

# FCC Part 15.247 Transmitter Certification

**Direct Sequence Spread Spectrum Transmitter**

## Test Report

**FCC ID: UID-WRMTM5**

**FCC Rule Part: 15.247**

**ACS Report Number: 06-0200-15C**

Manufacturer: SerComm  
Applicant: ARRIS International, Inc.

Model: TM552 WRM


Test Begin Date: August 2, 2006  
Test End Date: August 31, 2006


Report Issue Date: September 26, 2006



FOR THE SCOPE OF ACCREDITATION UNDER LAB Code 200612-0

This report is not to be used to claim certification, approval, or endorsement by NVLAP, NIST or any government agency.

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**This report contains 20 pages**

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## Additional Exhibits Included In Filing

Internal Photographs  
Test Setup Photographs  
Product Labeling  
RF Exposure – MPE Calculations  
Installation/Users Guide

Theory of Operation  
BOM (Parts List)  
System Block Diagram  
Schematics

1.0 GENERAL

1.1 Purpose

The purpose of this report is to demonstrate compliance with Part 15, Subpart C of the FCC’s Code of Federal Regulations.

1.2 Product Description

1.2.1 General

TM552 WRM (Wireless Router Module) is a Router that integrated 4-port Ethernet and 802.11b/g Wireless LAN. The TM552 WRM router includes an IEEE802.11b/g-compliant wireless access point providing continuous, high-speed 54 Mbps access between wireless and Ethernet devices.

Detailed photographs of the EUT are filed separately with this filing.

1.2.2 Intended Use

The TM552 WRM is intended to be used as a Wireless Router Module.

1.2.3 Antenna Information

Two Antennas are available with the TM552 WRM. They are as follows:

Manufacturer.....Wha Yu Industrial Co., LTD
P/NO.....C147-510023-A
Frequency Range.....2.4GHz ~ 2.5GHz
Impedance .....50Ω Nominal
VSWR .....1.92 Max
Return Loss.....-10 dB Maximum
Radiation .....Omni-directional
Gain(peak).....1.8dBi
Polarization.....Linear Vertical
Admitted Power.....1W
Connector.....SMA Plug Reverse

Manufacturer.....Wha Yu Industrial Co., LTD
P/NO.....C66-510003-A
Frequency Range.....2.4GHz ~ 2.5GHz
Impedance .....50Ω Nominal
VSWR .....1.92 Max
Return Loss.....-10 dB Maximum
Radiation .....1/2 Wave Dipole
Gain(peak).....1.8dBi
Polarization.....Linear Vertical
Admitted Power.....1W
Connector.....SMA Plug Reverse

1.3 Test Methodology and Considerations

The Sercomm TM552 WRM was tested as a stand-alone board for the purpose of modular approval. All modes of operation including all data rates were evaluated and the worst case data presented in this report.

For the purpose of demonstrating compliance with 15.207 for AC power line conducted emissions, the module was integrated into a typical host which connects to the AC mains.

## 2.0 TEST FACILITIES

### 2.1 Location

The radiated and conducted emissions test sites are located at the following address:

Advanced Compliance Solutions  
5015 B.U. Bowman Drive  
Buford, GA 30518  
Phone: (770) 831-8048  
Fax: (770) 831-8598

### 2.2 Laboratory Accreditations/Recognitions/Certifications

The Semi-Anechoic Chamber Test Site, Open Area Test Site (OATS) and Conducted Emissions Site have been fully described, submitted to, and accepted by the FCC, Industry Canada and the Japanese Voluntary Control Council for Interference by information technology equipment. In addition, ACS is compliant to ISO 17025 as certified by the National Institute of Standards and Technology under their National Voluntary Laboratory Accreditation Program. The following certification numbers have been issued in recognition of these accreditations and certifications:

FCC Registration Number: 89450  
Industry Canada Lab Code: IC 4175  
VCCI Member Number: 1831

- VCCI OATS Registration Number R-1526
- VCCI Conducted Emissions Site Registration Number: C-1608

NVLAP Lab Code: 200612-0

**2.3 Radiated Emissions Test Site Description**

**2.3.1 Semi-Anechoic Chamber Test Site**

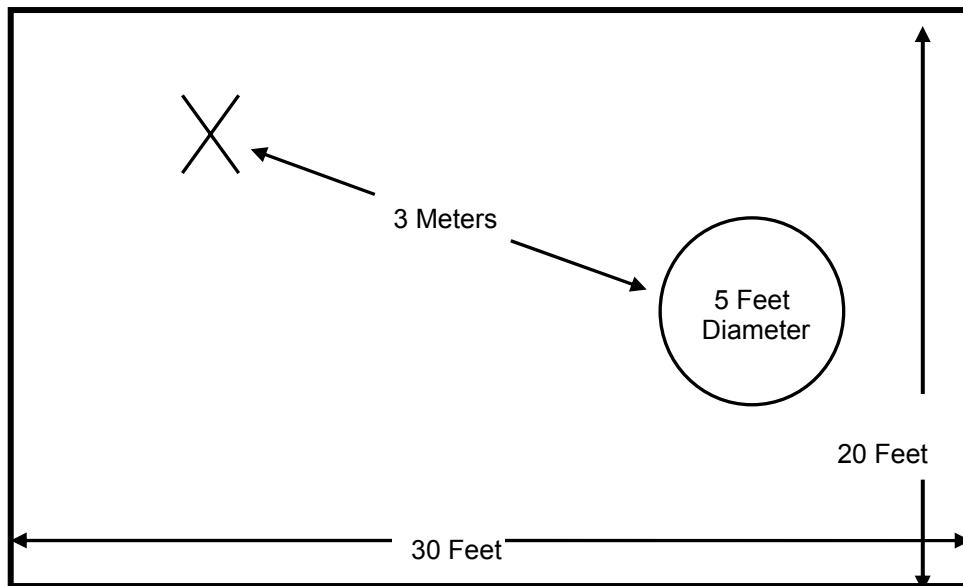
The Semi-Anechoic Chamber Test Site consists of a 20' x 30' x 18' shielded enclosure. The chamber is lined with Toyo Ferrite Grid Absorber, model number FFG-1000. The ferrite tile grid is 101 x 101 x 19mm thick and weighs approximately 550 grams. These tiles are mounted on steel panels and installed directly on the inner walls of the chamber.

The turntable is 150cm in diameter and is located 160cm from the back wall of the chamber. The chamber is grounded via 1 - 8' copper ground rod, installed at the center of the back wall, it is bound to the ground plane using 3/4" stainless steel braided cable.

The turntable is all steel, flush mounted table installed in an all steel frame. The table is remotely operated from inside the control room located 25' from the range. The turntable is electrically bonded to the surrounding ground plane via steel fingers installed on the edge of the turn table. The steel fingers make constant contact with the ground plane during operation.

Behind the turntable is a 3' x 6' x 4' deep shielded pit used for support equipment if necessary. The pit is equipped with 1 - 4" PVC chases from the turntable to the pit that allow for cabling to the EUT if necessary. The underside of the turntable can be accessed from the pit so cables can be supplied to the EUT from the pit.

