FCC Part 15 C

EMI TEST REPORT

of

E.U.T. : Wireless Audio System
FCC ID. : INGSPT-1T
Model No. : SPT-1T
Working Frequency : 470-608 MHz

for

APPLICANT : JTS Professional Co., Ltd.
ADDRESS : No. 148, Gongye 9th Road, Tali Dist., Taichung City 41280 Taiwan, R.O.C.

Test Performed by

Taiwan Testing and Certification Center
No.34, Dingfu, Linkou Dist., New Taipei City 244, Taiwan (R.O.C.)
TEL : (02)26023052 FAX : (02)26010910
http:// www.etc.org.tw ; e-mail:emc@etc.org.tw

Report Number : 21-10-RBF-015-09

TEST REPORT CERTIFICATION

Applicant	:	JTS Professional Co., Ltd. No. 148, Gongye 9th Road, Tali Dist., Taichung City 41280 Taiwan, R.O.C.
Manufacturer	:	JTS Professional Co., Ltd. No. 148, Gongye 9th Road, Tali Dist., Taichung City 41280 Taiwan, R.O.C.
Description of EUT	:	
a) Type of EUT	:	Wireless Audio System
b) Trade Name	:	JTS
c) Model No.	:	SPT-1T
d) FCC ID	:	INGSPT-1T
e) Working Frequency	:	470-608 MHz
f) Type of Modulation	:	FM
g) Antenna	:	1.67 dBi (monopole ANT)
h) Power Supply	:	Input:100~240VAC~50/60Hz 0.5A max.

Regulation Applied : FCC Rules and Regulations Part 15 Subpart C

I HEREBY CERTIFY THAT; The data shown in this report were made in accordance with the procedures given in FCC Rules Part 15.236, ETSI EN 300 422-1, ANSI C63.10-2013, and the energy emitted by the device was founded to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these data.

Summary of Tests

Test	Results
RF Power Output	**Pass**
Occupied Bandwidth	**Pass**
Emission Mask	**Pass**
Radiated Spurious Emission	**Pass**
Frequency Stability	**Pass**
Line Conducted Emission	**Pass**

Issued Date : Dec. 07, 2023

Test Engineer : Brian Huang

(Brian Huang, Engineer)

Approve & Authorized : Kevin Lee

Kevin Lee
Section Manager of EMC Testing Department II

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1. GENERAL INFORMATION

1.1 Product Description

a) Type of EUT	:	Wireless Audio System
b) Trade Name	:	JTS
c) Model No.	:	SPT-1T
d) FCC ID	:	INGSPT-1T
e) Working Frequency	:	470-608 MHz
f) Type of Modulation	:	FM
g) Antenna	:	1.67 dBi (monopole ANT)
h) Power Supply	:	Input:100~240VAC~50/60Hz 0.5A max.

1.2 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.10-2013 and section 15.236 of Part 15C. Test also follow "TIA-603-E(2016)-Land Mobile FM or PM Communications Equipment Measurement and Performance Standsrds" and section 2.1046, 1049, and 2.1055 of Part 2 of CFR 47. Other required measurements were illustrated in separate sections of this test report for details.

Measueement Software

Software	Version	Note
e3	Version 6.100618f	Radiated Emission Test
e3	Version 6.100421	Conducted Emission Test

1.3 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located on the roof top of Building at No.34, Lin 5, Dingfu Vil., Linkou Dist., New Taipei City, Taiwan 24442, R.O.C.

Designation Number: TW2628.

2. REQUIREMENTS OF PROVISIONS

2.1 Definition

Wireless Microphone.
An intentional radiator that converts sound into electrical audio signals that are transmitted using radio signals to a receiver which converts the radio signals back into audio signals that are sent through a sound recording or amplifying system. Wireless microphones may be used for cue and control communications and synchronization of TV camera signals as defined in §74.801 of this chapter. Wireless microphones do not include auditory assistance devices as defined in §15.3(a) of this part.

2.2 Frequencies Available

According to section. 15.236 of Part 15, the following frequencies are available for wireless microphones :

Frequencies (MHz)

54.000-72.000	470.000-608.000
76.000-88.000	614.000-698.000
174.000-216.000	

2.3 Requirements for Radio Equipment on Certification

(1) RF Power Output

FCC15.236 (d)

The maximum radiated power shall not exceed the following values:

(1) In the 600 MHz guard band and the 600 MHz duplex gap: 20 mW EIRP.

Operation of wireless microphones in the bands ：657-663MHz

(2) Occupied Bandwidth

FCC15.236 (f)(2)

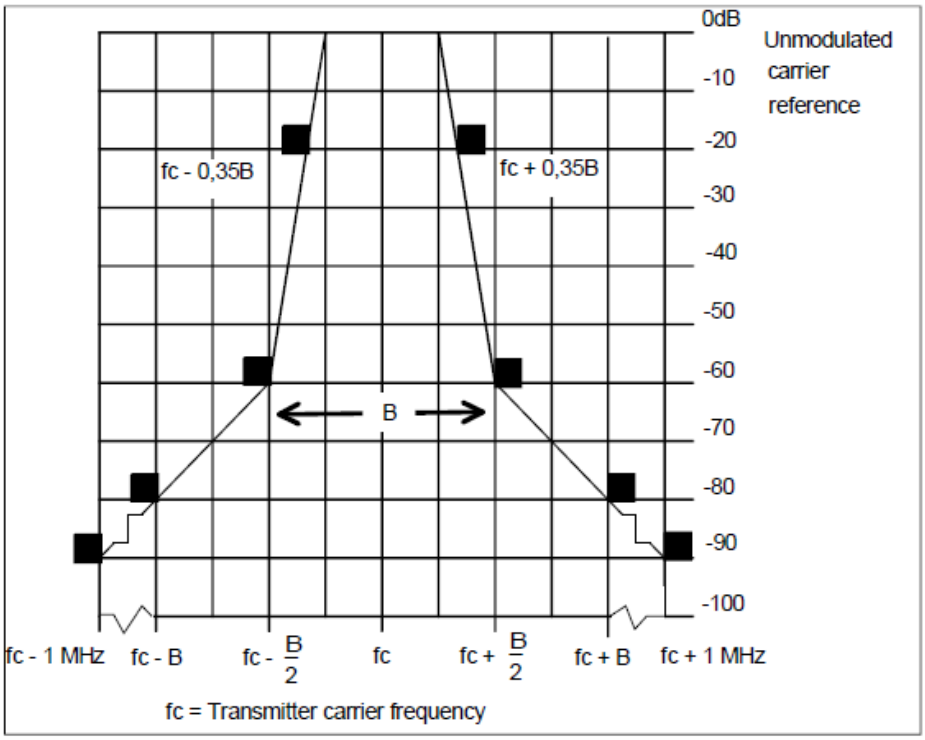
One or more adjacent 25 kHz segments within the assignable frequencies may be combined to form a channel whose maximum bandwidth shall not exceed 200 kHz. The operating bandwidth shall not exceed 200 kHz.

(3) Emission Mask

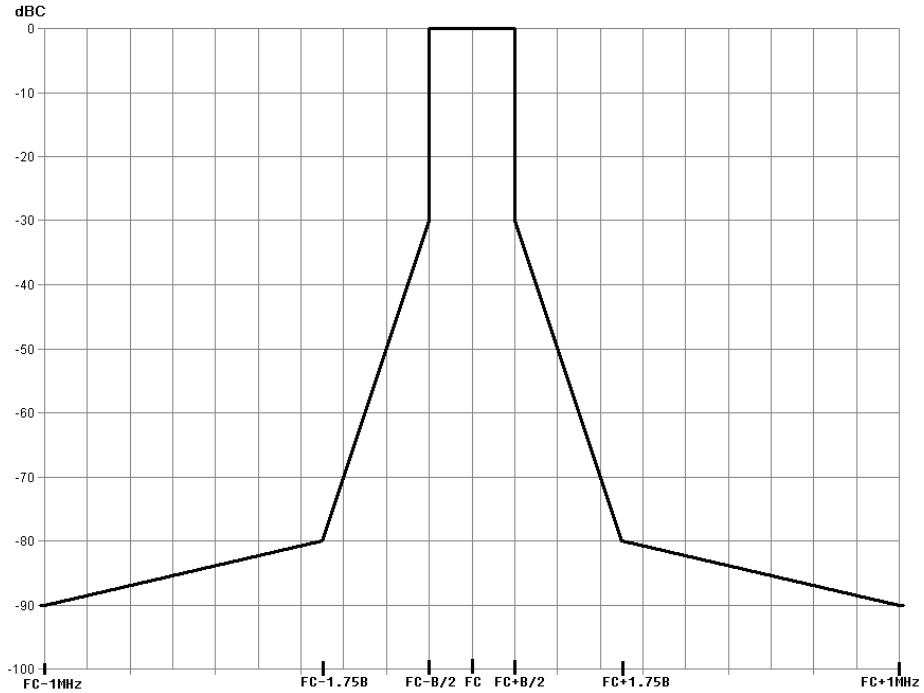
FCC15.236 (g)

Emissions within the band from one megahertz below to one megahertz above the carrier frequency shall comply with the emission mask in §8.3 of ETSI EN 300 422-1 V2.1.1 (2017-02), Electromagnetic compatibility and Radio spectrum Matters (ERM); Wireless microphones in the 25 MHz to 3 GHz frequency range; Part 1: Technical characteristics and methods of measurement. Emissions outside of this band shall comply with the limits specified in section 8.4 of ETSI EN 300 422-1 V2.1.1 (2017-02).

Spectrum mask for analogue systems in all bands (Limit According Subclause 8.3.1.2)



Spectrum mask for digital systems below 1 GHz (Limit According Subclause 8.3.2.2)



(4) Radiated Spurious Emission

FCC15.236 (g)

Emissions within the band from one megahertz below to one megahertz above the carrier frequency shall comply with the emission mask in §8.4 of ETSI EN 300 422-1 V2.1.1 (2017-02), Electromagnetic compatibility and Radio spectrum Matters (ERM); Wireless microphones in the 25 MHz to 3 GHz frequency range; Part 1: Technical characteristics and methods of measurement. Emissions outside of this band shall comply with the limits specified in section 8.4 of ETSI EN 300 422-1 V2.1.1 (2017-02).

(5) Frequency Stability

FCC15.236 (f)(3)

The frequency tolerance of the carrier signal shall be maintained within ±0.005% of the operating frequency over a temperature variation of −20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. Battery operated equipment shall be tested using a new battery.

(6) Conducted Emission Requirement

FCC15.207

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges.

Frequency MHz	Quasi Peak dBμV	Average dBμV
0.15 - 0.5	66-56	56-46
0.5 - 5.0	56	46
5.0 - 30.0	60	50

2.4 Labeling Requirement

Each equipment for which a type acceptance application is filed on or after May 1,1981, shall bear an identification plate or label pursuant to §2.925（Identification of equipment）and §2.926（FCC identifier）.

2.5 Measurement Uncertainty

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

Measurement	Frequency	Uncertainty
Conducted emissions	9kHz ~ 30MHz	±2.22dB (Mains)(LISN)
Effective Radiated Power	30MHz ~ 1GHz	±4.2dB (30MHz≦f≦300MHz)
		±4.44dB (300MHz＜f≦1GHz)
	Above 1GHz	±4.44dB (1GHz≦f≦18GHz)
Conducted Measurement	9kHz ~ 18GHz	±0.88dB (9kHz≦f≦30MHz)
		±0.88dB (30MHz＜f≦1GHz)
		±1.04dB (1GHz≦f≦18GHz)
Frequencies Tolerance (Ambient temperature & Supply voltage)	9kHz ~ 40GHz	$\pm 4.04 \times 10^{-8}$
Occupied Bandwidth	9kHz ~ 40GHz	±5%
Modulation Characteristics / Frequency deviation	9kHz ~ 1GHz	±1.38%

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

3. RF POWER OUTPUT MEASUREMENT

3.1 Provision Applicable

According to §2.1046, Measurements required: RF power output.

