



MEASUREMENT REPORT

FCC PART15.245 / RSS-210 Issue 10

FCC ID: 2AYYZKMGR1T1R02
IC: 26995-KMGR1T1R02
APPLICANT: XIAMEN KOMOO INTELLIGENT TECHNOLOGY CO., LTD.

Application Type: Certification
Product: 24GHz Microwave Radar Sensor Module
Model No.: KMGR-1T1R02
FCC Classification: Part 15 Field Disturbance Sensor (FDS)
FCC Rule Part(s): FCC PART15.245
ISED Rule(s): RSS-210 Issue 10 Annex F, RSS-Gen Issue 5
Test Procedure(s): ANSI C63.10-2013
Test Date: February 25 ~ March 07, 2021

Reviewed By:

Kevin Guo

Approved By:

Robin Wu



The test results relate only to the samples tested.

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.10-2013. Test results reported herein relate only to the item(s) tested.

The test report shall not be reproduced except in full without the written approval of MRT Technology (Suzhou) Co., Ltd.

Revision History

Report No.	Version	Description	Issue Date	Note
2102RSU049-U2	Rev. 01	Initial Report	03-17-2021	Valid

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1. INTRODUCTION

1.1. Applicant

XIAMEN KOMOO INTELLIGENT TECHNOLOGY CO.,LTD.

No.0807, Unit 109, No.62, Chengyi North Street, Software 3, Xiamen

1.2. Manufacturer

XIAMEN KOMOO INTELLIGENT TECHNOLOGY CO.,LTD.

No.0807, Unit 109, No.62, Chengyi North Street, Software 3, Xiamen

1.3. Testing Facility

☒	Test Site – MRT Suzhou Laboratory	
	Laboratory Location (Suzhou - Wuzhong) D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China	
	Laboratory Location (Suzhou - SIP) 4b Building, Liando U Valley, No.200 Xingpu Rd., Shengpu Town, Suzhou Industrial Park, China	
	Laboratory Accreditations	
	A2LA: 3628.01 FCC: CN1166 VCCI: R-20025, G-20034, C-20020, T-20020	CNAS: L10551 ISED: CN0001
☐	Test Site – MRT Shenzhen Laboratory	
	Laboratory Location (Shenzhen) 1G, Building A, Junxiangda Building, Zhongshanyuan Road West, Nanshan District, Shenzhen, China	
	Laboratory Accreditations	
	A2LA: 3628.02 FCC: CN1284	CNAS: L10551 ISED: CN0105
☐	Test Site – MRT Taiwan Laboratory	
	Laboratory Location (Taiwan) No. 38, Fuxing 2nd Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)	
	Laboratory Accreditations	
	TAF: L3261-190725 FCC: 291082, TW3261	ISED: TW3261

2. PRODUCT INFORMATION

2.1. Equipment Description

Product Name (PMN)	24GHz Microwave Radar Sensor Module
Model No. (HVIN)	KMGR-1T1R02
Transmitting Frequency	24.15GHz
Operation Voltage	DC5V
EUT Identification No.	20210220@sample#13

2.2. Product Specification Subjective to this Report

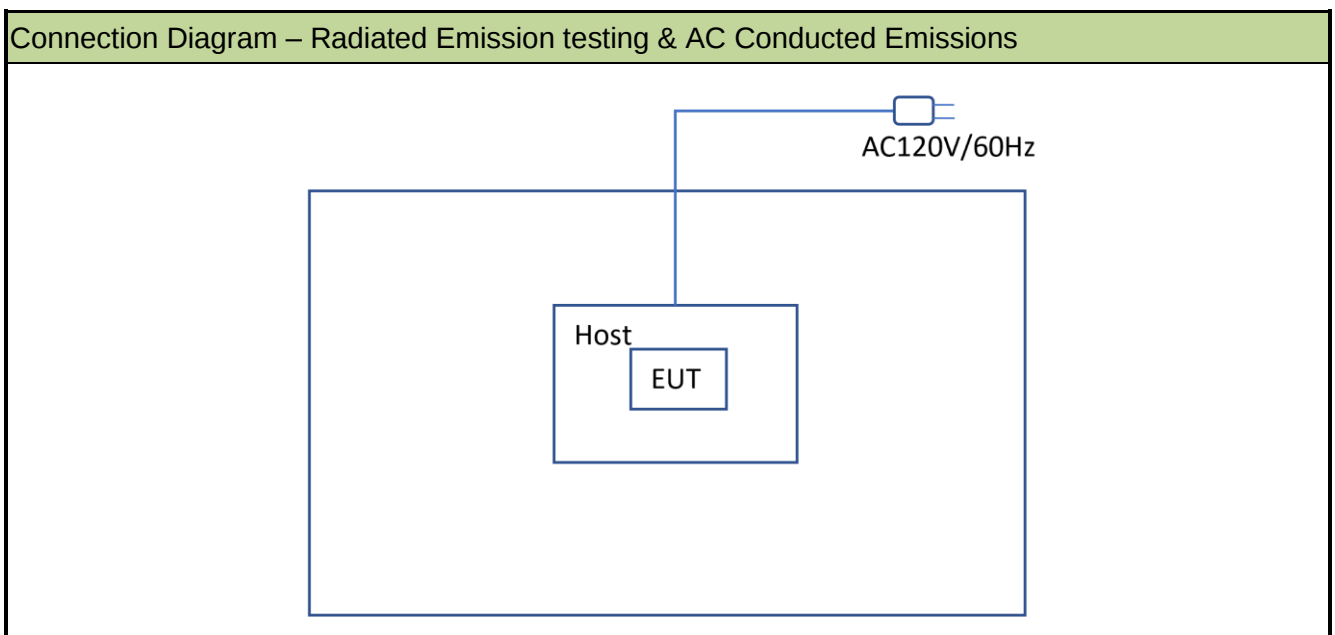
Frequency Band	24.075 – 24.175GHz
Channel Number	1
Type of Modulation	CW
Antenna	Integrated antenna

2.3. Test Mode

Test Mode	Mode 1: Transmit continuously at 24.15GHz
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2.4. Configuration of Test System

The device was tested per the guidance ANSI C63.10: 2013 was used to reference the appropriate EUT setup for radiated emissions testing and AC line conducted testing.



2.5. Host Information

Host Information	Product Name	Manufacturer	Mode name
	Toilet	Komoo	ZD74A2-SA-ASL305
	Toilet	Komoo	SLi4000

Note: Host is provided by manufacturer, different models with the same design, except the different model names. ZD74A2-SA-ASL305 is selected for RF test as the module's host.

2.6. Description of Test Software

N/A

2.7. EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and/or no modifications were made during testing.

2.8. Test Environment Condition

Ambient Temperature	15°C~35°C
Relative Humidity	20%RH ~75%RH

3. ANTENNA REQUIREMENTS

Excerpt from §15.203 of the FCC Rules/Regulations:

“An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.”

- The antenna of this device is **permanently attached**.
- There are no provisions for connection to an external antenna.

Conclusion:

The unit complies with the requirement of §15.203.

4. TEST EQUIPMENT CALIBRATION DATE

Occupied Channel Bandwidth / Unwanted Emissions / Radiated Restricted Band Edge (SIP-AC2)

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR3	MRTSUE06613	1 year	2021/07/02
EXA Signal Analyzer	Keysight	N9030B	MRTSUE06395	1 year	2021/09/03
Bilog Period Antenna	Schwarzbeck	VULB9168	MRTSUE06646	1 year	2021/12/17
Horn Antenna	Schwarzbeck	BBHA9120D	MRTSUE06648	1 year	2021/12/17
Broad Band Horn Antenna	Schwarzbeck	BBHA 9170	MRTSUE06024	1 year	2021/12/17
Microwave System Amplifier	Agilent	83017A	MRTSUE06076	1 year	2021/11/14
Preamplifier	EMCI	EMC051845SE	MRTSUE06644	1 year	2021/11/12
Micro-Wave Antenna	MI-WWAVE	261U-25	MRTSUE06273	N/A	N/A
Micro-Wave Antenna	MI-WWAVE	261E-25	MRTSUE06276	N/A	N/A
Micro-Wave Antenna	MI-WWAVE	261F-25	MRTSUE06275	N/A	N/A
Micro-Wave Antenna	MI-WWAVE	261G	MRTSUE06274	N/A	N/A
Standard Gain Horn Antenna	A-INFOMW	LB-10-25-A	MRTSUE06410	N/A	N/A
Standard Gain Horn Antenna	A-INFOMW	LB-15-25-A	MRTSUE06409	N/A	N/A
Waveguide Harmonic Mixer	Keysight	M1970V	MRTSUE06271	N/A	N/A
Waveguide Harmonic Mixer	Keysight	M1970W	MRTSUE06272	N/A	N/A
RF Signal Generator	Keysight	E8257D	MRTSUE06453	N/A	N/A
SA Extension Module	Keysight	N9029AV06	MRTSUE06368	N/A	N/A
SA Extension Module	Keysight	N9029AV05	MRTSUE06367	N/A	N/A
SA Extension Module	Keysight	N9029AV03	MRTSUE06366	N/A	N/A
Millimeter wave signal source frequency expander	Keysight	E8257DV15	MRTSUE06456	N/A	N/A
Thermal Hygrometer	testo	608-H1	MRTSUE06624	1 year	2021/12/29
Anechoic Chamber	RIKEN	SIP-AC2	MRTSUE06781	1 year	2021/12/25

Conducted Emission (SIP-SR2)

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR3	MRTSUE06613	1 year	2021/07/02
Two-Line V-Network	R&S	ENV216	MRTSUE06003	1 year	2021/09/09
Thermal Hygrometer	testo	608-H1	MRTSUE06621	1 year	2021/12/29

Software	Version	Function
EMI Software	V3	EMI Test Software

5. MEASUREMENT UNCERTAINTY

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k = 2$.

