

# FCC PART 15 TEST REPORT

For

AMBIT Microsystems Corporation

4-1, Ming Shen Street, Tu Chen Industrial District.  
Tu Chen, Taipei Hsien 236, Taiwan, R.O.C.

**FCC ID: MCLT60H677**

February 11, 2003

|                                                                                                                                                                     |                                                          |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|
| <b>This Report Concerns:</b><br><input checked="" type="checkbox"/> Original Report                                                                                 | <b>Equipment Type:</b><br>MiniPCI 802.11a/b Combo Module |
| <b>Test Engineer:</b> Benjamin Jing                                                                                                                                 |                                                          |
| <b>Report No.:</b> R0301172                                                                                                                                         |                                                          |
| <b>Test Date:</b> January 27, 2003                                                                                                                                  |                                                          |
| <b>Reviewed By:</b> Hans Mellberg                                                                                                                                   |                                                          |
| <b>Prepared By:</b> Bay Area Compliance Laboratory Corporation (BACL)<br>230 Commercial Street<br>Sunnyvale, CA 94085<br>Tel: (408) 732-9162<br>Fax: (408) 732 9164 |                                                          |

**Note:** This test report is specially limited to the above client company and product model only. It may not be duplicated without prior written consent of Bay Area Compliance Laboratory Corporation. This report **must not** be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government.

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## 1 - GENERAL INFORMATION

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### 1.1 Product Description for Equipment Under Test (EUT)

The *AMBIT Microsystems Corporation's*, model: *T60H677*, or the "EUT" as referred to in this report MiniPCI 802.11a/b Combo Module which measures approximately 2.4"L x 1.7"W x 0.1"H.

*\* The test data gathered is from typical production samples provided by the manufacturer.*

### 1.2 Objective

This type approval report is prepared on behalf of. *AMBIT Microsystems Corporation* in accordance with Part 2, Subpart J, Part 15, Subparts A , C, and E of the Federal Communication Commissions rules.

The objective of the manufacturer is to demonstrate compliance with FCC rules for Output Power, Antenna Requirements, 6 dB Bandwidth and 26 dB Bandwidth, power spectral density, 100 kHz Bandwidth of Band Edges Measurement, Out of Band Emission, Spurious Emission, Conducted and Spurious Radiated Emission, Discontinue Transmitting with Absence of Data or Operational Failure, Peak Excursion to Average Ratio and Frequency Stability.

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

No Related Submittals.

### 1.4 Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-1992, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratory, Corp. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

### 1.5 Test Facility

The Open Area Test site used by BACL to collect radiated and conducted emission measurement data is located in the back parking lot of the building at 230 Commercial Street, Sunnyvale, California, USA.

Test site at BACL has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports has been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997 and Article 8 of the VCCI regulations on December 25, 1997. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-1992.

The Federal Communications Commission and Voluntary Control Council for Interference has the reports on file and is listed under FCC file 31040/SIT 1300F2 and VCCI Registration No.: C-1298 and R-1234. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (Lab Code 200167-0). The scope of the accreditation covers the FCC Method – 47 CFR Part – Digital Devices, CISPER 22: 1997: Electromagnetic Interference – Limits and Methods of Measurement of Information Technology Equipment test methods.

### 1.6 Test Equipment List

| Manufacturer      | Description          | Model            | Serial Number | Cal. Due Date |
|-------------------|----------------------|------------------|---------------|---------------|
| HP                | Spectrum Analyzer    | 8568B            | 2610A02165    | 12/6/03       |
| HP                | Spectrum Analyzer    | 8593B            | 2919A00242    | 12/20/03      |
| HP                | Amplifier            | 8349B            | 2644A02662    | 12/20/03      |
| HP                | Quasi-Peak Adapter   | 85650A           | 917059        | 12/6/03       |
| HP                | Amplifier            | 8447E            | 1937A01046    | 12/6/03       |
| A.H. System       | Horn Antenna         | SAS0200/571      | 261           | 12/27/03      |
| Com-Power         | Log Periodic Antenna | AL-100           | 16005         | 11/2/03       |
| Com-Power         | Biconical Antenna    | AB-100           | 14012         | 11/2/03       |
| Solar Electronics | LISN                 | 8012-50-R-24-BNC | 968447        | 12/28/03      |
| Com-Power         | LISN                 | LI-200           | 12208         | 12/20/03      |
| Com-Power         | LISN                 | LI-200           | 12005         | 12/20/03      |
| BACL              | Data Entry Software  | DES1             | 0001          | 12/20/03      |

**\* Statement of Traceability:** Bay Area Compliance Laboratory Corp. certifies that all calibration has been performed using suitable standards traceable to the NIST.

### 1.7 Local Support Equipment List and Details

| Manufacturer | Description | Model | Serial Number | FCC ID |
|--------------|-------------|-------|---------------|--------|
| ACER         | Notebook PC | SKU-4 | N/A           | DoC    |
| HP           | Printer     | 2225C | 2821S14783    | DOC    |

### 1.8 External I/O Cabling List and Details

| Cable Description      | Length (M) | Port/From                 | To      |
|------------------------|------------|---------------------------|---------|
| Shielded Printer Cable | 2.0        | Parallel Port/Notebook PC | Printer |

## **2 - SYSTEM TEST CONFIGURATION**

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### **2.1 Justification**

The host system was configured for testing in a typical fashion (as normally used by a typical user).

The EUT was tested in the normal (native) operating mode to represent *worst-case* results during the final qualification test.

### **2.2 EUT Exercise Software**

The EUT exercise program used during radiated and conducted testing was designed to exercise the system components in a manner similar to a typical use. The test software, provided by the customer, is started the Windows terminal program under the Windows 98/2000/ME/XP operating system.

Once loaded, set the Tx channel to low, mid and high for testing.

### **2.3 Special Accessories**

As shown in section 2.7, all interface cables used for compliance testing are shielded. The host PC and the peripherals featured shielded metal connectors.

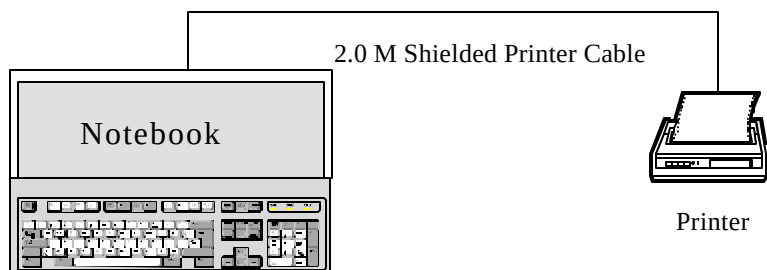
### **2.4 Schematics / Block Diagram**

Please refer to Appendix A.

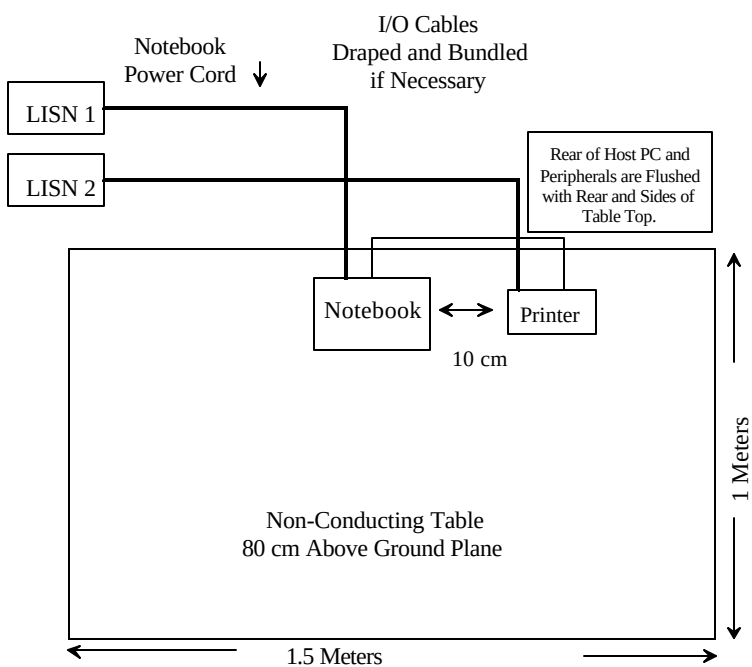
### **2.5 Equipment Modifications**

No modifications were made by BACL to ensure the EUT to comply with the applicable limits and requirements.

## 2.6 Configuration of Test System



## 2.7 Test Setup Block Diagram



### 3 - SUMMARY OF TEST RESULTS

| FCC RULES                          | DESCRIPTION OF TEST                                                                                                                                                                                                                                                                                                                                                                                                                            | RESULT    | REFERENCE                     |
|------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-------------------------------|
| § 15.203                           | Antenna Requirement                                                                                                                                                                                                                                                                                                                                                                                                                            | Compliant | Section 11                    |
| § 15.205,<br>§ 15.407 (b)(6)       | Restricted Bands                                                                                                                                                                                                                                                                                                                                                                                                                               | Compliant | Section 12                    |
| § 15.209 (a),<br>§ 15.407 (b)(5)   | Radiated Emission                                                                                                                                                                                                                                                                                                                                                                                                                              | Compliant | Section 12                    |
| § 15.209 (f)                       | Spurious Emission                                                                                                                                                                                                                                                                                                                                                                                                                              | Compliant | Section 10                    |
| § 15.247 (a)(2)                    | 6 dB Bandwidth                                                                                                                                                                                                                                                                                                                                                                                                                                 | Compliant | Section 5                     |
| § 15.247 (b)(1),<br>§ 15.407(a)(2) | Maximum Peak Output Power                                                                                                                                                                                                                                                                                                                                                                                                                      | Compliant | Section 4                     |
| § 15.247(b)(4),<br>§ 15.407 (f)    | RF Exposure Requirement                                                                                                                                                                                                                                                                                                                                                                                                                        | Compliant | Section 14                    |
| § 15.247 (c)                       | 100 kHz Bandwidth of Frequency Band Edge                                                                                                                                                                                                                                                                                                                                                                                                       | Compliant | Section 7                     |
| § 15.247 (d)                       | Peak Power Spectral Density                                                                                                                                                                                                                                                                                                                                                                                                                    | Compliant | Section 6                     |
| § 15.207 (a)                       | For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequency within the band 450 kHz to 30 MHz shall not exceed 250 micovolts.                                                                                                                                                                 | Compliant | Section 13                    |
| § 15.407 (a)(2)                    | The peak power spectral density shall not exceed 11dBm in any 1 MHz band                                                                                                                                                                                                                                                                                                                                                                       | Compliant | Section 6                     |
| § 15.407 (a)(6)                    | The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified in this paragraph) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.                                                                                                                                                                           | Compliant | Section 8                     |
| § 15.407 (c)                       | The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude the transmission of control or signaling information or the user of repetitive codes used by certain digital technologies to complete frame or burst intervals. Applicants shall include in their application a description of how this requirement is met. | Compliant | See Provided Technical Manual |
| § 15.407 (g)                       | The responsibility for manufacturer to ensure U-NII device frequency stability                                                                                                                                                                                                                                                                                                                                                                 | Compliant | Section 16                    |



## 4 - PEAK OUTPUT POWER MEASUREMENT

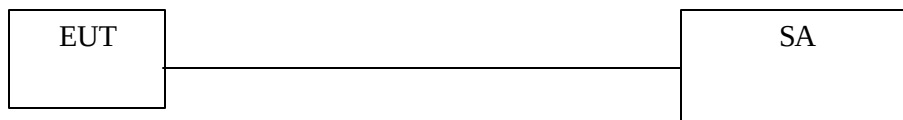
### 4.1 Standard Applicable

According to §15.247(b) (1), for frequency hopping systems in the 2400-2483.5MHz band employing at least 75 hopping channels, and all direct sequence systems, the maximum peak output power of the transmitter shall not exceed 1 Watt.

According to §15.407(b) (3), for the band 5.725~5.825 GHz, all emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an EIRP of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an EIRP of -27 dBm/MHz.

### 4.2 Measurement Procedure

1. Place the EUT on a bench 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 a spectrum analyzer.
3. Add a correction factor to the display.



### 4.3 Measurement Result

#### 4.3.1 RF Output Power (15.247) for 802.11b

| Port | Channel | Frequency (MHz) | Output Power (dBm) | Correction Factor (dB) | Corrected Output Power (dBm) | Corrected Output Power (mW) | Standard (W) | Result    |
|------|---------|-----------------|--------------------|------------------------|------------------------------|-----------------------------|--------------|-----------|
| J1   | Low     | 2412            | 9.5                | 7.2                    | 16.7                         | 46.8                        | ≤ 1W         | Compliant |
|      | Mid     | 2437            | 9.17               | 7.2                    | 16.37                        | 43.4                        | ≤ 1W         | Compliant |
|      | High    | 3462            | 8.67               | 7.2                    | 15.87                        | 38.6                        | ≤ 1W         | Compliant |
| J2   | Low     | 2412            | -9.00              | 7.2                    | -1.8                         | 0.66                        | ≤ 1W         | Compliant |
|      | Mid     | 2437            | -13.50             | 7.2                    | -6.3                         | 0.23                        | ≤ 1W         | Compliant |
|      | High    | 2462            | -14.17             | 7.2                    | -6.9                         | 0.21                        | ≤ 1W         | Compliant |

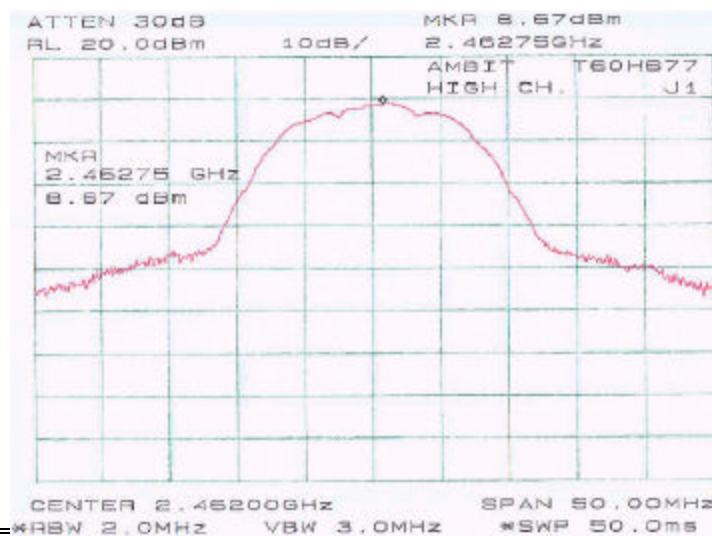
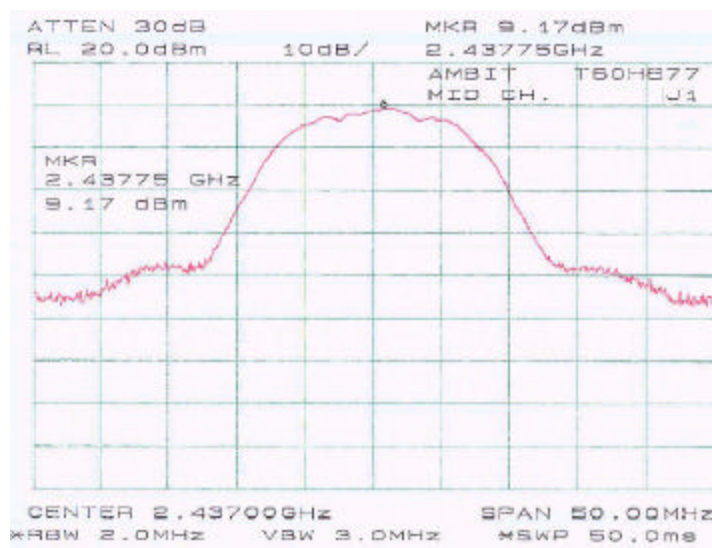
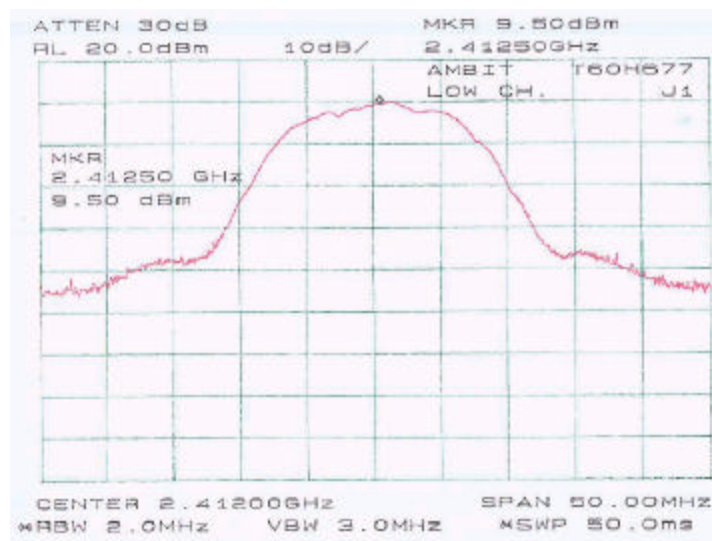
Note: Correction Factor =  $10\log(\text{BW}_{6\text{dB}}/\text{RBW}) = 10\log(10.5/2) = 7.2\text{dB}$

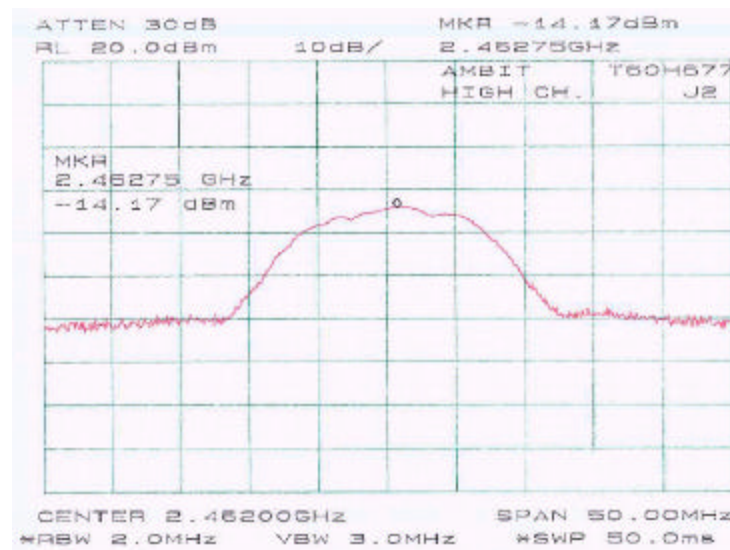
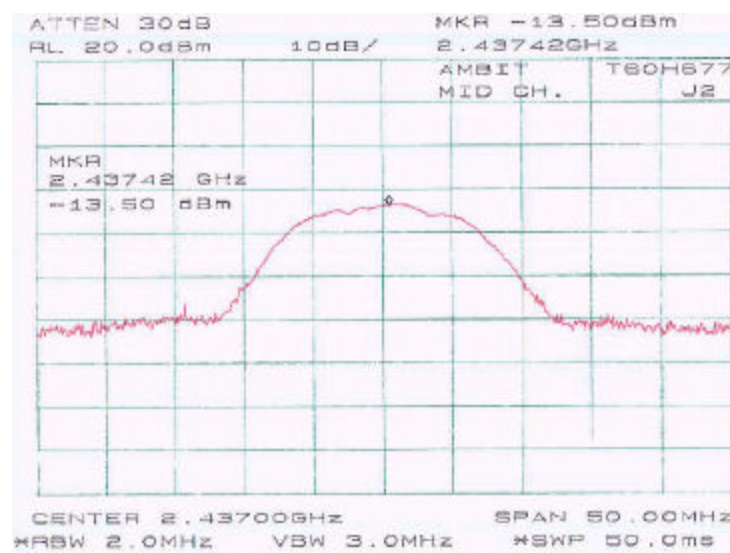
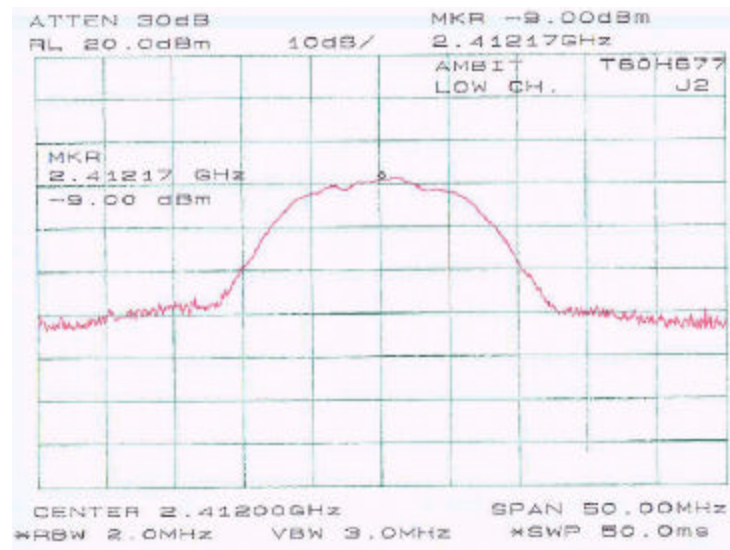
### 4.3.2 RF Output Power (15.407) for 802.11a

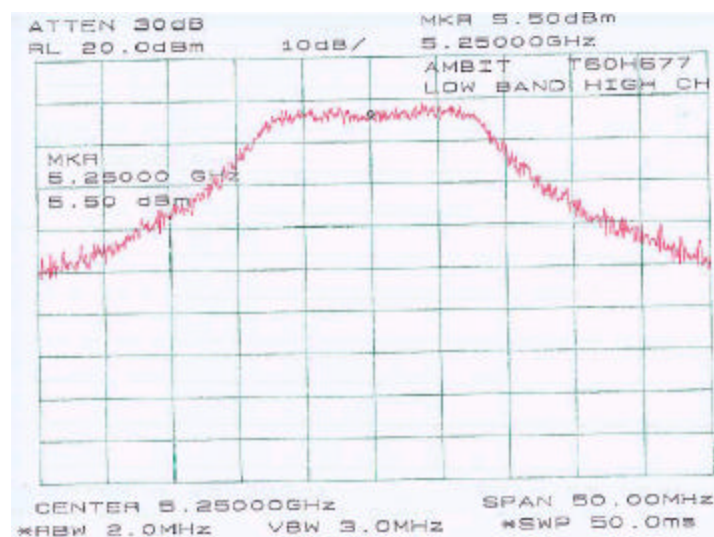
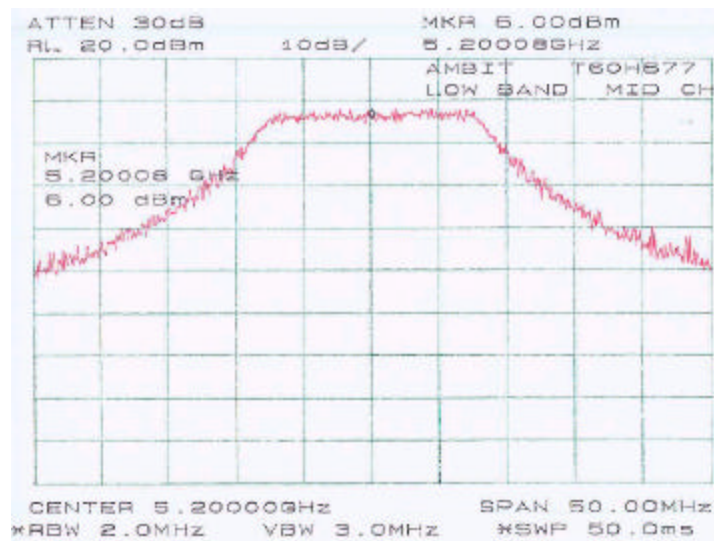
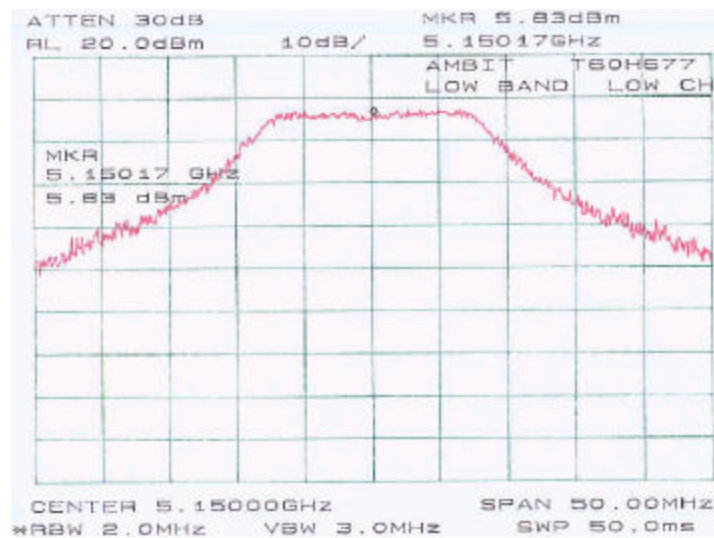
| Band | Channel (MHz) | Frequency (MHz) | Output Power (dBm) | Correction Factor (dB) | Corrected Output Power (dBm) | Output Power (mW) | Standard (mW) | Result    |
|------|---------------|-----------------|--------------------|------------------------|------------------------------|-------------------|---------------|-----------|
| Low  | Low           | 5150            | 5.83               | 10.7                   | 16.53                        | 44.9              | <50           | Compliant |
|      | Mid           | 5200            | 6                  | 10.7                   | 16.7                         | 46.8              | <50           | Compliant |
|      | High          | 5250            | 5.5                | 10.7                   | 16.2                         | 41.7              | <50           | Compliant |
| Mid  | Low           | 5250            | 5.5                | 10.7                   | 16.2                         | 41.7              | <50           | Compliant |
|      | Mid           | 5300            | 5.33               | 10.7                   | 16.03                        | 40.1              | <50           | Compliant |
|      | High          | 5330            | 5.83               | 10.7                   | 16.53                        | 44.9              | <50           | Compliant |
| High | Low           | 5745            | 5.33               | 10.7                   | 16.03                        | 40.1              | <50           | Compliant |
|      | Mid           | 5775            | 5.67               | 10.7                   | 16.37                        | 43.4              | <50           | Compliant |
|      | High          | 5810            | 5.83               | 10.7                   | 16.53                        | 44.9              | <50           | Compliant |

Note: Correction Factor =  $10\log(\text{BW}26\text{dB}/\text{RBW}) = 10\log(23.83/2) = 10.7\text{dB}$

