

FCC Part 15 Subpart C
EMI TEST REPORT
of

E.U.T. : XS WIRELESS
FCC ID. : DMOSKXSW
Model No. : SK-XSW
Working Frequency : 548~572MHz

for

APPLICANT : Sennheiser Electric Corp.
ADDRESS : 1 Enterprise Drive, Old Lyme, CT 06371, USA

Test Performed by

ELECTRONICS TESTING CENTER (ETC) , TAIWAN
NO. 34, LIN 5, DINGFU VIL., LINKOU DIST.,
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Report Number : 18-11-RBF-013-04

TEST REPORT CERTIFICATION

Applicant : Sennheiser Electric Corp.
1 Enterprise Drive, Old Lyme, CT 06371, USA

Manufacturer : MASCOT ELECTRIC CO., LTD
NO. 85, CHANGXING 1ST ST., RENDE DIST., TAINAN CITY
717, TAIWAN

Description of EUT :

a) Type of EUT : XS WIRELESS

b) Trade Name : SENNHEISER

c) Model No. : SK-XSW

d) FCC ID : DMOSKXSW

e) Working Frequency : 548~572 MHz

f) Power Supply : DC 3V Battery

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 ANSI C63.10-2013 and the energy emitted by the device was founded to be within the limits applicable. I assume full responsibility for 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	N/A

Issued Date : Dec.27, 2018

Test Engineer : Brian Huang
(Brian Huang, Engineer)



Approve & Authorized Signer : Vincent Chang
Vincent Chang, Supervisor
EMC Dept. II of ELECTRONICS
TESTING CENTER, TAIWAN

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1. GENERAL INFORMATION

1.1 Product Description

- a) Type of EUT : XS WIRELESS
- b) Trade Name : SENNHEISER
- c) Model No. : SK-XSW
- d) FCC ID : DMOSKXSW
- e) Working Frequency : 548~572 MHz
- f) Power Supply : DC 3V Battery

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 15 of CFR 47 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.

Measurement Software

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

1.3 Test Facility

The OATS / SAC used for the measurement is located 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)

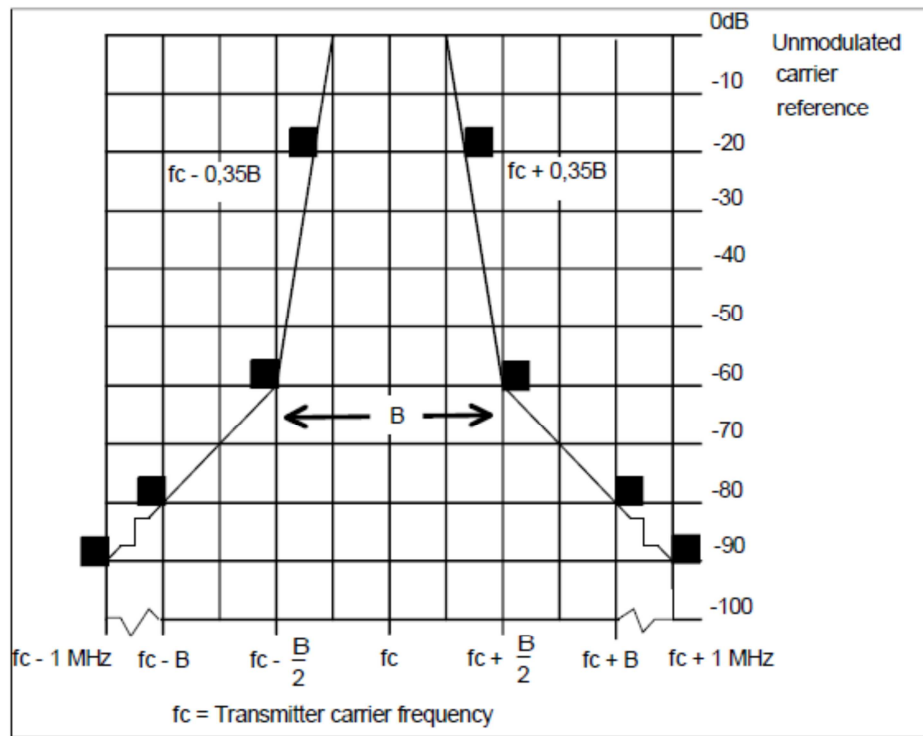
One or more adjacent 25 kHz segments within the assignable frequencies may be combined to form a channel whose maximum bandwidth shall not exceed 200 kHz. The operating bandwidth shall not exceed 200 kHz.

(3) Emission Mask

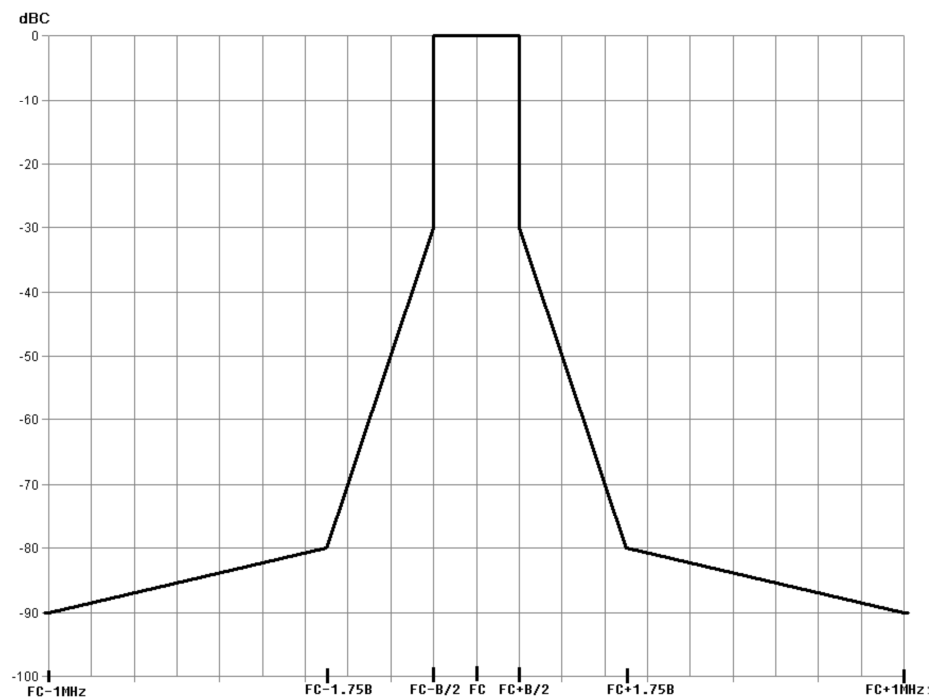
FCC15.236 (g)

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 V1.4.2 (2011-08), 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 V1.4.2 (2011-08).

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 §8.3 of ETSI EN 300 422-1 V1.4.2 (2011-08), 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 V1.4.2 (2011-08).

(5) Frequency Stability

FCC15.236 (f)(3)

The frequency tolerance of the carrier signal shall be maintained within $\pm 0.005\%$ 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 μ H/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 dB μ V	Average dB μ V
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 for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Uncertainty
Conducted emissions	9kHz ~ 30MHz	2.5dB(Mains)
Conducted emission at telecommunication ports	150kHz ~ 30MHz	2.22dB(Voltage)
		2.88dB(Current)
Radiated emissions	30MHz ~ 1GHz	3.90dB($30\text{MHz} \leq f \leq 300\text{MHz}$)
		3.95dB($300\text{MHz} < f \leq 1\text{GHz}$)
	Above 1GHz	4.42dB($1\text{GHz} \leq f \leq 18\text{GHz}$)
		4.86dB($18\text{GHz} \leq f \leq 40\text{GHz}$)
Effective Radiated Power	30MHz ~ 40GHz	2.28dB($30\text{MHz} \leq f \leq 300\text{MHz}$)
		2.28dB($300\text{MHz} < f \leq 1\text{GHz}$)
		2.04dB($1\text{GHz} \leq f \leq 40\text{GHz}$)
Conducted Measurement	9kHz ~ 40GHz	0.78dB($9\text{kHz} \leq f \leq 30\text{MHz}$)
		0.78dB($30\text{MHz} < f \leq 1\text{GHz}$)
		0.86dB($1\text{GHz} \leq f \leq 18\text{GHz}$)
		0.74dB($18\text{GHz} \leq f \leq 40\text{GHz}$)
Frequencies Tolerance (Ambient temperature & Supply voltage)	9kHz ~ 40GHz	$2.7 \times 10^{-6} \%$ ($9\text{kHz} \leq f \leq 40\text{GHz}$)
Occupied Bandwidth	9kHz ~ 40GHz	2.7×10^{-8} ($9\text{kHz} \leq f \leq 40\text{GHz}$)
Modulation Characteristics	9kHz ~ 1GHz	1.26×10^{-3} ($9\text{kHz} \leq f \leq 1\text{GHz}$)

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)).

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)).

3.2 Measurement Procedure

1. Setup the configuration per figure 1 for frequencies measured below 1 GHz respectively.
2. For emission frequencies measured below 1 GHz, set the spectrum analyzer on a 100 kHz resolution bandwidth respectively.
3. 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.
4. Repeat step 3 until all frequencies need to be measured were complete.
5. Repeat step 5 with search antenna in vertical polarized orientations.
6. Check the three frequencies of highest emission with varying the placement of cables associated with EUT (if any) to obtain the worse case and record the result.

