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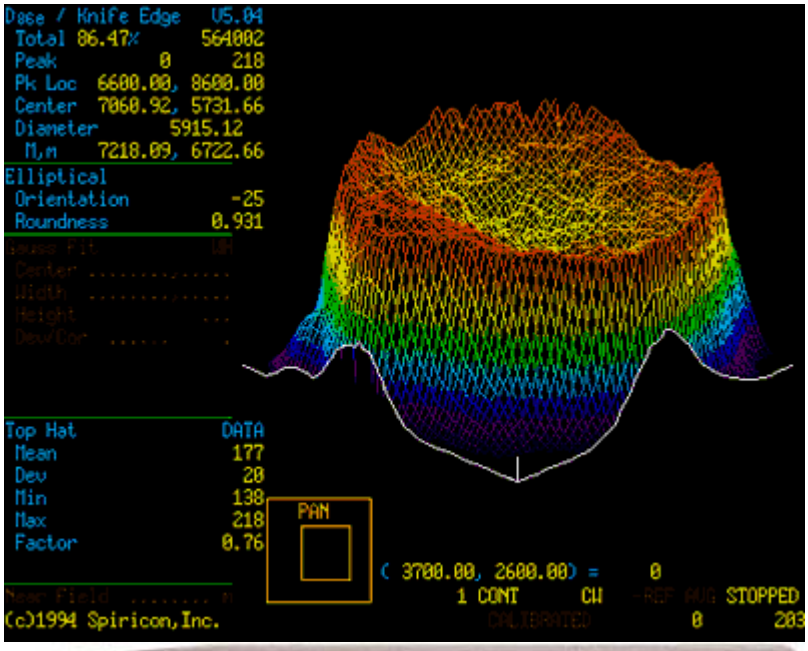
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Find the *MKS Instruments / Ophir / Spiricon LBA-100* at our website: *Click HERE*

Advanced Laser Beam Analyzer Model LBA-100A

from the Technology Leader

SPIRICON
Laser Beam Diagnostics





Displays and measures laser beam profiles with unparalleled clarity and accuracy.

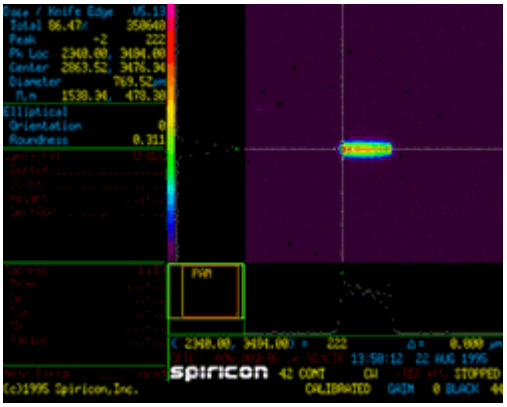
View Clear And Illuminating Beam Profile Displays!

Clearly seeing the beam profile is essential! Spiricon's LBA-100A provides all the options that you'll ever need. You see exactly what you need to see to start getting greater

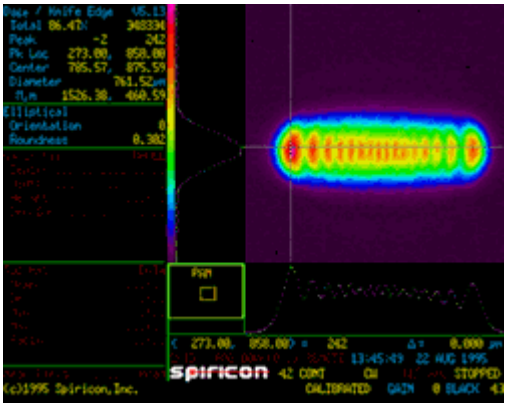
performance from your laser.

2D Beam Profiles Show The Entire Beam Simultaneously.

2D beam profile displays show the entire beam structure. The accompanying cross-sectional profiles help interpret the color contour plots.



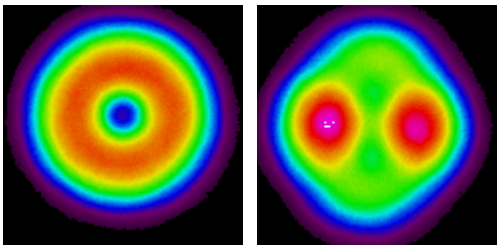
Laser diode shown at 1X Zoom



Laser diode shown at 4X Zoom

Shown at the left is the same laser diode beam displayed at 1X and 4X zoom. The LBA-100A maintains the same digitized resolution regardless of zoom. Note how the beam structure becomes more prominent when it is properly sized in the display.

