RF MEASUREMENT REPORT

FCC ID:	DD4MXW1X
Applicant:	Shure Incorporated
Product:	Wireless Microphone
Regulatory Model Number (RMN):	MXW1X
Product Number:	MXW1X/O Z10
Brand Name:	SHURE, SHURE
FCC Classification:	Unlicensed PCS portable Tx worn on body
FCC Rule Part(s):	FCC Part 15, Subpart D
Result:	Complies
Receiver Date:	2022-11-21
Test Date:	2022-11-28 ~ 2023-05-18

Reviewed By: Jame Yuan

Approved By: Robin Wu

ACCREDITED
TESTING LABORATORY
CERTIFICATE #3628.01

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 C63.17. 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
2211RSU054-U2	V01	Initial Report	2023-05-20	Invalid
2211RSU054-U2	V02	Update product information	2023-06-12	Valid

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Appendix B - EUT Photograph 55

1. General Information

1.1. Applicant

Shure Incorporated

5800 West Touhy Avenue, Niles, IL 60714-4608, USA

1.2. Manufacturer

Shure Incorporated

5800 West Touhy Avenue, Niles, IL 60714-4608, USA

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 CNAS: L10551 FCC: CN1166 ISED: CN0001 VCCI: ☐R-20025 ☐G-20034 ☐C-20020 ☐T-20020 ☐R-20141 ☐G-20134 ☐C-20103 ☐T-20104
☐	**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 CNAS: L10551 FCC: CN1284 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

1.4. Product Information

Product Name	Wireless Microphone
Regulatory Model Number (RMN)	MXW1X
Product Number	MXW1X/O Z10
Serial No.	3BH18925784 (Conducted testing) 3BH18925405 (Radiated testing)
DECT Specification	1920 ~ 1930MHz
Bluetooth Specification	V5.0 signal mode, BLE only
Antenna Information	Refer to section 1.5
Working Voltage	Power by Li-ion battery or USB-C input
Operating Temperature	5 ~ 40 °C
Accessories	
Rechargeable Li-ion Battery	Model: SB906 Rating: 3.7Vdc, 1150mAh, 4.255Wh
Note: The information of EUT was provided by the manufacturer, and the accuracy of the information shall be the responsibility of the manufacturer.	

1.5. Radio Specification under Test

Frequency Range	1921.536 ~ 1928.448MHz
Channel Number	5
Type of Modulation	GFSK
Antenna Type	Internal Chip
Antenna A Gain	1.27dBi
Antenna B Gain	-0.16dBi
Note: Only one antenna works at a time.	

1.6. Working Frequencies

UPCS Channel	Frequency (MHz)
Highest Band Edge	1930.000
0 (Highest)	1928.448
1	1926.720
2	1924.992
3	1923.264
4 (Lowest)	1921.536
Lowest Band Edge	1920.000

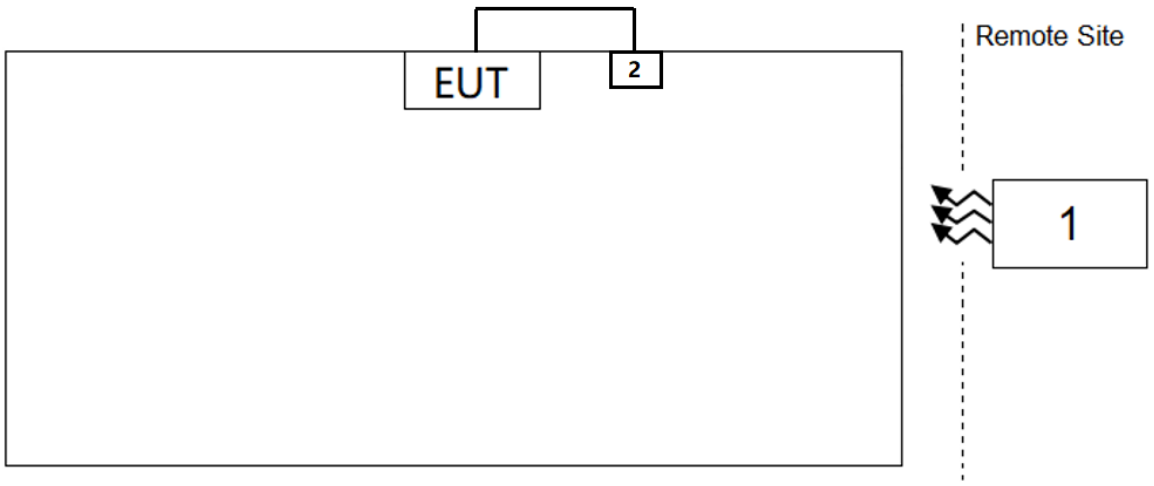
2. Test Configuration

2.1. Test Mode

Mode 1: Transmit at DECT channel

2.2. Test System Connection Diagram

Connection Diagram – Radiated Spurious Emission Testing



Product		Manufacturer	Model No.
1	DECT Tester	RTX	RTX2012
2	Adapter	Shure	SBC10-USB15WSUSTWJ

2.3. Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 15D
- ANSI C63.17-2013

2.4. Test Environment Condition

Ambient Temperature	15 ~ 35°C
Relative Humidity	20 ~ 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 the unit is **permanently attached.**
- There are no provisions for connection to an external antenna.

Conclusion:

The unit complies with the requirement of §15.203.

4. Measuring Instrument

Instrument	Manufacturer	Model No.	Asset No.	Cali. Interval	Cali. Due Date	Test Site
TRILOG Antenna	Schwarzbeck	VULB 9162	MRTSUE06022	1 year	2023-05-20	WZ-AC2
EMI Test Receiver	Agilent	N9038A	MRTSUE06125	1 year	2023-06-04	WZ-AC2
Thermohygrometer	Mingle	ETH529	MRTSUE06170	1 year	2023-11-27	WZ-AC2
Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06171	1 year	2023-10-13	WZ-AC2
Preamplifier	Schwarzbeck	BBV 9718	MRTSUE06176	1 year	2023-05-08	WZ-AC2
				1 year	2024-05-07	WZ-AC2
Anechoic Chamber	RIKEN	WZ-AC2	MRTSUE06213	1 year	2023-04-21	WZ-AC2
				1 year	2024-04-20	WZ-AC2
Thermohygrometer	testo	Testo 608-H1	MRTSUE11038	1 year	2023-11-01	WZ-AC2
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2023-09-29	WZ-AC2
Horn Antenna	Schwarzbeck	BBHA 9170	MRTSUE06597	1 year	2023-11-05	WZ-AC2
Preamplifier	EMCI	EMC184045SE	MRTSUE06640	1 year	2024-01-12	WZ-AC2
Two-Line V-Network	R&S	ENV216	MRTSUE06002	1 year	2023-06-04	WZ-SR2
Shielding Room	MIX-BEP	WZ-SR2	MRTSUE06215	5 years	2026-12-20	WZ-SR2
Thermohygrometer	testo	608-H1	MRTSUE06404	1 year	2023-06-06	WZ-SR2
EMI Test Receiver	R&S	ESR3	MRTSUE06909	1 year	2023-10-27	WZ-SR2
Thermohygrometer	testo	608-H1	MRTSUE06402	1 year	2023-06-06	WZ-SR5
Signal Generator	R&S	SMBV100A	MRTSUE06279	1 year	2023-04-06	WZ-SR5
				1 year	2024-02-29	WZ-SR5
DECT Tester	RTX	RTX2012	MRTSUE06408	1 year	2024-02-29	WZ-SR5
Signal Generator	Keysight	N5182B	MRTSUE06993	1 year	2023-08-23	WZ-SR5
Signal Generator	Keysight	N5182B	MRTSUE06451	1 year	2023-07-08	WZ-SR5
Attenuator	MVE	MVE2213	MRTSUE11085	1 year	2023-06-09	WZ-SR5
Temperature Chamber	BAOYT	BYH-150CL	MRTSUE06051	1 year	2023-10-08	WZ-TR3
Thermohygrometer	testo	608-H1	MRTSUE06401	1 year	2023-06-06	WZ-TR3
Signal Analyzer	Keysight	N9010B	MRTSUE06457	1 year	2023-06-04	WZ-TR3

Software	Version	Function
EMI V3	V 3.0.0	EMI Test Software
Controller_MF 7802	1.02	RE Antenna & turntable
RTX2012	V 2.08.17	DECT

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.

AC Conducted Emission Measurement
The maximum measurement uncertainty is evaluated as: 9kHz~150kHz: 3.58dB 150kHz~30MHz: 3.20dB
Radiated Emission Measurement
The maximum measurement uncertainty is evaluated as: Coaxial: 9kHz~30MHz: 2.59dB Coplanar: 9kHz~30MHz: 2.60dB Horizontal: 30MHz~200MHz: 3.85dB 200MHz~1GHz: 4.36dB 1GHz~40GHz: 4.98dB Vertical: 30MHz~200MHz: 4.06dB 200MHz~1GHz: 5.28dB 1GHz~40GHz: 4.91dB
Spurious Emissions, Conducted
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 2.3dB
Output Power
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 1.5dB
Power Spectrum Density
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 2.3dB
Occupied Bandwidth
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 3.2%

6. Test Result

6.1. Summary

FCC Section(s)	Test Description	Test Condition	Verdict
15.319(b)	Digital Modulation Techniques	Declared	Pass
15.19(a)(3)	Labeling requirements		Pass
15.319(f)	Automatic discontinuation of transmission	Conducted	Pass
15.317, 15.203	Antenna Requirement	Declared	Pass
15.315	AC Power Line Conducted Emission	Line Conducted	Pass
15.323(a)	Emission Bandwidth	Conducted	Pass
15.319(c)	Peak Transmit Power		Pass
15.319(d)	Power Spectral Density		Pass
15.323(d)	In-band emissions		Pass
15.323(d)	Out-of-band emissions	Conducted and Radiated	Pass
15.323(e)	Frame Repetition Stability and period and Jitter	Conducted	Pass
15.323(f)	Carrier frequency stability		Pass
15.323(c1, c2, c3, c4)	Listen Before Transmit (LBT)		Pass
15.323(c5)	Least Interfered Channel (LIC)		Pass
15.323(c6)	Random Waiting		N/A
15.323(c7)	Monitoring Requirements		Pass
15.323(c8)	Monitoring Antenna	Declared	Pass
15.323(c9)	Monitoring Threshold Relaxation	Conducted	N/A
15.323(c10)	Duplex System LBT		N/A
15.323(c11)	Co-Located Device LBT		N/A
15.323(c12)	Fair Access	Declared	N/A

Remark:

1. “N/A” means that this item is not applicable, and the detail information refer to relevant section.
2. For radiated emission test, every axis (X, Y, Z) was also verified. The test results shown in the following sections represent the worst-case emissions.

