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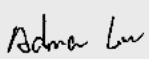
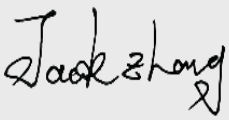
Test report No:
2180545R-RF-US-P06V02

FCC & ISED TEST REPORT

Product Name	LPS Module
Trademark	Murata
Model and /or type reference	LBES0ZZ1VG
FCC ID	VPYLB1VG
IC	772C-LB1VG
Applicant´s name / address	Murata Manufacturing Co., Ltd. 10-1, Higashikotari 1-chome, Nagaokakyo-shi, Kyoto 617-8555, Japan
Test method requested, standard	FCC CFR Title 47 Part 15 Subpart C Section 15.247 ANSI C63.10: 2013 KD558074 D01 15.247 Meas Guidance v05r02 RSS-Gen Issue 5 RSS-247 Issue 2
Verdict Summary	IN COMPLIANCE
Tested by (name / position & signature)	Adma Lu / Project Engineer 
Approved by (name / position & signature)	Jack Zhang/Supervisor 
Date of issue	2022-01-06
Report Version	V1.0
Report template No	Template_FCC 15.247-RF-V1.0

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COMPETENCES AND GUARANTEES

DEKRA is a testing laboratory competent to carry out the tests described in this report.
In order to assure the traceability to other national and international laboratories, DEKRA has a calibration and maintenance program for its measurement equipment.

DEKRA guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated in the report and it is based on the knowledge and technical facilities available at DEKRA at the time of performance of the test.

DEKRA is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

The results presented in this Test Report apply only to the particular item under test established in this document.

IMPORTANT: No parts of this report may be reproduced or quoted out of context, in any form or by any means, except in full, without the previous written permission of DEKRA.

GENERAL CONDITIONS

Test Location	No. 99, Hongye Road, Suzhou Industrial Park Suzhou, 215006, P.R. China
Date(receive sample)	Oct. 16, 2021
Date (start test)	Oct. 19, 2021
Date (finish test)	Dec. 13, 2021

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or Competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of DEKRA.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA.

ENVIRONMENTAL CONDITIONS

The climatic conditions during the tests are within the limits specified by the manufacturer for the operation of the EUT and the test equipment. The climatic conditions during the tests were within the following limits:

Ambient temperature	15 °C – 35 °C
Relative Humidity air	30% - 60%

If explicitly required in the basic standard or applied product / product family standard the climatic values are recorded and documented separately in this test report.

POSSIBLE TEST CASE VERDICTS

Test case does not apply to test object	N/A
Test object does meet requirement	P (Pass) / PASS
Test object does not meet requirement	F (Fail) / FAIL
Not measured	N/M

ABBREVIATIONS

For the purposes of the present document, the following abbreviations apply:

EUT : Equipment Under Test
QP : Quasi-Peak
CAV : CISPR Average
AV : Average
CDN : Coupling Decoupling Network
SAC : Semi-Anechoic Chamber
OATS : Open Area Test Site
BW : Bandwidth
AM : Amplitude Modulation
PM : Pulse Modulation
HCP : Horizontal Coupling Plane
VCP : Vertical Coupling Plane
U_N : Nominal voltage
*T*x : Transmitter
*R*x : Receiver
N/A : Not Applicable
N/M : Not Measured

DOCUMENT HISTORY

Report No.	Version	Description	Issued Date
2180545R-RF-US-P06V02	V1.0	Initial issue of report.	2022-01-06

REMARKS AND COMMENTS

1. The equipment under test (EUT) does meet the essential requirements of the stated standard(s)/test(s).
2. These test results on a sample of the device are for the purpose of demonstrating Compliance with Part 15 Subpart C Paragraph 15.247, RSS-Gen Issue 5, RSS-247 Issue 2.
3. The measurement result is considered in conformance with the requirement if it is within the prescribed limit, It is not necessary to account the uncertainty associated with the measurement result.
4. The test results presented in this report relate only to the object tested.
5. The test report shall not be reproduced without the written approval of DEKRA Testing and Certification (Suzhou) Co., Ltd.
6. This report will not be used for social proof function in China market.
7. DEKRA declines any responsibility with the following test data provided by customer that may affect the validity of result:
   - Chapter 1.1 General Description of the Item(s);
   - Chapter 1.2 Antenna Information;
   - Chapter 1.3 Channel List.

USED EQUIPMENT

Emissions in non-restricted frequency bands/ Occupied Bandwidth/ Fundamental emission output power/ Power Spectral Density / TR8

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2021.07.11	2022.07.10
EXA Spectrum Analyzer	Keysight	N9010A	MY55370495	2021.03.20	2022.03.19
MXA Signal Anlyzer	Keysight	N9020A	MY56060147	2021.07.11	2022.07.10
4TX MIMO Power Sensor	Keysight	X8750A	MY59400102	2021.03.31	2022.03.30
Coaxial Cable	Woken	SFL402	F02-150410-044	2021.01.01	2021.12.31
Temperature/Humidity Meter	RTS	RTS-8S	RF08	2021.07.09	2022.07.08

Radiated Emission(30MHz-1GHz) / AC3

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
EMI Test Receiver	R&S	ESCI	100176	2021.08.15	2022.08.14
Bilog Antenna	Teseq GmbH	CBL6112D	27613	2021.08.23	2022.08.22
Coaxial Cable	Huber+Suhner	RG 214	AC3-C	2021.03.31	2022.03.30
Temperature/Humidity Meter	RTS	RTS-8S	AC3-TH	2021.07.09	2022.07.08
Dekra test software	Dekra	-	-	-	-

Radiated Emission(1GHz-40GHz) / AC5

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
EXA Spectrum Analyzer	Keysight	N9010A	MY55370495	2021.03.20	2022.03.19
Preamplifier	EMCI	EMC184045SE	980263	2021.05.22	2022.05.21
DRG Horn Antenna	ETS-Lindgren	3117	00167055	2021.08.23	2022.08.22
Broad-Band Horn Antenna	Schwarzbeck	BBHA9170	294	2021.04.14	2023.04.13
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC5-C2	2021.03.31	2022.03.30
Coaxial Cable	ROSENBERGER	LA1-C011-2000/3000	AC5-40G	2021.03.20	2022.03.19
Temperature/Humidity Meter	RTS	RTS-8S	AC5-TH	2021.07.09	2022.07.08
High-Pass Filter	Wainwright	WHKX1.0/15G-10SS	AC6&AC5	2021.06.08	2022.06.07
Dekra test software	Dekra	-	-	-	-

UNCERTAINTY

Uncertainties have been calculated according to the DEKRA internal document.The reported expanded uncertainties are based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%The Uncertainties is complice with standard required as below.

Test item	Uncertainty
AC Power Line Conducted Emission	9kHz~150kHz: 2.80dB 150kHz~30MHz: 2.40dB
Peak Power Output	± 1.27 dB
Radiated Emission(30MHz~1GHz)	Horizontal: 30MHz~200MHz: 3.50 dB 300MHz~1GHz: 3.60 dB Vertical: 30MHz~200MHz: 3.60 dB 300MHz~1GHz: 3.50 dB
Radiated Emission(1GHz~26.5GHz)	Horizontal: 1GHz~18GHz: 5.00 dB Vertical: 1GHz~18GHz: 4.80 dB
RF antenna conducted test	± 1.27dB
Radiated Emission Band Edge	± 3.9 dB
DTS Bandwidth	±150Hz
Occupied Bandwidth	±1kHz
Power Density	±1.27dB

1 GENERAL INFORMATION

1.1 General Description of the Item(s)

Product Name ..... :	LPS Module
Model No. ..... :	LBES0ZZ1VG
FCC ID ..... :	LBES0ZZ1VG
IC ..... :	772C-LB1VG
Manufacturter ..... :	Murata Manufacturing Co., Ltd.
Manufacturer Address ..... :	10-1, Higashikotari 1-chome, Nagaokakyo-shi, Kyoto 617-8555, Japan

Wireless specifiction ..... :	Sub-G
Operating frequency range(s) ..... :	902-928MHz
Type of Modulation ..... :	GFSK
Number of channel ..... :	25

Rated power supply ..... :	Voltage and Frequency	
	☐	AC: 220 – 240 V, 50/60 Hz
	☐	AC: 110 – 130 Vac, 50/60 Hz
	☒	DC: 3.0 – 3.6 V
	☐	Battery: ……
Mounting position ..... :	☐	Table top equipment
	☐	Wall/Ceiling mounted equipment
	☐	Floor standing equipment
	☐	Head-mounted equipment
	☒	Other: RF Module

1.2 Antenna Information

Antenna model / type number ..... :	Monopole PCB antenna			
Antenna serial number ..... :	LPSSubG-Antenna			
Antenna Delivery ..... :	☒	1TX + 1RX		
	☐	2TX + 2RX		
Antenna technology ..... :	☒	SISO		
	☐	MIMO	☐	CDD
			☐	Beam-forming
Antenna Type ..... :	☐	External	☐	Dipole
			☐	Sectorized
	☒	Internal	☐	PIFA
			☒	PCB
			☐	Metal Monopole Antenna
			☐	Others……..
Antenna Gain ..... :	1.5dBi			

1.3 Channel List

Sub-GHz Working Frequency of Each Channel:							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
00	903.6 MHz	01	904.6 MHz	02	905.6 MHz	03	906.6 MHz
04	907.6 MHz	05	908.6 MHz	06	909.6 MHz	07	910.6 MHz
08	911.6 MHz	09	912.6 MHz	10	913.6 MHz	11	914.6 MHz
12	915.6 MHz	13	916.6 MHz	14	917.6 MHz	15	918.6 MHz
16	919.6 MHz	17	920.6 MHz	18	921.6 MHz	19	922.6 MHz
20	923.6 MHz	21	924.6 MHz	22	925.6 MHz	23	926.6 MHz
24	927.6 MHz	N/A	N/A	N/A	N/A	N/A	N/A

Note: The general description of the Item(s), antenna information and channel list in clause 1 are provided and confirmed by the client.

2 DESCRIPTION OF TEST SETUP

2.1 Operating mode(s) used for tests

During the tests the following operating mode(s) has(have) been used.