According to §15.236(d)(1), In the bands allocated and assigned for broadcast television and in the 600 MHz service band: 50 mW EIRP.
(maximum radiated power shall not exceed 50 milliwatts (EIRP)).
Operation of wireless microphones in the bands：470-608MHz

According to §15.236(d)(2), In the 600 MHz guard band and the 600 MHz duplex gap: 20 mW EIRP.
(maximum radiated power shall not exceed 20 milliwatts (EIRP)).
Operation of wireless microphones in the bands ：657-663MHz

3.2 Measurement Procedure

A. Preliminary Measurement For Portable Devices

For portable devices, the following procedure was performed to determine the maximum emission axis of EUT:

1. With the receiving antenna is H polarization, rotate the EUT in turns with three orthogonal axes to determine the axis of maximum emission.

2. With the receiving antenna is V polarization, rotate the EUT in turns with three orthogonal axes to determine the axis of maximum emission.

3. Compare the results derived from above two steps. So, the axis of maximum emission from EUT was determined and the configuration was used to perform the final measurement.

B. Final Measurement

1. Setup the configuration per figure 1 and 2 for frequencies measured below and above 1 GHz respectively. Turn on EUT and make sure that it is in normal function.

2. For emission frequencies measured below and above 1 GHz, a pre-scan is performed in a shielded chamber to determine the accurate frequencies & final measurement.

3. For emission frequencies measured below and above 1 GHz, set the spectrum analyzer on a 100 kHz and 1 MHz resolution bandwidth respectively for each frequency measured in step 2.

4. The search antenna is to be raised and lowered over a range from 1 to 4 meters in horizontally polarized orientation. Position the highness when the highest value is

indicated on spectrum analyzer, then change the orientation of EUT on test table over a range from 0 ◦ to 360 ◦ with a speed as slow as possible, and keep the azimuth that highest emission is indicated on the spectrum analyzer. Vary the antenna position again and record the highest value as a final reading. A RF test receiver is also used to confirm emissions measured.

5. Repeat step 4 until all frequencies need to be measured were complete.

6. Repeat step 5 with search antenna in vertical polarized orientations.

7. Check the three frequencies of highest emission with varying the placement of cables (if any) associated with EUT to obtain the worse case and record the result.

Note:
According to 12.7.2(d)(2) of ANSI C63.10-2013:

E[dBμV/m] = EIRP[dBm] + 95.2, for d = 3 m.

12.7.2(e) of ANSI C63.10-2013:

For conducted measurements below 1000 MHz, the field strength shall be computed as specified in item d), and then an additional 4.7 dB shall be added as an upper bound on the field strength that would be observed on a test range with a ground plane for frequencies between 30 MHz and 1000 MHz, or an additional 6 dB shall be added for frequencies below 30 MHz.

Figure 1 : Frequencies measured below 1 GHz configuration

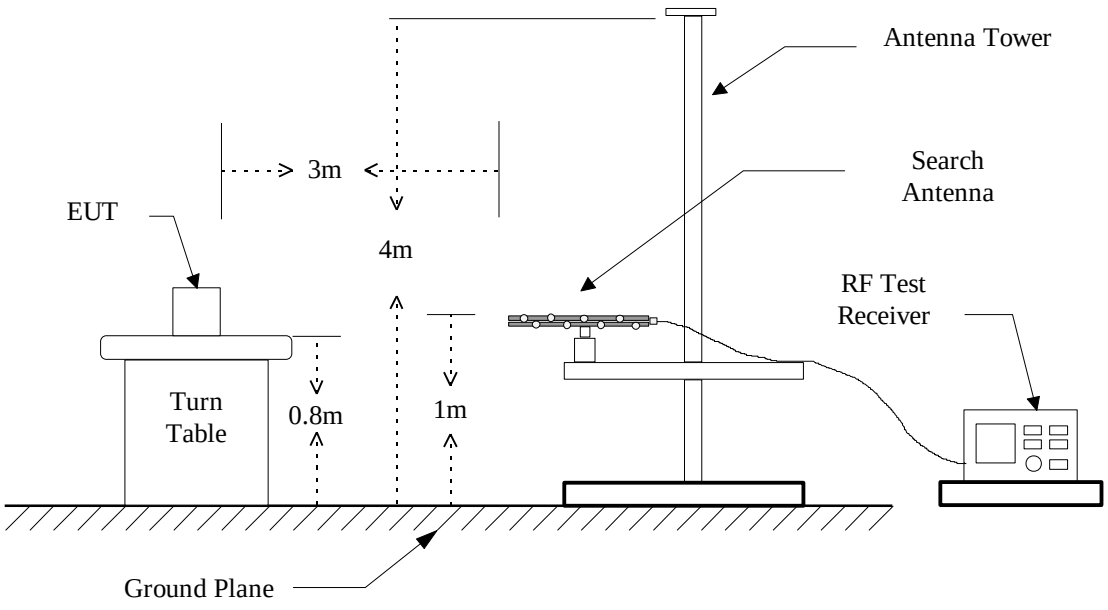
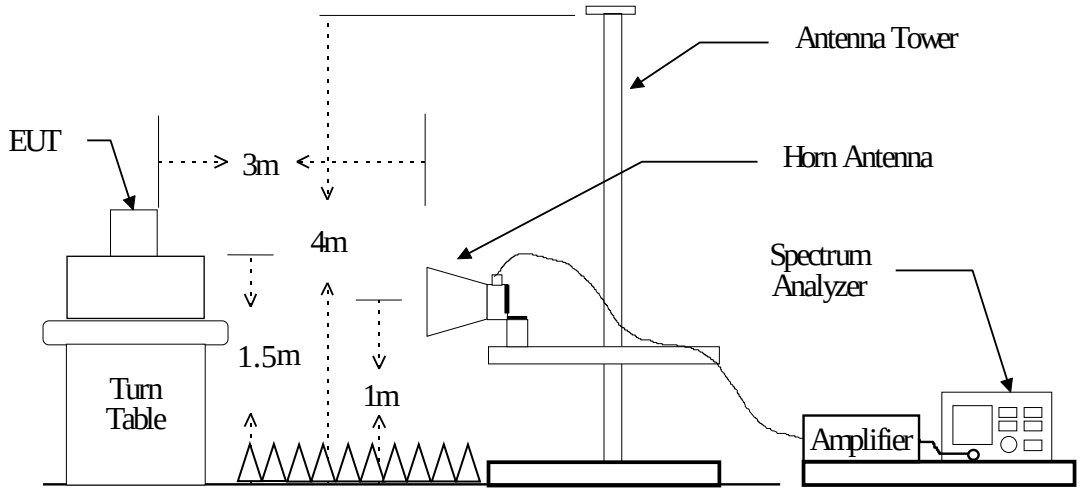


Figure 2 : Frequencies measured above 1 GHz configuration

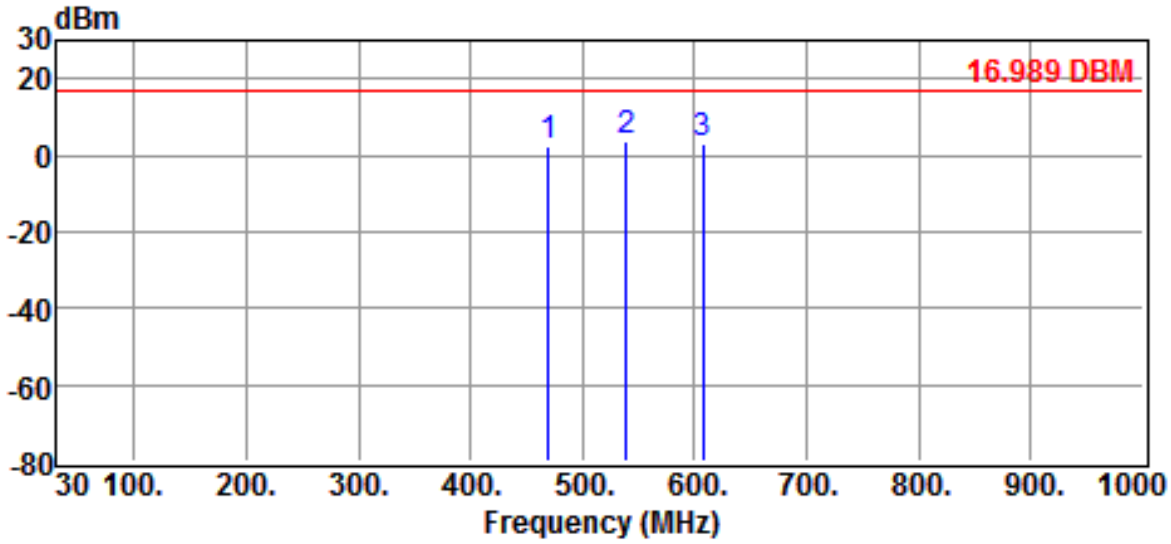


3.3 Test Equipment

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
EMI Test Receiver	Rohde & Schwarz	ESU40 (13054416-001)	2023/03/03	2024/03/02
Bi-Log Antenna with 5dB Pad (3m)	ETC & JYE BAO	MCTD 2786 & FATS-NM5NF5S3G2W5 (13057618-002 & RF-002)	2023/06/05	2024/06/04
Amplifier	HP	8447D (13040711-001)	2023/09/11	2024/09/10
Horn Antenna	ETS-Lindgren	3117 (13059211-002)	2023/03/23	2024/03/22
Amplifier	HP	8449B (13052901-001)	2023/10/17	2024/10/16

3.4 Measuring Data

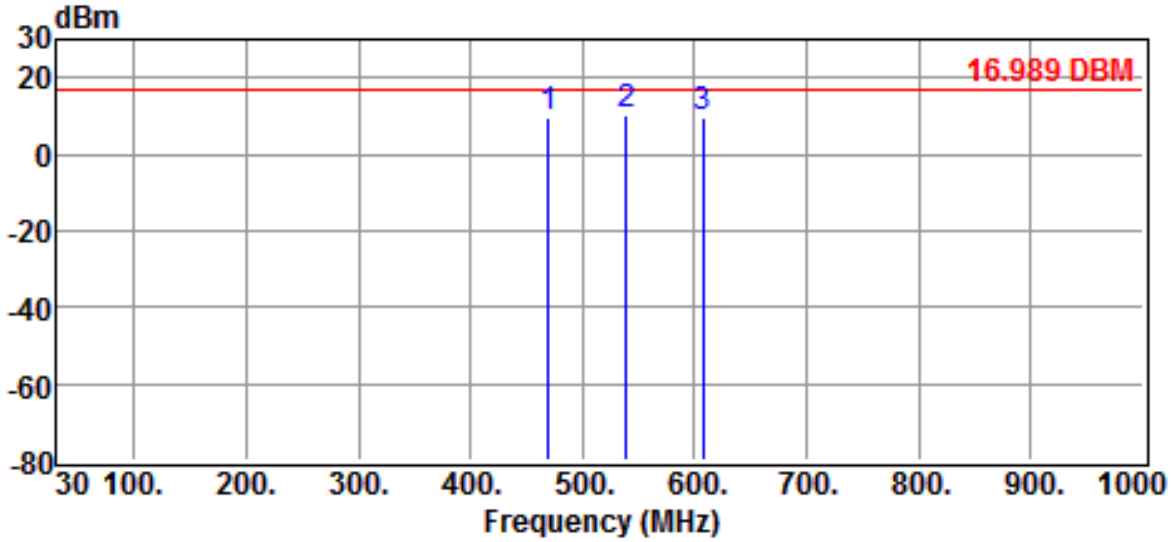
3.4.1 RF Portion



Site	:Chamber #2	Date	:2023-12-01
Limit	:16.989 DBM	Ant. Pol.	:HORIZONTAL
EUT	: Wireless Audio System	Model	:SPT-1T
Power Rating	:120Vac60Hz	Temp.	:20˚C
Engineer	:Brian Huang	Humi.	:65 %
Test Mode	:TX Mode		

	Freq MHz	Reading dBuV	Correction Factor dB/m	Result dBm	Limits dBm	Over limit dB	Detector
	470.1000	106.46	-104.12	2.34	16.99	-14.65	Peak
*	539.0000	106.72	-103.33	3.39	16.99	-13.60	Peak
	607.9000	105.24	-102.36	2.88	16.99	-14.11	Peak

Note :
1. Result = Reading + Correction Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)-EIRP Factor
{EIRP Factor = -101.2dB (9kHz-30MHz) or -99.9dB (30MHz-1GHz)
or -95.2dB (1GHz Above)}
3. The margin value=Limit - Result
4. ” * ” mean this data is the worst emission level.



