FCC TEST REPORT

quipment Under Test : GPS-HANDHELD-BLUETOOTH
Model No. : GPSmartBT

Applicant : Fortuna Electronic Corp.
Address of Applicant : 3F,No 9,Sec.1,Chang An East Rd., Taipei, 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** : **Feb. 27,2003**

Approved by : **Jason Lin** **Date** : **Feb. 27,2003**

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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 : Fortuna Electronic Corp.
Address 3F,No 9,Sec.1,Chang An East Rd., Taipei, Taiwan, R.O.C.

Contact : Mr. Vincent Chen
Telephone : +886-2-25818373 ext.280

1.3 Description of EUT(s)

1	Product name	GPS-HANDHELD-BLUETOOTH
2	Product ID	GPSmartBT
3	Supply Voltage	4.5V
4	Carrier Frequency	2402MHz to 2480MHz
5	Modulation Method	GFSK,1Mbps,0.5BT Gaussian
6	Hopping	1600hops/sec, 1MHz channel space
7	Output Interface	RS232
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=55 (at max. power). Since the RS232 port on the EUT is only for outputting GPS navigation data (NMEA sentence) , the manufacturer provide another RS232 interface to control the Bluetooth module by BlueSuite.

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(shown 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

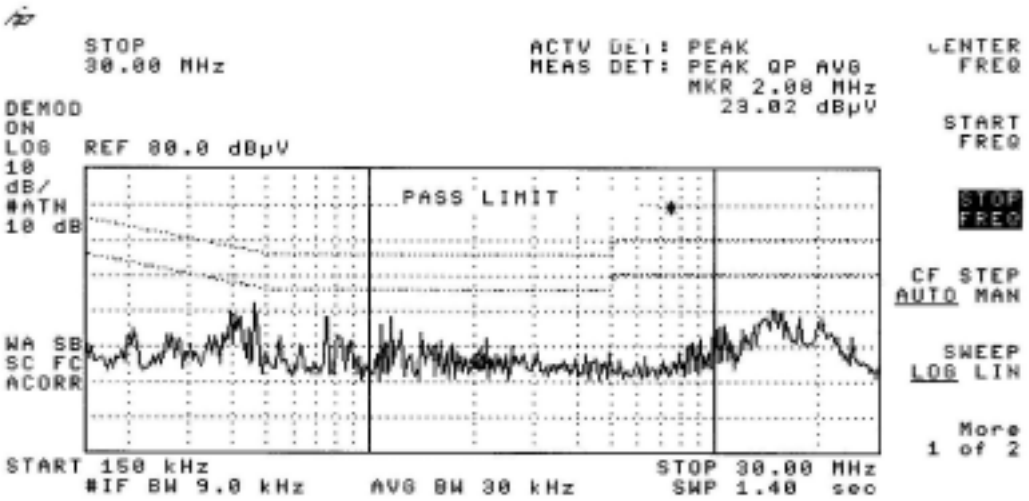
3. Instruments List

Instrument	Model	Serial number	Calibration date
Desktop PC	HP Pavilion 700	TW23420339	N/A
Spectrum Analyser	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 Analyser	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

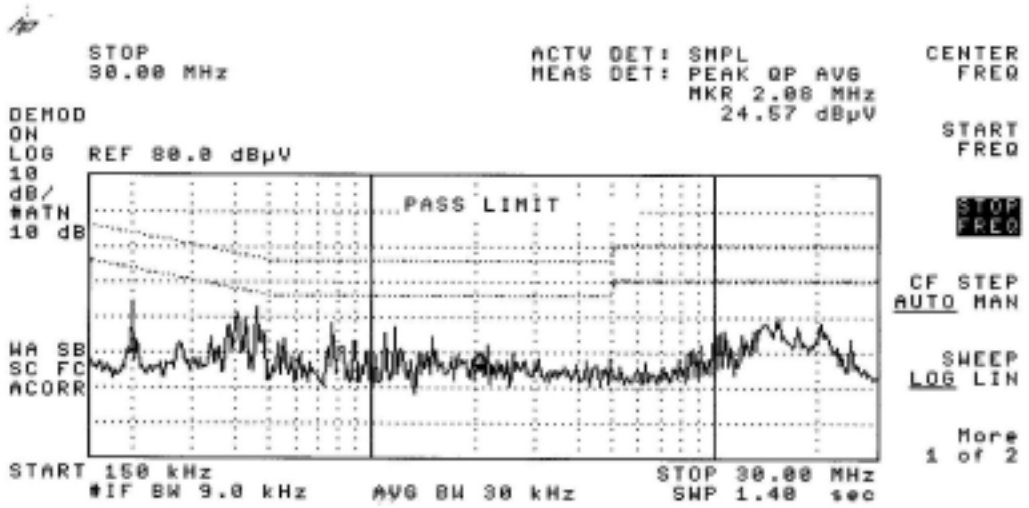
4. Measurements

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

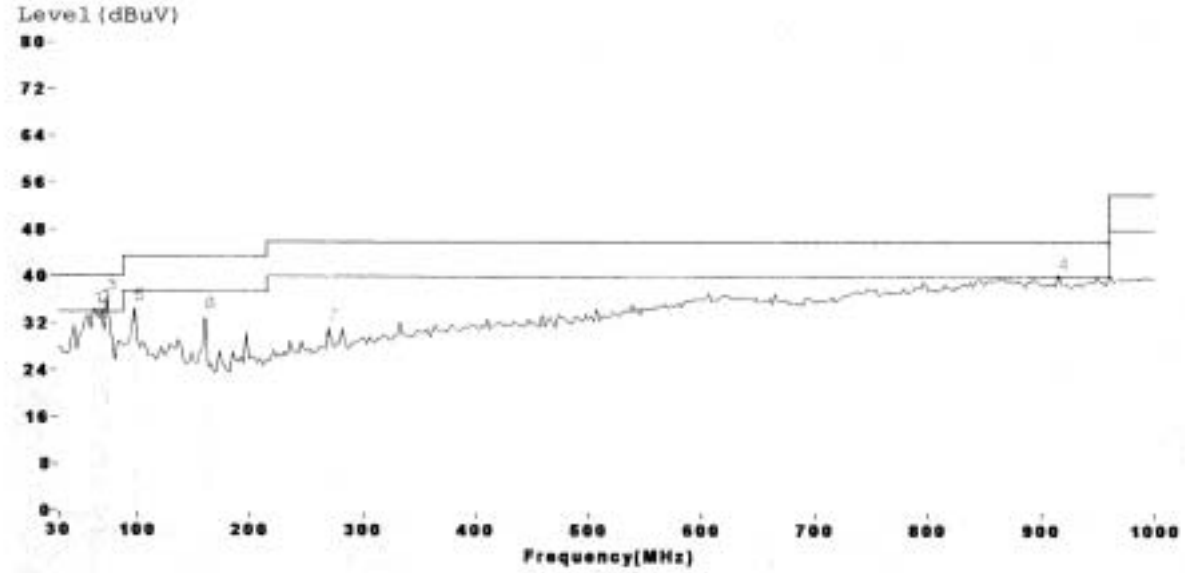
Vertical

SGS EMC Lab. Site 2

EMI TESTING REPORT

Customer:
Model :
Spec. :
Ser. No.:
Limit :FCC B

Date:2003-02-27 Time:08:55
Polar. :Vertical- 3M
Report No.:ER/2003/10008
File :-1
Tester :alex
Tmp.(C):20.0 Humid.(%):60



MEMO:

		Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Factor	Other Factor
		MHz	dB	dB	dB	dB	dB	dB	dB
!	1	61.52	34.41	-5.59	40.00	22.98	10.84	0.59	0.00
!	2	68.80	34.65	-5.35	40.00	26.13	7.90	0.62	0.00
!	3	73.65	36.70	-3.30	40.00	29.28	6.78	0.64	0.00
!	4	915.12	40.48	-5.52	46.00	15.50	22.38	2.60	0.00
	5	97.90	34.97	-8.53	43.50	22.46	11.77	0.74	0.00
	6	160.95	33.56	-9.94	43.50	24.59	8.07	0.89	0.00
	7	270.07	31.48	-14.52	46.00	17.87	12.44	1.17	0.00

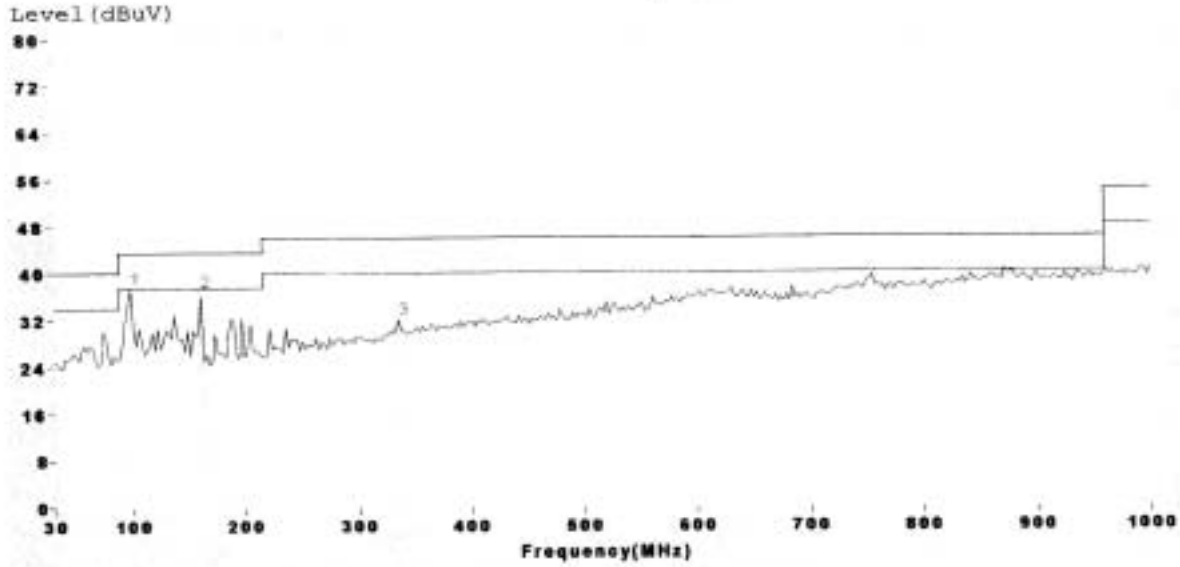
Horizontal

SGS EMC Lab. Site 2

EMI TESTING REPORT

Customer:
Model :
Spec. :
Ser. No.:
Limit :FCC B

Date:2003-02-27 Time:08:53
Polar. :Horizontal- 3M
Report No.:ER/2003/10008
File :-1
Tester :alex
Tmp.(C):20.0 Humid.(%):60