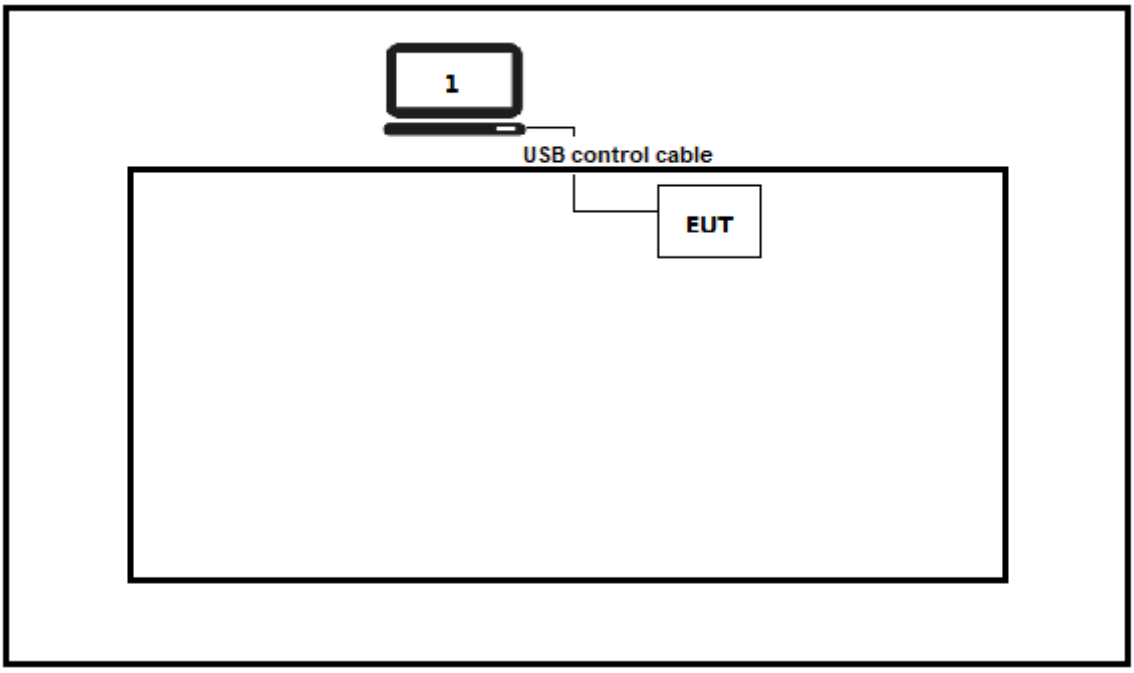
Test Mode For Sub-G	Mode1: Transmit

2.2 Auxiliary equipment / Test software for the EUT

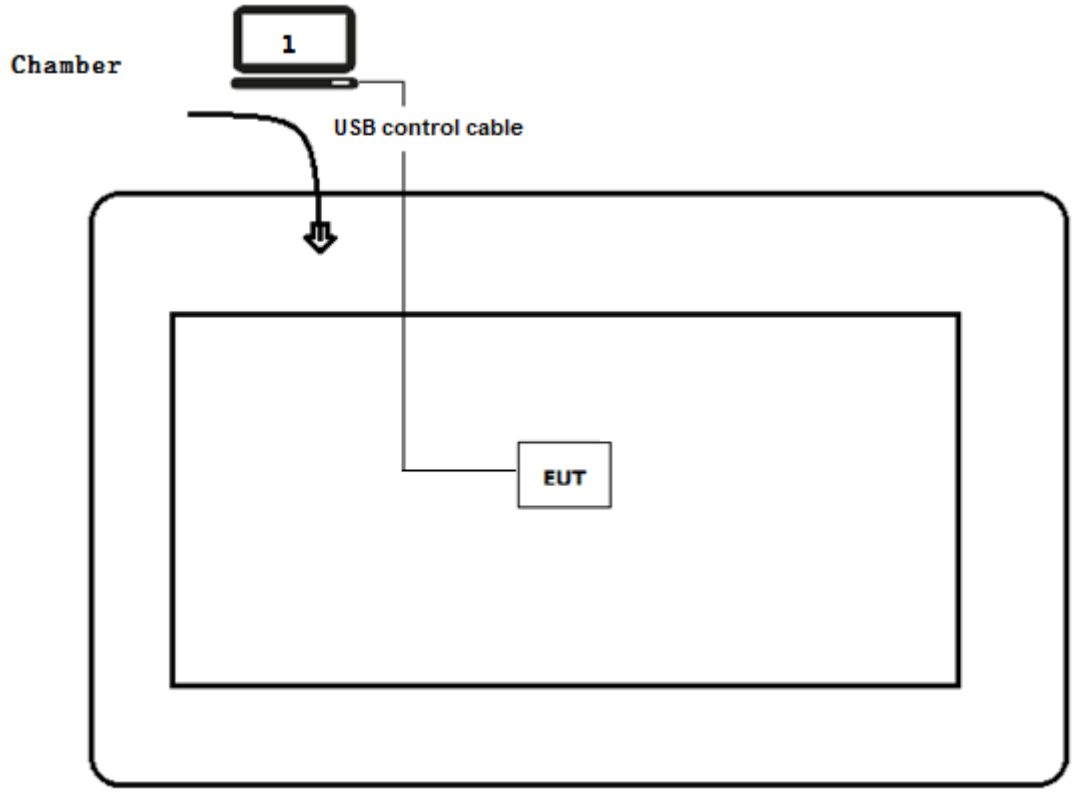
Auxiliary equipment	Type / Version	Manufacturer	Supplied by
Notebook	Think pad x220	Lenovo	Adapter
Software	Type / Version	Manufacturer	Supplied by
SSCOM	N/A	N/A	N/A

2.3 Test Configuration / Block diagram used for tests

Test setup Diagram- AC Line Conducted Emission Test



Test setup Diagram- Radiated Emission



2.4 Testing process

1	Setup the EUT as shown in Section 2.3.
2	Execute test software“SSCOM”on the notebook.
3	Configure the test mode, the test channel, and the data rate.
4	Verify that the EUT works properly.

3 VERDICT SUMMARY SECTION

This chapter presents an overview of standards and results. Refer to the next chapters for details of measured test results and applied test levels.

3.1 Standards

Standard	Year	Description
FCC CFR Title 47 Part 15 Subpart C Section 15.247	2021	Operation within the bands902–928 MHz, 2400–2483.5 MHz, and5725–5850 MHz.
ANSI C63.10	2013	American National Standard ofProcedures for Compliance Testing ofUnlicensed Wireless Devices
KDB558074 D01 v05r02	2019	Guidance for performing compliance measurements on Digital Transmission System (DTS) operating under section 15.247
RSS-Gen Issue 5 Amendment 2	2021	General Requirements forCompliance of Radio Apparatus
RSS-247 Issue 2	2017	Digital Transmission Systems (DTSs),Frequency Hopping Systems (FHSs)and Licence-Exempt Local Area Network(LE-LAN) Devices

3.2 Deviation(s) from the Standard(s) / Test Specification(s)

The following deviation(s) was / were made from the published requirements of the listed standards: N/A.

(Please define the deviations from the standard(s) if applicable)

3.3 Overview of results

For FCC

Requirement – Test case	Basic standard(s)	Verdict	Remark
AC Power Line Conducted Emission	FCC 15.207	N/A	---
Emissions in restricted frequency bands	FCC 15.247(b)(3)	PASS	---
Duty cycle	ANSI C63.10:2013	PASS	---
Emissions in non-restricted frequency bands	FCC 15.247(d), FCC 15.209	PASS	---
Radiated Emission Band Edge	FCC 15.247(d)	N/A	---
Fundamental emission output power	FCC 15.247(d), FCC 15.209	PASS	---
DTS Bandwidth	FCC 15.247(a)(2)	PASS	---
Power Spectral Density	FCC 15.247(e)	PASS	---
Antenna Requirement	FCC 15.203	PASS	---

For ISED

Requirement – Test case	Basic standard(s)	Verdict	Remark
AC Power Line Conducted Emission	RSS-Gen Issue 5Section 8.8	N/A	---
Emissions in restricted frequency bands	RSS-Gen Issue 5 Section 8.9	PASS	---
Duty cycle	ANSI C63.10:2013	PASS	---
Emissions in non-restricted frequency bands	RSS-247 Issue 2 Section 5.5	PASS	---
Radiated Emission Band Edge	RSS-Gen Issue 5 Section 8.10	N/A	---
Fundamental emission output power	RSS-247 Issue 2 Section 5.4(d)	PASS	---
DTS Bandwidth	RSS-Gen Issue 5 Section 6.7	PASS	---
Power Spectral Density	RSS-247 Issue 2 Section 5.2(b)	PASS	---
Antenna Requirement	RSS-Gen Issue 5 Section 6.8	PASS	---

3.4 Test Facility

USA	**:**	**FCC Designation Number: CN1199**
CA	**:**	**ISED CAB identifier: CN0040**

4 TEST RESULTS

4.1 AC Power Line Conducted Emission	VERDICT: N/A

4.1.1 Limit

Standard	FCC Part 15 Subpart C Paragraph 15.207	
Frequency range [MHz]	Limit: QP [dB(μV)[1)]]	Limit: AV [dB(μV) [1)]]
0,15 - 0,50	66 – 56 [2)]	56 - 46 [2)]
0,50 - 5,0	56	46
5,0 - 30	60	50

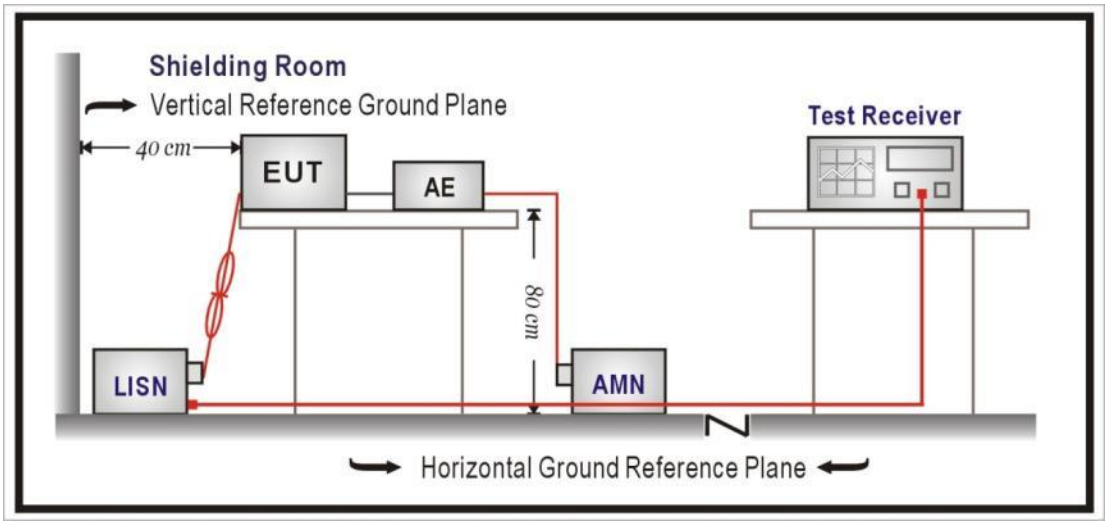
[1)] At the transition frequency, the lower limit applies.

[2)] The limit decreases linearly with the logarithm of the frequency.

NOTE 1: The exclusion band for transmitters shall be considered for transmitters operating at frequencies below 30 MHz.

NOTE 2: Where the AC output port is directly connected (or via a circuit breaker) to the AC power input port of the EUT the AC power output port need not to be tested.

4.1.2 Test Setup



4.1.3 Test Procedure

	References Rule	Chapter	Item
☒	ANSI C63.10-2013	6.2	Standard test method for ac power-line conducted emissions from unlicensedwireless devices

4.1.4 Test Data

Note：EUT is DC powered

4.2 Emissions in restricted frequency bands — VERDICT: PASS

4.2.1 Limit

Standard	FCC Part 15 Subpart C Paragraph 15.205; 15.209		
Restricted Bands of operation for FCC			
Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (GHz)
0.090 – 0.110	16.42 – 16.423	399.9 – 410	4.5 – 5.15
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
8.81425 – 8.81475	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	
13.36 – 13.41			
Restricted Bands of operation for IC			
0.090 - 0.110	13.36 - 13.41	960 - 1427	9.0 - 9.2
0.495 - 0.505	16.42 - 16.423	1435 - 1626.5	9.3 - 9.5
2.1735 - 2.1905	16.69475 - 16.69525	1645.5 - 1646.5	10.6 - 12.7
3.020 - 3.026	16.80425 - 16.80475	1660 - 1710	13.25 - 13.4
4.125 - 4.128	25.5 - 25.67	1718.8 - 1722.2	14.47 - 14.5
4.17725 - 4.17775	37.5 - 38.25	2200 - 2300	15.35 - 16.2
4.20725 - 4.20775	73 - 74.6	2310 - 2390	17.7 - 21.4
5.677 - 5.683	74.8 - 75.2	2483.5 - 2500	22.01 - 23.12
6.215 - 6.218	108 - 138	2655 - 2900	23.6 - 24.0
6.26775 - 6.26825	149.9 - 150.05	3260 - 3267	31.2 - 31.8
6.31175 - 6.31225	156.52475 - 156.52525	3332 - 3339	36.43 - 36.5
8.291 - 8.294	156.7 - 156.9	3345.8 - 3358	Above 38.6
8.362 - 8.366	162.0125 - 167.17	3500 - 4400	
8.37625 - 8.38675	167.72 - 173.2	4500 - 5150	
8.41425 - 8.41475	240 - 285	5350 - 5460	
12.29 - 12.293	322 - 335.4	7250 - 7750	
12.51975 - 12.52025	399.9 - 410	8025 - 8500	
12.57675 - 12.57725	608 - 614	--	

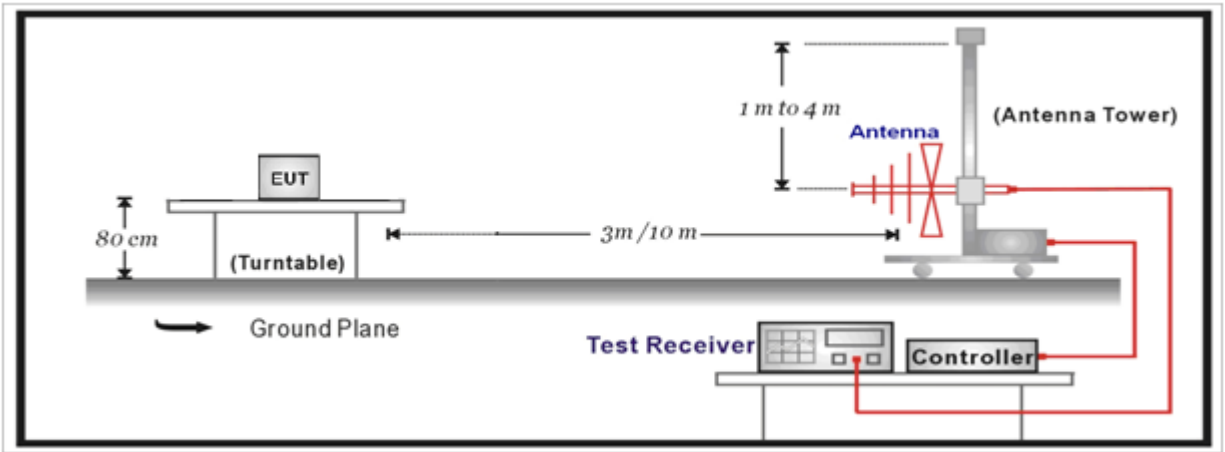
Restricted Band Emissions Limit			
Frequency (MHz)	Field strength (μV/m)	Field strength (dBμV/m)	Measurement distance (m)
0.009 - 0.49	2400/F(kHz)	48.5 – 13.8	300(Note 1)
0.49 - 1.705	24000/F(kHz)	33.8 - 23	30(Note 1)
1.705 - 30	30	29.5	30(Note 1)
30 -88	100	40	3(Note 2)
88-216	150	43.5	3(Note 2)
216 - 960	200	46	3(Note 2)
Above 960	500	54	3(Note 2)

Note 1: At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field. Pending the development of an appropriate measurement procedure for measurements performed below 30 MHz, when performing measurements at a closer distance than specified, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade).