Conducted Emission Measurement
Measurement Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$): 9kHz~150kHz: 3.74dB 150kHz~30MHz: 3.44dB
Radiated Emission Measurement
Measurement Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$): Horizontal: 30MHz~300MHz: 5.04dB 300MHz~1GHz: 4.95dB 1GHz~40GHz: 6.40dB 40GHz~200GHz: 6.20dB Vertical: 30MHz~300MHz: 5.24dB 300MHz~1GHz: 6.03dB 1GHz~40GHz: 6.40dB 40GHz~200GHz: 6.20dB

6. TEST RESULT

6.1. Summary

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
15.215(c)	20dB Bandwidth	20 dB bandwidth of the emission is contained within 24.075~24.175GHz	Radiated	Pass	Section 6.2
15.209 15.245	Fundamental Field Strength Harmonic Field Strength Restricted Bands Emission	FCC Part 15.245(b), FCC Part 15.209		Pass	Section 6.3 & 6.4
15.207	AC Conducted Emissions 150kHz - 30MHz	< FCC 15.207 limits	Line Conducted	Pass	Section 7.5

RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
RSS-Gen Clause 6.7	99% Bandwidth	N/A	Radiated	Pass	Section 6.2
RSS-Gen Clause 8.9, RSS-210 Annex F.1	Fundamental Field Strength Harmonic Field Strength Restricted Bands Emission	Emissions in restricted bands must meet the radiated limits detailed in clause 8.10		Pass	Section 6.3 & 6.4
RSS-Gen Clause 8.11	Frequency Stability	Fall within at least the central 80% of its permitted operating frequency band		Pass	Section 6.6
RSS-Gen Clause 8.8	AC Conducted Emissions 150kHz - 30MHz	< RSS-Gen Clause 8.8 limits	Line Conducted	Pass	Section 6.5

6.2. Occupied Bandwidth Measurement

6.2.1. Test Limit

20dB Bandwidth

20 dB bandwidth of the emission shall be contained within the frequency band 24.075 ~ 24.175 GHz.

99% Bandwidth

N/A

6.2.2. Test Procedure used

ANSI C63.10-2013 - Section 6.9.2 (20dB Bandwidth)

ANSI C63.10-2013 - Section 6.9.3 (99% bandwidth)

6.2.3. Test Setting

For 20dB Bandwidth

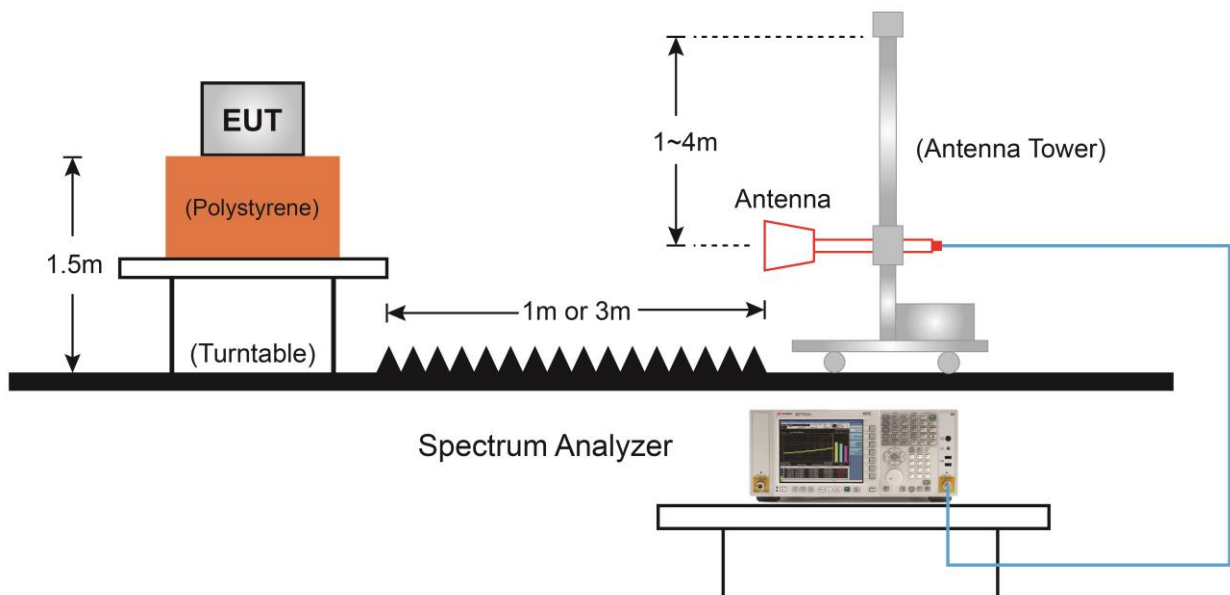
1. Set RBW $\geq$ 1% to 5% of the 20dB bandwidth.
2. VBW = approximately three times RBW
3. Span = approximately 2 to 5 times the 20dB bandwidth, centered on a hopping channel
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. Allow the trace to stabilize.
8. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 20 dB relative to the maximum level measured in the fundamental emission.

For 99% Bandwidth

1. Span = 1.5 times to 5 times the OBW
2. Set RBW = 1% to 5% the OBW

3. $VBW \geq 3 \times RBW$
4. Detector = Peak
5. Trace mode = Max hold
6. Sweep = Auto couple
7. Allow the trace was allowed to stabilize

