# ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT

*OF*

**G-Star Bluetooth Dongle**

**MODEL No.: GC-10202-01**

**BRAND NAME: G-Star**

**FCC ID: QP5GC-10202-01**

**REPORT NO: 020074-RF-ID**

**ISSUE DATE: Oct. 29, 2002**

*Prepared for*

**G-Star Communications Inc.**
**No. 69-10,5F,Sec.2,Chung Cheng East RD.,**
**Tamshui,Taipei Hsien,Taiwan.**

*Prepared by*

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# VERIFICATION OF COMPLIANCE

| | |
|---|---|
| **Applicant:** | **G-Star Communications Inc.**<br>**No. 69-10, 5F, Sec.2, Chung Cheng East Rd.,**<br>**Tamshui, Taipei Hsien, Taiwan.** |
| **Equipment Under Test:** | G-Star Bluetooth Dongle |
| **BRAND NAME:** | G-Star |
| **MODEL No.:** | GC-10202-01 |
| **Serial Number:** | N/A |
| **File Number:** | 020074-RF-ID |
| **Date of test:** | Oct 14 ~ Oct. 28, 2002 |

## We hereby certify that:

The above equipment was tested by C&C Laboratory Co., Ltd. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4 (1992) and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.

The test results of this report relate only to the tested sample identified in this report.

***Approved By***

**Vincent Su / RF Dept. Vice Manager**
**C&C Laboratory Co., Ltd**

# Table of Contents

# GENERAL INFORMATION

## 1.1 Product Description

The G-Star Communications Inc. Model: GC-10202-01 (referred to as the EUT in this report) is a USB Bluetooth transceiver.

The EUT is compliance with Bluetooth Standard.

A major technical descriptions of EUT is described as following:

A). Operation Frequency: 2402 – 2480MHz 79 channels

B). Modulation type: Frequency Hopping Sequence Spread Spectrum (FHSS)

C). Antenna Designation: Non-User Replaceable (Fixed)

D). Power Supply: 5Vdc via USB port of Notebook PC.

E). Receiver type: Super heterodyne

## 1.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: QP5GC-10202-01 filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules. The composite system (receiver) is compliance with Subpart B is authorized under a Doc procedure.

## 1.3 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4 (1992). Radiated testing was performed at an antenna to EUT distance 3 meters.

## 1.4 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located on the address of C&C Laboratory, Co., Ltd. No. 81-1, 210 Lane, Pa-de 2nd Road, Lu-Chu Hsiang, Taoyuan, Taiwan, R.O.C.. The Open Area Test Sites and the Line Conducted labs are constructed and calibrated to meet the FCC requirements in documents ANSI C63.4: 1992 and CISPR 22/EN 55022 requirements.

## 1.5 Special Accessories

Not available for this EUT intended for grant.

## 1.6 Equipment Modifications

Not available for this EUT intended for grant.

# 2. SYSTEM TEST CONFIGURATION

## 2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

## 2.2 EUT Exercise

The EUT (Transmitter) was operated in the engineering mode to fix the Tx frequency which was for the purpose of the measurements.

## 2.3 Test Procedure

### 2.3.1 Conducted Emissions

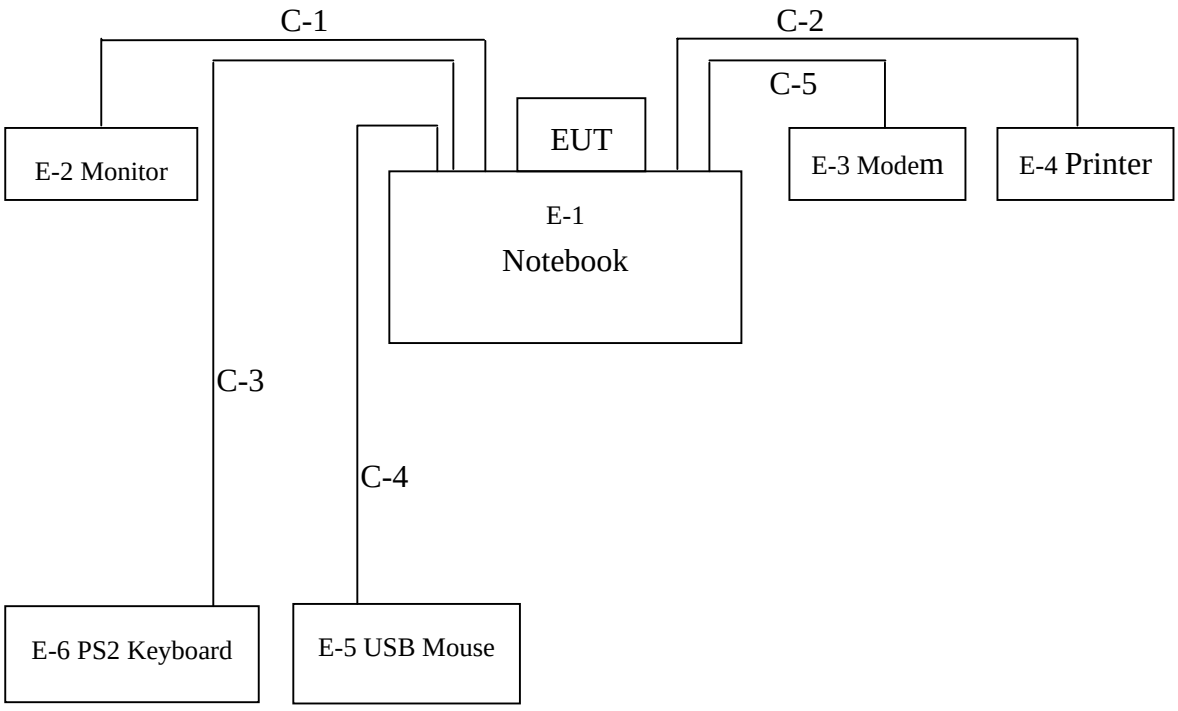
The EUT is a placed on as turn table which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.4-1992.Conducted emissions from the EUT measured in the **frequency range between 0.15 MHz and 30MHz** using **CISPR Quasi-Peak and Average detector mode**.

### 2.3.2 Radiated Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter(EUT) was rotated through three orthogonal axes according to the requirements in Section 13.1.4.1 of ANSI C63.4-1992.

## 2.4 Configuration of Tested System

Fig. 2-1 Configuration of Tested System



## Table 2-1 Equipment Used in Tested System

| Item | Equipment | Mfr/Brand | Model/Type No. | FCC ID | Series No. | Note |
|---|---|---|---|---|---|---|
| E-1 | Notebook | LEO | M285 | DOC | N/A | |
| E-2 | MONITOR | SONY | CPD-G200 | DOC | 2715884 | |
| E-3 | MODEM | Computer Peripherals | 2400 | DK467GSM24 | 94-364-176273 | |
| E-4 | PRINTER | EPSON | STYLUS C20SX | DOC | DW4E126664 | |
| E-5 | USB-MOUSE | LOGITECH | M-BB48 | DOC | LZE2250259 | |
| E-6 | PS2 KEYBORAD | COMPAQ | SK-2800C | GYUR79SK | B1C790BCPJ73JQ | |

## Table 2-2 Information of Interface Cable

| Item | I/O Cable | Device Connected | Shielded Type | Ferrite Core | Detachable/ Permanently | Length | Note |
|---|---|---|---|---|---|---|---|
| C-1 | Video Cable | Notebook-PC | Yes | Yes | Permanently attached on Monitor | 150cm | |
| C-2 | Centronics Cable | PC-Printer | Yes | No | Part of Printer, Detachable | 200cm | |
| C-3 | Keyboard Cable | PC-Keyboard | Yes | No | Permanently attached on Keyboard | 200cm | |
| C-4 | Mouse Cable | PC-Mouse | Yes | No | Permanently attached on Mouse | 180cm | |
| C-5 | Interface Cable | PC-Modem | Yes | No | Permanently attached on Mouse | 180cm | |

Note:

(1) Unless otherwise marked as ※ in『Remark』column, Neutron consigns the support equipment to the tested system.
(2) For detachable type I/O cable should be specified the length in cm in『Length』column.

# 3. SUMMARY OF TEST RESULTS

| FCC Rules | Description Of Test | Result |
|---|---|---|
| §15.207(a) | Conducted Emission | Compliant |
| §15.247(b) | Peak Output Power | Compliant |
| §15.247(a)(1)(ii) | 20dB Bandwidth | Compliant |
| §15.247(c) | 100 KHz Bandwidth Of Frequency Band Edges | Compliant |
| §15.209(a) (f) | Spurious Emission | Compliant |
| §15.247(a)(1) | Frequency Separation | Compliant |
| §15.247(a)(1)(ii) | Number of hopping frequency | Compliant |
| §15.247(a)(1)(ii) | Time of Occupancy | Compliant |
| §15.247 | Peak Power Density | Compliant |
| §15.203 | Antenna Requirement | Compliant |
| §1.1310 | RF Exposure | Compliant |

# 4. DESCRIPTION OF TEST MODES

The EUT (G-Star Bluetooth Dongle) has been tested under operating condition.
Software used to control the EUT for staying in continuous transmitting and receiving mode is programmed.
Channel low (2402MHz)、mid (2441MHz) and high (2480MHz) with 741k highest data rate are chosen for testing.

# 5. CONDUCTED EMISSION TEST

## 5.1 Standard Applicable

According to §15.207. frequency within 450KHz to 30MHz shall not exceed

| Frequency range MHz | Limits dB(uV) | |
|---|---|---|
| | **Quasi-peak** | **Average** |
| 0.15 to 0.50 | **66 to 56** | **56 to 46** |
| 0.50 to 5 | **56** | **46** |
| 5 to 30 | **60** | **50** |

Note
1.The lower limit shall apply at the transition frequencies
2.The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

## 5.2 EUT Setup

1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.4-1992.
2. The EUT was plug-in the host PC via USB port. The host PC system was placed on the center of the back edge on the test table. The peripherals like modem, monitor printer, K/B, and mouse were placed on the side of the host PC system. The rear of the EUT and peripherals were placed flushed with the rear of the tabletop.
3. The keyboard was placed directly in the front of the monitor, flushed with the front tabletop. The mouse was placed next to the Keyboard, flushed with the back of keyboard.
4. The spacing between the peripherals was 10 centimeters.
5. External I/O cables were draped along the edge of the test table and bundle when necessary.
6. The host PC system was connected with 110Vac/60Hz power source.

## 5.3 Measurement Procedure

1. The EUT was placed on a table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

## 5.4 Measurement Equipment Used:

| Conducted Emission Test Site # 3 | | | | | |
|---|---|---|---|---|---|
| **EQUIPMENT TYPE** | **MFR** | **MODEL NO.** | **SERIAL NO.** | **LAST CAL.** | **CAL DUE.** |
| EMI Test Receiver | R&S | ESCS30 | 847793/012 | 12/19/2001 | 12/18/2002 |
| LISN | R&S | ESH2-Z5 | 843285/010 | 12/10/2001 | 12/09/2002 |
| LISN | EMCO | 3825/2 | 9003-1628 | 07/26/2002 | 07/25/2003 |
| Spectrum Analyzer | ADVANTEST | R3261C | 71720533 | 08/06/2002 | 08/05/2003 |
| 2X2 WIRE ISN | R&S | ENY22 | 100020 | 06/20/2002 | 06/19/2003 |
| FOUR WIRE ISN | R&S | ENY41 | 100006 | 06/20/2002 | 06/19/2003 |

## 5.5 Measurement Result

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the following data page, and these signals are then quasi-peaked.

# LINE CONDUCTED TEST

**Model Number:** GC-10202-01 **Tested by:** Robin Chen

**Test Mode:** TX +RX **Detector Function:** Quasi-Peak

**Temperature:** $33^0$C **Humidity:** 65%RH

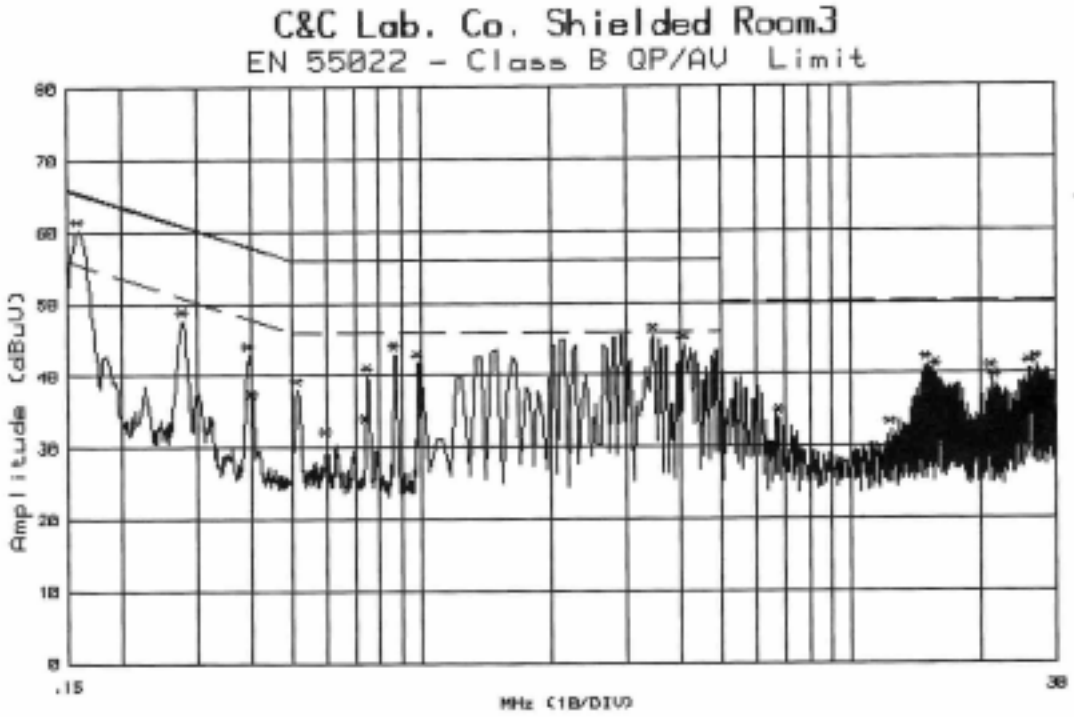
(The chart below shows the highest readings taken from the final data)

| FREQ | Q.P. | AVG | Q.P. | AVG | Q.P. | AVG | NOTE |
|---|---|---|---|---|---|---|---|
| MHz | Raw dBuV | Raw dBuV | Limit dBuV | Limit dBuV | Margin dB | Margin dB | |
| 0.160 | 60.80 | 31.50 | 65.46 | 55.46 | -4.66 | -23.96 | L1 |
| 0.279 | 47.60 | --- | 60.85 | 50.85 | -13.25 | --- | L1 |
| 0.279 | 42.80 | --- | 60.85 | 50.85 | -18.05 | --- | L1 |
| 0.752 | 39.80 | --- | 56.00 | 46.00 | -16.20 | --- | L1 |
| 0.870 | 42.80 | --- | 56.00 | 46.00 | -13.20 | --- | L1 |
| 3.486 | 45.40 | --- | 56.00 | 46.00 | -10.60 | --- | L1 |
| | | | | | | | |
| 0.159 | 60.80 | 32.30 | 65.52 | 55.52 | -4.72 | -23.22 | L2 |
| 0.279 | 49.00 | --- | 60.85 | 50.85 | -11.85 | --- | L2 |
| 0.398 | 43.20 | --- | 57.90 | 47.90 | -14.70 | --- | L2 |
| 0.744 | 33.80 | --- | 56.00 | 46.00 | -22.20 | --- | L2 |
| 0.869 | 41.60 | --- | 56.00 | 46.00 | -14.40 | --- | L2 |
| 0.985 | 43.80 | --- | 56.00 | 46.00 | -12.20 | --- | L2 |

L1 = Line One (Hot side) / L2 = Line Two (Neutral side)

****NOTE: "---" denotes the emission level was or more than 2dB below the Average limit, so no re-check anymore.**

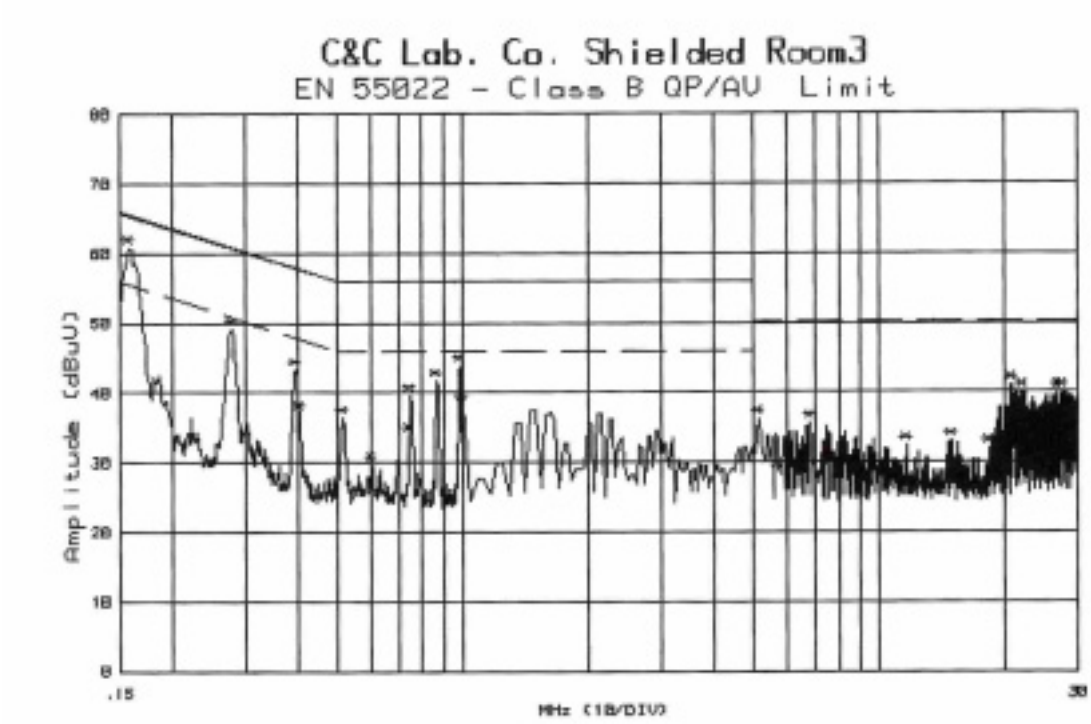
# Conducted Emission Test Plot L1




Customer:G-STAR File#: 2503 Date :30 Oct 2002 14:07:46
Model :1 Humd.:68 (%) Temp. :26 (C)
Mode : Port :L1 Tested by:ROBIN
Reading :Peak(R3261C SPA)
Remark :110V

| No. | Freq. (MHz) | Reading (dBuV) | I_Loss (dB) | Total (dBuV) | QP.Lmt (dBuV) | Margin (dB) | Warning Mark |
|---|---|---|---|---|---|---|---|
| 1 | .160 | 59.9 | .3 | 60.2 | 65.5 | -5.3 | |
| 2 | .279 | 47.1 | .5 | 47.6 | 60.9 | -13.3 | |
| 3 | .398 | 42.4 | .4 | 42.8 | 57.9 | -15.1 | |
| 4 | .405 | 35.8 | .4 | 36.2 | 57.8 | -21.6 | |
| 5 | .517 | 37.6 | .4 | 38.0 | 56.0 | -18.0 | |
| 6 | .601 | 30.6 | .4 | 31.0 | 56.0 | -25.0 | |
| 7 | .744 | 32.4 | .4 | 32.8 | 56.0 | -23.2 | |
| 8 | .752 | 39.4 | .4 | 39.8 | 56.0 | -16.2 | |
| 9 | .870 | 42.4 | .4 | 42.8 | 56.0 | -13.2 | |
| 10 | .985 | 41.2 | .4 | 41.6 | 56.0 | -14.4 | |
| 11 | 3.486 | 45.1 | .3 | 45.4 | 56.0 | -10.6 | |
| 12 | 4.107 | 43.5 | .5 | 44.0 | 56.0 | -12.0 | |
| 13 | 6.841 | 33.3 | .5 | 33.8 | 60.0 | -26.2 | |
| 14 | 12.434 | 31.7 | .5 | 32.2 | 60.0 | -27.8 | |

# Conducted Emission Test Plot L2




Customer:G-STAR File#: 2505 Date :30 Oct 2002 14:13:54
Model :1 Humd.:68 (%) Temp. :26 (C)
Mode : Port :L2 Tested by:ROBIN
Reading :Peak(R3261C SPA)
Remark :110V

| No. | Freq. (MHz) | Reading (dBuV) | I_Loss (dB) | Total (dBuV) | QP.Lmt (dBuV) | Margin (dB) | Warning Mark |
|---|---|---|---|---|---|---|---|
| 1 | .159 | 60.5 | .3 | 60.8 | 65.5 | -4.7 | |
| 2 | .279 | 48.5 | .5 | 49.0 | 60.9 | -11.9 | |
| 3 | .398 | 42.8 | .4 | 43.2 | 57.9 | -14.7 | |
| 4 | .405 | 36.6 | .4 | 37.0 | 57.8 | -20.8 | |
| 5 | .514 | 35.9 | .5 | 36.4 | 56.0 | -19.6 | |
| 6 | .605 | 29.1 | .5 | 29.6 | 56.0 | -26.4 | |
| 7 | .744 | 33.3 | .5 | 33.8 | 56.0 | -22.2 | |
| 8 | .751 | 39.1 | .5 | 39.6 | 56.0 | -16.4 | |
| 9 | .869 | 41.1 | .5 | 41.6 | 56.0 | -14.4 | |
| 10 | .985 | 43.3 | .5 | 43.8 | 56.0 | -12.2 | |
| 11 | 1.000 | 37.9 | .5 | 38.4 | 56.0 | -17.6 | |
| 12 | 5.143 | 35.8 | .4 | 36.2 | 60.0 | -23.8 | |
| 13 | 6.841 | 35.2 | .4 | 35.6 | 60.0 | -24.4 | |
| 14 | 11.647 | 32.1 | .3 | 32.4 | 60.0 | -27.6 | |

# 6. PEAK OUTPUT POWER MEASUREMENT

## 6.1 Standard Applicable

According to §15.247(b)(2), for direct sequence systems, the maximum peak output power of the intentional radiator shall not exceed 1 Watt.

## 6.2 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter or spectrum. (Channel power function, RBW, VBW = 1MHz)
3. Record the max. reading.
4. Repeat above procedures until all frequency measured were complete.

