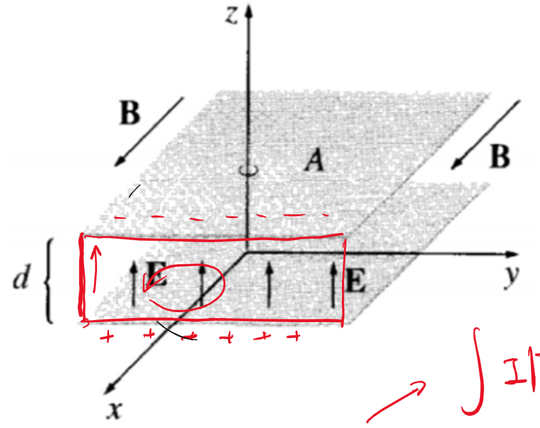


$\rho_p = \varepsilon_0 (\vec{E} \times \vec{B})$

(a) $\underline{\vec{P} = A d\, \varepsilon_0 |\vec{E}| |\vec{B}| \hat{y}}$

(b) $\vec{F} = \int I d\vec{l} \times \vec{B}$

$d\vec{F} = I d\vec{l} \times \vec{B}$

$\int I |\vec{B}| dl \cdot \hat{y} = I |\vec{B}| d \hat{y}$

$\underline{I d\vec{l} \times \vec{B} = I |\vec{B}| dl \hat{y}}$

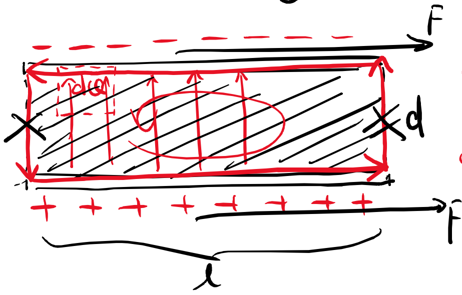
$\vec{I} = \int \vec{F} dt = \int \left(\int I d\vec{l} \times \vec{B} \right) dt$

$\vec{I} = \int I |\vec{B}| d \cdot \hat{y}\, dt = |\vec{B}| d \hat{y} \int I dt \qquad dQ = I dt$

$= |\vec{B}| d \hat{y}\, Q$

$= |\vec{B}| d \hat{y} \varepsilon_0 |E| A$

$= \vec{P}$



$dQ = \varepsilon_0 \cdot |\vec{E}| dA$

$\int dQ = \int \varepsilon_0 |\vec{E}| dA$

$Q = \varepsilon_0 |\vec{E}| \cdot A$

$\oint \vec{E} \cdot d\vec{l} = - \int \frac{\partial \vec{B}}{\partial t} dA$

$- \int \frac{\partial \vec{B}}{\partial t} \cdot d\vec{S} = - \frac{\partial B}{\partial t} \int d\vec{S} = - \frac{\partial B}{\partial t} \cdot l d$

$E \cancel{l} + E \cancel{l} = - \frac{\partial B}{\partial t} \cancel{l} \cdot d \qquad E = - \frac{d}{2} \cdot \frac{\partial B}{\partial t}$

$F = \left(- \frac{d}{2} \cdot \frac{\partial B}{\partial t} Q \right) \cdot \hat{y} \cdot 2 = - d Q \frac{\partial \vec{B}}{\partial t} \cdot \hat{y} \qquad \frac{d\vec{B}}{dt}$

$\vec{F} dt = - dQ\, dB\, \hat{y} \qquad \vec{I} = \int_0^t \vec{F} dt = - \int_{|\vec{B}|}^{0} d Q |\vec{B}| \hat{y} = d Q |\vec{B}| \hat{y}$

$= \varepsilon_0 A d |\vec{E}| |\vec{B}| \hat{y} = \vec{P}$