Datos $\rightarrow a, b, c$ $\qquad E_{MAX1} \qquad E_{MAX2}$

$\vec{E}, \vec{D}, \vec{P}$

$\vec{E} \propto \frac{A}{r} \qquad a < r < c$

$\propto \frac{A}{a} < E_{MAX1} \Rightarrow \qquad Q_L \leq \alpha E_{MAX1}$

$\vec{E} = \frac{B}{r} \qquad c < r < b$

$\frac{B}{c} \leq E_{MAX2} \qquad Q_L \leq \beta E_{MAX2}$

$\boxed{\frac{A}{a} \leq E_{MAX1}}$

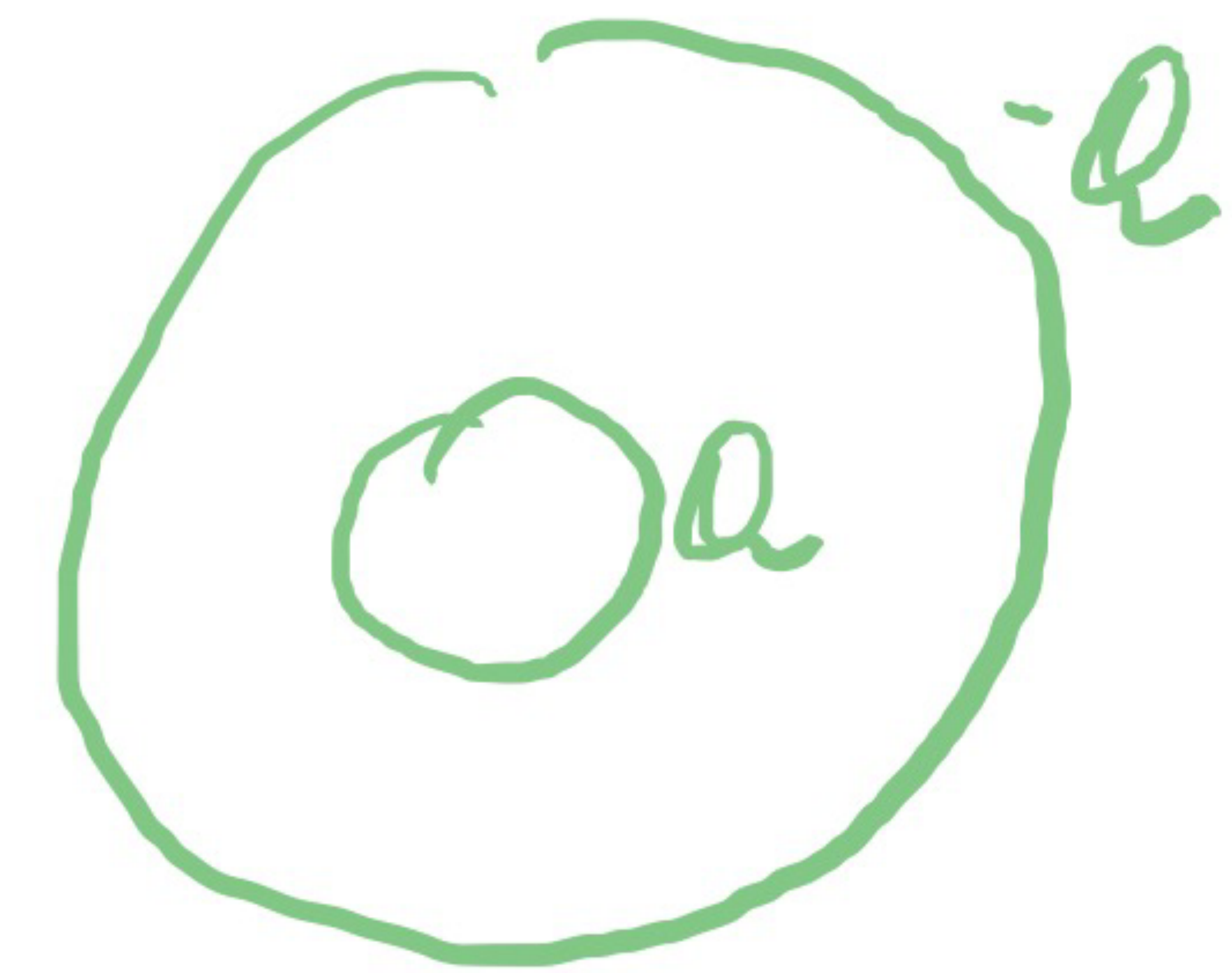
$\frac{A}{r} \leq E_{MAX1}$

$a < r < c$

$Q_L = \min\left[\alpha E_{MAX1}, \beta E_{MAX2}\right]$

$$\vec{E} = \underbrace{\frac{Q_L}{2\pi L \varepsilon_1 r}}\hat{r} \leq \underline{E_{MAX1}}$$

