Certification Test Report

FCC ID: HSW-2410G
IC: 4492A-2410G

FCC Rule Part: 15.247
ISED Canada Radio Standards Specification: RSS-247

Report Number: AT72130732-1P2

Manufacturer: Murata Electronics North America
Models: WIT2410G

Test Begin Date: August 28, 2017
Test End Date: January 20, 2018

Report Issue Date: February 6, 2018

FOR THE SCOPE OF ACCREDITATION UNDER Certificate Number: AT-2021

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

Prepared by:

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This report contains 20 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 ISED Canada's Radio Standards Specification RSS-247 for a Class II Permissive Change.

The purpose of this class II permissive change is due to a modification to the transmitter that will allow for adjustment of the RF output power during production. This change should eliminate need to modify the Bill of Materials to set the output power to nominal values. RF output power will be set to the levels defined during the original FCC Certification.

Additionally, the power amplifier transistor went obsolete in early 2017 and replaced with a pin-for-pin compatible and functionally equivalent transistor. Performance data measured in the lab (and over the operating range of -30 to +70 degrees) have confirmed the new transistor is a form-fit-function equivalent.

Finally, a 16-pin digital connector previously used left a residue on the connector pins during reflow soldering. The residue caused intermittent connections between the WIT2410G and the customer's board. The vendor of the 16-pin digital connector has re-tooled the connector to use a different mounting scheme during reflow soldering that eliminates the intermittent connection issues. No electrical changes were made to the digital connector.

1.2 Manufacturer Information

Murata Electronics North America
2200 Lake Park Drive
Smyrna, GA 30080

1.3 Product description

The WIT2410G is a 2.4 GHz frequency hopping transceiver. Basic operating parameters of the radio are:

Detail	Description
Frequency Range (MHz)	2401.6896 – 2469.888
Number of Channels	75
Channel spacing (kHz)	921.6
Modulation Format	FSK
Data Rates (kbps)	460
Operating Voltage	3.3 Vdc – 10 Vdc (5 Vdc Nominal)
Maximum Output Power (dBm)	18.01
Antenna Type(s) / Gain(s)	L-COM HG2418P Panel Antenna / 18.0 dBi Mobile Mark SCR14-2400 Corner Reflector Antenna / 14.0 dBi Mobile Mark OD9-2400-BLK Dipole Antenna / 9.0 dBi

EUT Serial Numbers: 22 22 22

Test Sample Condition: The test samples were provided in good working order with no visible defects.

1.4 Test Methodology and Considerations

A test evaluation board was utilized to supply power and program the EUT for test modes. See Section 5.0 – 6.0 for additional details.

For radiated emissions, the EUT was programmed to generate a continuously modulated carrier on the lowest, middle, and highest channels. The EUT was tested in three orthogonal orientations. The worst-case orientation was the Z-orientation. See the test setup photos for more information.

For RF Conducted emissions, the EUT was programmed to generate a continuously modulated carrier on the lowest, middle, and highest channels. The EUT was evaluated for amplitude related tests including conducted output power, conducted spurious emissions, and conducted band-edges.

Power setting during test: Not set in software

2 TEST FACILITIES

2.1 Location

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

TÜV SÜD America, Inc.
5015 B.U. Bowman Drive
Buford, GA 30518
Phone: (770) 831-8048
Fax: (770) 831-8598

2.2 Laboratory Accreditations/Recognitions/Certifications

TÜV SÜD America, Inc. is accredited to ISO/IEC 17025 by the ANSI-ASQ National Accreditation Board/ANAB accreditation program, and has been issued certificate number AT-2021 in recognition of this accreditation. Unless otherwise specified, all tests methods described within this report are covered under the ISO/IEC 17025 scope of accreditation.

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, Innovation, Science, and Economic Development Canada and the Japanese Voluntary Control Council for Interference by information technology equipment.

FCC Registration Number: 391271
Innovation, Science, and Economic Development Canada Lab Code: IC 23597
VCCI Member Number: 1831

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

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:

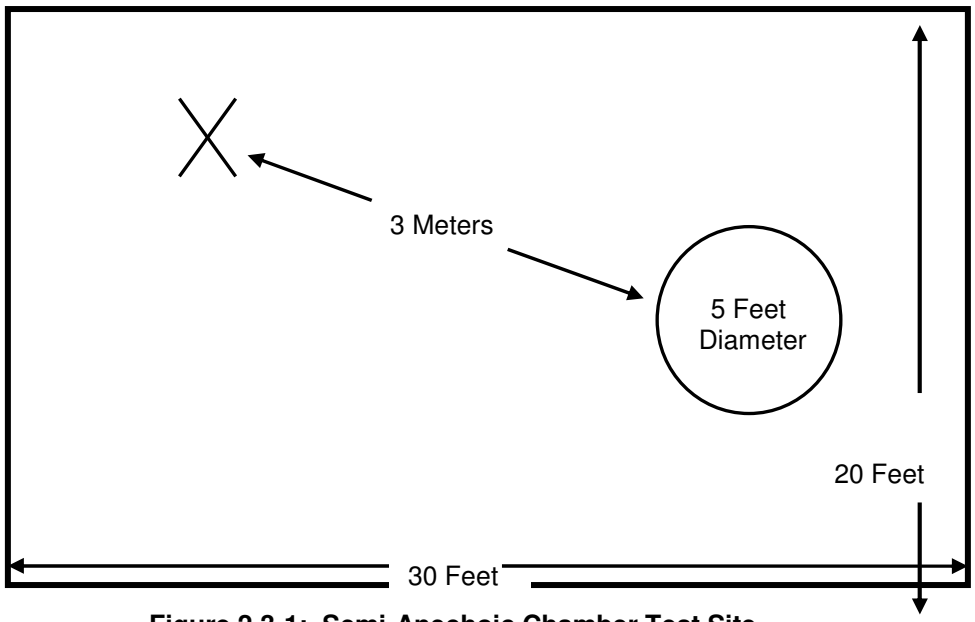

Figure 2.3-1: Semi-Anechoic Chamber Test Site

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 C63.10.

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

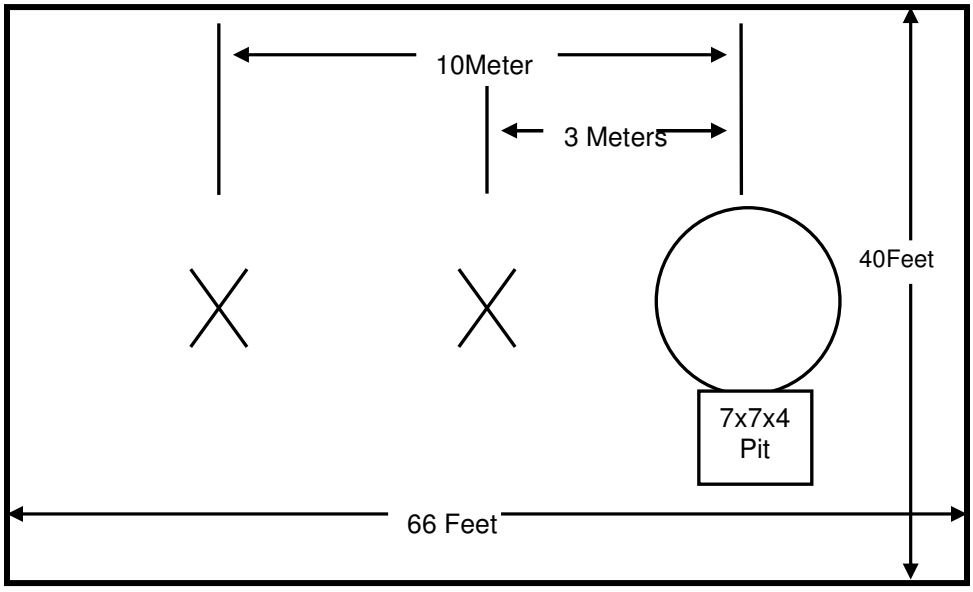

Figure 2.3-2: Open Area Test Site

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 ground 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 C63.10.

A diagram of the room is shown below in figure 2.4-1:

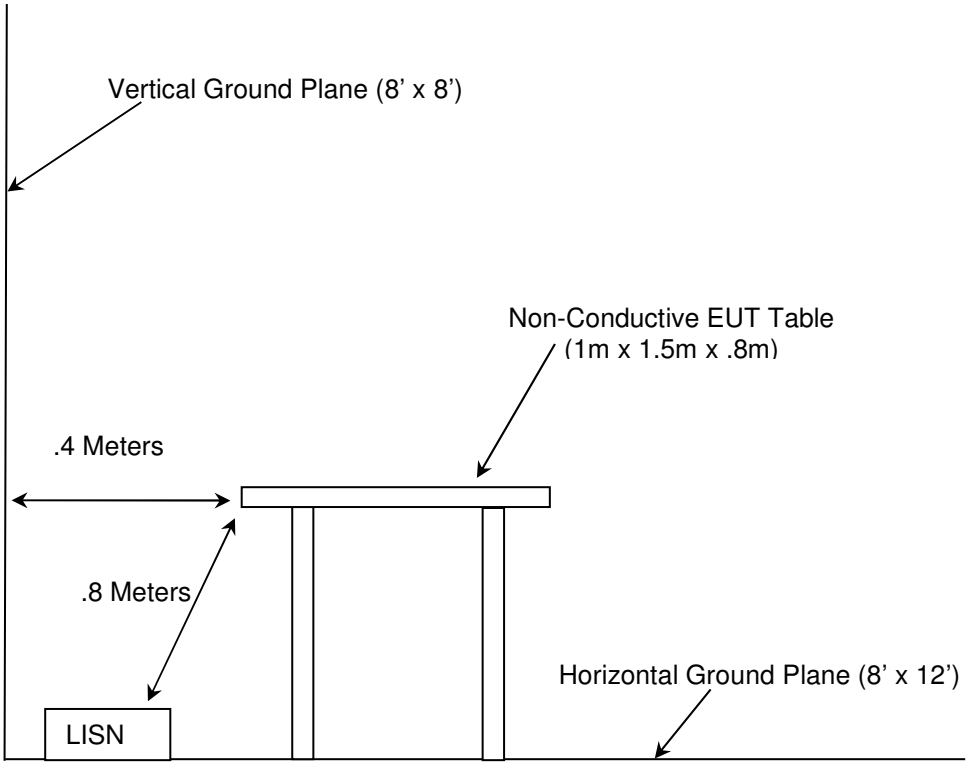

Figure 2.4-1: AC Mains Conducted EMI Site

3 APPLICABLE STANDARD REFERENCES

The following standards were used:

- ANSI C63.10-2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
- US Code of Federal Regulations (CFR): Title 47, Part 2, Subpart J: Equipment Authorization Procedures, 2017
- US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2017
- ISED Canada Radio Standards Specification: RSS-247 – Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices, Issue 2, Feb 2017.
- ISED Canada Radio Standards Specification: RSS-GEN – General Requirements and Information for the Certification of Radiocommunication Equipment, Issue 4, Nov 2014.

