

# TEST REPORT

**Equipment Under Test** : Bluetooth Hands-Free Car Kit  
**Model No.** : BCK-001

**Applicant** : Taiwan Alliance Corporation  
**Address of Applicant** : 6F NO. 218, Chinshan S . Road  
Sec,2 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** : Jun. 23, 2003

**Approved by** : Robert Chang      **Date** : Jun 25, 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

## **2. Summary of Results..... 6**

## **3. Instruments List..... 7**

## **4. Measurements..... 8**

4.1 Radiated emission Limits, general requirement.....	8
4.2 Channel Spacing.....	15
4.3 20db bandwidth / No. of channels.....	16
4.5 Average time of Occupancy.....	21
4.6 Peak output power.....	24
4.7 Band-edge emission.....	27
4.8 Spurious Emission under 25Ghz.....	29

## **APPENDIX**

Photographs of Test Setup.....	41
Photographs of EUT.....	42-43

# 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** : Taiwan Alliance Corporation  
**Address of Applicant** : 6F NO,218, Chinshan S . Road  
Contact : Sec,2 Taipei, Taiwan R.O.C  
Telephone : +886-2-23975577

## 1.3 Description of EUT(s)

1	Product name	Bluetooth Hands-Free Car Kit
2	Product ID	BCK-001
3	Supply Voltage	DC 12V
4	Carrier Frequency	2400MHz to 2483.5MHz
5	Modulation Method	GFSK,1Mbps,0.5BT Gaussian
6	Hopping	1600hops/sec, 1MHz channel space
8	Operation Temperature	-20 to +55 degree
9	Compliant	Bluetooth Specification Ver1.1

## **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)

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 plug in the USB port of PC 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 rotatable 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.
- f. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be retested one by one using the quasi-peak method or average method as specified and then reported in Data sheet peak mode and QP 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.

## 2.Summary of Results

subclause	Parameter to be measures	Verdict	Page
15.209	Radiated emission Limits, general requirement	<i>PASS</i>	8
15.247(a)(1)	Channel Spacing	<i>PASS</i>	15
15.247(a)(1)(ii)	20db bandwidth / No. of channels	<i>PASS</i>	16
15.247(a)(1)(ii)	Average Time of Occupancy	<i>PASS</i>	21
15.247(b)(1)	Peak Output power	<i>PASS</i>	24
15.247(c)	Band-Edge Emission	<i>PASS</i>	27
15.247(c)	Spurious Emission under 25Ghz	<i>PASS</i>	29

### 3. Instruments List

Instrument	Model	Serial number	Calibration date
Desktop PC	HP Pavillion 723D	N/A	N/A
Spectrum Analyzer	Agilent E7405A	US40240202	Jun 01, 2002
Spectrum Analyzer	R&S FSP 40	100034	Mar. 27, 2003
Antenna	Schwarzbeck BBHA9170A	184/185	July 01, 2002
Antenna	Schwarzbeck BBHA9120A	309/320	July 01, 2002
Antenna	Schwarzbeck VULB9163	152	July 01, 2002
Signal generator	R&S SMR 40	100210	Feb. 11, 2003

## 4. Measurements

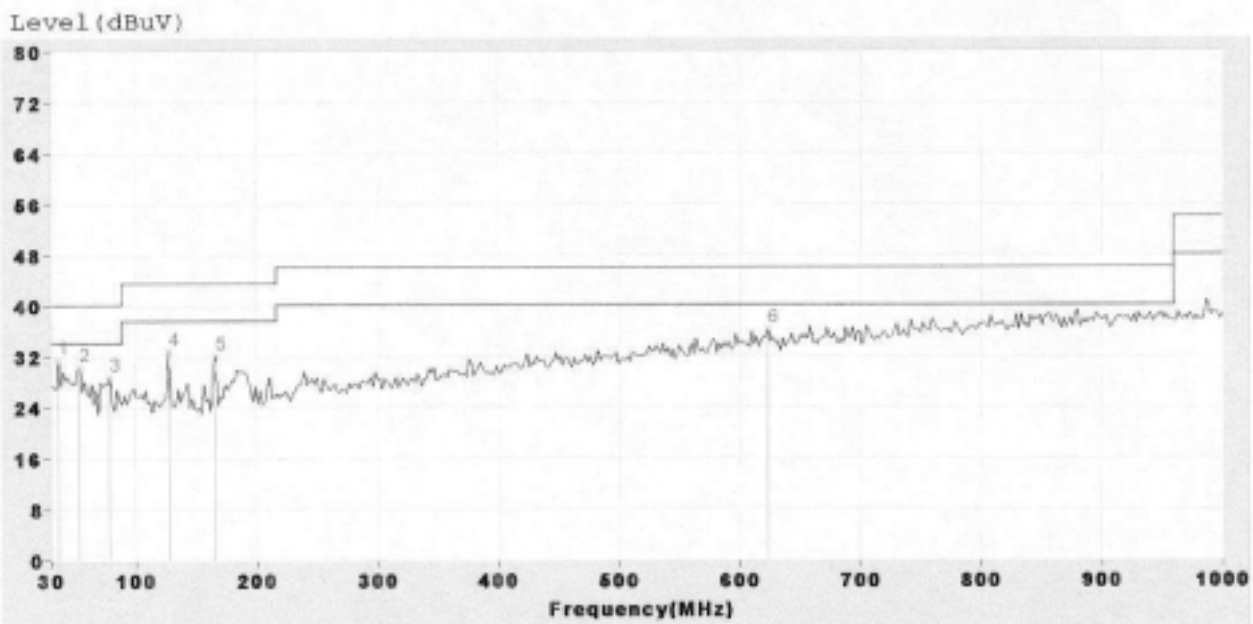
### 4.1 Radiated emission Limits, general requirement SUBCLAUSE 15.209

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

#### SGS EMC Lab. Site 2 EMI TESTING REPORT

Customer:  
Model :  
Spec. :  
Ser. No.: Car kit( 2402 MHz )  
Limit : FCC\_B

Date: 2003-06-23 Time: 15:57  
Polar. : Vertical- 3M  
Report No.:  
File : -1  
Tester : Alex  
Tmp. (C): 22.0 Humid. (%): 59



MEMO:

	Freq	Level	Over	Limit	Read	Antenna	Cable	Other
	-----	-----	Limit	Line	Level	Factor	Factor	Factor
	-----	-----	-----	-----	-----	-----	-----	-----
	MHz	dB	dB	dB	dB	dB	dB	dB
1	35.82	31.43	-8.57	40.00	19.73	11.26	0.43	0.00
2	53.28	30.24	-9.76	40.00	17.86	11.84	0.54	0.00
3	78.50	28.68	-11.32	40.00	20.95	7.07	0.66	0.00
4	127.00	32.76	-10.74	43.50	23.68	8.27	0.81	0.00
5	165.80	32.05	-11.45	43.50	22.88	8.27	0.90	0.00
6	623.64	36.15	-9.85	46.00	14.60	19.43	2.12	0.00



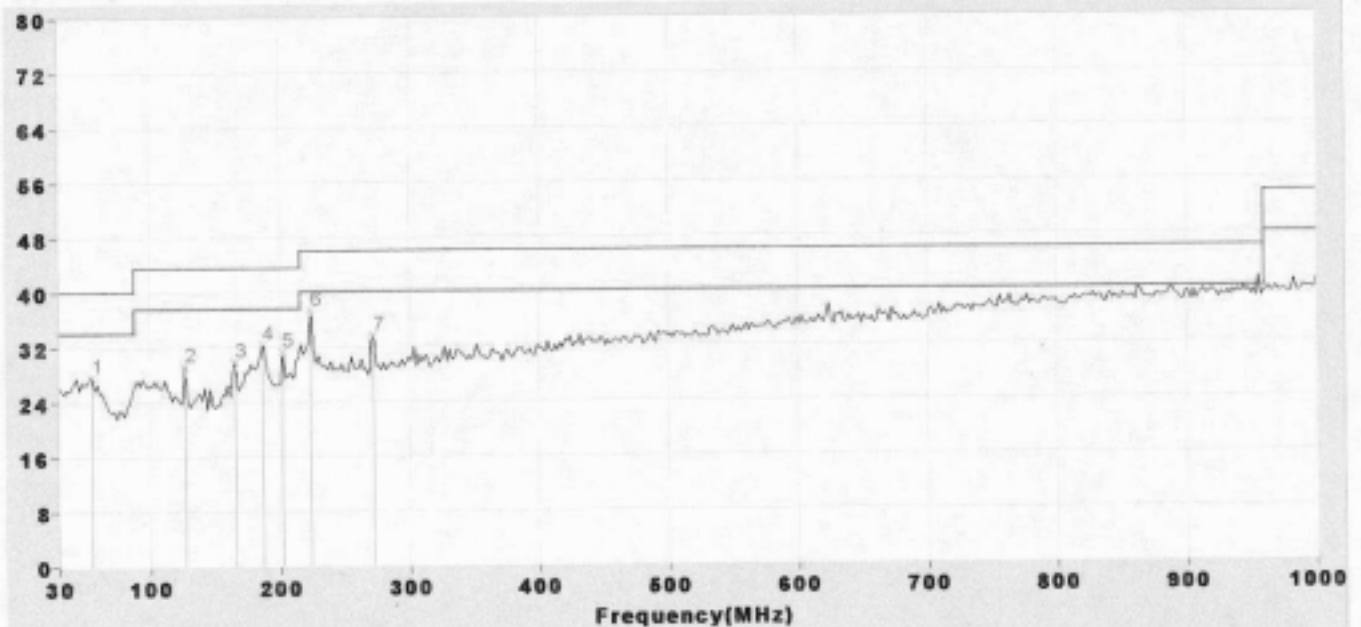
2. Transmit at 2402Mhz, The Spectrum setting : RBW=120Khz , VBW=120Khz, **Horizontal**

**SGS EMC Lab. Site 2**  
**EMI TESTING REPORT**

Customer:  
Model :  
Spec. :  
Ser. No.: Car kit( 2402 MHz )  
Limit : FCC\_B

Date: 2003-06-23 Time: 15:56  
Polar. : Horizontal- 3M  
Report No.:  
File : -1  
Tester : Alex  
Tmp. (C): 22.0 Humid. (%): 59

Level (dBuV)



MEMO:

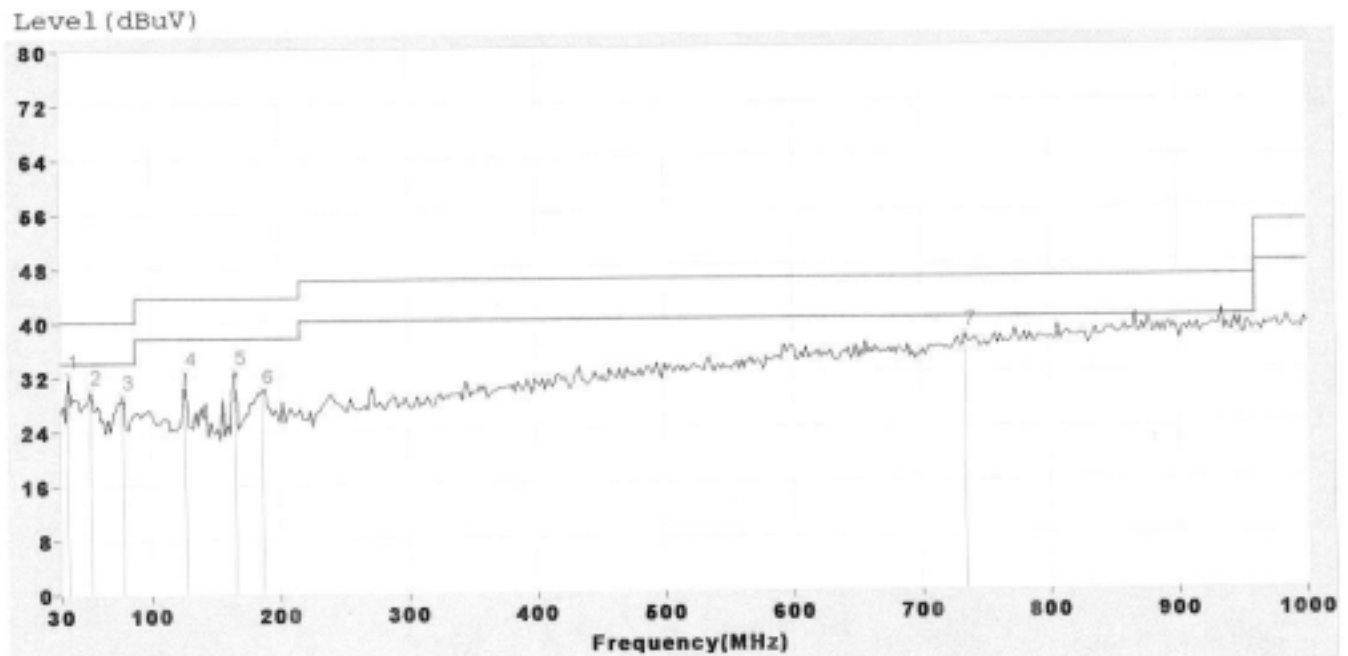
	Freq	Level	Over	Limit	Read	Antenna	Cable	Other
	-----	-----	Limit	Line	Level	Factor	Factor	Factor
	MHz	dB	dB	dB	dB	dB	dB	dB
1	55.22	27.66	-12.34	40.00	15.36	11.75	0.55	0.00
2	127.00	29.12	-14.38	43.50	20.04	8.27	0.81	0.00
3	165.80	29.81	-13.69	43.50	20.64	8.27	0.90	0.00
4	187.14	32.28	-11.22	43.50	21.38	9.94	0.96	0.00
5	202.66	31.27	-12.23	43.50	19.91	10.36	1.00	0.00
6	224.00	37.26	-8.74	46.00	24.91	11.30	1.05	0.00
7	272.50	33.61	-12.39	46.00	19.89	12.55	1.17	0.00

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

SGS EMC Lab. Site 2  
EMI TESTING REPORT

Customer:  
Model :  
Spec. :  
Ser. No.: Car kit( 2441 MHz )  
Limit : FCC\_B

Date: 2003-06-23 Time: 16:02  
Polar. : Vertical- 3M  
Report No.:  
File : -1  
Tester : Alex  
Tmp. (C): 22.0 Humid. (%): 59



MEMO:

