## **BEAM PROFILING** Overview of the different models



## **BEAM PROFILING CAMERAS**

Profiling a laser beam is a convenient complement to the measurement of its power or energy because it provides very useful additional information, like spatial energy or intensity distribution, beam widths, centroid, ellipticity and orientation, that may help you determine if your laser-based systems are operating optimally.

The Beamage is the most cost-effective USB3.0 Beam Profiling Camera on the market. It is available for UV to IR wavelengths and in 2 sizes. It comes with an intuitive and complete software that features an array of useful tools and functions. Its calculations are ISO compliant.

## MAIN SPECIFICATIONS

	BEAMAGE-4M	BEAMAGE-4M-IR	BEAMAGE-4M-FOCUS
Wavelength range			
Camera only	350 - 1150 nm	1495 - 1595 nm	350 - 1150 nm
With UG11-UV filter	250 - 370 nm		
With B3-IR-Filter	1250 - 1350 nm		
Pixel count	4.2 MPixels	4.2 MPixels	4.2 MPixels
HxV	2048 x 2048	2048 x 2048	2048 x 2048
Sensor size	11.3 x 11.3 mm	11.3 x 11.3 mm	20.5 x 20.5 mm



## **BEAM QUALITY MEASUREMENT**

The performance of a laser in practical applications is critical in the design of optical systems and focusing applications, and it can be quantified by measuring M2, the laser beam quality factor, which indicates how close a laser is to being an ideal Gaussian beam.

The Beamage-M2 acquires a sequence of beam profile measurements to automatically perform beam quality measurements within a few seconds. It is equipped with the largest optics on the market for easy alignment and fast measurements that you can trust. Its software is both intuitive and ISO compliant.





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## IF YOUR LASER SPECIFICATIONS EXCEED THE LIMITS IN TERMS OF

- > WAVELENGTH
- > BEAM SIZE
- > LASER POWER

YOU CAN MANAGE THEM WITH THE ACCESSORIES PRESENTED BELOW

## MANAGE THE WAVELENGTH

Since CMOS sensors are not sensitive to every frequency of the electromagnetic spectrum, we offer several wavelength management solutions to enhance the capabilities of the Beamage beam profiling cameras.



## MANAGE THE BEAM SIZE

A simple solution is offered to those who need to profile beams that are larger than the CMOS sensor (> 11.3 mm x 11.3 mm). This solution is a beam reducing optical component called camera lens. It works either by indirectly imaging the transmission of the beam after it has passed through a diffusing element or by directly imaging the beam that is incident on a Gentec-EO detector or beam dump.



## MANAGE THE LASER POWER

CMOS sensors have low saturation levels as well as low damage thresholds. It is thus very important that you control your laser power to get the best measurement possible and avoid damaging the Beamage camera.

- For laser power under 1 W, you can attenuate the beam with ND filters
- For laser power up to 1000 W, you can sample a small fraction of the beam with a BA optical sampler



POWER DETECTORS









### INTUITIVE SOFTWARE INTERFACE

Easy to navigate interface, with many displays and control features:

- 2D, 3D and XY Displays
- Background Subtraction Function
- Unique "Animate" Function
- Gaussian Fit
- Semi-Log Graph

### **KEY FEATURES**

- > USB 3.0 FOR THE FASTEST TRANSFER RATES Up to 10X faster than regular USB 2.0 connections
- > HIGH RESOLUTION 4.2 Mpixels resolution gives accurate profile measurements of very small beams
- > LARGE APERTURES
  - 11.3 x 11.3 mm for the Beamage-4M
  - 20.5 x 20.5 mm for the Beamage-4M-FOCUS
- > AVAILABLE WITH IR COATING Beamage 4M-IR cameras have a special phosphor coating for IR wavelengths (1495-1595 nm)
- > ISO COMPLIANT D4odefinition of diameter, centroid, ellipticity and orientation are ISO 11146:2004 and 11146:2005 compliant
- > EXTERNAL TRIGGER To synchronize the camera with a pulsed laser

