DataRay Inc.

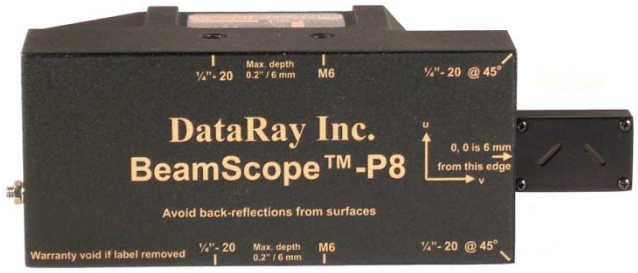
Slit Scanning

Wavelength Range:	190 - 1100 nm 800 - 1800 nm 1.5 – 3.5 µm
Resolution:	2 µm
Smallest Beam:	100 µm
Scanned Area:	5 x 7 mm - Si 3 mm - Ge 3 mm - InGAs
With 2D Stage:	23 x 43 mm

BeamScope-P8

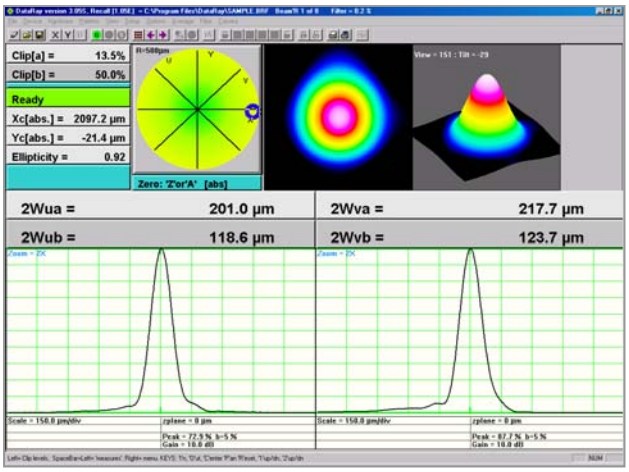
Typical Applications

- ◊ Laser / Diode Laser characterization
- ◊ Laser assembly development, alignment, characterization, production test & QA.
- ◊ Lasers And Laser Assemblies for
  - Disk / Wafer Characterization
  - Laser Printing / Marking
  - Medical Lasers
  - Bar Code Scanners … etc.



Real Time:

- ◊ X-Y Profile Measurement
- ◊ Angular Divergence
- ◊ Ellipticity, Centroid, Gaussian fit
- ◊ Relative Power

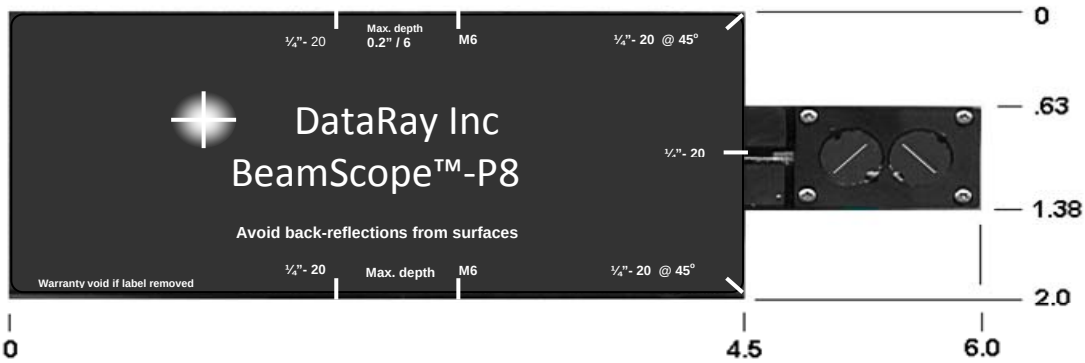


Features:

- ◊ Beam dimensions 100 µm to 45 mm
- ◊ Resolution 2 µm or 0.5 %
- ◊ 190 nm to 3.5 µm options
- ◊ M^2 measurement accessory
- ◊ ISO 11146 Compliant
- ◊ Narrow probe for confined spaces
- ◊ Front mounted apertures
- ◊ Wide dynamic range
- ◊ Powerful, intuitive software
- ◊ Upgrade option, BeamScope-P7 to USB 2.0

Accessories & Options

- ◊ M^2 Measurement Accessory-USB 2.0
- ◊ UV - NIR Options 190 to 3.5 µm
- ◊ 2-D Scan Stage for 23 x 45 mm profiling



BeamScope-P8 system is comprised of: a compact head, interface box, a 3 m (10 ft.) USB 2.0 cable, user manual, and Software for Windows XP, Vista or Windows7. (Windows and Vista are registered trademarks of Microsoft Corp.)

