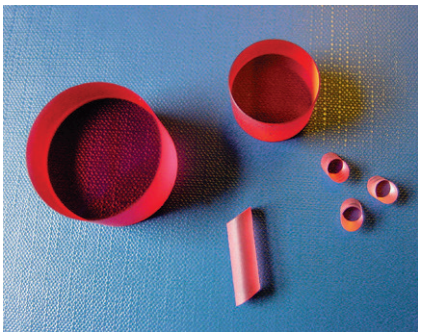
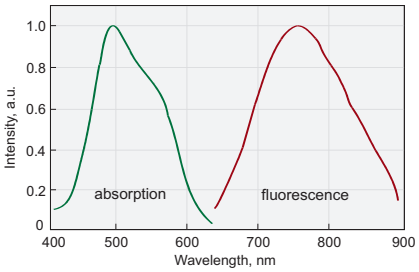
FemtoLine Laser Crystals

Ti:Sapphire (TITANIUM DOPED SAPPHIRE – $Ti:Al_2O_3$) LASER LINE AND HARMONICS



Ti:Sapphire laser crystal is used as a gain medium for tunable lasers and femtosecond solid-state lasers. Lasers based on Ti:Sapphire crystal are mainly used to generate ultrashort – femtosecond pulses.

The lasing band of Ti:Sapphire is 660-1050 nm, while common pump wavelength is frequency doubled Nd:YAG laser line at 532 nm or Argon Ion laser lines at 490-514 nm. The peak of emission in Ti:Sapphire is at 790-800 nm wavelength.



MATERIAL PHYSICAL AND LASER PROPERTIES

Chemical formula	$Ti^{3+}:Al_2O_3$
Crystal structure	Hexagonal
Lattice constants	a=4.748, c=12.957
Density	3.98 g/cm^3
Mohs hardness	9
Thermal conductivity	0.11 cal/(°C×sec×cm)
Specific heat	0.10 cal/g
Melting point	2050 °C
Laser action	4-Level Vibronic
Fluorescence lifetime	3.2 µsec (T=300K)
Tuning range	660–1050 nm
Absorbtion range	400–600 nm
Emission peak	795 nm
Absorption peak	488 nm
Refractive index	1.76 @ 800 nm

STANDARD PRODUCT SPECIFICATIONS

Orientation	optical axis C normal to rod axis
Ti_2O_3 concentration	0.03–0.25 wt %
Figure of Merit	> 150
Size	up to 15 mm dia and up to 30 mm length
End configurations	flat/flat or Brewster/Brewster
End flatness	λ/10 @ 633 nm
Parallelism	10 arcsec
Surface finishing	10-5 scratch & dig
Wavefront distortion	λ/4 inch

Note: To inquire or order a finished Ti:Sa laser rod, please provide detailed specifications. Dopant concentration, size of crystal and end configuration are essential specifications.

FREQUENCY CONVERSION OF Ti:Sapphire LASER WAVELENGTHS

Frequency doubling and tripling allow access to the green, blue and ultraviolet spectral regions. While the frequency conversion by Optical Parametric Generation offers wide tuning range in the near-infrared spectral region, it is often sufficient to tune the Ti:sapphire wavelength for tuning the OPO, rather than tuning the OPO itself, e.g. by actively affecting the phase-matching conditions. Further wavelength extension to mid infrared range is possible by Difference Frequency Generation employing signal and idler wavelength pulses obtained from OPO.

CRYSTALS SELECTION FOR Ti:Sapphire LASER FREQUENCY CONVERSION

Thin BBO crystals for SHG @ 800 nm	→	350 – 450 nm range
Thin BBO crystals for THG @ 800 nm	→	230 – 300 nm range
Thin BBO crystals for OPG/OPA @ pump 800 nm	→	1050 – 2300 nm range
Thin BBO crystals for OPG/OPA @ pump 400 nm	→	480 – 2300 nm range
$AgGaS_2$ crystals for DFG	→	2500 – 12000 nm range

THIN BBO CRYSTALS FOR SHG AND THG OF TI:SAPPHIRE LASER WAVELENGTH

FREE STANDING BBO CRYSTALS

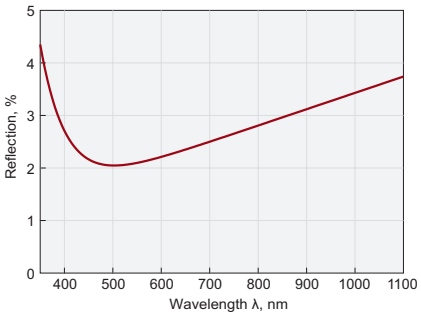
The crystals down to 100 µm can be supplied as free standing crystals not attached to the support. However, ring mounts are highly recommended for safe handling of these thin crystals. Minimum aperture of free standing BBO is 5×5 mm, maximum aperture is 22×22 mm. The tolerance is ±50 µm for crystals of thickness down to 300 µm and ±20 µm for crystals of thickness down to 100 µm.

