Electromagnetic Compatibility Test Report

Tests Performed on a New Cosmos Electric Co., Ltd.

Methane Detector Transciever, Model ML-310CE

Radiometrics Document RP-9012B

ACCREDITED
TESTING CERT #1495.01

Product Detail:
FCC ID: 2ARF2ML-310 Equipment type: DSS
Test Standards:
US CFR Title 47, Chapter I, FCC Part 15 Subpart C FCC Part 15 CFR Title 47: 2018 This report concerns: Class II Permissive Change FCC Part 15.247

Tests Performed For:	*Test Facility:*
New Cosmos Electric Co., Ltd. 2-5-4 Mitsuya-naka, Yodogawa-ku Osaka 532-0036 Japan	**Radiometrics Midwest Corporation** 12 Devonwood Avenue Romeoville, IL 60446-1349 (815) 293-0772

Test Date(s):
January 4 to March 4, 2019

Document RP-9012B Revisions:

Rev.	Issue Date	Affected Sections	Revised By
0	February 22, 2019		
1	March 4, 2019	10, 11.3	Joseph Strzelecki

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1.0 ADMINISTRATIVE DATA

Equipment Under Test:	
A New Cosmos Electric Co. Ltd., Methane Detector Model: ML-310CE Serial Number: 01350050092B71B This will be referred to as the EUT in this Report	
Date EUT Received at Radiometrics:	*Test Date(s):*
January 3, 2019	January 4 to March4, 2019
Test Report Written By:	*Test Partially Witnessed By:*
Joseph Strzelecki Senior EMC Engineer	Joe Deluca New Cosmos Electric Co.
Radiometrics' Personnel Responsible for Test:	*Test Report Authorized By:*
Joseph Strzelecki Senior EMC Engineer NARTE EMC-000877-NE	Chris W. Carlson Director of Engineering NARTE EMC-000921-NE

2.0 TEST SUMMARY AND RESULTS

The EUT (Equipment Under Test) is a Methane Detector, Model ML-310CE, manufactured by New Cosmos Electric Co., Ltd. The detailed test results are presented in a separate section. The following is a summary of the test results.

Emissions Tests Results

Environmental Phenomena	Frequency Range	FCC Section	Test Result
Carrier Frequency Separation	902-928 MHz	15.247 a	Note 1
Number of Hopping Frequencies	902-928 MHz	15.247 a	Note 1
Time of Occupancy (Dwell Time)	902-928 MHz	15.247 a	Note 1
20 dB Bandwidth Test	902-928 MHz	15.247 a	Pass
Peak Output Power	902-928 MHz	15.247 b	Pass
Band-edge Compliance of RF Conducted Emissions	902-928 MHz	15.247 d	Pass
Spurious RF Conducted Emissions	30-9300 MHz	15.247 d	Pass
Spurious Radiated Emissions	30-9300 MHz	15.247 d	Pass

Note 1: Test not repeated since change made to product would not affect results.

AC Conducted emissions are not needed since the product is battery powered.

3.0 EQUIPMENT UNDER TEST (EUT) DETAILS

3.1 EUT Description

The EUT is a Methane Detector, Model ML-310CE, manufactured by New Cosmos Electric Co., Ltd. The EUT is a methane gas detection system. The EUT was in good working condition during the tests, with no known defects.

3.1.1 FCC Section 15.203 Antenna Requirements

The antennas have a connector type that is not readily available to the general public. The connector is inside the housing and not readily available to the end user. Therefore, it meets the 15.203 Requirements.

4.0 TESTED SYSTEM DETAILS

4.1 Tested System Configuration

The system was configured for testing in a typical fashion. The EUT was placed on an 80-cm or 150 cm high, nonconductive test stand. The testing was performed in conditions as close as possible to installed conditions. Wiring was consistent with manufacturer's recommendations. The EUT was tested as a stand-alone device. Power was supplied by new 3-volt batteries.

The identification for all equipment, plus descriptions of all cables used in the tested system, are:

Tested System Configuration List

Item	Description	Type*	Manufacturer	Model Number	Serial Number
1	Methane Detector	E	New Cosmos Electric Co., Ltd.	ML-310CE	01350050092B71B

* Type: E = EUT

4.2 Special Accessories

No special accessories were used during the tests in order to achieve compliance.

4.3 Equipment Modifications

No modifications were made to the EUT at Radiometrics' test facility in order to comply with the standards listed in this report.

5.0 TEST SPECIFICATIONS

Document	Date	Title
FCC CFR Title 47	2018	Code of Federal Regulations Title 47, Chapter 1, Federal Communications Commission, Part 15 - Radio Frequency Devices

6.0 TEST PROCEDURE DOCUMENTS

The tests were performed using the procedures from the following specifications:

Document	Date	Title
ANSI C63.4-2014	2014	Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
ANSI C63.10-2013	2013	American National Standard for Testing Unlicensed Wireless Devices

7.0 RADIOMETRICS' TEST FACILITIES

The results of these tests were obtained at Radiometrics Midwest Corp. in Romeoville, Illinois, USA. Radiometrics is accredited by A2LA (American Association for Laboratory Accreditation) to conform to ISO/IEC 17025: 2005 "General Requirements for the Competence of Calibration and Testing Laboratories". Radiometrics' Lab Code is 121191 and Certification Number is 1495.01. Radiometrics' scope of accreditation includes all of the test methods listed herein. A copy of the accreditation can be accessed on our web site (www.radiomet.com). Radiometrics accreditation status can be verified at A2LA's web site (www.a2la2.org).

The following is a list of shielded enclosures located in Romeoville, Illinois used during the tests:

Chamber E: Is a custom-made anechoic chamber that measures 52' L X 30' W X 18' H. The walls and ceiling are fully lined with RF absorber. Pro-shield of Collinsville, Oklahoma manufactured the chamber. The floor has a 9' x 9' section of microwave absorber for testing above 1 GHz.

A separate ten-foot long, brass plated, steel ground rod attached via a 6-inch copper braid grounds each of the above chambers. Each enclosure is also equipped with low-pass power line filters.

The FCC has accepted these sites as test site number US1065. The FCC test site Registration Number is 732175.

A complete list of the test equipment is provided herein. The calibration due dates are indicated on the equipment list. The equipment is calibrated in accordance to ANSI/NCSL Z540-1 with traceability to the National Institute of Standards and Technology (NIST).

8.0 DEVIATIONS AND EXCLUSIONS FROM THE TEST SPECIFICATIONS

There were no deviations or exclusions from the test specifications.

9.0 CERTIFICATION

Radiometrics Midwest Corporation certifies that the data contained herein was taken under conditions that meet or exceed the requirements of the test specification and the data contained herein was taken with calibrated test equipment. The results relate only to the EUT listed herein.

10.0 TEST EQUIPMENT TABLE

RMC ID	Manufacturer	Description	Model No.	Serial No.	Frequency Range	Cal Period	Cal Date
AMP-05	RMC/Celeritek	Pre-amplifier	MW110G	1001	1.0-12GHz	12 Mo.	01/17/18 01/10/19
ANT-04	Tensor	Biconical Antenna	4104	2246	20-250MHz	24 Mo.	01/24/18
ANT-06	EMCO	Log-Periodic Ant.	3146	1248	200-1000MHz	24 Mo.	12/05/17
ANT-36	Ailtech-Eaton	Horn Antenna	96001	2013	1.0-18GHz	24 Mo.	11/19/18
CAB-106A	Teledyne	Coaxial Cable	N/A	1090	DC-2 GHz	24 Mo.	05/07/18
CAB-1090	Teledyne	Coaxial Cable	N/A	1090	DC-18 GHz	24 Mo.	05/16/18
CAB-160B	Teledyne	Coaxial Cable	N/A	1090	DC-18 GHz	24 Mo.	05/09/18
HPF-07	Mini-Circuits	High Pass Filter	VHF-1500+	31121	1.7-10 GHz	24 Mo.	04/04/18
REC-20	HP / Agilent	Spectrum Analyzer	85460A/84562A	33330A00135 3410A00178	30Hz-6GHz	24 Mo.	08/03/17
REC-21	Agilent	Spectrum Analyzer	E7405A	MY45118341	9Hz-26.5 GHz	24 Mo.	01/06/18

Note: All calibrated equipment is subject to periodic checks.

Software Company	Test Software Name	Version	Applicable Tests
Radiometrics	REREC11D	04.19.17	RF Radiated Emissions (FCC Part 15)
Agilent	PSA/ESA-E/L/EMC	2.4.0.42	Bandwidth and screen shots