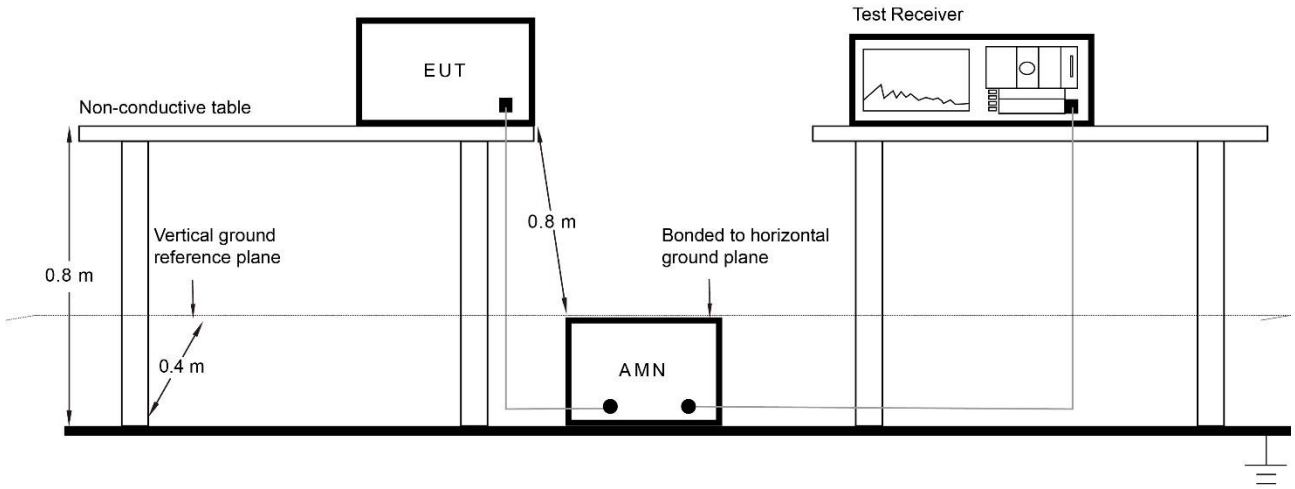
6.2. AC Power Line Conducted Measurement Emissions

6.2.1. Test Limit

An unlicensed PCS device that is designed to be connected to the public utility (AC) power line must meet the limits specified in § 15.207.

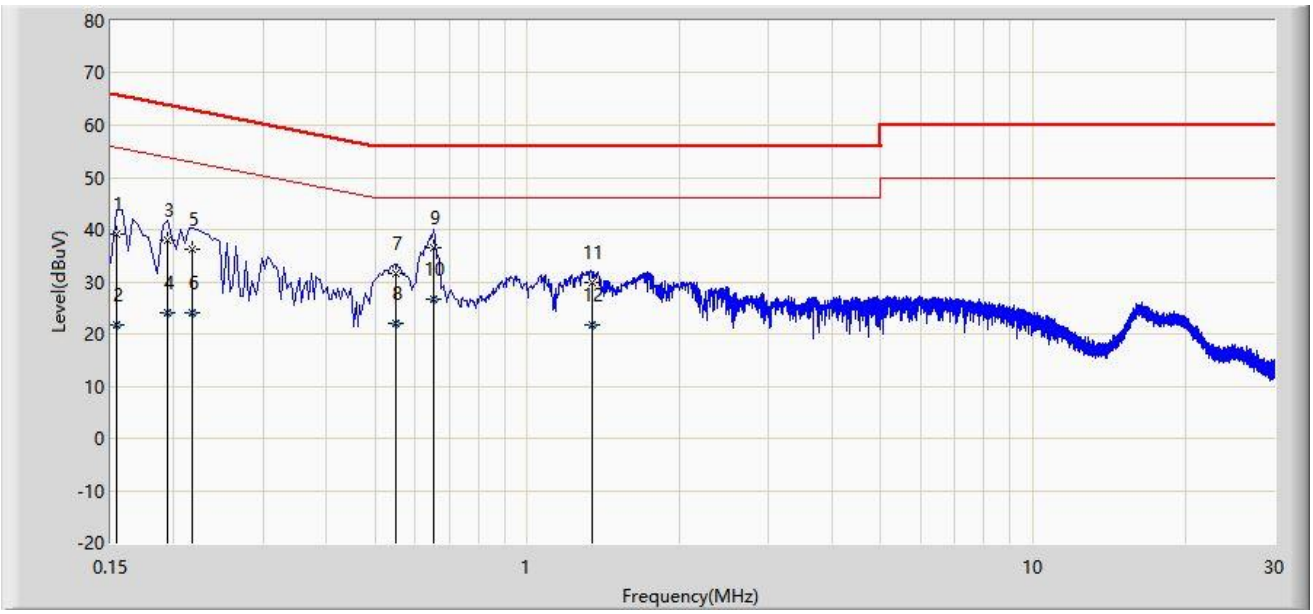
FCC Part 15.207 Limits		
Frequency (MHz)	QP (dBμV)	AV (dBμV)
0.15 - 0.50	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30	60	50
Note 1: The lower limit shall apply at the transition frequencies. Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz.		

6.2.2. Test Setup



6.2.3. Test Result

Site: WZ-SR2	Test Date: 2022-12-21
Limit: FCC_Part15.207_CE_AC Power	Engineer: Helen Han
Probe: ENV216_101683_Filter Off_E	Polarity: Line
EUT: Wireless Microphone	Power: By Adapter
Test Mode: Transmit at channel 00	



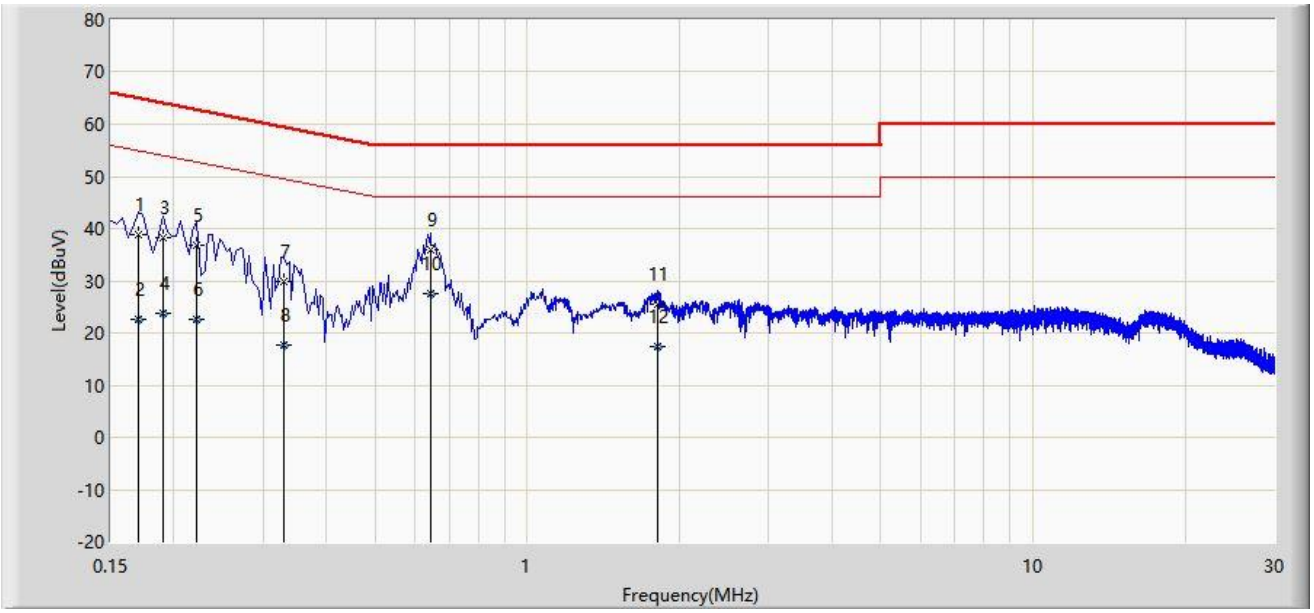
No	Mark	Frequency (MHz)	Measure Level (dBμV)	Reading Level (dBμV)	Margin (dB)	Limit (dBμV)	Factor (dB)	Type
1		0.154	39.250	29.372	-26.531	65.781	9.878	QP
2		0.154	21.876	11.997	-33.905	55.781	9.878	AV
3		0.194	37.922	28.041	-25.942	63.864	9.881	QP
4		0.194	24.170	14.289	-29.693	53.864	9.881	AV
5		0.218	36.216	26.332	-26.679	62.895	9.884	QP
6		0.218	24.110	14.226	-28.785	52.895	9.884	AV
7		0.550	31.495	21.545	-24.505	56.000	9.950	QP
8		0.550	22.106	12.156	-23.894	46.000	9.950	AV
9	*	0.654	36.606	26.657	-19.394	56.000	9.949	QP
10		0.654	26.552	16.603	-19.448	46.000	9.949	AV
11		1.346	29.873	19.886	-26.127	56.000	9.987	QP
12		1.346	21.667	11.680	-24.333	46.000	9.987	AV

Note 1: " * ", means this data is the worst emission level.

Note 2: Measure Level (dBμV) = Reading Level (dBμV) + Factor (dB).

Note 3: Factor (dB) = Cable Loss (dB) + LISN Factor (dB).

Site: WZ-SR2	Test Date: 2022-12-21
Limit: FCC_Part15.107_CE_AC Power_Class B	Engineer: Helen Han
Probe: ENV216_101683_Filter Off_E	Polarity: Neutral
EUT: Wireless Microphone	Power: By Adapter
Test Mode: Transmit at channel 00	



No	Mark	Frequency (MHz)	Measure Level (dBμV)	Reading Level (dBμV)	Margin (dB)	Limit (dBμV)	Factor (dB)	Type
1		0.170	38.773	28.868	-26.188	64.960	9.904	QP
2		0.170	22.553	12.649	-32.407	54.960	9.904	AV
3		0.190	38.364	28.455	-25.673	64.037	9.908	QP
4		0.190	23.781	13.873	-30.255	54.037	9.908	AV
5		0.222	36.723	26.810	-26.020	62.744	9.913	QP
6		0.222	22.519	12.605	-30.225	52.744	9.913	AV
7		0.330	29.983	20.051	-29.468	59.451	9.931	QP
8		0.330	17.716	7.785	-31.735	49.451	9.931	AV
9		0.642	36.031	26.058	-19.969	56.000	9.973	QP
10	*	0.642	27.423	17.450	-18.577	46.000	9.973	AV
11		1.806	25.630	15.614	-30.370	56.000	10.016	QP
12		1.806	17.349	7.333	-28.651	46.000	10.016	AV

Note 1: " * ", means this data is the worst emission level.

Note 2: Measure Level (dBμV) = Reading Level (dBμV) + Factor (dB).

Note 3: Factor (dB) = Cable Loss (dB) + LISN Factor (dB).

