# FCC Part 15

# EMI TEST REPORT

of

E.U.T.: **Router with Wireless Card**

Trade Name: N/A

Model Number: WQS418; WPS418; WUS418; WIS418

Prepared for

**Advance Multimedia Internet Technology Inc**

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Prepared by

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# TEST REPORT CERTIFICATION

| | |
|---|---|
| **Applicant:** | Advance Multimedia Internet Technology Inc |
| **Manufacturer:** | Advance Multimedia Internet Technology Inc |
| **EUT Description:** | Router with Wireless Card |
| **Model No.:** | WQS418; WPS418; WUS418; WIS418 |
| **Serial No.:** | N/A |
| **Tested Power Supply:** | 120Vac, 60Hz |
| **Date of Final Test:** | Oct. 8, 2003 |

**Measurement Procedures and Standards Used :**

FCC Rules and Regulations Part 15 Subpart B & C (2002)

I HEREBY CERTIFY THAT: The data shown in this report were made in accordance with the procedures given in ANSI C63.4, and the energy emitted by the device was founded to be within the limits applicable. I assume full responsibility for accuracy and completeness of these data.

**Note:** 1. The result of the testing report relate only to the item tested.

2. The testing report shall not be reproduced expect in full, without the written approval of IETC

Report Issued: 2003/12/10

Test Engineer: Posen Huang 2003/12/10
Posen Huang

Checked: Jeff Chuang 2003/12/10
Jeff Chuang

Approved: Joseph Tu Authorized 2003/12/15
Tim Hong

# Table of Contents

# 1 GENERAL INFORMATION

## 1.1 Description of Equipment Under Test

**Equipment Under Test** : Router with Wireless Card

**Model Number** : WQS418; WPS418; WUS418; WIS418

**Serial Number** : N/A

**Type of Sample Tested** : ☒Proto-type ☐Pre-Production ☐Mass Production

**Applicant** : **Advance Multimedia Internet Technology Inc**
NO.32, Hwan-Gong Rd. Yung Kang City,
Tainan Hsien, Taiwan, R.O.C

**Manufacturer** : **Advance Multimedia Internet Technology Inc**
NO.32, Hwan-Gong Rd. Yung Kang City,
Tainan Hsien, Taiwan, R.O.C

**Power Adapter** : AC Adapter
**Manufacturer: FAIRWAY, M/N: WN10B-050**
Input: 100-240Vac, 50-60Hz, 1.0A
Output: 5Vdc, 2.0A, 10W
Power cable: ☒Non-shielded ☒Non-detachable, 1.8m

**Product information** :

| | |
|---|---|
| Product | Router with Wireless Card |
| Rated RF Output Power | 18dBm |
| Type of Modulation | BPSK/QPSK/CCK (DSSS) |
| Antenna (Type) | Dipole antenna |
| Max.Gain | 2.0dB |
| Channel Spacing | 5 MHz |
| Number of channel | 11 |
| Bit rate of transmitter | For IEEE802.11b (11Mbps).<br>IEEE802.11g (54Mbps) |
| Alignment range | 2400 ~ 2483.5 MHz |
| Operating frequency | CH1(2412) ~ CH11(2462) MHz |
| IF,L.O | IF=374MHz,LO=2038~2088MHz |
| Temperature range | 0℃ ~ +55℃ |

**Date of Receipt of Sample** : Oct. 3, 2003

**Date of Test** : Oct. 3 ~ 9, 2002

**Description of E.U.T.** :

1. The Wireless Card (WL541M) was installed in to the router (WQS418) for testing.
2. The EUT is Router with Wireless Card.
3. Different specification of model numbers:

| Model Number | USB Port | Printer Port |
|---|---|---|
| WQS418 | ○ | ○ |
| WPS418 | X | ○ |
| WUS418 | ○ | X |
| WIS418 | X | X |

4. The description of the connecting ports are as following:
   ① LAN Port * 4.
   ② WAN Port * 1.
   ③ Print Port * 1.
   ④ USB Port * 1.
   ⑤ DC Power Port * 1.
5. The WQS418 is representative selected in the test and included in this report.

## 1.2 Details of Supporting System

- Printer
  PR06

| | | |
|---|---|---|
| Model Number | : | C20SX |
| Serial Number | : | DW4E085945 |
| EMC Approved | : | BSMI 3902E004 |
| Manufacturer | : | EPSON |
| Data Cable | : | Printer Cable: Non-shielded, Detachable, 1.6m |
| Power Cord | : | Non-shielded, Un-detachable, 1.8m |

- IBM Note Book (Remote)

| | | |
|---|---|---|
| Model Number | : | 2655-GT1 |
| Serial Number | : | 78-LRZR4 |
| EMC Approved | : | FCC DoC, CE, VCCI, 檢磁 3902I050 |
| Manufacturer | : | IBM |
| Data Cable | : | RJ45 Cable: Non-shielded, Detachable, 10m |
| Adapter | : | IBM AA21070, 檢磁 3892A299<br>Input: 100-240Vac, 1.2~0.5A, 50/60Hz<br>Non-shielded, Detachable, 1.5m<br>Output: 16Vdc, 4.5A<br>Non-shielded, Un-detachable, 1.8m |

## 1.3 Test Methodology

For Router with Wireless Card, both conducted and radiated emissions were performed according to the procedures illustrated in ANSI C63.4 (1992) and Other required measurements were illustrated in separate sections of this test report for details.

## 1.4 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located on the roof top of Building at No.5-2, Lin 1, Tin-Fu Tsun, Lin-Kou Hsiang, Taipei County, Taiwan, R.O.C.

This site has been fully described in a report submitted to your office, and accepted in a letter dated Oct 28,2002.

# 2 PROVISIONS APPLICABLE

## 2.1 Definition

**Unintentional radiator:**
A device that intentionally generates and radio frequency energy for use within the device, or that sends radio frequency signals by conduction to associated equipment via connecting wiring, but which is not intended to emit RF energy by radiation or induction.

**Class A Digital Device:**
A digital device which is marketed for use in commercial or business environment; exclusive of a device which is market for use by the general public, or which is intended to be used in the home.

**Class B Digital Device:**
A digital device which is marketed for use in a residential environment notwithstanding use in a commercial, business of industrial environment. Example of such devices that are marketed for the
general public.

**Note :** A manufacturer may also qualify a device intended to be marketed in a commercial, business, or industrial environment as a Class B digital device, and in fact is encouraged to do so, provided the device complies with the technical specifications for a Class B Digital Device. In the event that a particular type of device has been found to repeatedly cause harmful interference to radio communications, the Commission may classify such a digital device as a Class B Digital Device, Regardless of its intended use.

**Intentional radiator:**
A device that intentionally generates and emits radio frequency energy by radiation or induction.

## 2.2 Requirement for Compliance

### (1) Conducted Emission Requirement

For intentional device, according to §15.207(a) Line Conducted Emission Limits is same as above table.

For unintentional device, according to CISPR Line Conducted Emission Limits class B is as following:

| Frequency (MHz) | Quasi Peak (dB $\mu$V) | Average (dB $\mu$V) |
|---|---|---|
| 0.15 - 0.5 | 66-56 | 56-46 |
| 0.5 - 5.0 | 56 | 46 |
| 5.0 - 30.0 | 60 | 50 |

For intentional device, according to CISPR Line Conducted Emission Limits is same as above table.

### (2) Radiated Emission Requirement

For unintentional device, according to §15.109(a), except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

| Frequency (MHz) | Distance Meters (m) | Radiated (dB $\mu$V/m) | Radiated ($\mu$V/m) |
|---|---|---|---|
| 30 - 88 | 3 | 40.0 | 100 |
| 88 - 216 | 3 | 43.5 | 150 |
| 216 - 960 | 3 | 46.0 | 200 |
| Above 960 | 3 | 54.0 | 500 |

For intentional device, according to §15.209(a), the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the above table.

For unintentional device, according to CISPR Line Conducted Emission Limits class B is as following:

| Frequency (MHz) | Distance Meters (m) | Radiated (dB $\mu$V/m ) |
|---|---|---|
| 30 to 230 | 10 | 30 |
| 230 to 1000 | 10 | 37 |

**(3) Antenna Requirement**

For intentional device, according to §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.

**(4) Bandwidth Requirement**

For direct sequence system, according to 15.247(a)(2), the minimum 6dB bandwidth shall be at least 500 kHz.

**(5) Output Power Requirement**

For direct sequence system, according to 15.247(b)(3), the maximum peak output power of the transmitter shall not exceed 1 Watt. According to 15.247(b)(4) If transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

**(6) 100 kHz Bandwidth of Frequency Band Edges Requirement**

According to 15.247(c), if any 100 kHz bandwidth outside these frequency bands, the radio frequency power that is produced by the modulation products of the spreading sequence, the information sequence and the carrier frequency shall be either at least 20 dB below that in any 100 kHz bandwidth within the band that contains the highest level of the desired power or shall not exceed the general levels specified in § 15.209(a), whichever results in the lesser attenuation.

**(7) Power Density Requirement**

For digitally modulated systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3kHz band during any time interval of continuous transmission.

## 2.3 Restricted Bands of Operation

Only spurious emissions are permitted in any of the frequency bands listed below:

| MHz | MHz | MHz | GHz |
|---|---|---|---|
| 0.090 - 0.110 | 16.42-16.423 | 399.9-410 | 4.5-5.25 |
| 0.495 - 0.505 ** | 16.69475 - 16.69525 | 608-614 | 5.35-5.46 |
| 2.1735 - 2.1905 | 16.80425 - 16.80475 | 960-1240 | 7.25-7.75 |
| 4.125-4.128 | 25.5-25.67 | 1300-1427 | 8.025-8.5 |
| 4.17725-4.17775 | 37.5-38.25 | 1435-1626.5 | 9.0-9.2 |
| 4.20725-4.20775 | 73-74.6 | 1645.5-1646.5 | 9.3-9.5 |
| 6.215-6.218 | 74.8-75.2 | 1660-1710 | 10.6-12.7 |
| 6.26775-6.26825 | 108-121.94 | 1718.8-1722.2 | 13.25-13.4 |
| 6.31175-6.31225 | 123-138 | 2200-2300 | 14.47-14.5 |
| 8.291-8.294 | 149.9-150.05 | 2310-2390 | 15.35-16.2 |
| 8.362-8.366 | 156.52475 - 156.52525 | 2483.5-2500 | 17.7-21.4 |
| 8.37625-8.38675 | 156.7-156.9 | 2655-2900 | 22.01-23.12 |
| 8.41425-8.41475 | 162.0125-167.17 | 3260-3267 | 23.6-24.0 |
| 12.29-12.293 | 167.72-173.2 | 3332-3339 | 31.2-31.8 |
| 12.51975-12.52025 | 240-285 | 3345.8-3358 | 36.43-36.5 |
| 12.57675-12.57725 | 322-335.4 | 3360-4400 | Above 38.6 |
| 13.36-13.41 | | | |

**: Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.
**: Above 38.6

## 2.4 Labeling Requirement

The device shall bear the following statement in a conspicuous location on the device:

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

## 2.5 User Information

According to **Section 15.21**:The users manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

According to **Section 15.105(b)**:For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual.

The Federal Communications Commission Radio Frequency Interference Statement includes the following paragraph.

This equipment has been tested and found to comply with the limits for a Class B Digital Device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction may cause harmful interference to radio communication. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

-- Reorient or relocate the receiving antenna.

-- Increase the separation between the equipment and receiver.

-- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

-- Consult the dealer or an experienced radio / TV technician for help.

# 3 SYSTEM TEST CONFIGURATION

## 3.1 Justification

For both radiated and conducted emissions below 1 GHz, the system was configured for testing in a typical fashion as a customer would normally use it. The peripherals other than EUT were connected in normally standing by situation. Measurement was performed under the condition that a computer program was exercised to simulate data communication of EUT, and the transmission rate was set to maximum allowed by EUT. Three highest emissions were verified with varying placement of the transmitting antenna connected to EUT to maximize the emission from EUT.

For conducted emissions, only measured on TX and RX mode operation, for the digital circuits portion also function normally whenever TX or RX is operated. For radiated emissions, whichever RF channel is operated, the digital circuits function identically. As the reason, measurement of radiated emissions from digital circuits is only performed with channel 1 by transmitting mode.

During the preliminary test, the RF-chip combined with 802.11b&g mode. It will auto-detect the situation the switch the mode. The 802.11g mode is the worse case than the 802.11b mode so it is only listed the 802.11g mode.

# 4 POWER LINE CONDUCTED EMISSION MEASUREMENT

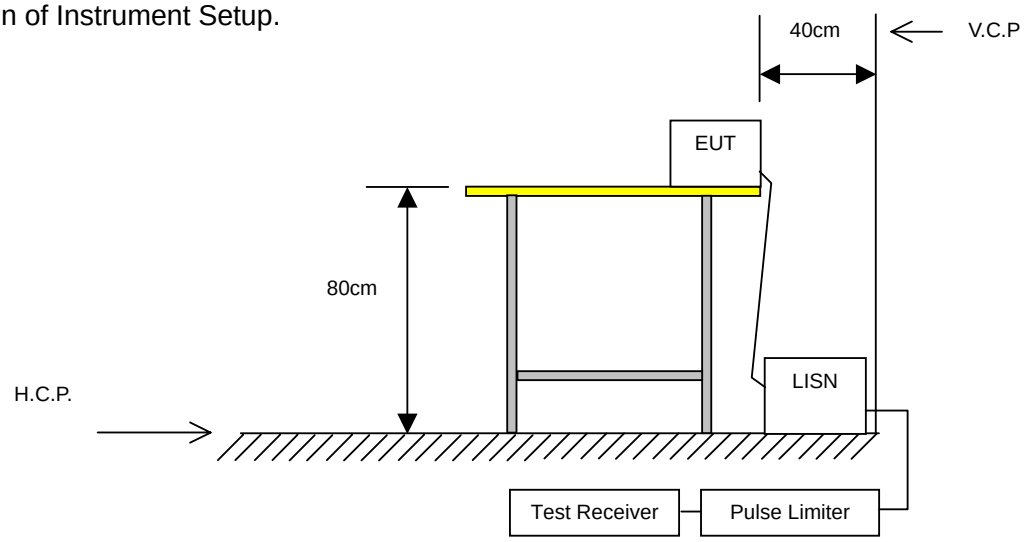
## 4.1 Instrument

| Instrument | Manufacturer | Model | Serial No. | Last Calibration |
|---|---|---|---|---|
| EMI Test Receiver | Rohde & Schwarz | ESCS 30 | 100127 | 2003/08/30 |
| L.I.S.N. | Schwarzbeck | NNLK8121 | 8121417 | 2003/07/26 |
| L.I.S.N. | Rohde & Schwarz | ESH3-Z5 | 829996/016 | 2003/06/11 |
| Pulse Limiter | Rohde & Schwarz | ESH3-Z2 | 830836/026 | 2003/07/15 |
| RF Cable | IETC | CBL04 | N/A | 2003/10/14 |

Note: All instrument upon which need to be calibrated are within calibration period of 1 year.

