

SELECTION GUIDE

PRODUCT TYPE	WAVELENGTHS	OPERATING CONDITIONS	PERFORMANCE	PAGE
Plate Beamsplitters				
HIGH ENERGY PLATE BEAMSPLITTERS: BS1	Center Wavelengths from 193 – 2100nm	10 J/cm ² , 20ns, 20Hz at 1064nm 1 MW/cm ² at 1064nm	R dependent on selected value	102
BROADBAND BEAMSPLITTERS: BBS	Wavelength Range 458 – 529nm, 488 – 694nm, 650 – 1100nm, or 1200 – 1500nm	10 mJ/cm ² , 20ns, 20Hz at 1064nm	R _{unp} = 50% ± 15%	104
STANDARD VISIBLE PLATE BEAMSPLITTERS: BTF	Center Wavelengths from 425 – 750nm	1 J/cm ² , 20ns, 20Hz at 532nm	Nominal R/T ratio: 30/70, 50/50 or 70/30	105
HIGH ENERGY HARMONIC SEPARATORS: BSR	Harmonics for Nd:YAG, Argon and Ti:Sapphire lasers	10 J/cm ² , 20ns, 20Hz at 1064nm 1 MW/cm ² at 1064nm	Primary wavelength R Secondary wavelength T	106
LONG WAVE PASS DICHROIC BEAMSPLITTERS: LWP	Center wavelength options: 266nm, 248nm, 532nm, 633nm, 670nm, 780nm and 1064nm	10 J/cm ² , 20ns, 20Hz at 1064nm 1 MW/cm ² at 1064nm	Primary wavelength R Secondary wavelength T	108
SHORT WAVE PASS DICHROIC BEAMSPLITTERS: SWP	Center wavelength options: 633nm, 780nm, 800nm, 1064nm, and 1550nm	10 J/cm ² , 20ns, 20Hz at 1064nm 1 MW/cm ² at 1064nm	Primary wavelength R Secondary wavelength T	109
LASER LINE NON-POLARIZING PLATE BEAMSPLITTERS: BSNP	Center Wavelengths: 532nm, or 1064nm	3 J/cm ² , 10ns, 20Hz at 1064nm	R _s -R _p , T _s -T _p < 5%	110

SELECTION GUIDE

PRODUCT TYPE	WAVELENGTHS	OPERATING CONDITIONS	PERFORMANCE	PAGE
Cube Beamsplitters				
UV LASER LINE POLARIZING CUBE BEAMSPLITTERS: UPBS	Center wavelength options: 355nm, 405nm	10 mJ/cm ² , 20ns, 20Hz at 266nm 10 W/cm ² at 266nm	Extinction: $T_p/T_s > 100:1$	111
LASER LINE POLARIZING CUBE BEAMSPLITTERS: PBS	Center wavelength options: 532nm, 633nm, 670nm, 780nm, 532nm, 633nm, 670nm, 780nm, 1047nm, 1064nm and 1550nm	1 J/cm ² , 20ns, 20Hz at 1064nm 100 W/cm ² at 1064nm	Extinction: $T_p/T_s > 1000:1$	112
HIGH ENERGY LASER LINE POLARIZING CUBE BEAMSPLITTERS: PBSO	Center wavelength options: 266nm, 355nm, 532nm and 1064nm	25 J/cm ² , 20ns, 20Hz at 1064nm 1 MW/cm ² at 1064nm	$\lambda = 532\text{nm}$ or 1064nm: $T_p/T_s = 500:1$ $\lambda < 500\text{nm}$: $T_p/T_s = 250:1$	113
ION-BEAM SPUTTERED HIGH ENERGY LASER LINE POLARIZING CUBE BEAMSPLITTERS: PBSI	Center wavelength options: 355nm, 532nm and 1064nm	10 J/cm ² , 20ns, 20Hz at 1064nm 1 MW/cm ² at 1064nm	$\lambda < 1064\text{nm}$: $T_p/T_s = 1000:1$ $\lambda < 532\text{nm}$: $T_p/T_s = 750:1$ $\lambda < 355\text{nm}$: $T_p/T_s = 500:1$	114
BROADBAND POLARIZING CUBE BEAMSPLITTERS: PBSH	450 – 700nm, 450 – 1300nm, 450 – 2000 or 670 – 980nm	500 mJ/cm ² , 20ns, 20Hz at 515nm 100 W/cm ² at 515nm	Extinction: $T_p/T_s > 500:1$	115
BROADBAND HYBRID CUBE BEAMSPLITTERS, VISIBLE: BSC	450 – 700nm	500 mJ/cm ² , 20ns, 20Hz at 515nm 100 W/cm ² at 515nm	45% ± 6%	116
Beamsplitter Assembly				
HIGH ENERGY CONTINUOUSLY VARIABLE BEAMSPLITTER: ABSO	Standard wavelegnth options: 266nm, 355nm, 532nm and 1064nm	5 J/cm ² , 20ns, 20Hz at 1064nm	Variable Transmission Range 1% – 95% 1MW/cm ² at 1064nm	117

LASER GRADE HIGH ENERGY PLATE BEAMSPLITTERS: BS1



Specifications

Product Code: **BS1**

Optical Material:

Standard Grade Corning 7980 1-D (Fused Silica)

Wedge: ≤5 arc min

Chamfer: 0.35mm leg width at 45° nominal

Surface Figure: $\lambda/10$ p-v at 633nm before coating; after coating on select substrates

Surface Quality: 10-5 scratch-dig per MIL-PRF-13830b

Clear Aperture: ≥85% of central diameter

Angle of Incidence: 45°

Adhesion and Durability: Per MIL-C-48497a

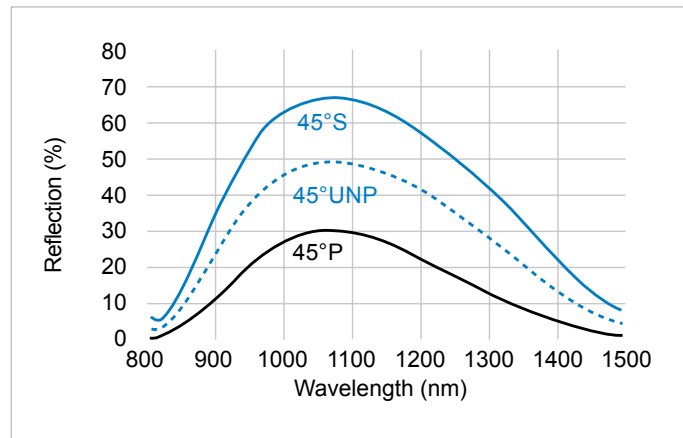
Damage Threshold:

Pulsed: 10 J/cm², 20ns, 20Hz at 1064nm

cw: 1 MW/cm² at 1064nm

CVI Laser Optics high energy plate beamsplitters are used to separate a laser beam into two separate beams or to combine beams at right angles to each other. The front surface of the beamsplitter reflects a portion of the incoming beam. The BS1 beamsplitters exhibit almost no absorption and are designed specifically for 45° at the wavelength and polarization being used. Standard substrates have an antireflection coating on the second surface and a wedge of less than five arc minutes. The beamsplitter coating can be done on any CVI Laser Optics wedged or plane parallel substrate to meet your OEM application requirements. For pick-off beam samplers, see product code W1. For normal incidence beamsplitters, see product code PR1.

- ▶ Ultrahard, high-damage-threshold coatings are available for wavelengths from 193nm to 2100nm
- ▶ Internally reflected ghost images are minimized by an antireflection coating on the rear surface



BS1-1064-50-45UNP high energy plate beamsplitter

Please see page T-38 for Surface 2 Anti-Reflective Coating Traces.