A diagram of the Semi-Anechoic Chamber Test Site is shown in Figure 2.3-1 below:



**Figure 2.3-1: Semi-Anechoic Chamber Test Site**

**2.3.2 Open Area Tests Site (OATS)**

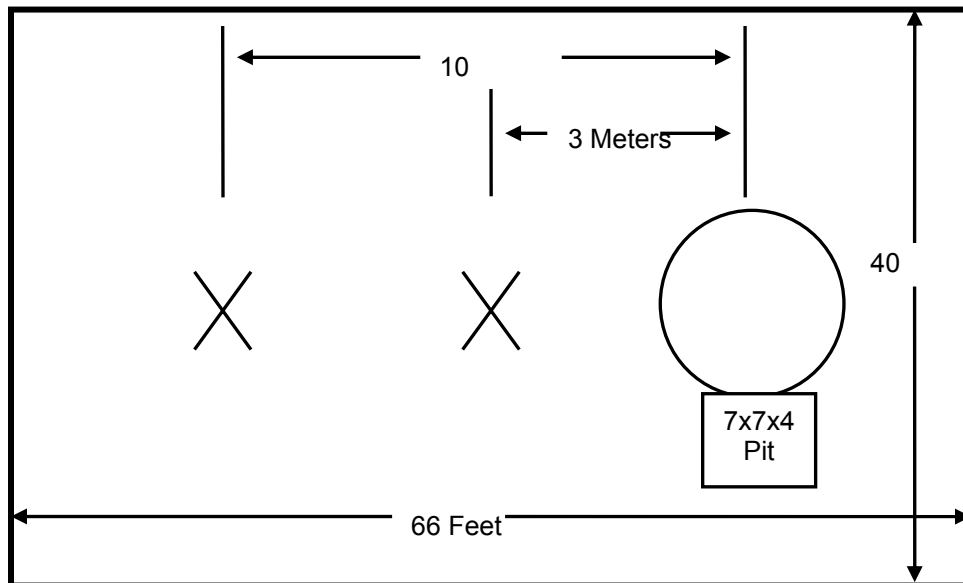
The open area test site consists of a 40' x 66' concrete pad covered with a perforated electro-plated galvanized sheet metal. The perforations in the sheet metal are 1/8" holes that are staggered every 3/16". The individual sheets are placed to overlap each other by 1/4" and are riveted together to provide a continuous seam. Rivets are spaced every 3" in a 3 x 20 meter perimeter around the antenna mast and EUT area. Rivets in the remaining area are spaced as necessary to properly secure the ground plane and maintain the electrical continuity.

The entire ground plane extends 12' beyond the turntable edge and 16' beyond the antenna mast when set to a 10 meter measurement distance. The ground plane is grounded via 4 - 8' copper ground rods, each installed at a corner of the ground plane and bound to the ground plane using 3/4" stainless steel braided cable.

The turntable is an all aluminum 10' flush mounted table installed in an all aluminum frame. The table is remotely operated from inside the control room located 40' from the range. The turntable is electrically bonded to the surrounding ground plane via steel fingers installed on the edge of the turn table. The steel fingers make constant contact with the ground plane during operation.

Adjacent to the turntable is a 7' x 7' square and 4' deep concrete pit used for support equipment if necessary. The pit is equipped with 5 - 4" PVC chases from the pit to the control room that allow for cabling to the EUT if necessary. The underside of the turntable can be accessed from the pit so cables can be supplied to the EUT from the pit. The pit is covered with 2 sheets of 1/4" diamond style re-enforced steel sheets. The sheets are painted to match the perforated steel ground plane; however the underside edges have been masked off to maintain the electrical continuity of the ground plane. All reflecting objects are located outside of the ellipse defined in ANSI C63.4.

A diagram of the Open Area Test Site is shown in Figure 2.3-2 below:



**Figure 2.3-2: Open Area Test Site**

## 2.4 Conducted Emissions Test Site Description

The AC mains conducted EMI site is located in the main EMC lab. It consists of an 8' x 8' solid aluminum horizontal group reference plane (GRP) bonded every 3" to an 8' X 8' vertical ground plane.

The site is of sufficient size to test table top and floor standing equipment in accordance with section 6.1.4 of ANSI C63.4.

A diagram of the room is shown below in figure 4.1.3-1:

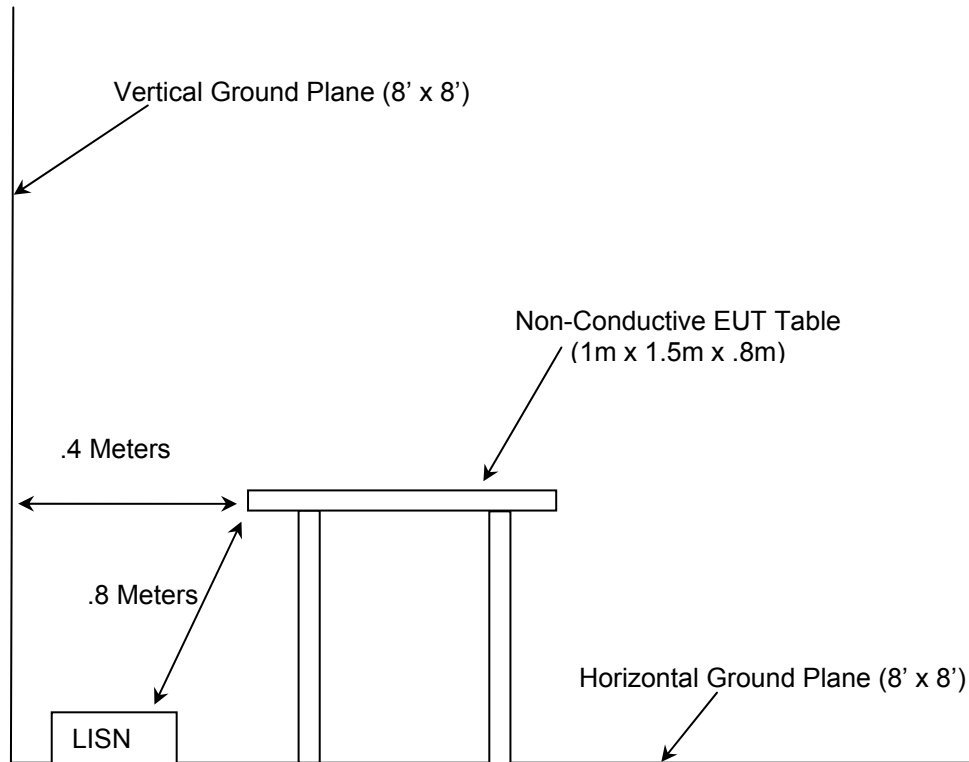


Figure 2.4-1: AC Mains Conducted EMI Site

## 3.0 APPLICABLE STANDARD REFERENCES

The following standards were used:

- ❖ ANSI C63.4-2003: Method of Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the 9KHz to 40GHz
- ❖ US Code of Federal Regulations (CFR): Title 47, Part 2, Subpart J: Equipment Authorization Procedures, 2005
- ❖ US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2005
- ❖ FCC OET Bulletin 65 Appendix C - Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields, 2001
- ❖ FCC KDB Publication No. 558074 - Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247), March 2005

**4.0 LIST OF TEST EQUIPMENT**

All test equipment used for regulatory testing is calibrated yearly or according to manufacturer's specifications.

**Table 4.0-1: Test Equipment**

<b>Equipment Calibration Information</b>					
<b>ACS#</b>	<b>Mfg.</b>	<b>Eq. type</b>	<b>Model</b>	<b>S/N</b>	<b>Cal. Due</b>
<input checked="" type="checkbox"/> 25	Chase	Bi-Log Antenna	CBL6111	1043	5/30/07
<input checked="" type="checkbox"/> 152	EMCO	LISN	3825/2	9111-1905	2/8/07
<input checked="" type="checkbox"/> 168	Hewlett Packard	Pulse Limiter	11947A	3107A02268	3/7/07
<input checked="" type="checkbox"/> 165	ACS	Conducted EMI Cable Set	RG8	165	3/07/07
<input checked="" type="checkbox"/> 22	Agilent	Pre-Amplifier	8449B	3008A00526	5/06/07
<input checked="" type="checkbox"/> 73	Agilent	Pre-Amplifier	8447D	272A05624	5/18/07
<input checked="" type="checkbox"/> 30	Spectrum Technologies	Horn Antenna	DRH-0118	970102	5/12/07
<input checked="" type="checkbox"/> 282	Microwave Circuits	High Pass Filter	H3G020G4	74541	3/10/07
<input checked="" type="checkbox"/> 1	Rohde & Schwarz	Receiver Display	804.8932.52	833771/007	3/01/07
<input checked="" type="checkbox"/> 2	Rohde & Schwarz	ESMI Receiver	1032.5640.53	839587/003	3/01/07
<input checked="" type="checkbox"/> 3	Rohde & Schwarz	Receiver Display	804.8932.52	839379/011	11/02/06
<input checked="" type="checkbox"/> 4	Rohde & Schwarz	ESMI Receiver	1032.5640.53	833827/003	11/02/06
<input checked="" type="checkbox"/> 283	Rohde & Schwarz	Spectrum Analyzer	FSP40	100033	3/24/07
<input checked="" type="checkbox"/> 290	Florida RF Labs	HF RF Cable	SMSE-200-72.0-SMRE	NA	5/08/07
<input checked="" type="checkbox"/> 291	Florida RF Labs	HF RF Cable	SMRE-200W-12.0-SMRE	NA	5/08/07
<input checked="" type="checkbox"/> 292	Florida RF Labs	HF RF Cable	SMR-280AW-480.0-SMR	NA	5/24/07
<input checked="" type="checkbox"/> 176	Weinschel	30 dB Attenuator	46-30-34	BN4922	4/28/07
<input checked="" type="checkbox"/> 267	Agilent	Power Meter	N1911A	MY45100129	10/30/06
<input checked="" type="checkbox"/> 268	Agilent	Power Sensor	N1921A	MY45240184	10/10/06
<input checked="" type="checkbox"/> 167	ACS	Chamber EMI Cable Set	RG6	167	1/7/07
<input checked="" type="checkbox"/> 16	ACS	Conducted Emission Cable	Cable	16	5/10/07



