APPROVAL SHEET

MULTI BAND DIPOLE ANTENNA		
NO	MODEL	FREQUENCY RANGE
1	HW- MULTI-G-RSMA	800 ~ 960 MHz
		1447.9 ~ 1880 MHz
		1920 ~ 2700 MHz

HANWOOL TECHNOLOGY CO., LTD
#1002 IT303-DONG, PUCHONTECHNOPARK Ⅲ 36-1
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TEL. : 032) 624-2555
FAX : 032) 624-2559

(ANTENNA SPECIFICATION)

1. MODEL: HW- MULTI-G-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	800 ~ 960 MHz		
		1448 ~ 1880 MHz		
		1920 ~ 2700 MHz		
5. 2	IMPEDANCE	50 Ω NOMINAL		
5. 3	V. S. W. R	800~960 MHz	LESS THAN 1:4.0	
		1448~1880 MHz	LESS THAN 1:2.5	
		1920~2700 MHz	LESS THAN 1:3.0	
5. 4	GAIN(Min)	800~960 MHz	-1 dBi	
		1448~1880 MHz	2 dBi	
		1920~2700 MHz	2.5 dBi	
5. 5	GAIN(PEAK)	824~849 MHz	2.151 dBi	
		1710~1755 MHz	3.964 dBi	
		1850~1910 MHz	3.196 dBi	
5. 6	RADIATION PATTERN	OMNI - DIRECTIONAL		
5. 7	POLARIZATION	VERTICAL		

6. Hardware specification and mechanical

No.	MECHANICAL	SPECIFICATIONS	REMARK
6. 1	SLEEVE	NYLON GRASS	BLACK-COLOR
6. 2	" A" COVER	NYLON GRASS	BLACK-COLOR
6. 3	JOINT PIN*2EA	BRASS	Ni-PLATING
6. 4	" B" COVER	NYLON GRASS	BLACK-COLOR
6. 5	SMA(Male) CONNECTOR	BRASS	Ni-PLATING
6. 6	ANTENNA TOTAL LENGTH	150.5 ± 2.0 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	

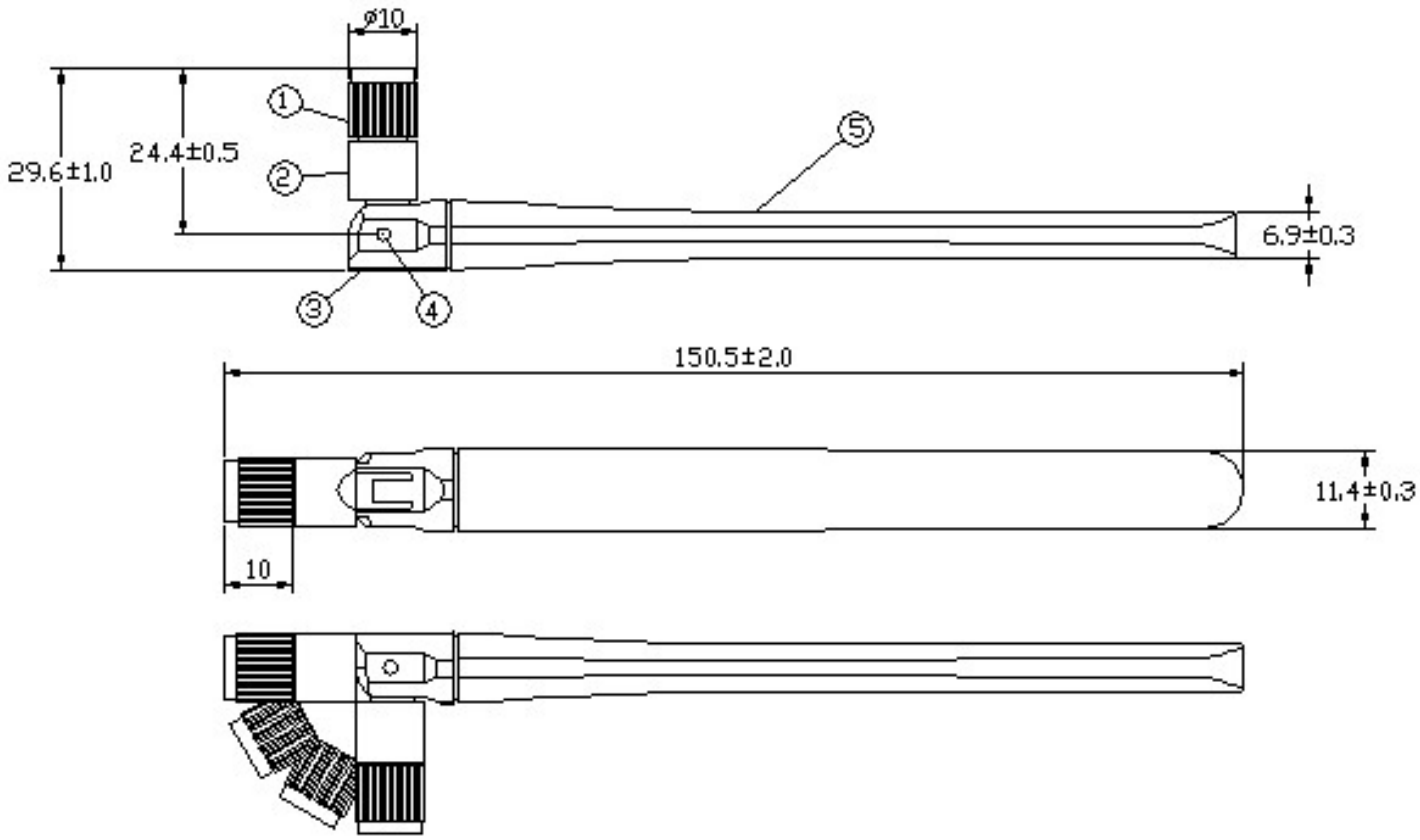
8. TEST and Q/C

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.

