EKSMA Co., Lasers, Optics, Electronics

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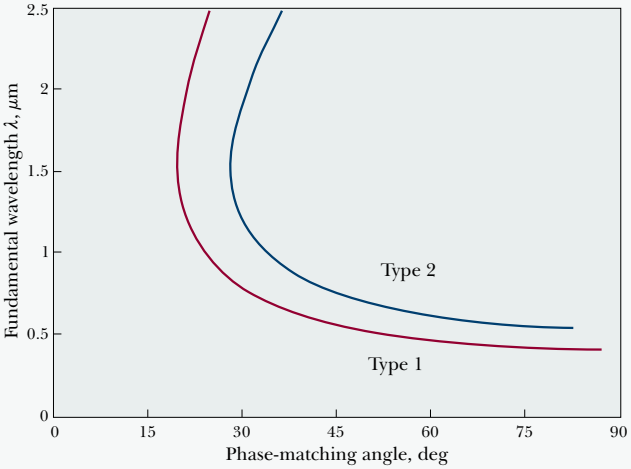
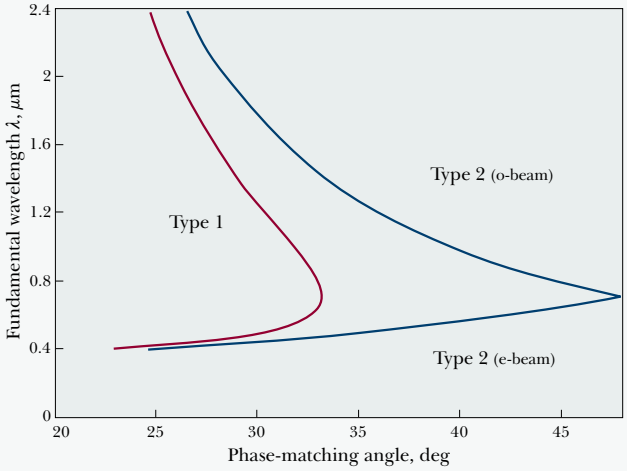
Beta Barium Borate – BBO



SHG tuning curve of BBO



OPO tuning curves of BBO at 355 nm pump

BBO is a nonlinear optical crystal with combination of number of unique features:

- wide transparency region
- broad phase-matching range
- large nonlinear coefficient
- high damage threshold
- wide thermal acceptance bandwidth
- high optical homogeneity.

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

- harmonic generations (up to fifth) of Nd:YAG and Nd:YLF 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.

EKSMA offers:

- crystal aperture up to 22 × 22 mm
- crystal length up to 22 mm
- thin crystals down to 5 μm thickness
- AR, BBAR, P-coating
- different mounting and repolishing services
- accurate quality control
- attractive prices and fast delivery
- one month customer's satisfaction term.

Please contact EKSMA for further information or nonstandard specifications.

Nonlinear and Laser Crystals

EKSMA Co., Lasers, Optics, Electronics

PHYSICAL AND OPTICAL PROPERTIES OF BBO

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	$\delta n = 10^{-6}$ 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])	$n_o^2 = 2.7405 + 0.0184/(\lambda^2 - 0.0179) - 0.0155\lambda^2$	
	$n_e^2 = 2.3730 + 0.0128/(\lambda^2 - 0.0156) - 0.0044\lambda^2$	
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	$d_{22} = \pm(2.22 \pm 0.09)$ pm/V	
	$d_{31} = \pm(0.16 \pm 0.08)$ pm/V	
Effective nonlinearity expressions	$d_{ooe} = d_{31} \sin\theta - d_{22} \cos\theta \sin 3\varphi$	
	$d_{eoe} = d_{oee} = d_{22} \cos^2\theta \sin 3\varphi$	
Damage threshold for TEM_{00} 1064 nm	> 5 GW/cm^2 at 10 ns	
	>50 GW/cm^2 at 1 ps	

STANDARD SPECIFICATIONS OF BBO CRYSTALS

Flatness	λ/6 at 633 nm
Parallelism	< 10 arc sec
Perpendicularity	< 5 arc min
Angle tolerance	< 30 arc min
Aperture tolerance	± 0.1 mm
Surface quality	10/5 scratch/dig as per MIL-O-13830A
Clear aperture	90% of full aperture