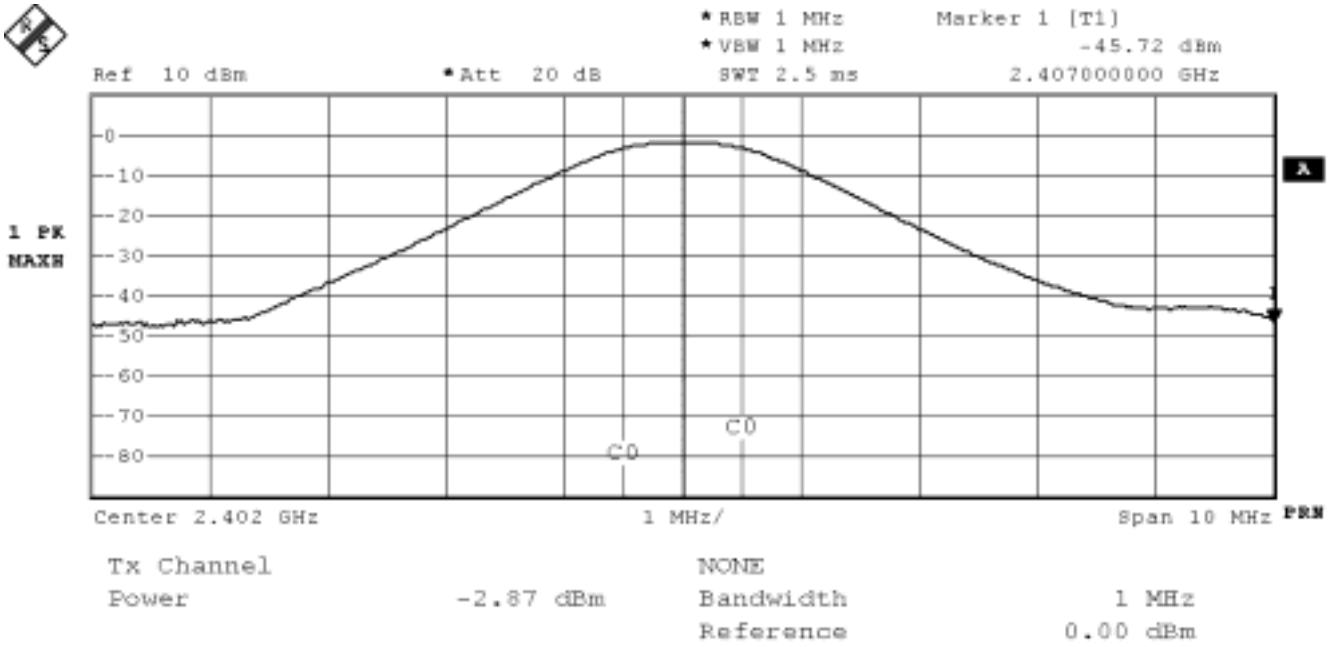
## 6.3 Measurement Result

| CH | Frequency (MHz) | Reading Power | Cabble Loss | Output Power dBm | Output Power W | Limit (W) |
|---|---|---|---|---|---|---|
| LOWER (2402MHz) | 2402.00 | -2.87 | 0.56 | -2.31 | 0.00059 | 1 |
| MID (2441MHz) | 2441.00 | -4.80 | 0.56 | -4.24 | 0.00038 | 1 |
| HIGHER (2480MHz) | 2480.00 | -4.92 | 0.56 | -4.36 | 0.00037 | 1 |

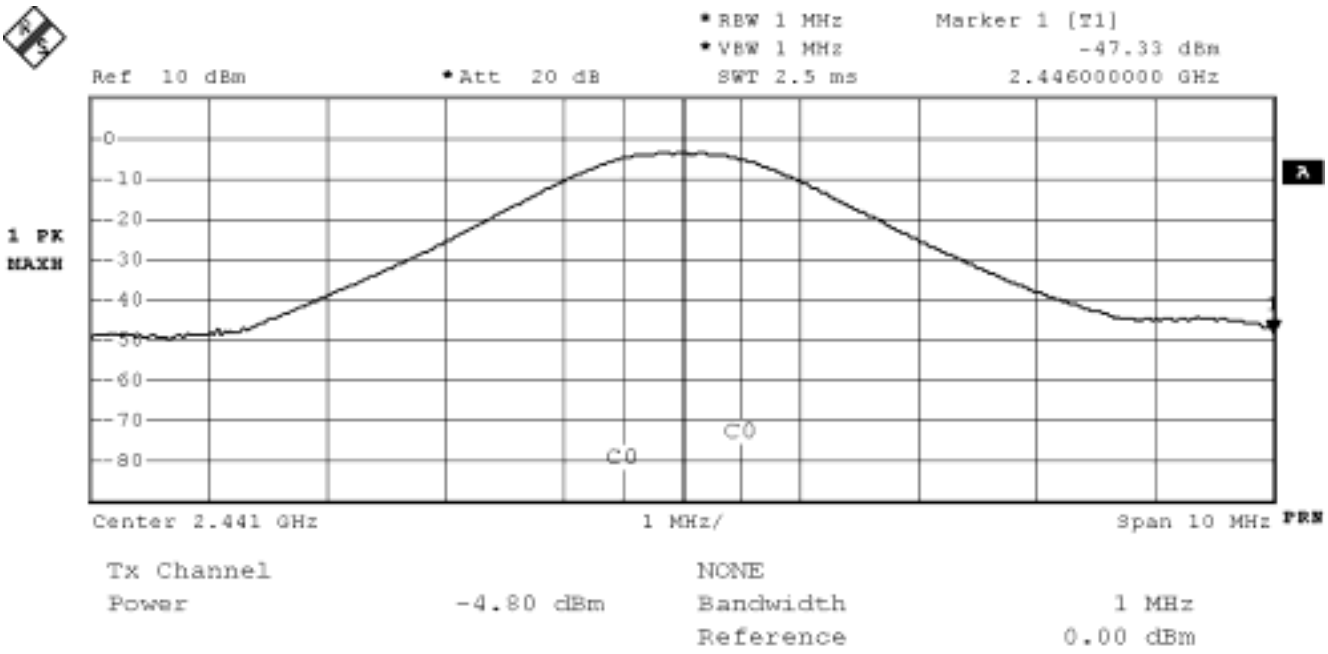
## 6.4 Measurement Equipment Used:

| EQUIPMENT TYPE | MFR | Model No. | Serial No. | LAST CAL. | Cal. Due. |
|---|---|---|---|---|---|
| Power Meter | HP | 436A | 2709A29027 | 03/16/2002 | 03/15/2003 |
| Power Sensor | HP | 8481A | 2702A61366 | 03/16/2002 | 03/15/2003 |
| Spectrum Analyzer | R&S | FSP30 | 1093.4495.30 | 07/23/2002 | 07/22/2003 |
| low loss cable | Huber + Suhner | Sucoflex 104 | N/A | N/A | N/A |

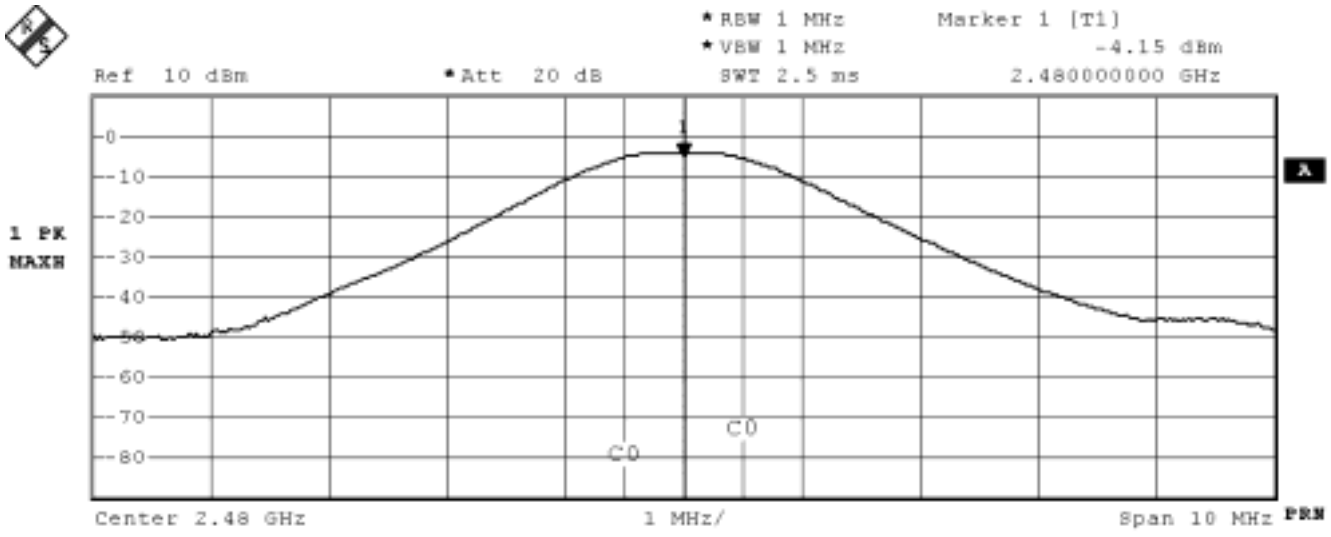
# Peak Power Output Data Plot (CH Low)



# Peak Power Output Data Plot (CH Mid)



# Peak Power Output Data Plot (CH High)




| | | | |
|---|---|---|---|
| Tx Channel | | NONE | |
| Power | -4.92 dBm | Bandwidth | 1 MHz |
| | | Reference | 0.00 dBm |

# 7. 20dB BAND WIDTH

## 7.1 Standard Applicable

According to §15.247(a)(1)(ii), Frequency hopping systems operating in the 2400MHz-2483.5 MHz and 5725MHz – 5850MHz bands. The Maximum 20dB bandwidth of the hopping channel is 1MHz.

## 7.2 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW=10KHz (1 % of Bandwidth.), Span= 5MHz, Sweep=auto
4. Mark the peak frequency and –20dB (upper and lower) frequency.
5. Repeat above procedures until all frequency measured were complete.

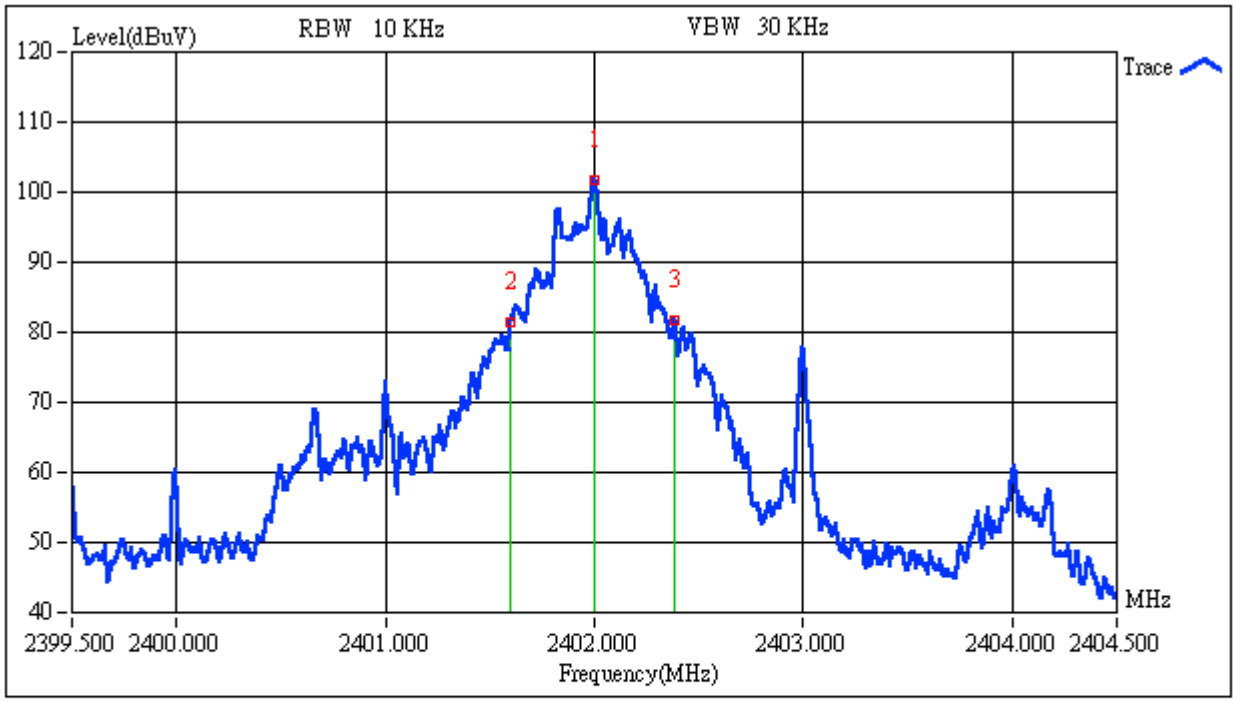
## 7.3 Measurement Result

| CH | Upper Frequency (MHz) | Lower Frequency (MHz) | Bandwidth (MHz) | Bandwidth Limit (MHz) | Result |
|---|---|---|---|---|---|
| Lower | 2402.38 | 2401.60 | 0.78 | 1 | PASS |
| Mid | 2441.28 | 2440.60 | 0.68 | 1 | PASS |
| Higher | 2480.38 | 2479.67 | 0.71 | 1 | PASS |

## 7.4 Measurement Equipment Used:

| EQUIPMENT TYPE | MFR | Model No. | Serial No. | LAST CAL. | Cal. Due. |
|---|---|---|---|---|---|
| Spectrum Analyzer | R&S | FSP30 | 1093.4495.30 | 07/23/2002 | 07/22/2003 |
| low loss cable | Huber + Suhner | Sucoflex 104 | N/A | N/A | N/A |

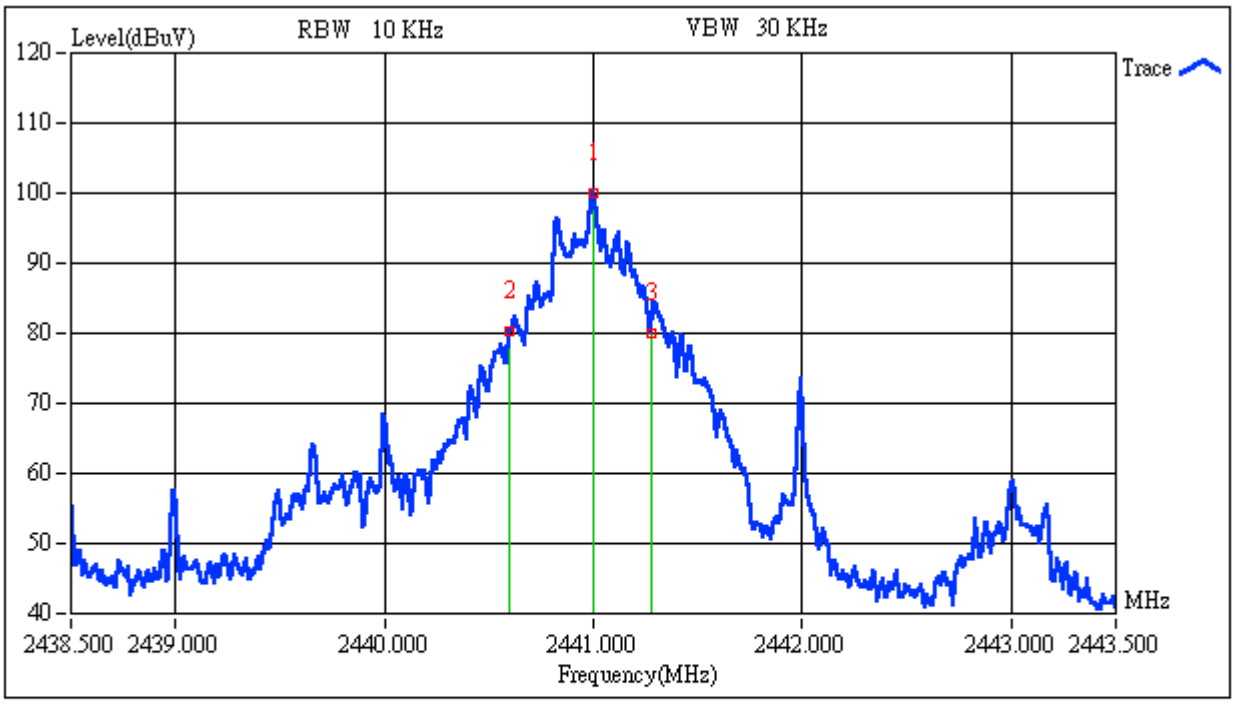
# 20dB Band Width Test Data CH-Low




Custom Name: G-STAR
Engineer:
Model Name: GC-10202-01
Report No.:
Test Mode: CH LOW

Peak 0.00 MHz
0.00 dBuV
Band Width 0.780 MHz
Delta1 2401.60 MHz
81.52 dBuV
Delta2 2402.38 MHz
81.59 dBuV

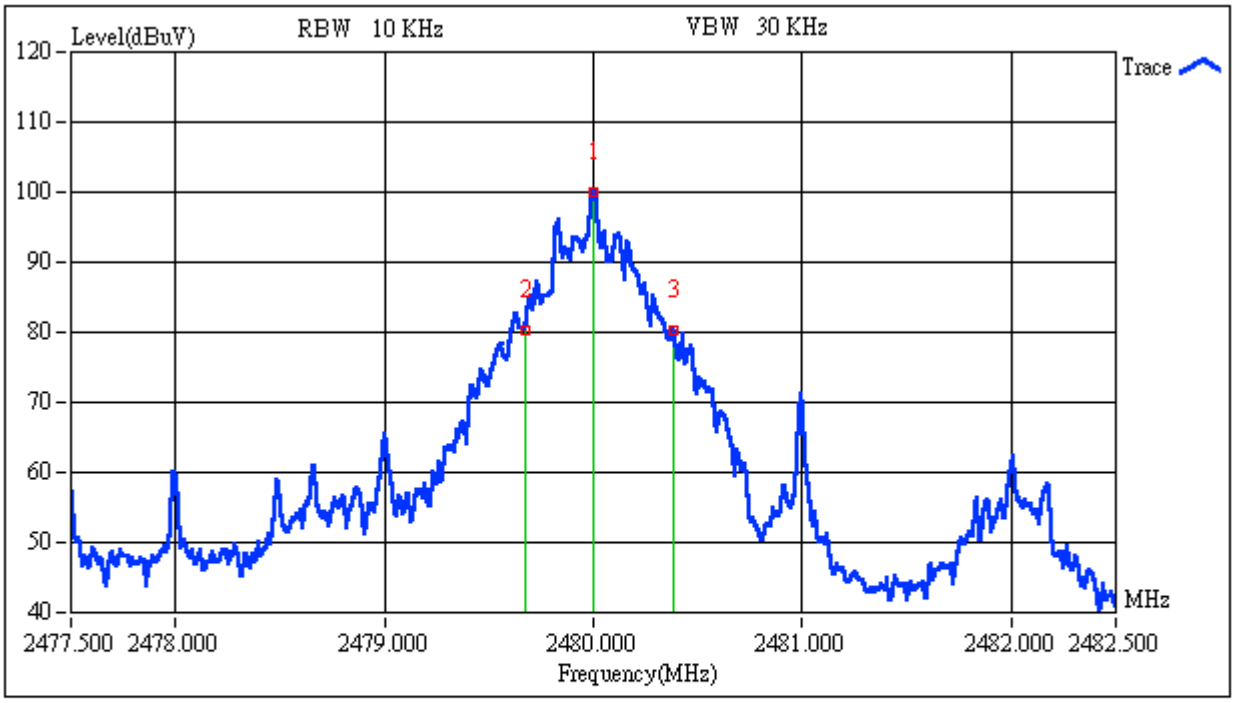
# 20dB Band Width Test Data CH-Mid




Custom Name: G-STAR
Engineer:
Model Name: GC-10202-01
Report No.:
Test Mode: CH LOW

| | | | | |
|---|---|---|---|---|
| Peak | 0.00 MHz | | Band Width | |
| | 0.00 dBuV | | 0.680 MHz | |
| Delta1 | 2440.60 MHz | Delta2 | 2441.28 MHz | |
| | 80.21 dBuV | | 79.88 dBuV | |

# 20dB Band Width Test Data CH-High




Custom Name: G-STAR

Engineer:

Model Name: GC-10202-01

Report No.:

Test Mode: CH LOW

| | | | | |
|---|---|---|---|---|
| Peak | 0.00 MHz | | Band Width | |
| | 0.00 dBuV | | 0.710 MHz | |
| Delta1 | 2479.67 MHz | Delta2 | 2480.38 MHz | |
| | 80.21 dBuV | | 80.15 dBuV | |

# 8. 100KHz BANDWIDTH OF BAND EDGES MEASUREMENT

## 8.1 Standard Applicable

According to §15.247(c), in any 100 KHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100KHz bandwidth within the band that contains 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 in15.209(a).

## 8.2 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set center frequency of spectrum analyzer = operating frequency.
4. Set the spectrum analyzer as RBW,VBW=100KHz, Start = 2.3857GHz, Stop = 2.406GHz or Start = 2.4751GHz, Stop = 2.495GHz,Sweep = auto.
5. Mark Peak ,2.4GHz and 2.4835GHz and record the max. level.
6. Repeat above procedures until all frequency measured were complete.

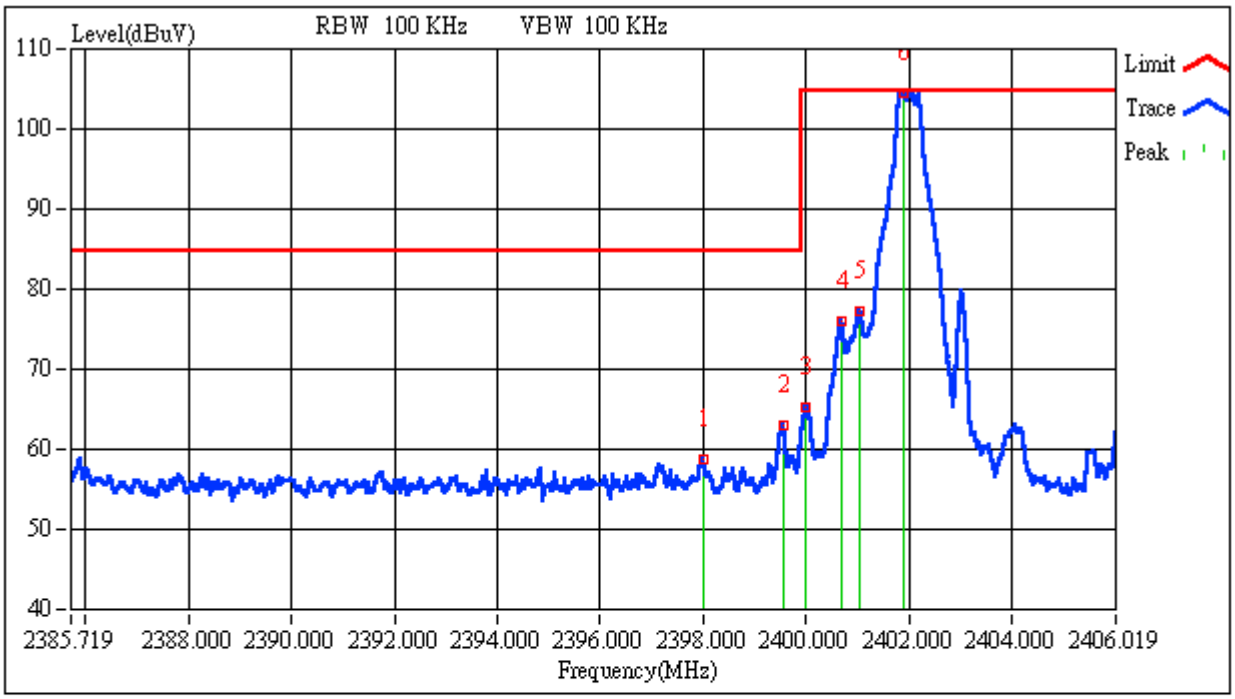
## 8.3 Measurement Result

Refer to attach spectrum analyzer data chart.