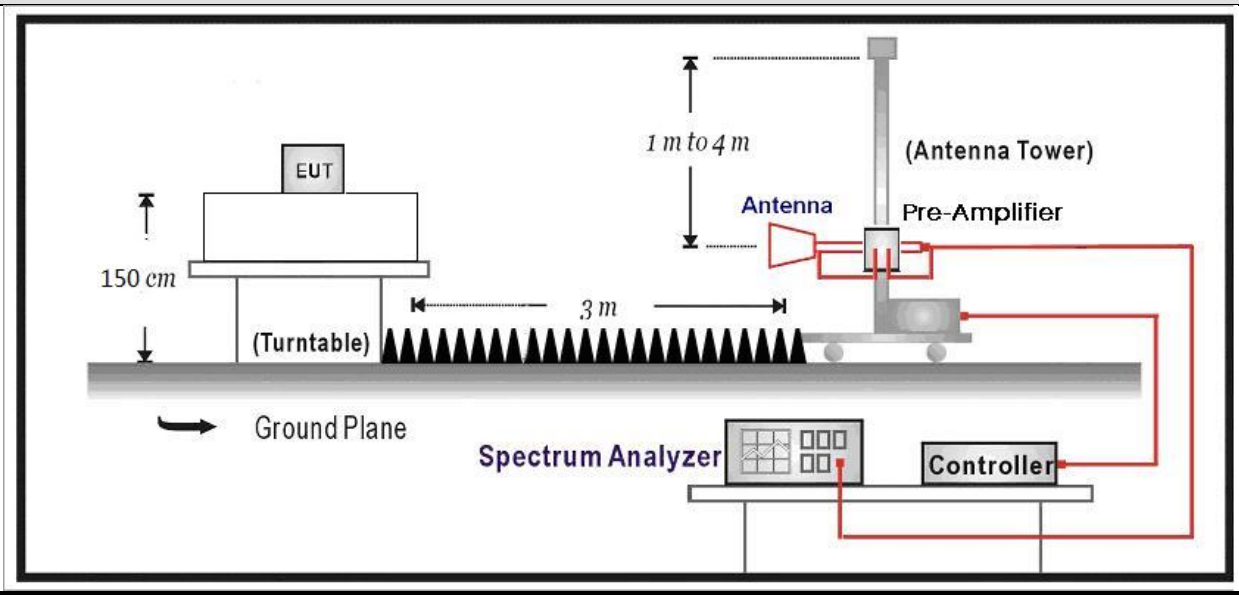
Note 2: At frequencies at or above 30 MHz, measurements may be performed at a distance other than what is specified provided: measurements are not made in the near field except where it can be shown that near field measurements are appropriate due to the characteristics of the device; and it can be demonstrated that the signal levels needed to be measured at the distance employed can be detected by the measurement equipment. Measurements shall not be performed at a distance greater than 30 meters unless it can be further demonstrated that measurements at a distance of 30 meters or less are impractical. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements; inverse-linear-distance-squared for power density measurements).

4.2.2 Test Setup

30MHz-1GHz Test Setup:



Above 1GHz Test Setup:

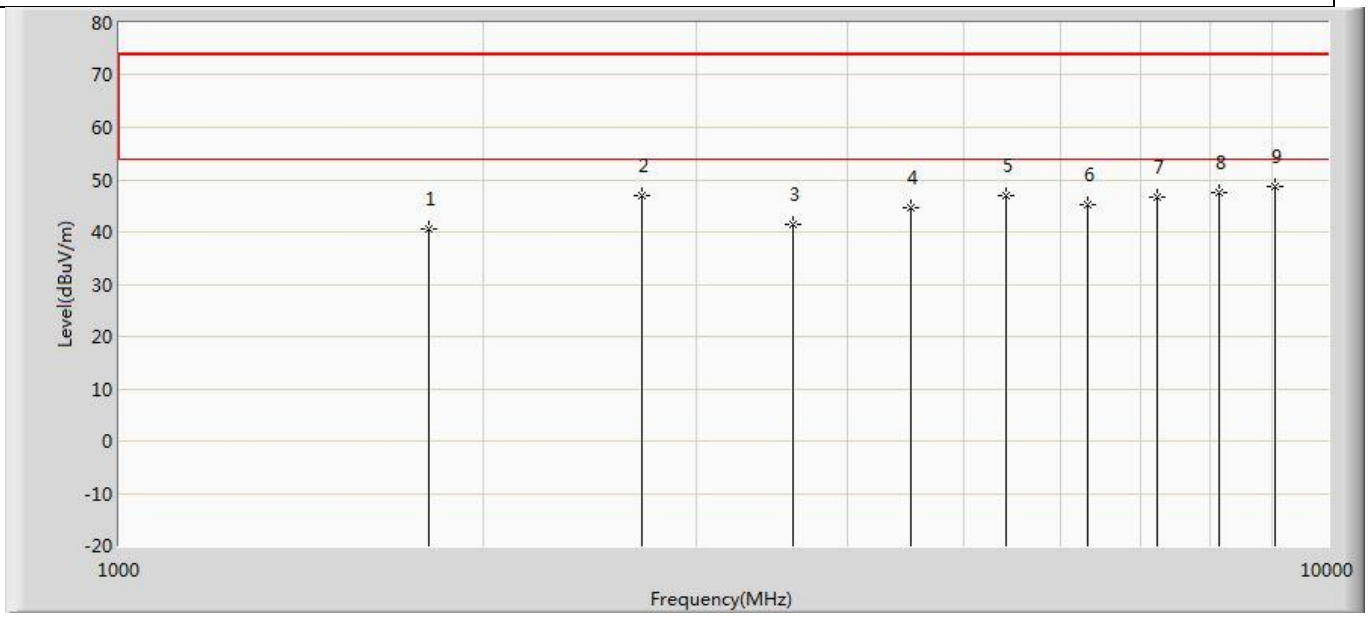


4.2.3 Test Procedure

	References Rule		Chapter	Description
☒	ANSI C63.10		11.12	Emissions in restricted frequency bands
	☒	ANSI C63.10	11.12.1	Radiated emission measurements
	☒	ANSI C63.10	11.12.2.7	Radiated spurious emission test
		☒ ANSI C63.10	6.4	Radiated emissions from unlicensed wireless devices below 30 MHz
		☒ ANSI C63.10	6.5	Radiated emissions from unlicensed wireless devices in the frequency range of 30 MHz to 1000 MHz
		☒ ANSI C63.10	6.6	Radiated emissions from unlicensed wireless devices above 1 GHz

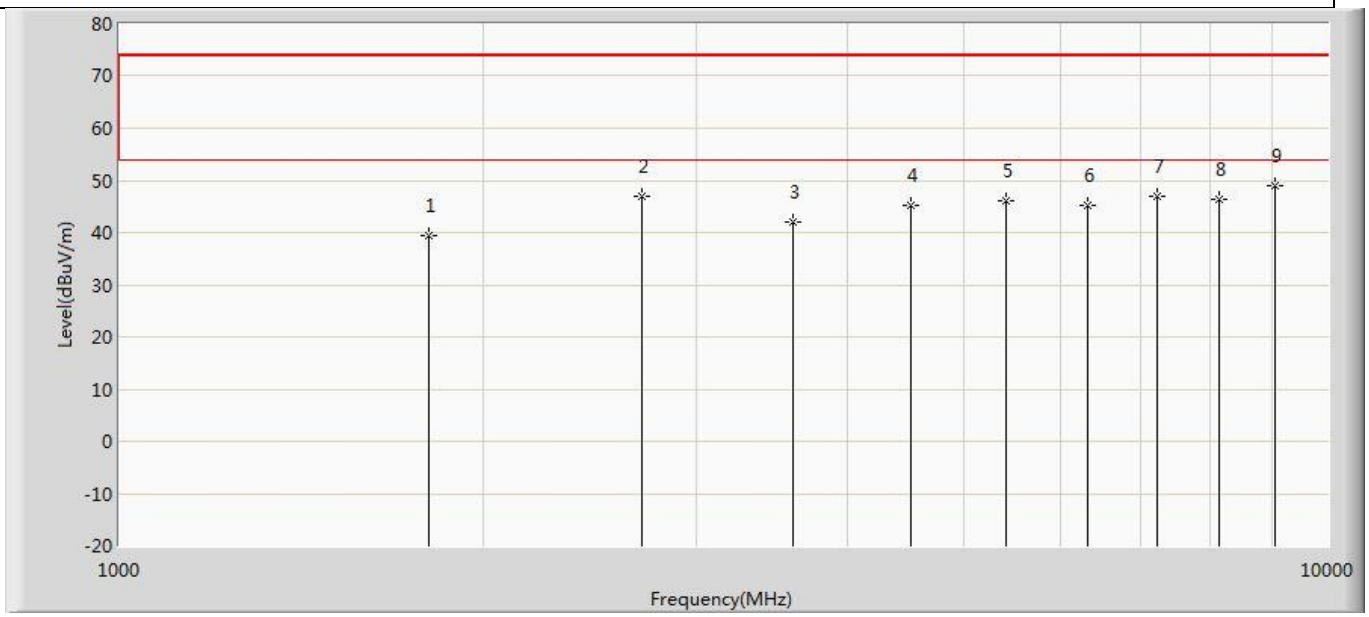
4.2.4 Test Data

Profile: 2180545R	Page No.: 19
Engineer: YULIU	
Site: AC5	Time: 2021/12/30 - 20:32
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00123988_(1-18GHz)	Polarity: Vertical
EUT:LPS（LOCAL POSITIONING SYSTEM)	Power: DC 3.3V
Note: Mode 1:Transmit at 903.6MHz	



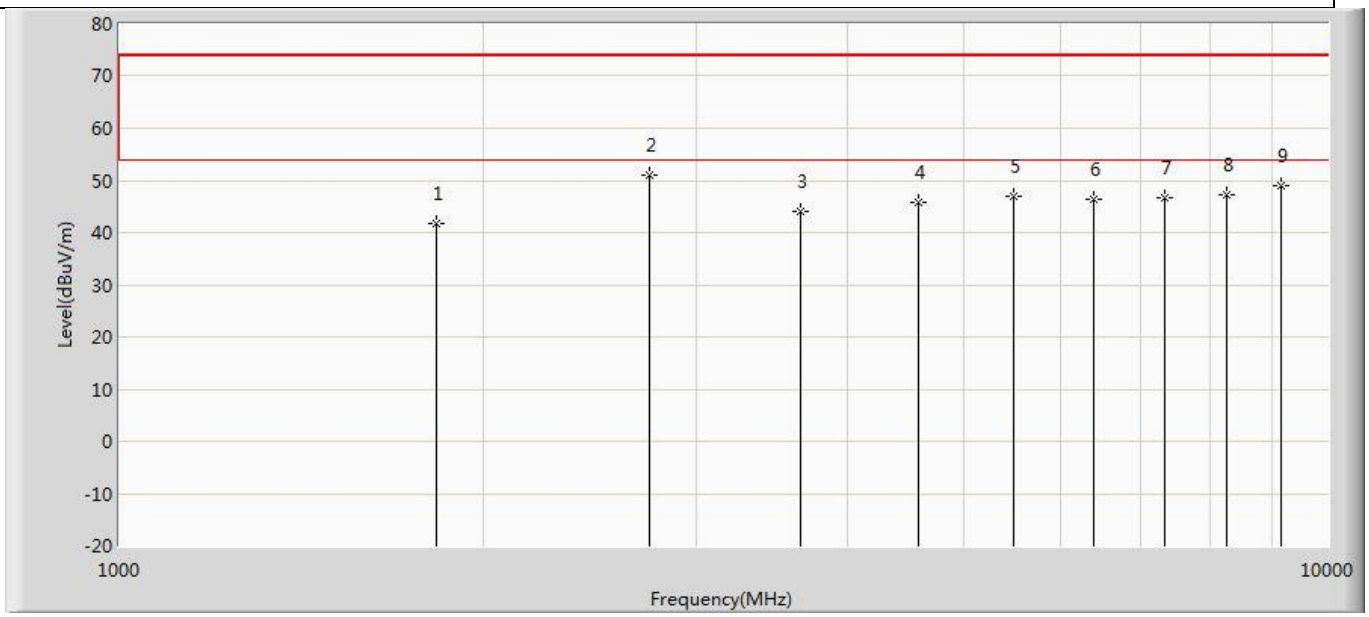
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		1807.200	40.439	40.326	-33.561	74.000	0.113	PK
2		2710.000	47.045	43.196	-26.955	74.000	3.849	PK
3		3614.400	41.480	35.535	-32.520	74.000	5.945	PK
4		4518.000	44.586	36.152	-29.414	74.000	8.434	PK
5		5421.600	46.889	35.061	-27.111	74.000	11.828	PK
6		6325.200	45.145	33.190	-28.855	74.000	11.955	PK
7		7228.800	46.572	34.403	-27.428	74.000	12.169	PK
8		8132.400	47.414	33.575	-26.586	74.000	13.839	PK
9	*	9036.000	48.839	33.270	-25.161	74.000	15.569	PK

Profile: 2180545R	Page No.: 20
Engineer: YULIU	
Site: AC5	Time: 2021/12/30 - 20:32
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00123988_(1-18GHz)	Polarity: Horizontal
EUT:LPS (LOCAL POSITIONING SYSTEM)	Power: DC 3.3V
Note: Mode 1:Transmit at 903.6MHz	



