FCC IC Test Report

Report No.:	FCC_IC_RF_SL19100101-OMP-002
FCC ID:	2ALLL243A
IC:	24107-243A
Test Model:	OPS243-A
Received Date:	10/13/2019
Test Date:	10/13/2019/-10/23/2019
Issued Date:	10/24/2019
Applicant:	OmniPreSense
Address:	1650 Zanker Road, Suite 222, San Jose, CA 95112
Manufacturer:	OmniPreSense
Address:	1650 Zanker Road, Suite 222, San Jose, CA 95112
Issued By:	Bureau Veritas Consumer Products Services, Inc.
Lab Address:	775 Montague Expressway, Milpitas, CA 95035
Test Location (1):	775 Montague Expressway, Milpitas, CA 95035
FCC Registration / Designation Number:	540430
ISED# / CAB identifier:	4842D

ACCREDITED
TESTING CERT # 2742-01

Table of Contents

Release Control Record

Issue No.	Description	Date Issued
FCC_IC_RF_SL19100101-OMP-002	Original Release	10/24/2019

1 Certificate of Conformity

Product:	Short Range Radar Sensor
Brand:	OmniPreSense
Test Model:	OPS243-A
Sample Status:	Engineering sample
Applicant:	OmniPreSense
Test Date:	10/13/2019/-10/23/2019
Standards:	47 CFR FCC Part 15.245 RSS-210 Issue 9, August 2016 ANSI C63.10: 2013 RSS-Gen Issue 5, March 2019

The above equipment has been tested by **Bureau Veritas Consumer Products Services, Inc., Milpitas Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Prepared by : _____ , **Date:** 10/24/2019

Deon Dai / Test Engineer

Approved by : _____ , **Date:** 10/24/2019

Chen Ge / Engineer Reviewer

2 Summary of Test Results

47 CFR FCC Part 15 (Section 15.245) RSS 210 Issue9, RSS Gen Issue5			
FCC / IC Clause	Test Item	Result	Remarks
15.207 RSS GEN	AC Conducted Emissions	PASS	Meet the requirement of limit.
15.245(b) RSS Gen	Fundamental Field Strength	PASS	Meet the requirement of limit.
15.245(b) RSS Gen	Harmonic Field Strength	PASS	Meet the requirement of limit.
15.245 RSS Gen	Emission Bandwidth	PASS	Meet the requirement of limit.
15.245(b)(3) RSS Gen	Spurious Radiated Emissions	PASS	Meet the requirement of limit.
RSS Gen	Frequency Stability	PASS	Meet the requirement of limit.
15.203	Antenna Requirement	PASS	Antenna type is Patch antenna. (The device is Permanently attached)

2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	3.51dB
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	3.73dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	4.64dB
	6GHz ~ 18GHz	4.82dB
	18GHz ~ 40GHz	4.91dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Short Range Radar Sensor
Brand	OmniPreSense
Test Model	OPS243-A
Identification No. of EUT	N/A
Status of EUT	Engineering sample
Power Supply Rating	5Vdc USB powered
Modulation Type	N/A
Operating Frequency	24.089 ~ 24.161 GHz
Number of Channel	5
Antenna Type	Patch
Antenna Gain	11 dBi
Antenna Connector	N/A

3.2 Description of Test Modes

5 channels are provided to this EUT:

Channel	Frequency (MHz)	Power Setting
0	24089	P0
1	24107	P0
2	24125	P0
3	24143	P0
4	24161	P0

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE≥1G	RE<1G	PLC	APCM	
-	√	√	√	X	-

Where RE≥1G: Radiated Emission above 1GHz & Bandedge Measurement
RE<1G: Radiated Emission below 1GHz
PLC: Power Line Conducted Emission
APCM: Antenna Port Conducted Measurement

NOTE: The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **Y-plane**.
NOTE: "-" means no effect.

Test Condition:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE≥1G	25deg. C, 65%RH	120Vac, 60Hz	Deon Dai
RE<1G	25deg. C, 65%RH	120Vac, 60Hz	Deon Dai
PLC	25deg. C, 68%RH	120Vac, 60Hz	Deon Dai

3.3 Duty Cycle of Test Signal

Duty cycle of test signal is 100%.

3.4 Description of Support Units

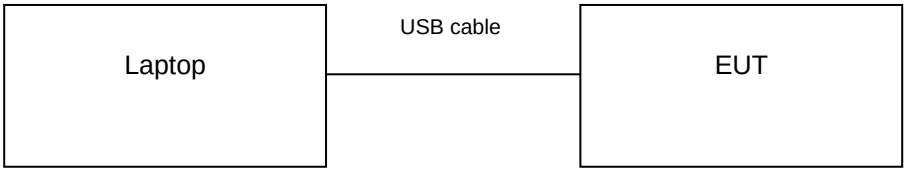
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Laptop	Dell	Latitude 4470	N/A	N/A	N/A
B.						

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Remarks
1.	USB cable	1	0.8	N	Provided by Customer

Note: The core(s) is(are) originally attached to the cable(s).

3.4.1 Configuration of System under Test



3.5 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

47 CFR FCC Part 15, Subpart C (Section 15.245)
RSS 210 Issue9, August 2016
ANSI C63.10: 2013
RSS Gen Issue5, March 2019

All test items have been performed and recorded as per the above standards.

4 Test Types and Results

4.1 Fundamental Field Strength

4.1.1 Limits of Radiated Emission and Bandedge Measurement

Field strength of fundamental emission in 24075 - 24175 MHz, < 2500 mV /m (128 dBuV /m) at 3 meter distance.

