Test of: BridgeWave Communications - BW64, BW64E

To: FCC CFR 47 Part 15.255 & IC RSS-210

Test Report Serial No.: BDWC12-U2 Rev B

TEST REPORT

FROM

MiCOM Labs

Test of: BridgeWave Communications BW64 & BW64E

To: FCC CFR 47 Part 15.255, Part 2 & IC RSS-210

Test Report Serial No.: BDWC12-U2 Rev B

This report supersedes: BDWC12-U2 Rev A

Applicant: BridgeWave Communications
3350 Thomas Road
Santa Clara, California 95054
USA

Product Function: Field Disturbance Sensor – PtP Fixed Wireless Backhaul

Copy No: pdf **Issue Date:** 27th June 2016

This Test Report is Issued Under the Authority of;

MiCOM Labs, Inc.
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A2LA ACCREDITED
TESTING CERT #2381.01

MiCOM Labs is an ISO 17025 Accredited Testing Laboratory

1. ACCREDITATION, LISTINGS & RECOGNITION

1.1. Test Accreditation

MiCOM Labs, Inc. is an accredited Electrical testing laboratory per the international standard ISO/IEC 17025:2005. The company is accredited by the American Association for Laboratory Accreditation (A2LA) www.a2la.org test laboratory number 2381.01. MiCOM Labs test schedule is available at the following URL; http://www.a2la.org/scopepdf/2381-01.pdf

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Accredited Laboratory

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MICOM LABS

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for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General requirements for the competence of testing and calibration laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009*).

Presented this 4th day of February 2016.

Senior Director of Quality & Communications
For the Accreditation Council
Certificate Number 2381.01
Valid to November 30, 2017

For the tests or types of tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

1.2. Recognition

MiCOM Labs, Inc has widely recognized wireless testing capabilities. Our international recognition includes Conformity Assessment Body designation by APEC MRA countries. MiCOM Labs test reports are accepted globally.

Country	Recognition Body	Status	Phase	Identification No.
USA	Federal Communications Commission (FCC)	TCB	-	US0159 Listing #: 102167
Canada	Industry Canada (IC)	FCB	APEC MRA 2	US0159 Listing #: 4143A-2 4143A-3
Japan	MIC (Ministry of Internal Affairs and Communication)	CAB	APEC MRA 2	RCB 210
	VCCI	--	--	A-0012
Europe	European Commission	NB	EU MRA	NB 2280
Australia	Australian Communications and Media Authority (ACMA)	CAB	APEC MRA 1	US0159
Hong Kong	Office of the Telecommunication Authority (OFTA)	CAB	APEC MRA 1	
Korea	Ministry of Information and Communication Radio Research Laboratory (RRL)	CAB	APEC MRA 1	
Singapore	Infocomm Development Authority (IDA)	CAB	APEC MRA 1	
Taiwan	National Communications Commission (NCC) Bureau of Standards, Metrology and Inspection (BSMI)	CAB	APEC MRA 1	
Vietnam	Ministry of Communication (MIC)	CAB	APEC MRA 1	

EU MRA – European Union Mutual Recognition Agreement.
NB – Notified Body
APEC MRA – Asia Pacific Economic Community Mutual Recognition Agreement.
Recognition agreement under which test lab is accredited to regulatory standards of the APEC member countries.

Phase I - recognition for product testing
Phase II – recognition for both product testing and certification

1.3. Product Certification

MiCOM Labs, Inc. is an accredited Product Certification Body per the international standard ISO/IEC 17065:2012. The company is accredited by the American Association for Laboratory Accreditation (A2LA) www.a2la.org test laboratory number 2381.02. MiCOM Labs test schedule is available at the following URL; http://www.a2la.org/scopepdf/2381-02.pdf

Accredited Product Certification Body

A2LA has accredited

MICOM LABS

Pleasanton, CA

This product certification body is accredited in accordance with the recognized International Standard ISO/IEC 17065:2012 *Requirements for bodies certifying products, processes and services*. This accreditation demonstrates technical competence for a defined scope and the operation of a management system.

Presented this 4th day of February 2016.

Senior Director of Quality & Communications
For the Accreditation Council
Certificate Number 2381.02
Valid to November 30, 2017

For the product certification schemes to which this accreditation applies, please refer to the organization's Product Certification Scope of Accreditation.

United States of America – Telecommunication Certification Body (TCB)
Industry Canada – Certification Body, CAB Identifier – US0159
Europe – Notified Body (NB), NB Identifier - 2280
Japan – Recognized Certification Body (RCB), RCB Identifier - 210

2. DOCUMENT HISTORY

Document History		
Revision	**Date**	**Comments**
Draft	4th April 2016	
Draft #2	18th April 2016	
Rev A	29th April 2016	Initial Release
Rev B	27th June 2016	Correct output power measurement test methodology

3. TEST RESULT CERTIFICATE

Manufacturer:	BridgeWave Communications 3350 Thomas Road Santa Clara, California 95054 USA
Model(s):	BW64 & BW64E
Equipment Type:	Field Disturbance Sensor – PtP Fixed Wireless Backhaul
S/N's:	BGWVRB15066004 BGWVRB15066005
Test Date(s):	28th – 29th March 2016 20th – 25th June 2016

Tested By:	MiCOM Labs, Inc. 575 Boulder Court Pleasanton California 94566 USA
Telephone:	+1 925 462 0304
Fax:	+1 925 462 0306
Website:	www.micomlabs.com

STANDARD(S)	TEST RESULTS
FCC CFR 47 Part 15.255 & Industry Canada RSS-210	EQUIPMENT COMPLIES

MiCOM Labs, Inc. tested the equipment mentioned in accordance with the requirements set forth in the above standards. Test results indicate that the equipment tested is capable of demonstrating compliance with the requirements as documented within this report.

Notes:

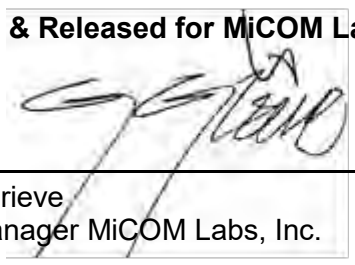
1. This document reports conditions under which testing was conducted and the results of testing performed.

2. Details of test methods used have been recorded and kept on file by the laboratory.

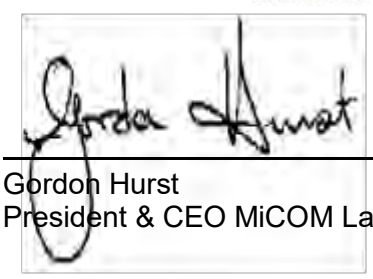
3. Test results apply only to the item(s) tested.

A2LA ACCREDITED
TESTING CERT #2381.01

Approved & Released for MiCOM Labs, Inc. by:



Graeme Grieve
Quality Manager MiCOM Labs, Inc.



Gordon Hurst
President & CEO MiCOM Labs, Inc.

4. REFERENCES AND MEASUREMENT UNCERTAINTY

4.1. Normative References

Ref.	Publication	Year	Title
(i)	FCC 47 CFR Part 15.255	2016	Code of Federal Regulations
(ii)	IC RSS-210	Issue 8, Dec 2010	License-exempt Radio Apparatus (All Frequency Bands): Category I Equipment
(iii)	M 3003	Edition 3 Nov. 2012	Expression of Uncertainty and Confidence in Measurements
(iv)	LAB34	Edition 1 Aug 2002	The expression of uncertainty in EMC Testing
(v)	ETSI TR 100 028	2001-12	Parts 1 and 2 Electromagnetic compatibility and Radio Spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics
(vi)	A2LA	Feb 2016	Reference to A2LA Accreditation Status – A2LA Advertising Policy
(vii)	ANSI C63	2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

4.2. Test and Uncertainty Procedures

Conducted and radiated emission measurements were conducted in accordance with American National Standards Institute ANSI C63.4, listed in the Normative References section of this report.

Measurement uncertainty figures are calculated in accordance with ETSI TR 100 028 Parts 1 and 2.

Measurement uncertainties stated are based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95 % in accordance with UKAS document M 3003 listed in the Normative References section of this report.

5. TEST SUMMARY

The following table represents the list of measurements required under the FCC CFR47 Part 15.255, Part 2 and Industry Canada RSS-210, Annex 13.2, Industry Canada RSS-Gen

Test Items	Description	Condition	Result	Test Report Section
Bandwidth(s)	26 dB & 99% Bandwidth	Radiated	N/A	7.1
Power Density	Emission power density	Radiated	Complies	7.2
Output Power & EIRP	EUT output power	Conducted	Complies	7.3
Maximum Permissible Exposure	MPE	Calculation	Complies	7.4
Spurious Emissions	Emissions below 1 GHz	Radiated	Complies	7.5
Radiated Emissions	Emissions above 1 GHz	Radiated	Complies	7.6/7.7
Frequency Stability	In-band emission stability	Radiated	Complies	7.8
AC Mains Line Conducted	0.15 – 30 MHz emissions	Conducted	Complies	7.9
Group Installations	Operation within group installations	Client Declaration	N/A	7.10
Transmitter Self-Identification Transmission	Transmission within buildings	Client Declaration	N/A	7.11

Note 1: *Test results reported in this document relate only to the items tested*
Note 2: *The required tests demonstrated compliance as per client declaration of test configuration, monitoring methodology and associated pass/fail criteria*
Note 3: *Section 3.7 Equipment Modifications highlights the equipment modifications that were required to bring the product into compliance with the above test matrix*

6. PRODUCT DETAILS AND TEST CONFIGURATIONS

Details	Description
Purpose:	Test of the Bridgewave Communications BW64 & BW64E Field Disturbance Sensor – PtP Fixed Wireless Backhaul to FCC Part 15.255 and IC RSS-210
Applicant:	BridgeWave Communications
Manufacturer:	BridgeWave Communications 3350 Thomas Road Santa Clara, California 95054 USA
Laboratory performing the tests:	MiCOM Labs, Inc. 575 Boulder Court Pleasanton, California 94566 USA
Test report reference number:	BDWC12 DRAFT
Date EUT received:	28th March 2016
Standard(s) applied:	FCC 15.255 & RSS-210 & RSS-Gen
Dates of test (from - to):	28th- 29th of March 2016
No of Units Tested:	2
Serial Number(s):	BGWVRB15066004 BGWVRB15066005
Type of Equipment:	Point to Point Fixed Wireless Backhaul
Manufacturers Trade Name:	Bridgewave Communications
Model:	BG64 and BW64E
Location for use:	Outdoor use only
Declared Frequency Range(s):	57.0 – 64.0 GHz
Type of Modulation:	BFSK
Declared Nominal Average Output Power:	+7.5 ± 2 dBm
EUT Modes of Operation:	1000 Mbit/s
Transmit/Receive Operation:	Full Duplex
Declared Channel Bandwidth:	1.4 GHz
Rated Input Voltage and Current:	Nominal: -48 Vdc, 0.70 Amps Minimum: -37.5 Vdc Maximum: -60 Vdc
Operating Temperature Range:	Declared range -33° to +55ºC
ITU Emission Designator:	1G40F3W
Equipment Dimensions:	H = 12.5” W = 12.5” D = 6.0”
Weight:	11.9 lbs
Primary function of equipment:	Point to Point Fixed Wireless Backhaul

6.1. Scope of Test Program

The scope of the test program was to test BridgeWave Communications Inc. BW64 & BW64E Point to Point Radio Link for network backhaul in the frequency range of 57 – 64 GHz for compliance against FCC 47 CFR Part 15.255 and IC RSS-210.

6.2. Frequency Allocation

Frequency Band (GHz)	Emissions Bandwidth (GHz)	Band Designator	Note
Rcr 58.1 – 62.9	1.4	V Band	See Note
Tx 62.9 – 58.1	1.4	V Band	See Note

NOTE: EUT operates as a field disturbance sensor

6.3. Equipment Model(s) and Serial Number(s)

Type (EUT/ Support)	Equipment Description	Manufacture	Model No.	Serial No.
EUT	Point to Point Fixed Wireless Backhaul	BridgeWave Communications, Inc.	BW64/BW 64E	BGWVRB15066004 BGWVRB15066005
PSU	AC/DC Adapter	MEANWELL	GS90A48-P1M	EB17889940
Support	Laptop PC	HP	--	None

6.4. Antenna Details

Antennas were not tested as part of the test program. Antenna details are provided for MPE (Maximum Permissible Exposure) calculations and information purposes.

Manufacturer	Antenna Type	Model Number	Frequency Band	Gain
RadioWaves	Parabolic. 24”	HP2-60BW	57-64GHz	48.0 dBi
Bridgewave	Parabolic, 10”	N/A	57-64GHz	40.0 dBi

6.5. Cabling and I/O Ports

The following is a description of the cable and input, output ports available on the EUT.

