

# EMC TEST REPORT

**Report No.** : EME-040838

**Model No.** : GLM-100

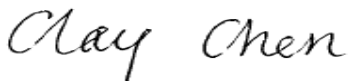
**Issued Date** : Sep. 14, 2004

**Applicant** : Cellvision Systems Inc.  
18F-7, No. 79 Sec. 1, Hsin Taiwu Road, Hsichih,  
Taipei, Taiwan

**Test By** : Intertek Testing Services Taiwan Ltd.  
No. 11, Lane 275, Ko-Nan 1 Street, Chia-Tung Li,  
Shiang-Shan District, Hsinchu City, Taiwan

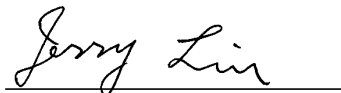
This test report consists of 51 pages in total. It may be duplicated completely for legal use with the allowance of the applicant. It shall not be reproduced except in full, without the written approval of Intertek Laboratory. The test result(s) in this report only applies to the tested sample(s).

Project Engineer



Clay Chen

Reviewed By



Jerry Liu

## Table of Contents

|                                                                         |    |
|-------------------------------------------------------------------------|----|
| Summary of Tests.....                                                   | 4  |
| 1. General information .....                                            | 5  |
| 1.1 Identification of the EUT .....                                     | 5  |
| 1.2 Additional information about the EUT .....                          | 5  |
| 1.3 Antenna description .....                                           | 6  |
| 1.4 Peripherals equipment.....                                          | 6  |
| 2. Test specifications .....                                            | 7  |
| 2.1 Test standard.....                                                  | 7  |
| 2.2 Operation mode .....                                                | 7  |
| 2.3 Test equipment.....                                                 | 8  |
| 3. Minimum 6dB Bandwidth test.....                                      | 9  |
| 3.1 Operating environment .....                                         | 9  |
| 3.2 Test setup & procedure.....                                         | 9  |
| 3.3 Measured data of Minimum 6dB Bandwidth test results.....            | 9  |
| 4. Maximum Output Power test.....                                       | 16 |
| 4.1 Operating environment .....                                         | 16 |
| 4.2 Test setup & procedure.....                                         | 16 |
| 4.3 Measured data of Maximum Output Power test results.....             | 17 |
| 5. Radiated Emission test .....                                         | 18 |
| 5.1 Operating environment .....                                         | 18 |
| 5.2 Test setup & procedure.....                                         | 18 |
| 5.3 Emission limits .....                                               | 19 |
| 5.4 Radiated spurious emission test data .....                          | 20 |
| 5.4.1 Measurement results: frequencies equal to or less than 1 GHz..... | 20 |
| 5.4.2 Measurement results: frequency above 1GHz.....                    | 22 |
| 6. Power Spectrum Density test.....                                     | 28 |
| 6.1 Operating environment .....                                         | 28 |
| 6.2 Test setup & procedure.....                                         | 28 |
| 6.3 Measured data of Power Spectrum Density test results.....           | 28 |
| 7. Emission on the band edge §FCC 15.247(C) .....                       | 35 |
| 7.1 Band-edge (Conducted method).....                                   | 36 |
| 7.2 Band-edge (Radiated method).....                                    | 40 |
| 8. Power Line Conducted Emission test §FCC 15.207 .....                 | 48 |

|                                                  |    |
|--------------------------------------------------|----|
| 8.1 Operating environment .....                  | 48 |
| 8.2 Test setup & procedure.....                  | 48 |
| 8.3 Emission limit.....                          | 49 |
| 8.4 Uncertainty of Conducted Emission .....      | 49 |
| 8.5 Power Line Conducted Emission test data..... | 50 |

**Summary of Tests****802.11b/g Wireless mini module-Model: GLM-100**  
**FCC ID: QTRGLM10001**

| Test                               | Reference      | Results  |
|------------------------------------|----------------|----------|
| Minimum 6dB Bandwidth test         | 15.247(a)(2)   | Complies |
| Maximum Output Power test          | 15.247(b)      | Complies |
| Radiated Spurious Emission test    | 15.205, 15.209 | Complies |
| Power Spectrum Density test        | 15.247(d)      | Complies |
| Power Line Conducted Emission test | 15.207         | Complies |

## 1. General information

### 1.1 Identification of the EUT

|                           |                                                                                                           |
|---------------------------|-----------------------------------------------------------------------------------------------------------|
| Applicant                 | : Cellvision Systems Inc.                                                                                 |
| Product                   | : 802.11b/g Wireless mini module                                                                          |
| Model No.                 | : GLM-100                                                                                                 |
| FCC ID.                   | : QTRGLM10001                                                                                             |
| Frequency Range           | : 2412MHz ~ 2462 MHz                                                                                      |
| Channel Number            | : 11 channels                                                                                             |
| Frequency of Each Channel | : 2412MHz, 2417MHz, 2422MHz, 2427MHz, 2432MHz,<br>2437MHz, 2442MHz, 2447MHz, 2452MHz, 2457MHz,<br>2462MHz |
| Type of Modulation        | : DSSS, OFDM                                                                                              |
| Rated Power               | : 3.3Vdc                                                                                                  |
| Power Cord                | : N/A                                                                                                     |
| Sample Received           | : Aug. 27, 2004                                                                                           |
| Test Date(s)              | : Aug. 27, 2004 to Sep. 29, 2004                                                                          |

A FCC DoC report has been generated for the client.

### 1.2 Additional information about the EUT

The EUT is an 802.11b/g Wireless mini module, and was defined as information technology equipment.

The EUT meets special requirements for full modular approval on FCC Public Notice DA 00-1407 and the device is only for OEM integrator, please refer the test result in this report.

For more detail features, please refer to User's manual as file name "Installation guide.pdf"

### 1.3 Antenna description

The EUT has three types of antenna, one of which is permanently connected antenna, and the other can be replaced.

*For permanently connected antenna: (Antenna 1)*

The EUT uses a permanently connected antenna.

Antenna Gain : 2.0dBi

Antenna Type : Dipole

Connector Type : N/A

*For replaceable antenna: (Antenna 2 and 3)*

The antenna is affixed to the EUT using a unique connector, which allows for replacement of a broken antenna, but DOES NOT use a standard antenna jack or electrical connector.

The Antenna 2 and Antenna 3 are only different in cable length.

Antenna Gain : 2.0dBi

Antenna Type : Dipole

Connector Type : SMA Reverse

Cable Length : 9mm (Antenna 2)  
16.5mm (Antenna 3)

### 1.4 Peripherals equipment

| Peripherals | Manufacturer | Product No.       | Serial No.              | FCC ID           |
|-------------|--------------|-------------------|-------------------------|------------------|
| AP          | SMC          | WG 4005-17 2 (A3) | C-G 3030232-1-1-3*1000  | FCC DoC Approved |
| Notebook    | DELL         | PP01L             | CN-06P83-48643-33V-0112 | FCC DoC Approved |
| Modem       | Dynalink     | V1456VQE          | 00A230A00116311         | FCC DoC Approved |
| Printer     | HP           | C2642A            | TH86K1N2ZB              | FCC DoC Approved |

Extended Card (PCMCIA to PCI Interface)

## 2. Test specifications

### 2.1 Test standard

The EUT was performed according to the procedures in FCC Part 15 Subpart C Section § 15.205 、 §15.207 、 §15.209 、 §15.247 and ANSI C63.4/2003.

The test of radiated measurements according to FCC Part15 Section 15.33(a) had been conducted and the field strength of this frequency band were all meet limit requirement, thus we evaluate the EUT pass the specified test.

### 2.2 Operation mode

The EUT has three types of antenna, the difference was listed below:

| Antenna   | Antenna connector | Cable Length | Antenna Gain |
|-----------|-------------------|--------------|--------------|
| Antenna 1 | N/A               | -            | 2.0dBi       |
| Antenna 2 | SMA's(reverse)    | 9mm          | 2.0dBi       |
| Antenna 3 | SMA's(reverse)    | 16.5mm       | 2.0dBi       |

During all of the tests, we chose the EUT with the antenna 2.

During the conduction test, the EUT was linked with Access Point.

During the other tests, the EUT was operated in transmitting continuously.

After verifying the maximum output power, we found the maximum output power was occurred at 11Mbps data rate in 802.11b with low channel and at 54 Mbps data rate in 802.11g with low channel. The final test was executed under this condition and recorded in this report individually.

### 2.3 Test equipment

| Equipment                                | Brand           | Frequency range | Model No. | Intertek ID No. | Next Cal. Date |
|------------------------------------------|-----------------|-----------------|-----------|-----------------|----------------|
| EMI Test Receiver                        | Rohde & Schwarz | 9kHz~2.75GHz    | ESCS 30   | EC303           | 04/13/2005     |
| EMI Test Receiver                        | Rohde & Schwarz | 20Hz~26.5GHz    | ESMI      | EC317           | 07/14/2005     |
| Spectrum Analyzer                        | Rohde & Schwarz | 9kHz~30GHz      | FSP 30    | EC353           | 07/13/2005     |
| Spectrum Analyzer                        | Rohde & Schwarz | 20Hz~40GHz      | FSEK 30   | EC365           | 10/19/2004     |
| Horn Antenna                             | EMCO            | 1GHz~18GHz      | 3115      | EC338           | 09/18/2004     |
| Horn Antenna                             | SCHWARZBECK     | 14GHz~40GHz     | BBHA 9170 | EC351           | 07/08/2005     |
| Bilog Antenna                            | SCHWARZBECK     | 25MHz~1.7GHz    | VULB 9160 | EC368           | 05/20/2005     |
| Pre-Amplifier                            | MITEQ           | 100MHz~26.5GHz  | 919981    | EC373           | 4/14/2005      |
| Pre-Amplifier                            | MITEQ           | 26GHz~40GHz     | 828825    | EC374           | 1/29/2005      |
| Controller                               | HDGmbH          | N/A             | HD 100    | EP317-1         | N/A            |
| Antenna Tower                            | HDGmbH          | N/A             | MA 240    | EP317-2         | N/A            |
| Turn Table                               | HDGmbH          | N/A             | DS 420S   | EP317-3         | N/A            |
| Signal Generator                         | Rohde & Schwarz | 20MHz~27GHz     | SMR27     | EC354           | 08/18/2005     |
| Crystal Detector                         | Agilent         | 10MHz~18GHz     | 8472B     | EC395           | 09/02/2005     |
| Two Channel Digital Storage Oscilloscope | Tektronix       | N/A             | TDS1012   | EC394           | 08/16/2005     |
| LISN                                     | Rohde & Schwarz | 9KHz~30MHz      | ESH3-Z5   | EC344           | 01/14/2005     |

Note: The above equipments are within the valid calibration period.

### 3. Minimum 6dB Bandwidth test

#### 3.1 Operating environment

Temperature: 25 °C  
 Relative Humidity: 56 %  
 Atmospheric Pressure 1023 hPa

#### 3.2 Test setup & procedure

The minimum 6dB bandwidth per FCC §15.247(a)(2) was measured using a 50 ohm spectrum analyzer with the resolutions bandwidth set at 100kHz, the video bandwidth set at 300kHz, and the SPAN>>RBW. The test was performed at 3 channels (lowest, middle and highest channel). The minimum 6-dB modulation bandwidth is in the following Table.

#### 3.3 Measured data of Minimum 6dB Bandwidth test results

Test Mode: 802.11b operating mode (DSSS Modulation)

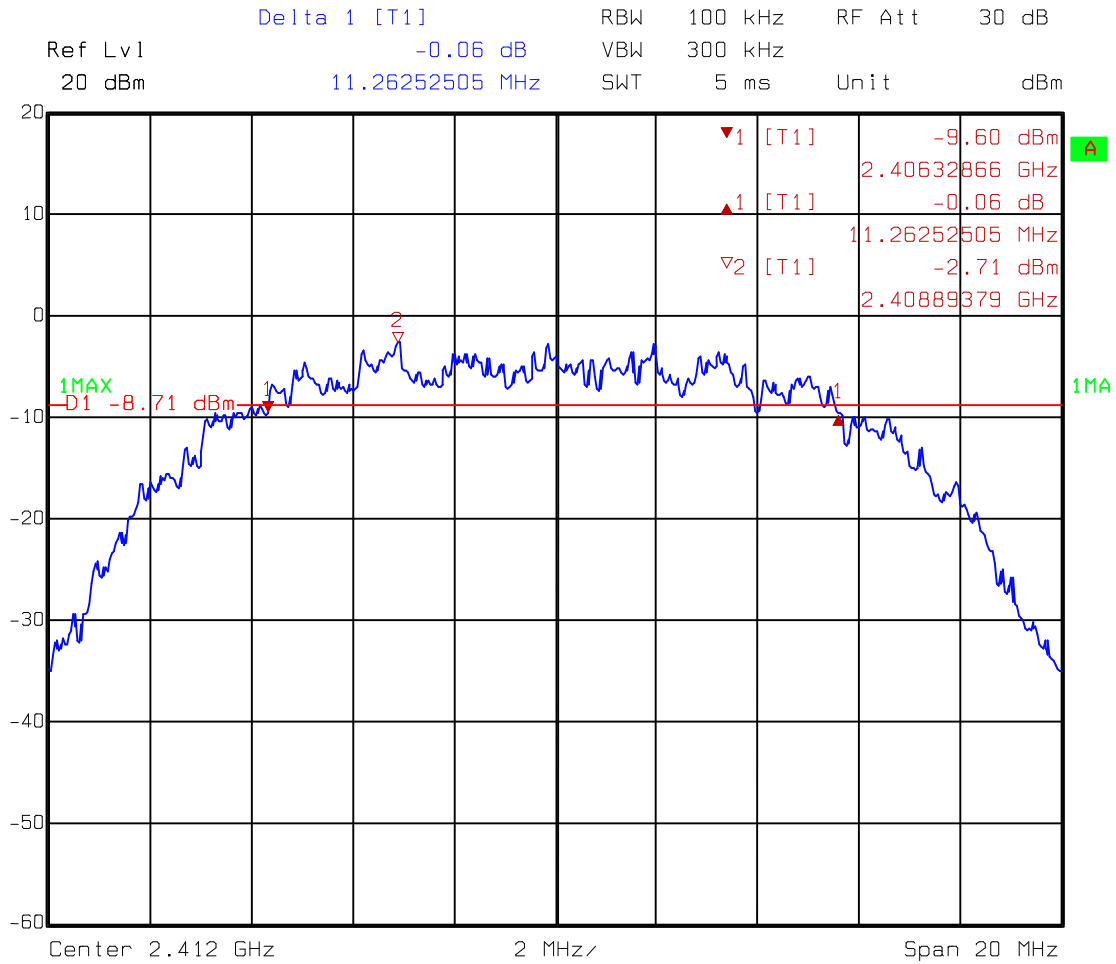
| Channel | Frequency (MHz) | Bandwidth (MHz) | Limit    |
|---------|-----------------|-----------------|----------|
| 1       | 2412            | 11.26252        | > 500kHz |
| 6       | 2437            | 11.42284        | > 500kHz |
| 11      | 2462            | 11.42284        | > 500kHz |

Test Mode: 802.11g operating mode (OFDM Modulation)

| Channel | Frequency (MHz) | Bandwidth (MHz) | Limit    |
|---------|-----------------|-----------------|----------|
| 1       | 2412            | 16.63326        | > 500kHz |
| 6       | 2437            | 16.63326        | > 500kHz |
| 11      | 2462            | 16.63326        | > 500kHz |

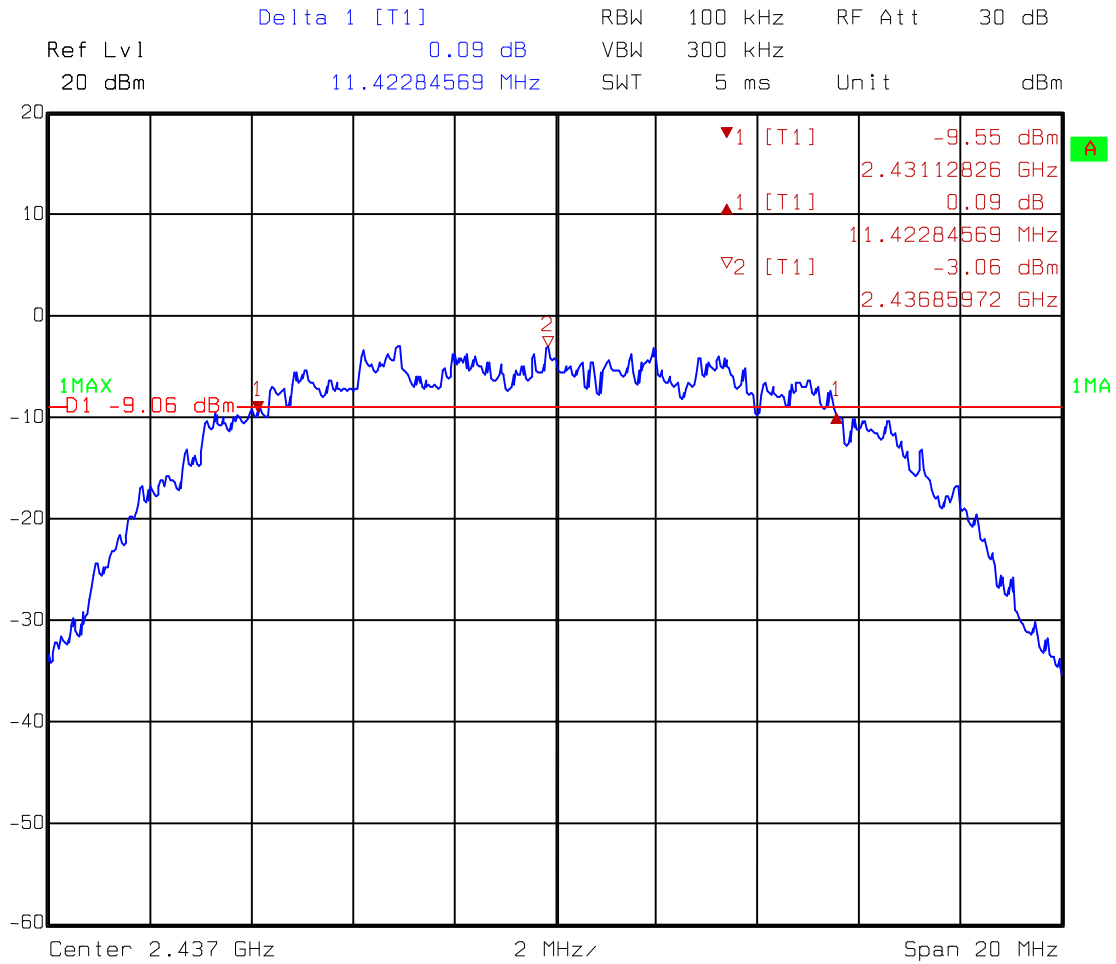
Please see the plot below.

