(https://gtat.com/)

HEM® Ti:Sapphire laser optics are renowned for their high quality and ubiquitous use in the world's top Ultrafast laser laboratories

GTAT's proprietary heat exchanger method (HEM) produces superior crystalline structure in crystal sizes up to 280 mm in diameter. The ultrafast laser optics made from HEM ti sapphire crystals have transmitted wavefront values of 1/10th wave or better and FOM values up to 1000.

Low damage, ti sapphire laser materials are processed in our optical fabrication facility with extremely tight geometries and crystal alignment. All aspects of crystal quality and optical fabrication workmanship are verified with our specialized test and measurement equipment. We provide detailed quality reporting on the laser, optical and mechanical attributes of our HEM ti sapphire laser optics.

GTAT has worked with the international community of high-intensity laser experts to develop the current range of HEM ti sapphire ultrafast laser optics. We are proud to deliver 200 mm and 220 mm ti sapphire laser optics in support of today's leading edge high-intensity laser facilities.

HEM® Ti:Sapphire

- 280 mm in diameter
- Excellent homogeneity
- Superior Thermal Properties
- High Figures of Merit (FOM)
- No Bulk Scatter
- High Laser Damage Threshold
- Large sizes and highly doped material available
- Alpha values @ 532 nm of 0.3-10.0