Site	:Chamber #2	Date	:2023-12-01
Limit	:16.989 DBM	Ant. Pol.	:VERTICAL
EUT	: Wireless Audio System	Model	:SPT-1T
Power Rating	:120Vac60Hz	Temp.	:20 ˚C
Engineer	:Brian Huang	Humi.	:65 %
Test Mode	:TX Mode		

	Freq MHz	Reading dBuV	Correction Factor dB/m	Result dBm	Limits dBm	Over limit dB	Detector
	470.1000	114.00	-104.12	9.88	16.99	-7.11	Peak
*	539.0000	113.29	-103.33	9.96	16.99	-7.03	Peak
	607.9000	112.10	-102.36	9.74	16.99	-7.25	Peak

Note :
1. Result = Reading + Correction Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)-EIRP Factor
{EIRP Factor = -101.2dB (9kHz-30MHz) or -99.9dB (30MHz-1GHz)
or -95.2dB (1GHz Above)}
3. The margin value=Limit - Result
4. ” * ” mean this data is the worst emission level.

4. OCCUPIED BANDWIDTH OF EMISSION

4.1 Provisions Applicable

According to §2.1049,

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured under the following conditions as applicable:

(e) Transmitters for use in the Radio Broadcast Services:

(3) FM broadcast transmitter not used for multiplex operation—when modulated 85 percent by a 15 kHz input signal.

According to §15.236(f)(2), One or more adjacent 25 kHz segments within the assignable frequencies may be combined to form a channel whose maximum bandwidth shall not exceed 200 kHz. The operating bandwidth shall not exceed 200 kHz..

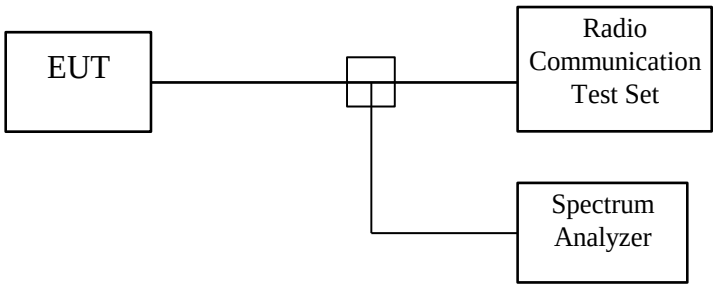
4.2 Measurement Method

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.

2. Position the EUT as shown in figure 2, and Install new batteries in the EUT. Turn on the EUT ant set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.

3. Apply a 15 kHz 85% modulation signal to EUT and measure the frequencies of the modulated signal from the EUT by using the 99% power OBW function of the spectrum analyzer. This is the occupied bandwidth specified.

Figure 2 : Occupied bandwidth measurement configuration



4.3 Occupied Bandwidth Test Equipment

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
Radio Communication Test Set	AEROFLEX	IFR 2945B (13100202-001)	2023/4/27	2024/04/26
Spectrum Analyzer	R&S	FSP40 (13040903-001)	2023/6/16	2024/06/15

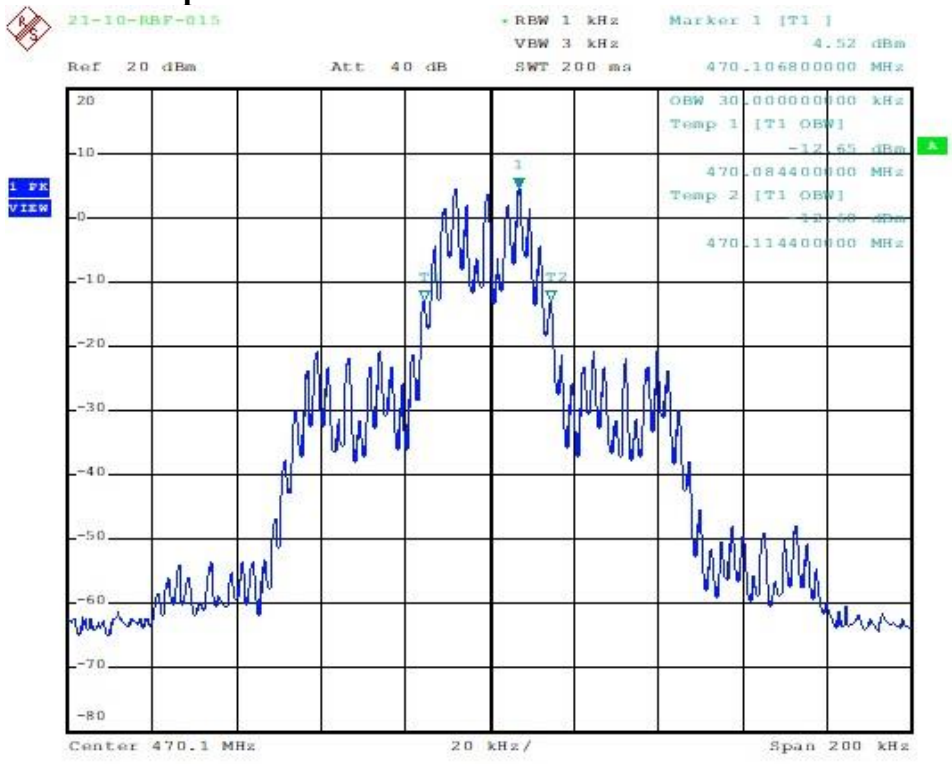
4.4 Bandwidth Measured

4.4.1 Input Level Derived

Test Date : 2023-11-09 Temperature : 25 °C Humidity : 65 %

RF Frequency (MHz)	99% Bandwidth (kHz)
470.100	30.000
539.000	30.000
607.900	30.400

4.4.2 Occupied Bandwidth Plotted



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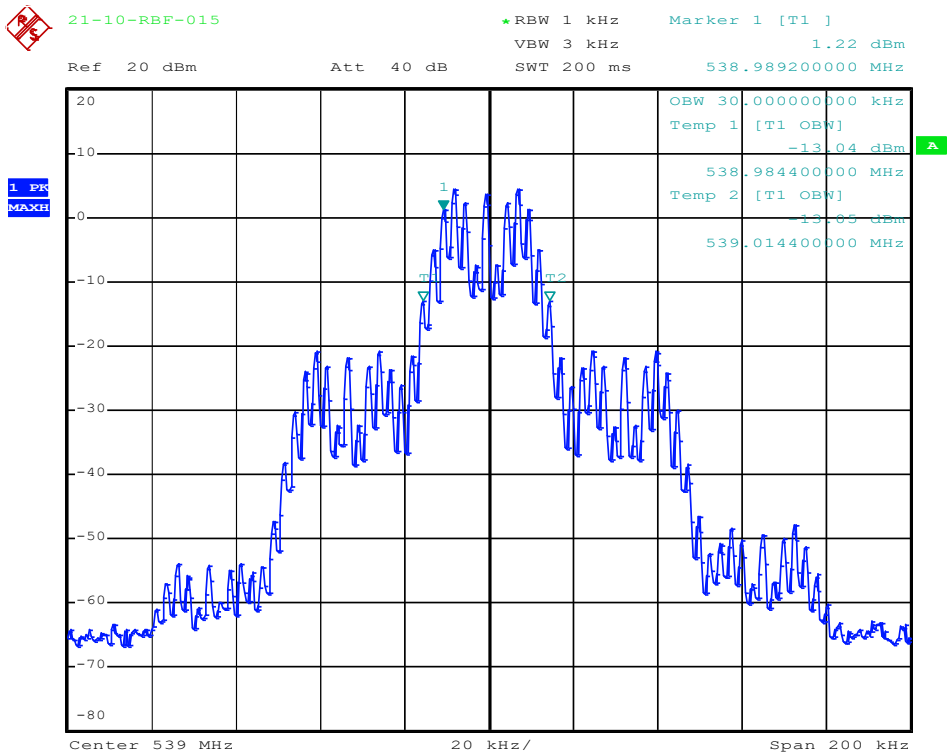

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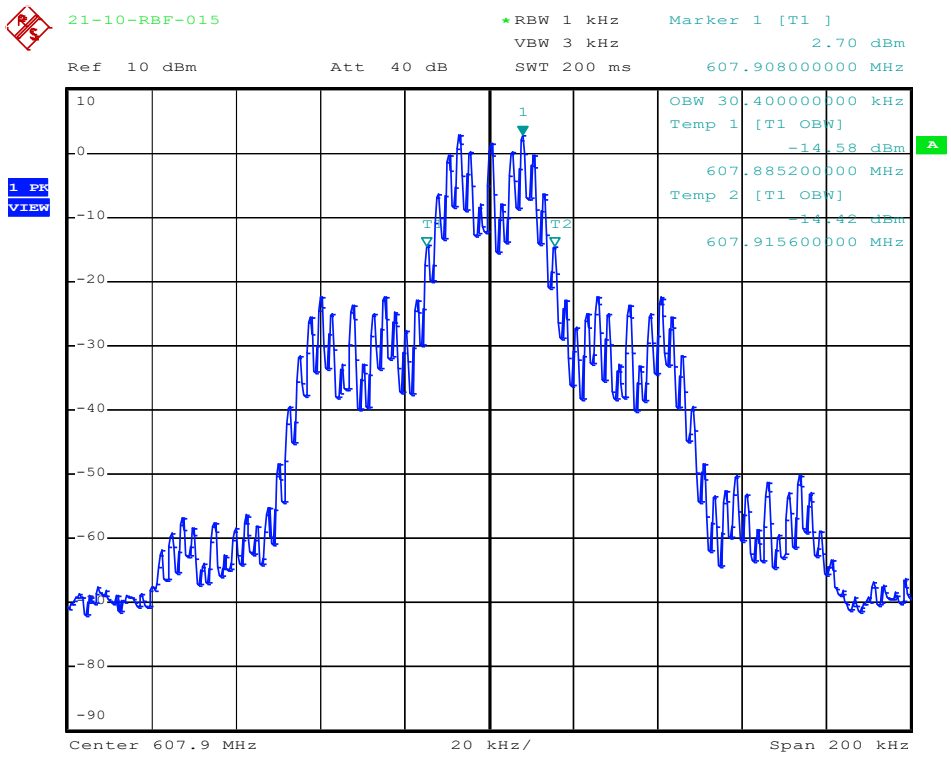

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5. Emission Mask

5.1 Provisions Applicable

According to §15.236(g), Emissions within the band from one megahertz below to one megahertz above the carrier frequency shall comply with the **emission mask in §8.3** of ETSI EN 300 422-1 V2.1.1 (2017-02), *Electromagnetic compatibility and Radio spectrum Matters (ERM); Wireless microphones in the 25 MHz to 3 GHz frequency range; Part 1: Technical characteristics and methods of measurement*. Emissions outside of this band shall comply with the limits specified in section 8.4 of ETSI EN 300 422-1 V2.1.1 (2017-02).