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

Asset ID	Manufacturer	Model #	Equipment Type	Serial #	Last Calibration Date	Calibration Due Date
30	Spectrum Technologies	DRH-0118	Antennas	970102	5/9/2017	5/9/2019
40	EMCO	3104	Antennas	3211	6/8/2016	6/8/2018
73	Agilent	8447D	Amplifiers	2727A05624	7/24/2017	7/24/2018
167	ACS	Chamber EMI Cable Set	Cable Set	167	9/29/2017	9/29/2018
267	Agilent	N1911A	Meters	MY45100129	8/22/2017	8/22/2019
268	Agilent	N1921A	Sensors	MY45240184	8/22/2017	8/22/2019
324	ACS	Belden	Cables	8214	3/21/2017	3/21/2018
334	Rohde&Schwarz	3160-09	Antennas	49404	NCR	NCR
335	Suhner	SF-102A	Cables	882/2A	7/11/2017	7/11/2018
338	Hewlett Packard	8449B	Amplifiers	3008A01111	7/11/2017	7/11/2019
340	Aeroflex / Weinschel	AS-20	Attenuators	7136	7/10/2017	7/10/2018
345	Suhner Sucoflex	102A	Cables	1077/2A	7/10/2017	7/10/2018
412	Electro Metrics	LPA-25	Antennas	1241	8/8/2016	8/8/2018
422	Florida RF	SMS-200AW-72.0-SMR	Cables	805	11/27/2017	11/27/2018
422	Florida RF	SMS-200AW-72.0-SMR	Cables	805	11/27/2017	11/27/2018
432	Microwave Circuits	H3G020G4	Filters	264066	5/13/2017	5/13/2018
616	Florida RF Cables	SMRE-200W-12.0-SMRE	Cables	N/A	10/7/2017	10/7/2018
616	Florida RF Cables	SMRE-200W-12.0-SMRE	Cables	N/A	10/7/2017	10/7/2018
622	Rohde & Schwarz	FSV40	Analyzers	101338	7/15/2016	7/15/2018
676	Florida RF Labs	SMS-290AW-480.0-SMS	Cables	MFR2Y194	11/4/2016	12/4/2017
676	Florida RF Labs	SMS-290AW-480.0-SMS	Cables	MFR2Y194	12/2/2017	12/2/2018
676	Florida RF Labs	SMS-290AW-480.0-SMS	Cables	MFR2Y194	1/8/2018	1/8/2019
813	PMM	9010	Receiver	697WW30606	2/6/2017	2/6/2018
819	Rohde & Schwarz	ESR26	Receivers	101345	10/31/2017	10/31/2018
3010	Rohde & Schwarz	ENV216	LISN	3010	7/11/2017	7/11/2018
RE135	Rohde & Schwarz	FSP30	Spectrum Analyzers	835618/031	10/31/2016	11/31/2017

NCR = No Calibration Required
NOTE: All testing was performed during the active calibration cycle of the equipment only.

5 SUPPORT EQUIPMENT

Table 5-1: Support Equipment – Radiated Emissions

Item	Equipment Type	Manufacturer	Model/Part Number	Serial Number
1	Evaluation Board	Cirronet, Inc.	Radio Eval Board	N/A
2	Wall Wart Power Supply	Volgen America, Inc.	NP12-US0520	N/A

Table 5-2: Cable Description – Radiated Emissions

Cable	Cable Type	Length	Shield	Termination
A	Ribbon Cable	20 cm	No	EUT – Evaluation Board
B	DC Power Cable	1.75 m	No	Evaluation Board – Wall Wart Power Supply
C	RF Cable	320 cm	Yes	EUT – Antenna

