WinCamD™ CCD and CMOS series

The popular WinCamD UCD series and UHR/XHR cameras are well suited for any laser beam profiling application. With pixel sizes as low as 3.2 µm, the cameras excel at imaging very small beams. The UCD series all have global shutters making them excellent choices for pulsed laser beam profiling. The UHR/XHR are excellent choices for affordable CW beam profiling. The TaperCamD-20-15 offers the very large image area of 20x15 mm.

The WinCamD™ is paired with DataRay's full-featured, highly customizable, user-centric software which has no license fees, unlimited installations, and free software updates. It is perfect for applications including: CW and pulsed laser profiling; field servicing of laser systems; optical assembly; instrument alignment; beam wander and logging; R&D; OEM integration; quality control; and M^2 measurement with available M2DU stage.

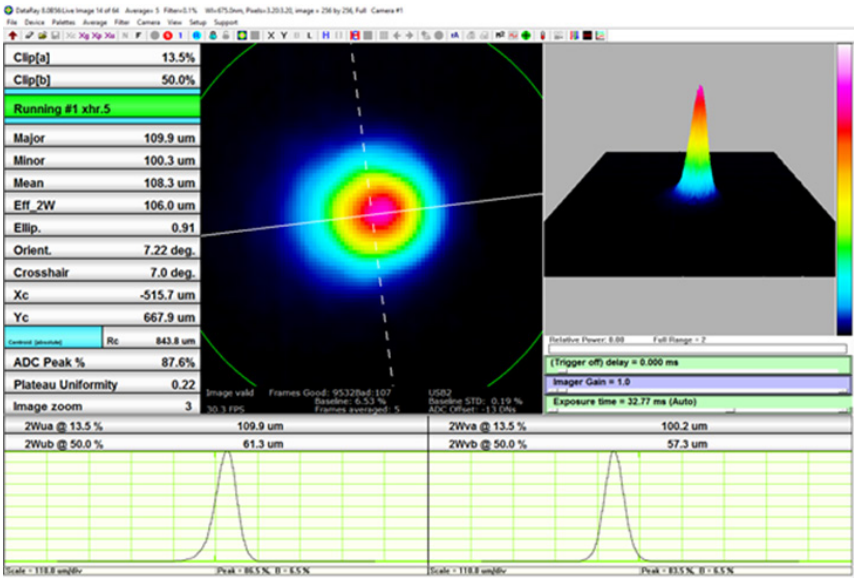
WinCamD Series

λ Range: 190 - 1350nm
Smallest pixel: 3.2 x 3.2 µm
Smallest direct beam: 32 µm
Max Imager area: 20x15 mm

WinCamD Series Camera
2.40 x 2.65 x 1.12" (x0.9" without filter)
61 x 67 x 28 mm

Applications

- **CW & Pulsed** laser profiling
- Field servicing of lasers and laser-based systems
- Optical assembly & instrument alignment
- Beam wander & logging
- M^2 measurements
- **OEM** integration
- Custom integration with VB, Python, MATLAB, LabVIEW, etc.
- Fiber Laser Analysis
- LED Testing



System Features

- Compact design for tight optical trains
- Imager areas from ½" optical format to 20x15 mm
- HyperCal™ Dynamic Noise and Baseline Correction software
- CTE™ Comet Tail Elimination for λ> 900 nm (UCD and TaperCamD series)
- Window-free sensors standard to avoid fringing
- Port-powered, flexible 3 m cable, no external power supply required
- Window-free sensors standard for no fringing
- 25,000:1 electronic auto-shutter, 40 µs to 1000 ms
- Pulsed laser synchronization (UCD series)
- 1,000:1 SNR (30/60 dB Optical/Electrical)
- Isolated Pulse Triggering (UCD and TaperCamD series) and Parallel capture on multiple cameras
- M2 option -50 mm and 200 mm M2DU stages available for automated M2 measurements
- ISO1146 compliant measurements
- -1310 models for enhanced imaging between 1310 and 1350 nm
- TEL model available
- UV converters available

