Ver 1.0

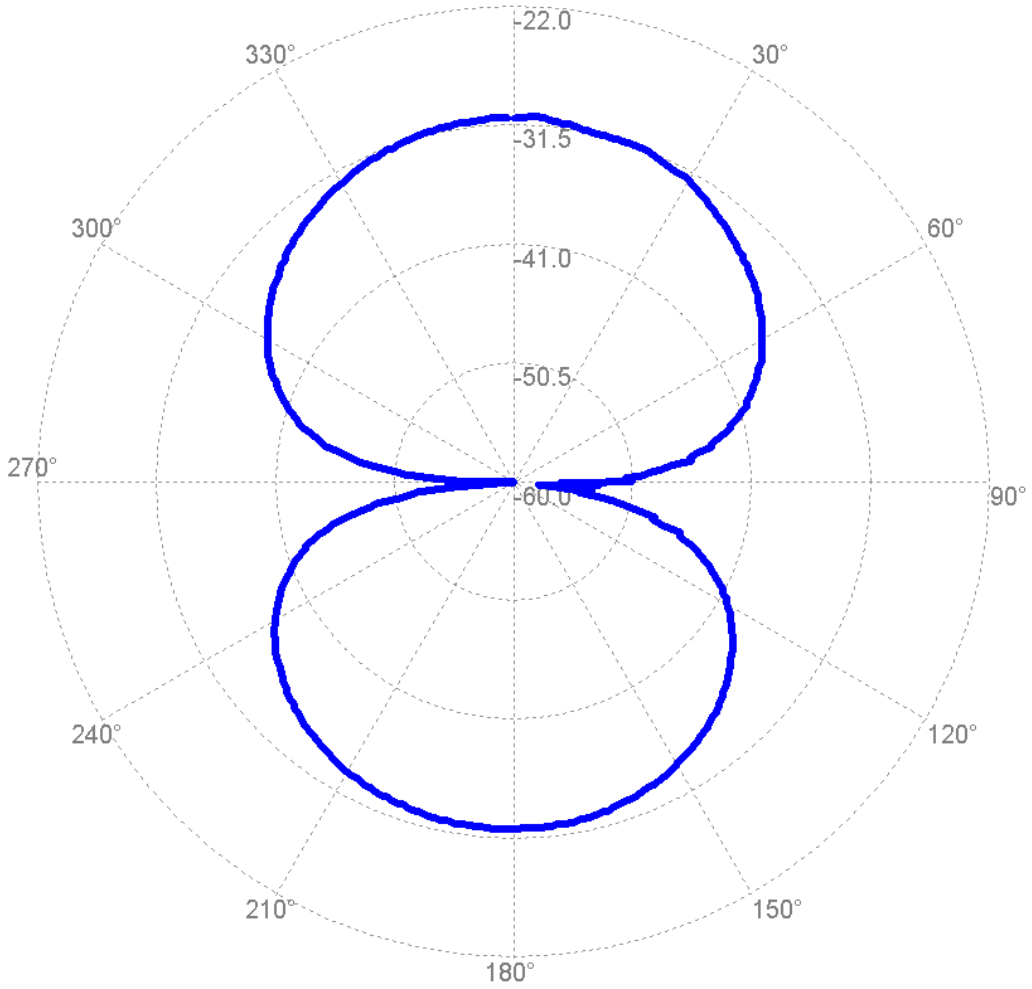
Answer Sheet

MATS-1000

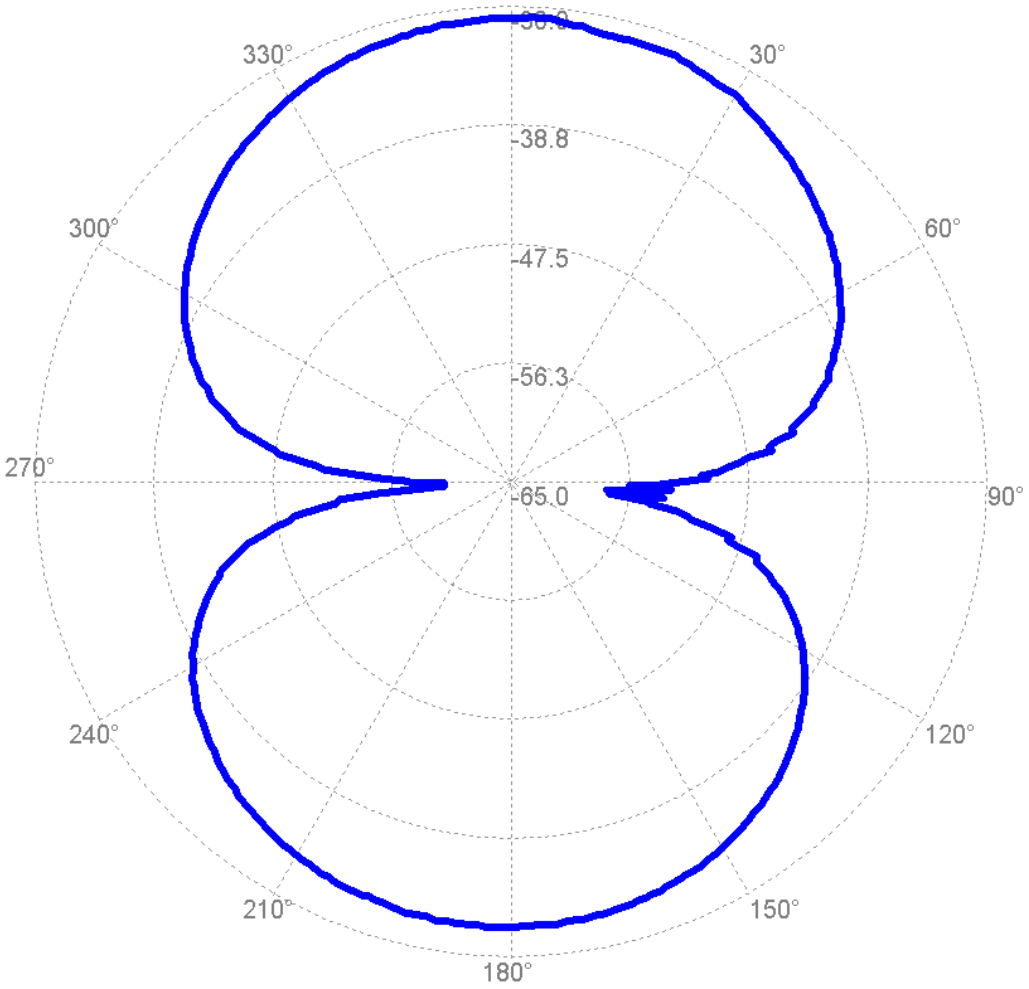
Man&Tel Co ., Ltd.

3. Practice for Dipole antenna

14) Submit the measured radiation pattern and measured data in an excel file format.



15)



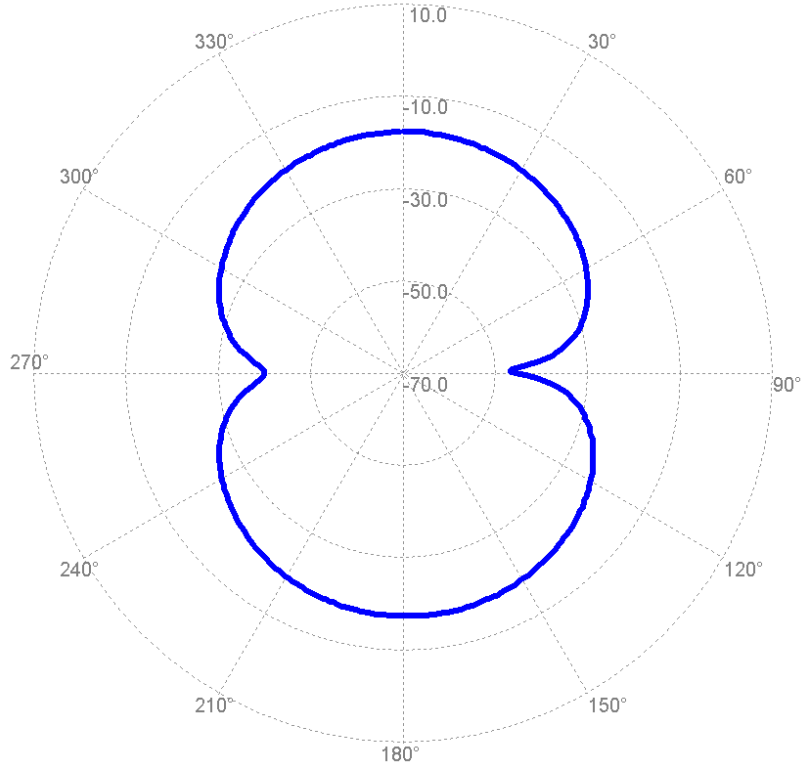
16) Max. received power : -30.9[*dBm*] , angle :0°

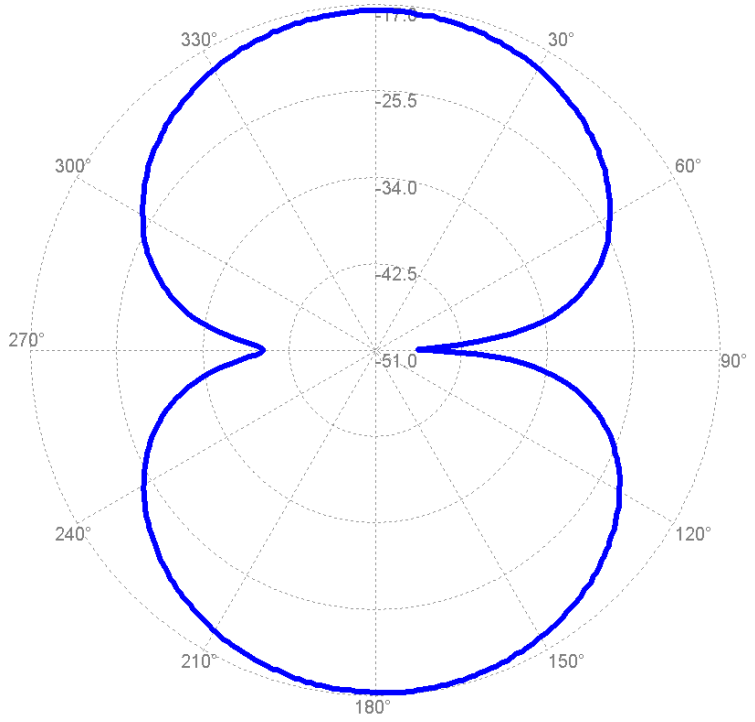
17) [left349°, right43°]

18) Half power beamwidth [84 °]

2. Measure radiation patterns of the 450Mhz dipole antenna

7).

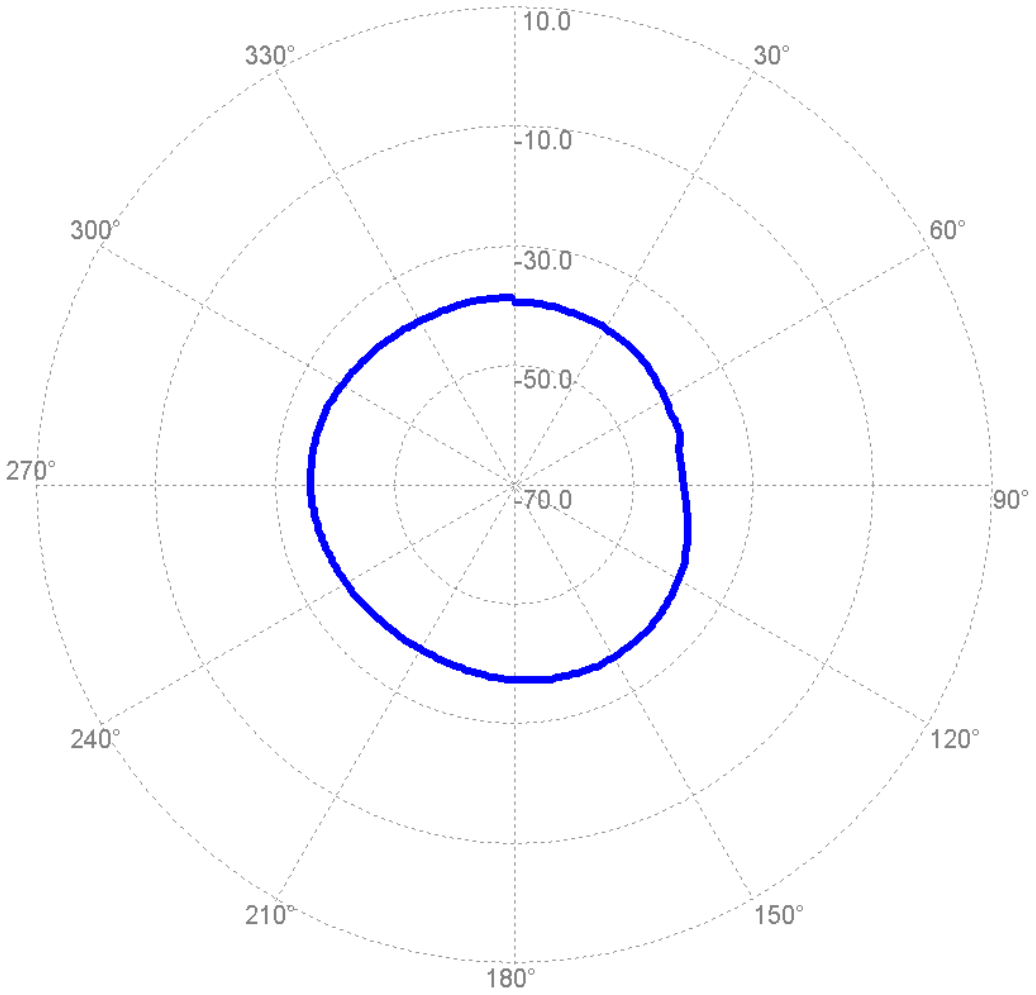




[fit]

3. Measuring *H*-plane radiation pattern

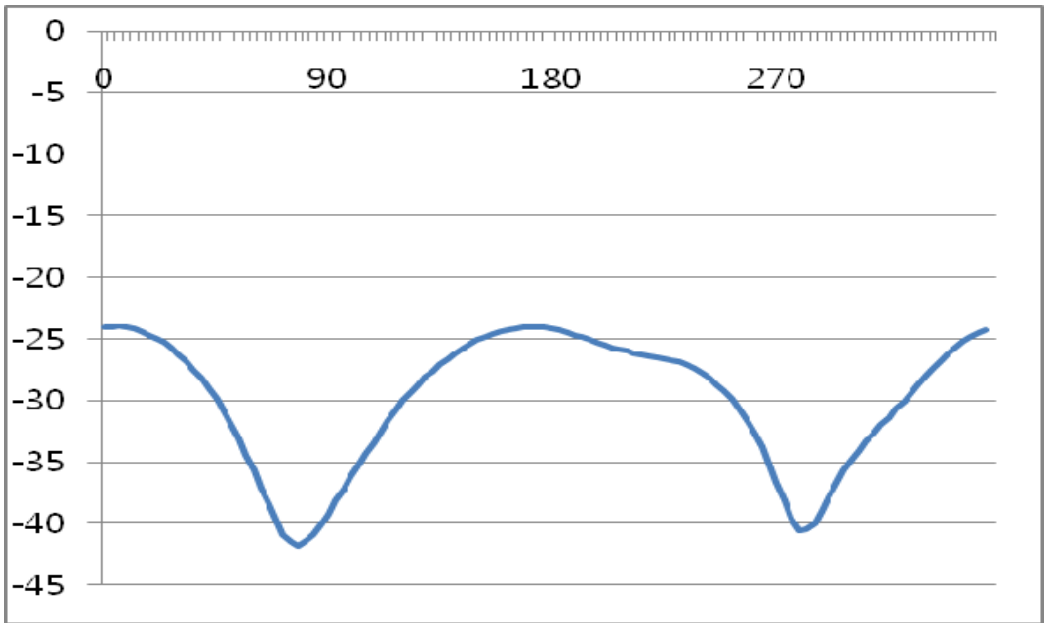
8)



4. Measurement with spectrum analyzer

Angle [degrees]	Received value [*dBm*]	Angle [degrees]	Received value [*dBm*]	Angle [degrees]	Received value [*dBm*]	Angle [degrees]	Received value [*dBm*]	Angle [degrees]	Received value [*dBm*]
3	-24.1	75	-40.9	147	-25.8	219	-26.3	291	-39
6	-24.1	78	-41.5	150	-25.4	222	-26.4	294	-37.9
9	-24	81	-41.8	153	-25.1	225	-26.5	297	-36.7
12	-24.1	84	-41.4	156	-24.9	228	-26.6	300	-35.7
15	-24.2	87	-40.9	159	-24.6	231	-26.8	303	-34.8
18	-24.4	90	-40	162	-24.4	234	-26.9	306	-34.1
21	-24.7	93	-39.2	165	-24.3	237	-27.1	309	-33.3
24	-25	96	-38.1	168	-24.2	240	-27.4	312	-32.7
27	-25.3	99	-37.2	171	-24.1	243	-27.8	315	-32
30	-25.7	102	-36.2	174	-24.1	246	-28.2	318	-31.4
33	-26.3	105	-35.2	177	-24.1	249	-28.7	321	-30.7
36	-26.9	108	-34.3	180	-24.1	252	-29.2	324	-30.1
39	-27.5	111	-33.4	183	-24.2	255	-29.9	327	-29.4
42	-28.2	114	-32.5	186	-24.3	258	-30.7	330	-28.7
45	-29	117	-31.6	189	-24.5	261	-31.6	333	-28
48	-29.9	120	-30.8	192	-24.7	264	-32.6	336	-27.4
51	-30.9	123	-30	195	-24.9	267	-33.8	339	-26.7
54	-31.9	126	-29.3	198	-25.1	270	-35.2	342	-26.2
57	-33.1	129	-28.8	201	-25.3	273	-36.7	345	-25.6
60	-34.4	132	-28.1	204	-25.5	276	-38.1	348	-25.2
63	-35.7	135	-27.6	207	-25.7	279	-39.6	351	-24.8
66	-37.1	138	-27.1	210	-25.9	282	-40.6	354	-24.5
69	-38.4	141	-26.6	213	-26	285	-40.5	357	-24.3
72	-39.7	144	-26.2	216	-26.2	288	-40	360	-24.1

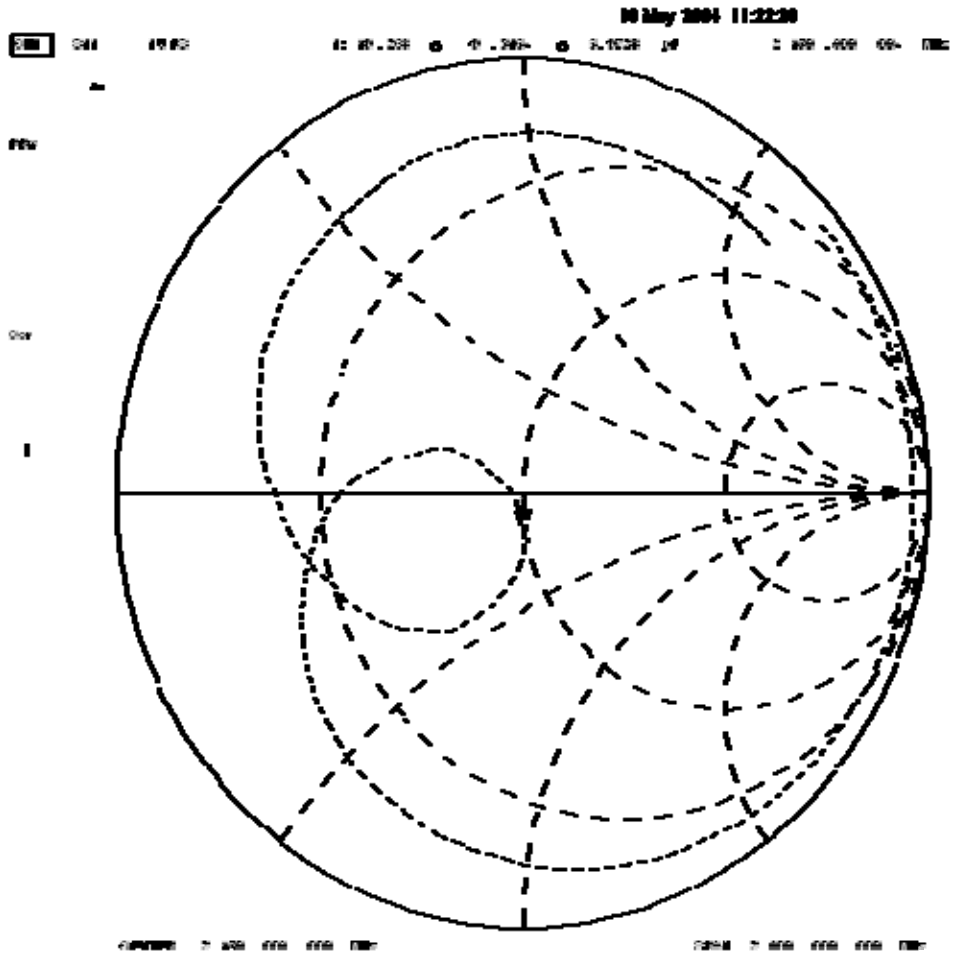
8)



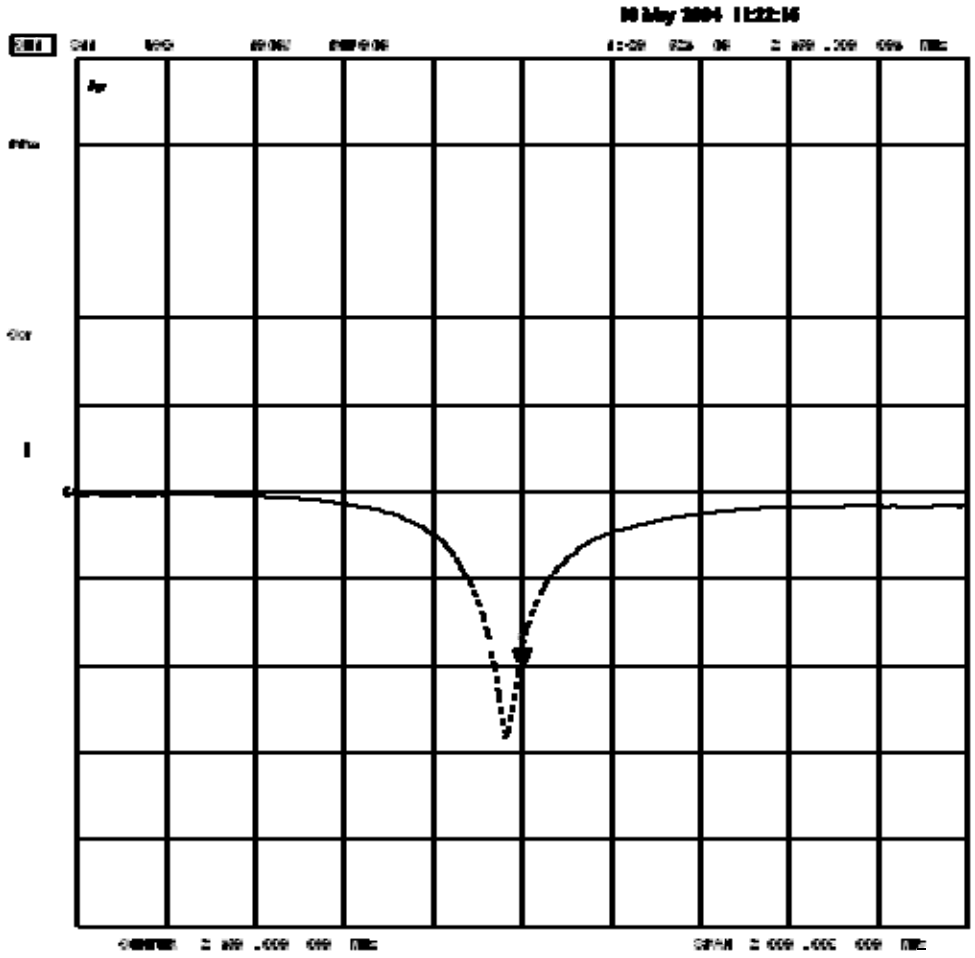
Consideration:

5. Measuring antenna characteristics

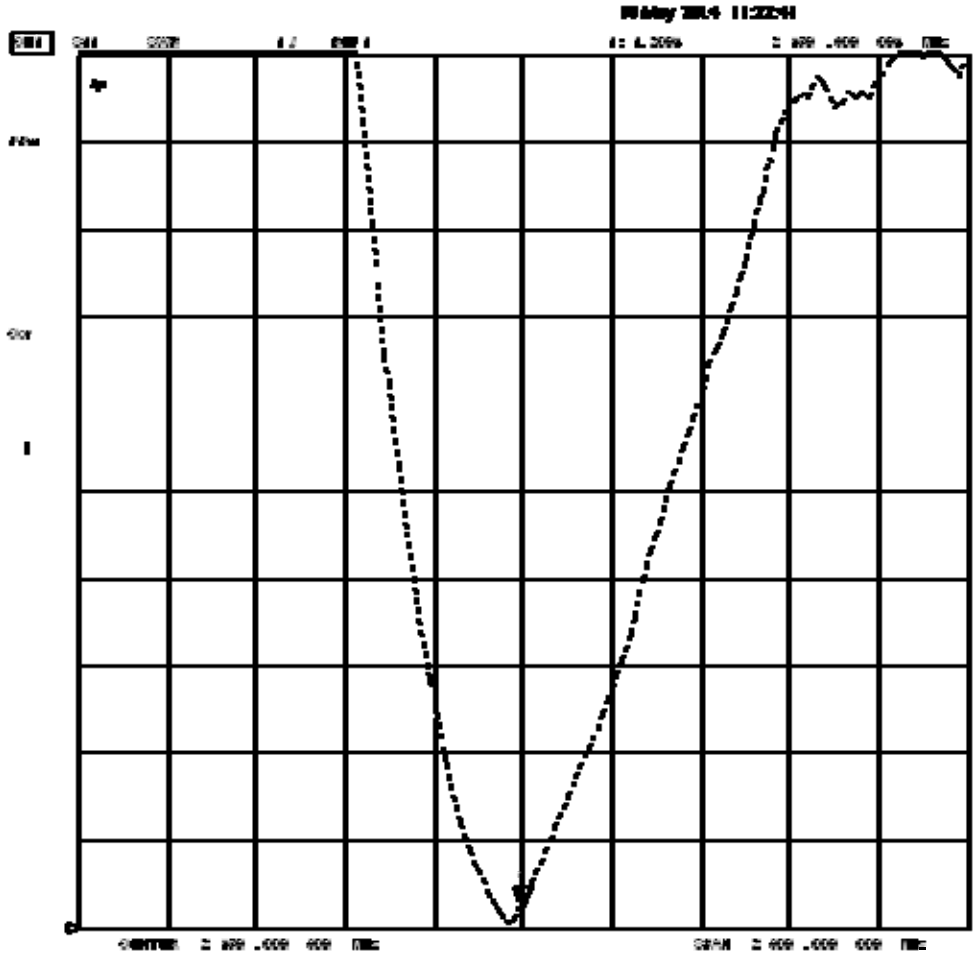
3) *Freq* = 2,450 [*MHz*], [*R* =49.268 Ω , *X* = X =-9.3164 Ω]



