Negative Lenses for LBS-300s for Focal Spot Analysis

P/N: SP90187, SP90188, SP90191

Negative lens shown mounted to the LBS-300 and camera
(LBS-300 and camera must be ordered separately)

Before discussing the negative lens assembly, please read the user notes for the LBS-300: https://www.ophiropt.com/laser--measurement/sites/default/files/LBS-300s-USER-NOTES_0.pdf

The negative lens series allow the measurement of the focal spot for relatively high power NIR laser beams. The LBA-300s has the ability to attenuate the beam to safe levels, however, the focal length of many laser systems is too short to reach the camera detector through the LBS-300s. The negative lens assembly lengthens the path of the focusing beam allowing the focal spot to reach the camera detector. The negative lens also has the added benefit of magnifying the beam to make measurements of focal spots easier.

The Beam Profiler Finder program on the Ophir website can help you decide if you need a negative lens and which one to choose. It will also determine if you are within permitted laser power and energy density limits.
https://www.ophiropt.com/laser--measurement/beam-profiler-finder

Alternatively, look at the diagram and formulas in Appendix A below.

Assembly:

The negative lens assembly simply screws into the input port of the LBS-300s.

Operation:

1. Make sure that there is a beam stop capable of handling the full power of the laser installed in the path of the deflected beam from the LBS-300s.

2. Calculate the distance D from the negative lens to the focusing lens of the laser using the formulas in Appendix A. Calculate the distance D from the negative lens to the laser. (See Appendix A)

3. Start the beam profiling software and adjust the LBS-300s until the beam image is centered and not saturated. Adjust the distance from the LBS-300s to the laser source until the displayed spot size is minimized. For additional information on using beam profiling software, consult the beam profiler user manual.

4. 4. To obtain the correct spatial results from the beam profiling software, the pixel scaling factor will need to be set to the magnification factor. The approximate magnification factor is provided by the spreadsheet or from the calculations in Appendix A.

To find the exact scaling factor, move the camera and beam sampler a known distance in a lateral direction while measuring the movement indicated by the software. The final scaling factor is: (movement indicated by software) / (actual movement)
Use this factor to modify the scaling in the beam profiling software.

Ordering Information (1) ::

Item	Focal length	P/N
FSA-50Y	-50mm	SP90187
FSA-100Y	-100mm	SP90188
FSA-200Y	-200mm	SP90191

(1) These lenses are coated for 1030 – 1070nm. Lenses for other wavelengths are available if requested.

Appendix A
Calculation of Distances for focal spot analysis

The correct placing of the focal spot assembly depends on the distance from the source to the focal spot and on the configuration of the system. In order to calculate this, you must determine the distance from the negative lens to the CCD as well as the distance from the source (or closest spot you can approach to the focusing lens) to the focal spot.

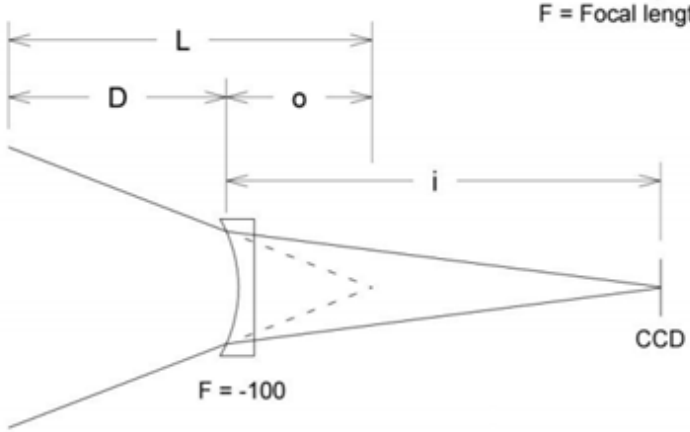
Calculate the placement as follows:

1. Make sure that there is a beam stop capable of handling the full power of the laser installed in the path of the deflected beam from the LBS-300s.
2. Calculate the distance D from the negative lens to the focusing lens of the laser using the formulas in Appendix A. Calculate the distance D from the negative lens to the laser. (See Appendix A)
2. The focal length of the negative lens F as chosen by the user and may be -50, -100, -or -200mm.
3. The distance L from the source to the focal spot will be the focal length of the system lens less the distance from the lens to the nearest approach point in the system to the lens.
4. When the above is known, calculate the distance D to place the negative lens from the source using the formula D = L + 1/(1/F-1/i). See the example below. The negative lens adapter extends 6.3mm above the negative lens, so when measuring the placement of the beam sampling system, use D - 6.3mm for the distance from the end of the FSA adapter to the source.

The Beam Profile Finder on the Ophir website will also calculate if a negative lens is needed, which one is needed and what the approximate magnification will be.

EXAMPLE

for: L = Source to Focus = 70mm
i = Internal path length from lens to CCD = 84mm
F = Focal length of negative lens = -100mm



formulas:
1/o + 1/i = 1/F
1/o = 1/F - 1/i
o = 1/ (1/F - 1/i)

D = L + o
D = L + 1/ (1/F - 1/i)

M = -i / o

o = Negative lens to original focus = 1/ (1/ -100mm - 1/84mm) = 45.6mm
D = Source to Negative lens = 70mm + 1/ (1/-100mm - 1/84mm) = 24.3mm
M = Magnification factor = -79.8mm / -44.4mm = 1.84