

3.3.3 Focal Spot Analyzer

Measure how focal distance shifts with power

- Image focal spots down to 37µm in size
- For laser powers up to 400W (additional external ND filters required)
- Can measure systems with focal length as short as 73mm (exact path length distance within the assembly will be NIST calibrated and includes a calibration certificate +/-50µm)
- Produces undistorted sample of laser under test
- Adjustable attenuation maximizes system dynamic range
- Up to 1×10^{-10} attenuation available (without external filters)
- Analyzer includes camera, attenuation, BeamGage software and calibration certificate



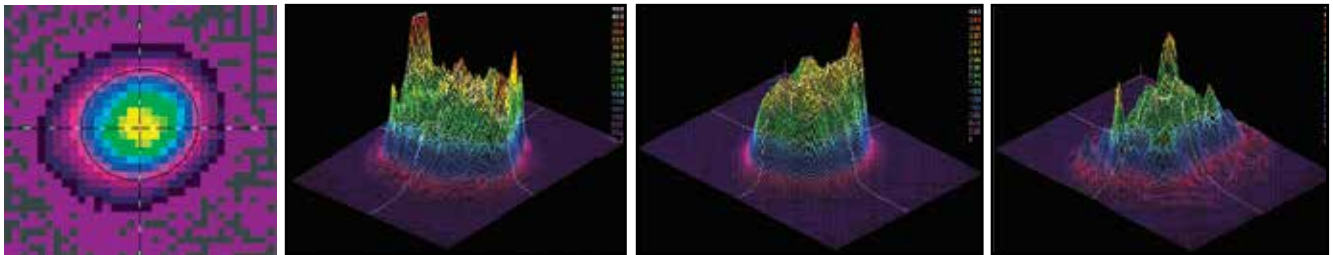
Measure your laser beam power distribution and focal spot size of wavelengths from 266 – 1100nm. The average power can be from <1 to 400 Watts and the focal spot can be as small as 37µm. The FSA can also be used to measure how the focal spot shifts with power during its critical start-up phase.

The FSA includes; choice of high resolution camera, 2 beam splitters, a removable beam block on the 2nd splitter, and user selectable attenuation filters prior to the beam entering the camera.

Operation

The assembly is placed below the final focusing lens of the laser at a distance equal to the expected focal length. The focal spot is found by moving the assembly closer and farther from the beam until the smallest spot size is seen. The distance between the focusing lens and the datum point on the FSA assembly is added to the distance from the datum to the camera array (each FSA assembly will be factory calibrated to within +/- 50 µm). These two measurements will give you the exact distance of your lasers focal spot.

Examples of Usage



65µm diameter focal spot

Focal spot spatial power density changing with laser power level

Specifications

| Model | SP928 | LT665 |
|---|--|--|
| Application | 1/1.8" format | 1" format |
| Spectral Response | 190 - 1100nm ⁽²⁾ | 190 - 1100nm ⁽²⁾ |
| Active Area | 7.1mm x 5.3mm | 12.5mm x 10mm |
| Pixel spacing | 3.69µm | 4.54µm x 4.54µm |
| Number of effective pixels | 1928 x 1448 | 2752 x 2192 |
| Minimum system dynamic range | 56 dB | 54 dB |
| Linearity with Power | ±1% | ±1% |
| Accuracy of beam width | ±2% | ±2% |
| Frame rates in 12 bit mode ⁽⁴⁾ | 13 fps at full resolution | 27 fps at full resolution |
| Shutter duration | 30µs to multiple frames | 31µs to multiple frames |
| Gain control | 0 dB to 24 dB | 0.8 dB to 56 dB |
| Trigger | Hardware/Software trigger & strobe out | Hardware/Software trigger & strobe out |
| Photodiode trigger | N/A | Si response: SP90408 |
| Saturation intensity ⁽¹⁾ | 0.97µW/cm ² | 1.3µW/cm ² |
| Lowest measurable signal ⁽¹⁾ | 1.2nW/cm ² | 0.3nW/cm ² |
| Damage threshold | 50W/cm ² / 0.1J/cm ² with all filters installed for < 100ns pulse width ⁽³⁾ | 50W/cm ² / 0.1J/cm ² with all filters installed for < 100ns pulse width ⁽³⁾ |
| Dimensions | 48 mm x 44 mm x 20.2 mm | 43 mm x 43 mm x 65 mm |
| CCD recess | 4.5 mm | 17.5mm |
| Image quality at 1064nm | Pulsed with trigger sync - excellent Pulsed with video trigger - good CW - good | Pulsed with trigger sync - excellent Pulsed with video trigger - good CW - good |
| Operation mode | Interline transfer CCD | Quad Tap interline transfer CCD |
| Software supported | BeamGage STD or PRO | BeamGage STD and PRO |
| PC interface | USB 3.0 | USB 3.0 |
| OS Supported | Windows 7 (64) and Windows 10 | Windows 7 (64) and Windows 10 |