WinCamD™-CCD & CMOS specifications

WinCamD™	-UCD12	-UCD15	-UCD23	-HR	-XHR	TaperCamD20-15
Pixel Count & H x V:	1.4 M Pixel 1360 x1024	1.9 M Pixel 1600 x 1200	1.4 M Pixel 1360 x1024	1.3 M Pixel 1280 x 1024	3.1 M Pixel 2048 x 1536	1.4 M Pixel 1360 x1024
Sensor image area (mm):	6.3 x 4.8	7.1 x 5.4	8.8 x 6.6	6.6 x 5.3	6.5 x 4.9	20 x 15
Pixel dimension (µm):	4.65 x 4.65	4.4 x 4.4	6.45 x 6.45	5.2 x 5.2	3.2 x 3.2	~15 x 15
Min. beam (10 pixels):	~47 µm	~44 µm	~65 µm	~52 µm	~32 µm	~150 µm
Wavelength Range:	355-1350	355-1350	355-1350	355-1350	355-1350	355-1350
Shutter type:	Synchronous	Synchronous	Synchronous	Rolling	Rolling	Synchronous
Max frame rate:	~5-10 Hz	~5-10 Hz	~5-10 Hz	~5-10 Hz	~5-10 Hz	~5-10 Hz
Signal to RMS Noise:	1,000:1	1,000:1	1,000:1	1,000:1	1,000:1	1,000:1
Opt./Elec. dB:	30/60 dB	30/60 dB	30/60* dB	30/60 dB	30/60 dB	30/60 dB
Electronic Shutter Range:	44 dB	44 dB	44 dB	38 dB	38 dB	44 dB
ADC:	14-bit	16-bit	14-bit	10-bit	10-bit	14-bit
Interface:	USB 2.0	USB 2.0	USB 2.0	USB 2.0	USB 2.0	USB 2.0
Notes:				Sensor available in BladeCam housing	Sensor available in BladeCam housing	Fiber optic taper optical bonded to sensor

About DataRay

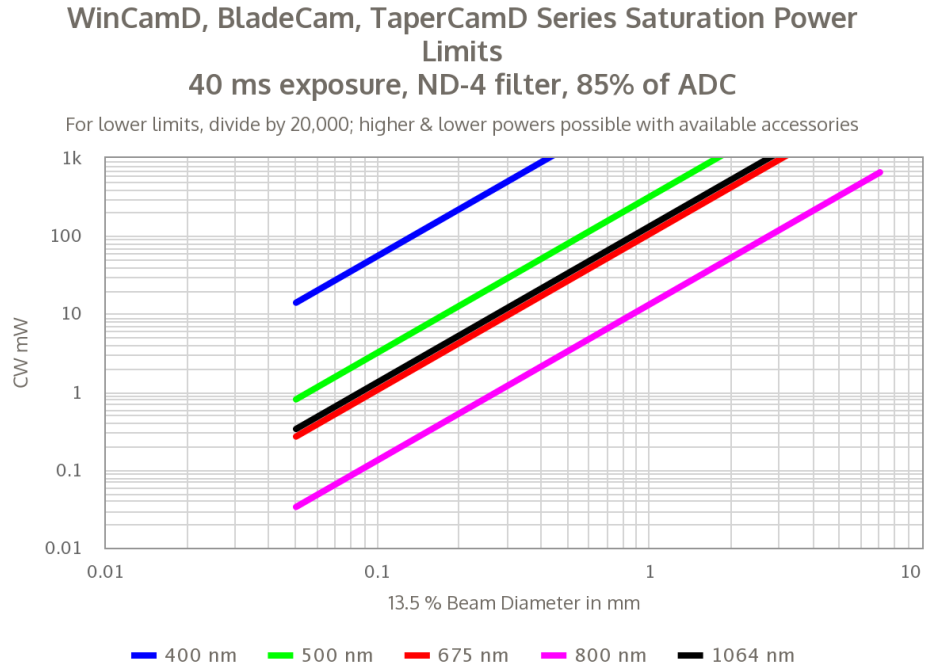
Founded in 1988, DataRay is the worldwide leader in beam profiling and analysis, delivering innovative, high-quality, affordable, and reliable instrumentation to the photonics industry. Product lines include beam profiling cameras (163 nm to 16 µm, model-dependent), and scanning slit beam profilers (190 nm to 3.9 µm, model-dependent).