See Beam Changes In Real-Time



HeNe multimode laser

2D profiles update at a real-time rate of 15Hz (about as fast as the eye can follow). Shown at the left are two successive profiles of a laser that was rapidly mode-hopping. As this laser was jumping from mode to mode, the beam power was very stable, illustrating the need to see the profile, not just measure the total power. The LBA-100A shows that for proper characterization, a laser needs not only the power measurement, but also a view of the beam profile.

With real-time beam profile displays you can maximize your laser performance more effectively than with any other technology or method.

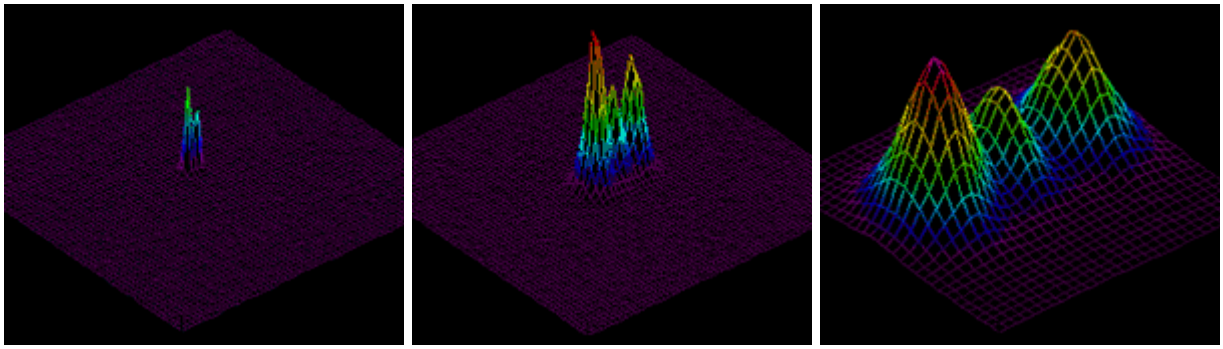
This Data sheet is composed of four parts, in order to increase loadtime efficiency.

Model LBA-100A
Fantastic 3D Displays Provide The Ultimate In Beam Profile Viewing And Recognition.

See The Finest Beam Structure With 3D Zoom

Do you want to see a tiny beam that covers only a few camera pixels? Simple, using Spiricon's combination of 1 to 4X 2D zoom, and 1 to 4X 3D zoom. This allows 16X overall magnification for a clear view of nearly focused spots.

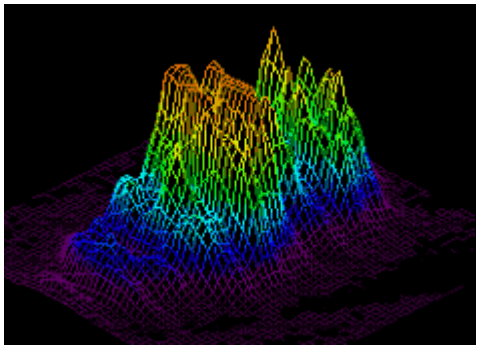
See the 3D beam profile at exactly the zoom you need.



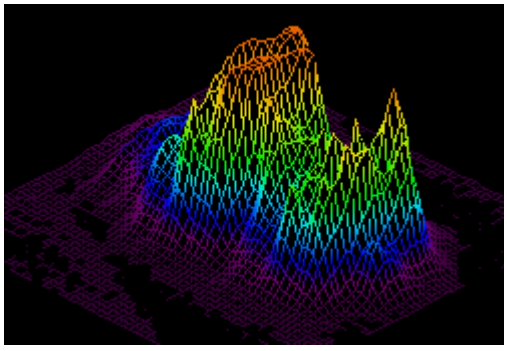
1X Zoom *4X Zoom* *16X Zoom*

Optionsof 3D zoom illustrating the possibility of viewing a profile of a small focused spot shown 1X at the left to 16X magnification at the right.