$\underline{\underline{a < r < c}}$



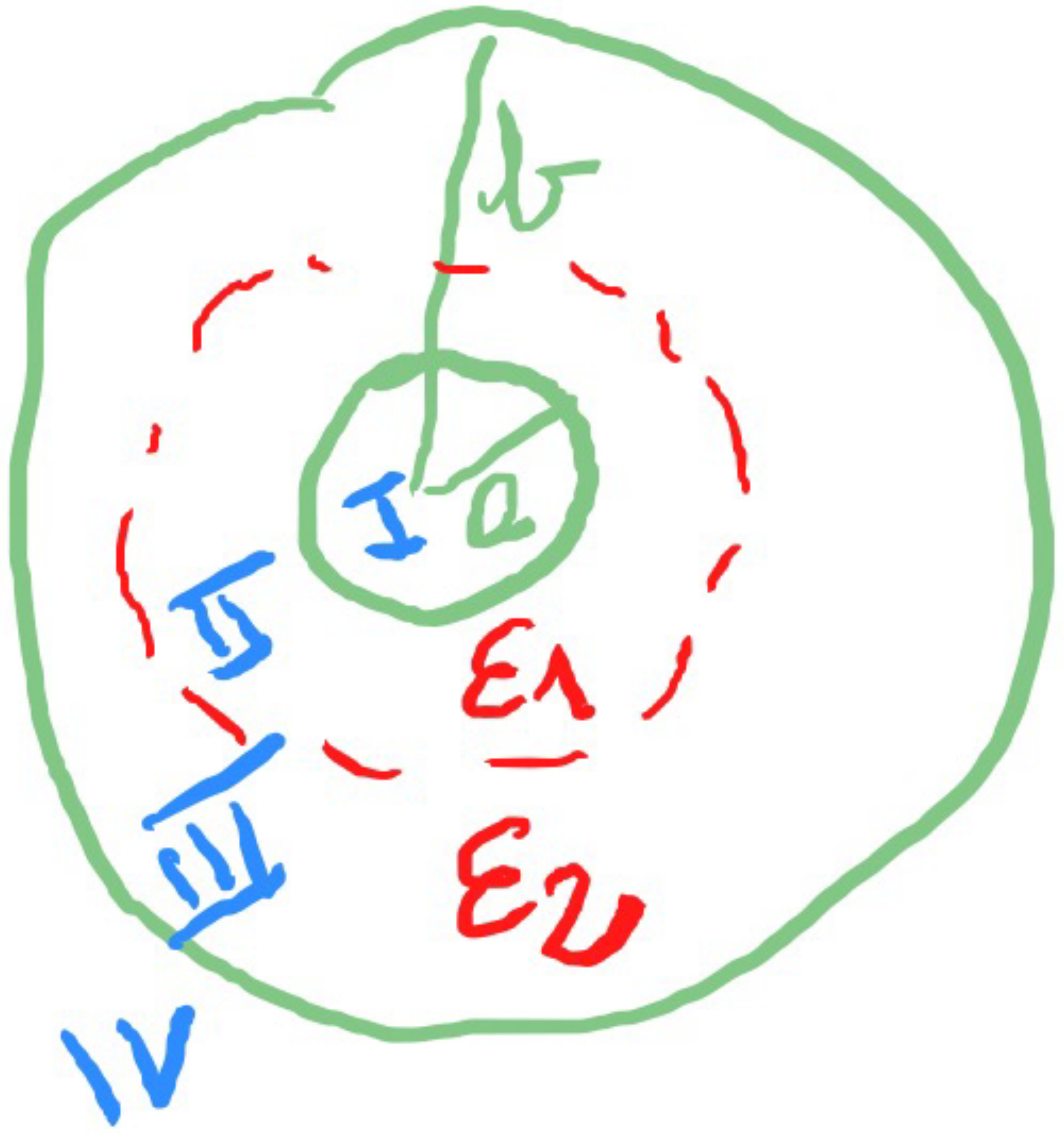
$$\vec{E}_2 = \frac{Q_L}{2\pi L \varepsilon_2 r}\hat{r} \leq \underline{E_{MAX2}}$$

