

FCC PART 15 SUBPART C
EMI MEASUREMENT AND 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: MCLT60H42400

November 13, 2002

| | |
|--|---|
| This Report Concerns: <input checked="" type="checkbox"/> Class II Permissive Change | Equipment Type: MiniPCI IIIB Wireless LAN Card |
| Test Engineer: Benjamin Jing | |
| Report No.: R0210292 | |
| Test Date: October 31, 2002 | |
| Reviewed By: Jeff Lee | |
| Prepared By: Bay Area Compliance Laboratory Corporation 230 Commercial Street Sunnyvale, CA 94085 Tel: (408) 732-9162 Fax: (408) 732 9164 | |

Note: This test report is specially limited to the above client company and the 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.

TABLE OF CONTENTS

1 - GENERAL INFORMATION..... 4

1.1 PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)4

1.2 OBJECTIVE4

1.3 RELATED SUBMITTAL(S)/GRANT(S)4

1.4 TEST METHODOLOGY.....4

1.5 TEST FACILITY5

1.6 TEST EQUIPMENT LIST AND DETAILS.....5

1.7 HOST SYSTEM CONFIGURATION LIST AND DETAILS.....6

1.8 LOCAL SUPPORT EQUIPMENT LIST AND DETAILS.....6

1.9 EXTERNAL CABLE LIST AND DETAILS.....6

2 - SYSTEM TEST CONFIGURATION..... 7

2.1 JUSTIFICATION.....7

2.2 EUT EXERCISE SOFTWARE.....7

2.3 SPECIAL ACCESSORIES.....7

2.4 SCHEMATICS / BLOCK DIAGRAM.....7

2.5 EQUIPMENT MODIFICATIONS.....7

2.6 CONFIGURATION OF TEST SYSTEM.....8

2.7 TEST SETUP BLOCK DIAGRAM.....8

3 - SUMMARY OF TEST RESULTS 9

4 - PEAK OUTPUT POWER MEASUREMENT 10

4.1 STANDARD APPLICABLE.....10

4.2 MEASUREMENT PROCEDURE.....10

4.3 MEASUREMENT RESULT10

5 - SPURIOUS EMISSION 11

5.1 STANDARD APPLICABLE.....11

5.2 MEASUREMENT PROCEDURE.....11

5.3 MEASUREMENT DATA.....11

6 - PEAK POWER SPECTRAL DENSITY..... 15

6.1 STANDARD APPLICABLE.....15

6.2 MEASUREMENT PROCEDURE.....15

6.3 TEST RESULTS.....15

7 - 6 DB BANDWIDTH..... 18

7.1 STANDARD APPLICABLE.....18

7.2 MEASUREMENT PROCEDURE.....18

7.3 MEASUREMENT DATA.....18

8 -100 KHZ BANDWIDTH OF BAND EDGES MEASUREMENT..... 21

8.1 STANDARD APPLICABLE.....21

8.2 MEASUREMENT PROCEDURE.....21

8.3 TEST RESULTS.....21

9 - ANTENNA REQUIREMENT..... 24

9.1 STANDARD APPLICABLE.....24

9.2 ANTENNA CONNECTED CONSTRUCTION24

10 - SPURIOUS RADIATED EMISSIONS 25

10.1 MEASUREMENT UNCERTAINTY.....25

10.2 EUT SETUP.....25

10.3 SPECTRUM ANALYZER SETUP.....25

10.4 TEST PROCEDURE25

10.5 CORRECTED AMPLITUDE & MARGIN CALCULATION.....26

10.6 SUMMARY OF TEST RESULTS.....26

| | |
|---|-----------|
| 11 - CONDUCTED EMISSIONS | 33 |
| 11.1 MEASUREMENT UNCERTAINTY..... | 33 |
| 11.2 EUT SETUP..... | 33 |
| 11.3 SPECTRUM ANALYZER SETUP..... | 33 |
| 11.4 TEST PROCEDURE | 33 |
| 11.5 SUMMARY OF TEST RESULTS..... | 34 |
| 11.6 CONDUCTED EMISSIONS TEST DATA..... | 34 |
| 11.7 PLOT OF CONDUCTED EMISSIONS TEST DATA..... | 34 |

1 - GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

The *Ambit Microsystems Corporation's* Model: *T60H424* or the "EUT" as referred to in this report is a MINIPCI IIIB Wireless LAN Card.

The EUT is complied with IEEE 802.11b 11 Mbps Standard. The WLAN application is implemented via a RF module. This RF module is developed for Wireless LAN application complied with IEEE 802.11b 11Mbps standard in ISM band. It can be used to provide a variety of low-cost wireless network interfaces to build your wireless connection via simply SMT procedure to speed the time to market. Three Intersil's chips are implemented in the RF module including ISL3985, HFA3783.

The EUT has the following functions:

- Compatible with IEEE 802.11b high rate standard to provide wireless Ethernet speeds of 11Mbps data rate
- Dynamic data rate switching with 11, 5.5, 2, and 1 Mbps
- Allows auto fallback data rate for optimized reliability, throughput and transmission range
- Supports wireless data encryption with 64/128-bit WEP standard for security
- Dual diversity antenna connectors supported for the multi-path environment
- Drivers supports Windows 95, 98, 98SE, NT, ME, 2000, Win XP.

** The test data in this test report was good for the test sample only. It may have deviation for other test samples.*

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, B and C of the Federal Communication Commissions rules.

The objective of the manufacturer is to demonstrate compliance with FCC rules for Antenna Requirement, Conducted and Spurious Radiated Emission as a Class II Permissive Change.

1.3 Related Submittal(s)/Grant(s)

This Class II permissive change device was originally granted on 4/15/2002. Please refer to BAEL report R0203066. The manufacturer did not make any modification on the EUT. Per marketing purpose, the device was installed in Compaq laptop and tested with the new antenna (Model: HTL008 P52, please refer to Appendix A for specification).

1.4 Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2000, 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 Corporation. 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 Bay Area Compliance Laboratory Corporation 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 Bay Area Compliance Laboratory Corporation 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 C63.4-2000.

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, Bay Area Compliance Laboratory Corporation is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (NVLAP). The scope of the accreditation covers the FCC Method - 47 CFR Part 15 - Digital Devices, IEC/CISPR 22: 1998, and AS/NZS 3548: Electromagnetic Interference - Limits and Methods of Measurement of Information Technology Equipment test methods under NVLAP Lab Code 200167-0.

1.6 Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Cal. Due Date |
|-------------------|----------------------|------------------|---------------|---------------|
| HP | Spectrum Analyzer | 8568B | 2610A02165 | 12/6/02 |
| HP | Spectrum Analyzer | 8593B | 2919A00242 | 12/20/02 |
| HP | Amplifier | 8349B | 2644A02662 | 12/20/02 |
| HP | Quasi-Peak Adapter | 85650A | 917059 | 12/6/02 |
| HP | Amplifier | 8447E | 1937A01046 | 12/6/02 |
| A.H. System | Horn Antenna | SAS0200/571 | 261 | 12/27/02 |
| 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 | 12/28/02 |
| Com-Power | LISN | LI-200 | 12208 | 12/20/02 |
| Com-Power | LISN | LI-200 | 12005 | 12/20/02 |
| BACL | Data Entry Software | DES1 | 0001 | 12/20/02 |

*** Statement of Traceability: Bay Area Compliance Laboratory Corp.** certifies that all calibration has been performed using suitable standards traceable to the NATIONAL INSTITUTE of STANDARDS and TECHNOLOGY (NIST).

1.7 Host System Configuration List and Details

| Manufacturer | Description | Model | Serial Number | FCC ID |
|--------------|-------------|-----------|---------------|--------|
| Compaq | AC Adapter | PPP012L | None | DoC |
| Compaq | Laptop | PC8672EAA | J291800P1058 | DoC |

1.8 Local Support Equipment List and Details

| Manufacturer | Description | Model | Serial Number | FCC ID |
|--------------|-------------|-----------|---------------|--------------|
| Compaq | Laptop | PC8672EAA | J291800P1058 | DOC |
| Citizen | Printer | LSP-10 | 5047999-82 | DLK66TLSP-10 |

1.9 External Cable List and Details

| Manufacturer | Length (M) | From | To |
|------------------------|------------|----------------------|---------|
| Shielded Printer Cable | 2.0 | Parallel Port/Laptop | Printer |

2 - SYSTEM TEST CONFIGURATION

2.1 Justification

The host system was configured for testing in a typical fashion (as a 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 exercising program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use. The test software, Prism Test Utility (Version 3.0.22), provided by the customer, is started the Windows 98 terminal program under the Windows 98 operating system.

Once loaded, the program sequentially exercises each system component, and the Prism Test Utility icon appears in the PC screen. By the icon, select the channel to be tested, set the mode as "Host BSS". After the setting, click the "Continuous TX" button for transmitting the RF power.

Repeat above steps for other channels to be tested.

2.3 Special Accessories

As shown in section 2.7, all interface cables used for compliance testing are shielded as normally supplied by INMAC and their respective support equipment manufacturers. The host pc and other peripherals featured shielded metal connectors.

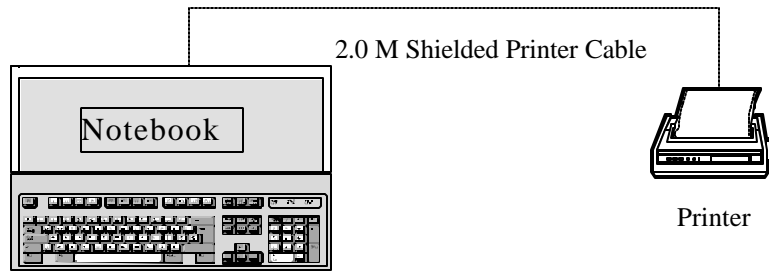
2.4 Schematics / Block Diagram

Please refer to Exhibit D.

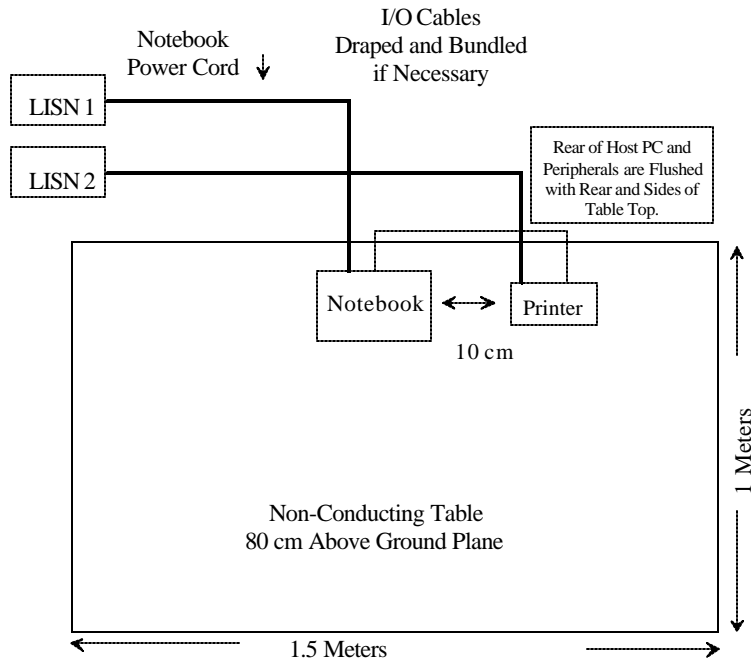
2.5 Equipment Modifications

No modifications were made by BACL Corporation 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 |
|------------------|---|-----------|
| § 15.205 | Restricted Bands | Compliant |
| § 15.203 | Antenna Requirement | Compliant |
| § 15.207 (a) | Conducted Emission | Compliant |
| § 15.209 (a) | Radiated Emission | Compliant |
| § 15.209 (f) | Spurious Emission | Compliant |
| § 15.247 (a) (2) | 6 dB Bandwidth | Compliant |
| § 15.247 (b) (2) | Peak Output Power | Compliant |
| § 15.247 (c) | 100 kHz Bandwidth of Frequency Band Edges | Compliant |
| § 15.247 (d) | Peak Power Spectral Density | Compliant |

Attestation: The testing was performed or supervised by BACL Corp. that the test measurements were made in accordance with the referred department standard(s); and that the radio equipment identified in this application has been subject to all the applicable test conditions specified in the department standards and all of the requirement standards have been met.