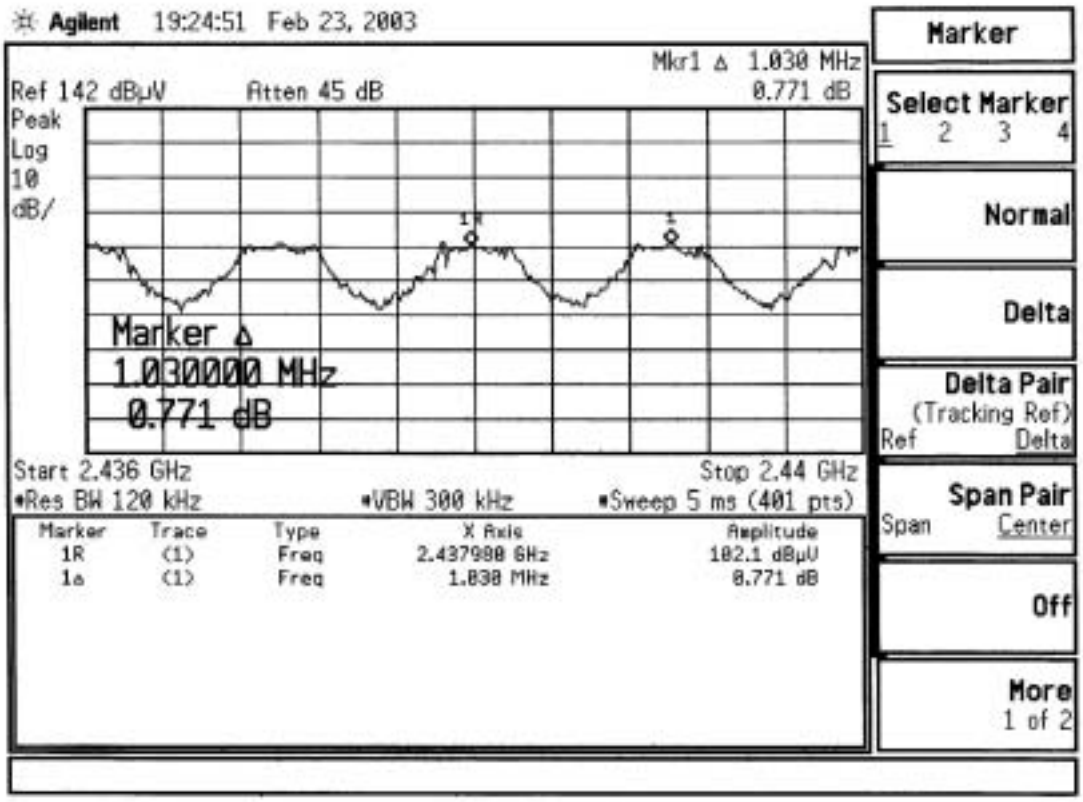
MEMO:

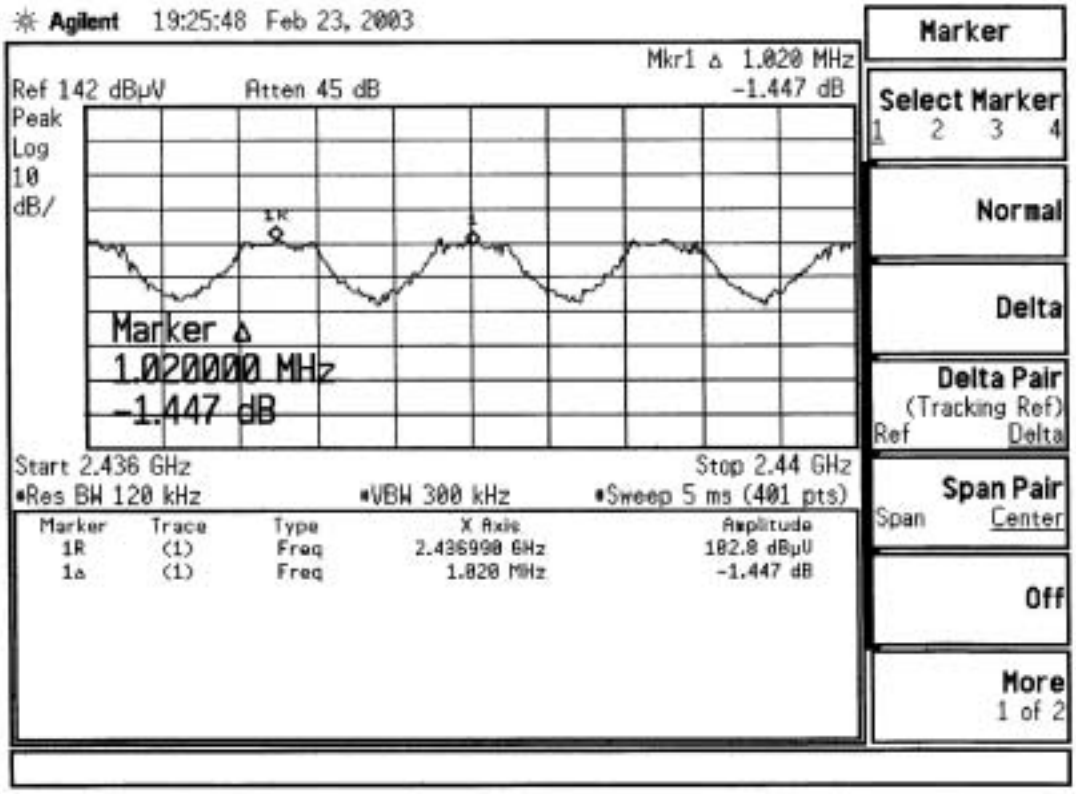
	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Factor	Other Factor
	MHz	dB	dB	dB	dB	dB	dB	dB
1	97.90	37.43	-6.07	43.50	24.92	11.77	0.74	0.00
2	160.95	36.78	-6.72	43.50	27.82	8.07	0.89	0.00
3	335.55	32.10	-13.90	46.00	16.38	14.35	1.37	0.00

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

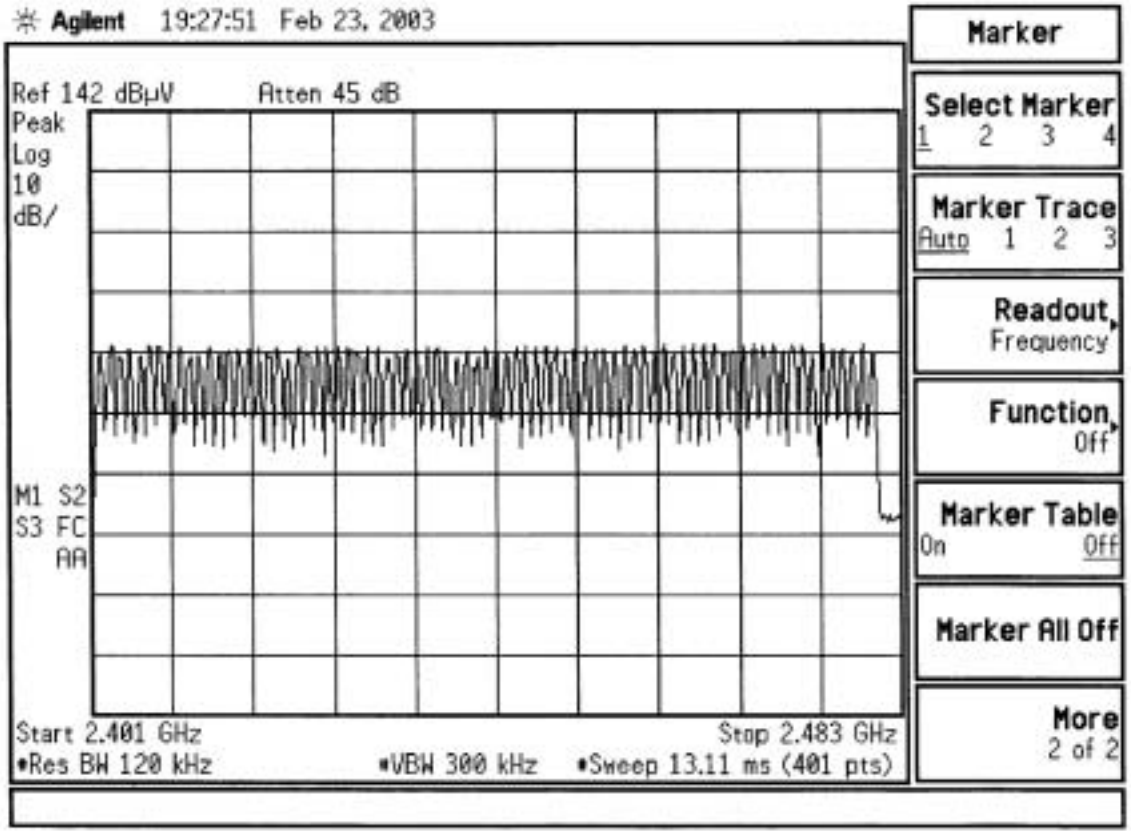
4.3 Channel Spacing SUBCLAUSE15.247(a)(1)



