3.4.3 Beam Splitter

Model	Beam Tap I & II	Beam Tap I & II YAG	Stackable Beam Splitter
Wavelength	400-700nm	1064nm	190-2000nm
Reflection	4% & 0.16% of incident beam	0.5% & 0.0025% of incident beam	5% & 0.025% of incident beam
Clear aperature	Ø17.5mm	Ø17.5mm	Ø15mm
Damage threshold	5W/cm² no distortion	5W/cm² no distortion	>5J/cm²
Mounting	C-Mount Threads	C-Mount Threads	C-Mount Threads

Beam Tap I & II

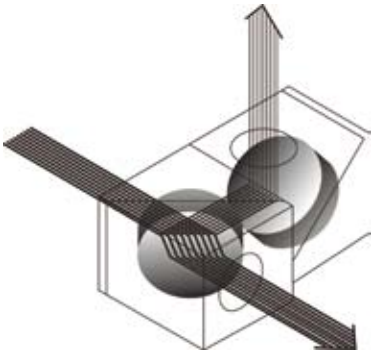
- Dual surface reflector for equalizing S & P polarization
- The two planes of reflection are orthogonal

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, 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

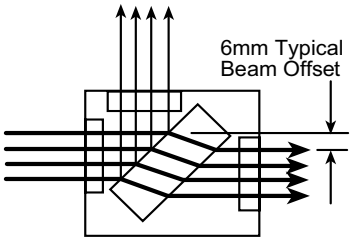
Any arbitrary polarization component can be broken into equivalent S & P components. With complimentary sampling surfaces any given component gets reflected once as the S polarization, and the second time as the P polarization. Thus using 2 surfaces, the total reflected energy for all polarization components 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 relection 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.

Ordering Information

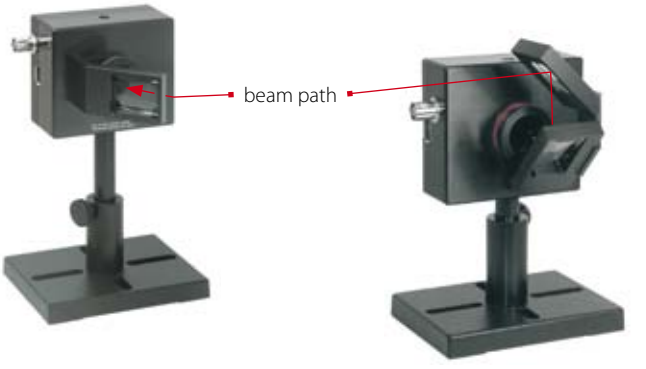
Model	Surface	Wavelength range	Optical Material	Reflection	P/N
BT-I	Single surface, 1 cube	400-700nm	UVFS	4% Ravg	SP90135
BT-II	Dual surface, 2 cubes	400-700nm	UVFS	0.16% Ravg	SP90133
BT-I-YAG	Single surface, 1 cube	1064nm	BK7	0.5% Ravg	SP90173
BT-II-YAG	Dual surface, 2 cubes	1064nm	BK7	0.0025% Ravg	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 reduces the intensity of the beam by ~20 times (see graph below) so if a camera is equipped with filters that can operate with lasers typically up to ~1 Watt, with one beam splitter it can operate up to ~20 Watts and with two beam splitters up to ~400W. The Beam Splitters will operate for wavelengths from 190nm to 2000nm. The damage threshold of the beam splitters is >5J/cm^2 for 10ns pulses. 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 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.



One beam splitter mounted

Two beam splitters mounted