Note:

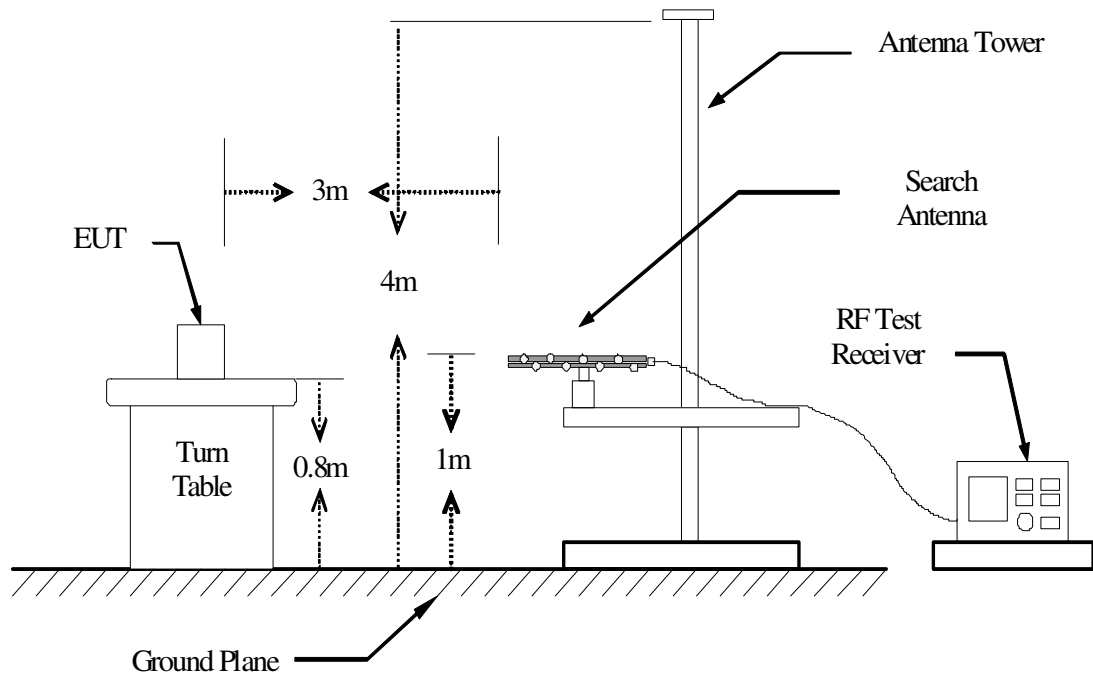
According to 12.7.2(d)(2) of ANSI C63.10-2013:

$$E[\text{dB}\mu\text{V/m}] = \text{EIRP}[\text{dBm}] + 95.2, \text{ for } d = 3 \text{ m.}$$

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

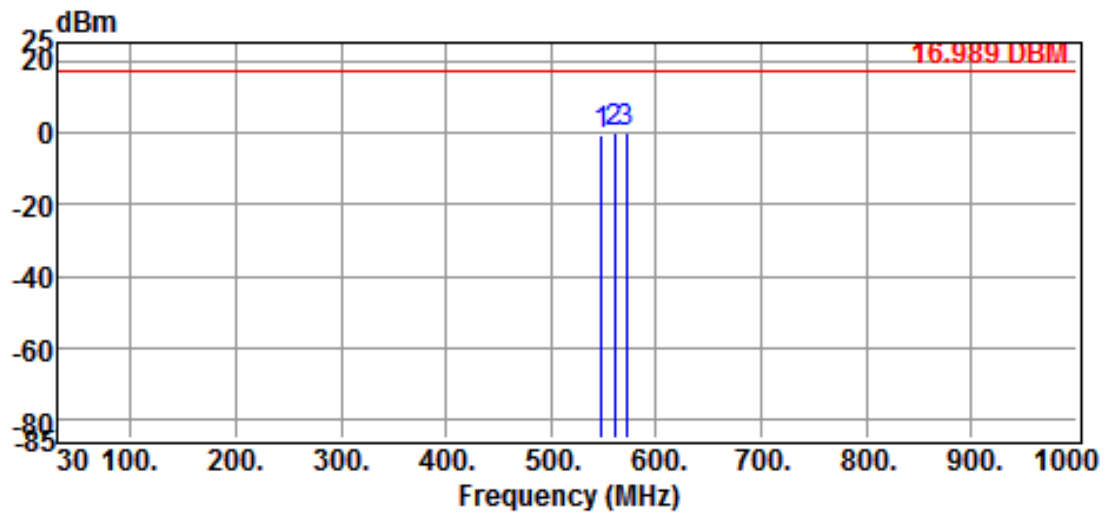


3.3 Test Equipment

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
Test Receiver	Rohde & Schwarz	ESU40	2018/11/01	2019/10/31
Spectrum Analyzer	R&S	FSP40	2018/11/02	2019/11/01
Loop Antenna	EMCO	6512	2018/10/05	2019/10/04
Bi-Log Antenna	ETC	MCTD 2786	2018/08/22	2019/08/21
Biconical Antenna	EMCO	3115	2018/10/15	2019/10/14
Biconical Antenna	EMCO	3117	2018/03/14	2019/03/13
Log-periodic Antenna	EMCO	3116	2018/12/05	2019/12/04
Amplifier	HP	8447D	2018/07/03	2019/07/02
Spectrum Analyzer	HP	8449B	2018/10/09	2019/10/08
Amplifier	Keysight	83051A	2018/09/03	2019/09/02
Attenuator	Mini-Circuits	BW-S10W2+	2018/10/05	2019/10/04

3.4 Measuring Data

3.4.1 RF Portion



Site	:CHAMBER #2	Date	:2018-12-21
Limit	:16.989 DBM	Ant. Pol.	:HORIZONTAL
EUT	: XS WIRELESS	Model	:SK-XSW
Power Rating	:Battery 3V	Temp.	:18 °C
Engineer	: Brian Huang	Humi.	:54 %
Test Mode	:Link		

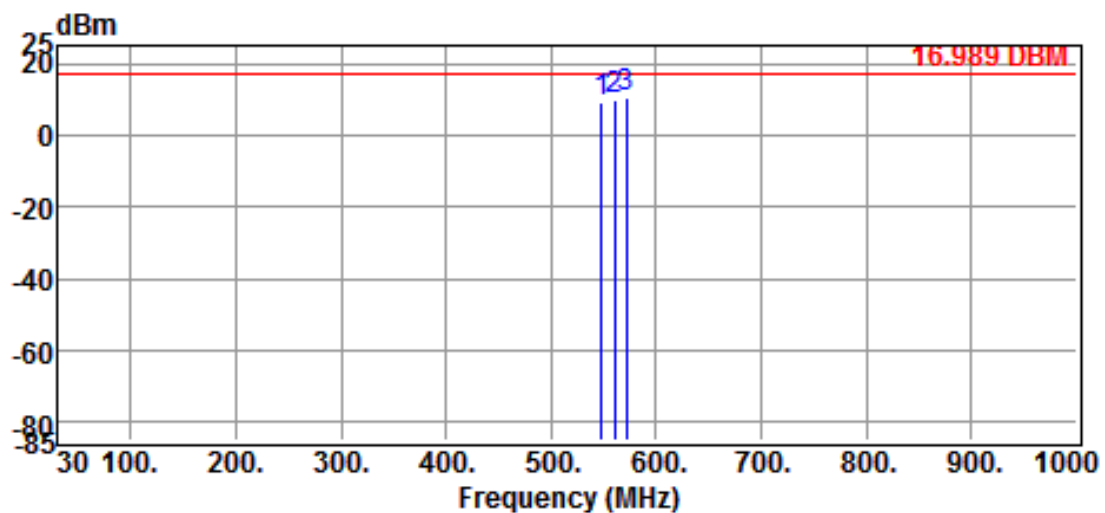
Freq MHz	Reading dBuV	Correction Factor dB	Result dBuV/m	Limits dBuV/m	Over limit dB	Detector
548.2500	100.14	-100.68	-0.54	16.99	-17.53	Peak
560.3500	100.28	-100.56	-0.28	16.99	-17.27	Peak
571.6500	100.57	-100.46	0.11	16.99	-16.88	Peak

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)-EIRP Factor-2.15dB

{ EIRP Factor = -101.2dB (9kHz-30MHz) or -99.9dB (30MHz-1GHz)
or -95.2dB (1GHz Above)}

3. The margin value=Limit - Result



Site	:CHAMBER #2	Date	:2018-12-21
Limit	:16.989 DBM	Ant. Pol.	:VERTICAL
EUT	: XS WIRELESS	Model	:SK-XSW
Power Rating	:Battery 3V	Temp.	:18 °C
Engineer	: Brian Huang	Humi.	:54 %
Test Mode	:Link		

Freq MHz	Reading dBuV	Correction Factor dB	Result dBuV/m	Limits dBuV/m	Over limit dB	Detector
548.2500	109.90	-100.68	9.22	16.99	-7.77	Peak
560.3500	110.21	-100.56	9.65	16.99	-7.34	Peak
571.6500	110.70	-100.46	10.24	16.99	-6.75	Peak

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)-EIRP Factor-2.15dB

{ EIRP Factor = -101.2dB (9kHz-30MHz) or -99.9dB (30MHz-1GHz)
or -95.2dB (1GHz Above)}

3. The margin value=Limit - Result

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:

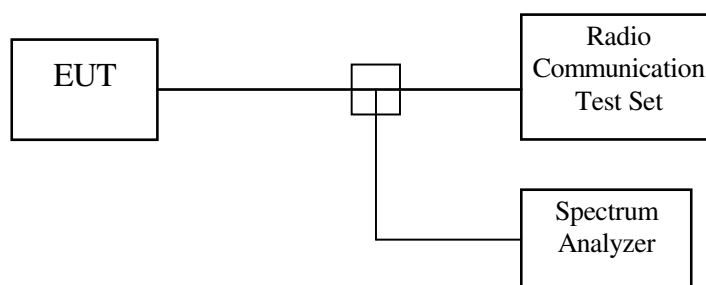
(3) FM broadcast transmitter not used for multiplex operation—when modulated 85 percent by a 15 kHz input signal.

