

TEST REPORT

Product Name : Bluetooth Headset
Product ID : BT400GII
Applicant : Bluetake Technology Co., Ltd.
Address of Applicant : 6F, No. 33, Lane 155, Sec. 3, Pei Shen Road,
Shen Keng Shiang, Taipei, Taiwan , R.O.C.

Standards:

FCC Part 15 subpart C

In the configuration tested, the EUT complied with the standards specified above. The test data, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4(1992).

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. 5, 2003

Approved by : Robert Chang Date : Jun. 10, 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.sqs.com.tw>

1.2 Details of Applicant

Name : Bluetake Technology Co., Ltd.
Address : 6F, No. 33, Lane 155, Sec. 3, Pei Shen Road,
Shen Keng Shiang, Taipei, Taiwan , R.O.C.
Contact : Ming Chen
Telephone : +886-2-2664-7199

1.3 Description of EUT(s)

| | | |
|---|-----------------------|----------------------------------|
| 1 | Product name | Bluetooth Headset |
| 2 | Product ID | BT400GII |
| 3 | Supply Voltage | DC 3.3V |
| 4 | Carrier Frequency | 2402MHz to 2480MHz |
| 5 | Modulation Method | GFSK,1Mbps,0.5BT Gaussian |
| 6 | Hopping | 1600hops/sec, 1MHz channel space |
| 7 | Operation Temperature | 0 to +60 degree |
| 8 | 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 "BlueTest" install in PC to control the EUT. And the applicant provide an additional UART interface (RS232) to control this Headset. Operating frequency are set as testing required. The output power is set as Ext=255, Int=55.

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.

The pseudorandom hopping sequence is produced by the Bluesuite software which is provided by the manufacturer of the chipset.

1.5 Testing Method

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

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 | 10 |
| 15.247(a)(1) | Channel Spacing | PASS | 17 |
| 15.247(a)(1)(ii) | 20db bandwidth / No. of channels | PASS | 19 |
| 15.247(a)(1)(ii) | Average Time of Occupancy | PASS | 24 |
| 15.247(b)(1) | Peak Output power | PASS | 27 |
| 15.247(c) | Band-Edge Emission | PASS | 30 |
| 15.247(c) | Spurious Emission under 25Ghz | PASS | 32 |

3. Instruments List

| Instrument | Model | Serial number | Calibration date |
|-------------------|--------------------------|---------------|------------------|
| Desktop PC | HP Pavillion 723D | N/A | N/A |
| Spectrum Analyzer | Agilent 7405A | 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 |
| 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

Product Name: Bluetooth Headset Test Date: May.26.2003
Model No.: BT400 G II Report No: EM/2003/50116
Test Mode: Operation Mode Tester : Tom Chou
Test Result: PASS Temperature 21 °C
Humidity: 52%

Main Terminals:L

| FREQ MHz | QP1 dBuV | AVG 1 | Factor | QP2 dBuV | AVG 2 | QP Limit | AV Limit | QP Offset | AV Offset |
|-------------|-------------|----------|--------|-------------|----------|-------------|-------------|--------------|--------------|
| 0.15 | 42.6 | 30.2 | 3.00 | 45.60 | 33.20 | 66.00 | 56.00 | -20.40 | -22.80 |
| 0.33 | 37.5 | 26.3 | 2.86 | 40.36 | 29.16 | 59.52 | 49.52 | -19.16 | -20.36 |
| 0.64 | 38.3 | 22.5 | 2.87 | 41.17 | 25.37 | 56.00 | 46.00 | -14.83 | -20.63 |
| 1.27 | 32.7 | 24.4 | 2.88 | 35.58 | 27.28 | 56.00 | 46.00 | -20.42 | -18.72 |
| 5.53 | 38.5 | 30.3 | 3.21 | 41.71 | 33.51 | 60.00 | 50.00 | -18.29 | -16.49 |
| 7.39 | 39.5 | 28.6 | 3.25 | 42.75 | 31.85 | 60.00 | 50.00 | -17.25 | -18.15 |

- 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.

Neural

Product Name: Bluetooth Headset Test Date: May.26.2003
Model No.: BT400 G II Report No: EM/2003/50116
Test Mode: Operation Mode Tester : Tom Chou
Test Result: PASS Temperature 21 °C
Humidity: 52%

Main Terminals:N

| FREQ MHz | QP1 dBuV | AVG 1 | Factor | QP2 dBuV | AVG 2 | QP Limit | AV Limit | QP Offset | AV Offset |
|-------------|-------------|----------|--------|-------------|----------|-------------|-------------|--------------|--------------|
| 0.16 | 41.7 | 31.5 | 2.98 | 44.68 | 34.48 | 65.5 | 55.52 | -20.8 | -21.04 |
| 0.35 | 39.40 | 27.60 | 2.90 | 42.30 | 30.50 | 59.05 | 49.05 | -16.75 | -18.55 |
| 0.75 | 37.20 | 25.70 | 2.85 | 40.05 | 28.55 | 56.00 | 46.00 | -15.95 | -17.45 |
| 1.24 | 31.60 | 20.20 | 2.87 | 34.47 | 23.07 | 56.00 | 46.00 | -21.53 | -22.93 |
| 4.42 | 39.60 | 30.50 | 3.18 | 42.78 | 33.68 | 56.00 | 46.00 | -13.22 | -12.32 |
| 6.42 | 36.70 | 29.70 | 3.23 | 39.93 | 32.93 | 60.00 | 50.00 | -20.07 | -17.07 |

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.

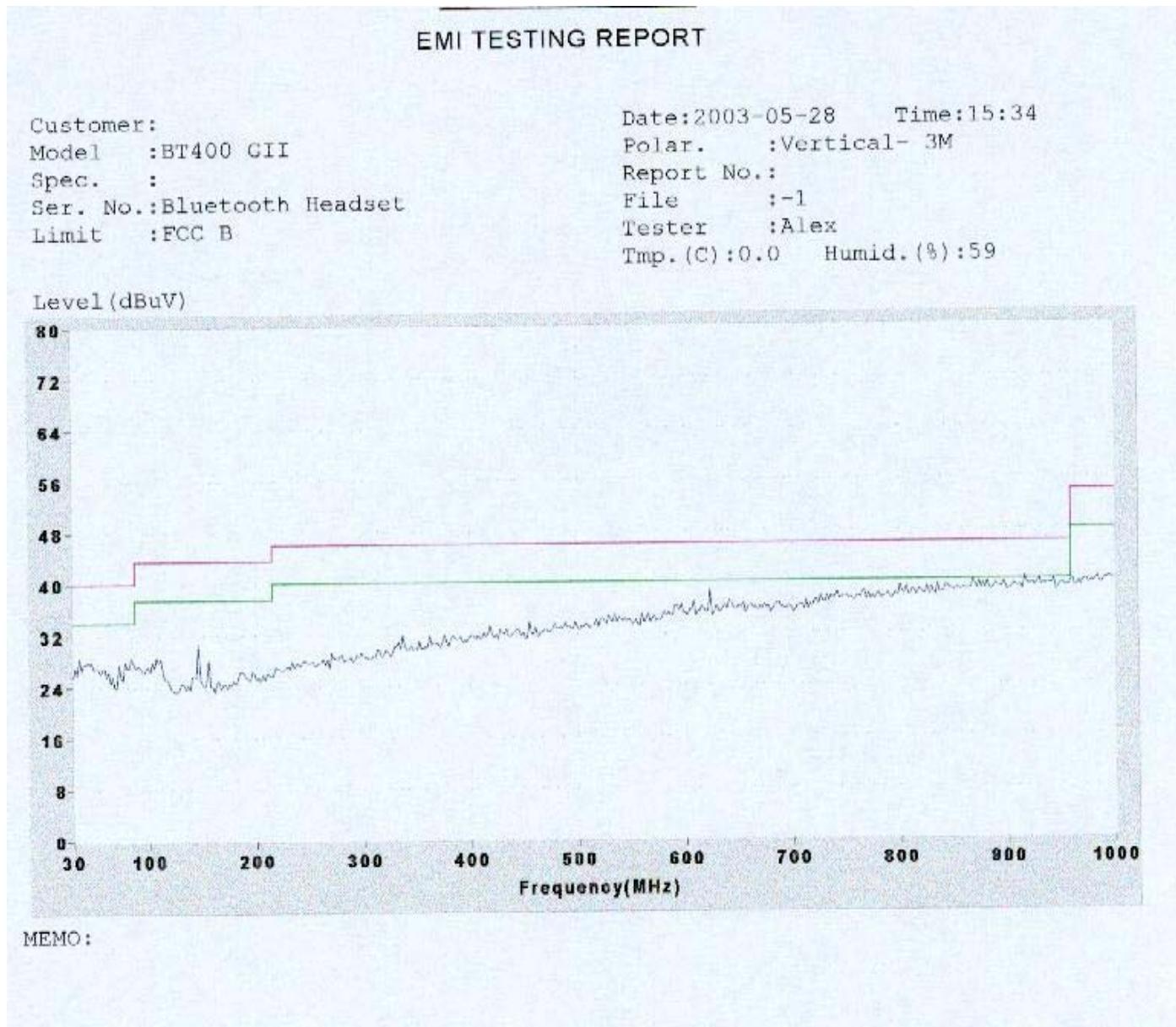
4.1.1 Limits (EN55022)

| 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-1000Mhz , transmit at 2402Mhz

Vertical



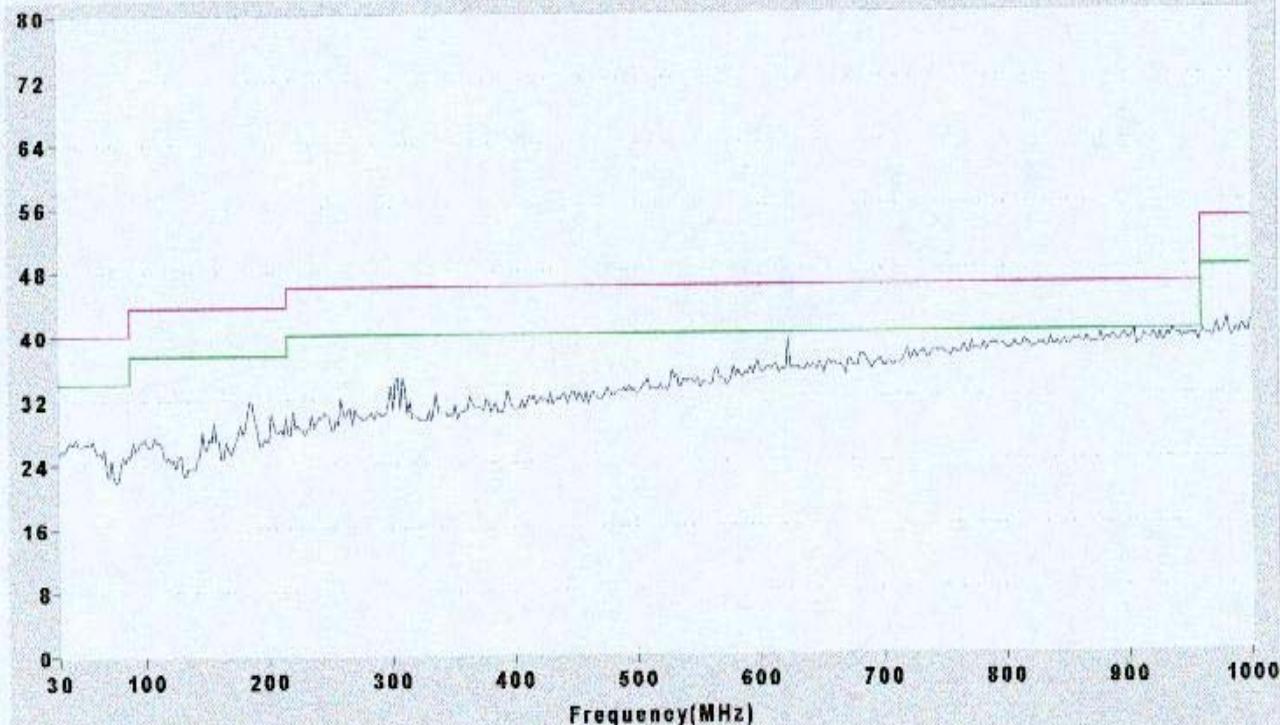
Horizontal

SGS EMC Lab. Site 2
EMI TESTING REPORT

Customer: _____
Model : BT400 GII
Spec. : _____
Ser. No.: Bluetooth Headset
Limit : FCC B

Date:2003-05-28 Time:15:33
Polar. :Horizontal- 3M
Report No.: _____
File : -1
Tester : Alex
Tmp. (C):0.0 Humid. (%):59

Level (dBuV)



MEMO:

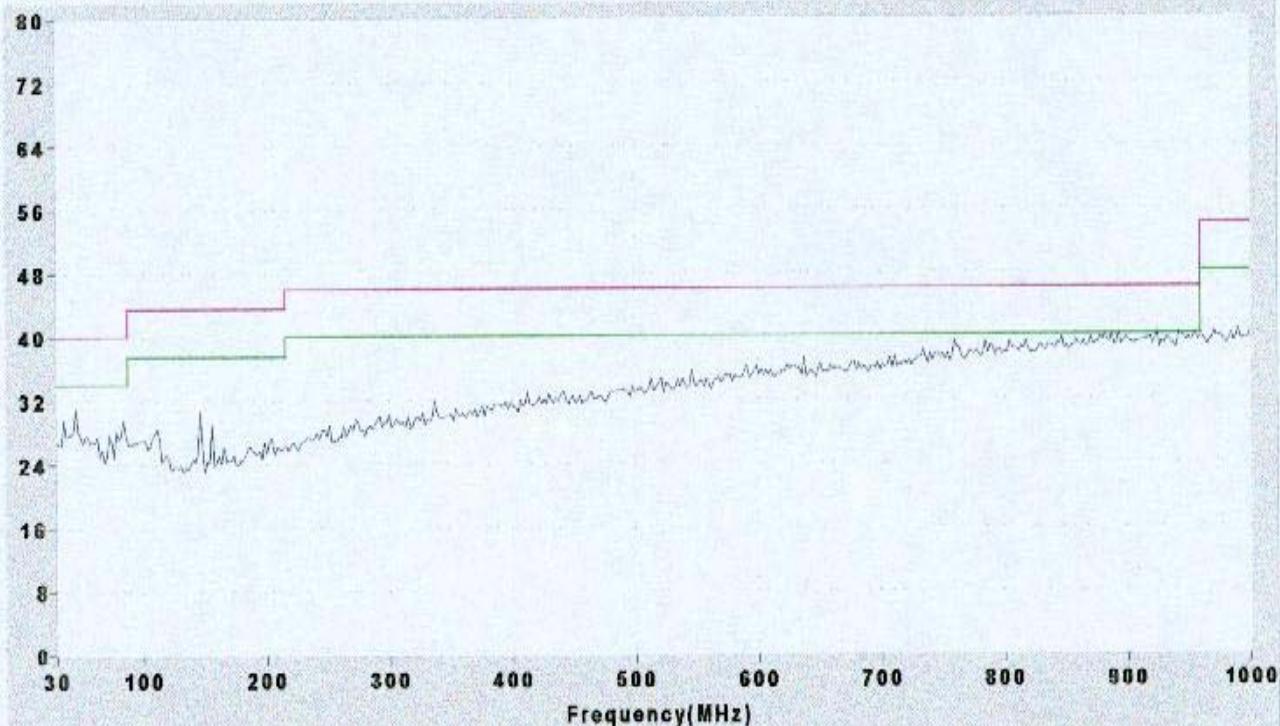
Part 2: 30Mhz-1000Mhz , transmit at 2441Mhz

Vertical

SGS EMC Lab. Site 2
EMI TESTING REPORT

Customer: Date:2003-05-28 Time:15:37
Model :BT400 GII Polar. :Vertical- 3M
Spec. : Report No.:
Ser. No.:Bluetooth Headset (2441 MHz) File : -1
Limit :FCC B Tester :Alex
Tmp. (C):0.0 Humid. (%):59

