

Certification Test Report

**FCC ID: SNA-M7
IC: 9458A-M7**

**FCC Rule Part: 15.247
IC Radio Standards Specification: RSS-210**

ACS Report Number: 12-2125.W06.1A

**Manufacturer: Woodstream Corporation
Model: M7**

**Test Begin Date: September 21, 2012
Test End Date: October 15, 2012**

Report Issue Date: October 22, 2012



FOR THE SCOPE OF ACCREDITATION UNDER CERTIFICATE NUMBER AT-1533

This report must not be used by the client to claim product certification, approval, or endorsement by ACCLASS, ANSI, or any agency of the Federal Government.

Project Manager:

A handwritten signature in black ink, appearing to read "Thierry Jean-Charles".

**Thierry Jean-Charles
EMC Technician
Advanced Compliance Solutions, Inc.**

Reviewed by:

A handwritten signature in black ink, appearing to read "Kirby Munroe".

**Kirby Munroe
Director, Wireless Certifications
Advanced Compliance Solutions, Inc.**

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This report contains 31 pages

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1 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 and Industry Canada's Radio Standards Specification RSS-210.

1.2 Product description

The M7 is a USB wireless bridge for wireless communication with wireless Mouse and Rat Trap. The M has an IEEE 802.15.4 compliant transceiver.

Technical Information:

Band of Operation: 2405 MHz - 2480 MHz
Number of Channels: 16
Modulation Format: O-QPSK
Antenna Type/Gain: Surface Mount Chip Antenna, -0.8 dBi
Operating Voltage: USB Port, 5.0 VDC

Manufacturer Information:

Woodstream Corporation
69 N. Locust Street
Lititz, PA 17543

Test Sample Serial Number(s): 43E3 (Radiated), 43E5 (RF Conducted)

Test Sample Condition: The unit was in good operating condition with no physical damages.

1.3 Test Methodology and Considerations

The M7 unit was powered via the laptop USB port.

For the radiated emissions evaluation, preliminary measurements were performed for the unit set in two orthogonal orientations corresponding to the vertical and horizontal USB ports. For the final measurements the unit was set in the orientation leading to the highest emissions. The RF conducted measurements were performed with the unit modified to provide an SMA connector at the RF port.

The unit was programmed using the Synapse Portal software. The power settings used during testing are:

2405 MHz - 8
2440 MHz - 8
2480 MHz - 15

The evaluation for the unintentional emissions is documented separately in a Declaration of Conformity/Verification Report.

2 TEST FACILITIES

2.1 Location

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

Advanced Compliance Solutions, Inc.
3998 FAU Blvd, Suite 310
Boca Raton, Florida 33431
Phone: (561) 961-5585
Fax: (561) 961-5587
www.acstestlab.com

FCC Test Firm Registration #: 587595
Industry Canada Lab Code: 4175C

2.2 Laboratory Accreditations/Recognitions/Certifications

ACS is accredited to ISO/IEC 17025 by ANSI-ASQ National Accreditation Board under their ACLASS program and has been issued certificate number AT-1533 in recognition of this accreditation. Unless otherwise specified, all test methods described within this report are covered under the ISO/IEC 17025 scope of accreditation.

2.3 Radiated & Conducted Emissions Test Site Description

2.3.1 Semi-Anechoic Chamber Test Site

The EMC radiated test facility consists of an RF-shielded enclosure. The interior dimensions of the indoor semi-anechoic chamber are approximately 48 feet (14.6 m) long by 36 feet (10.8 m) wide by 24 feet (7.3 m) high and consist of rigid, 1/8 inch (0.32 cm) steel-clad, wood core modular panels with steel framing. In the shielded enclosure, the faces of the panels are galvanized and the chamber is self-supporting. 8-foot RF absorbing cones are installed on 4 walls and the ceiling. The steel-clad ground plane is covered with vinyl floor.

The turntable is driven by pneumatic motor, which is capable of supporting a 2000 lb. load. The turntable is flushed with the chamber floor which it is connected to, around its circumference, with a continuous metallic loaded spring. An EMCO Model 1050 Multi-device Controller controls the turntable position.

A pneumatic motor is used to control antenna polarizations and height relative to the ground. The height information is displayed on the control unit EMCO Model 1050.

The control room is an RF shielded enclosure attached to the semi-anechoic chamber with two bulkhead panels for connecting RF, and control cables. The dimension of the room is 7.3 m x 4.9 m x 3 m high and the entrance doors of both control and conducted rooms are 3 feet (0.91 m) by 7 feet (2.13 m).

A diagram of the Semi-Anechoic Chamber Test Site is shown in Figure 2.3.1-1 below:

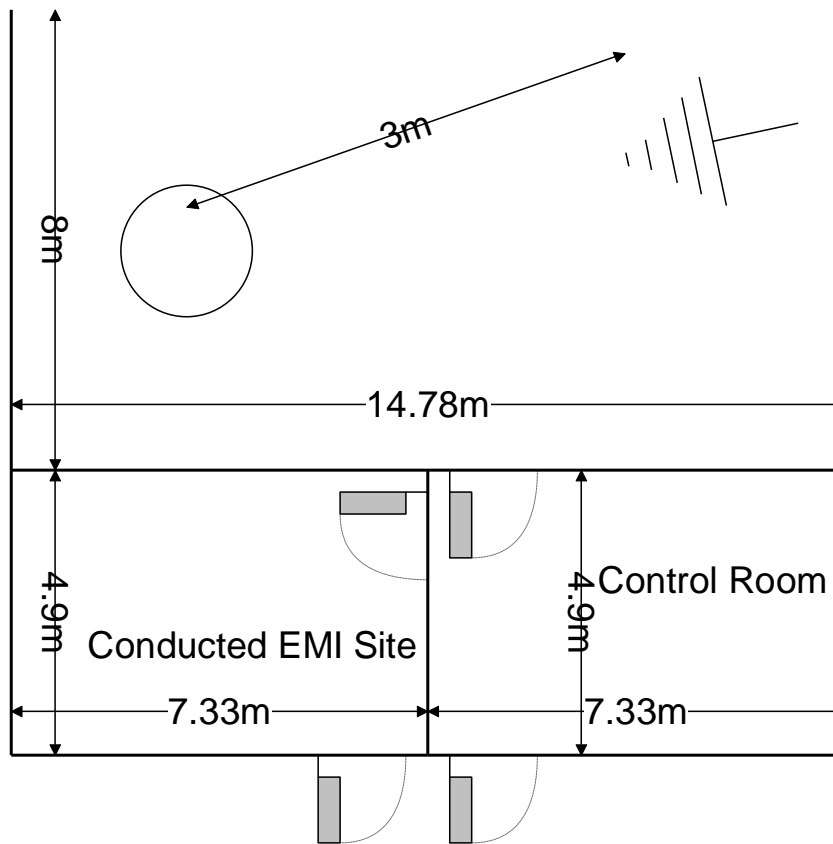
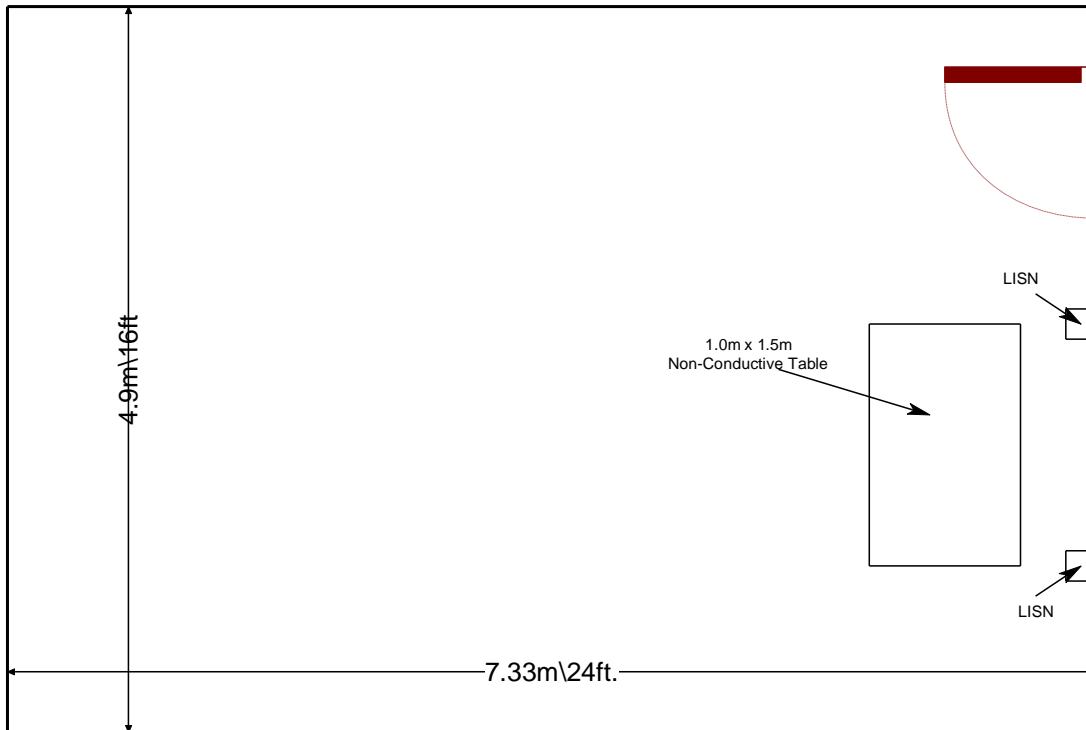


