3.5.3 Beam Splitter




Model	Beam Tap I & II	Beam Tap I & II YAG	Stackable Beam Splitter	Single & Dual Front-Surface Beam Samplers
Wavelength	400-700nm	1064nm	190-2000nm	200nm-2.5µm
Reflection	4% & 0.16% of incident beam	0.5% & 0.0025% of incident beam	5% & 0.25% of incident beam	0.057% @ 532nm
Clear aperture	Ø17.5mm	Ø17.5mm	Ø15mm	14mm x14mm
Damage threshold	1MW/cm^2 CW, or 1MJ/cm^2 pulsed	1MW/cm^2 CW, or 1MJ/cm^2 pulsed	>5J/cm^2	100MW/cm^2
Mounting	C-Mount Threads	C-Mount Threads	C-Mount Threads	C-Mount Threads

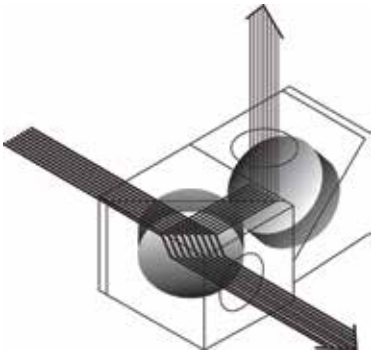
Beam Tap I & II

- Dual surface reflector for equalizing S & P polarization
- The two planes of reflection are orthogonal

Single Surface Polarization Problems

A single surface reflection at 45° is often used to sample a laser beam for profile measurements or for monitoring power or energy. However, as shown on page 191, at 45° a single surface reflects the S polarization component at more than 10 times the reflection of the P component. Depending on the laser polarization content, or stability, this sampling can provide very misleading and unreliable measurements. (The BT-I-YAG has both surfaces A/R coated for 1064nm so the reflection for both polarizations is equal at 0.5%. At other wavelengths far from 1064nm the above discussion applies).

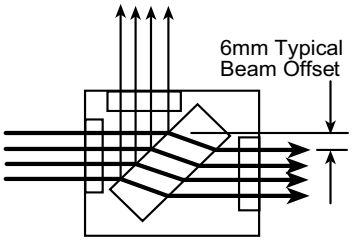
Equalizing S & P reflected polarization



Any arbitrary polarization component can be broken into equivalent S & P components. With complimentary sampling surfaces any given component gets reflected once as the S polarization, and the second time as the P polarization. Thus using 2 surfaces, the total reflected energy for all polarization components is the sum of the **S** reflectance and the **P** reflectance. This causes the sampled beam to have **S & P** components that are identical to the original beam.

Beam path through beam tap

The Beam Tap II uses two reflecting surfaces such that the two planes of reflection are orthogonal. The standard Beam Tap I rear surface is AR coated from 400-700nm.



This diagram shows the 6mm offset of the through beam that is created by the reflecting optic. The deflection angle of the output beam is less than 0.007 degrees. The rear surface of the flat is AR coated to maximize the throughput of the main beam. The standard Beam Tap II rear surface is AR coated for 400nm-700nm. The YAG version is AR coated for 1064nm on both surfaces.

Beam tap reflection vs wavelength

Shown is the Beam Tap II final sampled reflection vs. wavelength.
As shown both the S & P reflection are nearly constant at 0.05% from the UV to the infrared.
(See figure 7 in the Beam Tap manual in our website)

Ordering Information

Model	Surface	Wavelength range	Optical Material	Reflection	P/N
BT-I	Single surface, 1 cube	400-700nm	UVFS	4% Ravg	SP90135
BT-II	Dual surface, 2 cubes	400-700nm	UVFS	0.16% Ravg	SP90133
BT-I-YAG	Single surface, 1 cube	1064nm	BK7	0.5% Ravg	SP90173
BT-II-YAG	Dual surface, 2 cubes	1064nm	BK7	0.0025% Ravg	SP90172