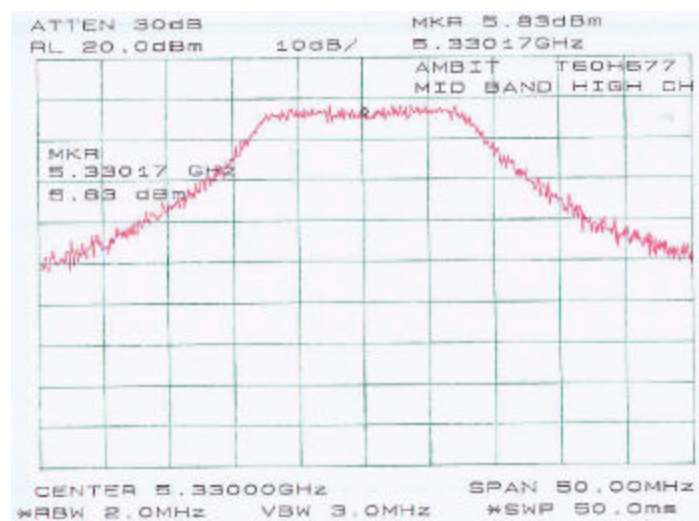
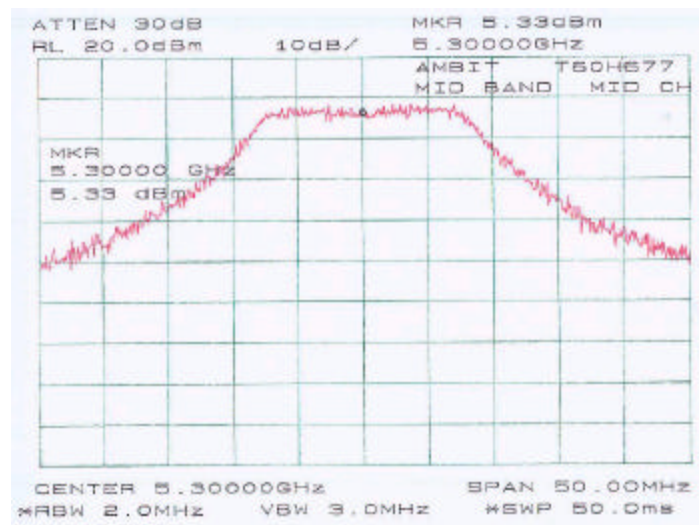
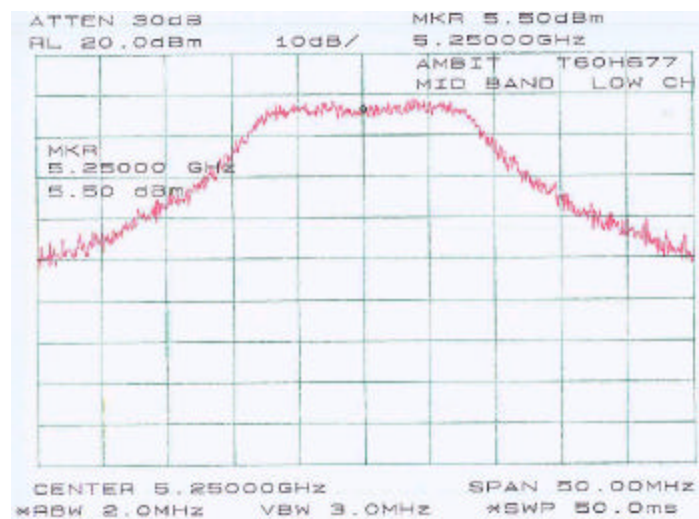
Test mode: target power = 15.0, ext pw detector = 1, xpdgain = 6, ob = 1, db = 2, b-ob = 1

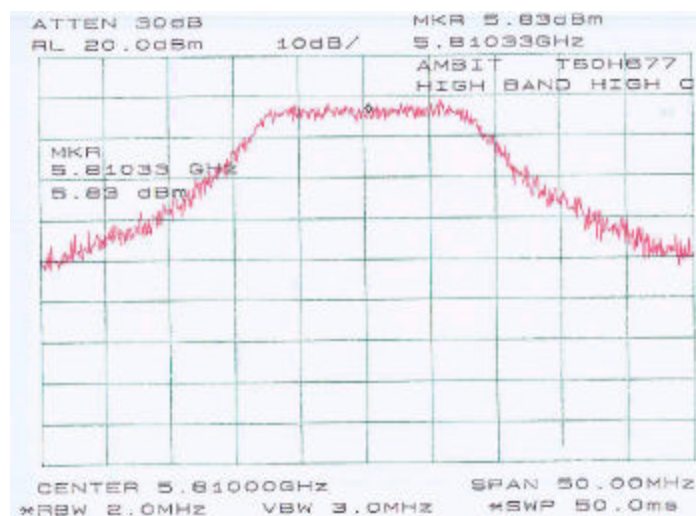
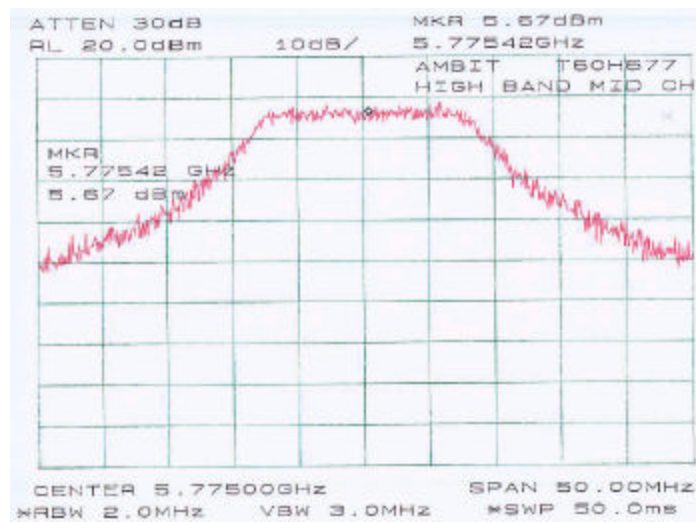
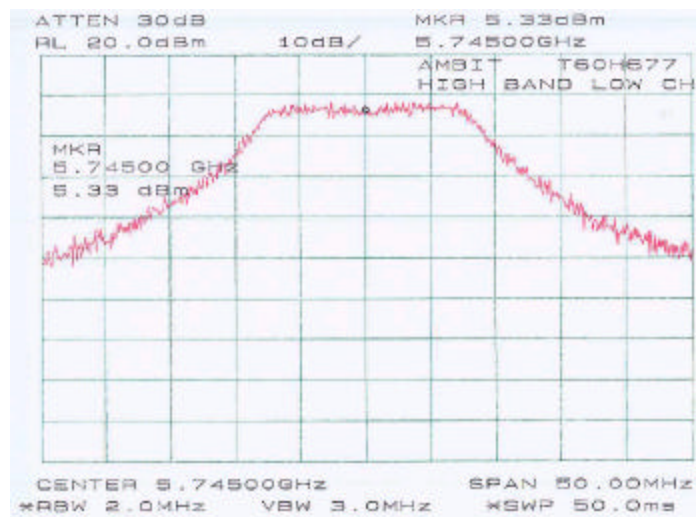












## 5 – 6 DB BANDWIDTH and 26 DB BANDWIDTH

### 5.1 Standard Applicable

According to §15.247(a)(2), for direct sequence systems, the minimum 6dB bandwidth shall be at least 500 kHz. According to §15.407, 26dB Bandwidth should be shown.

### 5.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 6 dB from the reference level. Record the frequency difference as the emission bandwidth. (6 dB bandwidth for DTS)
4. Same as (3) except 26 dB. (26dB bandwidth for UNII)
5. Repeat above procedures until all frequencies measured were complete.

### 5.3 Measurement Result

#### 5.3.1 Test Result for 2410-2483.5 MHz Band (15.247)

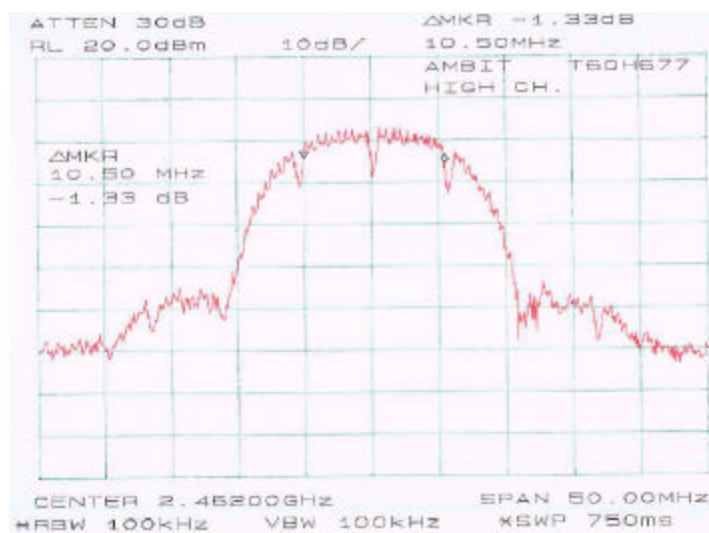
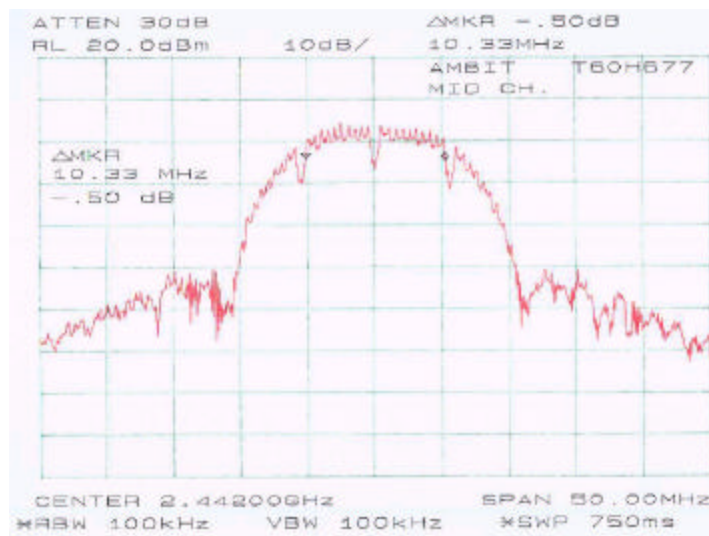
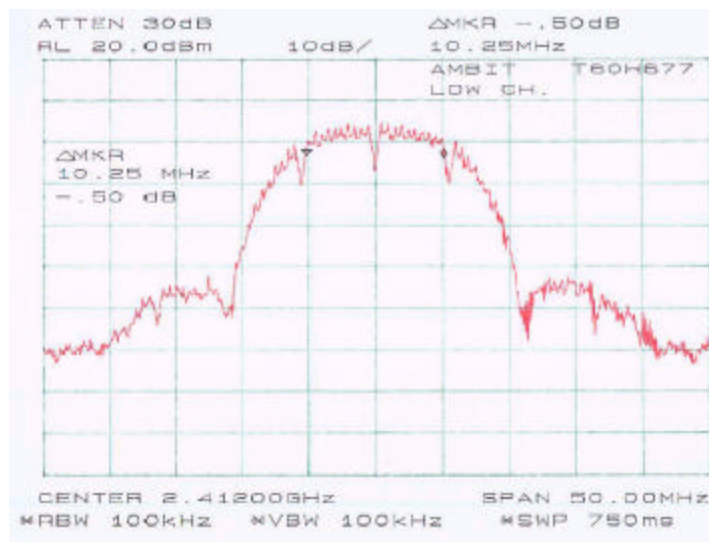
| Frequency | Measured  | Standard (kHz) | Result    |
|-----------|-----------|----------------|-----------|
| Low       | 10.25 MHz | $\geq 500$     | Compliant |
| Mid       | 10.33 MHz | $\geq 500$     | Compliant |
| High      | 10.50 MHz | $\geq 500$     | Compliant |

#### 5.3.2 Test Result for 5150-5825 MHz Band (15.407)

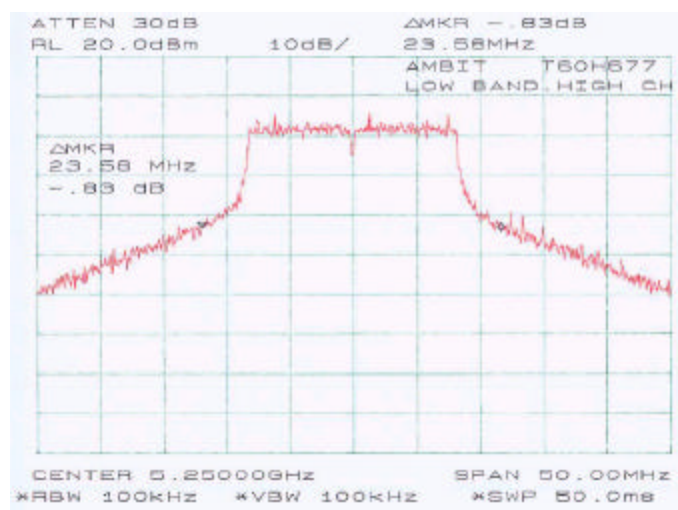
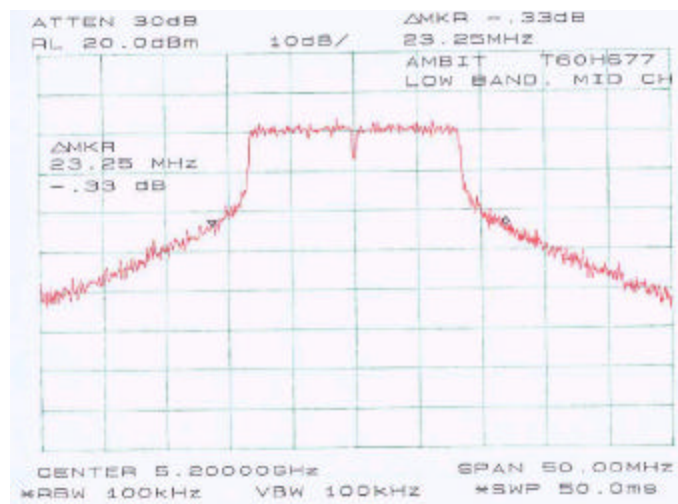
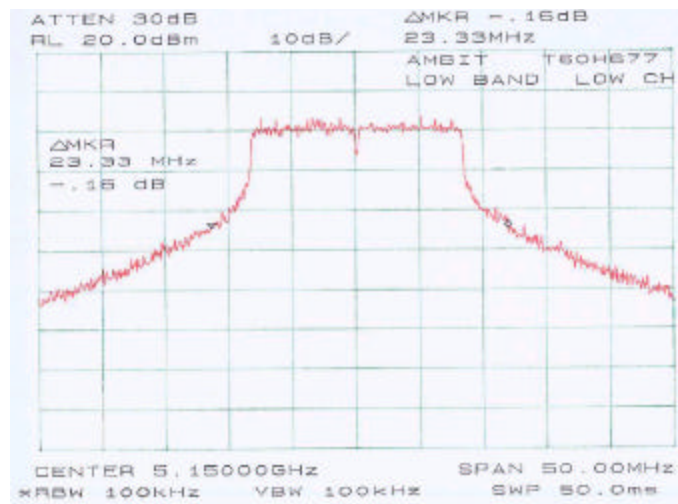
| Band | Channel | Measured (MHz) |
|------|---------|----------------|
| Low  | Low     | 23.33          |
|      | Mid     | 23.25          |
|      | High    | 23.58          |
| Mid  | Low     | 23.83          |
|      | Mid     | 23.08          |
|      | High    | 23.83          |
| High | Low     | 23.00          |
|      | Mid     | 23.75          |
|      | High    | 23.50          |

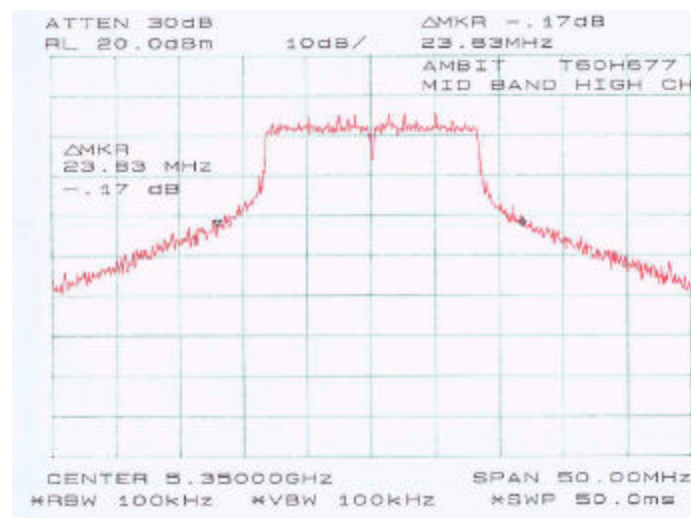
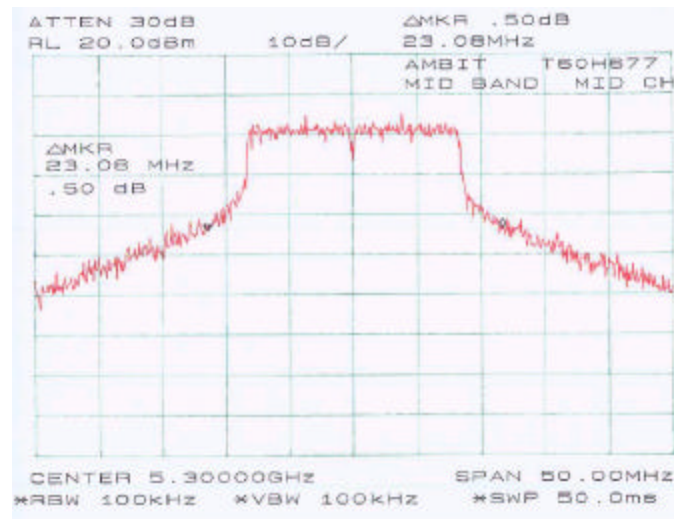
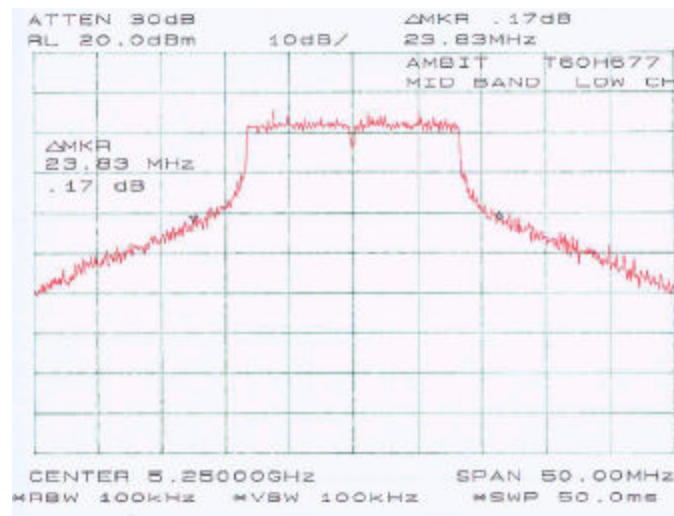


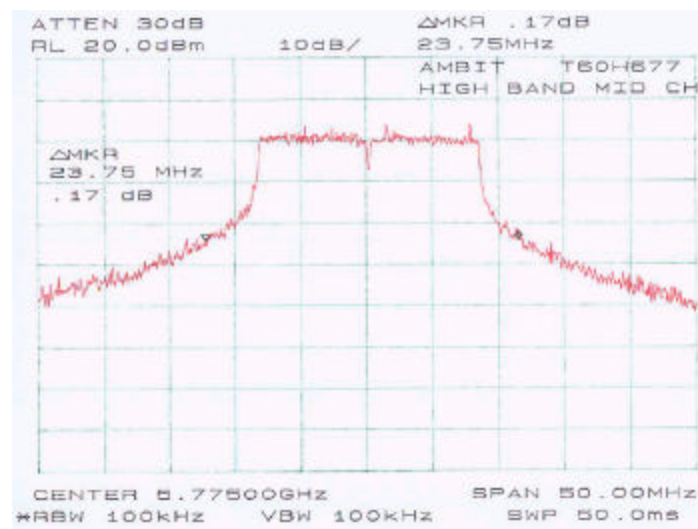
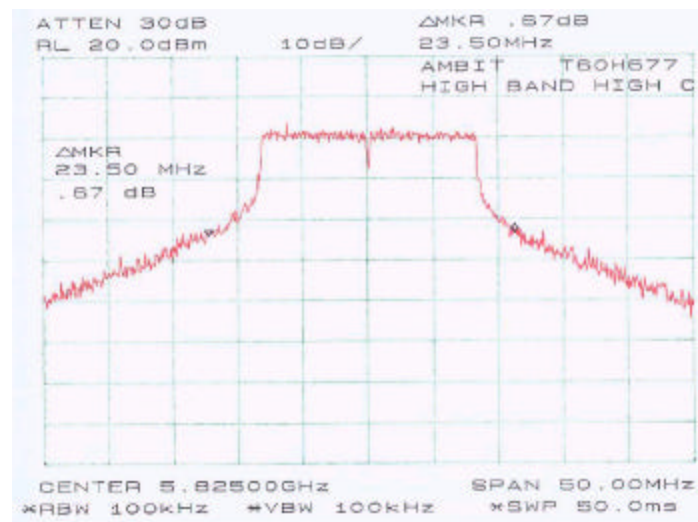
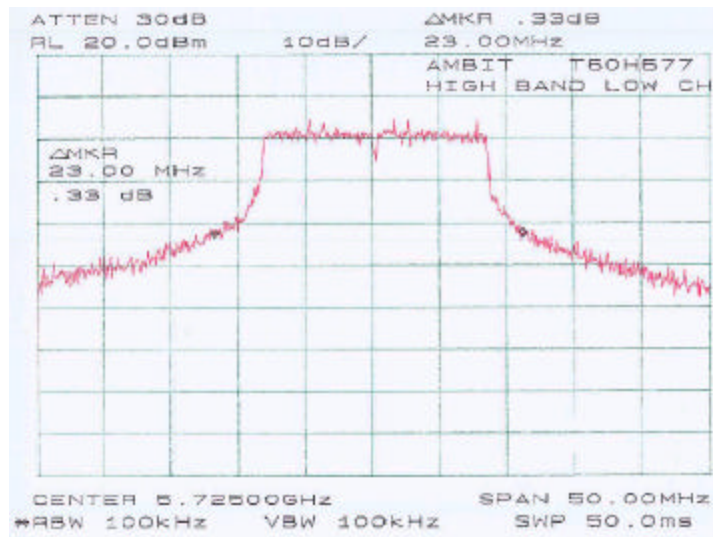
Plots of 6dB Band Width (15.247)



Plots of Band Width (15.407)







## 6 - POWER SPECTRAL DENSITY

### 6.1 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 3 kHz band during any time interval of continuous transmission.

According to §15.407(a) (2), the peak power spectral density shall not exceed 11 dBm in any 1-MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceed 6 dBi.

### 6.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT was set without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Adjust the center frequency of SA on any frequency be measured and set SA to 6MHz span mode. And then, set RBW and VBW of spectrum analyzer to proper value. (DTS)
4. Adjust the center frequency of SA on any frequency be measured and set SA to 50MHz span mode. And then, set RBW and VBW of spectrum analyzer to proper value. (UNII)
5. Repeat above procedures until all frequencies measured were complete.

