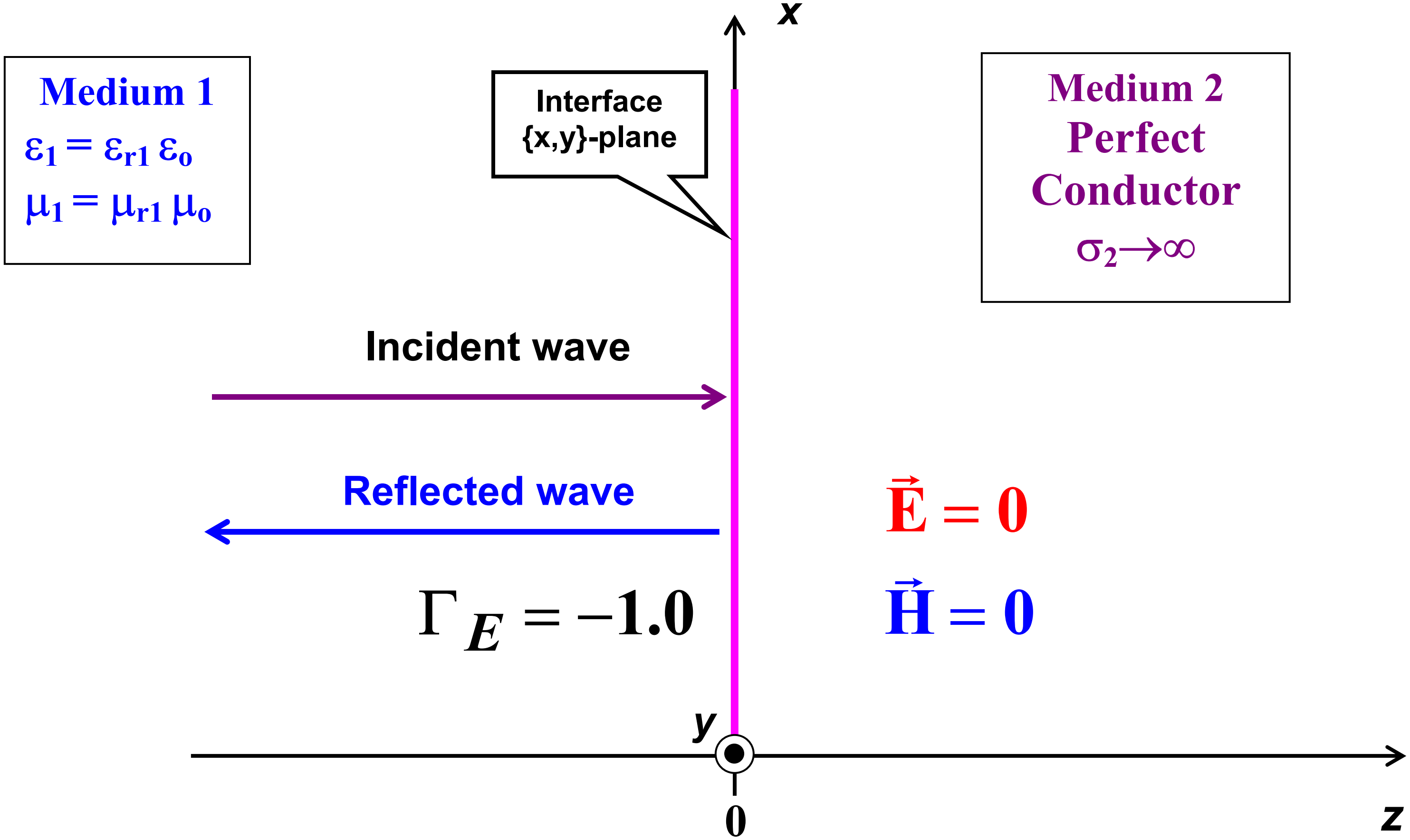