4) *Freq* = 2,450 [*MHz*] , *Return Loss* =-20.524 [*dB*]



5) *Freq* = 2,450 [*MHz*] , *SWR* =1:1.2004

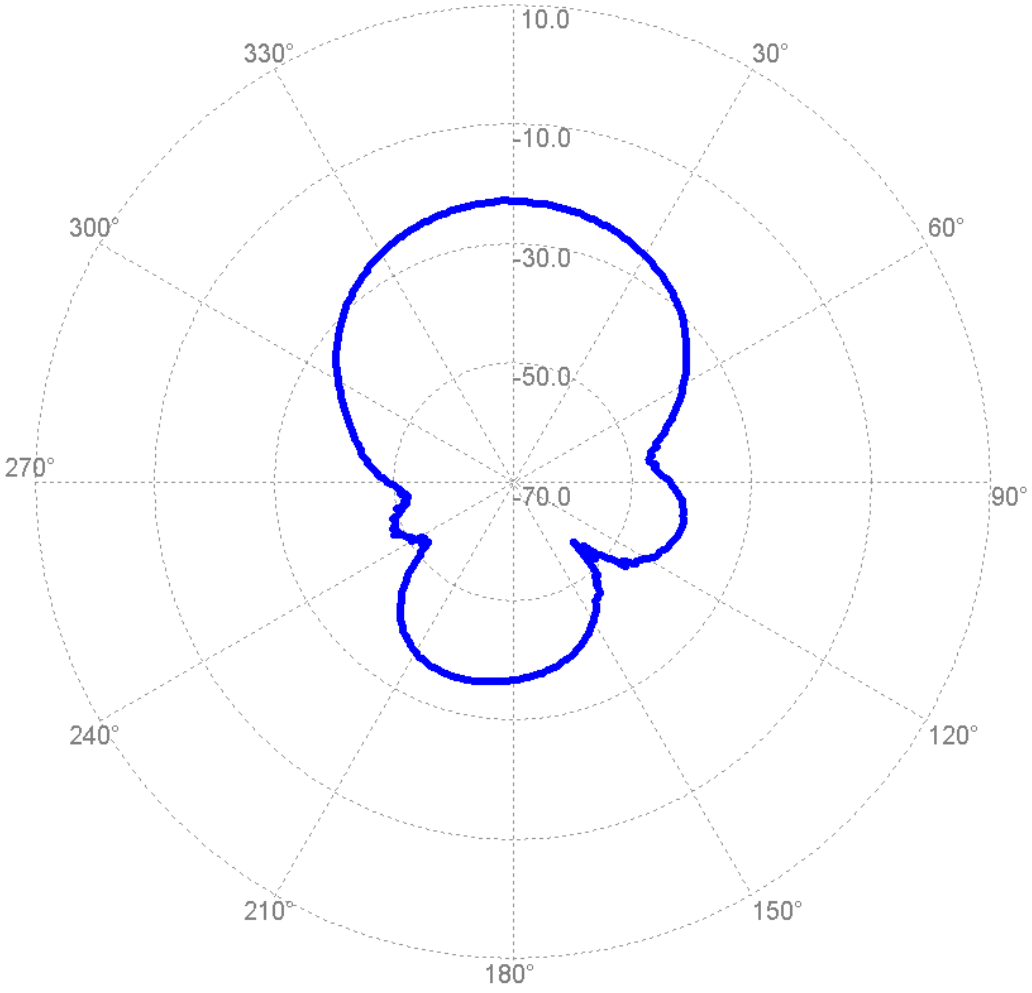


4. Practice for Yagi antenna

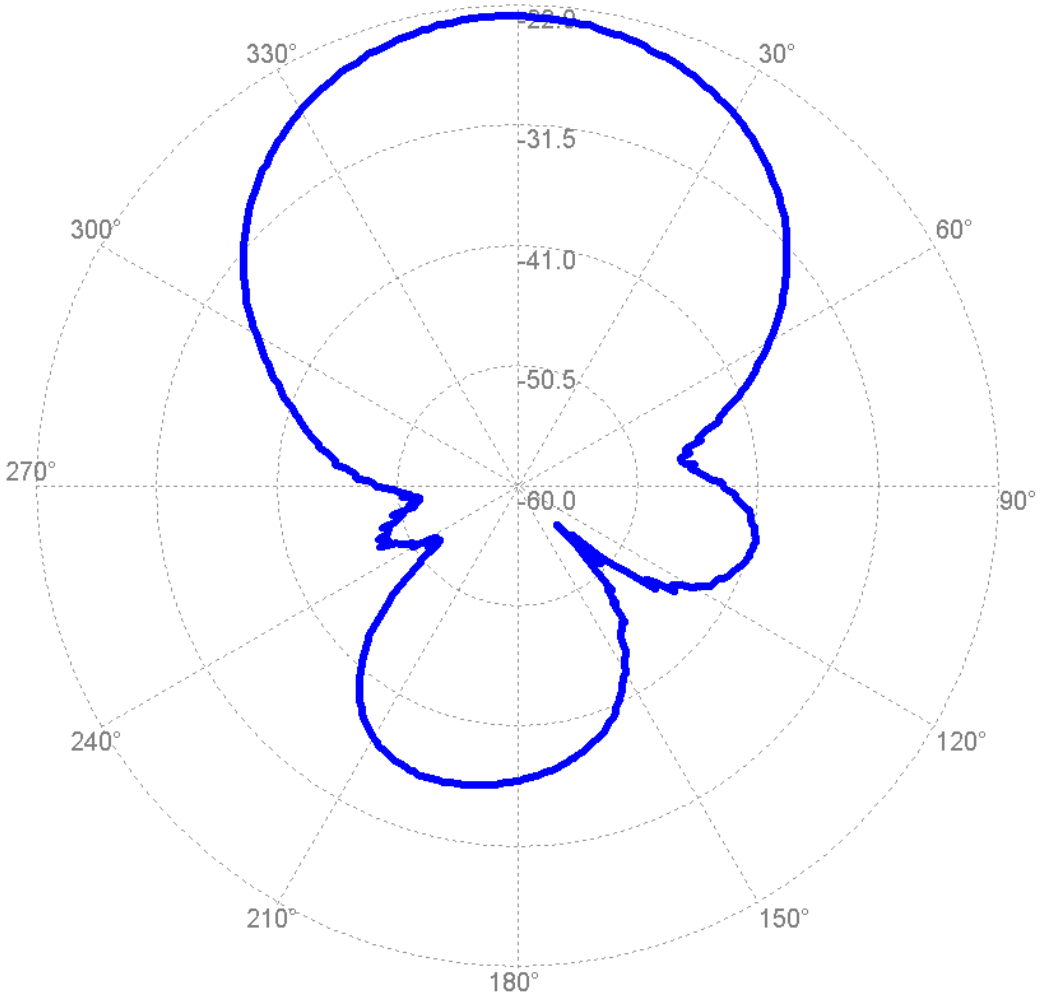
1. Measure the radiation pattern of *E*-plane

1-1. Auto test

15) Print and submit the measured data on the window and submit an excel file.



16)



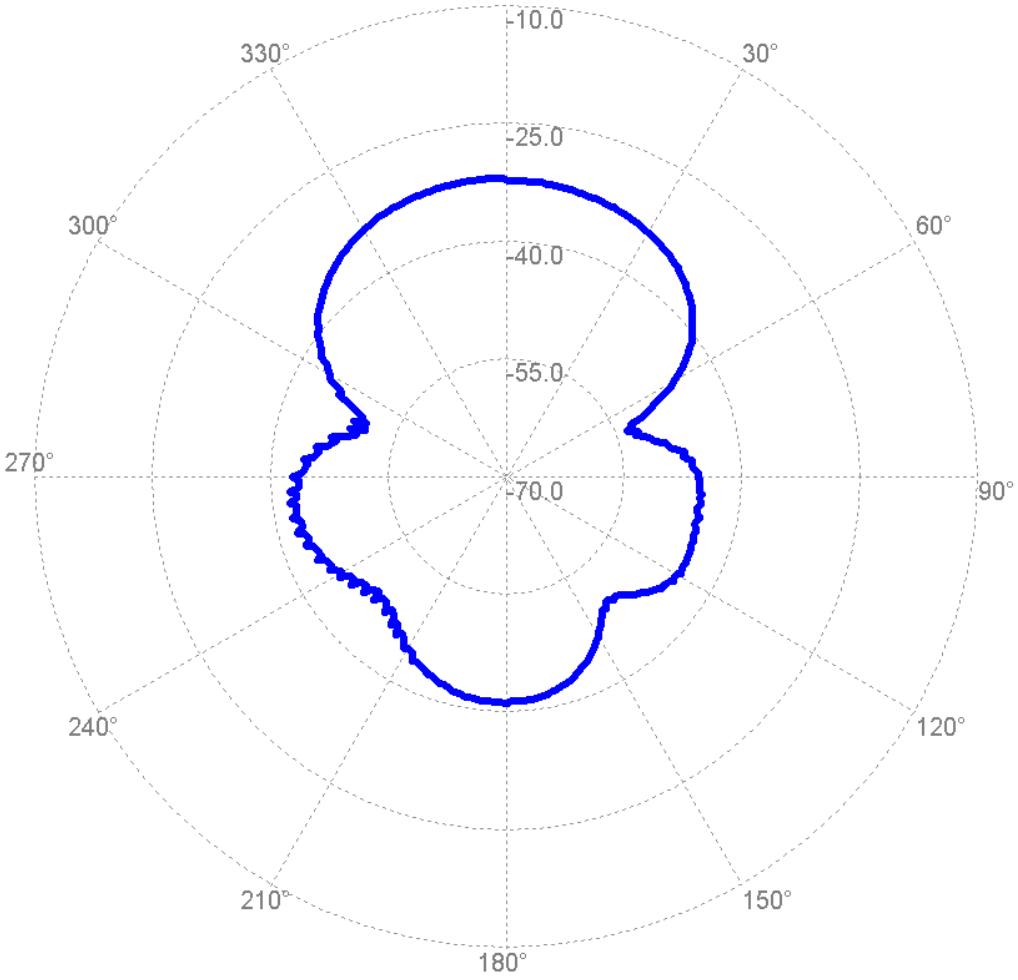
17) Max. received power : -22.9[*dBm*] , angle : 0 °

18) Record the angle of right and left half power points where received power is -3 [*dB*] lower than the maximum power.

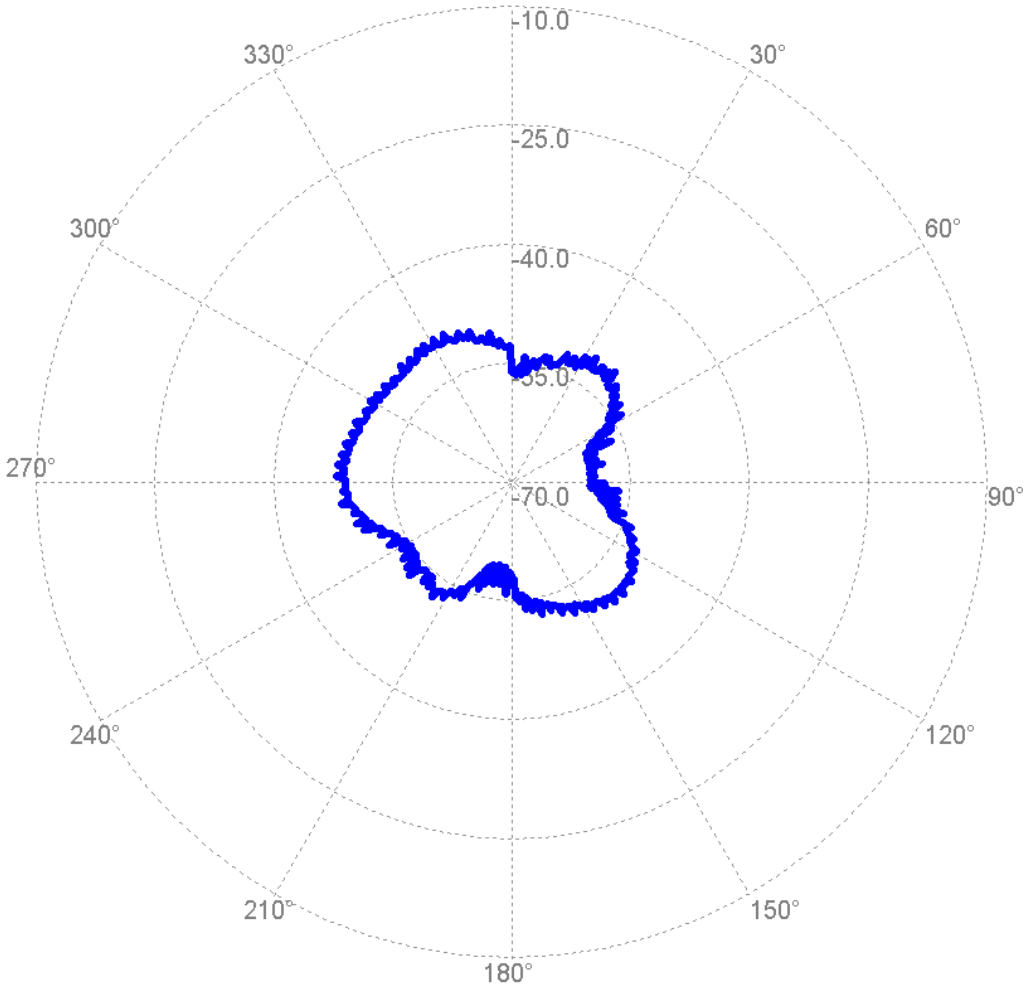
[left 333 °, right 29°

2. Measuring *H*-plane radiation pattern

3) Print and submit the measured data on the window and submit an excel file.



3. Receiving polarized wave in vertical relation

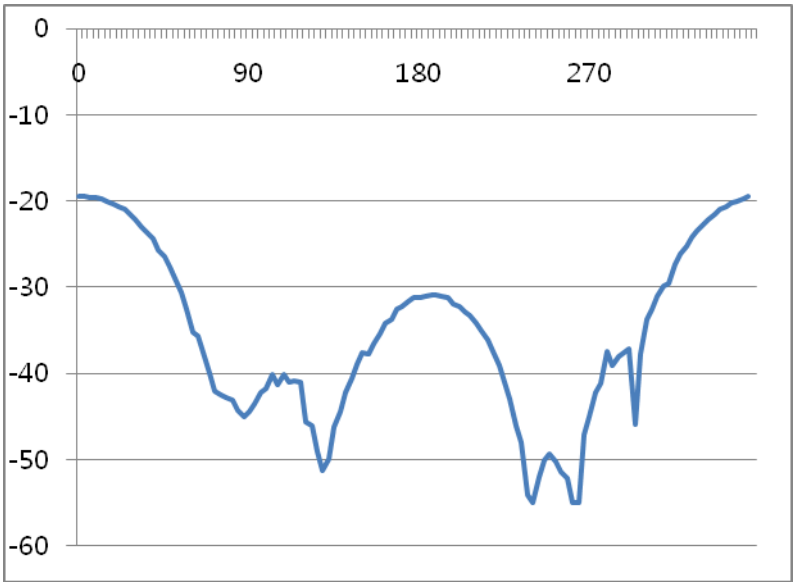


4. Measurement with spectrum analyzer

6) Table 4-1. Received radio wave level at each antenna angle

Angle [degrees]	Received value [*dBm*]	Angle [degrees]	Received value [*dBm*]	Angle [degrees]	Received value [*dBm*]	Angle [degrees]	Received value [*dBm*]	Angle [degrees]	Received value [*dBm*]
3	-19.5	75	-42.1	147	-40.5	219	-36.1	291	-37.6
6	-19.5	78	-42.5	150	-38.9	222	-37.5	294	-37.2
9	-19.6	81	-42.8	153	-37.6	225	-39.1	297	-45.9
12	-19.6	84	-43.1	156	-37.7	228	-41	300	-37.8
15	-19.8	87	-44.3	159	-36.5	231	-42.9	303	-33.7
18	-20	90	-45	162	-35.3	234	-46	306	-32.6
21	-20.3	93	-44.4	165	-34.2	237	-48	309	-31.1
24	-20.7	96	-43.6	168	-33.8	240	-54.1	312	-29.9
27	-21	99	-42.2	171	-32.6	243	-55	315	-29.6
30	-21.6	102	-41.7	174	-32.2	246	-52	318	-27.3
33	-22.2	105	-40.1	177	-31.6	249	-50.1	321	-26.2
36	-23	108	-41.3	180	-31.2	252	-49.4	324	-25.3
39	-23.6	111	-40.1	183	-31.2	255	-50.3	327	-24.2
42	-24.4	114	-41	186	-31.1	258	-51.4	330	-23.5
45	-25.7	117	-40.9	189	-30.9	261	-52.1	333	-22.7
48	-26.5	120	-41	192	-30.9	264	-55	336	-22.1
51	-27.6	123	-45.6	195	-31.1	267	-55	339	-21.5
54	-29	126	-46.1	198	-31.2	270	-47.1	342	-21
57	-30.6	129	-49.1	201	-32	273	-45	345	-20.6
60	-32.6	132	-51.2	204	-32.2	276	-42.2	348	-20.2
63	-35.2	135	-50	207	-32.8	279	-41.2	351	-20
66	-35.7	138	-46.2	210	-33.3	282	-37.5	354	-19.7
69	-38.1	141	-44.5	213	-34.2	285	-39.1	357	-19.5
72	-40	144	-42.2	216	-35	288	-38.1	360	-19.5

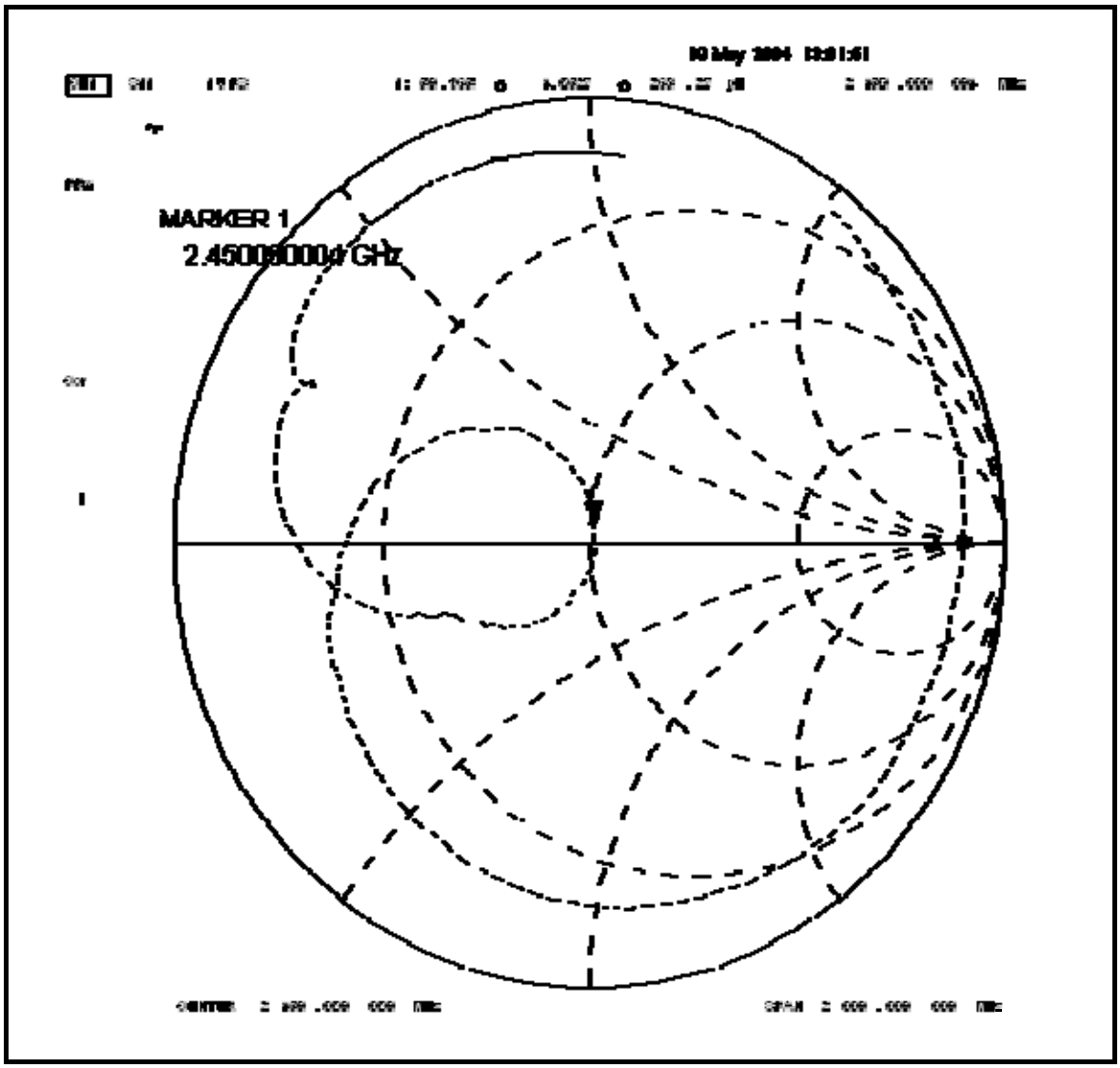
7)



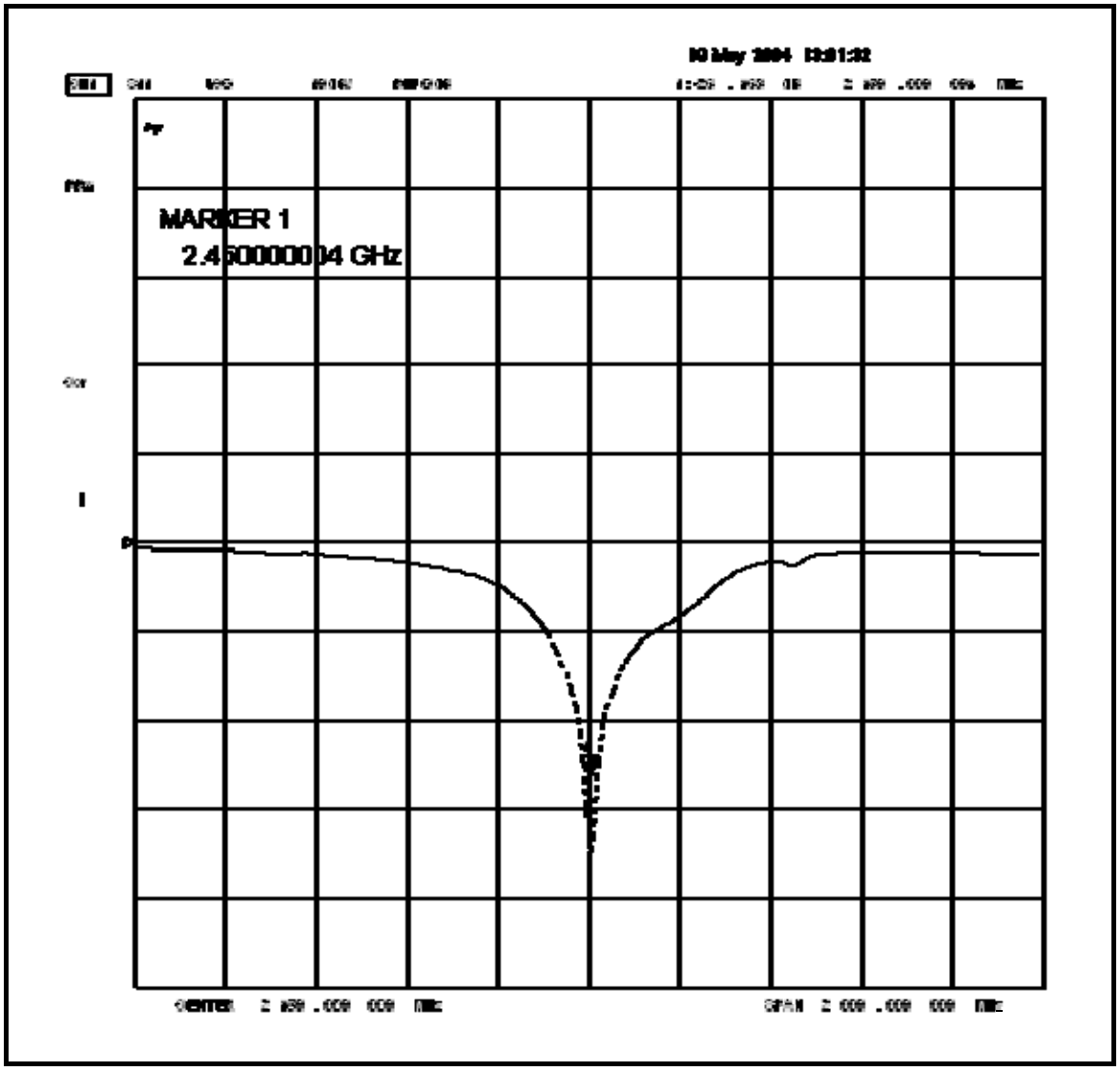
[Figure 4-9] Received radio wave level at each antenna angle

