

AM Telecom

APPROVAL SHEET

MULTI BAND DIPOLE ANTENNA		
NO	MODEL	FREQUENCY RANGE
1	HW- MULTI-GA-RSMA	806 ~ 960 MHz
		1447.9 ~ 1510.9 MHz
		17575.42MHz
		1710 ~ 2700 MHz



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(ANTENNA SPECIFICATION)

1. MODEL: HW- MULTI-GA-RSMA

2. APPLICATION: This specification is provided for MULTI DIPOLE ANTENNA.

3 ANTENNA used condition

Portable Fixing Movement Out-door In-door Etc()

4. ANTENNA Drawing

Attached Drawing paper

5. Electrical specification and performance

Satisfied next data with real used or similar environment conditions.

No.	ELECTRICAL DATA	SPECIFICATIONS	REMARK
5. 1	FREQUENCY RANGE	806 ~ 960 MHz	
		1447.9~1510.9 MHz	
		1575.42MHz	
		1710 ~ 2700 MHz	
5. 2	IMPEDANCE	50 Ω NOMINAL	
5. 3	V. S. W. R	806~960 MHz	LESS THAN 1:4.0
		1447.9~1510.9 MHz	LESS THAN 1:2.5
		1575.42MHz	LESS THAN 1:2.5
		1710~2700 MHz	LESS THAN 1:3.0
5. 4	GAIN	806~960 MHz	LESS THAN 3dBi
		1447.9~1510.9 MHz	LESS THAN 3dBi
		1575.42MHz	LESS THAN 3dBi
		1710~2700 MHz	LESS THAN 3dBi
5. 5	RADIATION PATTERN	OMNI - DIRECTIONAL	
5. 6	POLARIZATION	VERTICAL	

6. Hardware specification and mechanical

No.	MECHANICAL	SPECIFICATIONS	REMARK
6. 1	PCB	FR-4	
6. 2	“ A” COVER	NYLON GRASS	
6. 3	“ B” CONER	NYLON GRASS	
6. 4	JOINT PIN*2EA	BRASS	Ni-PLATING
6. 5	SLEEVE	NYLON GRASS	
6. 6	SMA(m) CONNECTOR	BRASS	Ni-PLATING
6. 7	ANTENNA TOTAL LENGTH	150.5 ± 2 mm	

7. Reliability test and standards

NO	TEST	TEST Method	Decision
1	Heat shock test	Temp.: -30℃(30min.)~50℃ (30min.), 24 CYCLE	* No transform about antenna * Satisfy the Electrical specification and performance
2	High-Tem. storage	Temp.: 60℃ , 48 Hour	
3	High-Humidity storage	Temp.: 60℃ ,Humidity: 95% 48 Hour	
4	High-Tem. storage	Temp.: -40℃ , 48 Hour	
5	Salt-spray	Salinity: 5% 48 Hour	

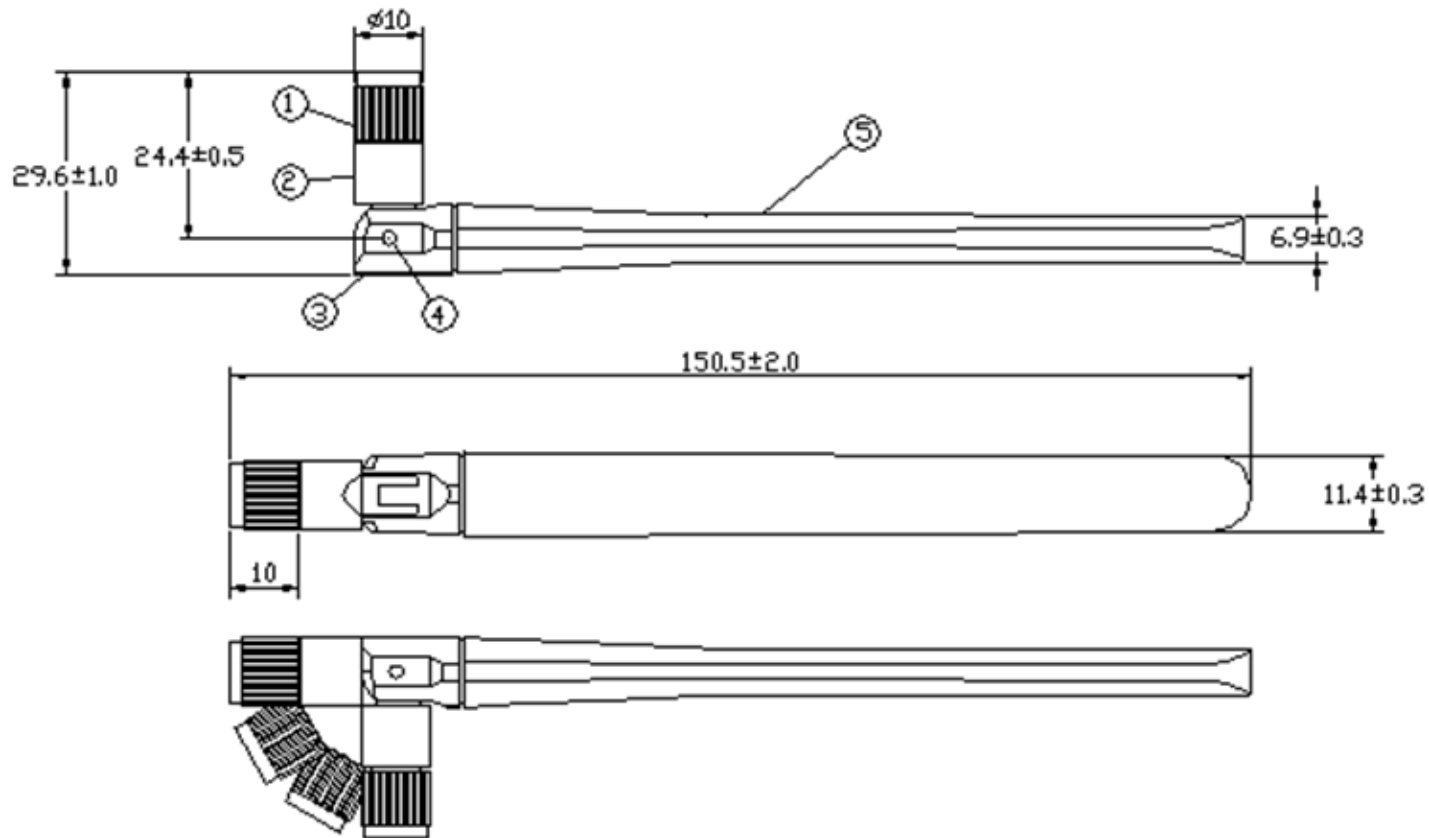
8. TEST and Q/C

This specification is according to fixed demands and suitable Hanwool technology Q/C provision.

But it is possible to skip No. 7 demands, after consultation with buyer.

Hanwool Technology

TOL Unless Noted	DIMENSION	mm	No	DATE	REVISION	CHECKER
X. = ±0.5	SCALE		⚠	201 . . .		
X.X = ±0.1	MATERIAL		⚠	201 . . .		
X.XX = ±0.05	FINISH		⚠	201 . . .		



5	SLEEVE	NYLON GRASS	
4	JOINT PIN*2ea	BRASS	NI-PLATING
3	'B' COVER	NYLON GRASS	
2	'A' COVER	NYLON GRASS	
1	SMA(n) CONN.	BRASS	NI-PLATING
No.	PART NAME	MATERIAL	FINISH

TITLE	MULTI DIPOLE ANTENNA ASS'Y	MODEL	HW-MULTI-GA-RSMA
Drawn	Checked	Approval	Date
W.C,LEE		C.G,NAM	2014.09.24
DWG No.	File Name		
140924-01	AM Telecom		