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 and 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
Communications Service Monitor	AEROFLEX	2945B	2018/01/10	2019/01/09
Spectrum Analyzer	Rohde & Schwarz	FSP40	2018/11/02	201911/01

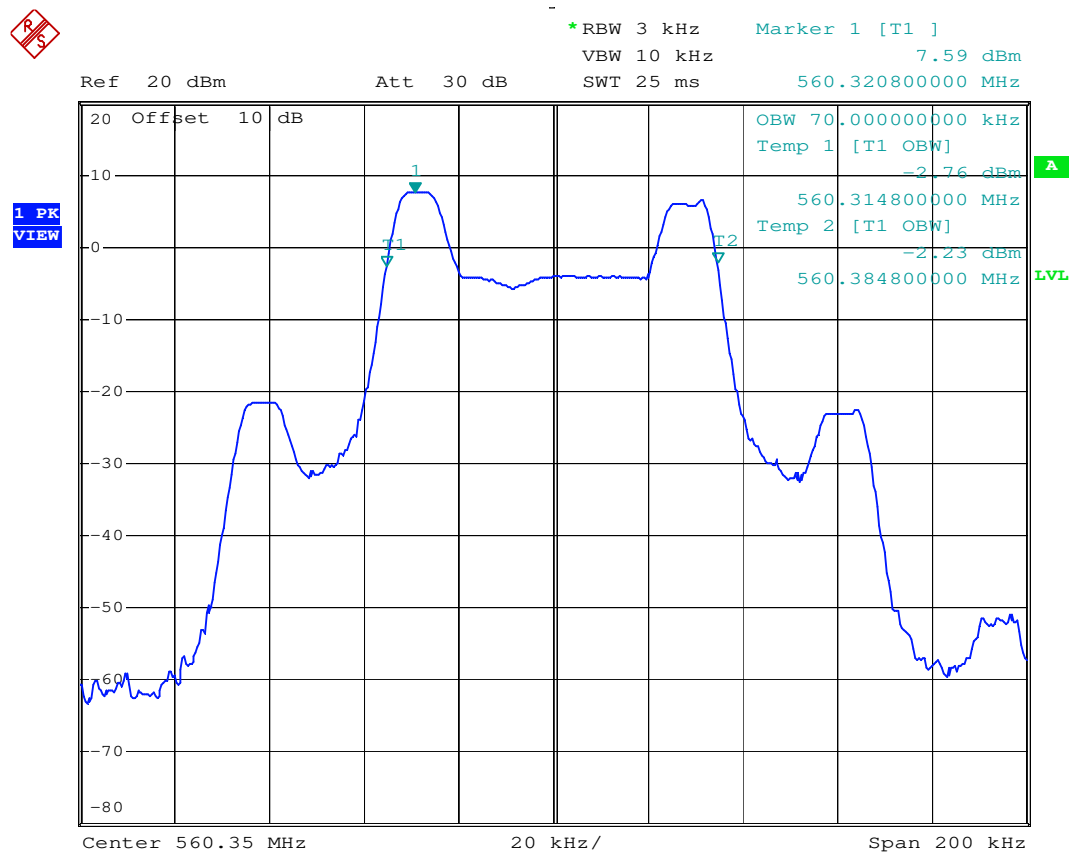
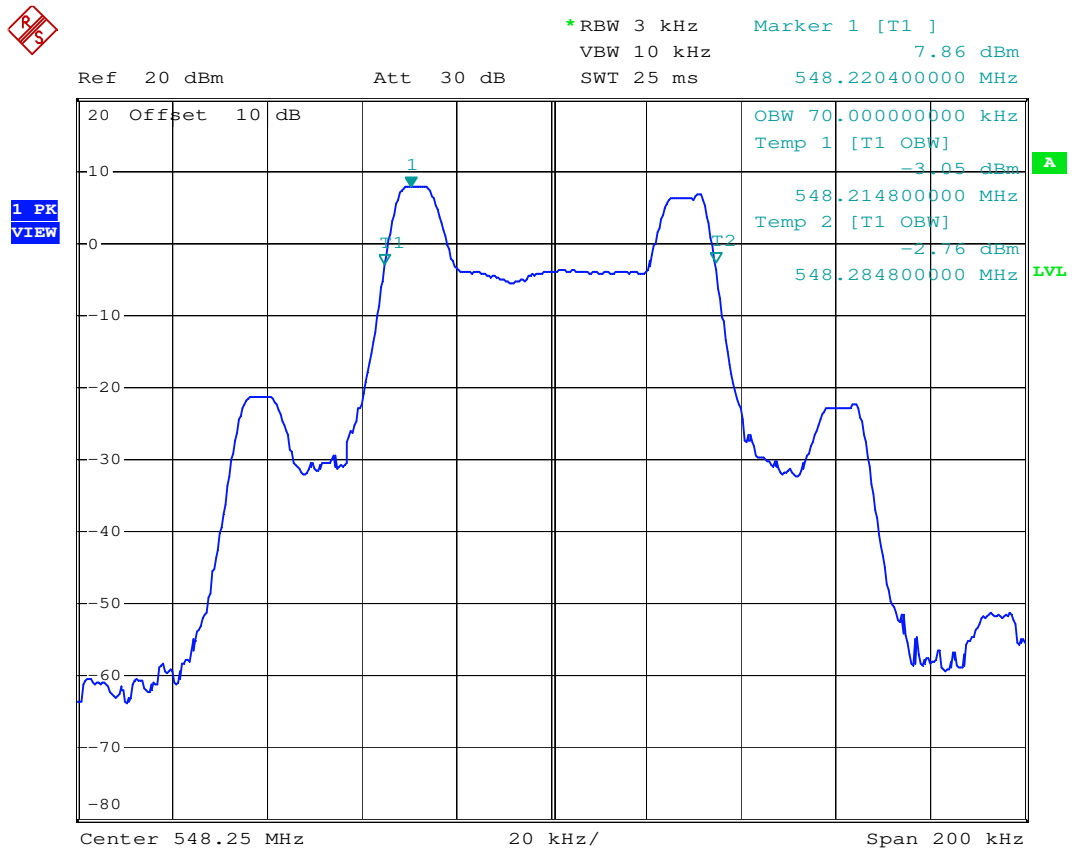
4.4 Bandwidth Measured

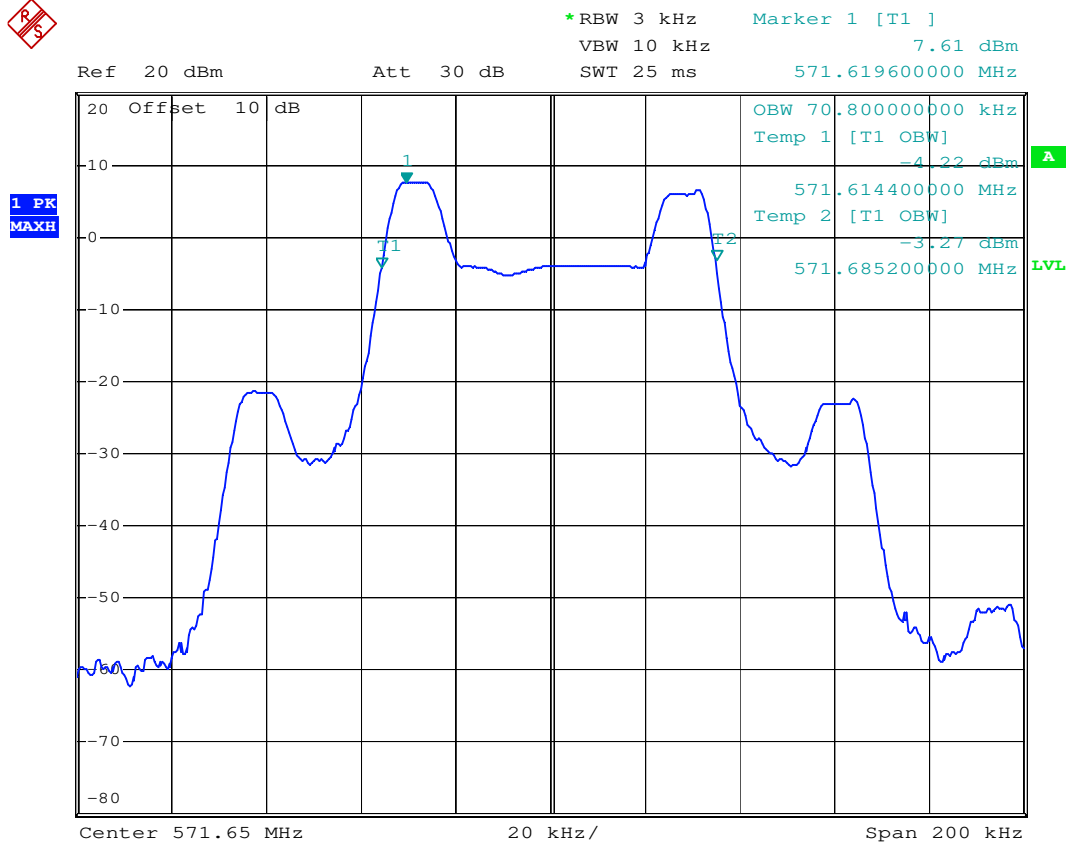
4.4.1 Input Level Derived

Test Date : Dec. 21, 2018 Temperature : 23 °C Humidity : 68 %

RF Frequency (MHz)	99% Bandwidth (kHz)
548.25	70.00
560.35	70.00
571.65	70.80

4.4.2 Occupied Bandwidth Plotted





5. Emission Mask

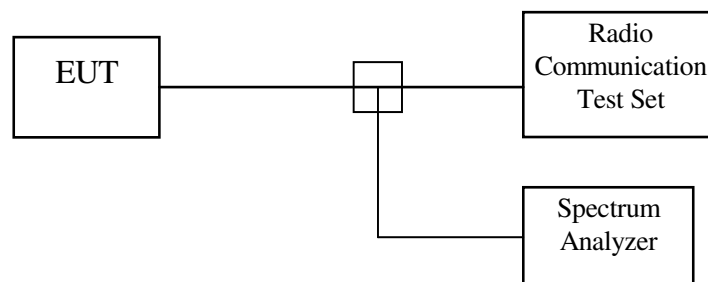
5.1 Provisions Applicable

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 V1.4.2 (2011-08), *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 V1.4.2 (2011-08).

