Scilab Manual for Radiation Pattern Measurement of Array Antennas

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Experiment: 1

Radiation Pattern Measurement of Circular Array Antenna

Scilab code Solution 1.0 Radiation Pattern Measurement of Circular Array Antenna

```
1 //1.RADIATION PATTERN OF CIRCULAR ARRAY ANTENNA (
    RECTANGULAR PLOT)
2 //OS-Windows 7
3 //Scilab 6.0.2
4 // RADIATION PATTERN MEASUREMENT OF ANTENNA ARRAYS
5 //Course Instructor Name: Dr. V. A. Sankar
    Ponnapalli
6 //Institute Name: Sreyas Institute of Engineering &
    Technology
7 clc;
8 clear;
9 close;
10 r=input('RADIUS=');// IN WAVELENGHTS
11 N=input('NUMBER OF ANTENNA ELEMENTS=')
12 af=0;
13 thio=0; //STEERING ANGLE
```

```
14 phio=0; // STEERING ANGLE
15 phi=%pi/2;
16 thi=-%pi:%pi/10000:%pi;
17 k=2*%pi
18     for n=1:N // NUMBER OF ANTENNA ELEMENTS
19         phin=(n-1).*(2.*%pi/N)
20         a=(exp(%i.*k.*r.*(((sin(thi)*cos(phi-phin)))
               -(sin(thio)*cos(phio-phin)))));
21         af=a+af;
22     end
23 af1=abs(af);
24 af1=af1/max(max((af1)));
25 CAA=20.*log10(af1);
26 plot((thi*57.3),(CAA));
27 xlabel('THETA');
28 ylabel('ARRAY FACTOR (dB)');
29 title('RADIATION PATTERN OF CIRCULAR ARRAY ANTENNA')
      ;
30 h=gca();
31 h.data_bounds=[-90,-80;90,0];
32
33 // INPUT PARAMETERS
34
35 //RADIUS=0.5
36
37 //NUMBER OF ANTENNA ELEMENTS=10
38
39 // DESCRIPTION OF THE FIGURE:
40 //**************************ARRAY FACTOR PROPERTIES
      ****************************
41 //                              Half Power Beam Width
      (HPBW): 41.8 (In degrees)
42 //                              Side Lobe Level (SLL)
          : -10 dB
43 //                              Side Lobe Level Angle
      (SLLA): 92.2 (In degrees)
```

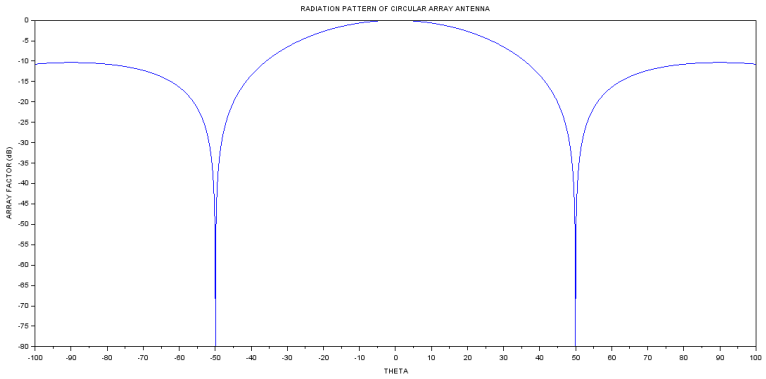


Figure 1.1: Radiation Pattern Measurement of Circular Array Antenna

Experiment: 2

Radiation Pattern Measurement of Concentric Circular Array Antenna

Scilab code Solution 2.0 Radiation Pattern Measurement of Concentric Circular Array Antenna

```
1 //2.RADIATION PATTERN  OF CONCENTRIC CIRCULAR ARRAY
    ANTENNA (RECTANGULAR PLOT)
2 //OS-Windows 7
3 //Scilab 6.0.2
4 // RADIATION PATTERN MEASUREMENT OF ANTENNA ARRAYS
5 //Course Instructor Name: Dr. V. A. Sankar
    Ponnapalli
6 //Institute Name: Sreyas Institute of Engineering &
    Technology
7 clc;
8 clear;
9 close;
10 //r=input('radius=');// IN WAVELENGHTS
11 N=input('NUMBER OF ANTENNA ELEMENTS=')
12 M=input('NUMBER OF CONCENTRIC RINGS=')
13 r=[0.5,1,1.5]; // Radius
```

```
14 af=0; // af-Array Factor
15 thio=0; //STEERING ANGLE
16 phio=0; // STEERING ANGLE
17 phi=%pi/2; // Elevation Angle
18 thi=-%pi:%pi/10000:%pi; // Azimuthal Angle
19 k=2*%pi // Wave Number
20 for m=1:M// NUMBER OF CONCENTRIC RINGS
21     for n=1:N // NUMBER OF ANTENNA ELEMENTS
22         phimn=(n-1).*(2.*%pi/N) // Antenna Element
               Position
23         a=(exp(%i.*k.*r(m).*(((sin(thi)*cos(phi-
               phimn)))-(sin(thio)*cos(phio-phimn)))));
24         af=a+af;
25     end
26 end
27 af1=abs(af);// af1- Array Factor
28 af1=af1/max(max((af1)));
29 CCAA=20.*log10(af1); // CCAA-CONCENTRIC CIRCULAR
   ARRAY ANTENNA
30 plot((thi*57.3),(CCAA));
31 xlabel('THETA');
32 ylabel('ARRAY FACTOR (dB)');
33 title('RADIATION PATTERN OF CIRCULAR ARRAY ANTENNA')
   ;
34 h=gca();
35 h.data_bounds=[-90,-80;90,0];
36
37 // INPUT PARAMETERS
38
39 //NUMBER OF ANTENNA ELEMENTS=10
40
41 //NUMBER OF CONCENTRIC RINGS=3
42
43 // DESCRIPTION OF THE FIGURE:
44 //**************************ARRAY FACTOR PROPERTIES
   ****************************
45 //                                Half Power Beam Width
   (HPBW): 19.2 (In degrees)
```