19 Aug 2014 11:59:27

CH1 MEM LOG 10 dB/ REF 0 dB

5:- 5.6915 dB 960.000 000 MHz

Cor

MARKER 5
960 MHz

CH1 Marker s

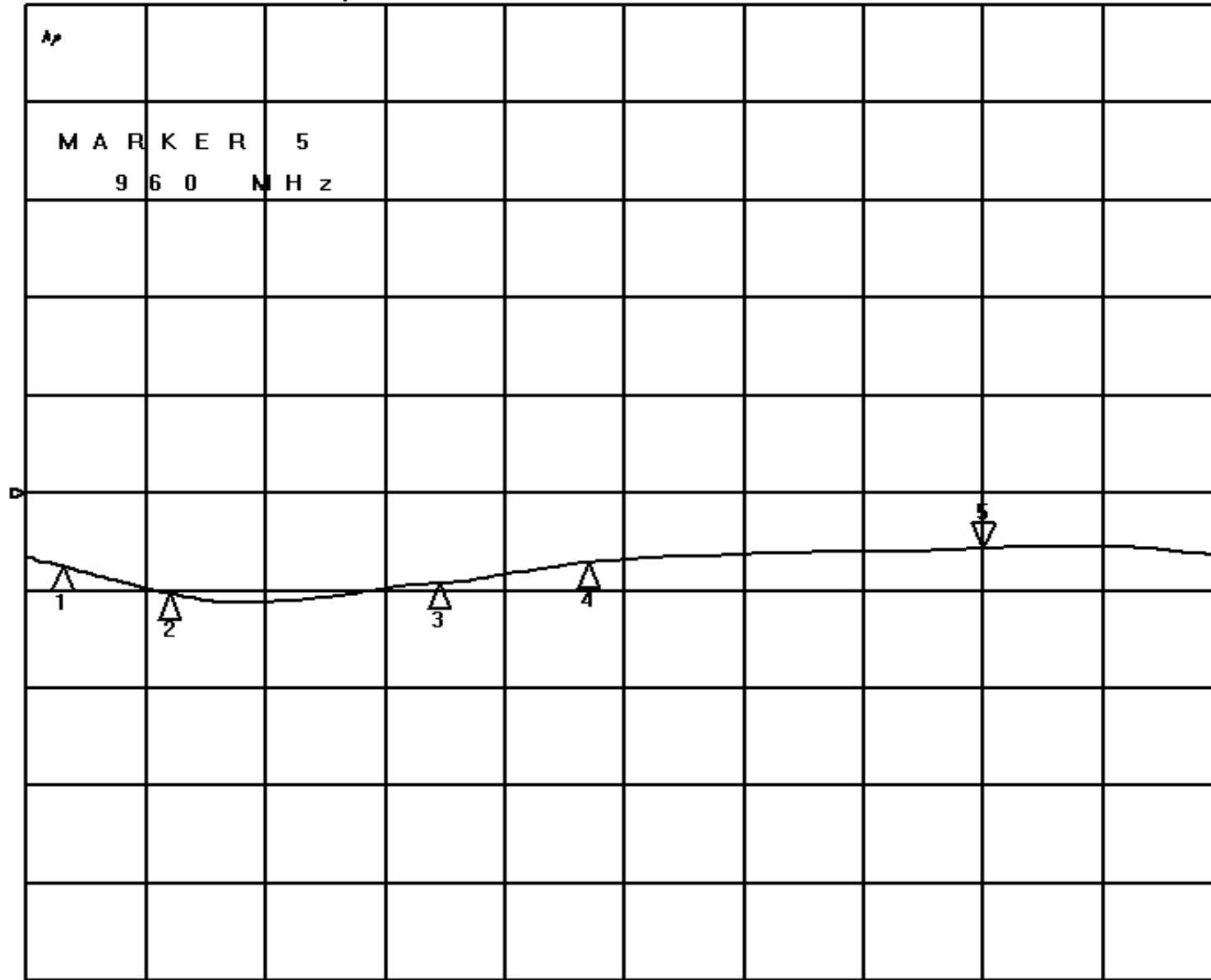
1:- 7.5466 dE
806.000 MHz

2:- 10.325 dE
824.000 MHz

3:- 9.3022 dE
869.000 MHz

4:- 7.1230 dE
894.000 MHz

f



START 800.000 000 MHz

STOP 1 000.000 000 MHz

19 Aug 2014 11:59:38

CHI MEM 1 UFS

5: 26.389 μ 37.305 μ 6.1846 nH

960.000 000 MHz

hp

MARKER 5

Cor

960 MHz

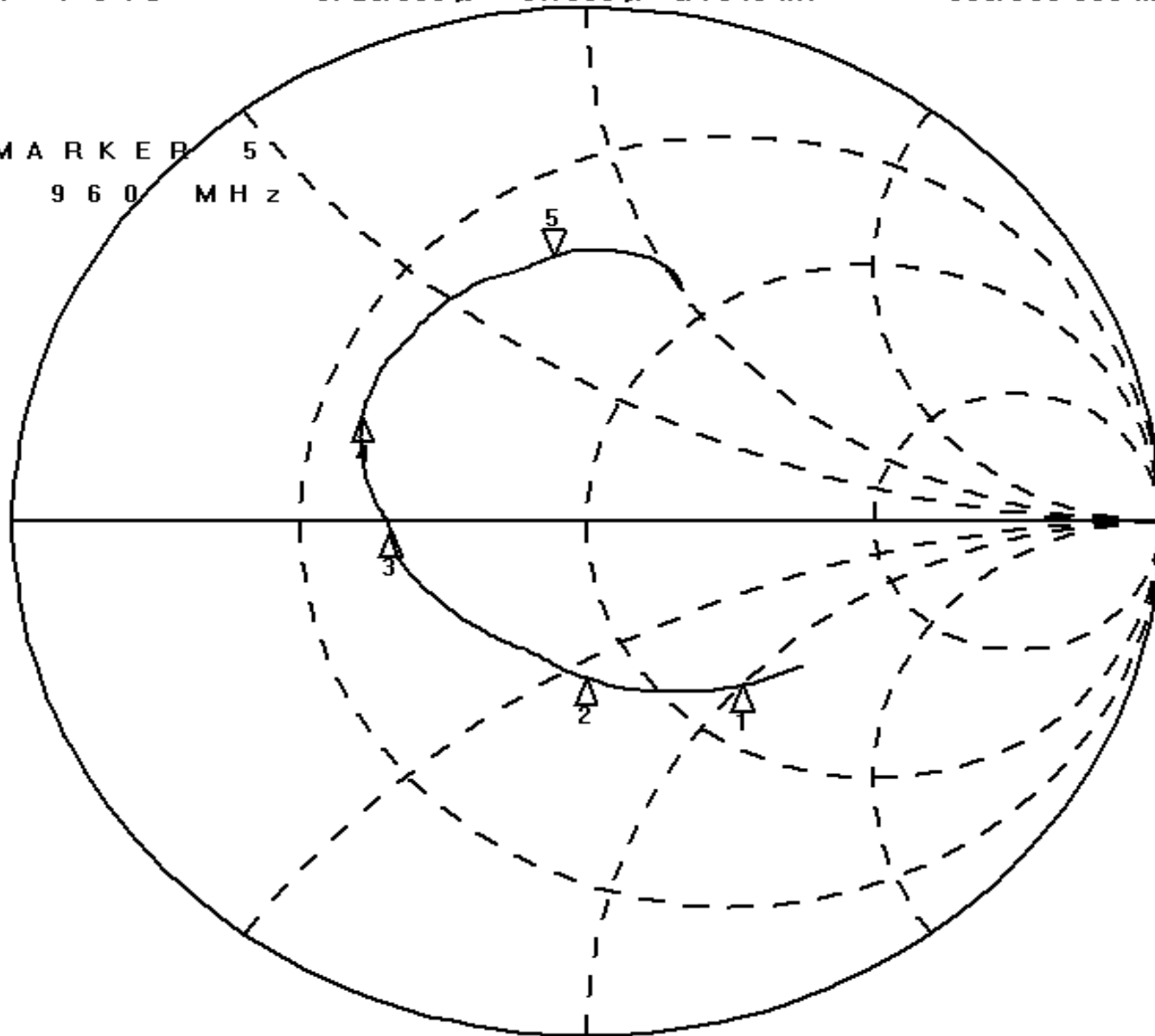
CHI Markers

1: 65.484 μ
- 50.559 μ
806.000 MHz

2: 41.383 μ
- 27.787 μ
824.000 MHz

3: 24.487 μ
- 950.20 nH
869.000 MHz

4: 20.426 μ
10.409 μ
894.000 MHz



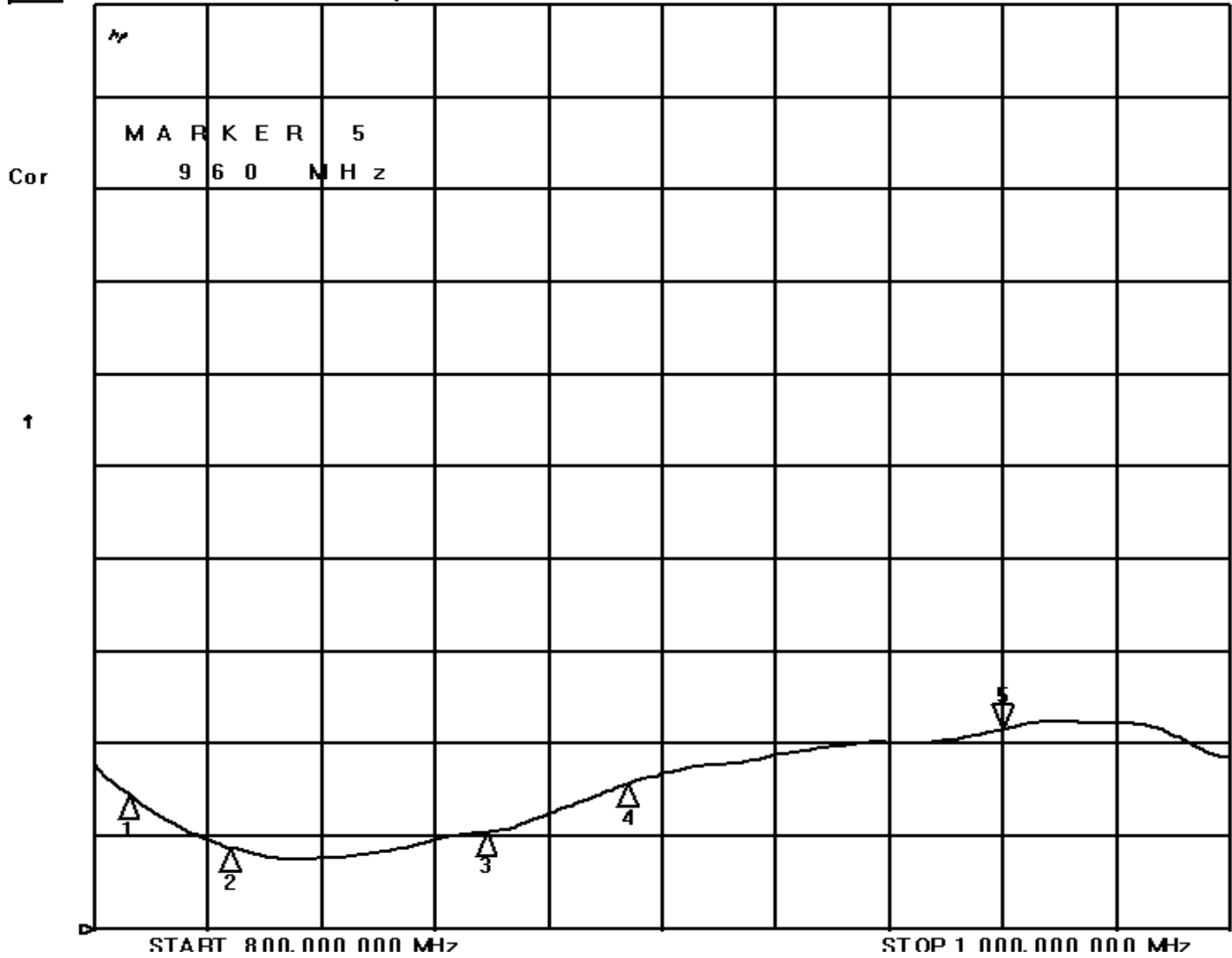
START 800.000 000 MHz

STOP 1 000.000 000 MHz

19 Aug 2014 11:59:45

MEM SWR 1 / REF 1