Figure 2.3.1-1: Semi-Anechoic Chamber Test Site

2.3.2 Conducted Emissions Test Site Description

The dimensions of the shielded conducted room are 7.3 x 4.9 x 3 m³. As per ANSI C63.4 2003 requirements, the data were taken using two LISNs; a Solar Model 8028-50 50 Ω/50 μH and an EMCO Model 3825, which are installed as shown in Photograph 3. For 220 V, 50 Hz, a Polarad LISN (S/N 879341/048) is used in conjunction with a 1 kVA, 50 Hz/220 V EDGAR variable frequency generator, Model 1001B, to filter conducted noise from the generator.

A diagram of the room is shown below in figure 2.3.2-1:



2.3.2-1: AC Mains Conducted EMI Site

Figure

3 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, 2012
- ❖ US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2012
- ❖ KDB Publication No. 558074 – Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247, January 2012.
- ❖ Industry Canada Radio Standards Specification: RSS-210 - Low-power License-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment, Issue 8, December 2010.
- ❖ Industry Canada Radio Standards Specification: RSS-GEN – General Requirements and Information for the Certification of Radiocommunication Equipment, Issue 3, December 2010.

4 LIST OF TEST EQUIPMENT

The calibration interval of test equipment is annually or the manufacturer's recommendations. Where the calibration interval deviates from the annual cycle based on the instrument manufacturer's recommendations, it shall be stated below.

Table 4-1: Test Equipment

AssetID	Manufacturer	Model #	Equipment Type	Serial #	Last Calibration Date	Calibration Due Date
523	Agilent	E7405	Spectrum Analyzers	MY45103293	1/5/2011	1/5/2013
524	Chase	CBL6111	Antennas	1138	1/7/2011	1/7/2013
2006	EMCO	3115	Antennas	2573	3/2/2011	3/2/2013
2008	COM-Power	AH-826	Antennas	81009	NCR	NCR
2011	Hewlett-Packard	HP 8447D	Amplifiers	2443A03952	1/2/2012	1/2/2013
2022	EMCO	LISN3825/2R	LISN	1095	8/19/2011	8/19/2013
2037	ACS Boca	Chamber EMI Cable Set	Cable Set	2037	1/2/2012	1/2/2013
2044	QMI	N/A	Cables	2044	1/2/2012	1/2/2013
2045	ACS Boca	Conducted Cable Set	Cable Set	2045	1/2/2012	1/2/2013
2064	CIR Q-TEL	FHT/22-10K-13/50-3A/3A	Filter	9	12/30/2011	12/30/2012
2070	Mini Circuits	VHF-8400+	Filter	2070	1/19/2012	1/19/2013
2072	Mini Circuits	VHF-3100+	Filter	30737	1/19/2012	1/19/2013
2075	Hewlett Packard	8495B	Attenuators	2626A11012	1/2/2012	1/2/2013
2076	Hewlett Packard	HP5061-5458	Cables	2076	1/2/2012	1/2/2013
2082	Teledyne Storm Products	90-010-048	Cables	2082	5/31/2012	5/31/2013
2086	Merrimac	FAN-6-10K	Attenuators	23148-83-1	12/30/2011	12/30/2012
2089	Agilent Technologies, Inc.	83017A	Amplifiers	3123A00214	12/22/2011	12/22/2012
2091	Agilent Technologies, Inc.	8573A	Spectrum Analyzers	2407A03233	12/12/2011	12/12/2013
2095	ETS Lindgren	TILE4! - Version 4.2.A	Software	85242	NCR	NCR

NCR=No Calibration Required

5 SUPPORT EQUIPMENT

Table 5-1: EUT and Support Equipment

Item #	Type Device	Manufacturer	Model/Part #	Serial #
1	USB Dongle (EUT)	Woodstream	M7	43E3, 43E5
2	Laptop	DELL	Latitude D620	CN-0TD761-12961-68G-3106
3	19.5 VDC Power Supply	DELL	PA-1650-05D2	CN-0F7970-71615-54P-C958
4	Mouse	DELL	M-UAR DEL7	LZ9440C43W5

Table 5-2: Cable Description

Cable #	Cable Type	Length	Shield	Termination
A	USB	1.8m	No	Mouse to Laptop
B	Power	1.83m	No	Power Supply to Laptop
C	Power	0.9m	No	Power Supply to AC Mains
D	Serial	1.83m	No	None

6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

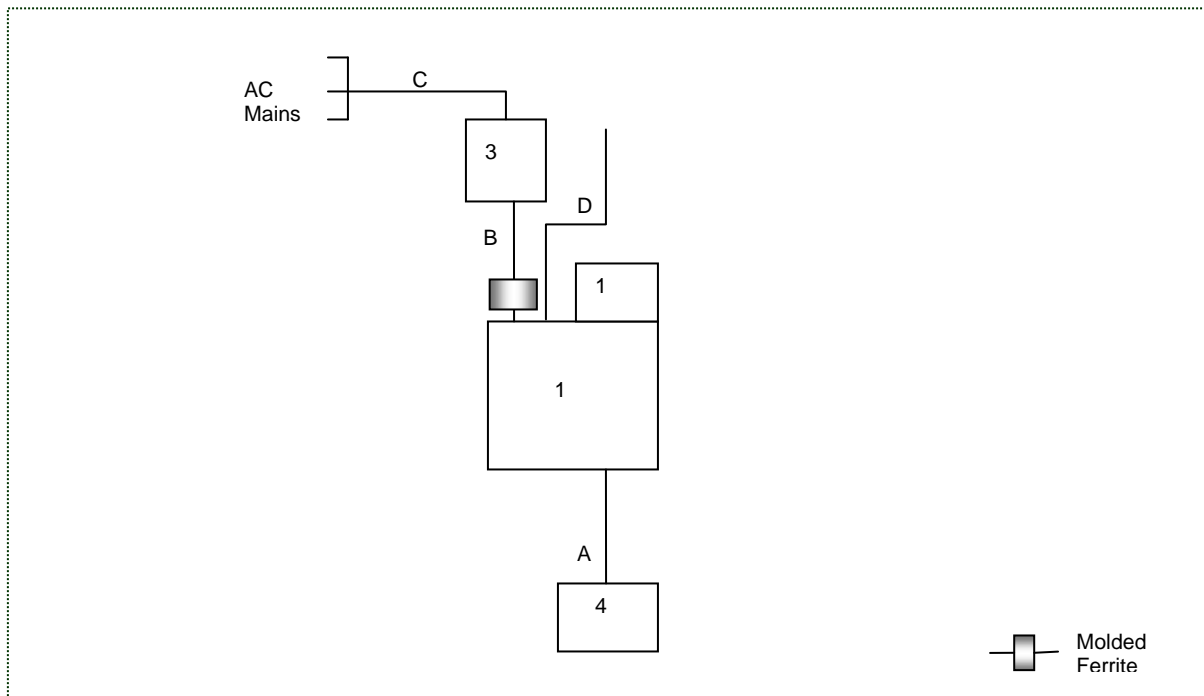


Figure 6-1: Test Setup

7 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 antenna of the device is a -0.8 dBi surface mount chip antenna that is soldered to the PCB, thus meeting the requirements of Section 15.203.