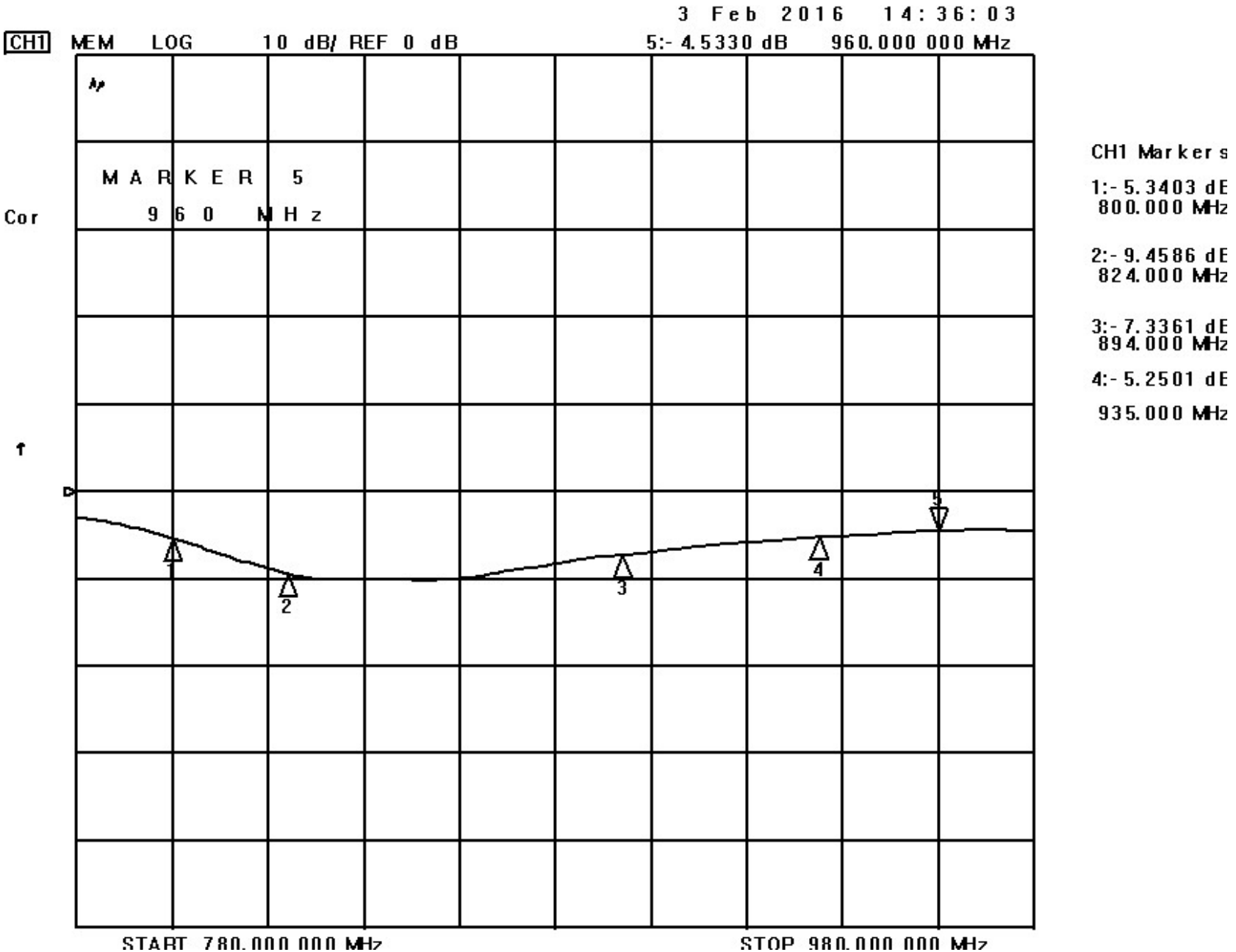
Hanwool
Technology

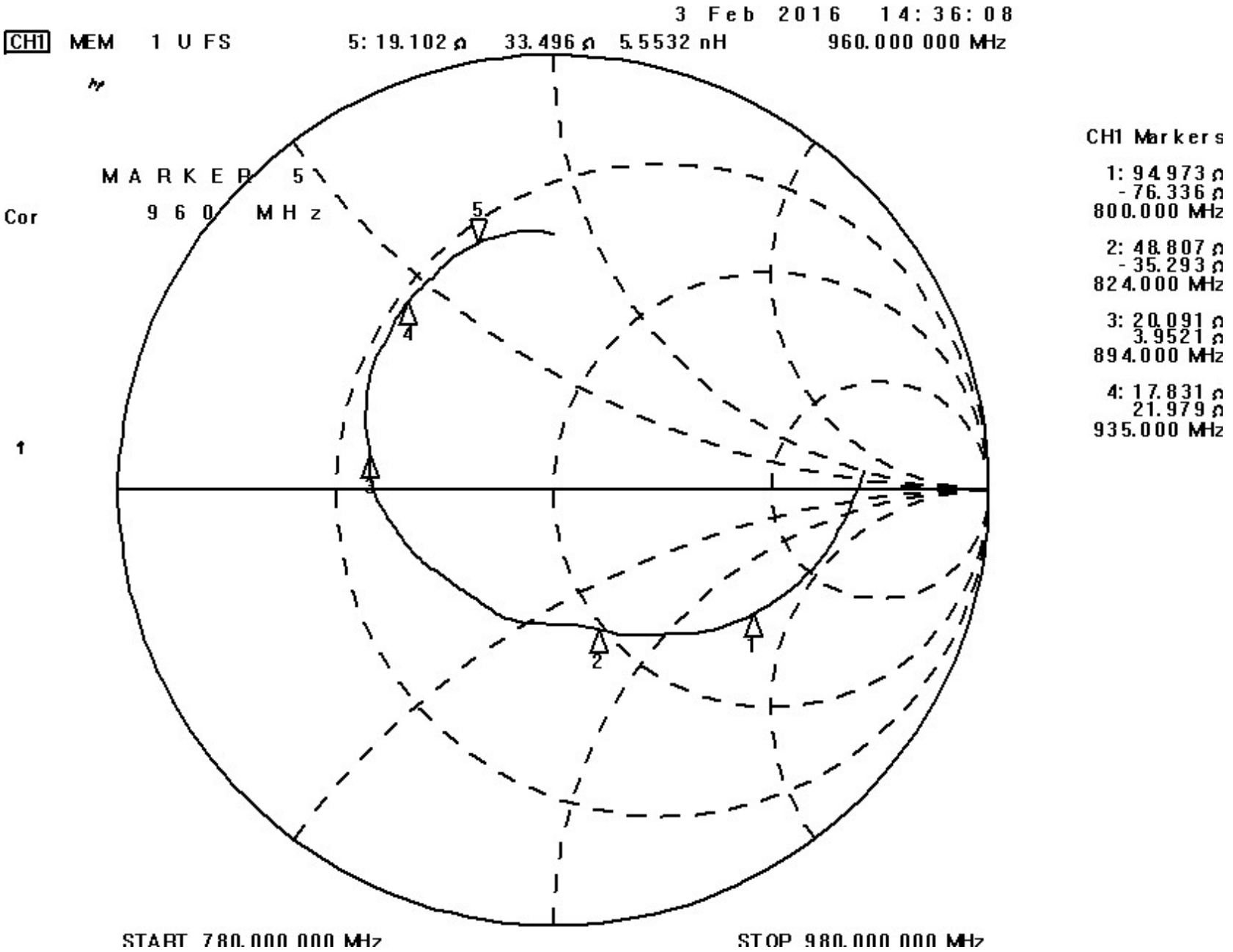
TOL Unless Noted	DIMENSION	mm	No	DATE	REVISION	CHECKER
X. =±0.5	SCALE		1	201 . . .		
X.X = ±0.1	MATERIAL		2	201 . . .		
X.XX = ±0.05	FINISH		3	201 . . .		

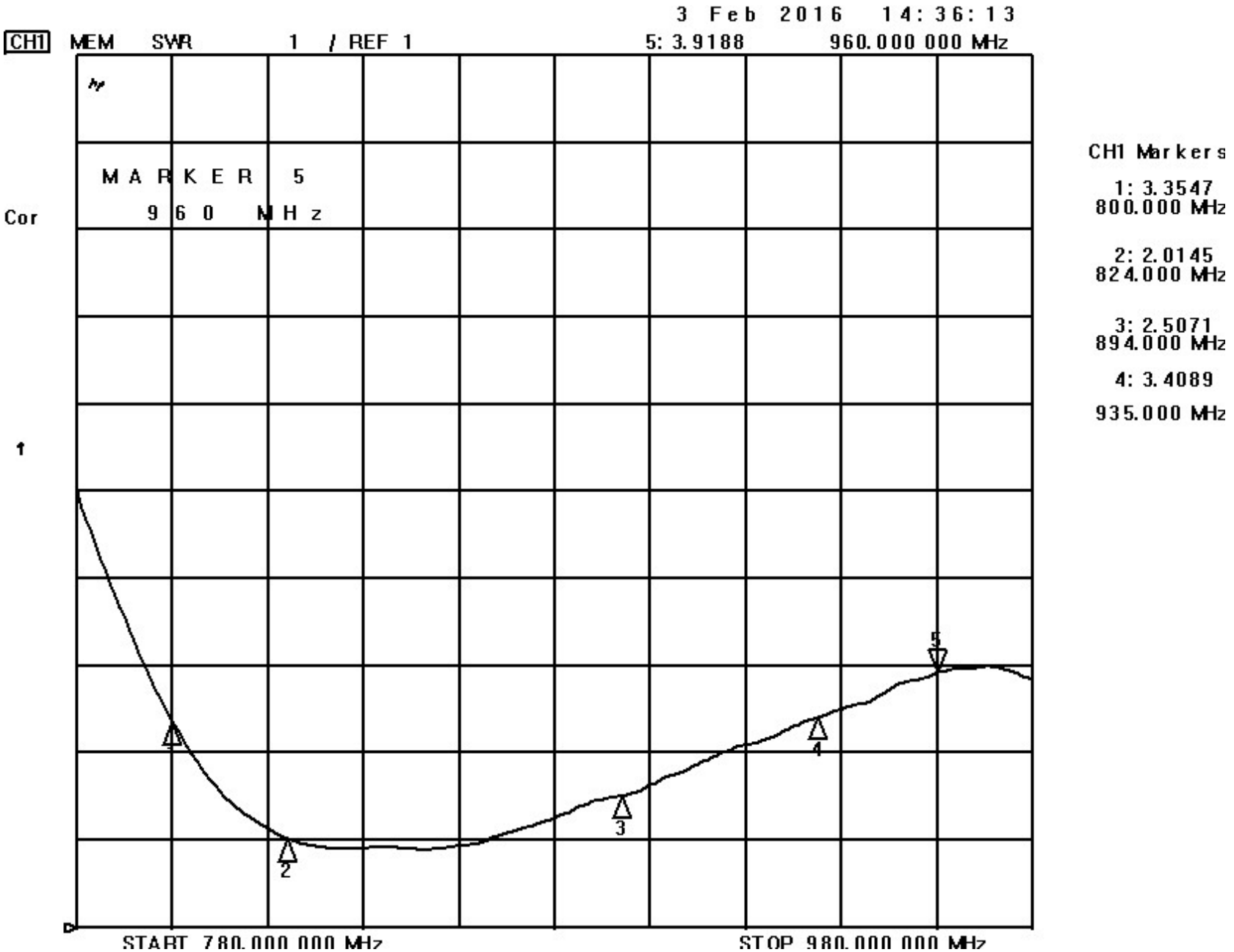


No.	PART NAME	MATERIAL	FINISH
5	SLEEVE	NYLON GRASS	BLACK-COLOR
4	JOINT PIN*2ea	BRASS	NI-PLATING
3	'B' COVER	NYLON GRASS	BLACK-COLOR
2	'A' COVER	NYLON GRASS	BLACK-COLOR
1	SMA(m) CONN.	BRASS	Ni-PLATING

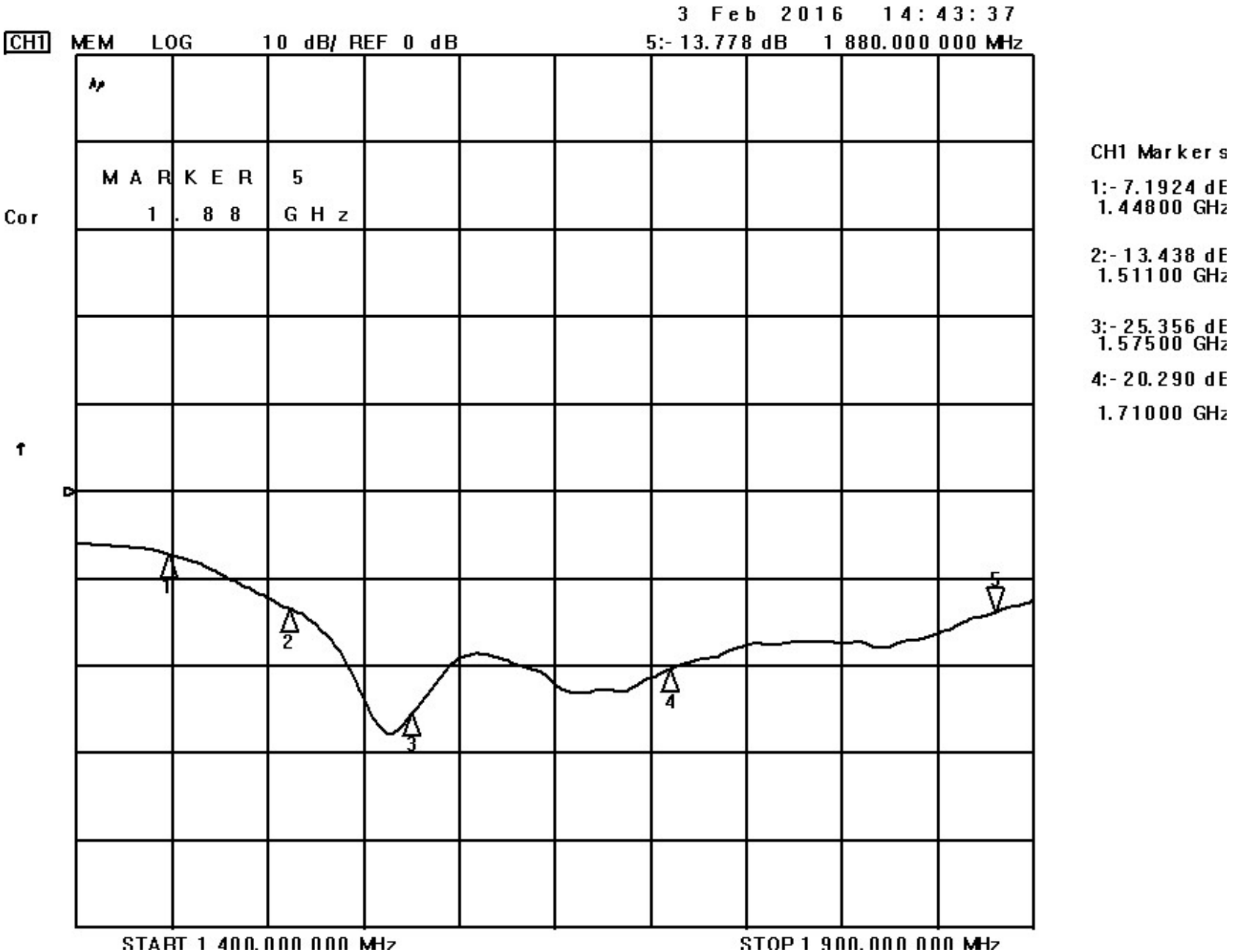
TITLE	MULTI DIPOLE ANTENNA ASS'Y		MODEL	HW-MULTI-G-RSMA
Drawn	Checked	Approval	Date	DWG No.	File Name
W.C,LEE		C.G,NAM	2014.04.21	140421-01	

