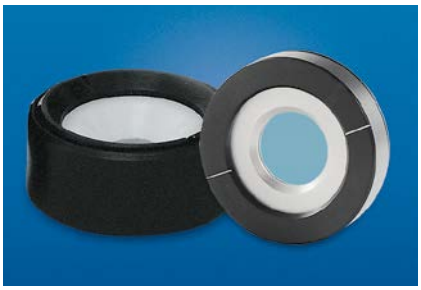
BBO – BETA BARIUM BORATE



FEATURES

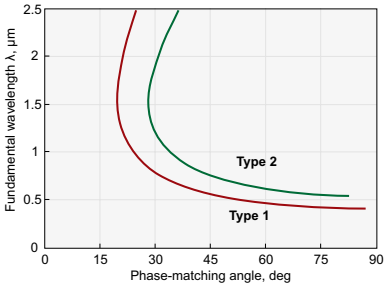
- Wide transparency region
- Broad phase-matching range
- Large nonlinear coefficient
- High damage threshold
- Wide thermal acceptance bandwidth
- High optical homogenity

As a result of its excellent properties BBO has a number of advantages for different applications:

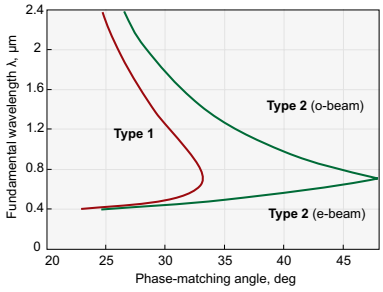
- harmonic generations (up to fifth) of Nd doped lasers
- frequency doubling and tripling of ultrashort pulse Ti:Sapphire and Dye lasers
- optical parametric oscillators (OPO) at both Type 1(ooe) and Type 2 (eoe) phase-matching
- frequency doubling of Argon ion and Copper vapour laser radiation
- electro-optic crystal for Pockels cells
- ultrashot pulse duration measurements by autocorrelation.

STANDARD SPECIFICATIONS

Flatness	λ/8 at 633 nm
Parallelism	< 20 arcsec
Surface quality	10 – 5 scratch & dig (MIL-PRF-13830B)
Perpendicularity	< 5 arcmin
Angle tolerance	< 30 arcmin
Aperture tolerance	± 0.1 mm
Clear aperture	90% of full aperture



SHG tuning curve of BBO



OPO tuning curves of BBO at 355 nm pump

WE OFFER:

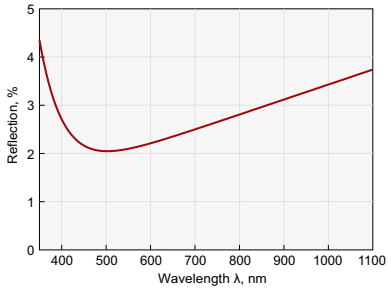
- Crystal aperture up to 25 × 25 mm
- Crystal length up to 25 mm
- Thin crystals down to 5 μm thickness
- AR, BBAR, P-coating
- BBO with gold electrodes for e/o applications
- Different mounting and repolishing services

STANDARD CRYSTALS LIST

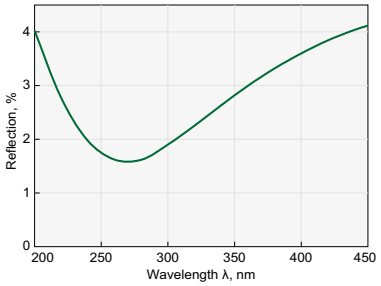
Size, mm	θ, deg	φ, deg	Coating	Application	Catalogue number	Price, EUR
6×6×0.1	29.2	90	P/P @ 400-800 nm	SHG @ 800 nm, Type 1	BBO-601H	505
6×6×0.2	29.2	90	P/P @ 400-800 nm	SHG @ 800 nm, Type 1	BBO-602H	505
6×6×0.5	29.2	90	P/P @ 400-800 nm	SHG @ 800 nm, Type 1	BBO-603H	440
6×6×1	29.2	90	P/P @ 400-800 nm	SHG @ 800 nm, Type 1	BBO-604H	390
6×6×2	29.2	90	P/P @ 400-800 nm	SHG @ 800 nm, Type 1	BBO-605H	360
6×6×0.1	44.3	90	P/P @ 400-800/266 nm	THG @ 800 nm, Type 1	BBO-609H	505
6×6×0.2	44.3	90	P/P @ 400-800/266 nm	THG @ 800 nm, Type 1	BBO-610H	505
6×6×0.5	44.3	90	P/P @ 400-800/266 nm	THG @ 800 nm, Type 1	BBO-611H	440
6×6×1	44.3	90	P/P @ 400-800/266 nm	THG @ 800 nm, Type 1	BBO-612H	390
10×10×0.1	29.2	90	P/P @ 400-800 nm	SHG @ 800 nm, Type 1	BBO-1001H	800
10×10×0.2	29.2	90	P/P @ 400-800 nm	SHG @ 800 nm, Type 1	BBO-1002H	790
10×10×0.5	29.2	90	P/P @ 400-800 nm	SHG @ 800 nm, Type 1	BBO-1003H	760
10×10×1	29.2	90	P/P @ 400-800 nm	SHG @ 800 nm, Type 1	BBO-1004H	765
10×10×2	29.2	90	P/P @ 400-800 nm	SHG @ 800 nm, Type 1	BBO-1005H	830
10×10×0.1	44.3	90	P/P @ 400-800/266 nm	THG @ 800 nm, Type 1	BBO-1009H	800
10×10×0.2	44.3	90	P/P @ 400-800/266 nm	THG @ 800 nm, Type 1	BBO-1010H	790
10×10×0.5	44.3	90	P/P @ 400-800/266 nm	THG @ 800 nm, Type 1	BBO-1011H	760
10×10×1	44.3	90	P/P @ 400-800/266 nm	THG @ 800 nm, Type 1	BBO-1012H	785