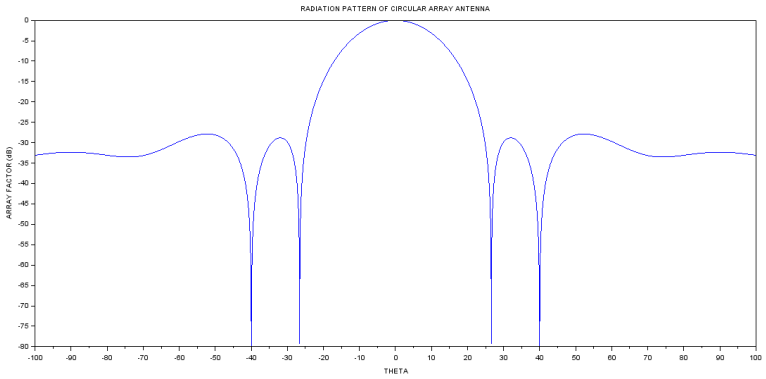


Figure 2.1: Radiation Pattern Measurement of Concentric Circular Array Antenna

```
46 //                                  Side Lobe Level (SLL)
       : -28.8 dB
47 //                                  Side Lobe Level Angle
   (SLLA): 31.9 (In degrees)
```

Experiment: 3

Radiation Pattern Measurement of Square Array Antenna

Scilab code Solution 3.0 Radiation Pattern Measurement of Square Array Antenna

```
1 //3.RADIATION PATTERN OF SQUARE ARRAY ANTENNA FOR
    FOUR ELEMENTS (RECTANGULAR PLOT)
2 //OS-Windows 7
3 //Scilab 6.0.2
4 // Antenna Arrays
5 //Course Instructor Name: Dr. V. A. Sankar
    Ponnapalli
6 //Institute Name: Sreyas Institute of Engineering &
    Technology
7 clc;
8 clear;
9 close;
10 af=0; // af-Array Factor
11 thio=0; //STEERING ANGLE
12 phio=0; // STEERING ANGLE
13 phi=%pi/2; // Elevation Angle
```

```
14 thi=-%pi:%pi/10000:%pi; // Azimuthal Angle
15 r=0.5//Radius
16 k=2*%pi // Wave Number
17     for n=1:4 // NUMBER OF ANTENNA ELEMENTS
18         phin=(n-1).*(2.*%pi/4) // Antenna Element
               Position
19         a=(exp(%i.*k.*r.*(((sin(thi)*cos(phi-phin)))
               -(sin(thio)*cos(phio-phin)))));
20         af=a+af;
21     end
22 af1=abs(af); //af1- Array Factor
23 af1=af1/max(max((af1)));
24 SAA=20.*log10(af1); // SAA-SQUARE ARRAY ANTENNA
25 plot((thi*57.3),(SAA));
26 xlabel('THETA');
27 ylabel('ARRAY FACTOR (dB)')
28 title('RADIATION PATTERN OF SQUARE ARRAY ANTENNA');
29 //h=gca();
30 //h.data_bounds=[-90,-80;90,0];
31
32 // DESCRIPTION OF THE FIGURE:
33 //**************************ARRAY FACTOR PROPERTIES
     ***************************
34 //                                Half Power Beam Width
     (HPBW): 43.4 (In degrees)
35 //                                Side Lobe Level (SLL)
           : -0.47 dB
36 //                                Side Lobe Level Angle
     (SLLA): 171.1 (In degrees)
```