5.0 SUPPORT EQUIPMENT

Table 5-3: Support Equipment

Manufacturer	Equipment Type	Model Number	Serial Number	FCC ID
Dell, Inc.	PC	DHM	9TP3M1J	NA
Dell, Inc.	Monitor	E173FPf	CN-OU4941-72872-531-00ML	NA
Dell, Inc.	Keyboard	RT7D20	CN-05N292-37172-4BT-0259	AQ6-7D20
Dell, Inc.	Mouse	M-UVDEL1	HCA50718403	NA
Arris	Cable Modem	WTM552H/CE	67KBN422200026	NA

\* Support equipment listed was used for AC power line conducted emissions testing only. For all other tests the module was stand-alone.

6.0 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

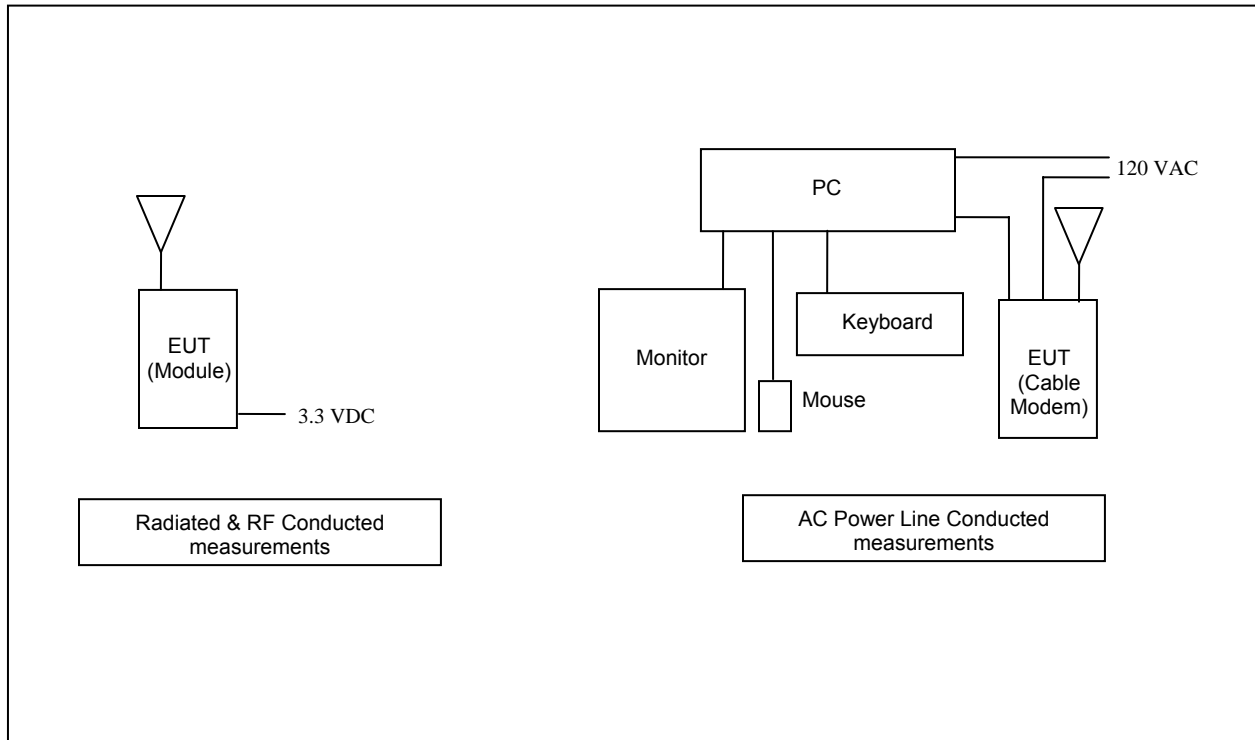


Figure 6-1: EUT Test Setup

\*See Test Setup photographs for additional detail.

**7.0 SUMMARY OF TESTS**

Along with the tabular data shown below, plots were taken of all signals deemed important enough to document.

**7.1 Antenna Requirement - FCC Section 15.203**

The EUT utilizes a detachable antenna and employs a unique antenna connector, reverse SMA. This device meets the requirements of CFR 47 Part 15.203. The antenna gain is 1.8dBi.

**7.2 Power Line Conducted Emissions - FCC Section 15.207**

**7.2.1 Test Methodology**

ANSI C63.4 sections 6 and 7 were the guiding documents for this evaluation. Conducted emissions were performed from 150kHz to 30MHz with the spectrum analyzer’s resolution bandwidth set to 9kHz and the video bandwidth set to 30kHz. The calculation for the conducted emissions is as follows:

**Corrected Reading = Analyzer Reading + LISN Loss + Cable Loss**  
**Margin = Applicable Limit - Corrected Reading**

**7.2.2 Test Results**

Results of the test are shown below in and Tables 7.2-1 through 7.2-4 and Figure 7.2-1 through 7.2-2.

**Table 7.2-1: Line 1 Conducted EMI Results (Quasi-Peak)**

Frequency MHz	Level dBµV	Limit dBµV	Margin dB	Line	PE
0.1800	54.10	64.4	10.2	L1	FLO
0.3600	43.70	58.7	14.9	L1	FLO
0.5400	40.10	56.0	15.8	L1	FLO
1.0140	31.10	56.0	24.9	L1	FLO
1.4580	44.70	56.0	11.2	L1	FLO
2.3520	28.90	56.0	27.0	L1	FLO
3.6180	23.30	56.0	32.7	L1	FLO
10.0380	32.00	60.0	27.9	L1	FLO
14.3880	36.80	60.0	23.1	L1	FLO
18.4860	27.80	60.0	32.2	L1	FLO

**Table 7.2-2: Line 1 Conducted EMI Results (Average)**

Frequency MHz	Level dBµV	Limit dBµV	Margin dB	Line	PE
0.1740	45.50	54.7	9.2	L1	FLO
0.3540	33.80	48.8	15.0	L1	FLO
0.5220	29.60	46.0	16.3	L1	FLO
1.0200	18.30	46.0	27.7	L1	FLO
1.4580	40.50	46.0	5.4	L1	FLO
2.3460	17.50	46.0	28.4	L1	FLO
3.6180	14.10	46.0	31.8	L1	FLO
10.0380	25.80	50.0	24.1	L1	FLO
14.3640	31.80	50.0	18.1	L1	FLO
18.2460	22.30	50.0	27.6	L1	FLO

Table 7.2-3: Line 2 Conducted EMI Results (Quasi-Peak)

Frequency MHz	Level dBµV	Limit dBµV	Margin dB	Line	PE
0.1800	54.50	64.4	9.9	L2	FLO
0.2640	45.90	61.3	15.3	L2	FLO
0.4260	40.70	57.3	16.6	L2	FLO
0.4320	40.10	57.2	17.1	L2	FLO
0.5400	37.50	56.0	18.4	L2	FLO
1.4580	44.10	56.0	11.8	L2	FLO
10.0320	32.90	60.0	27.1	L2	FLO
14.4660	39.70	60.0	20.2	L2	FLO
16.9380	30.50	60.0	29.4	L2	FLO
0.1800	54.50	64.4	9.9	L2	FLO

Table 7.2-4: Line 2 Conducted EMI Results (Average)

Frequency MHz	Level dBµV	Limit dBµV	Margin dB	Line	PE
0.1700	46.80	54.7	7.9	L2	FLO
0.2500	37.20	51.4	14.2	L2	FLO
0.4320	30.60	47.2	16.5	L2	FLO
0.4380	29.90	47.0	17.1	L2	FLO
0.5160	26.70	46.0	19.2	L2	FLO
1.4580	40.80	46.0	5.1	L2	FLO
10.0980	27.80	50.0	22.1	L2	FLO
14.2680	32.90	50.0	17.0	L2	FLO
16.8420	25.00	50.0	24.9	L2	FLO
0.1740	46.80	54.7	7.9	L2	FLO

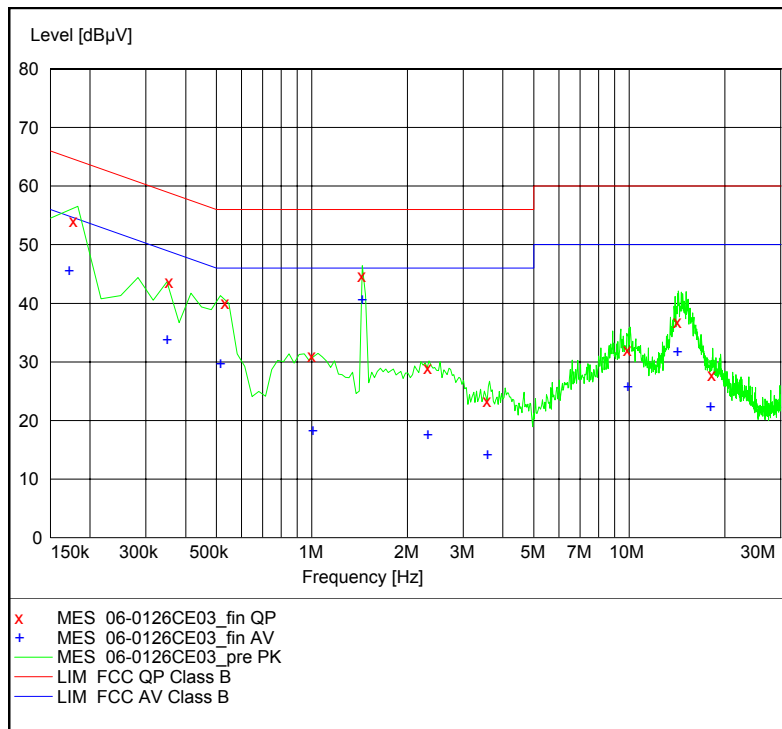


Figure 7.2-1: Conducted Emissions Graph – Line 1

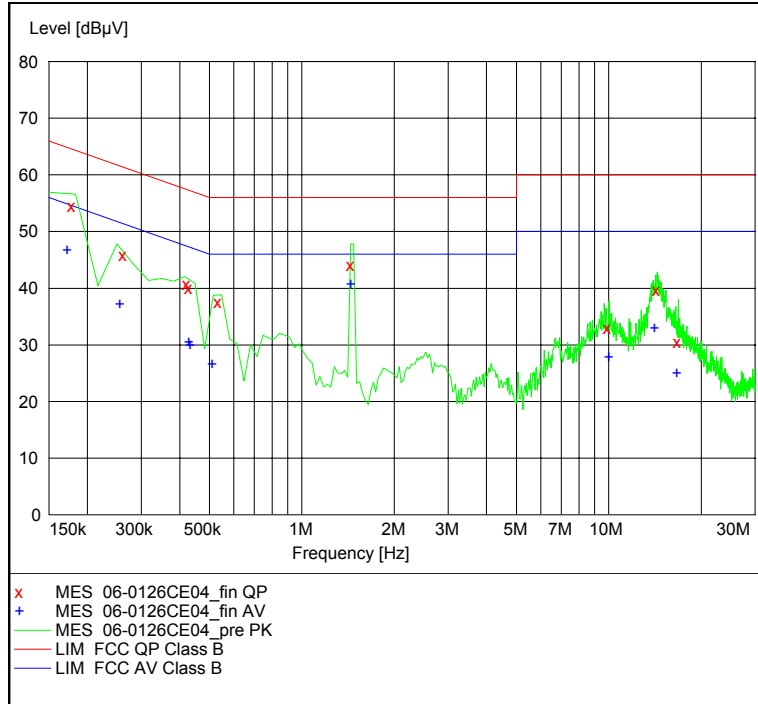


Figure 7.2-2: Conducted Emissions Graph – Line 2

7.3 Radiated Emissions - FCC Section 15.109(Unintentional Radiation)

7.3.1 Test Methodology

Radiated emissions tests were performed over the frequency range of 30MHz to 12.5GHz. Measurements of the radiated field strength were made at a distance of 3m from the boundary of the equipment under test (EUT) and the receiving antenna. The antenna height was varied from 1m to 4m so that the maximum radiated emissions level would be detected. Radiated measurements were made with the Spectrum Analyzer's resolution bandwidth set to 120 KHz for measurements above 30MHz. Average measurements are taken with the RBW and VBW were set to 1MHz and 10 Hz respectively for measurements above 1000MHz.

7.3.2 Test Results

Results of the test are given in Table 7.3-1 below:

Table 7.3-1: Radiated Emissions Tabulated Data

Frequency (MHz)	Level (dBuV)		Antenna Polarity (H/V)	Correction Factors (dB)	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg			pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
32.32	-----	39.6	H	-8.3	-----	31.3	-----	40	-----	8.7
46.16	-----	41.5	V	-15.1	-----	26.4	-----	40.0	-----	13.6
71.44	-----	47.7	H	-20	-----	27.7	-----	40.0	-----	12.3
160	-----	51.6	V	-14.5	-----	37.1	-----	43.5	-----	6.4
800	-----	40.9	V	-0.7	-----	40.2	-----	46.0	-----	5.8
914.72	-----	22.5	V	1.3	-----	23.8	-----	46.0	-----	22.2
915.2	-----	22.3	V	1.4	-----	23.7	-----	46.0	-----	22.3
926.24	-----	22.4	V	1.9	-----	24.3	-----	46.0	-----	21.7
1120	46.83	*	V	-6.56	40.27	*	74.0	54.0	33.73	13.73
1450	52.77	*	V	-4.70	48.07	*	74.0	54.0	25.93	5.93
1759	52.42	*	V	-2.93	49.49	*	74.0	54.0	24.51	4.51
2080	46.40	*	V	-1.26	45.14	*	74.0	54.0	28.86	8.86
3039	42.69	*	V	2.27	44.96	*	74.0	54.0	29.04	9.04
3359	45.16	*	V	3.01	48.17	*	74.0	54.0	25.83	5.83
1119	48.18	*	H	-6.79	41.39	*	74.0	54.0	32.61	12.61
1439	49.80	*	H	-5.05	44.75	*	74.0	54.0	29.25	9.25
1760	46.30	*	H	-3.07	43.23	*	74.0	54.0	30.77	10.77
2079	48.43	*	H	-1.20	47.23	*	74.0	54.0	26.77	6.77

\* Peak emissions above 1GHz meet average limits therefore average measurements were not recorded.

Note: All emissions above 2079 MHz were attenuated below the permissible limit.