7.2 6 dB Bandwidth - FCC: Section 15.247(a)(2) 99% Bandwidth IC: RSS-210 A8.2(a)

7.2.1 Measurement Procedure

The 6dB bandwidth was measured in accordance with the FCC KDB Publication No. 558074 “Guidance for Performing Compliance Measurements on Digital Transmission Systems (47 CFR 15.247)”. The RBW of the spectrum analyzer was set to 30 kHz and VBW 100 kHz. Span was set large enough to capture the entire emissions and >> RBW.

The 99% occupied bandwidth was measured with the spectrum analyzer span set to fully display the emission, including the emissions skirts. The RBW was to 1% of the span. The occupied 99% bandwidth was measured by using a delta marker at the lower and upper frequencies leading to 0.5% of the total power.

7.2.2 Measurement Results

Results are shown below.

Table 7.2.2-1: 6dB / 99% Bandwidth

Frequency [MHz]	6dB Bandwidth [kHz]	99% Bandwidth (kHz)
2405	1580	2450
2440	1545	2500
2480	1710	2550

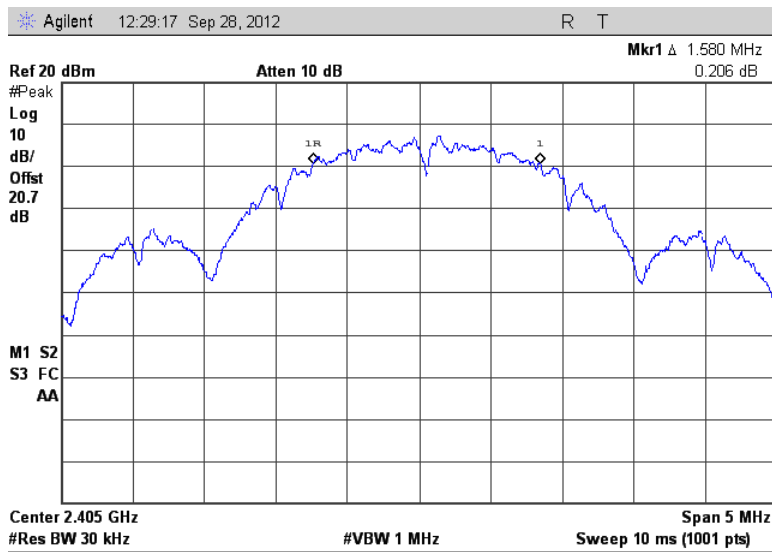


Figure 7.2.2-1: 6dB BW - Low Channel

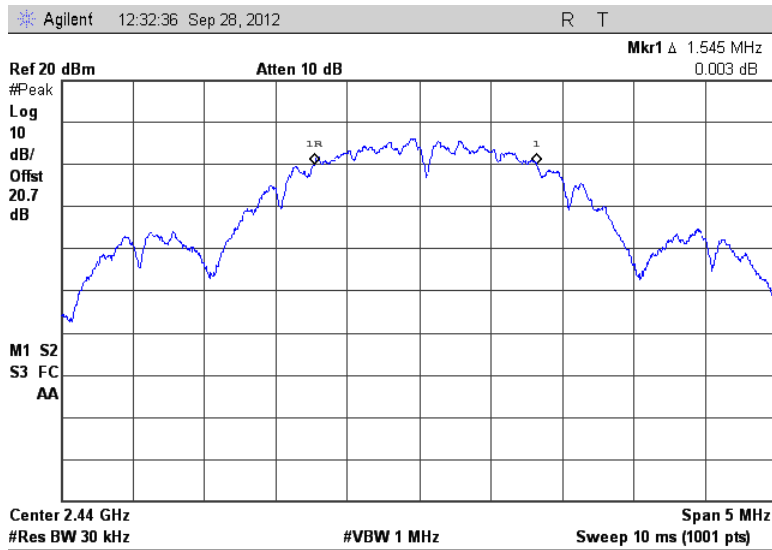


Figure 7.2.2-2: 6dB BW - Middle Channel

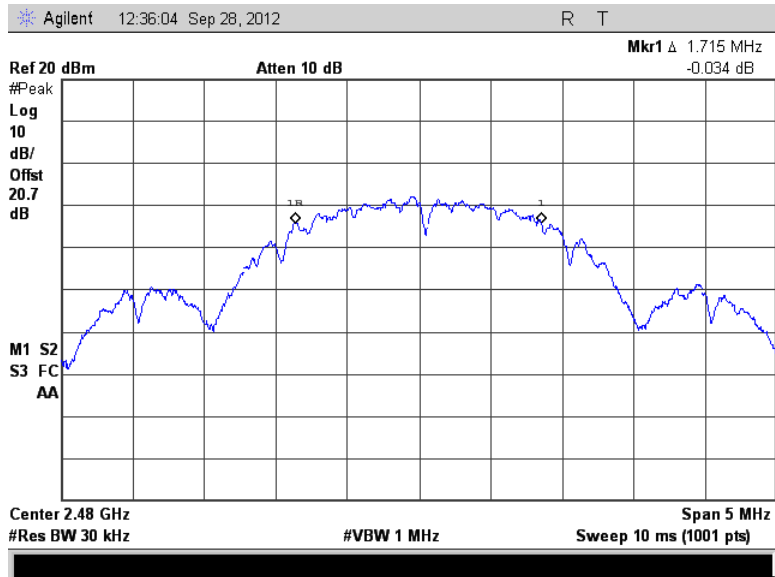


Figure 7.2.2-3: 6dB BW - High Channel

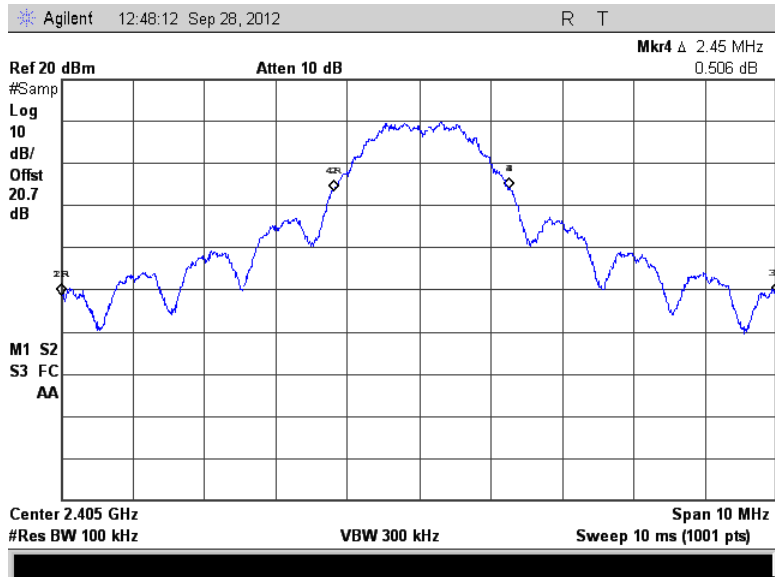


Figure 7.2.2-4: 99% OBW - Low Channel

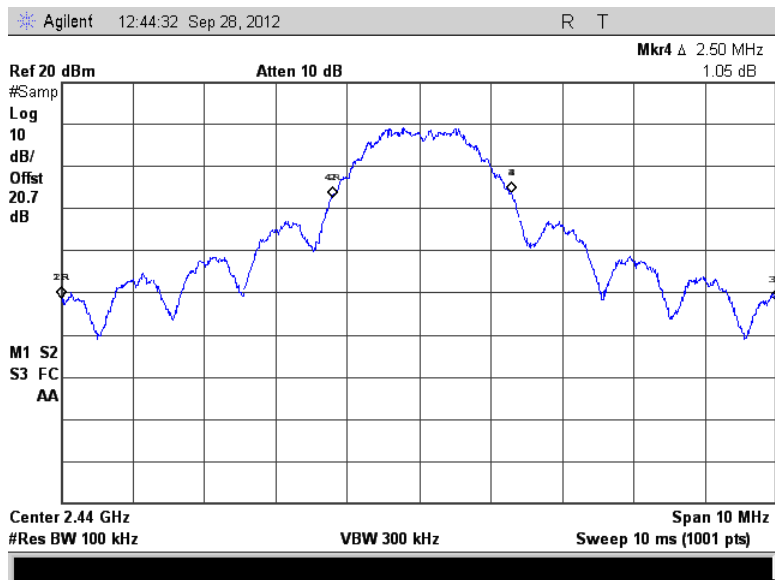


Figure 7.2.2-5: 99% OBW - Middle Channel

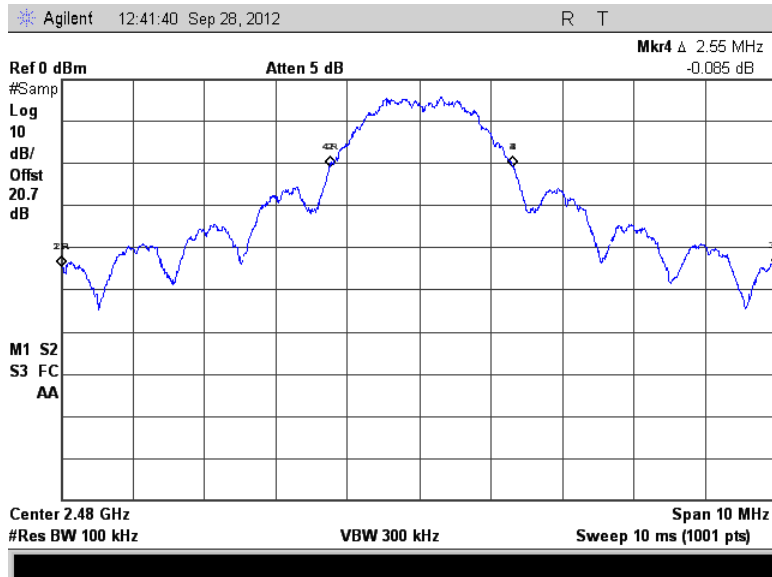


Figure 7.2.2-6: 99% OBW - High Channel