5: 3.1606 960.000 000 MHz



CH1 Markers

1: 2.4449
806.000 MHz

2: 1.8760
824.000 MHz

3: 2.0426
869.000 MHz

4: 2.5740
894.000 MHz

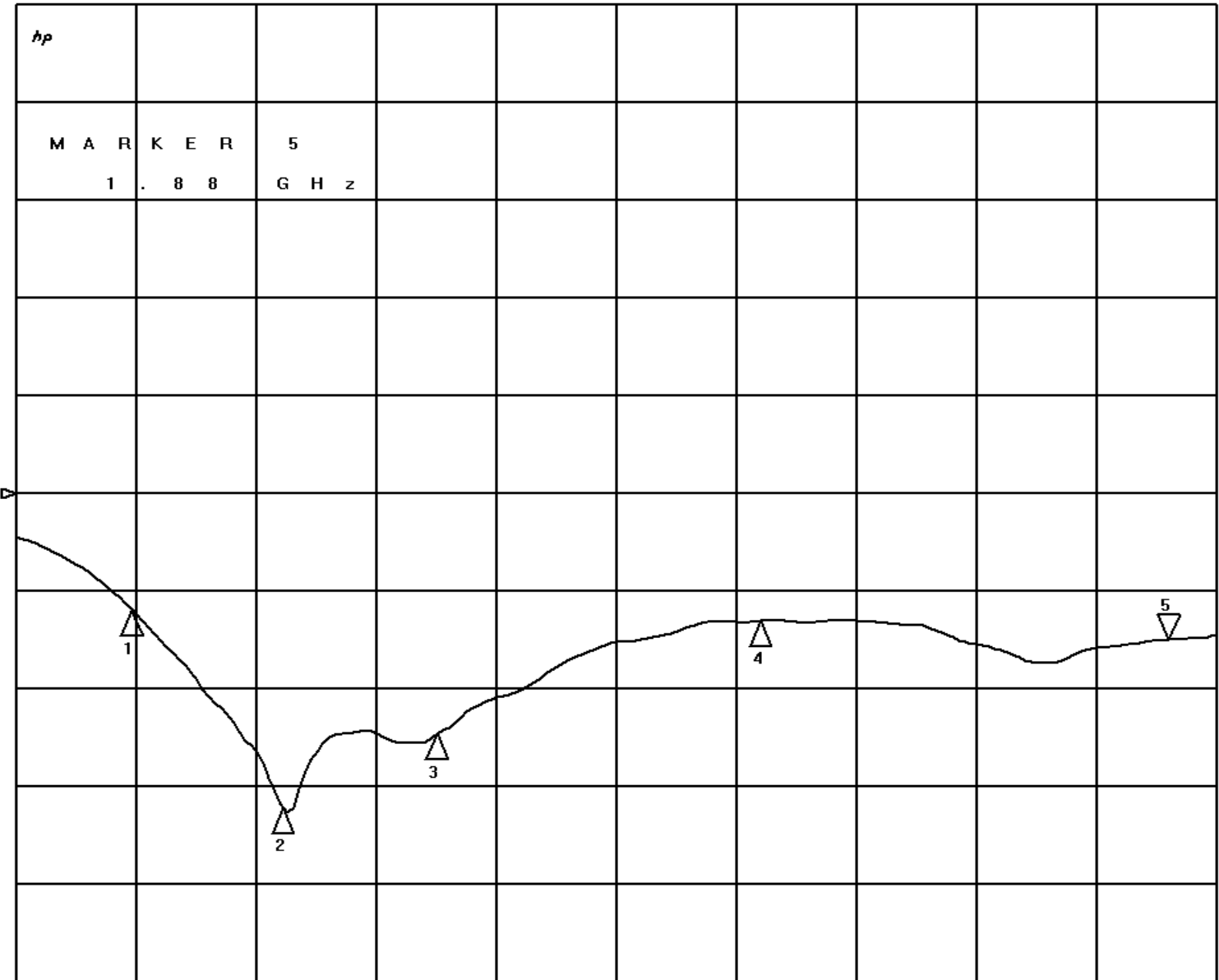
21 Apr 2014 13:18:19

CH1

MEM LOG 10 dB/ REF 0 dB

5:- 15.003 dB 1 880.000 000 MHz

Cor



CH1 Markers

1:- 11.986 dB
1.44800 GHz

2:- 32.215 dB
1.51100 GHz

3:- 24.688 dB
1.57500 GHz

4:- 13.039 dB
1.71000 GHz

START 1 400.000 000 MHz

STOP 1 900.000 000 MHz

21 Apr 2014 13:18:28

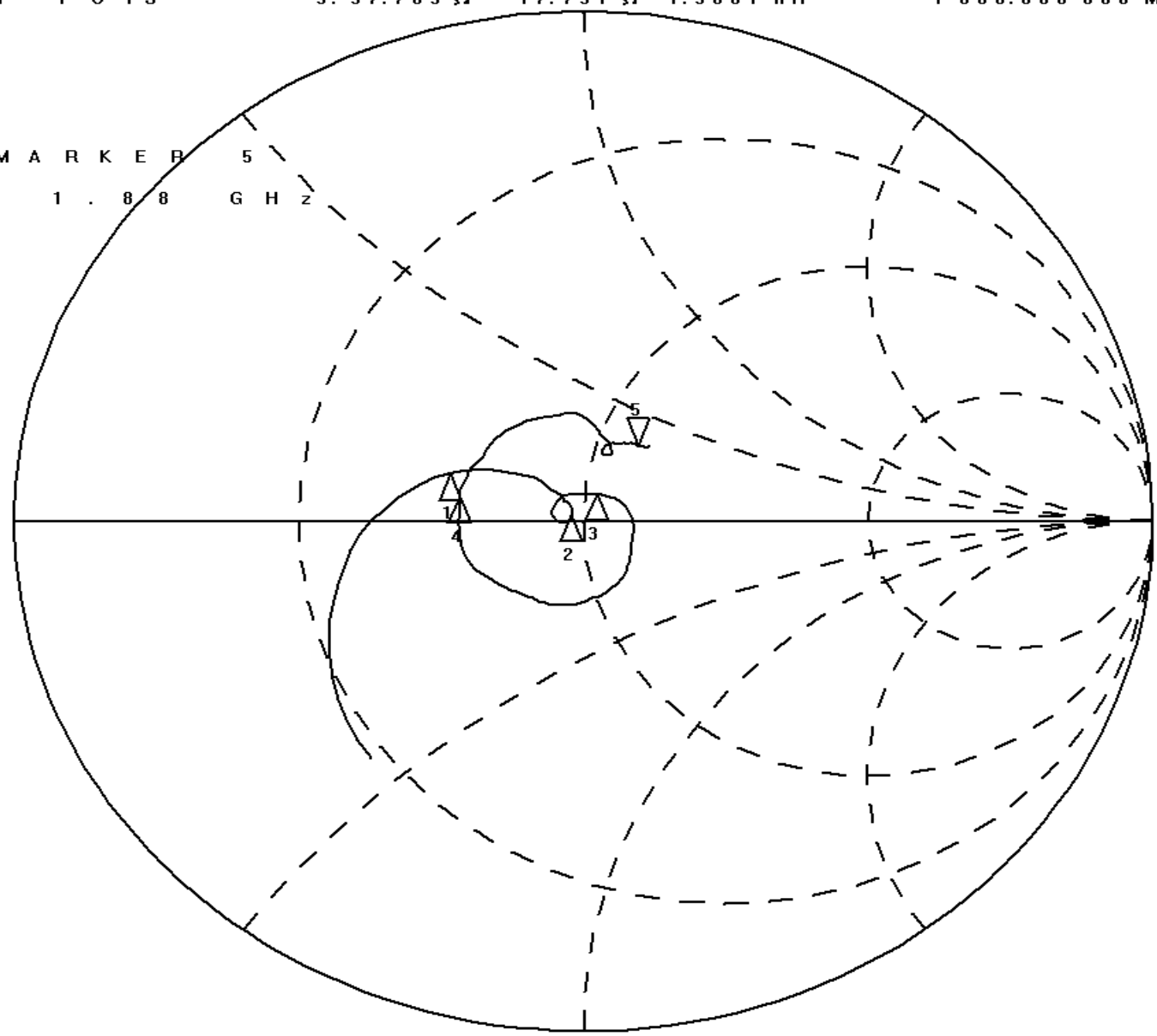
CH1 MEM 1 UFS 5: 57.789 Ω 17.791 Ω 1.5061 nH 1 880.000 000 MHz

hp

MARKER 5
Cor 1.88 GHz

Cor

f



CH1 Markers

- 1: 30.596 Ω
6.1016 Ω
1.44800 GHz
- 2: 47.959 Ω
1.2441 Ω
1.51100 GHz
- 3: 52.160 Ω
5.5547 Ω
1.57500 GHz
- 4: 31.998 Ω
3.2393 Ω
1.71000 GHz