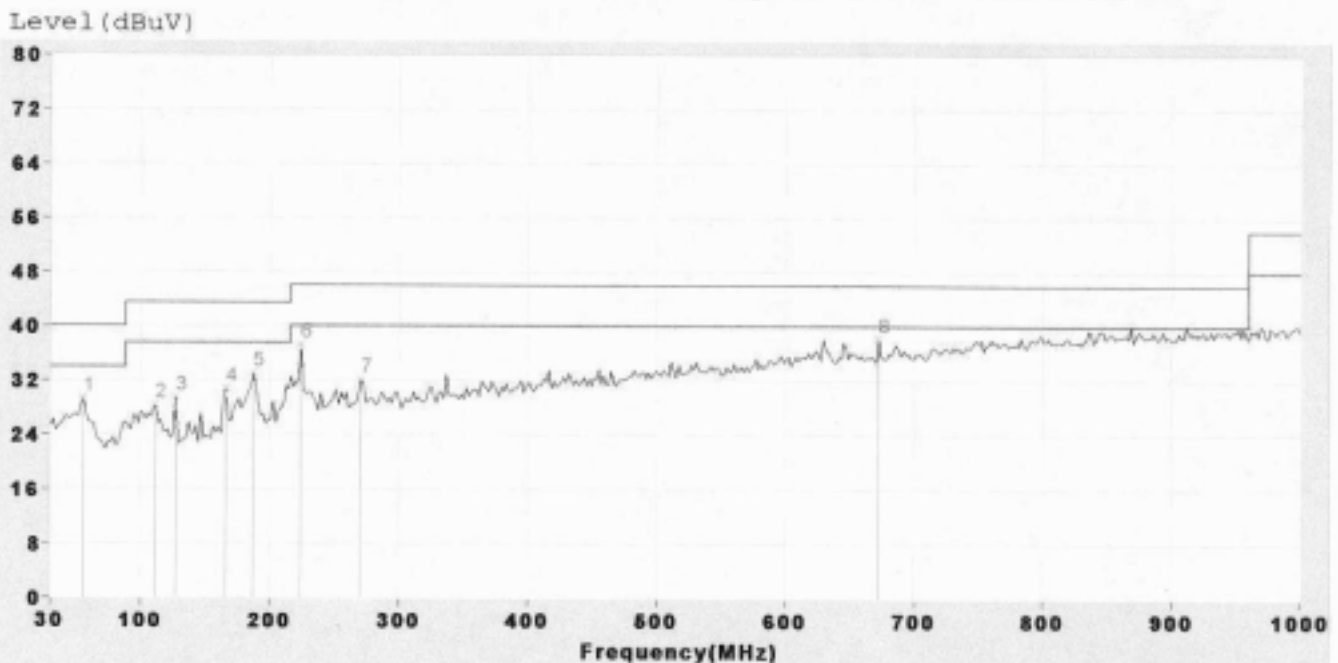
	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Factor	Other Factor
	MHz	dB	dB	dB	dB	dB	dB	dB
1	35.82	32.50	-7.50	40.00	20.81	11.26	0.43	0.00
2	53.28	30.02	-9.98	40.00	17.63	11.84	0.54	0.00
3	78.50	29.26	-10.74	40.00	21.53	7.07	0.66	0.00
4	127.00	32.71	-10.79	43.50	23.63	8.27	0.81	0.00
5	165.80	32.73	-10.77	43.50	23.56	8.27	0.90	0.00
6	187.14	29.96	-13.54	43.50	19.07	9.94	0.96	0.00
7	734.22	37.56	-8.44	46.00	14.56	20.70	2.30	0.00

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

**SGS EMC Lab. Site 2**  
**EMI TESTING REPORT**

Customer:  
Model :  
Spec. :  
Ser. No.: Car kit( 2441 MHz )  
Limit : FCC\_B

Date: 2003-06-23 Time: 16:01  
Polar. : Horizontal- 3M  
Report No.:  
File : -1  
Tester : Alex  
Tmp. (C): 22.0 Humid. (%): 59



MEMO:

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Factor	Other Factor
	MHz	dB	dB	dB	dB	dB	dB	dB
1	55.22	29.21	-10.79	40.00	16.92	11.75	0.55	0.00
2	111.48	28.32	-15.18	43.50	16.81	10.74	0.77	0.00
3	127.00	29.42	-14.08	43.50	20.34	8.27	0.81	0.00
4	165.80	30.80	-12.70	43.50	21.63	8.27	0.90	0.00
5	187.14	33.02	-10.48	43.50	22.12	9.94	0.96	0.00
6	224.00	37.25	-8.75	46.00	24.90	11.30	1.05	0.00
7	270.56	32.14	-13.86	46.00	18.51	12.46	1.17	0.00
8	672.14	38.27	-7.73	46.00	16.40	19.69	2.18	0.00

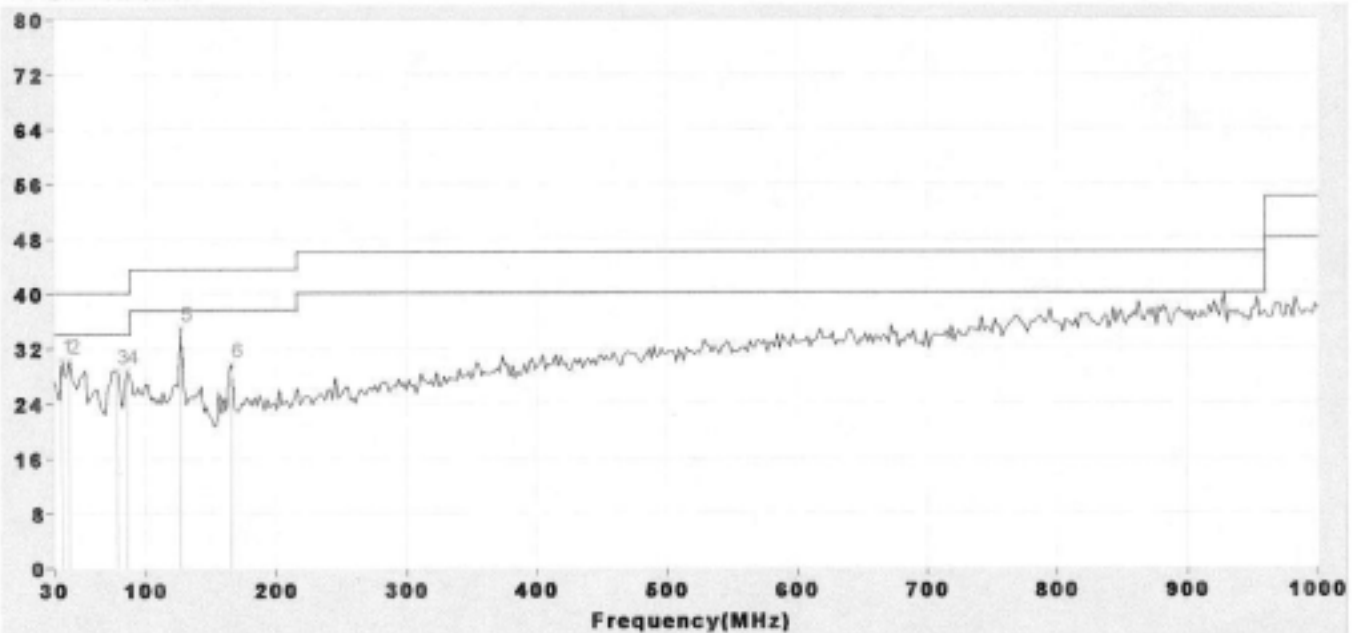
5. Transmit at 2480Mhz, The Spectrum setting : RBW=120Khz , VBW=120Khz, **Vertical**

SGS EMC Lab. Site 2  
EMI TESTING REPORT

Customer:  
Model :  
Spec. :  
Ser. No.:Car kit( 2480 MHz )  
Limit :FCC\_B

Date:2003-06-23 Time:16:08  
Polar. :Vertical- 3M  
Report No.:  
File :-1  
Tester :Alex  
Tmp.(C):22.0 Humid.(%):59

Level (dBuV)



MEMO:

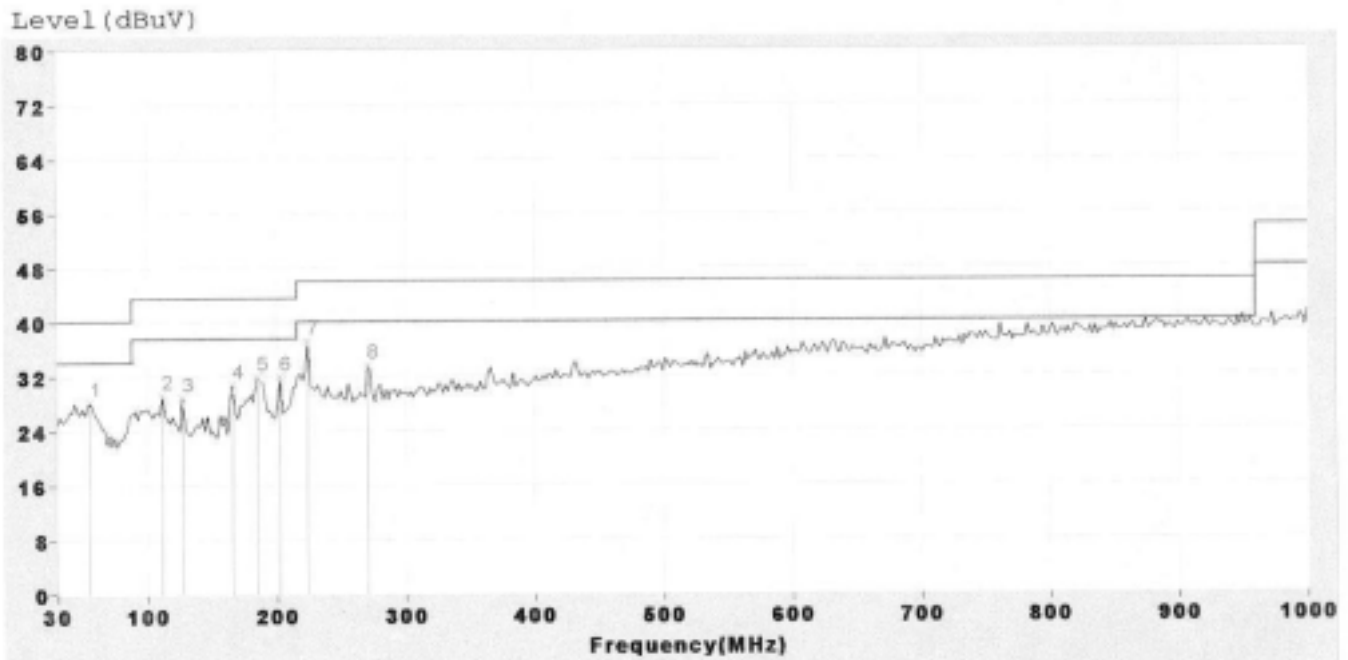
	Freq	Level	Over	Limit	Read	Antenna	Cable	Other
	-----	-----	Limit	Line	Level	Factor	Factor	Factor
	MHz	dB	dB	dB	dB	dB	dB	dB
1	35.82	30.40	-9.60	40.00	18.71	11.26	0.43	0.00
2	41.64	30.33	-9.67	40.00	17.54	12.32	0.48	0.00
3	78.50	28.81	-11.19	40.00	21.08	7.07	0.66	0.00
4	86.26	28.84	-11.16	40.00	18.68	9.45	0.70	0.00
5	127.00	35.01	-8.49	43.50	25.93	8.27	0.81	0.00
6	165.80	29.68	-13.82	43.50	20.51	8.27	0.90	0.00

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

SGS EMC Lab. Site 2  
EMI TESTING REPORT

Customer:  
Model :  
Spec. :  
Ser. No.: Car kit( 2480 MHz )  
Limit : FCC\_B

Date: 2003-06-23 Time: 16:04  
Polar. : Horizontal- 3M  
Report No.:  
File : -1  
Tester : Alex  
Tmp. (C): 22.0 Humid. (%): 59



MEMO:

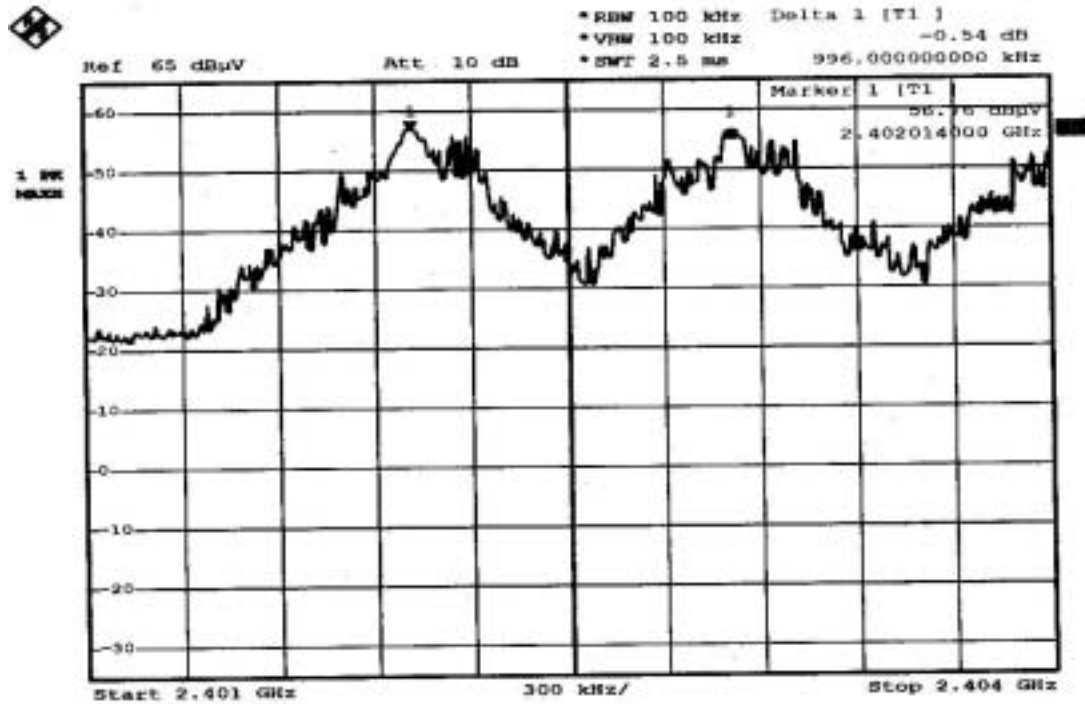
	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Factor	Other Factor
	----- MHz	----- dB	----- dB	----- dB	----- dB	----- dB	----- dB	----- dB
1	55.22	28.13	-11.87	40.00	15.83	11.75	0.55	0.00
2	111.48	29.12	-14.38	43.50	17.61	10.74	0.77	0.00
3	127.00	28.83	-14.67	43.50	19.75	8.27	0.81	0.00
4	165.80	30.66	-12.84	43.50	21.49	8.27	0.90	0.00
5	185.20	31.86	-11.64	43.50	21.16	9.75	0.95	0.00
6	202.66	31.87	-11.63	43.50	20.51	10.36	1.00	0.00
7	224.00	37.12	-8.88	46.00	24.78	11.30	1.05	0.00
8	270.56	33.61	-12.39	46.00	19.98	12.46	1.17	0.00

#### 4.2.1 Limits

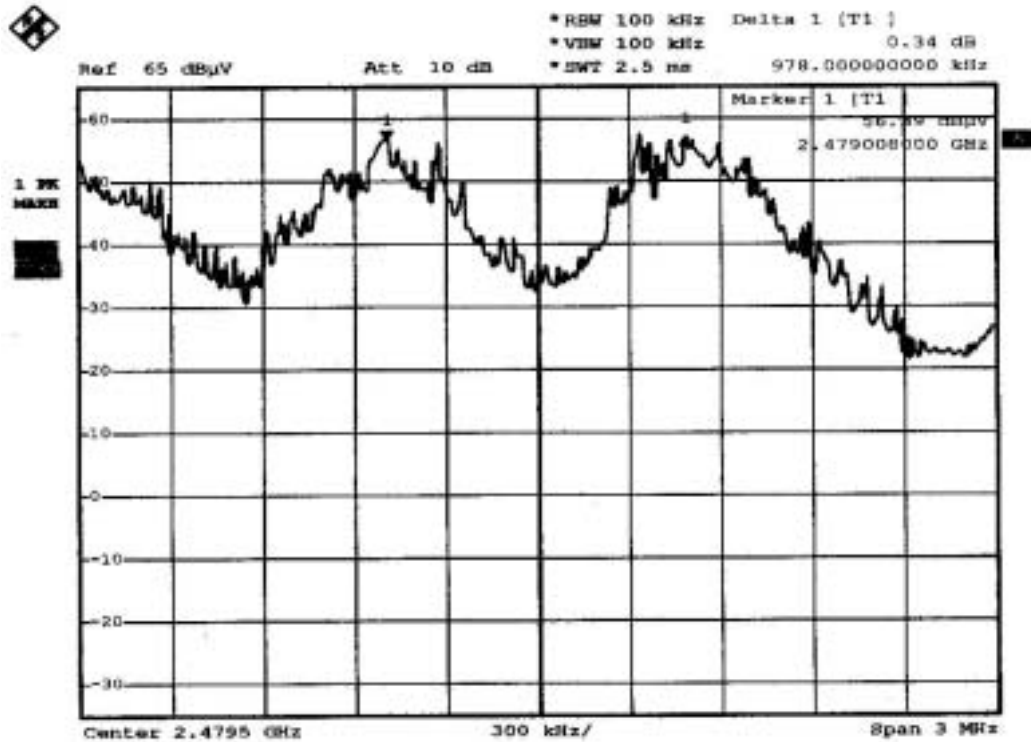
Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100 **	3
88 - 216	150 **	3
216 - 960	200 **	3
Above 960	500	3