OPTICALLY CONTACTED CRYSTALS

BBO crystals less than 100 µm thickness can be supplied optically contacted on UV Fused Silica substrate sizes 10×10×1 mm or 12×12×2 mm. Other sizes of substrates are also available on request. Minimum aperture of optically contacted BBO is 5×5 mm, maximum aperture is 10×10 mm. The tolerance of crystal thickness is +10/-5 microns.

PROTECTIVE COATINGS FOR BBO CRYSTALS

P-protective coating – is a single or two layer 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 highly recommended for ultrashort pulse applications and features low dispersion and very high laser damage threshold.



Typical P-coating for BBO SHG@800 nm application

STANDARD SPECIFICATIONS OF ULTRATHIN BBO CRYSTALS

Flatness	λ/8 @ 633 nm
Parallelism	< 20 arcsec
Perpendicularity	< 5 arcmin
Angle tolerance	< 30 arcmin
Aperture tolerance	± 0.1 mm
Surface quality	10 – 5 scratch & dig (MIL-PRF-13830B)
Clear aperture	>90% of full aperture
Laser damage threshold	>200 GW/cm², 133 fsec pulse, 800 nm typical, 50 Hz

EKSMA OPTICS recommends the following thickness BBO crystals depending on application and fundamental wavelength pulse duration, assuming it is spectrum limited Gausian pulse.

Application	Pulse duration, fs	Thickness, mm
Type 1, SHG @ 800 nm, Θ=29.2°, φ=90°	10	0.05
	20	0.1
	50	0.2
	100	0.5
	200	1
Type 1, THG @ 800 nm, Θ=44,3°, φ=90°	10	0.01
	20	0.02
	50	0.05
	100	0.1
	200	0.2

BBO FOR SHG @ 800 nm

BBO CRYSTAL. Thickness = 0.05 mm*

Aperture, mm	UV FS support size, mm	θ, deg	φ, deg	Coating	Catalogue number	Price, EUR
6×6	10×10×2	29.2	90	P/P @ 400-800 nm	BBO-600H	948
8×8	10×10×2	29.2	90	P/P @ 400-800 nm	BBO-800H	990
10×10	12×12×2	29.2	90	P/P @ 400-800 nm	BBO-1000H	1110

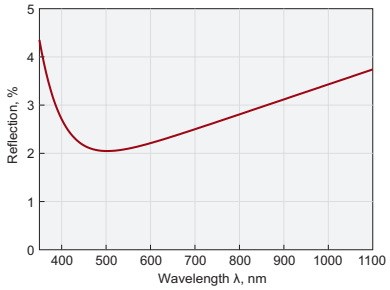
** All BBO crystals of thickness less than 100 µm are optically contacted onto UV FS support.*
All crystals are mounted into open ring holders.

SHG BBO CRYSTALS. Thickness = 0.1 mm

Aperture, mm	θ, deg	φ, deg	Coating	Catalogue number	Price, EUR
6×6	29.2	90	P/P @ 400-800 nm	BBO-601H	505
8×8	29.2	90	P/P @ 400-800 nm	BBO-801H	710
10×10	29.2	90	P/P @ 400-800 nm	BBO-1001H	800
12×12	29.2	90	P/P @ 400-800 nm	BBO-1201H	1295
15×15	29.2	90	P/P @ 400-800 nm	BBO-1501H	2040
20×20	29.2	90	P/P @ 400-800 nm	BBO-2001H	3785
22×22	29.2	90	P/P @ 400-800 nm	BBO-2201H	5155

SHG BBO CRYSTAL. Thickness = 0.5 mm

Aperture, mm	θ, deg	φ, deg	Coating	Catalogue number	Price, EUR
6×6	29.2	90	P/P @ 400-800 nm	BBO-603H	440
8×8	29.2	90	P/P @ 400-800 nm	BBO-803H	665
10×10	29.2	90	P/P @ 400-800 nm	BBO-1003H	760
12×12	29.2	90	P/P @ 400-800 nm	BBO-1203H	1265
15×15	29.2	90	P/P @ 400-800 nm	BBO-1503H	1980
20×20	29.2	90	P/P @ 400-800 nm	BBO-2003H	3720
22×22	29.2	90	P/P @ 400-800 nm	BBO-2203H	5150



P-protective coating curve of Type 1
(θ=29.2°, φ=90°) BBO crystal used for SHG@800 nm