START 1 400.000 000 MHz

STOP 1 900.000 000 MHz

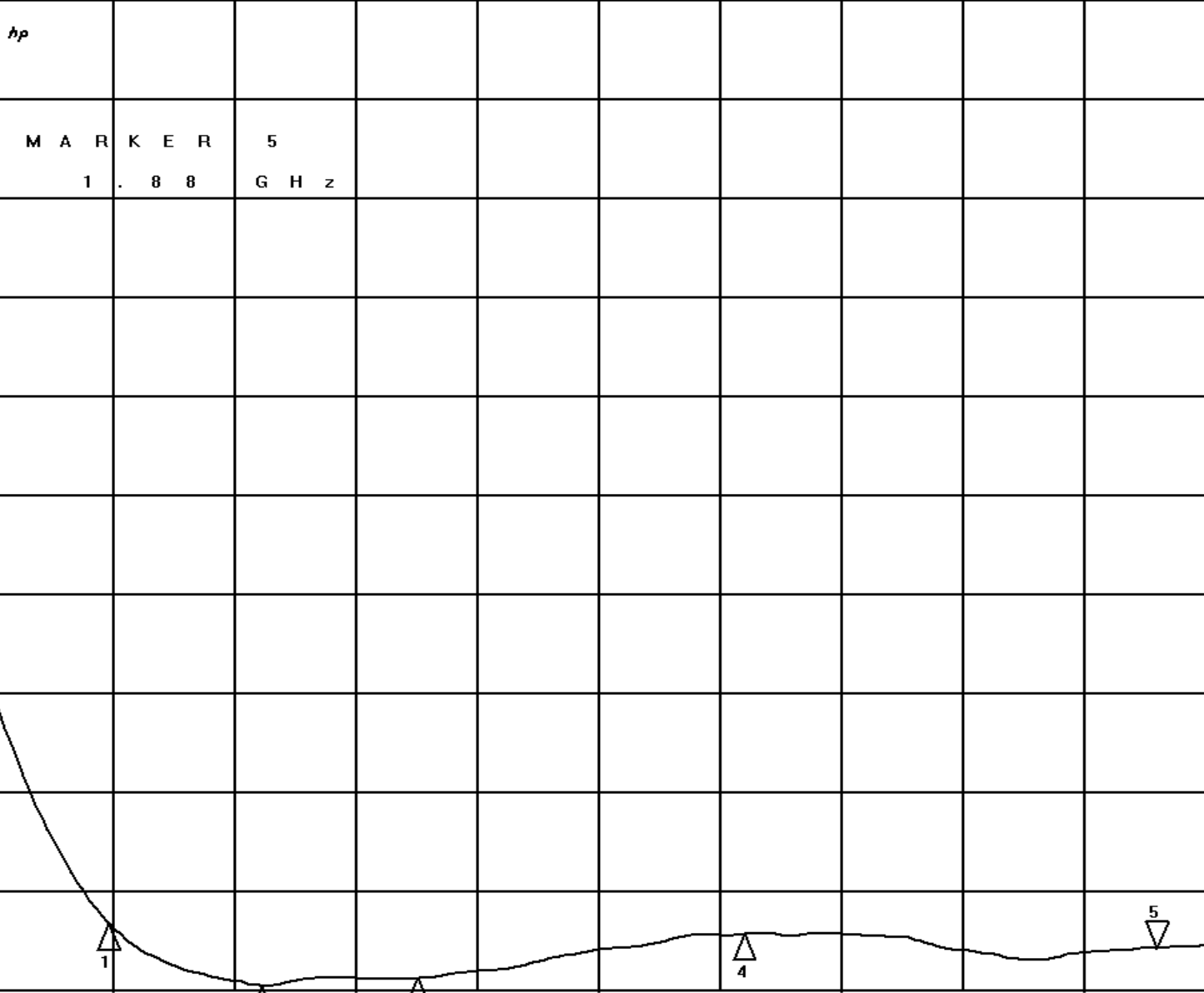
21 Apr 2014 13:18:37

CH1

MEM SWR 1 / REF 1

5: 1.4324 1 880.000 000 MHz

Cor



CH1 Markers

1: 1.6729
1.44800 GHz

2: 1.0503
1.51100 GHz

3: 1.1238
1.57500 GHz

4: 1.5735
1.71000 GHz

↑

START 1 400.000 000 MHz

STOP 1 900.000 000 MHz

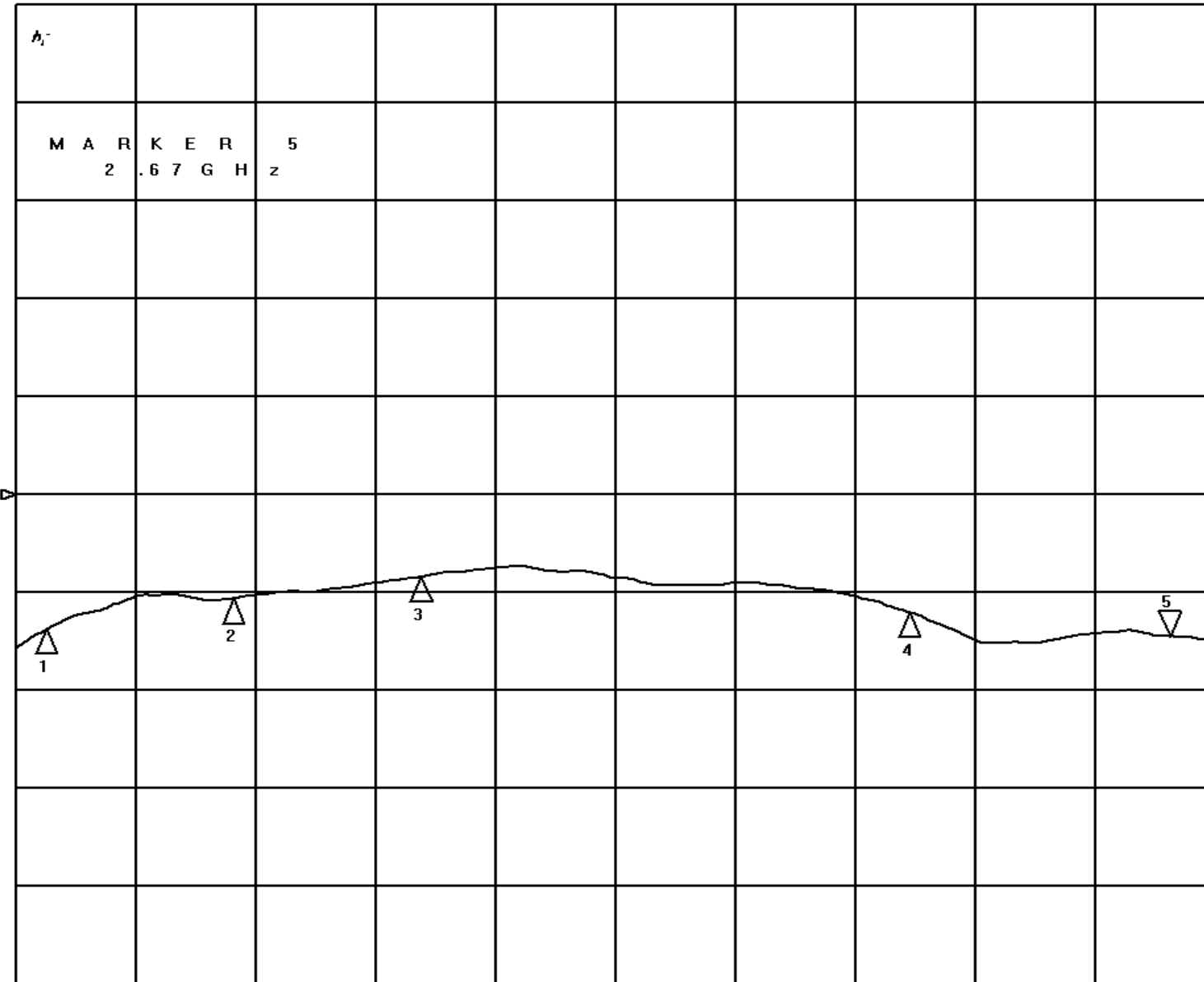
21 Apr 2014 13:20:14

CH1

MEM LOG 10 dB/ REF 0 dB

5:- 14.514 dB 2 670.000 000 MHz

Cor



CH1 Markers

1:- 13.708 dB
1.92000 GHz

2:- 10.622 dB
2.04500 GHz

3:- 8.3921 dB
2.17000 GHz

4:- 12.036 dB
2.49600 GHz

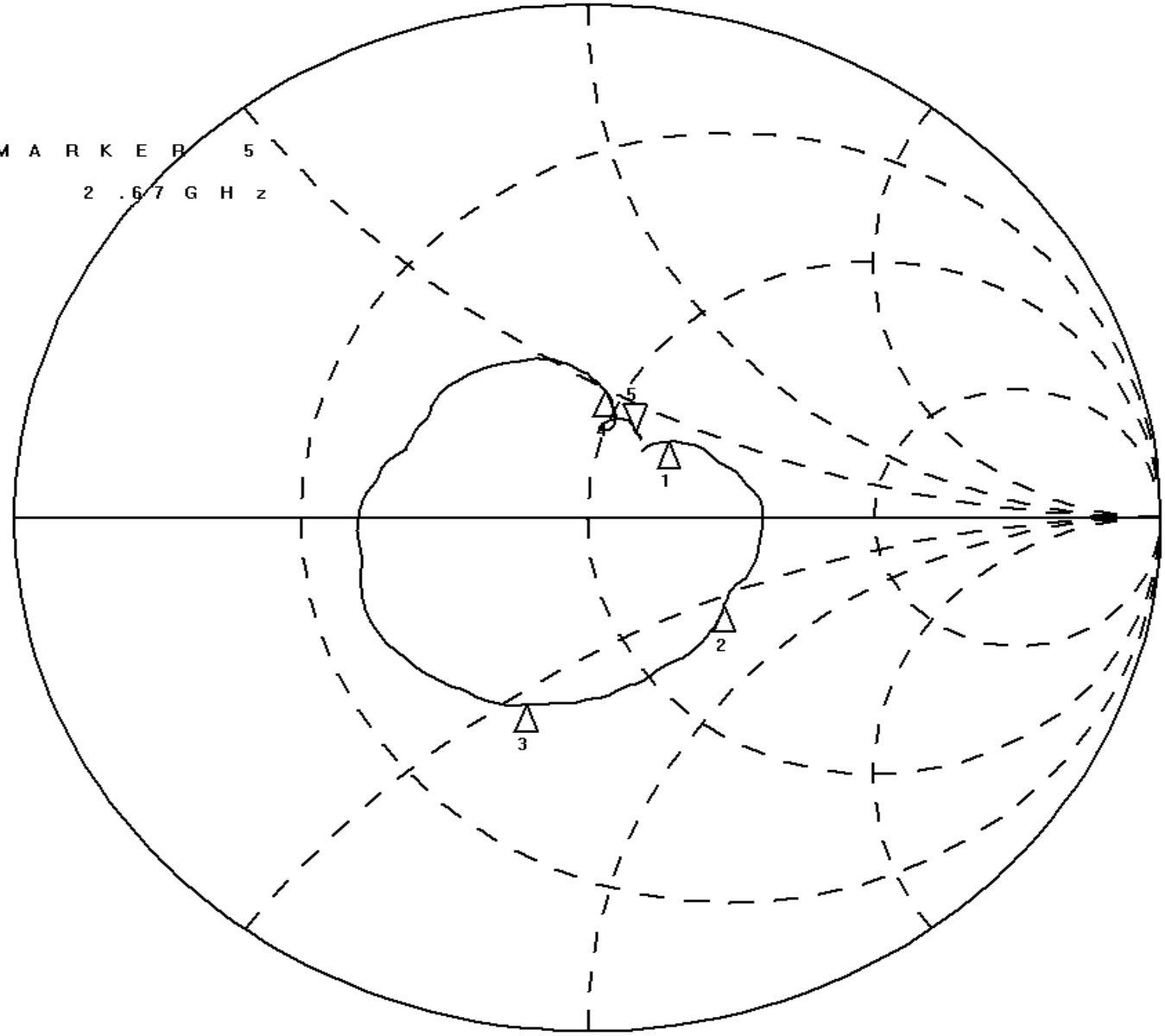
START 1 900.000 000 MHz

STOP 2 700.000 000 MHz

21 Apr 2014 13:20:23

CH1 MEM 1 UFS 5: 55.646 Ω 19.391 Ω 1.1558 nH 2 670.000 000 MHz

MARKER 5
Cor 2.67 GHz



CH1 Markers

- 1: 63.195 Ω
19.689 Ω
1.92000 GHz
- 2: 75.227 Ω
- 28.125 Ω
2.04500 GHz
- 3: 31.496 Ω
- 26.904 Ω
2.17000 GHz
- 4: 46.789 Ω
24.787 Ω
2.49600 GHz

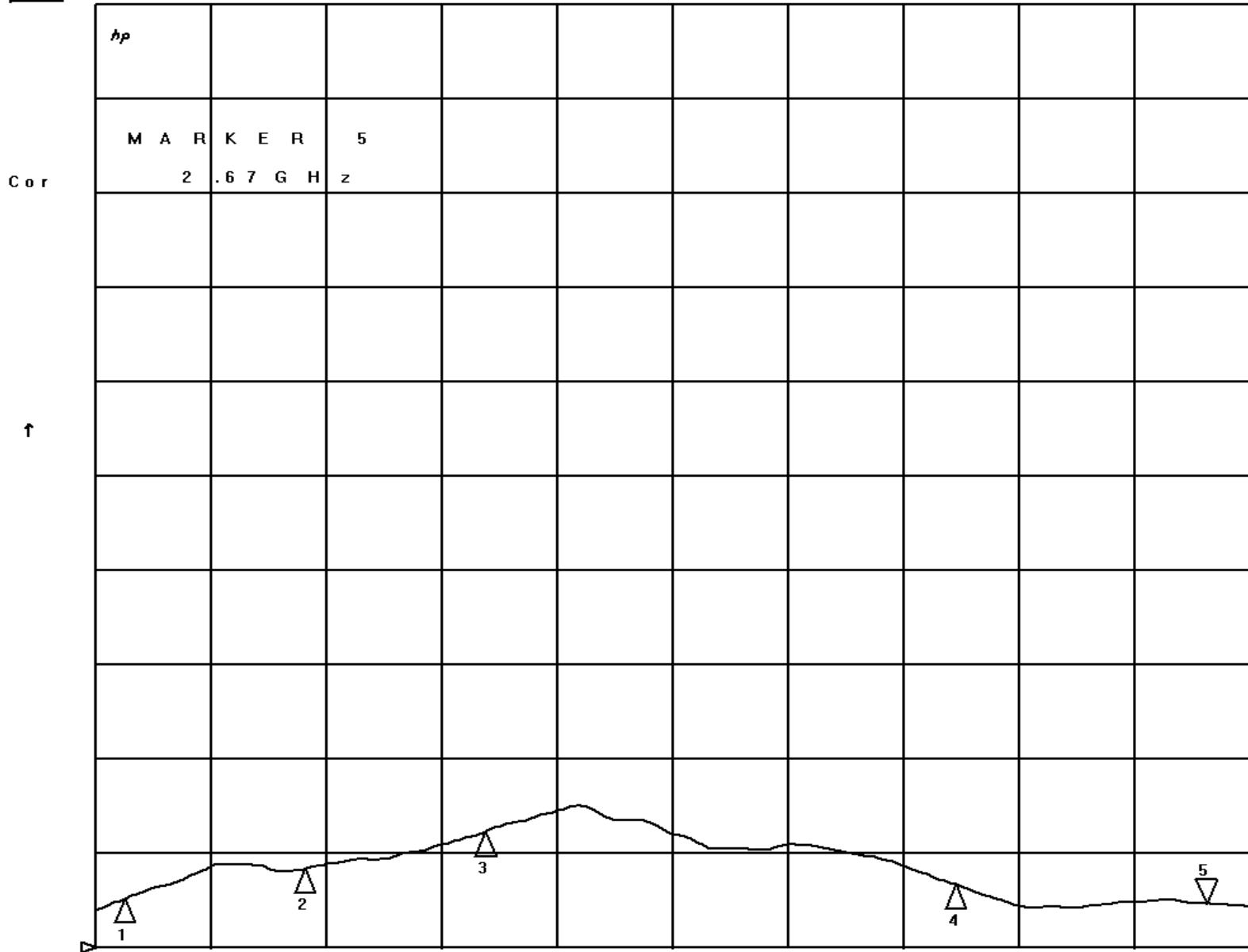
START 1 900.000 000 MHz

STOP 2 700.000 000 MHz

21 Apr 2014 13:20:31

CH1

MEM SWR 1 / REF 1 5: 1.4633 2 670.000 000 MHz



- CH1 Markers
- 1: 1.5200
1.92000 GHz
 - 2: 1.8344
2.04500 GHz
 - 3: 2.2286
2.17000 GHz
 - 4: 1.6672
2.49600 GHz

