FCC Part 15 Subpart C

EMI TEST REPORT

of

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

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.,
NEW TAIPEI CITY, TAIWAN, 24442, R.O.C.
TEL : (02)26023052 FAX : (02)26010910
http:// www.etc.org.tw ; e-mail:emc@etc.org.tw

Report Number : 18-11-RBF-013-03

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.	:	SKM-XSW
d) FCC ID	:	DMOSKMXSW
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, Engineer)

Approve & Authorized Signer : 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. : SKM-XSW
d) FCC ID : DMOSKMXSW
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.

Measueement 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)

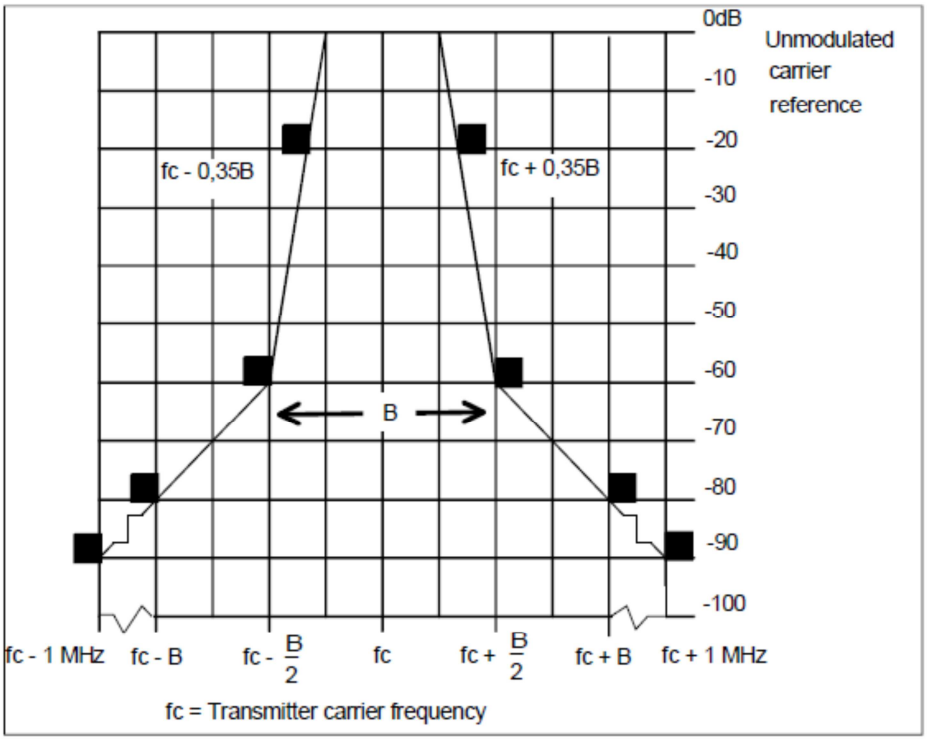
One or more adjacent 25 kHz segments within the assignable frequencies may be combined to form a channel whose maximum bandwidth shall not exceed 200 kHz. The operating bandwidth shall not exceed 200 kHz.

(3) Emission Mask

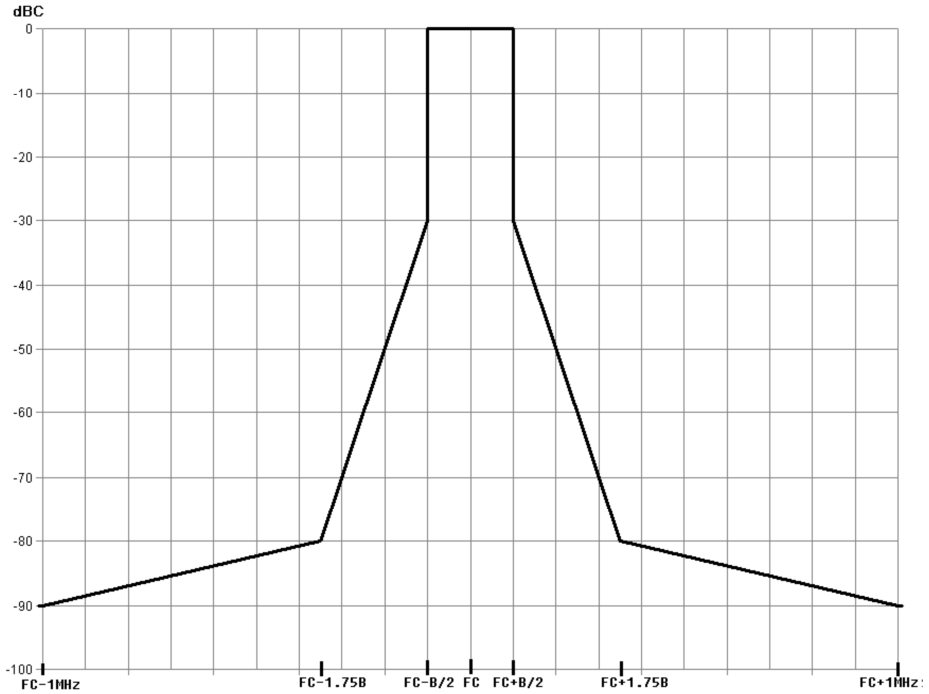
FCC15.236 (g)

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

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.