### 6.3 Measurement Results

#### 6.3.1 Test Result (15.247)

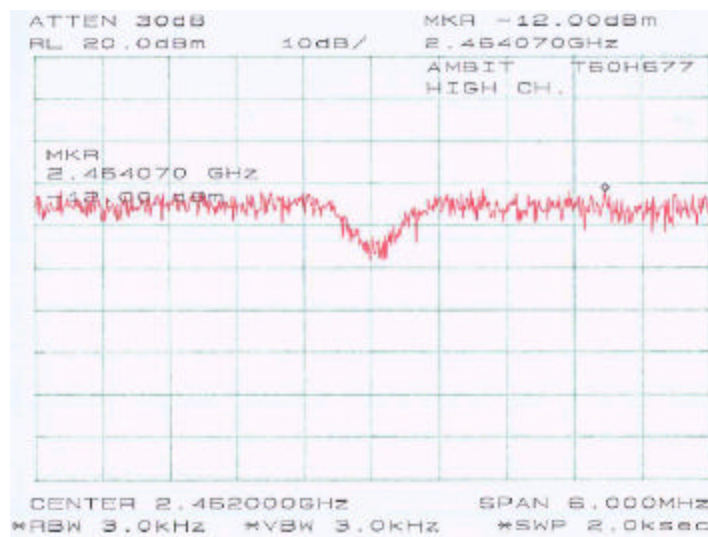
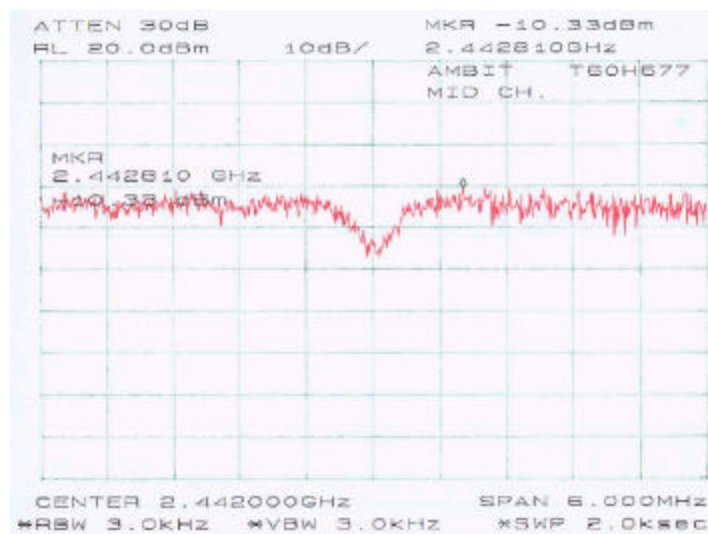
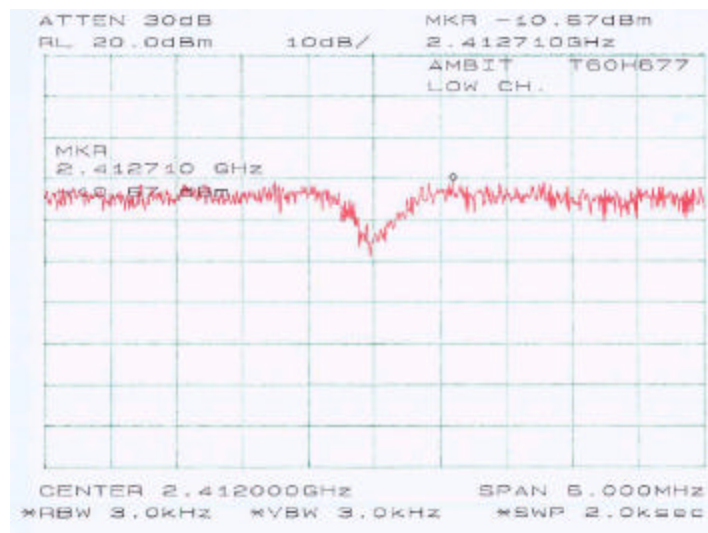
| Frequency | Peak Power Spectral Density<br>(dBm) | Standard<br>(dBm) | Result    |
|-----------|--------------------------------------|-------------------|-----------|
| Low       | -10.67                               | $\leq 8$          | Compliant |
| Mid       | -10.33                               | $\leq 8$          | Compliant |
| High      | -12.00                               | $\leq 8$          | Compliant |

**6.3.2 Test Result (15.407)**

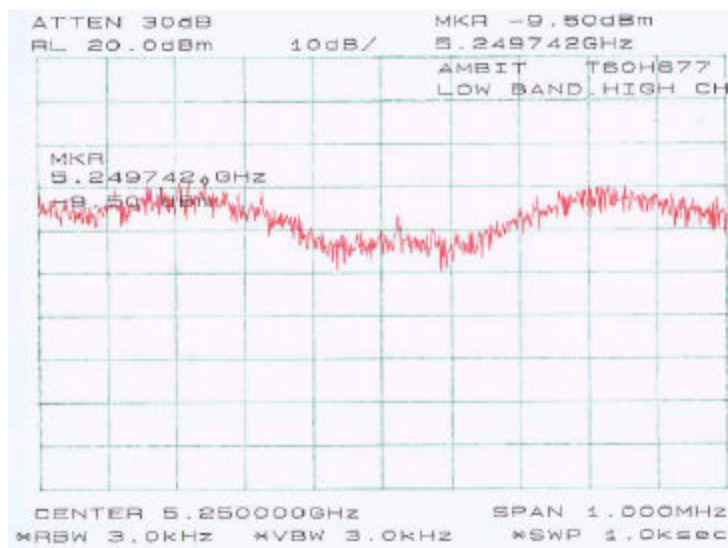
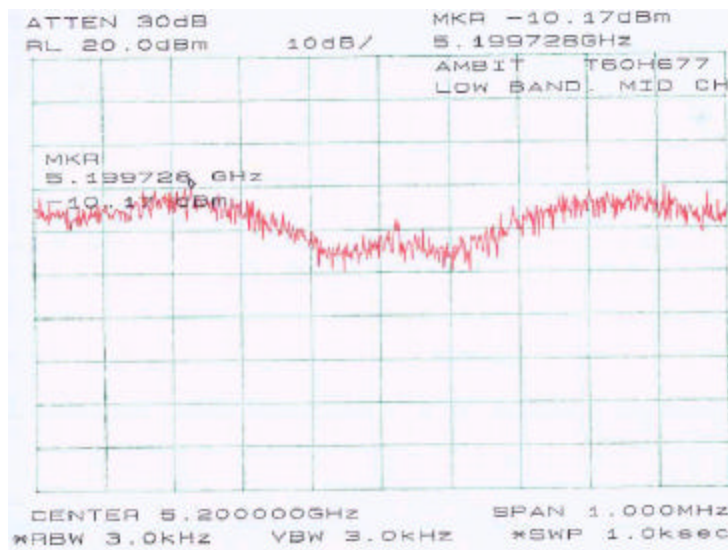
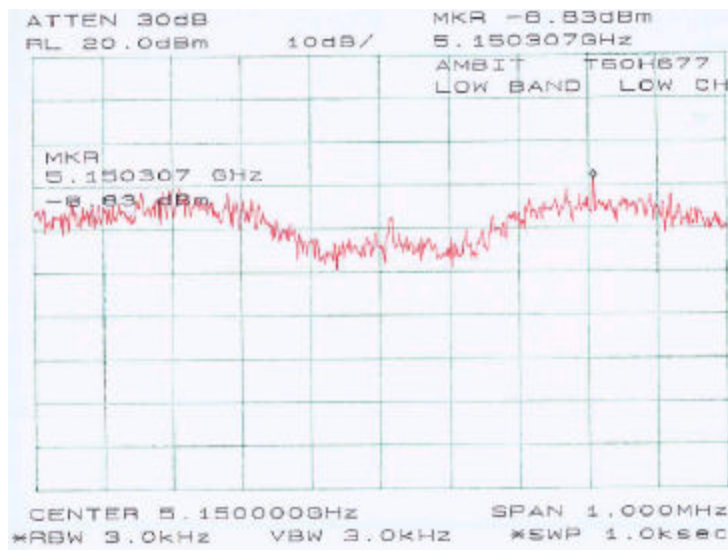
| Band | Frequency | Peak Power Spectral Density (dBm) | Standard (dBm) | Result    |
|------|-----------|-----------------------------------|----------------|-----------|
| Low  | Low       | -8.83                             | $\leq 4$       | Compliant |
|      | Mid       | -10.17                            | $\leq 4$       | Compliant |
|      | High      | -9.50                             | $\leq 4$       | Compliant |
| Mid  | Low       | -8.83                             | $\leq 11$      | Compliant |
|      | Mid       | -9.67                             | $\leq 11$      | Compliant |
|      | High      | -7.50                             | $\leq 11$      | Compliant |
| High | Low       | -8.17                             | $\leq 17$      | Compliant |
|      | Mid       | -9.83                             | $\leq 17$      | Compliant |
|      | High      | -10.00                            | $\leq 17$      | Compliant |



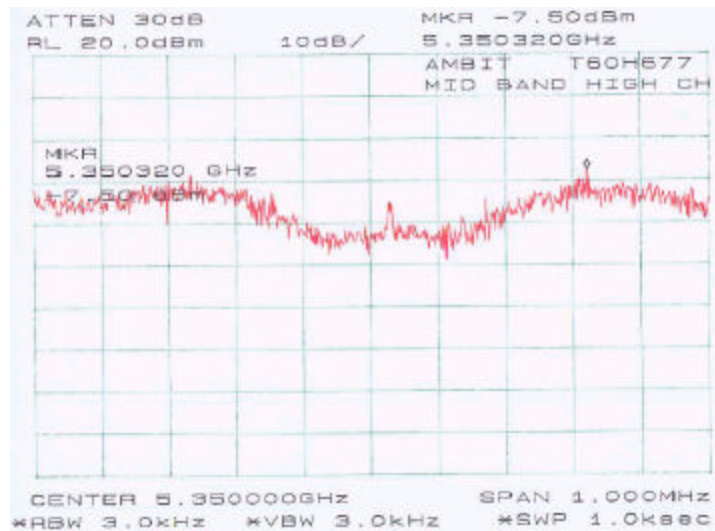
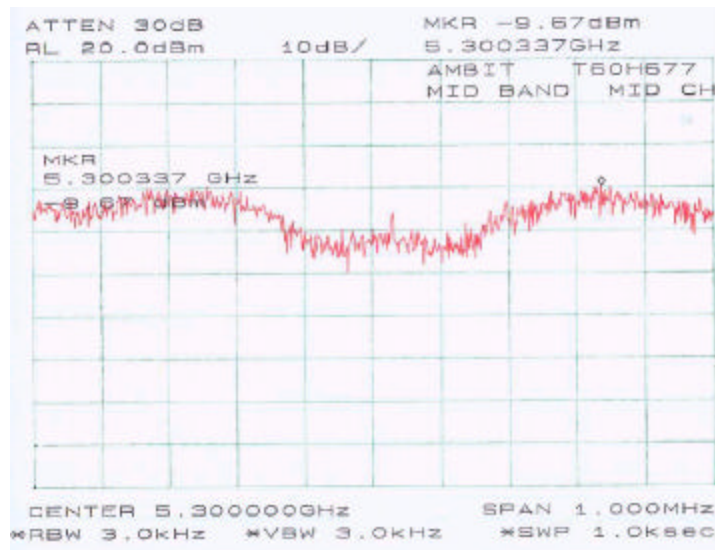
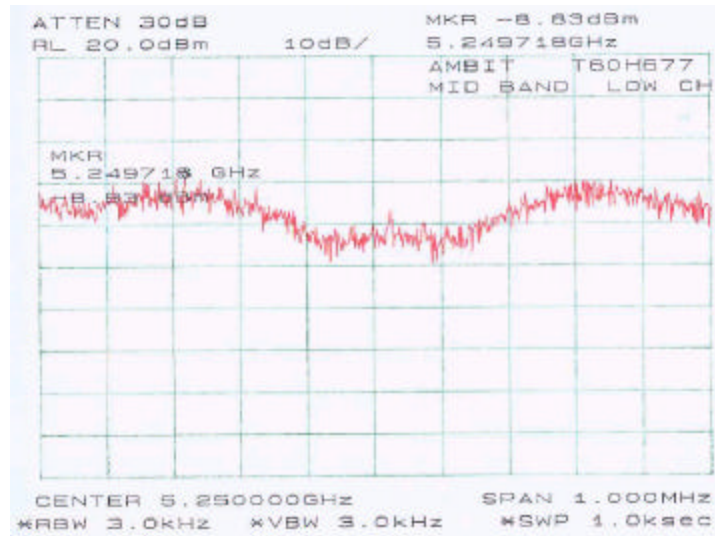
Plots of Spectral Density (15.247)

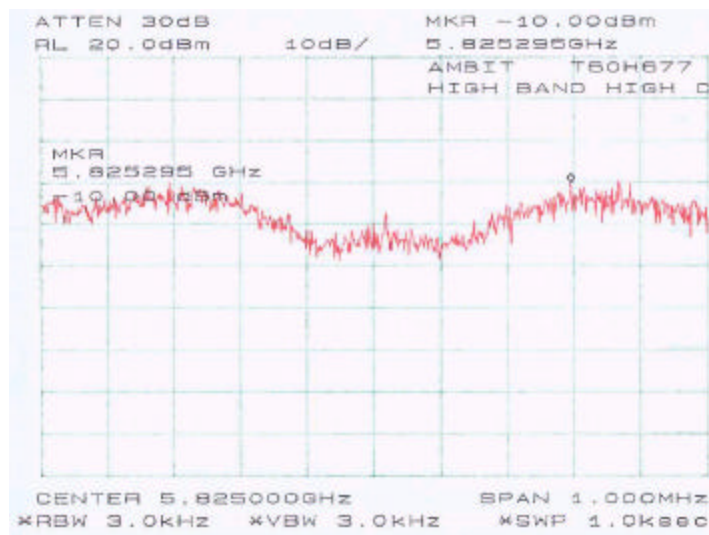
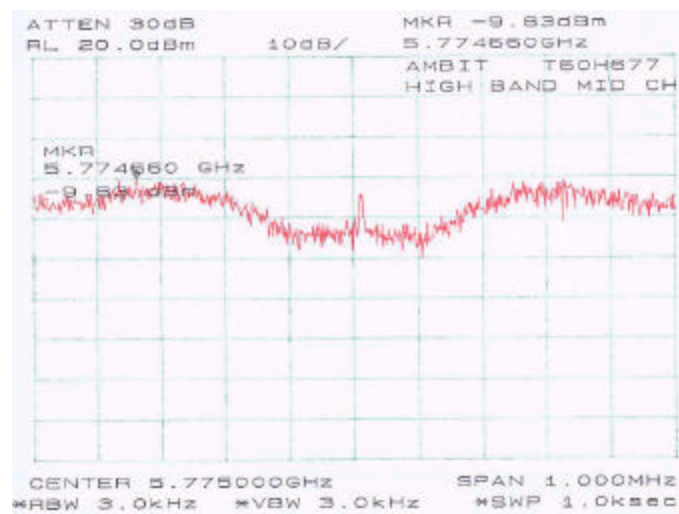
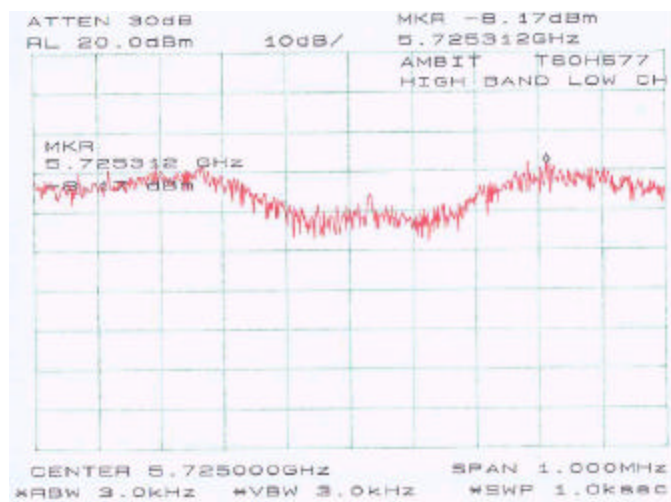


Plots of Spectral Density (15.407)









## 7 - 100 KHZ BANDWIDTH OF BAND EDGES

### 7.1 Standard Applicable

According to §15.247(c), in *any* 100 kHz bandwidth outside the frequency bands 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. 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) see §15.205(c)).

### 7.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

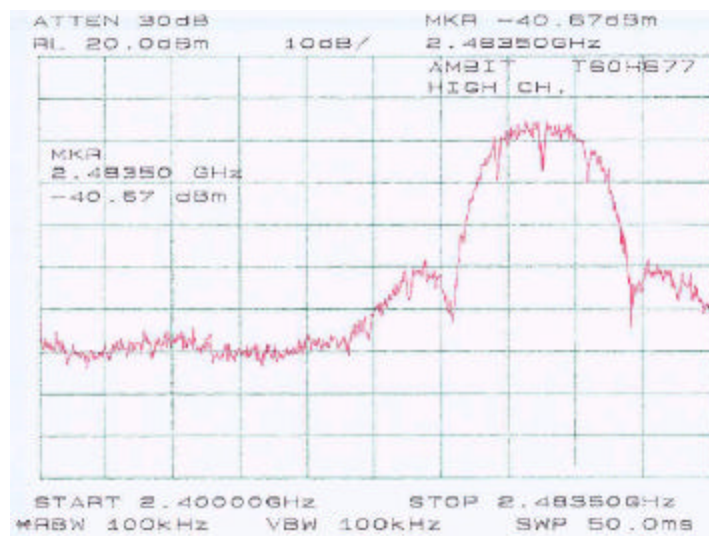
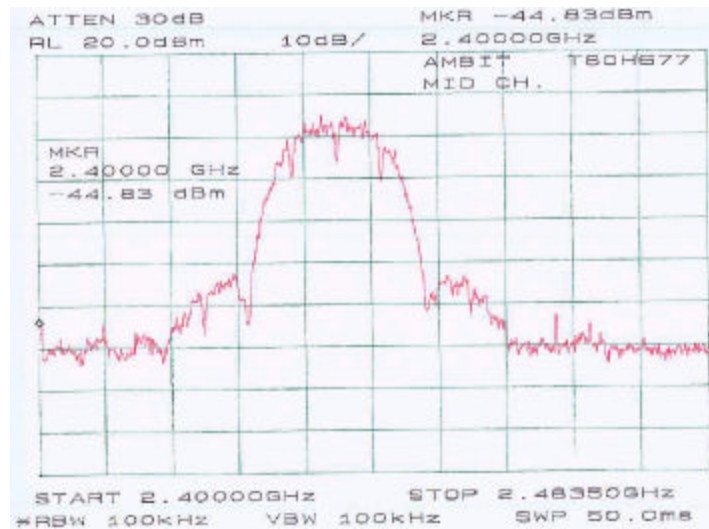
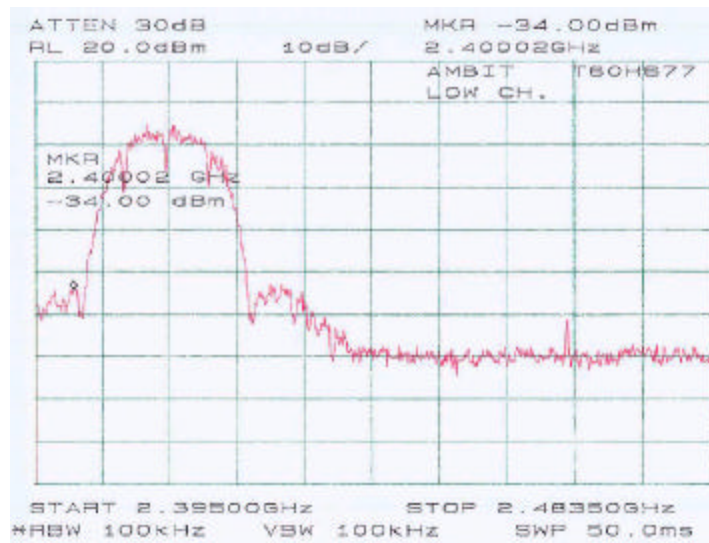
### 7.3 Measure Results

#### 7.3.1 Test Result (15.247)

| Frequency | Standard (dBm) | Result    |
|-----------|----------------|-----------|
| Low       | $\leq 20$      | Compliant |
| Mid       | $\leq 20$      | Compliant |
| High      | $\leq 20$      | Compliant |

Please refer to following pages for plots of band edge.

Plots for 15.247



## 8 - Peak Excursion To Average Ratio

### 8.1 Standard Applicable

According to §15.407(a)(6), the ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13dB across any 1MHz bandwidth or the emission bandwidth whichever is less.

### 8.2 Test Procedure

For this test, the EUT's antenna was removed and replaced with a SMA jack to UMP2.0 plug test cable, so output power levels were calculated from conducted emission levels.

The analyzer center frequency was set to the EUT carrier frequency. For the peak value trace A, the analyzer resolution and video bandwidth were set to 1MHz. Do a MAX HOLD, then VIEW. For the average value trace B, the analyzer resolution bandwidth was set to 1MHz, the video bandwidth was set to 30kHz. MAX HOLD then VIEW trace B also.

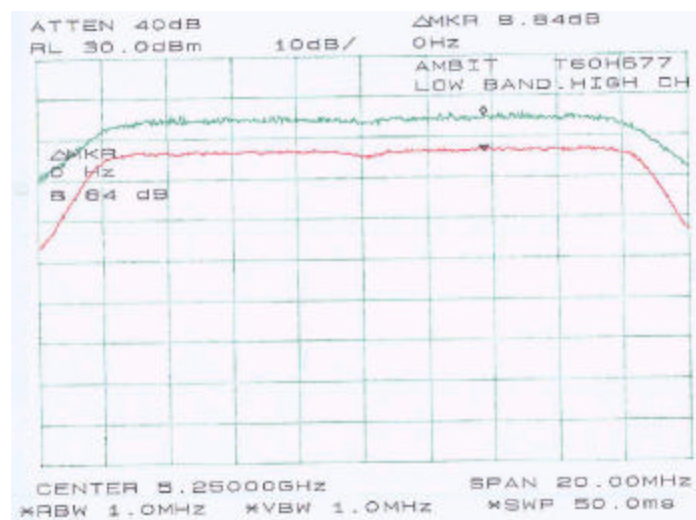
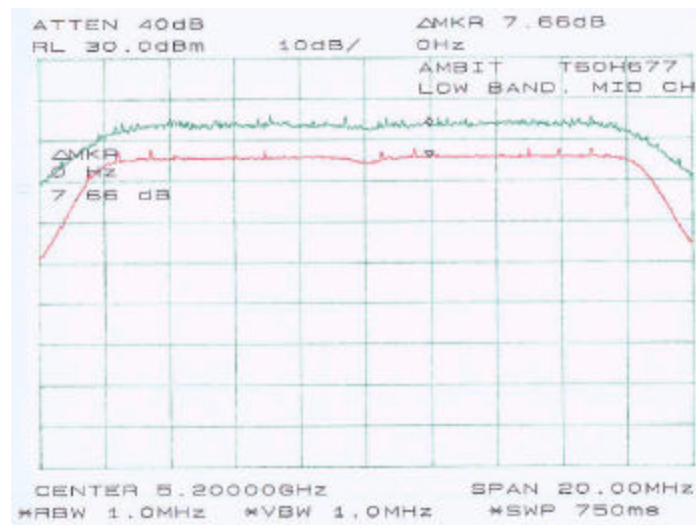
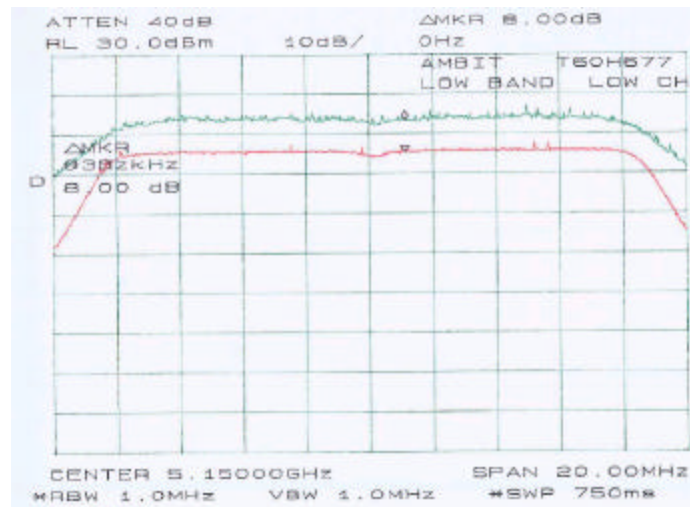
The delta from the peak value trace and the Average should not exceed 13dBm across any 1MHz bandwidth.

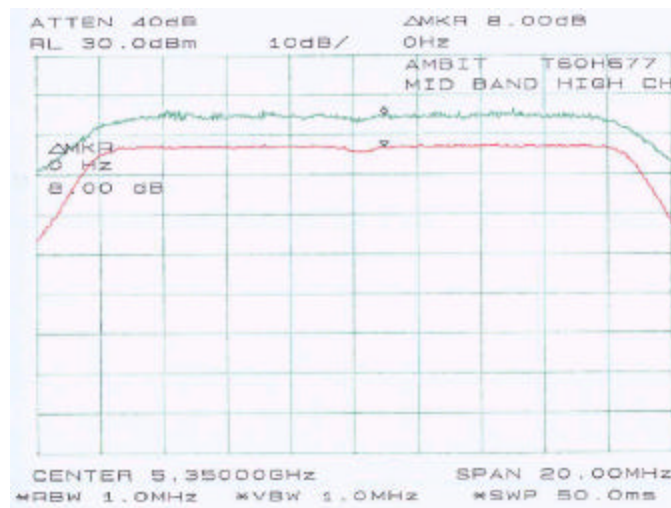
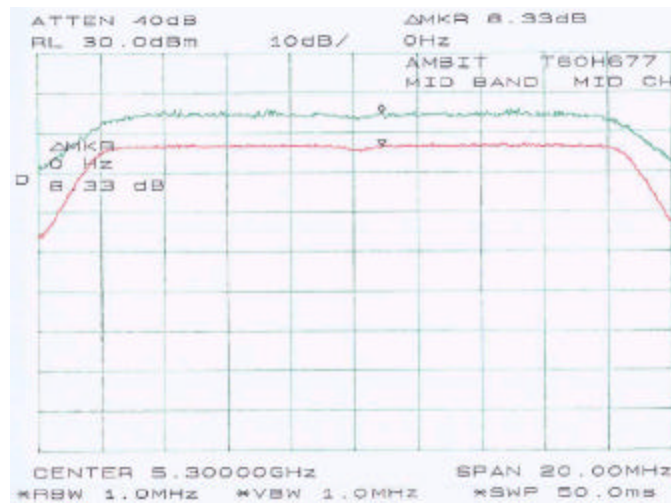
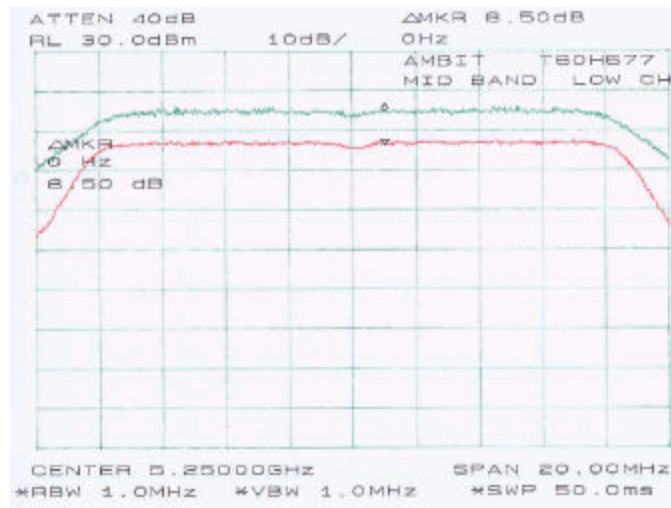
### 8.3 Test Result for 15.407

| Band | Frequency | Reading (dB) | Limit (dBm) | Result    |
|------|-----------|--------------|-------------|-----------|
| Low  | Low       | 8.00         | 13          | Compliant |
|      | Mid       | 7.66         | 13          | Compliant |
|      | High      | 8.84         | 13          | Compliant |
| Mid  | Low       | 8.50         | 13          | Compliant |
|      | Mid       | 8.33         | 13          | Compliant |
|      | High      | 8.00         | 13          | Compliant |
| High | Low       | 7.17         | 13          | Compliant |
|      | Mid       | 7.17         | 13          | Compliant |
|      | High      | 6.84         | 13          | Compliant |

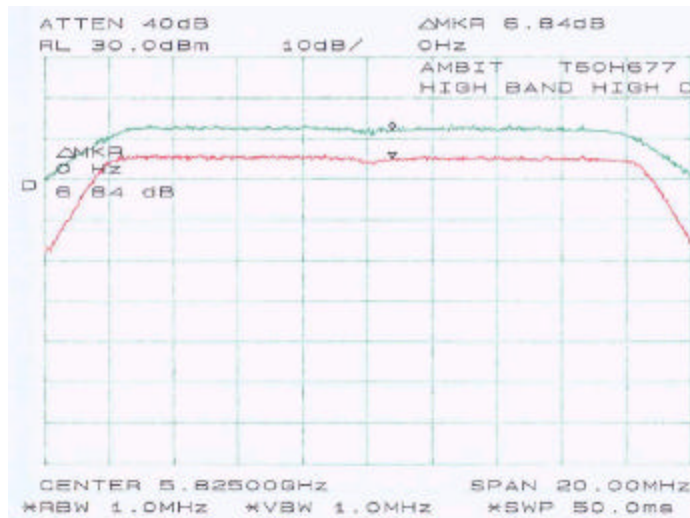
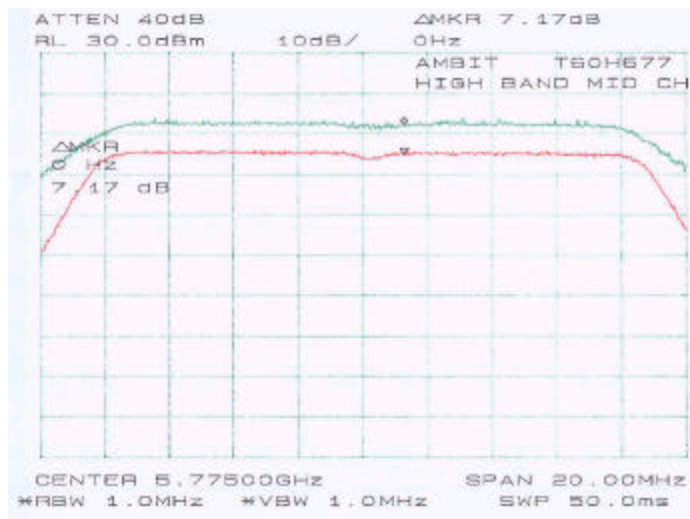
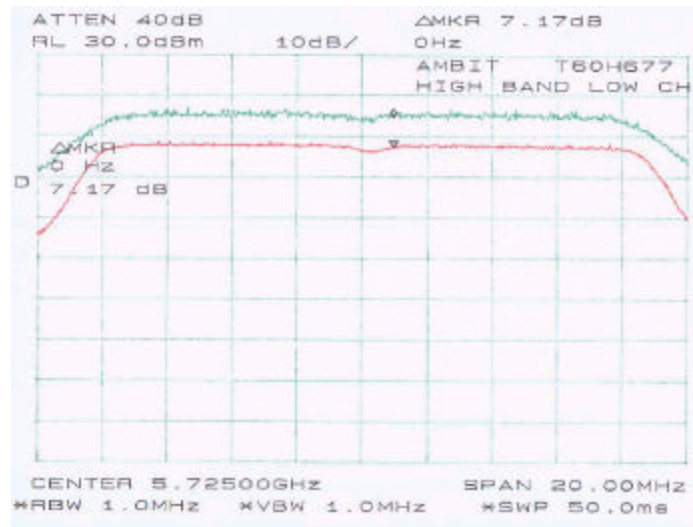
Please see the hereinafter plots for more detail.











