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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	<i>PASS</i>	7
15.209	Radiated emission Limits, general requirement	<i>PASS</i>	9
15.247(a)(1)	Channel Spacing	<i>PASS</i>	14
15.247(a)(1)(ii)	20db bandwidth / No. of channels	<i>PASS</i>	15
15.247(a)(1)(ii)	Average Time of Occupancy	<i>PASS</i>	19
15.247(b)(1)	Peak Output power	<i>PASS</i>	21
15.247(c)	Band-Edge Emission	<i>PASS</i>	22
15.247(c)	Spurious Emission under 25Ghz	<i>PASS</i>	24

3. Instruments List

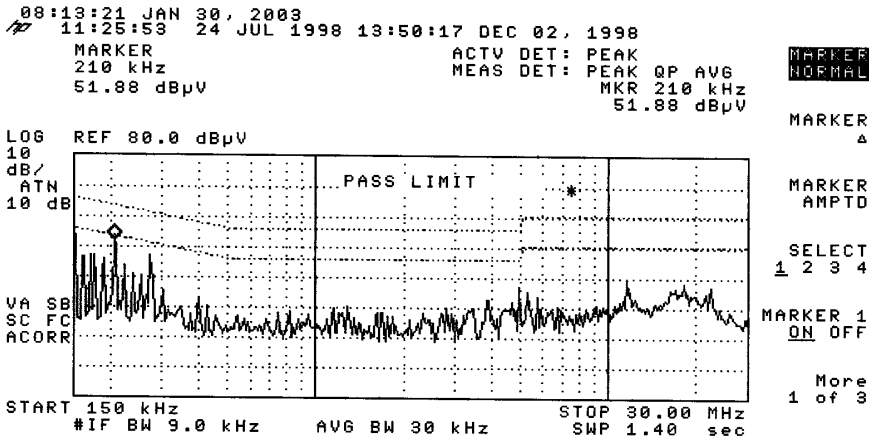
Instrument	Model	Serial number	Calibration date
Desktop PC	Acer Veriton 7200	N/A	N/A
Spectrum Analyzer	Agilent 7405A	US40240202	May 22, 2002
Climatic chamber	Terchy MHG-120L	911009	Oct. 15, 2002
Antenna	Schwarzbeck BBHA9120A	309/320	July 01, 2002
Antenna	Schwarzbeck VULB9163	152	July 01, 2002
RF Signal 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

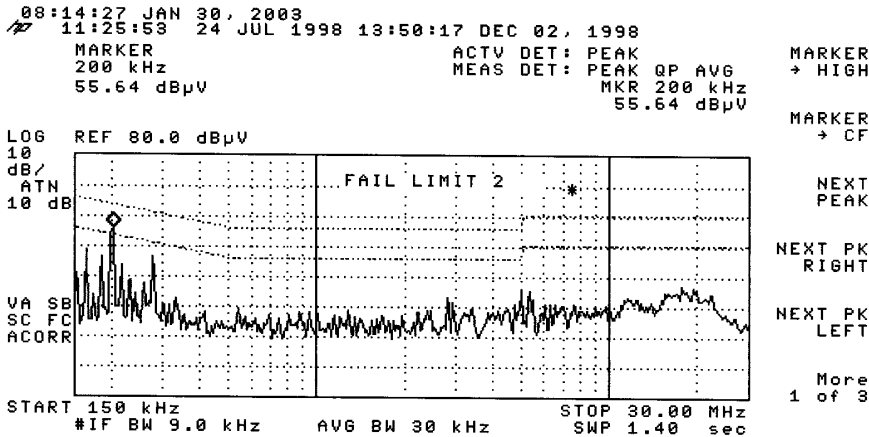
4.1 Conducted Limits

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

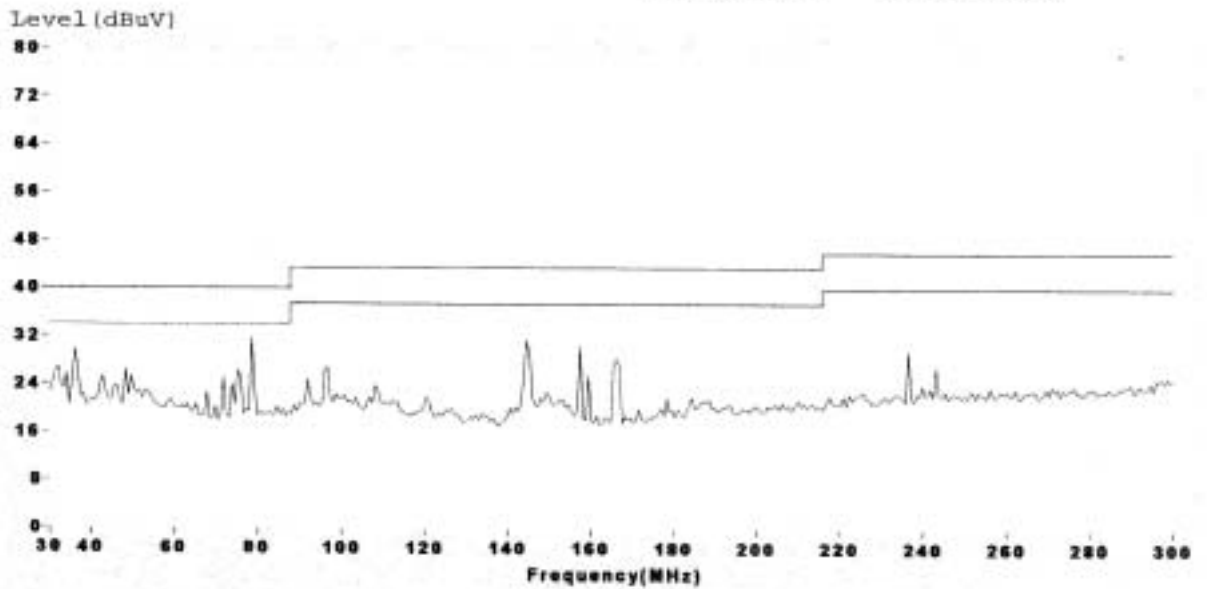
Part 1: 30Mhz-300Mhz

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:

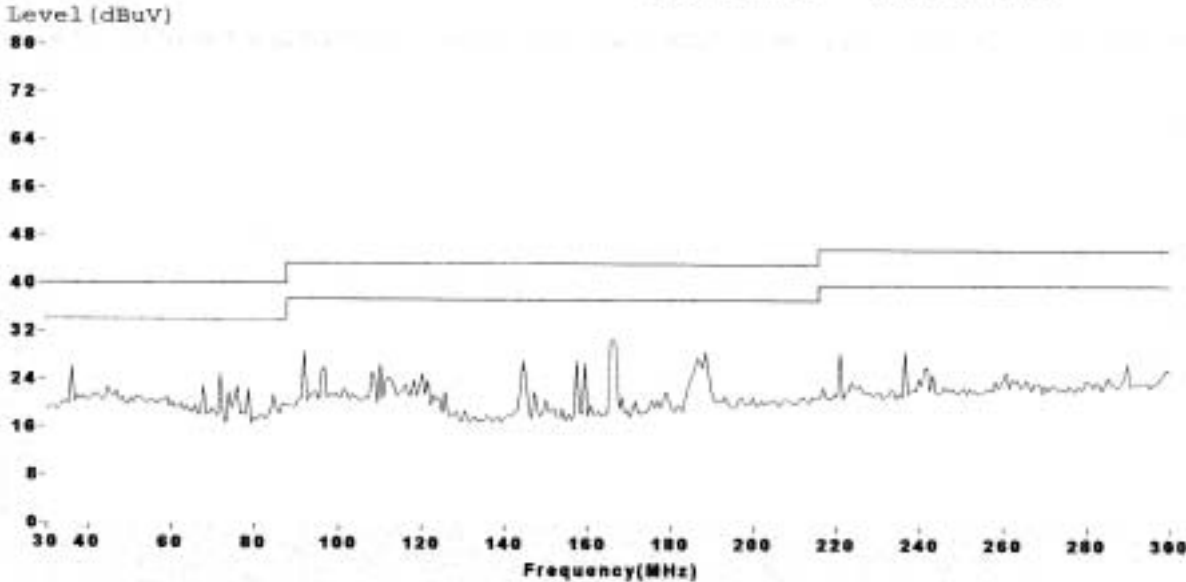
Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Factor	Other Factor
-----	-----	-----	-----	-----	-----	-----	-----
MHz	dB	dB	dB	dB	dB	dB	dB

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

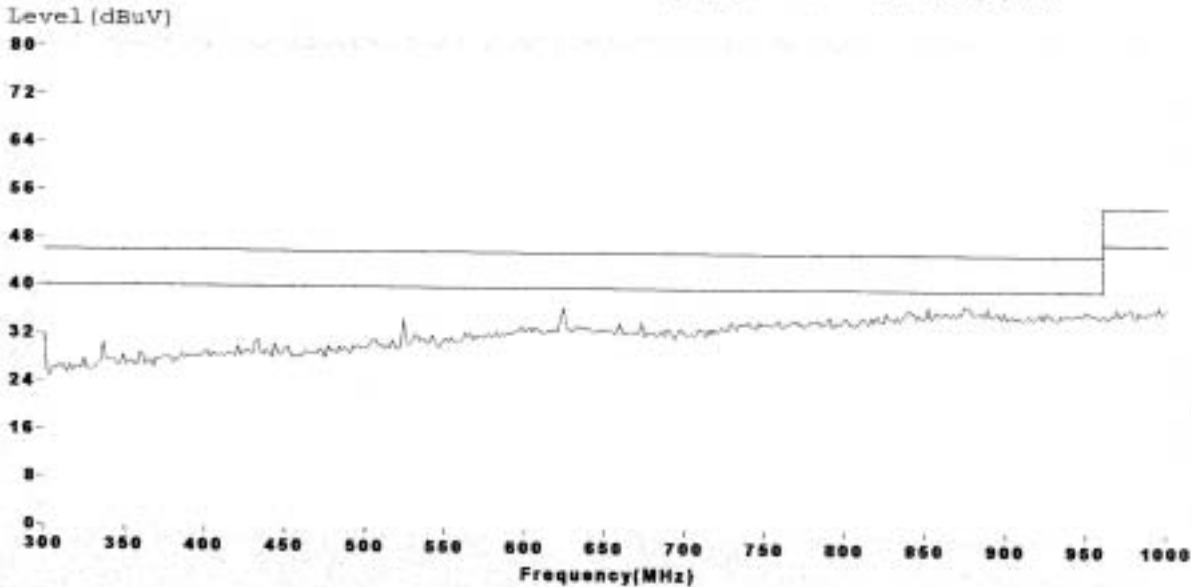
Part2: 300Mhz- 1Ghz

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:

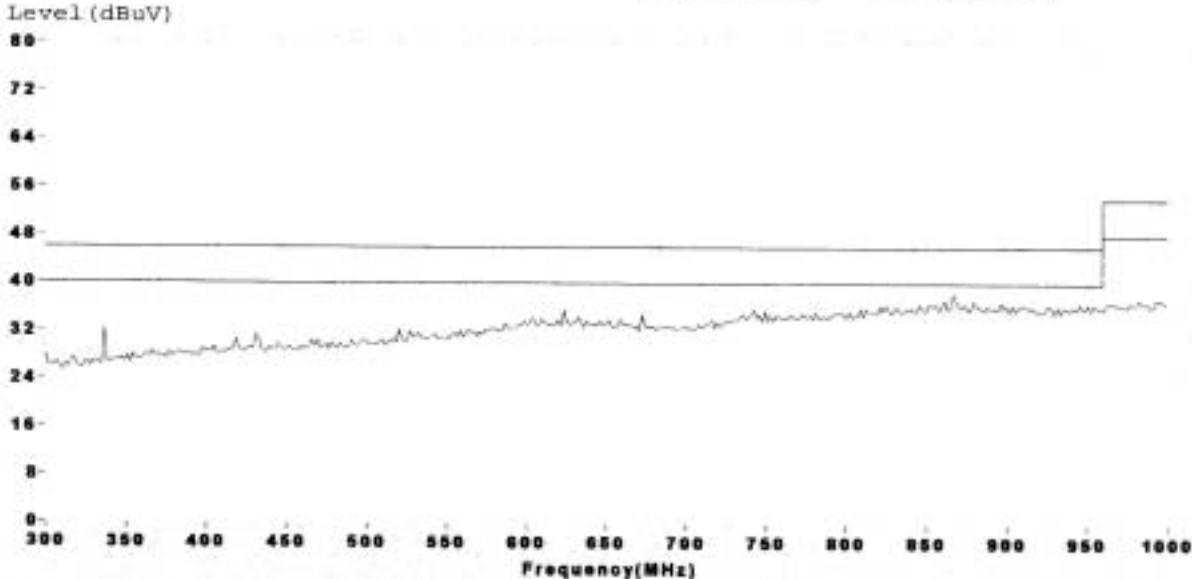
Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Factor	Other Factor
-----	-----	-----	-----	-----	-----	-----	-----
MHz	dB	dB	dB	dB	dB	dB	dB

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:

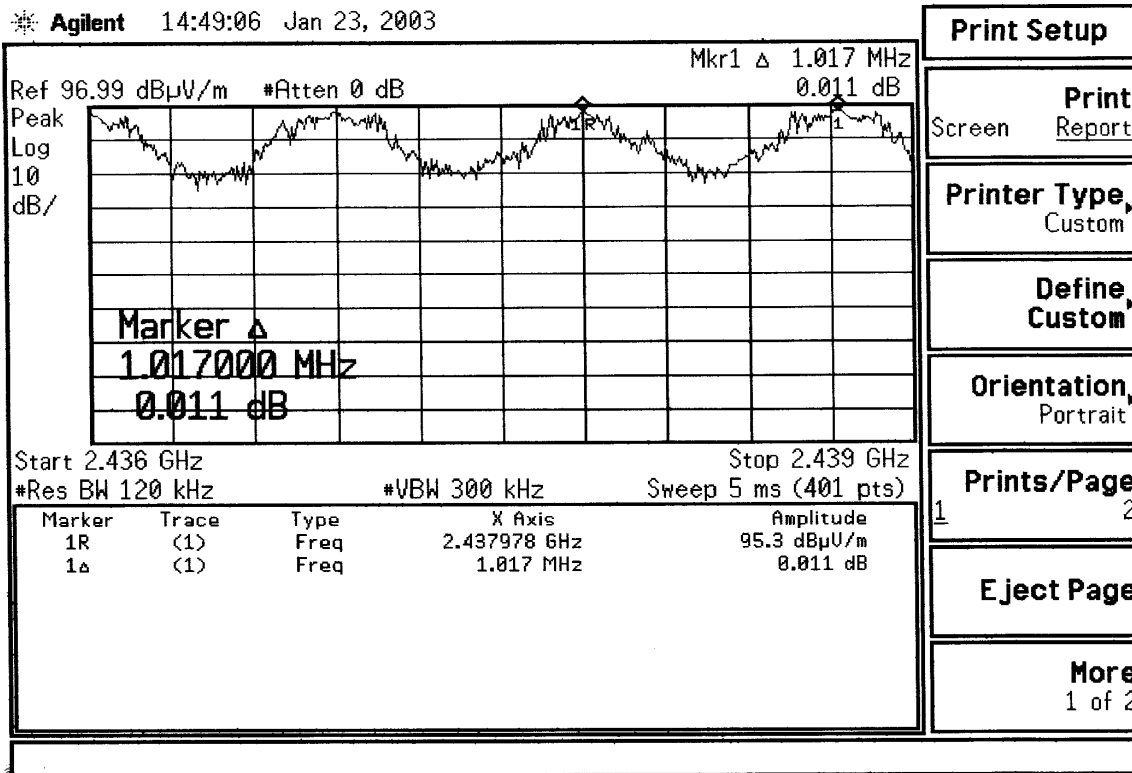
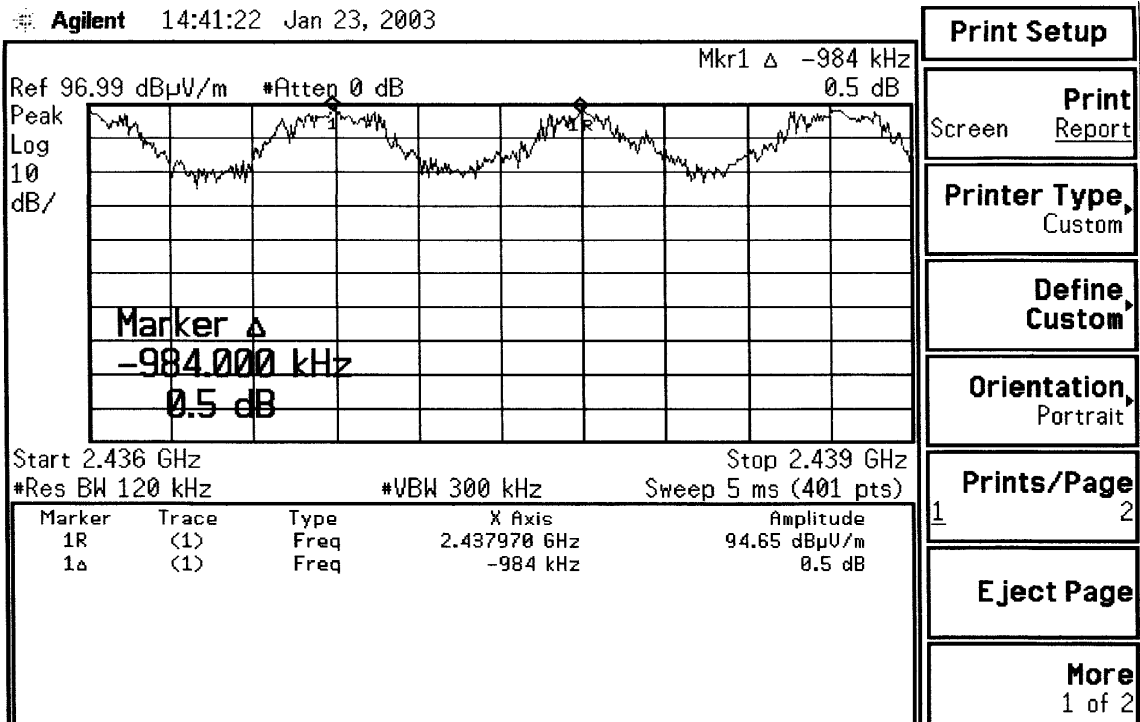
Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Factor	Other Factor
MHz	dB	dB	dB	dB	dB	dB	dB

