



# Integrated Photonics, Inc.

RoHS Compliant

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## FLL Garnet — Low Loss Faraday Rotator

For Non-Reciprocal Passive Optical Components  
 (Isolators, Circulators, Switches, Interleavers)

Bismuth-doped rare-earth iron garnet thick films are the principal Faraday rotator materials for non-reciprocal devices in telecommunications applications. They have high specific rotations and are highly transparent in the near infrared telecom band. Combined with the correct polarizing or birefringent elements, these Faraday rotators can be made into polarization dependent and independent isolators as well as incorporated into many other non-reciprocal devices. Integrated Photonics' low loss **FLL** Faraday rotator composition is optimized to give **low insertion loss** across the telecommunications bands 1290-1610 nm.

### Product Features

- Third-party certified RoHS compliant
- Excellent crystal quality for high isolation  $\geq 40$  dB
- Good crystal design and process control for low insertion loss  $\leq 0.05$  dB (0.02 dB typical)
- Anti-Reflection coating per customer requirements
  - Pinhole free
  - Reflectance  $\leq 0.15\%$  per side
  - Highly durable against abrasion, humidity, high processing temperatures and other environmental factors
- Custom fabrication to customer's specification
  - A wide variety of wavelengths are available or can be fabricated
  - Coatings available for air, epoxy, uncoated or in combinations

Properties	FLL Garnet
Temperature Coefficient; $d\theta/dT$ (deg/ $^{\circ}C$ )	-0.065
Wavelength Dispersion; $d\theta/d\lambda$ (deg/nm)	-0.07 @ 1550 nm -0.09 @ 1310 nm
Thermal Expansivity; $\alpha$ ( $^{\circ}C^{-1}$ )	$11.0 \times 10^{-6}$
Refractive Index; n	2.356 @ 1550 nm 2.369 @ 1310 nm
Curie Temperature; $T_c$ ( $^{\circ}C$ )	270
Specific Faraday Rotation; $\theta/t$ (deg/mm)	-105 @ 1550 nm -158 @ 1310 nm
Thickness for 45 degrees; t ( $\mu m$ )	~430 @ 1550 nm ~285 @ 1310 nm
Saturating Field; $H_s$ (Oersted)	$\leq 1000$ for 11x11mm $\leq 800$ for 2x2 mm $\leq 650$ for 1x1 mm

### Ordering Information

Part numbers are given as **FLL-(Wavelength)-(Rotation Tolerance)-(AR Coating)-(Dimensions in mm)**

- Wavelength,  $\lambda$  (nm)—Typical wavelengths are 1310, 1480, 1550 and 1610 nm, but custom wavelengths are available by customer request. All Faraday rotations are 45 degrees at 22 $^{\circ}C$  and the center specification wavelength unless otherwise specified.
- Rotation Tolerance,  $\pm\Delta\theta$  (degrees)—The Faraday rotation is given to a specific tolerance, typically  $\pm 0.5$ ,  $\pm 1.0$  or  $\pm 2.0$  degrees.
- Anti-Reflection (AR) Coatings—Films may be coated to Air or Epoxy, Uncoated or to some custom specification. Ordering information must specify coatings for both sides such as AA-to Air both sides, EE-to Epoxy both sides, AE-One side to Air and one to Epoxy or UU-uncoated.
- Dimensions (mm)—The part number gives the square dimensions of the part in mm. Standard size is 11x11 mm.  
 e. g. **FLL-1550-1.0-AA-11.0** would be a Faraday rotator for 1550 nm with  $45.0 \pm 1.0$  degrees Faraday rotation, Anti-Reflection coated 2 sides to Air in the form of a square 11.0 mm on a side.