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 and 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
Communications Service Monitor	AEROFLEX	2945B	2018/01/10	2019/01/09
Spectrum Analyzer	Rohde & Schwarz	FSP40	2018/11/02	2019/11/01

5.4 Emission Mask plots

(1) 548.25 MHz



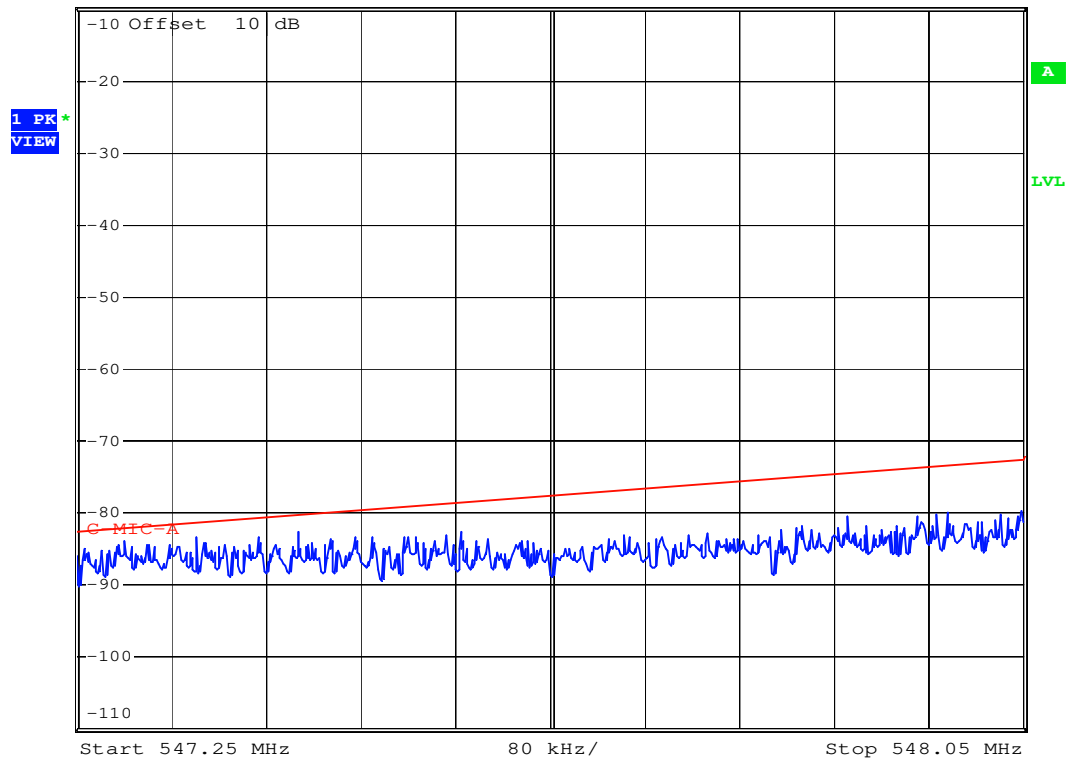
*RBW 1 kHz

*VBW 1 kHz

Ref -10 dBm

Att 10 dB

SWT 800 ms



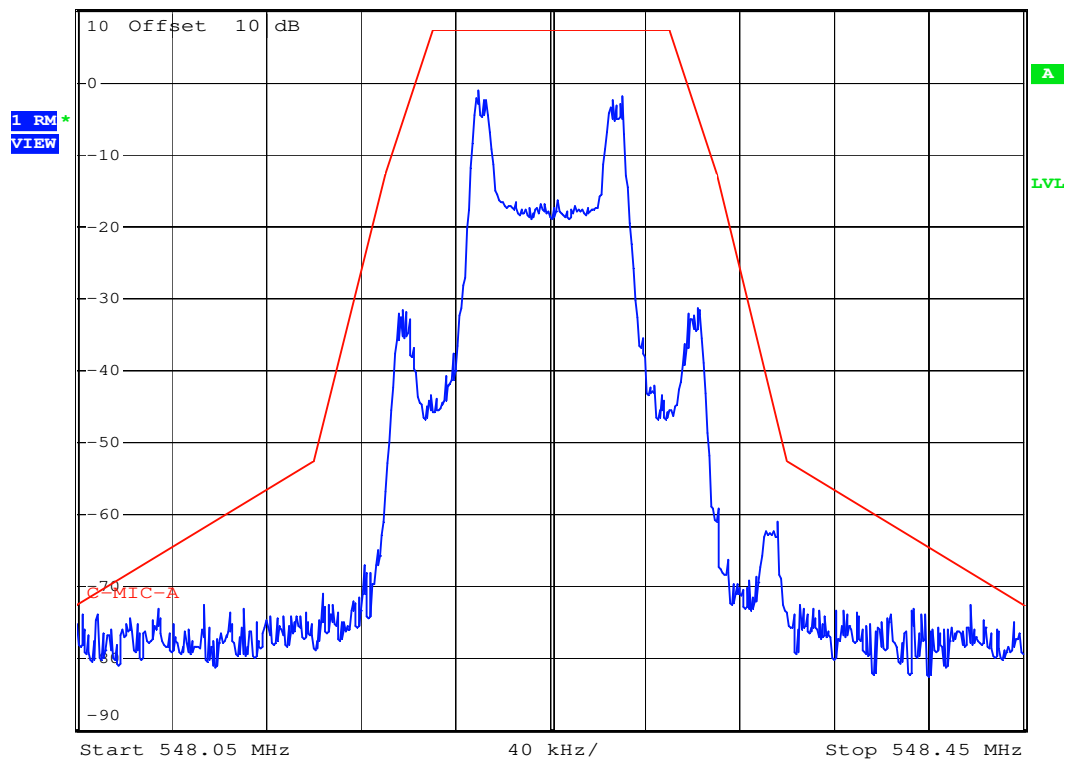
*RBW 1 kHz

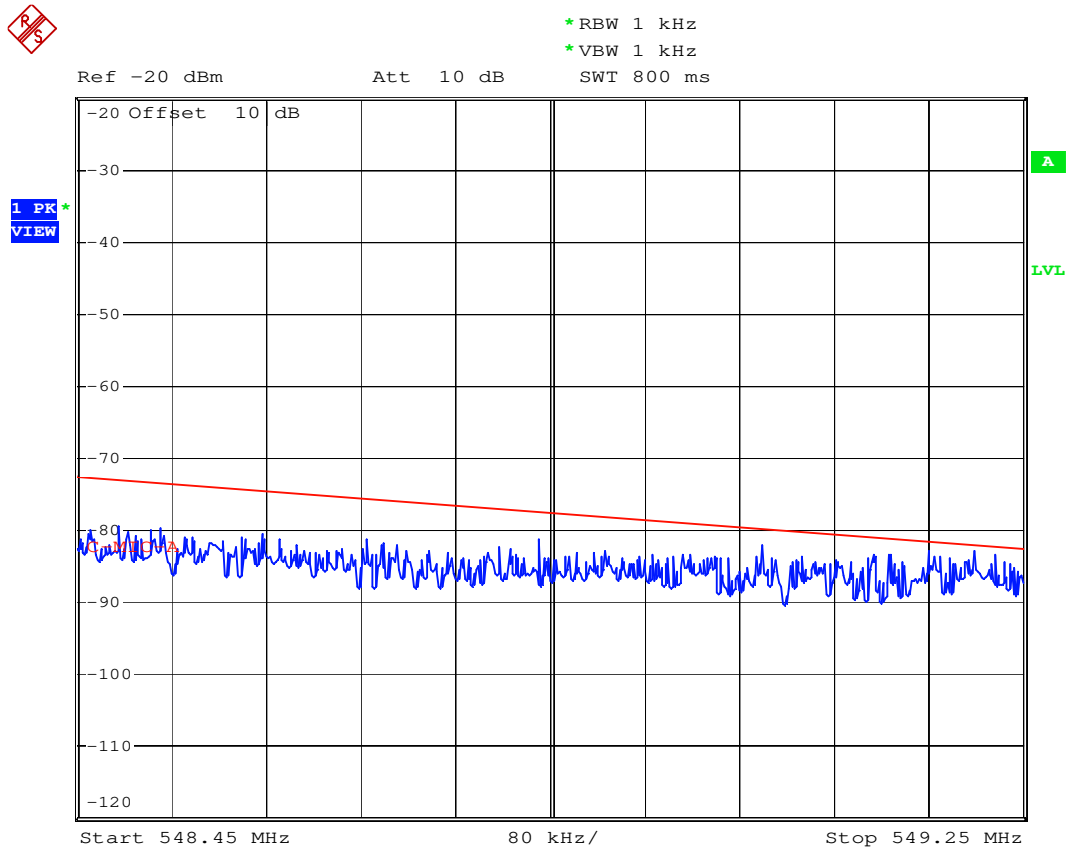
*VBW 1 kHz

Ref 10 dBm

Att 30 dB

SWT 560 ms





(2)560.35 MHz

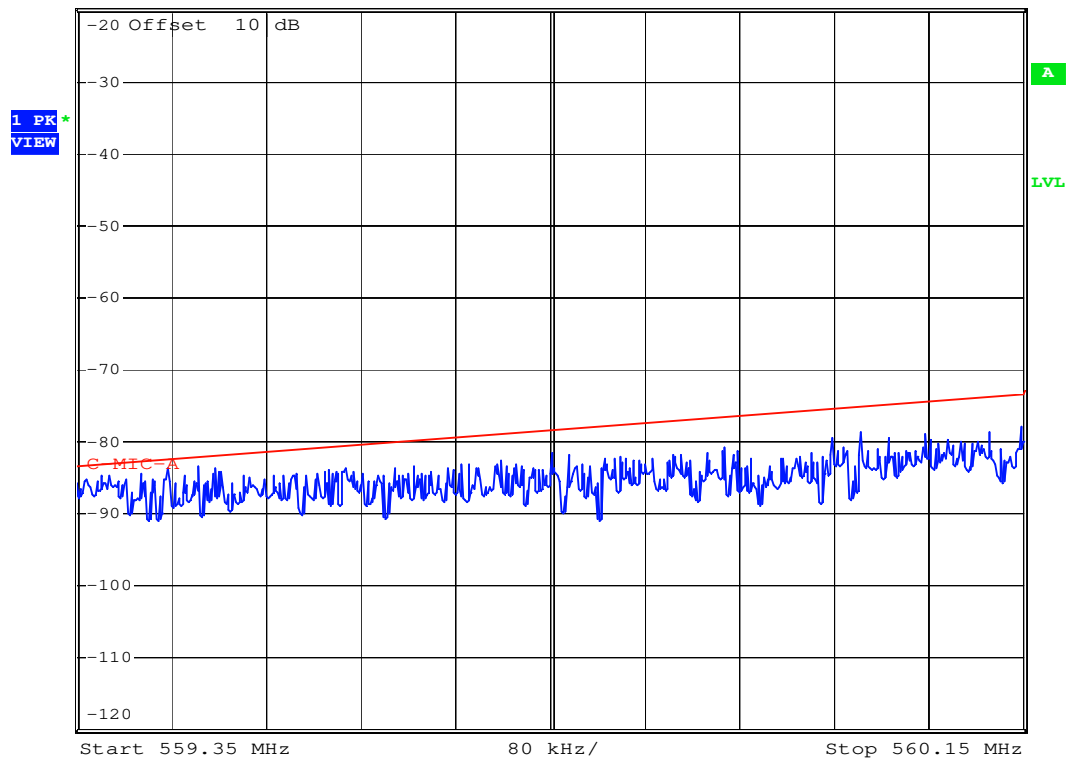
*RBW 1 kHz

*VBW 1 kHz

Ref -20 dBm

Att 10 dB

SWT 800 ms



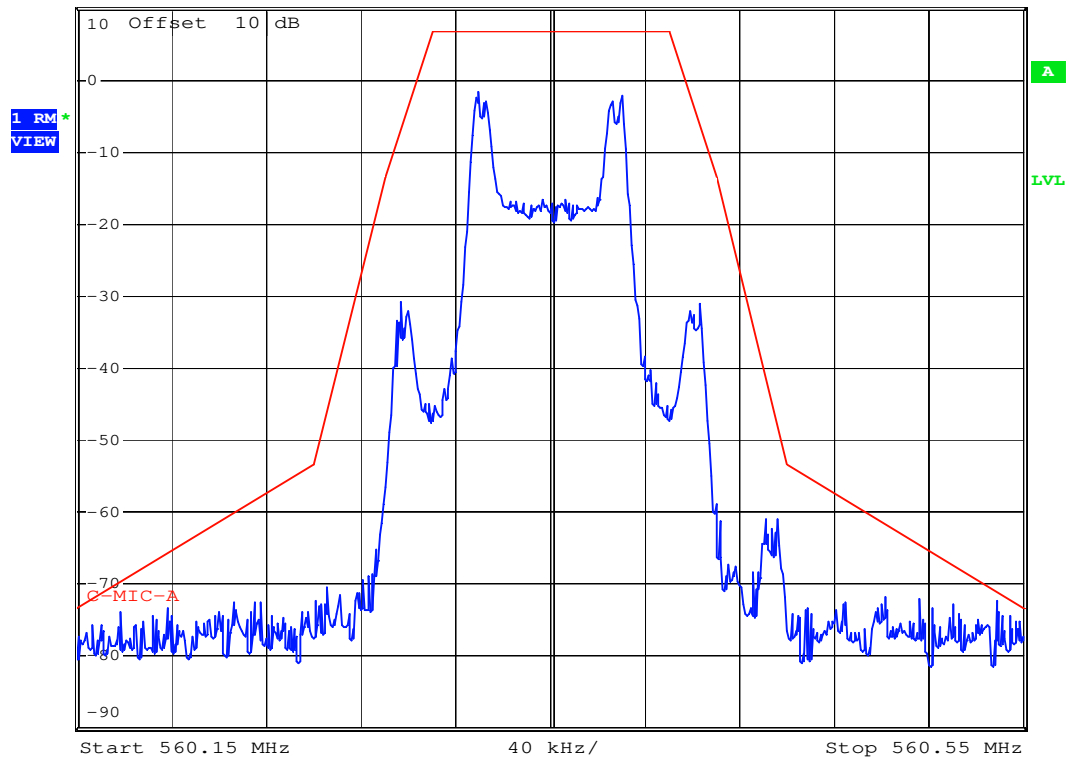
*RBW 1 kHz

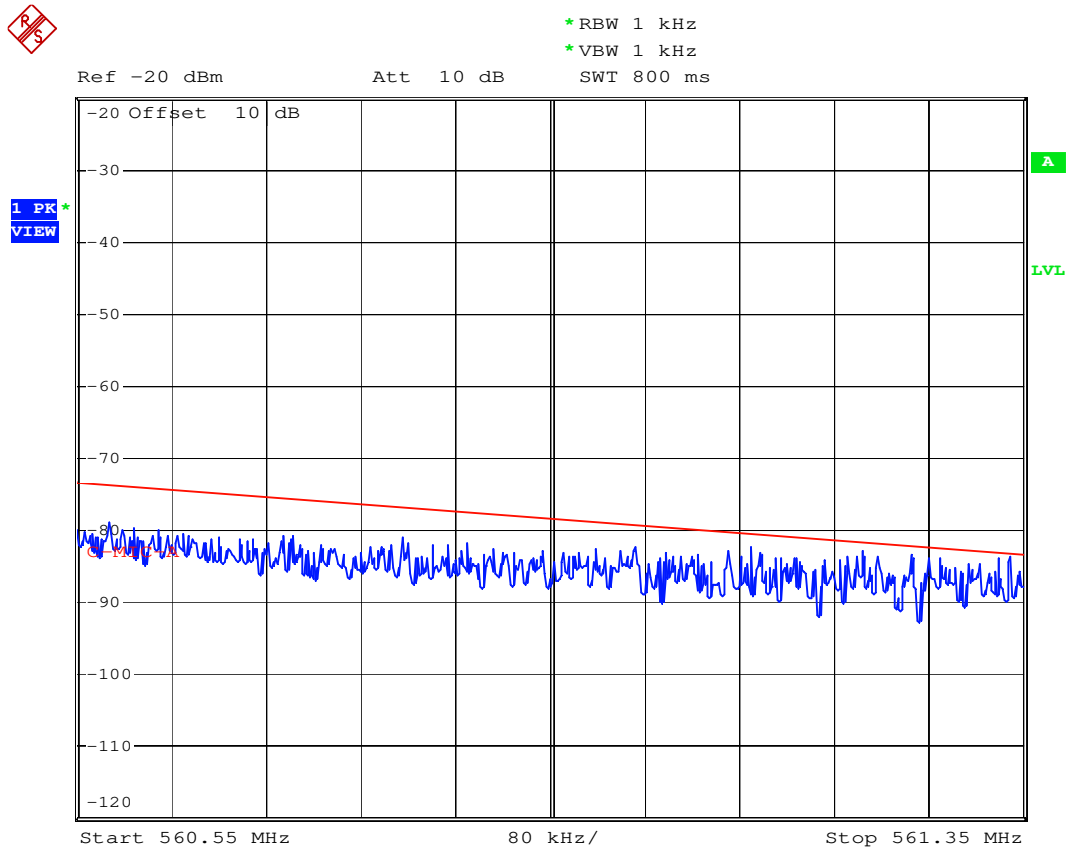