## 4.2 Channel Spacing

## SUBCLAUSE 15.247(a)(1)



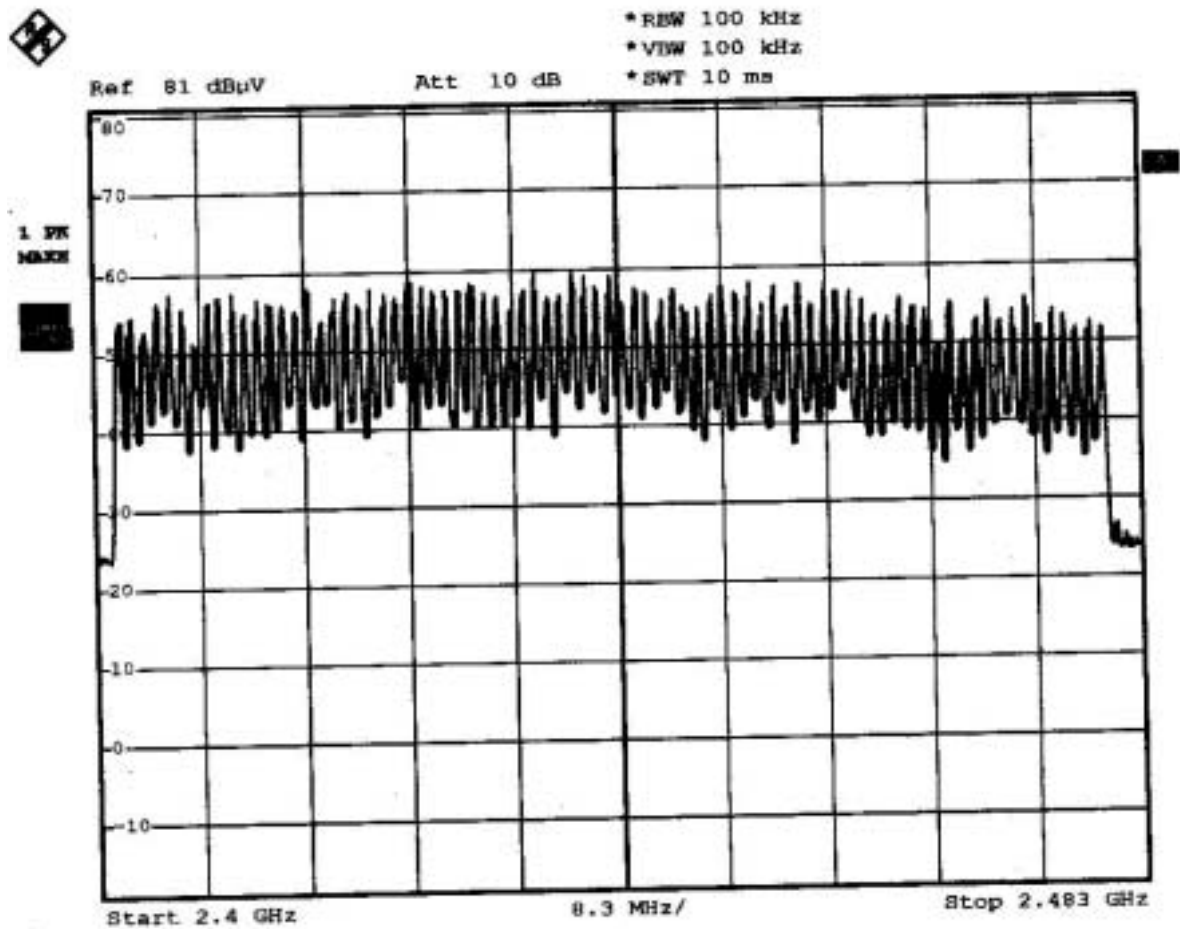
Date: 23.JUN.2003 14:19:31



Date: 23.JUN.2003 14:26:20

#### 4.3 No. of carrier frequency / 20db Bandwidth

##### SUBCLAUSE 15.247(a)(1)(ii)

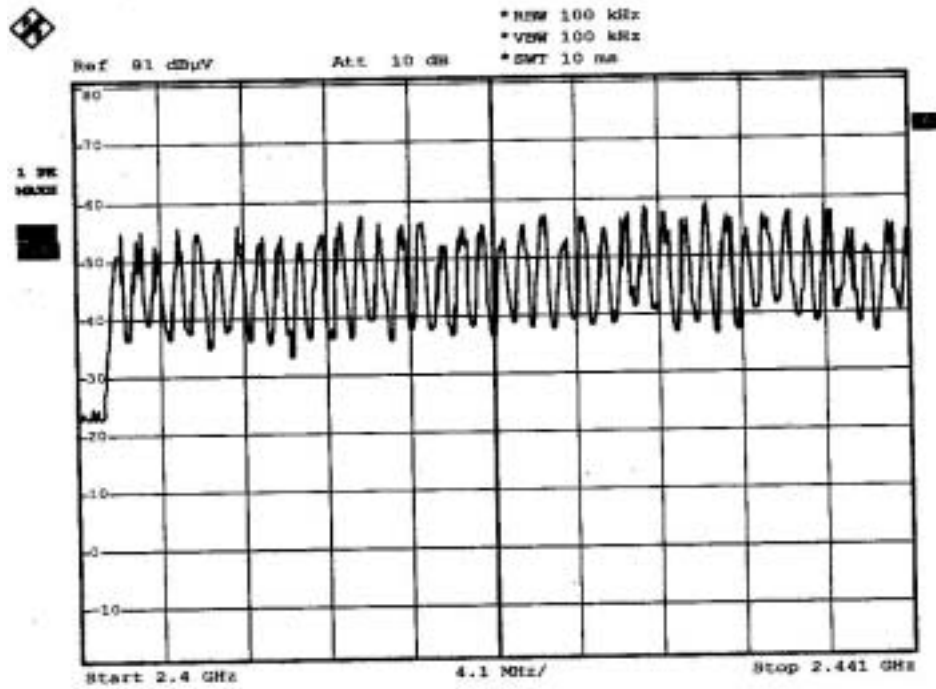


Date: 23.JUN.2003 14:36:28

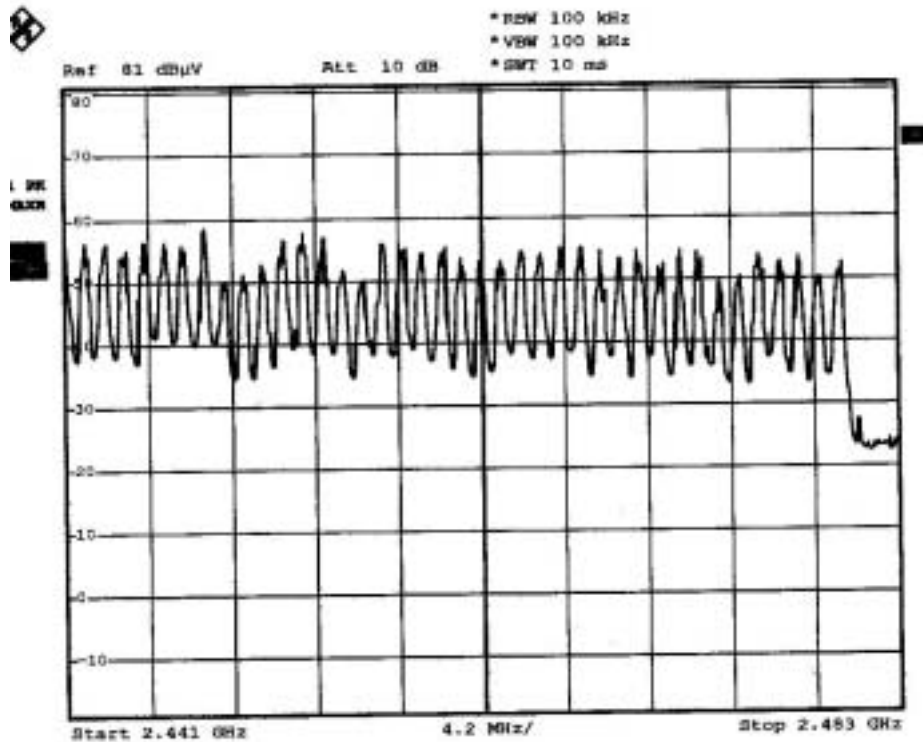
Number of channels = 79



Split the whole frequency band into two.

