ASSIGNMENT

ON

TOPIC

Idea of Superdirective Arrays

Radiation from a Current Sheet

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Idea of Superdirective Arrays

Antennas or array designed to yeield directive gains appreciably greater than those obtain able from uniform distributions have become known as supergain or superdirective arrays.

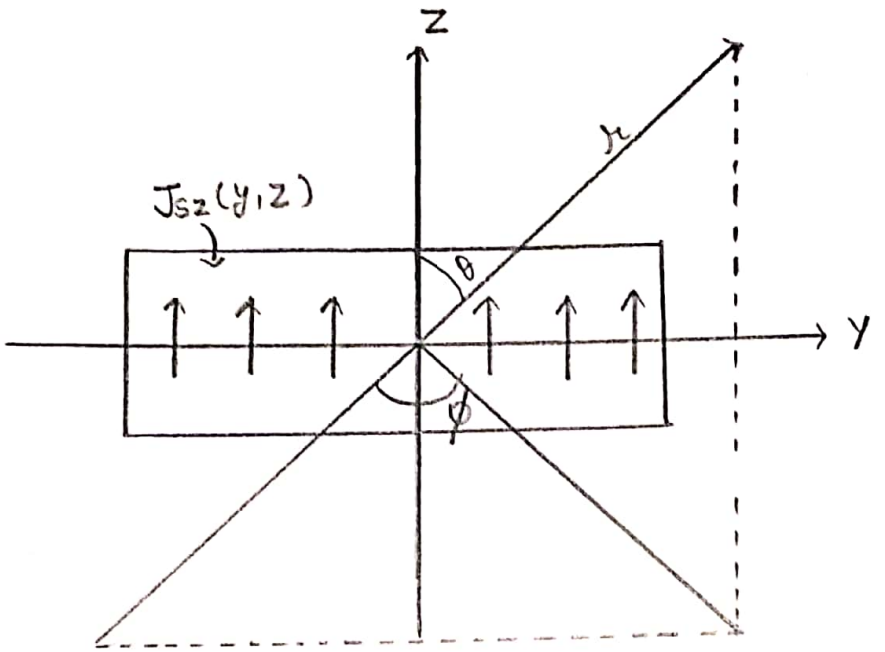
The term supergain is in common use the correct term is superdirective because it is directive gain that is minimized.

Radiation From a Current Sheet

A continuous current distribution using in a plane this can be used to represent the induced current in a metal sheet or grating when it is excited by an incident wave.

Consider a sheet of electric current lying in the plane y-z plane and flowing in the z- direction.

The electric field strength far from this source may be.



$$E_\theta = -\frac{j\beta\eta}{4\pi}\frac{e^{-j\beta r}}{r} f_o(\theta,\phi) \longrightarrow (1)$$

$$f_\theta = -\sin\theta\, f_z$$

$$f_z = \int_{\text{all space}} J_z(r')\, e^{j\beta \vec{r}\, r'}\, dV'$$

"r" in spherical co-ordinate and the source point "r" in rectangular coordinates. the dot product in the volume integral is given by.

$$\hat{r}.r' = x'\sin\theta\cos\phi + y'\sin\theta\sin\phi + z'\cos\theta.$$

For current lying in the y-z plane $x'=0$ and thus from equation (1)

$$E_\theta = \frac{\dot{I}B\eta e^{-iBr}}{4\pi r} \sin\theta \iint_{-\infty}^{\infty} J_{sz}(y', z') r' \, dv' \, e^{\dot{J}B(y' \sin\theta \sin\phi + z' \cos\theta)} dy' dz'$$

→ (2)

The radiation field in the x-y plane may be expressed as -

$$E(v) = \frac{E_\theta}{E_0}$$

$$E(v) = \int_{-\infty}^{\infty} J_0(y) \, e^{\dot{J}2\pi v y} \, dy$$

$$E_0 = \frac{\dot{I}B\eta}{4\pi} \cdot \frac{e^{-\dot{J}Br}}{r} \int_{-\infty}^{\infty} J_b(z) \, dz$$

$$\boxed{v = \frac{\beta}{2\pi} \sin\phi = \frac{1}{\lambda} \sin\phi}$$

The exhaustive literature on the fourier transform provides us with a large number of computational techniques and algebric manipulation which may be applied directly to antenna problem.