# FCC TEST REPORT

according to

## FCC Rules and Regulations

## Part 15 Subpart C

| | |
|---|---|
| Applicant | Socket Communications, Inc. |
| Address | 37400 Central Court Newark, CA 94560 U.S.A. |
| Equipment | Class 1 Bluetooth USB Adapter |
| Model No. | Class 1 Bluetooth USB Adapter |
| FCC ID | LUBUSB-1 |
| Trade Name | Socket |

- The test result refers exclusively to the test presented test model / sample.,
- Without written approval of ***E**xclusive **C**ertification **C**orp.* the test report shall not be reproduced except in full.

# Contents

# CERTIFICATE OF COMPLIANCE

according to

## FCC Rules and Regulations

## Part 15 Subpart C

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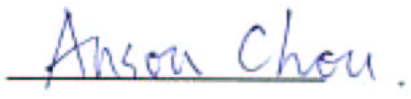
| Model No. | Class 1 Bluetooth USB Adapter |
| FCC ID | LUBUSB-1 |

I **HEREBY** CERTIFY THAT :

The measurements shown in this test report were made in accordance with the procedures given in **ANSI C63.4.** The equipment was ***passed*** the test performed according to **FCC Rules and Regulations Part 15 Subpart C (2002).** The test was carried out on Oct. 18, 2004 at ***E**xclusive **C**ertification **C**orp.*

Signature



Anson Chou / Manager

# 1. Report of Measurements and Examinations

## 1.1. List of Measurements and Examinations

| FCC Rule | . Description of Test | Result |
|---|---|---|
| 15.203 | . Antenna Requirement | Pass |
| 15.207 | . Conducted Emission | Pass |
| 15.209 | . Radiated Emission | Pass |
| 15.247(a)(1)(iii) | . Channel Carrier Frequencies Separation | Pass |
| 15.247(a)(1) | . 20dB Bandwidth Measurement | Pass |
| 15.247(a)(1)(iii) | . Dwell Time | Pass |
| 15.247(b)(1) | . Number of Hopping Channels | Pass |
| 15.247(b) | . Peak Output Power Measurement Data | Pass |
| 15.247(c) | . Band Edges Measurement Data | Pass |
| 15.247(d) | . Power Spectral Density Measurement Data | Pass |

Test by: 

## 1.2. Antenna Requirements

### 1.2.1. Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

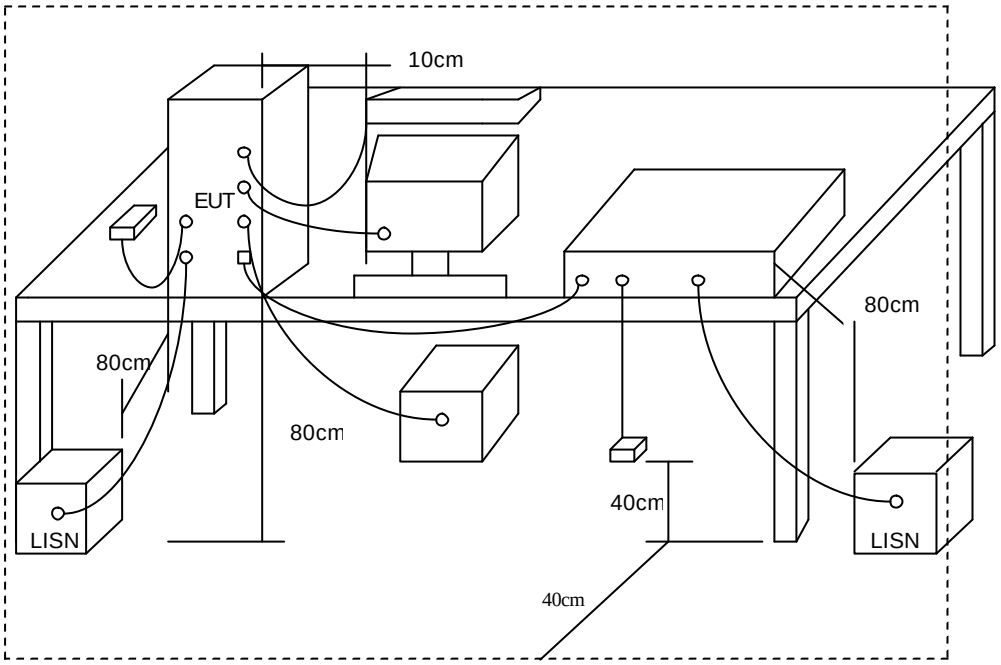
## 1.3. Test of Conducted Emission

Conducted Emissions were measured from 150 kHz to 30 MHz with a bandwidth of 9 KHz on the 115 VAC power and return leads of the EUT according to the methods defined in ANSI C63.4-2003 Section 3.1. The EUT was placed on a nonmetallic stand in a shielded room 0.8 meters above the ground plane as shown in section 1.3.2. The interface cables and equipment positioning were varied within limits of reasonable applications to determine the position produced maximum conducted emissions.

### 1.3.1. Test Procedures

a. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
b. Connect EUT to the power mains through a line impedance stabilization network (LISN).
c. All the support units are connecting to the other LISN.
d. The LISN provides 50 ohm coupling impedance for the measuring instrument.
e. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
f. Both sides of AC line were checked for maximum conducted interference.
g. The frequency range from 150 kHz to 30 MHz was searched.
h. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

### 1.3.2. Typical Test Setup Layout of Conducted Emission




### 1.3.3. Conducted Emission Requirement

Except for A digital devices, for equpment that is designed to be connected to the public utility (AC) power line on any frequency voltage that is conducted back onto the AC power line on ant frequency or frequencies within the band 150KHz to 30MHz shall not exceed the limits in the following table, as measured using a 50μH/50 ohms line impeddance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the Radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges.

| Frequency (MHz) | Quasi Peak (dB μ V) | Average (dB μ V) |
|---|---|---|
| 0.15 – 0.5 | 66-56* | 56-46* |
| 0.5 – 5.0 | 56 | 46 |
| 5.0 – 30.0 | 60 | 50 |

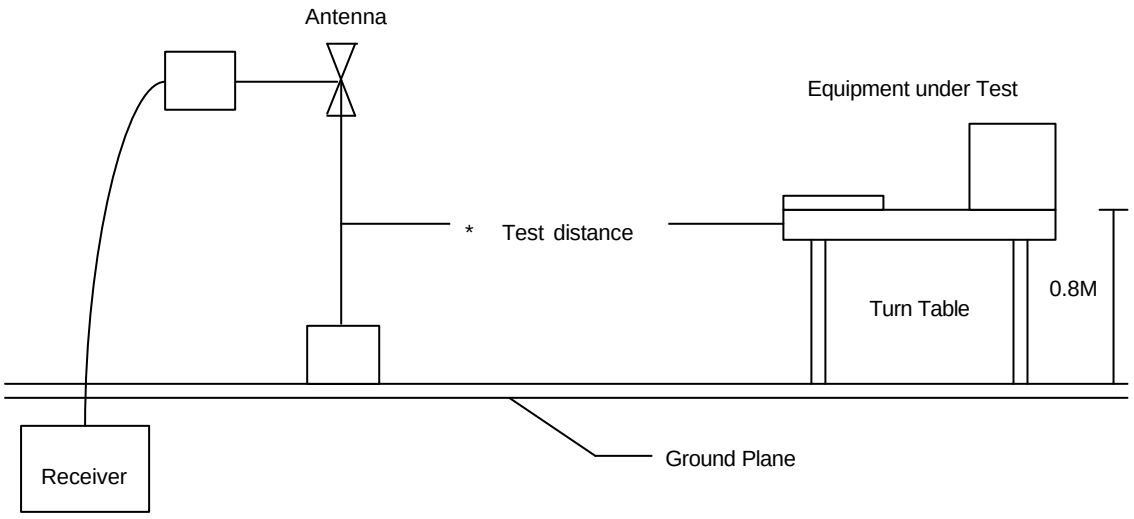
## 1.4. Test of Radiated Emission

Radiated emissions from 30 MHz to 25 GHz were measured according to the methods defines in ANSI C63.4-2003. The EUT was placed, 0.8 meter above the ground plane, as shown in section 1.4.2. The interface cables and equipment positions were varied within limits of reasonable applications to determine the positions producing maximum radiated emissions

### 1.4.1. Test Procedures

1. The EUT was placed on a rotatable table top 0.8 meter above ground.
2. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest radiation.
4. The antenna is a broadband antenna and its height is varied between one meter and four meters above ground to find the maximum value of the field strength both horizontal polarization and vertical polarization of the antenna are set to make the measurement.
5. For each suspected emission the EUT was arranged to its worst case and then tune the antenna tower (from 1 M to 4 M) and turn table (from 0 degree to 360 degrees) to find the maximum reading.
6. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function and specified bandwidth with Maximum Hold Mode.
7. If the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method and reported.
8. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

### 1.4.2. Typical Test Setup Layout of Radiated Emission

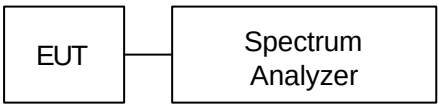


## 1.5. Channel Carrier Frequencies Separation

### 1.5.1. Test Procedure：

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in 1.5.2. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measurement frequency within its operating ragne and make sure the instrument is operated in its linear range.
3. Set spectrum analyzer maximum hold to measure channel carrier frequency , then adjust channel carrier frequency to adjacent channel.
4. Repeat above procedure until all measured frequencies were complete.

### 1.5.2. Test Setup Layout：




## 1.6. 20dB Bandwidth Measurement Data

### 1.6.1. Test Procedure：

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in 1.6.2. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

### 1.6.2. Test Setup Layout：

## 1.7. Dwell Time

### 1.7.1. Test Procedure：

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in 1.7.2.

### 1.7.2. Test Setup Layout：


## 1.8. Number of Hopping Channels

### 1.8.1. Test Procedure：

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in 1.8.2. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set EUT to hopping operating mode and set spectrum analyzer miximum to measure the number of hopping channels.

### 1.8.2. Test Setup Layout：

## 1.9. Peak Output Power Measurement Data

### 1.9.1. Test Procedure：

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in 1.9.2. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
3. Set RBW of spectrum analyzer to 1 MHz and VBW to 3 MHz.
4. Measure the highest amplitude appearing on spectral display and record the level to calculate result data.
5. Repeat above procedures until all frequencies measured were complete.

### 1.9.2. Test Setup Layout：


## 1.10. Band Edges Measurement Data

### 1.10.1. Test Procedure：

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in 1.10.2. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
3. Set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

### 1.10.2. Test Setup Layout：

# 2. Test Configuration of Equipment under Test

## 2.1. Test Mode and Test Software

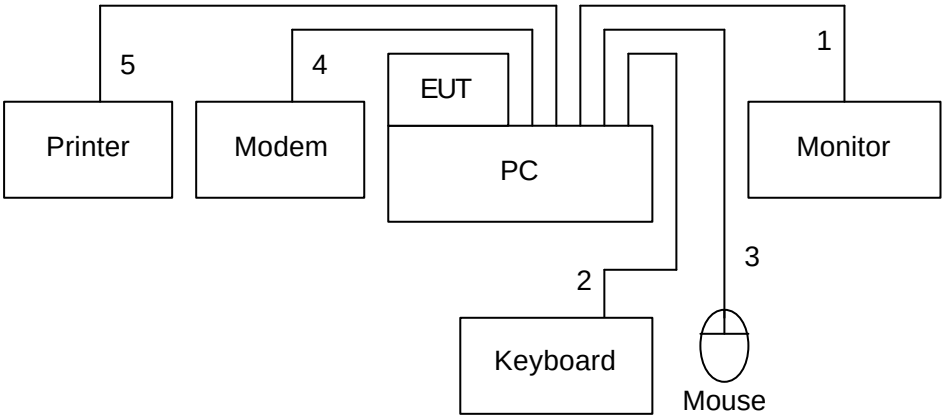
The following test mode and test software was performed for conduction and radiation test:

- CH LO: 2402MHz
- CH MID: 2441MHz
- CH HI: 2480MHz
- An executive programs, “Blue test” Application under WIN XP.

## 2.2. Description of Test System

| Device | Manufacturer | Model No. | Description |
|---|---|---|---|
| PC | IBM | IGV | Power Cable, Unshielding 1.8 m |
| Monitor | SlimAGE | 510A | Power Cable, Adapter Unshielding 1.8 m<br>Data Cable, VGA shielding 1.35 m |
| Keyboard | IBM | KB-0225 | Data Cable, PS2 shielding 1.85 m |
| Mouse | IBM | MO28VO | Data Cable, USB shielding 1.85 m |
| Notebook | IBM | R40(2723-BV1) | Power Cable, Adapter Unshielding 1.8 m |
| Modem | ACEXX | DM-1414 | Power Cable, Adapter Unshielding 1.8 m<br>Data Cable, Unshielding 1.35 m |
| Printer | HP | Desk Jet400 | Power Cable, Adapter Unshielding 1.8 m<br>Data Cable, PRINT shielding 1.6 m |

## 2.3. Connection Diagram of Test System




1. The I/O cable is connected from PC to the Monitor.
2. The I/O cable is connected from PC to the Keyboard.
3. The I/O cable is connected from PC to the Mouse.
4. The I/O cable is connected from PC to the Modem.
5. The I/O cable is connected from PC to the Printer.

## 2.4. Feature of Equipment under Test

- Wireless interface with your telephone through Bluetooth
- Full- duplex with echo cancellation using the DSP
- Background noise reduction
- Voice dialing through the phone
- Voice memo (duration 64 sec)

## 2.5. RF Module Specifications

| | |
|---|---|
| Host/Radio Interface | USB/Bluetooth |
| Type of Modulation | GFSK |
| Number of Channels | 79 |
| Frequency Band | 2402~2480MHz |
| Carrier Frequency of each channel | 2402,2403,…..2480MHz |
| Bandwidth of each channel | 1MHz |
| Maximum Output Power to Antenna | 13dBm |
| IF & L.O. frequency | Near Zero IF, 2402+ K MHz K=0~78 |
| Type of Antenna Connector<br>(Ex: SMA,TNC, MCX, MMCX, UFC……etc) | N.A. |
| Antenna Type / Class and Gain | Chip antenna / 0~2dBi |
| Function Type | Transceiver |
| Power Rating (DC/AC , Voltage) | 200mA / 5V |
| Basic function of product | Wireless data transmission |
| Temperature Range (Operating) | -20~60℃ |

## 2.6. History of this test report

This report had been revised as below:

(1) Modified the antenna gain on page 15.

(2) Move the description of RF Exposure.

(3) Correct and resupply the measurements and notes on page 27-29 and page 50.

