(1) <u>per $r < a$</u> $\quad Q_r = \rho\left(\frac{4}{3}\pi r^3\right)$

Gauss $\rightarrow \quad \Phi = \frac{q}{\varepsilon_0}$

$$E(\cancel{4\pi r^2}) = \frac{\rho\left(\frac{4}{3}\cancel{\pi r^3}\right)}{\varepsilon_0} \Rightarrow E(r) = \frac{\rho \cancel{\pi}}{3\varepsilon_0} r$$

<u>per $a < r < b$</u>

$$E(4\pi r^2) = \frac{\rho\left(\frac{4}{3}\pi a^3\right)}{\varepsilon_0} = \frac{Q}{\varepsilon_0}$$

$$\Rightarrow E(r) = \frac{Q}{4\pi\varepsilon_0 r^2} = \frac{\rho a^3}{3\varepsilon_0 r^2}$$

<u>per $b < r < c$</u>

si deve avere $E = 0$

<u>per $r > c$</u>

$$E(r) = \frac{Q}{4\pi\varepsilon_0 r^2}$$

per una superficie gaussiana di raggio $b < r < c$ otteniamo:

$$0 = \frac{Q - Q_b}{\varepsilon_0} \Rightarrow Q_b = Q$$

$$\sigma_b = -\frac{Q_b}{A} = -\frac{Q}{4\pi b^2}$$

$Q_c = Q_b$ dalla neutralità della sfera cava,

$$\Rightarrow \quad \sigma_c = \frac{Q}{4\pi c^2}$$

(2) $$d\vec{B} = \frac{\mu_0 I}{4\pi} \frac{d\vec{l} \times \Delta\vec{r}}{|\Delta\vec{r}|^3}$$

$$\int_0^P d\vec{B} = \int_Q^0 d\vec{B} = 0 \qquad (d\vec{l} \parallel \Delta\vec{r})$$

$$B(0) = \frac{\mu_0 I}{4\pi} \int_P^Q \frac{dl}{R^2} = \frac{\mu_0 I}{4\pi R^{\cancel{2}}} \cdot \cancel{R}\theta$$

$$B(0) = \frac{\mu_0 I \theta}{4\pi R}$$

③ $$I_L(t=0) = \frac{f}{R+R_0} = \frac{f}{2R}$$

$$\Delta V_C(t=\infty) = I_L(t=\infty) \cdot R$$

$$U_L^i = \frac{1}{2} L\, I_L^2(t=0)$$

$$U_C^i = \frac{1}{2} C\, \Delta V_C^2(t=0)$$

$$U_J^f = U_L^i + U_C^i$$

$$\Downarrow$$

$$C = 2\,\frac{U_J^f - U_L^i}{\Delta V_C^2(t=0)} = 10^{-7}\ F$$

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$$B = \frac{\mu_0 I}{2\pi r} \qquad d\vec{F} = dq\, \vec{v} \times \vec{B} =$$

$$= -dq \frac{v \mu_0 I}{2\pi r}$$

$$E_r = -\frac{v \mu_0 I}{2\pi r}$$

$$V(P) - V(Q) = -\int_Q^P E_r\, dr = +\int_P^Q E_r\, dr =$$

$$= -\int_a^{a+L} \frac{v \mu_0 I}{2\pi r}\, dr = -\frac{v \mu_0 I}{2\pi} \ln\left(\frac{a+R}{a}\right)$$

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$$\lambda = \frac{c}{\nu} = 30\,m \gg a \Rightarrow \vec{E}, \vec{B} \simeq \text{cost su spire.}$$

$$E_0 = \sqrt{2Z\bar{I}} \quad ; \quad B_0 = \frac{E_0}{c} \quad ;$$

$$\vec{B} \parallel \hat{z} \qquad \Phi_{spire}(\vec{B}) \simeq B_0\, a^2 \cos(2\pi\nu t) =$$

$$= \frac{\sqrt{2Z\bar{I}}\, a^2}{c} \cos(2\pi\nu t)$$

$$f_{em} = -\frac{d\Phi}{dt} = \frac{a^2 2\pi\nu\sqrt{2Z\bar{I}}}{c} \sin(2\pi\nu t)$$

$$I^{max} = \frac{f_{em}^{max}}{R} = \frac{a^2 2\pi\nu\sqrt{2Z\bar{I}}}{Rc} \simeq 8 \cdot 10^{-6}\,A$$