

WPBS20-VIS - November 6, 2020

Item # WPBS20-VIS was discontinued on November 6, 2020. For informational purposes, this is a copy of the website content at that time and is valid only for the stated product.

WIRE GRID POLARIZING BEAMSPLITTER CUBES

- ▶ Polarize and Split Wavelengths from 400 to 700 nm
- ▶ Accept Broad Angles of Incidence and Uncollimated Light
- ▶ High Extinction Ratio: >1 000:1 for Transmitted Beam



WPBS254-VIS
1" Wire Grid Polarizing
Beamsplitter Cube



WPBS20-VIS
20.0 mm Wire Grid
Polarizing Beamsplitter Cube



Application Idea
WPBS254-VIS Mounted in a
CM1-A4ER 30 mm Cage Cube

[Hide Overview](#)

OVERVIEW

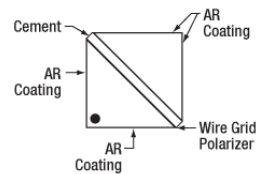
Features

- Transmits P-Polarized Light and Reflects S-Polarized Light
- Unmounted 20.0 mm and 1" Polarizing Beamsplitter Cubes
- Large Field of View
- High Extinction Ratio
 - $T_p:T_s > 1\ 000:1$ (AOI: $0^\circ - 5^\circ$)
 - $T_p:T_s > 100:1$ (AOI: $0^\circ - 25^\circ$)

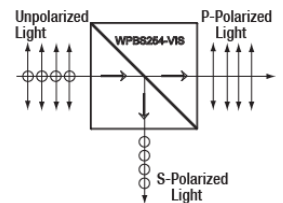
Thorlabs' Wire Grid Polarizing Beamsplitter Cubes consist of an array of parallel metallic wires sandwiched between two N-BK7 prisms. Wire grid polarizers transmit radiation with an electric field vector perpendicular to the wire and reflect radiation with the electric field vector parallel to the wire. These cubes separate the s- and p-polarized components by reflecting the s-polarized component at the wire grid, while allowing the p-polarized component to pass. Due to surface reflections, the reflected beam contains both polarizations.

This type of beamsplitter cube has a larger Angle of Incidence (AOI) than traditional broadband polarizing beamsplitter cubes. For the highest polarization extinction ratio, use the transmitted beam, which offers an extinction ratio of $T_p:T_s > 1\ 000:1$ for an AOI from 0° to 5° . For higher AOI (5° to 25°), these cubes can maintain an extinction ratio of $T_p:T_s > 100:1$.

The wire grid is sandwiched between the hypotenuses of the two prisms that make up the cube. Then, optical cement is used to bind the two prism halves together (refer to the diagram above). The engraved dot on the top of the cube indicates the prism with the wire grid polarizer. Light can be input into any of the polished faces to separate the s- and p-polarizations. One possible orientation is engraved on the top of the cube. Please refer to the *BS Cube Mounting* tab above for information on mounting options and compatibility.



Wire Grid Beamsplitter Diagram (Not to Scale)



Transmission and Reflection of Light Through Wire Grid Polarizing Beamsplitter

These beamsplitter cubes are AR coated for 400 - 700 nm ($R_{avg} < 0.5\%$ @ 0° AOI). Custom beamsplitter cubes can be ordered by contacting Tech Support. For high power applications, we also offer high-power polarizing beamsplitting cubes that have damage thresholds greater than 10 J/cm^2 . Mounted wire grid beamsplitting cubes are available. We also offer polarizing beamsplitter cubes at laser line wavelengths, which have a high extinction ratio of $>3 \text{ 000:1}$ ($T_p:T_s$).

[Hide Specs](#)