# 3. General Information of Test

| | |
|---|---|
| Test Site: | Exclusive Certification Corp.<br>4F-2, No. 28, Lane 78, Xing-Ai Rd. Nei-hu, Taipei City 114 Taiwan R.O.C. |
| Test Site Location (OATS1-SD): | No.68-1, Shihbachongsi, shihding Township,<br>Taipei County 223, Taiwan, R.O.C. |
| Test Voltage: | AC 110V/ 60Hz for PC |
| Test in Compliance with: | ANSI C63.4-2003<br>FCC Part 15 Subpart C |
| Frequency Range Investigated: | Conducted: from 150kHz to 30 MHz<br>Radiation: from 30 MHz to 24620MHz |
| Test Distance: | The test distance of radiated emission from antenna to EUT is 3 M. |

# 4. Test Result and Data

## 4.1. Antenna Requirement

### 4.1.1. Antenna Construction and Directional Gain

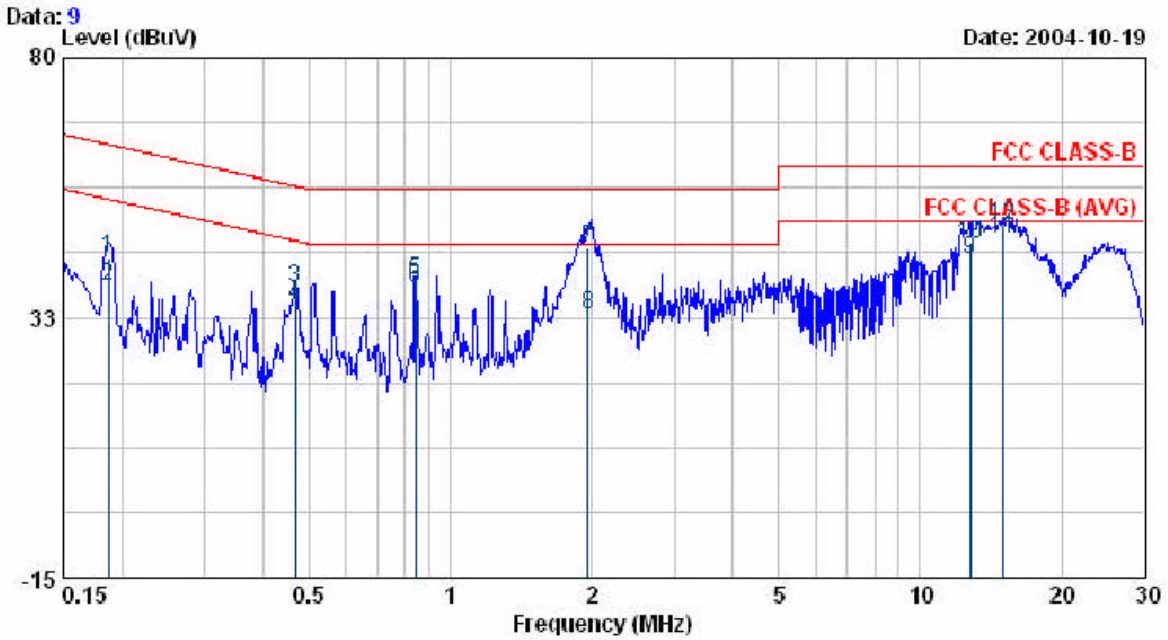
Antenna type: Highly efficient special antennas fix on the PCB.

Antenna Gain: 2 dBi.

## 4.2. Test Result of Conducted Emission

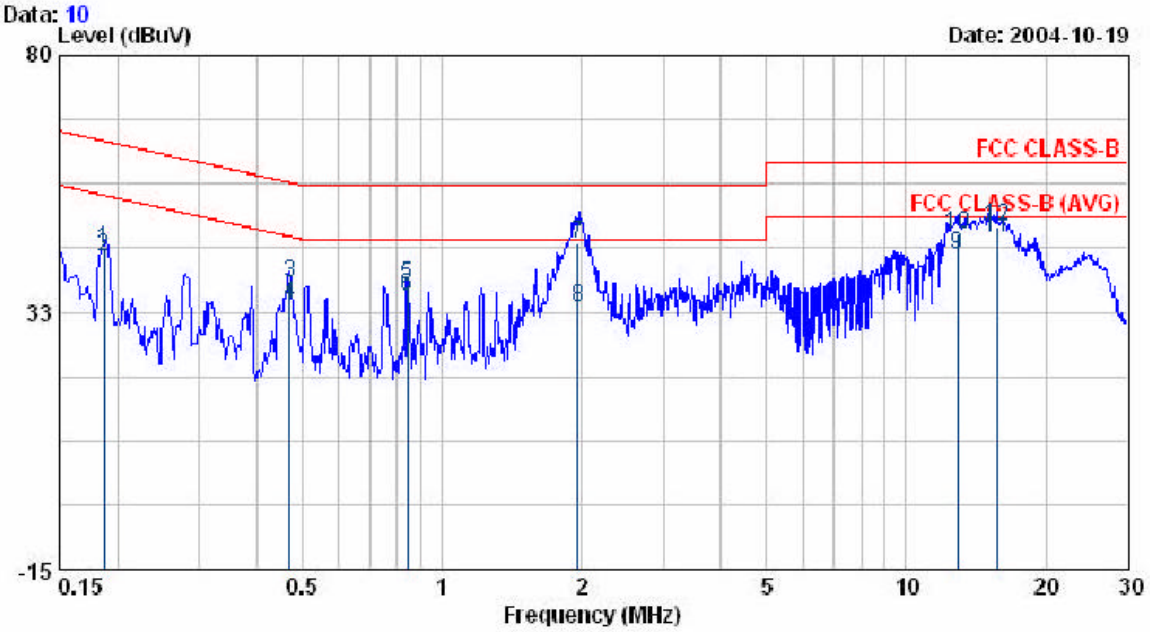
EUT : Class 1Bluetooth USB Adaptor
Power : 110V 60Hz (for pc)
Test Mode : CH LO
Memo :

Pol/Phase : NEUTRAL
Temperature : 26 ℃
Humidity : 58 %



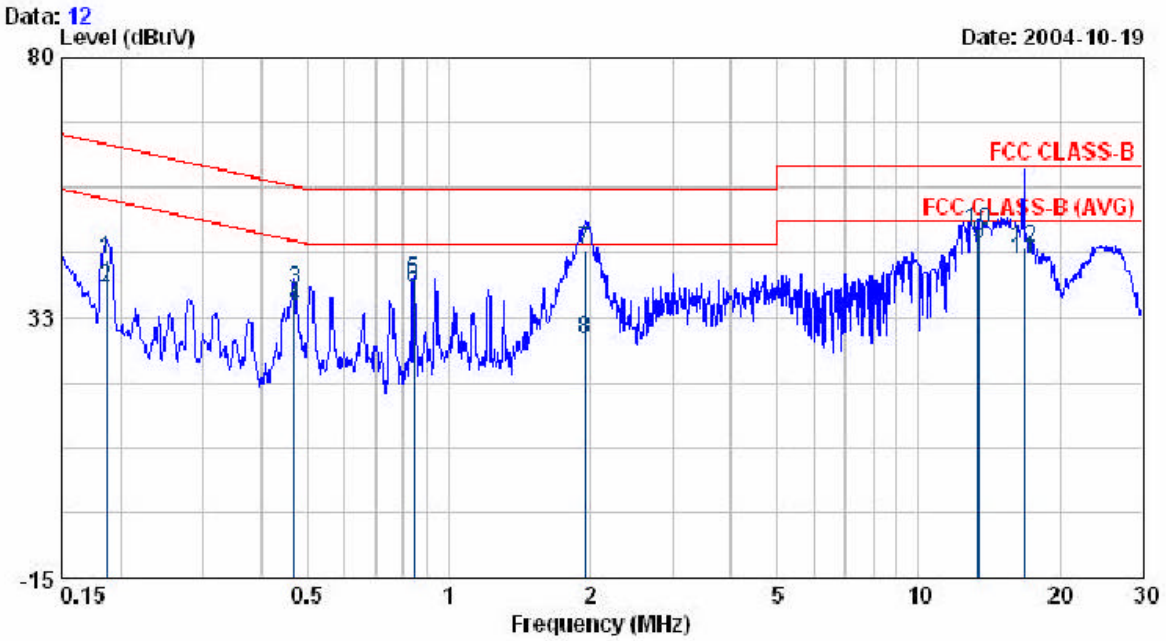

| Freq | Read Level | Factor | Level | Limit | Over Limit | Remark |
|---|---|---|---|---|---|---|
| MHz | dBuV | dB | dBuV | dBuV | dBuV | |
| 0.188 | 42.90 | 0.41 | 43.31 | 64.14 | -20.83 | QP |
| 0.188 | 37.81 | 0.41 | 38.22 | 54.14 | -15.92 | AVERAGE |
| 0.469 | 37.34 | 0.47 | 37.81 | 56.53 | -18.73 | QP |
| 0.469 | 34.21 | 0.47 | 34.68 | 46.53 | -11.86 | AVERAGE |
| 0.844 | 38.69 | 0.50 | 39.19 | 56.00 | -16.81 | QP |
| 0.844 | 37.36 | 0.50 | 37.86 | 46.00 | -8.14 | AVERAGE |
| 1.965 | 44.83 | 0.54 | 45.37 | 56.00 | -10.63 | QP |
| 1.965 | 32.36 | 0.54 | 32.90 | 46.00 | -13.10 | AVERAGE |
| 12.760 | 42.45 | 0.74 | 43.19 | 50.00 | -6.81 | AVERAGE |
| 12.760 | 45.21 | 0.74 | 45.95 | 60.00 | -14.05 | QP |
| 14.996 | 46.12 | 0.75 | 46.87 | 50.00 | -3.13 | AVERAGE |
| 14.996 | 48.46 | 0.75 | 49.21 | 60.00 | -10.79 | QP |

| | | | |
|---|---|---|---|
| EUT | : Class 1Bluetooth USB Adaptor | | |
| Power | : 110V 60Hz (for pc) | Pol/Phase | : LINE |
| Test Mode | : CH LO | Temperature | : 26 ℃ |
| Memo | : | Humidity | : 58 % |



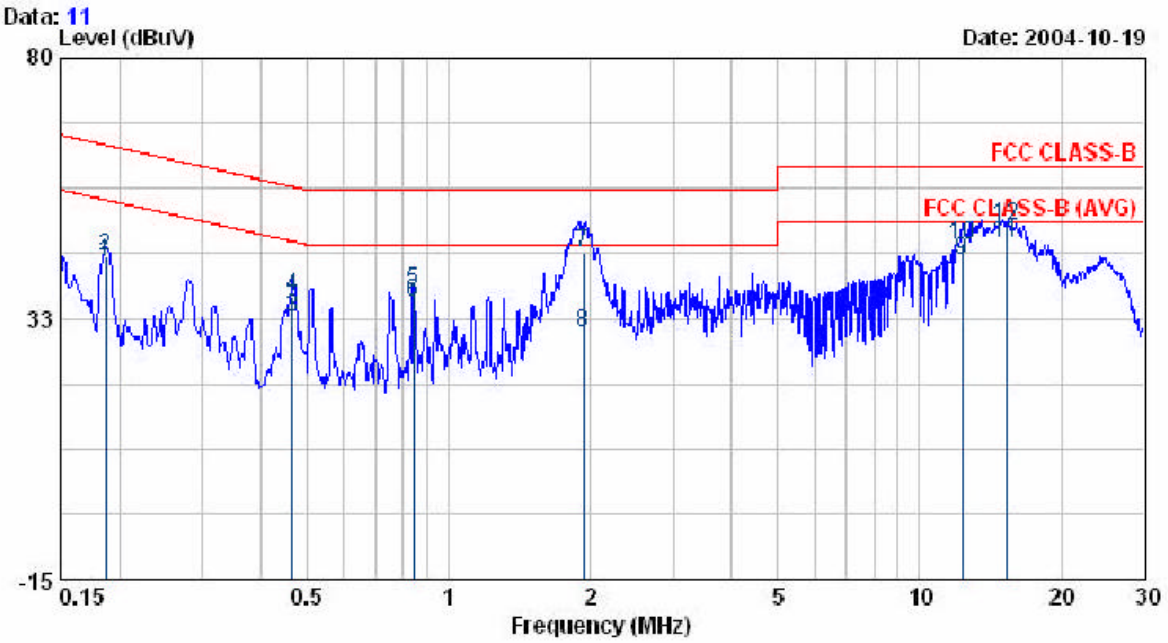

| Freq | Read Level | Factor | Level | Limit | Over Limit | Remark |
|---|---|---|---|---|---|---|
| MHz | dBuV | dB | dBuV | dBuV | dBuV | |
| 0.187 | 43.61 | 0.41 | 44.02 | 64.15 | -20.13 | QP |
| 0.187 | 42.28 | 0.41 | 42.69 | 54.15 | -11.46 | AVERAGE |
| 0.469 | 37.26 | 0.47 | 37.73 | 56.53 | -18.80 | QP |
| 0.469 | 33.62 | 0.47 | 34.09 | 46.53 | -12.44 | AVERAGE |
| 0.843 | 37.18 | 0.50 | 37.68 | 56.00 | -18.32 | QP |
| 0.843 | 35.11 | 0.50 | 35.61 | 46.00 | -10.39 | AVERAGE |
| 1.965 | 44.78 | 0.54 | 45.32 | 56.00 | -10.68 | QP |
| 1.965 | 32.82 | 0.54 | 33.36 | 46.00 | -12.64 | AVERAGE |
| 12.906 | 42.32 | 0.70 | 43.02 | 50.00 | -6.98 | AVERAGE |
| 12.906 | 46.34 | 0.70 | 47.04 | 60.00 | -12.96 | QP |
| 15.721 | 45.37 | 0.77 | 46.14 | 50.00 | -3.86 | AVERAGE |
| 15.721 | 47.41 | 0.77 | 48.18 | 60.00 | -11.82 | QP |

| | | | |
|---|---|---|---|
| EUT | : Class 1Bluetooth USB Adaptor | | |
| Power | : 110V 60Hz (for pc) | Pol/Phase | : NEUTRAL |
| Test Mode | : CH MID | Temperature | : 26 ℃ |
| Memo | : | Humidity | : 58 % |