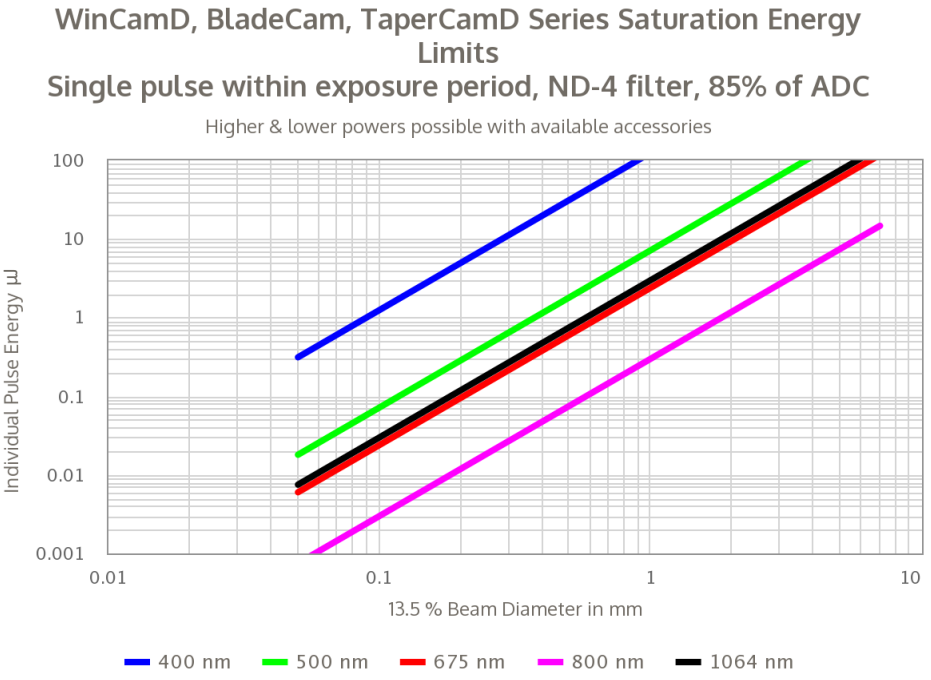
Common WinCamD Series Specifications: (Specifications are subject to change without notice)	
Wavelength: Standard -1310 -TEL -UV	~350 to 1150 nm ~350 to 1330 nm. Residual silicon response. 1290 nm long-pass filter and light guard tube provided. ~1480 to 1680 nm. NIR to Visible conversion phosphor (Erbium response), 40 µm FWHM Point Spread Function. See separate datasheet ~190 to 1150 nm UV converters with wavelength options down to X-ray. *UV resolution to 1 µm. See separate datasheet*
Pulsed Lasers:	Auto-trigger sync, TTL input trigger (UCD and TaperCamD series)
Interface:	Port Powered USB 2.0 for laptops & desktops. 3 m standard thin cable.
Multiple Beams:	Measure up to 8 beams simultaneously
Multiple Heads:	Supports up to 8 separate cameras. Parallel capture for up to 4 cameras.
ISO 11146:	Compliant
Certification:	RoHS, WEEE, CE
Measurable Sources:	CW beams, Pulsed sources. CW to 25 kHz with single pulse isolation, user configurable Synchronous, Asynchronous & Variable Delay trigger options (UCD and TaperCamD series).
Measured Beam Powers:	*See the Saturation Beam Power/Pulse Energy Graph and Notes, below.*
Manual Beam Attenuation Options:	Standard with ND 1,2, and 4.0 (10,000:1) stackable C-mount Neutral Density filters. **PPBS**: Polarization Preserving Beam Sampler to 50 W **EAM-2**: 4-wheel stepped variable attenuator, 0 to 930 dB
Measurement Accuracy:	0.1 µm processing resolution for interpolated diameters. Absolute accuracy is beam profile dependent – ~1 µm accuracy is frequently achievable. Centroid accuracy is also beam dependent. It can be as good as ±1 µm since it is arithmetically derived from all pixels above the centroid clip level.
Displayed Profiles & Plots:	X-Y Profiles, 2D, 3D Plots
Processing Options:	**HyperCal™** Real-time electronic baseline correction (HR and XHR) **CTE™ C**omet **T**ail **E**limination (UCD and TaperCamD Series) Image & profile averaging, 1, 5, 10, 20, Continuous Background Capture and Subtraction User set Capture Block option ***.job** files save all WinCamD custom settings for particular test configurations
Chip depth from front of case /filter holder (±~0.2 mm):	WinCamD-UCD12 8.9 / 13.9 mm WinCamD-UCD15 5.9/ 10.9 mm WinCamD-UHR/ XHR 9.4/ 14.4 mm WinCamD-UCD23 8.2 / 13.2 mm
Outline and Mounting W x H x D: See Drawings Below	WinCamD-Series 2.65 x 2.4 x 0.9” (67 x 61 x 23 mm) C-mount ND Filter adds 0.2” (5mm)
Camera Head Weight"	WinCamD 155 gm (5.5 oz);
Minimum Computer Requirements: PC or Intel-Mac	2 GHz processor or higher running Windows 10/8/7; OpenGL 3.3 or later; 2 GB RAM; 200 MB Hard Drive space; 1366x768 monitor, Standard USB 3.0/2.0 port.