6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

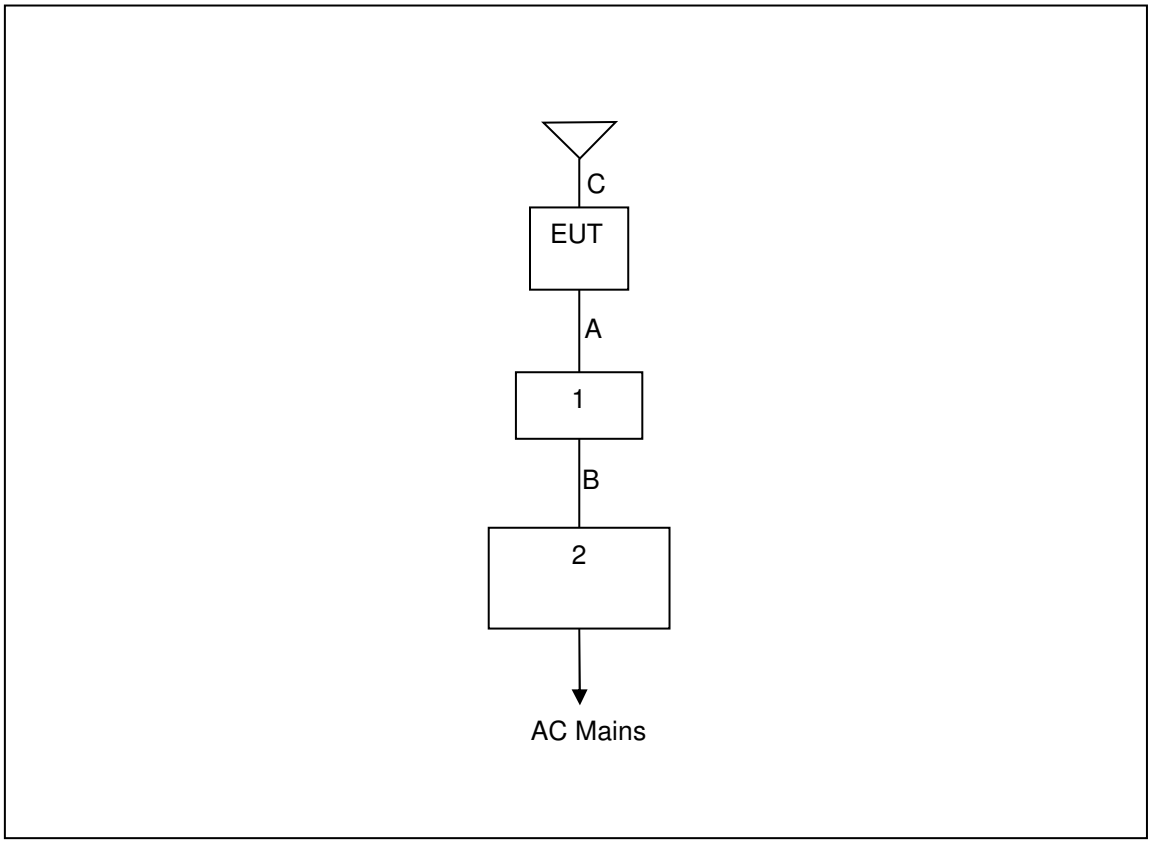

Figure 6-1: Test Setup Block Diagram

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 EUT utilizes an MMCX connector therefore satisfying the requirements of Section 15.203.

7.2 Power Line Conducted Emissions – FCC: Section 15.207; ISED Canada: RSS-Gen 8.8

7.2.1 Measurement Procedure

Conducted emissions were performed from 150 kHz to 30 MHz 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

7.2.2 Measurement Results

Performed by: Arthur Sumner

Table 7.2.2-1: Conducted EMI Results – Line 1 – Corner Reflector Antenna

Frequency (MHz)	Corrected Reading		Limit		Margin		
	Quasi-Peak (dBuV)	Average (dBuV)	Quasi-Peak (dBuV)	Average (dBuV)	Quasi-Peak (dB)	Average (dB)	Correction (dB)
0.278	49.42	29.64	60.88	50.88	-11.46	-21.24	9.58
0.286	52.84	46.7	60.64	50.64	-7.8	-3.94	9.58
0.426	50.87	39.64	57.33	47.33	-6.46	-7.69	9.59
0.574	43.23	37.58	56	46	-12.77	-8.42	9.59
0.858	40.31	38.18	56	46	-15.69	-7.82	9.6
0.994	43	34.81	56	46	-13	-11.19	9.6
1.146	42.59	36.8	56	46	-13.41	-9.2	9.61
1.282	43.44	33.25	56	46	-12.56	-12.75	9.63
1.418	40.58	24.71	56	46	-15.42	-21.29	9.64
1.438	37.71	25.56	56	46	-18.29	-20.44	9.64

Table 7.2.2-2: Conducted EMI Results – Line 2 – Corner Reflector Antenna

Frequency (MHz)	Corrected Reading		Limit		Margin		
	Quasi-Peak (dBuV)	Average (dBuV)	Quasi-Peak (dBuV)	Average (dBuV)	Quasi-Peak (dB)	Average (dB)	Correction (dB)
0.282	51.41	42.06	60.76	50.76	-9.35	-8.7	9.59
0.554	32.46	14.62	56	46	-23.54	-31.38	9.59
0.574	43.72	32.27	56	46	-12.28	-13.73	9.59
0.846	35.16	17.41	56	46	-20.84	-28.59	9.59
0.858	40.05	31.4	56	46	-15.95	-14.6	9.59
1.006	42.73	31.23	56	46	-13.27	-14.77	9.6
1.134	39.01	22.31	56	46	-16.99	-23.69	9.61
1.146	42.64	31.35	56	46	-13.36	-14.65	9.61
1.286	42.03	27.81	56	46	-13.97	-18.19	9.63
1.718	39.75	26.71	56	46	-16.25	-19.29	9.68