LASER GRADE HIGH ENERGY PLATE BEAMSPLITTERS						
266nm						
Wavelength (nm)	Reflection (%)	Tolerances (%)	Polarization	Ø (mm)	t (mm)	PART NUMBER
266	50	±4.0	P	25.4	3.175	BS1-266-50-1012-45P
266	50	±4.0	UNP	25.4	3.175	BS1-266-50-1012-45UNP
266	50	±4.0	UNP	50.8	6.35	BS1-266-50-2025-45UNP
266	50	±4.0	S	25.4	3.175	BS1-266-50-1012-45S
355nm						
Wavelength (nm)	Reflection (%)	Tolerances (%)	Polarization	Ø (mm)	t (mm)	PART NUMBER
355	50	±4.0	P	25.4	3.175	BS1-355-50-1012-45P
355	50	±4.0	P	50.8	6.35	BS1-355-50-2025-45P
355	50	±4.0	UNP	25.4	3.175	BS1-355-50-1012-45UNP
355	50	±4.0	S	25.4	3.175	BS1-355-50-1012-45S
355	99	±0.5	P	25.4	3.175	BS1-355-99-1012-45P

LASER GRADE HIGH ENERGY PLATE BEAMSPLITTERS						
532nm						
Wavelength (nm)	Reflection (%)	Tolerances (%)	Polarization	Ø (mm)	t (mm)	PART NUMBER
532	50	±4.0	P	25.4	3.175	BS1-532-50-1012-45P
532	50	±4.0	P	50.8	6.35	BS1-532-50-2025-45P
532	50	±4.0	UNP	25.4	3.175	BS1-532-50-1012-45UNP
532	50	±4.0	UNP	50.8	6.35	BS1-532-50-2025-45UNP
532	50	±4.0	S	25.4	3.175	BS1-532-50-1012-45S
532	50	±4.0	S	50.8	6.35	BS1-532-50-2025-45S
532	99	±0.5	P	25.4	3.175	BS1-532-99-1012-45P
800nm						
Wavelength (nm)	Reflection (%)	Tolerances (%)	Polarization	Ø (mm)	t (mm)	PART NUMBER
800	10	±4.0	P	25.4	3.175	BS1-800-10-1012-45P
800	10	±4.0	S	25.4	3.175	BS1-800-10-1012-45S
800	10	±4.0	P	50.8	6.35	BS1-800-10-2025-45P
800	30	±4.0	P	25.4	3.175	BS1-800-30-1012-45P
800	50	±4.0	P	25.4	3.175	BS1-800-50-1012-45P
800	50	±4.0	P	50.8	6.35	BS1-800-50-2025-45P
800	50	±4.0	S	25.4	3.175	BS1-800-50-1012-45S
800	50	±4.0	S	50.8	6.35	BS1-800-50-2025-45S
800	70	±4.0	P	25.4	3.175	BS1-800-70-1012-45P
800	70	±4.0	P	50.8	6.35	BS1-800-70-2025-45P
800	80	±4.0	P	25.4	3.175	BS1-800-80-1012-45P
800	90	±3.0	P	25.4	3.175	BS1-800-90-1012-45P
800	90	±3.0	P	50.8	6.35	BS1-800-90-2025-45P
800	95	±2.0	P	25.4	3.175	BS1-800-95-1012-45P
800	98	±1.0	P	25.4	3.175	BS1-800-98-1012-45P
800	99	±0.5	P	25.4	3.175	BS1-800-99-1012-45P
1064nm						
Wavelength (nm)	Reflection (%)	Tolerances (%)	Polarization	Ø (mm)	t (mm)	PART NUMBER
1064	10	±4.0	UNP	25.4	3.175	BS1-1064-10-1012-45UNP
1064	10	±4.0	UNP	50.8	6.35	BS1-1064-10-2025-45UNP
1064	50	±4.0	P	25.4	3.175	BS1-1064-50-1012-45P
1064	50	±4.0	P	50.8	6.35	BS1-1064-50-2025-45P
1064	50	±4.0	UNP	25.4	3.175	BS1-1064-50-1012-45UNP
1064	50	±4.0	UNP	50.8	6.35	BS1-1064-50-2025-45UNP
1064	50	±4.0	S	25.4	3.175	BS1-1064-50-1012-45S
1064	50	±4.0	S	50.8	6.35	BS1-1064-50-2025-45S
1064	95	±2.0	UNP	50.8	6.35	BS1-1064-95-2025-45UNP
1064	98	±1.0	UNP	50.8	6.35	BS1-1064-98-2025-45UNP
1064	99	±0.5	UNP	50.8	6.35	BS1-1064-99-2025-45UNP

LASER GRADE BROADBAND BEAMSPLITTERS: BBS



Specifications

Product Code: **BBS**

Optical Material: N-BK7

Diameter Tolerance: +0/-0.25mm

Thickness: 6.35mm ±0.25mm

Wedge: ≤5 arc min

Chamfer: 0.35mm leg width at 45° nominal

Surface Figure: $\lambda/10$ p-v at 633nm before coating; after coating on select substrates

Surface Quality: 10-5 scratch-dig per MIL-PRF-13830b

Adhesion and Durability: Per MIL-C-48497a

Reflection: $R_{unp} = 50\% \pm 15\%$

Clear Aperture: ≥85% of central diameter

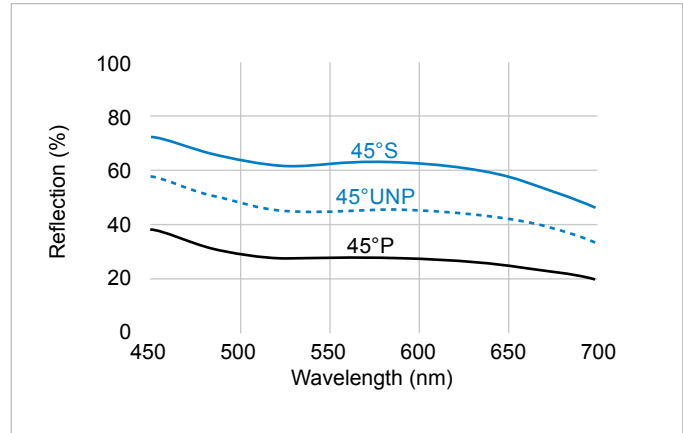
Coating on S2: Low-reflection BBAR coating (see page T-31)

Damage Threshold:

100 mJ/cm², 20ns, 20Hz at 1064nm

BBS beamsplitter plates can be used to either split or combine a laser beam with a broad bandwidth or multiple beams in the same optical path within a specified wavelength range.

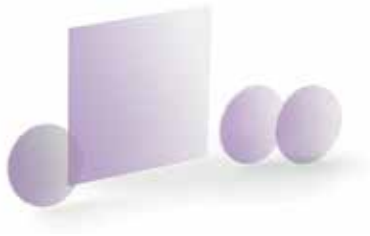
- ▶ Near 50/50 laser splitting for UNP light
- ▶ Low reflection BBAR coating on back surface (S2)
- ▶ For cw and low-energy pulsed laser applications



Broadband dielectric beamsplitter for 488 – 694nm

LASER GRADE BROADBAND BEAMSPLITTERS		
Wavelength Range (nm)	Ø (mm)	PART NUMBER
488 – 694	25.4	BBS-488-694-1025-45
488 – 694	50.8	BBS-488-694-2025-45
650 – 1100	25.4	BBS-650-1100-1025-45
650 – 1100	50.8	BBS-650-1100-2025-45

IMAGE GRADE VISIBLE PLATE BEAMSPLITTERS: BTF



Specifications

Product Code: **BTF**

Material: Optical grade crown glass

Dimensional Tolerances:

Square: $A \pm 0.2\text{mm}$,

Round: $A +0/-0.15\text{mm}$

Thickness: $1.0 \pm 0.2\text{mm}$

Surface Quality: 60-40 scratch-dig per MIL-PRF-13830b; edges beveled

Parallelism: < 5 arc minutes

Clear Aperture: 90% of dimension A

Transmitted Wavefront Error (TWE): $\leq 2 \lambda$ p-v at 633nm

R/T Tolerance at 45°:

$\pm 5\%$ (50nm from center wavelength range)

$\pm 10\%$ (outside of $\pm 50\text{nm}$ from center wavelength range)

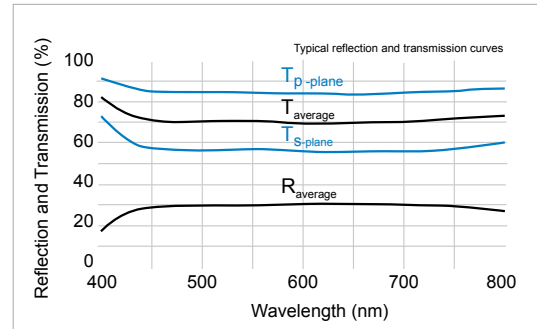
Coating:

1st Surface: All-dielectric partial reflection coating for 45°, surface marked with a dot

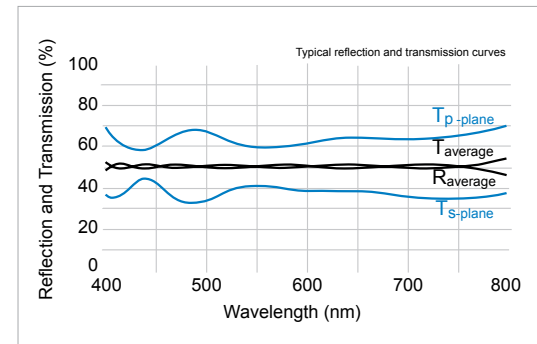
2nd Surface: $R_{\text{avg}} \leq 1.5\%$ at 45°, UNP

Angle of Incidence: 45°

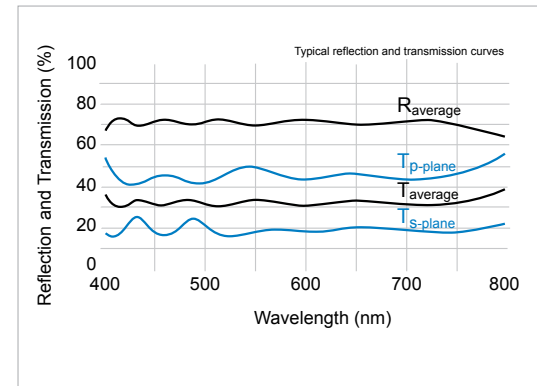
IMAGE GRADE PLATE BEAMSPLITTERS				
Visible				
A (mm)	Shape	Nominal R/T Ratio	Clear Aperture at 45°(mm)	PART NUMBER
25	Round	30/70	15.9x22.5	BTF-VIS-30-2501M-C
25	Round	50/50	15.9x22.5	BTF-VIS-50-2501M-C
25	Round	70/30	15.9x22.5	BTF-VIS-70-2501M-C
50	Square	30/70	31.8x45.0	BTF-VIS-30-SQW-5001M-C
50	Square	50/50	31.8x45.0	BTF-VIS-50-SQW-5001M-C
50	Square	70/30	31.8x45.0	BTF-VIS-70-SQW-5001M-C



30/70 plate beamsplitter for visible wavelengths



50/50 plate beamsplitter for visible wavelengths



70/30 plate beamsplitter for visible wavelengths

LASER GRADE HIGH ENERGY HARMONIC SEPARATORS: BSR



Specifications

Product Code: **BSR**

Optical Material: If λ_1 or $\lambda_2 < 450\text{nm}$: Standard Grade Corning 7980 1-D (Fused Silica), If λ_1 or $\lambda_2 \geq 450\text{nm}$: N-BK7

Diameter Tolerance: $+0/-0.25\text{mm}$

Thickness Tolerance: $\pm 0.25\text{mm}$

Wedge: ≤ 5 arc min

Chamfer: 0.35mm leg width at 45° nominal

Surface Figure: $< \lambda/10$ p-v at 633nm before coating; after coating on select substrates

Surface Quality: 10-5 scratch-dig per MIL-PRF-13830b

Transmitted Wavefront Error (TWE): $< \lambda/4$ p-v at 633nm

Clear Aperture: $\geq 85\%$ of central dimension

Anti-reflection Coating: $R \leq 0.75\%$ (45° UNP) (see page T-31)

Adhesion and Durability: Per MIL-C-48497a

Angle of Incidence: 45°

Damage Threshold:

Pulsed:

10 J/cm², 20ns, 20Hz for reflection at 1064nm,

4 J/cm², 20ns, 20Hz; for reflection at 532nm,

4 J/cm², 20ns, 20Hz for transmission at 1064nm

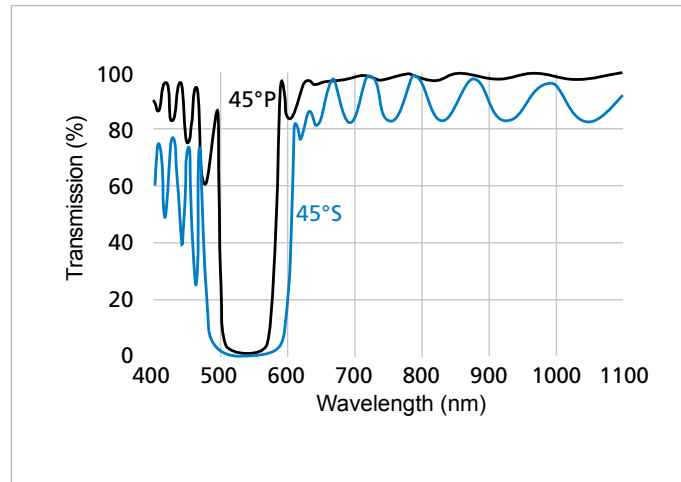
cw: 1 MW/cm² at 1064nm and 532nm

High energy harmonic separators are used to reflect a laser's primary or harmonic wavelength while transmitting another. Our standard High Energy Harmonic Separators are designed for the Nd:YAG and Ti:Sapphire laser systems. These beamsplitters are coated on the front surface with a high energy dichroic coating designed to reflect the wavelength of interest $\geq 99.5\%$ and transmit another wavelength $\geq 90\%$. A high energy antireflection coating is applied to the rear surface of the harmonic separator at the transmitted wavelength.

A typical example would be our BSR-51-1025 high energy harmonic separator, which reflects the second Nd:YAG harmonic of 532nm, and transmits the primary 1064nm wavelength.

For other OEM beamsplitter options or applications please contact CVI Laser Optics for assistance.

- ▶ Isolates Nd:YAG and Nd:YLF harmonics
- ▶ 2nd, 3rd, and 4th harmonic separation; 5th harmonic separation available as custom
- ▶ Characterization of collagen orientation in human dermis by two-dimensional second-harmonic-generation polarimetry
- ▶ 45° dichroic beamsplitters
- ▶ High energy all dielectric coating design, AR coated on side 2



BSR-51-1025 high energy harmonic separator

Visit cvilaseroptics.com for additional traces.

LASER GRADE HIGH ENERGY HARMONIC SEPARATORS

Reflect 266nm, Transmit 532nm and 1064nm — AR Coating Optimized for 532nm

Reflected Wavelength (nm)	Transmitted Wavelength Range (nm)	Unpolarized Reflection (%)	Unpolarized Transmission (%)	Antireflection Coating λ	\varnothing (mm)	t (mm)	PART NUMBER
266	532/1064	99.5	90	532	25.4	6.35	BSR-25-1025

Reflect 266nm, Transmit 532nm and 1064nm — AR Coating Optimized for 1064nm

Reflected Wavelength (nm)	Transmitted Wavelength Range (nm)	Unpolarized Reflection (%)	Unpolarized Transmission (%)	Antireflection Coating λ	\varnothing (mm)	t (mm)	PART NUMBER
266	532/1064	99.5	90	1064	25.4	6.35	BSR-21-1025

Reflect 355nm, Transmit 532nm and 1064nm — AR Coating Optimized for 532nm

Reflected Wavelength (nm)	Transmitted Wavelength Range (nm)	Unpolarized Reflection (%)	Unpolarized Transmission (%)	Antireflection Coating λ	\varnothing (mm)	t (mm)	PART NUMBER
355	532/1064	99.5	90	532	12.7	6.35	BSR-35-0525
355	532/1064	99.5	90	532	25.4	6.35	BSR-35-1025

Reflect 355nm, Transmit 532nm and 1064nm — AR Coating Optimized for 1064nm

Reflected Wavelength (nm)	Transmitted Wavelength Range (nm)	Unpolarized Reflection (%)	Unpolarized Transmission (%)	Antireflection Coating λ	\varnothing (mm)	t (mm)	PART NUMBER
355	532/1064	99.5	90	1064	25.4	6.35	BSR-31-1025
355	532/1064	99.5	90	1064	50.8	6.35	BSR-31-2025