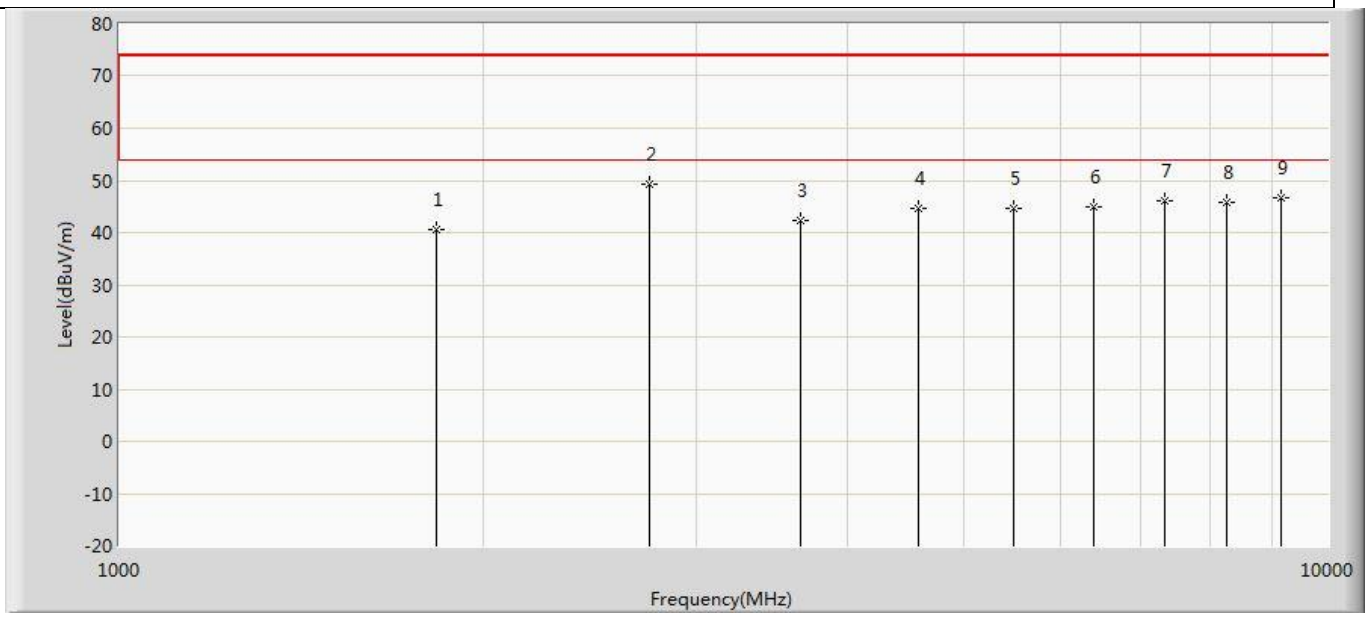
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		1807.200	39.498	39.385	-34.502	74.000	0.113	PK
2		2710.000	47.079	43.230	-26.921	74.000	3.849	PK
3		3614.400	42.097	36.152	-31.903	74.000	5.945	PK
4		4518.000	45.125	36.691	-28.875	74.000	8.434	PK
5		5421.600	46.177	34.349	-27.823	74.000	11.828	PK
6		6325.200	45.267	33.312	-28.733	74.000	11.955	PK
7		7228.800	46.971	34.802	-27.029	74.000	12.169	PK
8		8132.400	46.293	32.454	-27.707	74.000	13.839	PK
9	*	9036.000	49.067	33.498	-24.933	74.000	15.569	PK

Profile: 2180545R	Page No.: 21
Engineer: YULIU	
Site: AC5	Time: 2021/12/30 - 20:32
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00123988_(1-18GHz)	Polarity: Vertical
EUT:LPS（LOCAL POSITIONING SYSTEM)	Power: DC 3.3V
Note: Mode 1:Transmit at 915.6MHz	



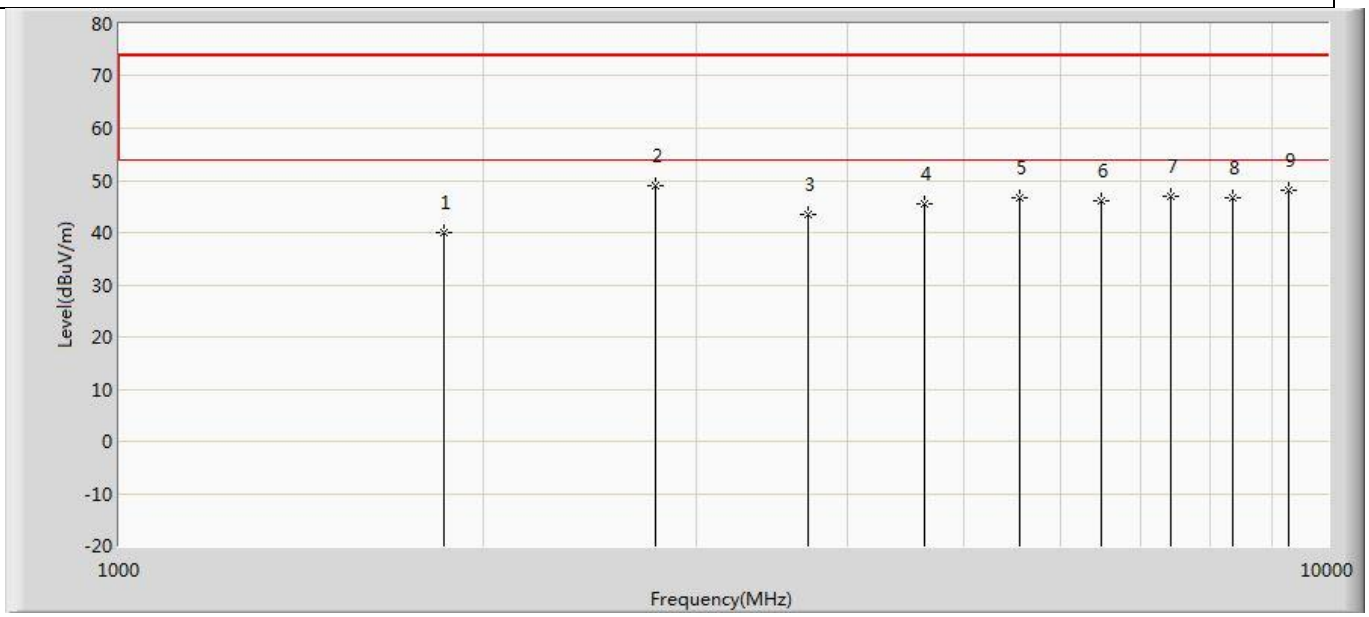
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		1831.200	41.846	41.255	-32.154	74.000	0.591	PK
2	*	2746.000	51.152	47.410	-22.848	74.000	3.742	PK
3		3662.400	44.101	38.164	-29.899	74.000	5.937	PK
4		4578.000	45.759	37.329	-28.241	74.000	8.430	PK
5		5493.600	47.024	35.172	-26.976	74.000	11.852	PK
6		6409.200	46.363	34.354	-27.637	74.000	12.009	PK
7		7324.800	46.684	33.949	-27.316	74.000	12.735	PK
8		8240.400	47.184	33.425	-26.816	74.000	13.759	PK
9		9156.000	48.851	32.234	-25.149	74.000	16.617	PK

Profile: 2180545R	Page No.: 22
Engineer: YULIU	
Site: AC5	Time: 2021/12/30 - 20:32
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00123988_(1-18GHz)	Polarity: Horizontal
EUT:LPS（LOCAL POSITIONING SYSTEM)	Power: DC 3.3V
Note: Mode 1:Transmit at 915.6MHz	



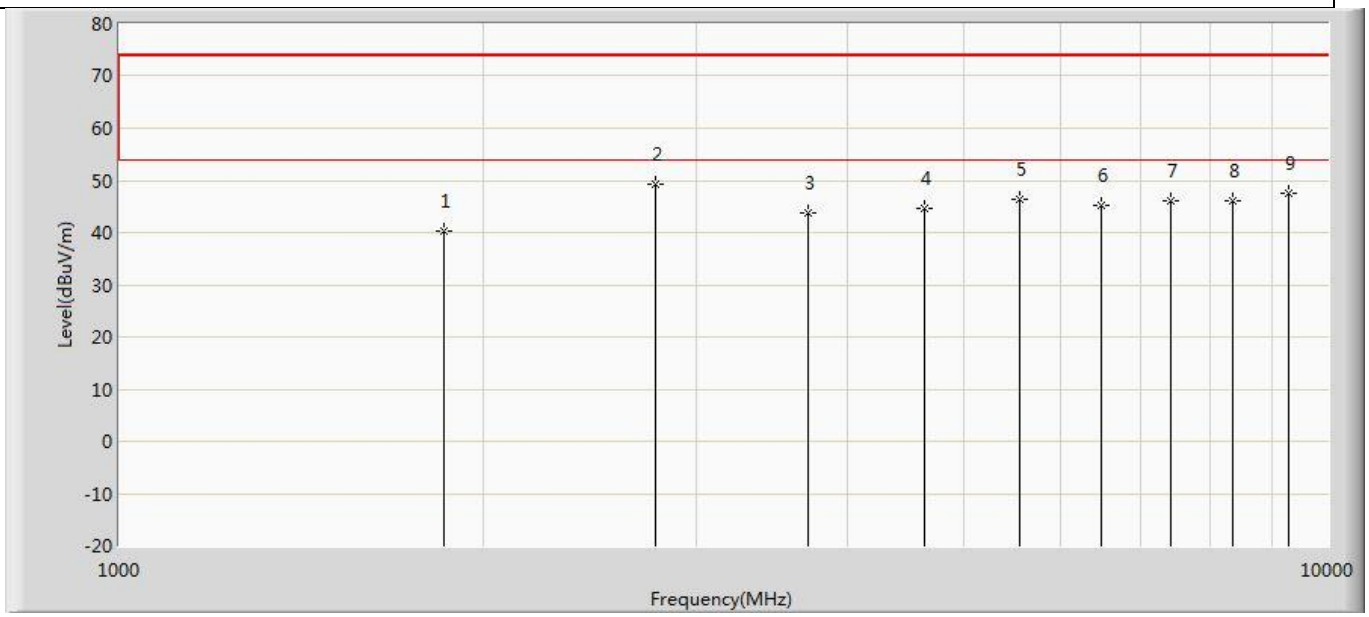
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		1831.200	40.619	40.028	-33.381	74.000	0.591	PK
2	*	2746.000	49.359	45.617	-24.641	74.000	3.742	PK
3		3662.400	42.268	36.331	-31.732	74.000	5.937	PK
4		4578.000	44.700	36.270	-29.300	74.000	8.430	PK
5		5493.600	44.501	32.649	-29.499	74.000	11.852	PK
6		6409.200	44.801	32.792	-29.199	74.000	12.009	PK
7		7324.800	46.006	33.271	-27.994	74.000	12.735	PK
8		8240.400	45.728	31.969	-28.272	74.000	13.759	PK
9		9156.000	46.679	30.062	-27.321	74.000	16.617	PK

Profile: 2180545R	Page No.: 23
Engineer: YULIU	
Site: AC5	Time: 2021/12/30 - 20:32
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00123988_(1-18GHz)	Polarity: Vertical
EUT:LPS（LOCAL POSITIONING SYSTEM)	Power: DC 3.3V
Note: Mode 1:Transmit at 927.6MHz	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		1855.200	39.958	39.304	-34.042	74.000	0.654	PK
2	*	2782.000	49.010	45.192	-24.990	74.000	3.818	PK
3		3710.400	43.510	37.452	-30.490	74.000	6.058	PK
4		4638.000	45.590	36.711	-28.410	74.000	8.879	PK
5		5565.600	46.667	34.696	-27.333	74.000	11.970	PK
6		6493.200	46.009	34.191	-27.991	74.000	11.819	PK
7		7420.800	47.086	34.467	-26.914	74.000	12.618	PK
8		8348.400	46.586	33.062	-27.414	74.000	13.525	PK
9		9276.000	48.072	30.858	-25.928	74.000	17.214	PK

Profile: 2180545R	Page No.: 24
Engineer: YULIU	
Site: AC5	Time: 2021/12/30 - 20:32
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00123988_(1-18GHz)	Polarity: Horizontal
EUT:LPS（LOCAL POSITIONING SYSTEM)	Power: DC 3.3V
Note: Mode 1:Transmit at 927.6MHz	

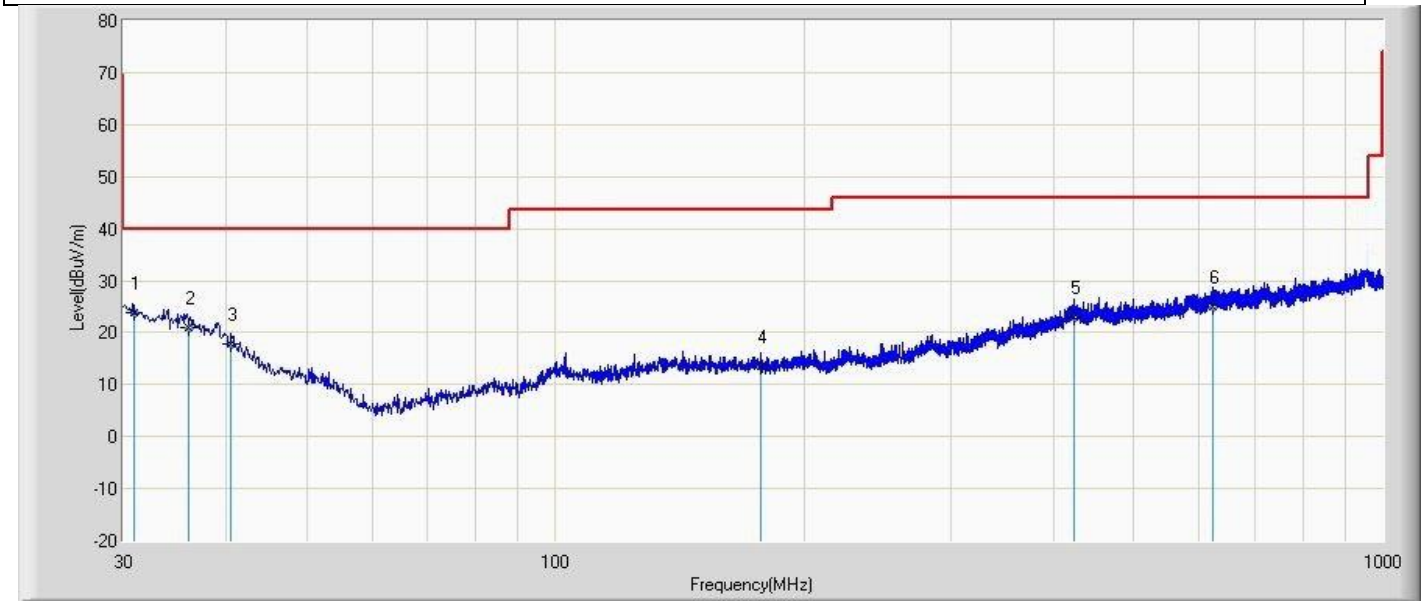


No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		1855.200	40.225	39.565	-33.775	74.000	0.659	PK
2	*	2782.000	49.245	45.427	-24.755	74.000	3.818	PK
3		3710.400	43.833	37.775	-30.167	74.000	6.058	PK
4		4638.000	44.753	35.874	-29.247	74.000	8.879	PK
5		5565.600	46.391	34.420	-27.609	74.000	11.970	PK
6		6493.200	45.266	33.448	-28.734	74.000	11.819	PK
7		7420.800	45.951	33.332	-28.049	74.000	12.618	PK
8		8348.400	45.967	32.443	-28.033	74.000	13.525	PK
9		9276.000	47.511	30.297	-26.489	74.000	17.214	PK

Note:
1. " * ", means this data is the worst emission level.
2. Measurement Level = Reading Level + Factor(Probe+Cable-Amp).
3. The test frequency range, 9kHz~30MHz worst case are at least 6dB below the limits, therefore no data appear in the report.
4. This limit applies for using average detector, if the test result on peak is lower than average limit, then average measurement needn't be performed.
5.Tne No. 1 is non-restricted bands, so the limit is Fundamental emission down 20dB, and then we evaluated each channel, it is complice with the RSE requirements.

