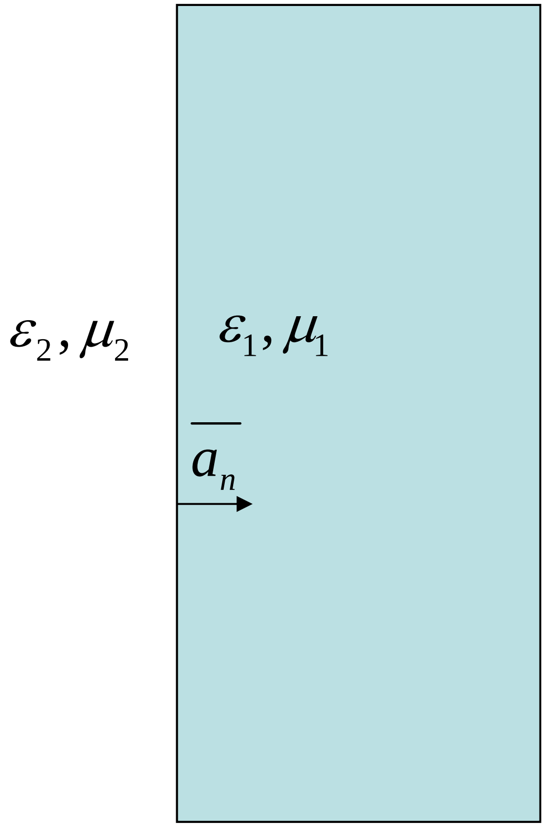
# Lect. 5: Boundary Conditions (Cheng 7-5)

✓ Boundary Conditions: Constraints on E,H fields at a boundary

➔ Each Maxwell's Eq. provides one constraint on E or H.




$$\nabla \cdot \overline{D} = \rho$$

$$D_{1,n} - D_{2,n} = \rho_s$$

$$\varepsilon_1 E_{1,n} - \varepsilon_2 E_{2,n} = \rho_s$$



W.-Y. Choi

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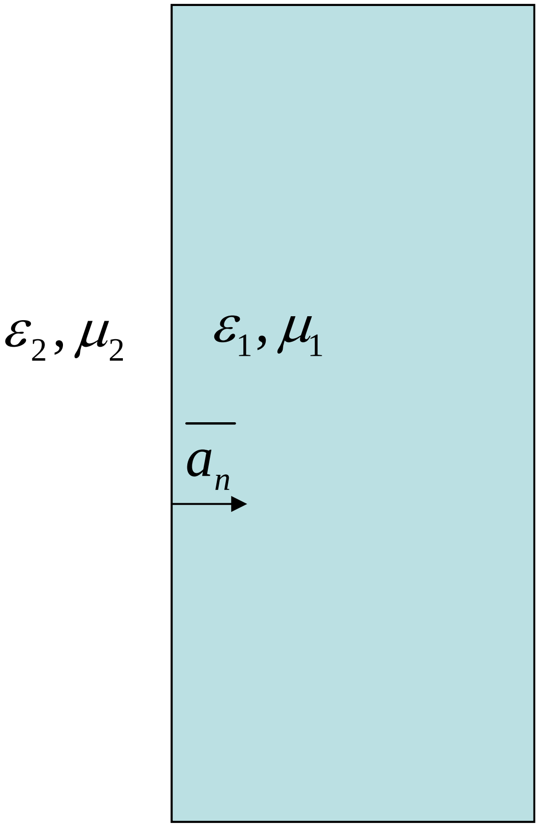


$$\nabla \cdot \overline{B} = 0$$

$$B_{1,n} - B_{2,n} = 0$$

$$\mu_1 H_{1,n} - \mu_2 H_{2,n} = 0$$

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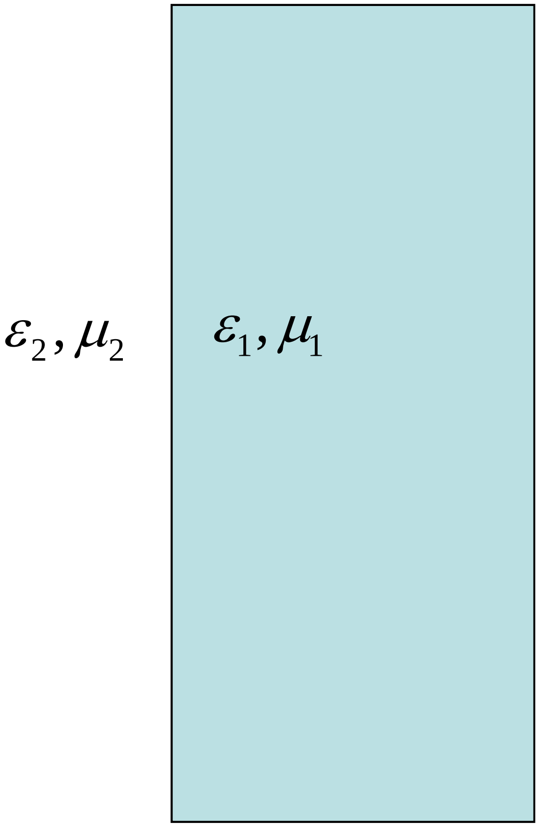