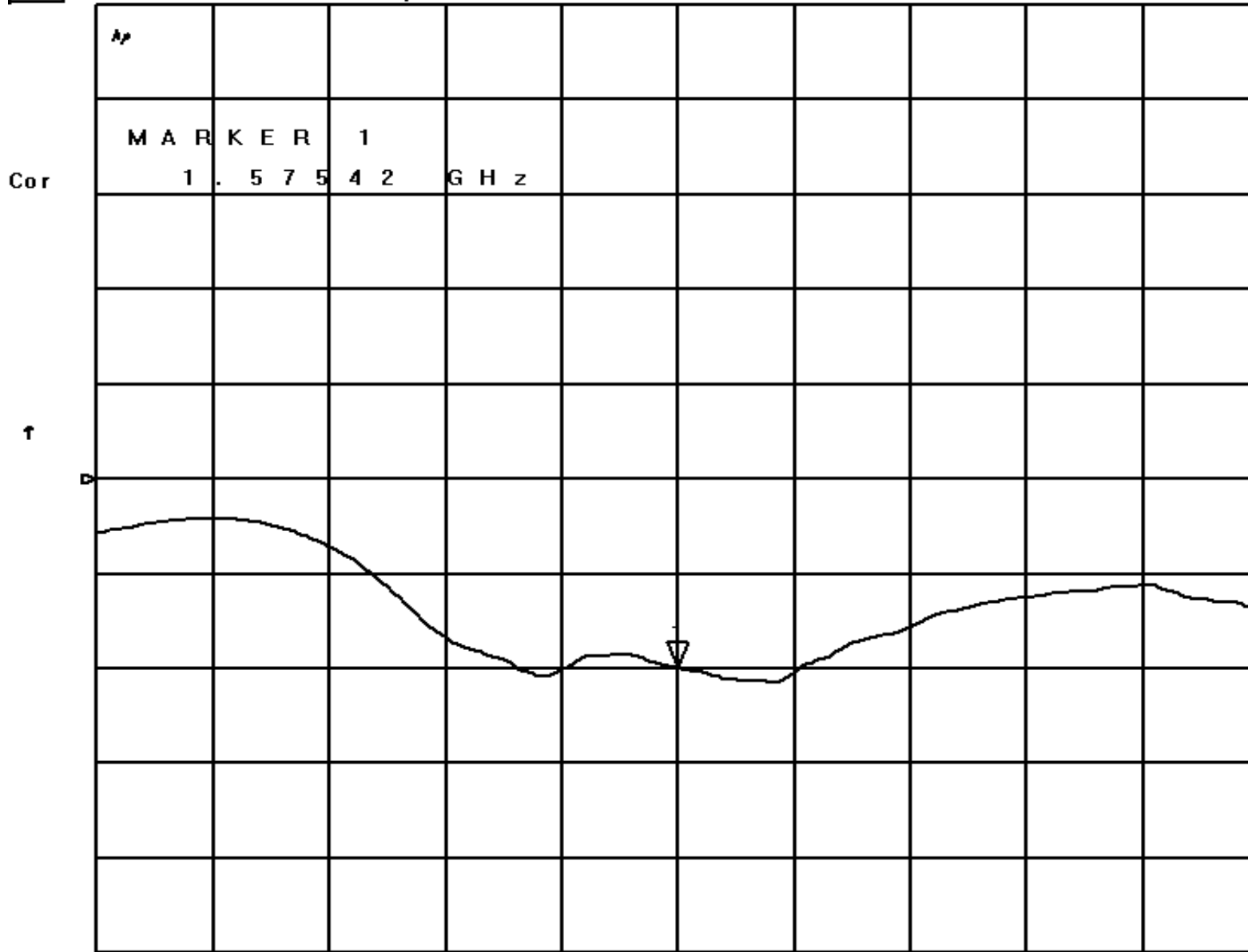
START 1 900.000 000 MHz

STOP 2 700.000 000 MHz

1 Oct 2014 10:06:08

CH1 MEM LOG 10 dB/ REF 0 dB

1:-19.914 dB 1 575.420 000 MHz



CENTER 1 575.420 000 MHz

SPAN 500.000 000 MHz

1 Oct 2014 10:06:20

CH1 MEM 1 UFS

1: 54.932 μ 9.4238 μ 952.03 μ H

1 575.420 000 MHz

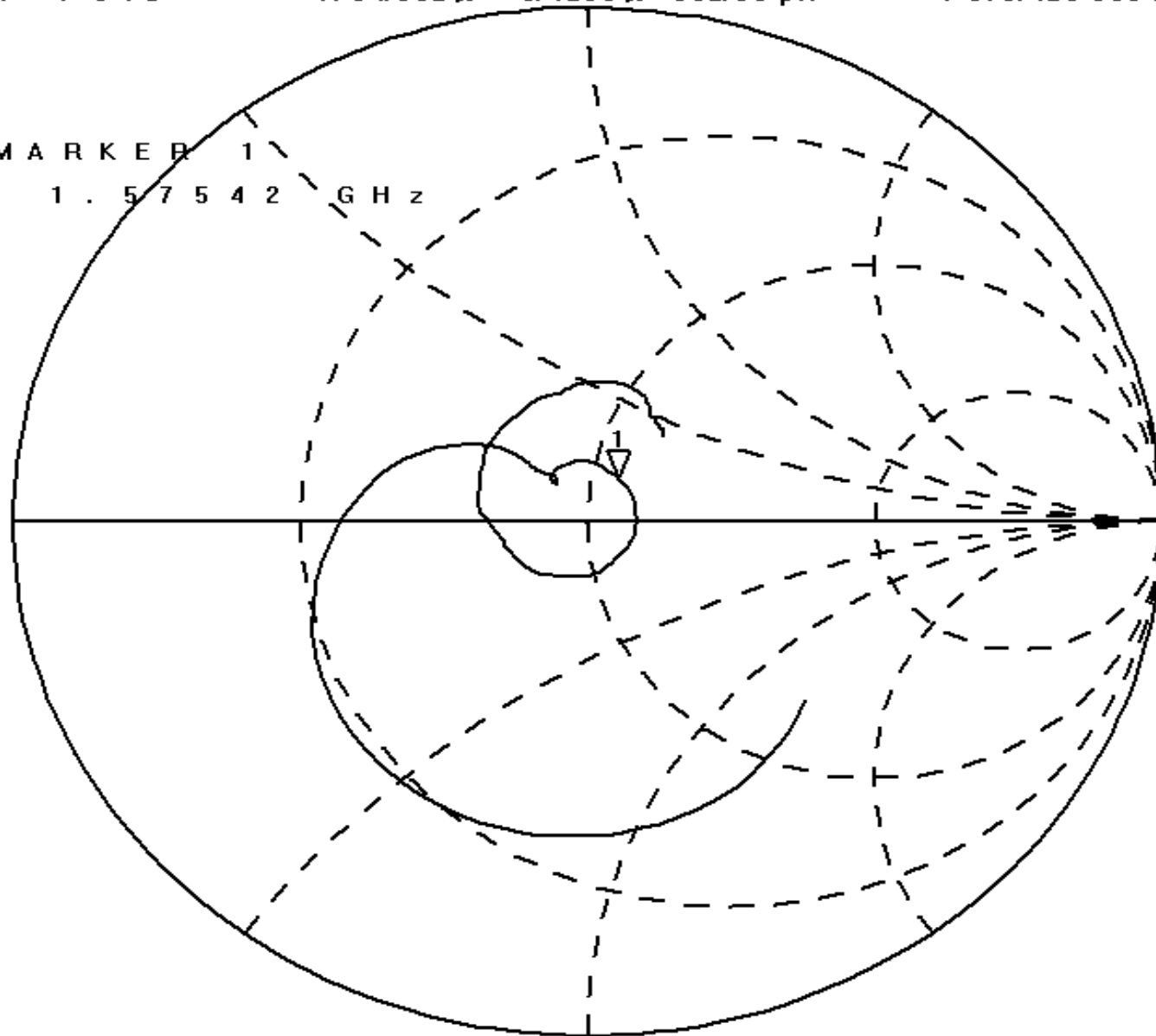
Ap

MARKER 1

Cor

1 . 5 7 5 4 2 GHz

r



CENTER 1 575.420 000 MHz

SPAN 500.000 000 MHz

1 Oct 2014 10:06:28

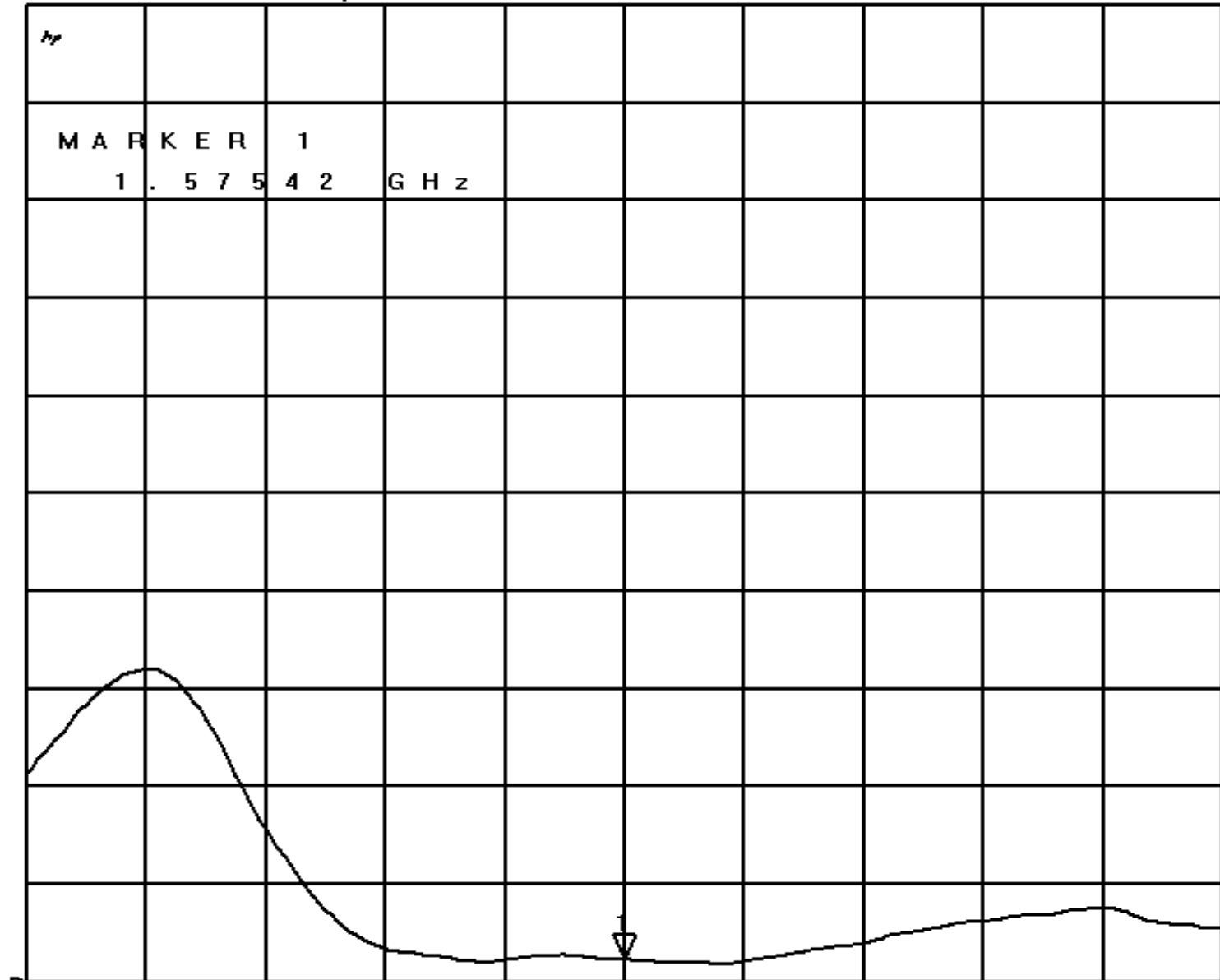
CH1 MEM SWR 1 / REF 1

1: 1.2247 1 575.420 000 MHz

Cor

MARKER 1
1 . 5 7 5 4 2 G H z

1

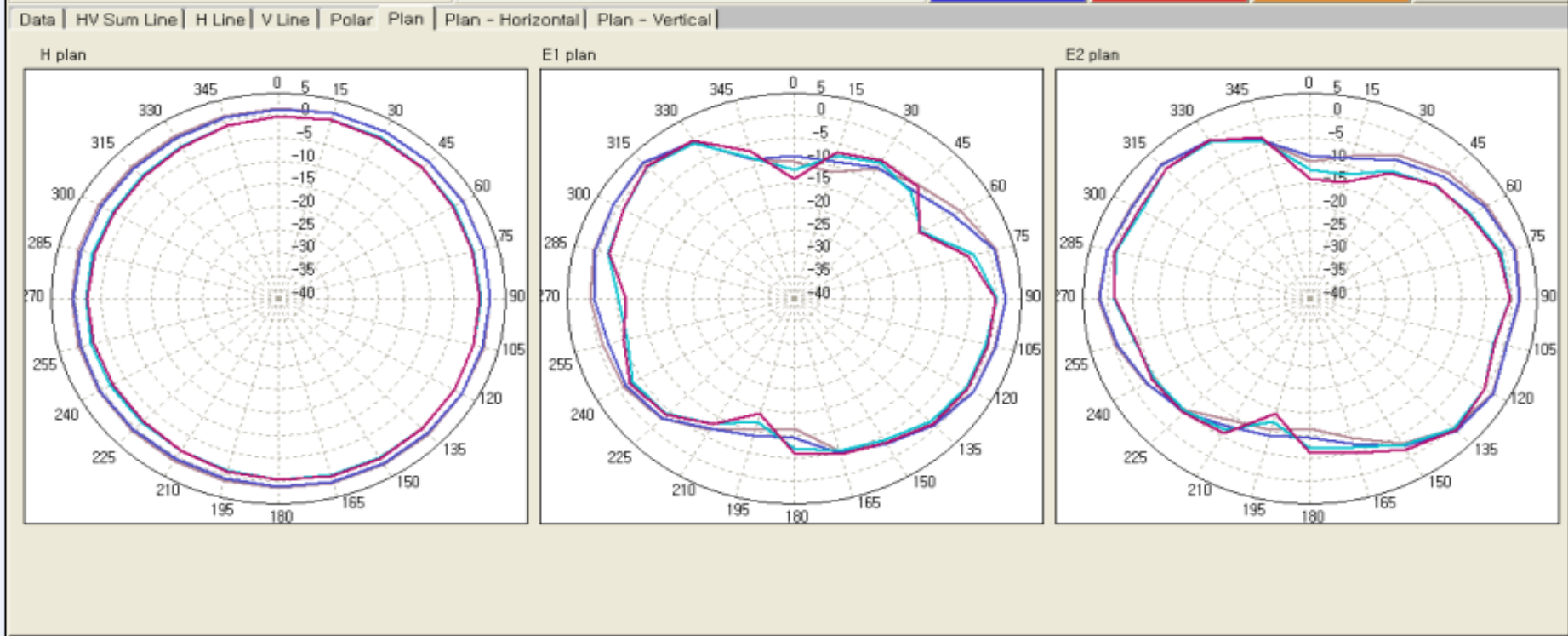


CENTER 1 575.420 000 MHz

SPAN 500.000 000 MHz

2014-04-17 오후 1:56:51 **KTM** Calibration TRS Select Frequency TRS Motor

Measurement Setup Angle Step 15 Measurement Pol H+V POL **START** **STOP** **EXIT** User Info Print



Hor+Ver | Horizontal | Vertical | H plan | E1 plan | E2 plan

	Frequency(MHz)	PeakValue	Theta(deg)	Phi(deg)	MinValue	Theta(deg)	Phi(deg)	3D Avg[dBi]	2D Avg[dBi]	Efficiency(%)
	806.000	2.324	90	45	-16.953	165	270	0.148	0	102.991%
	821.000	2.336	90	45	-15.200	165	255	-0.020	0	99.086%
	851.000	0.841	120	240	-13.443	165	255	-2.019	0	62.530%
	866.000	1.079	120	255	-13.775	15	360	-1.852	0	64.979%

Frequency

Add Delete

Sort Save

File

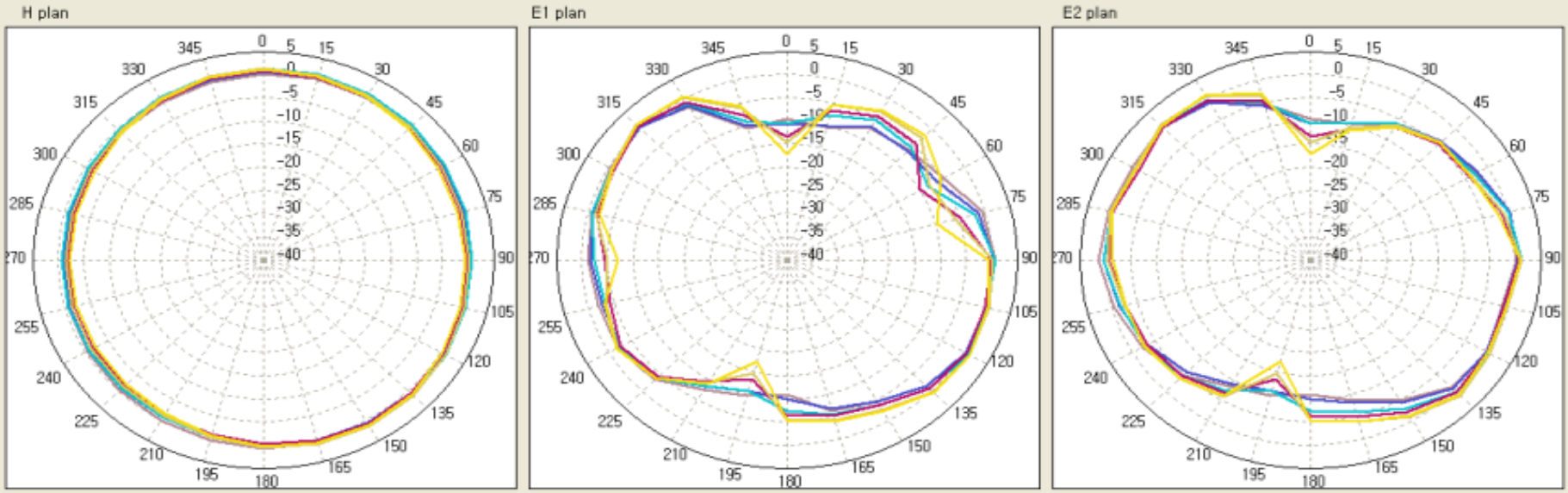
Save as Open

