

# Chromium, Erbium: Yttrium Scandium Gallium Garnet - Cr, Er: YSGG

YSGG (Yttrium Scandium Gallium Garnet) doped with Chromium and Erbium provides an efficient laser crystal for generating 2.8 micron light in an important water absorption band.

## Advantages of Cr, Er: YSGG Include:

- Lowest threshold and highest slope efficiency of common Erbium doped crystals<sup>(1,2)</sup>
- Can be flash lamp pumped via Cr bands or diode pumped via Er bands
- Operates CW, free-running or Q-switched<sup>(2,3)</sup>
- The intrinsic crystal disorder increases pump line widths and tenability

<b>Crystal Properties</b>	
Formula:	$Y_{2.93}Sc_{1.43}Ga_{3.64}O_{12}$ <sup>(4)</sup>
Structure:	cubic, Garnet
Density (g / cm <sup>3</sup> ):	5.67 (Cr & Er doped)
Index of Refraction at 1 micron:	1.92
dn / dT (10 <sup>-6</sup> K <sup>-1</sup> ):	12 <sup>(5)</sup>
Thermal Conductivity (W / m K):	8 <sup>(5)</sup>
Hardness (Moh):	8
Chemical Resistance:	Inert
<b>Material Specifications</b>	
Growth Method:	Czochralski
Chromium Concentration:	2 at % ( $1.7 \times 10^{20}$ cm <sup>-3</sup> , octahedral Cr <sup>3+</sup> )
Erbium Concentration:	30 at % ( $3.7 \times 10^{21}$ cm <sup>-3</sup> , dodecahedral Er <sup>3+</sup> )
Rod Diameters:	up to 15 mm

## Standard Rod Specifications

<u>Parameter</u>	<u>Nominal</u>	<u>Tolerance</u>
Cr Concentration	2 at %	–
Er Concentration	30 at %	–
Diameter	–	+0.0000 / -0.0020 in
Length	–	+0.040 / -0.000 in
Length (<10 mm)	–	±0.010 in
Length (as-cut)	–	+0.080 / -0.000 in
Tilt / Wedge Angle	–	±5 min
Chamfer	0.005	±0.003 in
Chamfer (< 5 mm diameter)	0.004	+0.001 / -0.002 in
Chamfer Angle	45 deg	±5 deg
Barrel Finish	55 micro-inch	±5 micro-inch
Parallelism	30 arc seconds	–
Parallelism (<10 mm length)	60 arc seconds	–
End Figure	$\lambda$ / 10 wave at 633 nm	–
Perpendicularity	5 arc minutes	–
Perpendicularity (<10 mm length)	20 arc minutes	–
Surface Quality	10 - 5 scratch-dig	–
Surface Quality (<10 mm length)	20 - 10 scratch-dig	–
Wavefront Distortion	1/2 wave per inch of length	–

- Grit blast serial number into barrel approx. 0.5 inch from the end of rod.

### **References**

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Specifications and information are subject to change without prior notice.  
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