$$\nabla \times \overline{E} = -\frac{\partial \overline{B}}{\partial t}$$

$$E_{1,t} - E_{2,t} = 0$$

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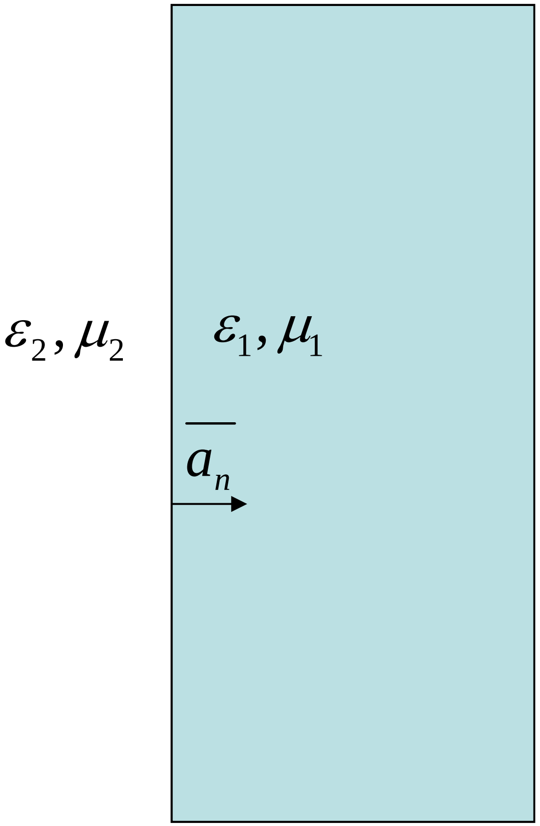


$$\nabla \times \overline{H} = \overline{J} + \frac{\partial \overline{D}}{\partial t}$$

$$H_{1,t} - H_{2,t} = J_s$$

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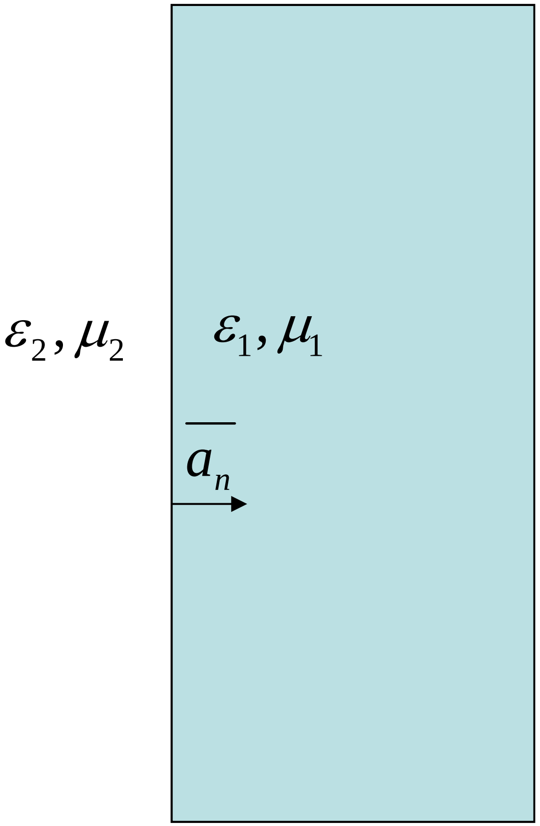
Boundary Conditions are 2-D Maxwell's Eqs.




$$\nabla \cdot \overline{D} = \rho \qquad D_{1,n} - D_{2,n} = \rho_s \Leftrightarrow \varepsilon_1 E_{1,n} - \varepsilon_2 E_{2,n} = \rho_s$$

$$\nabla \times \overline{E} = -\frac{\partial \overline{B}}{\partial t} \qquad E_{1,t} - E_{2,t} = 0$$

$$\nabla \cdot \overline{B} = 0 \qquad B_{1,n} - B_{2,n} = 0 \Leftrightarrow \mu_1 H_{1,n} - \mu_2 H_{2,n} = 0$$

$$\nabla \times \overline{H} = \overline{J} + \frac{\partial \overline{D}}{\partial t} \qquad H_{1,t} - H_{2,t} = J_s$$

# Lect. 5: Boundary Conditions

Characteristics of E, H field
on the surface of a perfect conductor?

$\varepsilon, \mu$

$\sigma = 0$

$\sigma = \infty$

$\overline{E} = \overline{H} = 0$