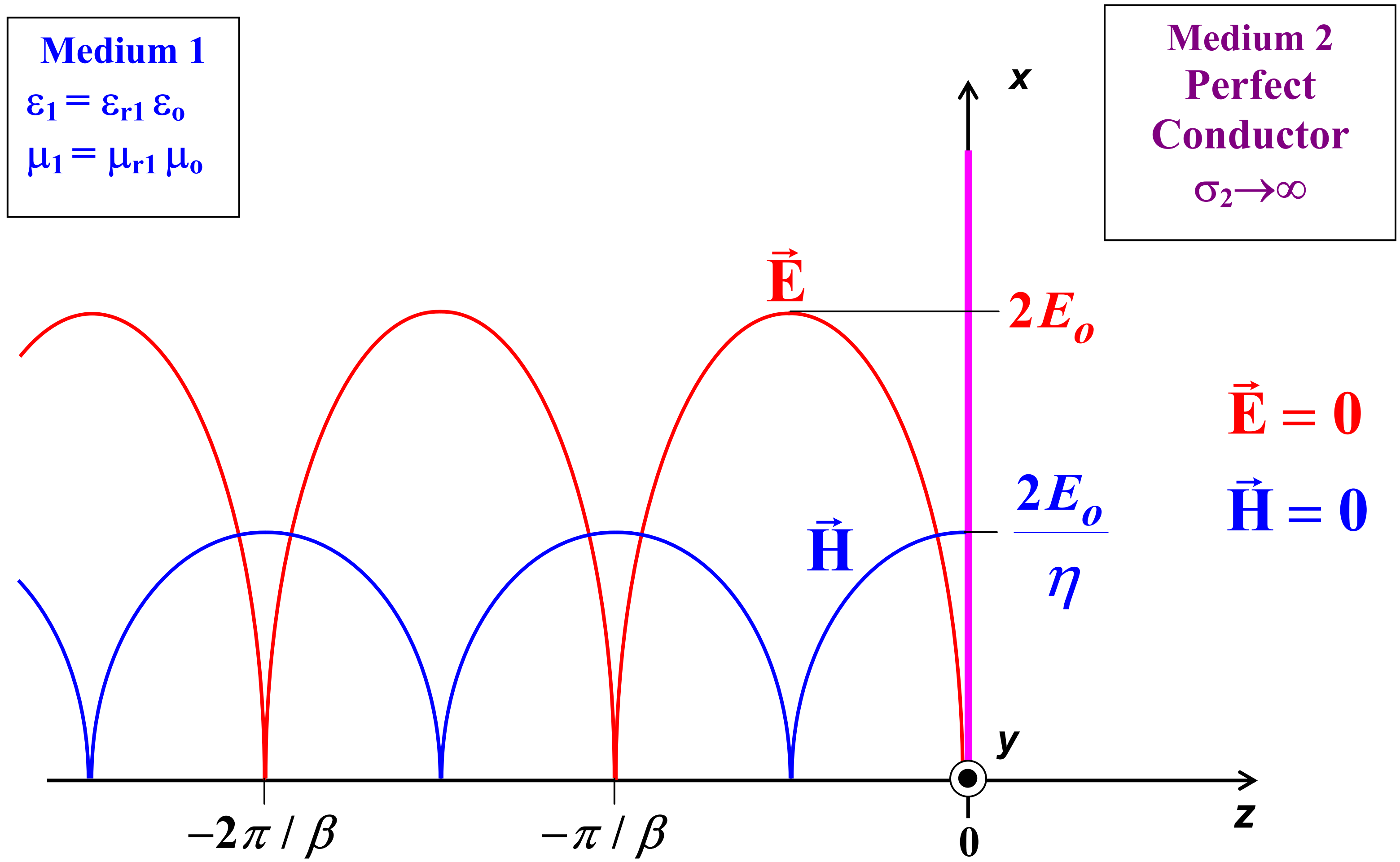
Incidence on Perfect Conductor