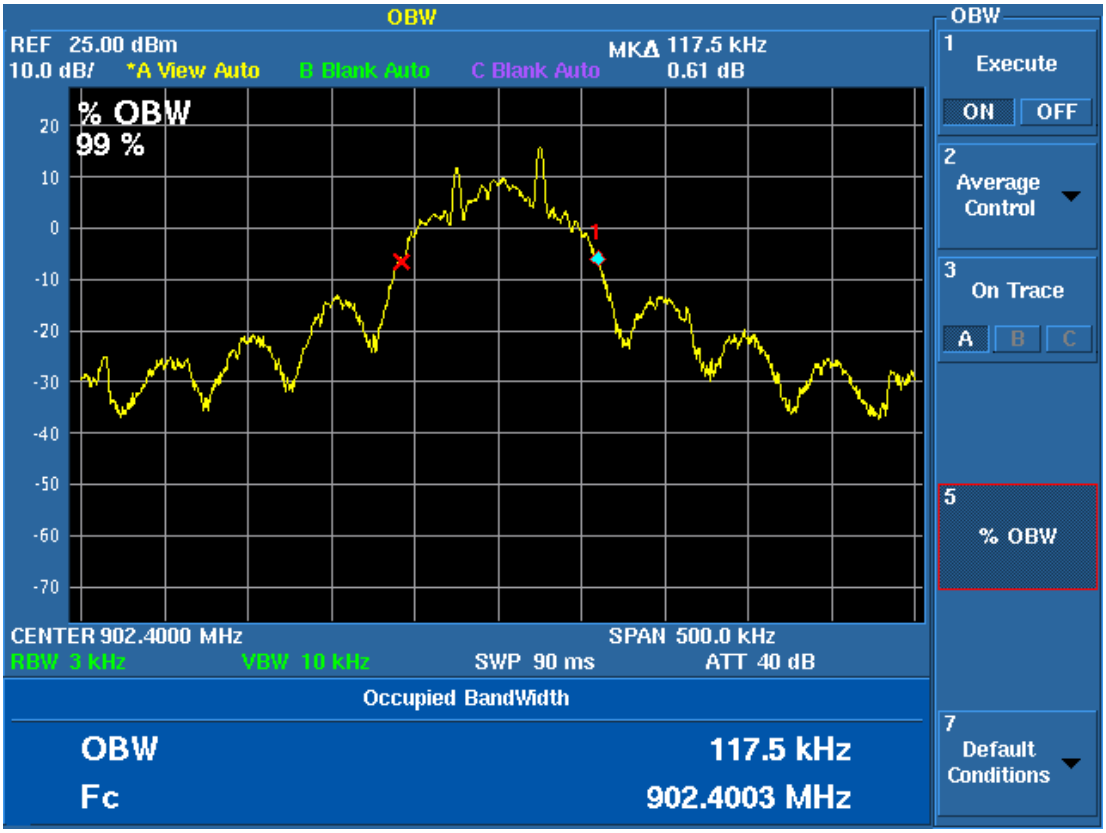
11.0 TEST SECTIONS

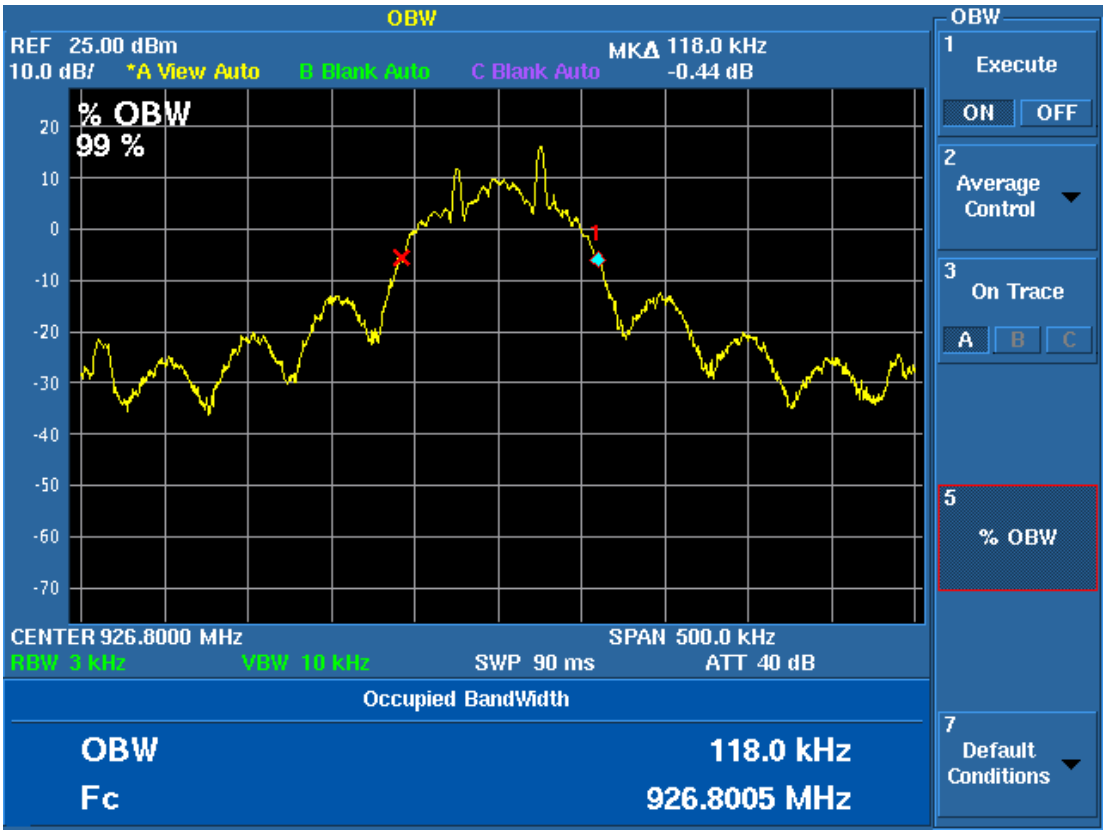
11.1 Occupied Bandwidth Data

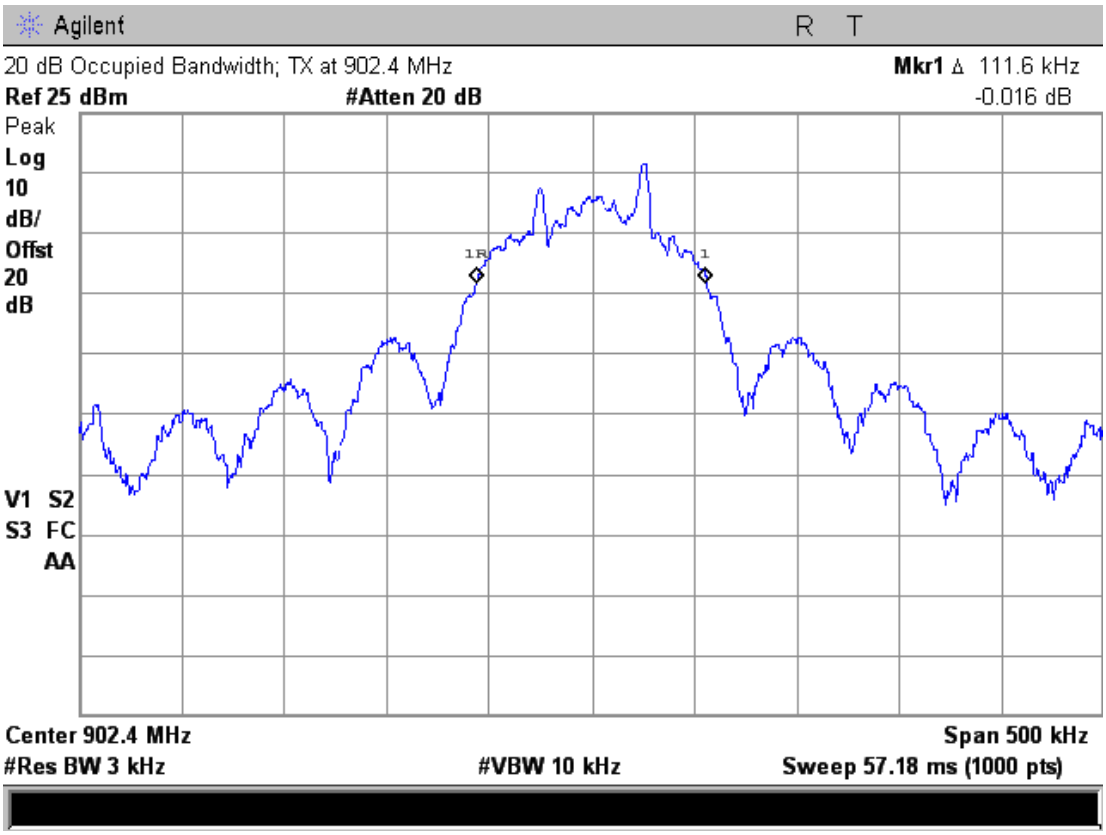
The occupied bandwidth of the RF output was measured using a spectrum analyzer. The bandwidth was measured using the peak detector function and a narrow resolution bandwidth. A broadband antenna was used to receive the modulated signal. The spectrum analyzer was set to the MAX HOLD mode to record the worst case of the modulation. The spectrum analyzer display was digitized and plotted. The plots of the occupied bandwidth for the EUT are supplied on the following page.

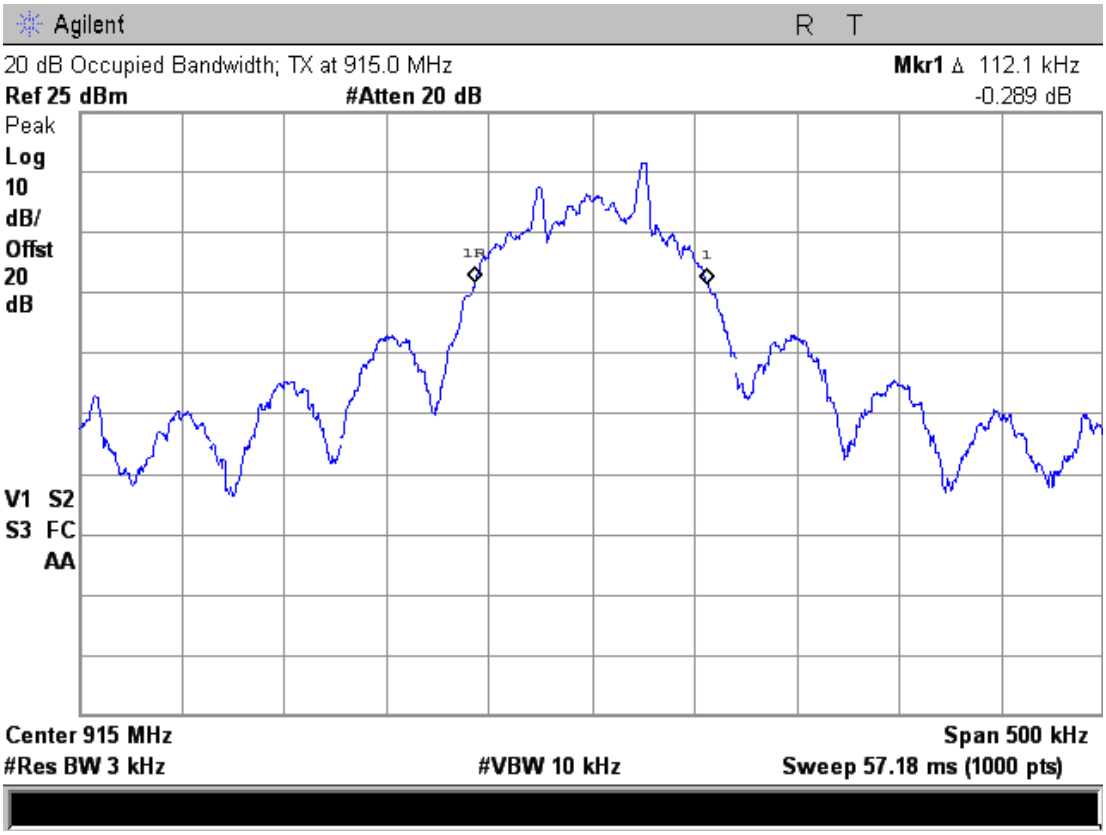
Channel	99% EBW kHz	20 dB EBW kHz
902.40	117.5	111.6
915.00	118.0	112.1
926.80	118.0	113.1

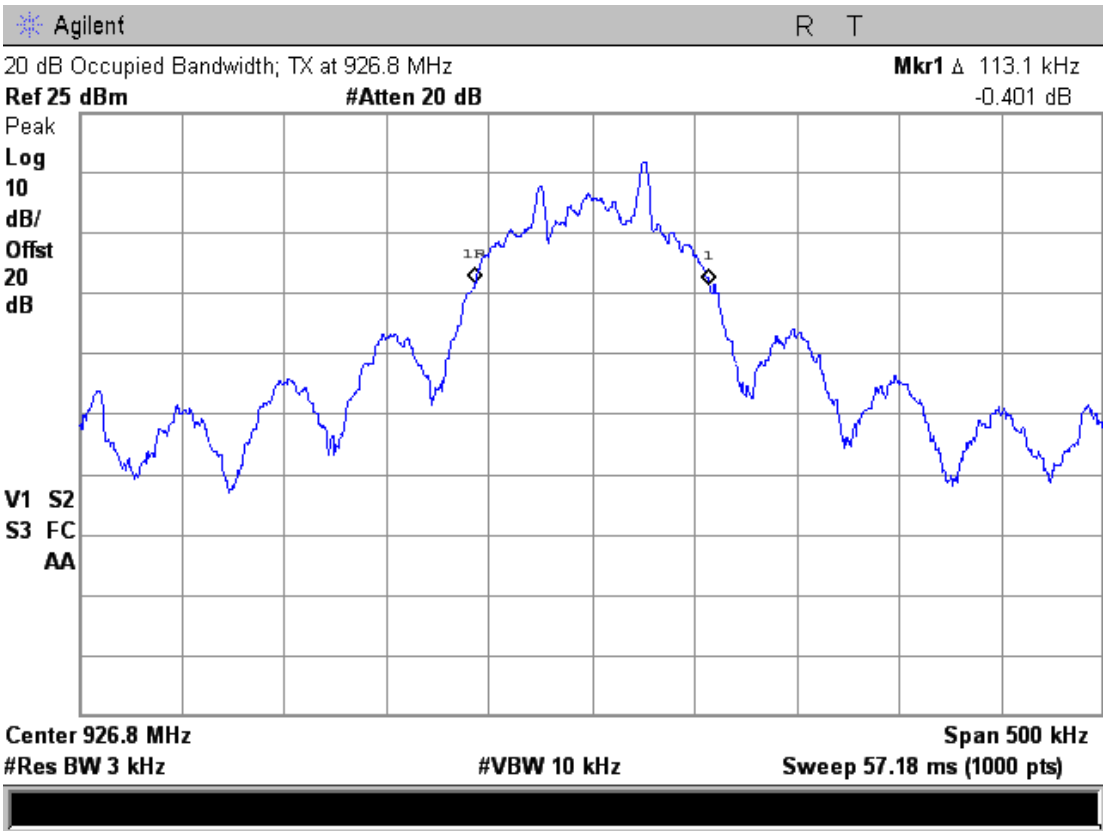
Figure 1. Occupied Bandwidth Plots




OBW
REF 25.00 dBm
10.0 dB/ *A View Auto B Blank Auto C Blank Auto
MKΔ 118.0 kHz
-0.44 dB
% OBW
99 %
20
10
0
-10
-20
-30
-40
-50
-60
-70
CENTER 926.8000 MHz
SPAN 500.0 kHz
RBW 3 kHz
VBW 10 kHz
SWP 90 ms
ATT 40 dB
Occupied BandWidth
OBW 118.0 kHz
Fc 926.8005 MHz
OBW
1 Execute
ON OFF
2 Average Control
3 On Trace
A B C
5 % OBW
7 Default Conditions