*VBW 1 kHz

Ref 10 dBm

Att 30 dB

SWT 560 ms

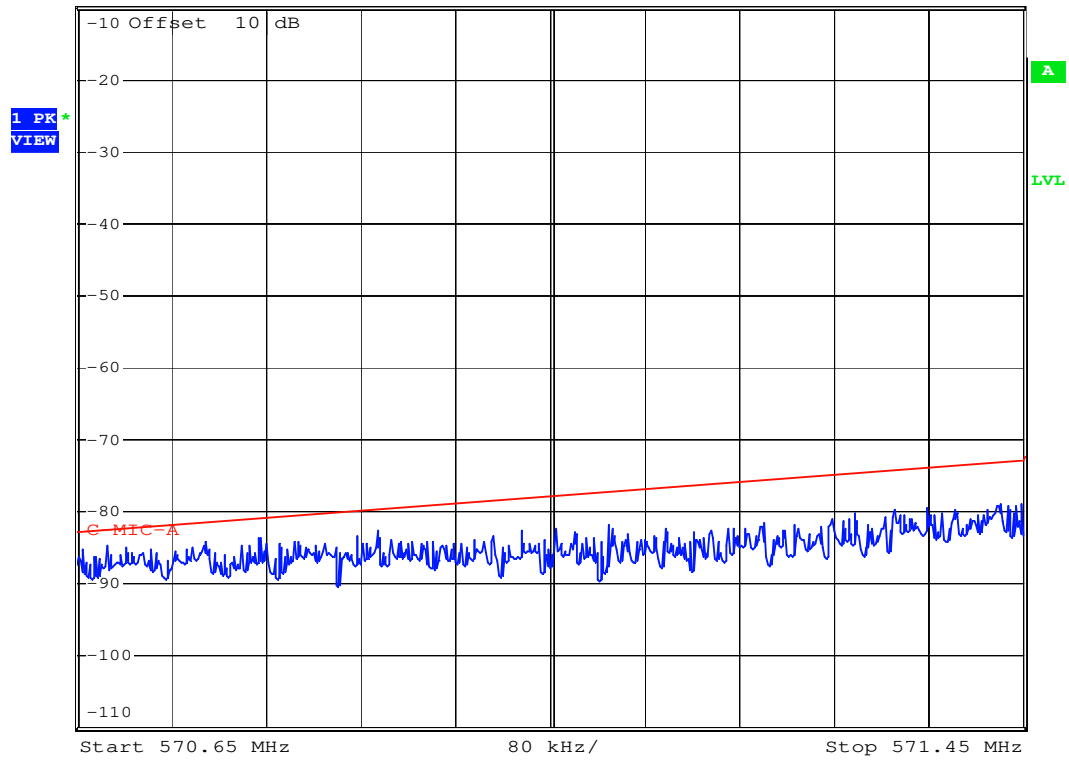




(3)571.65 MHz

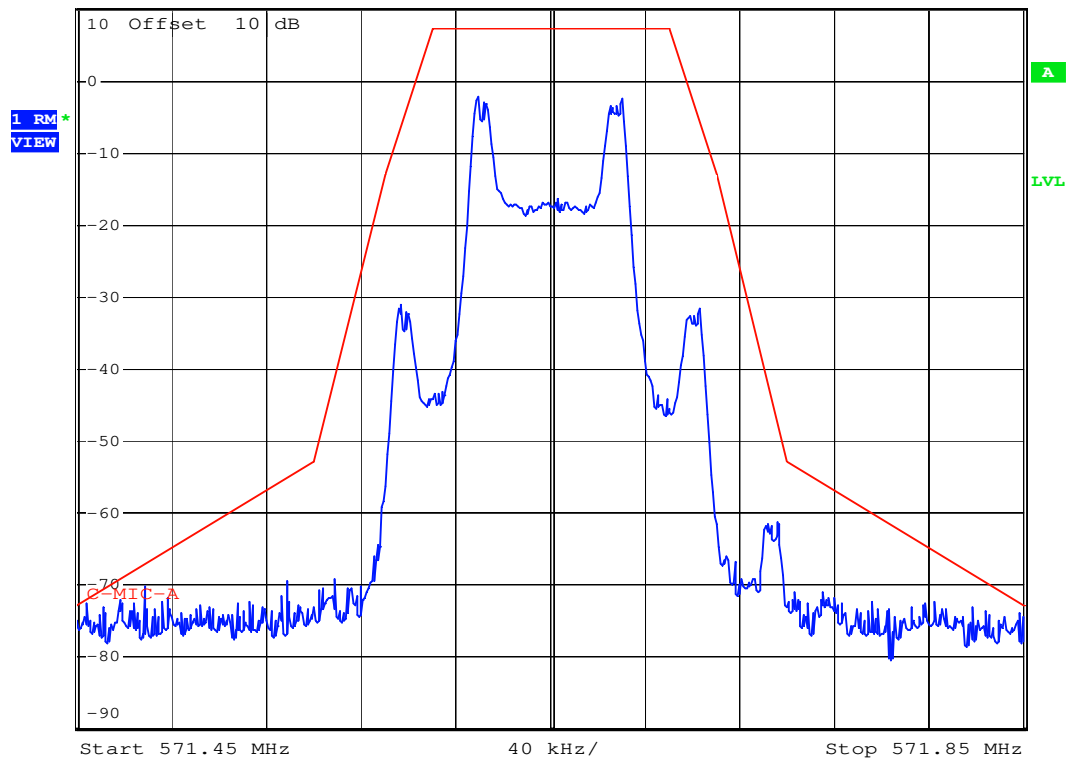
*RBW 1 kHz
*VBW 1 kHz

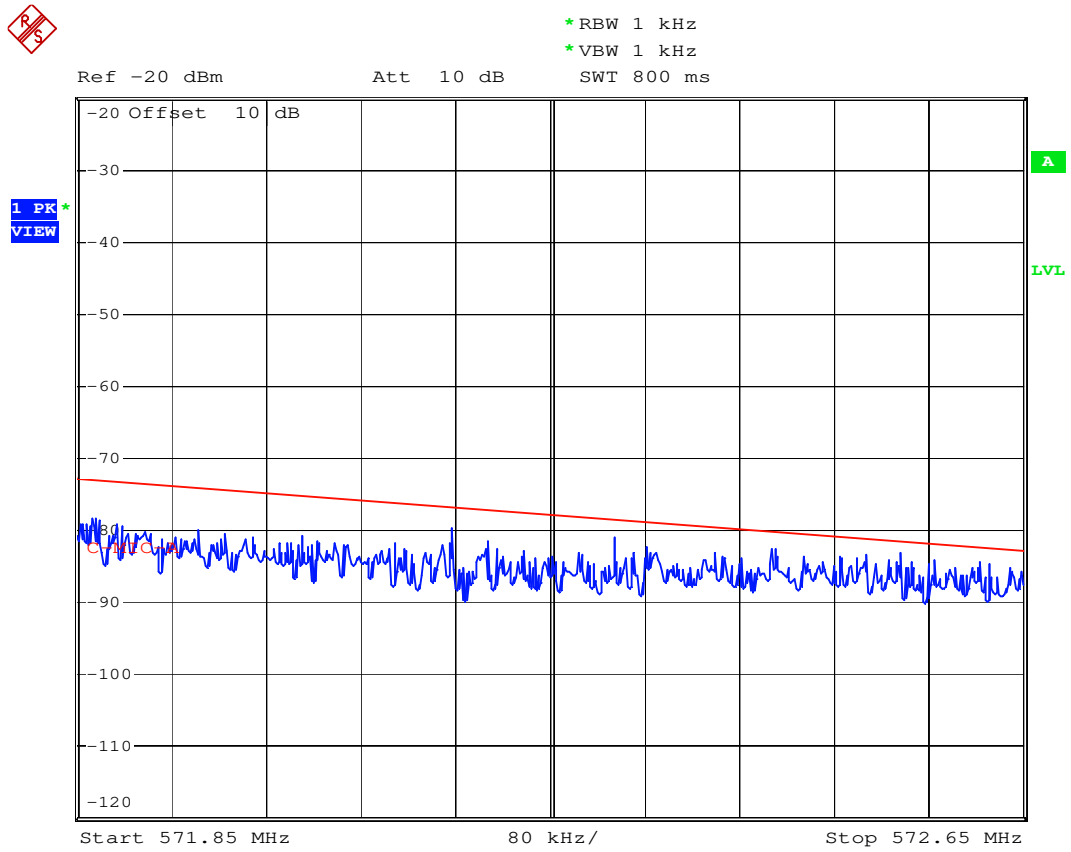
Ref -10 dBm Att 10 dB SWT 800 ms



*RBW 1 kHz
*VBW 1 kHz

Ref 10 dBm Att 30 dB SWT 560 ms





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 §8.3 of ETSI EN 300 422-1 V1.4.2 (2011-08), *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 V1.4.2 (2011-08).

6.2 Measurement Procedure

1. Setup the configuration per figure 4 and 5 for frequencies measured below and above 1 GHz respectively.
2. For emission frequencies measured below and above 1 GHz, set the spectrum analyzer on a 100 kHz and 1 MHz resolution bandwidth respectively.