Reflect 400nm, Transmit 800nm — AR Coating Optimized for 800nm

Reflected Wavelength (nm)	Transmitted Wavelength Range (nm)	Unpolarized Reflection (%)	Unpolarized Transmission (%)	Antireflection Coating λ	\varnothing (mm)	t (mm)	PART NUMBER
400	800	99.5	90	800	25.4	6.35	BSR-48-1025
400	800	99.5	90	800	50.8	6.35	BSR-48-2025

Reflect 532nm, Transmit 1064nm — AR Coating Optimized for 1064nm

Reflected Wavelength (nm)	Transmitted Wavelength Range (nm)	Unpolarized Reflection (%)	Unpolarized Transmission (%)	Antireflection Coating λ	\varnothing (mm)	t (mm)	PART NUMBER
532	1064	99.5	90	1064	12.7	6.35	BSR-51-0525
532	1064	99.5	90	1064	25.4	6.35	BSR-51-1025
532	1064	99.5	90	1064	50.8	6.35	BSR-51-2025

Reflect 800nm, Transmit 400nm — AR Coating Optimized for 400nm

Reflected Wavelength (nm)	Transmitted Wavelength Range (nm)	Unpolarized Reflection (%)	Unpolarized Transmission (%)	Antireflection Coating λ	\varnothing (mm)	t (mm)	PART NUMBER
800	400	99.5	90	400	25.4	6.35	BSR-84-1025
800	400	99.5	90	400	50.8	6.35	BSR-84-2025

Reflect 1064nm, Transmit 532nm — AR Coating Optimized for 532nm

Reflected Wavelength (nm)	Transmitted Wavelength Range (nm)	Unpolarized Reflection (%)	Unpolarized Transmission (%)	Antireflection Coating λ	\varnothing (mm)	t (mm)	PART NUMBER
1064	532	99.5	90	532	12.7	6.35	BSR-15-0525
1064	532	99.5	90	532	25.4	6.35	BSR-15-1025
1064	532	99.5	90	532	50.8	6.35	BSR-15-2025

LASER GRADE LONG WAVE PASS DICHROIC BEAMSPLITTERS: LWP



Specifications

Product Code: **LWP**

Optical Material:

Standard Grade Corning 7980 1-D (Fused Silica)

Diameter Tolerance: +0/-0.25mm

Thickness Tolerance: ±0.25mm

Wedge: ≤5 arc min

Chamfer: 0.35mm leg width at 45° nominal

Surface Figure: < λ/10 p-v at 633nm before coating; after coating on select substrates

Surface Quality: 10-5 scratch-dig per MIL-PRF-13830b

Clear Aperture: ≥85% of central dimension

Anti-reflection Coating:

$R_p \leq 0.75\%$ at 45°

$R_{unp} \leq 1.0\%$ at 45°

$R_s \leq 1.3\%$ at 45°

Adhesion and Durability: Per MIL-C-48497a

Reflection: R ≥ 99.0% for unpolarized light

Average Transmission: >85% in long wave pass to approximately 2200nm

Damage Threshold:

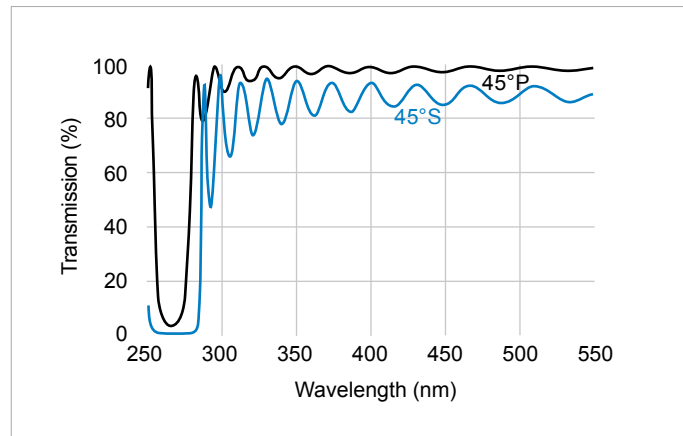
Pulsed: 10 J/cm², 20ns, 20Hz at 1064nm

cw: 1 MW/cm² at 1064nm

Long wave pass dichroic beamsplitters exhibit high transmission for a long wavelength band, high damage thresholds, and high reflectivity for a shorter band of wavelengths.

Reflectivity bandwidth is limited by coating design, incidence angle, and polarization.

- ▶ Reflectance is centered for 45° p-polarization to assure optimal reflectance center wavelength
- ▶ Any polarization can be used; however, to maximize efficiency, reflect 45° s-polarized and transmit 45° p-polarized
- ▶ Fluorescence microscopy
- ▶ Optical parametric generation
- ▶ Contact CVI Laser Optics for OEM capabilities



Long wave pass dichroic beamsplitter at 45° incidence angle

Visit cvilaseroptics.com for additional traces.

LASER GRADE LONG WAVE PASS DICHROIC BEAMSPLITTERS							
Reflected Wavelength (nm)	Transmitted Wavelength Range (nm)	Unpolarized Reflection (%)	Unpolarized Transmission (%)	Antireflection Coating λ	Ø (mm)	t (mm)	PART NUMBER
266	400	≥99.0	≥85.0	400	25.4	3.175	LWP-45-RP266-TU400-PW1-1012-UV
266	400	≥99.0	≥85.0	400	50.8	6.35	LWP-45-RP266-TU400-PW1-2025-UV
266	800	≥99.0	≥85.0	800	25.4	3.175	LWP-45-RP266-TU800-PW1-1012-UV
266	800	≥99.0	≥85.0	800	50.8	6.35	LWP-45-RP266-TU800-PW1-2025-UV
266	1064/532	≥99.0	≥85.0	1064/532	25.4	3.175	LWP-45-RP266-TU1064/532-PW1-1012-UV
266	355 – 532	≥99.0	≥85.0	355 – 532	25.4	3.175	LWP-45-RP266-TU355-532-PW1-1012-UV
532	633 – 1064	≥99.0	≥85.0	633 – 1064	25.4	3.175	LWP-45-RP532-TU633-1064-PW1-1012-UV
532	633 – 1064	≥99.0	≥85.0	633 – 1064	50.8	6.35	LWP-45-RP532-TU633-1064-PW1-2025-UV
633	800	≥85.0	≥90	800	25.4	3.175	LWP-45-RP633-TU800-PW1-1012-UV
670	800	≥99.0	≥85.0	800	25.4	3.175	LWP-45-RP670-TU800-PW1-1012-UV
780	1550	≥99.0	≥85.0	1550	25.4	3.175	LWP-45-RP780-TU1550-PW1-1012-UV
1064	1550	≥99.0	≥85.0	1550	25.4	3.175	LWP-45-RP1064-TU1550-PW1-1012-UV

LASER GRADE SHORT WAVE PASS DICHROIC BEAMSPLITTERS: SWP



Specifications

Product Code: **SWP**

Optical Material:

Standard Grade Corning 7980 1-D (Fused Silica)

Diameter Tolerance: +0/-0.25mm

Thickness Tolerance: ±0.25mm

Wedge: ≤5 arc min

Chamfer: 0.35mm leg width at 45° nominal

Surface Figure: < λ/10 p-v at 633nm before coating; after coating on select substrates

Surface Quality: 10-5 scratch-dig per MIL-PRF-13830b

Clear Aperture: ≥85% of central dimension

Anti-reflection Coating:

$R \leq 0.75\%$ at 0°

$R_p \leq 1.0\%$ at 45°

$R_{unp} \leq 0.75\%$ at 45°

$R_s \leq 1.3\%$ at 45°

Adhesion and Durability: Per MIL-C-48497a

Reflection: $R \geq 99.0\%$ for Unpolarized light

Average Transmission: >80% in short wave pass

Damage Threshold:

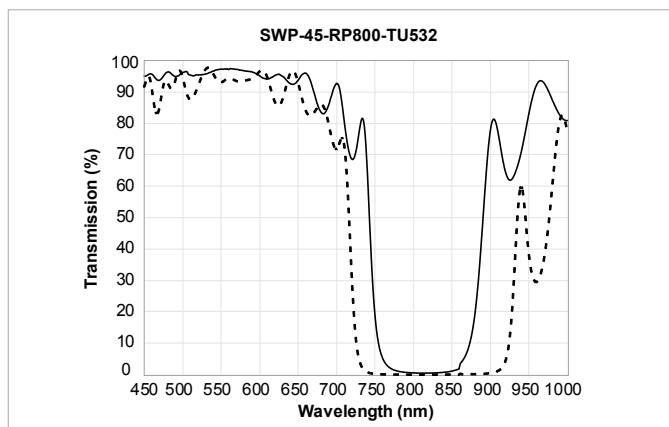
Pulsed: 10 J/cm², 20ns, 20Hz at 1064nm

cw: 1 MW/cm² at 1064nm

Short wave pass dichroic beamsplitters exhibit high transmission for a short wavelength band, high damage thresholds, and high reflectivity for a longer band of wavelengths.