### ACCESSORIES





BA series optical attenuators





UV and IR filters

Pelican carrying case



UV converters &



USB-A to USB-C adaptor



Stackable ND filters (0.5, 1.0, 2.0, 3.0, 4.0 & 5.0)



Fiber adaptors & connectors (FC, ST and SMA)



IR adaptors





USB \$



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	5.0 4M 0	3.0 	
	gentec-(+)	gentec-co	
	BEAMAGE-4M	BEAMAGE-4M-IR	BEAMAGE-4M-FOCUS
SENSOR TECHNOLOGY	CMOS	CMOS (with phosphor coating)	CMOS (with fiber optic taper)
EFFECTIVE APERTURE	11.3 x11.3 mm	11.3 x 11.3 mm	20.5 X 20.5 mm ª
MEASUREMENT CAPABILITY			
Wavelength range			
Camera only	350 - 1150 nm	1495 - 1595 nm	350 - 1150 nm
With UG11-UV filter	250 - 370 nm		
With B3-IR-filter	1250 - 1350 nm		
Pixel count	4.2 MPixels	4.2 MPixels	4.2 MPixels
HxV	2048 x 2048	2048 x 2048	2048 x 2048
Minimum measurable beam	55 µm	70 µm	120 µm
RMS noise	1000:1 (60 dB)	1000:1 (60 dB)	1000:1 (60 dB)
DAMAGE THRESHOLDS			
Maximum average power	1 W with ND filter	1 W with ND filter	1 W with ND filter
Maximum density (1064 nm)	10 W/cm <sup>2</sup> 0.1 J/cm <sup>2</sup>	10 W/cm <sup>2</sup> 0.1 J/cm <sup>2</sup>	10 W/cm² 0.1 J/cm²
SOETWADE			
Displays		2D. 3D. XY and Beam Tracking	
Display Features		2D: Print Screen, Reset View, Show/Hide Bean	n Diameter
	3D: Print Screen, Reset View, Top View XY: Save Data, Zoom, Gaussian Fit, Semi-Log, Show/Hide Cursor, Show/Hide FWHM, Show/Hide 1/e <sup>2</sup>		
		Beam Tracking: Save Data, Print Screen, Reset	View, Zoom
Beam Diameter Definitions		$D4\sigma$ (ISO compliant),	
		FWHM along crosshairs (50%)	
	Custom (%)		
Buffer Controls	Open File, Save Current Data, Save All Data, Previous/Next Image, Clear Buffer, Animate		
Printing and Reports		Full Report in Print Ready Format (2D, 3D, XY, Measu Print Screen in BMP format (2D and 3	ures, Parameters) D)
PHYSICAL CHARACTERISTICS			
Sensor size	11.3 x 11.3 mm	11.3 x 11.3 mm	11.3 x 11.3 mm
Sensor area	1.28 cm <sup>2</sup>	1.28 cm <sup>2</sup>	1.28 cm <sup>2</sup>
Effective aperture	Same as sensor	Same as sensor	20.5 x 20.5 mm
Dimensions (not including filter)	61H x 81.1W x 19.7D mm	61H x 81.1W x 19.7D mm	61H x 81.1W x 46.5D mm
Weight (head only)	138 g	138 g	235 g
ORDERING INFORMATION			
Compatible stand	STAND-D-233	STAND-D-233	STAND-D-233
Product page			
	1512-0.0051-0.00		1-1 1.16666

USB USB







## MAIN CONTROLS

The upper part of the software includes all the main controls in a ribbon format. These controls are grouped by family: Capture Controls, File Controls, Buffer Controls, M2 Controls and Data Computations. The last includes very useful filters and a normalization function.

