
Sheet (6)

(1) (**a**) Show that the relative field pattern of a broadside array of two identical isotropic in-phase point sources spaced a distance "d" along the polar axis (z-axis) is given by :

$$E = \text{Cos}\left(\frac{d_r}{2} Cos\theta\right)$$

Where $d_r = 2\pi d/\lambda$, θ is the polar angle, and the center point of the array is the origin point.

(**b**) Find expressions for the maxima, nulls, and half power points of the pattern (in terms of distance d).

(**c**) Plot the field pattern for $d = \lambda/4$, $\lambda/2$ and λ.

(2) (**a**) Show that the relative field pattern of an end-fire array of two identical isotropic point sources in-phase opposition spaced a distance "d" along the polar axis (z-axis) is given by :

$$E = \text{Sin}\left(\frac{d_r}{2} Cos\theta\right)$$

Where $d_r = 2\pi d/\lambda$, θ is the polar angle, and the center point of the array is the origin point.

(**b**) Find expressions for the maxima, nulls, and half power points of the pattern (in terms of distance d).

(**c**) Plot the field pattern for $d = \lambda/4$, $\lambda/2$ and λ.

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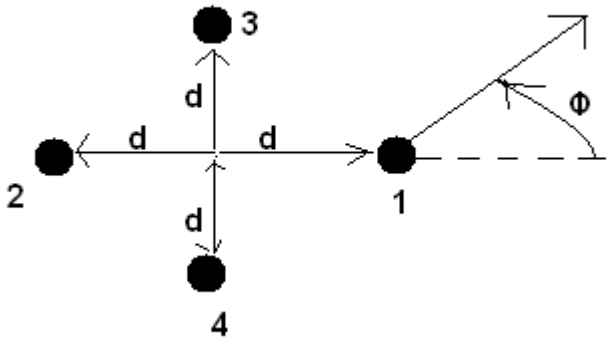
(3) (**a**) Show that the directivity of a broad side array of two identical isotropic in-phase point sources spaces a distance d is given by

$$D = \frac{2}{1 + (\lambda / 2\pi d) Sin(2\pi d / \lambda)}$$

(**b**) Find the directivity at d = λ/4, λ/2 and λ.

(4) Derive an expression for E (Φ) for an array of 4 identical isotropic sources arranged in a square array as shown in the figure. The spacing "d" between each source and the center point of the array is 3λ/8. Sources 1 and 2 are in phase, sources 3 and 4 in opposite phase with respect to 1 and 2.



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