6.3. Emission Bandwidth Measurement

6.3.1. Test Limit

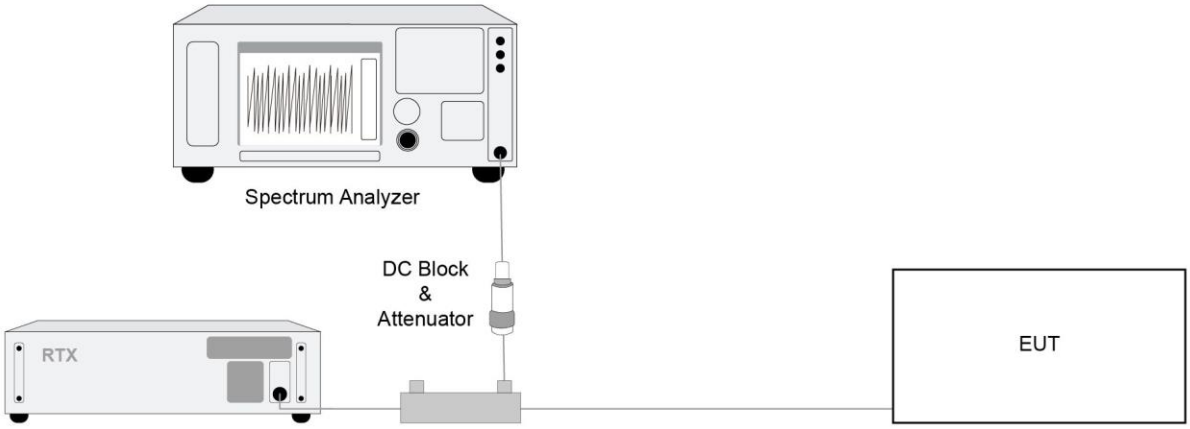
The 26 dB Bandwidth B shall be larger than 50 kHz and less than 2.5MHz.

No requirement for 6 dB and 12 dB Bandwidth. These values are only used for testing Monitoring Bandwidth if the Simple Compliance test fails (ANSI C63.17, clause 7.4).

6.3.2. Test Procedure

ANSI C63.17, Clause 6.1.3

6.3.3. Test Setup



6.3.4. Test Result

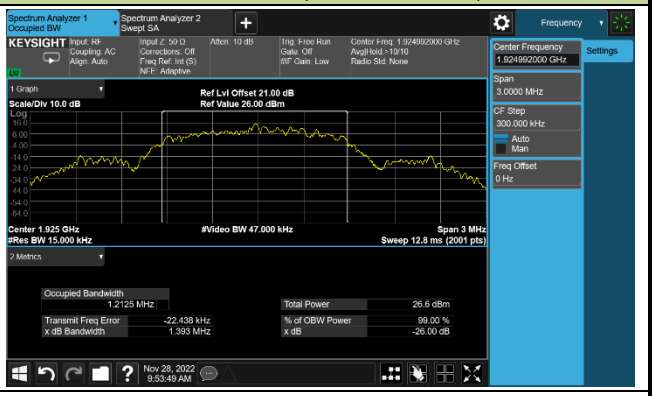
Test Site	WZ-SR4	Test Engineer	Dandy Li
Test Date	2022-11-28		

Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	Limit (MHz)	Result
04	1921.536	1.397	0.05 ~ 2.5	Pass
02	1924.992	1.393	0.05 ~ 2.5	Pass
00	1928.448	1.395	0.05 ~ 2.5	Pass

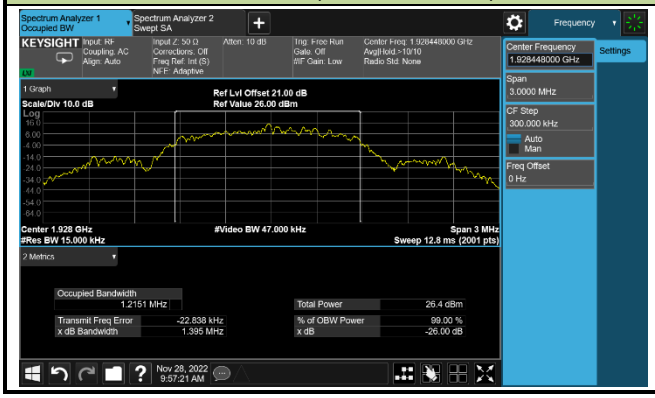
26dB Bandwidth

Channel 04 (1921.536MHz)

Channel 02 (1924.992MHz)



Channel 00 (1928.448MHz)



6.4. Peak Transmit Power and Antenna Gain

6.4.1. Test Limit

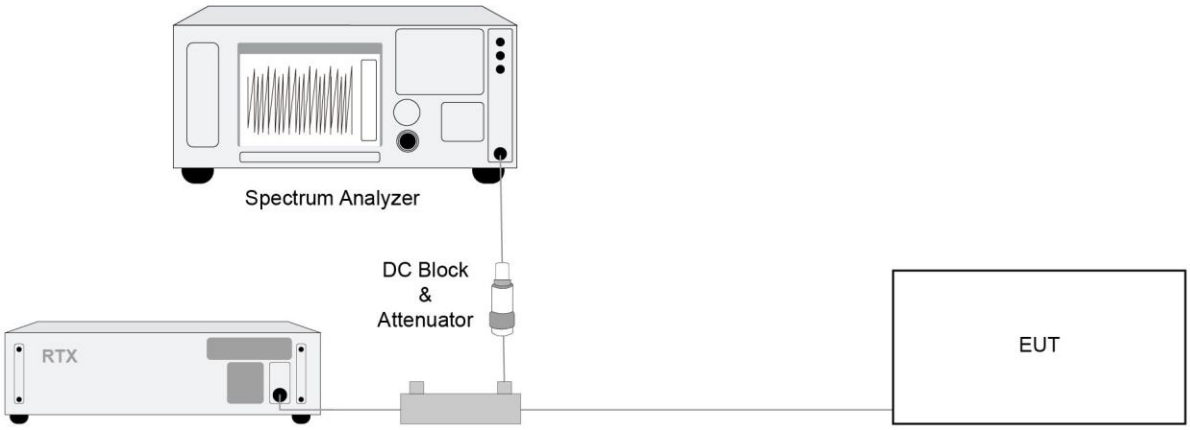
Peak transmit power shall not exceed 100 microwatts multiplied by the square root of the emission bandwidth in Hertz.

The peak transmit power shall be reduced by the amount in decibels that the maximum directional gain of the antenna exceeds 3dBi.

6.4.2. Test Procedure

ANSI C63.17, Clause 6.1.2

6.4.3. Test Setup



6.4.4. Test Result

Test Site	WZ-SR4	Test Engineer	Dandy Li
Test Date	2022-11-28		

Channel No.	Frequency (MHz)	Peak Transmit Power (dBm)	Limit (dBm)	Result
04	1921.536	19.25	≤ 20.72	Pass
02	1924.992	19.16	≤ 20.72	Pass
00	1928.448	20.58	≤ 20.72	Pass

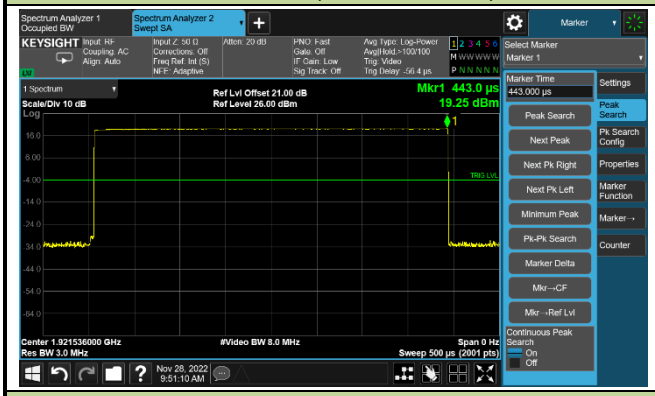
Note 1: The min EBW = 1393000Hz

Limit = 10*log(100μW x $(EBW)^{1/2}$ ÷ 1000) = 20.72dBm

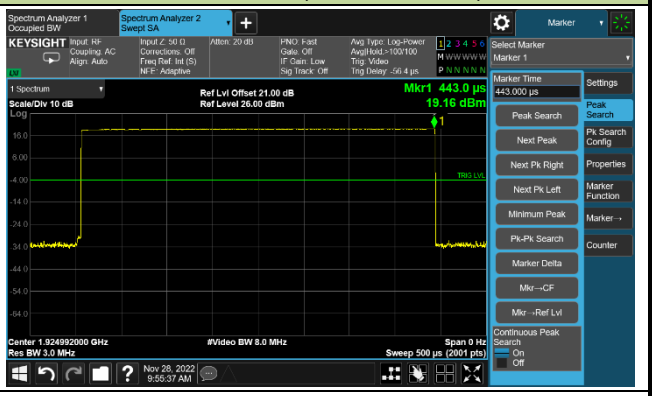
Note 2: Antenna Gain = 1.27dBi < 3dBi

Peak Output Power

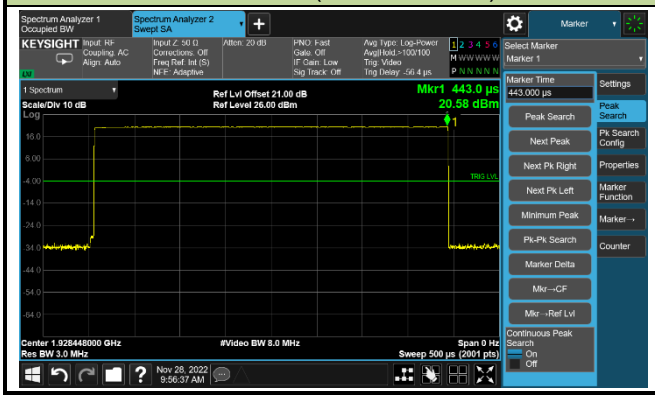
Channel 04 (1921.536MHz)



Channel 02 (1924.992MHz)



Channel 00 (1928.448MHz)



6.5. Power Spectral Density

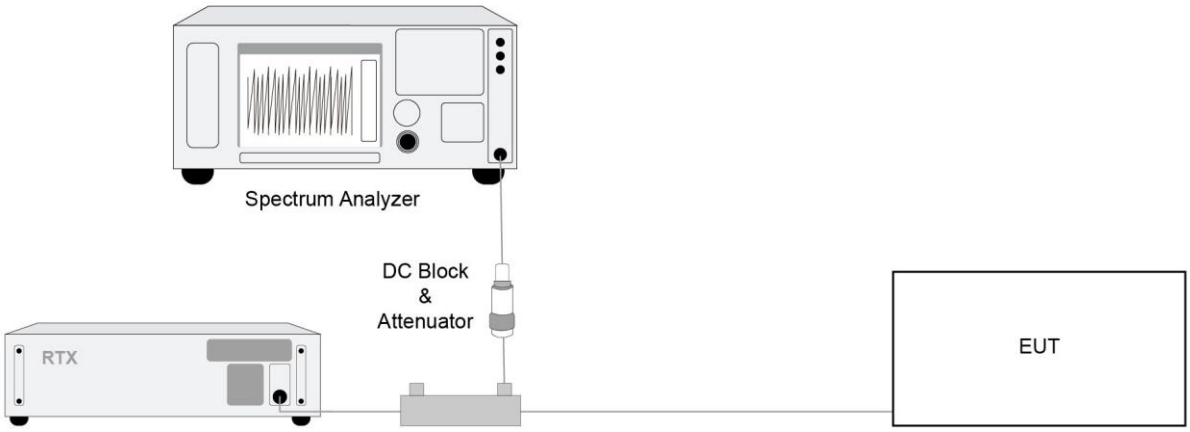
6.5.1. Test Limit

Power spectral density shall not exceed 3 milliwatts in any 3 kHz bandwidth as measured with a spectrum analyzer having a resolution bandwidth of 3 kHz.

