Optics

Kerr effect

Problem 1.- Suppose a Kerr cell needs 7,100 volts to produce a retardation of 90º (behaving as a quarter wave plate). How much voltage do you need if you want a retardation of 180º?

Solution: Since the rotation is proportional to the voltage squared if we want to increase the rotation by a factor of 2 the voltage should increase by a factor of $\sqrt{2}$, so it should be **10,000 volts**

Problem 2.- Calculate the voltage necessary to produce a rotation of 90º when light from a He-Ne laser (λ=632 nm) goes through a Pockels cell made of lithium niobate. Assume the plane of polarization of the laser makes 45º with respect to the fast axis.
r=3.05x10^{-12} m/V
n=2.18

Solution: To produce a rotation of 90º we need to make the Pockels cell to behave as a half wave plate, so:

$$\frac{\lambda}{2} = rn^3V \rightarrow V = \frac{\lambda}{2rn^3} = \frac{632nm}{2(3.05\times10^{-12}m/V)2.18^3} = \textbf{10,000 volt}$$