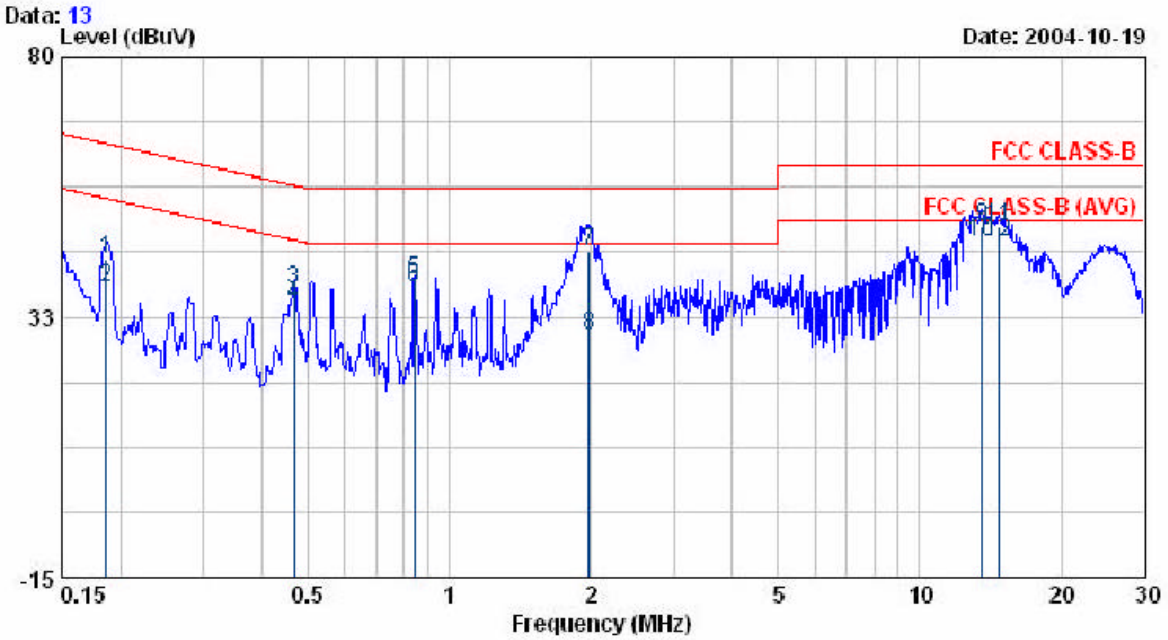

| Freq | Read Level | Factor | Level | Limit | Over Limit | Remark |
|---|---|---|---|---|---|---|
| MHz | dBuV | dB | dBuV | dBuV | dBuV | |
| 0.187 | 42.78 | 0.41 | 43.19 | 64.15 | -20.96 | QP |
| 0.187 | 37.65 | 0.41 | 38.06 | 54.15 | -16.09 | AVERAGE |
| 0.470 | 37.11 | 0.47 | 37.58 | 56.52 | -18.94 | QP |
| 0.470 | 33.84 | 0.47 | 34.31 | 46.52 | -12.21 | AVERAGE |
| 0.843 | 38.63 | 0.50 | 39.13 | 56.00 | -16.87 | QP |
| 0.843 | 37.32 | 0.50 | 37.82 | 46.00 | -8.18 | AVERAGE |
| 1.953 | 44.34 | 0.54 | 44.88 | 56.00 | -11.12 | QP |
| 1.953 | 28.11 | 0.54 | 28.65 | 46.00 | -17.35 | AVERAGE |
| 13.491 | 45.04 | 0.75 | 45.79 | 50.00 | -4.21 | AVERAGE |
| 13.491 | 47.67 | 0.75 | 48.42 | 60.00 | -11.58 | QP |
| 16.739 | 42.28 | 0.80 | 43.08 | 50.00 | -6.92 | AVERAGE |
| 16.739 | 44.52 | 0.80 | 45.32 | 60.00 | -14.68 | QP |

| | | | |
|---|---|---|---|
| EUT | : Class 1Bluetooth USB Adaptor | | |
| Power | : 110V 60Hz (for pc) | Pol/Phase | : LINE |
| Test Mode | : CH MID | Temperature | : 26 ℃ |
| Memo | : | Humidity | : 58 % |




| Freq | Read Level | Factor | Level | Limit | Over Limit | Remark |
|---|---|---|---|---|---|---|
| MHz | dBuV | dB | dBuV | dBuV | dBuV | |
| 0.187 | 42.23 | 0.41 | 42.64 | 54.16 | -11.52 | AVERAGE |
| 0.187 | 43.54 | 0.41 | 43.95 | 64.16 | -20.21 | QP |
| 0.466 | 32.08 | 0.47 | 32.55 | 46.58 | -14.03 | AVERAGE |
| 0.466 | 35.97 | 0.47 | 36.44 | 56.58 | -20.14 | QP |
| 0.843 | 37.09 | 0.50 | 37.59 | 56.00 | -18.41 | QP |
| 0.843 | 35.02 | 0.50 | 35.52 | 46.00 | -10.48 | AVERAGE |
| 1.941 | 44.07 | 0.54 | 44.61 | 56.00 | -11.39 | QP |
| 1.941 | 29.19 | 0.54 | 29.73 | 46.00 | -16.27 | AVERAGE |
| 12.333 | 42.34 | 0.69 | 43.03 | 50.00 | -6.97 | AVERAGE |
| 12.333 | 45.22 | 0.69 | 45.91 | 60.00 | -14.09 | QP |
| 15.364 | 45.60 | 0.76 | 46.36 | 50.00 | -3.64 | AVERAGE |
| 15.364 | 48.54 | 0.76 | 49.30 | 60.00 | -10.70 | QP |

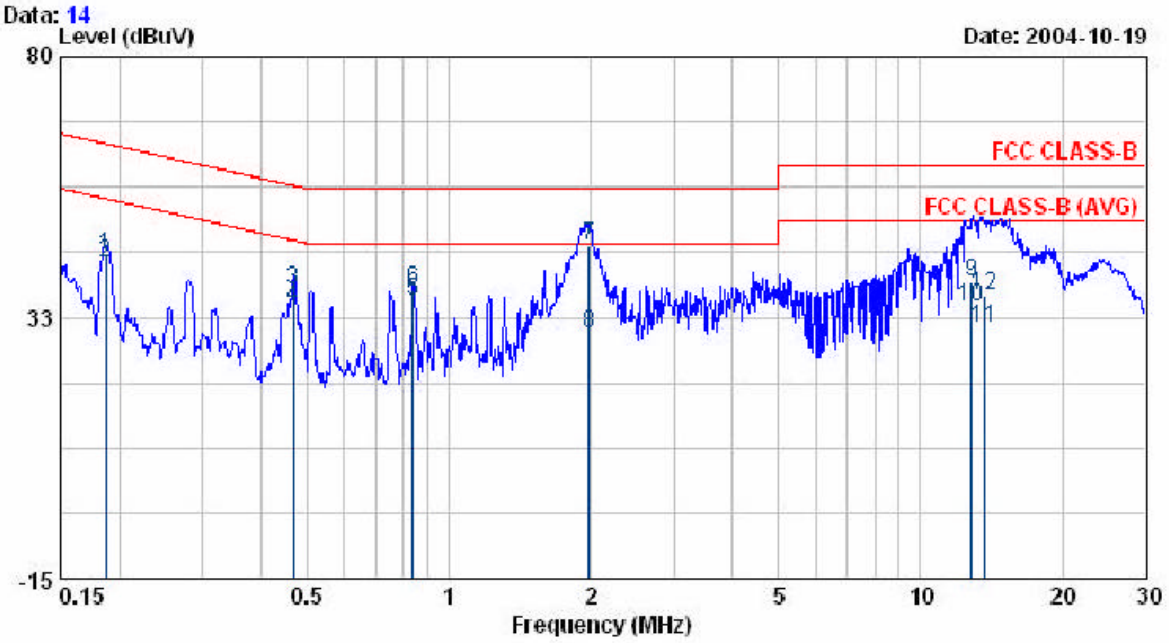
| | | | |
|---|---|---|---|
| EUT | : Class 1Bluetooth USB Adaptor | | |
| Power | : 110V 60Hz (for pc) | Pol/Phase | : NEUTRAL |
| Test Mode | : CH HI | Temperature | : 26 ℃ |
| Memo | : | Humidity | : 58 % |




| Freq | Read Level | Factor | Level | Limit | Over Limit | Remark |
|---|---|---|---|---|---|---|
| MHz | dBuV | dB | dBuV | dBuV | dBuV | |
| 0.187 | 42.63 | 0.41 | 43.04 | 64.18 | -21.13 | QP |
| 0.187 | 37.49 | 0.41 | 37.90 | 54.18 | -16.27 | AVERAGE |
| 0.468 | 37.19 | 0.47 | 37.66 | 56.54 | -18.89 | QP |
| 0.468 | 34.20 | 0.47 | 34.67 | 46.54 | -11.88 | AVERAGE |
| 0.843 | 38.63 | 0.50 | 39.13 | 56.00 | -16.87 | QP |
| 0.843 | 37.30 | 0.50 | 37.80 | 46.00 | -8.20 | AVERAGE |
| 1.978 | 44.10 | 0.54 | 44.64 | 56.00 | -11.36 | QP |
| 1.978 | 28.48 | 0.54 | 29.02 | 46.00 | -16.98 | AVERAGE |
| 13.566 | 48.13 | 0.75 | 48.88 | 60.00 | -11.12 | QP |
| 13.566 | 45.55 | 0.75 | 46.30 | 50.00 | -3.70 | AVERAGE |
| 14.724 | 48.22 | 0.75 | 48.97 | 60.00 | -11.03 | QP |
| 14.724 | 45.61 | 0.75 | 46.36 | 50.00 | -3.64 | AVERAGE |

EUT : Class 1Bluetooth USB Adaptor
Power : 110V 60Hz (for pc)
Test Mode : CH HI
Memo :

Pol/Phase : LINE
Temperature : 26 ℃
Humidity : 58 %




| Freq | Read Level | Factor | Level | Limit | Over Limit | Remark |
|---|---|---|---|---|---|---|
| MHz | dBuV | dB | dBuV | dBuV | dBuV | |
| 0.187 | 43.38 | 0.41 | 43.79 | 64.15 | -20.36 | QP |
| 0.187 | 41.97 | 0.41 | 42.38 | 54.15 | -11.77 | AVERAGE |
| 0.467 | 37.02 | 0.47 | 37.49 | 56.57 | -19.08 | QP |
| 0.467 | 33.96 | 0.47 | 34.43 | 46.57 | -12.14 | AVERAGE |
| 0.841 | 34.83 | 0.50 | 35.33 | 46.00 | -10.67 | AVERAGE |
| 0.841 | 37.19 | 0.50 | 37.69 | 56.00 | -18.31 | QP |
| 1.978 | 44.87 | 0.54 | 45.41 | 56.00 | -10.59 | QP |
| 1.978 | 29.04 | 0.54 | 29.58 | 46.00 | -16.42 | AVERAGE |
| 12.846 | 38.28 | 0.70 | 38.98 | 60.00 | -21.02 | QP |
| 12.846 | 33.74 | 0.70 | 34.44 | 50.00 | -15.56 | AVERAGE |
| 13.675 | 30.00 | 0.72 | 30.72 | 50.00 | -19.28 | AVERAGE |
| 13.675 | 35.91 | 0.72 | 36.63 | 60.00 | -23.37 | QP |

Test by: Carol

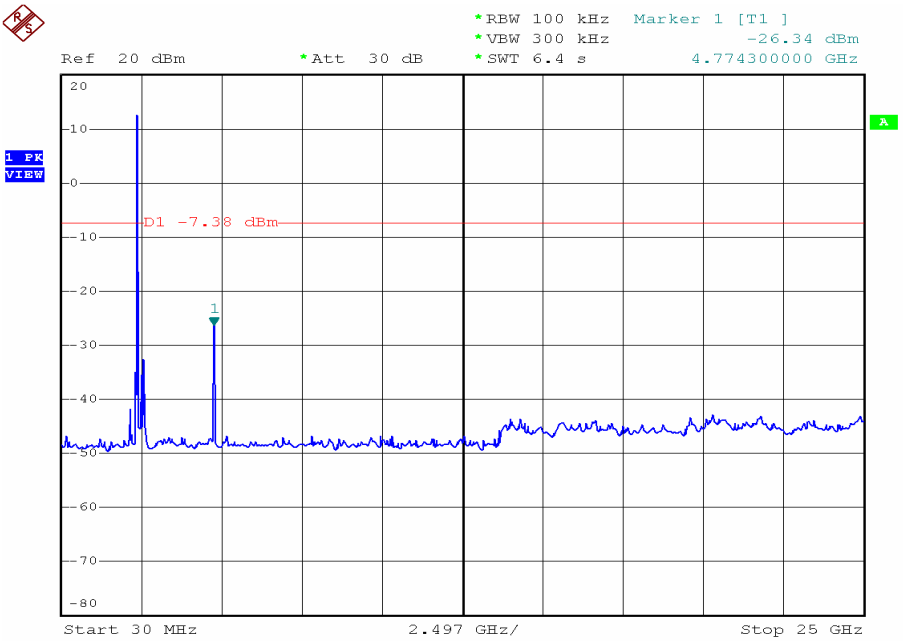
### 4.2.1. Photographs of Conducted Emission Test

FRONT VIEW

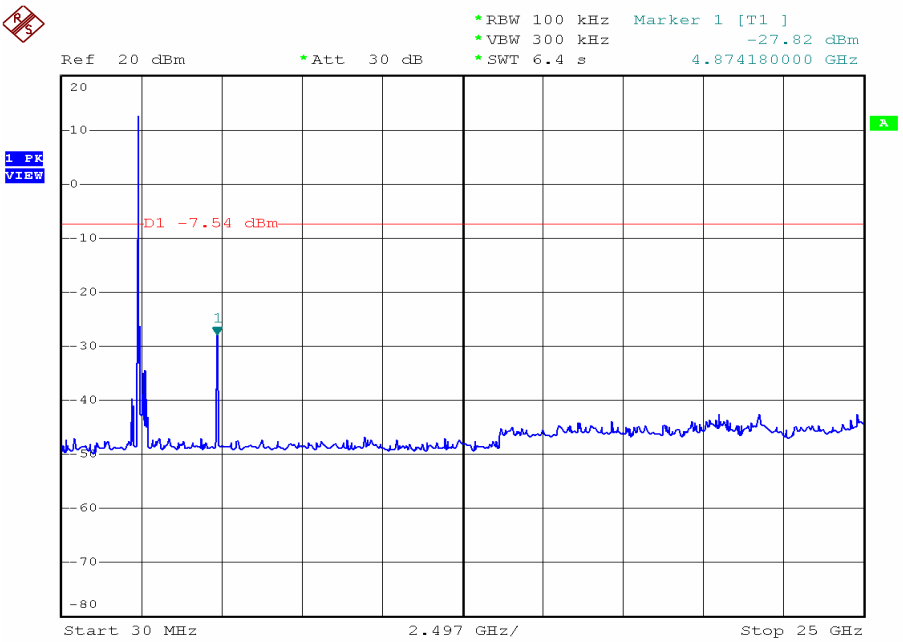

REAR VIEW

## 4.3. RF Portion

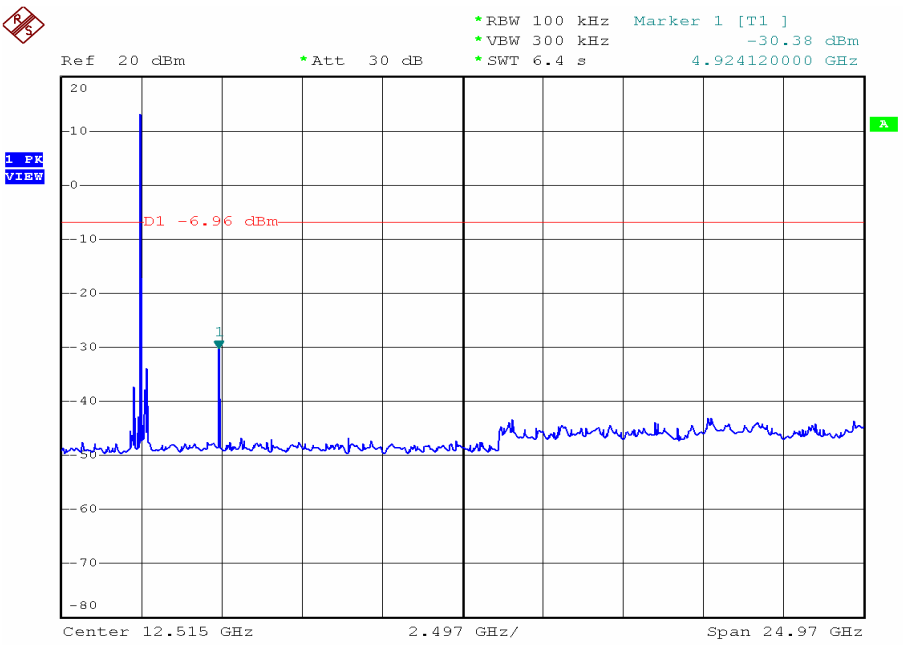
### 4.3.1. Test Result of Conducted Emission