Saturation Beam Power/Pulse Energy Graphs

These two graphs allow you to simply determine the approximate maximum CW optical power (above) or pulse energy (below) that the standard WinCamD configuration can measure for your beam diameter and wavelength *without additional attenuation*. The **Saturation Limit** assumes:

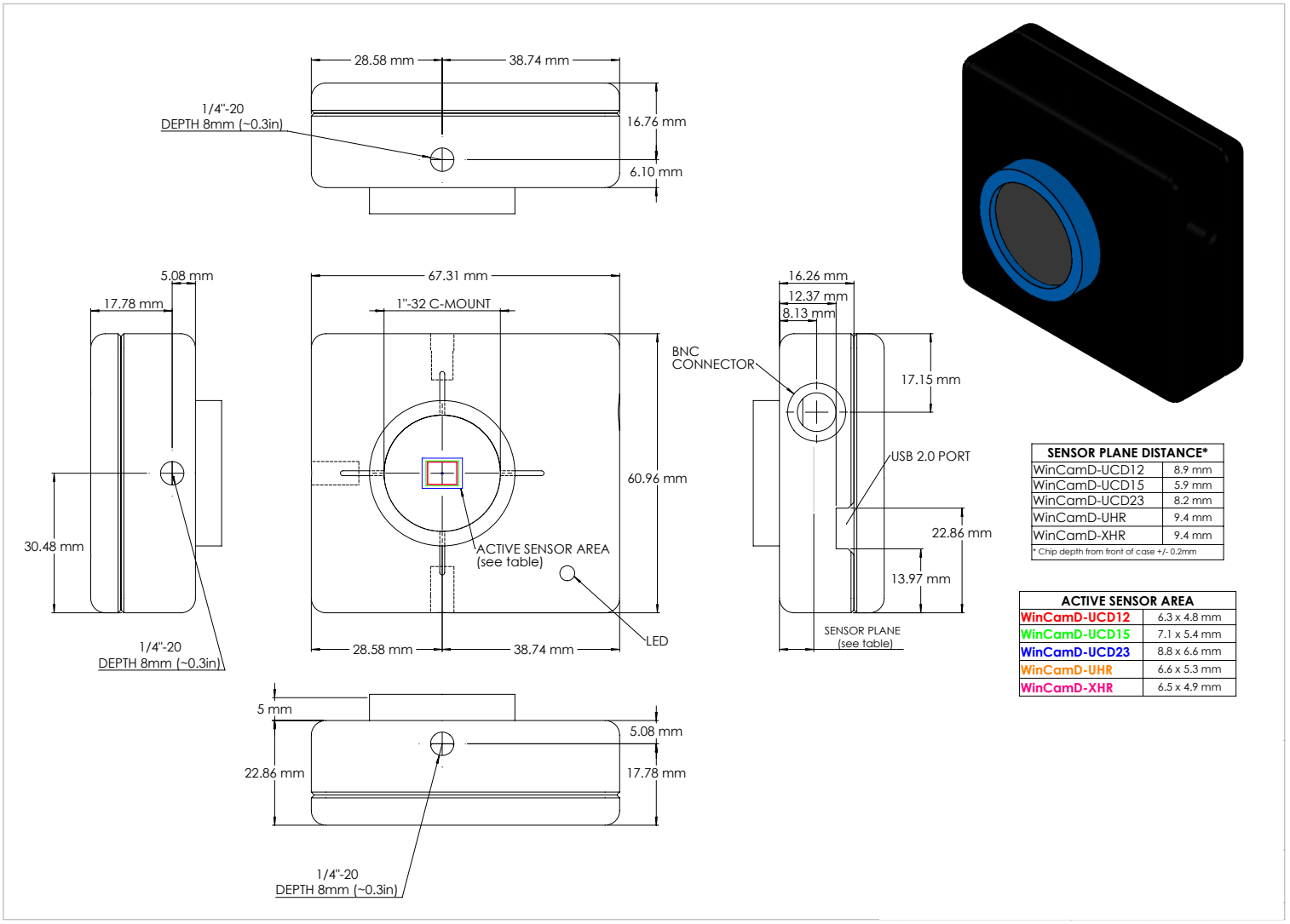
- The provided ND 4.0 filter in place
- The electronic shutter set at 40 µs, its lowest value
- The ADC gain set at 1, its lowest value
- **The beam onto the ND filter must not exceed 2.5 x** (Beam diam. in mm) **W, or 10 W total power for large beams.**





The lower limit in the standard configuration is ~10^{-5} x the Saturation Limit.

Outline and Mounting Drawing



SENSOR PLANE DISTANCE*	
WinCamD-UCD12	8.9 mm
WinCamD-UCD15	5.9 mm
WinCamD-UCD23	8.2 mm
WinCamD-UHR	9.4 mm
WinCamD-XHR	9.4 mm

* Chip depth from front of case +/- 0.2mm

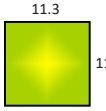
ACTIVE SENSOR AREA	
WinCamD-UCD12	6.3 x 4.8 mm
WinCamD-UCD15	7.1 x 5.4 mm
WinCamD-UCD23	8.8 x 6.6 mm
WinCamD-UHR	6.6 x 5.3 mm
WinCamD-XHR	6.5 x 4.9 mm

Imager area is shown **actual size in mm** for:

WinCamD-UCD12

WinCamD-UCD15

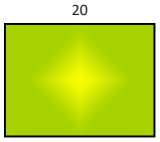
WinCamD-UCD23



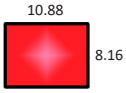
WinCamD-LCM

WinCamD-HR

WinCamD-XHR



TaperCamD-UCD23



WinCamD-IR-BB

WinCamD 1310 series options: High Resolution Beam Profiling to 1350 nm

The WinCamD-1310 series proprietary software and electronics in conjunction with sensors that exhibit residual sensitivity at 1310 nm. This is a tailing silicon response, and has been observed out to at least 1350 nm. The effective Quantum Efficiency (QE) in this tailing response is around 0.01%; i.e., a factor of around ~10^4 down on the visible response. Despite the low QE, 1310 series ameras can be very attractive for 1310 nm region use if the source irradiance is adequate (see chart). The small 5.5 micron square pixels give much higher resolution than standard NIR cameras. The WinCamD shutter exposure of up to 2 sec. is 25 to 30 times greater than that of standard cameras, partially compensating the low 1310 nm sensitivity. The system comes with 3 ND filters, a 1290 nm long pass filter, and housing to limit the field of view and reduce ambient illumination background.