4.1.2 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
EMI Test Receiver ROHDE & SCHWARZ	ESIB 40	100179	08/28/2019	08/28/2020
Spectrum Analyzer KEYSIGHT	N9030B	MY57140374	07/22/2019	07/22/2020
Hybrid Antenna SUNAR	JB6	A111717	03/09/2019	03/09/2020
DRG Horn Antenna ETS LINDGREN	3117	214309	11/22/2018	11/22/2019
Preamplifier RF-LAMBDA	RAMP00M50GA	17032300047	09/19/2019	09/19/2020
Preamplifier RF-BAY	LPA-6-30	11170602	05/06/2019	05/06/2020

4.1.3 Test Procedures

For Radiated emission above 30MHz

a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

f. The test-receiver system was set to peak and average detects function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

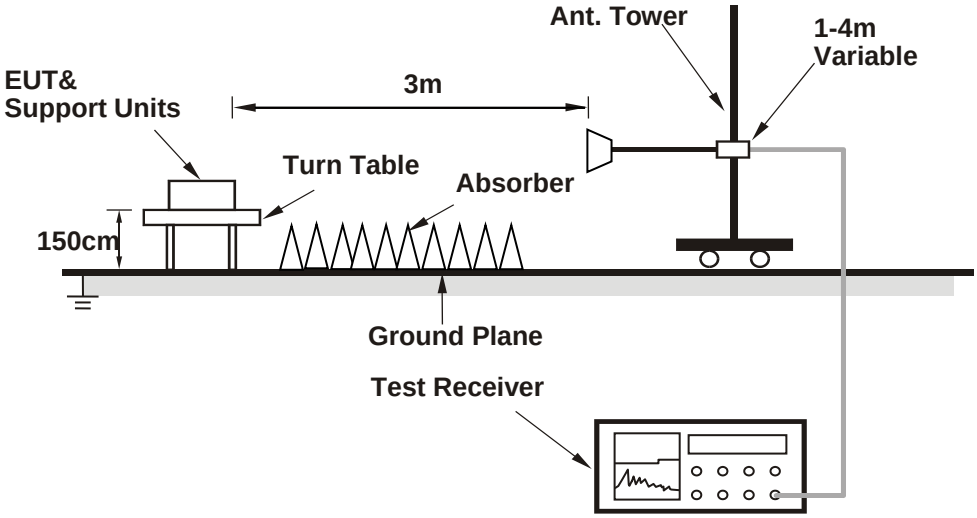
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) or 10Hz (Duty cycle ≥ 98%) for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

No deviation.

4.1.5 Test Setup

For Radiated emission above 1GHz



For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.1.6 EUT Operating Conditions

a. Connected the EUT with the Notebook Computer which is placed on remote site.
b. Controlling software has been activated to set the EUT on specific status.

4.1.7 Test Results

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
24089	87.42	11.27	2.44	101.13	Peak Max	V	4	218	128	-26.87	Pass
24125	87.29	11.27	2.44	101.00	Peak Max	V	4	218	128	-27.00	Pass
24161	87.55	11.27	2.44	101.26	Peak Max	V	4	218	128	-26.74	Pass

4.2 Conducted Emission Measurement

4.2.1 Limits of Conducted Emission Measurement

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

Note: 1. The lower limit shall apply at the transition frequencies.
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

4.2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date Of Calibration	Due Date Of Calibration
EMI Test Receiver ROHDE & SCHWARZ	ESIB 40	100179	08/28/2019	08/28/2020
Transient Limiter ELECTRO-METRICS	EM-7600-5	106	12/31/2018	12/31/2019
LISN EMCO	3816/2NM	214372	01/10/2019	01/10/2020

4.2.3 Test Procedures

a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.

b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

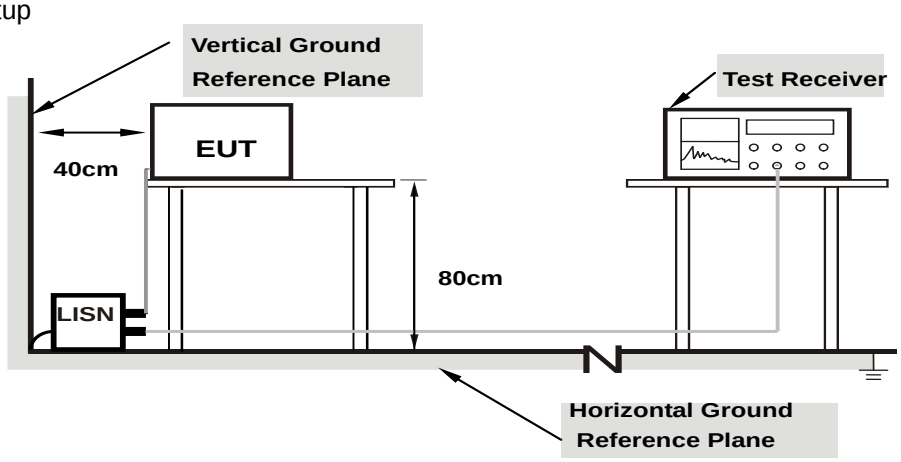
c. The frequency range from 150 kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

NOTE: The resolution bandwidth and video bandwidth of test receiver is 9 kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 Test Setup



Note: 1.Support units were connected to second LISN.

For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.2.6 EUT Operating Conditions

Same as 4.1.6.