Agilent
R T
20 dB Occupied Bandwidth; TX at 902.4 MHz
Mkr1 Δ 111.6 kHz
-0.016 dB
Ref 25 dBm
#Atten 20 dB
Peak
Log
10
dB/
Offst
20
dB
1R
1
V1 S2
S3 FC
AA
Center 902.4 MHz
Span 500 kHz
#Res BW 3 kHz
#VBW 10 kHz
Sweep 57.18 ms (1000 pts)


Agilent
R T
20 dB Occupied Bandwidth; TX at 915.0 MHz
Mkr1 Δ 112.1 kHz
Ref 25 dBm
#Atten 20 dB
-0.289 dB
Peak
Log
10
dB/
Offst
20
dB
1R
1
V1 S2
S3 FC
AA
Center 915 MHz
Span 500 kHz
#Res BW 3 kHz
#VBW 10 kHz
Sweep 57.18 ms (1000 pts)


Agilent
R T
20 dB Occupied Bandwidth; TX at 926.8 MHz
Mkr1 Δ 113.1 kHz
Ref 25 dBm
#Atten 20 dB
-0.401 dB
Peak
Log
10
dB/
Offst
20
dB
1R
1
V1 S2
S3 FC
AA
Center 926.8 MHz
Span 500 kHz
#Res BW 3 kHz
#VBW 10 kHz
Sweep 57.18 ms (1000 pts)

11.2 Peak Output Power

The EUT antenna port was connected to the Spectrum analyzer via a low-loss coaxial cable. The power output test method from ANSI C63.10 section 12.3.1 was used for this test. Trace averaging was not used. The EUT was transmitting continously. The spectrum analyzer was set to the following settings:

Span = 5 MHz; RBW = 1 MHz; VBW = 3 MHz; Sweep = auto
Detector function = peak; Trace = max hold

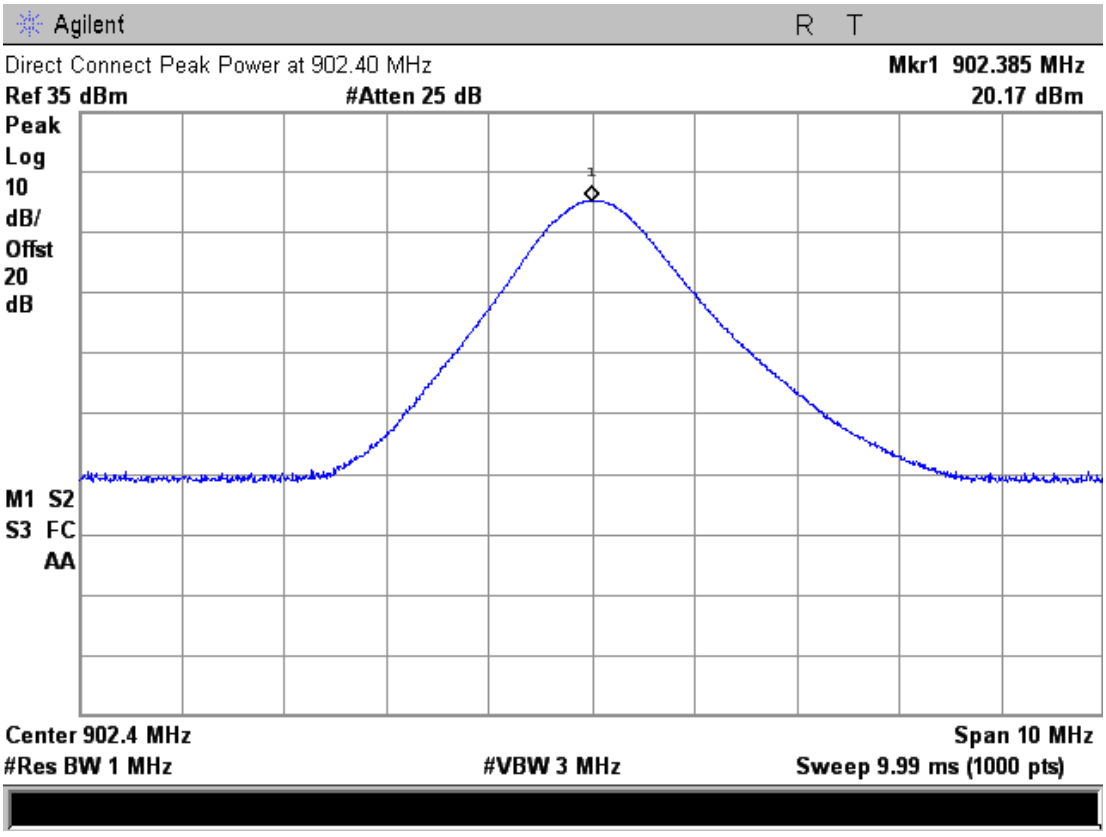
The trace was allowed to stabilize. The indicated level is the peak output power. Since the gain of the antenna is less than 6 dB, the limit is not reduced.

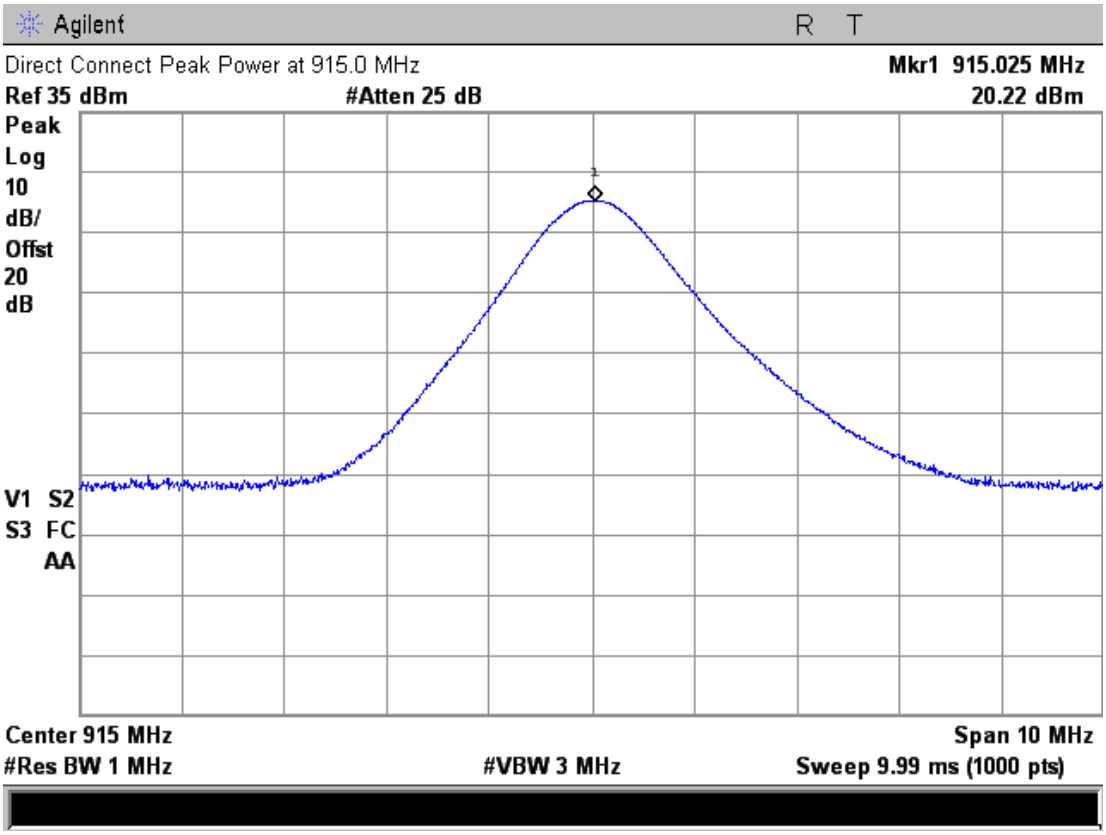
Tested by: Joseph Strzelecki/Richard Tichgelaar
Test Date: 01/11/2019

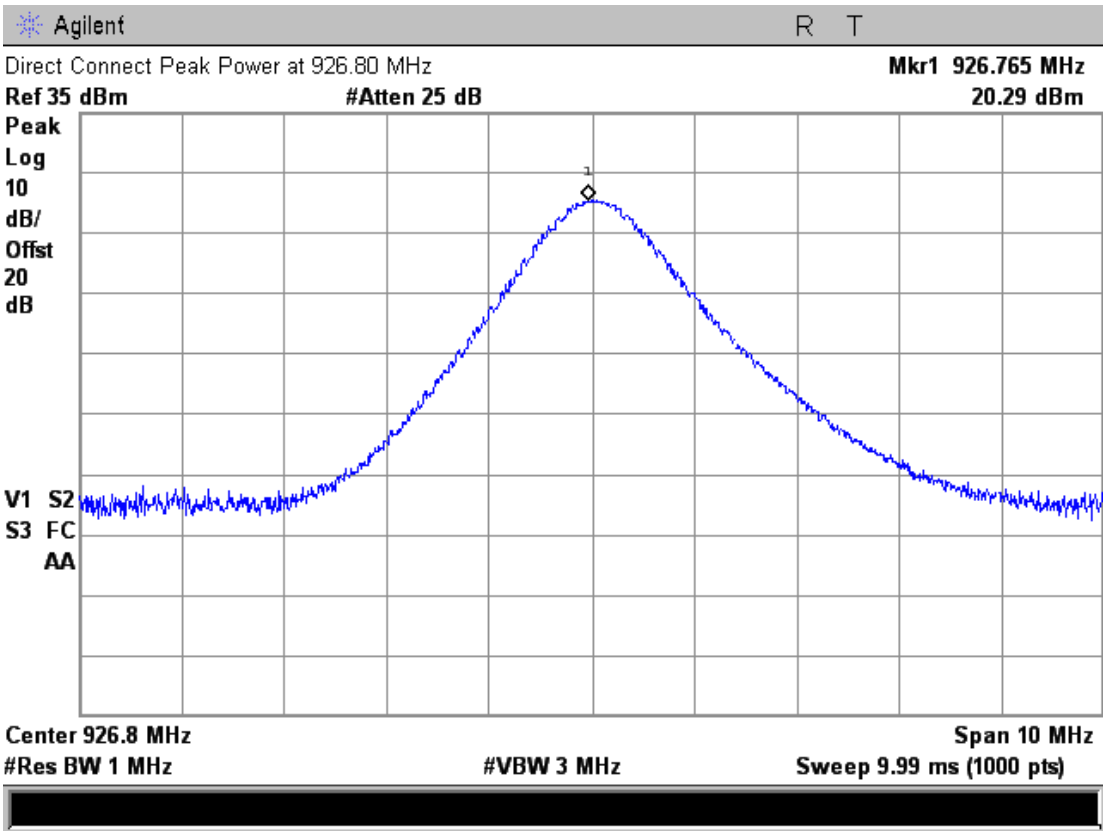
Frequency (MHz)	Reading (dBm)	Cable Loss (dB)	Total Power (dBm)		Limit (dBm)
			dBm	Watts	
902.4	20.17	0.95	21.12	0.1294	30.0
915.0	20.22	0.98	21.20	0.1318	30.0
926.8	20.29	1.00	21.29	0.1346	30.0

Judgment: Passed by 8.7 dB

Tested by: Joseph Strzelecki, Richard Tichgelaar
Test Date: 01/11/2019




Agilent
R T
Direct Connect Peak Power at 915.0 MHz
Mkr1 915.025 MHz
Ref 35 dBm
#Atten 25 dB
20.22 dBm
Peak
Log
10
dB/
Offst
20
dB
V1 S2
S3 FC
AA
Center 915 MHz
Span 10 MHz
#Res BW 1 MHz
#VBW 3 MHz
Sweep 9.99 ms (1000 pts)


Agilent
R T
Direct Connect Peak Power at 926.80 MHz
Mkr1 926.765 MHz
Ref 35 dBm
#Atten 25 dB
20.29 dBm
Peak
Log
10
dB/
Offst
20
dB
V1 S2
S3 FC
AA
Center 926.8 MHz
Span 10 MHz
#Res BW 1 MHz
#VBW 3 MHz
Sweep 9.99 ms (1000 pts)