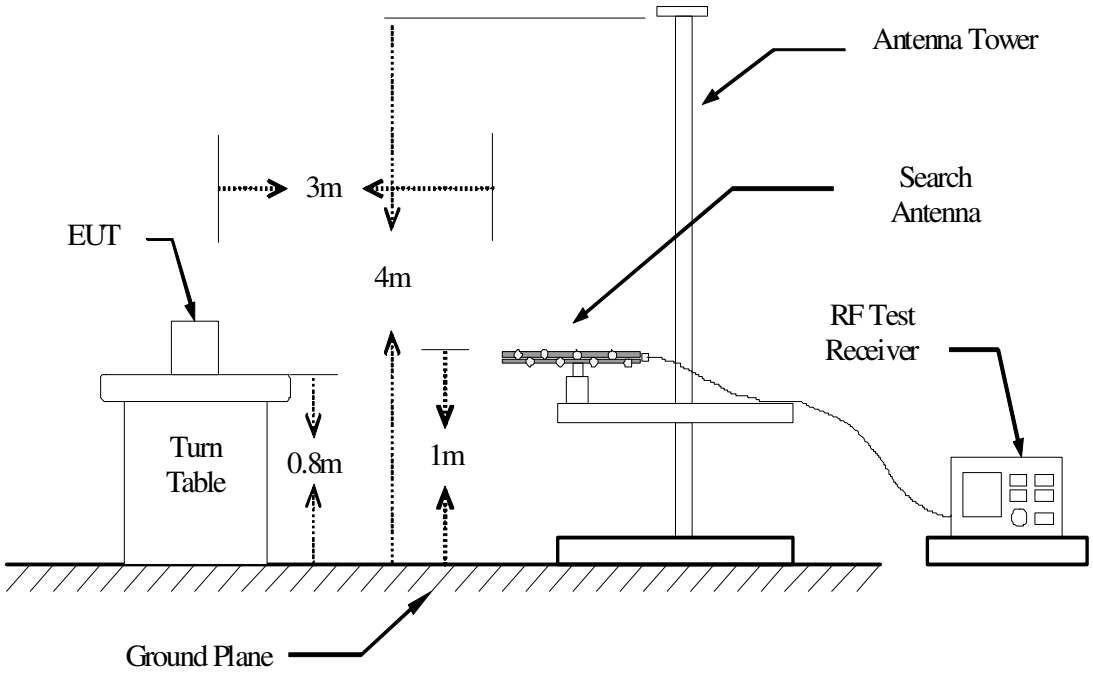
Note:
According to 12.7.2(d)(2) of ANSI C63.10-2013:

E[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

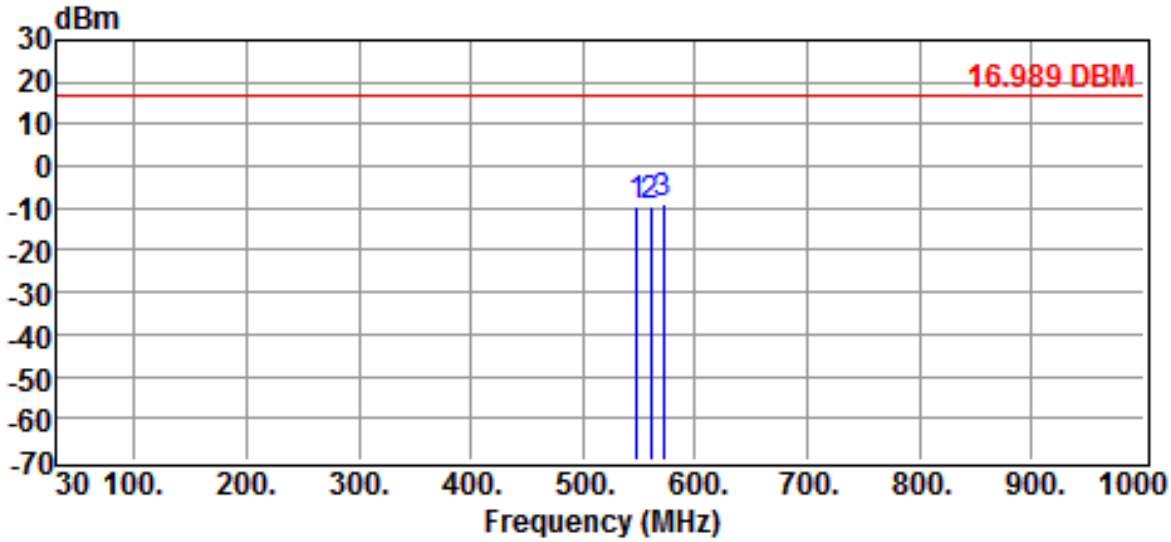


3.3 Test Equipment

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

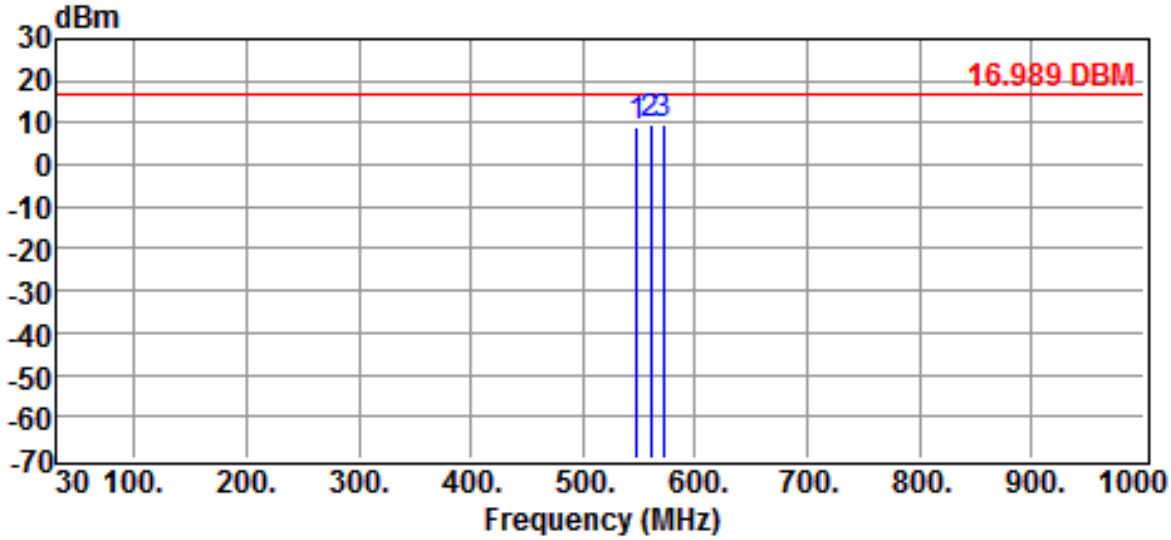
3.4.1 RF Portion



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

Freq MHz	Reading dBuV	Correction Factor dB	Result dBm	Limits dBm	Over limit dB	Detector
548.2500	91.02	-100.68	-9.66	16.99	-26.65	Peak
560.3500	91.05	-100.56	-9.51	16.99	-26.50	Peak
571.6500	91.40	-100.46	-9.06	16.99	-26.05	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	:SKM-XSW
Power Rating	:Battery 3V	Temp.	:18˚C
Engineer	: Brian Huang	Humi.	:54 %
Test Mode	:Link		

Freq MHz	Reading dBuV	Correction Factor dB	Result dBm	Limits dBm	Over limit dB	Detector
548.2500	109.60	-100.68	8.92	16.99	-8.07	Peak
560.3500	110.15	-100.56	9.59	16.99	-7.40	Peak
571.6500	110.35	-100.46	9.89	16.99	-7.10	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..