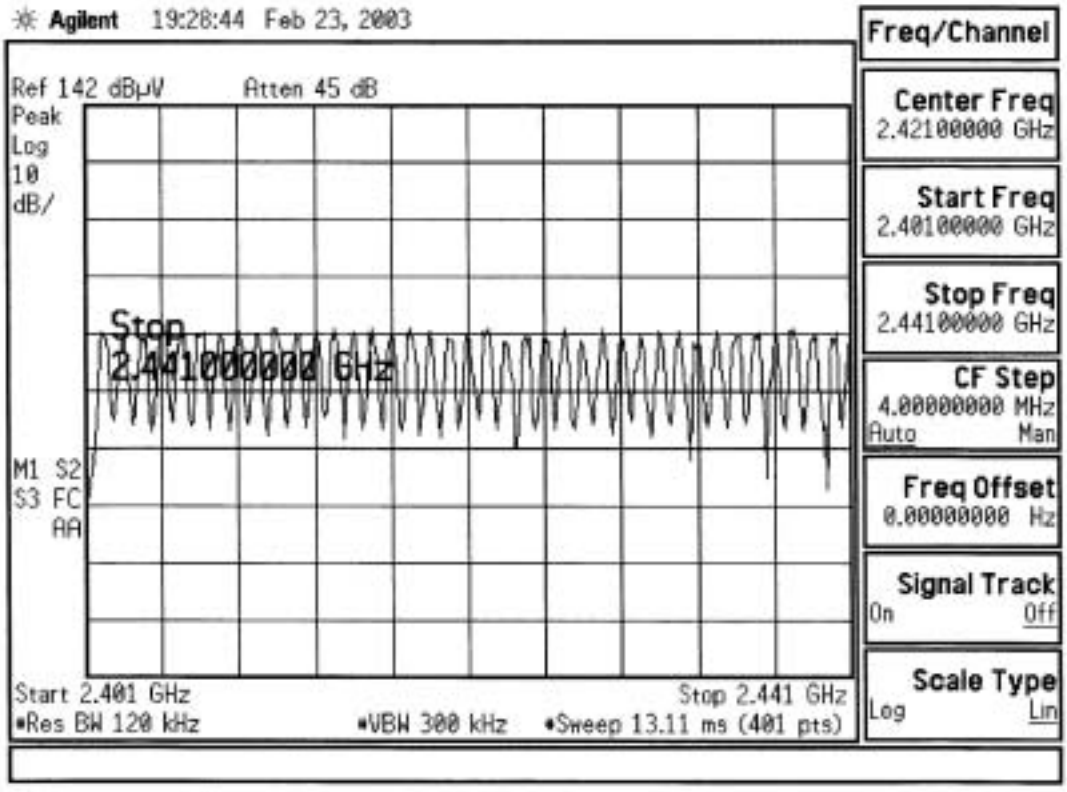


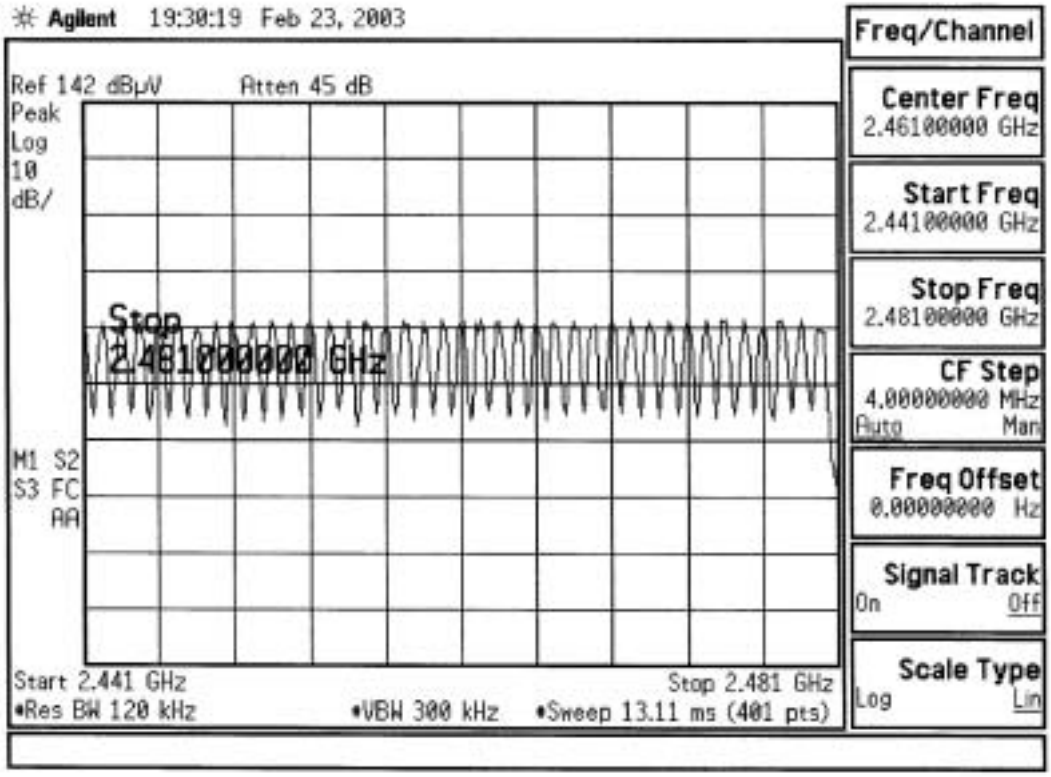
4.4 No. of carrier frequency / 20db Bandwidth

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

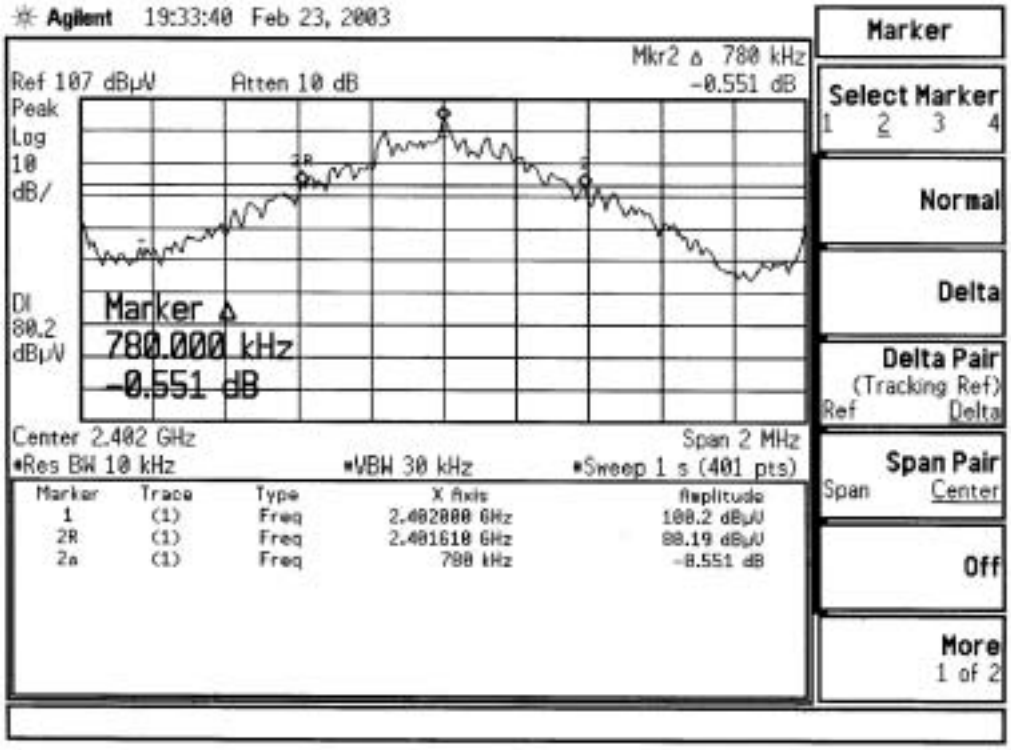


Split the whole frequency band into two.