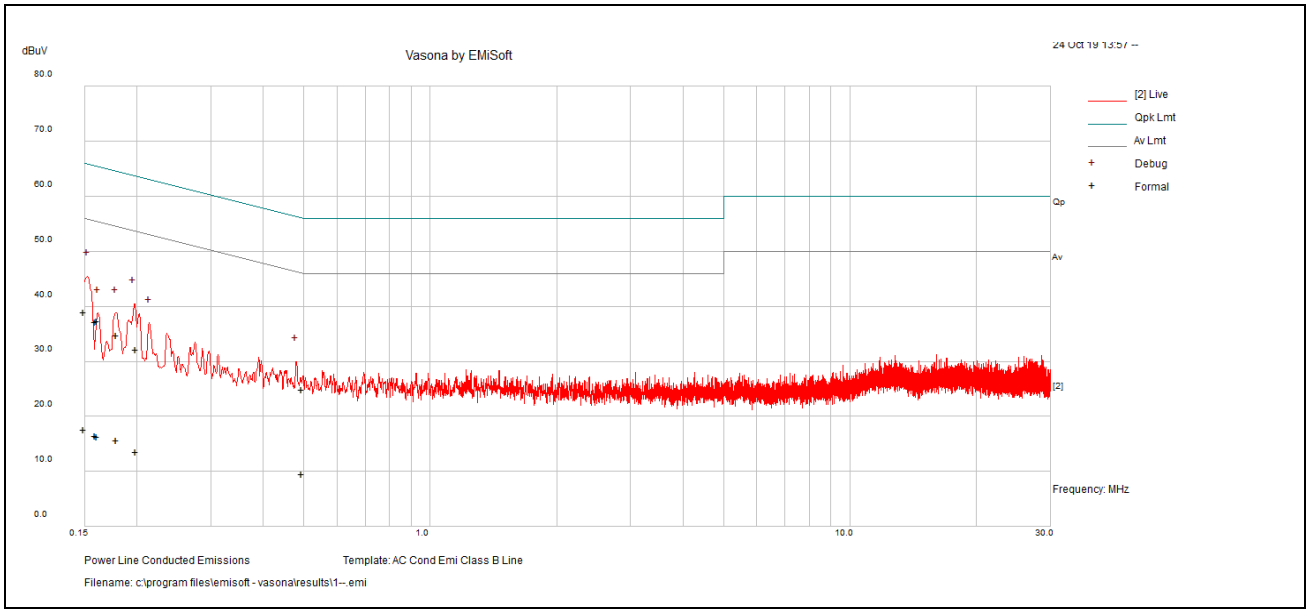
4.2.7 Test Results

Phase	Line (L)	Detector Function	Quasi-Peak / Average

No	Freq.	Raw	Cale Loss	Factors	Level	Measurement Type	Line	Limit	Margin	Pass /Fail
	[MHz]	(dBuV)	(dB)	(dB)	(dBuV)			(dBuV)	(dB)	
1	0.15	31.76	7.11	0.05	38.92	Quasi Peak	Live	66	-27.08	Pass
2	0.18	27.5	7.15	0.05	34.69	Quasi Peak	Live	64.51	-29.82	Pass
3	0.16	30.21	7.13	0.05	37.38	Quasi Peak	Live	65.4	-28.02	Pass
4	0.20	24.99	7.17	0.04	32.2	Quasi Peak	Live	63.63	-31.44	Pass
5	0.50	17.44	7.34	0.04	24.82	Quasi Peak	Live	56.07	-31.25	Pass
6	0.16	30.07	7.12	0.05	37.24	Quasi Peak	Live	65.5	-28.26	Pass
7	0.15	10.42	7.11	0.05	17.59	Average	Live	56	-38.42	Pass
8	0.18	8.46	7.15	0.05	15.65	Average	Live	54.51	-38.85	Pass
9	0.16	9.11	7.13	0.05	16.29	Average	Live	55.4	-39.12	Pass
10	0.20	6.35	7.17	0.04	13.56	Average	Live	53.63	-40.07	Pass
11	0.50	2.15	7.34	0.04	9.53	Average	Live	46.07	-36.54	Pass
12	0.16	9.26	7.12	0.05	16.43	Average	Live	55.5	-39.07	Pass

REMARKS:

1. The emission levels of other frequencies were very low against the limit.
2. Margin value = Emission level - Limit value
3. Emission Level = Correction Factor + Raw Value + Factors Value.

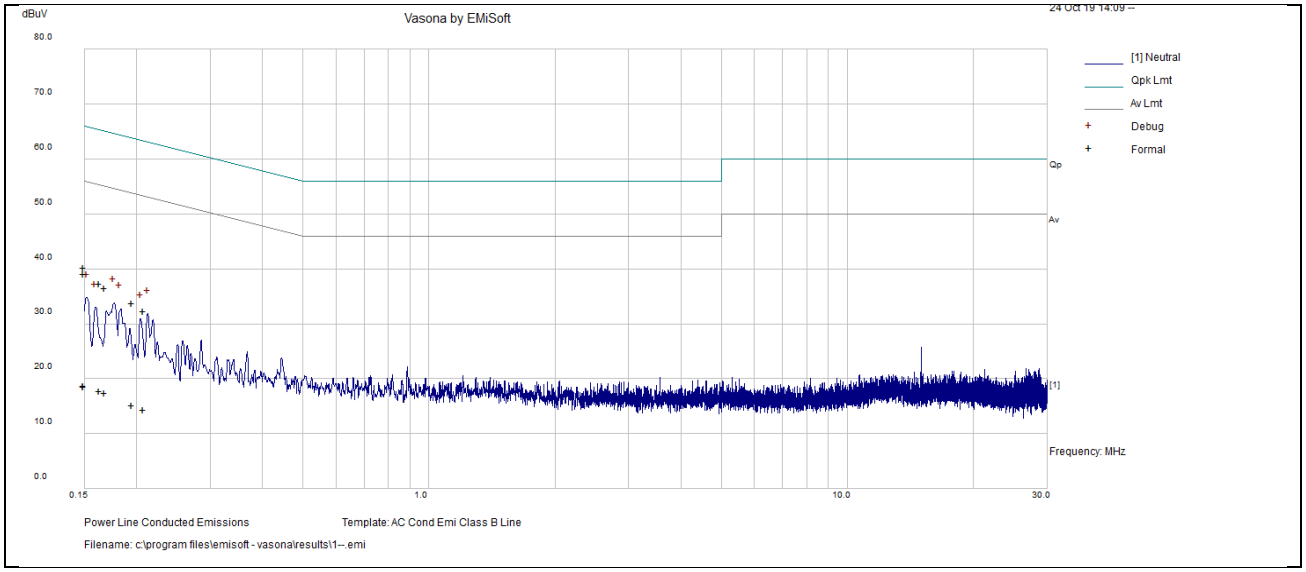


Phase	Neutral (N)	Detector Function	Quasi-Peak / Average

No	Freq.	Raw	Cale Loss	Factors	Level	Measurement Type	Line	Limit	Margin	Pass /Fail
	[MHz]	(dBuV)	(dB)	(dB)	(dBuV)			(dBuV)	(dB)	
1	0.16	30.24	7.13	0.05	37.42	Quasi Peak	Neutral	65.3	-27.88	Pass
2	0.15	33.05	7.11	0.05	40.22	Quasi Peak	Neutral	66	-25.78	Pass
3	0.19	26.63	7.16	0.04	33.84	Quasi Peak	Neutral	63.82	-29.99	Pass
4	0.17	29.41	7.13	0.05	36.59	Quasi Peak	Neutral	65.06	-28.47	Pass
5	0.21	25.13	7.18	0.04	32.35	Quasi Peak	Neutral	63.28	-30.93	Pass
6	0.15	32.04	7.11	0.05	39.2	Quasi Peak	Neutral	66	-26.8	Pass
7	0.16	10.54	7.13	0.05	17.72	Average	Neutral	55.3	-37.59	Pass
8	0.15	11.49	7.11	0.05	18.66	Average	Neutral	56	-37.35	Pass
9	0.19	8.06	7.16	0.04	15.27	Average	Neutral	53.82	-38.56	Pass
10	0.17	10.25	7.13	0.05	17.43	Average	Neutral	55.06	-37.63	Pass
11	0.21	7.19	7.18	0.04	14.41	Average	Neutral	53.28	-38.87	Pass
12	0.15	11.51	7.11	0.05	18.67	Average	Neutral	56	-37.33	Pass

