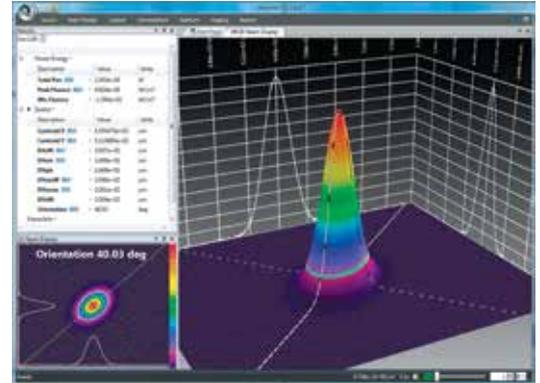




### 3.3.2 BeamMic™ – Basic Laser Beam Analyzer System

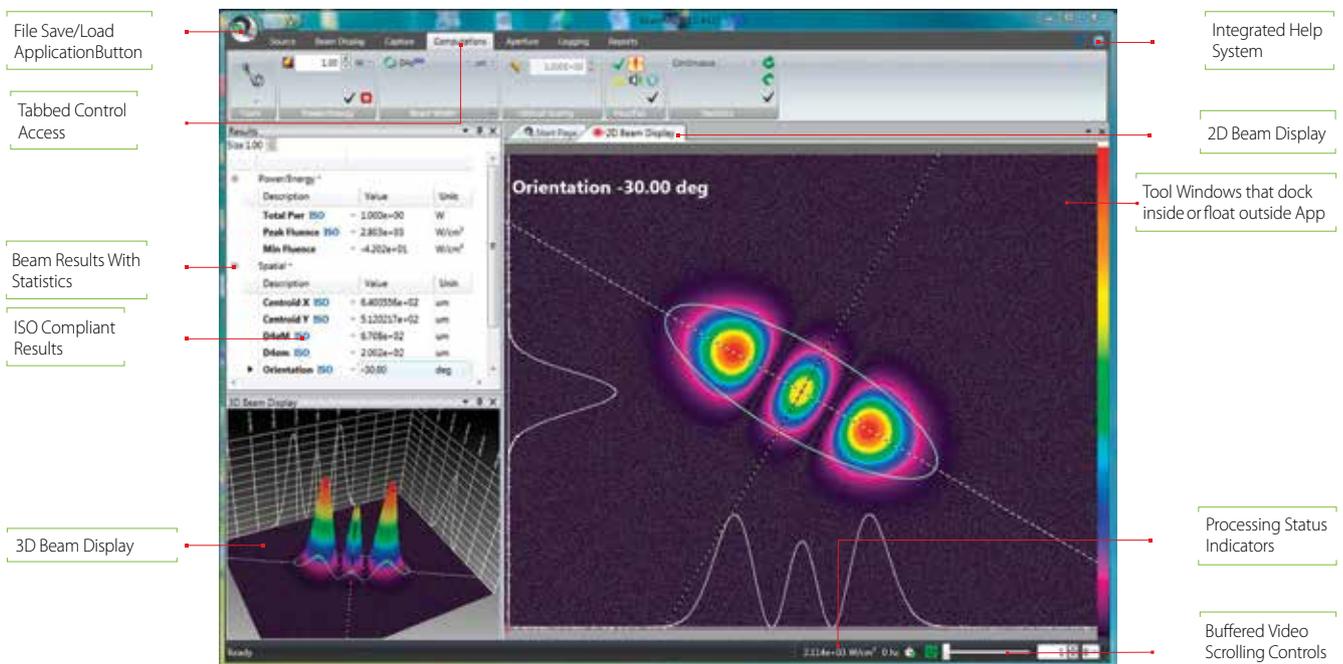
- High-speed false color beam intensity profile displays in both 2D and 3D
- Operates in Windows 7 and Windows 10
- Numerical beam profile analysis employs patented advanced calibration algorithms
- Extensive set of ISO quantitative measurements
- ISO beam width and diameter methods
- Enhanced window layout tools to get the most out of the desktop display area
- Pass/fail testing available on most all measured parameters
- Support for USB SPxxx series cameras
- Supports satellite windows on multiple monitors
- Continuous zoom scaling in both 2D and 3D
- Results logging capabilities exportable to Excel
- Industry std data file formats, HDF5 and CSV
- Configurable Report Generator that allows cut and paste of results, images and settings from .PDF and .XPS file types
- Statistical Analysis of all measured parameters
- Both Drawn and Auto Aperture for isolating beam data
- Integrated automatic Help linked into this .pdf Users Guide
- Automation interface via .NET components



BeamMic is an introductory product for those that do not need all of the features in our award winning beam profiling product, BeamGage. BeamMic includes a simplified set of measurements allowing for basic beam characterization to help improve your system performance without going to a full-featured SPC type system. This is perfect for the operator to do a quick check on the laser system prior to starting their process. BeamMic meets many of our industrial customer's basic needs at a cost effective price.