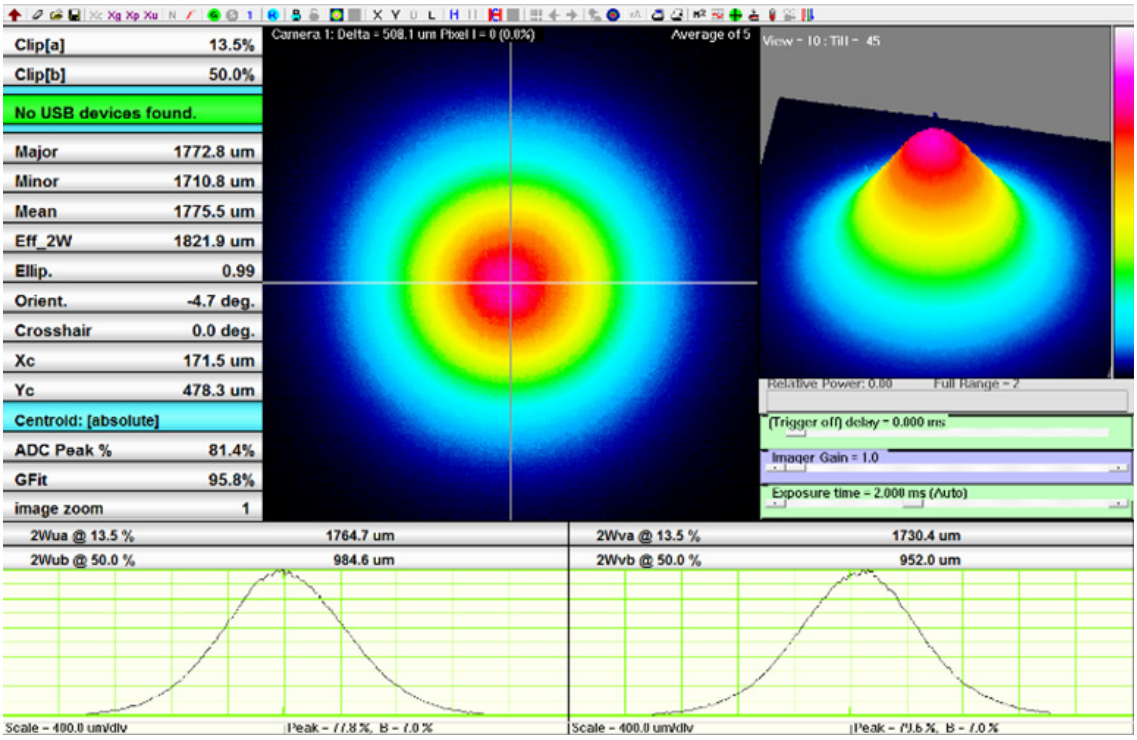
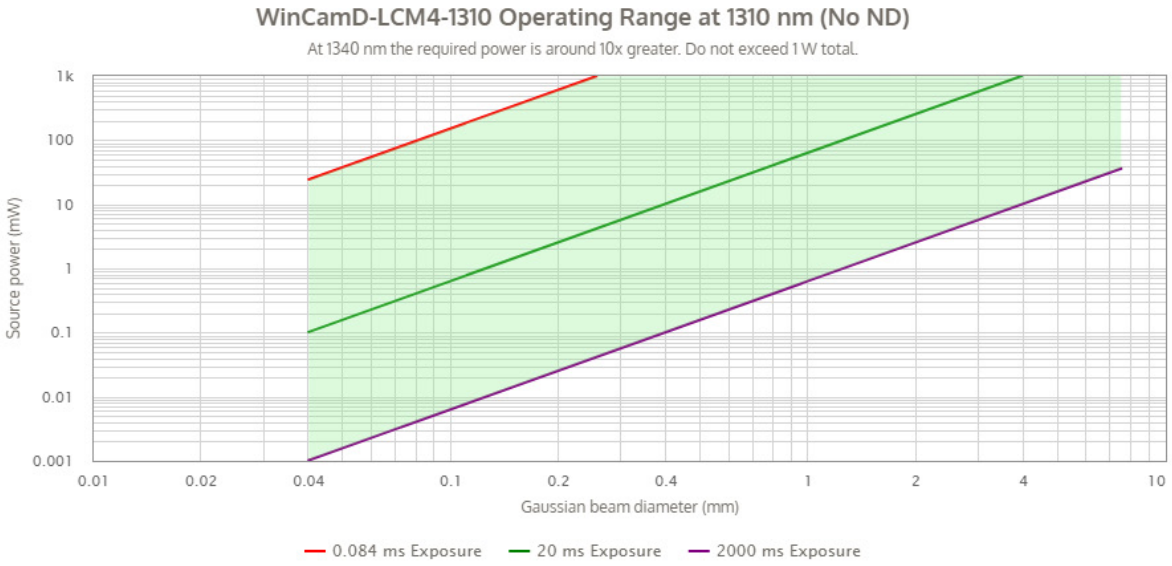