REMARKS:

1. The emission levels of other frequencies were very low against the limit.
2. Margin value = Emission level - Limit value
3. Emission Level = Correction Factor + Raw Value + Factors Value.

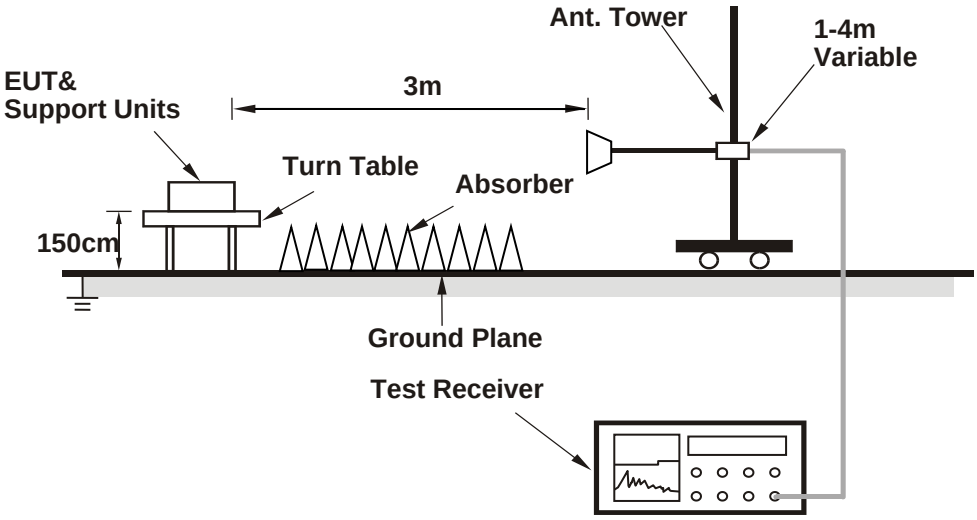


4.3 Emission Bandwidth Measurement

4.3.1 Limits of Emission Bandwidth Measurement

According to FCC §15.215(c), Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

4.3.2 Test Setup



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedure

Span = approximately 2 to 5 times the 99% occupied bandwidth, centered on a hopping channel RBW = 1% to 5 % of the 99% occupied bandwidth

VBW = 3RBW

Sweep = auto

Detector function = peak Trace = max hold

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20dB from the reference level. Record the frequency difference as the minimum emission or emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

4.3.5 Deviation from Test Standard

No deviation.