Test Mode: 802.11b operating mode (DSSS Modulation)



Comment A: 6dB bandwidth at low channel (EC365) 802.11b

Date: 02.SEP.2004 14:07:03

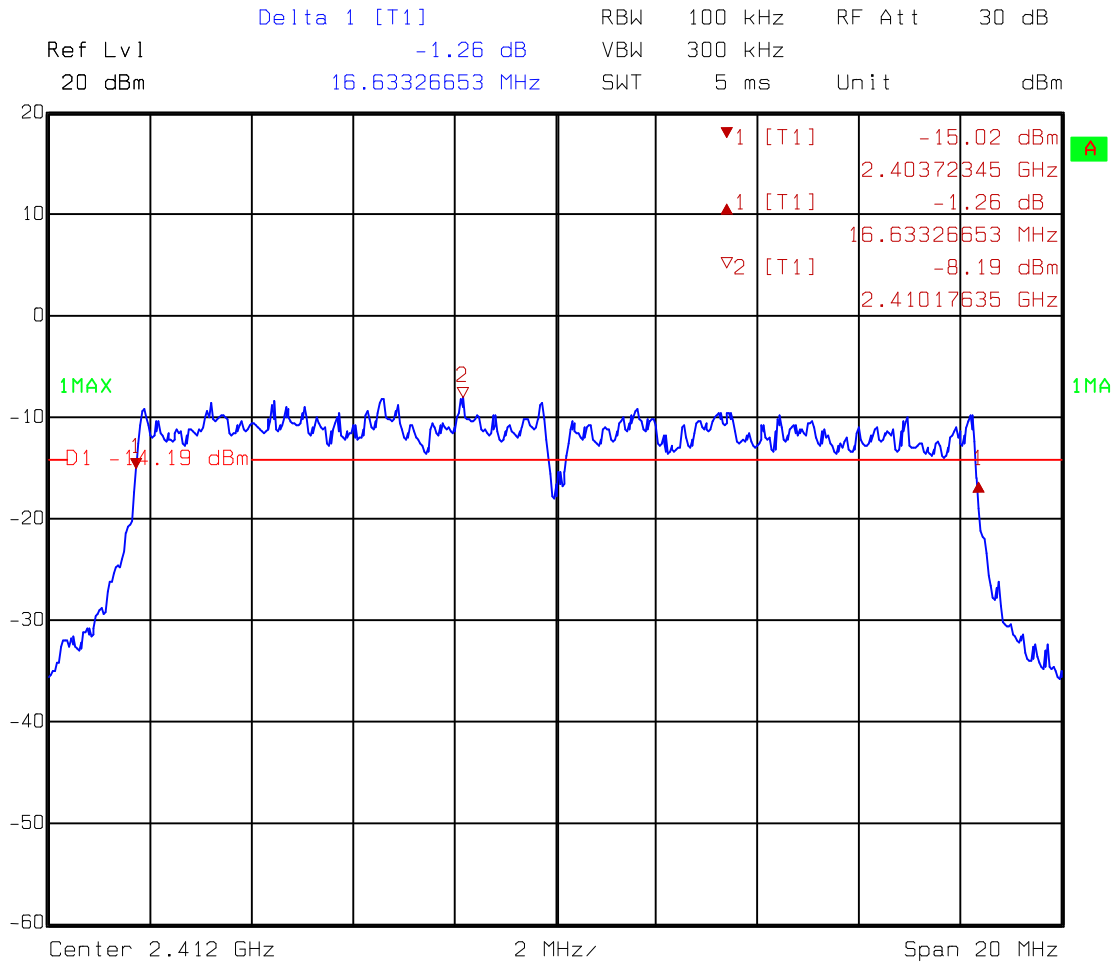


Comment A: 6dB bandwidth at middle channel (EC365) 802.11b

Date: 02.SEP.2004 14:08:45

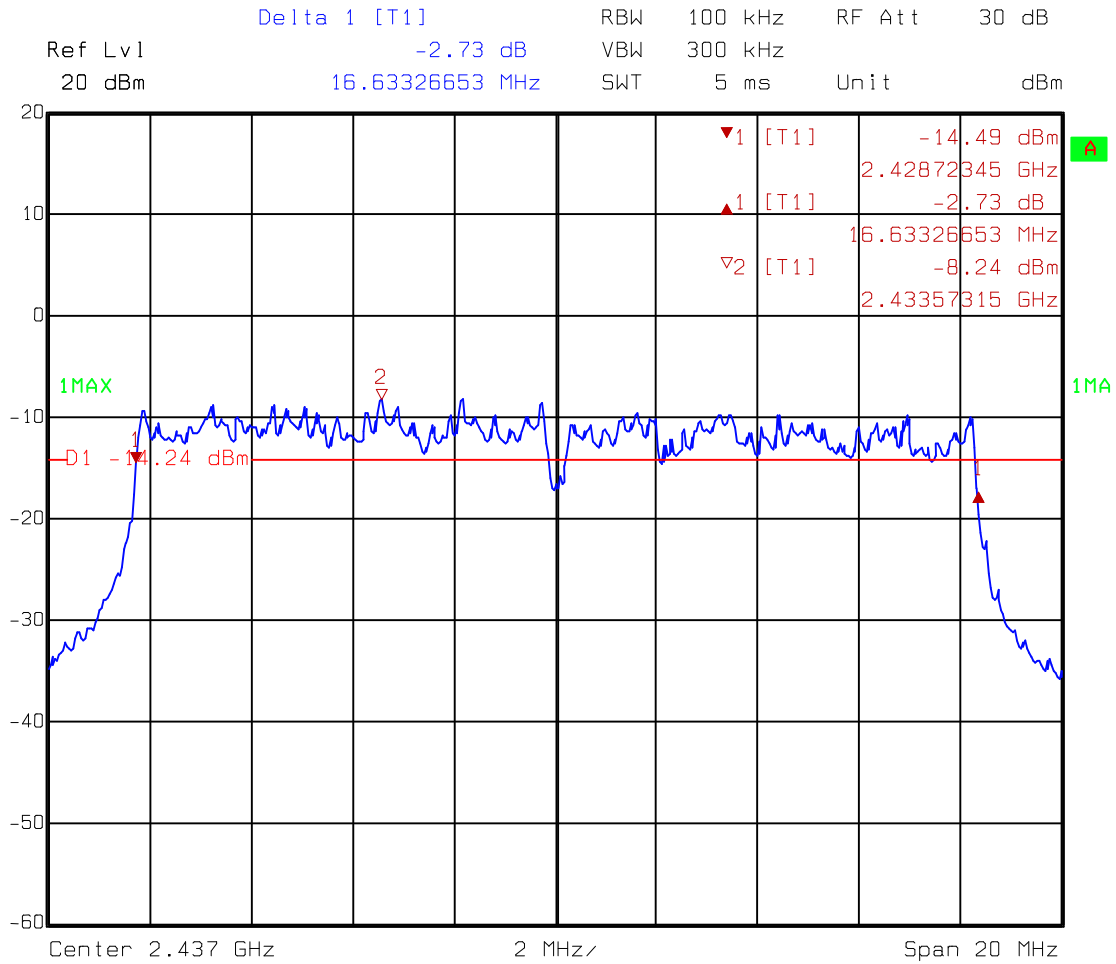
Report No.: EME-040838  
Page 12 of 51

## Test Mode: 802.11g operating mode (OFDM Modulation)

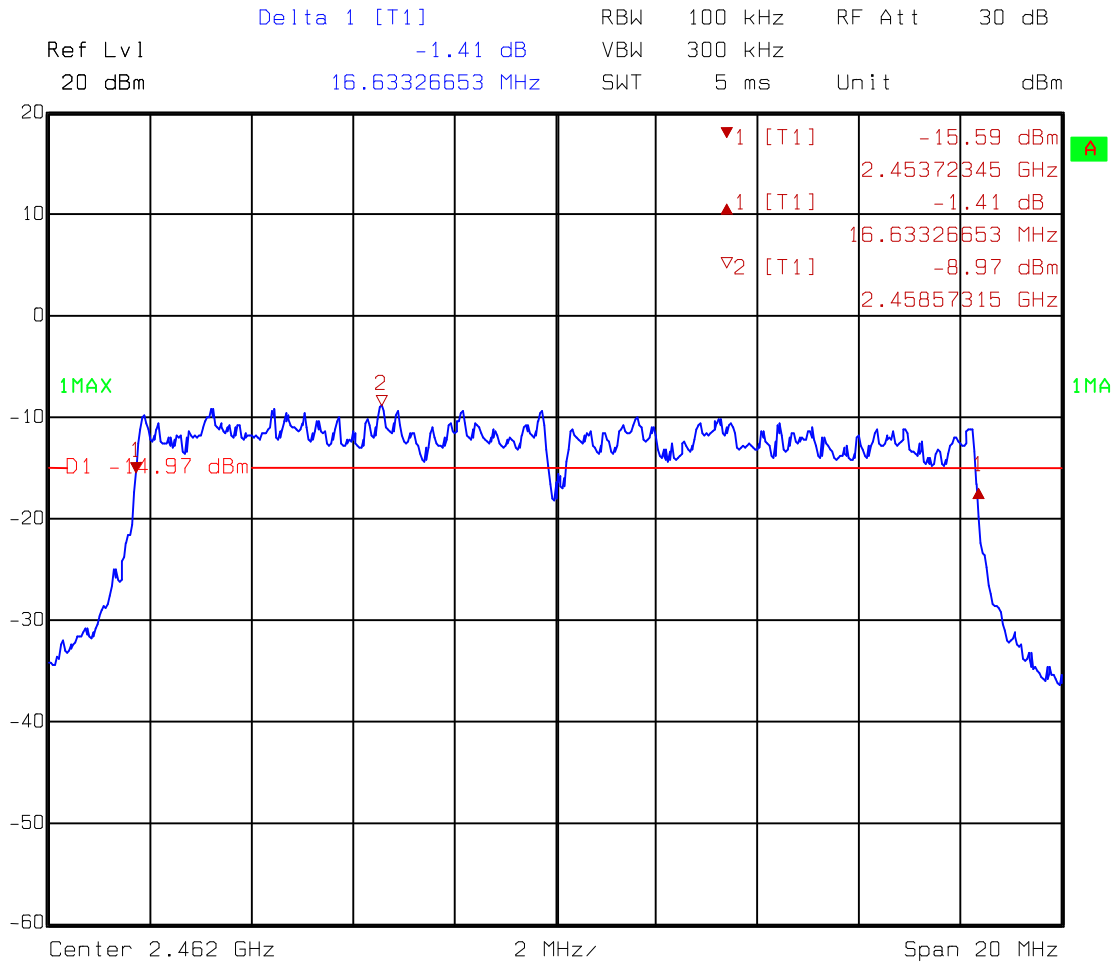


Comment A: 6dB bandwidth at low channel (EC365) 802.11g

Date: 02.SEP.2004 14:15:24



Comment A: 6dB bandwidth at middle channel (EC365) 802.11g  
Date: 02.SEP.2004 14:13:38



Comment A: 6dB bandwidth at high channel (EC365) 802.11g

Date: 02.SEP.2004 14:12:11

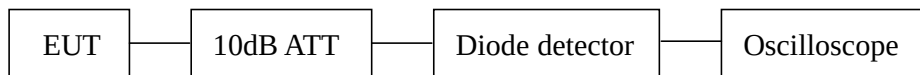
#### 4. Maximum Output Power test

##### 4.1 Operating environment

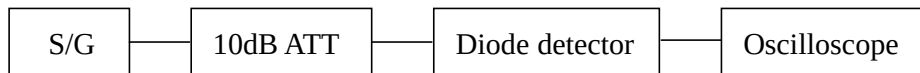
Temperature: 25 °C  
Relative Humidity: 56 %  
Atmospheric Pressure 1023 hPa

##### 4.2 Test setup & procedure

A:



B:



1. The output of the transmitter via a 10 dB attenuator and coupled to a diode detector.
2. The output of the diode detector connected to the vertical channel of an oscilloscope. The observed trace of the oscilloscope shall be recorded as "A".
3. The transmitter replaced by a signal generator. The output frequency of the signal made equal to the center of the frequency range occupied by the transmitter and unmodulated.
4. The output of the signal generator raised to reach the peak of trace "A" named X.
5. The signal generator output level X (dBm) is the transmitter peak output power.

#### 4.3 Measured data of Maximum Output Power test results

Test Mode: 802.11b operating mode (DSSS Modulation)

| Channel | Frequency (MHz) | Reading (dBm) | Output Power |        | Limit (dBm) |
|---------|-----------------|---------------|--------------|--------|-------------|
|         |                 |               | (dBm)        | (mW)   |             |
| 1       | 2412            | 23.91         | 23.91        | 246.04 | 30          |
| 6       | 2437            | 23.74         | 23.74        | 236.59 | 30          |
| 11      | 2462            | 23.11         | 23.11        | 204.64 | 30          |

Test Mode: 802.11g operating mode (OFDM Modulation)

| Channel | Frequency (MHz) | Reading (dBm) | Output Power |        | Limit (dBm) |
|---------|-----------------|---------------|--------------|--------|-------------|
|         |                 |               | (dBm)        | (mW)   |             |
| 1       | 2412            | 23.51         | 23.51        | 224.39 | 30          |
| 6       | 2437            | 23.30         | 23.30        | 213.80 | 30          |
| 11      | 2462            | 22.62         | 22.62        | 182.81 | 30          |

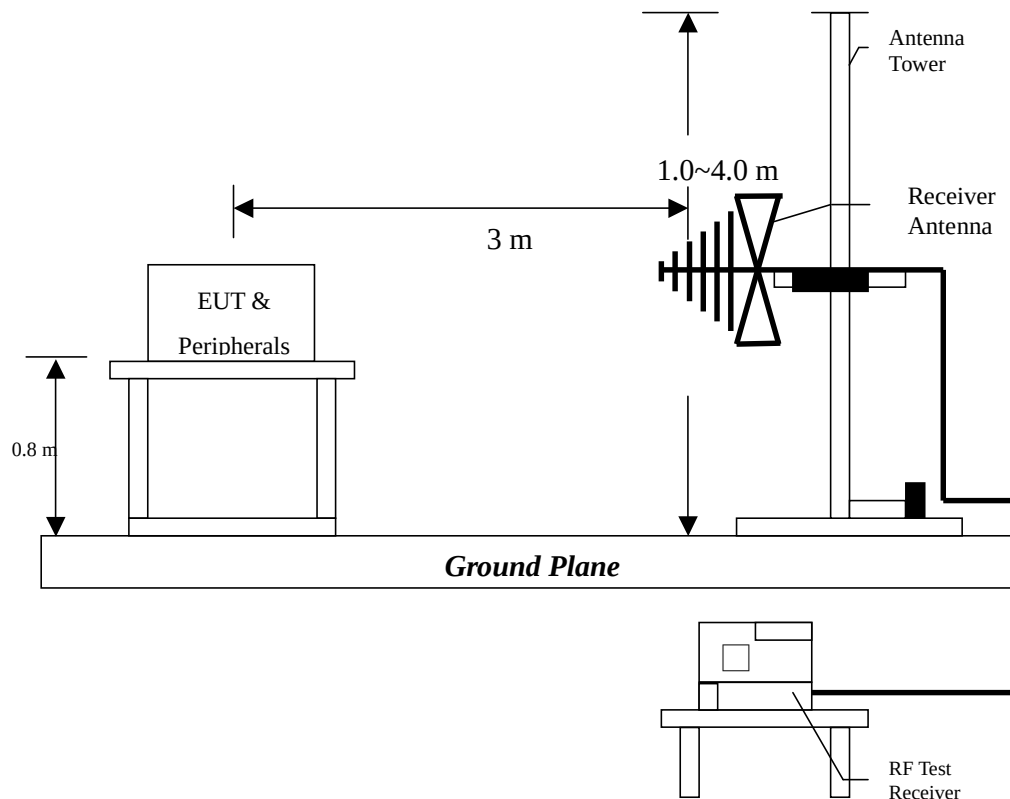
## 5. Radiated Emission test

### 5.1 Operating environment

|                      |      |     |               |
|----------------------|------|-----|---------------|
| Temperature:         | 25   | °C  | (10-40°C)     |
| Relative Humidity:   | 53   | %   | (10-90%)      |
| Atmospheric Pressure | 1023 | hPa | (860-1060hPa) |

### 5.2 Test setup & procedure

The Diagram below shows the test setup, which is utilized to make these measurements.