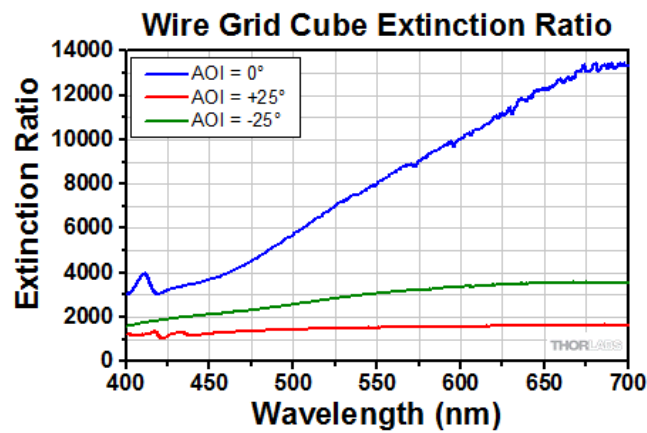
S P E C S

Item #	WPBS20-VIS	WPBS254-VIS
Design Wavelength	400 - 700 nm	
AR Coating	$R_{avg} < 0.5\%$ @ 0° AOI for 400 - 700 nm	
Material	N-BK7	
Extinction Ratio ^a	$T_p:T_s > 1 \text{ 000:1}$ @ $0^\circ - 5^\circ$ AOI $T_p:T_s > 100:1$ @ $0^\circ - 25^\circ$ AOI	
Transmission	$T_p > 75\%$ (Avg.) @ 0° AOI for 400 - 700 nm	
Reflectance	$R_s > 70\%$ @ $0^\circ - 25^\circ$ AOI for 400 - 700 nm	
Transmitted Beam Deviation	< 5 arcmin	
Reflected Beam Deviation	$90^\circ \pm 5$ arcmin	
Clear Aperture ^b	$> 16.0 \text{ mm} \times 16.0 \text{ mm}$	$> 22.9 \text{ mm} \times 22.9 \text{ mm}$
Transmitted Wavefront Error	$< \lambda/4$ @ 633 nm	
Surface Quality	40-20 Scratch-Dig	
Dimensions (L = W = H)	20.0 mm (0.79")	1" (25.4 mm)
Dimensional Tolerance	$+0.00 \text{ mm} / -0.25 \text{ mm}$	

- ^aThe extinction ratio (ER) is the ratio of maximum to minimum transmission of a sufficiently linearly polarized input. When the transmission axis and input polarization are parallel, the transmission is at its maximum; rotate the polarizer by 90° for minimum transmission.
- ^bThrough Entrance Faces

[Hide Graphs](#)

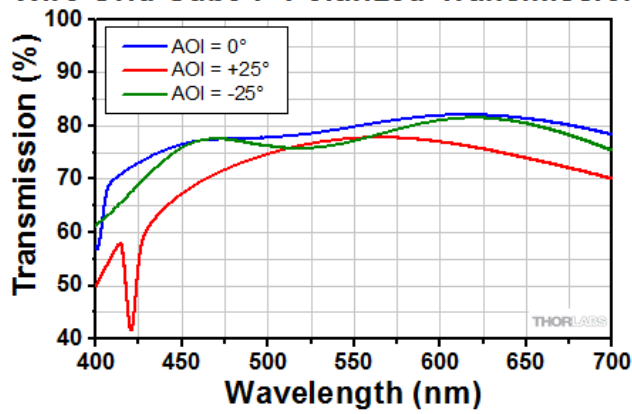
G R A P H S



Click to Enlarge
Click for Raw Data

The graph above shows the measured extinction ratio (ER) for transmitted light for light incident upon one of the entrance faces. The extinction ratio (also known as contrast) is the ratio of the maximum transmission of a sufficiently linearly polarized signal when the polarizer's axis is aligned with the signal to the minimum transmission when the polarizer is rotated by 90° . The plotted data is given for AOIs of 0° and $\pm 25^\circ$.

Wire Grid Cube P-Polarized Transmission

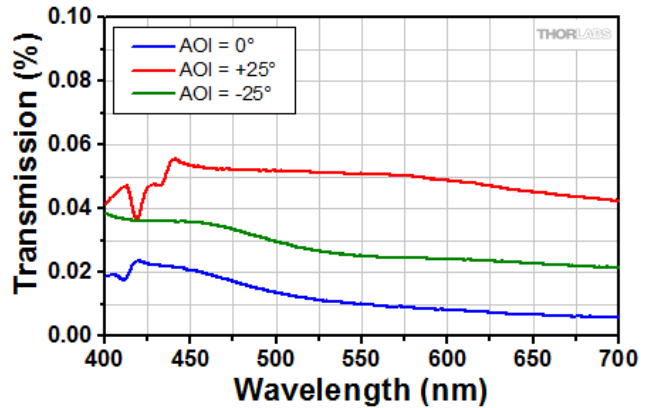


[Click to Enlarge](#)

[Click for Raw Data](#)

The graph above shows the measured transmission through the wire grid polarizing cube for p-polarized light for light incident upon one of the entrance faces. The plotted data is given for AOIs of 0° and ±25°.

Wire Grid Cube S-Polarized Transmission

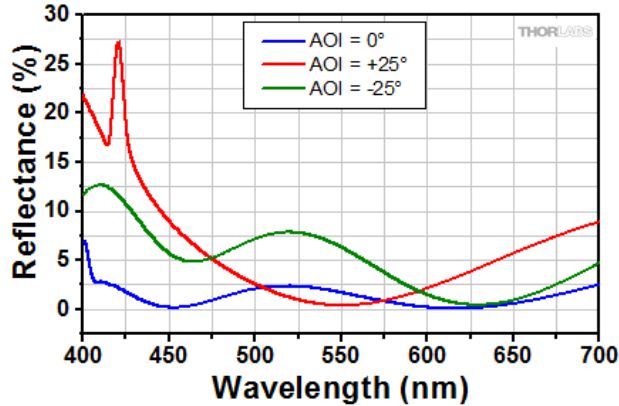


[Click to Enlarge](#)

[Click for Raw Data](#)

The graph above shows the measured transmission through the wire grid polarizing cube for s-polarized light for light incident upon one of the entrance faces. The plotted data is given for AOIs of 0° and ±25°.