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## 9 - Out Of Band Emission for 15.407

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### 9.1 Standard Applicable

§15.407 (b), undesirable emission limits: except as shown in paragraph (b)(6) of this section, the peak emission outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

§15.407 (b)(2), for transmitters operating in the 5.25 – 5.35 GHz band: all emissions outside of the 5.15 – 5.25 GHz band shall not exceed an EIRP of –27 dBm/MHz. Devices operating in the 5.25 – 5.35 GHz band that generate emissions in the 5.15 – 5.25 GHz band must meet all applicable technical requirements for operation in the 5.15 – 5.25 GHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of –27 dBm/MHz in the 5.15 – 5.25 GHz band.

§15.407 (b)(3), for transmitters operating in the 5.725 – 5.825 GHz band: all emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an EIRP of –17dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emission shall not exceed an EIRP of –27 dBm/MHz.

### 9.2 Test Procedure

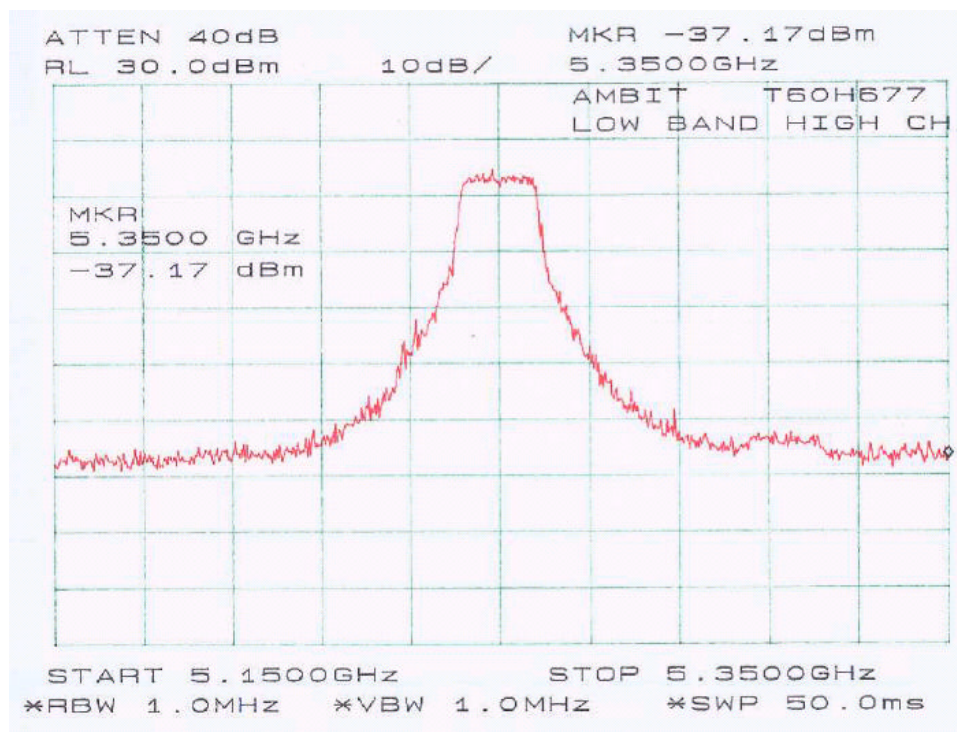
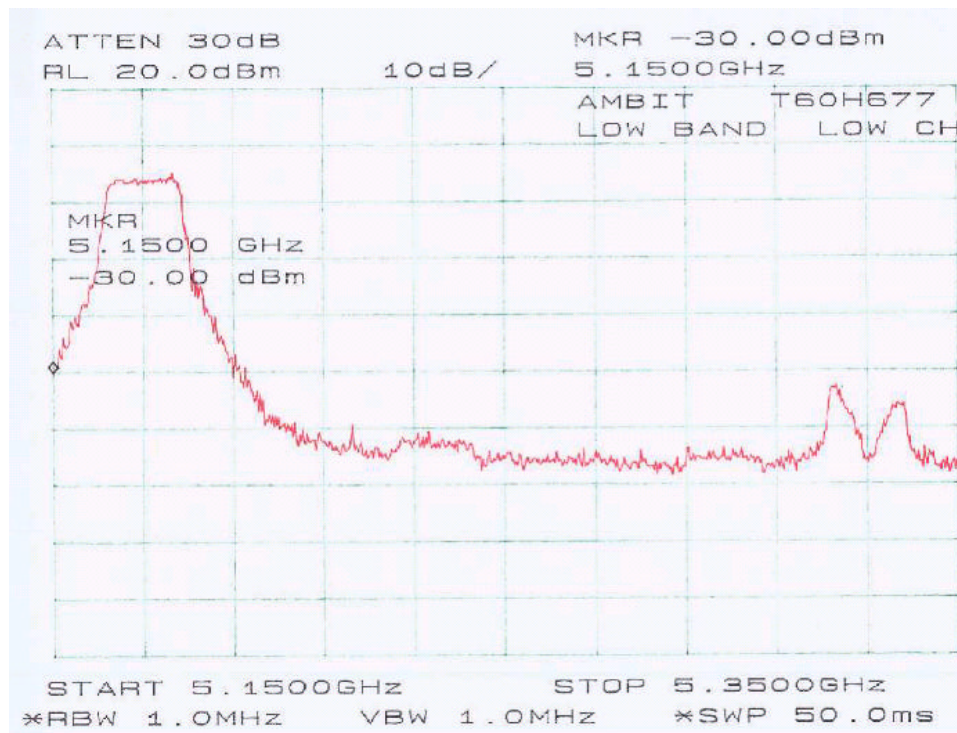
For this test, the EUT's antenna was removed and replaced with a low loss cable, so output power levels were calculated from conducted emission levels.

The analyzer center frequency was set to the EUT carrier frequency. The analyzer resolution and video bandwidth were set to 1MHz. The entire band from 30kHz to 40GHz was investigated.

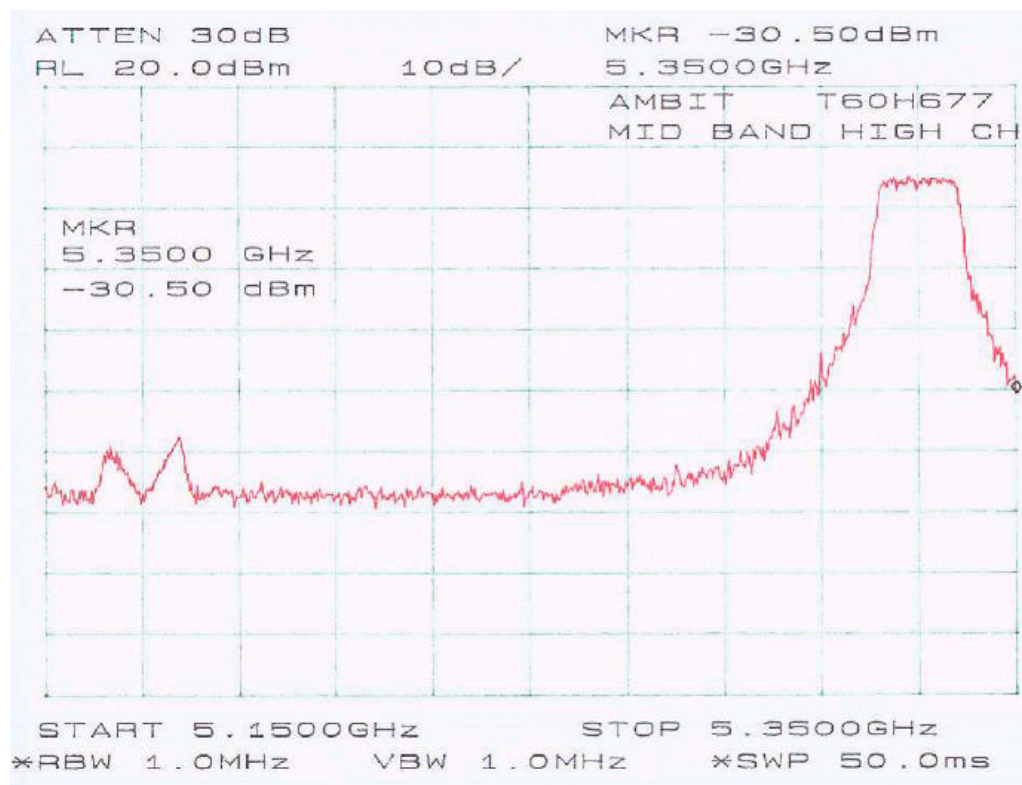
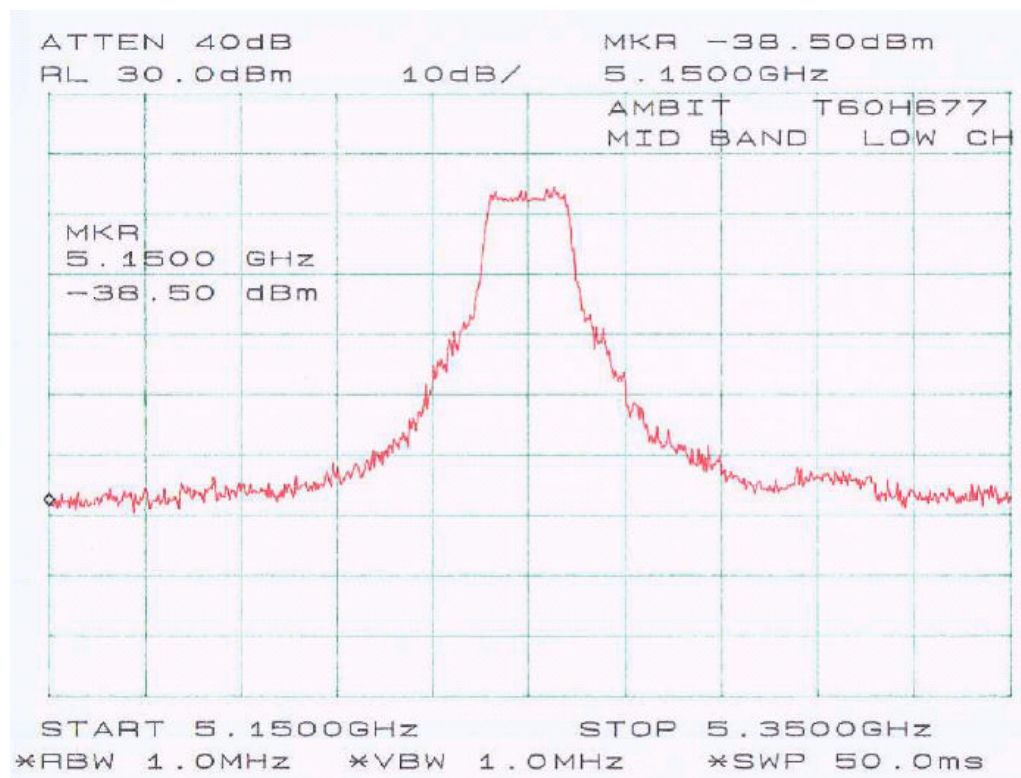
Every suspected signal was also investigated through radiated emission. Refer to section 15.205 restricted bands of operation.

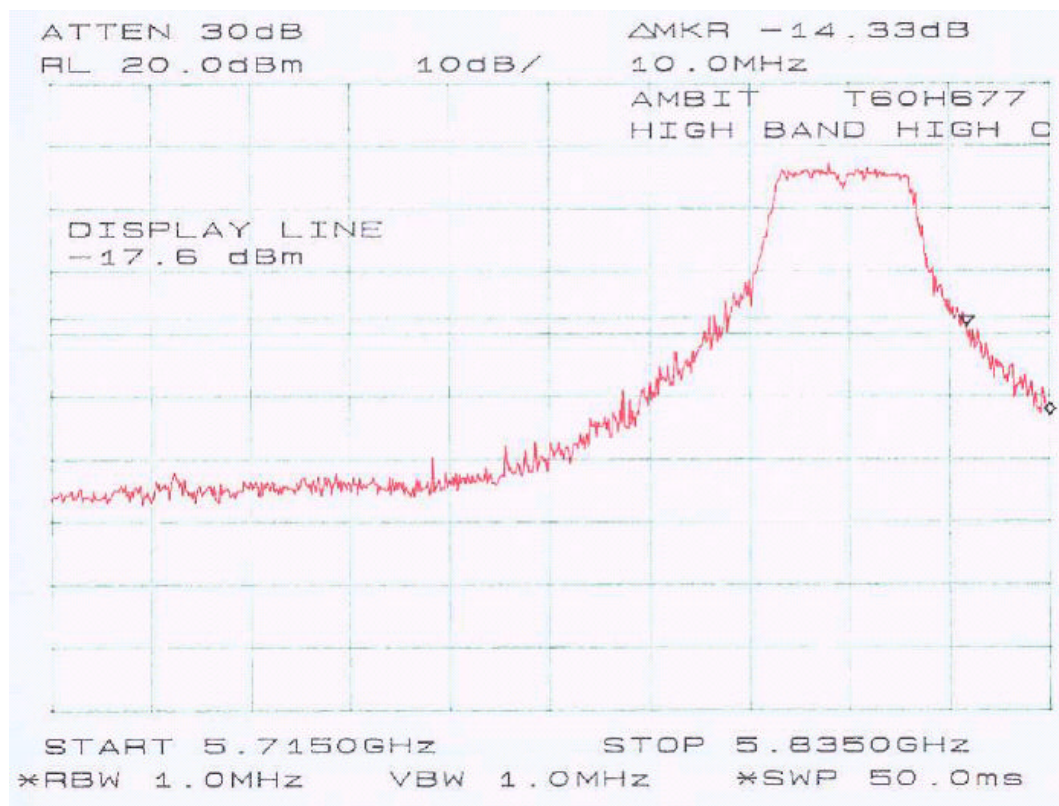
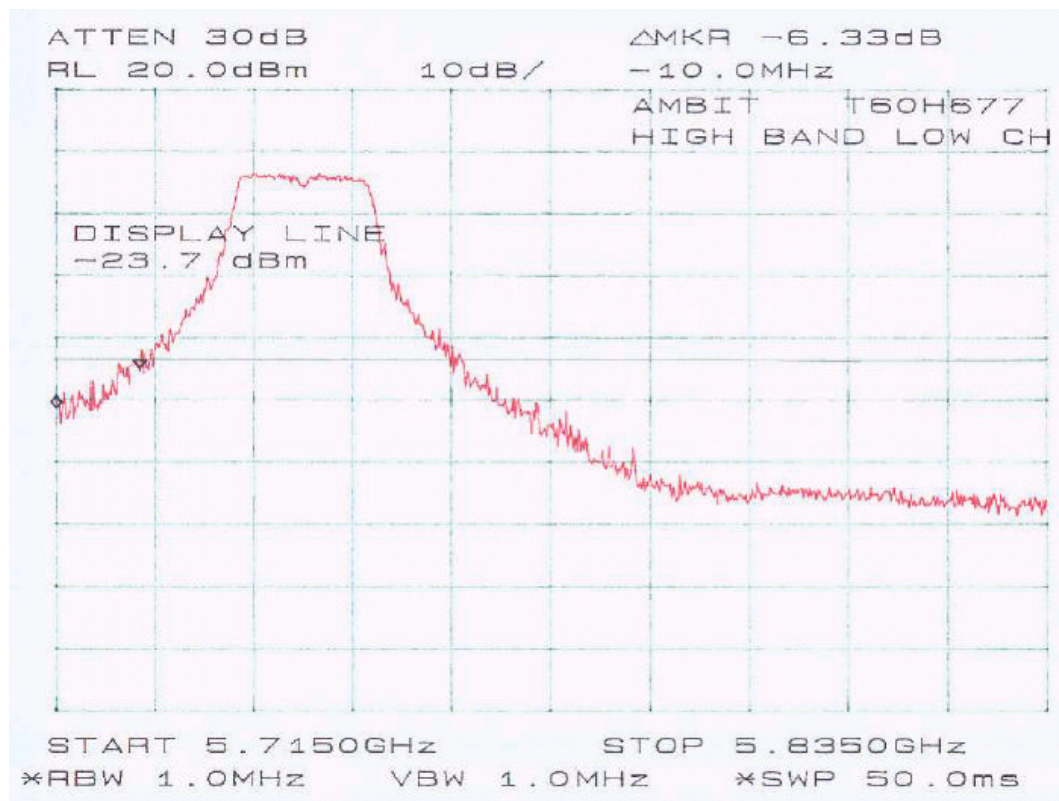
### 9.3 Test Result

Please refer to the following plots.









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## 10 - SPURIOUS EMISSION

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### 10.1 Standard Applicable

According to §15.209 (f) and §15.33(a), in some cases the emissions from an intentional radiator must be measured to beyond the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator because of the incorporation of a digital device. If measurements above the tenth harmonic are so required, the radiated emissions above the tenth harmonic shall comply with the general radiated emission limits applicable to the incorporated digital device, as shown in §15.109 and as based on the frequency of the emission being measured, or, except for emissions contained in the restricted frequency bands shown in §15.205, the limit on spurious emissions specified for the intentional radiator, whichever is the higher limit.

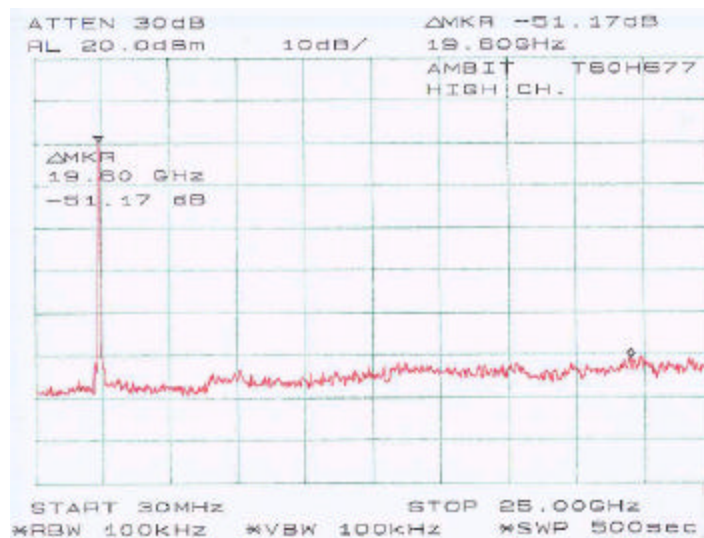
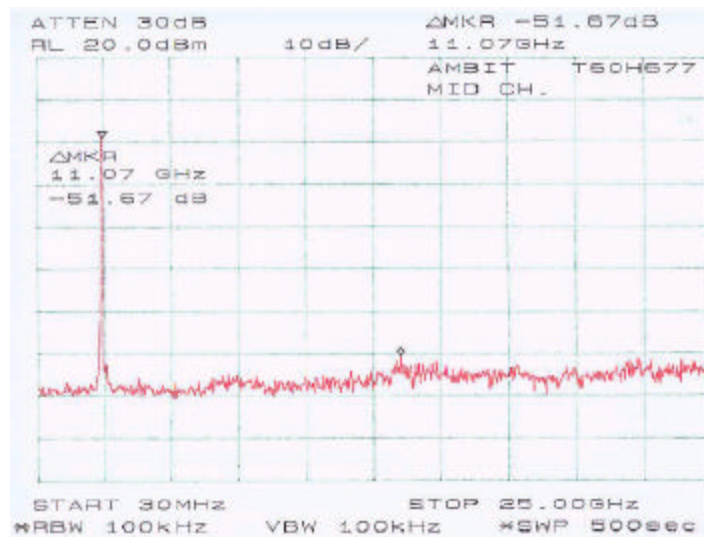
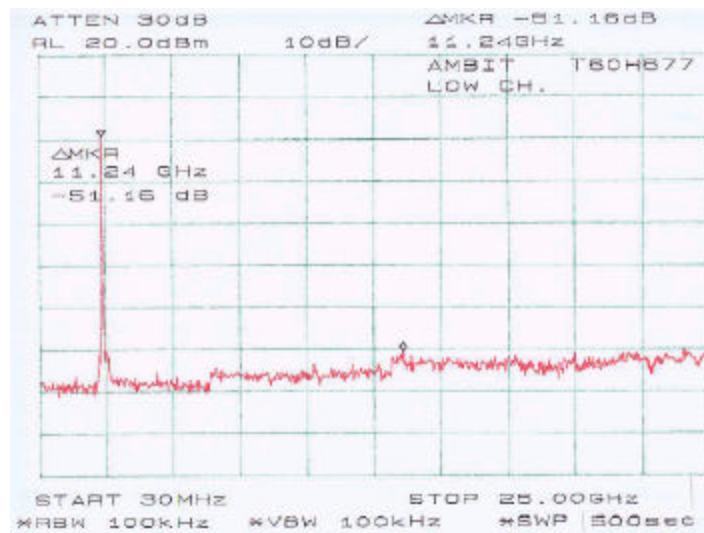
### 10.2 Measurement Procedure

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 4 without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set the SA on Max-Hold Mode, and then keep the EUT in transmitting mode. Record all the signals from each channel until each one has been recorded.
4. Set the SA on View mode and then plot the result on SA screen.
5. Repeat above procedures until all frequencies measured were complete.