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

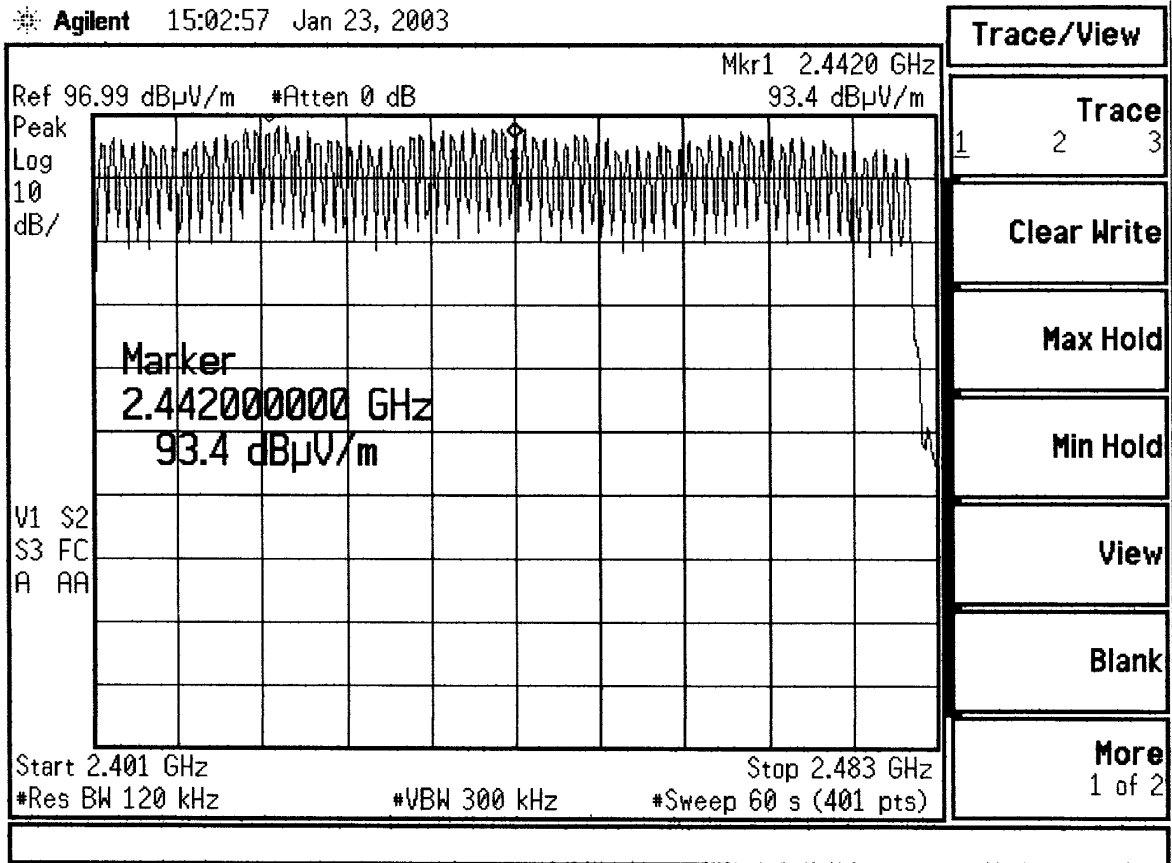
4.3 Channel Spacing

SUBCLAUSE15.247(a)(1)



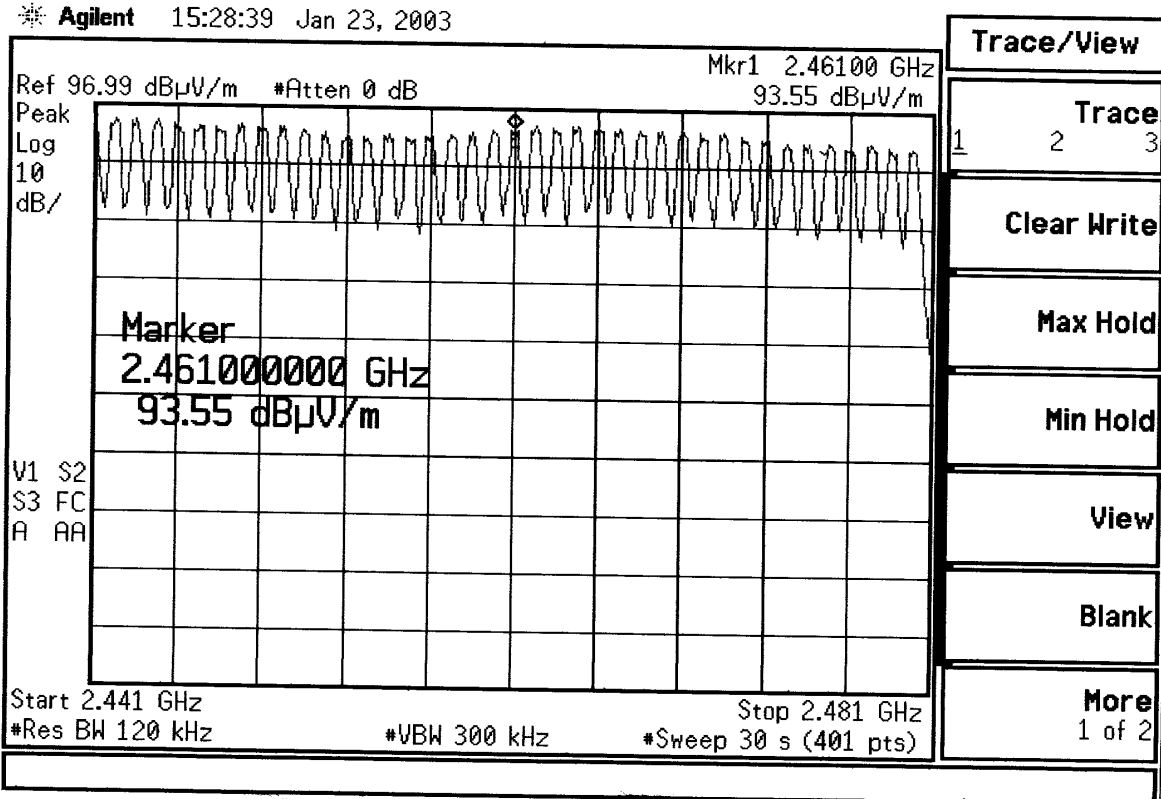
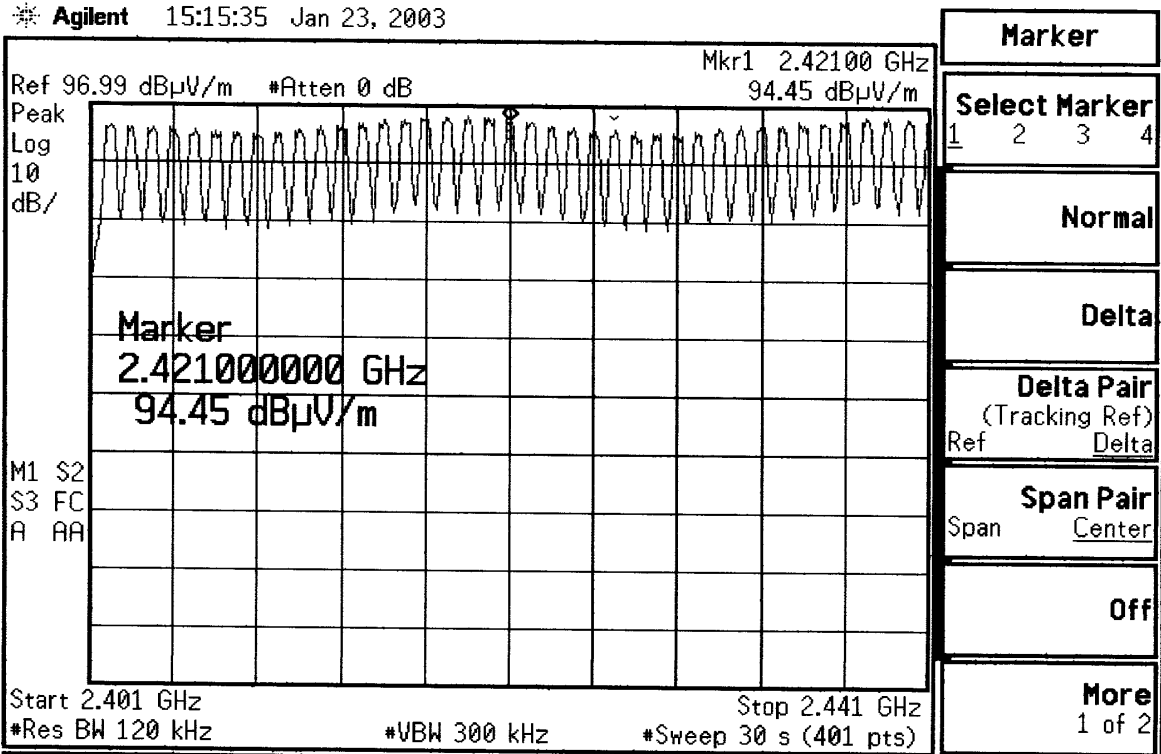
4.4 No. of carrier frequency / 20db Bandwidth

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

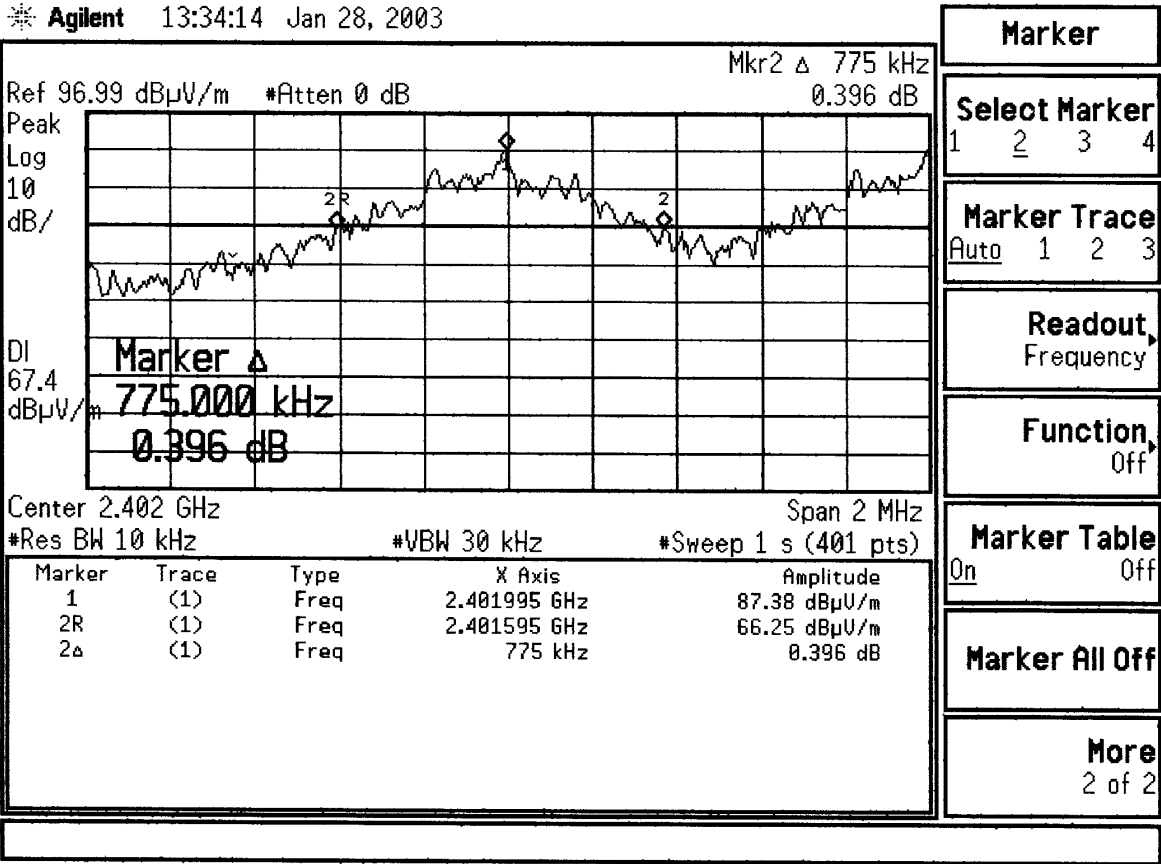


>

Split the whole frequency band into two.



