Available in:
✔ **Production Quantities**
✔ **Custom Sizes**

Etalons

Melles Griot Fabry-Perot etalons, used in many laser-based applications, are supplied to laser manufacturers where quality and performance cannot be compromised.

- Ultranarrow-linewidth filters produce a series of sharp transmission peaks which provide a high throughput at peak resonance and a very narrow spectral transmission.
- Material purity, optical figure, plate parallelism, surface quality, spacer mounting, and coating quality are all critical to the overall performance of an etalon.
- Because special processing and coating techniques ensure very high resistance to high-energy laser damage, they are ideal for use in intracavity applications for mode selection and narrowing laser linewidths.
- They are also used outside the laser cavity for monitoring and diagnostic applications.

For PZT scanning Fabry-Perot interferometers and filters using both planar and confocal mirror cavities, see Chapter 48, *Laser Beam Characterization.*

SPECIFICATIONS: ETALONS

Wavelength Range: 193–2200 nm

Aperture: 20–50 mm

Thickness:
Solid etalons: 50 μm–37.5 mm
Air-spaced etalons: 5 μm–15 mm

ORDERING INFORMATION

Melles Griot Fabry-Perot etalons are custom made to your specific requirements. To order an etalon, the following information must be provided:

- Wavelength
- Free spectral range (FSR) — the frequency spacing between transmission peaks
- Finesse — the ratio of transmission bandwidth, (FWHM) to free spectral range.

Contact your nearest Melles Griot representative for more information.

APPLICATION NOTE

Air-Spaced Etalons

Air-spaced etalons are pairs of plano-plano plates separated by optically contacted spacer blocks. The inner surfaces are coated with partially transmitting etalon coatings; the outer surfaces, with antireflection coatings. Air-spaced etalons offer the following advantages over solid etalons:

- Higher thermal stability
- Greater mechanical stability
- Wider range of free spectral ranges
- Pressure tuning
- Improved broadband transmission via simultaneous application of perfectly matched etalon coatings
- Higher defect finesse.

Solid Etalons

Solid etalons are parallel-sided plano-plano plates with etalon coatings on both sides. The cavity is formed by the plate thickness between coatings. Solid etalons offer the following advantages over air-spaced etalons:

- Improved narrowband transmission for intracavity use
- Higher quality cavities due to multilayer coatings
- Ruggedness and compactness
- Lower cost
- Distortion-free substrates with harder coatings
- Potentially higher laser damage thresholds.

SUMMARY OF INTERFEROMETER THEORY SPECIFIC TO FIXED SPACE ETALONS

Transmitted Intensity $I_t = \dfrac{I_0}{1+\dfrac{4R}{(1-R)^2}\sin^2\left(\dfrac{2\pi nd}{\lambda}\cos\theta\right)}$

Reflectance Finesse (F_r) $= \dfrac{\pi\sqrt{R}}{1-R}$

Defect Finesse (F_d) $= \dfrac{N}{2}$

Free Spectral Range $= \dfrac{1}{2nd}$ in wave numbers

$= \dfrac{c}{2nd}$ in frequency

$= \dfrac{\lambda^2}{2nd}$ in wavelength

Fringe width (FWHM) or Minimum Resolvable Bandwidth $= \dfrac{FSR}{F}$

Maximum Transmission $= \dfrac{T^2}{(1-R)^2}$

Contrast $= \left(\dfrac{1+R}{1-R}\right)^2 = \dfrac{I_{max}}{I_{min}}$

Where,

I_t = transmitted radiation intensity

I_0 = incident radiation intensity

R = mirror reflectance (as a fraction of unity)

θ = angle of incidence (inside etalon)

N = wavefront error in fractions of λ (i.e., expressed as λN)

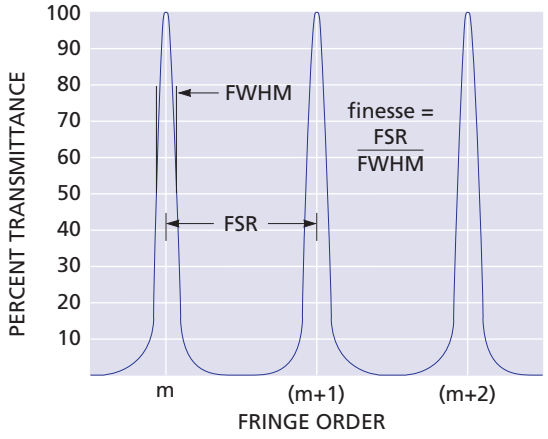
n = refractive index of cavity (i.e., 1 for air gap etalons)

d = distance between mirror surfaces or cavity gap

c = speed of light

λ = wavelength (free space)

T = mirror transmittance after losses due to absorption and scatter (as a fraction of unity)



The transmission pattern of a simple Fabry-Perot interferometer. The transmission peaks, or fringes, are equally spaced with respect to reciprocal wavelength (usually termed wavenumber) or frequency.