The worst case of Radiated Emission below 1GHz:

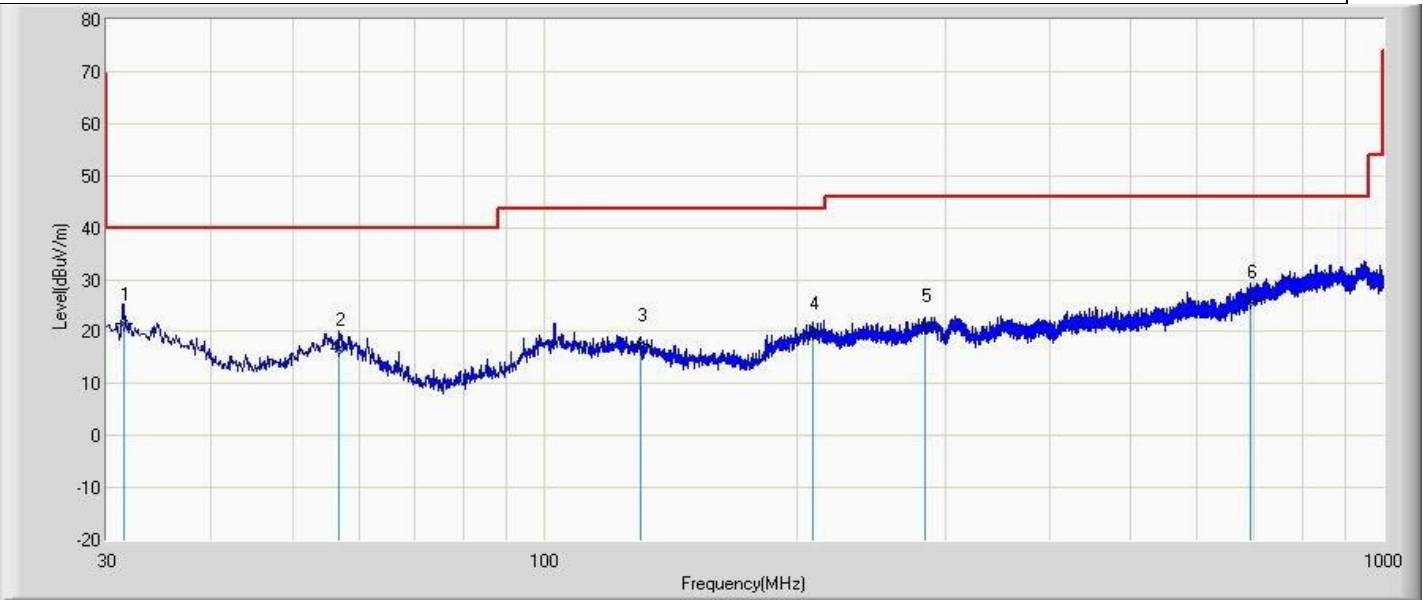
Profile: 2180545R	Page No.: 3
Engineer: Julius zhou	
Site: AC3	Time: 2021/12/12 - 01:15
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: AC3_3m (30-1000MHz)	Polarity: Horizontal
EUT: LPS（Local Positioning System）	Power: DC 3.3V
Note: Mode 1:Transmit at 915.6MHz	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Type
1	*	30.990	23.738	-3.520	-16.262	40.000	27.258	100	15	QP
2		35.990	20.952	-4.544	-19.048	40.000	25.496	100	63	QP
3		40.555	17.932	-3.520	-22.068	40.000	21.453	100	85	QP
4		176.999	13.584	-3.580	-29.916	43.500	17.164	100	152	QP
5		423.989	22.849	-4.412	-23.151	46.000	27.261	100	63	QP
6		623.400	24.888	-4.770	-21.112	46.000	29.658	100	321	QP

Note:
1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Factor(Probe+Cable-Amp).

Profile: 2180545R	Page No.: 4
Engineer: Julius zhou	
Site: AC3	Time: 2021/12/12 - 01:17
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: AC3_3m (30-1000MHz)	Polarity: Vertical
EUT: LPS（Local Positioning System）	Power: DC 3.3V
Note: Mode 1:Transmit at 915.6MHz	

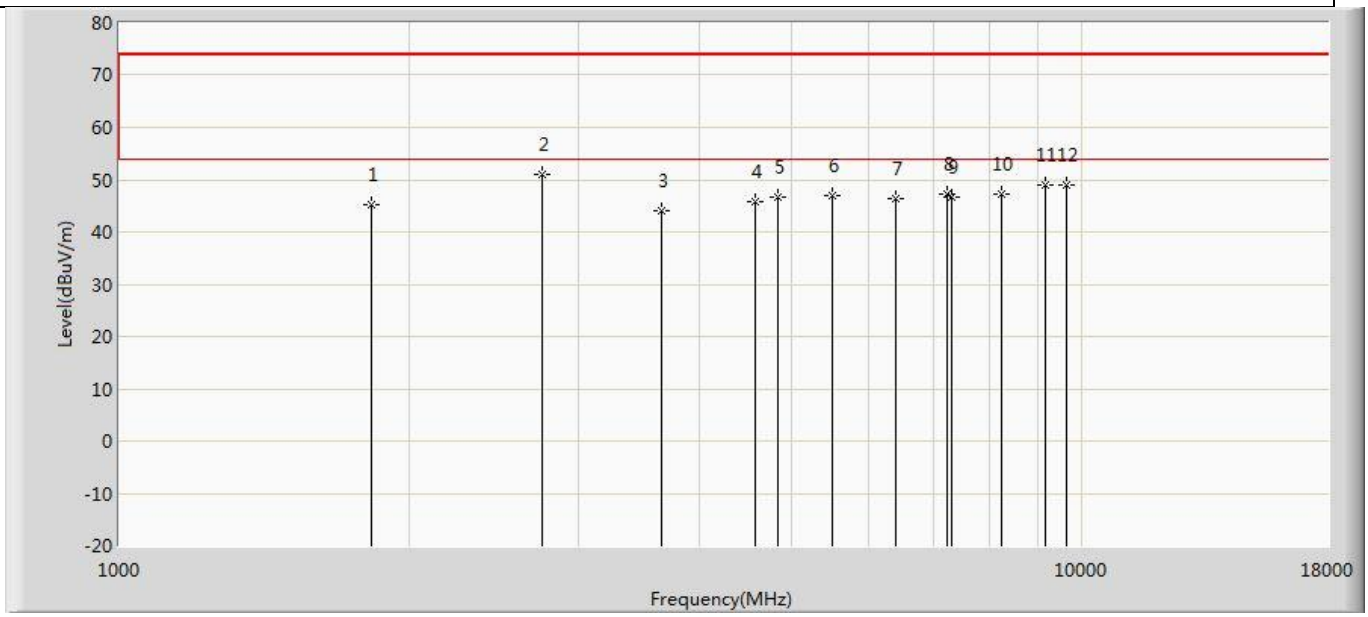


No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Type
1	*	31.440	21.632	-1.880	-18.368	40.000	23.511	100	12	QP
2		56.744	16.671	0.550	-23.329	40.000	16.121	100	15	QP
3		130.001	17.453	-3.440	-26.047	43.500	20.893	100	15	QP
4		208.700	19.782	-3.400	-23.718	43.500	23.182	100	11	QP
5		284.152	21.348	-3.330	-24.652	46.000	24.677	100	98	QP
6		694.050	25.885	-3.550	-20.115	46.000	29.435	100	49	QP

Note:
1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Factor(Probe+Cable-Amp).

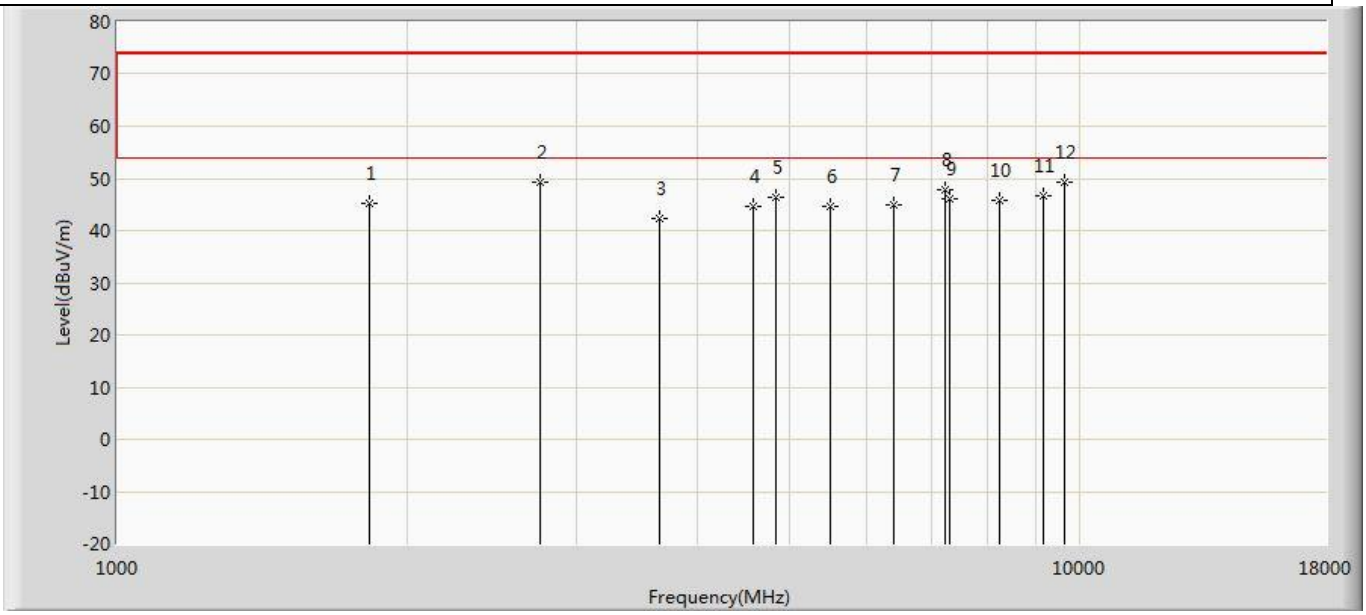
Sub-G+2.4G WLAN The worst case of Simultaneous Radiated Emission:

Profile: 2180545R	Page No.: 25
Engineer: YULIU	
Site: AC5	Time: 2022/01/04 - 10:50
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00123988_(1-18GHz)	Polarity: Vertical
EUT: LPS（Local Positioning System)	Power: DC3.3V
Note: Mode 1: Simultaneous transmission with Sub-G（915.6MHz）+2.4G WLAN 11n20（2412MHz）MIMO	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		1831.200	45.261	44.661	-28.739	74.000	0.600	PK
2	*	2746.000	51.152	47.410	-22.848	74.000	3.742	PK
3		3662.400	44.101	38.164	-29.899	74.000	5.937	PK
4		4578.000	45.759	37.329	-28.241	74.000	8.430	PK
5		4824.000	46.648	36.786	-27.352	74.000	9.862	PK
6		5493.600	47.024	35.172	-26.976	74.000	11.852	PK
7		6409.200	46.363	34.354	-27.637	74.000	12.009	PK
8		7236.000	47.113	34.670	-26.887	74.000	12.443	PK
9		7324.800	46.684	33.949	-27.316	74.000	12.735	PK
10		8240.400	47.184	33.425	-26.816	74.000	13.759	PK
11		9156.000	48.851	32.234	-25.149	74.000	16.617	PK
12		9648.000	49.058	33.089	-24.942	74.000	15.970	PK