6.5.2. Test Procedure

ANSI C63.17, Clause 6.1.5

6.5.3. Test Setup



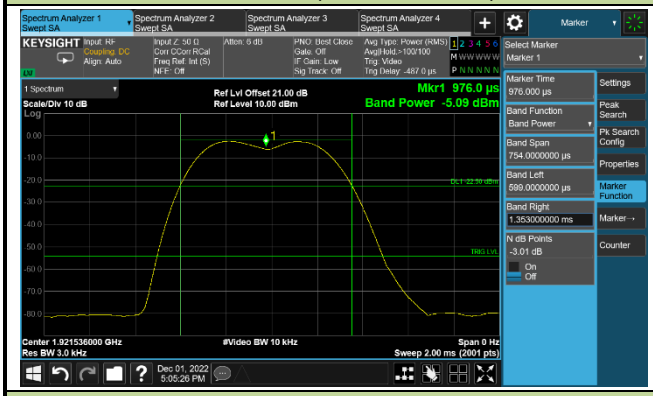
6.5.4. Test Result

Test Site	WZ-SR4	Test Engineer	Dandy Li
Test Date	2022-06-29		

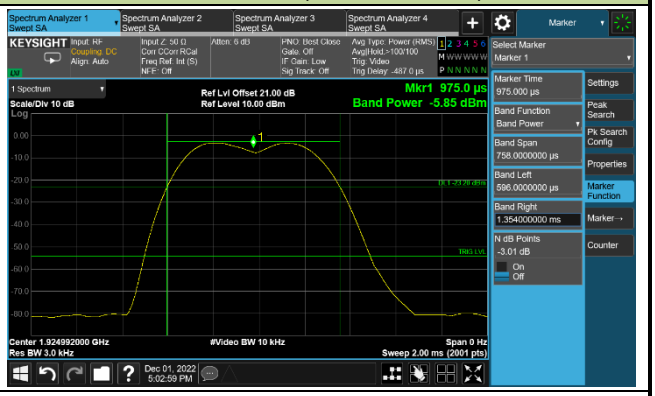
Channel No.	Frequency (MHz)	Measured PSD (dBm / 3kHz)	Measured PSD (mW / 3kHz)	Limit (mW / 3kHz)	Result
04	1921.536	-5.09	0.310	≤ 3.000	Pass
02	1924.992	-5.85	0.260	≤ 3.000	Pass
00	1928.448	-1.18	0.762	≤ 3.000	Pass

Power Spectral Density

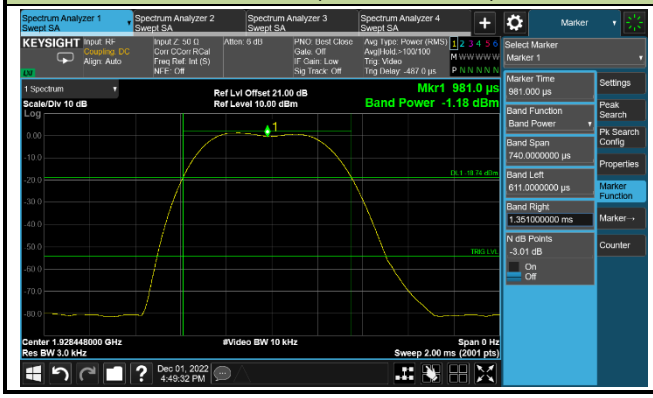
Channel 04 (1921.536MHz)



Channel 02 (1924.992MHz)



Channel 00 (1928.448MHz)



6.6. In-Band Unwanted Emissions

6.6.1. Test Limit

B < f2 _2B: less than or equal to 30 dB below maximum permitted peak power level.

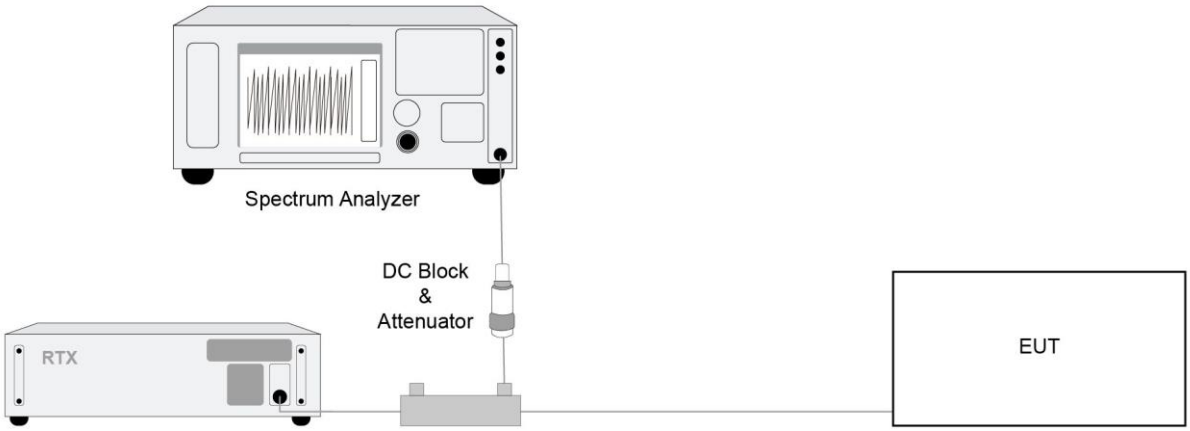
2B < f2 _3B: less than or equal to 50 dB below maximum permitted peak power level.

3B < f2 _UPCS Band Edge: less than or equal to 60 dB below maximum permitted peak power level.

6.6.2. Test Procedure

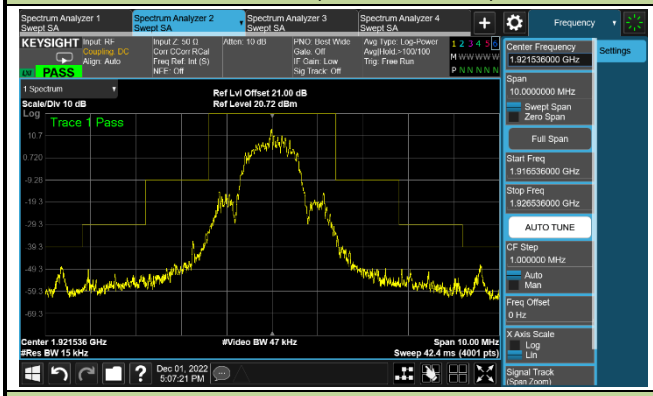
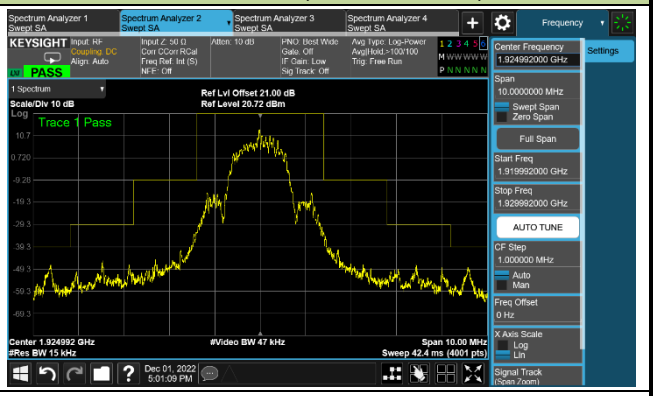
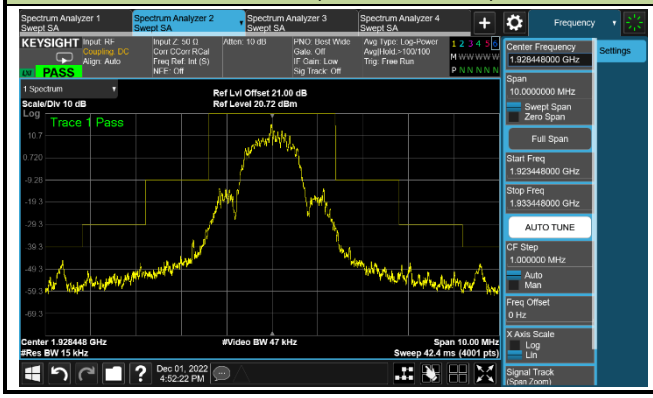
ANSI C63.17, Clause 6.1.6.1

6.6.3. Test Setup



6.6.4. Test Result

Test Site	WZ-SR4	Test Engineer	Dandy Li
Test Date	2022-12-01		

In-Band Unwanted Emissions	
Channel 04 (1921.536MHz)	Channel 02 (1924.992MHz)
	
Channel 00 (1928.448MHz)	
	

6.7. Out-of-Band Emissions, Conducted

6.7.1. Test Limit

f ≤ 1.25 MHz outside UPCS band: ≤ -9.5dBm

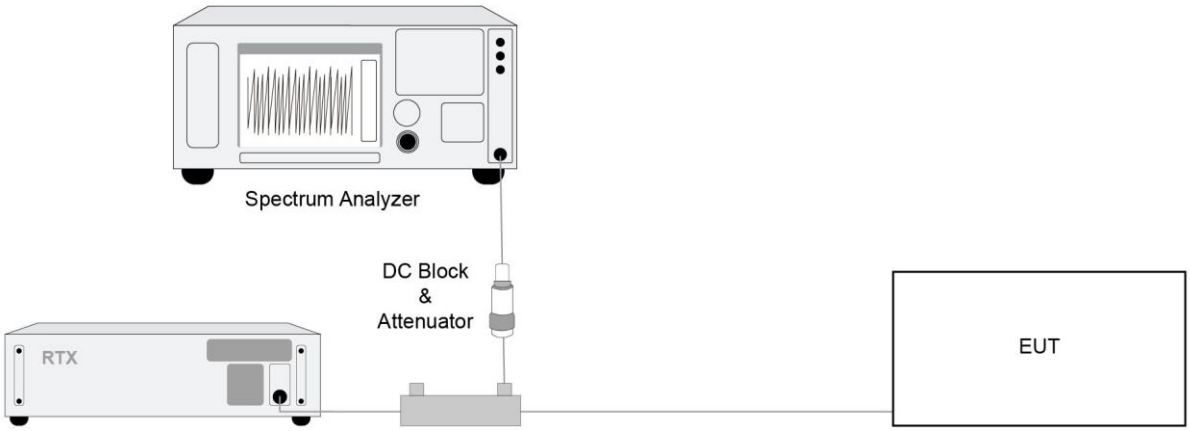
1.25 MHz ≤ f ≤ 2.5 MHz outside UPCS band: ≤ -29.5dBm