SHG BBO CRYSTAL. Thickness = 0.2 mm

Aperture, mm	θ, deg	φ, deg	Coating	Catalogue number	Price, EUR
6×6	29.2	90	P/P @ 400-800 nm	BBO-602H	505
8×8	29.2	90	P/P @ 400-800 nm	BBO-802H	710
10×10	29.2	90	P/P @ 400-800 nm	BBO-1002H	790
12×12	29.2	90	P/P @ 400-800 nm	BBO-1202H	1285
15×15	29.2	90	P/P @ 400-800 nm	BBO-1502H	2020
20×20	29.2	90	P/P @ 400-800 nm	BBO-2002H	3725
22×22	29.2	90	P/P @ 400-800 nm	BBO-2202H	5150

SHG BBO CRYSTAL. Thickness = 1 mm

Aperture, mm	θ, deg	φ, deg	Coating	Catalogue number	Price, EUR
6×6	29.2	90	P/P @ 400-800 nm	BBO-604H	390
8×8	29.2	90	P/P @ 400-800 nm	BBO-804H	615
10×10	29.2	90	P/P @ 400-800 nm	BBO-1004H	765
12×12	29.2	90	P/P @ 400-800 nm	BBO-1204H	1150
15×15	29.2	90	P/P @ 400-800 nm	BBO-1504H	1860
20×20	29.2	90	P/P @ 400-800 nm	BBO-2004H	3575
22×22	29.2	90	P/P @ 400-800 nm	BBO-2204H	4580

SHG BBO CRYSTAL. Thickness = 2 mm

Aperture, mm	θ, deg	φ, deg	Coating	Catalogue number	Price, EUR
6×6	29.2	90	P/P @ 400-800 nm	BBO-605H	360
8×8	29.2	90	P/P @ 400-800 nm	BBO-805H	620
10×10	29.2	90	P/P @ 400-800 nm	BBO-1005H	830
12×12	29.2	90	P/P @ 400-800 nm	BBO-1205H	1200
15×15	29.2	90	P/P @ 400-800 nm	BBO-1505H	1910
20×20	29.2	90	P/P @ 400-800 nm	BBO-2005H	3625
22×22	29.2	90	P/P @ 400-800 nm	BBO-2205H	4630

HOUSING ACCESSORIES

Ring Holders
for Nonlinear Crystals
See page 2.26

Positioning Mount
840-0199 for
Nonlinear Crystal
Housing
See page 2.27

BBO FOR THG @ 800 nm

BBO CRYSTAL. Thickness = 0.01 mm, optically contacted

Aperture, mm	UV FS support size, mm	θ, deg	φ, deg	Coating	Catalogue number	Price, EUR
6×6	10×10×2	44.3	90	P/P @ 400-800/266	BBO-606H	1020
8×8	10×10×2	44.3	90	P/P @ 400-800/266	BBO-806H	1060
10×10	12×12×2	44.3	90	P/P @ 400-800/266	BBO-1006H	1175

BBO CRYSTAL. Thickness = 0.02 mm, optically contacted

Aperture, mm	UV FS support size, mm	θ, deg	φ, deg	Coating	Catalogue number	Price, EUR
6×6	10×10×2	44.3	90	P/P @ 400-800/266	BBO-607H	1020
8×8	10×10×2	44.3	90	P/P @ 400-800/266	BBO-807H	1060
10×10	12×12×2	44.3	90	P/P @ 400-800/266	BBO-1007H	1175

BBO CRYSTAL. Thickness = 0.05 mm, optically contacted

Aperture, mm	UV FS support size, mm	θ, deg	φ, deg	Coating	Catalogue number	Price, EUR
6×6	10×10×2	44.3	90	P/P @ 400-800/266	BBO-608H	948
8×8	10×10×2	44.3	90	P/P @ 400-800/266	BBO-808H	990
10×10	12×12×2	44.3	90	P/P @ 400-800/266	BBO-1008H	1110

THG BBO CRYSTAL. Thickness = 0.1 mm

Aperture, mm	θ, deg	φ, deg	Coating	Catalogue number	Price, EUR
6×6	44.3	90	P/P @ 400-800/266	BBO-609H	505
8×8	44.3	90	P/P @ 400-800/266	BBO-809H	710
10×10	44.3	90	P/P @ 400-800/266	BBO-1009H	800
12×12	44.3	90	P/P @ 400-800/266	BBO-1209H	1330
15×15	44.3	90	P/P @ 400-800/266	BBO-1509H	2140
20×20	44.3	90	P/P @ 400-800/266	BBO-2009H	3925
22×22	44.3	90	P/P @ 400-800/266	BBO-2209H	5355

