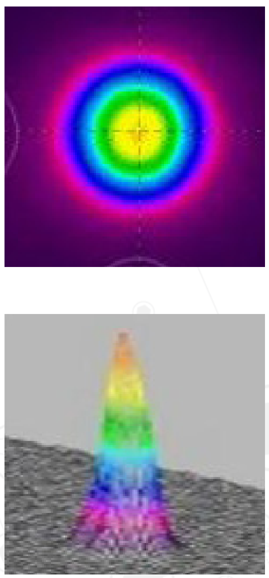
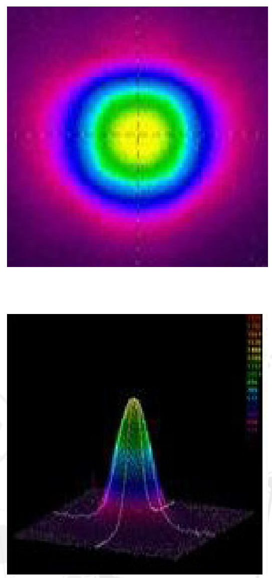
ONYX Optics, Inc.

Crystal Fiber Waveguides (CFW)

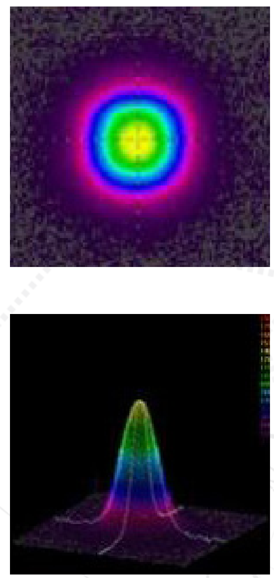
Intrinsic single mode beam quality of designed crystal fiber waveguides (CFWs)



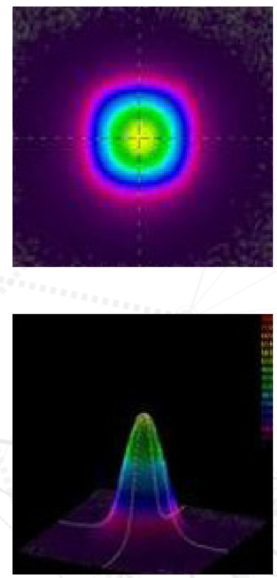
Er:YAG CFW
40µ x 40µ



Er:YAG CFW
60µ x 60µ



Yb:YAG CFW
40µ x 40µ



Ho:YAG CFW
40µ x 40µ

Phone: (925) 833-1969 | Fax: (925) 833-1759
Email: sales@onyxoptics.com | Visit Our Website

Crystal Fiber Waveguide (CFW) Design Parameters

Intrinsic single mode beam quality of designed crystal fiber waveguides (CFWs)

Mode design

- can be designed for instrinsic single mode or multimode

Single clad with:

- undoped YAG, laser-inactive doped YAG, or sapphire cladding
- ceramic spinel or single crystal spinel cladding

Double clad with:

- inner claddings of undoped YAG or laser-inactive doped YAG
- outer claddings with sapphire, single crystal spinel, or ceramic spinel

Core sizes

- single mode: ~20μ x 20μ to 150μ x 150μ
- multimode: ~20μ x 20μ to 1000μ x 1000μ (depending on cladding)

Lengths

- ~10mm x 10mm to ~300mm x 300mm

Pumping

- cladding pumped with diode lasers
- core pumped with fiber laser or solid state laser

Laser media

- Garnets: doped YAG, LuAG, GGG, GSGG; Re2O3
- optical ceramic YAG
- Ti:sapphire; other uniaxial or biaxial crystals

Loss

- ~0.005/cm

CLICK HERE TO REQUEST A QUOTE

Phone: (925) 833-1969 | Fax: (925) 833-1759
Email: sales@onyxoptics.com | Visit Our Website

Comparison of Crystal Fiber Waveguides (CFWs) to Glass Fibers

Thermal effects

- YAG has ~10x the thermal conductivity of silica fibers
- YAG has a smaller dn/dT than silica fibers
- Therefore, the YAG CFW length can be reduced by a factor of 10
- Therefore, the CFWs do not have to be bent
- Therefore, compact large single mode areas (LSMA) CFWs are possible

Laser induced damage

- Laser damage threshold is higher for single mode vs. multimode lasers

Nonlinear effects

- Gain coefficient for YAG Stimulated Brillouin Scattering (SBS) is at least 100 times higher than for silica glass

Phone: (925) 833-1969 | Fax: (925) 833-1759
Email: sales@onyxoptics.com | Visit Our Website

Laser Systems Based on Onyx AFB® Components

Onyx has detailed designs of laser systems that utilize the unique features of various types of AFB® composite crystal laser components. These include standard AFB® components, crystal fiber waveguides (CFWs), walk-off corrected non-linear optics (WOC NLOs), and periodically bonded nonlinear optical walk-off corrected (PB NLO WOC) crystals. We would be glad to discuss the specific performance requirements of a custom-designed system that fulfills your solid state laser system needs.

Examples include:

- 946nm Nd:YAG CFW laser system (CW/pulsed)
- 1064nm Nd:YAG CFW laser system (CW/pulsed)
- 1030nm Yb:YAG CFW laser system (CW/pulsed/ultra-short)
- 1645nm Er:YAG CFW laser system (CW/pulsed)
- 2013nm Tm:YAG CFW laser system (CW/pulsed/ultra-short)
- 2090nm Ho:YAG CFW laser system (CW/pulsed)
- 2.94μ single mode Er:YAG high power laser source

Phone: (925) 833-1969 | Fax: (925) 833-1759
Email: sales@onyxoptics.com | Visit Our Website

Protype system examples include:

- 47nm blue laser system based on SHG of 946nm from Nd:YAG CFW (CW/pulsed)
- 589nm yellow laser system based on SFG of 1064nm and 1319nm from Nd:YAG (CW/pulsed)
- 220nm deep UV laser system based on FHG of 880nm from Ti:sapphire CFW (CW/pulsed)
- 236.5 deep UV laser system based on FHG of 946nm from Nd:YAG CFW (CW/pulsed)

Tunable laser system examples include:

- Tunable 2-3μ laser source based on OPO in WOC KTP stacks
- Tunable 3-5μ laser source based on Tm:YAG CFW and WOC ZGP OPO
- Tunable 4.5-7.5μ laser source
- Tunable Ti:sapphire CFW laser and Ti:sapphire pumped CFW laser systems
- Tunable deep UV laser

Phone: (925) 833-1969 | Fax: (925) 833-1759
Email: sales@onyxoptics.com | Visit Our Website