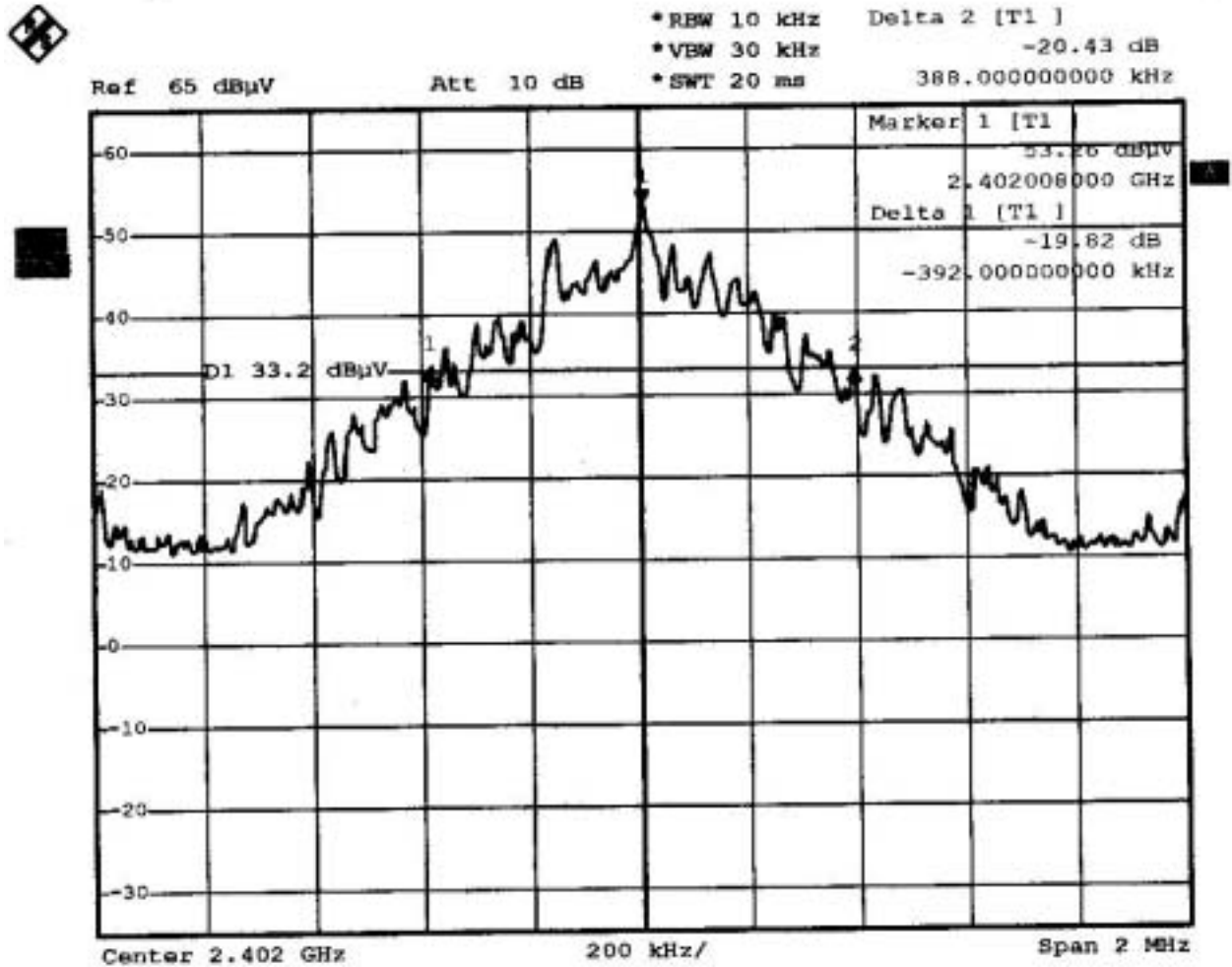


Date: 23.JUN.2003 14:38:51



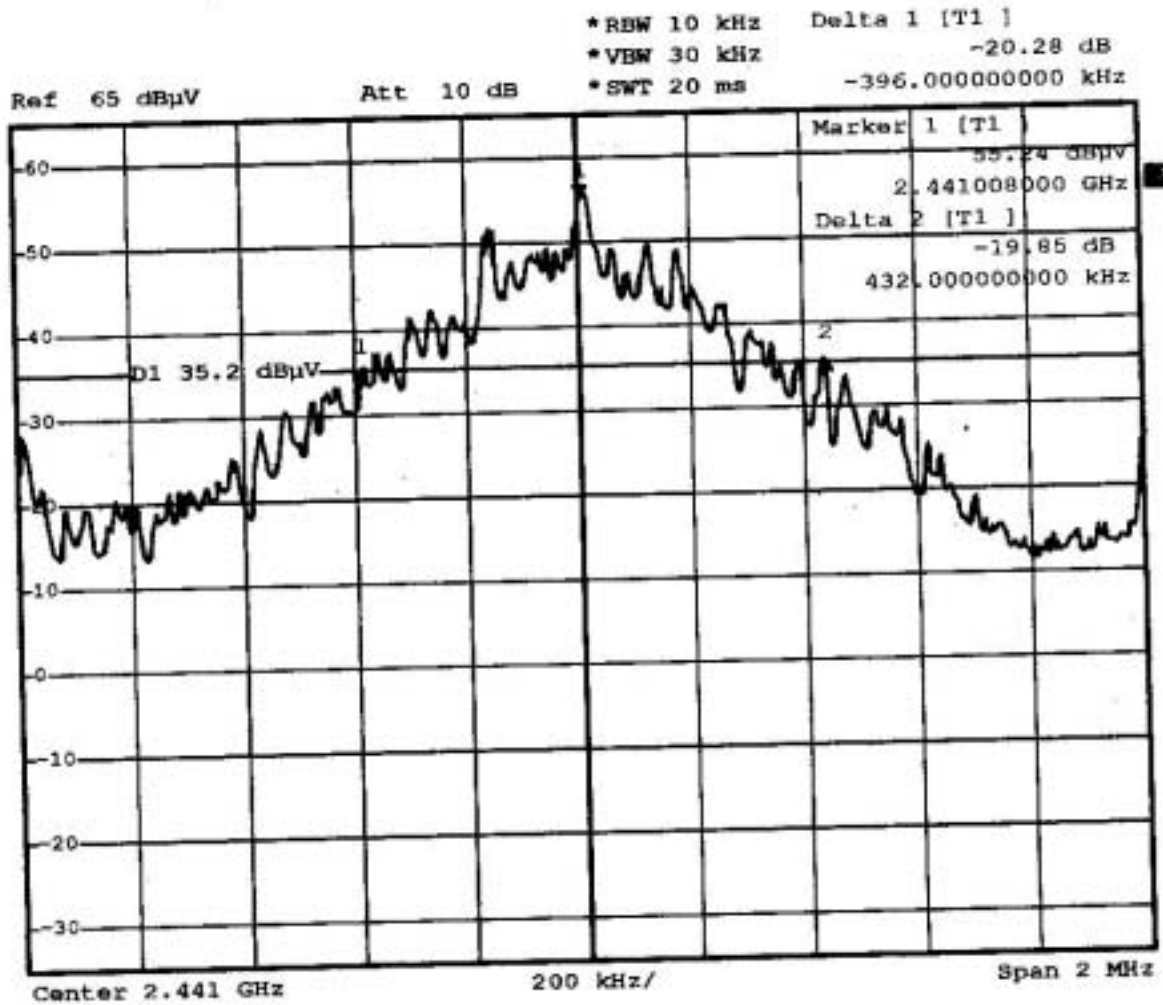
Date: 23.JUN.2003 14:41:02

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



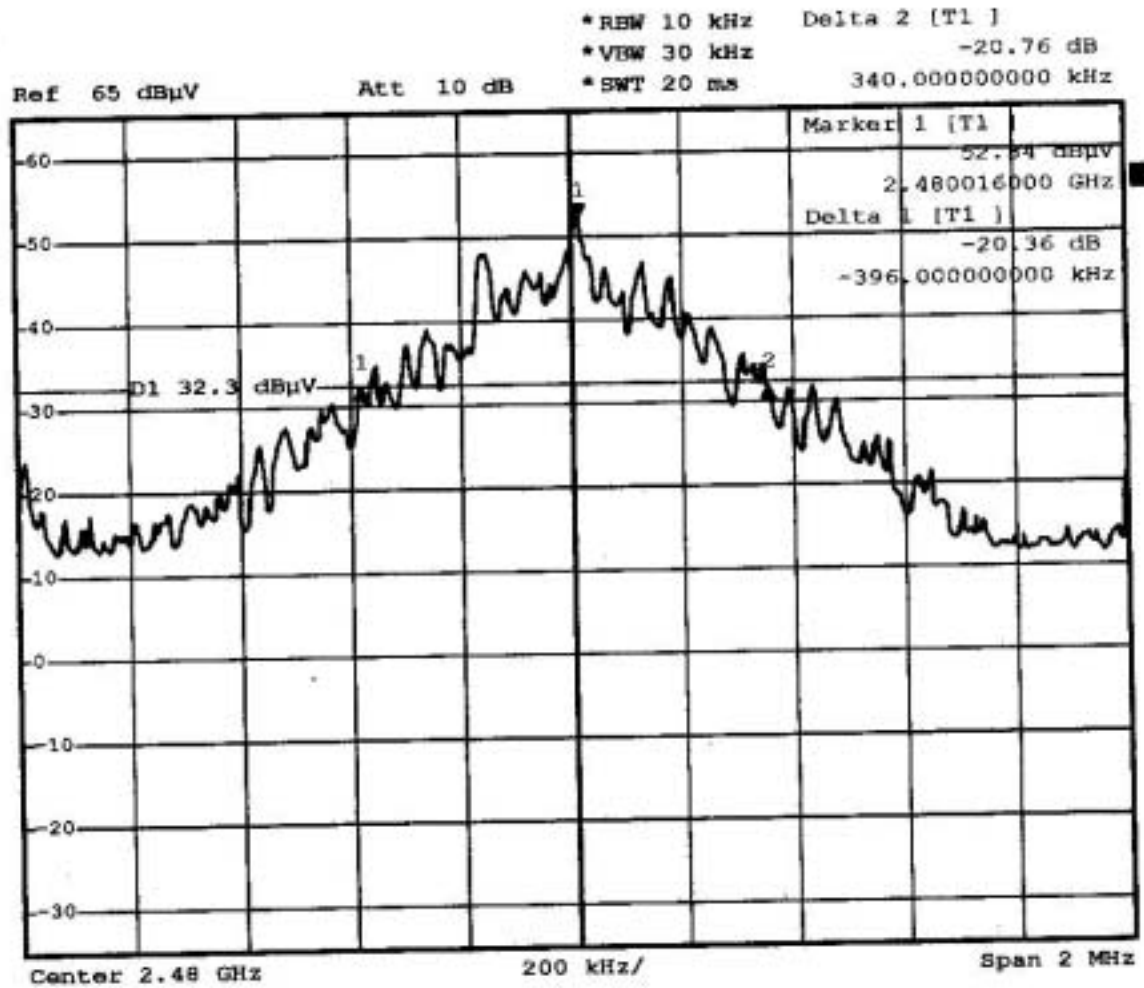
Date: 23.JUN.2003 14:12:47

Channel bandwidth = 780 KHZ



Date: 23.JUN.2003 14:10:12

Channel bandwidth =828 KHZ

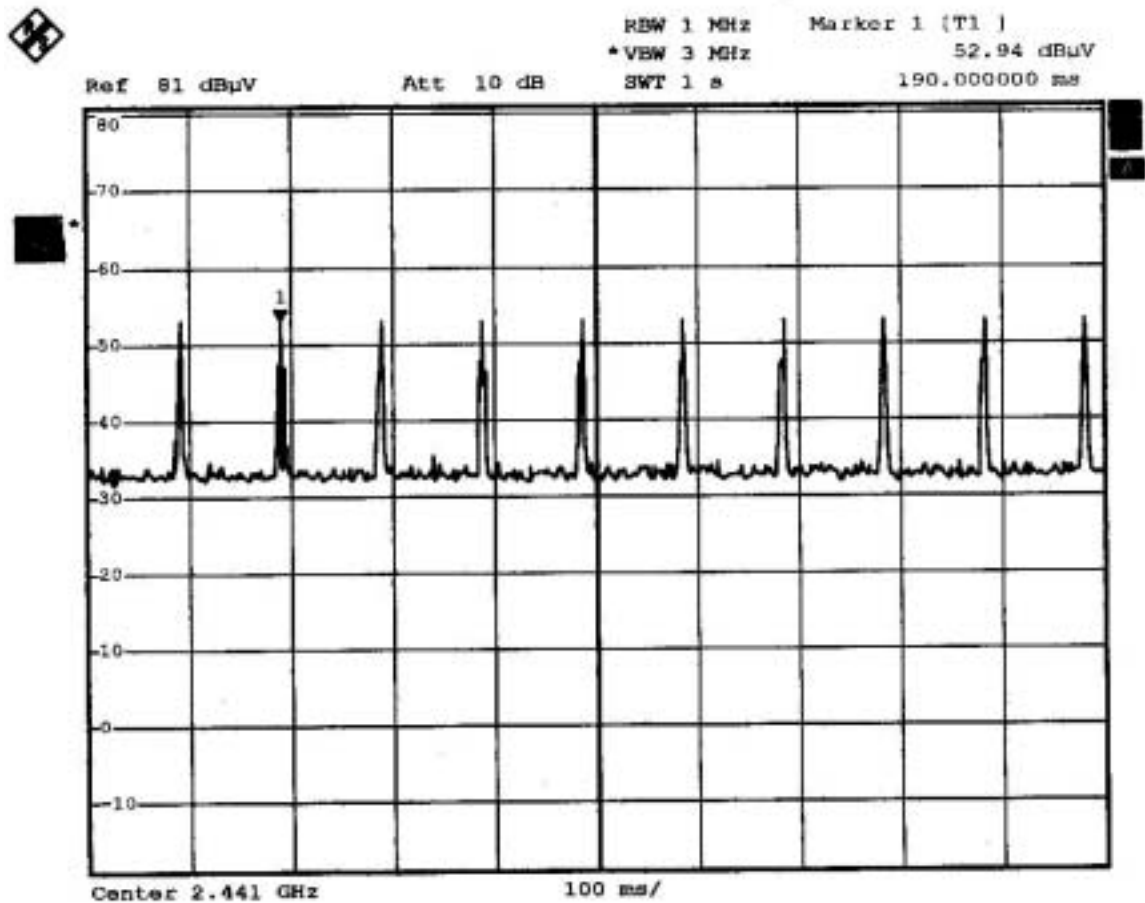


Date: 23.JUN.2003 14:05:57

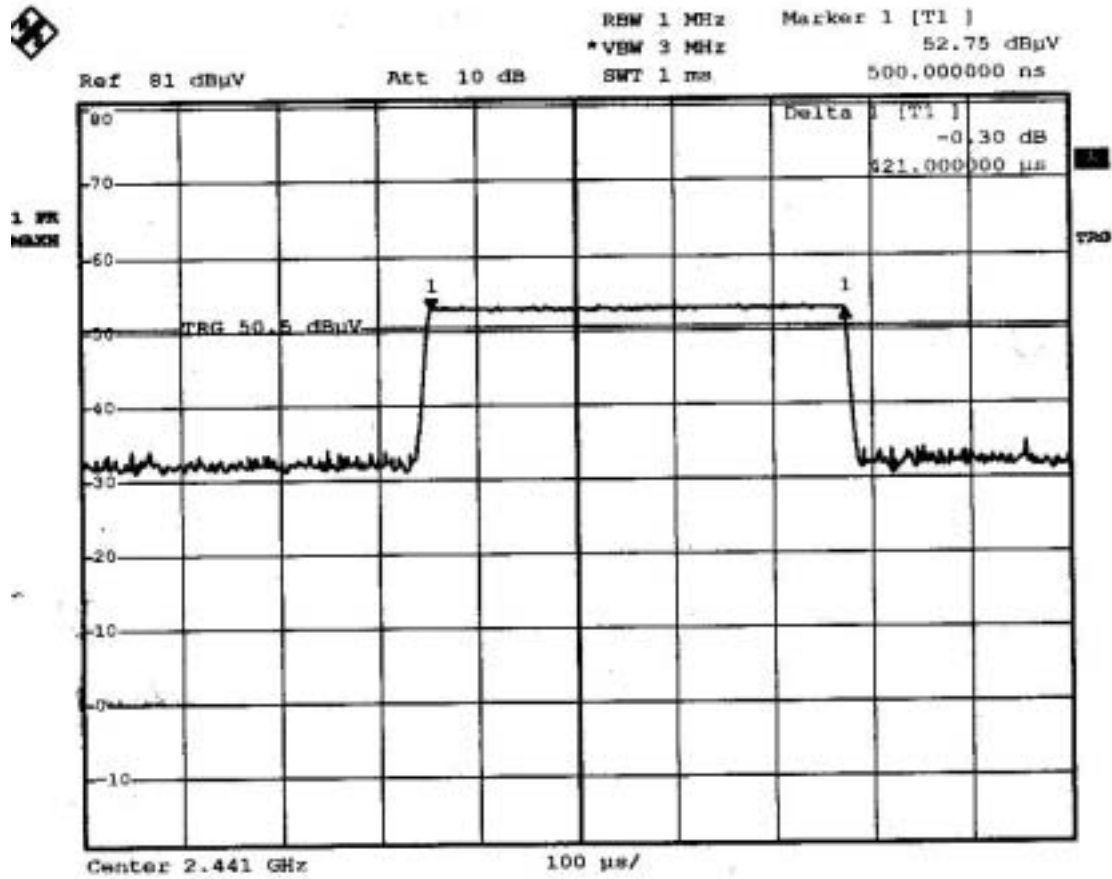
Channel bandwidth = 736 KHZ

#### 4.4 Average Time of Occupancy

#### SUBCLAUSE 15.247(a)(1)(ii)



Date: 23.JUN.2003 14:58:58



Date: 23.JUN.2003 15:07:28

#### 4.5.1 calculation

At channel 2441Mhz, there are 10 bursts in 1 sec. Time period of each burst is 500  $\mu$  Sec. So the occupancy time within 30 second is  $500 \times 10 \times 30 = 150000 \mu$  Sec = 150 mSec = 0.15 Sec.

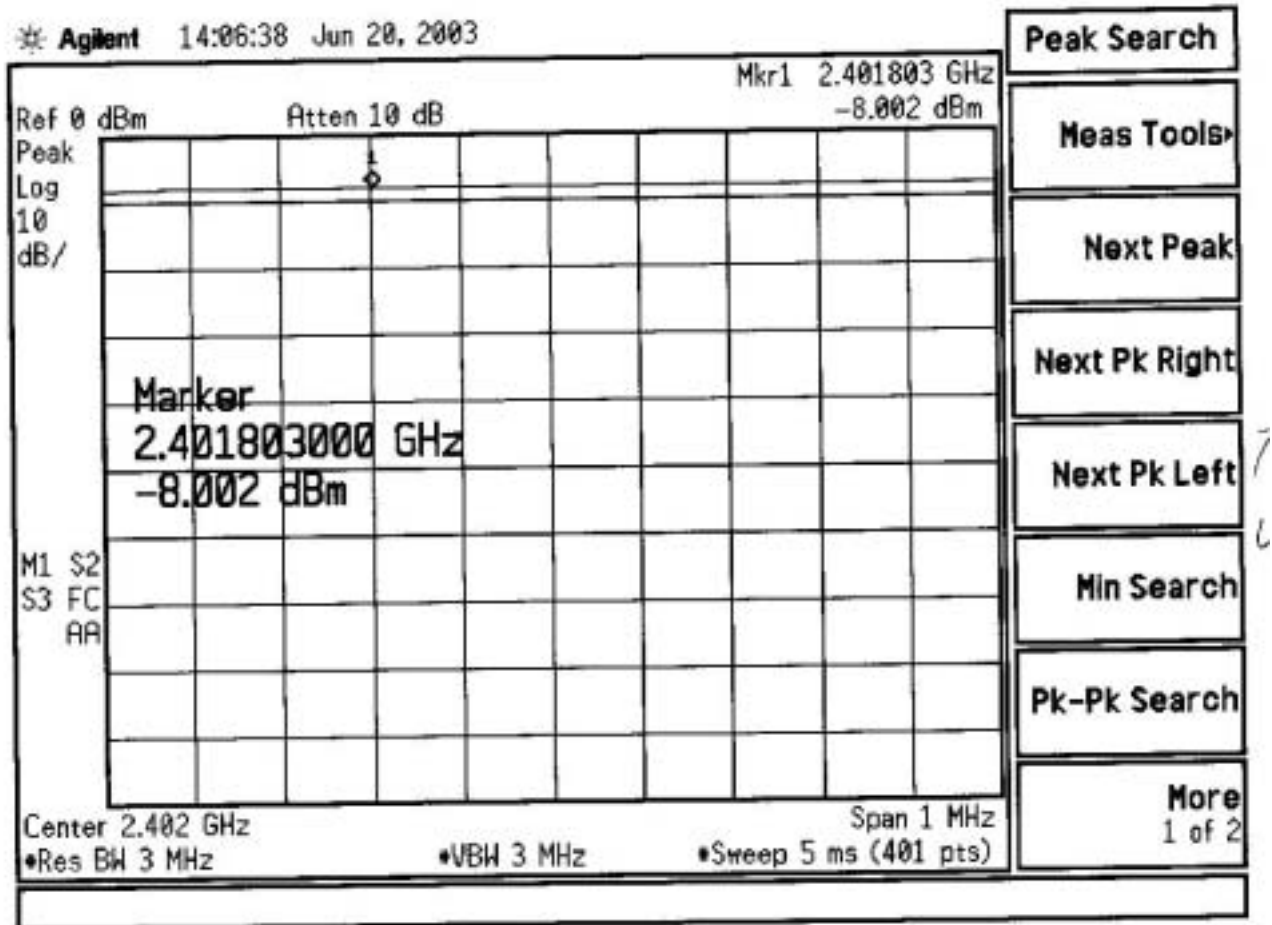
#### 4.5.2 Limits

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.**

**4.5 Peak output Power****SUBCLAUSE15.247(b)(1)**

Transmitter transmit at lowest channel (2402Mhz)