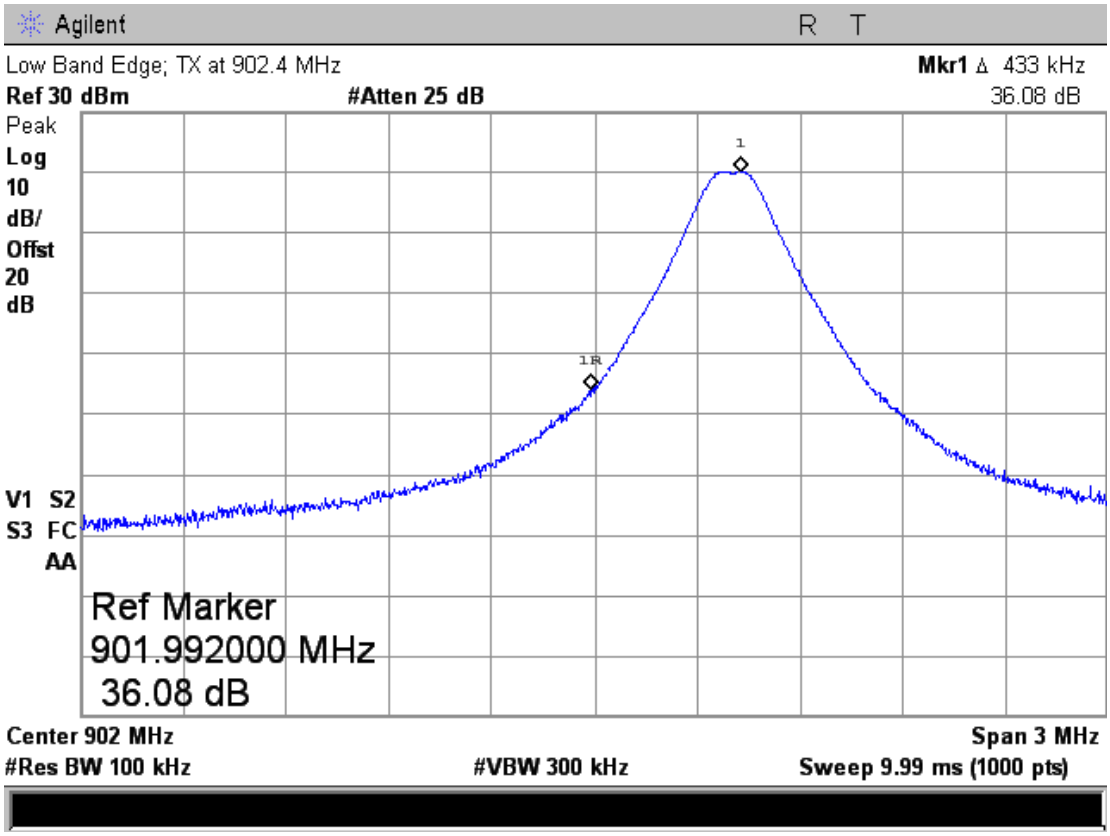
11.3 Band-edge Compliance of RF Conducted Emissions

The spectrum analyzer was set to the MAX HOLD mode to record the worst case of the modulation at the band-edge, with the EUT set to the lowest frequency. The trace was allowed to stabilize.

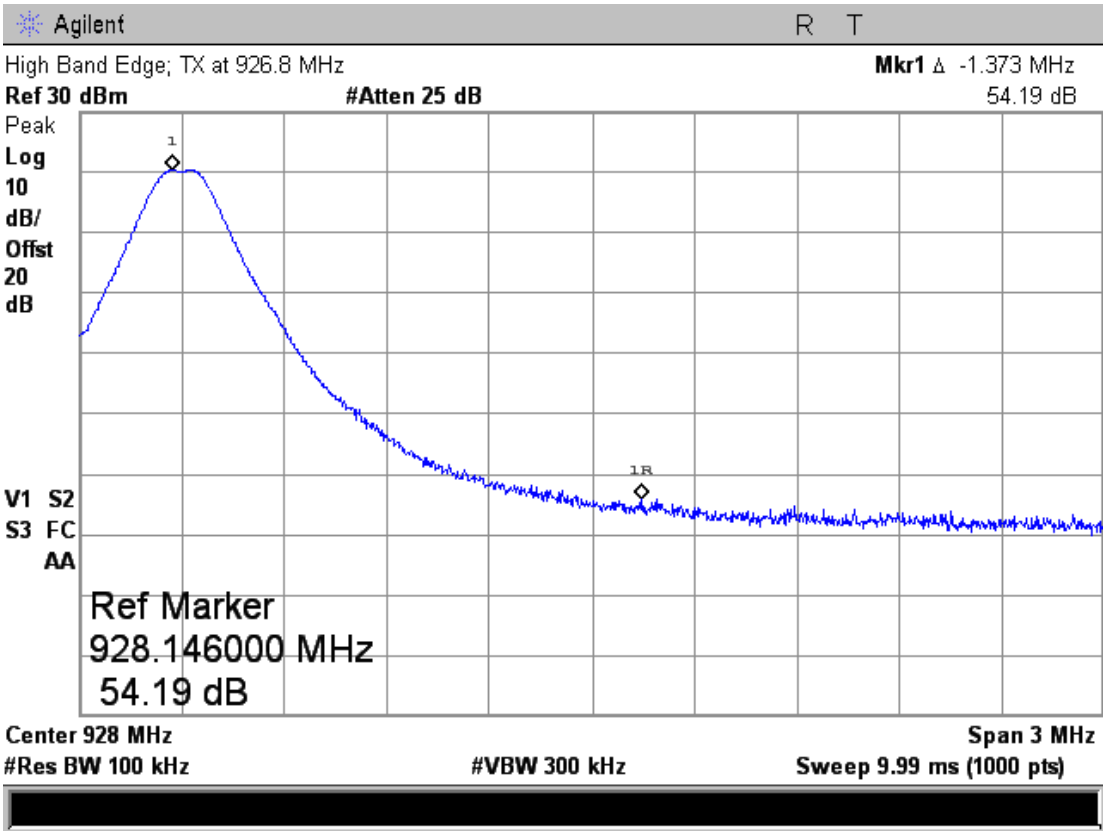
Tested by: Richard Tichgelaar, Joseph Strzelecki
Test Date: January 11, 2019, and March 4, 2019

Channel	Reading at Band Edge			Minimum Allowed
	Freq. (MHz)	Non Hopping Delta (dB)	Hopping Delta (dB)	dB
902.4 Lower Band edge	902.0	36.08	34.75	20
926.8 Upper Band edge	928.0	54.19	53.32	20