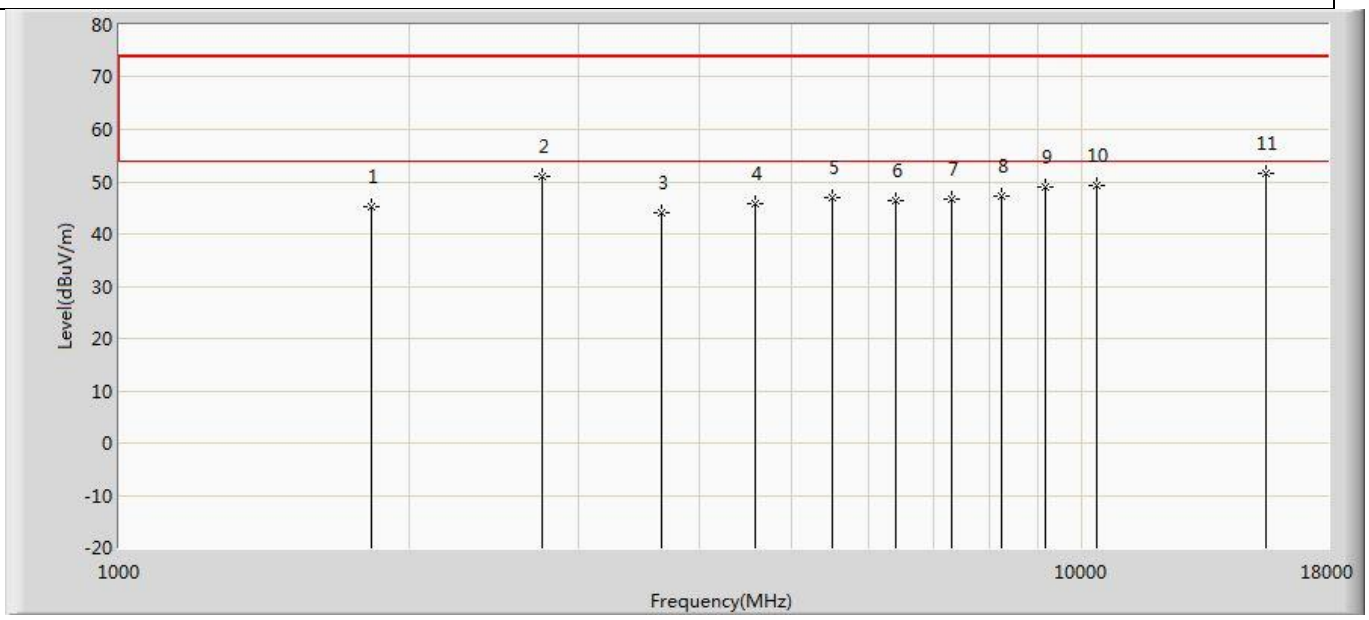
Profile: 2180545R	Page No.: 26
Engineer: YULIU	
Site: AC5	Time: 2022/01/04 - 10:50
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00123988_(1-18GHz)	Polarity: Horizontal
EUT: LPS（Local Positioning System)	Power: DC3.3V
Note: Mode 1: Simultaneous transmission with Sub-G（915.6MHz）+2.4G WLAN 11n20（2412MHz）MIMO	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		1831.200	45.165	44.565	-28.835	74.000	0.600	PK
2	*	2746.000	49.359	45.617	-24.641	74.000	3.742	PK
3		3662.400	42.268	36.331	-31.732	74.000	5.937	PK
4		4578.000	44.700	36.270	-29.300	74.000	8.430	PK
5		4824.000	46.259	36.397	-27.741	74.000	9.862	PK
6		5493.600	44.501	32.649	-29.499	74.000	11.852	PK
7		6409.200	44.801	32.792	-29.199	74.000	12.009	PK
8		7236.000	47.732	35.289	-26.268	74.000	12.443	PK
9		7324.800	46.006	33.271	-27.994	74.000	12.735	PK
10		8240.400	45.728	31.969	-28.272	74.000	13.759	PK
11		9156.000	46.679	30.062	-27.321	74.000	16.617	PK
12		9648.000	49.332	33.363	-24.668	74.000	15.970	PK

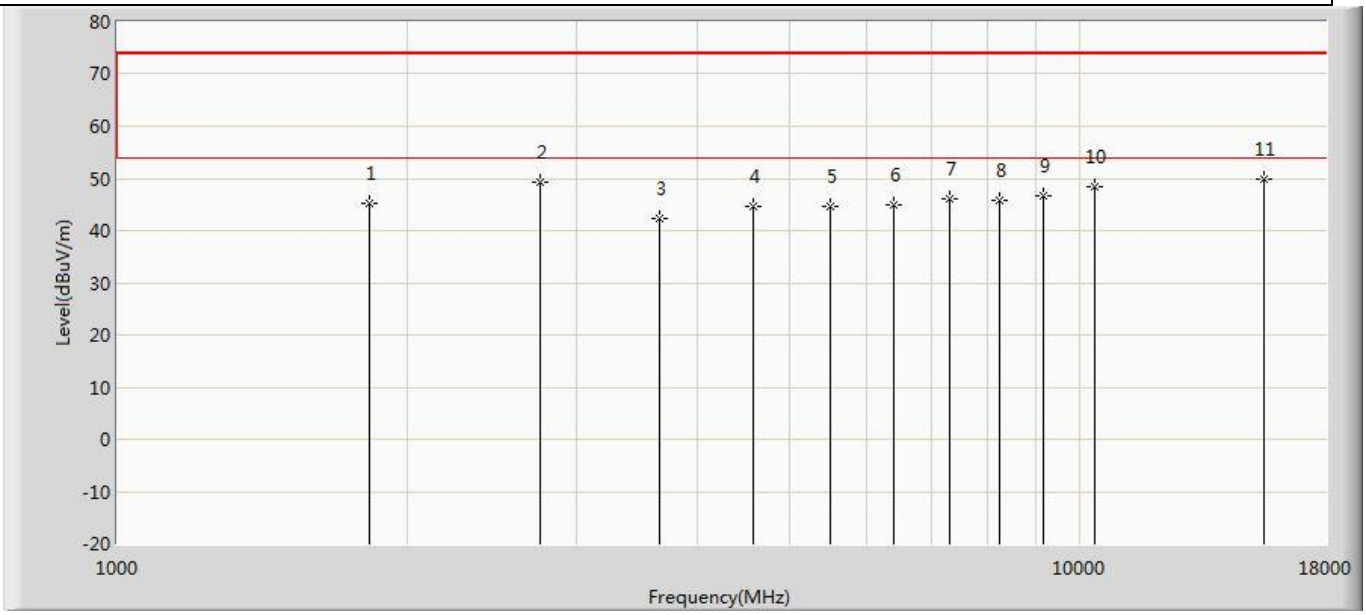
Sub-G+5G WLAN The worst case of Simultaneous Radiated Emission:

Profile: 2180545R	Page No.: 7
Engineer: Julius zhou	
Site: AC5	Time: 2021/12/17 - 13:49
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00165315_(1-18GHz)	Polarity: Vertical
EUT: LPS（Local Positioning System）	Power: DC 3.3V
Note: Simultaneous transmission with Sub-G（915.6MHz）+5G WLAN 11ac20（5180MHz）MIMO	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		1831.200	45.261	44.661	-28.739	74.000	0.600	PK
2		2746.000	51.152	47.410	-22.848	74.000	3.742	PK
3		3662.400	44.102	38.164	-29.898	74.000	5.937	PK
4		4578.000	45.758	37.329	-28.242	74.000	8.430	PK
5		5493.600	47.024	35.172	-26.976	74.000	11.852	PK
6		6409.200	46.363	34.354	-27.637	74.000	12.009	PK
7		7324.800	46.685	33.950	-27.315	74.000	12.735	PK
8		8240.400	47.185	33.426	-26.815	74.000	13.759	PK
9		9156.000	48.851	32.234	-25.149	74.000	16.617	PK
10		10360.000	49.231	33.576	-24.769	74.000	15.655	PK
11	*	15540.000	51.536	29.429	-22.464	74.000	22.107	PK

Profile: 2180545R	Page No.: 8
Engineer: Julius zhou	
Site: AC5	Time: 2021/12/17 - 13:50
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00165315_(1-18GHz)	Polarity: Horizontal
EUT: LPS（Local Positioning System）	Power: DC 3.3V
Note: Simultaneous transmission with Sub-G（915.6MHz）+5G WLAN 11ac20（5180MHz）MIMO	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		1831.200	45.165	44.565	-28.835	74.000	0.600	PK
2		2746.000	49.359	45.617	-24.641	74.000	3.742	PK
3		3662.400	42.269	36.331	-31.731	74.000	5.937	PK
4		4578.000	44.699	36.270	-29.301	74.000	8.430	PK
5		5493.600	44.501	32.649	-29.499	74.000	11.852	PK
6		6409.200	44.801	32.792	-29.199	74.000	12.009	PK
7		7324.800	46.006	33.271	-27.994	74.000	12.735	PK
8		8240.400	45.728	31.969	-28.272	74.000	13.759	PK
9		9156.000	46.678	30.061	-27.322	74.000	16.617	PK
10		10360.000	48.411	32.756	-25.589	74.000	15.655	PK
11	*	15540.000	49.738	27.631	-24.262	74.000	22.107	PK

4.3 Emissions in non-restricted frequency band	VERDICT: PASS

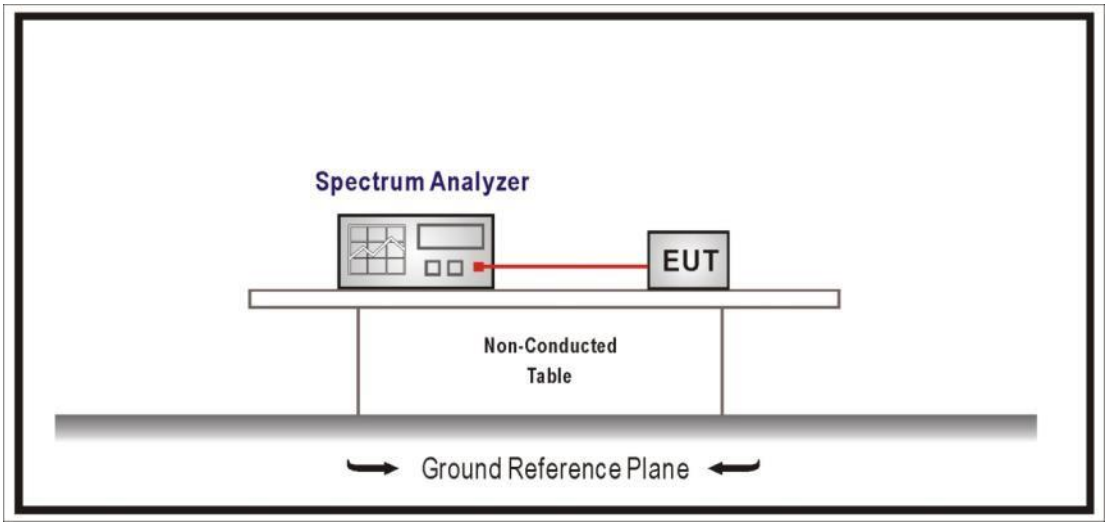
4.3.1 Limit

Standard	FCC Part 15 Subpart C Paragraph 15.247(d)
RF Output power (Detection methods)	Limit(dB)
RF Output power(Average detector)	30dBc(Note1)
RF Output power(PK detector)	20dBc(Note2)

Note 1: If maximum conducted (average) output power was used to demonstrate compliance as described in 9.2, then the peak power in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum in-band peak PSD level in 100 kHz (i.e., 30 dBc).

Note 2: If the maximum peak conducted output power procedure was used, then the peak output power measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz (i.e., 20 dBc).

4.3.2 Test Setup



4.3.3 Test Procedure

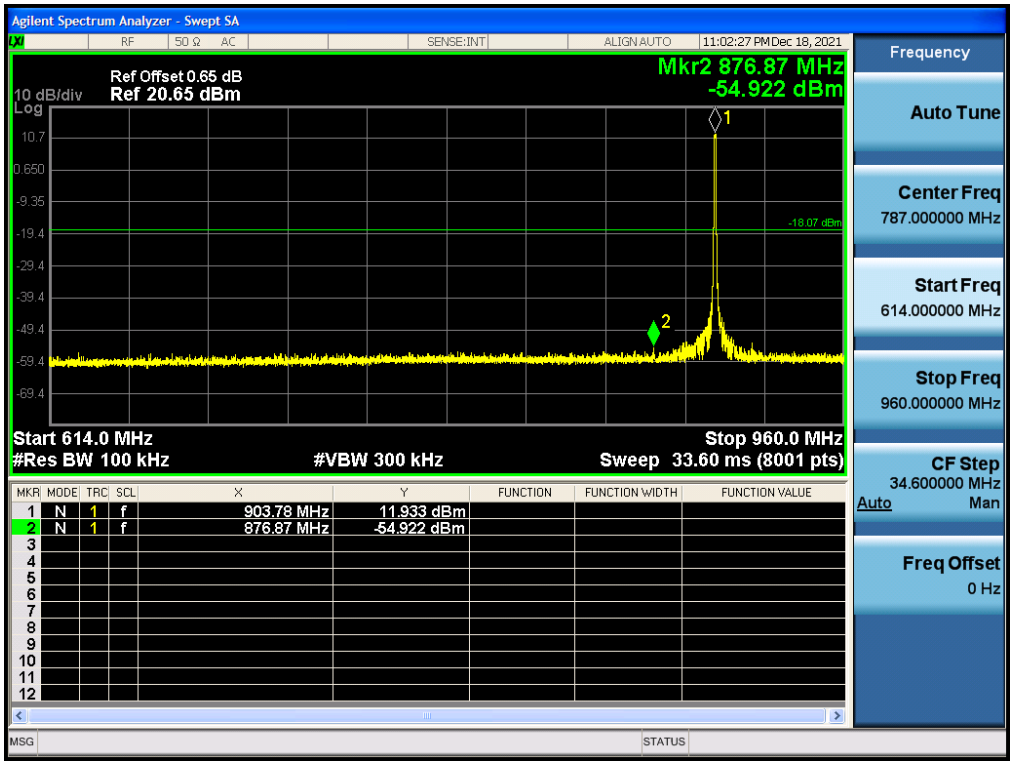
References Rule			Chapter	Description
☒	ANSI C63.10		11.11	Emissions in non-restricted frequency bands
	☒	ANSI C63.10	11.11.1	General
	☒	ANSI C63.10	11.11.2	Reference level measurement
	☒	ANSI C63.10	11.11.3	Emission level measurement