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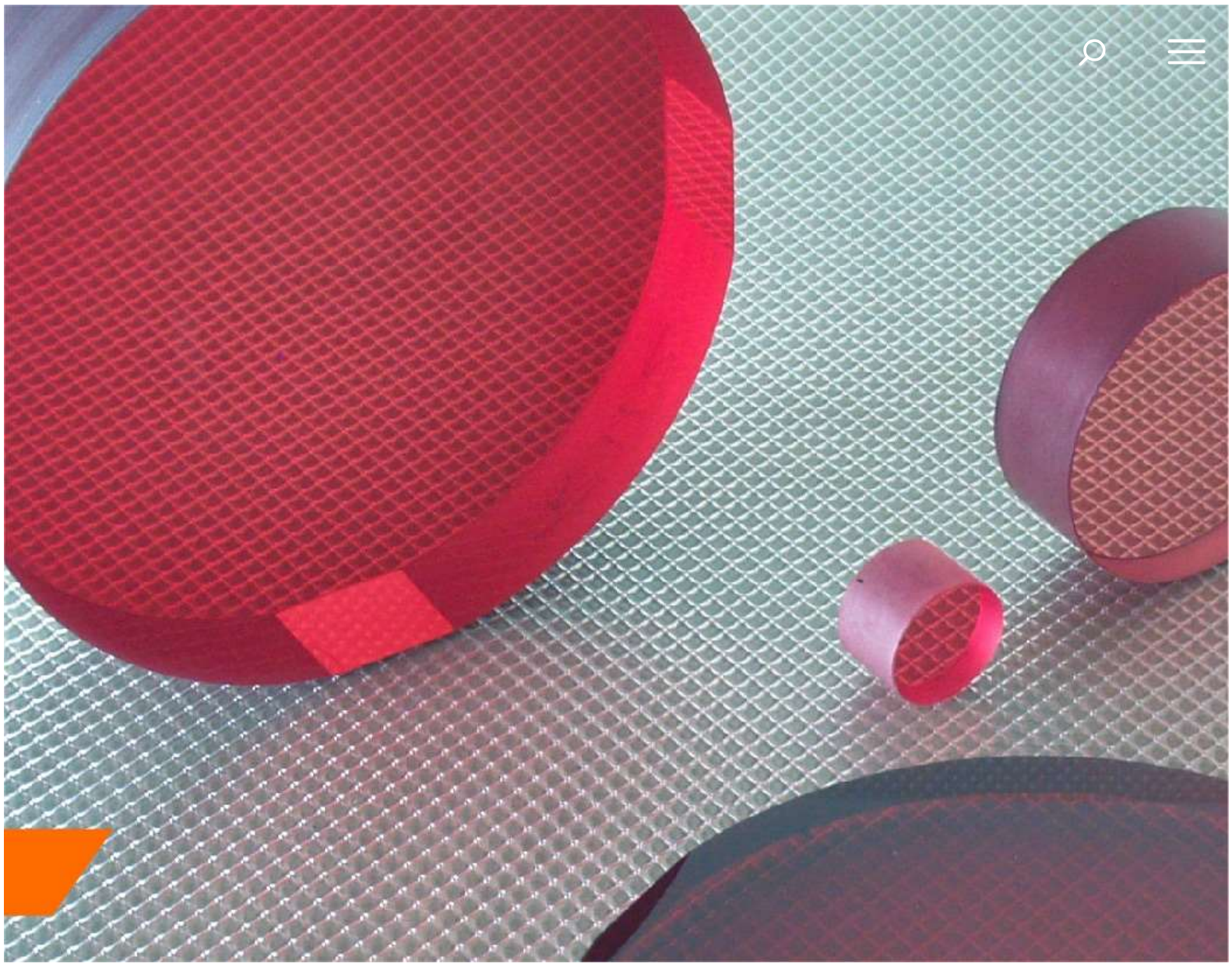
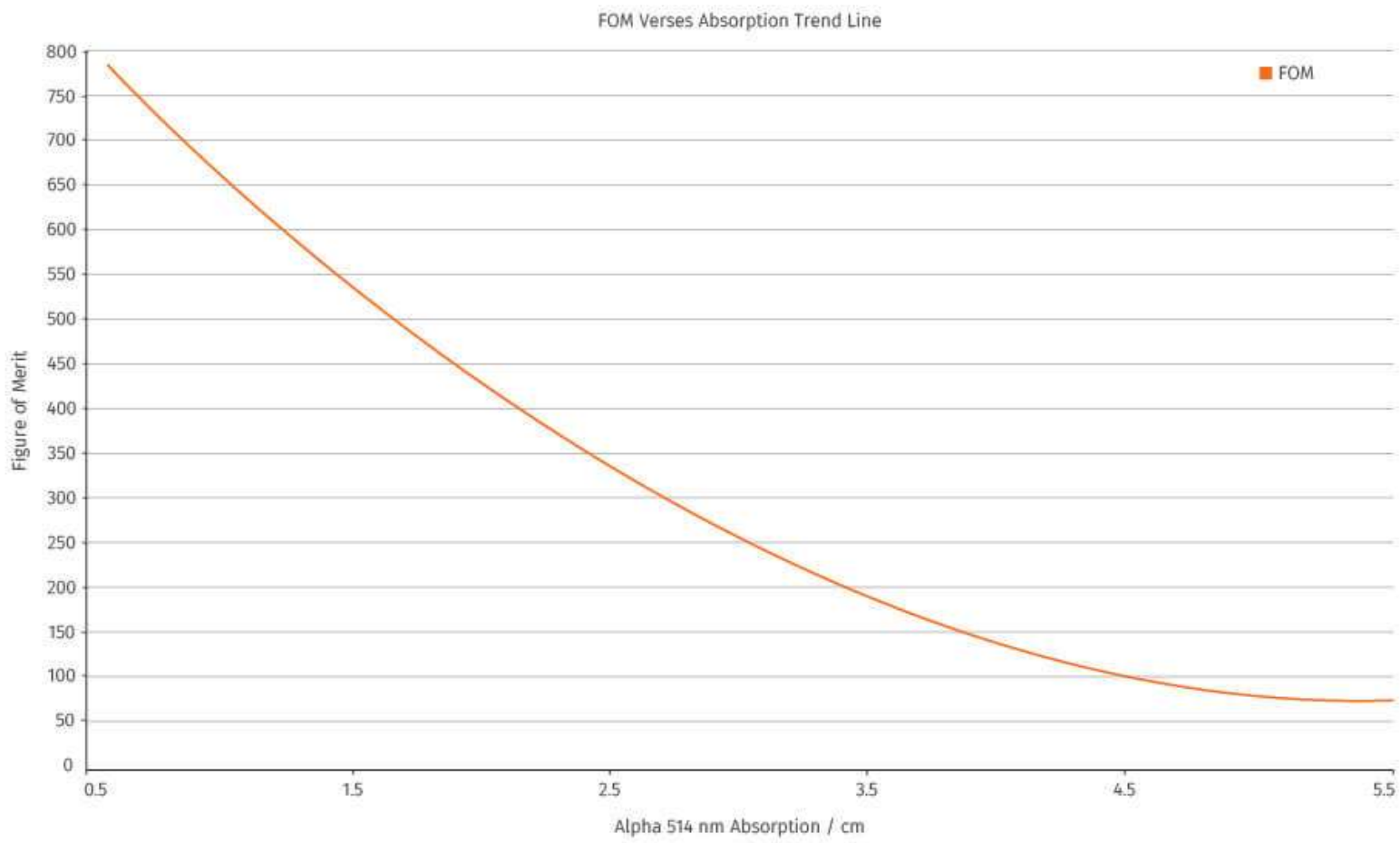