Level (dBuV)



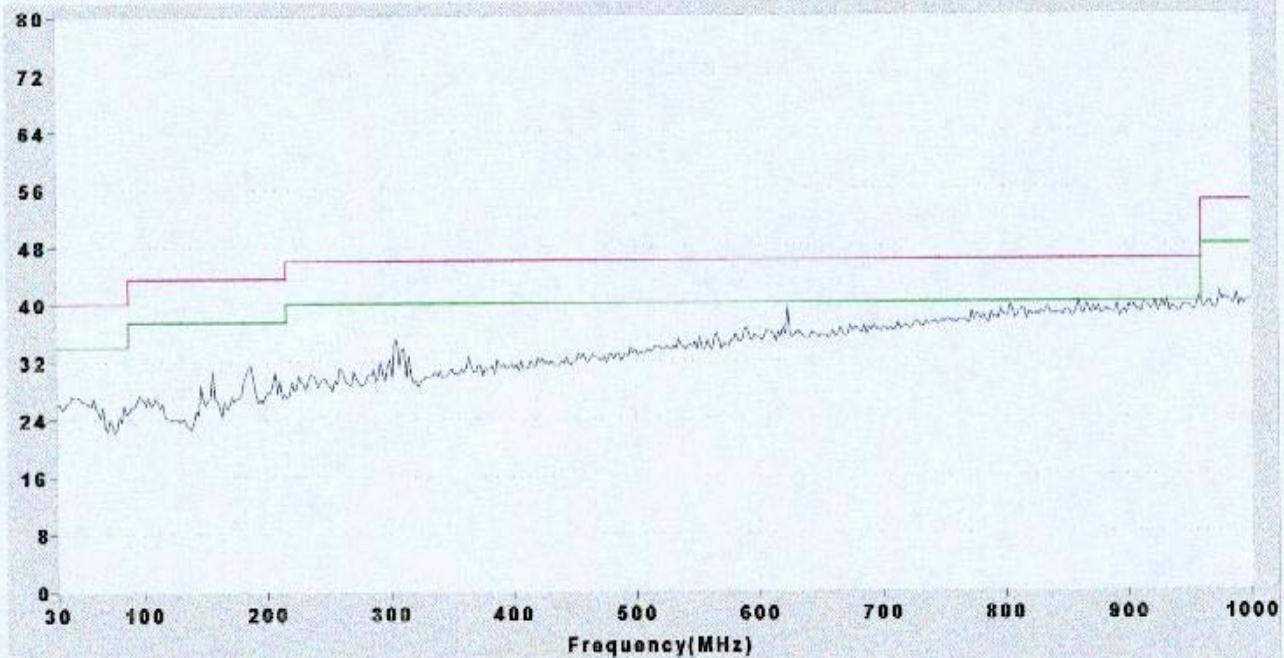
MEMO:

Horizontal

SGS EMC Lab. Site 2
EMI TESTING REPORT

Customer: Date:2003-05-28 Time:15:36
Model :BT400 GII Polar. :Horizontal- 3M
Spec. : Report No.:
Ser. No.:Bluetooth Headset (2441 MHz) File : -1
Limit :FCC B Tester :Alex
Tmp. (C):0.0 Humid. (%):59

Level (dBuV)



MEMO:

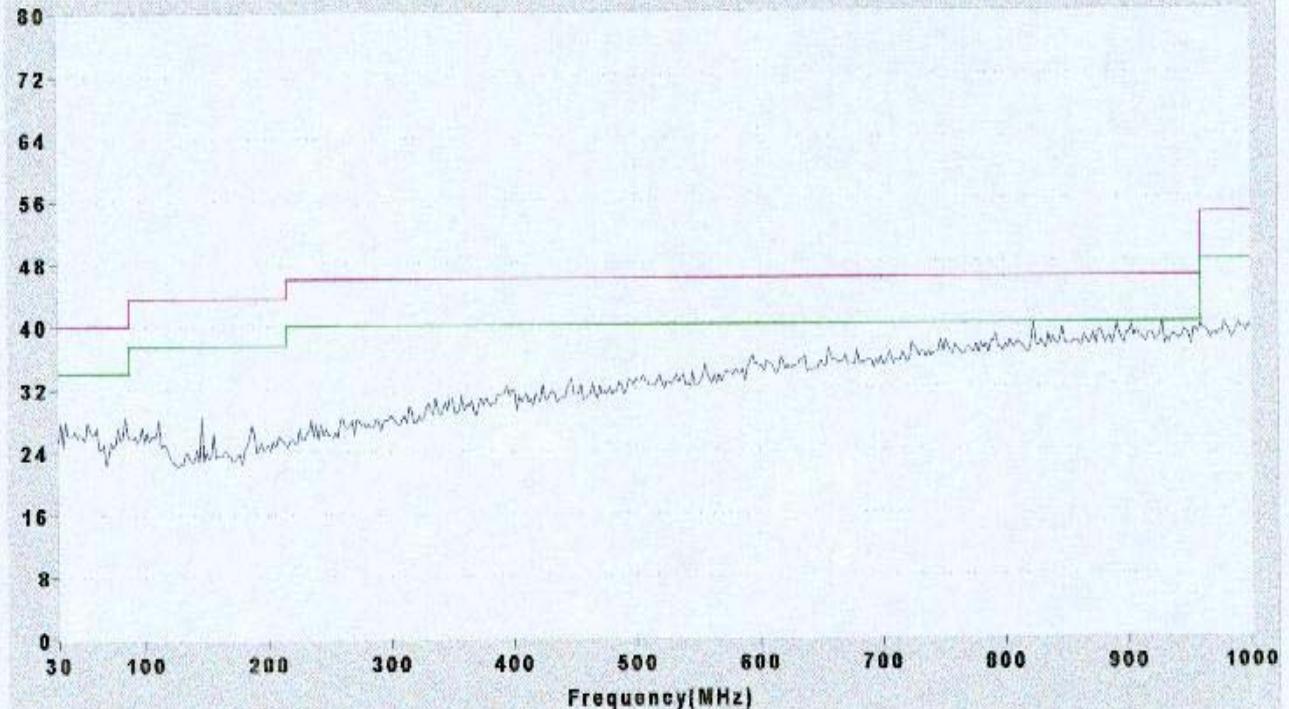
Part 3: 30Mhz-1000Mhz , transmit at 2480Mhz

Vertical

SGS EMC Lab. Site 2
EMI TESTING REPORT

Customer: Date:2003-05-28 Time:15:42
Model :BT400 GII Polar. :Vertical- 3M
Spec. : Report No.:
Ser. No.:Bluetooth Headset (2480 MHz) File : -1
Limit :FCC B Tester :Alex
Tmp.(C):0.0 Humid.(%):59

Level (dBuV)



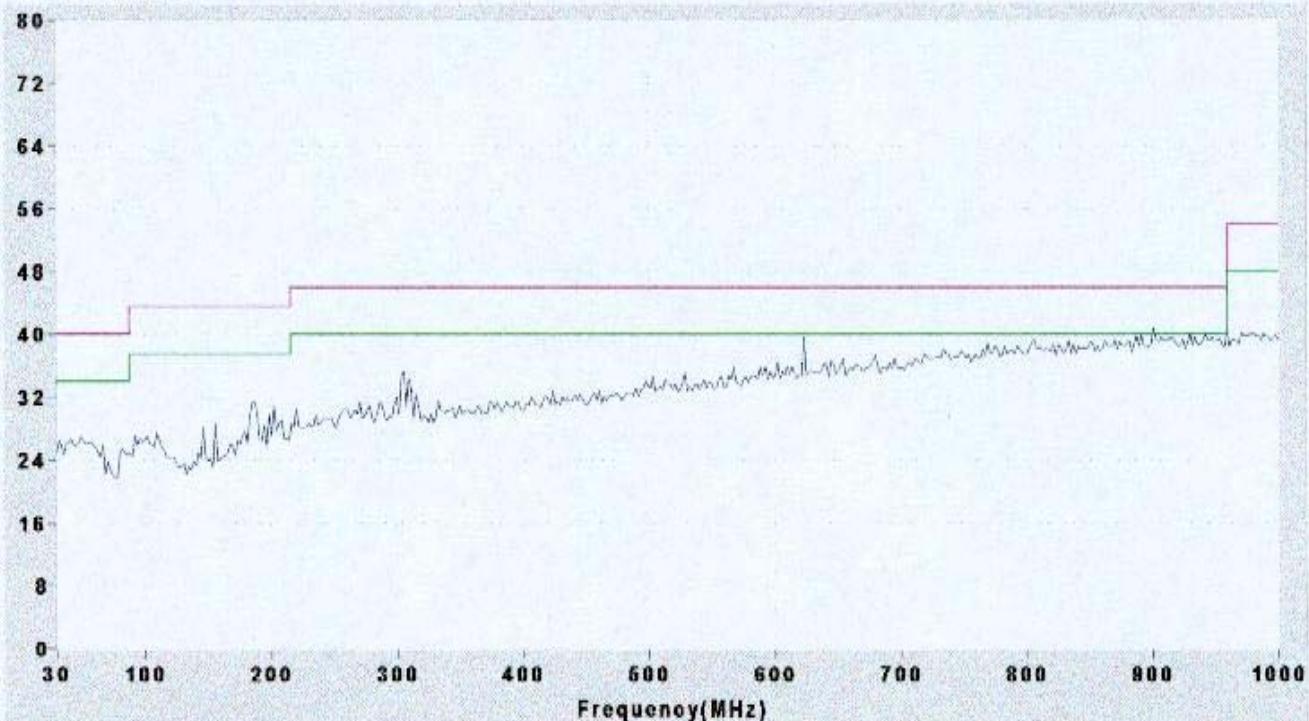
MEMO:

Horizontal

SGS EMC Lab. Site 2
EMI TESTING REPORT

Customer: Date:2003-05-28 Time:15:41
Model :BT400 GII Polar. :Horizontal- 3M
Spec. : Report No.:
Ser. No.:Bluetooth Headset (2480 MHz) File :-1
Limit :FCC B Tester :Alex
Tmp. (C):0.0 Humid. (%):59

Level (dBuV)



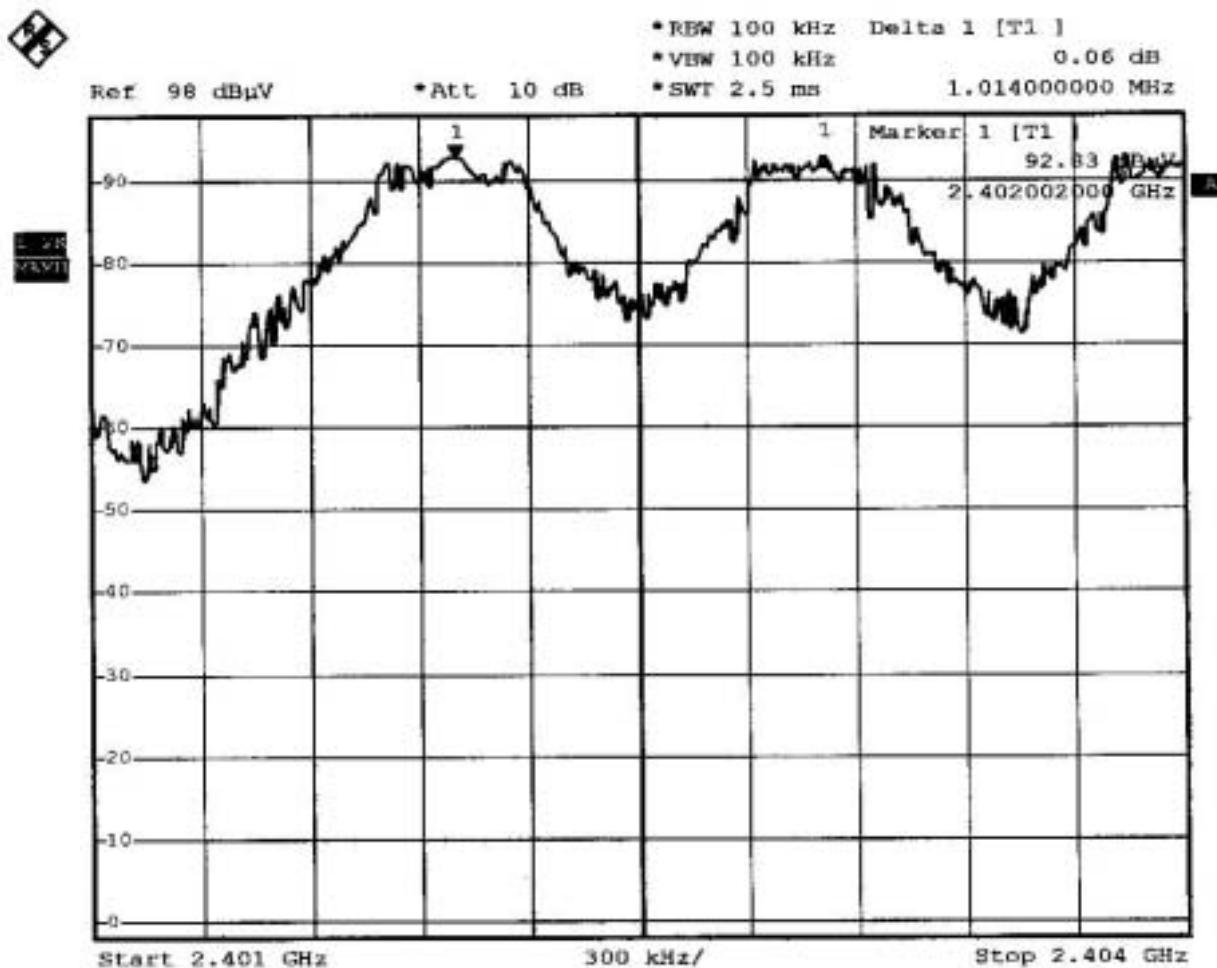
MEMO:

4.2.1 Limits

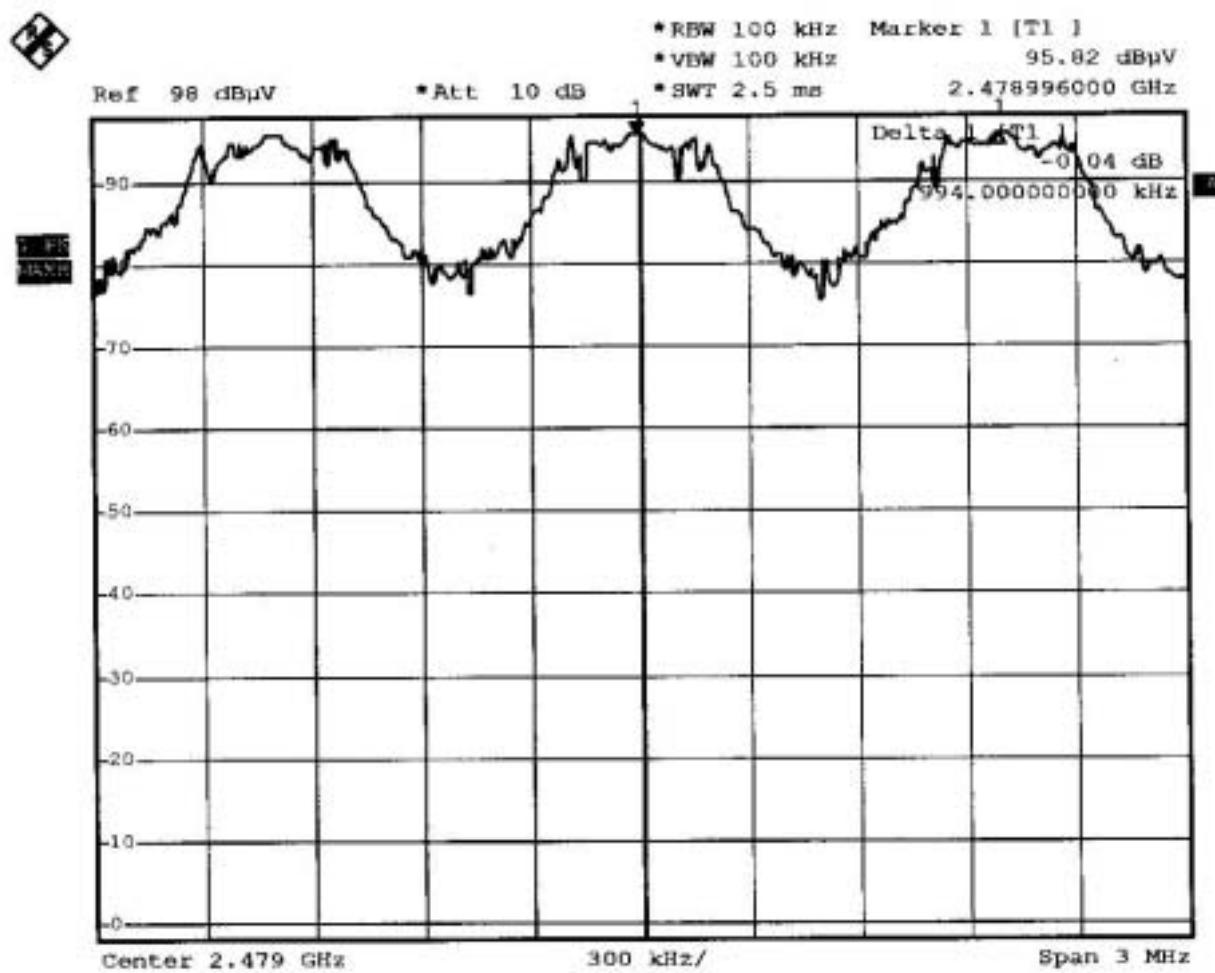
| Frequency (MHz) | Field Strength (microvolts/meter) | Measurement Distance (meters) |
|--------------------|--------------------------------------|----------------------------------|
| 0.009 - 0.490 | 2400/F(kHz) | 300 |
| 0.490 - 1.705 | 24000/F(kHz) | 30 |
| 1.705 - 30.0 | 30 | 30 |
| 30 - 88 | 100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

4.3 Channel Separation

SUBCLAUSE15.247(a)(1)

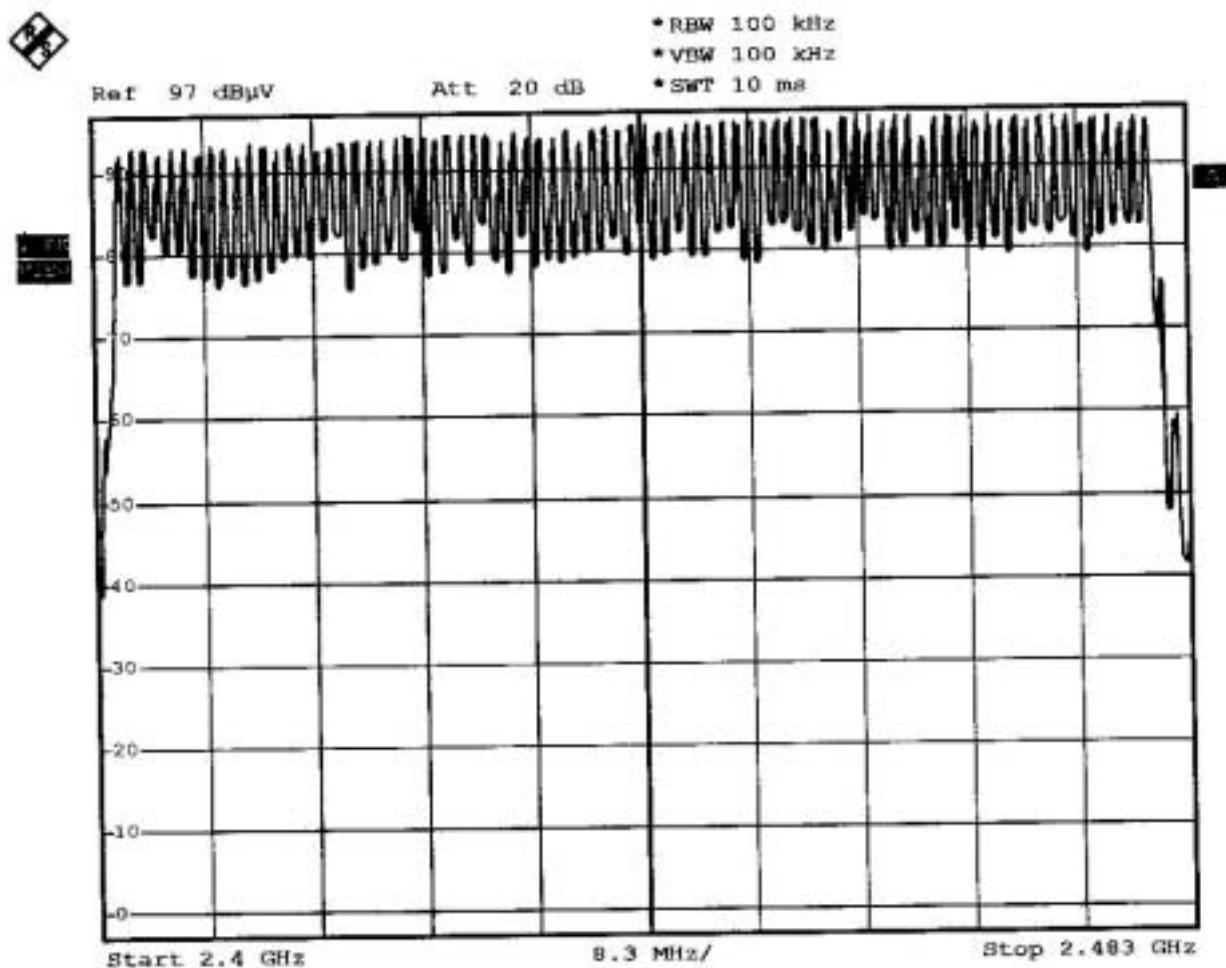


Date: 29.MAY.2003 15:11:37



Date: 29.MAY.2003 15:09:20

| | Lowest channel | Highest channel |
|--------------------------|----------------|-----------------|
| Channel separation (khz) | 1008 | 996 |

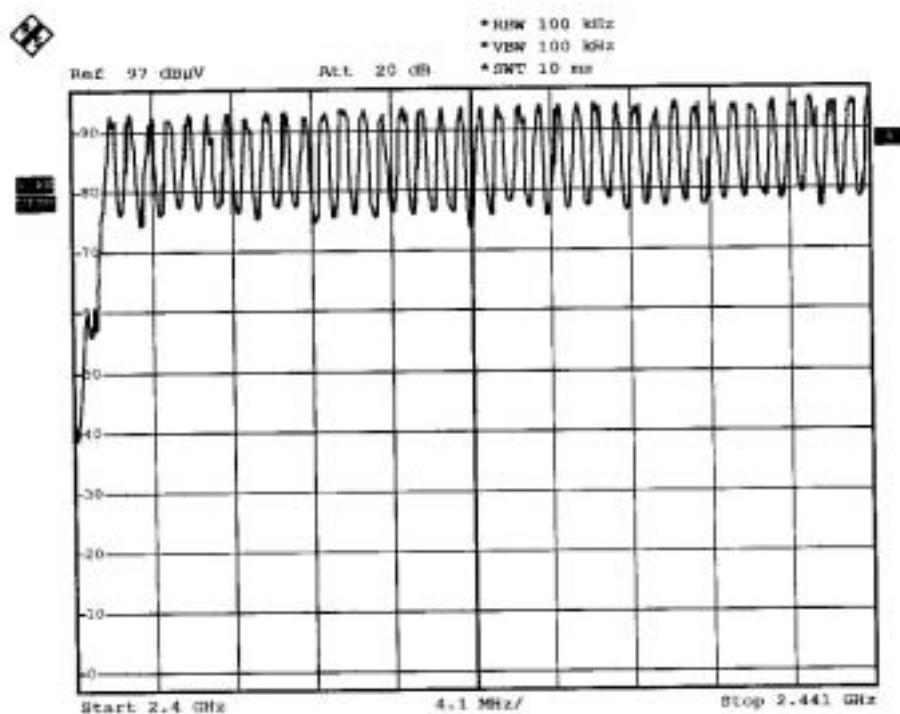
4.4 No. of carrier frequency / 20db Bandwidth**SUBCLAUSE15.247(a)(1)(ii)**

Date: 29.MAY.2003 14:56:59

/17

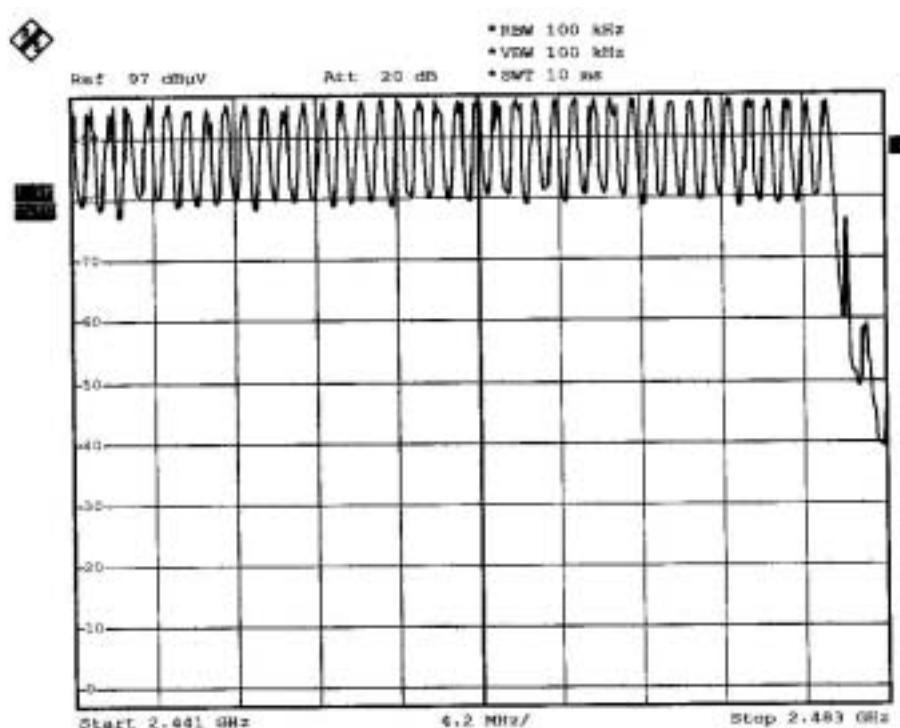
No. of channels = 79

Split the whole frequency band into two.