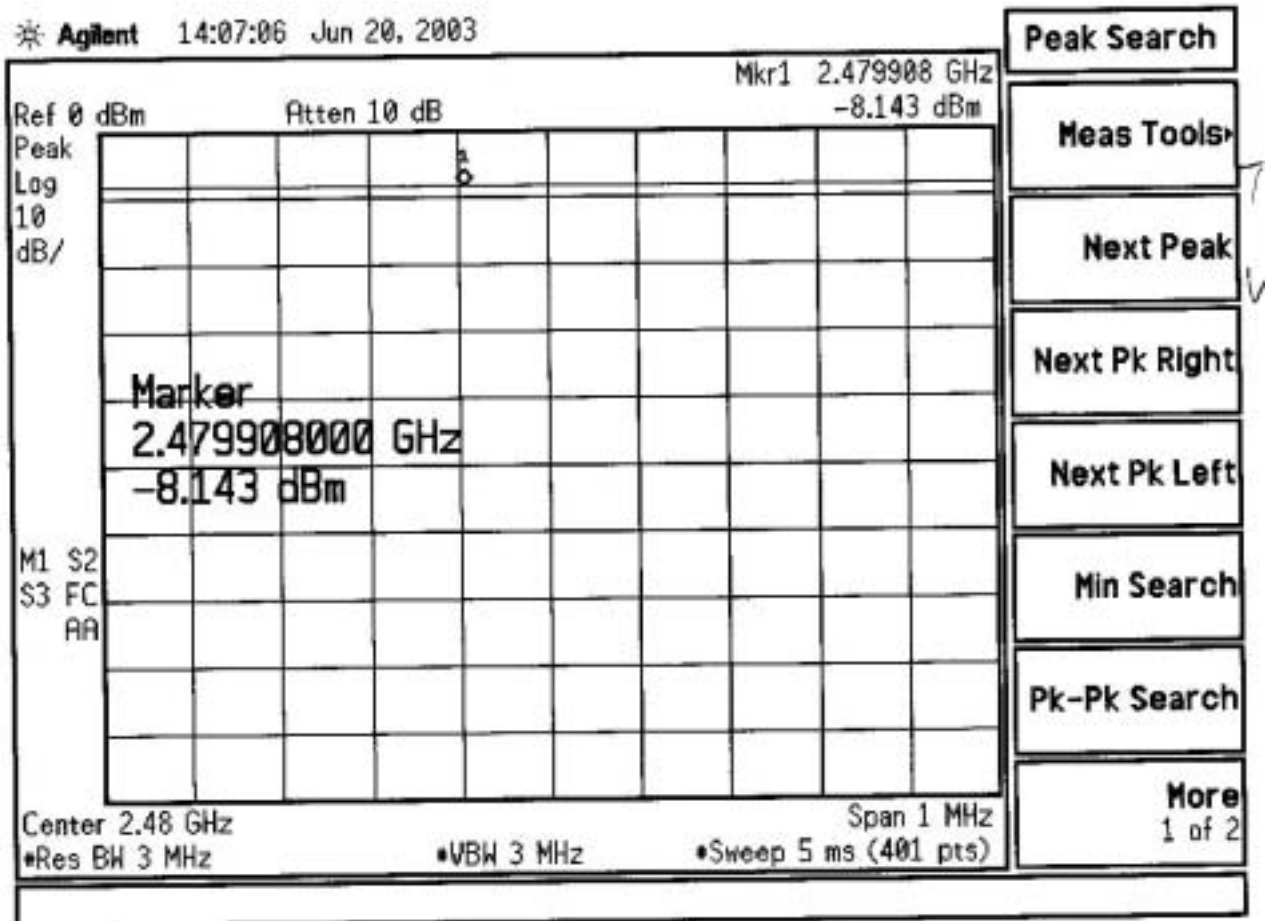


The Power (ERP) = Output power + cable loss + antenna gain

$$= -8.002 \text{ dbm} + 2.7 \text{ db} + 1 \text{ dBi} = -4.302 \text{ dbm}$$



Transmitter transmit at highest channel (2480Mhz)



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

$$= -8.143 \text{ dbm} + 2.7 \text{ db} + 1 \text{ dBi} = -4.443 \text{ dbm}$$

**So the max power happens at 2402Mhz , which equals to  $-4.443 \text{ dbm} = 0.36 \text{ mW}$**

**Limits:**

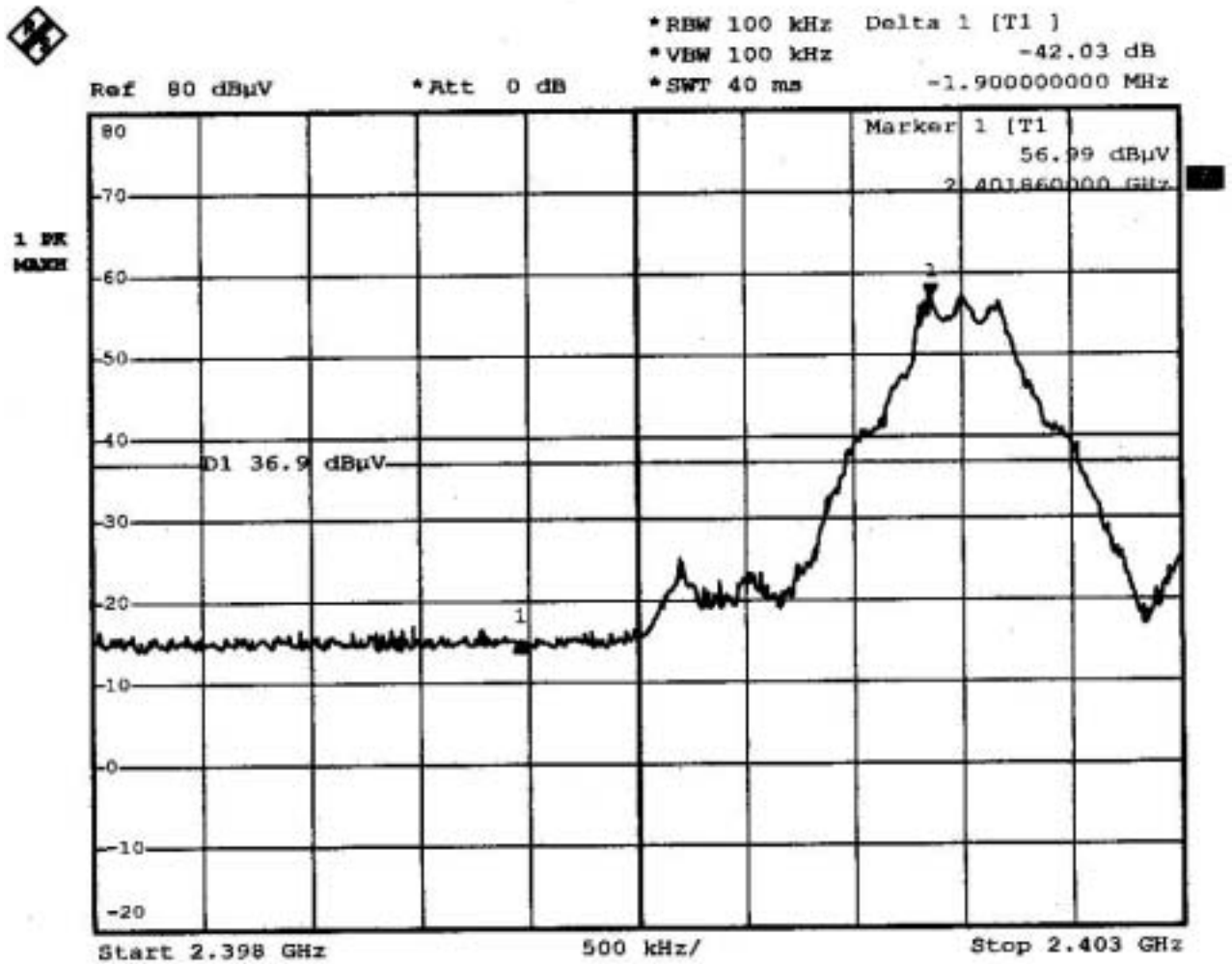
For frequency hopping systems operating in the 2400-2483.5 MHz band employing

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

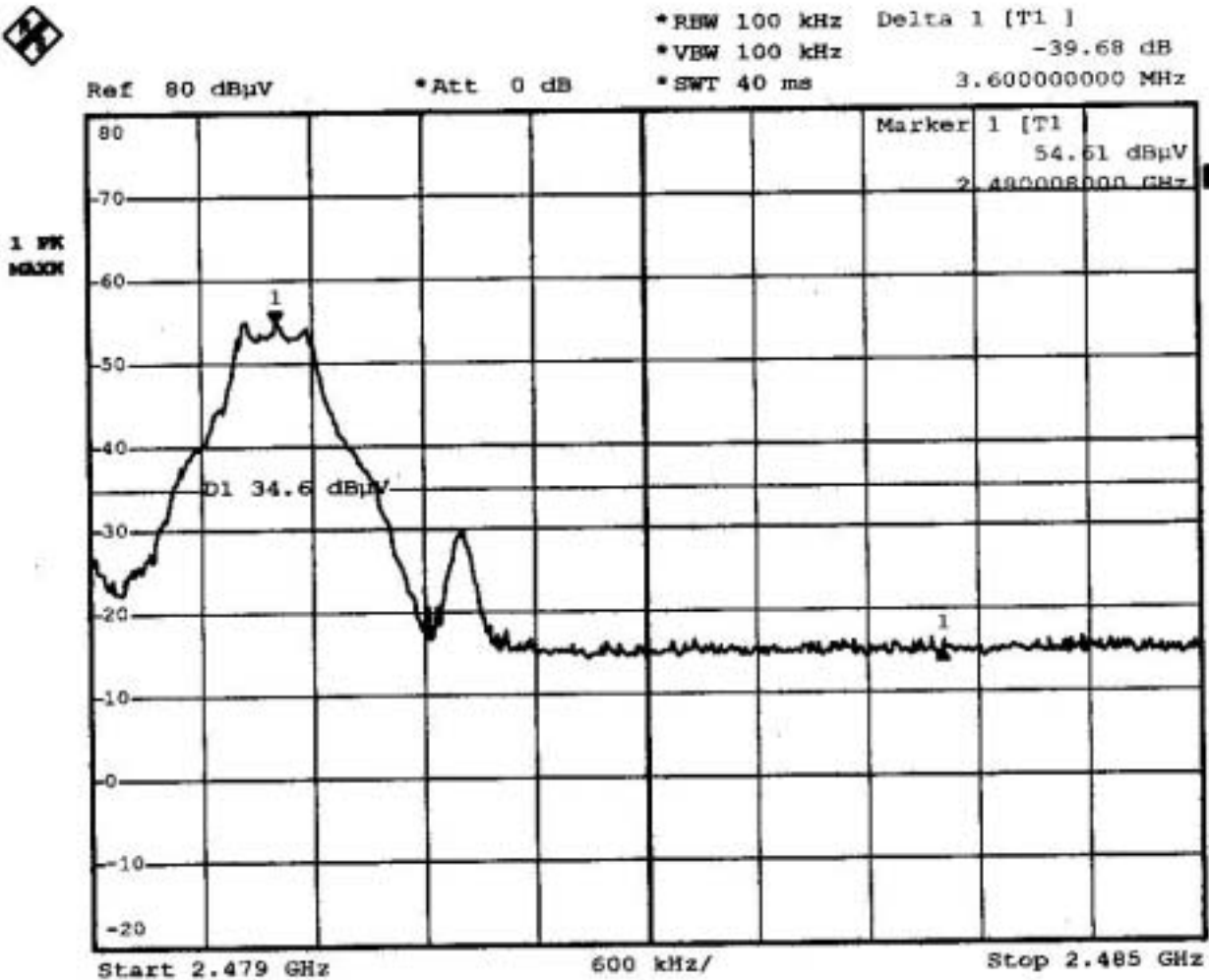
Band, and all direct sequence systems: 1 Watt.

#### 4.6 Band Edge emission

#### SUBCLAUSE15.247(c)



Date: 23.JUN.2003 13:52:28



Date: 23.JUN.2003 13:56:57

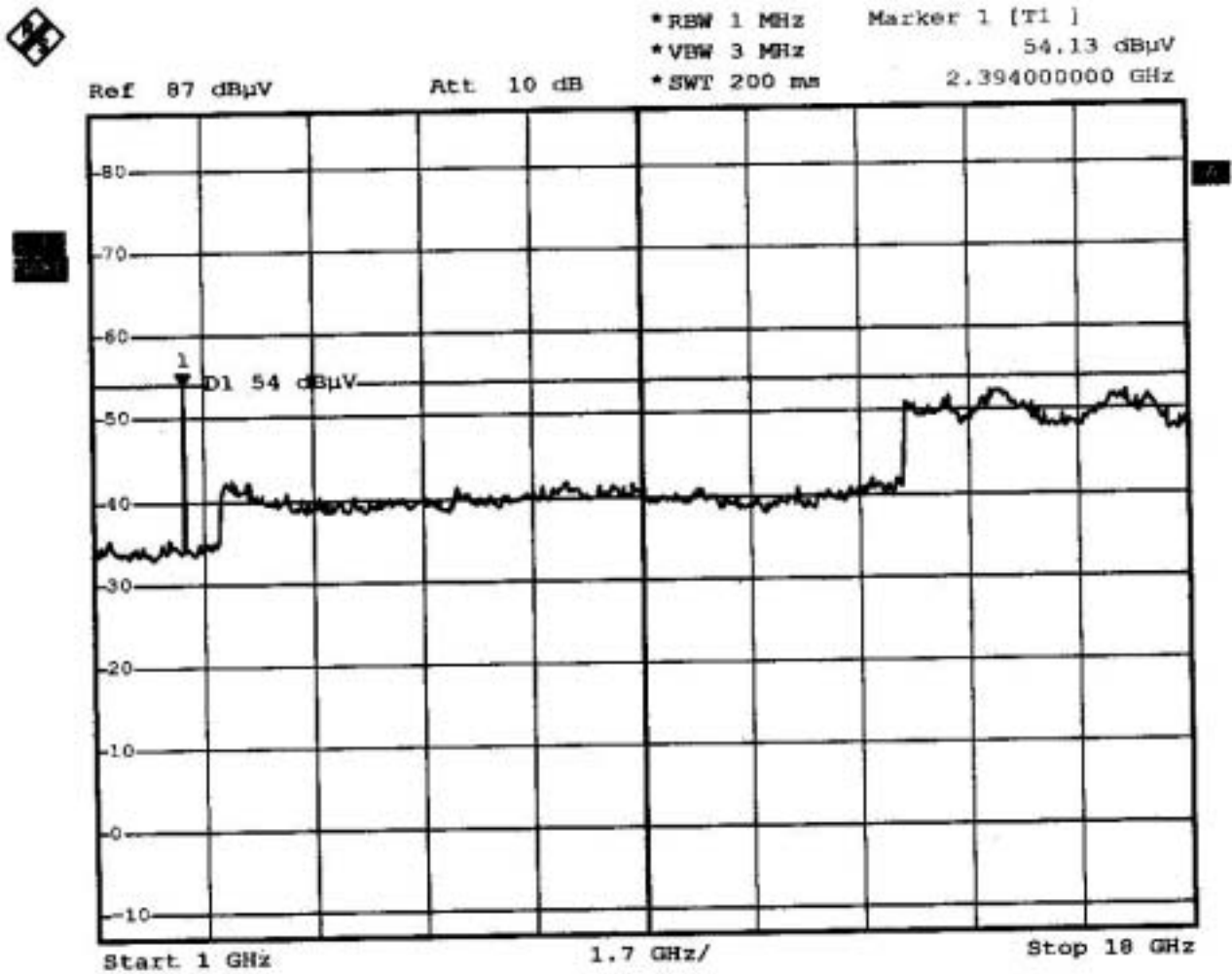
	Lower bandedge	Upper bandedge
Band-edge difference from main channel	42.03 db	39.68 db