5.2 Measurement Procedure & Method

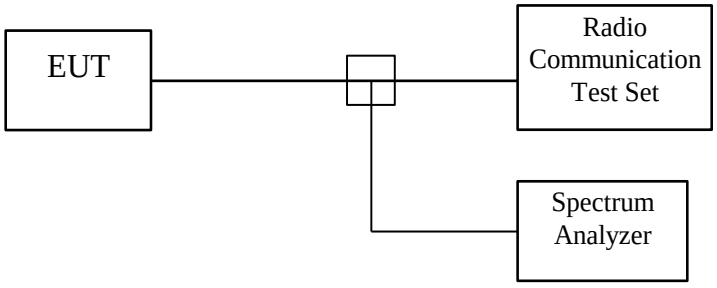
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.

2. Position the EUT as shown in figure 3, and Install new batteries in the EUT. Turn on the EUT ant set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.

3. Apply a 500Hz modulation signal to EUT and measure the frequencies of the modulated signal from the EUT where it is the specified number of dB below the reference level set in step 2. This is the occupied bandwidth specified.

4. Declared Channel Bandwidth B: 200 kHz

Figure 3 : Emission Mask measurement configuration

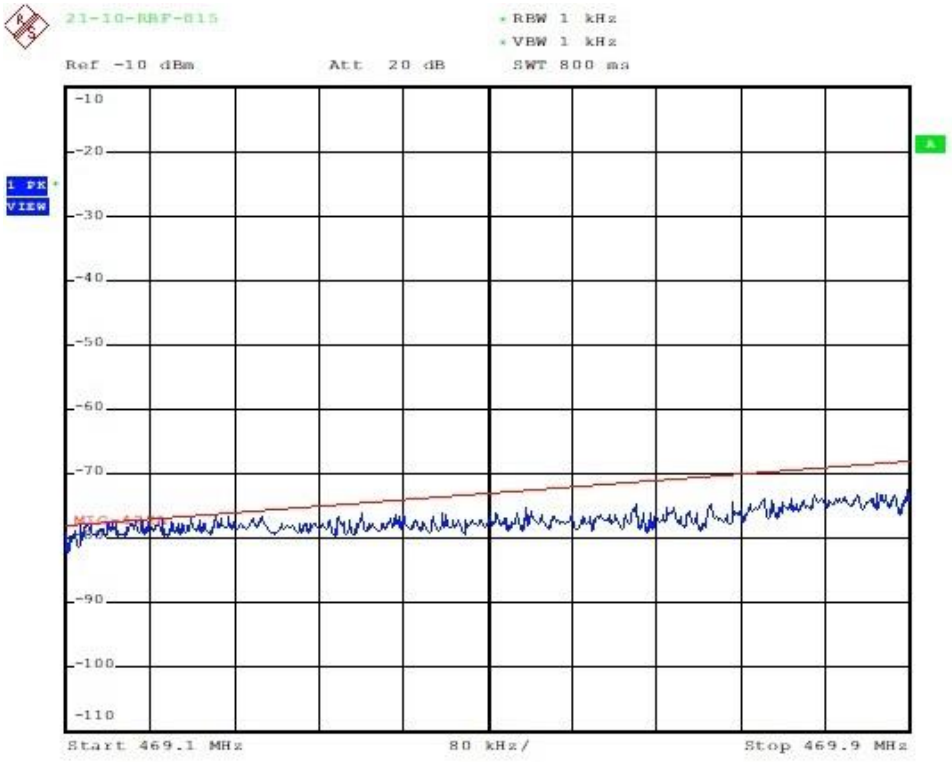


5.3 Emission Mask Test Equipment

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
Radio Communication Test Set	AEROFLEX	IFR 2945B (13100202-001)	2023/4/27	2024/04/26
Spectrum Analyzer	R&S	FSP40 (13040903-001)	2023/6/16	2024/06/15

5.4 Emission Mask plots

(1)470.100 MHz



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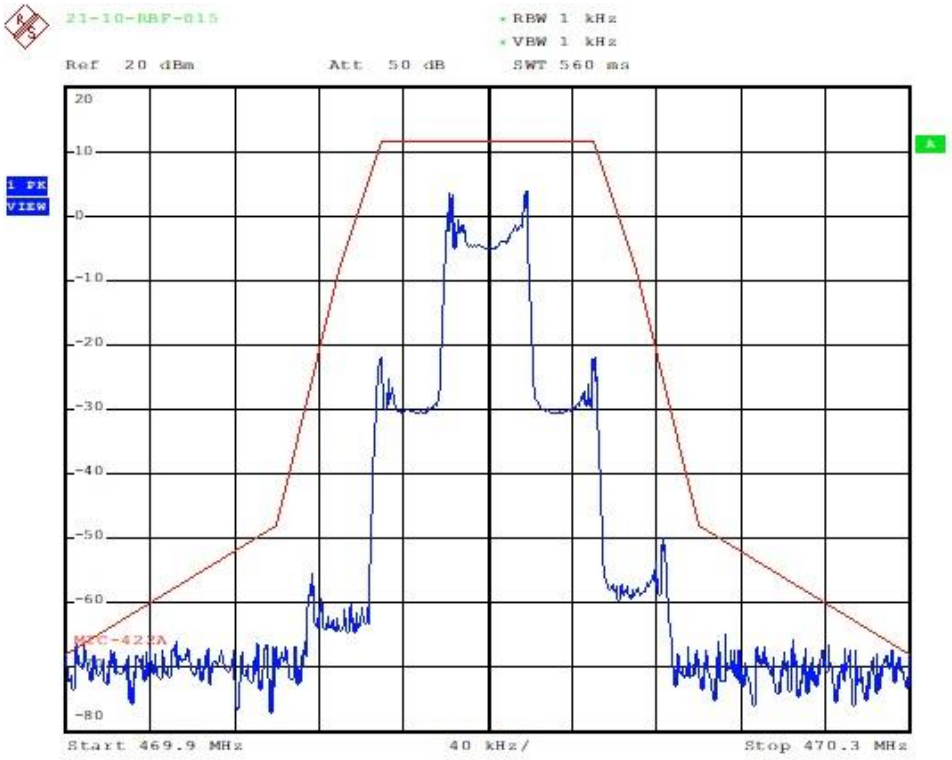

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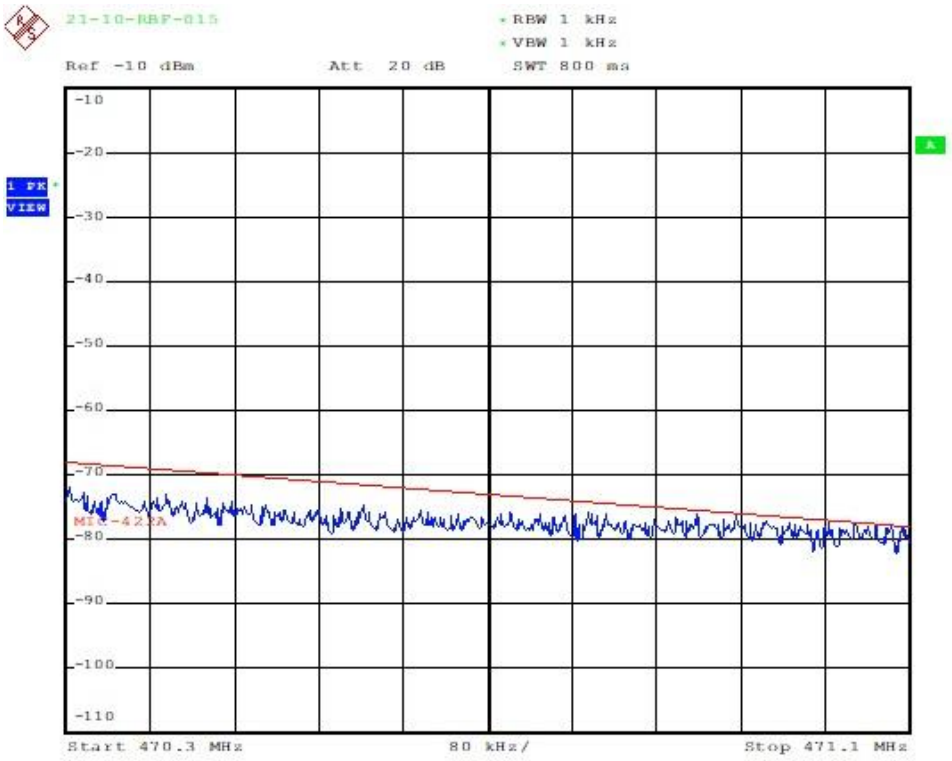

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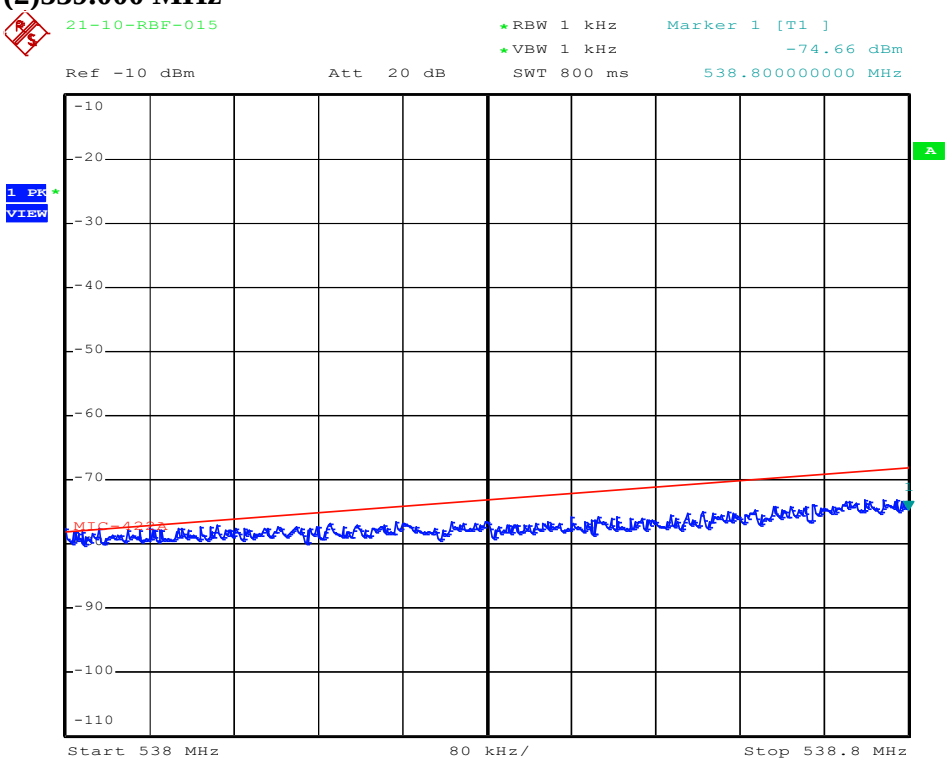
(2)539.000 MHz