Delete Screen capture

Result

Summary Report

Select Graph 3D Graph



Hor+Ver | Horizontal | Vertical | H plan | E1 plan | E2 plan

	Frequency(MHz)	PeakValue	Theta(deg)	Phi(deg)	MinValue	Theta(deg)	Phi(deg)	3D Avg[dBi]	2D Avg[dBi]	Efficiency(%)
	824.000	1.372	75	165	-18.447	165	270	-1.155	0	76.289%
	835.000	0.844	90	135	-14.401	165	255	-1.382	0	72.405%
	849.000	1.458	90	15	-12.931	165	240	-1.130	0	76.731%
	869.000	0.839	90	135	-11.896	15	330	-1.630	0	68.384%
	880.000	1.545	90	150	-12.164	15	330	-0.989	0	79.268%
	894.000	1.307	120	225	-12.768	15	330	-1.233	0	74.936%

Frequency

Add Delete

Sort Save

File

Save as Open

Delete Screen capture

Result

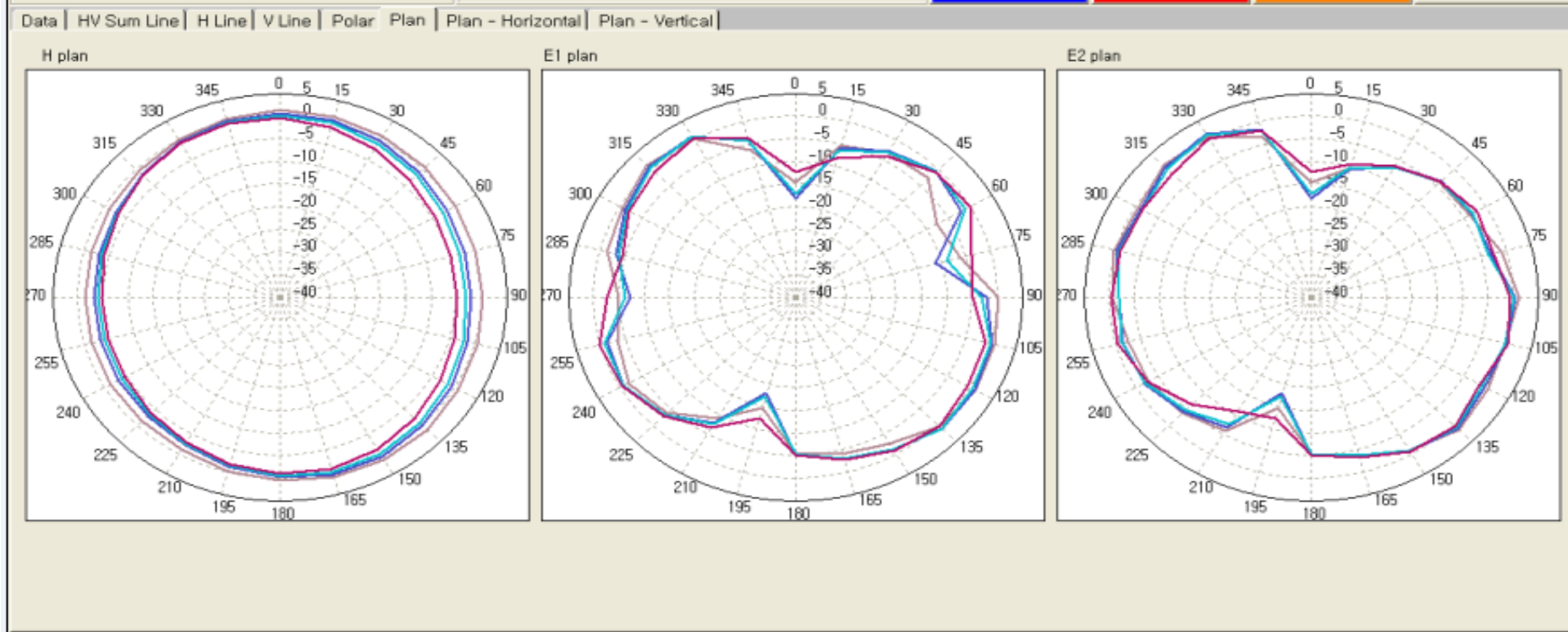
Summary Report

Select Graph 3D Graph

2014-04-17 오후 5:45:37 **KTM** Calibration 820~960MHz Select Frequency EGSM **Motor**

Measurement Setup Angle Step 15 Measurement Pol H+V POL **START** **STOP** **EXIT** **User Info**

2D Measurement **3D Measurement** **Print**



Hor+Ver | Horizontal | Vertical | H plan | E1 plan | E2 plan

	Frequency(MHz)	PeakValue	Theta(deg)	Phi(deg)	MinValue	Theta(deg)	Phi(deg)	3D Avg[dBi]	2D Avg[dBi]	Efficiency(%)
	890.000	1.525	90	150	-12.183	15	330	-0.997	0	79.128%
	915.000	1.569	135	180	-11.364	15	345	-1.105	0	77.185%
	925.000	1.269	135	195	-10.965	15	345	-1.336	0	73.177%
	960.000	0.674	135	15	-11.282	165	255	-1.389	0	72.286%