Choose The Optimum Beam Viewing Angle



R=45°, T=30°



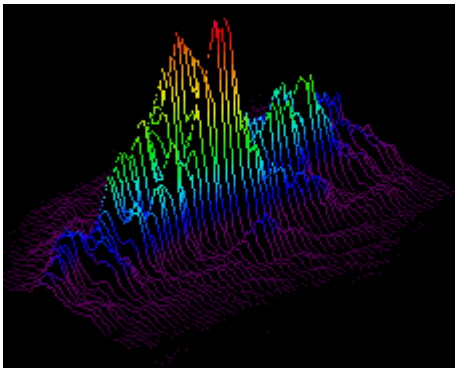
R=315°, T=30°

Where on the beam is the structure you want to see? At what rotation and/or tilt angle is the optimum viewing position? With the LBA-100A

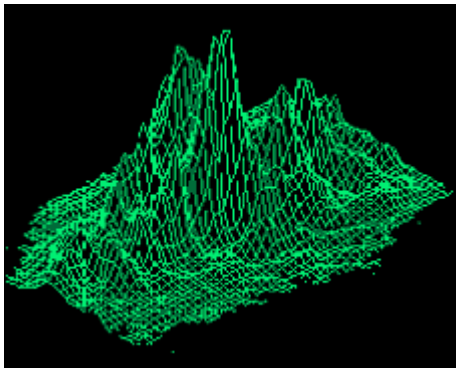
Two rotation and tilt angles of the same beam for optimum beam profile viewing

you get 72 options of rotation angle (every 5° through 360°), and 36 options of tilt angle (5° increments through± 90°).

Select Your Own Display Mode



60X120 single line



60X60 solid green

Two of the many 3D beam display modes.

You can choose between 8 options of display resolution, including 30X30 to 120X120 cross-hatch and 30X120 to 120X120 single line without cross-hatch. You have 5 choices of 3D color, including 16 color, 128 color and 128 shades of gray. Solid colors of green or orange are for use when goggles block one of the color segments.

Multiple options of magnification, rotation, tilt, color and resolution enable viewing the structure of the beam that is most important for you to see. 3D displays update as fast as 5Hz, which enables real-time laser tuning and following of subtle changes in laser characteristics. **The LBA-100A provides more viewing options that allow you to see the beam the way you need to see it.**

This Data sheet is composed of four parts, in order to increase loadtime efficiency.
For more information Go To:

Beam Display Page | 3-D Display Page | Beam Measurement Page | Specifications Page

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spiricon@cache.net

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Model LBA-100A

Achieve Precise Laser Beam Measurements!

"Measuring the width of a laser beam is like trying to measure the size of a cotton ball with a caliper." -Tom Johnston

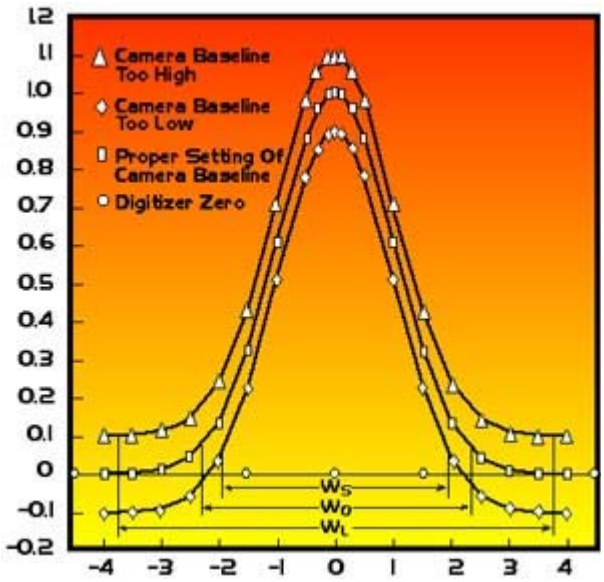


Figure 1. Effect of measured laser beam width, W, for camera baseline settings that are too high, just right, and too low relative to the digitizer zero.

Accurately measuring a laser beam width, W_0, is intensely complicated by the continuation of energy out into the wings of the beam as shown in Figure 1. Further complicating the measurement is DC drift in the camera and digitizer. This can create measurements too small, W_S, or too large, W_L, also shown in the figure.