Radiated emissions were investigated cover the frequency range from 30MHz to 1000MHz using a receiver RBW of 120kHz record QP reading, and the frequency over 1GHz using a spectrum analyzer RBW of 1MHz and 10Hz VBW record Average reading. (15.209 paragraph), the Peak reading (1MHz RBW/VBW) recorded also on the report.

The EUT for testing is arranged on a wooden turntable. If some peripherals apply to the EUT, the peripherals will be connected to EUT and the whole system. During the test, all cables were arranged to produce worst-case emissions. The signal is maximized through rotation. The height of antenna and polarization is changing constantly for exploring for maximum signal level. The height of antenna can be up to 4 meters and down to 1 meter.

The measurement for radiated emission will be done at the distance of three meters unless the signal level is too low to measure at that distance. In the case of the reading under noise floor, a pre-amplifier is used and/or the test is conducted at a closer distance. And then all readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance.

The EUT configuration please refer to the “Spurious set-up photo.pdf”.

### 5.3 Emission limits

The spurious Emission shall test through the 10th harmonic. 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 §15.209(a).

| Frequency<br>(MHz) | Limits<br>(dB $\mu$ V/m@3m) |
|--------------------|-----------------------------|
| 30-88              | 40                          |
| 88-216             | 43.5                        |
| 216-960            | 46                          |
| Above 960          | 54                          |

Remark:

1. In the above table, the tighter limit applies at the band edges.
2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system

Uncertainty was calculated in accordance with NAMAS NIS 81.

Expanded uncertainty (k=2) of radiated emission measurement is  $\pm 4.98$  dB.

#### 5.4 Radiated spurious emission test data

The radiated spurious emissions at

| Frequency (MHz) | Margin | Test condition           |
|-----------------|--------|--------------------------|
| 2037.940        | -2.07  | 802.11b Tx at channel 1  |
| 2063.140        | -1.96  | 802.11b Tx at channel 6  |
| 2088.100        | -2.62  | 802.11b Tx at channel 11 |
| 2037.990        | -2.93  | 802.11g Tx at channel 1  |
| 2063.020        | -2.58  | 802.11g Tx at channel 6  |
| 2088.000        | -2.35  | 802.11g Tx at channel 11 |

are less than uncertainty. This is within the stated measurement uncertainty; this may affect compliance determined in other test arrangements.

##### 5.4.1 Measurement results: frequencies equal to or less than 1 GHz

The test was performed the 802.11b and 802.11g transmitting continuously modes with channel 1,6,11, the worst case was occurred in 802.11b Tx at channel 1 and 802.11g Tx at channel 1.

EUT : GLM-100

Worst case Condition : 802.11b Tx at channel 1 with Antenna 2

| Frequency<br>(MHz) | Spectrum<br>Analyzer<br>Detector | Antenna<br>Polariz.<br>(H/V) | Correction<br>Factor<br>(dB/m) | Reading<br>(dBuV) | Corrected<br>Level<br>(dBuV) | Limit<br>@ 3 m<br>(dBuV) | Margin<br>(dB) | Antenna<br>high<br>(cm) | Turn<br>Table<br>angle<br>(degree) |
|--------------------|----------------------------------|------------------------------|--------------------------------|-------------------|------------------------------|--------------------------|----------------|-------------------------|------------------------------------|
| 76.670             | QP                               | V                            | 11.62                          | 22.04             | 33.66                        | 40.00                    | -6.34          | 100.00                  | 167.00                             |
| 99.600             | QP                               | V                            | 10.03                          | 25.10             | 35.13                        | 43.50                    | -8.37          | 128.00                  | 225.00                             |
| 165.840            | QP                               | V                            | 14.92                          | 21.74             | 36.66                        | 43.50                    | -6.84          | 104.00                  | 207.00                             |
| 399.740            | QP                               | V                            | 16.70                          | 14.25             | 30.95                        | 46.00                    | -15.05         | 208.00                  | 332.00                             |
| 480.150            | QP                               | V                            | 18.61                          | 10.47             | 29.08                        | 46.00                    | -16.92         | 122.00                  | 164.00                             |
| 662.470            | QP                               | V                            | 21.38                          | 13.24             | 34.62                        | 46.00                    | -11.38         | 177.00                  | 182.00                             |
| 99.6700            | QP                               | H                            | 10.03                          | 26.57             | 36.60                        | 43.50                    | -6.90          | 240.00                  | 315.00                             |
| 165.4700           | QP                               | H                            | 14.92                          | 22.51             | 37.43                        | 43.50                    | -6.07          | 145.00                  | 87.00                              |
| 231.1100           | QP                               | H                            | 12.41                          | 19.58             | 31.99                        | 46.00                    | -14.01         | 213.00                  | 252.00                             |
| 332.5800           | QP                               | H                            | 15.33                          | 18.47             | 33.80                        | 46.00                    | -12.20         | 225.00                  | 141.00                             |
| 359.8700           | QP                               | H                            | 15.60                          | 18.03             | 33.63                        | 46.00                    | -12.37         | 174.00                  | 354.00                             |
| 399.5200           | QP                               | H                            | 16.70                          | 20.14             | 36.84                        | 46.00                    | -9.16          | 200.00                  | 189.00                             |

Remark:

1. Corrected Level = Reading Level + Correction Factor

2. Correction Factor = Antenna Factor + Cable Loss

EUT : GLM-100

Worst case Condition : 802.11g Tx at channel 1 with Antenna 2

| Frequency<br>(MHz) | Spectrum<br>Analyzer<br>Detector | Antenna<br>Polariz.<br>(H/V) | Correction<br>Factor<br>(dB/m) | Reading<br>(dBuV) | Corrected<br>Level<br>(dBuV) | Limit<br>@ 3 m<br>(dBuV) | Margin<br>(dB) | Antenna<br>high<br>(cm) | Turn<br>Table<br>angle<br>(degree) |
|--------------------|----------------------------------|------------------------------|--------------------------------|-------------------|------------------------------|--------------------------|----------------|-------------------------|------------------------------------|
| 76.650             | QP                               | V                            | 11.62                          | 23.14             | 34.76                        | 40.00                    | -5.24          | 107.00                  | 104.00                             |
| 98.770             | QP                               | V                            | 10.03                          | 25.17             | 35.20                        | 43.50                    | -8.30          | 200.00                  | 205.00                             |
| 132.840            | QP                               | V                            | 13.34                          | 16.27             | 29.61                        | 43.50                    | -13.89         | 205.00                  | 107.00                             |
| 165.840            | QP                               | V                            | 14.92                          | 19.58             | 34.50                        | 43.50                    | -9.00          | 184.00                  | 111.00                             |
| 399.840            | QP                               | V                            | 16.70                          | 14.72             | 31.42                        | 46.00                    | -14.58         | 169.00                  | 194.00                             |
| 662.470            | QP                               | V                            | 21.38                          | 16.24             | 37.62                        | 46.00                    | -8.38          | 207.00                  | 137.00                             |
| 97.990             | QP                               | H                            | 10.03                          | 25.42             | 35.45                        | 43.50                    | -8.05          | 154.00                  | 207.00                             |
| 132.840            | QP                               | H                            | 13.34                          | 18.25             | 31.59                        | 43.50                    | -11.91         | 191.00                  | 257.00                             |
| 165.870            | QP                               | H                            | 14.92                          | 21.45             | 36.37                        | 43.50                    | -7.13          | 173.00                  | 159.00                             |
| 231.840            | QP                               | H                            | 12.41                          | 20.92             | 33.33                        | 46.00                    | -12.67         | 208.00                  | 108.00                             |
| 332.680            | QP                               | H                            | 15.33                          | 18.27             | 33.60                        | 46.00                    | -12.40         | 283.00                  | 155.00                             |
| 399.650            | QP                               | H                            | 16.70                          | 17.39             | 34.09                        | 46.00                    | -11.91         | 114.00                  | 214.00                             |

Remark:

1. Corrected Level = Reading Level + Correction Factor

2. Correction Factor = Antenna Factor + Cable Loss

#### 5.4.2 Measurement results: frequency above 1GHz

EUT : GLM-100

Test Condition : 802.11b Tx at channel 1 with Antenna 2

| Frequency<br>(MHz) | Spectrum<br>Analyzer<br>Detector | Antenna<br>Polariz.<br>(H/V) | Preamp<br>(dB) | Correction<br>Factor<br>(dB/m) | Reading<br>(dBuV) | Corrected<br>Level<br>(dBuV) | Limit<br>@ 3 m<br>(dBuV) | Margin<br>(dB) | Antenna<br>high<br>(cm) | Turn Table<br>angle<br>(degree) |
|--------------------|----------------------------------|------------------------------|----------------|--------------------------------|-------------------|------------------------------|--------------------------|----------------|-------------------------|---------------------------------|
| 2037.940           | PK                               | V                            | 39.55          | 29.46                          | 68.47             | 58.38                        | 74.00                    | -15.62         | 138.00                  | 171.00                          |
| 2037.940           | AV                               | V                            | 39.55          | 29.46                          | 62.02             | 51.93                        | 54.00                    | -2.07          | 138.00                  | 171.00                          |
| 3160.300           | PK                               | V                            | 39.58          | 32.71                          | 53.73             | 46.86                        | 74.00                    | -27.14         | 111.00                  | 348.00                          |
| 3160.300           | AV                               | V                            | 39.58          | 32.71                          | 44.31             | 37.44                        | 54.00                    | -16.56         | 111.00                  | 348.00                          |
| 4824.300           | PK                               | V                            | 39.60          | 35.25                          | 49.91             | 45.56                        | 74.00                    | -28.44         | 134.00                  | 7.00                            |
| 4824.300           | AV                               | V                            | 39.60          | 35.25                          | 36.84             | 32.49                        | 54.00                    | -21.51         | 134.00                  | 7.00                            |
| 7233.300           | PK                               | V                            | 39.25          | 39.05                          | 55.26             | 55.06                        | 74.00                    | -18.94         | 144.00                  | 266.00                          |
| 7233.300           | AV                               | V                            | 39.25          | 39.05                          | 45.12             | 44.92                        | 54.00                    | -9.08          | 144.00                  | 266.00                          |

#### Remark:

1. Corrected Level = Reading Level + Correction Factor – Preamp
2. Correction Factor = Antenna Factor + Cable Loss
3. The frequency measured ranges from 1GHz to 25GHz. The data value listed above which is higher than the noise floor, the others please refer to noise floor level.

#### Noise floor level

For PK:

1GHz-3GHz: 20dBuV

3GHz-14GHz: 27dBuV

14GHz-26.5GHz: 39dBuV

For AV:

1GHz-3GHz: 10dBuV

3GHz-14GHz: 16dBuV

14GHz-26.5GHz: 28dBuV

EUT : GLM-100

Test Condition : 802.11b Tx at channel 6 with Antenna 2

| Frequency<br>(MHz) | Spectrum<br>Analyzer<br>Detector | Antenna<br>Polariz.<br>(H/V) | Preamp<br>(dB) | Correction<br>Factor<br>(dB/m) | Reading<br>(dBuV) | Corrected<br>Level<br>(dBuV) | Limit<br>@ 3 m<br>(dBuV) | Margin<br>(dB) | Antenna<br>high<br>(cm) | Turn Table<br>angle<br>(degree) |
|--------------------|----------------------------------|------------------------------|----------------|--------------------------------|-------------------|------------------------------|--------------------------|----------------|-------------------------|---------------------------------|
| 2063.140           | PK                               | V                            | 39.55          | 29.46                          | 68.66             | 58.57                        | 74.00                    | -15.43         | 170.00                  | 136.00                          |
| 2063.140           | AV                               | V                            | 39.55          | 29.46                          | 62.13             | 52.04                        | 54.00                    | -1.96          | 170.00                  | 136.00                          |
| 3184.000           | PK                               | V                            | 39.58          | 32.71                          | 49.03             | 42.16                        | 74.00                    | -31.84         | 111.00                  | 348.00                          |
| 3184.000           | AV                               | V                            | 39.58          | 32.71                          | 38.45             | 31.58                        | 54.00                    | -22.42         | 111.00                  | 348.00                          |
| 4873.900           | PK                               | V                            | 39.60          | 35.25                          | 49.74             | 45.39                        | 74.00                    | -28.61         | 129.00                  | 5.00                            |
| 4873.900           | AV                               | V                            | 39.60          | 35.25                          | 36.55             | 32.20                        | 54.00                    | -21.80         | 129.00                  | 5.00                            |
| 7311.800           | PK                               | V                            | 39.25          | 39.05                          | 54.28             | 54.08                        | 74.00                    | -19.92         | 149.00                  | 267.00                          |
| 7311.800           | AV                               | V                            | 39.25          | 39.05                          | 44.35             | 44.15                        | 54.00                    | -9.85          | 149.00                  | 267.00                          |

#### Remark:

1. Corrected Level = Reading Level + Correction Factor – Preamp
2. Correction Factor = Antenna Factor + Cable Loss
3. The frequency measured ranges from 1GHz to 25GHz. The data value listed above which is higher than the noise floor, the others please refer to noise floor level.

Noise floor level

For PK:

1GHz-3GHz: 20dBuV  
3GHz-14GHz: 27dBuV  
14GHz-26.5GHz: 39dBuV

For AV:

1GHz-3GHz: 10dBuV  
3GHz-14GHz: 16dBuV  
14GHz-26.5GHz: 28dBuV

EUT : GLM-100

Test Condition : 802.11b Tx at channel 11 with Antenna 2

| Frequency<br>(MHz) | Spectrum<br>Analyzer<br>Detector | Antenna<br>Polariz.<br>(H/V) | Preamp<br>(dB) | Correction<br>Factor<br>(dB/m) | Reading<br>(dBuV) | Corrected<br>Level<br>(dBuV) | Limit<br>@ 3 m<br>(dBuV) | Margin<br>(dB) | Antenna<br>high<br>(cm) | Turn Table<br>angle<br>(degree) |
|--------------------|----------------------------------|------------------------------|----------------|--------------------------------|-------------------|------------------------------|--------------------------|----------------|-------------------------|---------------------------------|
| 2088.100           | PK                               | V                            | 39.55          | 29.46                          | 70.24             | 60.15                        | 74.00                    | -13.85         | 134.00                  | 170.00                          |
| 2088.100           | AV                               | V                            | 39.55          | 29.46                          | 61.47             | 51.38                        | 54.00                    | -2.62          | 134.00                  | 170.00                          |
| 3206.200           | PK                               | V                            | 39.58          | 32.71                          | 44.57             | 37.70                        | 74.00                    | -36.30         | 108.00                  | 354.00                          |
| 3206.200           | AV                               | V                            | 39.58          | 32.71                          | 32.59             | 25.72                        | 54.00                    | -28.28         | 108.00                  | 354.00                          |
| 4924.000           | PK                               | V                            | 39.60          | 35.25                          | 48.72             | 44.37                        | 74.00                    | -29.63         | 131.00                  | 6.00                            |
| 4924.000           | AV                               | V                            | 39.60          | 35.25                          | 34.73             | 30.38                        | 54.00                    | -23.62         | 131.00                  | 6.00                            |
| 7384.900           | PK                               | V                            | 39.25          | 39.05                          | 52.96             | 52.76                        | 74.00                    | -21.24         | 146.00                  | 267.00                          |
| 7384.900           | AV                               | V                            | 39.25          | 39.05                          | 42.24             | 42.04                        | 54.00                    | -11.96         | 146.00                  | 267.00                          |

#### Remark:

1. Corrected Level = Reading Level + Correction Factor – Preamp
2. Correction Factor = Antenna Factor + Cable Loss
3. The frequency measured ranges from 1GHz to 25GHz. The data value listed above which is higher than the noise floor, the others please refer to noise floor level.