Principle of Operation: A linear scanning probe carries either a single pinhole, a single slit, or orthogonal X-Y slits. This linear scan satisfies the strict requirements of the ISO 11146 laser profiling standard*. Light passing through the slits falls onto a Silicon (190 to 1150 nm) or Germanium (800 to 1800 nm) detector. [* Until the introduction of the DataRay BeamScope Beam Profiler, no commercially available slit scan or knife-edge scan beam profiler met the ISO 11146 Standard. The Standard requires that the scan be performed in a *plane* orthogonal to the propagation axis. Drum style scanners cannot meet the Standard. DataRay's unique linear scan probe is designed to fully comply with the Standard.]

Acquire Beam Profiles In Constricted Areas

BeamScope-P8 has made the measurement of once inaccessible beam profiles not merely possible, but simple. The unique probe-style scan head easily peers into confined axial gaps between lens, mirrors, and filters. Its ability to probe along-axis spaces as narrow as 12mm creates a whole new world of applications.

No Beam Distortion From Optics Or Filters

There's no distortion of the beam due to ancillary optics or filters because the BeamScope-P8 doesn't need them when analyzing most type of lasers. The AUTO GAIN feature can continually adjust the detector amplifier gain to ensure full use of the 55 dB (300,000:1) gain range. Spot dimensions from 3 μm to 23 mm can be measured from a single scan head. Scan beam areas up to 23 x 45 mm with the new 2-D stage accessory.

Front Mounted Apertures

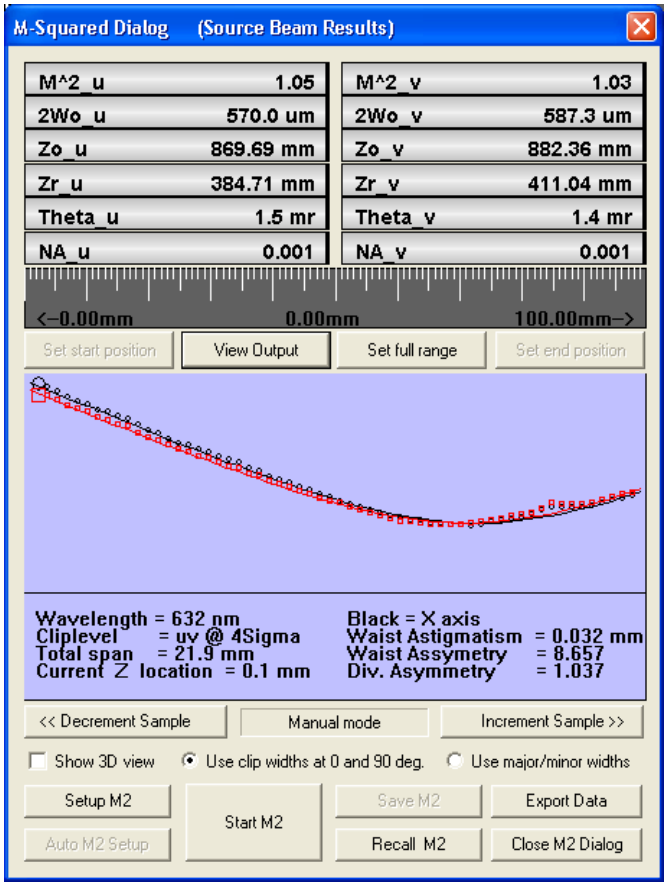
Front mounted apertures enable you to see precisely where the beam is being measured. Rapidly diverging and fast focusing beams are simple to capture if you can get close to your source. Now it's easier than ever to measure laser diode arrays, micro-lensed sources, broad stripe lasers, etc. Available apertures can accommodate power densities up to 100 W/mm^2 onto small pinhole apertures. (Max. Total power = 0.5 W) Change apertures in minutes from slits to pinholes. This makes the BeamScope-P8 an unbeatable value in beam analyzers.

Notebook PC Portability with USB 2.0

BeamScope plugs interface to a USB 2.0 port on your notebook PC to give a portable unit with a small footprint.