Type of I/O Ports	Description	Shielded (Y/N)	Length	Qty	Tested (Y/N)
Gigabit Ethernet	RJ-45 Cat5e or Cat6	N	325 feet	1	Y
Waveguide	RF Antenna Port	N	--	1	N
DC	DC Input	N	--	1	N
mmFiber	Payload	N	501	1	N
SFP	1000 Mbit/s	N	--	--	N

6.6. Test Configurations

Number of 1.4 GHz Channels: 1
EUT (High band) transmits 62.9 GHz and receives on at 58.1 GHz
Low Band Transmits 58.1 GHz and receives on at 62.9 GHz

6.7. Equipment Modifications

The following modifications were required to bring the equipment into compliance:

1. NONE

6.8. Deviations from the Test Standard

The following deviations from the test standard were required in order to complete the test program:

1. NONE

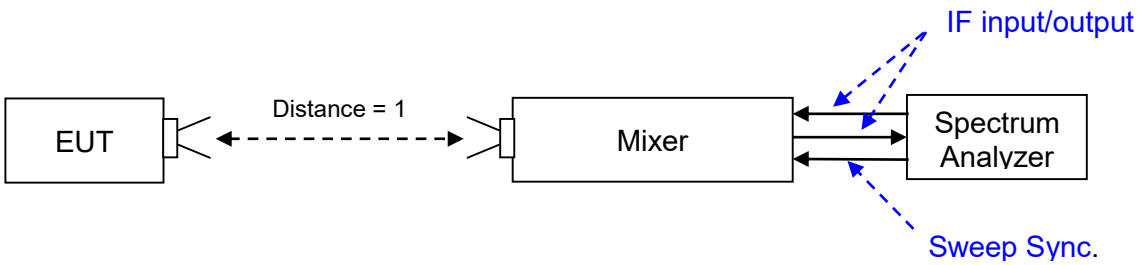
7. TEST RESULTS

7.1. Bandwidth Measurement(s)

FCC, Part 15 Subpart C §15.255, §2.1049
Industry Canada RSS-210

Test Procedure
The bandwidth at 26 dB and 99 % were measured at a 1m measurement distance. A horn antenna was connected to the pre-selector mixer and the measurement results recorded on the spectrum analyzer.

Test Measurement Set up



Measurement set up for 26 dB and 99 % bandwidth

Specification Limits

§15.255 None. **§ IC RSS-Gen 6.6 Occupied Bandwidth** When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth, as calculated or measured.

Laboratory Measurement Uncertainty for Spectrum Measurement

Measurement uncertainty	±2.81 dB

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-03 'Measurement of RF Spectrum Mask'	0088, 0146, 0158, 0227, 0252, 0310, 0312, 0307

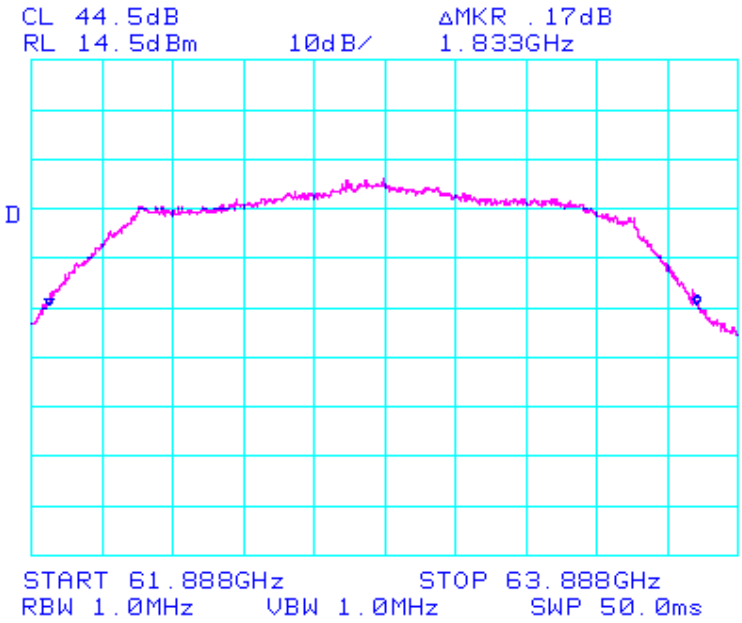
Equipment Configuration for 26 dB & 99% Occupied Bandwidth			
Variant:	2FSK	**Duty Cycle (%):**	100
Data Rate:	1000 Mbit/s	**Antenna Gain (dBi):**	48
Modulation:	FSK	**Beam Forming Gain (Y)(dB):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Frequency	Measured 26 dB Bandwidth (GHz)
	Port(s)
GHz	**A**
62.90	1.833

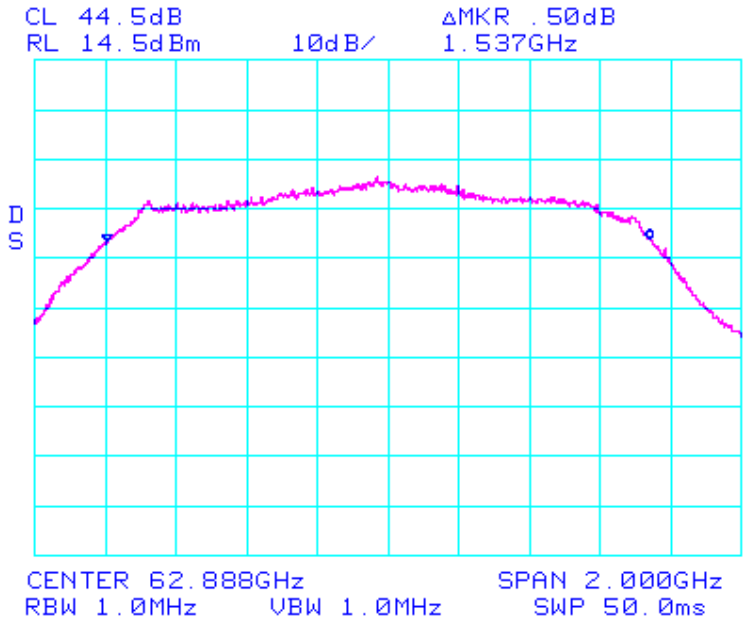
Test Frequency	Measured 99% Bandwidth (GHz)
	Port(s)
MHz	**A**
62.90	1.537

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

26 dB Bandwidth



99% dB Bandwidth



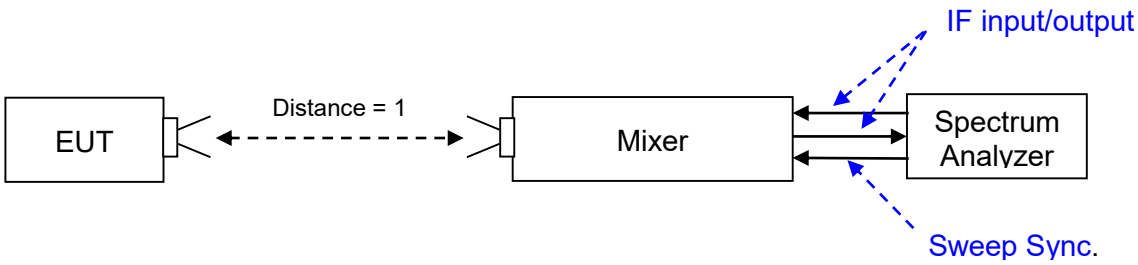
7.2. Power Density

Industry Canada RSS-210

Test Procedure

The Power Density was measured at a 1m measurement distance. A horn antenna was connected to the pre-selector mixer and the measurement results recorded on the spectrum analyzer.

Test Measurement Set up



Measurement set up for Power Density

Power Density Limit: 18 uW/cm^2 @3m distance

Area = $4\pi r^2$ where r = 300 cm

Specification

Industry Canada RSS-210
A13.2.2 Limits of Radiated Emissions (1) In-band Emissions: Within the band 57-64 GHz, emission levels measured 3 meters from the radiating source shall not exceed the following: (i) For products other than fixed field disturbance sensors, the average power density of any emission, measured during the transmit interval, shall not exceed 9 μW/cm2 , and the peak power density of any emission shall not exceed 18 μW/cm2 .

Laboratory Measurement Uncertainty for Spectral Density

Measurement uncertainty	±1.33 dB

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-01 'Measuring RF Output Power'	0088, 0146, 0158, 0227, 0252, 0310, 0312, 0307

Equipment Configuration for Power Spectral Density			
Variant:	2FSK	**Duty Cycle (%):**	100
Data Rate:	1000 Mbit/s	**Antenna Gain (dBi):**	48
Modulation:	FSK	**Beam Forming Gain (Y)(dB):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Frequency (GHz)	PSD @ 1m dBuV/m	PSD @ 3m dBuV/m	PSD V/m	PSD uV/cm2	PSD Limit uV/cm2
62.90	90.67	81.17	0.01144	0.3472	18

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

Power Density (PSD) at 1 meter distance = 90.67 dBuV/m

Conversion factor from 3m to 1m:

20 Log (1/3)

=9.5

PSD @ 3meter = 90.67 – 9.5 = **81.17 dBuV/m**

Conversion from dBuV to V/m:

$10^{(\frac{dBuV}{20})}*1E+6$

$=10^{(\frac{81.17}{20})}*1E+6$

=0.01144

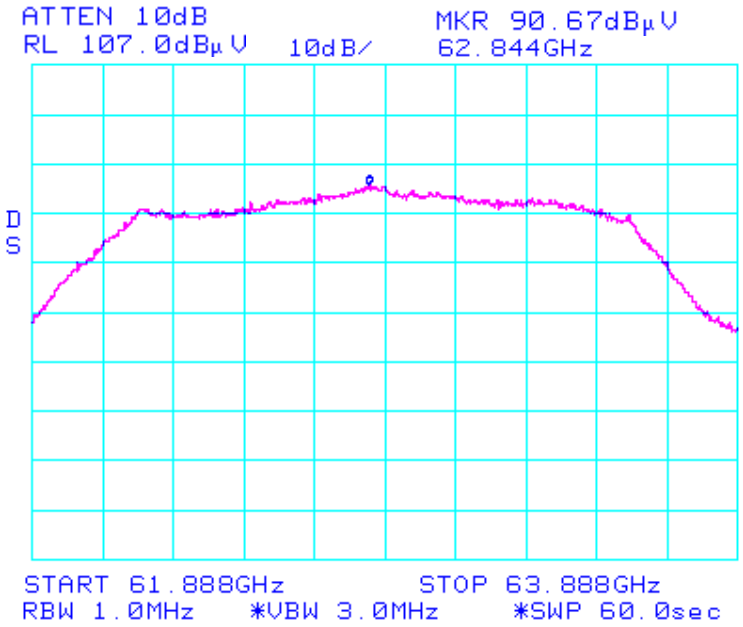
Conversion from V/m to uV/cm2:

$=(V/m)\ 2/377$

$=(0.01144)\ 2/377$

=0.3472 uW/cm2

Power Density



7.3. Conducted Output Power and EIRP

FCC, Part 15 Subpart C §15.255, §2.1046
Industry Canada RSS-210

Test Procedure

1) Place the EUT in a continuous transmission mode.
2) For radiated emission measurements, attach a test horn antenna for the fundamental frequency band to the RF input of an RF detector or a downconverter with an RF detector at the output. If necessary, insert a low noise amplifier between the output of the test antenna and the RF input. For conducted transmitter output power measurements, connect the RF detector or the downconverter with appropriate attenuation to the output port of the EUT, if available.
3) Connect the video output of the detector to the 50 ohm input of the DSO through a 10 MHz or greater low pass filter.
4) Set the sampling rate of the DSO to the required value. Adjust the memory depth, the triggering and the sweep speed to obtain a display which is representative of the signal considering the type of modulation. If the signal is non-continuous, identify the segment of the signal which has the highest amplitude and adjust the triggering and the sweep speed to capture that segment.
5) Measurement system calibration. To determine the power level from the signal display on the DSO, the measurement system must be calibrated. This can be accomplished by applying a signal from a source of known amplitude to the input of the RF detector or downconverter and adjusting the amplitude of the source so the level on the DSO display equals the recorded measured amplitude.
6) For conducted emission measurements, calculate the EIRP using equation (7).

(7) PCond = EIRP = PCond + GdBi

ANSI C63.10: 2013 (Section 9.11 Pg 97-98)
KDB 200443 D02 Millimeter Wave Method DR02-41500

Specification Limits

FCC, Part 15

§15.255 (e) Except as specified elsewhere in this paragraph (e), the total peak transmitter output power shall not exceed 500 mW.

(e) Except as specified paragraph (e)(1) of this section, the peak transmitter conducted output power shall not exceed 500 mW. Depending on the gain of the antenna, it may be necessary to operate the intentional radiator using a lower peak transmitter output power in order to comply with the EIRP limits specified in paragraph (b) of this section.

(1) Transmitters with an emission bandwidth of less than 100 MHz must limit their peak transmitter conducted output power to the product of 500 mW times their emission bandwidth divided by 100 MHz. For the purposes of this paragraph, emission bandwidth is defined as the instantaneous frequency range occupied by a steady state radiated signal with modulation, outside which the radiated power spectral density never exceeds 6 dB below the maximum radiated power spectral density in the band, as measured with a 100 kHz resolution bandwidth spectrum analyzer. The center frequency must be stationary during the measurement interval, even if not stationary during normal operation (e.g., for frequency hopping devices).

15.255 ((b) Within the 57-64 GHz band, emission levels shall not exceed the following equivalent isotopically radiated power (EIRP):

(1)(ii) For transmitters located outdoors, the average power of any emission shall not exceed 82 dBm minus 2 dB for every dB that the antenna gain is less than 51 dBi. The peak power of any emission shall not exceed 85 dBm minus 2 dB for every dB that the antenna gain is less than 51 dBi. The provisions of §15.204(c)(2) and (c)(4) of this part that permit the use of different antennas of the same type and of equal or less directional gain do not apply to intentional radiator systems operating under this provision. In lieu thereof, intentional radiator systems shall be certified using the specific antenna(s) with which the system will be marketed and operated. Compliance testing shall be performed using the highest gain and the lowest gain antennas for which certification is sought and with the intentional radiator operated at its maximum available output power level. The responsible party, as defined in §2.909 of this chapter, shall supply a list of acceptable antennas with the application for certification

Industry Canada RSS-210

A13.2.2 Limits of Radiated Emissions (1) In-band Emissions: Within the band 57-64 GHz, emission levels measured 3 meters from the radiating source shall not exceed the following: (i) For products other than fixed field disturbance sensors, the average power density of any emission, measured during the transmit interval, shall not exceed 9 $\mu W/cm^2$, and the peak power density of any emission shall not exceed 18 $\mu W/cm^2$.