(https://gtat.com/wp-content/uploads/2017/10/Artboard-48@2x-100.jpg)

Attributes

- FOM (Figure Of Merit) Vs. Absorption – The HEM process has been developed to maximize absorption @ 532 nm and reduce parasitic absorption at 800 nm, thereby delivering the highest FOM values in the industry. Many companies claim to have high FOM values, however, upon further investigation you will find them unsubstantiated and incorrect. Each GTAT Ti:Sapphire crystal is tested for actual FOM values, and these values are known to be the highest in the industry, (up to 1000).



(https://gtat.com/wp-content/uploads/2017/10/FOM.jpg)

- Tunability Range of HEM Ti:Sapphire – ti sapphire has a wide tunable range from 650 nm to 1200 nm with peak intensity at ~800 nm. The wide bandwidth of the material allows for short pulses and high repetition rates. Our Ti laser optics are offered in a range of titanium doping

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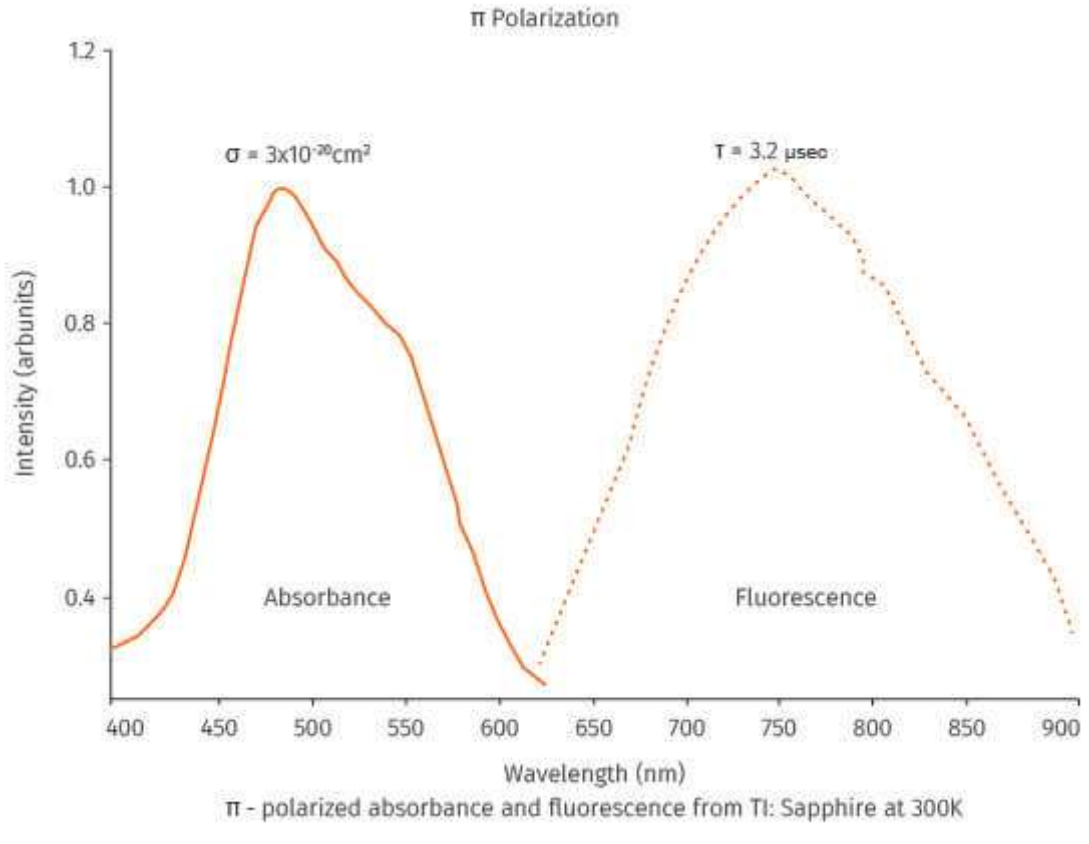
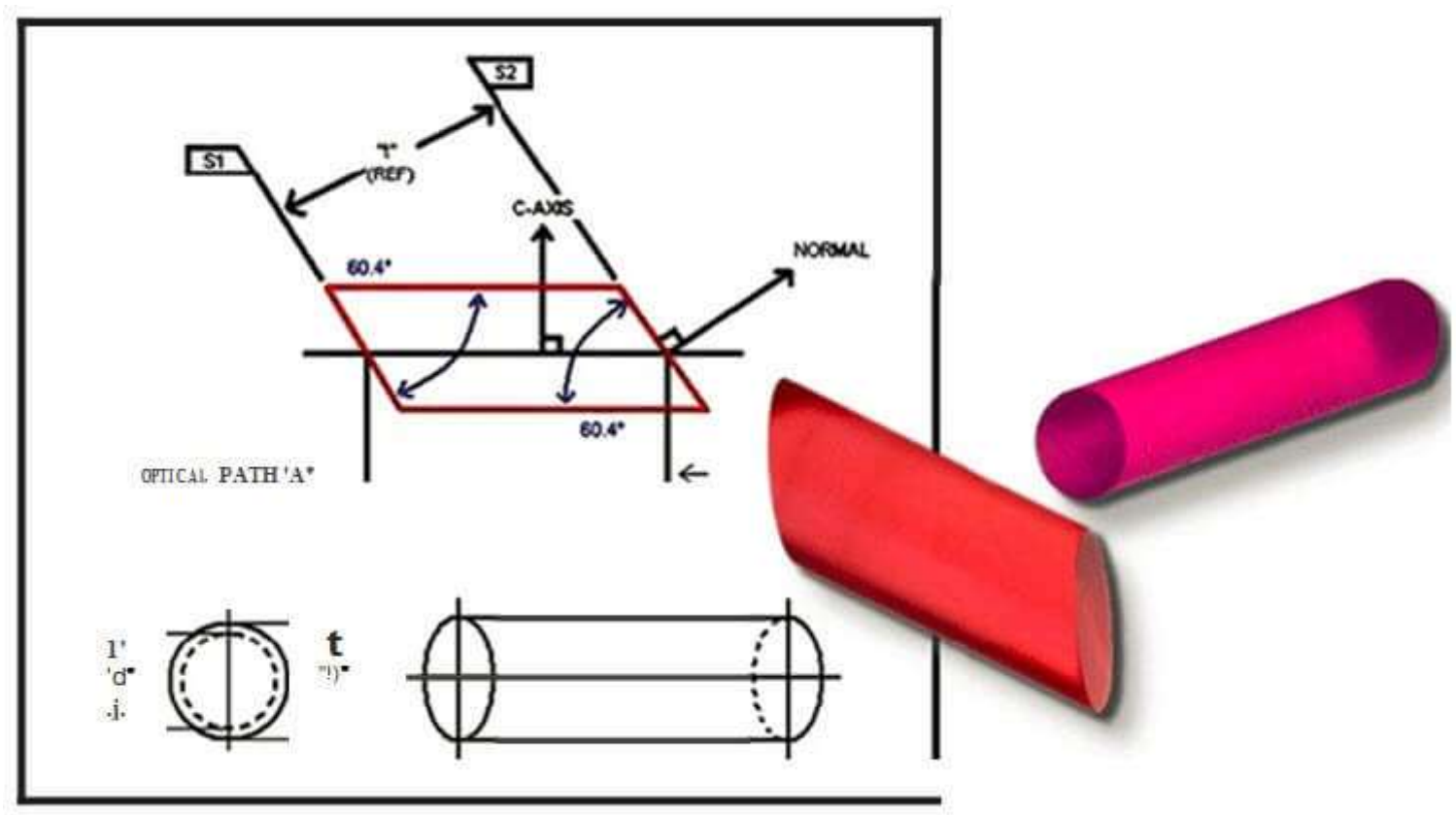
concentrations, (0.3 to 10.0 @ alpha 532 nm) which allows adjustment of overall path length designs to meet your total low power single pass absorption, (LPSP).