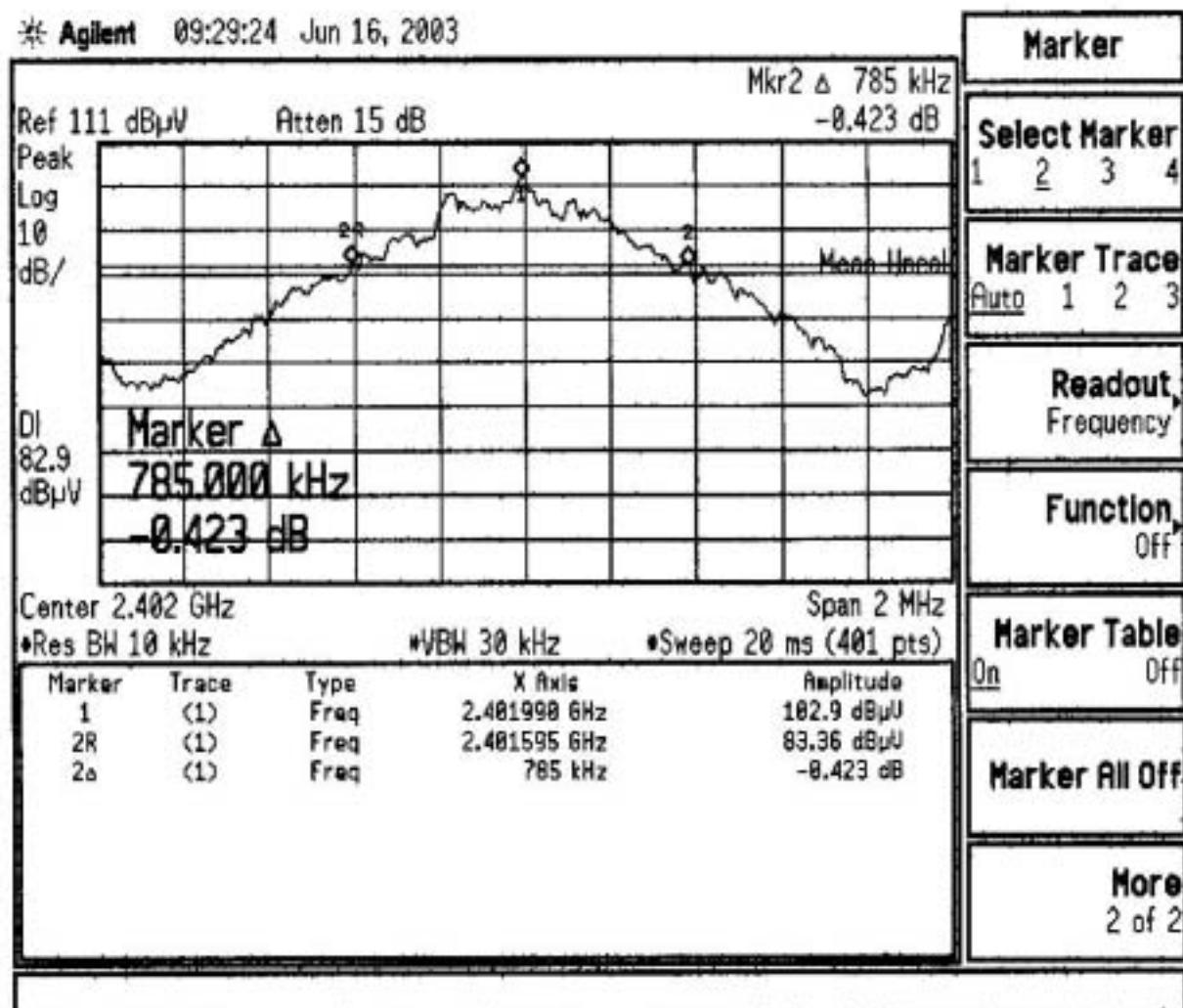
Date: 29.MAY.2003 14:59:16

✓



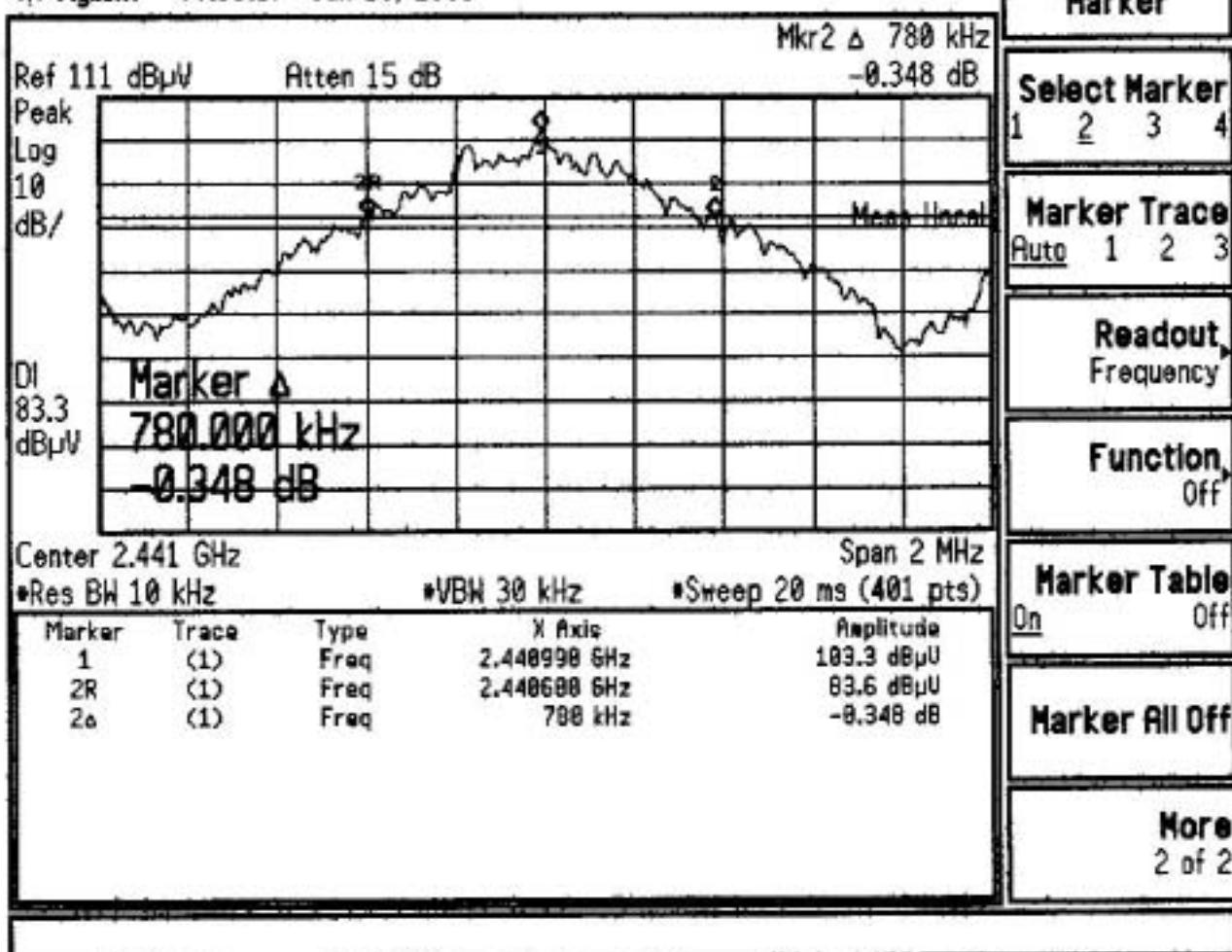
Date: 29.MAY.2003 15:02:03

20dB bandwidth at lowest (2402Mhz), middle(2442Mhz), highest channel(2480Mhz)



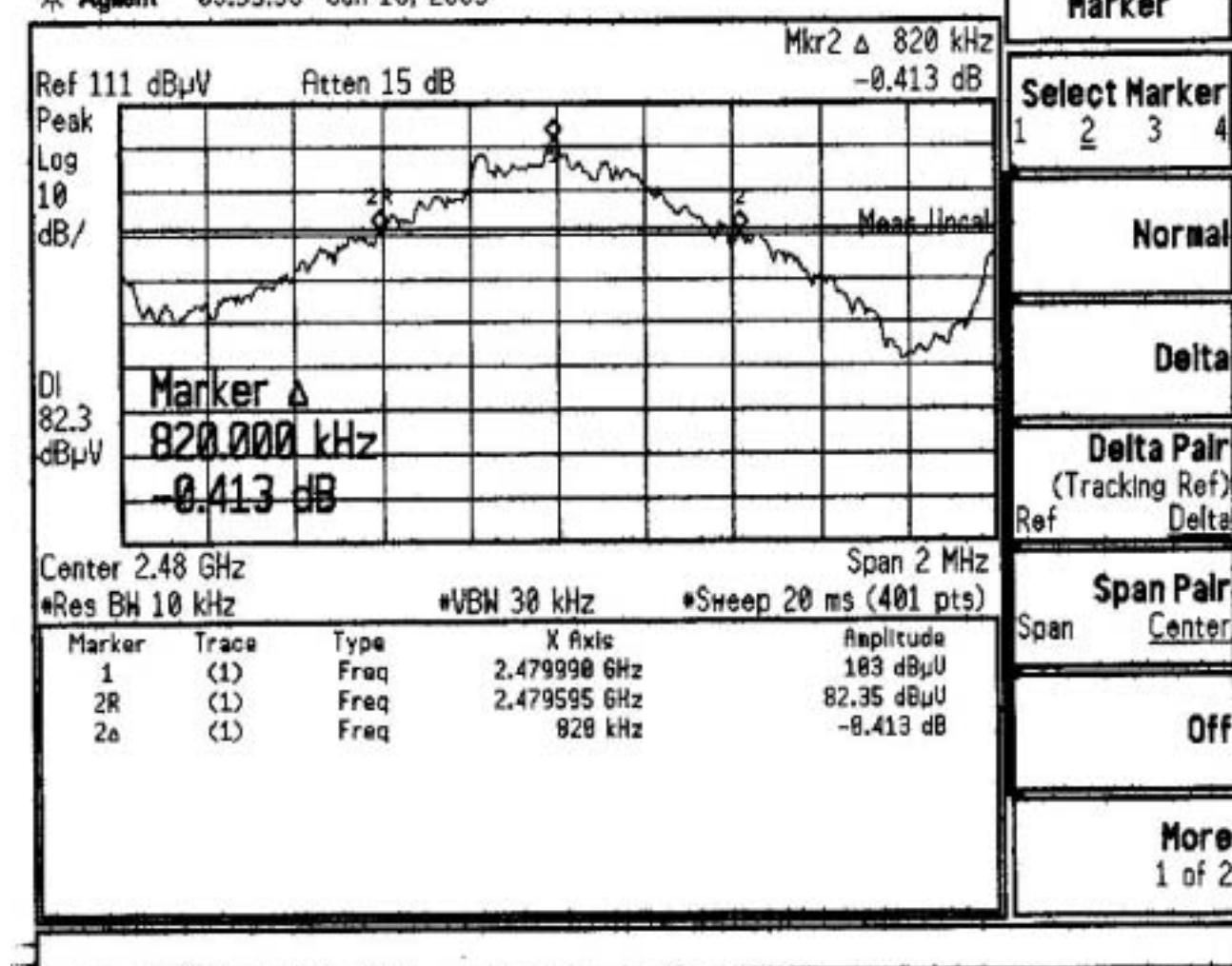
channel bandwidth = 785 KHz

* Agilent 09:33:17 Jun 16, 2003



channel bandwidth = 780 KHz

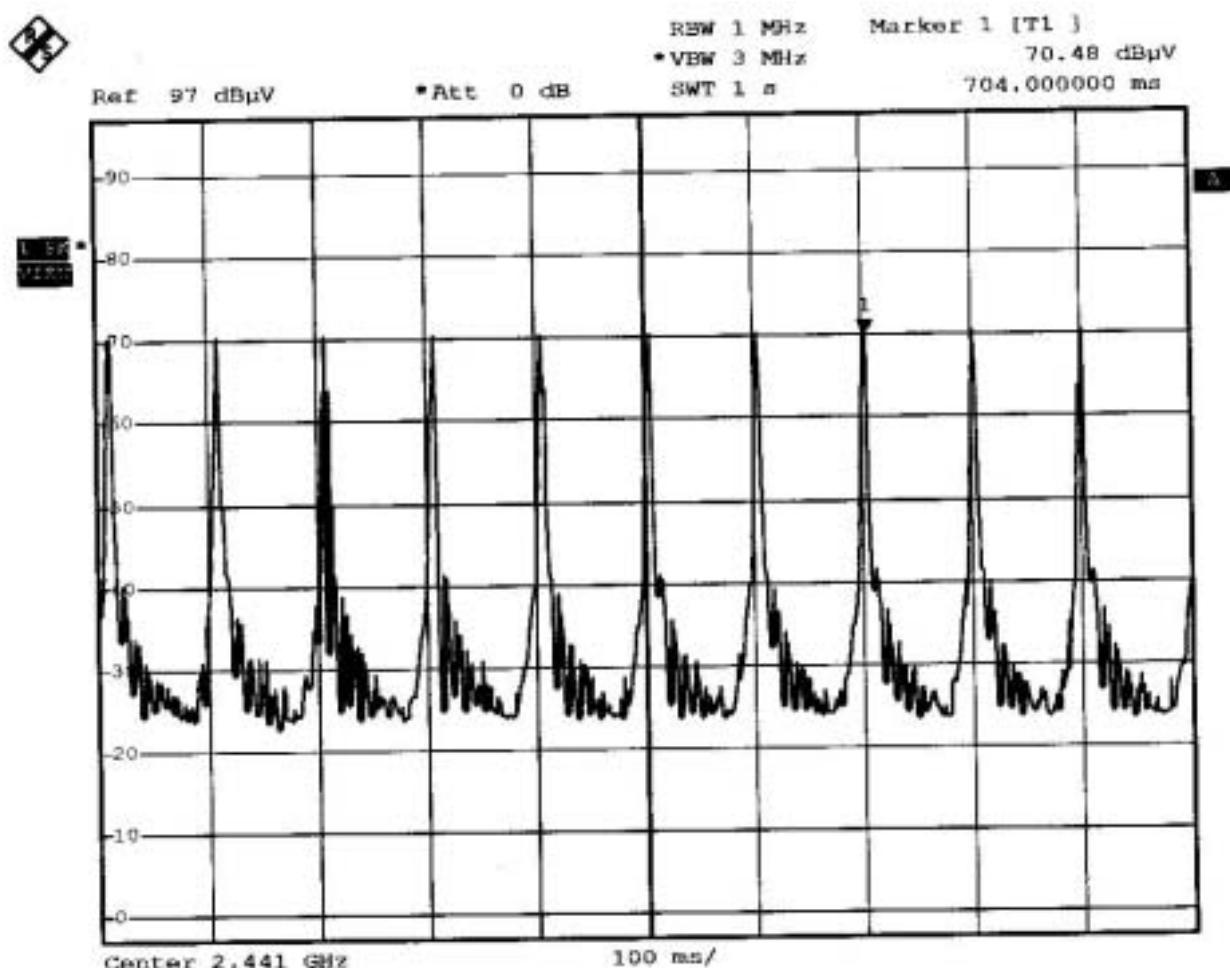
Agilent 09:35:38 Jun 16, 2003



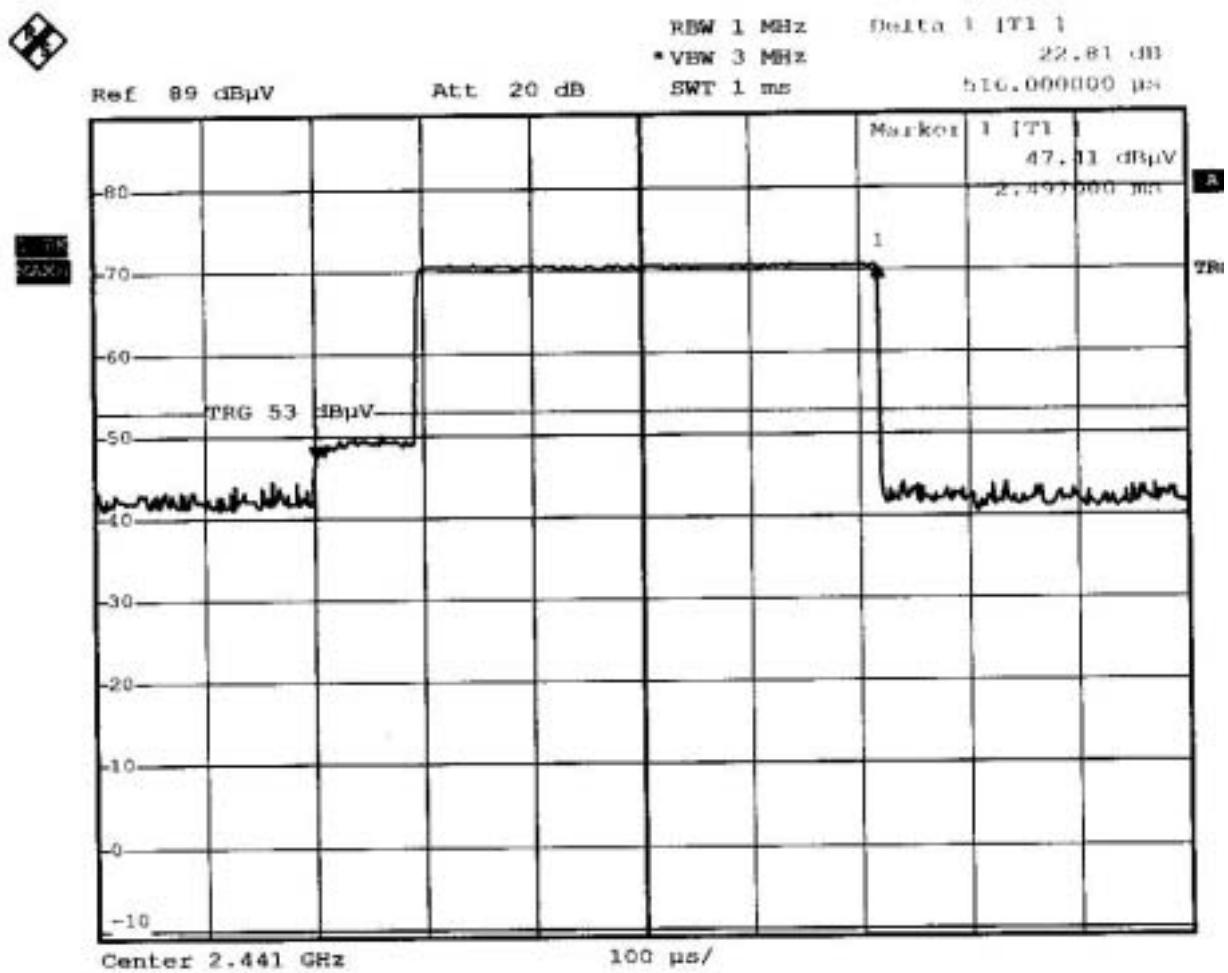
channel bandwidth = 828 Khz

4.5 Average Time of Occupancy

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



Date: 29.MAY.2003 13:27:18



Date: 29.MAY.2003 14:28:38

4.5.1 calculation

At channel 2441Mhz, there are 10 bursts in 1 sec. Time period of each burst is 510 μ Sec. So the occupancy time within 30 second is $510 \times 10 \times 30 = 153000 \mu \text{Sec} = 153 \text{ mSec} = 0.153 \text{ Sec.}$

4.5.2 Limits

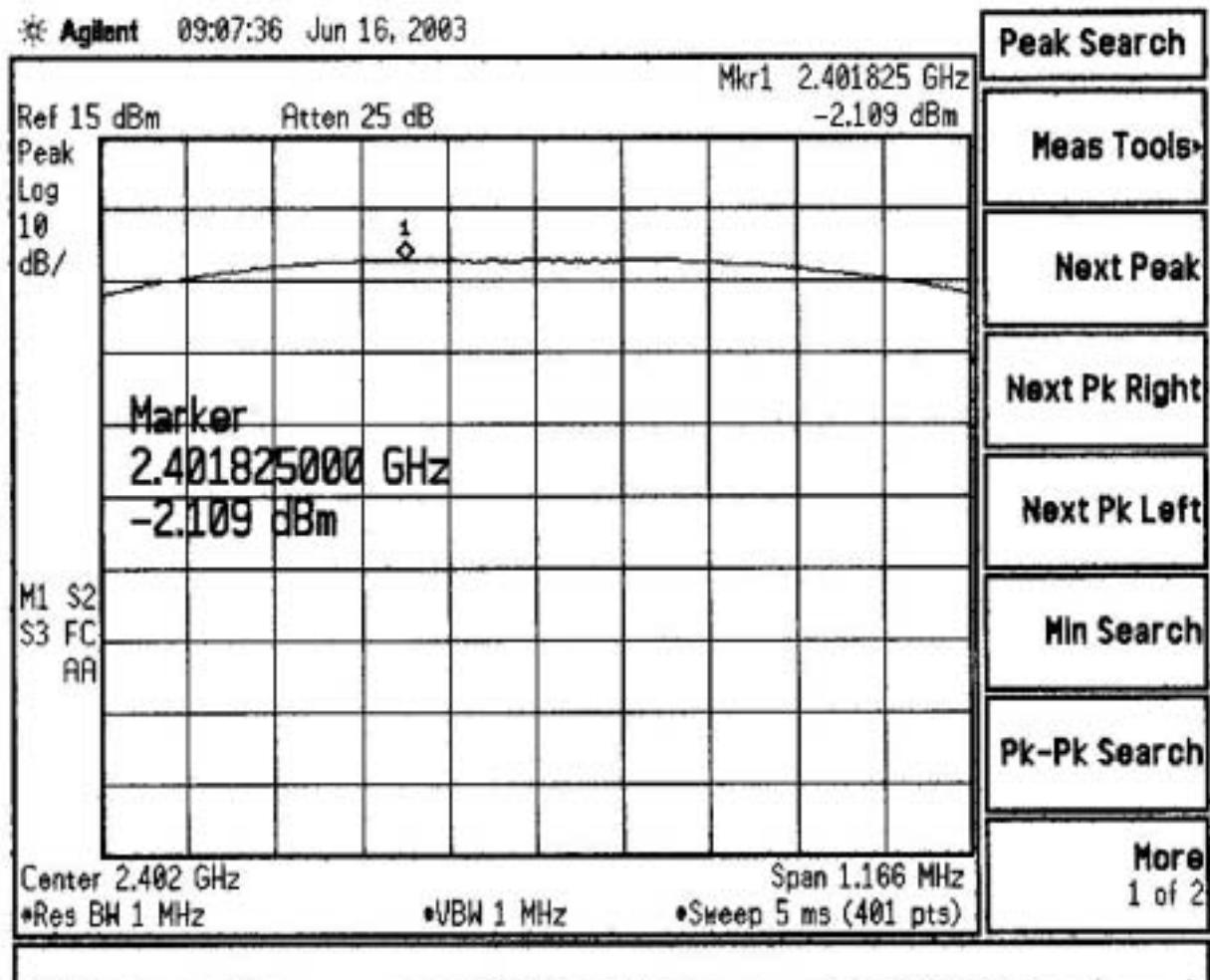
The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 30 second period.