A13.2.3 Peak Transmitter Output Power (1) The total peak transmitter output power shall not exceed 500 mW, with the exception that transmitters with an emission bandwidth of less than 100 MHz must limit their peak transmitter output power to the product of 500 mW times their emission bandwidth divided by 100 MHz.

Laboratory Measurement Uncertainty for Power Measurements

Measurement uncertainty	±1.33 dB

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-01 'Measuring RF Output Power'	0088, 0146, 0158, 0227, 0252, 0310, 0312, 0307

BGWVRB15066004

Equipment Configuration for RF Conducted Output Power			
Variant:	2FSK	**Duty Cycle (%):**	100
Data Rate:	1000 Mbit/s	**Antenna Gain (dBi):**	48.00
Modulation:	FSK	**Beam Forming Gain (Y)(dB):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	CC
Engineering Test Notes:	None		

Test Measurement Results

Peak Measurement						
Test Frequency	**Output Power**	**Limit Output Power**	**Margin**	**EIRP**	**EIRP Limit**	**Margin**
GHz	**dBm**	**dBm**	**dB**	**dBm**	**dBm**	**dB**
62.9	10.60	27.00	-16.40	58.60	79.00	-20.4
Average Measurement						
62.9	8.17	--	--	56.17	76.00	-19.8

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-01 MEASURING RF OUTPUT POWER
Uncertainty:	±1.33 dB

Note: 6 dB bandwidth was observed to be greater than 100 MHz.

BGWVRB15066005

Equipment Configuration for RF Output Power			
Variant:	2FSK	**Duty Cycle (%):**	100
Data Rate:	1000 Mbit/s	**Antenna Gain (dBi):**	40
Modulation:	FSK	**Beam Forming Gain (Y)(dB):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	CC
Engineering Test Notes:	None		

Test Measurement Results

Peak Measurement						
Test Frequency	**Output Power**	**Limit Output Power**	**Margin**	**EIRP**	**EIRP Limit**	**Margin**
GHz	**dBm**	**dBm**	**dB**	**dBm**	**dBm**	**dB**
62.9	10.60	27.00	-16.40	50.60	63.00	-12.4
Average Measurement						
62.9	8.17	--	--	48.17	60.00	-11.8

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-01 MEASURING RF OUTPUT POWER
Uncertainty:	±1.33 dB

Note: 6 dB bandwidth was observed to be greater than 100 MHz.

7.4. Maximum Permissible Exposure

FCC, Part 1 Subpart C §1.1310 & 1307(b)
Industry Canada RSS-102

Calculations for Maximum Permissible Exposure Levels

Power Density = Pd (mW/cm^2) = $EIRP/(4\pi d^2)$

P = Peak output power (mW)

G = Antenna numeric gain (numeric)

d = Separation distance (cm)

Numeric Gain = 10 ^ (G (dBi)/10)

The peak power in the table below is calculated by assuming a worst case scenario where the transmitter is operating maximum power.

Because the EUT belongs to the General Population/Uncontrolled Exposure the limit of power density is 1.0 mW/cm^2

Freq. Band (GHz)	Antenna Gain (dBi)	Numeric Gain (numeric)	Output Power (dBm)	Output Power (mW)	Calculated Safe Distance @ 1mW/cm² Limit(cm)	Minimum Separation Distance (cm)
62.90	40	10000	+8.17	6.56	72.28	73

Freq. Band (GHz)	Antenna Gain (dBi)	Numeric Gain (numeric)	Output Power (dBm)	Output Power (mW)	Calculated Safe Distance @ 1mW/cm² Limit(cm)	Minimum Separation Distance (cm)
62.90	48	63095.7	+8.17	6.56	181.54	182

***Note:** for mobile or fixed location transmitters the minimum separation distance is 20cm, even if calculations indicate the MPE distance to be less.

Specification

Maximum Permissible Exposure Limits

FCC §1.1310
Limit = 1mW / cm^2 from 1.310 Table 1

RSS-102
Before equipment certification is granted, the application requirements of RSS-102 shall be met.

Laboratory Measurement Uncertainty for Power Measurements

Measurement uncertainty	±1.33 dB

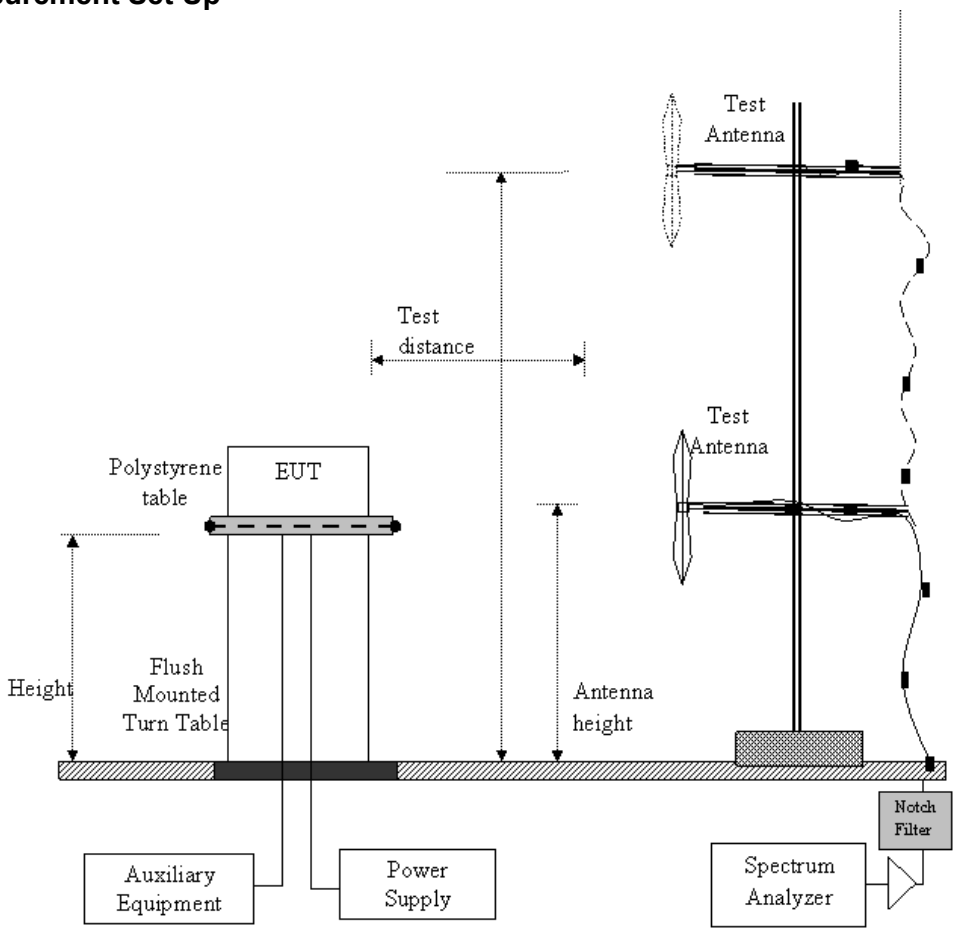
7.5. Radiated Emissions (< 1GHz)

Test Procedure

Testing was performed in a 3-meter anechoic chamber. Preliminary radiated emissions were measured on every azimuth and with the receiving antenna in both horizontal and vertical polarizations. Preliminary emissions were recorded with in Spectrum Analyzer mode, using a maximum peak detector while in peak hold mode.

Emissions nearest the limits were chosen for maximization and formal measurement using a CISPR Compliant receiver. Emissions above 1000 MHz are measured utilizing a CISPR compliant average detector with a tuned receiver, using a bandwidth of 1 MHz. Emissions from 30 MHz – 1000 MHz are measured utilizing a CISPR compliant quasi-peak detector with a tuned receiver, using a bandwidth of 120 kHz. Only the highest emissions relative to the limit are listed.

Test Measurement Set Up



Radiated Emission Measurement Setup – Below 1 GHz

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss, and subtracting Amplifier Gain from the measured reading. All factors are included in the reported data.

FS = R + AF + CORR – FO

FS = Field Strength
R = Measured Spectrum analyzer Input Amplitude
AF = Antenna Factor

CORR = Correction Factor = CL – AG + NFL

CL = Cable Loss
AG = Amplifier Gain
FO = Distance Falloff Factor
NFL = Notch Filter Loss or Waveguide Loss

Field Strength Calculation Example:

Given receiver input reading of 51.5 dBμV; Antenna Factor of 8.5 dB; Cable Loss of 1.3 dB; Falloff Factor of 0 dB, an Amplifier Gain of 26 dB and Notch Filter Loss of 1 dB. The Field Strength of the measured emission is:

FS = 51.5 + 8.5 + 1.3 - 26.0 +1 = 36.3 dBμV/m

Conversion between dBμV/m (or dBμV) and μV/m (or μV) are done as:

Level (dBμV/m) = 20 * Log (level (μV/m))

40 dBμV/m = 100 μV/m
48 dBμV/m = 250 μV/m

Specification

Radiated Spurious Emissions

FCC §15.255(c) (1) The power density of any emissions outside the 57-64 GHz band shall consist solely of spurious emissions. (2) Radiated emissions below 40 GHz shall not exceed the general limits in Section 15.209 of this part.

FCC §15.205 (a) Except as shown in paragraph (d) of 15.205 (a), only spurious emissions are permitted in any of the frequency bands listed.

FCC §15.205 (a) Except as shown in paragraphs (d) and (e) of this section, the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

FCC §15.209 (a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table.

FCC § 2.1051

Table 1: FCC 15.209 Spurious Emissions Limits

Frequency (MHz)	Field Strength (µV/m)	Field Strength (dBµV/m)	Measurement Distance (meters)
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	500	54.0	3

Laboratory Measurement Uncertainty for Spectrum Measurement

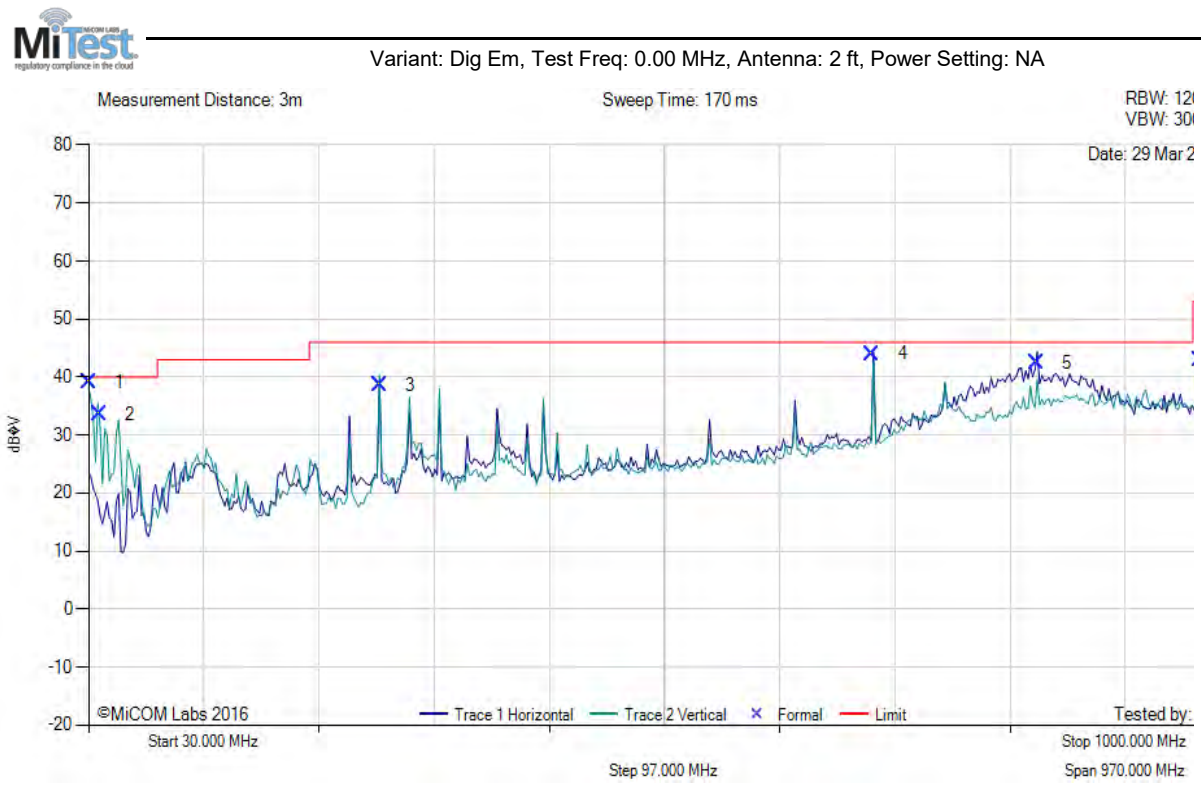
Measurement Uncertainty	+5.6/ -4.5 dB

Traceability:

Method	Test Equipment Used
Work instruction WI-03	0088, 0158, 0134, 0304, 0311, 0315, 0310, 0312