Table 7.2.2-3: Conducted EMI Results – Line 1 – Dipole Antenna

Frequency (MHz)	Corrected Reading		Limit		Margin		
	Quasi-Peak (dBuV)	Average (dBuV)	Quasi-Peak (dBuV)	Average (dBuV)	Quasi-Peak (dB)	Average (dB)	Correction (dB)
0.278	50.79	30.87	60.88	50.88	-10.09	-20.01	9.58
0.286	54.19	46.03	60.64	50.64	-6.45	-4.61	9.58
0.422	52.45	33.43	57.41	47.41	-4.96	-13.98	9.59
0.574	43.37	33.98	56	46	-12.63	-12.02	9.59
0.858	40.97	33.86	56	46	-15.03	-12.14	9.6
0.994	42.84	36.17	56	46	-13.16	-9.83	9.6
1.126	40.28	22.2	56	46	-15.72	-23.8	9.61
1.134	42.88	31.12	56	46	-13.12	-14.88	9.61
1.294	40.13	22.3	56	46	-15.87	-23.7	9.63
1.854	39.08	27.31	56	46	-16.92	-18.69	9.7

Table 7.2.2-4: Conducted EMI Results – Line 2 – Dipole Antenna

Frequency (MHz)	Corrected Reading		Limit		Margin		
	Quasi-Peak (dBuV)	Average (dBuV)	Quasi-Peak (dBuV)	Average (dBuV)	Quasi-Peak (dB)	Average (dB)	Correction (dB)
0.274	44.12	22.94	61	51	-16.88	-28.06	9.59
0.286	53.87	45.57	60.64	50.64	-6.77	-5.07	9.59
0.43	48.93	39.97	57.25	47.25	-8.32	-7.28	9.59
0.566	40.87	32.04	56	46	-15.13	-13.96	9.59
0.574	44.07	35.84	56	46	-11.93	-10.16	9.59
0.718	41.97	31.09	56	46	-14.03	-14.91	9.59
0.854	43.03	37.11	56	46	-12.97	-8.89	9.59
0.994	42.89	34.94	56	46	-13.11	-11.06	9.6
1.142	40.2	36.75	56	46	-15.8	-9.25	9.61
1.702	37.56	25.07	56	46	-18.44	-20.93	9.68

Table 7.2.2-5: Conducted EMI Results – Line 1 – Panel Antenna

Frequency (MHz)	Corrected Reading		Limit		Margin		
	Quasi-Peak (dBuV)	Average (dBuV)	Quasi-Peak (dBuV)	Average (dBuV)	Quasi-Peak (dB)	Average (dB)	Correction (dB)
0.27	41.65	22.28	61.12	51.12	-19.47	-28.84	9.58
0.286	53.16	46.76	60.64	50.64	-7.48	-3.88	9.58
0.426	50.87	40.76	57.33	47.33	-6.46	-6.57	9.59
0.574	43.57	33.7	56	46	-12.43	-12.3	9.59
0.714	40.86	34.89	56	46	-15.14	-11.11	9.59
0.85	42.44	33.24	56	46	-13.56	-12.76	9.59
0.862	43.33	30.77	56	46	-12.67	-15.23	9.6
0.986	40.48	22.99	56	46	-15.52	-23.01	9.6
0.998	43.43	39.46	56	46	-12.57	-6.54	9.6
1.134	43.32	33.21	56	46	-12.68	-12.79	9.61

Table 7.2.2-6: Conducted EMI Results – Line 2 – Panel Antenna

Frequency (MHz)	Corrected Reading		Limit		Margin		
	Quasi-Peak (dBuV)	Average (dBuV)	Quasi-Peak (dBuV)	Average (dBuV)	Quasi-Peak (dB)	Average (dB)	Correction (dB)
0.282	51.57	42.21	60.76	50.76	-9.19	-8.55	9.59
0.43	41.07	34.21	57.25	47.25	-16.18	-13.04	9.59
0.574	43.76	31.46	56	46	-12.24	-14.54	9.59
0.71	42.97	27.44	56	46	-13.03	-18.56	9.59
0.846	35.37	18.43	56	46	-20.63	-27.57	9.59
0.858	41.84	31.97	56	46	-14.16	-14.03	9.59
0.998	42.16	30.62	56	46	-13.84	-15.38	9.6
1.29	41.57	28.18	56	46	-14.43	-17.82	9.63
1.566	39.68	23.58	56	46	-16.32	-22.42	9.67
3.014	38.8	21.9	56	46	-17.2	-24.1	9.72

7.3 Peak Output Power – FCC: Section 15.247(b)(1); ISED Canada: RSS-247 5.4(b)

7.3.1 Measurement Procedure

The RF output port of the EUT was directly connected to the input of a power meter using suitable attenuation. The device employs 75 channels at any given time. For this Class II Permissive Change, the peak output power is limited to 18.39 dBm.

7.3.2 Measurement Results

Performed By: Ryan McGann

Table 7.3.2-1: Maximum Conducted Peak Output Power

Frequency [MHz]	Level [dBm]
2401.6896	16.97
2435.7888	17.22
2469.8880	16.98

7.4 Band-Edge Compliance and Spurious Emissions

7.4.1 Band-Edge Compliance of RF Conducted Emissions – FCC: Section 15.247(d); ISED Canada RSS-247 5.5

7.4.1.1 Measurement Procedure

The RF output of the EUT was directly connected to the input of the spectrum analyzer applying suitable attenuation. The Resolution Bandwidth (RBW) of the spectrum analyzer was set to 100 kHz. The Video Bandwidth (VBW) was set to 300 kHz. The span was set to 1.5 times the DTS bandwidth. The trace was set to max hold with a peak detector active. The resulting spectrum analyzer peak level was used to determine the reference level with respect to the 20dBc limit. The spectrum span was then adjusted for the measurement of the band edge. The EUT was investigated at the lowest and highest channel available to determine band-edge compliance.

