nclab
Online STEM Laboratory

Capacitor Module

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

1 Module Description

The capacitor model calculates the distribution of the electric potential φ induced by stationary electric charges on the two plates of the capacitor. One first has to specify dimensions of the capacitor (the size of the plates h and distance between the plates d). Then the relative permittivity ϵ_r of the dielectric and voltages on the two plates need to be specified.

The image below shows a real-life plate capacitor with white-colored dielectric between the two plates.

Figure 1: A plate capacitor.

2 Underlying Equations

The equation for the electric potential φ is

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

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,

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