Radiated Emissions Results < 1 GHz

BW64 High-band (2ft Antenna) SN# BGWVRB15066004, 48V DC 30-1000 MHz

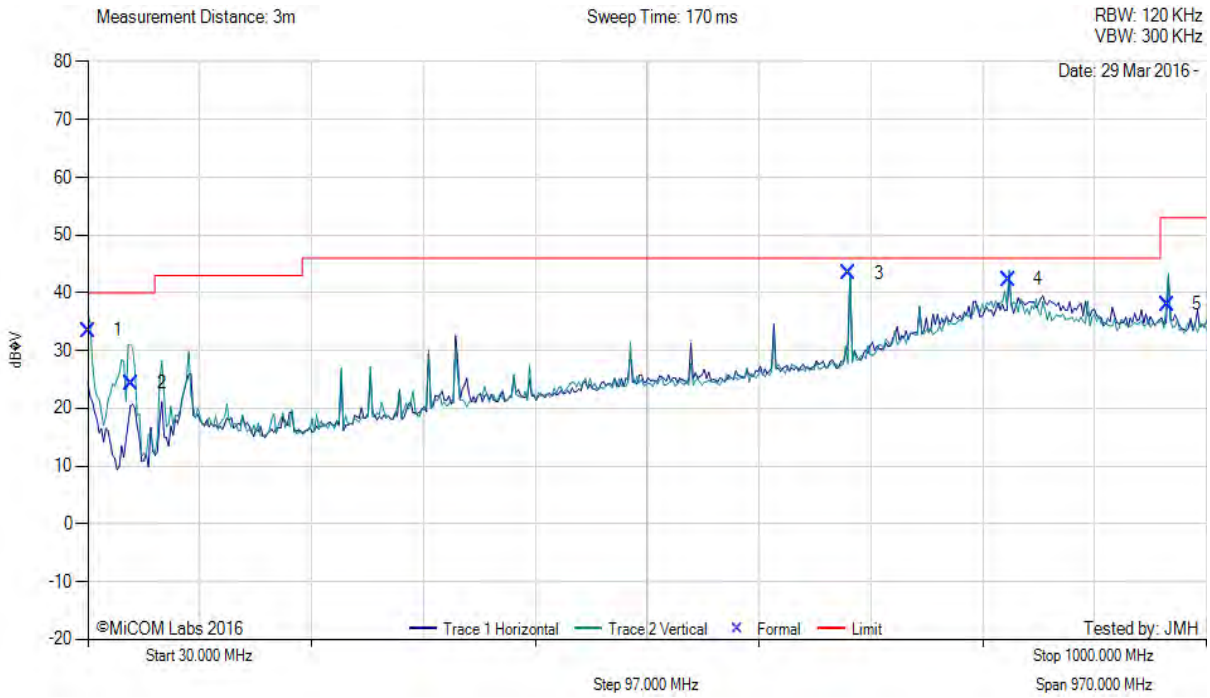


Num	Frequency MHz	Raw dBµV	Cable Loss	AF dB	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB
1	30.62	46.26	3.43	-10.61	39.08	MaxQP	Vertical	100	239	40.0	-0.9
2	38.94	46.76	3.49	-16.67	33.58	MaxQP	Vertical	100	7	40.0	-6.4
3	274.98	51.36	4.62	-17.42	38.56	MaxQP	Vertical	100	252	46.0	-7.4
4	689.98	48.50	5.83	-10.35	43.98	MaxQP	Vertical	208	345	46.0	-2.0
5	828.01	44.60	6.18	-8.30	42.48	MaxQP	Vertical	193	355	46.0	-3.5
6	965.97	43.54	6.49	-7.03	43.00	MaxQP	Vertical	185	355	53.0	-10.0

Test Notes: BW64 on tripod powered by 48V from DC supply fiber and enet connected to laptop for traffic and payload generation

BW64 High-band (2ft Antenna) SN# BGWVRB15066004, POE 30-1000 MHz

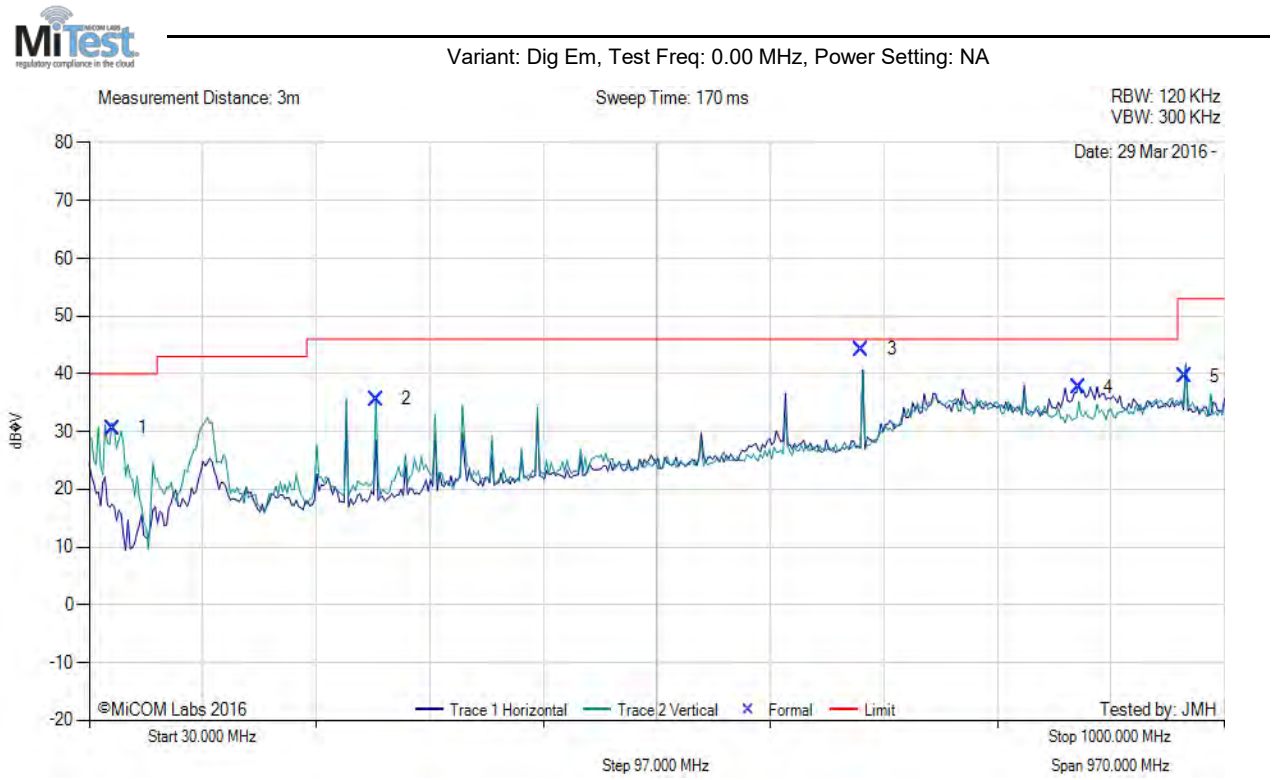
Variant: Dig Em, Test Freq: 0.00 MHz, Antenna: 2 ft, Power Setting: NA



Num	Frequency MHz	Raw dBµV	Cable Loss	AF dB	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	30.64	40.64	3.43	-10.61	33.46	MaxQP	Vertical	102	218	40.0	-6.5	Pass
2	68.17	43.93	3.69	-23.29	24.33	MaxQP	Vertical	144	169	40.0	-15.7	Pass
3	689.98	47.91	5.83	-10.35	43.39	MaxQP	Vertical	153	21	46.0	-2.6	Pass
4	828.01	44.40	6.18	-8.30	42.28	MaxQP	Vertical	193	355	46.0	-3.7	Pass
5	965.99	38.53	6.49	-7.03	37.99	MaxQP	Vertical	100	304	53.0	-15.0	Pass

Test Notes: BW64 on tripod powered by 48V poe Meanwell GS9048A, fiber and enet connected to laptop for traffic and payload generation

BW64 Low-band (10 in Antenna) SN# BGWVRB15066005, 48V DC, 30-1000 MHz

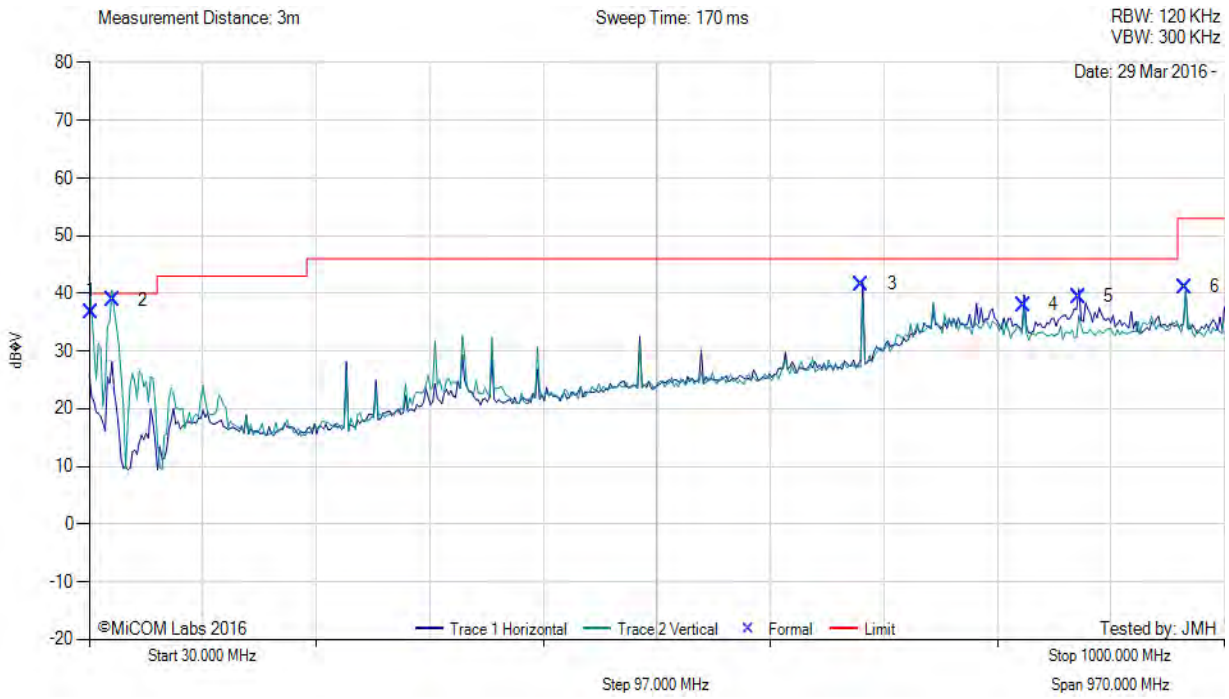


Num	Frequency MHz	Raw dBµV	Cable Loss	AF dB	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	50.43	50.19	3.57	-23.14	30.62	MaxQP	Vertical	100	165	40.0	-9.4	Pass
2	274.95	48.43	4.62	-17.42	35.63	MaxQP	Vertical	177	219	46.0	-10.4	Pass
3	689.97	48.75	5.83	-10.35	44.23	MaxQP	Horizontal	131	123	46.0	-1.8	Pass
4	874.98	39.44	6.27	-8.09	37.62	MaxQP	Horizontal	212	210	46.0	-8.4	Pass
5	965.99	40.10	6.49	-7.03	39.56	MaxQP	Horizontal	346	190	53.0	-13.4	Pass

Test Notes: BW64 Lowband on tripod powered by 48V DC , fiber and enet connected to laptop for traffic and payload generation

BW64 Low-band (10 in Antenna) SN# BGWVRB15066005, POE 30-1000 MHz

Variant: Dig Em, Test Freq: 0.00 MHz, Power Setting: NA



Num	Frequency MHz	Raw dBµV	Cable Loss	AF dB	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	31.28	43.96	3.43	-10.61	36.78	MaxQP	Vertical	101	195	40.0	-3.2	Pass
2	50.43	58.48	3.57	-23.14	38.91	MaxQP	Vertical	100	159	40.0	-1.1	Pass
3	689.99	46.14	5.83	-10.35	41.62	MaxQP	Horizontal	209	241	46.0	-4.4	Pass
4	827.98	40.10	6.18	-8.30	37.98	MaxQP	Horizontal	118	260	46.0	-8.0	Pass
5	874.96	41.31	6.27	-8.09	39.49	MaxQP	Horizontal	205	241	46.0	-6.5	Pass
6	965.98	41.63	6.49	-7.03	41.09	MaxQP	Horizontal	201	177	53.0	-11.9	Pass

Test Notes: BW64 Lowband on tripod powered by POE 48V Meanwell GS9048A , fiber and enet connected to laptop for traffic and payload generation

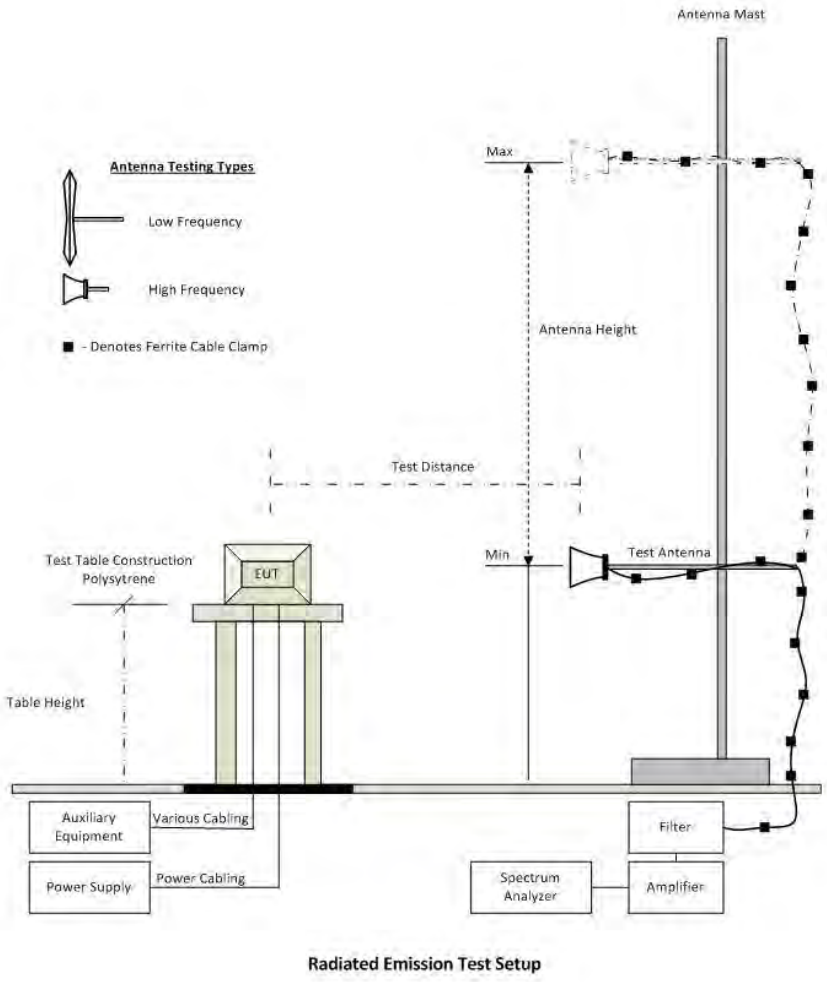
7.6. Radiated Spurious Emissions (Above 1 GHz and Below 40 GHz)

Test Procedure

Testing was performed in a 3-meter anechoic chamber. Preliminary radiated emissions were measured on every azimuth and with the receiving antenna in both horizontal and vertical polarizations. Preliminary emissions were recorded with in Spectrum Analyzer mode, using a maximum peak detector while in peak hold mode.

