Linewidth Characteristics of Fiber Bragg Gratings

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Using coupling-modes equations, the linewidth, reflectance and sidelobs of the uniform fiber Bragg gratings were investigated. With the same grating length, the linewidth of high reflectance gratings are narrower than that of the low reflectance gratings. For the same reflectance gratings, the linewidth of the long length gratings are narrower than that of the short length gratings. The FWHM of the grating can be expressed as

$$\frac{k_0^2 \sin^2(\sqrt{(\Delta\beta)^2 - k_0^2}\,L)}{(\Delta\beta)^2 - k_0^2 + k_0^2 \sin^2(\sqrt{(\Delta\beta)^2 - k_0^2}\,L)} = \frac{1}{2}\tanh^2(k_0 L)$$

where $\Delta\beta = 2\pi n_{eff}\Delta\lambda / \lambda_0^2$, $k_0 = \eta\pi\Delta n / \lambda_0$ is coupling coefficient, L is the grating length, then the FWHM=$2\Delta\lambda$.

Fiber Bragg gratings were fabricated by the phase-mask method using high Ge-doped fiber and KrF excimer laser(248nm, 20Hz, 400mJ/pulse). The experimental and theoretical result of the linewidth is 0.2nm in the FBG with 20dB reflectance and 10mm long.

[References]

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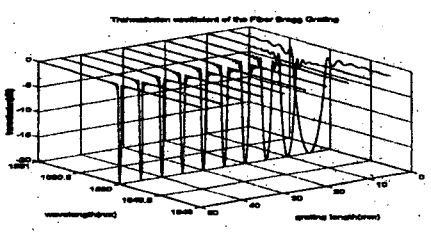

Fig 1. The transmission spectrum of fiber grating via the grating length by calculating

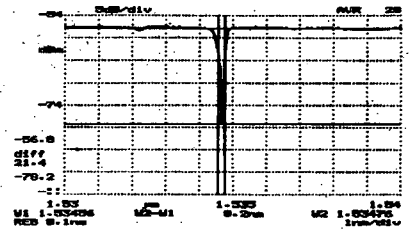

Fig 2. The transmission spectrum of fiber grating with 20dB peak reflectance