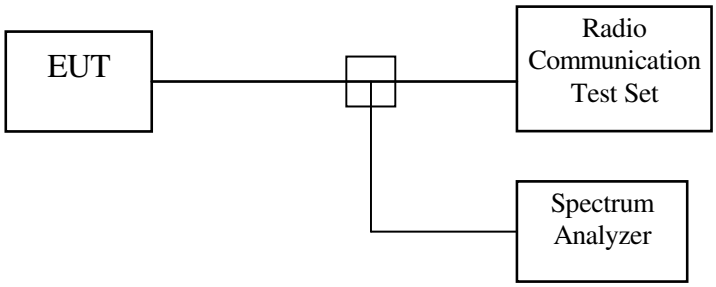
4.2 Measurement Method

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

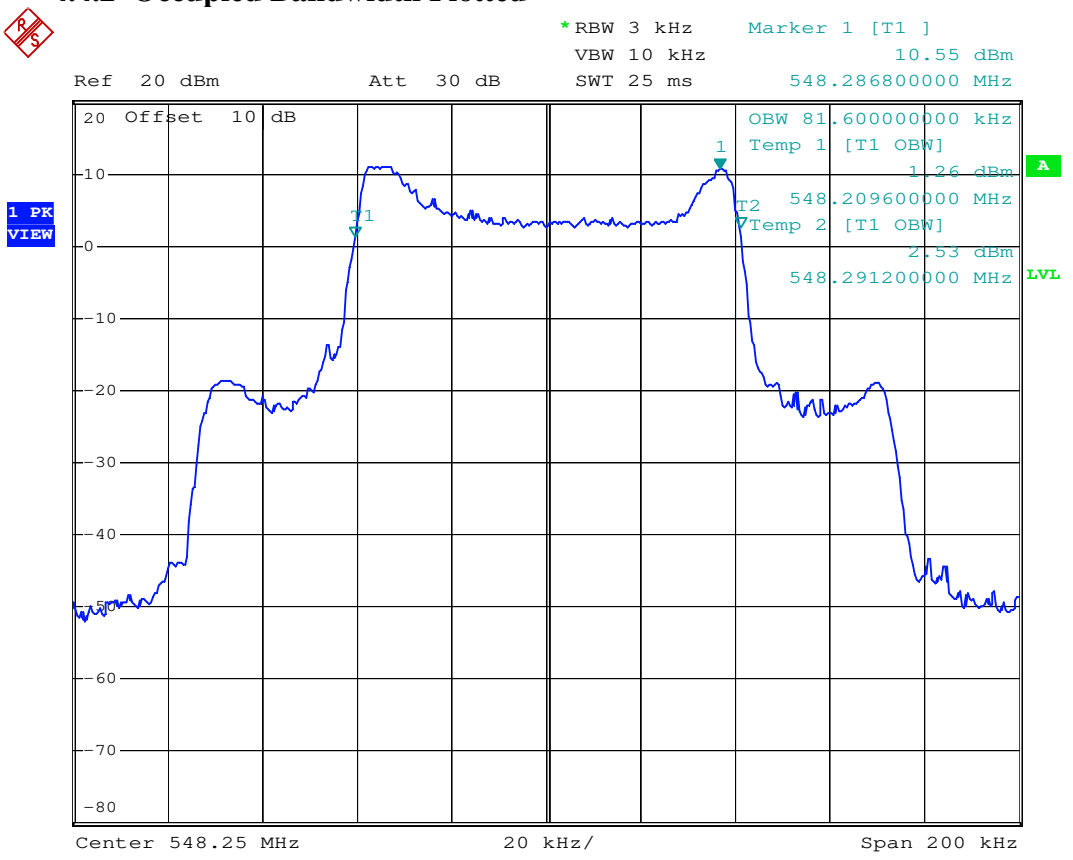
4.4 Bandwidth Measured

