

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

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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

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 | PASS | 8 |
| 15.247(a)(1) | Channel Spacing | PASS | 15 |
| 15.247(a)(1)(ii) | 20db bandwidth / No. of channels | PASS | 16 |
| 15.247(a)(1)(ii) | Average Time of Occupancy | PASS | 21 |
| 15.247(b)(1) | Peak Output power | PASS | 24 |
| 15.247(c) | Band-Edge Emission | PASS | 27 |
| 15.247(c) | Spurious Emission under 25Ghz | PASS | 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

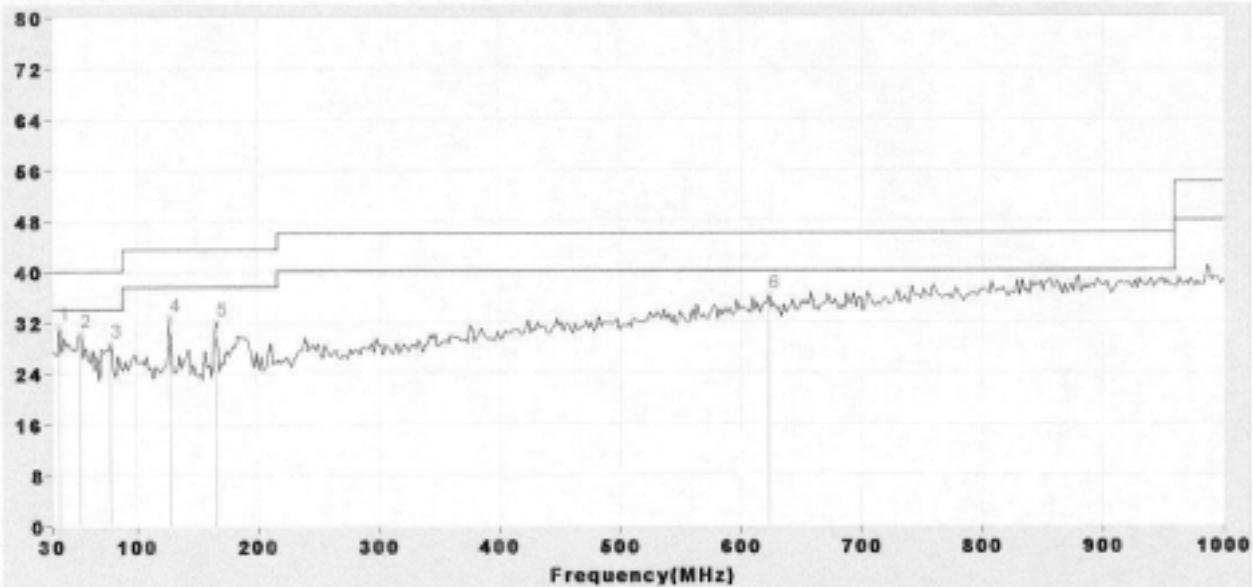
4.1 Radiated emission Limits, general requirement SUBCLAUSE 15.209

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

SGS EMC Lab. Site 2
EMI TESTING REPORT

Customer: Date:2003-06-23 Time:15:57
 Model : Polar. :Vertical- 3M
 Spec. : Report No.:
 Ser. No.:Car kit(2402 MHz) File :-1
 Limit :FCC_B Tester :Alex
 Tmp.(C):22.0 Humid.(%):59

Level(dBuV)



MEMO:

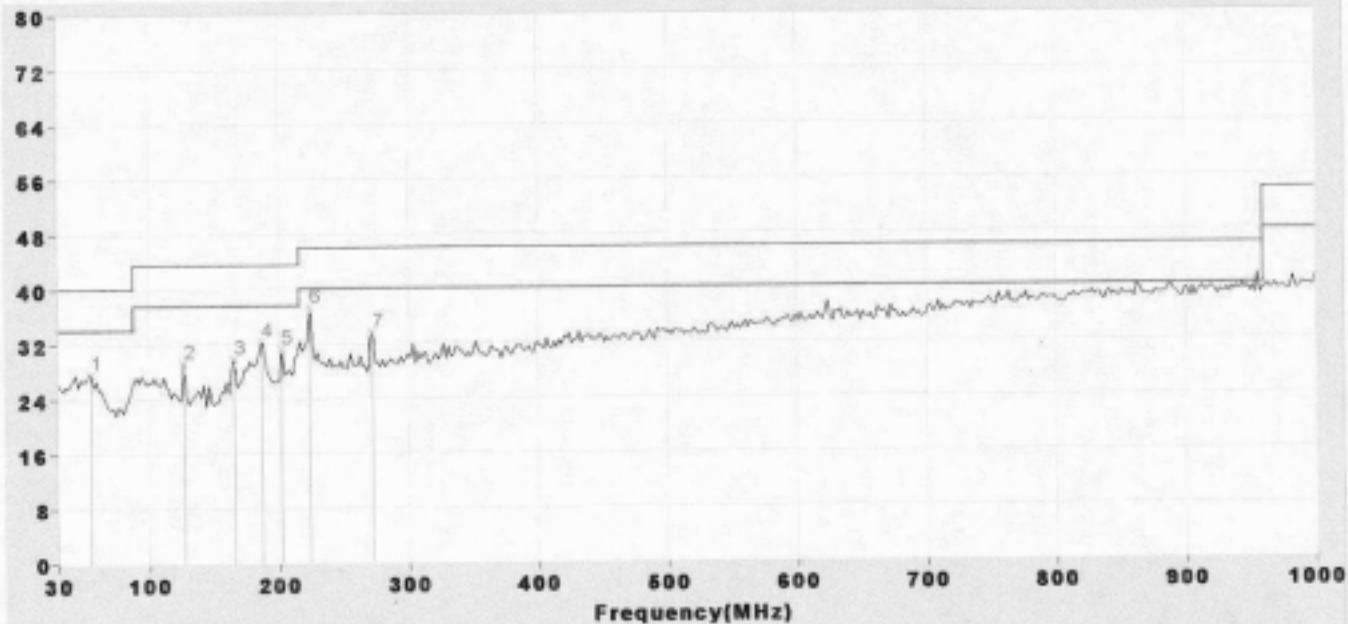
| | Freq | Level | Over Limit | Limit | Read Line | Antenna Factor | Cable Factor | Other Factor |
|---|--------|-------|------------|-------|-----------|----------------|--------------|--------------|
| | MHz | dB | dB | dB | dB | dB | dB | dB |
| 1 | 35.82 | 31.43 | -8.57 | 40.00 | 19.73 | 11.26 | 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: Date:2003-06-23 Time:15:56
 Model : Polar. :Horizontal- 3M
 Spec. : Report No.:
 Ser. No.:Car kit(2402 MHz) File : -1
 Limit :FCC_B Tester : Alex
 Tmp.(C):22.0 Humid.(%):59

Level(dBuV)



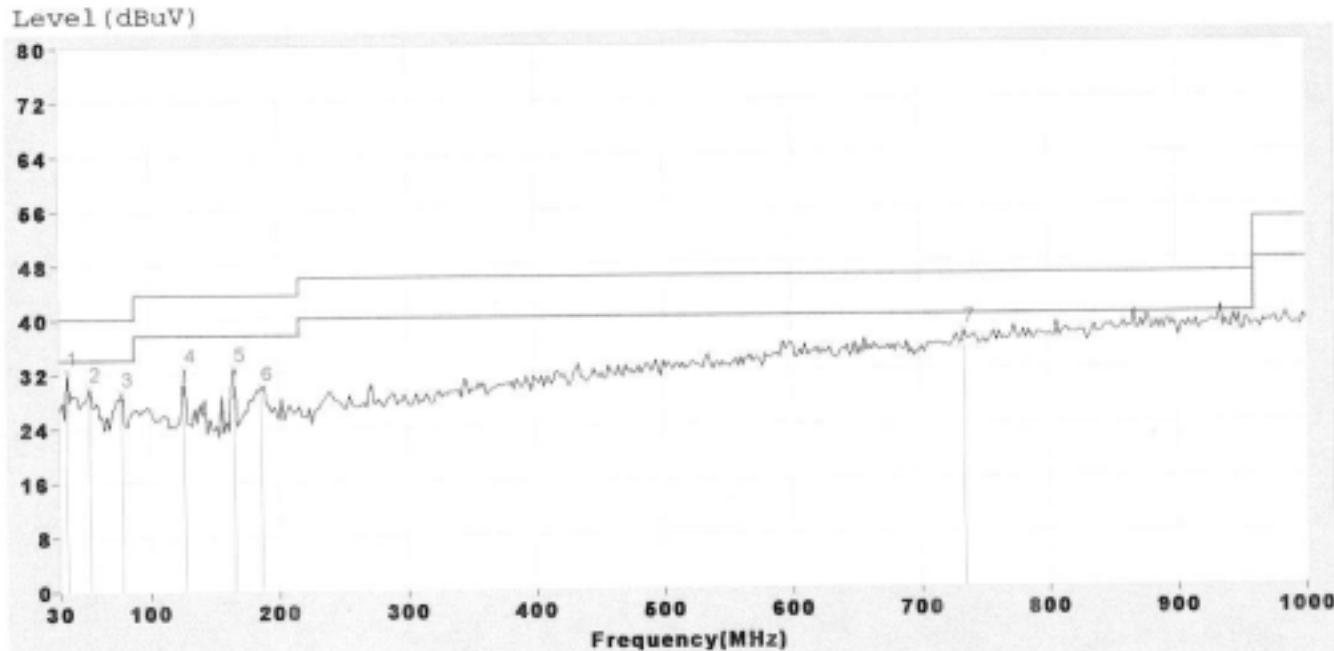
MEMO:

| | Freq | Level | Over Limit | Limit | Read Line | Antenna Factor | Cable Factor | Other 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: Date:2003-06-23 Time:16:02
 Model : Polar. :Vertical- 3M
 Spec. : Report No.:
 Ser. No.:Car kit(2441 MHz) File : -1
 Limit :FCC_B Tester :Alex
 Tmp. (C):22.0 Humid. (%):59



MEMO:

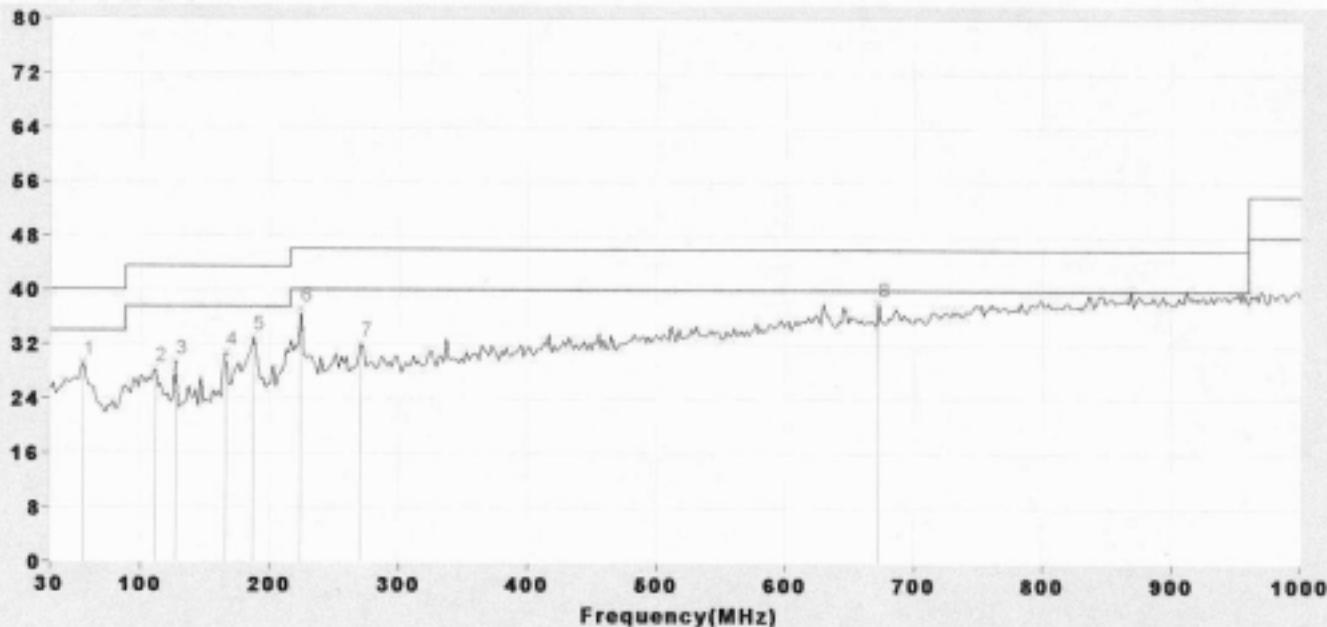
| | Freq | Level | Over Limit | Limit Line | Read Level | Antenna Factor | Cable Factor | Other Factor |
|---|--------|-------|------------|------------|------------|----------------|--------------|--------------|
| | MHz | dB | dB | dB | dB | dB | dB | dB |
| 1 | 35.82 | 32.50 | -7.50 | 40.00 | 20.81 | 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: Date:2003-06-23 Time:16:01
Model : Polar. :Horizontal- 3M
Spec. : Report No.:
Ser. No.:Car kit(2441 MHz) File :-1
Limit :FCC_B Tester :Alex
Tmp. (C):22.0 Humid. (%):59

Level (dBuV)



MEMO:

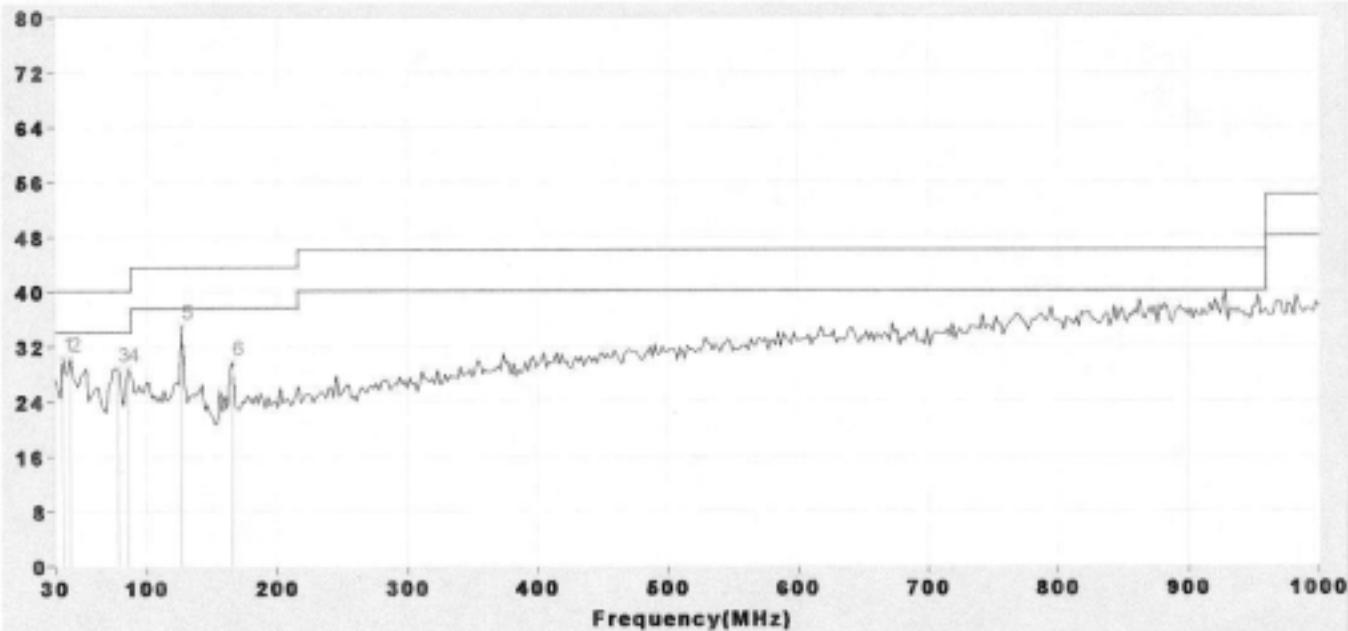
| Freq | Level | Over Limit | Limit | Read Line | Antenna | Cable | Other |
|------|--------|------------|--------|-----------|---------|-------|-------|
| MHz | dB | dB | dB | dB | dB | dB | dB |
| 1 | 55.22 | 29.21 | -10.79 | 40.00 | 16.92 | 11.75 | 0.55 |
| 2 | 111.48 | 28.32 | -15.18 | 43.50 | 16.81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

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

SGS EMC Lab. Site 2
EMI TESTING REPORT

Customer: Date:2003-06-23 Time:16:08
 Model : Polar. :Vertical- 3M
 Spec. : Report No.:-
 Ser. No.:Car kit(2480 MHz) File :-1
 Limit :FCC_B Tester :Alex
 Tmp. (C):22.0 Humid. (%):59

Level (dBuV)



MEMO:

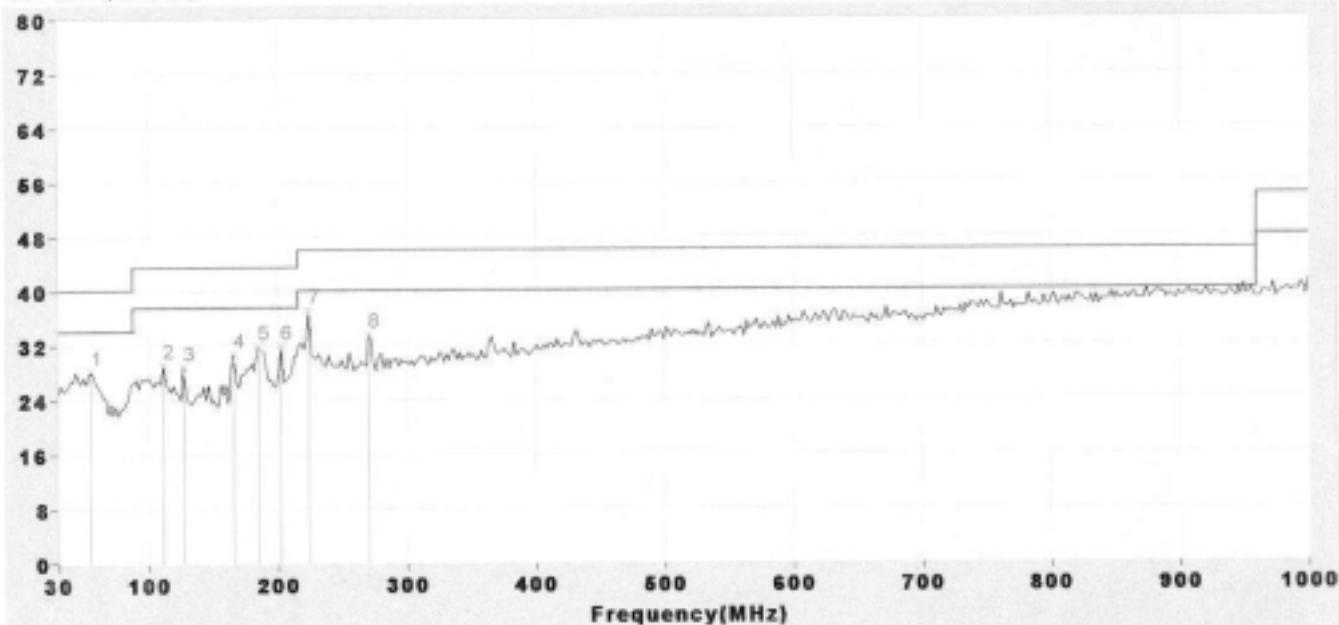
| Freq | Level | Over | Limit | Read | Antenna | Cable | Other |
|------|--------|-------|--------|-------|---------|-------|-------|
| | | ----- | ----- | ----- | ----- | ----- | ----- |
| MHz | dB | dB | dB | dB | dB | dB | dB |
| 1 | 35.82 | 30.40 | -9.60 | 40.00 | 18.71 | 11.26 | 0.43 |
| 2 | 41.64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

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

SGS EMC Lab. Site 2
EMI TESTING REPORT

Customer: Date:2003-06-23 Time:16:04
 Model : Polar. :Horizontal- 3M
 Spec. : Report No.:
 Ser. No.:Car kit(2480 MHz) File :-1
 Limit :FCC_B Tester :Alex
 Tmp. (C):22.0 Humid. (%):59

Level (dBuV)



MEMO:

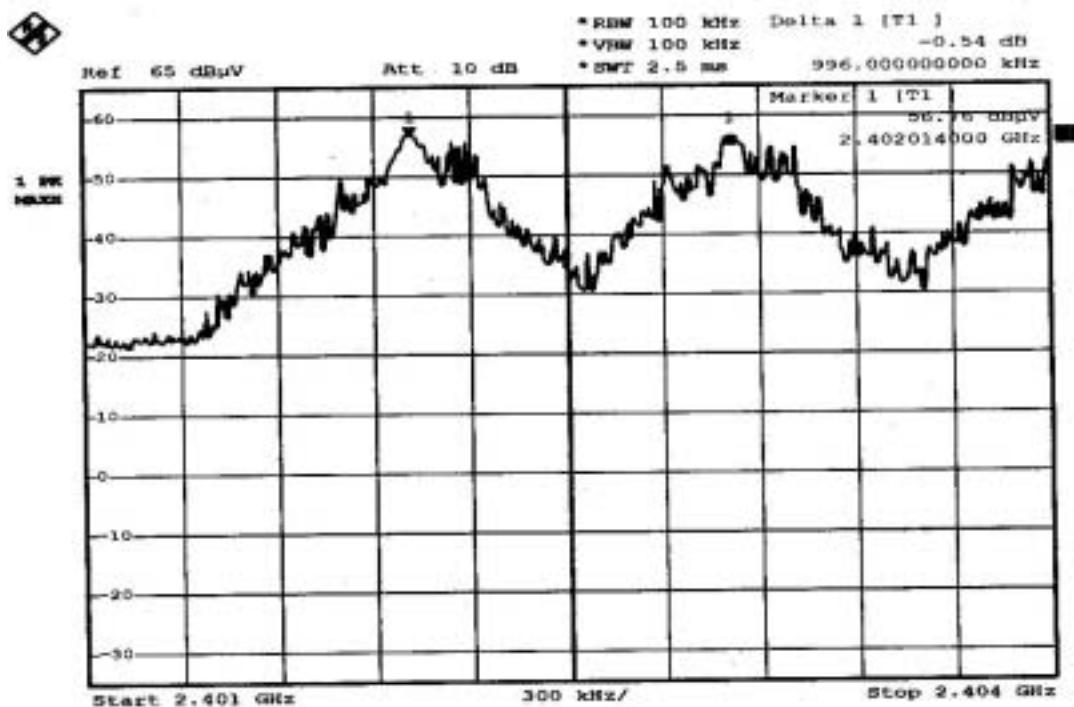
| | Freq | Level | Over Limit | Limit Line | Read Level | Antenna Factor | Cable Factor | Other Factor |
|---|--------|-------|------------|------------|------------|----------------|--------------|--------------|
| | MHz | dB | dB | dB | dB | dB | dB | dB |
| 1 | 55.22 | 28.13 | -11.87 | 40.00 | 15.83 | 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

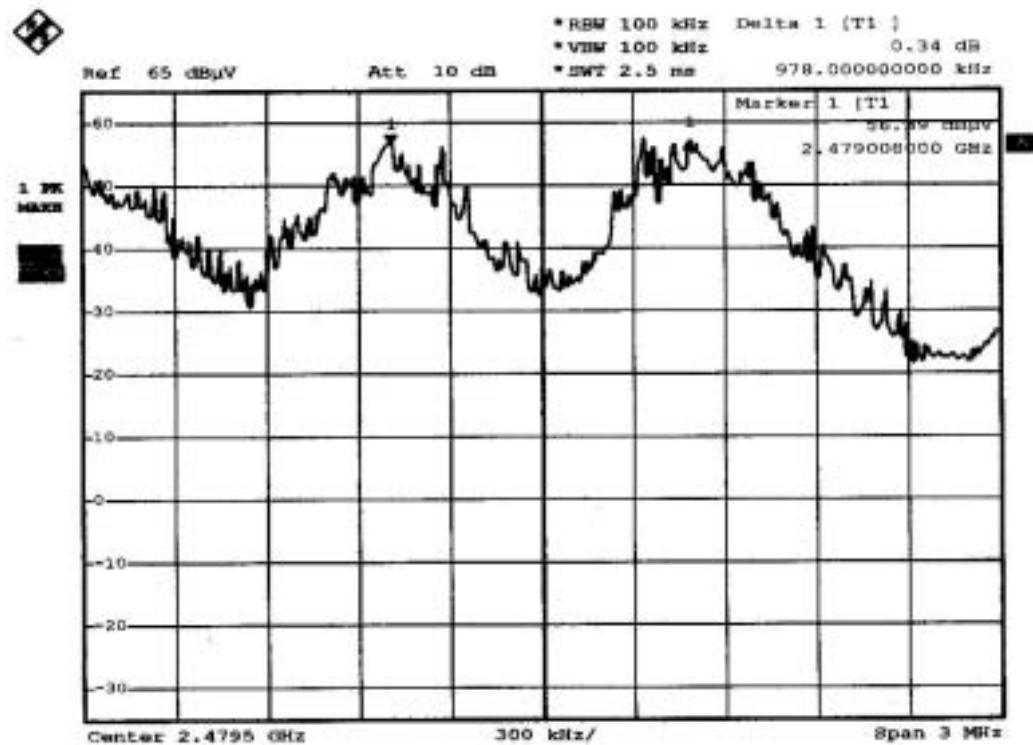
| Frequency (MHz) | Field Strength (microvolts/meter) | Measurement Distance (meters) |
|--------------------|--------------------------------------|----------------------------------|
| 0.009 - 0.490 | 2400/F(kHz) | 300 |
| 0.490 - 1.705 | 24000/F(kHz) | 30 |
| 1.705 - 30.0 | 30 | 30 |
| 30 - 88 | 100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

4.2 Channel Spacing

SUBCLAUSE15.247(a)(1)