5. Measuring antenna characteristics

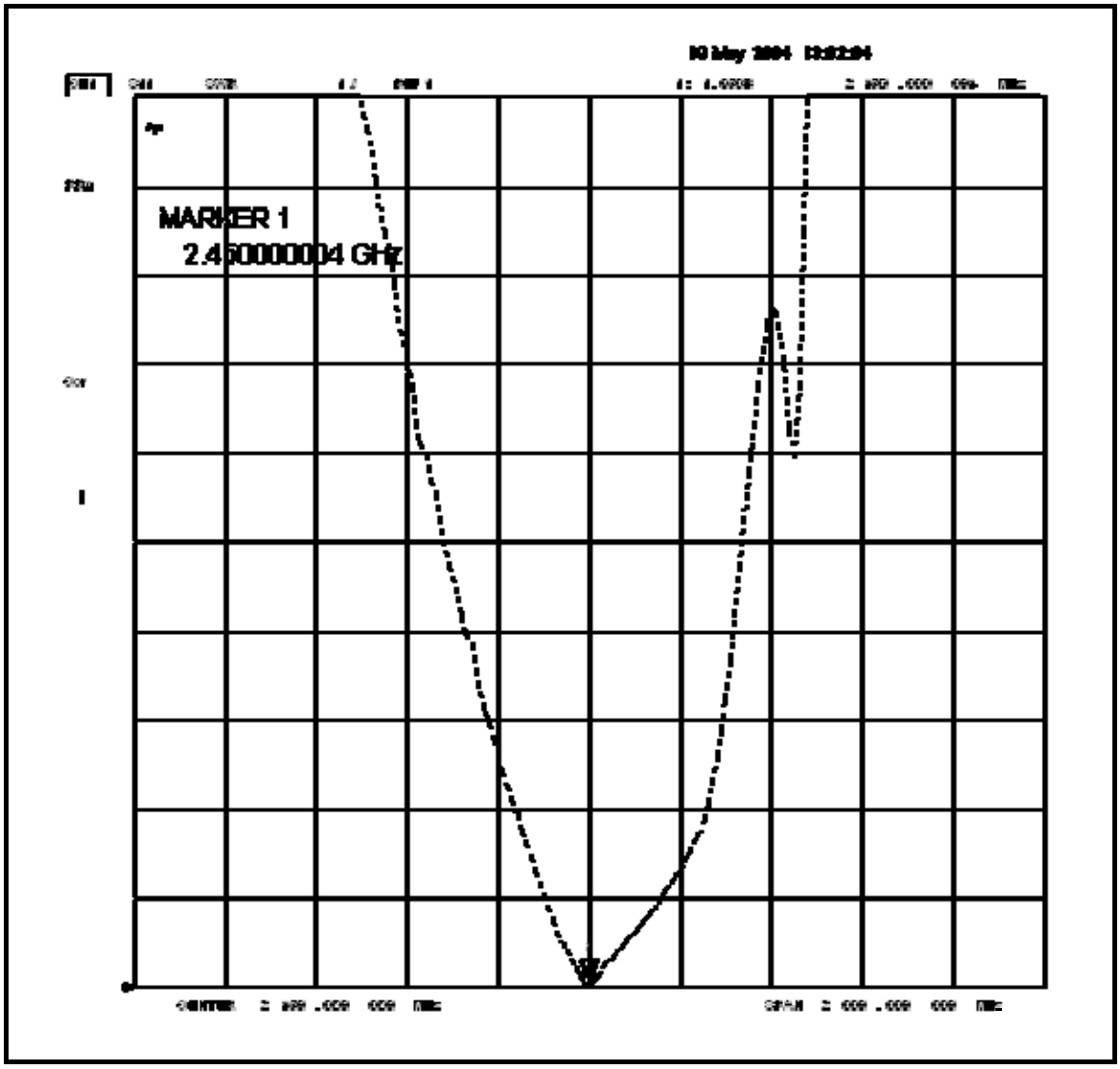
3) Freq = 2.45 GHz, R = 50.965 Ω, X = 4.0527 Ω



4) Return Loss = -26.463 dB



5) SWR =1 : 1.0506

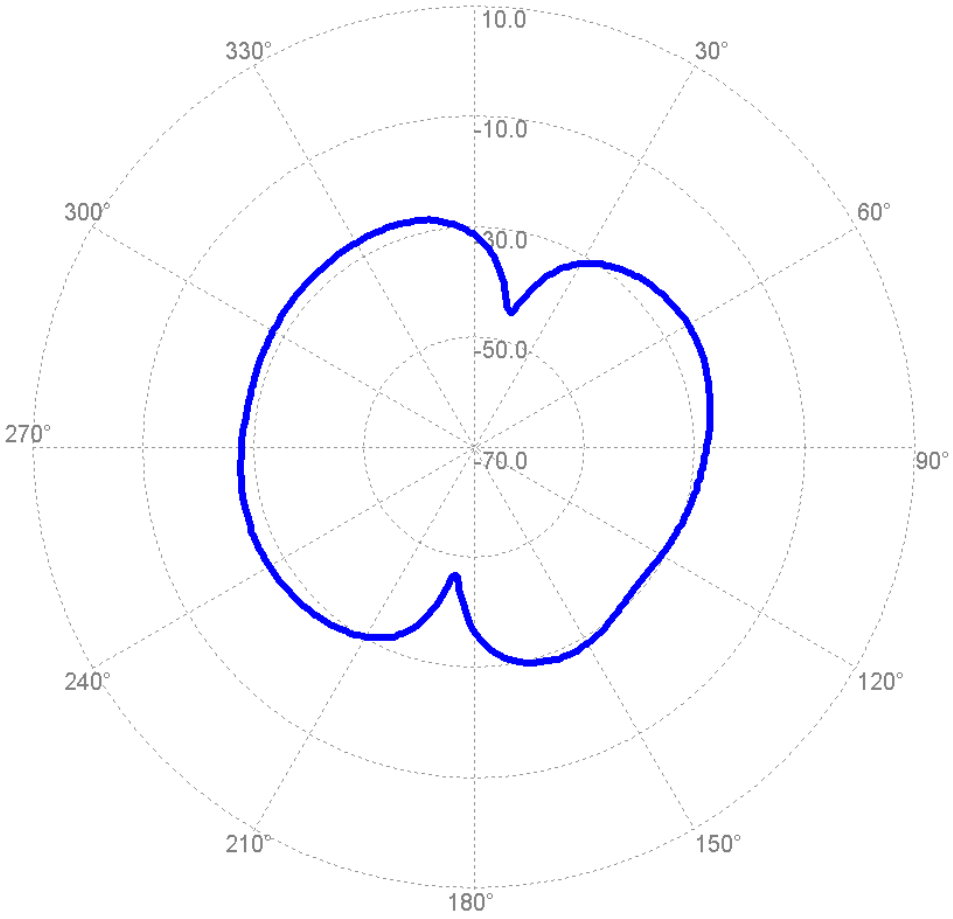


5. Practice for Monopole Antenna

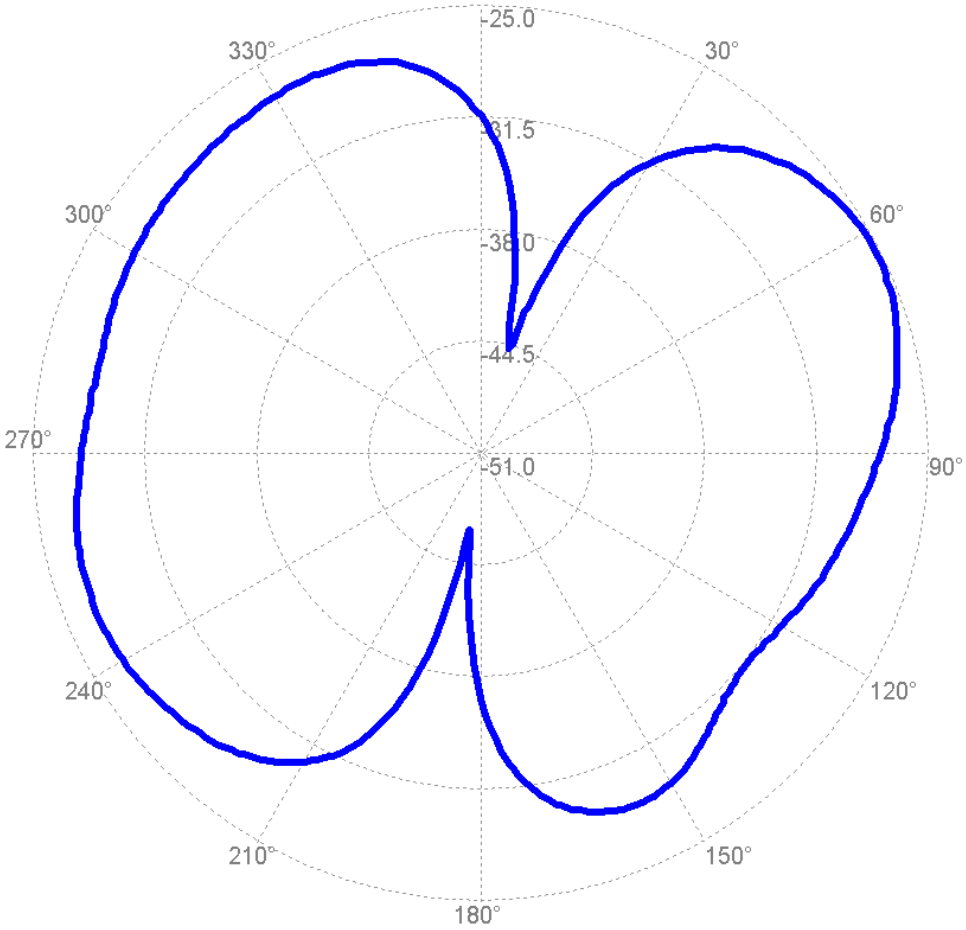
1. Measure the radiation pattern of E-plane

1-1. Auto test

15)



16)

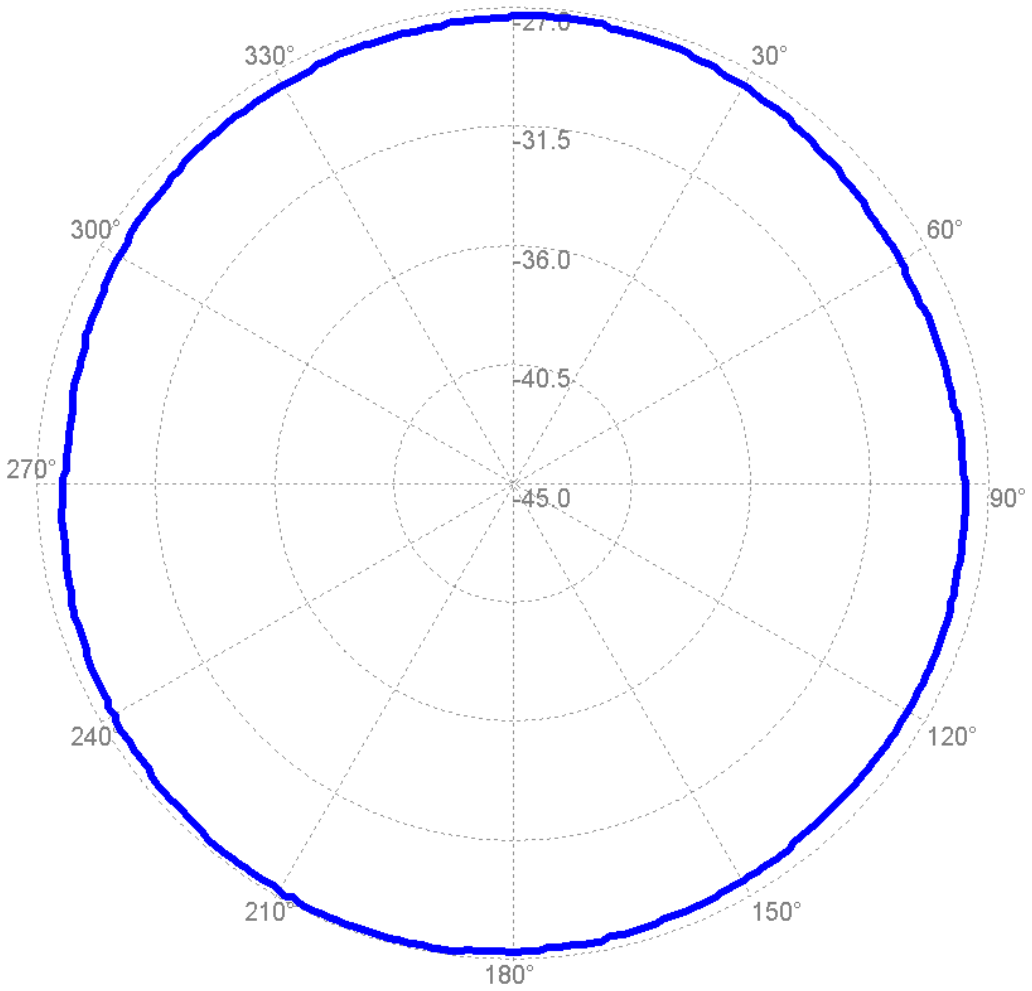


17) Maximum received power: -25.3[*dBm*], Angle 60°

18) [left 40°, right 94°]

2. Measuring *H*-plane radiation patterns

3)



3. Measurement with a spectrum analyzer

7) Table 5-1. Received radio wave level at each antenna angle

Angle [degrees]	Received value [*dBm*]	Angle [degrees]	Received value [*dBm*]	Angle [degrees]	Received value [*dBm*]	Angle [degrees]	Received value [*dBm*]	Angle [degrees]	Received value [*dBm*]
3	-32.5	75	-25.9	147	-29.4	219	-28.8	291	-28
6	-34.5	78	-26.2	150	-29	222	-28.4	294	-27.9
9	-37.3	81	-26.5	153	-28.8	225	-28	297	-27.9
12	-41	84	-26.9	156	-28.7	228	-27.8	300	-27.8
15	-44.1	87	-27.3	159	-28.7	231	-27.6	303	-27.7
18	-42.4	90	-27.7	162	-29	234	-27.4	306	-27.6
21	-39.4	93	-28.1	165	-29.4	237	-27.2	309	-27.5
24	-36.1	96	-28.4	168	-30	240	-27	312	-27.5
27	-33.8	99	-28.8	171	-30.8	243	-26.9	315	-27.4
30	-32	102	-29.1	174	-32	246	-26.8	318	-27.4
33	-30.6	105	-29.4	177	-33.6	249	-26.8	321	-27.3
36	-29.5	108	-29.7	180	-35.7	252	-26.9	324	-27.2
39	-28.5	111	-29.9	183	-38.7	255	-26.9	327	-27.2
42	-27.7	114	-30.2	186	-42.5	258	-27	330	-27.1
45	-27.1	117	-30.5	189	-46.5	261	-27.2	333	-27
48	-26.5	120	-30.8	192	-44.3	264	-27.3	336	-27
51	-26.1	123	-31	195	-40.1	267	-27.6	339	-27.1
54	-25.8	126	-31.2	198	-36.8	270	-27.7	342	-27.1
57	-25.5	129	-31.3	201	-34.5	273	-27.9	345	-27.4
60	-25.3	132	-31.3	204	-32.8	276	-28	348	-27.7
63	-25.3	135	-31	207	-31.5	279	-28.1	351	-28.2
66	-25.3	138	-30.7	210	-30.6	282	-28.2	354	-28.9
69	-25.4	141	-30.3	213	-29.8	285	-28.2	357	-29.8
72	-25.6	144	-29.8	216	-29.2	288	-28.1	360	-31.1

8)

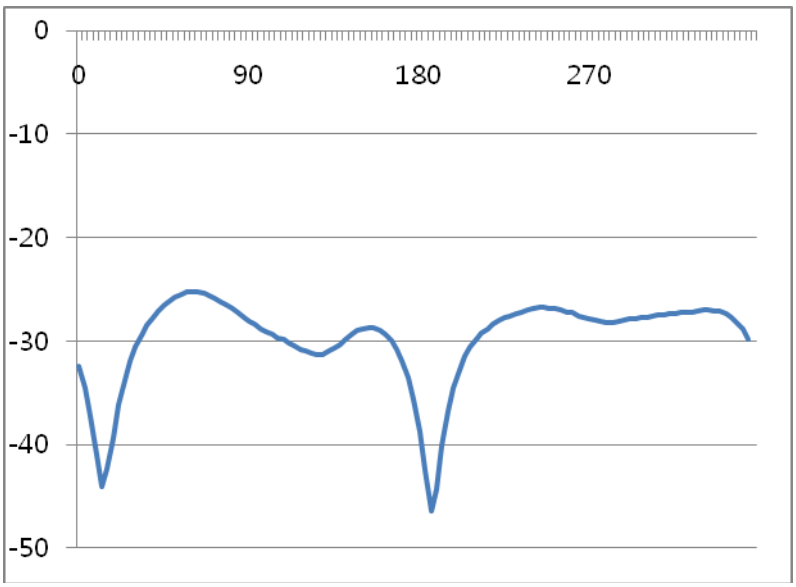
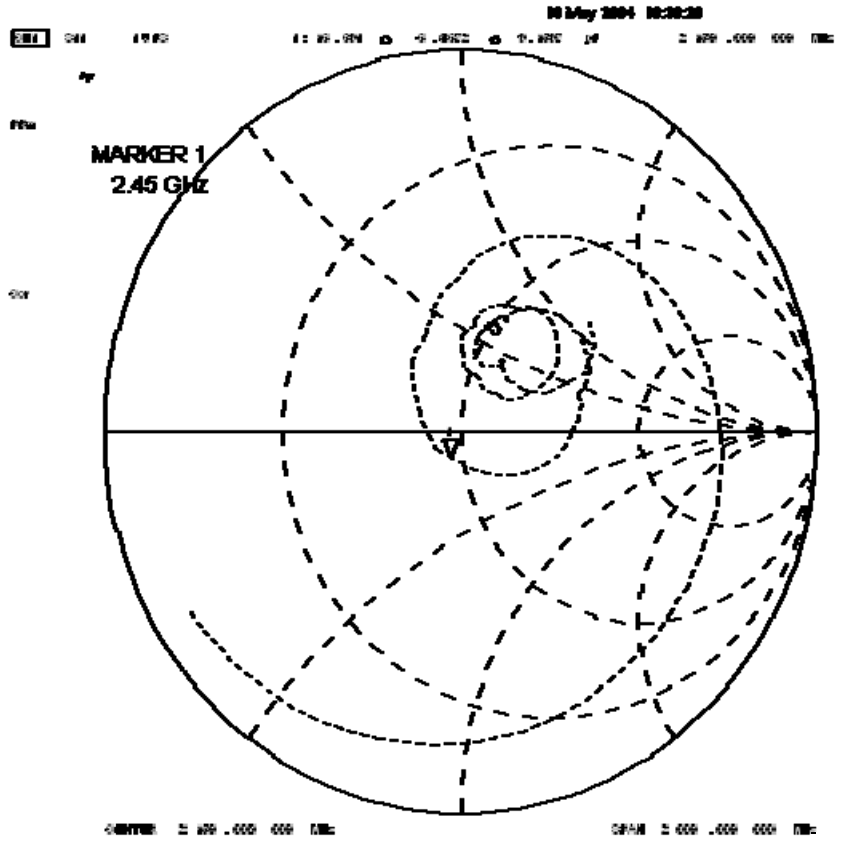


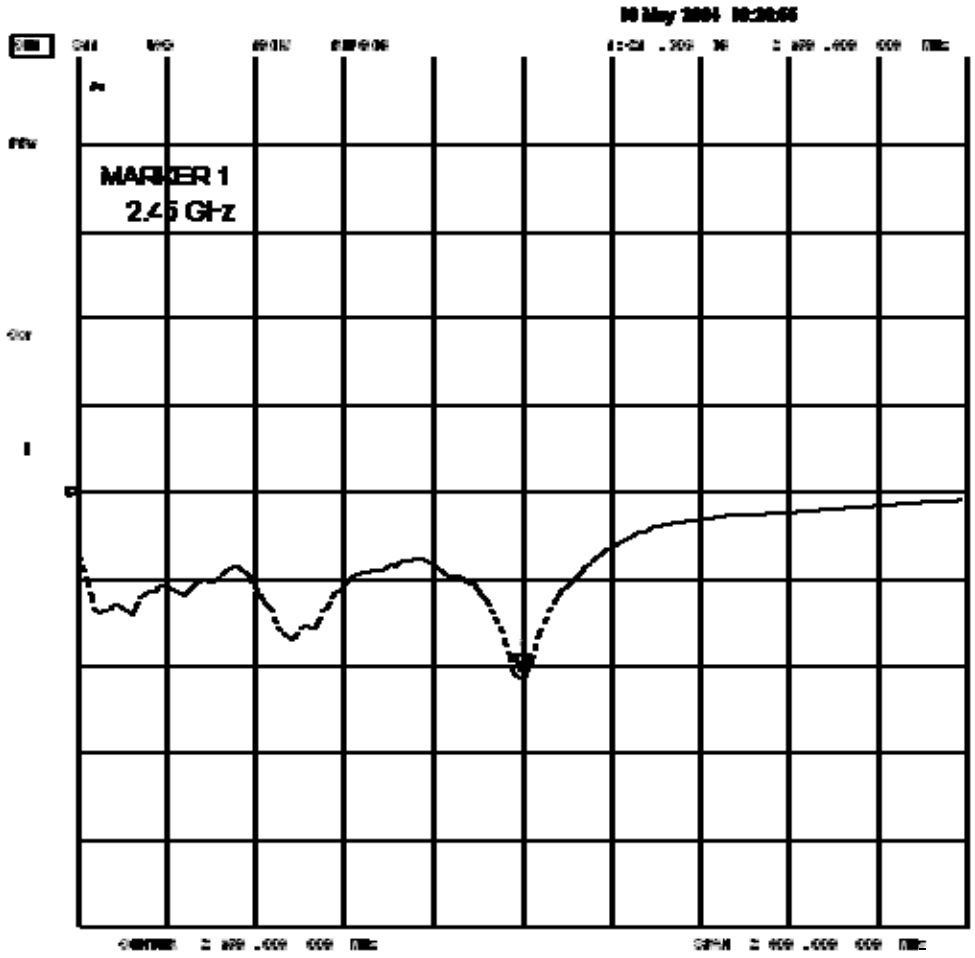
Figure 5-12. Received radio wave level at each antenna angle

4. Measuring antenna characteristics

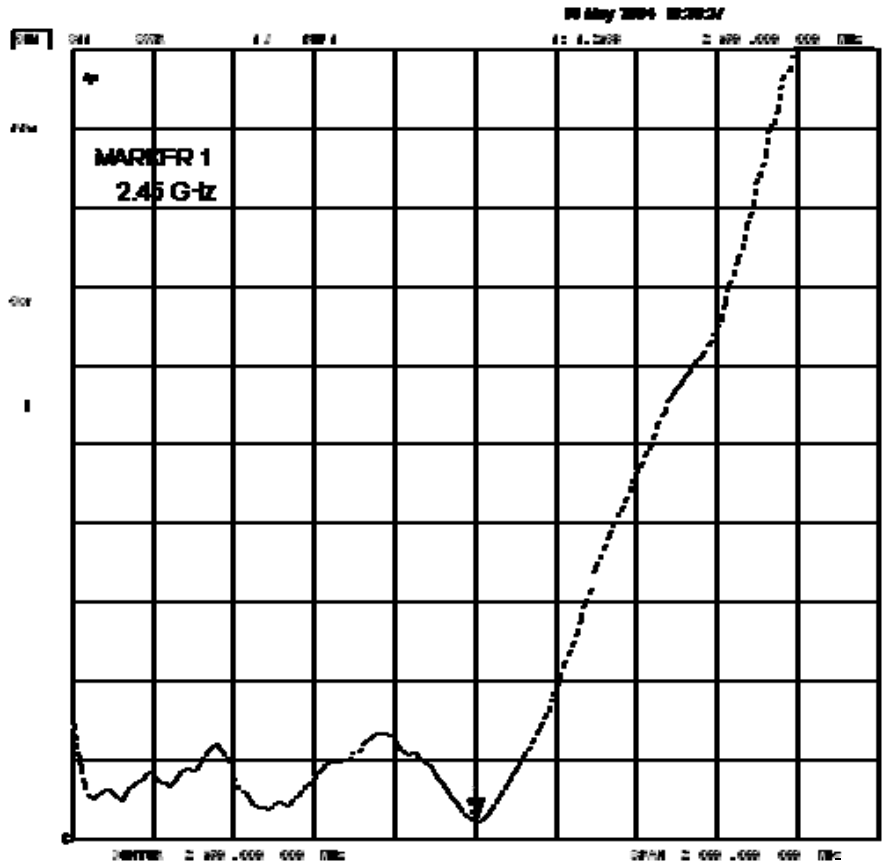
3) *Freq* = 2450*MHz*] , [*R* =46.691Ω , *X* =6.8672Ω]



4) *Freq* = 2450 [*MHz*] , *Return Loss* =-21.306[*dB*]



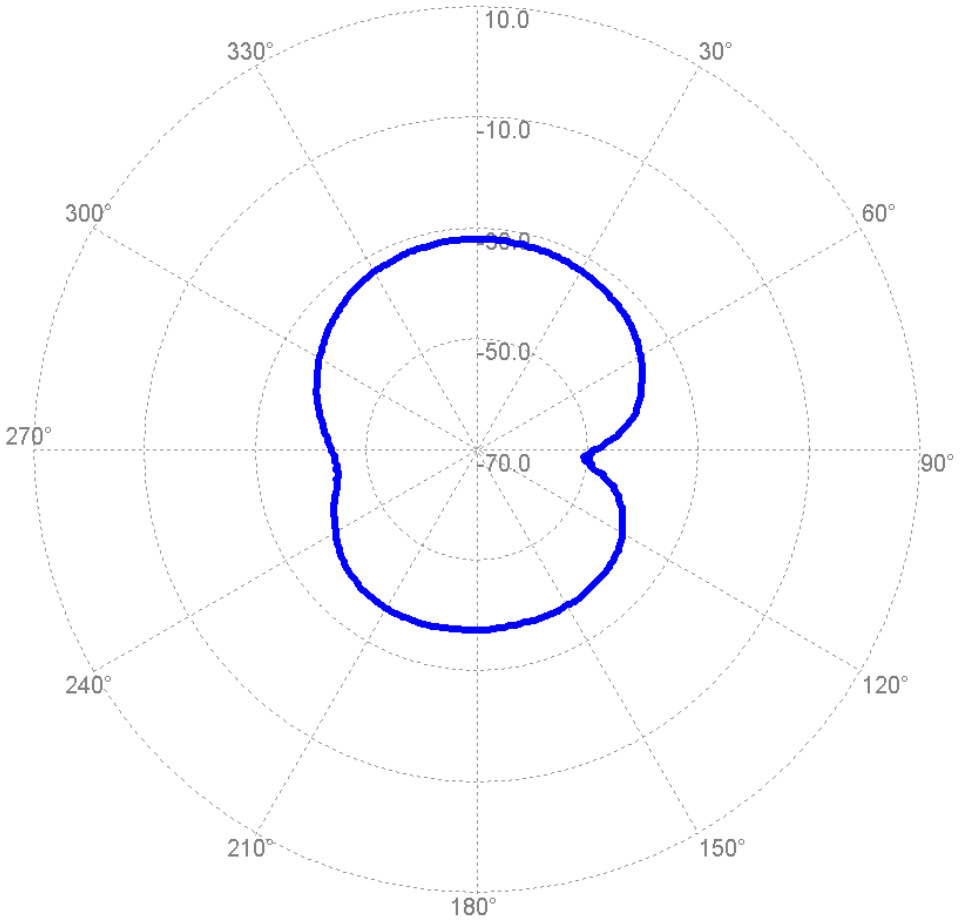
5) *Freq* = 2450 [*MHz*] , *SWR* = 1:1.2468



