

BeamScope™-P7 Beam Analyzer, 3µm to 45 mm

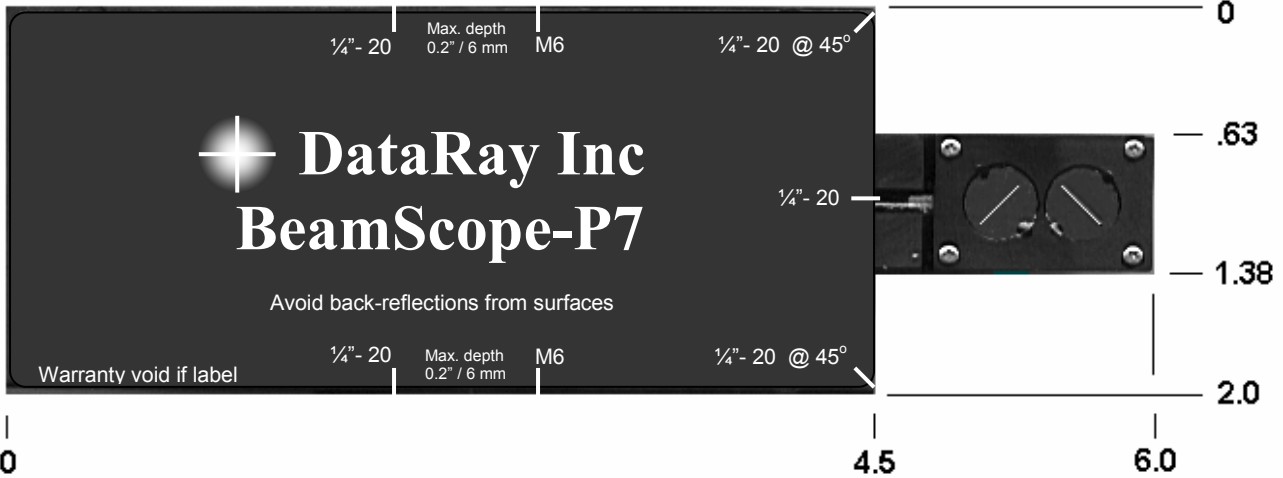
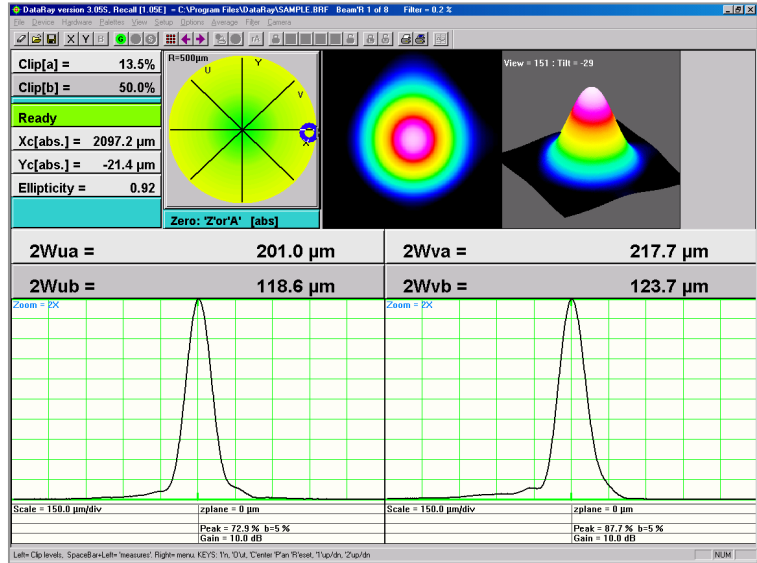
All Beam Profiling should be this simple...

Real-time:

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

Features:

- Beam dimensions 3 µm to 45 mm
- Resolution 0.5 µm or 0.5 %
- 190 nm to 12 µm options
- M² measurement accessory
- ISO 11146 Compliant
- Narrow probe for confined spaces
- Front mounted apertures
- Wide dynamic range
- Powerful, intuitive software



Typical Applications

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

Accessories & Options

- M² Measurement Accessory
- 2-D Scan Stage for 23 x 45 mm profiling
- Magma™ CB1H for portable use with a Notebook PC.

Principle of Operation: A linear scanning probe carries either a single pinhole, a single slit, or X-Y slits at 90°. The 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), Germanium (800 to 1800 nm), Indium Arsenide (1.5 to 4 μm) or II-VI detectors for 3 to 12 μm .