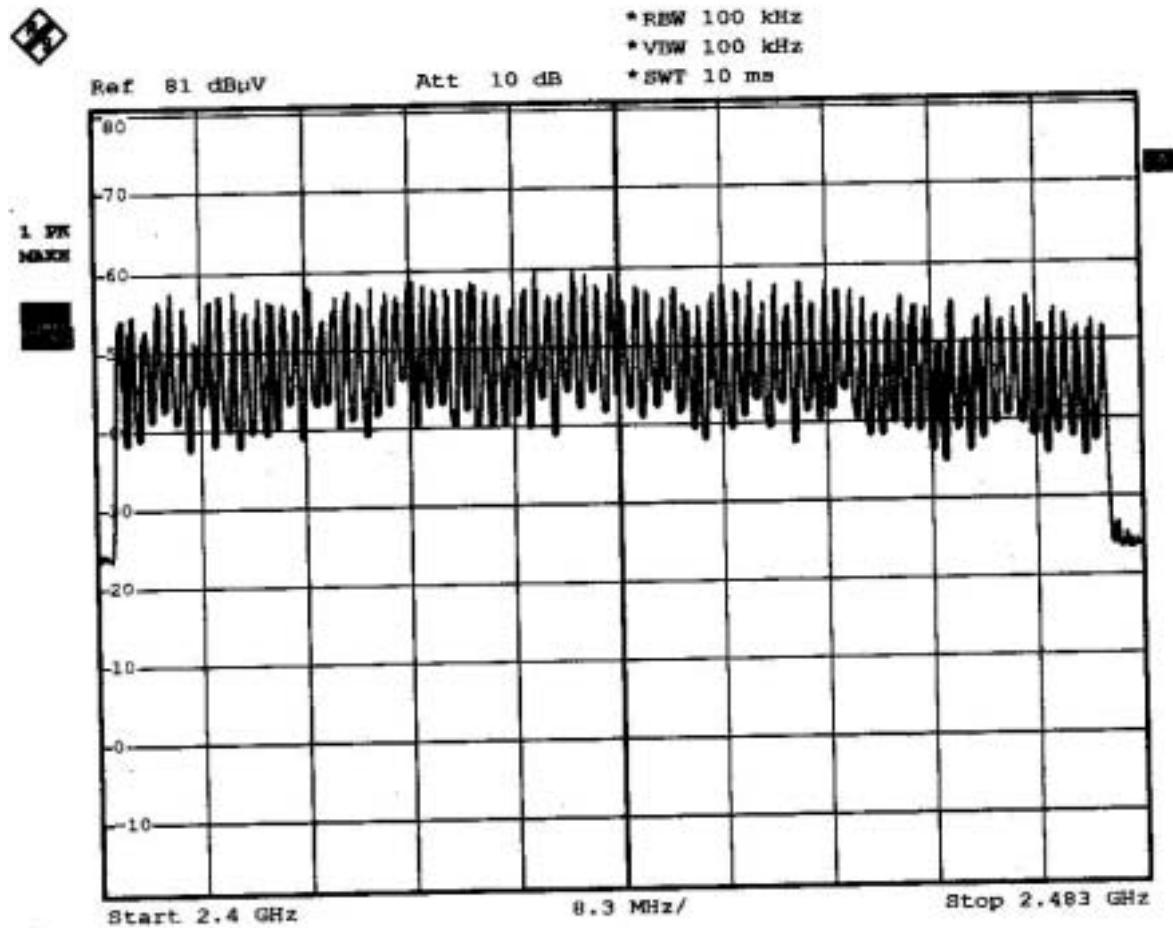
Date: 23.JUN.2003 14:19:31



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

4.3 No. of carrier frequency / 20db Bandwidth

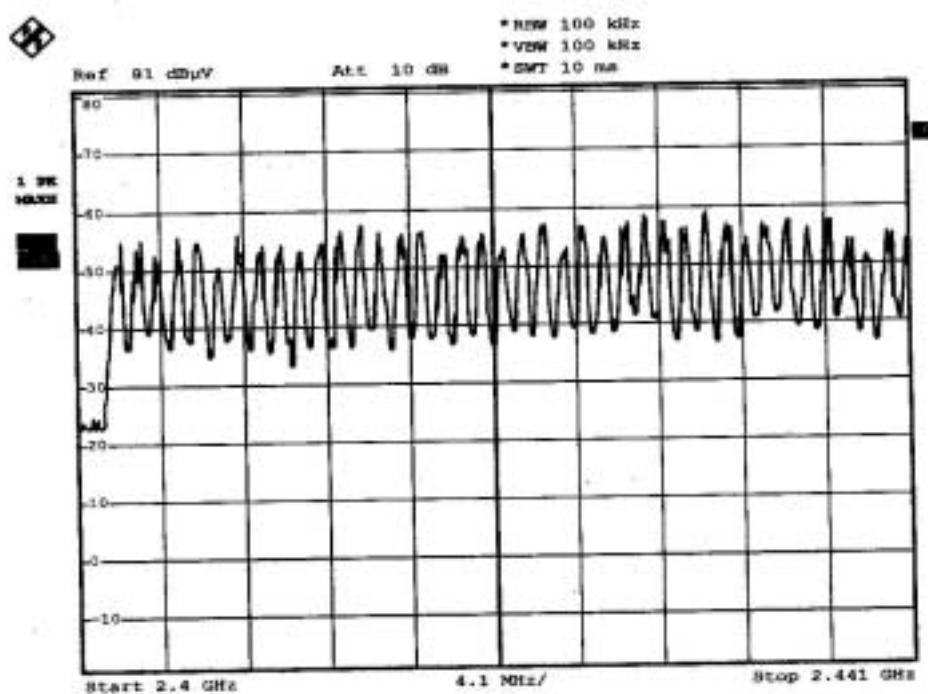
SUBCLAUSE15.247(a)(1)(ii)



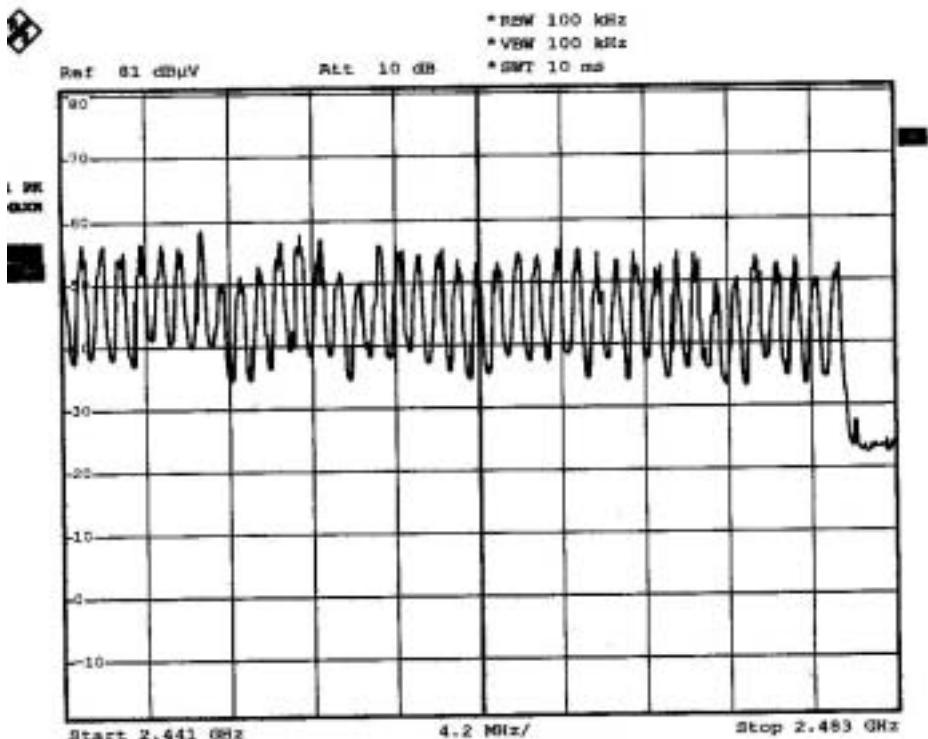
Date: 23.JUN.2003 14:36:28

Number of channels = 79

Split the whole frequency band into two.