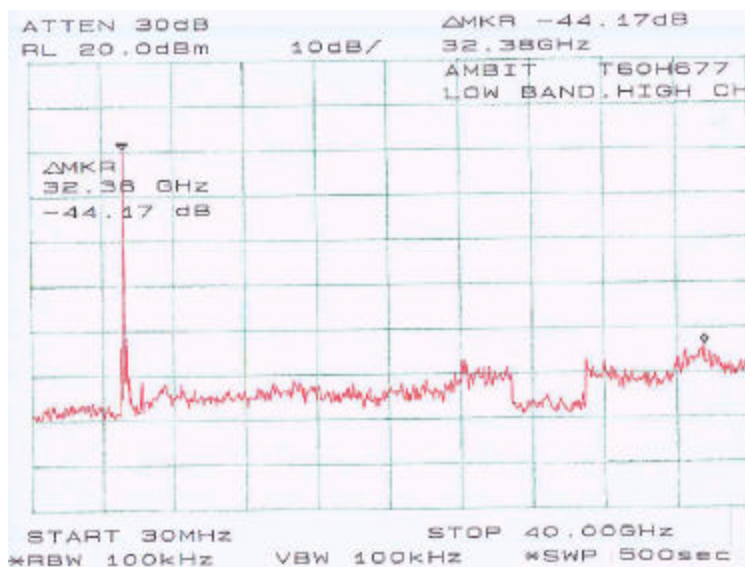
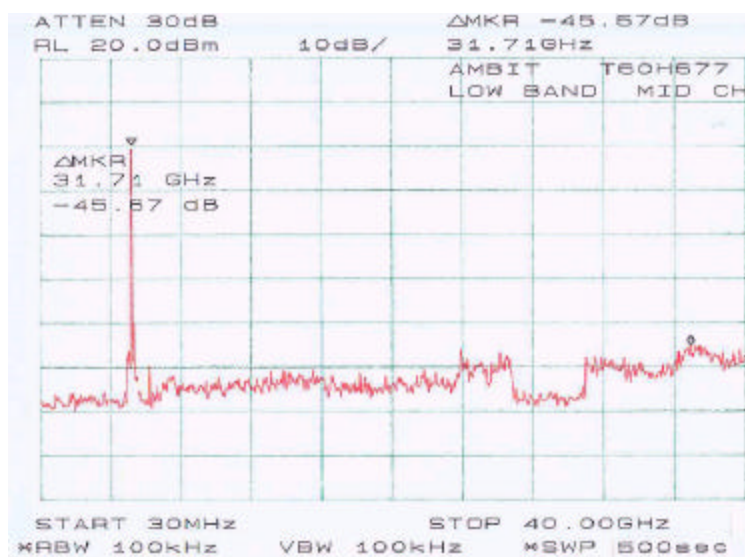
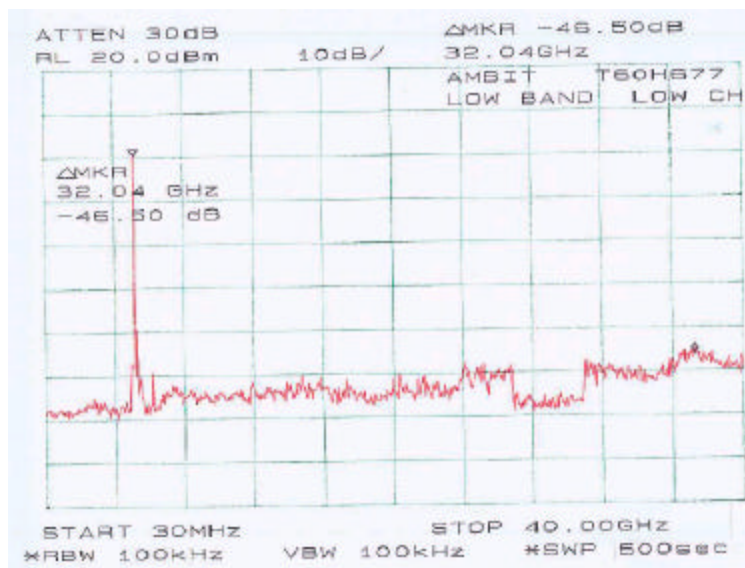
### 10.3 Measurement Result

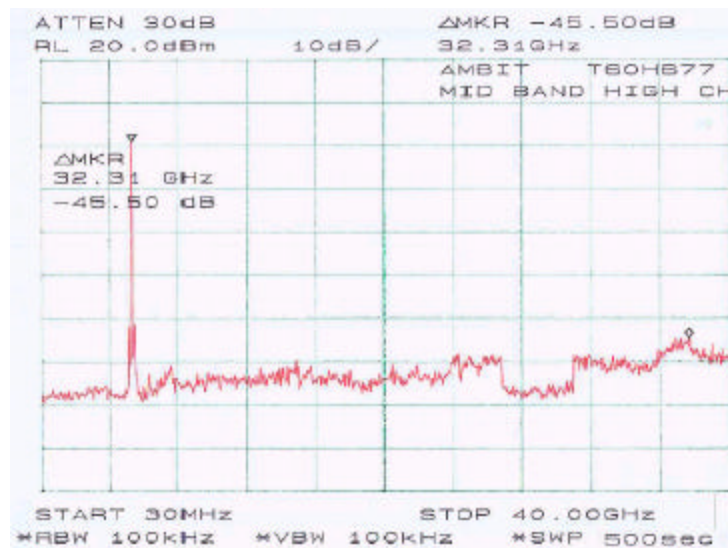
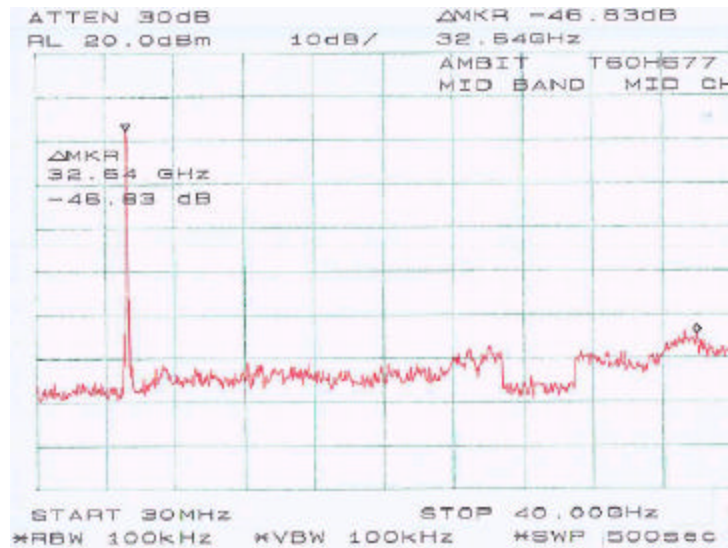
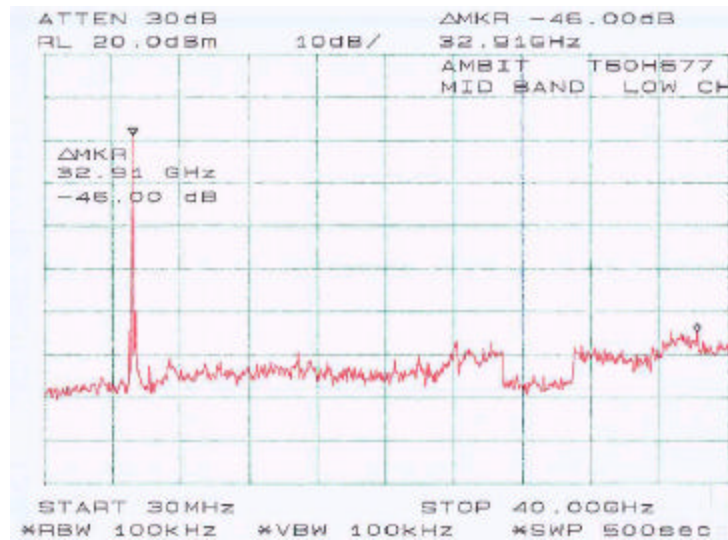
Please refer to following pages for plots of spurious emission.

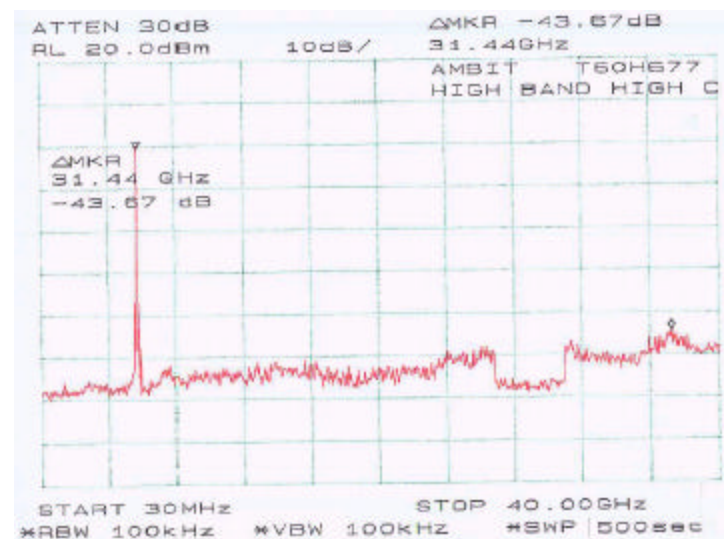
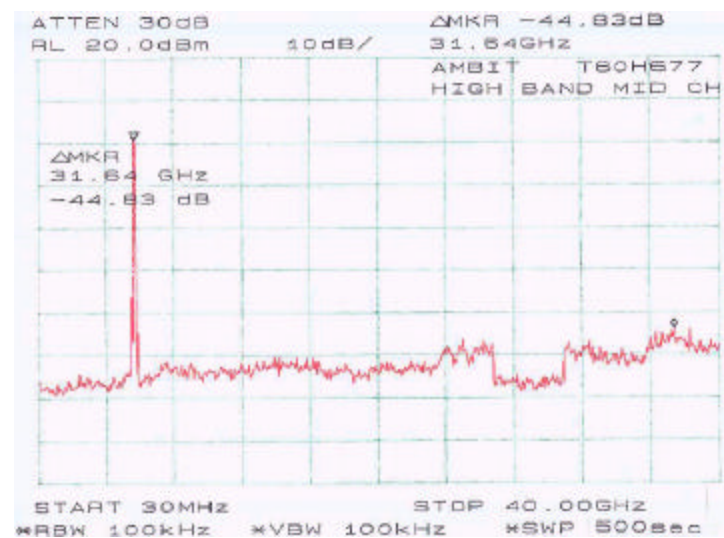
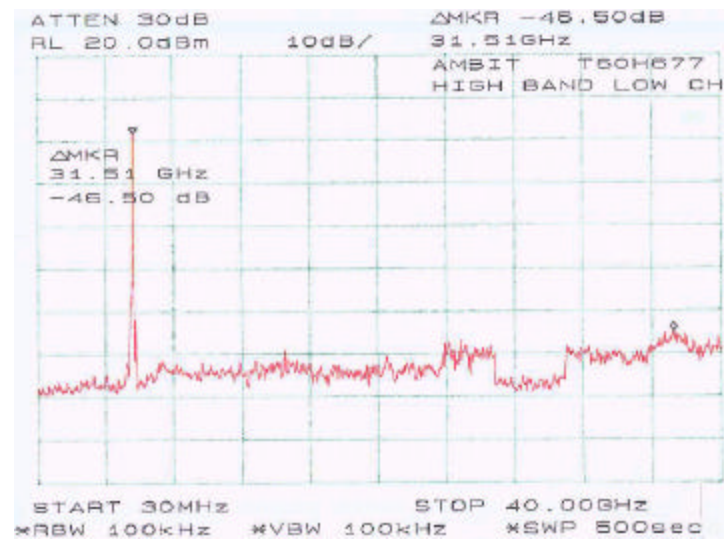












## **11 - ANTENNA REQUIREMENT**

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### **11.1 Standard Applicable**

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

And according to § 15.247 (1), if transmitting antennas of directional gain greater than 6 dBi are used the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

According to § 15.407 (d), any U-NII device shall use a transmitting antenna that is an integral part of the device.

Refer to statement below for compliance.

“The antenna for the device is an integral antenna that the end user cannot access. Further the device is for outdoor use as detailed in the Users Manual and Operational Description, which are included in this application.”

### **11.2 Antenna Connected Construction**

The antenna connector is designed with permanent attachment and no consideration of replacement.

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## **12 - SPURIOUS RADIATED EMISSION**

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## 12.1 Measurement Uncertainty

All measurements involve certain levels of uncertainties. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at BACL is  $\pm 4.0$  dB.

According to §15.205, except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

| MHz                        | MHz                   | MHz             | GHz              |
|----------------------------|-----------------------|-----------------|------------------|
| 0.090 – 0.110              | 16.42 – 16.423        | 399.9 – 410     | 4.5 – 5.15       |
| <sup>1</sup> 0.495 – 0.505 | 16.69475 – 16.69525   | 608 – 614       | 5.35 – 5.46      |
| 2.1735 – 2.1905            | 16.80425 – 16.80475   | 960 – 1240      | 7.25 – 7.75      |
| 4.125 – 4.128              | 25.5 – 25.67          | 1300 – 1427     | 8.025 – 8.5      |
| 4.17725 – 4.17775          | 37.5 – 38.25          | 1435 – 1626.5   | 9.0 – 9.2        |
| 4.20725 – 4.20775          | 73 – 74.6             | 1645.5 – 1646.5 | 9.3 – 9.5        |
| 6.215 – 6.218              | 74.8 – 75.2           | 1660 – 1710     | 10.6 – 12.7      |
| 6.26775 – 6.26825          | 108 – 121.94          | 1718.8 – 1722.2 | 13.25 – 13.4     |
| 6.31175 – 6.31225          | 123 – 138             | 2200 – 2300     | 14.47 – 14.5     |
| 8.291 – 8.294              | 149.9 – 150.05        | 2310 – 2390     | 15.35 – 16.2     |
| 8.362 – 8.366              | 156.52475 – 156.52525 | 2483.5 – 2500   | 17.7 – 21.4      |
| 8.37625 – 8.38675          | 156.7 – 156.9         | 2655 – 2900     | 22.01 – 23.12    |
| 8.41425 – 8.41475          | 162.0125 – 167.17     | 3260 – 3267     | 23.6 – 24.0      |
| 12.29 – 12.293             | 167.72 – 173.2        | 3332 – 3339     | 31.2 – 31.8      |
| 12.51975 – 12.57725        | 240 – 285             | 3345.8 – 3358   | 36.43 – 36.5     |
| 13.36 – 13.41              | 322 – 335.4           | 3600 – 4400     | ( <sup>2</sup> ) |

<sup>1</sup> Until February 1, 1999, this restricted band shall be 0.490-0.510MHz

<sup>2</sup> Above 38.6

Except as provided in paragraph (d) and (e), the filed strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

According to §15.209, the device shall meet radiated emission general requirements.

Except for Class A device, the filed strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

| Frequency of Emission<br>(MHz) | Field Strength<br>(Microvolts/meter) | dB<br>(dBµV/meter) |
|--------------------------------|--------------------------------------|--------------------|
| 30 - 88                        | 100                                  | 40                 |
| 88 - 216                       | 150                                  | 43.5               |
| 216 - 960                      | 200                                  | 46                 |
| Above 960                      | 500                                  | 54                 |

## 12.2 EUT Setup

The radiated emission tests were performed in the open area 3-meter test site, using the setup in accordance with the ANSI C63.4-1992. The specification used was the FCC 15 Subpart C limits.

The spacing between the peripherals was 10 centimeters.

External I/O cables were draped along the edge of the test table and bundle when necessary.

The host PC system was connected with 110Vac/60Hz power source.

## 12.3 Spectrum Analyzer Setup

According to FCC CFR 47, Section 15.31, the EUT was tested to 60GHz. During the radiated emission test, the spectrum analyzer was set with the following configurations:

Start Frequency .....30 MHz  
 Stop Frequency .....60GHz  
 Sweep Speed.....Auto  
 IF Bandwidth.....1 MHz  
 Video Bandwidth .....1 MHz  
 Quasi-Peak Adapter Bandwidth .....120 kHz  
 Quasi-Peak Adapter Mode.....Normal  
 Resolution Bandwidth.....1MHz



## 12.4 Test Procedure

For the radiated emissions test, the Host PC system power cord was connected to the AC floor outlet since the power supply used in the EUT did not provide an accessory power outlet.

Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance is with all installation combinations. All data was recorded in the peak detection mode. Quasi-peak readings was performed only when an emission was found to be marginal (within -4 dB $\mu$ V of specification limits), and are distinguished with a "Qp" in the data table.

## 12.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Antenna Factor} + \text{Cable Factor} - \text{Amplifier Gain}$$

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB $\mu$ V means the emission is 7dB $\mu$ V below the maximum limit for Subpart C. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{Subpart C Limit}$$

## 12.6 Summary of Test Results

According to the data in section 11.7, the EUT complied with the FCC Title 47, Part 15, Subpart C, section 15.205, 15.207 and 15.247, and had the worst margin of:

ZI1S Antenna, 30MHz – 25GHz, 15.247:

- 11.2 dB at 2412.30 MHz in the **Vertical** polarization, Low Channel
- 10.8 dB at 7314.30 MHz in the **Vertical** polarization, Middle Channel
- 11.5 dB at 7386.60 MHz in the **Vertical** polarization, High Channel
- 1.3 dB at 208.41 MHz in the **Vertical** polarization, Unwanted Emission

ZG1S Antenna, 30MHz – 25GHz, 15.247:

- 10.7 dB at 4824.60 MHz in the **Vertical** polarization, Low Channel
- 10.9 dB at 4884.00 MHz in the **Vertical** polarization, Middle Channel
- 11.1 dB at 7386.60 MHz in the **Vertical** polarization, High Channel
- 1.7 dB at 208.41 MHz in the **Vertical** polarization, Unwanted Emission

Compal Antenna, 30MHz – 25GHz, 15.247:

- 11.1 dB at 4824.60 MHz in the **Vertical** polarization, Low Channel
- 10.8 dB at 4884.00 MHz in the **Vertical** polarization, Middle Channel
- 11.1 dB at 7386.60 MHz in the **Vertical** polarization, High Channel
- 1.9 dB at 208.41 MHz in the **Vertical** polarization, Unwanted Emission

ZI1S Antenna, 1 – 50GHz, 15.407:

- 11.7 dB at 10340.00 MHz in the **Vertical** polarization, Low Band, Low Channel
- 11.4 dB at 10400.00 MHz in the **Vertical** polarization, Low Band, Mid Channel
- 11.8 dB at 10500.00 MHz in the **Vertical** polarization, Low Band, High Channel
- 11.8 dB at 10500.00 MHz in the **Vertical** polarization, Mid Band, Low Channel
- 11.6 dB at 10600.00 MHz in the **Vertical** polarization, Mid Band, Mid Channel
- 11.7 dB at 10660.00 MHz in the **Vertical** polarization, Mid Band, High Channel
- 11.9 dB at 11490.00 MHz in the **Vertical** polarization, High Band, Low Channel
- 10.6 dB at 11550.00 MHz in the **Vertical** polarization, High Band, Mid Channel
- 11.9 dB at 11620.00 MHz in the **Vertical** polarization, High Band, High Channel

**-4.3 dB at 408.01 MHz** in the **Vertical** polarization, Unwanted Emission

ZG1S Antenna, 1 – 50GHz, 15.407:

**-10.9 dB at 10300.00 MHz** in the **Vertical** polarization, Low Band, Low Channel

**-11.0 dB at 10400.00 MHz** in the **Vertical** polarization, Low Band, Mid Channel

**-11.2 dB at 10500.00 MHz** in the **Vertical** polarization, Low Band, High Channel

**-11.2 dB at 10500.00 MHz** in the **Vertical** polarization, Mid Band, Low Channel

**-10.6 dB at 10600.00 MHz** in the **Vertical** polarization, Mid Band, Mid Channel

**-9.9 dB at 10700.00 MHz** in the **Vertical** polarization, Mid Band, High Channel

**-11.4 dB at 11450.00 MHz** in the **Vertical** polarization, High Band, Low Channel

**-11.6 dB at 11550.00 MHz** in the **Vertical** polarization, High Band, Mid Channel

**-11.0 dB at 11650.00 MHz** in the **Vertical** polarization, High Band, High Channel

**-4.1 dB at 480.01 MHz** in the **Vertical** polarization, Unwanted Emission

Compal Antenna, 1 – 50GHz, 15.407:

**-11.0 dB at 10300.00 MHz** in the **Vertical** polarization, Low Band, Low Channel

**-11.1 dB at 10400.00 MHz** in the **Vertical** polarization, Low Band, Mid Channel

**-11.3 dB at 10500.00 MHz** in the **Vertical** polarization, Low Band, High Channel

**-11.3 dB at 10300.00 MHz** in the **Vertical** polarization, Mid Band, Low Channel

**-11.3 dB at 10600.00 MHz** in the **Vertical** polarization, Mid Band, Mid Channel

**-11.4 dB at 10700.00 MHz** in the **Vertical** polarization, Mid Band, High Channel

**-11.8 dB at 11450.00 MHz** in the **Vertical** polarization, High Band, Low Channel

**-11.6 dB at 11550.00 MHz** in the **Vertical** polarization, High Band, Mid Channel

**-11.8 dB at 11650.00 MHz** in the **Vertical** polarization, High Band, High Channel

**-4.2 dB at 480.01 MHz** in the **Vertical** polarization, Unwanted Emission

### 12.6.1 Final test data, ZI1S Antenna, 30MHz – 25GHz (15.247)

| INDICATED               |                 |          | TABLE           | ANTENNA         |               | CORRECTION FACTOR |             |            | CORRECTED<br>AMPLITUDE | FCC 15<br>SUBPART C |              |
|-------------------------|-----------------|----------|-----------------|-----------------|---------------|-------------------|-------------|------------|------------------------|---------------------|--------------|
| Frequency<br>MHz        | Ampl.<br>dBμV/m | Comments | Angle<br>Degree | Height<br>Meter | Polar<br>H/ V | Antenna<br>dBμV/m | Cable<br>DB | Amp.<br>DB | Corr. Ampl.<br>dBμV/m  | Limit<br>dBμV/<br>m | Margin<br>dB |
| Low Channel, 1-25GHz    |                 |          |                 |                 |               |                   |             |            |                        |                     |              |
| 2412.30                 | 106.5           | FUND.    | 0               | 1.2             | v             | 28.1              | 3.4         | 30.0       | 108.0                  | /                   | /            |
| 2412.30                 | 100.4           | FUND.    | 90              | 1.5             | h             | 28.1              | 3.4         | 30.0       | 101.9                  | /                   | /            |
| 7236.90                 | 32.1            | Avg.     | 210             | 1.2             | v             | 35.1              | 5.6         | 30.0       | 42.8                   | 54                  | -11.2        |
| 7236.90                 | 31.3            | Avg.     | 230             | 1.5             | h             | 35.1              | 5.6         | 30.0       | 42.0                   | 54                  | -12.0        |
| 4824.60                 | 32.8            | Avg.     | 150             | 1.2             | v             | 32.5              | 4.9         | 30.0       | 40.2                   | 54                  | -13.8        |
| 4824.60                 | 31.1            | Avg.     | 180             | 1.5             | h             | 32.5              | 4.9         | 30.0       | 38.5                   | 54                  | -15.5        |
| 7236.90                 | 42.8            | Peak     | 210             | 1.2             | v             | 35.1              | 5.6         | 30.0       | 53.5                   | 74                  | -20.5        |
| 7236.90                 | 40.5            | Peak     | 230             | 1.5             | h             | 35.1              | 5.6         | 30.0       | 51.2                   | 74                  | -22.8        |
| 4824.60                 | 43.6            | Peak     | 150             | 1.2             | v             | 32.5              | 4.9         | 30.0       | 51.0                   | 74                  | -23.0        |
| 4824.60                 | 41.2            | Peak     | 180             | 1.5             | h             | 32.5              | 4.9         | 30.0       | 48.6                   | 74                  | -25.4        |
| Middle Channel, 1-25GHz |                 |          |                 |                 |               |                   |             |            |                        |                     |              |
| 2442.00                 | 110.9           | FUND     | 0               | 1.2             | v             | 28.1              | 3.4         | 30.0       | 112.4                  | /                   | /            |
| 2442.00                 | 100.2           | FUND     | 30              | 1.5             | h             | 28.1              | 3.4         | 30.0       | 101.7                  | /                   | /            |
| 7314.30                 | 32.5            | Avg.     | 270             | 1.5             | v             | 35.1              | 5.6         | 30.0       | 43.2                   | 54                  | -10.8        |
| 7314.30                 | 31.2            | Avg.     | 210             | 1.2             | h             | 35.1              | 5.6         | 30.0       | 41.9                   | 54                  | -12.1        |
| 4884.00                 | 33.1            | Avg.     | 340             | 1.5             | v             | 32.5              | 4.9         | 30.0       | 40.5                   | 54                  | -13.5        |
| 4884.00                 | 30.9            | Avg.     | 30              | 1.2             | h             | 32.5              | 4.9         | 30.0       | 38.3                   | 54                  | -15.7        |
| 7314.30                 | 42.9            | Peak     | 270             | 1.5             | v             | 35.1              | 5.6         | 30.0       | 53.6                   | 74                  | -20.4        |
| 4884.00                 | 43.8            | Peak     | 340             | 1.5             | v             | 32.5              | 4.9         | 30.0       | 51.2                   | 74                  | -22.8        |
| 7314.30                 | 40.2            | Peak     | 210             | 1.2             | h             | 35.1              | 5.6         | 30.0       | 50.9                   | 74                  | -23.1        |
| 4884.00                 | 41.1            | Peak     | 30              | 1.2             | h             | 32.5              | 4.9         | 30.0       | 48.5                   | 74                  | -25.5        |
| High Channel, 1-25GHz   |                 |          |                 |                 |               |                   |             |            |                        |                     |              |
| 2462.20                 | 105.7           | FUND     | 0               | 1.5             | v             | 28.1              | 3.4         | 30.0       | 107.2                  | /                   | /            |
| 2462.20                 | 99.6            | FUND     | 0               | 1.5             | h             | 28.1              | 3.4         | 30.0       | 101.1                  | /                   | /            |
| 7386.60                 | 31.8            | Avg.     | 230             | 1.2             | v             | 35.1              | 5.6         | 30.0       | 42.5                   | 54                  | -11.5        |
| 7386.60                 | 31.2            | Avg.     | 250             | 1.2             | h             | 35.1              | 5.6         | 30.0       | 41.9                   | 54                  | -12.1        |
| 4924.40                 | 32.5            | Avg.     | 90              | 1.5             | v             | 32.5              | 4.9         | 30.0       | 39.9                   | 54                  | -14.1        |
| 4924.40                 | 30.7            | Avg.     | 120             | 1.5             | h             | 32.5              | 4.9         | 30.0       | 38.1                   | 54                  | -15.9        |
| 7386.60                 | 42.5            | Peak     | 230             | 1.2             | v             | 35.1              | 5.6         | 30.0       | 53.2                   | 74                  | -20.8        |
| 7386.60                 | 40.3            | Peak     | 250             | 1.2             | h             | 35.1              | 5.6         | 30.0       | 51.0                   | 74                  | -23.0        |
| 4924.40                 | 43.3            | Peak     | 90              | 1.5             | v             | 32.5              | 4.9         | 30.0       | 50.7                   | 74                  | -23.3        |
| 4924.40                 | 40.9            | Peak     | 120             | 1.5             | h             | 32.5              | 4.9         | 30.0       | 48.3                   | 74                  | -25.7        |

| Unwanted Emission, 30 – 1000MHz |      |   |     |     |   |      |     |      |      |      |      |
|---------------------------------|------|---|-----|-----|---|------|-----|------|------|------|------|
| 208.41                          | 50.2 | / | 270 | 1.8 | v | 12.4 | 4.6 | 25.0 | 42.2 | 43.5 | -1.3 |
| 480.01                          | 46.7 | / | 0   | 1.5 | v | 18.7 | 2.5 | 25.0 | 42.9 | 46   | -3.1 |
| 225.90                          | 50.6 | / | 225 | 1.5 | h | 12.1 | 3.9 | 25.0 | 41.6 | 46   | -4.4 |
| 192.00                          | 44.7 | / | 270 | 1.0 | v | 14.4 | 2.7 | 25.0 | 36.8 | 43.5 | -6.7 |
| 576.10                          | 40.1 | / | 225 | 1.0 | h | 20.1 | 3.4 | 25.0 | 38.6 | 46   | -7.4 |
| 128.00                          | 46.3 | / | 45  | 1.0 | v | 12.3 | 1.8 | 25.0 | 35.4 | 43.5 | -8.1 |