Noise floor level

For PK:

1GHz-3GHz: 20dBuV

3GHz-14GHz: 27dBuV

14GHz-26.5GHz: 39dBuV

For AV:

1GHz-3GHz: 10dBuV

3GHz-14GHz: 16dBuV

14GHz-26.5GHz: 28dBuV

EUT : GLM-100

Test Condition : 802.11g Tx at channel 1 with Antenna 2

| Frequency<br>(MHz) | Spectrum<br>Analyzer<br>Detector | Antenna<br>Polariz.<br>(H/V) | Preamp<br>(dB) | Correction<br>Factor<br>(dB/m) | Reading<br>(dBuV) | Corrected<br>Level<br>(dBuV) | Limit<br>@ 3 m<br>(dBuV) | Margin<br>(dB) | Antenna<br>high<br>(cm) | Turn Table<br>angle<br>(degree) |
|--------------------|----------------------------------|------------------------------|----------------|--------------------------------|-------------------|------------------------------|--------------------------|----------------|-------------------------|---------------------------------|
| 2037.990           | PK                               | V                            | 39.55          | 29.46                          | 68.02             | 57.93                        | 74.00                    | -16.07         | 122.00                  | 193.00                          |
| 2037.990           | AV                               | V                            | 39.55          | 29.46                          | 61.16             | 51.07                        | 54.00                    | -2.93          | 122.00                  | 193.00                          |
| 3158.920           | PK                               | V                            | 39.58          | 32.71                          | 54.81             | 47.94                        | 74.00                    | -26.06         | 114.00                  | 348.00                          |
| 3158.920           | AV                               | V                            | 39.58          | 32.71                          | 45.07             | 38.20                        | 54.00                    | -15.80         | 114.00                  | 348.00                          |
| 4823.800           | PK                               | V                            | 39.60          | 35.25                          | 49.65             | 45.30                        | 74.00                    | -28.70         | 136.00                  | 8.00                            |
| 4823.800           | AV                               | V                            | 39.60          | 35.25                          | 36.35             | 32.00                        | 54.00                    | -22.00         | 136.00                  | 8.00                            |
| 7233.300           | PK                               | V                            | 39.25          | 39.05                          | 56.86             | 56.66                        | 74.00                    | -17.34         | 149.00                  | 267.00                          |
| 7233.300           | AV                               | V                            | 39.25          | 39.05                          | 46.80             | 46.60                        | 54.00                    | -7.40          | 149.00                  | 267.00                          |

#### Remark:

1. Corrected Level = Reading Level + Correction Factor – Preamp
2. Correction Factor = Antenna Factor + Cable Loss
3. The frequency measured ranges from 1GHz to 25GHz. The data value listed above which is higher than the noise floor, the others please refer to noise floor level.

#### Noise floor level

For PK:

1GHz-3GHz: 20dBuV

3GHz-14GHz: 27dBuV

14GHz-26.5GHz: 39dBuV

For AV:

1GHz-3GHz: 10dBuV

3GHz-14GHz: 16dBuV

14GHz-26.5GHz: 28dBuV

EUT : GLM-100

Test Condition : 802.11g Tx at channel 6 with Antenna 2

| Frequency<br>(MHz) | Spectrum<br>Analyzer<br>Detector | Antenna<br>Polariz.<br>(H/V) | Preamp<br>(dB) | Correction<br>Factor<br>(dB/m) | Reading<br>(dBuV) | Corrected<br>Level<br>(dBuV) | Limit<br>@ 3 m<br>(dBuV) | Margin<br>(dB) | Antenna<br>high<br>(cm) | Turn Table<br>angle<br>(degree) |
|--------------------|----------------------------------|------------------------------|----------------|--------------------------------|-------------------|------------------------------|--------------------------|----------------|-------------------------|---------------------------------|
| 2063.020           | PK                               | V                            | 39.55          | 29.46                          | 68.23             | 58.14                        | 74.00                    | -15.86         | 121.00                  | 191.00                          |
| 2063.020           | AV                               | V                            | 39.55          | 29.46                          | 61.51             | 51.42                        | 54.00                    | -2.58          | 121.00                  | 191.00                          |
| 3183.800           | PK                               | V                            | 39.58          | 32.71                          | 49.77             | 42.90                        | 74.00                    | -31.10         | 111.00                  | 346.00                          |
| 3183.800           | AV                               | V                            | 39.58          | 32.71                          | 39.57             | 32.70                        | 54.00                    | -21.30         | 111.00                  | 346.00                          |
| 4874.100           | PK                               | V                            | 39.60          | 35.25                          | 49.71             | 45.36                        | 74.00                    | -28.64         | 135.00                  | 6.00                            |
| 4874.100           | AV                               | V                            | 39.60          | 35.25                          | 36.12             | 31.77                        | 54.00                    | -22.23         | 135.00                  | 6.00                            |
| 7308.200           | PK                               | V                            | 39.25          | 39.05                          | 56.08             | 55.88                        | 74.00                    | -18.12         | 154.00                  | 266.00                          |
| 7308.200           | AV                               | V                            | 39.25          | 39.05                          | 45.94             | 45.74                        | 54.00                    | -8.26          | 154.00                  | 266.00                          |

#### Remark:

1. Corrected Level = Reading Level + Correction Factor – Preamp
2. Correction Factor = Antenna Factor + Cable Loss
3. The frequency measured ranges from 1GHz to 25GHz. The data value listed above which is higher than the noise floor, the others please refer to noise floor level.

Noise floor level

For PK:

1GHz-3GHz: 20dBuV

3GHz-14GHz: 27dBuV

14GHz-26.5GHz: 39dBuV

For AV:

1GHz-3GHz: 10dBuV

3GHz-14GHz: 16dBuV

14GHz-26.5GHz: 28dBuV

EUT : GLM-100

Test Condition : 802.11g Tx at channel 11 with Antenna 2

| Frequency<br>(MHz) | Spectrum<br>Analyzer<br>Detector | Antenna<br>Polariz.<br>(H/V) | Preamp<br>(dB) | Correction<br>Factor<br>(dB/m) | Reading<br>(dBuV) | Corrected<br>Level<br>(dBuV) | Limit<br>@ 3 m<br>(dBuV) | Margin<br>(dB) | Antenna<br>high<br>(cm) | Turn Table<br>angle<br>(degree) |
|--------------------|----------------------------------|------------------------------|----------------|--------------------------------|-------------------|------------------------------|--------------------------|----------------|-------------------------|---------------------------------|
| 2088.000           | PK                               | V                            | 39.55          | 29.46                          | 68.97             | 58.88                        | 74.00                    | -15.12         | 144.00                  | 193.00                          |
| 2088.000           | AV                               | V                            | 39.55          | 29.46                          | 61.74             | 51.65                        | 54.00                    | -2.35          | 144.00                  | 193.00                          |
| 3212.500           | PK                               | V                            | 39.58          | 32.71                          | 46.91             | 40.04                        | 74.00                    | -33.96         | 108.00                  | 346.00                          |
| 3212.500           | AV                               | V                            | 39.58          | 32.71                          | 38.38             | 31.51                        | 54.00                    | -22.49         | 108.00                  | 346.00                          |
| 4923.900           | PK                               | V                            | 39.60          | 35.25                          | 48.62             | 44.27                        | 74.00                    | -29.73         | 134.00                  | 8.00                            |
| 4923.900           | AV                               | V                            | 39.60          | 35.25                          | 34.29             | 29.94                        | 54.00                    | -24.06         | 134.00                  | 8.00                            |
| 7383.100           | PK                               | V                            | 39.25          | 39.05                          | 53.10             | 52.90                        | 74.00                    | -21.10         | 151.00                  | 266.00                          |
| 7383.100           | AV                               | V                            | 39.25          | 39.05                          | 42.69             | 42.49                        | 54.00                    | -11.51         | 151.00                  | 266.00                          |

#### Remark:

1. Corrected Level = Reading Level + Correction Factor – Preamp
2. Correction Factor = Antenna Factor + Cable Loss
3. The frequency measured ranges from 1GHz to 25GHz. The data value listed above which is higher than the noise floor, the others please refer to noise floor level.

Noise floor level

For PK:

1GHz-3GHz: 20dBuV  
3GHz-14GHz: 27dBuV  
14GHz-26.5GHz: 39dBuV

For AV:

1GHz-3GHz: 10dBuV  
3GHz-14GHz: 16dBuV  
14GHz-26.5GHz: 28dBuV

## 6. Power Spectrum Density test

### 6.1 Operating environment

Temperature: 23 °C  
Relative Humidity: 55 %  
Atmospheric Pressure 1021 hPa

### 6.2 Test setup & procedure

The power spectrum density per FCC §15.247(d) was measured from the antenna port of the EUT using a 50ohm spectrum analyzer with the resolution bandwidth set at 3kHz, the video bandwidth set at 10kHz, a span of 1.5 MHz, and the sweep time set at 500 seconds. Power Density was read directly and cable loss (1.2dB)/external attenuator (10dB) correction was added to the reading to obtain power at the EUT antenna terminals. The test was performed at 3 channels (lowest, middle and highest channel). The Power Spectral Density measured result is in the following table.

### 6.3 Measured data of Power Spectrum Density test results

Test Mode: 802.11b operating mode (DSSS Modulation)

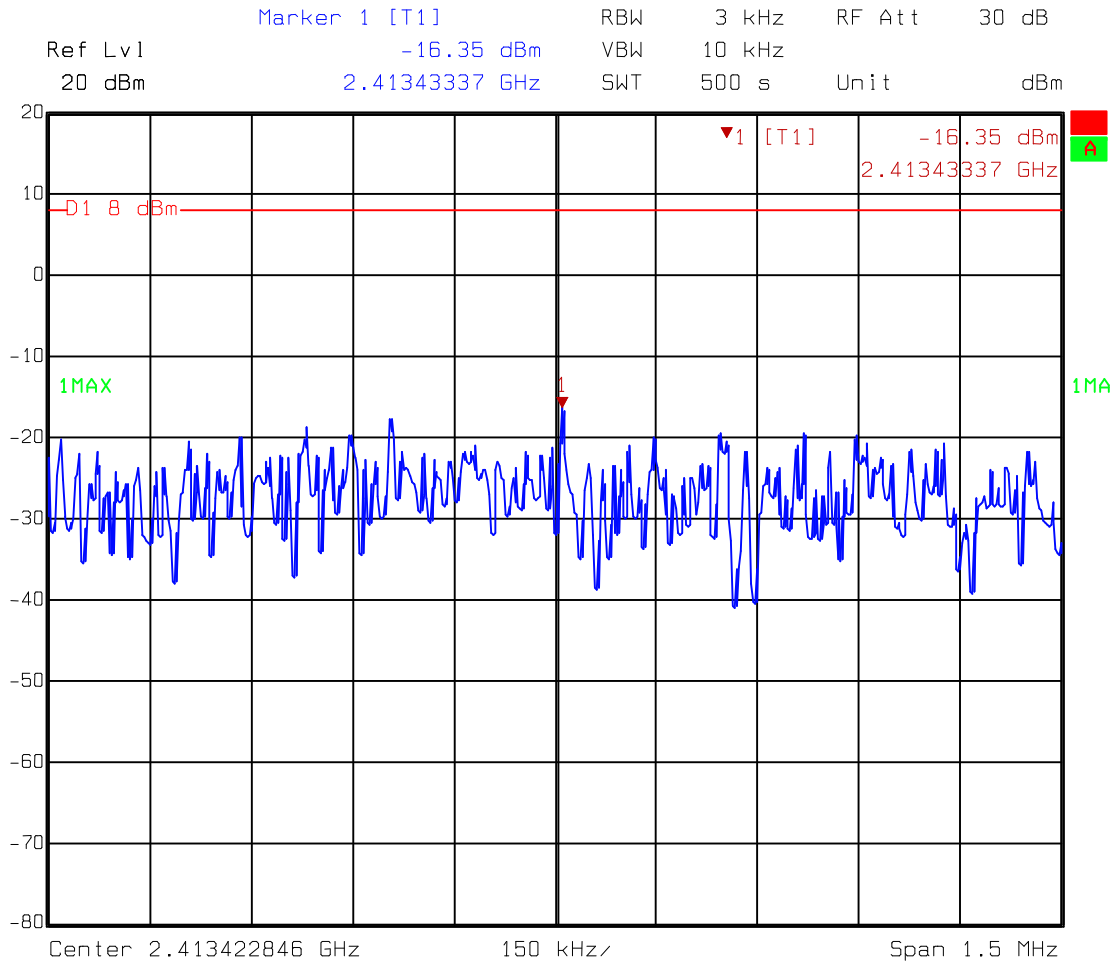
| Channel | Frequency (MHz) | Measured level (dBm) | Limit (dBm) |
|---------|-----------------|----------------------|-------------|
| 1       | 2412            | -5.15                | 8           |
| 6       | 2437            | -5.17                | 8           |
| 11      | 2462            | -5.74                | 8           |

Test Mode: 802.11g operating mode (OFDM Modulation)

| Channel | Frequency (MHz) | Measured level (dBm) | Limit (dBm) |
|---------|-----------------|----------------------|-------------|
| 1       | 2412            | -11.34               | 8           |
| 6       | 2437            | -11.49               | 8           |
| 11      | 2462            | -12.20               | 8           |

Please see the plot below.