#### 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.

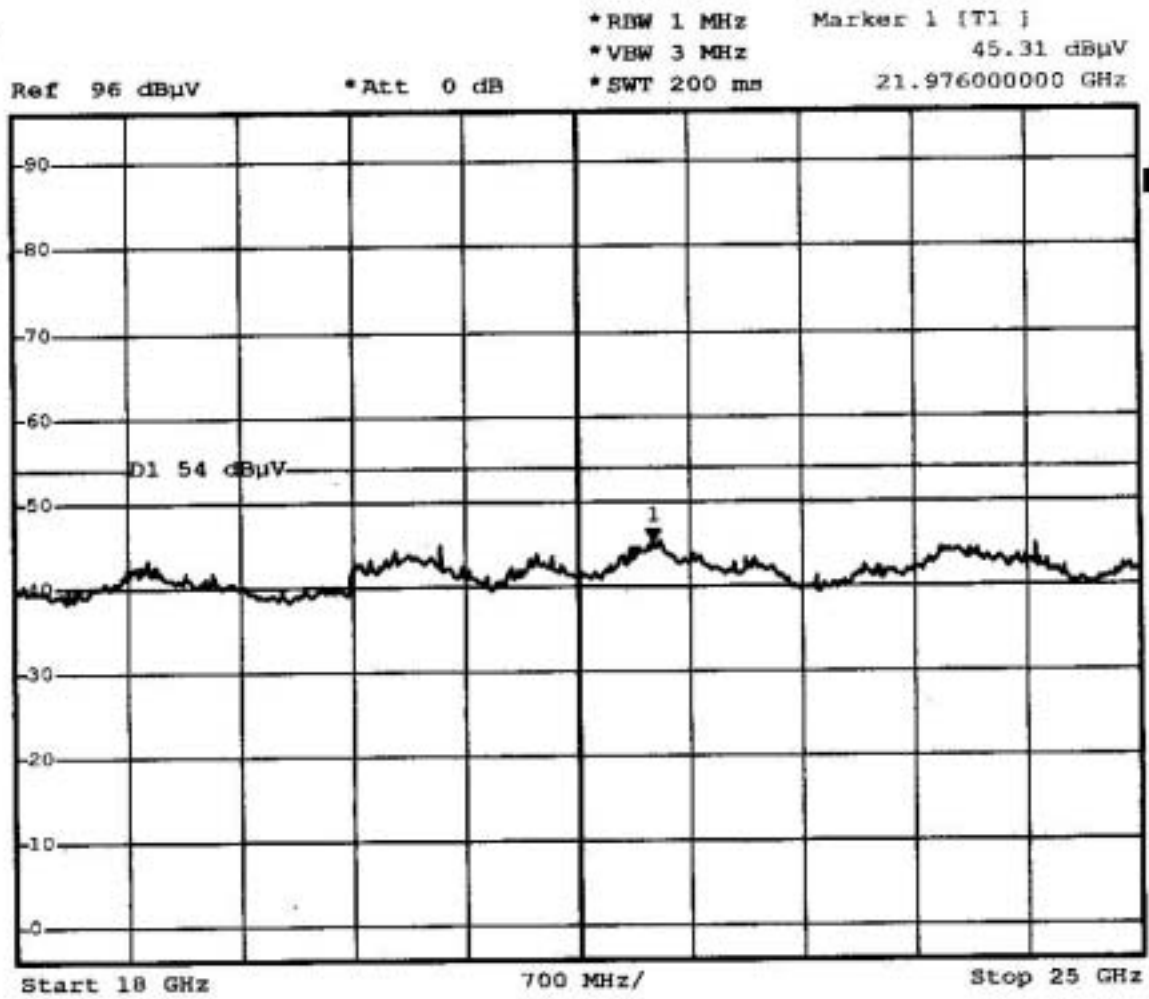
#### 4.7 Spurious Emission under 25Ghz (from 1Ghz) SUBCLAUSE15.247(c)

