

*User Manual*  
***LaserCam™-HR-UV***  
*Beam Diagnostics Digital CMOS Camera*  
*USB 2.0*





*User Manual*  
*LaserCam-HR-UV*  
*Beam Diagnostics Digital*  
*CMOS Camera*  
*USB 2.0*



27650 SW 95th Ave.  
Wilsonville, OR 97070

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## **Technical Support**

### **In the U.S.:**

Should you experience difficulties with your product, or need technical information, please visit our website: [www.Coherent.com](http://www.Coherent.com). You can obtain additional support by either telephoning our Technical Support Hotline at 1.800.343.4912, or e-mailing our Support Team at [support.instruments@Coherent.com](mailto:support.instruments@Coherent.com). Telephone coverage is available Monday through Friday (except U.S. holidays).

If you call outside our office hours, your call will be taken by our answering system and will be returned when the office reopens.

If there are technical difficulties with your product that cannot be resolved by support mechanisms outlined above, please e-mail or telephone Coherent Technical Support with a description of the problem and the corrective steps attempted. When communicating with our Technical Support Department, via the web or telephone, the model and serial number of the product will be required by the Support Engineer responding to your request.

**Outside the U.S.:**

If you are located outside the U.S., visit our website for technical assistance, or telephone our local Service Representative. Representative phone numbers and addresses can be found on the Coherent website: [www.Coherent.com](http://www.Coherent.com).

Coherent provides web and telephone technical assistance as a service to its customers and assumes no liability thereby for any injury or damage that may occur contemporaneous with such services. These support services do not, under any circumstances, affect the terms of any warranty agreement between Coherent and the buyer. Operating a Coherent product with any of its interlocks defeated is always at the operator's risk.



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## ***Preface***

This manual contains user information for the LaserCam<sup>™</sup>-HR-UV Beam Diagnostics Digital CMOS camera.

## ***RoHS Compliance***

Effective 8/2008, this Coherent product was released as RoHS-compliant. If you purchased your product prior to 8/2008, contact Coherent Technical Support to determine the appropriate part numbers for your product. You can locate the date of manufacturing for your product on the serial number label.

## ***U.S. Export Control Laws Compliance***

It is the policy of Coherent to comply strictly with U.S. export control laws.

Export and re-export of lasers manufactured by Coherent are subject to U.S. Export Administration Regulations, which are administered by the Commerce Department. In addition, shipments of certain components are regulated by the State Department under the International Traffic in Arms Regulations.

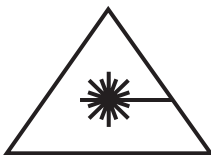
The applicable restrictions vary depending on the specific product involved and its destination. In some cases, U.S. law requires that U.S. Government approval be obtained prior to resale, export or re-export of certain articles. When there is uncertainty about the obligations imposed by U.S. law, clarification should be obtained from Coherent or an appropriate U.S. Government agency.

## ***Publication Updates***

To view information that may have been added or changed since this publication went to print:

1. Connect to [www.Coherent.com](http://www.Coherent.com).
2. Type **LaserCam-HR-UV** in the Site Search box (top left of the screen) and then click the “>>” button.

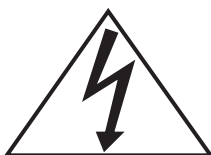
## ***Symbols Used in This Document***



---

**This symbol is intended to alert the operator to the presence of exposure to hazardous visible and invisible laser radiation.**

---



---

**This symbol is intended to alert the operator to the presence of dangerous voltages associated with the product that may be of sufficient magnitude to constitute a risk of electrical shock.**

---



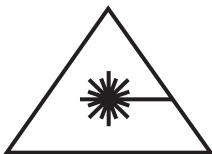
---

**This symbol is intended to alert the operator to the presence of important operating and maintenance instructions.**

---

# SAFETY

Carefully review the following safety information to avoid personal injury and to prevent damage to this instrument or any sensor connected to it. This equipment contains no user-serviceable parts. For service information, refer to “Obtaining Service” on page 28.



---

**The use and measuring of lasers is potentially dangerous. This instrument operates over wavelengths that include non-visible laser emissions.**

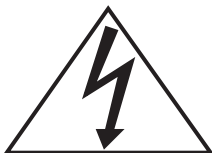
---

Proper laser operating practice in accordance with manufacturer recommendations is vital.

Eyewear and other personal protective equipment must be used in accordance with applicable laws and regulations.

If in doubt of correct operating procedures, consult the laser manufacturer and your laser safety officer.

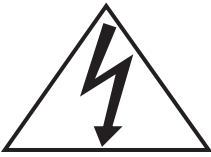
The equipment is not for use in critical medical environments.



---

**Do not operate the camera if its panels are removed or any of the interior circuitry is exposed.**

---



---

**Do not operate the camera in wet or damp conditions, or in an explosive atmosphere.**

---



---

**Operate the camera only within the specified voltage range.**

---



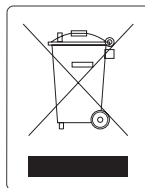
---

**Do not operate the camera if there are suspected failures. Refer damaged equipment to qualified Coherent service personnel.**

---

***Waste  
Electrical and  
Electronic  
Equipment  
(WEEE, 2002)***

The European Waste Electrical and Electronic Equipment (WEEE) Directive (2002/96/EC) is represented by a crossed-out garbage container label. The purpose of this directive is to minimize the disposal of WEEE as unsorted municipal waste and to facilitate its separate collection.