THG BBO CRYSTAL. Thickness = 0.2 mm

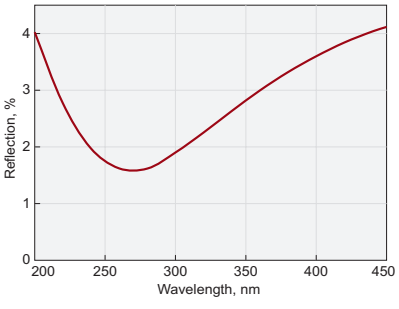
Aperture, mm	θ, deg	φ, deg	Coating	Catalogue number	Price, EUR
6×6	44.3	90	P/P @ 400-800/266	BBO-610H	505
8×8	44.3	90	P/P @ 400-800/266	BBO-810H	710
10×10	44.3	90	P/P @ 400-800/266	BBO-1010H	790
12×12	44.3	90	P/P @ 400-800/266	BBO-1210H	1285
15×15	44.3	90	P/P @ 400-800/266	BBO-1510H	2020
20×20	44.3	90	P/P @ 400-800/266	BBO-2010H	3915
22×22	44.3	90	P/P @ 400-800/266	BBO-2210H	5310

THG BBO CRYSTAL. Thickness = 0.5 mm

Aperture, mm	θ, deg	φ, deg	Coating	Catalogue number	Price, EUR
6×6	44.3	90	P/P@400-800/266	BBO-611H	440
8×8	44.3	90	P/P@400-800/266	BBO-811H	665
10×10	44.3	90	P/P@400-800/266	BBO-1011H	760
12×12	44.3	90	P/P@400-800/266	BBO-1211H	1265
15×15	44.3	90	P/P@400-800/266	BBO-1511H	1980
20×20	44.3	90	P/P@400-800/266	BBO-2011H	3900
22×22	44.3	90	P/P@400-800/266	BBO-2211H	5300

THG BBO CRYSTAL. Thickness = 1 mm

Aperture, mm	θ, deg	φ, deg	Coating	Catalogue number	Price, EUR
6×6	44.3	90	P/P @ 400-800/266	BBO-612H	390
8×8	44.3	90	P/P @ 400-800/266	BBO-812H	625
10×10	44.3	90	P/P @ 400-800/266	BBO-1012H	785
12×12	44.3	90	P/P @ 400-800/266	BBO-1212H	1210
15×15	44.3	90	P/P @ 400-800/266	BBO-1512H	1920
20×20	44.3	90	P/P @ 400-800/266	BBO-2012H	3860
22×22	44.3	90	P/P @ 400-800/266	BBO-2212H	4960



P-protective coating curve of Type 1 (θ=44.3°, φ=90°)
BBO crystal's exit face used for THG@800 nm

RELATED PRODUCTS

Zero Order Dual Wavelength Plates
See page 4.24

Ring Holders
for Nonlinear Crystals
See page 2.26

Positioning
Mount 840-0199
for Nonlinear
Crystal Housing
See page 2.27

FEMTOKITS FOR THIRD HARMONIC GENERATION OF FEMTOSECOND Ti:Sapphire LASER

Kits consist of set of components required for efficient third harmonic generation of femtosecond Ti:Sapphire laser. The schemes of the third harmonic generation in basic and extended Femtokits are presented below.

BASIC FEMTOKIT FK SERIES

The thickness of SHG BBO crystal, THG BBO crystal and group delay compensation plate is different in each kit and is optimal for certain pulse duration of fundamental harmonic to avoid harmonic pulses broadening.

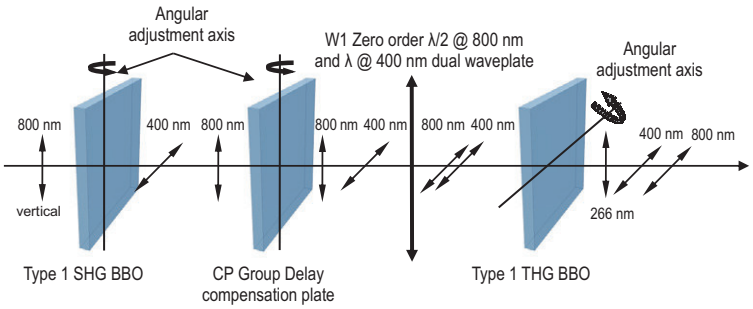
Basic Femtokit FK series includes:

- Type 1 SHG BBO crystal with 6×6 mm aperture, P-coated @ 400-800 nm,
- Type 1 THG BBO crystal with 6×6 mm aperture, P-coated @ 400-800/266 nm,
- Calcite plate for group velocity delay compensation CP, AR coated @ 800+400 nm,
- Zero order dual waveplate W1, optically contacted, AR coated @ 800+400 nm,
- All above four components are mounted in to 1 inch ring holders for convenient handling.

