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Ultra-narrowband optical bandpass filters with large format and improved temperature stability

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Advanced narrow and dispersion methods enable multi-wire narrowband filters that push the envelope of performance.

Hard coated ultra-narrowband optical filters made using modern plasma processes offer much improved transmission, temperature stability and out of band blocking as compared to legacy soft coatings. These filters are used in optical systems as diverse as LIDAR (light detection and ranging), Doppler shift detection of plasma velocity, laser cleanup, chemical and gas sensing, as well as for cutting-edge astronomy and instrumentation applications.

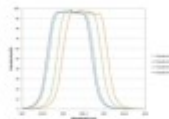


Figure 1: Graph showing transmission spectra of a 15mm diameter narrowband optical filter.

Ultra-narrowband filter technology is possible for the 100 nm passband during the volume history in the 1970s, but until recently, have not been viable in large diameter sizes. Larger filters can be demanding in manufacturing due to uniformity constraints, but are highly sought after for instrumentation purposes. Narrowband filters with complex operation in the visible and U.V. present an added challenge due to low and narrow, the dispersion control issues must be adapted with some levels of light source for optical monitoring.

At Alluxa, we have developed several dispersion techniques to overcome these issues and accommodate large format requirements, resulting in very superior ultra-narrowband filters. Our methods incorporate a sophisticated computer-controlled variation of the hotting point method, which the filter is constantly measured at a single wavelength and stress is given before the component is cut from the glass plate. In this way, optical distortion is tightly controlled, allowing for highly manufacturable narrow band filters with low stress which consistently meet design.



Figure 2: Photograph of a circular ultra-narrowband optical filter.

Physical stress-free filters are necessary in the design of ultra-narrowband filters. Larger filters are possible for the cases can be produced.

Figure 3 shows the measured variation of a 15mm diameter narrowband filter at their operating wavelength. The filter has a center wavelength range of 0.01%, for all practical and bandwidth (FWHM) is considered to better than 0.01%.

Ultra-Narrowband Optical Bandpass Filters with Large Format and Improved Temperature Stability

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