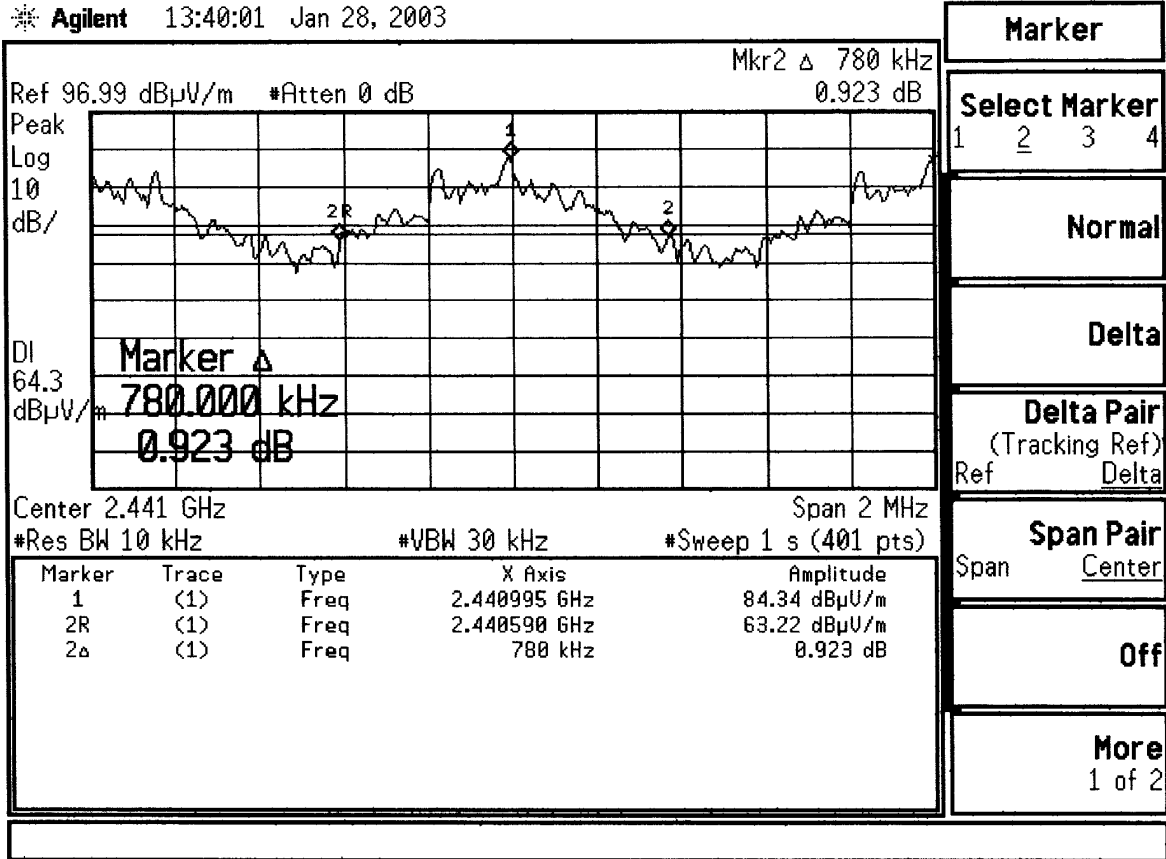
20dB bandwidth at lowest (2402Mhz), middle(2441Mhz), highest channel(2480Mhz)