6. Practice for Loop antenna

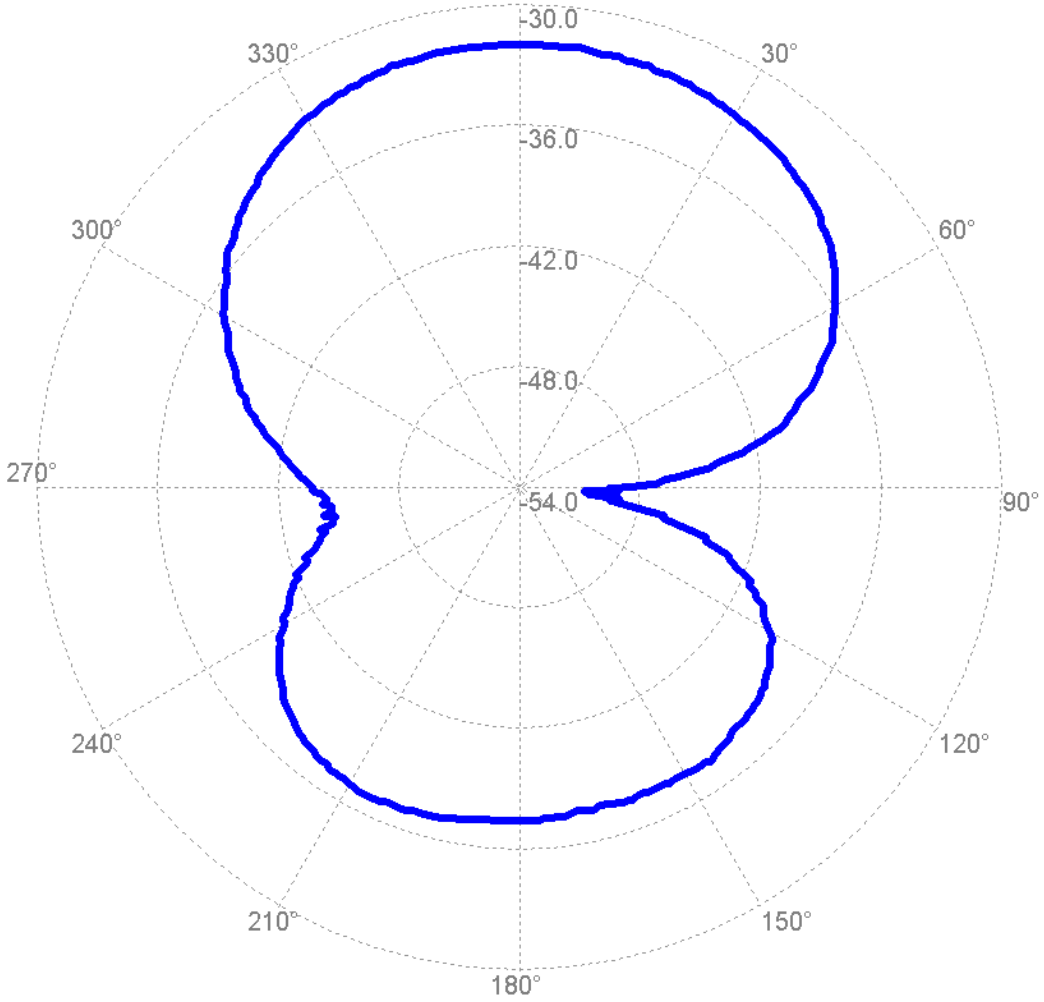
1. E plane radiation pattern measurement

15) Print and submit the results of measurements.



[Figure 6-10] Measured radiation pattern

16)

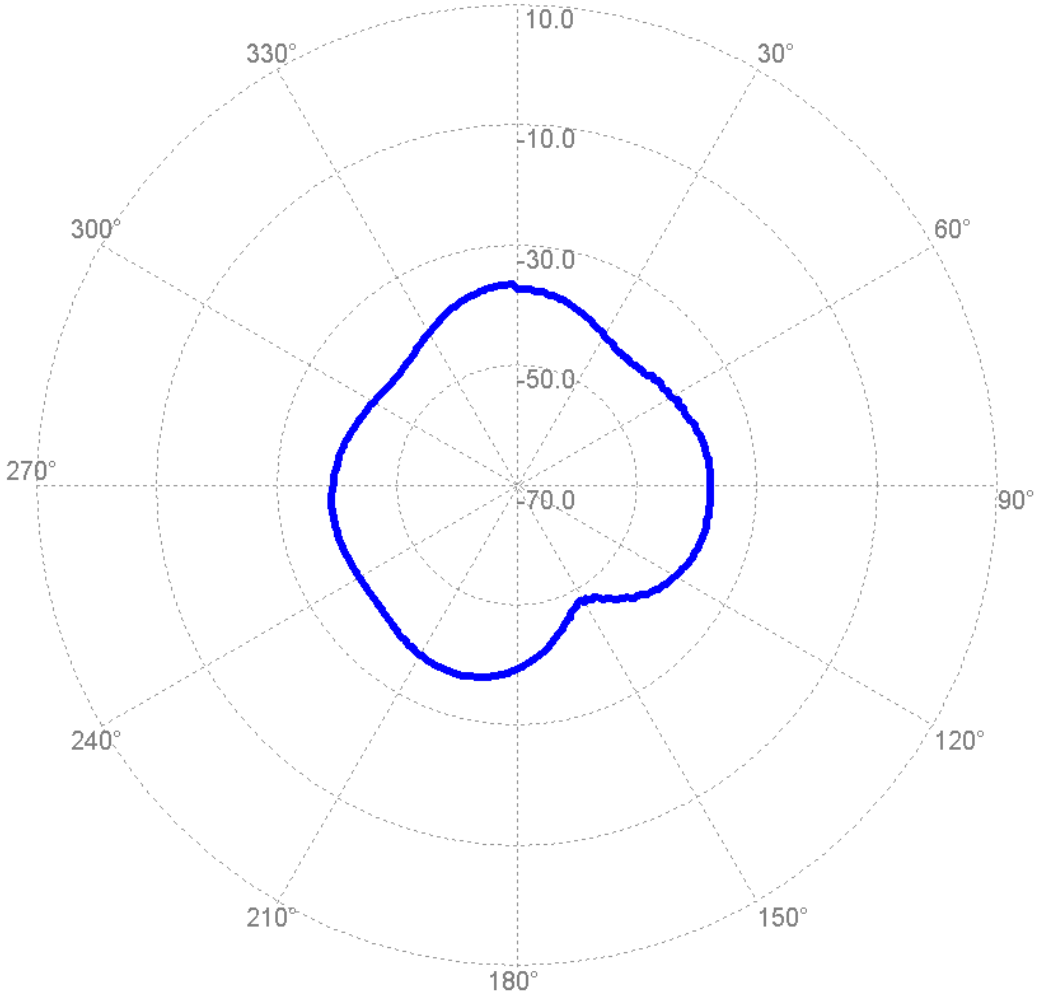


17) Maximum received power:-32[*dBm*], Angle : 0°

18) [left : 313°, right: 56 °]

2. Measuring *H*-plane radiation patterns

7)



3. Measurement with a spectrum analyzer

7) Table 6-1. Received radio wave level at each antenna angle

Angle [degrees]	Received value [*dBm*]	Angle [degrees]	Received value [*dBm*]	Angle [degrees]	Received value [*dBm*]	Angle [degrees]	Received value [*dBm*]	Angle [degrees]	Received value [*dBm*]
3	-32	75	-39.8	147	-37.5	219	-37.3	291	-39.1
6	-32	78	-40.6	150	-37.5	222	-37.5	294	-38.5
9	-31.9	81	-42.3	153	-37.6	225	-37.8	297	-37.8
12	-32.1	84	-44.1	156	-37.6	228	-38.1	300	-37.2
15	-32.1	87	-46	159	-37.6	231	-38.6	303	-36.7
18	-32.1	90	-48.2	162	-37.5	234	-39	306	-36.2
21	-32.2	93	-49.1	165	-37.6	237	-39.5	309	-35.5
24	-32.3	96	-49.6	168	-37.6	240	-40.2	312	-35.1
27	-32.4	99	-49.5	171	-37.7	243	-40.9	315	-34.6
30	-32.6	102	-46.7	174	-37.5	246	-41.4	318	-34.2
33	-32.7	105	-45.5	177	-37.5	249	-42.1	321	-33.8
36	-32.9	108	-43.9	180	-37.4	252	-42.8	324	-33.5
39	-33	111	-42.6	183	-37.4	255	-43.5	327	-33.2
42	-33.3	114	-41.6	186	-37.4	258	-44.1	330	-32.9
45	-33.5	117	-40.6	189	-37.3	261	-44.6	333	-32.7
48	-33.8	120	-40	192	-37.2	264	-44.6	336	-32.5
51	-34.2	123	-39.3	195	-37.1	267	-44.4	339	-32.4
54	-34.6	126	-38.8	198	-37.1	270	-43.7	342	-32.2
57	-35.1	129	-38.5	201	-37	273	-43.3	345	-32.1
60	-35.7	132	-38.2	204	-37	276	-42.7	348	-32.1
63	-36.3	135	-38	207	-36.9	279	-42	351	-32
66	-36.9	138	-37.9	210	-37	282	-41.3	354	-32
69	-37.9	141	-37.8	213	-37.1	285	-40.5	357	-32
72	-38.7	144	-37.6	216	-37.2	288	-39.8	360	-32

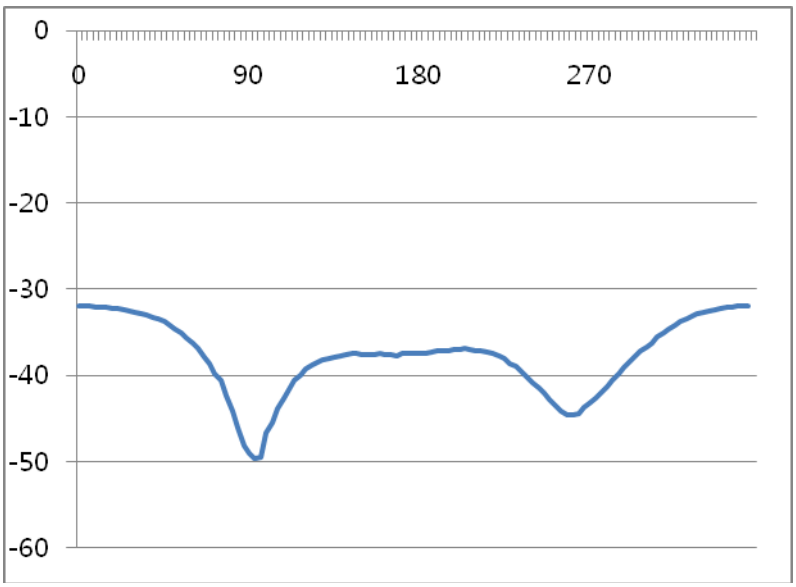
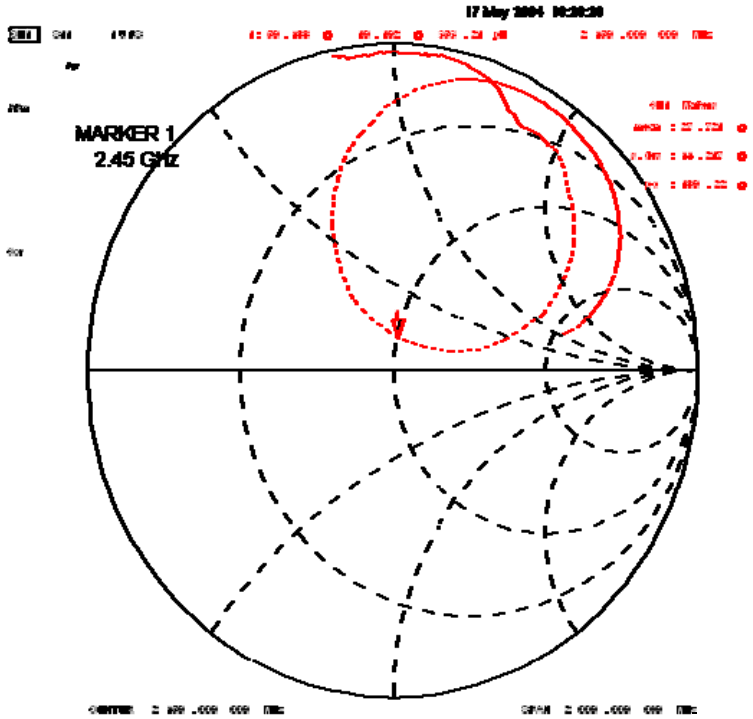


Figure [6-13] Received power level at each antenna angle

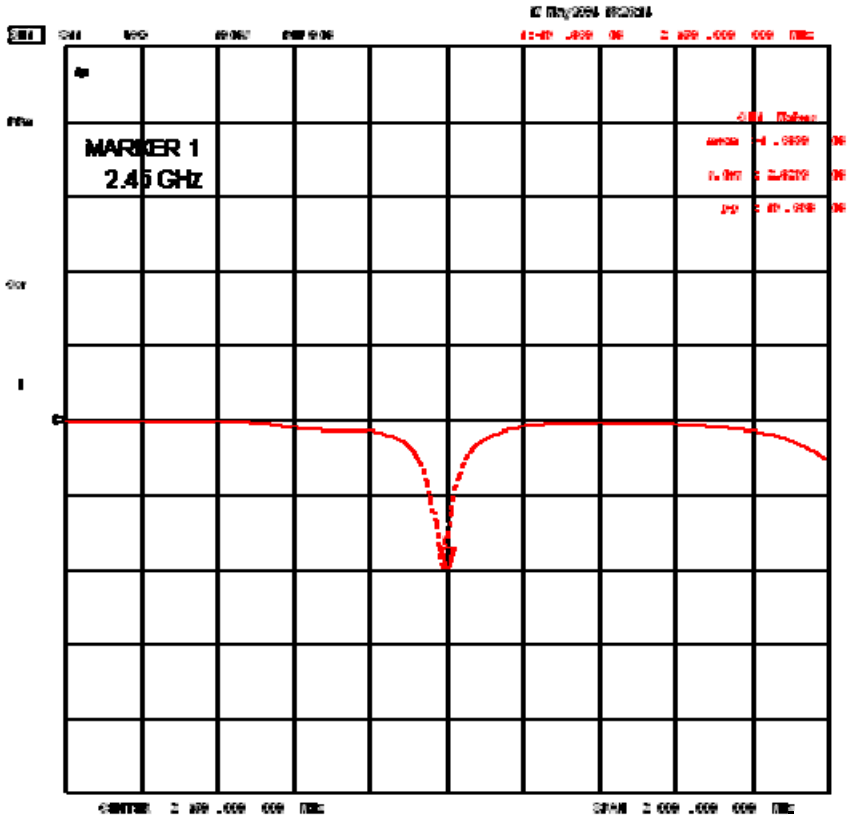
4. Measuring antenna characteristics

3) Input impedance

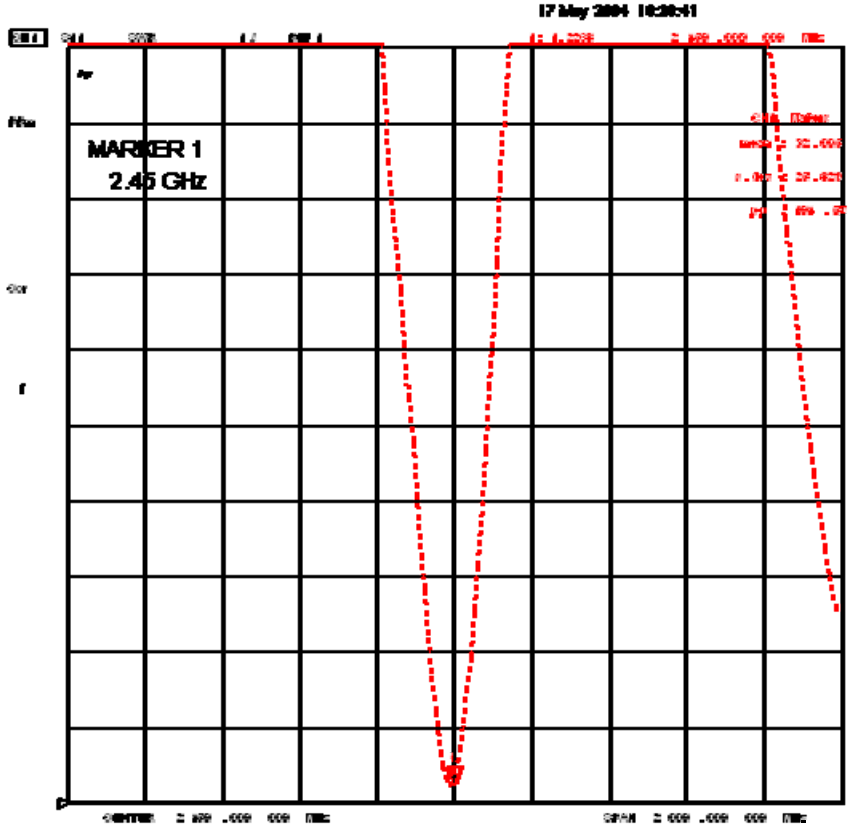
$Freq$ = 2450[MHz] , [R =50.488 Ω , X =10.102Ω]



4) *Freq* = 2450[*MHz*] , *Return Loss* =-19.960 [*dB*]



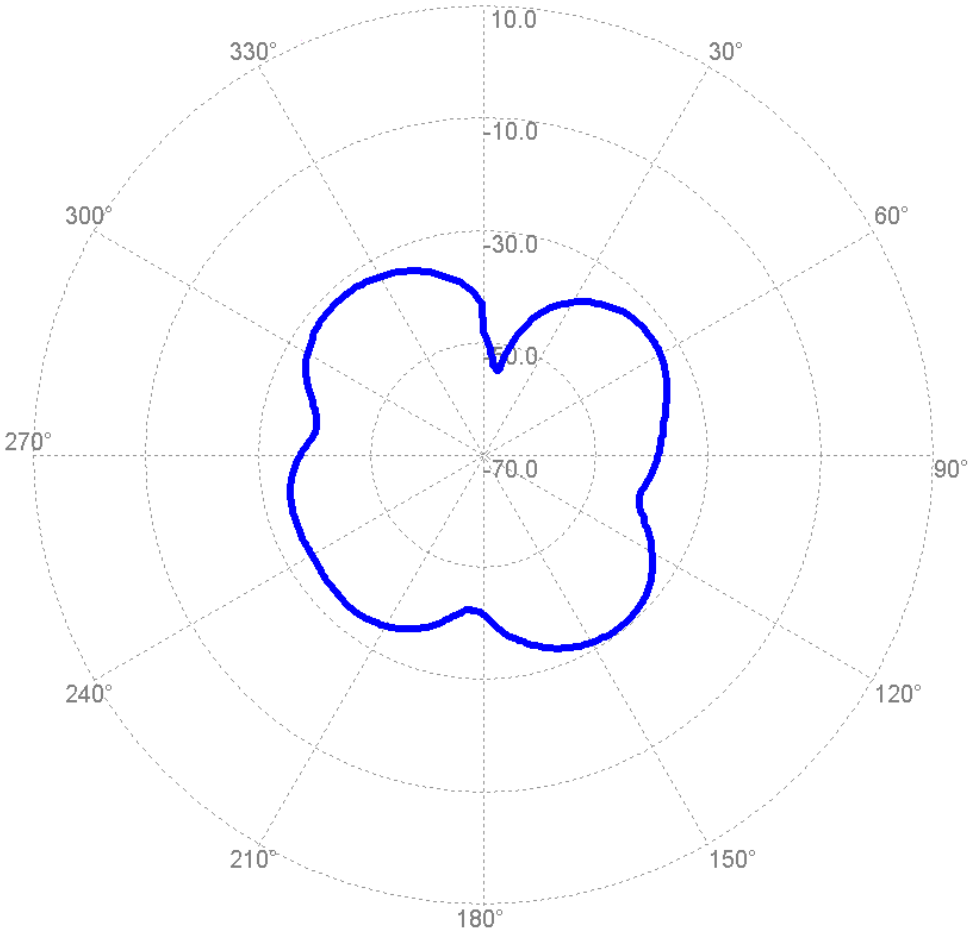
5) *Freq* = 2450[*MHz*] , *SWR* = 1:12268



7. Practice for Ceramic Chip antenna

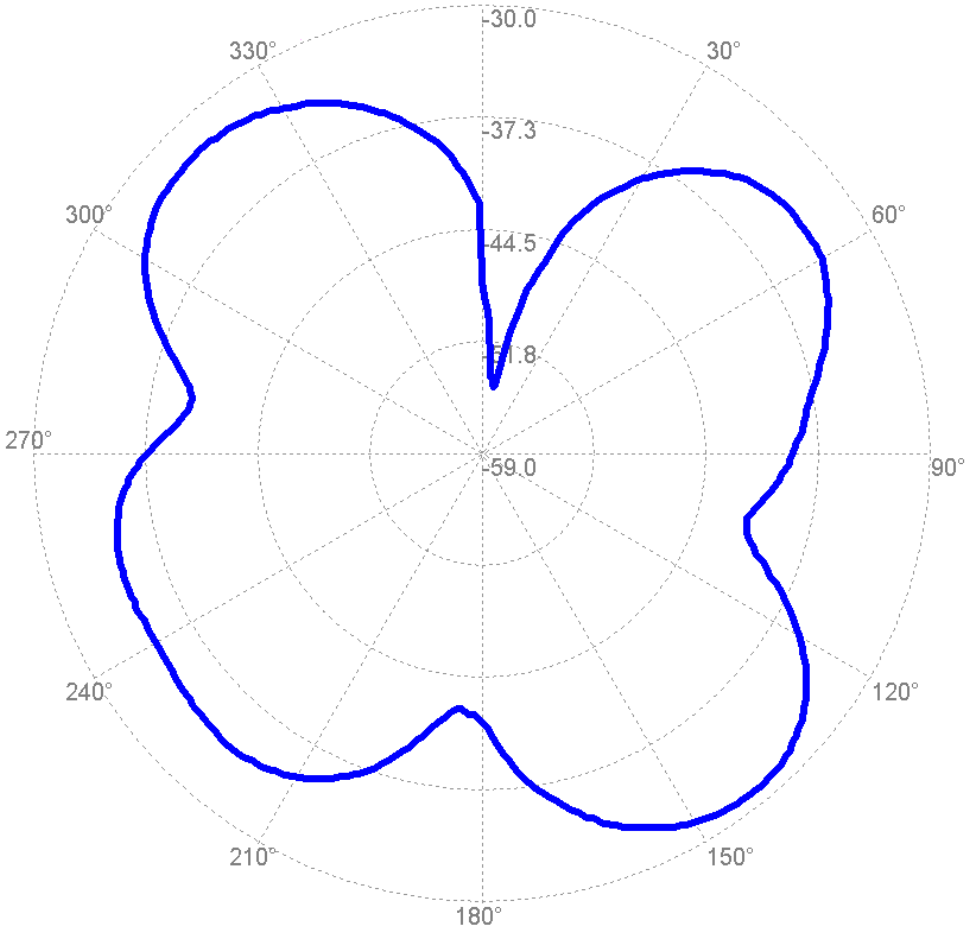
1. *xz* plane radiation pattern measurement

15)



Measured radiation pattern

16)