Reflectivity bandwidth is limited by coating design, incidence angle, and polarization. For high energy laser applications, specify pulse energy, pulse duration, repetition rate, and beam diameter.

- ▶ Reflectance is centered for 45° p-polarization to assure optimal reflectance center wavelength
- ▶ Any polarization can be used; however, to maximize efficiency, reflect 45° s-polarized and transmit 45° p-polarized
- ▶ 0° options also available
- ▶ Optical parametric generation; fluorescence microscopy
- ▶ Contact CVI Laser Optics for OEM capabilities



Short wave pass dichroic beamsplitter at 45° incidence angle

P-POL: — UNP: - - - S-POL: — 0°: ·····

Visit cvilaseroptics.com for additional traces.

LASER GRADE SHORT WAVE PASS DICHROIC BEAMSPLITTERS							
Reflected Wavelength (nm)	Transmitted Wavelength Range (nm)	Unpolarized Reflection (%)	Unpolarized Transmission (%)	Antireflection Coating λ	∅ (mm)	t (mm)	PART NUMBER
633	355 – 532	≥ 99.0	≥ 80	355 – 532	25.4	3.175	SWP-45-RP633-TU355-532-PW1-1012-UV
780	415 – 700	≥ 99.0	≥ 80	415 – 700	25.4	3.175	SWP-45-RP780-TU415-700-PW1-1012-UV
* 800	532	≥ 99.0	≥ 80	532.0	25.4	3.175	SWP-0-R800-T532-PW1-1012-UV
800	532	≥ 99.0	≥ 80	532.0	25.4	3.175	SWP-45-RP800-TU532-PW1-1012-UV
800	532	≥ 99.0	≥ 80	532.0	50.8	6.35	SWP-45-RP800-TU532-PW1-2025-UV
* 1064	415 – 700	≥ 99.0	≥ 80	415 – 700	25.4	3.175	SWP-0-R1064-T415-700-PW1-1012-UV
1064	415 – 700	≥ 99.0	≥ 80	415 – 700	12.7	3.175	SWP-45-RP1064-TU415-700-PW1-0512-UV
1064	415 – 700	≥ 99.0	≥ 80	415 – 700	25.4	3.175	SWP-45-RP1064-TU415-700-PW1-1012-UV
1064	415 – 700	≥ 99.0	≥ 80	415 – 700	50.8	6.35	SWP-45-RP1064-TU415-700-PW1-2025-UV
* 1064	700 – 900	≥ 99.0	≥ 80	700 – 900	25.4	3.175	SWP-0-R1064-T700-900-PW1-1012-UV
1064	700 – 900	≥ 99.0	≥ 80	700 – 900	25.4	3.175	SWP-45-RP1064-TU700-900-PW1-1012-UV
1550	780	≥ 99.0	≥ 80	780.0	25.4	3.175	SWP-45-RP1550-TU780-PW1-1012-UV

* Angle of incidence is 0° for these options.

LASER LINE NON-POLARIZING PLATE BEAMSPLITTERS: **BSNP**



Specifications

Product Code: **BSNP**

Optical Material: N-BK7

Diameter Tolerance: +0/-0.25mm

Thickness Tolerance: ±0.25mm

Clear Aperture: ≥85% of central dimension

Transmitted Wavefront Error (TWE): $< \lambda/10$ p-v at 633nm before coating; after coating on select substrates

Surface Quality: 10-5 scratch-dig per MIL-PRF-13830b

Angle of Incidence: 45°

Adhesion and Durability: Per MIL-C-48497a

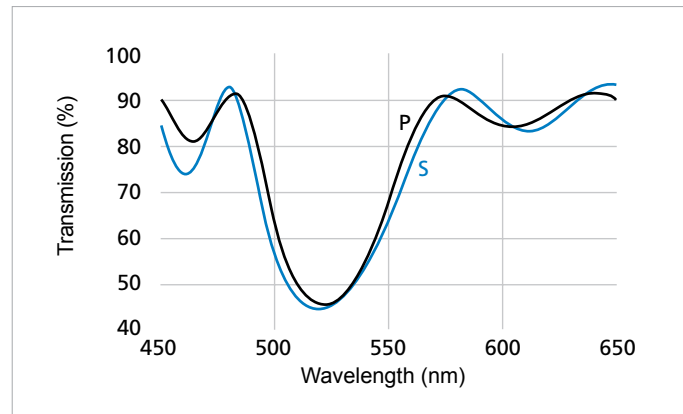
$|R_s - R_p|, |T_s - T_p|: < 5\%$

Damage Threshold: 3 J/cm², 10ns pulse at 1064nm

CVI Laser Optics all dielectric 45° non-polarizing plate beamsplitters divide laser energy while preserving input polarization in reflected and transmitted beams. With 3 J/cm² damage threshold, these non-polarizing beamsplitter plates are especially useful for high energy applications where cemented beamsplitter cubes may fail.

Plate beamsplitters are thinner and lighter than cube beamsplitters. This may be required in some applications where there is not enough room for a cube.

- ▶ Near 50% reflection
- ▶ $|R_s - R_p| < 5\%$
- ▶ Damage threshold $> 3 \text{ J/cm}^2$
- ▶ Cement free
- ▶ Contact CVI Laser Optics for your OEM requirements



BSNP-532-50-1025 non-polarizing plate beamsplitter

LASER LINE NON-POLARIZING PLATE BEAMSPLITTERS			
Wavelength (nm)	Ø (mm)	Reflection (%)	PART NUMBER
532	25.4	50±5%	BSNP-532-50-1025
532	50.8	50±5%	BSNP-532-50-2025
1064	25.4	50±5%	BSNP-1064-50-1025
1064	50.8	50±5%	BSNP-1064-50-2025

UV LASER LINE POLARIZING CUBE BEAMSPLITTERS: UPBS



Specifications

Product Code: **UPBS**

Optical Material:

Standard Grade Corning 7980 1-D (Fused Silica)

Edge Dimension Tolerance (A): $\pm 0.25\text{mm}$

Surface Quality: 20-10 scratch-dig per MIL-PRF-13830b

Transmitted Wavefront Error (TWE): $< \lambda/4$ p-v at 633nm

Clear Aperture: $\geq 85\%$ of central dimension

Field of View: $\pm 2^\circ$ typical

Anti-reflection Coating: $R \leq 0.25\%$, all entrance and exit surfaces

Extinction Ratio: $T_p/T_s > 100:1$

Transmission Efficiency: $T_p > 90.0\%$

Reflection Efficiency: $R_s > 99.0\%$

Damage Threshold:

Pulsed: 10 mJ/cm^2 , 20ns, 20Hz at 266nm

cw: 10 W/cm^2 at 266nm

These polarizing cube beamsplitters are made from fused silica to optimize UV performance.

To avoid damage when using a laser, be sure to orient the cube so that the beam enters through the prism marked with the dot.