## 4.2 Block Diagram of Test Configuration

Configuration of Instrument Setup.



## 4.3 Conducted Limit (Power Line)

| Frequency (MHz) | ☐ Class A | | ☒ Class B | |
|---|---|---|---|---|
| | Q.P. (Quasi-Peak) | A.V. (Average) | Q.P. (Quasi-Peak) | A.V. (Average) |
| 0.15 ~ 0.50 | 79 dBμ V | 66 dBμ V | 66 to 56 dBμ V | 56 to 46 dBμ V |
| 0.50 ~ 5.0 | 73 dBμ V | 60 dBμ V | 56 dBμ V | 46 dBμ V |
| 5.0 ~ 30 | 73 dBμ V | 60 dBμ V | 60 dBμ V | 50 dBμ V |

**Note:** The emission requirement only applies to telecommunication ports as specified in EN 55022[7]. The provisional relaxation 10dB.Will be review no later than 3 years After the date of withdrawal based on the results and interface cases seen in the period. Wherever possible it is recommended to comply with the limits without the provisional relaxation.

## 4.4 Measurement Procedure

1. The EUT was placed on a non-conductive table whose total height equaled 80cm and vertical conducting plane located 40cm to the rear of the EUT.
2. The EUT was connected to the main power through Line Impedance Stabilization Networks (LISN). This setup provided a 50ohm / 50μH coupling impedance for the measuring equipment. The auxiliary equipment was also connected to the main power through a LISN that provided a 50ohm/50μH coupling impedance with 50ohm termination. (Refer to the block diagram of the test setup and photographs.)
3. The conducted disturbance was measured between the phase lead and the reference ground, and between the neutral lead and reference ground. The initial testing identified the frequency that has the highest disturbance relative to the limit while operating the EUT in typical modes of operation and cable positions in a test setup representative of typical system configuration.
4. The identification of the frequency of highest disturbance with respect to the limit was found by investigating disturbances at a number of significant frequencies. The probable frequency of maximum disturbance had been found and that the associated cable and EUT configuration and mode of operation had been identified.

## 4.5 Measuring Instrument

1. Set the EMI test receiver frequency range from 150 KHz to 30 MHz.
2. Set the EMI test receiver bandwidth at 9kHz.
3. Set the EMI test receiver detector as Quasi-Peak (Q.P.) and Average (AV).

## 4.6 Test Step of EUT

1. Setup the EUT and peripheral as shown in section 4.2.
2. Turn on the power of all equipment.
3. Boot up the Notebook PC from hard disk to Windows operation system, and setup Notebook PC to auto give IP address.
4. Executive “Wireless” program, Notebook PC will detect the Router (EUT).
5. Measured the Line phase and record value.
6. Changed into Neutral phase then measure and record value.

## Power Line Conducted Test Data

Date of Tested : Oct. 6, 2003 Power Line : Line

Temperature : 26°C Humidity : 42%

Tested Mode : Link Mode

| Frequency (MHz) | Factor (dB) | Meter Reading (dBuV) | | Emission Level (dBuV) | | Limits (dBuV) | | Margin (dB) | |
|---|---|---|---|---|---|---|---|---|---|
| | | Quasi-Peak | Average | Quasi-Peak | Average | Quasi-Peak | Average | Quasi-Peak | Average |
| 0.158 | 0.20 | 45.45 | 29.74 | 45.65 | 29.94 | 65.57 | 55.57 | -19.92 | -25.63 |
| 0.369 | 0.19 | 36.29 | 23.48 | 36.48 | 23.67 | 58.52 | 48.52 | -22.04 | -24.85 |
| 0.627 | 0.20 | 37.37 | 25.60 | 37.57 | 25.80 | 56.00 | 46.00 | -18.43 | -20.20 |
| 0.681 | 0.20 | 38.78 | 28.18 | 38.98 | 28.38 | 56.00 | 46.00 | -17.02 | -17.62 |
| 0.912 | 0.30 | 37.78 | 24.54 | 38.08 | 24.84 | 56.00 | 46.00 | -17.92 | -21.16 |
| 1.037 | 0.30 | 34.10 | 19.45 | 34.40 | 19.75 | 56.00 | 46.00 | -21.60 | -26.25 |
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Remark:

1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.
3. Please refer to appendix 1.

## Power Line Conducted Test Data

Date of Tested : Oct. 6, 2003 Power Line : Neutral

Temperature : 26°C Humidity : 42%

Tested Mode : Link Mode

| Frequency (MHz) | Factor (dB) | Meter Reading (dBuV) | | Emission Level (dBuV) | | Limits (dBuV) | | Margin (dB) | |
|---|---|---|---|---|---|---|---|---|---|
| | | Quasi-Peak | Average | Quasi-Peak | Average | Quasi-Peak | Average | Quasi-Peak | Average |
| 0.158 | 0.20 | 42.48 | 27.54 | 42.68 | 27.74 | 65.57 | 55.57 | -22.89 | -27.83 |
| 0.380 | 0.18 | 37.17 | 27.53 | 37.35 | 27.71 | 58.28 | 48.28 | -20.93 | -20.57 |
| 0.646 | 0.20 | 31.12 | 24.28 | 31.32 | 24.48 | 56.00 | 46.00 | -24.68 | -21.52 |
| 0.912 | 0.30 | 36.17 | 22.14 | 36.47 | 22.44 | 56.00 | 46.00 | -19.53 | -23.56 |
| 0.974 | 0.30 | 37.32 | 25.25 | 37.62 | 25.55 | 56.00 | 46.00 | -18.38 | -20.45 |
| 1.197 | 0.30 | 32.19 | 19.26 | 32.49 | 19.56 | 56.00 | 46.00 | -23.51 | -26.44 |
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Remark:
1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.
3. Please refer to appendix 1.

# 5 RADIATED EMISSION MEASUREMENT

## 5.1 Instrument

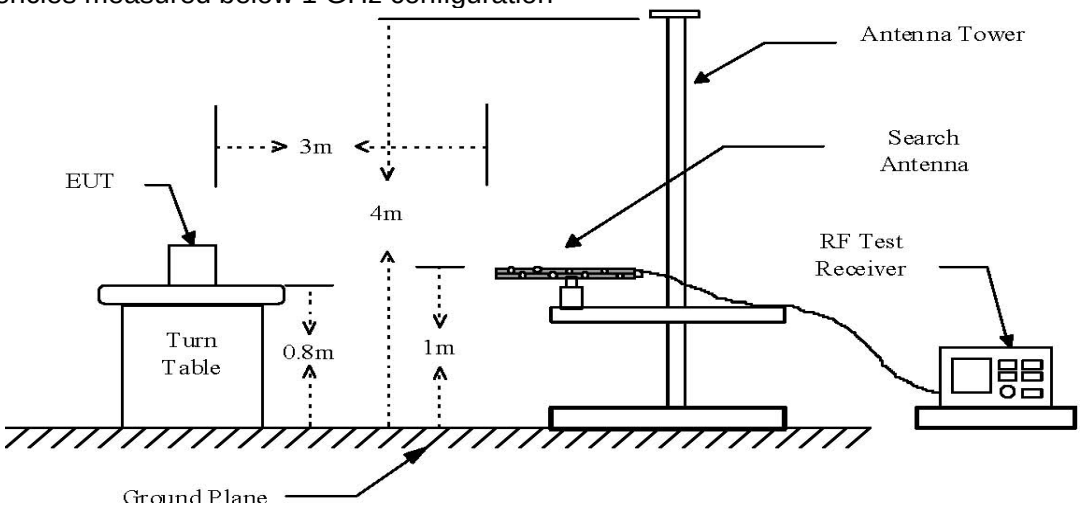
☒OATS 1

| Instrument | Manufacturer | Model | Serial No. | Last Calibration |
|---|---|---|---|---|
| EMI Test Receiver | Rohde & Schwarz | ESI 07 | 830154/002 | 2003/07/24 |
| Antenna | Schaffner | CBL6112B | 2610 | 2003/02/25 |
| Pre-Amplifier | Schaffner | CPA9231A | 3351 | 2003/09/30 |
| RF Cable | IETC | CBL01 | N/A | 2003/09/15 |
| HORN Antenna | COM-POWER | AH-118 | 10081 | 2003/04/19 |
| RF Preamplifier | Agilent Technologies | 8449B | 3008A01434 | 2003/04/24 |
| Cable | Insulated Wire Incorporated | NPS-2251-7880-NPR | CBL06 | 2003/05/05 |

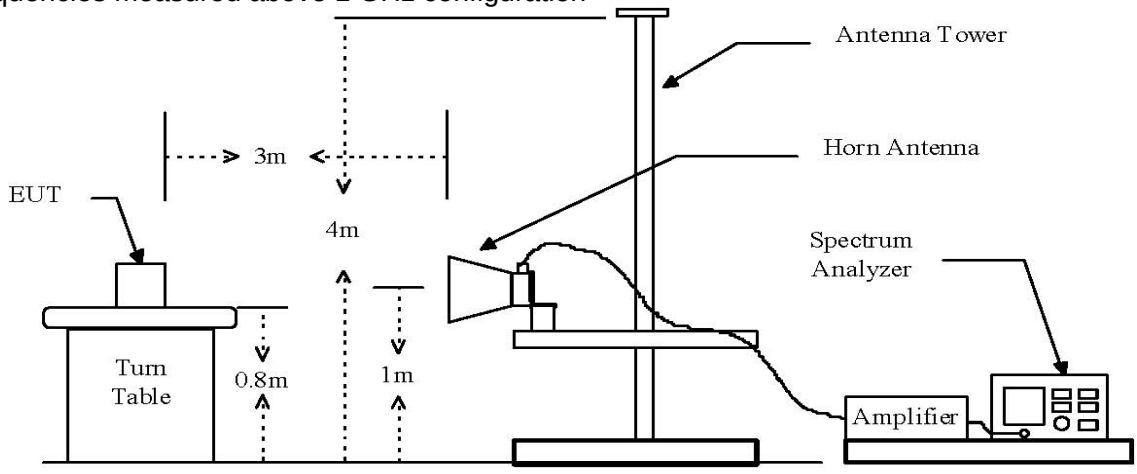
Note: All instrument upon which need to be calibrated are within calibration period of 1 year.

## 5.2 Block Diagram of Test Configuration

Frequencies measured below 1 GHz configuration




Frequencies measured above 1 GHz configuration



## 5.3 Applicable Standard

For unintentional radiator, the radiated emission shall comply with §15.109(a).

For intentional radiators, according to §15.247 (a), operation under this provision is limited to frequency hopping and direct sequence spread spectrum, and the out band emission shall be comply with §15.247 (c)

## 5.4 Measurement Procedure

1. Setup the configuration per figure 5 and 6 for frequencies measured below and above 1 GHz respectively.
2. For emission frequencies measured below 1 GHz, a pre-scan is performed in a shielded chamber to determine the accurate frequencies of higher emissions will be checked on a open test site. As the same purpose, for emission frequencies measured above 1 GHz, a pre-scan also be performed with a 1 meter measuring distance before final test.
3. For emission frequencies measured below and above 1 GHz, set the spectrum analyzer on a 100 kHz and 1 MHz resolution bandwidth respectively for each frequency measured in step 2.
4. The search antenna is to be raised and lowered over a range from 1 to 4 meters in horizontally polarized orientation. Position the highness when the highest value is indicated on spectrum

   analyzer, then change the orientation of EUT on test table over a range from 0◦ to 360◦ with a speed as slow as possible, and keep the azimuth that highest emission is indicated on the spectrum analyzer. Vary the antenna position again and record the highest value as a final reading. A RF test receiver is also used to confirm emissions measured.

   **Note :** A band pass filter was used to avoid pre-amplifier saturated when measure TX operation mode in frequency band above 1 GHz.

5. Repeat step 4 until all frequencies need to be measured were complete.
6. Repeat step 5 with search antenna in vertical polarized orientations.
7. Check the three frequencies of highest emission with varying the placement of cables associated with EUT to obtain the worse case and record the result.

## 5.5 Measuring Instrument

Measuring instrument setup in measured frequency band when specified detector function is used:

| Frequency Band (MHz) | Instrument | Function | Resolution bandwidth | Video Bandwidth |
|---|---|---|---|---|
| 0.01 to 30 | RF Test Receiver | Quasi-Peak | 9 kHz | N/A |
| | Spectrum Analyzer | Peak | 100 kHz | 100 kHz |
| 30 to 1000 | RF Test Receiver | Quasi-Peak | 120 kHz | N/A |
| | Spectrum Analyzer | Peak | 100 kHz | 100 kHz |
| Above 1000 | Spectrum Analyzer | Peak | 1 MHz | 1 MHz |
| | Spectrum Analyzer | Average | 1 MHz | 300 Hz |

## 5.6 Test Step of EUT

1. Setup the EUT and peripheral as shown in section 5.2.
2. Turn on the power of all equipment.
3. Boot up the Notebook PC from hard disk to Windows operation system, and setup Notebook PC to auto give IP address.
4. Executive “Wireless” program, Notebook PC will detect the Router (EUT).
5. Measured the horizontal polarization and record the value.
6. Changed into vertical polarization measure and record the value.