## 8.4 Measurement Equipment Used:

| EQUIPMENT TYPE | MFR | Model No. | Serial No. | LAST CAL. | Cal. Due. |
|---|---|---|---|---|---|
| Spectrum Analyzer | R&S | FSP30 | 1093.4495.30 | 07/23/2002 | 07/22/2003 |
| low loss cable | Huber + Suhner | Sucoflex 104 | N/A | N/A | N/A |

# Out of Band Test Data CH-Low




Custom Name: G-STAR

Engineer:

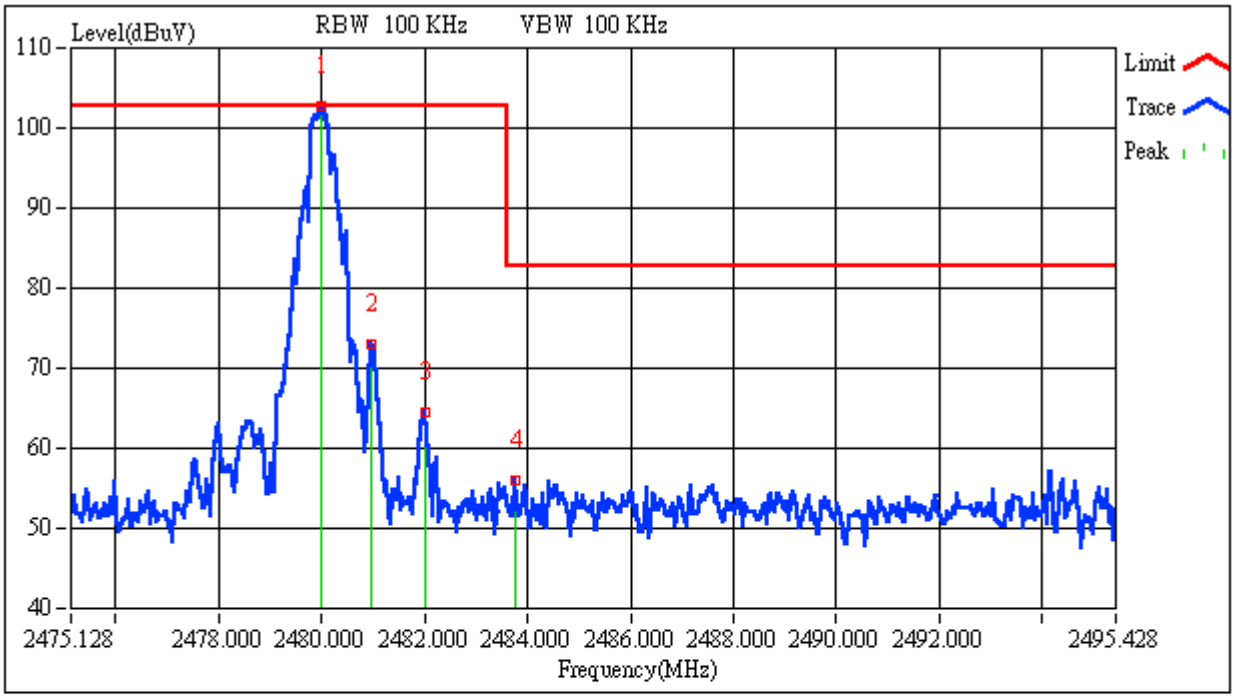
Model Name: GC-10202-01

Report No.:

Test Mode: LOW

| | Frequency(MHz) | Read Level (dBuV) | Probe (dB) | Cable Loss (dB) | Level(dBuV) |
|---|---|---|---|---|---|
| 1 | 2398.0212 | 58.68 | 0.00 | 0.00 | 58.68 |
| 2 | 2399.5640 | 63.10 | 0.00 | 0.00 | 63.10 |
| 3 | 2400.0106 | 65.34 | 0.00 | 0.00 | 65.34 |
| 4 | 2400.7008 | 76.01 | 0.00 | 0.00 | 76.01 |
| 5 | 2401.0256 | 77.15 | 0.00 | 0.00 | 77.15 |

# Out of Band Test Data CH-Low




Custom Name: G-STAR

Engineer:

Model Name: GC-10202-01

Report No.:

Test Mode: HIGH

| | Frequency(MHz) | Read Level (dBuV) | Probe (dB) | Cable Loss (dB) | Level(dBuV) |
|---|---|---|---|---|---|
| 1 | 2480.0000 | 102.84 | 0.00 | 0.00 | 102.84 |
| 2 | 2480.9744 | 72.96 | 0.00 | 0.00 | 72.96 |
| 3 | 2482.0300 | 64.38 | 0.00 | 0.00 | 64.38 |
| 4 | 2483.7758 | 56.09 | 0.00 | 0.00 | 56.09 |
| | | | | | |

# 9. SPURIOUS RADIATED EMISSION TEST

## 9.1 Standard Applicable

According to §15.247(c), all other emissions outside these bands shall not exceed the general radiated emission limits specified in §15.209(a). And according to §15.33(a)(1), for an intentional radiator operates below 10GHz, the frequency range of measurements: to the tenth harmonic of the highest fundamental frequency or to 40GHz, whichever is lower.

## 9.2 EUT Setup

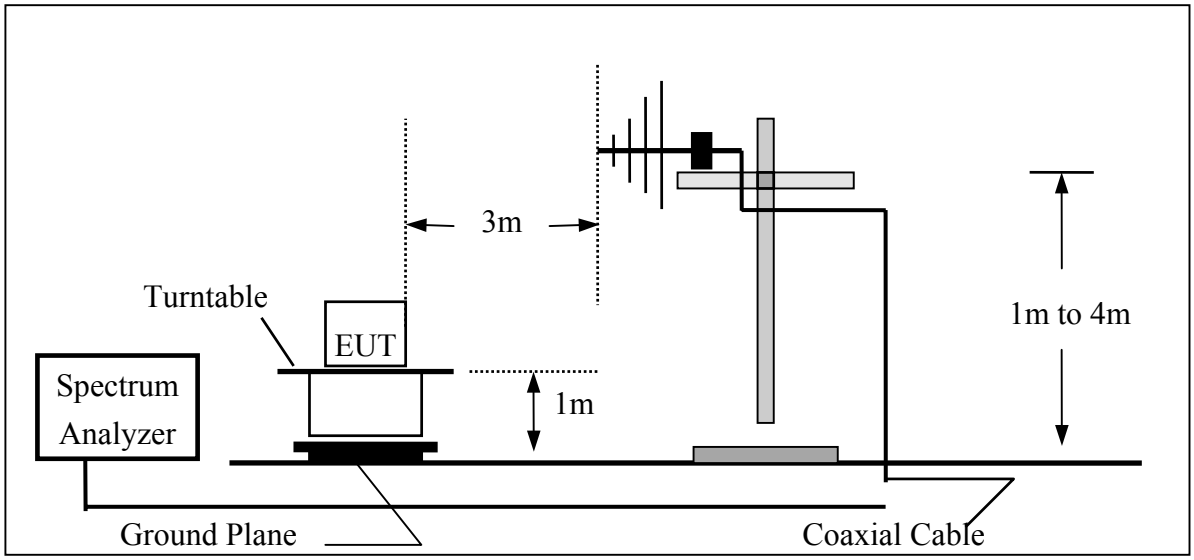
1. The radiated emission tests were performed in the 3 meter open-test site, using the setup in accordance with the ANSI C63.4-1992.
2. The EUT was put in the front of the test table. The host PC system was placed on the center of the back edge on the test table. The peripherals like modem, monitor printer, K/B, and mouse were placed on the side of the host PC system. The rear of the EUT and peripherals were placed flushed with the rear of the tabletop.
3. The keyboard was placed directly in the front of the monitor, flushed with the front tabletop. The mouse was placed next to the Keyboard, flushed with the back of keyboard.
4. The spacing between the peripherals was 10 centimeters.
5. External I/O cables were draped along the edge of the test table and bundle when necessary.
6. The host PC system was connected with 110Vac/60Hz power source.

## 9.3 Measurement Procedure

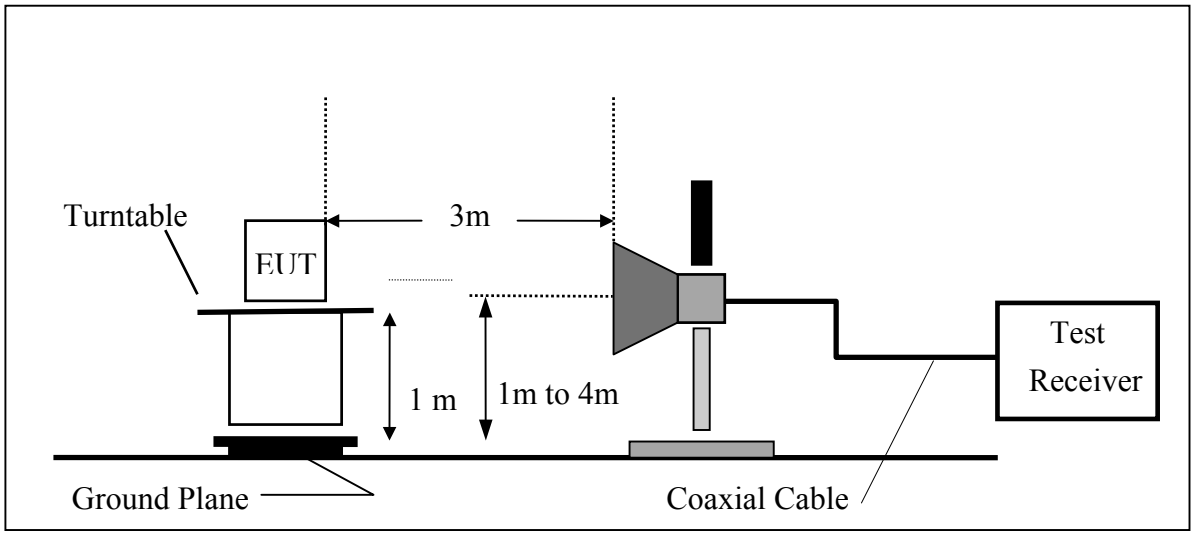
1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until all frequency measured were complete.

## 9.4 Test SET-UP (Block Diagram of Configuration)

(A) Radiated Emission Test Set-Up, Frequency Below 1000MHz




(B) Radiated Emission Test Set-UP Frequency Over 1 GHz



## 9.5 Measurement Equipment Used:

| Open Area Test Site # 3 | | | | | |
|---|---|---|---|---|---|
| **EQUIPMENT TYPE** | **MFR** | **MODEL NUMBER** | **SERIAL NUMBER** | **LAST CAL.** | **CAL DUE.** |
| Spectrum Analyzer | ADVANTEST | R3261A | N/A | 03/19/2002 | 03/18/2003 |
| Spectrum Analyzer | ROHDE & SCHWARZ | FSP30 | 100112 | 06/29/2002 | 06/28/2003 |
| EMI Test Receiver | R&S | ESVS20 | 838804/004 | 01/05/2002 | 01/04/2003 |
| Pre-Amplifier | HP | 8447D | 2944A09173 | 03/04/2002 | 03/03/2003 |
| Bilog Antenna | SCHWAZBECK | VULB9163 | 145 | 07/06/2002 | 07/05/2003 |
| Horn Antenna | SCHWAZBECK | BBHA 9120 | D210 | 2/22/2002 | 2/23/2003 |
| Turn Table | EMCO | 2081-1.21 | 9709-1885 | N.C.R | N.C.R |
| Antenna Tower | EMCO | 2075-2 | 9707-2060 | N.C.R | N.C.R |
| Controller | EMCO | 2090 | 9709-1256 | N.C.R | N.C.R |
| RF Switch | ANRITSU | MP59B | M53867 | N.C.R | N.C.R |
| Site NSA | C&C | N/A | N/A | 11/17/2001 | 11/16/2002 |
| Horn antenna | Schwarzbeck | BBHA 9120 | D210 | 2/24/2002 | 2/23/2003 |
| Pre-Amplifier | HP | 8449B | 3008B00965 | 10/01/2002 | 10/02/2003 |

## 9.6 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor(if any) from the measured reading. The basic equation with a sample calculation is as follows:

**FS = RA + AF + CL - AG**

| | | |
|---|---|---|
| Where | FS = Field Strength | CL = Cable Attenuation Factor (Cable Loss) |
| | RA = Reading Amplitude | AG = Amplifier Gain |
| | AF = Antenna Factor | |

## 9.7 Measurement Result

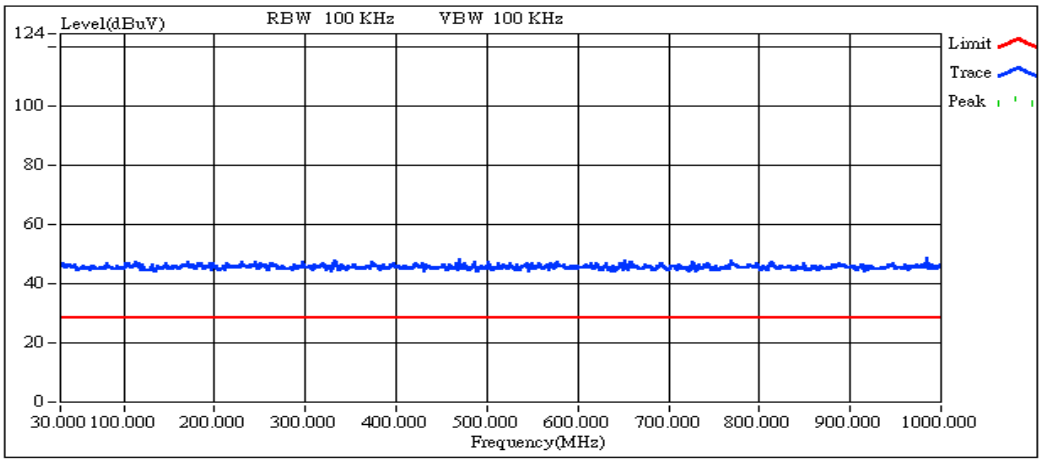
Refer to attach tabular data sheets.

**NOTE:**

The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 100kHz for Peak detection (PK) and Quasi-peak detection (QP) at frequency below 1GHz.

# Conducted Spurious Emission Measurement Result

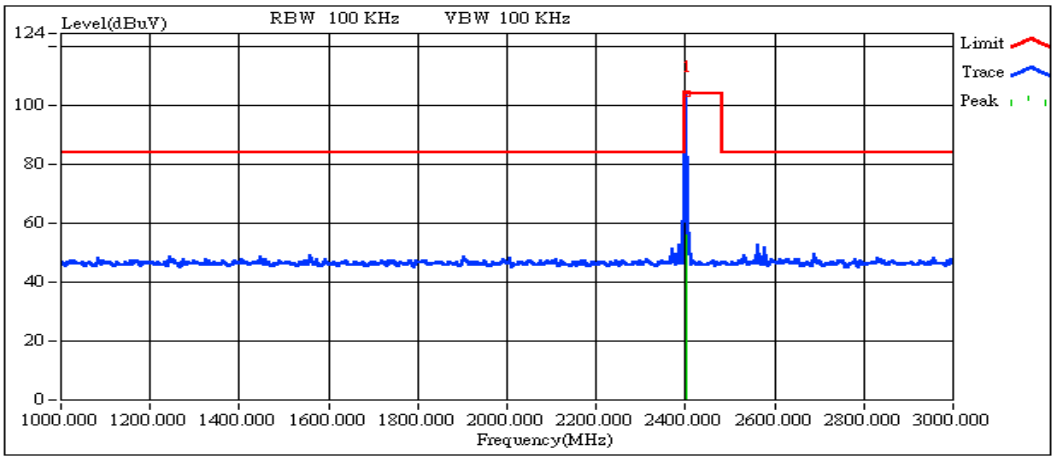
## CH Low 30MHz – 1GHz




Custom Name: G-STAR
Engineer: Vincent
Model Name: GC-10202-01
Report No.:
Test Mode: Low

| | Frequency(MHz) | Read Level (dBuV) | Probe (dB) | Cable Loss (dB) | Level(dBuV) |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

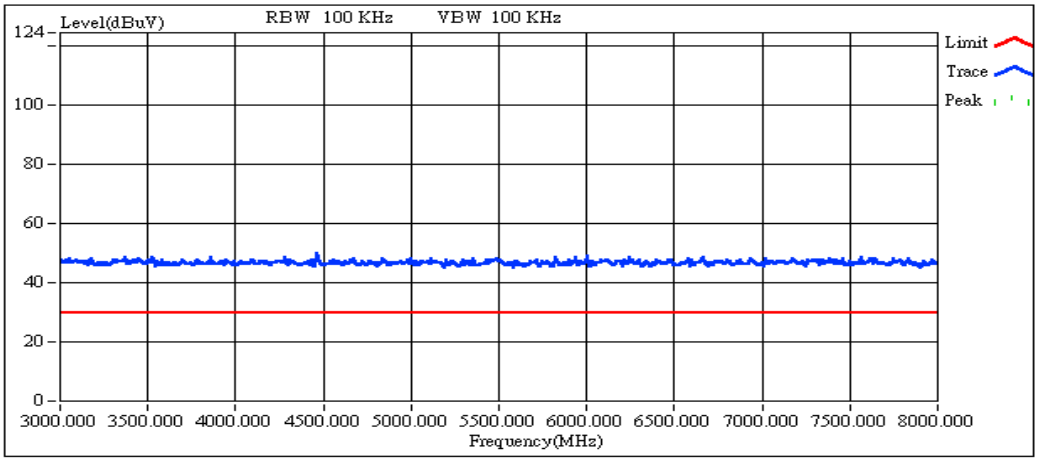
## CH Low 1GHz- 3GHz




Custom Name: G-STAR
Engineer: Vincent
Model Name: GC-10202-01
Report No.:
Test Mode: Low

| | Frequency(MHz) | Read Level (dBuV) | Probe (dB) | Cable Loss (dB) | Level(dBuV) |
|---|---|---|---|---|---|
| 1 | 2404.0000 | 103.86 | 0.00 | 0.00 | 103.86 |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

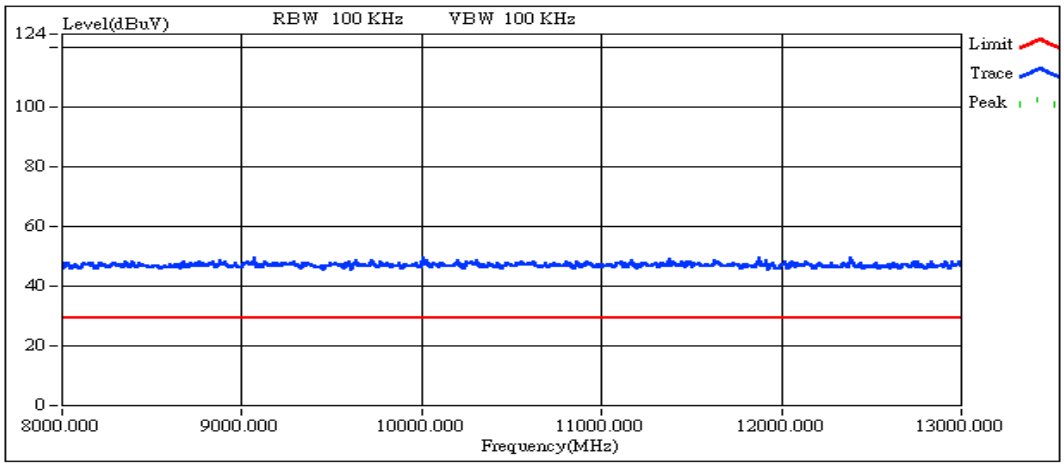
## CH Low 3GHz – 8GHz




Custom Name: G-STAR
Engineer: Vincent
Model Name: GC-10202-01
Report No.:
Test Mode: Low

| | Frequency(MHz) | Read Level (dBuV) | Probe (dB) | Cable Loss (dB) | Level(dBuV) |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

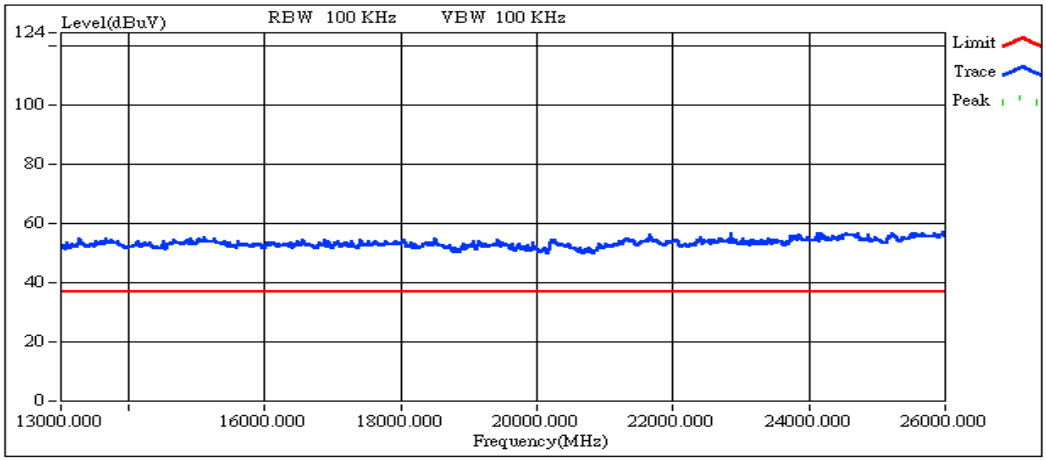
## CH Low 8GHz- 13GHz




Custom Name: G-STAR
Engineer: Vincent
Model Name: GC-10202-01
Report No.:
Test Mode: Low

| | Frequency(MHz) | Read Level (dBuV) | Probe (dB) | Cable Loss (dB) | Level(dBuV) |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

# CH Low 13GHz – 26GHz




Custom Name: G-STAR

Engineer: Vincent

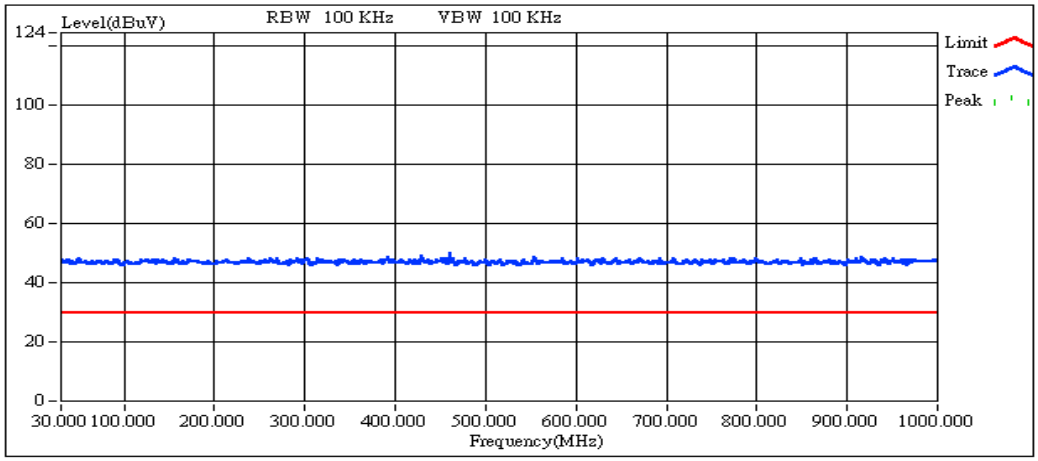
Model Name: GC-10202-01

Report No.:

Test Mode: Low

| | Frequency(MHz) | Read Level (dBuV) | Probe (dB) | Cable Loss (dB) | Level(dBuV) |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

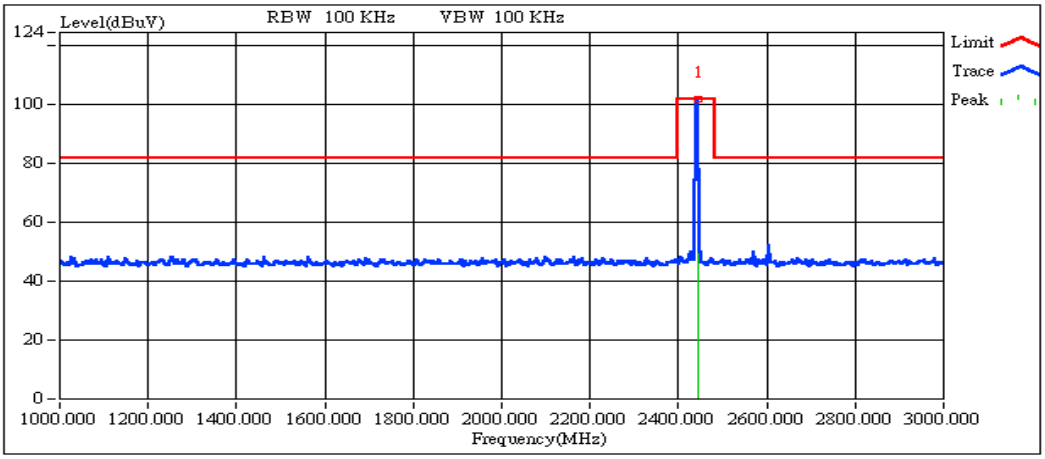
## CH Mid 30MHz – 1GHz




Custom Name: G-STAR
Engineer: Vincent
Model Name: GC-10202-01
Report No.:
Test Mode: MID

| | Frequency(MHz) | Read Level (dBuV) | Probe (dB) | Cable Loss (dB) | Level(dBuV) |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