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



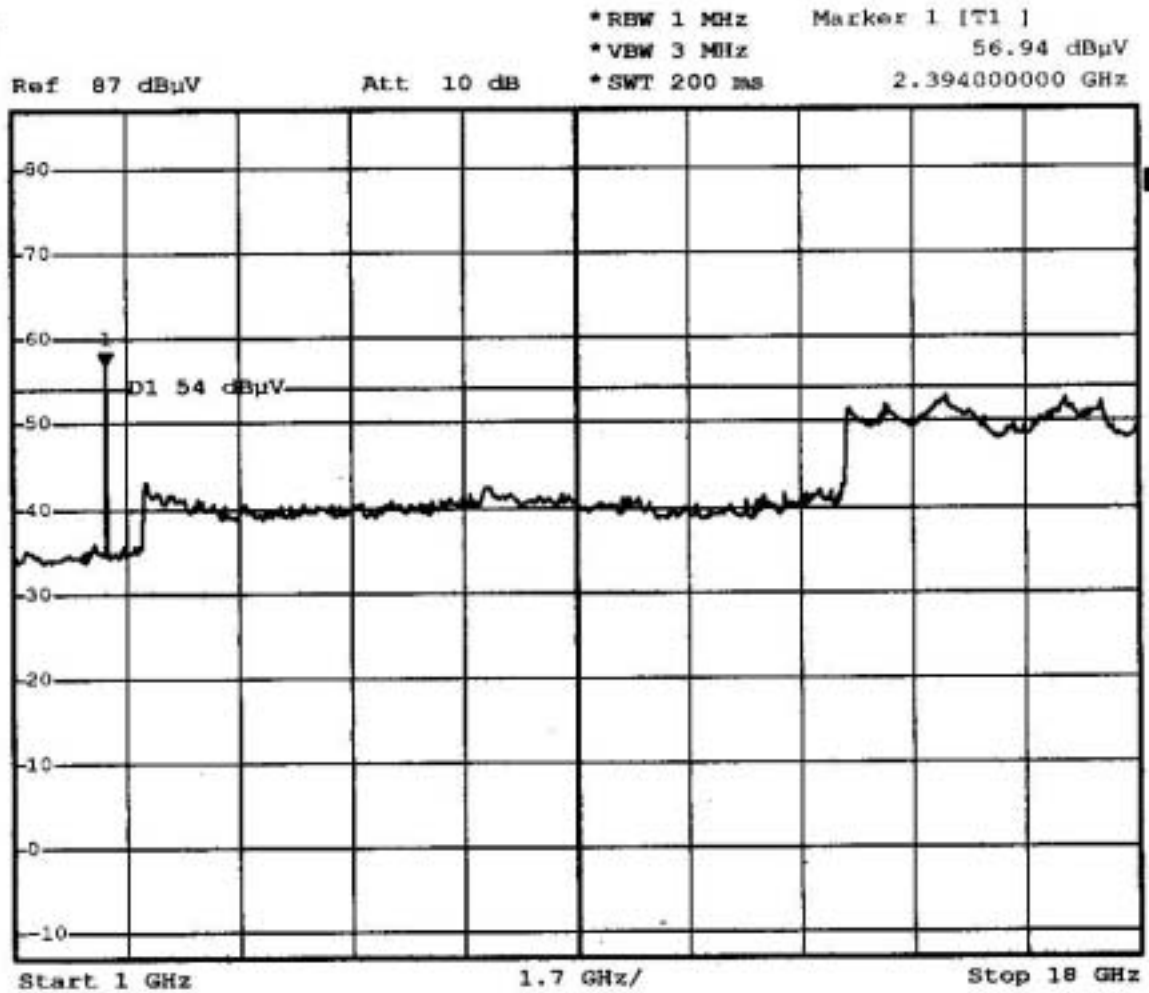
Date: 23.JUN.2003 15:15:50

# 18GHz – 25GHz , Vertical



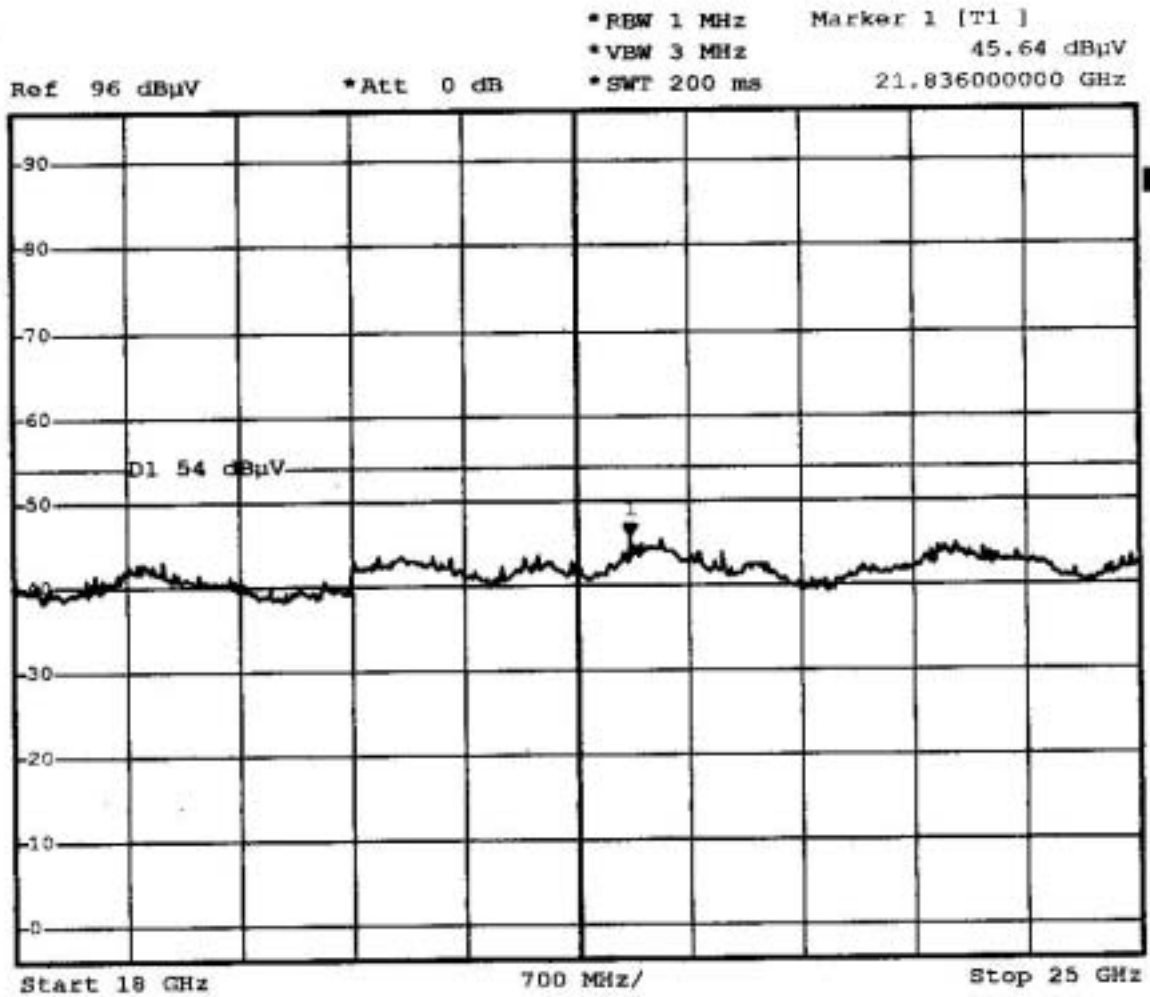
Date: 23.JUN.2003 15:45:55

1Ghz – 18Ghz , Horizontal



Date: 23.JUN.2003 15:15:00

# 18GHz – 25GHz , Horizontal

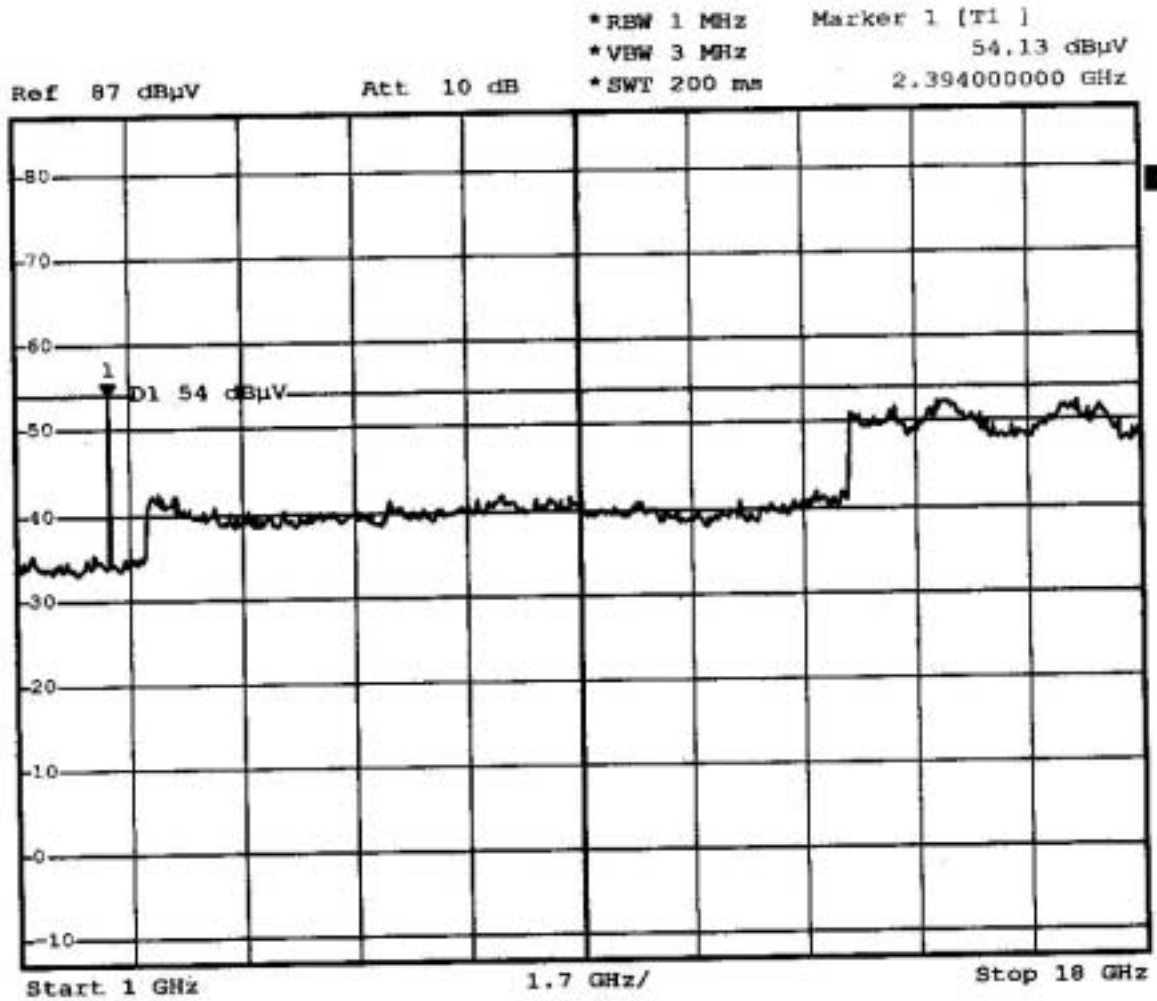


Date: 23.JUN.2003 15:48:00

1 1

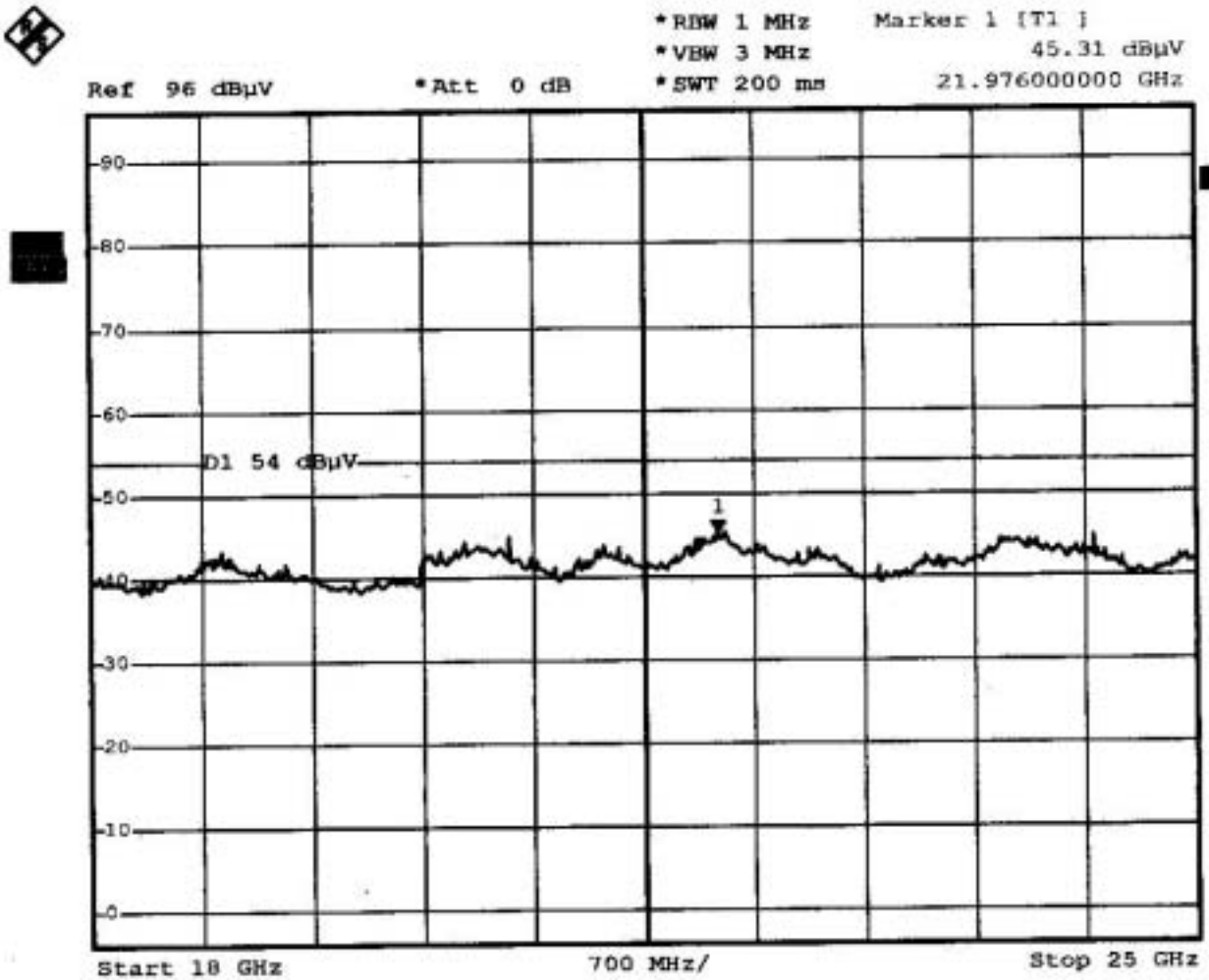


## 2. Transmit at 2441Mhz 1Ghz – 18Ghz , Vertical



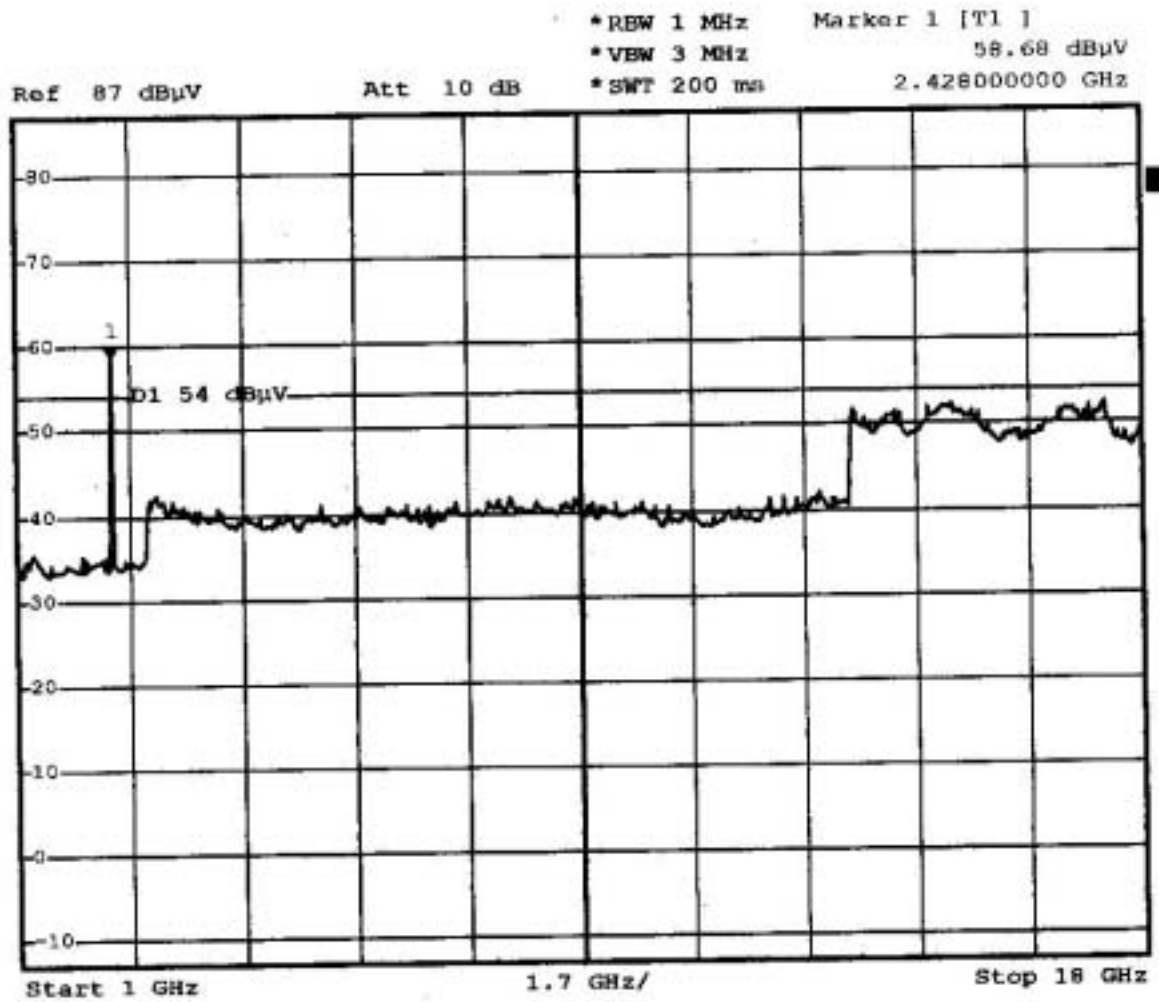
Date: 23.JUN.2003 15:15:50

# 18GHz – 25GHz , Vertical



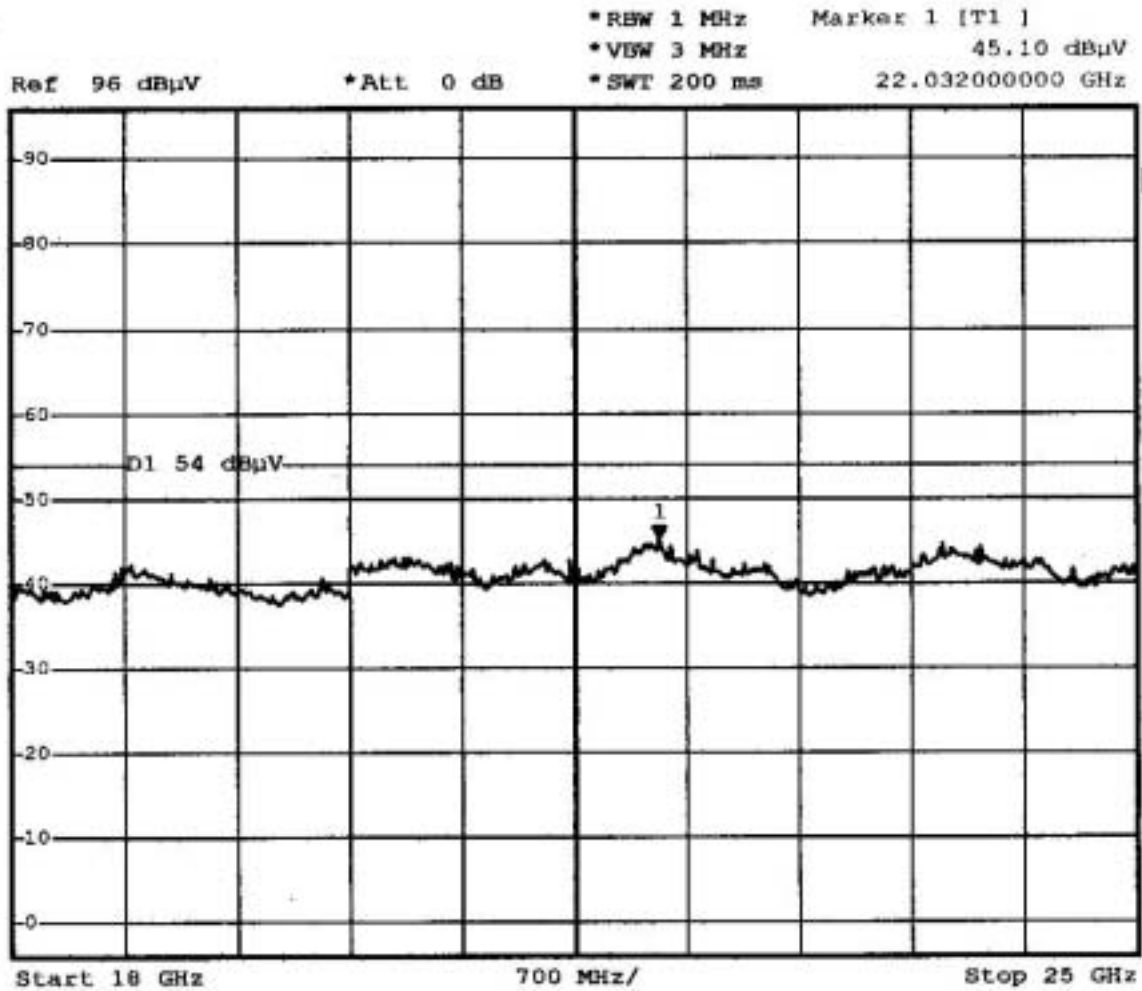
Date: 23.JUN.2003 15:45:55