PHYSICAL AND OPTICAL PROPERTIES

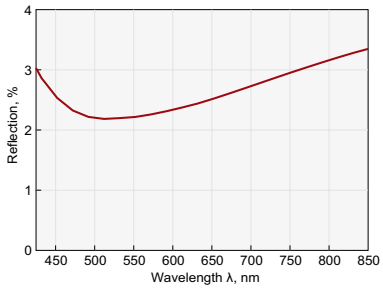
Chemical formula	BaB_2O_4	
Crystal structure	trigonal, 3m	
Optical symmetry	Negative Uniaxial ($n_o > n_e$)	
Space group	R3c	
Density	3.85 g/cm^3	
Mohs hardness	5	
Optical homogeneity	$\partial n = 10^{-6}$ cm^{-1}	
Transparency region at "0" transmittance level	189 – 3500 nm	
Linear absorption coefficient at 1064 nm	< 0.1% cm^{-1}	
Refractive indices	n_o	n_e
at 1064 nm	1.6551	1.5426
at 532 nm	1.6750	1.5555
at 355 nm	1.7055	1.5775
at 266 nm	1.7571	1.6139
at 213 nm	1.8465	1.6742
Sellmeier equations (λ, μm)	$n_o^2 = 2.7366122 + 0.0185720 / (\lambda^2 - 0.0178746) - 0.0143756\ \lambda^2$ $n_e^2 = 2.3698703 + 0.0128445 / (\lambda^2 - 0.0153064) - 0.0029129\ \lambda^2$	
Phase matching range Type 1 SHG	410 – 3300 nm	
Phase matching range Type 2 SHG	530 – 3300 nm	
Walk-off angle	55.9 mrad (Type 1 SHG 1064 nm)	
Angular acceptance	1.2 mrad × cm (Type 1 SHG 1064 nm)	
Thermal acceptance	70 K × cm (Type 1 SHG 1064 nm)	
Nonlinearity coefficients	$d_{22} = \pm 2.2$ pm/V; $d_{15} = d_{31} = \pm 0.08$ pm/V	
Effective nonlinearity expressions	$d_{ooe} = d_{31} \sin\theta - d_{22} \cos\theta \sin 3\varphi$ $d_{eoe} = d_{oee} = d_{22} \cos^2\theta \cos 3\varphi$	
Thermal expansion coefficient	$\alpha_{11} = 4 \times 10^{-6}$ K^{-1}; $\alpha_{33} = 36 \times 10^{-6}$ K^{-1}	
Damage threshold for TEM_{00}	> 0.5 GW/cm^2 at 1064 nm, 10 ns ~ 50 GW/cm^2 at 1064 nm, 1 ps > 200 GW/cm^2 at 800 nm, 100 fs, 50 Hz	



Typical P-coating for BBO SHG@800 nm application



Typical coating for BBO THG@800 nm or SHG@532 nm applications (output face P@266 nm)



Typical coating for BBO SHG@532 nm application (input face P@532 nm)

P-protective coating. It's a single or two layers antireflection coating made at specified wavelength range. Typical reflection values are R≈2% in the mid range, R<4% at the edges. P coating is recommended for ultra-short pulses applications and features low dispersion.

RELATED PRODUCTS

Thin BBO crystals for SHG and THG of Ti:Sapphire laser wavelength
See page 4.35

BBO crystals for SHG of Yb:KGW/KYW laser frequency conversion
See page 4.42

HOUSING ACCESSORIES

Ring Holders for Nonlinear Crystals
See page 2.26

Positioning Mount 840-0199 for Nonlinear Crystal Housing

Accepts crystals with aperture up to 12x12 mm and thichness up to 3 mm.

See page 2.27