Answer on Question #70835 – Physics – Field Theory

Consider rectangle PQRS of size 20cm and 156cm with charges 0.000002C, 0.000004C and 0.000009C at PQ and S respectively. Determine the resultant electric field intensity at fourth corner R of the rectangle due to the changes PQS

Solution. Let PS=20cm.

$$E_{QR} = \frac{1}{4\pi\varepsilon_0}\frac{q_Q}{R_{QR}^2} \approx 898,755\,\frac{N}{C},$$

$$E_{SR} = \frac{1}{4\pi\varepsilon_0}\frac{q_S}{R_{SR}^2} \approx 33,238\,\frac{N}{C},$$

$$\angle PRS = \theta = \arctan 20/156 \approx 7.3°$$

$$E_{PR} = \frac{1}{4\pi\varepsilon_0}\frac{q_P}{R_{PR}^2} \approx 7,267\,\frac{N}{C}.$$

$$E_{tot} = \sqrt{\left(E_{QR} + E_{PR}\sin\theta\right)^2 + (E_{SR} + E_{PR}\cos\theta)^2} = 900,587\,\frac{N}{C} \approx 9\times10^5\,\frac{N}{C}$$

Answer. $E_{tot} = 9\times10^5\,\frac{N}{C}$.