7.4.1.2 Measurement Results

Performed By: Ryan McGann

Single Channel Mode

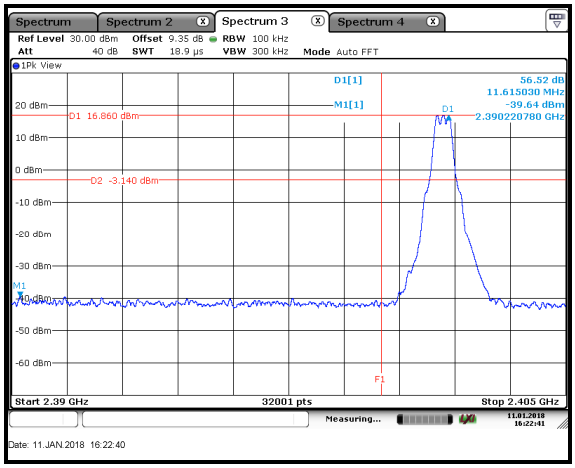

Figure 7.4.1.2-1: Lower Band Edge

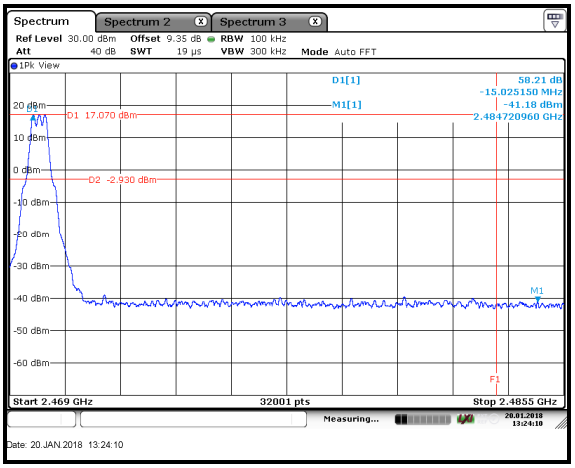

Figure 7.4.1.2-2: Upper Band Edge

Hopping Mode

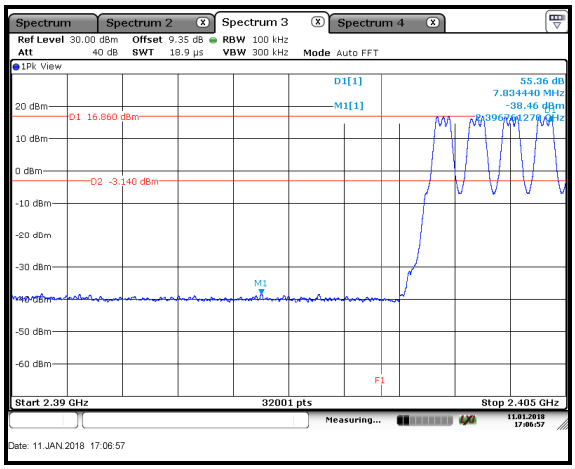

Figure 7.4.1.2-3: Lower Band Edge - Hopping

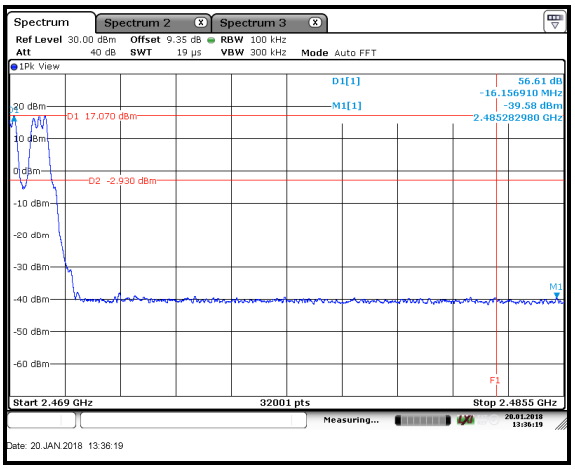

Figure 7.4.1.2-4: Upper Band Edge - Hopping

7.4.2 RF Conducted Spurious Emissions – FCC: Section 15.247(d); ISED Canada RSS-247 5.5

7.4.2.1 Measurement Procedure

The RF output of the EUT was directly connected to the input of the spectrum analyzer applying suitable attenuation. The Resolution Bandwidth (RBW) of the spectrum analyzer was set to 100 kHz. The Video Bandwidth (VBW) was set to 300 kHz. The span was set to 1.5 times the DTS bandwidth. The trace was set to max hold with a peak detector active. The resulting spectrum analyzer peak level was used to determine the reference level with respect to the 20dBc limit. The spectrum span was then adjusted for the measurement of spurious emissions from 30 MHz to 25 GHz.