Notes:

(1) Camera set to full resolution at maximum frame rate and exposure times, running CW at 632.8nm wavelength. Camera set to minimum useful gain for saturation test and maximum useful gain for lowest signal test.

(2) Camera 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 significant errors of beam width measurement. We would suggest our XC130 InGaAs camera for these wavelengths to give the best measurements.

(3) This is the damage threshold of the filter glass of the filters. Assuming all filters mounted with ND1 (red housing) filter in the front. Distortion of the beam may occur with average power densities as low as 5W/cm².

(4) Highly dependent on PC processor and graphics adapter performance.

Ordering Information

| Model | LBS-300s-UV | LBS-300s-VIS | LBS-300s-NIR | LBS-300s-BB |
|--|---|---|---|------------------------------------|
| Wavelength | 266-355nm | 400-700nm | 1064nm | 190-1550nm |
| Wedge Material | UVFS | UVFS | UVFS | UVFS |
| Wedge Coating | A/R ≤1% | AR ≤1% | AR ≤1% | No coating, 4% reflection |
| Clear aperture | 17.5mm | 17.5mm | 17.5mm | 17.5mm |
| Reflection | 0.01% | 0.01% | 0.01% | 0.16% |
| Wedge ND value, each | ND ≥2 | ND ≥2 | ND ≥2 | ND ~1.3 |
| ND Filters | Inconel | Bulk ND | Bulk ND | One each of the UV, VIS & NIR sets |
| ND Values, nominal | 0.3, 0.7, 1.0, 2.0, 3.0, 4.0 (Blu holders) | 0.3, 0.7, 1.0, 2.0, 3.0, 4.0 (Grn holders) | 0.3, 0.7, 1.0, 2.0, 3.0, 4.0 (Red holders) | See UV, VIS and NIR descriptions |
| Filter Slides | 3 | 3 | 3 | 9 |
| Maximum allowable input to filter ⁽¹⁾ | 100 W/cm ² CW 20mJ/cm ² , 10ns pulse | 50 W/cm ² 1J/cm ² , 10ns pulse | 50 W/cm ² 1J/cm ² , 10ns pulse | See adjacent specifications |
| Note: | (1) ND bulk absorbing filters damage threshold is 50W/cm ² but should be used at <5W/cm ² to avoid thermal lensing effects. | | | |