4 - PEAK OUTPUT POWER MEASUREMENT

4.1 Standard Applicable

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

4.2 Measurement Procedure

1. Place the EUT on the turntable and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter.

4.3 Measurement Result

| Frequency (MHz) | Output Power in dBm | Output Power in W | Standard | Result |
|-----------------|---------------------|-------------------|----------|-----------|
| 2412.00 | 13.74 | 0.024 | ≤ 1W | Compliant |
| 2442.00 | 13.57 | 0.023 | ≤ 1W | Compliant |
| 2472.00 | 12.32 | 0.017 | ≤ 1W | Compliant |

4.4 Test Equipment

| Manufacturer | Model No. | Serial No. | Calibration Due Date |
|--------------|-----------|------------|----------------------|
| Agilent | E4419b | GB40202891 | 4/8/03 |
| Agilent | E4412a | US38486529 | 4/8/03 |

5 - SPURIOUS EMISSION

5.1 Standard Applicable

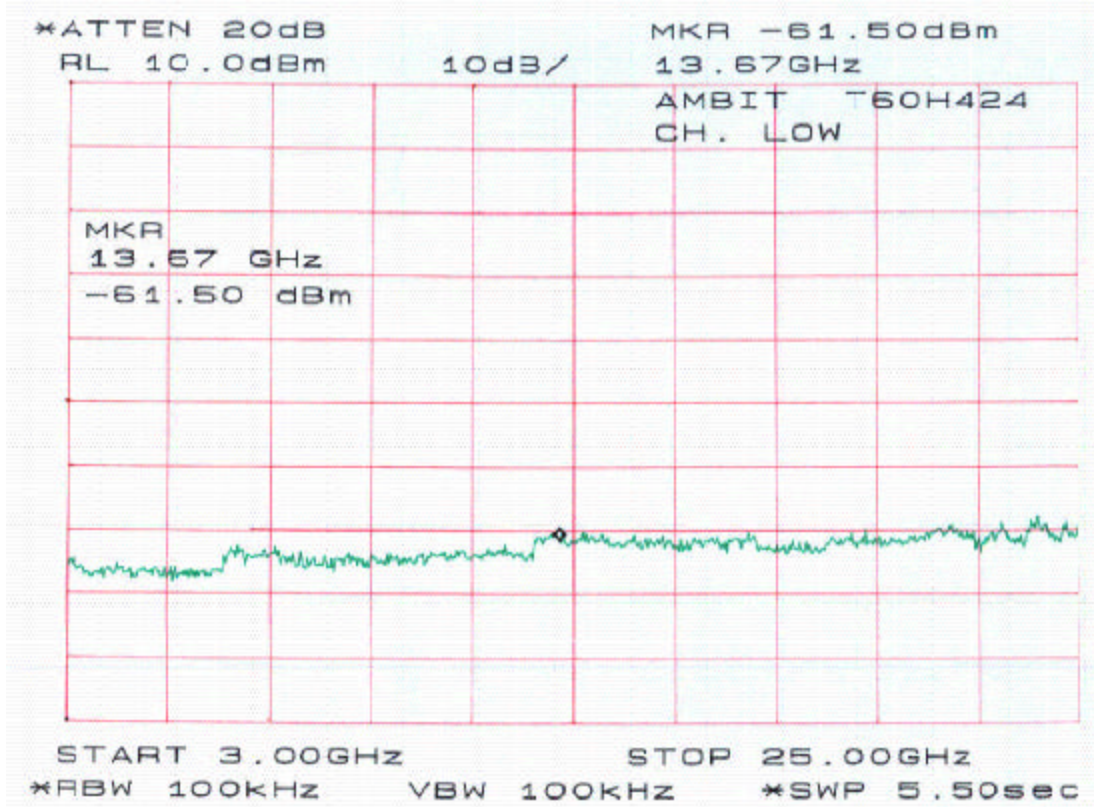
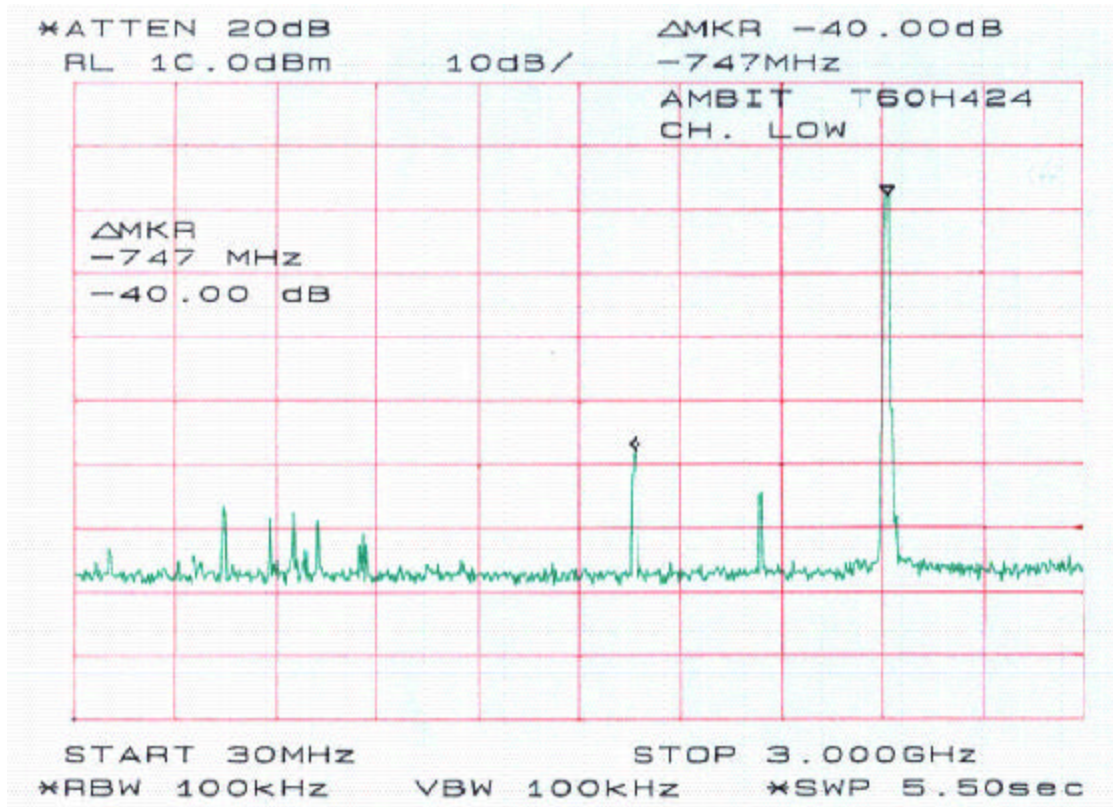
According to §15.209 (f) and §15.33(a), in some cases the emissions from an intentional radiator must be measured to beyond the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator because of the incorporation of a digital device. If measurements above 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.

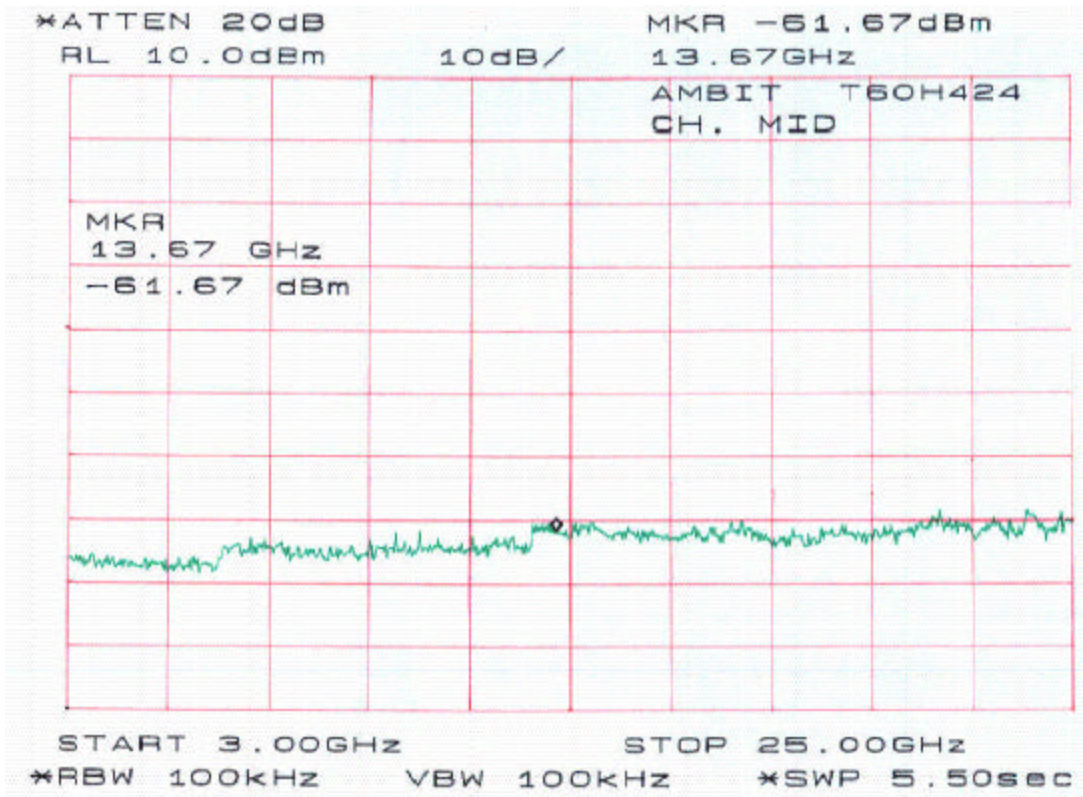
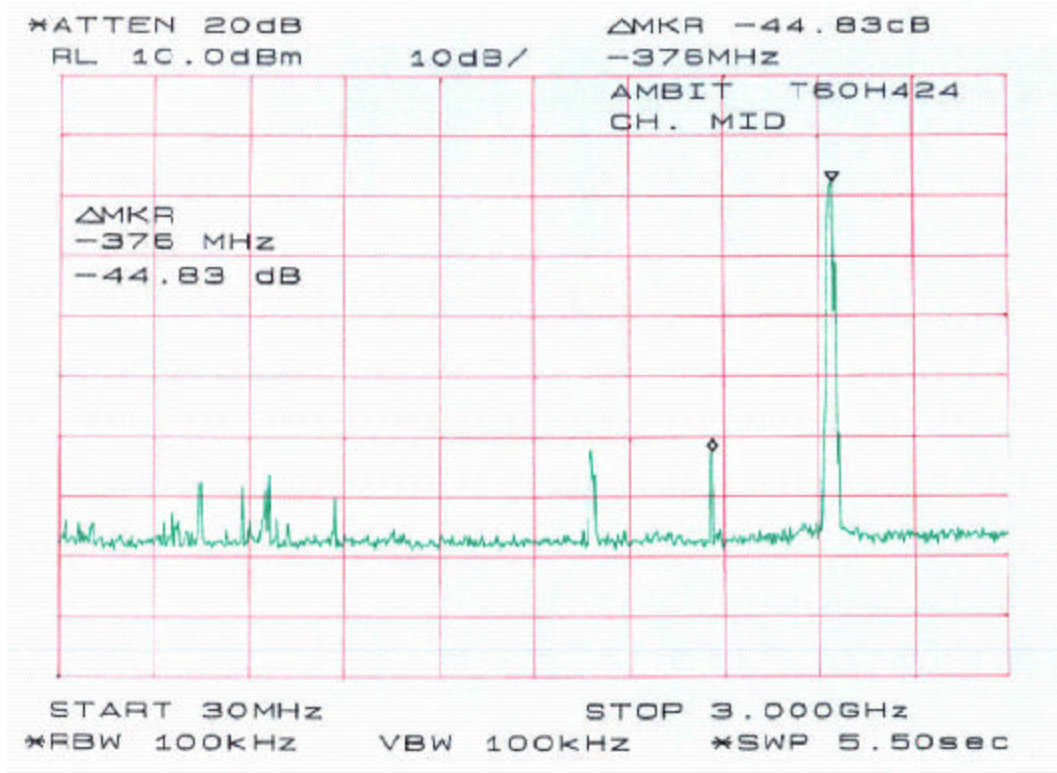
5.2 Measurement Procedure

