

Parallel Plate Capacitor

Based on Hermes2D (<http://hpfem.org/hermes>)

1 Module Description

The parallel plate capacitor model calculates the distribution of the electric potential φ induced by stationary electric charges on the two plates of the capacitor. User-defined parameters include the dimensions of the capacitor (the radius of the plates r and the distance between the plates d), relative permittivity of the dielectric ϵ_r , and the two voltages.

The image below shows a historical model of a parallel plate capacitor with white-colored dielectric between the plates.



Figure 1: Parallel plate capacitor.

2 Underlying Equations

The equation for the electric potential φ is

$$-\operatorname{div}(\epsilon \nabla \varphi) = \varrho$$

where ϱ is electric charge density. Once the electric potential φ is calculated, the electric field vector E can be obtained as its negative gradient,

$$E = -\nabla \varphi.$$