## 5.7 Radiated Emission Data

Results for the radiated measurements below 30MHz according §15.33

| Frequency | Measured Values | Remarks |
|---|---|---|
| 10KHz-30MHz | No emission found, caused by the EUT | This is valid for all the test channels |

**Radiated Emission Measurement Data**

| | | | | | |
|---|---|---|---|---|---|
| Date of Tested | : Oct. 8, 2003 | | Polarization | : Horizontal | |
| Temperature | : 28°C | | Humidity | : 63% | |
| Tested Mode | : TX/RX Mode | | Distance | : 3m | |

| Frequency (MHz) | Factor (dB) | Meter Reading (dBuV) | Emission Level dB(uV/m) | Limits dB(uV/m) | Margin (dB) |
|---|---|---|---|---|---|
| 199.997 * | -21.10 | 47.60 | 26.50 | 43.50 | -17.00 |
| 300.000 * | -16.20 | 53.20 | 37.00 | 46.00 | -9.00 |
| 399.997 * | -11.05 | 47.60 | 36.55 | 46.00 | -9.45 |
| 724.997 * | -4.35 | 41.50 | 37.15 | 46.00 | -8.85 |
| 800.012 ** | -3.71 | 41.90 | 38.19 | 46.00 | -7.81 |
| 878.490 ** | -2.59 | 39.60 | 37.01 | 46.00 | -8.99 |
| 900.014 ** | -2.56 | 40.60 | 38.04 | 46.00 | -7.96 |
| 933.350 ** | -1.81 | 43.20 | 41.39 | 46.00 | -4.61 |
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**Remark:**
1. " * " Mark means readings are Peak Values.
2. " ** " Mark means readings are Quasi-Peak values.
3. Factor = Antenna Factor + Cable Loss – Pre-amplifier.

## Radiated Emission Measurement Data

| | | | | | |
|---|---|---|---|---|---|
| Date of Tested | : | Oct. 8, 2003 | Polarization | : | Vertical |
| Temperature | : | 28°C | Humidity | : | 63% |
| Tested Mode | : | TX/RX Mode | Distance | : | 3m |

| Frequency (MHz) | Factor (dB) | Meter Reading (dBuV) | Emission Level dB(uV/m) | Limits dB(uV/m) | Margin (dB) |
|---|---|---|---|---|---|
| 133.237 ** | -20.82 | 56.20 | 35.38 | 43.50 | -8.12 |
| 400.014 ** | -11.05 | 51.20 | 40.15 | 46.00 | -5.85 |
| 499.994 * | -8.99 | 47.90 | 38.91 | 46.00 | -7.09 |
| 800.012 ** | -3.71 | 45.60 | 41.89 | 46.00 | -4.11 |
| 833.329 ** | -3.63 | 44.20 | 40.57 | 46.00 | -5.43 |
| 899.997 ** | -2.56 | 39.80 | 37.24 | 46.00 | -8.76 |
| 933.343 ** | -1.81 | 43.90 | 42.09 | 46.00 | -3.91 |
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**Remark:**

1. " * " Mark means readings are Peak Values.
2. " ** " Mark means readings are Quasi-Peak values.
3. Factor = Antenna Factor + Cable Loss – Pre-amplifier.

## Radio Frequency Measurement Results

| | | | | | |
|---|---|---|---|---|---|
| Date of Tested | : | Oct. 3, 2003 | Polarization | : | Vertical / Horizontal |
| Temperature | : | 27°C | Humidity | : | 49% |
| Fundamental Wave Frequency | : | 2412MHz | Distance | : | 3m |
| Tested Mode | : | TX Mode (Channel 01) | | | |

| Frequency | Read Value (dBuV) | | Corrected Factor | Max. Results (dBuv/m) | | Limit (dBuV/m) | | Tolerance (dB) | Altitude | Angle |
|---|---|---|---|---|---|---|---|---|---|---|
| (MHz) | Peak | AV | (dB) | Peak | AV | Peak | AV | (dBuV/m) | (m) | (degre |
| 4824.000 | --- | --- | 4.10 | --- | --- | 74.00 | 54.00 | --- | --- | --- |
| 7236.000 | --- | --- | 10.10 | --- | --- | 74.00 | 54.00 | --- | --- | --- |
| 9648.000 | --- | --- | 12.50 | --- | --- | 74.00 | 54.00 | --- | --- | --- |
| 12060.000 | --- | --- | 14.90 | --- | --- | 74.00 | 54.00 | --- | --- | --- |
| 14472.000 | --- | --- | 23.10 | --- | --- | 74.00 | 54.00 | --- | --- | --- |
| 16884.000 | --- | --- | 20.20 | --- | --- | 74.00 | 54.00 | --- | --- | --- |
| 19296.000 | --- | --- | 14.70 | --- | --- | 74.00 | 54.00 | --- | --- | --- |
| 21708.000 | --- | --- | 14.60 | --- | --- | 74.00 | 54.00 | --- | --- | --- |
| 24120.000 | --- | --- | 16.20 | --- | --- | 74.00 | 54.00 | --- | --- | --- |
| | | | | | | | | | | |

***Note :***

1. *Item of margin shown in above table refer to average limit.*
2. *It is considered that the results of average comply with average limit when measuring data with a peak function detector meet the average limit. Mark "***" means that Peak result is meet average limit.*
3. *Remark "---" means that the emissions level is too low to be measured.*
4. *Item "Margin" referred to Average limit while there is only peak result.*
5. *The expanded uncertainty of the radiated emission tests is 3.53 dB.*

## Radio Frequency Measurement Results

| | | | | | |
|---|---|---|---|---|---|
| Date of Tested | : | Oct. 3, 2003 | Polarization | : | Horizontal |
| Temperature | : | 27°C | Humidity | : | 49% |
| Fundamental Wave Frequency | : | 2038MHz | Distance | : | 3m |
| Tested Mode | : | RX Mode (Channel 01) | | | |

| Frequency | Read Value (dBuV) | | Corrected Factor | Max. Results (dBuv/m) | | Limit (dBuV/m) | Tolerance (dB) | Altitude | Angle |
|---|---|---|---|---|---|---|---|---|---|
| (MHz) | Peak | AV | (dB) | Peak | AV | AV | (dBuV/m) | (m) | (degre |
| 2038.000 | 46.80 | --- | -0.60 | 46.20 | --- | 54.00 | -7.80 | 1.30 | 250.00 |
| 4076.000 | --- | --- | 1.60 | --- | --- | 54.00 | --- | --- | --- |
| 6114.000 | --- | --- | 5.70 | --- | --- | 54.00 | --- | --- | --- |
| 8152.000 | --- | --- | 10.90 | --- | --- | 54.00 | --- | --- | --- |
| 10190.000 | --- | --- | 15.00 | --- | --- | 54.00 | --- | --- | --- |
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***Note :***

1. *Item of margin shown in above table refer to average limit.*
2. *It is considered that the results of average comply with average limit when measuring data with a peak function detector meet the average limit. Mark "***" means that Peak result is meet average limit.*
3. *Remark "---" means that the emissions level is too low to be measured.*
4. *Item "Margin" referred to Average limit while there is only peak result.*
5. *The expanded uncertainty of the radiated emission tests is 3.53 dB.*

## Radio Frequency Measurement Results

| | | | | | |
|---|---|---|---|---|---|
| Date of Tested | : | Oct. 3, 2003 | Polarization | : | Vertical |
| Temperature | : | 27°C | Humidity | : | 49% |
| Fundamental Wave Frequency | : | 2038MHz | Distance | : | 3m |
| Tested Mode | : | RX Mode (Channel 01) | | | |

| Frequency | Read Value (dBuV) | | Corrected Factor | Max. Results (dBuv/m) | | Limit (dBuV/m) | Tolerance (dB) | Altitude | Angle |
|---|---|---|---|---|---|---|---|---|---|
| (MHz) | Peak | AV | (dB) | Peak | AV | AV | (dBuV/m) | (m) | (degre |
| 2038.000 | 49.20 | --- | -0.60 | 48.60 | --- | 54.00 | -5.40 | 1.10 | 185.00 |
| 4076.000 | --- | --- | 1.60 | --- | --- | 54.00 | --- | --- | --- |
| 6114.000 | --- | --- | 5.70 | --- | --- | 54.00 | --- | --- | --- |
| 8152.000 | --- | --- | 10.90 | --- | --- | 54.00 | --- | --- | --- |
| 10190.000 | --- | --- | 15.00 | --- | --- | 54.00 | --- | --- | --- |
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***Note :***

1. *Item of margin shown in above table refer to average limit.*
2. *It is considered that the results of average comply with average limit when measuring data with a peak function detector meet the average limit. Mark "***" means that Peak result is meet average limit.*
3. *Remark "---" means that the emissions level is too low to be measured.*
4. *Item "Margin" referred to Average limit while there is only peak result.*
5. *The expanded uncertainty of the radiated emission tests is 3.53 dB.*

## Radio Frequency Measurement Results

| | | | | | |
|---|---|---|---|---|---|
| Date of Tested | : | Oct. 6, 2003 | Polarization | : | Vertical / Horizontal |
| Temperature | : | 27°C | Humidity | : | 49% |
| Fundamental Wave Frequency | : | 2437MHz | Distance | : | 3m |
| Tested Mode | : | TX Mode (Channel 06) | | | |

| Frequency | Read Value (dBuV) | | Corrected Factor | Max. Results (dBuv/m) | | Limit (dBuV/m) | | Tolerance (dB) | Altitude | Angle |
|---|---|---|---|---|---|---|---|---|---|---|
| (MHz) | Peak | AV | (dB) | Peak | AV | Peak | AV | (dBuV/m) | (m) | (degre |
| 4874.000 | --- | --- | 4.30 | --- | --- | 74.00 | 54.00 | --- | --- | --- |
| 7311.000 | --- | --- | 10.30 | --- | --- | 74.00 | 54.00 | --- | --- | --- |
| 9748.000 | --- | --- | 13.30 | --- | --- | 74.00 | 54.00 | --- | --- | --- |
| 12185.000 | --- | --- | 16.40 | --- | --- | 74.00 | 54.00 | --- | --- | --- |
| 14622.000 | --- | --- | 22.90 | --- | --- | 74.00 | 54.00 | --- | --- | --- |
| 17059.000 | --- | --- | 22.40 | --- | --- | 74.00 | 54.00 | --- | --- | --- |
| 19496.000 | --- | --- | 14.90 | --- | --- | 74.00 | 54.00 | --- | --- | --- |
| 21933.000 | --- | --- | 14.60 | --- | --- | 74.00 | 54.00 | --- | --- | --- |
| 24370.000 | --- | --- | 16.20 | --- | --- | 74.00 | 54.00 | --- | --- | --- |
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***Note :***

1. *Item of margin shown in above table refer to average limit.*
2. *It is considered that the results of average comply with average limit when measuring data with a peak function detector meet the average limit. Mark "***" means that Peak result is meet average limit.*
3. *Remark "---" means that the emissions level is too low to be measured.*
4. *Item "Margin" referred to Average limit while there is only peak result.*
5. *The expanded uncertainty of the radiated emission tests is 3.53 dB.*

## Radio Frequency Measurement Results

| | | | | | |
|---|---|---|---|---|---|
| Date of Tested | : | Oct. 6, 2003 | Polarization | : | Horizontal |
| Temperature | : | 27°C | Humidity | : | 49% |
| Fundamental Wave Frequency | : | 2063MHz | Distance | : | 3m |
| Tested Mode | : | RX Mode (Channel 06) | | | |

| Frequency | Read Value (dBuV) | | Corrected Factor | Max. Results (dBuv/m) | | Limit (dBuV/m) | Tolerance (dB) | Altitude | Angle |
|---|---|---|---|---|---|---|---|---|---|
| (MHz) | Peak | AV | (dB) | Peak | AV | AV | (dBuV/m) | (m) | (degre |
| 2063.000 | 45.70 | --- | -0.70 | 45.00 | --- | 54.00 | -9.00 | 1.30 | 315.00 |
| 4123.000 | --- | --- | 2.00 | --- | --- | 54.00 | --- | --- | --- |
| 6189.000 | --- | --- | 6.30 | --- | --- | 54.00 | --- | --- | --- |
| 8252.000 | --- | --- | 11.10 | --- | --- | 54.00 | --- | --- | --- |
| 10315.000 | --- | --- | 14.20 | --- | --- | 54.00 | --- | --- | --- |
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***Note :***

1. *Item of margin shown in above table refer to average limit.*
2. *It is considered that the results of average comply with average limit when measuring data with a peak function detector meet the average limit. Mark "***" means that Peak result is meet average limit.*
3. *Remark "---" means that the emissions level is too low to be measured.*
4. *Item "Margin" referred to Average limit while there is only peak result.*
5. *The expanded uncertainty of the radiated emission tests is 3.53 dB.*

## Radio Frequency Measurement Results

| | | | | | |
|---|---|---|---|---|---|
| Date of Tested | : | Oct. 6, 2003 | Polarization | : | Vertical |
| Temperature | : | 27°C | Humidity | : | 49% |
| Fundamental Wave Frequency | : | 2063MHz | Distance | : | 3m |
| Tested Mode | : | RX Mode (Channel 06) | | | |

| Frequency | Read Value (dBuV) | | Correcte d Factor | Max. Results (dBuv/m) | | Limit (dBuV/m) | Tolerance (dB) | Altitude | Angle |
|---|---|---|---|---|---|---|---|---|---|
| (MHz) | Peak | AV | (dB) | Peak | AV | AV | (dBuV/m) | (m) | (degre |
| 2063.000 | 46.40 | --- | -0.70 | 45.70 | --- | 54.00 | -8.30 | 1.00 | 180.00 |
| 4123.000 | --- | --- | 2.00 | --- | --- | 54.00 | --- | --- | --- |
| 6189.000 | --- | --- | 6.30 | --- | --- | 54.00 | --- | --- | --- |
| 8252.000 | --- | --- | 11.10 | --- | --- | 54.00 | --- | --- | --- |
| 10315.000 | --- | --- | 14.20 | --- | --- | 54.00 | --- | --- | --- |
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***Note :***