Fundamental pulse duration	Basic FemtoKit FK Series		Basic Mounted FemtoKit FK Series	
	Catalogue number	Price, EUR	Catalogue number	Price, EUR
150 – 250 fsec	FK-800-200	1710	FK-800-200-M	2658
120 – 150 fsec	FK-800-130	1760	FK-800-130-M	2708
70 – 120 fsec	FK-800-100	1760	FK-800-100-M	2708
30 – 70 fsec	FK-800-050	2268	FK-800-050-M	3216
15 – 30 fsec	FK-800-020	2340	FK-800-020-M	3288

Non-standard kits with larger apertures of BBO crystals and thicknesses optimal for other pulse durations are available on request.

Mounted Femtokit FK Series



EXTENDED FEMTOKIT FKE SERIES

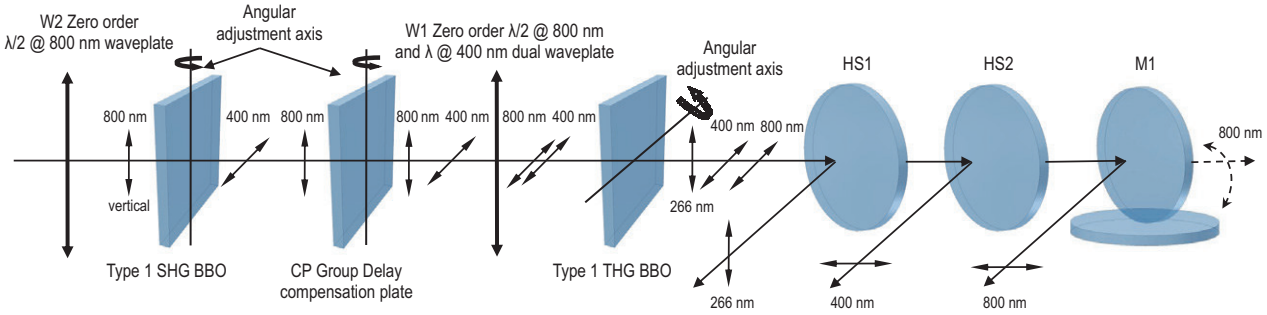
Up to 50% SHG conversion efficiency which was achieved in 0.5 mm SHG BBO crystal with Ti:Sapphire Super Spitfire laser operating at 1 kHz, 130 fs, 20-100 μJ @ 800 nm and effective beam diameter 0.9 mm. THG efficiency was reached up to 8% from fundamental using FKE-800-100 Femtokit.

Extended Femtokit FKE series includes:

- All components from basic kit,
- Additional zero order waveplate W2, optically contacted, AR coated @ 800 nm,
- Harmonic Separator HS1 HR @ 266 nm and HT @ 800+400 nm at AOI=45 deg,
- Harmonic Separator HS2 HR @ 400 nm and HT @ 800 nm at AOI=45 deg,
- Laser mirror M1, HR at 800 nm at AOI=45 deg.

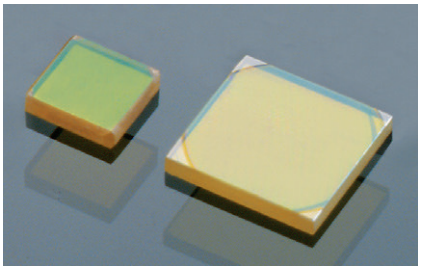
Fundamental pulse duration	Extended FemtoKit FKE Series		Extended Mounted FemtoKit FKE Series	
	Catalogue number	Price, EUR	Catalogue number	Price, EUR
150 – 250 fsec	FKE-800-200	2402	FKE-800-200-M	4122
120 – 150 fsec	FKE-800-130	2452	FKE-800-130-M	4172
70 – 120 fsec	FKE-800-100	2452	FKE-800-100-M	4172
30 – 70 fsec	FKE-800-050	2960	FKE-800-050-M	4680
15 – 30 fsec	FKE-800-020	3032	FKE-800-020-M	4752

Non-standard kits with larger apertures of BBO crystals and thicknesses optimal for other pulse durations are available on request.



Extended Mounted Femtokit FKE Series

THIN $AgGaS_2$ CRYSTALS FOR DFG → 2.5 – 1.3 µm



STANDARD SPECIFICATIONS

Flatness	λ/6 @ 633 nm
Parallelism	< 20 arcsec
Perpendicularity	< 10 arcmin
Angle tolerance	< 30 arcmin
Aperture tolerance	± 0.1 mm
Surface quality	10 – 5 scratch & dig (MIL-PRF-13830B)
Clear aperture	> 90% of full aperture

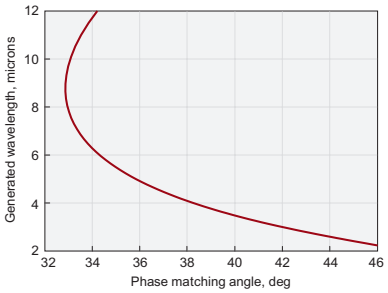
BBAR COATED $AgGaS_2$ CRYSTALS

BBAR coating – is multilayer dialectric antireflection coating made at specified wavelength range. Standard coating is designed to reduce reflection losses at input side at 1.1 – 2.6 micron range and output side at 2.6 – 11 micron range.