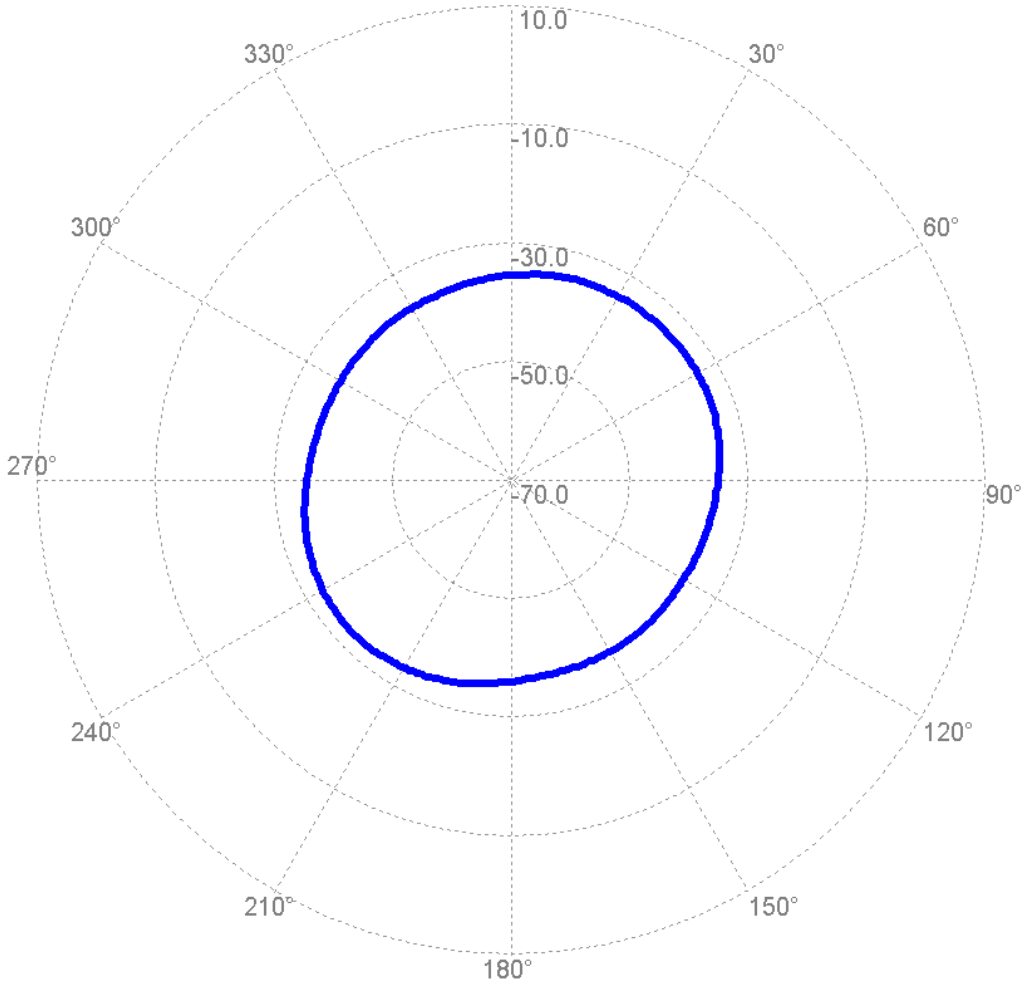


17) Maximum received power: : −31 [*dBm*], Angle : 145°

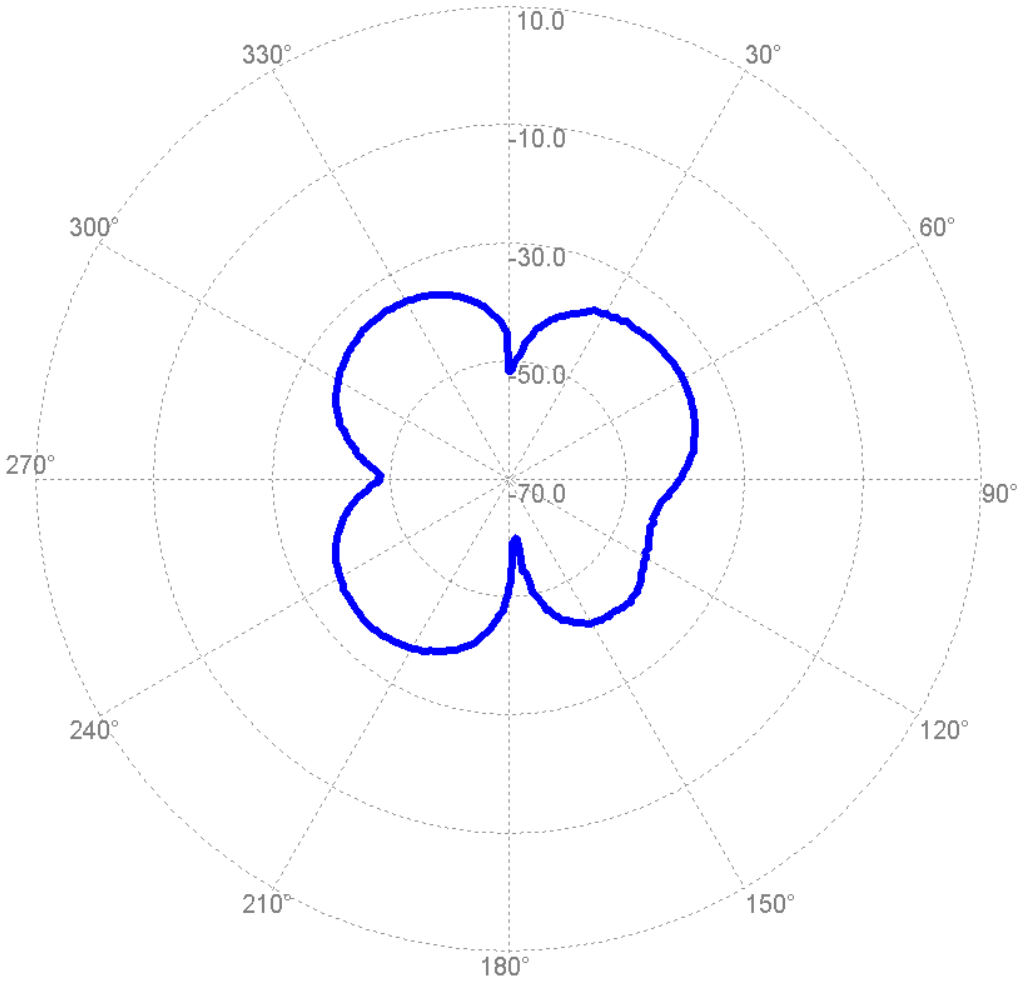
18) [left 125°, right 163°]

2. x*y* plane radiation pattern measurement

3)



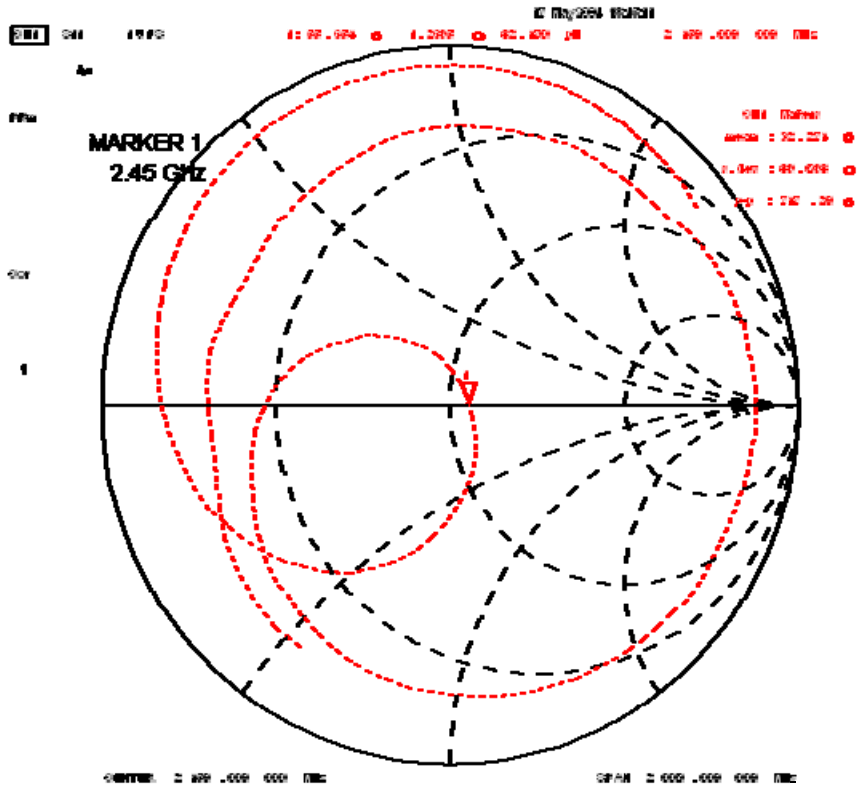
8)



3. Measuring antenna characteristics

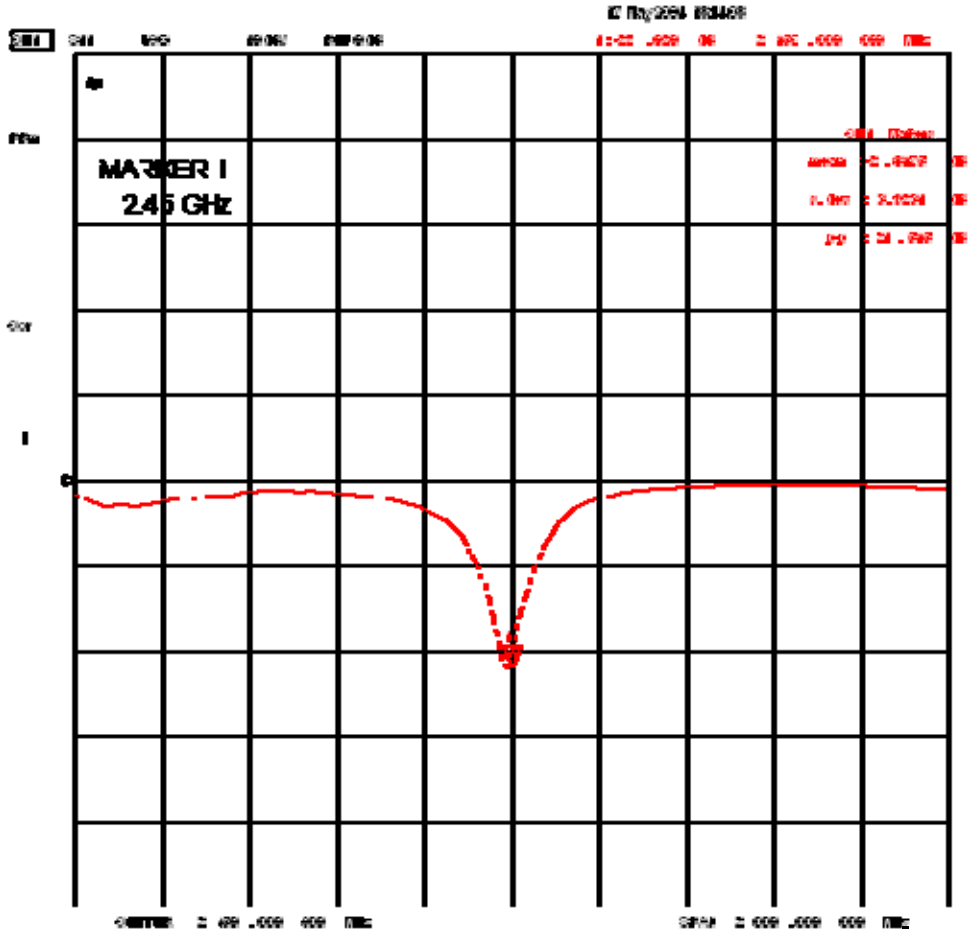
3) Input impedance

$Freq = 2450[MHz]$, $[R =$55.645Ω , $X =$ 1.2695$]$

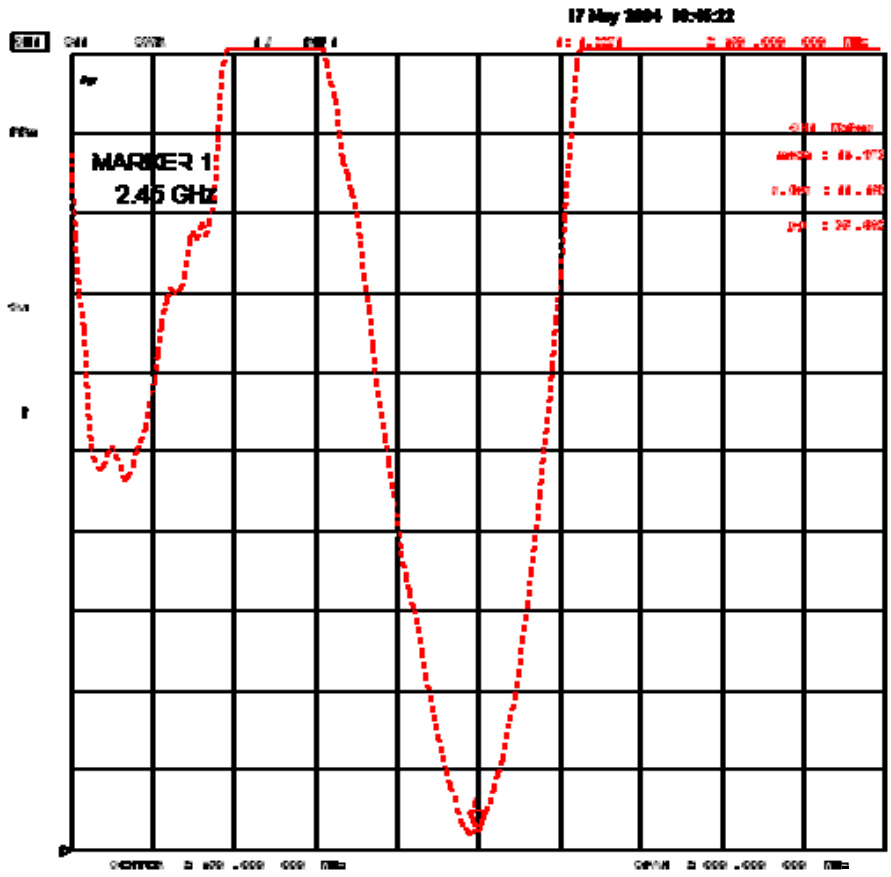


4) Return loss

Freq = 2450[*MHz*] , *Return Loss* =-22.020 [*dB*]



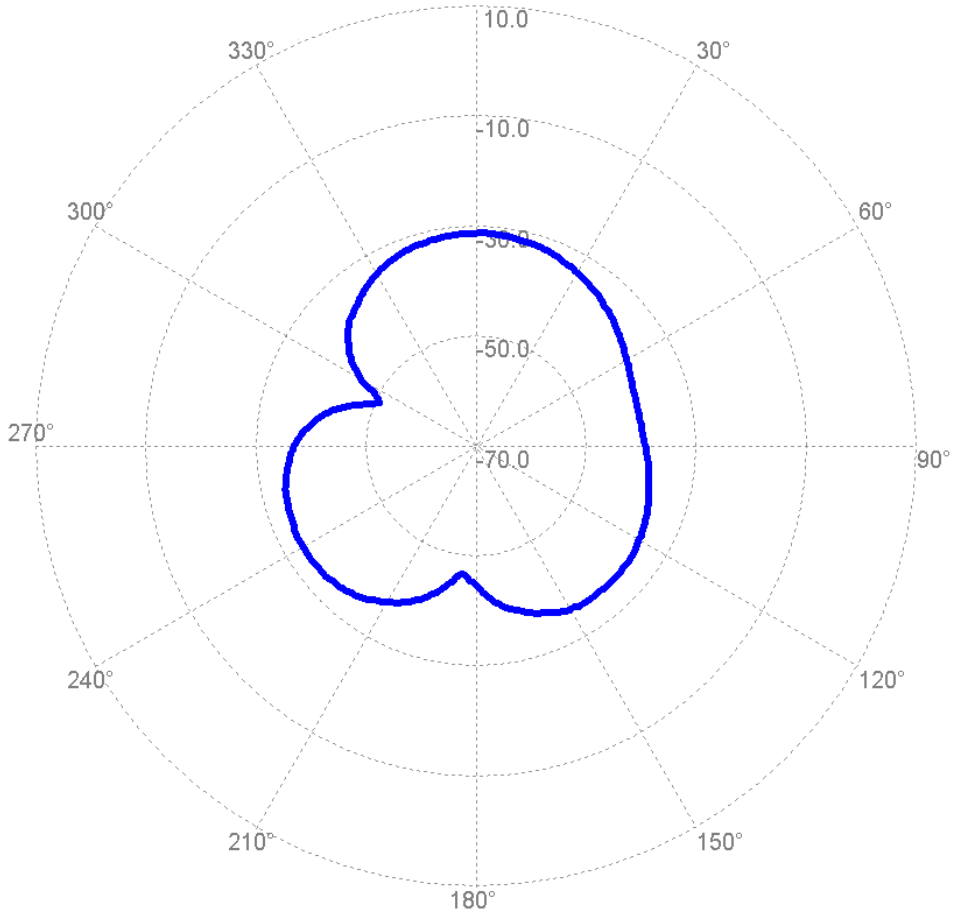
5) *Freq* = 2450[*MHz*] , *SWR* = 1:12271



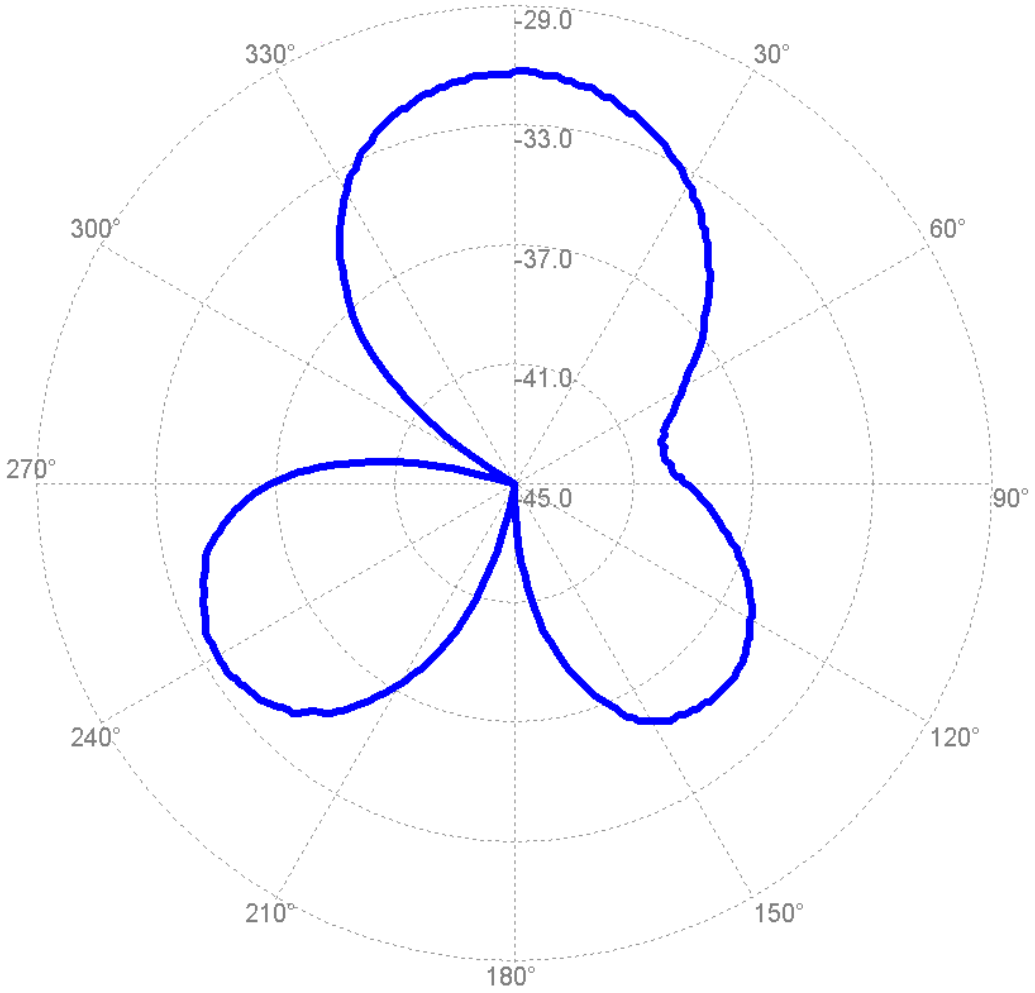
8. Practice for Inverted F antenna .

1. Radiation pattern measurement

14) Submit the measured radiation pattern and measured data in an excel file



15)



16) Maximum receive power : -31.2 [*dBm*], angle : 2 °

17) Record the angle of right and left half power points -3 [*dB*] lower than the maximum power. [left 329°, right 36°]

18) Half power beamwidth [67°]

2. Measurement using spectrum analyzer

7) Record the measured received power

Fig. 8-1. Receiving power levels at different receiving antenna angles

각도 [도]	수신값 [dBm]	각도 [도]	수신값 [dBm]	각도 [도]	수신값 [dBm]	각도 [도]	수신값 [dBm]	각도 [도]	수신값 [dBm]
3	-31.2	75	-39.9	147	-35.5	219	-35.3	291	-48
6	-31.3	78	-39.9	150	-35.7	222	-34.9	294	-49.7
9	-31.4	81	-39.9	153	-36	225	-34.3	297	-49.8
12	-31.5	84	-39.7	156	-36.5	228	-34.1	300	-47.1
15	-31.7	87	-39.7	159	-37.2	231	-33.8	303	-44.1
18	-32	90	-39.4	162	-37.9	234	-33.7	306	-42.2
21	-32.2	93	-39	165	-38.6	237	-33.5	309	-40.5
24	-32.5	96	-38.7	168	-39.5	240	-33.5	312	-39.1
27	-32.9	99	-38.3	171	-40.4	243	-33.5	315	-37.8
30	-33.3	102	-38	174	-41.5	246	-33.6	318	-36.9
33	-33.7	105	-37.6	177	-42.8	249	-33.8	321	-36.1
36	-34.1	108	-37.2	180	-44.2	252	-34	324	-35.3
39	-34.6	111	-36.9	183	-45.4	255	-34.2	327	-34.5
42	-35.1	114	-36.5	186	-46.4	258	-34.4	330	-33.9
45	-35.6	117	-36.2	189	-46.3	261	-34.8	333	-33.3
48	-36.2	120	-35.9	192	-44.7	264	-35.3	336	-32.8
51	-36.7	123	-35.7	195	-43.1	267	-35.9	339	-32.4
54	-37.2	126	-35.5	198	-41.7	270	-36.6	342	-32.1
57	-37.8	129	-35.3	201	-40.5	273	-37.4	345	-31.9
60	-38.3	132	-35.2	204	-39.4	276	-38.4	348	-31.6
63	-38.7	135	-35.2	207	-38.3	279	-39.9	351	-31.5
66	-39.1	138	-35.2	210	-37.5	282	-41.2	354	-31.4
69	-39.5	141	-35.3	213	-36.7	285	-42.9	357	-31.3
72	-39.7	144	-35.4	216	-36	288	-45.1	360	-31.3

8) Plot the measurement values

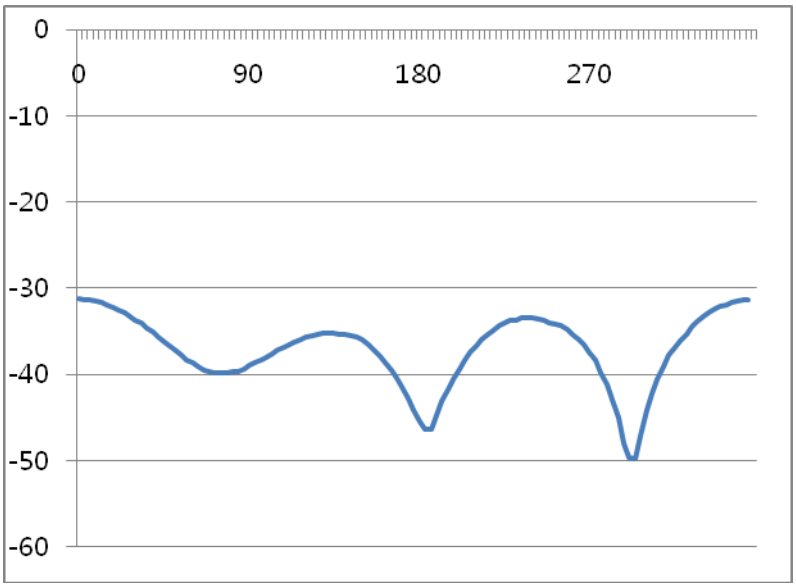
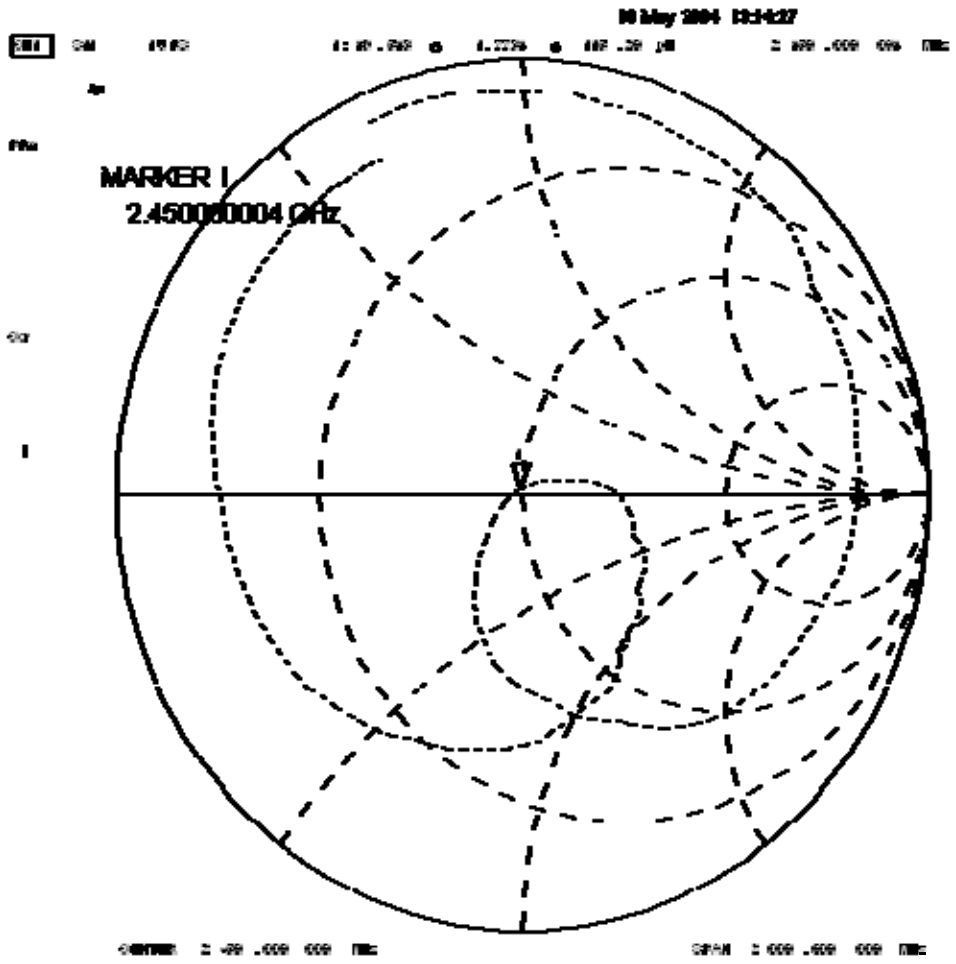