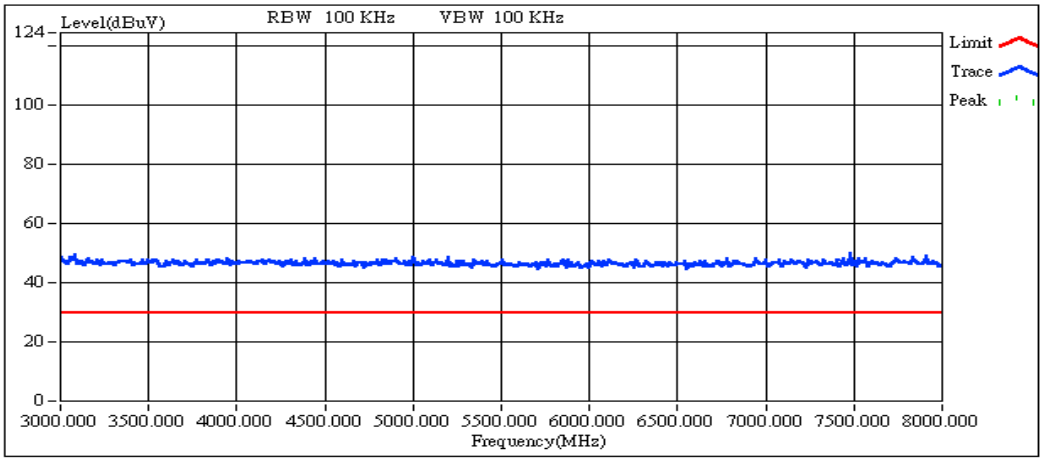
## CH Mid 1GHz- 3GHz




Custom Name: G-STAR
Engineer: Vincent
Model Name: GC-10202-01
Report No.:
Test Mode: MID

| | Frequency(MHz) | Read Level (dBuV) | Probe (dB) | Cable Loss (dB) | Level(dBuV) |
|---|---|---|---|---|---|
| 1 | 2444.0000 | 101.62 | 0.00 | 0.00 | 101.62 |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

## CH Mid 3GHz – 8GHz




Custom Name: G-STAR
Engineer: Vincent
Model Name: GC-10202-01
Report No.:
Test Mode: MID

| | Frequency(MHz) | Read Level (dBuV) | Probe (dB) | Cable Loss (dB) | Level(dBuV) |
|---|---|---|---|---|---|
| | | | | | |
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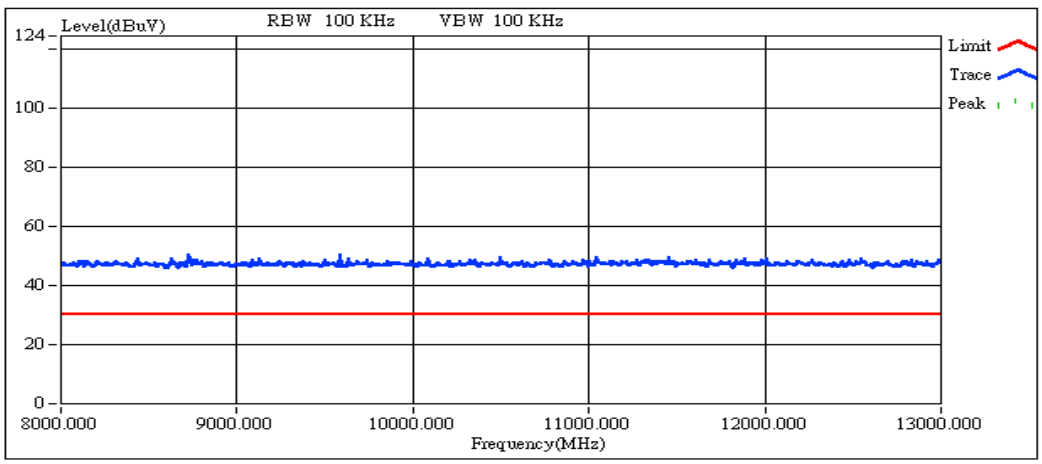
| | | | | | |
| | | | | | |

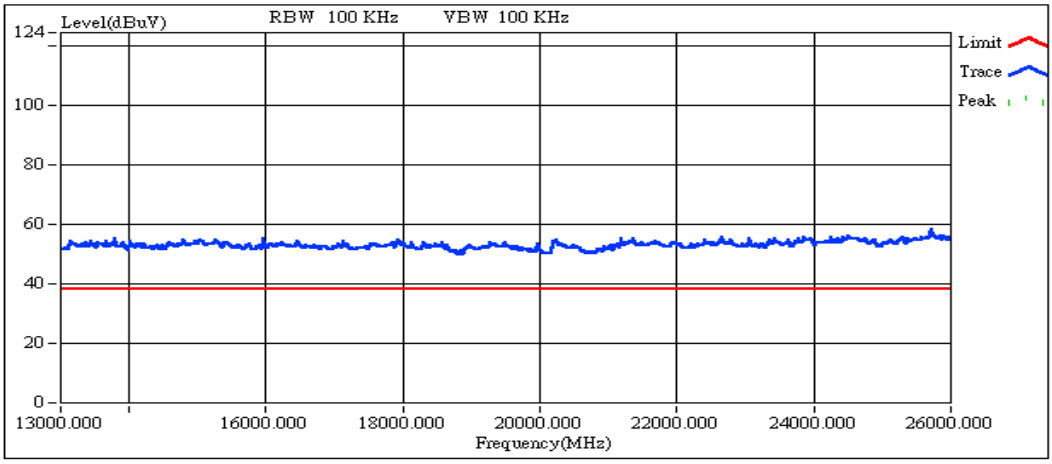
## CH Mid 8GHz- 13GHz




Custom Name: G-STAR
Engineer: Vincent
Model Name: GC-10202-01
Report No.:
Test Mode: MID

| | Frequency(MHz) | Read Level (dBuV) | Probe (dB) | Cable Loss (dB) | Level(dBuV) |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

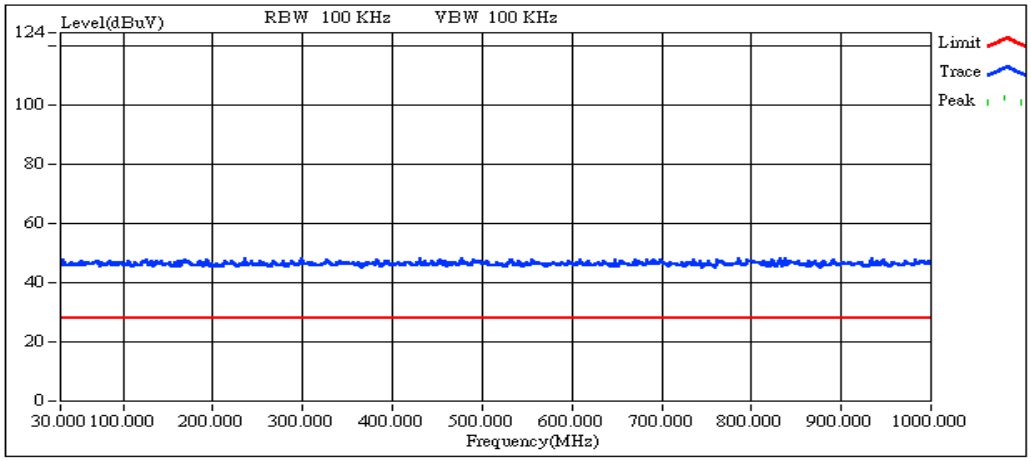
# CH Mid 13GHz – 26GHz




Custom Name: G-STAR
Engineer: Vincent
Model Name: GC-10202-01
Report No.:
Test Mode: MID

| | Frequency(MHz) | Read Level (dBuV) | Probe (dB) | Cable Loss (dB) | Level(dBuV) |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

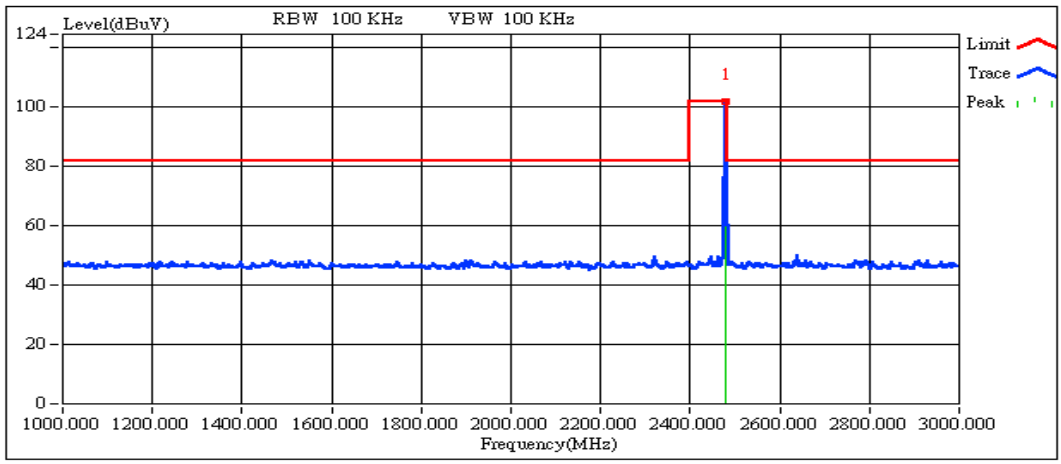
## CH High 30MHz – 1GHz




Custom Name: G-STAR
Engineer: Vincent
Model Name: GC-10202-01
Report No.:
Test Mode: HIGH

| | Frequency(MHz) | Read Level (dBuV) | Probe (dB) | Cable Loss (dB) | Level(dBuV) |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

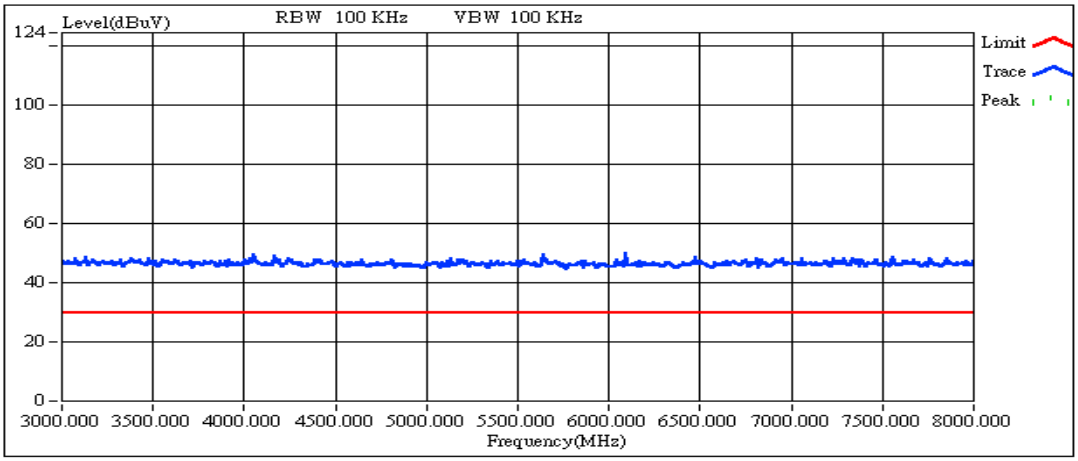
## CH High 1GHz- 3GHz




Custom Name: G-STAR
Engineer: Vincent
Model Name: GC-10202-01
Report No.:
Test Mode: HIGH

| | Frequency(MHz) | Read Level (dBuV) | Probe (dB) | Cable Loss (dB) | Level(dBuV) |
|---|---|---|---|---|---|
| 1 | 2480.0000 | 101.68 | 0.00 | 0.00 | 101.68 |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

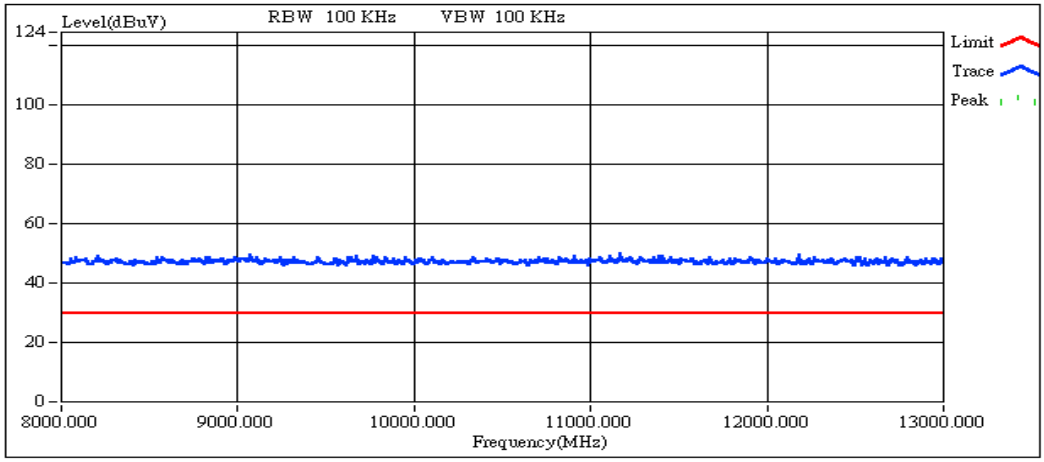
## CH High 3GHz – 8GHz




Custom Name: G-STAR
Engineer: Vincent
Model Name: GC-10202-01
Report No.:
Test Mode: HIGH

| | Frequency(MHz) | Read Level (dBuV) | Probe (dB) | Cable Loss (dB) | Level(dBuV) |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

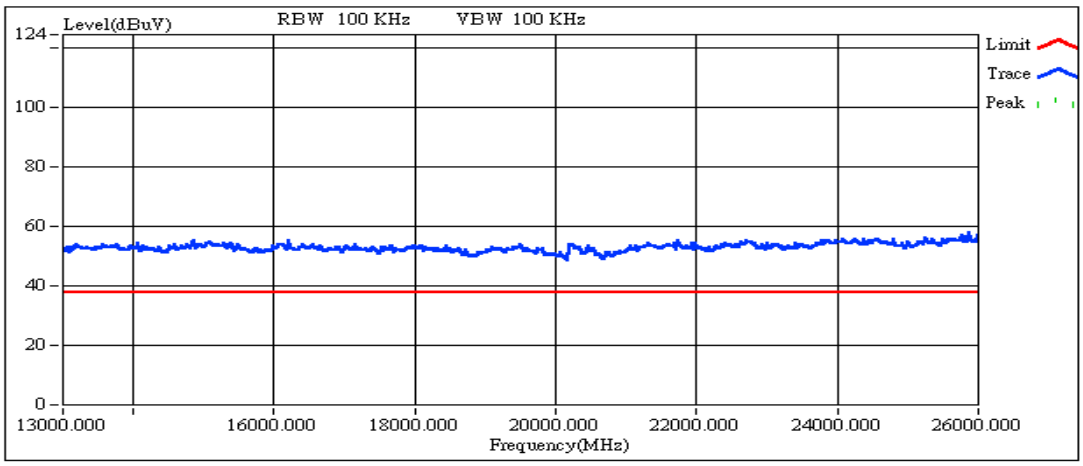
## CH High 8GHz- 13GHz




Custom Name: G-STAR
Engineer: Vincent
Model Name: GC-10202-01
Report No.:
Test Mode: HIGH

| | Frequency(MHz) | Read Level (dBuV) | Probe (dB) | Cable Loss (dB) | Level(dBuV) |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

# CH High 13GHz – 26GHz




Custom Name: G-STAR

Engineer: Vincent

Model Name: GC-10202-01

Report No.:

Test Mode: HIGH

| | Frequency(MHz) | Read Level (dBuV) | Probe (dB) | Cable Loss (dB) | Level(dBuV) |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

## Radiated Spurious Emission Measurement Result (below 1GHz)

Operation Mode: TX CH Low Mode
Fundamental Frequency: 2402MHz
Temperature : 23 ℃
Humidity : 65 %

Test Date : Oct. 29, 2002
Test By: Markba
Pol: Ver./Hor

| Freq. (MHz) | Ant.Pol. H/V | Detector Mode (PK/AV) | Reading (dBuV) | Ant./CL/ Amp. CF(dB) | Actual FS (dBuV/m) | Limit3m (dBuV/m) | Safe Margin (dB) |
|---|---|---|---|---|---|---|---|
| 133.44 | V | Peak | 17.09 | 11.1 | 28.19 | 43.50 | -15.31 |
| 195.46 | V | Peak | 18.45 | 14.47 | 32.92 | 43.50 | -10.58 |
| 260.74 | V | Peak | 21.3 | 16.05 | 37.35 | 46.00 | -8.65 |
| 662.67 | V | Peak | 18.23 | 25.11 | 43.34 | 46.00 | -2.66 |
| 944.27 | V | Peak | 12.07 | 28.78 | 40.85 | 46.00 | -5.15 |
| 101.89 | H | Peak | 12.46 | 13.89 | 26.35 | 43.50 | -17.15 |
| 195.45 | H | Peak | 16.18 | 14.47 | 30.65 | 43.50 | -12.85 |
| 260.74 | H | Peak | 19.3 | 16.05 | 35.35 | 46.00 | -10.65 |
| 399.37 | H | Peak | 12.55 | 20.69 | 33.24 | 46.00 | -12.76 |
| 455.69 | H | Peak | 12.98 | 20.44 | 33.42 | 46.00 | -12.58 |

Remark：

(1) Measuring frequencies from 30 MHz to the 1GHz。

(2) Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak detector mode.

(3) Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB

(4) * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.

(5) Datas of measurement within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

(6) The IF bandwidth of SPA between 30MHz to 1GHz was 100KHz.

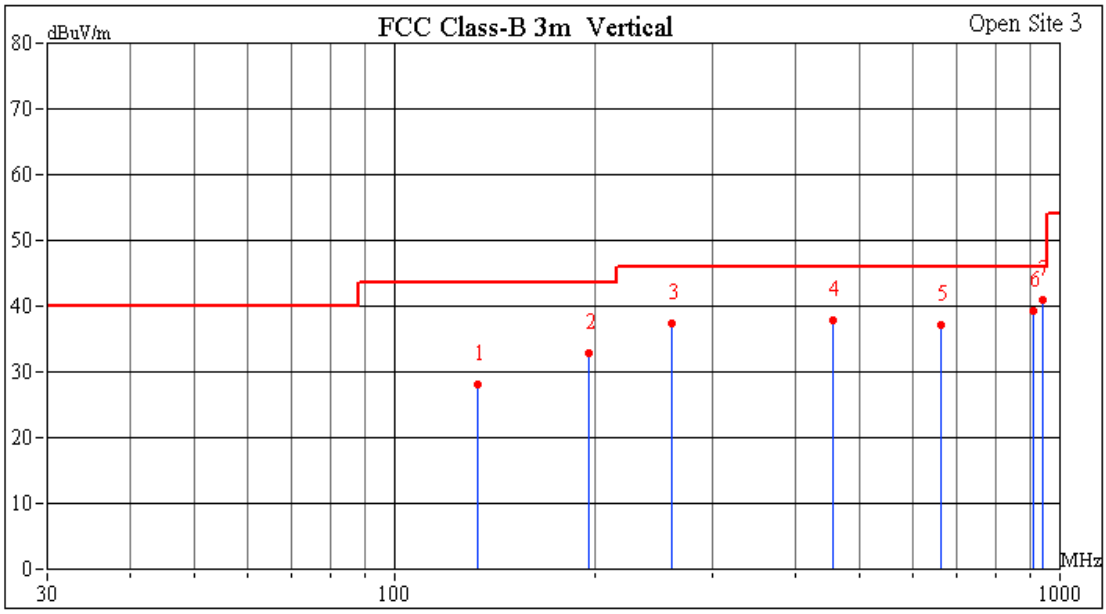
## Radiated Emission test data plot below 1GHz (CH Low V)

C&C LABORATORY CO., LTD.

Custom Name: G-STAR Test Mode: TX Low

Model Name: GC-10202-01 Engineer Name: Jean

Date: 2002/10/30




| | Frequency(MHz) | Amplitude(dBuV/m) | Margin(dB) | Limit(dBuV/m) | Read Amplitude(dBuV) | Factor(dB) | |
|---|---|---|---|---|---|---|---|
| 1 | 133.4480 | 28.19 | -15.31 | 43.50 | 17.09 | 11.10 | PK |
| 2 | 195.4640 | 32.92 | -10.58 | 43.50 | 18.45 | 14.47 | PK |
| 3 | 260.7440 | 37.35 | -8.65 | 46.00 | 21.30 | 16.05 | PK |
| 4 | 455.6960 | 37.85 | -8.15 | 46.00 | 17.41 | 20.44 | PK |
| 5 | 662.6720 | 37.16 | -8.84 | 46.00 | 12.05 | 25.11 | PK |
| 6 | 913.2960 | 39.25 | -6.75 | 46.00 | 10.91 | 28.34 | PK |
| 7 | 944.2720 | 40.85 | -5.15 | 46.00 | 12.07 | 28.78 | PK |

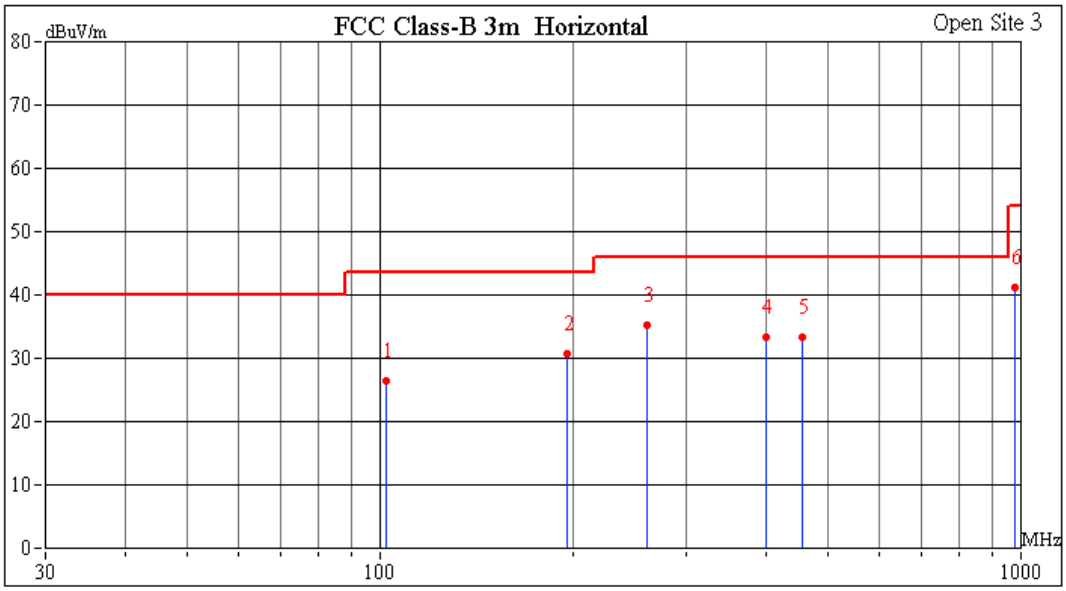
## Radiated Emission test data plot below 1GHz (CH Low H)

C&C LABORATORY CO., LTD.