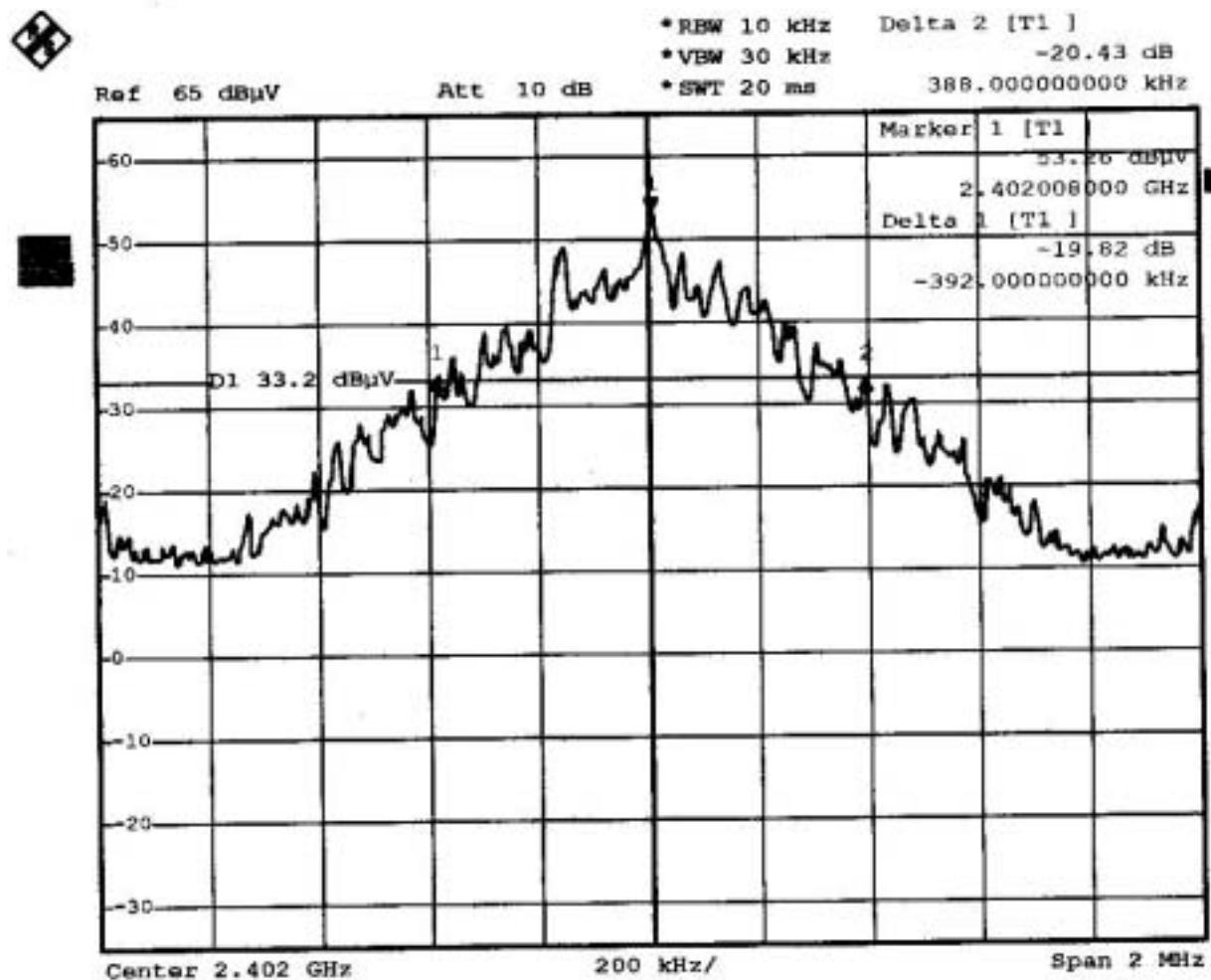


Date: 23.JUN.2003 14:38:51



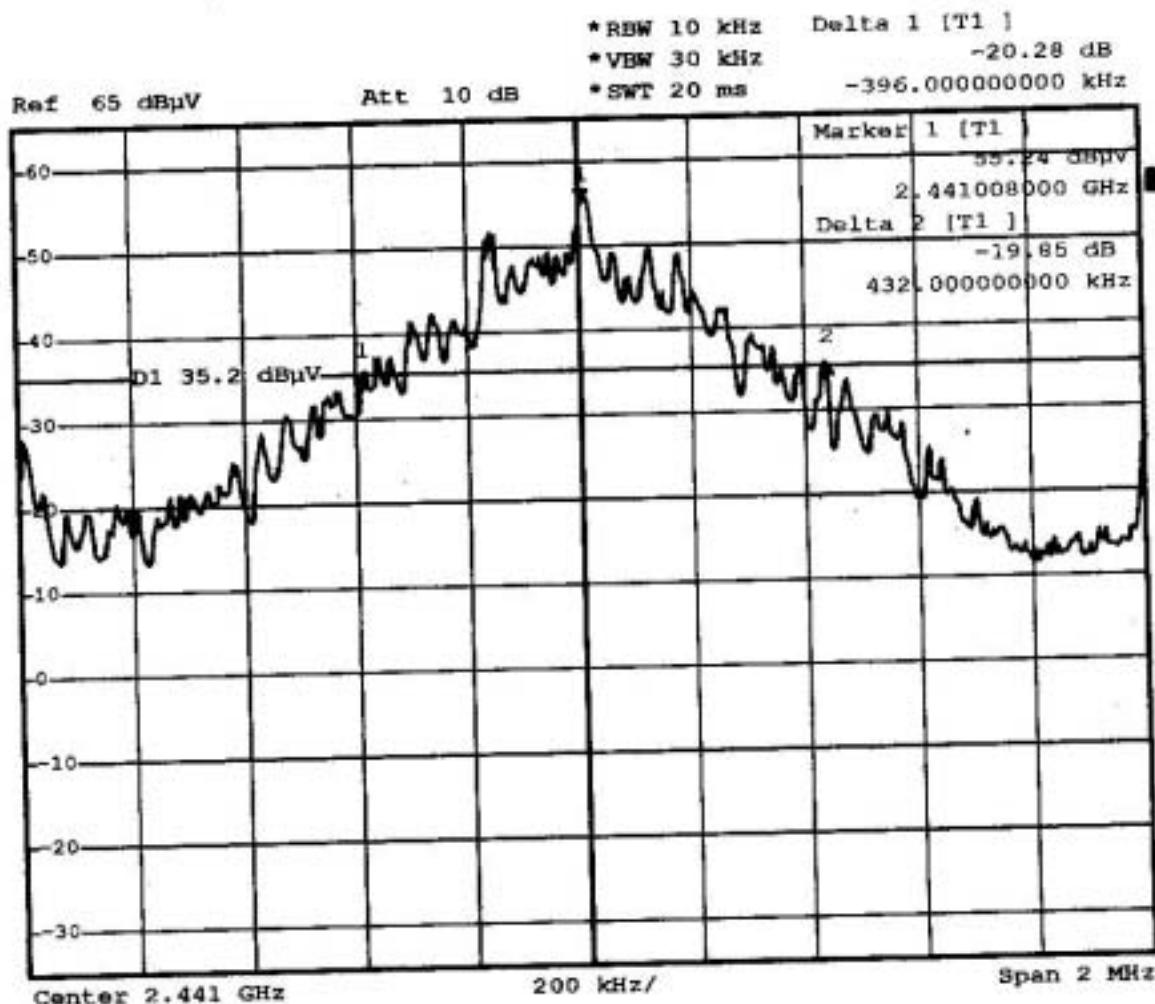
Date: 23.JUN.2003 14:41:02

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



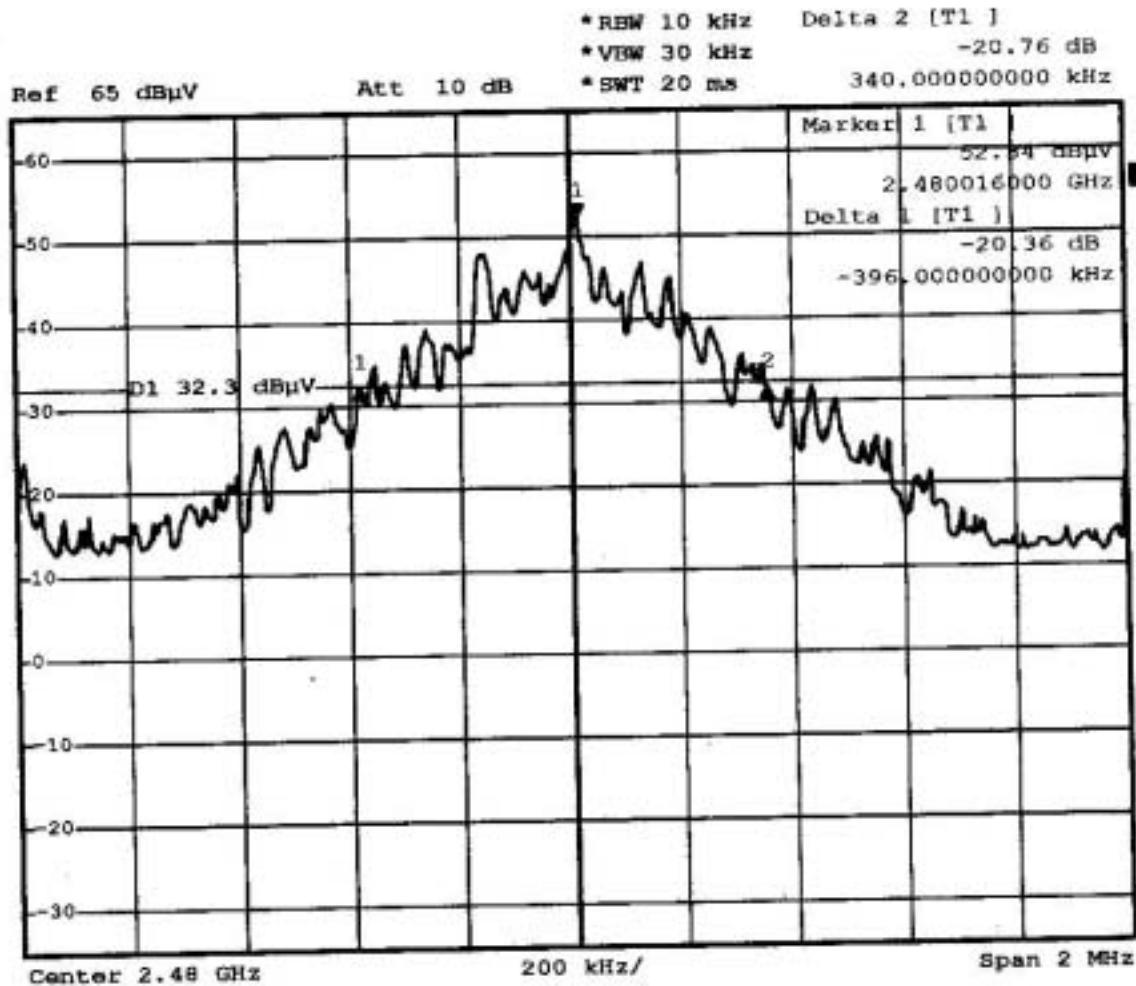
Date: 23.JUN.2003 14:12:47

Channel bandwidth = 780 KHZ



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

Channel bandwidth =828 KHZ

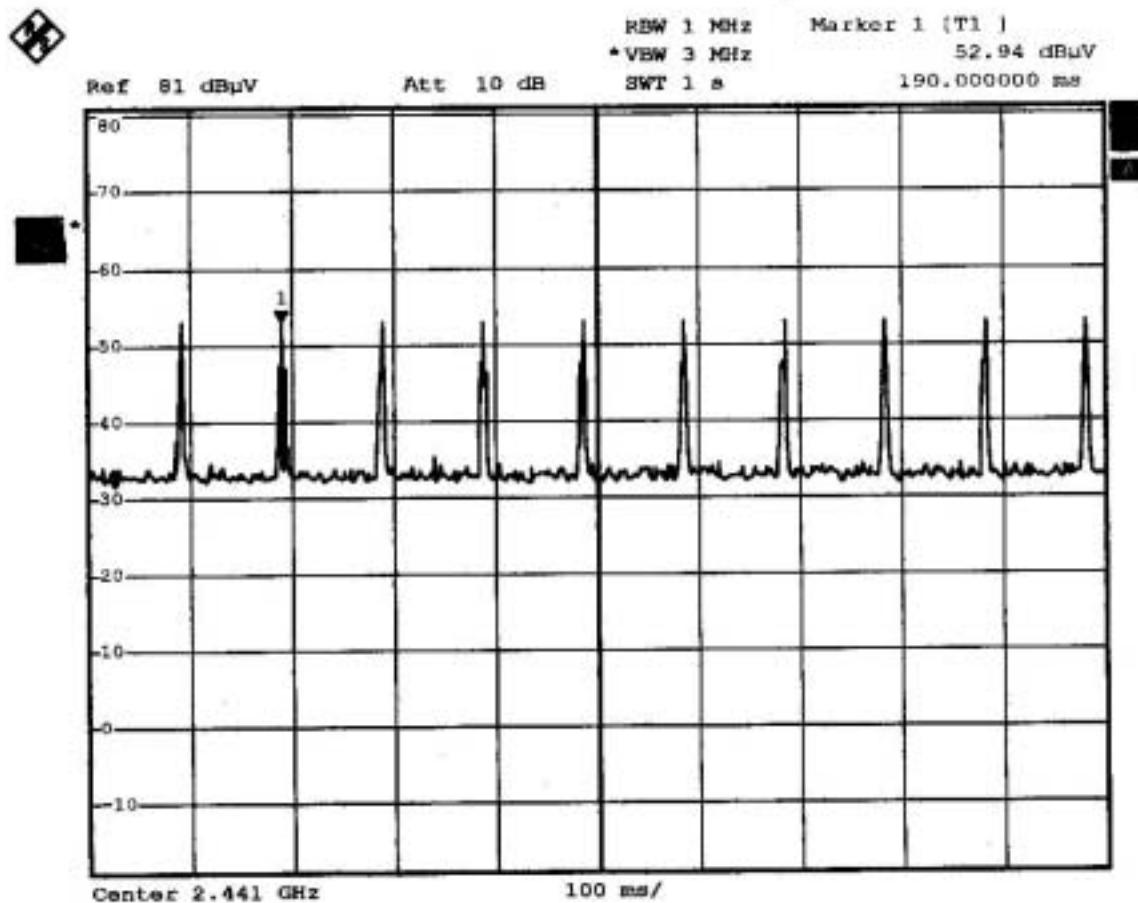


Date: 23.JUN.2003 14:05:57

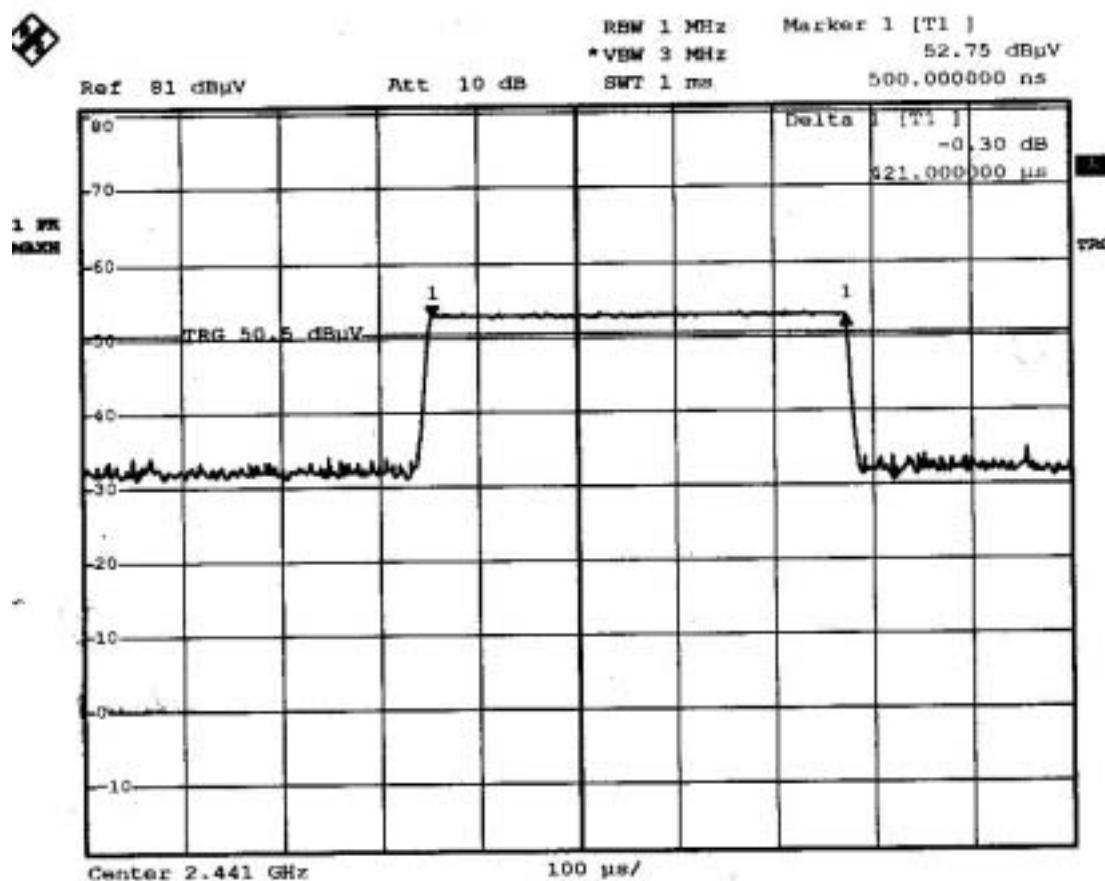
Channel bandwidth = 736 KHZ

4.4 Average Time of Occupancy

SUBCLAUSE15.247(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 µ Sec. So the occupancy time within 30 second is $500 \times 10 \times 30 = 150000 \mu \text{Sec} = 150 \text{ mSec} = 0.15 \text{ Sec.}$

4.5.2 Limits

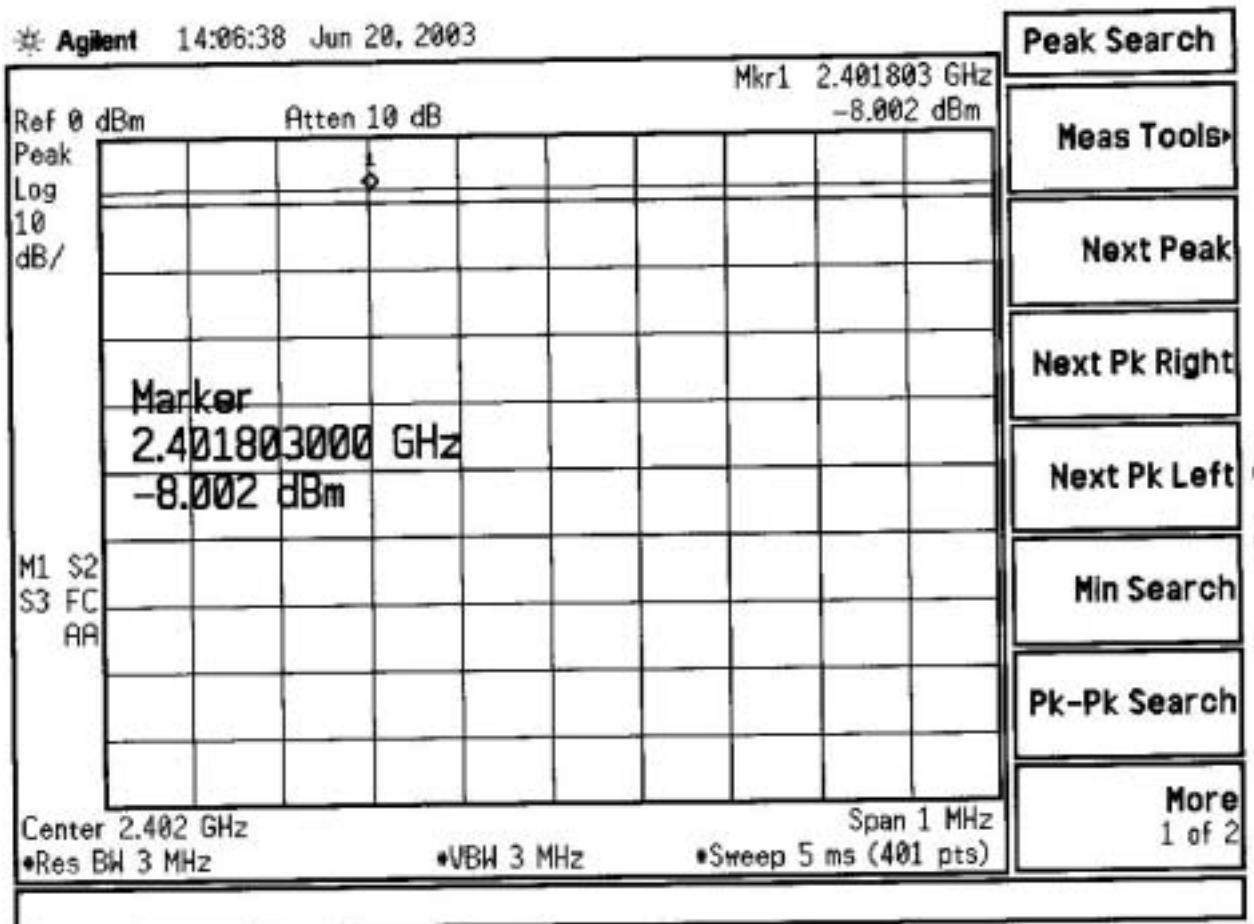
The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 30 second period.

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.

4.5 Peak output Power

SUBCLAUSE15.247(b)(1)

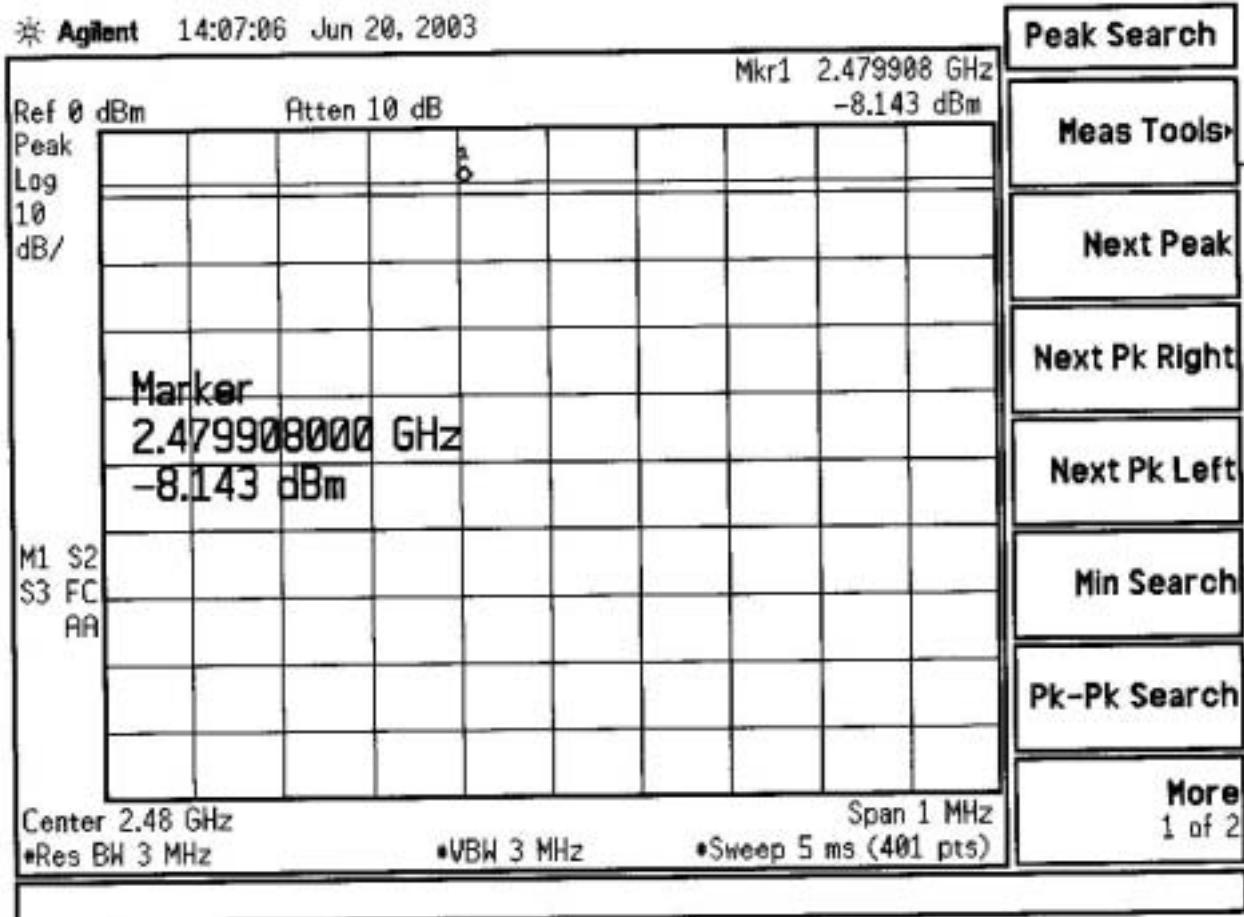
Transmitter transmit at lowest channel (2402Mhz)



