Rules of Thumb

$$\eta = \sin^2\left[\frac{\pi \Delta n_2 d}{\lambda \cos(\alpha_{2B})}\right]$$

Reaches a maximum when:

$$\Delta n_2 d/\cos(\alpha) = \lambda/2$$

So if the thickness-modulation product is smaller than half the wavelength, the grating is not effective. The thickness-modulation product can be *larger*, and still yield high efficiency, but at the expense of bandwidth.

So for low angles, the reddest grating possible is about 2 x 50μ x 0.1 = 5μ. At larger angles (high dispersion), this is reduced.

On the blue end, this equation gives no limit, but the limit is set by the condition for a grating to behave as a "thick" device:

$$\rho \equiv \frac{\lambda^2}{\Lambda^2 n_2 \Delta n_2} \geq 10$$

For short wavelength and large fringe spacings, Δn_2 must be small. But the lower limit is set to about 0.0035 (with 50μ emulsion and 350 nm radiation) by the Kogelnik approximation we just used. The above condition is therefore not met for 300 or 600 l/mm gratings at 350 nm.