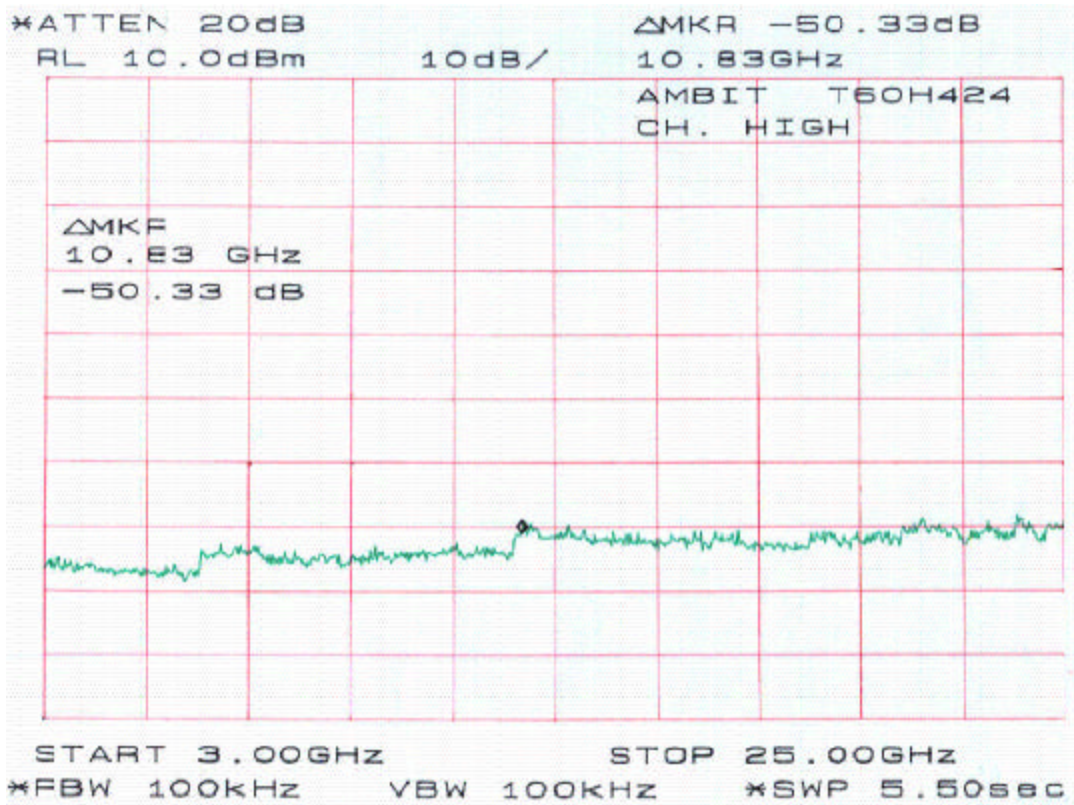
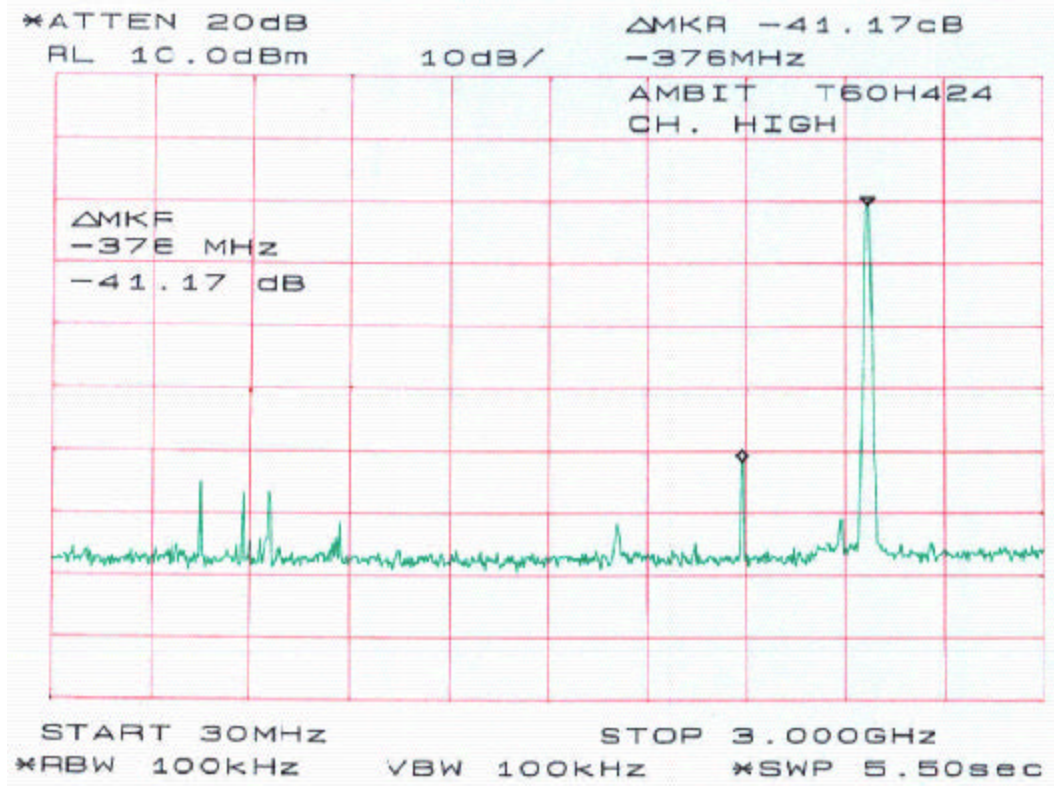
1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Placed the EUT on a bench. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency 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.

5.3 Measurement Data

Please refer to the appendings for more information.







6 - PEAK POWER SPECTRAL DENSITY

6.1 Standard Applicable

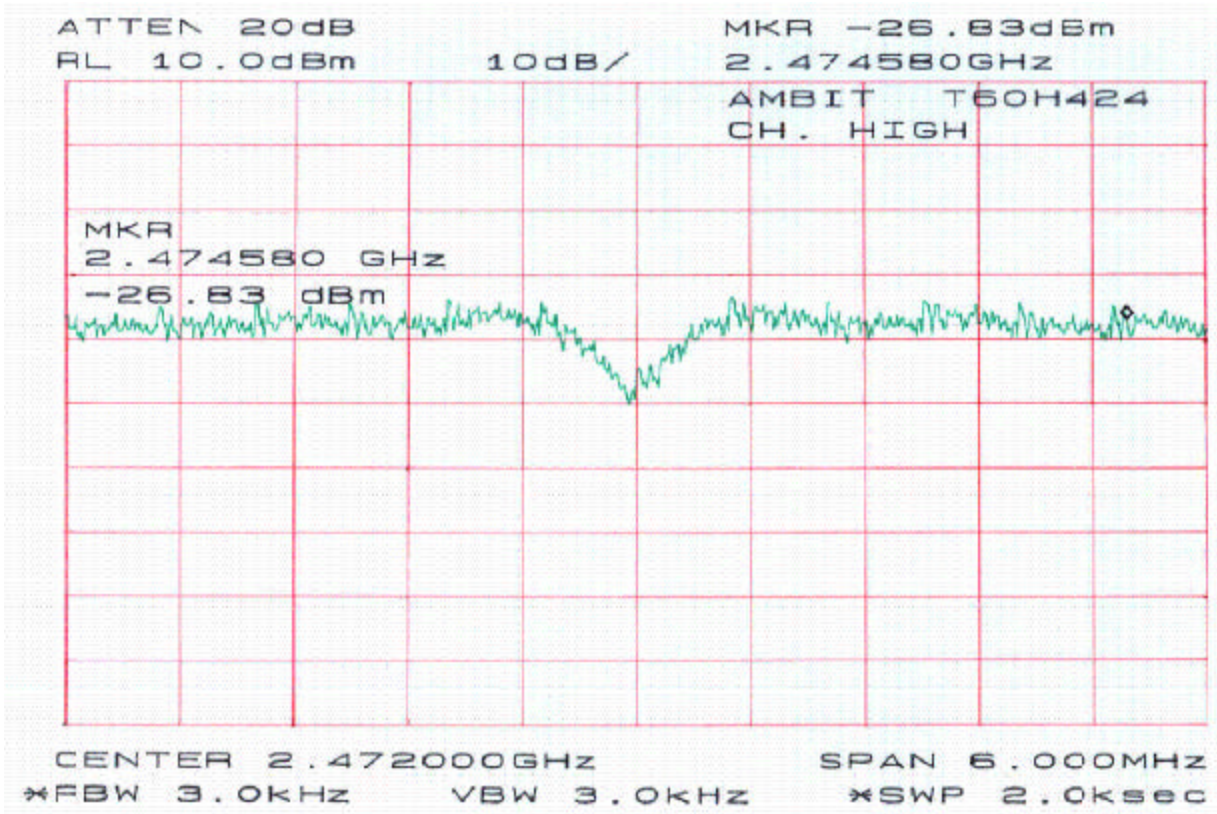
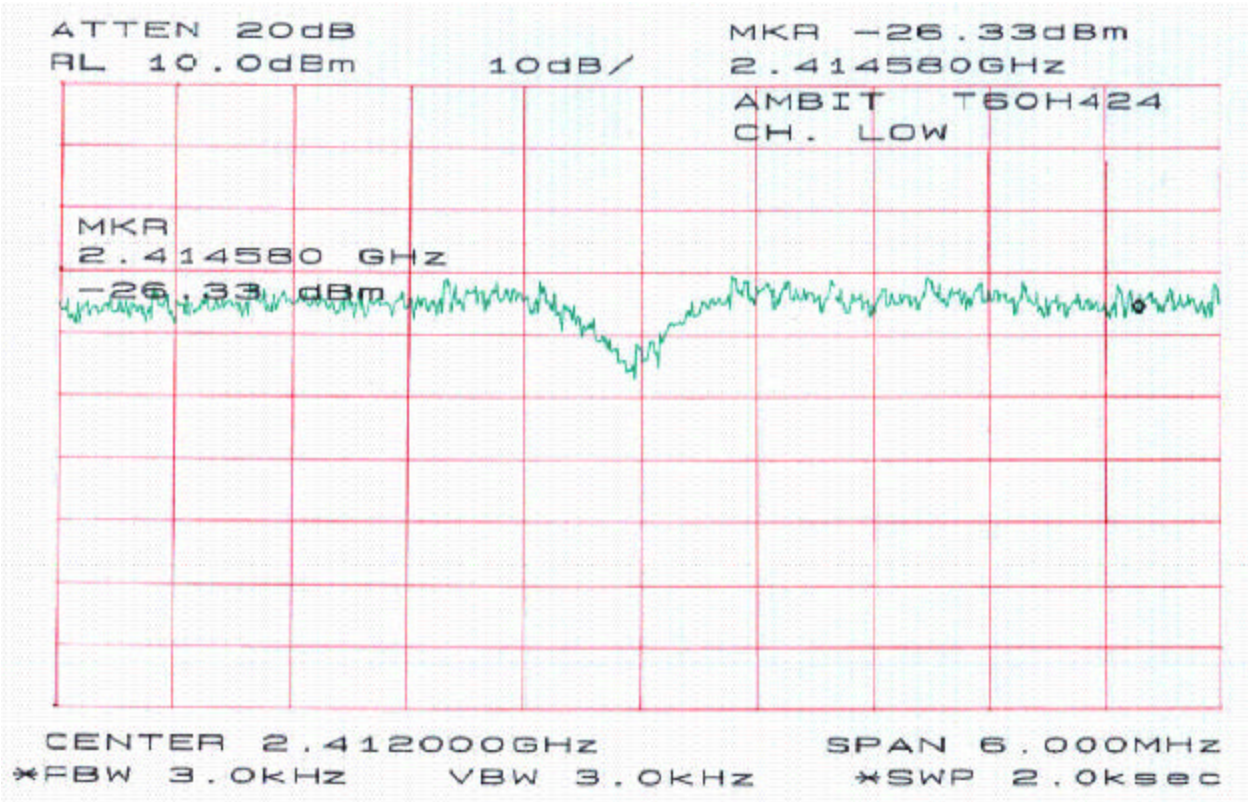
According to §15.247 (d), for direct sequence systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