3-2

Channel bandwidth = 775KHZ

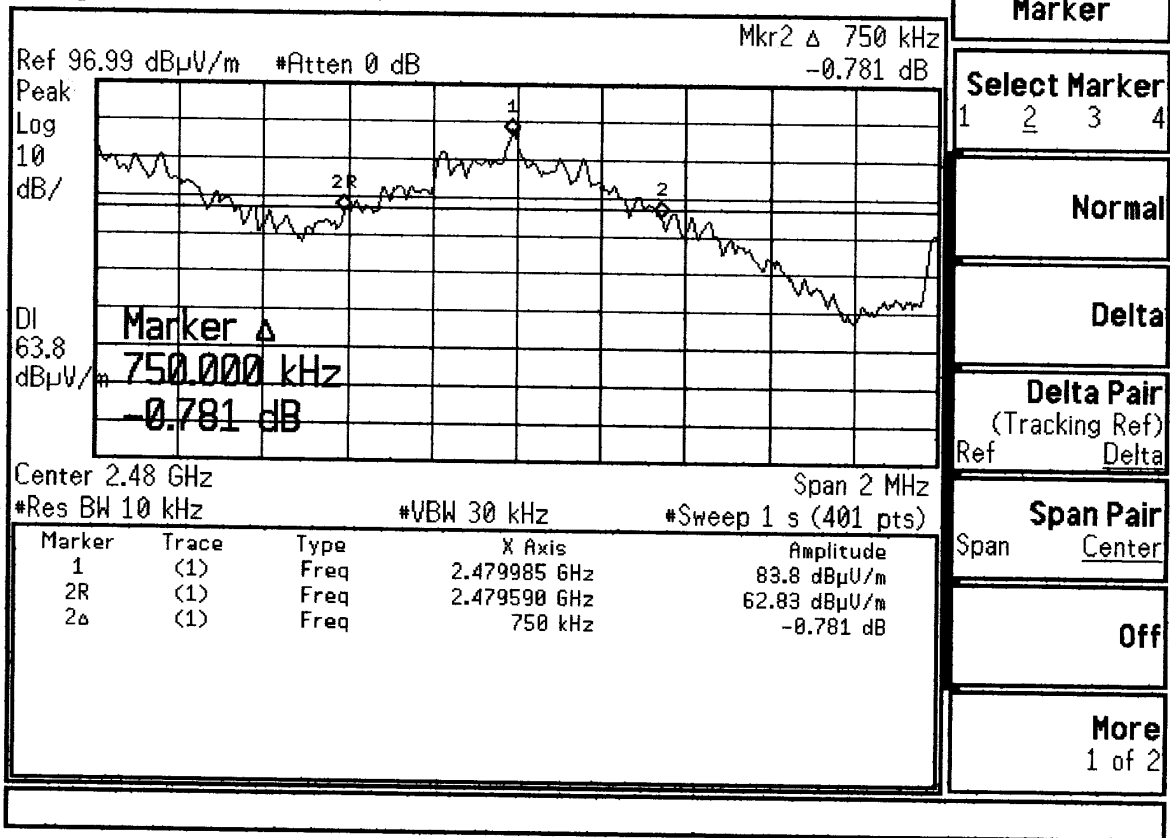
* Agilent 13:40:01 Jan 28, 2003



3-1

Channel bandwidth = 780KHZ

* Agilent 13:51:43 Jan 28, 2003

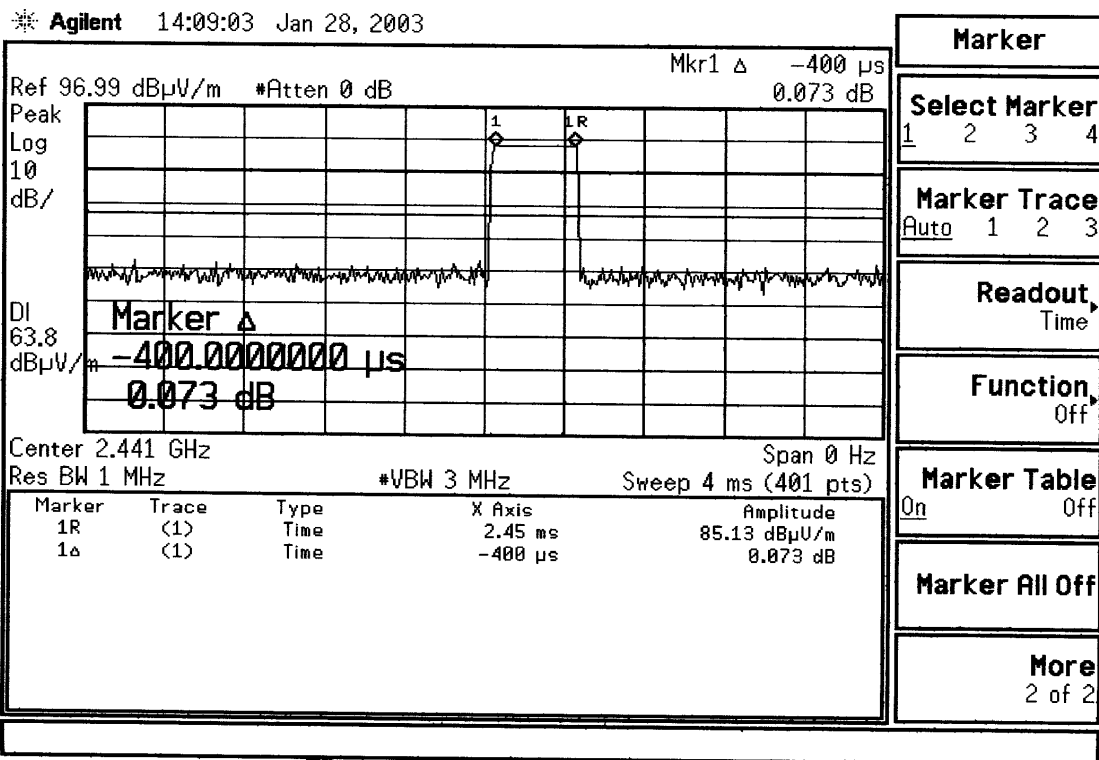
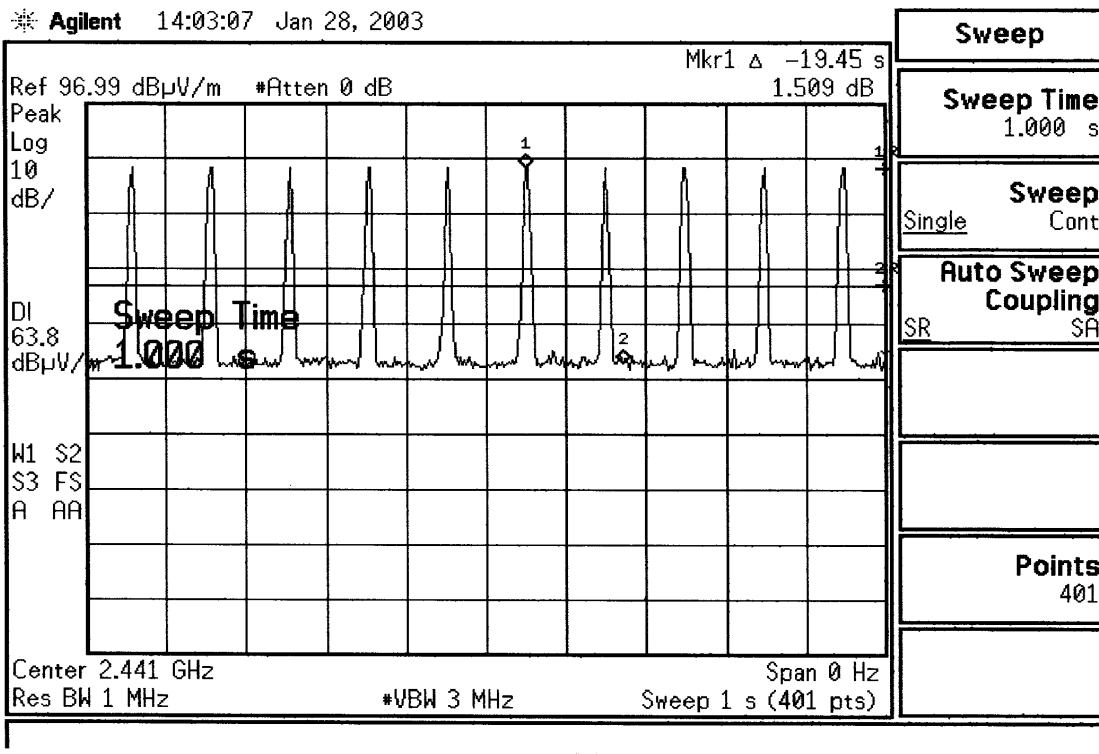


33

Channel bandwidth = 750KHZ

4.5 Average Time of Occupancy

SUBCLAUSE 15.247(a)(1)(ii)



4.5.1 calculation

At channel 2441Mhz, there are 10 bursts in 1 sec. Time period of each burst is 400 μ Sec. So the occupancy time within 30 second is $400 \times 10 \times 30 = 120000 \mu$ Sec = 120 mSec = 0.12 Sec.

4.5.2 Limits

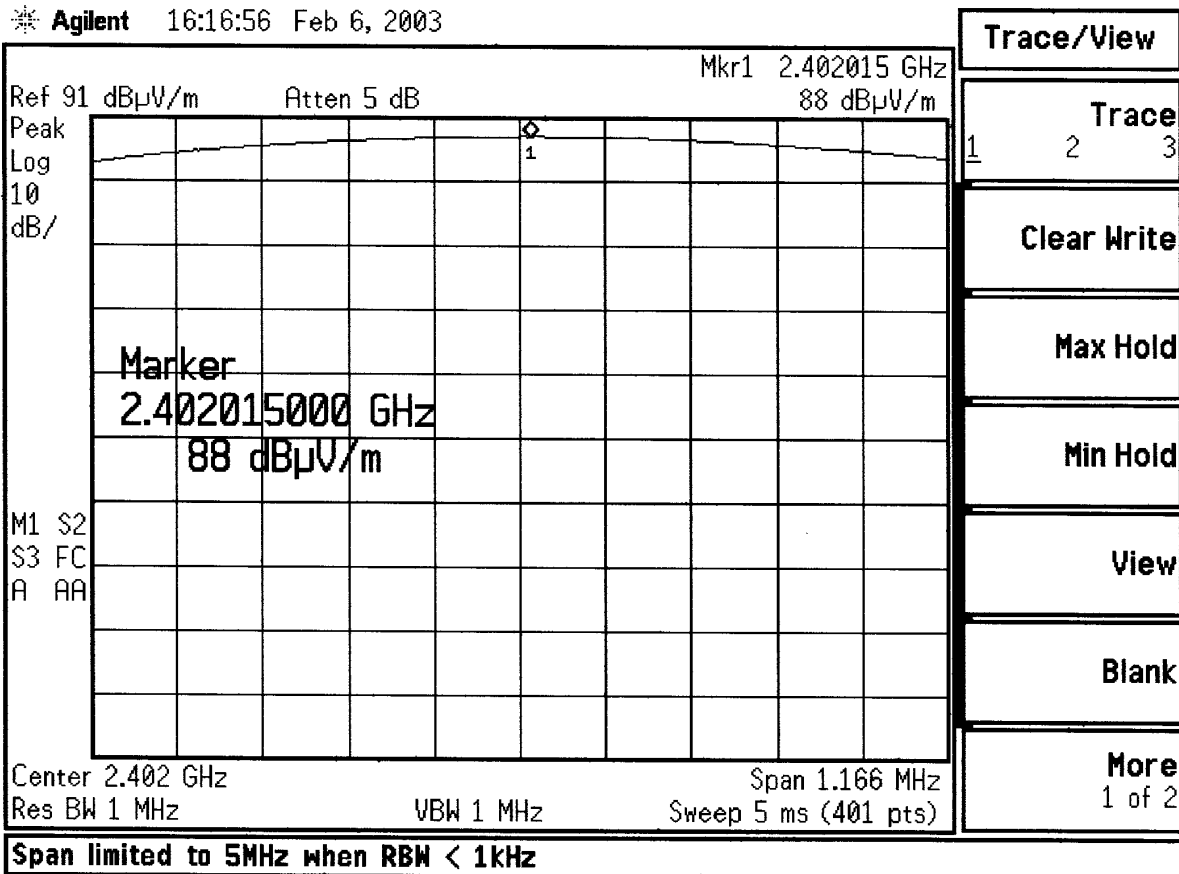
The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 30 second period.

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)

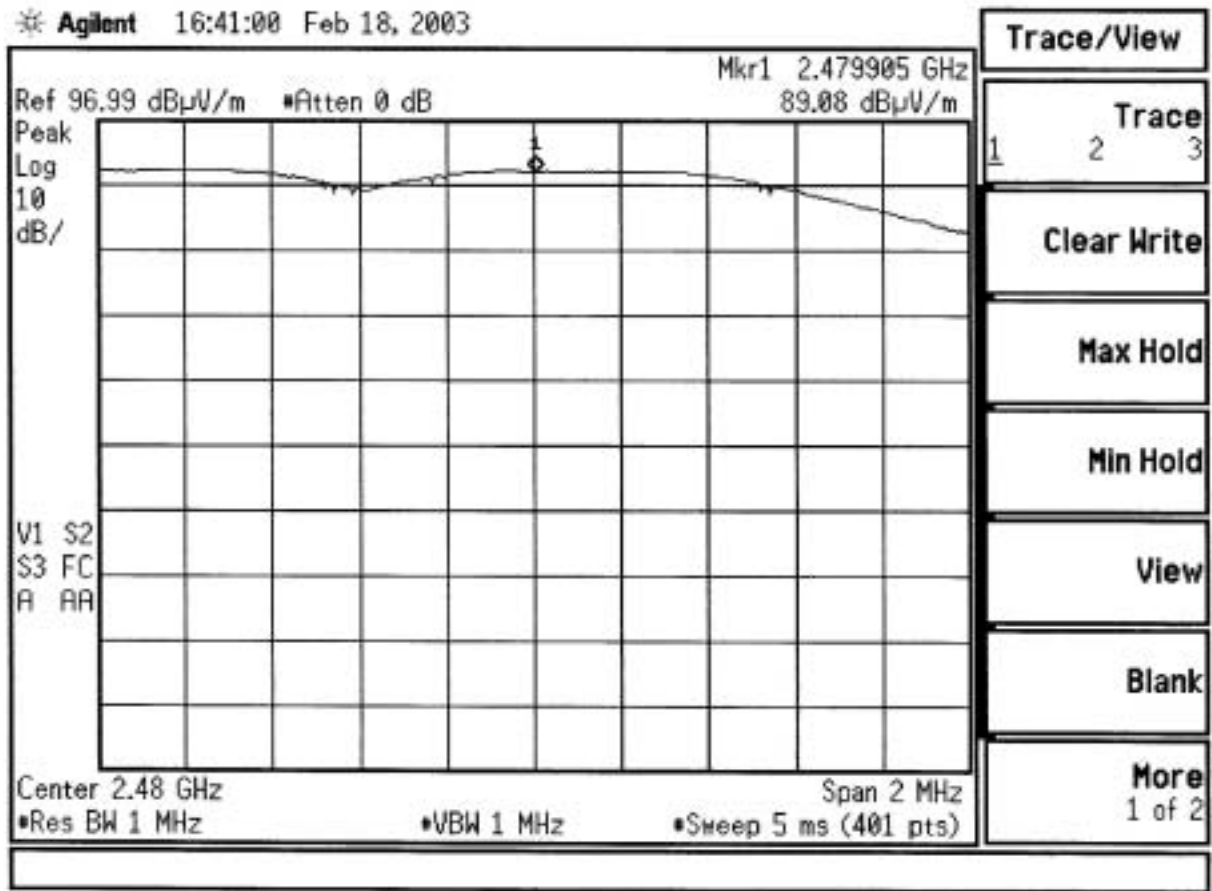


sg. 3.5 dbm

We use substitution method to calculate the ERP of EUT.