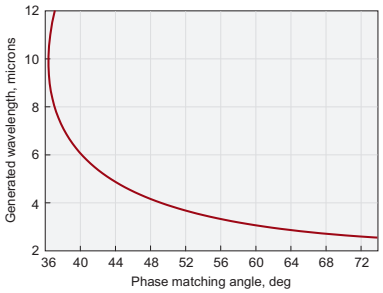
Typical reflection values are R<0.5% in the mid range, and up to reflection values of uncoated crystal at the edges of given ranges. BBAR coating is designed to minimise dispersion of ultrashort pulses and also features high damage threshold.

Size, mm			Orientation		Coating	Application	Catalogue number	Price, EUR
W	H	L	θ	φ				
5	5	1	39	45	BBAR/BBAR @ 1.1-2.6 / 2.6-11 µm	DFG @ 1.2-2.4 µm -> 2.4-11 µm	AGS-401H	835
6	6	2	50	0	BBAR/BBAR @ 1.1-2.6 / 2.6-11 µm	DFG @ 1.2-2.4 µm -> 2.4-11 µm	AGS-402H	1345
5	5	0.4	34	45	BBAR/BBAR @ 3-6 / 1.5-3 µm	SHG @ 3-6 µm, Type 1	AGS-403H	995
5	5	0.4	39	45	BBAR/BBAR @ 1.1-2.6 / 2.6-11 µm	DFG @ 1.2-2.4 µm -> 2.4-11 µm	AGS-404H	995
8	8	0.4	39	45	BBAR/BBAR @ 1.1-2.6 / 2.6-11 µm	DFG @ 1.2-2.4 µm -> 2.4-11 µm	AGS-801H	2340
8	8	1	39	45	BBAR/BBAR @ 1.1-2.6 / 2.6-11 µm	DFG @ 1.2-2.4 µm -> 2.4-11 µm	AGS-802H	2140

Crystals are mounted into open ring holders (see page 2.26).



Type 1 DFG (e-o=o) in AGS. DFG of signal and idler generated in BBO pumped at 800 nm



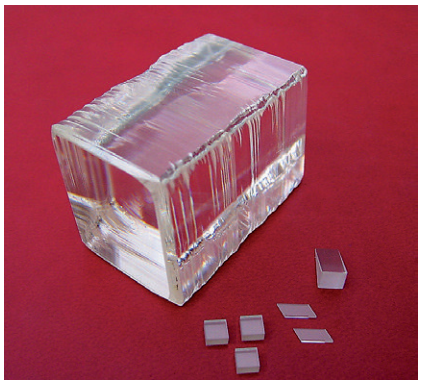
Type 2 DFG (e-o=e) in AGS. DFG of signal and idler generated in BBO pumped at 800 nm

HOUSING ACCESSORIES

Ring Holders for Nonlinear Crystals
See page 2.26

Positioning Mount 840-0199 for Nonlinear Crystal Housing
See page 2.27

Yb:KGW AND Yb:KYW CRYSTALS LASER LINES AND HARMONICS



Yb:KGW and Yb:KYW crystals have broad emission bandwidths and are used as lasing materials to generate ultrashort (~100 – 200 fs) high power pulses. Direct pump of Yb:KGW/KYW crystals with laser diodes operating at 981 nm supports compact laser systems. Yb:KGW/KYW laser generates pulses at 1023 – 1060 nm wavelength range. Also Yb:KGW and Yb:KYW can be used as ultrashort pulse amplifiers.

We believe that Yb:KGW and Yb:KYW are some of the best materials for high power thin disk lasers generating femtosecond pulses.

FEATURES

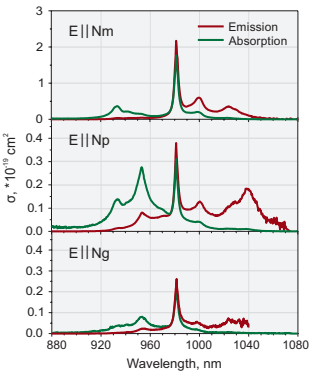
- High absorption coefficient at 981 nm
- High stimulated emission cross section
- Low laser threshold
- Extremely low quantum defect $\lambda_{pump} / \lambda_{se}$
- Broad polarized output at 1023–1060 nm
- High slope efficiency with diode pumping (~ 60%)
- High Yb doping concentration