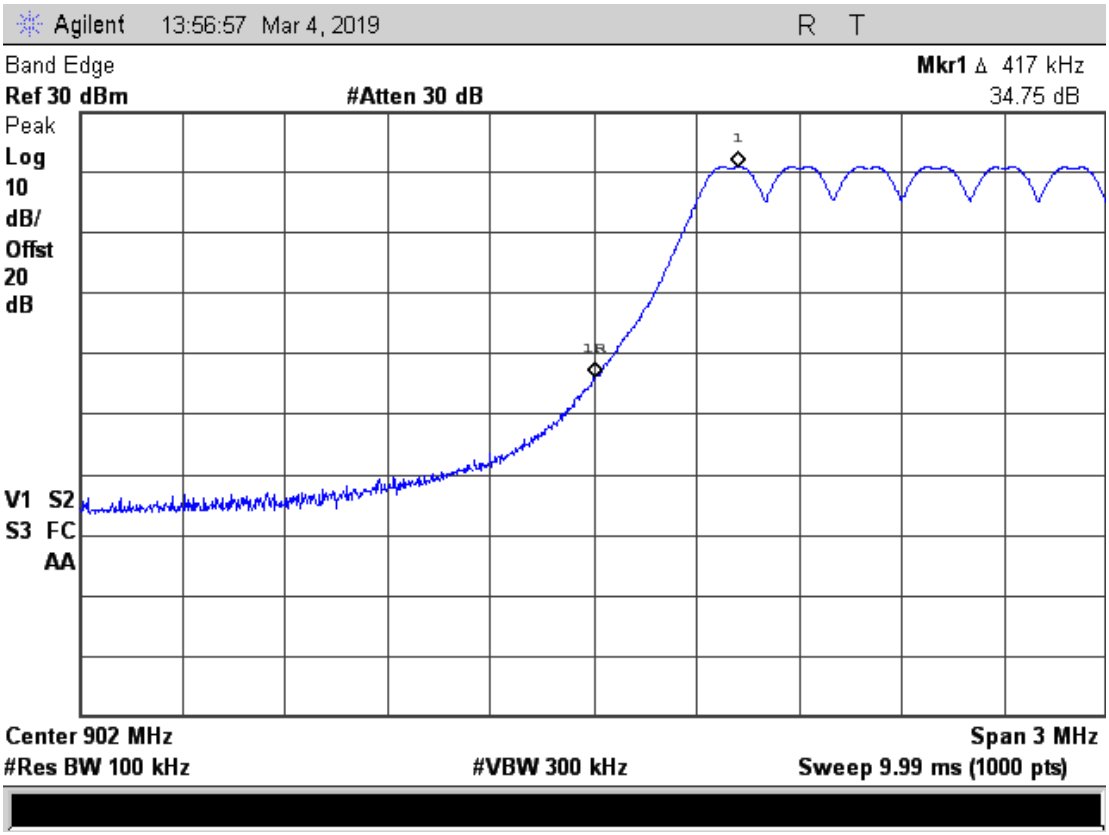
Judgment: Passed by 14.8 dB



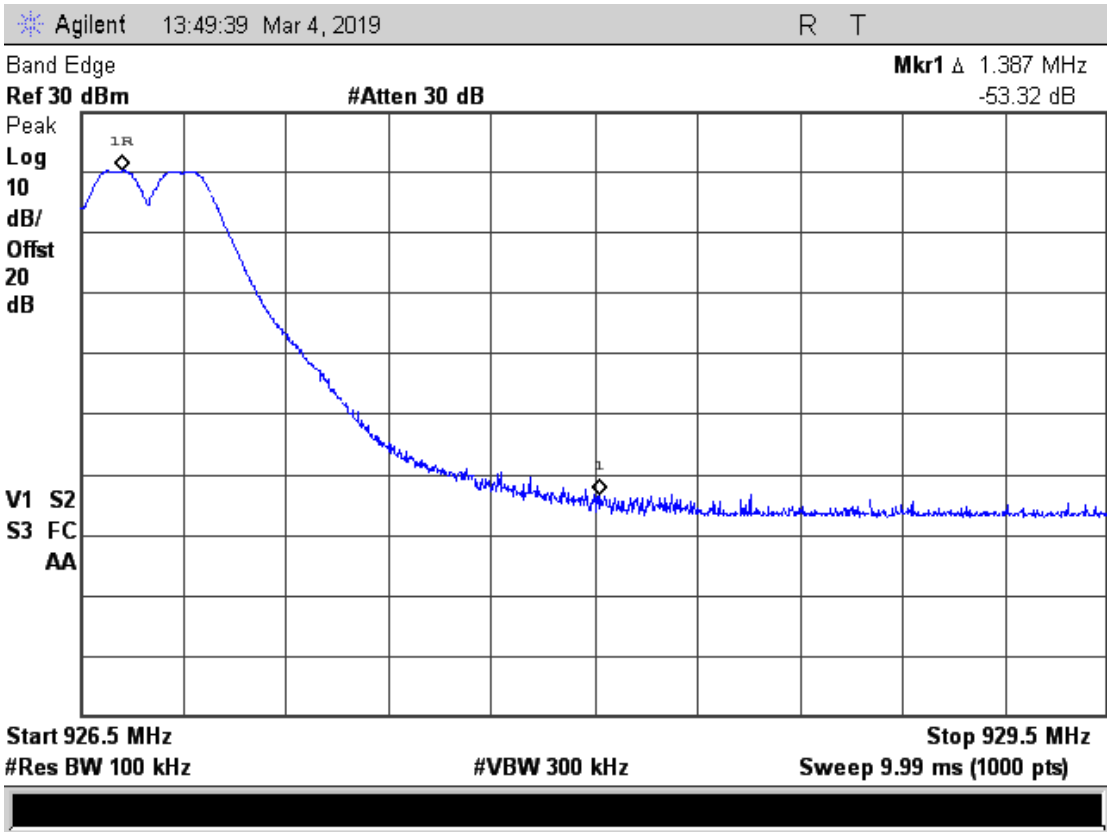
Not Hopping



Not Hopping



Hopping Mode



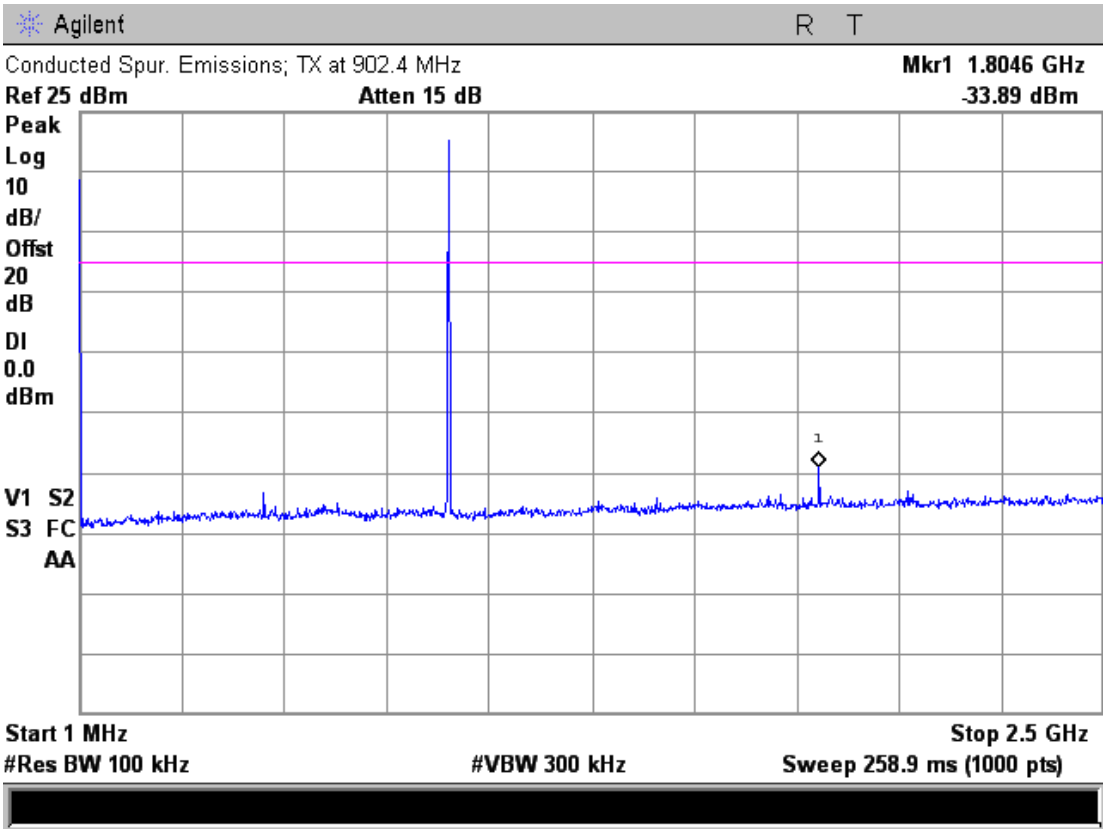
Hopping Mode

11.4 Spurious RF Conducted Emissions at Antenna Port

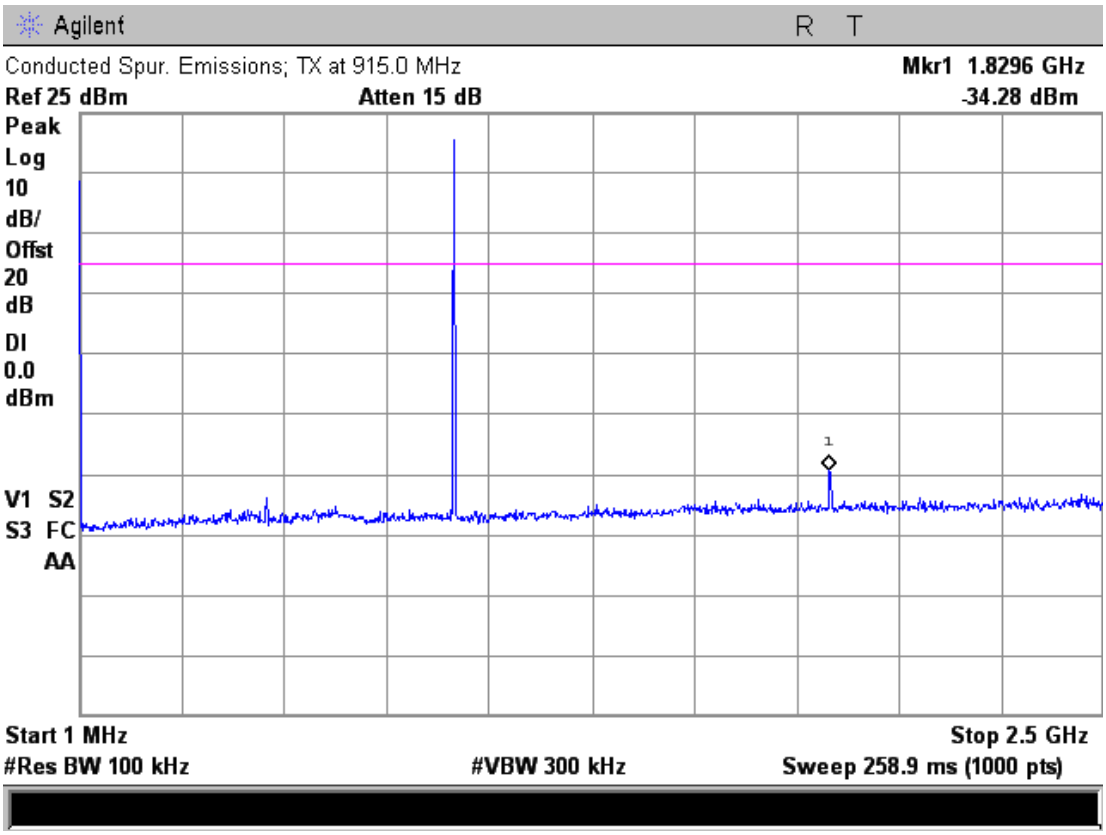
The spectrum analyzer was set to the MAX HOLD mode to record all spurious emissions from the lowest frequency generated in the EUT up through the 10th harmonic. The trace was allowed to stabilize. The first two plots were made while stepping through three frequencies (Low middle and high). Each frequency was on for 30 seconds. The red dislplay line was set to 20 dB below the level of the fundamental.

Tested by: Joseph Strzelecki/Richard Tichgelaar
Test Date: January 14, 2019

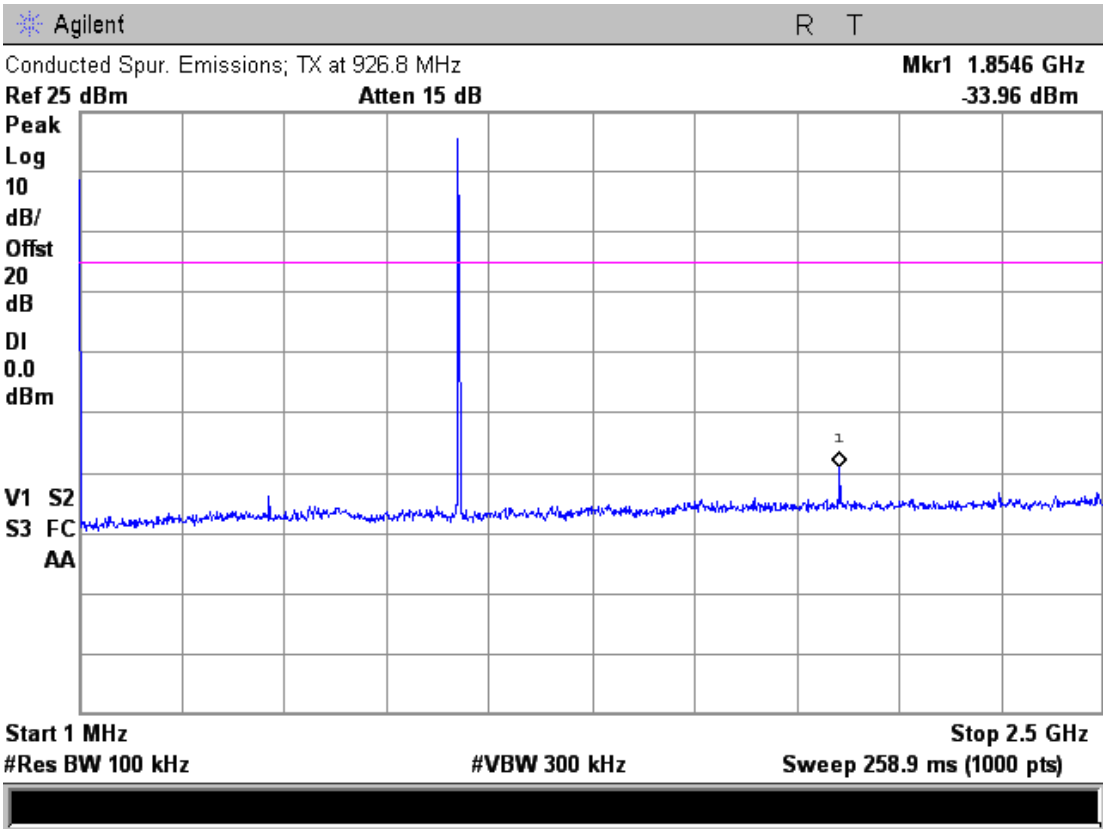
The pink Display Line on all plots was set to 20 dB below the level of the carrier.



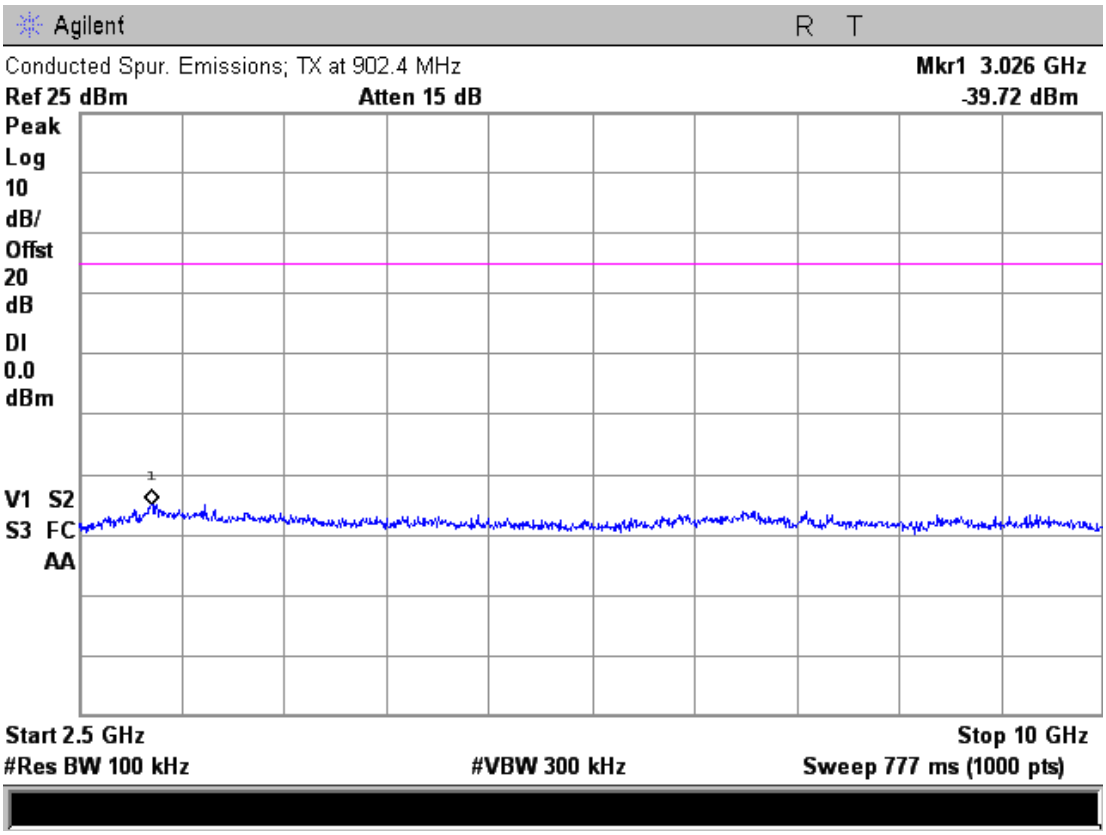
1 MHz to 2.5 GHz (902.4 MHz)