Figure 8-7. Received power levels at each antenna angles

3. Antenna characteristics measurement

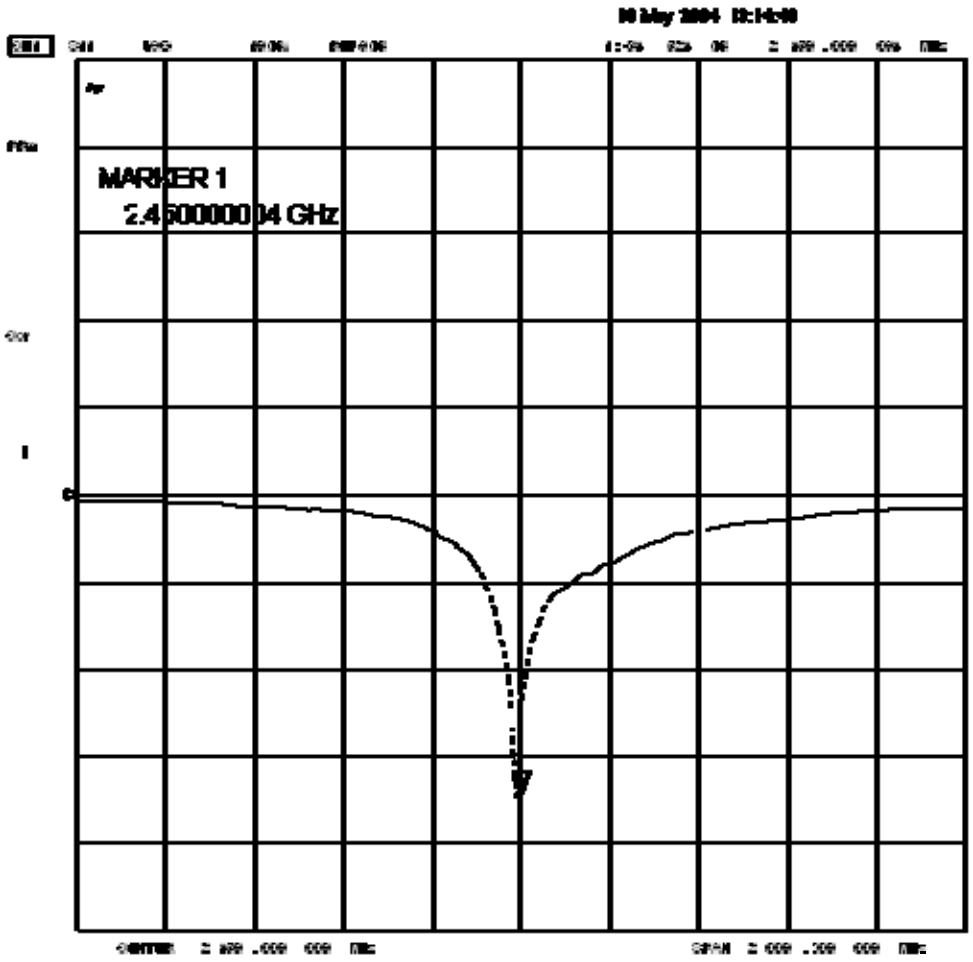
3) Input impedance

Freq = 2,450 [*MHz*] , [*R* =49.543 Ω , *X* =1.7734 Ω]

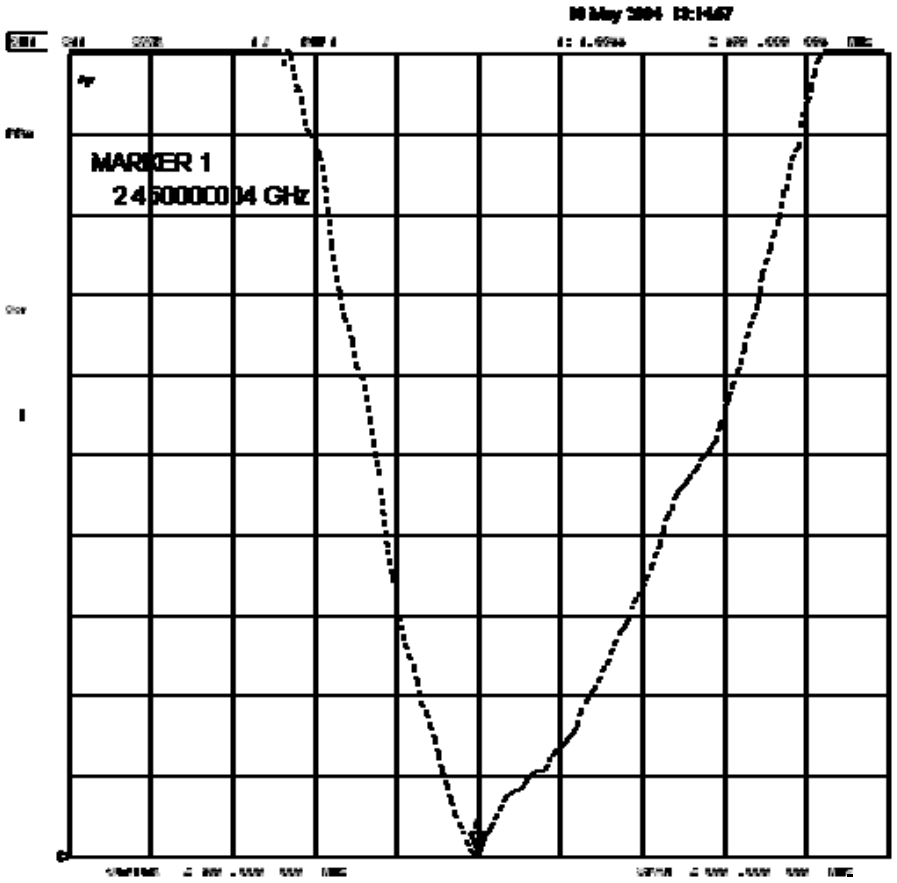


4) *Return loss*

Freq = 2450 [*MHz*] , *Return Loss* =−34.524 [*dB*]



5) *Freq* = 2450 [*MHz*] , *SWR* =1:10344

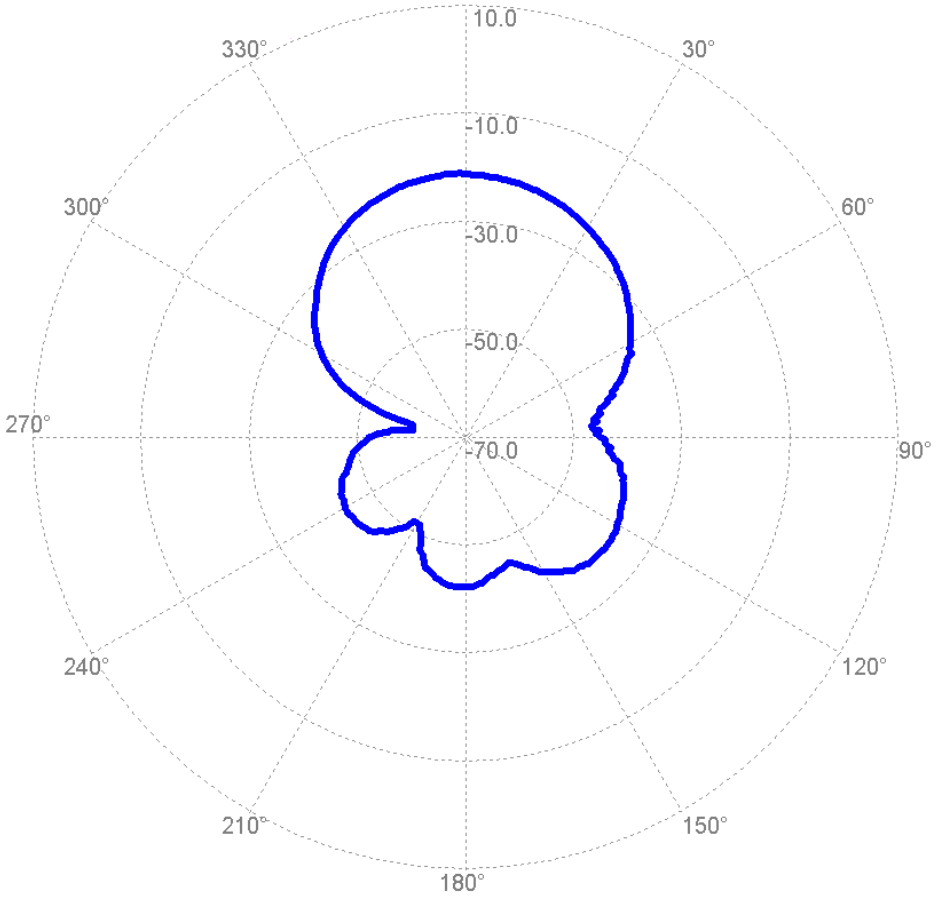


9. Practice for Patch and Patch Array antenna

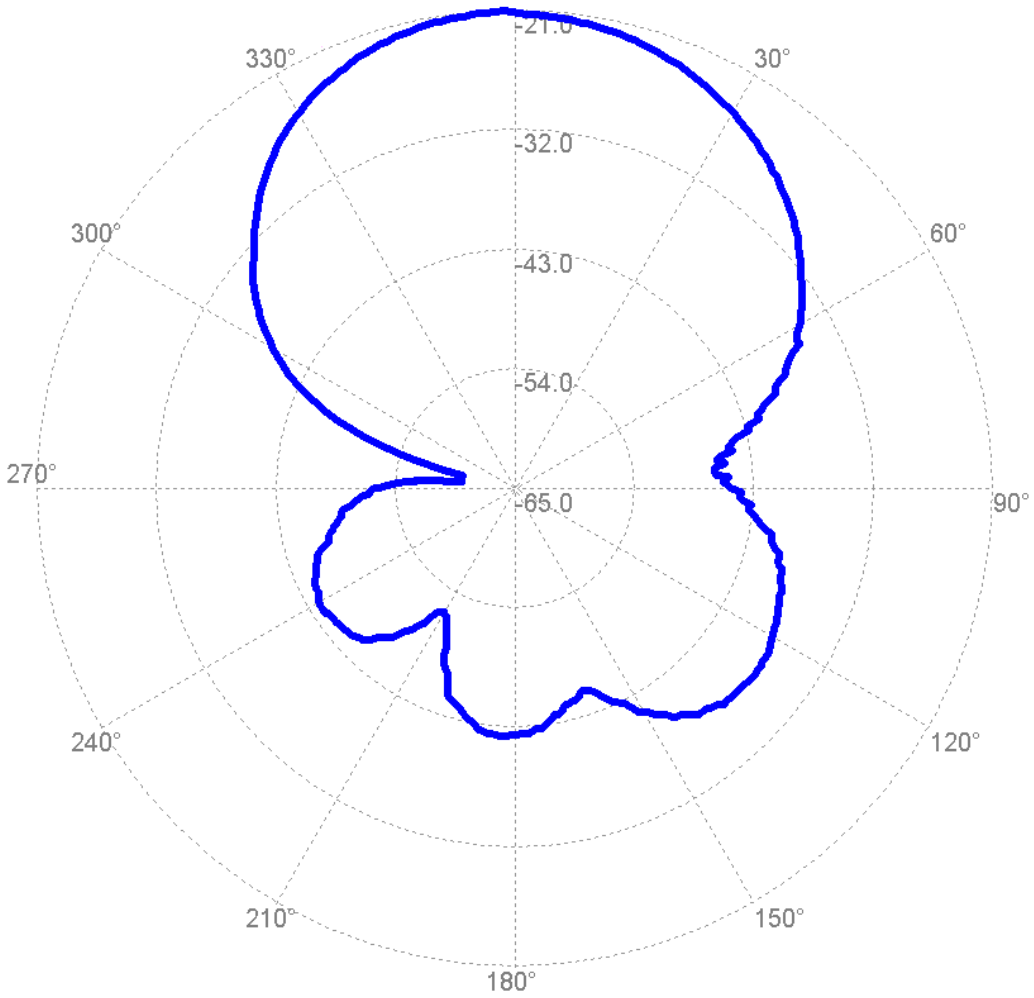
1. Practice for Patch antenna

1-1. H plane Radiation pattern measurement

14)



15)



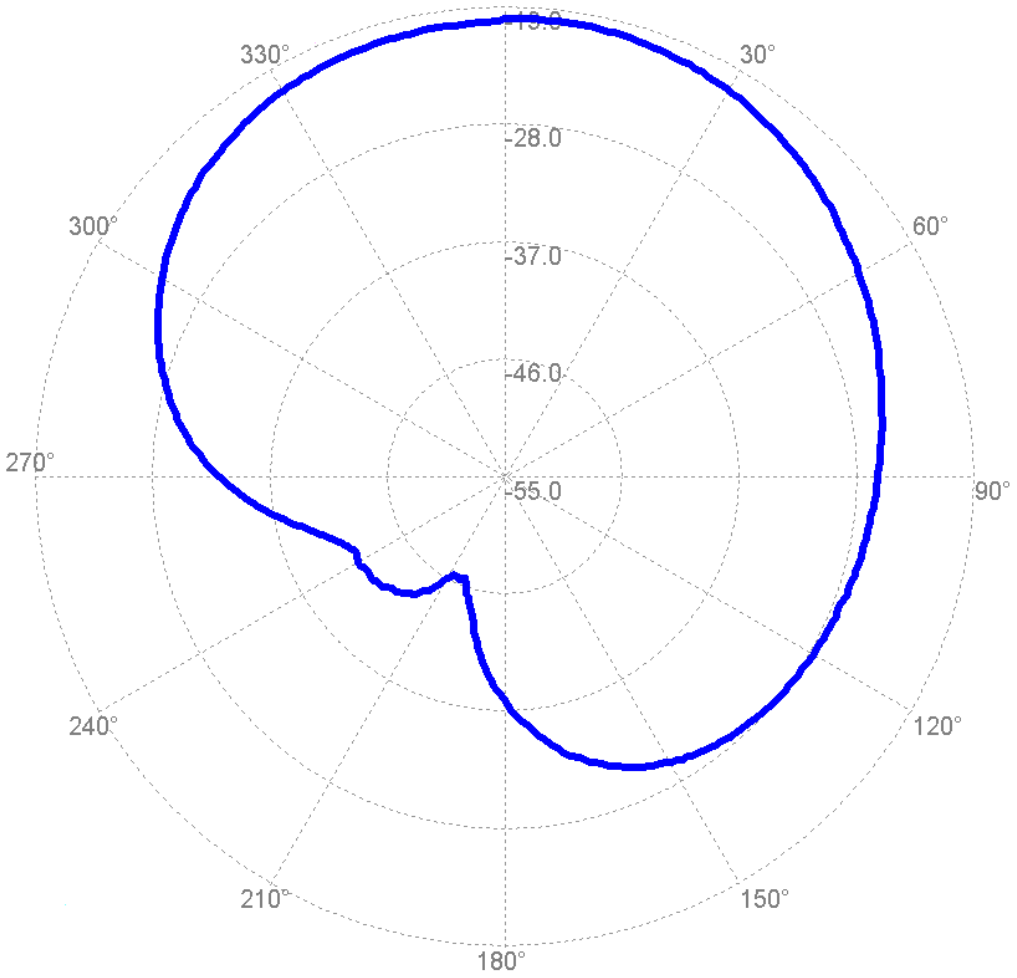
16) Maximum receive power: -21.1[*dBm*], Angle : 0°

17) [left 335°, right 26°]

18) [51°]

1-2. E plane radiation pattern measurement

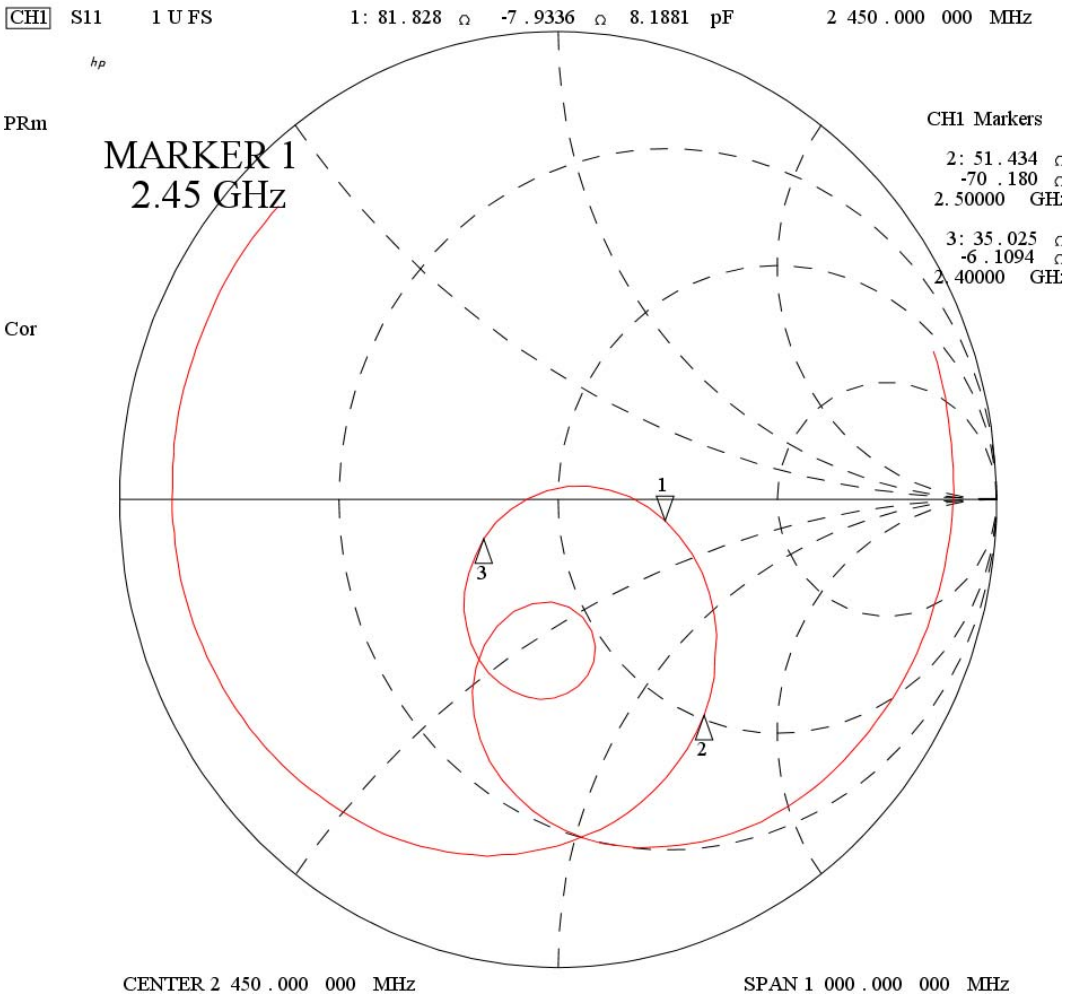
5)



2. Antenna characteristics measurement

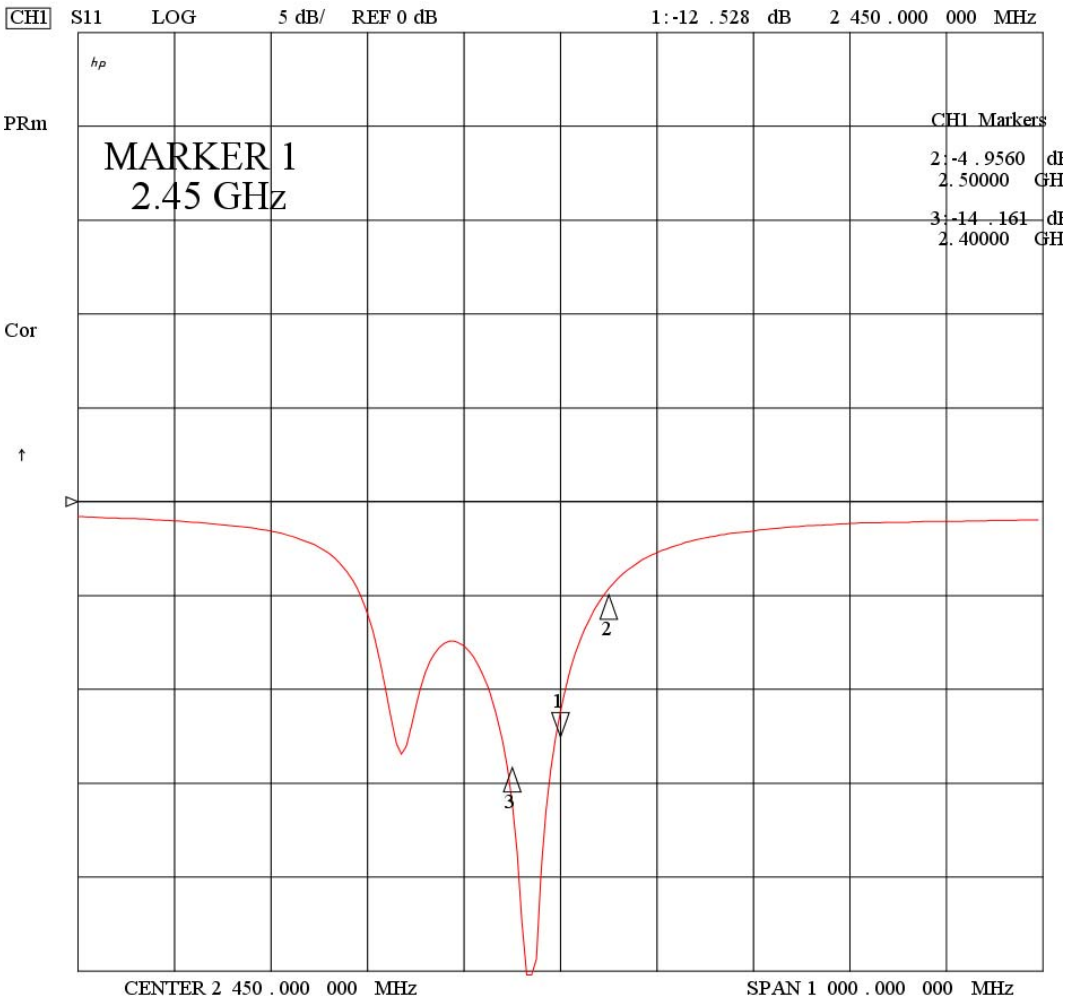
Path Antenna Input impedance

3) *Freq* = 2,450 [*MHz*] , [*R* =81.828 Ω , *X* =-7.9336 Ω]

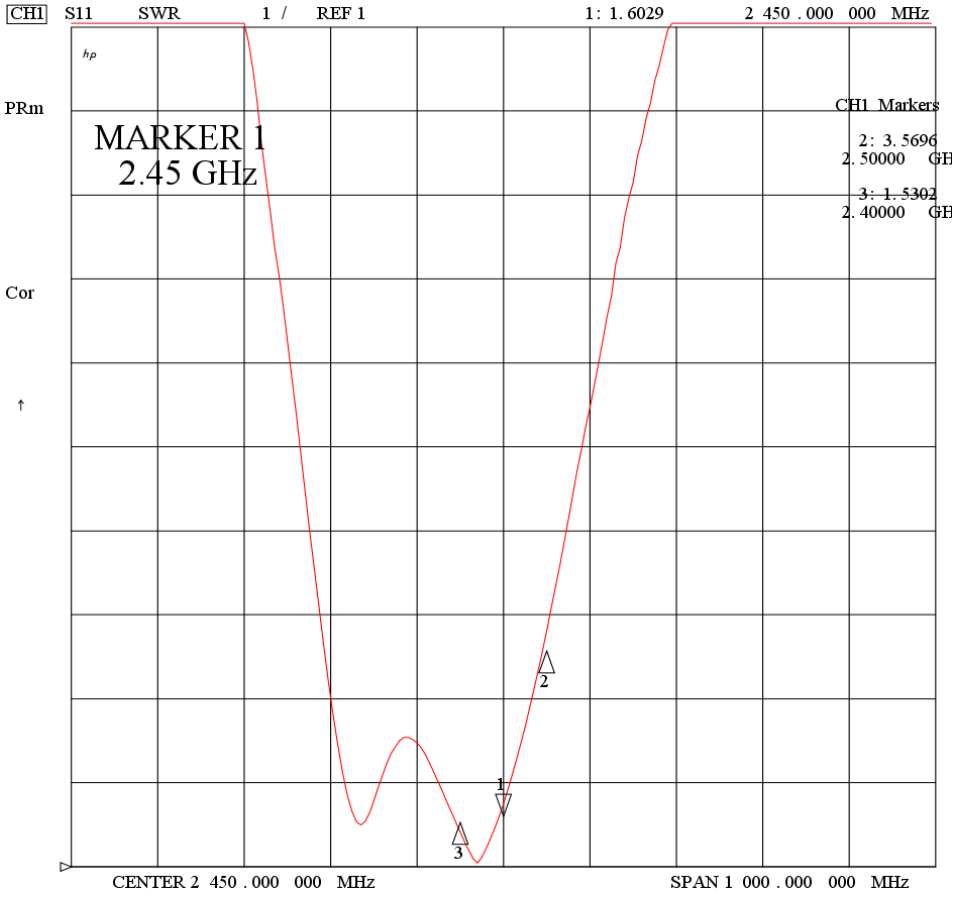


4) *Return loss*

Freq = 2450 [*MHz*] , *Return Loss* =-12.528 [*dB*]



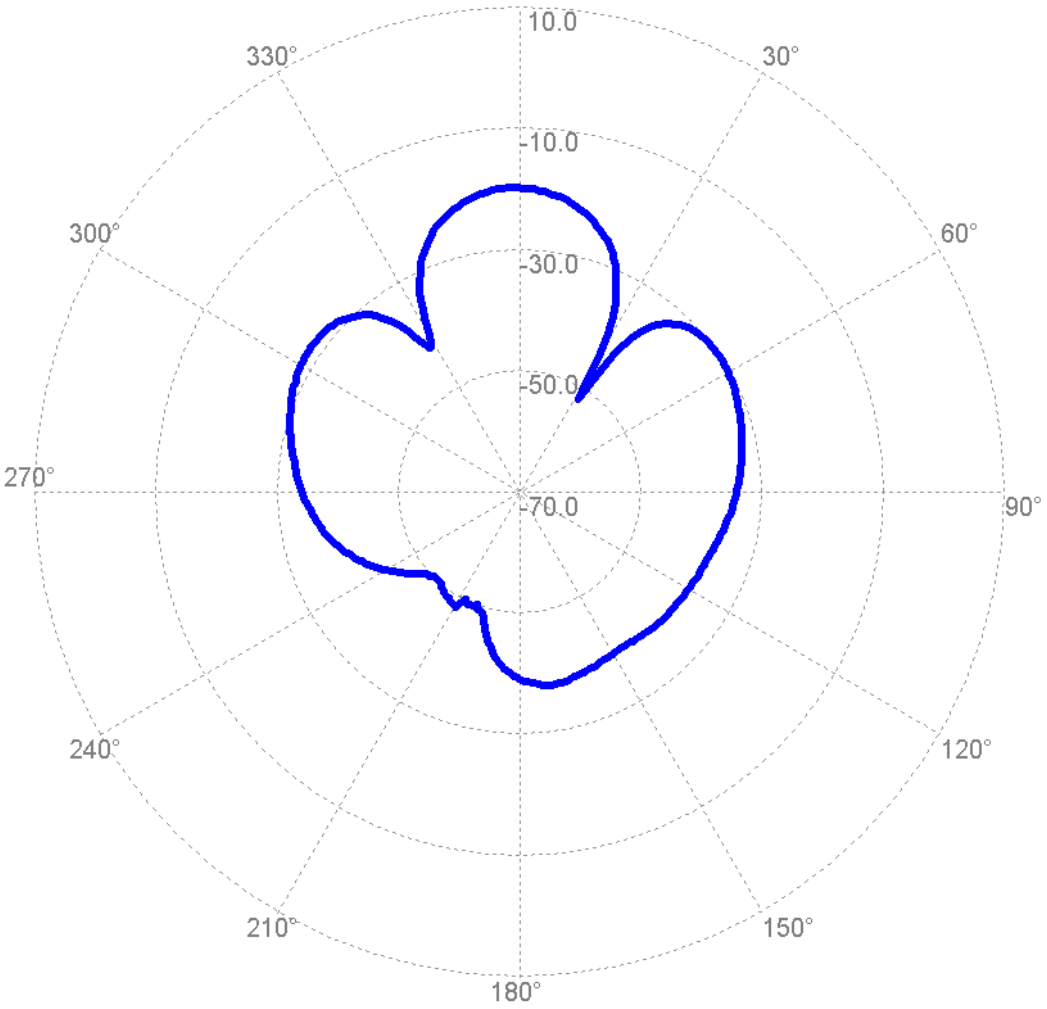
5) *Freq* = 2450 [*MHz*] , *SWR* = 1: 1.6029