***Figure 1. Waste Electrical and Electronic Equipment Label***

# Declaration of Conformity

D121452

Revision AA

## Declaration of Conformity

We

Coherent, Inc.  
7470 SW Bridgeport Road  
Portland, Oregon, USA 97224

declare under sole responsibility that the

### LaserCam-HR

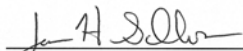
meets the intent of Directive 89/336/EEC for Electromagnetic Compatibility. Compliance was demonstrated per testing to EN61326 Electromagnetic Compatibility Product Family Standard for Measurement, Control and Laboratory Equipment to include the following test specifications as of June 2005:

EN55011 Class A Radiated Emissions

EN61000-4-2 Electrostatic Discharge – Performance Criteria C

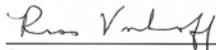
Degradation of performance allowed during and after application of EMC phenomena as long as the operator may get the equipment functional without replacement of damaged parts..

EN61000-4-3 Radiated Immunity – Performance Criteria A

  
\_\_\_\_\_

Director of Engineering

Date: 7/19/05

  
\_\_\_\_\_

Site Manager

Date: 7-19-05



## DESCRIPTION

The LaserCam™ -HR-UV Beam Diagnostics Digital CMOS camera utilizes a laser grade  $\frac{2}{3}$ -inch progressive scan CMOS sensor for detection and analysis of laser beam profiles from 400  $\mu\text{m}$  to 6.0 mm in diameter with 20.0 by 20.0  $\mu\text{m}$  effective spatial resolution over the spectral range of 190 to 355 nm. LaserCam-HR-UV characteristics include excellent signal-to-noise ratio and linear response for accurate beam dimension and uniformity measurements, and high overexposure protection for distortion-less measurements of saturated beam profiles.

Other features include:

- USB 2.0 digital interface
- Compact design minimizes space required in optical train
- Mountable in any orientation for maximum flexibility. Camera markings provide for X, Y, and 38.6° alignments.
- Uses a single interface cable for data and power
- Low Distortion Faceplate (LDFP) that minimizes room light, protects the CMOS array, and provides laser grade quality attenuation with a nominal OD (optical density) of 3.0 at 248 nm.
- High sensitivity and dynamic range
- No lag, geometric distortion, or image burn-in



- Accepts C-mount optics, including all Coherent optical sampling, attenuation, and UV conversion accessories.
- High resolution: 1280 x 1024 active picture elements (pixels)
- Requires only USB 2.0 connections
- CE compliant when used with a CE-compliant computer and cables

***Parts and Accessories List***

Table 1 lists the orderable parts for the LaserCam-HR-UV system.

***Table 1. Parts and Accessories List***

<b>ITEM</b>	<b>PART NUMBER</b>
LaserCam-HR-UV System (RoHS)	1149004
Low Distortion Face Plate (LDFP-UV)	1156843
Trigger In and Pass/Fail Output Cable (RoHS)	1120313
USB Cable, 3.0 meters (RoHS)	1114614
LaserCam-HR-UV Shipping Container	1073686
LaserCam-HR-UV User Manual (this document)	1148417



# GETTING STARTED

This section discusses the following topics:

- Unpacking (this page)
- Installing the software (page 8)
- Cabling (page 14)
- Mounting the camera (page 16)

## *Unpacking*

The LaserCam-HR-UV is a digital CMOS camera, designed for use with a USB 2.0 interface. The camera, trigger cable, and CD-ROM are shipped in a high-density plastic carrying case. This specially-designed case protects all items during shipment.

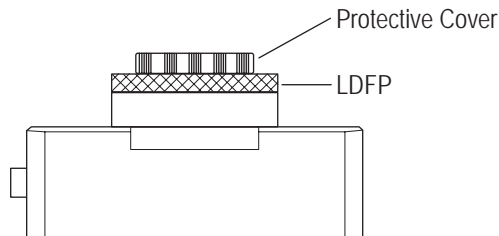
Visually check all cartons for damage before unpacking. If there is no visible external damage, remove all items from the cartons and inspect them for damage. Immediately advise Coherent of any damage. A Returned Material Authorization (RMA) will be issued for any damaged instruments (refer to the last page of this guide for contact information).



---

**When inspecting a LaserCam-HR-UV camera, remove only the protective cover, not the LDFP (Low Distortion Faceplate). See the following figure.**

---



## ***Installing the Software***

This section explains how to install the software on the following operating systems:

- Windows XP™
- Windows Vista™ (32-bit)

---

**Before installing BeamView-USB 4.4.x software, Coherent recommends that previous versions of BeamView-USB 4.3.x software be uninstalled by using the Add or Remove utility in the Windows™ Control Panel.**

---

Software installation procedures are discussed, next.