At the 2402Mhz , The measured strength is 88 dB µ V/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.

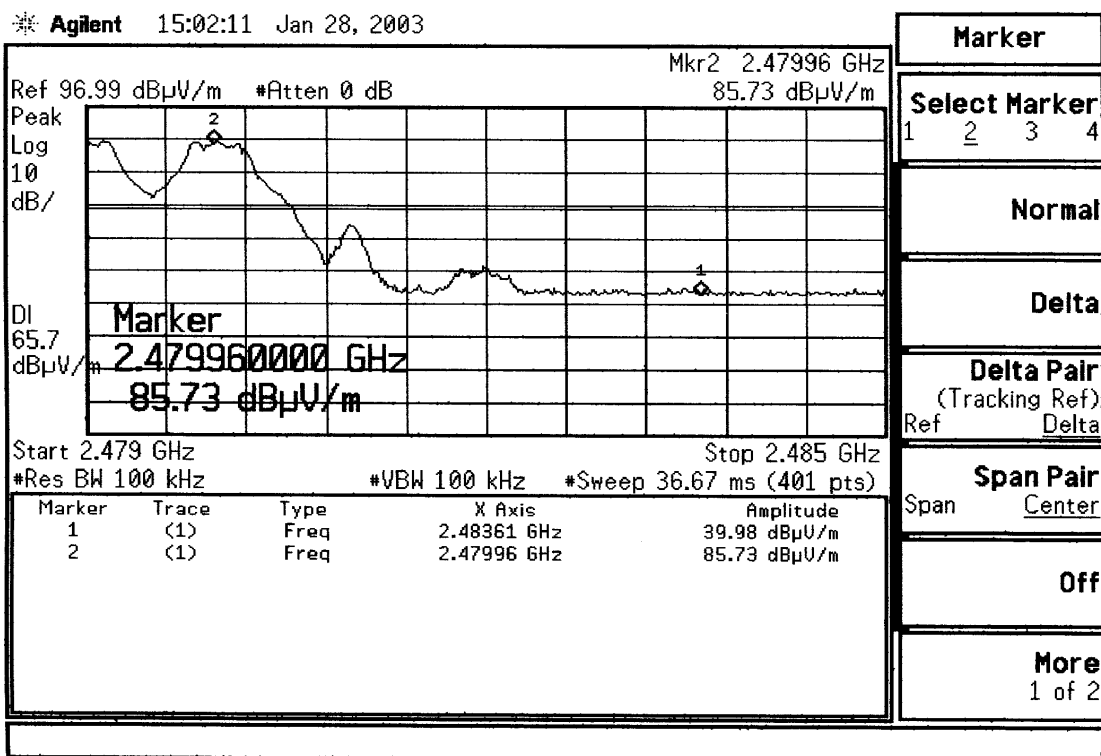
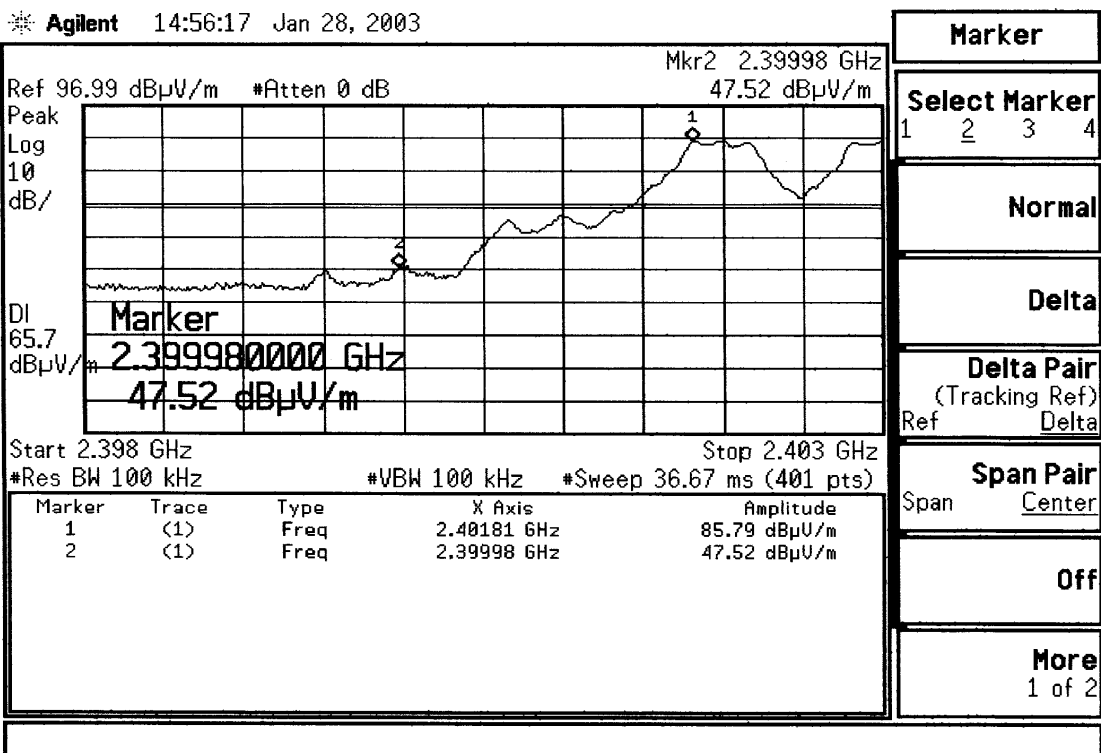
So, the ERP = 4.5 + 10.6 –1.8 = 13.3 dbm = 21.38mW

