ANGULAR CHARACTERISTICS



ANGLE OF INCIDENCE EFFECTS AND 'TUNING'

Due to the construction of interference filters, a shift to shorter wavelengths occurs if the angle of incidence varies from normal. At small angles this shift can be very useful in tuning a filter to a desired peak wavelength but larger angles (30º or more) can cause a fall in transmittance and distortion of the band pass shape. The shift in peak wavelength can be estimated using the following formula (which is valid only for collimated light with incident angles less than 10º).

$$\lambda_\theta = \lambda_o \left[1 - \frac{n_o}{n_*} \sin^2 \theta \right]^{1/2}$$

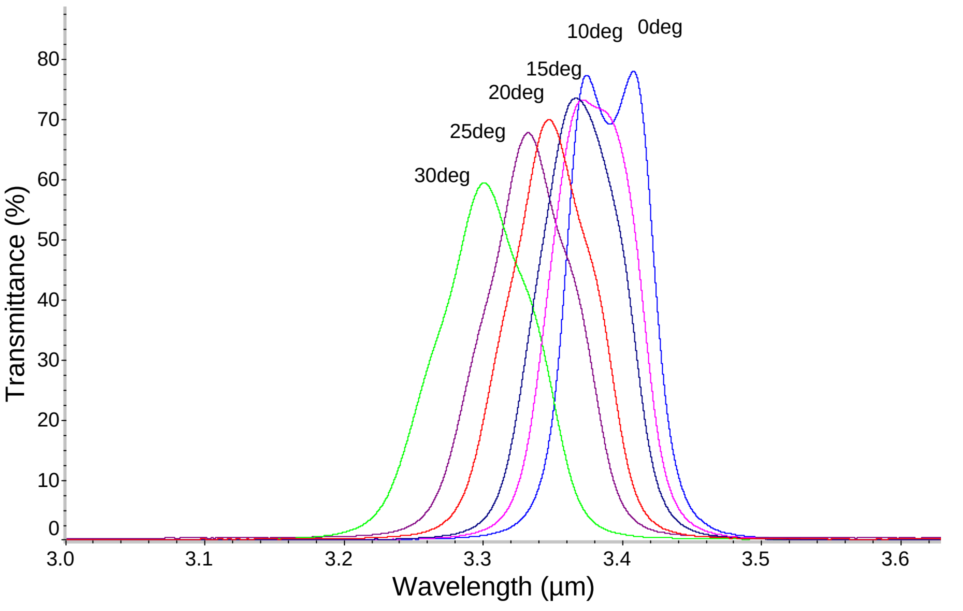
where		
	λ_θ	peak wavelength at incident angle θ
	λ_o	peak wavelength at normal incidence
	n_o	refractive index of incident medium (air = 1.0)
	n_*	effective index of filter assembly
	θ	angle of incidence

FILTERS USED IN UNCOLLIMATED LIGHT

When a filter is used in a converging or diverging beam, the changes are much more exaggerated and result not only in a central wavelength shift but also in a broadening of the bandwidth and a reduction in peak transmittance. For semi-cone angles up to 5° these changes are negligible. For angles above 5° the shift in peak wavelength can be estimated by substituting the semi-cone angle into the above equation and halving the resultant shift. It should be stressed, however, that the above formula should only be used as a guide.

TYPICAL PERFORMANCE

The curve of an actual narrow band filter shows how the transmittance and shape of the filter are affected by the change in incident angle. The degree of change in transmittance or shape of the filter is dependant upon the design used to produce the coating. Therefore, accurate results can only be obtained by measuring actual filters.



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