7.4.2.2 Measurement Results

Performed By: Ryan McGann

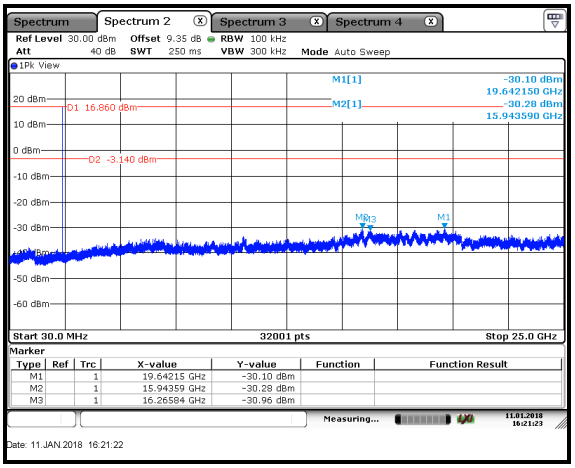

Figure 7.4.2.2-1: 30 MHz – 25 GHz – LCH

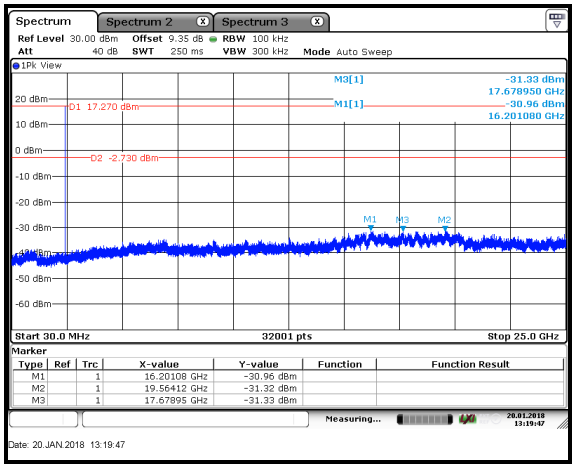

Figure 7.4.2.2-2: 30 MHz – 25 GHz – MCH

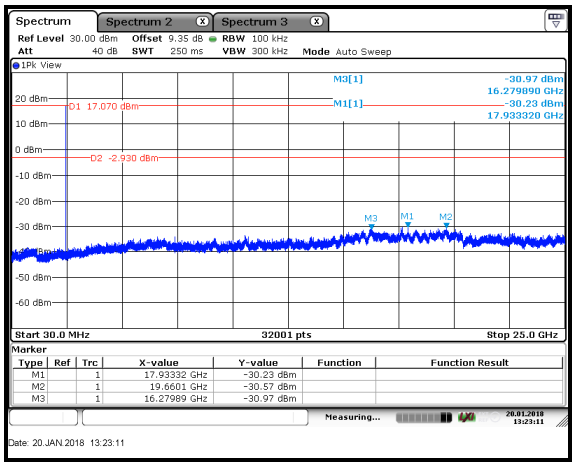

Figure 7.4.2.2-3: 30 MHz – 25 GHz – HCH

7.4.3 Radiated Spurious Emissions – FCC: Section 15.205, 15.209; ISED Canada RSS-Gen 8.9/8.10

7.4.3.1 Measurement Procedure

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 1 meter to 4 meters so that the maximum radiated emissions level would be detected. For frequencies below 1000 MHz, quasi-peak measurements were made using a resolution bandwidth RBW of 120 kHz and a video bandwidth VBW of 300 kHz. For frequencies above 1000 MHz, peak measurements were made with RBW and VBW of 1 MHz and 3 MHz respectively. Average measurements were made in linear amplitude mode with a RBW of 1 MHz and a reduced VBW of 1 kHz.

Each emission found to be in a restricted band, including band edges, was compared to the applicable radiated emission limits.

7.4.3.2 Duty Cycle Correction

For average radiated measurements, using a 5.56% duty cycle, the measured level was reduced by a factor 25.10dB. The duty cycle correction factor is determined using the formula: 20log (5.56/100).

A detailed explanation of the duty cycle is provided in the original certification report.

7.4.3.3 Measurement Results

Performed By: Tyler Leeson, Ryan McGann, Alton Smith

Table 7.4.3.3-1: Radiated Spurious Emissions Tabulated Data – Corner Reflector Antenna

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
Low Channel										
2390	57.58	43.68	V	-5.49	52.09	13.09	74.0	54.0	21.9	40.9
4803.3792	67.29	62.75	H	1.91	69.20	39.56	74.0	54.0	4.8	14.4
4803.3792	67.84	62.72	V	1.91	69.75	39.53	74.0	54.0	4.3	14.5
Mid Channel										
4871.5776	69.86	64.58	H	2.15	72.01	41.63	74.0	54.0	2.0	12.4
4871.5776	70.19	63.26	V	2.15	72.34	40.31	74.0	54.0	1.7	13.7
7307.3664	63.43	58.86	H	7.68	71.11	41.44	74.0	54.0	2.9	12.6
7307.3664	61.90	57.43	V	7.68	69.58	40.01	74.0	54.0	4.4	14.0
High Channel										
2483.5	49.16	40.55	H	-5.10	44.06	10.35	74.0	54.0	29.9	43.6
2483.5	56.81	45.16	V	-5.10	51.71	14.96	74.0	54.0	22.3	39.0
4939.776	71.30	65.85	H	2.39	73.69	43.15	74.0	54.0	0.3	10.9
4939.776	69.02	64.19	V	2.39	71.41	41.49	74.0	54.0	2.6	12.5
7409.664	66.10	62.96	H	7.74	73.84	45.60	74.0	54.0	0.2	8.4
7409.664	66	62.69	V	7.74	73.74	45.33	74.0	54.0	0.3	8.7

