FCC TEST REPORT

quipment Under Test	:	Bluetooth USB Dongle
Model No.	:	GL2BDG91
Applicant	:	Global Sun Technology Inc.
Address of Applicant	:	No.13, Tung Yuan Rd., Jung Li Industrial Park, Jung Li city, Tao Yuan Hsien, Taiwan, R.O. C.

Standards:

FCC Part 15 subpart C

In the configuration tested, the EUT complied with the standards specified above.

Remarks:

This report details the results of the testing carried out on one sample, the results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

This report may only be reproduced and distributed in full. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS Taiwan E&E Services or testing done by SGS Taiwan E&E Services in connection with distribution or use of the product described in this report must be approved by SGS Taiwan E&E Services in writing.

Tested by : Alex Lee **Date : Jan. 23,2003**

Approved by : Jason Lin **Date : Jan. 30,2003**

Contents

1. General Information
1.1 Testing Laboratory 3
1.2 Details of Applicant 3
1.3 Description of EUT(s) 3
1.4 Operation Procedure 4

2. Summary of Results 5
3. Instruments List 6
4. Measurements 7
4.1 Conducted Limits 7
4.2 Radiated emission Limits, general requirement 9
4.3 Channel Spacing 14
4.4 20db bandwidth / No. of channels 16
4.5 Average time of Occupacy 22
4.6 Peak outpot power 24
4.7 Band-edge emission 26
4.8 Spurious Emission under 25Ghz 28

APPENDIX
Photographs of Test Setup 32
Photographs of EUT 33-34

1. General Information

1.1 Testing Laboratory

SGS Taiwan Ltd. (FCC Registration number: 573967)
1F, No. 134, Wukung Road, Wuku industrial zone
Taipei county , Taiwan , R.O.C.
Telephone : +886-2-2299-3279
Fax : +886-2-2298-2698
Internet : http://www.sgs.com.tw

1.2 Details of Applicant

Name : Global Sun Technology Inc.
Address No.13, Tung Yuan Rd., Jung Li Industrial Park,
Jung Li city, Tao Yuan Hsien, Taiwan, R.O. C.
Contact : Miss. Amber Huang
Telephone : +886-2-85227155 ext. 666

1.3 Description of EUT(s)

1	Product name	Bluetooth USB Dongle
2	Product ID	GL2BDG91
3	Supply Voltage	USB Power Supply 5V±10%
4	Carrier Frequency	2402MHz to 2480MHz
5	Modulation Method	GFSK,1Mbps,0.5BT Gaussian
6	Hopping	1600hops/sec, 1MHz channel space
7	Output Interface	USB
8	Operation Temperature	-20 to +70 degree
9	Compliant	Bluetooth Specification Ver1.1
10	Storage Temperature	-40 to +85 degree

1.4 Operation Procedure

Since Bluetooth is a FHSS system, it is difficult to measure the parameters under hopping mode. The output power and operating frequency are NOT End-user adjustable. Applicant offer a engineering software “BlueSuite” to control the EUT. Setting of the software parameters are set as default. Operating frequency are set as testing required. The output power is set as Ext=255, Int=60 (at max. power)

The lowest operating frequency within Bluetooth specification is 2402Mhz, and highest operating frequency is 2480Mhz. So the frequency above are used as the lowest and highest frequency in the testing, and the middle frequency is set as 2441Mhz.

Due to cable loss, the real value will equal to measured value(show on the instrument) add cable loss.

2.Summary of Results

subclause	Parameter to be measures	Verdict	Page
15.207	Conducted Limits	*PASS*	7
15.209	Radiated emission Limits, general requirement	*PASS*	9
15.247(a)(1)	Channel Spacing	*PASS*	14
15.247(a)(1)(ii)	20db bandwidth / No. of channels	*PASS*	15
15.247(a)(1)(ii)	Average Time of Occupacy	*PASS*	19
15.247(b)(1)	Peak Output power	*PASS*	21
15.247(c)	Band-Edge Emission	*PASS*	22
15.247(c)	Spurious Emission under 25Ghz	*PASS*	24

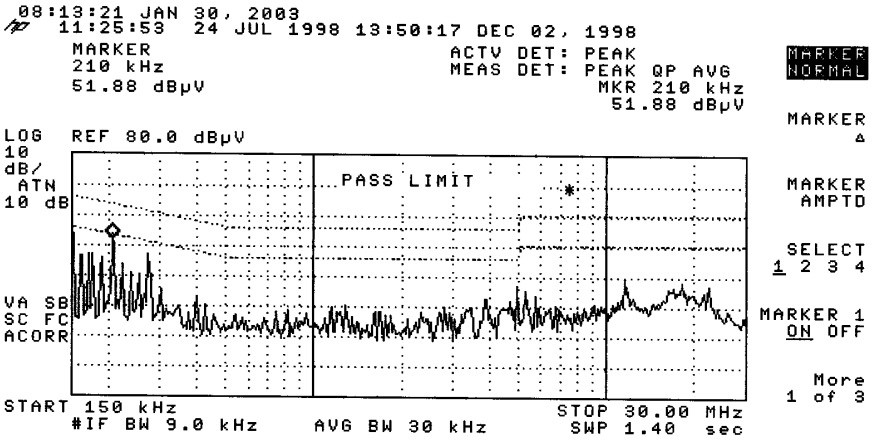
3. Instruments List

Instrument	Model	Serial number	Calibration date
Desktop PC	Acer Veriton 7200	N/A	N/A
Spectrum Analyzer	Agilent 7405A	US40240202	May 22, 2002
Climatic chamber	Terchy MHG-120L	911009	Oct. 15, 2002
Antenna	Schwarzbeck BBHA9120A	309/320	July 01, 2002
Antenna	Schwarzbeck VULB9163	152	July 01, 2002
RF Signal generator	Agilent 83752A	3601A02720	Sep. 04, 2002
EMC Analyzer	HP 8594EM	3624A00203	Dec. 13, 2002
EMI Test Receiver	R&S ESCS 30	828985/004	Oct. 11, 2002
Transient Limiter	HP 11947A	3107A02062	Jul. 24, 2002
L.I.S.N	Rolf-Heine NNB-2/16Z	99012	Oct. 08, 2002

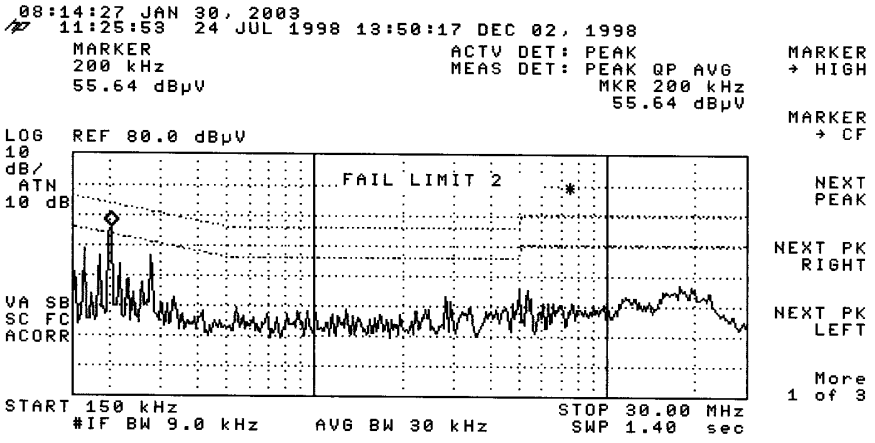
4. Measurements

4.1 Conducted Limits SUBCLAUSE 15.207

Line



Neural



4.1.1 Limits (EN55022)

Frequency range Mhz	Limits dB(uV)	
	Quasi-peak	Average
0.15 to 0.5	66 to 56	56 to 46
0.5 to 5	56	46
5 to 30	60	50

4.2 Radiated emission Limits, general requirement SUBCLAUSE 15.209

Part 1: 30Mhz-300Mhz

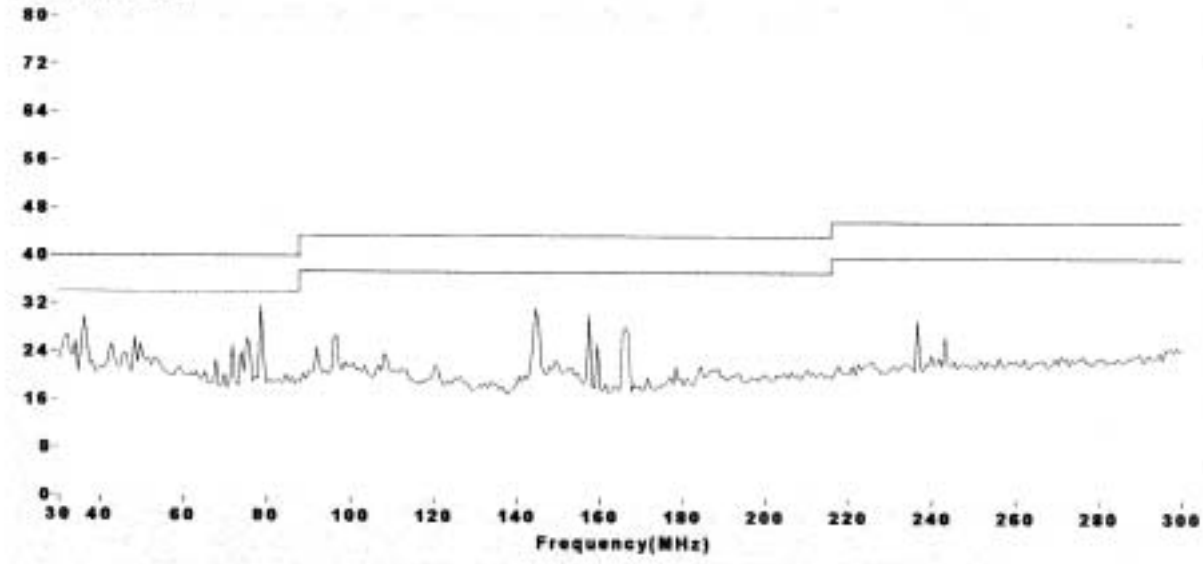
Vertical

SGS EMC Lab. Site 2

EMI TESTING REPORT

Customer:Global Sun Tech.
Model :GL2BDG91
Spec. :N/A
Ser. No.:N/A
Limit :FCC B

Date:2003-01-30 Time:09:10
Polar. :Vertical- 3M
Report No.:pretest
File :-1
Tester :Jason
Tmp.(C):21.0 Humid.(%):36



MEMO:

Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Factor	Other Factor
MHz	dB	dB	dB	dB	dB	dB	dB

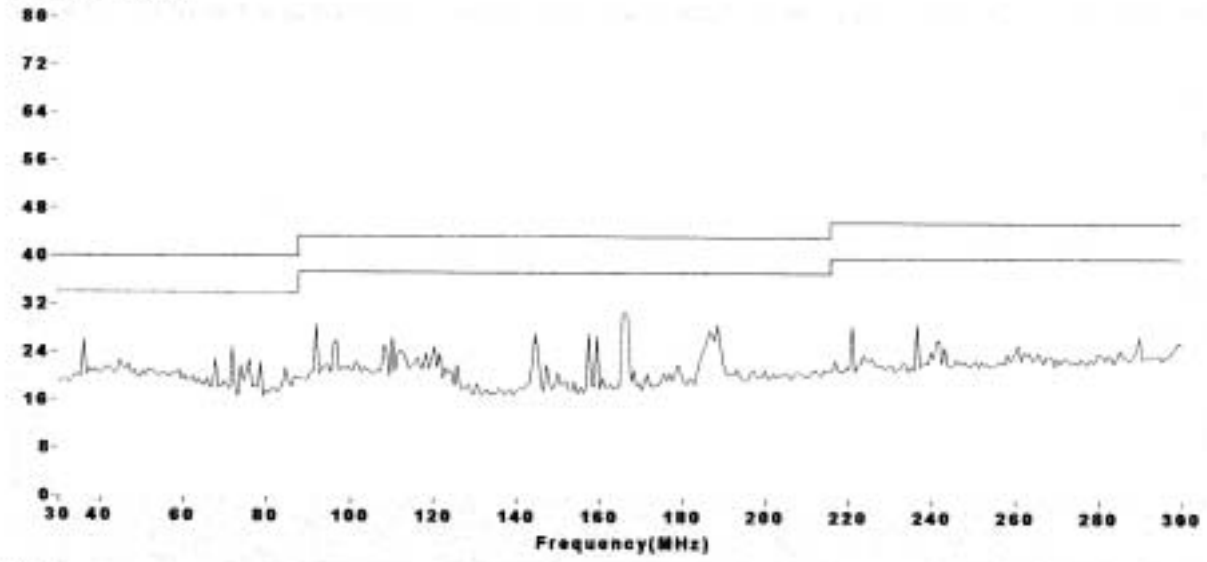
Horizontal

SGS EMC Lab. Site 2

EMI TESTING REPORT

Customer:Global Sun Tech.
Model :GL2BDG91
Spec. :N/A
Ser. No.:N/A
Limit :FCC B

Date:2003-01-30 Time:09:04
Polar. :Horizontal- 3M
Report No.:pretest
File :-1
Tester :Jason
Tmp.(C):21.0 Humid.(%):36