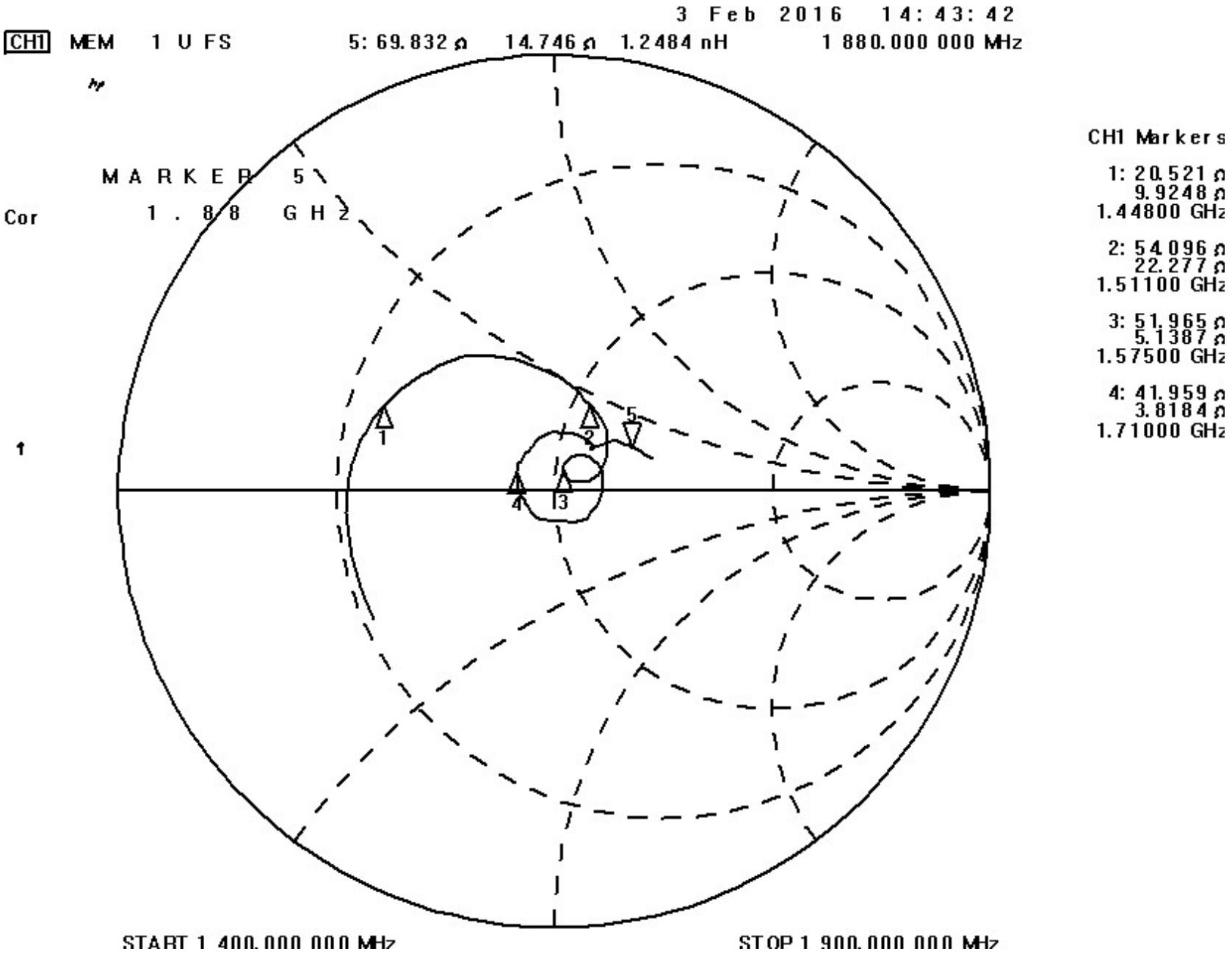

3 Feb 2016 14:36:03
CH1 MEM LOG 10 dB/ REF 0 dB
5:- 4.5330 dB 960.000 000 MHz
MARKER 5
960 MHz
Cor
START 780.000 000 MHz
STOP 980.000 000 MHz
CH1 Markers
1:- 5.3403 dB
800.000 MHz
2:- 9.4586 dB
824.000 MHz
3:- 7.3361 dB
894.000 MHz
4:- 5.2501 dB
935.000 MHz

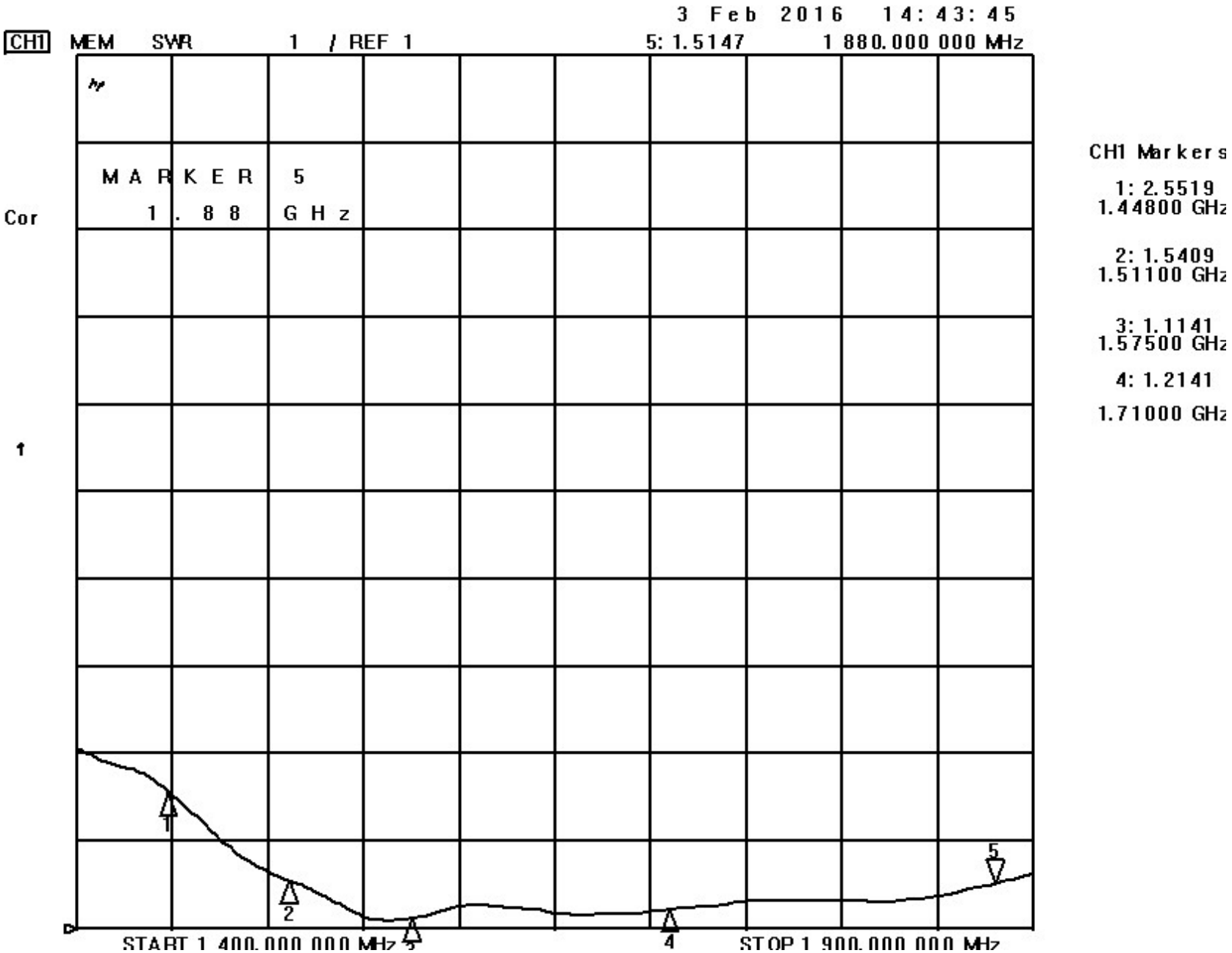

3 Feb 2016 14:36:08
CH1 MEM 1 U FS
5: 19.102 Ω 33.496 Ω 5.5532 nH
960.000 000 MHz
MARKER 5
960 MHz
Cor
CH1 Markers
1: 94.973 Ω
-76.336 Ω
800.000 MHz
2: 48.807 Ω
-35.293 Ω
824.000 MHz
3: 20.091 Ω
3.9521 Ω
894.000 MHz
4: 17.831 Ω
21.979 Ω
935.000 MHz
START 780.000 000 MHz
STOP 980.000 000 MHz