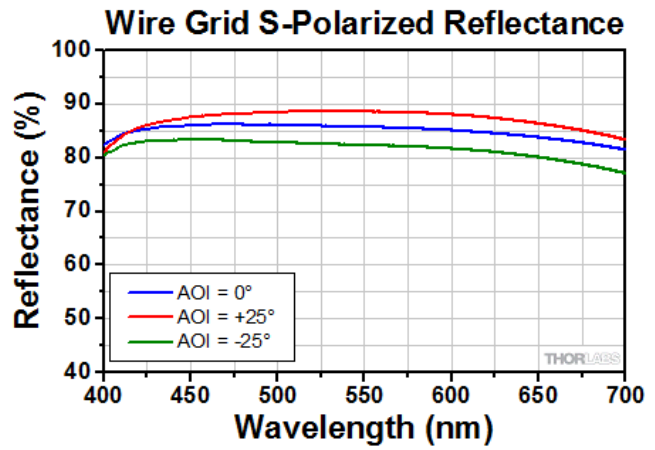
Wire Grid Cube P-Polarized Reflectance



[Click to Enlarge](#)

[Click for Raw Data](#)

The graph above shows the measured reflectance from the wire grid polarizing cube for p-polarized light for light incident upon one of the entrance faces. The plotted data is given for AOIs of 0° and ±25°.



[Click to Enlarge](#)

[Click for Raw Data](#)

The graph above shows the measured reflectance from the wire grid polarizing cube for s-polarized light for light incident upon one of the entrance faces. The plotted data is given for AOIs of 0° and ±25°.

[Hide BS Cube Mounting](#)



BS CUBE MOUNTING

Thorlabs offers a variety of mounting solutions for our beamsplitter cubes. The mounts below allow our cubes to be post-mounted or integrated into our 16 mm or 30 mm cage systems. Post-mountable solutions are compatible with our Ø1/2" Posts as well as Ø1" Posts with 8-32 (M4) taps.

Post-Mountable Mounts for Beamsplitter Cubes

Click Photo to Enlarge (Cubes Not Included)								
Item #	PCM(M)	BSH10(M) BSH05(M) BSH20(M) BSH1(M) BSH2(M)	FBTB(M)	KM100PM(M)	KM200PM(M)	KM100B(M)	KM200B(M)	K6XS
Required Accessories	Base: PCMP(M)	-	-	Clamp: PM3(M) or PM4(M)	Clamp: PM3(M) or PM4(M)	Clamp: PM3(M) or PM4(M)	Clamp: PM3(M) or PM4(M)	Adapter: K6A1(M)
Mounting Options	Ø1/2" Posts	Ø1/2" Posts ^{a,b}	Ø1/2" Posts	Ø1/2" Posts	Ø1/2" Posts	Ø1/2" Posts	Ø1/2" Posts	Ø1/2" Posts
Features	Compact	Compact	Glue-In Mount with Precision Tip, Tilt, and Rotation	Tip and Rotation	Tip and Rotation	Kinematic Mount	Kinematic Mount	6-Axis Mount
Compatible Beamsplitter Cube Size(s)	Up to 20 mm	10 mm, 1/2", 20 mm, 1", 2"	5 mm	Up to 20 mm ^c Up to 1" ^d	Up to 20 mm ^c Up to 1" ^d Up to 2" ^e	Up to 20 mm ^c Up to 1" ^d	Up to 20 mm ^c Up to 1" ^d Up to 2" ^e	5 mm 10 mm 1/2"

- ^a The BSH10(M) requires a AP8E4E thread adapter to mount to a Ø1/2" Post.
- ^b The BSH1(M) and BSH2(M) can be mounted directly to an optical table using their two 1/4" (M6) counterbores.
- ^c With PM3(M) Clamp
- ^d With PM4(M) Clamp
- ^e With PM4(M) and PM4SP(M) Extension Post