CUSTOM MANUFACTURING CAPABILITIES

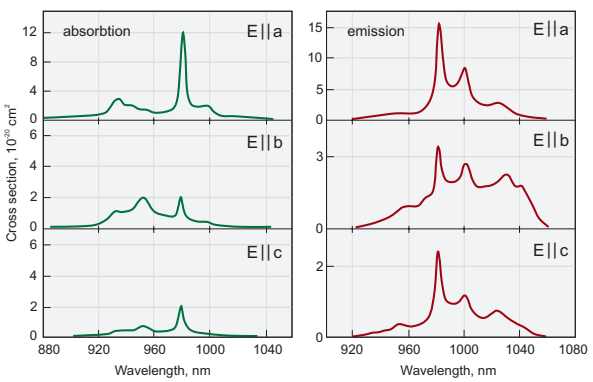
- Various shapes (slabs, rods, cubes, disks)
- Different dopant levels
- Diversified coatings
- Attractive prices for introductory quantities to OEMs

PROPERTIES OF Yb:KGW AND Yb:KYW

Name	Yb:KGW	Yb:KYW
Yb^{3+} concentration	0.5–5%	0.5–100%
Crystal structure	monoclinic	monoclinic
Point group	C2/c	C2/c
Lattice parameters	a=8.095 Å, b=10.43 Å, c=7.588 Å, β=94.43°	a=8.05 Å, b=10.35 Å, c=7.54 Å, β=94°
Thermal expansion	α_a=4×10^{-6}/°C, α_b=3.6×10^{-6}/°C, α_c=8.5×10	—
Thermal conductivity	K_a=2.6 W/mK, K_b=3.8 W/mK, K_c=3.4 W/mK	—
Density	7.27 g/cm^3	6.61 g/cm^3
Mohs' hardness	4–5	4–5
Melting temperature	1075 °C	—
Transmission range	0.35–5.5 µm	0.35–5.5 µm
Refractive indices (λ=1.06 µm)	n_g=2.037, n_p=1.986, n_m=2.033	—
Thermo-optic coefficients @ 1064 nm	$\partial n_p/\partial T$= -15.7×10^{-6} K^{-1} $\partial n_m/\partial T$= -11.8×10^{-6} K^{-1} $\partial n_g/\partial T$= -17.3×10^{-6} K^{-1}	*For 20% Yb:KYW* $\partial n_p/\partial T$= -13.08×10^{-6} K^{-1} $\partial n_m/\partial T$= -7.61×10^{-6} K^{-1} $\partial n_g/\partial T$= -11.83×10^{-6} K^{-1}
Laser wavelength	1023–1060 nm	1025–1058 nm
Fluorescence lifetime	0.3 ms	0.3 ms
Stimulated emission cross section (**E**‖a)	2.6×10^{-20} cm^2	3×10^{-20} cm^2
Absorption peak and bandwidth	α_a=26 cm^{-1}, λ=981 nm, Δλ=3.7 nm	α_a=40 cm^{-1}, λ=981 nm, Δλ=3.5 nm
Absorption cross section	1.2×10^{-19} cm^2	1.33×10^{-19} cm^2
Lasing threshold	35 mW	70 mW
Stark levels energy (in cm^{-1}) of the $^2F_{5/2}$ manifolds of Yb^{3+} @ 77K	10682, 10471, 10188	10695, 10476, 10187
Stark levels energy (in cm^{-1}) of the $^2F_{7/2}$ manifolds of Yb^{3+} @ 77K	535, 385, 163, 0	568, 407, 169, 0



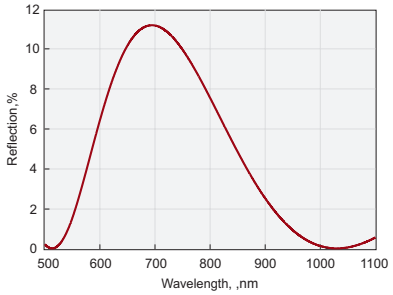
Absorption and stimulated emission cross sections of Yb:KYW



Absorption and emission spectrae of Yb(5%):KGW

BBO AND LBO CRYSTALS FOR Yb:KGW/KYW FREQUENCY CONVERSION

EKSMA OPTICS recommends the following thickness BBO and LBO crystals for Yb:KGW/KYW frequency conversion depending on fundamental wavelength pulse duration, assuming it is spectrum limited Gausian pulse.



Typical AR@1030+515 nm coating for LBO or BBO SHG@1030 nm application

BBO CRYSTALS

Pulse duration	BBO SHG @ 1030 nm	BBO THG @ 1030 nm	BBO 4HG @ 1030 nm
50 fs	0.5 mm	0.15 mm	0.1 mm
100 fs	1 mm	0.25 mm	0.15 mm
150 fs	1.5 mm	0.4 mm	0.2 mm
200 fs	2 mm	0.55 mm	0.3 mm

LBO CRYSTALS

Pulse duration	LBO SHG @ 1030 nm
50 fs	0.9 mm
100 fs	1.9 mm
150 fs	2.8 mm
200 fs	3.7 mm

Note:
LBO crystals can be supplied with Clear Aperture up to 50 mm diameter.

