

## Capacitance

18.49 We want to compute the plate spacing of a parallel-plate capacitor as the dielectric constant is increased from 2.2 to 3.7, while maintaining the capacitance constant. Combining Equations 18.26 and 18.27 yields

$$C = \frac{\epsilon_r \epsilon_0 A}{l}$$

Now, let us use the subscripts 1 and 2 to denote the initial and final states, respectively. Since  $C_1 = C_2$ , then

$$\frac{\epsilon_{r1} \epsilon_0 A}{l_1} = \frac{\epsilon_{r2} \epsilon_0 A}{l_2}$$

And, solving for  $l_2$

$$l_2 = \frac{\epsilon_{r2} l_1}{\epsilon_{r1}} = \frac{(3.7)(2 \text{ mm})}{2.2} = 3.36 \text{ mm}$$