## DISPLAYS

3

The left-hand side of the software is the display panel. Four displays are available: 3D, 2D, XY (cross-sectional graphs along the crosshairs) and Beam Tracking. The desired display is selected by clicking on the corresponding icon at the bottom of the panel. Print screen controls are available for the 3D, 2D and Beam Tracking displays. They allow the user to save an image of the current view in BMP format.

## HOME AND SETUP TABS

The right-hand side of the software contains the Home, Setup and Data Acquisition tabs. The Home tab allows the user to select the main controls for his measurements (Beam Diameter Definition, Crosshair Center and Orientation) and displays the resulting measurements below. The Setup tab allows the user to set the measurement parameters (Exposure Time, Image Orientation and Averaging, Active Area, etc.) and the Data Acquisition tab allows the user to save measurements with or without full images, to enter the Sampling Rates and a Total Duration for the Acquisition. More tabs with advanced controls are available when clicking on the Show/Hide Options button in the Computations panel.





## **3D DISPLAY**

The 3D display shows the actual shape of the beam. It is possible to easily zoom, pan and rotate the image. The Reset button puts the data back in its original configuration. This display also features a Print Screen button to save the latest image in BMP format.



format.

Select

**2D DISPLAY** 



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The 2D display features the crosshairs (set to the major and minor axis or along a specific angle) and the measured diameters of the beam. These diameters vary with the chosen definition (4-sigma, FWHM, 1/e2, etc.) and the display can be turned ON or OFF. The Print Screen button allows to save a picture of the current screen in BMP

 $\bigcirc$ 

Toggle to

grayscale

0



Crosshairs



## XY DISPLAY

Active Area

The XY display plots cross-sectional graphs of the beam along the crosshairs. This display features many useful tools like zoom, cursor, and FWHM and 1/e2 level bars. It is also possible to display the graphs in semi-log format to enhance the details in the low intensity parts of the beam.

**Reset View** 

Show/Hide

Diameter

0



## **BEAM TRACKING DISPLAY**

-0-

Screen

The Beam Tracking Display allows the user to visualize the variation of the beam's centroid position on the sensor. This display shows the latest calculated position as well as the previous ones, until the user resets the view. The display also shows the mean position of all computed values and gives information regarding position stability for both X and Y axes. This tool is great to monitor the beam pointing stability over time.





# BEAMAGE-M2 Automated M<sup>2</sup> measurement system



### **AUTOMATED MEASUREMENTS**



Inside the BEAMAGE-M2, a computer-controlled motorized rail allows precise positioning of two mirrors, which in turn allow a 400 mm beam path difference. At each position of the translation stage, a beam profile is acquired and the beam diameter is measured. The automation of the translation stage allowed by the software is the key to a fast measurement.

### **KEY FEATURES**

- LARCE APERTURES The only M<sup>2</sup> system on the market equipped with a complete set of 50mm (2") optics. Also, the sensor is 11.3 x 11.3mm
- SIMPLE ALIGNMENT Two beam-steering mirrors are included for quick and easy alignment of your laser into the system.
- > COMPACT

The low-profile ingenious mechanics make it easy to fit the device on any optical table

#### ISO COMPLIANT The calculations are fully compliant to the ISO

11146 and 13694 standards

### FAST ACQUISITION

Make a complete, ISO-compliant measurement in only 20 seconds with the ROI feature and in less than a minute with full-frame acquisition

### > FLEXIBLE & INTUITIVE SOFTWARE

### PRACTICAL ALIGNMENT TOOL



Each BEAMAGE-M2 system includes an alignment tube that helps you set up the system faster. Simply use the two alignment mirrors to center your laser beam onto both irises, and you will be ready to start measuring in no time!

The fluorescent material around the pinholes also helps to align beams that are in the NIR range without having to use an IR viewer.