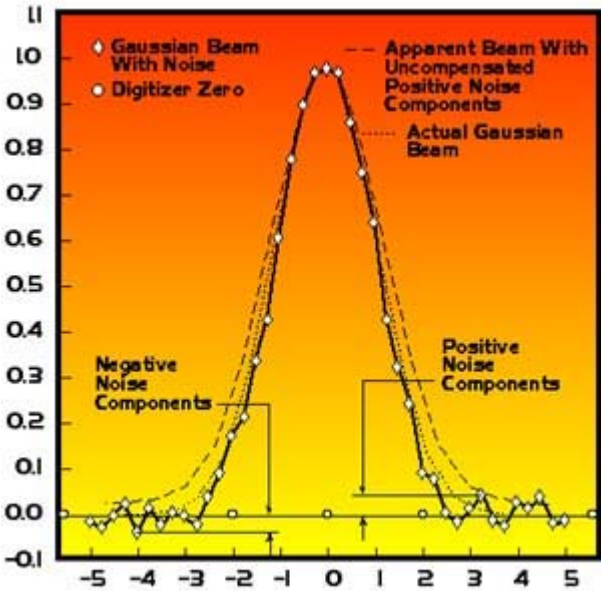


Figure 2. Noise in the wings of a laser beam distort the beam width measurement unless

A final complication arises from camera random noise, shown in Figure 2, that can distort beam width measurements unless properly processed.

"Autocalibrate" To The Rescue

Spiricon's patented "Autocalibrate" is the one beam analysis algorithm that properly accounts for camera DC drift and camera random noise.

First, "Autocalibrate" digitally sets the camera DC baseline precisely at zero. This is superior to simple "background subtraction" which relies on permanently setting the baseline high enough to accommodate all possible camera drift conditions, which sacrifices camera dynamic range.

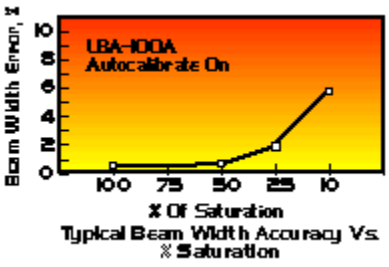
Secondly, the patented "Autocalibrate" is the only algorithm that keeps track of negative going noise components as shown in Figure 2. Without the negative noise components

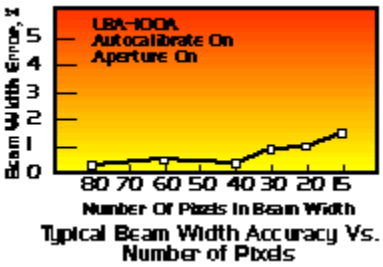
the negative components are retained to compensate for the positive components.

the computer will sense a net positive average DC offset even if the baseline is properly set at zero. The computer would then report a beam width too large, W_L.

No other beam analysis algorithm properly accounts for the negative noise components from the CCD camera. Thus, no other method can equal the accuracy of measurements made with Spiricon's "Autocalibrate"!

Beam Width Accuracy Vs. Intensity And Beam Size With "Autocalibrate"





To illustrate the power of "Autocalibrate", consider the accuracy of beam width measurements regardless of the beam intensity on the camera. Plotted at the left is a typical beam width accuracy, vs. the peak intensity level on the camera driving the LBA-100A, using the patented "Autocalibrate" function. Note that 6% measurements are achieved with the peak energy as low as 10% of saturation. "Autocalibrate" is simple and quick to activate whenever accurate beam measurements are required. It assures accurate beam width measurements regardless of beam intensity on the camera.

Consider the accuracy of beam width measurements regardless of the size of the beam. From large beams that fill the camera, to focused spots that cover only a few pixels, "Autocalibrate" provides the maximum possible accuracy. As shown in the second figure at the left, you can accurately measure beams that cover as few as 15X15 pixels. Don't be fooled by claims of other manufacturers who say that double the number of pixels captured provides greater accuracy than the LBA-100A.

Spiricon's LBA-100A also provides other easy to use functions such as frame averaging, results averaging and apertures to further increase the accuracy of beam parameter measurements.

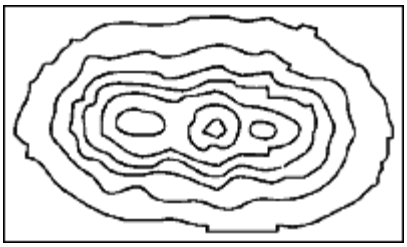
"Autocalibrate" is an exclusive patented process by Spiricon. With "Autocalibrate" the LBA-100A accurately measures laser beam width in the presence of baseline offset and noise in CCD and other cameras.