Custom Name: G-Star Test Mode: TX Low

Model Name: GC-10202-01 Engineer Name: Jean

Date: 2002/10/30




| | Frequency(MHz) | Amplitude(dBuV/m) | Margin(dB) | Limit(dBuV/m) | Read Amplitude(dBuV) | Factor(dB) | |
|---|---|---|---|---|---|---|---|
| 1 | 101.8960 | 26.35 | -17.15 | 43.50 | 12.46 | 13.89 | PK |
| 2 | 195.4640 | 30.65 | -12.85 | 43.50 | 16.18 | 14.47 | PK |
| 3 | 260.7440 | 35.35 | -10.65 | 46.00 | 19.30 | 16.05 | PK |
| 4 | 399.3760 | 33.24 | -12.76 | 46.00 | 12.55 | 20.69 | PK |
| 5 | 455.6960 | 33.42 | -12.58 | 46.00 | 12.98 | 20.44 | PK |
| 6 | 978.0640 | 41.11 | -12.89 | 54.00 | 11.72 | 29.39 | PK |

**Radiated Spurious Emission Measurement Result (below 1GHz)**

| | | | |
|---|---|---|---|
| Operation Mode: | TX CH Mid Mode | Test Date : | Oct. 29, 2002 |
| Fundamental Frequency: | 2442MHz | Test By: | Markba |
| Temperature : | 23 ℃ | Pol: | Ver./Hor |
| Humidity : | 65 % | | |

| Freq. (MHz) | Ant.Pol. H/V | Detector Mode (PK/AV) | Reading (dBuV) | Ant./CL/ Amp. CF(dB) | Actual FS (dBuV/m) | Limit3m (dBuV/m) | Safe Margin (dB) |
|---|---|---|---|---|---|---|---|
| 160.64 | V | Peak | 24.06 | 11.43 | 35.49 | 43.50 | -8.01 |
| 260.74 | V | Peak | 19.33 | 16.05 | 35.38 | 46.00 | -10.62 |
| 324.75 | V | Peak | 16.07 | 17.35 | 33.42 | 46.00 | -12.58 |
| 455.67 | V | Peak | 16.99 | 20.44 | 37.43 | 46.00 | -8.57 |
| 495.46 | V | Peak | 8.25 | 22.3 | 30.55 | 46.00 | -15.45 |
| 944.27 | V | Peak | 11.95 | 28.78 | 40.73 | 46.00 | -5.27 |
| 128.00 | H | Peak | 15.73 | 11.29 | 27.02 | 43.50 | -16.48 |
| 195.46 | H | Peak | 17.3 | 14.47 | 31.77 | 43.50 | -11.73 |
| 260.74 | H | Peak | 17.8 | 16.05 | 33.85 | 46.00 | -12.15 |
| 455.69 | H | Peak | 12.5 | 20.44 | 32.94 | 46.00 | -13.06 |
| 847.12 | H | Peak | 10.93 | 27.21 | 38.14 | 46.00 | -7.86 |
| 978.02 | H | Peak | 11.21 | 29.37 | 40.58 | 54.00 | -13.42 |

Remark：

(1) Measuring frequencies from 30 MHz to the 1GHz。

(2) Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak detector mode.

(3) Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB

(4) * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.

(5) Datas of measurement within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

(6) The IF bandwidth of SPA between 30MHz to 1GHz was 100KHz.

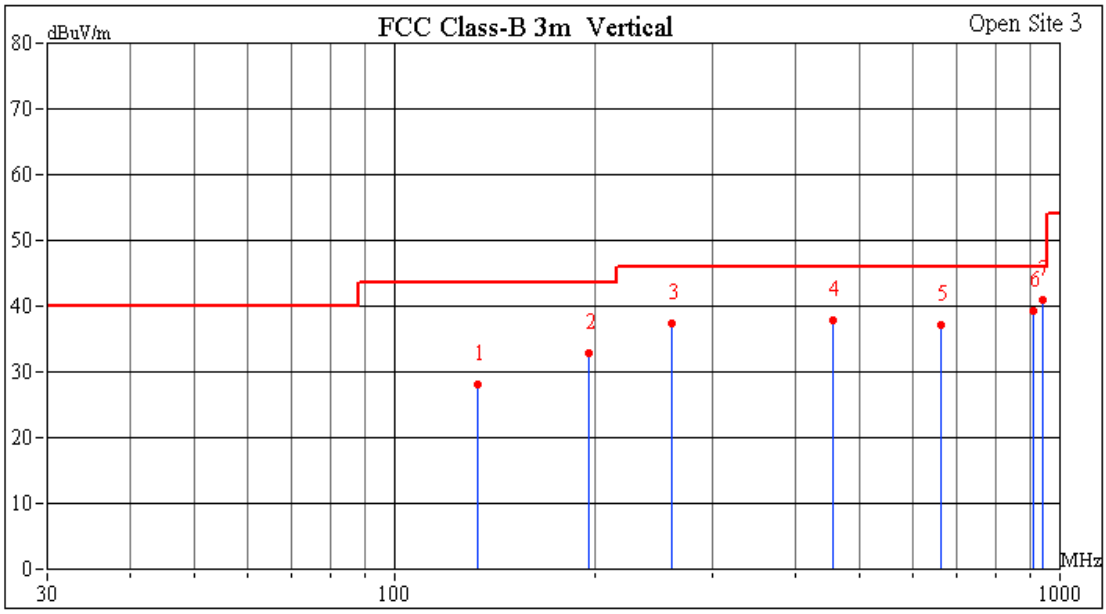
## Radiated Emission test data plot below 1GHz (CH Mid V)

C&C LABORATORY CO., LTD.

Custom Name: G-STAR Test Mode: TX Low

Model Name: GC-10202-01 Engineer Name: Jean

Date: 2002/10/30




| | Frequency(MHz) | Amplitude(dBuV/m) | Margin(dB) | Limit(dBuV/m) | Read Amplitude(dBuV) | Factor(dB) | |
|---|---|---|---|---|---|---|---|
| 1 | 133.4480 | 28.19 | -15.31 | 43.50 | 17.09 | 11.10 | PK |
| 2 | 195.4640 | 32.92 | -10.58 | 43.50 | 18.45 | 14.47 | PK |
| 3 | 260.7440 | 37.35 | -8.65 | 46.00 | 21.30 | 16.05 | PK |
| 4 | 455.6960 | 37.85 | -8.15 | 46.00 | 17.41 | 20.44 | PK |
| 5 | 662.6720 | 37.16 | -8.84 | 46.00 | 12.05 | 25.11 | PK |
| 6 | 913.2960 | 39.25 | -6.75 | 46.00 | 10.91 | 28.34 | PK |
| 7 | 944.2720 | 40.85 | -5.15 | 46.00 | 12.07 | 28.78 | PK |

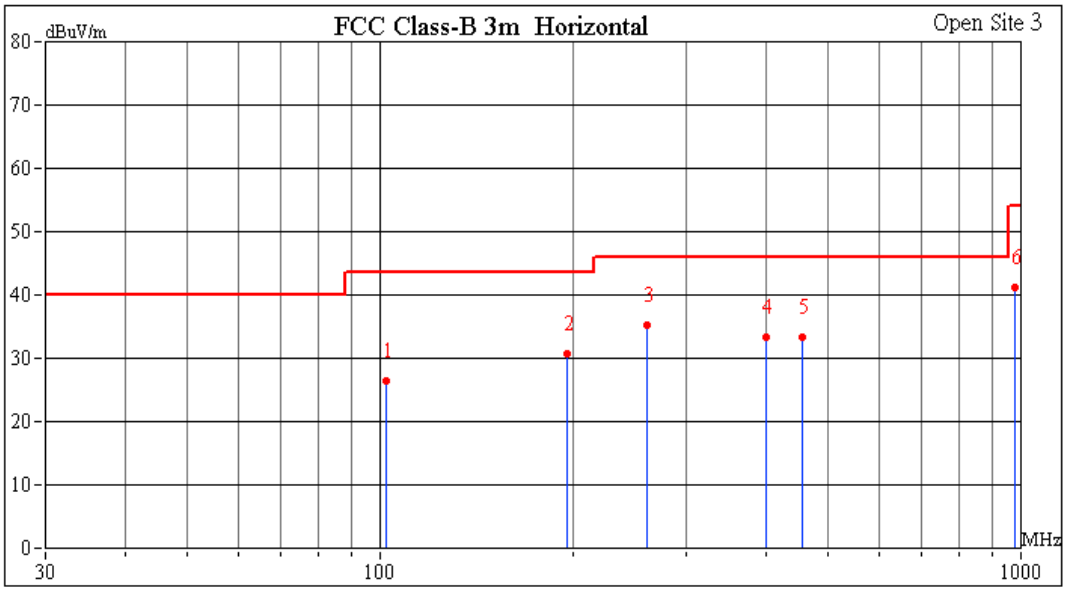
## Radiated Emission test data plot below 1GHz (CH Mid H)

C&C LABORATORY CO., LTD.

Custom Name: G-Star Test Mode: TX Low

Model Name: GC-10202-01 Engineer Name: Jean

Date: 2002/10/30




| | Frequency(MHz) | Amplitude(dBuV/m) | Margin(dB) | Limit(dBuV/m) | Read Amplitude(dBuV) | Factor(dB) | |
|---|---|---|---|---|---|---|---|
| 1 | 101.8960 | 26.35 | -17.15 | 43.50 | 12.46 | 13.89 | PK |
| 2 | 195.4640 | 30.65 | -12.85 | 43.50 | 16.18 | 14.47 | PK |
| 3 | 260.7440 | 35.35 | -10.65 | 46.00 | 19.30 | 16.05 | PK |
| 4 | 399.3760 | 33.24 | -12.76 | 46.00 | 12.55 | 20.69 | PK |
| 5 | 455.6960 | 33.42 | -12.58 | 46.00 | 12.98 | 20.44 | PK |
| 6 | 978.0640 | 41.11 | -12.89 | 54.00 | 11.72 | 29.39 | PK |

## Radiated Spurious Emission Measurement Result (below 1GHz)

Operation Mode: TX CH High Mode
Fundamental Frequency: 2480MHz
Temperature : 23 ℃
Humidity : 65 %

Test Date : Oct. 29, 2002
Test By: Markba
Pol: Ver./Hor

| Freq. (MHz) | Ant.Pol. H/V | Detector Mode (PK/AV) | Reading (dBuV) | Ant./CL/ Amp. CF(dB) | Actual FS (dBuV/m) | Limit3m (dBuV/m) | Safe Margin (dB) |
|---|---|---|---|---|---|---|---|
| 195.46 | V | Peak | 18.76 | 7 | 25.76 | 43.50 | -17.74 |
| 260.74 | V | Peak | 20.67 | 16.05 | 36.72 | 46.00 | -9.28 |
| 293.38 | V | Peak | 17.35 | 16.42 | 33.77 | 46.00 | -12.23 |
| 455.69 | V | Peak | 12.66 | 20.44 | 33.1 | 46.00 | -12.90 |
| 667.08 | V | Peak | 11.99 | 25.18 | 37.17 | 46.00 | -8.83 |
| 944.27 | V | Peak | 12.22 | 28.78 | 41 | 46.00 | -5.00 |
| 122.02 | H | Peak | 17.09 | 11.5 | 28.59 | 43.50 | -14.91 |
| 195.42 | H | Peak | 17.27 | 14.47 | 31.74 | 43.50 | -11.76 |
| 260.74 | H | Peak | 18.34 | 16.05 | 34.39 | 46.00 | -11.61 |
| 661.26 | H | Peak | 9.56 | 25.08 | 34.64 | 46.00 | -11.36 |
| 847.12 | H | Peak | 10.36 | 27.21 | 37.57 | 46.00 | -8.43 |
| 978.06 | H | Peak | 11.06 | 29.39 | 40.45 | 54.00 | -13.55 |

Remark：

(1) Measuring frequencies from 30 MHz to the 1GHz。

(2) Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak detector mode.

(3) Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB

(4) * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.

(5) Datas of measurement within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

(6) The IF bandwidth of SPA between 30MHz to 1GHz was 100KHz.

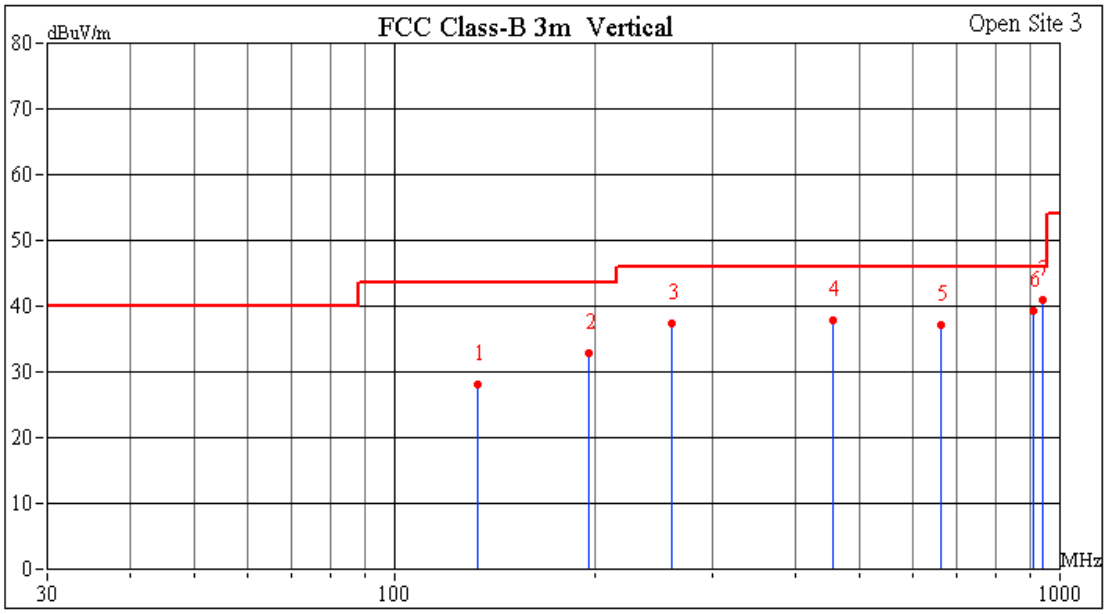
## Radiated Emission test data plot below 1GHz (CH High V)

C&C LABORATORY CO., LTD.

Custom Name: G-STAR Test Mode: TX Low

Model Name: GC-10202-01 Engineer Name: Jean

Date: 2002/10/30



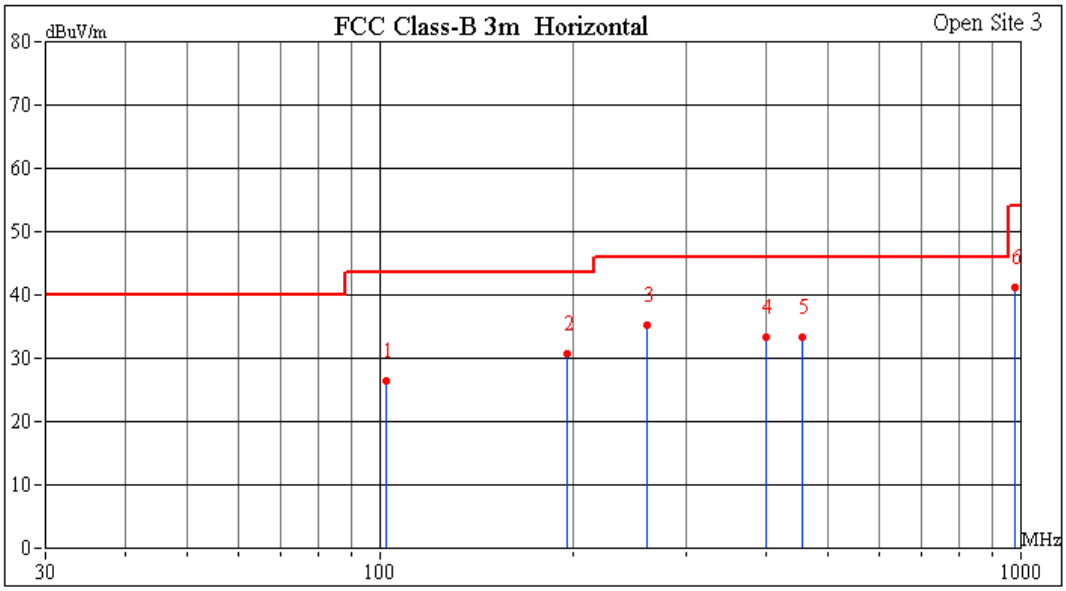

| | Frequency(MHz) | Amplitude(dBuV/m) | Margin(dB) | Limit(dBuV/m) | Read Amplitude(dBuV) | Factor(dB) | |
|---|---|---|---|---|---|---|---|
| 1 | 133.4480 | 28.19 | -15.31 | 43.50 | 17.09 | 11.10 | PK |
| 2 | 195.4640 | 32.92 | -10.58 | 43.50 | 18.45 | 14.47 | PK |
| 3 | 260.7440 | 37.35 | -8.65 | 46.00 | 21.30 | 16.05 | PK |
| 4 | 455.6960 | 37.85 | -8.15 | 46.00 | 17.41 | 20.44 | PK |
| 5 | 662.6720 | 37.16 | -8.84 | 46.00 | 12.05 | 25.11 | PK |
| 6 | 913.2960 | 39.25 | -6.75 | 46.00 | 10.91 | 28.34 | PK |
| 7 | 944.2720 | 40.85 | -5.15 | 46.00 | 12.07 | 28.78 | PK |

## Radiated Emission test data plot below 1GHz (CH High H)

C&C LABORATORY CO., LTD.

Custom Name: G-Star Test Mode: TX Low
Model Name: GC-10202-01 Engineer Name: Jean

Date: 2002/10/30




| | Frequency(MHz) | Amplitude(dBuV/m) | Margin(dB) | Limit(dBuV/m) | Read Amplitude(dBuV) | Factor(dB) | |
|---|---|---|---|---|---|---|---|
| 1 | 101.8960 | 26.35 | -17.15 | 43.50 | 12.46 | 13.89 | PK |
| 2 | 195.4640 | 30.65 | -12.85 | 43.50 | 16.18 | 14.47 | PK |
| 3 | 260.7440 | 35.35 | -10.65 | 46.00 | 19.30 | 16.05 | PK |
| 4 | 399.3760 | 33.24 | -12.76 | 46.00 | 12.55 | 20.69 | PK |
| 5 | 455.6960 | 33.42 | -12.58 | 46.00 | 12.98 | 20.44 | PK |
| 6 | 978.0640 | 41.11 | -12.89 | 54.00 | 11.72 | 29.39 | PK |

Measurement Result (above 1GHz)

Operation Mode: TX Mode
Fundamental Frequency: CH Low
Temperature : 30 ℃
Humidity : 55%

Test Date : 10/23/2002
Test By: Markba Lee
Pol: VERTICAL

| Freq. (MHz) | Peak Reading (dBuV) | AV Reading (dBuV) | Ant./CL CF(dB) | Actual FS Peak (dBuV/m) | Actual FS AV (dBuV/m) | Peak Limit (dBuV/m) | AV Limit (dBuV/m) | Margin (dB) | |
|---|---|---|---|---|---|---|---|---|---|
| 1068.0 | 49.41 | | -11.32 | 38.09 | | 74.00 | 54.00 | -15.91 | Peak |
| 1120.0 | 49.51 | | -10.99 | 38.52 | | 74.00 | 54.00 | -15.48 | Peak |
| 1684.0 | 53.41 | | -8.65 | 44.76 | | 74.00 | 54.00 | -9.24 | Peak |
| 1824.0 | 51.11 | | -8.28 | 42.83 | | 74.00 | 54.00 | -11.17 | Peak |
| 2516.0 | 51.34 | | -5.72 | 45.62 | | 74.00 | 54.00 | -8.38 | Peak |
| 2736.0 | 49.64 | | -5.23 | 44.41 | | 74.00 | 54.00 | -9.59 | Peak |
| 3170.0 | 44.20 | | -10.99 | 33.21 | | 74.00 | 54.00 | -20.79 | Peak |

Remark：

(1) Measuring frequencies from 30 MHz to the 10th harmonic of highest fundamental frequency。

(2) Datas of measurement within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

(3) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column。

(4) Spectrum Setting : 30MHz – 1000MHz , RBW= 100KHz, VBW=100KHz, Sweep time = 200 ms. 1GHz- 8GHz, RBW= 1MHz, VBW= 1MHz, Sweep time= 200 ms.

| | | | |
|---|---|---|---|
| Operation Mode: | TX Mode | Test Date : | 10/23/2002 |
| Fundamental Frequency: | CH Low | Test By: | Markba Lee |
| Temperature : | 30 ℃ | Pol: | HORIZONTAL |
| Humidity : | 55% | | |

-

| Freq. (MHz) | Peak Reading (dBuV) | AV Reading (dBuV) | Ant./CL CF(dB) | Actual FS Peak (dBuV/m) | Actual FS AV (dBuV/m) | Peak Limit (dBuV/m) | AV Limit (dBuV/m) | Margin (dB) | |
|---|---|---|---|---|---|---|---|---|---|
| 1068.0 | 48.46 | | -8.66 | 39.80 | | 74.00 | 54.00 | -14.20 | Peak |
| 2520.0 | 48.01 | | -5.71 | 42.30 | | 74.00 | 54.00 | -11.70 | Peak |

Remark：

(1) Measuring frequencies from 30 MHz to the 10th harmonic of highest fundamental frequency。

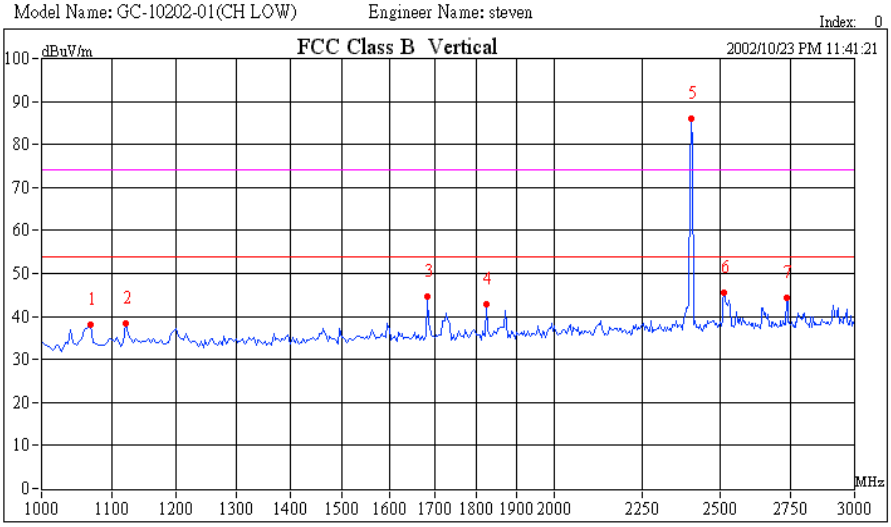
(2) Datas of measurement within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

(3) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column。

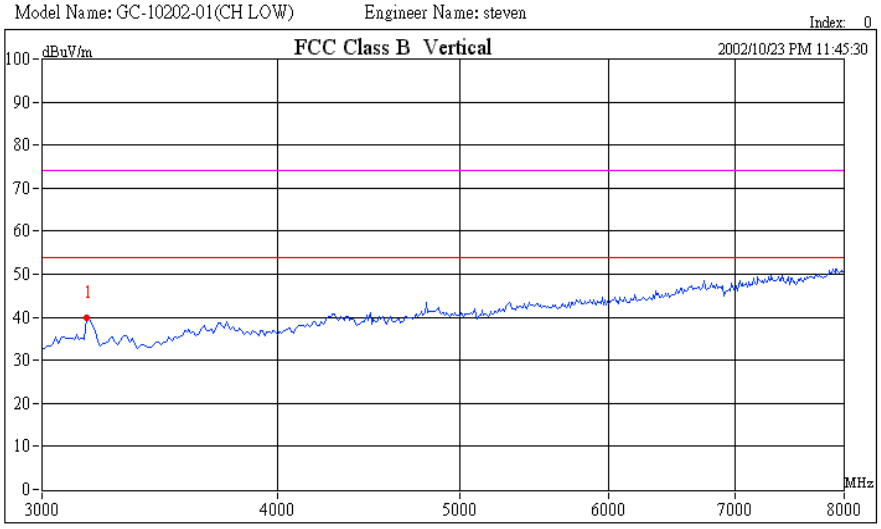
(4) Spectrum Setting : 30MHz – 1000MHz , RBW= 100KHz, VBW=100KHz, Sweep time = 200 ms. 1GHz- 8GHz, RBW= 1MHz, VBW= 1MHz, Sweep time= 200 ms.