## Windows XP

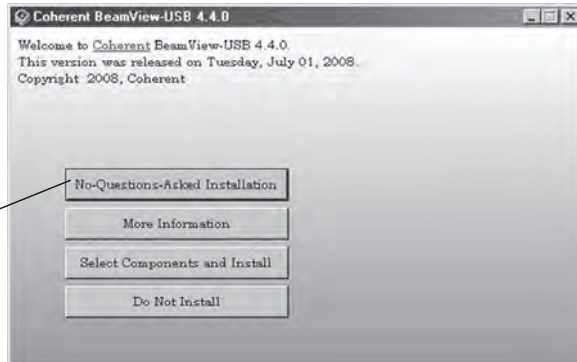


---

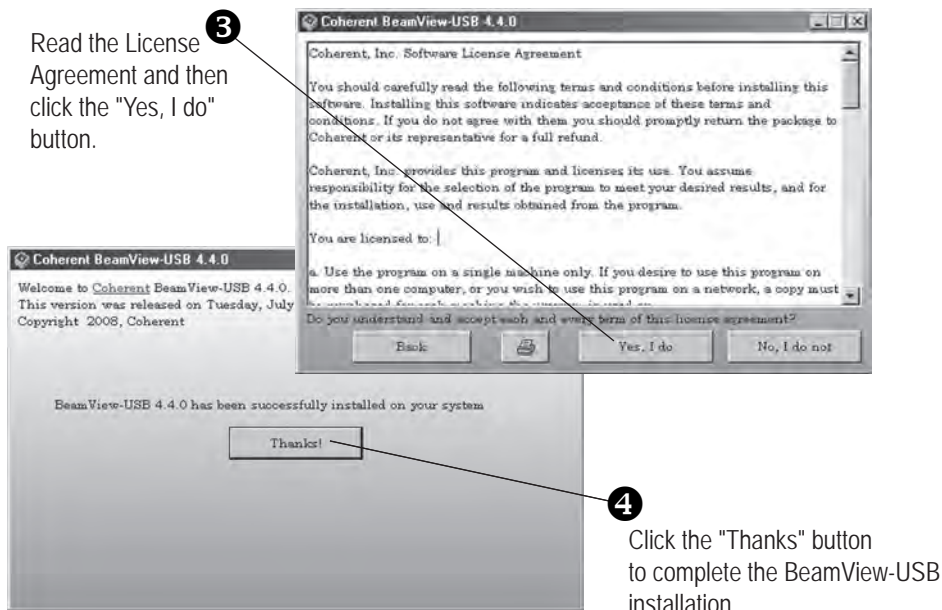
**Do not connect a LaserCam-HR-UV camera to a USB 2.0 PC port at this time. The software must be installed *before* physically connecting a camera to the computer.**

---

- 1** Insert the BeamView-USB CD into your CD-ROM drive. If Autorun is enabled on your system, installation will start automatically; otherwise, select Run from the Start menu and then type `D:\Setup` (substitute the appropriate letter of your CD-ROM drive for *D*).



- 2** Click the "No-Questions-Asked Installation" button.



---

**A shortcut to BeamView-USB will automatically be placed on the desktop. Do not click it at this time. Continue with the installation.**

---



---

**Connect a LaserCam-HR-UV camera to the USB 2.0 PC port before continuing with the installation.**

---

5 Click "Next" when this screen appears.

6 Click "Finish" to complete the LaserCam-HR-UV installation.

*If you are asked to reboot, do so at this time to complete the installation process. If rebooting is not required, installation is now complete.*

---

**For information on getting started with LabVIEW for BeamView-USB 4.4.0, refer to the LV\_BV AppNote.pdf file located on the Installation CD and in the BeamViewUSB folder.**

---

## Windows Vista (32-bit)



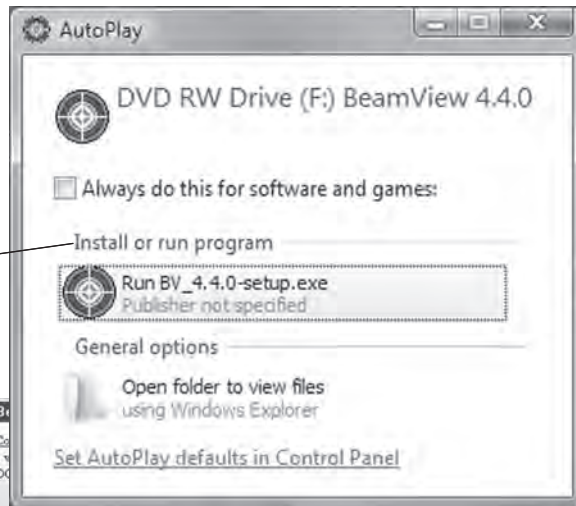
---

**Do not connect a LaserCam-HR-UV camera to a USB 2.0 PC port at this time. The software must be installed *before* physically connecting a camera to the computer.**

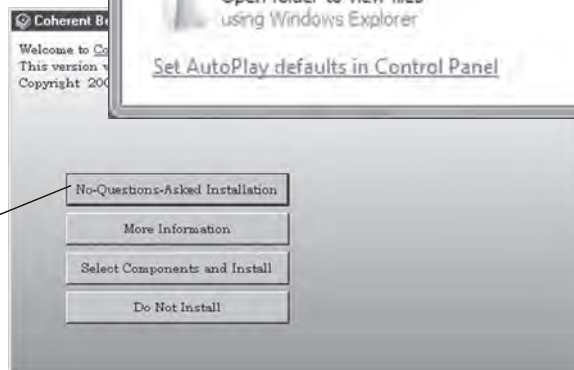
---

- 1** Insert the BeamView-USB CD into your CD-ROM drive. If Autorun is enabled on your system, installation will start automatically; otherwise, select Run from the Start menu and then type `D:\Setup` (substitute the appropriate letter of your CD-ROM drive for `D`).