Accurately Measure Your Focused Beam Through The Waist.

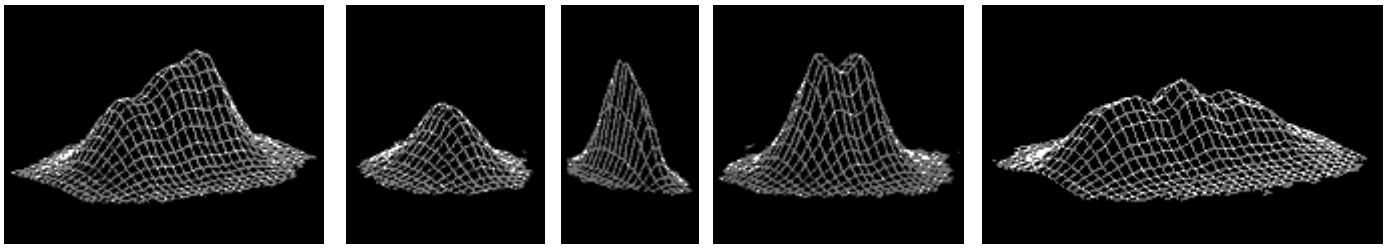
M^2 Measurements -- Pulsed and CW Lasers

Laser beam profiles often change in surprising ways near focus, especially depending on the mode content of the beam. In many laser applications it becomes essential to characterize the beam as it propagates through the waist. Spiricon's LBA-100A, in conjunction with the M^2 -101 Beam Propagation Analyzer, provides this characterization more thoroughly than any other method.

Focus minus 20mm *Focus minus 10mm* *Focus* *Focus plus 10mm*

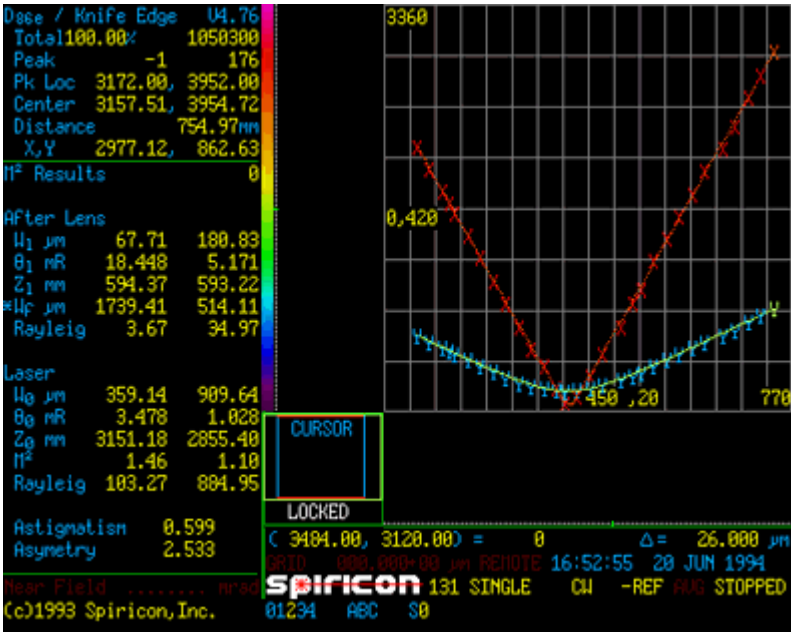


Focus plus 20mm



Beam profiles of a laser diode through focus. The M^2-101 and LBA-100A not only give M^2 but also enable complete 2D and 3D beam profile display and analysis through the critical beam waist region, and in the far field.

M^2-101 Beam Propagation Analyzer



M^2-101 Beam waist measurement and display

The M^2 -101 consists of an input lens and internal mirrors to couple the focused beam to a CCD camera. The mirrors are mounted on a movable table that automatically translates the beam imaged on the camera through the beam waist. Beam profile measurements are made and stored by the LBA-100A at each point along the beam path. Shown above is an illustration of how the beam profile of a "collimated" laser diode changes dramatically through the waist region.