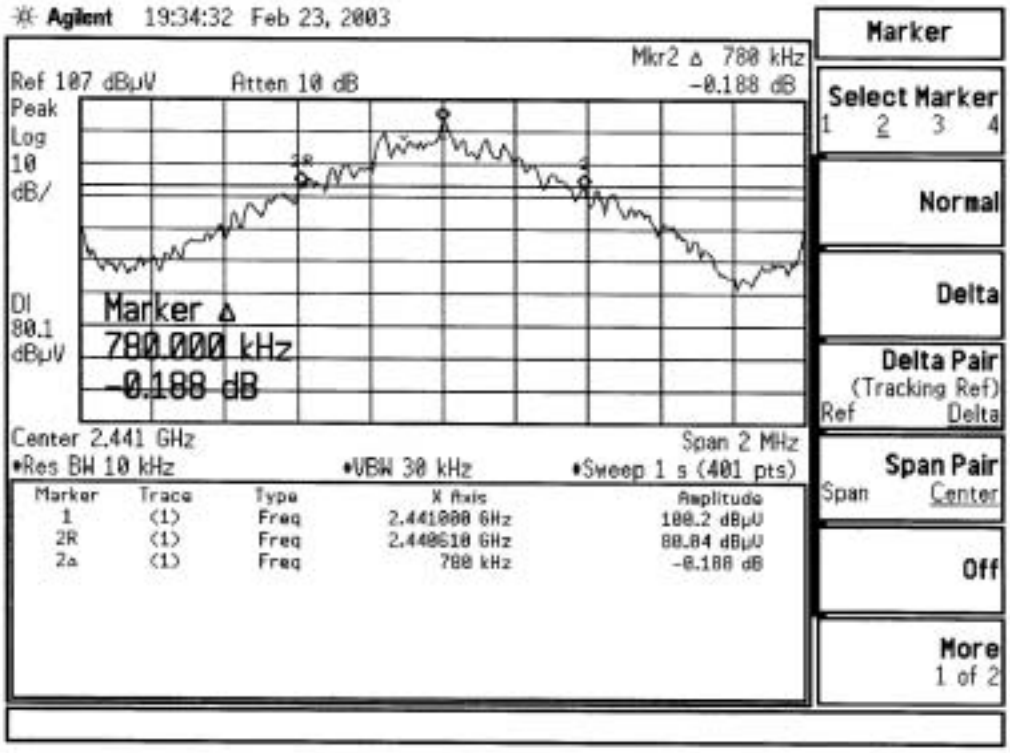




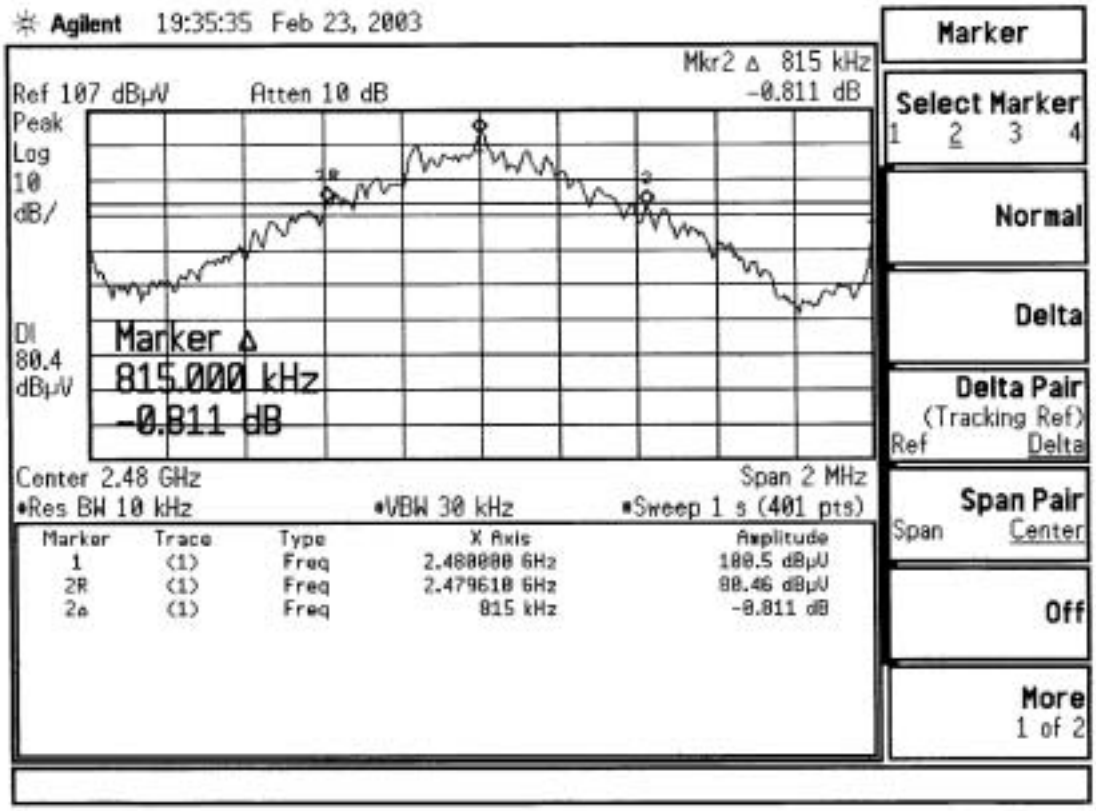
20dB bandwidth at lowest (2402Mhz), middle(2441Mhz), highest channel(2480Mhz)



Channel bandwidth = 780KHZ

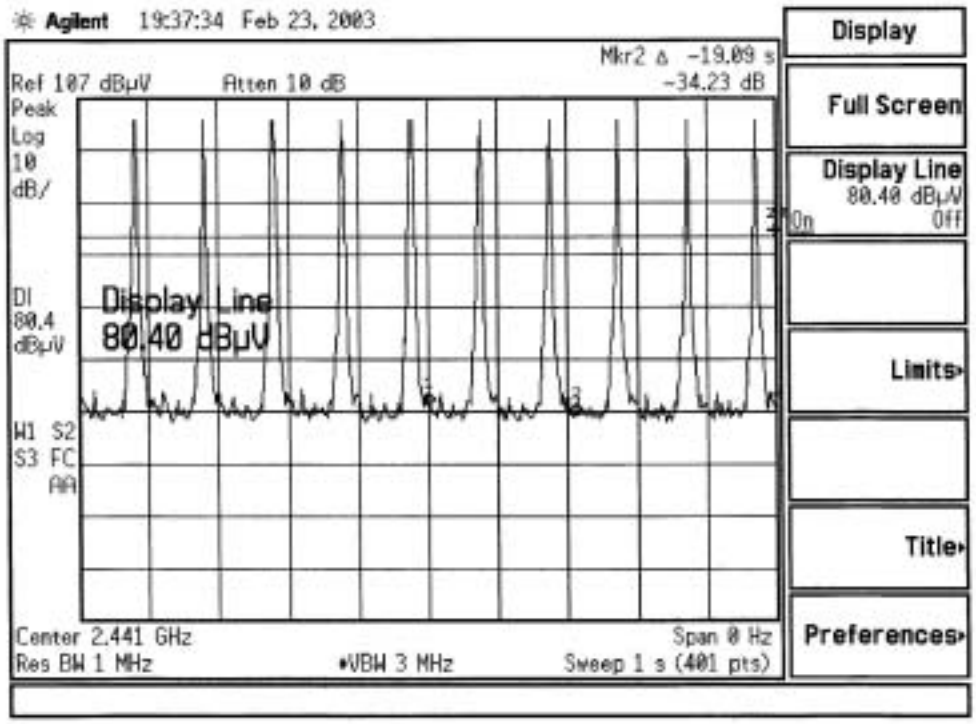


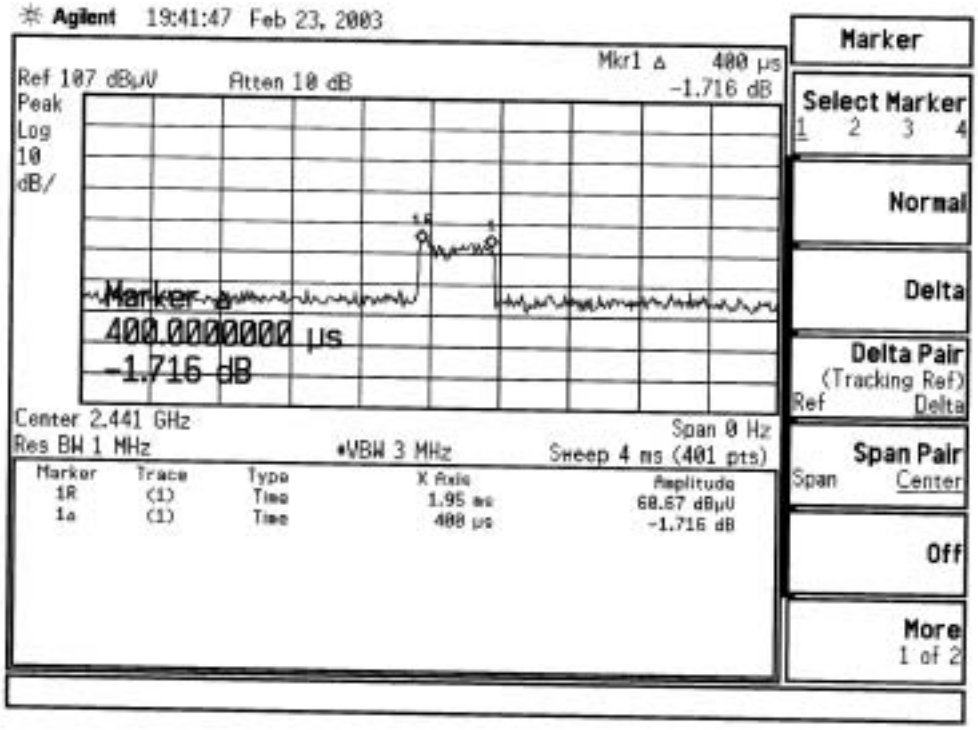
Channel bandwidth = 780KHZ



Channel bandwidth = 815KHZ

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.

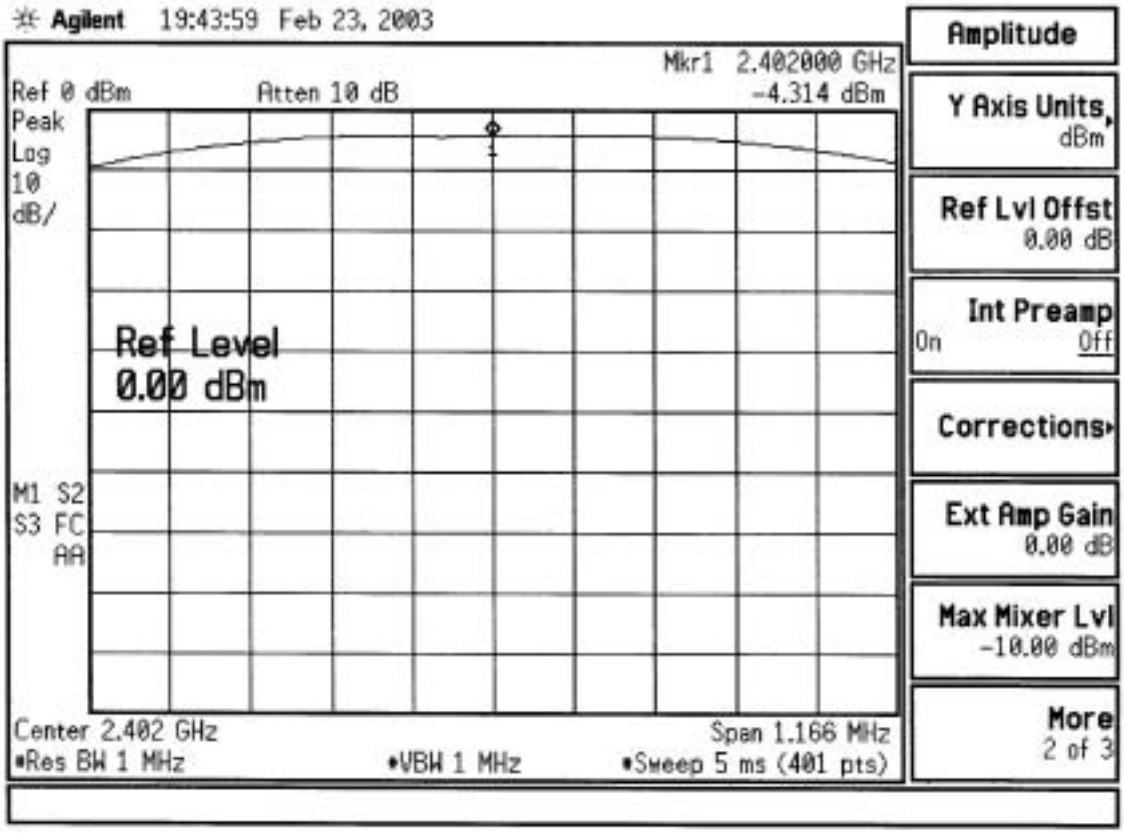
4.5.2 Limits

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.

