Sheet (6)

1. Estimate the relative field pattern (equation) of an array of two identical isotropic point sources in phase, spaced $\lambda/2$ apart along the z axis. Then calculate the directivity.

2. Design a two-element uniform array of isotropic sources, positioned along the Z-axis a distance of $\lambda/4$ apart, so that its only maximum occurs along $\theta=0^o$, assuming end fire conditions (Maximum at $\psi=0$), find the

i. Relative phase excitation of each element.
ii. Array factor of the array.
iii. Directivity.

3.Construct an antenna array using 2-isotropic elements to produce the cardioid radiation pattern shown in figure (1).

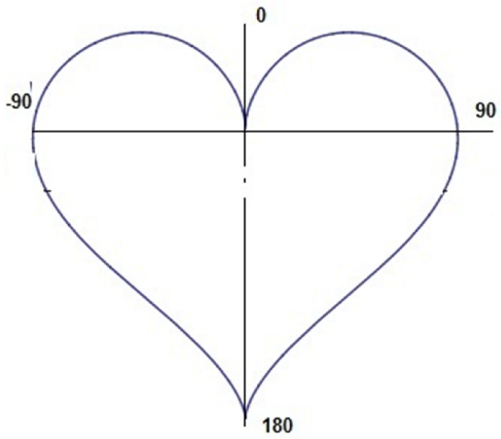

Figure (1)

4. Two infinetismal (short) dipoles of equal length are equidistant from the origin with their centers lying on the y-axis, and oriented parallel to the z-axis, they are excited with currents of equal amplitude. The current in dipole 1 (at y = -d/2) leads the current in

dipole 2 (at y = +d/2) by 90° in phase. The spacing between dipoles is one quarter wavelength. To simplify the notation, let E_o equal the maximum magnitude of the far field at distance r due to either source alone.

Derive **only** expressions for the following plane patterns

i. $|E_\theta|$ For $\Phi = 0^o$

ii. $|E_\theta|$ for $\Phi = 90^o$

iii. $|E_\theta|$ for $\theta = 90^o$

iv. $|E_\phi|$ for $\Phi = 0^o$

v. $|E_\phi|$ for $\Phi = 90^o$

vi. $|E_\phi|$ for $\theta = 90^o$

REPORT

1. Repeat (1-a) for of two identical isotropic point sources in **<u>phase opposition</u>** and **<u>quadrature phase</u>**.

2.Repeat (2-a) for array with its maximum occurs along $\theta=180^o$

3.Derive an expression for $E(\phi)$ for an array of 4 identical isotropic point sources arranged as in Fig. 2. The spacing *d* between each source and the center point of the array is $3\lambda/8$. Sources 1 and 2 are in-phase, and sources 3 and 4 in opposite phase with respect to 1 and 2.

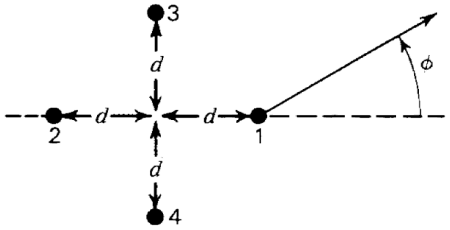

Figure 2

4.Show that the directivity for an array of two identical isotropic point sources in phase and spaced a distance *d* is given by

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

Good Luck

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