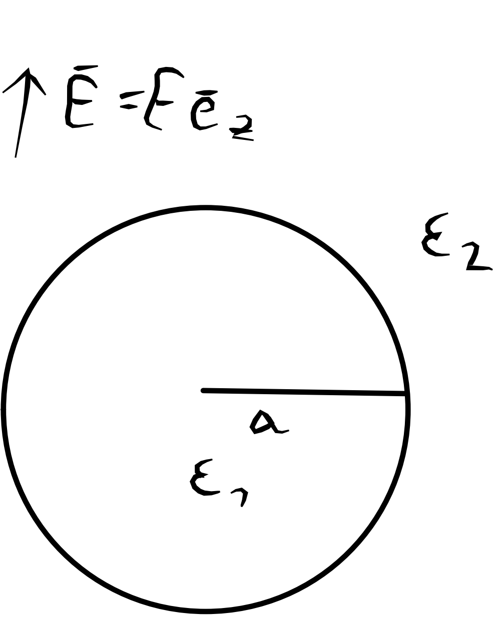

$$\Phi(\bar{r}) = \begin{cases} \sum_{l=0}^{\infty} \left(A_l r^l + \frac{B_l}{r^{l+1}}\right) P_l(\cos\theta) & r < a \\ \sum_{l=0}^{\infty} \left(C_l r^l + \frac{D_l}{r^{l+1}}\right) P_l(\cos\theta) & r > a \end{cases}$$

1) $\Phi(r=0) < \infty \Rightarrow B_l = 0$

2) $\Phi(r \to \infty) = -Ez = -E r\cos(\theta) = -E r P_1(\cos\theta)$

$C_1 = -E \qquad C_{l\neq 1} = 0$

3) $\Phi(a^-) = \Phi(a^+)$

$$\sum_{l=0}^{\infty} A_l a^l P_l(\cos\theta) = -E a P_1(\cos\theta) + \sum_{l=0}^{\infty} \frac{D_l}{a^{l+1}} P_l(\cos\theta)$$

dla $l \neq 1$

$$A_l a^l = \frac{D_l}{a^{l+1}}$$

$$D_l = A_l a^{2l+1}$$

dla $l = 1$

$$-Ea + \frac{D_1}{a^2} = A_1 a$$

$$D_1 = a^3(A_1 + E)$$

4) $D_\perp^-(a) = D_\perp^+(a)$

$$\varepsilon_1 \frac{\partial \Phi}{\partial r}\Big|_{a^-} = \varepsilon_2 \frac{\partial \Phi}{\partial r}\Big|_{a^+}$$

$$\varepsilon_1 \sum_{l=0}^{\infty} A_l l a^{l-1} P_l(\cos\theta) = -\varepsilon_2 E P_1(\cos\theta) - \sum_{l=0}^{\infty} (l+1)\varepsilon_2 \frac{D_l}{a^{l+2}} P_l(\cos\theta)$$

dla $l = 1$

$$\varepsilon_1 A_1 = -\varepsilon_2 E - 2\varepsilon_2 \frac{D_1}{a^3}$$

$$\varepsilon_1 A_1 = -\varepsilon_2 E - 2\varepsilon_2 A_1 - 2\varepsilon_2 E$$

$$\begin{cases} A_1 = \frac{-3\varepsilon_2}{\varepsilon_1 + 2\varepsilon_2} E \\ D_1 = \frac{\varepsilon_1 - \varepsilon_2}{\varepsilon_1 + 2\varepsilon_2} a^3 E \end{cases}$$

dla $l \neq 1$

$$\varepsilon_1 A_l l a^{l-1} = -(l+1)\varepsilon_2 \frac{D_l}{a^{l+2}}$$

$$\varepsilon_1 A_l l a^{l-1} = -(l+1)\varepsilon_2 a^{l-1} A_l$$

$$\begin{cases} A_l = 0 \\ D_l = 0 \end{cases}$$

$$\Phi(\bar{r}) = \begin{cases} \frac{-3\varepsilon_2}{\varepsilon_1 + 2\varepsilon_2} E r \cos(\theta) & r < a \\ -E r\cos\theta + \frac{\varepsilon_1 - \varepsilon_2}{\varepsilon_1 + 2\varepsilon_2} \frac{a^3 E}{r^2} \cos(\theta) & r > a \end{cases}$$