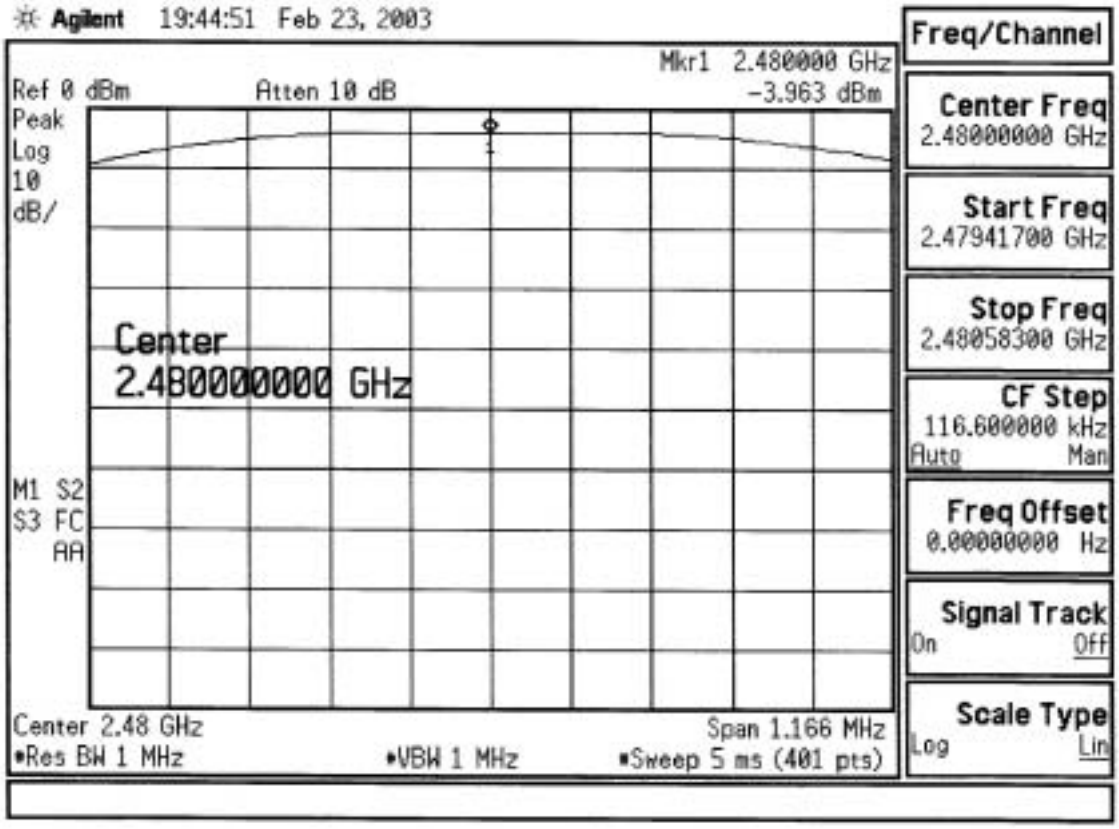
4.6 Peak output Power SUBCLAUSE15.247(b)(1)

Transmitter transmit at lowest channel (2402Mhz)



At the 2402Mhz , The output power is –4.314 dbm.

-4.314 dBm + 2.2 db(cable loss) = -2.114 dbm = 0.615 mW



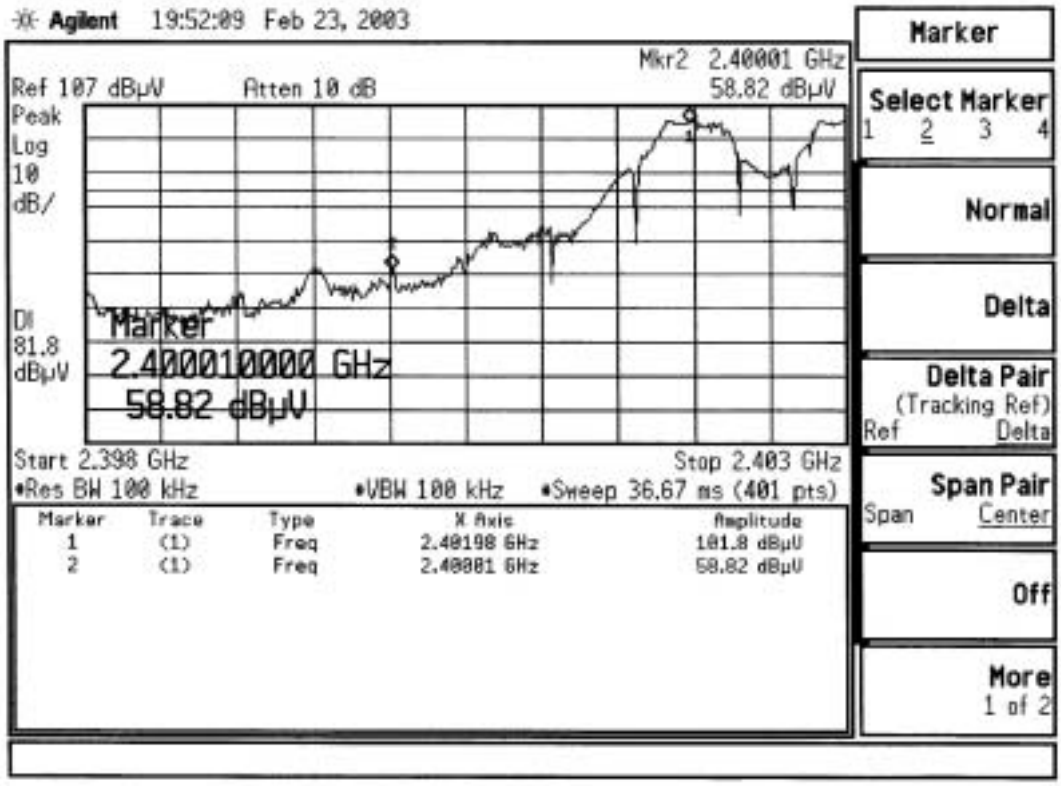
At the 2480 Mhz , The measured output power is –3.963 dBm.

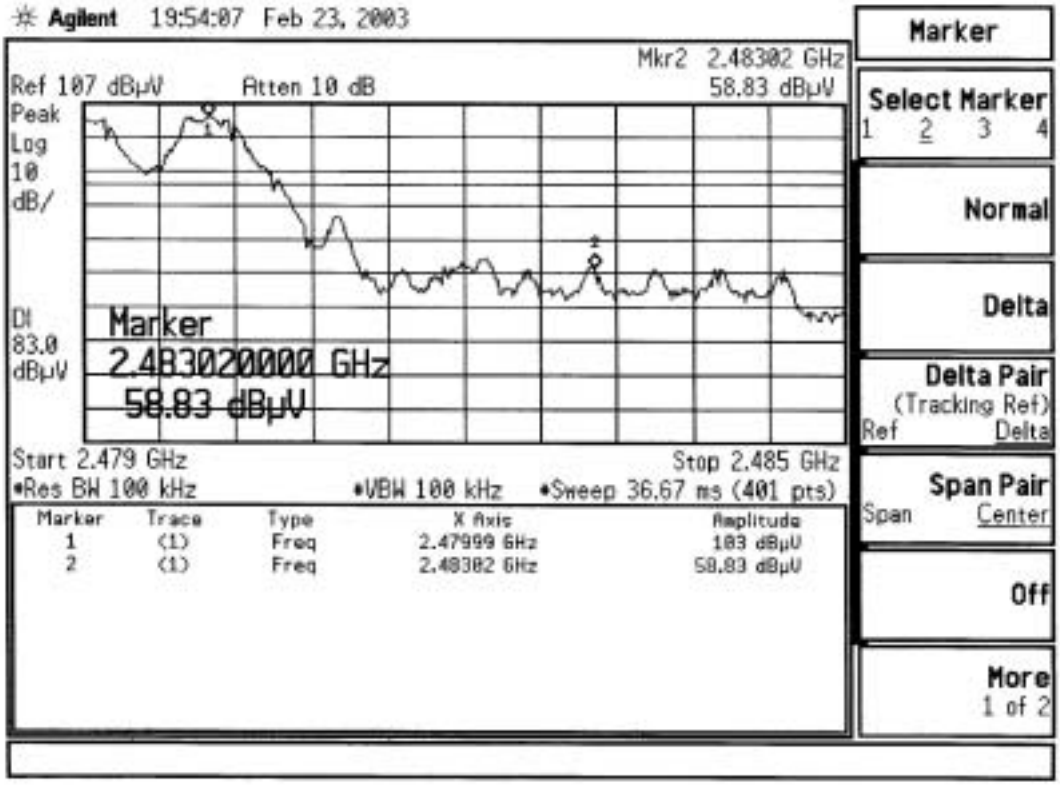
-3.963 dBm + 2.2 db (cable loss) = -1.763 dbm = 0.666 mW

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

EUT operating at low frequency

Frequency(MHz)	Read value(dBuV/m)	Antenna factor	Cable loss(db)	Real Value(dbuV/m)	Limit(dbuV/m)
2401.997	51.91	27.8	3.94	83.65	In band
4803.997	14.43	31.26	3.96	49.65	54
7206.009	N/A	30.21	4.01	N/A	54

N/A means the emission value the same as the background noise.