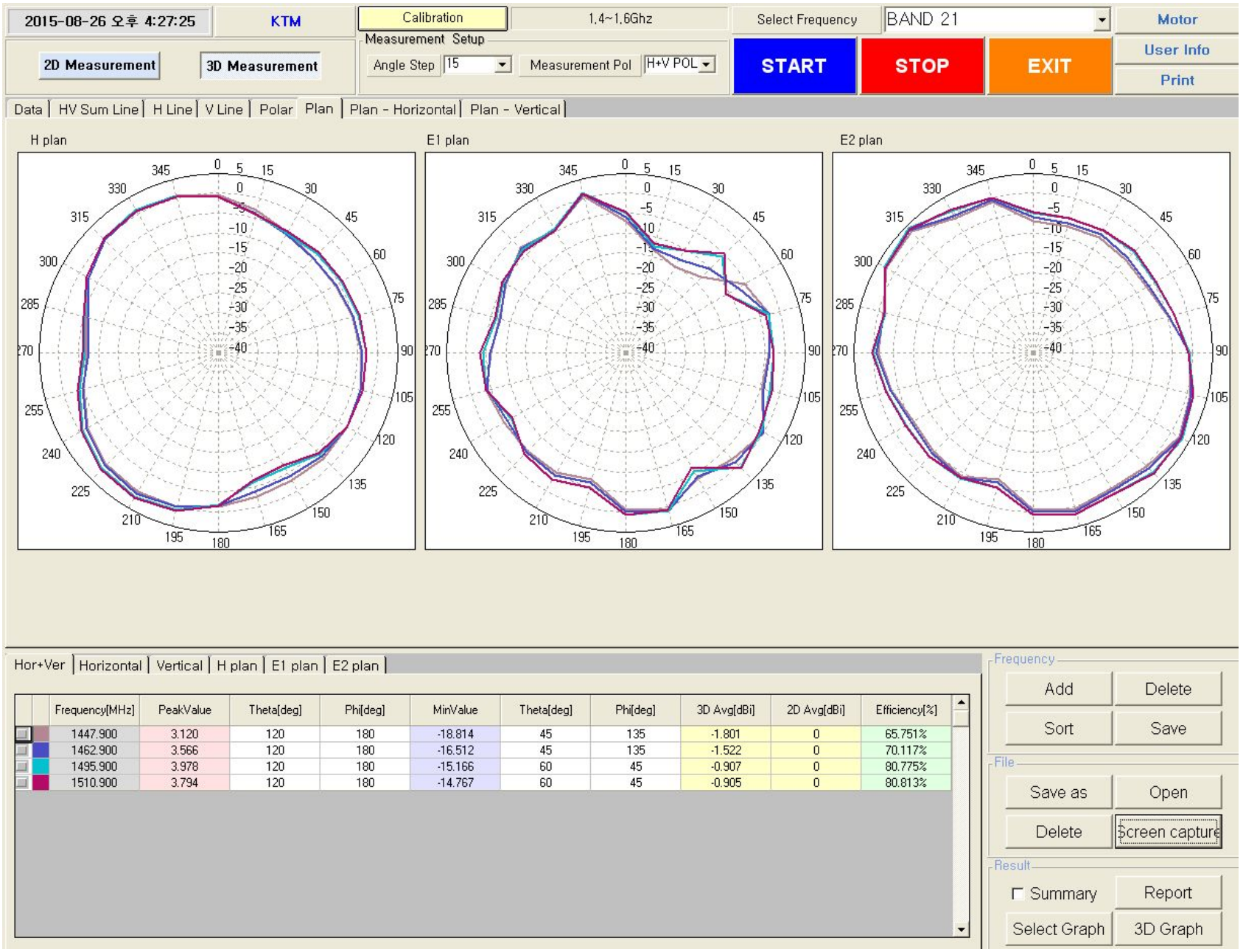

3 Feb 2016 14:36:13
CH1 MEM SWR 1 / REF 1
5: 3.9188 960.000 000 MHz
MARKER 5
960 MHz
Cor
1
CH1 Markers
1: 3.3547
800.000 MHz
2: 2.0145
824.000 MHz
3: 2.5071
894.000 MHz
4: 3.4089
935.000 MHz
START 780.000 000 MHz
STOP 980.000 000 MHz


2013-08-29 오전 12:20:54
KTM
Calibration
800_980Mhz
Select Frequency
800_960
Motor
User Info
Print
2D Measurement
3D Measurement
Measurement Setup
Angle Step
15
Measurement Pol
H+V POL
START
STOP
EXIT
Data
HV Sum Line
H Line
V Line
Polar
Plan
Plan - Horizontal
Plan - Vertical
H plan
E1 plan
E2 plan
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[%]
800.000 -0.237 90 45 -21.361 165 270 -2.178 0 60.285%
810.000 0.633 90 30 -19.859 165 270 -1.597 0 68.920%
824.000 1.528 90 75 -25.157 165 255 -0.847 0 81.899%
849.000 2.151 90 90 -20.609 165 255 -0.616 0 86.369%
880.000 2.269 90 90 -19.842 165 255 -1.009 0 78.902%
894.000 1.559 90 90 -17.738 165 255 -1.874 0 64.652%
935.000 2.410 105 75 -12.143 165 270 -0.993 0 79.199%
960.000 2.735 105 75 -12.953 75 90 -0.835 0 82.121%
Frequency
Add
Delete
Sort
Save
File
Save as
Open
Delete
Screen capture
Result
Summary
Report
Select Graph
3D Graph


3 Feb 2016 14:43:37
CH1 MEM LOG 10 dB/ REF 0 dB
5:-13.778 dB 1 880.000 000 MHz
MARKER 5
1.88 GHz
Cor
CH1 Markers
1:-7.1924 dB
1.44800 GHz
2:-13.438 dB
1.51100 GHz
3:-25.356 dB
1.57500 GHz
4:-20.290 dB
1.71000 GHz
START 1 400.000 000 MHz
STOP 1 900.000 000 MHz

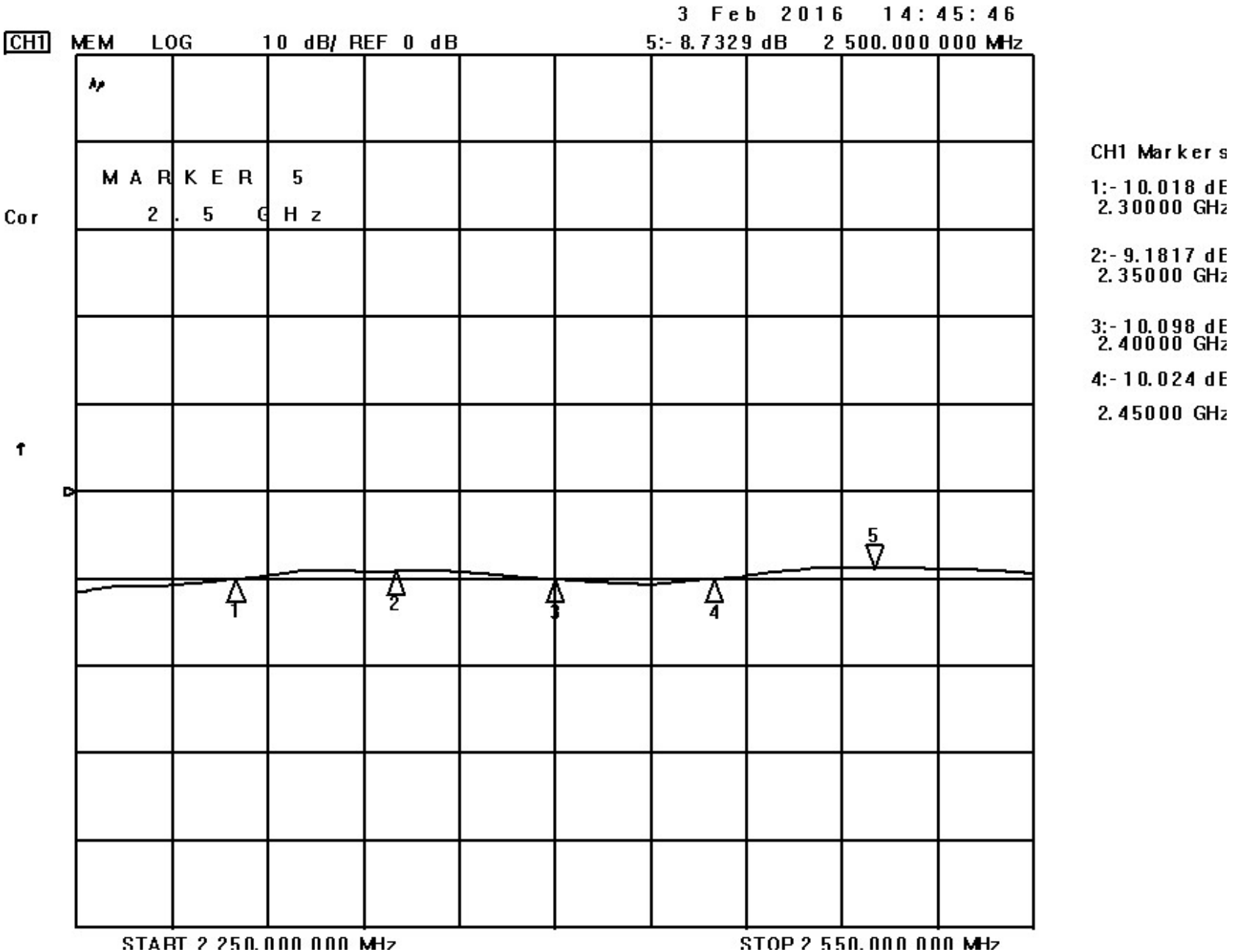

3 Feb 2016 14:43:42
CH1 MEM 1 U FS
5: 69.832 Ω 14.746 Ω 1.2484 nH
1 880.000 000 MHz
MARKER 5
1.88 GHz
Cor
CH1 Markers
1: 20.521 Ω
9.9248 Ω
1.44800 GHz
2: 54.096 Ω
22.277 Ω
1.51100 GHz
3: 51.965 Ω
5.1387 Ω
1.57500 GHz
4: 41.959 Ω
3.8184 Ω
1.71000 GHz
START 1 400.000 000 MHz
STOP 1 900.000 000 MHz