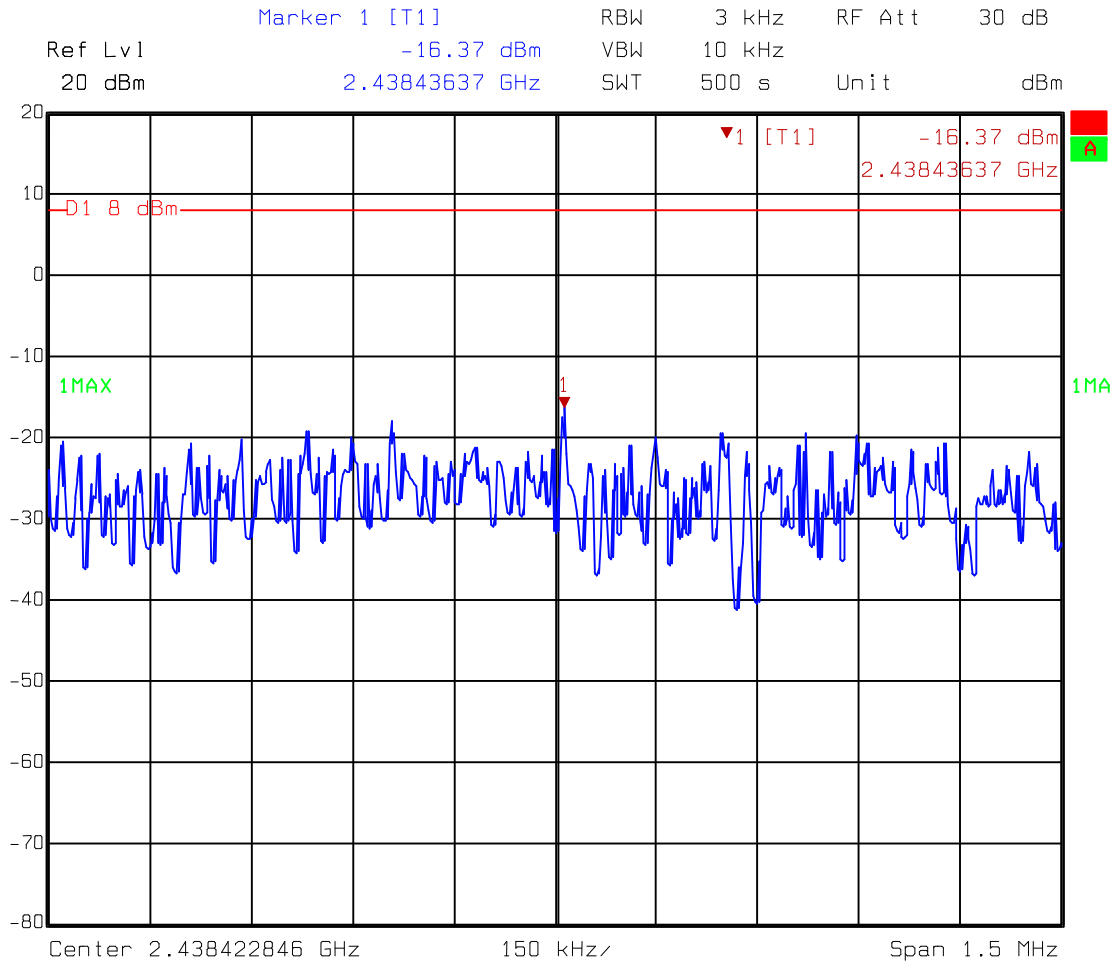
Test Mode: 802.11b operating mode (DSSS Modulation)



Comment A: Power spectrum density at low channel

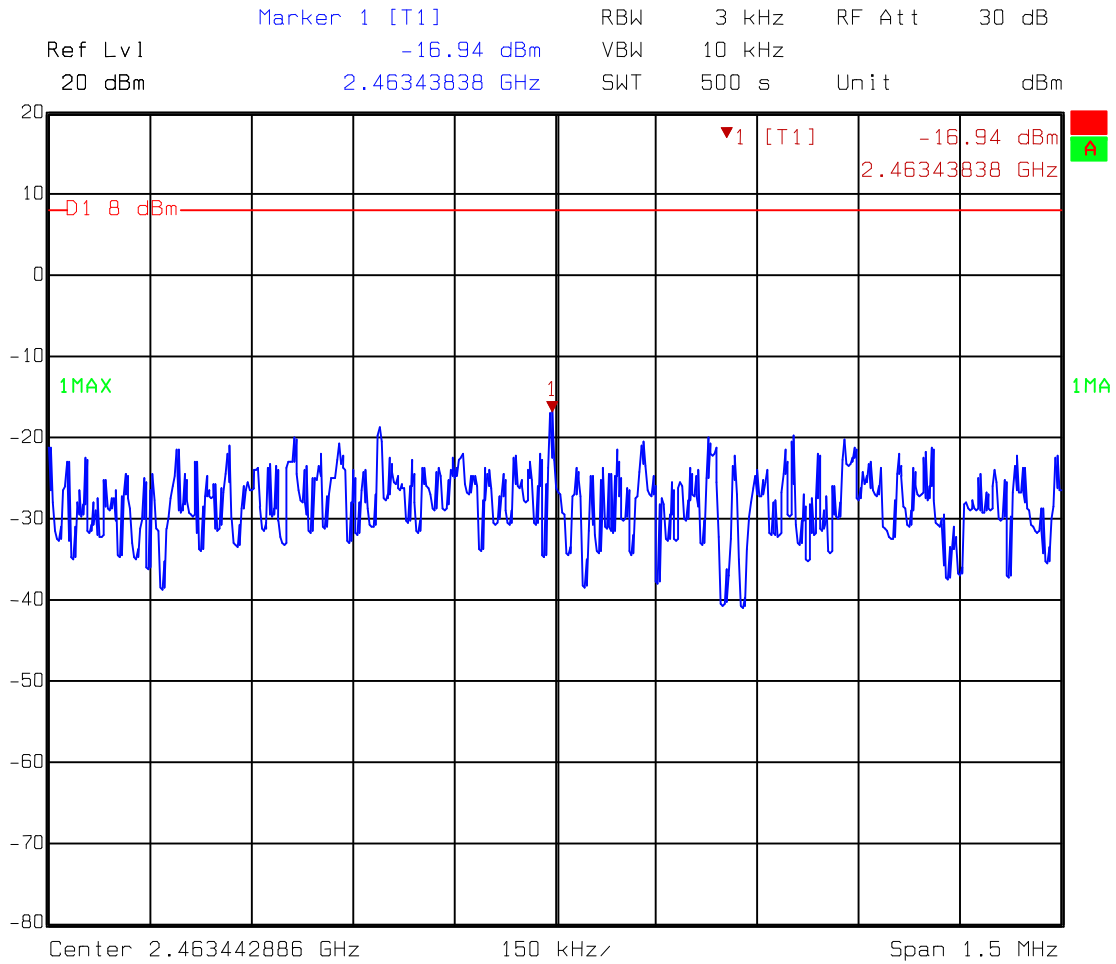
ATT=10dB CL=1.2dB (EC365) 802.11b

Date: 02.SEP.2004 14:29:38



Comment A: Power spectrum density at middle channel  
ATT=10dB CL=1.2dB (EC365) 802.11b

Date: 02.SEP.2004 14:22:48

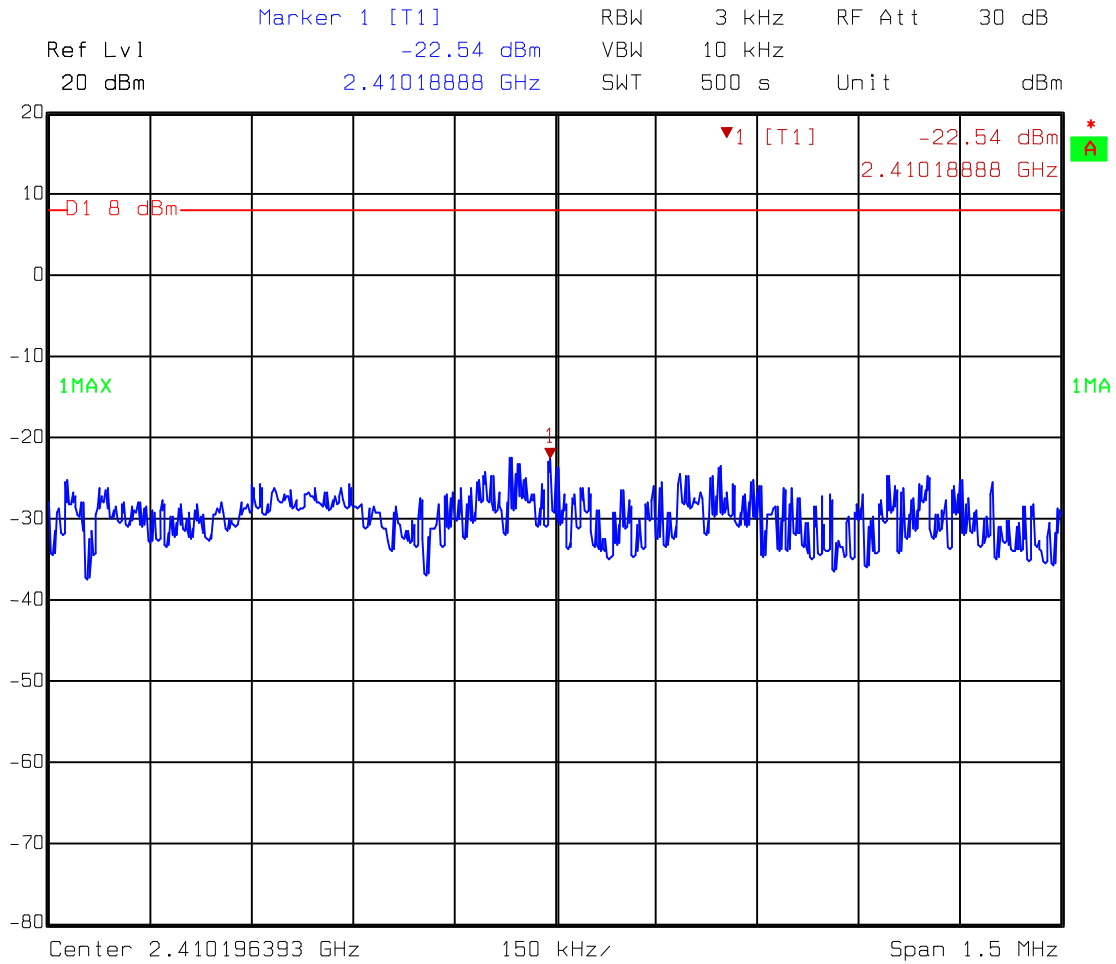


Comment A: Power spectrum density at high channel

ATT=10dB CL=1.2dB (EC365) 802.11b

Date: 02.SEP.2004 14:21:50

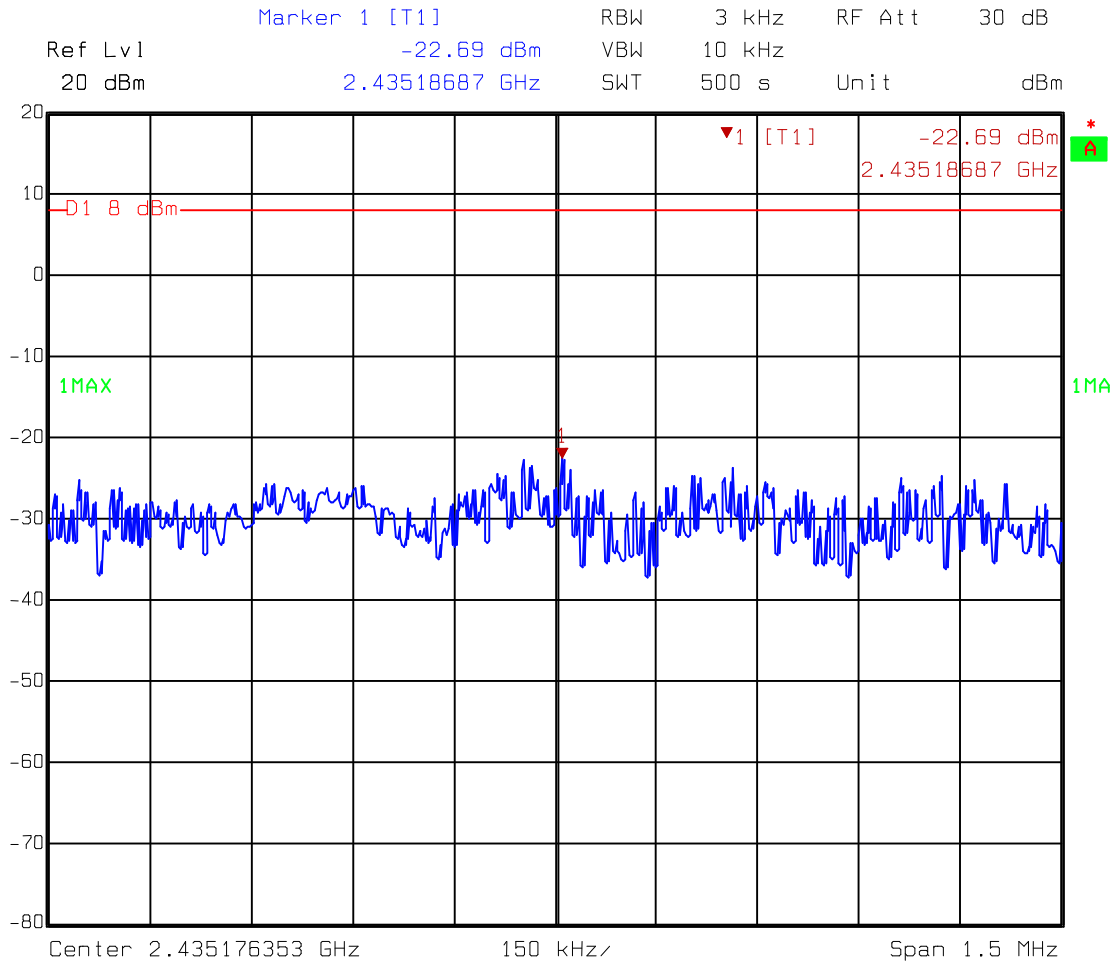
## Test Mode: 802.11g operating mode (OFDM Modulation)



Comment A: Power spectrum density at low channel

ATT=10dB CL=1.2dB (EC365) 802.11g

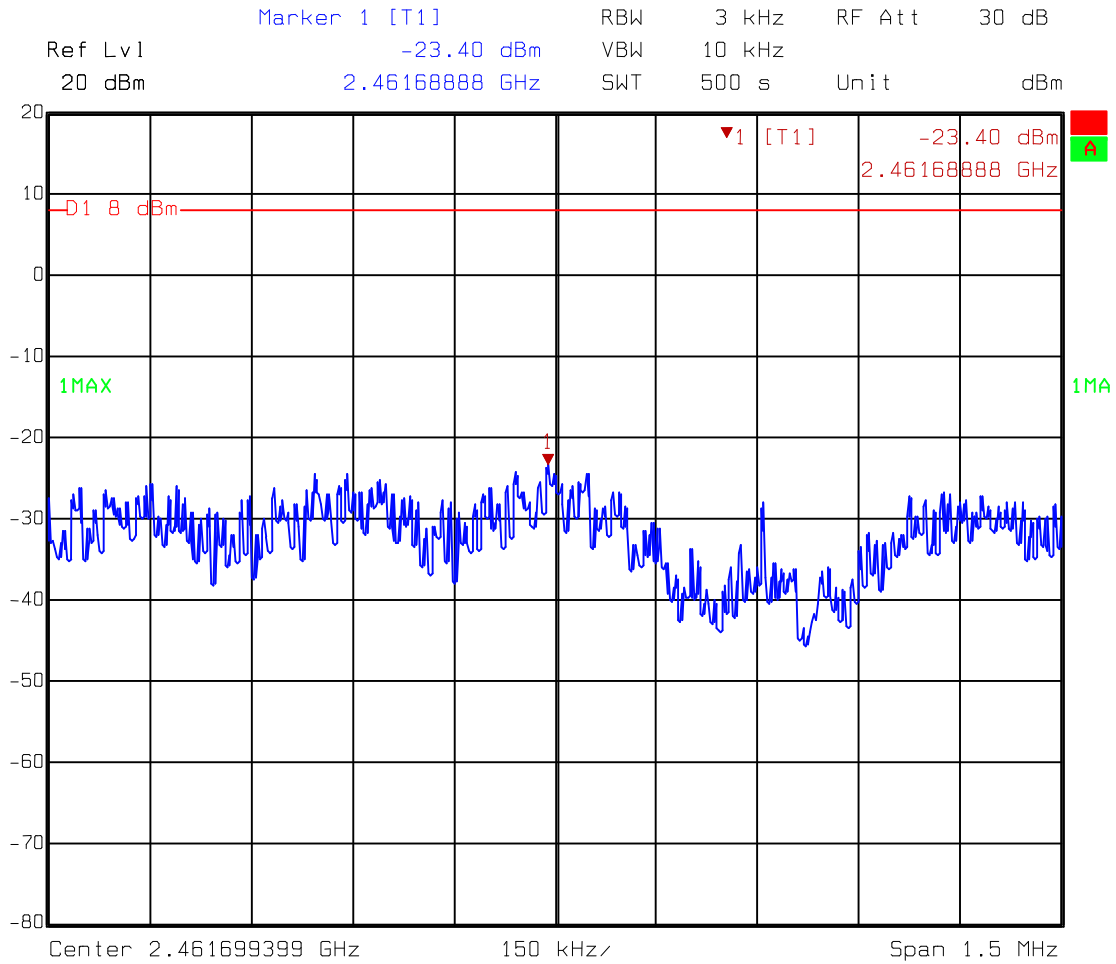
Date: 02.SEP.2004 14:17:29



Comment A: Power spectrum density at middle channel

ATT=10dB CL=1.2dB (EC365) 802.11g

Date: 02.SEP.2004 14:18:50



Comment A: Power spectrum density at high channel  
 ATT=10dB CL=1.2dB (EC365) 802.11g