6.2.4. Test Setup



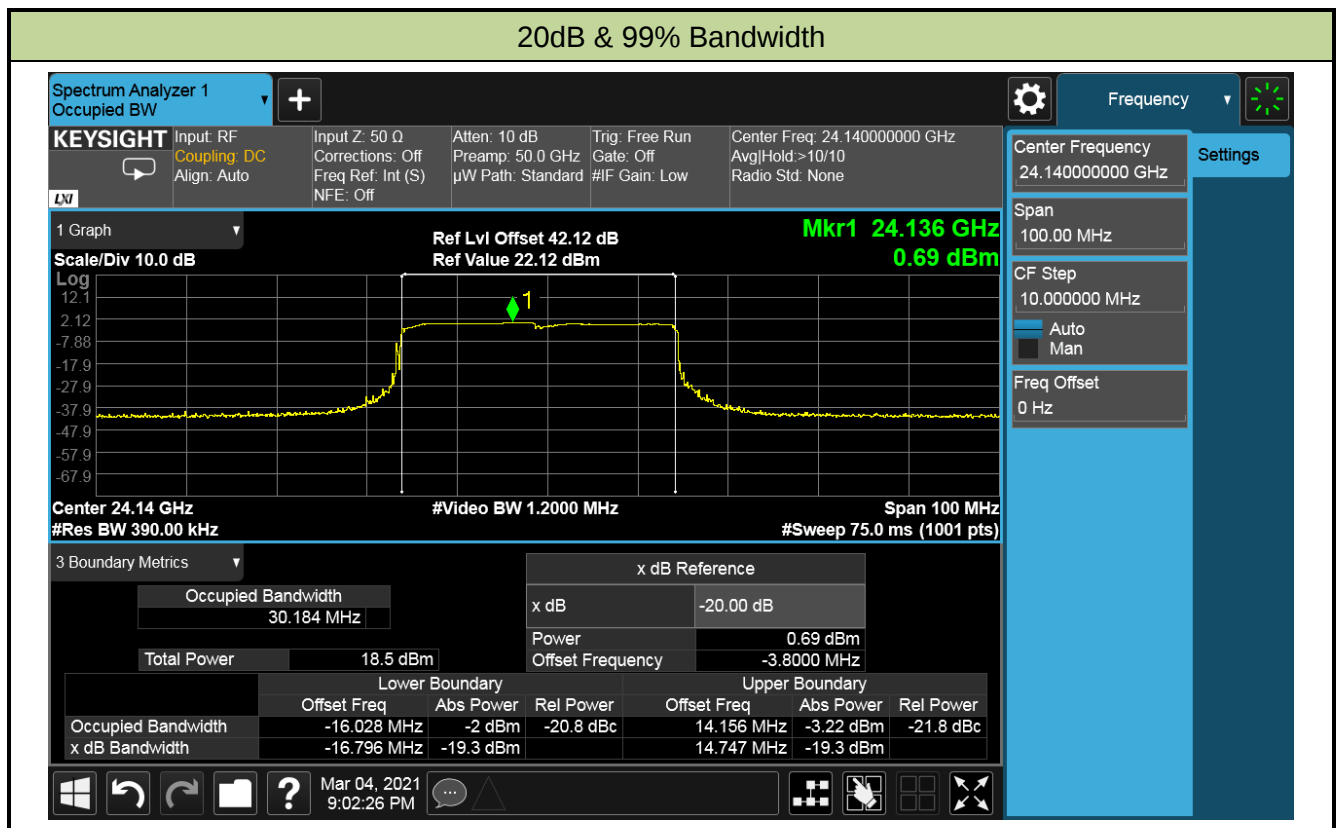
6.2.5. Test Result

Test Site	SIP-AC2	Test Engineer	Andy Zhu
Test Date	2021/03/04		

Frequency (GHz)	20dB Bandwidth (MHz)	Frequency Range (MHz)	Limit (MHz)	Result	99% Bandwidth (MHz)
24.15	31.543	24123.204	> 24075	Pass	30.184
		24154.747	< 24175	Pass	

Note: $F_L = 24140 \text{ MHz} - 16.796 \text{ MHz} = 24123.204 \text{ MHz}$

$F_H = 24140 \text{ MHz} + 14.747 \text{ MHz} = 24154.747 \text{ MHz}$



6.3. Radiated Emission Measurement

6.3.1. Test Limit

FCC Part 15 Subpart C Paragraph 15.245 & RSS 210		
Fundamental frequency (MHz)	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (millivolts/meter)
902 ~ 928	500	1.6
2435 ~ 2465	500	1.6
5785 ~ 5815	500	1.6
10500 ~ 10550	2500	25.0
24075 ~ 24175	2500	25.0

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47CFR must not exceed the limits shown in Table per Section 15.209.

FCC Part 15 Subpart C Paragraph 15.209		
Frequency [MHz]	Field Strength [uV/m]	Measured Distance [Meters]
0.009 - 0.490	2400/F (kHz)	300
0.490 - 1.705	24000/F (kHz)	30
1.705 - 30	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

All out of band emissions appearing in a restricted band as specified in Section 8.10 of the RSS-Gen must not exceed the limits shown in Table per Section 8.9.

RSS-Gen Section 8.9			
Frequency [MHz]	Magnetic field strength (H-Field) [uA/m]	Field Strength [uV/m]	Measured Distance [Meters]
0.009 - 0.490	6.37/F(F in kHz)	--	300
0.490 - 1.705	63.7/F(F in kHz)	--	30
1.705 - 30	0.08	--	30
30 - 88	--	100	3
88 - 216	--	150	3
216 - 960	--	200	3
Above 960	--	500	3

6.3.2. Test Procedure used

ANSI C63.10 – 2013 - Section 6.3 (General Requirements)

ANSI C63.10 – 2013 - Section 6.4 (Standard test method below 30MHz)

ANSI C63.10 – 2013 - Section 6.5 (Standard test method above 30MHz to 1GHz)

ANSI C63.10 – 2013 - Section 6.6 (Standard test method above 1GHz)

6.3.3. Test Procedure

Quasi-Peak Measurements below 1GHz

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. Span was set greater than 1MHz
3. RBW = as specified in Table 1
4. Detector = CISPR quasi-peak or average
5. Sweep time = auto couple
6. Trace was allowed to stabilize

Table 1 - RBW as a function of frequency

Frequency	RBW
9 ~ 150 kHz	200 ~ 300 Hz
0.15 ~ 30 MHz	9 ~ 10 kHz
30 ~ 1000 MHz	100 ~ 120 kHz
> 1000 MHz	1 MHz

Peak Measurements above 1GHz

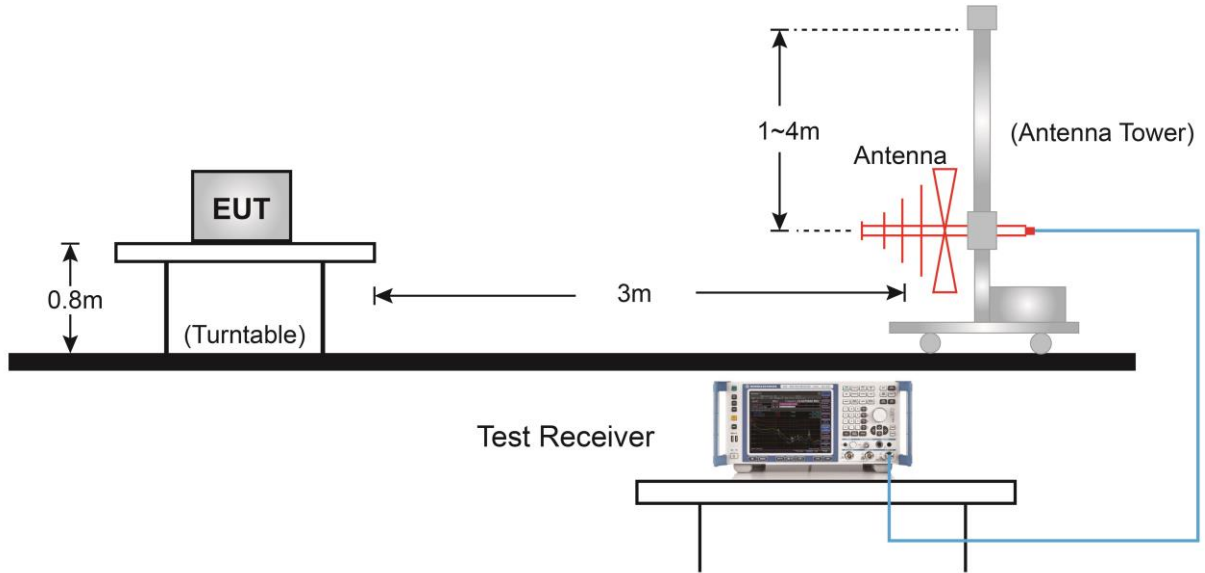
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

Average Measurements above 1GHz

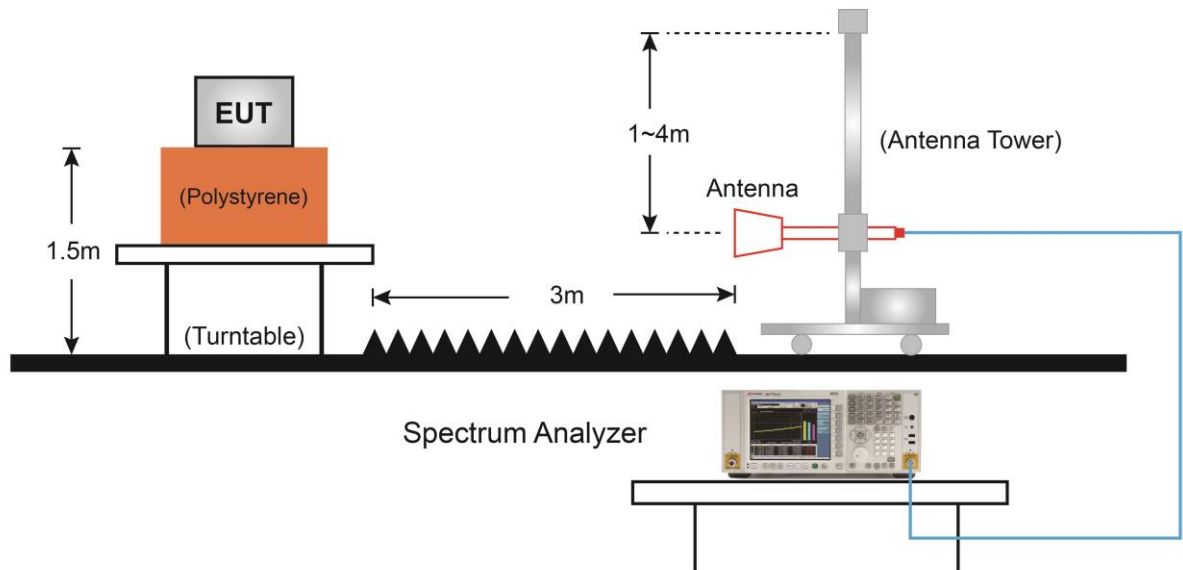
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. $VBW \geq [1 / (\text{Minimum transmitter on time})]$ and no less than 1 Hz.
4. The instrument may be set to linear detector mode. Ensure that video filtering is applied in linear voltage domain (rather than in a log or dB domain). Some instruments require linear display mode in order to accomplish this. Others have a setting for Average-VBW Type, which can be set to "Voltage" regardless of the display mode
5. Detector = Peak
6. Sweep time = auto
7. Trace mode = max hold