π - polarized absorbance and fluorescence from TI: Sapphire at 300K

(https://gtat.com/wp-content/uploads/2017/10/Absorption.jpg)

- Absorption / Fluorescence – Ti:Sapphire lasers are typically operated using π-polarization. This chart shows the absorption and fluorescence bands of Ti:Sapphire in π-polarization.
- Brewster's Angle Laser Crystals – Most of our smaller crystals are polished with Brewster's angle ends to minimize reflection losses. Brewster's angle is based on the index of refraction of the material. The index of refraction for Ti:Sapphire is ~1.76, resulting in ~60.4° Brewster's angle. The accuracy of our C-axis rotation is tightly controlled to avoid laser modulation.



(https://gtat.com/wp-content/uploads/2017/10/TiSapphire-Brewster-Cut-Laser-Crystal.jpg)

- Advanced laser polishing and high damage coatings – We apply today's most advanced polishing technologies to our sapphire optics in order to create angstrom level roughness with low sub-surface damage. We perform testing to ensure high and repeatable laser damage threshold values.

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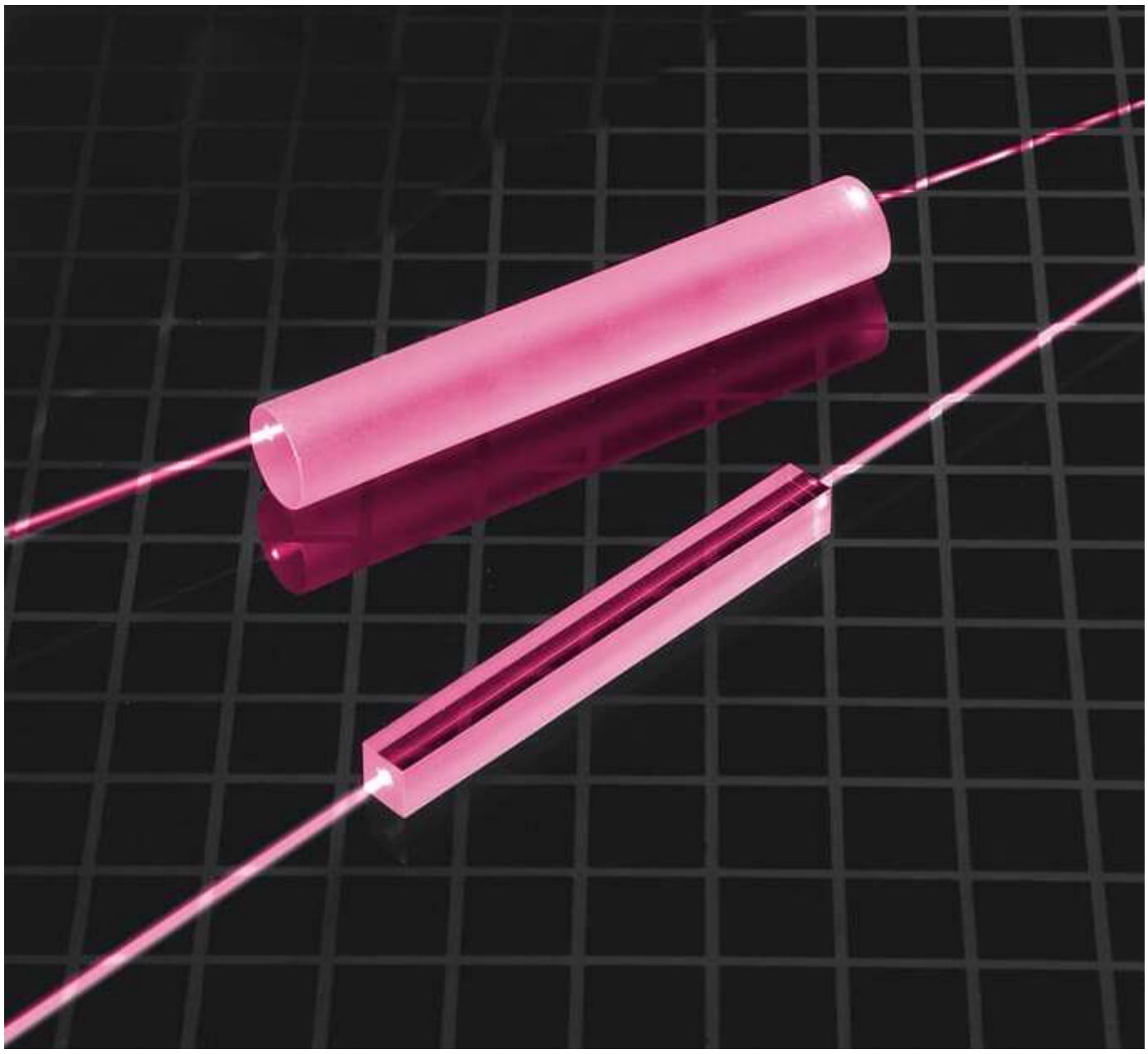
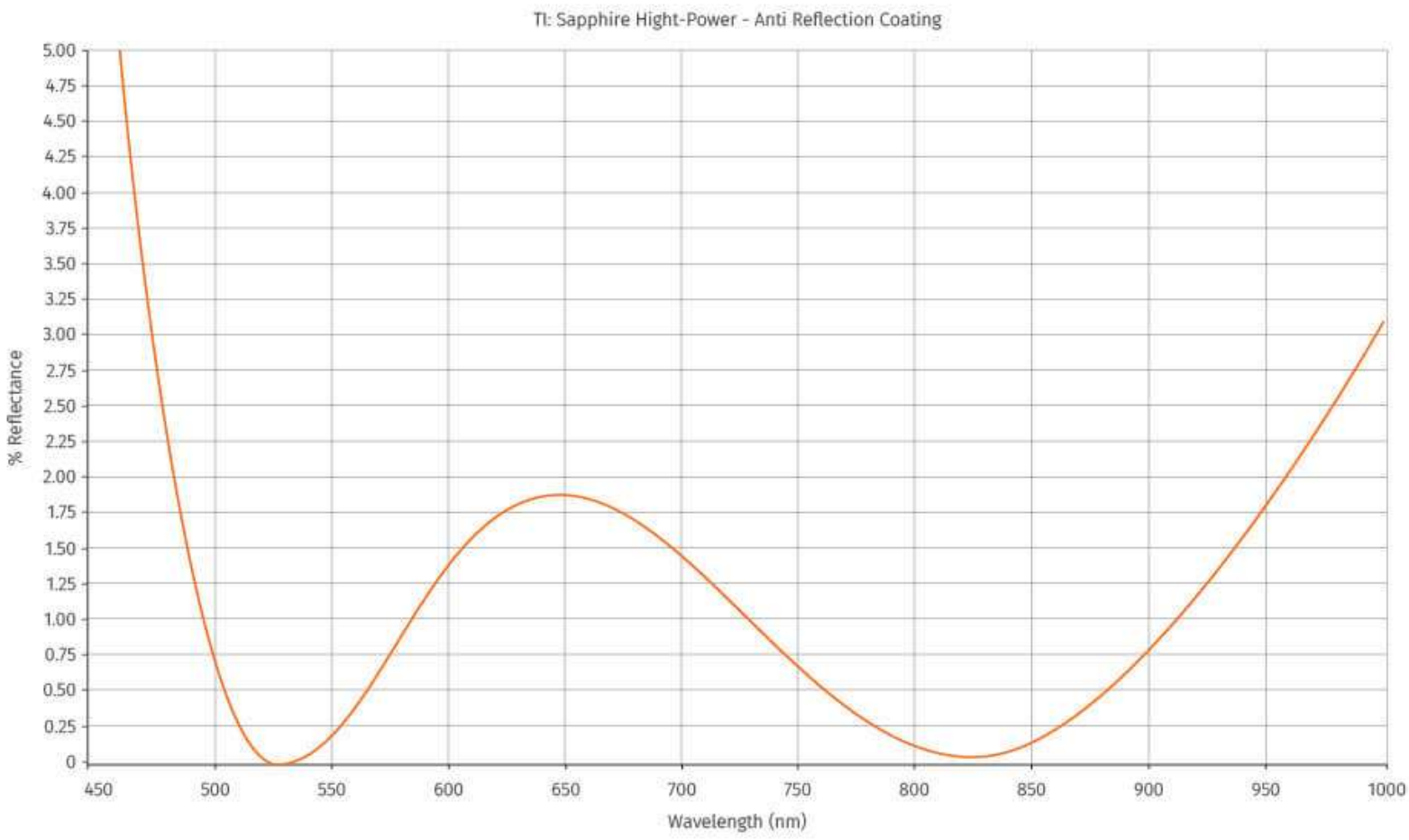