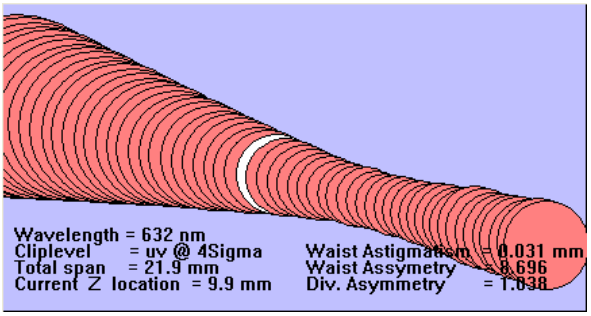
Perfect For R&D, QA & Production

R&D users will appreciate the comprehensive range of analytical functions. QA & Production engineers will appreciate the ability to save test configurations as JOB files, and to indicate **Pass** / **Fail** on-screen.



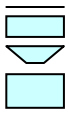
Unparalleled M^2 Measurements

The BeamScope™ P8 optional M2DU-P8 accessory is unlike any other on the market. There are no complicated adjustments, yet the user can achieve highly repeatable measurements. The software automatically takes more frequent measurements in the waist area in order to accurately determine the true waist diameter.



23 x 45 mm 2-D Scan Stage

DataRay's latest beam profiling innovation offers *extraordinary* 0.2% (512 x 512 pixels) resolution, down to 5 x 5 μm (HxV), over beam areas up to 23 x 45 mm. 2-D scan results display in the integral imaging software for area image analysis.

BeamScope	**P8 Product Specifications** [Subject to change without notice.]
Measurable Sources	CW or Pulsed sources ≥ 5kHz Pulse Rep Rate @ 5% duty factor. Higher PRR is better.
Measured Beam Powers	See the graph in the Notes, below. E.g. 6 μW to 3 W, for a 1 mm diameter ($1/e^2$) Gaussian beam @ 633 nm, 5 μm slit.
Optical Dynamic Range	55 dB (= 300,000:1) [75 dB with Neutral Density 2.0 film]
Shape of Maximum Scanned Area **Pinholes (PA series)** **Single Slits (SS series)** **X-Y Slits (XY series)** **2-D Stage (M2B)** 	***Important**: For accurate measurements, beam width should be ≤ 0.5 x Scan Dimensions With /EPH extended probe head, dimension 23 mm below, becomes 35 mm.* Shape — Cross Scan x Scanned Length Line Scan — Pinhole diameter x 23 mm Rectangle — 7* x 23 mm, (* 5 for Ge, 3 for InAs) Trapezoid — 5* x 15/5 mm, (* 3 for Ge, 2 for InAs, 3.5 x 13.5/6.5 for XYPI5) Rectangle — 45 x 23 mm scanned area image. Scans a pinhole over this area.
Measured Beam Diameters / Widths	100 μm to ~ 25 mm. Defined as the $1/e^2$ diameter, = 13.5% of peak for Gaussian beams)
Measurement Resolution	2 μm, or 0.5 % of the measured beam diameter, whichever is greater
Measurement Accuracy	±2 μm ± 2% of measured beam diameter
Measured Beam Profiles	X & Y Linear & logarithmic profile display modes
Measured Profile Parameters	Gaussian beam diameter Gaussian fit Second Moment beam diameter Knife-Edge beam diameter Centroid position, relative and absolute Ellipticity + Orientation of Major Axis Beam Wander display
Displayed Profiles	X only, Y only, X & Y 2-D plot (10,16 or 256 colors) reconstruction see Note 1 3-D plot (10,16 or 256 colors) reconstruction see Note 1
Update Rate	1 to 2 Hz. Depends upon the PC Processor Speed, Scanned Profile & Selected Options
Data Analysis **Pass / Fail** **Averaging** **Standard Deviation**	 On all measured parameters, on-screen, in selectable **Pass / Fail** colors Beam Diameter Running Average and Accumulating Average options On Accumulation Averaging Screen
Power Measurement	Units of mW, dBm, dB, % or user entered (relative to a reference measurement provided by the user.)
Source to Slit Distance	1.0 mm minimum
Aperture sizes Slits Pinholes	***Important**: See Scanned Area (above) for measurable beam dimensions see Note 2* 2.5, 5, 10, 25 and 100 μm wide 7 mm long (Planar version of 5 μm slits are 5 mm long) 5, 10, 25 and 50 μm diameter (Larger or smaller pinholes to special order) see Note 2
Wavelength Range Silicon Detector Germanium Detector InAs	 190 to 1150 nm 800 to 1800 nm 1500 to 3.5 μm
Mounting	¼-20 & M6 threaded mounting holes
Temp. Range (inc. Accessories) Operating Storage	 10° to 35° C 5° to 45° C
***Minimum* PC Requirements** **PC or Intel-Mac**	USB2.0 port, Windows XP, Vista or Windows 7; 1024 MB RAM; 10 MB Hard Drive space; 1024 x 768 monitor. Windows and Vista are trademarks of Microsoft Corp.