7.3 Peak Output Power - FCC Section 15.247(b)(3) IC: RSS-210 A8.4(4)

7.3.1 Measurement Procedure (Conducted Method)

The Peak Output Power was measured in accordance with the FCC KDB Publication No. 558074 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (47 CFR 15.247)" Measurement Procedure PK2. The RF output of the equipment under test was connected to the input of the Spectrum Analyzer via 20 dB of attenuation. Data was collected with the EUT operating at maximum power per channelization.

7.3.2 Measurement Results

Results are shown below.

Table 7.3.2-1: RF Output Power

Frequency [MHz]	Level [dBm]
2405	15.98
2440	15.26
2480	2.13

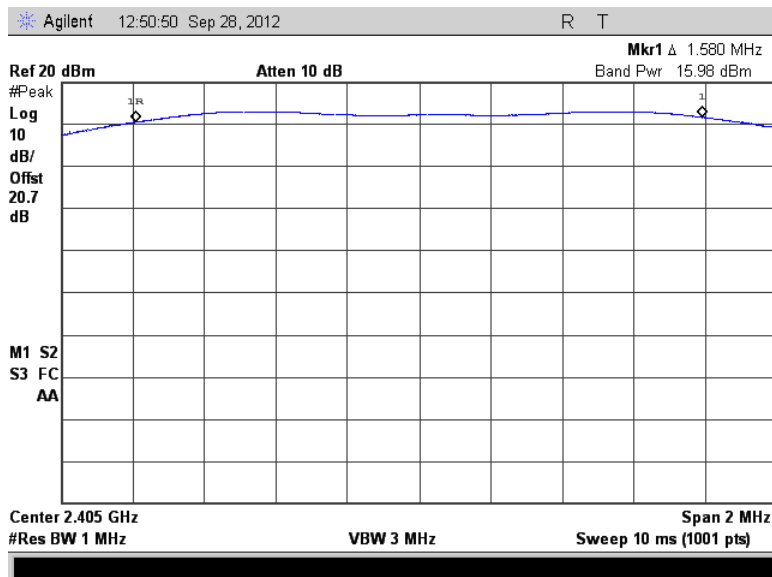


Figure 7.3.2-1: RF Output Power - Low Channel

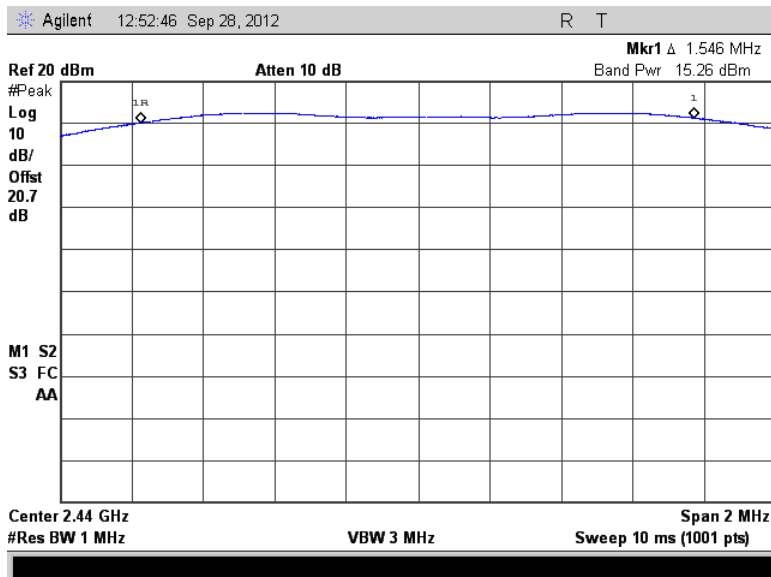


Figure 7.3.2-2: RF Output Power - Middle Channel

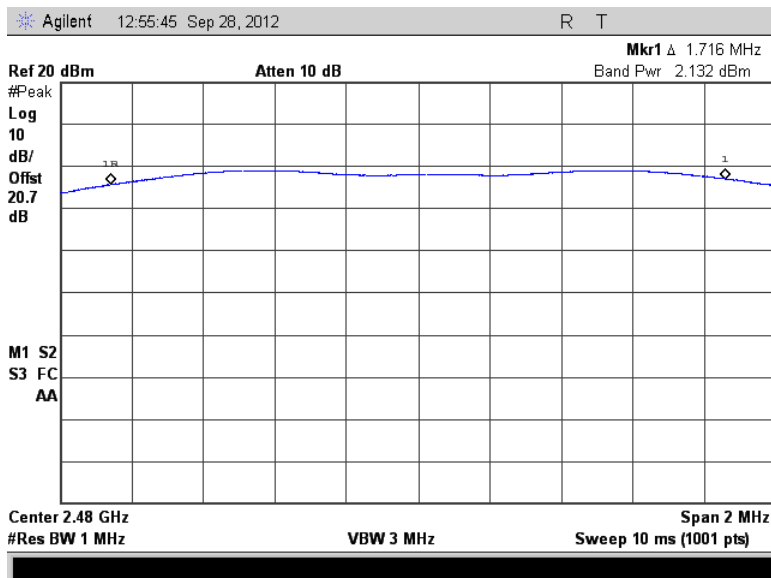


Figure 7.3.2-3: RF Output Power - High Channel

7.4 Band-Edge Compliance and Spurious Emissions-FCC 15.247(d) IC:RSS-210 A8.5

7.4.1 Band-Edge Compliance of RF Conducted Emissions

7.4.1.1 Measurement Procedure

The RF output port of the EUT was directly connected to the input of the spectrum analyzer via suitable attenuation. The EUT was investigated at the lowest and highest channel available to determine band-edge compliance. For each measurement the spectrum analyzer's RBW was set to 100 kHz, and the VBW was set to 300 kHz.

