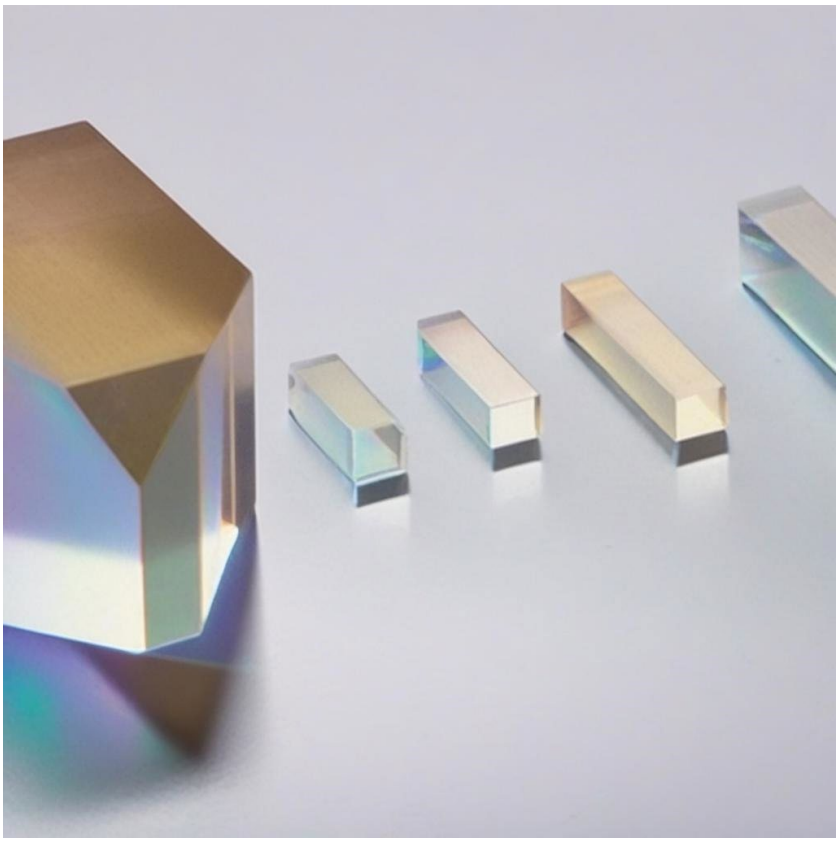
Photonics On Crystals

POC-OC-122444-Pr:YLF Crystal Datasheet

1 Main Features

- High absorption and emission cross-sections (~10^-19 cm^2).
- Exceptional overlap with InGaN laser diode and 2ω-OPSL emission lines.
- Customizable configurations available upon request.
- Excellent thermal and mechanical stability for high-power applications.
- Wide emission range for visible and UV lasers.



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2. Material General Description

Praseodymium-doped Lithium Yttrium Fluoride (Pr:YLF) crystal is a robust and versatile material for producing visible solid-state lasers. With its high absorption cross-section in the blue spectral region and overlapping emission lines of InGaN diodes, Pr:YLF is widely used for both research and industrial applications. The material features excellent thermal conductivity and a tetragonal structure, providing stability under high-power operations. The unique energy level transitions of Pr^{3+} allow generation of red, orange, green, and blue lasers, making it ideal for multicolor and high-intensity laser systems.

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3. General Applications and Examples

Pr:YLF crystals are essential for diode-pumped solid-state lasers and have a broad spectrum of applications, such as:

- **Industrial Applications**: Efficient processing of metals like copper or gold, precision machining, and material marking.
- **Scientific Research**: Generation of multicolor lasers for spectroscopy and imaging.
- **Entertainment**: Laser shows with visible colors from red to blue.
- **Medical Technology**: High-precision laser tools for diagnostics and surgery.
- **UV Laser Generation**: Pr:YLF supports second harmonic generation (SHG) to produce ultraviolet laser light.

Pr:YLF crystals are particularly advantageous for lasing in the visible spectrum, with transitions at:

- **Red**: 640 nm
- **Orange**: 607 nm
- **Green**: 523 nm
- **Blue**: 480 nm

These unique properties make Pr:YLF indispensable for visible laser generation directly from solid-state systems.