3. 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.
4. Repeat step 3 until all frequencies need to be measured were complete.
5. Repeat step 5 with search antenna in vertical polarized orientations.
6. Check the three frequencies of highest emission with varying the placement of cables associated with EUT (if any) to obtain the worse case and record the result.

Note:

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

$$E[\text{dB}\mu\text{V/m}] = \text{EIRP}[\text{dBm}] + 95.2, \text{ for } d = 3 \text{ m.}$$

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 4 : Frequencies measured below 1 GHz configuration

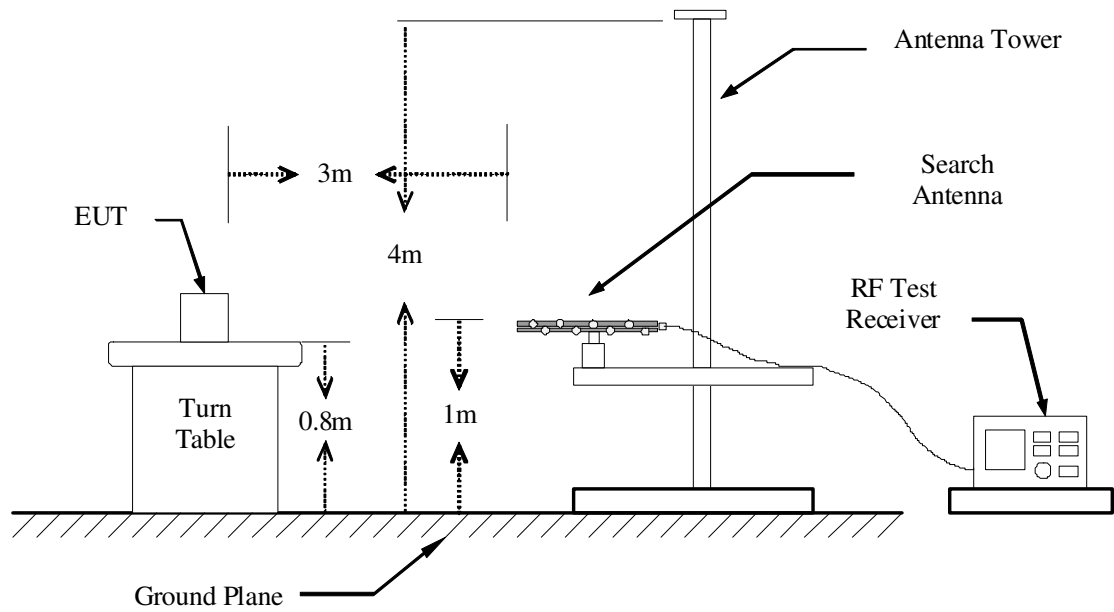
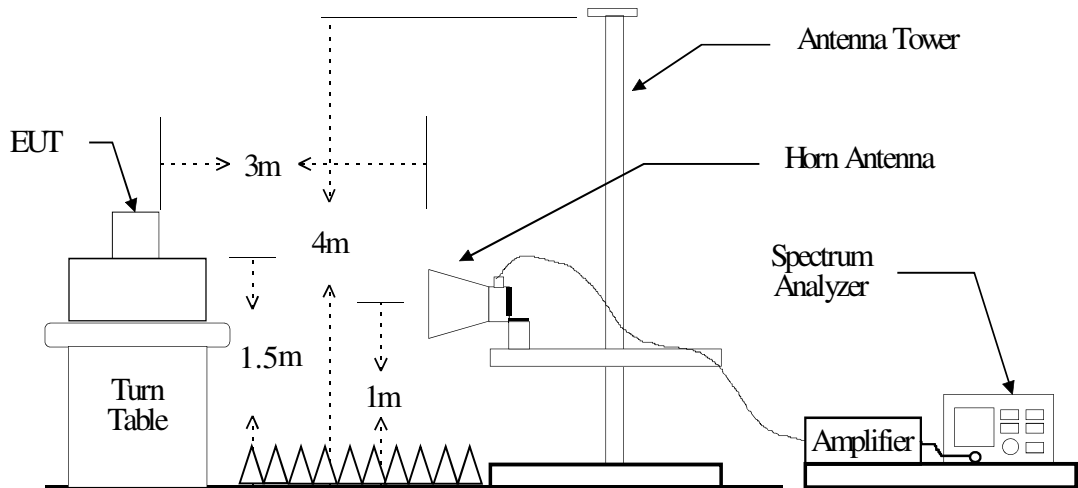


