

Electromagnetic Field Theory

Week 4

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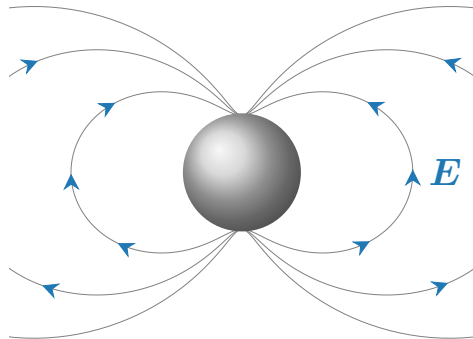
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1. Good Conductors





Conductors

Inside the conductor

$$\mathbf{E} = \mathbf{0},$$

$$\varphi = K.$$

Boundary condition

$$\mathbf{E}(\mathbf{r} \in \partial V) = \frac{\sigma}{\varepsilon_0} \hat{\mathbf{n}}.$$



Parallel-Plate Capacitor

Potential from the charged plane

$$\varphi = - \int \mathbf{E} \cdot d\mathbf{l} + K = -\frac{\sigma}{2\varepsilon_0}|z| + K.$$

Electric potential from two planes charged with opposite surface charge density

$$\varphi(z) = \varphi_+(z) + \varphi_-(z) = \frac{\sigma}{2\varepsilon_0} \left(\left| z + \frac{d}{2} \right| - \left| z - \frac{d}{2} \right| \right).$$

Voltage and capacity

$$U = Q \frac{d}{\varepsilon_0 S} \quad \Rightarrow \quad CU = Q.$$

Questions?

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