The EUT comply with the requirement in Sec 15.247 (a)(1) that use at least 75 hopping frequencies. The maximum 20 dB 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

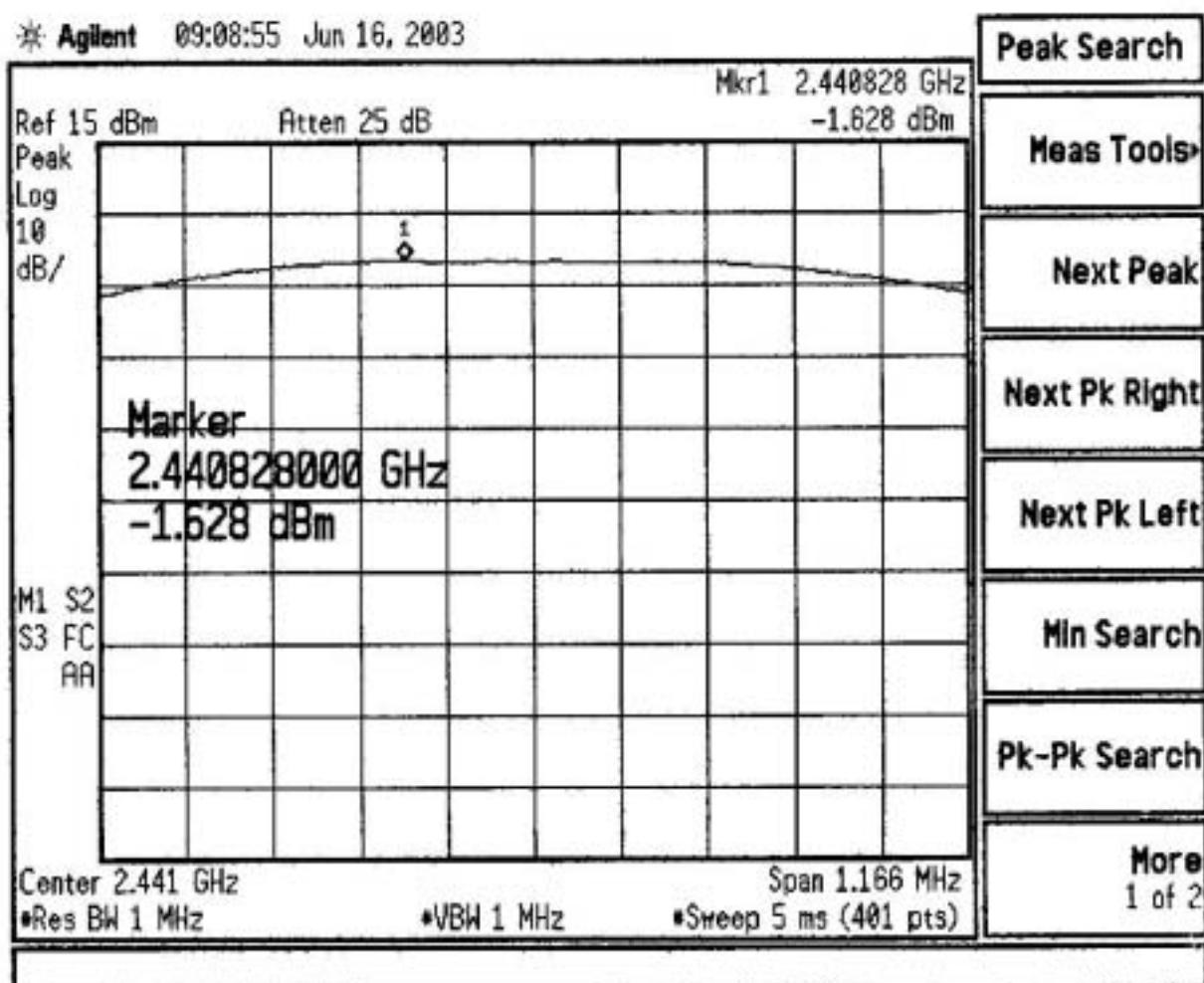
SUBCLAUSE15.247(b)(1)

Transmitter transmit at lowest channel (2402Mhz)



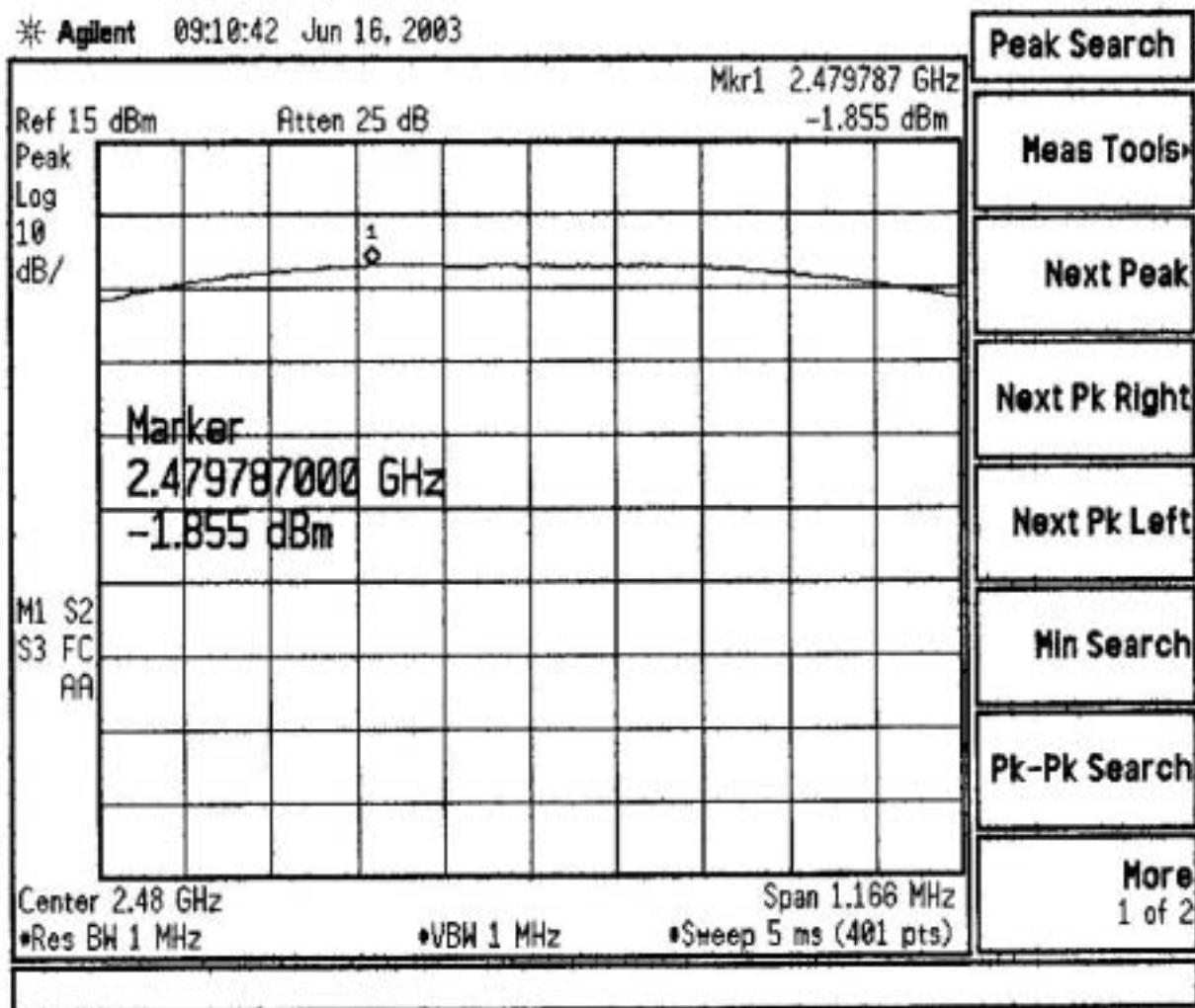
$$\text{Power} = -2.109 \text{ dbm} + 2.76 \text{ db (cable loss)} = 0.651 \text{ dbm}$$

Transmitter transmit at middle channel (2441Mhz)



$$\text{Power} = -1.628 \text{ dbm} + 2.76 \text{ db (cable loss)} = 1.132 \text{ dbm}$$

Transmitter transmit at highest channel (2480Mhz)



$$\text{Power} = -1.885 \text{ dbm} + 2.76 \text{ db (cable loss)} = 0.875 \text{ dbm}$$

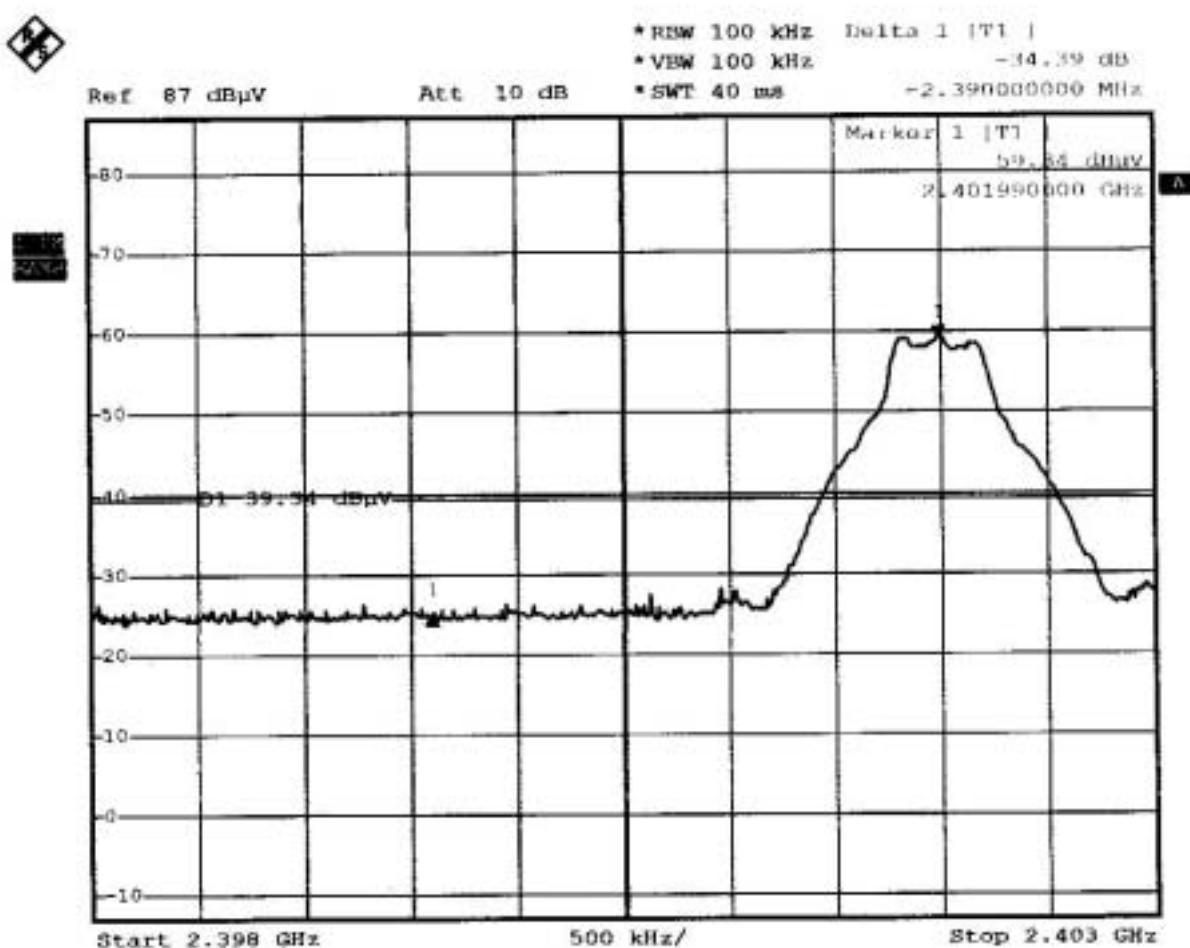
The maximum power happens in lowest channel which is 1.132 dbm = 1.30 mW

Limits:

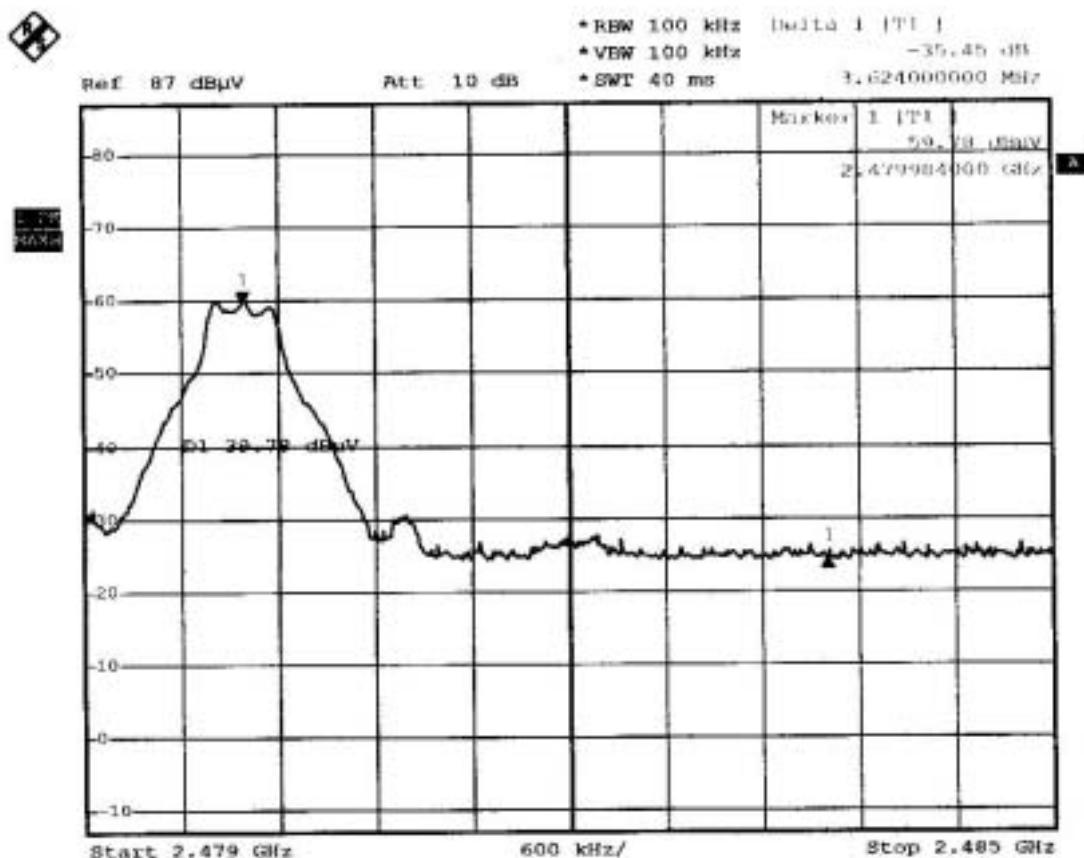
For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 hopping channels, all frequency hopping systems in the 5725-5850 MHz band, and all direct sequence systems: 1 watt.

4.7 Band Edge emission

SUBCLAUSE15.247(c)



Date: 19.JUN.2003 11:34:27



Date: 19.JUN.2003 11:49:33

| | Lower bandedge | Upper bandedge |
|--|-----------------|-----------------|
| Bandedge difference from main channel | 34.39 db | 35.45 db |

4.7.1 Limits

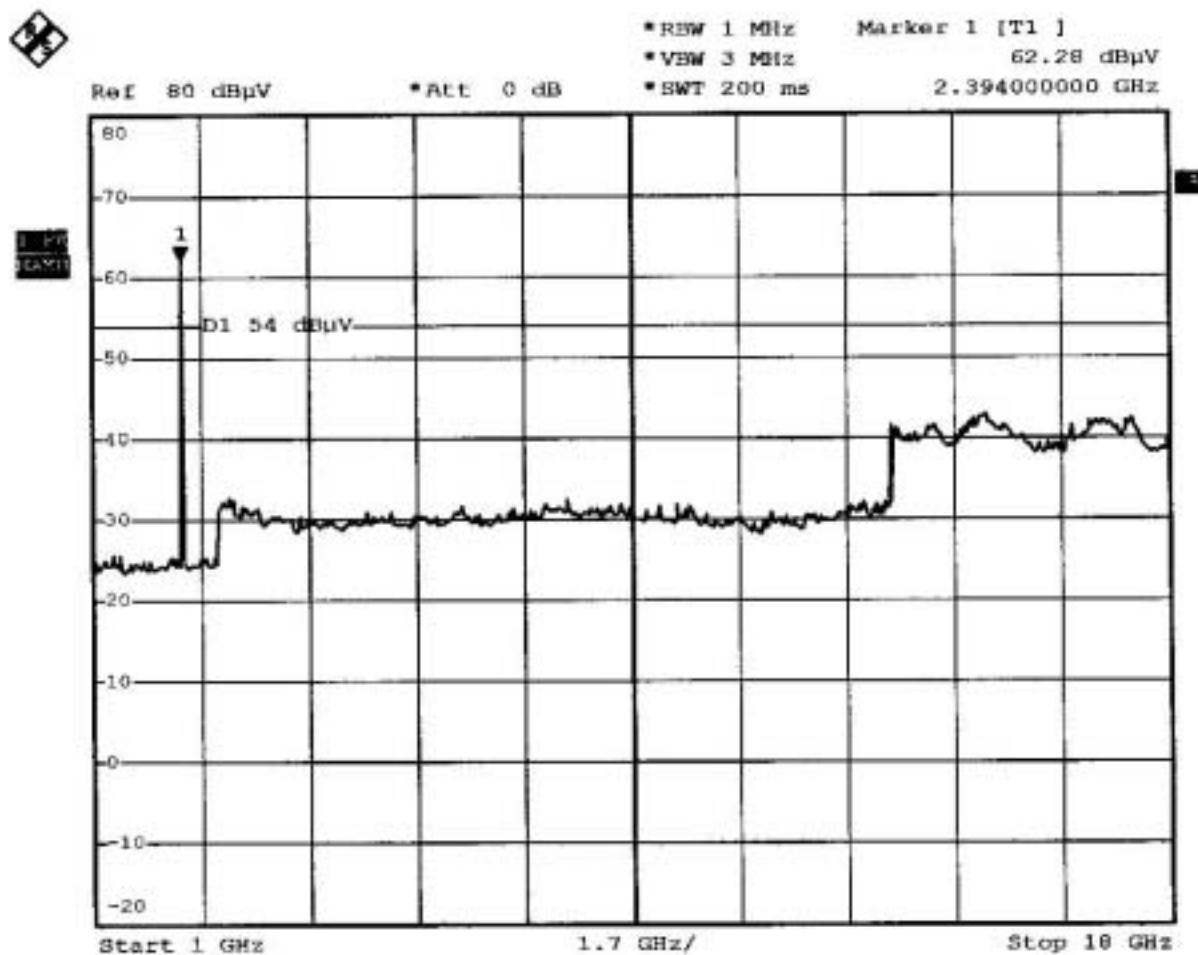
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the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

4.8 Spurious Emission under 25Ghz

SUBCLAUSE15.247(c)