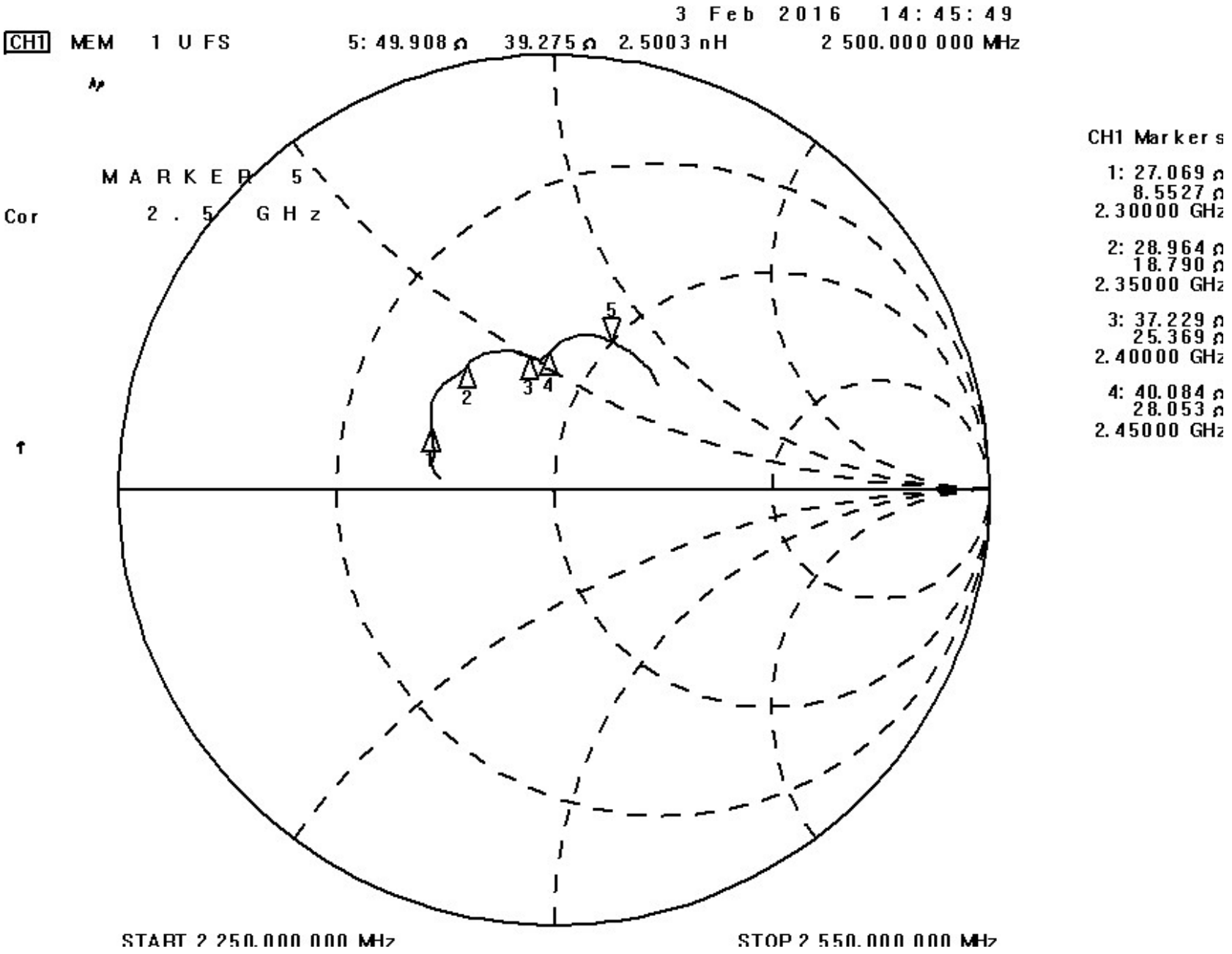

3 Feb 2016 14:43:45
CH1 MEM SWR 1 / REF 1
5: 1.5147 1 880.000 000 MHz
MARKER 5
1.88 GHz
Cor
1
CH1 Markers
1: 2.5519
1.44800 GHz
2: 1.5409
1.51100 GHz
3: 1.1141
1.57500 GHz
4: 1.2141
1.71000 GHz
START 1 400.000 000 MHz
STOP 1 900.000 000 MHz

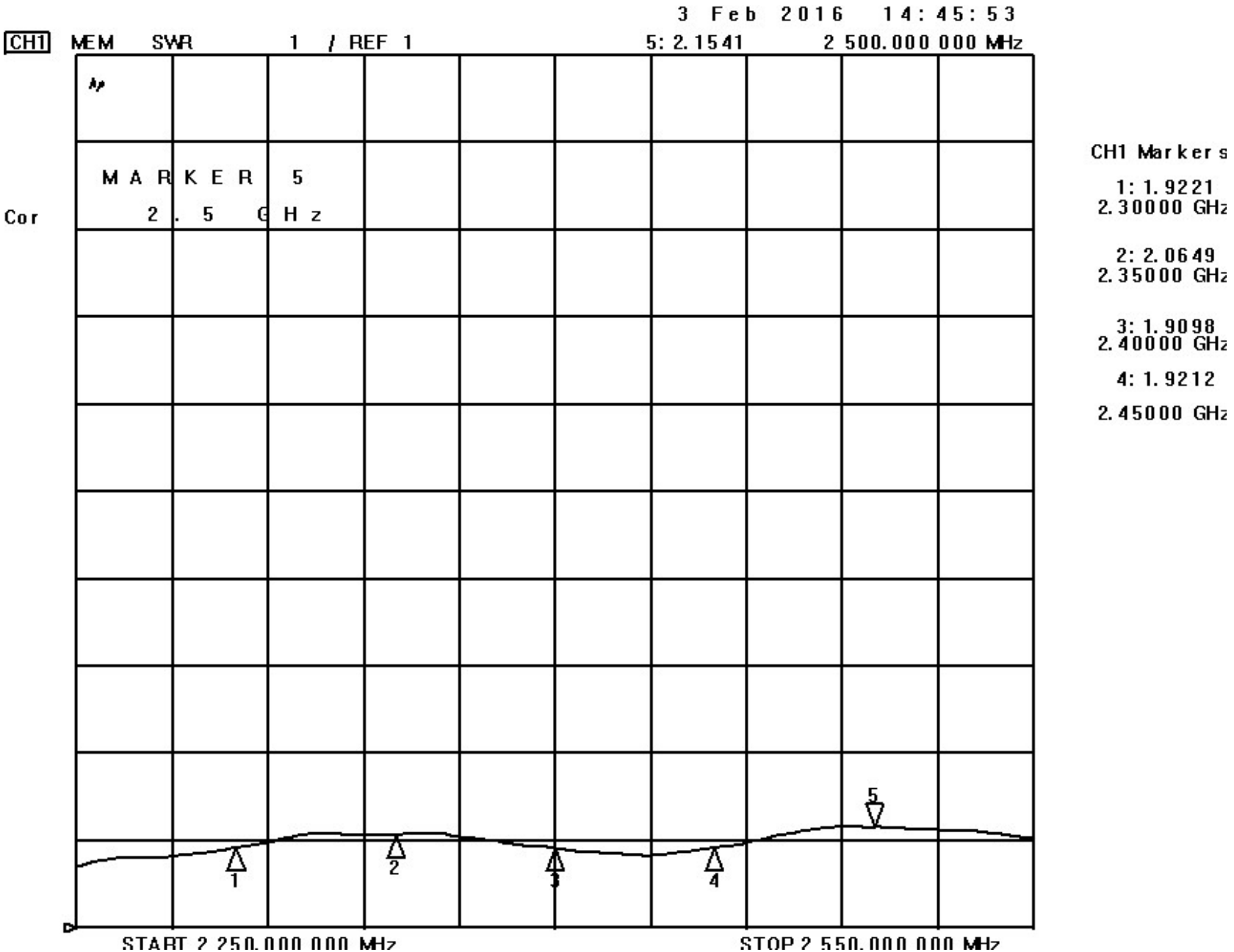

2015-08-26 오후 4:27:25
KTM
Calibration
1.4~1.6Ghz
Select Frequency
BAND 21
Motor
User Info
Print
2D Measurement
3D Measurement
Measurement Setup
Angle Step
15
Measurement Pol
H+V POL
START
STOP
EXIT
Data
HV Sum Line
H Line
V Line
Polar
Plan
Plan - Horizontal
Plan - Vertical
H plan
E1 plan
E2 plan
Hor+Ver
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[%]
1447.900 3.120 120 180 -18.814 45 135 -1.801 0 65.751%
1462.900 3.566 120 180 -16.512 45 135 -1.522 0 70.117%
1495.900 3.978 120 180 -15.166 60 45 -0.907 0 80.775%
1510.900 3.794 120 180 -14.767 60 45 -0.905 0 80.813%
Frequency
Add
Delete
Sort
Save
File
Save as
Open
Delete
Screen capture
Result
Summary
Report
Select Graph
3D Graph