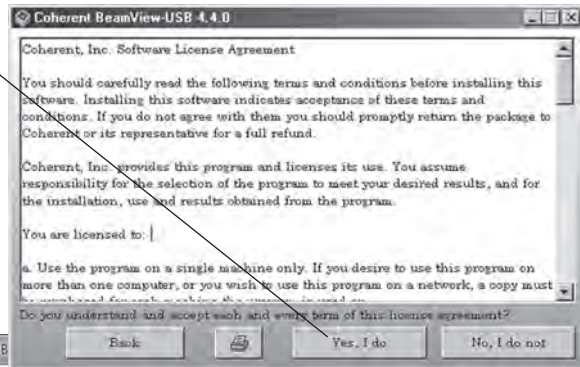
- 2** Click "Install or run program."



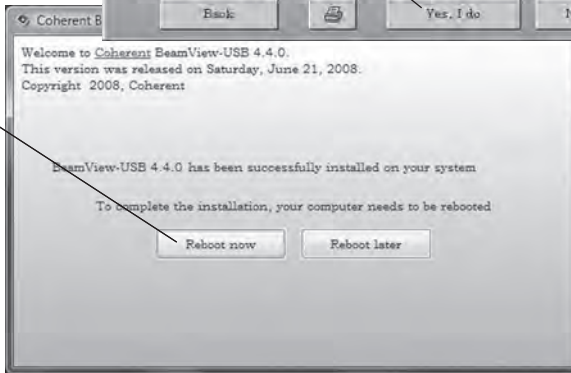
- 3** Click the "No-Questions-Asked Installation" button.



4 Read the License Agreement and then click the "Yes, I do" button.



5 Click the "Reboot now" button to reboot your computer and complete the BeamView-USB installation.



---

**A shortcut to BeamView-USB will automatically be placed on the desktop. Do not click it at this time.**

---

Once the computer has rebooted:

- Connect a LaserCam-HR-UV camera to the USB 2.0 PC port.
- Double-click the BeamView-USB shortcut on the desktop. This action will start the BeamView-USB program and automatically install the camera.

The installation process is now complete.

**For information on getting started with LabVIEW for BeamView-USB 4.4.0, refer to the LV\_BV AppNote.pdf file located on the Installation CD and in the BeamViewUSB folder.**

## ***Cabling***

Two cables are provided with the LaserCam-HR-UV camera: USB, and Trigger Input and Pass/Fail Output. These cables are explained next.

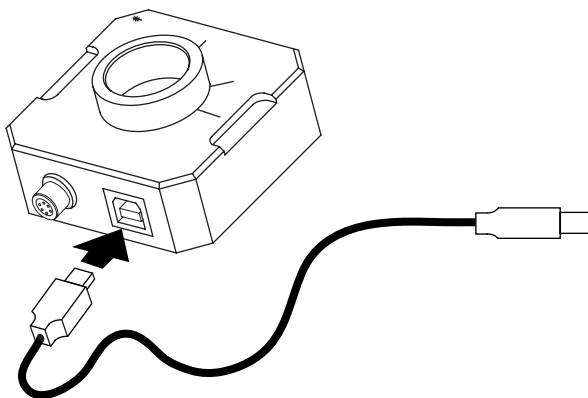
### **USB Cable**

Connect the USB 2.0 cable to the USB 2.0 connector on the LaserCam-HR-UV camera (see Figure 2).

---

**Do not connect the USB cable to the computer until instructed to do so.**

---



***Figure 2. Connecting the USB Cable***

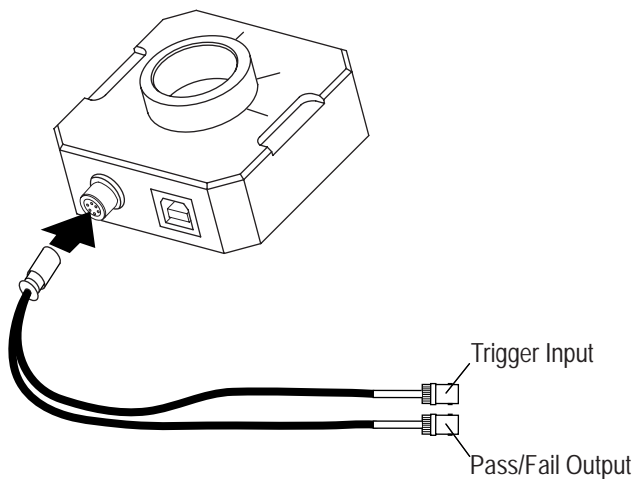


LaserCam-HR-UV produces a standard USB 2.0 digital signal. It will interface through the USB 2.0 connector of any compatible PC using Coherent BeamView Version 4.4.x software.

Connecting the Trigger Input and Pass/Fail Output cable is discussed next.

## Trigger Input and Pass/Fail Output Cable

The Trigger Input and Pass/Fail Output cable shown in Figure 3 provides for asynchronous pulsed laser beam capture or a TTL level Pass/Fail output signal. This cable is not required for CW (continuous) laser analysis or pulsed laser beam capture using BeamView in the auto-trigger mode based on an intensity threshold.