Date: 18.OCT.2004 13:05:30




Date: 18.OCT.2004 13:06:56


*RBW 100 kHz
Marker 1 [T1 ]
*VBW 300 kHz
-30.38 dBm
Ref 20 dBm
*Att 30 dB
*SWT 6.4 s
4.924120000 GHz
1 PK
VIEW
A
D1 -6.96 dBm
Center 12.515 GHz
2.497 GHz/
Span 24.97 GHz
Date: 18.OCT.2004 13:07:51

### 4.3.2. Test Result of Radiated Emission

a) Emission frequencies below 1 GHz Channel 0

Test Date: Oct. 18, 2004 Temperature: 25℃ Humidity: 55%

| Frequency (MHz) | Ant-Pol H/V | Meter Reading (dBuV) | Corrected Factor (dB) | Result@3m (dBuV/m) | Limit@3m (dBuV/m) | Margin (dB) | Remark | Table Deg. | Ant High (m) |
|---|---|---|---|---|---|---|---|---|---|
| 514.03 | H | 17.0 | 22.3 | 39.3 | 46 | -6.7 | Peak | 205 | 1.1 |
| 706.09 | H | 12.9 | 26.6 | 39.5 | 46 | -6.5 | Peak | 210 | 1.0 |
| 900.09 | H | 10.1 | 30.4 | 40.5 | 46 | -5.5 | Peak | 205 | 1.2 |
| 87.23 | V | 22.4 | 10.1 | 32.5 | 40 | -7.5 | Peak | 270 | 1.0 |
| 284.14 | V | 19.9 | 16.5 | 36.4 | 46 | -9.6 | Peak | 275 | 1.0 |
| 819.58 | V | 11.4 | 27.6 | 39.0 | 46 | -7.0 | Peak | 270 | 1.0 |

b) Emission frequencies above 1 GHz Channel 0

| Frequency (MHz) | Ant-Pol H/V | Meter Reading (dBuV) | Corrected Factor (dB) | Result@3m (dBuV/m) | Limit@3m (dBuV/m) | Margin (dB) | Remark | Table Deg. | Ant High (m) |
|---|---|---|---|---|---|---|---|---|---|
| 2210.13 | H | 52.3 | -3.4 | 48.9 | 74 | -25.1 | Peak | 79 | 1.1 |
| 2226.08 | H | 51.5 | -3.4 | 48.1 | 74 | -25.9 | Peak | 80 | 1.1 |
| 2242.05 | H | 54.2 | -3.4 | 50.8 | 74 | -23.2 | Peak | 79 | 1.1 |
| 4804.00 | H | 58.0 | 3.8 | 61.8 | 74 | 12.2 | Peak | 75 | 1.2 |
| 4804.00 | H | 41.2 | 3.8 | 45.0 | 54 | -9.0 | Ave | 75 | 1.2 |
| 2210.13 | V | 50.3 | -3.4 | 46.9 | 74 | -27.1 | Peak | 79 | 1.1 |
| 2226.08 | V | 49.9 | -3.4 | 46.5 | 74 | -27.5 | Peak | 80 | 1.1 |
| 2242.05 | V | 52.4 | -3.4 | 49.0 | 74 | -25.0 | Peak | 79 | 1.1 |
| 4804.00 | V | 56.5 | 3.8 | 60.3 | 74 | -13.7 | Peak | 75 | 1.2 |
| 4804.00 | V | 41.5 | 3.8 | 45.3 | 54 | -8.7 | Ave | 75 | 1.2 |

Notes:

1. Result = Meter Reading + Corrected Factor.
2. Corrected Factor = Antenna Factor + Cable Loss – Amplifier.
3. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120KHz for Peak detection at frequency below 1GHz.
4. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1MHz for Peak detection and Quasi-peak detection at frequency above 1GHz.
5. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 10Hz for Average detection at frequency above 1GHz.
6. The other emission is too low to be measured.
7. The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel , based upon Bluetooth theory the transmitter is on 0.625*5 per 247 ms per channel. Therefore, the duty cycle be equal to : 20log(3.125/100) = -30dB.
8. Average value = peak reading – 20log(duty cycle)

a) Emission frequencies below 1 GHz Channel 39

Test Date: Oct. 18, 2004 Temperature: 25℃ Humidity: 55%

| Frequency (MHz) | Ant-Pol H/V | Meter Reading (dBuV) | Corrected Factor (dB) | Result@3m (dBuV/m) | Limit@3m (dBuV/m) | Margin (dB) | Remark | Table Deg. | Ant High (m) |
|---|---|---|---|---|---|---|---|---|---|
| 514.03 | H | 17.2 | 22.3 | 39.5 | 46 | -6.5 | Peak | 200 | 1.1 |
| 706.09 | H | 13.4 | 26.6 | 40.0 | 46 | -6.0 | Peak | 205 | 1.0 |
| 900.09 | H | 9.6 | 30.4 | 40.0 | 46 | -6.0 | Peak | 200 | 1.0 |
| 87.23 | V | 22.1 | 10.1 | 32.2 | 40 | -7.8 | Peak | 275 | 1.0 |
| 284.14 | V | 19.6 | 16.5 | 36.1 | 46 | -9.9 | Peak | 270 | 1.0 |
| 819.58 | V | 11.8 | 27.6 | 39.4 | 46 | -6.6 | Peak | 268 | 1.0 |

b) Emission frequencies above 1 GHz Channel 39

| Frequency (MHz) | Ant-Pol H/V | Meter Reading (dBuV) | Corrected Factor (dB) | Result@3m (dBuV/m) | Limit@3m (dBuV/m) | Margin (dB) | Remark | Table Deg. | Ant High (m) |
|---|---|---|---|---|---|---|---|---|---|
| 2249.05 | H | 56.2 | -3.4 | 52.8 | 74 | -21.2 | Peak | 75 | 1.1 |
| 2265.02 | H | 52.7 | -3.4 | 49.3 | 74 | -24.7 | Peak | 79 | 1.1 |
| 2281.00 | H | 55.8 | -3.4 | 52.4 | 74 | -21.6 | Peak | 75 | 1.1 |
| 2313.00 | H | 52.0 | -3.4 | 48.6 | 74 | -25.4 | Peak | 75 | 1.1 |
| 4882.00 | H | 61.0 | 3.8 | 64.8 | 74 | -9.2 | Peak | 75 | 1.2 |
| 4882.00 | H | 42.2 | 3.8 | 46.0 | 54 | -8.0 | Ave | 75 | 1.2 |
| 2249.05 | V | 54.2 | -3.4 | 50.8 | 74 | -23.2 | Peak | 75 | 1.1 |
| 2265.02 | V | 50.7 | -3.4 | 47.3 | 74 | -26.7 | Peak | 79 | 1.1 |
| 2281.00 | V | 53.6 | -3.4 | 50.2 | 74 | -23.8 | Peak | 75 | 1.1 |
| 2313.00 | V | 50.1 | -3.4 | 46.7 | 74 | -27.3 | Peak | 79 | 1.1 |
| 4882.00 | V | 59.5 | 3.8 | 63.3 | 74 | -10.7 | Peak | 75 | 1.2 |
| 4882.00 | V | 42.5 | 3.8 | 46.3 | 54 | -7.7 | Ave | 75 | |

Notes:

1. Result = Meter Reading + Corrected Factor.
2. Corrected Factor = Antenna Factor + Cable Loss – Amplifier.
3. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120KHz for Peak detection at frequency below 1GHz.
4. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1MHz for Peak detection and Quasi-peak detection at frequency above 1GHz.
5. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 10Hz for Average detection at frequency above 1GHz.
6. The other emission is too low to be measured.
7. The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel , based upon Bluetooth theory the transmitter is on 0.625*5 per 247 ms per channel. Therefore, the duty cycle be equal to : 20log(3.125/100) = -30dB.
8. Average value = peak reading – 20log(duty cycle)

a) Emission frequencies below 1 GHz Channel 78

Test Date: Oct. 18, 2004 Temperature: 25℃ Humidity: 55%

| Frequency (MHz) | Ant-Pol H/V | Meter Reading (dBuV) | Corrected Factor (dB) | Result@3m (dBuV/m) | Limit@3m (dBuV/m) | Margin (dB) | Remark | Table Deg. | Ant High (m) |
|---|---|---|---|---|---|---|---|---|---|
| 514.03 | H | 17.23 | 22.3 | 39.53 | 46 | -6.47 | Peak | 200 | 1.1 |
| 706.09 | H | 12.70 | 26.6 | 39.30 | 46 | -6.70 | Peak | 210 | 1.0 |
| 900.09 | H | 10.60 | 30.4 | 41.00 | 46 | -5.00 | Peak | 213 | 1.2 |
| 87.23 | V | 23.20 | 10.1 | 33.30 | 40 | -6.70 | Peak | 265 | 1.0 |
| 284.14 | V | 20.40 | 16.5 | 36.90 | 46 | -9.10 | Peak | 278 | 1.0 |
| 819.58 | V | 11.90 | 27.6 | 39.50 | 46 | -6.50 | Peak | 279 | 1.0 |

b) Emission frequencies above 1 GHz Channel 78

| Frequency (MHz) | Ant-Pol H/V | Meter Reading (dBuV) | Corrected Factor (dB) | Result@3m (dBuV/m) | Limit@3m (dBuV/m) | Margin (dB) | Remark | Table Deg. | Ant High (m) |
|---|---|---|---|---|---|---|---|---|---|
| 2288.05 | H | 58.0 | -3.4 | 54.6 | 74 | -19.4 | Peak | 75 | 1.1 |
| 2288.05 | H | 41.3 | -3.4 | 37.9 | 54 | -16.1 | Ave | 75 | 1.1 |
| 2320.00 | H | 58.3 | -3.4 | 54.9 | 74 | -19.1 | Peak | 75 | 1.1 |
| 2320.00 | H | 41.5 | -3.4 | 38.1 | 54 | -15.9 | Ave | 75 | 1.1 |
| 2352.00 | H | 53.7 | -3.4 | 50.3 | 74 | -23.1 | Peak | 79 | 1.1 |
| 4960.00 | H | 58.2 | 3.8 | 62.0 | 74 | -12.0 | Peak | 75 | 1.2 |
| 4960.00 | H | 41.7 | 3.8 | 45.5 | 54 | -8.5 | Ave | 75 | 1.2 |
| 2288.05 | V | 55.8 | -3.4 | 52.4 | 74 | -21.6 | Peak | 75 | 1.1 |
| 2320.00 | V | 56.3 | -3.4 | 52.9 | 74 | -21.1 | Peak | 75 | 1.1 |
| 2352.00 | V | 50.8 | -3.4 | 47.4 | 74 | -26.6 | Peak | 79 | 1.1 |
| 4960.00 | V | 58.2 | 3.8 | 62.0 | 74 | -12.0 | Peak | 75 | 1.2 |
| 4960.00 | V | 41.7 | 3.8 | 45.5 | 54 | -8.5 | Ave | 75 | 1.2 |

Notes:

1. Result = Meter Reading + Corrected Factor.
2. Corrected Factor = Antenna Factor + Cable Loss – Amplifier.
3. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120KHz for Peak detection at frequency below 1GHz.
4. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1MHz for Peak detection and Quasi-peak detection at frequency above 1GHz.
5. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 10Hz for Average detection at frequency above 1GHz.
6. The other emission is too low to be measured.
7. The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel , based upon Bluetooth theory the transmitter is on 0.625*5 per 247 ms per channel. Therefore, the duty cycle be equal to : 20log(3.125/100) = -30dB.
8. Average value = peak reading – 20log(duty cycle)

### 4.3.3. Photographs of Radiated Emission Test

FRONT VIEW


REAR VIEW

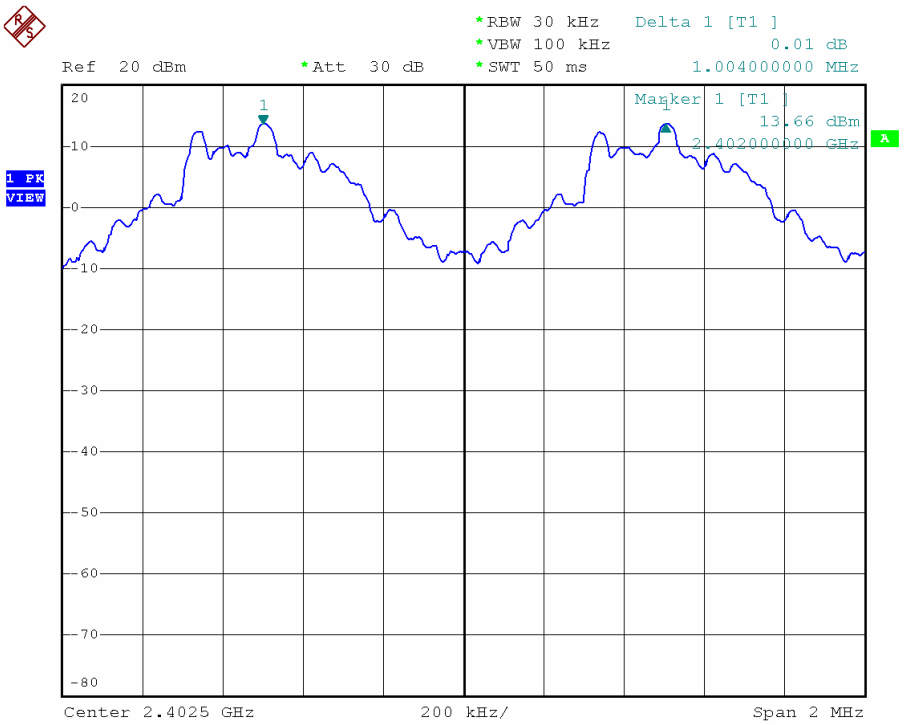
## 4.4. Channel Carrier Frequencies Separation