Emissions nearest the limits were chosen for maximization and formal measurement using a CISPR Compliant receiver. Emissions above 1000 MHz are measured utilizing a CISPR compliant average detector with a tuned receiver, using a bandwidth of 1 MHz. Emissions from 30 MHz – 1000 MHz are measured utilizing a CISPR compliant quasi-peak detector with a tuned receiver, using a bandwidth of 120 kHz. Only the highest emissions relative to the limit are listed.

Test Measurement Set Up



Radiated Emission Test Setup

Radiated Emission Measurement Setup – above 1 GHz

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss, and subtracting Amplifier Gain from the measured reading. All factors are included in the reported data.

FS = R + AF + CORR – FO

FS = Field Strength
R = Measured Spectrum analyzer Input Amplitude
AF = Antenna Factor

CORR = Correction Factor = CL – AG + NFL

CL = Cable Loss
AG = Amplifier Gain
FO = Distance Falloff Factor
NFL = Notch Filter Loss or Waveguide Loss

Field Strength Calculation Example:

Given receiver input reading of 51.5 dBμV; Antenna Factor of 8.5 dB; Cable Loss of 1.3 dB; Falloff Factor of 0 dB, an Amplifier Gain of 26 dB and Notch Filter Loss of 1 dB. The Field Strength of the measured emission is:

FS = 51.5 + 8.5 + 1.3 - 26.0 +1 = 36.3 dBμV/m

Conversion between dBμV/m (or dBμV) and μV/m (or μV) are done as:

Level (dBμV/m) = 20 * Log (level (μV/m))

40 dBμV/m = 100 μV/m
48 dBμV/m = 250 μV/m

Specification

Radiated Spurious Emissions

FCC §15.255(c) (1) The power density of any emissions outside the 57-64 GHz band shall consist solely of spurious emissions. (2) Radiated emissions below 40 GHz shall not exceed the general limits in Section 15.209 of this part.

FCC §15.205 (a) Except as shown in paragraph (d) of 15.205 (a), only spurious emissions are permitted in any of the frequency bands listed.

FCC §15.205 (a) Except as shown in paragraphs (d) and (e) of this section, the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

FCC §15.209 (a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table.

FCC §2.1051

Table 1: FCC 15.209 Spurious Emissions Limits

Frequency (MHz)	Field Strength (µV/m)	Field Strength (dBµV/m)	Measurement Distance (meters)
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	500	54.0	3

Laboratory Measurement Uncertainty for Radiated Spurious Emissions

Measurement uncertainty	+5.6 / -4.5 dB

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-05 'Measurement of Spurious Emissions'	0088, 128, 0145, 0146, 0147, 0148, 0158, 227, 229, 0252, 0310, 0312, 0307

BGWVRB15066004

Equipment Configuration for Transmitter Unwanted Emissions Above 1GHz and Below 40GHz			
Variant:	2FSK	**Duty Cycle (%):**	100
Data Rate:	1000 Mbit/s	**Antenna Gain (dBi):**	48
Modulation:	FSK	**Beam Forming Gain (Y)(dB):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

BGWVRB15066004					
Temperature	**20.0 °C**	**Maximum Observed Spurious Emission**		**Limit**	**Margin**
Voltage	**48.00 Vdc**	**Amplitude**	**Emission Frequency**		
Test Frequency	**Frequency Range**	**dBuV/m**	**GHz**	**dBuV/m**	**dB**
62.90 GHz	**1000 - 18000 MHz**	43.04	6.55	54.0	-10.96
	18000-26500 MHz	55.83	21.62	63.5*	-7.67
	26500 - 40000 MHz	57.00	34.59	63.5*	-6.5

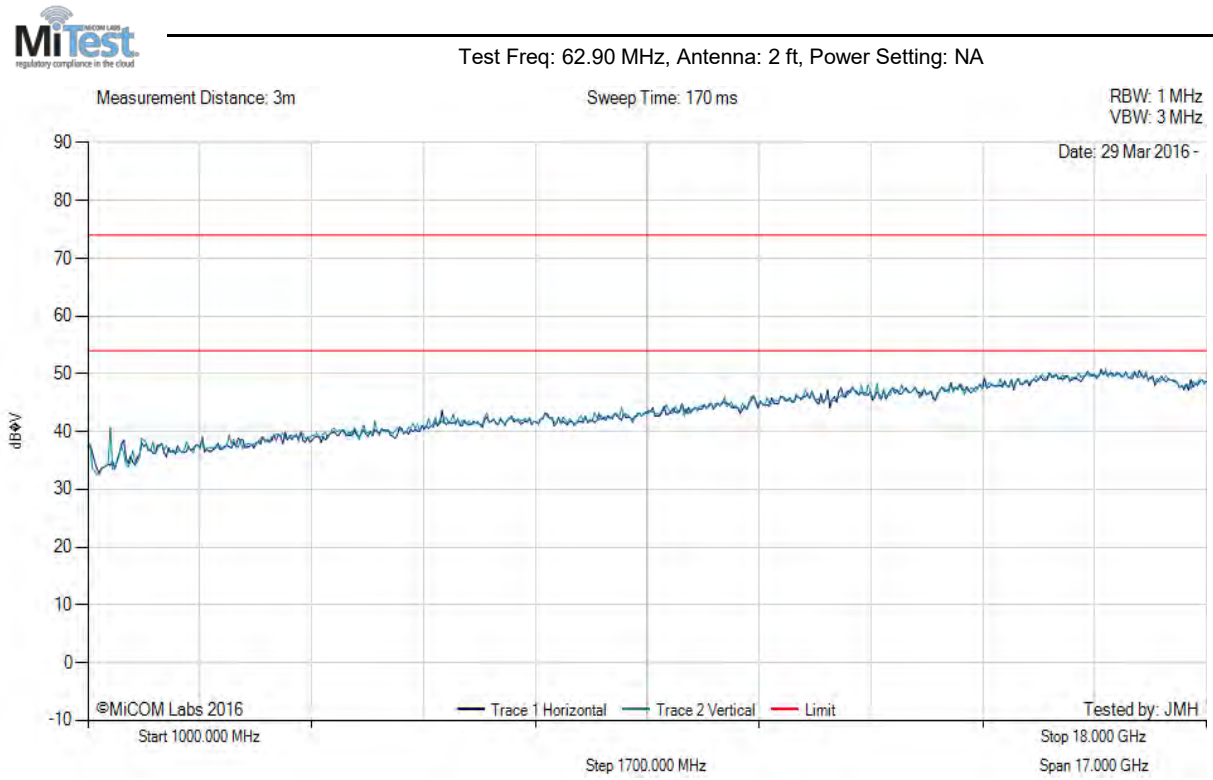
Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-05 MEASUREMENT OF SPURIOUS EMISSIONS
Measurement Uncertainty:	<=40 GHz ±2.37 dB, > 40 GHz ±4.6 dB

*** Note: Limit was changed for 1-meter distance of testing based on conversion factor as below:**

Limit @ 3 m: 54 dBuV/m
Limit @ 1 m= Limit @ 3 m – 20 log (1/3) = 54+9.5 = 63.5 dBuV/m

Radiated Spurious Emissions 1.0 – 18.000 GHz

BW64 Highband (2ft Antenna) SN# BGWVRB15066004, 48V DC



There are no emissions found within 6dB of the limit line.

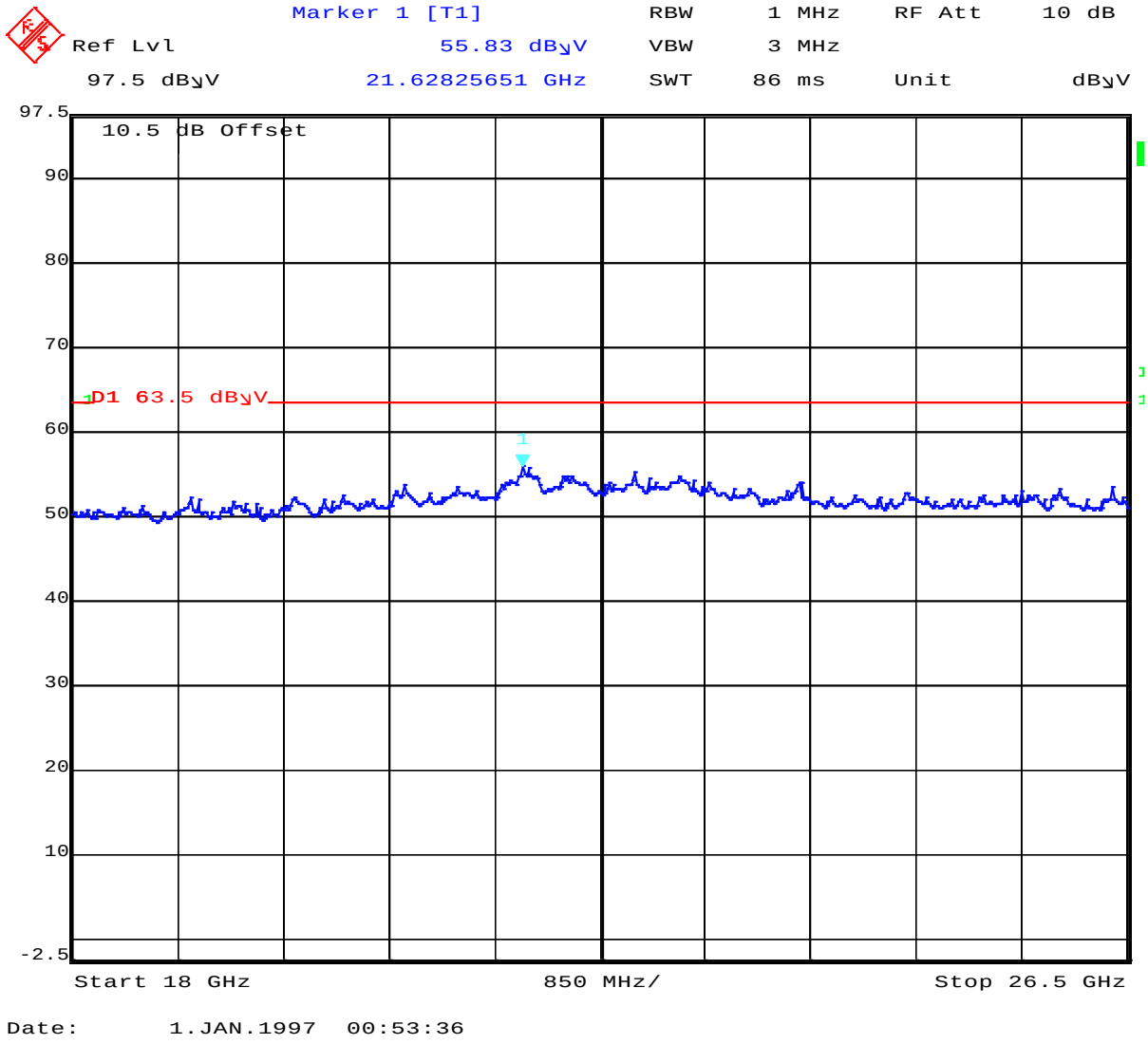
Test Notes: BW64 on tripod powered by 48V DC, fiber and Enet connected to laptop for traffic and payload generation