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

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

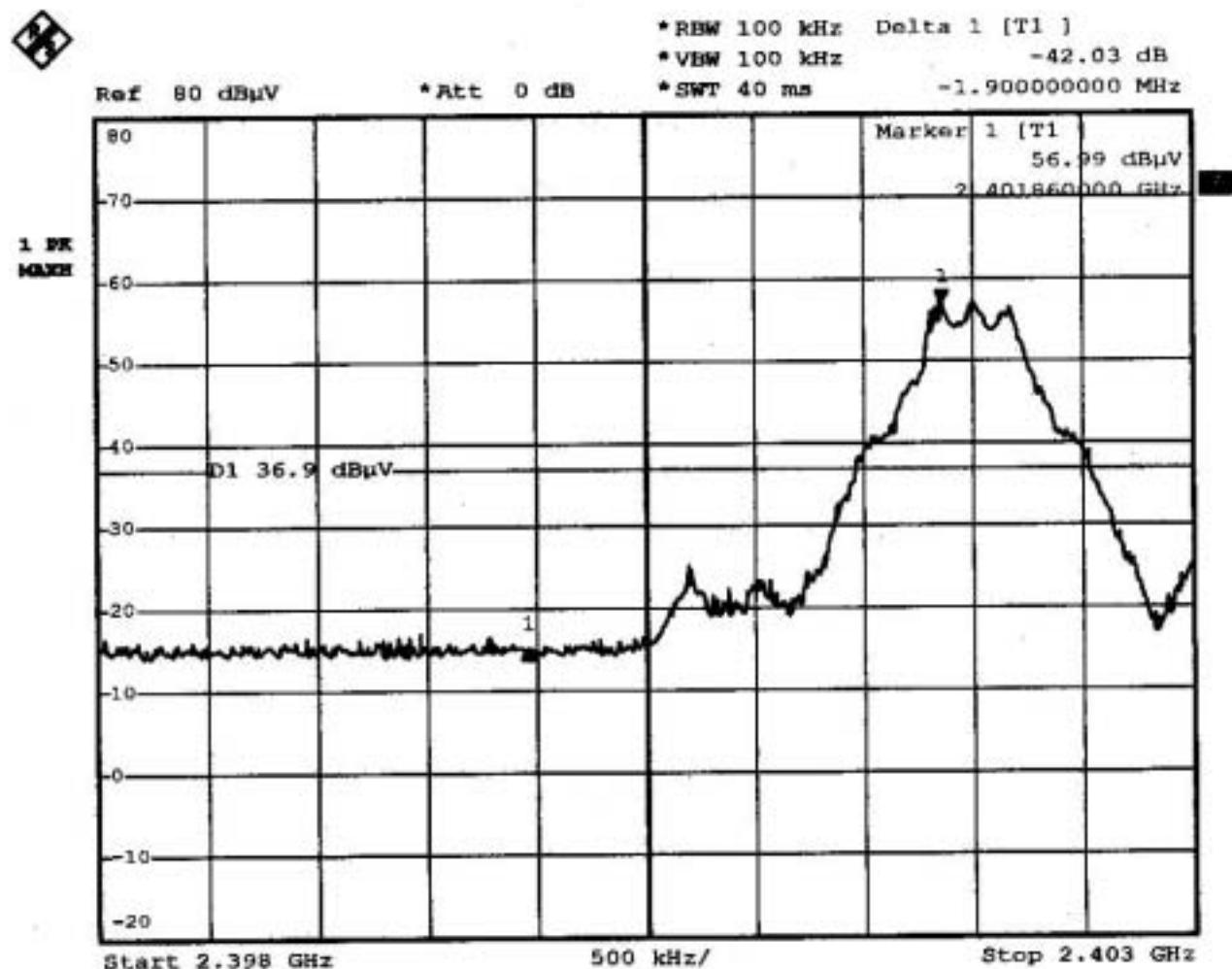
So the max power happens at 2402Mhz , which equals to $-4.443 \text{ dbm} = 0.36 \text{ mW}$

Limits:

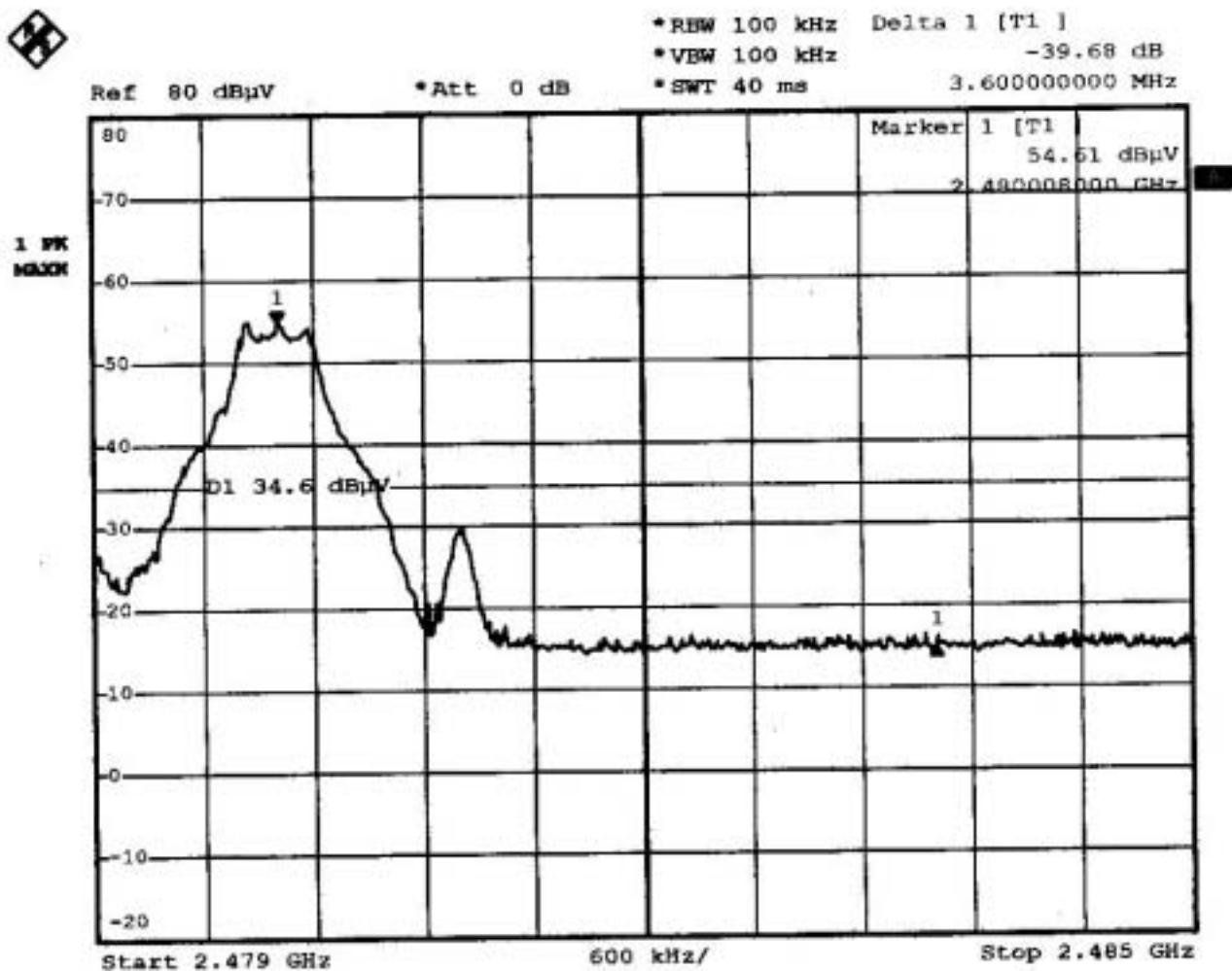
For frequency hopping systems operating in the 2400-2483.5 MHz band employing At least 75 hopping channels, all frequency hopping systems in the 5725-5850MHz Band, and all direct sequence systems: 1 Watt.

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 |

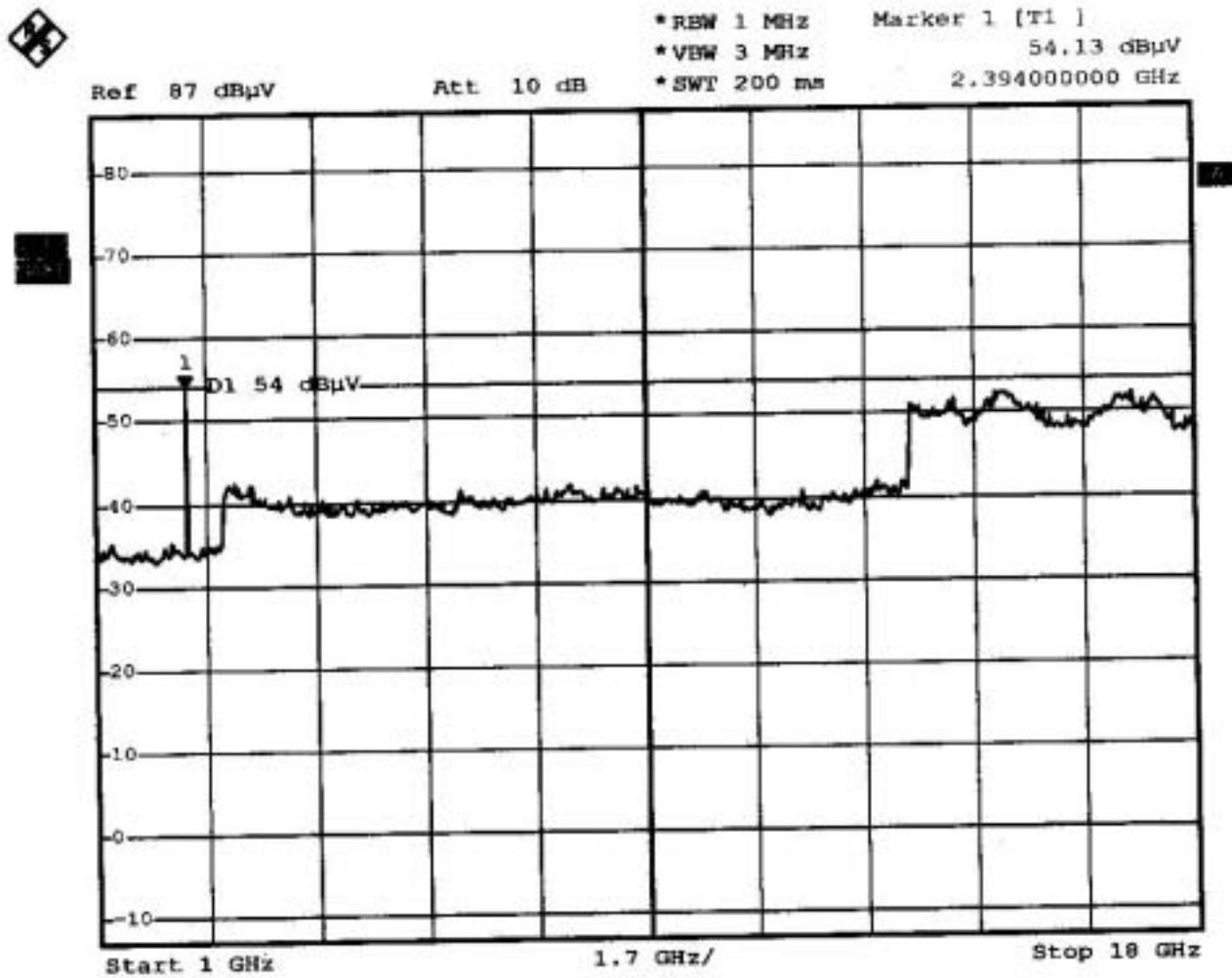
4.7.1 Limits

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)