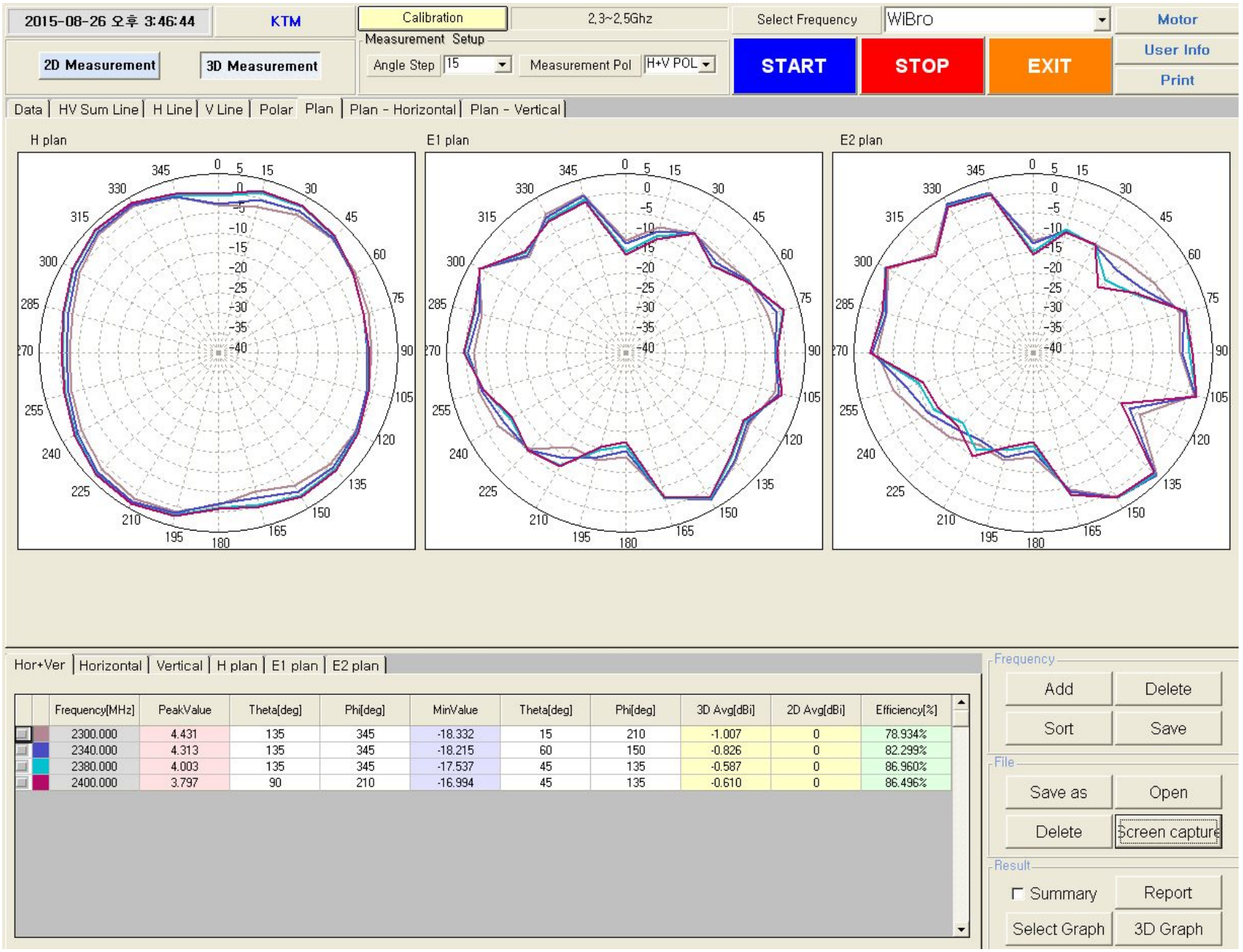

2015-08-26 오후 4:20:59
KTM
Calibration
1.4~1.6Ghz
Select Frequency
GPS
Motor
2D Measurement
3D Measurement
Measurement Setup
Angle Step
15
Measurement Pol
H+V POL
START
STOP
EXIT
User Info
Print
Data
HV Sum Line
H Line
V Line
Polar
Plan
Plan - Horizontal
Plan - Vertical
H plan
E1 plan
E2 plan
Hor+Ver
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 4.187 120 195 -16.527 30 90 -1.102 0 77.234%
1575.420 4.177 120 195 -16.491 30 90 -1.112 0 77.050%
1576.000 4.170 120 195 -16.411 30 90 -1.130 0 76.734%
Frequency
Add
Delete
Sort
Save
File
Save as
Open
Delete
Screen capture
Result
Summary
Report
Select Graph
3D Graph

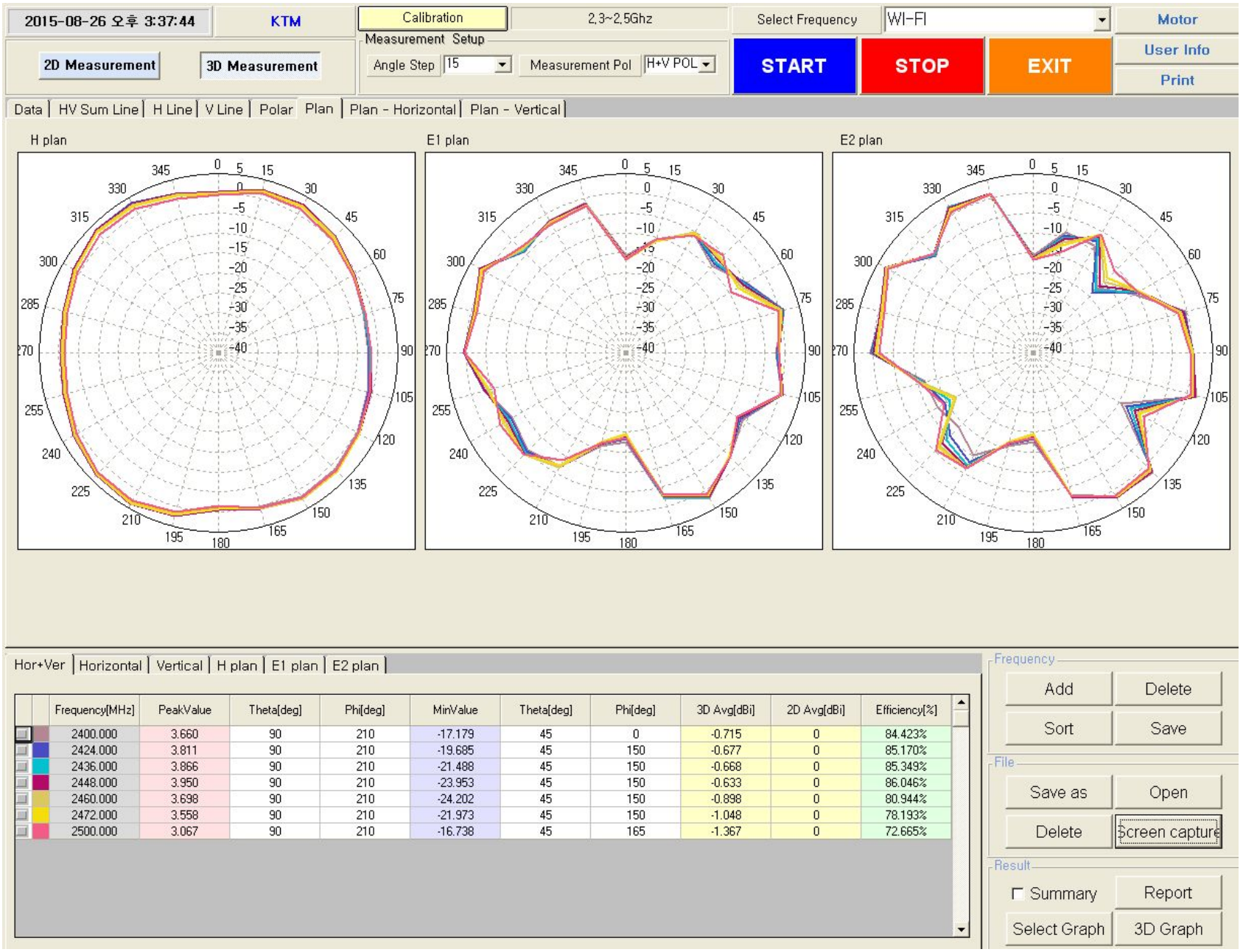

2015-08-26 오후 4:14:16
KTM
Calibration
1.7~2.2Ghz
Select Frequency
DCS
Motor
2D Measurement
3D Measurement
Measurement Setup
Angle Step
15
Measurement Pol
H+V POL
START
STOP
EXIT
User Info
Print
Data
HV Sum Line
H Line
V Line
Polar
Plan
Plan - Horizontal
Plan - Vertical
H plan
E1 plan
E2 plan
Hor+Ver
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 3.964 120 195 -9.445 150 255 -1.215 0 75.255%
1785.000 5.257 120 180 -13.711 150 255 -0.033 0 98.793%
1805.000 5.315 120 180 -14.673 150 255 0.035 0 100.337%
1880.000 3.196 90 270 -18.787 30 105 -1.051 0 78.138%
Frequency
Add
Delete
Sort
Save
File
Save as
Open
Delete
Screen capture
Result
Summary
Report
Select Graph
3D Graph