The LBA-100A then plots the measured beam widths, performs a curve fit and calculates important beam parameters. These are displayed as shown at the left. Calculations include the beam propagation factor K, or times diffraction limit M^2, the laser divergence angle, the Rayleigh range, and others.



M^2-101 Instrument

Model LBA-100A

Performance Specifications:
The LBA-100A Meets Your Individual Needs The Way No Other Beam Analyzer Can!

2D Beam Profile Displays

Color Contour Plots On VGA Monitor
- Up to 15Hz display rate
- 2D/3D Hot Key
- Color options
  - 16 color, 128 color, 128 shades of gray

ZOOM Levels & PAN
- 1X, 2X, or 4X ZOOM
- Single pixel resolution at 4X
- PAN to any detector location
- Resolution (all zoom levels) 120X120 pixels
- High Resolution Display Mode
  - 464X360 pixels displayed, 512X480 storage

X And Y Cross Section Profiles
- Positioned manually or automatically through beam centroid or peak
- Secondary displays of a reference beam or a best-fit Gaussian plot

X-Y Cursors
- For precise dimensional measurements
- Origin can be set manually or at beam peak or beam centroid
- Numerical readout gives precise distance between origin and user positioned cursors

Apertures
- Overlay of user defined aperture
  - Calculations performed only inside aperture to reduce extraneous camera noise
  - Circle, square, ellipse, or rectangle to fit your beam shape
- Calculated aperture shows beam width calculation overlaid on beam profile display

Pointing Stability Histogram
- Displays beam centroid position with time

3D Beam Profile Displays

Up To 5Hz Real Time 3D Displays
- Color options: Hot keys toggle through 16 color,
  - 128 color, 128 shades of gray, solid green, or solid orange

Resolution Options
- Hot keys toggle through 27 resolution formats for the best display in each application, providing:
  - Cross-hatch displays
    - 120X120, 60X60, 40X40, 30X30

Without cross-hatch

120X120, 60X120, 40X120, 30X120

Zoom Control

Operates from any of the 2D zoom levels

3D zoom of 1X, 2X, 3X, or 4X

In conjuction with 2D zoom, provides total zoom capability from 1X to 16X

Rotation, Tilt, And Pan

Beam rotation every 5° through 360°

Tilt every 5° through ± 90°

Pan to any detector location

M^2 Display

Displays the focused beam width data points

Beam waist curve fit in X and Y dimensions

Quantitative Calculations Performed

Basic Calculations

Total power or energy

Relative display or calibrated to a known reference

Beam peak power or energy density

Beam peak location

Beam centroid location

Beam diameter

D86e method (enclosing 86% of beam energy)

Percent of energy method (level is user selectable)

Percent of peak method (level is user selectable)

Beam width

X and Y, or off-axis ellipse major and minor axes

Uses ISO knife-edge method for beam width measurement

Beam calculations are calibrated to the camera pixel spacing, or can be user altered for lens magnification

Aperture Overlay (Power-in-the-bucket)

All calculations performed only within selected aperture

(Improves accuracy by eliminating outside noise)

Aperture configurations

Circle, square, ellipse, rectangle

Aperture size, shape, position, and rotation angle continuously selectable by user

Calculates percent of energy within the aperture

Gaussian Fit

Whole beam (uses all points in beam, not just X and Y axes)

Line fit on X,Y or on major & minor axis of elliptical beams

Gaussian parameters:

Center location	Intensity at center
Widths in $1/e^2$ radius	Coefficient of fit

Top Hat Measurement

Mean, Standard Deviation, Minimum, Maximum, and Top Hat Factor

Rectangular, square, elliptical or round beams

Separate measurements in X,Y or major, minor axes

Elliptical

Orientation, Roundness factor
Major and minor axes beam widths

Divergence Angle

Near field measurement
Far field measurement
Separate X and Y measurement

Statistical Measurements

Mean, Standard Deviation, Minimum, Maximum
User selectable time interval from 1 second to 41 days
Parameters measured:

Total power or energy	X & Y or major & minor
Centroid position	beam widths

Pass/Fail Calculations -

Set maximum and minimum limits on calculations
Calculations evaluated by pass/fail

Total power or energy	Angle of major axis	Centroid position
Diameter or width	Top Hat limits	Gaussian fit coefficient limits