7.4 6dB Bandwidth – FCC Section 15.247(a)

7.4.1 Test Methodology

The 6dB bandwidth was measured in accordance with the FCC KDB Publication No. 558074 “Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247)”. The RBW of the spectrum analyzer was set to 100 kHz and VBW 300 kHz. Span was set large enough to capture the entire emissions and >> RBW.

7.4.2 Test Results

Results are shown below in table 7.4.2-1to 7.4.2-1 and figures 7.4.2-1 to 7.4.2-6:

Table 7.4.2-1: 6dB Bandwidth – 802.11b

Frequency [MHz]	Bandwidth [MHz]	Limit
2412	10.24	≥ 500kHz
2437	10.28	≥ 500kHz
2462	10.16	≥ 500kHz

Table 7.4.2-2: 6dB Bandwidth – 802.11g

Frequency [MHz]	Bandwidth [MHz]	Limit
2412	16.60	≥ 500kHz
2437	16.60	≥ 500kHz
2462	16.70	≥ 500kHz

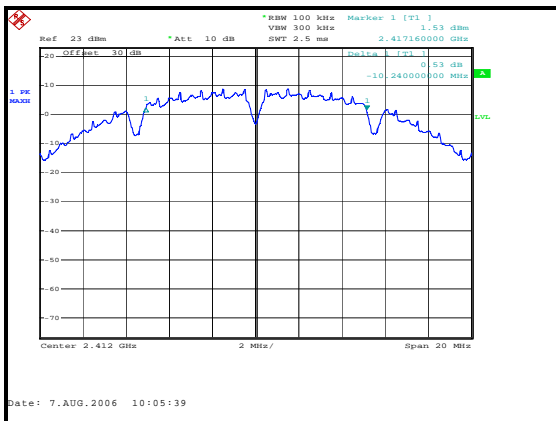


Figure 7.4.2-1: 6dB Bandwidth Plot – Low Channel – 802.11b

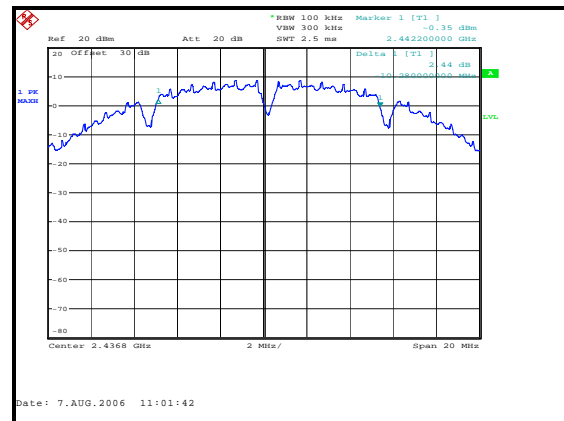


Figure 7.4.2-2: 6dB Bandwidth Plot – Mid Channel – 802.11b

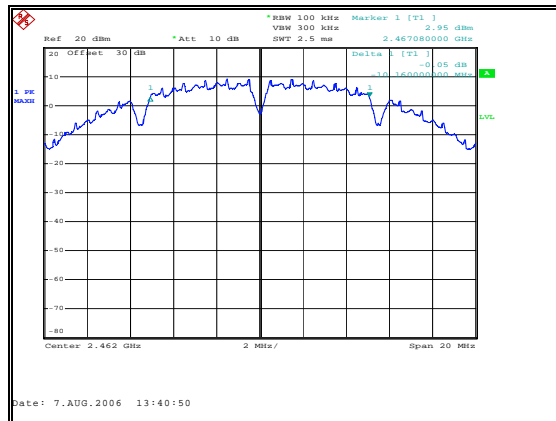


Figure 7.4.2-3: 6dB Bandwidth Plot – High Channel – 802.11b

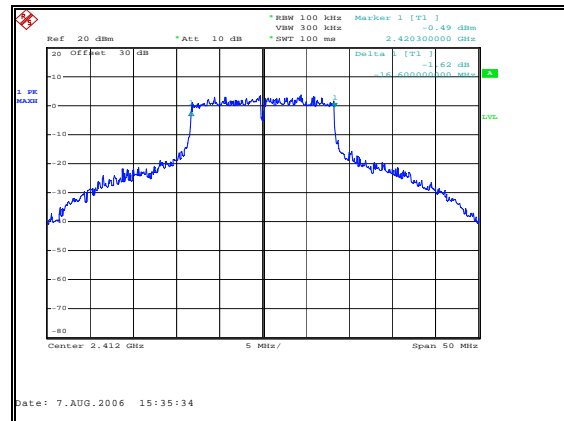


Figure 7.4.2-4: 6dB Bandwidth Plot – Low Channel – 802.11g

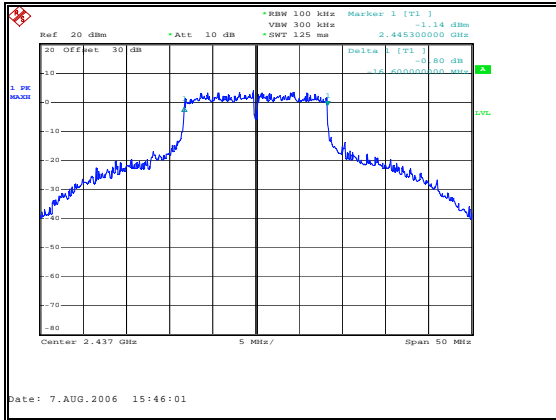


Figure 7.4.2-5: 6dB Bandwidth Plot – Mid Channel – 802.11g

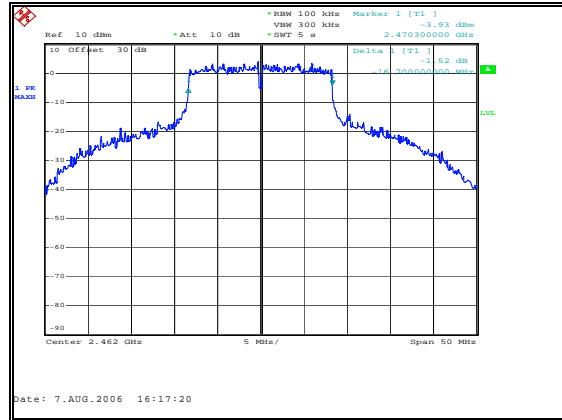


Figure 7.4.2-6: 6dB Bandwidth Plot – High Channel

## 7.5 Peak Output Power Requirement - FCC Section 15.247(b)

### 7.5.1 Test Methodology

The Peak Output Power was measured in accordance with the FCC KDB Publication No. 558074 “Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247)” Power Option 1. The RF output of the equipment under test was directly connected to the input of a wideband peak power meter.

Data was collected with the EUT operating at maximum power.

### 7.5.2 Test Results

Results are shown below in Table 7.5.2-1 and 7.5.2-2.

Table 7.5.2-1: Peak Output Power – 802.11b

Frequency (MHz)	Output Power (dBm)
2412	15.67
2437	16.16
2462	16.24

Table 7.5.2-2: Peak Output Power – 802.11g

Frequency (MHz)	Output Power (dBm)
2412	21.46
2437	21.45
2462	21.56

7.6 Band-Edge Compliance and Spurious Emissions - FCC Section 15.247(d)

7.6.1 Band-Edge Compliance of RF Emissions

7.6.1.1 Test Methodology

The EUT was investigated at the low and high channels of operation to determine band-edge compliance. Because the upper band-edge coincides with a restricted band, band-edge compliance for the upper band-edge was measured as a radiated emission. Band-edge compliance for the upper band-edge is shown in section 7.6.3, Radiated Spurious Emissions.

The lower band-edge compliance was determined using the marker-delta method in which the radio frequency power that is produced by the EUT is at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of desired power.

7.6.1.2 Test Results

Band-edge compliance for the lower band-edge is displayed in Figures 7.6.1.2-1 – 7.6.1.2-2.