4.3.6 EUT Operating Conditions

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.3.7 Test Result

24089 MHz

Type	Result (MHz)	Limit (MHz)	Result
20 dB BW	0.942	-	Pass
99% OBW	0.786	-	Pass

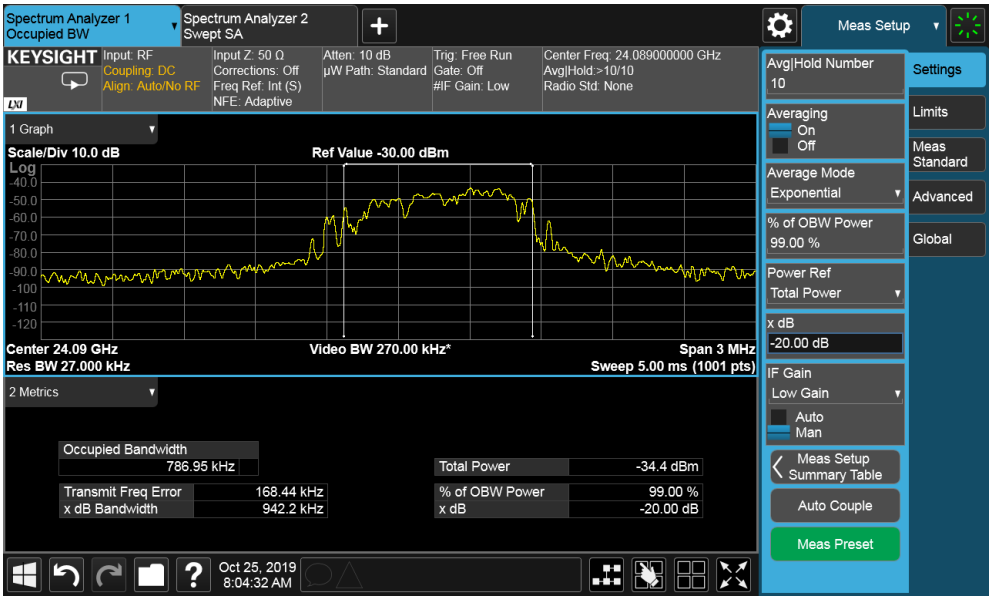
24125 MHz

Type	Result (MHz)	Limit (MHz)	Result
20 dB BW	0.776	-	Pass
99% OBW	0.665	-	Pass

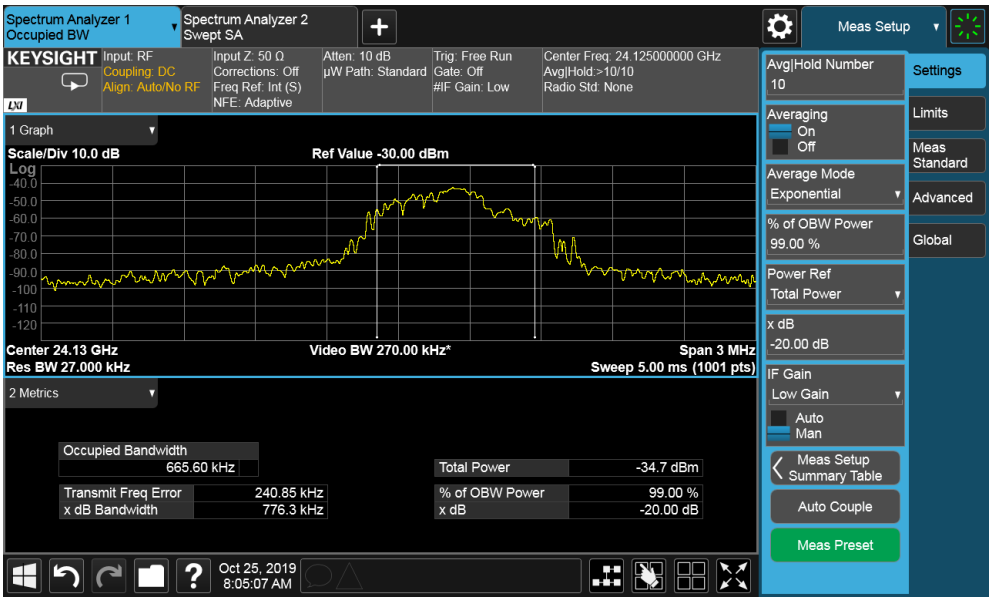
24161 MHz

Type	Result (MHz)	Limit (MHz)	Result
20 dB BW	0.743	-	Pass
99% OBW	0.716	-	Pass

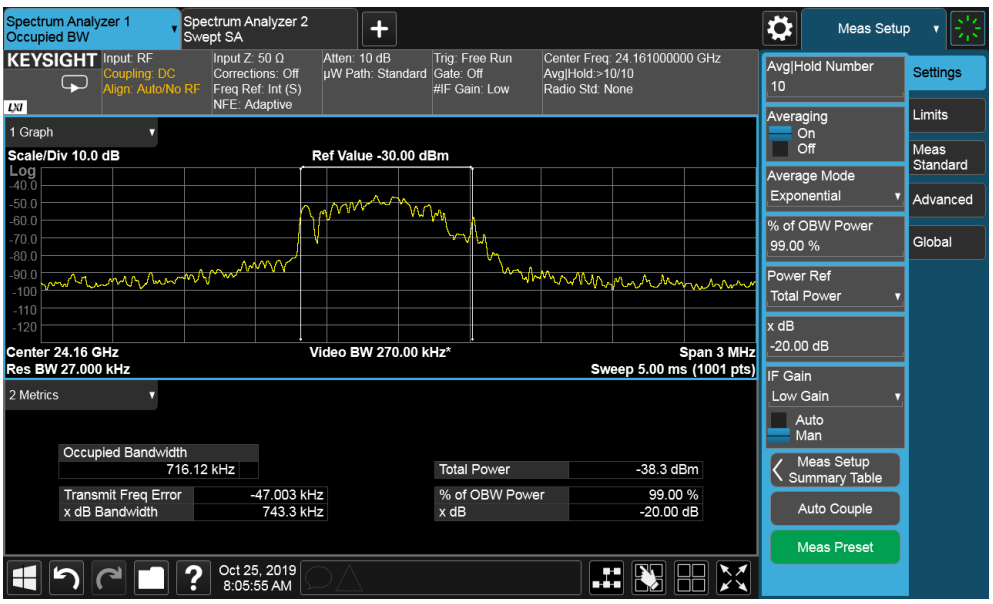
Test Plots:



24089MHz



24125MHz


Spectrum Analyzer 1
Occupied BW
Spectrum Analyzer 2
Swept SA
Meas Setup
KEYSIGHT
Input: RF
Coupling: DC
Align: Auto/No RF
Input Z: 50 Ω
Corrections: Off
Freq Ref: Int (S)
NFE: Adaptive
Atten: 10 dB
µW Path: Standard
Trig: Free Run
Gate: Off
#IF Gain: Low
Center Freq: 24.161000000 GHz
Avg|Hold:>10/10
Radio Std: None
1 Graph
Scale/Div 10.0 dB
Ref Value -30.00 dBm
Log
-40.0
-50.0
-60.0
-70.0
-80.0
-90.0
-100
-110
-120
Center 24.16 GHz
Res BW 27.000 kHz
Video BW 270.00 kHz*
Span 3 MHz
Sweep 5.00 ms (1001 pts)
2 Metrics
Occupied Bandwidth
716.12 kHz
Transmit Freq Error
-47.003 kHz
x dB Bandwidth
743.3 kHz
Total Power
-38.3 dBm
% of OBW Power
99.00 %
x dB
-20.00 dB
Oct 25, 2019
8:05:55 AM
Avg|Hold Number
10
Averaging
On
Off
Average Mode
Exponential
% of OBW Power
99.00 %
Power Ref
Total Power
x dB
-20.00 dB
IF Gain
Low Gain
Auto
Man
Meas Setup
Summary Table
Auto Couple
Meas Preset
Settings
Limits
Meas
Standard
Advanced
Global