BeamScope comprises a compact head & a single PCI card for Windows 98, Me, NT, 2000 & XP compatible.

Until the introduction of the DataRay BeamScope-P7 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-P7 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-P7 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) dynamic 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

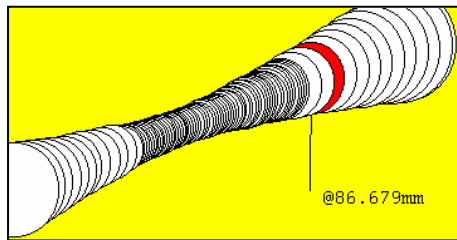
Front mounted apertures enable you to see precisely where the beam is being measured. Rapidly diverging and fast focusing beams are simple to capture if you can get close to your source. Now it's easier than ever to measure laser diode arrays, micro-lensed sources, broad stripe lasers, etc. Available apertures can accommodate power densities up to 100 W/mm² onto small pinhole apertures. (Max. Total power = 0.5 W) Change apertures in minutes from slits to pinholes. This makes the BeamScope-P7 an unbeatable value in beam analyzers.

Notebook PC Portability

BeamScope can also work with your notebook PC to give a portable unit with a small footprint. The CB1H from Magma™ interfaces the BeamScope head and its PCI Card to the Cardbus port on your Notebook PC.

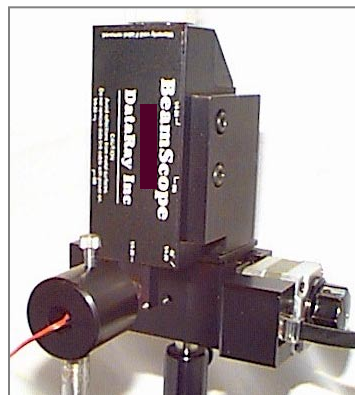
Perfect For R&D, QA & Production

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 M² Measurements





The BeamScope™P7 optional M² 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-P7 Product Specifications (Subject to change without notice.)

Measurable Sources	CW Pulsed sources: >5kHz Pulse Repetition Rate @ 5% duty factor. Higher PRR is better.
Measured Beam Powers	See the graph in the Notes, below. E.g. 6 μ W to 3 W, for a 1 mm diameter ($1/e^2$) Gaussian beam @ 633 nm, 5 μ m slit.
Optical Dynamic Range	55 dB (= 300,000:1) [75 dB with Neutral Density 2.0 film (3.5 " diskette cut-out) after slit]
Shape of Maximum Scanned Area	Important: For accurate measurements, beamwidth should be $< 0.5 \times$ Scan Dimens With /EPH extended probe head, dimension 23 mm below, becomes 35 mm.
Pinholes (PA series)	
Single Slits (SS series)	
X-Y Slits (XY series)	
2-D Stage (M2B)	
	Shape Cross Scan x Scanned Length
	Line Scan Pinhole diameter x 23 mm
	Rectangle 7* x 23 mm, (* 5 for Ge, 3 for InAs, 1 for II-VI)
	Trapezoid 5* x 15/5 mm, (* 3 for Ge, 2 for InAs; 0.7 for II-VI; 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	0.5 μ m to ~25 mm (Defined as the $1/e^2$ diameter, = 13.5% of peak for Gaussian bec
Measurement Resolution	0.5 μ m, or 0.5% of the measured beam diameter, whichever is greater
Measurement Accuracy	$\pm 1 \mu\text{m} \pm 2\%$ 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 (Note 1)	X only, Y only, X & Y 2-D plot (10,16 or 256 colors) 3-D plot (10,16 or 256 colors)
Update Rate	1 to 2 Hz. Depends upon the PC Processor Speed, Scanned Profile & Selected Options
Data Analysis	
Pass/Fail	On all measured parameters, on-screen, in selectable Pass/Fail colors
Averaging	Beam Diameter Running Average and Accumulating Average options
Standard Deviation	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 (Note 2)	Important: See Scanned Area (above) for measurable beam dimensions
Slits	2.5, 5, 10, 25 and 100 μ m wide 7 mm long (Planar version of 5 μ m slits are 5 mm long)
Pinholes	5, 10, 25 and 50 μ m diameter (Larger or smaller pinholes to special order)
Wavelength Range	
Silicon Detector	190 to 1150 nm
Germanium Detector	800 to 1800 nm
Indium Arsenide Detector	1.5 μ m to 4 μ m
II-VI Detector	3 μ m to 12 μ m

Dimensions

Probe Style Head

Across axis width x Height x Along axis depth
115 x 51 x 62 mm (4.5 x 2.0 x 2.5 inches)
[Probe fully extended width: 140 mm (5.9")]

Dual slit separation



Dual slit center-to-center separation 10 mm
Bottom end separation 5 mm for 7mm long slits.

