Electromagnetic Field Theory

Week 4

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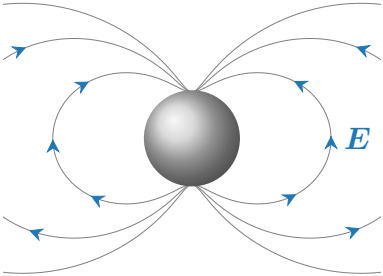
October 22, 2024
Winter semester 2024/25

Outline

1. Good Conductors



Conductors

Inside the conductor

$$\boldsymbol{E} = \boldsymbol{0},$$
$$\varphi = K.$$

Boundary condition

$$\boldsymbol{E}(\boldsymbol{r} \in \partial V) = \frac{\sigma}{\epsilon_0}\hat{\boldsymbol{n}}.$$

Parallel-Plate Capacitor

Potential from the charged plane

$$\varphi = -\int \boldsymbol{E} \cdot \mathrm{d}\boldsymbol{l} + K = -\frac{\sigma}{2\epsilon_0}|z| + K.$$

Electric potential from two planes charged with opposite surface charge density

$$\varphi(z) = \varphi_+(z) + \varphi_-(z) - = \frac{\sigma}{2\epsilon_0}\left(\left|z + \frac{d}{2}\right| - \left|z - \frac{d}{2}\right|\right).$$

Voltage and capacity

$$U = Q\frac{d}{\epsilon_0 S} \quad \Rightarrow \quad CU = Q.$$

Questions?

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This document has been created as a part of BAB17EMP course.