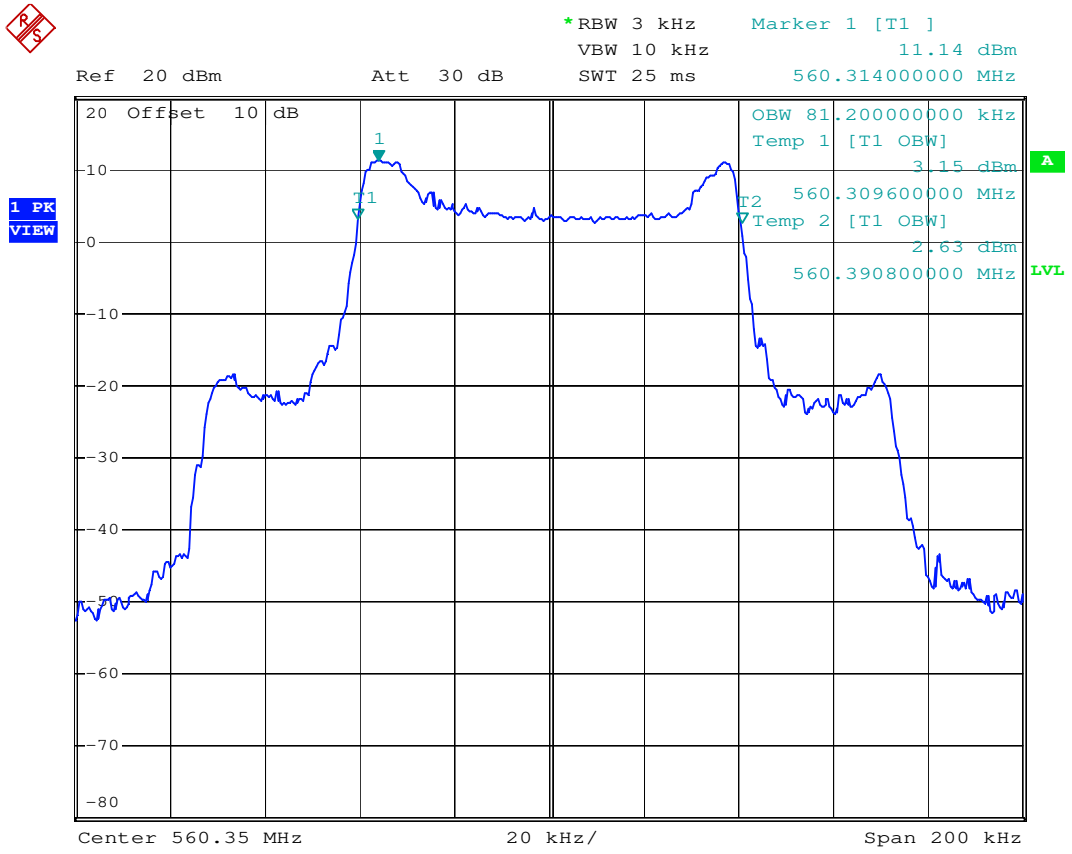
4.4.1 Input Level Derived

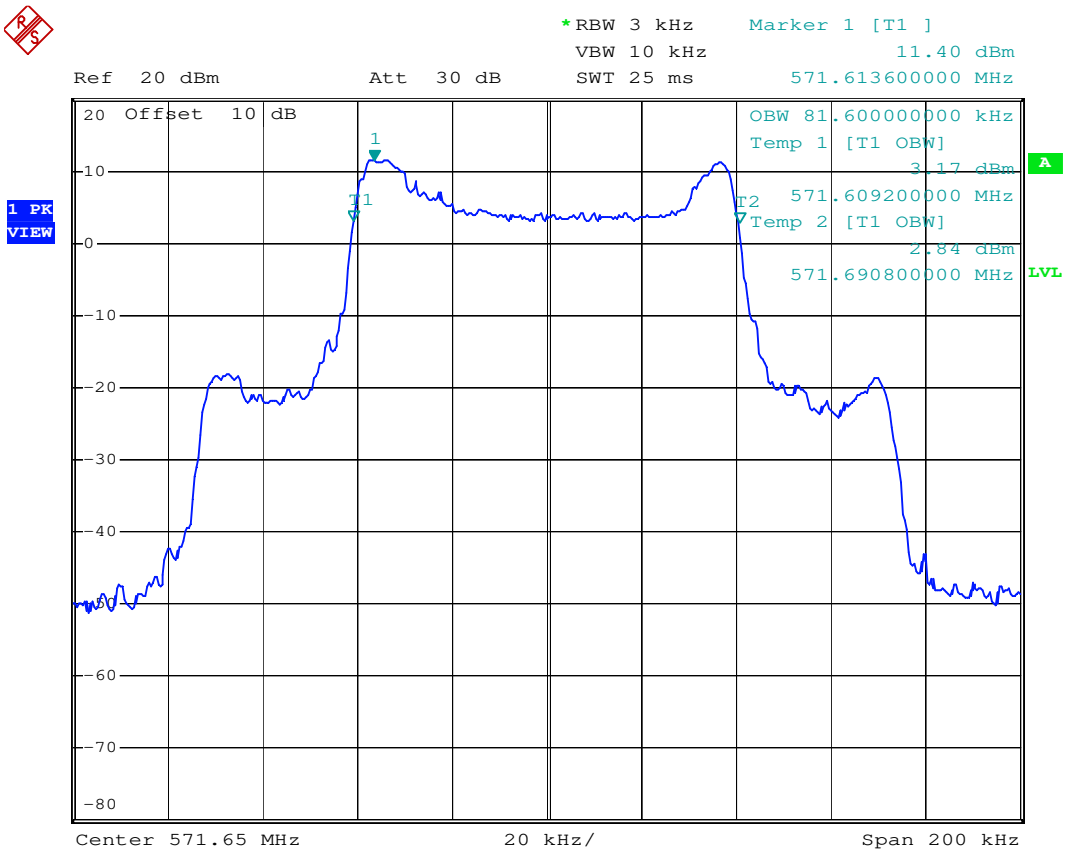
Test Date : Dec. 21, 2018 Temperature : 23 °C Humidity : 68 %