f ≤ 2.5 MHz outside UPCS band: ≤ -39.5dBm

6.7.2. Test Procedure

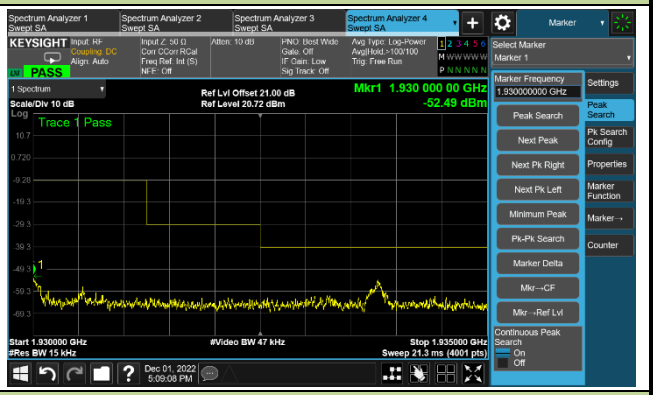
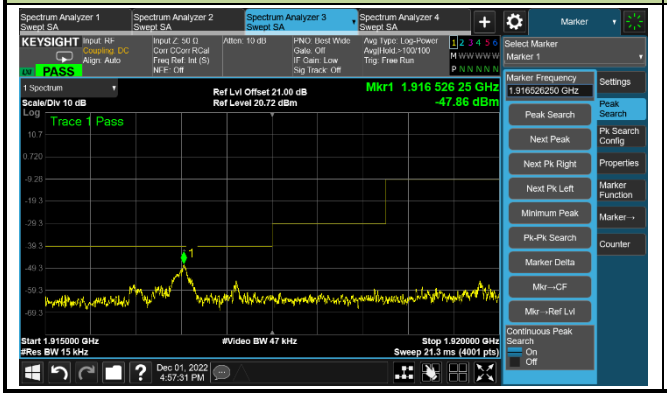
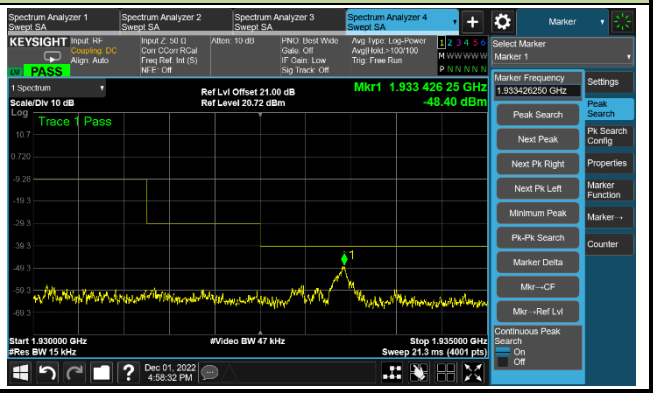
ANSI C63.17, Clause 6.1.6.2

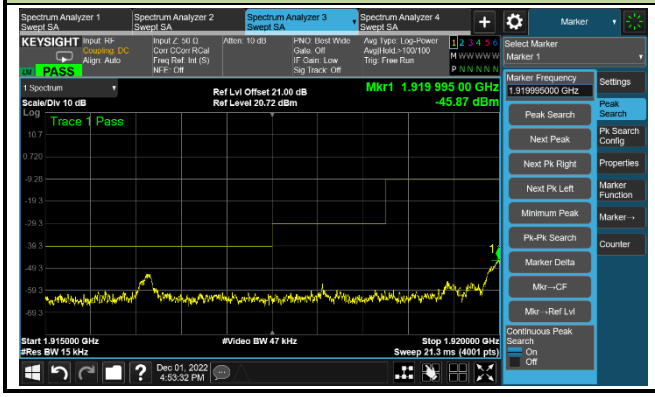
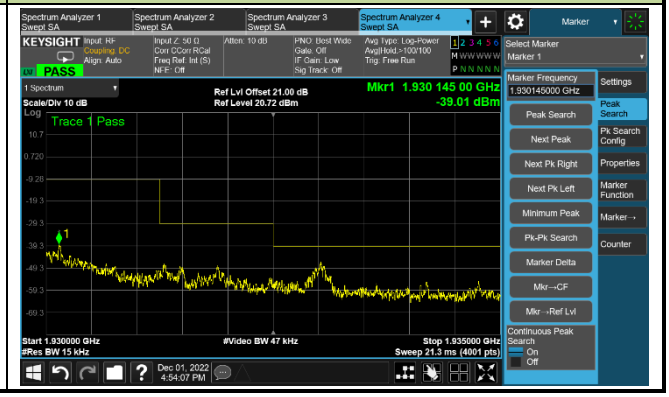
6.7.3. Test Setup



6.7.4. Test Result

Test Site	WZ-SR4	Test Engineer	Dandy Li
Test Date	2022-12-01		

Out-Band Unwanted Emissions – Channel 04	
1.915GHz ~ 1.92GHz	1.93GHz ~ 1.935GHz
	
Out-Band Unwanted Emissions –Channel 02	
1.915GHz ~ 1.92GHz	1.93GHz ~ 1.935GHz
	

Out-Band Unwanted Emissions –Channel 00	
1.915GHz ~ 1.92GHz	1.93GHz ~ 1.935GHz
	

6.8. Radiated Spurious Emission Measurement

6.8.1. Test Limit

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

6.8.2. Test Procedure

ANSI C63.10 Section 6.3 (General Requirements)

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

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

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

6.8.3. Test Setting

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

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

5. Sweep time = auto couple

6. Trace was allowed to stabilize

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 (Method VB)

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest

2. RBW = 1MHz

3. VBW; If the EUT is configured to transmit with duty cycle ≥ 98%, set VBW = 10 Hz.

If the EUT duty cycle is < 98%, set VBW ≥ 1/T. T is the minimum transmission duration.

