

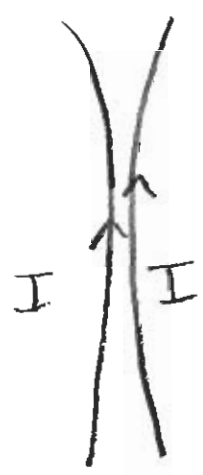
Magnetism



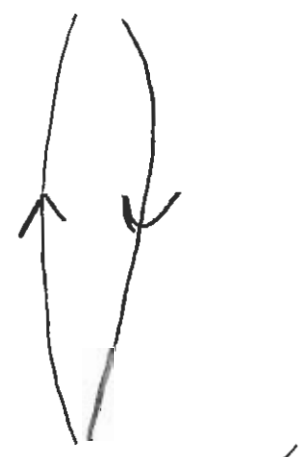
Compass needle initially \parallel to wire, turns \perp to current

current in wire I

Currents attract

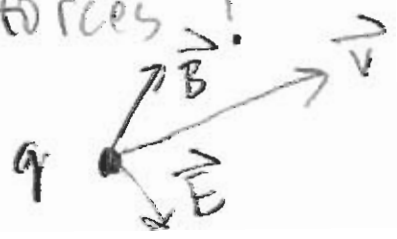


like currents attract



opposite currents repel

Putting a conducting plate between the wires does not eliminate or reduce the forces!



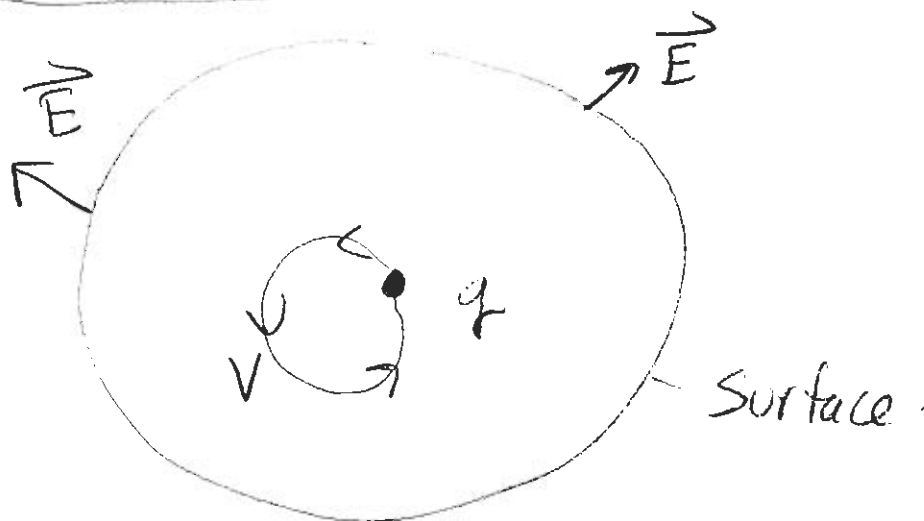
\vec{B} (magnetic field)

$$\vec{F} = q' \left(\vec{E} + \frac{\vec{v}}{c} \times \vec{B} \right)$$

Electric

Charge Independent of \vec{v} (!)mass was not :

$$\frac{m_0}{\sqrt{1 - (v/c)^2}}$$

use Gauss' Law:

$$\int \vec{E} \cdot d\vec{A} = 4\pi q$$

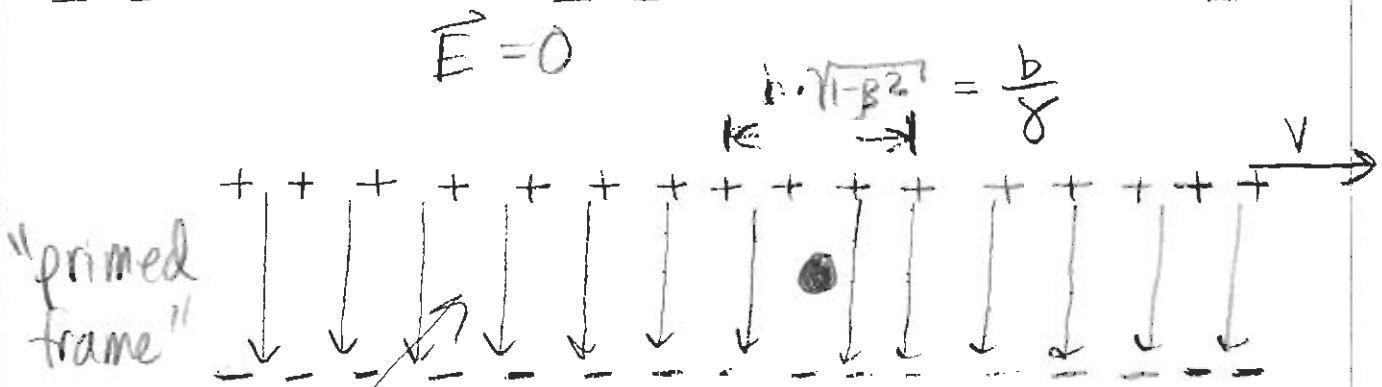
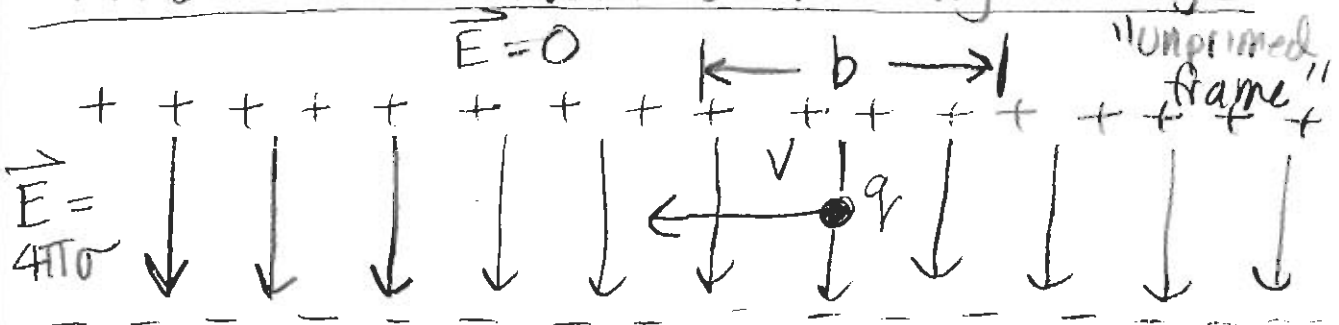
even if charge
moving at
light!
speed of

Note: (x, t) of surface is actually different as viewed in different frame: (x', t') . But

$$\int_S \vec{E} \cdot d\vec{A} = \int_{S'} \vec{E}' \cdot d\vec{A}' \quad (!)$$

since charge is enclosed in both cases.

Field Viewed From a Moving Charge



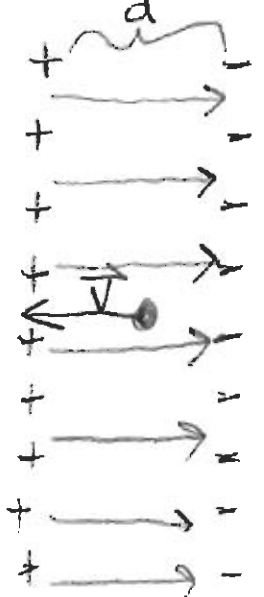
stronger:
 $\sigma' = \gamma\sigma$

$\vec{E}' = \gamma\vec{E}$

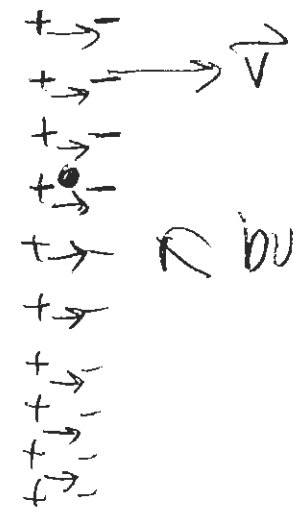
more generally, $\vec{E}'_{\perp} = \gamma\vec{E}_{\perp}$

\perp to direction of motion

How about \parallel to direction of motion



$d \cdot \sqrt{1-\beta^2} = d/\gamma$



but, $\vec{E}'_{\parallel} = \vec{E}_{\parallel}$

"unprimed frame"