- ▶ Fused-silica cube polarizers for doubled argon, tripled Nd:YAG, quadrupled Nd:YAG, and UV excimer lasers
- ▶ For use with fluences less than 10 mJ/cm^2
- ▶ Index matching optical adhesive assembly (low absorbing, high UV transmission)
- ▶ Contact CVI Laser Optics for alternate wavelengths, dimensions, or other specification changes for OEM applications

UV LASER LINE POLARIZING CUBE BEAMSPLITTERS

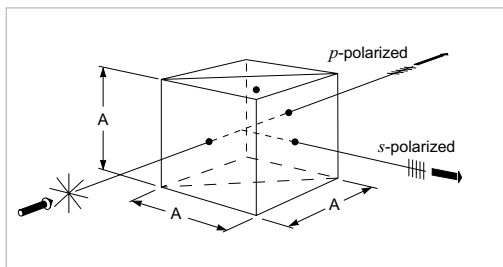
12.7mm Cube

Wavelength (nm)	PART NUMBER
355	UPBS-355-050
405	UPBS-405-050

25.4mm Cube

Wavelength (nm)	PART NUMBER
355	UPBS-355-100
405	UPBS-405-100

Visit cvilaseroptics.com for additional traces.



UPBS UV laser line polarizing beamsplitter cubes

LASER LINE POLARIZING CUBE BEAMSPLITTERS: PBS



Specifications

Product Code: **PBS**

Optical Material: N-BK7

Edge Dimension Tolerance (A): $\pm 0.25\text{mm}$

Surface Quality: 20-10 scratch-dig per MIL-PRF-13830b

Transmitted Wavefront Error (TWE):

$< \lambda/4$ p-v at 633nm

Clear Aperture: $\geq 85\%$ of central dimension

Field of View: $\pm 3^\circ$

Anti-reflection Coating: $R \leq 0.25\%$ per surface

Extinction Ratio: $T_p/T_s > 1000:1$

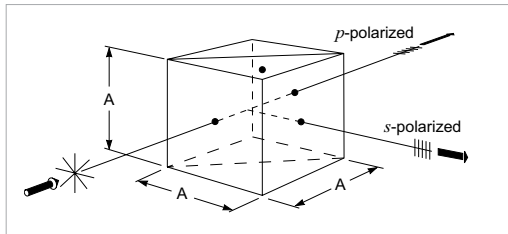
Transmission Efficiency: $T_p > 95\%$

Reflection Efficiency: $R_s > 99.9\%$

Damage Threshold:

Pulsed: 1 J/cm^2 , 20ns, 20Hz at 1064nm

cw: 100 W/cm^2 at 515nm



PBS laser line polarizing beamsplitter cubes

Polarizing beamsplitter cubes are used to split a laser beam into two orthogonally polarized components; p-polarization is transmitted straight through while s-polarization is reflected at 90° .

To avoid damage when using a high power laser, be sure to orient the cube so that the beam enters through the prism face marked with the dot.

- ▶ Projection systems, signal monitoring, color separation and recombination, optical coupling
- ▶ Fewer ghost images than plate beamsplitters
- ▶ Index matching optical adhesive assembly (low absorbing, high VIS/NIR transmission)
- ▶ $T_p/T_s > 1000:1$ extinction ratio

LASER LINE POLARIZING CUBE BEAMSPLITTERS	
12.7mm Cube	
Wavelength (nm)	PART NUMBER
532	PBS-532-050
780	PBS-780-050
800	PBS-800-050
810	PBS-810-050
830	PBS-830-050
850	PBS-850-050
1030	PBS-1030-050
1064	PBS-1064-050
1550	PBS-1550-050
25.4mm Cube	
Wavelength (nm)	PART NUMBER
532	PBS-532-100
780	PBS-780-100
800	PBS-800-100
1064	PBS-1064-100

Please see page T-38 for coating traces.

HIGH ENERGY LASER LINE POLARIZING CUBE BEAMSPLITTERS: PBSO



CVI Laser Optics' high-energy, polarizing cube coatings are designed for optimal extinction ratio (T_p/T_s) and laser damage threshold. Via optical contacting, the cube remains free of adhesive within the clear aperture, preventing any environmental and spectral anomalies that can be attributed by said adhesive. For applications requiring higher transmission efficiency (i.e. $T_p > 98.0\%$), a reduction in extinction ratio can be applied.

- ▶ Adhesive free; optically contacted
- ▶ High laser damage threshold
- ▶ 750:1 extinction ratio typical

Specifications

Product Code: **PBSO**

Optical Material:

Standard Grade Corning 7980 1-D (Fused Silica)

Edge Dimension Tolerance: $A \pm 0.25\text{mm}$

Surface Quality: 20-10 scratch-dig per MIL-PRF-13830b

Transmitted Beam Deviation: < 5 arc minutes

Transmitted Wavefront Error (TWE): $< \lambda/4$ p-v at 633nm

Clear Aperture: $\geq 85\%$ of central dimension

Anti-reflection Coating:

$R < 0.25\%$, all entrance and exit surfaces

Extinction Ratio:

$\lambda > 500\text{nm}$: $T_p/T_s > 500:1$; $> 750:1$ typical

$\lambda \leq 500\text{nm}$: $T_p/T_s > 250:1$; $> 500:1$ typical

Transmission Efficiency:

$T_p > 95\%$

Reflection Efficiency:

$\lambda > 500\text{nm}$ $R_s > 99.5\%$

$\lambda \leq 500\text{nm}$ $R_s > 99.0\%$

Damage Threshold:

Pulsed:

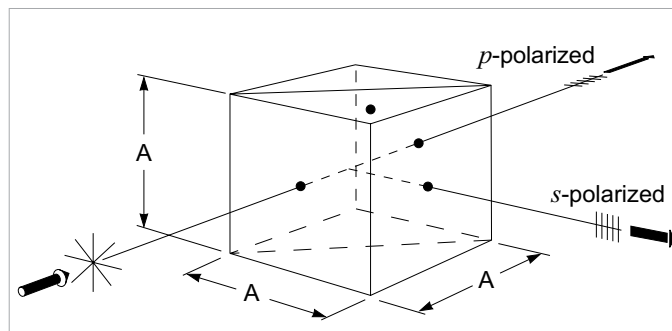
25 J/cm², 20ns, 20Hz at 1064nm

15 J/cm², 20ns, 20Hz at 532nm

3 J/cm², 20ns, 20Hz at 355nm

2 J/cm², 20ns, 20Hz at 266nm

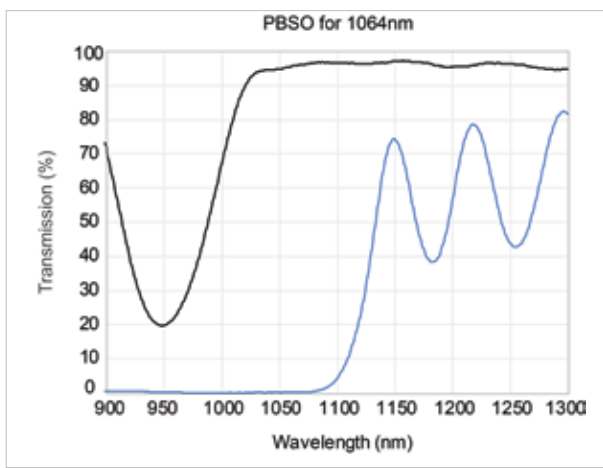
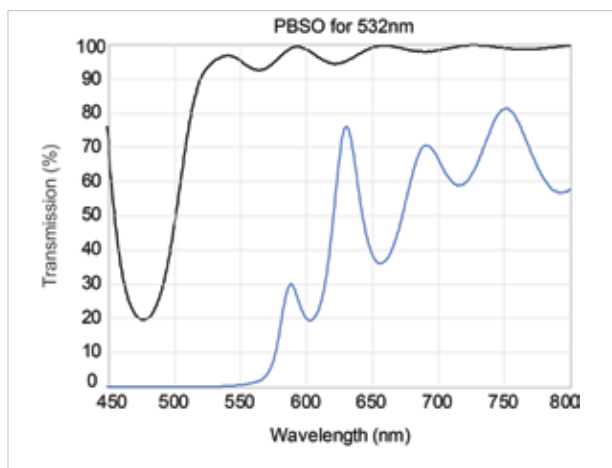
cw: 1 MW/cm² at 1064nm



PBSO high energy laser line polarizing beamsplitter cubes

HIGH ENERGY LASER LINE POLARIZING CUBE BEAMSPLITTERS		
Wavelength (nm)	PART NUMBER	
	12.7mm Cube	25.4mm Cube
266	PBSO-266-050	PBSO-266-100
355	PBSO-355-050	PBSO-355-100
532	PBSO-532-050	PBSO-532-100
1064	PBSO-1064-050	PBSO-1064-100

Please see page T-38 for coating traces.



