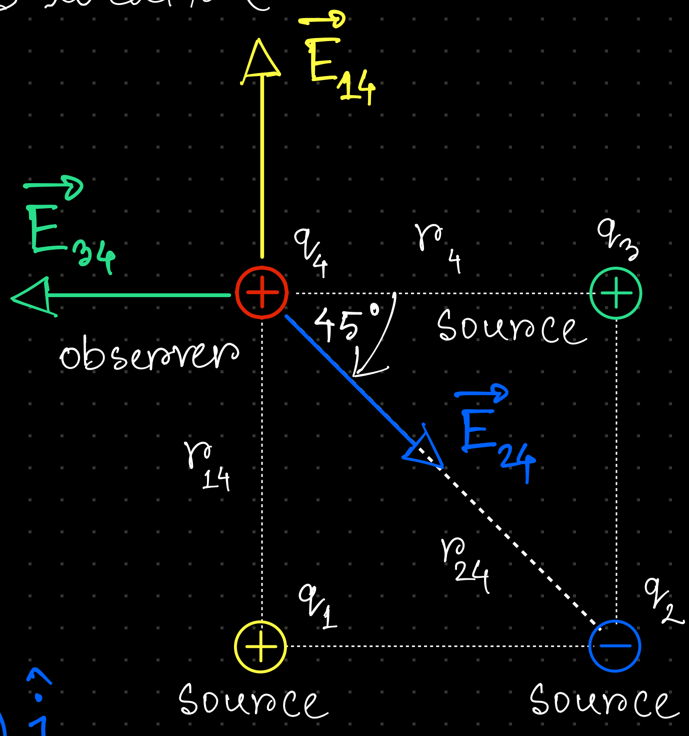
Q: Find the net field at q_4's location.



$$\vec{E}_4 = \vec{E}_{14} + \vec{E}_{34} + \vec{E}_{24}$$

$$= \frac{C q_1}{r_{14}^2}\hat{j} + \frac{C q_3}{r_{34}^2}(-\hat{i}) + \frac{C q_2}{r_{24}^2}\cos(-45°)\,\hat{i} + \frac{C q_2}{r_{24}^2}\sin(-45°)\,\hat{j}$$

$$= \left\{4.494\times10^{11}\,\hat{j} - 4.494\times10^{11}\,\hat{i} + 1.589\times10^{11}\,\hat{i} - 1.589\times10^{11}\,\hat{j}\right\} NC^{-1}$$

$$= \left\{\left(-4.494\times10^{11} + 1.589\times10^{11}\right)\hat{i} + \left(4.494\times10^{11} - 1.589\times10^{11}\right)\hat{j}\right\} NC^{-1}$$

$$= \left(-2.905\times10^{11}\,\hat{i} + 2.905\times10^{11}\,\hat{j}\right) NC^{-1}$$

This is the net field at q_4's location in vector form.

The magnitude can be found as,

$$|\vec{E}_4| = \sqrt{\left(-2.905\times10^{11}\right)^2 + \left(2.905\times10^{11}\right)^2}$$

$$= 4.1083\times10^{11}\,NC^{-1}$$

You could also find the direction in the following way.

$$\theta = 180^\circ - \tan^{-1}\left|\frac{E_{4,y}}{E_{4,x}}\right|$$

2.905×10^{11}

-2.905×10^{11}

$$= 180^\circ - 45^\circ$$

$$= 135^\circ;$$ counterclockwise with the $+x$-axis.

Note: The values for F_E and E remain the same because we held the observer to carry $+1C$, an archtypical test charge. Otherwise, it would have been different. It usually is.