Ordering Information

| Item | Description | P/N |
|----------------------------|---|---------|
| BGS-LBS-300s-UV-CAL | LBS-300s-UV beam splitter & neutral density filters combo + BeamGage Standard software, software license, 1/1.8" format 1928X1448 pixel camera + NIST traceable calibrated path length from top of unit to CCD array. Comes with USB cable and 3 ND filters. | SP90456 |
| BGS-LBS-300s-UV-CAL-LT665 | LBS-300s-UV beam splitter & neutral density filters combo + BeamGage Standard software, software license, 1" format 2752X2192 pixel camera + NIST traceable calibrated path length from top of unit to CCD array. Comes with USB cable and 3 ND filters. | SP90477 |
| BGS-LBS-300s-VIS-CAL | LBS-300s-VIS beam splitter & neutral density filters combo + BeamGage Standard software, software license, 1/1.8" format 1928X1448 pixel camera + NIST traceable calibrated path length from top of unit to CCD array. Comes with USB cable and 3 ND filters. | SP90457 |
| BGS-LBS-300s-VIS-CAL-LT665 | LBS-300s-VIS beam splitter & neutral density filters combo + BeamGage Standard software, software license, 1" format 2752X2192 pixel camera + NIST traceable calibrated path length from top of unit to CCD array. Comes with USB cable and 3 ND filters. | SP90478 |
| BGS-LBS-300s-NIR-CAL | LBS-300s-NIR beam splitter & neutral density filters combo + BeamGage Standard software, software license, 1/1.8" format 1928X1448 pixel camera + NIST traceable calibrated path length from top of unit to CCD array. Comes with USB cable and 3 ND filters. | SP90458 |
| BGS-LBS-300s-NIR-CAL-LT665 | LBS-300s-NIR beam splitter & neutral density filters combo + BeamGage Standard software, software license, 1" format 2752X2192 pixel camera + NIST traceable calibrated path length from top of unit to CCD array. Comes with USB cable and 3 ND filters. | SP90479 |
| BGS-LBS-300s-BB-CAL | LBS-300s-BB beam splitter & neutral density filters combo + BeamGage Standard software, software license, 1/1.8" format 1928X1448 pixel camera + NIST traceable calibrated path length from top of unit to CCD array. Comes with USB cable and 3 ND filters. | SP90459 |
| BGS-LBS-300s-BB-CAL-LT665 | LBS-300s-BB beam splitter & neutral density filters combo + BeamGage Standard software, software license, 1" format 2752X2192 pixel camera + NIST traceable calibrated path length from top of unit to CCD array. Comes with USB cable and 3 ND filters. | SP90480 |
| BGP-LBS-300s-UV-CAL | LBS-300s-UV beam splitter & neutral density filters combo + BeamGage Professional software, software license, 1/1.8" format 1928X1448 pixel camera + NIST traceable calibrated path length from top of unit to CCD array. Comes with USB cable and 3 ND filters. | SP90460 |
| BGP-LBS-300s-UV-CAL-LT665 | LBS-300s-UV beam splitter & neutral density filters combo + BeamGage Professional software, software license, 1" format 2752X2192 pixel camera pixel camera + NIST traceable calibrated path length from top of unit to CCD array. Comes with USB cable and 3 ND filters. | SP90481 |
| BGP-LBS-300s-VIS-CAL | LBS-300s-VIS beam splitter & neutral density filters combo + BeamGage Professional software, software license, 1/1.8" format 1928X1448 pixel camera + NIST traceable calibrated path length from top of unit to CCD array. Comes with USB cable and 3 ND filters. | SP90461 |
| BGP-LBS-300s-VIS-CAL-LT665 | LBS-300s-VIS beam splitter & neutral density filters combo + BeamGage Professional software, software license, 1" format 2752X2192 pixel camera + NIST traceable calibrated path length from top of unit to CCD array. Comes with USB cable and 3 ND filters. | SP90482 |
| BGP-LBS-300s-NIR-CAL | LBS-300s-NIR beam splitter & neutral density filters combo + BeamGage Professional software, software license, 1/1.8" format 1928X1448 pixel camera + NIST traceable calibrated path length from top of unit to CCD array. Comes with USB cable and 3 ND filters. | SP90462 |
| BGP-LBS-300s-NIR-CAL-LT665 | LBS-300s-NIR beam splitter & neutral density filters combo + BeamGage Professional software, software license, 1" format 2752X2192 pixel camera + NIST traceable calibrated path length from top of unit to CCD array. Comes with USB cable and 3 ND filters. | SP90483 |
| BGP-LBS-300s-BB-CAL | LBS-300s-BB beam splitter & neutral density filters combo + BeamGage Professional software, software license, 1/1.8" format 1928X1448 pixel camera + NIST traceable calibrated path length from top of unit to CCD array. Comes with USB cable and 3 ND filters. | SP90463 |
| BGP-LBS-300s-BB-CAL-LT665 | LBS-300s-BB beam splitter & neutral density filters combo + BeamGage Professional software, software license, 1" format 2752X2192 pixel camera + NIST traceable calibrated path length from top of unit to CCD array. Comes with USB cable and 3 ND filters. | SP90484 |