MEMO:

Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Factor	Other Factor
MHz	dB	dB	dB	dB	dB	dB	dB

Part2: 300Mhz- 1Ghz

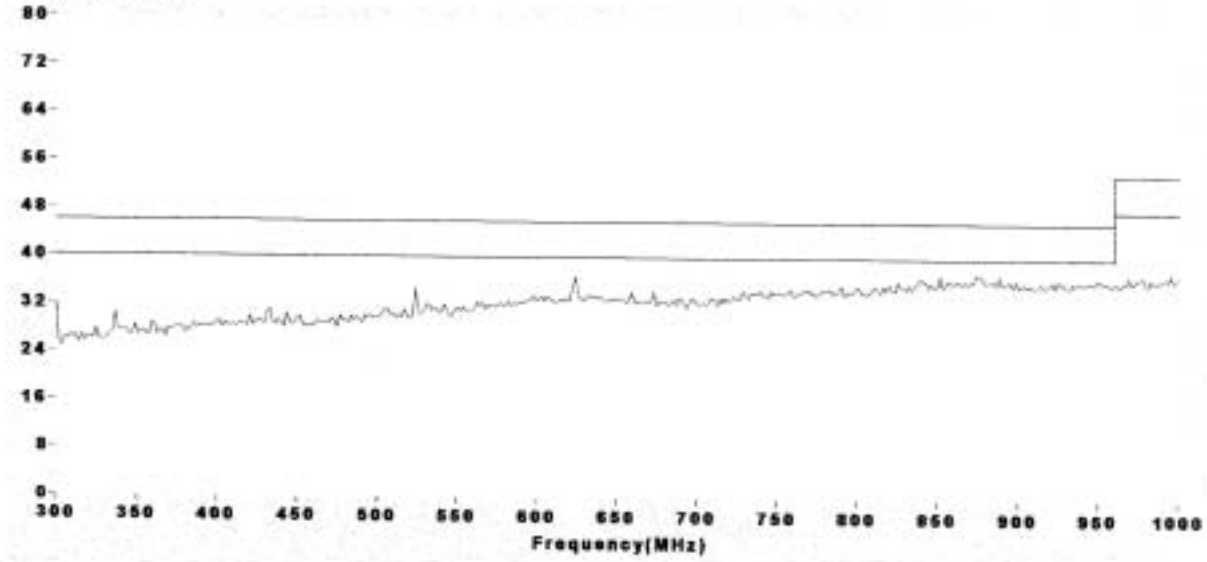
Vertical

SGS EMC Lab. Site 2

EMI TESTING REPORT

Customer:Global Sun Tech.
Model :GL2BDG91
Spec. :N/A
Ser. No.:N/A
Limit :FCC B

Date:2003-01-30 Time:09:13
Polar. :Vertical- 3M
Report No.:pretest
File :-1
Tester :Jason
Tmp.(C):21.0 Humid.(%):36



MEMO:

Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Factor	Other Factor
MHz	dB	dB	dB	dB	dB	dB	dB

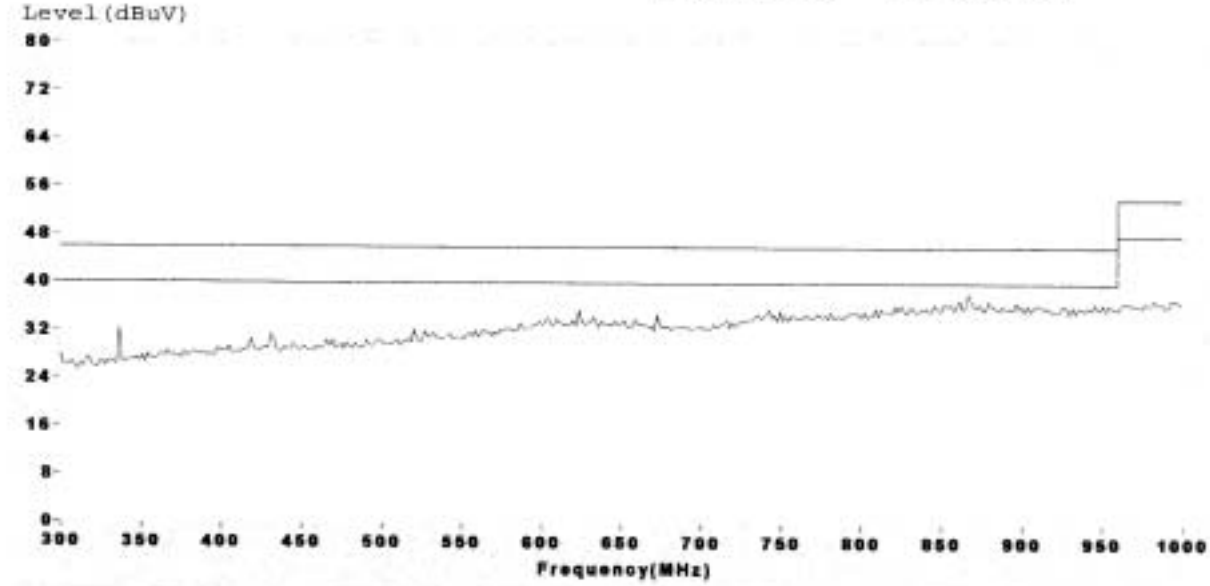
Horizontal

SGS EMC Lab. Site 2

EMI TESTING REPORT

Customer:Global Sun Tech.
Model :GL2BDG91
Spec. :N/A
Ser. No.:N/A
Limit :FCC B

Date:2003-01-30 Time:09:07
Polar. :Horizontal- 3M
Report No.:pretest
File :-1
Tester :Jason
Tmp.(C):21.0 Humid.(%):36



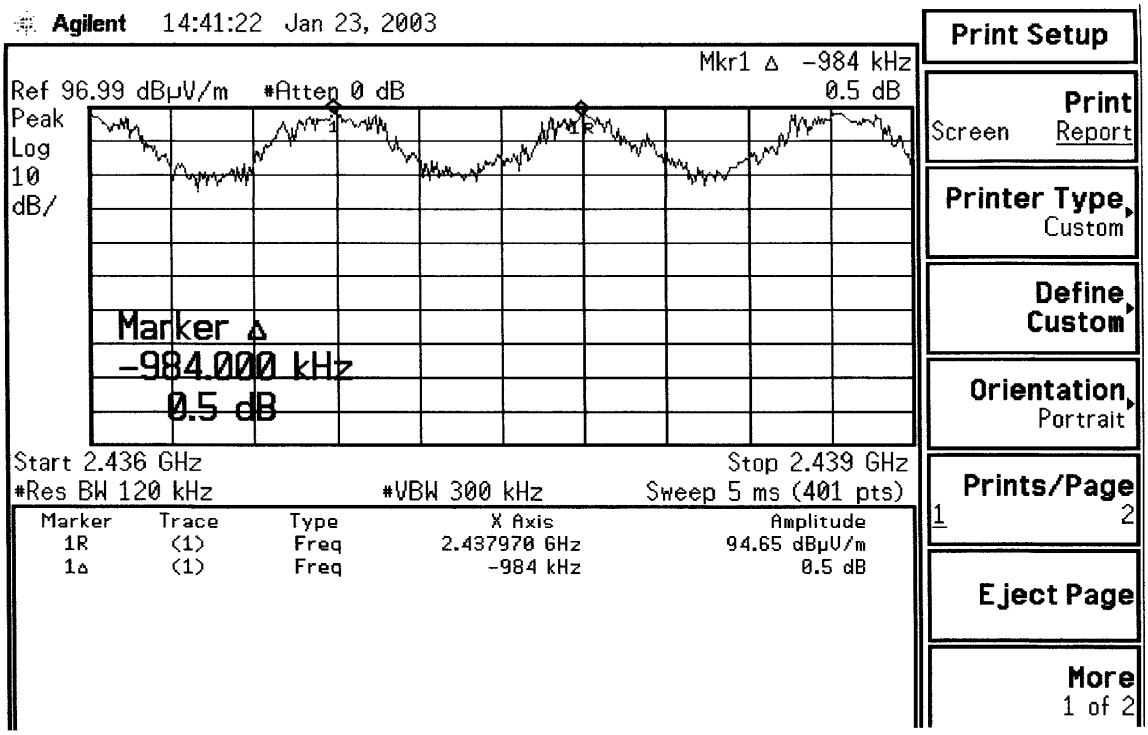
MEMO:

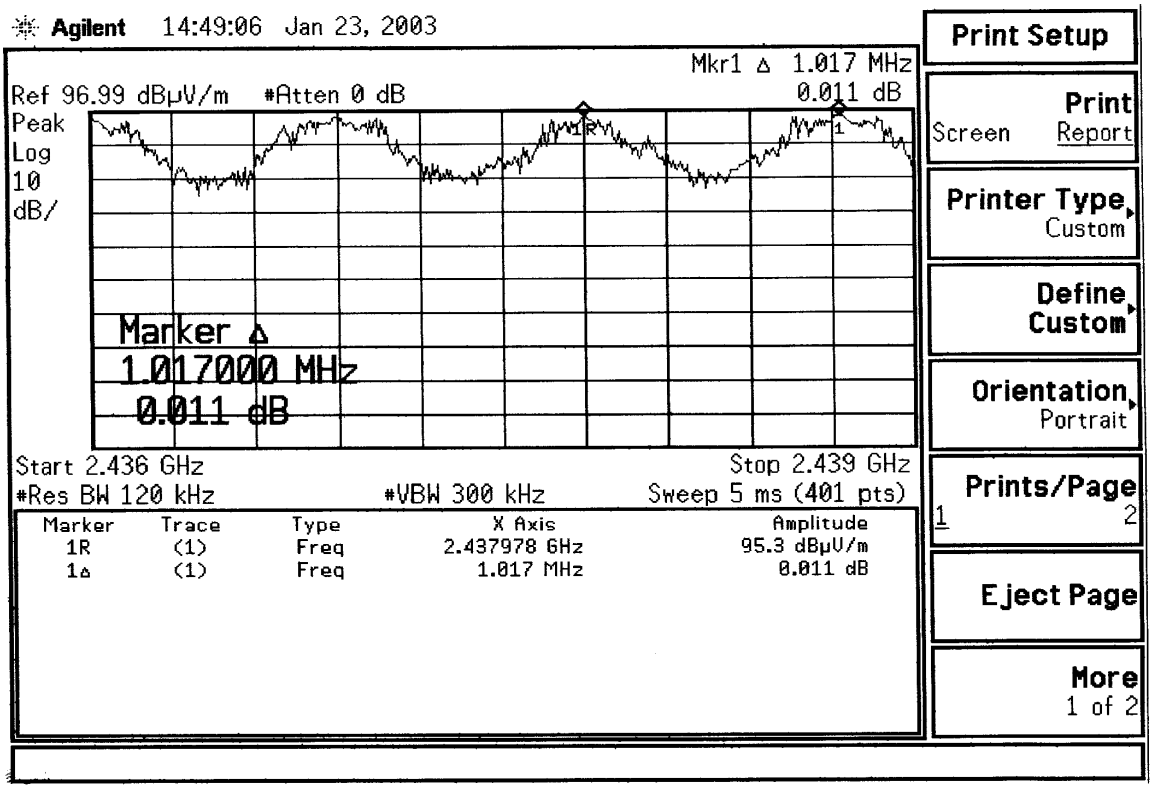
Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Factor	Other Factor
MHz	dB	dB	dB	dB	dB	dB	dB

4.2.1 Limits

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100 **	3
88 - 216	150 **	3
216 - 960	200 **	3
Above 960	500	3