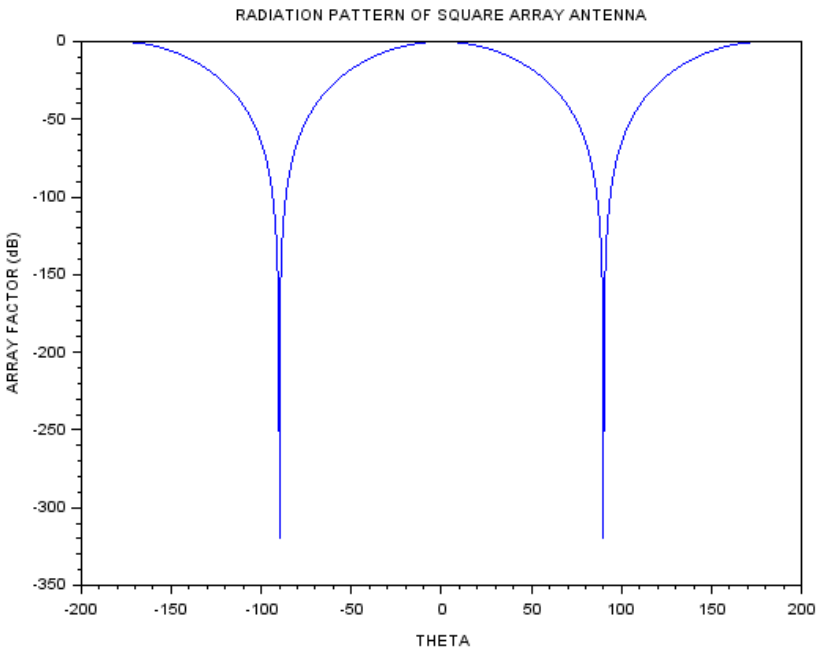


Figure 3.1: Radiation Pattern Measurement of Square Array Antenna

Experiment: 4

Radiation Pattern Measurement of Hexagonal Array Antenna

Scilab code Solution 4.0 Radiation Pattern Measurement of Hexagonal Array Antenna

```
1  //4.RADIATION PATTERN OF HEXAGONAL ARRAY ANTENNA (
       RECTANGULAR PLOT)
2  //OS-Windows 7
3  //Scilab 6.0.2
4  // Antenna Arrays
5  //Course Instructor Name: Dr. V. A. Sankar
       Ponnapalli
6  //Institute Name: Sreyas Institute of Engineering &
       Technology
7  clc;
8  clear;
9  close;
10 af=0; //af- Array Factor
11 thio=0; //STEERING ANGLE
12 phio=0; // STEERING ANGLE
13 phi=%pi/2; // Elevation Angle
```

```
14 thi=-%pi:%pi/10000:%pi; // Azimuthal Angle
15 r=0.5//Radius
16 k=2*%pi // Wave Number
17     for n=1:6 // NUMBER OF ANTENNA ELEMENTS
18         phin=(n-1).*(2.*%pi/6) // Antenna Element
               Position
19         a=(exp(%i.*k.*r.*(((sin(thi)*cos(phi-phin)))
               -(sin(thio)*cos(phio-phin)))));
20         af=a+af;
21     end
22 af1=abs(af); // af1-Array Factor
23 af1=af1/max(max((af1)));
24 HAA=20.*log10(af1); // HEXAGONAL ARRAY ANTENNA
25 plot((thi*57.3),(HAA));
26 xlabel('THETA');
27 ylabel('ARRAY FACTOR (dB)')
28 title('RADIATION PATTERN OF HEXAGONAL ARRAY ANTENNA'
   );
29 h=gca();
30 h.data_bounds=[-90,-80;90,0];
31
32 // DESCRIPTION OF THE FIGURE:
33 //**************************ARRAY FACTOR PROPERTIES
   ****************************
34 //                                Half Power Beam Width
   (HPBW): 41.8 (In degrees)
35 //                                Side Lobe Level (SLL)
          : -11.2 dB
36 //                                Side Lobe Level Angle
   (SLLA): 94.1 (In degrees)
```

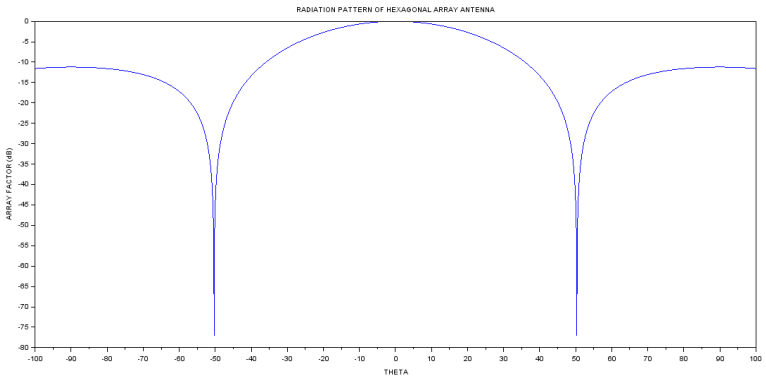


Figure 4.1: Radiation Pattern Measurement of Hexagonal Array Antenna