Back to Matrix

No spurious emissions were found within this frequency range

Radiated Spurious Emissions 18.000 – 26.500 GHz

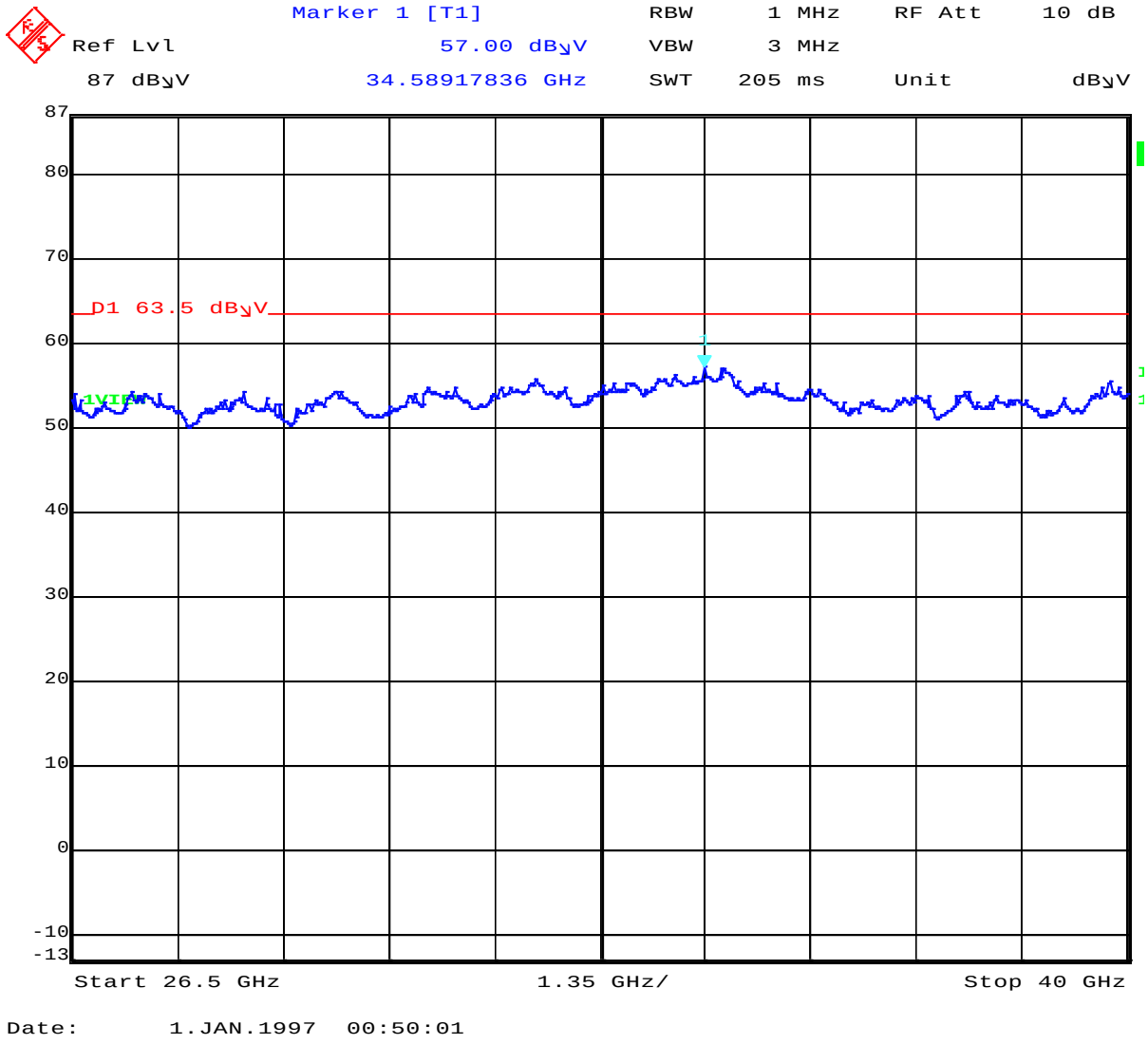
BW64 Highband (2ft Antenna) SN# BGWVRB15066004, 48V DC



Back to Matrix

Radiated Spurious Emissions 26.500- 40 GHz

BW64 Highband (2ft Antenna) SN# BGWVRB15066004, 48V DC



Back to Matrix

BGWVRB15066005

Equipment Configuration for Transmitter Unwanted Emissions Above 1GHz and Below 40GHz			
Variant:	2FSK	**Duty Cycle (%):**	100
Data Rate:	1000 Mbit/s	**Antenna Gain (dBi):**	40
Modulation:	FSK	**Beam Forming Gain (Y)(dB):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

BGWVRB15066005

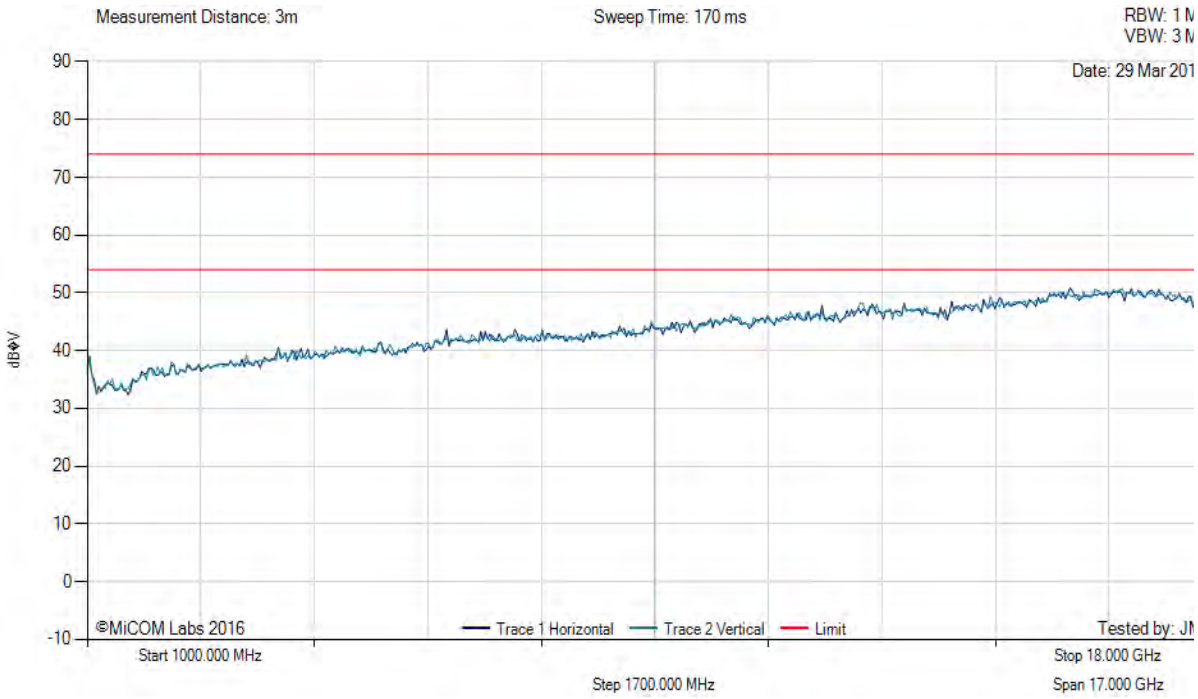
Temperature	20.0 °C	Maximum Observed Spurious Emission		Emission Limit	Margin
Voltage	48.00 Vdc	Amplitude	Emission Frequency		
Test Frequency	Frequency Range	dBuV	GHz	dBuV/m	dB
62.90 GHz	1000 - 18000 MHz	42.59	6.58	54.0	-11.41
	18000-26500 MHz	55.34	21.56	63.5*	-8.16
	26500 - 40000 MHz	56.63	34.9	63.5*	-6.87

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-05 MEASUREMENT OF SPURIOUS EMISSIONS
Measurement Uncertainty:	<=40 GHz ±2.37 dB, > 40 GHz ±4.6 dB

*** Note: Limit was changed for 1-meter distance of testing based on conversion factor as below:**

Limit @ 3 m: 54 dBuV/m
Limit @ 1 m= Limit @ 3 m – 20 log (1/3) = 54+9.5 = 63.5 dBuV/m

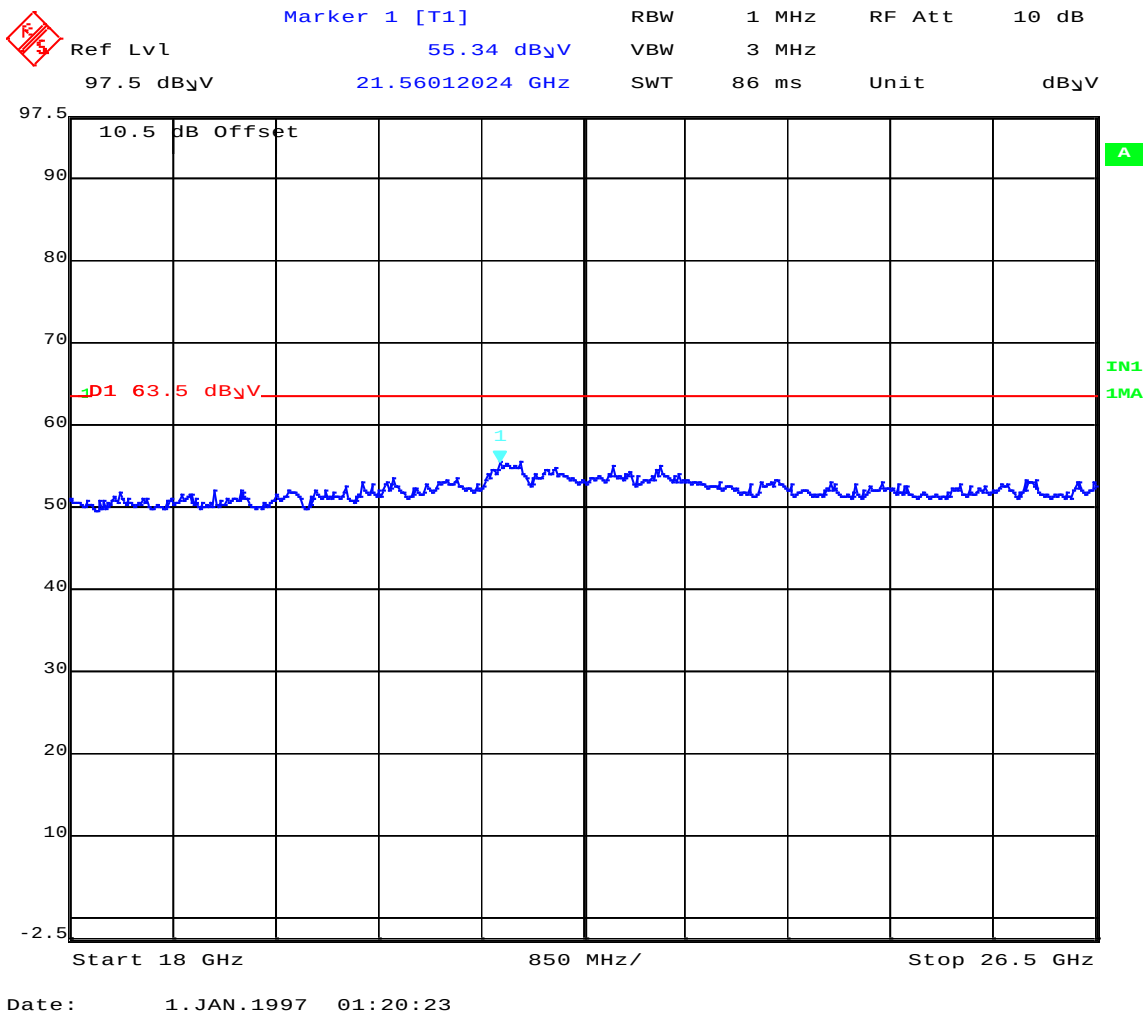
Radiated Spurious Emissions 1.0 – 18.000 GHz



Back to Matrix

No spurious emissions were found within this frequency range

Radiated Spurious Emissions 18.000 – 26.500 GHz



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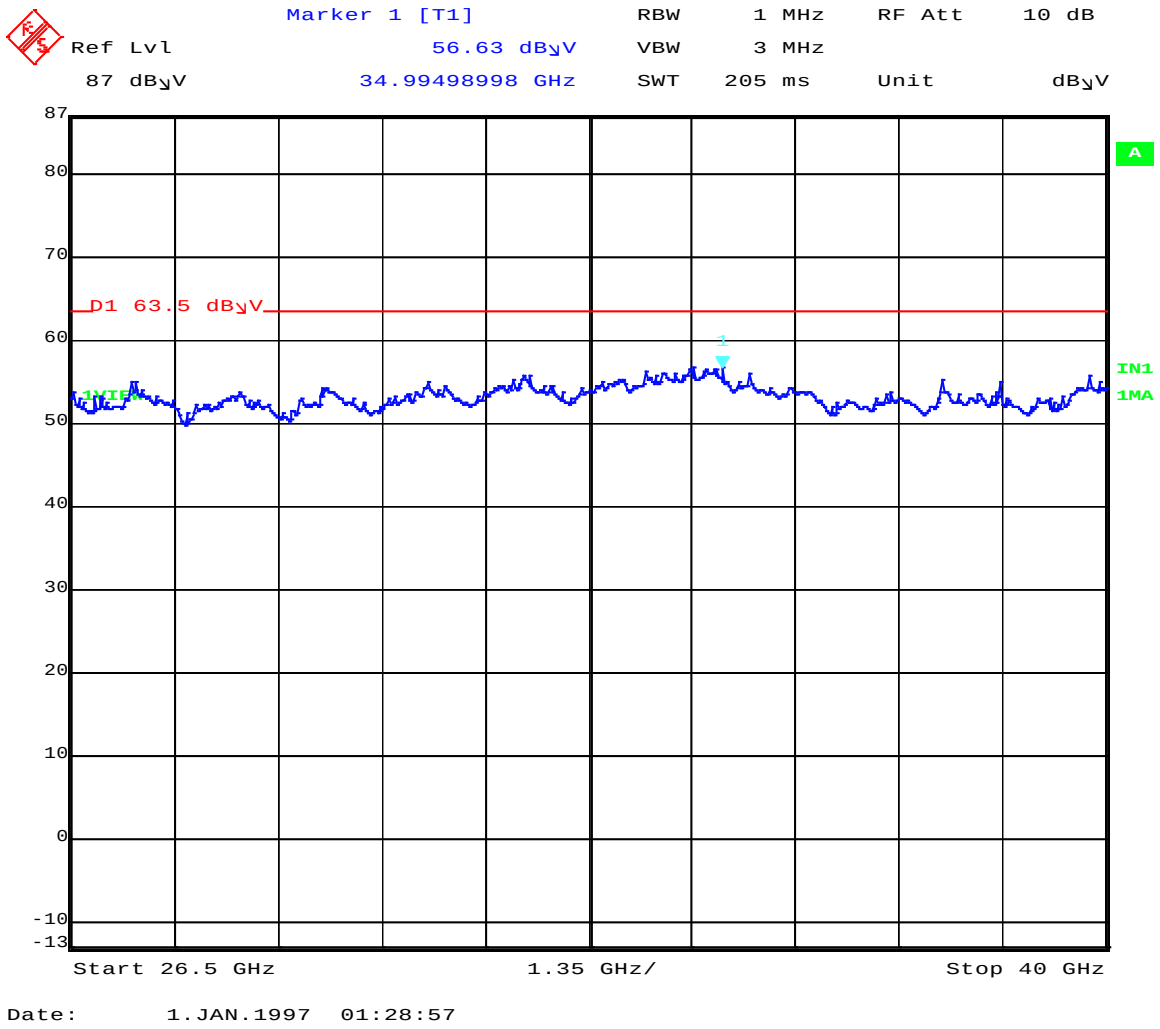
Radiated Spurious Emissions 26.500- 40 GHz