Frequency

Add Delete

Sort Save

File

Save as Open

Delete Screen capture

Result

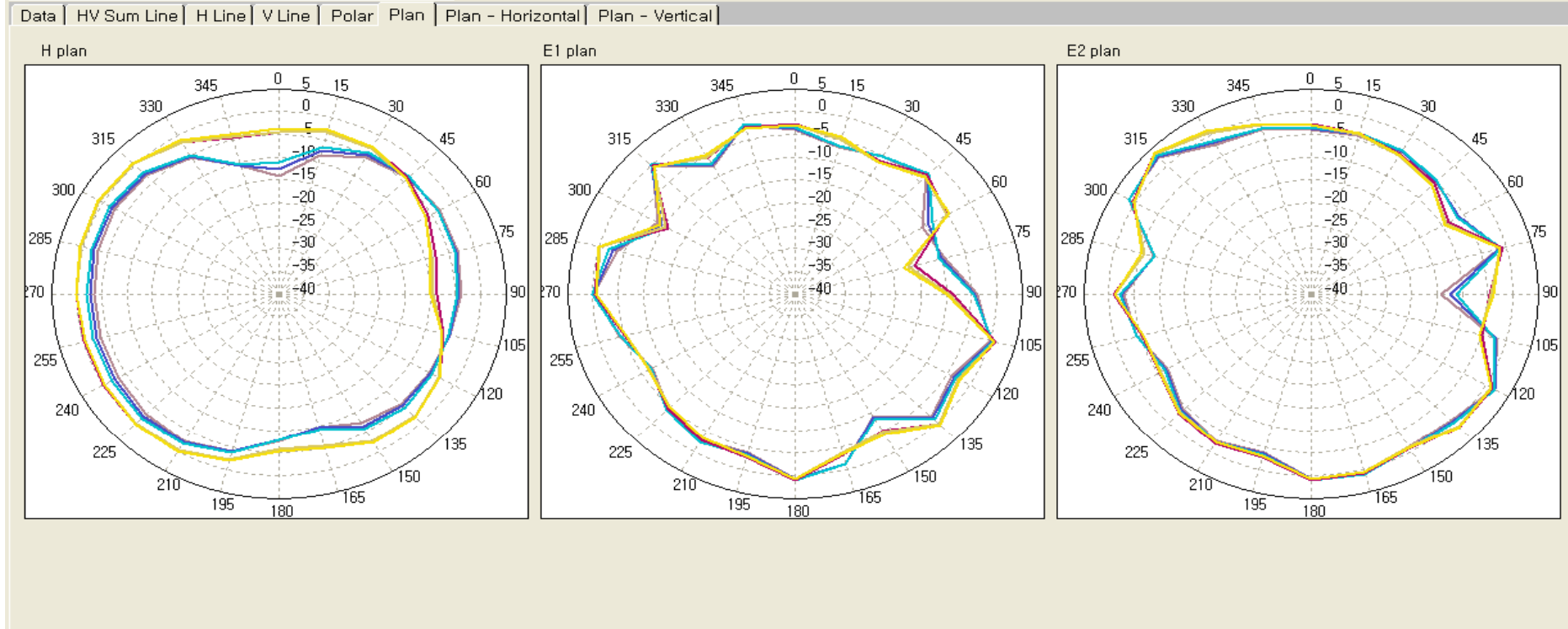
Summary Report

Select Graph 3D Graph

2014-04-17 오후 5:31:31 KTM Calibration LTE21 Select Frequency: LTE21 Motor

Measurement Setup: Angle Step: 15 Measurement Pol: H+V POL

START **STOP** **EXIT** User Info Print



Hor+Ver | Horizontal | Vertical | H plan | E1 plan | E2 plan

	Frequency[MHz]	PeakValue	Theta[deg]	Phi[deg]	MinValue	Theta[deg]	Phi[deg]	3D Avg[dBi]	2D Avg[dBi]	Efficiency[%]
	1450.400	2.493	120	180	-16.156	60	120	-2.562	0	55.179%
	1455.400	2.756	120	180	-16.787	60	120	-2.362	0	57.782%
	1460.400	2.016	120	180	-16.487	60	120	-2.168	0	60.417%
	1498.400	2.829	120	180	-17.414	60	135	-2.757	0	66.420%
	1503.400	2.596	120	180	-16.794	60	135	-2.999	0	62.825%
	1508.400	2.829	120	180	-17.418	75	90	-2.808	0	65.646%

Frequency

Add Delete

Sort Save

File

Save as Open

Delete Screen capture

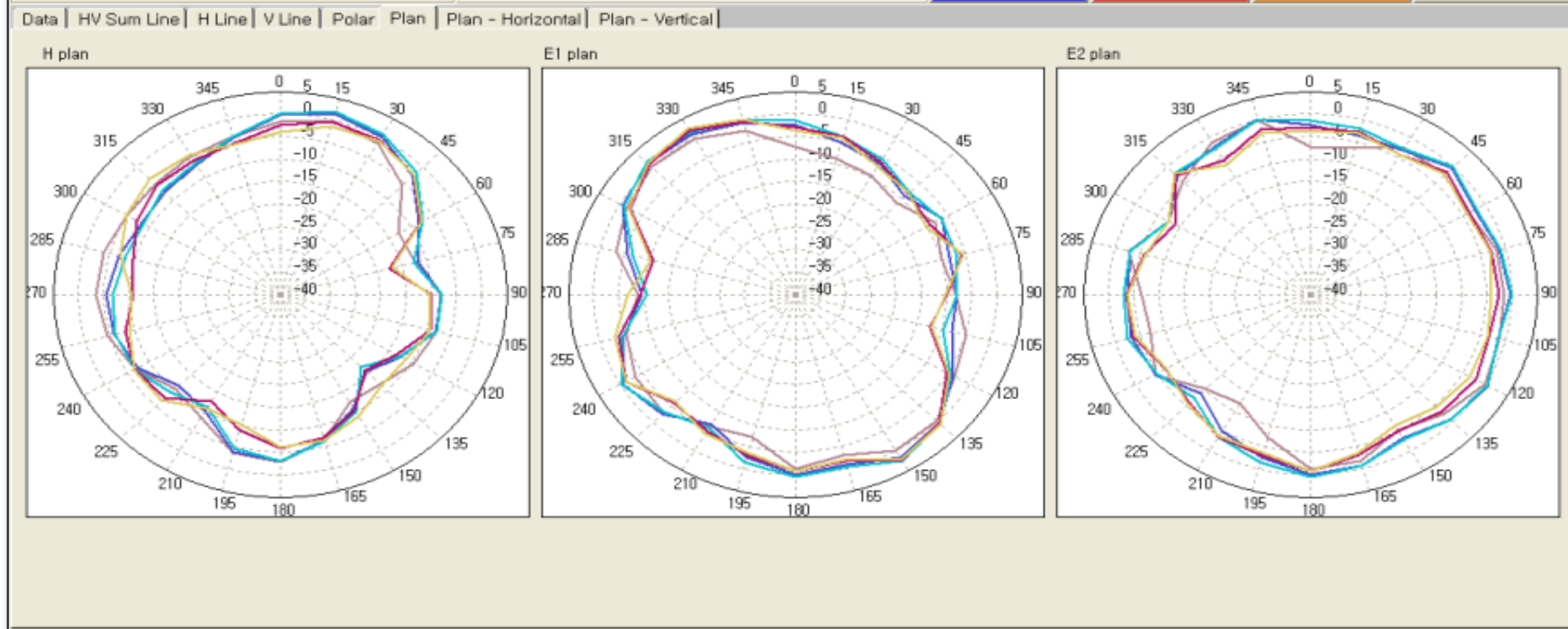
Result

Summary Report

Select Graph 3D Graph

2014-06-16 오후 7:12:13 KTM Calibration 1710~1880MHz Select Frequency DCS Motor

2D Measurement 3D Measurement Measurement Setup Angle Step 15 Measurement Pol H+V POL **START** **STOP** **EXIT** User Info Print



Hor+Ver | Horizontal | Vertical | H plan | E1 plan | E2 plan

	Frequency(MHz)	PeakValue	Theta(deg)	Phi(deg)	MinValue	Theta(deg)	Phi(deg)	3D Avg[dBi]	2D Avg[dBi]	Efficiency(%)
	1710.000	2.894	135	30	-17.633	135	330	-2.737	0	52.099%
	1785.000	2.721	135	30	-15.641	90	135	-2.553	0	55.296%
	1805.000	2.461	150	60	-19.877	105	75	-2.084	0	61.607%
	1850.000	2.078	135	45	-17.413	90	75	-2.913	0	50.898%
	1880.000	2.377	135	60	-17.097	90	75	-2.749	0	52.856%

Frequency

Add Delete

Sort Save

File

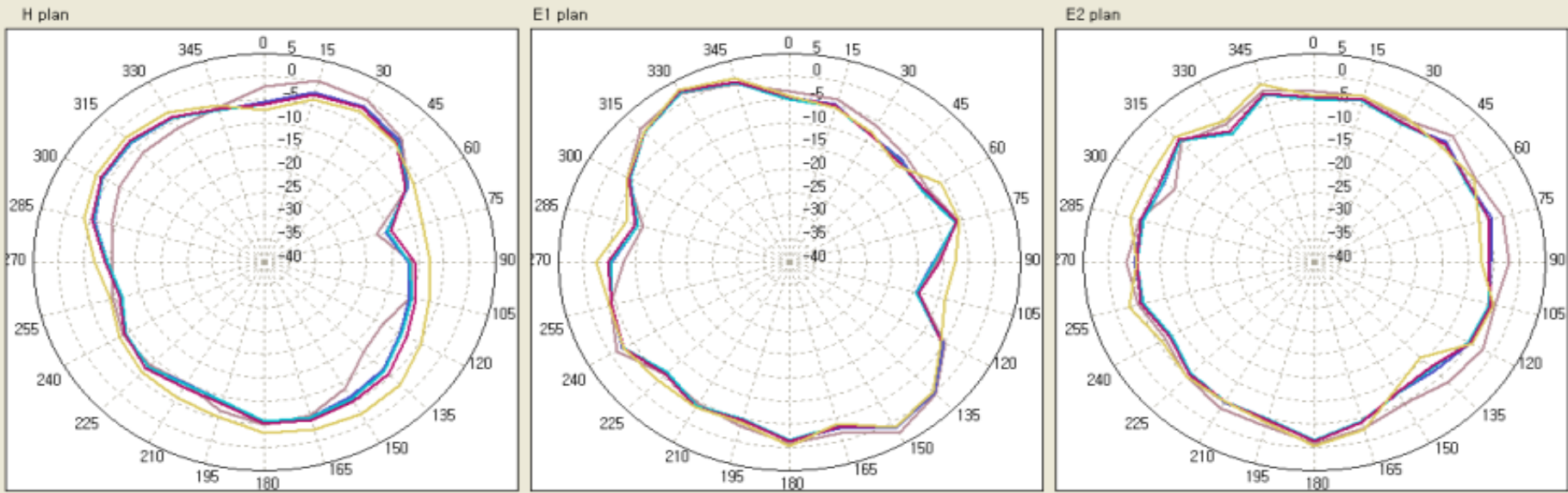
Save as Open

Delete Screen capture

Result

Summary Report

Select Graph 3D Graph



Hor+Ver | Horizontal | Vertical | H plan | E1 plan | E2 plan

	Frequency(MHz)	PeakValue	Theta[deg]	Phi[deg]	MinValue	Theta[deg]	Phi[deg]	3D Avg[dBi]	2D Avg[dBi]	Efficiency[%]
	1850.000	2.250	150	60	-17.214	90	75	-2.878	0	51.315%
	1910.000	2.657	135	60	-15.507	90	75	-3.320	0	46.342%
	1920.000	2.532	135	285	-15.185	90	75	-3.487	0	44.594%
	1930.000	2.811	135	285	-14.255	90	75	-3.280	0	46.777%
	1990.000	2.655	135	285	-14.292	45	120	-2.471	0	56.356%