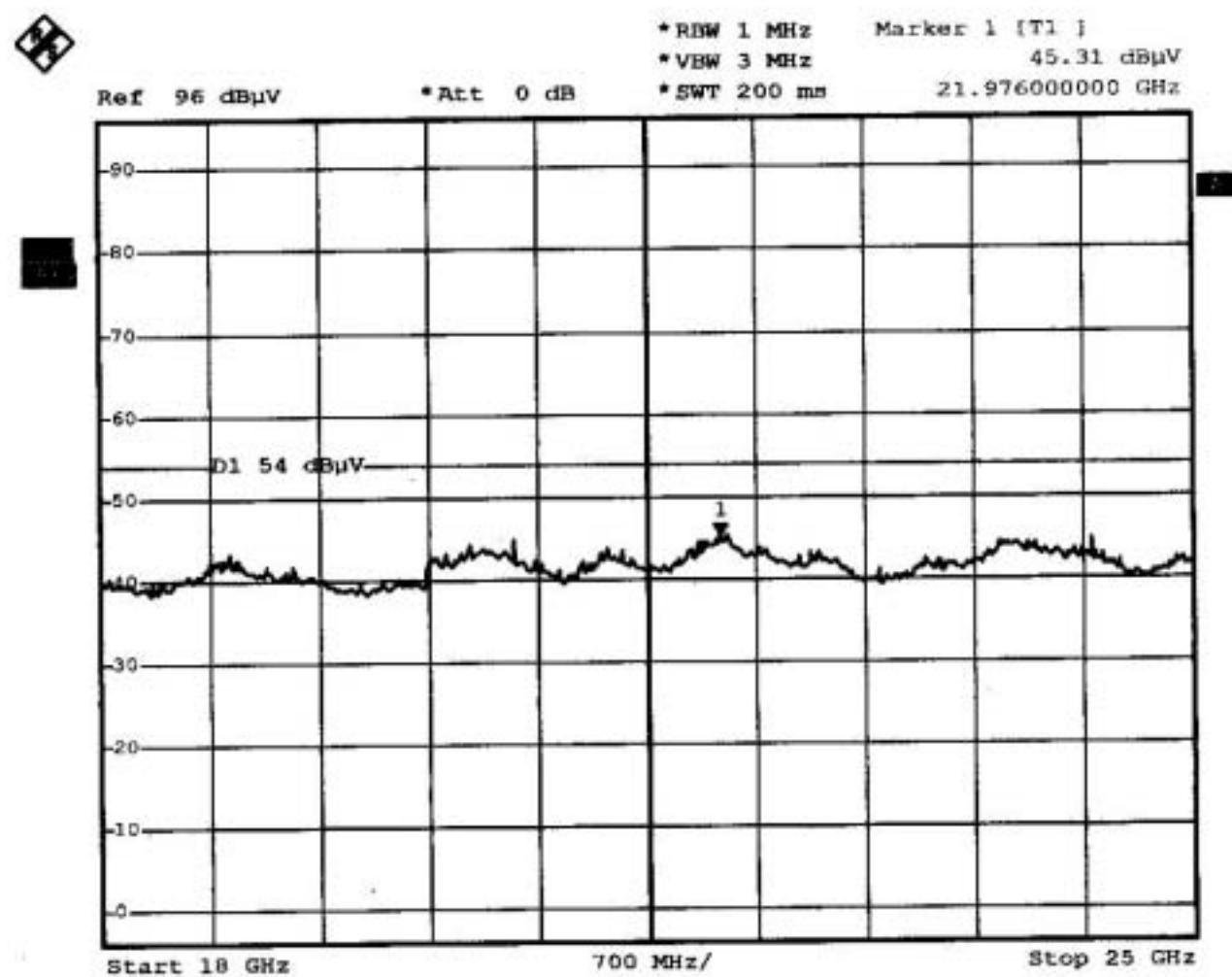
1. Transmit at 2402Mhz

1Ghz – 18Ghz , Vertical



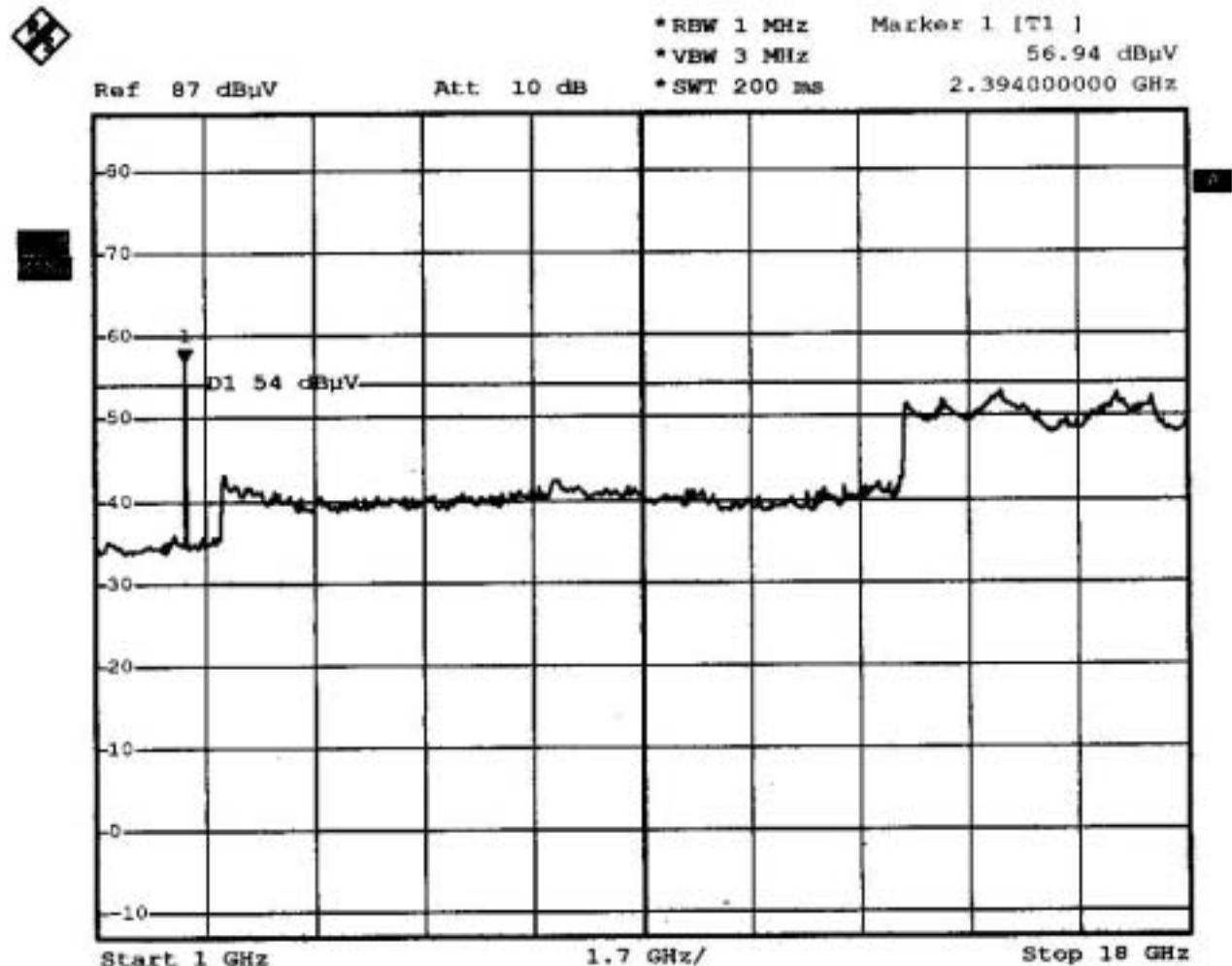
Date: 23.JUN.2003 15:15:50

18Ghz – 25Ghz , Vertical



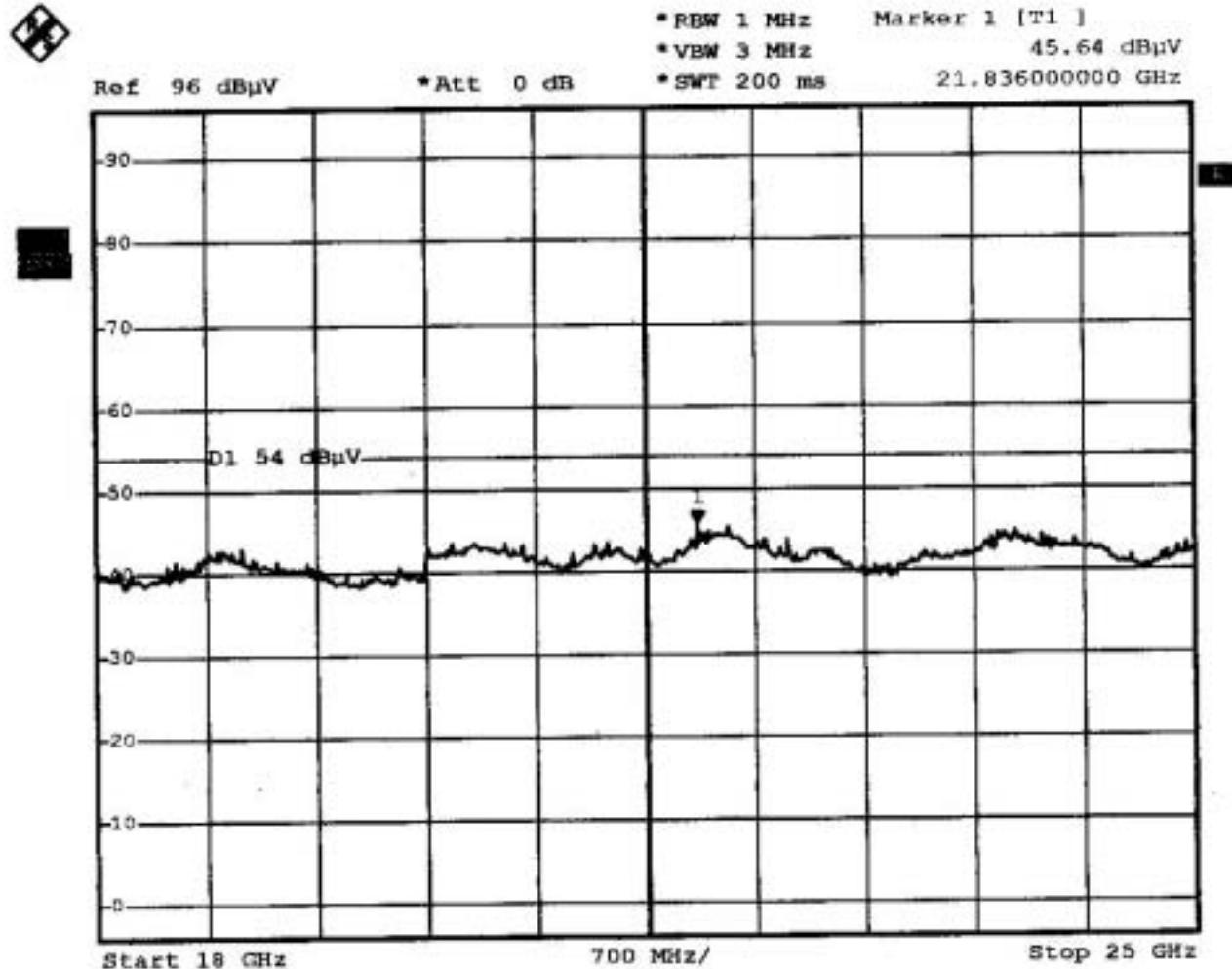
Date: 23.JUN.2003 15:45:55

1Ghz – 18Ghz , Horizontal



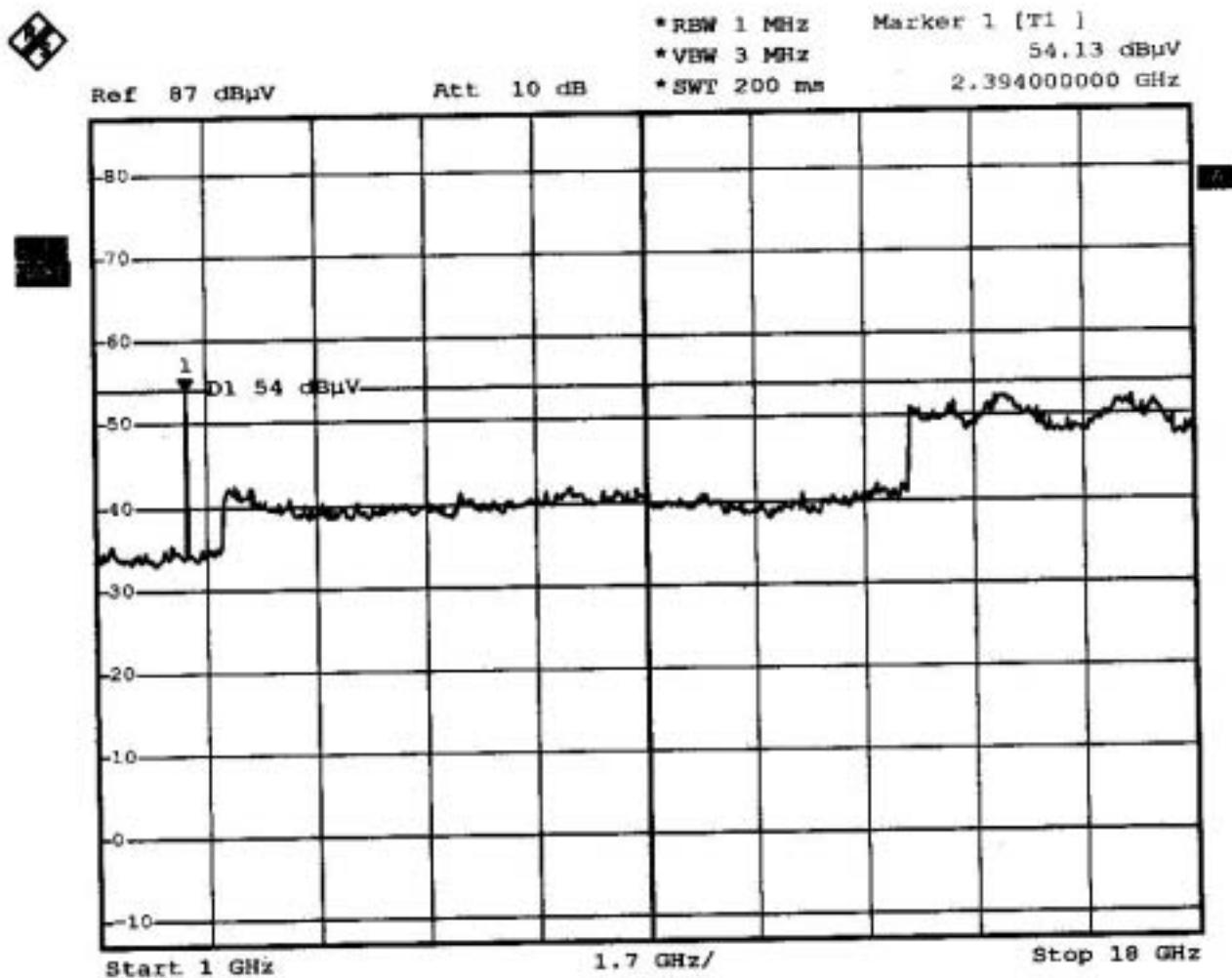
Date: 23.JUN.2003 15:15:00

18Ghz – 25Ghz , Horizontal



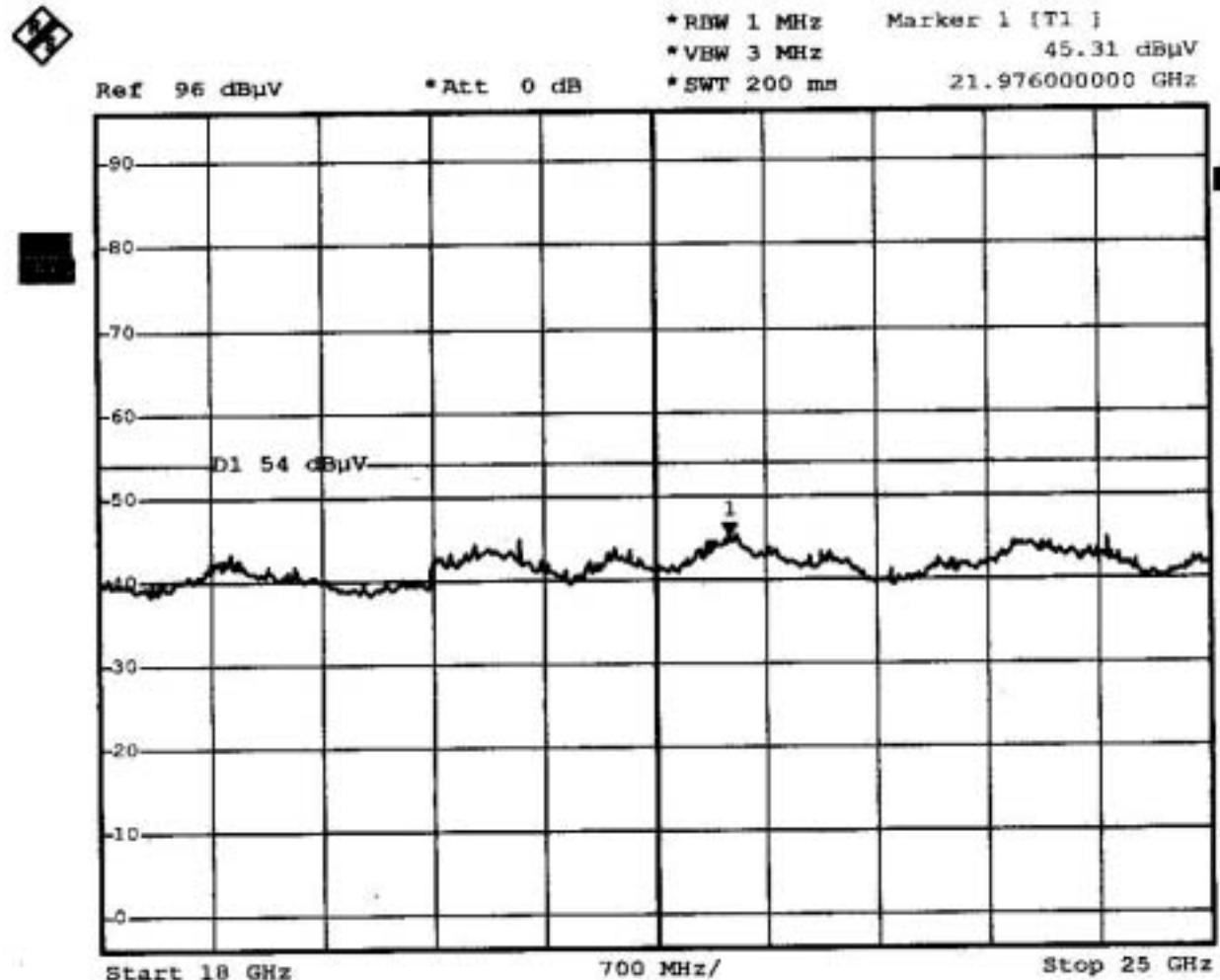
Date: 23.JUN.2003 15:48:00