$\underline{\underline{c < r < b}}$

$$\underbrace{\frac{Q_L}{2\pi L \varepsilon_1 a}} \leq E_{MAX1}$$

$$\frac{Q_L}{2\pi L \varepsilon_2 c} \leq E_{MAX2}$$

$$Q_L = \min\left[2\pi L \varepsilon_1 a\, E_{MAX1},\ 2\pi L \varepsilon_2 c\, E_{MAX2}\right]$$



$$\vec{D} = \varepsilon_0 \vec{E} + \vec{P}$$

1) $r < a$ o $r > b$

$\vec{P} = 0 \qquad \vec{D} = \varepsilon_0 \vec{E}$

$$\vec{\nabla}\times\vec{D} = \varepsilon_0 \vec{\nabla}\times\vec{E} = 0$$

2) $a < r < c$

$\vec{P} = \varepsilon_0 \chi_1 \vec{E} \qquad \vec{\nabla}\times\vec{P} = \varepsilon_0 \chi_1 \nabla\times\vec{E} = 0$

$$\vec{\nabla}\times\vec{D} = 0$$

3) $c < r < b$

$$\vec{P} = \varepsilon_0 \chi_2 \vec{E} \Longrightarrow \vec{\nabla}\times\vec{P} = \varepsilon_0 \chi_2 \vec{\nabla}\times\vec{E} = 0$$

$$\vec{\nabla}\times\vec{D} = \vec{\nabla}\times\vec{P} = 0$$

De 1, 2 y 3

medio

$\vec{D} = \varepsilon \vec{E} \rightarrow$ L.I.H

$$\boxed{\vec{P} = \varepsilon_0 \chi \vec{E}}$$

$\vec{\nabla}\times\vec{P} = 0 \qquad \vec{P}\times\hat{n} = 0$

$\vec{\nabla}\times\vec{D} = \vec{\nabla}\times\vec{P} = 0 \qquad \boxed{\vec{\nabla}\cdot\vec{D} = \rho_L}$

	VOL	SUP
$\vec{D}$	$\rho_L \quad \vec{\nabla}\times\vec{P}$	$\underline{\vec{P}\times\hat{n}} \quad \underline{\sigma_L}$
$\vec{E}$	$\rho_T = \rho_L + \rho_p$	$\sigma_T = \sigma_L + \sigma_p$

$\vec{P} = \alpha r \hat{r}$

CASO GENERAL ELECTRETE

$\vec{\nabla} \times \vec{P} \neq 0.$

$\vec{P} \times \hat{n} \neq 0 \qquad r = a \qquad \alpha a \hat{r} \times (-\hat{r}) = 0$

$\vec{P} \times \hat{n} \neq 0 \qquad r = b \qquad \alpha b \hat{r} \times (-\hat{r}) = 0$

NO ES PARTE DEL PROBLEMA 18

$$\vec{D} = \begin{cases} 0 & r<a \text{ o } r>b \\ \dfrac{Q_L}{2\pi L r}\hat{r} & a<r<b \end{cases}$$

$$\boxed{\vec{D} = \varepsilon_0 E + \vec{P}} \longrightarrow \text{VALE SIEMPRE}$$

$$\vec{D} = \varepsilon \vec{E} \longrightarrow \text{VALE SOLO LIH}$$

$a<r<c$

LIH $\vec{D} = \varepsilon_1 \vec{E}$

$c<r<b$

LIH $\vec{D} = \varepsilon_2 \vec{E}$

$$\Longrightarrow \vec{E} = \begin{cases} 0 & r<a \text{ o } r>b \\ \dfrac{Q_L}{2\pi L \varepsilon_1 r}\hat{r} & a<r<c \\ \dfrac{Q_L}{2\pi L \varepsilon_2 r}\hat{r} & c<r<b \end{cases}$$