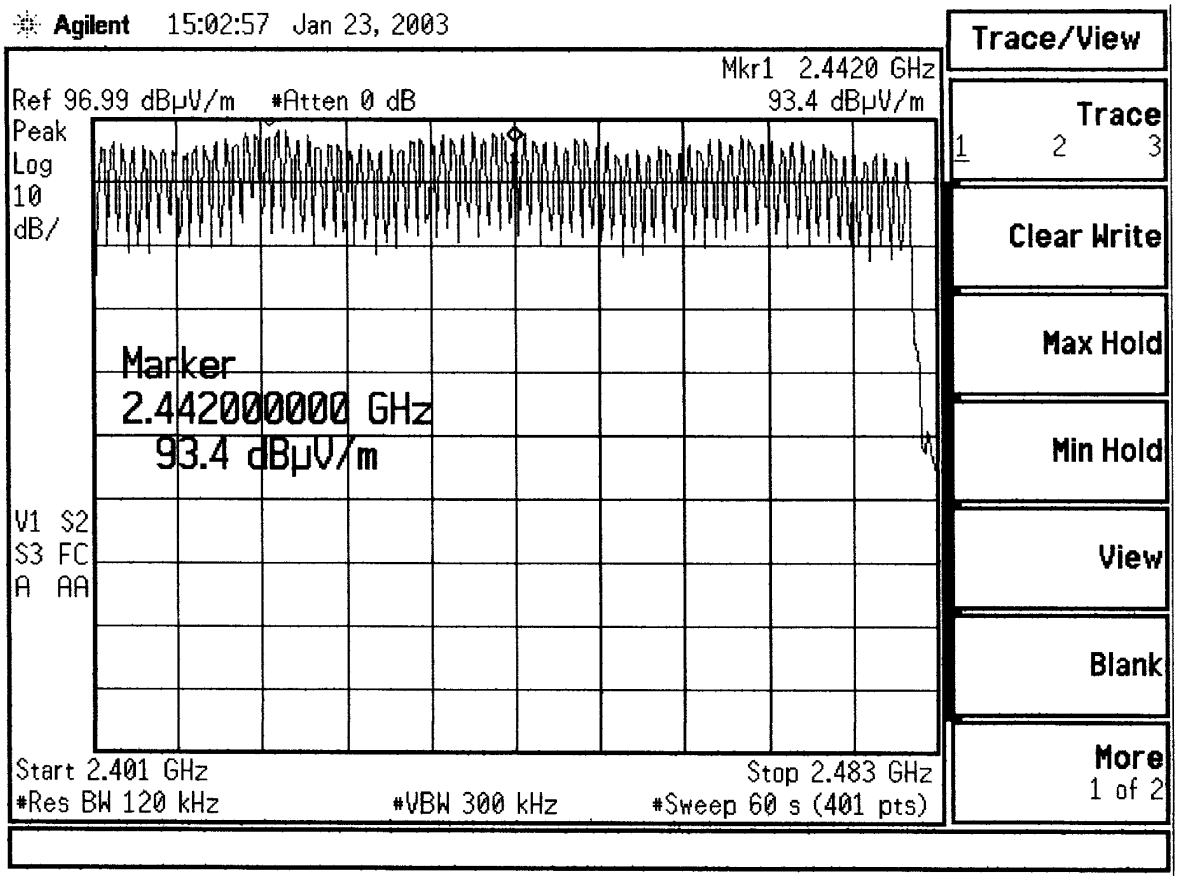
4.3 Channel Spacing SUBCLAUSE15.247(a)(1)



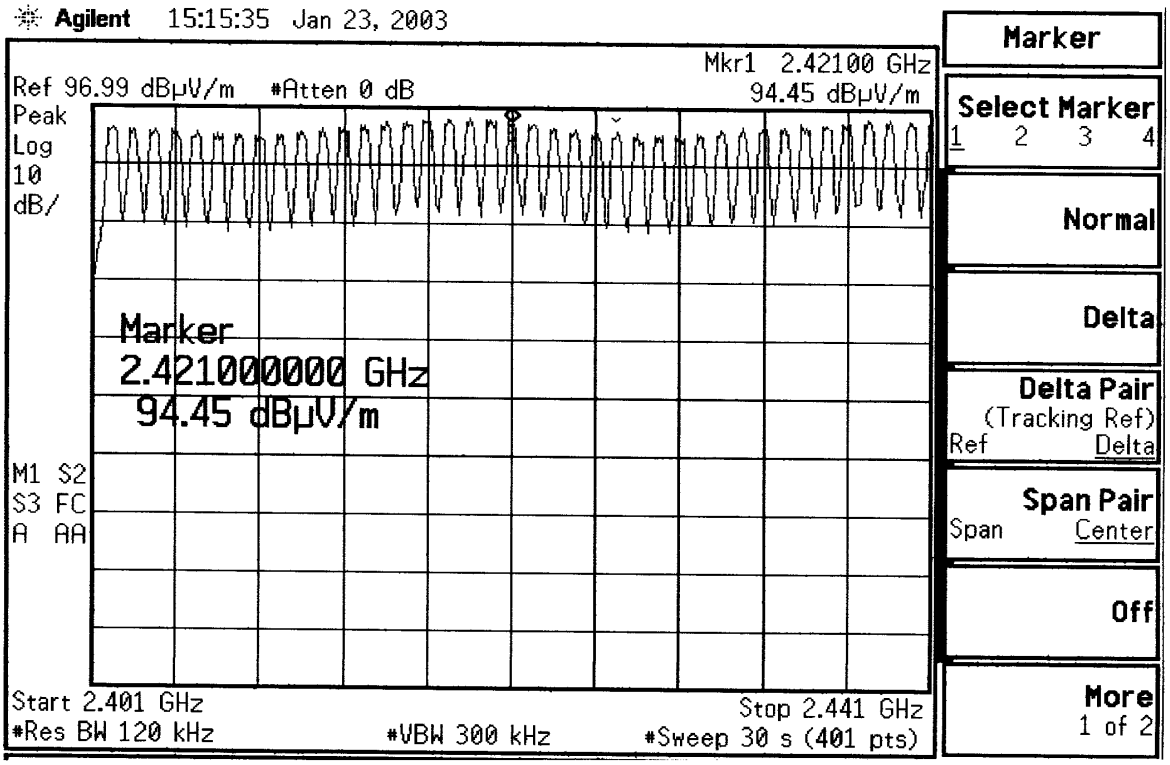


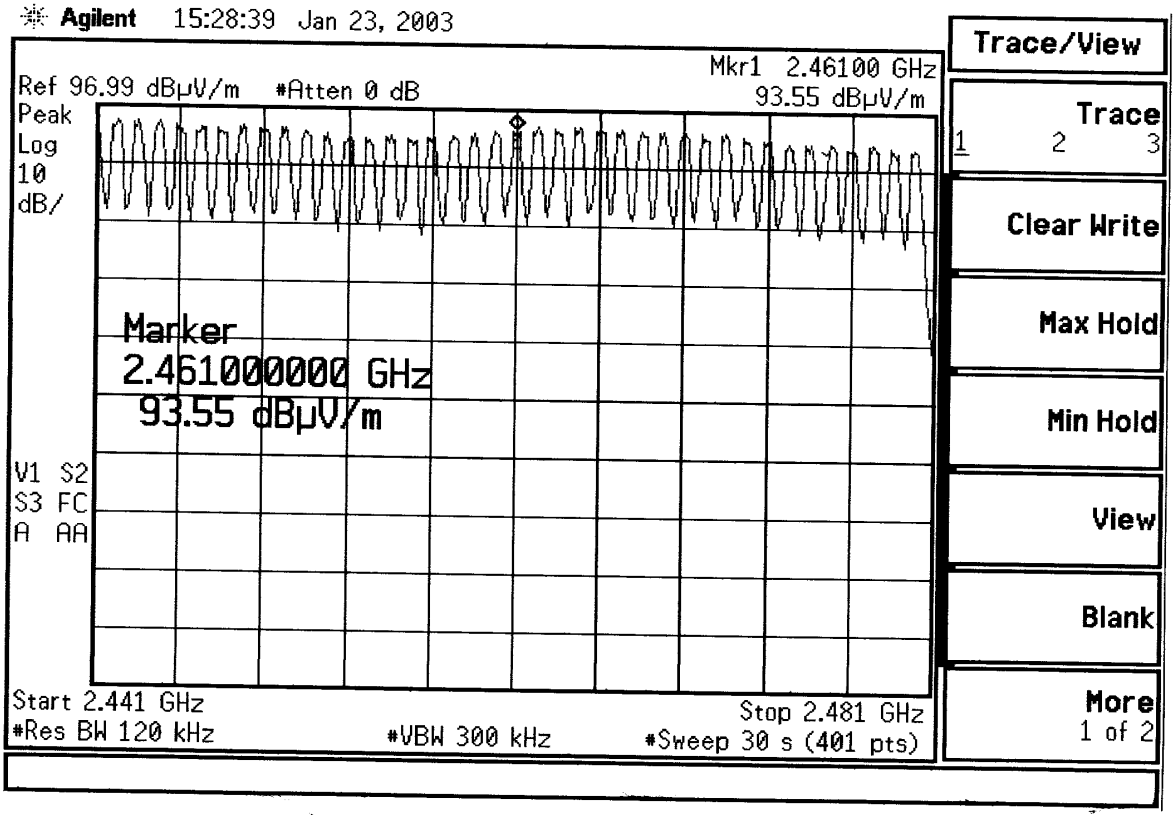
4.4 No. of carrier frequency / 20db Bandwidth

SUBCLAUSE15.247(a)(1)(ii)

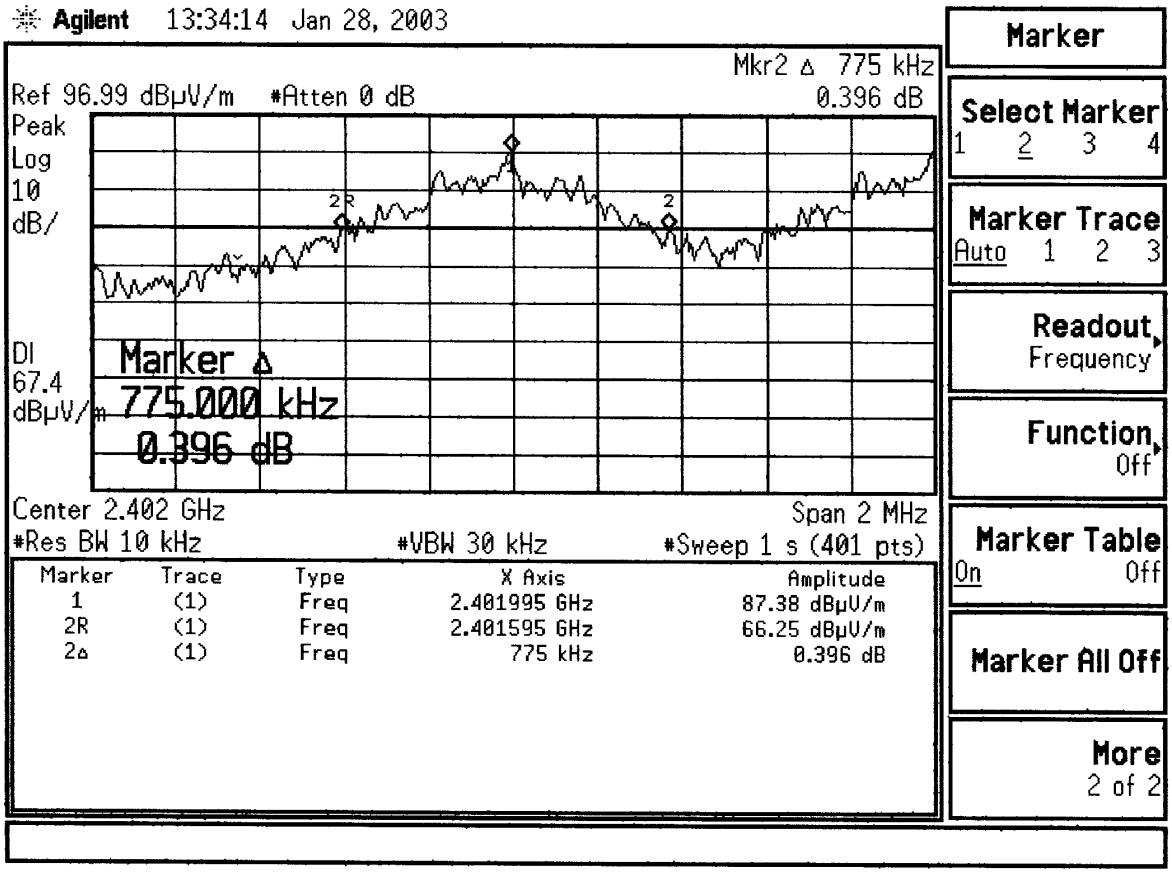


Split the whole frequency band into two.

