



Why an all-fiber Fabry-Perot Tunable Filter?

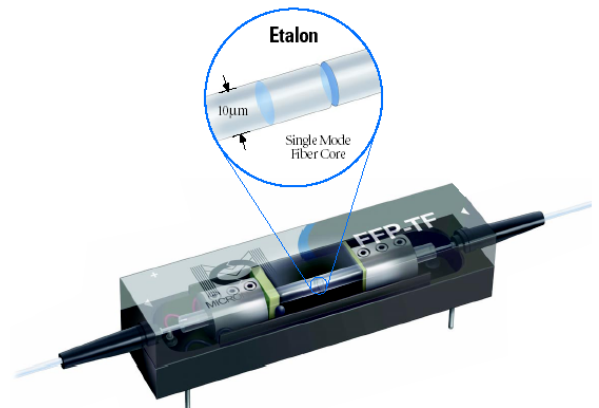
Fabry-Perot filters and interferometers have provided the highest known optical wavelength resolution for 100 years, and are still considered seminal instruments in many branches of science including astronomy, atomic physics, chemistry, lasers, metrology, optics, plasma physics and spectroscopy. These original optical configurations, developed in the late 1800's, were constructed of bulk lenses, mirrors and beam optics along with geared positioning stages. However, in spite of their superior optical resolution, "old" bulk optic, Fabry-Perot devices had two fundamental problems:

- There is no method of guiding the light between the mirrors, which results in extreme sensitivity to alignment, temperature and vibration. With each bounce of the beam, some light walks-off and is lost. Other light generates extra cavity modes that cause gross deviation from the ideal mathematical theory published in 1831 by George Airy.
- There is no mechanism for moving the mirrors the extremely small, atomic distances required to accurately tune or continually scan the Fabry-Perot device.

Advantages of Micron Optics Fiber Fabry-Perot Technology

Charles Fabry and Alfred Perot coined the term etalon (a standard weight or measure) to describe an optical cavity between two reflecting surfaces. Micron Optics, Inc. has added a single segment of optical fiber within the original Fabry-Perot etalon and developed and patented a fiber Fabry-Perot (FFP) tunable filter. No lenses, no collimating optics, just simply fiber and mirrors. This true fiber etalon constitutes Micron Optics FFP-Technology. All the high optical resolution advantages of the "old", bulk optic device is preserved, but with three critical distinctions:

- Micron Optics FFP Technology has optical fiber inside the etalon which guides the light with each bounce between the mirrors. The extreme alignment, temperature and vibration sensitivities of the "old", bulk optic Fabry-Perot interferometers are gone. In fact, the alignment sensitivity of FFP technology is no more than that of an individual single-mode optical fiber splice or connector.
- Micron Optics FFP Technology has natural fiber connection compatibility unlike lenses or integrated waveguides, which encounter fundamental connection difficulties. The FFP platform is joining the ranks of the other commercially successful all-fiber components, including fiber couplers, Erbium-doped fiber amplifiers (EDFAs), and fiber Bragg gratings (FBGs).
- Micron Optics FFP Technology is combined with the highest resolution mechanical positioning devices, Piezo-electric Transducers (PZTs), to position the mirrors in Micron Optics' FFPs. PZTs are used in atomic force microscopes to position elements to sub-atomic dimensions. This level of mechanical resolution ensures stable, smooth, repeatable tuning of any FFP filter.



These three critical innovations allow the FFP's optical response to truly follow the Airy function from the top of its low-loss peak down to the very bottom of its stop band, and to be smoothly and precisely controlled over all points in between.

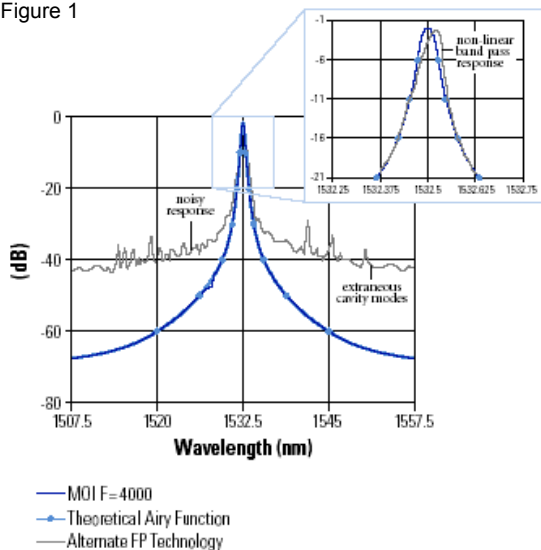
Advantages of Fiber Fabry-Perot Technology

Why filter response is so critical

The shape of any filter response defines its performance characteristics. The high degree to which the Micron Optics FFP Technology follows the Airy Function theory means optical systems can be designed to exhibit extremely low loss, predictable cross-talk, highly accurate power measurements, high Optical Signal to Noise Ratio (OSNR), and excellent wavelength resolution.

Micron Optics FFP tunable filters show distinct advantages over competitive Fabry-Perot technology, including excellent linearity and isolation characteristics as shown below.

Figure 1



Micron Optics FFP Technology means better solutions

Micron Optics FFP Technology enables the highest performance embedded optical channel analyzer available today, monitoring up to 400 channels in the C band alone. The high resolution, deep dynamic range and continuous, smooth and true tuning combine to generate superior specifications. In addition, these specifications are valid over the entire temperature range of 0 to 65°C.

Micron Optics FFP Technology is used in telecom systems around the world for optical noise filtering and dynamic channel locking. A key attribute is the extremely low insertion loss (less than 1.5 dB) of the Micron Optics FFP filter and its reliable locking capability. Actual field data from thousands of filters carrying live telecom traffic has demonstrated extremely high reliability (less than 80 FITS).

Micron Optics FFP Technology enables wide dynamic range (70 dB) optical component test and measurement systems with lightning fast real time scan speeds (0.2 sec) and incredible accuracy (± 1 pm). These instruments will revolutionize the manufacture of Micron Optics' own FFP-TFs.

The rapid tuning and locking capabilities of Micron Optics FFP Technology enables channel selection and dropping applications in dynamic optical networks. The high degree to which the filters follow the Airy Function theory allows optical engineers to accurately design single and cascaded filters for the densest DWDM systems (down to 6 GHz channel spacing).

Micron Optics FFP Technology, with its superior set of performance characteristics, can be applied to multiple diverse applications including those above, as well as optical transport, optical sensing and others.



components