**Figure 3. Connecting the Trigger Input and Pass/Fail Output Cable**

## **Trigger Input**

The Trigger Input cable accepts an external TTL level signal. The external trigger signal can be supplied from an external source, such as a TTL output from a laser source, a pulse generator, or a photo detector.

Trigger In uses the BNC connector labeled “IN” on the LaserCam-HR-UV Trigger and Pass/Fail cable. This 5 VDC, TTL input—available on the rising or falling edge—causes the camera to immediately reset and begin integrating light. The Trigger In delay is 150  $\mu$ S. This is the time it takes for the camera to begin integrating light once the trigger signal occurs.

## **Pass/Fail Output**

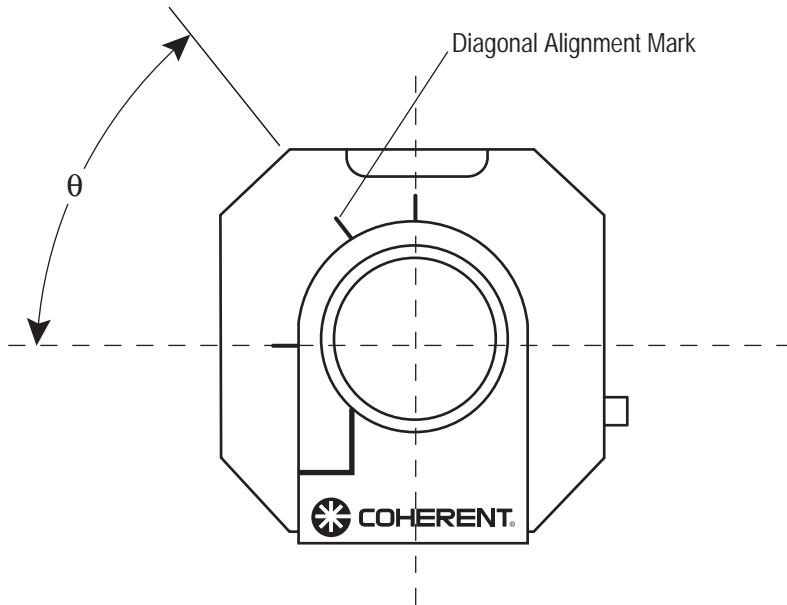
The Pass/Fail cable provides a 5VDC, TTL output that is enabled through the Fault Actions command of the BeamView-USB software.

For more information about the Trigger Input and Pass/Fail Output cable, refer to the BeamView-USB software Help file.

## ***Mounting the Camera***

LaserCam-HR-UV is designed to be mounted in any rotational position (in Figure 4,  $\theta = 0$  to  $360^\circ$ ) with a  $\frac{1}{4}$ -20 threaded mounting post (for mounting post location, see “Physical Dimensions” on page 31). Alignment marks permit the camera to be rotated and aligned with the vertical, horizontal, and diagonal orientation of the sensor. The diagonal alignment mark helps identify the maximum diagonal position of the sensor array. Depending on the mounting orientation of the camera, the diagonal alignment mark will be either  $38^\circ$  or  $52^\circ$  off-axis to account for the rectangular shape of the

sensor. Note that the beam movement on the camera will not match the beam movement on the monitor for all positions.



***Figure 4. Mounting Configurations***



# OPERATION

This section discusses the following topics:

- Pixel spacing (page 20)
- Power on (page 20)
- Warm-up time (page 20)
- Maximum power levels (page 21)
- Saturation (page 21)
- Low Distortion Faceplate (LDFP) (page 21)
- Dust/dirt (page 22)
- Cleaning the sensor (page 23)
- Fringes (page 23)
- How to get the most from your camera system (page 24)

## *Pixel Spacing*

The LaserCam-HR-UV camera incorporates a phosphor coating. The granularity of this thin coating results in an effective pixel size of 20.0 x 20.0  $\mu\text{m}$ . In comparison, the CMOS array without the UV coating has a 6.7 x 6.7  $\mu\text{m}$  pixel pitch.

Effective pixel spacing values for the LaserCam-HR-UV are shown in the following table.

*Table 2. LaserCam-HR-UV Effective Pixel Spacing*

<b><math>\frac{2}{3}</math>-INCH FORMAT</b>		
	<b>EFFECTIVE PIXEL SPACING</b>	
	<b>Horizontal</b>	<b>Vertical</b>
LaserCam-HR-UV	20.0 $\mu\text{m}$	20.0 $\mu\text{m}$

## *Power On*

LaserCam-HR-UV has no ON/OFF switch. As soon as power is applied to the camera via the USB 2.0 connection, it begins operating.

## *Warm-Up Time*

The LaserCam-HR-UV does not require warm-up. However, if it is used to make high-accuracy measurements, it should be allowed to warm-up at least 30 minutes to insure best baseline (background) stability.

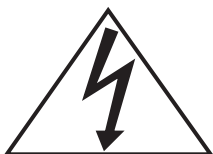
---

**For best results, the background map should be taken after the camera warm-up period.**

---

## Maximum Power Levels

The camera will saturate at approximately  $90.0 \mu\text{W}/\text{cm}^2$  at 248 nm wavelength at CW without the Low Distortion Face Plate (LDFP), or  $5.0 \mu\text{J}/\text{cm}^2$  pulsed 248 nm wavelength without the LDFP.