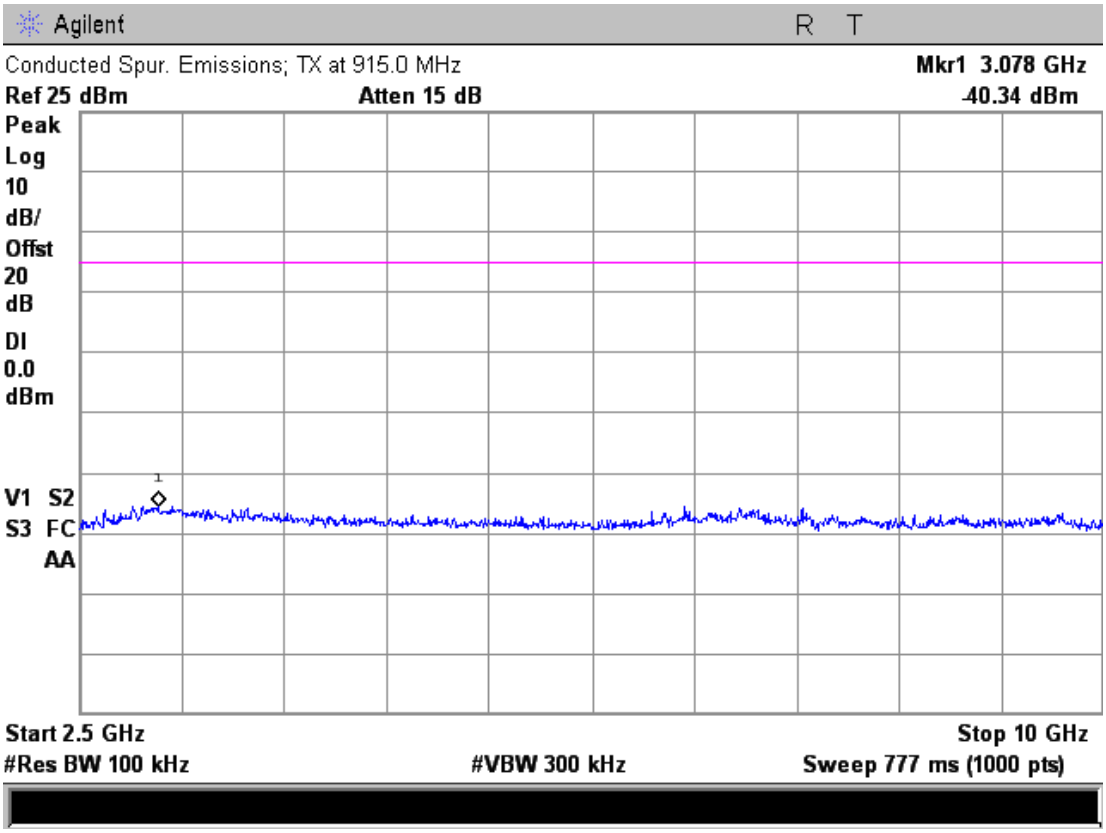
1 MHz to 2.5 GHz (915 MHz)



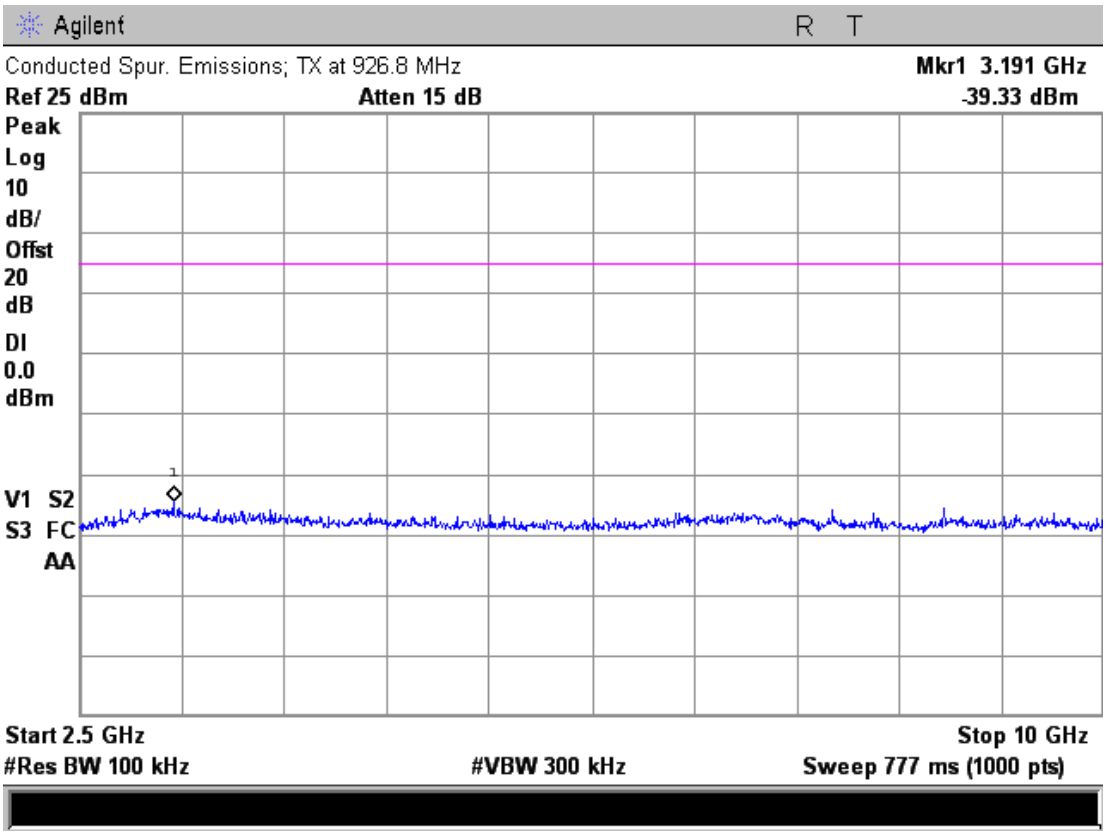
1 MHz to 2.5 GHz (926.8 MHz)



2.5 to 10 GHz (902.4 MHz)



2.5 to 10 GHz (915 MHz)



2.5 to 10 GHz (926.8 MHz)

Judgement: Pass by at least 10 dB

11.5 Radiated RF Emissions

Radiated emission measurements were performed with linearly polarized broadband antennas. The results obtained with these antennas can be correlated with results obtained with a tuned dipole antenna. The radiated emission measurements were performed with a spectrum analyzer. The bandwidth used from 150 kHz to 30 MHz is 9 or 10 kHz and the bandwidth from 30 MHz to 1000 MHz is 100 or 120 kHz. Above 1 GHz, a 1 MHz bandwidth is used. A 10 dB linearity check is performed prior to start of testing in order to determine if an overload condition exists. A harmonic mixer was used from 18 to 25 GHz. Figure 4 herein lists the details of the test equipment used during radiated emissions tests.

In addition, a high pass filter was used to reduce the fundamental emission. The EUT was rotated through three orthogonal axis as per 5.10.1 of ANSI C63.10 during the radiated tests.

Final radiated emissions measurements were performed inside of an anechoic chamber at a test distance of 3 meters. The anechoic chamber is designated as Chamber E. This Chamber meets the Site Attenuation requirements of ANSI C63.4 and CISPR 16-1. Chamber E is located at 12 East Devonwood Ave. Romeoville, Illinois EMI test lab.

The entire frequency range from 30 to 9300 MHz was slowly scanned with particular attention paid to those frequency ranges which appeared high. Measurements were performed using two antenna polarizations, (vertical and horizontal). The worst case emissions were recorded. All measurements may be performed using either the peak, average or quasi-peak detector functions. If the peak detector data exceeds or is marginally close to the limits, the measurements are repeated using a quasi-peak detector or average function as required by the specification for final determination of compliance.

The detected emission levels were maximized by rotating the EUT, adjusting the positions of all cables, and by scanning the measurement antenna from 1 to 4 meters above the ground.

11.5.1 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss, and by subtracting the Amplifier Gain from the measured reading. The basic equation is as follows:

FS = RA + AF + CF - AG + HPF + PKA

Where: FS = Field Strength
RA = Receiver Amplitude
AF = Antenna Factor
CF = Cable Attenuation Factor
AG = Amplifier Gain
HPF = High pass Filter Loss

Note: The actual FCC limits are in uV/m. The data in the results table coverted the limits to dBuV/m.
100 uV/m = 40.0 dBuV/m
150 uV/m = 43.5 dBuV/m
200 uV/m = 46.0 dBuV/m
500 uV/m = 54.0 dBuV/m

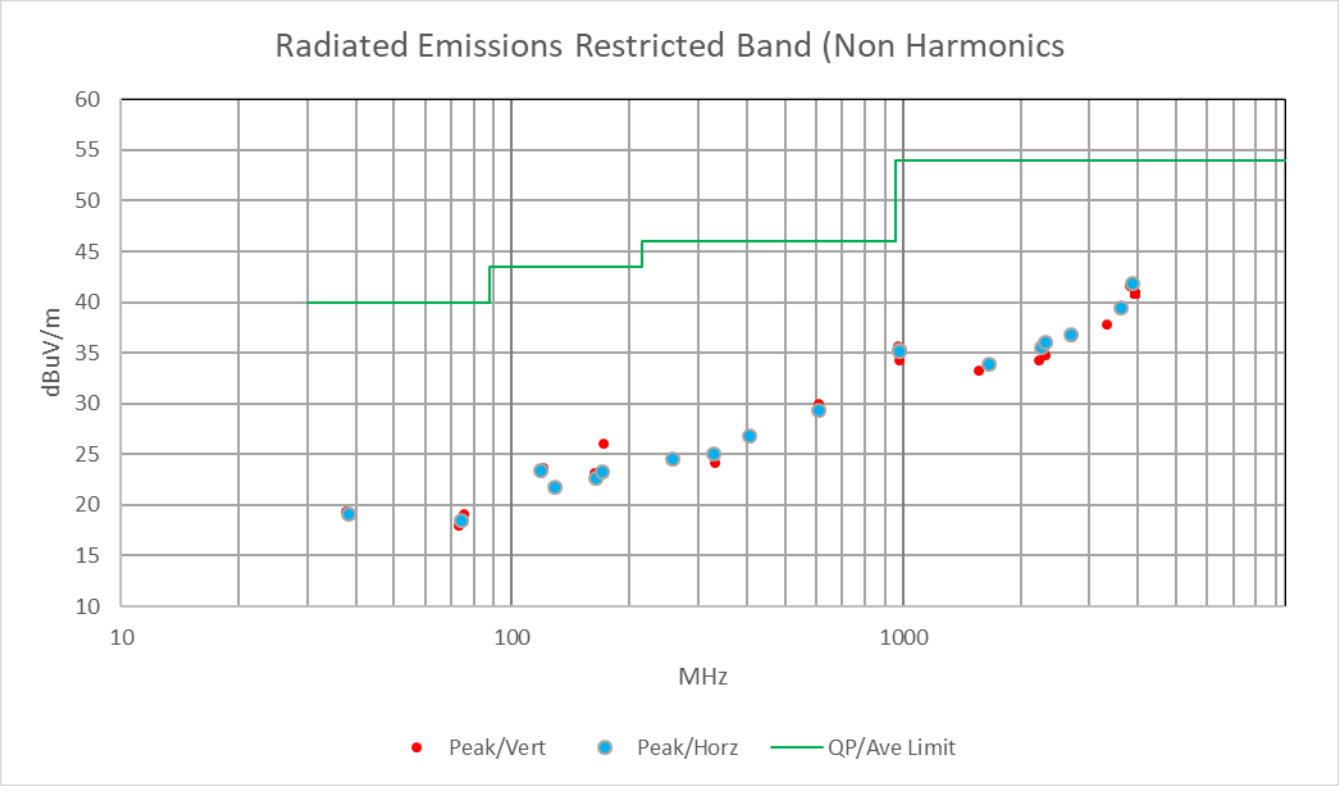
11.5.2 Radiated Emissions Test Results

Test Date	February 1, 2019
Test Distance	3 Meters
Specification	FCC Part 15 Subpart C
Tested by	Joseph Strzelecki, Richard Tichgelaar
Notes	Corr. Factors = Cable Loss – Preamp Gain External preamp used above 1 GHz
Abbreviations	Pol = Antenna Polarization; V = Vertical; H = Horizontal; P = peak; Q = QP