Date: 02.SEP.2004 14:20:37

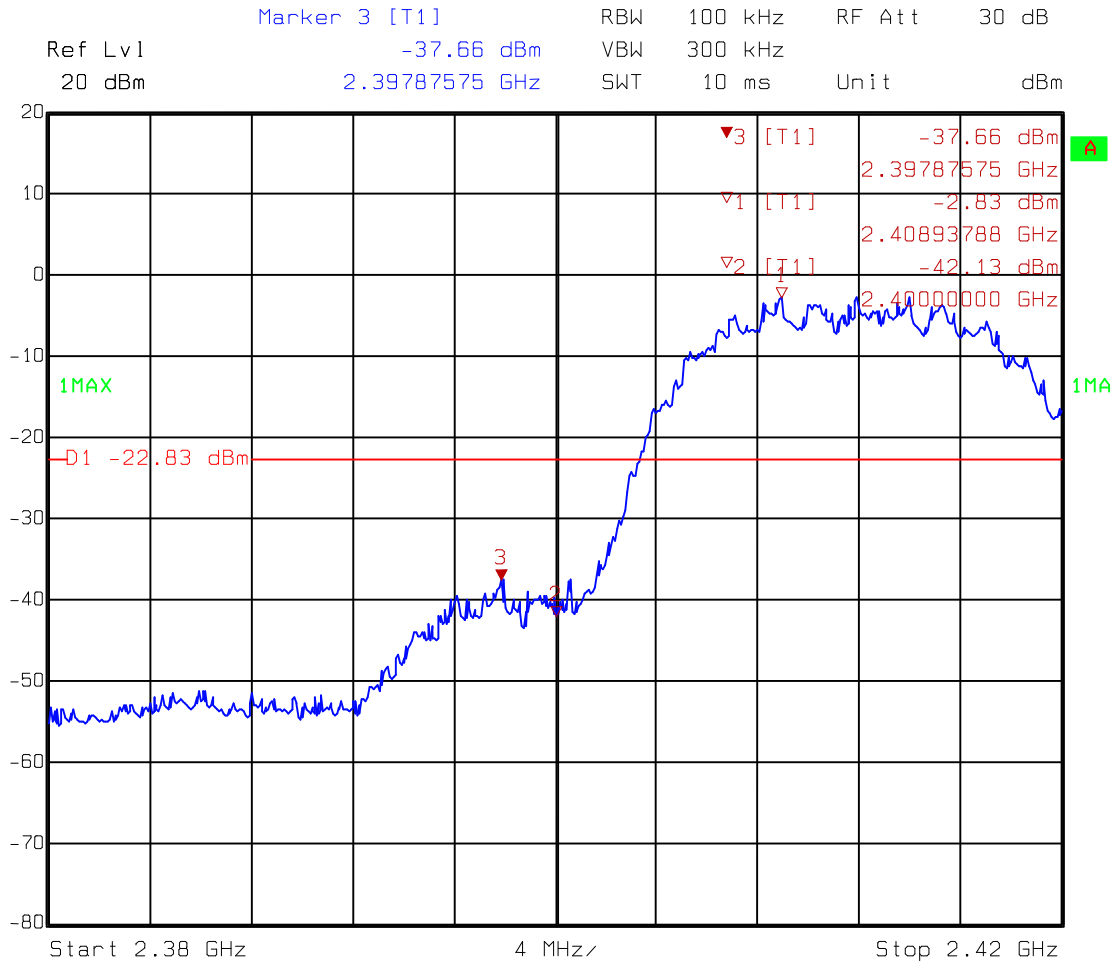
**7. Emission on the band edge §FCC 15.247(C)**

In any 100kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 KHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

Please see the plot below.

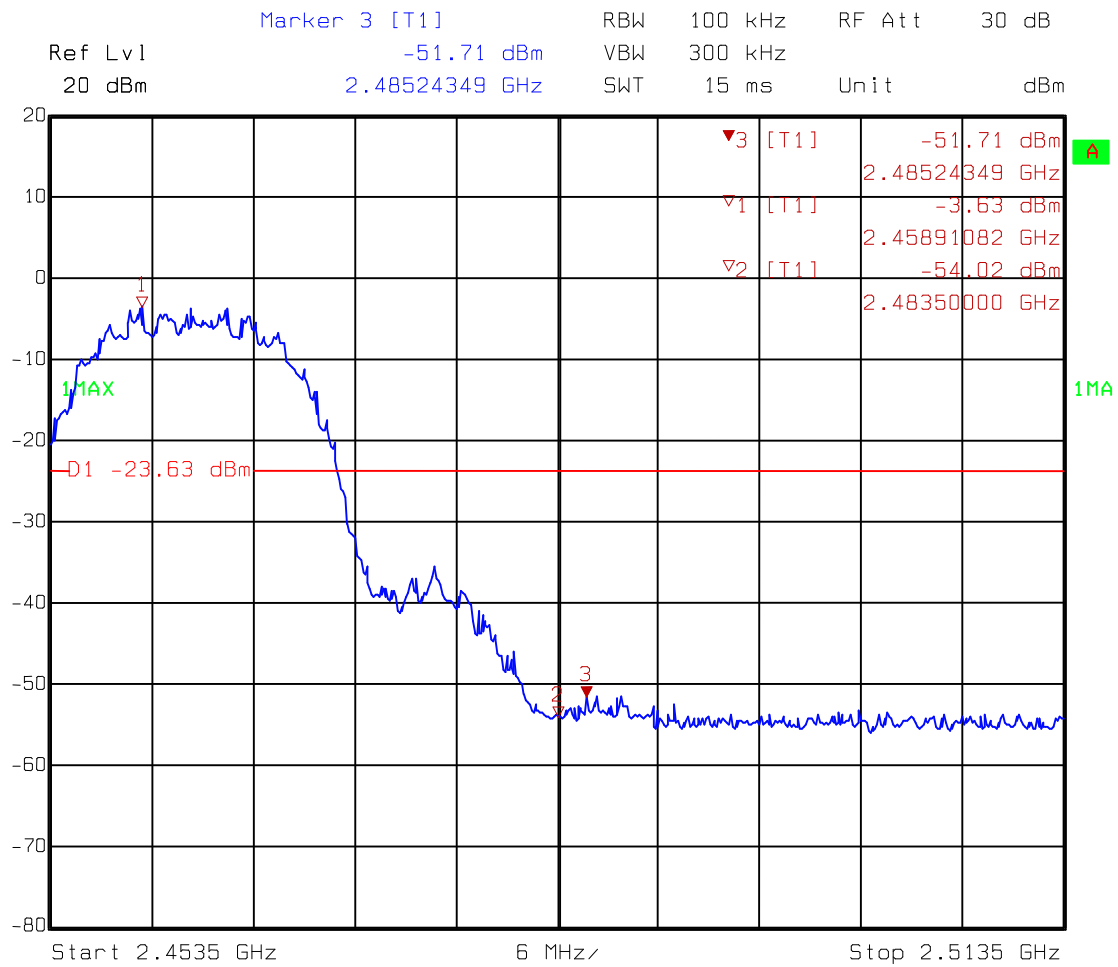
## 7.1 Band-edge (Conducted method)

Test Mode: 802.11b operating mode (DSSS Modulation)



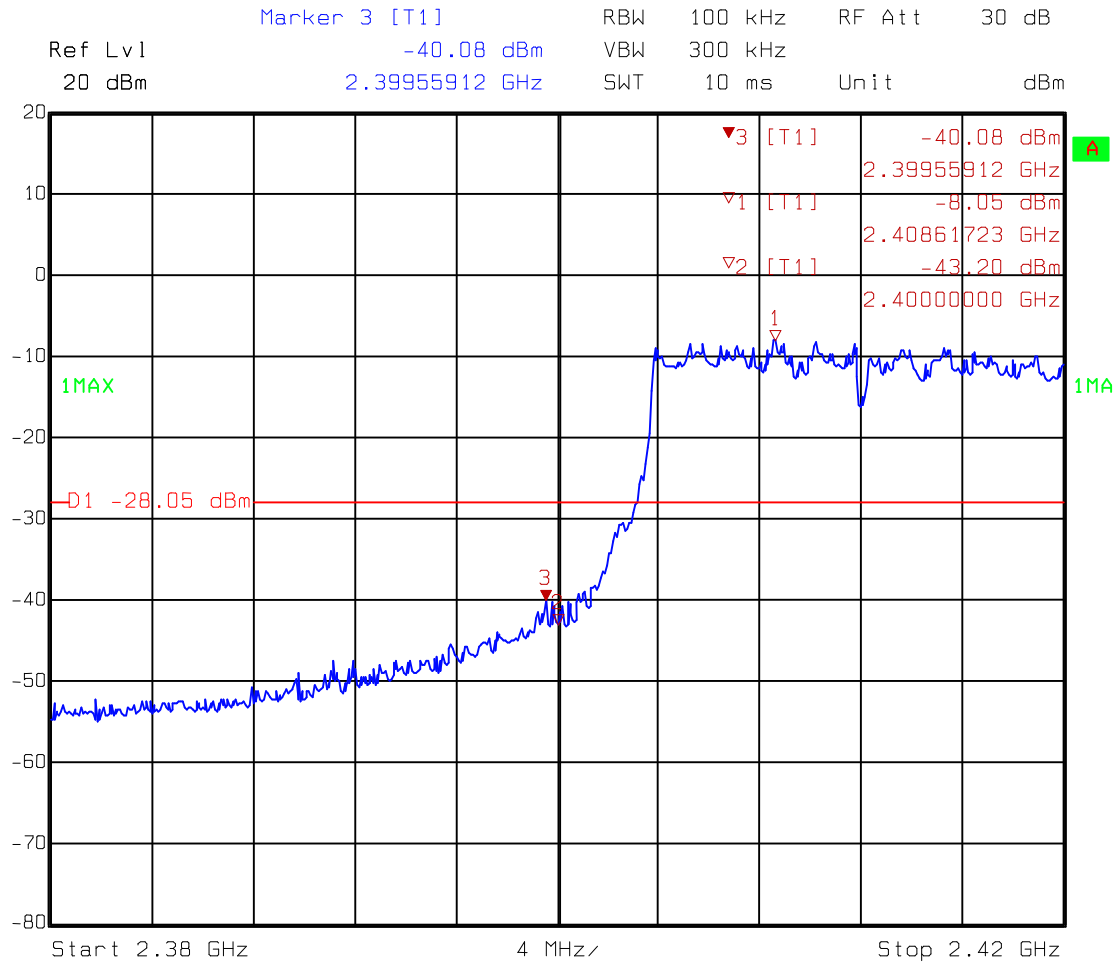
Comment A: Band-edge at low channel (EC365) 802.11b

Date: 02.SEP.2004 14:05:09



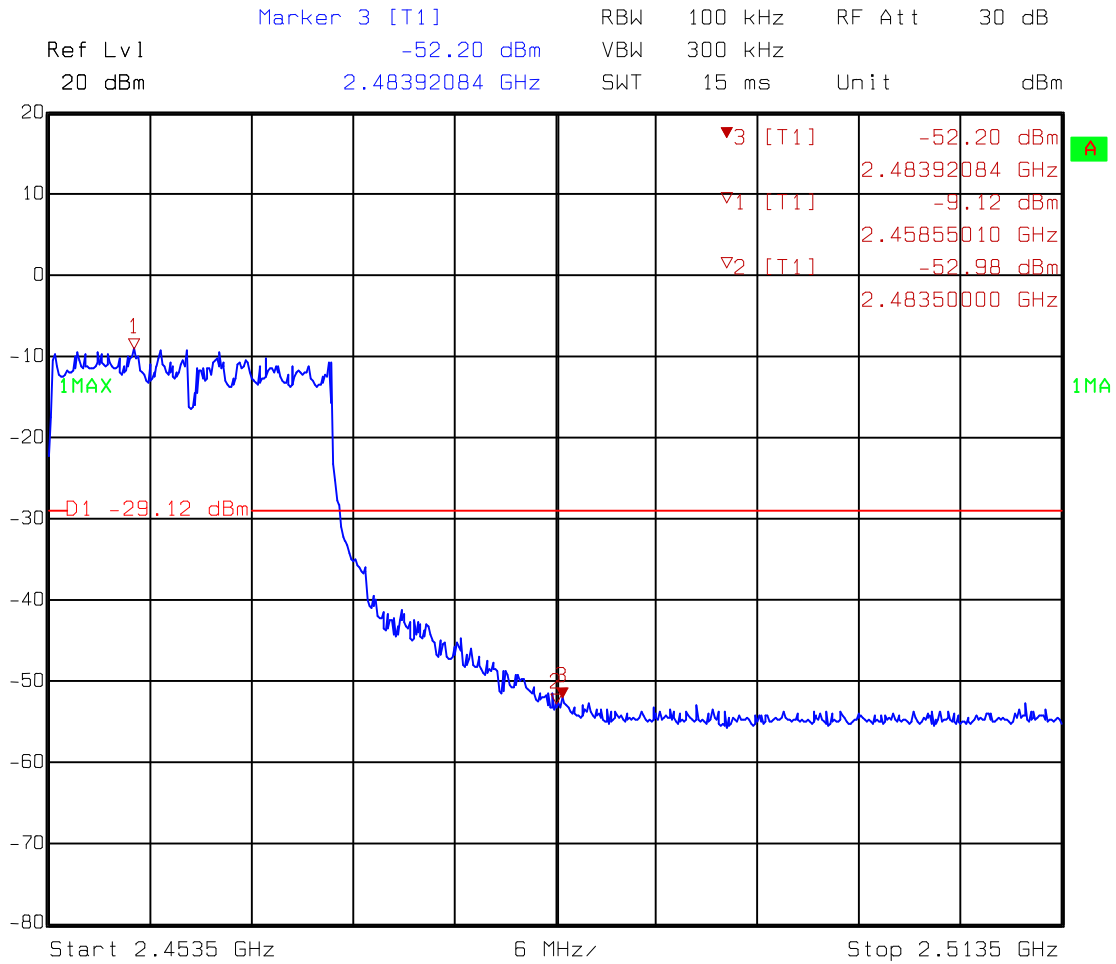
Comment A: Band-edge at high channel (EC365) 802.11b  
Date: 02.SEP.2004 14:03:25