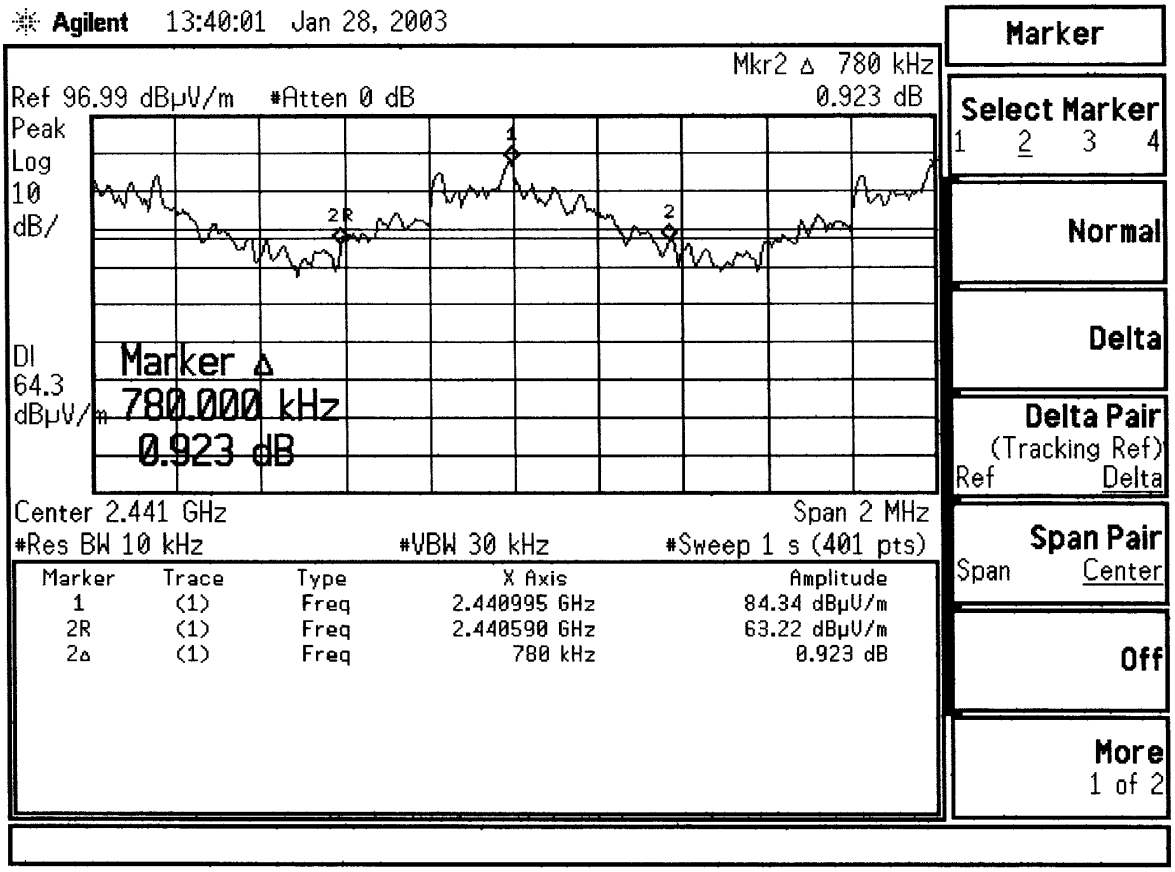




20dB bandwidth at lowest (2402Mhz), middle(2441Mhz), highest channel(2480Mhz)

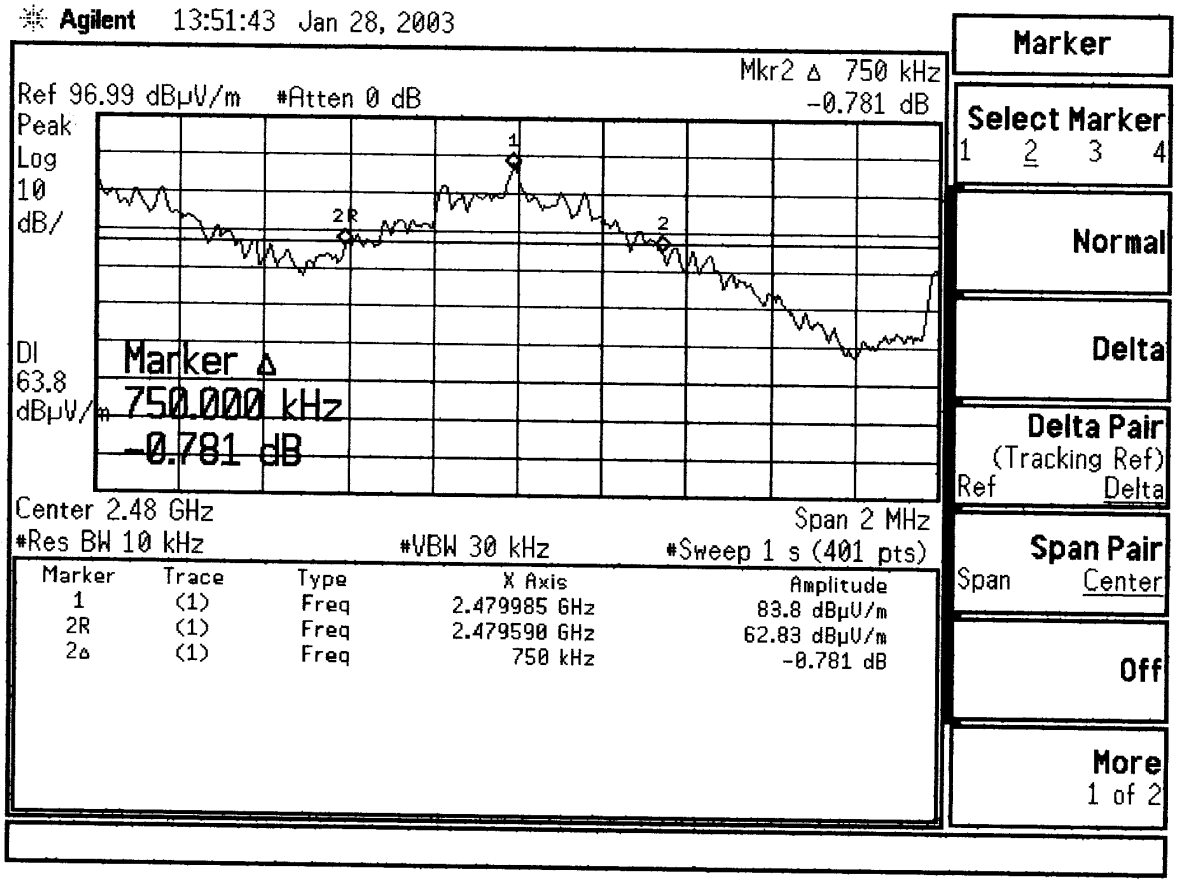


Channel bandwidth = 775KHZ



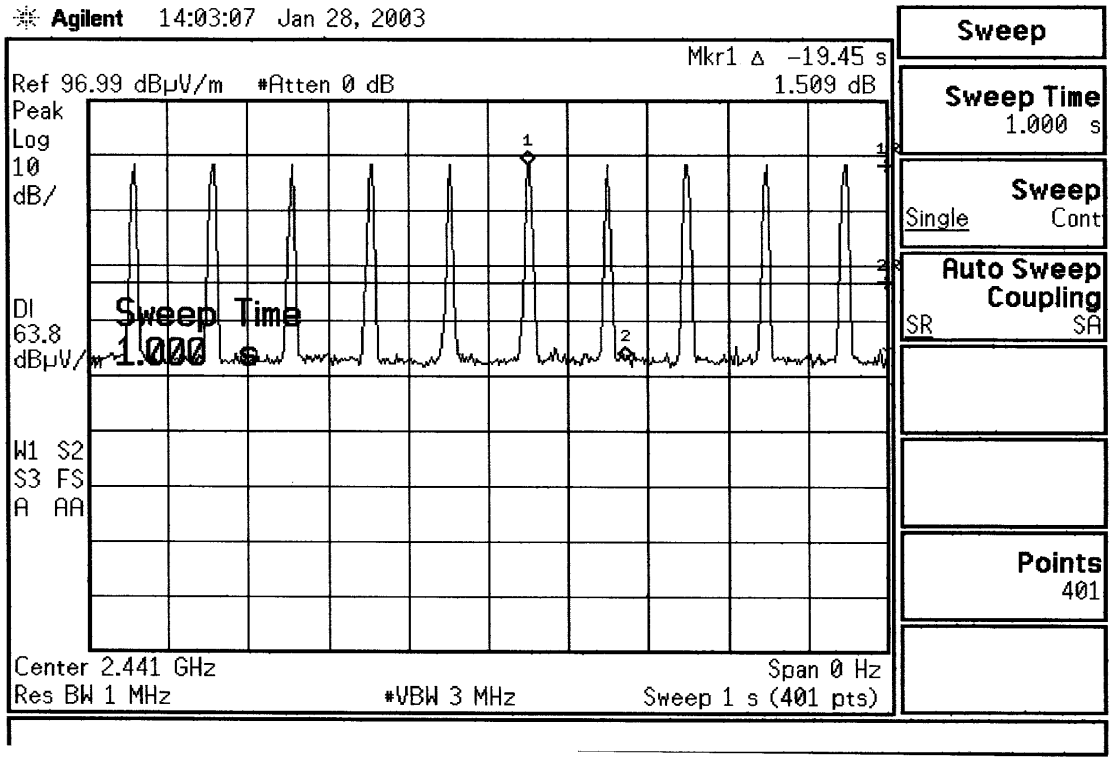
3-1

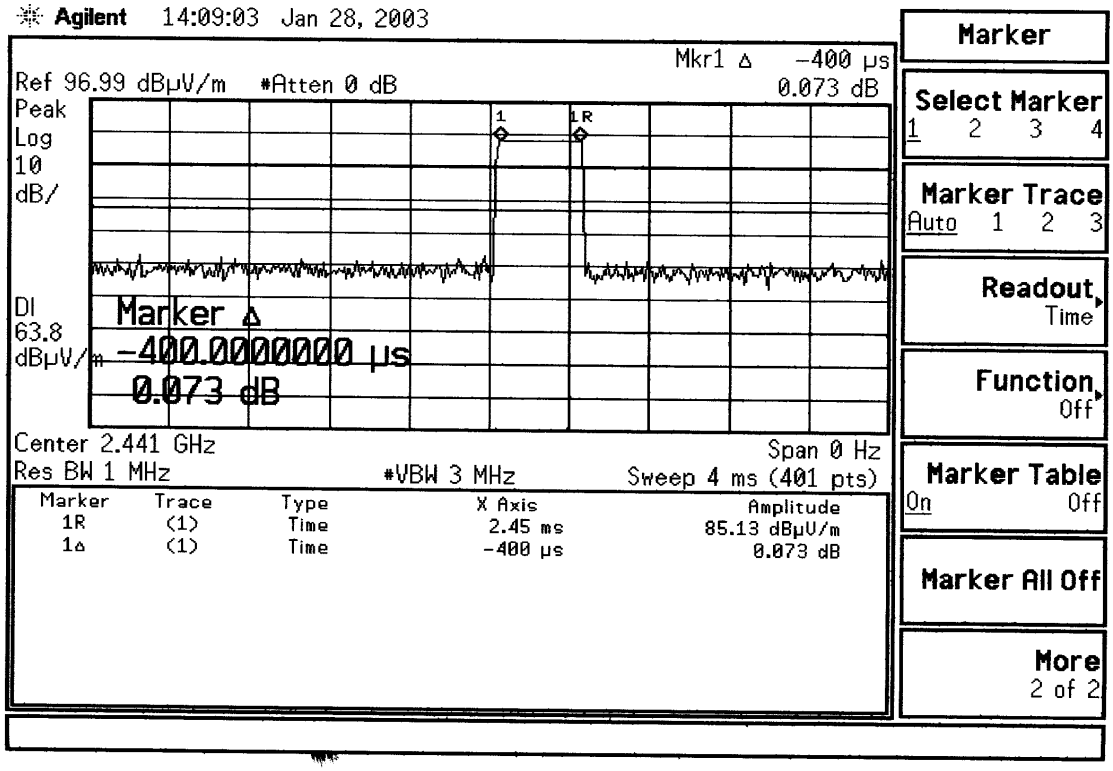
Channel bandwidth = 780KHZ



Channel bandwidth = 750KHZ

4.5 Average Time of Occupancy SUBCLAUSE15.247(a)(1)(ii)





4.5.1 calculation

At channel 2441Mhz, there are 10 bursts in 1 sec. Time period of each burst is 400 μSec. So the occupacy time within 30 second is 400 x 10 x 30 = 120000 μSec = 120 mSec = 0.12 Sec.