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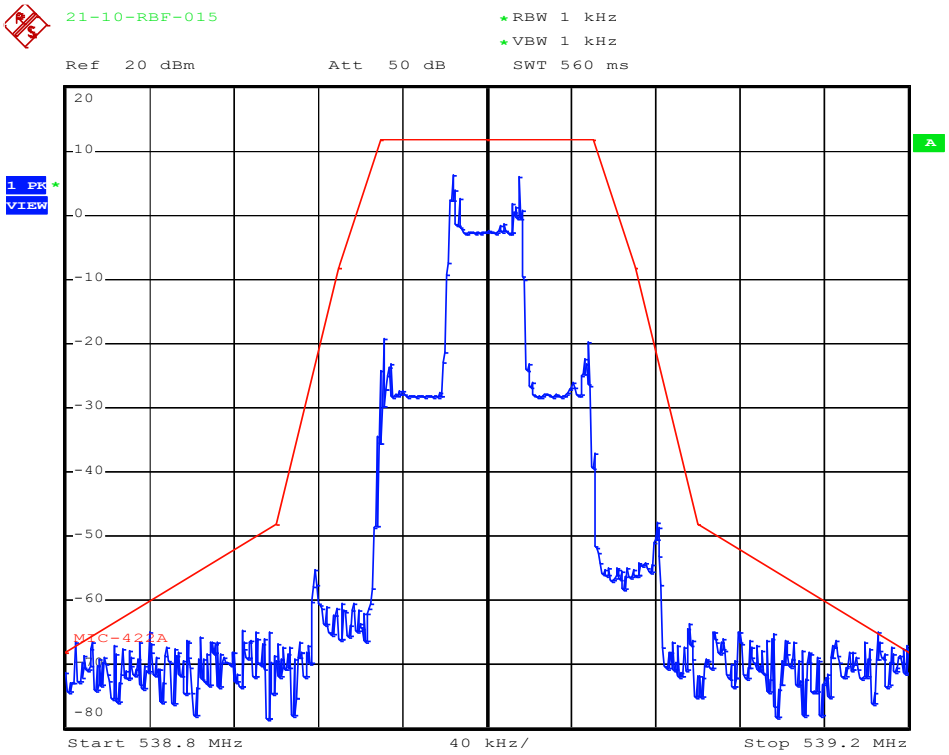

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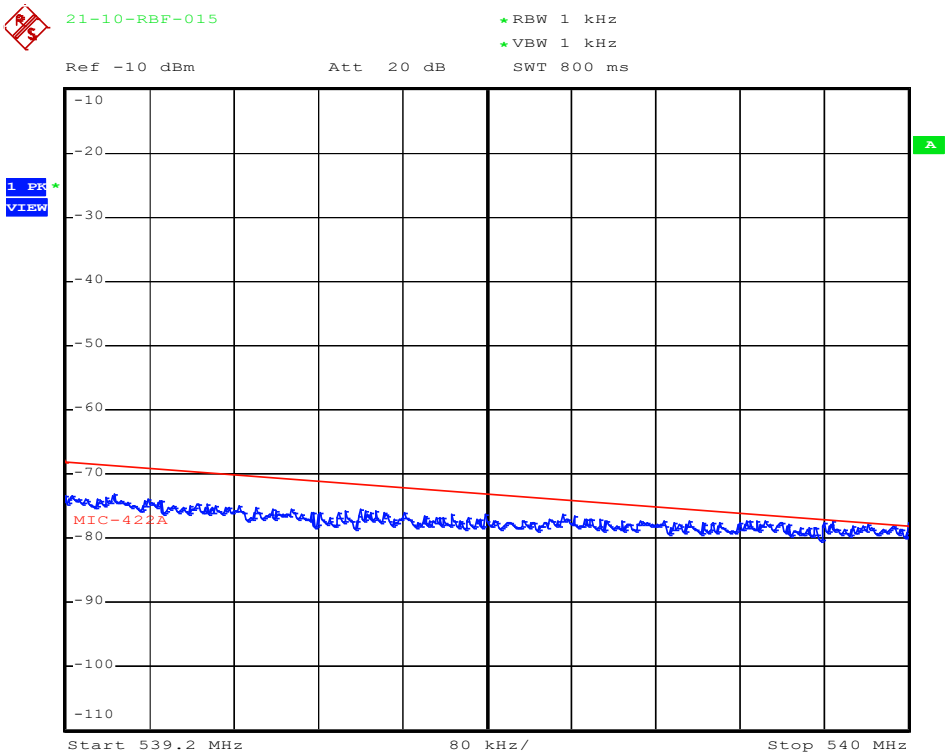

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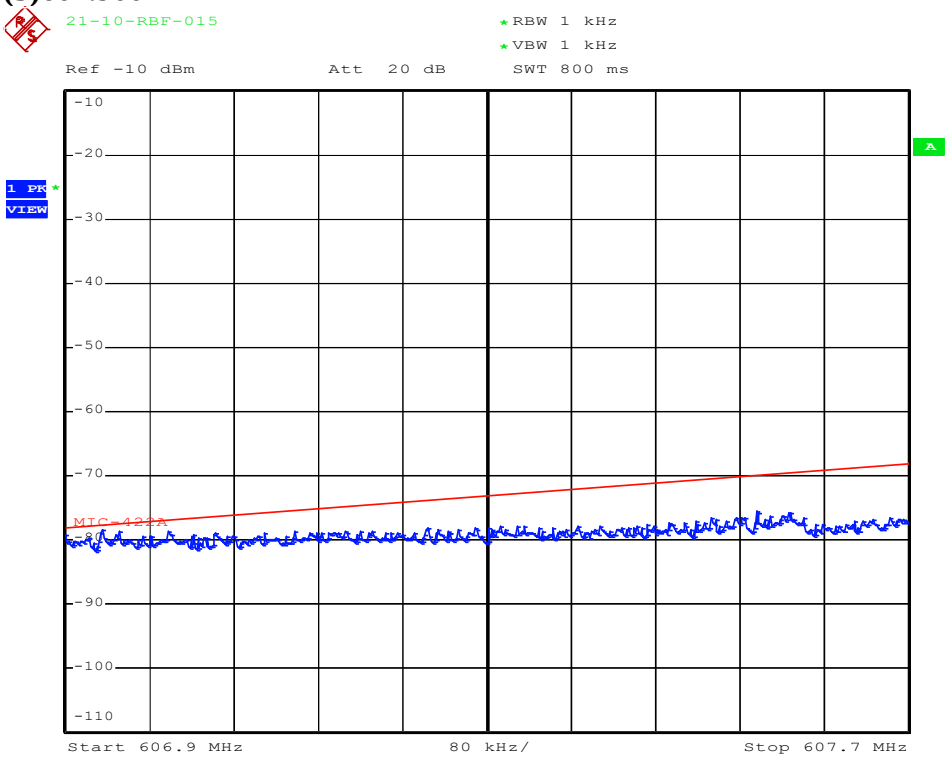
(3)607.900 MHz



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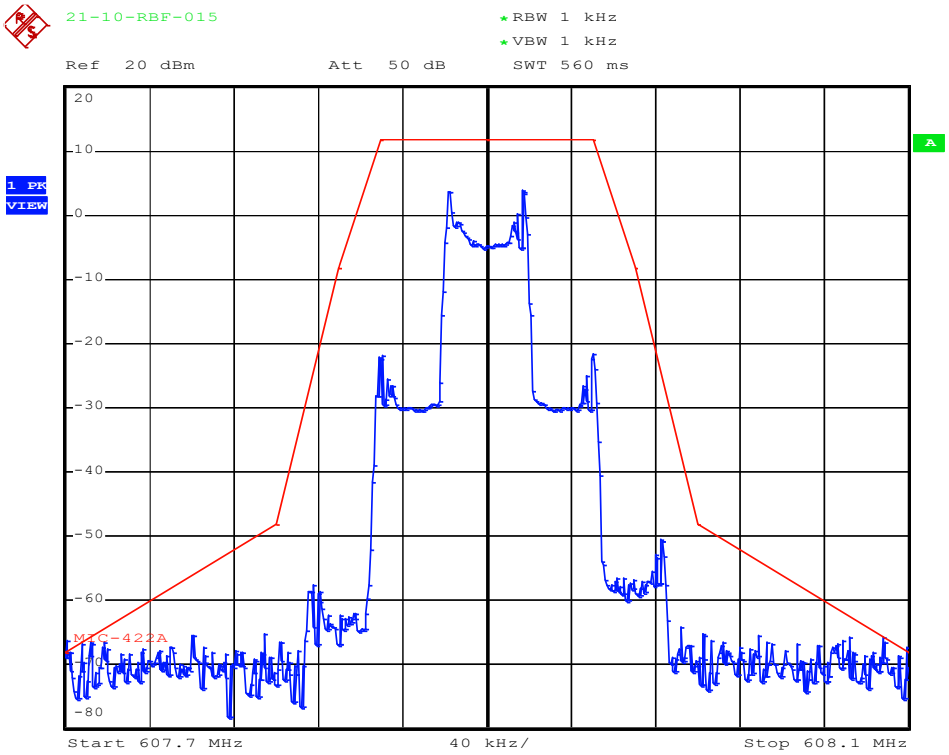

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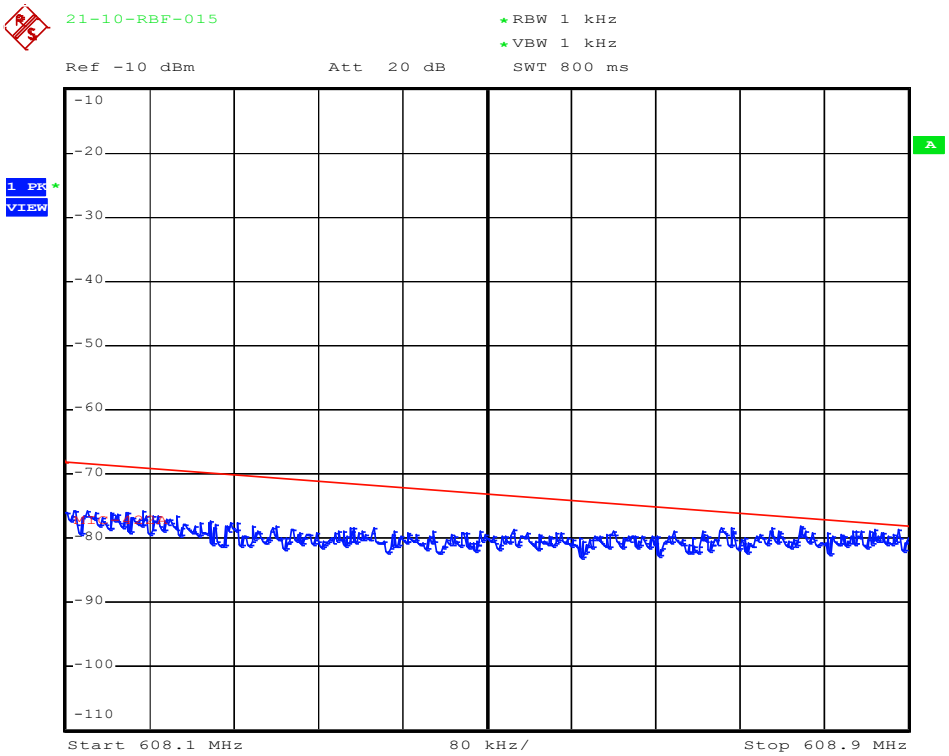

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6. Radiated Spurious Emission

6.1 Provisions Applicable

According to §15.236 (g), Emissions within the band from one megahertz below to one megahertz above the carrier frequency shall comply with the emission mask in §8.4 of ETSI EN 300 422-1, *Electromagnetic compatibility and Radio spectrum Matters (ERM); Wireless microphones in the 25 MHz to 3 GHz frequency range; Part 1: Technical characteristics and methods of measurement*. **Emissions outside of this band shall comply with the limits specified at the edges of the ETSI mask**.