1. *Item of margin shown in above table refer to average limit.*
2. *It is considered that the results of average comply with average limit when measuring data with a peak function detector meet the average limit. Mark "***" means that Peak result is meet average limit.*
3. *Remark "---" means that the emissions level is too low to be measured.*
4. *Item "Margin" referred to Average limit while there is only peak result.*
5. *The expanded uncertainty of the radiated emission tests is 3.53 dB.*

## Radio Frequency Measurement Results

| | | | | | |
|---|---|---|---|---|---|
| Date of Tested | : | Oct. 6, 2003 | Polarization | : | Vertical / Horizontal |
| Temperature | : | 27°C | Humidity | : | 49% |
| Fundamental Wave Frequency | : | 2462MHz | Distance | : | 3m |
| Tested Mode | : | TX Mode (Channel 11) | | | |

| Frequency | Read Value (dBuV) | | Corrected Factor | Max. Results (dBuv/m) | | Limit (dBuV/m) | | Tolerance (dB) | Altitude | Angle |
|---|---|---|---|---|---|---|---|---|---|---|
| (MHz) | Peak | AV | (dB) | Peak | AV | Peak | AV | (dBuV/m) | (m) | (degre |
| 4924.000 | --- | --- | 4.30 | --- | --- | 74.00 | 54.00 | --- | --- | --- |
| 7386.000 | --- | --- | 10.40 | --- | --- | 74.00 | 54.00 | --- | --- | --- |
| 7848.000 | --- | --- | 13.80 | --- | --- | 74.00 | 54.00 | --- | --- | --- |
| 12310.000 | --- | --- | 16.50 | --- | --- | 74.00 | 54.00 | --- | --- | --- |
| 14772.000 | --- | --- | 21.50 | --- | --- | 74.00 | 54.00 | --- | --- | --- |
| 17234.000 | --- | --- | 24.00 | --- | --- | 74.00 | 54.00 | --- | --- | --- |
| 19696.000 | --- | --- | 14.70 | --- | --- | 74.00 | 54.00 | --- | --- | --- |
| 22158.000 | --- | --- | 14.60 | --- | --- | 74.00 | 54.00 | --- | --- | --- |
| 24620.000 | --- | --- | 16.20 | --- | --- | 74.00 | 54.00 | --- | --- | --- |
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***Note :***

1. *Item of margin shown in above table refer to average limit.*
2. *It is considered that the results of average comply with average limit when measuring data with a peak function detector meet the average limit. Mark "***" means that Peak result is meet average limit.*
3. *Remark "---" means that the emissions level is too low to be measured.*
4. *Item "Margin" referred to Average limit while there is only peak result.*
5. *The expanded uncertainty of the radiated emission tests is 3.53 dB.*

## Radio Frequency Measurement Results

| | | | | | |
|---|---|---|---|---|---|
| Date of Tested | : | Oct. 6, 2003 | Polarization | : | Horizontal |
| Temperature | : | 27°C | Humidity | : | 49% |
| Fundamental Wave Frequency | : | 2088MHz | Distance | : | 3m |
| Tested Mode | : | RX Mode (Channel 11) | | | |

| Frequency | Read Value (dBuV) | | Corrected Factor | Max. Results (dBuv/m) | | Limit (dBuV/m) | Tolerance (dB) | Altitude | Angle |
|---|---|---|---|---|---|---|---|---|---|
| (MHz) | Peak | AV | (dB) | Peak | AV | AV | (dBuV/m) | (m) | (degre |
| 2088.000 | 45.70 | --- | -0.70 | 45.00 | --- | 54.00 | -9.00 | 1.50 | 215.00 |
| 4176.000 | --- | --- | 2.10 | --- | --- | 54.00 | --- | --- | --- |
| 6264.000 | --- | --- | 6.40 | --- | --- | 54.00 | --- | --- | --- |
| 8352.000 | --- | --- | 11.20 | --- | --- | 54.00 | --- | --- | --- |
| 10440.000 | --- | --- | 14.30 | --- | --- | 54.00 | --- | --- | --- |
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***Note :***

1. *Item of margin shown in above table refer to average limit.*
2. *It is considered that the results of average comply with average limit when measuring data with a peak function detector meet the average limit. Mark "***" means that Peak result is meet average limit.*
3. *Remark "---" means that the emissions level is too low to be measured.*
4. *Item "Margin" referred to Average limit while there is only peak result.*
5. *The expanded uncertainty of the radiated emission tests is 3.53 dB.*

## Radio Frequency Measurement Results

| | | | | | |
|---|---|---|---|---|---|
| Date of Tested | : | Oct. 6, 2003 | Polarization | : | Vertical |
| Temperature | : | 27°C | Humidity | : | 49% |
| Fundamental Wave Frequency | : | 2088MHz | Distance | : | 3m |
| Tested Mode | : | RX Mode (Channel 11) | | | |

| Frequency | Read Value (dBuV) | | Corrected Factor | Max. Results (dBuv/m) | | Limit (dBuV/m) | Tolerance (dB) | Altitude | Angle |
|---|---|---|---|---|---|---|---|---|---|
| (MHz) | Peak | AV | (dB) | Peak | AV | AV | (dBuV/m) | (m) | (degre |
| 2088.000 | 46.50 | --- | -0.70 | 45.80 | --- | 54.00 | -8.20 | 1.30 | 180.00 |
| 4176.000 | --- | --- | 2.10 | --- | --- | 54.00 | --- | --- | --- |
| 6264.000 | --- | --- | 6.40 | --- | --- | 54.00 | --- | --- | --- |
| 8352.000 | --- | --- | 11.20 | --- | --- | 54.00 | --- | --- | --- |
| 10440.000 | --- | --- | 14.30 | --- | --- | 54.00 | --- | --- | --- |
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***Note :***

1. *Item of margin shown in above table refer to average limit.*
2. *It is considered that the results of average comply with average limit when measuring data with a peak function detector meet the average limit. Mark "***" means that Peak result is meet average limit.*
3. *Remark "---" means that the emissions level is too low to be measured.*
4. *Item "Margin" referred to Average limit while there is only peak result.*
5. *The expanded uncertainty of the radiated emission tests is 3.53 dB.*

## 5.8 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor, High Pass Filter Loss(if used) and Cable Loss, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation calculation is as follows:

***Result = Reading + Corrected Factor***

where Corrected Factor = Antenna FACTOR + Cable Loss + High Pass Filter Loss - Amplifier Gain

# 6 EMISSION LIMITATIONS – Conducted (Transmitter)

## Limits

In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in 15.205(a), must also comply with the radiated emission limits specified in 15.205(c)).

**Note :**

1. **Please see appendix 6 for Plotted Data**
2. **The expanded uncertainty of the EMISSION LIMITATIONS – Conducted (Transmitter) of band edges tests is 2dB.**

# 7 ANTENNA REQUIREMENT

## 7.1 Standard Applicable

For intentional device, according to §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 §15.247 (b), if transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

## 7.2 Antenna Construction and Directional Gain

This device uses Dipole antenna and this antenna use **Inverse Connecter** and the antenna is unique to the device**.** User cannot purchase the antenna in the market. Please see photo of EUT (**Page 55**).

The max antenna gain is **2.0** dBi.

# 8 EMISSION BANDWIDTH MEASUREMENT

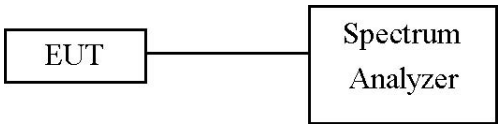
## 8.1 Standard Applicable

According to 15.247(a)(2), for direct sequence system, the minimum 6dB bandwidth shall be at least 500 kHz.

## 8.2 Measurement 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 figure 4 without connection to measurement instrument. 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 6 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

Figure 4: Emission bandwidth measurement configuration.




## 8.3 Measurement Equipment

| Equipment | Manufacturer | Model No. | Next Calibration |
|---|---|---|---|
| Spectrum Analyzer | Rohde & Schwarz | FSP-30 | 2004/03/10 |

## 8.4 Measurement Data

Test Date: Oct. 4, 2003 Temperature: 23 ℃ Humidity: 61 %

a) Channel 01 : 6 dB Emission Bandwidth is 10.2 MHz
b) Channel 06 : 6 dB Emission Bandwidth is 10.16 MHz
c) Channel 11 : 6 dB Emission Bandwidth is 10.16 MHz

***Note : 1. Please see appendix 2 for Plotted Data***

***2. The expanded uncertainty of the emission bandwidth tests is 1500Hz.***

# 9 OUTPUT POWER MEASUREMENT

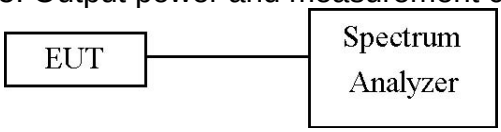
## 9.1 Standard Applicable

For direct sequence system, according to 15.247(b)(3), the maximum peak output power of the transmitter shall not exceed 1 Watt. According to 15.247(b)(4), If transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

## 9.2 Measurement 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 figure 5 without connection to measurement instrument. 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 1 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.

Figure 5: Output power and measurement configuration.




## 9.3 Measurement Equipment

| Equipment | Manufacturer | Model No. | Next Calibration |
|---|---|---|---|
| Spectrum Analyzer | Rohde & Schwarz | FSP-30 | 2004/03/10 |

## 9.4 Measurement Data

Test Date: Oct. 4, 2003 Temperature: 23 ℃ Humidity: 61 %

a) Channel 01 : Output Peak Power is 17.94 dBm or **62.23**mW
b) Channel 06 : Output Peak Power is 17.13 dBm or **51.65**mW
c) Channel 11 : Output Peak Power is 16.33 dBm or **42.96**mW

***Note : 1. Please see appendix 3 for Plotted Data***

***2. The expanded uncertainty of the output power tests is 2dB.***

# 10 100 kHz BANDWIDTH OF BAND EDGES MEASUREMENT

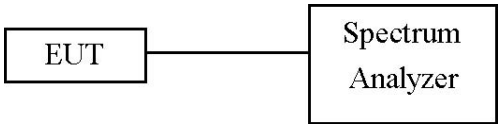
## 10.1 Standard Applicable

According to 15.247(c), if any 100 kHz bandwidth outside these frequency bands, the radio frequency power that is produced by the modulation products of the spreading sequence, the information sequence and the carrier frequency shall be either at least 20 dB below that in any 100 kHz bandwidth within the band that contains the highest level of the desired power or shall not exceed the general levels specified in § 15.209(a), whichever results in the lesser attenuation.

## 10.2 Measurement 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 figure 6 without connection to measurement instrument. 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.

Figure 6: BAND EDGES MEASUREMENT configuration.




## 10.3 Measurement Equipment

| Equipment | Manufacturer | Model No. | Next Calibration |
|---|---|---|---|
| Spectrum Analyzer | Rohde & Schwarz | FSP -30 | 2004/3/10 |

## 10.4 Measurement Data

Test Date: Oct. 4, 2003 Temperature: 23 ℃ Humidity: 61 %

A. Lower Band Edge: maximum value is –24.97 dBm that is attenuated more than 20 dB
B. Upper Band Edge: maximum value is –54.72 dBm that is attenuated more than 20 dB

***Note : 1. Please see appendix 4 for Plotted Data***

***2. The expanded uncertainty of the 100 khz bandwidth of band edges tests is 2dB.***

# 11 POWER DENSITY MEASUREMENT

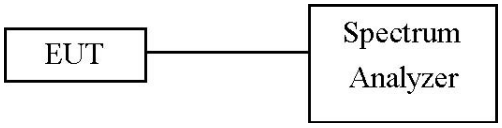
## 11.1 Standard Applicable

For digitally modulated systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3kHz band during any time interval of continuous transmission.

## 11.2 Measurement 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 figure 7 without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set EUT to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
3. Adjust the center frequency of spectrum analyzer on highest level appearing on spectral display within a 300 kHz frequency span.
4. Set the spectrum analyzer on a 3 kHz resolution bandwidth and 30 kHz video bandwidth as well as max. hold function. Also turn on SA level corrected function by 21 dB and then record the measurement result.
5. Repeat above procedures until all measured frequencies were complete.

Figure 7: BAND EDGES MEASUREMENT configuration.