Figure 5 : Frequencies measured above 1 GHz configuration



6.3 Test Equipment

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
Test Receiver	Rohde & Schwarz	ESU40	2018/11/01	2019/10/31
Spectrum Analyzer	R&S	FSP40	2018/11/02	2019/11/01
Loop Antenna	EMCO	6512	2018/10/05	2019/10/04
Bi-Log Antenna	ETC	MCTD 2786	2018/08/22	2019/08/21
Biconical Antenna	EMCO	3115	2018/10/15	2019/10/14
Biconical Antenna	EMCO	3117	2018/03/14	2019/03/13
Log-periodic Antenna	EMCO	3116	2018/12/05	2019/12/04
Amplifier	HP	8447D	2018/07/03	2019/07/02
Spectrum Analyzer	HP	8449B	2018/10/09	2019/10/08
Amplifier	Keysight	83051A	2018/09/03	2019/09/02
Attenuator	Mini-Circuits	BW-S10W2+	2018/10/05	2019/10/04

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

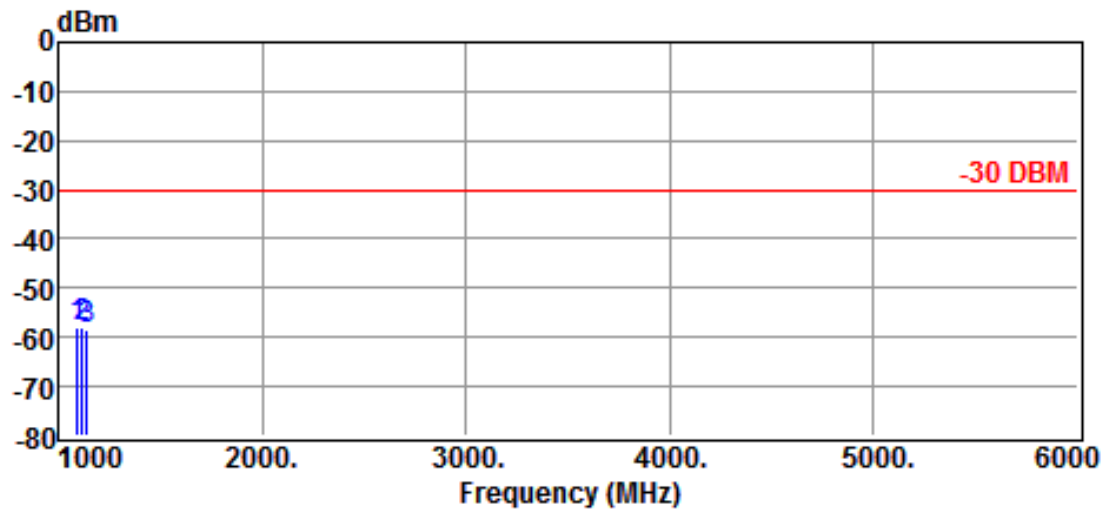
Frequency Band (MHz)	Instrument	Function	Resolution bandwidth	Video Bandwidth
25 to 30	Spectrum Analyzer	Peak	9kHz to 10kHz	9kHz to 10kHz
30 to 1000	Spectrum Analyzer	Peak	100kHz to 120kHz	100kHz to 120kHz
Above 1000	Spectrum Analyzer	Peak	1 MHz	1 MHz

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 μ W (-30dBm)
Standby	2 nW (-57dBm)	2 nW (-57dBm)	20 nW(-47dBm)

6.4 Measuring Data

6.4.1. Harmonic Frequencies



Site :CHAMBER #2
 Limit :-30 DBM
 EUT : XS WIRELESS
 Power Rating :Battery 3V
 Engineer : Brian Huang
 Test Mode :Link

Date :2018-12-21
 Ant. Pol. :HORIZONTAL
 Model :SK-XSW
 Temp. :18 °C
 Humi. :53 %

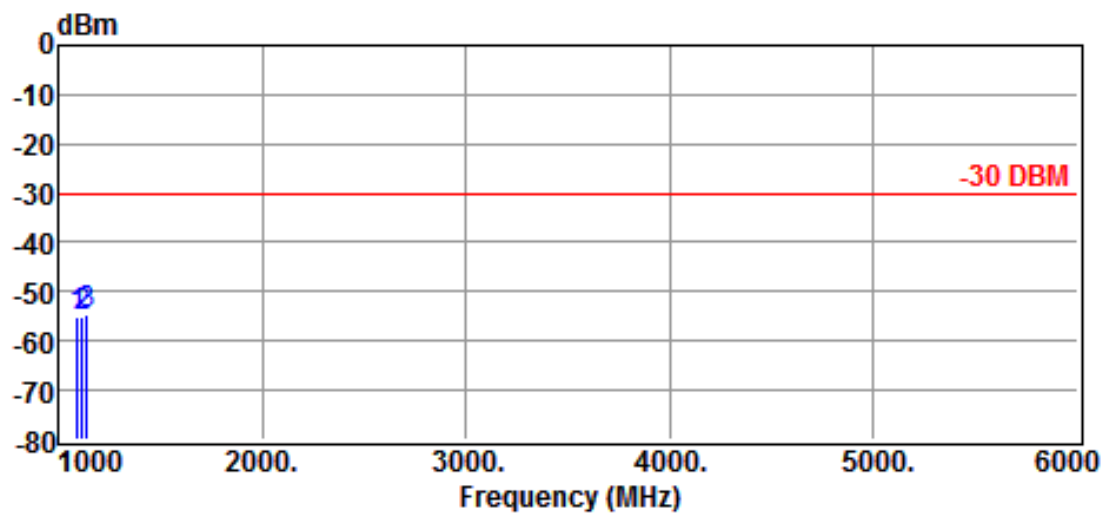
Freq MHz	Reading dBuV	Correction Factor dB	Result dBm	Limits dBm	Over limit dB	Detector
1096.5000	49.97	-107.77	-57.80	-30.00	-27.80	Peak
1120.7000	49.69	-107.78	-58.09	-30.00	-28.09	Peak
1143.3000	49.55	-107.77	-58.22	-30.00	-28.22	Peak

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)-EIRP Factor-2.15dB

{EIRP Factor = -101.2dB (9kHz-30MHz) or -99.9dB (30MHz-1GHz)
 or -95.2dB (1GHz Above)}

3. The margin value=Limit - Result



Site	:CHAMBER #2	Date	:2018-12-21
Limit	:-30 DBM	Ant. Pol.	:VERTICAL
EUT	: XS WIRELESS	Model	:SK-XSW
Power Rating	:Battery 3V	Temp.	:18 °C
Engineer	: Brian Huang	Humi.	:53 %
Test Mode	:Link		

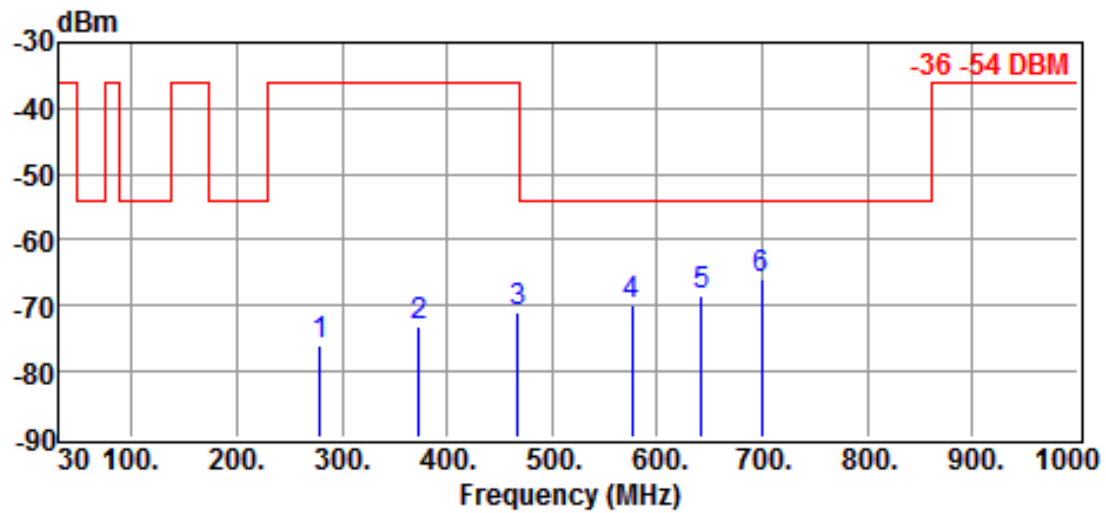
Freq MHz	Reading dBuV	Correction Factor dB	Result dBm	Limits dBm	Over limit dB	Detector
1096.5000	52.68	-107.77	-55.09	-30.00	-25.09	Peak
1120.7000	52.79	-107.78	-54.99	-30.00	-24.99	Peak
1143.3000	53.11	-107.77	-54.66	-30.00	-24.66	Peak

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)-EIRP Factor-2.15dB

{ EIRP Factor = -101.2dB (9kHz-30MHz) or -99.9dB (30MHz-1GHz)
or -95.2dB (1GHz Above)}

3. The margin value=Limit - Result

6.4.2 Spurious Emissions frequencies below 1 GHz

Site :CHAMBER #2
 Limit :-36 -54 DBM
 EUT : XS WIRELESS
 Power Rating :Battery 3V
 Engineer : Brian Huang
 Test Mode :Link

Date :2018-12-21
 Ant. Pol. :HORIZONTAL
 Model :SK-XSW
 Temp. :18 °C
 Humi. :53 %