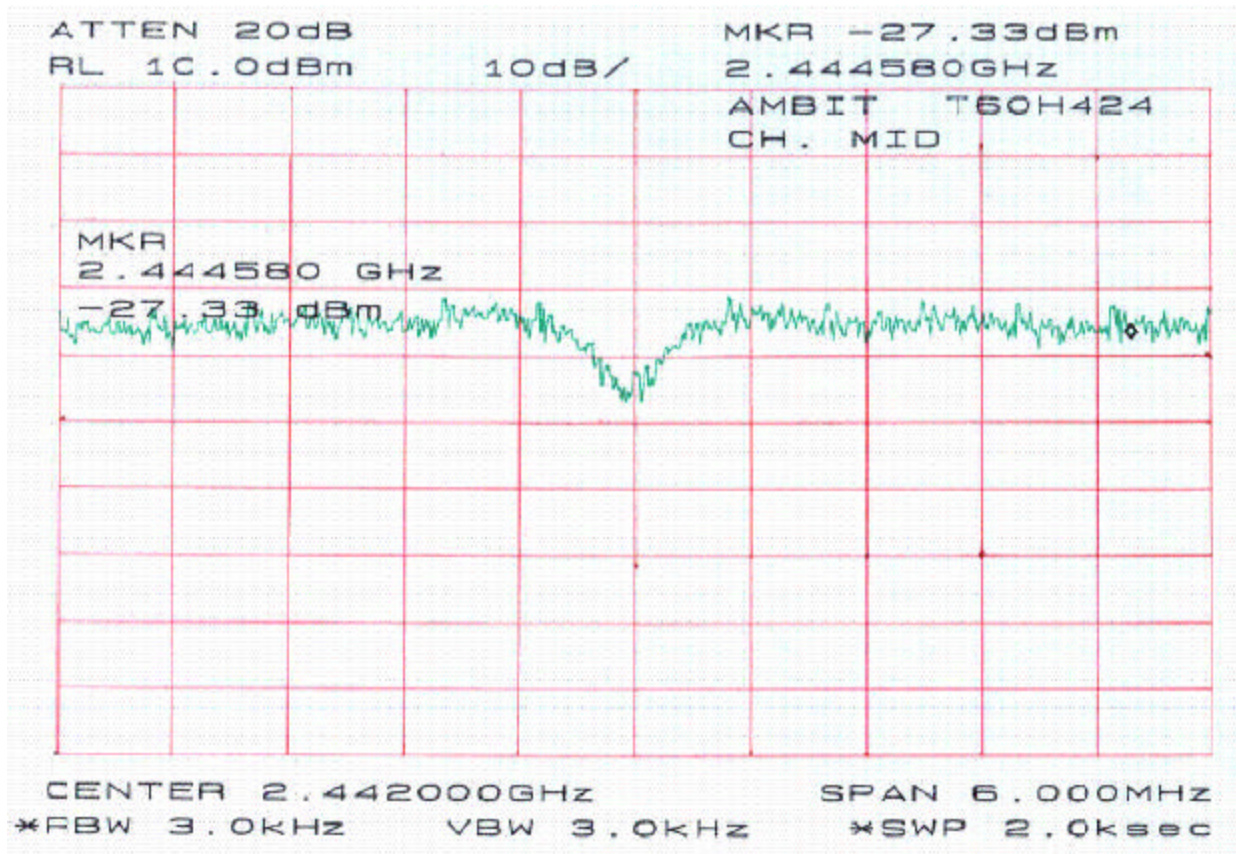
6.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Placed the EUT on a bench. 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.
4. Repeat above procedures until all frequencies measured were complete.

6.3 Test Results

Please refer to the attached plot(s).





7 - 6 DB BANDWIDTH

7.1 Standard Applicable

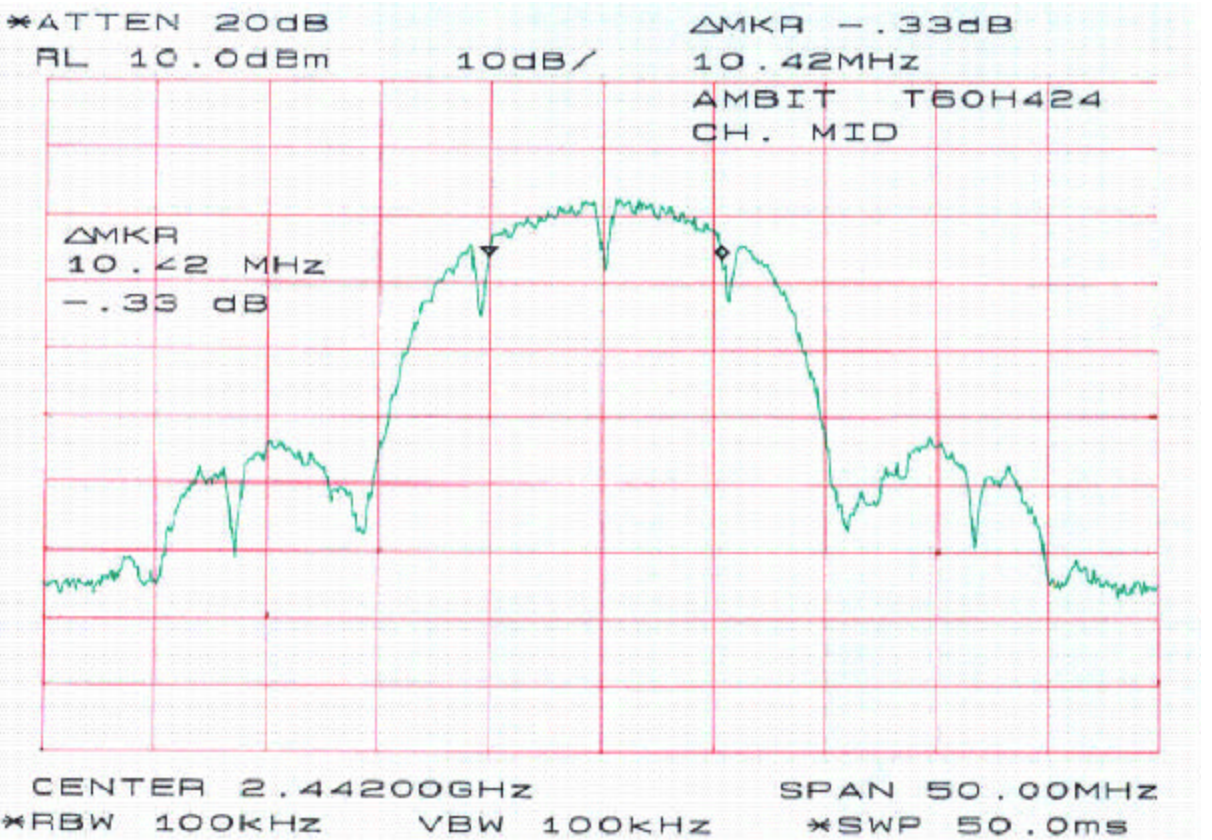
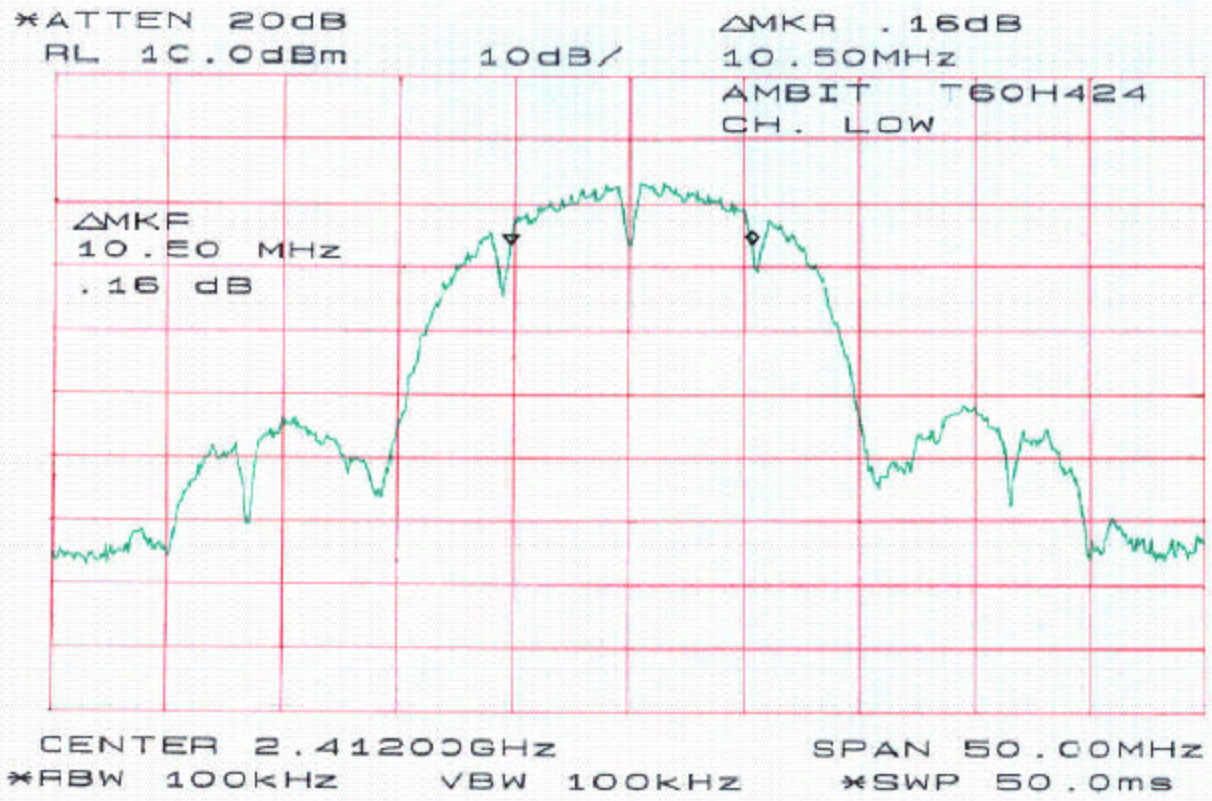
According to §15.247(a)(2), for direct sequence systems, the minimum 6dB bandwidth shall be at least 500 kHz.