# 12.6.2 Final test data, ZG1S Antenna, 30MHz – 25GHz (15.247)

| INDICATED               |                 |          | TABLE           | ANTENNA         |               | CORRECTION FACTOR |             |            | CORRECTED<br>AMPLITUDE | FCC 15<br>SUBPART C |              |
|-------------------------|-----------------|----------|-----------------|-----------------|---------------|-------------------|-------------|------------|------------------------|---------------------|--------------|
| Frequency<br>MHz        | Ampl.<br>dBμV/m | Comments | Angle<br>Degree | Height<br>Meter | Polar<br>H/ V | Antenna<br>dBμV/m | Cable<br>DB | Amp.<br>DB | Corr. Ampl.<br>dBμV/m  | Limit<br>dBμV/<br>m | Margin<br>dB |
| Low Channel, 1-25GHz    |                 |          |                 |                 |               |                   |             |            |                        |                     |              |
| 2412.30                 | 104.1           | FUND.    | 330             | 1.2             | v             | 28.1              | 3.4         | 30.0       | 105.6                  | /                   | /            |
| 2412.30                 | 99.2            | FUND.    | 0               | 1.8             | h             | 28.1              | 3.4         | 30.0       | 100.7                  | /                   | /            |
| 4824.60                 | 35.9            | Avg.     | 110             | 1.5             | v             | 32.5              | 4.9         | 30.0       | 43.3                   | 54                  | -10.7        |
| 7236.90                 | 31.4            | Avg.     | 260             | 1.0             | v             | 35.1              | 5.6         | 30.0       | 42.1                   | 54                  | -11.9        |
| 7236.90                 | 30.8            | Avg.     | 290             | 1.2             | h             | 35.1              | 5.6         | 30.0       | 41.5                   | 54                  | -12.5        |
| 4824.60                 | 33.1            | Avg.     | 130             | 1.2             | h             | 32.5              | 4.9         | 30.0       | 40.5                   | 54                  | -13.5        |
| 4824.60                 | 40.7            | Peak     | 110             | 1.5             | v             | 32.5              | 4.9         | 30.0       | 48.1                   | 74                  | -25.9        |
| 7236.90                 | 36.3            | Peak     | 260             | 1.0             | v             | 35.1              | 5.6         | 30.0       | 47.0                   | 74                  | -27.0        |
| 7236.90                 | 35.4            | Peak     | 290             | 1.2             | h             | 35.1              | 5.6         | 30.0       | 46.1                   | 74                  | -27.9        |
| 4824.60                 | 38.5            | Peak     | 130             | 1.2             | h             | 32.5              | 4.9         | 30.0       | 45.9                   | 74                  | -28.1        |
| Middle Channel, 1-25GHz |                 |          |                 |                 |               |                   |             |            |                        |                     |              |
| 2442.00                 | 101.2           | FUND     | 270             | 1.2             | v             | 28.1              | 3.4         | 30.0       | 102.7                  | /                   | /            |
| 2442.00                 | 98.1            | FUND     | 0               | 1.5             | h             | 28.1              | 3.4         | 30.0       | 99.6                   | /                   | /            |
| 4884.00                 | 35.7            | Avg.     | 30              | 1.5             | v             | 32.5              | 4.9         | 30.0       | 43.1                   | 54                  | -10.9        |
| 7314.30                 | 31.3            | Avg.     | 230             | 1.5             | v             | 35.1              | 5.6         | 30.0       | 42.0                   | 54                  | -12.0        |
| 7314.30                 | 30.6            | Avg.     | 250             | 1.5             | h             | 35.1              | 5.6         | 30.0       | 41.3                   | 54                  | -12.7        |
| 4884.00                 | 32.9            | Avg.     | 60              | 1.2             | h             | 32.5              | 4.9         | 30.0       | 40.3                   | 54                  | -13.7        |
| 4884.00                 | 40.5            | Peak     | 30              | 1.5             | v             | 32.5              | 4.9         | 30.0       | 47.9                   | 74                  | -26.1        |
| 7314.30                 | 36.2            | Peak     | 230             | 1.5             | v             | 35.1              | 5.6         | 30.0       | 46.9                   | 74                  | -27.1        |
| 4884.00                 | 38.4            | Peak     | 60              | 1.2             | h             | 32.5              | 4.9         | 30.0       | 45.8                   | 74                  | -28.2        |
| 7314.30                 | 35.1            | Peak     | 250             | 1.5             | h             | 35.1              | 5.6         | 30.0       | 45.8                   | 74                  | -28.2        |
| High Channel, 1-25GHz   |                 |          |                 |                 |               |                   |             |            |                        |                     |              |
| 2462.20                 | 100.6           | FUND     | 270             | 1.5             | v             | 28.1              | 3.4         | 30.0       | 102.1                  | /                   | /            |
| 2462.20                 | 97.5            | FUND     | 310             | 1.2             | h             | 28.1              | 3.4         | 30.0       | 99.0                   | /                   | /            |
| 4924.40                 | 35.5            | Avg.     | 270             | 1.3             | v             | 32.5              | 4.9         | 30.0       | 42.9                   | 54                  | -11.1        |
| 7386.60                 | 31.1            | Avg.     | 160             | 1.5             | v             | 35.1              | 5.6         | 30.0       | 41.8                   | 54                  | -12.2        |
| 7386.60                 | 30.5            | Avg.     | 190             | 1.2             | h             | 35.1              | 5.6         | 30.0       | 41.2                   | 54                  | -12.8        |
| 4924.40                 | 32.7            | Avg.     | 90              | 1.5             | h             | 32.5              | 4.9         | 30.0       | 40.1                   | 54                  | -13.9        |
| 4924.40                 | 40.3            | Peak     | 270             | 1.3             | v             | 32.5              | 4.9         | 30.0       | 47.7                   | 74                  | -26.3        |
| 7386.60                 | 35.9            | Peak     | 160             | 1.5             | v             | 35.1              | 5.6         | 30.0       | 46.6                   | 74                  | -27.4        |
| 4924.40                 | 38.2            | Peak     | 90              | 1.5             | h             | 32.5              | 4.9         | 30.0       | 45.6                   | 74                  | -28.4        |
| 7386.60                 | 34.7            | Peak     | 190             | 1.2             | h             | 35.1              | 5.6         | 30.0       | 45.4                   | 74                  | -28.6        |



| Unwanted Emission, 30 – 1000MHz |      |   |     |     |   |      |     |      |      |      |      |
|---------------------------------|------|---|-----|-----|---|------|-----|------|------|------|------|
| 208.41                          | 49.8 | / | 270 | 1.5 | v | 12.4 | 4.6 | 25.0 | 41.8 | 43.5 | -1.7 |
| 480.01                          | 46.5 | / | 0   | 1.5 | v | 18.7 | 2.5 | 25.0 | 42.7 | 46   | -3.3 |
| 225.90                          | 50.4 | / | 225 | 1.5 | h | 12.1 | 3.9 | 25.0 | 41.4 | 46   | -4.6 |
| 192.00                          | 44.6 | / | 270 | 1.0 | v | 14.4 | 2.7 | 25.0 | 36.7 | 43.5 | -6.8 |
| 576.10                          | 39.7 | / | 225 | 1.2 | h | 20.1 | 3.4 | 25.0 | 38.2 | 46   | -7.8 |
| 128.00                          | 46.1 | / | 45  | 1.0 | v | 12.3 | 1.8 | 25.0 | 35.2 | 43.5 | -8.3 |

### 12.6.3 Final test data, Compal Antenna, 30MHz – 25GHz (15.247)

| INDICATED               |                 |          | TABLE           | ANTENNA         |               | CORRECTION FACTOR |             |            | CORRECTED<br>AMPLITUDE | FCC 15<br>SUBPART C |              |
|-------------------------|-----------------|----------|-----------------|-----------------|---------------|-------------------|-------------|------------|------------------------|---------------------|--------------|
| Frequency<br>MHz        | Ampl.<br>dBμV/m | Comments | Angle<br>Degree | Height<br>Meter | Polar<br>H/ V | Antenna<br>dBμV/m | Cable<br>DB | Amp.<br>DB | Corr. Ampl.<br>dBμV/m  | Limit<br>dBμV/<br>m | Margin<br>dB |
| Low Channel, 1-25GHz    |                 |          |                 |                 |               |                   |             |            |                        |                     |              |
| 2412.30                 | 101.2           | FUND.    | 0               | 1.2             | v             | 28.1              | 3.4         | 30.0       | 102.7                  | /                   | /            |
| 2412.30                 | 97.2            | FUND.    | 180             | 1.2             | h             | 28.1              | 3.4         | 30.0       | 98.7                   | /                   | /            |
| 4824.60                 | 35.5            | Avg.     | 210             | 1.5             | v             | 32.5              | 4.9         | 30.0       | 42.9                   | 54                  | -11.1        |
| 7236.90                 | 31.0            | Avg.     | 90              | 1.2             | v             | 35.1              | 5.6         | 30.0       | 41.7                   | 54                  | -12.3        |
| 7236.90                 | 30.3            | Avg.     | 110             | 1.0             | h             | 35.1              | 5.6         | 30.0       | 41.0                   | 54                  | -13.0        |
| 4824.60                 | 32.9            | Avg.     | 250             | 1.5             | h             | 32.5              | 4.9         | 30.0       | 40.3                   | 54                  | -13.7        |
| 4824.60                 | 40.4            | Peak     | 210             | 1.5             | v             | 32.5              | 4.9         | 30.0       | 47.8                   | 74                  | -26.2        |
| 7236.90                 | 35.8            | Peak     | 90              | 1.2             | v             | 35.1              | 5.6         | 30.0       | 46.5                   | 74                  | -27.5        |
| 4824.60                 | 38.5            | Peak     | 250             | 1.5             | h             | 32.5              | 4.9         | 30.0       | 45.9                   | 74                  | -28.1        |
| 7236.90                 | 34.9            | Peak     | 110             | 1.0             | h             | 35.1              | 5.6         | 30.0       | 45.6                   | 74                  | -28.4        |
| Middle Channel, 1-25GHz |                 |          |                 |                 |               |                   |             |            |                        |                     |              |
| 2442.00                 | 101.7           | FUND     | 0               | 1.2             | v             | 28.1              | 3.4         | 30.0       | 103.2                  | /                   | /            |
| 2442.00                 | 93.6            | FUND     | 90              | 1.5             | h             | 28.1              | 3.4         | 30.0       | 95.1                   | /                   | /            |
| 4884.00                 | 35.8            | Avg.     | 0               | 1.5             | v             | 32.5              | 4.9         | 30.0       | 43.2                   | 54                  | -10.8        |
| 7314.30                 | 31.6            | Avg.     | 250             | 1.5             | v             | 35.1              | 5.6         | 30.0       | 42.3                   | 54                  | -11.7        |
| 7314.30                 | 30.2            | Avg.     | 290             | 1.5             | h             | 35.1              | 5.6         | 30.0       | 40.9                   | 54                  | -13.1        |
| 4884.00                 | 32.2            | Avg.     | 30              | 1.2             | h             | 32.5              | 4.9         | 30.0       | 39.6                   | 54                  | -14.4        |
| 4884.00                 | 40.9            | Peak     | 0               | 1.5             | v             | 32.5              | 4.9         | 30.0       | 48.3                   | 74                  | -25.7        |
| 7314.30                 | 36.1            | Peak     | 250             | 1.5             | v             | 35.1              | 5.6         | 30.0       | 46.8                   | 74                  | -27.2        |
| 4884.00                 | 38.1            | Peak     | 30              | 1.2             | h             | 32.5              | 4.9         | 30.0       | 45.5                   | 74                  | -28.5        |
| 7314.30                 | 34.3            | Peak     | 290             | 1.5             | h             | 35.1              | 5.6         | 30.0       | 45.0                   | 74                  | -29.0        |
| High Channel, 1-25GHz   |                 |          |                 |                 |               |                   |             |            |                        |                     |              |
| 2462.20                 | 100.6           | FUND     | 330             | 1.8             | v             | 28.1              | 3.4         | 30.0       | 102.1                  | /                   | /            |
| 2462.20                 | 91.8            | FUND     | 180             | 1.5             | h             | 28.1              | 3.4         | 30.0       | 93.3                   | /                   | /            |
| 4924.40                 | 35.5            | Avg.     | 130             | 1.3             | v             | 32.5              | 4.9         | 30.0       | 42.9                   | 54                  | -11.1        |
| 7386.60                 | 31.1            | Avg.     | 240             | 1.5             | v             | 35.1              | 5.6         | 30.0       | 41.8                   | 54                  | -12.2        |
| 7386.60                 | 30.2            | Avg.     | 270             | 1.2             | h             | 35.1              | 5.6         | 30.0       | 40.9                   | 54                  | -13.1        |
| 4924.40                 | 32.1            | Avg.     | 90              | 1.5             | h             | 32.5              | 4.9         | 30.0       | 39.5                   | 54                  | -14.5        |
| 4924.40                 | 40.3            | Peak     | 130             | 1.3             | v             | 32.5              | 4.9         | 30.0       | 47.7                   | 74                  | -26.3        |
| 7386.60                 | 35.9            | Peak     | 240             | 1.5             | v             | 35.1              | 5.6         | 30.0       | 46.6                   | 74                  | -27.4        |
| 4924.40                 | 37.8            | Peak     | 90              | 1.5             | h             | 32.5              | 4.9         | 30.0       | 45.2                   | 74                  | -28.8        |
| 7386.60                 | 33.7            | Peak     | 270             | 1.2             | h             | 35.1              | 5.6         | 30.0       | 44.4                   | 74                  | -29.6        |

| Unwanted Emission, 30 – 1000MHz |      |   |     |     |   |      |     |      |      |      |      |
|---------------------------------|------|---|-----|-----|---|------|-----|------|------|------|------|
| 208.41                          | 49.6 | / | 270 | 1.5 | v | 12.4 | 4.6 | 25.0 | 41.6 | 43.5 | -1.9 |
| 480.01                          | 46.1 | / | 0   | 1.5 | v | 18.7 | 2.5 | 25.0 | 42.3 | 46   | -3.7 |
| 225.90                          | 50.2 | / | 225 | 1.5 | h | 12.1 | 3.9 | 25.0 | 41.2 | 46   | -4.8 |
| 192.00                          | 44.5 | / | 270 | 1.0 | v | 14.4 | 2.7 | 25.0 | 36.6 | 43.5 | -6.9 |
| 128.00                          | 46.6 | / | 45  | 1.0 | v | 12.3 | 1.8 | 25.0 | 35.7 | 43.5 | -7.8 |
| 576.10                          | 39.2 | / | 225 | 1.2 | h | 20.1 | 3.4 | 25.0 | 37.7 | 46   | -8.3 |

# 12.6.4 Final test data, ZI1S Antenna (15.407)

| INDICATED                         |                 |          | TABLE           | ANTENNA         |               | CORRECTION FACTOR |             |            | CORRECTED<br>AMPLITUDE | FCC 15<br>SUBPART C |              |
|-----------------------------------|-----------------|----------|-----------------|-----------------|---------------|-------------------|-------------|------------|------------------------|---------------------|--------------|
| Frequency<br>MHz                  | Ampl.<br>dBμV/m | Comments | Angle<br>Degree | Height<br>Meter | Polar<br>H/ V | Antenna<br>dBμV/m | Cable<br>DB | Amp.<br>DB | Corr. Ampl.<br>dBμV/m  | Limit<br>dBμV/<br>m | Margin<br>dB |
| Low Band, Low Channel, 1-50GHz    |                 |          |                 |                 |               |                   |             |            |                        |                     |              |
| 5170.00                           | 83.40           | FUND     | 45              | 1.2             | v             | 33.9              | 5.2         | 30.0       | 92.5                   | /                   | /            |
| 5170.00                           | 80.3            | FUND     | 240             | 1.8             | h             | 33.9              | 5.2         | 30.0       | 89.4                   | /                   | /            |
| 10340.00                          | 31.6            | avg      | 180             | 1.2             | v             | 35.1              | 5.6         | 30.0       | 42.3                   | 54                  | -11.7        |
| 10340.00                          | 30.4            | avg      | 45              | 1.5             | h             | 35.1              | 5.6         | 30.0       | 41.1                   | 54                  | -12.9        |
| 15510.00                          | 29.7            | avg      | 0               | 1.2             | v             | 35.1              | 5.6         | 30.0       | 40.4                   | 54                  | -13.6        |
| 15510.00                          | 28.5            | avg      | 30              | 1.2             | h             | 35.1              | 5.6         | 30.0       | 39.2                   | 54                  | -14.8        |
| 10340.00                          | 37.3            | Peak     | 180             | 1.2             | v             | 35.1              | 5.6         | 30.0       | 48.0                   | 74                  | -26.0        |
| 10340.00                          | 35.2            | Peak     | 45              | 1.5             | h             | 35.1              | 5.6         | 30.0       | 45.9                   | 74                  | -28.1        |
| 15510.00                          | 34.4            | Peak     | 0               | 1.2             | v             | 35.1              | 5.6         | 30.0       | 45.1                   | 74                  | -28.9        |
| 15510.00                          | 33.5            | Peak     | 30              | 1.2             | v             | 35.1              | 5.6         | 30.0       | 44.2                   | 74                  | -29.8        |
| Low Band, Middle Channel, 1-50GHz |                 |          |                 |                 |               |                   |             |            |                        |                     |              |
| 5200.00                           | 85.8            | FUND     | 45              | 1.2             | v             | 33.9              | 5.2         | 30.0       | 94.9                   | /                   | /            |
| 5200.00                           | 81.2            | FUND     | 180             | 1.5             | h             | 33.9              | 5.2         | 30.0       | 90.3                   | /                   | /            |
| 10400.00                          | 31.9            | avg      | 90              | 1.0             | v             | 35.1              | 5.6         | 30.0       | 42.6                   | 54                  | -11.4        |
| 10400.00                          | 30.6            | avg      | 130             | 1.2             | h             | 35.1              | 5.6         | 30.0       | 41.3                   | 54                  | -12.7        |
| 15600.00                          | 29.8            | avg      | 0               | 1.5             | v             | 35.1              | 5.6         | 30.0       | 40.5                   | 54                  | -13.5        |
| 15600.00                          | 28.7            | avg      | 30              | 1.5             | h             | 35.1              | 5.6         | 30.0       | 39.4                   | 54                  | -14.6        |
| 10400.00                          | 37.5            | Peak     | 90              | 1.0             | v             | 35.1              | 5.6         | 30.0       | 48.2                   | 74                  | -25.8        |
| 10400.00                          | 35.4            | Peak     | 130             | 1.2             | h             | 35.1              | 5.6         | 30.0       | 46.1                   | 74                  | -27.9        |
| 15600.00                          | 34.6            | Peak     | 0               | 1.5             | v             | 35.1              | 5.6         | 30.0       | 45.3                   | 74                  | -28.7        |
| 15600.00                          | 33.7            | Peak     | 30              | 1.5             | h             | 35.1              | 5.6         | 30.0       | 44.4                   | 74                  | -29.6        |
| Low Band, High Channel, 1-50GHz   |                 |          |                 |                 |               |                   |             |            |                        |                     |              |
| 5250.00                           | 82.9            | FUND     | 90              | 1.2             | v             | 33.9              | 5.2         | 30.0       | 92.0                   | /                   | /            |
| 5250.00                           | 80.3            | FUND     | 180             | 1.5             | h             | 33.9              | 5.2         | 30.0       | 89.4                   | /                   | /            |
| 10500.00                          | 31.5            | avg      | 45              | 1.5             | v             | 35.1              | 5.6         | 30.0       | 42.2                   | 54                  | -11.8        |
| 10500.00                          | 30.3            | avg      | 180             | 1.4             | h             | 35.1              | 5.6         | 30.0       | 41.0                   | 54                  | -13.0        |
| 15750.00                          | 29.5            | avg      | 150             | 1.5             | v             | 35.1              | 5.6         | 30.0       | 40.2                   | 54                  | -13.8        |
| 15750.00                          | 28.5            | avg      | 90              | 1.5             | h             | 35.1              | 5.6         | 30.0       | 39.2                   | 54                  | -14.8        |
| 10500.00                          | 37.2            | Peak     | 45              | 1.5             | v             | 35.1              | 5.6         | 30.0       | 47.9                   | 74                  | -26.1        |
| 10500.00                          | 35.1            | Peak     | 180             | 1.4             | h             | 35.1              | 5.6         | 30.0       | 45.8                   | 74                  | -28.2        |
| 15750.00                          | 34.2            | Peak     | 150             | 1.5             | v             | 35.1              | 5.6         | 30.0       | 44.9                   | 74                  | -29.1        |
| 15750.00                          | 33.5            | Peak     | 90              | 1.5             | h             | 35.1              | 5.6         | 30.0       | 44.2                   | 74                  | -29.8        |

| INDICATED                         |                 |          | TABLE           | ANTENNA         |              | CORRECTION FACTOR |             |            | CORRECTED<br>AMPLITUDE | FCC 15<br>SUBPART C |              |
|-----------------------------------|-----------------|----------|-----------------|-----------------|--------------|-------------------|-------------|------------|------------------------|---------------------|--------------|
| Frequency<br>MHz                  | Ampl.<br>dBμV/m | Comments | Angle<br>Degree | Height<br>Meter | Polar<br>H/V | Antenna<br>dBμV/m | Cable<br>DB | Amp.<br>DB | Corr. Ampl.<br>dBμV/m  | Limit<br>dBμV/m     | Margin<br>dB |
| Mid Band, Low Channel, 1-50GHz    |                 |          |                 |                 |              |                   |             |            |                        |                     |              |
| 5250.00                           | 82.9            | FUND     | 90              | 1.2             | v            | 33.9              | 5.2         | 30.0       | 92.0                   | /                   | /            |
| 5250.00                           | 80.3            | FUND     | 180             | 1.5             | h            | 33.9              | 5.2         | 30.0       | 89.4                   | /                   | /            |
| 10500.00                          | 31.5            | avg      | 45              | 1.5             | v            | 35.1              | 5.6         | 30.0       | 42.2                   | 54                  | -11.8        |
| 10500.00                          | 30.3            | avg      | 180             | 1.4             | h            | 35.1              | 5.6         | 30.0       | 41.0                   | 54                  | -13.0        |
| 15750.00                          | 29.5            | avg      | 150             | 1.5             | v            | 35.1              | 5.6         | 30.0       | 40.2                   | 54                  | -13.8        |
| 15750.00                          | 28.5            | avg      | 90              | 1.5             | h            | 35.1              | 5.6         | 30.0       | 39.2                   | 54                  | -14.8        |
| 10500.00                          | 37.2            | Peak     | 45              | 1.5             | v            | 35.1              | 5.6         | 30.0       | 47.9                   | 74                  | -26.1        |
| 10500.00                          | 35.1            | Peak     | 180             | 1.4             | h            | 35.1              | 5.6         | 30.0       | 45.8                   | 74                  | -28.2        |
| 15750.00                          | 34.2            | Peak     | 150             | 1.5             | v            | 35.1              | 5.6         | 30.0       | 44.9                   | 74                  | -29.1        |
| 15750.00                          | 33.5            | Peak     | 90              | 1.5             | h            | 35.1              | 5.6         | 30.0       | 44.2                   | 74                  | -29.8        |
| Mid Band, Middle Channel, 1-50GHz |                 |          |                 |                 |              |                   |             |            |                        |                     |              |
| 5300.00                           | 85.4            | FUND     | 45              | 1.2             | v            | 33.9              | 5.2         | 30.0       | 94.5                   | /                   | /            |
| 5300.00                           | 82.3            | FUND     | 0               | 1.2             | h            | 33.9              | 5.2         | 30.0       | 91.4                   | /                   | /            |
| 10600.00                          | 31.7            | avg      | 90              | 1.0             | v            | 35.1              | 5.6         | 30.0       | 42.4                   | 54                  | -11.6        |
| 10600.00                          | 30.8            | avg      | 130             | 1.2             | h            | 35.1              | 5.6         | 30.0       | 41.5                   | 54                  | -12.5        |
| 15900.00                          | 29.7            | avg      | 0               | 1.5             | v            | 35.1              | 5.6         | 30.0       | 40.4                   | 54                  | -13.6        |
| 15900.00                          | 28.8            | avg      | 30              | 1.5             | h            | 35.1              | 5.6         | 30.0       | 39.5                   | 54                  | -14.5        |
| 10600.00                          | 37.4            | Peak     | 90              | 1.0             | v            | 35.1              | 5.6         | 30.0       | 48.1                   | 74                  | -25.9        |
| 10600.00                          | 35.6            | Peak     | 130             | 1.2             | h            | 35.1              | 5.6         | 30.0       | 46.3                   | 74                  | -27.7        |
| 15900.00                          | 34.5            | Peak     | 0               | 1.5             | v            | 35.1              | 5.6         | 30.0       | 45.2                   | 74                  | -28.8        |
| 15900.00                          | 33.8            | Peak     | 30              | 1.5             | h            | 35.1              | 5.6         | 30.0       | 44.5                   | 74                  | -29.5        |
| Mid Band, High Channel, 1-50GHz   |                 |          |                 |                 |              |                   |             |            |                        |                     |              |
| 5330.00                           | 85.2            | FUND     | 90              | 1.5             | v            | 33.9              | 5.2         | 30.0       | 94.3                   | /                   | /            |
| 5330.00                           | 82.6            | FUND     | 0               | 1.5             | h            | 33.9              | 5.2         | 30.0       | 91.7                   | /                   | /            |
| 10660.00                          | 31.6            | avg      | 45              | 1.5             | v            | 35.1              | 5.6         | 30.0       | 42.3                   | 54                  | -11.7        |
| 10660.00                          | 30.9            | avg      | 180             | 1.4             | h            | 35.1              | 5.6         | 30.0       | 41.6                   | 54                  | -12.4        |
| 15990.00                          | 29.5            | avg      | 150             | 1.5             | v            | 35.1              | 5.6         | 30.0       | 40.2                   | 54                  | -13.8        |
| 15990.00                          | 29.1            | avg      | 90              | 1.5             | h            | 35.1              | 5.6         | 30.0       | 39.8                   | 54                  | -14.2        |
| 10660.00                          | 37.2            | Peak     | 45              | 1.5             | v            | 35.1              | 5.6         | 30.0       | 47.9                   | 74                  | -26.1        |
| 10660.00                          | 35.8            | Peak     | 180             | 1.4             | h            | 35.1              | 5.6         | 30.0       | 46.5                   | 74                  | -27.5        |
| 15990.00                          | 34.4            | Peak     | 150             | 1.5             | v            | 35.1              | 5.6         | 30.0       | 45.1                   | 74                  | -28.9        |
| 15990.00                          | 33.9            | Peak     | 90              | 1.5             | h            | 35.1              | 5.6         | 30.0       | 44.6                   | 74                  | -29.4        |