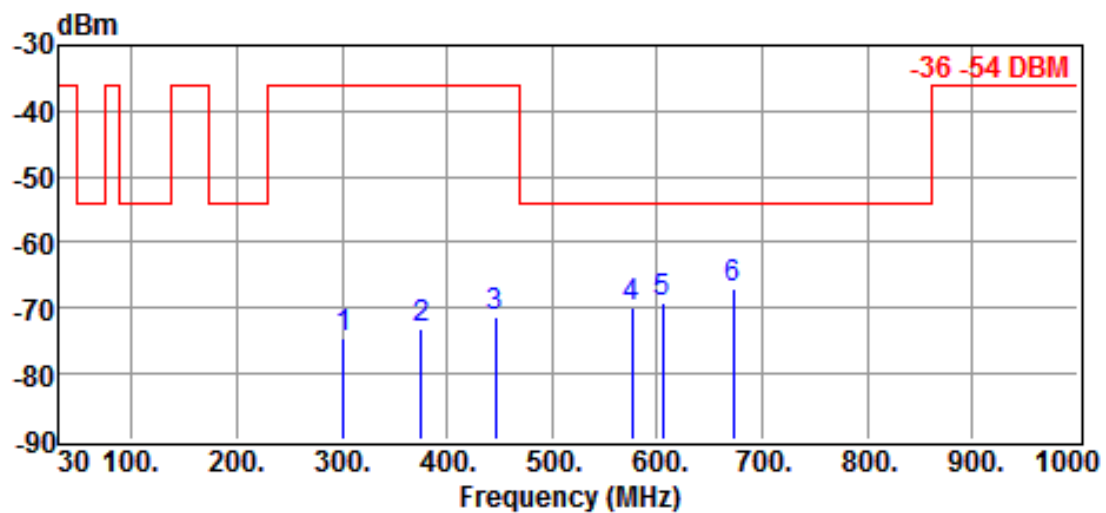
Freq MHz	Reading dBuV	Correction Factor dB	Result dBm	Limits dBm	Over limit dB	Detector
279.2900	29.83	-105.72	-75.89	-36.00	-39.89	Peak
373.3800	30.46	-103.62	-73.16	-36.00	-37.16	Peak
467.4700	31.19	-102.10	-70.91	-36.00	-34.91	Peak
576.1100	30.53	-100.42	-69.89	-54.00	-15.89	Peak
642.0700	30.45	-98.82	-68.37	-54.00	-14.37	Peak
699.3000	31.72	-97.61	-65.89	-54.00	-11.89	Peak

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)-EIRP Factor-2.15dB

{ EIRP Factor = -101.2dB (9kHz-30MHz) or -99.9dB (30MHz-1GHz)
 or -95.2dB (1GHz Above)}

3. The margin value=Limit - Result



Site :CHAMBER #2
 Limit :-36 -54 DBM
 EUT : XS WIRELESS
 Power Rating :Battery 3V
 Engineer : Brian Huang
 Test Mode :Link

Date :2018-12-21
 Ant. Pol. :VERTICAL
 Model :SK-XSW
 Temp. :18 °C
 Humi. :53 %

Freq MHz	Reading dBuV	Correction Factor dB	Result dBm	Limits dBm	Over limit dB	Detector
301.6000	29.91	-104.62	-74.71	-36.00	-38.71	Peak
375.3200	30.38	-103.57	-73.19	-36.00	-37.19	Peak
446.1300	31.11	-102.49	-71.38	-36.00	-35.38	Peak
576.1100	30.53	-100.42	-69.89	-54.00	-15.89	Peak
605.2100	30.64	-99.81	-69.17	-54.00	-15.17	Peak
672.1400	30.82	-97.88	-67.06	-54.00	-13.06	Peak

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)-EIRP Factor-2.15dB

{ EIRP Factor = -101.2dB (9kHz-30MHz) or -99.9dB (30MHz-1GHz)
 or -95.2dB (1GHz Above)}

3. The margin value=Limit - Result

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 $\pm 0.005\%$ 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

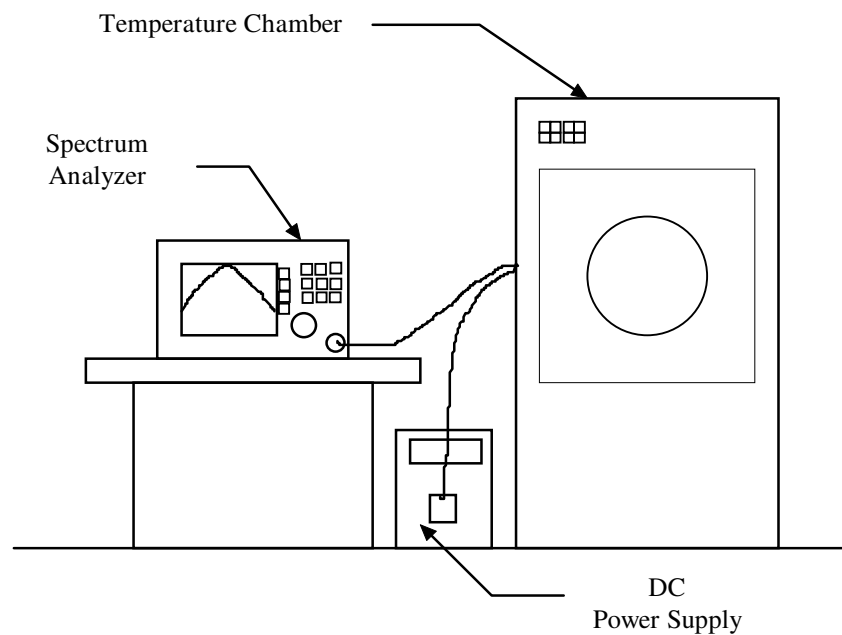
1. Setup the configuration per figure 6 for frequencies measured at an environmental chamber.
2. Turn on EUT and set SA center frequency to the right frequency needs to be measured. Set SA RBW to 30 kHz, VBW to 100kHz and frequency span to 500 kHz. Then turn off the EUT.
3. Set the temperature of chamber to 50°C . 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 stabilized.
4. Repeat step 3 with a 10°C decreased per stage until the lowest temperature -30°C 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°C .

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	Rohde & Schwarz	FSP40	2018/11/02	2019/11/01
Temperature Chamber	ESPEC	EFL-3	2018/07/25	2019/07/24

7.4 Measurement Data

Test Date : Dec. 21, 2018

Temperature : 26 °CHumidity : 68 %**A. Tx Frequency 548.25MHz****A1. Frequency stability versus environment temperature**

Reference Frequency : 548.25 MHz		Limit : 0.005%							
Environment Temperature (°C)	Power Supplied (Vdc)	Frequency measured with time elapsed							
		Startup		2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
50	3.0	548.2690	0.00347	548.2420	-0.00146	548.2361	-0.00254	548.2690	0.00347
40		548.2331	-0.00308	548.2385	-0.00210	548.2307	-0.00352	548.2331	-0.00308
30		548.2321	-0.00326	548.2398	-0.00186	548.2471	-0.00053	548.2321	-0.00326
20		548.2296	-0.00372	548.2695	0.00356	548.2444	-0.00102	548.2296	-0.00372
10		548.2422	-0.00142	548.2360	-0.00255	548.2421	-0.00144	548.2422	-0.00142
0		548.2644	0.00263	548.2562	0.00113	548.2517	0.00031	548.2644	0.00263
-10		548.2459	-0.00075	548.2362	-0.00252	548.2312	-0.00343	548.2459	-0.00075
-20		548.2626	0.00230	548.2560	0.00109	548.2651	0.00275	548.2626	0.00230

A2. Frequency stability versus supplied voltage

Reference Frequency : 548.25 MHz		Limit : 0.005%	
Environment Temperature (°C)	Power Supplied (Vac)	(MHz)	(%)
20	3.45	548.2465	-0.00064
20	2.55	548.2302	-0.00361
20	3.00	548.2413	-0.00159

B. Tx Frequency 560.35 MHz**B1. Frequency stability versus environment temperature**

Reference Frequency : 560.35 MHz Limit : 0.005%									
Environment Temperature (°C)	Power Supplied (Vac)	Frequency measured with time elapsed							
		Startup		2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
50	3.0	560.3324	-0.00314	560.3628	0.00228	560.3663	0.00291	560.3324	-0.00314
40		560.3418	-0.00146	560.3457	-0.00077	560.3684	0.00328	560.3418	-0.00146
30		560.3619	0.00212	560.3457	-0.00077	560.3343	-0.00280	560.3619	0.00212
20		560.3307	-0.00344	560.3648	0.00264	560.3311	-0.00337	560.3307	-0.00344
10		560.3289	-0.00377	560.3518	0.00032	560.3384	-0.00207	560.3289	-0.00377
0		560.3458	-0.00075	560.3602	0.00182	560.3513	0.00023	560.3458	-0.00075
-10		560.3647	0.00262	560.3677	0.00316	560.3298	-0.00360	560.3647	0.00262
-20		560.3357	-0.00255	560.3401	-0.00177	560.3392	-0.00193	560.3357	-0.00255

B2. Frequency stability versus supplied voltage

Reference Frequency : 560.35 MHz Limit : 0.005%			
Environment Temperature (°C)	Power Supplied (Vac)	(MHz)	(%)
20	3.45	560.3911	0.00198
20	2.55	560.3921	0.00216
20	3.45	560.3911	0.00198

C. Tx Frequency 571.65 MHz**C1. Frequency stability versus environment temperature**

Reference Frequency : 571.65 MHz Limit : 0.005%									
Environment Temperature (°C)	Power Supplied (Vac)	Frequency measured with time elapsed							
		Startup		2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
50	3.0	571.6502	0.00003	571.6538	0.00066	571.6645	0.00254	571.6502	0.00003
40		571.6701	0.00352	571.6346	-0.00269	571.6434	-0.00115	571.6701	0.00352
30		571.6519	0.00033	571.6610	0.00192	571.6511	0.00019	571.6519	0.00033
20		571.6643	0.00250	571.6316	-0.00322	571.6473	-0.00047	571.6643	0.00250
10		571.6421	-0.00138	571.6695	0.00341	571.6333	-0.00292	571.6421	-0.00138
0		571.6284	-0.00378	571.6614	0.00199	571.6652	0.00266	571.6284	-0.00378
-10		571.6711	0.00369	571.6578	0.00136	571.6452	-0.00084	571.6711	0.00369
-20		571.6540	0.00070	571.6523	0.00040	571.6305	-0.00341	571.6540	0.00070

C2. Frequency stability versus supplied voltage

Reference Frequency : 517.65 MHz Limit : 0.005%			
Environment Temperature (°C)	Power Supplied (Vac)	(MHz)	(%)
20	3.00	571.6285	-0.00376
20	3.45	571.6374	-0.00220
20	2.55	571.6640	0.00245

8 CONDUCTED EMISSION MEASUREMENT

8.1 Standard Applicable

This EUT is excused from investigation of conducted emission, for it is powered by DC battery only. According to §15.207 (d), measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines.