

## Exercise 2.4.1 Field Screening

Illustration



Consider a capacitor made of parallel metal plates in air with an area of  $1 \text{ cm}^2$  at a distance of  $1 \text{ cm}$ .

1. How many electrons per  $\text{cm}^2$  do you need on the surface to provide for some field  $E$  ending there?
2. What would be the maximum charge density for reasonable field strengths up to an ultimate limit of about  $10 \text{ MV/cm}$ ? (For higher field strengths you will get violent discharge).
3. How does this number compare to the average *volume* density of electrons in metals. Consider, e.g., from how far away from the surface you have to collect electrons to achieve the required surface density, if you allow the volume density in the afflicted volume to decrease by  $x\%$ ?



Link to the [solution](#)