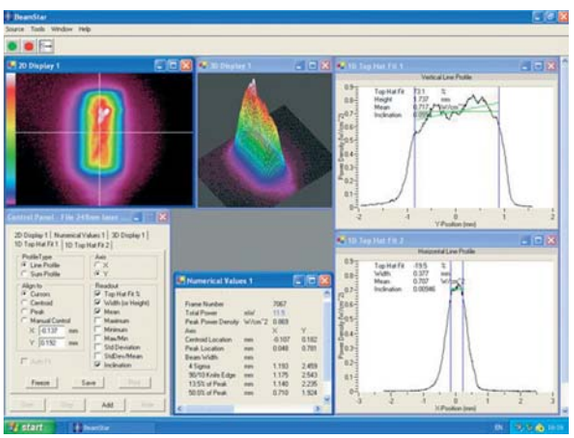
Accessories for UV lasers
Integral Reimaging UV Image Converters

The UV image converters are fluorescent plates that convert UV radiation that is poorly imaged by silicon cameras into visible light that is then imaged onto the CCD of the camera. These fluorescent plates are specially designed for UV conversion and have a high light output, wide linear dynamic range and high damage threshold.

There are 3 versions available:

1. The 4X UV image converter for large beams converts to visible and then images onto the CCD while reducing the beam size 4X.
2. The 1:1 UV image converter converts to visible and images the beam onto the CCD without changing the size.
3. The 4X expander with UV converter converts to visible and images a beam enlarged 4X onto the CCD.

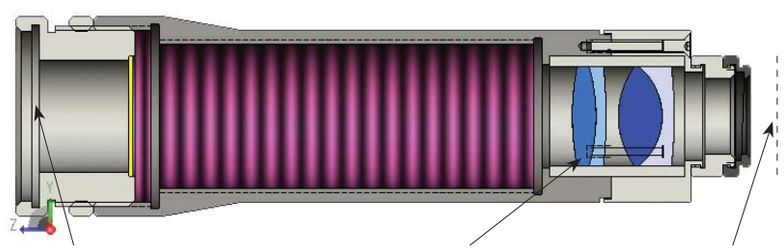
All of the above imagers allow a beam splitter to be mounted at 45 deg angle in front of the imager so as to allow imaging of higher power/ energy beams.



Shown here is a profile of a 248mm Excimer laser beam

4X beam reducing UV Image Converter as mounted on camera

1X UV Image Converter with Optional Beam Splitter



Cross section of 4X reducing UV image Converter

4X beam expander with UV converter

Specifications	4X UV Image Reducing Converter	1X UV Image Converter	4X Beam Expander with UV converter
Beam Reduction	4X reduction ±2% with included correction factor	1:1 imaging ±2% with included correction factor	4X expansion ±2% with included correction factor
Resolution	50μm x 50μm	20μm x 20μm	15μm x 15μm
Spectral range	193 to 360nm		
Minimum signal	~1uJ/cm² with blank filter	~50uJ/cm² with blank filter	~1μJ/cm² with blank filter
Saturation intensity	~30mJ/cm² at 193nm, ~15mJ/cm² at 248nm with included filter 20 times above values with optional beam splitter	~15mJ/cm² at 193nm, ~20mJ/cm² at 248nm with included filter 20 times above values with optional beam splitter	~30mJ/cm² at 193nm, ~15mJ/cm² at 248nm 20 times above values with optional beam splitter
Effective Aperture	Ø30mm but effective beam size is limited to 4X CCD dimensions (see pages 138-143)	Ø18mm but effective beam size is limited to CCD dimensions (see pages 138-143)	1/4 the size of the CCD dimensions (see pages 138-143)
Damage threshold	100W/cm² or 2J/cm² with beam splitter		
Dimensions	Ø50mm dia x 185mm length	Ø31mm dia x 120mm length	Ø29mm dia x 69mm length

