

TEST REPORT

Equipment Under Test : Bluetooth Data Access Point
Model No. : DBT-900AP

Applicant : D-Link Corp.
Address of Applicant : 2F, No. 233-2, Pao-Chiao Rd., Hsin-Tien, 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 Hsieh **Date** : Sep. 27, 2003

Approved by : Robert Chang **Date** : Oct. 15, 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
1.5 Testing Method.....	4
1.6 Antenna Type.....	5

2. Summary of Results..... 6

3. Instruments List..... 7

4. Measurements..... 8

4.1 Conducted Emission Limits.....	8
4.2 Radiated emission Limits, general requirement.....	11
4.3 Channel Spacing.....	18
4.4 20db bandwidth / No. of channels.....	19
4.5 Average time of Occupancy.....	24
4.6 Peak output power.....	28
4.7 Band-edge emission.....	31
4.8 Spurious Emission under 25Ghz.....	33

APPENDIX

Photographs of Test Setup.....	45
Photographs of EUT.....	46-47

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

Applicant : D-Link Corp.
Address of Applicant : 2F, No. 233-2, Pao-Chiao Rd.,
Hsin-Tien, Taipei, Taiwan, R.O.C.

1.3 Description of EUT(s)

1	Product name	Bluetooth Data Access Point
2	Product ID	DBT-900AP
3	Supply Voltage	DC 5V by adapter
4	Antenna Gain	1.9 dBi
5	Carrier Frequency	2402MHz to 2480MHz
6	Modulation Method	GFSK,1Mbps,0.5BT Gaussian
7	Hopping	1600hops/sec, 1MHz channel space
8	Operation Temperature	-20 to +55 degree
9	Compliant	Bluetooth Specification Ver1.1
10	Antenna type	Monopole
11	Type of antenna connector	Reversed SMA type

1.4 Operation Procedure

The Bluetooth is a FHSS system, and the output power and operating frequency are NOT End-user adjustable. Applicant offer a engineering software "BlueSuite" installed on PC 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=63 (at max. power). Inside the BlueSuite software, there is a BlueTest to control EUT hopping on or off. We select "Txdata1" (which modulated by pseudo-random sequence) and assign the transmit channel(as below). When the EUT is required to transmit in hopping on mode. We select "Txdata2"

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.

1.5 Testing Method

The testing standard follows CFR 47, Part 15.247 and ANSI C63.4 1992, and measurement method according to Public Notice DA00-705 (March 2000).

The Testing procedure is as following:

- a. The EUT was plugged in power and placed on the top of a rotating table 0.8 meters above the ground at a 3m chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna.
- c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the turn table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Peak detection (PK) and Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz for Peak detection at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 300 Hz for Average detection (AV) at frequency above 1GHz.
4. During the Output power testing, the manufacturer attach a test fixture which is a short cable that replace the antenna. So we use conducted method to measure the power. Hence the EIRP is the output power plus the antenna gain in dBi. Due to cable loss, the real value will equal to measured value(show on the instrument) add cable loss.

1.6 Antenna Type

The EUT use a monopole antenna , which has a peak gain 1.9 dBi. The connector is reversed SMA type , that means the traditional SMA male connector has a hole inside , and the traditional SMA female has a pin inside. It is unique , and can not be purchased in the “radio shack”.

2.Summary of Results

subclause	Parameter to be measures	Verdict	Page
15.207	Conducted Emission Limits	<i>PASS</i>	8
15.209	Radiated emission Limits, general requirement	<i>PASS</i>	11
15.247(a)(1)	Channel Spacing	<i>PASS</i>	18
15.247(a)(1)(ii)	20db bandwidth / No. of channels	<i>PASS</i>	19
15.247(a)(1)(ii)	Average Time of Occupancy	<i>PASS</i>	24
15.247(b)(1)	Peak Output power	<i>PASS</i>	28
15.247(c)	Band-Edge Emission	<i>PASS</i>	31
15.247(c)	Spurious Emission under 25Ghz	<i>PASS</i>	33

3. Instruments List

Instrument	Model	Serial number	Calibration date
Desktop PC	HP Pavillion 723D	N/A	N/A
Spectrum Analyzer	Agilent E7405A	US40240202	Jun 02, 2003
Spectrum Analyzer	R&S FSP 40	100034	Mar. 27, 2003
Antenna	Schwarzbeck BBHA9170A	184/185	Jul. 04, 2003
Antenna	Schwarzbeck BBHA9120A	309/320	Feb 24, 2003
Antenna	Schwarzbeck VULB9163	152	Jul. 07, 2003
Signal generator	R&S SMR 40	100210	Feb. 11, 2003
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. 22, 2003
L.I.S.N	Rolf-Heine NNB-2/16Z	99012	Oct. 08, 2002

4. Measurements

4.1 Conducted Emission Limits

SUBCLAUSE 15.207

Product Name: Bluetooth Data Access Point

Test Date: Oct,15,2003

Model No.: DBT-900AP

Tester : Gallon

Test Mode: Connect LAN mode

Temperature: 26 °C

Test Result: PASS

Humidity: 57 %

Main Terminals:L

FREQ MHz	QP1 dBuV	AVG1 dBuV	Factor	QP2 dBuV	AVG2 dBuV	QP Limit	AV Limit	QP Offset	AV Offset
0.16	37.1	32.5	2.98	40.08	35.48	65.52	55.52	-25.44	-20.04
0.25	34.2	29.7	2.85	37.05	32.55	61.93	51.93	-24.88	-19.38
0.34	46.1	37.3	2.88	48.98	40.18	59.28	49.28	-10.30	-9.10
0.48	38.8	27.2	2.92	41.72	30.12	56.37	46.37	-14.65	-16.25
0.58	32.9	25.3	2.88	35.78	28.18	56.00	46.00	-20.22	-17.82
5.17	11.8	9.6	3.20	15.00	12.80	60.00	50.00	-45.00	-37.20

1." -" denotes the emission level was - 10 dB beneath the Average limit,so nothing need to re-check anymore.

2. QP1/ AVG1 value means the QP/AV reading without the factor.

3. QP2/AVG2 value means the QP/AV final reading with the factor.

Product Name: Bluetooth Data Access Point Test Date: Oct,15,2003
Model No.: DBT-900AP Tester : Gallon
Test Mode: Connect LAN mode Temperature: 26 °C
Test Result: PASS Humidity: 57 %

Main Terminals:N

FREQ MHz	QP1 dBuV	AVG1 dBuV	Factor	QP2 dBuV	AVG2 dBuV	QP Limit	AV Limit	QP Offset	AV Offset
0.2	35.2	30	2.9	38.1	32.9	63.6	53.61	-25.5	-20.71
0.28	34.10	29.40	2.82	36.92	32.22	60.91	50.91	-23.99	-18.69
0.33	41.20	33.90	2.86	44.06	36.76	59.52	49.52	-15.46	-12.76
0.36	46.10	37.30	2.92	49.02	40.22	58.81	48.81	-9.79	-8.59
0.48	38.30	27.20	2.92	41.22	30.12	56.37	46.37	-15.15	-16.25
5.17	13.20	10.20	3.20	16.40	13.40	60.00	50.00	-43.60	-36.60

1." -" denotes the emission level was - 10 dB beneath the Average limit,so nothing need to re-check anymore.

2. QP1/ AVG1 value means the QP/AV reading without the factor.

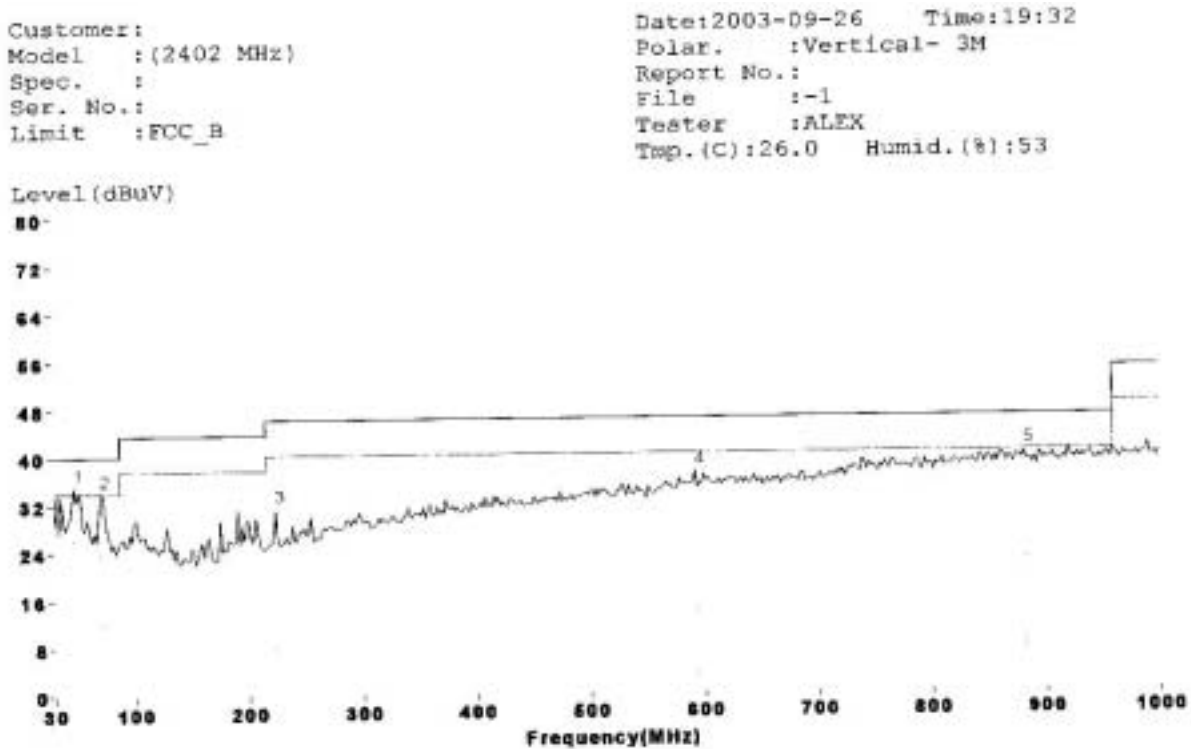
3. QP2/AVG2 value means the QP/AV final reading with the factor.

4.1.1 Limits (CISPR 22)

FREQUENCY (MHz)	Class A (dBuV)		Class B (dBuV)	
	Quasi - peak	Average	Quasi - peak	Average
0.15 - 0.5	79	66	66 - 56	56 - 46
0.50 - 5.0	73	60	56	46
5.0 - 30.0	73	60	60	50

4.2 Radiated emission Limits, general requirement SUBCLAUSE 15.209

1. Transmit at 2402Mhz, The Spectrum setting : RBW=120Khz , VBW=120Khz, **Vertical**



MEMO:

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Factor	Other Factor
	MHz	dB	dB	dB	dB	dB	dB	dB
1	47.46	35.31	-4.69	40.00	21.70	13.10	0.51	0.00
2	70.74	34.12	-5.88	40.00	25.12	8.37	0.63	0.00
3	224.00	31.32	-14.68	46.00	19.99	10.28	1.05	0.00
4	592.60	36.99	-9.01	46.00	16.10	18.82	2.07	0.00
5	881.66	39.84	-6.16	46.00	15.59	21.71	2.55	0.00

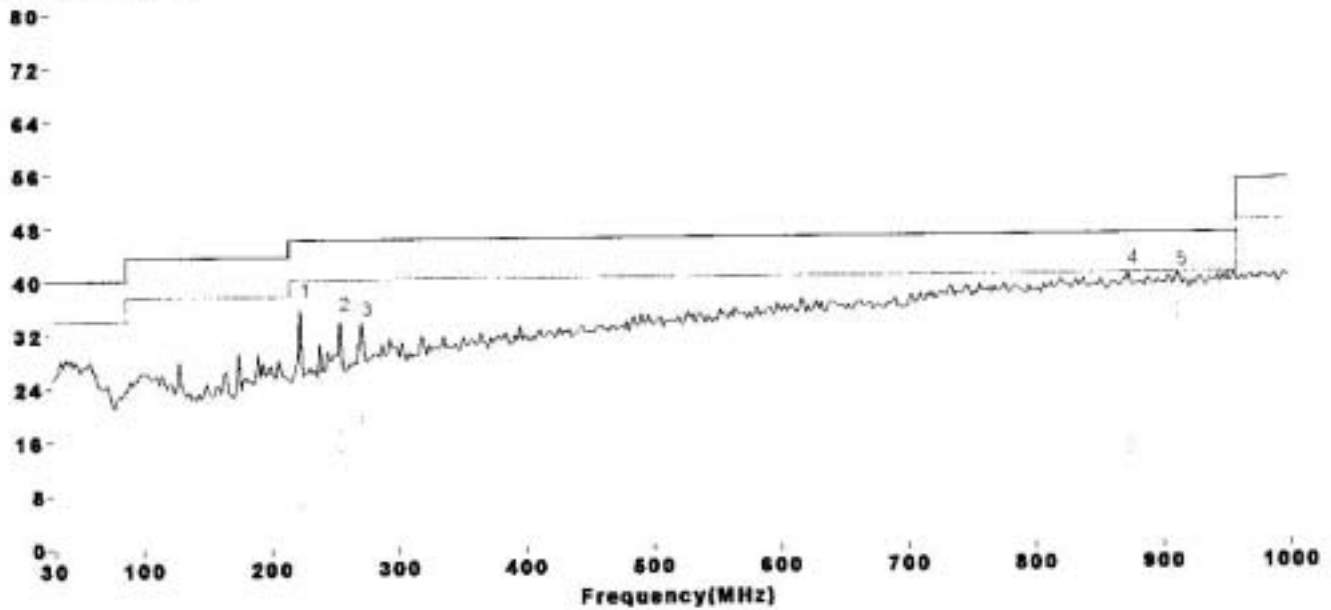
Freq	Level	Over Limit	Read Level	Antenna Factor	Cable Factor
47.46	35.31	-4.69	21.70	13.10	0.51
70.74	34.12	-5.88	25.22	8.37	0.63

2. Transmit at 2402Mhz, The Spectrum setting : RBW=120Khz , VBW=120Khz, **Horizontal**

Customer:
Model : (2402 MHz)
Spec. :
Ser. No.:
Limit : FCC_B

Date:2003-09-26 Time:19:31
Polar. :Horizontal- 3M
Report No.:
File :-1
Tester :ALEX
Tmp.(C):26.0 Humid.(%):53

Level (dBuV)



MEMO:

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Factor	Other Factor
	MHz	dB	dB	dB	dB	dB	dB	dB
1	224.00	36.51	-9.49	46.00	25.18	10.28	1.05	0.00
2	255.04	34.41	-11.59	46.00	21.89	11.40	1.13	0.00
3	272.50	33.67	-12.33	46.00	19.93	12.58	1.17	0.00
4	873.90	40.13	-5.87	46.00	15.92	21.67	2.54	0.00
5	912.70	39.85	-6.15	46.00	15.26	21.99	2.60	0.00

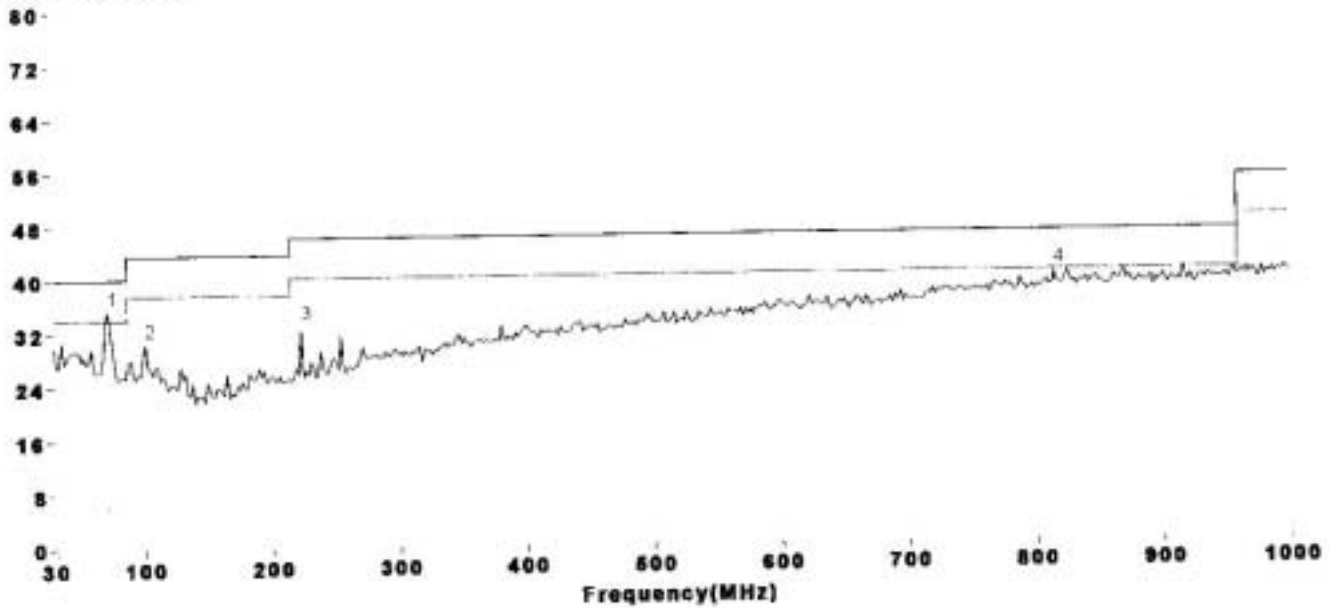
Freq	Level	Over Limit	Read Level	Antenna Factor	Cable Factor
873.90	40.13	-5.87	15.92	21.67	2.54
912.70	39.85	-6.15	15.26	21.99	2.60