3. Patch Array antenna experiment

3-1. H plane pattern measurement

8)



9) Maximum receive power : -19.9[*dBm*], Angle : 0°

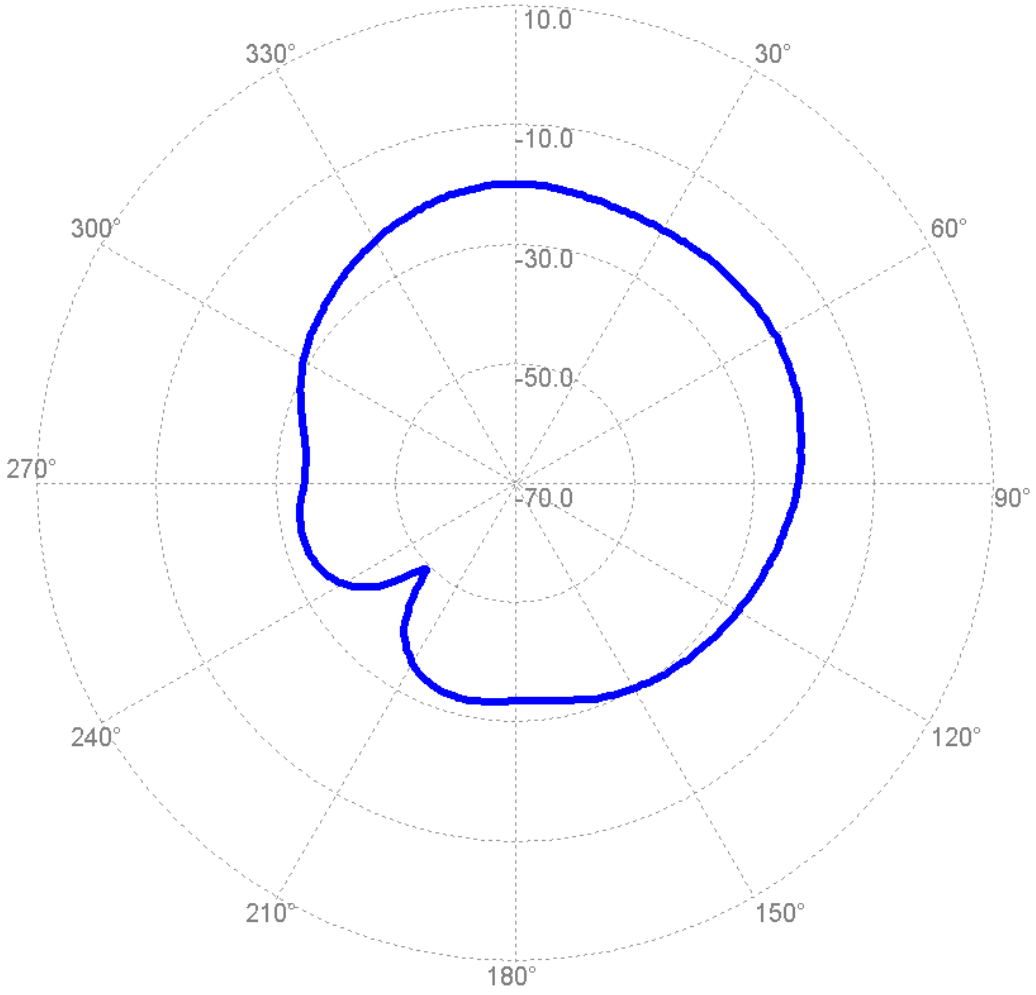
10) Record the angle of right and left half power points -3 [*dB*]

[left 346°, right 14°]

11) Find the half power beam width. [28°]

3-2. E plane radiation pattern measurement

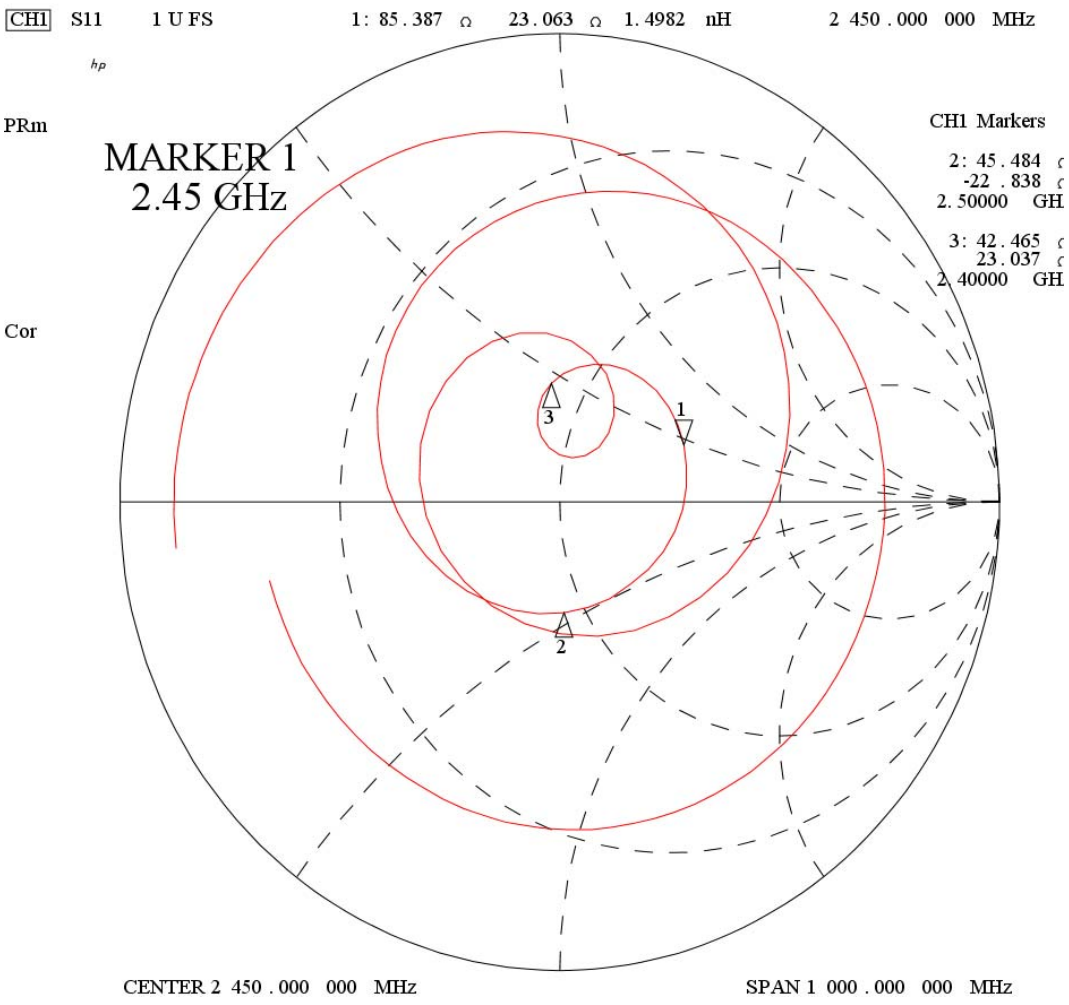
5)



3-3. Patch Array antenna characteristics measurement

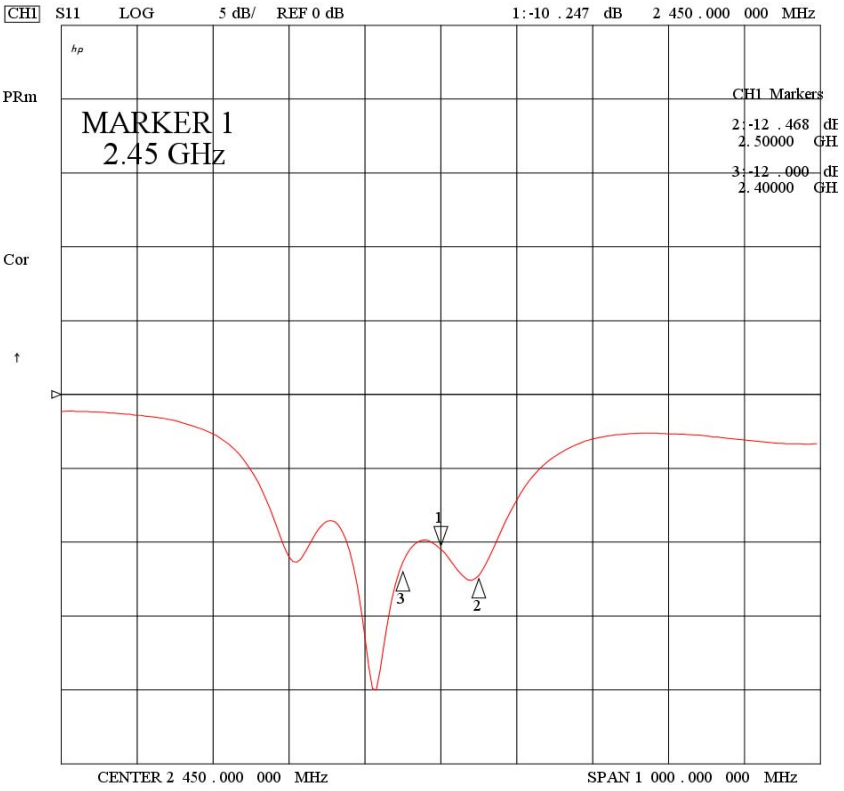
3) input impedance of the 2.45 GHz Ceramic chip antenna

Freq = 2,450 [*MHz*], [*R* =85.387 Ω, *X* =23.063 Ω]



4) Return loss

Return Loss =-10.247 [*dB*]



10. Practice for Antenna Impedance Matching

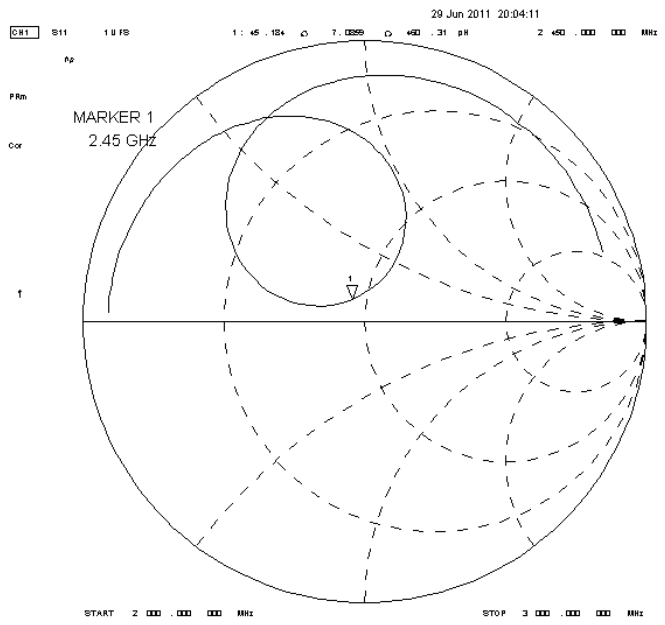
1. Design & Manufacture of antenna

2) W = 20mm , L = 31mm , D = 7.5mm

w_f = 1.5 mm , l_f =33.5mm

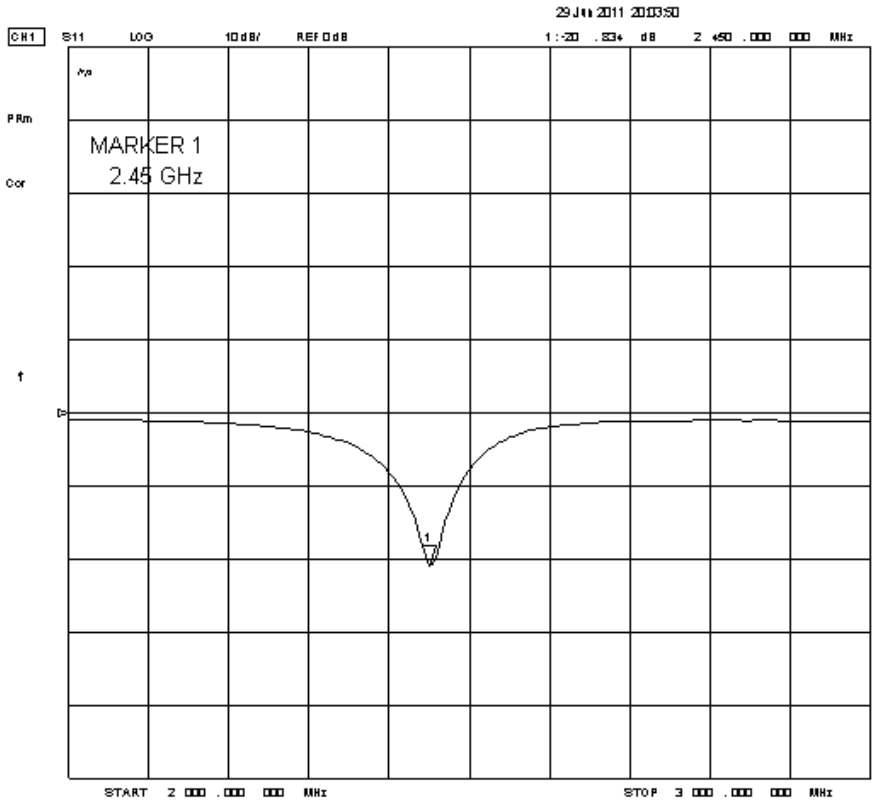
2. Measuring antenna impedance.

5) Measure impedance characteristics of the antenna manufactured to be D=L/4 with the VNA in the Smith chart. Find and record the resonant frequency.



Smith chart (2~3GHz)

6)

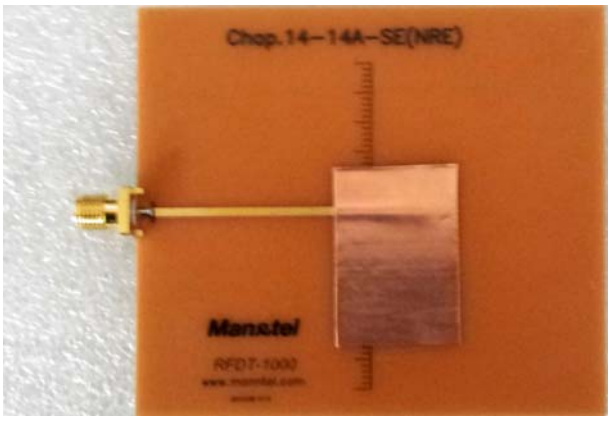


$|S_{11}|_{dB}$ (2~3GHz)

9) Present parameters (L, W, D) of the antenna.

L : 31[mm], W : 20[mm], D : 7.5[mm]

10)



Smith chart (2~3GHz)

11)

Resonant frequency: 2.45GHz

$|S_{11}|_{dB} < -10dB$ (bandwidth): 2.42 ~ 2.47GHz (50MHz)

(bandwidth /mean frequency)×100%: 2[%]

11. Practice for antenna Gain measurement

1. Measure absolute gain by using same 2 antennas.

1-1. Auto test

14) Maximum receive power: $P_{T\_Yagi\_Yagi}$ =-24.5[*dBm*], Angle: 0°

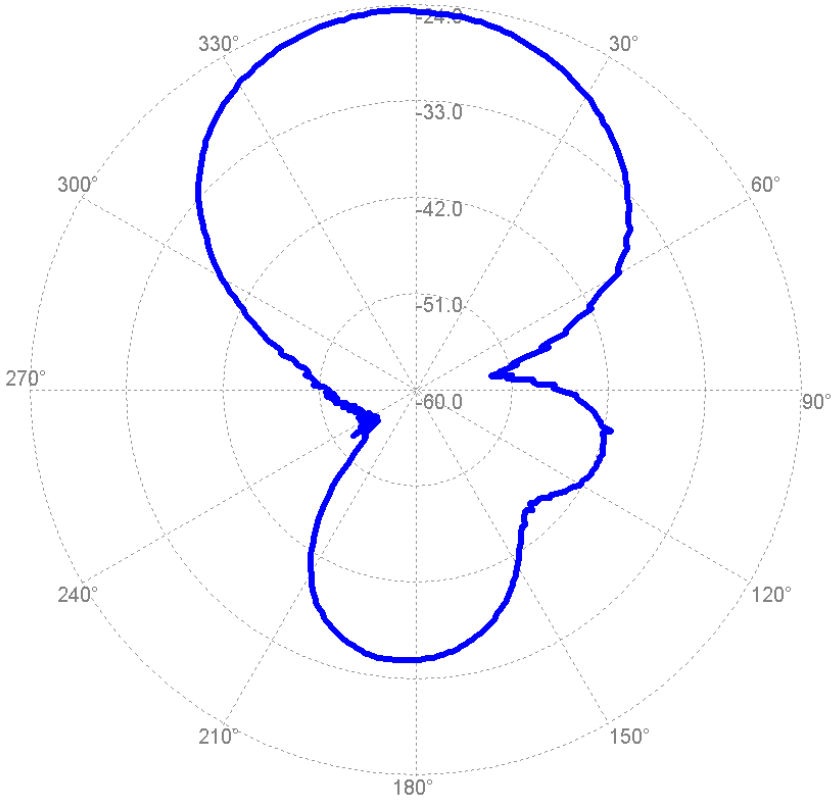


Figure 11-6. Program run screen

1-2. Cable loss test

6) Record the receive power value from the measured data on the result window. Let's say the value P_{T_Cable}.

Receive power: P_{T_Cable} =-2.5[*dBm*]

1-3. Antenna Gain calculation

Calculate the Yagi antenna gain to be measured with equation (5).

$$G_{\text{AUT}}\,[\text{dBi}]=\left(\frac{4\pi R}{\lambda}\right)[dB]+\frac{1}{2}\{P_r[dBm]-P_t[dBm]\}\ \ldots\ldots(5)$$

3) Calculate $P_{T\_Yagi\_Yagi}-P_{T\_Cable}$.

$$P_{T\_Yagi\_Yagi}-P_{T\_Cable}=(-24.5\text{dBm})-(-2.5\text{dBm})=-22\text{dB}$$

1) Calculate path loss.

2) Calculate the wavelength λ at measured frequency f=2.45GHz.

$$\lambda=\frac{c}{f}=\frac{0.3}{2.45}[m]=0.122[\text{m}]$$

- Calculate path loss.

$$\left(\frac{4\pi R}{\lambda}\right)=51.47$$

Calculate path loss in dB.

$$\left(\frac{4\pi R}{\lambda}\right)[dB]=10\log_{10}\left(\frac{4\pi R}{\lambda}\right)=17.1[\text{dB}]$$

Substitute it in equation (5) to calculate antenna gain.

$$G_{Yagi}\,[\text{dBi}]=\left(\frac{4\pi R}{\lambda}\right)[dB]+\frac{1}{2}\{P_{T\_Yagi\_Yagi}-P_{T\_Cable}\}=6.1\,[\text{dBi}]$$

2. Compare gain of two different antennas

2-1. Auto test

12) Maximum receive power: $P_{T\_Yagi\_Dipole}$ =-22.9[dBm], Angle: 1°

12. Manufacture of Dipole antenna

1. Dipole antenna manufacture

915Mhz Dipole Antenna

1) Original wavelength[lambda, λ : 328.04[mm], 82.01[mm]

Contracted wavelength[lambda, λ : 311.64[mm], 77.90[mm]

2450Mhz Dipole Antenna

2) Original wavelength[lambda, λ : 122.45[mm], 30.66[mm]

Contracted wavelength[lambda, λ : 116.33[mm], 29.08[mm]

2. Antenna characteristics measurement

7) Input impedance Freq= 914[MHz], [R=53.5Ω, X= -20.7Ω]

8) Rreturn loss Freq= 914[MHz], Return Loss : -23[dB]

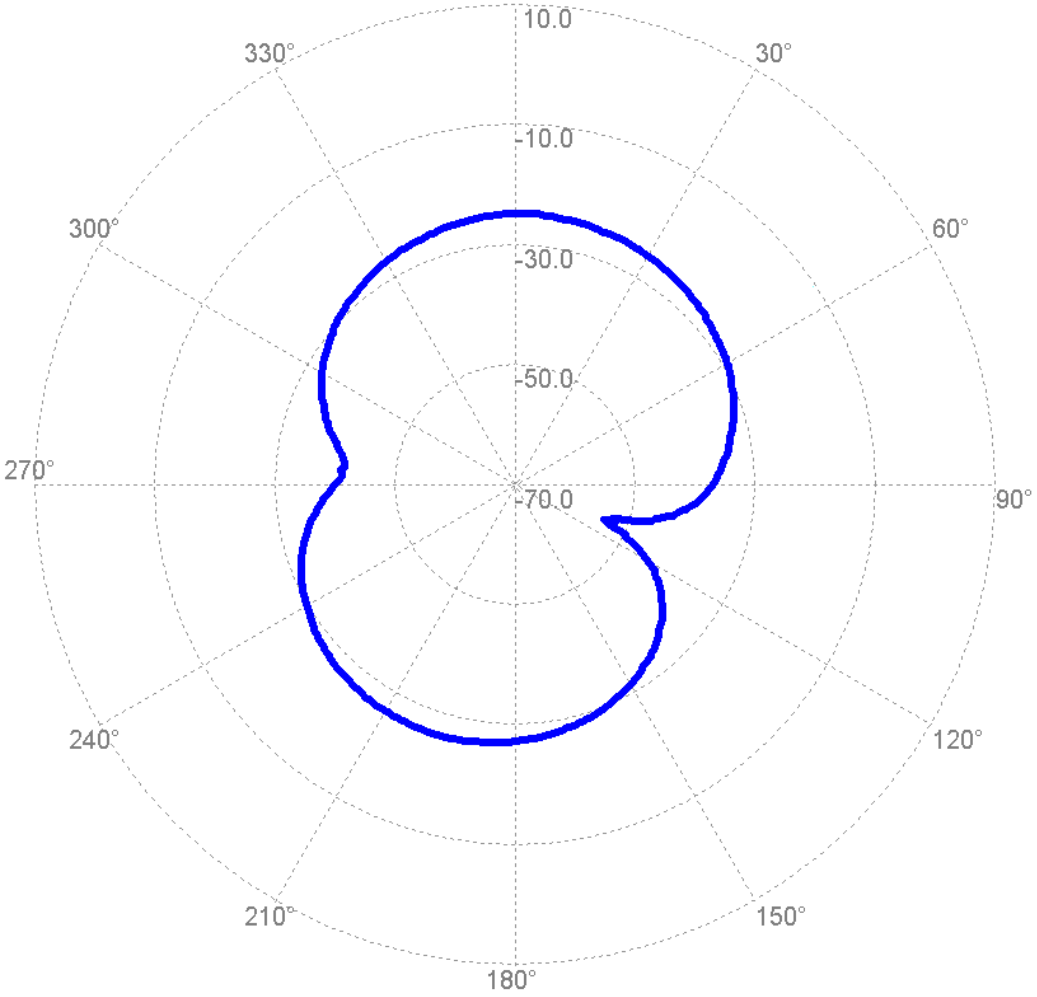
9) SWR SWR : 1:1.235

10) length of each Dipole antenna 150[mm]

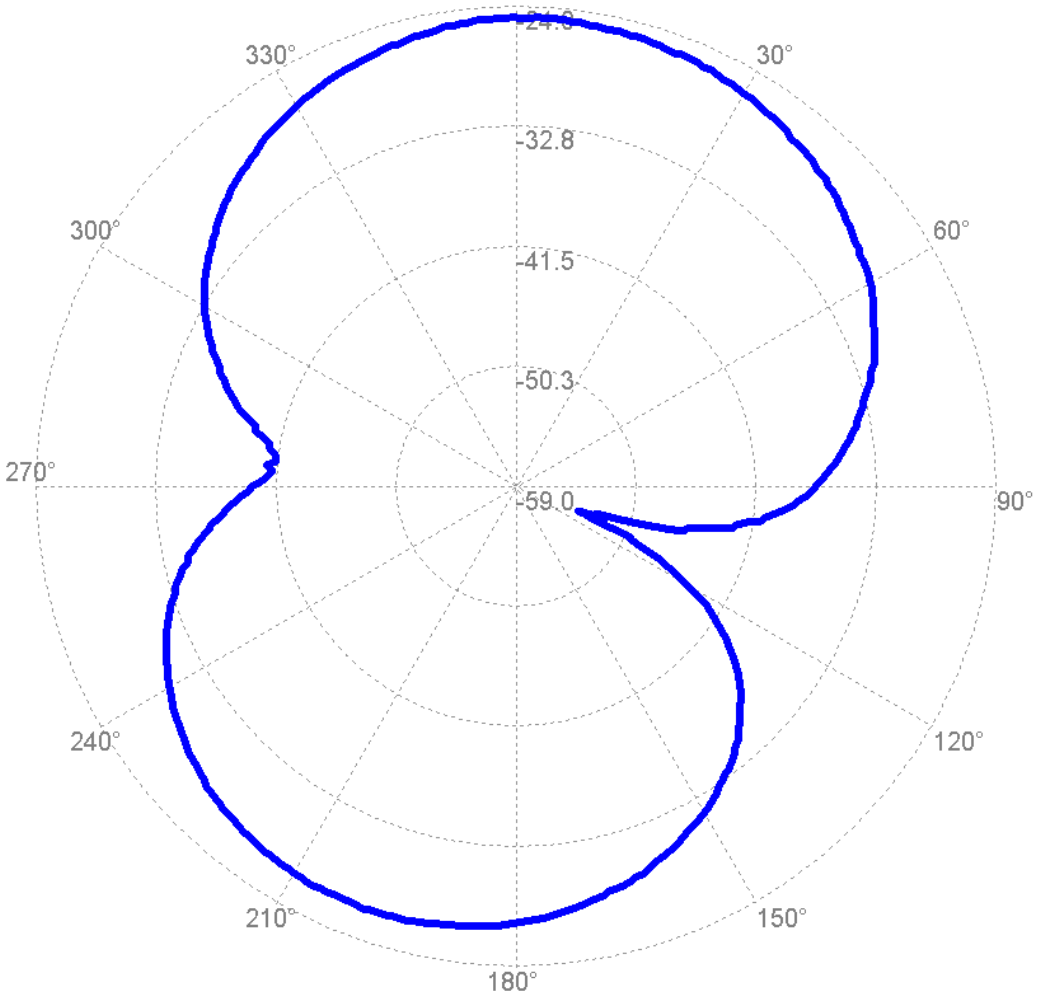
3. E Plane radiation pattern experiment measurement