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



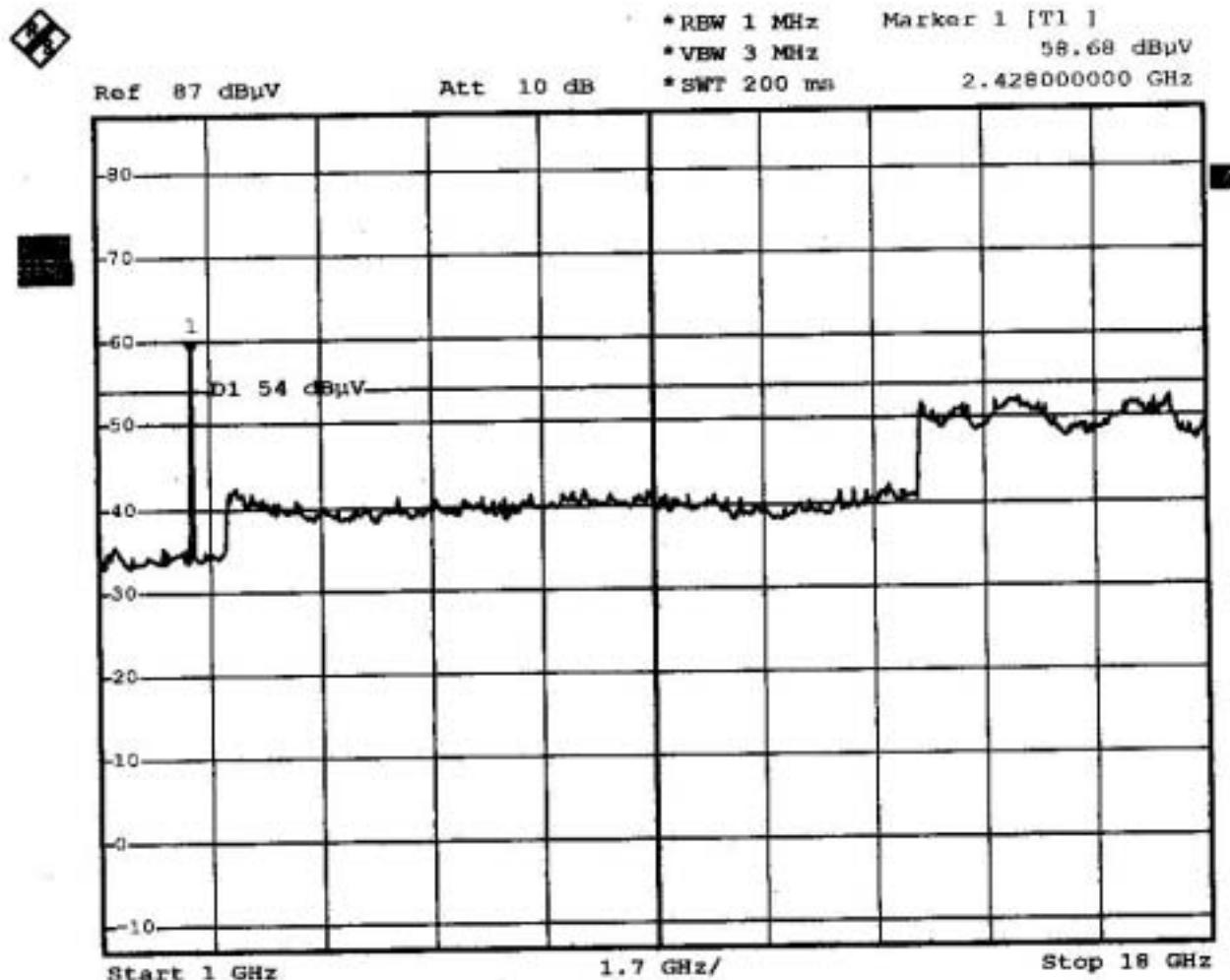
Date: 23.JUN.2003 15:15:50

18Ghz – 25Ghz , Vertical



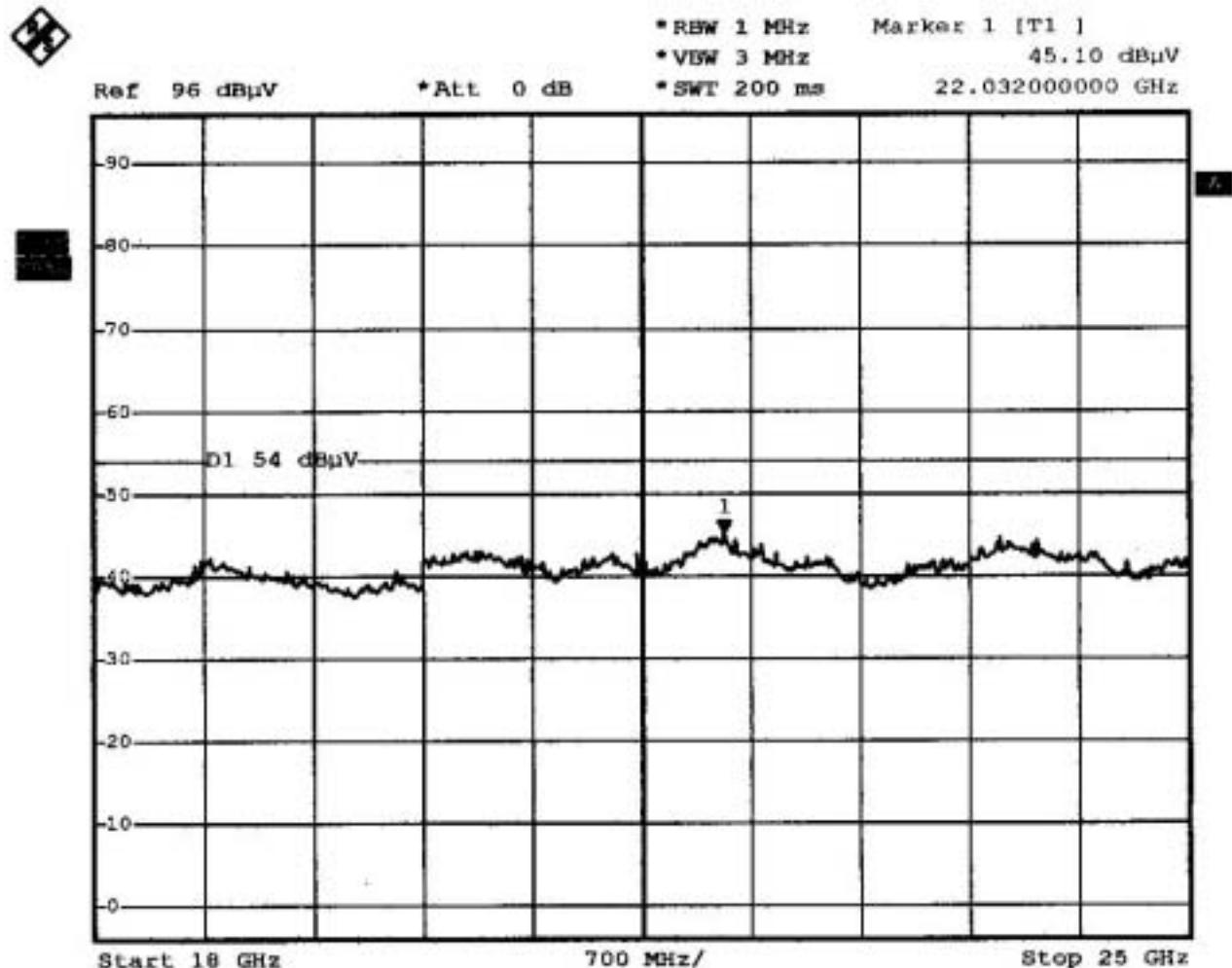
Date: 23.JUN.2003 15:45:55

1Ghz – 18Ghz , Horizontal



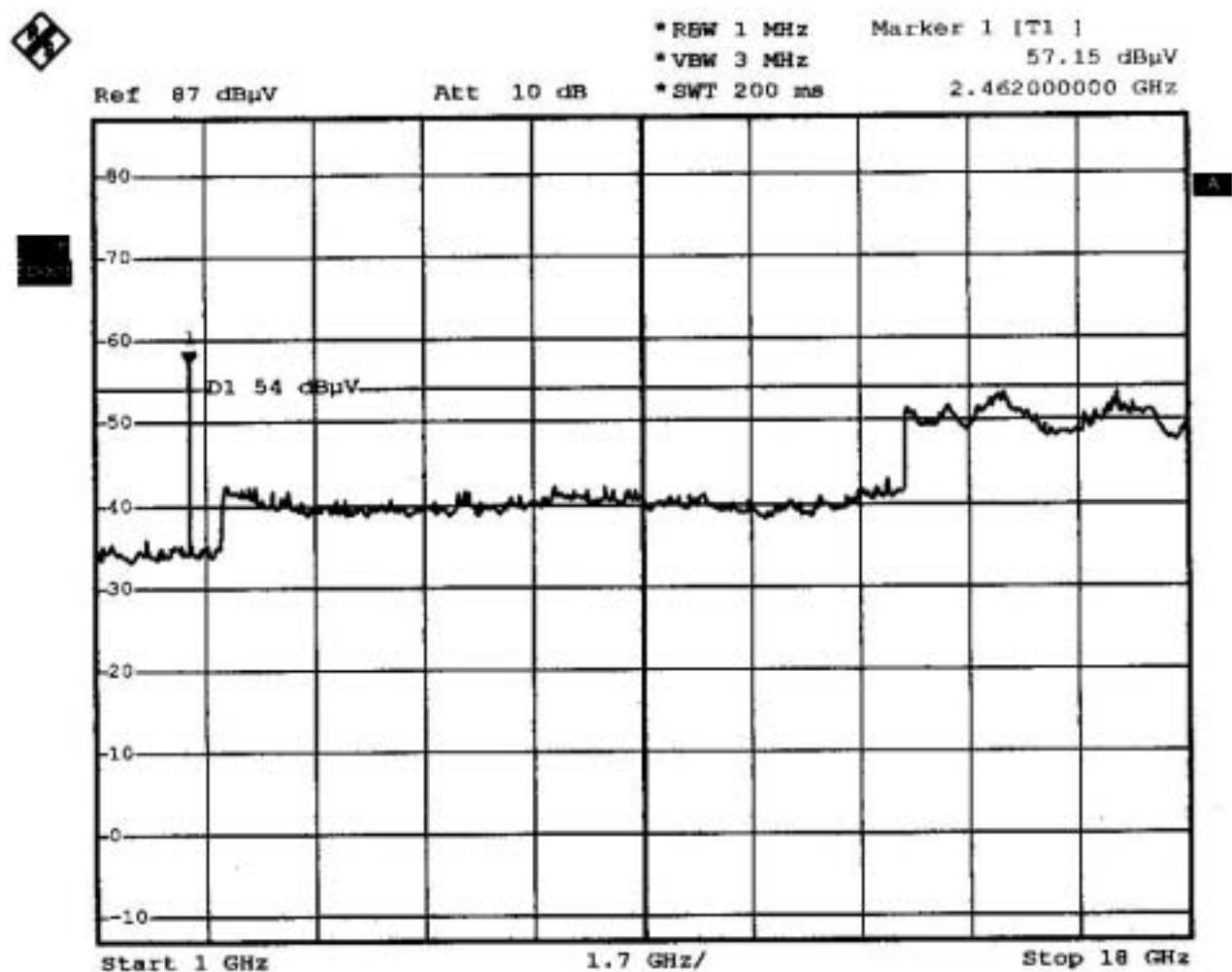
Date: 23.JUN.2003 15:20:14

18Ghz – 25Ghz , Horizontal



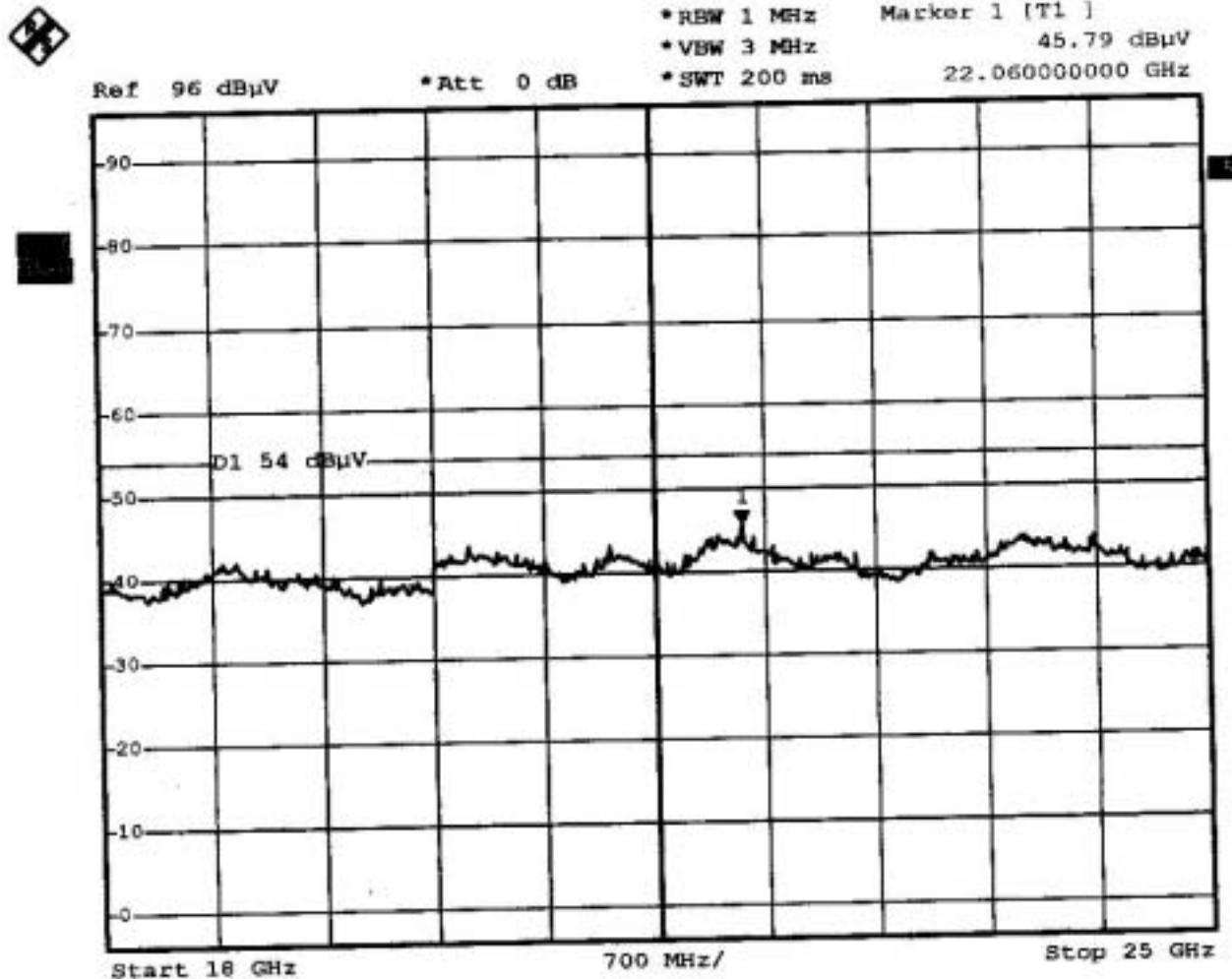
Date: 23.JUN.2003 15:47:14

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