6.2 Measurement Procedure

A. Preliminary Measurement For Portable Devices

For portable devices, the following procedure was performed to determine the maximum emission axis of EUT:

1. With the receiving antenna is H polarization, rotate the EUT in turns with three orthogonal axes to determine the axis of maximum emission.
2. With the receiving antenna is V polarization, rotate the EUT in turns with three orthogonal axes to determine the axis of maximum emission.
3. Compare the results derived from above two steps. So, the axis of maximum emission from EUT was determined and the configuration was used to perform the final measurement.

B. Final Measurement

1. Setup the configuration per figure 1 and 2 for frequencies measured below and above 1 GHz respectively. Turn on EUT and make sure that it is in normal function.

2. For emission frequencies measured below and above 1 GHz, a pre-scan is performed in a shielded chamber to determine the accurate frequencies & final measurement.

3. For emission frequencies measured below and above 1 GHz, set the spectrum analyzer on a 100 kHz and 1 MHz resolution bandwidth respectively for each frequency measured in step 2.

4. The search antenna is to be raised and lowered over a range from 1 to 4 meters in a horizontally polarized orientation. Position the highness when the highest value is indicated on the the spectrum analyzer, then change the orientation of EUT on the test table over a range from 0◦ to 360◦ with a speed as slow as possible, and keep the azimuth that highest emission is indicated on the spectrum analyzer. Vary the antenna position again and record the highest value as a final reading. A RF test receiver is also used to confirm emissions measured.

5. Repeat step 4 until all frequencies need to be measured were complete.

6. Repeat step 5 with search antenna in vertical polarized orientations.
7. Check the three frequencies of highest emission with varying the placement of cables (if any) associated with EUT to obtain the worse case and record the result.

Note:
According to 12.7.2(d)(2) of ANSI C63.10-2013:

E[dBμV/m] = EIRP[dBm] + 95.2, for d = 3 m.

12.7.2(e) of ANSI C63.10-2013:
For conducted measurements below 1000 MHz, the field strength shall be computed as specified in item d), and then an additional 4.7 dB shall be added as an upper bound on the field strength that would be observed on a test range with a ground plane for frequencies between 30 MHz and 1000 MHz, or an additional 6 dB shall be added for frequencies below 30 MHz.

6.3 Test Equipment

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
EMI Test Receiver	Rohde & Schwarz	ESU40 (13054416-001)	2023/03/03	2024/03/02
Bi-Log Antenna with 5dB Pad (3m)	ETC & JYE BAO	MCTD 2786 & FAT-NM5NF5T3G2W5 (BL13J03014 & 5dB-001)	2023/06/05	2024/06/04
Amplifier	HP	8447D (13040711-001)	2023/09/11	2024/09/10
Horn Antenna	ETS-Lindgren	3117 (13059211-002)	2023/03/23	2024/03/22
Amplifier	HP	8449B (13052901-001)	2023/10/17	2024/10/16

Table1：Measuring instrument setup in frequency band measured is as following :

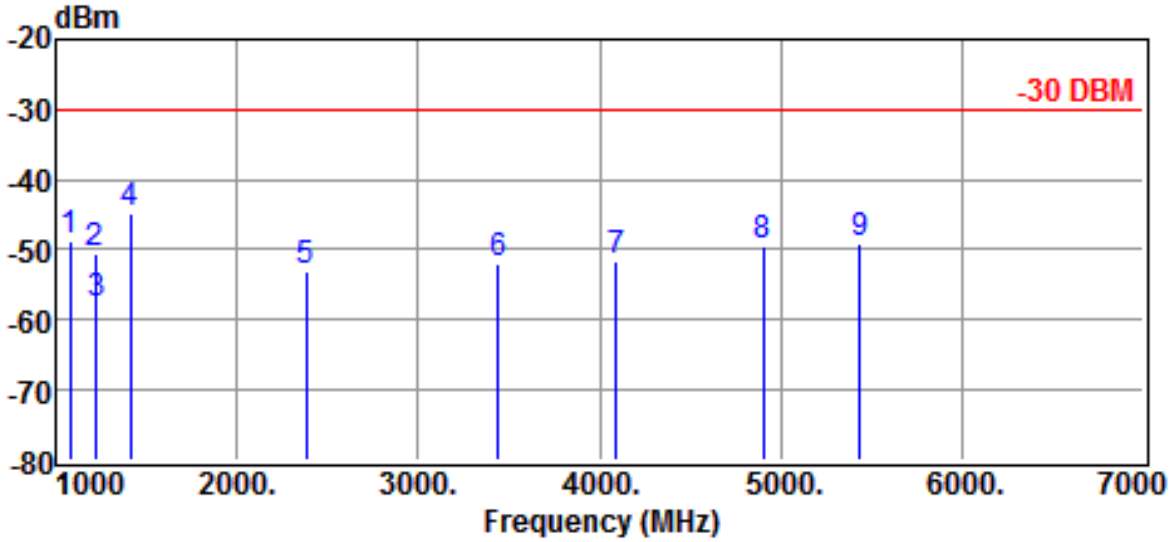
Frequency Band (MHz)	Instrument	Function	Resolution bandwidth	Video Bandwidth
25 to 30	Spectrum Analyzer	Peak	9kHz to 10kHz	9kHz to 10kHz
30 to 1000	Spectrum Analyzer	Peak	100kHz to 120kHz	100kHz to 120kHz
Above 1000	Spectrum Analyzer	Peak	1 MHz	1 MHz

Table2：Limits for spurious emissions (Subclause 8.4.3)

State	Frequency		
	47 MHz to 74 MHz 87,5 MHz to 137 MHz 174 MHz to 230 MHz 470 MHz to 862 MHz	Other Frequencies below 1 000 MHz	Frequencies above 1 000 MHz
Operation	4 nW (-54dBm)	250 nW (-36dBm)	1 μW (-30dBm)
Standby	2 nW (-57dBm)	2 nW (-57dBm)	20 nW(-47dBm)

6.4 Measuring Data

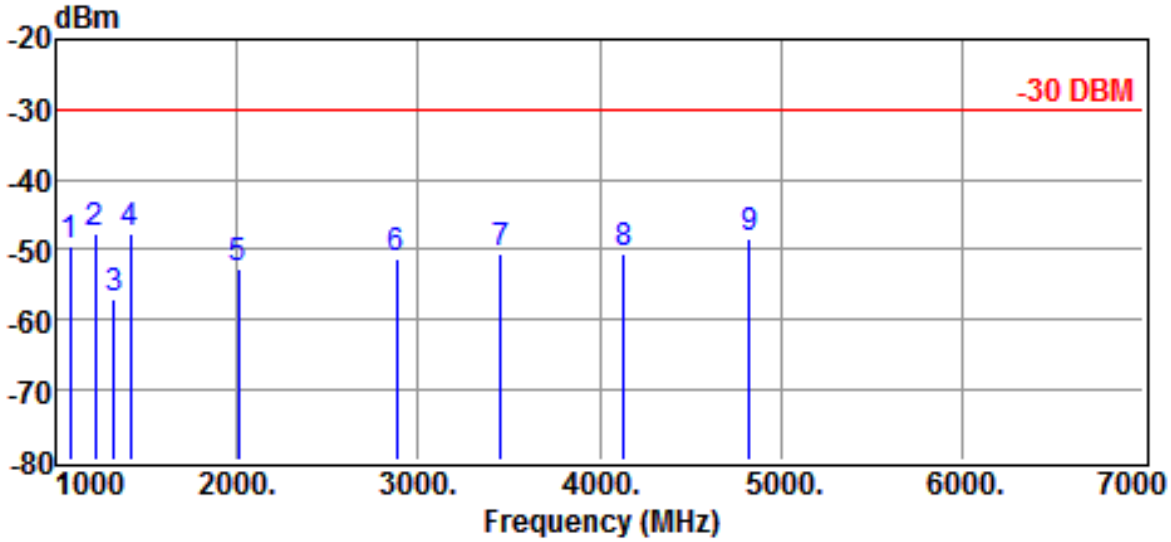
6.4.1. Harmonic Frequencies



Site	:Chamber #2	Date	:2023-12-01
Limit	:-30 DBM	Ant. Pol.	:HORIZONTAL
EUT	:Wireless Audio System		
Model	:SPT-1T		
Power Rating	:120Vac60Hz	Temp.	:20°C
Engineer	:Brian Huang	Humi.	:60 %
Test Mode	:TX Mode		

	Freq MHz	Reading dBuV	Correction Factor dB/m	Result dBm	Limits dBm	Over limit dB	Detector
	1078.0000	57.07	-105.72	-48.65	-30.00	-18.65	Peak
	1215.8000	53.87	-104.23	-50.36	-30.00	-20.36	Peak
	1225.0000	46.38	-104.22	-57.84	-30.00	-27.84	Peak
*	1410.3000	58.74	-103.39	-44.65	-30.00	-14.65	Peak
	2380.0000	44.79	-97.94	-53.15	-30.00	-23.15	Peak
	3440.0000	44.33	-96.44	-52.11	-30.00	-22.11	Peak
	4095.0000	43.38	-94.84	-51.46	-30.00	-21.46	Peak
	4905.0000	43.72	-93.28	-49.56	-30.00	-19.56	Peak
	5435.0000	42.91	-92.07	-49.16	-30.00	-19.16	Peak

Note :
1. Result = Reading + Correction Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)-EIRP Factor
{EIRP Factor = -101.2dB (9kHz-30MHz) or -99.9dB (30MHz-1GHz)
or -95.2dB (1GHz Above)}
3. The margin value=Limit - Result
4. ” * ” mean this data is the worst emission level.