Cage System Mounts for Beamsplitter Cubes									
Click Photo to Enlarge (Cubes Not Included)									
Item #	Cage Cube: SC6W	ARV1	CRM1 (M) or CRM1P (M)	Cage Cube: C4W or C6W ^a		CCM1-4ER (M)	CCM1-A4ER (M)	CCM1-B4ER (M)	CCM1-C4ER (M)
Required Accessories	Clamp: SB6C, Platform: SPM2	-	Adapter: K6A1 (M)	Clamp: B6C, Platform: B3C (M) or B4C (M)	Clamp: B6C, Platform: B3CR (M) or B4CRP (M)	-	-	-	-
Mounting Options	16 mm Cage Systems	30 mm Cage Systems	30 mm Cage Systems or Ø1/2" Posts		30 mm Cage Systems	30 mm Cage Systems or Ø1/2" Posts			
Features	Compact	Compact	Rotation Mount	Fixed or Kinematic Platforms	Rotation Platforms	-	One Rotation Mount	Two Rotation Mounts @ 180°	Two Rotation Mounts @ 90°
Compatible Beamsplitter Cube Size(s)	10 mm	5 mm 10 mm	5 mm 10 mm 1/2"	1/2" 20 mm 1"		5 mm (with BS5CAM Adapter) 10 mm (with BS10CAM Adapter) 1/2" (with BS127CAM Adapter) 20 mm (with BS20CAM Adapter) 1" (Directly Compatible)			

- ^aThese photos illustrate two possible combinations. Any combination of cage cube, clamp, and platform is possible.

[Hide BS Selection Guide](#)

BS SELECTION GUIDE

Thorlabs' portfolio contains many different kinds of beamsplitters, which can split beams by intensity or by polarization. We offer plate and cube beamsplitters, though other form factors exist, including pellicle and birefringent crystal. Many of our beamsplitters come in premounted or unmounted variants. Below is a complete listing of our beamsplitter offerings. To explore the available types, wavelength ranges, splitting/extinction ratios, transmission, and available sizes for each beamsplitter category, click *More [+]* in the appropriate row below.

Non-Polarizing Beamsplitters

Plate Beamsplitters

Cube Beamsplitters

Pellicle Beamsplitters

- ^a45° AOI Unless Otherwise Noted

Polarizing Beamsplitters

Plate Beamsplitters

Cube Beamsplitters

Birefringent Crystal Beamsplitters

- ^aMounted in a protective box, unthreaded ring, or cylinder.
- ^bAvailable unmounted or mounted in a protective box or unthreaded cylinder.

Other Beamsplitters

Other Beamsplitters

[Hide Polarizer Guide](#)

Polarizer Selection Guide

Thorlabs offers a diverse range of polarizers, including wire grid, film, calcite, alpha-BBO, rutile, and beamsplitting polarizers. Collectively, our line of wire grid polarizers offers coverage from the visible range to the beginning of the Far-IR range. Our nanoparticle linear film polarizers provide extinction ratios as high as 100 000:1. Alternatively, our other film polarizers offer an affordable solution for polarizing light from the visible to the Near-IR. Next, our beamsplitting polarizers allow for use of the reflected beam, as well as the more completely polarized transmitted beam. Finally, our alpha-BBO (UV), calcite (visible to Near-IR), rutile (Near-IR to Mid-IR), and yttrium orthovanadate (YVO₄) (Near-IR to Mid-IR) polarizers each offer an exceptional extinction ratio of 100 000:1 within their respective wavelength ranges.

To explore the available types, wavelength ranges, extinction ratios, transmission, and available sizes for each polarizer category, click *More [+]* in the appropriate row below.

Wire Grid Polarizers
Film Polarizers
Beamsplitting Polarizers
alpha-BBO Polarizers
Calcite Polarizers
Quartz Polarizers
Magnesium Fluoride Polarizers
Yttrium Orthovanadate (YVO₄) Polarizers
Rutile Polarizers

- Click on the graph icons in this column to view a transmission curve for the corresponding polarizer. Each curve represents one substrate sample or coating run and is not guaranteed.
- Mounted in a protective box, unthreaded ring, or cylinder.
- Available unmounted or in an SM05-threaded (0.535"-40) mount that indicates the polarization axis.
- Available unmounted or in an SM1-threaded (1.035"-40) mount that indicates the polarization axis.
- Available unmounted or mounted in cubes for cage system compatibility.
- Calcite's transmittance of light near 350 nm is typically around 75% (see *Transmission* column).
- Available unmounted or in an unthreaded Ø1/2" housing.
- The transmission curves for calcite are valid for linearly polarized light with a polarization axis aligned with the mark on the polarizer's housing.
- The 1064 nm V coating corresponds to a -C26 suffix in the item number.
- Available unmounted or mounted in a protective box or unthreaded cylinder that indicates the polarization axis.

[Hide](#)

Part Number	Description	Price	Availability
WPBS20-VIS	20.0 mm Wire Grid Polarizing Beamsplitter Cube, 400 - 700 nm	\$401.02	Lead Time
WPBS254-VIS	1" Wire Grid Polarizing Beamsplitter Cube, 400 - 700 nm	\$430.68	Today