---

**Damage may occur at power levels that exceed 10,000 times saturation power density.**

---

## Saturation

*Table 3. Saturation*

WAVELENGTH	ON ARRAY	ON LDFP
248 nm (CW)	$90 \mu\text{W}/\text{cm}^2$	$90 \text{ mW}/\text{cm}^2$
248 nm (Pulse)	$5.0 \mu\text{J}/\text{cm}^2$	$5.0 \text{ mJ}/\text{cm}^2$

## Low Distortion Faceplate (LDFP)

The Low Distortion Faceplate provides a protective window for the camera array that also acts as a background attenuator. The LDFP is made of laser grade filter glass that minimizes interference fringes (refer to “Fringes” on page 23) and does not distort the beam image. The LDFP limits room light, instrumentation lights, and flash lamp light from reaching the camera sensor. These lights cause a background level that may not be effectively subtracted by the Background Subtraction Wizard.



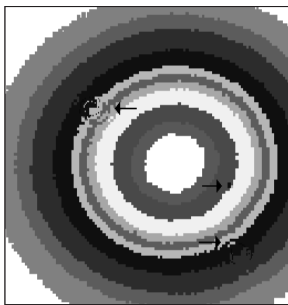
---

**The LDFP has a fragile coating. Cleaning the LDFP filter glass with anything other than clean air at low pressure may damage the glass.**

---

## *Dust/Dirt*

If low intensity spots or small circles are noticed in the camera video then dust may be present on the CMOS sensor or on the Low Distortion Faceplate (see Figure 5). Dust on the LDFP filter glass can cause distortion in the form of small circular diffraction rings, or can cause low-intensity spots if present on the sensor array. Observe the defects with a flashlight or a small light illuminating the camera. If the defect moves when the illumination angle is changed, then the dust is on the LDFP. Otherwise it is dust on the sensor array. Use clean air at low pressure to clean the LDFP filter glass. Take all necessary precautions to insure that nothing comes in contact with the sensor surface.



*Figure 5. Dust on Filter Glass*



## ***Cleaning the Sensor***

Avoid unnecessary exposure of the sensor to dust and dirt. If the surface of the sensor has to be cleaned, *never* use any kind of cloth, tissue, or brush, and strictly avoid the use of any kind of cleaning fluid. Only use clean, dry, micro-filtered low-pressure air to gently blow away particles from the surface of the sensor. Contact Coherent Customer Service if the sensor requires additional cleaning (refer to “Coherent Service Centers” on page 29 for contact information).



---

**Touching the sensor will cause irreversible damage.**

---



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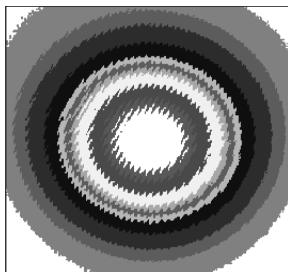
**Always cover the sensor with a dust cap when not in use.**

---

## ***Fringes***

If the LDFP filter glass is installed in the camera, fringes may appear in the video (see Figure 6). The fringe pattern is due to a second reflection off the sensor and LDFP superimposing back onto the original beam image. This situation can be corrected by loosening the C-mount

setscrew and rotating the LDFP housing until the fringes are no longer present. Slightly turning the camera with respect to the laser beam may also reduce this effect.



**Figure 6. Fringes**

## ***How to Get the Most From Your Camera System***

The LaserCam-HR-UV has been carefully designed to provide accurate measurements of the spatial and intensity characteristics of laser beams. Significant attention has been paid to every aspect of the instrument that impacts data accuracy. The following items will help you obtain the best performance from your LaserCam-HR-UV:

- System tray—Turn off everything that is non-essential to the running of the computer. This action will help assure the fastest frame update rate possible.
- Resolution—Select 640 x 512 x 8 resolution to obtain the highest update rates.
- RAM—A minimum of 512 MB is required. 1 GB is recommended. More is typically better.

- Select RAM for the buffer to obtain the highest update rates.
- Processor speed—A minimum of 2.1 GHz is recommended. Faster clock speeds provide higher frame update rates. Again, “the faster the better.”
- Keep all optics clean—Dirty LDFP, beam sampling, and attenuation optics will distort the beam under test. It is important that you regularly check these optical surfaces for dust, fingerprints, and other contamination. Follow standard coated optical surfaces cleaning techniques. Use the Inclusion command to reduce the size and amount of data that is processed.
- The Inclusion command provides control of the sensor area where calculations are performed. Reducing this area can significantly increase frame update rates and is especially effective with small spot sizes.



---

**Cleaning the sensor surface will void the warranty and most likely will damage the camera.**

---

It is strongly recommended that the LDFP always be left in place and that the dust cap be used to protect the LDFP when the instrument is not in use.

- Read the user documentation—The LaserCam-HR-UV is a complex piece of optical test equipment. Many functions are included in the system that may not be obvious to a casual or first-time user. Review the *LaserCam-HR-UV User*

*Manual* (this manual) and the BeamView-USB Help (accessed by clicking the Help button in the BeamView software) to learn about these useful functions. Many calculations and functions that may at first appear to require post-processing or exporting of the data to another application are included in the instrument. The user documentation is designed to explain all of the functions in an easy-to-use format.



