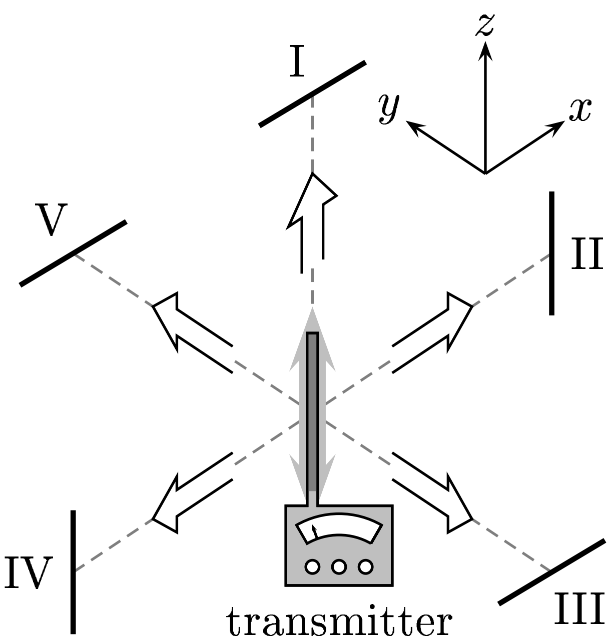
A radio transmitter drives an oscillating current driven back and forth along the z axis in the aerial antenna wire as shown below.

Five linear receiving antennas are positioned with their centers at equal distances d from the center of the transmitter as follows



I. Horizontal orientation, perpendicular to the antenna, positioned at d, in the $+\hat{k}$ direction.
II. Vertical orientation, parallel to the antenna, positioned at d, in the $+\hat{\imath}$ direction.
III. Horizontal orientation, perpendicular to the antenna, positioned at d, in the $-\hat{\jmath}$ direction.
IV. Vertical orientation, parallel to the antenna, positioned at d, in the $-\hat{\imath}$ direction.
V. Horizontal orientation, perpendicular to the antenna, positioned at d, in the $+\hat{\jmath}$ direction.

The strongest signal is received by antennas

A) I

D) III and V

B) I, II, and IV

E) II and IV

C) II, III, IV, and V

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The antenna receives the strongest signal when it is oriented parallel to the electric field vector, or polarization direction, of the propagating EM wave. The E-vector of a propagating EM wave is parallel to the acceleration-vector of the source charges (along the antenna in this problem), but must also be perpendicular to the direction of propagation. The EM radiation reaching antennas II and IV is therefore polarized parallel to the antennas, resulting in a strong signal. The EM radiation reaching antennas V and III is polarized perpendicular to the antennas, resulting in no signal. The EM radiation reaching antenna I is reduced, because the E-vector mentioned above is near zero since the direction of the radiation is along the direction of the transmitter.

Answer **E**.