# Radiated Emission test data plot (CH Low V)

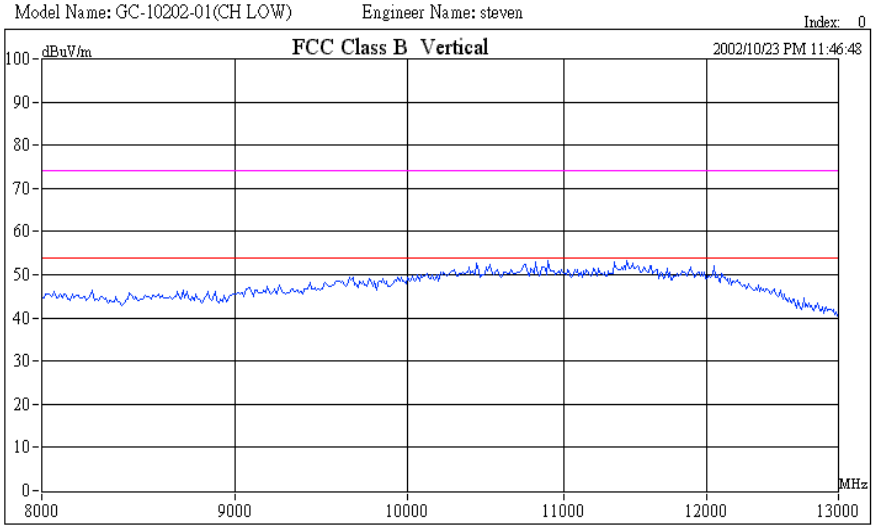
Custom Name: G-STAR
Model Name: GC-10202-01(CH LOW)
Test Mode: TX
Engineer Name: steven

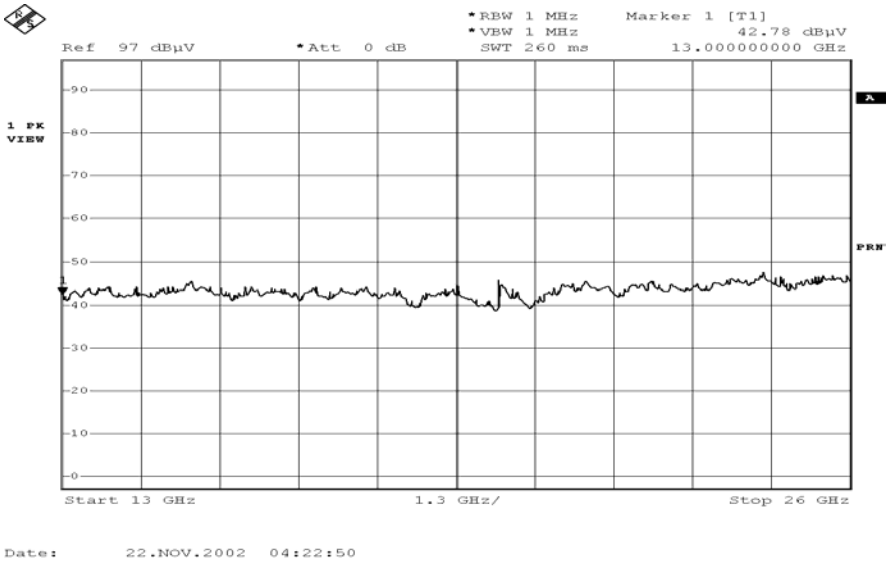



Custom Name: G-STAR
Model Name: GC-10202-01(CH LOW)
Test Mode: TX
Engineer Name: steven



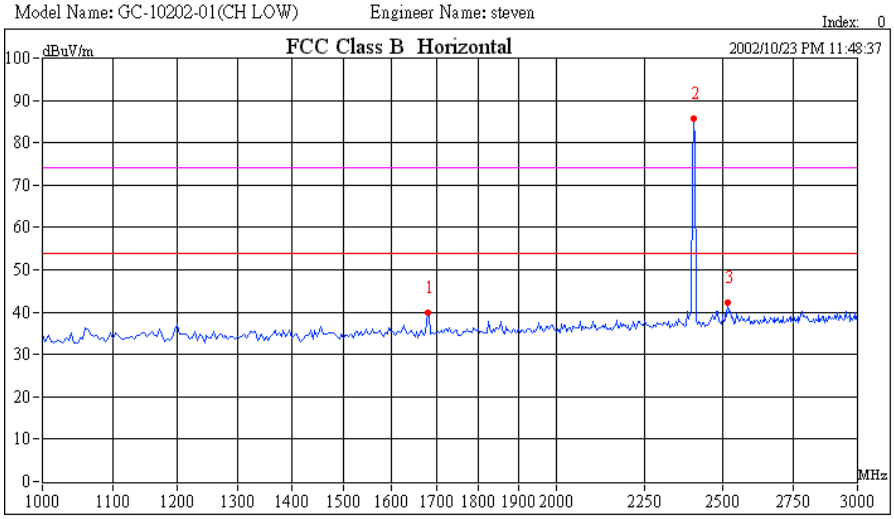

Custom Name: G-STAR
Model Name: GC-10202-01(CH LOW)
Test Mode: TX
Engineer Name: steven



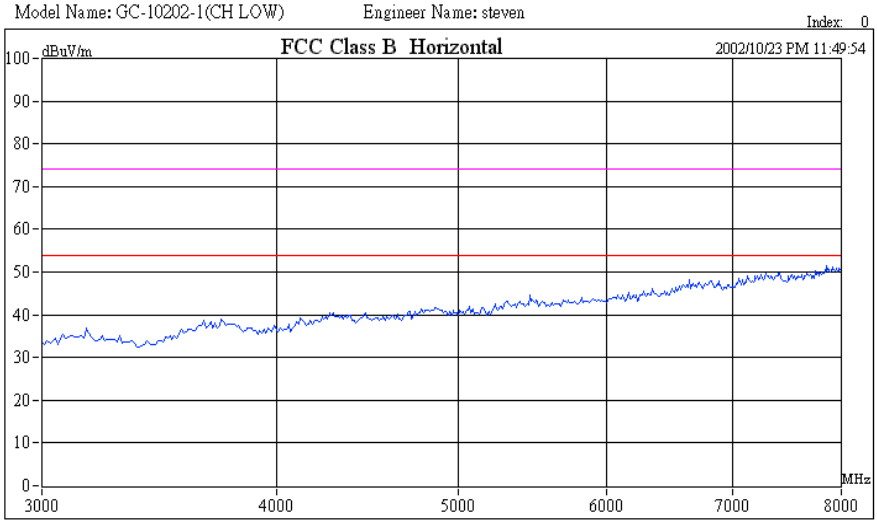

*RBW 1 MHz
*VBW 1 MHz
SWT 260 ms
Marker 1 [T1]
42.78 dBµV
13.000000000 GHz
Ref 97 dBµV
*Att 0 dB
1 PK
VIEW
A
PRN
Start 13 GHz
1.3 GHz/
Stop 26 GHz
Date: 22.NOV.2002 04:22:50

# Radiated Emission test data plot (CH Low H)

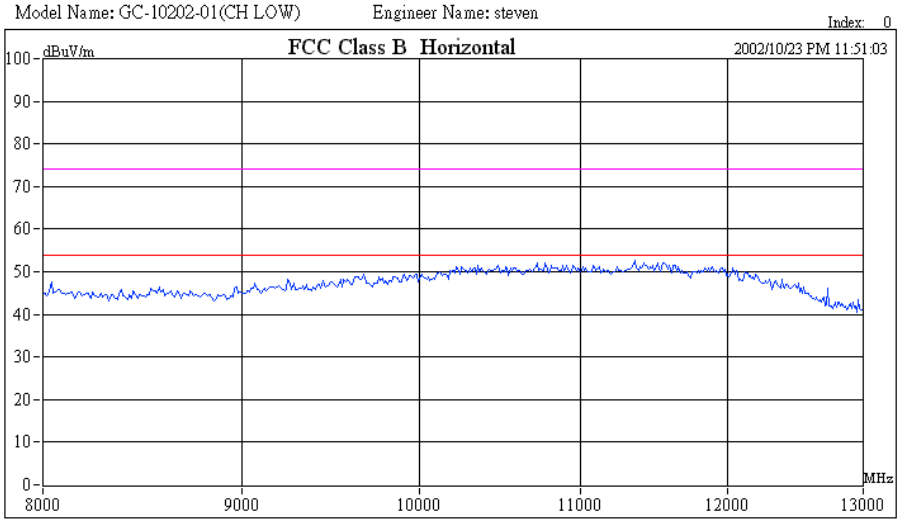
Custom Name: G-STAR Test Mode: TX
Model Name: GC-10202-01(CH LOW) Engineer Name: steven

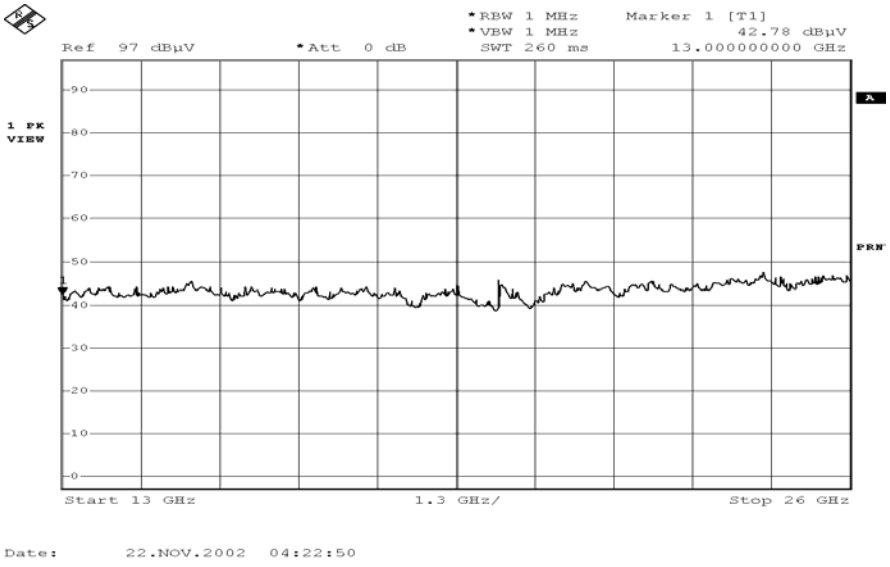



Custom Name: G-STAR Test Mode: TX
Model Name: GC-10202-1(CH LOW) Engineer Name: steven




Custom Name: G-STAR Test Mode: TX
Model Name: GC-10202-01(CH LOW) Engineer Name: steven




*RBW 1 MHz
*VBW 1 MHz
SWT 260 ms
Marker 1 [T1]
42.78 dBµV
13.000000000 GHz
Ref 97 dBµV
*Att 0 dB
1 PK
VIEW
A
PRN
Start 13 GHz
1.3 GHz/
Stop 26 GHz
Date: 22.NOV.2002 04:22:50

| | | | |
|---|---|---|---|
| Operation Mode: | TX Mode | Test Date : | 10/23/2002 |
| Fundamental Frequency: | CH Mid | Test By: | Markba Lee |
| Temperature : | 30 ℃ | Pol: | VERTICAL |
| Humidity : | 55% | | |

| Freq. (MHz) | Peak Reading (dBuV) | AV Reading (dBuV) | Ant./CL CF(dB) | Actual FS Peak (dBuV/m) | Actual FS AV (dBuV/m) | Peak Limit (dBuV/m) | AV Limit (dBuV/m) | Margin (dB) | |
|---|---|---|---|---|---|---|---|---|---|
| 1060.0 | 51.13 | | -11.37 | 39.76 | | 74.00 | 54.00 | -14.24 | Peak |
| 1680.0 | 53.14 | | -8.66 | 44.48 | | 74.00 | 54.00 | -9.52 | Peak |
| 1720.0 | 49.75 | | -8.56 | 41.19 | | 74.00 | 54.00 | -12.81 | Peak |
| 1824.0 | 50.68 | | -8.28 | 42.40 | | 74.00 | 54.00 | -11.60 | Peak |
| 1868.0 | 49.98 | | -8.12 | 41.86 | | 74.00 | 54.00 | -12.14 | Peak |
| 2384.0 | 47.94 | | -6.17 | 41.77 | | 74.00 | 54.00 | -12.23 | Peak |
| 2532.0 | 49.51 | | -5.69 | 43.82 | | 74.00 | 54.00 | -10.18 | Peak |
| 2740.0 | 49.60 | | -5.22 | 44.38 | | 74.00 | 54.00 | -9.62 | Peak |
| 3180.0 | 43.15 | | -10.99 | 32.16 | | 74.00 | 54.00 | -21.84 | Peak |

Remark：

(1) Measuring frequencies from 30 MHz to the 10th harmonic of highest fundamental frequency。

(2) Datas of measurement within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

(3) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column。

(4) Spectrum Setting : 30MHz – 1000MHz , RBW= 100KHz, VBW=100KHz, Sweep time = 200 ms. 1GHz- 8GHz, RBW= 1MHz, VBW= 1MHz, Sweep time= 200 ms.

| | | | |
|---|---|---|---|
| Operation Mode: | TX Mode | Test Date : | 10/23/2002 |
| Fundamental Frequency: | CH Mid | Test By: | Markba Lee |
| Temperature : | 30 ℃ | Pol: | HORIZONTAL |
| Humidity : | 55% | | |

| Freq. (MHz) | Peak Reading (dBuV) | AV Reading (dBuV) | Ant./CL CF(dB) | Actual FS Peak (dBuV/m) | Actual FS AV (dBuV/m) | Peak Limit (dBuV/m) | AV Limit (dBuV/m) | Margin (dB) | |
|---|---|---|---|---|---|---|---|---|---|
| 1060.0 | 48.33 | | -11.37 | 36.96 | | 74.00 | 54.00 | -17.04 | Peak |
| 1220.0 | 47.94 | | -10.46 | 37.48 | | 74.00 | 54.00 | -16.52 | Peak |
| 3180.0 | 42.96 | | -4.28 | 38.68 | | 74.00 | 54.00 | -15.32 | Peak |

Remark：

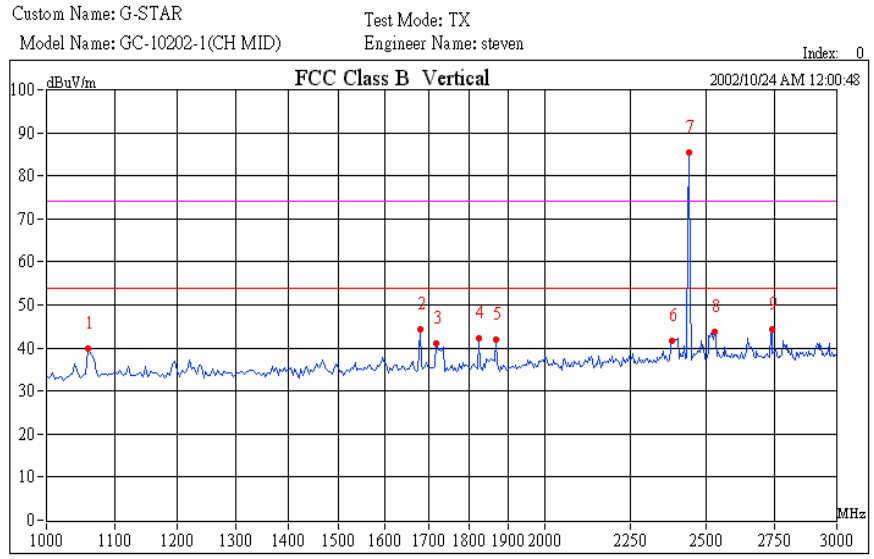
(1) Measuring frequencies from 30 MHz to the 10th harmonic of highest fundamental frequency。

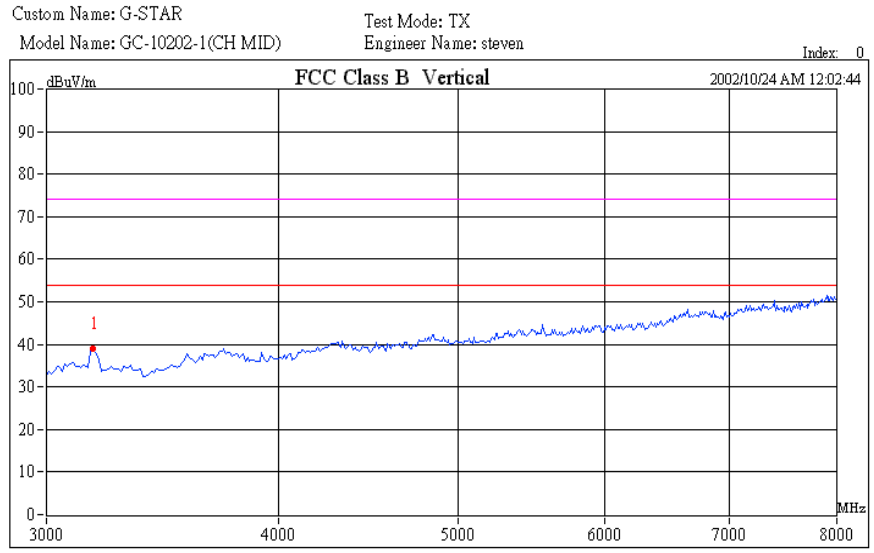
(2) Datas of measurement within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

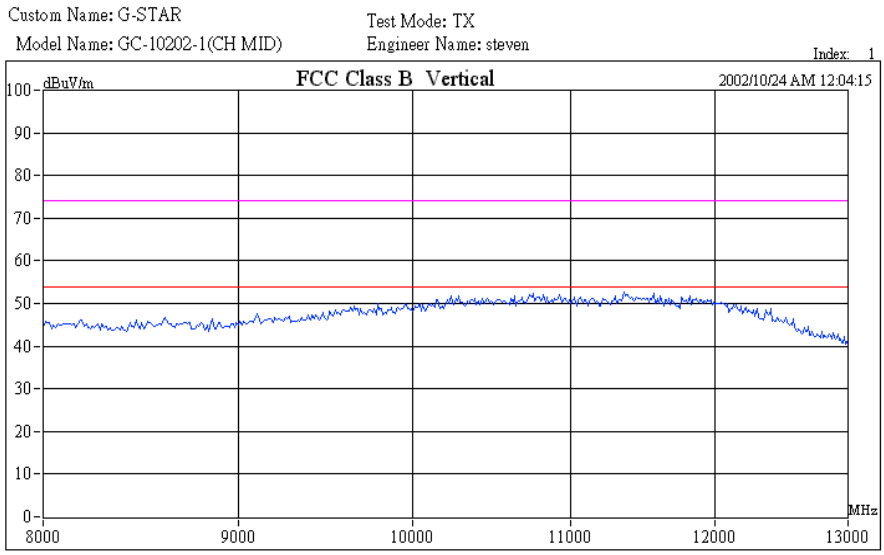
(3) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column。

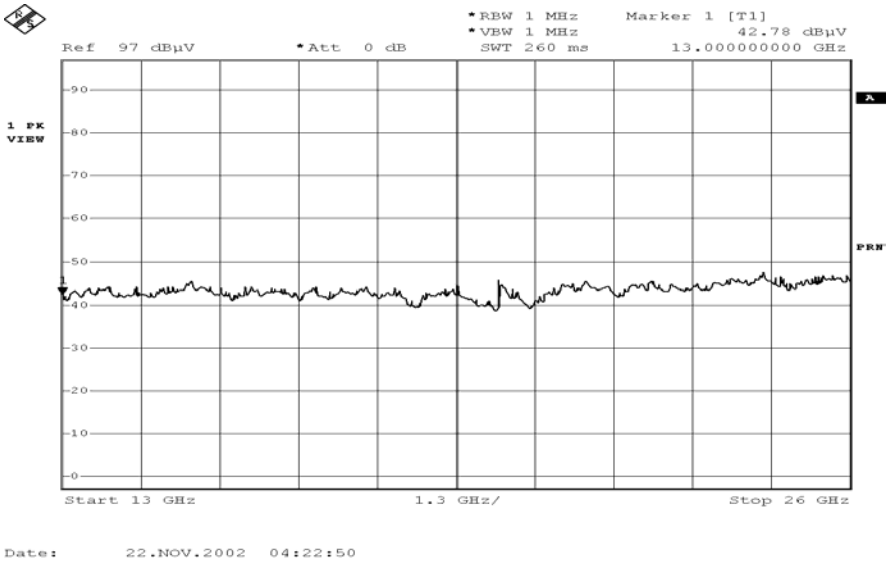
(4) Spectrum Setting : 30MHz – 1000MHz , RBW= 100KHz, VBW=100KHz, Sweep time = 200 ms. 1GHz- 8GHz, RBW= 1MHz, VBW= 1MHz, Sweep time= 200 ms.

# Radiated Emission test data plot (CH Mid V)

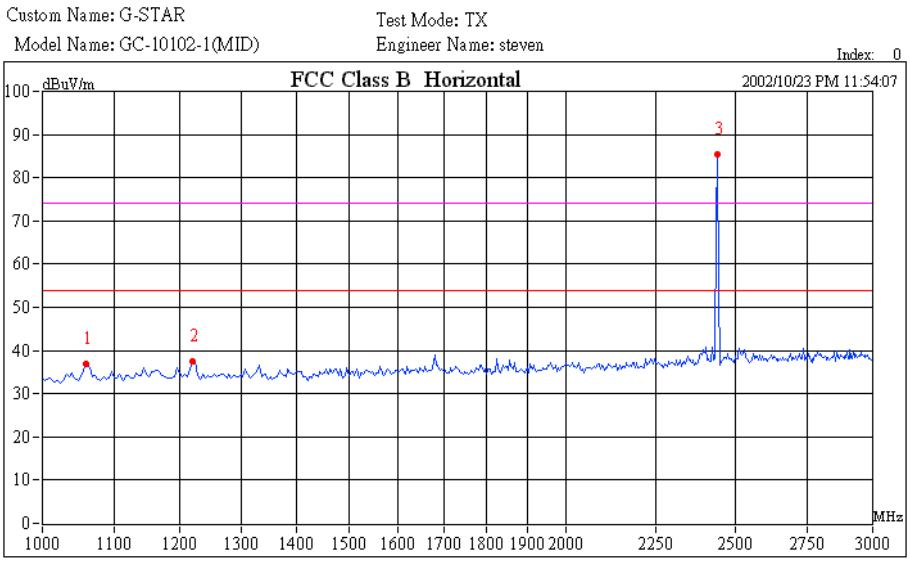


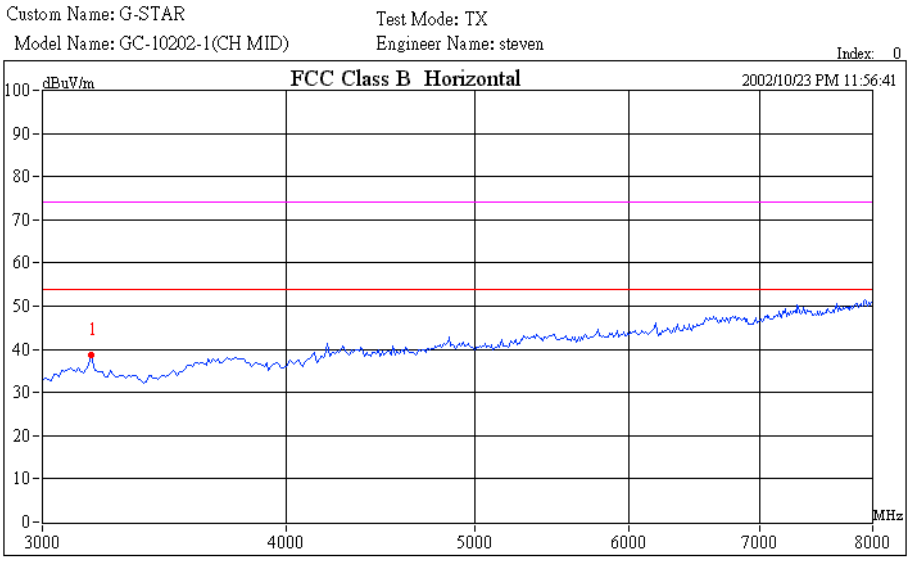



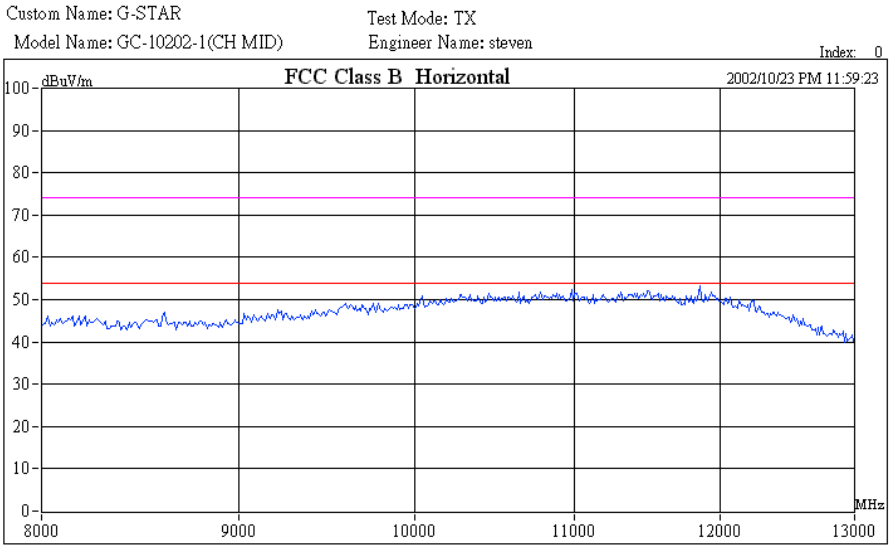



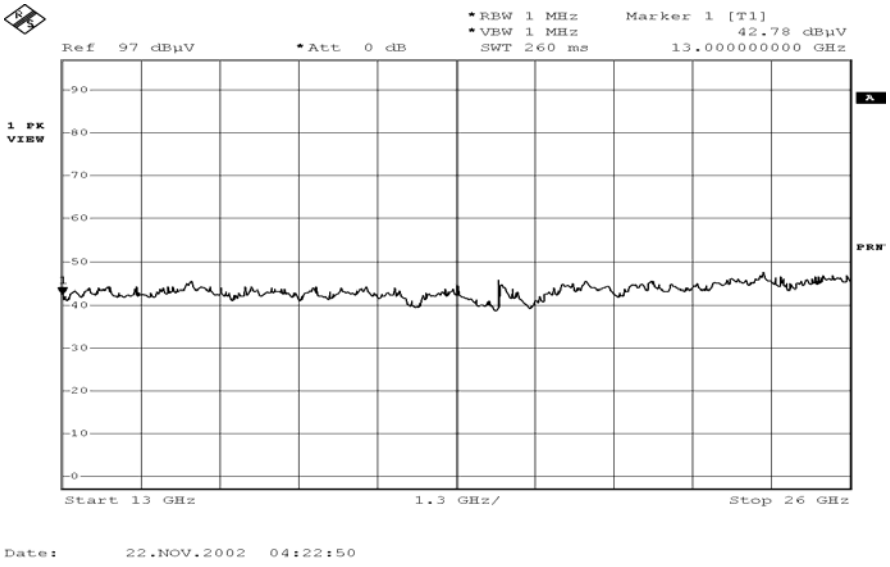

*RBW 1 MHz
*VBW 1 MHz
SWT 260 ms
Marker 1 [T1]
42.78 dBµV
13.000000000 GHz
Ref 97 dBµV
*Att 0 dB
1 PK
VIEW
A
PRN
Start 13 GHz
1.3 GHz/
Stop 26 GHz
Date: 22.NOV.2002 04:22:50