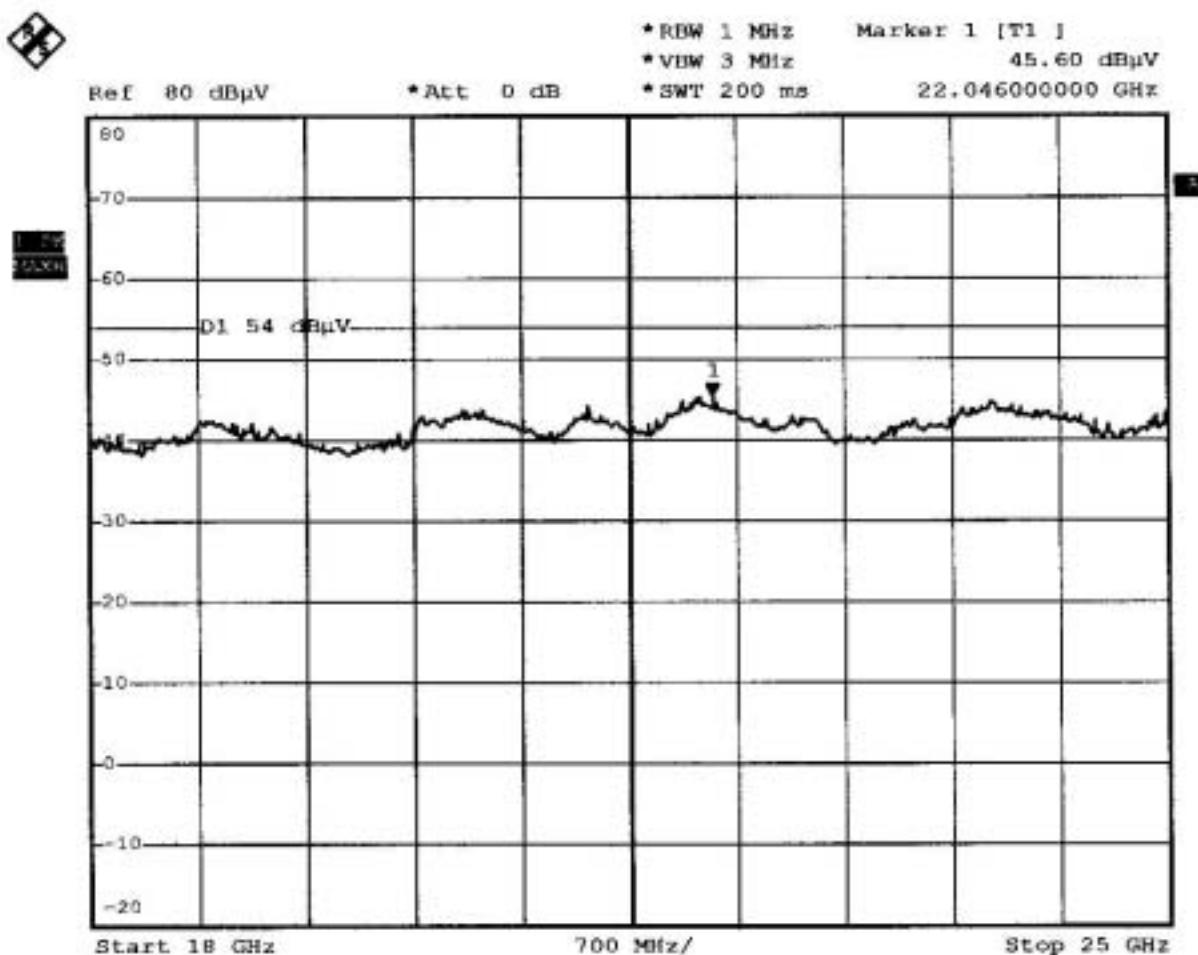
F=2402MHz with max. power , vertical

(1) 1Ghz – 18Ghz



Date: 28.MAY.2003 15:49:10

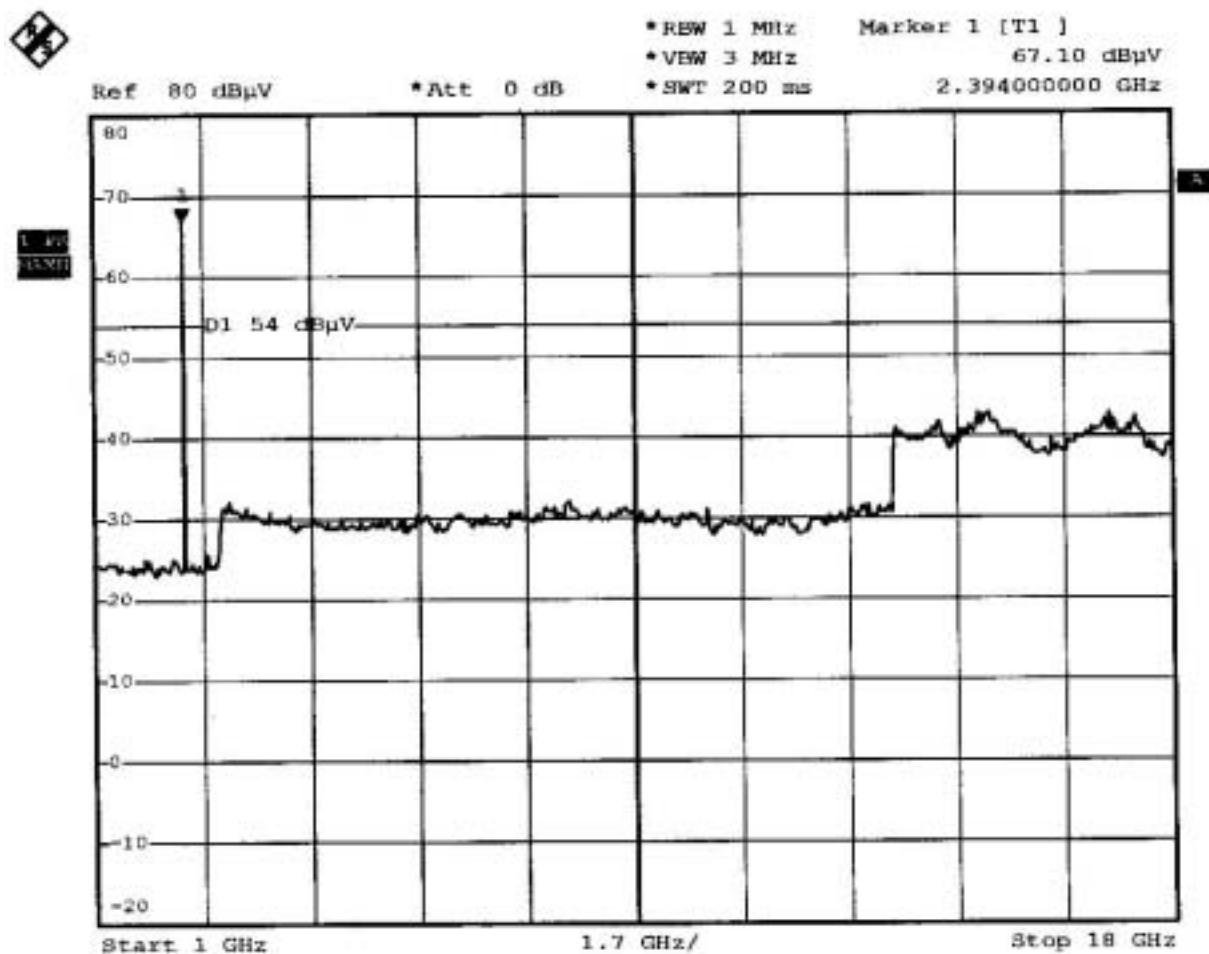
(2) 18Ghz – 25Ghz



Date: 28.MAY.2003 16:13:16

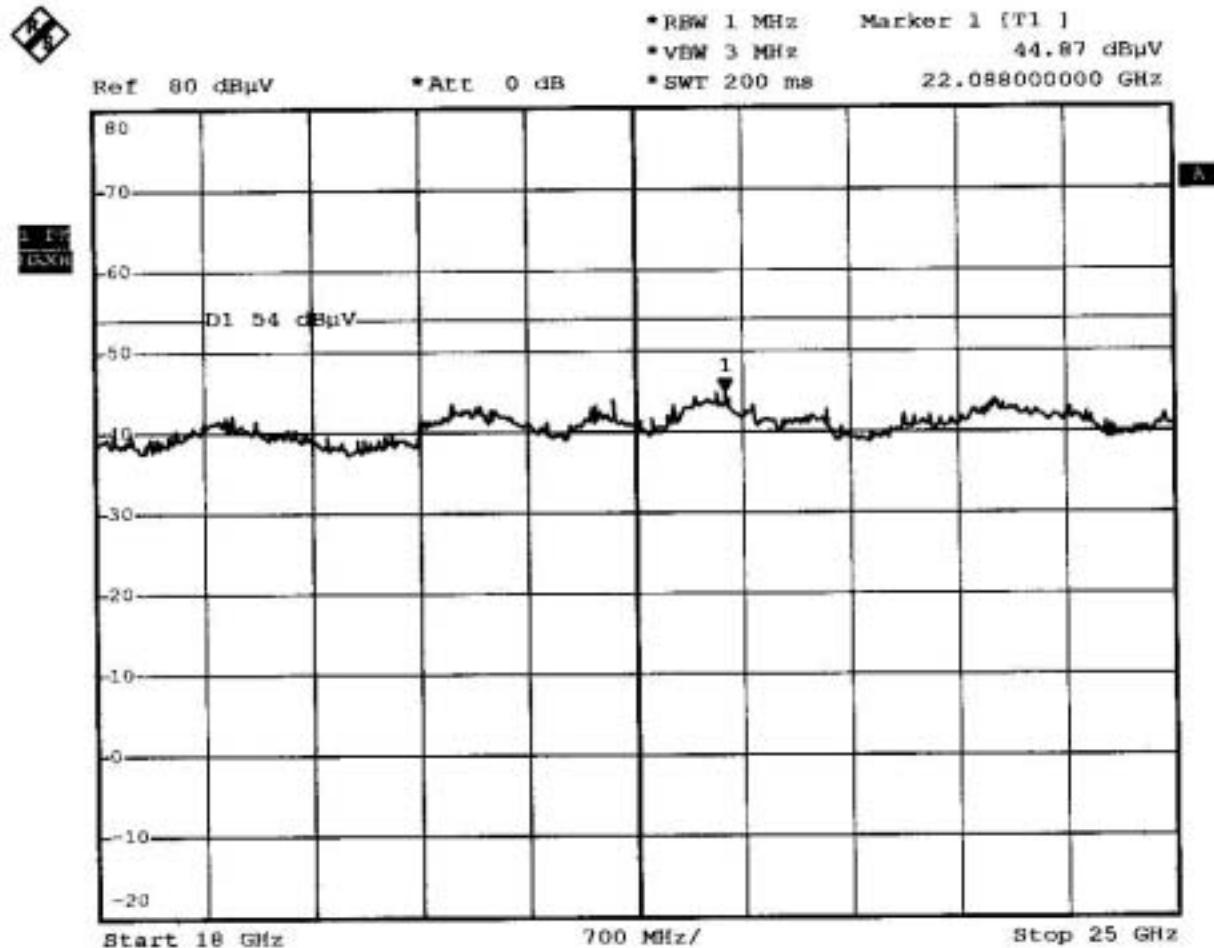
F=2402MHz with max. power , horizontal

(1) 1Ghz – 18Ghz



Date: 28.MAY.2003 15:50:36

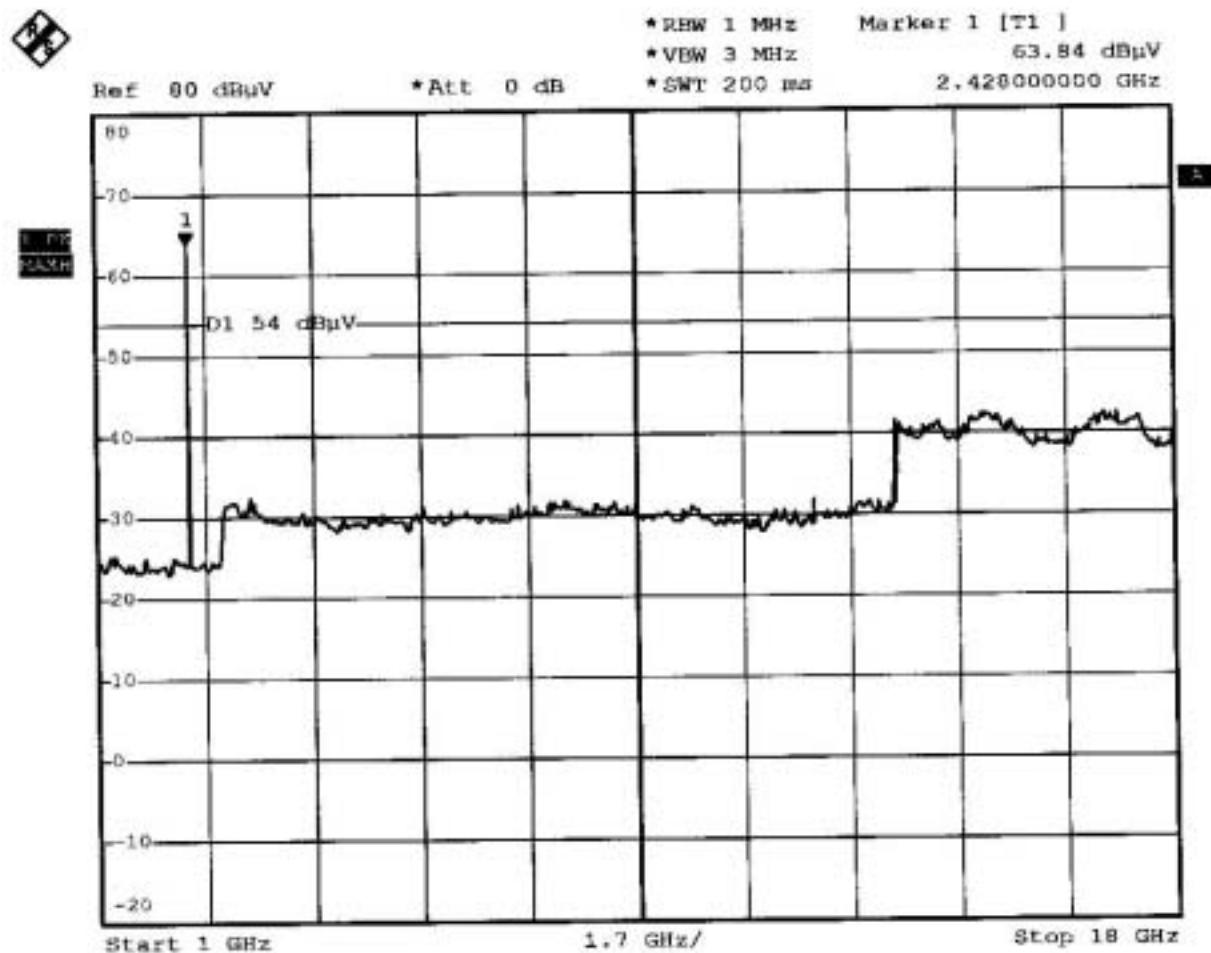
(2) 18Ghz – 25Ghz



Date: 28.MAY.2003 16:11:23

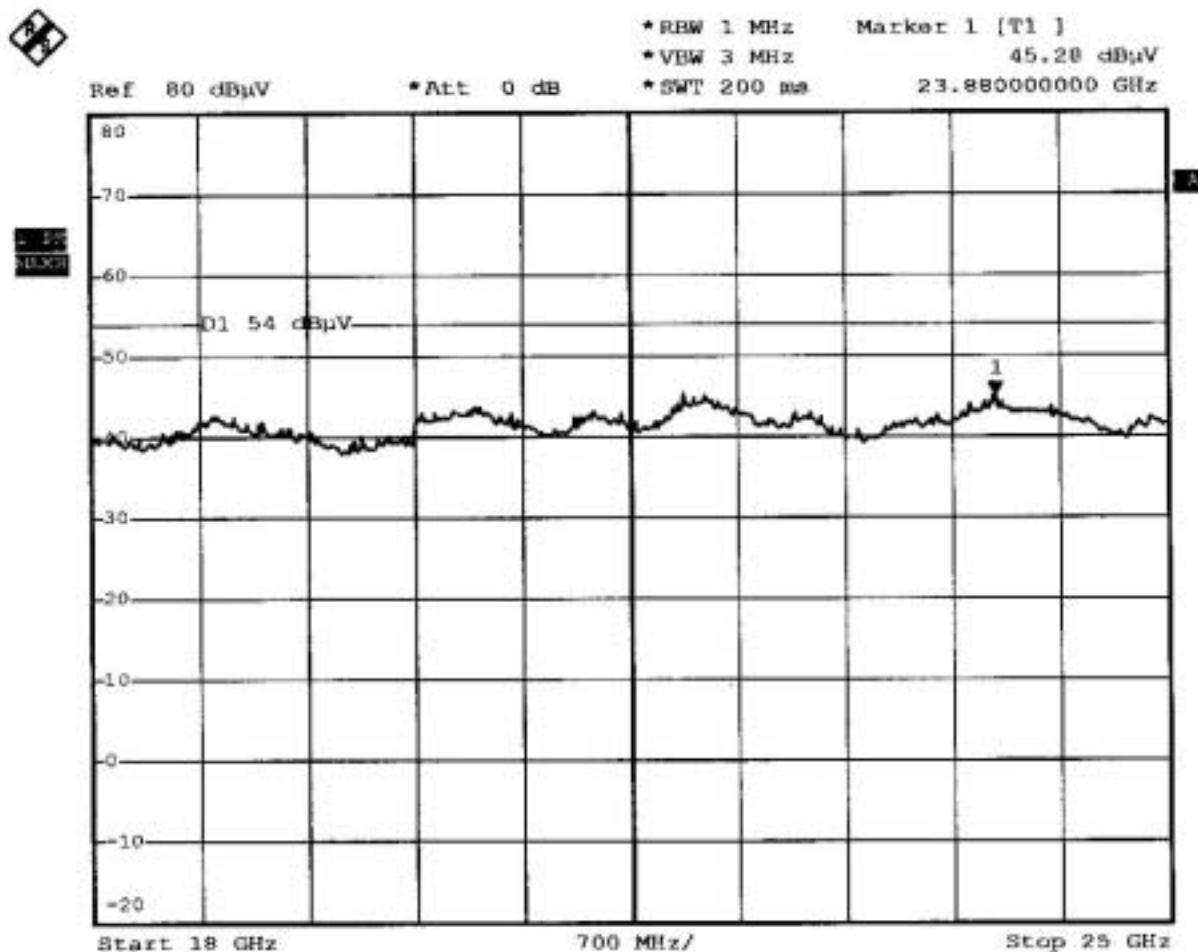
F=2441MHz with max. power , vertical

(1) 1Ghz – 18Ghz



Date: 28.MAY.2003 15:54:34

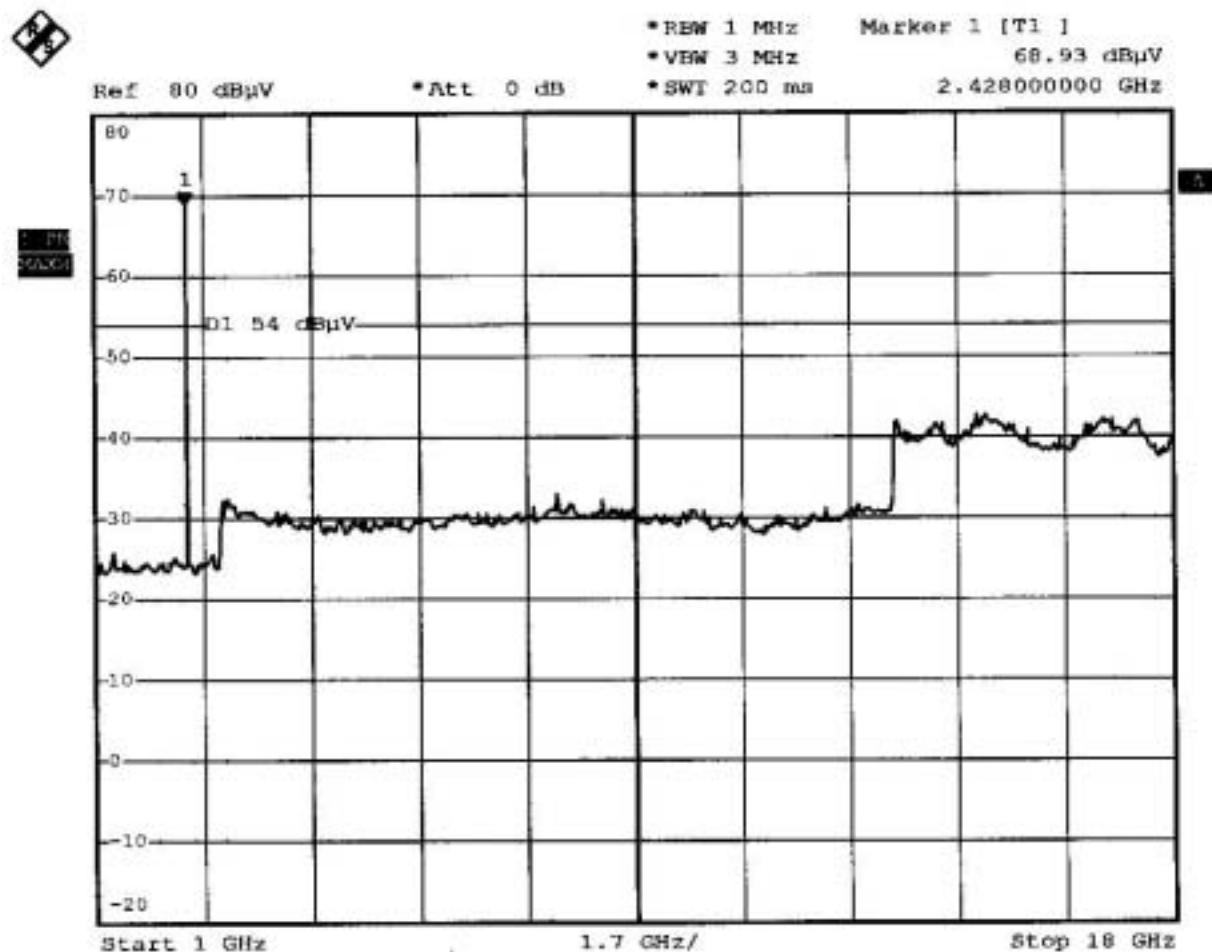
(2) 18Ghz – 25Ghz



Date: 28, MAY, 2003 16:07:50

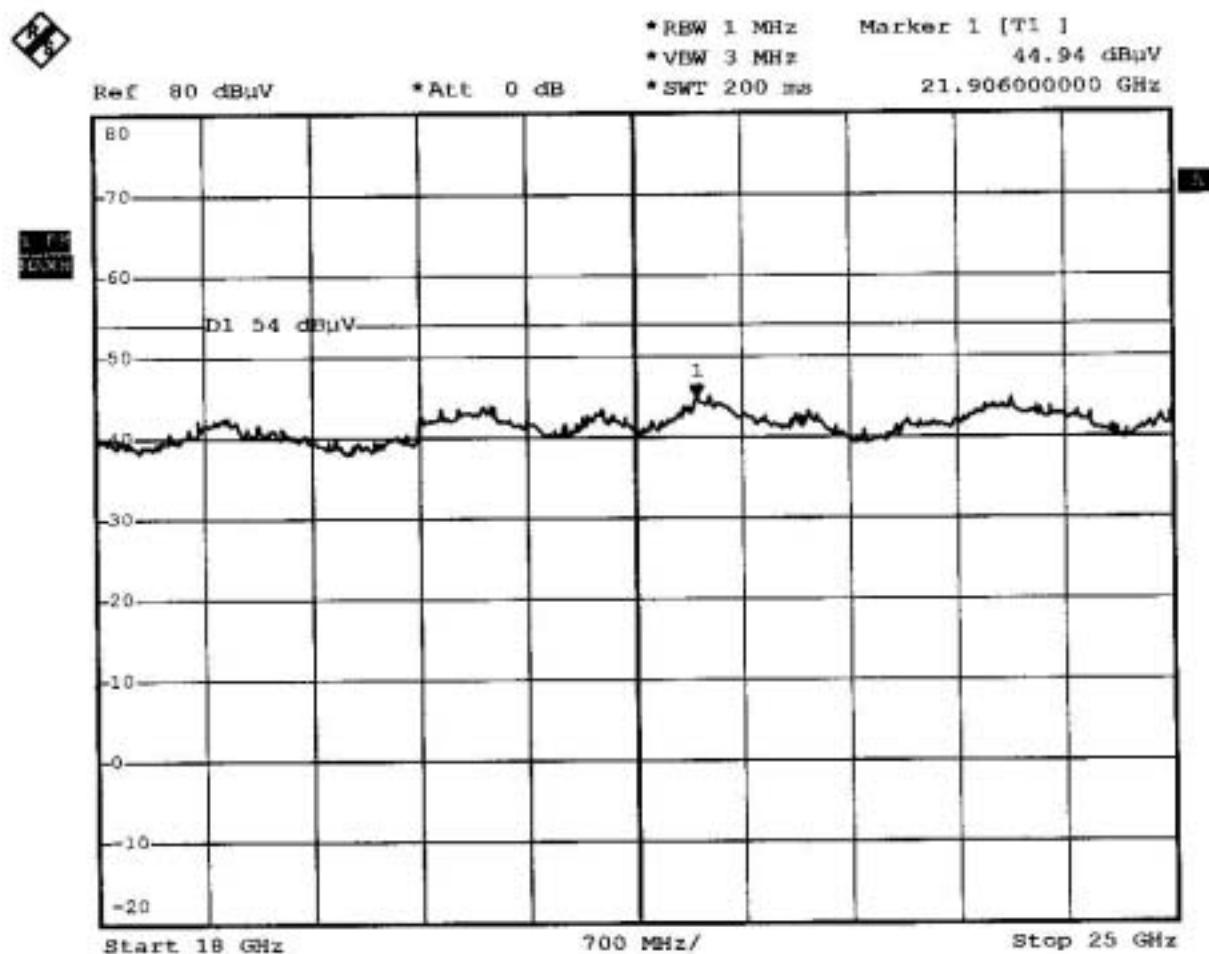
F=2441MHz with max. power , horizontal