4.3.4 Test Data

Mode	Channel	Test Frequency (MHz)	Maximum In-Band PSD[a] (dBm/100kHz)	Frequency (MHz)	Out-Band PSD[b] (dBm/100kHz)	[a]-[b] (dB)	Limit (dB)
1	00	903.6	11.933	876.87	-54.922	66.855	⩾30
	24	927.6	12.406	899.41	-55.994	68.400	⩾30

Note 1: The worst data plot as below:

Mode1/CH00/903.6MHz



The data of entire corresponding spectrum:

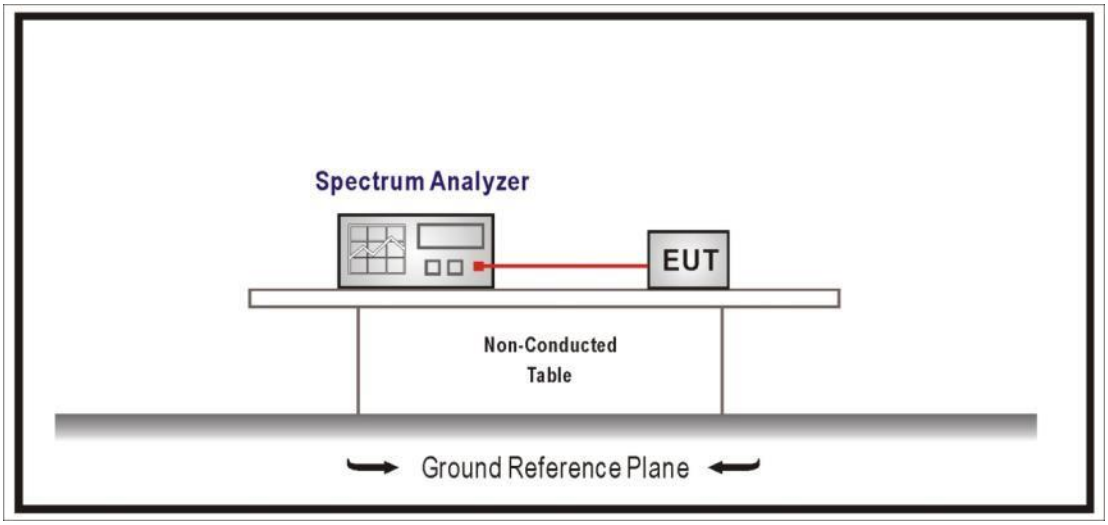
Mode 1 CH00 (903.6MHz)	Mode 1 CH24 (927.6MHz)

4.4 Duty cycle	VERDICT: PASS

4.4.1 Limit

N/A

4.4.2 Test Setup



4.4.3 Test Procedure

References Rule		Chapter	Description
☒	ANSI C63.10	11.6	Duty cycle (D), transmission duration (T), and maximum power control level

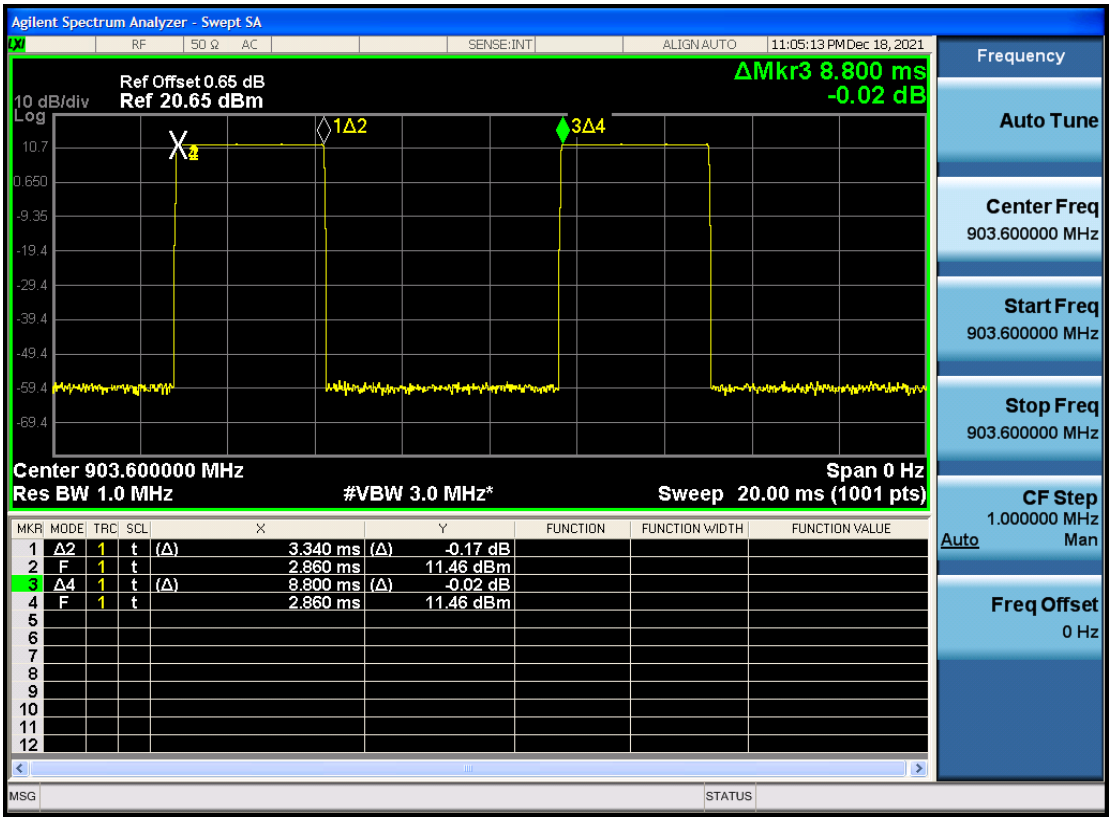
4.4.4 Test Data

Test Mode	Tx On (ms)	Tx Off (ms)	VBW (Hz)	Tx On + Tx Off (ms)	Duty Cycle (%)
Mode 1	3.34	5.46	300	8.80	37.95

Note 1: T means the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

Note 2: According to KDB 558074, when test for Radiated Emission Band Edge and Radiated Emission, for average detector set: VBW ⩾ 1/T will be used.

Mode 1 CH00 903.6MHz



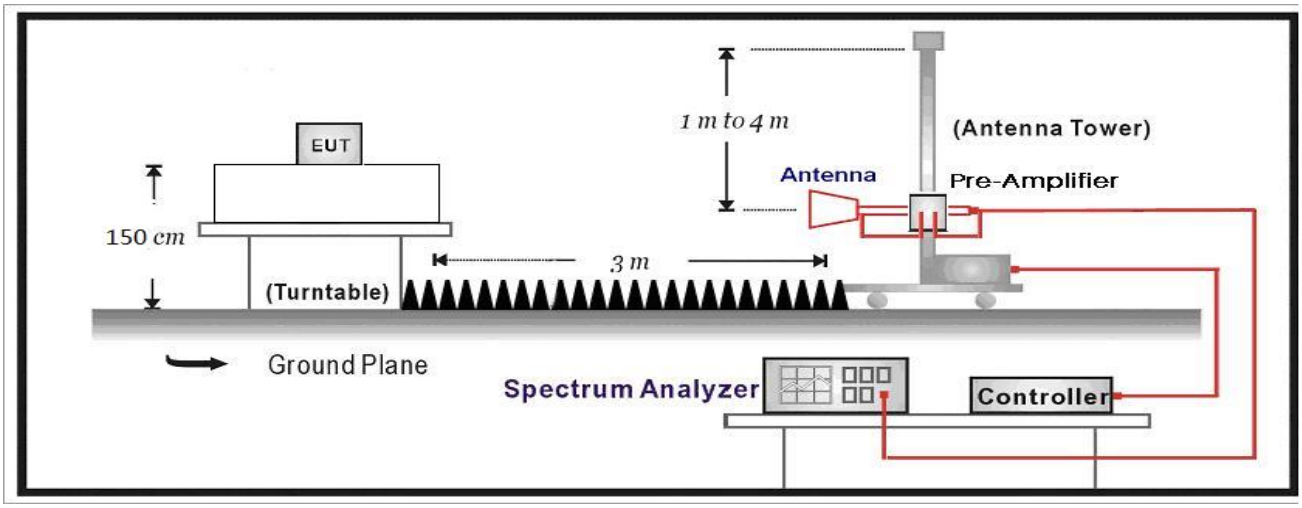
4.5 Radiated Emission Band Edge	VERDICT:	N/A

4.5.1 Limit

Standard	FCC Part 15 Subpart C Paragraph 15.247(d) ,15.209			
Frequency bands (MHz)	Detector	Limit (dBµV/m)	RBW (MHz)	Distance (m)
2310-2390 2483.5-2500	PK	74	1	3
	AV	54	1	3
Note: The field strength of emissions appearing within these frequency bands shall not exceed the limits.				

4.5.2 Test Setup

Above 1GHz Test Setup:



4.5.3 Test Procedure

	References Rule	Chapter	Description
☒	ANSI C63.10	6.10	Band-edge testing
	☒ ANSI C63.10	6.10.5	Restricted-band band-edge measurements
	☐ ANSI C63.10	6.10.6	Marker-delta method
☒	ANSI C63.10	11.12	Emissions in restricted frequency bands
	☒ ANSI C63.10	11.12.1	Radiated emission measurements
	☒ ANSI C63.10	11.12.2.7	Radiated spurious emission test
☐	ANSI C63.10	6.4	Radiated emissions from unlicensed wireless devices below 30 MHz
☐	ANSI C63.10	6.5	Radiated emissions from unlicensed wireless devices in the frequency range of 30 MHz to 1000 MHz
☒	ANSI C63.10	6.6	Radiated emissions from unlicensed wireless devices above 1 GHz

4.5.4 Test Data

Note：No restricted band in the range ± 2 channel bandwidths of the Band-edges of the specified emission band! (608 MHz – 614 MHz and 960 MHz – 1240 MHz).

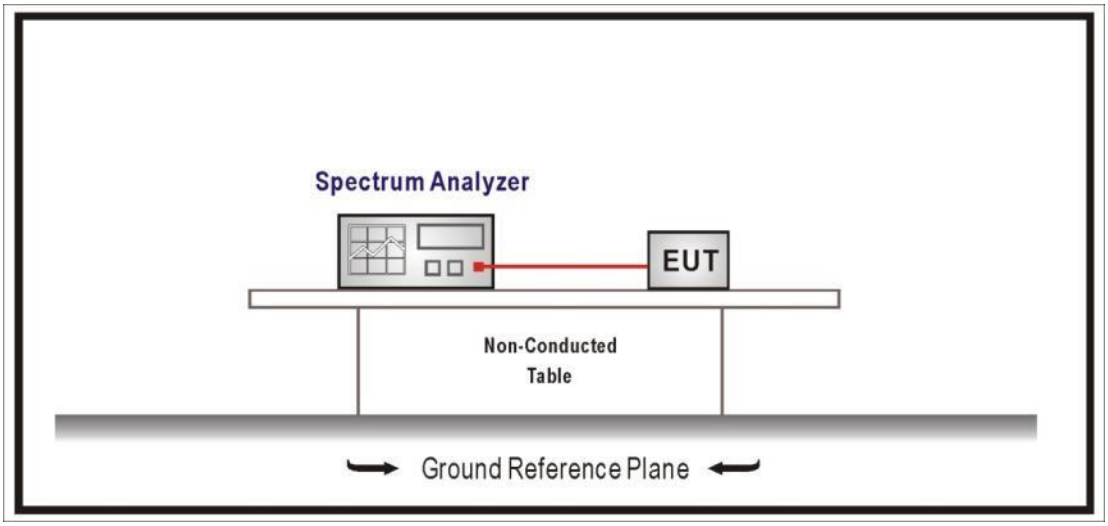
4.6 DTS Bandwidth	VERDICT: PASS

4.6.1 Limit

Standard	FCC Part 15 Subpart C Paragraph 15.247 (a)(2)

Systems using digital modulation techniques operate in the2400-2483.5 MHz .The minimum 6 dB bandwidth shall be at least 500 kHz