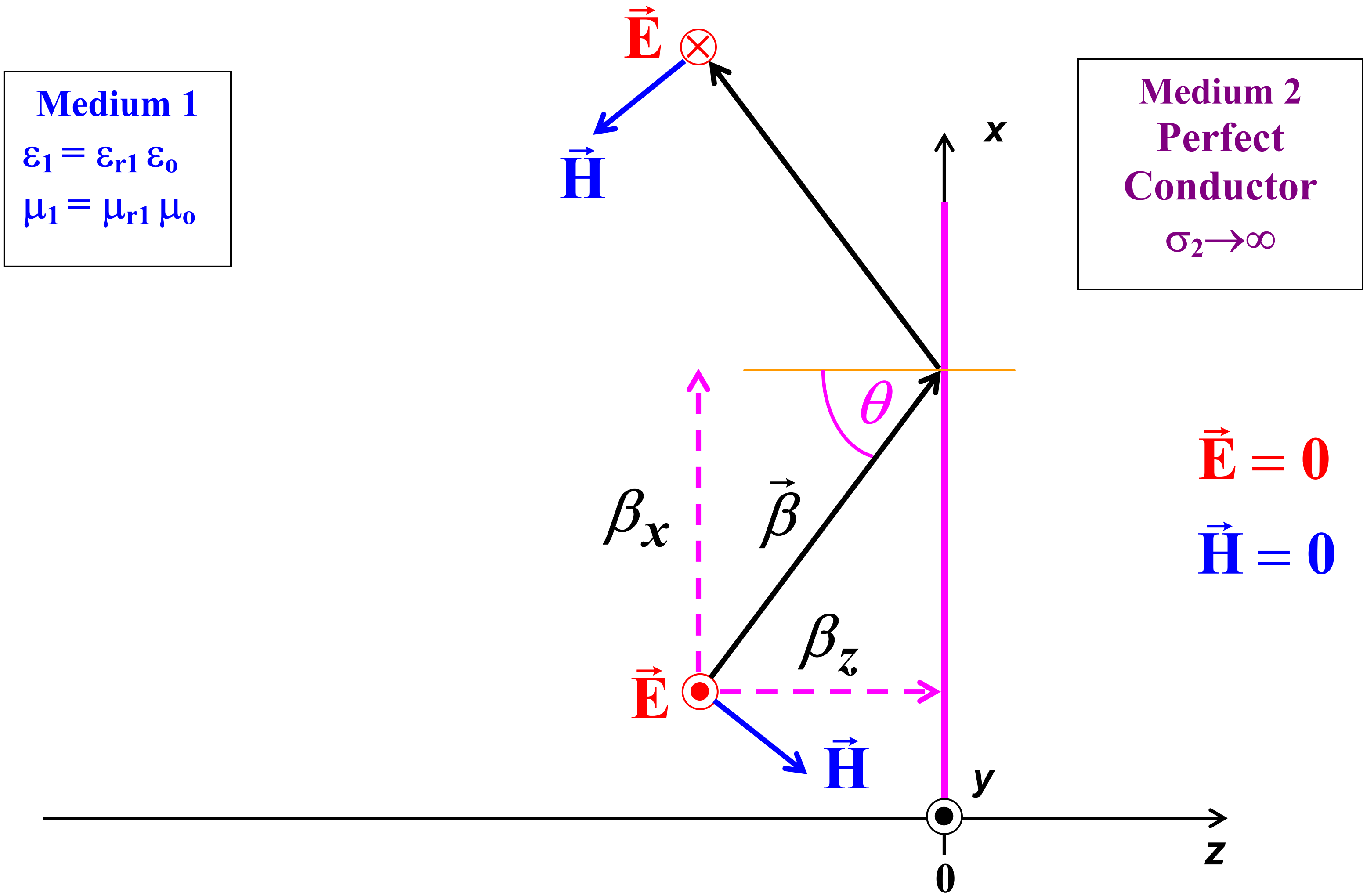
Consider first normal incidence at an interface between a dielectric and a perfect conductor. Total reflection occurs, as in a short-circuited transmission line.