Notes:

1. The 2-D and 3-D profiles are 'reconstructed' from the X-Y scan, making the assumption that the measured X beam profile is the same for all values of Y, and that the measured Y beam profile is the same for all values of X.

2. In Single Slit or Pinhole mode, the slit/pinhole width should be ≤1/3rd of the diameter of the beam under measurement. For X-Y slit pairs inclined at ±45°, the ratio is approximately 1/5th.

3. In Knife-Edge mode, the slit width should be ≥ 3x the beam diameter. For X-Y slit pairs inclined at ±45°, the ratio is ≥4.3 times the beam diameter.

Power Limit. The graph allows you to simply determine the approximate maximum optical power that BeamScope can measure without additional attenuation. The limit is a detector current limit.

PxS is the **Power Limit in Watts**.

To calculate the power limit at the laser wavelength:

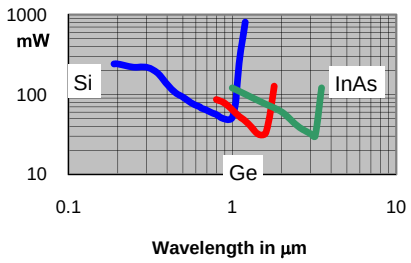
The graph shows the approximate saturation beam power in mW versus wavelength for a 100 µm diameter beam ($1/e^2$) & a 5 µm slit.

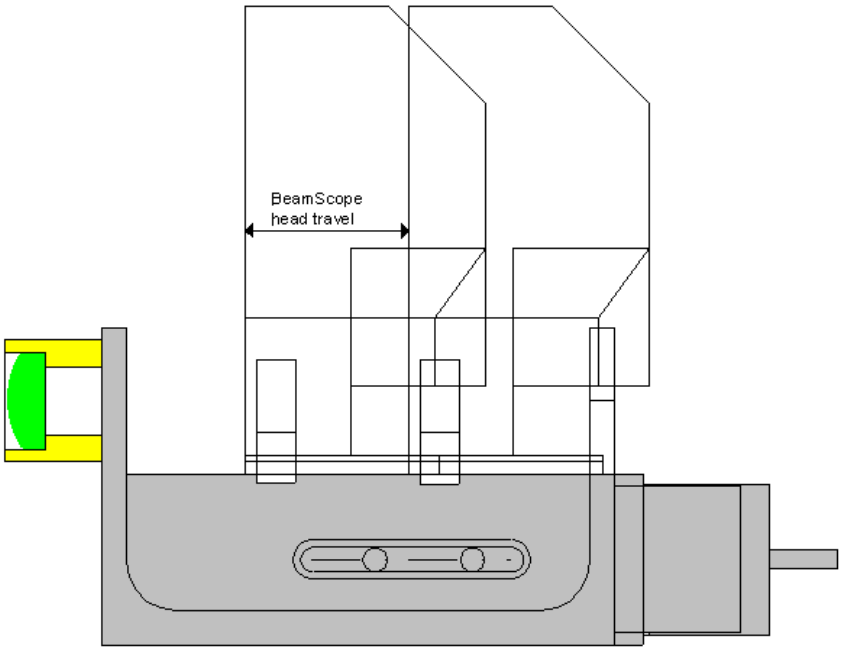
1) Determine the plotted value, P_S mW, for your wavelength. (e.g. 70 mw at 633 nm)

2) For a different slit or beam, multiply P_S by:
0.05.(beam diam., µm)/(slit width, µm)

3) For a pinhole multiply P_S by:
0.05 x (beam diam., µm)^2/(pinhole diam. µm)^2

Approximate saturation beam power
100 µm beam diameter, 5 µm slit.





