In the task on page 16 we were asked to calculate the theoretical values for the experiment. We were given $R = 50mm$ for both plano-convex lenses, $L = 45mm$ distance between the lenses. The lenses have a width $b = 6.35mm$ and a refraction index $n_L = 1.515$ The wavelength of the light will be $\lambda = 632nm$ for the following calculations.

Using the given equation for the waist within the optical resonator

$$\omega_0^2 = \frac{\lambda}{\pi}\sqrt{\frac{L}{2}(R - \frac{L}{2})} \tag{1}$$

we obtain

$\omega_0^2 = \frac{632nm}{\pi}\sqrt{\frac{4.5mm}{2}(50mm - \frac{4.5mm}{2})} = 4.9 * 10^(- 8)m$

The resulting rayleigh length is then

$z_R = \frac{\pi 4.9*10^{(-8)}m}{632} = 1.2 * 10^{-8}m$

$D = \frac{n_L - 1}{R}$