6.3.4. Test Setup

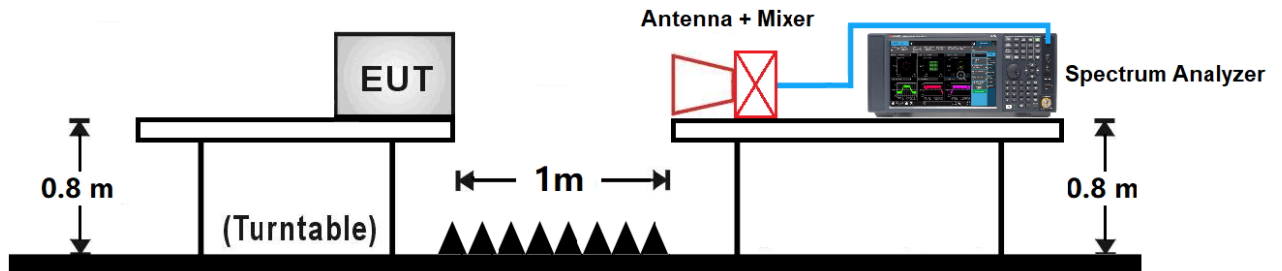
Below 1GHz Test Setup:



1GHz ~ 40GHz Test Setup:



Above 40GHz Test Setup:



6.3.5. Test Results

Test Site	SIP-AC2	Test Engineer	Andy Zhu
Test Date	2021/03/04		
Remark:	Fundamental Radiated Emission		

Frequency (GHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
24.152	90.4	-8.9	81.5	148.0	-66.5	Peak	Horizontal
	83.9	-8.9	75.0	128.0	-53.0	Average	Horizontal
	108.2	-8.9	99.3	148.0	-48.7	Peak	Vertical
	102.4	-8.9	93.5	128.0	-34.5	Average	Vertical

Note: Peak Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

Test Site	SIP-AC2	Test Engineer	Andy Zhu
Test Date	2021/03/04		
Remark:	Harmonics Radiated Emission		

Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
30 MHz ~ 40 GHz							
127.5	10.3	16.0	26.3	43.5	-17.2	QP	Horizontal
141.3	9.7	17.7	27.4	43.5	-16.1	QP	Horizontal
47.0	13.9	18.0	31.9	40.0	-8.1	QP	Vertical
142.8	8.4	17.8	26.2	43.5	-17.3	QP	Vertical
2249.5	52.7	-15.4	37.3	74.0	-36.7	Peak	Horizontal
7664.0	52.5	-4.9	47.6	74.0	-26.4	Peak	Horizontal
2266.5	52.7	-15.3	37.4	74.0	-36.6	Peak	Vertical
7477.0	52.1	-5.6	46.5	74.0	-27.5	Peak	Vertical
35677.0	59.6	-6.7	52.9	74.0	-21.1	Peak	Horizontal
39252.0	55.3	0.0	55.3	74.0	-18.7	Peak	Horizontal
39252.0	40.2	0.0	40.2	54.0	-13.8	Average	Horizontal
36590.0	59.0	-6.0	53.0	74.0	-21.0	Peak	Horizontal
39219.0	54.9	-0.1	54.8	74.0	-19.2	Peak	Horizontal
39219.0	40.1	-0.1	40.0	54.0	-14.0	Average	Horizontal

Note:

- Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)
Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre Amplifier Gain (dB)
- Average measurement was not performed when the peak level lower than average limit.
- The amplitude of radiated emissions (frequency range from 9kHz to 30MHz) is that proximity to ambient noise, which also are attenuated more than 20 dB below the permissible value. Therefore, the data is not presented in the report.

Test Site	SIP-AC2	Test Engineer	Andy Zhu
Test Date	2021/03/04		
Remark:	Harmonics Radiated Emission - 40GHz ~ 100GHz		

Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level @ 1.0m (dBμV/m)	Measure Level @ 3m (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
48280	17.2	46.1	63.3	53.8	108.0	-54.2	Peak	Horizontal
72420	35.0	42.1	77.1	67.6	108.0	-40.4	Peak	Horizontal
96560	38.3	44.42	82.7	73.2	108.0	-34.8	Peak	Horizontal
48280	20.5	46.1	66.6	57.1	108.0	-50.9	Peak	Vertical
72420	35.4	42.1	77.5	68.0	108.0	-40.0	Peak	Vertical
96560	38.0	44.42	82.4	72.9	108.0	-35.1	Peak	Vertical

Note:

- Measure Level @ 1.0m (dBμV/m) = Reading Level (dBμV) + Factor (dB)
Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) + Mixer Conversion Loss (dB)
- Measure Level @ 3m (dBμV/m) = Measure Level @ 1.0m (dBμV/m) + 20 * log (1.0m / 3m) (dB)
- Average measurement was not performed when the peak level lower than average limit.

6.4. Radiated Restricted Band Edge Measurement

6.4.1. Test Limit

For 15.205 requirement:

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a) of FCC part 15, must also comply with the radiated emission limits specified in Section 15.209(a).

Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (GHz)
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	(²)
13.36 - 13.41	--	--	--

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR must not exceed the limits shown in Table per Section 15.209.

FCC Part 15 Subpart C Paragraph 15.209		
Frequency [MHz]	Field Strength [uV/m]	Measured Distance [Meters]
0.009 ~ 0.490	2400/F (kHz)	300
0.490 ~ 1.705	24000/F (kHz)	30
1.705 ~ 30	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

For RSS-Gen Section 8.10 Requirement:

Radiated emissions which fall in the restricted bands, as defined in Section 8.10 of RSS-Gen, must also comply with the radiated emission limits specified in Section 8.9.

Frequency (MHz)	Frequency (MHz)	Frequency (GHz)
0.090 - 0.110	149.9 - 150.05	9.0 - 9.2
0.495 - 0.505	156.52475 - 156.525225	9.3 - 9.5
2.1735 - 2.1905	156.7 - 156.9	10.6 - 12.7
3.020 - 3.026	162.0125 - 167.17	13.25 - 13.4
4.125 - 4.128	167.72 - 173.2	14.47 - 14.5
4.17725 - 4.17775	240 - 285	15.35 - 16.2
4.20725 - 4.20775	322 - 335.4	17.7 - 21.4
5.677 - 5.683	399.9 - 410	22.01 - 23.12
6.215 - 6.218	608 - 614	23.6 - 24.0
6.26775 - 6.26825	960 - 1427	31.2 - 31.8
6.31175 - 6.31225	1435 - 1626.5	36.43 - 36.5
8.291 - 8.294	1645.5 - 1646.5	Above 38.6
8.362 - 8.366	1660 - 1710	--
8.37625 - 8.38675	1718.8 - 1722.2	
8.41425 - 8.41475	2200 - 2300	
12.29 - 12.293	2310 - 2390	
12.51975 - 12.52025	2483.5 - 2500	
12.57675 - 12.57725	2655 - 2900	
13.36 - 13.41	3260 - 3267	
16.42 - 16.423	3332 - 3339	
16.69475 - 16.69525	3345.8 - 3358	
16.80425 - 16.80475	3500 - 4400	
25.5 - 25.67	4500 - 5150	
37.5 - 38.25	5350 - 5460	
73 - 74.6	7250 - 7750	
74.8 - 75.2	8025 - 8500	
108 - 138	--	

All out of band emissions appearing in a restricted band as specified in Section 8.10 of the RSS-Gen must not exceed the limits shown in Table per Section 8.9.

RSS-Gen Section 8.9			
Frequency [MHz]	Magnetic field strength (H-Field) [uA/m]	Field Strength [uV/m]	Measured Distance [Meters]
0.009 - 0.490	6.37/F(F in kHz)	--	300
0.490 - 1.705	63.7/F(F in kHz)	--	30
1.705 - 30	0.08	--	30
30 - 88	--	100	3
88 - 216	--	150	3
216 - 960	--	200	3
Above 960	--	500	3

6.4.2. Test Procedure used

ANSI C63.10 – 2013 - Section 6.10.5

6.4.3. Test Procedure

Peak Measurements

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

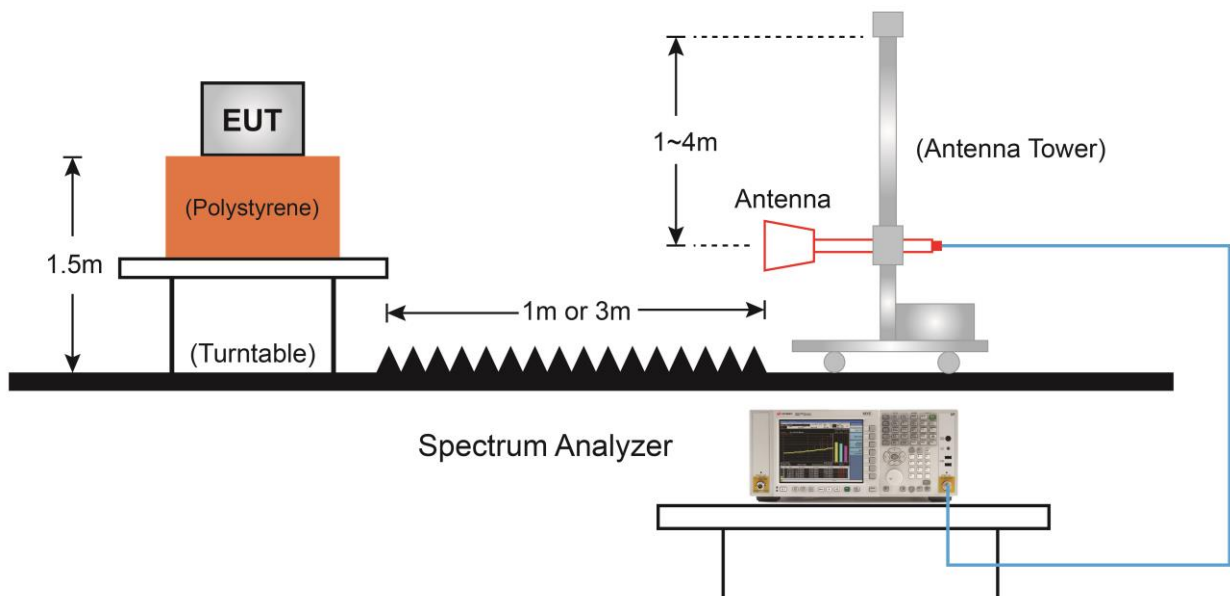
Average Measurements

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW $\geq [1 / (\text{Minimum transmitter on time})]$ and no less than 1 Hz
4. The instrument may be set to linear detector mode. Ensure that video filtering is applied in linear

voltage domain (rather than in a log or dB domain). Some instruments require linear display mode in order to accomplish this. Others have a setting for Average-VBW Type, which can be set to “Voltage” regardless of the display mode

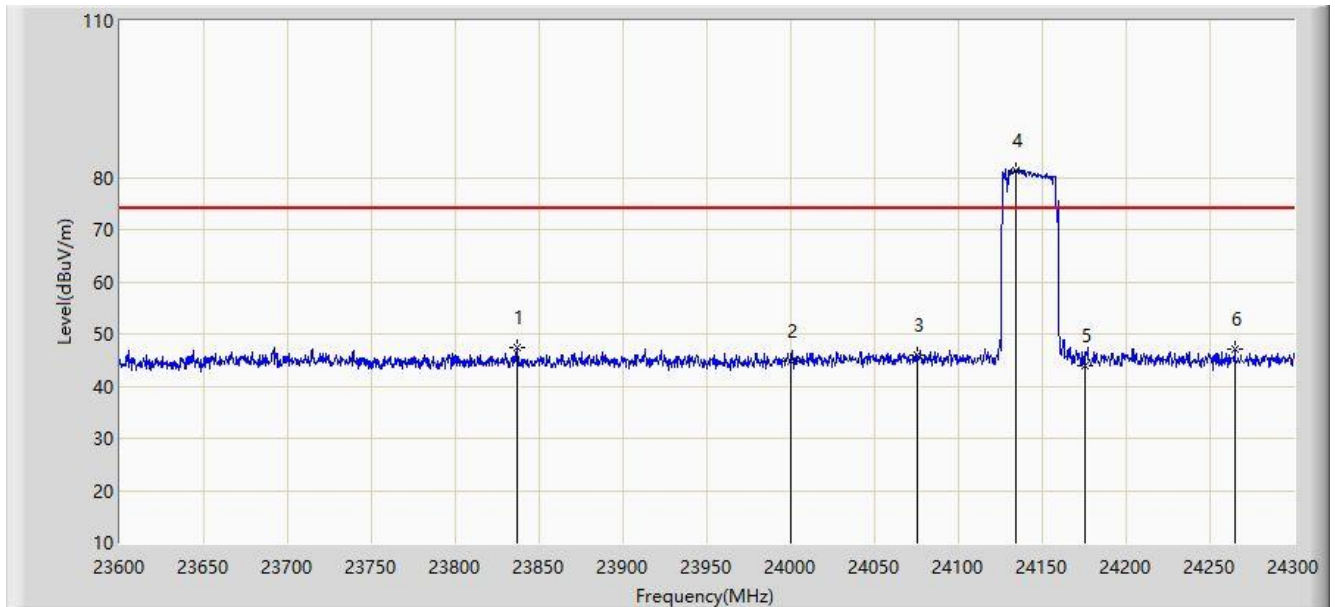
5. Detector = Peak
6. Sweep time = auto
7. Trace mode = max hold

6.4.4. Test Setup



6.4.5. Test Result

Site: SIP-AC2	Time: 2021/03/04 - 09:55
Limit: FCC_Part15.209_RE(3m)	Engineer: Allen Zou
Probe: SIP-AC2_BBHA9170_18-40GHz(00935)	Polarity: Horizontal
EUT: 24GHz Microwave Radar Sensor Module	Power: DC 5V
Test Mode 1	

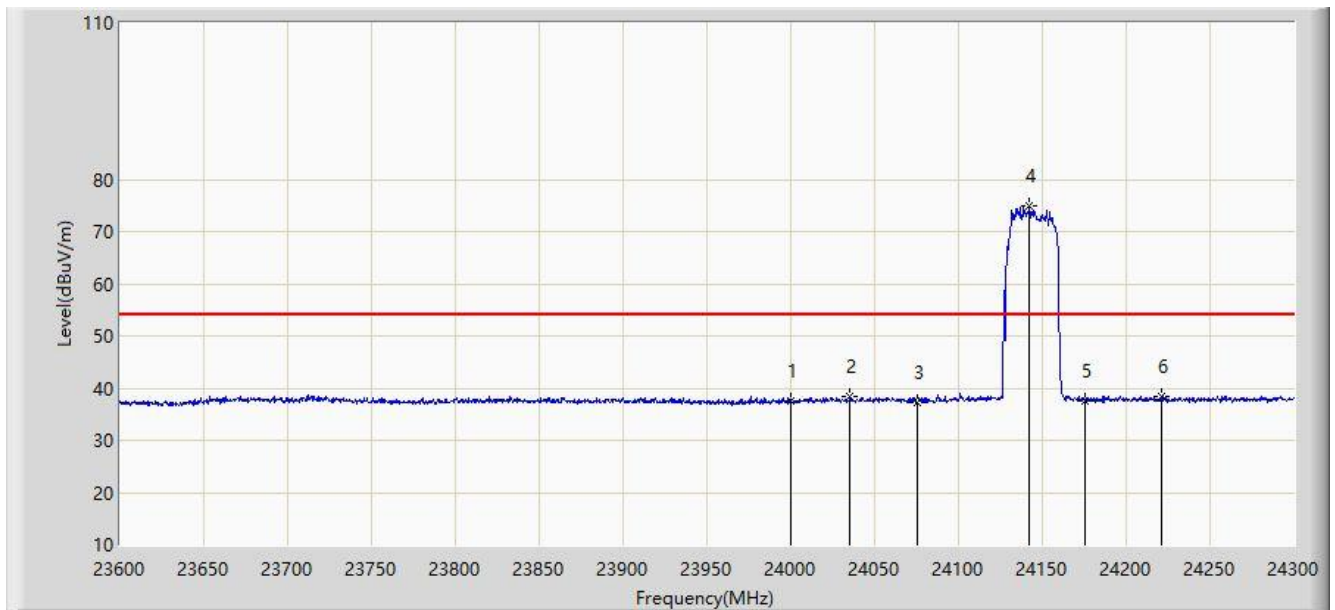


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			23836.949	47.479	56.503	-26.521	74.000	-9.025	PK
2			24000.000	44.648	53.771	-29.352	74.000	-9.123	PK
3			24075.000	45.906	55.081	-28.094	74.000	-9.175	PK
4		*	24134.100	81.414	90.455	N/A	N/A	-9.042	PK
5			24175.000	43.923	52.888	-30.077	74.000	-8.965	PK
6			24265.000	47.059	56.208	-26.941	74.000	-9.149	PK

Note: Peak Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

Site: SIP-AC2	Time: 2021/03/04 - 10:00
Limit: FCC_Part15.209_RE(3m)	Engineer: Allen Zou
Probe: SIP-AC2_BBHA9170_18-40GHz(00935)	Polarity: Horizontal
EUT: 24GHz Microwave Radar Sensor Module	Power: DC 5V
Test Mode 1	

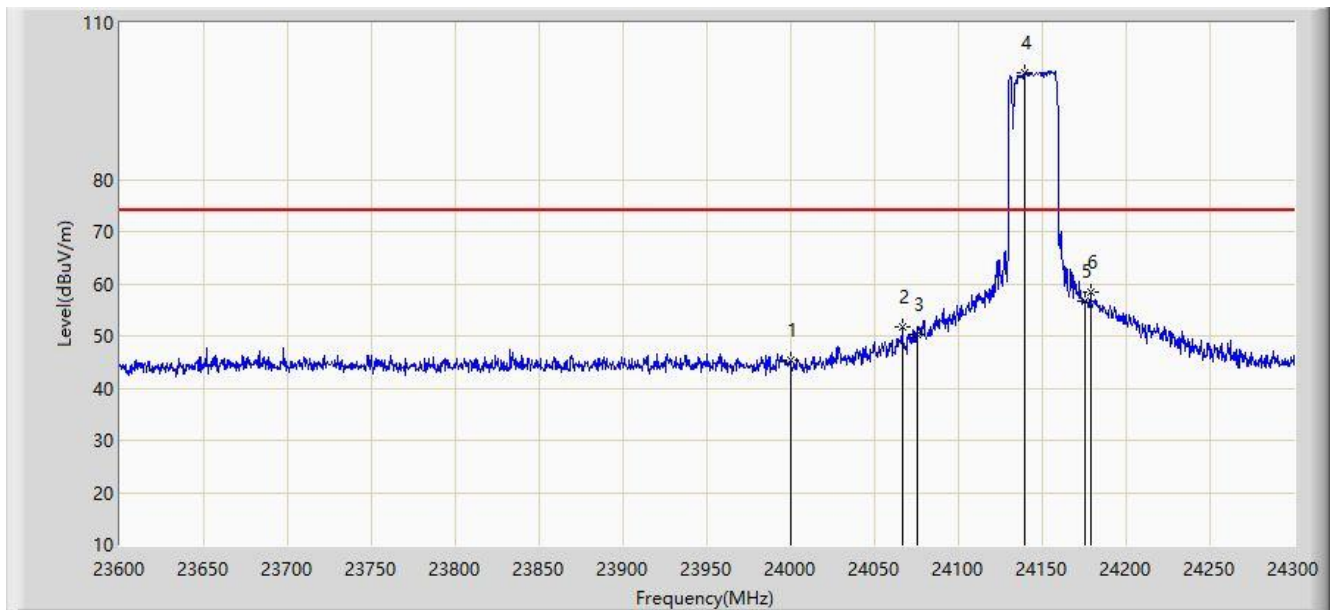


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			24000.000	37.483	46.606	-16.517	54.000	-9.123	AV
2			24035.400	38.545	47.601	-15.455	54.000	-9.056	AV
3			24075.000	37.309	46.484	-16.691	54.000	-9.175	AV
4		*	24142.500	74.862	83.862	N/A	N/A	-9.000	AV
5			24175.000	37.484	46.449	-16.516	54.000	-8.965	AV
6			24220.900	38.519	47.591	-15.481	54.000	-9.073	AV

Note: Peak Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

Site: SIP-AC2	Time: 2021/03/04 - 10:10
Limit: FCC_Part15.209_RE(3m)	Engineer: Allen Zou
Probe: SIP-AC2_BBHA9170_18-40GHz(00935)	Polarity: Vertical
EUT: 24GHz Microwave Radar Sensor Module	Power: DC 5V
Test Mode 1	

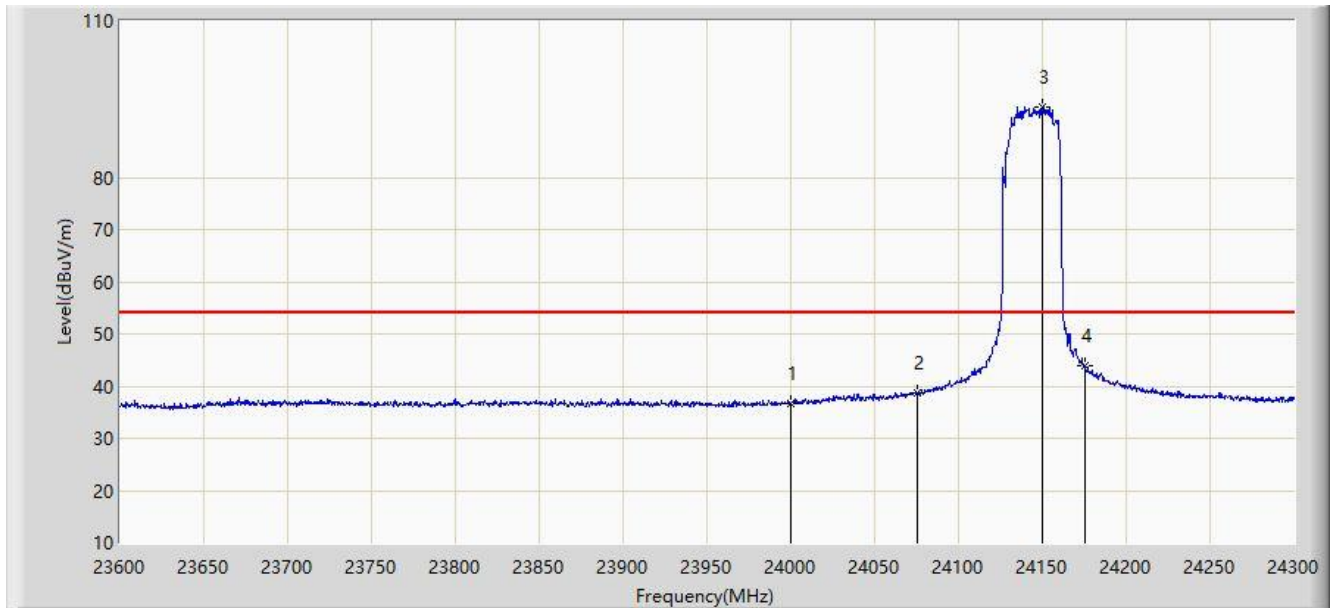


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			24000.000	45.302	54.425	-28.698	74.000	-9.123	PK
2			24066.551	51.638	60.802	-22.362	74.000	-9.164	PK
3			24075.000	50.353	59.528	-23.647	74.000	-9.175	PK
4		*	24139.699	100.297	109.326	N/A	N/A	-9.029	PK
5			24175.000	56.578	65.543	-17.422	74.000	-8.965	PK
6			24178.900	58.273	67.278	-15.727	74.000	-9.005	PK

Note: Peak Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

Site: SIP-AC2	Time: 2021/03/04 - 10:15
Limit: FCC_Part15.209_RE(3m)	Engineer: Allen Zou
Probe: SIP-AC2_BBHA9170_18-40GHz(00935)	Polarity: Vertical
EUT: 24GHz Microwave Radar Sensor Module	Power: DC 5V
Test Mode 1	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			24000.000	36.664	45.787	-17.336	54.000	-9.123	AV
2			24075.000	38.622	47.797	-15.378	54.000	-9.175	AV
3		*	24149.850	93.549	102.471	N/A	N/A	-8.922	AV
4			24175.000	43.780	52.745	-10.220	54.000	-8.965	AV