The beam's size, shape, uniformity or approximation to the expected power distribution, can make or break an application. Accurate knowledge of these parameters is essential to the accuracy of any laser-based application. As laser applications push the boundaries of laser performance it is becoming more critical to understand the operating criteria.

### BeamMic Main Display Screen



## Camera Compatibility

For lasers between 190-1100nm wavelengths, BeamMic interfaces to silicon CCD USB cameras. For applications between 1440-1605nm, BeamMic supports cost effective phosphor coated CCD cameras.

### 190-1100nm



Model	SP907	SP928
Spectral Response nm	190 - 1100nm*	190 - 1100nm*
Application	1/1.8" format, slim profile, wide dynamic range, CW & pulsed lasers, adjustable ROI	1/1.8" format, high resolution, wide dynamic range, CW & pulsed lasers, adjustable ROI
Number of Elements	964 x 724	1928 x 1448
Interface Style	USB 3.0	USB 3.0
Windows OS Support	Windows 7 and Windows 10	

\* May be useable for wavelengths below 350nm but sensitivity is low and detector deterioration may occur. Therefore UV image converter is recommended. Although our silicon cameras have shown response out to 1320nm it can cause significant blooming which could lead to errors of beam width measurement. We would suggest our XC130 InGaAs camera and BeamGage for these wavelengths to give you the best measurements.

### 1440-1605nm



Model	SP907-1550	SP928-1550
Spectral Response nm	1440 - 1605nm	1440 - 1605nm
Application	NIR wavelengths, 1/1.8" format, low resolution, adjustable ROI and binning	NIR wavelengths, 1/1.8" format, low resolution, adjustable ROI and binning
Number of Elements	964 x 724	1928 x 1448
Interface Style	USB 3.0	USB 3.0
Windows OS Support	Windows 7 and Windows 10	

\*\* Despite the small pixel size, the spatial resolution will not exceed 50µm due to diversion of the light by the phosphor coating.

### 3.3.2.1 Software Specifications

Features	BeamMic - Laser Beam Analyzer Software
Features Overview	<p>Designed for entry level or basic profiling needs</p> <p>Supports our patented Ultracal algorithm plus Auto-setup and Auto-exposure capabilities</p> <p>Extensive set of ISO quantitative measurements</p> <p>Support for high and low resolution USB cameras</p> <p>Simultaneous 2D and 3D displays</p> <p>Multi-instance, multi-camera use</p> <p>Supports Satellite windows on multiple monitors</p> <p>Continuous zoom scaling in both 2D and 3D</p> <p>Camera ROI support</p> <p>Manual and Auto-aperturing to reduce background effects</p> <p>Pass/Fail on all results items, w/multiple alarm options</p> <p>Results logging capabilities in a reloadable</p> <p>Industry standard data file format</p> <p>Configurable Report Generator that allows cut and paste of results, images and settings.</p> <p>Supports English, German, Japanese and Chinese Windows OS in 64bit . Multilingual GUI in English, Japanese and Chinese.</p>
Quantitative Calculations; Basic Results Power/Energy Results	<p>(per ISO 11145, 11146-1/-3, and 13694)</p> <p>Total power or energy</p> <p>Peak power/energy density</p> <p>Min. Fluence</p>
Spatial Results	<p>Peak and Centroid locations</p> <p>Beam width</p> <ul style="list-style-type: none"> <li>■ Second Moment (D4s)</li> <li>■ Knife Edge 90/10</li> <li>■ Knife Edge (User selectable level)</li> <li>■ Percent of Peak (User selectable)</li> <li>■ Percent of Total Energy (User selectable)</li> <li>■ Encircled power smallest slit @ 95.4</li> <li>■ Moving Slit (User Selectable)</li> </ul> <p>Beam diameter</p> <ul style="list-style-type: none"> <li>■ Average diameter (based on x/y widths)</li> <li>■ Second Moment (D4s)</li> </ul> <p>Elliptical Results</p> <ul style="list-style-type: none"> <li>■ Elliptical orientation</li> <li>■ Ellipticity</li> <li>■ Eccentricity</li> </ul>
2D Features	<p>Continuously zoomable and resizable displays in satellitable window</p> <p>Continuous Z axis display magnitude scaling</p> <p>Zoomable to subpixel resolution for origin and cursor placements</p> <p>Pixel boundaries delineated at higher zoom magnifications</p> <p>Adjustable Cursors that can track peak or centroid</p> <p>Adjustable manual apertures</p> <p>Viewable Auto-aperture placement</p> <p>Displayed beam width marker</p> <p>Integrated Mouse actuated pan/zoom controls</p> <p>Manual or fixed origin placement</p>
3D Features	<p>3D graphics utilize solid surface construction with lighting and shading effects</p> <p>Integrated Mouse actuated pan/zoom/tilt/rotate controls</p> <p>Selectable Mesh for drawing speed vs resolution control</p> <p>Continuously zoomable and resizable displays in satellitable window</p> <p>Continuous Z axis display magnitude scaling</p> <p>User enabled backplanes with cursor projections</p>
Statistical Analysis	<p>Performed on all measurement functions with on-screen display</p> <ul style="list-style-type: none"> <li>■ Choices of intervals</li> <li>■ Manual start/stop</li> <li>■ Time from 1 second to 1000 hours</li> <li>■ Frames from 2 to 99,999</li> </ul> <p>Measurements reported</p> <ul style="list-style-type: none"> <li>■ Current frame data, Mean, Standard Deviation, Minimum, Maximum of each calculation performed</li> </ul>