UV Beam Profiling with Fluorescent Plates

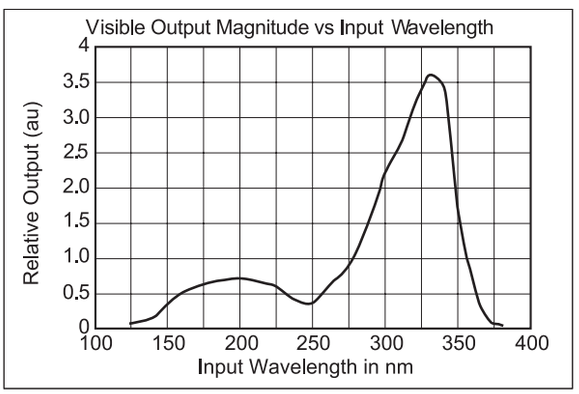
Applications

- Semiconductor Photolighography
- Excimer Laser Beams
- YAG 3rd & 4th Harmonics

Single Surface Poloration Issues

Florescent imaging of UV beams offers simple solutions to the challenges of large beams and high energy. A UV beam impinges onto a plate that fluoresces at visible wavelengths, proportional to the UV energy in the beam. The visible fluorescence is imaged with a CCD camera and imaging lens. Both the plate and the glass lens block UV scattered light so that only visible light is imaged.

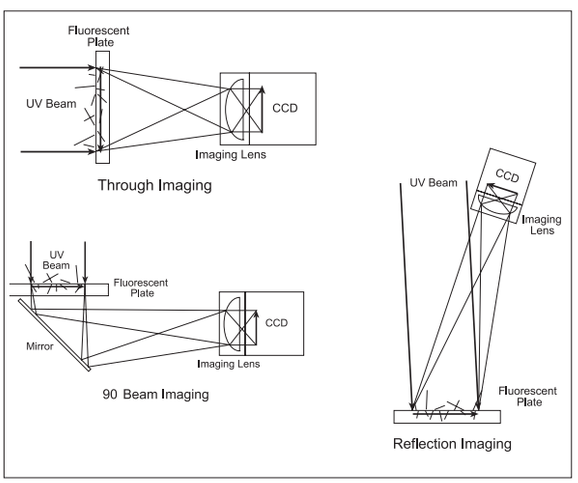
There are many crystalline materials that fluoresce in the visible in response to UV stimulation. Spiricon offers a non-crystalline plate, which is much less expensive. The graph shows an approximate UV spectral sensitivity of the plate.



The UV beam strikes the plate and fluoresces in the visible light range. Visible light passes through the fluorescent plate and is imaged in-line by the CCD camera.

In the reflection method, visible light is imaged from the same side as the incident beam. (Both vertical and horizontal configurations are possible.)

The vertical reflection diagram shows a typical setup for measuring the intensity distribution of UV semiconductor exposure beams. A particular advantage of any of these setups is that the fluorescent plate can be obtained in many sizea, from 2cm diameter (D) to over 10cm square (S). The camera and lens can be adjusted to image the size of almost any beam and plate desired. (A microscope objective can be used to image focused spots in the 10um range.)



Different imaging configuration are shown; Transmission, Reflection, and 90° Imaging.

Recommended System Components

LBA Beam Analyzer Software
CCD Camera
CCTV Imaging Lens

Beam Size	Lens Model
0.5cm to 5cm	FL-50-CCTV Lens
2.5cm to 30cm	FL-25-CCTV Lens

Fluorescent Plate Models

Size	Model Number
2 cm Circle	FLUOR-2-D
3 cm Circle	FLUOR-3-D
5 cm Square	FLUOR-5-S
10 cm Square	FLUOR-10-S

Custom sizes available

Imaging Systems		
Beam Expanders		
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 ~6X. Fits 4.5mm recess and CS mount cameras. Needs spacer assy below.	SPZ08257
12X expanding microscope objective	Screw optical assembly that images the plane 6mm in front of the lens onto the CCD while enlarging it ~12X. Fits 4.5mm recess and CS mount cameras. Needs spacer assy below.	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 ~22X. Fits 4.5mm recess and CS mount cameras. Needs spacer assy below.	SPZ08260
Spacer assy 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 ~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

