

Capacitor and Force

Source: <http://sci.tech-archive.net/Archive/sci.electronics.design/2007-10/msg01713.html>

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 - *Date:* Wed, 10 Oct 2007 09:15:30 -0500
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I'm trying out a little experiment but its not working ;/

Since

$$Q = C * V$$

and

$$F = k * Q1 * Q2 / r^2,$$

The force one parallel plate capacitor due to the charge is

$$F = k * (CV)^2 / r^2$$

So for a ceramic capacitor of 20nF with V = 20V, F ~ 3.6N. (assuming r ~ 1mm)

I've tried this with two pennies and a piece of paper(as the dielectric/insulator) which gives about 20pF and about 1nF(theoretically and to small for me to measure).

I grinded down one side of 40nF ceramic plate capacitor and a penny and it has a total of 40nF but I experience no force when moving the plates close together(which is surely < 1mm). But why? Surely since they act as a 40nF capacitor and there is 20V across is then there should be a significant force between the two. A large enough force to feel at when trying to sepearte the two?

But this isn't the case so I must be wrong either in theory or application. The theory is pretty straight forward and even if my calulations are off by 1000 I probably should feel some force between the two but as far as I can tell there is nothing. Not sure about the application either as it also is pretty straight forward(the main problem is getting a large enough capacitance in a simple way).

Any ideas where I went wrong?

Thanks,
Jon

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