EUT operating at middle frequency

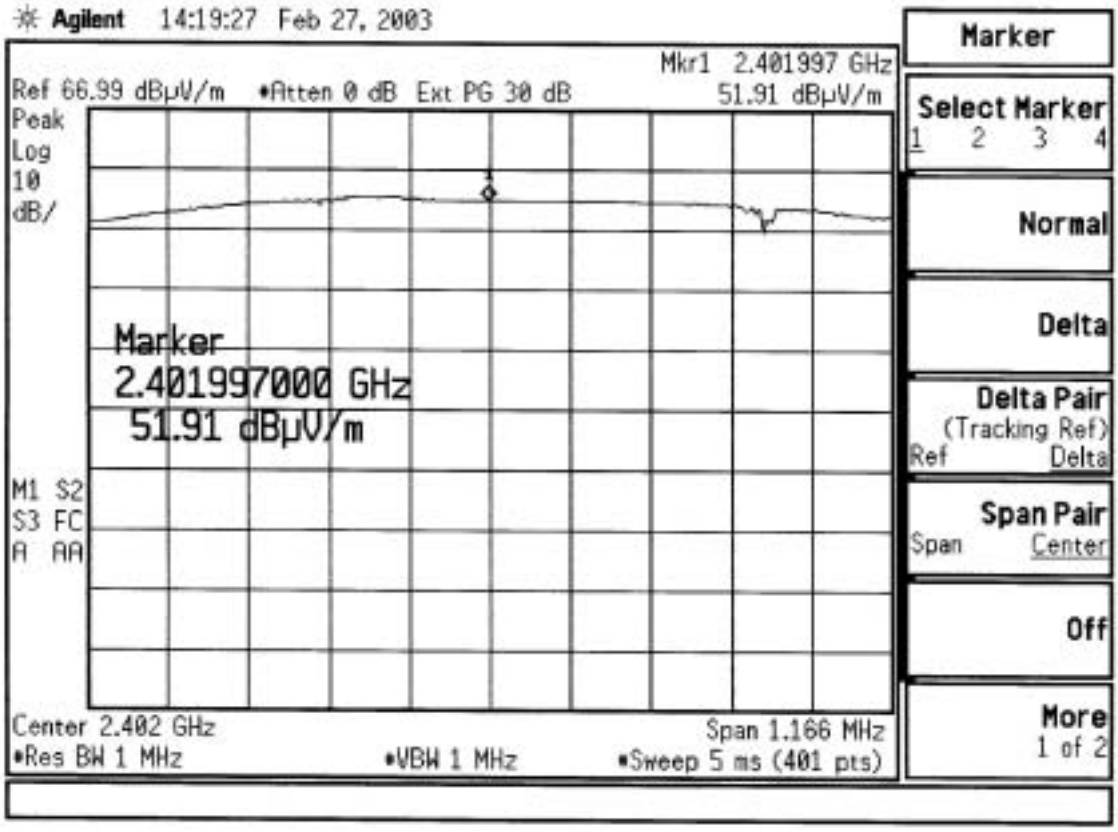
Frequency(MHz)	Read value(dBuV/m)	Antenna factor	Cable loss(db)	Real Value(dbuV/m)	Limit(dbuV/m)
2441.009	56.82	27.9	3.95	88.67	In band
4882.009	13.35	31.41	3.96	48.72	54
7324.009	13.35	31.55	4.02	48.92	54

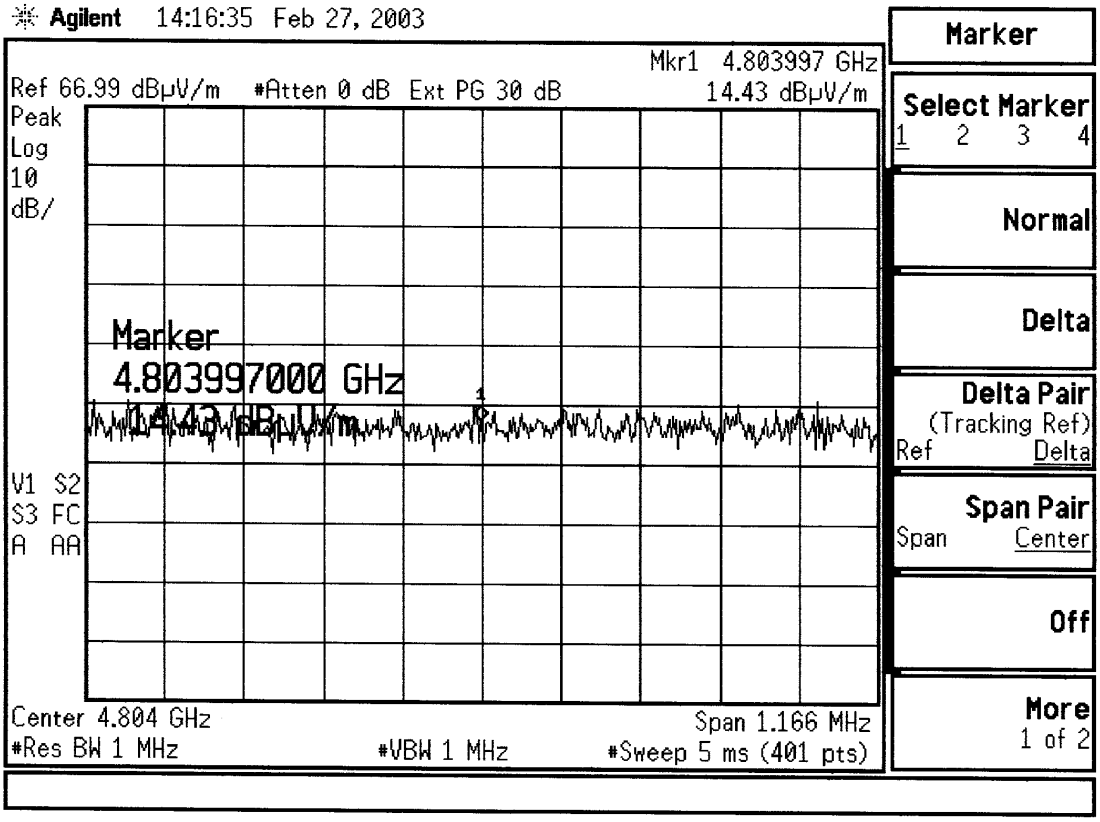
N/A means the emission value the same as the background noise.

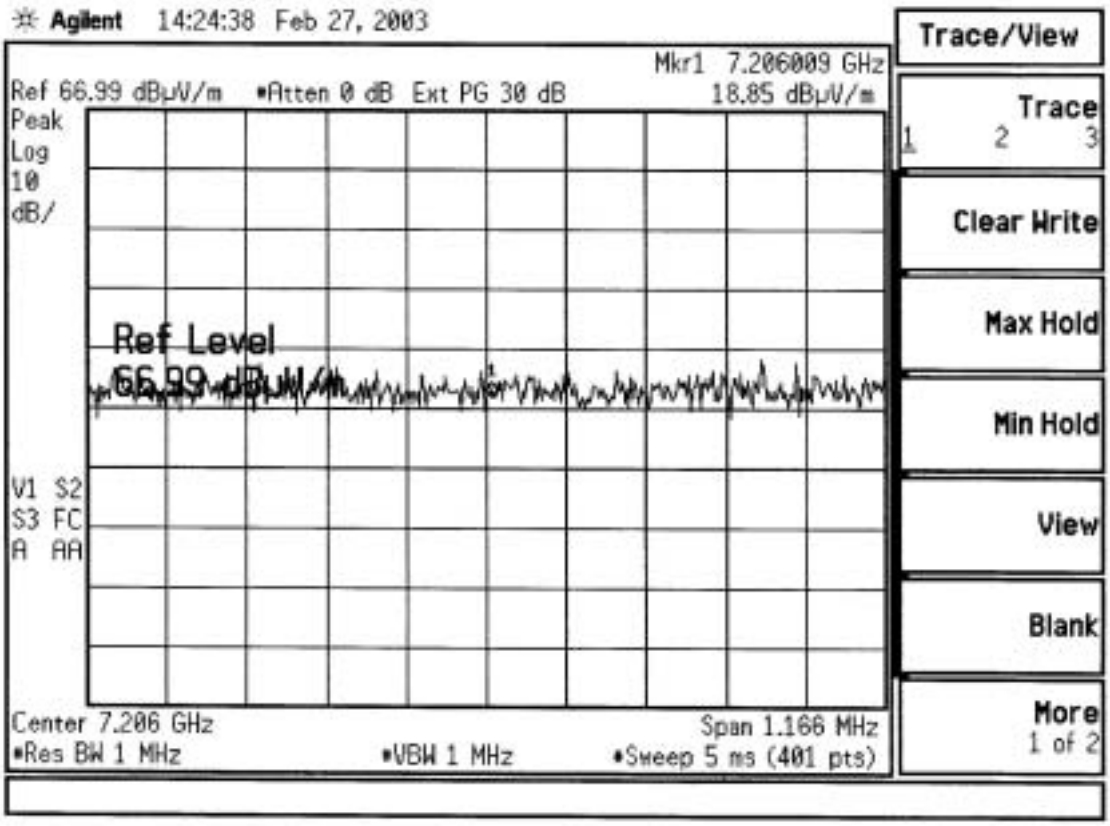
EUT operating at highest frequency

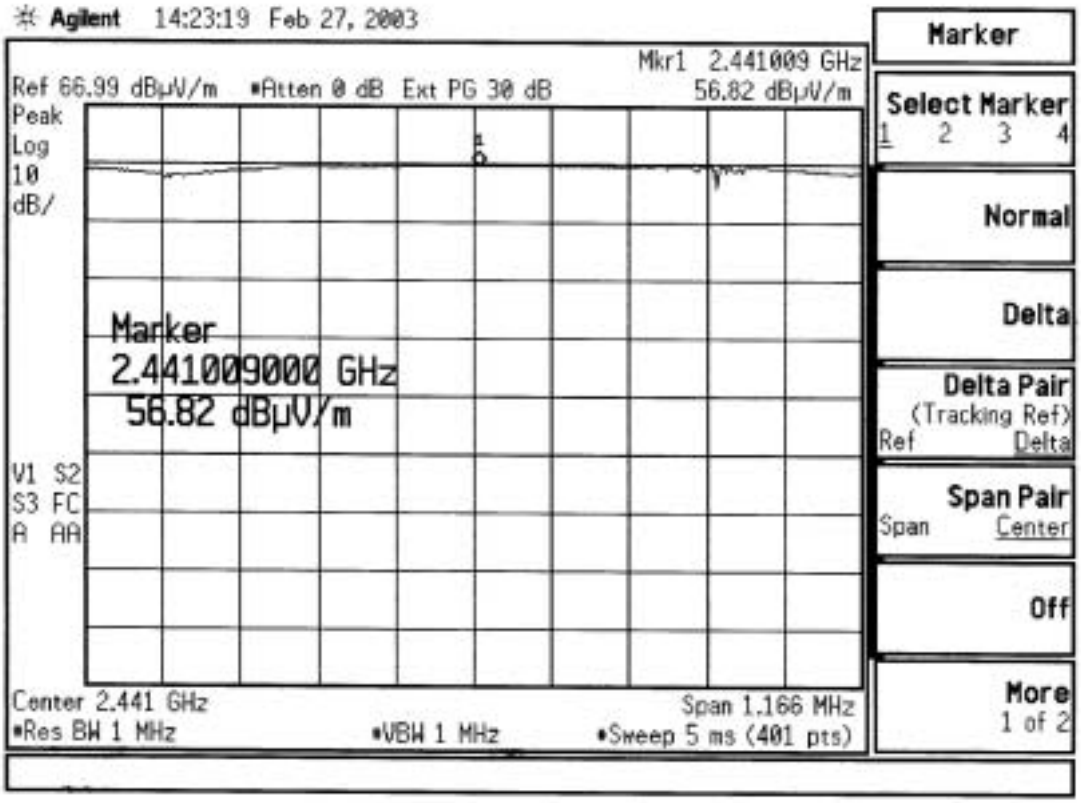
Frequency(MHz)	Read value(dBuV/m)	Antenna factor	Cable loss(db)	Real Value(dbuV/m)	Limit(dbuV/m)
2.480.009	54.88	27.58	3.96	86.42	In band
4956.009	14.62	31.45	3.98	50.05	54
7440.017	N/A	31.95	4.03	N/A	54