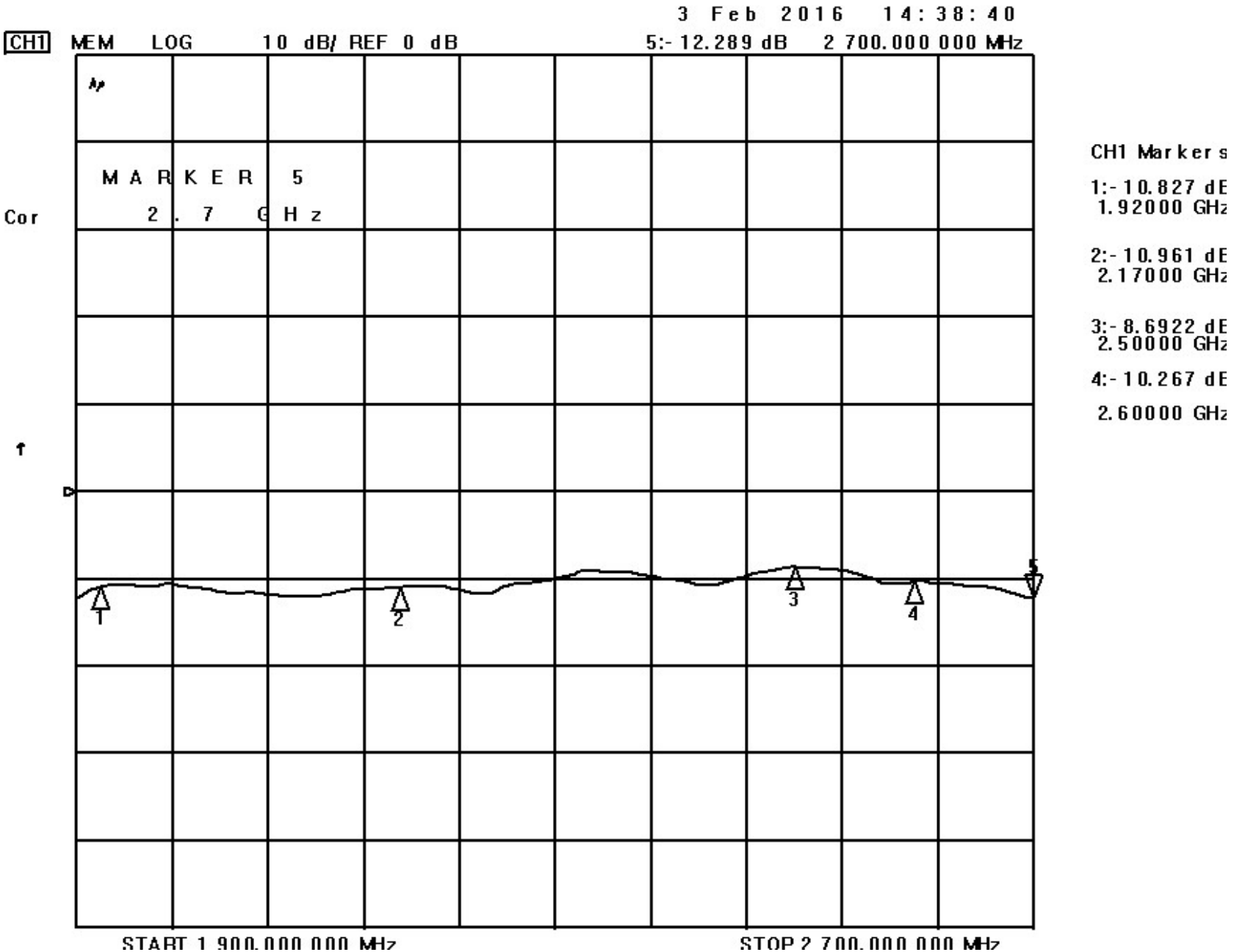

3 Feb 2016 14:45:46
CH1 MEM LOG 10 dB/ REF 0 dB
5:- 8.7329 dB 2 500.000 000 MHz
MARKER 5
2.5 GHz
Cor
CH1 Markers
1:- 10.018 dB
2.30000 GHz
2:- 9.1817 dB
2.35000 GHz
3:- 10.098 dB
2.40000 GHz
4:- 10.024 dB
2.45000 GHz
START 2 250.000 000 MHz
STOP 2 550.000 000 MHz

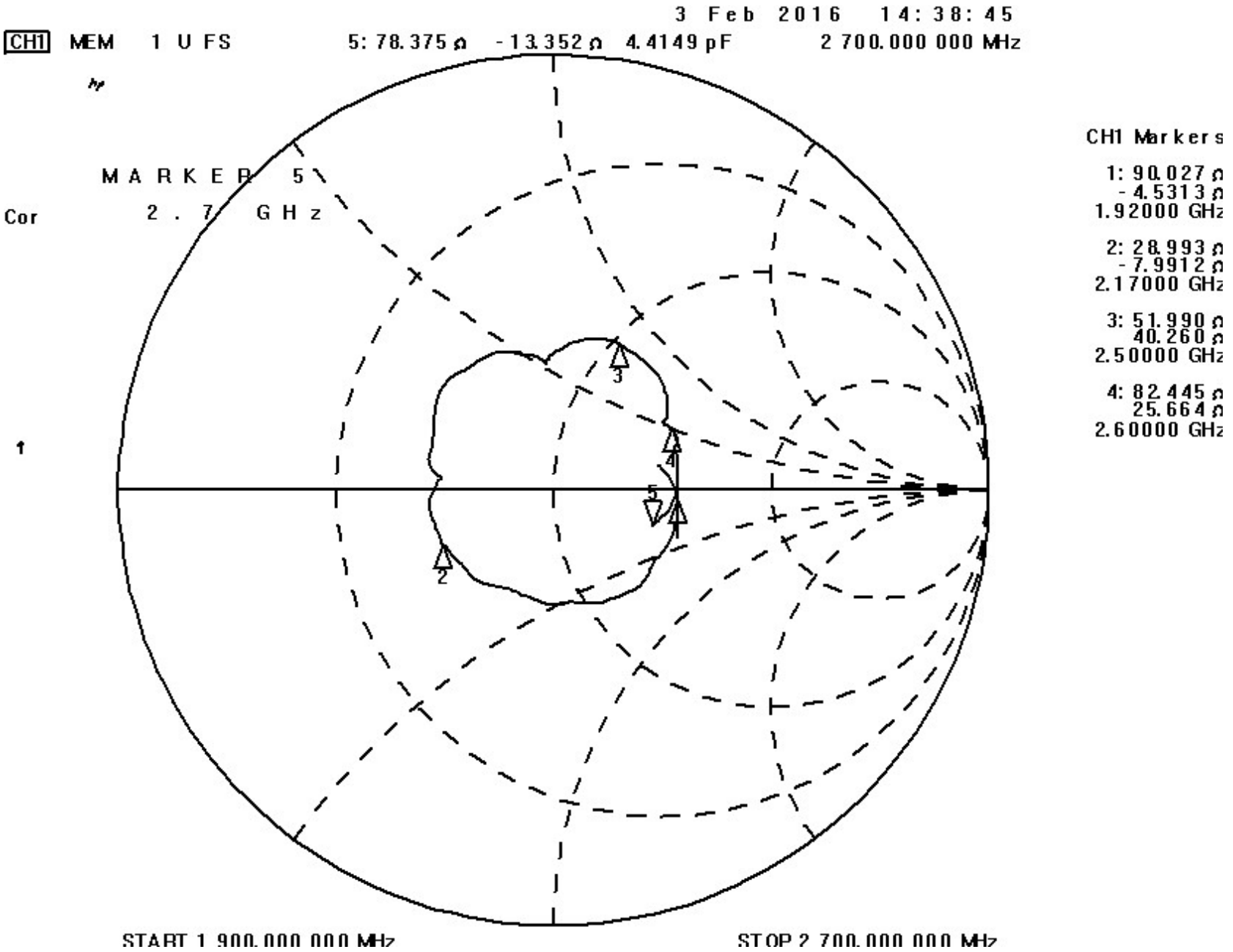

3 Feb 2016 14:45:49
CH1 MEM 1 U FS
5: 49.908 Ω 39.275 Ω 2.5003 nH
2 500.000 000 MHz
MARKER 5
Cor 2.5 GHz
CH1 Markers
1: 27.069 Ω
8.5527 Ω
2.30000 GHz
2: 28.964 Ω
18.790 Ω
2.35000 GHz
3: 37.229 Ω
25.369 Ω
2.40000 GHz
4: 40.084 Ω
28.053 Ω
2.45000 GHz
START 2 250.000 000 MHz
STOP 2 550.000 000 MHz

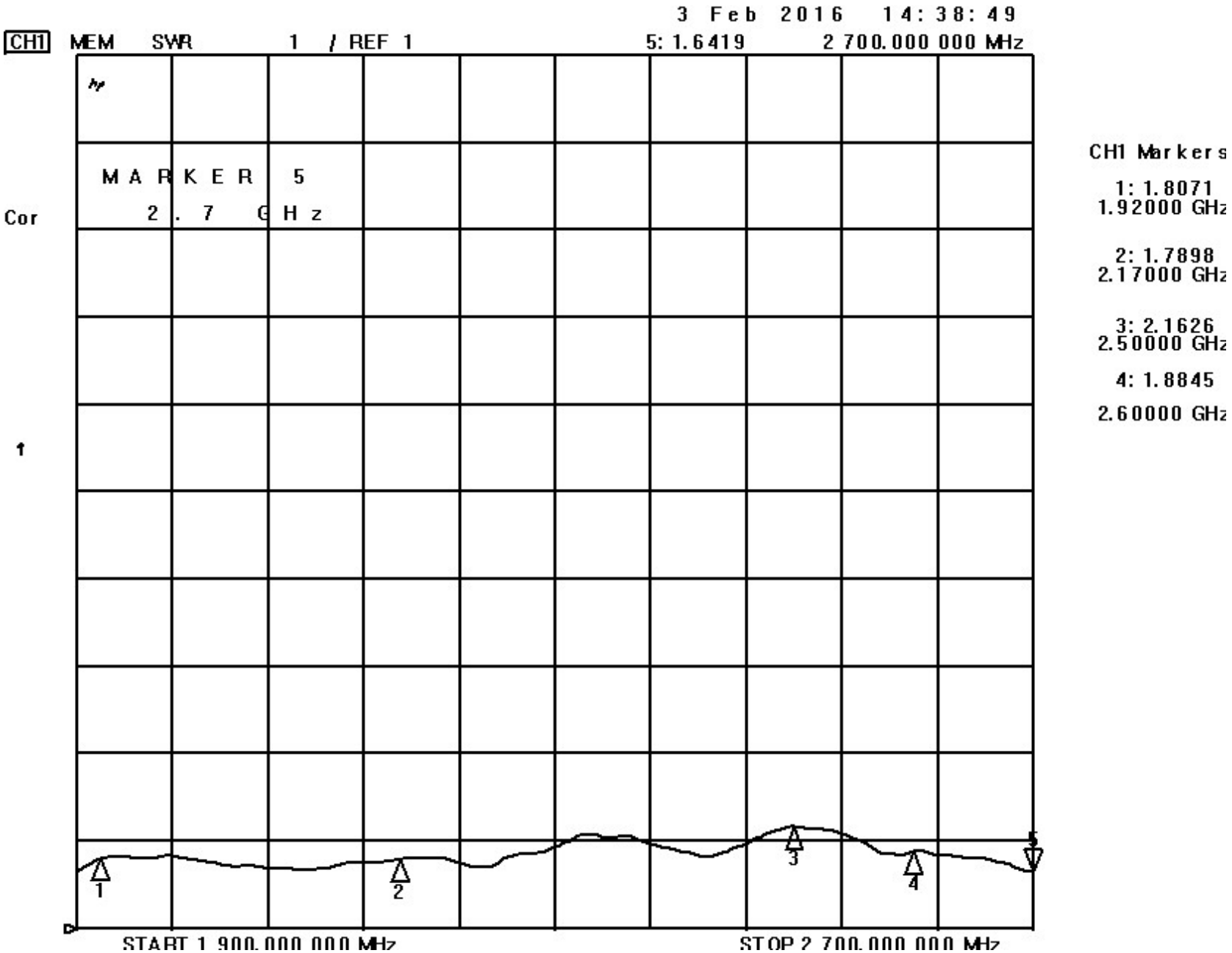

3 Feb 2016 14:45:53
CH1 MEM SWR 1 / REF 1
5: 2.1541
2 500.000 000 MHz
MARKER 5
2.5 GHz
Cor
CH1 Markers
1: 1.9221
2.30000 GHz
2: 2.0649
2.35000 GHz
3: 1.9098
2.40000 GHz
4: 1.9212
2.45000 GHz
START 2 250.000 000 MHz
STOP 2 550.000 000 MHz