# **BEAMAGE-M2** Specifications



	Provention of the second	POWE
	BEAMAGE-M2	R DET
SENSOR TECHNOLOGY	Beamage-4M included	ECTO
EFFECTIVE APERTURE	Ø 48 mm optics - 11.3 x 11.3 mm sensor	ORS
MEASUREMENT CAPABILITY		
System wavelength range	350 - 1100 nm	
Attenuation range	3 Flip-mount attenuators for 8 levels of attenuation: no attenuation, ND0.5, ND1, ND2, ND1.5, ND2.5, ND3, ND3.5	m
Beam diameter range <sup>a</sup>	55 μm to 11.3/3 mm	NEF
Translation stage		RCY
Mechanical travel range	200 mm	DET
Effective optical path range	400 mm	ECT
Lens focal length	5 AR-coated lenses included: 200 mm, 250 mm, 300 mm, 400 mm and 500 mm	ORS
Typical M <sup>2</sup> accuracy <sup>b</sup>	± 5%	
Typical M <sup>2</sup> repeatability <sup>b</sup>	± 2%	
Applicable light sources	CW and quasi-CW	
Typical measurement time	45 s with full-frame acquisition	BE
DAMAGE THRESHOLDS 6		AM
Maximum average power	1 W with ND filter	PRO
Maximum density (1064 nm)	CW: 10 W/cm <sup>2</sup> ; Pulsed: 0.1 J/cm <sup>2</sup>	FILI
PHYSICAL CHARACTERISTICS		NC
Dimensions		
Main enclosure	357 mm (L) x 165 mm (W) x 135 mm (H)	
Total (including external mirrors)	602 mm (L) x 193 mm (W) x 172 mm (H)	H
Optical axis height	86 mm	RAH
Weight	6.6 kg	HER.
Power supply	48 VDC, 1.25A out	rz d
SOFTWARE		 ETE
Displays	2D, 3D, XY, Beam Tracking and M <sup>2</sup>	СТО
Beam diameter definitions	D4o	RS
	1/e <sup>2</sup> along crosshairs (13.5%) FWHM along crosshairs (50%)	
	Custom (%)	DIS
Beam quality definitions	Laser beam quality M <sup>2</sup> : $M^2_{\chi^2}$ M <sup>2</sup> <sub>v</sub> (ISO compliant)	PLA
	Beam Propagation Factor: BPP <sub>x</sub> , BPP <sub>y</sub> Width at waist: W . W	% S/
	Waist location and offset: $Z_x, Z_y, \Delta Z$	PC
	Rayleigh length: $Z_{p_i}$ , $Z_{p_i}$	INTE
	Astigmatism	ERF/
Printing and reports	Full report in print-ready format	ACES
ORDERING INFORMATION		 57
Product page		C
		STO
	Benne Arten Fan State	M / N
		OEN

Specifications in the table above are for the use with a Beamage-4M beam profiler (included in the Beamage-M2 kit)

a. At the Beamage sensor

b. Depending on the beam quality and optical configuration

c. With ND4 filter at the Beamage

CE

# BEAMAGE-M2 Software features

Select which set of Rayleigh range boundaries



M2 Results tab:

View and understand all the measured parameters

quickly, for both the initial laser beam and the

gentec-eo.com/laser-beam-diagnostics

START ISO SCAN

RUN M SETUP



With the "RUN M2 SETUP" button, the software automatically defines new parameters for a more precise M<sup>2</sup> measurement. The "ISO SCAN" data set complies with the ISO-11146 M<sup>2</sup> measurement standard, being spread between  $-3Z_p$  and  $+3Z_p$ .

The automatic settings are updated after each calculation, considering the values of  $\rm Z_{_0}$  and  $\rm Z_{_p}$  from the latest measurement.

By default, the results graph always shows the calculated positions of the first three Rayleigh distances on each side of the waist.

	Values			
aser Wav	elength 1064	nm	Focal Length (Lens)	300 mm
utomatic	Settings-			
Х Р	UNMPSETUP		IOD SCAN	stor
Jser-Defir	ved Scan-		Manual Frames	
õ	SETTINGS		Enter Distance	586.63 mm
			(Lens to sensor)	
	ART L		4 +	Add 🕨
Data				
Data	TRATEMP	Datate Son	Class M	
Data	CULATE MP	Delete Son	Clear All	
Index	Distance	Delete Sot	Clear All	Exposure Time
Index	Distance 271.0	Delete Sot X Diameter 702.8	Clear As Y Diameter 689.7	Exposure Time
Index 2	Distance 271.0 280.6	X Diameter 702.8 659.3	Clear All Y Diameter 689.7 046.1	Exposure Time ' 10.55 9.16
Index 1 2 3	Distance 271.0 280.6 290.3	X Diameter 702.8 659.3 612.6	Clear All Y Diameter 689.7 946.1 600.5	Exposure Time 4 10.55 9.16 7.96
Index 1 2 3 4	Distance 271.0 280.6 290.3 300.0	X Diameter 702.8 639.3 612.6 567.8	Clear A8 Y Diameter 689.7 046.1 600.5 556.0	Exposure Time 4 10.55 9.16 7.96 6.93
Index 1 2 3 4 5	Distance 271.0 280.6 290.3 300.0 309.7	X Diameter 702.8 659.3 612.6 567.8 522.3	Clear All Y Diameter 688.7 646.1 600.5 556.0 512.7	Exposure Time 10.55 9.16 7.96 6.93 5.87
Index 1 2 3 4 5 6	Distance 271.0 280.6 290.3 300.0 309.7 319.3	X Diameter 702.8 659.3 612.6 567.8 523.3 480.3	Clear All Y Diameter 698.7 946.1 600.5 556.0 512.7 471.4	Deposure Time 10.55 9.16 7.96 6.93 5.87 5.00
Index Index 1 2 3 4 5 6 7	Distance 271.0 280.6 290.3 300.0 309.7 319.3 329.0	X Diameter 702.8 659.3 612.6 567.8 523.3 480.3 435.6	Y Diameter 689.7 666.1 600.5 556.0 512.7 471.4 428.3	Exposure Time 10.55 9.16 7.96 6.93 5.87 5.00 4.22
Data Index 1 2 3 4 5 6 7 8	Distance 271.0 280.6 290.3 300.0 309.7 319.3 329.0 338.7	X Diameter 762.8 659.3 612.6 567.8 523.3 480.3 435.6 394.5	Clear Ad Y Diameter 689.7 646.1 600.5 556.0 512.7 471.4 428.3 388.3	Exposure Time 10.55 9.16 7.96 6.93 5.87 5.00 4.22 3.47

## FULL CONTROL ON YOUR DATA

During an M<sup>2</sup> scan, each of the measured profiles is saved and the flexible software gives you complete control on your acquired data.

- View each acquired profile in 2D display or 3D display.
- Add measurement points to a data set at the position of your choice with the "ADD" button.
- Remove unwanted profiles from your data set & recalculate the measurements.



## **FAST ATTENUATION**

Add or remove attenuation with the flick of a finger. The software adjusts the exposure time at each frame during an acquisition, and advises the user on the required attenuation.



### **COMPATIBLE PRODUCTS**









**BEAMAGE-4M-FOCUS** 



PH series

### **KEY FEATURES**

- > FOR ALL BEAMAGE MODELS We offer various SM1-threaded absorptive ND filters that can be fixed directly on the aperture of the Beamage camera via a SMI to C-mount adaptor. We also offer SM2-threaded filters that can be fixed on the Beamage-4M-FOCUS via a SM2 to T-Mount adaptor.
- > HIGH-QUALITY OPTICS These filters reduce the intensity of all wavelengths without affecting the wavefront of the beam or distorting the image.
- > STACKABLE ATTENUATION Subsequent filters can be stacked directly on each other. Sets of 3 filters or 6 filters as well as individual filters are available.