RF Frequency (MHz)	99% Bandwidth (kHz)
548.25	81.60
560.35	81.20
571.65	81.60

4.4.2 Occupied Bandwidth Plotted






*RBW 3 kHz
VBW 10 kHz
SWT 25 ms
Marker 1 [T1]
11.40 dBm
571.613600000 MHz
Ref 20 dBm
Att 30 dB
20 Offset 10 dB
OBW 81.600000000 kHz
Temp 1 [T1 OBW]
3.17 dBm
571.609200000 MHz
Temp 2 [T1 OBW]
2.84 dBm
571.690800000 MHz
1 PK
VIEW
A
LVL
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 571.65 MHz
20 kHz/
Span 200 kHz

-

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

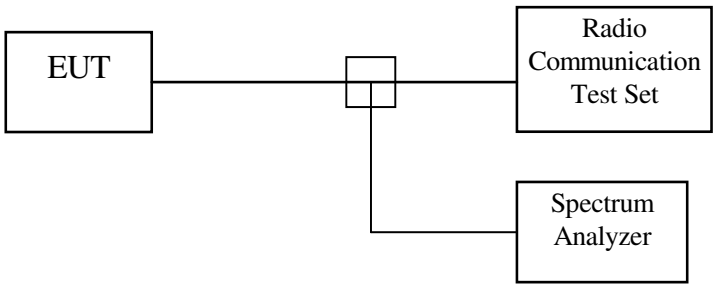
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.

2. Position the EUT as shown in figure 3, and Install new batteries in the EUT. Turn on the EUT 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