## 11.3 Measurement Equipment 8.4 Measurement Data

| Equipment | Manufacturer | Model No. | Next Calibration |
|---|---|---|---|
| Spectrum Analyzer | Rohde & Schwarz | FSP -30 | 2004/3/10 |

## 11.4 Measurement Data

Test Date Oct. 4, 2003 Temperature: 23 ℃ Humidity: 61 %

a) Channel 01 : Maximun Power Density of 3 kHz Bandwidth is –7.98 dBm

b) Channel 06 : Maximun Power Density of 3 kHz Bandwidth is –9.04dBm

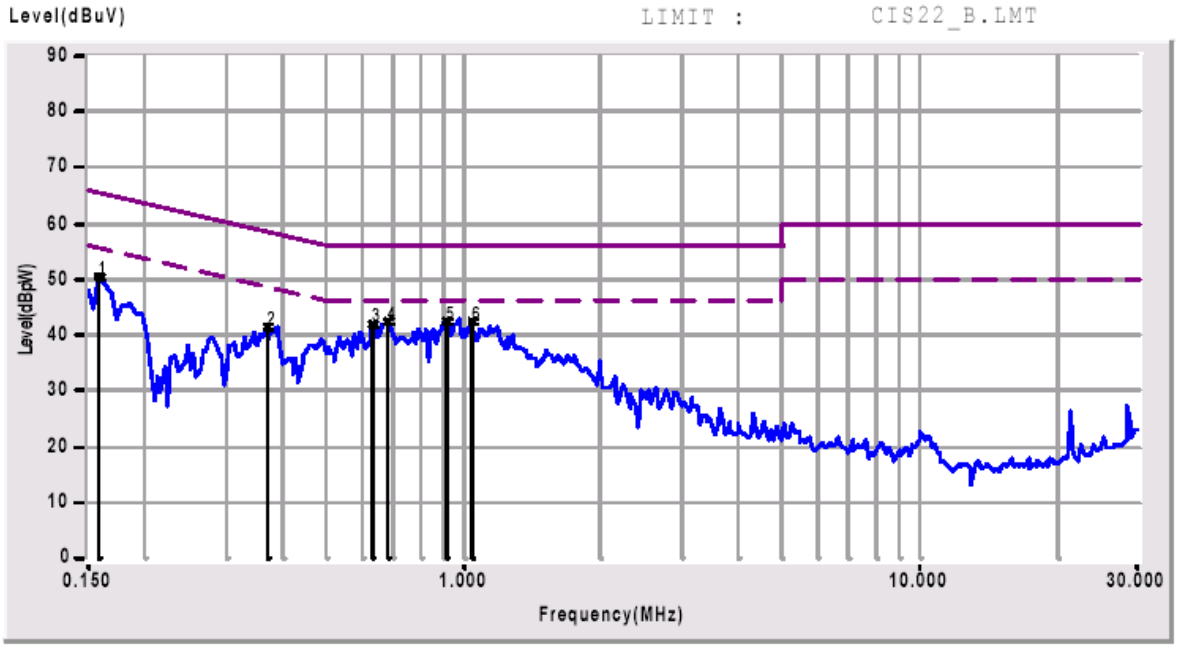
c) Channel 11 : Maximun Power Density of 3 kHz Bandwidth is –9.97 dBm

***Note: 1. Please see appendix 5 for Plotted Data.***

***2. The expanded uncertainty of the power density tests is 2dB.***

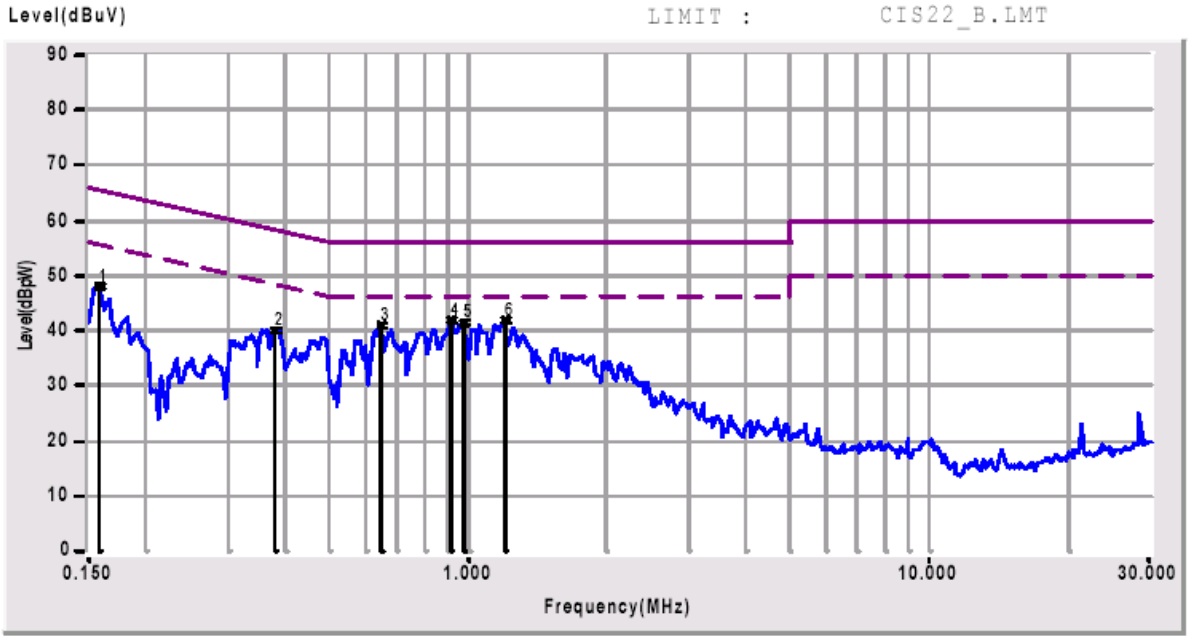
# Appendix 1: POWER LINE CONDUCTED EMISSION MEASUREMENT

## A1.1 Mode 1: Link Mode




COMMENT: Link MODE
ADAPTOR:TC10A-050

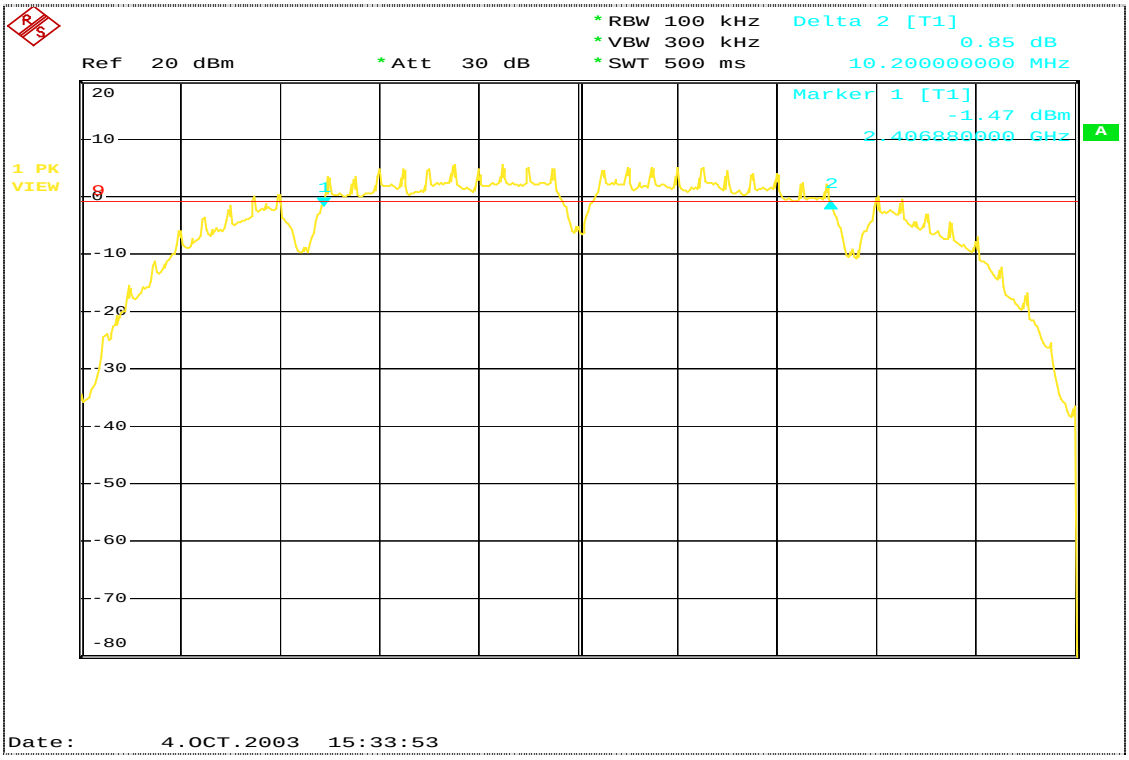
Line



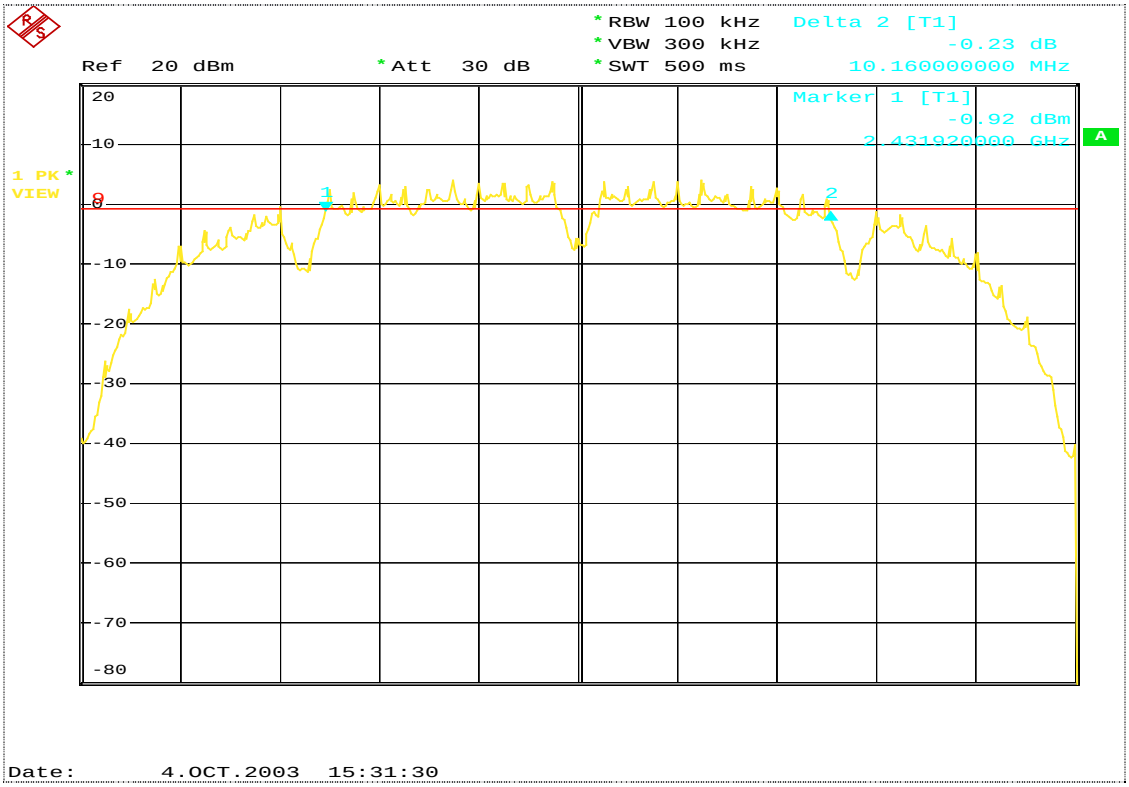

COMMENT: Link MODE
ADAPTOR:TC10A-050

Neutral

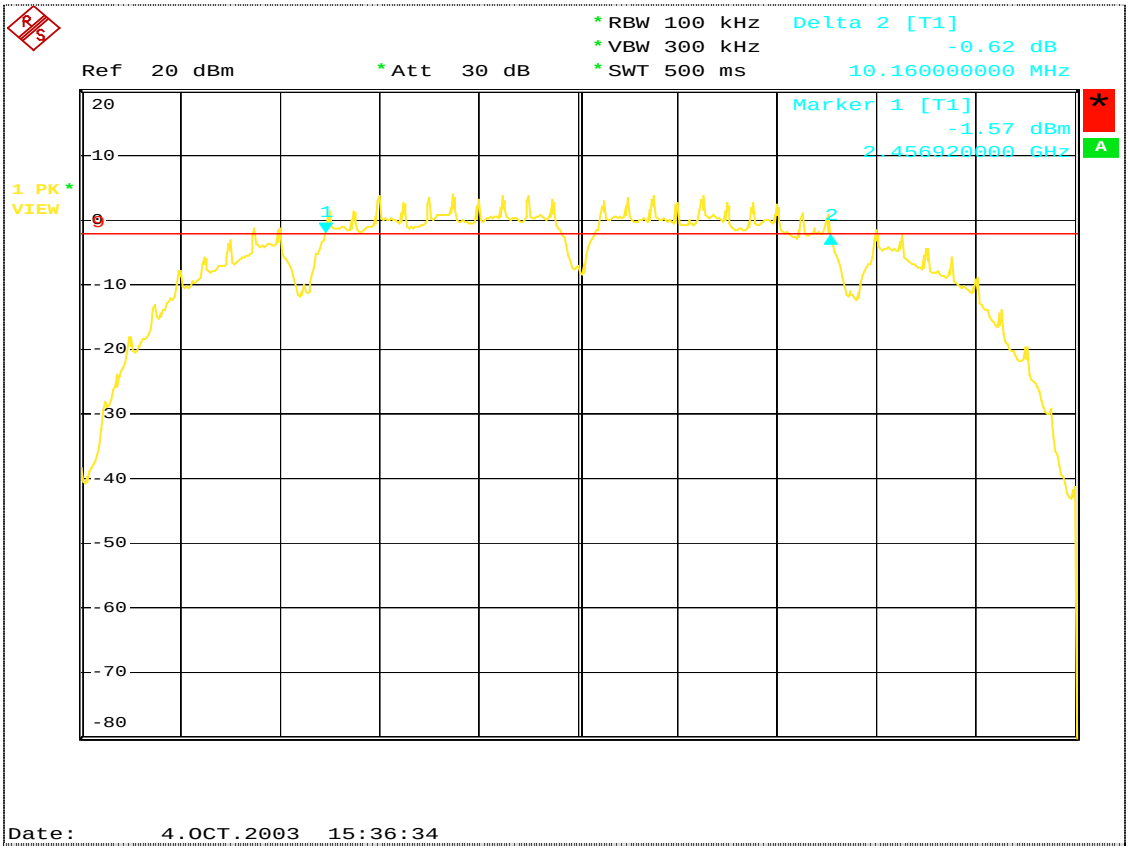
# Appendix 2: EMISSION BANDWIDTH MEASUREMENT