LBO FOR SHG @ 1030 nm

SHG LBO CRYSTALS. Type 1, Thickness = 0.9 mm

Aperture, mm	θ, deg	φ, deg	Coating	Catalogue number	Price, EUR
6×6	90	13.8	AR/AR @ 515+1030 nm	LBO-601H	515
8×8	90	13.8	AR/AR @ 515+1030 nm	LBO-801H	620
10×10	90	13.8	AR/AR @ 515+1030 nm	LBO-1001H	650

SHG LBO CRYSTALS. Type 1, Thickness = 1.9 mm

Aperture, mm	θ, deg	φ, deg	Coating	Catalogue number	Price, EUR
6×6	90	13.8	AR/AR @ 515+1030 nm	LBO-602H	460
8×8	90	13.8	AR/AR @ 515+1030 nm	LBO-802H	610
10×10	90	13.8	AR/AR @ 515+1030 nm	LBO-1002H	815

SHG LBO CRYSTALS. Type 1, Thickness = 2.8 mm

Aperture, mm	θ, deg	φ, deg	Coating	Catalogue number	Price, EUR
6×6	90	13.8	AR/AR @ 515+1030 nm	LBO-603H	545
8×8	90	13.8	AR/AR @ 515+1030 nm	LBO-803H	790
10×10	90	13.8	AR/AR @ 515+1030 nm	LBO-1003H	1035

SHG LBO CRYSTALS. Type 1, Thickness = 3.7 mm

Aperture, mm	θ, deg	φ, deg	Coating	Catalogue number	Price, EUR
6×6	90	13.8	AR/AR @ 515+1030 nm	LBO-604H	465
8×8	90	13.8	AR/AR @ 515+1030 nm	LBO-804H	660
10×10	90	13.8	AR/AR @ 515+1030 nm	LBO-1004H	895

BBO FOR SHG @ 1030 nm

SHG BBO CRYSTALS. Type 1, Thickness = 0.5 mm

Aperture, mm	θ, deg	φ, deg	Coating	Catalogue number	Price, EUR
6×6	23.4	90	AR/AR @ 515+1030 nm	BBO-651H	495
8×8	23.4	90	AR/AR @ 515+1030 nm	BBO-851H	640
10×10	23.4	90	AR/AR @ 515+1030 nm	BBO-1051H	760

SHG BBO CRYSTALS. Type 1, Thickness = 1.0 mm

Aperture, mm	θ, deg	φ, deg	Coating	Catalogue number	Price, EUR
6×6	23.4	90	AR/AR @ 515+1030 nm	BBO-652H	430
8×8	23.4	90	AR/AR @ 515+1030 nm	BBO-852H	560
10×10	23.4	90	AR/AR @ 515+1030 nm	BBO-1052H	785

SHG BBO CRYSTALS. Type 1, Thickness = 1.5 mm

Aperture, mm	θ, deg	φ, deg	Coating	Catalogue number	Price, EUR
6×6	23.4	90	AR/AR @ 515+1030 nm	BBO-653H	475
8×8	23.4	90	AR/AR @ 515+1030 nm	BBO-853H	600
10×10	23.4	90	AR/AR @ 515+1030 nm	BBO-1053H	795

SHG BBO CRYSTALS. Type 1, Thickness = 2.0 mm

Aperture, mm	θ, deg	φ, deg	Coating	Catalogue number	Price, EUR
6×6	23.4	90	AR/AR @ 515+1030 nm	BBO-654H	480
8×8	23.4	90	AR/AR @ 515+1030 nm	BBO-854H	630
10×10	23.4	90	AR/AR @ 515+1030 nm	BBO-1054H	835

BBO FOR THG @ 1030 nm

Aperture, mm	Thickness, mm	θ, deg	φ, deg	Coating	Catalogue number	Price, EUR
6×6	0.15	32.5	90	AR/AR @ 1030+515/343 nm	BBO-631H	725
6×6	0.25	32.5	90	AR/AR @ 1030+515/343 nm	BBO-632H	665
6×6	0.4	32.5	90	AR/AR @ 1030+515/343 nm	BBO-633H	605
6×6	0.55	32.5	90	AR/AR @ 1030+515/343 nm	BBO-634H	540

BBO FOR 4HG @ 1030 nm

Aperture, mm	Thickness, mm	θ, deg	φ, deg	Coating	Catalogue number	Price, EUR
6×6	0.1	50	90	P/P @ 515/257 nm	BBO-641H	600
6×6	0.15	50	90	P/P @ 515/257 nm	BBO-642H	570
6×6	0.2	50	90	P/P @ 515/257 nm	BBO-643H	550
6×6	0.3	50	90	P/P @ 515/257 nm	BBO-644H	535