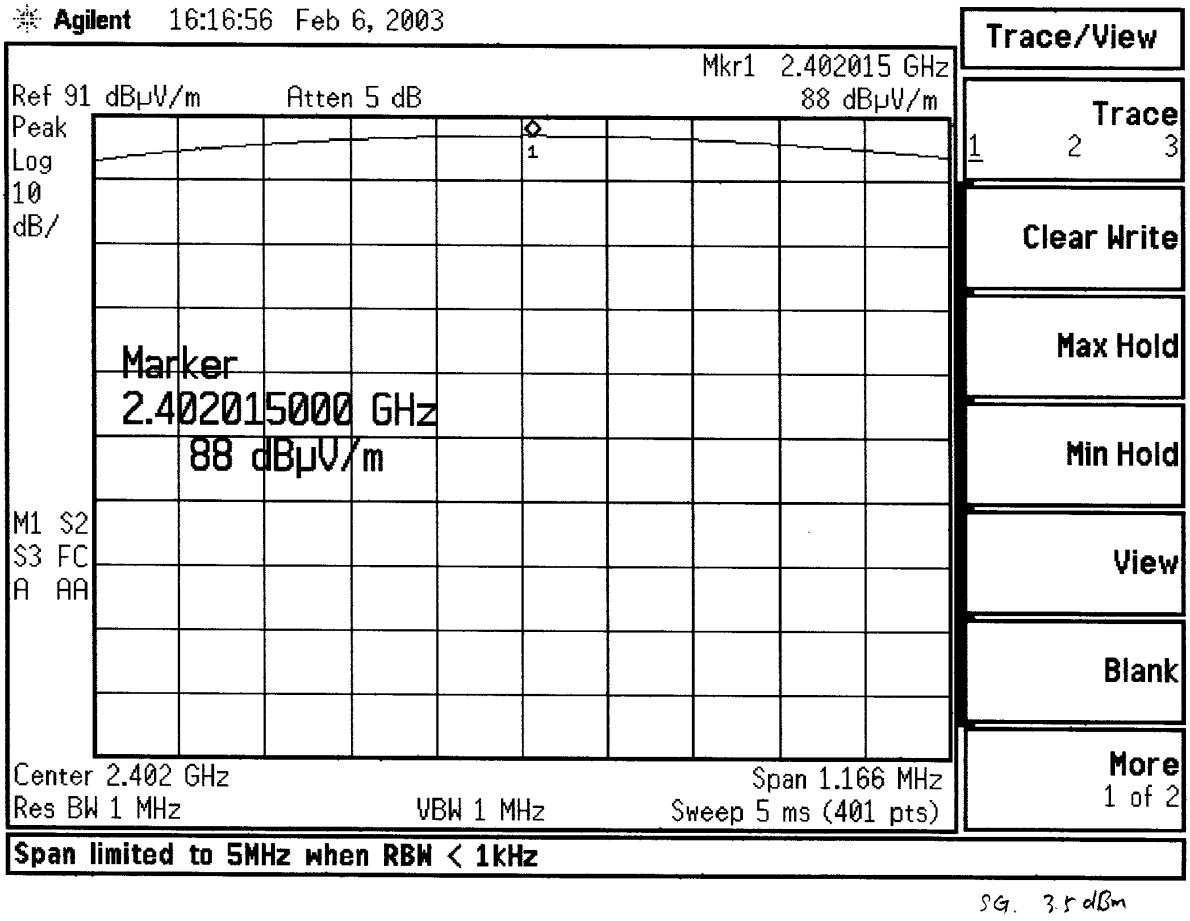
4.5.2 Limits

The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 30 second period.

The EUT comply with the requirement in Sec 15.247(a)(1) that use at least 75 hopping frequencies. The maximum 20dB bandwidth of the hopping channel is 1 MHz. The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 30 second period.

4.6 Peak output Power SUBCLAUSE15.247(b)(1)

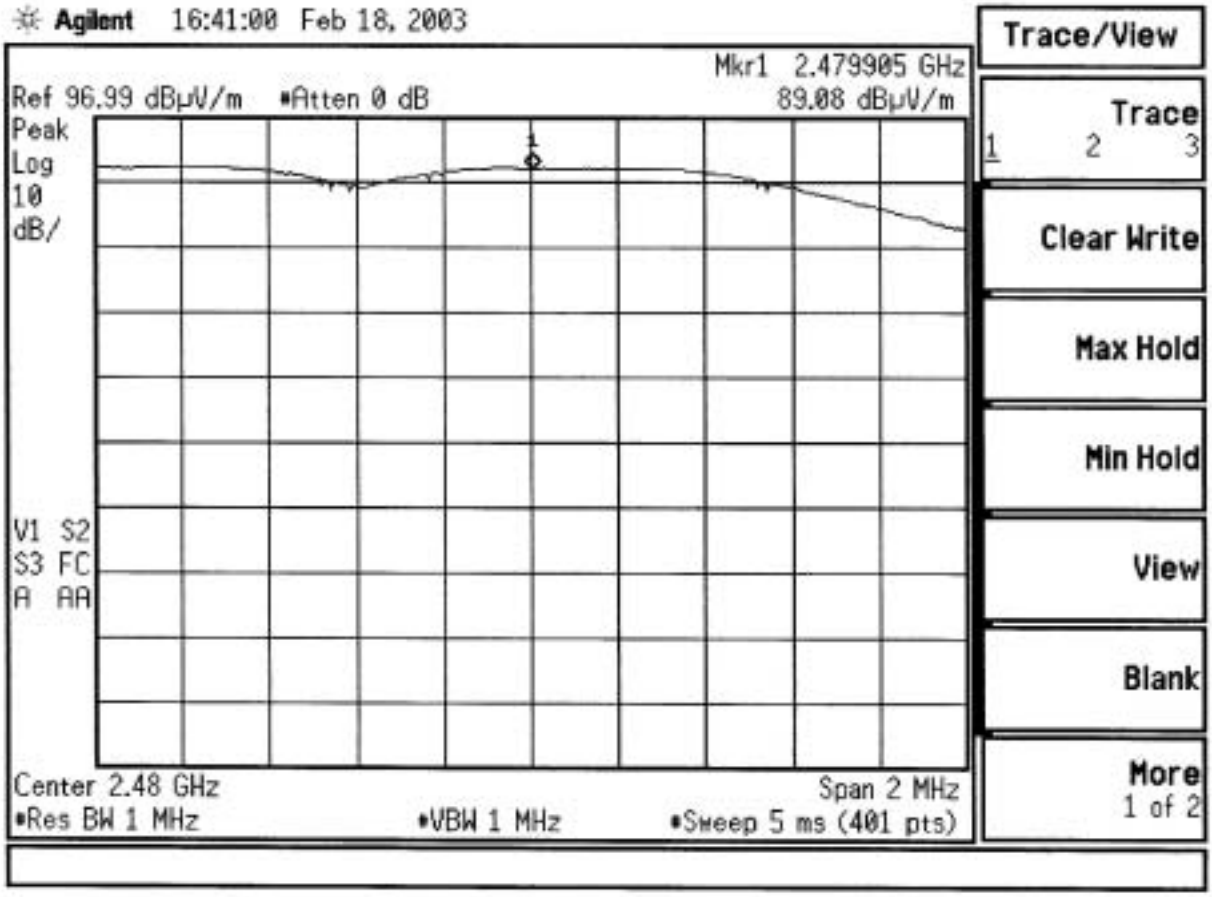
Transmitter transmit at lowest channel (2402Mhz)



We use substitution method to calculate the ERP of EUT.

At the 2402Mhz , The measured strength is 88 dBµV/m. The output power of signal generator is 3.5 dbm, and the antenna gain at this frequency is 10.6 dbi, the cable loss at this frequency is 1.7 db.

So, the ERP = 3.5 + 10.6 –1.7 = 12.4 dbm = 17.38 mW



We use substitution method to calculate the ERP of EUT.

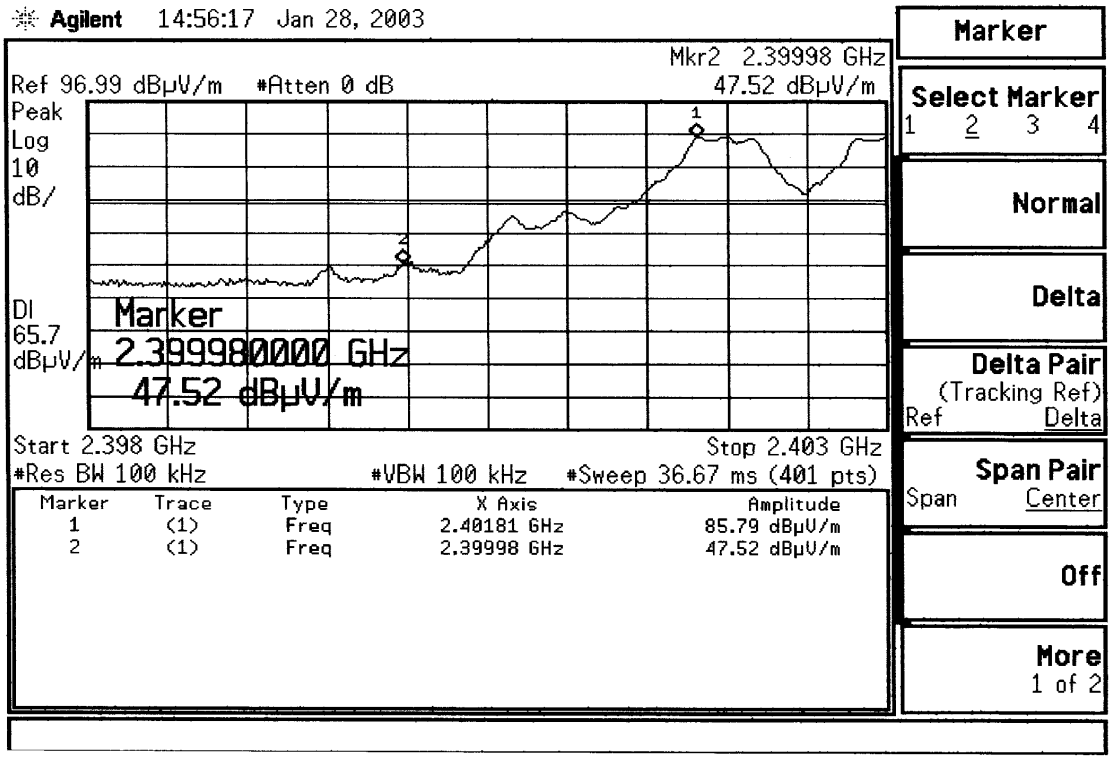
At the 2480 Mhz , The measured strength is 89.08 dBµV/m. The output power of signal generator is 4.5 dbm, and the antenna gain at this frequency is 10.6dbi, the cable loss at this frequency is 1.8 db.

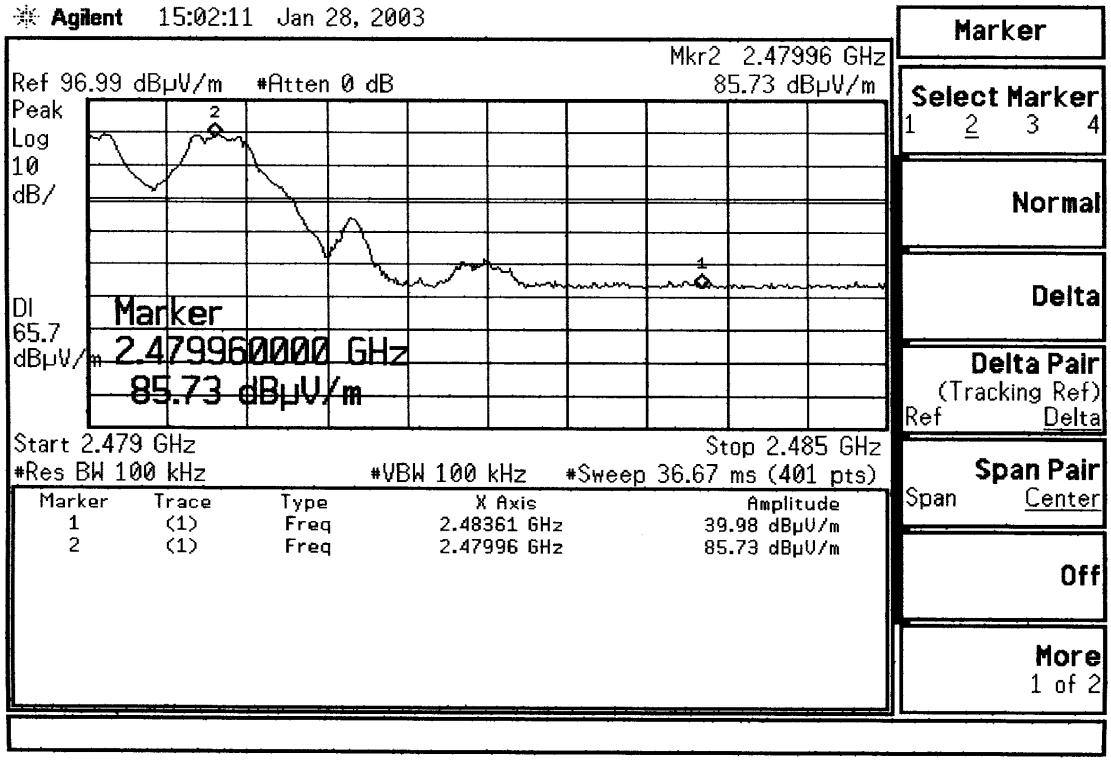
So, the ERP = 4.5 + 10.6 –1.8 = 13.3 dbm = 21.38mW

Limits:

For frequency hopping systems operating in the 2400-2483.5 MHz band employing At least 75 hopping channels, all frequency hopping systems in the 5725-5850MHZ Band, and all direct sequence systems: 1 Watt.