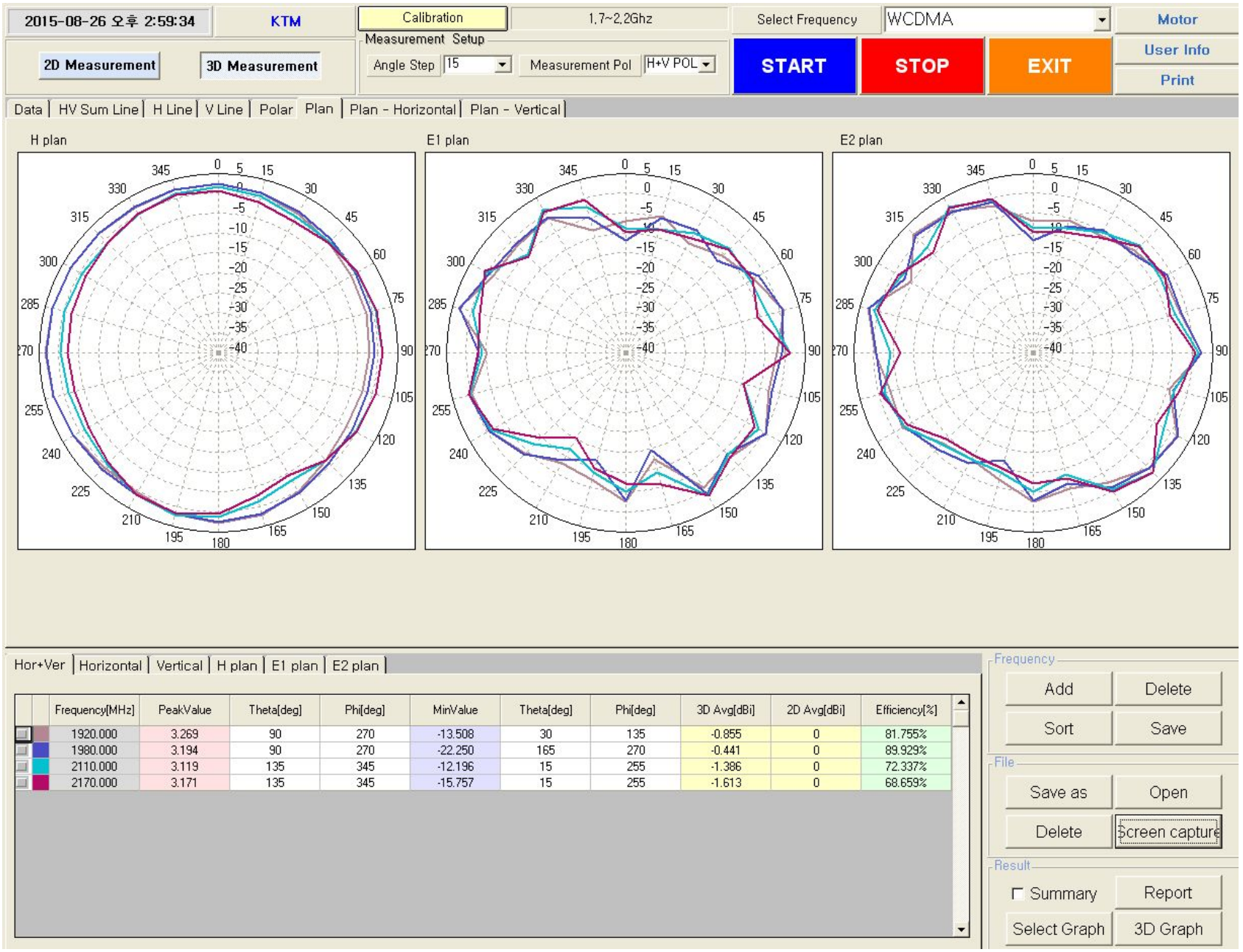

2015-08-26 오후 3:46:44
KTM
Calibration
2.3~2.5Ghz
Select Frequency
WiBro
Motor
User Info
Print
2D Measurement
3D Measurement
Measurement Setup
Angle Step
15
Measurement Pol
H+V POL
START
STOP
EXIT
Data
HV Sum Line
H Line
V Line
Polar
Plan
Plan - Horizontal
Plan - Vertical
H plan
E1 plan
E2 plan
Hor+Ver
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[%]
2300.000 4.431 135 345 -18.332 15 210 -1.007 0 78.934%
2340.000 4.313 135 345 -18.215 60 150 -0.826 0 82.299%
2380.000 4.003 135 345 -17.537 45 135 -0.587 0 86.960%
2400.000 3.797 90 210 -16.994 45 135 -0.610 0 86.496%
Frequency
Add
Delete
Sort
Save
File
Save as
Open
Delete
Screen capture
Result
Summary
Report
Select Graph
3D Graph


2015-08-26 오후 3:37:44
KTM
Calibration
2.3~2.5Ghz
Select Frequency
WI-FI
Motor
User Info
Print
2D Measurement
3D Measurement
Measurement Setup
Angle Step
15
Measurement Pol
H+V POL
START
STOP
EXIT
Data
HV Sum Line
H Line
V Line
Polar
Plan
Plan - Horizontal
Plan - Vertical
H plan
E1 plan
E2 plan
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[%]
2400.000 3.660 90 210 -17.179 45 0 -0.715 0 84.423%
2424.000 3.811 90 210 -19.685 45 150 -0.677 0 85.170%
2436.000 3.866 90 210 -21.488 45 150 -0.668 0 85.349%
2448.000 3.950 90 210 -23.953 45 150 -0.633 0 86.046%
2460.000 3.698 90 210 -24.202 45 150 -0.898 0 80.944%
2472.000 3.558 90 210 -21.973 45 150 -1.048 0 78.193%
2500.000 3.067 90 210 -16.738 45 165 -1.367 0 72.665%
Frequency
Add
Delete
Sort
Save
File
Save as
Open
Delete
Screen capture
Result
Summary
Report
Select Graph
3D Graph


3 Feb 2016 14:38:40
CH1 MEM LOG 10 dB/ REF 0 dB
5:-12.289 dB 2 700.000 000 MHz
MARKER 5
2.7 GHz
Cor
CH1 Markers
1:-10.827 dB
1.92000 GHz
2:-10.961 dB
2.17000 GHz
3:-8.6922 dB
2.50000 GHz
4:-10.267 dB
2.60000 GHz
START 1 900.000 000 MHz
STOP 2 700.000 000 MHz


3 Feb 2016 14:38:45
CH1 MEM 1 U FS
5: 78.375 Ω -13.352 Ω 4.4149 pF
2 700.000 000 MHz
MARKER 5
2.7 GHz
Cor
CH1 Markers
1: 90.027 Ω
-4.5313 Ω
1.92000 GHz
2: 28.993 Ω
-7.9912 Ω
2.17000 GHz
3: 51.990 Ω
40.260 Ω
2.50000 GHz
4: 82.445 Ω
25.664 Ω
2.60000 GHz
START 1 900.000 000 MHz
STOP 2 700.000 000 MHz


3 Feb 2016 14:38:49
CH1 MEM SWR 1 / REF 1
5: 1.6419
2 700.000 000 MHz
MARKER 5
2.7 GHz
Cor
1
CH1 Markers
1: 1.8071
1.92000 GHz
2: 1.7898
2.17000 GHz
3: 2.1626
2.50000 GHz
4: 1.8845
2.60000 GHz
START 1 900.000 000 MHz
STOP 2 700.000 000 MHz


2015-08-26 오후 2:59:34
KTM
Calibration
1.7~2.2Ghz
Select Frequency
WCDMA
Motor
User Info
Print
2D Measurement
3D Measurement
Measurement Setup
Angle Step
15
Measurement Pol
H+V POL
START
STOP
EXIT
Data
HV Sum Line
H Line
V Line
Polar
Plan
Plan - Horizontal
Plan - Vertical
H plan
E1 plan
E2 plan
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 3.269 90 270 -13.508 30 135 -0.855 0 81.755%
1980.000 3.194 90 270 -22.250 165 270 -0.441 0 89.929%
2110.000 3.119 135 345 -12.196 15 255 -1.386 0 72.337%
2170.000 3.171 135 345 -15.757 15 255 -1.613 0 68.659%
Frequency
Add
Delete
Sort
Save
File
Save as
Open
Delete
Screen capture
Result
Summary
Report
Select Graph
3D Graph


2015-08-26 오후 3:19:56
KTM
Calibration
2.5~2.7Ghz
Select Frequency
WI-MAX
Motor
User Info
Print
2D Measurement
3D Measurement
Measurement Setup
Angle Step
15
Measurement Pol
H+V POL
START
STOP
EXIT
Data
HV Sum Line
H Line
V Line
Polar
Plan
Plan - Horizontal
Plan - Vertical
H plan
E1 plan
E2 plan
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 3.687 90 225 -20.029 45 165 -1.039 0 78.366%
2520.000 3.469 90 225 -16.979 15 345 -1.156 0 76.279%
2540.000 3.399 90 225 -18.091 15 330 -1.107 0 77.144%
2570.000 3.213 90 225 -15.743 15 330 -1.093 0 77.394%
2600.000 3.191 90 225 -15.288 60 105 -1.112 0 77.057%
2650.000 3.020 90 225 -18.059 60 285 -1.313 0 73.565%
2700.000 2.761 90 225 -19.390 60 285 -1.826 0 65.380%
Frequency
Add
Delete
Sort
Save
File
Save as
Open
Delete
Screen capture
Result
Summary
Report
Select Graph
3D Graph