## **OVERVIEW OF THE MODELS**

MODEL NAME		EQUIVALENT ATTENUATION	TRANSMITTANCE AT 633 NM	
SM1 FILTERS	SM2 FILTERS			
ND0.5	ND0.5-FOCUS	(1/3.16)	~32%	
ND1.0	ND1.0-FOCUS	(1/10)	~10%	
ND2.0	ND2.0-FOCUS	(1/100)	~1%	
ND3.0	ND3.0-FOCUS	(1/1000)	~0.1%	
ND4.0	ND4.0-FOCUS	(1/10 000)	~0.01%	
ND5.0	ND5.0-FOCUS	(1/100 000)	~0.001%	
NDSET-6 (Set of 6 filters)				
NDSET-3 (Set of 3 fil	ters: ND1, ND2, ND3)			

ND-H (ND filter holder)





	ND0.5 TO ND5.0
Spectral range	400 nm² - 1595 nm
Filter diameter	25 mm Ø
Clear aperture	22.5 mm Ø (90% of diameter)
Dimensional tolerance	+0.0/-0.25 mm
Optical density tolerance	±5%
Parallelism	< 10 arcsec
Transmitted wavefront error	< λ/10 at 633 nm
Surface flatness	< \/4
Surface quality	40 - 20 Scratch-Dig
Maximum power	1W
Damage thresholds	100 W/cm <sup>2</sup> or 3 J/cm <sup>2</sup>
Product page	

\* Data specified at 633 nm

a. For ND4.0 filter, lower limit with other models.

## SPECTRAL TRANSMISSION OF ALL FILTERS



# Optical attenuators - up to 1 kW



### **MULTIPLES USES**

- > Monitor power and beam profile simultaneously
- > Polarization insensitive beam-splitter with no back-reflections
- Optical pick-off for use with our energy or power detectors
- > Attenuator for our high sensitivity detectors like M6 series and PH series

### **COMPATIBLE PRODUCTS**







PH series

BEAMAGE-4M

BEAMAGE-4M-FOCUS (for BA32-1KW only)



M6 series

### **KEY FEATURES**

- > MANAGE THE LASER POWER CMOS sensors have low saturation levels as well as low damage thresholds. It is thus very important that you control your laser power to get the best measurement possible and avoid damaging the BEAMAGE camera.
- > SAMPLE YOUR LASER BEAM The BA series optical attenuators use Fresnel reflections on two orthogonal wedges to pick off a small fraction of the input beam. The incoming beam polarization state and irradiance are preserved.
- > IMPROVED MECHANICS The BA16 models are now compatible with 30-mm cage systems and also include SMI threads on the input face

### **ACCESSORIES FOR BA16-60S**





UP19K-15S-H5 (increase max power to 150 W) (increase max power to 500 W)



UP19K-110F-H9

### **ACCESSORIES FOR BA32-1KW**





BA32 mounting kit for

BEAMAGE-4M-FOCUS



BA32 mounting kit for UP55N-40S-H9

BEAMAGE-4M





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	* APUTERNY *	
	BA16-60S	BA32-1KW
MAXIMUM POWER	Up to 500 W	1000 W
EFFECTIVE APERTURE	16 mm Ø	32 mm Ø
COOLING METHOD	Convection	Water
MEASUREMENT CAPABILITY		
Spectral range	200 - 2100 nm	200 - 2100 nm
Integrated power detector	N/A	Compatible with UP55 series (not included)
Fan input voltage	N/A	N/A
Equivalent attenuation	1/1700 @ 1064 nm	1/1900 @ 1064 nm
Optical wedges material	UV fused silica (uncoated)	UV fused silica (uncoated)
Residual beam deviation	5.6°	3.6° @ 1064 nm
Polarization correction	Yes (pair of orthogonal wedges)	Yes (pair of orthogonal wedges)
DAMAGE THRESHOLDS		
Maximum power	With included cover: 60 W	1000 W
	With UP15K-15S-H5: 150 W	
	With UP19K-110F-H9: 500 W	
Maximum average power density	10 MW/cm <sup>2</sup>	10 MW/cm <sup>2</sup>
Maximum energy density	10 J/cm <sup>2</sup>	10 J/cm <sup>2</sup>
PHYSICAL CHARACTERISTICS		
Aperture diameter	16 mm Ø	32 mm Ø
Dimensions	45H x 47W x 81D mm	145H x 250W x 132D mm
Weight	0.26 kg	5.5 kg
Mounting thread	SM1	SM2
Included adaptor	SMI external threaded tube	N/A
ORDERING INFORMATION		
Compatible Stand	STAND-S-233	2x STAND-S-443-C-M
Product Page		