4.6.2 Test Setup



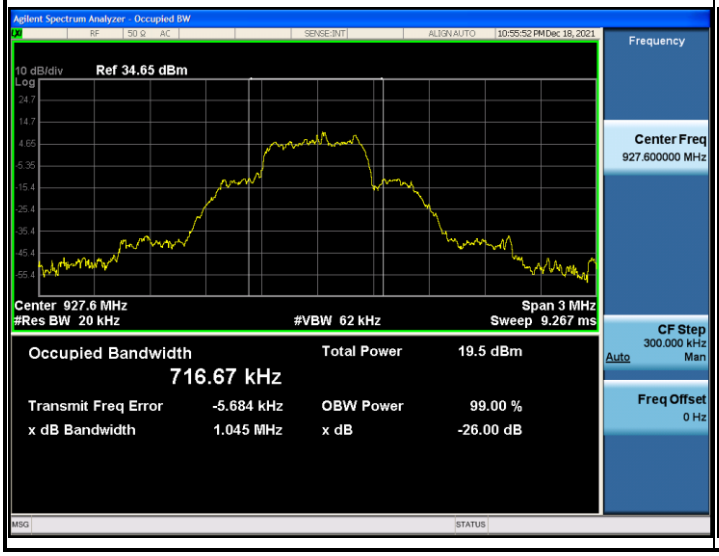
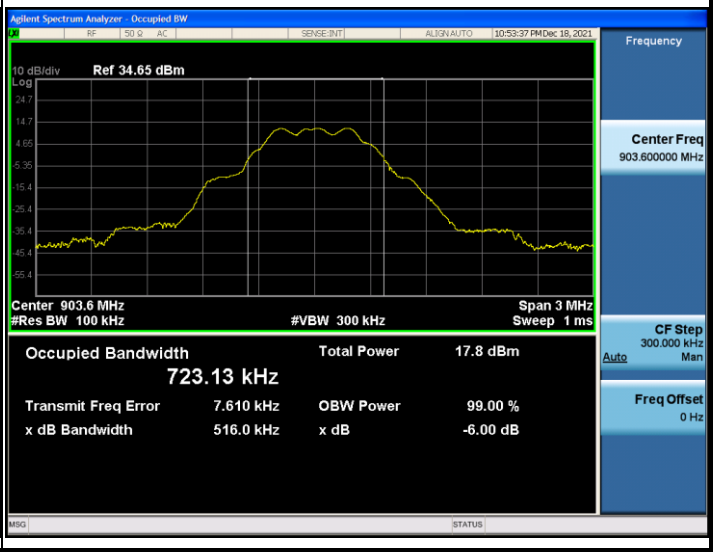
4.6.3 Test Procedure

	Reference Rule		Chapter	Description
☒	ANSI C63.10		11.8	DTS bandwidth
	☐	ANSI C63.10	11.8.1	Option 1
	☒	ANSI C63.10	11.8.2	Option 2

4.6.4 Test Data

Mode	CH.	Test Freq. (MHz)	99% Occupied Bandwidth (kHz)	6dB Occupied Bandwidth (kHz)	Limit (kHz)	Result
1	00	903.6	624.64	516.0	>500	Pass
	12	915.6	647.29	524.5	>500	Pass
	24	927.6	716.67	554.3	>500	Pass

Note : The worst case of Occupied Bandwidth as below:

99% Occupied Bandwidth	6dB Occupied Bandwidth
Mode CH24 (927.6MHz)	Mode 1 CH00(903.6MHz)
	

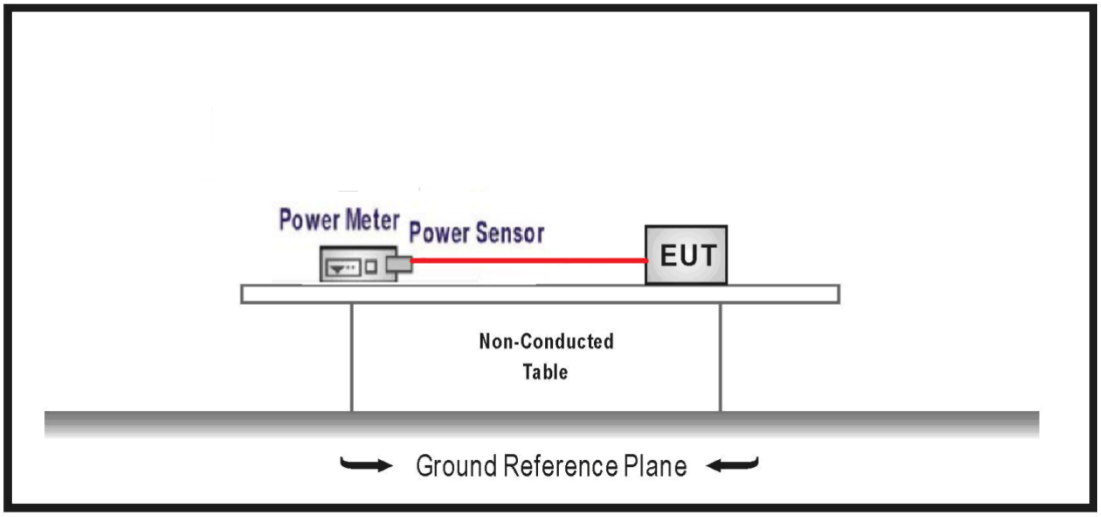
4.7 Fundamental emission output power — VERDICT: PASS

4.7.1 Limit

Standard			FCC Part 15 Subpart C Paragraph 15.247 (b)(3)
☒	GTX＜6dBi		Pout≤30dBm
☐	GTX ＞6dBi		
	☐	Non-Fix point-point	Pout≤30-(GTX -6)
	☐	Fix point-point	Pout≤30-[(GTX-6)]/3
	☐	Point-to-multipoint	Pout≤30-(GTX-6)
	☐	Overlap Beams	Pout≤30-[(GTX-6)]/3
	☐	Aggregate power transmitted simultaneously on all beams	Pout≤30-[(GTX-6)]/3
	☐	single directional beam	Pout≤30-[(GTX-6)]/3+8dB

Note 1 : GTX directional gain of transmitting antennas.
Note 2 : Pout is maximum conducted output power .

4.7.2 Test Setup



4.7.3 Test Procedure

	References Rule	Chapter	Description
☒	ANSI C63.10	11.9	Fundamental emission output power
	☐ ANSI C63.10	11.9.1	Maximum peak conducted output power
	☐ ANSI C63.10	11.9.1.1	RBW ≥ DTS bandwidth
	☐ ANSI C63.10	11.9.1.2	Integrated band power method
	☒ ANSI C63.10	11.9.1.3	PKPM1 Peak power meter method
	☒ ANSI C63.10	11.9.2	Maximum conducted (average) output power
	☐ ANSI C63.10	11.9.2.2	Measurement using a spectrum analyzer (SA)
	☐ ANSI C63.10	11.9.2.2.2	Method AVGSA-1(Duty cycle≥98%)
	☐ ANSI C63.10	11.9.2.2.3	Method AVGSA-1A(Duty cycle≥98%)
	☐ ANSI C63.10	11.9.2.2.4	Method AVGSA-2(Duty cycle≤98%)
	☐ ANSI C63.10	11.9.2.2.5	Method AVGSA-2A(Duty cycle≤98%)
	☐ ANSI C63.10	11.9.2.2.4	Method AVGSA-3
	☐ ANSI C63.10	11.9.2.2.5	Method AVGSA-3A
	☒ ANSI C63.10	11.9.2.3	Measurement using a power meter (PM)
	☐ ANSI C63.10	11.9.2.3.1	Method AVGPM
	☐ ANSI C63.10	11.9.2.3.2	Method AVGPM-G

4.7.4 Test Data

Mode	Channel	Test Frequency (MHz)	Conducted Power (dBm)	EIRP (dBm)	Conducted Power Limit (dBm)	EIRP Limit (dBm)	Result
Mode 1	00	903.6	11.35	12.85	⩽30	⩽36	Pass
	12	915.6	11.43	12.93	⩽30	⩽36	Pass
	24	927.6	11.57	13.07	⩽30	⩽36	Pass

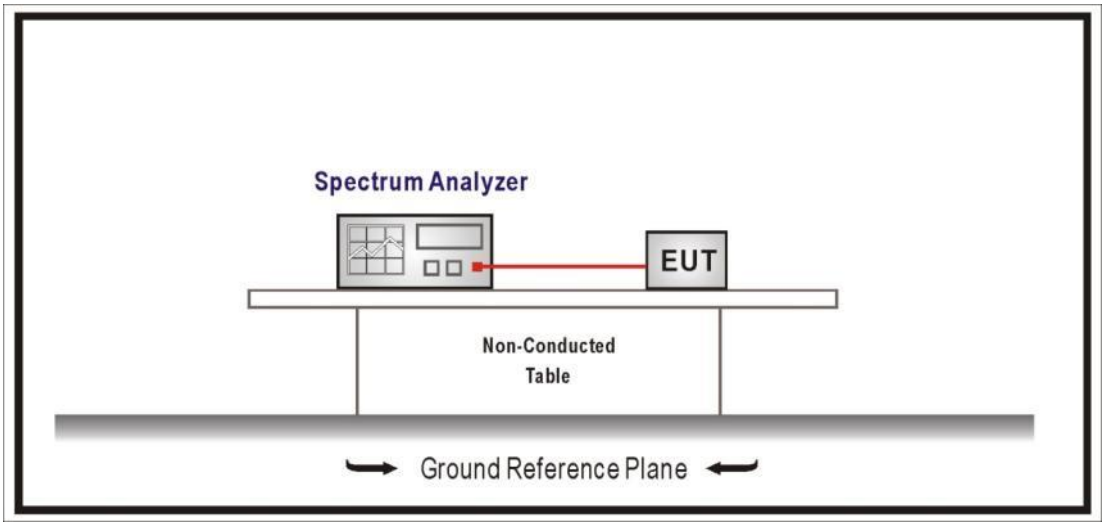
Power setting parameter

Test Mode	Frequency	Power Setting
Mode 1	903.6	13
	915.6	13
	927.6	13

4.8 Power Density	VERDICT: PASS

4.8.1 Limit:	
Standard	FCC Part 15 Subpart C Paragraph 15.247 (b)(3)
Power Spectral Density≤8dBm/3kHz	

4.8.2 Test Setup



4.8.3 Test Procedure

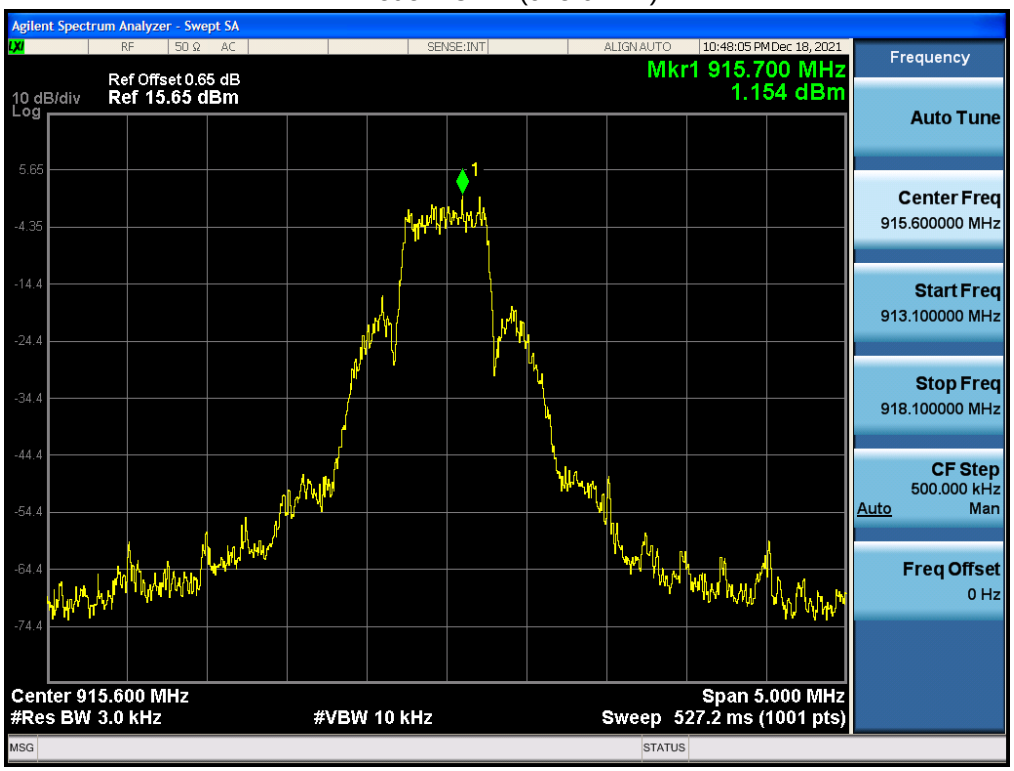
	References Rule		Chapter	Description
☒	ANSI C63.10		11.10	Maximum power spectral density level in the fundamental emission
	☐	ANSI C63.10	11.10.2	Method PKPSD (peak PSD)
	☐	ANSI C63.10	11.10.3	Method AVGPSD-1(Duty cycle≥98%)
	☐	ANSI C63.10	11.10.4	Method AVGPSD-1A(Duty cycle≥98%)
	☒	ANSI C63.10	11.10.5	Method AVGPSD-2(Duty cycle＜98%)
	☐	ANSI C63.10	11.10.6	Method AVGPSD-2A(Duty cycle＜98%)
	☐	ANSI C63.10	11.10.7	Method AVGPSD-3
	☐	ANSI C63.10	11.10.8	Method AVGPSD-3A

4.8.4 Test Data

Mode	Channel	Test Frequency (MHz)	Measurement PSD (dBm/3kHz)	Limit (dBm/3kHz)	Result
Mode 1	00	903.6	1.010	≤8	Pass
	12	915.6	1.154	≤8	Pass
	24	927.6	1.132	≤8	Pass

Note : The worst case of PSD as below:

Mode 1 CH12(915.6MHz)



4.9 Antenna Requirement	VERDICT: PASS

4.9.1 Limit:	
Standard	FCC Part 15 Subpart C Paragraph 15.203
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall 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 manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.	

4.9.2 Antenna Connector Construction:	
☒	The use of a permanently attached antenna
☐	The antenna use of a unique coupling to the intentional radiator
☐	The use of a nonstandard antenna jack or electrical connector
Please refer to the attached document “Internal Photograph” to show the antenna connector.	

5 TEST SETUP PHOTO AND EUT PHOTO

Remark: The test setup photo and EUT Photo please see appendix.

The End