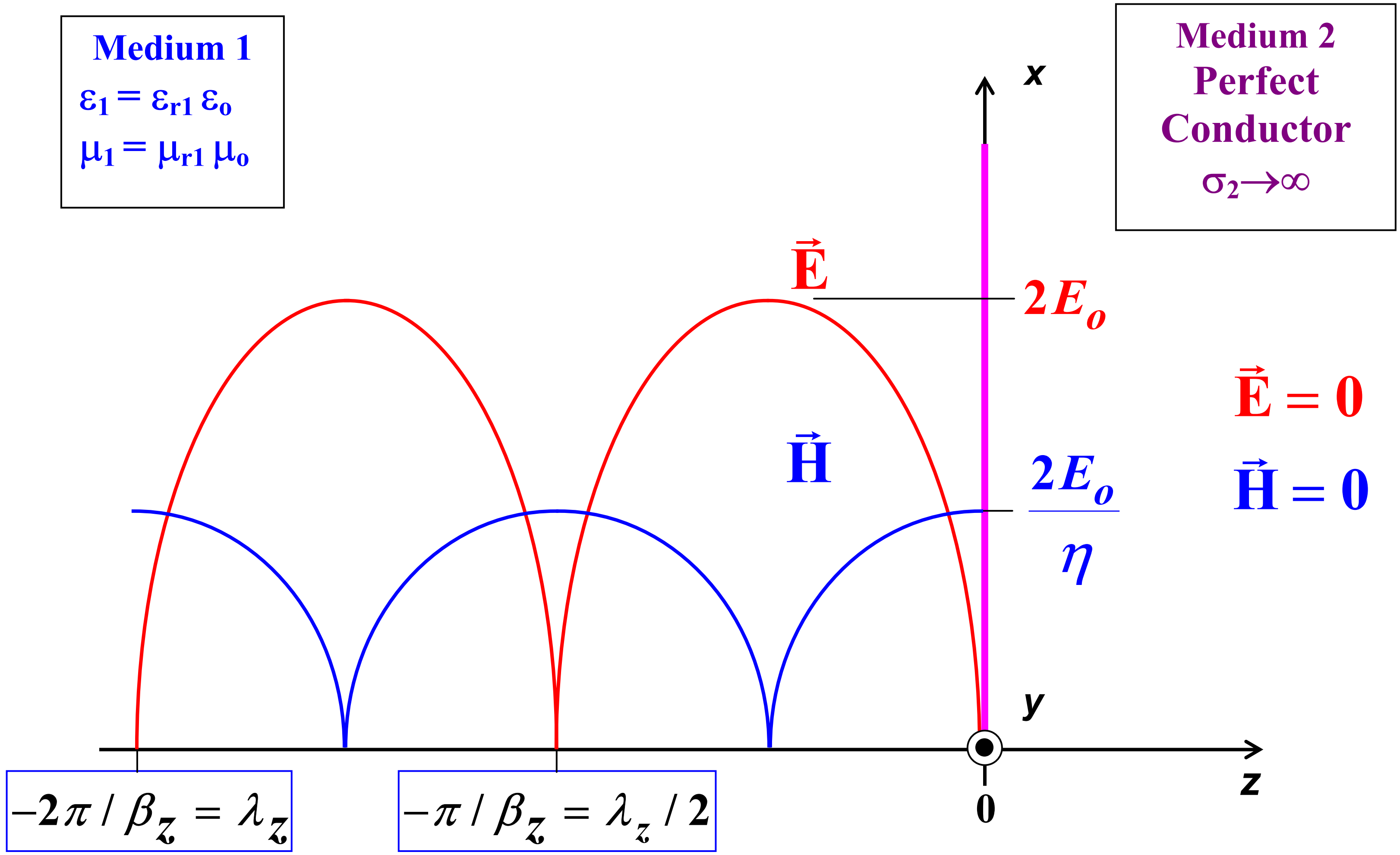
Because of interference between incident and reflected wave, there is a standing wave in medium 1.