## UV CONVERTERS Wavelength management



UV Converters take advantage of a phenomenon called fluorescence to extend the performance range of the Beamage beam profiling camera to ultraviolet wavelengths. A fluorescent crystal located at the entrance of the converter absorbs UV wavelengths and reemits longer wavelengths (in the visible spectrum), which are less energetic and detected by the CMOS sensor.

### MAIN CHARACTERISTICS

- Transforms wavelengths contained between X-rays and 400 nm to visible and near-IR wavelengths.
- Images larger beams due to the magnification properties of the optics.
- Built with an iris at the output port for a control of the exposure on the CMOS sensor.
- Removable extension tube that is easily fixed onto the entrance port of the Beamage camera.
- Ready to use within minutes

### **SPECIFICATIONS**

	BSF23C11.3N	BSF23P11.3N	BSF23R11.3N	BSF23G11.3N
Input aperture Ø	23 mm	23 mm	23 mm	23 mm
Overall length (OAL)	97 mm	97 mm	97 mm	97 mm
Magnification	1.4	1.4	1.4	1.4
Crystal type	С	Р	R	G
Wavelength range	110 - 225 nm	10 - 350 nm	110 - 532 nm	X-ray - 400 nm
Saturation level 193 nm 248 nm 308 nm	400 mJ/cm² N/A N/A	30 mJ/cm² 30 mJ/cm² 50 mJ/cm²	50 mJ/cm² 400 mJ/cm² 400 mJ/cm²	10 mJ/cm² 10 mJ/cm² 50 mJ/cm²
Decay time	3 - 5 µs	5 µs	4000 µs	0.1 µs
Max repetition rate	20 - 30 kHz	20 kHz	25 Hz	20 kHz
Product page				

A complete procedure on how to choose the appropriate UV Converter (UV Converter Application Note) is available on our website at <u>www.gentec-eo.com</u>.

# RADAPT Wavelength management



Typically, a CMOS silicon sensor is operating at its full potential when imaging lasers with wavelengths between 350 nm and 1150 nm. If you want to extend the performance range of your Beamage beam profiling camera to the near-IR telecom wavelengths band, you can use the IR Adaptor. This ideal solution takes advantage of a multi-photon absorption process to extend the sensitivity range of the camera sensor to a portion of the near-IR spectrum (1495 nm - 1595 nm).

### MAIN CHARACTERISTICS

- > Converts wavelengths between 1495 nm and 1595 nm to shorter wavelengths between 950 nm and 1075 nm.
- > Images larger beams due to the convergent properties of the optics (3.29X).
- > Built with a high quality coated anti-reflection input window that allows wavelength conversion with low distortion and maximum image resolution.
- > Removable and easily C-mounted onto the entrance port of the camera.
- > Ready to use within minutes.