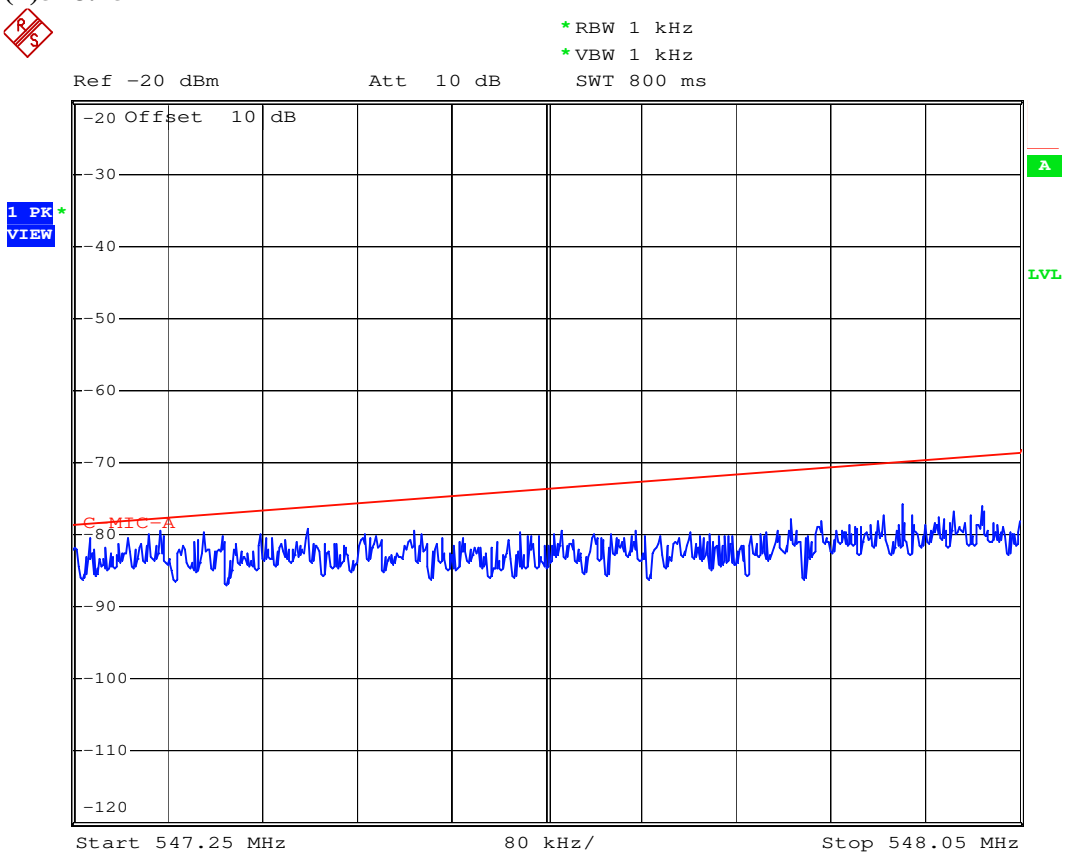


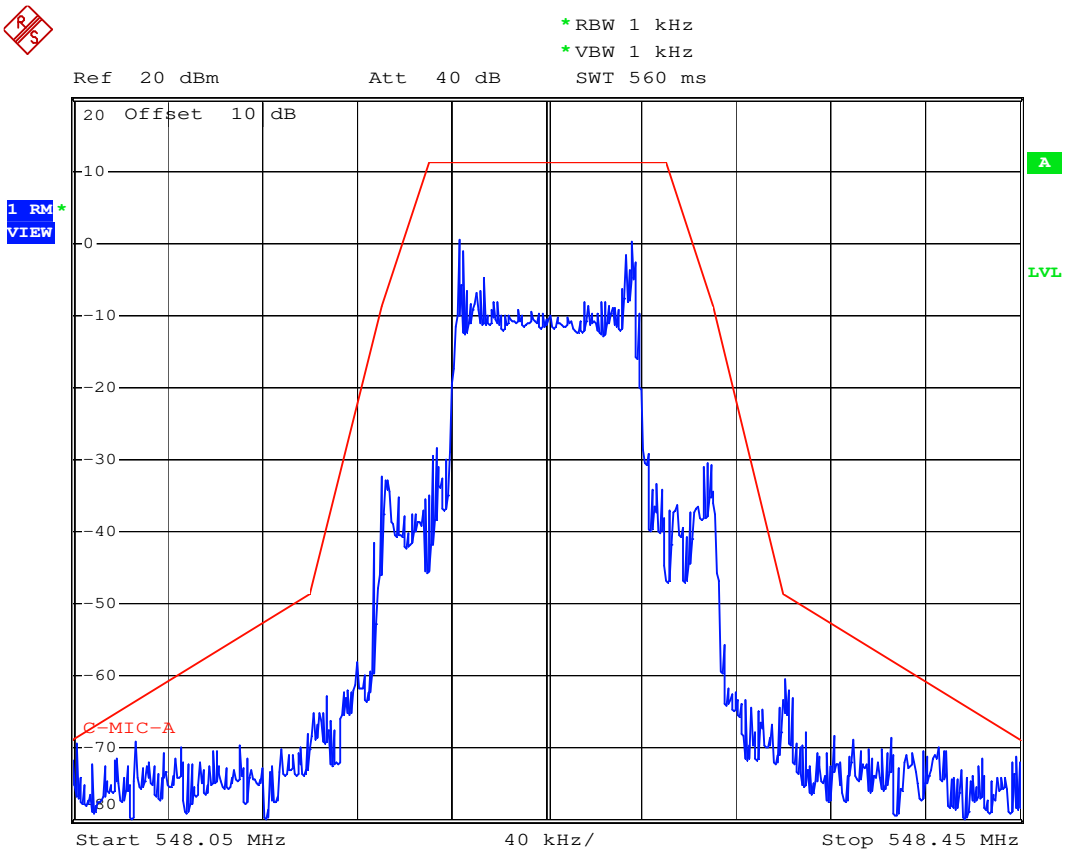
5.3 Emission Mask Test Equipment

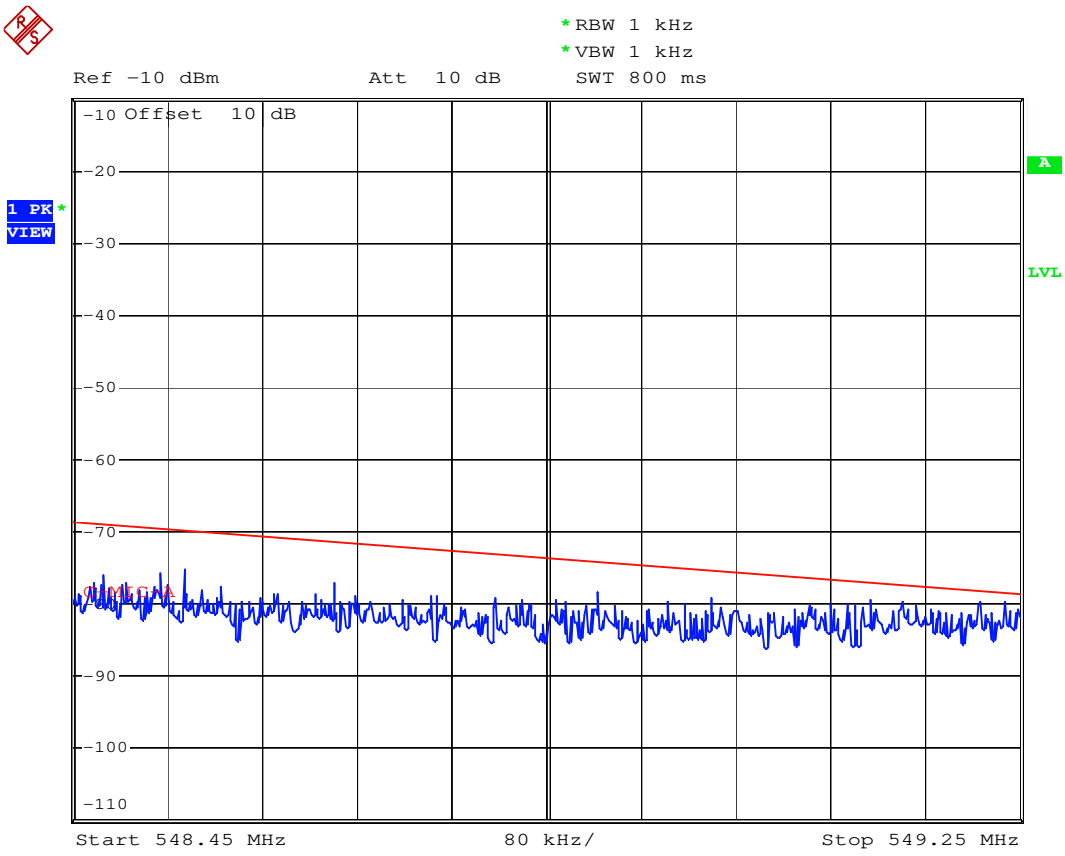
Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
Communications Service Monitor	AEROFLEX	2945B	2018/01/10	2019/01/09
Spectrum Analyzer	Rohde & Schwarz	FSP40	2018/11/02	2019/11/01