915Mhz Dipole Antenna

14)



15)



16) Maximum receive power: -24.8 [*dBm*], Angle: 5 °

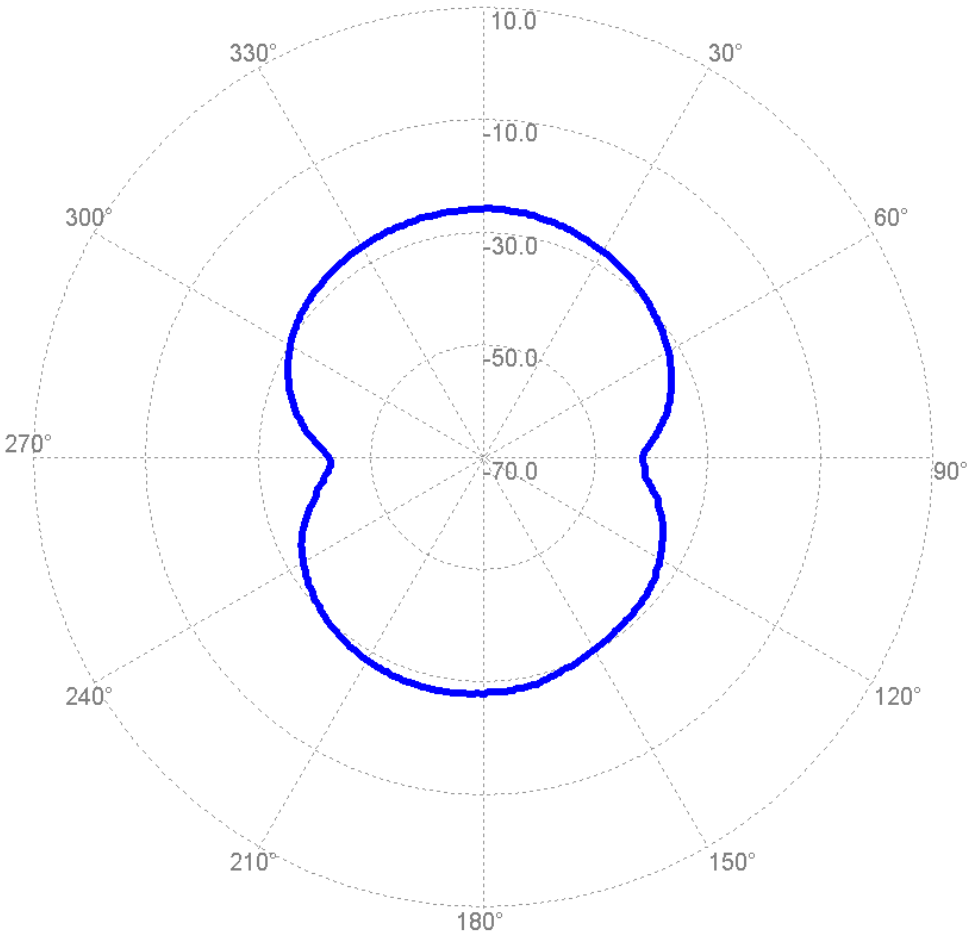
17) angle of right and left half power points -3 [*dB*]

[left 332°, right 50°]

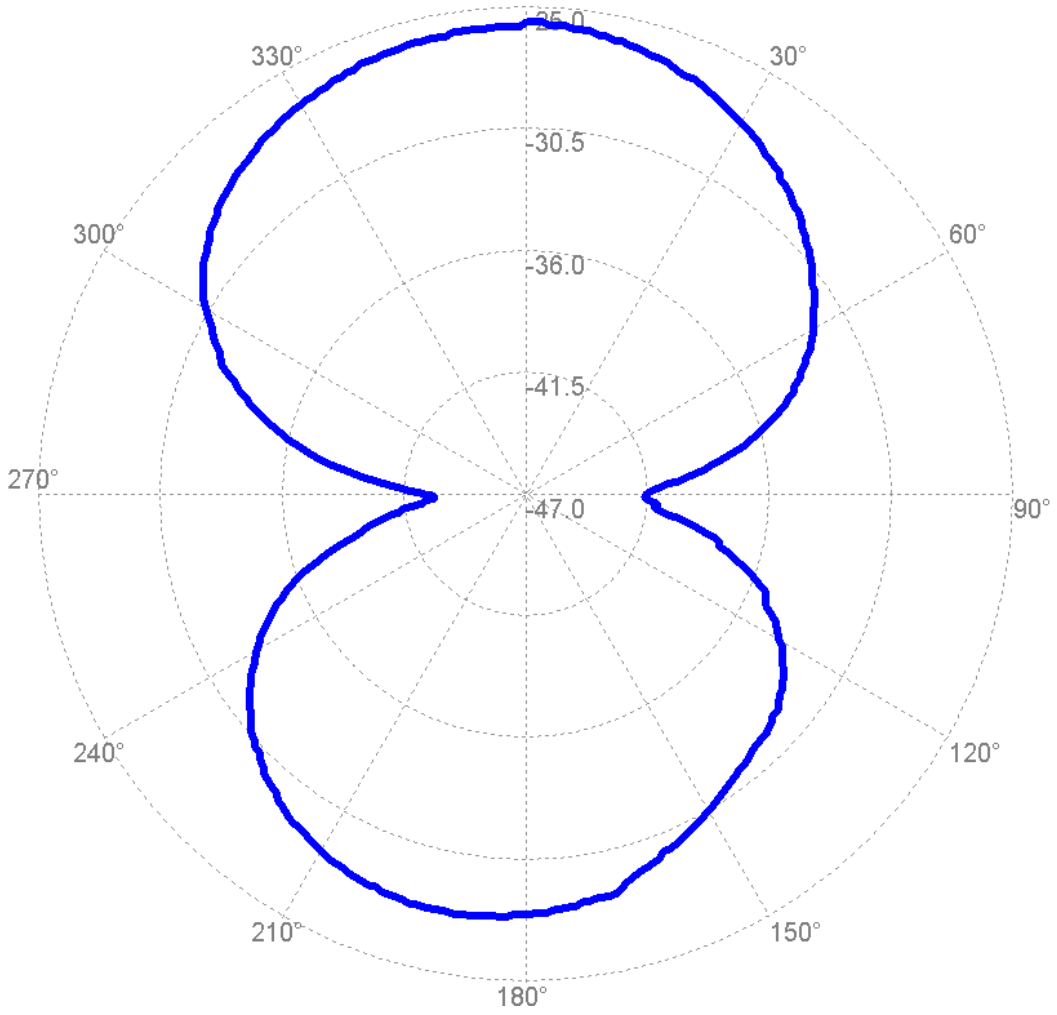
18) Find the half power beam width [78°]

2450Mhz Dipole Antenna

27)



28)



16) Maximum receive power: -25.7 [*dBm*], Angle 1 °

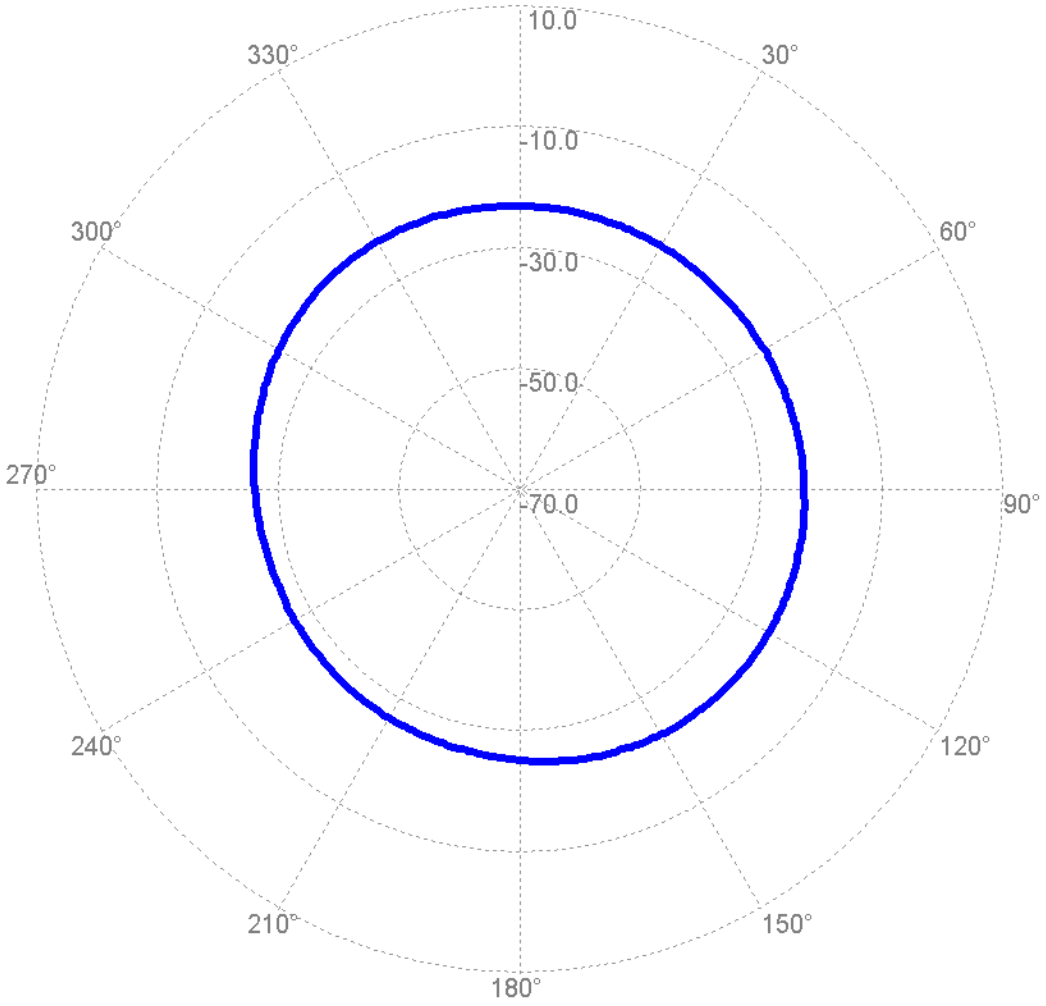
17) angle of right and left half power points -3 [*dB*]

[left 310°, right 40°]

18) Find the half power beam width [90 °]

4. H plane radiation pattern measurement

14)



2-2. Gain difference

1) Compare the maximum receive power levels of the Yagi antenna and the dipole antenna.

$$P_{T\_Yagi\_Yagi}\ [\text{dBm}] - P_{T\_Yagi\_Dipole}\ [\text{dBm}] = -8\ [\text{dB}]$$

2) Calculate dipole antenna gain (G_{Dipole} [dBi]).

$$G_{Dipole}\ [\text{dBi}] = P_{T\_Yagi\_Dipole}\ [\text{dBm}] - P_{T\_Yagi\_Yagi}\ [\text{dBm}] + G_{Yagi}\ [\text{dBi}]$$

13. Manufacture of Loop antenna

1. 914 MHz Loop antenna manufacturing experiment

1) Calculate a wavelength of a 914 MHz loop antenna.

328.04[mm]

2. Antenna characteristics measurement

4) Input impedance at the center frequency of 914.5125 MHz.

Freq= 914.5125 [MHz], [R=44.153Ω , X= -8.921Ω]

5) Freq= 914.5125 [MHz], Return Loss : -19 [dB]

6) 914.5125 [MHz], SWR : 1:126

7) Reduce the length of the loop antenna 118 [mm]

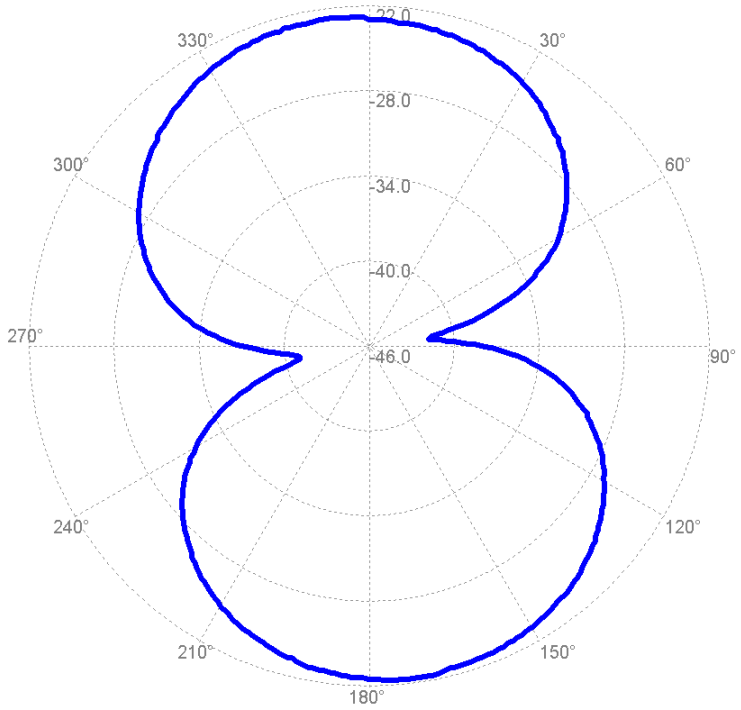
8)

- Impedance: [R]=44.153[Ω] X=-8.921
- Freq=914[MHz], SWR : 1:1.26
- Return Loss : -19[dB]

3. E Plane radiation pattern measurement

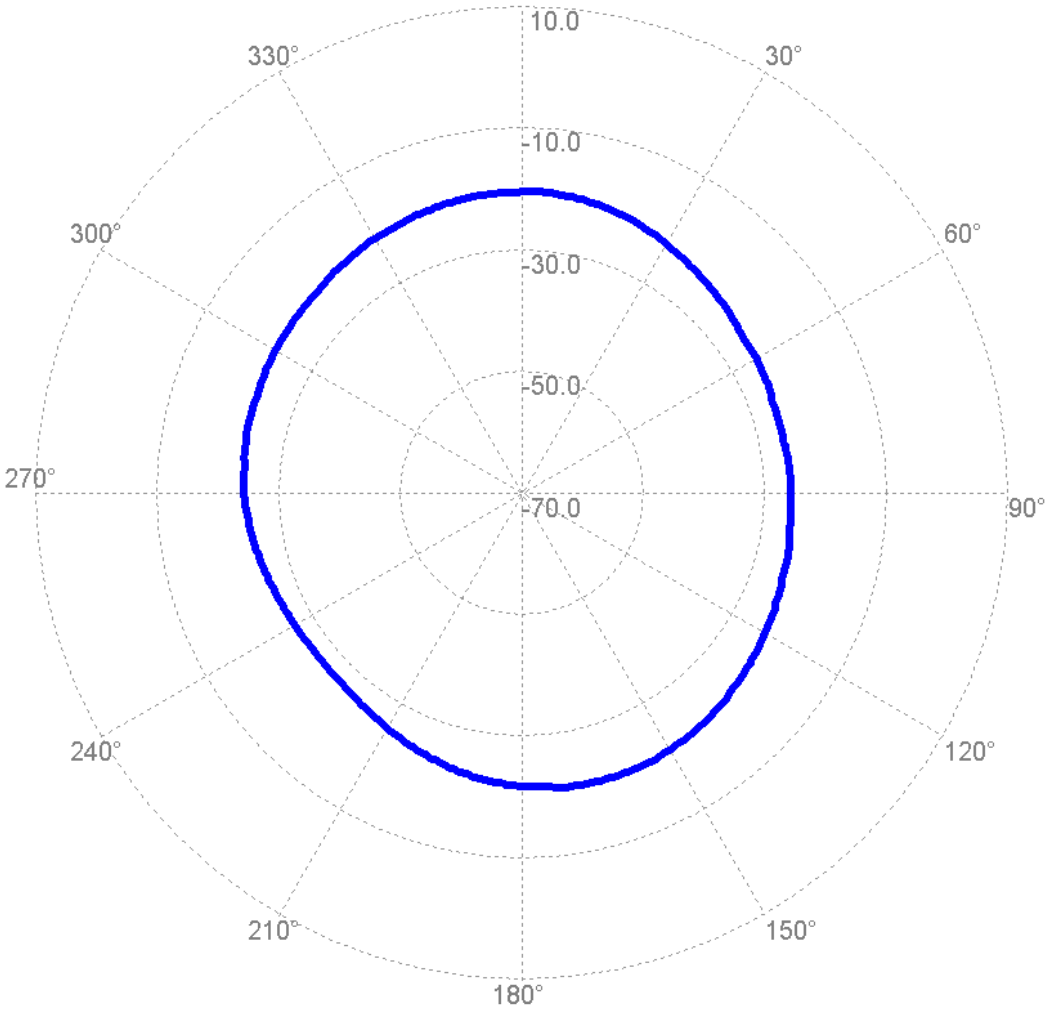
914 MHz Loop antenna

15)



4. H-Plane Radiation pattern measurement

8)

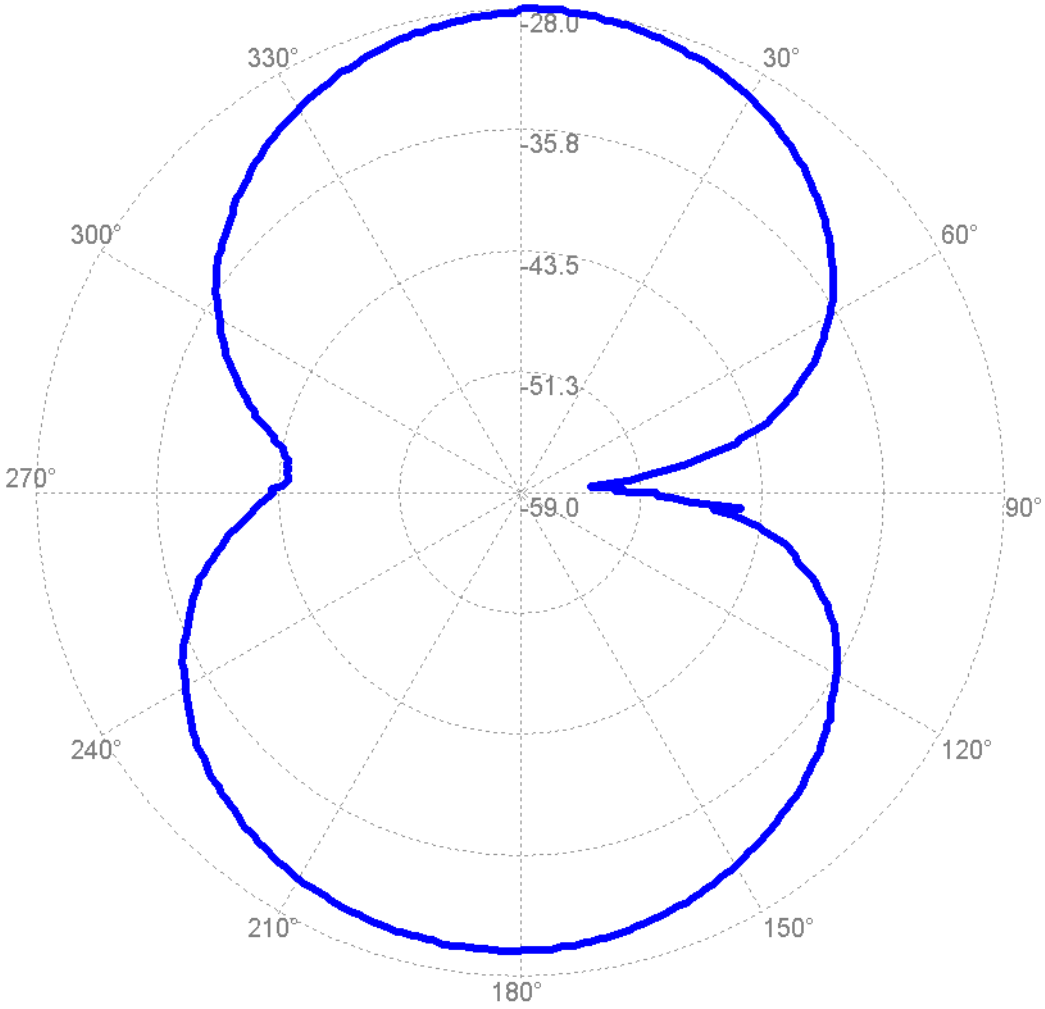


5. 2.45 GHz Loop antenna manufacturing experiment

1) wavelength of a 2.45GHz loop antenna. 122.45[mm]

5) Record the final length of the loop. 115[mm]

11)



14. Manufacture of Yagi antenna

1. 2.45 GHz Yagi antenna manufacture

1) [lambda, λ] = 122.45[*mm*], $\lambda/4$ =36.61 [*mm*]

4-3. E-Plane radiation pattern measurement.

12)

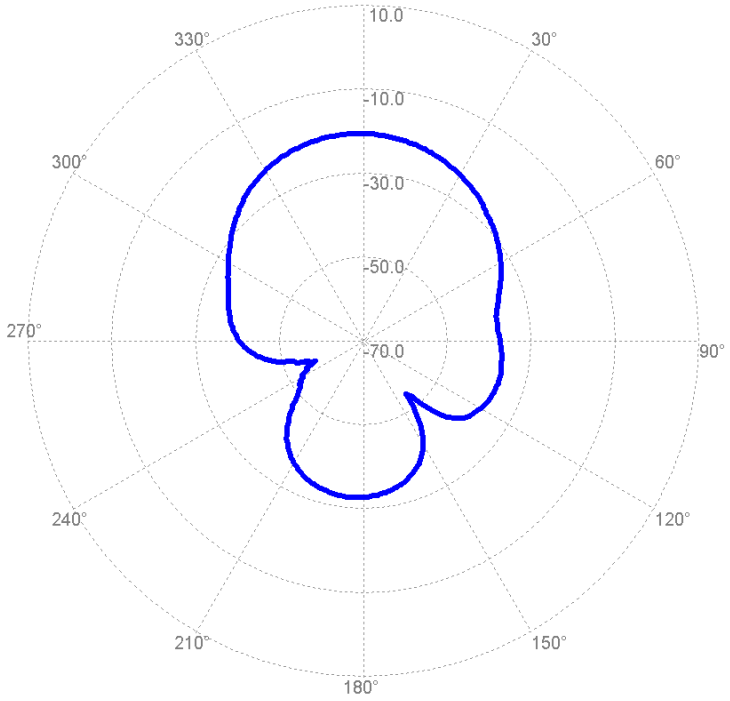
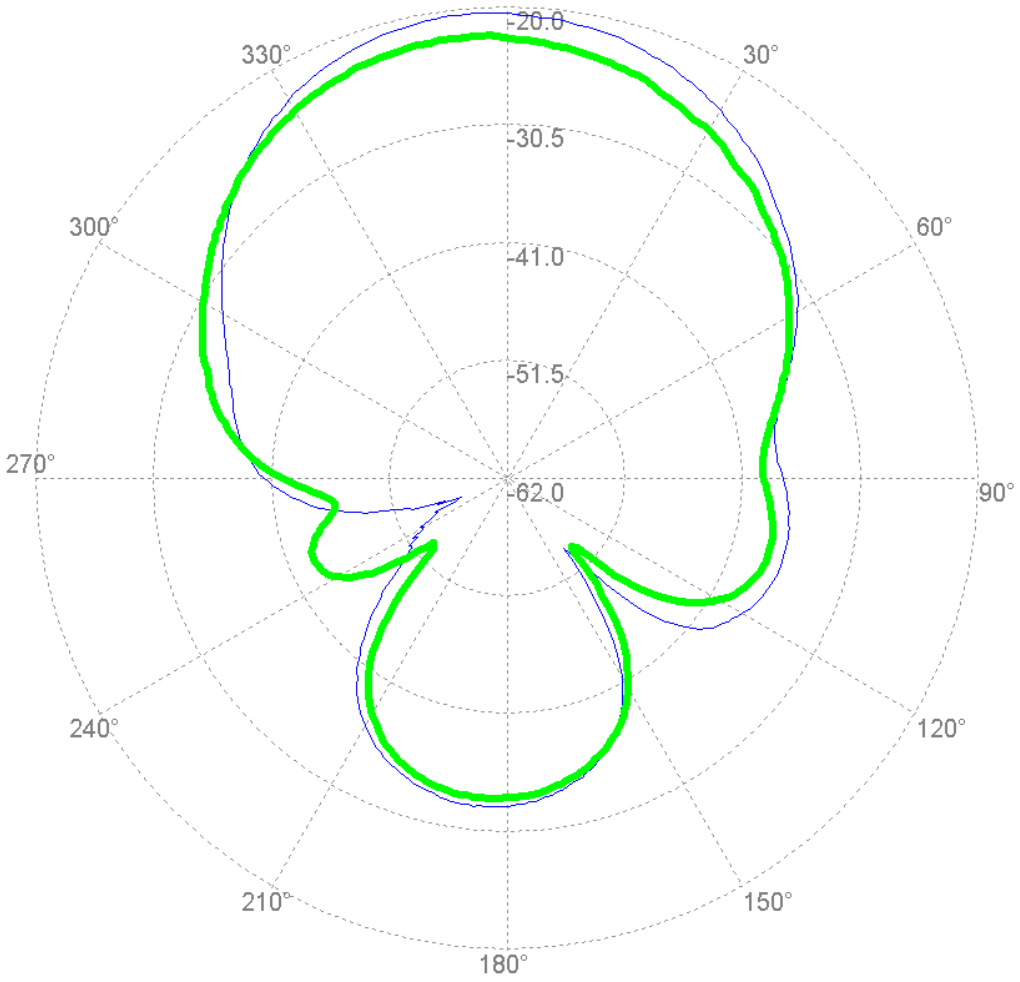


Figure 4-5. Measured radiation pattern


-20.0
-30.5
-41.0
-51.5
-62.0
30°
60°
90°
120°
150°
180°
210°
240°
270°
300°
330°

Records of Change

Date	Revision	Reason for Change
28 FEB 2012	**Rev 1.0**	