Note: Peak Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

6.5. AC Conducted Emissions Measurement

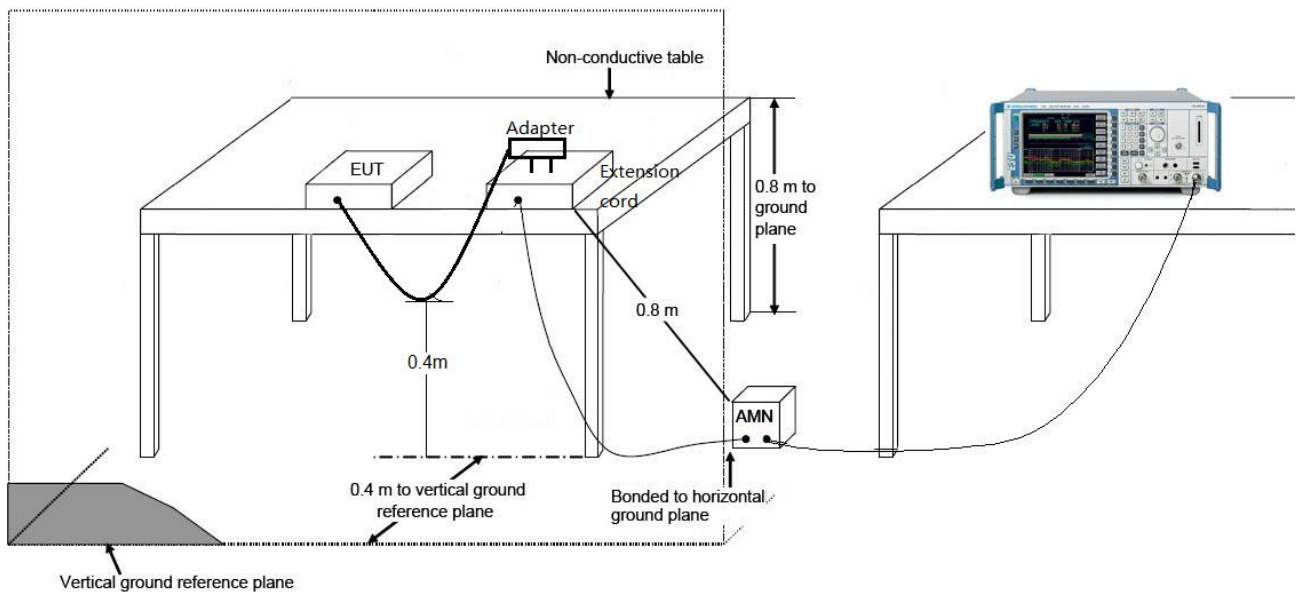
6.5.1. Test Limit

FCC 15.207 & RSS-Gen Issue 5 Section 8.8 Limits		
Frequency (MHz)	QP (dBuV)	AV (dBuV)
0.15 ~ 0.50	66 ~ 56	56 ~ 46
0.50 ~ 5.0	56	46
5.0 ~ 30	60	50

Note 1: The lower limit shall apply at the transition frequencies.

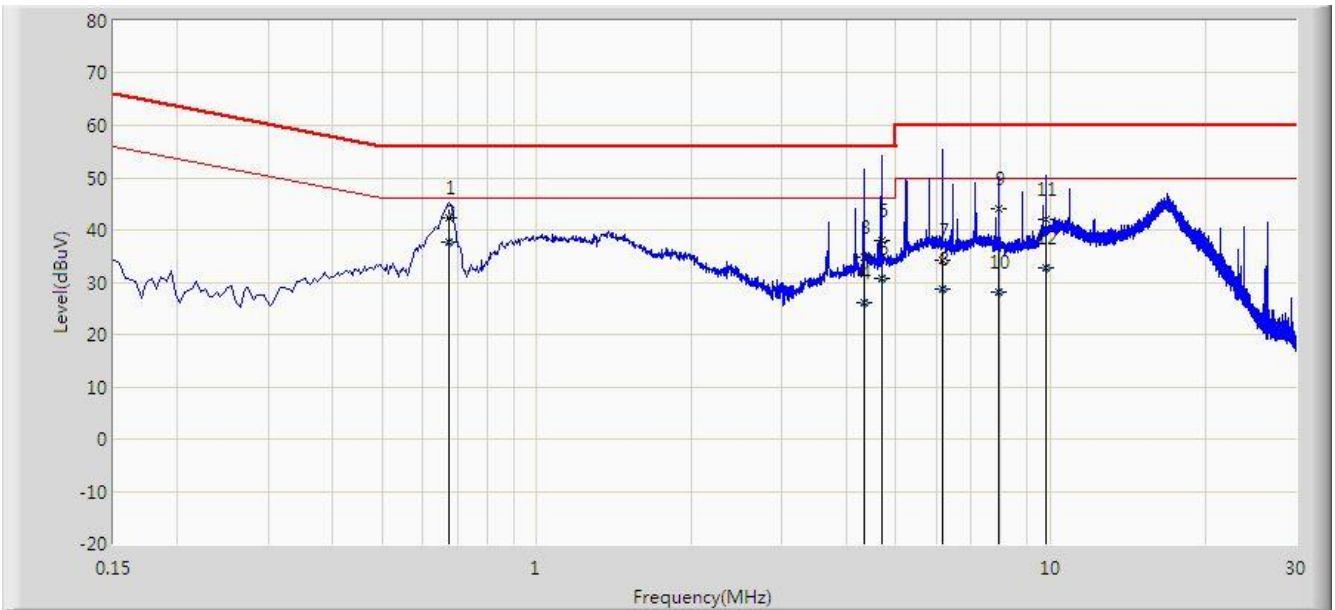
Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz.

6.5.2. Test Setup



6.5.3.Test Result

Site: SIP-SR2	Time: 2021/03/02 - 14:44
Limit: FCC_Part15.207_CE_AC Power	Engineer: Kyrie Xie
Probe: ENV216_101683_Filter On	Polarity: Line
EUT: 24GHz Microwave Radar Sensor Module	Power: AC 120V/60Hz
Test Mode 1	

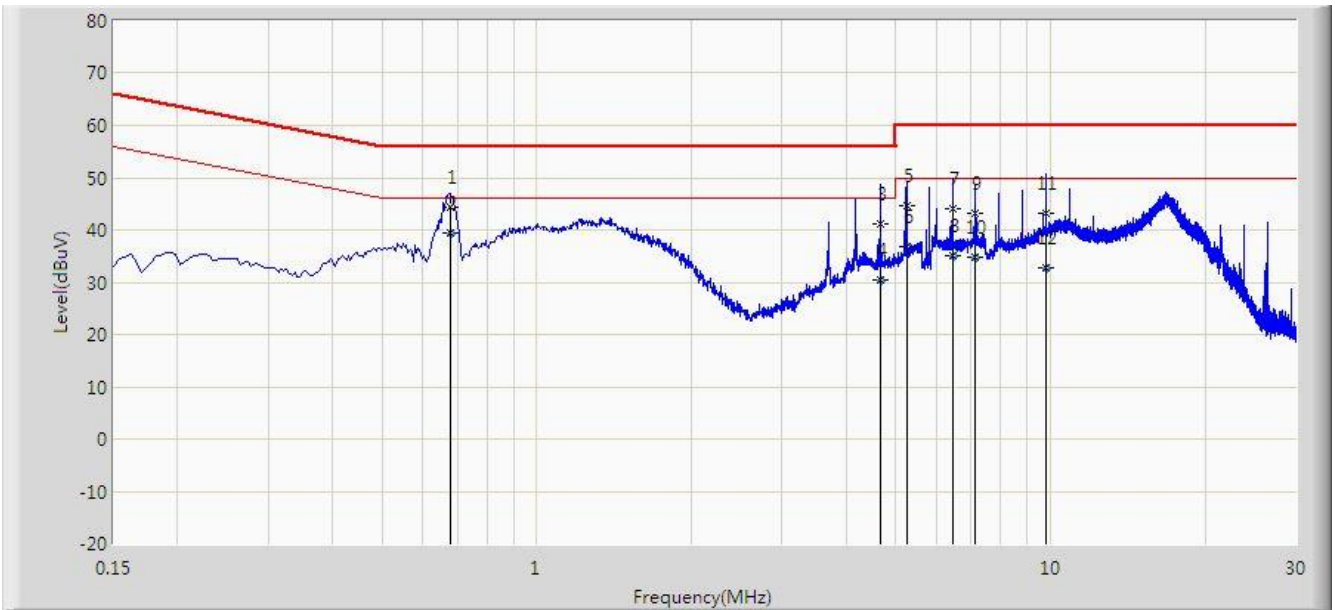


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV)	Factor (dB)	Type
1			0.674	42.418	32.858	-13.582	56.000	9.560	QP
2		*	0.674	37.565	28.005	-8.435	46.000	9.560	AV
3			4.326	34.800	25.092	-21.200	56.000	9.708	QP
4			4.326	26.173	16.465	-19.827	46.000	9.708	AV
5			4.706	38.024	28.303	-17.976	56.000	9.721	QP
6			4.706	30.791	21.071	-15.209	46.000	9.721	AV
7			6.150	34.131	24.316	-25.869	60.000	9.815	QP
8			6.150	28.741	18.926	-21.259	50.000	9.815	AV
9			7.918	43.914	34.025	-16.086	60.000	9.890	QP
10			7.918	28.172	18.282	-21.828	50.000	9.890	AV
11			9.786	42.151	32.147	-17.849	60.000	10.004	QP
12			9.786	32.765	22.761	-17.235	50.000	10.004	AV

Note: Measure Level (dBμV) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + LISN Factor (dB).