Test Date: Oct. 18, 2004 Temperature: 25℃ Humidity: 55%

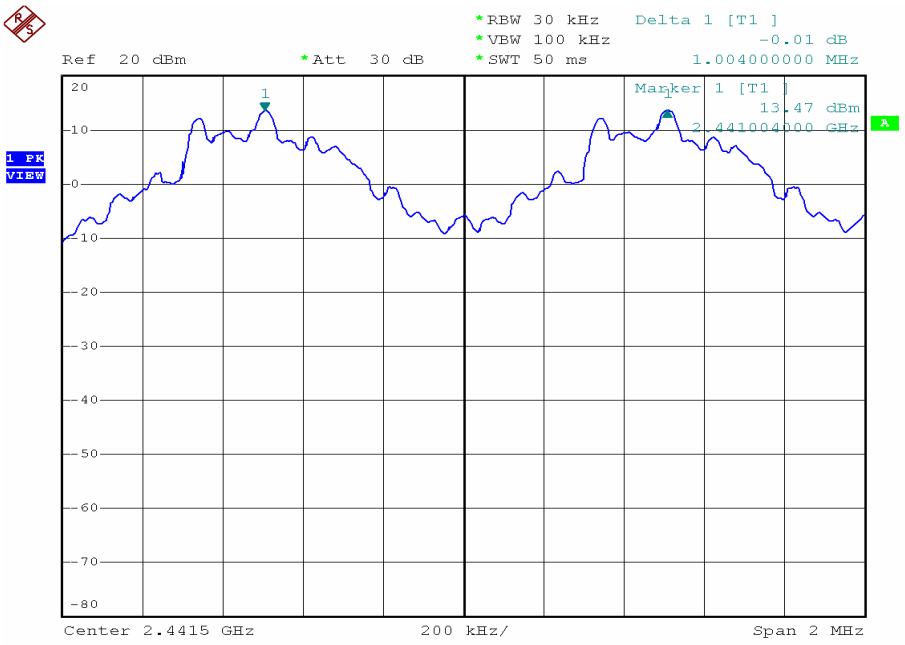
a) 2402 MHz Channel Separation is 1.004 MHz

b) 2441 MHz Channel Separation is 1.004 MHz

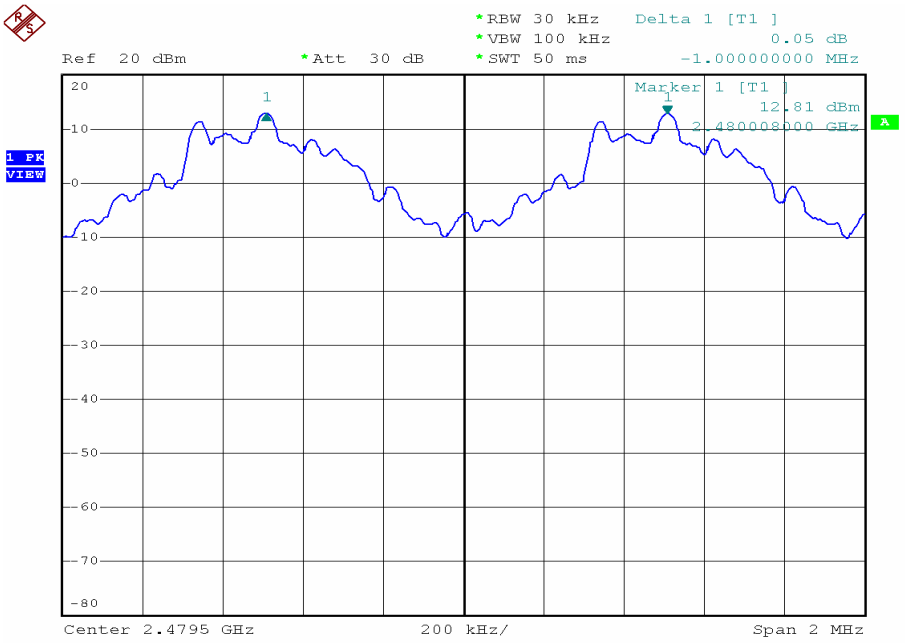
c) 2480 MHz Channel Separation is 1.000 MHz




Date: 18.OCT.2004 11:33:44




Date: 18.OCT.2004 11:32:05

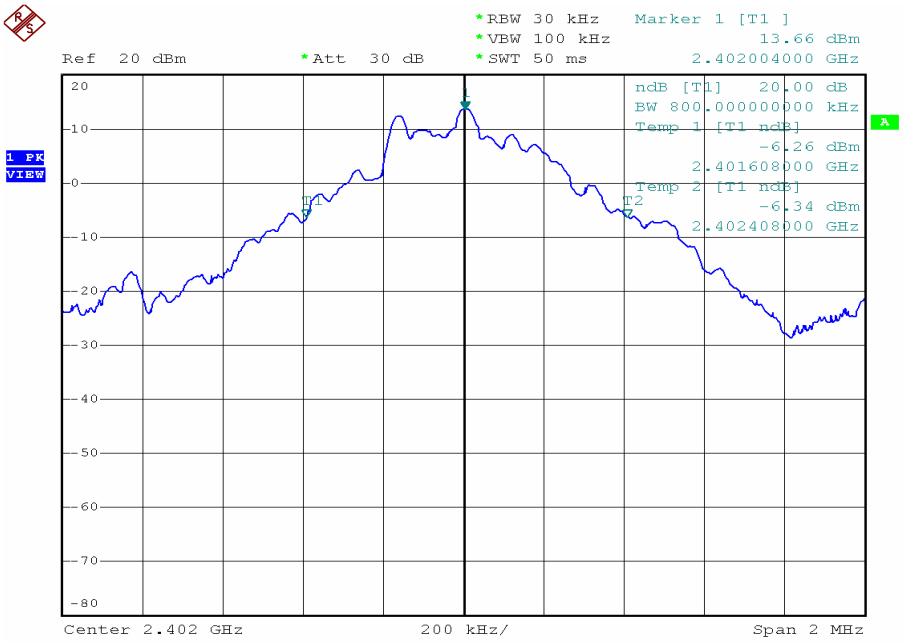



Date: 18.OCT.2004 11:30:54

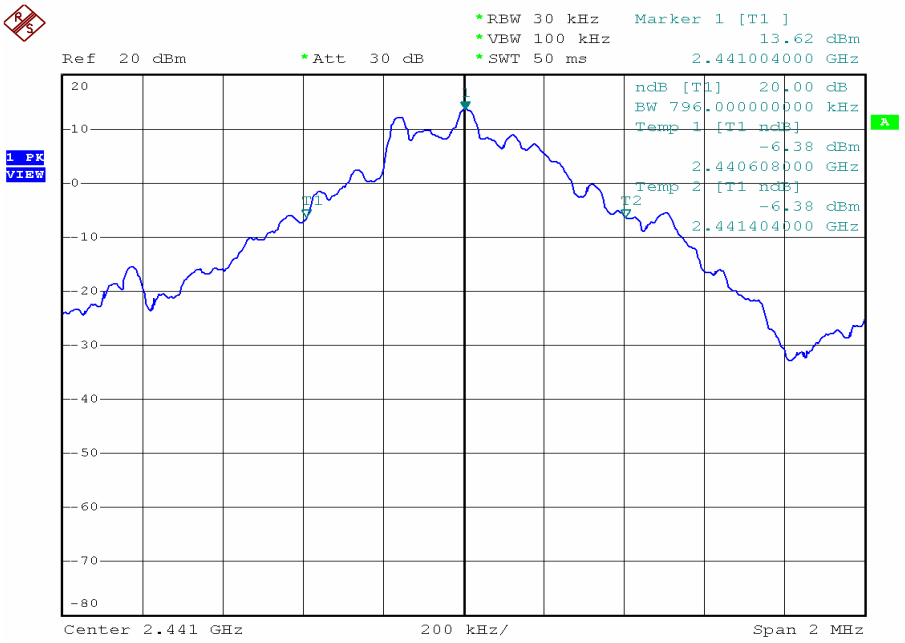
## 4.5. 20dB Bandwidth Measurement Data

Test Date: Oct. 18, 2004 Temperature: 25℃ Humidity: 55%

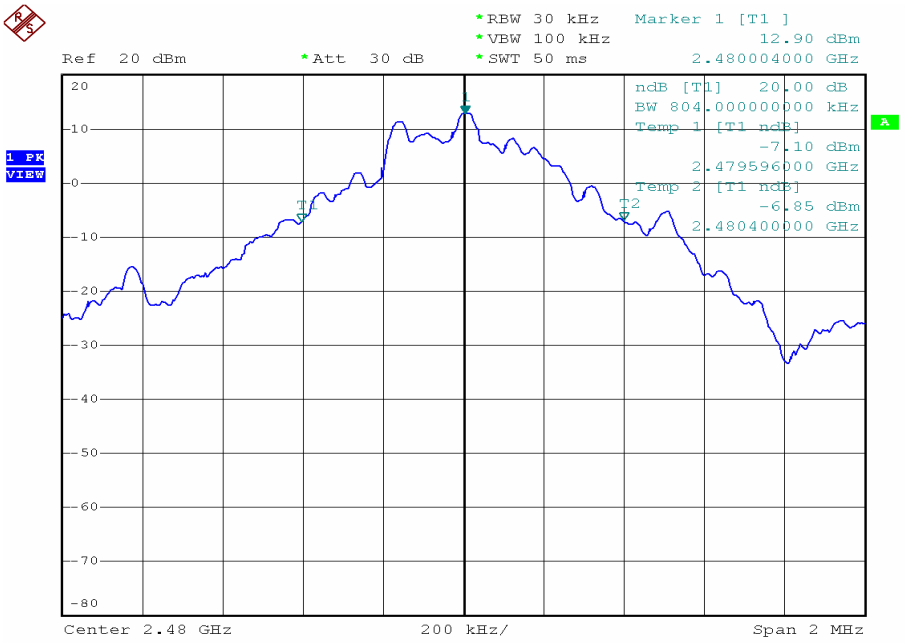
| | | |
|---|---|---|
| a) Channel 0: 20dB Emission Bandwidth is | 800 | KHz |
| b) Channel 39: 20dB Emission Bandwidth is | 796 | KHz |
| c) Channel 78: 20dB Emission Bandwidth is | 804 | KHz |




Date: 18.OCT.2004 11:37:25




Date: 18.OCT.2004 11:58:08


*RBW 30 kHz
*VBW 100 kHz
*SWT 50 ms
Marker 1 [T1 ]
12.90 dBm
2.480004000 GHz
Ref 20 dBm
*Att 30 dB
ndB [T1] 20.00 dB
BW 804.000000000 kHz
Temp 1 [T1 ndB]
-7.10 dBm
2.479596000 GHz
Temp 2 [T1 ndB]
-6.85 dBm
2.480400000 GHz
1 PK
VIEW
A
T1
T2
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.48 GHz
200 kHz/
Span 2 MHz
Date: 18.OCT.2004 12:00:42

## 4.6. Dwell Time

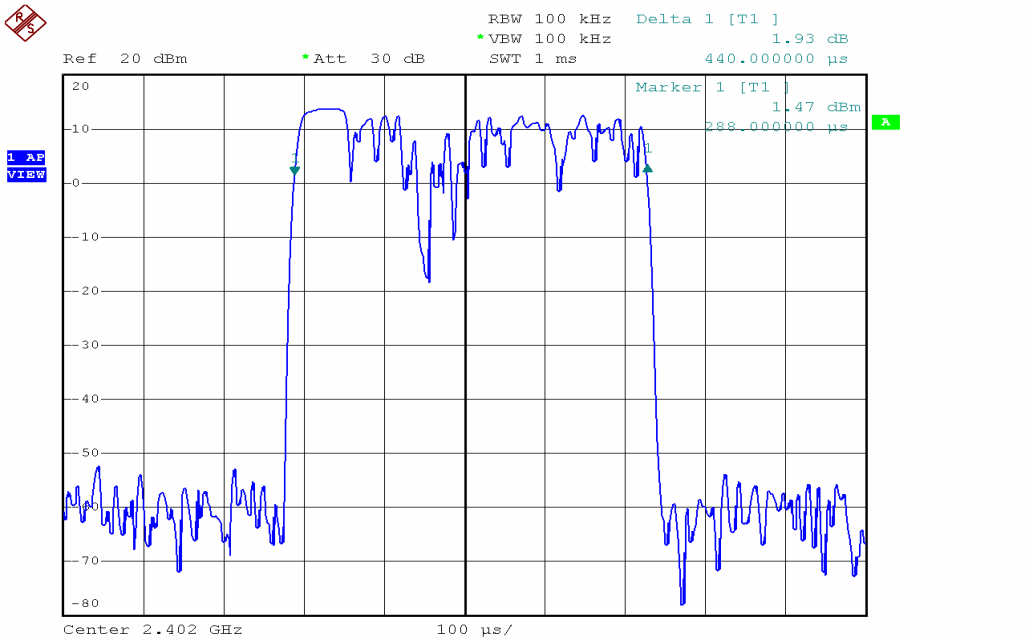
Test Date: Oct. 18, 2004 Temperature: 25℃ Humidity: 55%