Back to Matrix

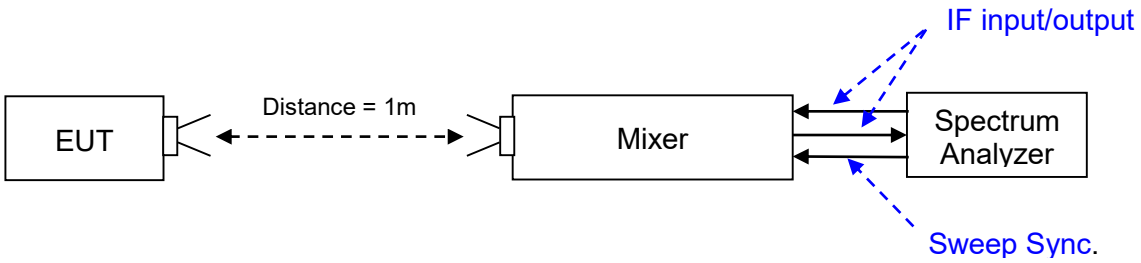
7.7. Spurious Emissions (> 40 GHz)

FCC, Part 15 Subpart C §15.255 (e)(2)
FCC, Part 15.209 & 15.205
Industry Canada RSS-210

Test Procedure
Spurious emissions were measured at a 1m measurement distance. A horn antenna was connected to the pre-selector mixer and the measurement results recorded on the spectrum analyzer.

The modulated transmitter was operating at the appropriate center frequency.

Test Measurement Set up



Measurement set up for Spurious Emissions

Spurious Emission Limit: 90 pW/cm^2 @ 3m distance

90 pW/cm^2 = 0.0001842 v/m

Radiated Emission limit @ 3 m distance= 45.31 dBμV/m

Radiated Emission Limit @ 1 m distance = Radiated Limit (@3 m distance) – 20 log (1/3) = **54.81 dBμV/m**

Limits

FCC §15.255 (c)(1) The power of any emission outside of the 57 – 64 GHz band shall consist solely of spurious emissions.

FCC §15.255 (c)(2) Radiated emissions below 40 GHz shall not exceed the general limits in §15.209.

FCC §15.255 (c)(3) Between 40 and 200 GHz the level of the emissions shall not exceed 90 pW/cm^2 at a distance of 3 meters.

FCC §15.255 (c)(4) The level of the spurious emission shall not exceed the level of the fundamental emission

FCC §15.255 (d) Only spurious emissions and transmissions related to a publicly accessible coordination channel, whose purpose is to coordinate operation between diverse transmitters with a view towards reducing the probability of interference throughout the 57 – 64 GHz band are permitted in the 57 – 57.05 GHz band.

FCC §2.1051

RSS-210 §A13.2.2 In-band Emissions: Within the band 57-64 GHz, emission levels measured 3 meters from the radiating source shall not exceed the following:

(i) For products other than fixed field disturbance sensors, the average power density of any emission, measured during the transmit interval, shall not exceed 9 µW/cm2, and the peak power density of any emission shall not exceed 18µW/cm2.

(ii) For fixed field disturbance sensors that occupy 500 MHz or less of bandwidth and that are contained wholly within the frequency band 61.0-61.5 GHz, the average power density of any emission, measured during the transmit interval, shall not exceed 9µW/cm2, and the peak power density of any emission shall not exceed 18 µW/cm2.

In addition, the average power density of any emission outside of the band 61.0-61.5 GHz, measured during the transmit interval, but still within the band 57-64 GHz, shall not exceed 9 nW/cm2, and the peak power density of any emission shall not exceed 18 nW/cm2.

(iii) For fixed field disturbance sensors other than those operating under the provisions of subsection A13.2.2(1)(ii) of this section, the peak transmitter output power shall not exceed 0.1 mW and the peak power density shall not exceed 9 nW/cm2.

(2) **Spurious emissions:** Any emissions outside the band 57-64 GHz shall consist solely of spurious emissions and shall not exceed:

(i) the limits shown in Tables 2 and 3 for emissions below 40 GHz;
(ii) 90 pW/cm^2 at a distance of 3 metres for emissions between 40 GHz and 200 GHz;

Within the band 57.0-57.05 GHz, only spurious emissions related to a publicly-accessible coordination channel are permitted. The band 57-57.05 GHz is reserved exclusively for a publicly-accessible coordination channel

Laboratory Measurement Uncertainty for Radiated Spurious Emissions

Measurement uncertainty	+5.6 / -4.5 dB

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-05 'Measurement of Spurious Emissions'	0088, 128, 0145, 0146, 0147, 0148, 0158, 227, 229, 0252, 0310, 0312, 0307

BGWVRB15066004

Equipment Configuration for Transmitter Unwanted Emissions Above 40GHz			
Variant:	2FSK	**Duty Cycle (%):**	100
Data Rate:	1000 Mbit/s	**Antenna Gain (dBi):**	48
Modulation:	FSK	**Beam Forming Gain (Y)(dB):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

BGWVRB15066004

Temperature	**20.0 °C**	**Maximum Observed Spurious Emission**		**Limit**	**Margin**
Voltage	**48.00 Vdc**	**Amplitude**	**Emission Frequency**		
Test Frequency	**Frequency Range**	**dBuV/m**	**GHz**	**dBuV/m**	**dB**
62.90 GHz	**40000 - 50000 MHz**	40.29	40.17	54.81	-14.52
	50000 - 75000 MHz	50.45	71.50	54.81	-4.36
	75000 - 110000 MHz	46.67	95.01	54.81	-8.14

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-05 MEASUREMENT OF SPURIOUS EMISSIONS
Measurement Uncertainty:	<=40 GHz ±2.37 dB, > 40 GHz ±4.6 dB

BGWVRB15066005

Equipment Configuration for Transmitter Unwanted Emissions Above 40GHz			
Variant:	2FSK	**Duty Cycle (%):**	100
Data Rate:	1000 Mbit/s	**Antenna Gain (dBi):**	40
Modulation:	FSK	**Beam Forming Gain (Y)(dB):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

BGWVRB15066005

Temperature	**20.0 °C**	**Maximum Observed Spurious Emission**		**Emission Limit**	**Margin**
Voltage	**48.00 Vdc**	**Amplitude**	**Emission Frequency**		
Test Frequency	**Frequency Range**	**dBuV**	**GHz**	**dBuV/m**	**dB**
62.90 GHz	**40000 - 50000 MHz**	41.13	40.20	54.81	-13.68
	50000 - 75000 MHz	50.45	73.20	54.81	-4.36
	75000 - 110000 MHz	46.17	97.17	54.81	-8.64

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-05 MEASUREMENT OF SPURIOUS EMISSIONS
Measurement Uncertainty:	<=40 GHz ±2.37 dB, > 40 GHz ±4.6 dB

7.8. Frequency Stability

FCC, Part 15 Subpart C §15.255, §2.1055
Industry Canada RSS-210 A13.1.5

Test Procedure for Transmitter Frequency Stability
Transmitter Frequency Stability testing was performed over nominal voltage and ambient temperature and results reported are for a single antenna port (should the device have multiple ports i.e. MIMO device).

Definition
The center frequency is the center of the channel declared by the manufacturer as part of the declared channel plan(s).

Specification

Limits

§15.255 (f) Fundamental emissions must be contained within the frequency bands specified in this section during all conditions of operation. Equipment is presumed to operate over the temperature range -20 to + 50°C with an input voltage variation of 85% to 115% of the rated input voltage, unless justification is presented to demonstrate otherwise.

RSS-210 A13.1.5
Fundamental emissions must be contained within the frequency bands specified in this section during all conditions of operation.

Test frequency	Temperature	Voltage	Measured Frequency	Frequency Error	
MHz	°C	VDC	Hz	KHz	PPM
62900	20	48	62900003610	3.61	5.74E-02
	20	40	62900003590	3.59	5.71E-02
	20	60	62900003610	3.61	5.74E-02
	-33	48	62900003580	3.58	5.69E-02
	-23	48	62900003560	3.56	5.66E-02
	-13	48	62900003590	3.59	5.71E-02
	-3	48	62900003580	3.58	5.69E-02
	0	48	62900003590	3.59	5.71E-02
	+10	48	62900003590	3.59	5.71E-02
	+30	48	62900003600	3.60	5.72E-02
	+40	48	62900003590	3.59	5.71E-02
	+50	48	62900003620	3.62	5.76E-02

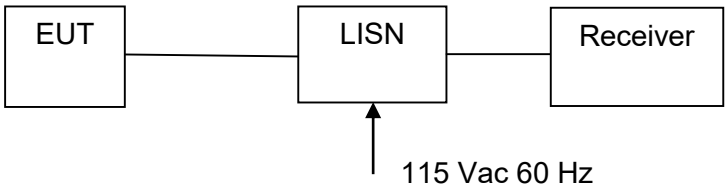
7.9. AC Mains Line Conducted

FCC, Part 15 Subpart C §15.207
Industry Canada RSS-Gen §8.8

Test Procedure

The EUT is configured in accordance with ANSI C63.4. The conducted emissions are measured in a shielded room with a spectrum analyzer in peak hold in the first instance. Emissions closest to the limit are measured in the quasi-peak mode (QP) with the tuned receiver using a bandwidth of 9 kHz. The emissions are maximized further by cable manipulation. The highest emissions relative to the limit are listed.

Test Measurement Set up



Measurement set up for AC Line Conducted Emissions Test

Specification

Limit

§15.207 (a)
Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μΩ line impedance stabilization network (LISN), see §15.207 (a) matrix below. Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal.

RSS-Gen §7.2.2
The radio frequency voltage that is conducted back into the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown in the table below. The tighter limit applies at the frequency range boundaries.

§15.207 (a) and **RSS-Gen §7.2.2** Limit Matrix
The lower limit applies at the boundary between frequency ranges

Frequency of Emission (MHz)	Conducted Limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency

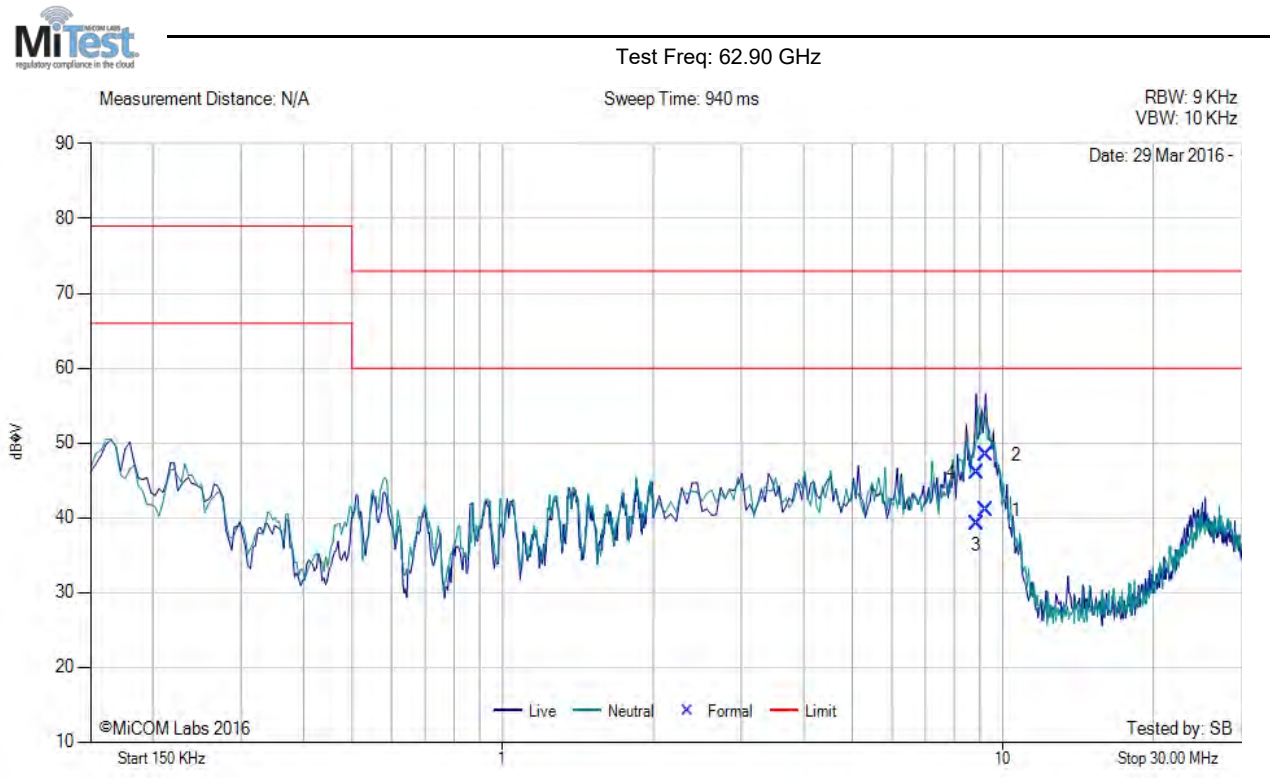
Laboratory Measurement Uncertainty for Conducted Emissions

Measurement uncertainty	±2.64 dB

Traceability

Method	Test Equipment Used
WI-EMC-01 'Measurement of Conducted Emissions'	0088, 0158, 0184, 0287, 0190, 0293, 0307

Measurement Results for AC Line Conducted Emissions (150 kHz – 30 MHz)



Num	Frequency MHz	Raw dBµV	Cable Loss	Factor dB	Total Correction dBµV	Corrected Value dBµV	Measurement Type	Line	Limit dBµV	Margin dB	Pass /Fail
1	9.235	30.39	0.44	10.21	10.65	41.04	Max Avg	Live	60.0	-19.0	Pass
2	9.235	37.75	0.44	10.21	10.65	48.40	Max Qp	Live	73.0	-24.6	Pass
3	8.863	28.55	0.44	10.21	10.65	39.20	Max Avg	Neutral	60.0	-20.8	Pass
4	8.863	35.35	0.44	10.21	10.65	46.00	Max Qp	Neutral	73.0	-27.0	Pass

Test Notes: MEANWELL: GS90A48-P1M; S/N: EB17889940;

7.10. Group Installation

FCC, Part 15 Subpart C §15.255 (h)
Industry Canada RSS-210 A13.2.6

Limits

15.207 (h)
Any transmitter that has received the necessary FCC equipment authorization under the rules of this chapter may be mounted in a group installation for simultaneous operation with one or more other transmitter(s) that have received the necessary FCC equipment authorization, without any additional equipment authorization. However, no transmitter operating under the provisions of this section may be equipped with external phase-locking inputs that permit beam-forming arrays to be realized.