## **SPECIFICATIONS**

	IR ADAPTOR
Active area	27.5 mm Ø
IR spectral range	1495 nm - 1595 nm
Peak IR sensitivity	1510 nm and 1540 nm
Converted wavelengths	950 nm - 1075 nm
<b>Pixel Multiplication Factor</b>	3.29
Minimum beam size	230 µm
Maximum beam size	19 mm
Maximum resolution	12 lp/mm over active area 40 lp/mm at sensor focal plane
Distortion	-1.0% barrel distortion (inverted image)
Linearity	Non-Linear, IR converted output ~ IR input intensity 1.41
Spectral transmission	360 nm - 2000 nm at F30.8
Damage threshold	1 W/cm <sup>2</sup>
Dimensions	46 mm Ø x 97 mm L
Operating temperature	-10°C to +40°C
Weight	210 g
Product page	



## **EXCITATION SPECTRUM**



POWER DETECTORS

ENERGY DETECTORS

CE



## **UV BANDPASS FILTER**

We also offer a color glass filter specially designed for the UV spectrum. Depending on the wavelength, the UG11-UV filter transmits 20% to 70% of the input beam power. It is particularly useful for applications with wavelengths contained between 250 nm and 370 nm. Other wavelengths are blocked by the filter.

### **SPECIFICATIONS**

MODEL	UG11-UV
Spectral range	250 nm - 370 nm
Diameter	25 mm Ø
Clear aperture	80% of area
Dimensional tolerance	+0.0 / -0.2 mm
Thickness	3 mm
Thickness tolerance	+0.0 / -0.2 mm
Parallelism	< 3 arcmin
Surface flatness	< \//4
Maximum power	1 W
Surface quality	40 - 20 Scratch-Dig
Damage threshold	30 W/cm² (typical)
Product page	

\* Data specified at 633 nm

## **IR FILTER**

The B3-IR-FILTER is a color glass filter specifically designed for IR applications. Acting as a longpass filter, the B3-IR-FILTER cuts all the wavelengths below 1250 nm and only lets the IR wavelengths pass. It transmits approximately 70% of the incident light.

### **SPECIFICATIONS**

MODEL	B3-IR-FILTER
Spectral range	1250 - 1350 nm
Diameter	25 mm Ø
Clear aperture	80% of area
Dimensional tolerance	+0.0/-0.2 mm
Thickness	6.3 mm max
Parallelism	< 3 arcmin
Surface flatness	< \/4
Maximum power	1 W
Surface quality	80-50 Scratch-Dig
Damage threshold	30 W/cm² (Typical)
Product page	
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### SPECTRAL TRANSMISSION



### SPECTRAL TRANSMISSION



## **CAMERA LENSES**

Camera lenses work by indirectly imaging on the sensor the reflection or the transmission of a beam that previously went through a diffusing material such as glass (see diagrams below).

It is necessary to use a camera lens to image beams that are larger than the CMOS sensor (11.3 mm X 11.3 mm) of the Beamage beam profiling camera. A camera lens can be directly C-mounted onto the aperture of the Beamage camera.



### **SPECIFICATIONS**

	CL-25	CL-50
Focal length	25 mm	50 mm
Horizontal FOV	14°	7°
FOV at 1m	245 mm	120 mm
Minimum working distance	0.5 m	1 m
Maximum beam size	2000 mm X 2000 mm (not a limiting factor)	2000 mm X 2000 mm (not a limiting factor)
Maximum measurable intensity / energ	<ul> <li>Very high because of indirect mechanism</li> </ul>	Very high because of indirect mechanism
Inverted image	Yes	Yes
Beam distortion	Setup, lens aberration and speckles from diffusing glass	Setup, lens aberration and speckles from diffusing glass
Diffusing material needed	Yes	Yes
Magnification calibration needed	Yes	Yes
Possibility of wavelength conversion	Yes	Yes
Optical filter needed	Rarely to never	Rarely to never
Removable	Yes	Yes
Product page		



### **IMAGING A TRANSMITTED BEAM**



## **IMAGING A REFLECTED BEAM**



CE

## **BSORPTION CURVES** Specifications

## Beamage relative response





# ABSORPTION CURVES

## Beamage operating range