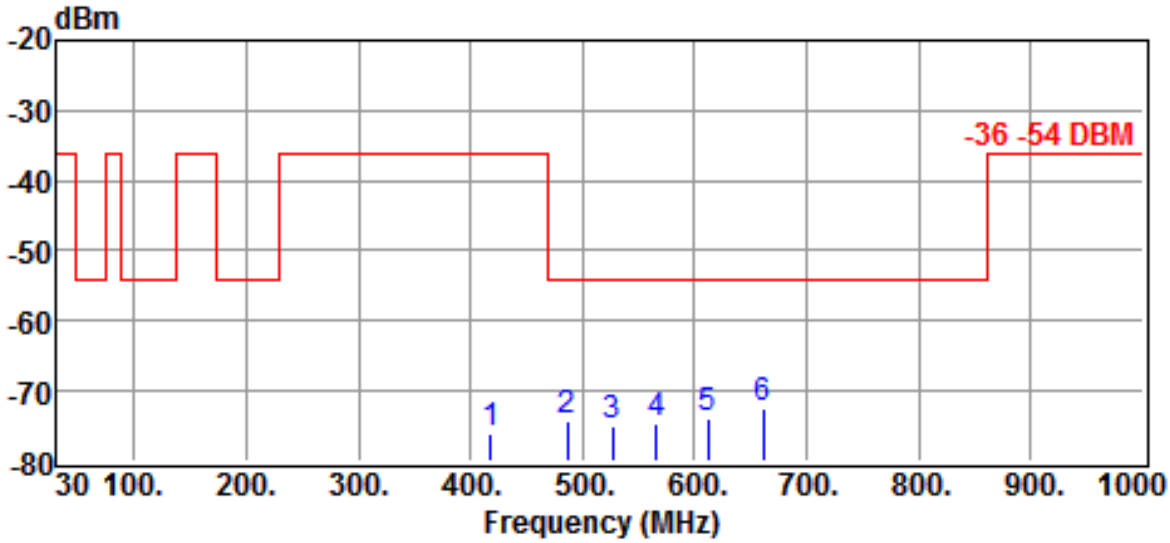


Site	:Chamber #2	Date	:2023-12-01
Limit	:-30 DBM	Ant. Pol.	:VERTICAL
EUT	:Wireless Audio System		
Model	:SPT-1T		
Power Rating	:120Vac60Hz	Temp.	:20 °C
Engineer	:Brian Huang	Humi.	:60 %
Test Mode	:TX Mode		

	Freq MHz	Reading dBuV	Correction Factor dB/m	Result dBm	Limits dBm	Over limit dB	Detector
	1078.0000	56.25	-105.72	-49.47	-30.00	-19.47	Peak
*	1215.8000	56.68	-104.23	-47.55	-30.00	-17.55	Peak
	1325.0000	46.90	-103.82	-56.92	-30.00	-26.92	Peak
	1410.3000	55.77	-103.39	-47.62	-30.00	-17.62	Peak
	2005.0000	45.82	-98.40	-52.58	-30.00	-22.58	Peak
	2880.0000	46.10	-97.35	-51.25	-30.00	-21.25	Peak
	3455.0000	45.82	-96.46	-50.64	-30.00	-20.64	Peak
	4135.0000	44.19	-94.82	-50.63	-30.00	-20.63	Peak
	4830.0000	44.88	-93.28	-48.40	-30.00	-18.40	Peak

Note :
1. Result = Reading + Correction Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)-EIRP Factor
{EIRP Factor = -101.2dB (9kHz-30MHz) or -99.9dB (30MHz-1GHz)
or -95.2dB (1GHz Above)}
3. The margin value=Limit - Result
4. ” * ” mean this data is the worst emission level.

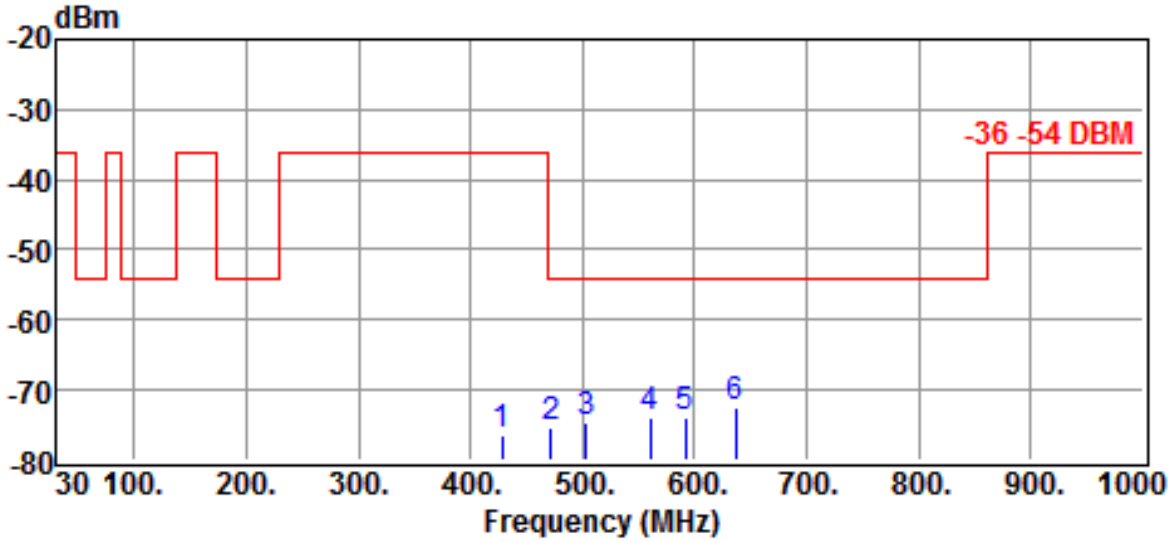
6.4.2 Spurious Emissions frequencies below 1 GHz



Site	:Chamber #2	Date	:2023-12-01
Limit	:-36 -54 DBM	Ant. Pol.	:HORIZONTAL
EUT	:Wireless Audio System		
Model	:SPT-1T		
Power Rating	:120Vac60Hz	Temp.	:20˚C
Engineer	:Brian Huang	Humi.	:60 %
Test Mode	:TX Mode		

	Freq MHz	Reading dBuV	Correction Factor dB/m	Result dBm	Limits dBm	Over limit dB	Detector
	418.0000	28.55	-104.66	-76.11	-36.00	-40.11	Peak
	486.8700	29.29	-103.69	-74.40	-54.00	-20.40	Peak
	526.6400	28.16	-103.23	-75.07	-54.00	-21.07	Peak
	566.4100	28.16	-102.66	-74.50	-54.00	-20.50	Peak
	612.0000	28.39	-102.26	-73.87	-54.00	-19.87	Peak
*	661.4700	27.86	-100.17	-72.31	-54.00	-18.31	Peak

Note :
1. Result = Reading + Correction Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)-EIRP Factor
{EIRP Factor = -101.2dB (9kHz-30MHz) or -99.9dB (30MHz-1GHz)
or -95.2dB (1GHz Above)}
3. The margin value=Limit - Result
4. ” * ” mean this data is the worst emission level.



Site	:Chamber #2	Date	:2023-12-01
Limit	:-36 -54 DBM	Ant. Pol.	:VERTICAL
EUT	:Wireless Audio System		
Model	:SPT-1T		
Power Rating	:120Vac60Hz	Temp.	:20°C
Engineer	:Brian Huang	Humi.	:60 %
Test Mode	:TX Mode		

	Freq MHz	Reading dBuV	Correction Factor dB/m	Result dBm	Limits dBm	Over limit dB	Detector
	427.7000	28.51	-104.74	-76.23	-36.00	-40.23	Peak
	472.3200	28.66	-104.03	-75.37	-54.00	-21.37	Peak
	503.3600	29.27	-103.77	-74.50	-54.00	-20.50	Peak
	560.5900	28.73	-102.70	-73.97	-54.00	-19.97	Peak
	591.6300	28.61	-102.41	-73.80	-54.00	-19.80	Peak
*	636.2500	29.01	-101.46	-72.45	-54.00	-18.45	Peak

Note :
1. Result = Reading + Correction Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)-EIRP Factor
{EIRP Factor = -101.2dB (9kHz-30MHz) or -99.9dB (30MHz-1GHz)
or -95.2dB (1GHz Above)}
3. The margin value=Limit - Result
4. ” * ” mean this data is the worst emission level.

6.4.3 Spurious Emissions frequencies above 1 GHz

Radiated emission frequencies above 1 GHz were too low to be measured with a pre-amplifier of 35 dB.

7. FREQUENCY STABILITY MEASUREMENT

7.1 Provisions Applicable

According to §2.1055, Measurements required: Frequency stability

According to § 15.236(f)(3), The frequency tolerance of the carrier signal shall be maintained within ±0.005% of the operating frequency over a temperature variation of −20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. Battery operated equipment shall be tested using a new battery.

7.2 Measurement Procedure

A) Frequency stability versus environmental temperature

1. Setup the configuration per figure 6 for frequencies measured at an environmental chamber.

2. Turn on EUT and set SA center frequency to the right frequency needs to be measured. Set SA RBW to 30 kHz, VBW to 100kHz and frequency span to 500 kHz. Then turn off the EUT.

3. Set the temperature of chamber to 50℃. Allow sufficient time for the temperature of the chamber to stabilize. While maintaining a constant temperature inside the chamber, turn the EUT on and measure the EUT operating frequency when the frequency has stablized.

4. Repeat step 3 with a 10℃ decreased per stage until the lowest temperature -30℃ is measured, record all measurement frequencies.

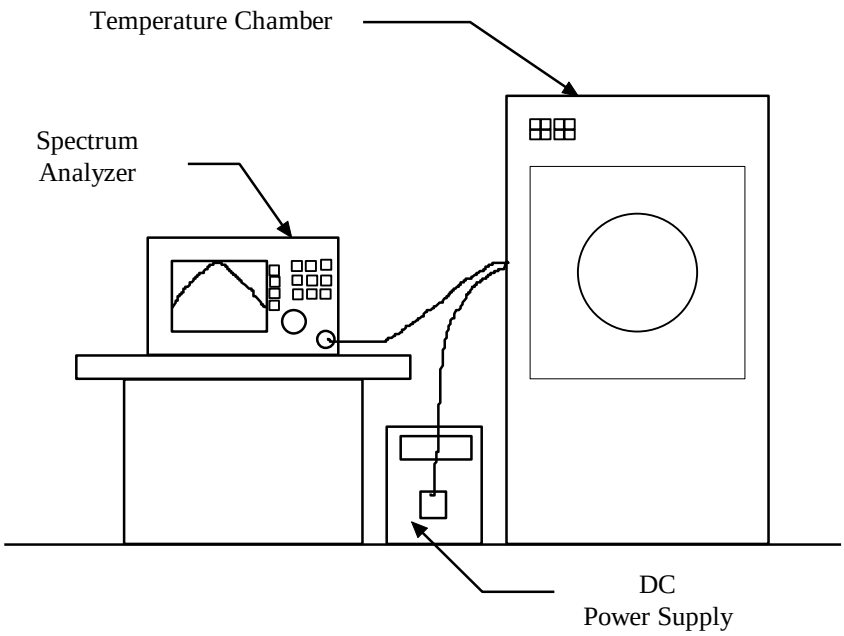
B) Frequency stability versus input voltage

1. Setup the configuration per figure 6 for frequencies measured at an environmental chamber set for a temperature of 25℃.

2. Set SA center frequency to the right frequency needs to be measured. Then set SA RBW to 30 kHz, VBW to 100kHz and frequency span to 500 kHz.