| INDICATED                          |                 |          | TABLE           | ANTENNA         |              | CORRECTION FACTOR |             |            | CORRECTED<br>AMPLITUDE | FCC 15<br>SUBPART C |              |
|------------------------------------|-----------------|----------|-----------------|-----------------|--------------|-------------------|-------------|------------|------------------------|---------------------|--------------|
| Frequency<br>MHz                   | Ampl.<br>dBμV/m | Comments | Angle<br>Degree | Height<br>Meter | Polar<br>H/V | Antenna<br>dBμV/m | Cable<br>DB | Amp.<br>DB | Corr. Ampl.<br>dBμV/m  | Limit<br>dBμV/m     | Margin<br>dB |
| High Band, Low Channel, 1-50GHz    |                 |          |                 |                 |              |                   |             |            |                        |                     |              |
| 5745.00                            | 84.90           | FUND     | 90              | 1.2             | v            | 34.1              | 5.4         | 30.0       | 94.4                   | /                   | /            |
| 5745.00                            | 83.7            | FUND     | 30              | 1.5             | h            | 34.1              | 5.4         | 30.0       | 93.2                   | /                   | /            |
| 11490.00                           | 31.4            | avg      | 180             | 1.2             | v            | 35.1              | 5.6         | 30.0       | 42.1                   | 54                  | -11.9        |
| 11490.00                           | 31.1            | avg      | 45              | 1.5             | h            | 35.1              | 5.6         | 30.0       | 41.8                   | 54                  | -12.2        |
| 17235.00                           | 29.3            | avg      | 0               | 1.2             | v            | 35.1              | 5.6         | 30.0       | 40.0                   | 54                  | -14.0        |
| 17235.00                           | 29.1            | avg      | 30              | 1.2             | h            | 35.1              | 5.6         | 30.0       | 39.8                   | 54                  | -14.2        |
| 11490.00                           | 36.9            | Peak     | 180             | 1.2             | v            | 35.1              | 5.6         | 30.0       | 47.6                   | 74                  | -26.4        |
| 11490.00                           | 36.1            | Peak     | 45              | 1.5             | h            | 35.1              | 5.6         | 30.0       | 46.8                   | 74                  | -27.2        |
| 17235.00                           | 34.3            | Peak     | 0               | 1.2             | v            | 35.1              | 5.6         | 30.0       | 45.0                   | 74                  | -29.0        |
| 17235.00                           | 34.0            | Peak     | 30              | 1.2             | h            | 35.1              | 5.6         | 30.0       | 44.7                   | 74                  | -29.3        |
| High Band, Middle Channel, 1-50GHz |                 |          |                 |                 |              |                   |             |            |                        |                     |              |
| 5775.00                            | 81.2            | FUND     | 90              | 1.2             | v            | 34.1              | 5.4         | 30.0       | 90.7                   | /                   | /            |
| 5775.00                            | 76.1            | FUND     | 90              | 1.2             | h            | 34.1              | 5.4         | 30.0       | 85.6                   | /                   | /            |
| 11550.00                           | 32.7            | avg      | 90              | 1.0             | v            | 35.1              | 5.6         | 30.0       | 43.4                   | 54                  | -10.6        |
| 11550.00                           | 30.1            | avg      | 130             | 1.2             | h            | 35.1              | 5.6         | 30.0       | 40.8                   | 54                  | -13.2        |
| 17325.00                           | 29.3            | avg      | 0               | 1.5             | v            | 35.1              | 5.6         | 30.0       | 40.0                   | 54                  | -14.0        |
| 17325.00                           | 28.4            | avg      | 30              | 1.5             | h            | 35.1              | 5.6         | 30.0       | 39.1                   | 54                  | -14.9        |
| 11550.00                           | 37.0            | Peak     | 90              | 1.0             | v            | 35.1              | 5.6         | 30.0       | 47.7                   | 74                  | -26.3        |
| 11550.00                           | 34.9            | Peak     | 130             | 1.2             | h            | 35.1              | 5.6         | 30.0       | 45.6                   | 74                  | -28.4        |
| 17325.00                           | 33.9            | Peak     | 0               | 1.5             | v            | 35.1              | 5.6         | 30.0       | 44.6                   | 74                  | -29.4        |
| 17325.00                           | 32.7            | Peak     | 30              | 1.5             | h            | 35.1              | 5.6         | 30.0       | 43.4                   | 74                  | -30.6        |
| High Band, High Channel, 1-50GHz   |                 |          |                 |                 |              |                   |             |            |                        |                     |              |
| 5810.00                            | 83.7            | FUND     | 90              | 1.2             | v            | 34.1              | 5.4         | 30.0       | 93.2                   | /                   | /            |
| 5810.00                            | 76.2            | FUND     | 180             | 1.2             | h            | 34.1              | 5.4         | 30.0       | 85.7                   | /                   | /            |
| 11620.00                           | 31.4            | avg      | 45              | 1.5             | v            | 35.1              | 5.6         | 30.0       | 42.1                   | 54                  | -11.9        |
| 11620.00                           | 30.1            | avg      | 180             | 1.4             | h            | 35.1              | 5.6         | 30.0       | 40.8                   | 54                  | -13.2        |
| 17340.00                           | 29.5            | avg      | 150             | 1.5             | v            | 35.1              | 5.6         | 30.0       | 40.2                   | 54                  | -13.8        |
| 17340.00                           | 28.3            | avg      | 90              | 1.5             | h            | 35.1              | 5.6         | 30.0       | 39.0                   | 54                  | -15.0        |
| 11620.00                           | 36.9            | Peak     | 45              | 1.5             | v            | 35.1              | 5.6         | 30.0       | 47.6                   | 74                  | -26.4        |
| 11620.00                           | 35.1            | Peak     | 180             | 1.4             | h            | 35.1              | 5.6         | 30.0       | 45.8                   | 74                  | -28.2        |
| 17340.00                           | 34.1            | Peak     | 150             | 1.5             | v            | 35.1              | 5.6         | 30.0       | 44.8                   | 74                  | -29.2        |
| 17340.00                           | 32.9            | Peak     | 90              | 1.5             | h            | 35.1              | 5.6         | 30.0       | 43.6                   | 74                  | -30.4        |



| Unwanted Emission, 30 – 1000MHz |      |   |     |     |   |      |     |      |      |      |      |
|---------------------------------|------|---|-----|-----|---|------|-----|------|------|------|------|
| 480.01                          | 45.3 | / | 0   | 1.4 | v | 18.3 | 3.1 | 25.0 | 41.7 | 46   | -4.3 |
| 225.90                          | 50.1 | / | 220 | 1.5 | h | 11.8 | 2.2 | 25.0 | 39.1 | 46   | -6.9 |
| 208.41                          | 46.5 | / | 270 | 1.5 | v | 11.5 | 2.2 | 25.0 | 35.2 | 43.5 | -8.3 |
| 192.00                          | 44.2 | / | 270 | 1.2 | v | 13.7 | 2.1 | 25.0 | 35.0 | 43.5 | -8.5 |
| 576.10                          | 39.7 | / | 220 | 1.5 | h | 19.3 | 3.4 | 25.0 | 37.4 | 46   | -8.6 |
| 128.00                          | 45.6 | / | 45  | 1.2 | v | 11.9 | 1.6 | 25.0 | 34.1 | 43.5 | -9.4 |

### 12.6.5 Final test data, ZG1S Antenna (15.407)

| INDICATED                         |                 |          | TABLE           | ANTENNA         |               | CORRECTION FACTOR |             |            | CORRECTED<br>AMPLITUDE | FCC 15<br>SUBPART C |              |
|-----------------------------------|-----------------|----------|-----------------|-----------------|---------------|-------------------|-------------|------------|------------------------|---------------------|--------------|
| Frequency<br>MHz                  | Ampl.<br>dBμV/m | Comments | Angle<br>Degree | Height<br>Meter | Polar<br>H/ V | Antenna<br>dBμV/m | Cable<br>DB | Amp.<br>DB | Corr. Ampl.<br>dBμV/m  | Limit<br>dBμV/<br>m | Margin<br>dB |
| Low Band, Low Channel, 1-50GHz    |                 |          |                 |                 |               |                   |             |            |                        |                     |              |
| 5150.00                           | 92.30           | FUND     | 0               | 1.5             | v             | 33.9              | 5.2         | 30.0       | 101.4                  | /                   | /            |
| 5150.00                           | 81.8            | FUND     | 45              | 1.8             | h             | 33.9              | 5.2         | 30.0       | 90.9                   | /                   | /            |
| 10300.00                          | 32.4            | avg      | 180             | 1.2             | v             | 35.1              | 5.6         | 30.0       | 43.1                   | 54                  | -10.9        |
| 10300.00                          | 31.3            | avg      | 45              | 1.5             | h             | 35.1              | 5.6         | 30.0       | 42.0                   | 54                  | -12.0        |
| 15450.00                          | 30.5            | avg      | 0               | 1.2             | v             | 35.1              | 5.6         | 30.0       | 41.2                   | 54                  | -12.8        |
| 15450.00                          | 29.6            | avg      | 30              | 1.2             | h             | 35.1              | 5.6         | 30.0       | 40.3                   | 54                  | -13.7        |
| 10300.00                          | 38.9            | Peak     | 180             | 1.2             | v             | 35.1              | 5.6         | 30.0       | 49.6                   | 74                  | -24.4        |
| 10300.00                          | 37.7            | Peak     | 45              | 1.5             | h             | 35.1              | 5.6         | 30.0       | 48.4                   | 74                  | -25.6        |
| 15450.00                          | 36.4            | Peak     | 0               | 1.2             | v             | 35.1              | 5.6         | 30.0       | 47.1                   | 74                  | -26.9        |
| 15450.00                          | 35.1            | Peak     | 30              | 1.2             | v             | 35.1              | 5.6         | 30.0       | 45.8                   | 74                  | -28.2        |
| Low Band, Middle Channel, 1-50GHz |                 |          |                 |                 |               |                   |             |            |                        |                     |              |
| 5200.00                           | 92.2            | FUND     | 330             | 1.8             | v             | 33.9              | 5.2         | 30.0       | 101.3                  | /                   | /            |
| 5200.00                           | 85.1            | FUND     | 0               | 2.0             | h             | 33.9              | 5.2         | 30.0       | 94.2                   | /                   | /            |
| 10400.00                          | 32.3            | avg      | 90              | 1.0             | v             | 35.1              | 5.6         | 30.0       | 43.0                   | 54                  | -11.0        |
| 10400.00                          | 31.5            | avg      | 130             | 1.2             | h             | 35.1              | 5.6         | 30.0       | 42.2                   | 54                  | -11.8        |
| 15600.00                          | 30.4            | avg      | 0               | 1.5             | v             | 35.1              | 5.6         | 30.0       | 41.1                   | 54                  | -12.9        |
| 15600.00                          | 29.8            | avg      | 30              | 1.5             | h             | 35.1              | 5.6         | 30.0       | 40.5                   | 54                  | -13.5        |
| 10400.00                          | 38.7            | Peak     | 90              | 1.0             | v             | 35.1              | 5.6         | 30.0       | 49.4                   | 74                  | -24.6        |
| 10400.00                          | 37.9            | Peak     | 130             | 1.2             | h             | 35.1              | 5.6         | 30.0       | 48.6                   | 74                  | -25.4        |
| 15600.00                          | 36.2            | Peak     | 0               | 1.5             | v             | 35.1              | 5.6         | 30.0       | 46.9                   | 74                  | -27.1        |
| 15600.00                          | 35.5            | Peak     | 30              | 1.5             | h             | 35.1              | 5.6         | 30.0       | 46.2                   | 74                  | -27.8        |
| Low Band, High Channel, 1-50GHz   |                 |          |                 |                 |               |                   |             |            |                        |                     |              |
| 5250.00                           | 90.7            | FUND     | 180             | 1.8             | v             | 33.9              | 5.2         | 30.0       | 99.8                   | /                   | /            |
| 5250.00                           | 83.9            | FUND     | 0               | 1.8             | h             | 33.9              | 5.2         | 30.0       | 93.0                   | /                   | /            |
| 10500.00                          | 32.1            | avg      | 45              | 1.5             | v             | 35.1              | 5.6         | 30.0       | 42.8                   | 54                  | -11.2        |
| 10500.00                          | 31.3            | avg      | 180             | 1.4             | h             | 35.1              | 5.6         | 30.0       | 42.0                   | 54                  | -12.0        |
| 15750.00                          | 30.2            | avg      | 150             | 1.5             | v             | 35.1              | 5.6         | 30.0       | 40.9                   | 54                  | -13.1        |
| 15750.00                          | 29.5            | avg      | 90              | 1.5             | h             | 35.1              | 5.6         | 30.0       | 40.2                   | 54                  | -13.8        |
| 10500.00                          | 38.4            | Peak     | 45              | 1.5             | v             | 35.1              | 5.6         | 30.0       | 49.1                   | 74                  | -24.9        |
| 10500.00                          | 37.5            | Peak     | 180             | 1.4             | h             | 35.1              | 5.6         | 30.0       | 48.2                   | 74                  | -25.8        |
| 15750.00                          | 35.9            | Peak     | 150             | 1.5             | v             | 35.1              | 5.6         | 30.0       | 46.6                   | 74                  | -27.4        |
| 15750.00                          | 35.2            | Peak     | 90              | 1.5             | h             | 35.1              | 5.6         | 30.0       | 45.9                   | 74                  | -28.1        |

| INDICATED                         |                 |          | TABLE           | ANTENNA         |              | CORRECTION FACTOR |             |            | CORRECTED<br>AMPLITUDE | FCC 15<br>SUBPART C |              |
|-----------------------------------|-----------------|----------|-----------------|-----------------|--------------|-------------------|-------------|------------|------------------------|---------------------|--------------|
| Frequency<br>MHz                  | Ampl.<br>dBμV/m | Comments | Angle<br>Degree | Height<br>Meter | Polar<br>H/V | Antenna<br>dBμV/m | Cable<br>DB | Amp.<br>DB | Corr. Ampl.<br>dBμV/m  | Limit<br>dBμV/m     | Margin<br>dB |
| Mid Band, Low Channel, 1-50GHz    |                 |          |                 |                 |              |                   |             |            |                        |                     |              |
| 5250.00                           | 90.7            | FUND     | 180             | 1.8             | v            | 33.9              | 5.2         | 30.0       | 99.8                   | /                   | /            |
| 5250.00                           | 83.9            | FUND     | 0               | 1.8             | h            | 33.9              | 5.2         | 30.0       | 93.0                   | /                   | /            |
| 10500.00                          | 32.1            | avg      | 45              | 1.5             | v            | 35.1              | 5.6         | 30.0       | 42.8                   | 54                  | -11.2        |
| 10500.00                          | 31.3            | avg      | 180             | 1.4             | h            | 35.1              | 5.6         | 30.0       | 42.0                   | 54                  | -12.0        |
| 15750.00                          | 30.2            | avg      | 150             | 1.5             | v            | 35.1              | 5.6         | 30.0       | 40.9                   | 54                  | -13.1        |
| 15750.00                          | 29.5            | avg      | 90              | 1.5             | h            | 35.1              | 5.6         | 30.0       | 40.2                   | 54                  | -13.8        |
| 10500.00                          | 38.4            | Peak     | 45              | 1.5             | v            | 35.1              | 5.6         | 30.0       | 49.1                   | 74                  | -24.9        |
| 10500.00                          | 37.5            | Peak     | 180             | 1.4             | h            | 35.1              | 5.6         | 30.0       | 48.2                   | 74                  | -25.8        |
| 15750.00                          | 35.9            | Peak     | 150             | 1.5             | v            | 35.1              | 5.6         | 30.0       | 46.6                   | 74                  | -27.4        |
| 15750.00                          | 35.2            | Peak     | 90              | 1.5             | h            | 35.1              | 5.6         | 30.0       | 45.9                   | 74                  | -28.1        |
| Mid Band, Middle Channel, 1-50GHz |                 |          |                 |                 |              |                   |             |            |                        |                     |              |
| 5300.00                           | 91.8            | FUND     | 0               | 1.5             | v            | 33.9              | 5.2         | 30.0       | 100.9                  | /                   | /            |
| 5300.00                           | 85.2            | FUND     | 160             | 1.5             | h            | 33.9              | 5.2         | 30.0       | 94.3                   | /                   | /            |
| 10600.00                          | 32.7            | avg      | 90              | 1.0             | v            | 35.1              | 5.6         | 30.0       | 43.4                   | 54                  | -10.6        |
| 10600.00                          | 31.9            | avg      | 130             | 1.2             | h            | 35.1              | 5.6         | 30.0       | 42.6                   | 54                  | -11.4        |
| 15900.00                          | 31.1            | avg      | 0               | 1.5             | v            | 35.1              | 5.6         | 30.0       | 41.8                   | 54                  | -12.2        |
| 15900.00                          | 29.8            | avg      | 30              | 1.5             | h            | 35.1              | 5.6         | 30.0       | 40.5                   | 54                  | -13.5        |
| 10600.00                          | 38.8            | Peak     | 90              | 1.0             | v            | 35.1              | 5.6         | 30.0       | 49.5                   | 74                  | -24.5        |
| 15900.00                          | 36.2            | Peak     | 0               | 1.5             | v            | 35.1              | 5.6         | 30.0       | 46.9                   | 74                  | -27.1        |
| 10600.00                          | 35.6            | Peak     | 130             | 1.2             | h            | 35.1              | 5.6         | 30.0       | 46.3                   | 74                  | -27.7        |
| 15900.00                          | 35.6            | Peak     | 30              | 1.5             | h            | 35.1              | 5.6         | 30.0       | 46.3                   | 74                  | -27.7        |
| Mid Band, High Channel, 1-50GHz   |                 |          |                 |                 |              |                   |             |            |                        |                     |              |
| 5350.00                           | 93.4            | FUND     | 0               | 1.5             | v            | 33.9              | 5.2         | 30.0       | 102.5                  | /                   | /            |
| 5350.00                           | 78.2            | FUND     | 210             | 1.8             | h            | 33.9              | 5.2         | 30.0       | 87.3                   | /                   | /            |
| 10700.00                          | 33.4            | avg      | 45              | 1.5             | v            | 35.1              | 5.6         | 30.0       | 44.1                   | 54                  | -9.9         |
| 16050.00                          | 31.9            | avg      | 150             | 1.5             | v            | 35.1              | 5.6         | 30.0       | 42.6                   | 54                  | -11.4        |
| 10700.00                          | 30.7            | avg      | 180             | 1.4             | h            | 35.1              | 5.6         | 30.0       | 41.4                   | 54                  | -12.6        |
| 16050.00                          | 29.3            | avg      | 90              | 1.5             | h            | 35.1              | 5.6         | 30.0       | 40.0                   | 54                  | -14.0        |
| 10700.00                          | 39.2            | Peak     | 45              | 1.5             | v            | 35.1              | 5.6         | 30.0       | 49.9                   | 74                  | -24.1        |
| 16050.00                          | 36.8            | Peak     | 150             | 1.5             | v            | 35.1              | 5.6         | 30.0       | 47.5                   | 74                  | -26.5        |
| 10700.00                          | 34.3            | Peak     | 180             | 1.4             | h            | 35.1              | 5.6         | 30.0       | 45.0                   | 74                  | -29.0        |
| 16050.00                          | 33.5            | Peak     | 90              | 1.5             | h            | 35.1              | 5.6         | 30.0       | 44.2                   | 74                  | -29.8        |

| INDICATED                          |                 |          | TABLE           | ANTENNA         |              | CORRECTION FACTOR |             |            | CORRECTED<br>AMPLITUDE | FCC 15<br>SUBPART C |              |
|------------------------------------|-----------------|----------|-----------------|-----------------|--------------|-------------------|-------------|------------|------------------------|---------------------|--------------|
| Frequency<br>MHz                   | Ampl.<br>dBμV/m | Comments | Angle<br>Degree | Height<br>Meter | Polar<br>H/V | Antenna<br>dBμV/m | Cable<br>DB | Amp.<br>DB | Corr. Ampl.<br>dBμV/m  | Limit<br>dBμV/m     | Margin<br>dB |
| High Band, Low Channel, 1-50GHz    |                 |          |                 |                 |              |                   |             |            |                        |                     |              |
| 5725.00                            | 87.10           | FUND     | 30              | 1.8             | v            | 34.1              | 5.4         | 30.0       | 96.6                   | /                   | /            |
| 5725.00                            | 81.3            | FUND     | 290             | 1.5             | h            | 34.1              | 5.4         | 30.0       | 90.8                   | /                   | /            |
| 11450.00                           | 31.9            | avg      | 180             | 1.2             | v            | 35.1              | 5.6         | 30.0       | 42.6                   | 54                  | -11.4        |
| 11450.00                           | 30.8            | avg      | 45              | 1.5             | h            | 35.1              | 5.6         | 30.0       | 41.5                   | 54                  | -12.5        |
| 11450.00                           | 37.4            | Peak     | 180             | 1.2             | v            | 35.1              | 5.6         | 30.0       | 48.1                   | 74                  | -25.9        |
| 11450.00                           | 35.5            | Peak     | 45              | 1.5             | h            | 35.1              | 5.6         | 30.0       | 46.2                   | 74                  | -27.8        |
| 17175.00                           | 29.7            | avg      | 0               | 1.2             | v            | 35.1              | 5.6         | 30.0       | 40.4                   | 54                  | -13.6        |
| 17175.00                           | 28.8            | avg      | 30              | 1.2             | h            | 35.1              | 5.6         | 30.0       | 39.5                   | 54                  | -14.5        |
| 17175.00                           | 34.6            | Peak     | 0               | 1.2             | v            | 35.1              | 5.6         | 30.0       | 45.3                   | 74                  | -28.7        |
| 17175.00                           | 33.9            | Peak     | 30              | 1.2             | v            | 35.1              | 5.6         | 30.0       | 44.6                   | 74                  | -29.4        |
| High Band, Middle Channel, 1-50GHz |                 |          |                 |                 |              |                   |             |            |                        |                     |              |
| 5775.00                            | 85.2            | FUND     | 110             | 1.8             | v            | 34.1              | 5.4         | 30.0       | 94.7                   | /                   | /            |
| 5775.00                            | 81.2            | FUND     | 90              | 1.5             | h            | 34.1              | 5.4         | 30.0       | 90.7                   | /                   | /            |
| 11550.00                           | 31.7            | avg      | 90              | 1.0             | v            | 35.1              | 5.6         | 30.0       | 42.4                   | 54                  | -11.6        |
| 11550.00                           | 30.6            | avg      | 130             | 1.2             | h            | 35.1              | 5.6         | 30.0       | 41.3                   | 54                  | -12.7        |
| 11550.00                           | 37.2            | Peak     | 90              | 1.0             | v            | 35.1              | 5.6         | 30.0       | 47.9                   | 74                  | -26.1        |
| 11550.00                           | 35.4            | Peak     | 130             | 1.2             | h            | 35.1              | 5.6         | 30.0       | 46.1                   | 74                  | -27.9        |
| 17325.00                           | 29.5            | avg      | 0               | 1.5             | v            | 35.1              | 5.6         | 30.0       | 40.2                   | 54                  | -13.8        |
| 17325.00                           | 28.7            | avg      | 30              | 1.5             | h            | 35.1              | 5.6         | 30.0       | 39.4                   | 54                  | -14.6        |
| 17325.00                           | 34.2            | Peak     | 0               | 1.5             | v            | 35.1              | 5.6         | 30.0       | 44.9                   | 74                  | -29.1        |
| 17325.00                           | 33.7            | Peak     | 30              | 1.5             | h            | 35.1              | 5.6         | 30.0       | 44.4                   | 74                  | -29.6        |
| High Band, High Channel, 1-50GHz   |                 |          |                 |                 |              |                   |             |            |                        |                     |              |
| 5825.00                            | 87.3            | FUND     | 180             | 1.8             | v            | 34.1              | 5.4         | 30.0       | 96.8                   | /                   | /            |
| 5825.00                            | 81.6            | FUND     | 270             | 1.8             | h            | 34.1              | 5.4         | 30.0       | 91.1                   | /                   | /            |
| 11650.00                           | 32.3            | avg      | 45              | 1.5             | v            | 35.1              | 5.6         | 30.0       | 43.0                   | 54                  | -11.0        |
| 11650.00                           | 31.1            | avg      | 180             | 1.4             | h            | 35.1              | 5.6         | 30.0       | 41.8                   | 54                  | -12.2        |
| 11650.00                           | 37.6            | Peak     | 45              | 1.5             | v            | 35.1              | 5.6         | 30.0       | 48.3                   | 74                  | -25.7        |
| 11650.00                           | 35.7            | Peak     | 180             | 1.4             | h            | 35.1              | 5.6         | 30.0       | 46.4                   | 74                  | -27.6        |
| 17475.00                           | 30.1            | avg      | 150             | 1.5             | v            | 35.1              | 5.6         | 30.0       | 40.8                   | 54                  | -13.2        |
| 17475.00                           | 29.4            | avg      | 90              | 1.5             | h            | 35.1              | 5.6         | 30.0       | 40.1                   | 54                  | -13.9        |
| 17475.00                           | 34.6            | Peak     | 150             | 1.5             | v            | 35.1              | 5.6         | 30.0       | 45.3                   | 74                  | -28.7        |
| 17475.00                           | 33.9            | Peak     | 90              | 1.5             | h            | 35.1              | 5.6         | 30.0       | 44.6                   | 74                  | -29.4        |

| Unwanted Emission, 30 – 1000MHz |      |   |     |     |   |      |     |      |      |      |      |
|---------------------------------|------|---|-----|-----|---|------|-----|------|------|------|------|
| 480.01                          | 45.5 | / | 0   | 1.4 | v | 18.3 | 3.1 | 25.0 | 41.9 | 46   | -4.1 |
| 225.90                          | 50.2 | / | 220 | 1.5 | h | 11.8 | 2.2 | 25.0 | 39.2 | 46   | -6.8 |
| 208.41                          | 46.7 | / | 270 | 1.5 | v | 11.5 | 2.2 | 25.0 | 35.4 | 43.5 | -8.1 |
| 192.00                          | 44.3 | / | 270 | 1.2 | v | 13.7 | 2.1 | 25.0 | 35.1 | 43.5 | -8.4 |
| 576.10                          | 39.6 | / | 220 | 1.5 | h | 19.3 | 3.4 | 25.0 | 37.3 | 46   | -8.7 |
| 128.00                          | 45.9 | / | 45  | 1.2 | v | 11.9 | 1.6 | 25.0 | 34.4 | 43.5 | -9.1 |