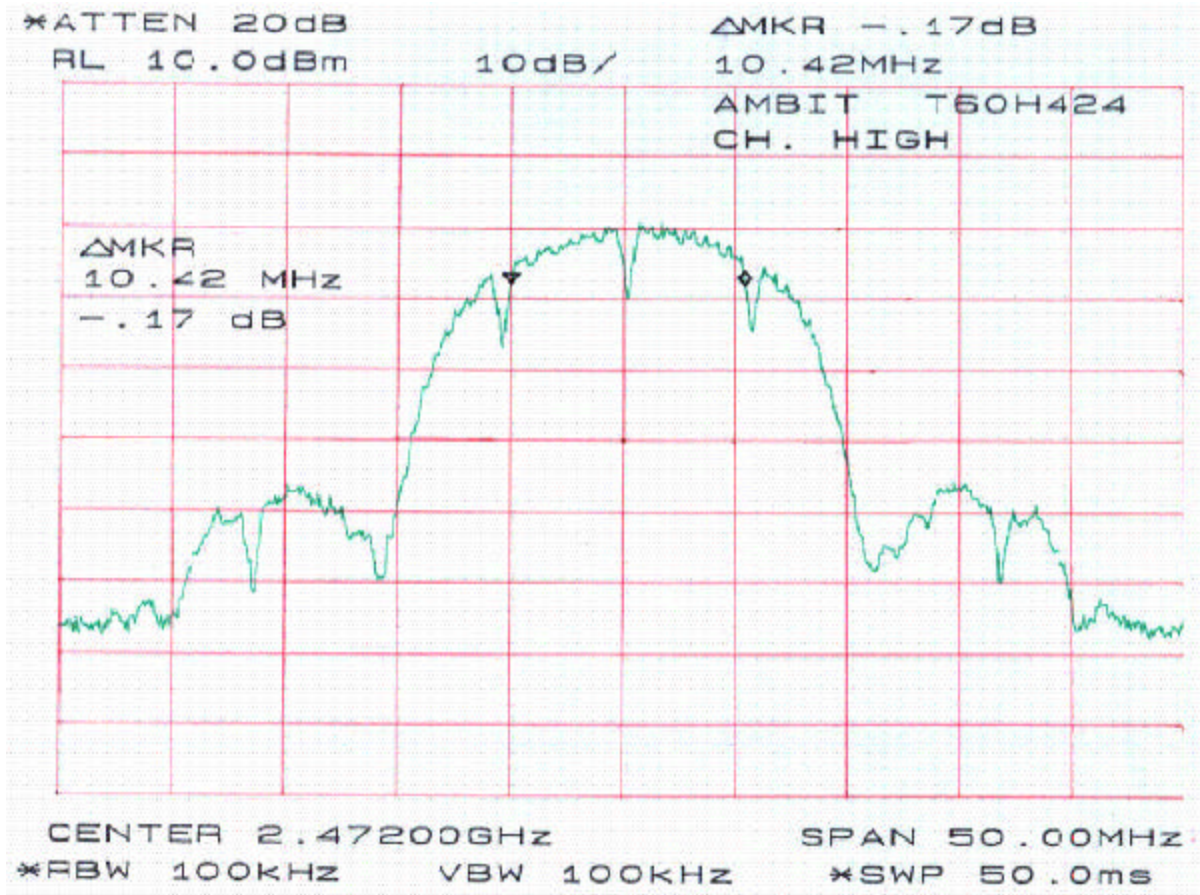
7.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Placed the EUT on a bench. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 6 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

7.3 Measurement Data

Please refer to appending plot for more information.





8 -100 KHZ BANDWIDTH OF BAND EDGES MEASUREMENT

8.1 Standard Applicable

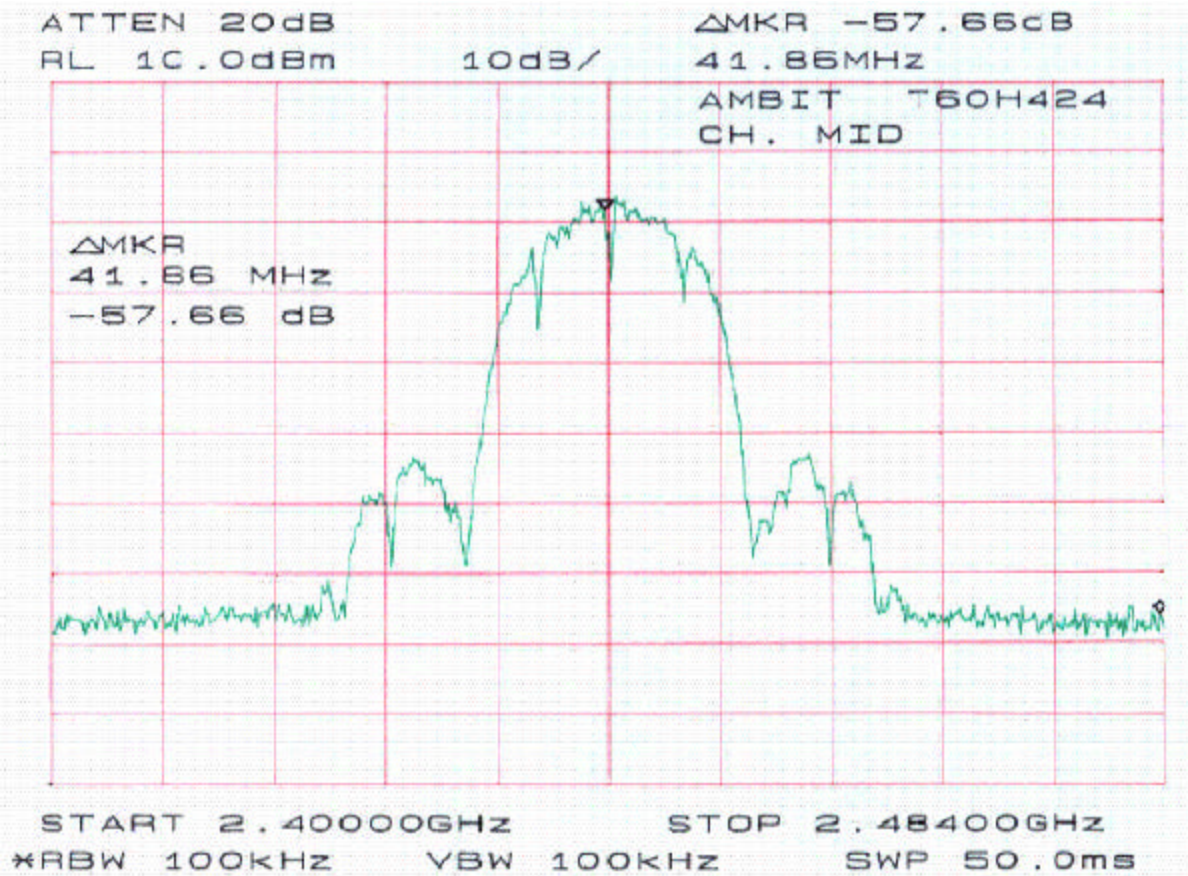
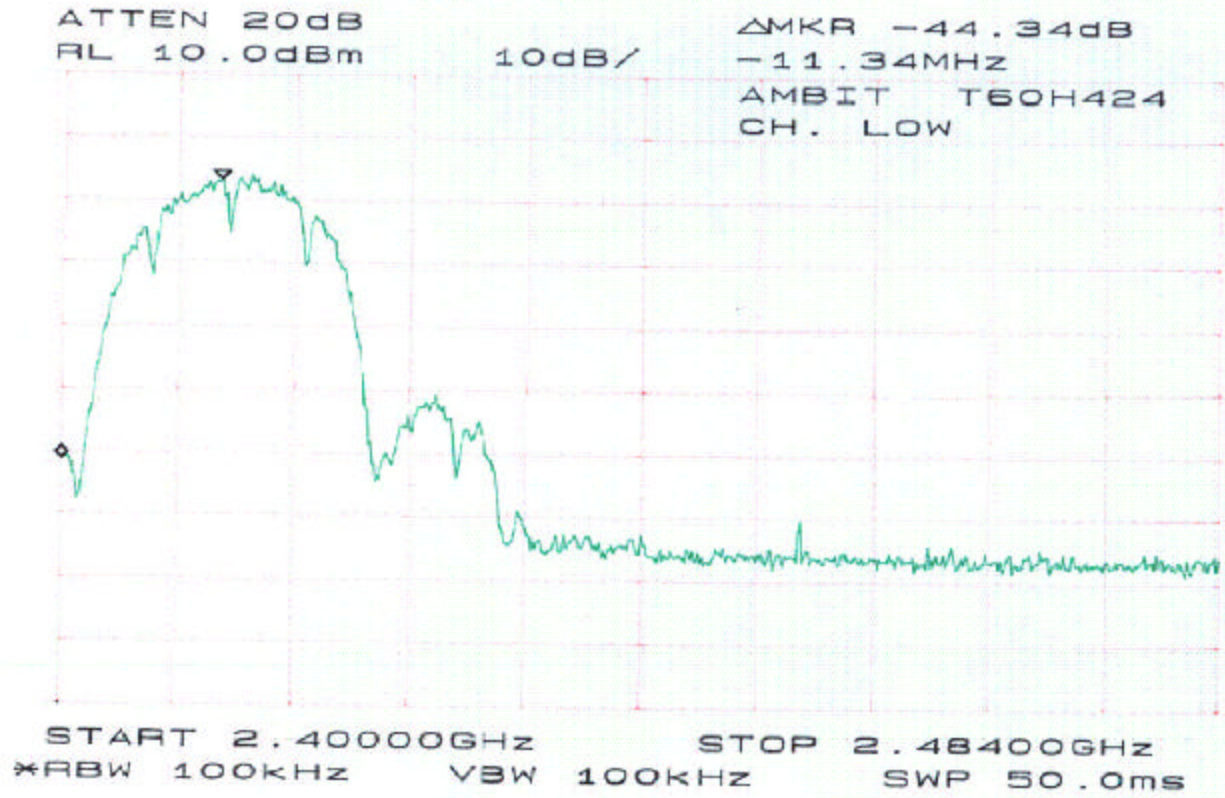
According to §15.247(c), in *any* 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains 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 §15.2057(c)).

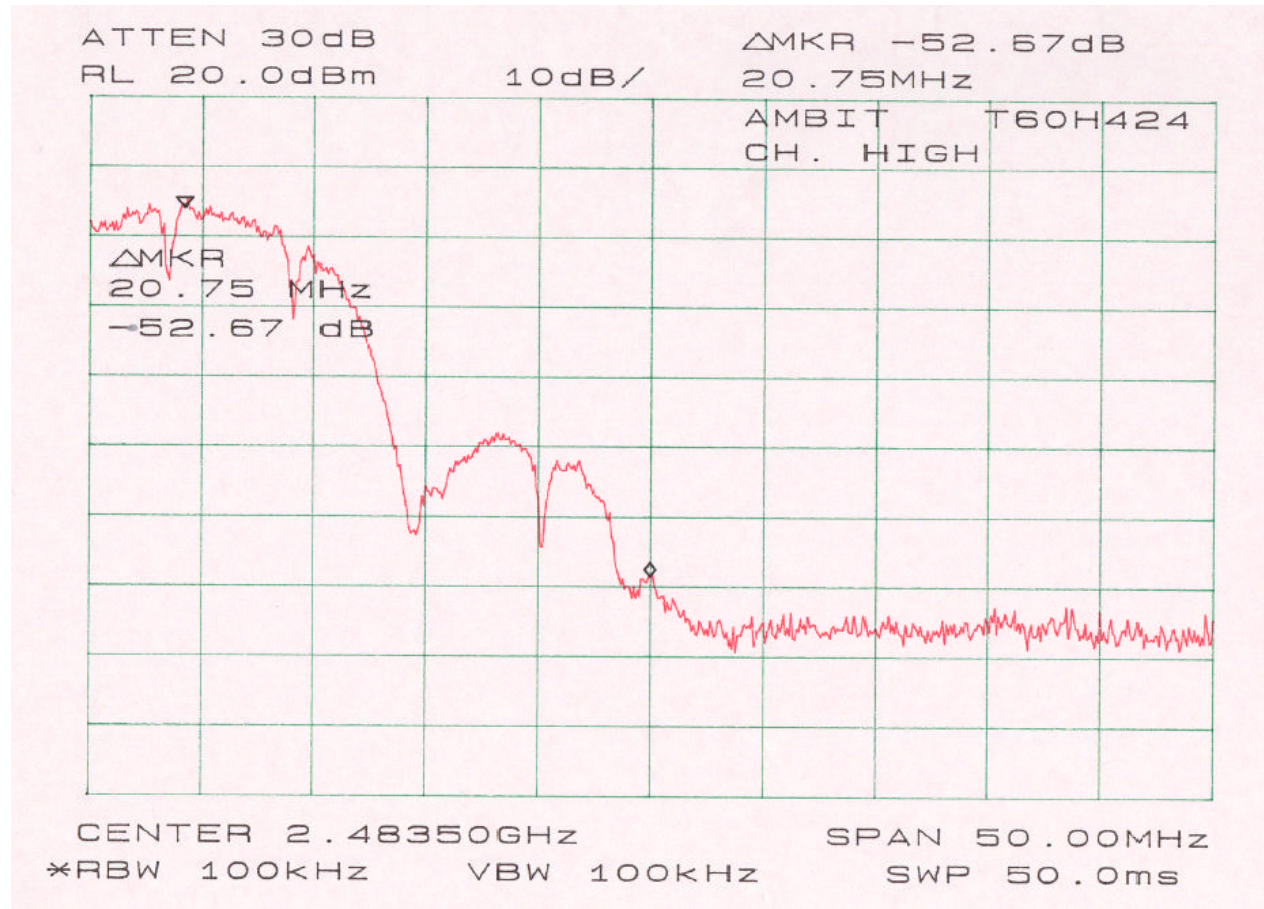
8.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Placed the EUT on a bench. 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.