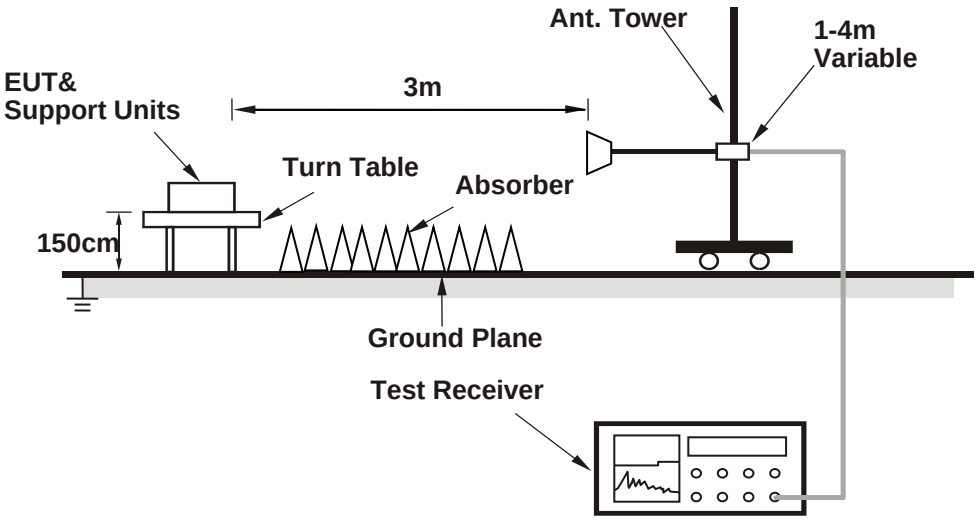
24161MHz

4.4 Harmonic Field Strength

4.4.1 Limits of Harmonic Field Strength Measurement

Harmonic emissions in the restricted bands at and above 17.7 GHz shall not exceed the following field strength limits:
(i) For the second and third harmonics of field disturbance sensors operating in the 24075-24175 MHz band and for other field disturbance sensors designed for use only within a building or to open building doors, 25.0 mV/m.
(ii) For all other field disturbance sensors, 7.5 mV/m.
(iii) Field disturbance sensors designed to be used in motor vehicles or aircraft must include features to prevent continuous operation unless their emissions in the restricted bands, other than the second and third harmonics from devices operating in the 24075-24175 MHz band, fully comply with the limits given in §15.209.

4.4.2 Test Setup



4.4.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.4.4 Test Procedures

Refer to section 4.1.3.

4.4.5 Deviation from Test Standard

No deviation.

4.4.6 EUT Operating Conditions

Same as Item 4.3.6.

4.4.7 Test Results

Measurement Result (40 – 60 GHz)

24089 MHz

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
48178	37.17	6.6	3.84	47.61	Peak Max	V	153	117	77.5	-29.89	Pass

24125 MHz

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
48250	39.41	6.6	3.84	48.85	Peak Max	V	153	117	77.5	-28.65	Pass

24161 MHz

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
48322	38.11	6.6	3.84	48.55	Peak Max	V	153	117	77.5	-28.95	Pass

Note: Both horizontal and vertical polarities were investigated. The results above show only the worst case.

Measurement Result (60 – 100 GHz)

The 3rd harmonic level is more than 20dB below the limit.

4.5 Radiated Emission out of Band Measurement

4.5.1 Limits of Emission Measurement

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation

4.5.2 Test Setup

For Radiated emission above 30MHz

g. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.

h. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

i. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

j. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

k. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

l. The test-receiver system was set to peak and average detects function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

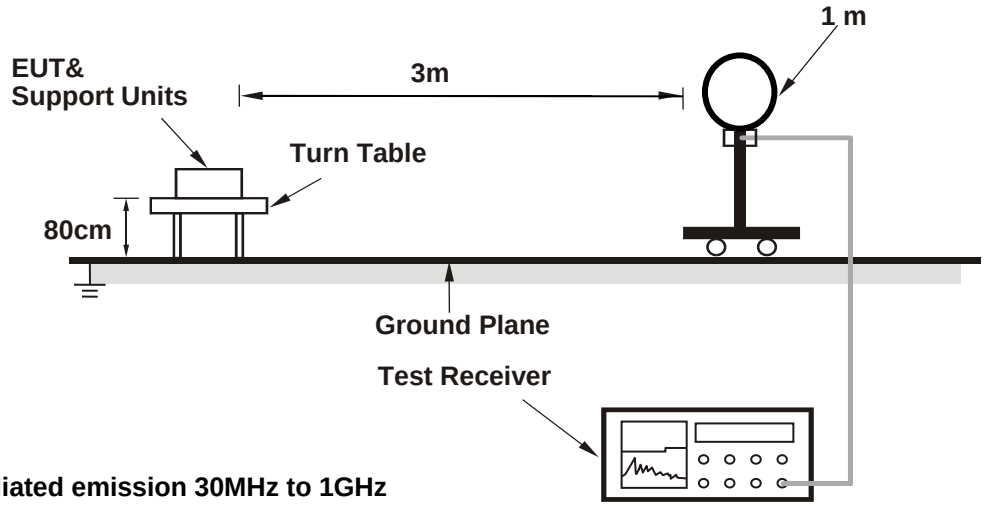
5. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) at frequency below 1GHz.
6. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
7. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) or 10Hz (Duty cycle ≥ 98%) for Average detection (AV) at frequency above 1GHz.
8. All modes of operation were investigated and the worst-case emissions are reported.

4.5.3 Deviation from Test Standard

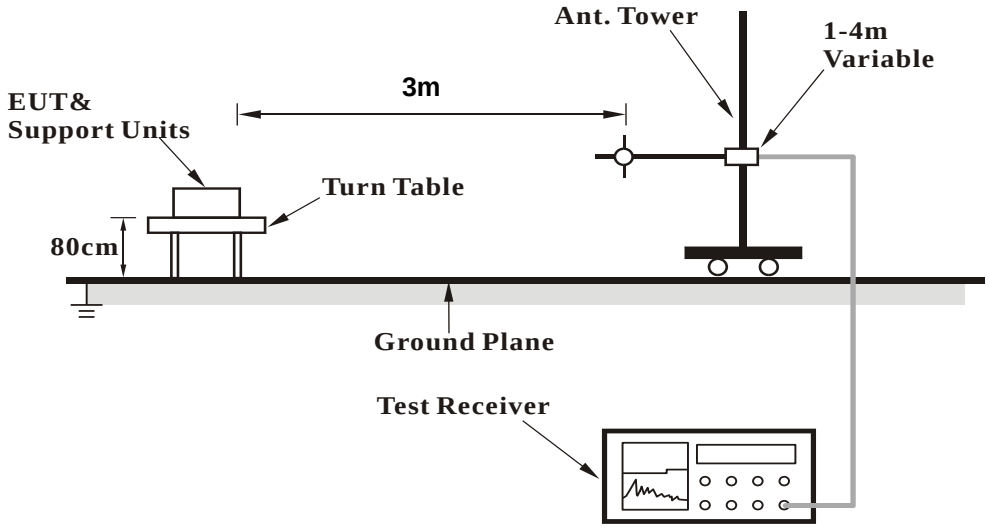
No deviation.