$Q_L = \sigma_{1L} 2\pi a L$

$Q_L = \sigma_{2L} 2\pi b L$

$$\vec{P} = \vec{D} - \varepsilon_0 \vec{E}$$

$$\vec{P} = \begin{cases} 0 & r<a \text{ o } r>b \\ \dfrac{Q_L}{2\pi L r}\left(1 - \dfrac{\varepsilon_0}{\varepsilon_1}\right)\hat{r} & a<r<c \\ \dfrac{Q_L}{2\pi L r}\left[1 - \dfrac{\varepsilon_0}{\varepsilon_2}\right]\hat{r} & c<r<b \end{cases}$$

$$\vec{E} = \begin{cases} 0 & r < a \text{ o } r > b \\ \dfrac{Q_L}{2\pi L \varepsilon_1 r}\hat{r} & a < r < c \\ \dfrac{Q_L}{2\pi L \varepsilon_2 r}\hat{r} & c < r < b \end{cases}$$

$$\frac{Q_L}{2\pi L \varepsilon_1 r} \leq E_{MAX1} \qquad Q_L \leq 2\pi L \varepsilon_1 a \, E_{MAX1}$$

y

$$\frac{Q_L}{2\pi L \varepsilon_2 r} \leq E_{MAX2} \qquad Q_L \leq 2\pi L \varepsilon_2 c \, E_{MAX2}$$

Elijo $Q_L = \min \left[2\pi L \varepsilon_1 a E_{MAX1}, \; 2\pi L \varepsilon_2 c E_{MAX2} \right]$

$$\Delta V = -\int_a^b \vec{E}\cdot d\vec{l} = -\int_a^c \frac{Q_L}{2\pi L \varepsilon_1 r}\hat{r}\cdot\hat{r}\,dr - \int_c^b \frac{Q_L}{2\pi \varepsilon_2 r L}\hat{r}\cdot\hat{r}\,dr$$

$$\rho_p = -\vec{\nabla}\cdot\vec{P} \qquad \sigma_p = \vec{P}\cdot\hat{n}$$

$$\vec{P} = \begin{cases} 0 & r<a \text{ or } r>b \\ \dfrac{Q_L}{2\pi L\, r}\left(1-\dfrac{\varepsilon_0}{\varepsilon_1}\right)\hat{r} & a<r<c \\ \dfrac{Q_L}{2\pi L\, r}\left(1-\dfrac{\varepsilon_0}{\varepsilon_2}\right)\hat{r} & c<r<b \end{cases}$$

$$\vec{\nabla}\cdot\vec{P} = \frac{1}{r}\frac{\partial}{\partial r}(r P_r) + \frac{1}{r}\frac{\partial P_\varphi}{\partial \varphi} + \frac{\partial P_z}{\partial z}$$

$$= \frac{1}{r}\frac{\partial}{\partial r}\left[\cancel{r}\frac{Q_L}{2\pi L \cancel{r}}\left(1-\frac{\varepsilon_0}{\varepsilon_1}\right)\right] = 0$$

$$\rho_p = 0$$

$$\sigma_p = \vec{P}\cdot\hat{n}$$

$r = a$

$$\frac{Q_L}{2\pi L a}\left(1-\frac{\varepsilon_0}{\varepsilon_1}\right)\hat{r}\cdot\left(-\hat{r}\right)$$

$$\sigma_p = \frac{Q_L}{2\pi L a}\left(\frac{\varepsilon_0}{\varepsilon_1}-1\right)$$

$r = c$

$$\sigma_p = \frac{Q_L}{2\pi L c}\left(1-\frac{\varepsilon_0}{\varepsilon_1}\right)\hat{r}\cdot\left(+\hat{r}\right)$$

$$+\frac{Q_L}{2\pi L c}\left(1-\frac{\varepsilon_0}{\varepsilon_2}\right)\hat{r}\cdot\left(-\hat{r}\right)$$

$r = b$

$$\sigma_p = \frac{Q_L}{2\pi L b}\left(1-\frac{\varepsilon_0}{\varepsilon_2}\right)\hat{r}\cdot\hat{r}$$

$0 \quad r<a \quad r>b$

$$\frac{Q_L}{2\pi L r}\left(1-\frac{\varepsilon_0}{\varepsilon_1}\right)\hat{r}$$

$a<r<c$

$$\frac{Q_L}{2\pi L r}\left(1-\frac{\varepsilon_0}{\varepsilon_2}\right)\hat{r}$$

$c<r<b$