Features	BeamMic - Laser Beam Analyzer Software
File types	Industry Standard HDF5 data and setup file format which are compatible in third party applications such as MatLab and Mathematica Math program and Excel compatible ASCII-csv results files Graphics in jpg file format A user defined single file output that can contain settings, beam displays, beam profiles, results in either .pdf or .xps file formats
Printing	Images, reports, results, statistics and setup information Option to print many frames in a single operation WYSIWYG images
Pass/Fail	Set Maximum/Minimum limits on all calculations and statistics Red/Green font color indication on result items Multiple choices for indication of failed parameters, including TTL pulse for external alarm Master pass/fail which triggers alarm on any failure USB signal, beep, stop, and log alarm options
Logging	Results in ASCII-csv Continuous Logging Time Interval Logging Frame Count Logging Pass/Fail Sampling
Exporting	Convert frame buffer data to third party format Export a user specified number of frames from the buffer Export Image Data: ASCII-cvs Export Results: ASCII-csv Export Picture: jpg, gif, tiff, bmp, png file formats supported Export Image Data in Aperture
Integrated Help	PDF Operators Manual Context Sensitive (Whats this?) Help Context Sensitive Hints
Signal Conditioning for Enhanced Accuracy	Spiricon's patented Ultracal enables more accurate beam measurement and display. Ultracal takes a multi-frame average of the baseline offset of each individual pixel to obtain a baseline accurate to approximately 1/8 of a digital count. This baseline offset is subtracted from each frame, pixel by pixel, to obtain a baseline correction accurate to 1/8 digital count. Spiricon's Ultracal method retains numbers less than zero that result from noise when the baseline is subtracted. Retaining fractional and negative numbers in the processed signal can increase the beam width measurement accuracy by up to 10X over conventional baseline subtraction and clip level methods. Spiricon's Ultracal conforms to the best method described in ISO 11146-3:2004
Frame Averaging	Up to 256 frames can be averaged for a signal-to-noise ratio, S/N, improvement of up to 16X (Noise is averaged up to 1/256th [8 fractional bits]). Data is processed and stored in a 32bit format
Frame Summing	Up to 256 frames can be summed to pull very weak signals out of the noise Due to the precise nature of Ultracal baseline setting, (i.e., a retention of both positive and negative noise components) summing of frames can be performed without generating a large offset in the baseline
Convolution (Adjacent Pixel Averaging)	Choice of 5 convolution algorithms for spatial filtering for both display and calculations. Spatial filtering improves the visual S/N
Camera Features	Camera features are governed by the capabilities of the various cameras that will interface with these software products, and second by which of these camera features are implemented in the software. This section will describe typical camera features supported in the application Black Level Control (used by Ultracal and Auto-X and Auto-setup) Gain Control (used by Auto-X and Auto-setup) Exposure Control (used by Auto-X and Auto-setup) Pixel Sampling Bits per pixel setting External Trigger Input Trigger Delay Strobe Output Strobe Delay External Trigger Probe Internal Trigger Probe
Camera related features in the applications	These are features related to but not generally dependent upon the camera design Gamma Correction Gain Correction Bad Pixel Correction Lens Applied Option Pixel scale settings Magnification settings Frame buffer settings Ultracal Enable Auto-X (auto exposure control) Perform an Auto-Setup 8 & 12 bits per pixel Select Format Measure S/N ratio

