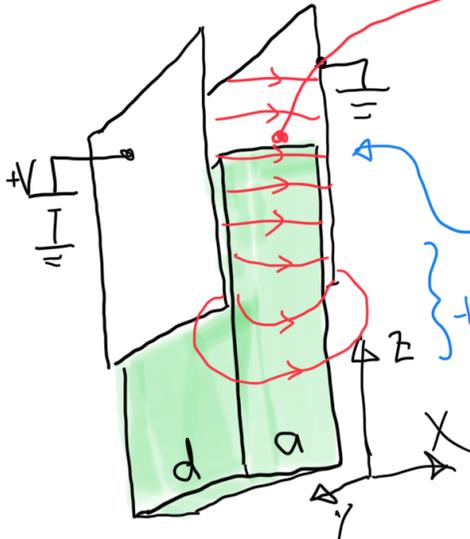


Indeed it can!

Recall that we had a force on the dielectric,

$$\begin{aligned}\vec{F} &= \frac{1}{2} E^2 a d (\epsilon - \epsilon_0) \hat{z} \\ &= \frac{1}{2} E^2 a d \epsilon_0 \chi_e \hat{z}, \quad E = V/a.\end{aligned}$$



uniform field near upper edge of slab, per the dielectric block example
 $-b < z < b$: nonuniform field near bottom edge of plates. This is where the force is exerted!

All we need do is integrate the force per volume:

$$\vec{F} = \frac{1}{2} \epsilon_0 \chi_e \int (\nabla E^2) d\tau \quad (\text{Here, } E = |\vec{E}(\vec{r})|)$$

By symmetry, make the replacement $\nabla \rightarrow \hat{z} \frac{\partial}{\partial z}$:

$$\vec{F} = \frac{1}{2} \epsilon_0 \chi_e \hat{z} \int_0^a dx \int_0^d dy \int_{-b}^b dz \frac{\partial}{\partial z} (E^2)$$

Now we take advantage of the fundamental theorem of calculus: The field goes from 0 to $E = V/a$ as we move up into the capacitor. So

$$\vec{F} = \frac{1}{2} \epsilon_0 \chi_e a d E^2 \hat{z} \quad \checkmark \quad (\text{Here, } E \text{ is the constant value } V/a.)$$