4.7 Band Edge emission SUBCLAUSE15.247(c)





4.7.1 Limits

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power,

4.8 Spurious Emission under 25Ghz SUBCLAUSE15.247(c)

Selected frequencies

Low= Yes (2.402000 GHz)
Mid= Yes (2.441000 GHz)
High= Yes (2.480000 GHz)

Spectrum Analyzer setup

Start frequency	0.030 GHz
Stop frequency	25.000 GHz
Center frequency	2.441 GHz
Low frequency	2.402 GHz
Mid frequency	2.441 GHz
High frequency	2.480 GHz
Resolution bandwidth	100 kHz
Video bandwidth	100 kHz
Sweep time	500ms

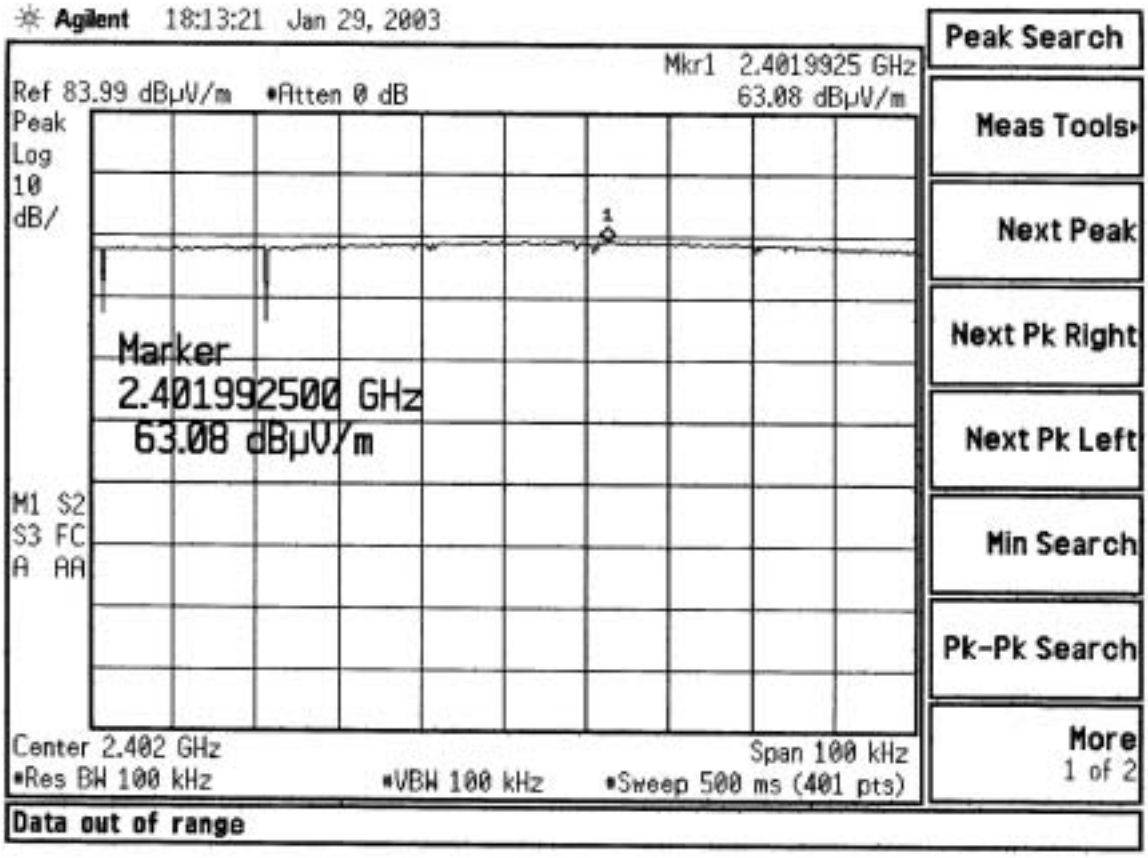
Frequency(MHz)	Read value(dBuV/m)	Antenna factor	Cable loss(db)	Real Value(dbuV/m)	Limit(dbuV/m)
2401.992	63.08	27.2	4.55	85.73	In band
4802.99	9.649	31.26	7.02	33.88	54
7205.99	15.28	36.53	9.09	42.72	54

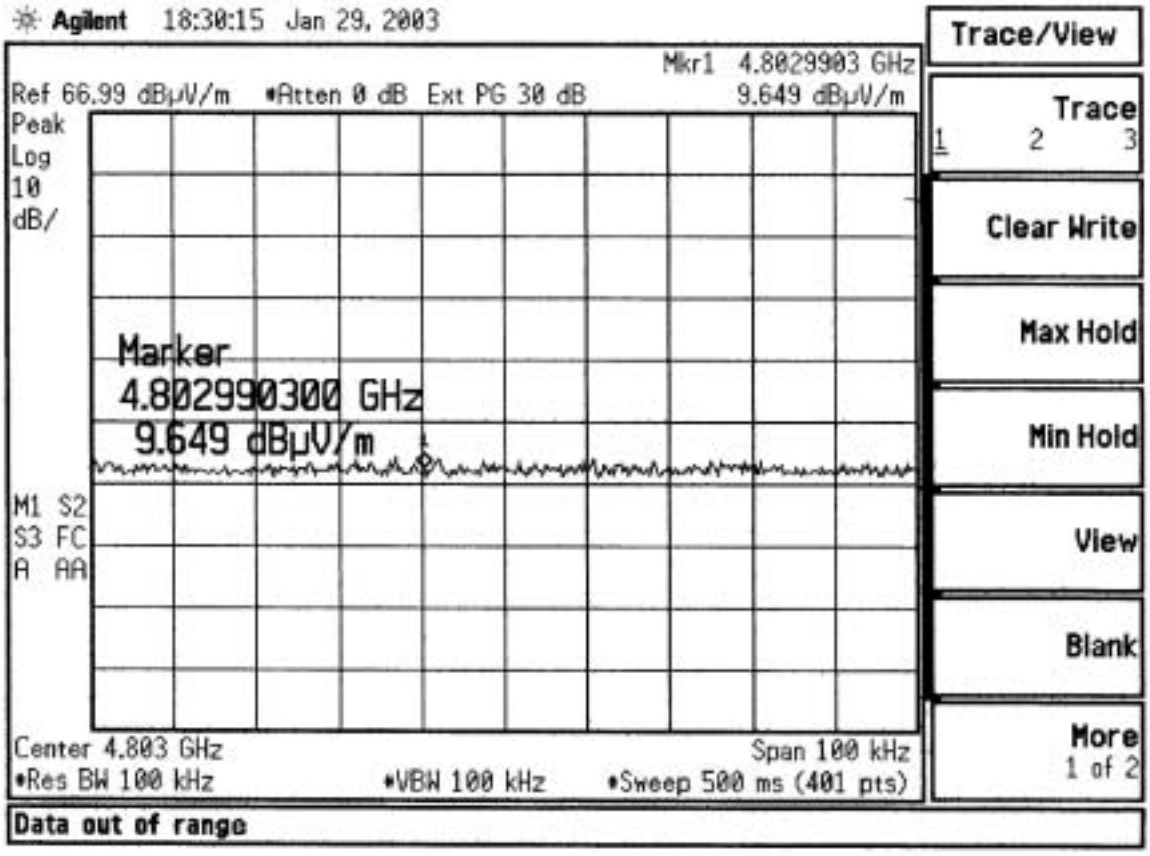
EUT operating at middle frequency

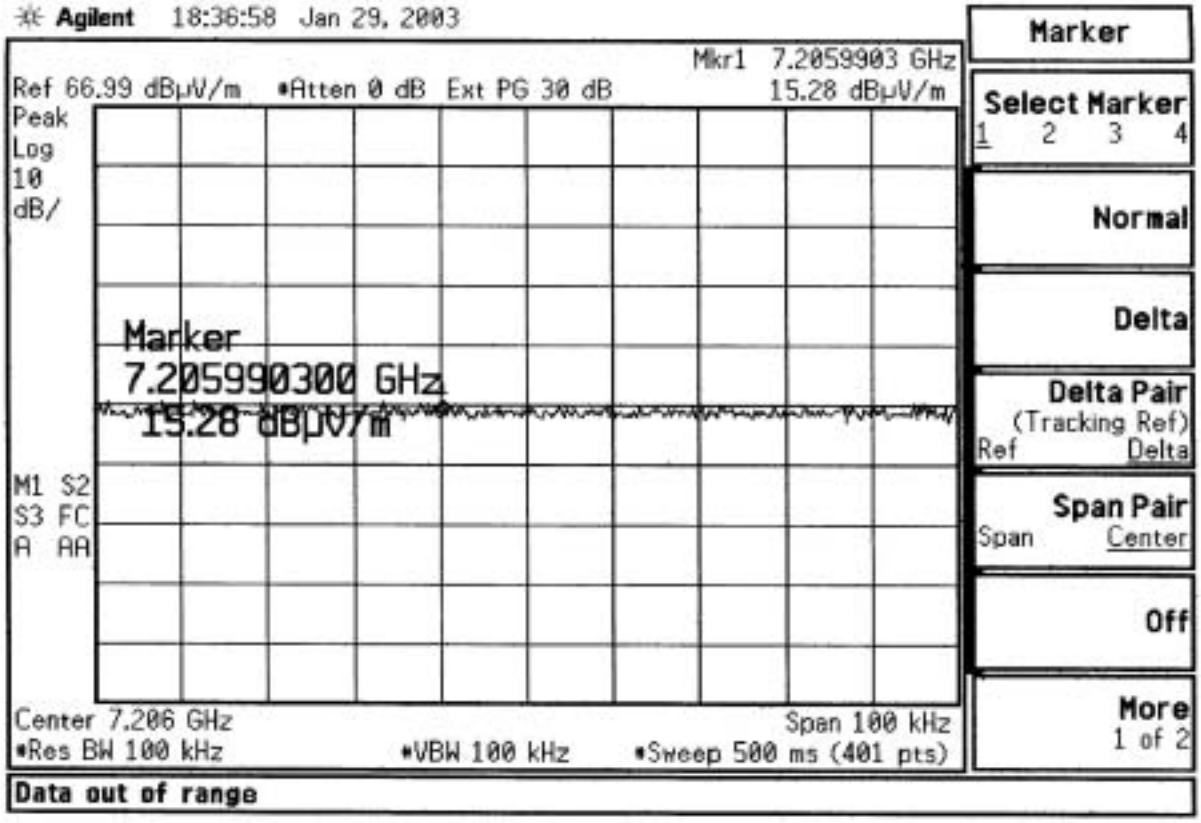
Frequency(MHz)	Read value(dBuV/m)	Antenna factor	Cable loss(db)	Real Value(dbuV/m)	Limit(dbuV/m)
2440.982	67.47	27.6	4.62	90.45	In band
4881.99	10.16	31.41	7.24	34.33	54
7324.993	18.39	36.55	9.13	45.81	54