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**Observe standard Laser Safety procedures—The eyes you save may be your own.**

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# WARRANTY

This section includes information on the following topics:

- Limited warranty (this page)
- Warranty limitations (page 28)
- Obtaining service (page 28)
- Product shipping instructions (page 30)

## *Limited Warranty*

Coherent, Inc. (the “Company”) warrants its laser beam diagnostic products (“Products”) to the original purchaser (the “Customer”) that the product is free from defects in materials and workmanship and complies with all specifications, active at the time of purchase, for a period of twelve (12) months.

If the Product fails and is returned to the Company within one year following the date of purchase, the Company will, at its option, repair or replace the Product or any component found to be defective. This warranty applies only to the original purchaser and is not transferable.

Coherent, Inc. will, at its option, repair or replace any product or component found to be defective during the warranty period. This warranty applies only to the original purchaser and is not transferable.

## ***Warranty Limitations***

The foregoing warranties shall not apply, and Coherent reserves the right to refuse warranty service, should malfunction or failure result from:

- Damage caused by improper installation, handling, or use.
- Laser damage (including sensor elements damaged beyond repair).
- Failure to follow recommended maintenance procedures.
- Unauthorized product modification or repair.
- Operation outside the environmental specifications of the product.

Coherent assumes no liability for Customer-supplied material returned with Products for warranty service or recalibration.

**THIS WARRANTY IS EXCLUSIVE IN LIEU OF ALL OTHER WARRANTIES WHETHER WRITTEN, ORAL, OR IMPLIED. COHERENT SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL THE COMPANY BE LIABLE FOR ANY INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES IN CONNECTION WITH ITS PRODUCTS.**

## ***Obtaining Service***

In order to obtain service under this warranty, Customer must notify the Company of the defect before the expiration of the warranty period and make suitable arrangements for the performance of service. The Company

shall, in its sole discretion, determine whether to perform warranty service at the Customer's facility, at the Company's facility or at an authorized repair station.

If Customer is directed by the Company to ship the product to the Company or a repair station, Customer shall package the product (to protect from damage during shipping) and ship it to the address specified by the Company, shipping prepaid. The Company shall pay the cost of shipping the Product back to the Customer in conjunction with product failures within the first twelve months of time of sale.

A Returned Material Authorization number (RMA) assigned by the Company must be included on the outside of all shipping packages and containers. Items returned without an RMA number are subject to return to the sender.

For the latest Customer Service information, refer to our website: [www.Coherent.com](http://www.Coherent.com).

Detailed instructions on how to prepare a product for shipping are shown under “Product Shipping Instructions” on page 30.

**Table 4. Coherent Service Centers**

<b>LOCATION</b>	<b>PHONE</b>	<b>FAX</b>	<b>E-MAIL</b>
USA	1.800.343.4912	503.454.5777	info_service@Coherent.com
Europe	+49-6071-968-0	+49-6071-968-499	info_service@Coherent.com
International	503.454.5700	503.454.5777	info_service@Coherent.com

## ***Product Shipping Instructions***

To prepare the product for shipping to Coherent:

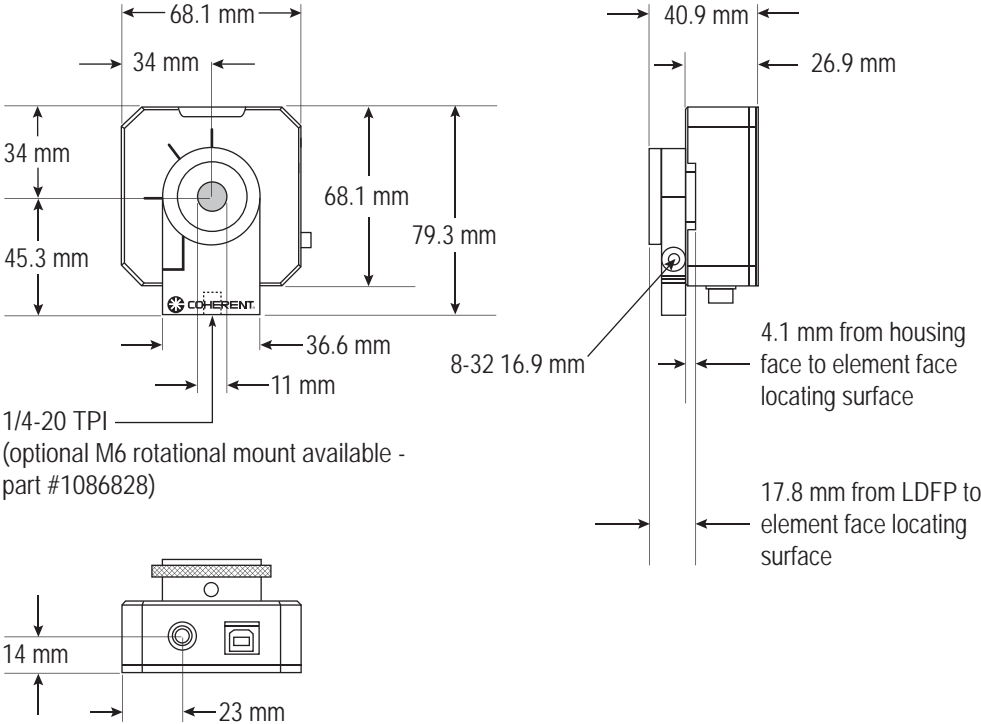
1. Contact Coherent Customer Service (refer to Table 4 on page 29) for a Return Material Authorization number.
2. Attach a tag to the product that includes the name and address of the owner, the person to contact, the serial number, and the RMA number you received from Coherent Customer Service.
3. Wrap the product with polyethylene sheeting or equivalent material.
4. If the original packing material and carton are not available, obtain a corrugated cardboard shipping carton with inside dimensions that are at least 6 in. (15 cm) taller, wider, and deeper than the product. The shipping carton must be constructed of cardboard with a minimum of 375 lb. (170 kg) test strength. Cushion the instrument in the shipping carton with packing material or urethane foam on all sides between the carton and the product. Allow 3 in. (7.5 cm) on all sides, top, and bottom.
5. Seal the shipping carton with shipping tape or an industrial stapler.
6. Ship the product to:  
Coherent, Inc.  
27650 SW 95th Ave.  
Wilsonville, OR 97070  
Attn: RMA # (*add the RMA number you received from Coherent Customer Service*)