Test Period = 0.4 (second/ channel) x 79 Channel = 31.6 sec

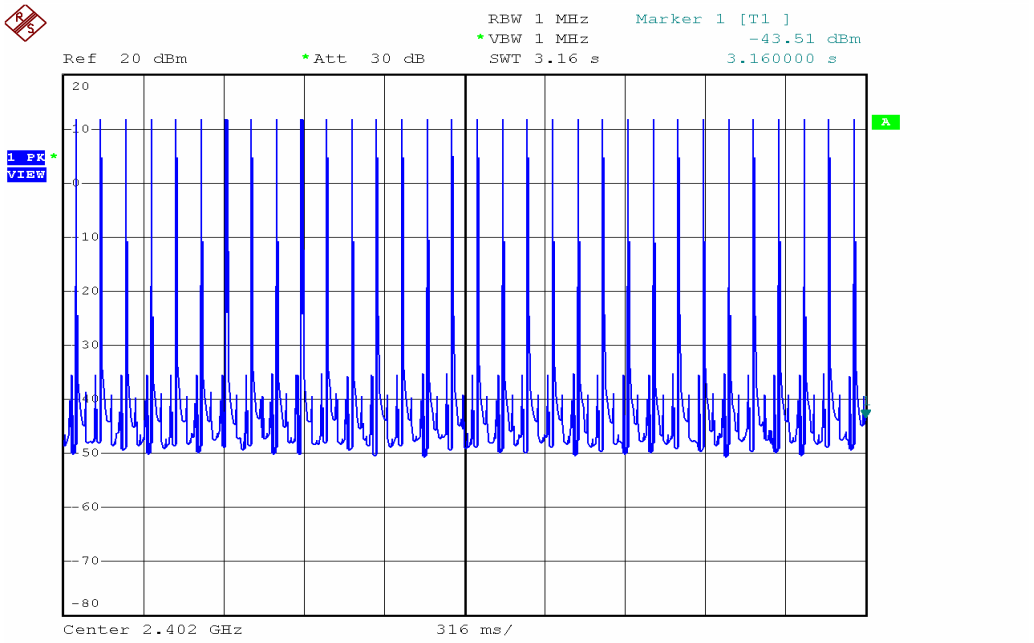
a) 2402 MHz Dwell Time is = 0.440ms x $\frac{31.6}{3.16}$ x 32 = 140.80ms

b) 2441 MHz Dwell Time is = 0.440ms x $\frac{31.6}{3.16}$ x 32 = 140.80ms

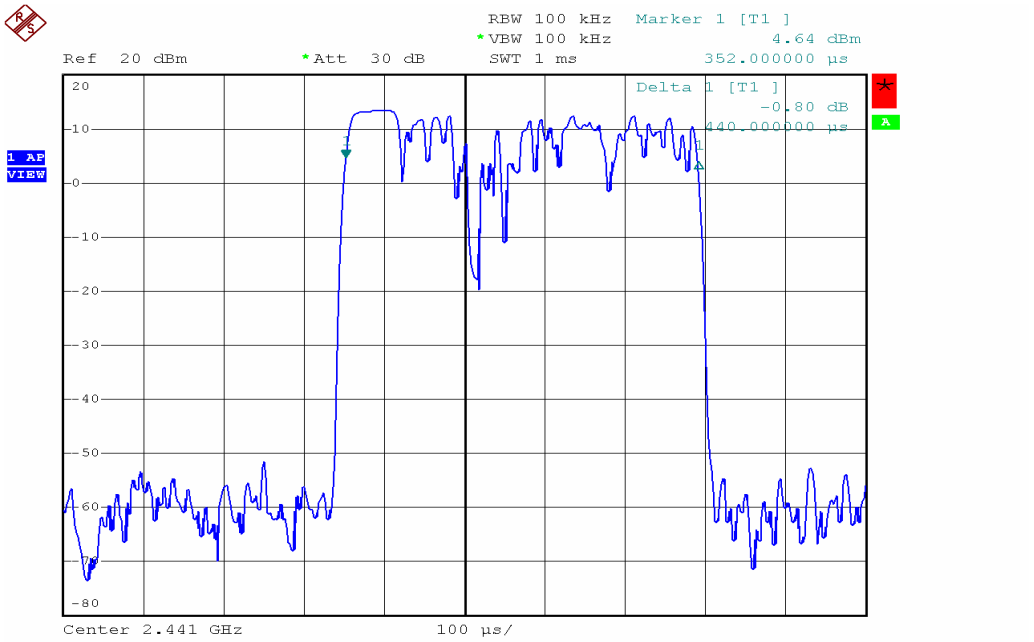
c) 2480 MHz Dwell Time is = 0.438ms x $\frac{31.6}{3.16}$ x 32 = 140.16ms