3. Supply the EUT primary voltage with 85 and 115 percent of the nominal value and record the frequency.

Figure 6 : Frequency stability measurement configuration



7.3 Test Equipment

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
Spectrum Analyzer	R&S	FSP40 (13040903-001)	2023/6/16	2024/06/15
Temperature Chamber	ESPEC	EFL-3(13490538-003)	2023/07/27	2024/07/26

7.4 Measurement Data

Test Date : Nov. 09, 2023 Temperature : 25 °C Humidity : 65 %

A. Tx Frequency 470.1000MHz

A1. Frequency stability versus environment temperature

Freq (MHz) :	**470.1000**	**Limit:**	**0.005%**
Environment Temperature (°C)	Power Supplied (Vac)	Frequency measured with time elapsed Startup (MHz)	(%)
50	**120**	470.1022	0.00047
40		470.1018	0.00038
30		470.1010	0.00021
20		470.1010	0.00021
10		470.1010	0.00021
0		470.1008	0.00017
-10		470.1008	0.00017
-20		470.1005	0.00011

A2. Frequency stability versus supplied voltage

Freq (MHz) :	**470.1000**	**Limit:**	**0.005%**
Environment Temperature (°C)	Power Supplied (Vac)	(MHz)	(%)
20	102	470.1010	0.00021
	120	470.1010	0.00021
	138	470.1011	0.00023

8 CONDUCTED EMISSION MEASUREMENT

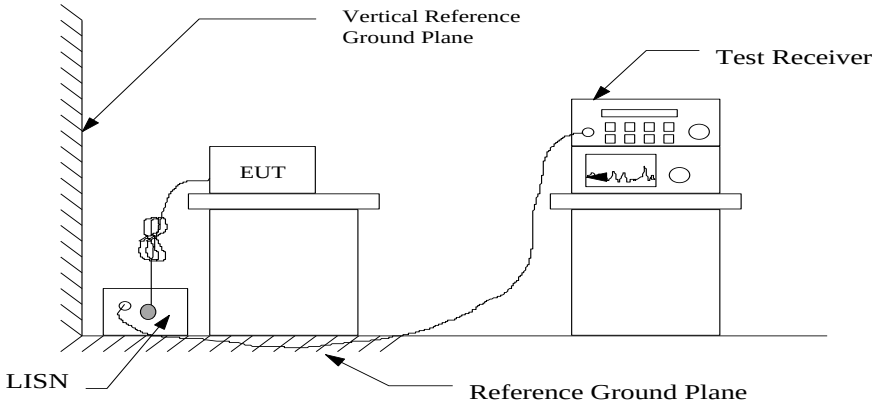
8.1 Standard Applicable

For unintentional and intentional device, Line Conducted Emission Limits are in accordance to § 15.107(a) and § 15.207(a) respectively. Both Limits are identical specification.

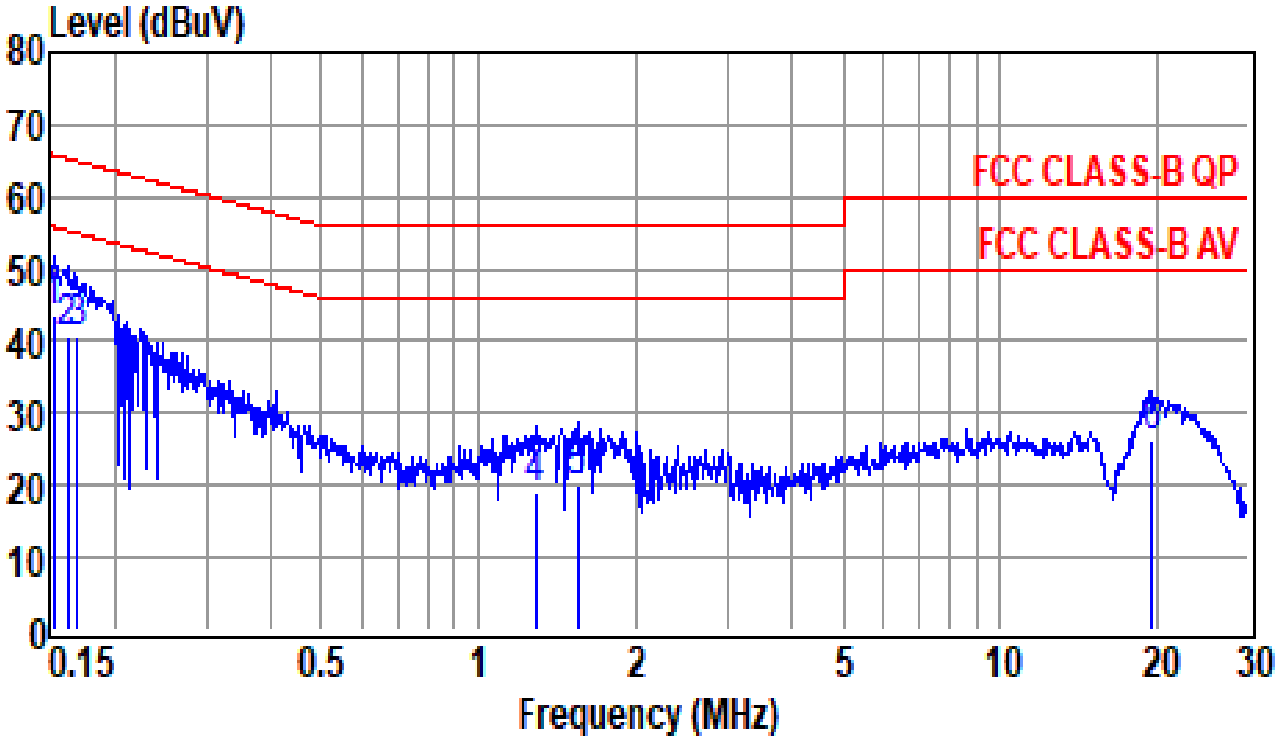
8.2 Measurement Procedure

1. Setup the configuration per figure 3.
2. A preliminary scan with a spectrum monitor is performed to identify the frequency of emission that has the highest amplitude relative to the limit by operating the EUT in selected modes of operation, typical cable positions, and with a typical system configuration.
3. Record the 6 or 8 highest emissions relative to the limit.
4. Measure each frequency obtained from step 3 by a test receiver set on quasi peak detector function, and then record the accuracy frequency and emission level. If all emissions measured in the specified band are attenuated more than 20 dB from the limit, this step would be ignored, and the peak detector function would be used.
5. Confirm the highest three emissions with variation of the EUT cable configuration and record the final data.
6. Repeat all above procedures on measuring each operation mode of EUT.

Figure 3 : Conducted emissions measurement configuration



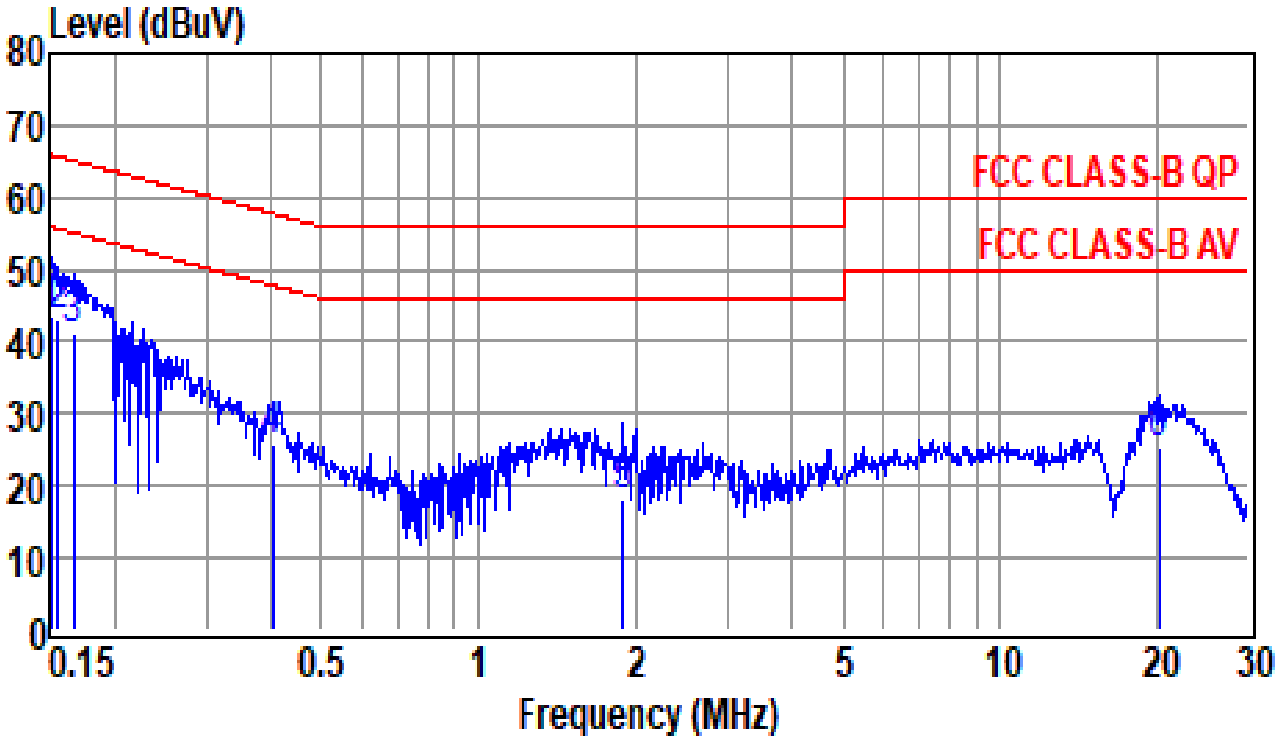
8.3 Conducted Emission Data



Site	: conducted #1		Date	: 2022-08-03
Condition	: FCC CLASS-B QP		LISN	: NEUTRAL
Tem / Hum	: 24 ℃ / 60%		Test Mode	: TX mode
EUT	:Wireless Audio System			
Power Rating	: 120Vac60Hz			
Engineer	: Brian Huang		Model	: SPT-1T

	Freq (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV)	Limit Line (dBuV)	Over Limit (dB)	Remark
*	0.1532	33.30	10.14	43.44	65.82	-22.38	QP
	0.1633	30.73	10.13	40.86	65.30	-24.44	QP
	0.1703	30.55	10.13	40.68	64.94	-24.26	QP
	1.2890	8.77	10.19	18.96	56.00	-37.04	QP
	1.5440	9.70	10.20	19.90	56.00	-36.10	QP
	19.6350	16.16	10.43	26.59	60.00	-33.41	QP

Note :
1. Result = Reading + Factor
2. Factor = LISN Factor + Cable Loss+ Pulse Limiter Factor
3. ” * ” mean this data is the worst emission level



Site	: conducted #1	Date	: 2022-08-03
Condition	: FCC CLASS-B QP	LISN	: LINE
Tem / Hum	: 24 ℃ / 60%	Test Mode	: TX mode
EUT	:Wireless Audio System		
Power Rating	: 120Vac60Hz		
Engineer	: Brian Huang	Model	: SPT-1T

	Freq (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV)	Limit Line (dBuV)	Over Limit (dB)	Remark
*	0.1516	33.66	10.13	43.79	65.91	-22.12	QP
	0.1565	32.76	10.13	42.89	65.65	-22.76	QP
	0.1668	31.01	10.12	41.13	65.12	-23.99	QP
	0.4040	15.67	10.10	25.77	57.77	-32.00	QP
	1.8980	7.88	10.18	18.06	56.00	-37.94	QP
	20.2700	15.20	10.39	25.59	60.00	-34.41	QP

Note :
1. Result = Reading + Factor
2. Factor = LISN Factor + Cable Loss+ Pulse Limiter Factor
3. ” * ” mean this data is the worst emission level

8.4 Result Data Calculation

The result data is calculated by adding the LISN Factor to the measured reading. The basic equation with a sample calculation is as follows:

RESULT = READING + LISN FACTOR

Assume a receiver reading of 22.5 dB μV is obtained, and LISN Factor is 0.1 dB, then the total of disturbance voltage is 22.6 dB μV.

RESULT = 22.5 + 0.1 = 22.6 dB μV
Level in μV = Common Antilogarithm[(22.6 dB μV)/20]
= 13.48 μV

8.5 Conducted Measurement Equipment

The following test equipment are used during the conducted test.

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
EMI Test Receiver	Rohde & Schwarz	ESCI	2021/10/18	2022/10/17
LISN	Schwarzbeck	NSLK 8127 PLC	2022/02/27	2023/02/26
LISN	Schwarzbeck	VTSD 9561 F-N	2022/04/13	2023/04/12