3. Transmit at 2441Mhz, The Spectrum setting : RBW=120Khz , VBW=120Khz, **Vertical**

Customer:
 Model : (2441 MHz)
 Spec. :
 Ser. No.:
 Limit : FCC_B

Date:2003-09-26 Time:19:45
 Polar. :Vertical- 3M
 Report No.:
 File :-1
 Tester :ALEX
 Temp.(C):26.0 Humid.(%):53

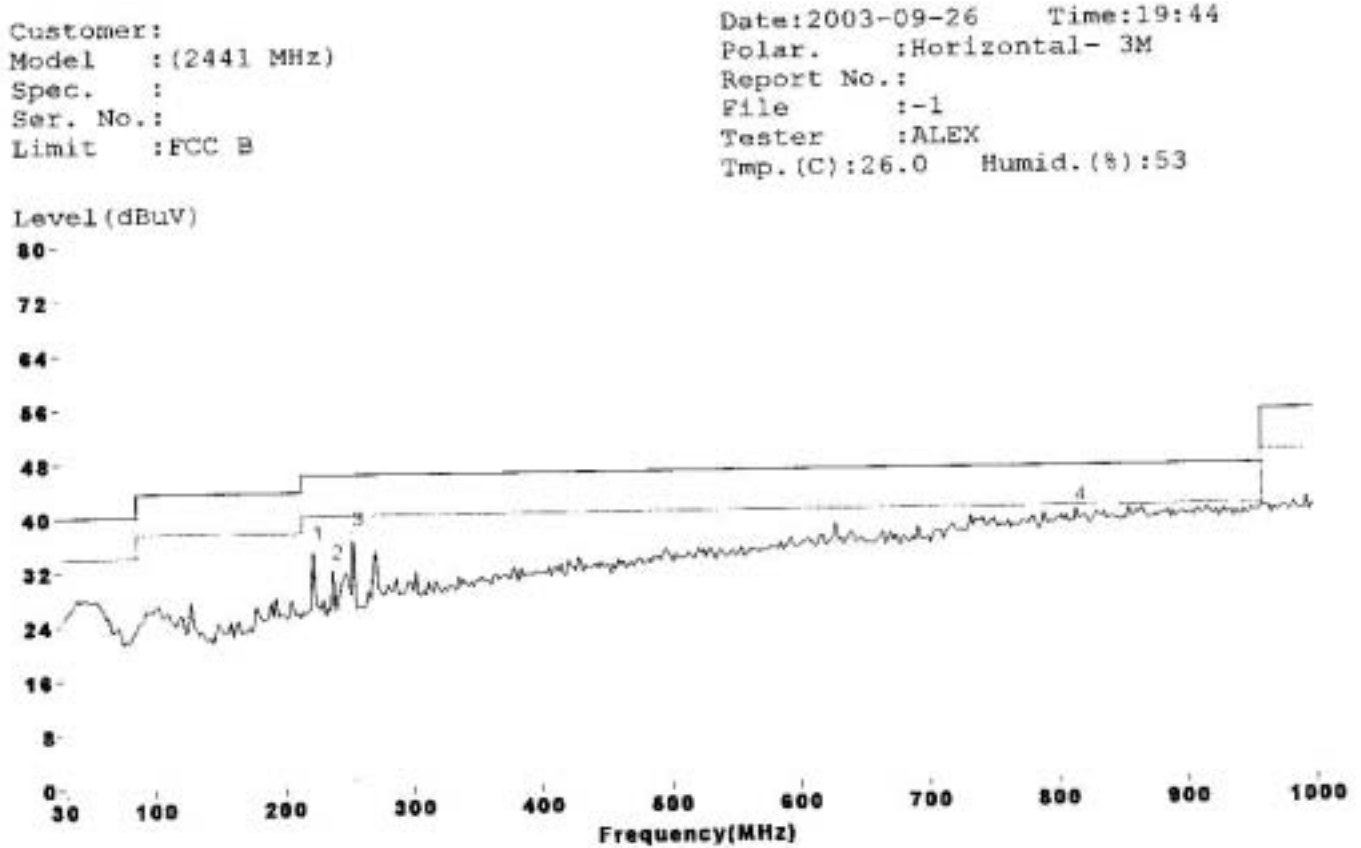
Level (dBuV)



MEMO:

		Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Factor	Other Factor
		----- MHz	----- dB	----- dB	----- dB	----- dB	----- dB	----- dB	----- dB
1	1	72.68	35.48	-4.52	40.00	26.82	8.02	0.64	0.00
	2	101.78	30.48	-13.02	43.50	18.20	11.54	0.74	0.00
	3	224.00	32.97	-13.03	46.00	21.64	10.28	1.05	0.00
	4	815.70	39.77	-6.23	46.00	16.20	21.11	2.46	0.00

Freq	Level	Over Limit	Read Level	Antenna Factor	Cable Factor
72.68	35.48	-4.52	26.82	8.02	0.64
815.70	39.77	-6.23	16.20	21.11	2.46

4. Transmit at 2441Mhz, The Spectrum setting : RBW=120Khz , VBW=120Khz, **Horizontal**

MEMO:

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Factor	Other Factor
	MHz	dB	dB	dB	dB	dB	dB	dB
1	224.00	35.50	-10.50	46.00	24.17	10.28	1.05	0.00
2	239.52	32.62	-13.38	46.00	20.56	10.97	1.09	0.00
3	255.04	37.48	-8.52	46.00	24.96	11.40	1.13	0.00
4	815.70	39.59	-6.41	46.00	16.02	21.11	2.46	0.00

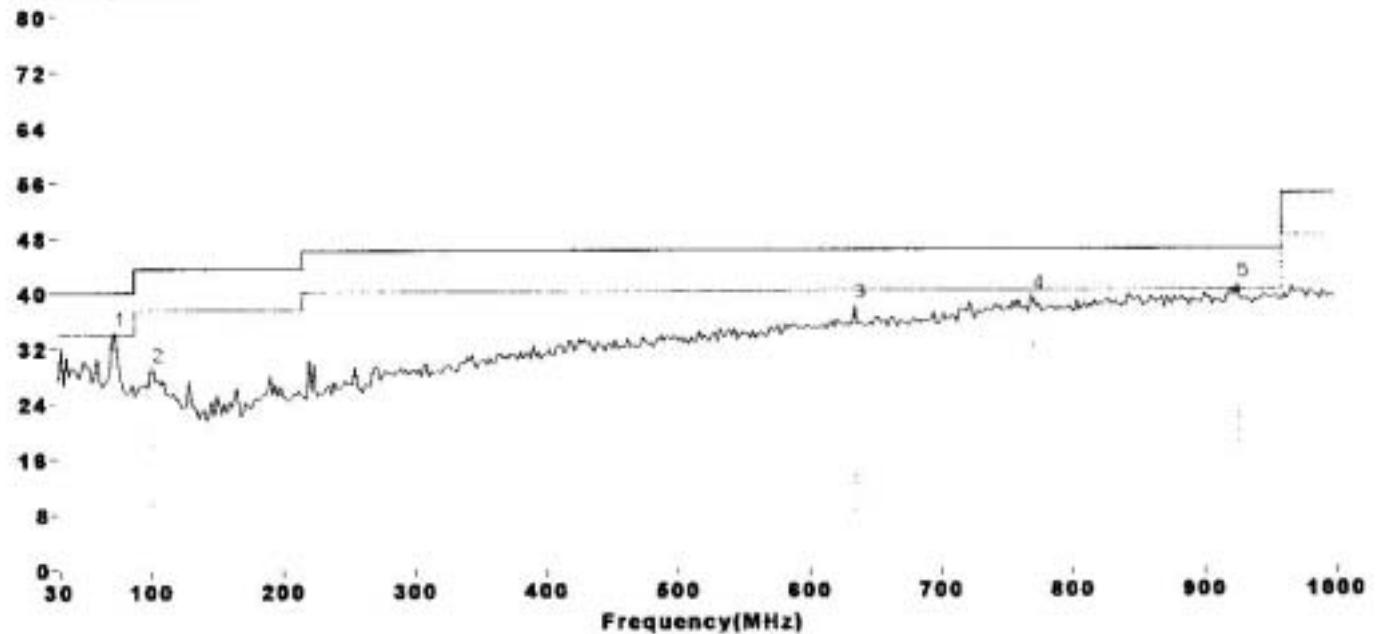
Freq	Level	Over Limit	Read Level	Antenna Factor	Cable Factor
255.04	37.48	-8.52	24.96	11.40	1.13
815.70	39.59	-6.41	16.02	21.11	2.46

5. Transmit at 2480Mhz, The Spectrum setting : RBW=120Khz , VBW=120Khz, **Vertical**

Customer:
 Model : (2480 MHz)
 Spec. :
 Ser. No.:
 Limit : FCC B

Date:2003-09-26 Time:19:59
 Polar. :Vertical- 3M
 Report No.:
 File :-1
 Tester :ALEX
 Temp.(C):26.0 Humid.(%):53

Level (dBuV)



MEMO:

		Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Factor	Other Factor
		----- MHz	----- dB	----- dB	----- dB	----- dB	----- dB	----- dB	----- dB
1	1	72.68	34.32	-5.68	40.00	25.66	8.02	0.64	0.00
	2	101.78	29.10	-14.40	43.50	16.82	11.54	0.74	0.00
	3	635.28	37.88	-8.12	46.00	16.57	19.18	2.14	0.00
	4	771.08	39.12	-6.88	46.00	15.95	20.80	2.38	0.00
1	5	926.28	40.73	-5.27	46.00	16.00	22.10	2.63	0.00

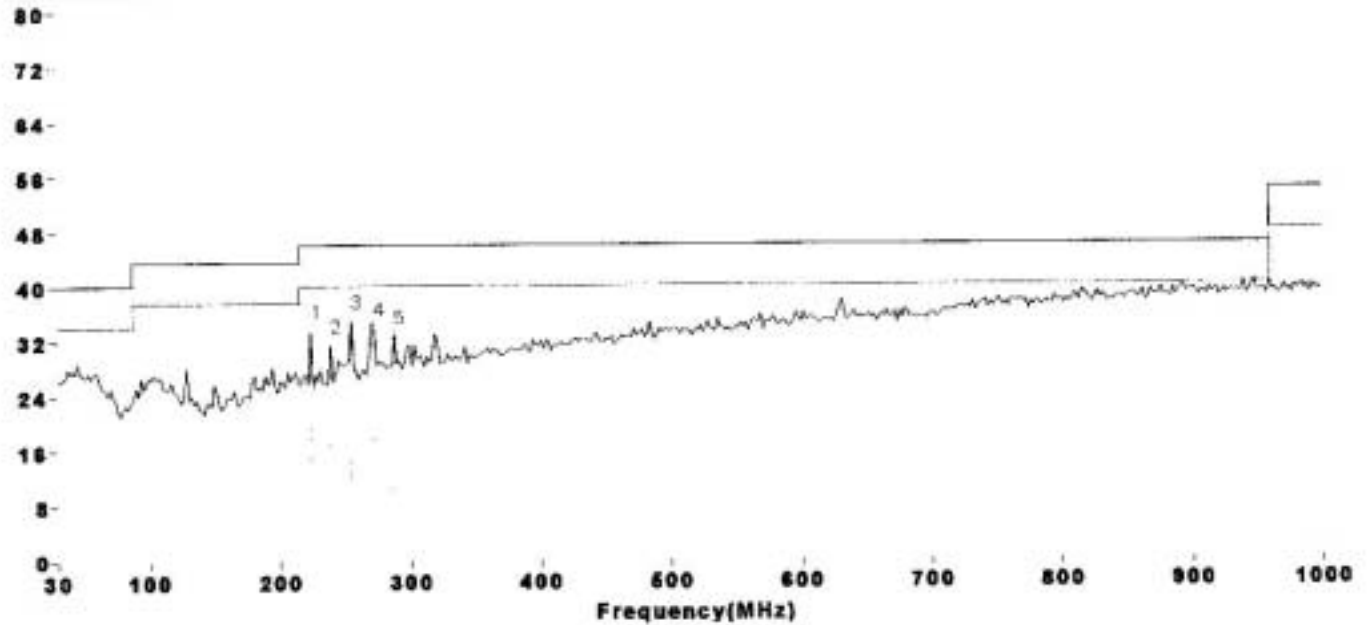
Freq	Level	Over Limit	Read Level	Antenna Factor	Cable Factor
72.68	34.32	-5.68	25.66	8.02	0.64
926.28	40.73	-5.27	16.00	22.10	2.63

6. Transmit at 2480Mhz, The Spectrum setting : RBW=120Khz , VBW=120Khz,**Horizontal**

Customer:
 Model : {2480 MHz}
 Spec. :
 Ser. No.:
 Limit : FCC_B

Date:2003-09-26 Time:19:58
 Polar. :Horizontal- 3M
 Report No.:
 File :-1
 Tester :ALEX
 Tmp. (C):26.0 Humid. (%):53

Level(dBuV)



MEMO:

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Factor	Other Factor
	MHz	dB	dB	dB	dB	dB	dB	dB
1	224.00	34.41	-11.59	46.00	23.08	10.28	1.05	0.00
2	239.52	32.08	-13.92	46.00	20.02	10.97	1.09	0.00
3	255.04	35.77	-10.23	46.00	23.24	11.40	1.13	0.00
4	272.50	34.70	-11.30	46.00	20.95	12.58	1.17	0.00
5	288.02	33.47	-12.53	46.00	18.90	13.36	1.21	0.00

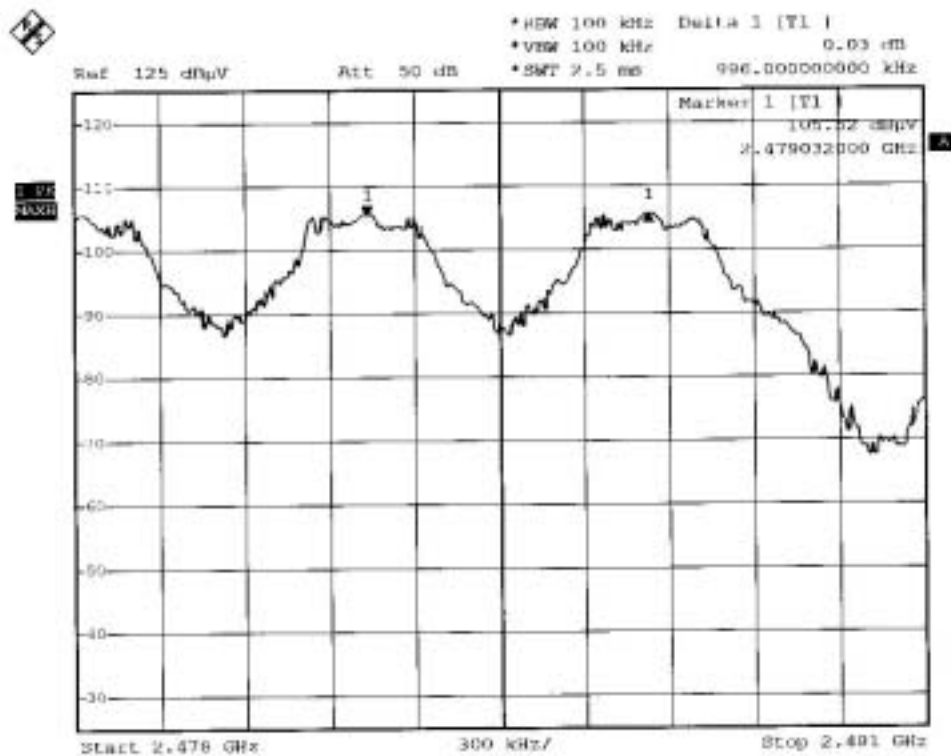
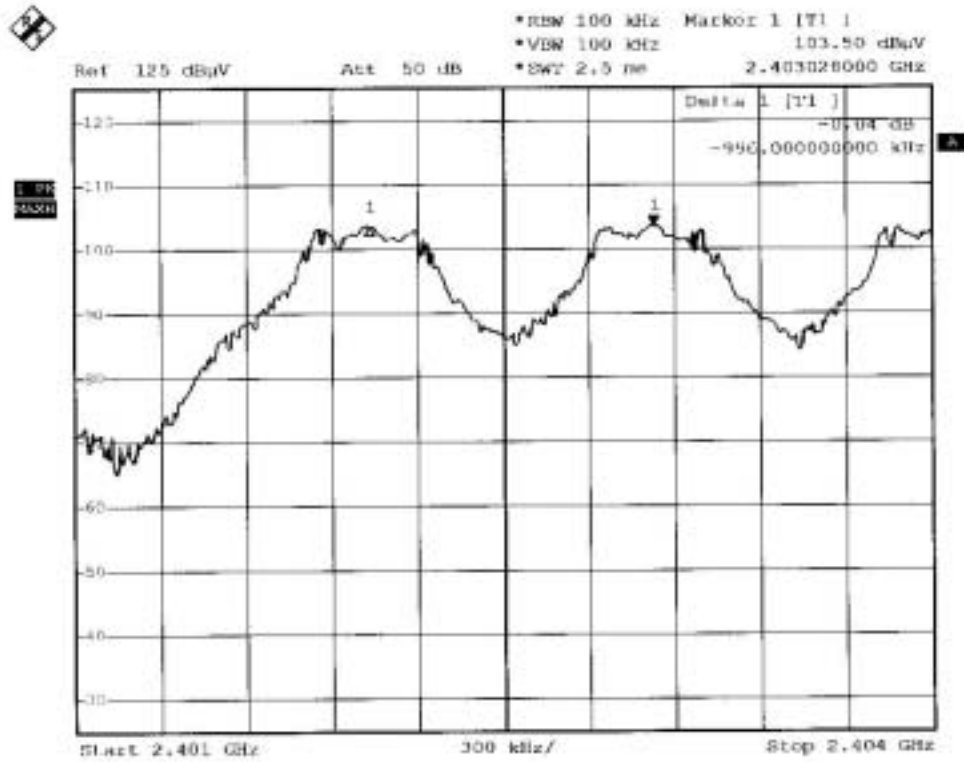
Freq	Level	Over Limit	Read Level	Antenna Factor	Cable Factor
255.04	35.77	-10.23	23.24	11.40	1.13
272.50	34.70	-11.30	20.95	12.58	1.17