# Radiated Emission test data plot (CH Mid H)




*RBW 1 MHz
*VBW 1 MHz
SWT 260 ms
Marker 1 [T1]
42.78 dBµV
13.000000000 GHz
Ref 97 dBµV
*Att 0 dB
1 PK
VIEW
A
PRN
Start 13 GHz
1.3 GHz/
Stop 26 GHz
Date: 22.NOV.2002 04:22:50

Operation Mode: TX Mode
Fundamental Frequency: CH High
Temperature : 30 ℃
Humidity : 55%

Test Date : 10/23/2002
Test By: Markba Lee
Pol: VERTICAL

| Freq. (MHz) | Peak Reading (dBuV) | AV Reading (dBuV) | Ant./CL CF(dB) | Actual FS Peak (dBuV/m) | Actual FS AV (dBuV/m) | Peak Limit (dBuV/m) | AV Limit (dBuV/m) | Margin (dB) | |
|---|---|---|---|---|---|---|---|---|---|
| 1060.0 | 49.76 | | -11.37 | 38.39 | | 74.00 | 54.00 | -15.61 | Peak |
| 1240.0 | 48.33 | | -10.41 | 37.92 | | 74.00 | 54.00 | -16.08 | Peak |
| 1680.0 | 53.45 | | -8.66 | 44.79 | | 74.00 | 54.00 | -9.21 | Peak |
| 1824.0 | 51.05 | | -8.28 | 42.77 | | 74.00 | 54.00 | -11.23 | Peak |
| 1868.0 | 50.52 | | -8.12 | 42.40 | | 74.00 | 54.00 | -11.60 | Peak |
| 2400.0 | 48.81 | | -6.12 | 42.69 | | 74.00 | 54.00 | -11.31 | Peak |
| 2524.0 | 49.78 | | -5.71 | 44.07 | | 74.00 | 54.00 | -9.93 | Peak |
| 2740.0 | 49.53 | | -5.22 | 44.31 | | 74.00 | 54.00 | -9.69 | Peak |
| 2912.0 | 47.52 | | -4.85 | 42.67 | | 74.00 | 54.00 | -11.33 | Peak |
| 3180.0 | 44.30 | | -4.28 | 40.02 | | 74.00 | 54.00 | -13.98 | Peak |

Remark：

(1) Measuring frequencies from 30 MHz to the 10th harmonic of highest fundamental frequency。

(2) Datas of measurement within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

(3) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column。

(4) Spectrum Setting : 30MHz – 1000MHz , RBW= 100KHz, VBW=100KHz, Sweep time = 200 ms. 1GHz- 8GHz, RBW= 1MHz, VBW= 1MHz, Sweep time= 200 ms.

| | | | |
|---|---|---|---|
| Operation Mode: | TX Mode | Test Date : | 10/23/2002 |
| Fundamental Frequency: | CH High | Test By: | Markba Lee |
| Temperature : | 30 ℃ | Pol: | HORIZONTAL |
| Humidity : | 55% | | |

| Freq. (MHz) | Peak Reading (dBuV) | AV Reading (dBuV) | Ant./CL CF(dB) | Actual FS Peak (dBuV/m) | Actual FS AV (dBuV/m) | Peak Limit (dBuV/m) | AV Limit (dBuV/m) | Margin (dB) | |
|---|---|---|---|---|---|---|---|---|---|
| 1060.0 | 48.52 | | -11.37 | 37.15 | | 74.00 | 54.00 | -16.85 | Peak |

Remark：

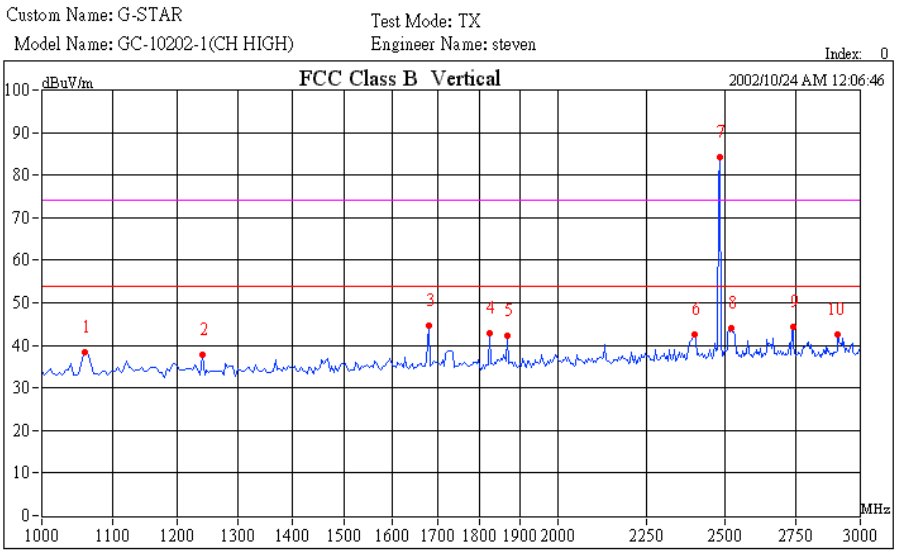
(1) Measuring frequencies from 30 MHz to the 10th harmonic of highest fundamental frequency。

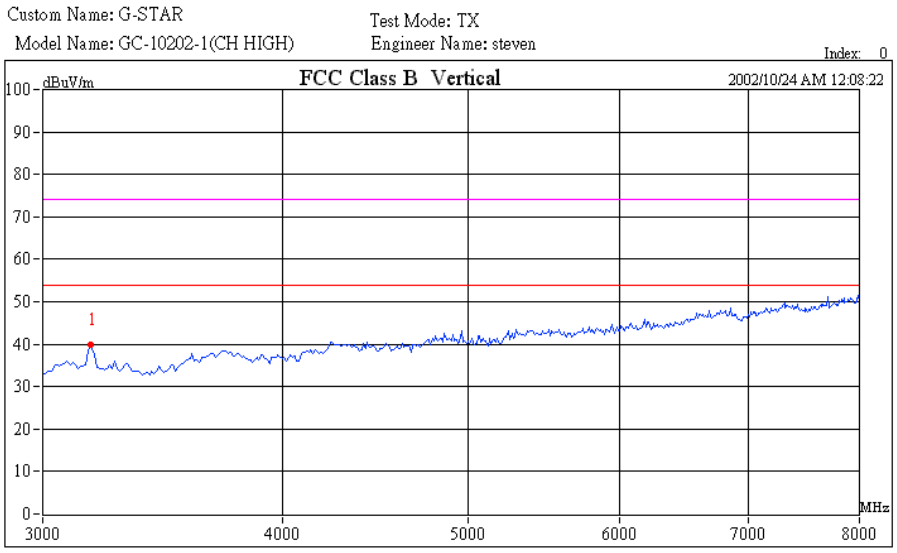
(2) Datas of measurement within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

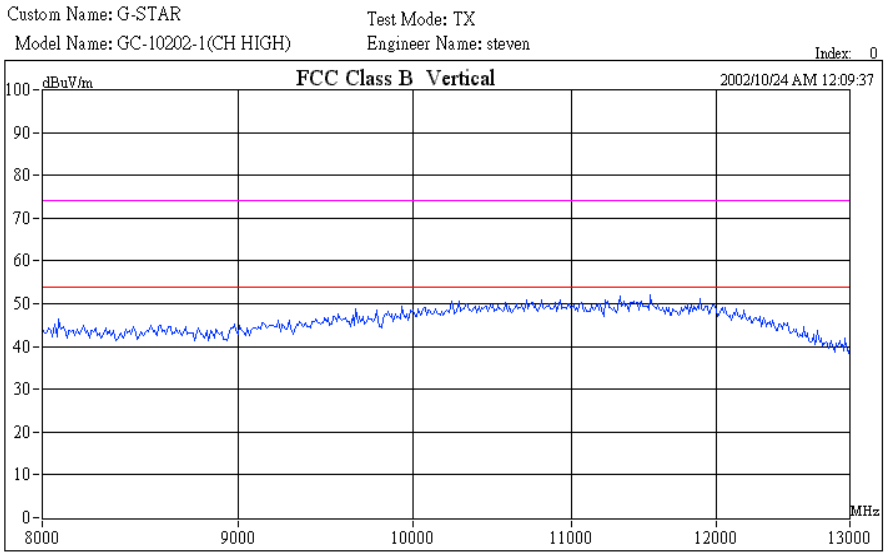
(3) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column。

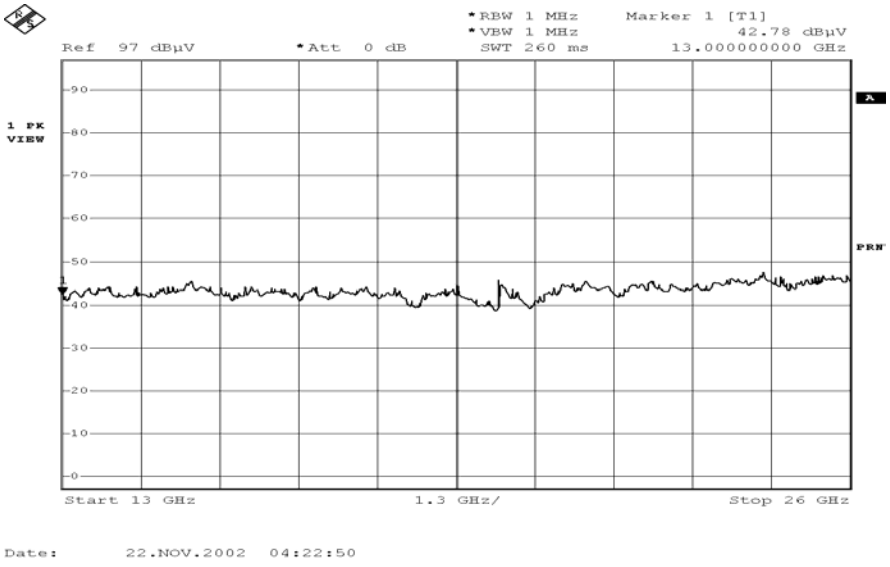
(4) Spectrum Setting : 30MHz – 1000MHz , RBW= 100KHz, VBW=100KHz, Sweep time = 200 ms. 1GHz- 8GHz, RBW= 1MHz, VBW= 1MHz, Sweep time= 200 ms.

# Radiated Emission test data plot (CH High V)

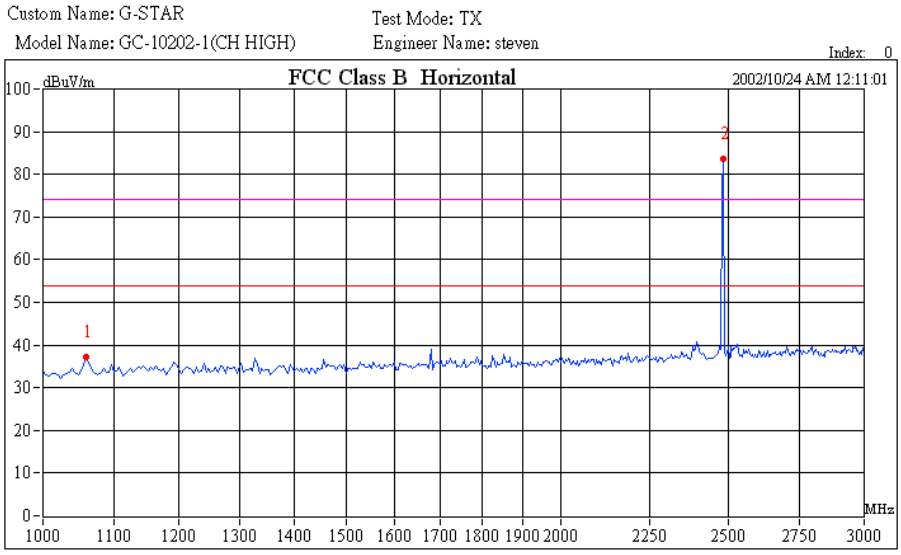


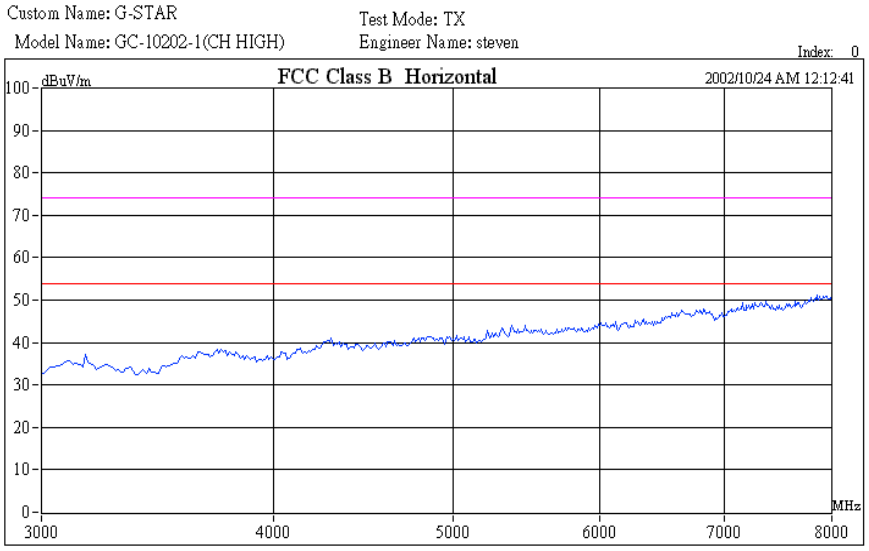



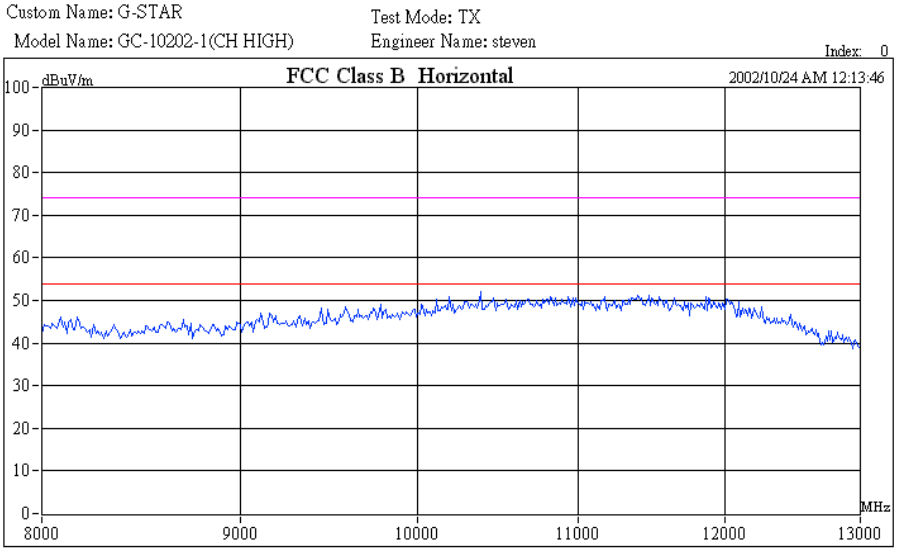



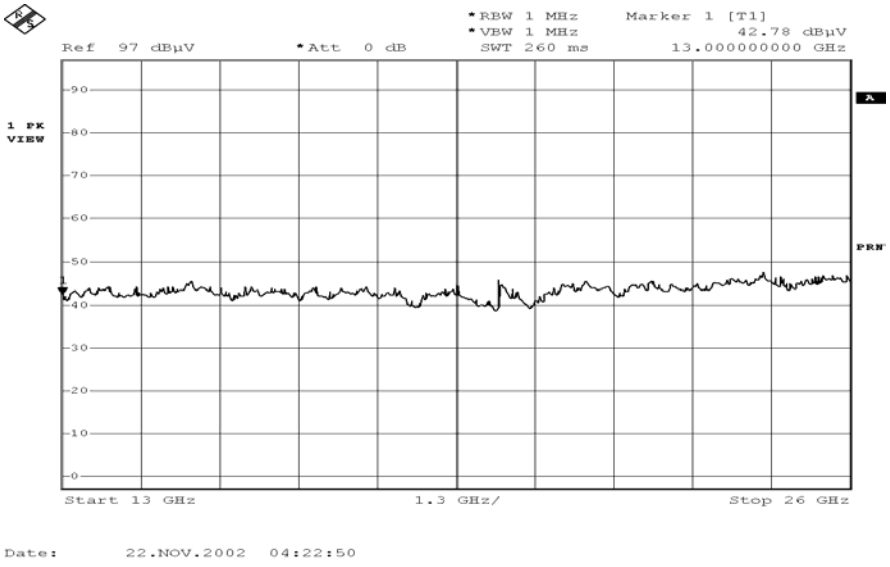

*RBW 1 MHz
*VBW 1 MHz
SWT 260 ms
Marker 1 [T1]
42.78 dBµV
13.000000000 GHz
Ref 97 dBµV
*Att 0 dB
1 PK
VIEW
A
PRN
Start 13 GHz
1.3 GHz/
Stop 26 GHz
Date: 22.NOV.2002 04:22:50

# Radiated Emission test data plot (CH High H)




*RBW 1 MHz
*VBW 1 MHz
SWT 260 ms
Marker 1 [T1]
42.78 dBµV
13.000000000 GHz
Ref 97 dBµV
*Att 0 dB
1 PK
VIEW
A
PRN
Start 13 GHz
1.3 GHz/
Stop 26 GHz
Date: 22.NOV.2002 04:22:50

# 10. FREQUENCY SEPARATION

## 10.1 Standard Applicable

According to §15.247(a), Frequency hopping systems shall have hopping channel carrier frequencies separated by minimum of 25KHz or the 20dB bandwidth of the hopping channel, whichever is greater.

## 10.2 9.2 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set center frequency of spectrum analyzer = middle of hopping channel .
4. Set the spectrum analyzer as RBW,VBW=100KHz, Adjust Span to 3.5 MHz, Sweep = auto.
5. Max hold. Mark 3 Peaks of hopping channel and record the 3 peaks frequency.

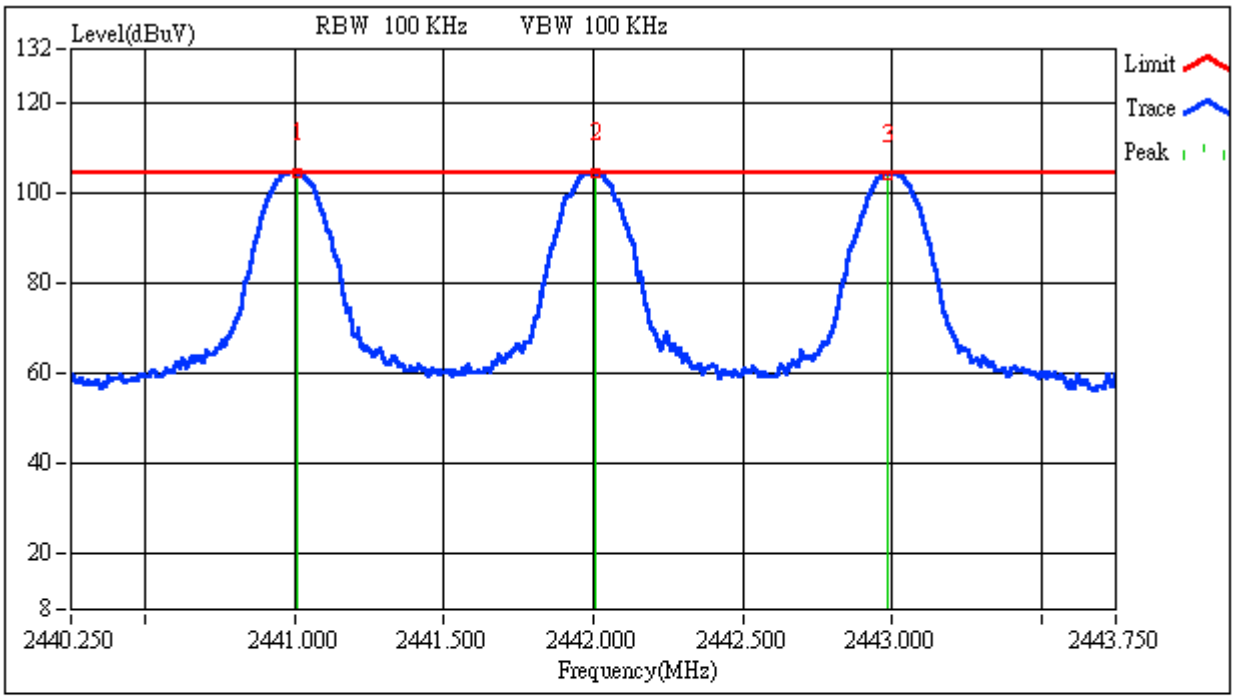
## 10.3 Measurement Result

| Channel separation | Limit | Result |
|---|---|---|
| MHz | kHz | |
| 0.98 | >=25 | PASS |

## 10.4 Measurement Equipment Used:

| EQUIPMENT TYPE | MFR | Model No. | Serial No. | LAST CAL. | Cal. Due. |
|---|---|---|---|---|---|
| Spectrum Analyzer | R&S | FSP30 | 1093.4495.30 | 07/23/2002 | 07/22/2003 |
| low loss cable | Huber + Suhner | Sucoflex 104 | N/A | N/A | N/A |

# Frequency Separation Test Data




Custom Name: G-STAR

Engineer:

Model Name: GC-10202-01

Report No.:

Test Mode: Channel sep

| | Frequency(MHz) | Read Level (dBuV) | Probe (dB) | Cable Loss (dB) | Level(dBuV) |
|---|---|---|---|---|---|
| 1 | 2441.0060 | 104.24 | 0.00 | 0.00 | 104.24 |
| 2 | 2442.0070 | 104.23 | 0.00 | 0.00 | 104.23 |
| 3 | 2442.9870 | 104.13 | 0.00 | 0.00 | 104.13 |
| | | | | | |
| | | | | | |

# 11. NUMBER OF HOPPING FREQUENCY

## 11.1 Standard Applicable

According to §15.247(a)(1)(ii), Frequency hopping systems operating in the 2400MHz-2483.5 MHz and 5725MHz – 5850MHz bands shall use at least 75 hopping frequencies.