Table 7.4.3.3-2: Radiated Spurious Emissions Tabulated Data – Dipole Antenna

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
Low Channel										
2390	49.27	41.77	H	-5.49	43.78	11.18	74.0	54.0	30.2	42.8
2390	53.47	44.93	V	-5.49	47.98	14.34	74.0	54.0	26.0	39.7
4803.3792	69.40	64.99	H	1.91	71.31	41.80	74.0	54.0	2.7	12.2
4803.3792	67.91	63.14	V	1.91	69.82	39.95	74.0	54.0	4.2	14.1
Mid Channel										
4871.5776	70.36	63.24	H	2.15	72.51	40.29	74.0	54.0	1.5	13.7
4871.5776	70.19	65.31	V	2.15	72.34	42.36	74.0	54.0	1.7	11.6
7307.3664	63.13	59.05	H	7.68	70.81	41.63	74.0	54.0	3.2	12.4
7307.3664	63.78	60.68	V	7.68	71.46	43.26	74.0	54.0	2.5	10.7
High Channel										
2483.5	50.54	43.29	H	-5.10	45.44	13.09	74.0	54.0	28.6	40.9
2483.5	53.39	43.57	V	-5.10	48.29	13.37	74.0	54.0	25.7	40.6
4939.776	69.62	65.10	H	2.39	72.01	42.40	74.0	54.0	2.0	11.6
4939.776	67.18	64.17	V	2.39	69.57	41.47	74.0	54.0	4.4	12.5
7409.664	65.88	61.96	H	7.74	73.62	44.60	74.0	54.0	0.4	9.4
7409.664	65.75	62.67	V	7.74	73.49	45.31	74.0	54.0	0.5	8.7

Table 7.4.3.3-3: Radiated Spurious Emissions Tabulated Data – Panel Antenna

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
Low Channel										
2390	47.87	39.46	H	-5.49	42.38	8.87	74.0	54.0	31.6	45.1
2390	52.55	45.17	V	-5.49	47.06	14.58	74.0	54.0	26.9	39.4
4803.3792	70.63	65.32	H	1.91	72.54	42.13	74.0	54.0	1.5	11.9
4803.3792	67.81	63.63	V	1.91	69.72	40.44	74.0	54.0	4.3	13.6
Mid Channel										
4871.5776	70.14	65.94	H	2.15	72.29	42.99	74.0	54.0	1.7	11.0
4871.5776	69.40	65.39	V	2.15	71.55	42.44	74.0	54.0	2.4	11.6
7307.3664	62.48	59.11	H	7.68	70.16	41.69	74.0	54.0	3.8	12.3
7307.3664	62.36	59.06	V	7.68	70.04	41.64	74.0	54.0	4.0	12.4
High Channel										
2483.5	49.00	40.15	H	-5.10	43.90	9.95	74.0	54.0	30.1	44.0
2483.5	56.53	46.20	V	-5.10	51.43	16.00	74.0	54.0	22.6	38.0
4939.776	68.71	64.33	H	2.39	71.10	41.63	74.0	54.0	2.9	12.4
4939.776	67.13	63.25	V	2.39	69.52	40.55	74.0	54.0	4.5	13.5
7409.664	65.19	60.79	H	7.74	72.93	43.43	74.0	54.0	1.1	10.6
7409.664	64.81	61.46	V	7.74	72.55	44.10	74.0	54.0	1.5	9.9

7.4.3.4 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

Example Calculation: Peak – Corner Reflector Antenna

Corrected Level: 57.58 - 5.49 = 52.09dBuV/m
Margin: 74dBuV/m – 52.09dBuV/m = 21.9dB

Example Calculation: Average – Corner Reflector Antenna

Corrected Level: 43.68 - 5.49 - 25.10 = 13.09dBuV
Margin: 54dBuV – 13.09dBuV = 40.9dB

8 ESTIMATION OF MEASUREMENT UNCERTAINTY

The expanded laboratory measurement uncertainty figures (U_{Lab}) provided below correspond to an expansion factor (coverage factor) k = 1.96 which provide confidence levels of 95%.

Parameter	U_{lab}
Occupied Channel Bandwidth	± 0.009 %
RF Conducted Output Power	± 0.349 dB
Power Spectral Density	± 0.372 dB
Antenna Port Conducted Emissions	± 1.264 dB
Radiated Emissions ≤ 1 GHz	± 5.814 dB
Radiated Emissions > 1 GHz	± 4.318 dB
Temperature	± 0.860 °C
Radio Frequency	± 2.832 x 10^{-8}
AC Power Line Conducted Emissions	± 3.360 dB

9 CONCLUSION

In the opinion of TÜV SÜD America Inc. the WIT2410M4G, manufactured by Murata Electronics North America meets the requirements of FCC Part 15 subpart C and Innovation, Science and Economic Development Canada's Radio Standards Specification RSS-247 for the tests documented in this test report.

END REPORT