Passed parameters displayed in green, failed in red
Options on failed parameters

M^2 Measurement

Measures both X and Y axis:

Beam Propagation Factor K	Beam Waist Width
Times Diffraction Limit M^2	Beam Waist Position
Beam Divergence Angle	Rayleigh Range

Signal Enhancement Features

Autocalibrate

Automatic digital setting of camera baseline to enable precise beam width measurements
Patented method retains both positive and negative camera noise contributions to give greater accuracy than "background subtraction"
Enables ±5% accuracy measurements with the peak signal as low as 10% of saturation, or with as few as 15X15 pixels illuminated

Signal Processing Features

Multiple frame averaging
    Up to 256 frames for potential S/N gain up to 16X
Background/Reference frame subtraction
"Block Mode" or continuous data capture
    Up to 192 frames collected at up to the camera frame rate w (64 frames with standard memory)
Gamma Correction
    Corrects for tube cameras with nonlinear output

Synchronization Features

Trigger Capability

CW and Pulsed lasers
"Video Trigger" or "Auto-Sync" automatically captures asynchronous pulsed lasers
Internal or external pulse synchronization
Pulse trigger delay control for synchronization to pulsed lasers

Other Controls

Digital front panel Video GAIN and BACKGROUND control for easy manual adjustment of signal for optimum measurement
"Genlock" capability to operate with all standard cameras, RS-170 or CCIR
Camera integration mode
    Stores multiple frames on the camera for improved signal-to-noise ratio
Camera shutter control
    Electronic shutter reduces video signal to achieve electronic attenuation
    Electronic shutter also enables separation of one pulse from a pulse train
Multiple LBA-100A's can be master-slaved together
Multiple cameras can be interfaced to an LBA-100A using an external video switch
Frame capture at up to 100 frames per second

Control Features

Easy To Use Pulldown Menus

Individual menus for each function
All choices simultaneously displayed
Help screen from keypad
    Help menu for every menu and display function
    Help menus are context sensitive

Automatic Setup For Many Cameras

Menu selection for camera parameters
Autocalibrate sets proper baseline for each new camera. No need to return to factory for setup and no wasted dynamic range by setting the baseline high enough to allow background subtraction to compensate for all cameras.

Video RAM

2 MB standard - stores 64 frames. Expansion to 4MB to store up to 192 frames
In High Resolution mode stores 4 frames standard and 12 frames with expansion memory

Interface Features

Software Upgrade Capability Via 3 1/2" Floppy Disk

Software Interface

Interface to PC computers through RS-232C or National Instruments AT-GPIB hardware
    LBA-Link/A for downloading files
    LBA-3D/A for additional PC computer data processing
Hayes compatible modem remote control capability
Import, display, and print data and screen images on PC and Macintosh computers using common desktop publishing or graphics capture and display programs

Setup Configurations

Instrument automatically boots up into the last configuration before shutdown
Save and record four other precise setup configurations for instant recall

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Unlimited setups stored to disk
Display comment line recorded with data file
Time and date display on screen and saved to data files
Lock menu settings using personal password

Ports

RS-232C port
IEEE-488 GPIB High Speed Port
Up to 15 frames/second data transfer to computer
Supports multiple printer types
HP LaserJet, HP PaintJet, Epson compatible dot matrix, and others
Parallel and serial printer ports included
Multiple printing modes
Both beam display and calculated data
Beam display or data separately
3D or 2D beam displays
Printout of current setup parameters
Color or black and white

3.5" Disk Drive

720kB/1.44MB PC compatible
Stores 100 data files per 1.44MB disk
Optional 2.88MB disk stores 200 data files
Multiple formats for image files and data files
.TIF, .PCX, .BMP, ASCII

Other Instrument Compatibility

Pyrocam I, 124X124 pyroelectric solid-state camera
M^2 -101 Beam Propagation Analyzer

Power, Dimensions, and Weight

Line Voltage 100-125 VAC or 200-240 VAC
Line Frequency 50-60 Hz
Power consumption 50 Watts (without camera and monitor)
Environmental
Operating temp 0°C to +50°C
Storage temp -55°C to +75°C
Humidity 95%, non-condensing
Dimensions
W. 11.04", H. 4.02", L. 16.22"
Weight
Net: approximately 5.7kg (13lb)
Shipping: approximately 7.5kg (17lb)

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