### 12.6.6 Final test data, Compal Antenna (15.407)

| INDICATED                         |                 |          | TABLE           | ANTENNA         |               | CORRECTION FACTOR |             |            | CORRECTED<br>AMPLITUDE | FCC 15<br>SUBPART C |              |
|-----------------------------------|-----------------|----------|-----------------|-----------------|---------------|-------------------|-------------|------------|------------------------|---------------------|--------------|
| Frequency<br>MHz                  | Ampl.<br>dBμV/m | Comments | Angle<br>Degree | Height<br>Meter | Polar<br>H/ V | Antenna<br>dBμV/m | Cable<br>DB | Amp.<br>DB | Corr. Ampl.<br>dBμV/m  | Limit<br>dBμV/m     | Margin<br>dB |
| Low Band, Low Channel, 1-50GHz    |                 |          |                 |                 |               |                   |             |            |                        |                     |              |
| 5150.00                           | 87.20           | FUND     | 30              | 1.2             | v             | 33.9              | 5.2         | 30.0       | 96.3                   | /                   | /            |
| 5150.00                           | 84.1            | FUND     | 90              | 1.2             | h             | 33.9              | 5.2         | 30.0       | 93.2                   | /                   | /            |
| 10300.00                          | 32.3            | avg      | 180             | 1.2             | v             | 35.1              | 5.6         | 30.0       | 43.0                   | 54                  | -11.0        |
| 10300.00                          | 31.4            | avg      | 45              | 1.5             | h             | 35.1              | 5.6         | 30.0       | 42.1                   | 54                  | -11.9        |
| 15450.00                          | 30.1            | avg      | 0               | 1.2             | v             | 35.1              | 5.6         | 30.0       | 40.8                   | 54                  | -13.2        |
| 15450.00                          | 29.8            | avg      | 30              | 1.2             | h             | 35.1              | 5.6         | 30.0       | 40.5                   | 54                  | -13.5        |
| 10300.00                          | 37.7            | Peak     | 180             | 1.2             | v             | 35.1              | 5.6         | 30.0       | 48.4                   | 74                  | -25.6        |
| 10300.00                          | 35.9            | Peak     | 45              | 1.5             | h             | 35.1              | 5.6         | 30.0       | 46.6                   | 74                  | -27.4        |
| 15450.00                          | 34.5            | Peak     | 0               | 1.2             | v             | 35.1              | 5.6         | 30.0       | 45.2                   | 74                  | -28.8        |
| 15450.00                          | 34.1            | Peak     | 30              | 1.2             | v             | 35.1              | 5.6         | 30.0       | 44.8                   | 74                  | -29.2        |
| Low Band, Middle Channel, 1-50GHz |                 |          |                 |                 |               |                   |             |            |                        |                     |              |
| 5200.00                           | 87.1            | FUND     | 90              | 1.8             | v             | 33.9              | 5.2         | 30.0       | 96.2                   | /                   | /            |
| 5200.00                           | 84.6            | FUND     | 90              | 1.5             | h             | 33.9              | 5.2         | 30.0       | 93.7                   | /                   | /            |
| 10400.00                          | 32.2            | avg      | 90              | 1.0             | v             | 35.1              | 5.6         | 30.0       | 42.9                   | 54                  | -11.1        |
| 10400.00                          | 31.5            | avg      | 130             | 1.2             | h             | 35.1              | 5.6         | 30.0       | 42.2                   | 54                  | -11.8        |
| 15600.00                          | 30.2            | avg      | 0               | 1.5             | v             | 35.1              | 5.6         | 30.0       | 40.9                   | 54                  | -13.1        |
| 15600.00                          | 29.9            | avg      | 30              | 1.5             | h             | 35.1              | 5.6         | 30.0       | 40.6                   | 54                  | -13.4        |
| 10400.00                          | 37.7            | Peak     | 90              | 1.0             | v             | 35.1              | 5.6         | 30.0       | 48.4                   | 74                  | -25.6        |
| 10400.00                          | 36.1            | Peak     | 130             | 1.2             | h             | 35.1              | 5.6         | 30.0       | 46.8                   | 74                  | -27.2        |
| 15600.00                          | 34.4            | Peak     | 0               | 1.5             | v             | 35.1              | 5.6         | 30.0       | 45.1                   | 74                  | -28.9        |
| 15600.00                          | 34.2            | Peak     | 30              | 1.5             | h             | 35.1              | 5.6         | 30.0       | 44.9                   | 74                  | -29.1        |
| Low Band, High Channel, 1-50GHz   |                 |          |                 |                 |               |                   |             |            |                        |                     |              |
| 5250.00                           | 86.4            | FUND     | 0               | 1.5             | v             | 33.9              | 5.2         | 30.0       | 95.5                   | /                   | /            |
| 5250.00                           | 83.9            | FUND     | 0               | 1.5             | h             | 33.9              | 5.2         | 30.0       | 93.0                   | /                   | /            |
| 10500.00                          | 32.0            | avg      | 45              | 1.5             | v             | 35.1              | 5.6         | 30.0       | 42.7                   | 54                  | -11.3        |
| 10500.00                          | 31.1            | avg      | 180             | 1.4             | h             | 35.1              | 5.6         | 30.0       | 41.8                   | 54                  | -12.2        |
| 15750.00                          | 30.1            | avg      | 150             | 1.5             | v             | 35.1              | 5.6         | 30.0       | 40.8                   | 54                  | -13.2        |
| 15750.00                          | 29.6            | avg      | 90              | 1.5             | h             | 35.1              | 5.6         | 30.0       | 40.3                   | 54                  | -13.7        |
| 10500.00                          | 37.5            | Peak     | 45              | 1.5             | v             | 35.1              | 5.6         | 30.0       | 48.2                   | 74                  | -25.8        |
| 10500.00                          | 35.9            | Peak     | 180             | 1.4             | h             | 35.1              | 5.6         | 30.0       | 46.6                   | 74                  | -27.4        |
| 15750.00                          | 34.3            | Peak     | 150             | 1.5             | v             | 35.1              | 5.6         | 30.0       | 45.0                   | 74                  | -29.0        |
| 15750.00                          | 33.5            | Peak     | 90              | 1.5             | h             | 35.1              | 5.6         | 30.0       | 44.2                   | 74                  | -29.8        |

| INDICATED                         |                 |          | TABLE           | ANTENNA         |              | CORRECTION FACTOR |             |            | CORRECTED<br>AMPLITUDE | FCC 15<br>SUBPART C |              |
|-----------------------------------|-----------------|----------|-----------------|-----------------|--------------|-------------------|-------------|------------|------------------------|---------------------|--------------|
| Frequency<br>MHz                  | Ampl.<br>dBμV/m | Comments | Angle<br>Degree | Height<br>Meter | Polar<br>H/V | Antenna<br>dBμV/m | Cable<br>DB | Amp.<br>DB | Corr. Ampl.<br>dBμV/m  | Limit<br>dBμV/m     | Margin<br>dB |
| Mid Band, Low Channel, 1-50GHz    |                 |          |                 |                 |              |                   |             |            |                        |                     |              |
| 5250.00                           | 86.4            | FUND     | 0               | 1.5             | v            | 33.9              | 5.2         | 30.0       | 95.5                   | /                   | /            |
| 5250.00                           | 83.9            | FUND     | 0               | 1.5             | h            | 33.9              | 5.2         | 30.0       | 93.0                   | /                   | /            |
| 10300.00                          | 32.0            | avg      | 45              | 1.5             | v            | 35.1              | 5.6         | 30.0       | 42.7                   | 54                  | -11.3        |
| 10300.00                          | 31.1            | avg      | 180             | 1.4             | h            | 35.1              | 5.6         | 30.0       | 41.8                   | 54                  | -12.2        |
| 15450.00                          | 30.1            | avg      | 150             | 1.5             | v            | 35.1              | 5.6         | 30.0       | 40.8                   | 54                  | -13.2        |
| 15450.00                          | 29.6            | avg      | 90              | 1.5             | h            | 35.1              | 5.6         | 30.0       | 40.3                   | 54                  | -13.7        |
| 10300.00                          | 37.5            | Peak     | 45              | 1.5             | v            | 35.1              | 5.6         | 30.0       | 48.2                   | 74                  | -25.8        |
| 10300.00                          | 35.9            | Peak     | 180             | 1.4             | h            | 35.1              | 5.6         | 30.0       | 46.6                   | 74                  | -27.4        |
| 15450.00                          | 34.3            | Peak     | 150             | 1.5             | v            | 35.1              | 5.6         | 30.0       | 45.0                   | 74                  | -29.0        |
| 15450.00                          | 33.5            | Peak     | 90              | 1.5             | h            | 35.1              | 5.6         | 30.0       | 44.2                   | 74                  | -29.8        |
| Mid Band, Middle Channel, 1-50GHz |                 |          |                 |                 |              |                   |             |            |                        |                     |              |
| 5300.00                           | 86.2            | FUND     | 90              | 1.2             | v            | 33.9              | 5.2         | 30.0       | 95.3                   | /                   | /            |
| 5300.00                           | 85.9            | FUND     | 0               | 1.2             | h            | 33.9              | 5.2         | 30.0       | 95.0                   | /                   | /            |
| 10600.00                          | 32.0            | avg      | 90              | 1.0             | v            | 35.1              | 5.6         | 30.0       | 42.7                   | 54                  | -11.3        |
| 10600.00                          | 31.3            | avg      | 130             | 1.2             | h            | 35.1              | 5.6         | 30.0       | 42.0                   | 54                  | -12.0        |
| 15900.00                          | 30.1            | avg      | 0               | 1.5             | v            | 35.1              | 5.6         | 30.0       | 40.8                   | 54                  | -13.2        |
| 15900.00                          | 29.8            | avg      | 30              | 1.5             | h            | 35.1              | 5.6         | 30.0       | 40.5                   | 54                  | -13.5        |
| 10600.00                          | 37.4            | Peak     | 90              | 1.0             | v            | 35.1              | 5.6         | 30.0       | 48.1                   | 74                  | -25.9        |
| 10600.00                          | 36.2            | Peak     | 130             | 1.2             | h            | 35.1              | 5.6         | 30.0       | 46.9                   | 74                  | -27.1        |
| 15900.00                          | 34.2            | Peak     | 0               | 1.5             | v            | 35.1              | 5.6         | 30.0       | 44.9                   | 74                  | -29.1        |
| 15900.00                          | 33.9            | Peak     | 30              | 1.5             | h            | 35.1              | 5.6         | 30.0       | 44.6                   | 74                  | -29.4        |
| Mid Band, High Channel, 1-50GHz   |                 |          |                 |                 |              |                   |             |            |                        |                     |              |
| 5350.00                           | 85.8            | FUND     | 15              | 1.2             | v            | 33.9              | 5.2         | 30.0       | 94.9                   | /                   | /            |
| 5350.00                           | 84.6            | FUND     | 90              | 1.2             | h            | 33.9              | 5.2         | 30.0       | 93.7                   | /                   | /            |
| 10700.00                          | 31.9            | avg      | 45              | 1.5             | v            | 35.1              | 5.6         | 30.0       | 42.6                   | 54                  | -11.4        |
| 10700.00                          | 30.7            | avg      | 180             | 1.4             | h            | 35.1              | 5.6         | 30.0       | 41.4                   | 54                  | -12.6        |
| 16050.00                          | 30.0            | avg      | 150             | 1.5             | v            | 35.1              | 5.6         | 30.0       | 40.7                   | 54                  | -13.3        |
| 16050.00                          | 29.6            | avg      | 90              | 1.5             | h            | 35.1              | 5.6         | 30.0       | 40.3                   | 54                  | -13.7        |
| 10700.00                          | 37.2            | Peak     | 45              | 1.5             | v            | 35.1              | 5.6         | 30.0       | 47.9                   | 74                  | -26.1        |
| 10700.00                          | 35.8            | Peak     | 180             | 1.4             | h            | 35.1              | 5.6         | 30.0       | 46.5                   | 74                  | -27.5        |
| 16050.00                          | 34.1            | Peak     | 150             | 1.5             | v            | 35.1              | 5.6         | 30.0       | 44.8                   | 74                  | -29.2        |
| 16050.00                          | 33.6            | Peak     | 90              | 1.5             | h            | 35.1              | 5.6         | 30.0       | 44.3                   | 74                  | -29.7        |



| INDICATED                          |                 |          | TABLE           | ANTENNA         |              | CORRECTION FACTOR |             |            | CORRECTED<br>AMPLITUDE | FCC 15<br>SUBPART C |              |
|------------------------------------|-----------------|----------|-----------------|-----------------|--------------|-------------------|-------------|------------|------------------------|---------------------|--------------|
| Frequency<br>MHz                   | Ampl.<br>dBμV/m | Comments | Angle<br>Degree | Height<br>Meter | Polar<br>H/V | Antenna<br>dBμV/m | Cable<br>DB | Amp.<br>DB | Corr. Ampl.<br>dBμV/m  | Limit<br>dBμV/m     | Margin<br>dB |
| High Band, Low Channel, 1-50GHz    |                 |          |                 |                 |              |                   |             |            |                        |                     |              |
| 5725.00                            | 83.10           | FUND     | 110             | 1.2             | v            | 34.1              | 5.4         | 30.0       | 92.6                   | /                   | /            |
| 5725.00                            | 82.7            | FUND     | 15              | 1.2             | h            | 34.1              | 5.4         | 30.0       | 92.2                   | /                   | /            |
| 11450.00                           | 31.5            | avg      | 180             | 1.2             | v            | 35.1              | 5.6         | 30.0       | 42.2                   | 54                  | -11.8        |
| 11450.00                           | 30.7            | avg      | 45              | 1.5             | h            | 35.1              | 5.6         | 30.0       | 41.4                   | 54                  | -12.6        |
| 17175.00                           | 29.8            | avg      | 0               | 1.2             | v            | 35.1              | 5.6         | 30.0       | 40.5                   | 54                  | -13.5        |
| 17175.00                           | 28.7            | avg      | 30              | 1.2             | h            | 35.1              | 5.6         | 30.0       | 39.4                   | 54                  | -14.6        |
| 11450.00                           | 37.2            | Peak     | 180             | 1.2             | v            | 35.1              | 5.6         | 30.0       | 47.9                   | 74                  | -26.1        |
| 11450.00                           | 35.5            | Peak     | 45              | 1.5             | h            | 35.1              | 5.6         | 30.0       | 46.2                   | 74                  | -27.8        |
| 17175.00                           | 34.4            | Peak     | 0               | 1.2             | v            | 35.1              | 5.6         | 30.0       | 45.1                   | 74                  | -28.9        |
| 17175.00                           | 33.8            | Peak     | 30              | 1.2             | v            | 35.1              | 5.6         | 30.0       | 44.5                   | 74                  | -29.5        |
| High Band, Middle Channel, 1-50GHz |                 |          |                 |                 |              |                   |             |            |                        |                     |              |
| 5775.00                            | 85.2            | FUND     | 45              | 1.2             | v            | 34.1              | 5.4         | 30.0       | 94.7                   | /                   | /            |
| 5775.00                            | 81.6            | FUND     | 90              | 1.2             | h            | 34.1              | 5.4         | 30.0       | 91.1                   | /                   | /            |
| 11550.00                           | 31.7            | avg      | 90              | 1.0             | v            | 35.1              | 5.6         | 30.0       | 42.4                   | 54                  | -11.6        |
| 11550.00                           | 30.7            | avg      | 130             | 1.2             | h            | 35.1              | 5.6         | 30.0       | 41.4                   | 54                  | -12.6        |
| 17325.00                           | 29.5            | avg      | 0               | 1.5             | v            | 35.1              | 5.6         | 30.0       | 40.2                   | 54                  | -13.8        |
| 17325.00                           | 28.9            | avg      | 30              | 1.5             | h            | 35.1              | 5.6         | 30.0       | 39.6                   | 54                  | -14.4        |
| 11550.00                           | 37.2            | Peak     | 90              | 1.0             | v            | 35.1              | 5.6         | 30.0       | 47.9                   | 74                  | -26.1        |
| 11550.00                           | 35.6            | Peak     | 130             | 1.2             | h            | 35.1              | 5.6         | 30.0       | 46.3                   | 74                  | -27.7        |
| 17325.00                           | 34.2            | Peak     | 0               | 1.5             | v            | 35.1              | 5.6         | 30.0       | 44.9                   | 74                  | -29.1        |
| 17325.00                           | 33.8            | Peak     | 30              | 1.5             | h            | 35.1              | 5.6         | 30.0       | 44.5                   | 74                  | -29.5        |
| High Band, High Channel, 1-50GHz   |                 |          |                 |                 |              |                   |             |            |                        |                     |              |
| 5825.00                            | 84.9            | FUND     | 45              | 1.2             | v            | 34.1              | 5.4         | 30.0       | 94.4                   | /                   | /            |
| 5825.00                            | 81.6            | FUND     | 0               | 1.5             | h            | 34.1              | 5.4         | 30.0       | 91.1                   | /                   | /            |
| 11650.00                           | 31.5            | avg      | 45              | 1.5             | v            | 35.1              | 5.6         | 30.0       | 42.2                   | 54                  | -11.8        |
| 11650.00                           | 30.7            | avg      | 180             | 1.4             | h            | 35.1              | 5.6         | 30.0       | 41.4                   | 54                  | -12.6        |
| 17475.00                           | 29.4            | avg      | 150             | 1.5             | v            | 35.1              | 5.6         | 30.0       | 40.1                   | 54                  | -13.9        |
| 17475.00                           | 28.9            | avg      | 90              | 1.5             | h            | 35.1              | 5.6         | 30.0       | 39.6                   | 54                  | -14.4        |
| 11650.00                           | 37.1            | Peak     | 45              | 1.5             | v            | 35.1              | 5.6         | 30.0       | 47.8                   | 74                  | -26.2        |
| 11650.00                           | 35.6            | Peak     | 180             | 1.4             | h            | 35.1              | 5.6         | 30.0       | 46.3                   | 74                  | -27.7        |
| 17475.00                           | 34.1            | Peak     | 150             | 1.5             | v            | 35.1              | 5.6         | 30.0       | 44.8                   | 74                  | -29.2        |
| 17475.00                           | 33.8            | Peak     | 150             | 1.5             | v            | 35.1              | 5.6         | 30.0       | 44.5                   | 74                  | -29.5        |

| Unwanted Emission, 30 – 1000MHz |      |   |     |     |   |      |     |      |      |      |      |
|---------------------------------|------|---|-----|-----|---|------|-----|------|------|------|------|
| 480.01                          | 45.4 | / | 0   | 1.4 | v | 18.3 | 3.1 | 25.0 | 41.8 | 46   | -4.2 |
| 225.90                          | 50.2 | / | 220 | 1.5 | h | 11.8 | 2.2 | 25.0 | 39.2 | 46   | -6.8 |
| 208.41                          | 46.6 | / | 270 | 1.5 | v | 11.5 | 2.2 | 25.0 | 35.3 | 43.5 | -8.2 |
| 192.00                          | 43.9 | / | 270 | 1.2 | v | 13.7 | 2.1 | 25.0 | 34.7 | 43.5 | -8.8 |
| 576.10                          | 39.4 | / | 220 | 1.5 | h | 19.3 | 3.4 | 25.0 | 37.1 | 46   | -8.9 |
| 128.00                          | 45.7 | / | 45  | 1.2 | v | 11.9 | 1.6 | 25.0 | 34.2 | 43.5 | -9.3 |

## 13 - CONDUCTED EMISSIONS

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### 13.1 Measurement Uncertainty

All measurements involve certain levels of uncertainties. The factors contributing to uncertainties are spectrum analyzer, cable loss, and LISN.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement at BACL is  $\pm 2.4$  dB.

### 13.2 EUT Setup

The measurement was performed at the **Open Area Test Site**, using the same setup per ANSI C63.4-1992 measurement procedure. The specification used was FCC 15 Subpart B limits.

The spacing between the peripherals was 10 centimeters.

External I/O cables were draped along the edge of the test table and bundle when necessary.

The host PC system was connected with 110Vac/60Hz power source.

### 13.3 Spectrum Analyzer Setup

The spectrum analyzer was set with the following configurations during the conduction test:

|                                   |         |
|-----------------------------------|---------|
| Start Frequency .....             | 150 kHz |
| Stop Frequency .....              | 30 MHz  |
| Sweep Speed.....                  | Auto    |
| IF Bandwidth.....                 | 10 kHz  |
| Video Bandwidth .....             | 10 kHz  |
| Quasi-Peak Adapter Bandwidth..... | 9 kHz   |
| Quasi-Peak Adapter Mode.....      | Normal  |

### 13.4 Test Procedure

During the conducted emission test, the power cord of the host system was connected to the auxiliary outlet of the first LISN.

Maximizing procedure was performed on the six (6) highest emissions of each modes tested to ensure EUT is compliant with all installation combination.

All data was recorded in the peak detection mode. Quasi-peak readings were only performed when an emission was found to be marginal (within -4 dB $\mu$ V of specification limits). Quasi-peak readings are distinguished with a "Qp".

### 13.5 Summary of Test Results

According to the data in section 11.6, the EUT complies with the FCC Conducted margin for a Class B device, with the *worst* margin reading of:

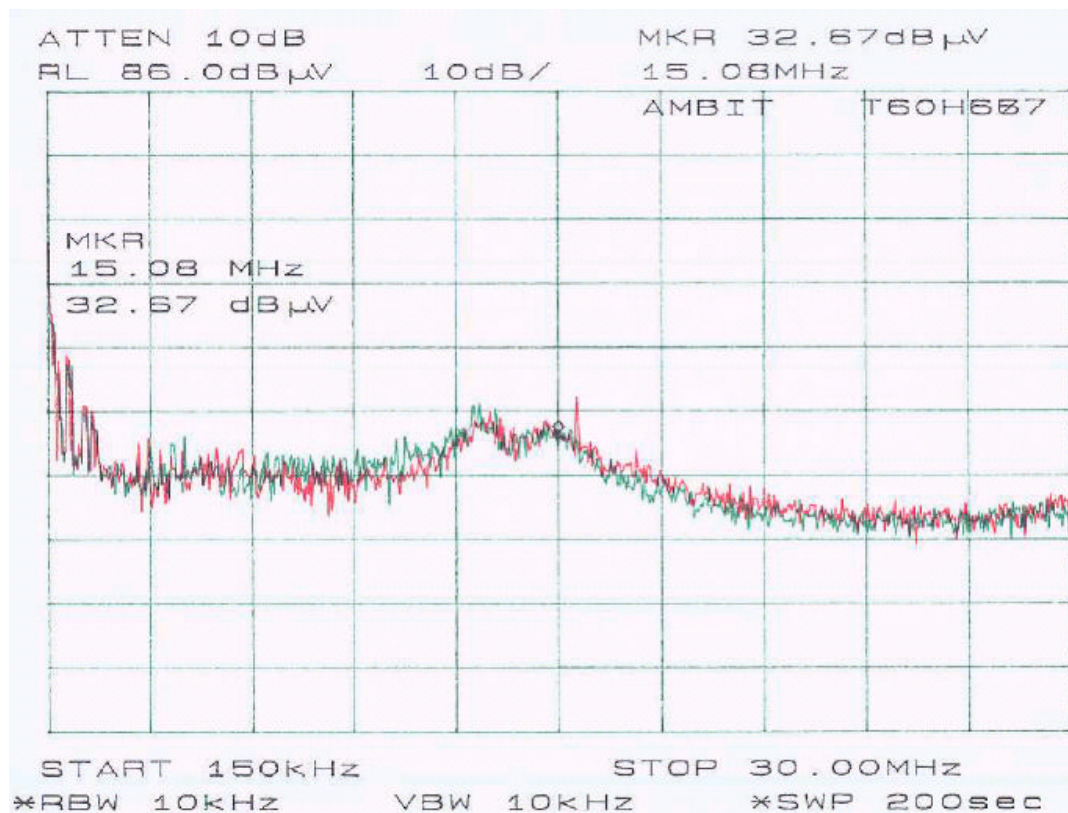
-3.9 dB $\mu$ V at 0.150 MHz in the Neutral mode

### 13.6 Conducted Emissions Test Data

| LINE CONDUCTED EMISSIONS |                         |                         |                       | FCC PART 15 CLASS B |              |
|--------------------------|-------------------------|-------------------------|-----------------------|---------------------|--------------|
| Frequency<br>MHz         | Amplitude<br>dB $\mu$ V | Detector<br>Qp/Ave/Peak | Phase<br>Line/Neutral | Limit<br>dB $\mu$ V | Margin<br>dB |
| 0.150                    | 62.1                    | QP                      | Neutral               | 66                  | -3.9         |
| 0.150                    | 51.8                    | AVE                     | Neutral               | 56                  | -4.2         |
| 0.210                    | 48.7                    | AVE                     | Line                  | 53                  | -4.3         |
| 0.210                    | 56.2                    | QP                      | Line                  | 63                  | -6.8         |
| 0.760                    | 44.2                    | QP                      | Neutral               | 56                  | -11.8        |
| 0.770                    | 41.9                    | QP                      | Line                  | 56                  | -14.1        |
| 15.620                   | 38.4                    | QP                      | Neutral               | 60                  | -21.6        |
| 12.590                   | 37.2                    | QP                      | Line                  | 60                  | -22.8        |

### 13.7 Plot of Conducted Emissions Test Data

Plot(s) of Conducted Emissions Test Data is presented hereinafter as reference.



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**14 - Discontinue Transmitting With Absence Of Data Or Operational Failure**

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According to § 15.407 (c), the device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude the transmission of control or signaling information or the user of repetitive codes used by certain digital technologies to complete frame or burst intervals. Applicants shall include in their application a description of how this requirement is met.

Please refer to respective technical description.

## **15 - Frequency Stability**

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### **16.1 Standard Applicable**

According to §15.407 (g), manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation .

### **16.2 Measurement Result**

Please refer to following pages for plots of spurious emission.