8.3 Test Results

Please refer to the appending plot for more information.





9 - ANTENNA REQUIREMENT

9.1 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.

9.2 Antenna Connected Construction

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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of the standard.

Please refer to the attached antenna information.

10 - SPURIOUS RADIATED EMISSIONS

10.1 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. 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 BAEL is ± 4.0 dB.

10.2 EUT Setup

The radiated emission tests were performed in the open area 3-meter test site, using the setup in accordance with the ANSI C63.4-2000. 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 notebook was connected with 110Vac/60Hz power source.

10.3 Spectrum Analyzer Setup

According to FCC Rules, 47 CFR §15.33 (a) (1), the system was tested to 26GHz.

During the radiated emission test, the spectrum analyzer was set with the following configurations:

| | |
|-----------------------------------|---------|
| Start Frequency | 30 MHz |
| Stop Frequency | 26GHz |
| 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 |

10.4 Test Procedure

For the radiated emissions test, the notebook and all support equipment power cords were connected to the AC floor outlet since the notebook power supply 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 μ V of specification limits), and are distinguished with a "Qp" in the data table.

10.5 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 $-7\text{dB}\mu\text{V}$ means the emission is $7\text{dB}\mu\text{V}$ below the maximum limit for Subpart C. The equation for margin calculation is as follows:

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

10.6 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:

- 6.3 dB at 2375.60 MHz in the **Vertical** polarization, Low Channel, Port 1
- 9.8 dB at 2326.90 MHz in the **Vertical** polarization, Middle Channel, Port 1
- 3.3 dB at 2487.10 MHz in the **Vertical** polarization, High Channel, Port 1
- 13.2 dB at 4824.20 MHz in the **Horizontal** polarization, Low Channel Port 2
- 12.1 dB at 4876.60 MHz in the **Vertical** polarization, Middle Channel, Port 2
- 13.2 dB at 4926.40 MHz in the **Vertical** polarization, High Channel, Port 2
- 3.6 dB at 246.10 MHz in the **Horizontal** polarization, *unintentional emission*

Intentional Emission, 30MHz ~ 26 GHz, 3 Meters, Port 1

| Frequency MHz | Indicated | | Table Height Meter | Antenna | | Correction Factor | | | FCC 15 Subpart C | | |
|-----------------------|-----------------|---------------------|--------------------------|--------------|-------------------|-------------------------|------------|--------------------------|------------------|--------------|------|
| | Ampl. dBµV/m | Direction Degree | | Polar H/V | Antenna dBµV/m | Cable Loss dBµV/m | Amp. dB | Corr. Ampl. dBµV/m | Limit dBµV/m | Margin dB | Mode |
| Low Channel | | | | | | | | | | | |
| 2412.1 | 98.90 | 60 | 1.2 | V | 28.1 | 3.4 | 30.0 | 100.4 | | | AVG |
| 2412.1 | 93.7 | 150 | 1.0 | H | 28.1 | 3.4 | 30.0 | 95.2 | | | AVG |
| 2375.60 | 46.2 | 160 | 1.5 | V | 28.1 | 3.4 | 30.0 | 47.7 | 54 | -6.3 | AVG |
| 2375.60 | 43.4 | 180 | 1.5 | H | 28.1 | 3.4 | 30.0 | 44.9 | 54 | -9.2 | AVG |
| 4824.20 | 33.4 | 180 | 1.2 | H | 32.5 | 4.9 | 30.0 | 40.8 | 54 | -13.2 | AVG |
| 4824.20 | 29.1 | 45 | 1.2 | V | 32.5 | 4.9 | 30.0 | 36.5 | 54 | -17.5 | AVG |
| 2375.60 | 49.1 | 160 | 1.5 | V | 28.1 | 3.4 | 30.0 | 50.6 | 74 | -23.5 | PEAK |
| 2375.60 | 46.5 | 180 | 1.5 | H | 28.1 | 3.4 | 30.0 | 48.0 | 74 | -26.1 | PEAK |
| 4824.20 | 35.9 | 180 | 1.2 | H | 32.5 | 4.9 | 30.0 | 43.3 | 74 | -30.7 | PEAK |
| 4824.20 | 35.9 | 180 | 1.2 | H | 32.5 | 4.9 | 30.0 | 43.3 | 74 | -30.7 | PEAK |
| 7236.30 | 35.9 | 45 | 1.5 | V | 35.1 | 5.6 | 30.0 | 46.6 | 80.4 | -33.8 | AVG |
| 4824.20 | 32.6 | 45 | 1.5 | V | 32.5 | 4.9 | 30.0 | 40.0 | 74 | -34.0 | PEAK |
| 4824.20 | 32.6 | 45 | 1.5 | V | 32.5 | 4.9 | 30.0 | 40.0 | 74 | -34.0 | PEAK |
| 7236.30 | 31.7 | 180 | 1.5 | H | 35.1 | 5.6 | 30.0 | 42.4 | 80.4 | -38.0 | AVG |
| 9648.40 | 30.7 | 30 | 1.2 | V | 35.1 | 5.6 | 30.0 | 41.4 | 80.4 | -39.0 | AVG |
| 9648.40 | 28.6 | 0 | 1.2 | H | 35.1 | 5.6 | 30.0 | 39.3 | 80.4 | -41.1 | AVG |
| Middle Channel | | | | | | | | | | | |
| 2438.30 | 98.2 | 110 | 1.5 | V | 28.1 | 3.4 | 30.0 | 99.7 | | | AVG |
| 2438.30 | 97.9 | 135 | 1.2 | H | 28.1 | 3.4 | 30.0 | 99.4 | | | AVG |
| 2326.90 | 42.70 | 0 | 1.2 | V | 28.1 | 3.4 | 30.0 | 44.2 | 54 | -9.8 | AVG |
| 7314.90 | 32.5 | 90 | 1.5 | V | 35.1 | 5.6 | 30.0 | 43.2 | 54 | -10.8 | AVG |
| 4876.60 | 34.9 | 130 | 1.0 | H | 32.5 | 4.9 | 30.0 | 42.3 | 54 | -11.7 | AVG |
| 7314.90 | 31.60 | 150 | 1.5 | H | 35.1 | 5.6 | 30.0 | 42.3 | 54 | -11.7 | AVG |
| 2326.90 | 40.3 | 60 | 1.2 | H | 28.1 | 3.4 | 30.0 | 41.8 | 54 | -12.3 | AVG |
| 4876.60 | 33.1 | 90 | 1.0 | V | 32.5 | 4.9 | 30.0 | 40.5 | 54 | -13.5 | AVG |
| 2326.90 | 45.80 | 0 | 1.2 | V | 28.1 | 3.4 | 30.0 | 47.3 | 74 | -26.8 | PEAK |
| 7314.90 | 34.8 | 90 | 1.2 | V | 35.1 | 5.6 | 30.0 | 45.5 | 74 | -28.5 | PEAK |
| 4876.60 | 37.9 | 130 | 1.0 | H | 32.5 | 4.9 | 30.0 | 45.3 | 74 | -28.7 | PEAK |
| 2326.90 | 43.7 | 60 | 1.2 | H | 28.1 | 3.4 | 30.0 | 45.2 | 74 | -28.9 | PEAK |
| 7314.90 | 33.70 | 150 | 1.2 | H | 35.1 | 5.6 | 30.0 | 44.4 | 74 | -29.6 | PEAK |
| 4876.60 | 35.8 | 90 | 1.0 | V | 32.5 | 4.9 | 30.0 | 43.2 | 74 | -30.8 | PEAK |
| 9753.20 | 30.2 | 270 | 1.0 | V | 35.1 | 5.6 | 30.0 | 40.9 | 79.7 | -38.8 | AVG |
| 9753.20 | 28.9 | 240 | 1.0 | H | 35.1 | 5.6 | 30.0 | 39.6 | 79.7 | -40.1 | AVG |

| High Channel | | | | | | | | | | | |
|--------------|-------|-----|-----|---|------|-----|------|------|------|-------|------|
| 2463.20 | 98.1 | 45 | 1.5 | V | 28.1 | 3.4 | 30.0 | 99.6 | | | AVG |
| 2463.20 | 95.4 | 120 | 1.4 | H | 28.1 | 3.4 | 30.0 | 96.9 | | | AVG |
| 2487.10 | 49.3 | 270 | 1.5 | V | 28.1 | 3.4 | 30.0 | 50.8 | 54 | -3.3 | AVG |
| 2487.10 | 45.10 | 290 | 1.4 | H | 28.1 | 3.4 | 30.0 | 46.6 | 54 | -7.5 | AVG |
| 7389.60 | 35.5 | 160 | 1.5 | V | 35.1 | 5.6 | 30.0 | 46.2 | 54 | -7.8 | AVG |
| 4926.40 | 36.2 | 45 | 1.5 | V | 32.5 | 4.9 | 30.0 | 43.6 | 54 | -10.4 | AVG |
| 4926.40 | 33.3 | 180 | 1.4 | H | 32.5 | 4.9 | 30.0 | 40.7 | 54 | -13.3 | AVG |
| 7389.60 | 29.50 | 180 | 1.2 | H | 35.1 | 5.6 | 30.0 | 40.2 | 54 | -13.8 | AVG |
| 2487.10 | 53.6 | 270 | 1.5 | V | 28.1 | 3.4 | 30.0 | 55.1 | 74 | -19.0 | PEAK |
| 2487.10 | 48.70 | 290 | 1.4 | H | 28.1 | 3.4 | 30.0 | 50.2 | 74 | -23.9 | PEAK |
| 7389.60 | 37.6 | 160 | 1.5 | V | 35.1 | 5.6 | 30.0 | 48.3 | 74 | -25.7 | PEAK |
| 4926.40 | 38.4 | 45 | 1.5 | V | 32.5 | 4.9 | 30.0 | 45.8 | 74 | -28.2 | PEAK |
| 7389.60 | 32.80 | 180 | 1.2 | H | 35.1 | 5.6 | 30.0 | 43.5 | 74 | -30.5 | PEAK |
| 4926.40 | 35.9 | 180 | 1.4 | H | 32.5 | 4.9 | 30.0 | 43.3 | 74 | -30.7 | PEAK |
| 9852.80 | 36.2 | 0 | 1.5 | V | 35.1 | 5.6 | 30.0 | 46.9 | 79.6 | -32.7 | AVG |
| 9852.80 | 33.3 | 30 | 1.5 | H | 35.1 | 5.6 | 30.0 | 44.0 | 79.6 | -35.6 | AVG |