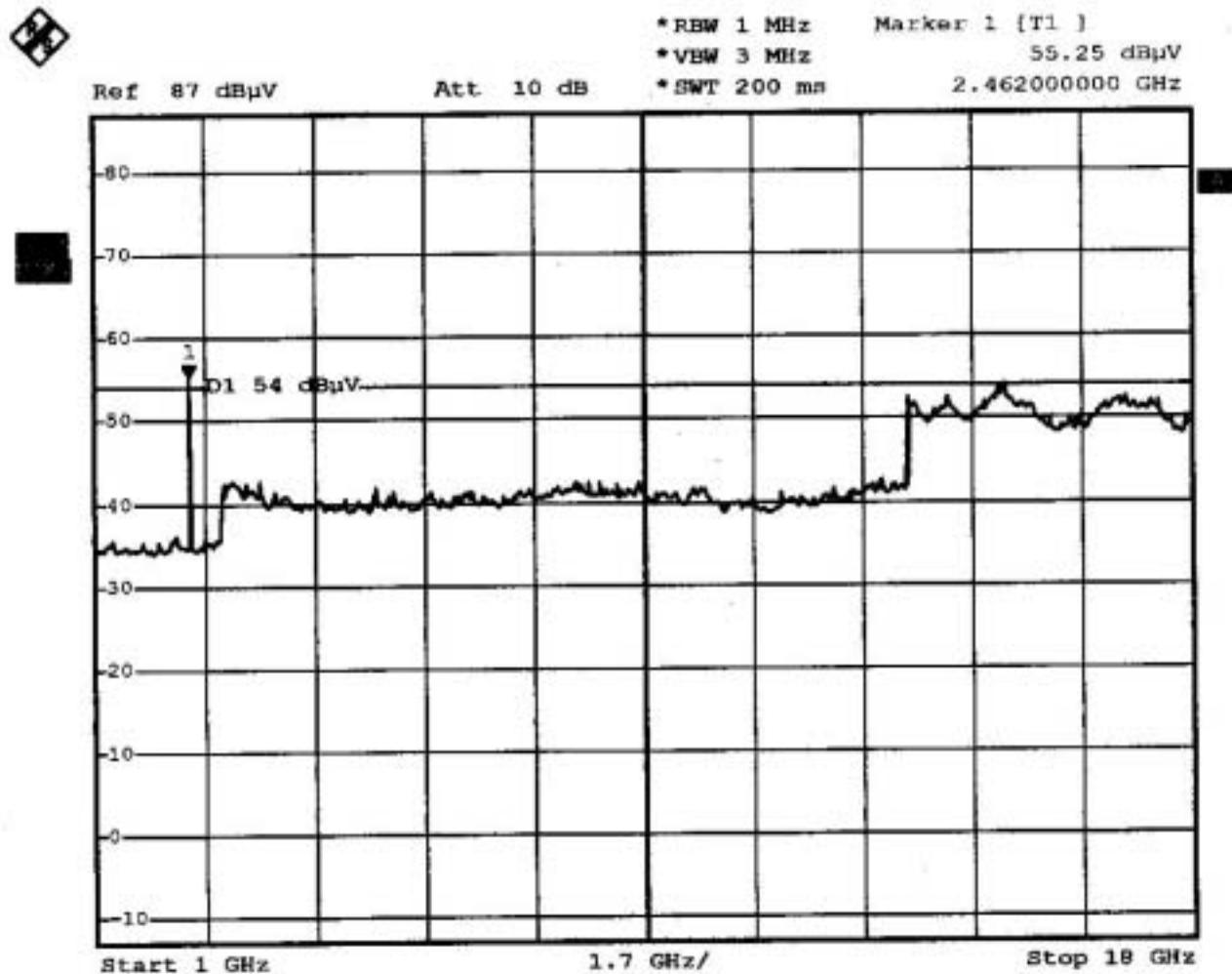
Date: 23.JUN.2003 15:26:57

18Ghz – 25Ghz , Vertical



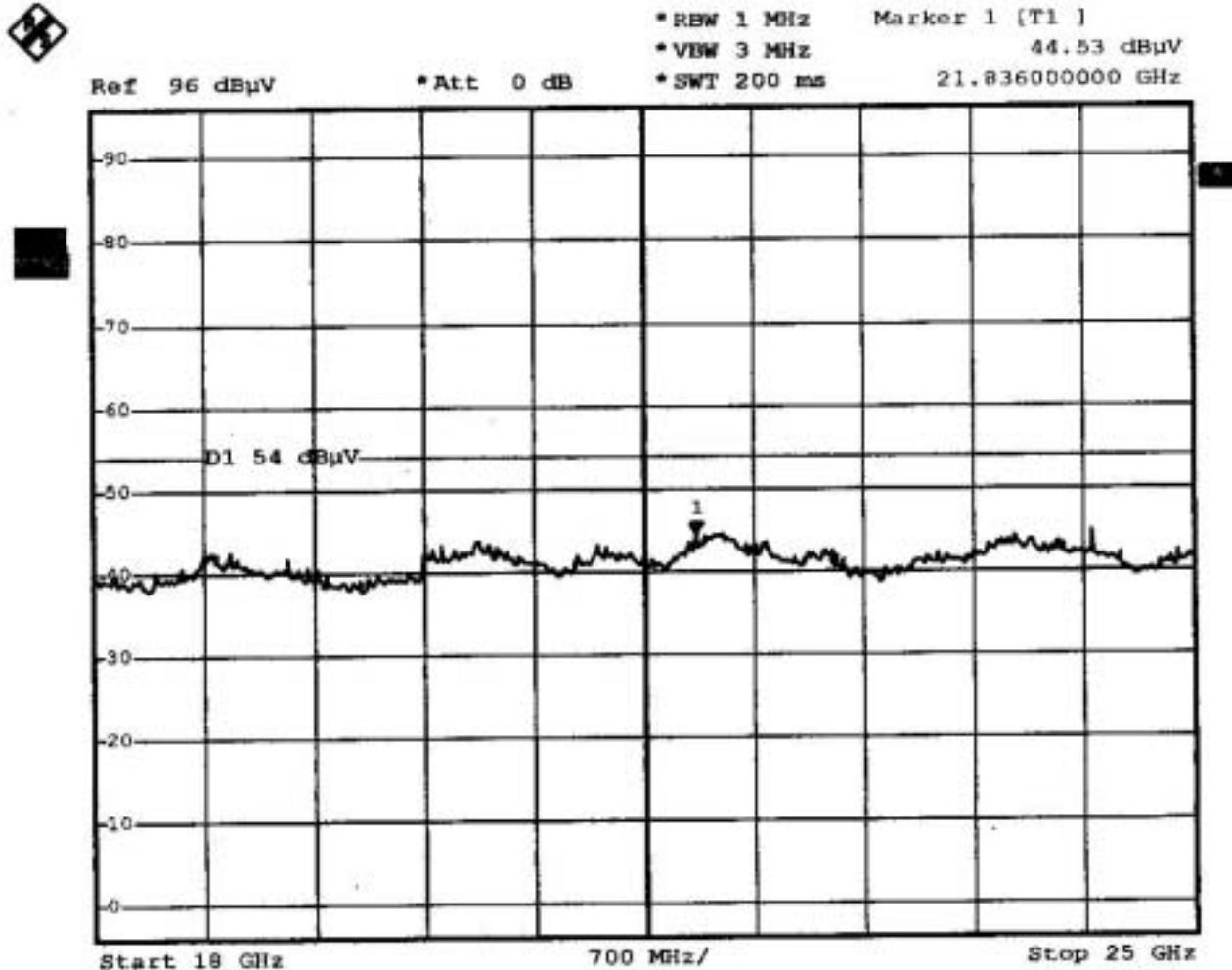
Date: 23.JUN.2003 15:44:49

1Ghz – 18Ghz , Horizontal



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

18Ghz – 25Ghz , Horizontal



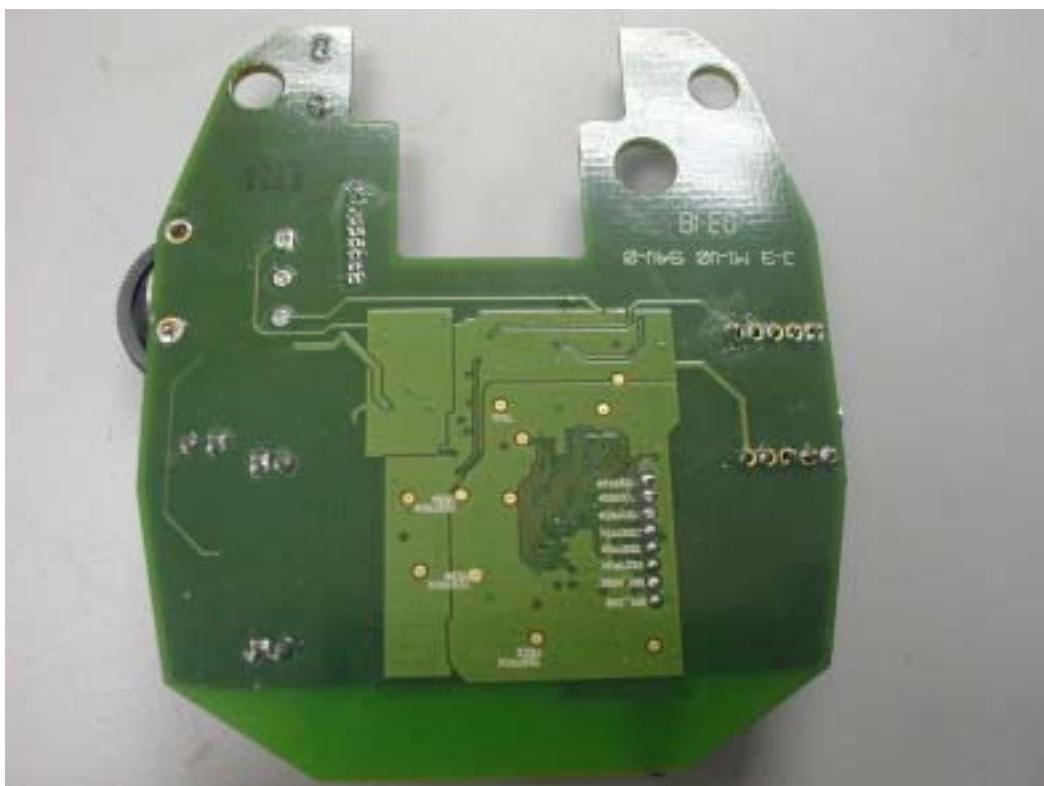
Date: 23.JUN.2003 15:45:19

APPENDIX: Photographs of Test Setup



APPENDIX : Photographs of EUT

Internal Photos



External Photos