4. Detector = Peak

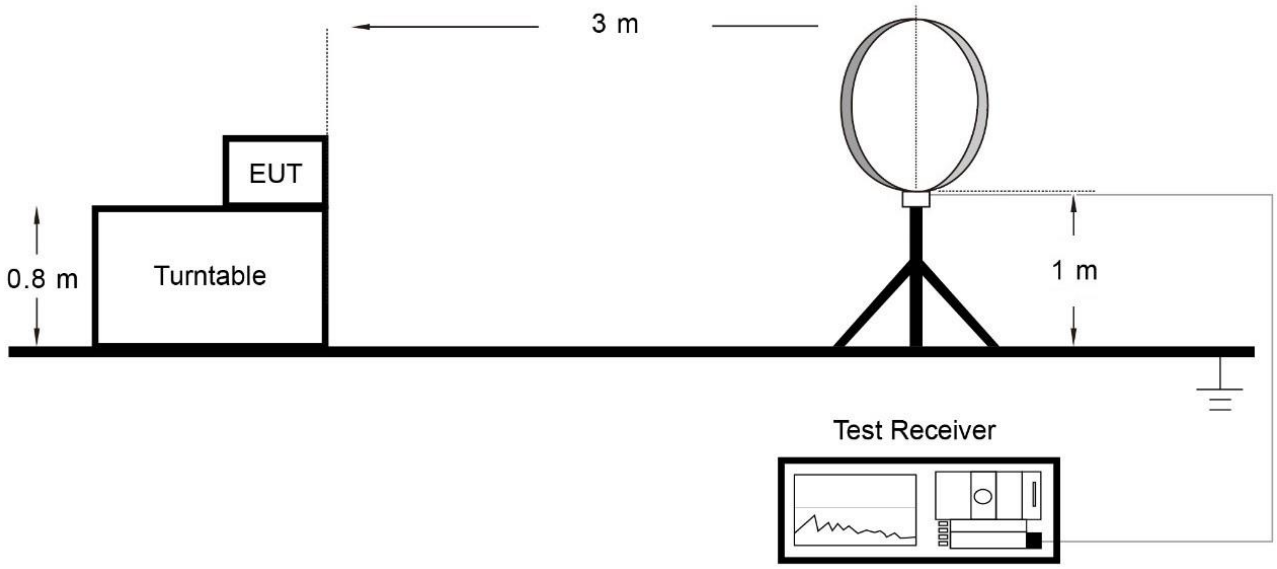
5. Sweep time = auto

6. Trace mode = max hold

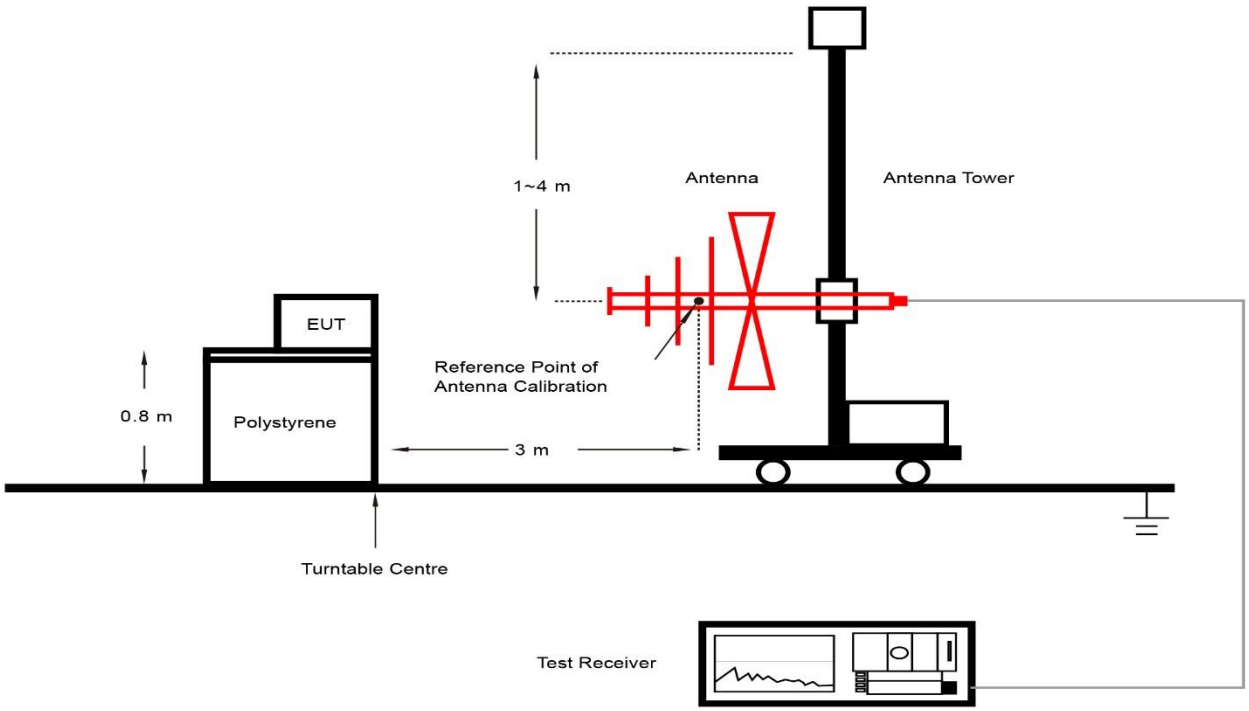
7. Trace was allowed to stabilize

6.8.4. Test Setup

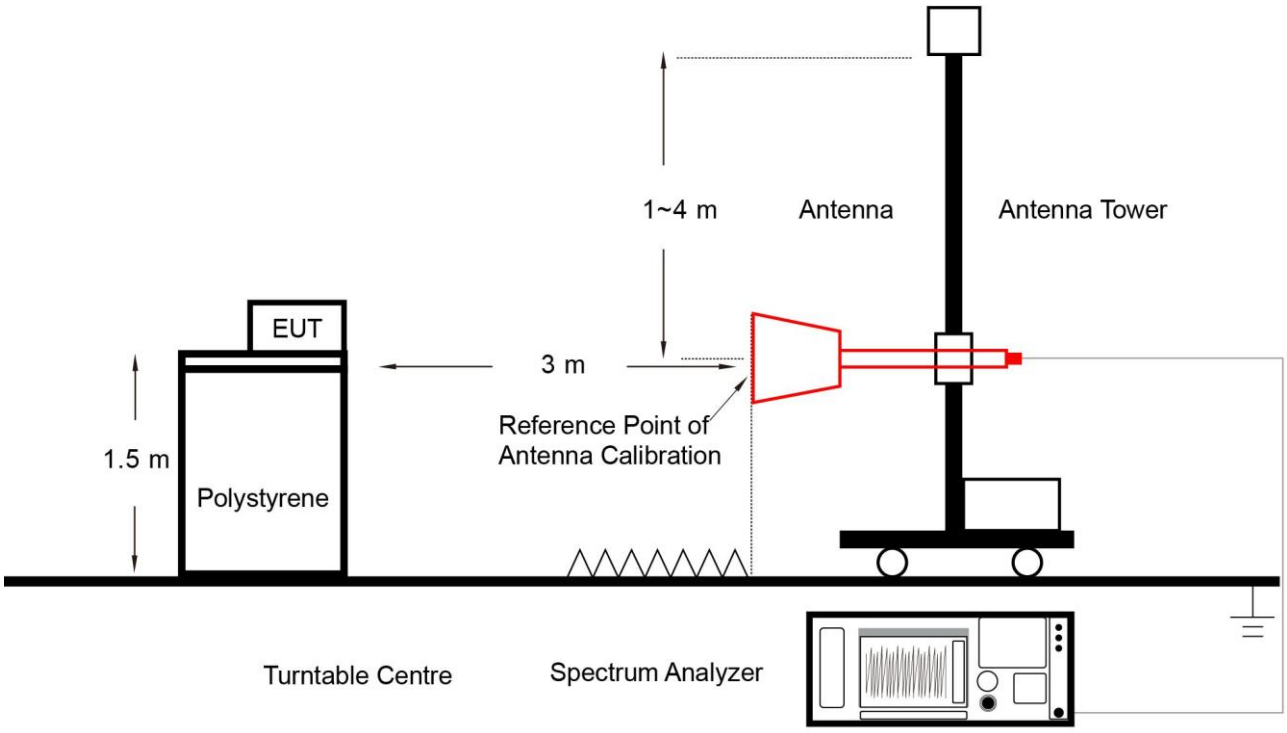
Below 30MHz Test Setup:



Below 1GHz Test Setup:



Above 1GHz Test Setup:



6.8.5. Test Result

Test Site	WZ-AC2	Test Engineer	Bob Zhang
Test Date	2022-12-04	Test Antenna	Antenna A
Remark	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

Test Channel	Frequency (MHz)	Reading Level (dBμV)	Factor (dB/m)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
00	3856.0	48.0	-0.1	47.9	74.0	-26.1	Peak	Horizontal
	4663.5	35.3	4.1	39.4	74.0	-34.6	Peak	Horizontal
	11285.0	31.3	17.8	49.1	74.0	-24.9	Peak	Horizontal
	3856.0	48.8	-0.1	48.7	74.0	-25.3	Peak	Vertical
	7715.0	39.2	11.3	50.5	74.0	-23.5	Peak	Vertical
	11208.5	30.6	17.6	48.3	74.0	-25.7	Peak	Vertical
02	3847.5	48.2	-0.2	48.0	74.0	-26.0	Peak	Horizontal
	7698.0	33.0	11.0	44.0	74.0	-30.0	Peak	Horizontal
	11506.0	31.2	17.7	48.9	74.0	-25.1	Peak	Horizontal
	3847.5	46.0	-0.2	45.8	74.0	-28.2	Peak	Vertical
	7698.0	40.6	11.0	51.6	74.0	-22.4	Peak	Vertical
	11565.5	30.7	17.9	48.6	74.0	-25.4	Peak	Vertical
04	3847.5	46.9	-0.2	46.7	74.0	-27.3	Peak	Horizontal
	7689.5	38.7	11.1	49.8	74.0	-24.2	Peak	Horizontal
	10987.5	31.6	17.0	48.6	74.0	-25.4	Peak	Horizontal
	4723.0	35.5	4.4	39.8	74.0	-34.2	Peak	Vertical
	7681.0	41.9	11.1	53.0	74.0	-21.0	Peak	Vertical
	11149.0	31.6	17.1	48.7	74.0	-25.3	Peak	Vertical

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

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

Test Site	WZ-AC2	Test Engineer	Bob Zhang
Test Date	2023-05-18	Test Antenna	Antenna B
Remark	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

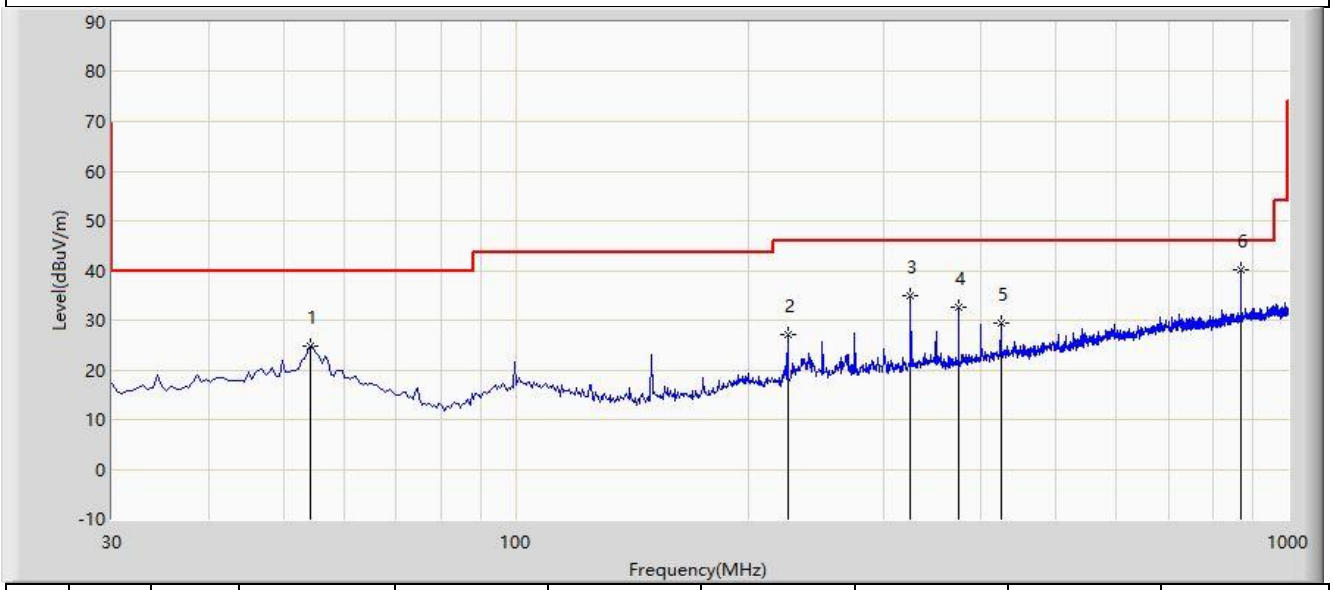
Test Channel	Frequency (MHz)	Reading Level (dBμV)	Factor (dB/m)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
00	3856.0	47.2	-0.2	47.0	74.0	-27.0	Peak	Horizontal
	7715.0	39.2	11.1	50.3	74.0	-23.7	Peak	Horizontal
	11531.5	31.1	17.3	48.4	74.0	-25.6	Peak	Horizontal
	3856.0	43.2	-0.2	43.0	74.0	-31.0	Peak	Vertical
	7715.0	34.6	11.1	45.7	74.0	-28.3	Peak	Vertical
	11191.5	31.8	16.8	48.6	74.0	-25.4	Peak	Vertical
02	3847.5	51.2	-0.3	50.9	74.0	-23.1	Peak	Horizontal
	7698.0	35.9	11.1	47.0	74.0	-27.0	Peak	Horizontal
	11650.5	32.4	17.8	50.2	74.0	-23.8	Peak	Horizontal
	3847.5	44.9	-0.3	44.6	74.0	-29.4	Peak	Vertical
	7698.0	36.3	11.1	47.4	74.0	-26.6	Peak	Vertical
	11225.5	30.0	16.8	46.8	74.0	-27.2	Peak	Vertical
04	3839.0	50.9	-0.4	50.5	74.0	-23.5	Peak	Horizontal
	7681.0	36.6	11.1	47.7	74.0	-26.3	Peak	Horizontal
	11718.5	30.9	17.8	48.7	74.0	-25.3	Peak	Horizontal
	3839.0	45.6	-0.4	45.2	74.0	-28.8	Peak	Vertical
	7494.0	32.0	11.9	43.9	74.0	-30.1	Peak	Vertical
	11123.5	32.1	16.3	48.4	74.0	-25.6	Peak	Vertical

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

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

The Worst Result of Radiated Emission below 1GHz:

Site: WZ-AC2	Test Data: 2022-12-04
Limit: FCC_Part15.209_RSE(3m)	Engineer: Bob Zhang
Probe: VULB9162_30-7000MHz	Polarity: Horizontal
EUT: Wireless Microphone	Power: By Adapter
Test Mode: Transmit at channel 00	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBμV/m)	Reading Level (dBμV)	Margin (dB)	Limit (dBμV/m)	Factor (dB/m)	Type
1			54.250	24.673	4.347	-15.327	40.000	20.326	PK
2			224.970	27.107	8.396	-18.893	46.000	18.711	PK
3			324.880	34.855	13.395	-11.145	46.000	21.460	PK
4			374.835	32.749	10.079	-13.251	46.000	22.670	PK
5			424.790	29.503	5.838	-16.497	46.000	23.665	PK
6		*	869.535	40.283	9.507	-5.717	46.000	30.776	PK

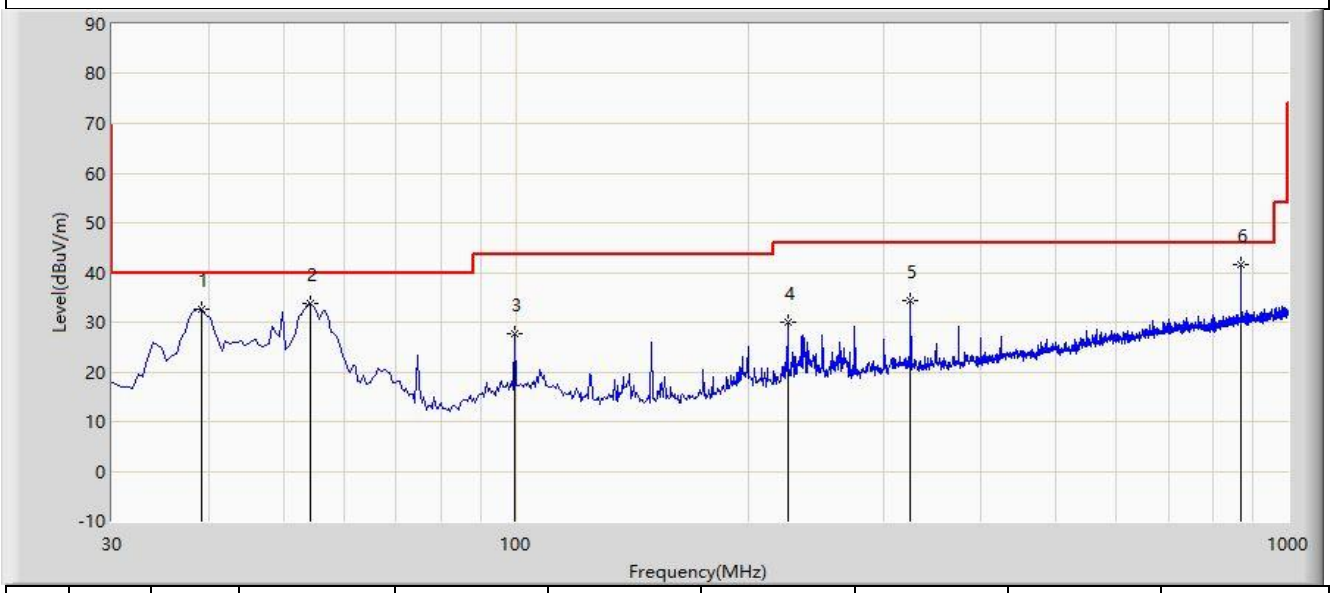
Note 1: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB/m)

Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m)

Note 2: QP measurement was not performed when peak measure level was lower than the QP limit.