Stackable Beam Splitters

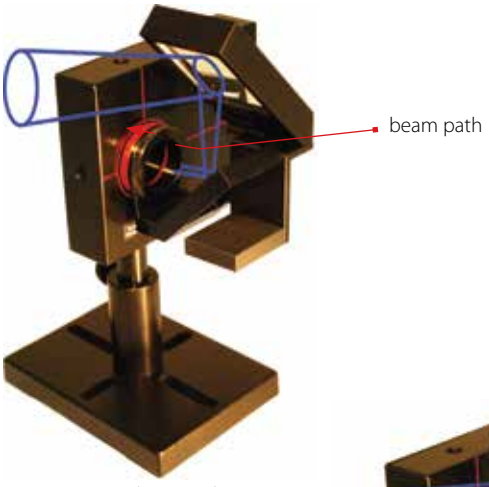
The stackable beam splitters are designed for maximum modularity and shortest beam path. They are compatible with almost all of our cameras having the standard C mount thread and can mount either to other attenuators or to the camera itself. Each beam splitter reflects ≤6% of the incoming beam and allows approximately ≥94% of the beam to pass directly through. By stacking 2 splitters ≤6% of ≤6% or 0.36% of the original beam intensity is directed into the camera. The beam splitters are mounted over the fixed or variable attenuators with a simple fastening ring and can be oriented in any direction with the beam coming from right, left, up, down, or front. The Beam Splitters will operate for wavelengths from 193nm - 2500nm. Damage threshold is >5J/cm2 for 10ns pulses.

An optional Ø30mm clear aperture splitter allows for larger diameter incoming beams. Caution: Beam convergence and power density must be known at the imager so you don't overflow the imager size and maximum power density at the imager.

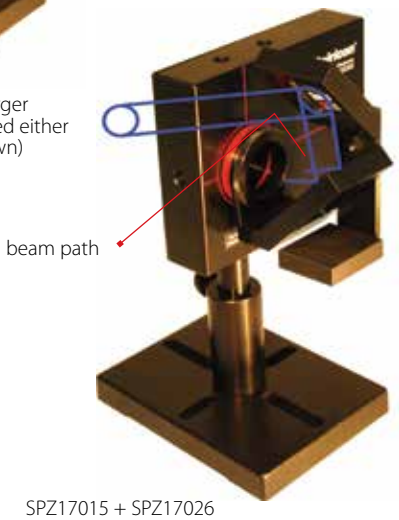
A different set of stackable beam splitters are specifically coated for optimization at 1064nm. Each beam splitter reduces the intensity to 1% of the input Beam. 2 stacked splitters will produce a sampling Beam with 0.01% intensity of the original beam.

The wedge angle of 10 degrees insures that only the reflection from the front surface will appear on the camera with no double images. The user must insure that there are beam stops for the transmitted and reflected beams.

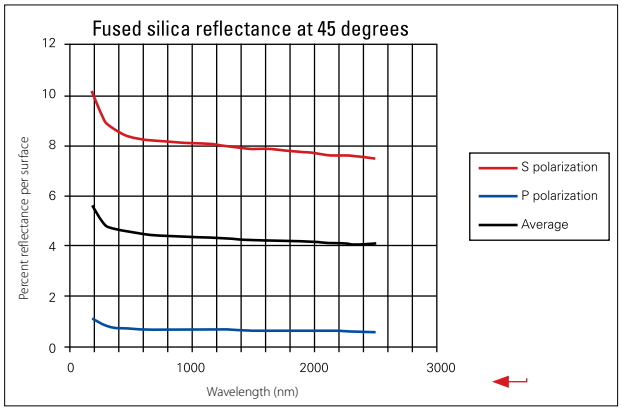
Note that if possible, the user should use an even number of beam splitters so as to cancel any possible polarization effects.



For converging beams a larger aperture splitter can be used either by itself or stacked (as shown)



SPZ17015 + SPZ17026
(used either singularly or stacked)



Ordering Information

Item	Description	Clear Aperture	Material	Wavelength	Reflectance	Path length to CCD with 3 screw-on ND filters	P/N
1st Wedge Beam Splitter	45 degree wedged beam splitter	Ø15mm	UVFS	193-2500nm	≤6%	60mm	SPZ17015
2nd Wedge Beam Splitter	Additional 45 degree wedged beam splitter to mount to 1st wedge beam splitter		UVFS	193-2500nm	≤6%	93mm	SPZ17026
Large Aperture Wedge Beam Splitter	For converging beams a larger aperture wedge beam splitter	Ø30mm	UVFS	193-2500nm	≤6%	60mm	SPZ17025
1st Wedge Beam Splitter	45 degree wedged beam splitter	Ø15mm	UVFS coated 1064nm	1064nm	≤1%	60mm	SPZ17031
2nd Wedge Beam Splitter	Additional 45 degree wedged beam splitter to mount to 1st wedge beam splitter		UVFS coated 1064nm	1064nm	≤1%	93mm	SPZ17032