Part Numbers — BeamScope Products & Accessories

System Examples	[Includes Software, 3 m long USB 2.0 cable, User Manual]
BS8-XY5	Silicon Detector system with 5 μm X-Y Slit
BS8-XY2.5	Silicon Detector system with 2.5 μm X-Y Slits
BS8G-XY5	Germanium Detector system with 5 μm X-Y Slits
BS8G-PA10	Germanium Detector system with 10 μm Pinhole
BS8-InAs SSX	Indium Arsenide Detector system with Single slit (pinholes are also available)
/EPH	Suffix for +10 mm Extended probe head, for probing deeper reces

P8 USB 2.0 interface

Accessories

PA5	Pinhole 5 μm diameter
PA10	Pinhole 10 μm diameter
PA25	Pinhole 25 μm diameter
PA50	Pinhole 50 μm diameter
PA100	Pinhole 100 μm diameter
SS2.5	Single Slit 2.5 μm wide x 3 mm long
SS5	Single Slit 5 μm wide x 7 mm long
SS10	Single Slit 10 μm wide x 7 mm long
SS25	Single Slit 25 μm wide x 7 mm long
SS50	Single Slit 50 μm wide x 7 mm long
SS100	Single Slit 100 μm wide x 7 mm long
XY2.5	X-Y Slit 2.5 μm wide x 3 mm long @ ±45° Planarity ± ~40 μm
XY5	X-Y Slit 5 μm wide x 7 mm long @ ±45° " "
XY10	X-Y Slit 10 μm wide " " "
XY25	X-Y Slit 25 μm wide " " "
XY50	X-Y Slit 50 μm wide " " "
XY100	X-Y Slit 100 μm wide " " "
XYPI5	Dual planar X-Y Slit 5 μm wide x 5 mm long, planarity set to ± 4 μm (for tightly focused beams).
M2DU-BS	M^2 Accessory, 44 mm scan / 2.5 μm steps, + 3 m long USB cable + M^2
LNZ-UV-XXX	Lens 185-450 nm, focal lengths from 50 mm to 1000 mm, clear apertures 22 and 47 mm
LNZ-VIS-XXX	Lens 400-700 nm, focal lengths from 50 mm to 1000 mm, clear apertures 22 and 47 mm
LNZ-NIR-XXX	Lens 630-1100 nm, focal lengths from 50 mm to 1000 mm, clear apertures 22 and 47 mm
LNZ-TEL-XXX	Lens 1030- 1800 nm, focal lengths from 50 mm to 1000 mm, clear apertures 22 and 47 mm

Additional lenses/ focal lengths are available. Please contact us for custom configurations

M2DU-2D	2D Scanning Stage 44 mm travel, 2.5 μm steps. Beam size to 23 x 44 mm with **M2DU-AP** plate
M2DU-AP	Additional adapter plate to connect BeamScope to M2DU-2D Scanning stage
P7-P7U-UPGRD	Upgrade a PCI BeamScope-P7 to USB 2.0 interfaced BeamScope-P7U with rebuilt head, calibration certificate, Interface box, USB 2.0 cables + Universal wall socket power supply and 3 year warranty.
P7-USB2-IF	Add USB2.0 interfacing to a BeamScope-P7.. [No head rebuild, no calibration, no warranty extension.]

M2 Accessory / 2D Stage Specifications

Standard Lens Assembly (Detached for 2-D Stage operation)	Coated achromatic lens, λ/4 @ 550 nm (see below for other wavelengths) Focal Lengths 50 mm to 500 mm, wavelengths UV to 16 microns Clear Aperture 22 and 47 mm
Stage Travel	44 mm
Step Size	2.5 μm
Dimensions M2DU	Across axis width x Height with BeamScope x Along axis depth 90 x 100 x 200 mm (5.5 x 6.5 x 8 inches)
Weight M2DU	0.8 kg (1.8 lb)
M2DU + BeamScope-P8	1.5 kg (3.3 lb)

Other DataRay Beam Profiling Instruments

BeamMap2	Real Time M-Squared Multi-plane profiler 0.1 micron resolution on CW lasers. XYZ profiles, XYZ focus, Centroid, Alignment, Divergence, M^2, Visible to Telecom wavelengths. Port-powered USB2.0
Beam'R2	0.1 micron resolution on CW lasers, 0.5 micron to 4 mm beam dimensions. Port-powered USB2.0
WinCamD	High performance, high resolution CCD and CMOS imaging systems. Port-powered USB2.0
WinCamD-XHR	New High resolution CCD array with 3.2 μm pixel and 2048 x 1536 array Port Powered USB2.0
WinCamD-FIR	Wavelength Range 2-16 μm, 25 μm pixel pitch, 320 x 240 pixels, 7.5 x 6.6 mm active area
BladeCamXR	The Smallest Beam Profiler in the known Universe - 1/2" and 1/1.8" formats Pixel size 4.4 and 5.2μm