(1) 1Ghz – 18Ghz



Date: 28.MAY.2003 15:52:07

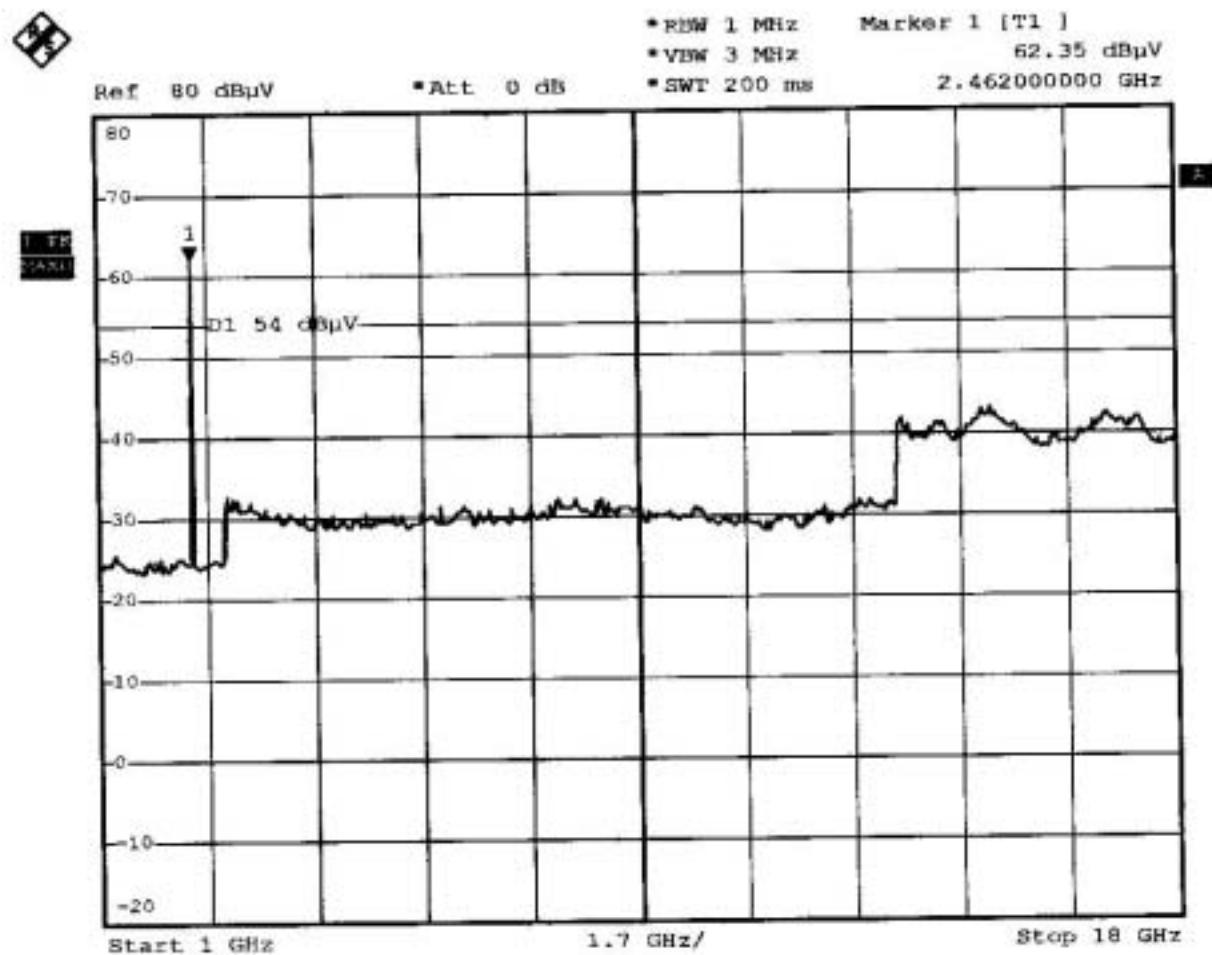
(2) 18Ghz – 25Ghz



Date: 26.MAY.2003 16:09:34

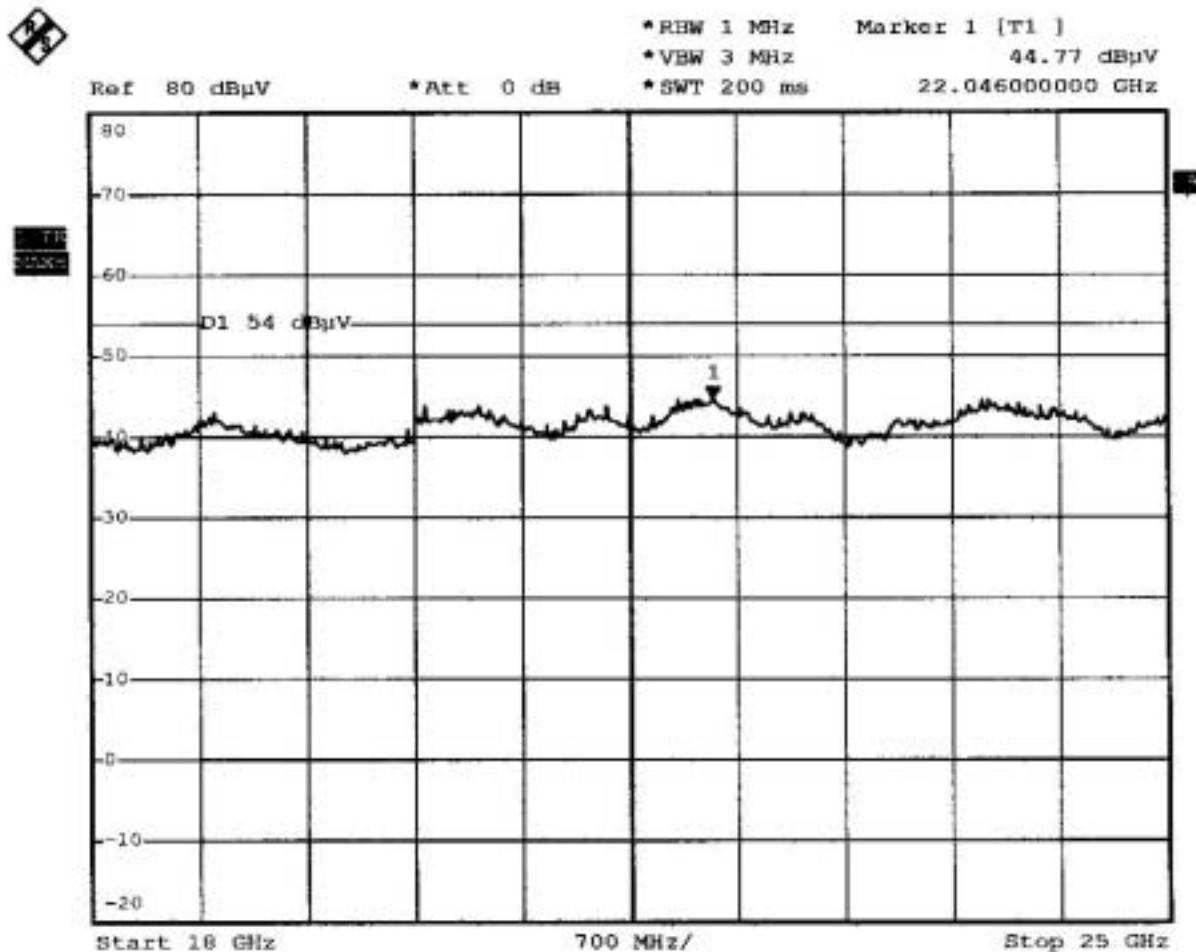
F=2480 MHz with max. power , vertical

(1) 1Ghz – 18Ghz



Date: 28.MAY.2003 15:57:00

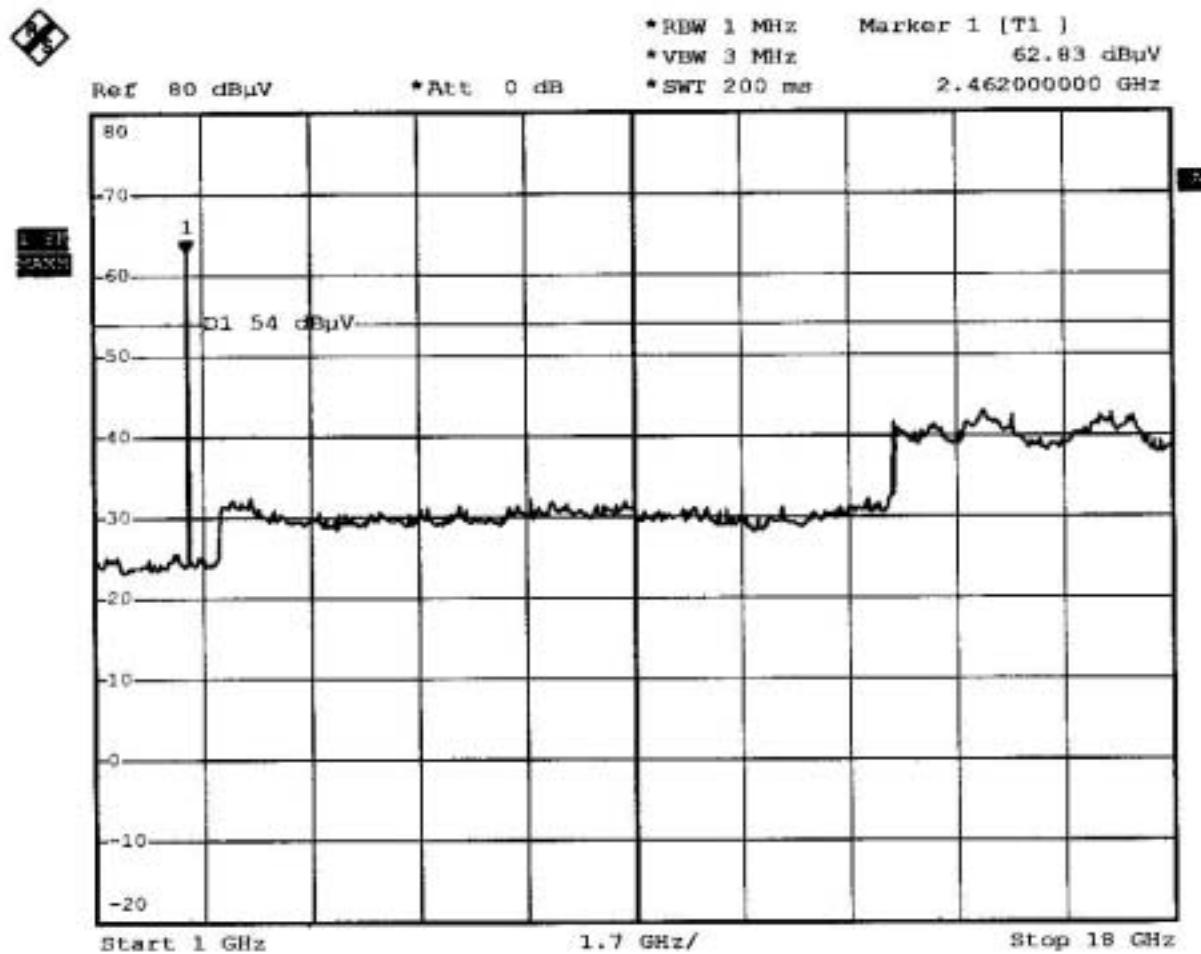
(2) 18Ghz – 25Ghz



Date: 28.MAY.2003 16:06:25

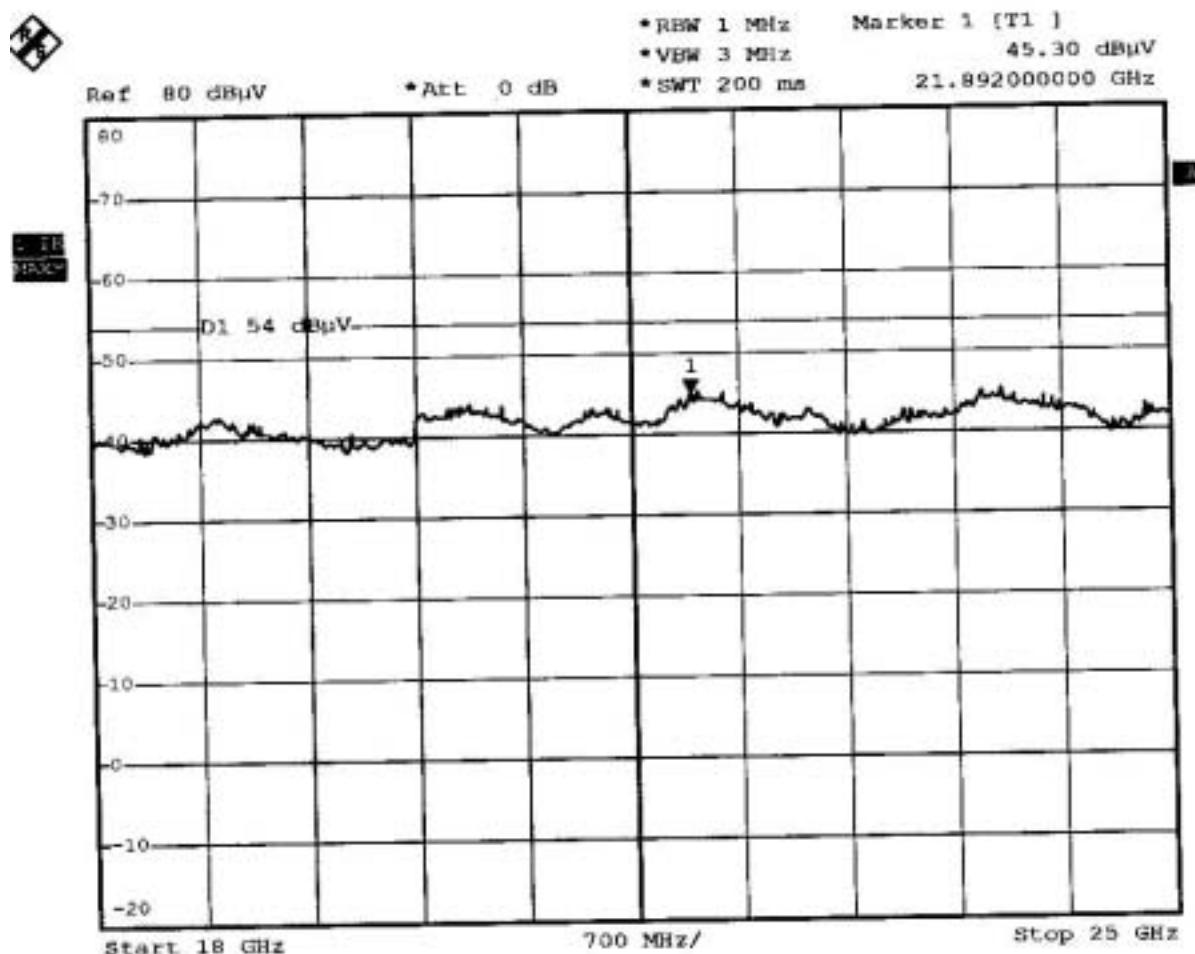
F=2480 MHz with max. power , horizontal

(1) 1Ghz – 18Ghz



Date: 28.MAY.2003 15:59:20

(2) 18Ghz – 25Ghz



Date: 28.MAY.2003 16:04:11

APPENDIX: Photographs of Test Setup

<Photos are saved separately>

APPENDIX : Photographs of EUT

Internal Photo

<Photos are saved separately>

External Photo

<Photos are saved separately>