Channel 01

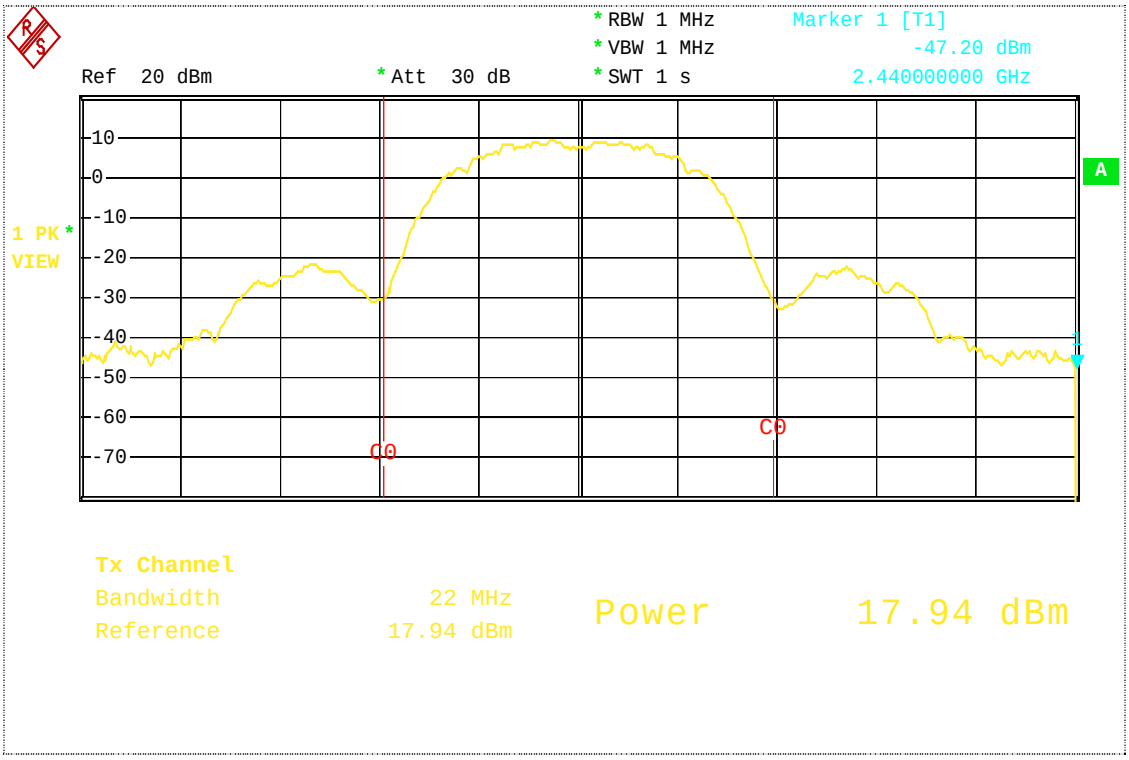



Channel 06

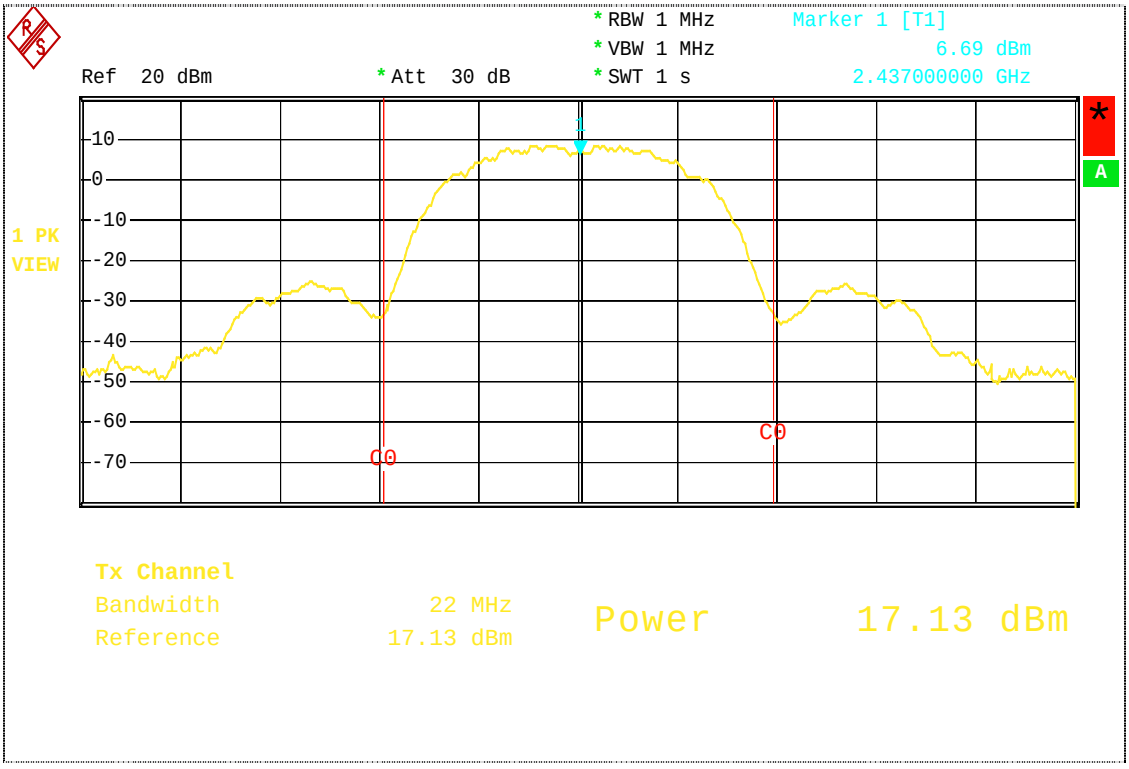

*RBW 100 kHz
*VBW 300 kHz
*SWT 500 ms
Delta 2 [T1]
-0.62 dB
10.160000000 MHz
Ref 20 dBm
*Att 30 dB
Marker 1 [T1]
-1.57 dBm
2.456920000 GHz
1 PK*
VIEW
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
1
2
A
Date: 4.OCT.2003 15:36:34