Mounting

1/4-20 & M6 threaded mounting holes

Weight Probe Style Head

540 gm (1.2 lb)

Temp. Range (inc. Accessories)

Operating
Storage

10° to 35° C
5° to 45° C

Minimum PC Requirements

(Mac version is *not* available)

300 MHz Pentium III (500 MHz or better preferred) running Windows 98, Me, NT, 2000, XP; 4 MB RAM; PCI Half-Slot; 10 MB Hard Drive space; SVGA (600x800) monitor.

Notes:

- 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.
- In Slit (or Pinhole) mode, the slit/pinhole width should be $\leq 1/3^{\text{rd}}$ of the diameter of the beam under measurement. **Inches** For X-Y slit pairs inclined at $\pm 45^\circ$, the ratio is approximately $1/5^{\text{th}}$.
E.g., for any beam below 20 μm diameter, use the 2.5 μm slits wherever possible.

In Knife-Edge mode, the slit width should be $\geq 3x$ the beam diameter. For X-Y slit pairs inclined at $\pm 45^\circ$, 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. **PxS** is the **Power Limit in Watts**.

To calculate the power limit at the laser wavelength:

- Read **PxS** off the graph: _____ **W** @ _____ **nm**
- Calculate **S**. Take care to use the same units for aperture & beam:

Sampling Factor **S** is given by:

- Pinholes: $S = (\text{Pinhole diam.}/\text{Beam diam.})^2$
- $1/e^2$ Beam Diam. < Slit width: $S = 1.0$
- $1/e^2$ Beam Diam. > Slit width:

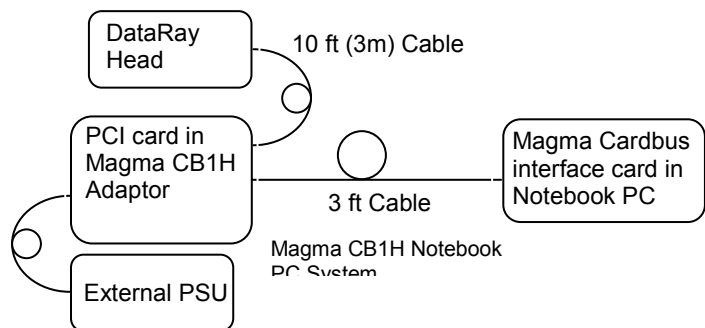
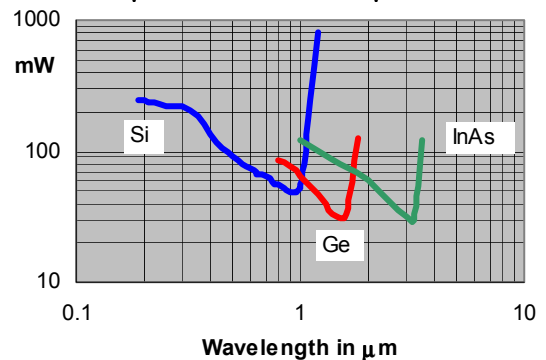
$$S = \sim 1.8 \times (\text{Slit width}/\text{Beam diam.})$$

$S = \underline{\quad}$ for a $\underline{\quad}$ $\mu\text{m}/\text{mm}$ slit/pinhole and a $\underline{\quad}$ $\mu\text{m}/\text{mm}$ beam