4.5.4 Test Setup

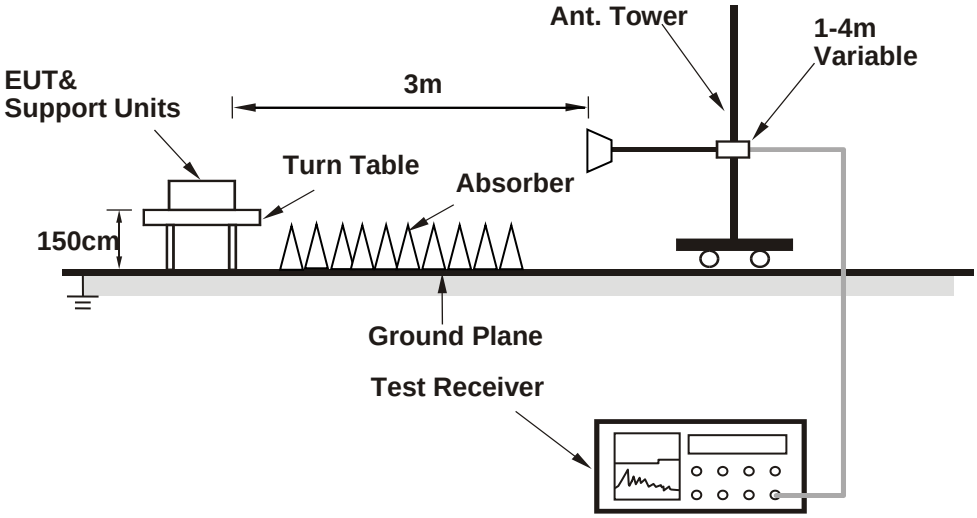
For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



For Radiated emission above 1GHz



For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.5.5 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.5.6 Test Procedures

Refer to section 4.1.3.

4.5.7 Deviation from Test Standard

No deviation.

4.5.8 EUT Operating Conditions

Same as Item 4.3.6.

4.5.9 Test Results

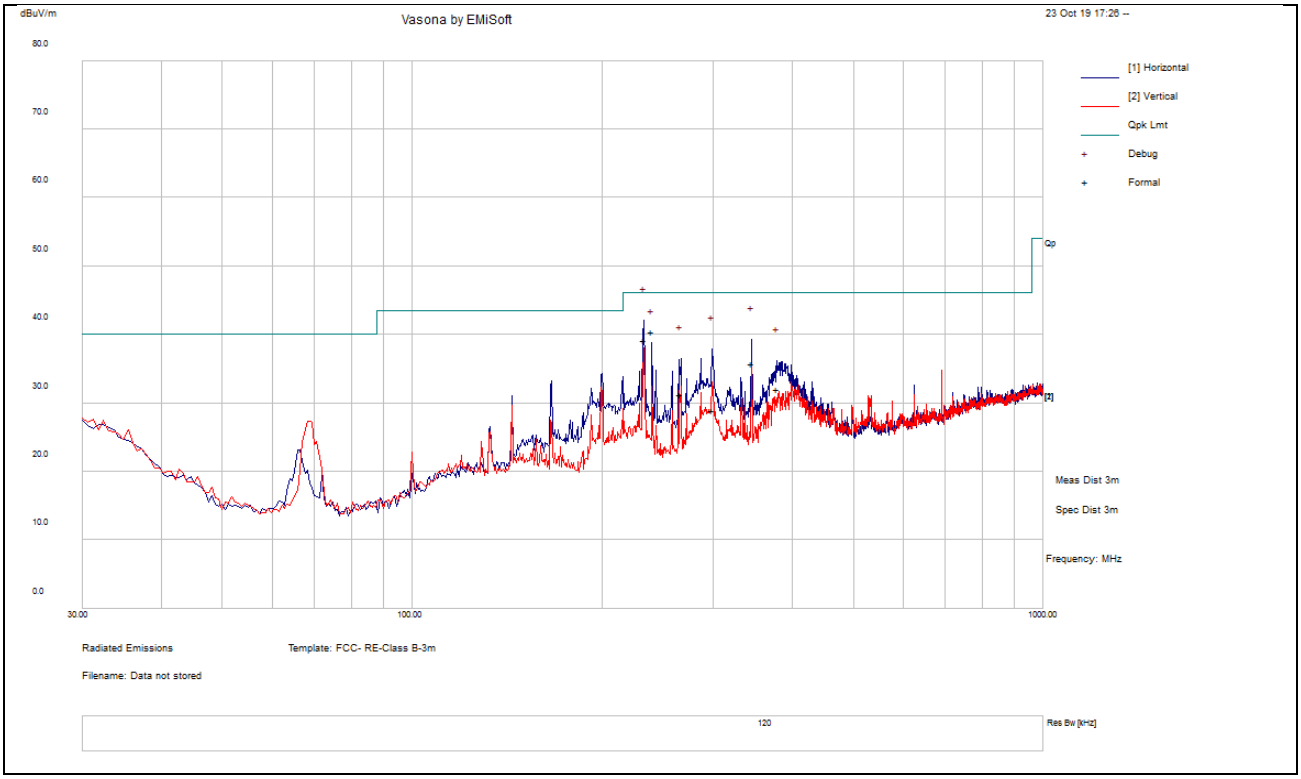
BELOW 1GHz WORST-CASE DATA:

CHANNEL	TX Channel 2	**DETECTOR FUNCTION**	Quasi Peak
FREQUENCY RANGE	30MHz – 1GHz		

ANTENNA POLARITY & test distance: HORIZONTAL& VERTICAL at 3 m												
No	Freq.	Raw	Cale Loss	AF	Level	Measurement Type	Pol	Hgt	Azt	Limit	Margin	Pass /Fail
	[MHz]	(dBuV)	(dB)	(dB/m)	(dBuV/m)			(cm)	Deg	(dBuV/m)	(dB)	
1	233.21	51.13	12.87	-24.73	39.27	Quasi Max	H	144	269	46	-6.74	Pass
2	345.00	43.6	13.52	-21.28	35.84	Quasi Max	H	104	8	46	-10.16	Pass
3	239.98	52.01	12.89	-24.49	40.41	Quasi Max	H	101	279	46	-5.59	Pass
4	298.58	37.8	13.24	-22.13	28.9	Quasi Max	H	109	326	46	-17.1	Pass
5	266.59	41.8	13.06	-23.62	31.25	Quasi Max	H	130	115	46	-14.76	Pass
6	378.67	39.04	13.67	-20.63	32.08	Quasi Max	H	202	194	46	-13.92	Pass

REMARKS:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Cable Loss (dB) + AF (dB)
2. AF (dB/m) = Antenna Factor (dB/m) – Preamplifier Gain (dB).
3. The emission levels of other frequencies were less than 20dB margin against the limit.
4. Margin value = Emission level – Limit value.



