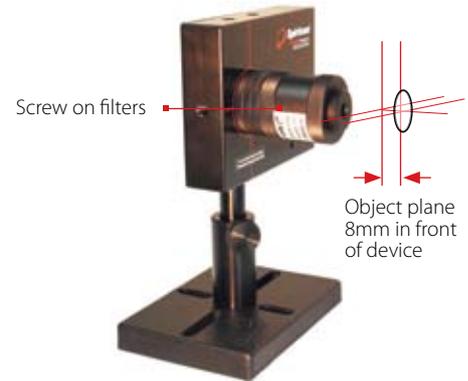


### 3.5.4 Beam Expanders Microscope Objectives



Model	Beam Expander	4X Beam Expander with UV Converter
Wavelength	400-1800nm	193nm-360nm
Beam Size Change	4X, 6X, 12X, 22X	4X Expansion
Clear aperture	1/4 the size of the CCD imager	
Mounting	C or CS Mount Threads	



Camera with 4X beam Expander (SPZ12022)

Beam expanders are designed to work with C-mount threaded cameras that have 4.5mm imager back focal spacing or with CS (12.5mm) back focal spacing. The 4X beam expander is an expanding telescope that images the beam as it looks at 8mm from the end of the expander onto the CCD while enlarging the image 4X. In addition to the 4X beam expander, other microscope objectives are available for expanding the beam even more. There are objectives for 6X, 12X, and 22X expansion. The various expanders allow the use of our 2% and 10% filters as well as the variable attenuator so as to accommodate the camera to a wide range of source intensities.

With a camera having 4.4µm pixel spacing using the beam expander, the effective resolution can be as good as 0.5µm. The object plane that is imaged onto the CCD is located several mm in front of the assembly so even hard to get to focal spots and other small images are easy to image. The beam expanders are designed to accommodate up to 3 screw on filters or a variable attenuator behind them so a wide range of intensities can be accommodated.

For intensities too large to be accommodated by just filters, beam splitters are available to reduce the intensity before the beam expander. The beam expander is primarily intended for nonparallel beams such as focal spots and fiber tips. If small parallel beams are imaged, interference effects may occur.

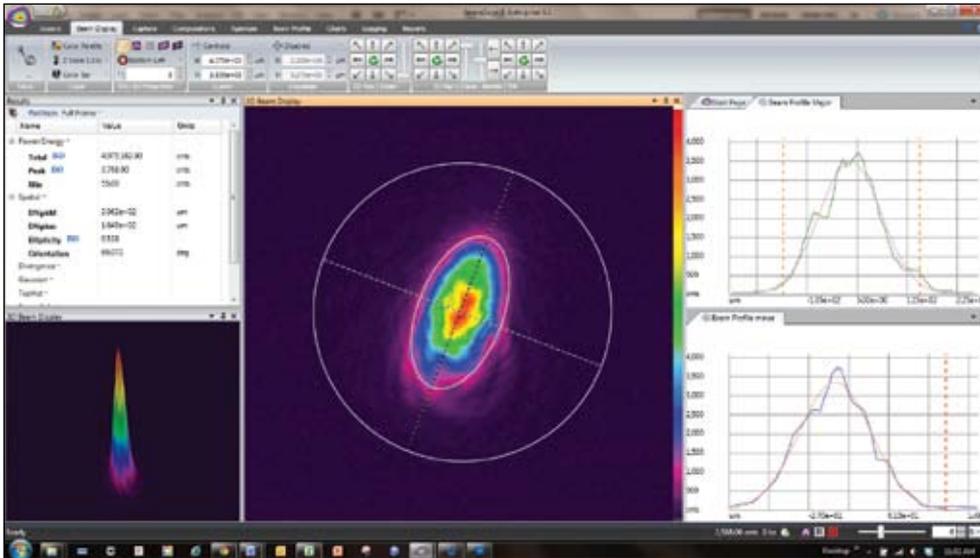
The 4X Beam expander can also be fitted with a UV converter plate at its object plane so that you can look at small beams in the spectral range 193-360nm and expand them 4X. See ordering information for further details.



Camera with 12X Expanding Microscope Objective (SPZ08259)



Camera with 4X Beam Expander (SPZ17022) and SPZ17027 Beam Splitter



Shown is an image of the tip of a single mode fiber measuring  $16\mu\text{m}$  by  $30\mu\text{m}$  in the two axes. The beam width as measured on the profiles shows 4X the actual size so we can measure to a resolution of  $\sim 2\mu\text{m}$ .

Approximate expansion ratio	Spectral range	Distance from lens barrel to focus	Distance from focus to 1 <sup>st</sup> beam splitter	Distance of closest approach to focus with 1 beam splitter	Total length of assembly
4X	400 - 1800nm	8mm	18mm	32mm	50mm
6X	600 - 1064nm	16mm	10mm past 1 <sup>st</sup> surface	4.5mm	107mm
12X	600 - 1064nm	6mm	6mm	20mm	101mm
22X	600 - 1064nm	2.4mm	8mm	22mm	102mm

The UV converter is a UV sensitive plate that can be mounted over the 4X Beam Expander.

The UV sensitive plate is positioned at the object plane of the 4X beam expander, 8 mm in front of the unit. When UV radiation hits the fluorescent plate, it absorbs the UV radiation and re-emits visible light proportionate to the incident UV light. This light pattern is then expanded 4 times and imaged onto the imager of a C-mount camera.

Specifications	4X Beam Expander with UV converter
Beam Reduction	4X expansion $\pm 2\%$ with included correction factor
Spectral range	193 - 360nm
Resolution	$15\mu\text{m} \times 15\mu\text{m}$ ;
Minimum signal	$\sim 50\mu\text{J}/\text{cm}^2$
Saturation intensity	$\sim 30\text{mJ}/\text{cm}^2$ at 193nm, $\sim 15\text{mJ}/\text{cm}^2$ at 248nm 20 times greater with optional beam splitter
Effective Aperture	1/4 the size of the CCD dimensions
Damage threshold	$0.1\text{J}/\text{cm}^2$ w/o beam splitter, $2\text{J}/\text{cm}^2$ w/ beam splitter
Dimensions	$\varnothing 31\text{mm}$ dia x 120mm length



Camera with 4X Beam Expander and UV Image Converter

## Ordering Information

Item	Description	P/N
4X reimaging beam expander	Screw optical assembly that images the plane 8 mm in front of the expander onto the CCD while enlarging it 4X. Fits 4.5mm recess and CS mount cameras	SPZ17022
Fiber adapter bracket for 4X beam expander	Screw on bracket to use with Ophir fiber adapters so fiber is held in correct position to image fiber tip onto camera. Will give exact focus with FC type fiber	SPG01649
UV converter assembly for 4X beam expander	Screw on assembly which has UV plate that converts 193 - 360nm radiation to visible. This plate is at the object plane of the 4X expander so it produces a 4X enlarged image on the CCD	SPZ17019
6X expanding microscope objective	Screw optical assembly that images the plane 16mm in front of the lens onto the CCD while enlarging it $\sim 6\text{X}$ . Fits 4.5mm recess and CS mount cameras. Needs spacer assembly SPZ08261	SPZ08257
12X expanding microscope objective	Screw optical assembly that images the plane 6mm in front of the lens onto the CCD while enlarging it $\sim 12\text{X}$ . Fits 4.5mm recess and CS mount cameras. Needs spacer assembly SPZ08261	SPZ08259
22X expanding microscope objective	Screw optical assembly that images the plane 2.6mm in front of the lens onto the CCD while enlarging it $\sim 22\text{X}$ . Fits 4.5mm recess and CS mount cameras. Needs spacer assembly SPZ08261	SPZ08260
Spacer assembly for objectives	Spacer assembly for above. One only needed for all expanders above	SPZ08261
Beam splitter for expanders above	45 degree angle wedge beam splitter which mounts onto beam expander. Reduces beam intensity by $\sim 20$ times. For spectral range 190 - 2500nm. Introduces 35mm extra beam path to object plane	SPZ17027
Additional beam splitter for above	Additional beam splitter to mount to 1st beam splitter	SPZ17026