement:	BeamPro (Photon Inc.)
T&M/Quality control:	Operator 2

Note: LED module output power is sensitive to the fiber pigtail handling.

Device has been burn-in tested for ~ 24 hrs.

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