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

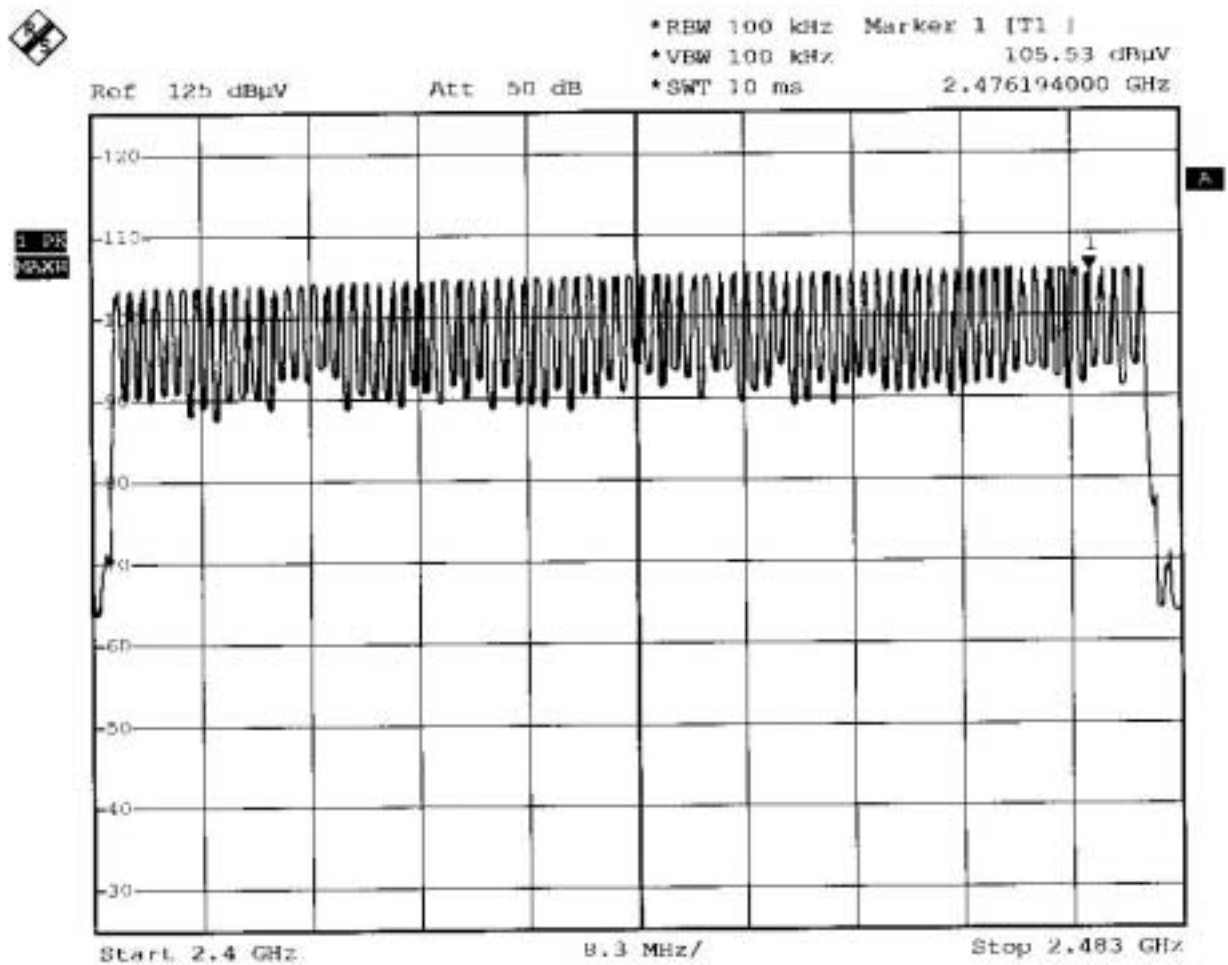
4.3 Channel Spacing

SUBCLAUSE15.247(a)(1)



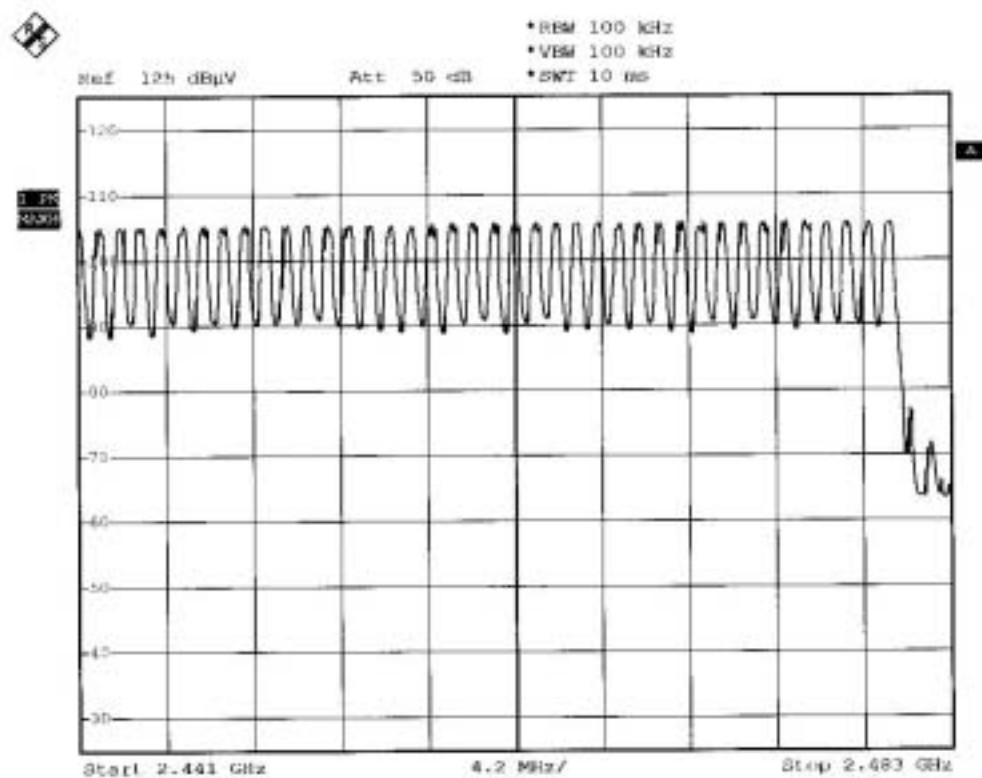
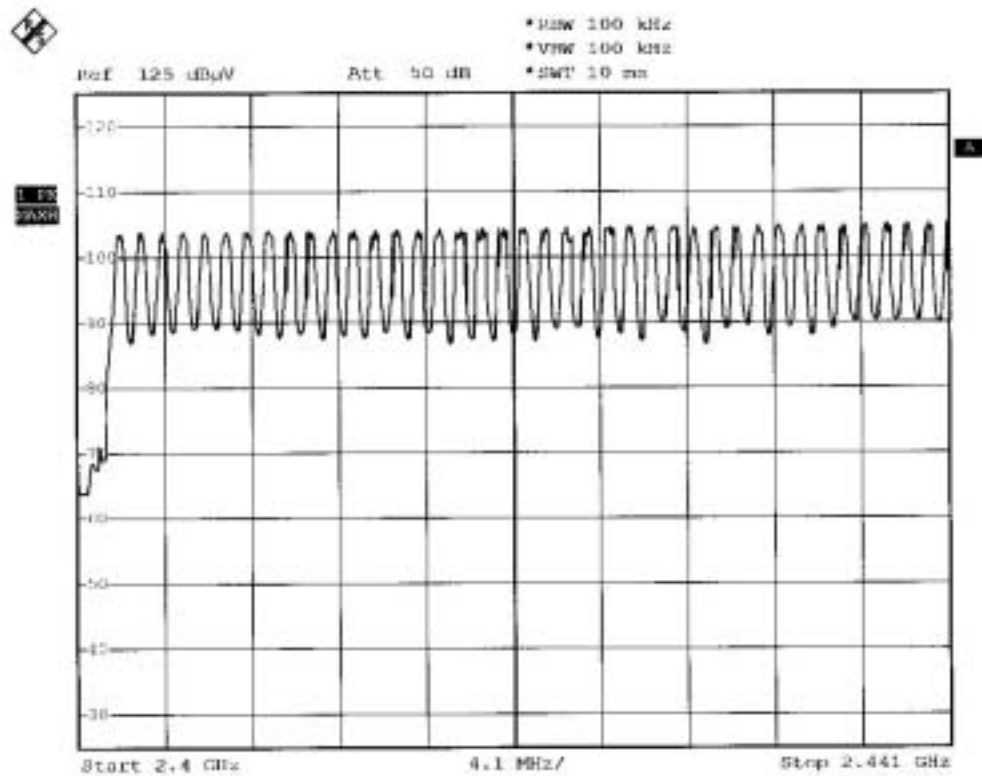
4.4 No. of carrier frequency / 20db Bandwidth

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

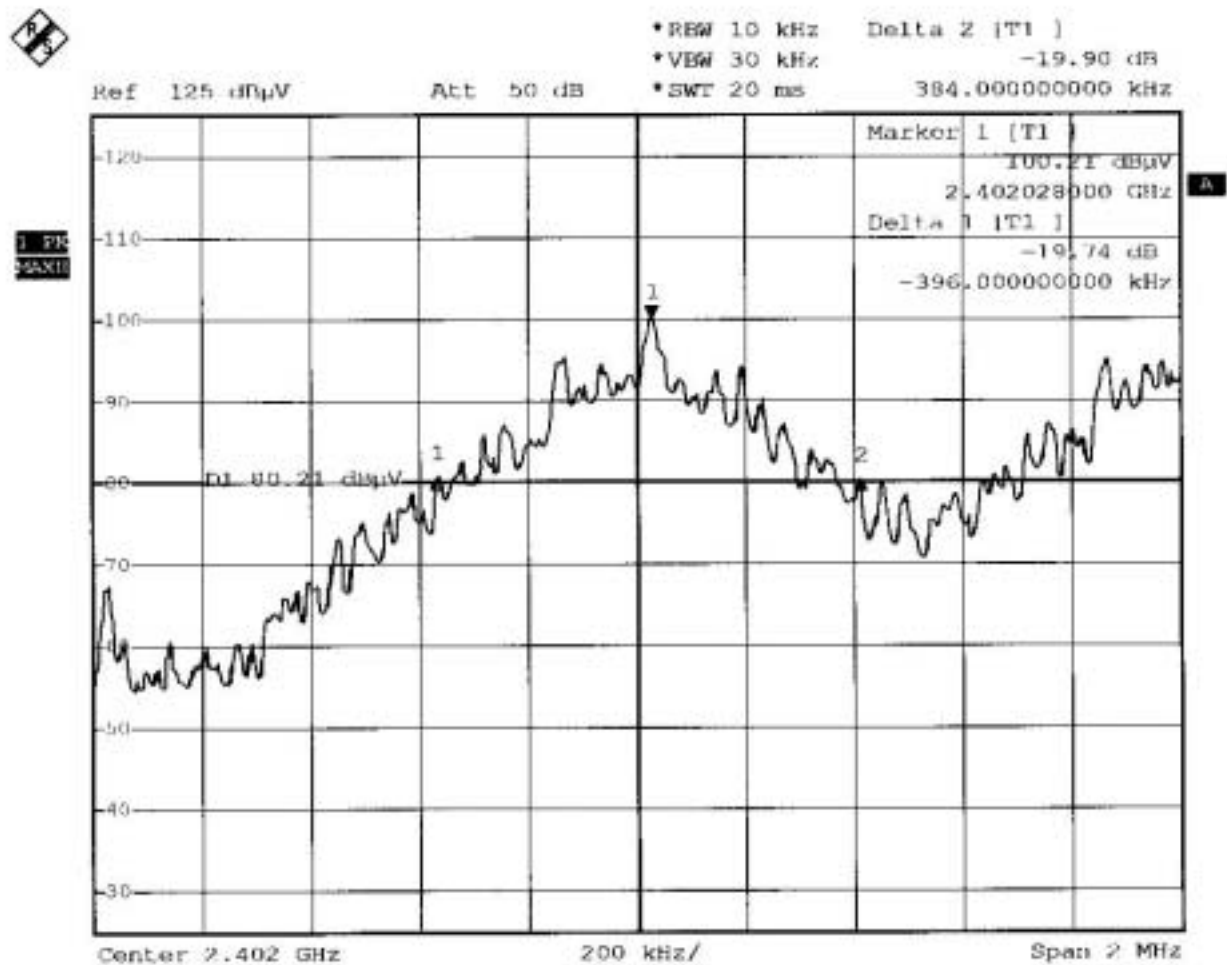


Number of channels = 79

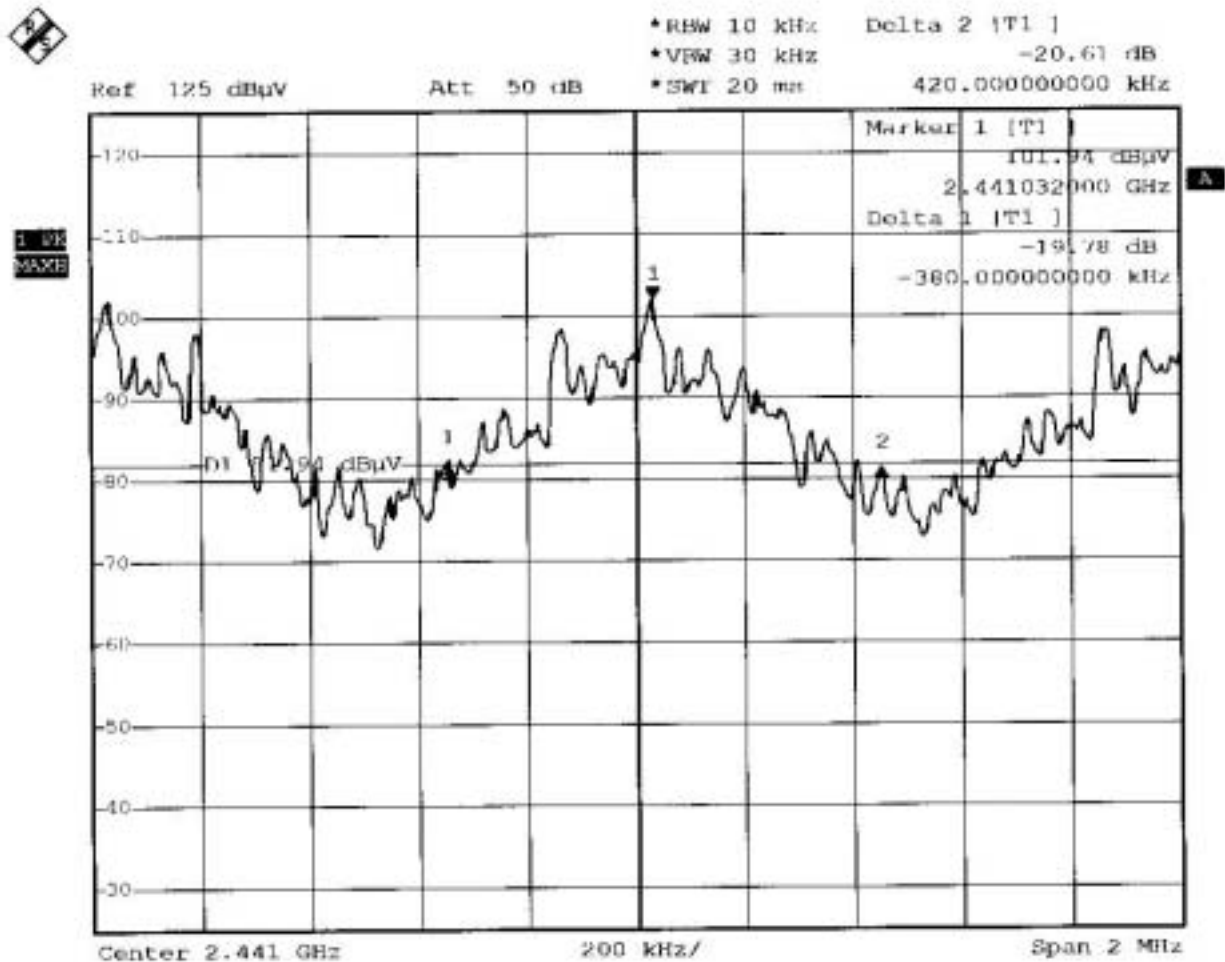
Split the whole frequency band into two.