RSS-210 A13.2.6
Any transmitter that has received the necessary IC certification under this RSS may be mounted in a group installation for simultaneous operation with one or more transmitter(s) that have received the necessary IC authorization, without any additional equipment authorization. However, no transmitter operating under the provisions of this section may be equipped with external phase-locking inputs that permit beam-forming arrays to be realized

7.11. Transmitter Self-Identification Transmission

RSS-210 A13.2.7

Results: Not Applicable

Transmitter Self-Identification Transmission is not applicable for this device as it is for outdoor use only. There will be no internal transmissions from a building.

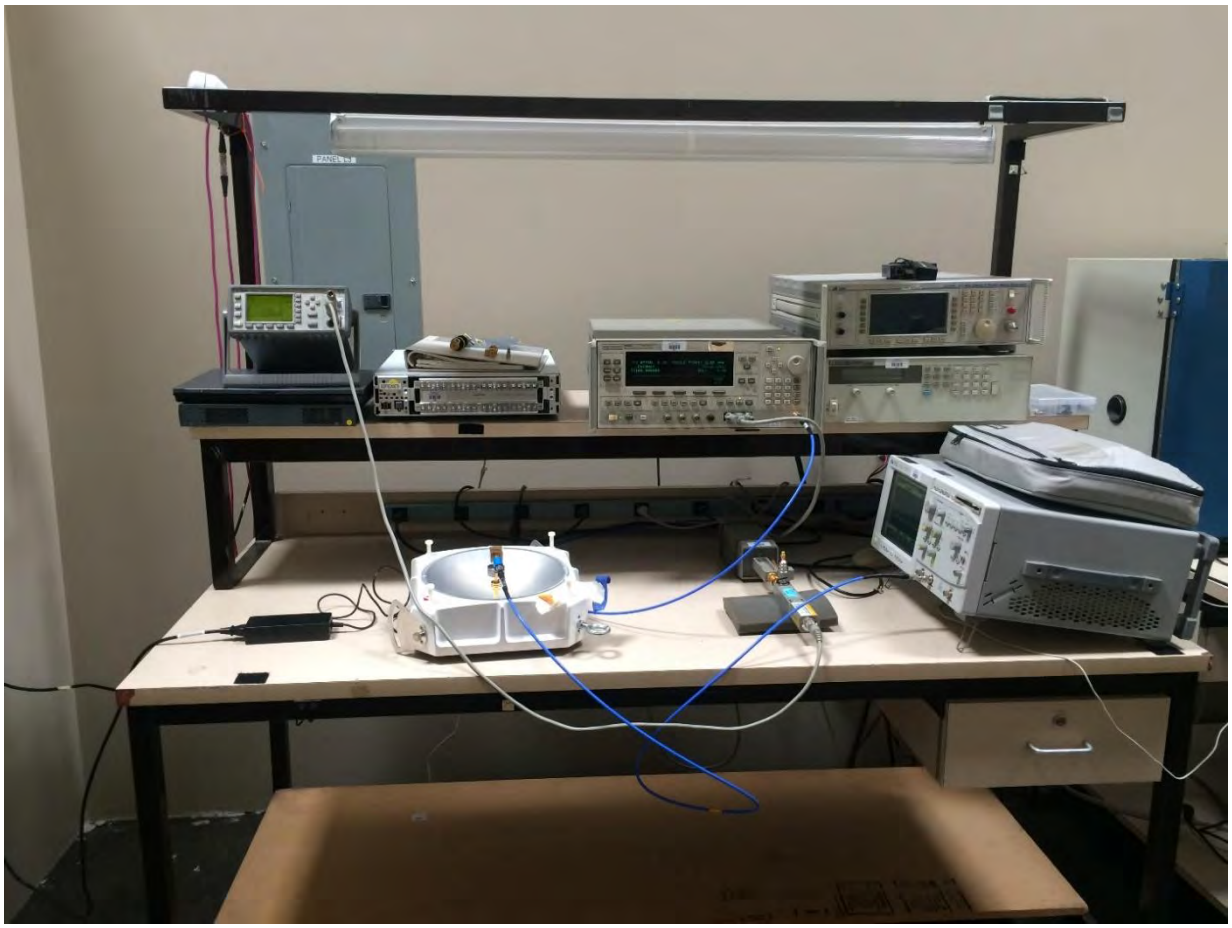
Limits

RSS-210

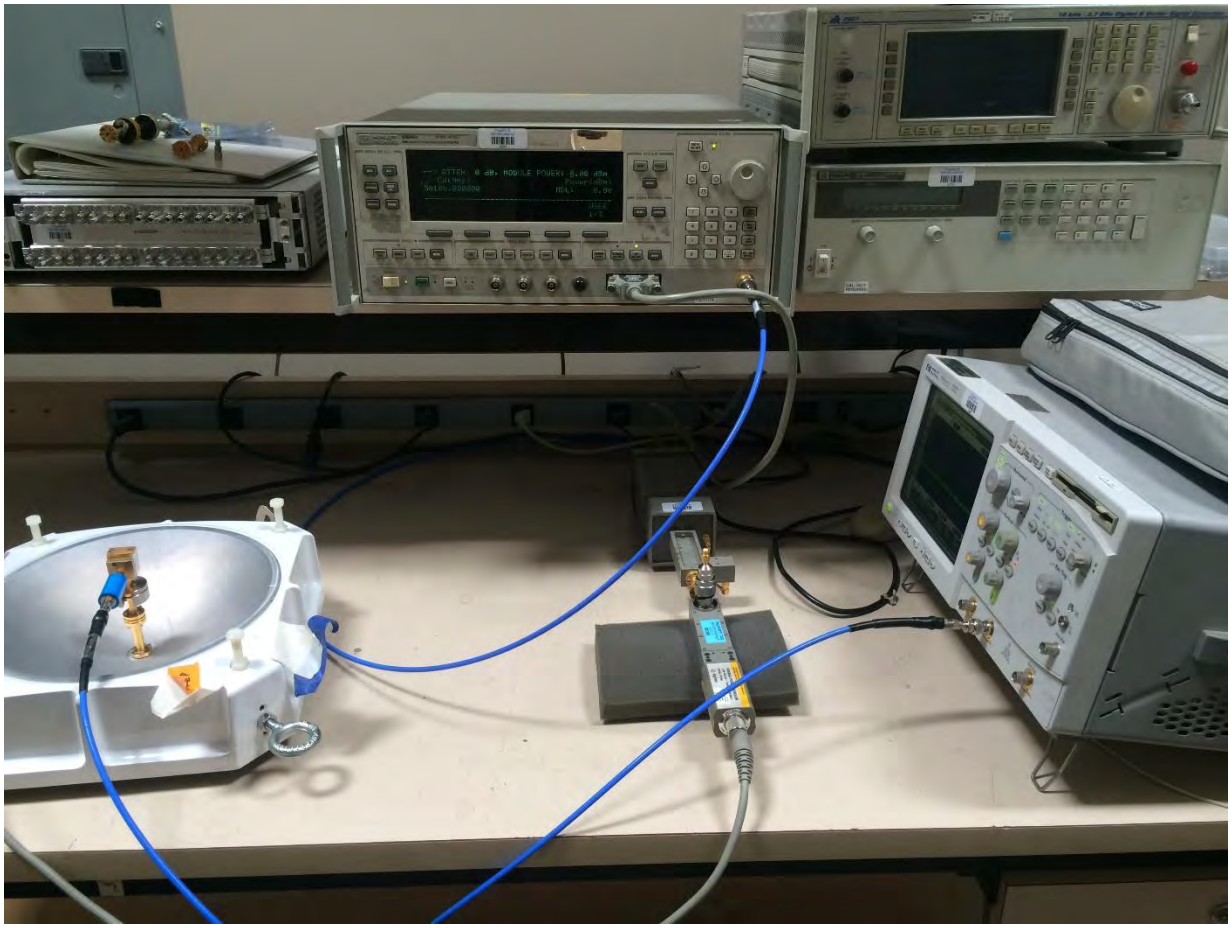
13.2.7 Transmitter Self-identification Transmission For all transmissions that emanate from inside a building, within any 1 second interval of signal transmission, each transmitter with a peak output power equal to or greater than 0.1 mW or a peak power density equal to or greater than 3 nW/cm2, as measured 3 meters from the radiating source, must transmit a transmitter identification at least once. Each application for equipment approval must declare that the equipment that will be used inside a building contains the required transmitter identification feature and must specify a method whereby interested parties can obtain sufficient information, at no cost, to enable them to fully detect and decode this transmitter identification information. Upon the completion of decoding, the transmitter identification data block must provide the following fields: (a) Industry Canada certification number, which shall be programmed at the factory; (b) Manufacturer's serial number, which shall be programmed at the factory; and (c) Provision for at least 24 bytes of data relevant to the specific device, which shall be field programmable. The applicant must implement a method that makes it possible for users to specify and update this data. The recommended content of this field is information to assist in contacting the operator.

8. Test Setup

RF Conducted #1



RF Conducted #2



9. TEST EQUIPMENT DETAILS

Asset #	Instrument	Manufacturer	Model #	Serial #
0088	Spectrum Analyzer	Hewlett Packard	8564E	3410A00141
0128	Pre-selector Mixer	Hewlett Packard	11974U	3001A00107
0134	Pre-Amplifier	COM Power	PA-122	181910
0145	Horn Antenna	Millimeter Products Inc	261K	595
0146	Horn Antenna	Maury Electronics	MPI261U	383
0147	Horn Antenna	Maury Electronics	MPI261E	387
0148	Horn Antenna	Millimeter Products Inc	MPI261A	59
0158	Barometer/Thermometer	Control Co.	4196	E2846
170	Video System Controller for Semi Anec. Chamber	Panasonic	WV-CY101	04R08507
0229	Pre-selector Mixer	Hewlett Packard	11970W	2521A01085
0252	SMA Cable	Megaphase	Sucoflex 104	None
287	Rohde & Schwarz 40 GHz Receiver	Rhode & Schwarz	ESIB40	100201
0312	SMA Cable	Huber & Suhner	104	77429
0307	BNC Cable	Megaphase	1689 1GVT4	15F50B002
338	Sunol 30 to 3000 MHz Ant	Sunol	JB3	A052907
399	ETS 1-18 GHz Horn Ant	ETS	3117	00154575
406	Amplifier for Radiated Emissions	MiCOM Labs	40dB 1 to 18GHz Amp	0406
410	Desktop Computer	Dell	Inspiron 620	WS38
411	Mast/Turntable Controller	Sunol Sciences	SC98V	060199-1D
412	USB to GPIB Interface	National Instruments	GPIB-USB HS	11B8DC2
413	Mast Controller	Sunol Sciences	TWR95-4	030801-3
415	Turntable Controller	Sunol Sciences	Turntable Controller	None
447	Rad Emissions Test Software	MiCOM	Rad Emissions Test Software Version 1.0.73	447
462	Schwarzbeck cable from Antenna to Amplifier.	Schwarzbeck	AK 9513	462
463	Schwarzbeck cable from Amplifier to Bulkhead.	Schwarzbeck	AK 9513	463
464	Schwarzbeck cable from Bulkhead to Receiver	Schwarzbeck	AK 9513	464
465	Low Pass Filter DC-1000 MHz	Mini-Circuits	NLP-1200+	VUU01901402
480	Cable - Bulkhead to Amp	SRC Haverhill	157-157-3050360	480
481	Cable - Bulkhead to Receiver	SRC Haverhill	151-151-3050787	481
482	Cable - Amp to Antenna	SRC Haverhill	157-157-3051574	482
090	Synthesized Sweeper	HP	83640A	3036A00294
098	Infinium Oscilloscope (DSO)	HP	54810A	US38100105
--	Power Sensor	Agilent	V8486A	MY50190006
--	EPM Series Power Meter	Agilent	E4419B	GB39290500
--	RF Detector	Hughes	47324H-1100	--
--	Low Pass Filter	Mini-Circuits	SLP-10.7	0006

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