# APPENDIX A: SPECIFICATIONS

Table 5 lists specifications for the LaserCam-HR-UV camera.

**Table 5. Specifications (Sheet 1 of 3)**

PARAMETER	DESCRIPTION
<b>GENERAL</b>	
<p>Physical Dimensions</p>  <p>The technical drawings include:</p> <ul style="list-style-type: none"> <li><b>Front View:</b> Shows a square housing with a central lens. Dimensions include a total width of 68.1 mm, a lens diameter of 34 mm, a mounting hole diameter of 45.3 mm, and a total height of 79.3 mm. A COHERENT logo is visible at the bottom.</li> <li><b>Side View:</b> Shows the camera's profile. Dimensions include a total width of 40.9 mm, a mounting hole diameter of 26.9 mm, and a distance of 4.1 mm from the housing face to the element face locating surface. A screw is shown with a specification of 8-32 16.9 mm. A distance of 17.8 mm is shown from the LDFP to the element face locating surface.</li> <li><b>Top View:</b> Shows the camera from above. Dimensions include a width of 23 mm and a height of 14 mm.</li> </ul> <p>1/4-20 TPI (optional M6 rotational mount available - part #1086828)</p>	

**Table 5. Specifications (Sheet 2 of 3)**

<b>PARAMETER</b>	<b>DESCRIPTION</b>
Spectral Range	$^{2}/_{3}$ -inch: 190 to 355 nm
Camera Type	Progressive scanning CMOS
Video Format	10-bit digital USB 2.0 hi-speed
Sensor Active Area	8.5 mm (H) x 6.8 mm (V) ( $^{2}/_{3}$ -inch format)
Sensor Elements	1280 (H) x 1024 (V)
Effective Element Spacing	6.7 $\mu$ m (H) x 6.7 $\mu$ m (V)
Spatial Resolution	20 $\mu$ m (H) x 20 $\mu$ m (V)
Recommended Beam Diam.	0.4 mm min, 6.0 mm max. ( $1/e^2$ )
Optical Dynamic Range	> 650 to 1
Dimensional Accuracy	$\pm 1\%$ (typical), $\pm 5\%$ (over entire spectral and dimensional range)
Pulse Trigger In	TTL, rising or falling edge
Pulse Integration Timing	Integration begins 150 $\mu$ s after rising edge of Trigger In
Automatic Pulse Trigger	0 to 100% of camera peak response (user adjustable)
Max. Sample Rate	25 Hz (Live mode), 15 Hz (Run mode)
Noise, Peak	0.1 $\mu$ W/cm <sup>2</sup> (at 248 nm)
CW Saturation	90 mW/cm <sup>2</sup> (at 248 nm) (with LDFP)
	90 $\mu$ W/cm <sup>2</sup> (at 248 nm) (without LDFP)
Pulsed Saturation	5 mJ/cm <sup>2</sup> (at 248 nm) (with LDFP)
	5 $\mu$ J/cm <sup>2</sup> (at 248 nm) (without LDFP)
Damage Threshold	200 $\mu$ J/cm <sup>2</sup> (at 248 nm) (without LDFP)
Distance to Image Plane	17.5 $\pm$ 0.5 mm (from front of LDFP)
Weight	208 g (235 g with cable)

**Table 5. Specifications (Sheet 3 of 3)**

<b>PARAMETER</b>	<b>DESCRIPTION</b>
Lens Mount	C-mount
Threaded Mounting Post	<sup>1</sup> / <sub>4</sub> -20 rotational camera mount *Optional M6 rotational camera mount available (part #1086828)
I/O Connector	USB 2.0 Type B
<b>ELECTRICAL</b>	
Signal-to-Noise Ratio	> 60 dB (gain 0 dB, gamma 1.0)
Power	Powered through USB 2.0 interface
Video Output	Digital: USB 2.0
Black Level	Self-adjusting
Exposure Time	Factory adjusted to 10 ms, user adjustable
Synchronization	Internal free-running (crystal)
Gamma	1.0
Gain	No automatic gain control. Gain is factory set for optimum linear dynamic range.
<b>ENVIRONMENTAL</b>	
Operating Temperature	5 to 60°C
Relative Humidity	To 95% non-condensing





*LaserCam™-HR-UV User Manual*

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