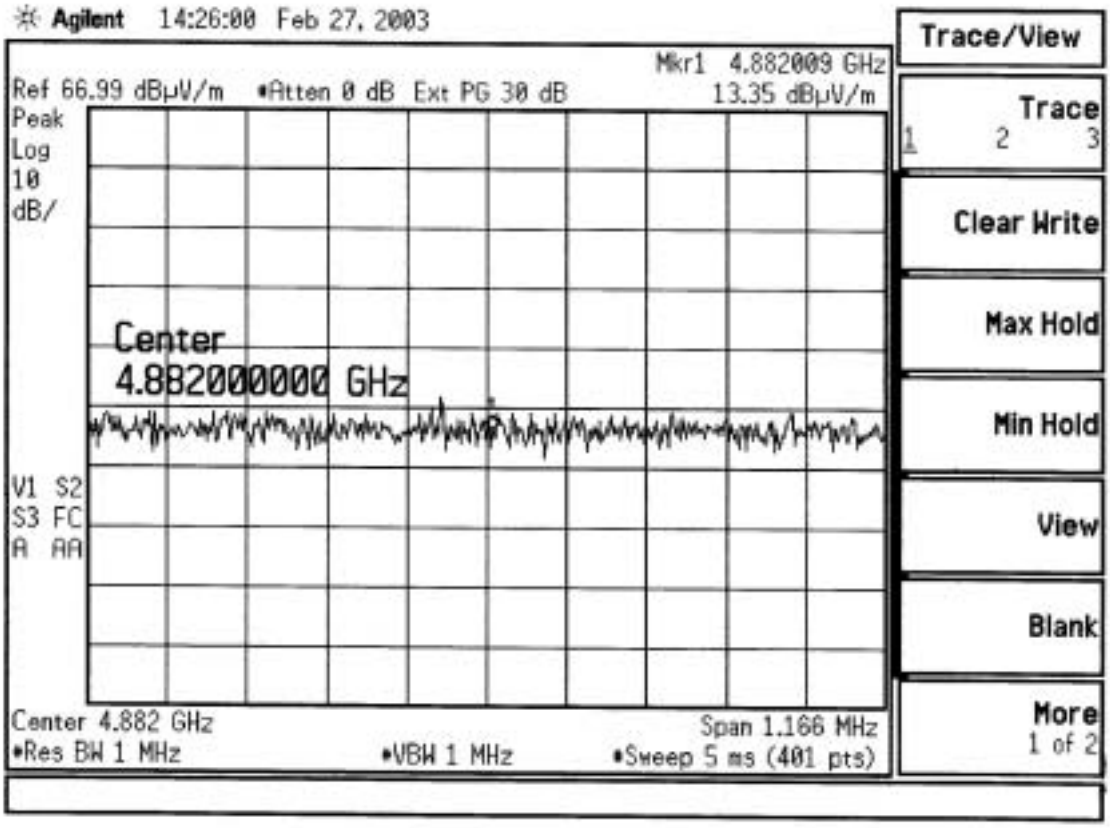
N/A means the emission value the same as the background noise.

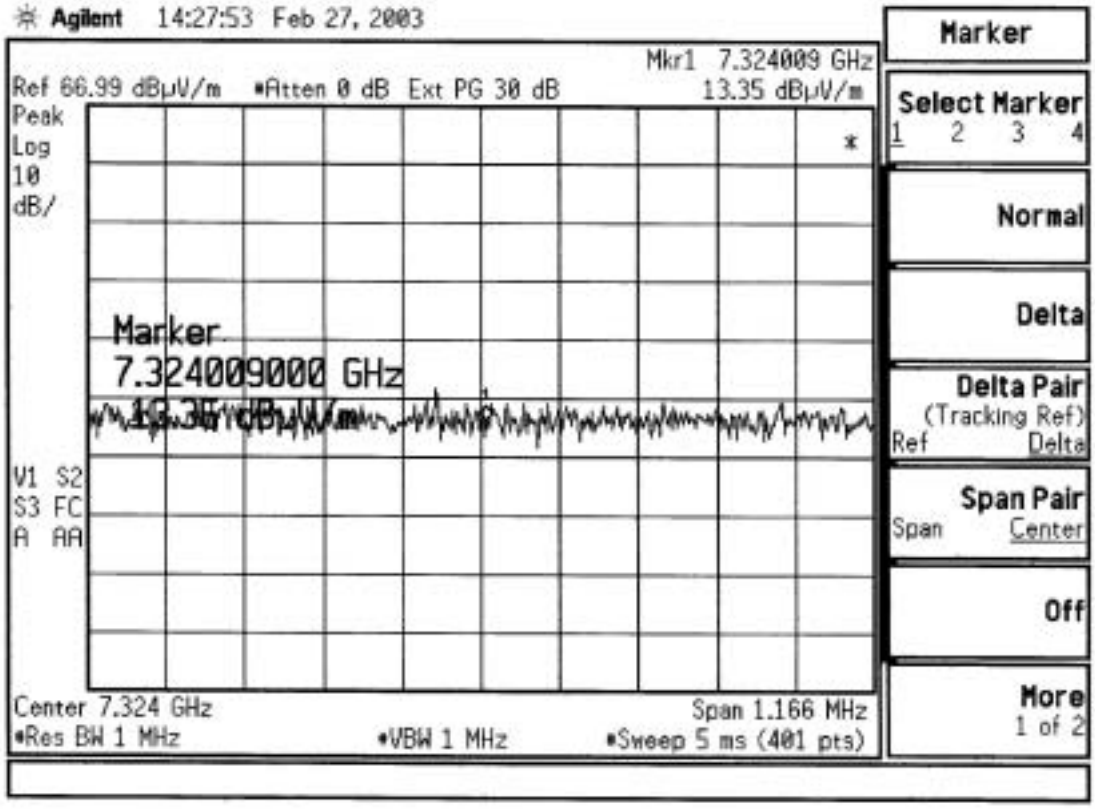

Agilent 14:19:27 Feb 27, 2003
Mkr1 2.401997 GHz
Ref 66.99 dBµV/m #Atten 0 dB Ext PG 30 dB
51.91 dBµV/m
Peak
Log
10
dB/
Marker
2.401997000 GHz
51.91 dBµV/m
M1 S2
S3 FC
A AA
Center 2.402 GHz
Span 1.166 MHz
#Res BW 1 MHz
#VBW 1 MHz
#Sweep 5 ms (401 pts)
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Delta
Span Pair
Span Center
Off
More
1 of 2

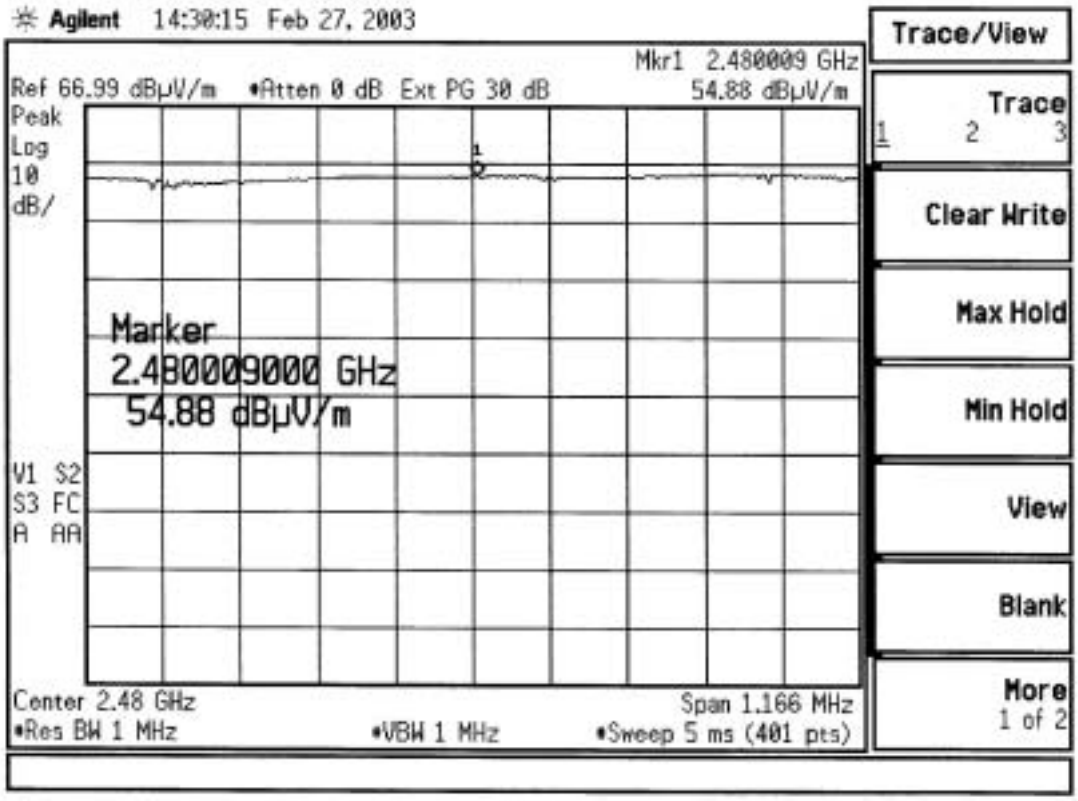

Agilent 14:16:35 Feb 27, 2003
Mkr1 4.803997 GHz
Ref 66.99 dBµV/m #Atten 0 dB Ext PG 30 dB
14.43 dBµV/m
Peak
Log
10
dB/
Marker
4.803997000 GHz
14.43 dBµV/m
V1 S2
S3 FC
A AA
Center 4.804 GHz
Span 1.166 MHz
#Res BW 1 MHz
#VBW 1 MHz
#Sweep 5 ms (401 pts)
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Delta
Span Pair
Span Center
Off
More
1 of 2