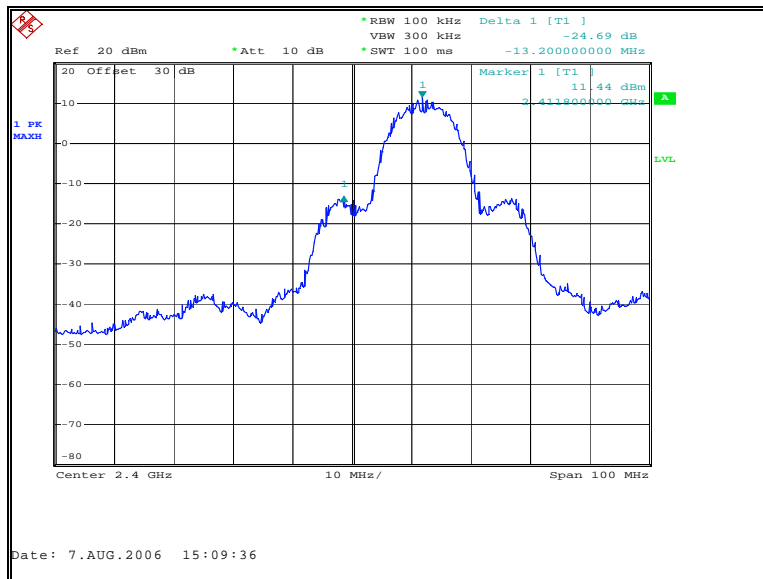


Figure 7.6.1.2-1: Lower Band-edge – 802.11b

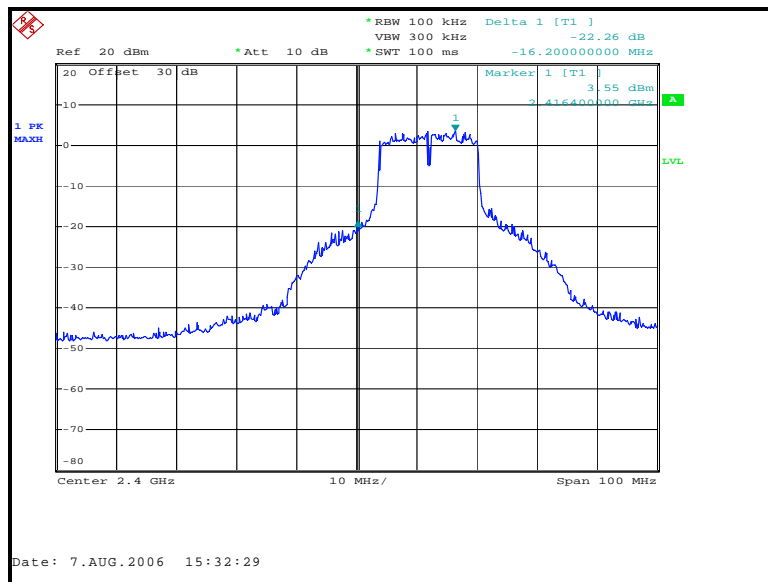


Figure 7.6.1.2-2: Lower Band-edge – 802.11g

## 7.6.2 RF Conducted Spurious Emissions

### 7.6.2.1 Test Methodology

The RF Conducted Spurious Emissions were measured in accordance with the FCC KDB Publication No. 558074 "Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247)". The RF output of the equipment under test was directly connected to the input of the Spectrum Analyzer. The EUT was investigated for conducted spurious emissions from 30MHz to 25GHz, 10 times the highest fundamental frequency. For each measurement, the spectrum analyzer's RBW was set to 100 kHz and the VBW was set to 300 kHz. The peak detector and Max Hold function of the analyzer were utilized.

### 7.6.2.2 Test Results

In a 100 kHz bandwidth, the radio frequency power that was produced by the EUT emissions is at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of desired power. RF Conducted Emissions are displayed in Figures 7.6.2.2-1 through 7.6.2.2-12.