Intentional Emission, 30MHz ~ 26 GHz, 3 Meters, Port 2

| Frequency MHz | Indicated | | Table Height Meter | Antenna | | Correction Factor | | | FCC 15 Subpart C | | |
|------------------|-----------------|---------------------|--------------------------|--------------|-------------------|-------------------------|------------|--------------------------|------------------|--------------|------|
| | Ampl. dBµV/m | Direction Degree | | Polar H/V | Antenna dBµV/m | Cable Loss dBµV/m | Amp. dB | Corr. Ampl. dBµV/m | Limit dBµV/m | Margin dB | Mode |
| Low Channel | | | | | | | | | | | |
| 2412.1 | 50.17 | 90 | 1.8 | H | 28.1 | 3.4 | 30.0 | 51.6 | | | AVG |
| 2412.1 | 50.7 | 225 | 1.2 | V | 28.1 | 3.4 | 30.0 | 52.2 | | | AVG |
| 4824.20 | 33.4 | 90 | 1.8 | H | 32.5 | 4.9 | 30.0 | 40.8 | 54 | -13.2 | AVG |
| 4824.20 | 32.5 | 225 | 1.2 | V | 32.5 | 4.9 | 30.0 | 39.9 | 54 | -14.1 | AVG |
| 4824.20 | 35.4 | 90 | 1.8 | H | 32.5 | 4.9 | 30.0 | 42.8 | 74 | -31.2 | PEAK |
| 4824.20 | 34.1 | 225 | 1.2 | V | 32.5 | 4.9 | 30.0 | 41.5 | 74 | -32.5 | PEAK |
| Middle Channel | | | | | | | | | | | |
| 2438.30 | 53.0 | 225 | 1.2 | V | 28.1 | 3.4 | 30.0 | 54.5 | | | AVG |
| 2438.30 | 48.8 | 135 | 1.5 | H | 28.1 | 3.4 | 30.0 | 50.3 | | | AVG |
| 4876.60 | 34.5 | 225 | 1.2 | V | 32.5 | 4.9 | 30.0 | 41.9 | 54 | -12.1 | AVG |
| 4876.60 | 31.3 | 135 | 1.5 | H | 32.5 | 4.9 | 30.0 | 38.7 | 54 | -15.3 | AVG |
| 4876.60 | 36.7 | 225 | 1.2 | V | 32.5 | 4.9 | 30.0 | 44.1 | 74 | -29.9 | PEAK |
| 4876.60 | 33.4 | 135 | 1.5 | H | 32.5 | 4.9 | 30.0 | 40.8 | 74 | -33.2 | PEAK |
| High Channel | | | | | | | | | | | |
| 2463.20 | 46.7 | 45 | 1.5 | H | 28.1 | 3.4 | 30.0 | 48.2 | | | AVG |
| 2463.20 | 48.2 | 0 | 1.3 | V | 28.1 | 3.4 | 30.0 | 49.7 | | | AVG |
| 4926.40 | 33.4 | 220 | 1.2 | V | 32.5 | 4.9 | 30.0 | 40.8 | 54 | -13.2 | AVG |
| 4926.40 | 32.5 | 270 | 1.5 | H | 32.5 | 4.9 | 30.0 | 39.9 | 54 | -14.1 | AVG |
| 4926.40 | 35.3 | 220 | 1.2 | V | 32.5 | 4.9 | 30.0 | 42.7 | 74 | -31.3 | PEAK |
| 4926.40 | 34.6 | 270 | 1.5 | H | 32.5 | 4.9 | 30.0 | 42.0 | 74 | -32.0 | PEAK |

Unintentional Emission, 30MHz to 1000 MHz, 3 Meters

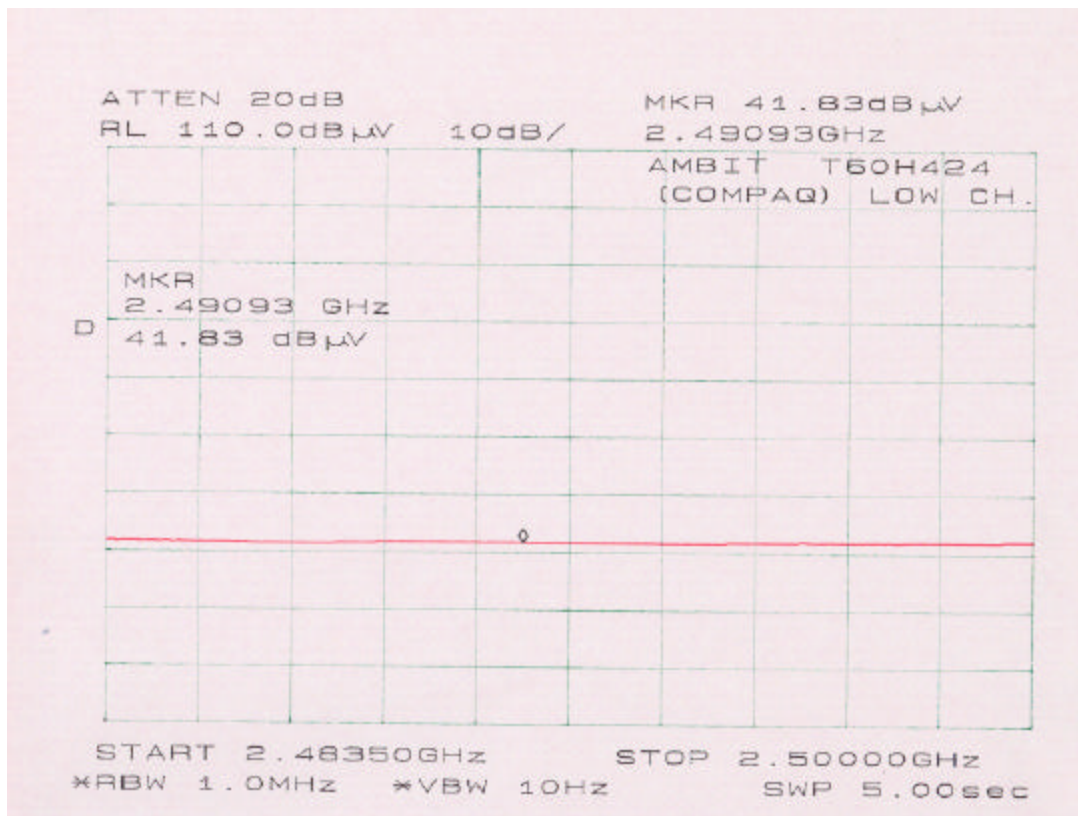
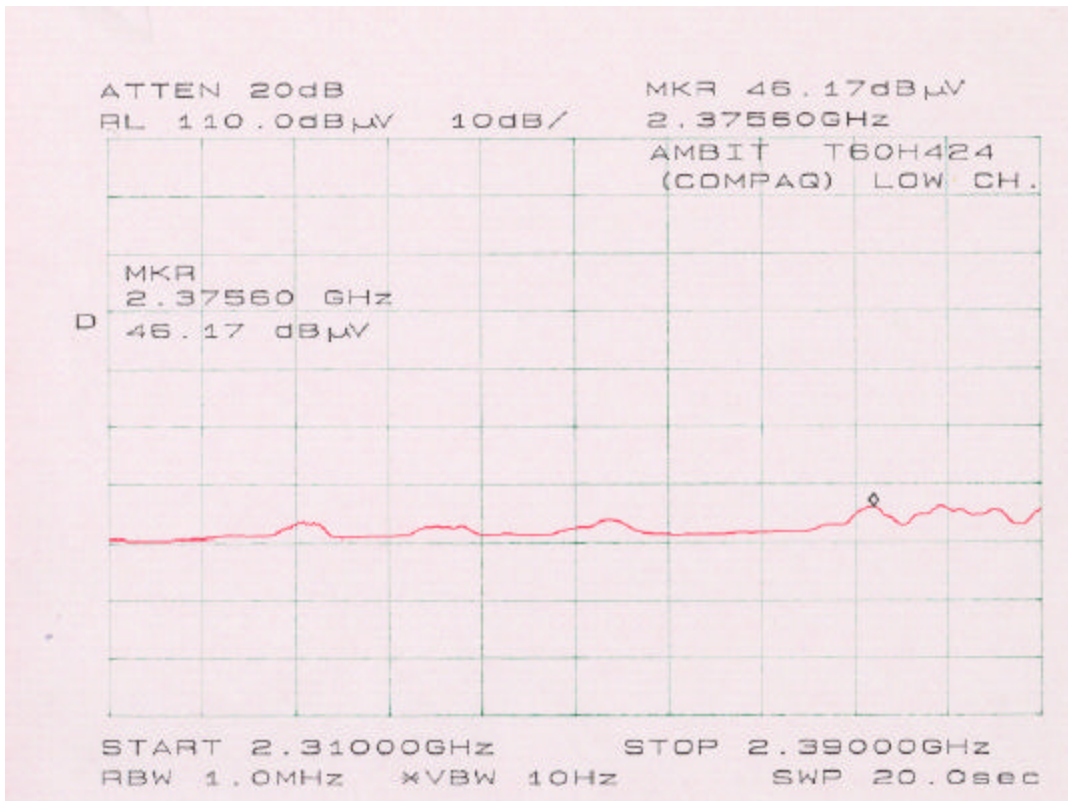
| Frequency MHz | Indicated | | Table Height Meter | Antenna | | Correction Factor | | | FCC 15 Subpart C | |
|------------------|-----------------|---------------------|--------------------------|--------------|-------------------|-------------------------|------------|--------------------------|------------------|--------------|
| | Ampl. dBµV/m | Direction Degree | | Polar H/V | Antenna dBµV/m | Cable Loss dBµV/m | Amp. dB | Corr. Ampl. dBµV/m | Limit dBµV/m | Margin dB |
| 246.10 | 51.4 | 130 | 1.2 | H | 13.8 | 2.2 | 25.0 | 42.4 | 46 | -3.6 |
| 220.30 | 50.9 | 130 | 1.5 | H | 11.8 | 2.2 | 25.0 | 39.9 | 46 | -6.1 |
| 659.99 | 40.8 | 310 | 1.5 | H | 20.6 | 2.8 | 25.0 | 39.2 | 46 | -6.8 |
| 132.60 | 47.3 | 220 | 1.0 | V | 12.0 | 1.6 | 25.0 | 35.9 | 43.5 | -7.6 |
| 308.40 | 44.2 | 280 | 1.2 | H | 14.4 | 2.3 | 25.0 | 35.9 | 46 | -10.1 |
| 177.40 | 42.8 | 180 | 1.5 | V | 13.1 | 1.9 | 25.0 | 32.8 | 43.5 | -10.7 |
| 395.77 | 41.4 | 45 | 1.2 | H | 16.4 | 2.5 | 25.0 | 35.3 | 46 | -10.7 |
| 88.20 | 46.5 | 350 | 1.8 | V | 9.8 | 1.2 | 25.0 | 32.5 | 43.5 | -11.0 |
| 150.06 | 40.9 | 310 | 1.2 | V | 12.7 | 1.7 | 25.0 | 30.3 | 43.5 | -13.2 |