7.4.1.2 Measurement Results

Results are shown below.

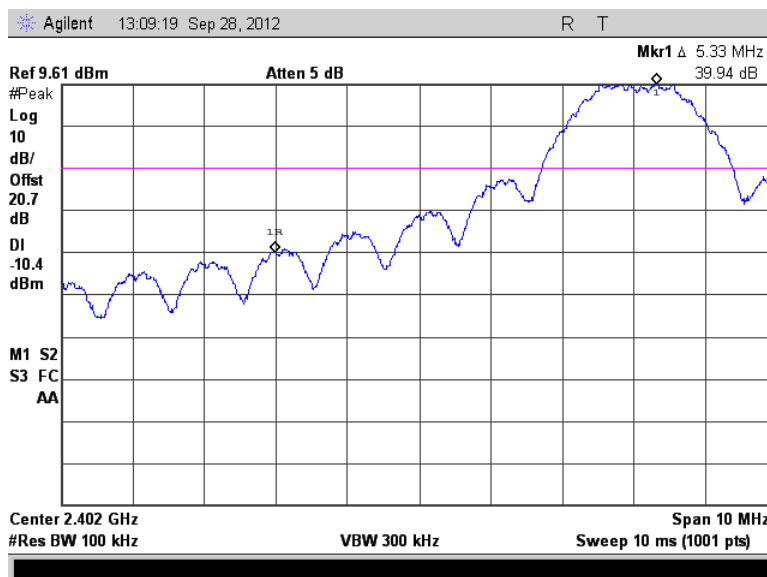


Figure 7.4.1.2-1: Lower Band-edge

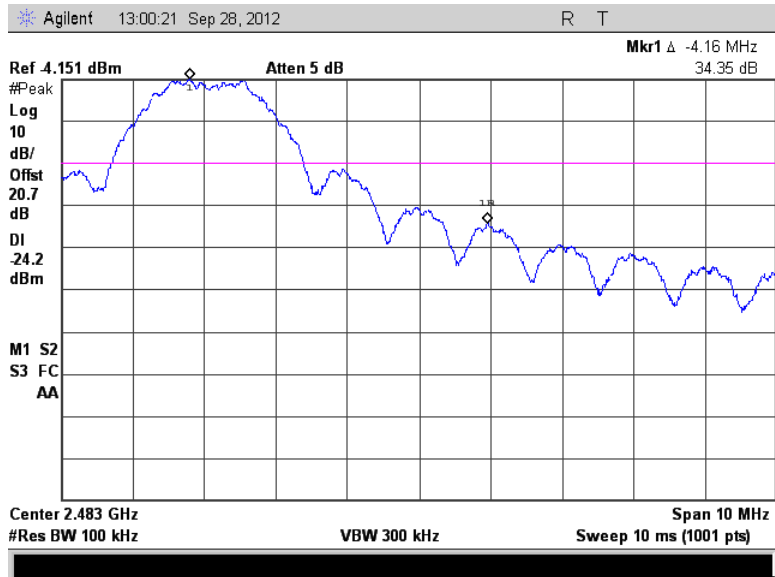


Figure 7.4.1.2-2: Upper Band-edge

7.4.2 RF Conducted Spurious Emissions

7.4.2.1 Measurement Procedure

The RF Conducted Spurious Emissions were measured in accordance with the FCC KDB Publication No. 558074 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (47 CFR 15.247)". The RF output port 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 26 GHz, 10 times the highest fundamental frequency. Measurements were made at the low, center and high channels of the EUT. For each measurement, the spectrum analyzer's RBW was set to 100 kHz and the VBW was set to 300 kHz. The peak Max Hold function of the analyzer was utilized.

7.4.2.2 Measurement Results

Results are shown below.