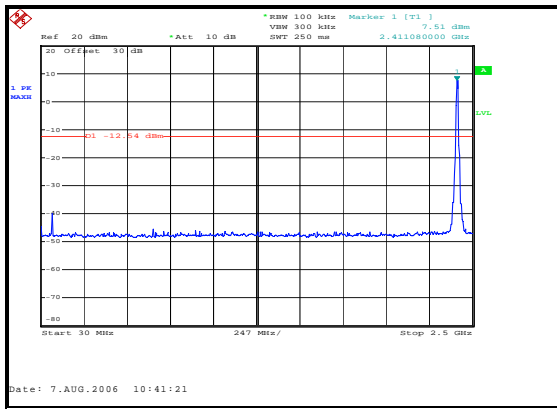


Figure 7.6.2.2-1: 30 MHz – 2.6 GHz – Low Channel – 802.11b

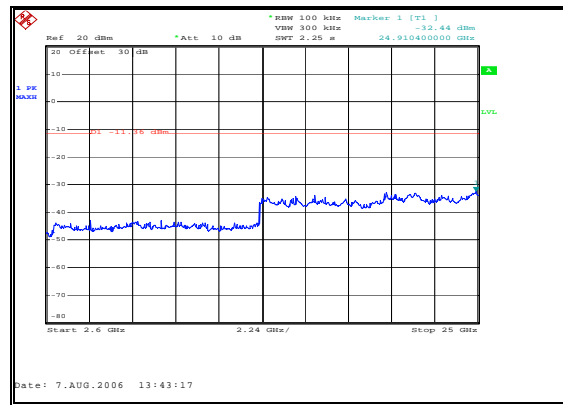


Figure 7.6.2.2-2: 2.6 GHz – 25 GHz – Low Channel – 802.11b

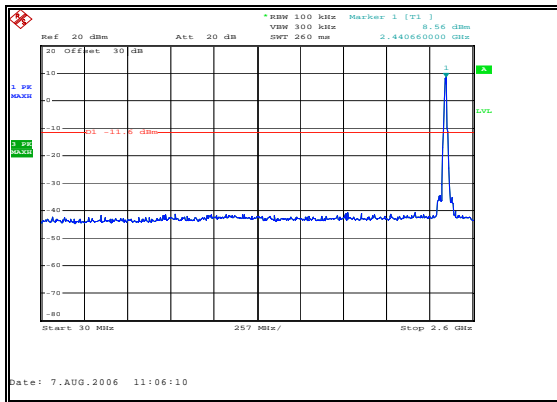


Figure 7.6.2.2-3: 30 MHz – 2.6 GHz – Mid Channel – 802.11b

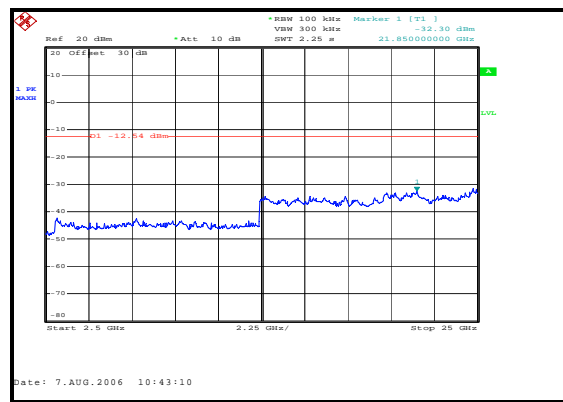


Figure 7.6.2.2-4: 2.6 GHz – 25 GHz – Mid Channel – 802.11b

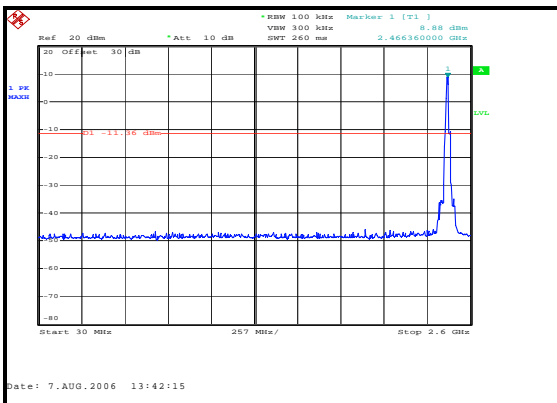


Figure 7.6.2.2-5: 30 MHz – 2.6 GHz – High Channel – 802.11b

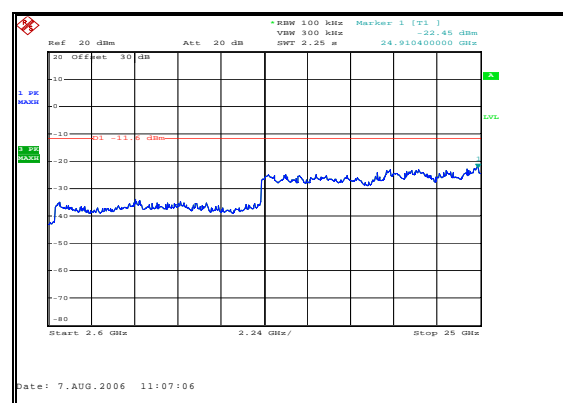


Figure 7.6.2.2-6: 2.6 GHz – 25 GHz – High Channel – 802.11b



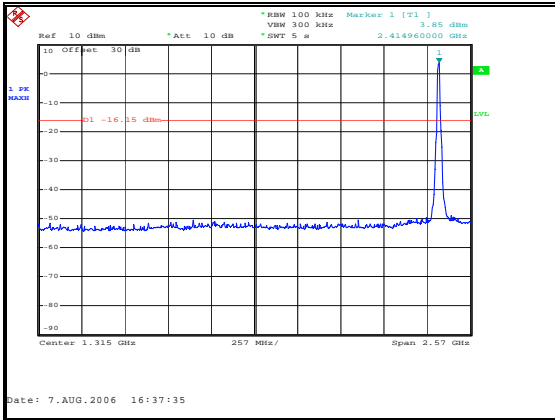


Figure 7.6.2.2-7: 30 MHz - 2.6 GHz - Low Channel - 802.11g

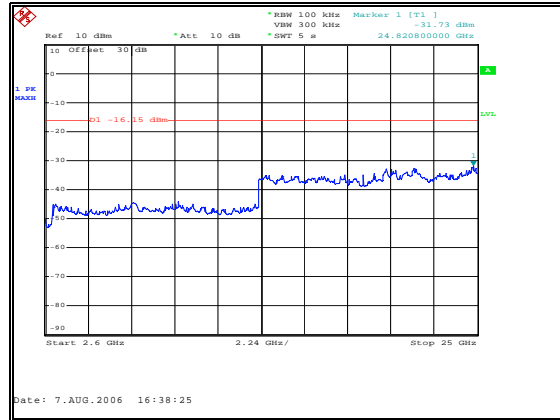


Figure 7.6.2.2-8: 2.6 GHz - 25 GHz - Low Channel - 802.11g

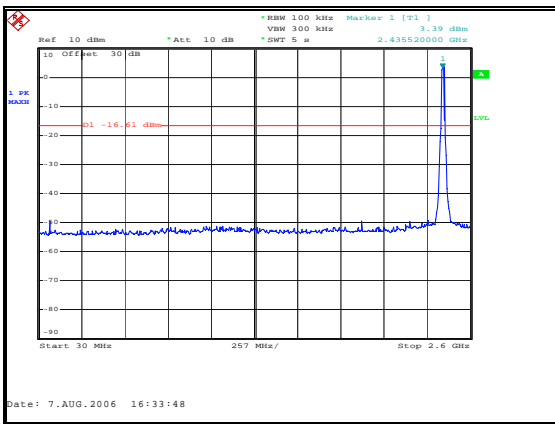


Figure 7.6.2.2-9: 30 MHz - 2.6 GHz - Mid Channel - 802.11g

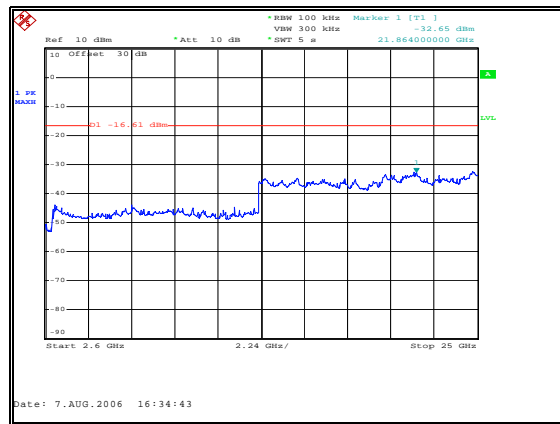


Figure 7.6.2.2-10: 2.6 GHz - 25 GHz - Mid Channel - 802.11g

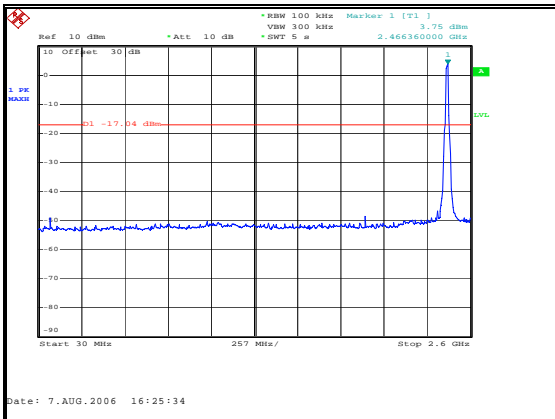


Figure 7.6.2.2-11: 30 MHz - 2.6 GHz - High Channel - 802.11g

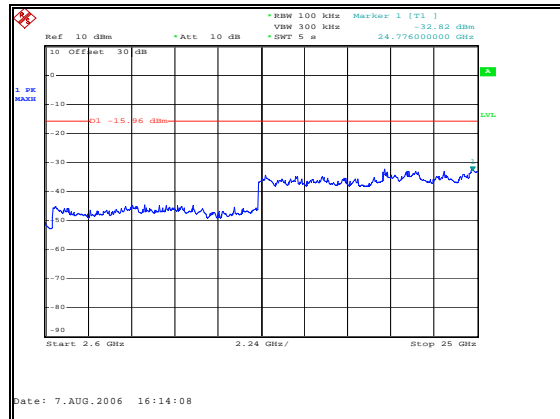


Figure 7.6.2.2-12: 2.6 GHz - 25 GHz - High Channel - 802.11g

### 7.6.3 Radiated Spurious Emissions (Restricted Bands) - FCC Section 15.205

#### 7.6.3.1 Test Methodology

Radiated emissions tests were made over the frequency range of 30MHz to 25GHz, 10 times the highest fundamental frequency.

The EUT was rotated through 360° and the receive antenna height was varied from 1m to 4m so that the maximum radiated emissions level would be detected. For frequencies below 1000MHz, quasi-peak measurements were made using a resolution bandwidth RBW of 120 kHz and a video bandwidth VBW of 300 kHz. For frequencies above 1000MHz, peak measurements made with RBW and VBW of 1 MHz. Average measurements were made with RBW of 1MHz and a VBW of 10Hz.

#### 7.6.3.2 Test Results

Using the procedures set forth in the FCC KDB Publication No. 558074 "Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247)", radiated spurious emissions found in the band of 30MHz to 25GHz are reported in Table 7.6.3.3-1 to 7.6.3.3-2. Each emission found to be in a restricted band as defined by section 15.205, was compared to the radiated emission limits as defined in section 15.209.