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4. Chemical, Physical, and Structural Properties

Property	Value
Chemical Formula	Pr^{3+}:$LiYF_4$
Crystal Structure	Tetragonal
Refractive Index (at 1064 nm)	n_o = 1.448, n_e = 1.470
Density	3.95 g/cm³
Mohs Hardness	5
Thermal Conductivity	6 W/m·K
Thermal Expansion Coefficient	-1.6 x 10^-6 /K
Typical Doping Level	<1.3%

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5. Optical, Laser, and Nonlinear Optical Properties

Parameter	Value
Absorption Peak Wavelength	444 nm

Absorption Cross-section	8 x 10^-19 cm^2
Absorption Bandwidth	~5 nm
Emission Wavelengths	523 nm, 607 nm, 640 nm
Emission Cross-section	20 x 10^-19 cm^2
Fluorescence Lifetime	50 µs

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6. Spectrum Transmission Curves

The transmission spectrum is available, showing high absorption and emission peaks at visible wavelengths, particularly in the red, green, and blue regions. This curve confirms the crystal's efficiency for multicolor laser operations.

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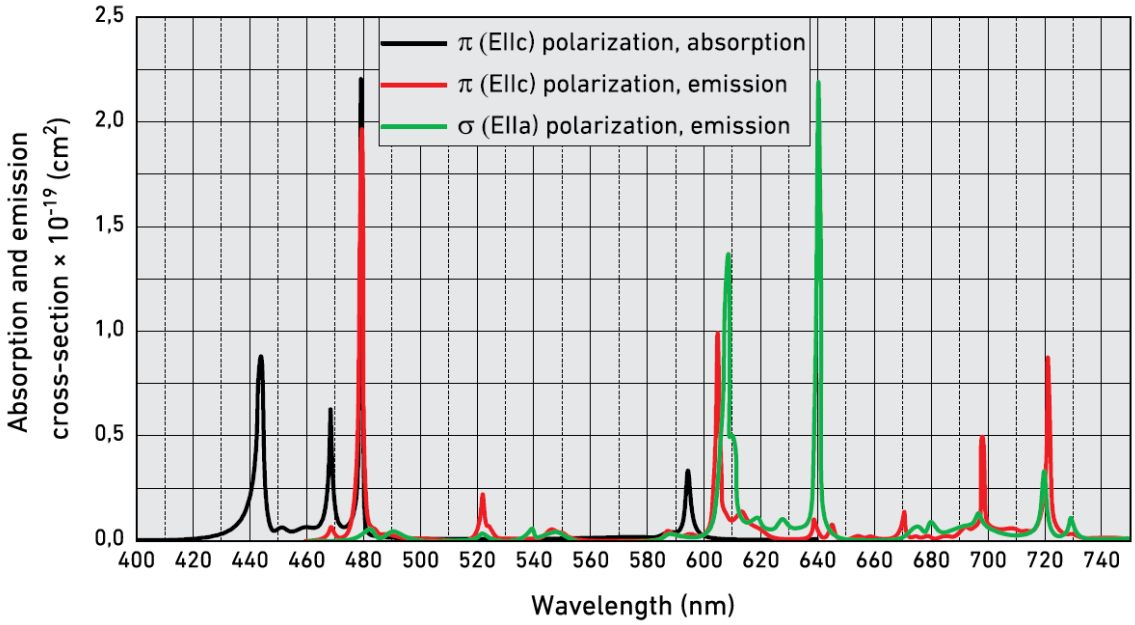
7. Coating Specification

- **Standard Coatings**:
  - AR coating for 444-725 nm on both faces.
  - Reflectivity: <0.2% across the operational wavelength range.
- **Custom Coatings**: Available upon request for optimized performance in specific applications.



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8. Standard Fabrication Specifications

Specification	Value

Orientation	c-cut
Clear Aperture	>90%
Face Dimensions Tolerance	+0.0/-0.1 mm
Length Tolerance	±0.1 mm
Surface Quality (Scratch/Dig)	20-10
Surface Flatness	λ/8 @ 633 nm
Parallelism Error	<20 arcsec
Perpendicularity Error	<10 arcmin
Chamfer	<0.1 mm at 45°
Laser Damage Threshold	>5 J/cm² @ 532 nm, 10 ns

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9. POC Strength and Capabilities

Photonics On Crystals (POC) specializes in producing high-quality Pr:YLF crystals with precise doping levels and optimized physical properties. POC offers a range of standard and custom crystal configurations, ensuring that every product meets the highest performance standards. With a dedicated research and development team, POC ensures continuous innovation and supports clients with custom designs for their laser applications.

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10. Standard Products

Face Dimensions (mm)	Length (mm)	End Faces	Doping (%)	Coatings	Price (USD)
2 x 2	6	Right-angle cut	0.5	AR @ 440-725 nm	480
3 x 3	6	Right-angle cut	0.5	AR @ 440-725 nm	540
5 x 5	6	Right-angle cut	0.5	AR @ 440-725 nm	640
Custom Size	Upon Request	Brewster/Right Cut	Upon Request	Custom coatings available	Upon Request

For custom configurations and coatings, please contact Photonics On Crystals (POC) directly.