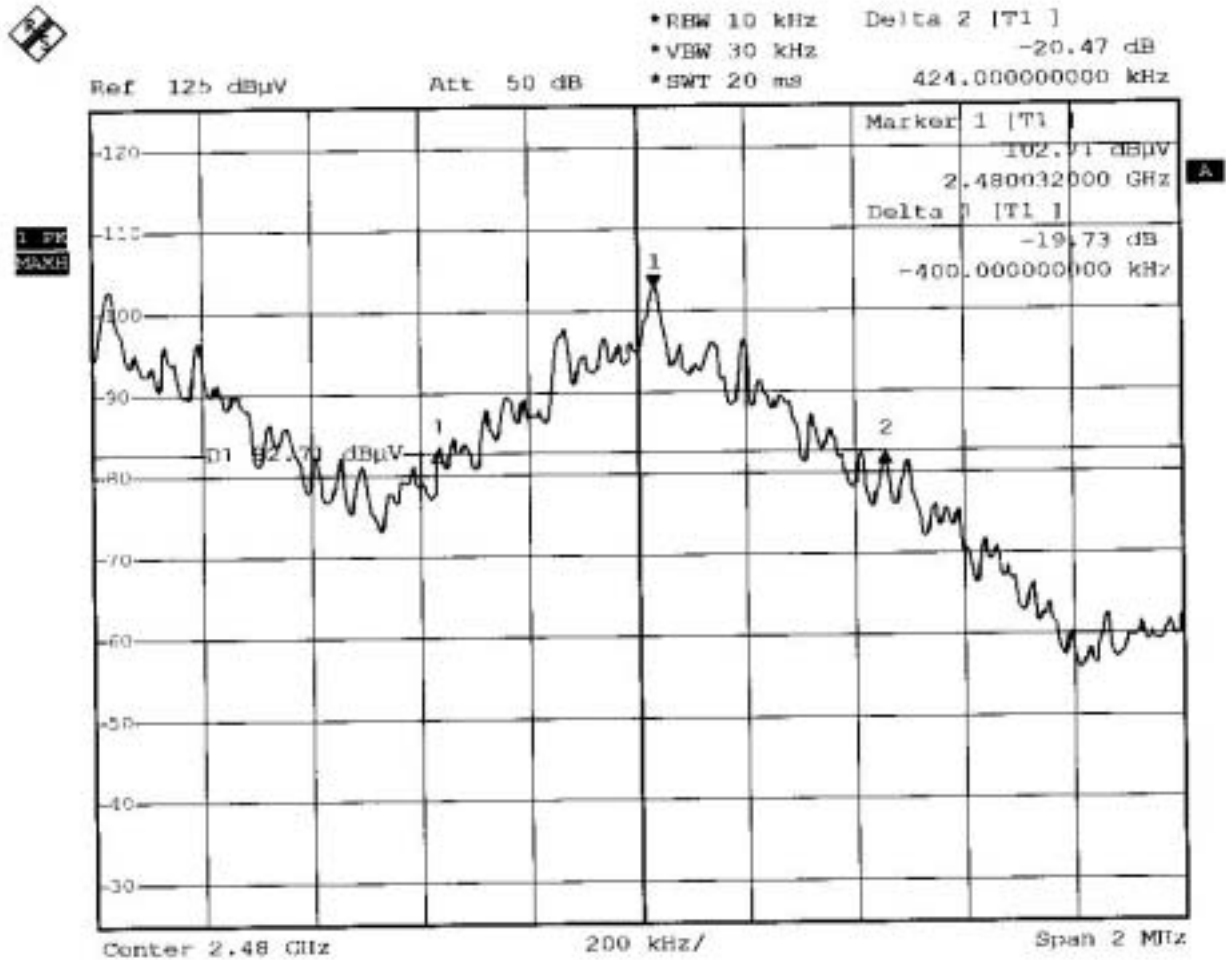
20dB bandwidth at lowest (2402Mhz), middle(2441Mhz), highest channel(2480Mhz)



Channel bandwidth = 780 KHZ



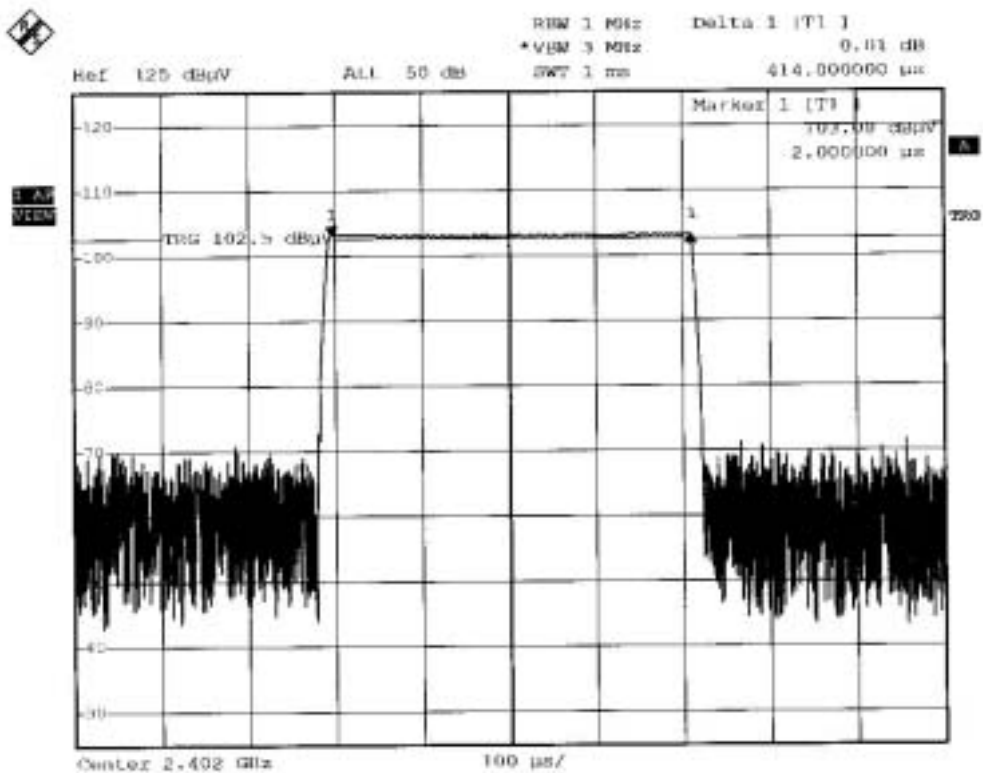
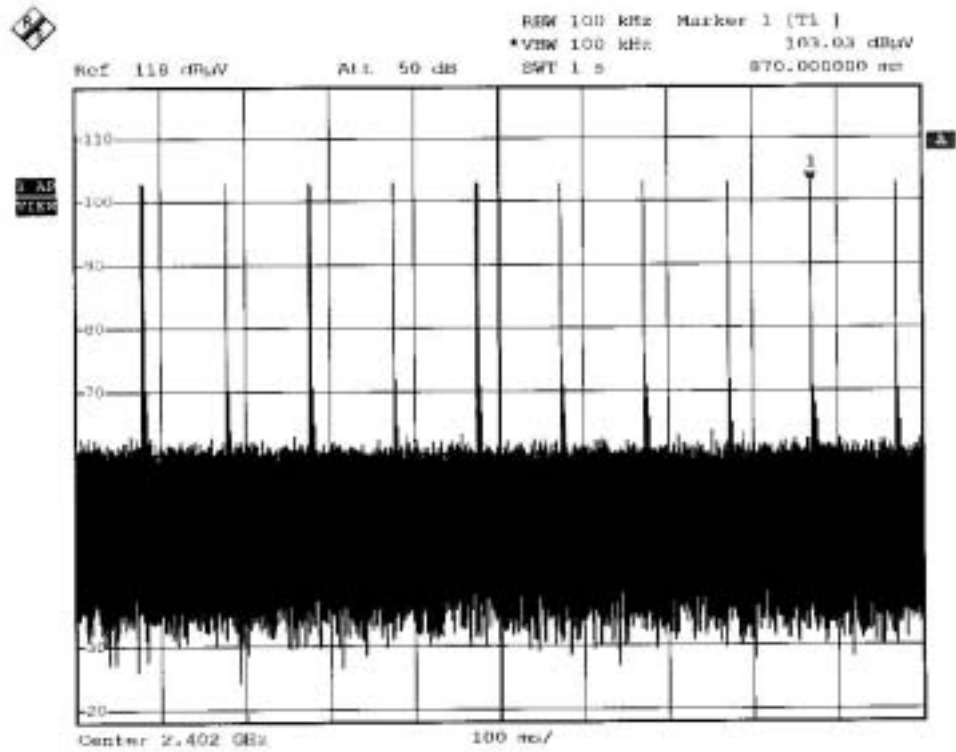
Channel bandwidth = 800 KHZ

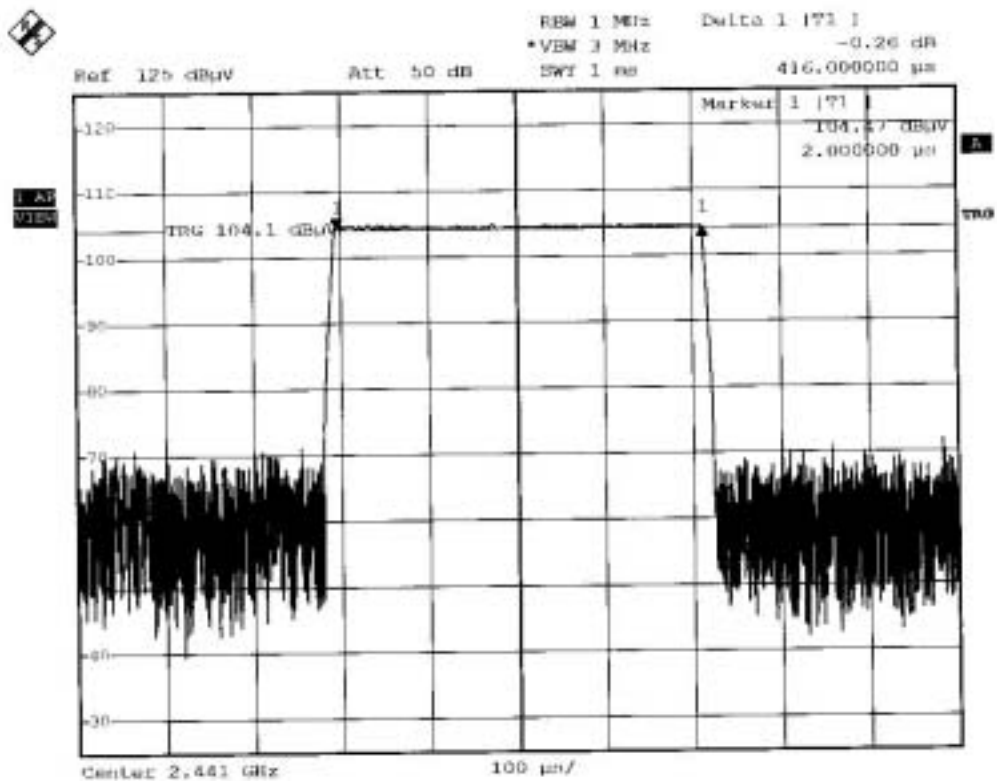
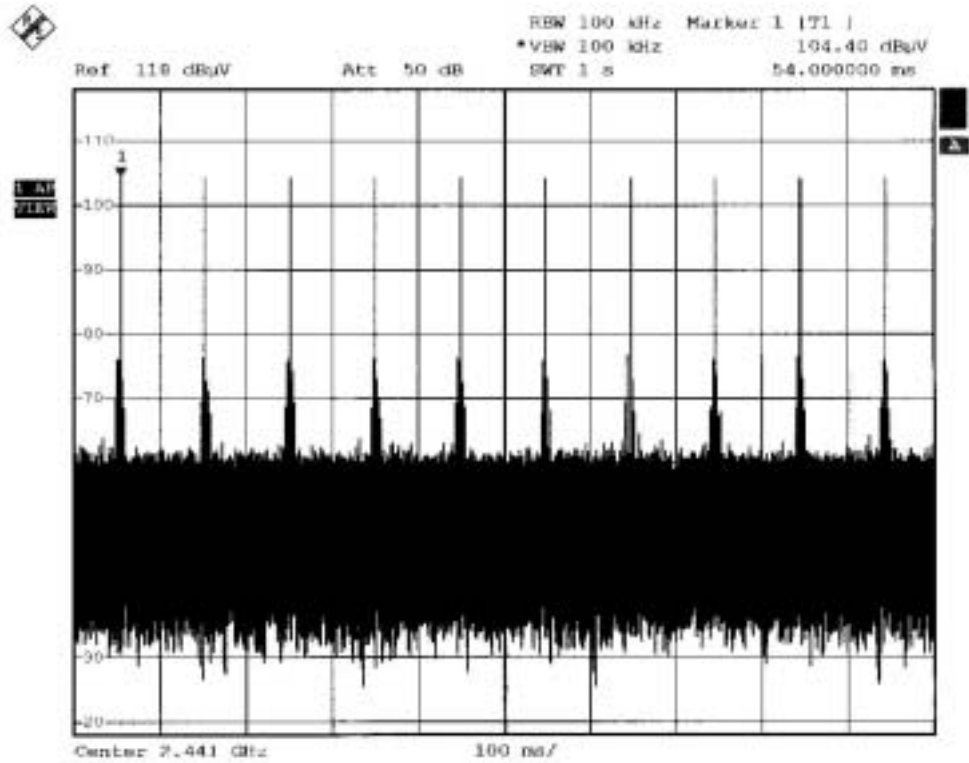