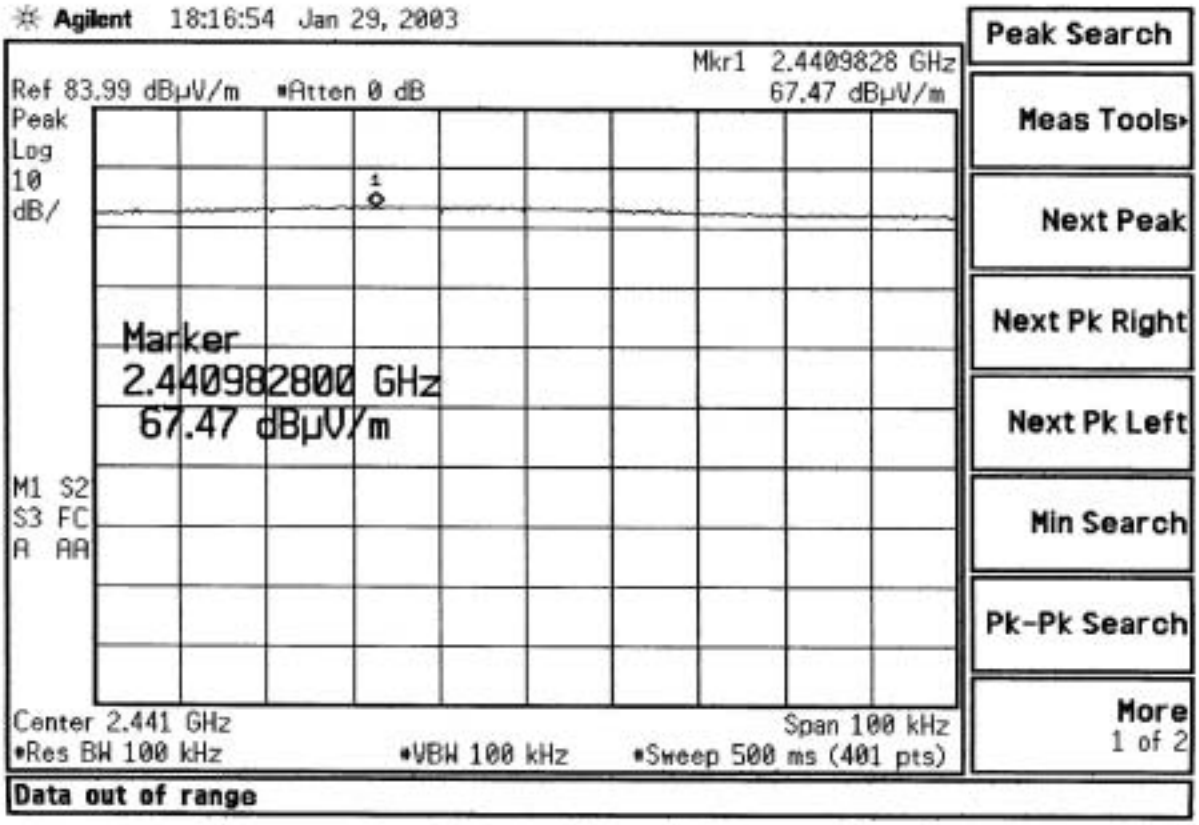
EUT operating at highest frequency

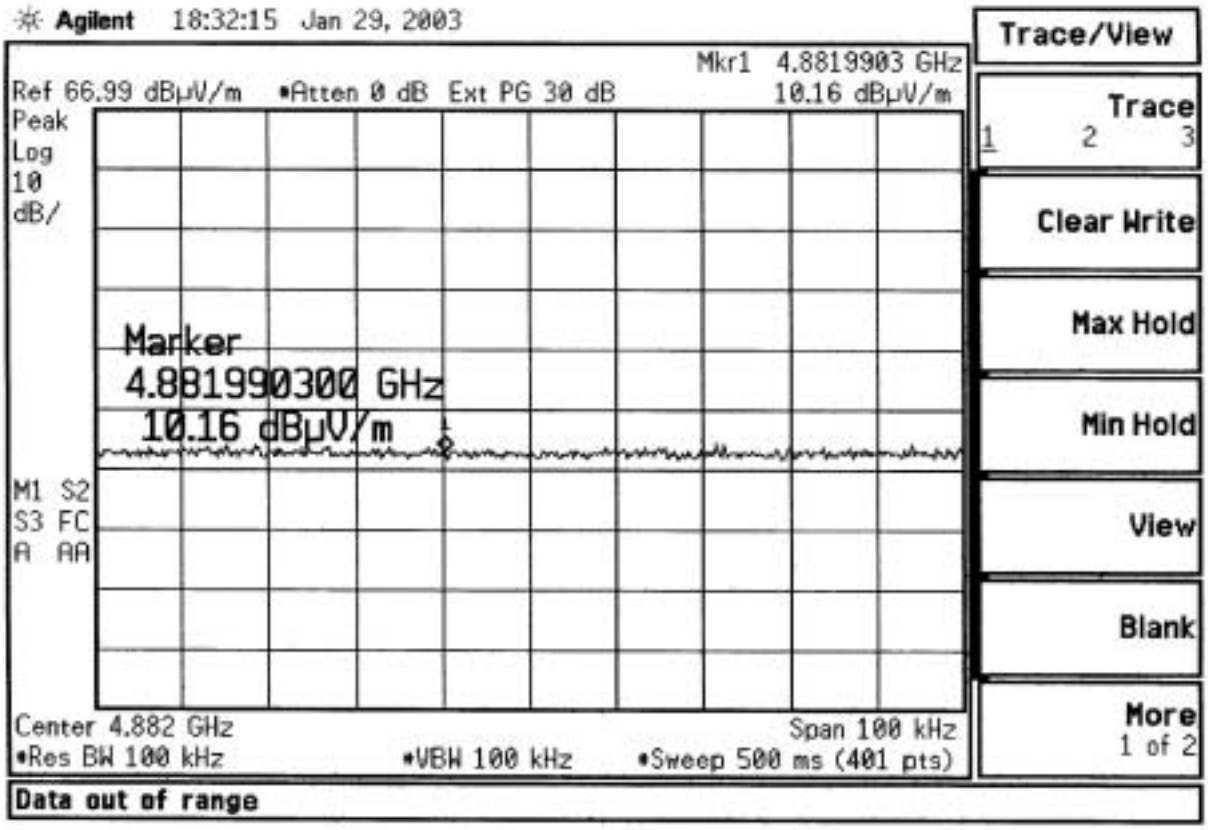
Frequency(MHz)	Read value(dBuV/m)	Antenna factor	Cable loss(db)	Real Value(dbuV/m)	Limit(dbuV/m)
2478.99	64.18	27.58	4.67	87.09	In band
4957.99	8.802	31.55	7.31	33.04	54
7439.99	14.5	36.59	9.24	41.85	54

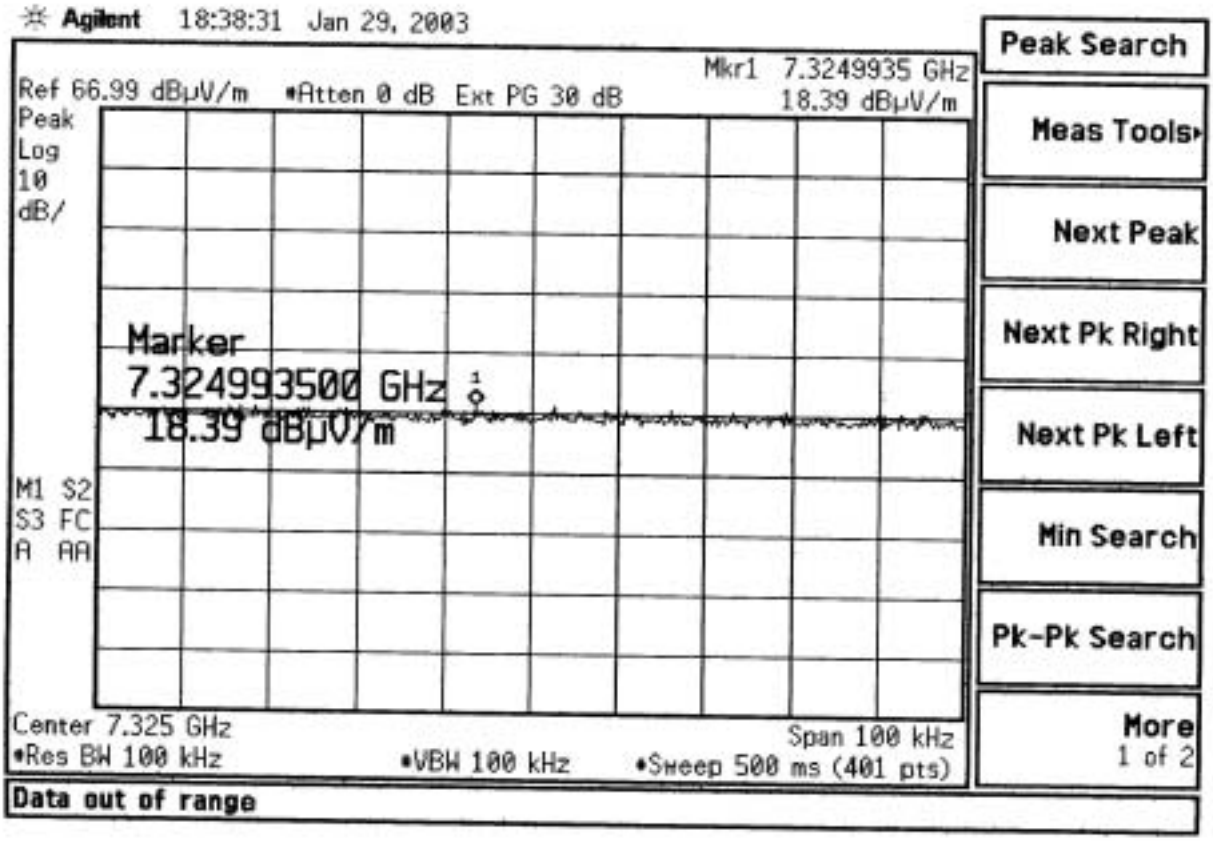

Agilent 18:13:21 Jan 29, 2003
Mkr1 2.4019925 GHz
63.08 dBµV/m
Ref 83.99 dBµV/m
#Atten 0 dB
Peak
Log
10
dB/
Marker
2.401992500 GHz
63.08 dBµV/m
M1 S2
S3 FC
A AA
Center 2.402 GHz
#Res BW 100 kHz
#VBW 100 kHz
Span 100 kHz
#Sweep 500 ms (401 pts)
Data out of range
Peak Search
Meas Tools
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
More
1 of 2

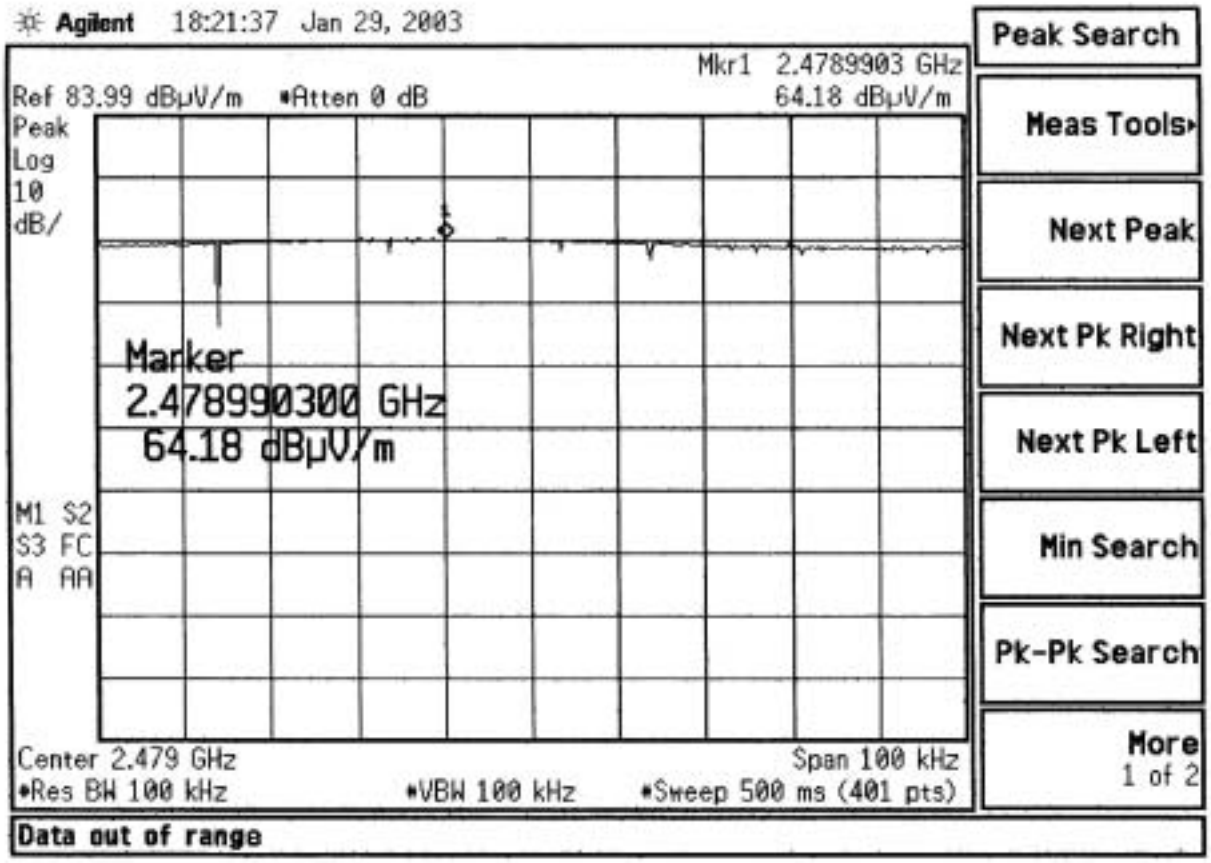

Agilent 18:30:15 Jan 29, 2003
Mkr1 4.8029903 GHz
9.649 dBµV/m
Ref 66.99 dBµV/m
#Atten 0 dB Ext PG 30 dB
Peak
Log
10
dB/
Marker
4.802990300 GHz
9.649 dBµV/m
M1 S2
S3 FC
A AA
Center 4.803 GHz
#Res BW 100 kHz
#VBW 100 kHz
Span 100 kHz
#Sweep 500 ms (401 pts)
Data out of range
Trace/View
Trace
1 2 3
Clear Write
Max Hold
Min Hold
View
Blank
More
1 of 2