## 11.2 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set spectrum analyzer Start=2400MHz, Stop = 2483.5MHz, Sweep = auto.
4. Set the spectrum analyzer as RBW,VBW=100KHz,
5. Max hold, view and count how many channel in the band.

## 11.3 Measurement Result

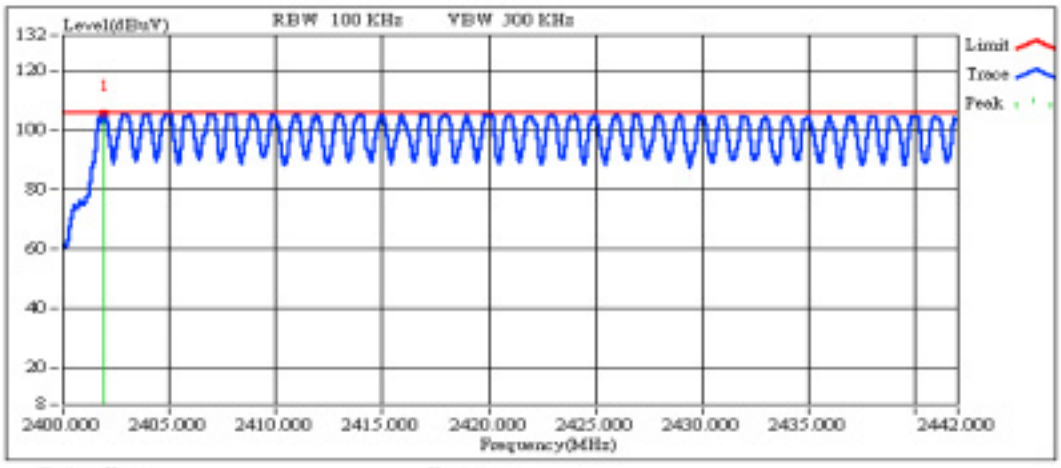
| Total no of hopping channel | Limit (CH) | Measurement result (CH) | Result |
|---|---|---|---|
| | 75 | 79 | PASS |

## 11.4 Measurement Equipment Used:

| EQUIPMENT TYPE | MFR | Model No. | Serial No. | LAST CAL. | Cal. Due. |
|---|---|---|---|---|---|
| Spectrum Analyzer | R&S | FSP30 | 1093.4495.30 | 07/23/2002 | 07/22/2003 |
| low loss cable | Huber + Suhner | Sucoflex 104 | N/A | N/A | N/A |

# Channel Number

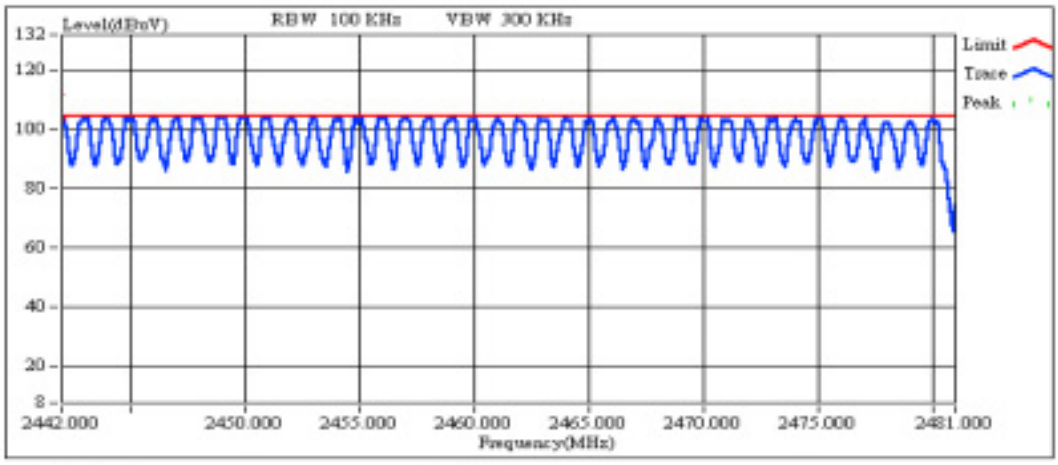
***2.4 GHz – 2.442GHz***




Custom Name: G-STAR
Engineer:
Model Name: GC-10202-01
Report No.:
Test Mode: 2.4G-2.42G

| | Frequency(MHz) | Read Level (dBuV) | Probe (dB) | Cable Loss (dB) | Level(dBuV) |
|---|---|---|---|---|---|
| 1 | 2401.9320 | 105.81 | 0.00 | 0.00 | 105.81 |

***2.442 GHz – 2.481GHz***




Custom Name: G-STAR
Engineer:
Model Name: GC-10202-01
Report No.:
Test Mode: 24.42-24.81

| | Frequency(MHz) | Read Level (dBuV) | Probe (dB) | Cable Loss (dB) | Level(dBuV) |
|---|---|---|---|---|---|
| 1 | 2442.0000 | 104.10 | 0.00 | 0.00 | 104.10 |

# 12. TIME OF OCCUPANCY (DWELL TIME)

## 12.1 Standard Applicable

According to §15.247(a)(1)(ii), Frequency hopping systems operating in the 2400MHz-2483.5 MHz and 5725MHz – 5850MHz bands. The average time of occupancy on any frequency shall not greater than 0.4 s within a 30s period.

## 12.2 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set center frequency of spectrum analyzer = operating frequency.
4. Set the spectrum analyzer as RBW,VBW=1MHz, Span = 0Hz , Adjust Sweep = 30s.
5. Repeat above procedures until all frequency measured were complete.

## 12.3 Measurement Result

A period time = 0.420 (ms) * 79 = 33.18 (s)

CH Low:: 0.42 (ms) * 1600/79 * 33.18=282.32 (ms)

CH Mid:: 0.41 (ms) * 1600/79 * 33.18=275.60 (ms)

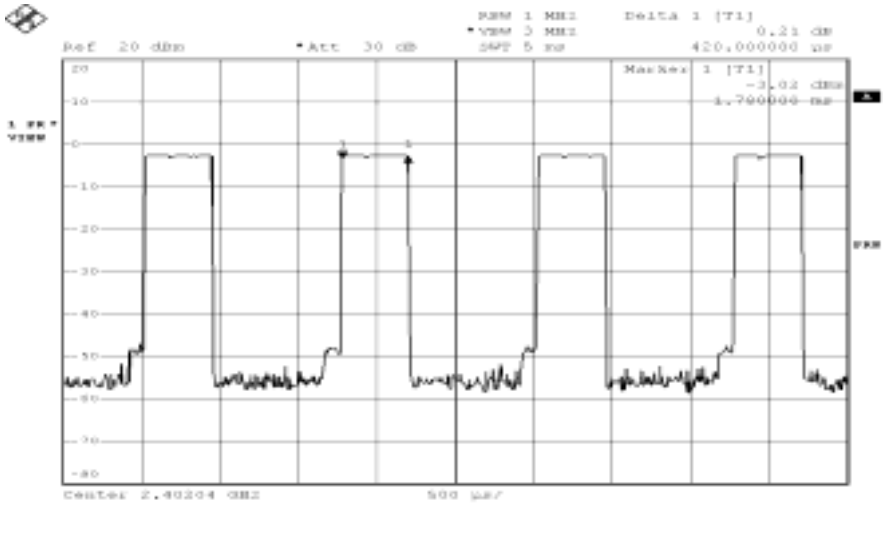
CH High: 0.40 (ms) * 1600/79 * 33.18=268.88 (ms)

| CH | Pulse Time ms | Total of Dwell Time (ms) | Period time (ms) | Limit (ms) |
|---|---|---|---|---|
| Low | 0.42 | 282.24 | 33.18 | 400.00 |
| Mid | 0.41 | 275.52 | 33.18 | 400.00 |
| High | 0.40 | 268.80 | 33.18 | 400.00 |

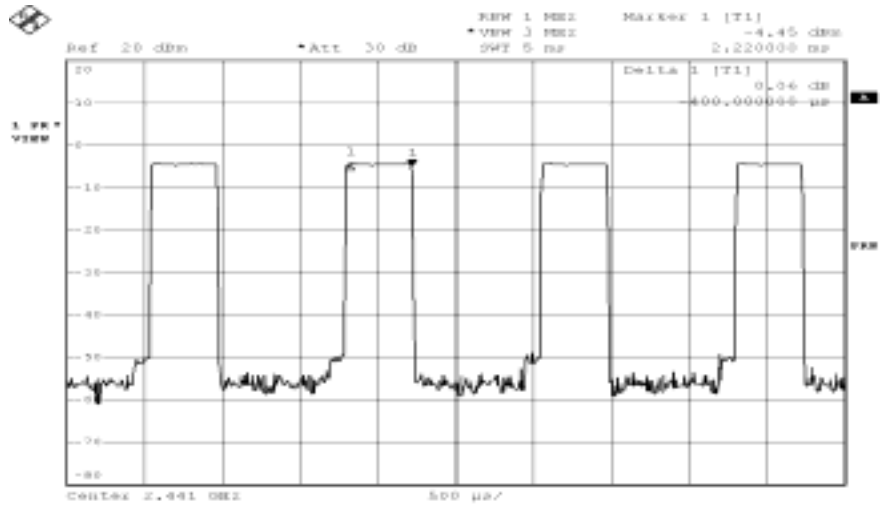
## 12.4 Measurement Equipment Used:

| EQUIPMENT TYPE | MFR | Model No. | Serial No. | LAST CAL. | Cal. Due. |
|---|---|---|---|---|---|
| Spectrum Analyzer | R&S | FSP30 | 1093.4495.30 | 07/23/2002 | 07/22/2003 |
| low loss cable | Huber + Suhner | Sucoflex 104 | N/A | N/A | N/A |

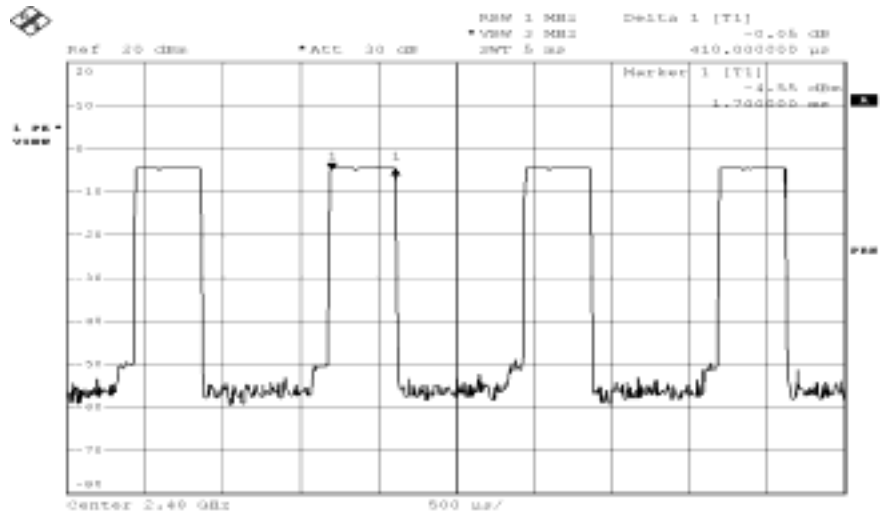
# Dwell Time Test Data




Date: 10.OCT.2002 13:32:42




Date: 10.OCT.2002 13:47:27




Date: 10.OCT.2002 13:55:45

# 13. Peak Power Spectral Density

## 13.1 Standard Applicable

According to §15.247(d), for direct sequence 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.

## 13.2 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW = 3KHz, VBW = 3KHz, Span = 300KHz, Sweep=100s
4. Record the max. reading.
5. Repeat above procedures until all frequency measured were complete.

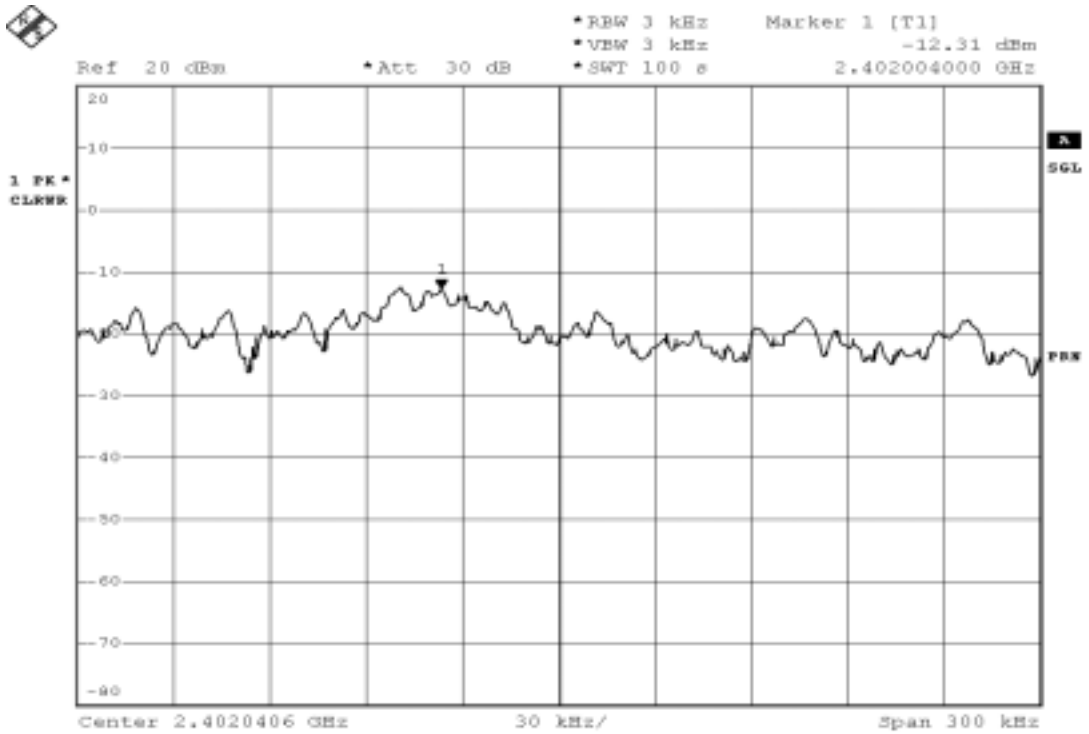
## 13.3 Measurement Result

| CH | RF Power Density Reading (dBm) | Cable loss (dB) | RF Power Density Level (dBm) | Maximum Limit (dBm) |
|---|---|---|---|---|
| Low | -12.31 | 0.56 | -11.75 | 8 |
| Mid | -14.19 | 0.56 | -13.63 | 8 |
| High | -15.09 | 0.56 | -14.53 | 8 |

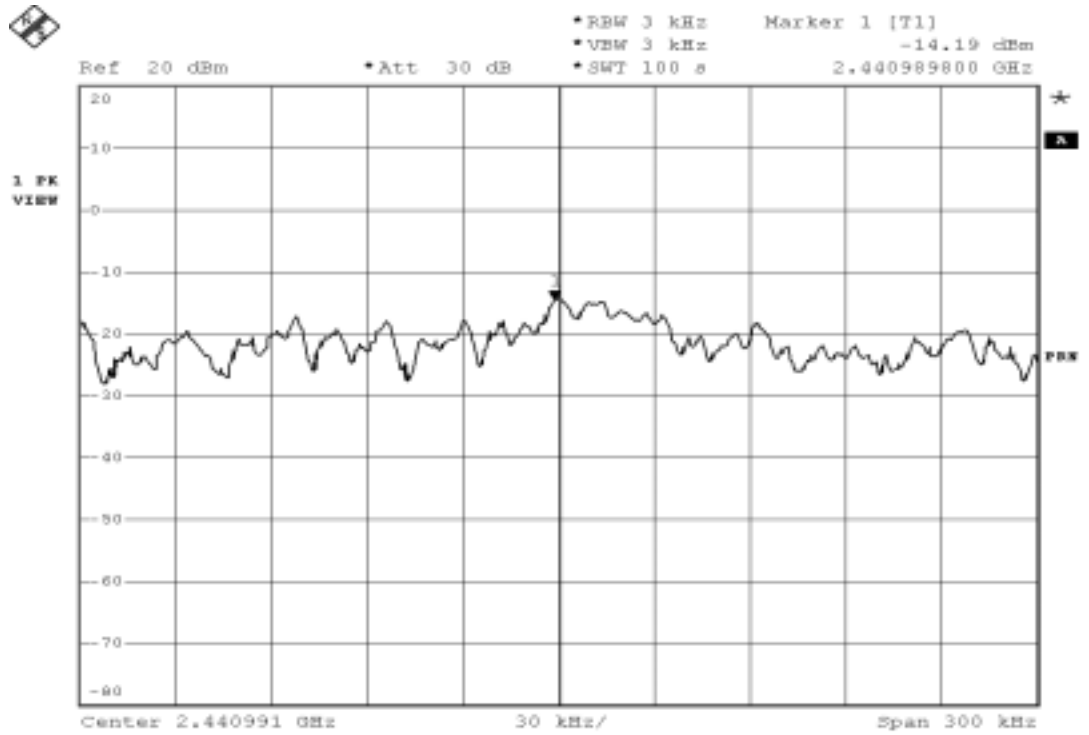
## 13.4 Measurement Equipment Used:

| EQUIPMENT TYPE | MFR | Model No. | Serial No. | LAST CAL. | Cal. Due. |
|---|---|---|---|---|---|
| Spectrum Analyzer | R&S | FSP30 | 1093.4495.30 | 07/23/2002 | 07/22/2003 |
| Plotter | HP | 7475A | 2938A29027 | N/A | N/A |
| low loss cable | Huber + Suhner | Sucoflex 104 | N/A | N/A | N/A |

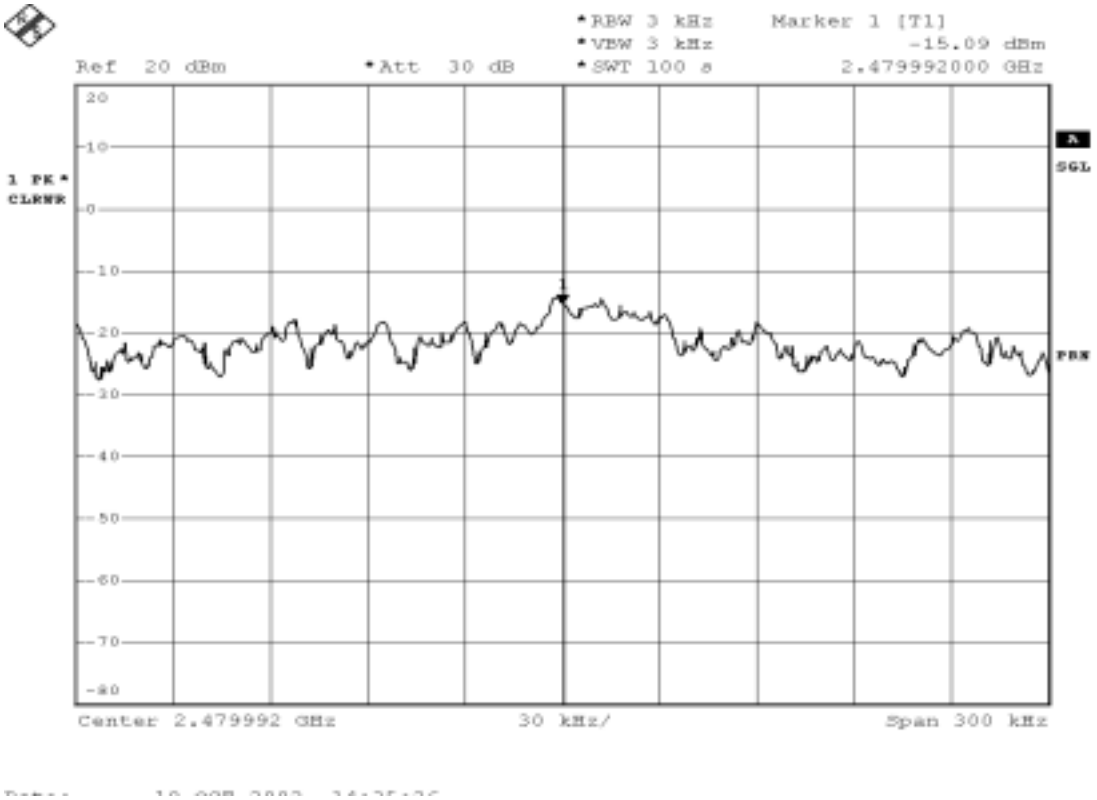
## Power Spectral Density Test Plot (CH-Low)




## Power Spectral Density Test Plot (CH-Mid)



## Power Spectral Density Test Plot (CH-High)



# 14. ANTENNA REQUIREMENT

## 14.1 Standard Applicable

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

And according to §15.246(1), if transmitting antennas of directional gain greater than 6dBi are used the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

## 14.2 Antenna Connected Construction

The directional gins of antenna used for transmitting is 0 ~ 2 dBi, and the antenna connector is designed with permanent attachment and no consideration of replacement. Please see EUT photo for details.

# 15. RF EXPOSURE

## 15.1 Standard Applicable

According to §15.247(b)(4) and §1.1307(b)(1), systems operating under the provisions of this sectionshall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

According to §1.1310 and §2.1093 RF exposure is calculated.

Limits for Maximum Permissive Exposure (MPE)

| Frequency Range (MHz) | Electric Field Strength (V/m) | Magnetic Field Strength (A/m) | Power Density ($mW/cm^2$) | Averaging Time (minute) |
|---|---|---|---|---|
| Limits for General Population/Uncontrolled Exposure | | | | |
| 0.3-1.34 | 614 | 1.63 | *(100) | 30 |
| 1.34-30 | 824/f | 2.19/f | *($180/f^2$) | 30 |
| 30-300 | 27.5 | 0.073 | 0.2 | 30 |
| 300-1500 | / | / | F/1500 | 30 |
| 1500-15000 | / | / | 1.0 | 30 |

F = frequency in MHz

* = Plane-wave equipment power density

**MPE Prediction**

Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$S=PG/4\pi R^2$

Where: S = Power density

P = Power input to antenna

G = Power gain of the antenna in the direction of interest relative to an isotropic radiator

R = Distance to the center of radiation of the antenna

Maximum peak output power at antenna input terminal: -2.31(dBm)
Maximum peak output power at antenna input terminal: 0.587m (mW)
Antenna gain (typical): 0 ~ 2 (dBi)
Maximum antenna gain: 2 (numeric)
Prediction distance: 3 (cm)
Prediction frequency: 2401 (MHz)

MPE limit for uncontrolled exposure at prediction frequency: 1 ($mW/cm^2$)
Power density at predication frequency at 3 (cm) distance is 0.005197 mW/cm^2

| S | P | P | G | R |
|---|---|---|---|---|
| mW/cm^2 | mW | dBm | dBi | cm |
| 0.005197181 | 0.587489353 | -2.31 | 0 | 3 |

## 15.2 Measurement Result

The predicted power density level at 3 cm is 0.005197 $mW/cm^2$. This is below the uncontrolled exposure limit of 1 $mW/cm^2$ at 2401MHz.