Channel 11

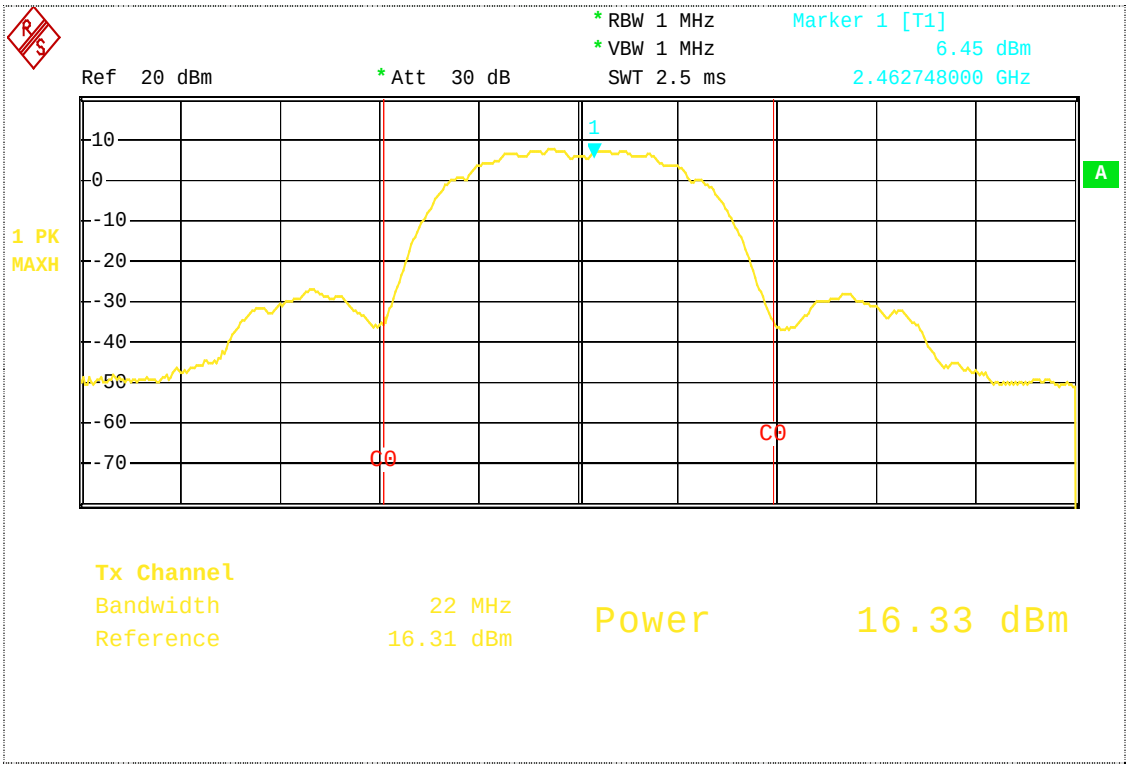
# Appendix 3: OUTPUT POWER MEASUREMENT




Channel 01



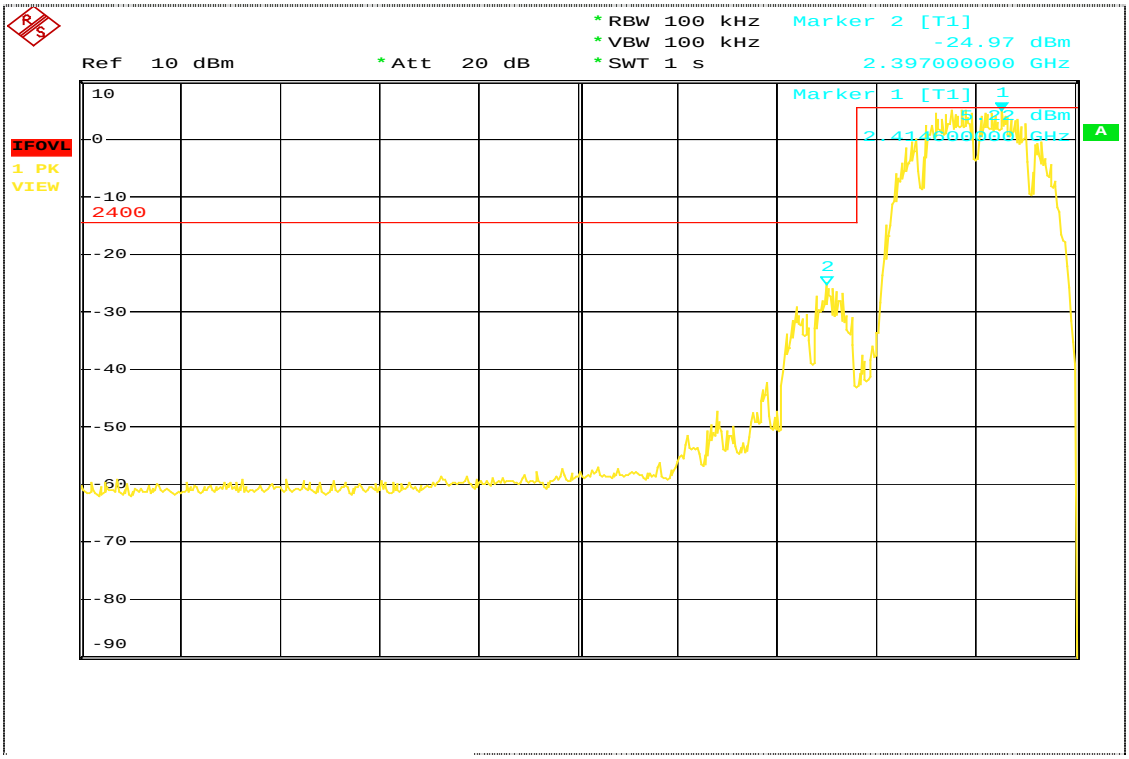

Channel 06



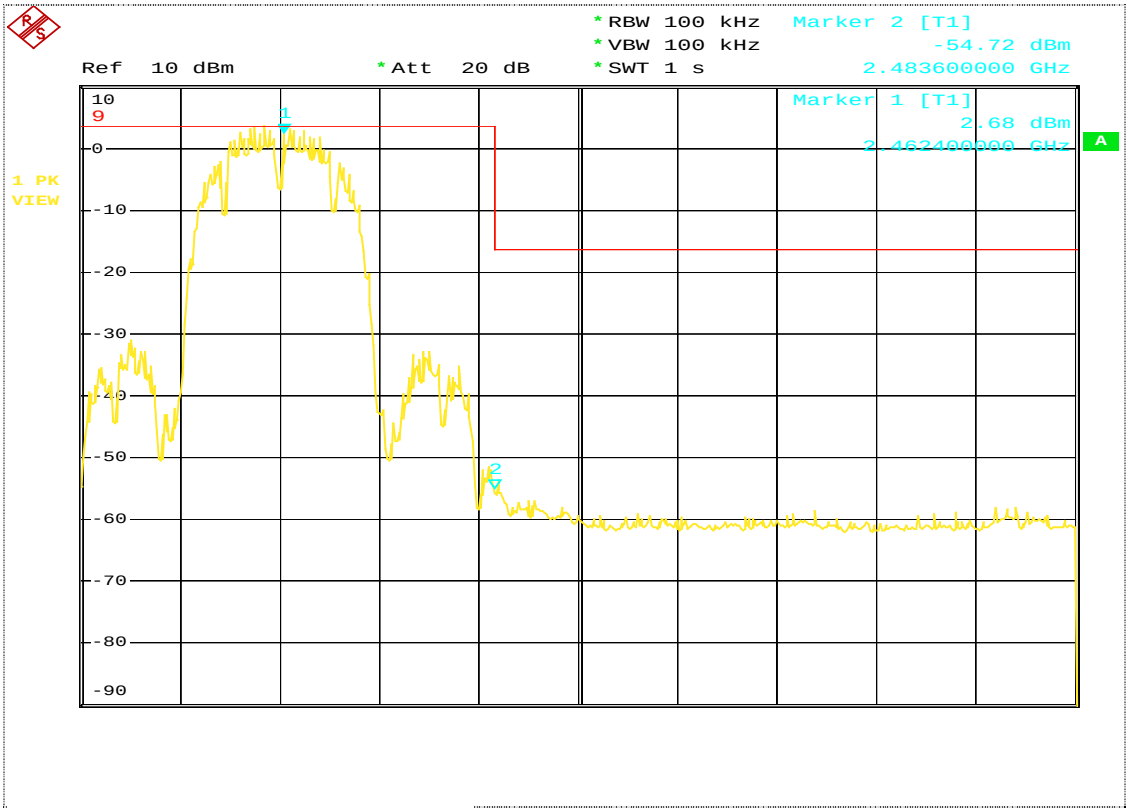

Channel 11

Date: 4.OCT.2003 15:22:36

# Appendix 4: 100 kHz BANDWIDTH OF BAND EDGES MEASUREMENT

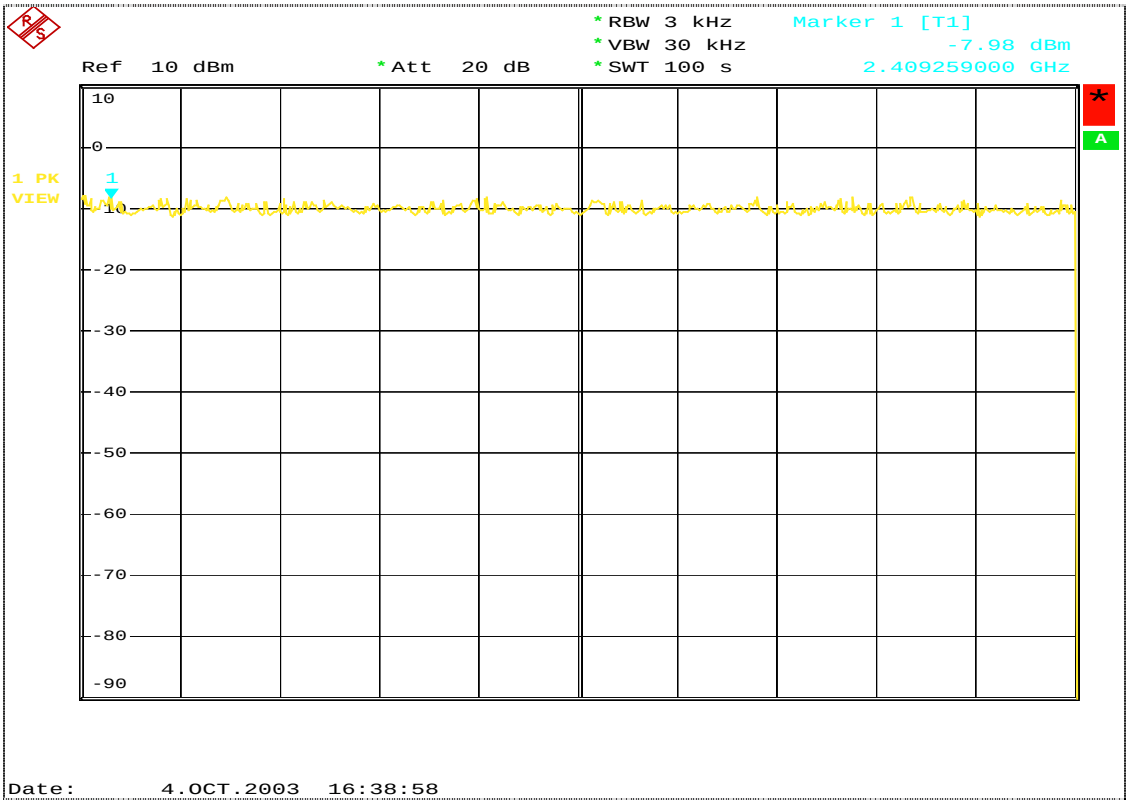



Channel 01

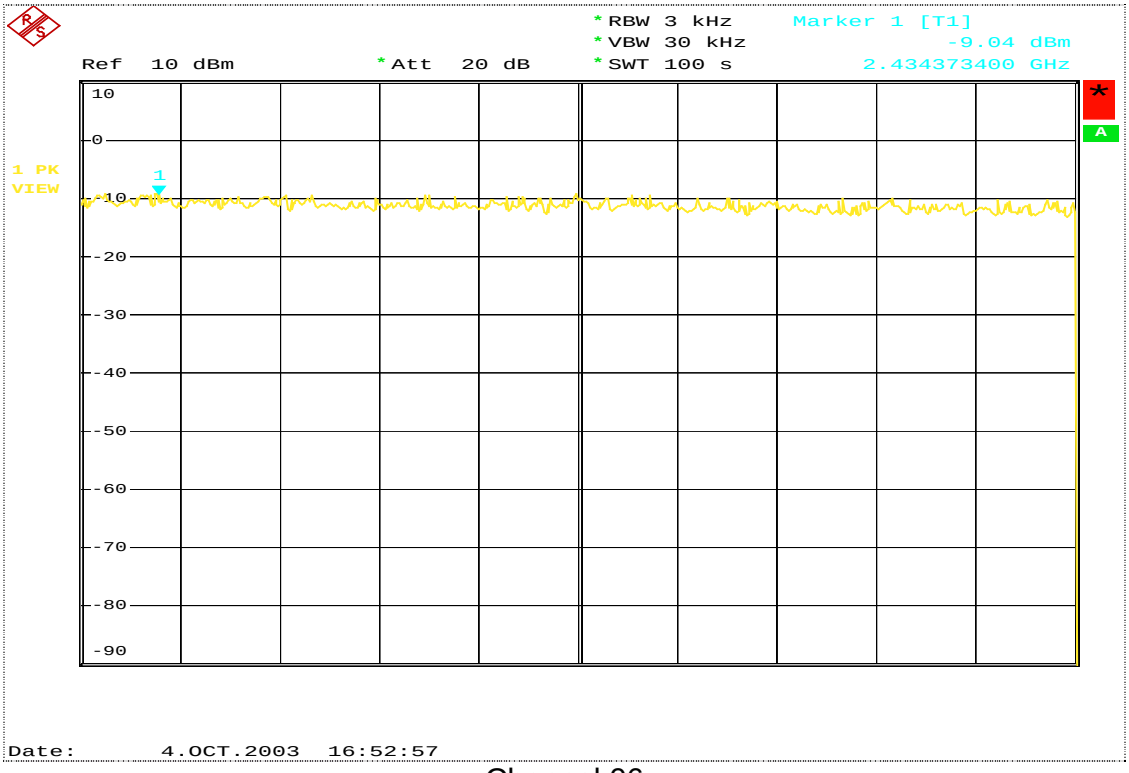



Channel 11

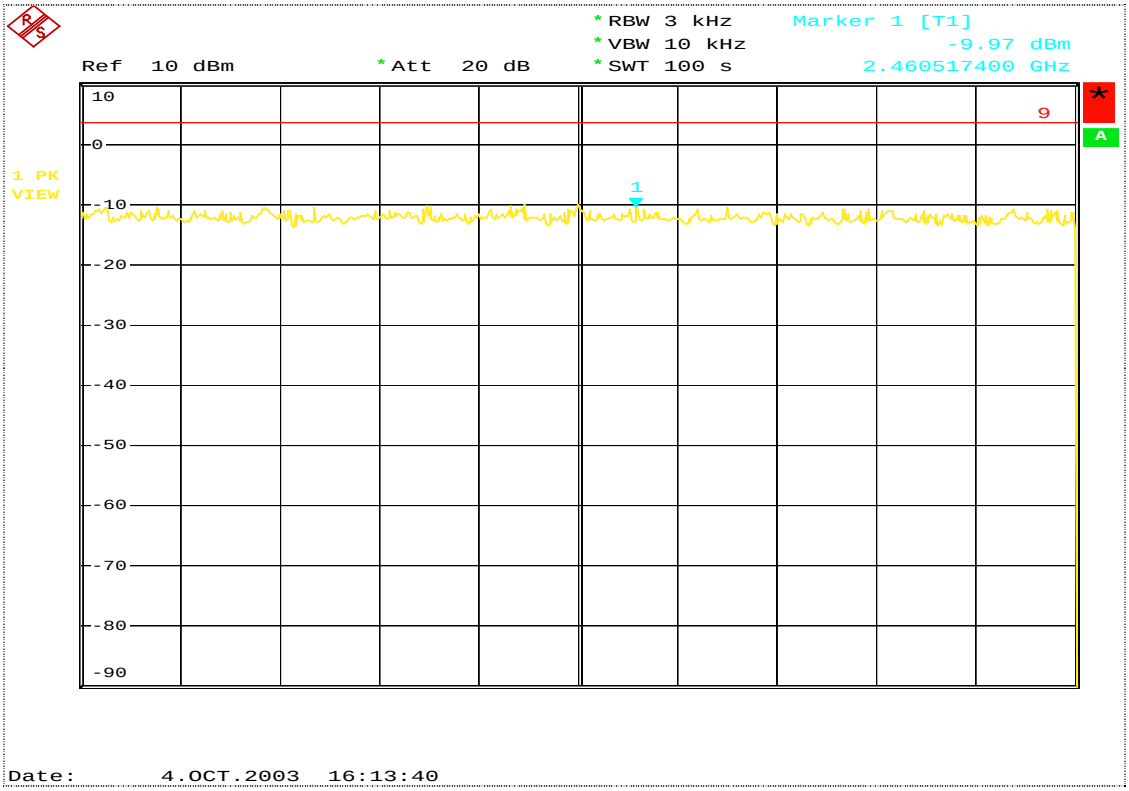
# Appendix 5: POWER DENSITY MEASUREMENT




Channel 01

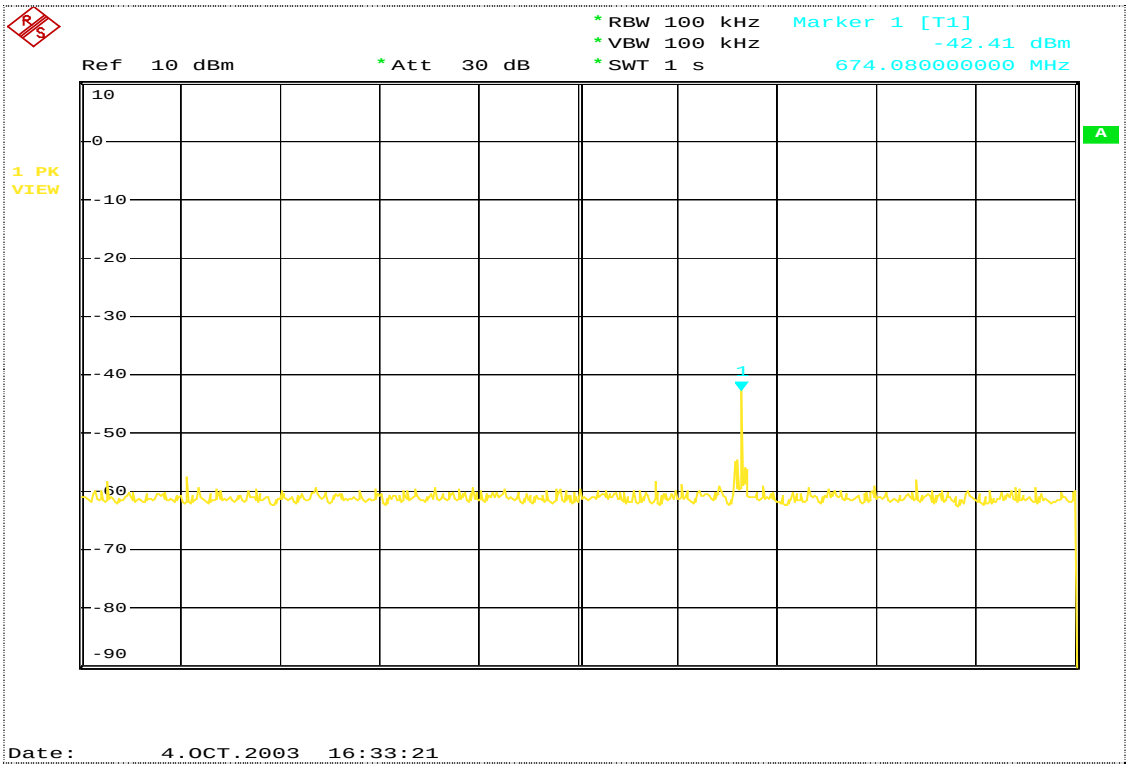



Channel 06

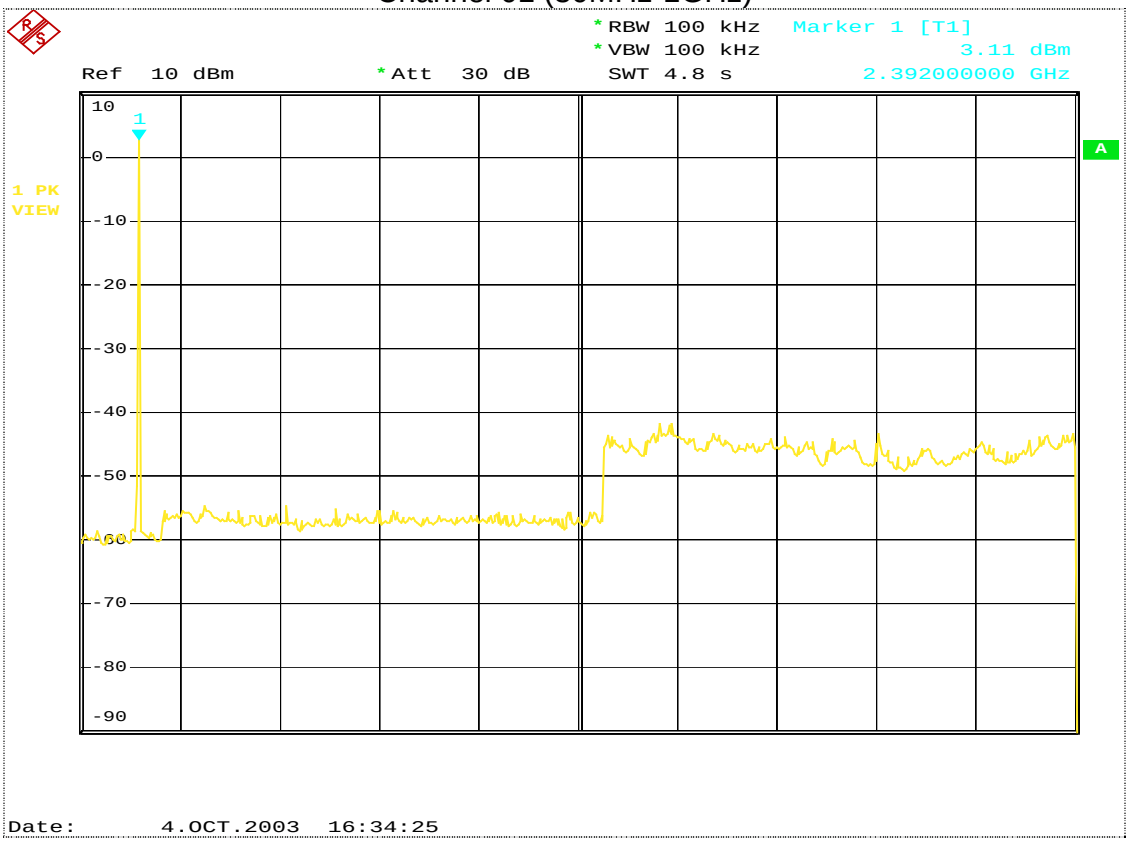

*RBW 3 kHz
*VBW 10 kHz
*SWT 100 s
Marker 1 [T1]
-9.97 dBm
2.460517400 GHz
Ref 10 dBm
*Att 20 dB
1 PK
VIEW
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
1
9
A
Date: 4.OCT.2003 16:13:40