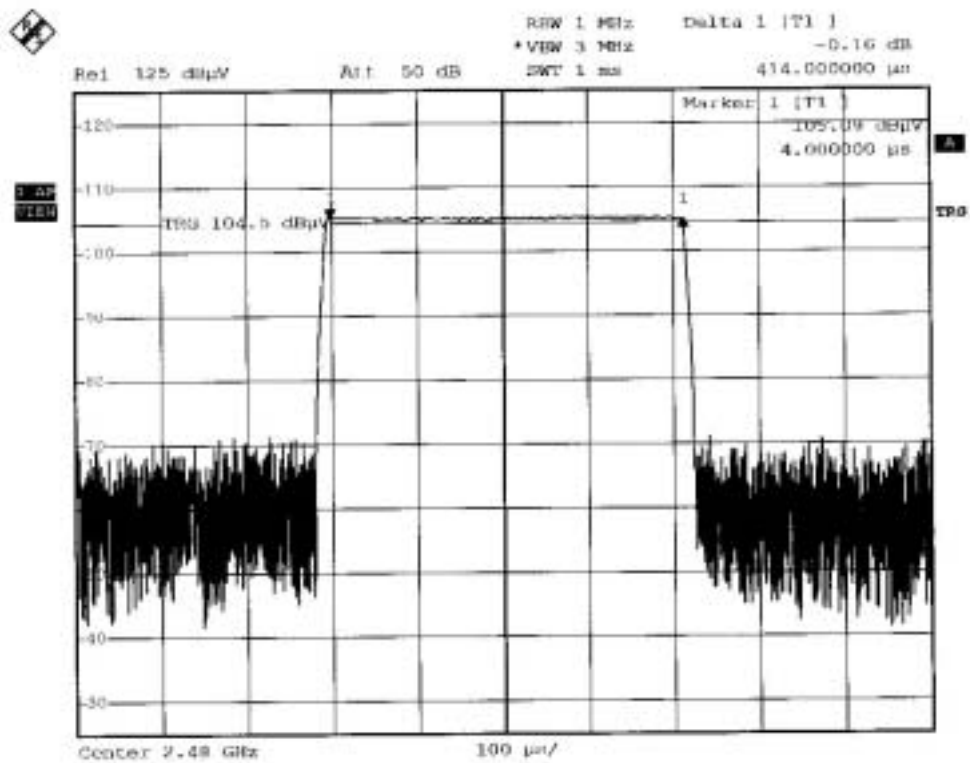
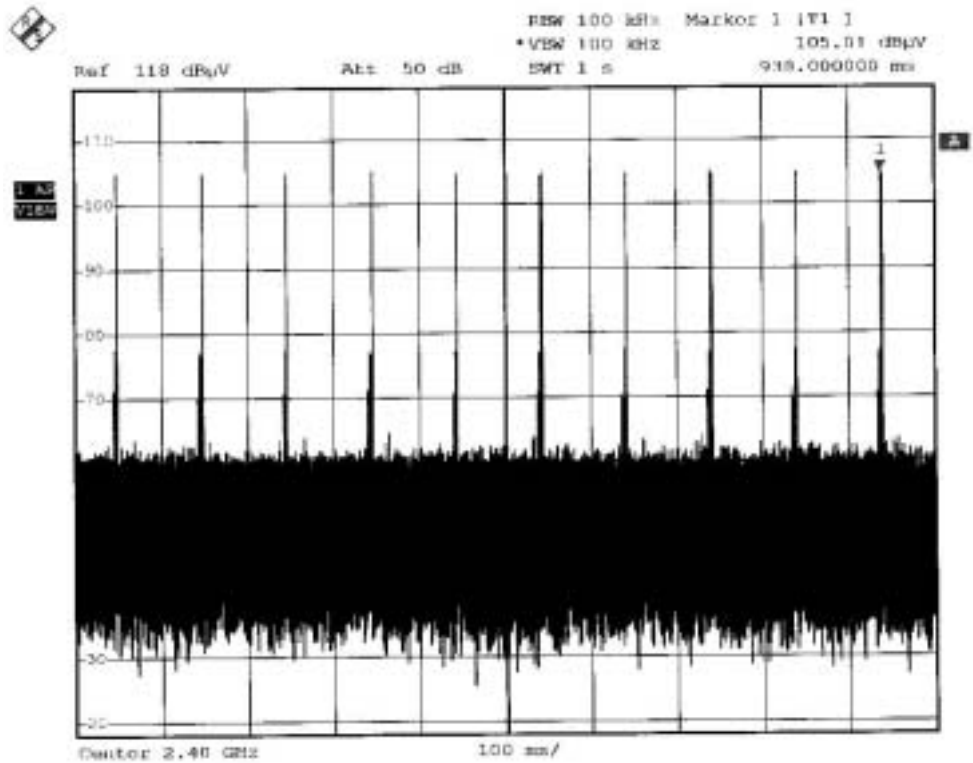
Channel bandwidth = 824 KHZ

4.5 Average Time of Occupancy

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







4.5.1 calculation

At channel 2402 (414 μ Sec), 2441(416 μ Sec)and 2480Mhz(414 μ Sec), there are 10 bursts in 1 sec. Time period of each burst is 416 μ Sec(worst case). So the occupancy time within 30 second is $416 \times 10 \times 30 = 124800 \mu \text{ Sec} = 124.8 \text{ mSec} = 0.125 \text{ Sec}$.

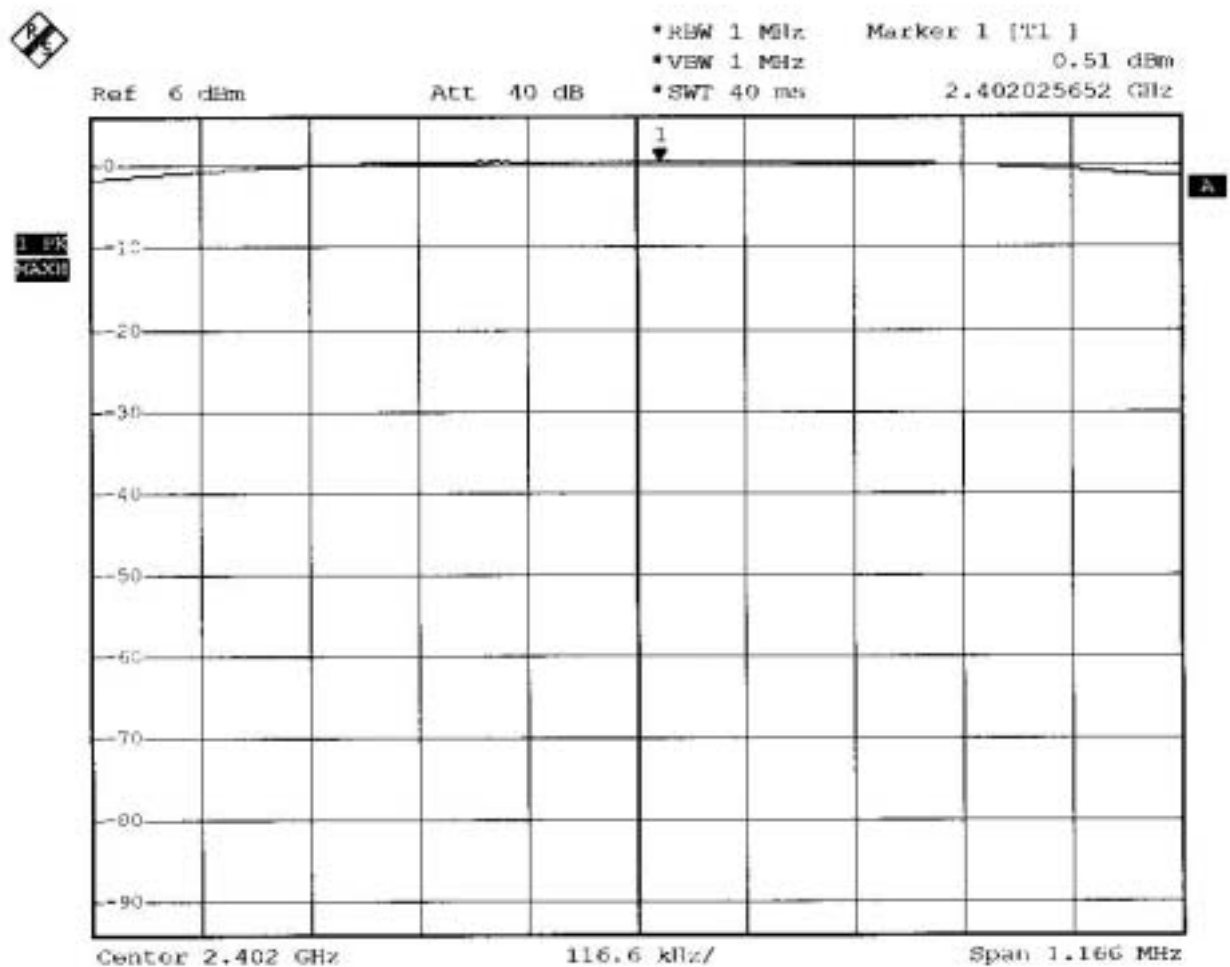
4.5.2 Limits

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)**

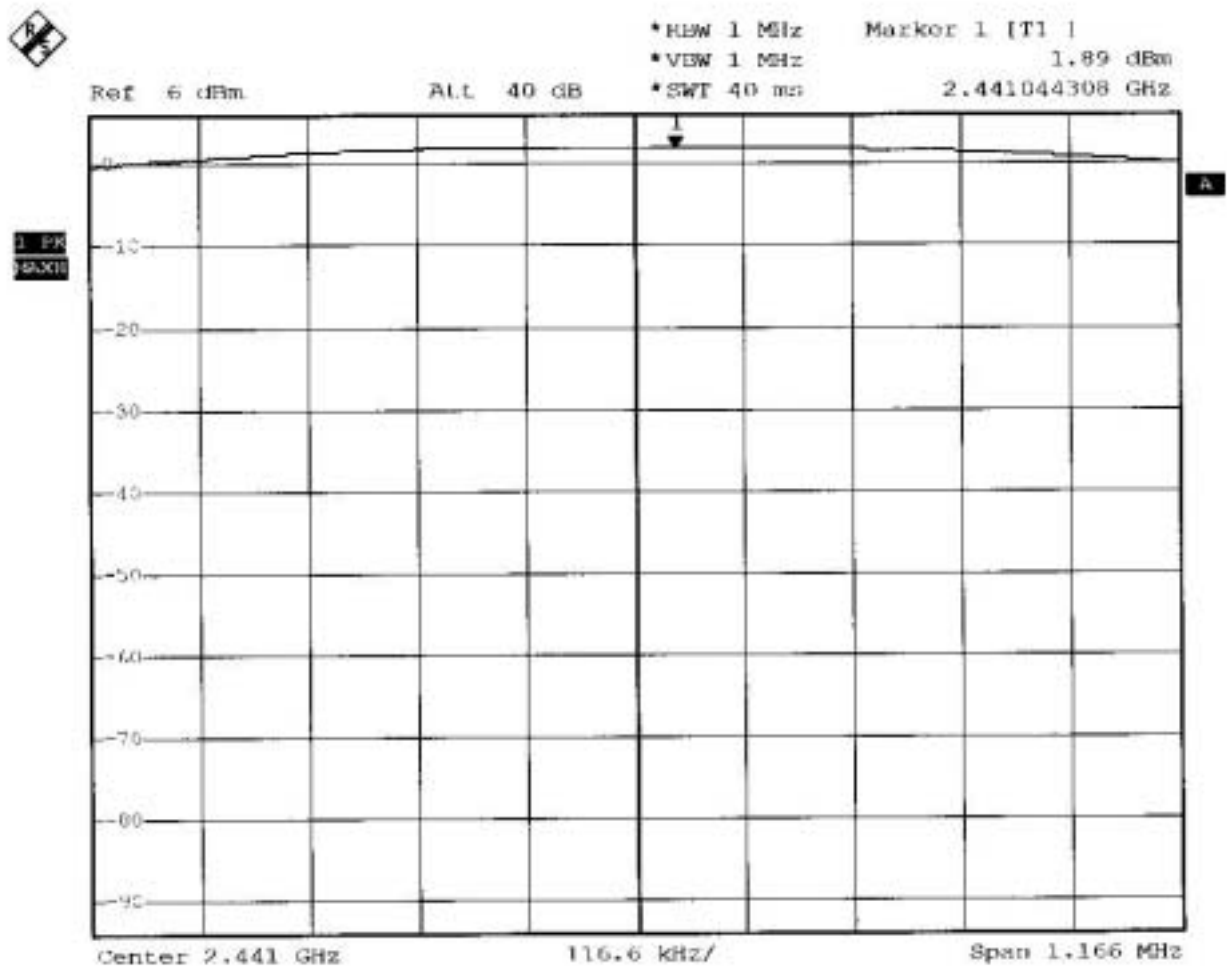
Transmitter transmit at lowest channel (2402Mhz)



The Power (ERP) = Output power + cable loss + antenna gain

$$= 0.51 \text{ dbm} + 1.3 \text{ db} + 1.9 \text{ dBi} = 3.71 \text{ dbm}$$

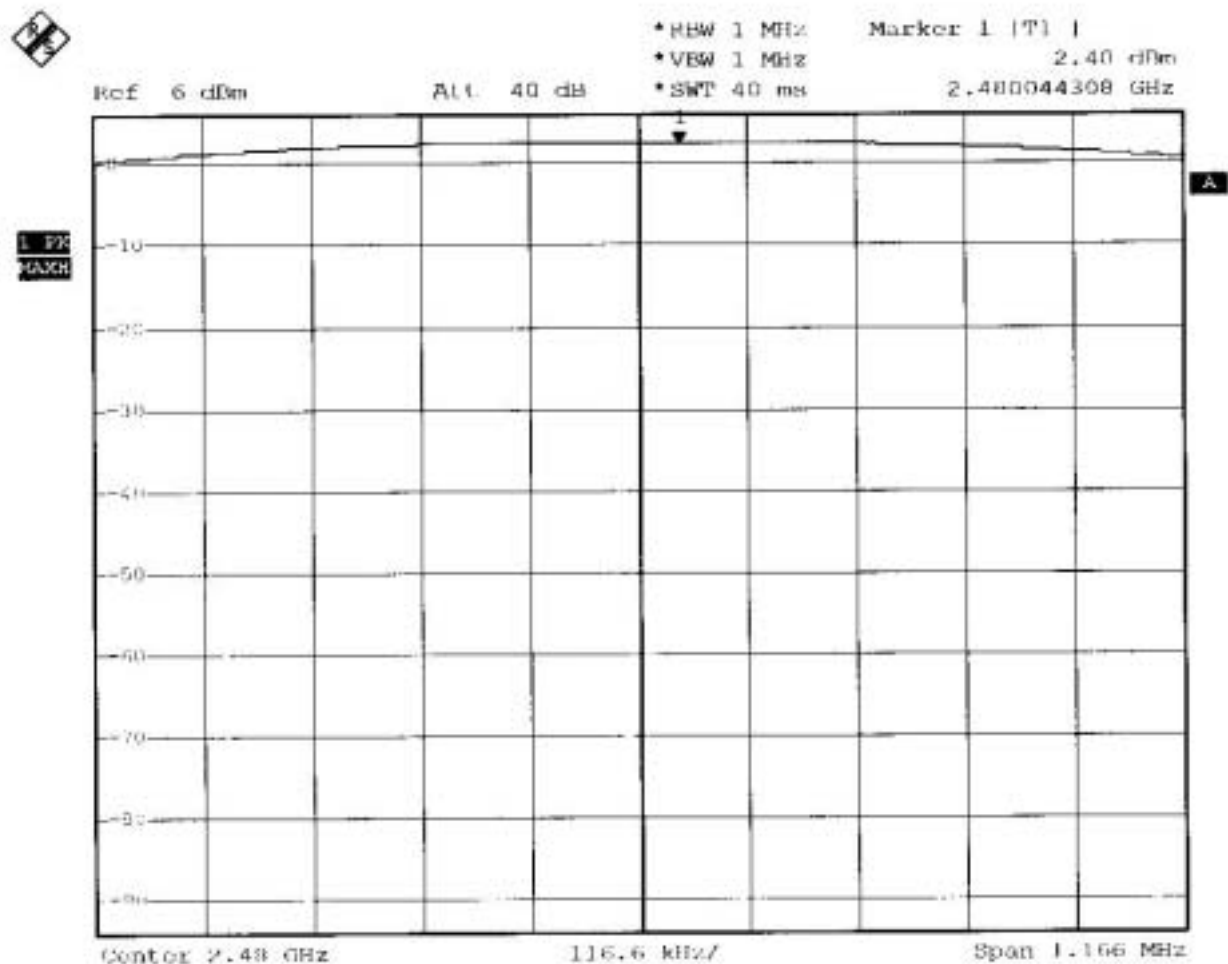
Transmitter transmit at middle channel (2441Mhz)



The Power (ERP) = Output power + cable loss + antenna gain

$$= 1.89 \text{ dbm} + 1.3 \text{ db} + 1.9 \text{ dBi} = 5.09 \text{ dbm}$$

Transmitter transmit at highest channel (2480Mhz)



The Power (ERP) = Output power + cable loss + antenna gain

$$= 2.40 \text{ dbm} + 1.3 \text{ db} + 1.9 \text{ dBi} = 5.6 \text{ dbm}$$

So the max power happens at 2480Mhz , which equals to 5.6 dbm = 7.48 mW(ERP)

Limits:

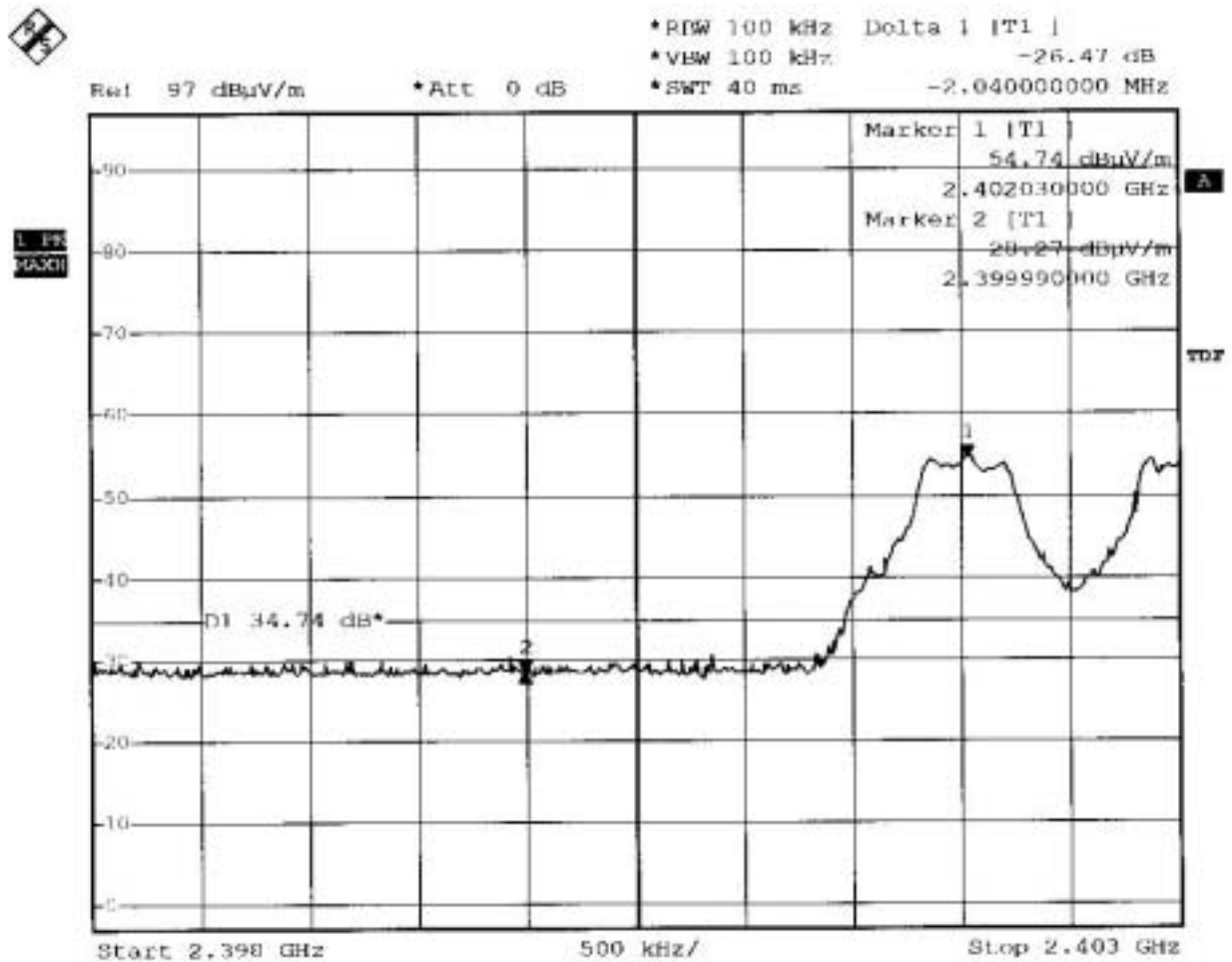
For frequency hopping systems operating in the 2400-2483.5 MHz band employing

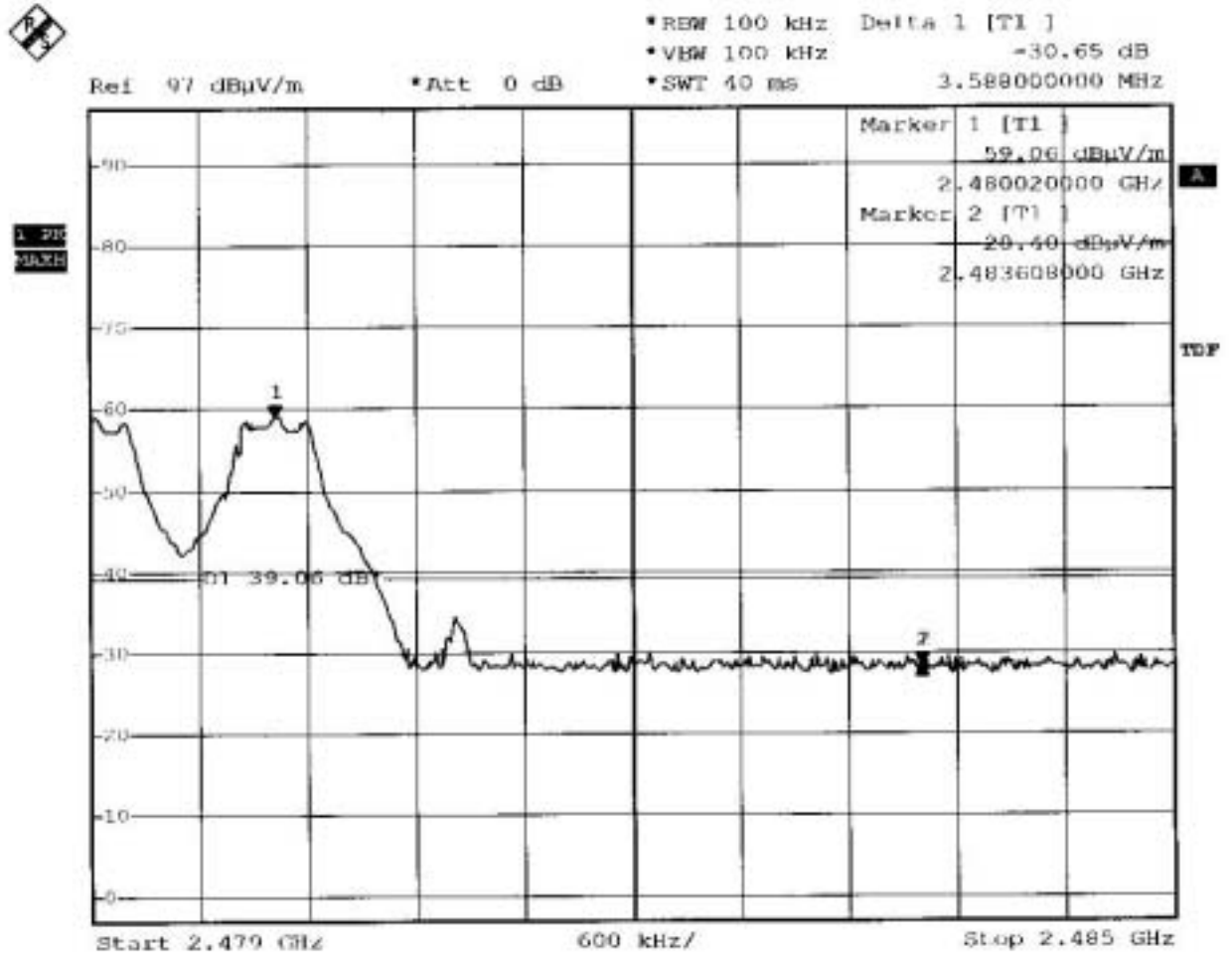
At least 75 hopping channels, all frequency hopping systems in the 5725-5850MHz

Band, and all direct sequence systems: 1 Watt.

4.7 Band Edge emission

SUBCLAUSE15.247(c)





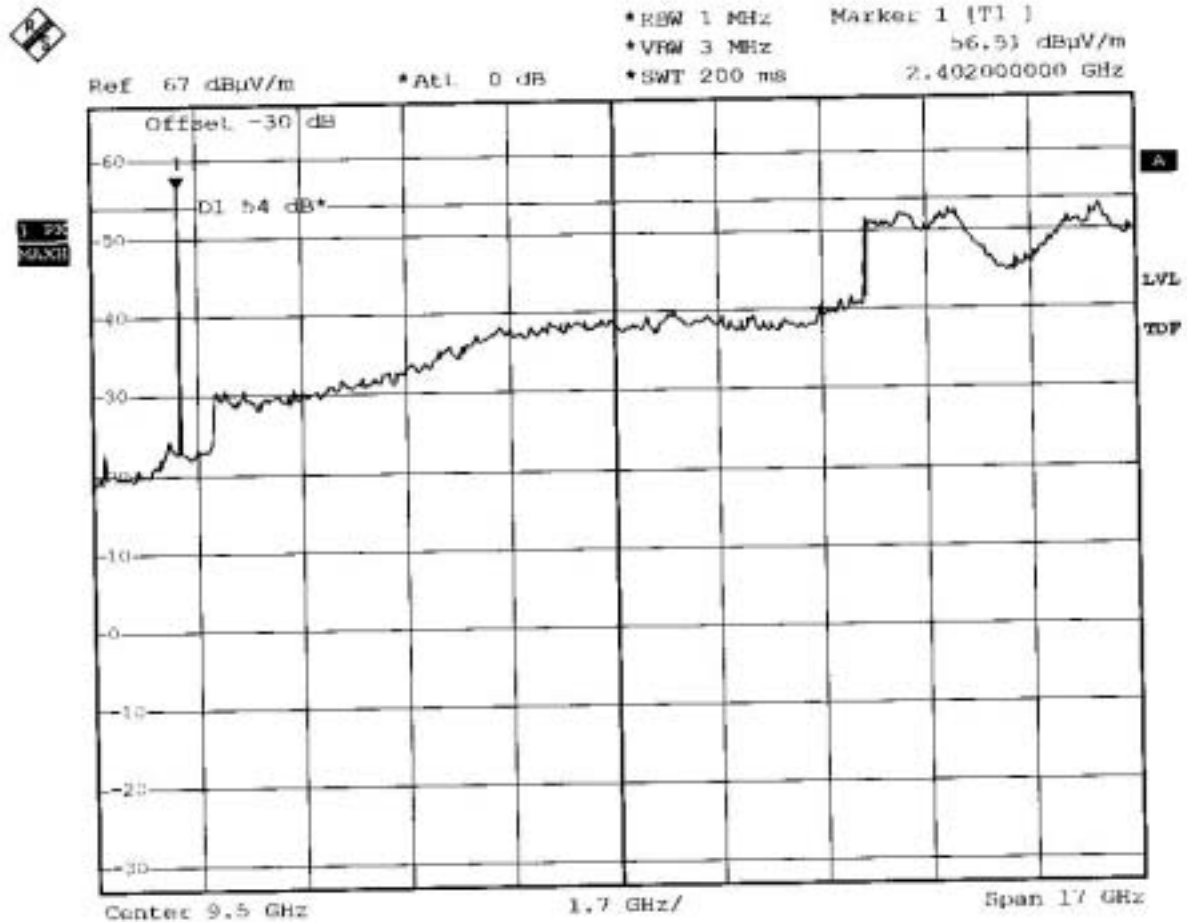
	Lower bandedge	Upper bandedge
Bandedge difference from main channel	26.47 db	30.65 db

4.7.1 Limits

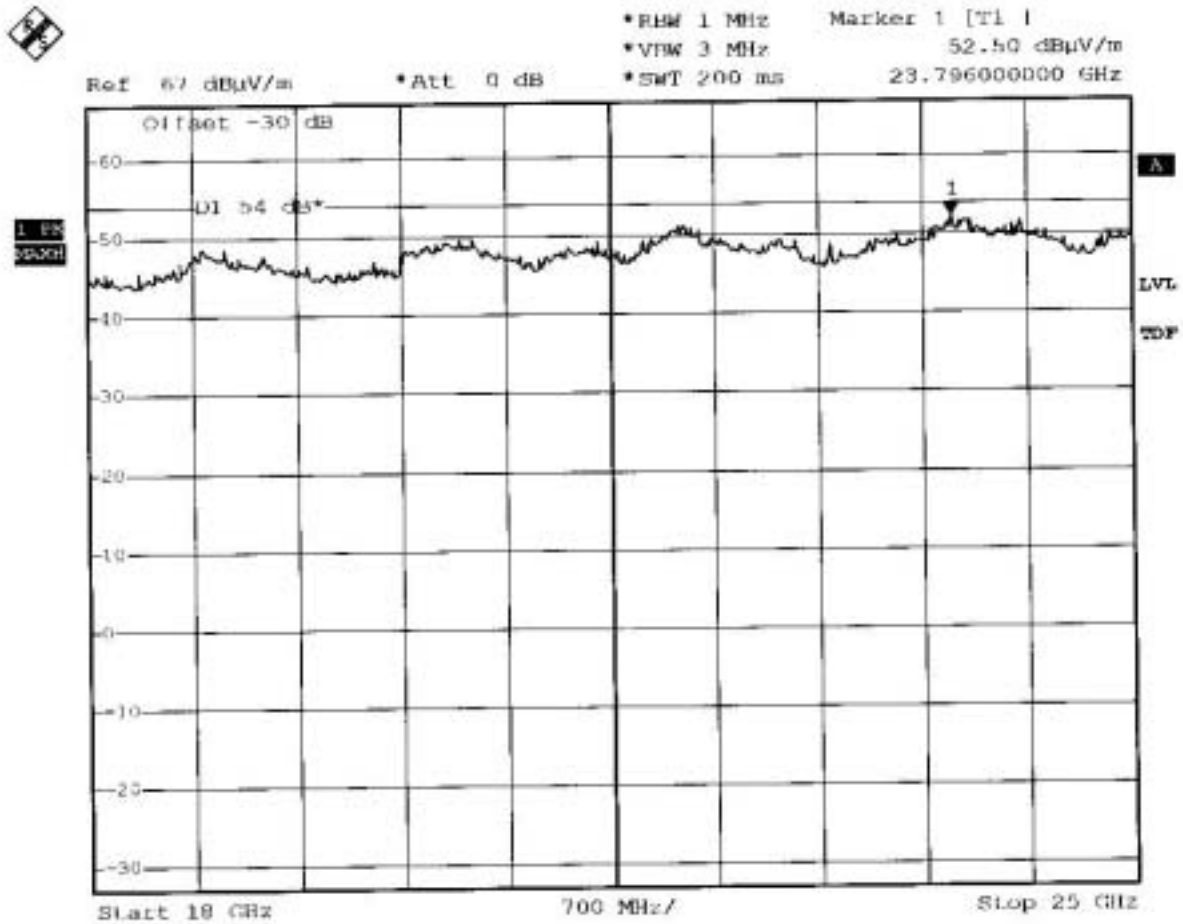
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, and it must comply with the limit in 15.209.

4.8 Spurious Emission under 25Ghz (from 1Ghz) SUBCLAUSE15.247(c)

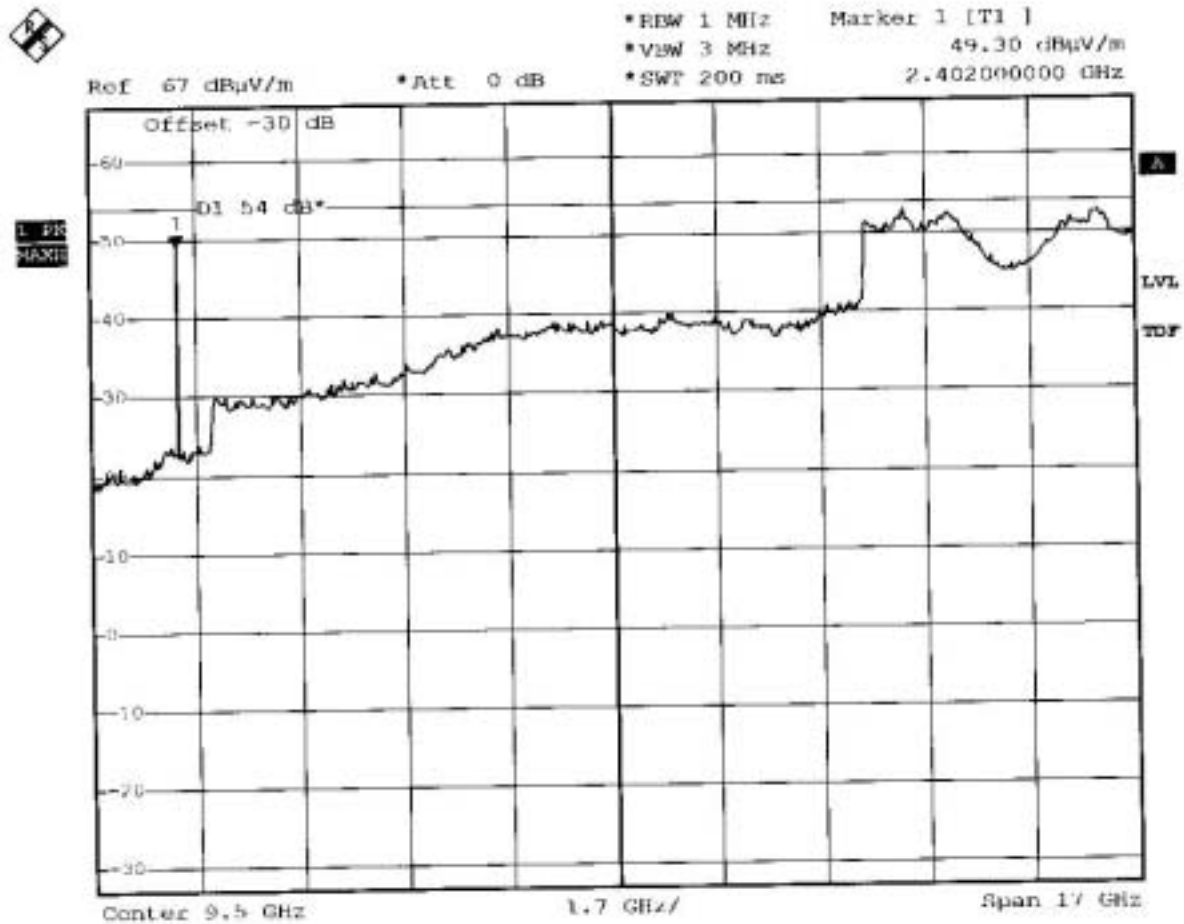
1. Transmit at 2402Mhz 1Ghz – 18Ghz , Vertical



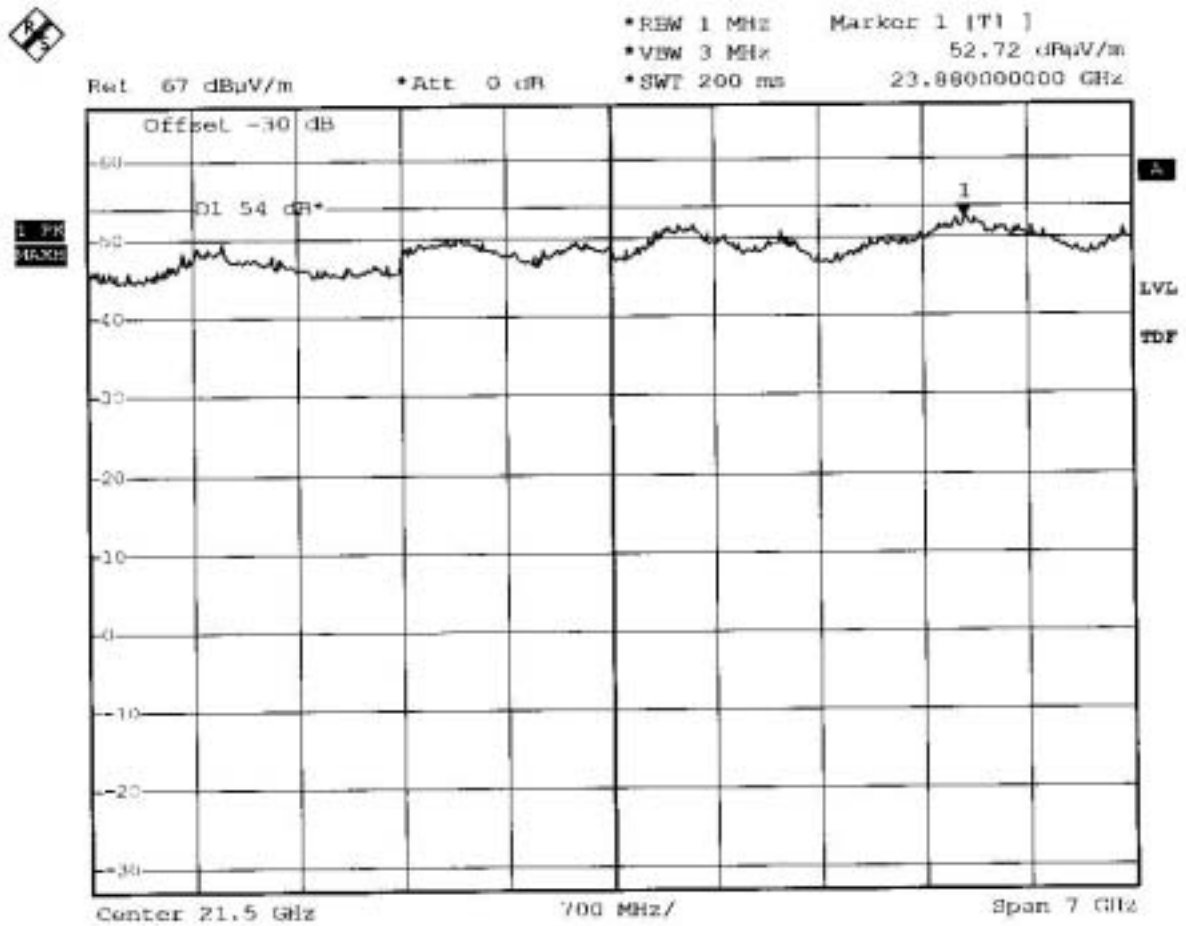
18GHz – 25GHz , Vertical



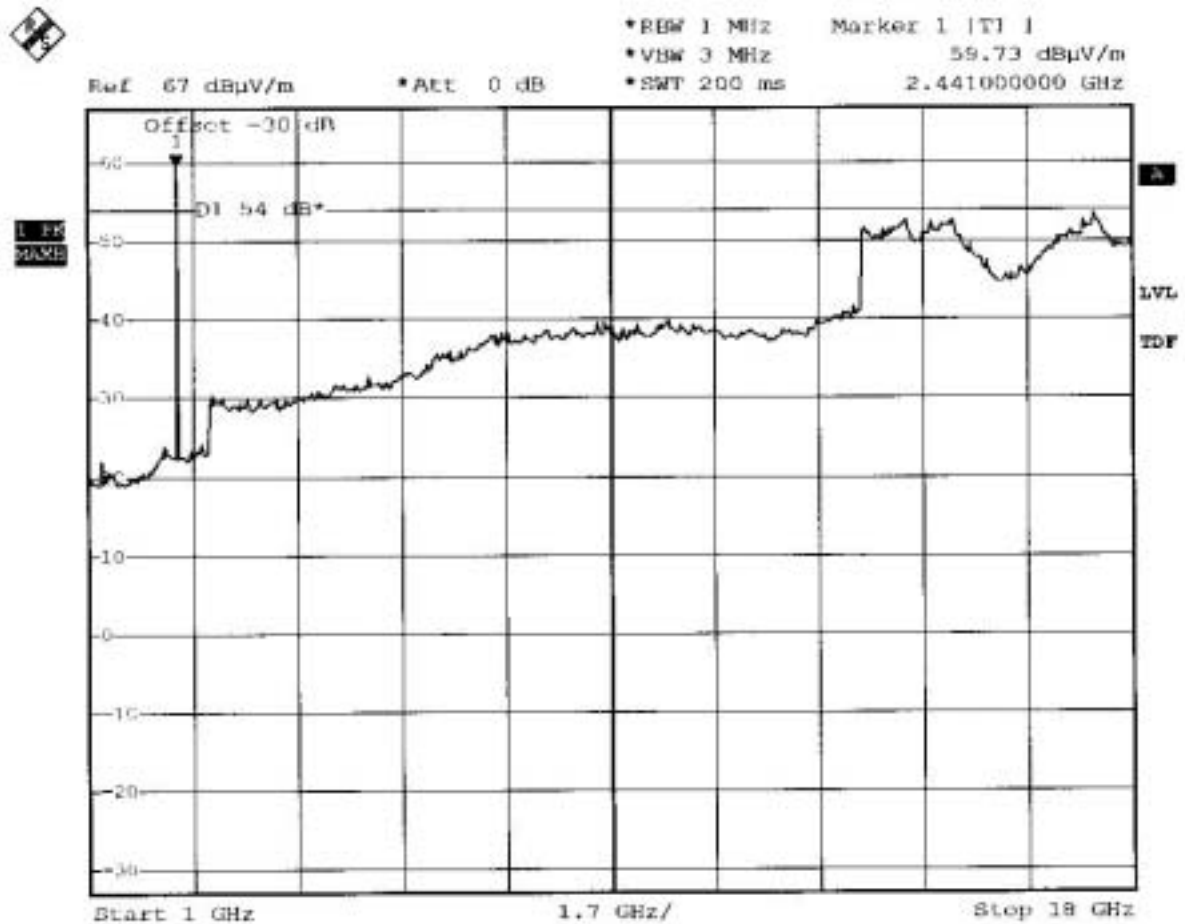
1Ghz – 18Ghz , Horizontal



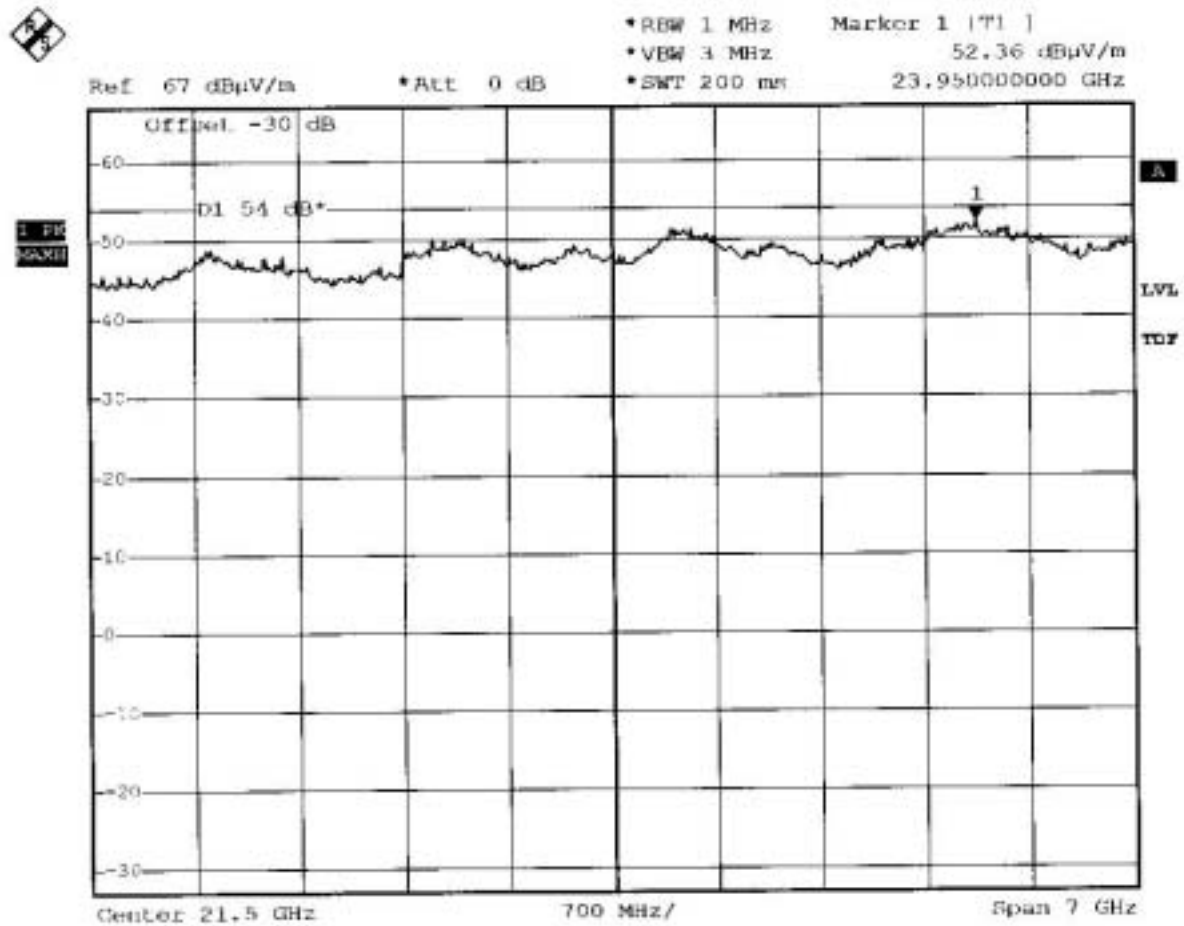
18GHz – 25GHz , Horizontal



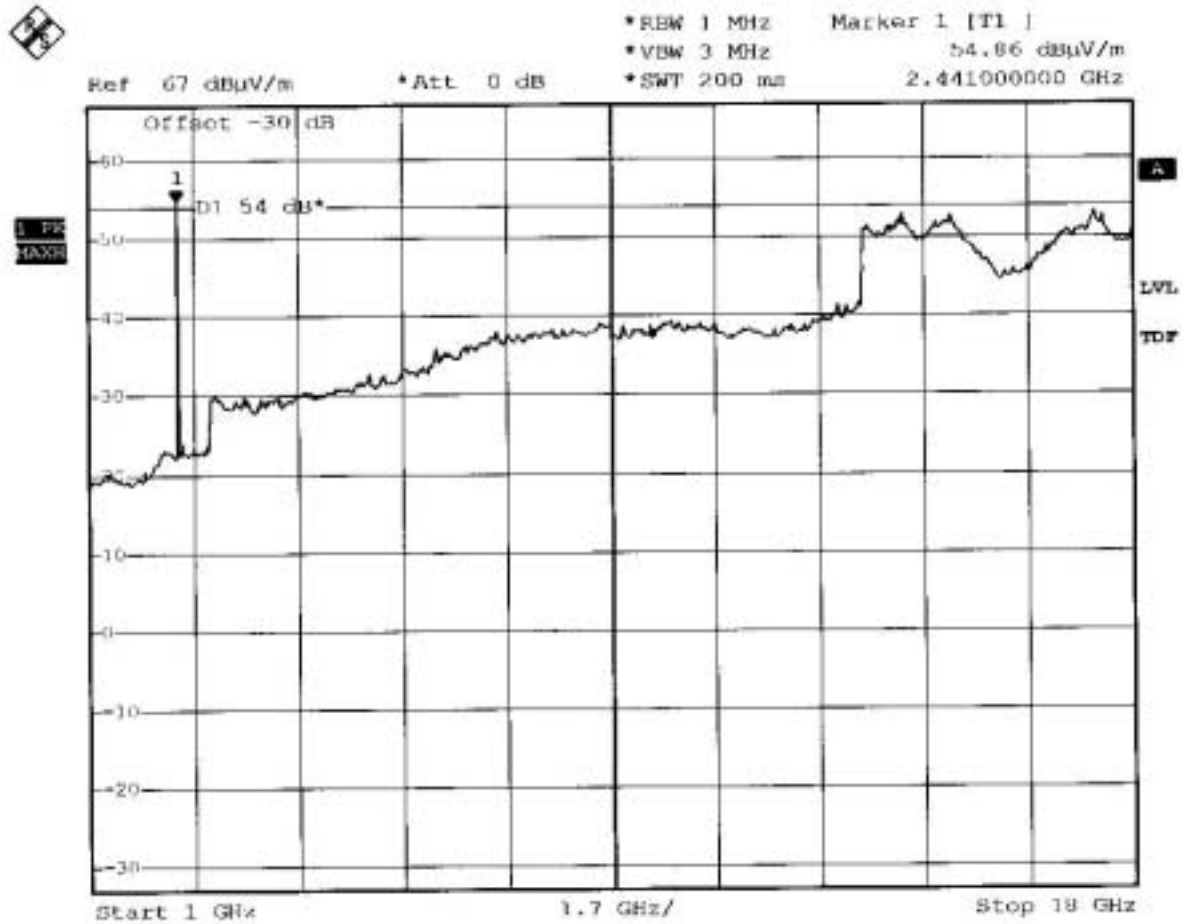
2. Transmit at 2441Mhz 1Ghz – 18Ghz , Vertical