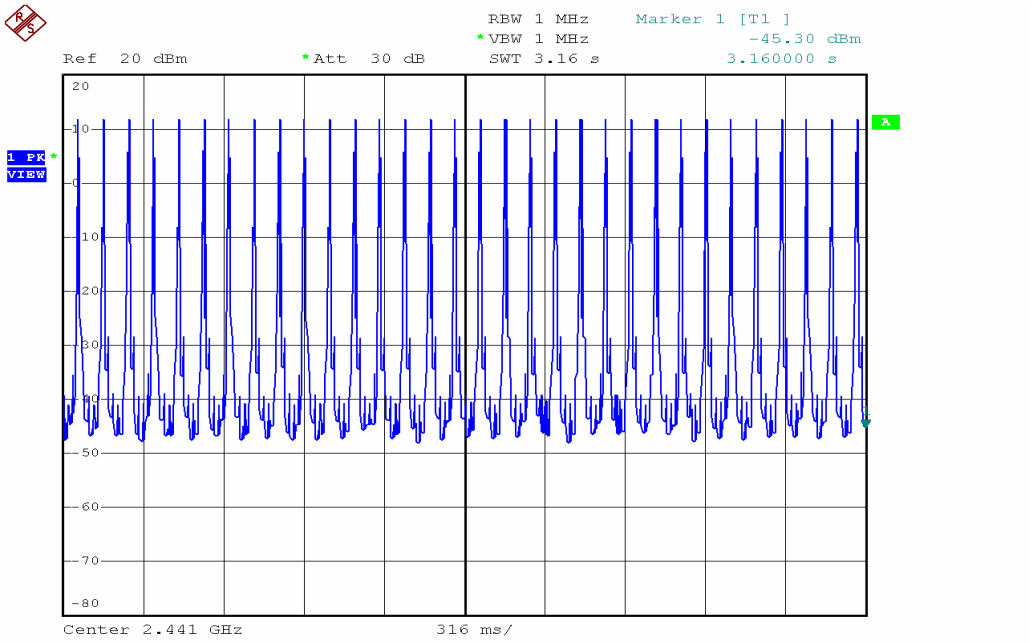

Date: 18.OCT.2004 14:25:37



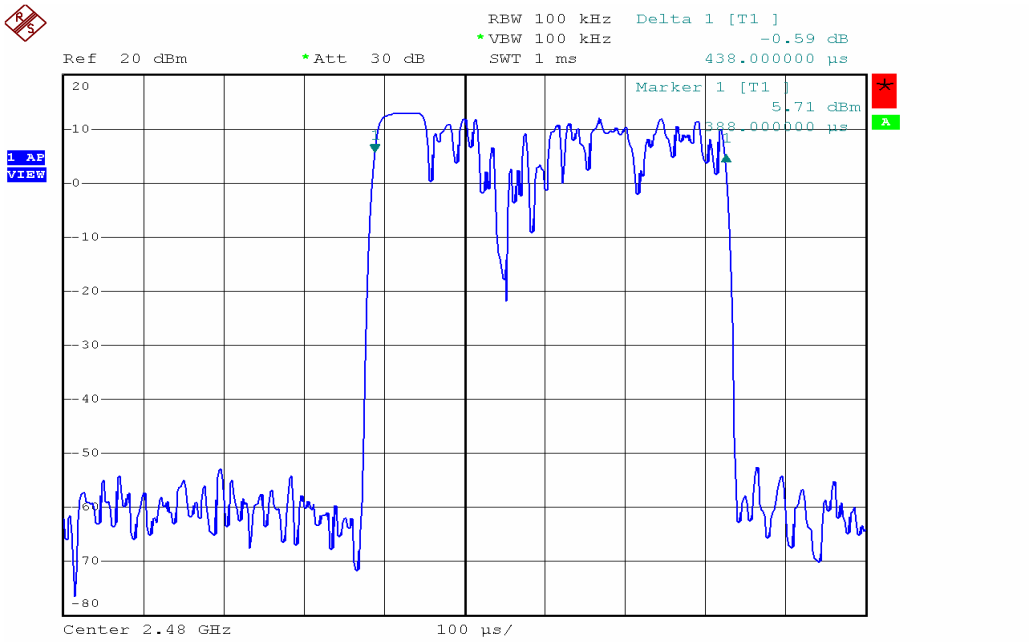

Date: 18.OCT.2004 18:27:02



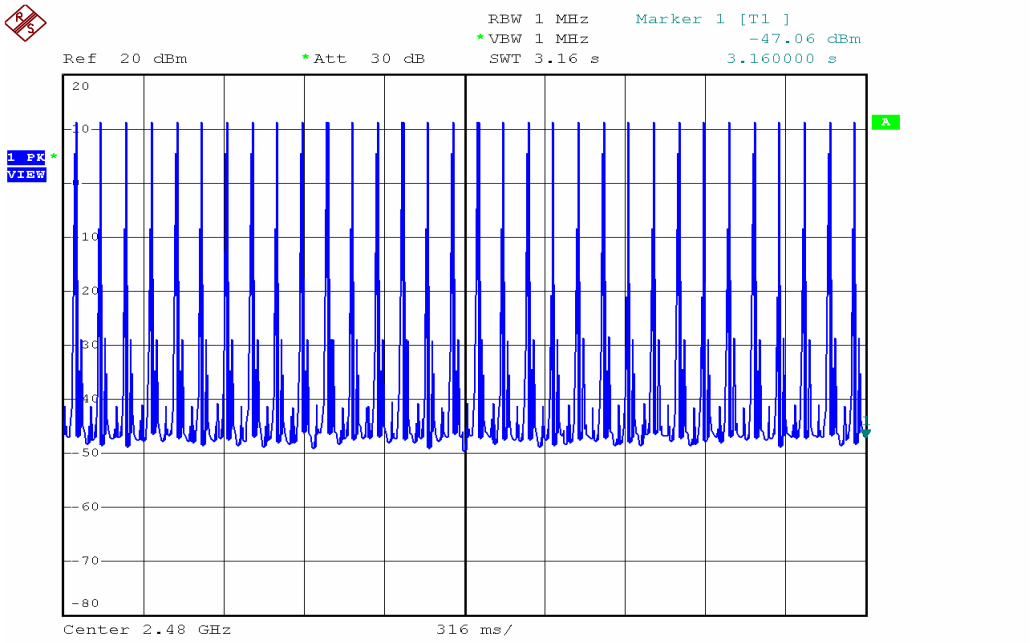

Date: 18.OCT.2004 14:27:09




Date: 18.OCT.2004 18:26:41




Date: 18.OCT.2004 14:28:07

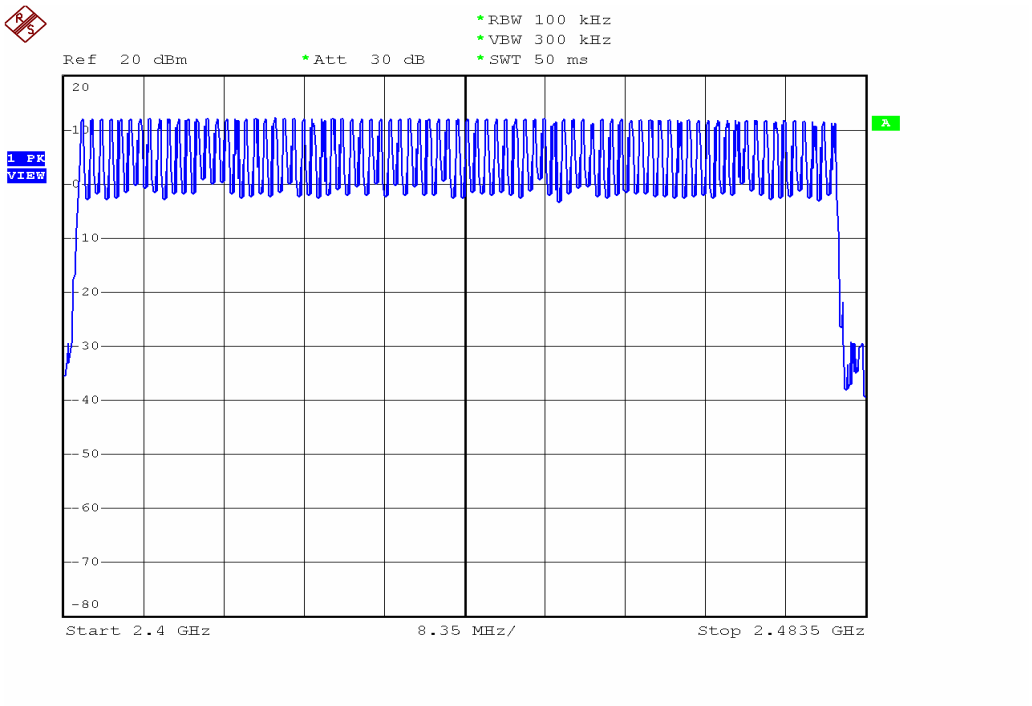



Date: 18.OCT.2004 18:26:16

## 4.7. Number of Hopping Channels

Test Date: Oct. 18, 2004 Temperature: 25℃ Humidity: 55%

Number of hopping channels 79 Channels

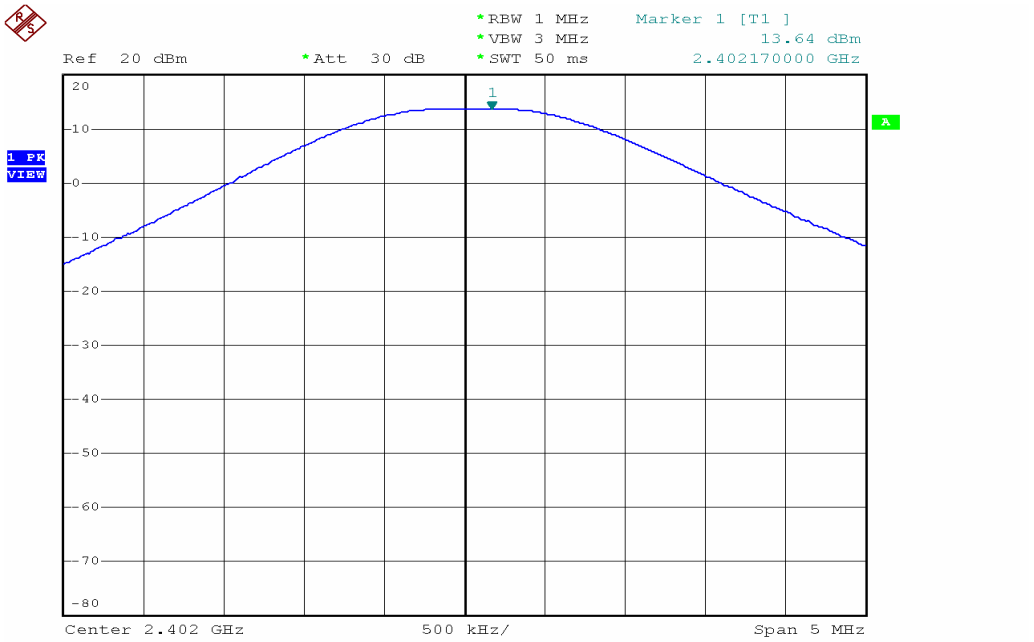



Date: 18.OCT.2004 18:08:27

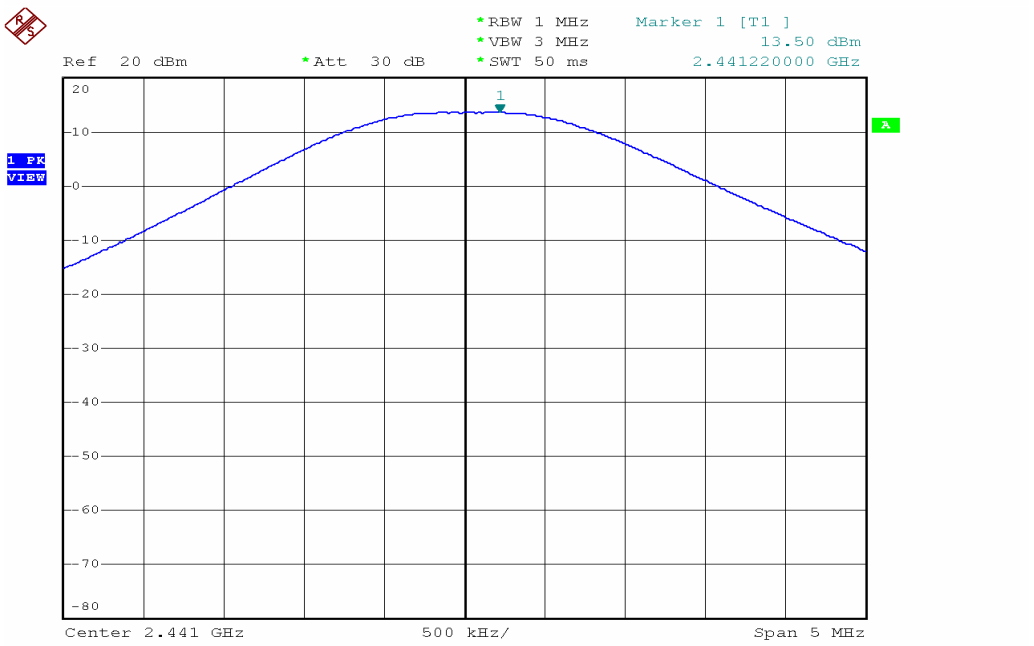
## 4.8. Peak Output Power Measurement Data

Test Date: Oct. 18, 2004 Temperature: 25℃ Humidity: 55%

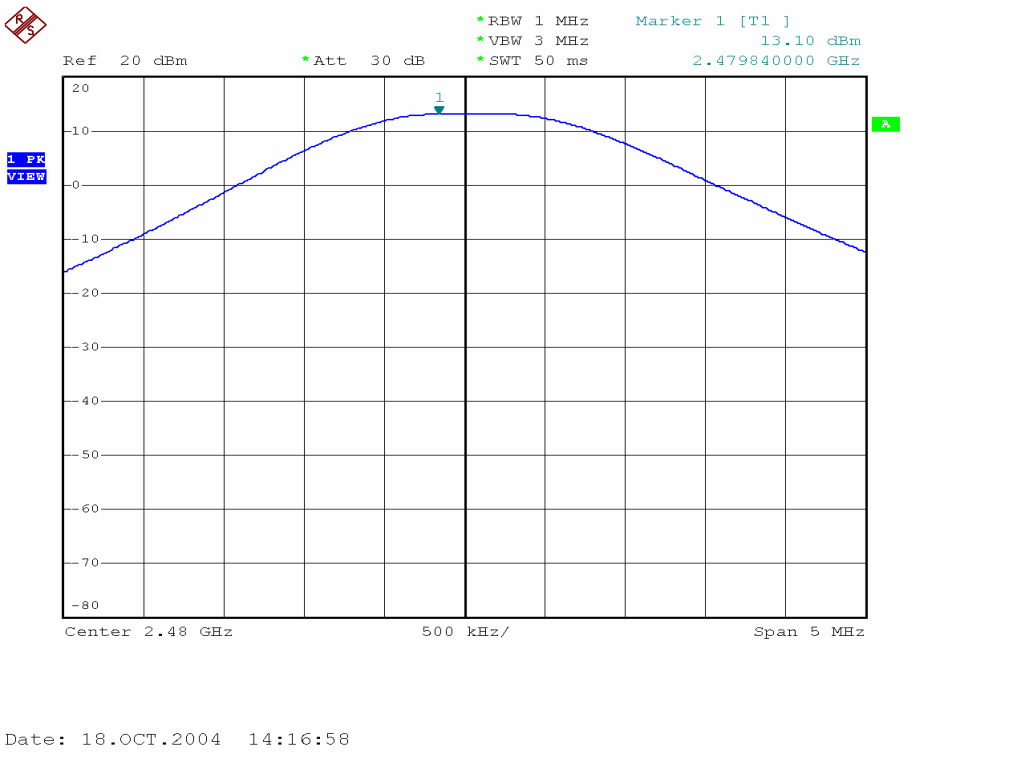
| | | | | | | |
|---|---|---|---|---|---|---|
| a) | Channel 0: Output Peak Power is | 13.64 | dBm or | 23.12 | mW |
| b) | Channel 39: Output Peak Power is | 13.50 | dBm or | 22.39 | mW |
| c) | Channel 78: Output Peak Power is | 13.10 | dBm or | 20.42 | mW |




Date: 18.OCT.2004 13:46:12




Date: 18.OCT.2004 13:45:16

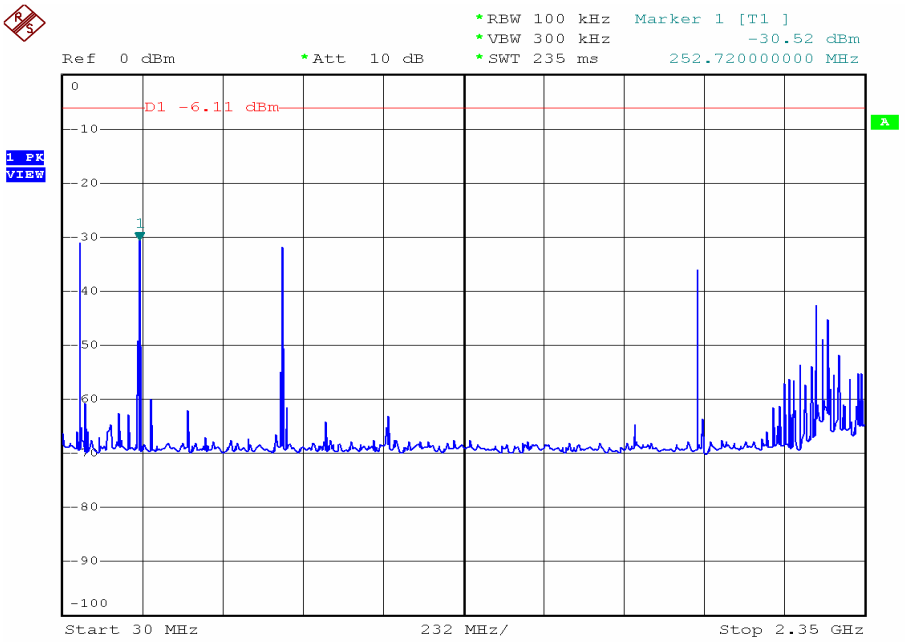

*RBW 1 MHz
*VBW 3 MHz
*SWT 50 ms
Marker 1 [T1 ]
13.10 dBm
2.479840000 GHz
Ref 20 dBm
*Att 30 dB
1 PK VIEW
A
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.48 GHz
500 kHz/
Span 5 MHz
Date: 18.OCT.2004 14:16:58

## 4.9. Band Edges Measurement Data

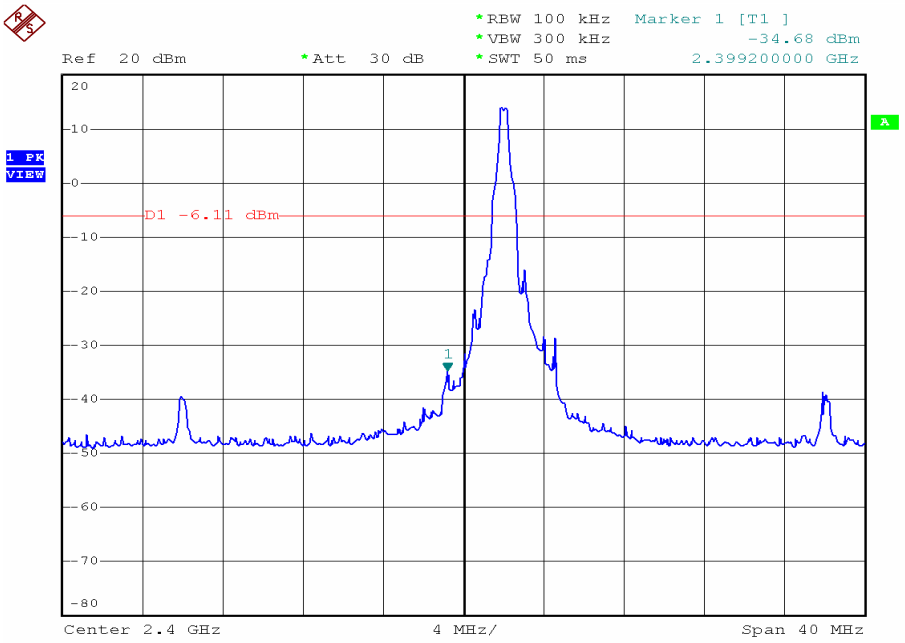
Test Date: Oct. 18, 2004 Temperature: 25℃ Humidity: 55%

a) Lower Band Edge: maximum value is -23.74 dBm that is attenuated more than 20dB

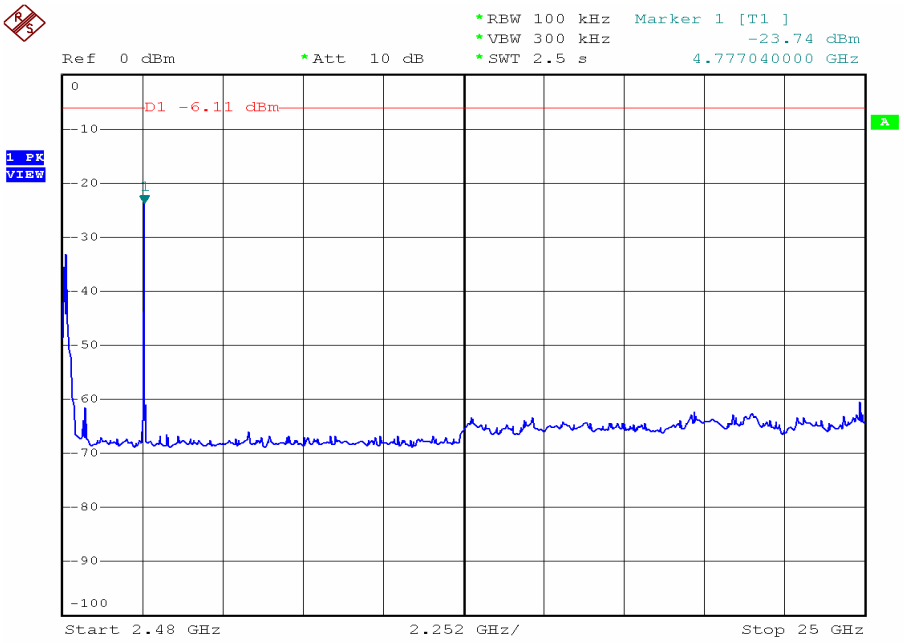
b) Upper Band Edge: maximum value is -27.89 dBm that is attenuated more than 20dB