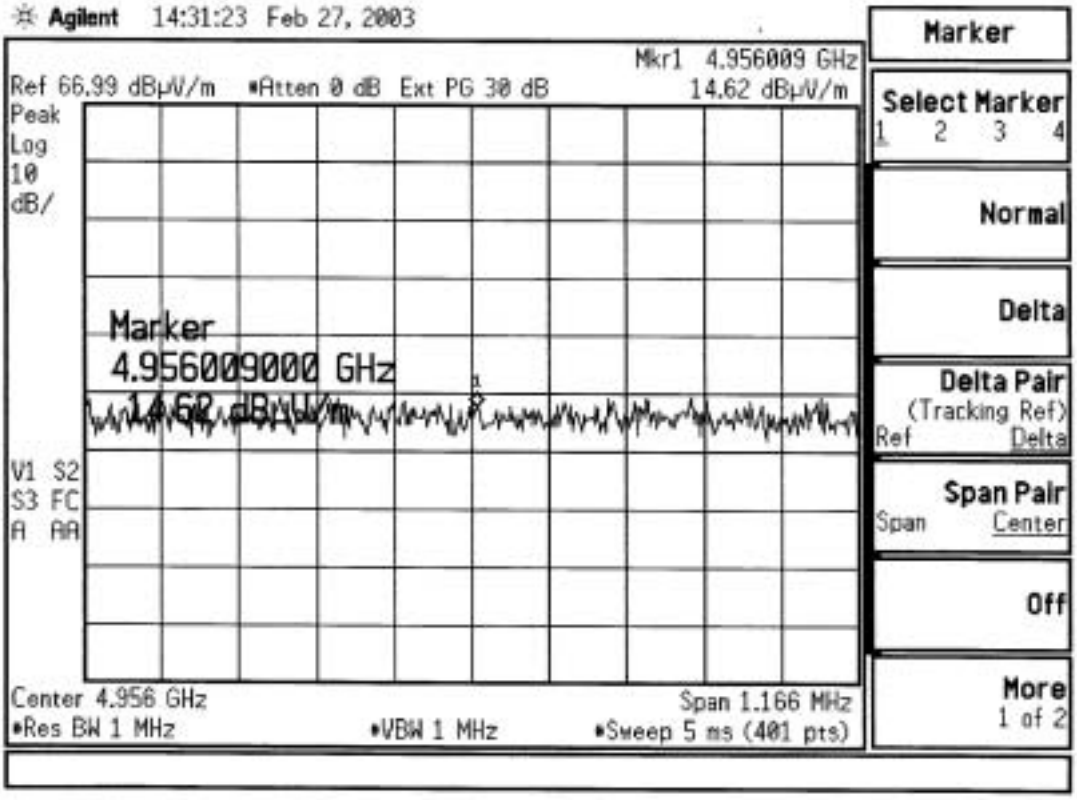

Agilent 14:24:38 Feb 27, 2003
Mkr1 7.206009 GHz
Ref 66.99 dBµV/m •Atten 0 dB Ext PG 30 dB
18.85 dBµV/m
Peak
Log
10
dB/
Ref Level
66.99 dBµV/m
V1 S2
S3 FC
A AA
Center 7.206 GHz
Span 1.166 MHz
•Res BW 1 MHz
•VBW 1 MHz
•Sweep 5 ms (401 pts)
Trace/View
Trace
1 2 3
Clear Write
Max Hold
Min Hold
View
Blank
More
1 of 2

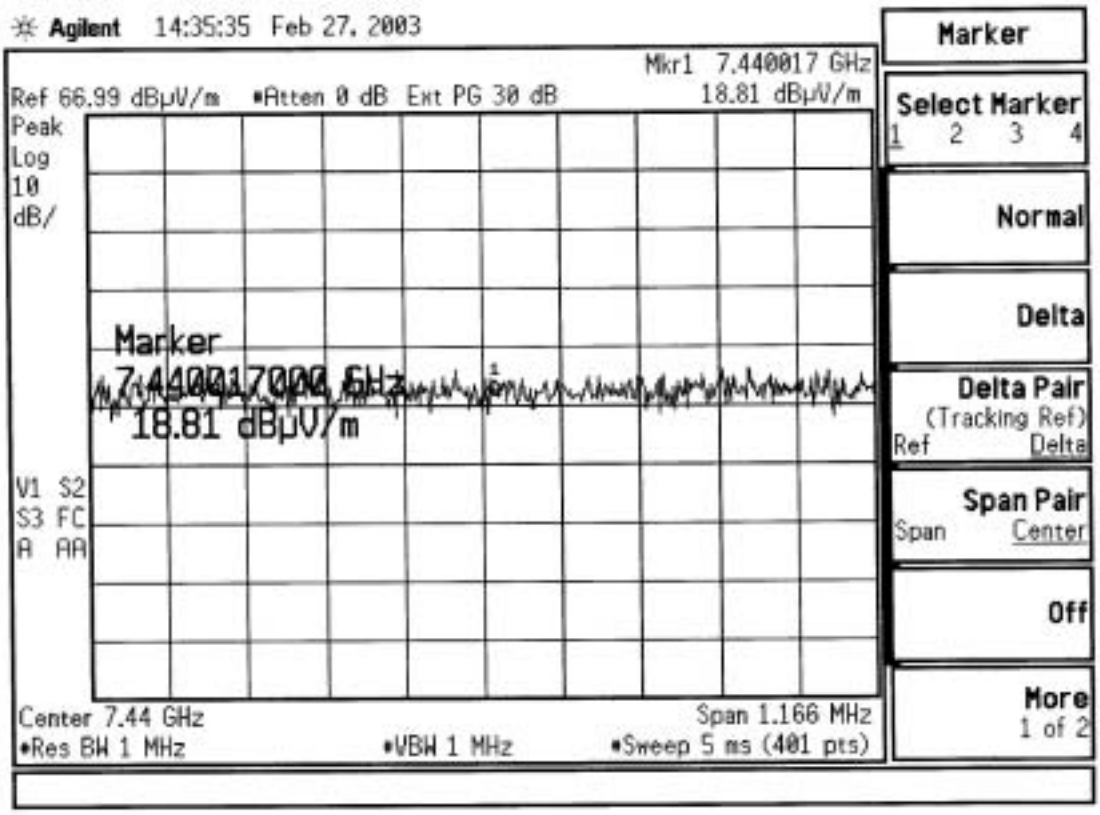

Agilent 14:23:19 Feb 27, 2003
Mkr1 2.441009 GHz
Ref 66.99 dBµV/m •Atten 0 dB Ext PG 30 dB
56.82 dBµV/m
Peak
Log
10
dB/
Marker
2.441009000 GHz
56.82 dBµV/m
V1 S2
S3 FC
A AA
Center 2.441 GHz
Span 1.166 MHz
•Res BW 1 MHz
•VBW 1 MHz
•Sweep 5 ms (401 pts)
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Delta
Span Pair
Span Center
Off
More
1 of 2


Agilent 14:26:00 Feb 27, 2003
Mkr1 4.882009 GHz
Ref 66.99 dBµV/m •Atten 0 dB Ext PG 30 dB
13.35 dBµV/m
Peak
Log
10
dB/
Center
4.882000000 GHz
V1 S2
S3 FC
A AA
Center 4.882 GHz
•Res BW 1 MHz
•VBW 1 MHz
Span 1.166 MHz
•Sweep 5 ms (401 pts)
Trace/View
Trace
1 2 3
Clear Write
Max Hold
Min Hold
View
Blank
More
1 of 2


Agilent 14:27:53 Feb 27, 2003
Mkr1 7.324009 GHz
Ref 66.99 dBµV/m •Atten 0 dB Ext PG 30 dB
13.35 dBµV/m
Peak
Log
10
dB/
Marker
7.324009000 GHz
V1 S2
S3 FC
A AA
Center 7.324 GHz
•Res BW 1 MHz
•VBW 1 MHz
Span 1.166 MHz
•Sweep 5 ms (401 pts)
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 14:30:15 Feb 27, 2003
Mkr1 2.480009 GHz
Ref 66.99 dBµV/m •Atten 0 dB Ext PG 30 dB
54.88 dBµV/m
Peak
Log
10
dB/
Marker
2.480009000 GHz
54.88 dBµV/m
V1 S2
S3 FC
A AA
Center 2.48 GHz
Span 1.166 MHz
•Res BW 1 MHz
•VBW 1 MHz
•Sweep 5 ms (401 pts)
Trace/View
Trace
1 2 3
Clear Write
Max Hold
Min Hold
View
Blank
More
1 of 2


Agilent 14:31:23 Feb 27, 2003
Mkr1 4.956009 GHz
Ref 66.99 dBµV/m •Atten 0 dB Ext PG 30 dB
14.62 dBµV/m
Peak
Log
10
dB/
Marker
4.956009000 GHz
14.62 dBµV/m
V1 S2
S3 FC
A AA
Center 4.956 GHz
Span 1.166 MHz
•Res BW 1 MHz
•VBW 1 MHz
•Sweep 5 ms (401 pts)
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 14:35:35 Feb 27, 2003
Mkr1 7.440017 GHz
Ref 66.99 dBµV/m
•Atten 0 dB Ext PG 30 dB
18.81 dBµV/m
Peak
Log
10
dB/
Marker
7.440017000 GHz
18.81 dBµV/m
V1 S2
S3 FC
A AA
Center 7.44 GHz
•Res BW 1 MHz
•VBW 1 MHz
Span 1.166 MHz
•Sweep 5 ms (401 pts)
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>