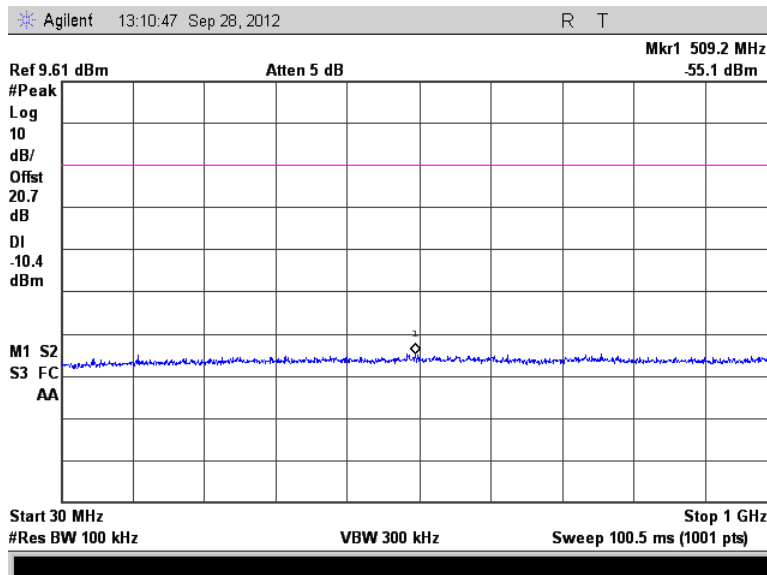


Figure 7.4.2.2-1: 30 MHz – 1 GHz – Low Channel

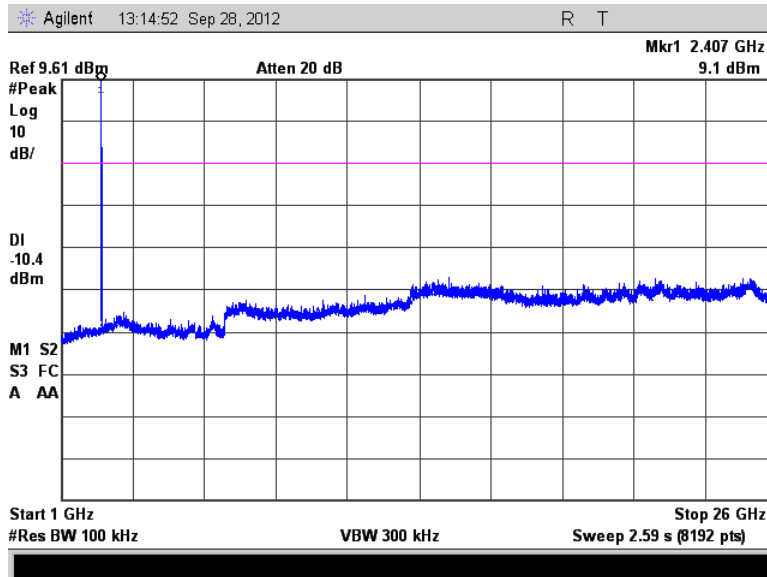


Figure 7.4.2.2-2: 1 GHz – 26 GHz – Low Channel

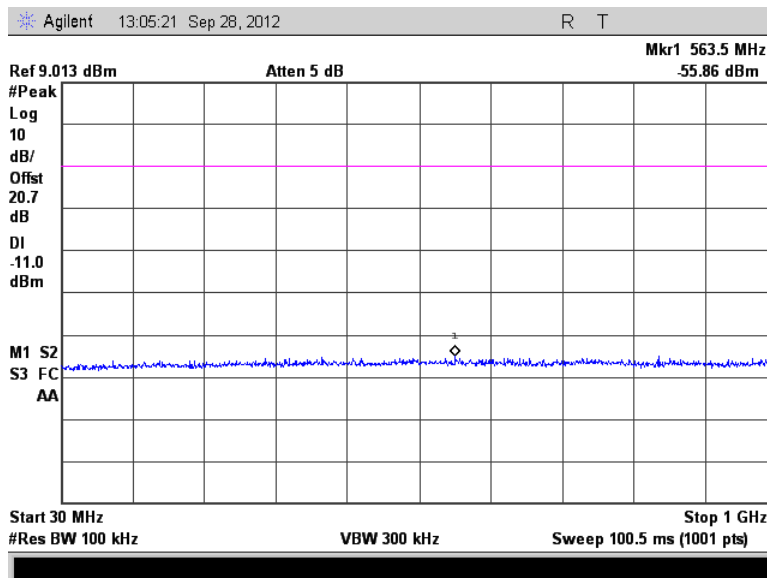


Figure 7.4.2.2-3: 30 MHz – 1 GHz – Middle Channel

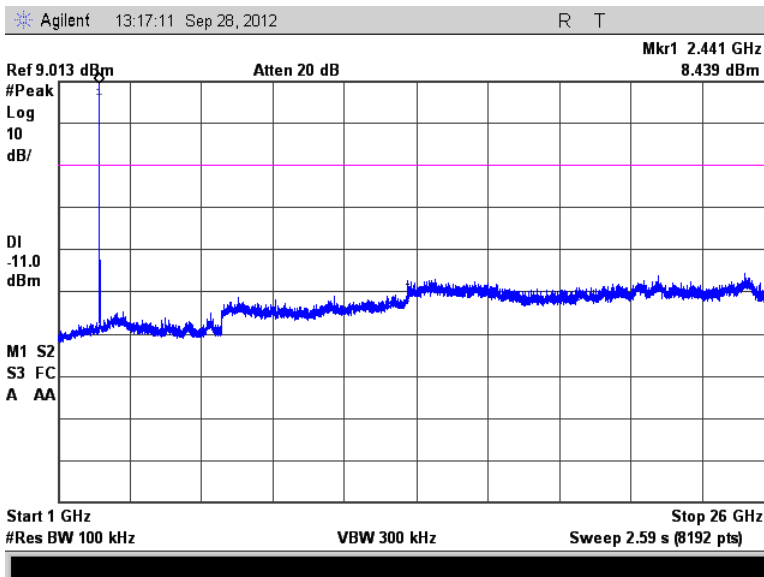


Figure 7.4.2.2-4: 1 GHz – 26 GHz – Middle Channel

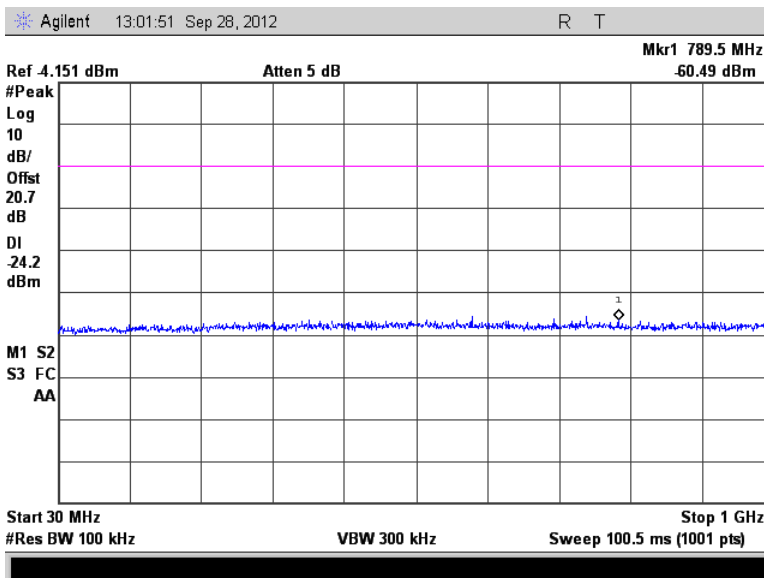


Figure 7.4.2.2-5: 30 MHz – 1 GHz – High Channel

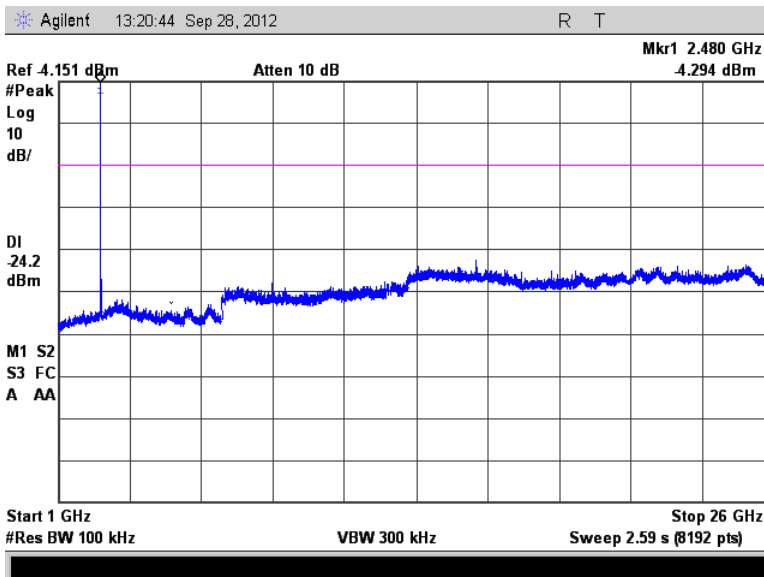


Figure 7.4.2.2-6: 1 GHz – 26 GHz –High Channel

7.4.3 Radiated Spurious Emissions - FCC Section 15.205 IC: RSS-210 2.2, RSS-GEN 7.2.5**7.4.3.1 Measurement Procedure**

Radiated emissions tests were made over the frequency range of 30MHz to 26GHz, 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 and average measurements made with RBW of 1 MHz and VBW of 3MHz and 10 Hz respectively.

Each emission found to be in a restricted band was compared to the applicable radiated limits. A duty cycle correction factor of 14.1% \approx -17.02 dB was applied to the average measurements. The justification for the correction is documented in the customer's theory of operation.

7.4.3.2 Measurement Results

Band Edge and radiated spurious emissions found in the band of 30MHz to 26GHz are reported below.

Table 7.4.3.2-1: Radiated Spurious 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
Low Channel (2405 MHz)										
2390	60.58	49.69	H	-8.42	52.16	24.25	74.0	54.0	21.80	29.70
2390	60.48	48.63	V	-8.42	52.06	23.19	74.0	54.0	21.90	30.80
4810	63.17	56.39	H	-1.29	61.88	38.09	74.0	54.0	12.10	15.90
4810	69.80	63.54	V	-1.29	68.51	45.24	74.0	54.0	5.50	8.80
12025	48.36	37.56	H	11.58	59.94	32.12	83.5	63.5	23.60	31.40
12025	48.57	38.70	V	11.58	60.15	33.26	83.5	63.5	23.40	30.20
19240	43.61	31.86	H	8.75	52.36	23.60	83.5	63.5	31.10	39.90
Middle Channel (2440 MHz)										
4880	63.87	57.56	H	-1.10	62.77	39.44	74.0	54.0	11.20	14.60
4880	70.66	64.65	V	-1.10	69.56	46.53	74.0	54.0	4.40	7.50
7320	68.32	61.30	H	3.54	71.86	47.83	74.0	54.0	2.10	6.20
7320	67.56	60.57	V	3.54	71.10	47.10	74.0	54.0	2.90	6.90
12200	51.22	42.13	H	11.69	62.91	36.81	83.5	63.5	20.60	26.70
12200	50.07	40.47	V	11.69	61.76	35.15	83.5	63.5	21.70	28.40
19520	43.86	31.18	H	8.51	52.37	22.68	83.5	63.5	31.10	40.80
High Channel (2480 MHz)										
2483.5	69.60	60.19	H	-8.03	61.57	35.14	74.0	54.0	12.40	18.90
2483.5	69.35	60.10	V	-8.03	61.32	35.05	74.0	54.0	12.70	18.90
4960	46.24	33.28	H	-0.90	45.34	15.37	74.0	54.0	28.70	38.60
4960	48.85	38.11	V	-0.90	47.95	20.20	74.0	54.0	26.00	33.80
7440	46.40	33.31	V	3.97	50.37	20.26	74.0	54.0	23.60	33.70

*Notes:

- A duty cycle correction factor of 14.1% \approx -17.02 dB was applied to the average measurements.
- The emissions above 19520 MHz were attenuated below the limits and the noise floor of the measurement equipment.
- The emissions above 10 GHz were performed at 1m distance and the limits were corrected using the distance factor of $20 \cdot \log(3/1)$ dB \approx 9.54 dB.