Channel 11

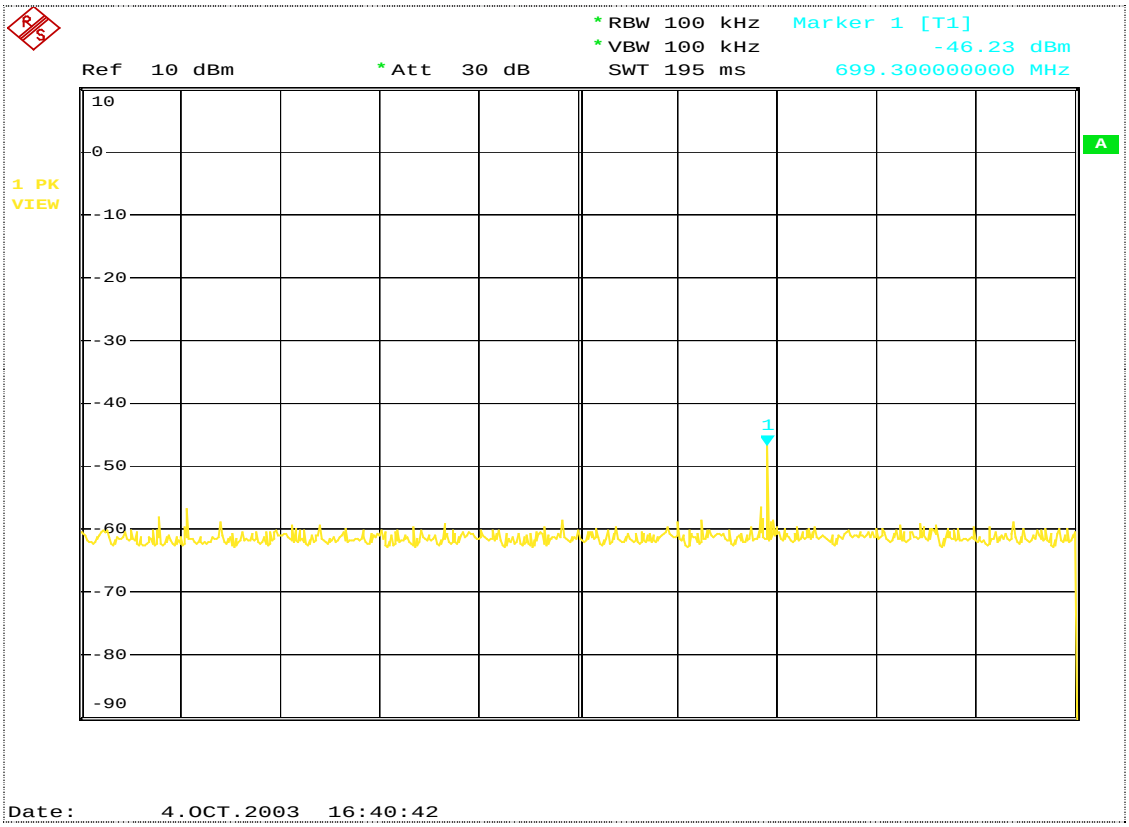
# Appendix 6: EMISSION LIMITATIONS – Conducted (Transmitter)



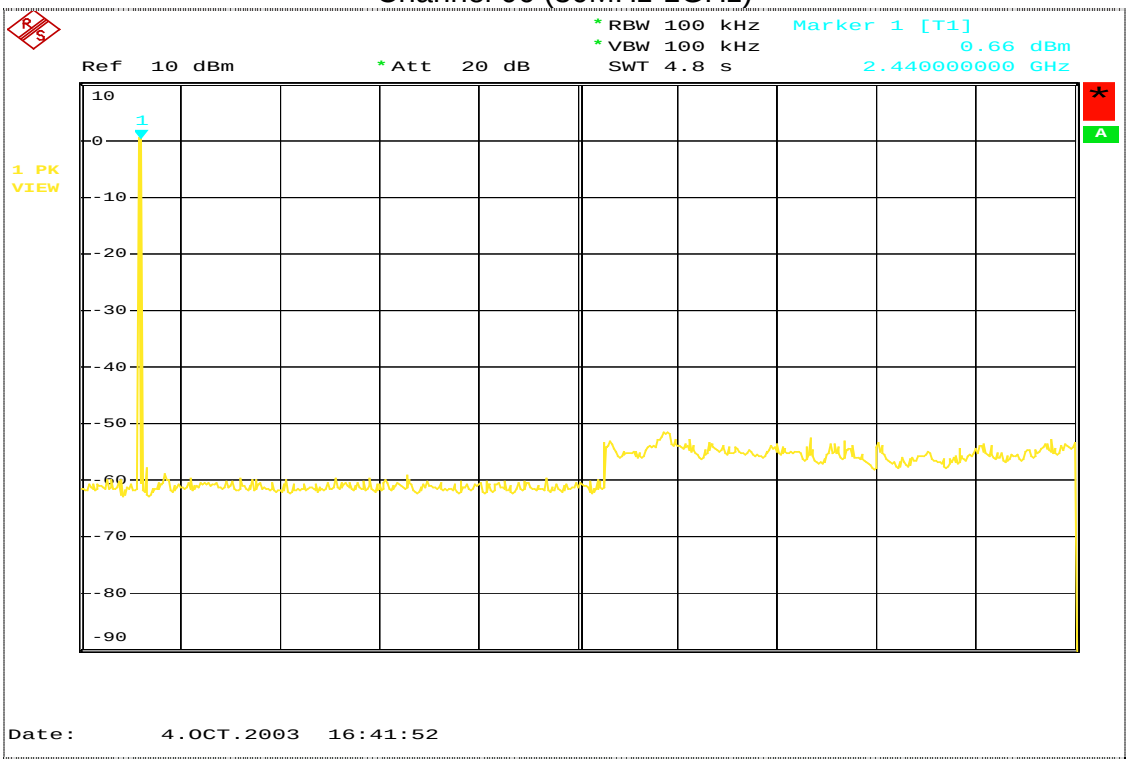

Channel 01 (30MHz-1GHz)



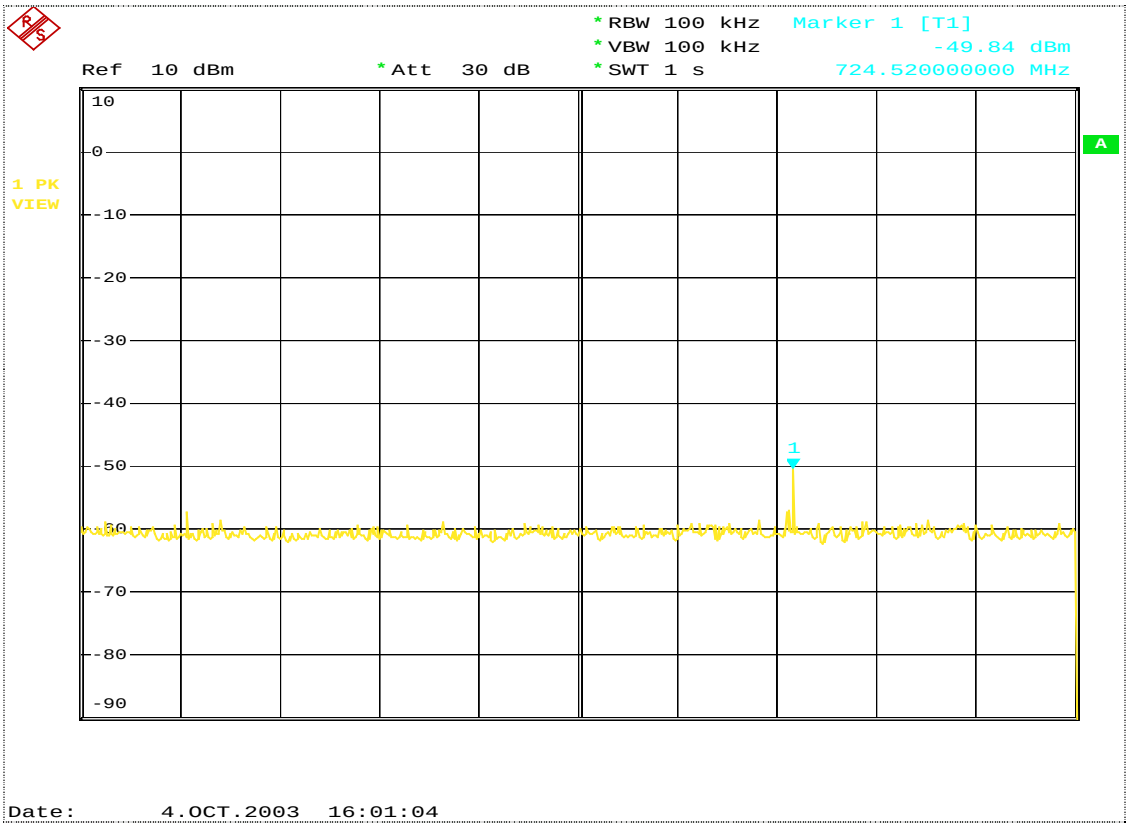

Channel 01 (1GHz-25GHz)



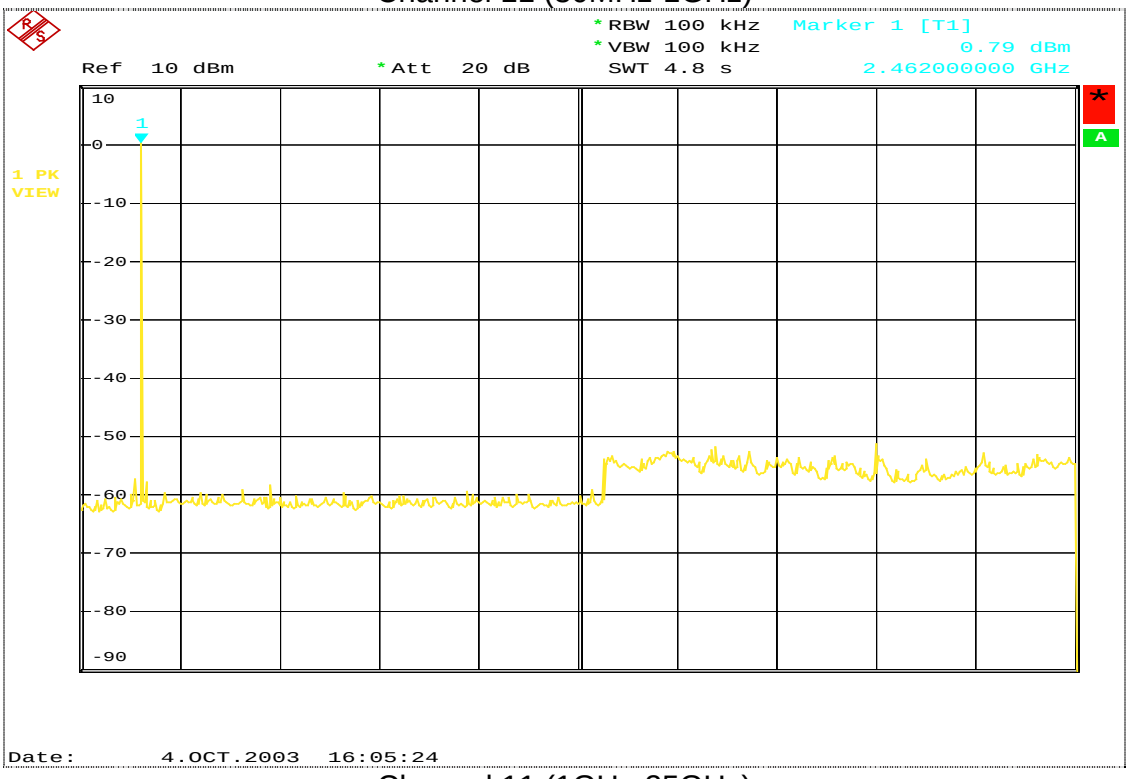

Channel 06 (30MHz-1GHz)




Channel 06 (1GHz-25GHz)




Channel 11 (30MHz-1GHz)




Channel 11 (1GHz-25GHz)