# 1Ghz – 18Ghz , Horizontal



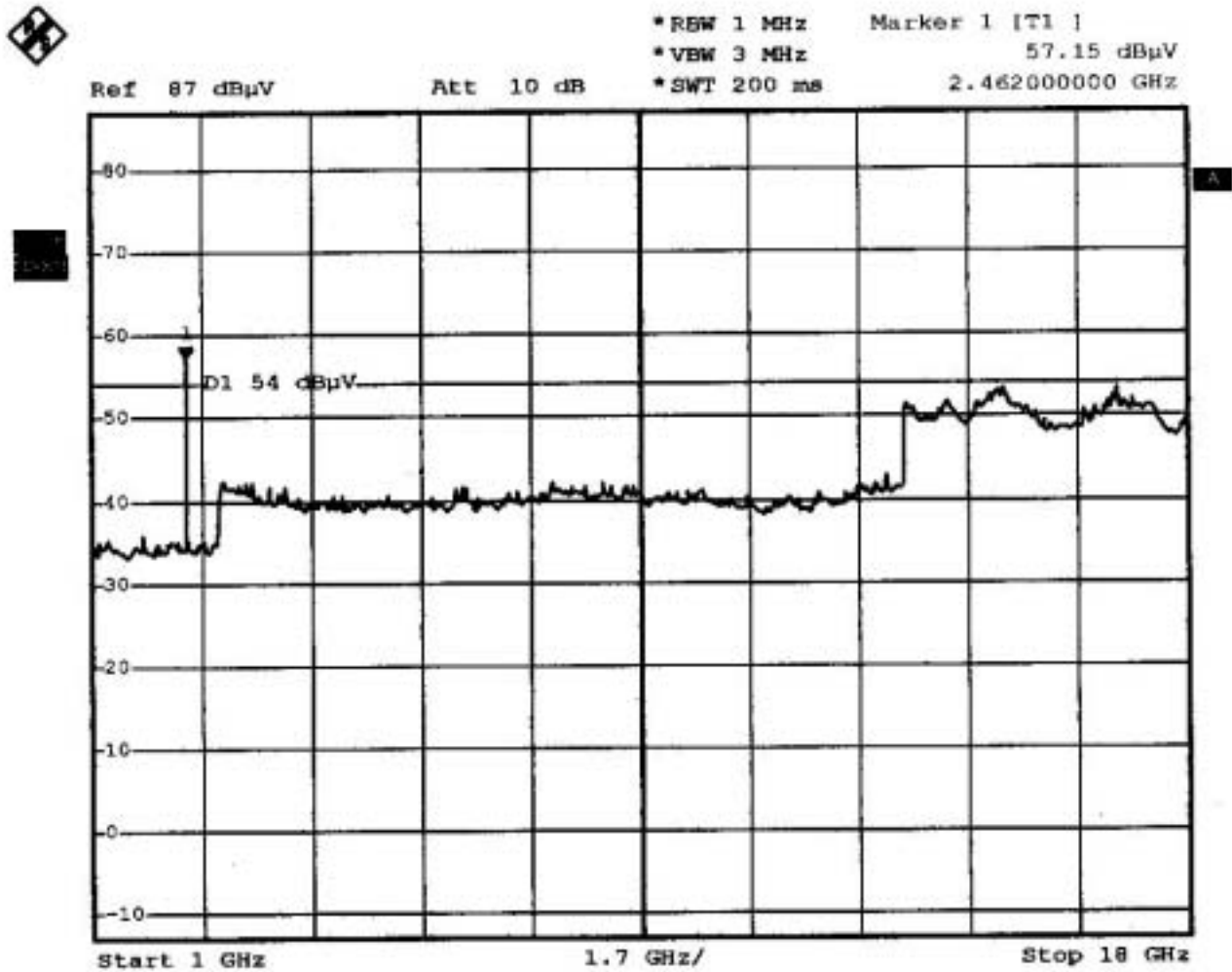
Date: 23.JUN.2003 15:20:14

18GHz – 25GHz , Horizontal



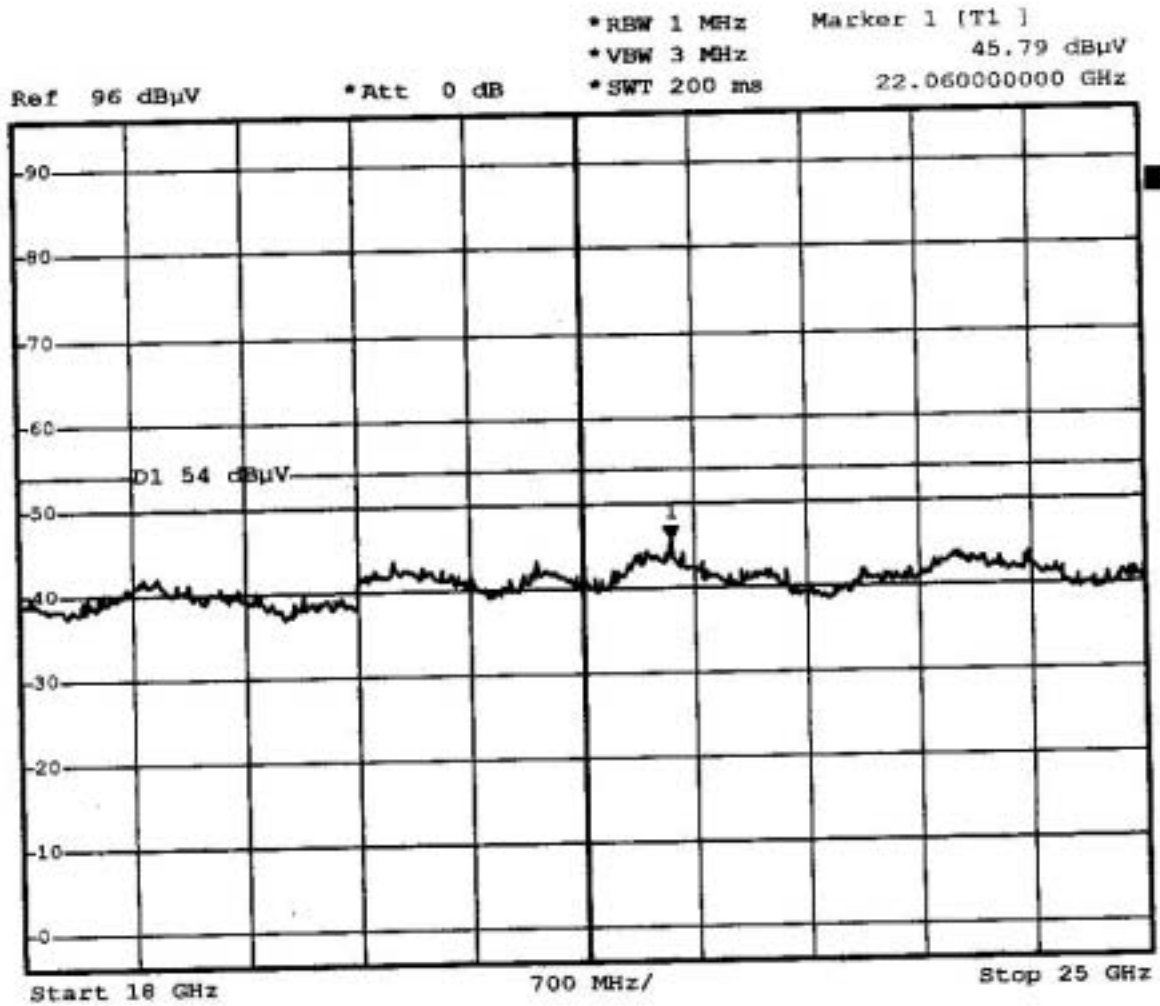
Date: 23.JUN.2003 15:47:14

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



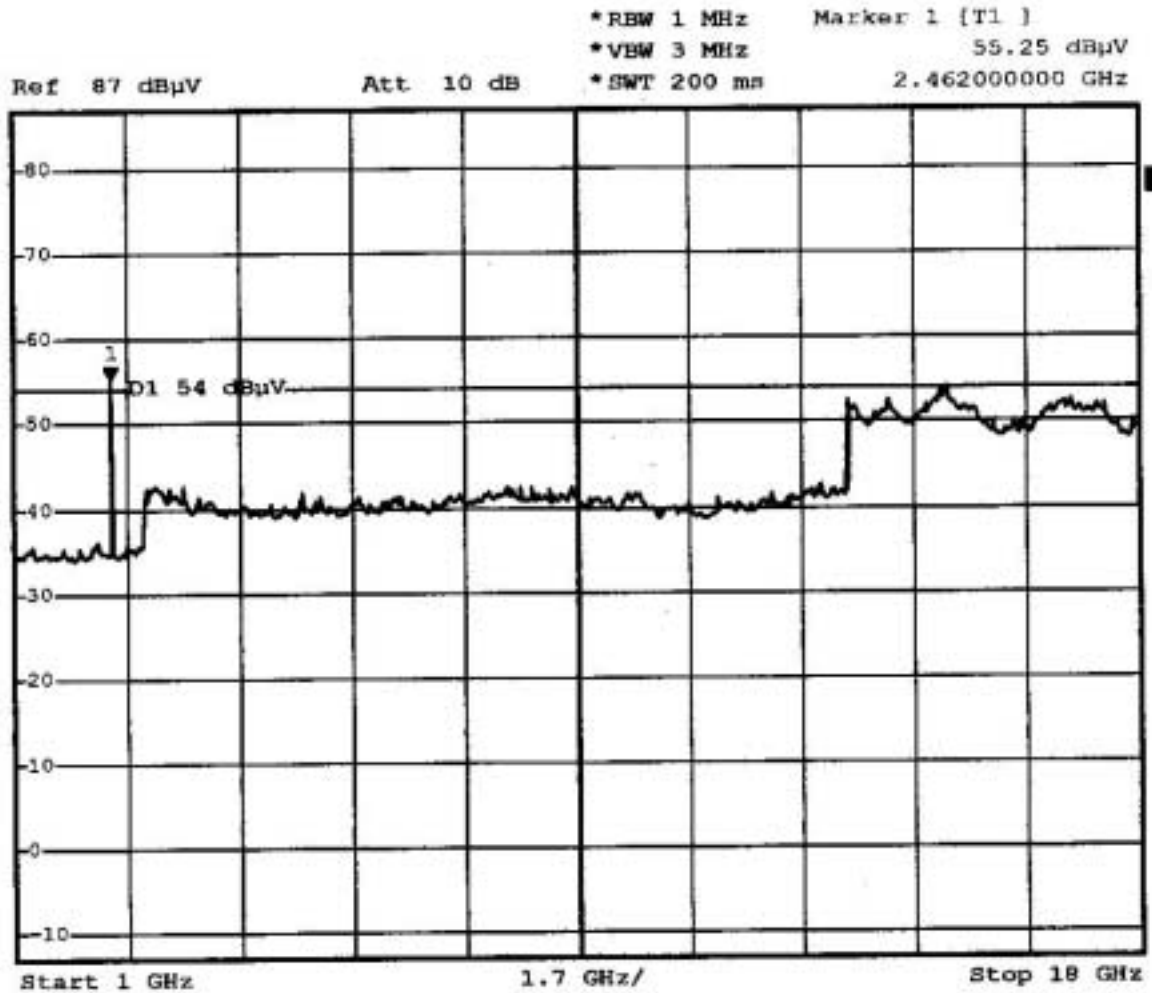
Date: 23.JUN.2003 15:26:57

# 18GHz – 25GHz , Vertical



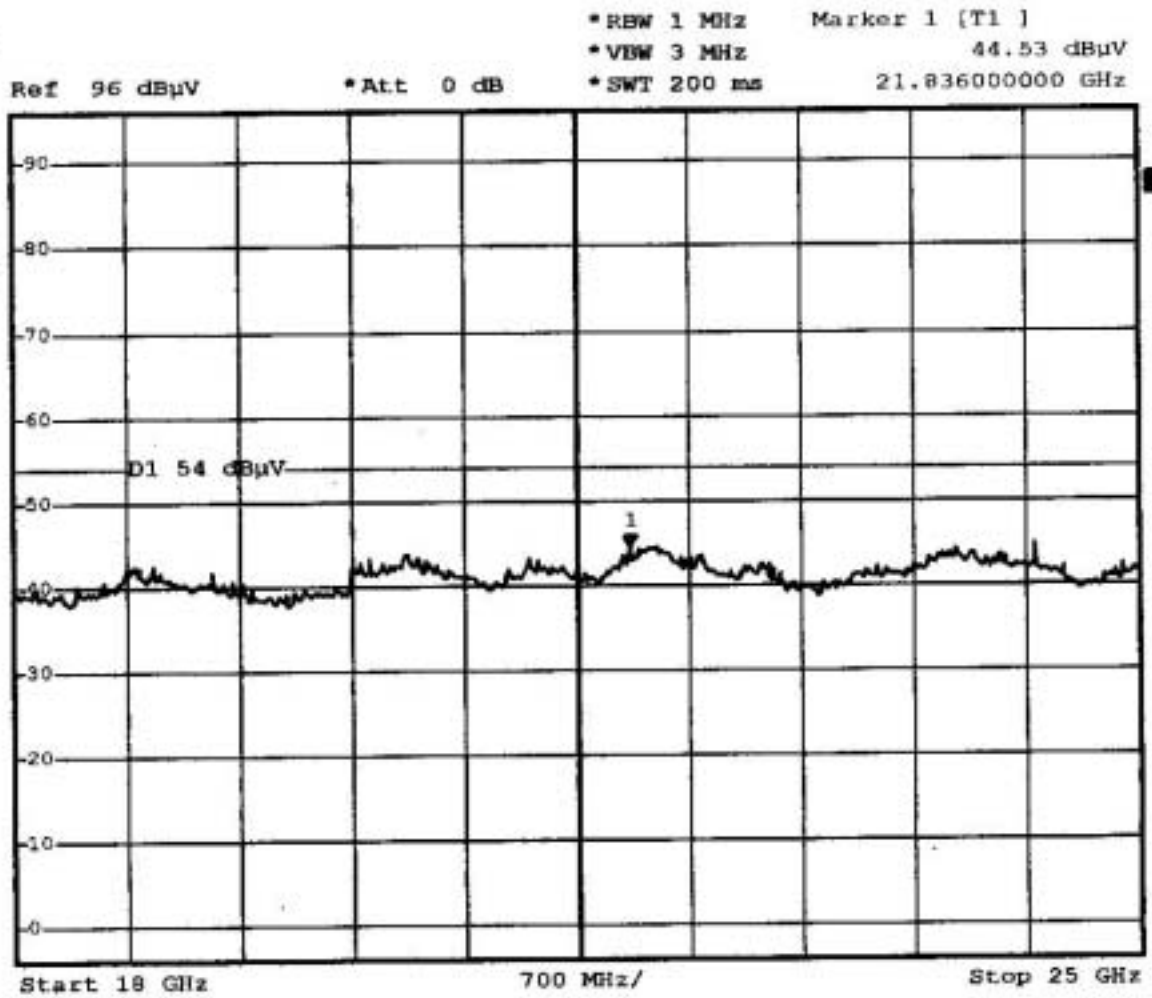
Date: 23.JUN.2003 15:44:49

# 1Ghz – 18Ghz , Horizontal



Date: 23.JUN.2003 15:25:29

18Ghz – 25Ghz , Horizontal



Date: 23.JUN.2003 15:45:19

- 111

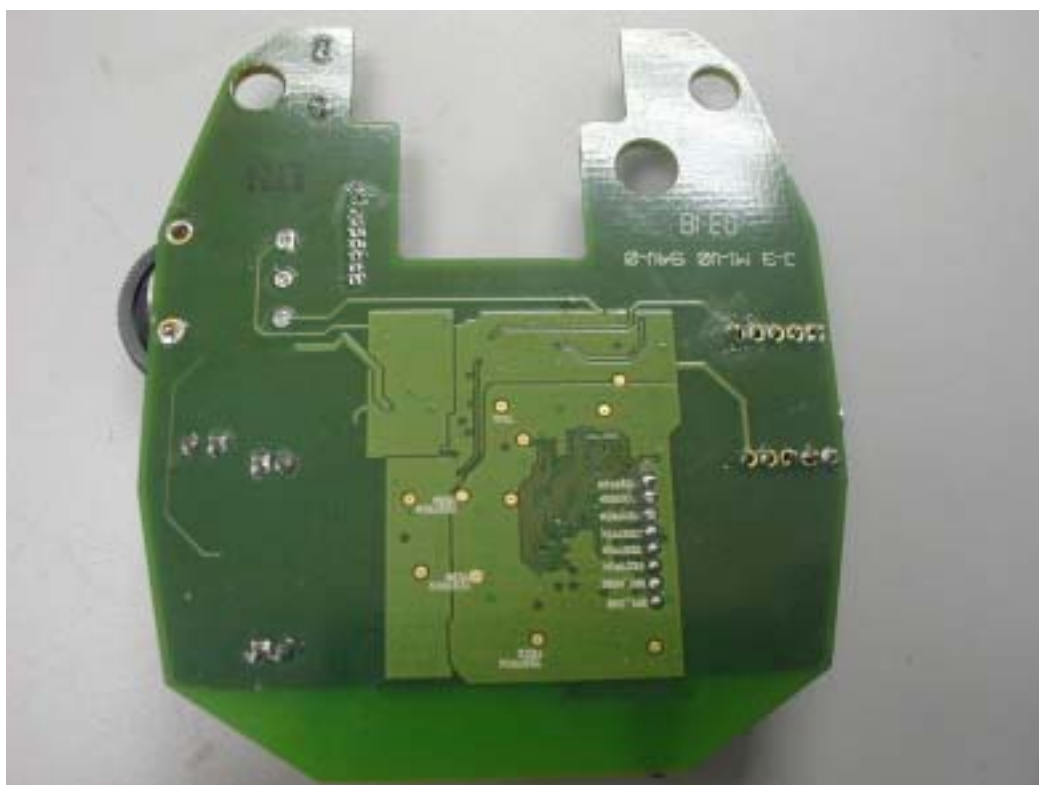


**APPENDIX: Photographs of Test Setup**



## APPENDIX : Photographs of EUT

### Internal Photos



## External Photos