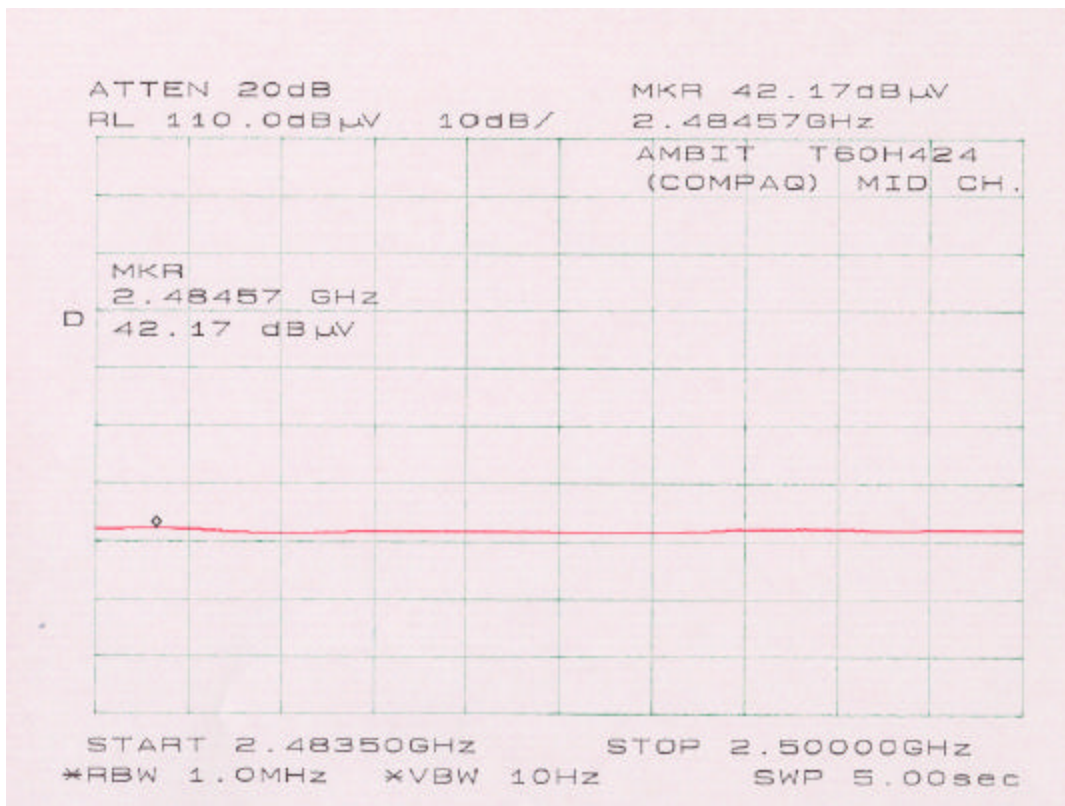
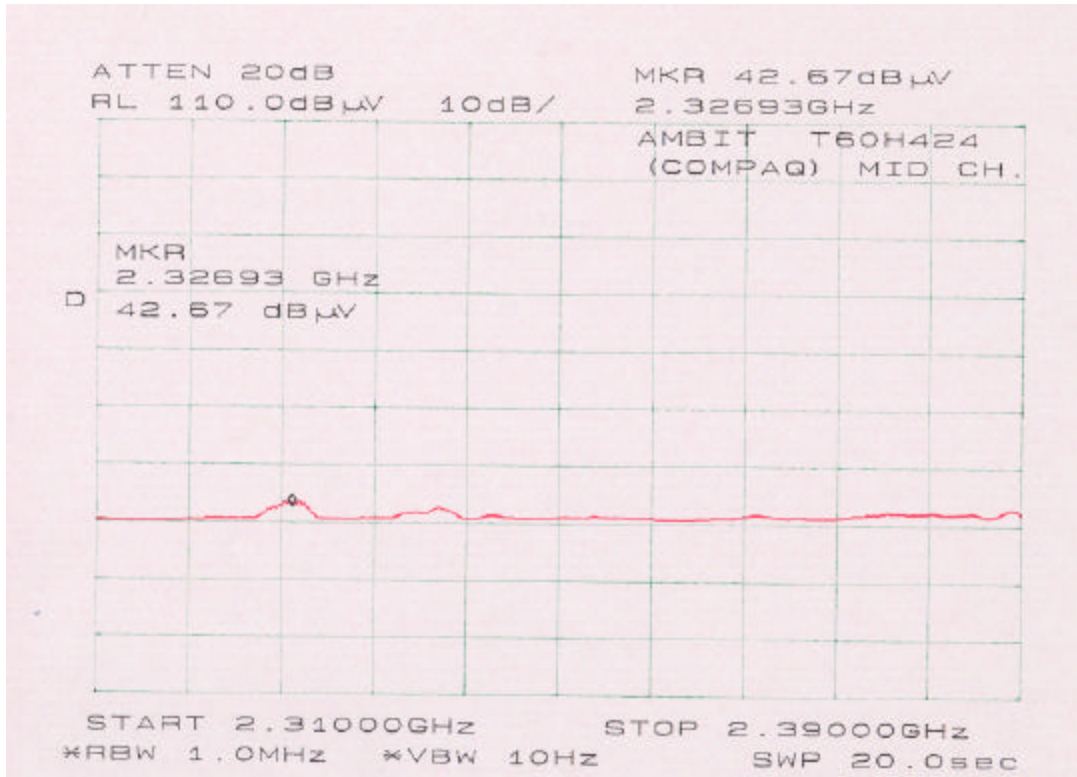
Note 1.

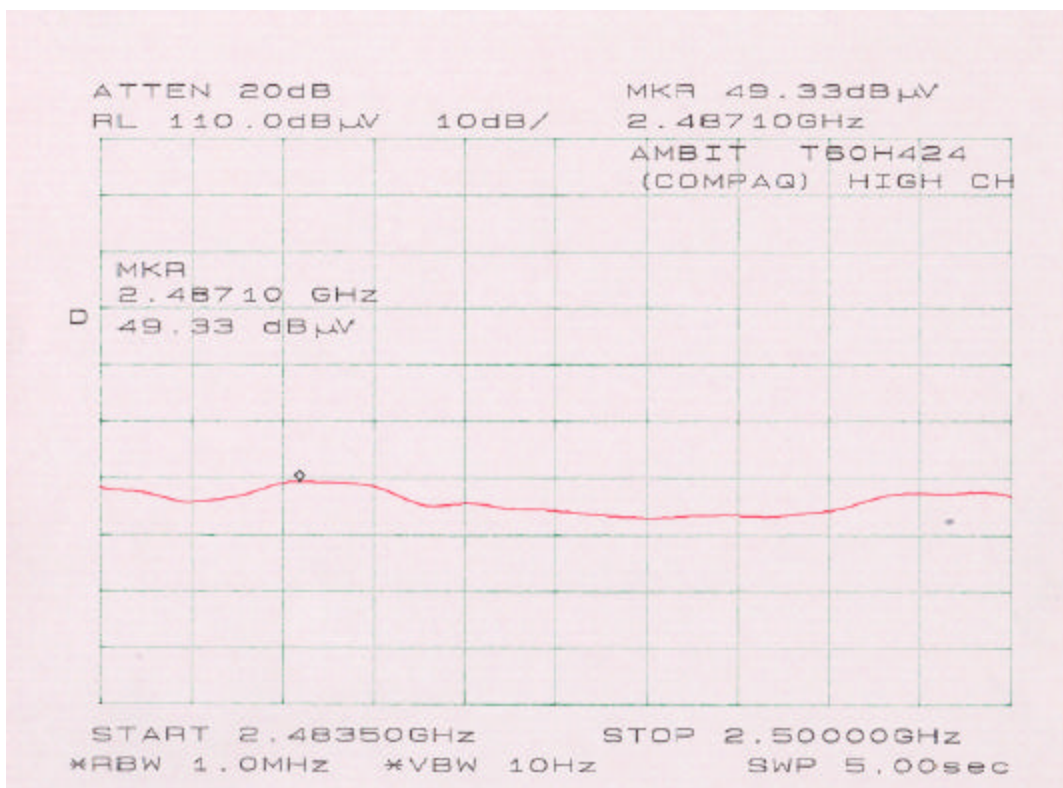
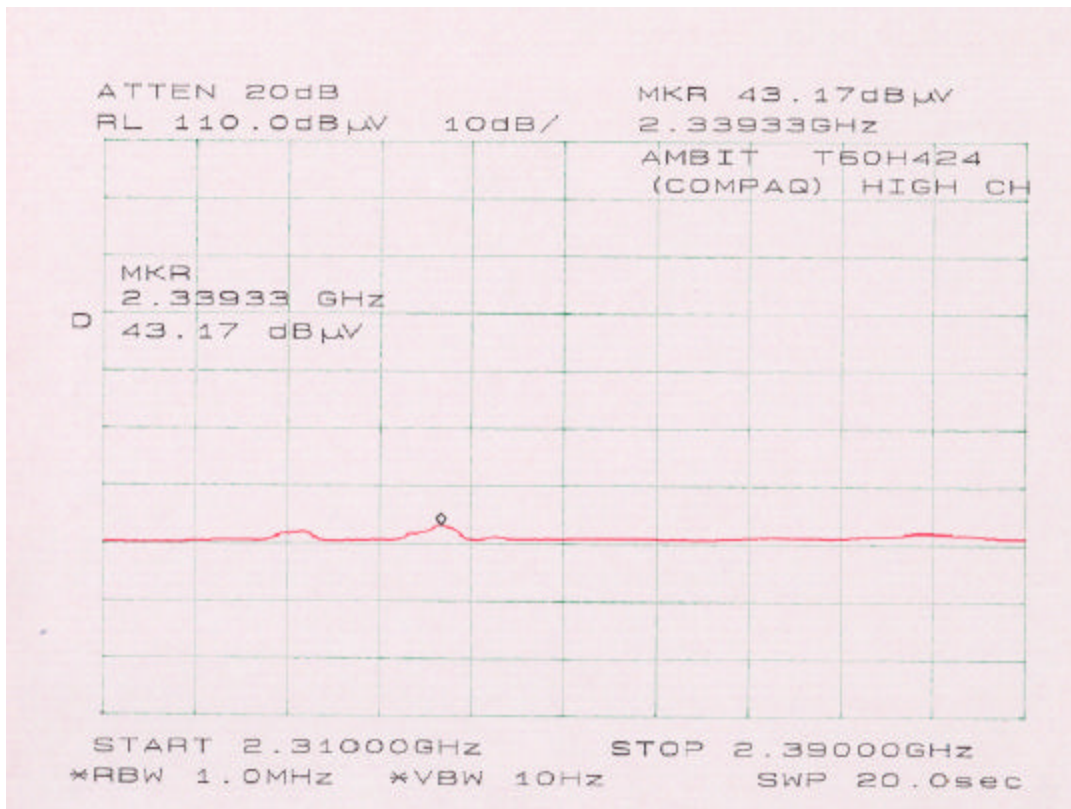
According to § 15.205, for this EUT only spurious emission are permitted in the restricted band 2310 – 2390 MHz and 2483.5 – 2500 MHz. The worst margin in the restricted bands is –3.3 dBuV/m at 2487.10 MHz. [Please refer to above data and plots below]

Note 2

Spurious and harmonics above 10GHz for “port 1” and 5 GHz for “port 2” are too low to be detected.







11 - CONDUCTED EMISSIONS

11.1 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. 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 ± 2.4 dB.

11.2 EUT Setup

The measurement was performed at the **Open Area Test Site**, using the same setup per ANSI C63.4-2000 measurement procedure. The specification used was 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.

11.3 Spectrum Analyzer Setup

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

| | |
|-----------------------------------|---------|
| Start Frequency | 450 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 |

11.4 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 μ V of specification limits). Quasi-peak readings are distinguished with a "**Qp**".

11.5 Summary of Test Results

The EUT complied with the FCC Conducted margin for a Class B device, with the *worst* margin reading of:

-1.5 dBµV at 0.740 MHz in the Neutral mode

11.6 Conducted Emissions Test Data

| Frequency MHz | LINE CONDUCTED EMISSIONS | | | FCC CLASS B | |
|------------------|--------------------------|-------------------------|-----------------------|---------------|--------------|
| | Amplitude dBµV | Detector Qp/Ave/Peak | Phase Line/Neutral | Limit dBµV | Margin dB |
| 0.740 | 46.5 | QP | Neutral | 48 | -1.5 |
| 0.770 | 46.1 | QP | Line | 48 | -1.9 |
| 2.030 | 42.3 | QP | Neutral | 48 | -5.7 |
| 0.460 | 40.5 | QP | Line | 48 | -7.5 |
| 13.600 | 37.5 | QP | Neutral | 48 | -10.5 |
| 12.760 | 36.2 | QP | Line | 48 | -11.8 |

11.7 Plot of Conducted Emissions Test Data

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