P-POL: — UNP: - - - - S-POL: — 0°: ·····

ION BEAM SPUTTERED HIGH ENERGY LASER LINE POLARIZING CUBE BEAMSPLITTERS: PBSI



Call us for more information on custom polarizers and beamsplitter cube designs

- ▶ High energy laser line polarizer cube
- ▶ Reflected and transmitted beams separated by 90°

Specifications

Product Code: **PBSI**

Optical Material:

Standard Grade Corning 7980 0-A (Fused Silica)

Edge Dimension Tolerance (A): $\pm 0.25\text{mm}$

Transmitted Beam Deviation: < 3 arc minutes

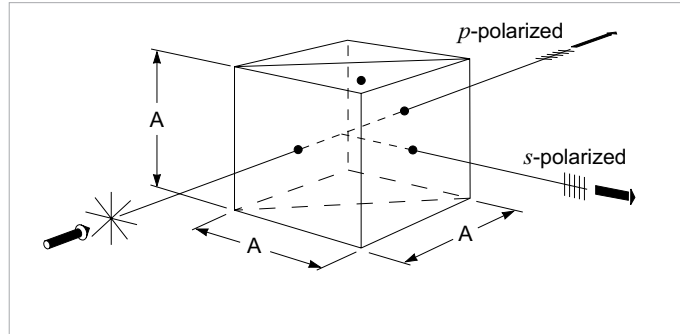
Surface Quality: 10-5 scratch-dig per MIL-PRF-13830b

Transmitted Wavefront Error (TWE): $< \lambda/4$ p-v at 633nm

Reflected Wavefront Error (RWE): $< \lambda/4$ p-v at 633nm

Clear Aperture: $\geq 85\%$ of central dimension

Anti-reflection Coating: $R \leq 0.20\%$, all entrance and exit surfaces



PBSI ion beam sputtered high energy laser line polarizing beamsplitter cubes

ION BEAM SPUTTERED HIGH ENERGY LASER LINE POLARIZING CUBE BEAMSPLITTERS

Wavelength (nm)	T_{p-pol}	Extinction Ratio T_p/T_s	Damage Threshold	PART NUMBER
355	$> 95.0\%$	$> 500:1$	2 J/cm ² @ 355nm	PBSI-355-050
532	$> 96.0\%$	$> 750:1$	4 J/cm ² @ 532nm	PBSI-532-050
1064	$> 97.0\%$	$> 1000:1$	10 J/cm ² @ 1064nm	PBSI-1064-050

Visit cvilaseroptics.com for traces.

VISIBLE AND NEAR-IR BROADBAND POLARIZING CUBE BEAMSPLITTERS: PBSH



Specifications

Product Code: **PBSH**

Optical Material: Schott N-SF2 glass

Edge Dimension Tolerance (A): $\pm 0.25\text{mm}$

Surface Quality: 20-10 scratch-dig per MIL-PRF-13830b

Transmitted Wavefront Error (TWE): $< \lambda/4$ p-v at 633nm

Clear Aperture: $\geq 85\%$ of central dimension

Field of View: $\pm 2.5^\circ$

Anti-reflection Coating: See table

Extinction Ratio: $T_p/T_s > 500:1$

Transmission Efficiency (T_p avg): $> 90\%$

Reflection Efficiency: $R_s > 99.5\%$ average

Clear Aperture: $\geq 85\%$ of central dimension

Damage Threshold:

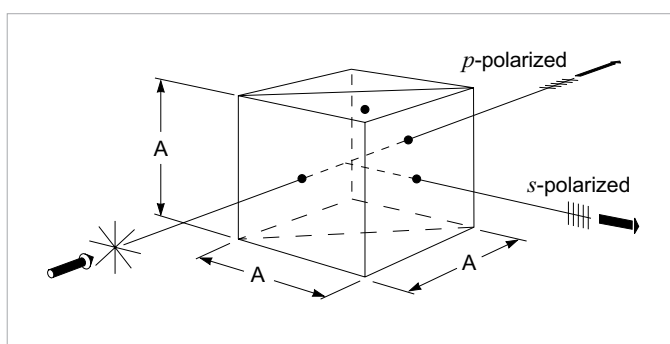
Pulsed: 500 mJ/cm^2 , 20ns, 20Hz at 515nm

cw: 100 W/cm^2 at 515nm

These broadband polarizing beamsplitter cubes are made from N-SF2 glass to improve broadband performance. A multi-layer anti-reflective coating is applied to each face of the beamsplitter to ensure maximum transmission efficiency.

To avoid damage when using a laser, be sure to orient the cube so that the beam enters through the prism marked with the dot.

- ▶ Broadband performance
- ▶ Reflected and transmitted beams separated by 90°
- ▶ Optical adhesive assembly
- ▶ Contact CVI Laser Optics for OEM opportunities for other wavelengths or dimensions



PBSH broadband polarizing cube beamsplitters

VISIBLE AND NEAR-IR BROADBAND POLARIZING CUBE BEAMSPLITTER

12.7mm Cube

Wavelength Range (nm)	R_{avg} (per surface)	PART NUMBER
450 – 700	$< 0.5\%$	PBSH-450-700-050
450 – 1300	$< 2.5\%$	PBSH-450-1300-050
450 – 2000	$< 3.0\%$	PBSH-450-2000-050
670 – 980	$< 0.5\%$	PBSH-670-980-050

25.4mm Cube

Wavelength Range (nm)	R_{avg} (per surface)	PART NUMBER
450 – 700	$< 0.5\%$	PBSH-450-700-100
450 – 1300	$< 2.5\%$	PBSH-450-1300-100
450 – 2000	$< 3.0\%$	PBSH-450-2000-100

Please see page T-38 for coating traces.

BROADBAND HYBRID CUBE BEAMSPLITTERS: BSC



Specifications

Product Code: **BSC**

Material: N-BK7

Edge Dimensions: $A \pm 0.3\text{mm}$

Transmission: $45\% \pm 6\%$

Surface Flatness: $< \lambda/2$ at 633nm per surface within clear aperture

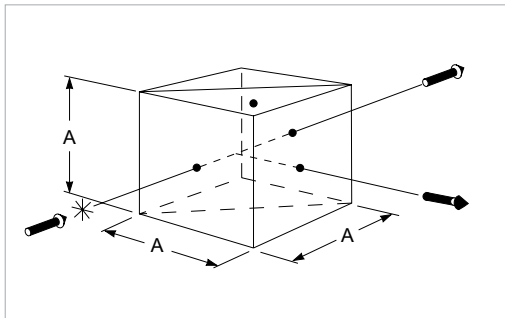
Clear Aperture: 90% of central area

Transmitted Beam Deviation: < 10 arc minutes

Surface Quality: 60-40 scratch-dig per MIL-PRF-13830b

Absorption: $< 10\%$

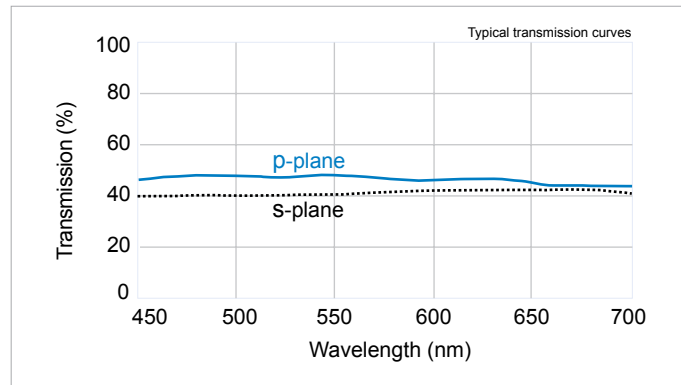
Coating: HEBBAR™ anti-reflection coating (entrance and exit faces) see page T-32



BSC broadband polarizing cube beamsplitters

Cube beamsplitters are recommended for use with collimated or nearly collimated light. Convergent or divergent beams will contribute unwanted spherical aberration to an optical system. Cube beamsplitters consist of matched pairs of right angle prisms cemented together. The hypotenuse of one prism has a partial reflecting coating. A black dot on the ground side of the prism indicates which prism has the partial reflector on the hypotenuse. The incident beam must enter the prism containing the partial reflector first.