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

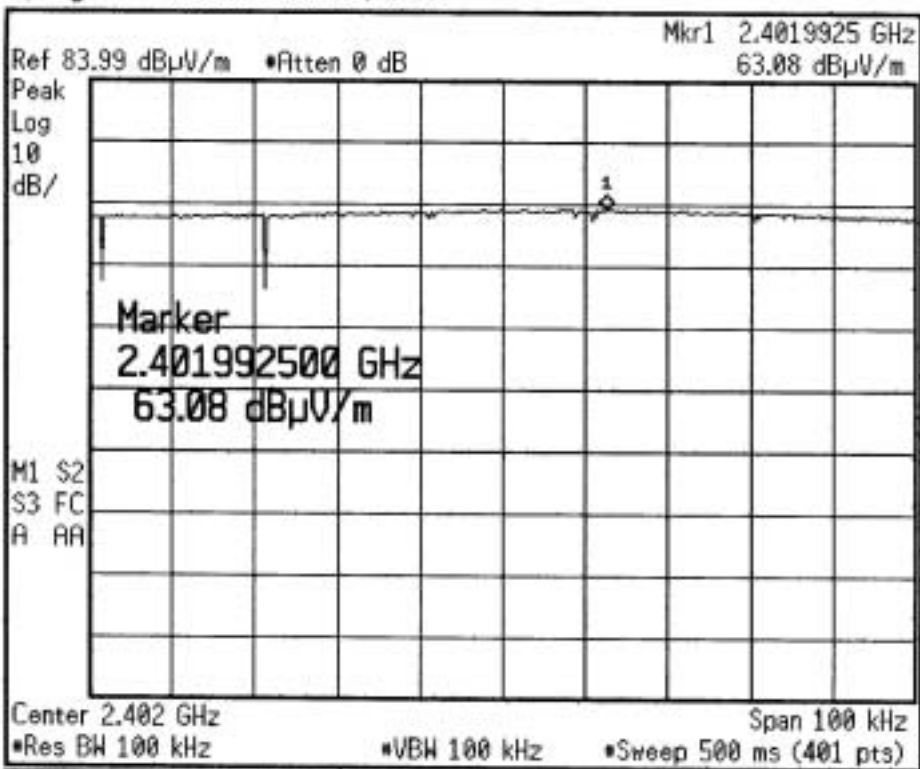
EUT operating at middle frequency

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



Peak Search

Meas Tools

Next Peak

Next Pk Right

Next Pk Left

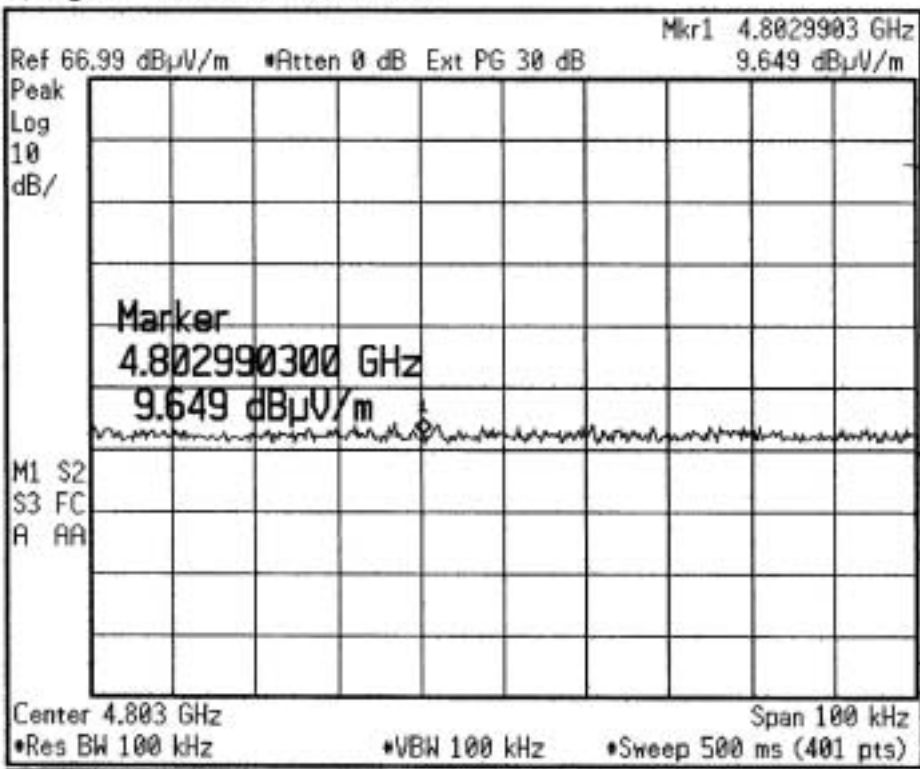
Min Search

Pk-Pk Search

More
1 of 2

Data out of range

Agilent 18:30:15 Jan 29, 2003



Trace/View

Trace
1 2 3

Clear Write

Max Hold

Min Hold

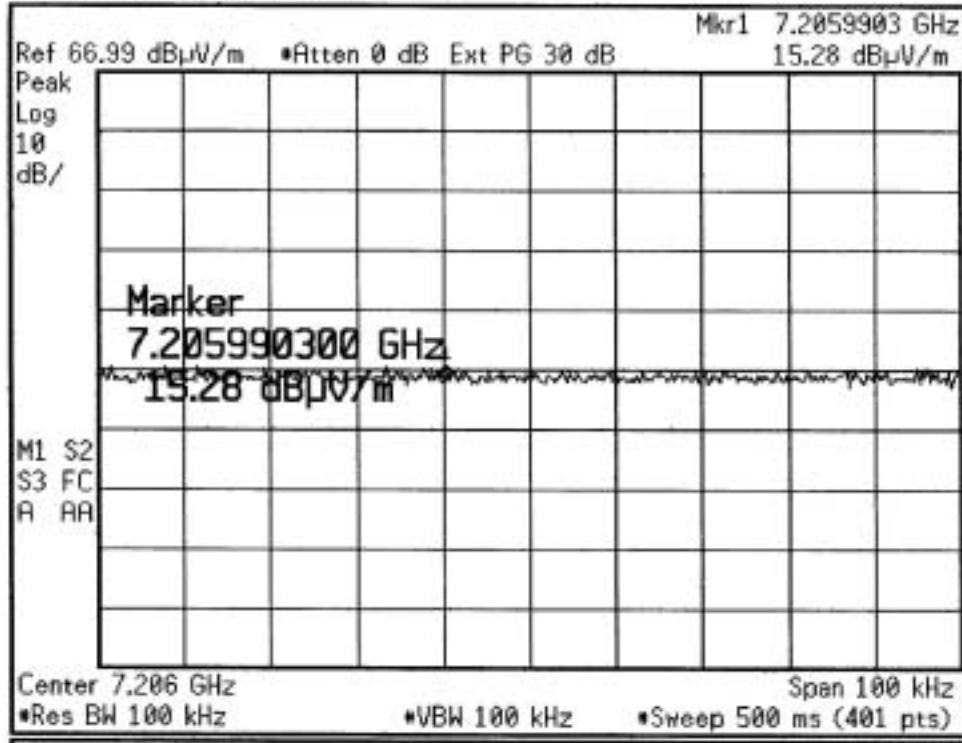
View

Blank

More
1 of 2

Data out of range

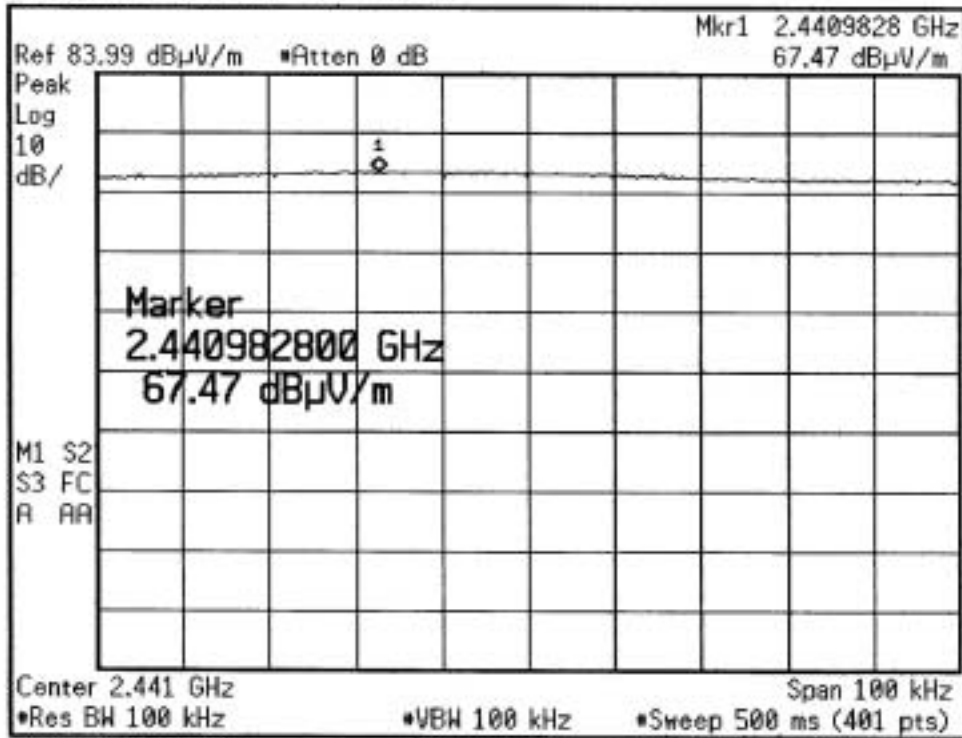
✱ Agilent 18:36:58 Jan 29, 2003



Marker
Select Marker 1 2 3 4
Normal
Delta
Delta Pair (Tracking Ref) Ref Delta
Span Pair Span Center
Off
More 1 of 2