- Calculate $(PxS)/S$ to get an answer in **Watts**

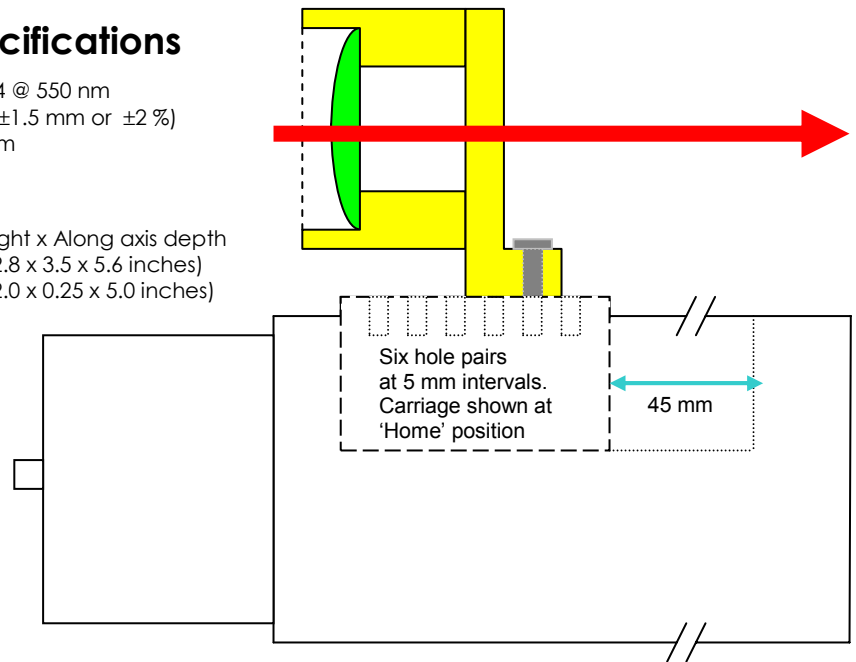
Add neutral density film* behind the slit for higher power densities. (*3.5" diskette material is ND ~ 2.0)

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



M² Accessory/2-D Stage Specifications

Lens (Detached for 2-D Stage operation)	Coated Achromat, $\lambda/4$ @ 550 nm Focal Length 85 mm (± 1.5 mm or $\pm 2\%$) Clear Aperture 17.5 mm
Stage Travel/Step Size	45 mm / 2.5 μ m
Dimensions	Across axis width x Height x Along axis depth
M ² Accessory/2-D Stage	71 x 87 x 140 mm (2.8 x 3.5 x 5.6 inches)
M ² Accessory Plate	50.4 x 6.3 x 127 mm (2.0 x 0.25 x 5.0 inches)
Weight M ² Accessory	680 gm (1.5 lb)



Part Numbers

Specifying a system

PCI-BS7

Head examples

7XY5
7GX5
7IX5
/EPH
PA5
PA10
PA25
PA50

Head, Probe Style, Silicon Detector, with **XY5** 5 μ m X-Y Slits
Head, Probe Style, Germanium Detector, with **XY5** 5 μ m X-Y Slits
Head, Probe Style, Indium Arsenide Detector, with **XY5** 5 μ m X-Y Slits
Suffix for +10 mm Extended probe head, for probing deeper recesses
Pinhole 5 μ m diameter
Pinhole 10 μ m diameter
Pinhole 25 μ m diameter
Pinhole 50 μ m diameter

SS2.5
SS5
SS10
SS25
SS100

Single Slit 2.5 μ m wide x 3 mm long
Single Slit 5 μ m wide x 7 mm long
Single Slit 10 μ m wide x 7 mm long
Single Slit 25 μ m wide x 7 mm long
Single Slit 100 μ m wide x 7 mm long

XY2.5
XY5
XY10
XY25
XY100
XYPI5

X-Y Slit 2.5 μ m wide x 3 mm long @ $\pm 45^\circ$ Planarity $\pm \sim 40$ μ m
X-Y Slit 5 μ m wide x 7 mm long @ $\pm 45^\circ$ " "
X-Y Slit 10 μ m wide " " "
X-Y Slit 25 μ m wide " " "
X-Y Slit 100 μ m wide " " "

Dual planar X-Y Slit 5 μ m wide x 5 mm long, planarity set to ± 4 μ m (for tightly focused beams).

M2D

M² Accessory/2-D Stage, 45 mm scan/2.5 μ m steps, + 3 m long RJ-45-style cable + M² lens
Includes M2-AAP and 2D-AAP

M2-AAP
2D-AAP

M² Accessory Adaptor Plate + Screws. (Attaches M2D to BeamScope for M² scan)
2-D Scan Stage Adaptor Plate + Screws. (Attaches M2D to BeamScope for 2D Scan)

CB1H

Magma CB1H interfaces PCI card to Notebook PC via Cardbus interface

Engineered as a System ... Delivered as a Solution