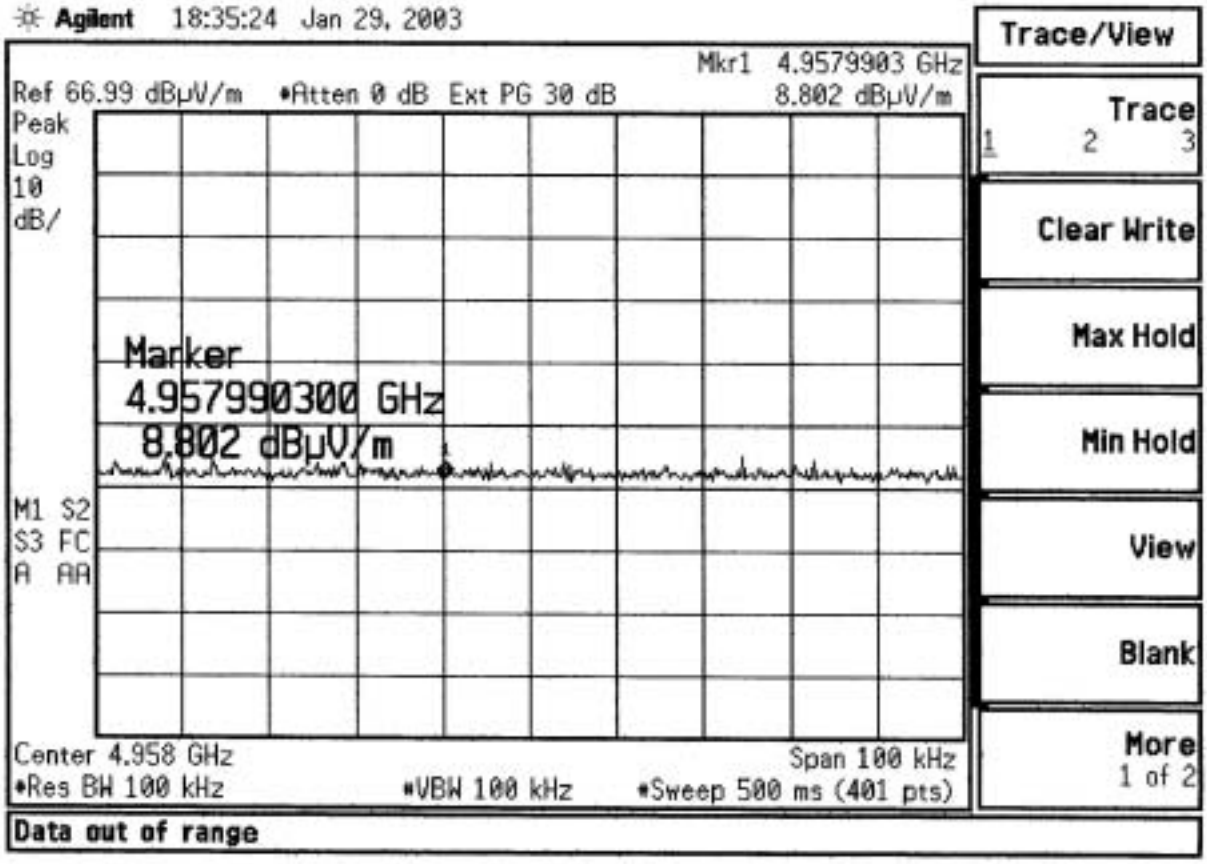

Agilent 18:36:58 Jan 29, 2003
Mkr1 7.2059903 GHz
Ref 66.99 dBµV/m #Atten 0 dB Ext PG 30 dB
15.28 dBµV/m
Peak
Log
10
dB/
Marker
7.205990300 GHz
15.28 dBµV/m
M1 S2
S3 FC
A AA
Center 7.206 GHz
#Res BW 100 kHz
#VBW 100 kHz
Span 100 kHz
#Sweep 500 ms (401 pts)
Data out of range
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Delta
Span Pair
Span Center
Off
More
1 of 2

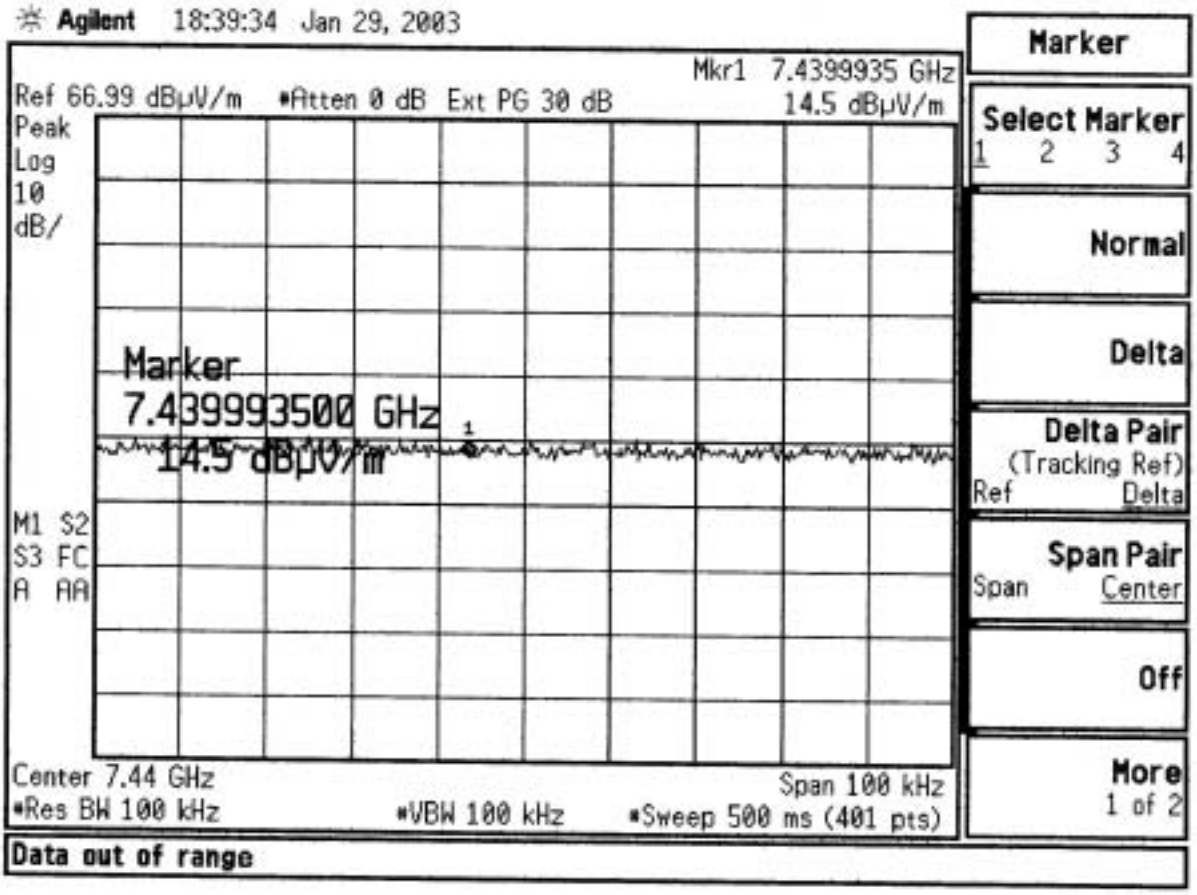

Agilent 18:16:54 Jan 29, 2003
Mkr1 2.4409828 GHz
Ref 83.99 dBµV/m #Atten 0 dB
67.47 dBµV/m
Peak
Log
10
dB/
Marker
2.440982800 GHz
67.47 dBµV/m
M1 S2
S3 FC
A AA
Center 2.441 GHz
#Res BW 100 kHz
#VBW 100 kHz
Span 100 kHz
#Sweep 500 ms (401 pts)
Data out of range
Peak Search
Meas Tools
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
More
1 of 2


Agilent 18:32:15 Jan 29, 2003
Mkr1 4.8819903 GHz
Ref 66.99 dBµV/m
•Atten 0 dB Ext PG 30 dB
10.16 dBµV/m
Peak
Log
10
dB/
Marker
4.881990300 GHz
10.16 dBµV/m
M1 S2
S3 FC
A AA
Center 4.882 GHz
•Res BW 100 kHz
•VBW 100 kHz
Span 100 kHz
•Sweep 500 ms (401 pts)
Data out of range
Trace/View
Trace
1 2 3
Clear Write
Max Hold
Min Hold
View
Blank
More
1 of 2


Agilent 18:38:31 Jan 29, 2003
Mkr1 7.3249935 GHz
Ref 66.99 dBµV/m
•Atten 0 dB Ext PG 30 dB
18.39 dBµV/m
Peak
Log
10
dB/
Marker
7.324993500 GHz
18.39 dBµV/m
M1 S2
S3 FC
A AA
Center 7.325 GHz
•Res BW 100 kHz
•VBW 100 kHz
Span 100 kHz
•Sweep 500 ms (401 pts)
Data out of range
Peak Search
Meas Tools
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
More
1 of 2


Agilent 18:21:37 Jan 29, 2003
Mkr1 2.4789903 GHz
64.18 dBµV/m
Ref 83.99 dBµV/m
#Atten 0 dB
Peak
Log
10
dB/
Marker
2.478990300 GHz
64.18 dBµV/m
M1 S2
S3 FC
A AA
Center 2.479 GHz
#Res BW 100 kHz
#VBW 100 kHz
Span 100 kHz
#Sweep 500 ms (401 pts)
Data out of range
Peak Search
Meas Tools
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
More
1 of 2


Agilent 18:35:24 Jan 29, 2003
Mkr1 4.9579903 GHz
8.802 dBµV/m
Ref 66.99 dBµV/m
#Atten 0 dB Ext PG 30 dB
Peak
Log
10
dB/
Marker
4.957990300 GHz
8.802 dBµV/m
M1 S2
S3 FC
A AA
Center 4.958 GHz
#Res BW 100 kHz
#VBW 100 kHz
Span 100 kHz
#Sweep 500 ms (401 pts)
Data out of range
Trace/View
Trace
1 2 3
Clear Write
Max Hold
Min Hold
View
Blank
More
1 of 2


Agilent 18:39:34 Jan 29, 2003
Mkr1 7.4399935 GHz
Ref 66.99 dBµV/m
#Atten 0 dB Ext PG 30 dB
14.5 dBµV/m
Peak
Log
10
dB/
Marker
7.439993500 GHz
14.5 dBµV/m
M1 S2
S3 FC
A AA
Center 7.44 GHz
#Res BW 100 kHz
#VBW 100 kHz
Span 100 kHz
#Sweep 500 ms (401 pts)
Data out of range
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Delta
Span Pair
Span Center
Off
More
1 of 2

APPENDIX: Photographs of Test Setup

(The Photos are saved separately)

APPENDIX : Photographs of EUT

Internal Photos

(The Photos are saved separately)

External Photos

(The Photos are saved separately)