**Table 7.6.3.2-1: Radiated Spurious Emissions – 802.11b**

Frequency (MHz)	Level (dBuV)		Antenna Polarity (H/V)	Correction Factors (dB)	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Avg			pk	Avg	pk	Avg	pk	Avg
<b>Spurious Emissions - Low Channel</b>										
4824	44.90	32.20	H	7.80	52.70	40.00	74.0	54.0	21.30	14.00
4824	49.77	42.46	V	7.96	57.73	50.42	74.0	54.0	16.27	3.58
<b>Spurious Emissions - Mid Channel</b>										
4874	43.81	31.36	H	7.96	51.77	39.32	74.0	54.0	22.23	14.68
4874	47.34	40.12	V	8.13	55.47	48.25	74.0	54.0	18.53	5.75
<b>Spurious Emissions - High Channel</b>										
2483.5	45.04	31.48	H	0.55	45.59	32.03	74.0	54.0	28.41	21.97
2483.5	50.40	37.43	V	0.16	50.56	37.59	74.0	54.0	23.44	16.41
4924	44.90	30.65	H	8.11	53.01	38.76	74.0	54.0	20.99	15.24
4924	49.24	40.78	V	8.30	57.54	49.08	74.0	54.0	16.46	4.92

**Table 7.6.3.2-2: Radiated Spurious Emissions – 802.11g**

Frequency (MHz)	Level (dBuV)		Antenna Polarity (H/V)	Correction Factors (dB)	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Avg			pk	Avg	pk	Avg	pk	Avg
<b>Spurious Emissions - High Channel</b>										
2483.5	59.77	37.12	H	0.55	60.32	37.67	74.0	54.0	13.68	16.33
2483.5	67.77	47.71	V	0.16	67.93	47.87	74.0	54.0	6.07	6.13

**7.6.3.3 Sample Calculation:**

$$R_C = R_U + CF_T$$

Where:

- CF<sub>T</sub> = Total Correction Factor (AF+CA+AG)-DC (Average Measurements Only)
- R<sub>U</sub> = Uncorrected Reading
- R<sub>C</sub> = Corrected Level
- AF = Antenna Factor
- CA = Cable Attenuation
- AG = Amplifier Gain
- DC = Duty Cycle Correction Factor

**Example Calculation: Peak**

Corrected Level: 44.80+ 7.80= 52.70dBuV/m  
 Margin: 74dBuV/m – 52.70dBuV/m = 21.30dB

**Example Calculation: Average**

Corrected Level: 32.20+ 7.80-0= 40.0dBuV  
 Margin: 54dBuV – 40.00dBuV = 14.00dB

**7.7 Peak Power Spectral Density- FCC Section 15.247(d)**

**7.7.1 Test Methodology**

The power spectral density was measured in accordance with the FCC KDB Publication No. 558074 “Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247)”. The emission peaks within the pass band were located and zoomed in on. The spectrum analyzer RBW was set to 3 kHz and VBW 10 kHz. Span was adjusted to 500 kHz and the sweep time was calculated to be >168s (Span/3 kHz).

**7.7.2 Test Results**

Results are shown below in table 7.7.2-1 to 7.7.2-2 and figures 7.7.2-1 – 7.7.2-6:

**Table 7.7.2-1: Peak Power Spectral Density – 802.11b**

Frequency [MHz]	Level [dBm]	Limit [dBm]
2412	-11.52	8
2437	-11.83	8
2462	-10.79	8

**Table 7.7.2-2: Peak Power Spectral Density – 802.11g**

Frequency [MHz]	Level [dBm]	Limit [dBm]
2412	-15.12	8
2437	-15.07	8
2462	-14.22	8

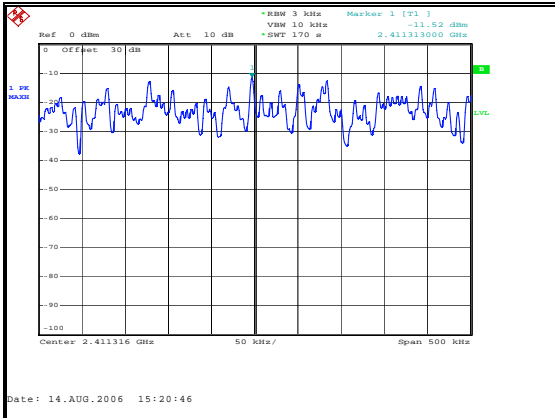


Figure 7.7.2-1: Power Spectral Density Plot – Low Channel – 802.11b

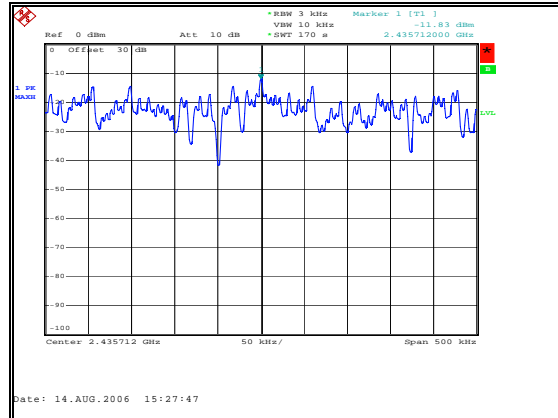


Figure 7.7.2-2: Power Spectral Density Plot – Mid Channel – 802.11b

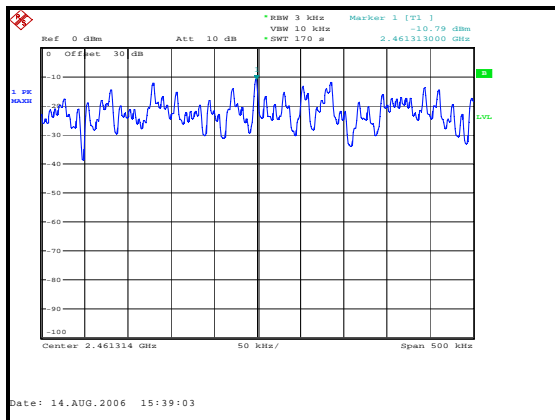


Figure 7.7.2-3: Power Spectral Density Plot – High Channel – 802.11b

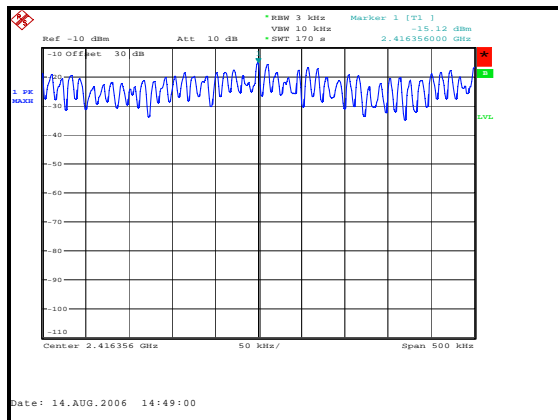


Figure 7.7.2-4: Power Spectral Density Plot – Low Channel – 802.11g

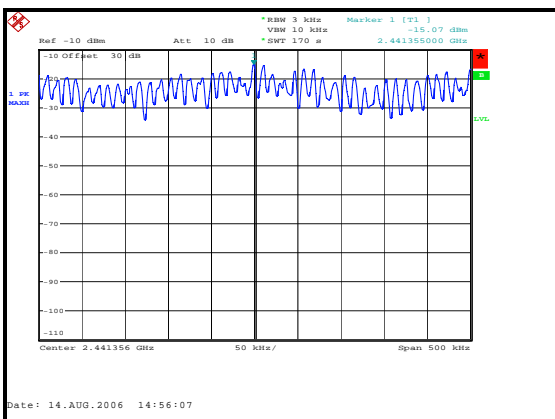


Figure 7.7.2-5: Power Spectral Density Plot – Mid Channel – 802.11g

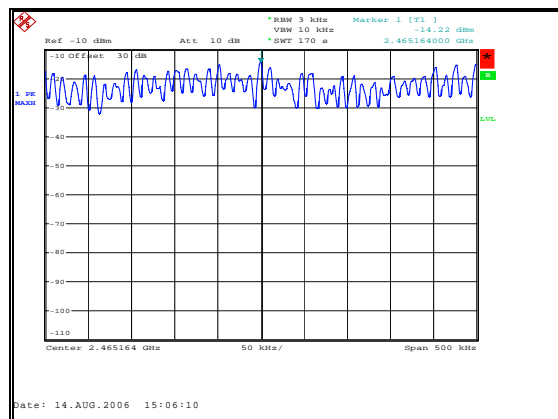


Figure 7.7.2-6: Power Spectral Density Plot – High Channel – 802.11g

### 8.0 CONCLUSION

In the opinion of ACS, Inc. the TM552 WRM, manufactured by SerComm meets the requirements of FCC Part 15 subpart C.

## END REPORT