Consider now incidence at an angle. We choose an electric field perpendicular to the plane of incidence.



Only the normal component, corresponding to β_z is reflected.



Note: $\beta_z < \beta \quad \Rightarrow \quad \lambda_z > \lambda$

$$\beta = \frac{2\pi}{\lambda} \;\; ; \beta_z = \frac{2\pi}{\lambda_z} = \frac{2\pi}{\lambda}\cos\theta$$

First maximum

$$|z_{max}| = \frac{\lambda_z}{4} = \frac{\lambda}{4\cos\theta}$$

First minimum

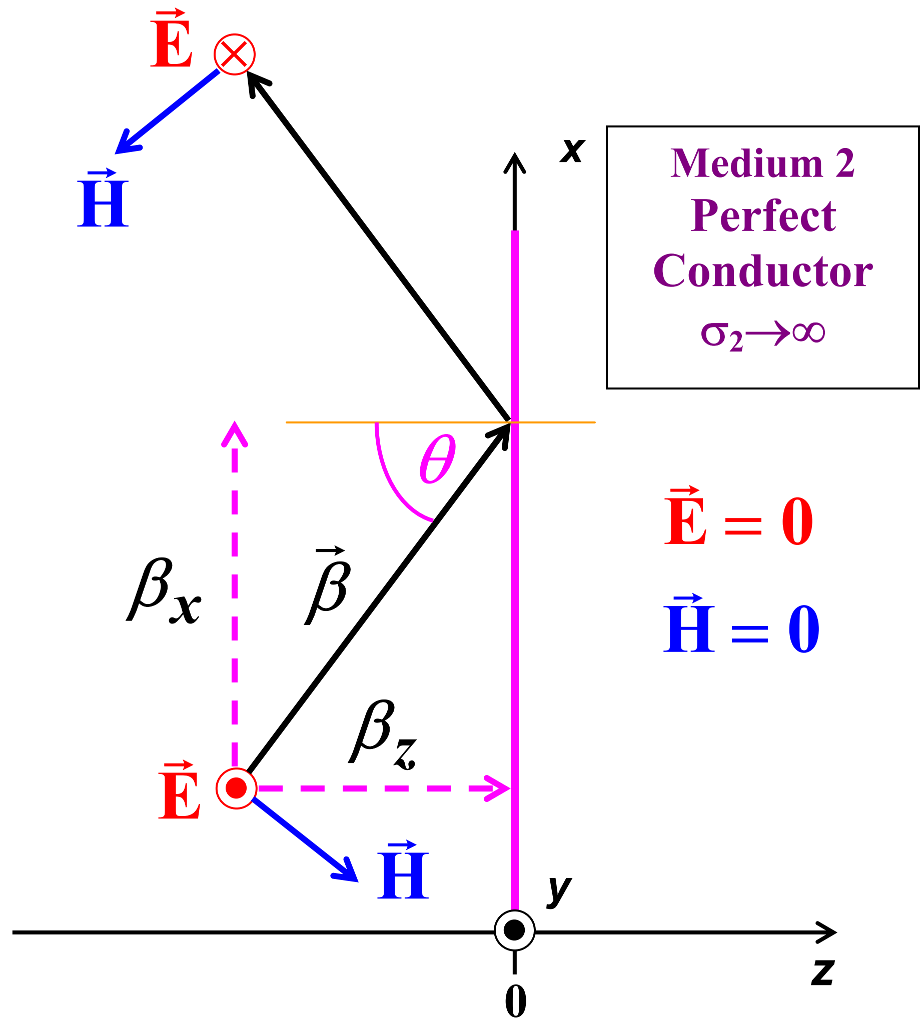
$$|z_{min}| = \frac{\lambda_z}{2} = \frac{\lambda}{2\cos\theta}$$

Examples:

$$\theta = 45^\circ \Rightarrow |z_{max}| \approx 0.35\lambda$$

$$\theta = 15^\circ \Rightarrow |z_{max}| \approx 0.259\lambda$$

$$\theta = 0^\circ \Rightarrow |z_{max}| \approx 0.25\lambda$$



If we place a second perfect conductor interface, parallel to the previous one, the wave is guided along the x-direction by reflection.