Restricted band (15.205) Radiated emissions; Non Harmonics Transmit Mode

Freq. MHz	Meter Reading dBuV	Dect.	Ant. Pol.	Ant Factor	Cbl/amp Factors	Dist Fact dB	EUT dBuV/m	Limit dBuV/m	Margin Under Limit dB	Note
38.2	7.1	P	H	11.5	0.5	0.0	19.1	40.0	20.9	
74.3	8.5	P	H	9.3	0.7	0.0	18.5	40.0	21.5	
118.6	11.1	P	H	11.5	0.8	0.0	23.4	43.5	20.1	
128.9	8.8	P	H	12.1	0.9	0.0	21.8	43.5	21.7	
164.2	8.6	P	H	12.9	1.1	0.0	22.6	43.5	20.9	
170.2	9.0	P	H	13.1	1.1	0.0	23.2	43.5	20.3	
258.1	11.2	P	H	12.1	1.2	0.0	24.5	46.0	21.5	
327.6	9.5	P	H	13.9	1.6	0.0	25.0	46.0	21.0	
406.9	9.8	P	H	15.2	1.8	0.0	26.8	46.0	19.2	
610.0	8.4	P	H	18.7	2.2	0.0	29.3	46.0	16.7	
977.5	9.9	P	H	22.5	2.9	0.0	35.3	54.0	18.7	
980.0	10.0	P	H	22.5	2.6	0.0	35.1	54.0	18.9	
1667.5	40.3	P	H	26.1	-32.5	0.0	33.9	74.0	40.1	1
2272.5	39.5	P	H	27.8	-31.8	0.0	35.5	74.0	38.5	1
2325.0	39.7	P	H	28.0	-31.7	0.0	36.0	74.0	38.0	1
2695.0	39.0	P	H	28.9	-31.1	0.0	36.8	74.0	37.2	1
3627.5	37.6	P	H	31.6	-29.7	0.0	39.5	74.0	34.5	1
3882.5	38.2	P	H	32.9	-29.2	0.0	41.9	74.0	32.1	1
37.7	7.3	P	V	11.6	0.5	0.0	19.4	40.0	20.6	
73.4	8.0	P	V	9.3	0.7	0.0	18.0	40.0	22.0	
75.2	9.1	P	V	9.3	0.7	0.0	19.1	40.0	20.9	
120.7	11.2	P	V	11.6	0.8	0.0	23.6	43.5	19.9	
163.3	9.1	P	V	12.9	1.1	0.0	23.1	43.5	20.4	
171.5	11.9	P	V	13.1	1.0	0.0	26.0	43.5	17.5	
330.6	8.6	P	V	13.9	1.6	0.0	24.1	46.0	21.9	
407.6	9.8	P	V	15.2	1.8	0.0	26.8	46.0	19.2	
610.0	9.1	P	V	18.7	2.2	0.0	30.0	46.0	16.0	
970.0	9.9	P	V	23.1	2.6	0.0	35.6	54.0	18.4	
977.5	8.8	P	V	22.5	2.9	0.0	34.2	54.0	19.8	
1565.0	40.2	P	V	25.7	-32.6	0.0	33.3	74.0	40.7	1
2232.5	38.3	P	V	27.7	-31.8	0.0	34.2	74.0	39.8	1
2315.0	38.4	P	V	28.0	-31.7	0.0	34.7	74.0	39.3	1
2695.0	38.7	P	V	28.9	-31.1	0.0	36.5	74.0	37.5	1
3337.5	36.5	P	V	31.2	-29.9	0.0	37.8	74.0	36.2	1
3807.5	38.1	P	V	32.7	-29.2	0.0	41.6	74.0	32.4	1
3935.0	37.1	P	V	32.9	-29.2	0.0	40.8	74.0	33.2	1

Note 1: All Peak readings above 1 GHz were under the Average limits, so average readings are not required.
Judgment: Passed by at least 10 dB



Radiated emissions in a graphical format. The above chart is the same data as the previous table.

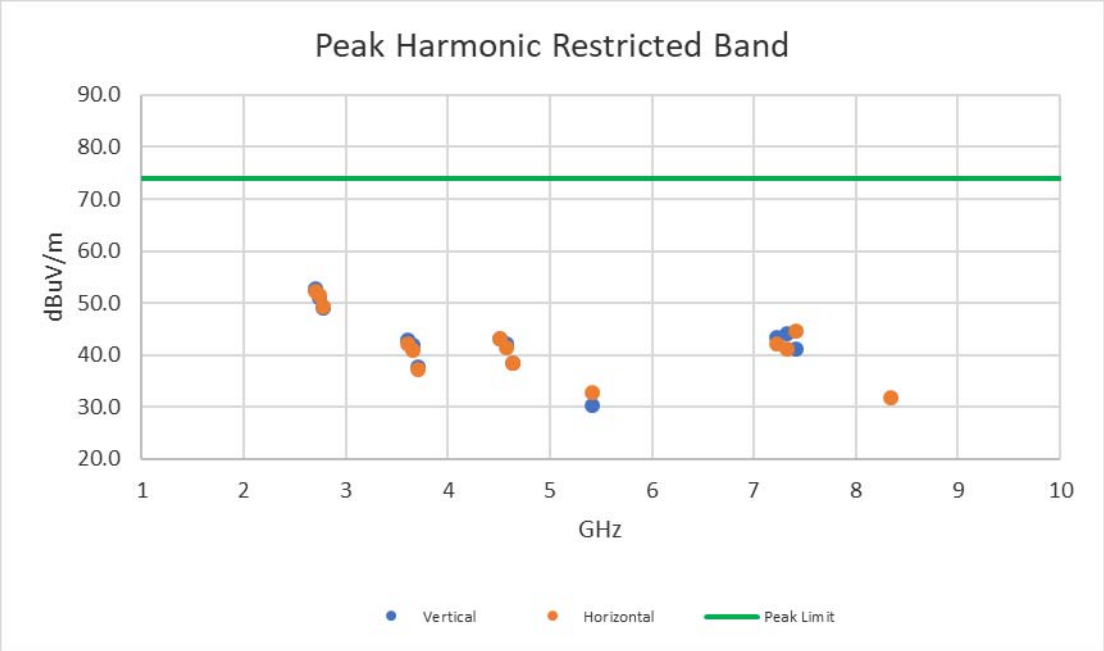
Restricted Band Harmonic Radiated emissions

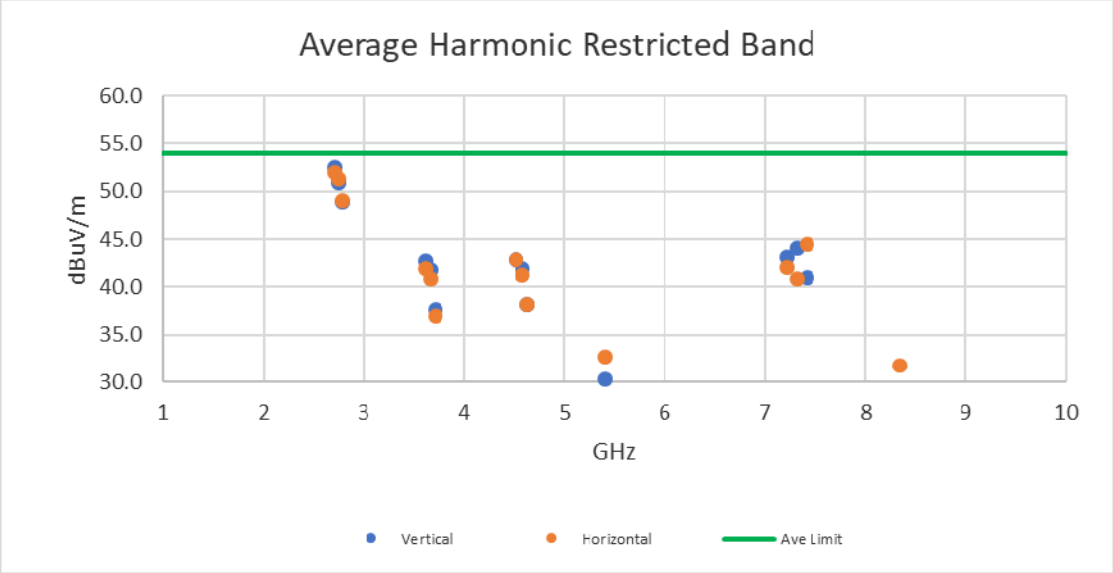
		Spectrum Analyzer Readings (dBuV)									EUT	Peak	Ave	Peak	Ave	Margin
hrm	Tx	Peak			Ave	Peak			Ave	Corr.	Emission	Tot. FS		Limit		Under
#	Freq MHz	Vertical Polarization				Horizontal Polarization				Fact. dB	Freq MHz	dBuV/m		dBuV/m		Limit dB
		X	Y	Z	Max	X	Y	Z	Max							
3	902.4	45.8	53.4	54.3	54.1	52.5	50.5	53.8	53.6	-1.6	2707.2	52.7	52.5	74	54	1.5
4	902.4	37.9	40.1	40.2	40.0	39.4	38.3	39.4	39.2	2.7	3609.6	42.9	42.7	74	54	11.3
5	902.4	37.0	37.3	37.0	37.1	36.4	37.0	37.2	37.0	5.8	4512.0	43.1	42.9	74	54	11.1
6	902.4	27.9	30.4	30.3	30.2	27.3	32.8	26.7	32.6	0.0	5414.4	32.8	32.6	74	54	21.4
8	902.4	32.8	30.9	33.0	32.8	30.4	30.3	31.9	31.7	10.3	7219.2	43.3	43.1	74	54	10.9
3	915.0	46.0	52.2	52.8	52.6	53.2	50.7	52.7	53.0	-1.7	2745.0	51.5	51.3	74	54	2.7
4	915.0	35.0	37.1	38.9	38.7	37.2	37.9	36.8	37.7	3.1	3660.0	42.0	41.8	74	54	12.2
5	915.0	35.7	34.8	36.0	35.8	34.6	35.4	33.6	35.2	6.1	4575.0	42.1	41.9	74	54	12.1
8	915.0	31.6	30.9	33.3	33.1	30.2	29.8	30.2	30.0	10.9	7320.0	44.2	44.0	74	54	10.0
3	926.8	43.0	48.6	50.6	50.4	50.7	49.4	50.0	50.5	-1.5	2780.4	49.2	49.0	74	54	5.0
4	926.8	31.8	33.5	34.4	34.2	33.7	33.8	31.5	33.6	3.4	3707.2	37.8	37.6	74	54	16.4
5	926.8	31.2	32.0	32.1	31.9	32.1	29.1	29.8	31.9	6.3	4634.0	38.4	38.2	74	54	15.8
8	926.8	29.6	29.0	29.6	29.4	32.8	30.9	33.0	32.8	11.6	7414.4	44.6	44.4	74	54	9.6
Column numbers (see below for explanations)																
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

Column #1. hrm = Harmonic; BE = Band Edge emissions
Column #2. Frequency of Transmitter.
Column #3. Uncorrected readings from the spectrum analyzer with First Axis Rotation.
Column #4. Uncorrected readings from the spectrum analyzer with Second Axis Rotation.
Column #5. Uncorrected readings from the spectrum analyzer with Third Axis Rotation.
Column #6. Average Reading based on peak reading reduced by the Duty cycle correction
Column #7. Uncorrected readings from the spectrum analyzer with First Axis Rotation.
Column #8. Uncorrected readings from the spectrum analyzer with Second Axis Rotation.
Column #9. Uncorrected readings from the spectrum analyzer with Third Axis Rotation.
Column #10. Average Reading based on peak reading reduced by the Duty cycle correction
Column #11. Corr. Factors = Cable Loss – Preamp Gain + Antenna Factor
Column #12. Frequency of Tested Emission
Column #13. Highest peak field strength at listed frequency.
Column #14. Highest Average field strength at listed frequency.
Column #15. Peak Limit.
Column #16. Average Limit.
Column #17. The margin (last column) is the worst case margin under the peak or average limits for that row.