## Test Mode: 802.11g operating mode (OFDM Modulation)



Comment A: Band-edge at low channel (EC365) 802.11g

Date: 02.SEP.2004 14:00:16

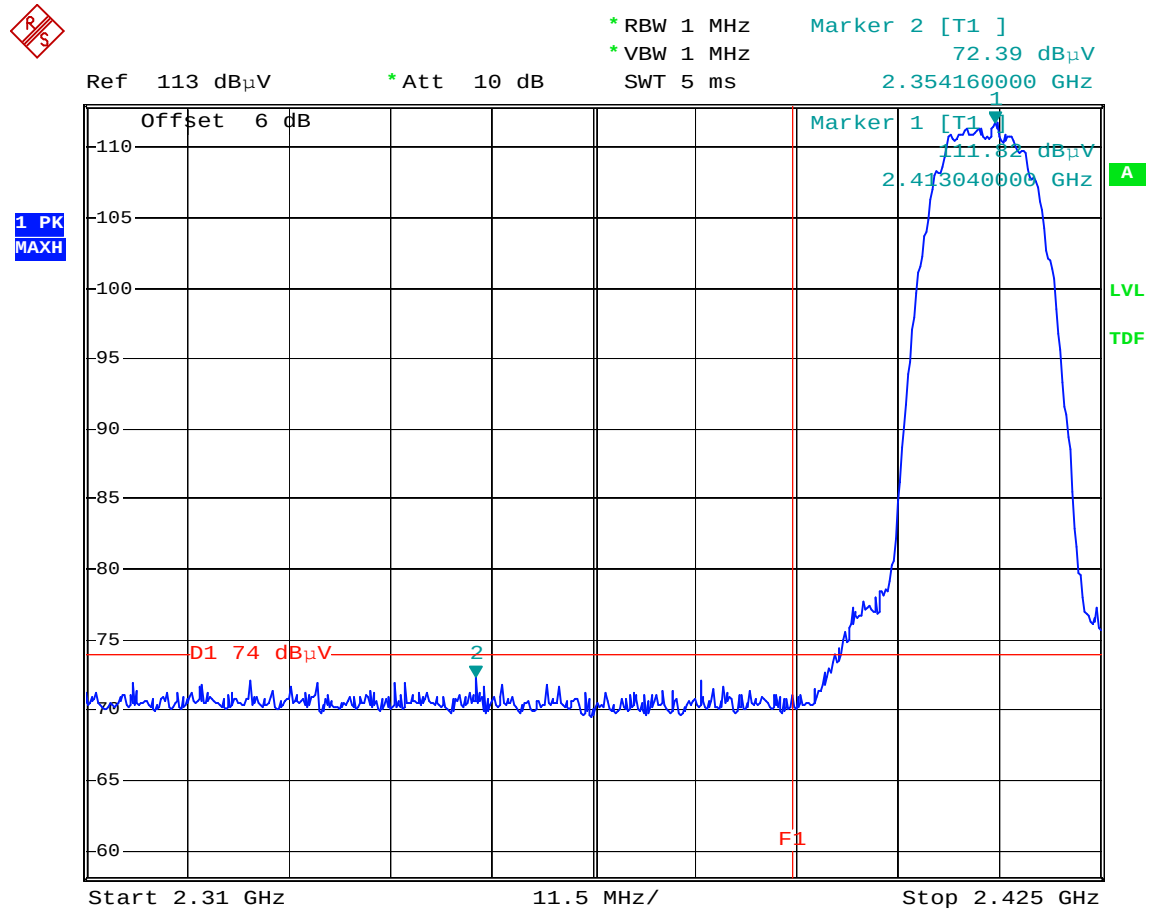


Comment A: Band-edge at high channel (EC365) 802.11g

Date: 02.SEP.2004 14:02:04

## 7.2 Band-edge (Radiated method)

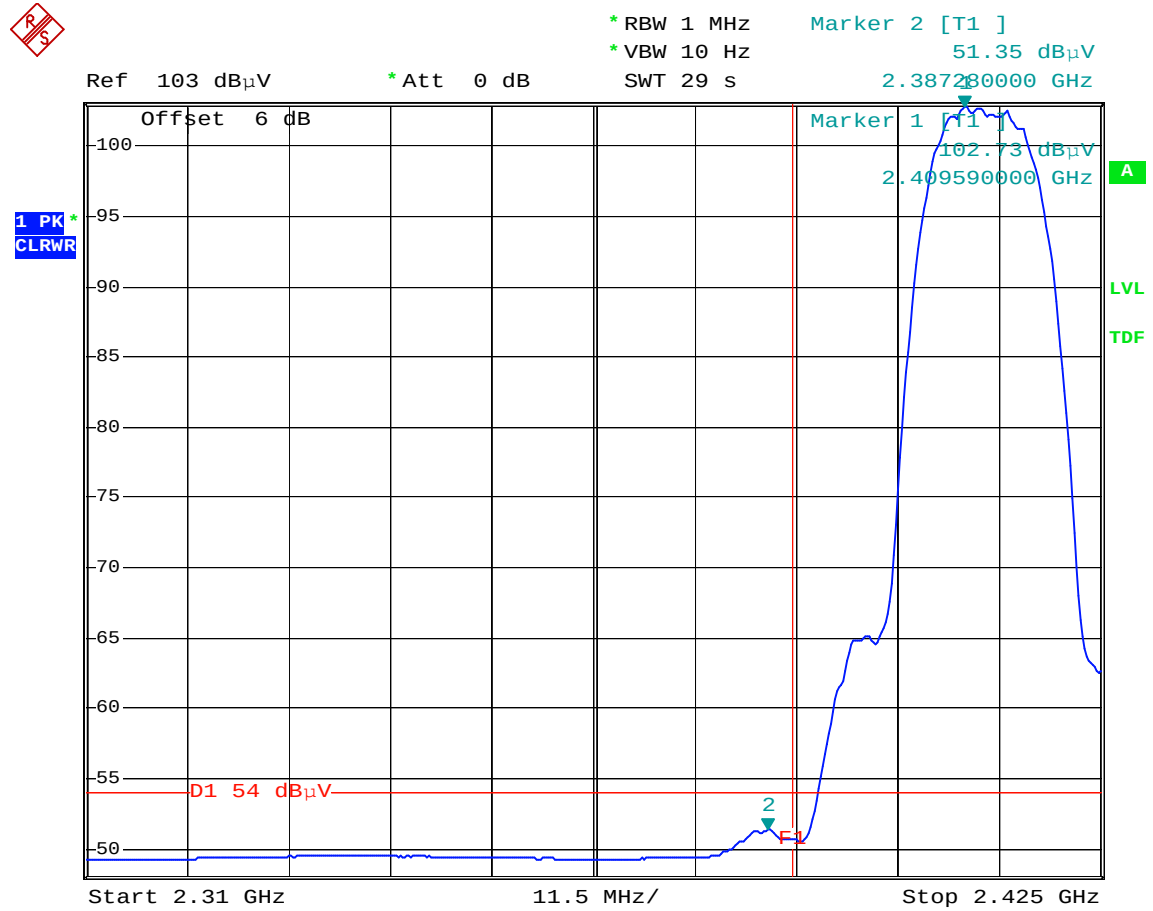
Test Mode: 802.11b operating mode (DSSS Modulation)



Comment: Band-edge test at low channel

Comment: Peak detector F1=2390MHz external Att.=6dB 802.11b

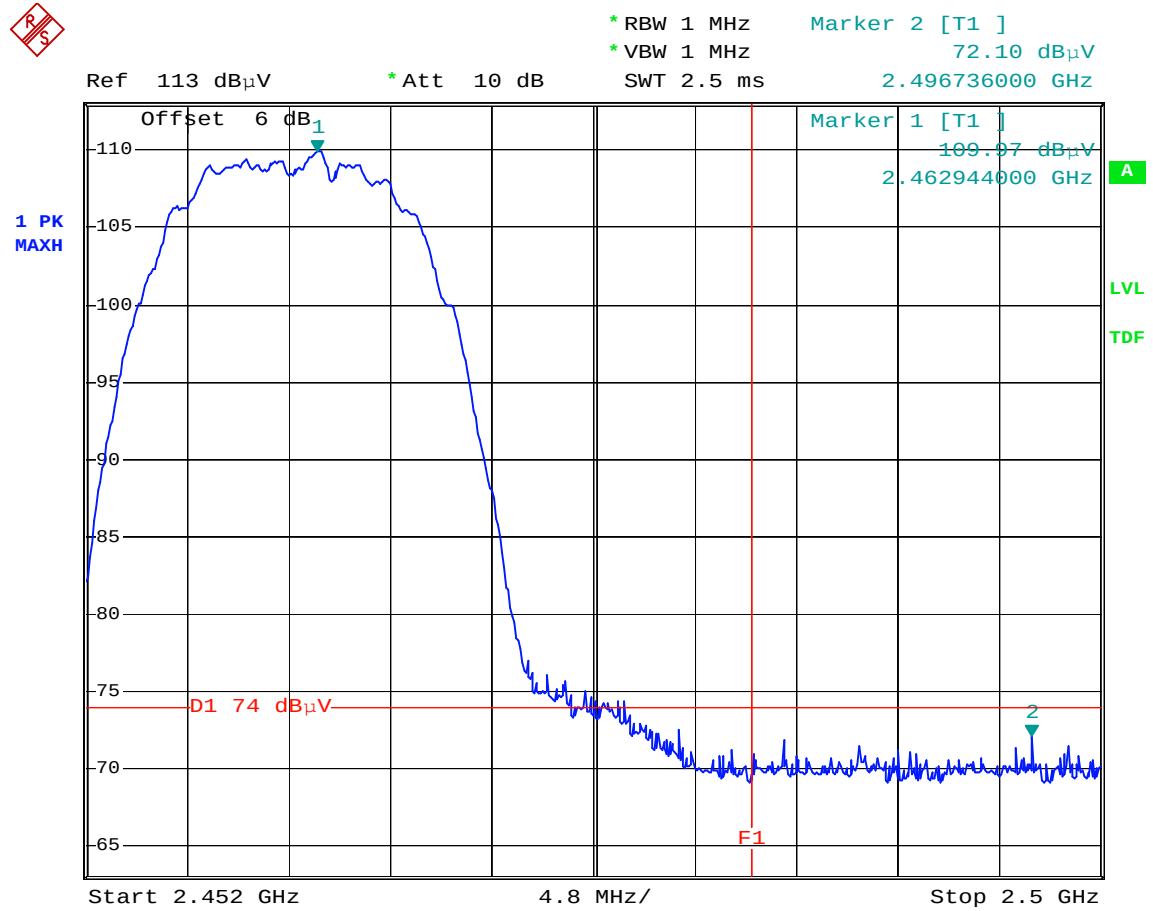
Date: 29.SEP.2004 19:44:57



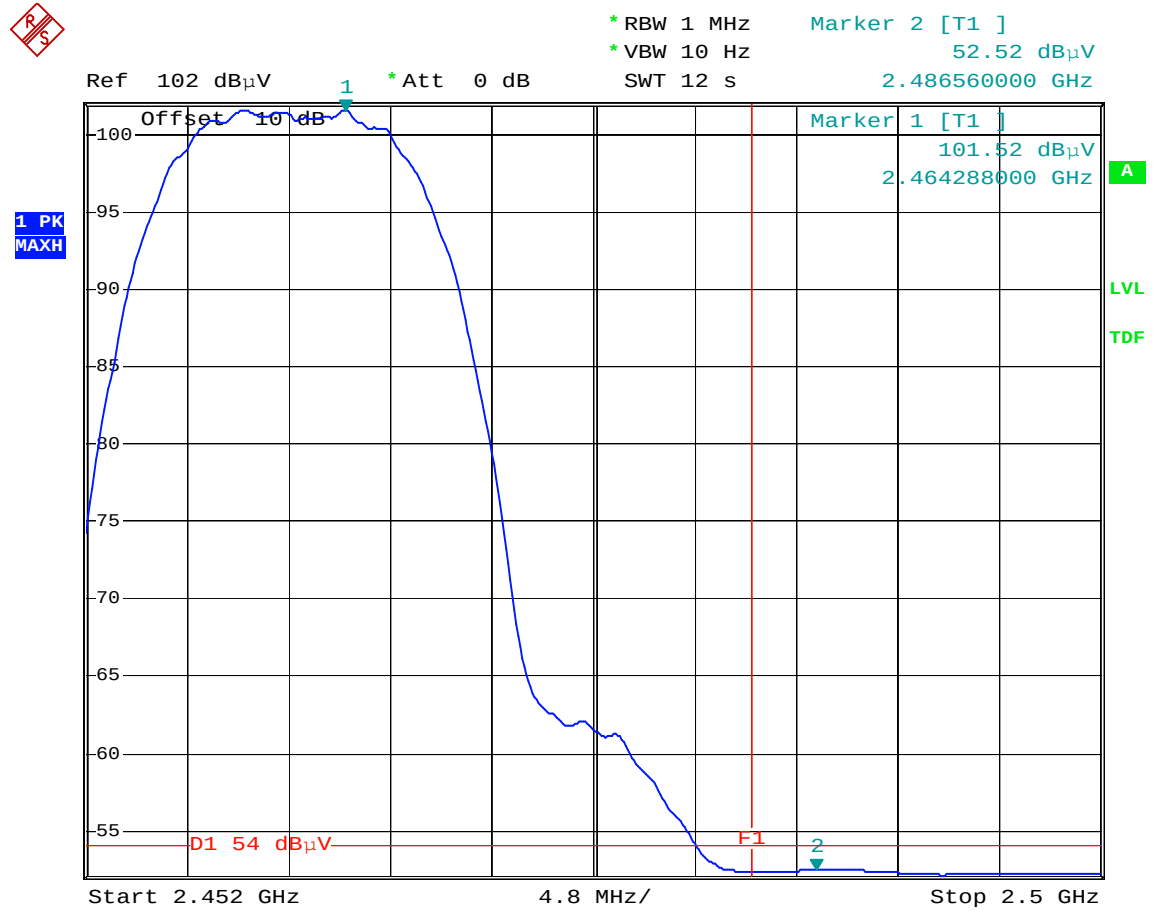
Comment: Band-edge test at low channel

Comment: Average detector F1=2390MHz external Att.=6dB 802.11b

Date: 29.SEP.2004 19:48:35



Comment: Band-edge test at high channel  
 Comment: Peak detector F1=2483.5MHz external Att.=6dB 802.11b  
 Date: 29.SEP.2004 19:58:24

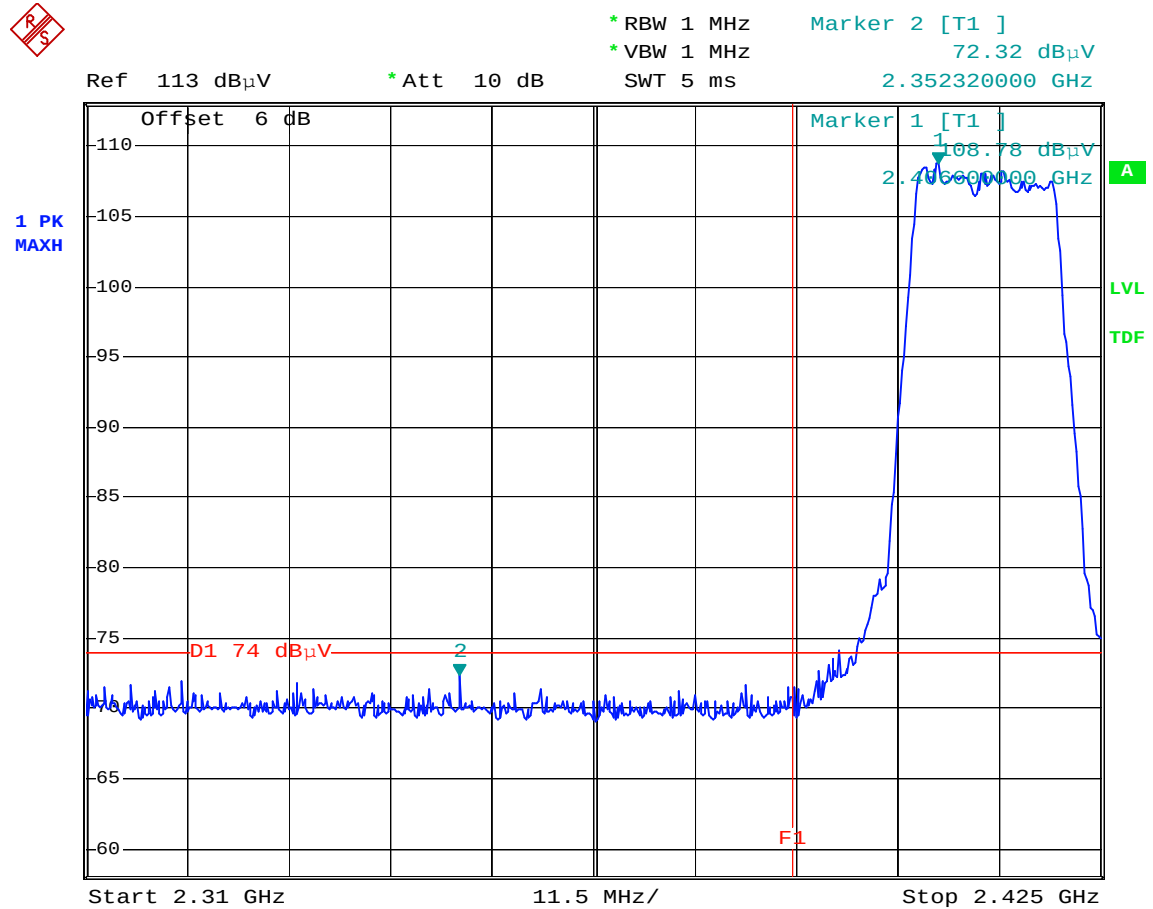


Comment: Band-edge test at high channel

Comment: Average detector F1=2483.5MHz external Att.=10dB 802.11b

Date: 29.SEP.2004 20:05:24

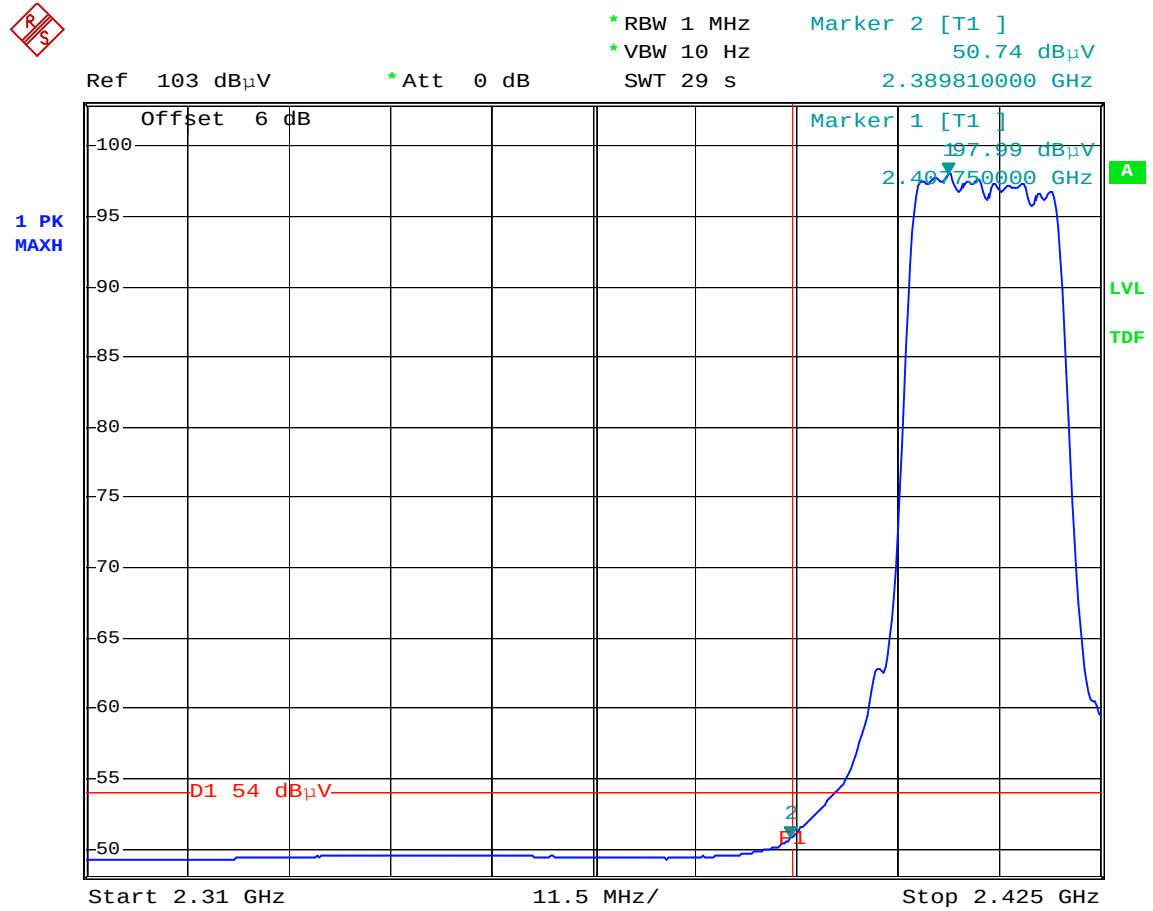
Test Mode: 802.11g operating mode (OFDM Modulation)



