

Series 5

Exercise 1

We consider a linear array of 5 equidistant antennas separated by a distance $d = \lambda/2$. The array feeds are symmetrical ($I_0 = I_4$ and $I_1 = I_3$) and normalized with respect to the current of the central antenna ($I_2 = 1$). We consider that the array is placed on the z-axis (figure).

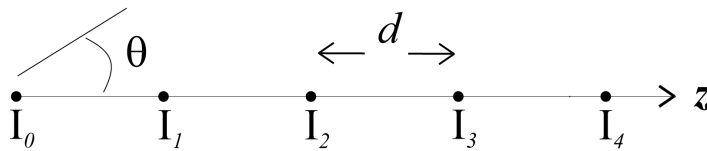


Figure 1. Linear equidistant array.

We want to obtain the following characteristics for the normalized array factor (NAF):

a) NAF 0dB for $\theta = 90^\circ$ b) NAF $-\infty$ dB for $\theta = 60^\circ$ c) NAF -10 dB for $\theta = 0^\circ$ (angles in degrees).

Find the values of currents I_0 and I_1 .

	Amplitude	Phase
I_0		
I_1		

Note: It can be intuitively assumed that the maximum radiation is in the “broadside” direction (condition a)) and verified a posteriori by plotting the diagram obtained in Matlab once the coefficients have been found using the other conditions.

Exercise 2

Consider a linear array of N antennas equidistant and separated by a distance d . The antennas are numbered $n=0,1,2,\dots,N-1$ and fed with currents $I_n = A^n$. Find the mathematical expression for the array factor (AF). Find, when $N=3$ and $d = \lambda / 2$, the zero radiation directions the cases $A=0.5, 1$, and 2 .

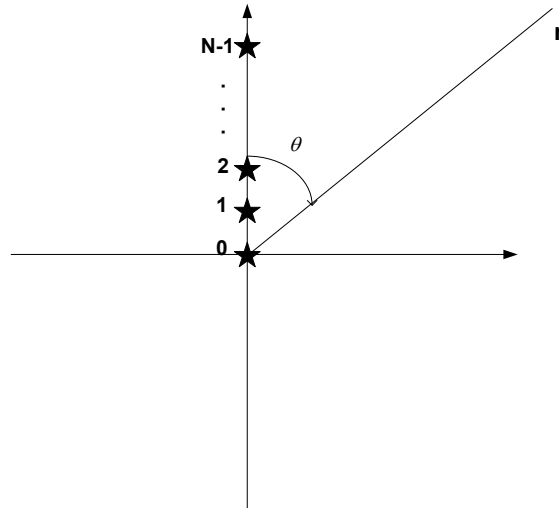


Figure 1 : Array geometry