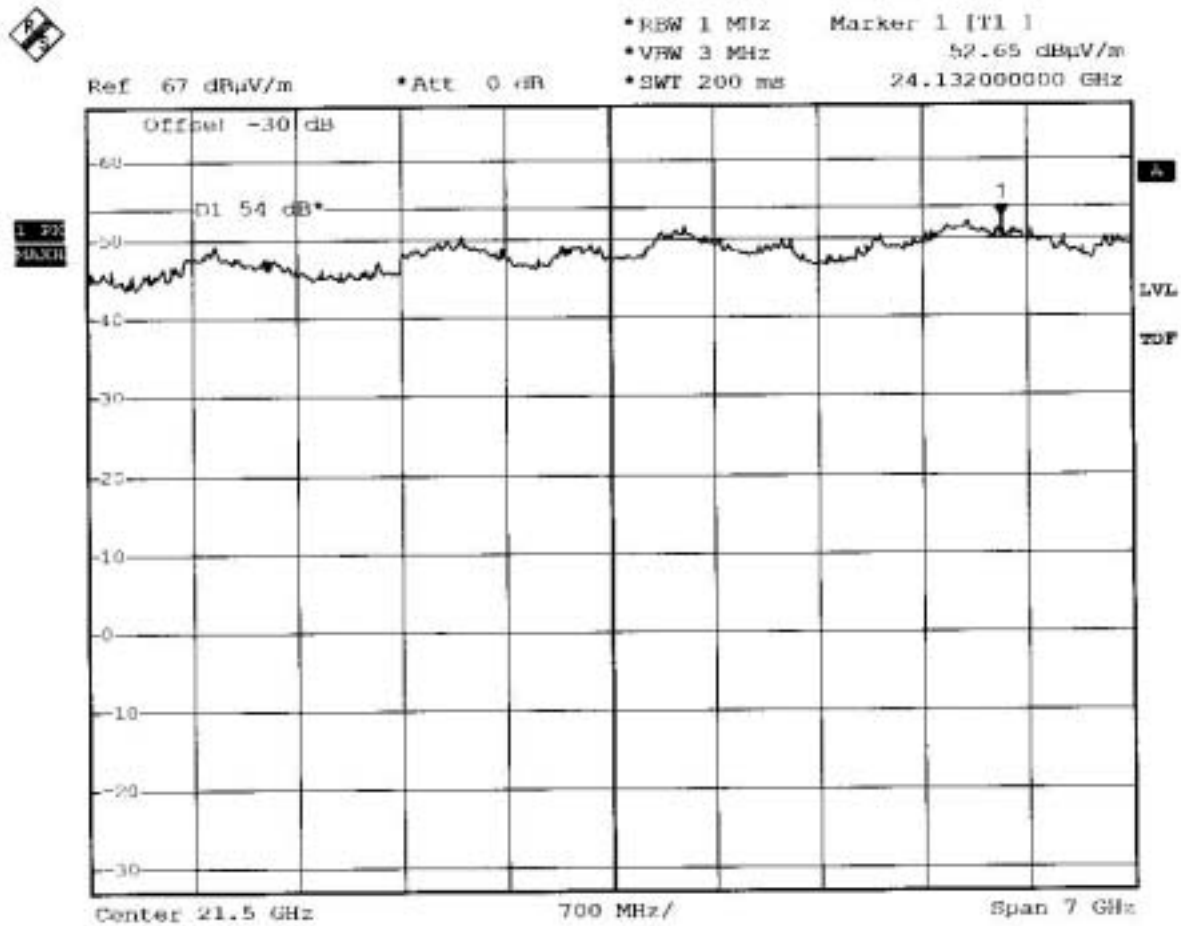
18GHz – 25GHz , Vertical



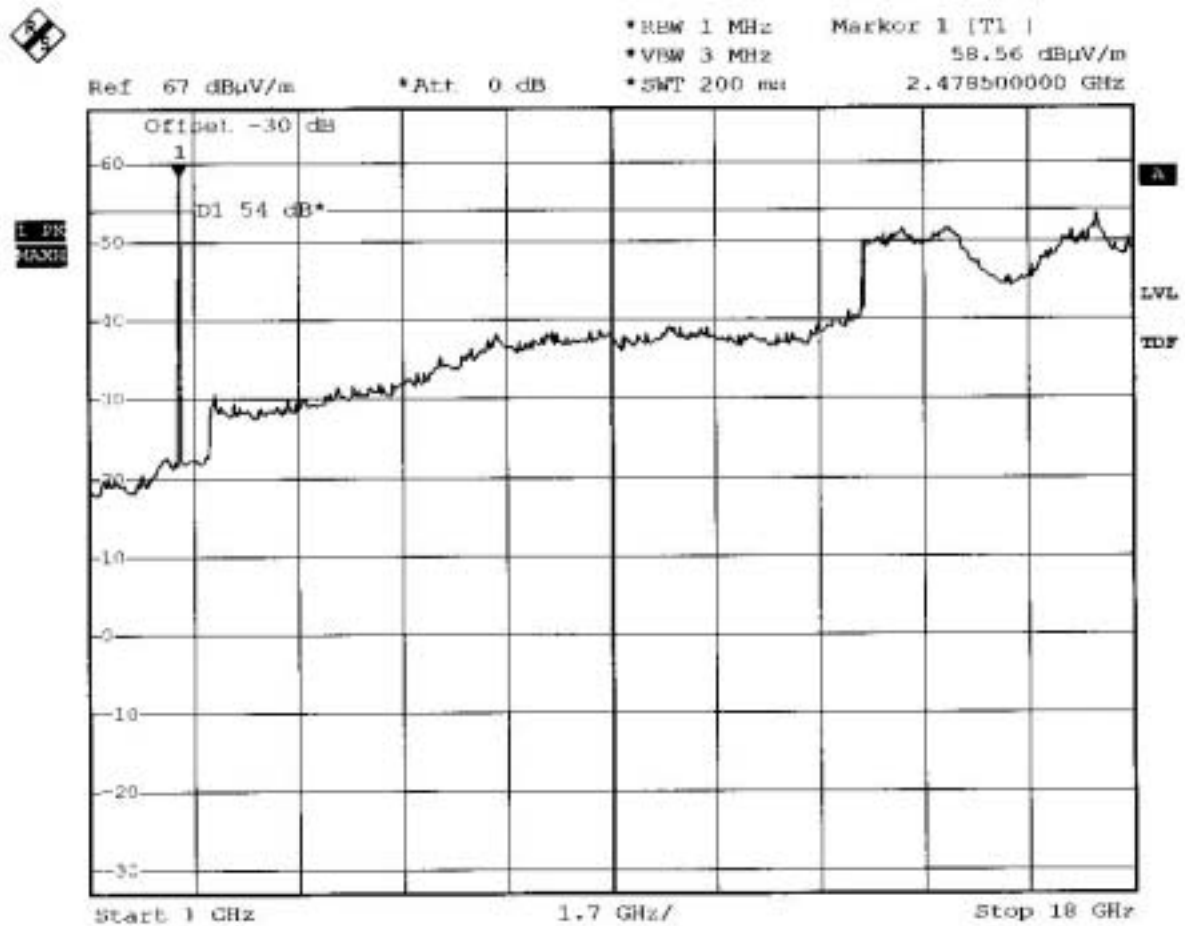
1Ghz – 18Ghz , Horizontal



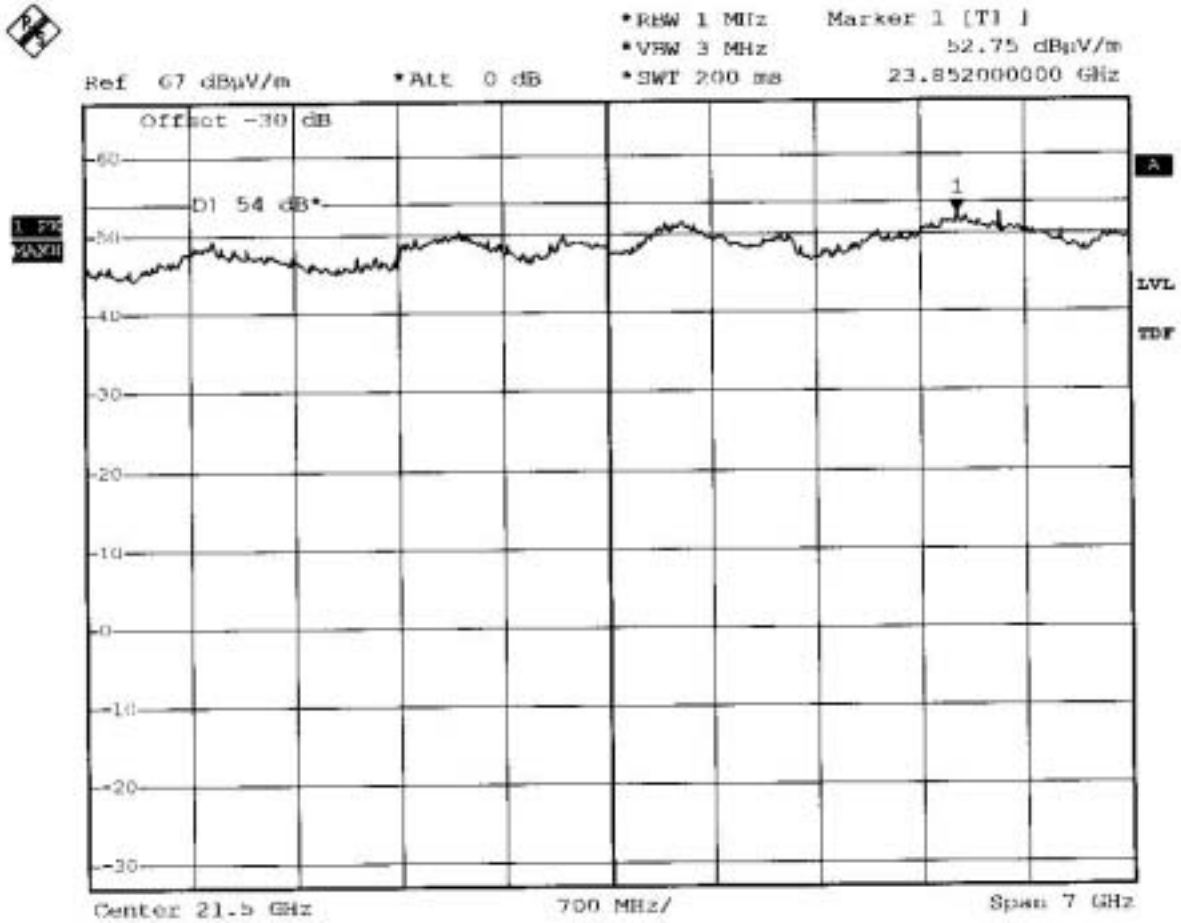
18GHz – 25GHz , Horizontal



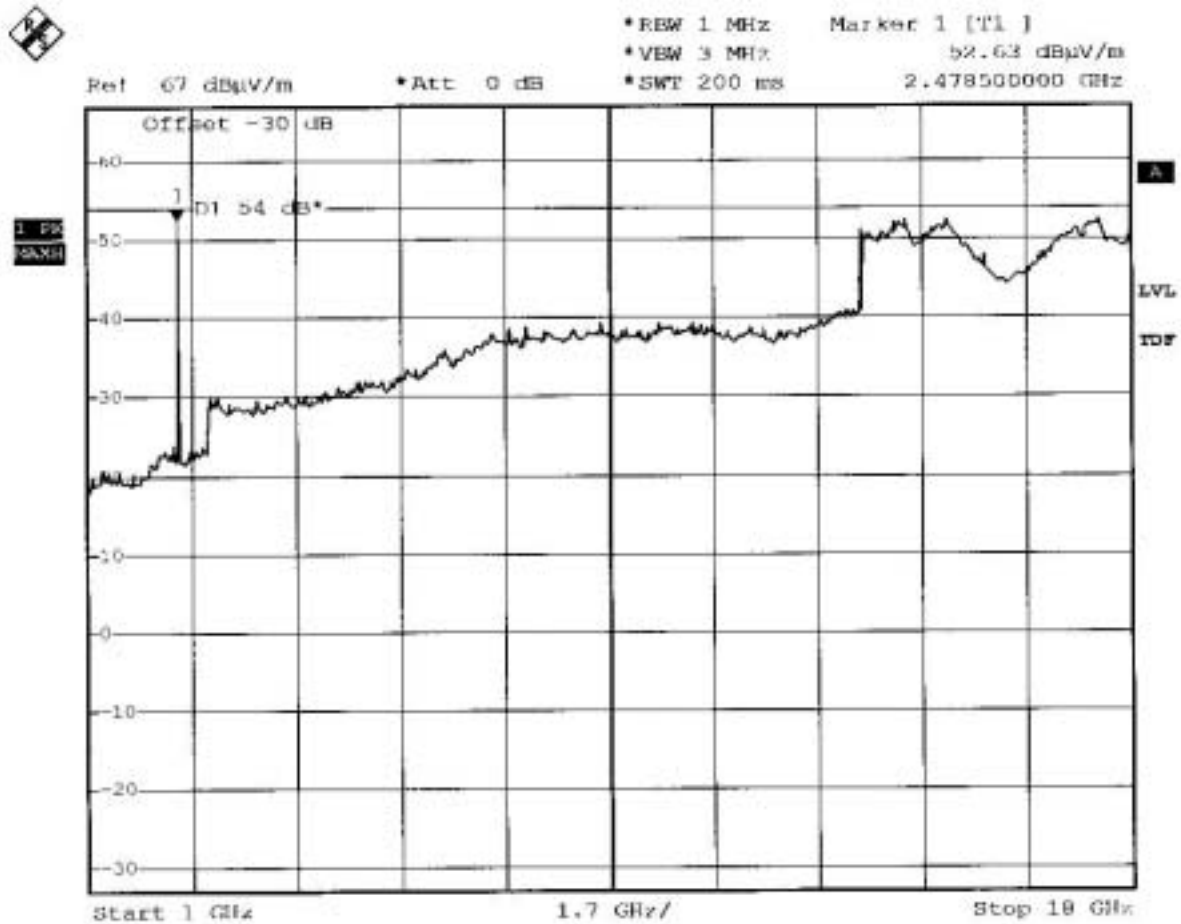
3. Transmit at 2480Mhz 1Ghz – 18Ghz , Vertical



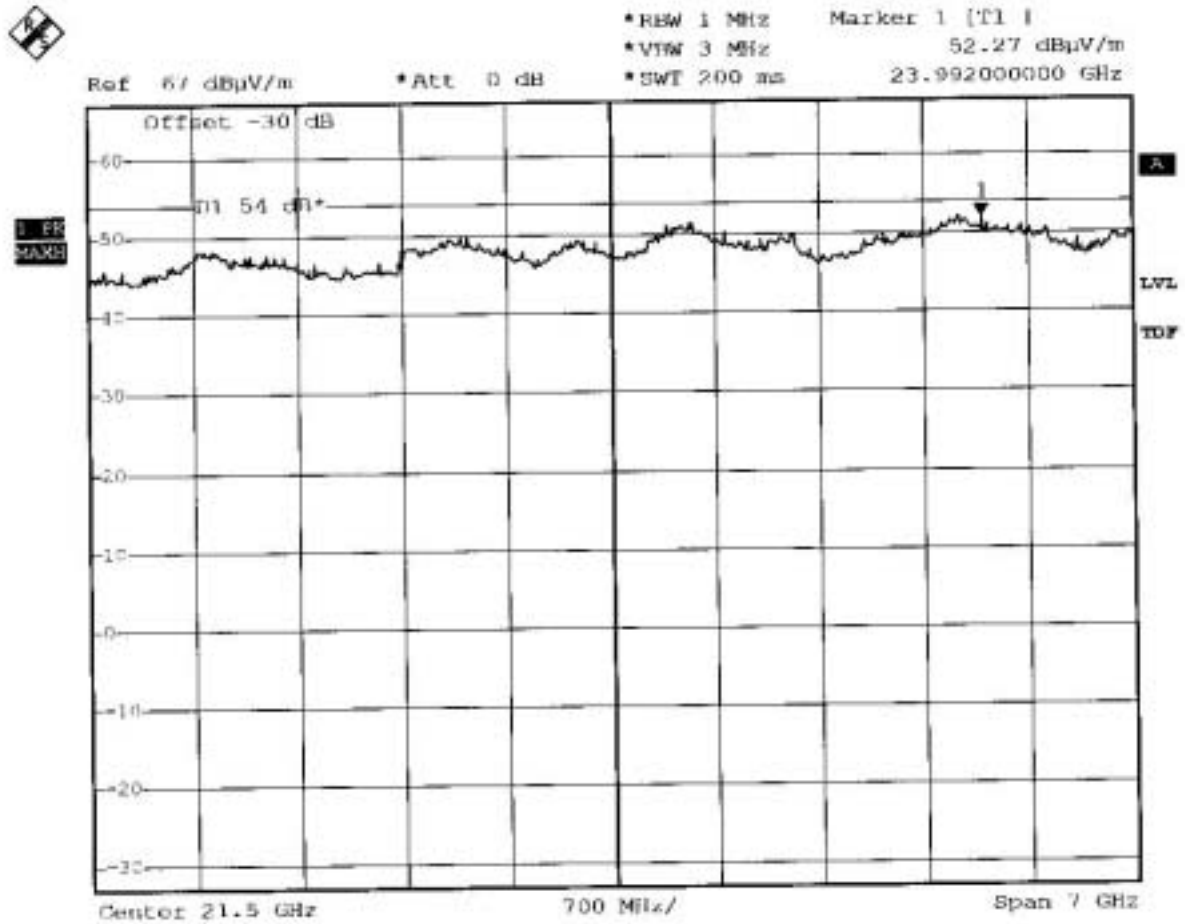
18GHz – 25GHz , Vertical



1Ghz – 18Ghz , Horizontal



18GHz – 25GHz , Horizontal



APPENDIX: Photographs of Test Setup

<Photos are saved separately>

APPENDIX : Photographs of EUT

Internal Photos

<Photos are saved separately>

External Photos

<Photos are saved separately>