Comment: Band-edge test at low channel

Comment: Peak detector F1=2390MHz external Att.=6dB 802.11g

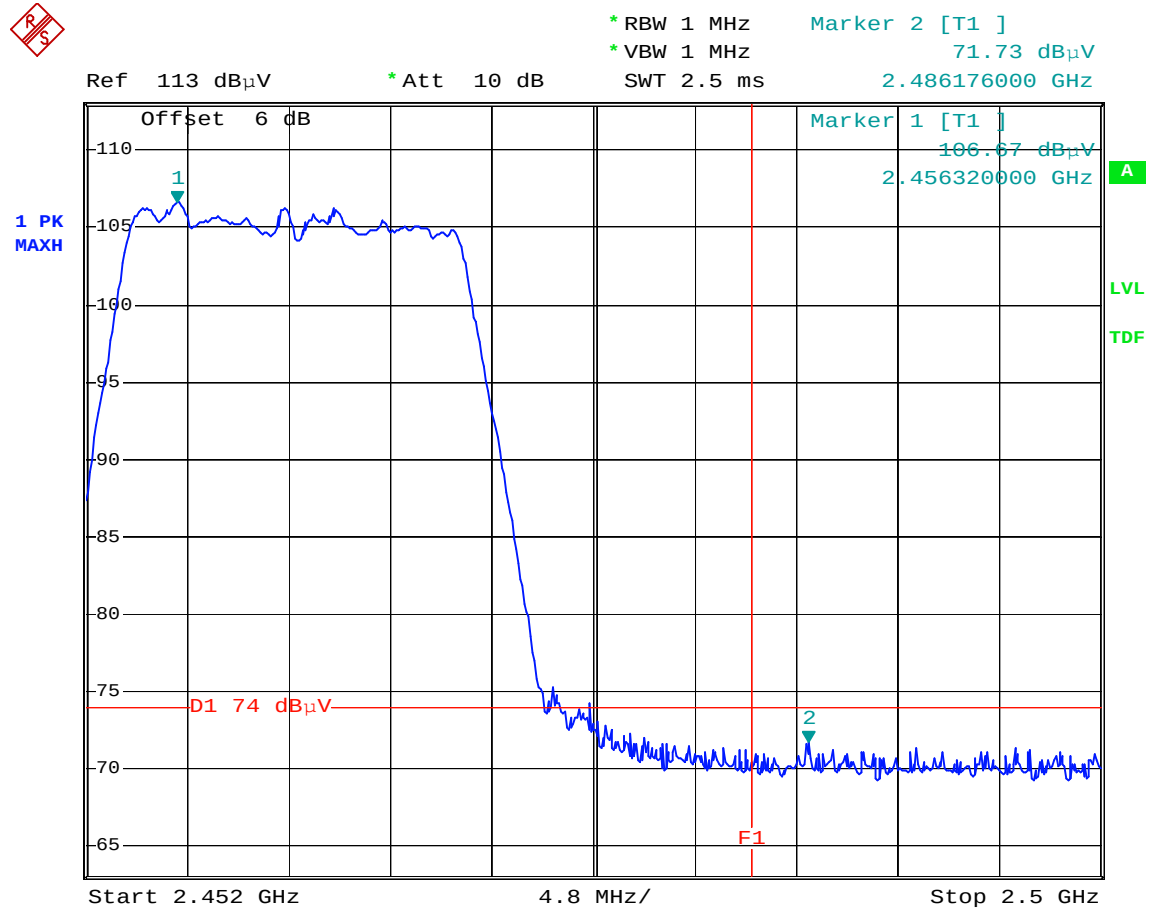
Date: 29.SEP.2004 19:51:26



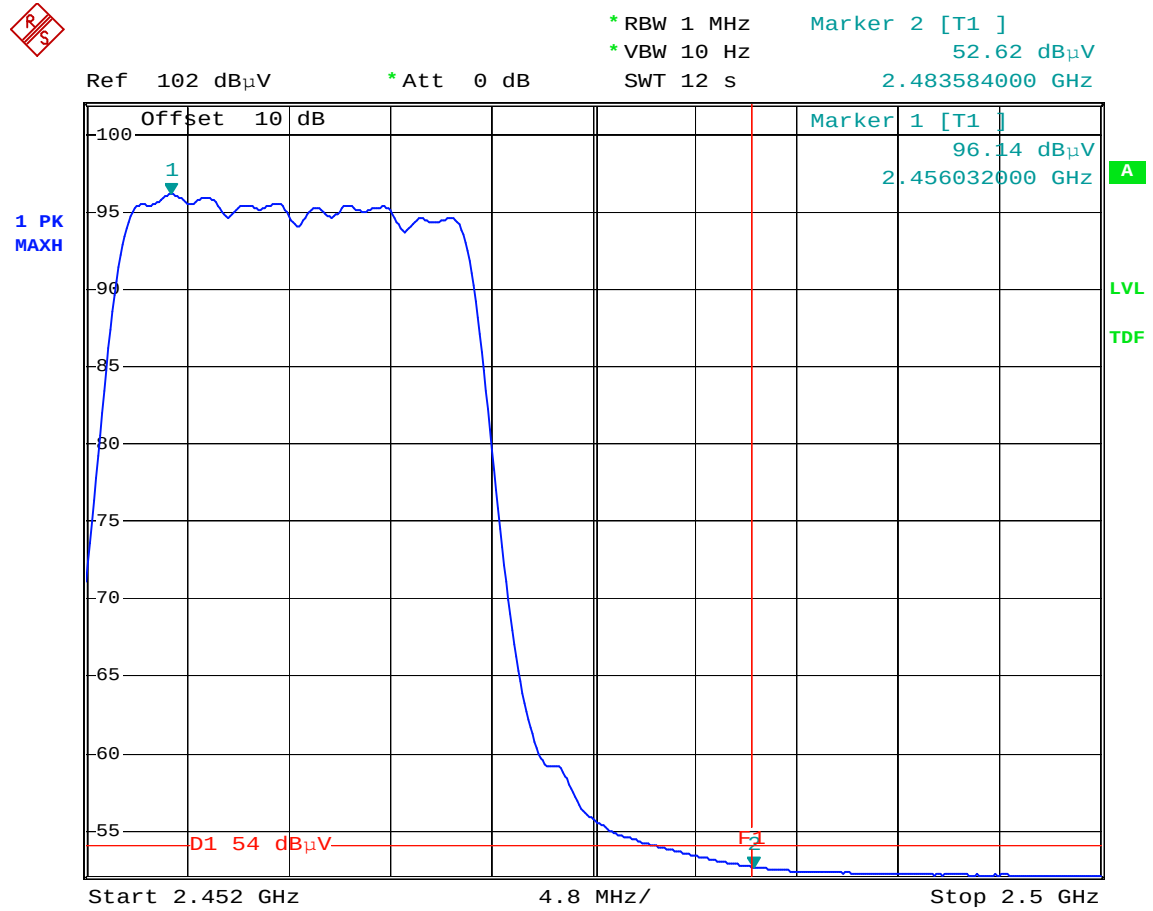
Comment: Band-edge test at low channel

Comment: Average detector F1=2390MHz external Att.=6dB 802.11g

Date: 29.SEP.2004 19:53:33



Comment: Band-edge test at high channel  
 Comment: Peak detector F1=2483.5MHz external Att.=6dB 802.11g  
 Date: 29.SEP.2004 20:10:27



Comment: Band-edge test at high channel

Comment: Average detector F1=2483.5MHz external Att.=10dB 802.11g

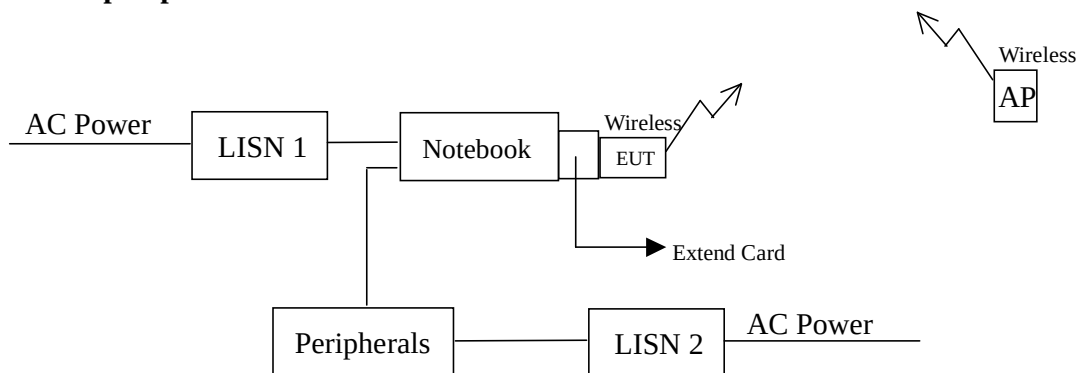
Date: 29.SEP.2004 20:07:47

## 8. Power Line Conducted Emission test §FCC 15.207

### 8.1 Operating environment

|                      |      |     |               |
|----------------------|------|-----|---------------|
| Temperature:         | 23   | °C  | (10-40°C)     |
| Relative Humidity:   | 55   | %   | (10-90%)      |
| Atmospheric Pressure | 1023 | hPa | (860-1061hPa) |

### 8.2 Test setup & procedure



The EUT are connected to the main power through a line impedance stabilization network (LISN). This provides a 50 ohm/50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination.

Both sides (Line and Neutral) of AC line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4/2003 on conducted measurement. The bandwidth of the field strength meter (R & S Test Receiver ESCS 30) is set at 9kHz.

The EUT configuration please refer to the “Conducted set-up photo.pdf”.

### 8.3 Emission limit

| Freq.<br>(MHz) | Conducted Limit (dBuV) |          |
|----------------|------------------------|----------|
|                | Q.P.                   | Ave.     |
| 0.15~0.50      | 66 – 56*               | 56 – 46* |
| 0.50~5.00      | 56                     | 46       |
| 5.00~30.0      | 60                     | 50       |

\*Decreases with the logarithm of the frequency.

### 8.4 Uncertainty of Conducted Emission

Expanded uncertainty (k=2) of conducted emission measurement is  $\pm 2.6$  dB.

## 8.5 Power Line Conducted Emission test data

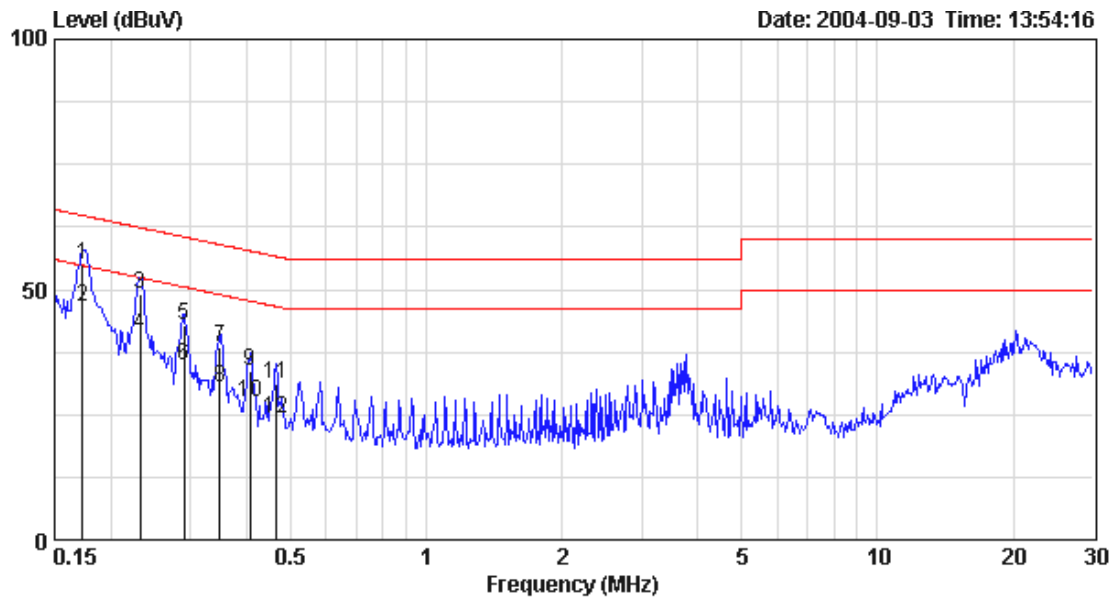
The test was performed the 802.11b and 802.11g normal operating modes, the worst case was occurred in 802.11g normal operating mode.

Phase : Line  
 EUT : GLM-100  
 Worst Case Condition : 802.11g normal operating mode with Antenna 2

| Frequency<br>(MHz) | Corr.<br>Factor<br>(dB) | Level        | Limit        | Level        | Limit        | Margin     |            |
|--------------------|-------------------------|--------------|--------------|--------------|--------------|------------|------------|
|                    |                         | Qp<br>(dBuV) | Qp<br>(dBuV) | AV<br>(dBuV) | Av<br>(dBuV) | Qp<br>(dB) | Av<br>(dB) |
| 0.173              | 0.10                    | 55.05        | 64.81        | 46.40        | 54.81        | -9.76      | -8.41      |
| 0.232              | 0.10                    | 49.03        | 62.36        | 41.19        | 52.36        | -13.33     | -11.17     |
| 0.291              | 0.10                    | 43.03        | 60.51        | 34.88        | 50.51        | -17.48     | -15.63     |
| 0.349              | 0.10                    | 38.38        | 58.98        | 30.48        | 48.98        | -20.60     | -18.50     |
| 0.406              | 0.10                    | 33.62        | 57.73        | 27.62        | 47.73        | -24.11     | -20.11     |
| 0.465              | 0.10                    | 30.97        | 56.60        | 24.11        | 46.60        | -25.63     | -22.49     |

Remark:

1. Correction Factor (dB)= LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Level (dBuV) – Limit (dBuV)



Phase : Neutral

EUT : GLM-100

Worst Case Condition : 802.11g normal operating mode with Antenna 2

| Frequency<br>(MHz) | Corr.<br>Factor<br>(dB) | Level        | Limit        | Level        | Limit        | Margin |        |
|--------------------|-------------------------|--------------|--------------|--------------|--------------|--------|--------|
|                    |                         | Qp<br>(dBuV) | Qp<br>(dBuV) | Av<br>(dBuV) | Av<br>(dBuV) | Qp     | Av     |
| 0.177              | 0.10                    | 52.79        | 64.61        | 44.50        | 54.61        | -11.82 | -10.11 |
| 0.234              | 0.10                    | 48.13        | 62.29        | 39.29        | 52.29        | -14.16 | -13.00 |
| 0.293              | 0.10                    | 41.12        | 60.44        | 32.60        | 50.44        | -19.32 | -17.84 |
| 0.352              | 0.10                    | 38.33        | 58.92        | 29.86        | 48.92        | -20.59 | -19.06 |
| 0.409              | 0.10                    | 33.26        | 57.66        | 25.24        | 47.66        | -24.40 | -22.42 |
| 0.469              | 0.10                    | 31.05        | 56.54        | 22.51        | 46.54        | -25.49 | -24.03 |

Remark:

1. Correction Factor (dB)= LISN Factor (dB) + Cable Loss (dB)

2. Margin (dB) = Level (dBuV) – Limit (dBuV)