Note 3: The amplitude of radiated emissions (frequency range from 9kHz to 30MHz and 18GHz to 20GHz) 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.

Site: WZ-AC2	Test Data: 2022-12-04
Limit: FCC_Part15.209_RSE(3m)	Engineer: Bob Zhang
Probe: VULB9162_30-7000MHz	Polarity: Vertical
EUT: Wireless Microphone	Power: By Adapter
Test Mode: Transmit at channel 00	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB/m)	Type
1			39.215	32.529	14.057	-7.471	40.000	18.473	PK
2			54.250	33.744	13.418	-6.256	40.000	20.326	PK
3			99.840	27.752	9.253	-15.748	43.500	18.499	PK
4			224.970	29.916	11.205	-16.084	46.000	18.711	PK
5			324.880	34.462	13.002	-11.538	46.000	21.460	PK
6		*	869.535	41.689	10.913	-4.311	46.000	30.776	PK

Note 1: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB/m)

Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m)

Note 2: QP measurement was not performed when peak measure level was lower than the QP limit.

Note 3: The amplitude of radiated emissions (frequency range from 9kHz to 30MHz and 18GHz to 20GHz) 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.

6.9. Frame Repetition Stability and Period and Jitter

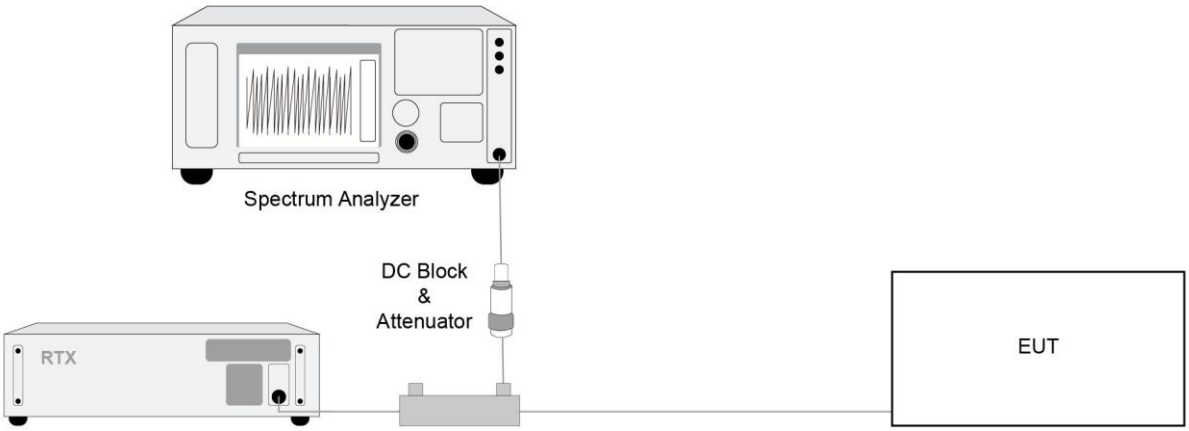
6.9.1. Test Limit

The frame period (a set of consecutive time slots in which the position of each time slot can be identified by reference to a synchronizing source) of an intentional radiator operating in this band shall be 20 milliseconds or 10 milliseconds/X where X is a positive whole number. Each device that implements time division for the purposes of maintaining a duplex connection on a given frequency carrier shall maintain a frame repetition rate with a frequency stability of at least 50 parts per million (ppm). Each device which further divides access in time in order to support multiple communication links on a given frequency carrier shall maintain a frame repetition rate with a frequency stability of at least 10 ppm. The jitter (time-related, abrupt, spurious variations in the duration of the frame interval) introduced at the two ends of such a communication link shall not exceed 25 microseconds for any two consecutive transmissions. Transmissions shall be continuous in every time and spectrum window during the frame period defined for the device.

6.9.2. Test Procedure

ANSI C63.17, Clause 6.2.2 & 6.2.3

6.9.3. Test Setup



6.9.4. Test Result

Test Site	WZ-SR4	Test Engineer	Dandy Li
Test Date	2022-12-04		

Carrier Frequency (MHz)	Frame Repetition Stability (ppm)					Limit (ppm)
	Standard deviation		Frame Repetition Stability			
1924.992	0.162		0.486			±10
Carrier Frequency (MHz)	Frame Jitter (us)					Limit (us)
	min	mean	max	△min	△max	
1924.992	-0.2	0	0.2	-0.2	0.2	±25

6.10. Carrier Frequency Stability

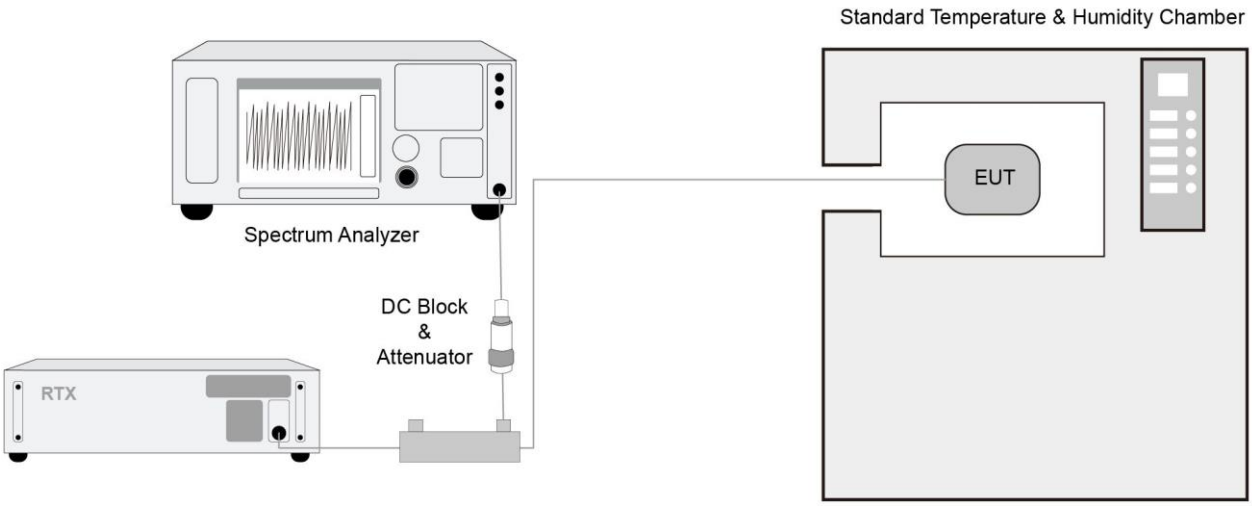
6.10.1. Test Limit

Per §15.323(f), the frequency stability of the carrier frequency of the intentional radiator shall be maintained within ±10 ppm over 1 hour or the interval between channel access monitoring, whichever is shorter. The frequency stability shall be maintained over a temperature variation of −20°C to +50°C at normal supply voltage, and over a variation in the primary supply voltage of 85 percent to 115 percent of the rated supply voltage at a temperature of 20 °C. For equipment that is capable only of operating from a battery, the frequency stability tests shall be performed using a new battery without any further requirement to vary supply voltage.

6.10.2. Test Procedure

ANSI C63.17, Clause 6.2.1

6.10.3. Test Setup



6.10.4. Test Result

Test Site	WZ-TR3	Test Engineer	Dandy Li
Test Date	2022-12-04		

Carrier Frequency Stability over Time at Nominal Temperature

Average Mean Carrier Frequency (MHz)	Max. Diff. (kHz)	Min. Diff. (kHz)	Max Dev. (ppm)	Limit (ppm)
1924.99325	6.7	1.0	2.83	±10

Carrier Frequency Stability over Temperature

Voltage	Average Mean Carrier Frequency (MHz)	Max. Diff (kHz)	Deviation (ppm)	Limit (ppm)
T = +20°C	1924.99325	Ref	Ref	±10
T = 0°C		6.5	2.73	
T = +50°C		6.3	2.62	

Note 1: Mean. Diff = Average Mean Carrier Frequency – Carrier Frequency

Deviation ppm = ((Max. Diff. - Mean. Diff.) / Mean Carrier Freq.) x 10^6.

Note 2: This sample is powered by batteries, so the stability over power supply voltage is not applicable.

6.11. Listen Before Transmit (LBT)

6.11.1. Test Limit

Monitoring Time Requirements

Immediately prior to initiating transmission, devices must monitor the combined time and spectrum window in which they intend to transmit. For a period of at least 10 milliseconds for systems designed to use a 10 milliseconds or shorter frame period or at least 20 milliseconds for systems designed to use a 20 milliseconds frame period.

Monitoring Threshold

The monitoring threshold must not be more than 30 dB above the thermal noise power for a bandwidth equivalent to the emission bandwidth of the device.

Calculation of monitoring threshold limits for isochroous devices:

Monitoring threshold: $T_L = -174+10Log_{10}B + M_u + P_{MAX} - P_{EUT}$ (dBm)

Where: B=Emission bandwidth (Hz)

M_u=dB the threshold may exceed thermal noise (30dB)

$P_{MAX}=5*Log_{10}B-10$(dBm)

P_{EUT}=Transmitted power (dBm)

Monitor Threshold	B (MHz)	M_U (dB)	P_{MAX} (dBm)	P_{EUT} (dBm)	Threshold (dBm)
T_L	1.393	30	20.72	20.58	-82.42

The EUT must not transmit until the interference level is less than or equal to:

Measured Threshold Level $\leq T_L + U_m$ = -82.42 + 6 = -76.42dBm

Maximum Transmit Period

If no signal above the threshold level is detected, transmission may commence and continue with the same emission bandwidth in the monitored time and spectrum windows without further monitoring. However, occupation of the same combined time and spectrum windows by a device or group of cooperating devices continuously over a period of time longer than 8 h is not permitted without repeating the access criteria.