Beam Reducers		
4X reimaging beam reducer	Screw on beam reducer for beams in the wavelength region 360 – 1100nm that reimages the beam 30cm in front of the unit onto the CCD while reducing the beam size 4X. Entrance aperture is 50mm. Fits 4.5mm recess cameras only	SPZ17017
Stand alone beam splitter for above	Large size Wedge beam splitter which mounts to standard ¼" thread ½" laboratory rod. Reduces beam intensity by ~20 times. For spectral range 190 – 2500nm. For mounting in front of 4X beam reducer.	SPZ17018
Filter holder and 50x50 filter set for 4X beam reducer	Filter holder with set of 4 standard Schott 50X50mm neutral density filters. Useful to further reduce intensity after beam splitter before inputting into 4X beam reducer. Mounts to standard ¼" thread, ½" diameter laboratory rod.	SPZ08240
LBS-100 to 4X beam reducer adapter	This adapter enables mounting of the LBS-100 beam splitter / attenuator assembly in front of the 4X beam reducer. The combined assembly can image large high power beams in one unit. See illustration on page 149.	SPZ17029
YAG Focal Spot Analyzer accessory (1 set for system)	Screw on accessory to beam splitter system which allows user to look at focal spots of YAG lasers of up to 400W average power. The set consists of an AR coated for 1064nm and a dielectric full reflector for 1064nm 45deg incidence and well as mounting hardware. It needs one of the lenses below as well as 2 -3 stackable beam splitters above.	SPZ17021
-100mm FL lens assembly	-100mm negative lens mounted in lens holder for mounting to YAG FSA assy.	SPZ08248
-125mm FL lens assembly	-125mm negative lens mounted in lens holder for mounting to YAG FSA assy.	SPZ08249
-150mm FL lens assembly	-150mm negative lens mounted in lens holder for mounting to YAG FSA assy.	SPZ08250
-200mm FL lens assembly	-200mm negative lens mounted in lens holder for mounting to YAG FSA assy.	SPZ08251
-50mm FL lens assembly	-50mm negative lens mounted in lens holder for mounting to YAG FSA assy.	SPZ08254
FL-50-CCTV LENS	50mm focal length lens assembly with built in iris and focus adjustment. Used to view reflected large beams or beams projected thru a translucent plate. Comes with various spacers. For imaging distances between 15cm and 1 meter in front of the lens with beam reductions from 2.3 to 20 times.	SP90038
FL-25-CCTV LENS	As above except lens focal length is 25mm	SP90085

UV converters		
1X UV image converter	Screw on imaging telescope that converts UV image to visible and images same size on CCD. For beam intensities from 50μJ/cm² to 15mJ/cm². Fits 4.5mm recess and CS mount cameras	SPZ17023
Beam splitter for above	45 degree wedged beam splitter to reduce intensities on image converter by ~20X. For beam intensities of up to 300mJ/cm² at 193nm	SPZ17015
4X reducing UV image converter	Screw on imaging telescope that converts UV image to visible reduces the size 4X and images on CCD. For beam intensities from 1μJ/cm² to 15mJ/cm². Fits 4.5mm recess cameras only.	SPZ17024
UV converter assembly for 4X beam expander	Screw on assembly which has UV plate to convert 193 – 360nm radiation to visible. The plate is at the object plane of the 4X expander (P/N SPZ17022) and produces a 4X enlarged image on the CCD	SPZ17019
Beam splitter for above	45 degree wedged beam splitter to reduce intensities on by ~20X. For beam intensities of up to 300mJ/cm² at 193nm.	SPZ17007
20mm diameter UV imaging plate	Ø20mm diameter UV image conversion plate only. For customers that have own imaging system. Converts UV image to visible. For beam intensities 50μJ/cm² to 10mJ/cm²	SPF01177

30mm diameter UV imaging plate	Ø30mm diameter UV image conversion plate only. For customers that have own imaging system. Converts UV image to visible. For beam intensities 50μJ/cm² to 10mJ/cm²	SPF01150
50mm x 50mm UV imaging plate	50x50mm UV image conversion plate only. For customers that have own imaging system. Converts UV image to visible. For beam intensities 1mJ/cm² to 20mJ/cm. Not suitable for 193nm	SP90082
100mm x 100mm UV imaging plate	100 x 100 mm UV image conversion plate only. For customers that have own imaging system. Converts UV image to visible. For beam intensities 1mJ/cm² to 20mJ/cm. Not suitable for 193nm	SP90083