ABOVE 1GHz TEST DATA:

CHANNEL	TX Channel 2	**DETECTOR FUNCTION**	Peak Average
FREQUENCY RANGE	1GHz ~ 18GHz		

ANTENNA POLARITY & test distance: HORIZONTAL& VERTICAL at 3 m												
No	Freq.	Raw	Cale Loss	AF	Level	Measurement Type	Pol	Hgt	Azt	Limit	Margin	Pass /Fail
	[MHz]	(dBuV)	(dB)	(dB/m)	(dBuV/m)			(cm)	Deg	(dBuV/m)	(dB)	
1	16808.00	45.92	9.57	1.9	57.39	Peak Max	H	199	314	74	-16.61	Pass
2	7534.59	48.09	6.57	-7.12	47.54	Peak Max	H	198	0	74	-26.46	Pass
3	4515.64	51.62	5.21	-11.6	45.24	Peak Max	V	137	360	74	-28.76	Pass
4	2666.85	53.54	3.58	-12.65	44.46	Peak Max	H	125	356	74	-29.54	Pass
5	1412.78	56.76	2.72	-16.82	42.66	Peak Max	H	167	323	74	-31.34	Pass
6	16808.00	33.39	9.57	1.9	44.86	Average Max	H	199	314	54	-9.14	Pass
7	7534.59	35.41	6.57	-7.12	34.86	Average Max	H	198	0	54	-19.14	Pass
8	4515.64	38.78	5.21	-11.6	32.4	Average Max	V	137	360	54	-21.6	Pass
9	2666.85	40.54	3.58	-12.65	31.47	Average Max	H	125	356	54	-22.53	Pass
10	1412.78	41.41	2.72	-16.82	27.31	Average Max	H	167	323	54	-26.69	Pass

REMARKS:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Cable Loss (dB) + AF (dB)
2. AF (dB/m) = Antenna Factor (dB/m) – Preamplifier Gain (dB).
3. The emission levels of other frequencies were less than 20dB margin against the limit.
4. Margin value = Emission level – Limit value.

Note: Both horizontal and vertical polarities were investigated, the levels emission above 40GHz of outside band emissions are below noise floor level.

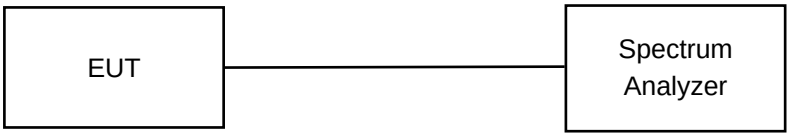
4.6 Frequency Stability

4.6.1 Limits of Frequency Stability

The frequency stability shall be sufficient to ensure that the 40 dB bandwidth stays within the operating frequency band when tested at the temperature and supply voltage variations specified the frequency stability measurement in RSS-Gen.

For licence-exempt devices, the following conditions apply:
a) at the temperatures of -20°C (-4°F), +20°C (+68°F) and +50°C (+122°F), and at the manufacturer's rated supply voltage
b) at the temperature of +20°C (+68°F) and at ±15% of the manufacturer's rated supply voltage

4.6.2 Test Setup



4.6.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.6.4 Test Procedure

MEASUREMENT PROCEDURE REF

1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. The bandwidth of the measuring receiver was set to 300Hz.
3. A test horn antenna was used to receive and monitor the EUT transmiting.
4. The horn antenna output was connected to spectrum analyser.
5. Max hold the trace on spectrum analyser, record the fundamental signal and its 40 dB points.

4.6.5 Deviation from Test Standard
No deviation.

4.6.6 EUT Operating Condition

Same as Item 4.3.6

4.6.7 Test Results

Temperature	DC Voltage	Nominal Frequency (MHz)	Measured 40dB Low Point (MHz)	Measured 40dB High Point (MHz)	Requirement (MHz)	Result
Norm Temp 20 ^{0}C	Normal 5V	24125	24124.07	24126.41	Within 24075 I 24175	Pass
	Low 4.25V	24125	24124.21	24126.49		
	High 5.75V	24125	24124.14	24126.55		
Low Temp -20 ^{0}C	Normal 5V	24125	24124.10	24126.40		
High Temp 50 ^{0}C	Normal 5V	24125	24124.04	24126.41		

5 Pictures of Test Arrangements

Please see setup photo file.

Appendix – Information on the Testing Laboratories

Bureau Veritas is a global leader in testing, inspection and certification (TIC) services. We help businesses improve safety, sustainability and productivity; and our clients include the majority of leading brands in retail, manufacturing and other industries. With a presence in every major country around the world, our quality assurance and compliance solutions are vital in helping our customers enhance product quality and concept-to-consumer journeys. We also assist with increasing speed to market, profitability and brand equity throughout the supply chain. Bureau Veritas is a leading wireless/IoT testing, inspection, audit and certification provider, with a global network of test laboratories to support the IoT industry in areas of connectivity, security, interoperability as well as quality, health & safety, and environmental/chemical requirements.

If you have any comments, please feel free to contact us at the following:

Milpitas EMC/RF/Safety/Telecom Lab
775 Montague Expressway, Milpitas, CA 95035
Tel: +1 408 526 1188

Sunnyvale OTA/Bluetooth Lab
1293 Anvilwood Avenue, Sunnyvale, CA 94089
Tel: +1 669 600 5293

Littleton EMC/RF/Safety/Environmental Lab
1 Distribution Center Cir #1, Littleton, MA 01460
Tel: +1 978 486 8880

Irvine OTA/PTCRB/Bluetooth/V2X Lab
15 Musick, Irvine, CA 92618
Tel: +1 949 716 6512

Email: sales.eaw@us.bureauveritas.com
Web Site: www.cpsusa-bureauveritas.com

The address and road map of all our labs can be found in our web site also.

--- END ---