System Acknowledgement

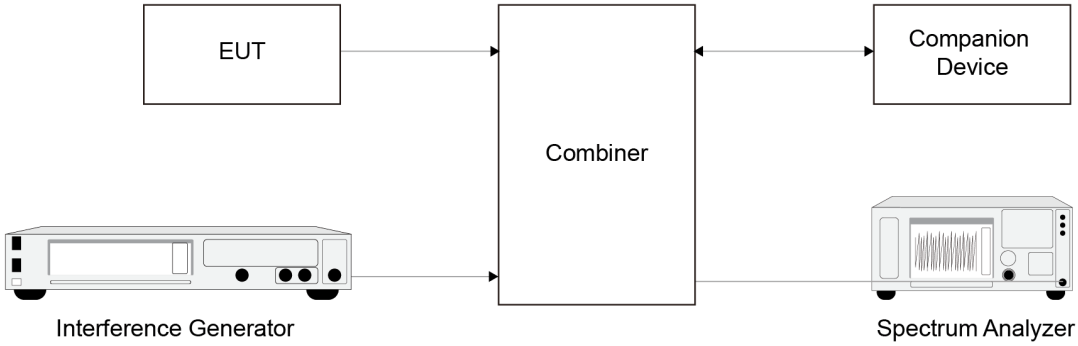
Once access to specific combined time and spectrum windows is obtained an acknowledgement from a system participant must be received by the initiating transmitter within one second or transmission must cease. Periodic acknowledgements must be received at least every 30 s or transmission must cease. Channels used exclusively for control and signaling information may transmit continuously for 30 s without receiving an

acknowledgement, at which time the access criteria must be repeated.

6.11.2. Test Procedure

ANSI C63.17, Clause 7.3 & 8.2.

6.11.3. Test Setup



6.11.4. Test Result

Test Site	WZ-SR4	Test Engineer	Dandy Li
Test Date	2022-12-04		

Monitoring Time Requirements

Interference ref. to ANSI C63.17 clause 7.3.3	Reaction of EUT	Results
Apply the interference on f1 at level T_L+U_M +20, and no interference on f2. Initiate transmission and verify the transmission on f2.	EUT transmits on f2	Pass
Apply the interference on f2 at level T_L+U_M +20, at the same time, no interference on f1. After about 20ms, initiate transmission and verify the transmission on f1.	EUT transmits on f1	Pass

Monitoring Threshold Requirements

The test is not applicable, because the EUT supports at least of 20 duplex system access channels and implements Least Interfered Channel (LIC) algorithm.

Maximum Transmit Period

Test ref. to ANSI C63.17 clause 8.2.2	Observation	Verdict
Transmission duration on same time and frequency window	Only for initiating device that controls which time slot is used	N/A

System Acknowledgements

Test ref. to ANSI C63.17 clause 8.2.1	Observation	Verdict
Initial transmission without acknowledgements	Not applicable for EUT that transmits control and signaling information	N/A
Transmission time after loss of acknowledgements	4.7 sec	Pass

6.12. Least Interfered Channel (LIC) Requirements

6.12.1. Test Limit

LIC Selection

If access to spectrum is not available as determined by the above, and a minimum of 20 duplex system access channels are defined for the system, the time and spectrum windows with the lowest power level may be accessed.

Least Interfered Channel Confirmation

A device utilizing the provisions of this paragraph must have monitored all access channels defined for its system within the last 10 s and must verify, within the 20ms (40ms for devices designed to use a 20 ms frame period) immediately preceding actual channel access, that the detected power of the selected time and spectrum windows is no higher than the previously detected value.

Power Measurement Resolution

The power measurement resolution for this comparison must be accurate to within 6dB.

Maximum Spectrum Occupancy

No device or group of co-operating devices located within 1 m of each other shall, during any frame period, occupy more than 6 MHz of aggregate bandwidth, or alternatively, more than one third of the time and spectrum windows defined by the system.

6.12.2. Test Procedure

ANSI C63.17, Clause 7.3.2 & 7.3.3

6.12.3. Test Result

Test Site	WZ-SR4	Test Engineer	Dandy Li
Test Date	2022-12-06		

LIC Selection

The customer claims the product supports a minimum of 20 duplex system access channels.

Least Interfered Channel Confirmation

The test result is reported in section 6.11.

Power Measurement Resolution

Test ref. to ANSI C63.17 clause 7.3.2	Observation	Verdict
b) Apply interference to the EUT on f_1 at a level of T_L + U_M + 7dB and on f_2 at a level of T_L + U_M. Initiate transmission. The EUT should transmit on f_2. Terminate the connection. Repeat five times.	EUT transmit on f_2	Pass
c) Apply interference to the EUT on f_1 at a level of T_L + U_M and on f_2 at a level of T_L + U_M + 7dB. Initiate transmission. The EUT should transmit on f_1. Terminate the connection. Repeat five times.	EUT transmit on f_1	Pass
d) Apply interference to the EUT on f_1 at a level of T_L + U_M + 1dB and on f_2 at a level of T_L + U_M − 6dB. Initiate transmission. If the EUT transmits on f_2, terminate the connection. Repeat five times.	EUT transmit on f_2	Pass
e) Apply interference to the EUT on f_1 at a level of T_L + U_M + 1dB and on f_2 at a level of T_L + U_M − 6dB. Initiate transmission. If the EUT transmits on f_2, terminate the connection. Repeat five times.	EUT transmit on f_1	Pass

Maximum Spectrum Occupancy

According to the technical description provided, the total number of the time and spectrum windows defined by the system is more than 20.

During any frame period, the maximum number of different channels will be 5, which is less than one third of the time and spectrum windows defined by the system.

6.13. Random waiting Requirements

6.13.1. Test Limit

If the selected combined time and spectrum windows are unavailable, the device may either monitor and select different windows or seek to use the same window after waiting an amount of time, randomly chosen from a uniform random distribution between 10 and 150 milliseconds, commencing when the channel becomes available.

6.13.2. Test Procedure

ANSI C63.17, Clause 8.1.3

6.13.3. Test Result

For systems that do implement the LIC algorithm and offer at least 20 duplex communications channels, the test is not applicable.

6.14. Monitoring Requirements

6.14.1. Test Limit

Threshold and LIC Monitoring Bandwidth

The monitoring system bandwidth must be equal to or greater than the emission bandwidth of the intended transmission.

Reaction Time and Monitoring Interval

The monitoring system shall have a maximum reaction time less than 50 × SQRT (2.5/emission bandwidth in MHz) μs for signals at the applicable threshold level but shall not be required to be less than 50μs. If a signal is detected that is 6 dB or more above the applicable threshold level, the maximum reaction time shall be 35 × SQRT (2.5/emission bandwidth in MHz) μs but shall not be required to be less than 35μs. and have a maximum reaction time less than 50xSQRT (1.25/emission bandwidth in MHz) microseconds for signals at the applicable threshold level but shall not be required to be less than 50 microseconds.

6.14.2. Test Procedure

ANSI C63.17, Clause 7.4 & 7.5

6.14.3. Test Result

Test Site	WZ-SR4	Test Engineer	Dandy Li
Test Date	2022-12-06		

Monitoring Bandwidth

Monitoring bandwidth of the EUT is equal to the occupied bandwidth of the intended transmission.

Monitoring is made through the radio receiver used by the EUT for communication.

Monitoring Reaction Time

Test Equation (μs)	B (MHz)	Pulse width(μs)
$50\ (1.25/B)^{1/2}$	1.393	47.36
$25\ (1.25/B)^{1/2}$	1.393	23.68

Test ref. to ANSI C63.17 clause 7.5	Observation	Verdict
1) Additionally apply a CW signal on f_2 at the level T_L and interference pulse on f_1 at level T_L+U_M to the receive port of the EUT. Verify that the EUT establishes a connection only on f_2 when the width of the interference pulse exceeds 50μs.	EUT transmit on f_2	Pass
2) Change the time-synchronized, pulsed interference on f_1 to the level T_L + U_M + 6dB. Verify that the EUT establishes a connection only on f_2 when the width of the interference pulse exceeds 35μs.	EUT transmit on f_2	Pass

6.15. Monitoring Antenna Requirements

6.15.1. Test Limit

The monitoring system shall use the same antenna used for transmission, or an antenna that yields equivalent reception at that location.

6.15.2. Test Procedure

ANSI C63.17 Clause 4

6.15.3. Test Result

The antenna of the EUT used for transmission is the same interior antenna that used for monitoring.

6.16. Monitoring Threshold Relaxation Requirements

6.16.1. Test Limit

Devices that have a power output Lowest than the maximum permitted under the rules can increase their monitoring detection threshold by one decibel for each one decibel that the transmitter power is below the maximum permitted.

6.16.2. Test Procedure

ANSI C63.17 Clause 4

6.16.3. Test Result

This requirement is covered by the results of Least Interfered Channel (LIC).

6.17. Duplex System LBT

6.17.1. Test Limit

An initiating device may attempt to establish a duplex connection by monitors both its intended transmit and receive time and spectrum windows. If both the intended transmit and receive time and spectrum windows meet the access criteria, then the initiating device can initiate a transmission in the intended transmit time and spectrum window. If the power detected by the responding device can be decoded as a duplex connection signal from the initiating device, then the responding device may immediately begin transmitting on the receive time and spectrum window monitored by the initiating device.

6.17.2. Test Procedure

ANSI C63.17, Clause 8.3.1 & 8.3.2

6.17.3. Test Result

The test is not applicable. Because the test is only applicable for EUT that can be initiating device.

6.18. Alternative monitoring interval for co-located devices Requirements

6.18.1. Test Limit

An initiating device that is prevented from monitoring during its intended transmit window due to monitoring system blocking from the transmissions of a co-located (within one meter) transmitter of the same system, may monitor the portions of the time and spectrum windows in which they intend to receive over a period of at least 10 milliseconds. The monitored time and spectrum window must total at least 50 percent of the 10 milliseconds frame interval and the monitored spectrum must be within 1.25 MHz of the center frequency of channel(s) already occupied by that device or co-located co-operating devices. If the access criteria is met for the intended receive time and spectrum window under the above conditions, then transmission in the intended transmit window by the initiating device may commence.

6.18.2. Test Procedure

ANSI C63.17, Clause 8.4

6.18.3. Test Result

The test is not applicable. Because the test is only applicable for EUT that can be initiating device.

6.19. Fair Access

6.19.1. Test Limit

The provisions of (c)(10) or (c)(11) shall not be used to extend the range of spectrum occupied over space or time for the purpose of denying fair access to spectrum to other devices.

6.19.2. Test Result

The test is not applicable. Because the test is only applicable for EUT that can be initiating device.

6.20. Automatic Discontinuation of Transmission

Does the EUT transmit Control and Signaling Information?	☒Yes	☐No
Does the EUT support Least Interfered Channel algorithm?	☒Yes	☐No
Type of EUT	☐Initiating Device	☒Responding Device

The following tests simulate the reaction of the EUT in case of either absence of information to transmit or operational failure after a connection with the companion device is established.

Number	Test	EUT Reaction	Verdict
1	Power Removed from EUT	A	Pass
2	Switch off EUT	N/A	Pass
3	Power Removed from Companion Device	B	Pass
4	Switch off Companion Device	B	Pass

A - Connection breakdown, Cease of all transmissions

B - Connection breakdown, EUT transmits control and signaling information

C - Connection breakdown, Companion Device transmits control and signaling information

N/A - Not Applicable (EUT does not have on/off switch)

Requirements, FCC 15.319(f)

The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude transmission of control and signaling information or use of repetitive codes used by certain digital technologies to complete frame or burst intervals.

Appendix A - Test Setup Photograph

Refer to “2211RSU054-UT” file.

Appendix B - EUT Photograph

Refer to “2211RSU054-UE” file.

The End