

Suppose that the susceptibility is $\chi = 1 + 2i$.

- (a) What is the complex index of refraction?
- (b) What is the speed of light in the medium?

Suppose that the susceptibility is $\chi = 1 + 2i$.

- (a) What is the complex index of refraction?
- (b) What is the speed of light in the medium?

(a)

$$\begin{aligned}\mathcal{N} &= \sqrt{1 + \chi} \\ &= \sqrt{1 + 1 + 2i} \\ &= \sqrt{2 + 2i} \\ &= \sqrt{\sqrt{8} e^{i\pi/4}} \\ &= \sqrt{\sqrt{8}} \sqrt{e^{i\pi/4}} \\ &= \sqrt{\sqrt{8}} e^{i\pi/8}\end{aligned}$$

(b)

$$n = \frac{c}{v} \longrightarrow v = \frac{c}{n}.$$

But

$$n = \mathcal{R}e[\mathcal{N}] = \sqrt{\sqrt{8}} \cos(\pi/8) = 1.5538$$

So

$$v = \frac{c}{n} = 0.54934 c.$$