- ▶ A hybrid metal dielectric coating exhibits moderate absorption with little polarization sensitivity
- ▶ These beamsplitters are fairly insensitive to changes in angle of incidence
- ▶ Optical adhesive contact
- ▶ Performance is relatively flat across a large spectral band
- ▶ Other wavelength ranges available



Broadband hybrid cube beamsplitter for 450 – 700nm

BROADBAND HYBRID CUBE BEAMSPLITTERS

Wavelength Range (nm)	A (mm)	CA (mm)	PART NUMBER
450 – 700	25.4	22.9x22.9 min	BSC-450-700-100

HIGH ENERGY CONTINUOUSLY VARIABLE BEAMSPLITTERS: ABSO



Specifications

Product Code: **ABSO**

Optical Material: Crystal Quartz and Standard Grade Corning 7980 1-D (Fused Silica)

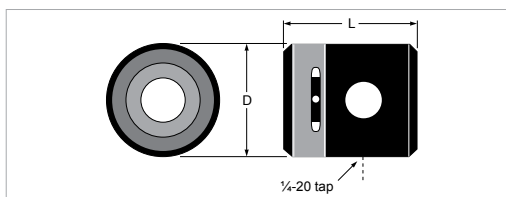
Housing Material: Black-Anodized Aluminum, 1/4-20 thread

Anti-reflection Coating: $R_s \leq 0.25\%$ on all entrance and exit surfaces

Transmission Range: 1%–95%

Transmitted Wavefront Error (TWE): $< \lambda/4$ p-v at 633nm

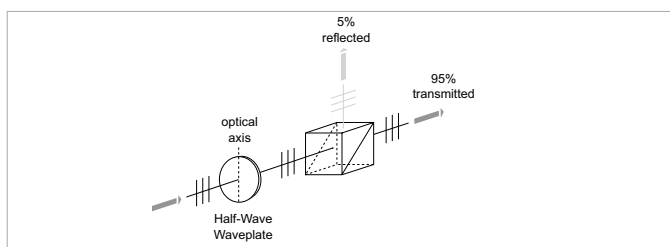
Damage Threshold: 5 J/cm², 20ns, 20Hz at 1064nm



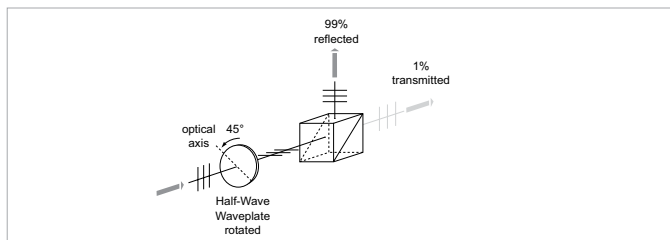
Housing for ABSO continuously variable beamsplitters

Continuously variable attenuation of linearly polarized light is achieved with a multiorder rotatable half-waveplate followed by a polarizing beamsplitter cube. The s-polarized light is reflected at 90° while p-polarized light is transmitted straight through the assembly. The amount of transmitted light depends on the alignment of the waveplate and can be manually adjusted from 1 to 95%.

- ▶ ABSO utilizes high powered cubes that are optically contacted
- ▶ Applications include: variable laser sampling, holography, interferometry, light entanglement, and variable ratio beamsplitting
- ▶ RoHS compliant
- ▶ Convenient 1/4-20 tapped thread for mounting



Orientation of waveplate for maximum p-polarized transmission



Orientation of waveplate for minimum p-polarized transmission

HIGH ENERGY CONTINUOUSLY VARIABLE BEAMSPLITTERS

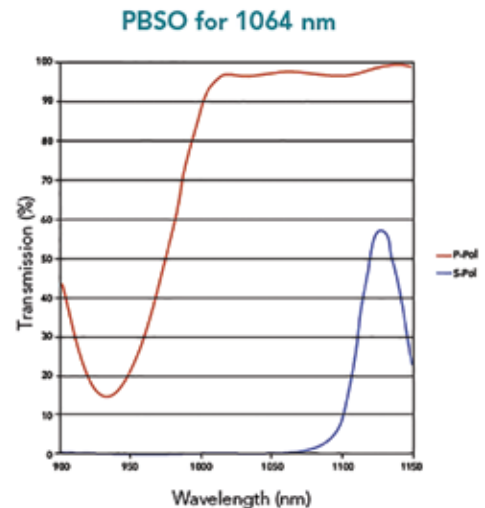
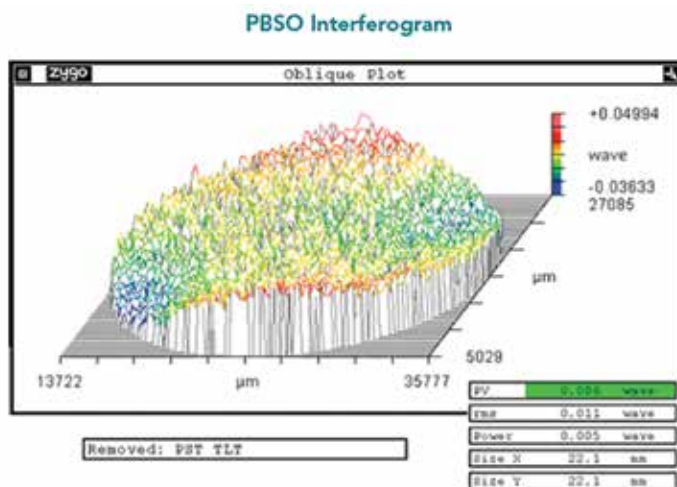
Wavelength (nm)	Clear Aperture (mm)	Housing Diameter (D)mm	Housing Length (L)mm	PART NUMBER
266	6.35	25.4	33.0	ABSO-6.35-266
355	6.35	25.4	33.0	ABSO-6.35-355
532	6.35	25.4	33.0	ABSO-6.35-532
1064	6.35	25.4	33.0	ABSO-6.35-1064
266	12.7	50.8	48.3	ABSO-12.7-266
355	12.7	50.8	48.3	ABSO-12.7-355
532	12.7	50.8	48.3	ABSO-12.7-532
1064	12.7	50.8	48.3	ABSO-12.7-1064

High Energy, High Extinction Plate and Cube Polarizers

CVI Laser Optics utilizes various coating technologies (Advanced Plasma Source, and Ion Beam Sputtering) and adhesive-free assembly techniques to enable the production of high performance polarizers. This results in laser damage and environmentally unsusceptible optics with high P-polarization versus S-polarization extinction ratio.

Newly Improved Optically Contacted Laser Line Polarizing Cube Beamsplitter

- Catalog Product Code: PBSO (see page 113)
- Increased laser damage threshold ($>30\text{J}/\text{cm}^2$, 20ns, 20Hz at 1064nm typical) and TP:TS extinction ($>750:1$ typical) of polarizing coating on hypotenuse face
- Increased durability against environmental factors such as humidity and abrasion
- Optically contacted
 - Adhesive free within clear aperture.
 - No index change, CTE mismatch, or environmental susceptibility concerns
- Optimized for Nd:YAG Wavelength and associated harmonics (1064nm, 532nm, 355nm, 266nm)
- CVI Laser Grade Surface Quality (10-5 Scratch-Dig per MIL-PRF-13830b) at 100W per surface
- Transmitted Wavefront Distortion (TWD) $< L/10$ p-v at 633nm over specified CA



Custom Polarizer Capability

- Brewster Plate Polarizers (56° AOI), Low Dispersion Plate Polarizers (72° AOI), Beam Path Accommodating Plate Polarizers (45° AOI), and Anything in Between from UV-NIR
- High Performing Laser Line and Broadband Polarizer Coatings
- Adhesive-Free Bonding Techniques for Polarizer Assemblies
- Custom Material, Substrates, Prisms, and Dimensional Features as Required
- Custom Designed and Assembled Optical Mounting and/or Housing (Metal or Glass)
- Transmitted Wavefront Distortion (TWD) $< L/20$ p-v at 633nm over Specified CA
- Expansive In-House Metrology for any Required Documentation