(https://gtat.com/wp-content/uploads/2017/10/TiSapphireRod.jpg)

- Anti-Reflection Coating – GTAT offers advanced anti-reflection coatings for multipass amplifier crystals. Our coatings are engineered to provide maximum efficiency at the pump and lasing wavelengths. The AR coatings are successfully operating in the field with consistently high laser damage threshold results, allowing laser operators to calculate pump powers accurately, thereby maximizing power output with low risk of damage.



(https://gtat.com/wp-content/uploads/2017/10/Reflection.jpg)

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Features

High quality Ti:Sapphire laser crystals begin with perfect crystalline structure and the correct 3^+ valance electron state. We ensure these requirements through our multiple-stage, rigorous inspection process, using state-of-the-art test and measurement equipment. We test our rods for absorption values, homogeneity, light scatter, FOM, flatness, and transmitted wave fronts. Each

(https://gtat.com/)

HEM laser rod is examined and verified utilizing advanced equipment and expert laser technicians. Total focus on quality and accuracy guarantees that our laser crystals dimensions, surfaces and crystalline structure provide the foundation for your laser platform's high power levels and excellent beam profiles.

Applications

HEM ti sapphire's wide emission range, (660 nm to 1180 nm), high-power density pumping capability along with excellent thermal properties enable today's high intensity laser platforms. These facilities are creating the next generation of laser based applications such as radiotherapy, proton therapy, accelerator physics, nuclear physics, far field physics, infrared spectroscopy and materials characterization. GTAT works closely with its customers to develop new crystal designs so that the ultrafast laser community can continue to advance the reliability and performance of high intensity lasers.

The highest quality ti sapphire crystals, advanced laser polishing techniques and optimized coatings form the foundation of your laser systems when you use HEM Ti Sapphire Laser Optics.

(https://gtat.com/wp-content/uploads/2017/10/TiSapphire_ApplificationLaserCrystal.jpg)

Laser Damage Threshold Testing of Ti Sapphire AR Coating

(https://gtat.com/)

The test results below come from one of the periodic tests that CSI performs on the AR coating that is used on HEM Ti:Sapphire Amplifier Crystals. These results are representative of the damage threshold that can be expected with our coatings.

Test Sample

- Test Type: laser damage threshold
- Substrate Material: HEM Ti:Sapphire
- Sample Size: 1″ diameter
- Coating Type: AR

Test Conditions

- Test Wavelength: 532 nm
- Angle of Incidence: 0º
- Pulse Repetition Frequencies: 10 Hz
- Polarization: linear
- Test Beam Profile: TEM Pulsewidth, (FWHM): 10 ns Axial Modes: multiple S
- Pit Diameter: 570 µm
- Number of Sites: 80
- Test Method: laser damage frequency
- Exposure Duration: 200 shots/site

Test Results

- Damage Definition: plasma, increased He-Ne scattering, visible damage as observed using a 100X Nomarski Brightfield Microscope.
- Description of Results: part irradiated at 13.00 Jcm-2 with no damage in 10 sites
- Laser Damage Threshold: calculated at 14.16 Jcm-2 peak fluence
- Testing provided by Spica Technologies Inc.

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HEM® Ti:Sapphire

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Features and Highlights

Laser Crystals up to 200 mm in diameter

Many design options including rectangles, squares and your unique designs

Low damage polished plano-ends, Brewster's angle ends

Highest laser damage threshold coatings available

Path lengths ranging from 1mm to 75mm

Absorption values from 0.5 to 10+ /cm @ alpha 514nm

Request a Quote

Contact one of our product experts to find out how crystals grown with our Heat Exchanger Method can benefit your company's operations.

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