7.4.3.3 Sample Calculation:

$$R_C = R_U + CF_T$$

Where:

CF_T = Total Correction Factor (AF+CA+AG)-DC (Average Measurements Only)

R_U = Uncorrected Reading

R_C = Corrected Level

AF = Antenna Factor

CA = Cable Attenuation

AG = Amplifier Gain

DC = Duty Cycle Correction Factor

Duty Cycle Correction Factor = $20 \cdot \log(14.1/100) \approx -17.02$ dB

Example Calculation: Peak

Corrected Level: $60.58 - 8.42 = 52.16$ dB μ V/m

Margin: 74 dB μ V/m – 52.16 dB μ V/m = 21.8 dB

Example Calculation: Average

Corrected Level: $49.69 - 8.42 - 17.02 = 24.25$ dB μ V/m

Margin: 54 dB μ V/m – 24.25 dB μ V/m = 29.7 dB

7.5 Power Spectral Density - FCC Section 15.247(e) IC: RSS-210 A8.2(b)

7.5.1 PSD Measurement Procedure (Conducted Method)

The power spectral density was measured in accordance with the FCC KDB Publication No. 558074 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (47 CFR 15.247)" Measurement Procedure PKPSD. The RF output port of the EUT was directly connected to the input of the spectrum analyzer. Offset values were input for cable and attenuation. The spectrum analyzer RBW was set to 100 kHz and VBW 300 kHz. The span was adjusted to 5-30% greater than the 6 dB bandwidth and the sweep time was set to auto. The PSD was calculated by using the BWCF = $10 \cdot \log(3 \text{ kHz}/100\text{kHz}) = -15.2 \text{ dB}$.

7.5.2 Measurement Results

Results are shown below.

Table 7.5.2-1: RF Output Power

Frequency (MHz)	PSD/100kHz (dBm)	Correction Factor (dB)	PSD/3kHz (dBm)	Limit (dBm)	Margin (dB)
2405	9.61	15.2	-5.59	8	13.59
2440	9.013	15.2	-6.187	8	14.187
2480	-4.151	15.2	-19.351	8	27.351

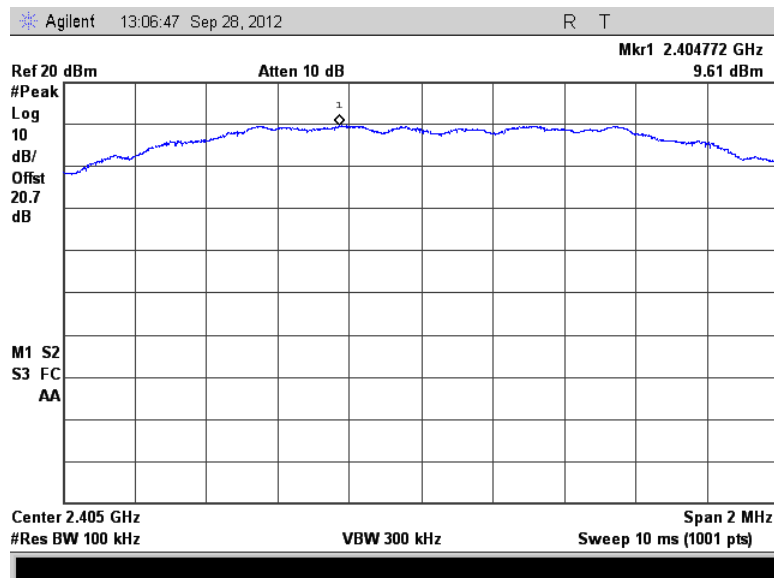


Figure 7.5.2-1: Power Spectral Density - Low Channel

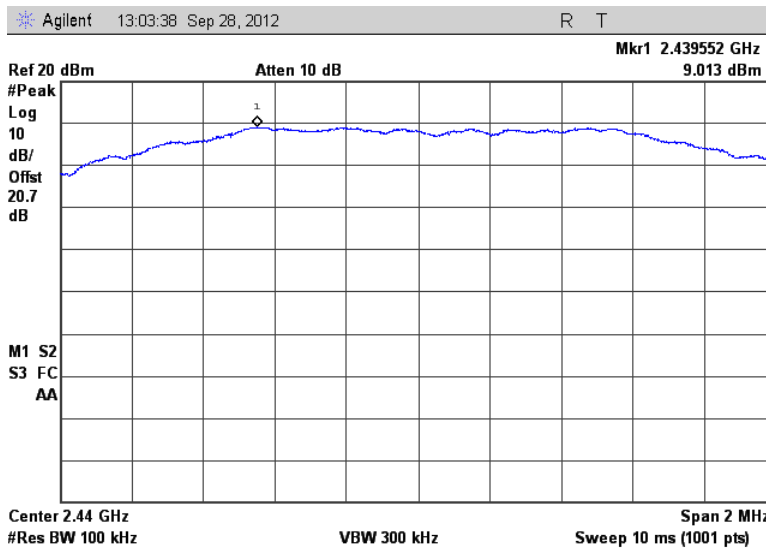


Figure 7.5.2-2: Power Spectral Density - Middle Channel

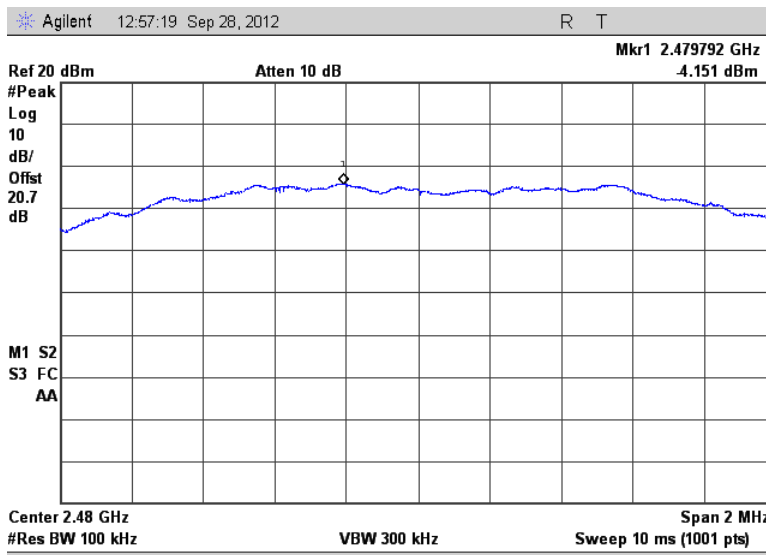


Figure 7.5.2-3: Power Spectral Density – High Channel

7.6 Power Line Conducted Emissions – FCC: Section 15.207 IC: RSS-Gen 7.2.2

7.6.1 Measurement Procedure

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

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

7.6.2 Measurement Results

Results of the test are shown below.

