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User Notes

4X BEAM REDUCER

P/N SPZ17017

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4x Beam Reducer P/N SPZ17017

The 4X Beam Reducer is an imaging system that images the plane 30cm in front of the reducer onto the camera sensor while reducing the size by approximately 4 times and inverting it. This device can only be used with cameras having a 4.5mm setback of the imager. It will not work correctly on cameras with C- or CS-mount imager spacing.

The beam reducer requires the use of exactly 3 (and no more than 3), 4mm spacers/C-mount ND filters. The spacers and ND filters may be mixed in any combination so long as they total 3. A set of 3 ND filters are provided with Ophir cameras. The 4X Beam reducer also includes 3 ND filters in case you require more attenuation, or if you have misplaced those supplied with the camera. If you use more or less than 3 ND filter/spacer combinations at one time then the focal points and magnification of the reducer will be altered.

Since the intensity of a beam after reduction will be increased by 4x4=16 times, it is advisable to attenuate the beam more than you would without beam reduction. This can be done with additional external filters and beam splitters placed in front of the beam reducer as described below.

CAUTION: The damage threshold for the ND filters is 50 Watts/cm² or 1J/cm². Make sure that the power/energy density in the beam as it hits the ND filters does not exceed this amount. At power levels >5 watts the ND filters may start to thermal lens and deform the observed beam profile.

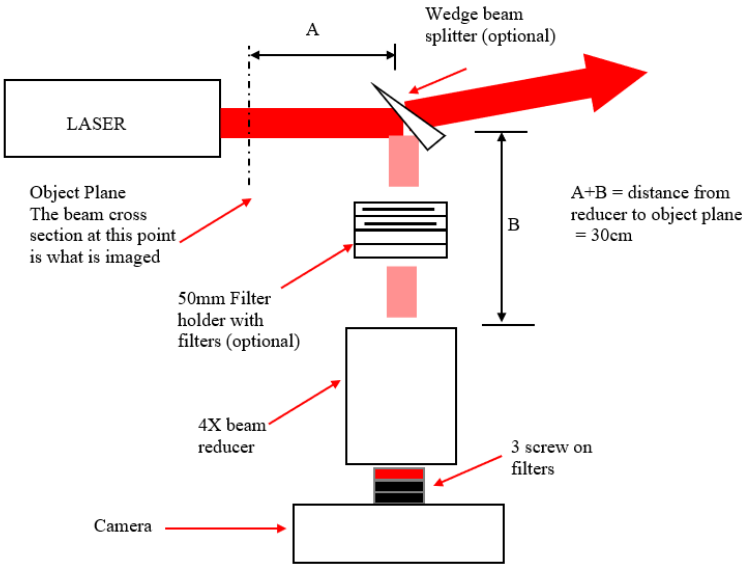
If you use the optional beam splitter and 50mm square ND filters, described below, the energy per pulse after the beam splitter and attenuators into the 4X reducer should not exceed 10mJ per pulse total energy.

SETUP AND ADJUSTMENT

1. Select three filters and screw them onto the camera. Make sure they are clean and free of dust. The black filters attenuate more, and the red less. You have been supplied with enough filters including the ones supplied with the camera to use any combination from all red to all black filters.

2. Screw the 4X reducer onto the filters as shown in picture above. Since the image is inverted, you may want to screw the camera onto the post on the opposite side you usually do so as to have the image appear in its normal orientation.

3. If the beam intensity entering the reducer is too high, then reduce the beam intensity coming out of the laser before it enters the reducer. This can be done using the wedge beam splitter P/N SPZ17018 and/or a 50x50mm filter and filter holder set P/N SPZ08240. (See the illustration below). Note that if the beam is polarized, orienting the beam splitter as close to normal incidence as possible will minimize beam distortions due to polarization.



4. Set up the system so the end of the 4X beam reducer is 30cm from the point you wish to measure the beam as shown above.

5. If the laser is pulsed and you will be using the optional optical trigger (P/N SPZ17005), then place the trigger photodiode in a place where it will catch enough light from the laser pulse to cause the camera to trigger.

6. Operate the software.

   With BeamGage Software: In the **Computations** ribbon, enable **Optical Scaling** and enter the number shown on the barrel of the beam reducer (the number will be close to 4X). This will set the camera to the exact reduction factor of the reducer so that the numerical measurements in the software will be correct.

   Note: The optical scaling factor on the label is for the wavelength region 360 – 800nm. For 1064nm, the magnification factor to use above is the label value multiplied by 1.021.

7. Operate the laser and move the camera/reducer assembly so the beam is centered on the 2D display. If you do not see anything, you may need to reduce the attenuation of the beam or adjust the camera exposure setting. Adjust the camera as you would ordinarily to get the optimum image.

Note: You can get a good image for the beam entering anywhere in the aperture of the reducer. In fact, if you see interference effects (lines or rings) then you should get rid of these by having the beam enter the reducer slightly off axis.

Specifications	
Spectral range	360nm to 1100nm
Antireflection coating	Antireflection coating optimized for 1064nm and 532nm
Beam reduction ratio	4X ± 3%, see label
Size	Ø60 mm dia x 94mm length
Aperture	50mm
Maximum beam size	1/2” format: 25x19mm 1/3” format: 18x14mm
Distortion of beam	Less than 1% over 80% of diameter

Ordering information for accessories to 4X beam reducer:

Large wedge beam splitter	Large size Wedge beam splitter for beam intensity reduction. The beam splitter mounts to standard ¼” thread ½” laboratory rod. Reduces beam intensity by ~20 times. For spectral range 190 – 2500nm. Especially useful for the 4X beam reducer.	SPZ17018
Filter holder w/ 50x50 filter set	Filter holder with set of 4 standard Schott 50X50mm neutral density filters. Useful to reduce intensity before inputting into 4X beam reducer. Mounts to standard ¼” thread, ½” diameter laboratory rod.	SPZ08240

The 4X beam reducer is compatible with the following systems:

- SP932U
- SP204S
- SP920s

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