Features	BeamMic - Laser Beam Analyzer Software
Trigger, Capture and Synchronization Methods	<p>Capture methods are features related to the application while Synchronization methods relate more to the abilities of the specific camera. NOTE: Frame capture rates are determined by many factors and are not guaranteed for any specific operating configuration.</p> <p>Trigger modes</p> <ul style="list-style-type: none"> <li>CW - captures continuously, see Capture Options below</li> <li>Trigger-In from laser: Trigger pulses supplied to the camera</li> <li>Strobe-Out to laser: Strobe pulses output from the camera</li> <li>Video Trigger: Frame captured and displayed only when the camera sees a signal greater than a user set level</li> </ul> <p>Capture options</p> <ul style="list-style-type: none"> <li>Capture options are redefined and are approached in a different manner than older products. The items listed below will allow for all of the previous methods but with more flexibility than ever before</li> <li>Results Priority: Results priority will slow the capture rate to be in sync with the computational results and display updates</li> <li>Frame Priority: Frame priority will slow results and display updating to insure that frames are collected and stored in the frame buffer as fast as possible (replaces block mode)</li> <li>Stop After: Will collect a set number of frames and then stop (replaces Single-Shot mode)</li> <li>Periodic: Will collect frame at a programmed periodic rate</li> <li>Periodic Burst: Will collect frames in a Burst at programmed periodic rates</li> </ul> <p>Post processing is still available but is done via a different mechanism and is limited to only data file sources</p>
Automation Interface (.NET)	<p>Automation Interface with examples in LabVIEW, Excel and Net VB</p> <p>Automate launch and termination of the application</p> <p>Automate start, stop, Ultracal, Auto-X and Auto Setup</p> <p>Automate the loading of application setups</p> <p>Automate control of most camera settings</p> <p>Automate a subset of the application features and controls</p> <p>Automate the capture of Binary Video Data</p> <p>Automate the acquisition of application results</p> <p>Automate the acquisition of application Images</p>
System Requirements	<p>PC computer running Windows 7 and Windows 10 Laptop or Desktop.</p> <p>GHz Pentium style processor, dual core recommended</p> <p>Minimum 2GB RAM</p> <p>Accelerated Graphics Processor</p> <p>Hard drive space suitable to hold the amount of video data you expect to store (50-100 GB recommended)</p> <p>Windows 7 (64) and Windows 10</p>

### 3.3.2.2 Ordering Information

Item	Description	P/N
<b>BeamMic USB2 Beam Analyzer Systems (camera and software)</b>		
BM-USB-SP907-OSI	BeamMic software, software license, 1/1.8" format 964X724 pixel camera with 4.5mm CCD recess. Comes with USB cable and 3 ND filters	SP90425
BM-USB-SP907-1550-OSI	BeamMic software, software license, 1/1.8" format 964X724 pixel camera with 4.5mm CCD recess. Phosphor coated to 1550 nm. Comes with USB cable and 3 ND filters	SP90426
BM-USB-SP928-OSI	BeamMic software, software license, 1/1.8" format 1928X1448 pixel camera with 4.5mm CCD recess. Comes with USB and cable and 3 ND filters	SP90427
BM-USB-SP928-1550-OSI	BeamMic software, software license, 1/1.8" format 1928X1448 pixel camera with 4.5mm CCD recess. Phosphor coated to 1550 nm. Comes with USB and cable, 3 ND filters	SP90428
<b>Software Upgrades</b>		
BeamMic to BGS Upgrade	Upgrade BeamMic to BeamGage Standard Edition. Requires a camera key to activate. (SP cameras may require a firmware upgrade to enable ROI features)	SP90219
BeamMic to BGP Upgrade	Upgrade BeamMic to BeamGage Professional Edition. Requires a camera key to activate (SP cameras may require a firmware upgrade to enable ROI features)	SP90229
<b>Optical Synch for Pulsed Lasers</b>		
Photodiode Trigger, Si, 1100	Optical trigger assembly which can be mounted on camera or separately to sense laser pulses and synchronize SP cameras with pulses. See optical trigger data sheet	SP90408
<b>Recommended Optional</b>		
LBS-300s-BB	Dual beam splitters and configurable 9 ND filters for 190-1550nm; screws onto front of camera	SP90467