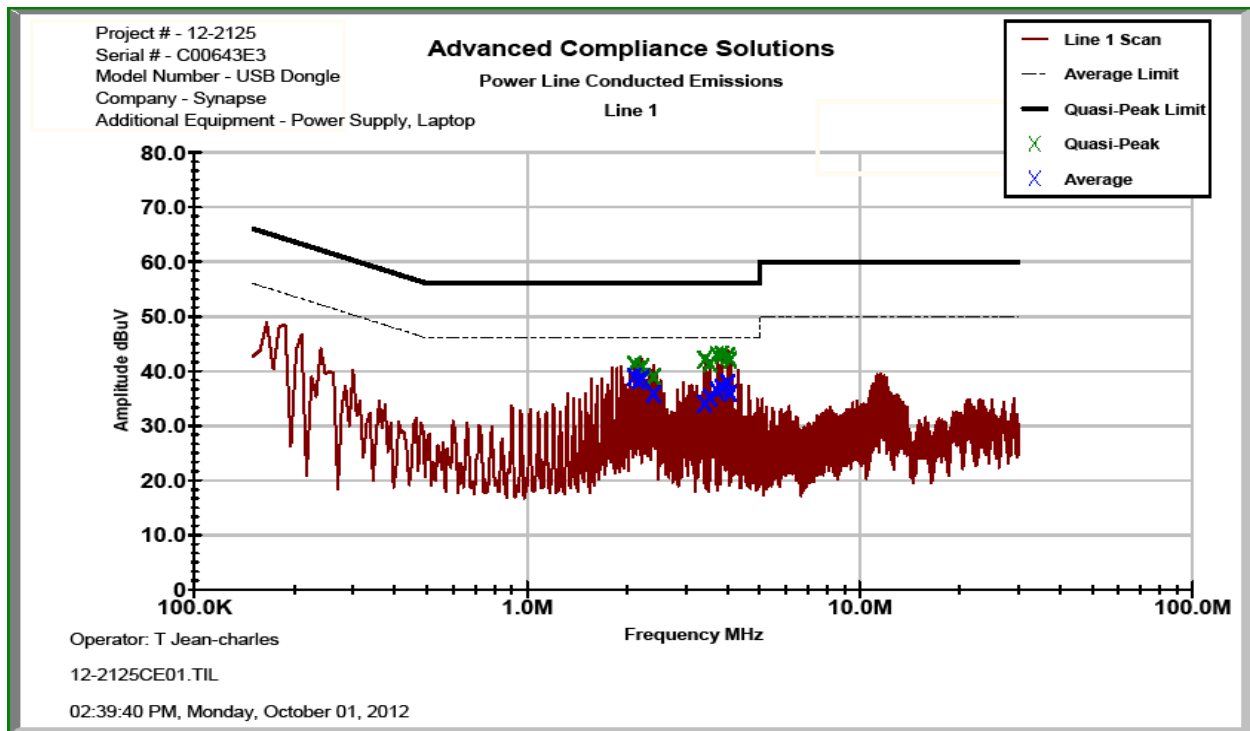


Figure 7.6.2-1: Power Line Conducted Emissions – Line 1

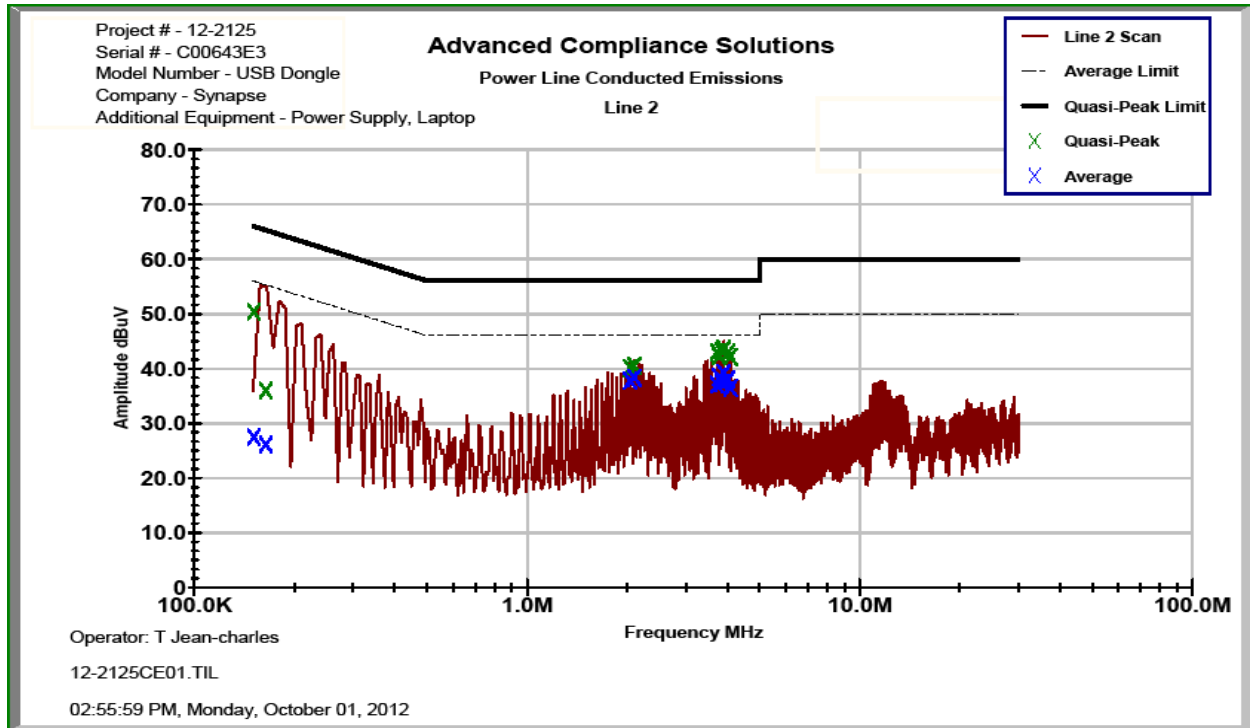


Figure 7.6.2-2: Power Line Conducted Emissions – Line 2

Table 7.6.2-1: Power Line Conducted Emissions Results

Line 1 Line 2 Line 3
 Line 4
 To Ground Floating
 Telecom Port
 dBµV dBµA

 Plot Number: 12-2125CE01
 Power Supply Description:
19.5 VDC

Frequency (MHz)	Uncorrected Reading		Total Correction Factor (dB)	Corrected Level		Limit		Margin (dB)	
	Quasi-Peak	Average		Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average
Line 1									
2.09821	40.81	38.481	0.46	41.27	38.94	56.00	46.00	14.7	7.1
2.15876	39.919	37.701	0.46	40.38	38.16	56.00	46.00	15.6	7.8
2.21876	40.245	38.113	0.46	40.70	38.57	56.00	46.00	15.3	7.4
2.39871	38.465	35.325	0.46	38.92	35.78	56.00	46.00	17.1	10.2
3.41754	41.527	33.468	0.52	42.05	33.99	56.00	46.00	14.0	12.0
3.53742	40.847	34.615	0.52	41.37	35.13	56.00	46.00	14.6	10.9
3.71848	42.288	35.857	0.52	42.81	36.38	56.00	46.00	13.2	9.6
3.83867	42.455	36.299	0.52	42.97	36.82	56.00	46.00	13.0	9.2
4.01529	42.106	37.085	0.59	42.69	37.67	56.00	46.00	13.3	8.3
4.07792	41.466	35.35	0.59	42.05	35.94	56.00	46.00	13.9	10.1
Line 2									
0.150846	48.859	25.929	1.53	50.39	27.46	65.95	55.95	15.6	28.5
0.1636	34.577	24.717	1.50	36.08	26.22	65.28	55.28	29.2	29.1
2.03806	39.61	37.253	0.49	40.10	37.74	56.00	46.00	15.9	8.3
2.09751	39.967	37.799	0.49	40.46	38.29	56.00	46.00	15.5	7.7
3.71882	42.424	36.419	0.56	42.98	36.98	56.00	46.00	13.0	9.0
3.77608	41.662	37.784	0.56	42.22	38.34	56.00	46.00	13.8	7.7
3.83926	42.557	36.753	0.56	43.11	37.31	56.00	46.00	12.9	8.7
3.89592	42.937	38.559	0.56	43.49	39.12	56.00	46.00	12.5	6.9
4.01532	42.298	37.372	0.62	42.91	37.99	56.00	46.00	13.1	8.0
4.07843	41.511	35.77	0.62	42.13	36.39	56.00	46.00	13.9	9.6

8 CONCLUSION

In the opinion of ACS, Inc. the M7, manufactured by Woodstream Corporation meets the requirements of FCC Part 15 subpart C and Industry Canada's Radio Standards Specification RSS-210.

END REPORT