Overall Judgment: Passed by 1.5 dB

No other Emissions were detected from 30 to 9300 MHz within 8 dB of the limits, in the restricted bands

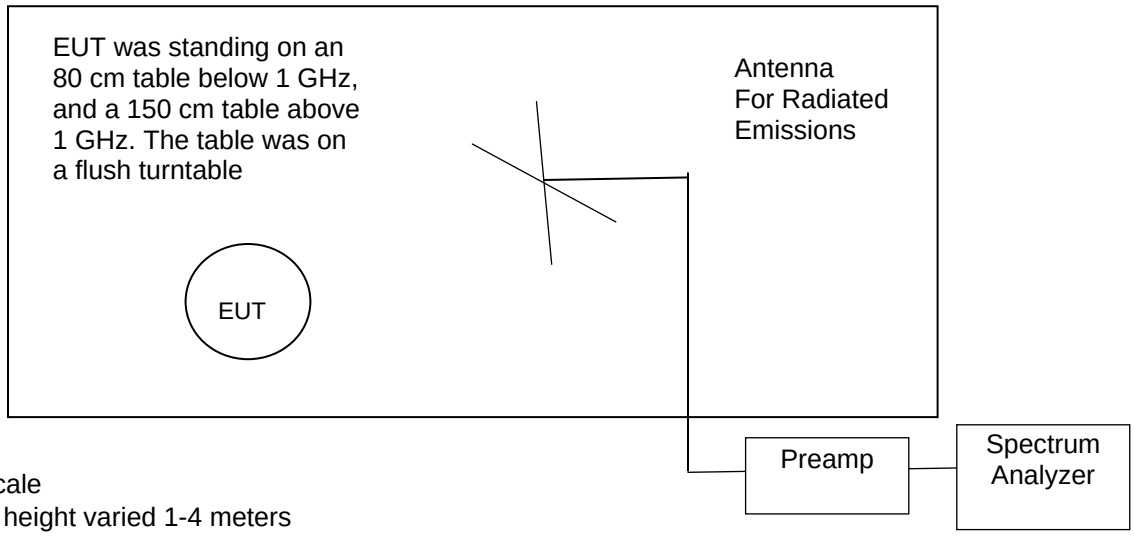




Radiated emissions in a graphical format. The above charts are the same data as the previous table.

Figure 2. Drawing of Radiated Emissions Setup

Chamber E, anechoic



Notes:
- Not to Scale
- Antenna height varied 1-4 meters
- Distance from antenna to tested system is 3 meters

Frequency Range	Receive Antenna	Pre-Amplifier	Spectrum Analyzer	High Pass Filter
30 to 200 MHz	ANT-04	Internal	REC-21	None*
200 to 1000 MHz	ANT-06	Internal	REC-21	None*
1 to 10 GHz	ANT-36	AMP-05	REC-21	HPF-07

* A high pass filter was not needed since the fundamental frequency was outside of the amplifiers pass band.

11.6 Unintentional Emissions (Receive Mode)

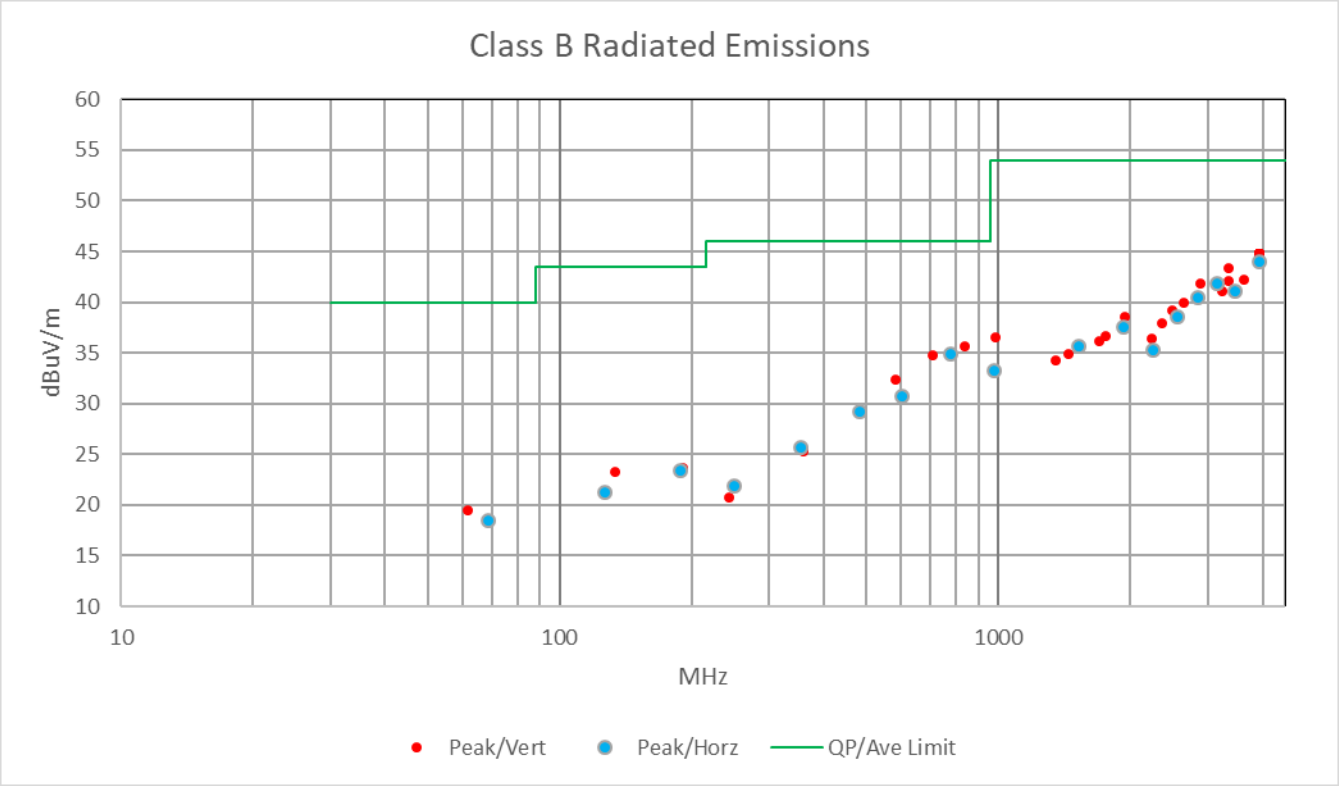
Manufacturer	New Cosmos Electric Co., Ltd.	Specification	FCC Part 15.209
Model	ML-310CE	Test Date	January 21, 2019
Serial Number	01350050092B71B	Test Distance	3 Meters
Abbreviations	Pol = Antenna Polarization; V = Vertical; H = Horizontal; P = peak; Q = QP		
Notes	Corr. Factors = Cable Loss – Preamp Gain External preamp used above 1 GHz		
Configuration	Receive mode		

Freq. MHz	Meter Reading dBuV	Dect.	Ant. Pol.	Ant Factor	Cbl/amp Factors	Dist Fact dB	EUT dBuV/m	Limit dBuV/m	Margin Under Limit dB	Note
68.7	8.6	P	H	9.2	0.6	0.0	18.4	40.0	21.6	
126.8	8.3	P	H	12.0	0.9	0.0	21.2	43.5	22.3	
189.1	8.5	P	H	13.8	1.1	0.0	23.4	43.5	20.1	
250.6	8.7	P	H	11.9	1.3	0.0	21.9	46.0	24.1	
354.8	9.2	P	H	14.8	1.7	0.0	25.7	46.0	20.3	
482.4	10.3	P	H	16.9	2.0	0.0	29.2	46.0	16.8	
601.3	9.9	P	H	18.6	2.2	0.0	30.7	46.0	15.3	
780.0	10.7	P	H	21.6	2.6	0.0	34.9	46.0	11.1	
975.0	7.8	P	H	22.5	2.9	0.0	33.2	54.0	20.8	
1527.5	42.5	P	H	25.7	-32.6	0.0	35.6	74.0	38.4	1

Freq. MHz	Meter Reading dBuV	Dect.	Ant. Pol.	Ant Factor	Cbl/amp Factors	Dist Fact dB	EUT dBuV/m	Limit dBuV/m	Margin Under Limit dB	Note
1927.5	41.7	P	H	27.8	-32.0	0.0	37.5	74.0	36.5	1
2250.0	39.4	P	H	27.7	-31.8	0.0	35.3	74.0	38.7	1
2552.5	40.9	P	H	28.8	-31.2	0.0	38.5	74.0	35.5	1
2847.5	42.0	P	H	29.2	-30.7	0.0	40.5	74.0	33.5	1
3152.5	40.8	P	H	30.9	-29.9	0.0	41.8	74.0	32.2	1
3465.0	39.6	P	H	31.2	-29.7	0.0	41.1	74.0	32.9	1
3940.0	40.3	P	H	32.9	-29.2	0.0	44.0	74.0	30.0	1
61.8	9.7	P	V	9.2	0.6	0.0	19.5	40.0	20.5	
133.6	10.1	P	V	12.3	0.9	0.0	23.3	43.5	20.2	
191.3	8.5	P	V	13.9	1.2	0.0	23.6	43.5	19.9	
243.8	7.9	P	V	11.5	1.3	0.0	20.7	46.0	25.3	
360.1	9.0	P	V	14.6	1.7	0.0	25.3	46.0	20.7	
487.7	10.0	P	V	17.3	2.0	0.0	29.3	46.0	16.7	
583.8	11.8	P	V	18.3	2.2	0.0	32.3	46.0	13.7	
708.8	11.7	P	V	20.7	2.4	0.0	34.8	46.0	11.2	
837.5	10.5	P	V	22.5	2.7	0.0	35.7	46.0	10.3	
986.3	10.9	P	V	22.7	2.9	0.0	36.5	54.0	17.5	
1347.5	41.3	P	V	25.6	-32.7	0.0	34.2	74.0	39.8	1
1442.5	42.0	P	V	25.5	-32.6	0.0	34.9	74.0	39.1	1
1695.0	42.4	P	V	26.2	-32.5	0.0	36.1	74.0	37.9	1
1757.5	42.3	P	V	26.7	-32.4	0.0	36.6	74.0	37.4	1
1945.0	42.8	P	V	27.8	-32.0	0.0	38.6	74.0	35.4	1
2230.0	40.5	P	V	27.7	-31.8	0.0	36.4	74.0	37.6	1
2357.5	41.3	P	V	28.2	-31.6	0.0	37.9	74.0	36.1	1
2492.5	42.0	P	V	28.6	-31.4	0.0	39.2	74.0	34.8	1
2642.5	41.8	P	V	29.0	-30.9	0.0	39.9	74.0	34.1	1
2887.5	43.1	P	V	29.4	-30.6	0.0	41.9	74.0	32.1	1
3245.0	40.0	P	V	31.1	-30.0	0.0	41.1	74.0	32.9	1
3335.0	42.0	P	V	31.2	-29.9	0.0	43.3	74.0	30.7	1
3355.0	40.8	P	V	31.2	-29.9	0.0	42.1	74.0	31.9	1
3630.0	40.3	P	V	31.6	-29.7	0.0	42.2	74.0	31.8	1
3937.5	41.0	P	V	32.9	-29.2	0.0	44.7	74.0	29.3	1

Note 1: All Peak readings above 1 GHz were under the Average limits, so average readings are not required.

Judgment: Passed by 10.3 dB



Radiated emissions in a graphical format. The above chart is the same data as the previous table.

11.6.1 Measurement Instrumentation Uncertainty

Measurement	Uncertainty
Radiated Emissions, E-field, 3 meters, 30 to 200 MHz	3.3 dB
Radiated Emissions, E-field, 3 meters, 200 to 1000 MHz	4.9 dB
Radiated Emissions, E-field, 3 meters, 1 to 18 GHz	4.8 dB
Bandwidth using marker delta method at a span of 500 kHz	4 kHz
99% Occupied Bandwidth using REC-43	1% of frequency span
Conducted power at 915 MHz	0.8 dB
Amplitude measurement 1-10,000 MHz	1.5 dB
Temperature THM-02	0.6 Deg C

The uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k=2 in accordance with CISPR 16-4-2.