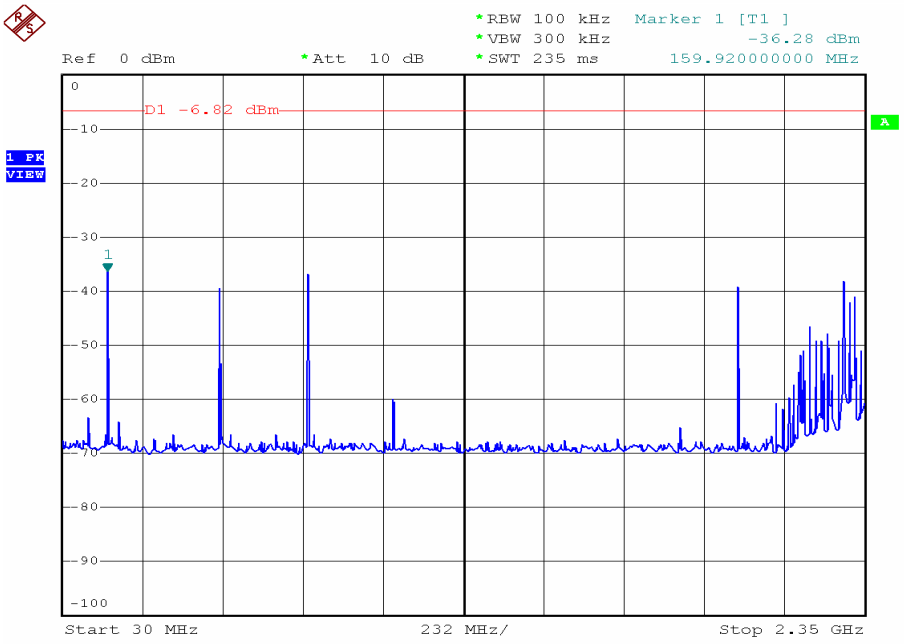

Date: 18.OCT.2004 12:21:56



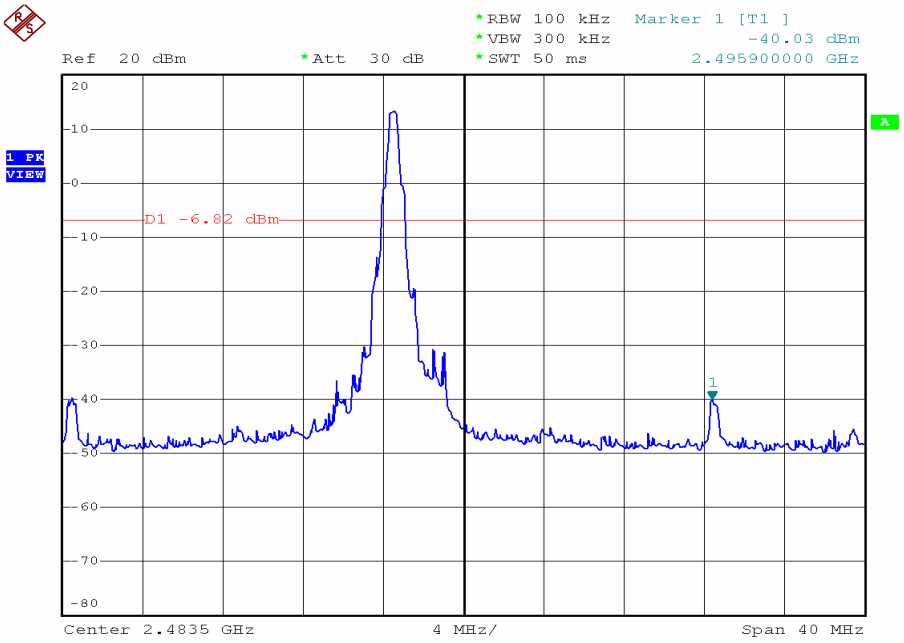

Date: 18.OCT.2004 12:15:47



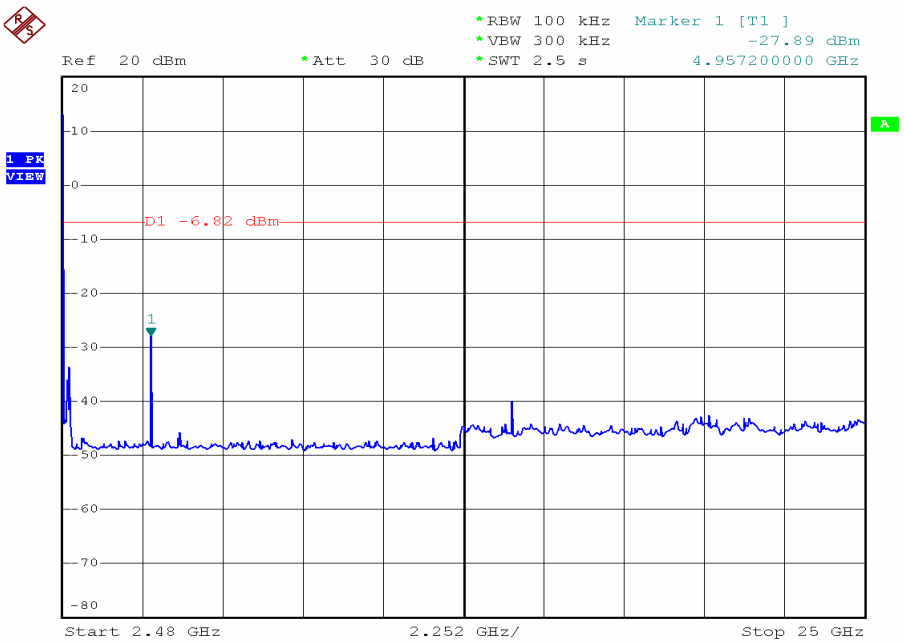

Date: 18.OCT.2004 12:29:35




Date: 18.OCT.2004 12:32:50




Date: 18.OCT.2004 12:31:51




Date: 18.OCT.2004 12:37:53

### 4.9.1. Restrict Band Emission Measurement Data

Test Date: Oct. 18, 2004 Temperature: 25℃ Humidity: 55%

a) Channel 0

Fundamental Frequency: 2402 MHz

| Frequency (MHz) | Meter Reading | Factor | Level (dBV) | Polarization | Remark | Limit@3m (dBuV/m) | | Margin (dB) | Table Deg. (Deg.) | Ant High (m) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Peak | Ave. | | | |
| 2390.0 | 65.2 | -3.3 | 61.9 | H | Peak | 74 | 54 | -12.1 | 75 | 1.2 |
| 2390.0 | 47.8 | -3.3 | 44.5 | H | Ave. | 74 | 54 | -9.5 | 75 | 1.2 |
| 2390.0 | 63.3 | -3.3 | 60.0 | V | Peak | 74 | 54 | -14.0 | 79 | 1.2 |
| 2390.0 | 46.8 | -3.3 | 43.5 | V | Ave. | 74 | 54 | -10.5 | 79 | 1.2 |

b) Channel 78

Fundamental Frequency: 2441 MHz

| Frequency (MHz) | Meter Reading | Factor | Level (dBV) | Polarization | Remark | Limit@3m (dBuV/m) | | Margin (dB) | Table Deg. (Deg.) | Ant High (m) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Peak | Ave. | | | |
| 2483.5 | 48.5 | -3.2 | 45.3 | H | Peak | 74 | 54 | -8.7 | 85 | 1.2 |
| 2483.5 | --- | --- | --- | H | Ave. | 74 | 54 | --- | --- | --- |
| 2483.5 | 48.4 | -3.2 | 45.2 | V | Peak | 74 | 54 | -8.8 | 81 | 1.2 |
| 2483.5 | --- | --- | --- | V | Ave. | 74 | 54 | --- | --- | --- |

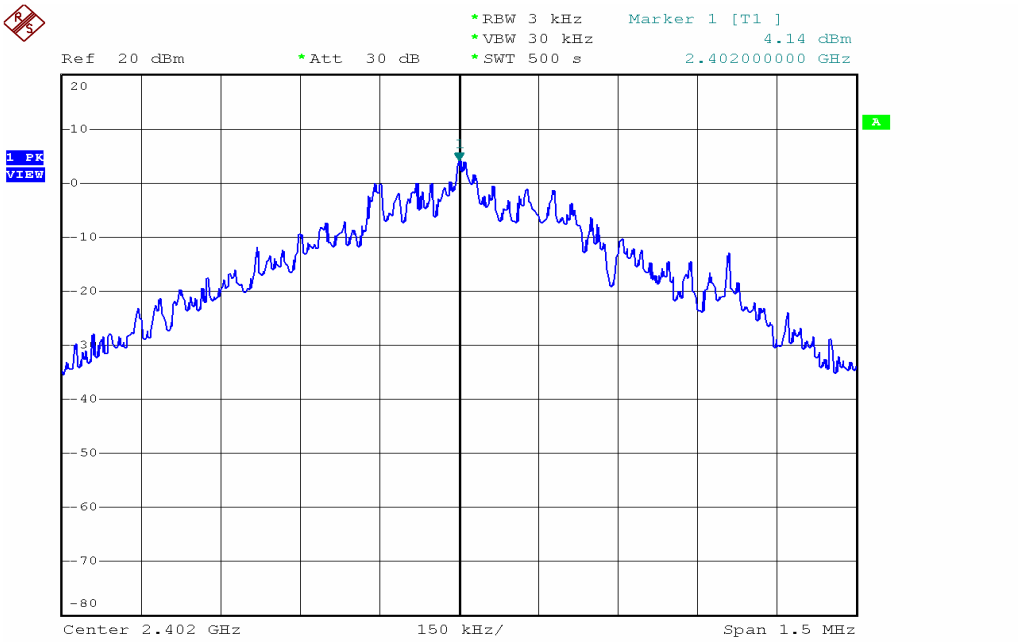
Notes:

1. Level = Meter Reading + Factor.
2. Factor = Antenna Factor + Cable Loss – Amplifier.
3. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1MHz for Peak detection and Quasi-peak detection at frequency above 1GHz.
4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 10Hz for Average detection at frequency above 1GHz.

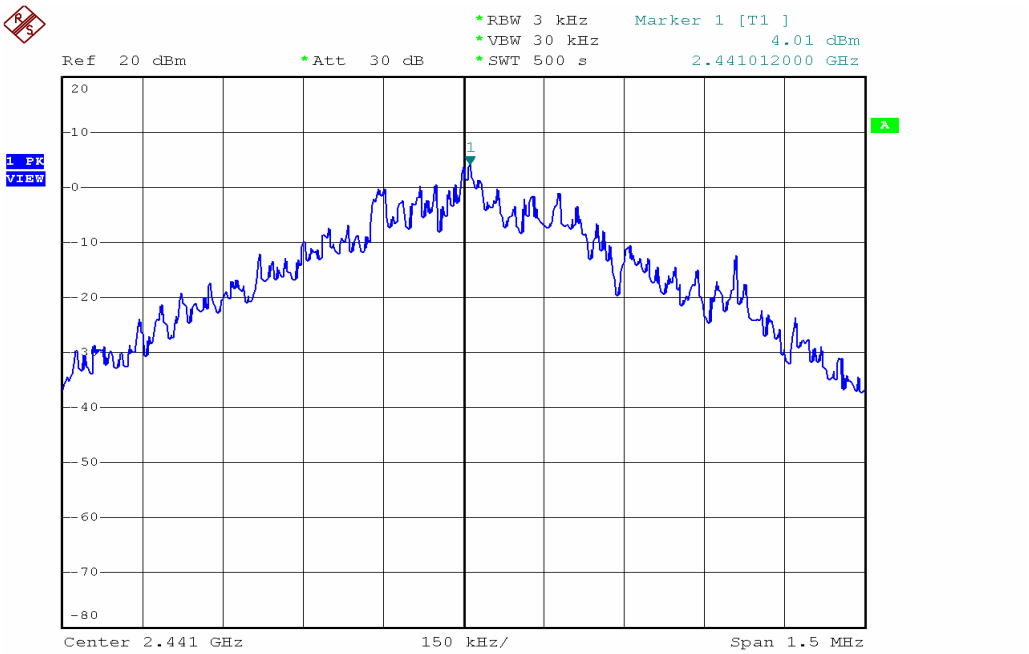
## 4.10. Power Spectral Density Measurement Data

Test Date: Oct. 18, 2004 Temperature: 25℃ Humidity: 55%

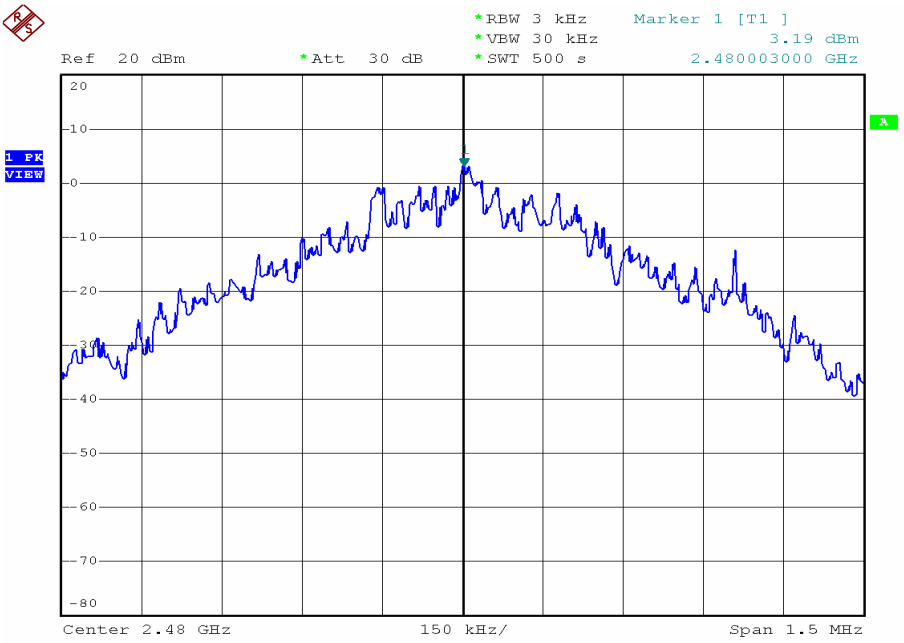
| | | |
|---|---|---|
| a) Channel 0: Maximum Power Density of 3 kHz Bandwidth is | 4.14 | dBm |
| b) Channel 39: Maximum Power Density of 3 kHz Bandwidth is | 4.01 | dBm |
| c) Channel 78: Maximum Power Density of 3 kHz Bandwidth is | 3.19 | dBm |




Date: 18.OCT.2004 16:01:23




Date: 18.OCT.2004 16:24:22




Date: 18.OCT.2004 16:53:28

# 5. List of Measuring Equipment Used

| No | Instrument/Ancillary | Type | Manufacturer | Serial No. | Valid Date. |
|---|---|---|---|---|---|
| 1 | Bilog Antenna | CBL6111C | Schaffner | 2762 | 2004/11/03 |
| 2 | Preamplifier | RFP4002 | Schaffner | 010 | 2004/11/03 |
| 3 | Receiver | SCR3501 | Schaffner | 437 | 2004/11/03 |
| 4 | Signal Generator | 8648B | HP | 3629U00612 | 2006/02/09 |
| 5 | Spectrum Analyzer | 8594E | HP | 3520A01913 | 2005/01/15 |
| 6 | Amplifier | 8447D | Agilent | 2443A04650 | 2005/02/02 |
| 7 | Amplifier | 8447D | Agilent | 2944A10531 | 2005/06/30 |
| 8 | Series Power Meter | E4416A | Agilent | GB41292146 | 2005/10/11 |
| 9 | Power Sensor | E9327A | Agilent | US40441392 | 2005/10/11 |
| 10 | Dipole Antenna | AD-100 | COM-Power | 721011 | 2004/12/02 |
| 11 | Dipole Antenna | AD-100 | COM-Power | 721010 | 2004/12/02 |
| 12 | Spectrum Analyzer | R3131A | Advantest | 131000021 | 2004/11/24 |
| 13 | Spectrum Analyzer | FSP40 | R&S | 100047 | 2004/12/16 |
| 14 | Preamplifier | 8449B | Agilent | 3008A01954 | 2005/01/04 |
| 15 | Horn Antenna | 3115 | EMCO | 31601 | 2005/01/13 |
| 16 | Horn Antenna | 3115 | EMCO | 31589 | 2005/01/13 |
| 17 | Horn Antenna | 3116 | EMCO | 31970 | 2005/01/29 |
| 18 | Horn Antenna | 3116 | EMCO | 31974 | 2005/01/29 |
| 19 | EMI Receiver | 8546A | HP | 3807A00454 | 2005/02/12 |
| 20 | RF Filter Section | 85460A | HP | 3704A00386 | 2005/02/12 |
| 21 | Signal Generator | 83640A | HP | 2927A00107 | 2006/04/02 |
| 22 | Attenuator | 8491B | Agilent | 50703 | 2004/12/16 |
| 23 | Attenuator | 8491B | Agilent | 50705 | 2004/12/16 |
| 24 | Temperature Chamber | TMJ-9712 | T Machine | T-12-040111 | 2005/02/05 |
| 25 | High Pass Filter | 84300-80038 | HP | 002 | N/A |
| 26 | High Pass Filter | 84300-80038 | HP | 006 | N/A |
| 27 | DC Power Supply | GPD-3030 | GM | 7020936 | N/A |
| 28 | AC Power Converter | AFC-11005 | APC | F103120008 | N/A |