Image of a 1310 nm beam, 100 µm diameter, 1.5 mW. [43 ms Shutter, no ND filter]



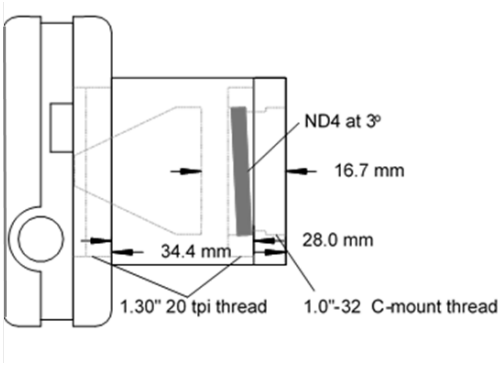
TaperCamD for Direct Imaging of Larger Beams

TaperCamD20-15-UCD23 beam profiling cameras are unique to DataRay and offer a larger effective imager area. TaperCamD cameras offer direct imaging of the beam without any of the Gaussian beam near-field/far-field issues that arise with the use of beam expansion telescopes.

They are available in standard, -1310 and –TEL versions.

Fiber optic tapers are fused coherent fiber bundles, heated, drawn and polished to give an output end the size of the imager chip. The image is ***de*-magnified** (M<1) from the faceplate input to the imager chip end. The taper ends are bonded to the surface of the imager chip using a proprietary DataRay process which eliminates both surface reflections and thermal cycling stress.

- The PMF (Pixel Multiply Factor) shown below and on the camera label is entered into the software in order to provide correct diameter readings.
- NA at the imager end is 1.0. NA.
- NA at the input faceplate is a factor of M smaller (0.45) so light at higher angles will be attenuated.
- The individual fibers at the input end are 6 µm pitch with a 50% core/cladding area ratio.
- Refractive index is 1.81, leading to a front surface reflectivity of 8.3%.
- Residual distortion is specified by the manufacturer at ±3% barrel/pin-cushion distortion. In our experience, this distortion is concentrated towards the edges of the field.
- Residual non-uniformity in optical response is generally small and requires no correction, but the ability to do so is available in the software.
- Empty filter holders are available for user's filters.
- A 0.25" deep extension ring is available with male and female 1.30"-20 tpi threads.



TaperCamD20-15-UCD23, PMF = 2.27