Frequency

Add Delete

Sort Save

File

Save as Open

Delete Screen capture

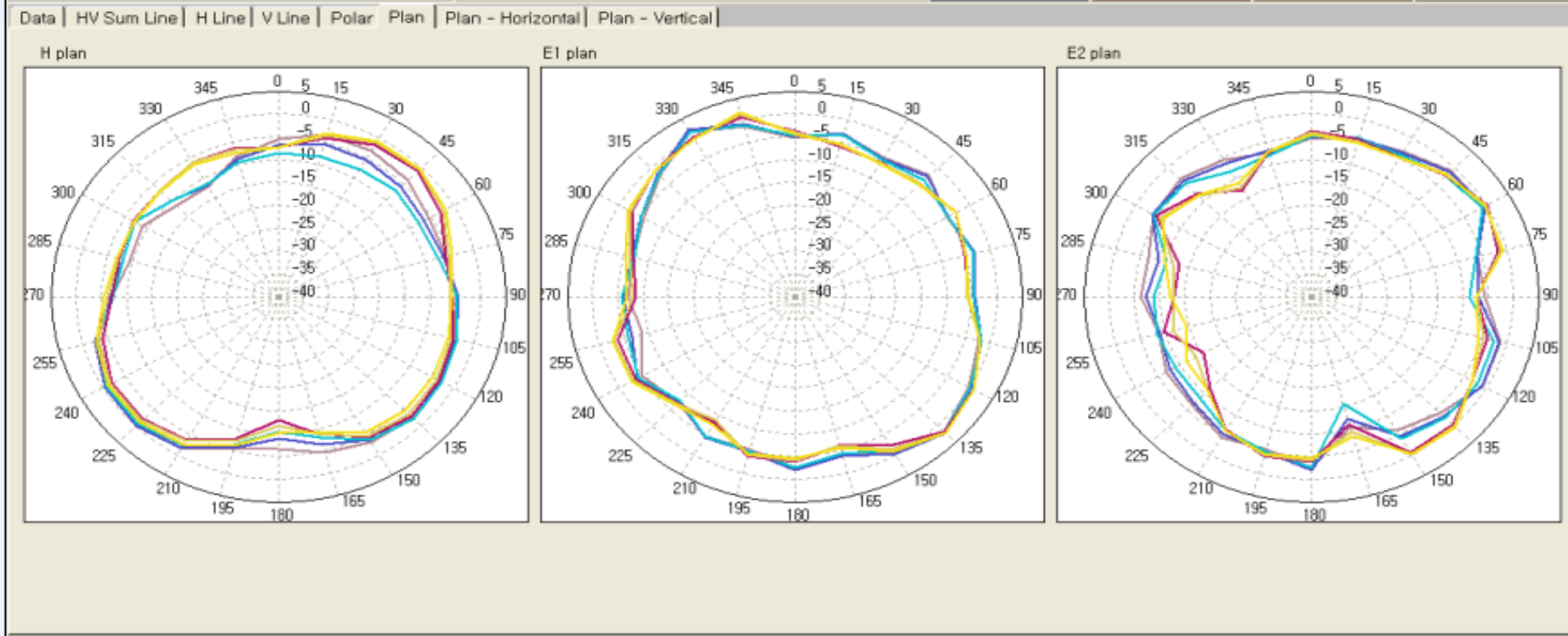
Result

Summary Report

Select Graph 3D Graph

2014-06-16 오후 6:57:39 **KTM** Calibration WCDMA Select Frequency WCDMA Motor

Measurement Setup Angle Step 15 Measurement Pol H+V POL **START** **STOP** **EXIT** User Info Print



Hor+Ver | Horizontal | Vertical | H plan | E1 plan | E2 plan

	Frequency(MHz)	PeakValue	Theta[deg]	Phi[deg]	MinValue	Theta[deg]	Phi[deg]	3D Avg[dBi]	2D Avg[dBi]	Efficiency[%]
	1920.000	2.734	135	255	-12.756	75	300	-2.436	0	56.813%
	1950.000	2.302	135	255	-13.324	165	345	-2.267	0	59.056%
	1980.000	2.908	135	240	-16.823	165	345	-2.727	0	53.129%
	2110.000	2.628	135	240	-28.628	45	195	-2.693	0	53.549%
	2140.000	2.769	135	240	-20.187	45	195	-2.569	0	55.092%
	2170.000	2.838	135	105	-14.680	60	180	-2.476	0	56.292%

Frequency

Add Delete

Sort Save

File

Save as Open

Delete Screen capture

Result

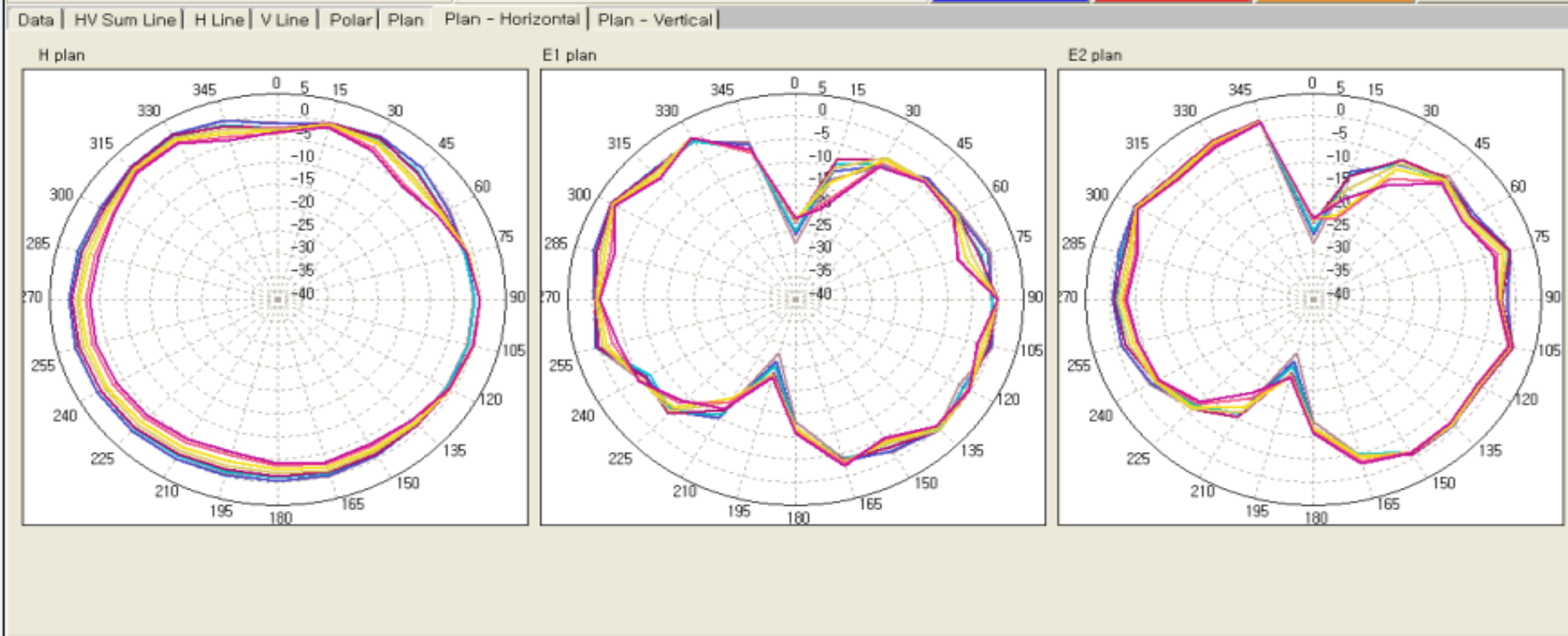
Summary Report

Select Graph 3D Graph

2014-06-16 오후 2:28:52 KTM Calibration WI-MAX Select Frequency: WI-MAX 2.5G Motor

Measurement Setup Angle Step: 15 Measurement Pol: H+V POL **START** **STOP** **EXIT** User Info

2D Measurement 3D Measurement Print



Hor+Ver | Horizontal | Vertical | H plan | E1 plan | E2 plan

	Frequency(MHz)	PeakValue	Theta(deg)	Phi(deg)	MinValue	Theta(deg)	Phi(deg)	3D Avg[dBi]	2D Avg[dBi]	Efficiency(%)
	2500.000	2.382	105	300	-12.276	15	90	-0.691	0	84.905%
	2530.000	2.613	105	300	-10.858	15	15	-0.593	0	86.830%
	2560.000	2.179	105	300	-11.248	15	15	-1.086	0	77.512%
	2590.000	2.617	135	210	-11.951	15	300	-0.702	0	84.692%
	2620.000	2.459	135	210	-15.495	15	15	-1.069	0	77.826%
	2650.000	2.383	135	210	-20.293	15	15	-1.464	0	71.055%
	2680.000	2.357	135	210	-17.102	15	0	-1.868	0	64.750%
	2700.000	2.619	135	210	-17.941	15	150	-1.874	0	64.658%

Frequency

Add Delete

Sort Save

File

Save as Open

Delete Screen capture

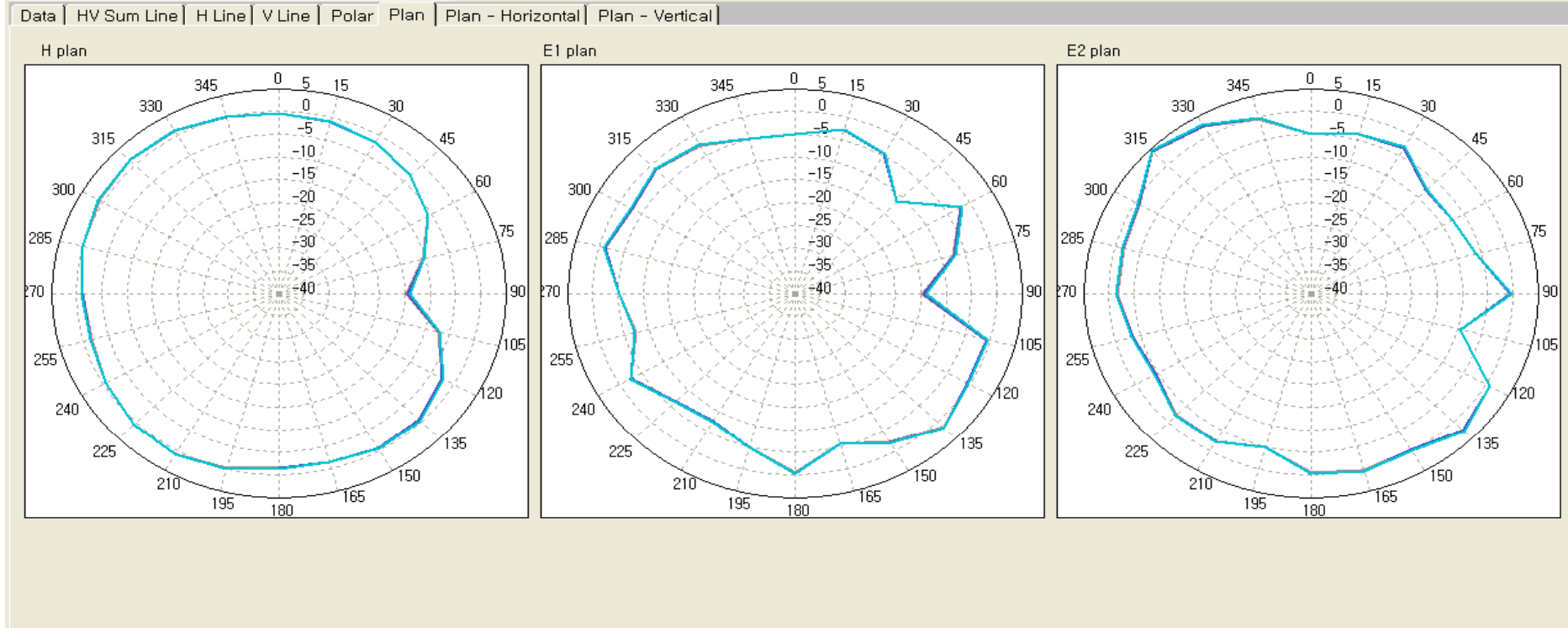
Result

Summary Report

Select Graph 3D Graph

2014-04-17 오후 5:24:27 KTM Calibration gps Select Frequency GPS Motor

2D Measurement 3D Measurement Measurement Setup Angle Step 15 Measurement Pol H+V POL **START** **STOP** **EXIT** User Info Print



Hor+Ver | Horizontal | Vertical | H plan | E1 plan | E2 plan

	Frequency[MHz]	PeakValue	Theta[deg]	Phi[deg]	MinValue	Theta[deg]	Phi[deg]	3D Avg[dBi]	2D Avg[dBi]	Efficiency[%]
	1575.000	2.380	120	195	-17.481	45	30	-2.229	0	75.004%
	1575.420	2.417	120	195	-17.589	45	30	-2.177	0	75.910%
	1576.000	2.476	120	195	-17.783	45	30	-2.096	0	77.348%

Frequency

Add Delete

Sort Save

File

Save as Open

Delete Screen capture

Result

Summary Report

Select Graph 3D Graph