Site: SIP-SR2	Time: 2021/03/02 - 14:55
Limit: FCC_Part15.207_CE_AC Power	Engineer: Kyrie Xie
Probe: ENV216_101683_Filter On	Polarity: Neutral
EUT: 24GHz Microwave Radar Sensor Module	Power: AC 120V/60Hz
Test Mode 1	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV)	Factor (dB)	Type
1			0.678	44.245	34.705	-11.755	56.000	9.540	QP
2		*	0.678	39.382	29.842	-6.618	46.000	9.540	AV
3			4.666	41.038	31.356	-14.962	56.000	9.682	QP
4			4.666	30.470	20.787	-15.530	46.000	9.682	AV
5			5.242	44.759	35.020	-15.241	60.000	9.738	QP
6			5.242	36.715	26.977	-13.285	50.000	9.738	AV
7			6.458	44.054	34.260	-15.946	60.000	9.794	QP
8			6.458	34.961	25.167	-15.039	50.000	9.794	AV
9			7.142	43.190	33.366	-16.810	60.000	9.824	QP
10			7.142	34.677	24.853	-15.323	50.000	9.824	AV
11			9.782	43.144	33.170	-16.856	60.000	9.974	QP
12			9.782	32.834	22.860	-17.166	50.000	9.974	AV

Note: Measure Level (dBμV) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + LISN Factor (dB).

6.1. Frequency Stability Measurement

6.1.1. Test Limit

RSS-Gen Clause 8.11

If the frequency stability of the licence-exempt radio apparatus is not specified in the applicable RSS, the fundamental emissions of the radio apparatus should be kept within at least the central 80% of its permitted operating frequency band in order to minimize the possibility of out-of-band operation. In addition, its occupied bandwidth shall be entirely outside the restricted bands and the prohibited TV bands of 54-72 MHz, 76-88 MHz, 174-216 MHz, and 470-602 MHz, unless otherwise indicated.

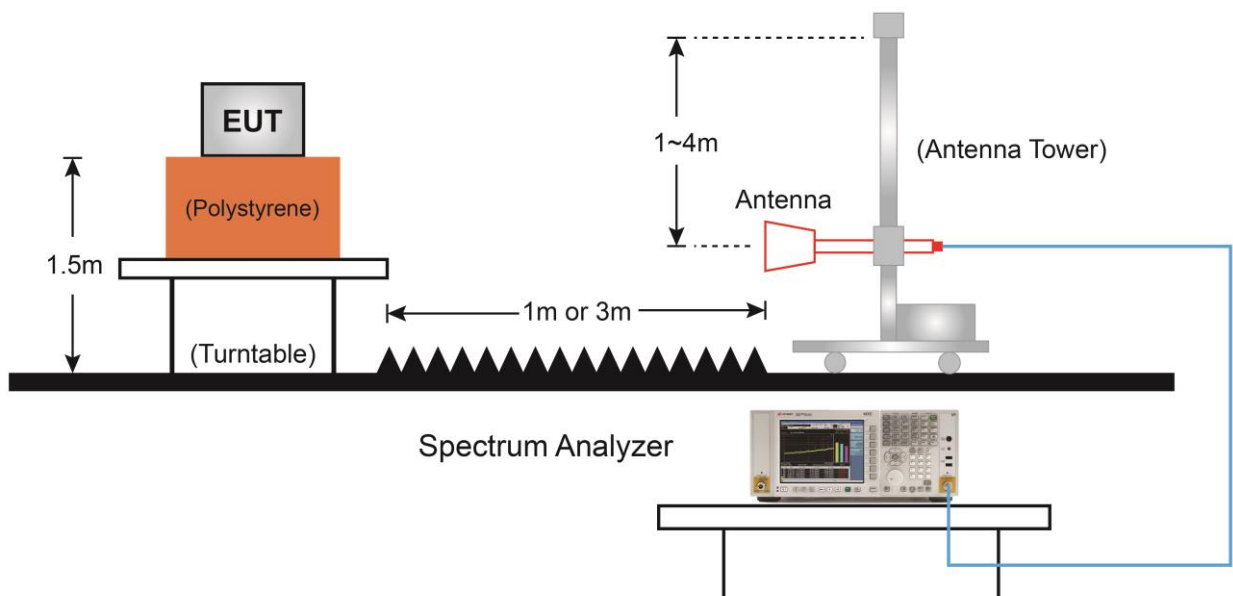
Conclusion:

So there is no requirement for frequency stability, but emission bandwidth should be satisfy this requirement.

6.1.2. Test Procedure used

ANSI C63.10 – 2013 - Section 6.9

6.1.3. Test Setup



6.1.4. Test Result

Test Site	SIP-AC2	Test Engineer	Andy Zhu
Test Date	2021/03/04		

Frequency (GHz)	99% Bandwidth (MHz)	Frequency Range (MHz)	Limit (MHz)	Result
24.15	30.184	24123.972	> (LIMIT _L = 24085)	Pass
		24154.156	< (LIMIT _H = 24165)	Pass

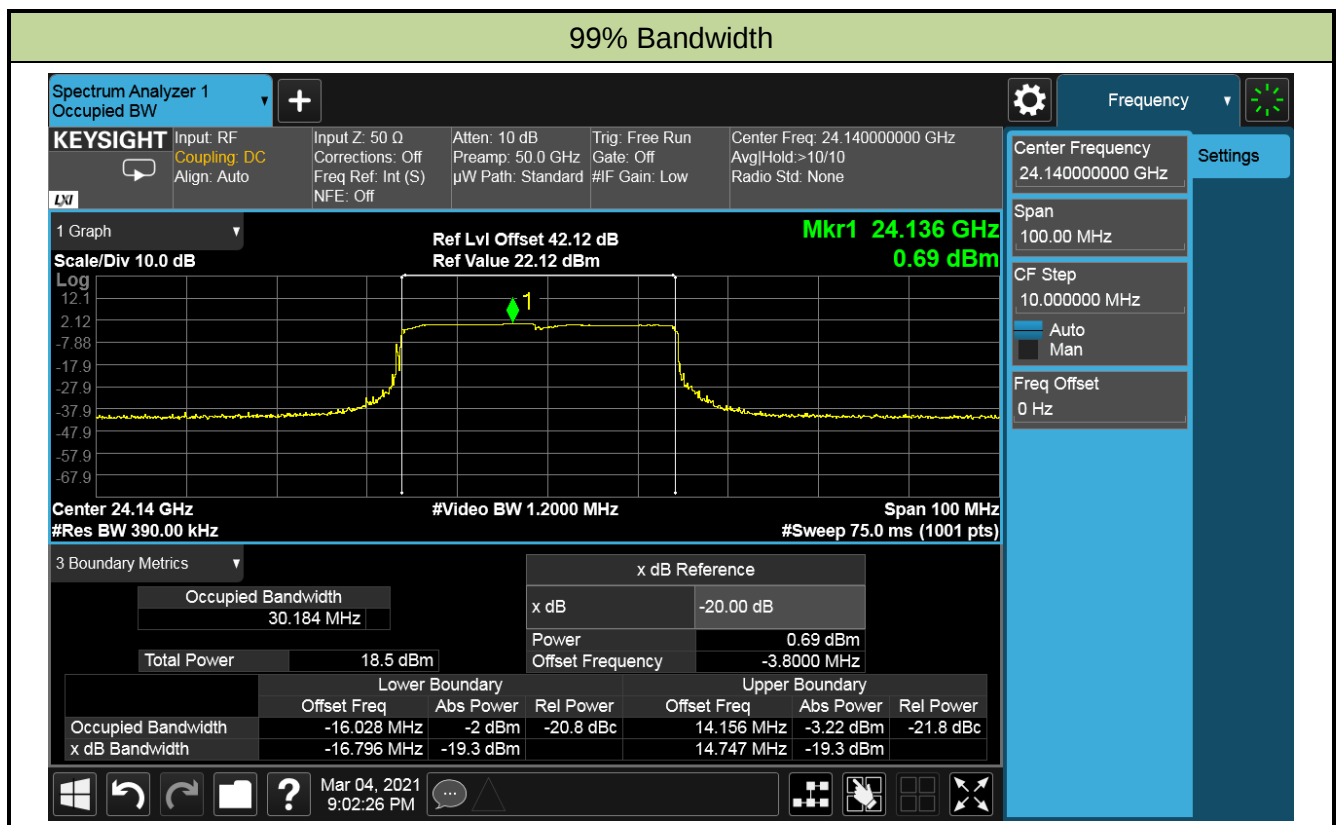
Note 1: LIMIT_L = 24075 MHz + (24175 MHz - 24075 MHz) * 0.1 = 24085 MHz

LIMIT_H = 24175 MHz + (24175 MHz - 24075 MHz) * 0.1 = 24165 MHz

Note 2: F_L = 24140 MHz – 16.028 MHz = 24123.972 MHz

F_H = 24140 MHz + 14.156 MHz = 24154.156 MHz

Note 3: Its occupied bandwidth is outside the restricted bands and the prohibited TV bands of 54-72 MHz, 76-88 MHz, 174-216 MHz, and 470-602 MHz



7. CONCLUSION

The data collected relate only the item(s) tested and show that the unit is in compliance with Part 15C of the FCC rules and ISED rules.

_____ The End _____

Appendix A - Test Setup Photograph

Refer to “2102RSU049-UT” file.

Appendix B - EUT Photograph

Refer to “2102RSU049-UE” file.