

Conductance and capacitance of a piezoelectric patch- an example of a COMSOL app

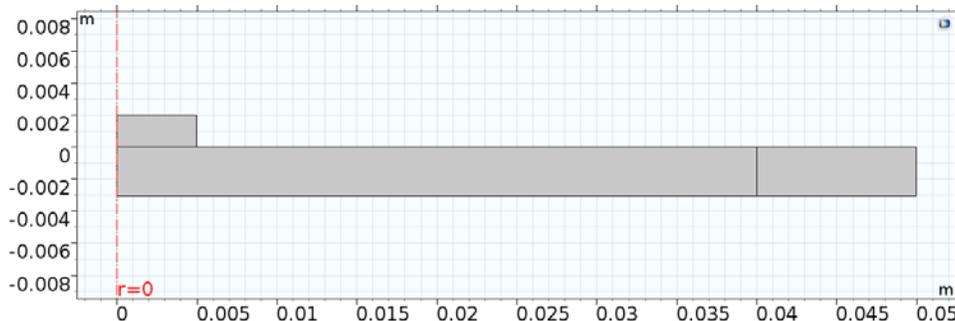
When to use an app

The advantages of using an app are discussed in detail at <https://www.comsol.com/comsol-server>. Briefly- apps are useful when simulations of a well-defined type need to be run by non-expert users. In this example, the app allows a user to predict the conductance and capacitance of a piezoelectric patch.

Lamb waves and piezoelectric patches

Piezoelectric patches are often used to generate Lamb waves in plates. Applications include the detection of flaws in plate-like structures. The capacitance and conductance at the terminals of the piezoelectric patch are often needed to choose electronics for wave generation. Because the piezoelectric patch couples electrical and mechanical domains, the electrical behavior depends on the mechanical parameters.

The app calculates the capacitance and conductance as a function of frequency. The user can choose the plate material (aluminum or steel) and the dimensions of the piezoelectric patch and plate thickness. The simulation is performed for a cylindrically symmetric system as shown below. The outer ring of the plate is a perfectly matched layer, simulating a piezoelectric patch radiating into an infinite domain.



The user can make a sector plot showing the wave emission at a selected frequency. Alternatively either capacitance or conductance can be plotted as a function of frequency. A typical result showing a plot of conductance is on the next page.

A large conductance indicates that substantial (real, as opposed to reactive) power is supplied by the electrical source. This happens when a particular wave mode is strongly coupled to the vibration of the piezoelectric patch.

Conductance as a function of frequency for a piezoelectric patch