Data out of range

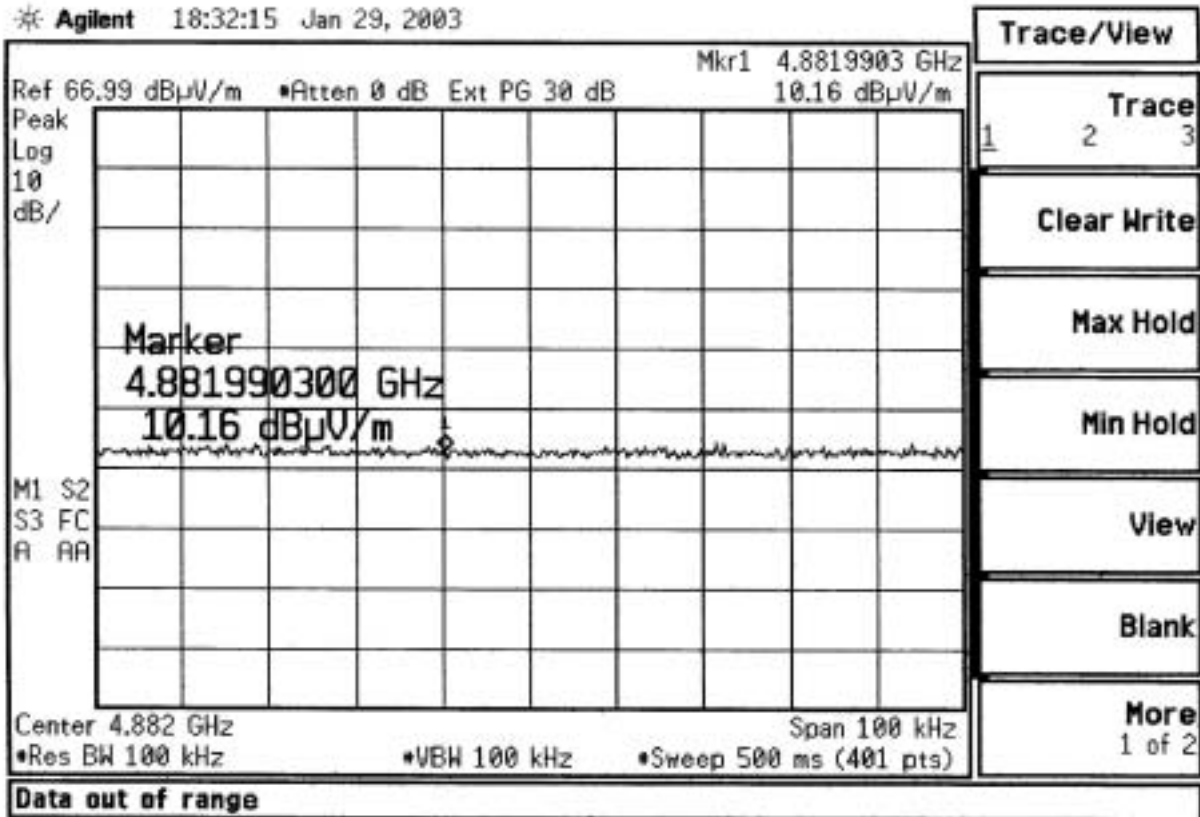
✱ Agilent 18:16:54 Jan 29, 2003



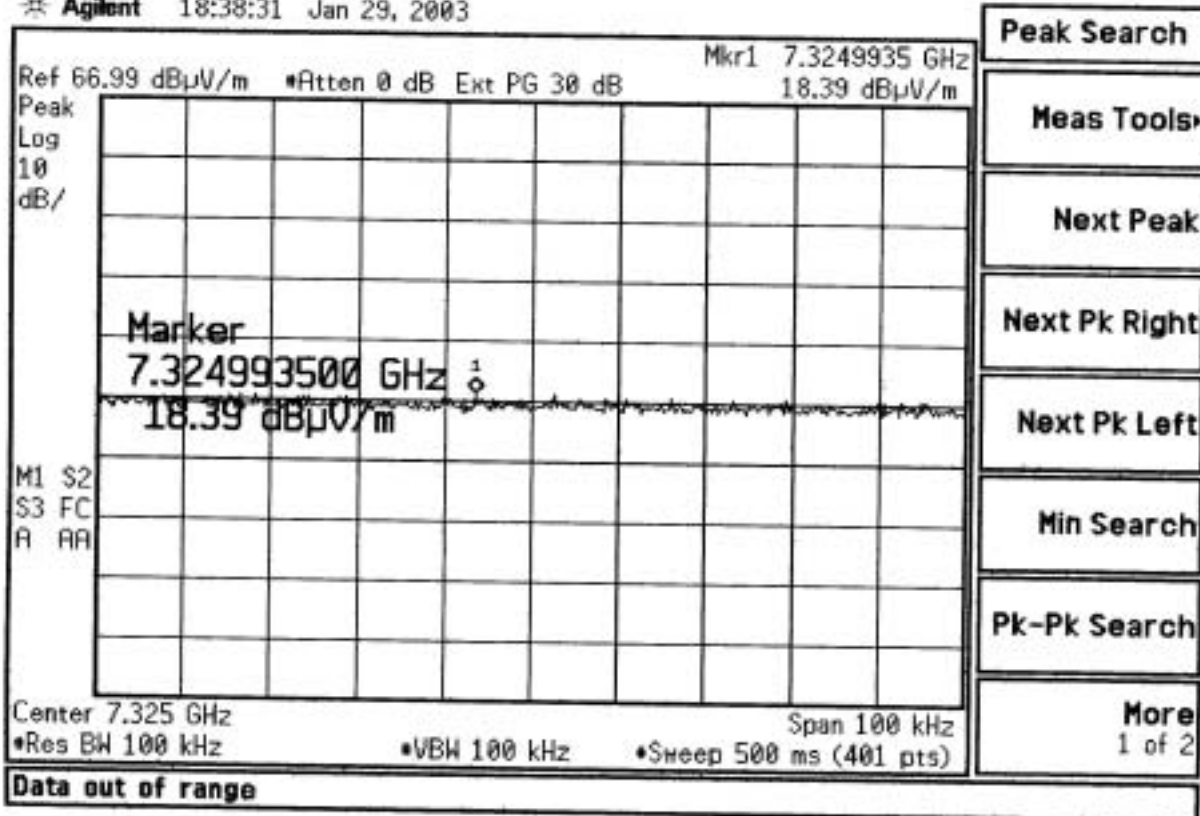
Peak Search
Meas Tools
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
More 1 of 2

Data out of range

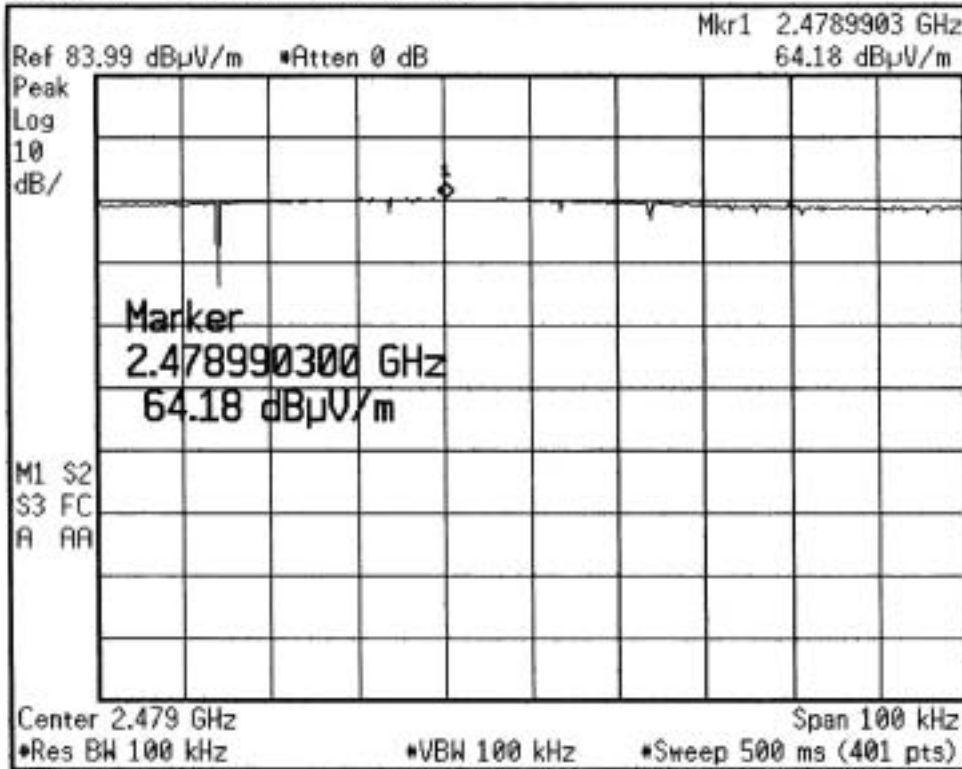
* Agilent 18:32:15 Jan 29, 2003



* Agilent 18:38:31 Jan 29, 2003



Agilent 18:21:37 Jan 29, 2003



Peak Search

Meas Tools

Next Peak

Next Pk Right

Next Pk Left

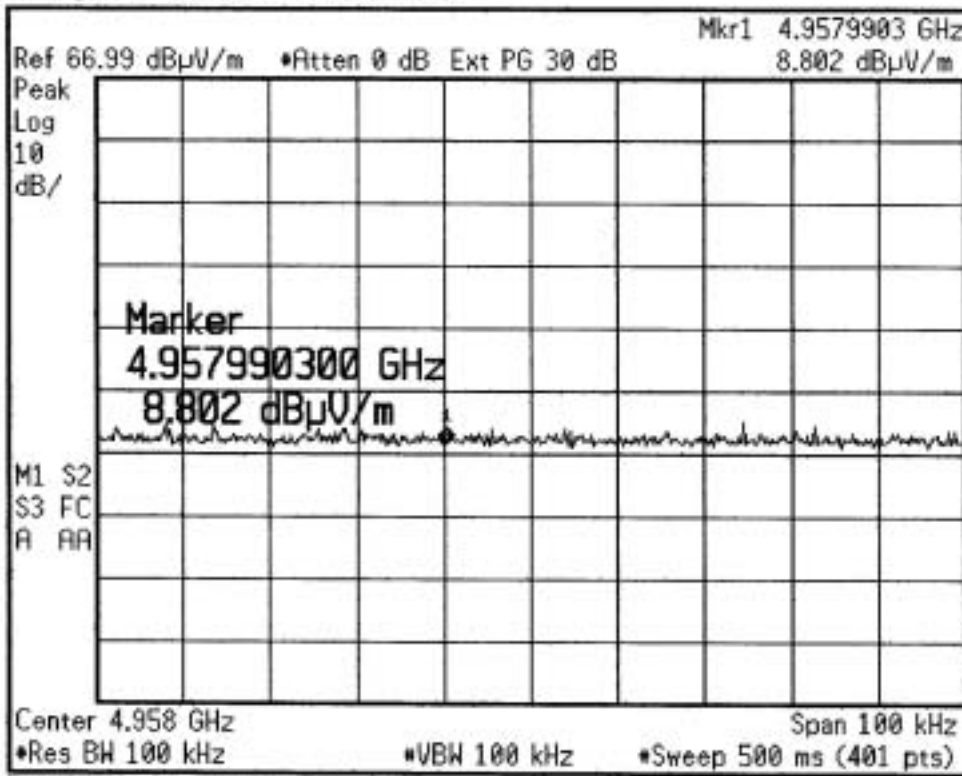
Min Search

Pk-Pk Search

More
1 of 2

Data out of range

Agilent 18:35:24 Jan 29, 2003



Trace/View

Trace
1 2 3

Clear Write

Max Hold

Min Hold

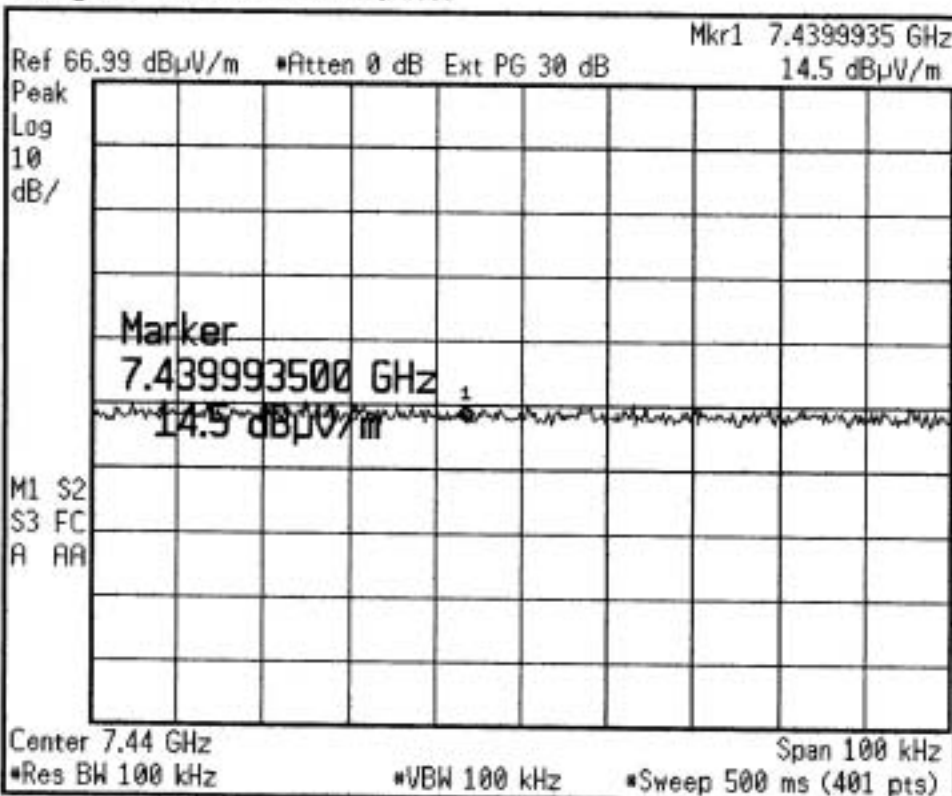
View

Blank

More
1 of 2

Data out of range

Agilent 18:39:34 Jan 29, 2003



Marker
Select Marker 1 2 3 4
Normal
Delta
Delta Pair (Tracking Ref) Ref Delta
Span Pair Span Center
Off
More 1 of 2

Data out of range

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)