5.4 Emission Mask plots

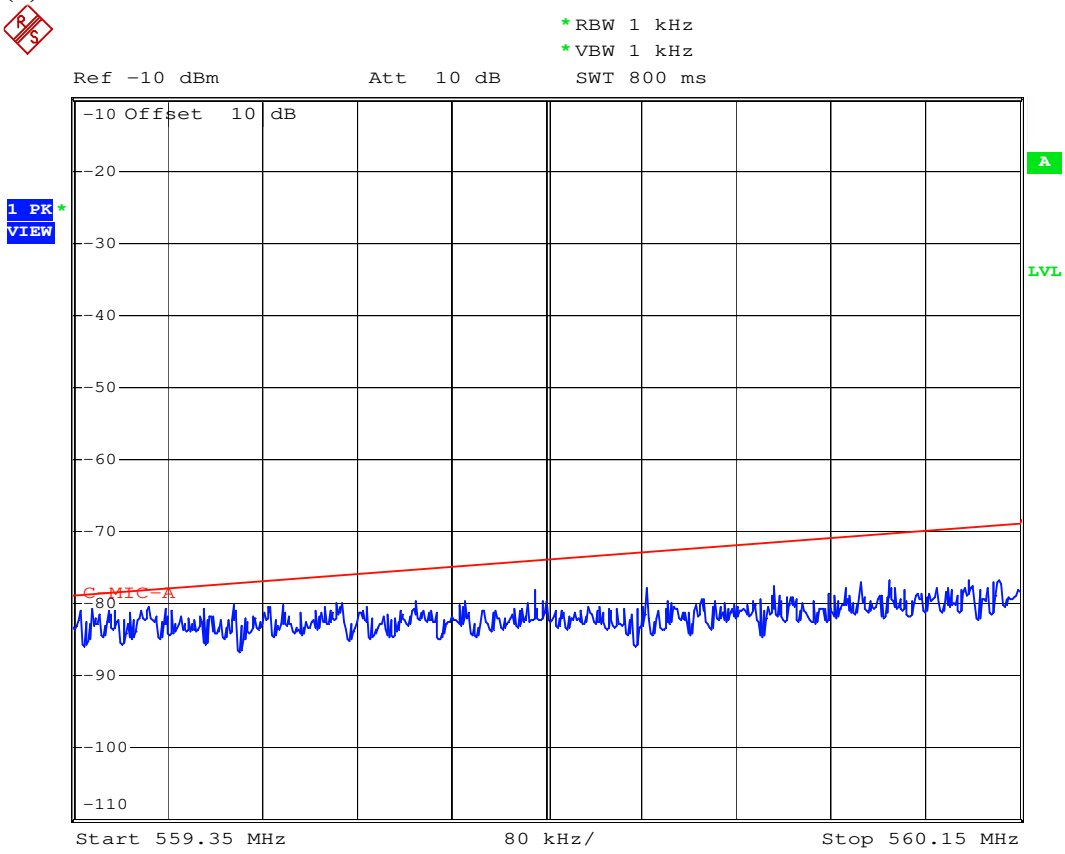
(1)548.25 MHz

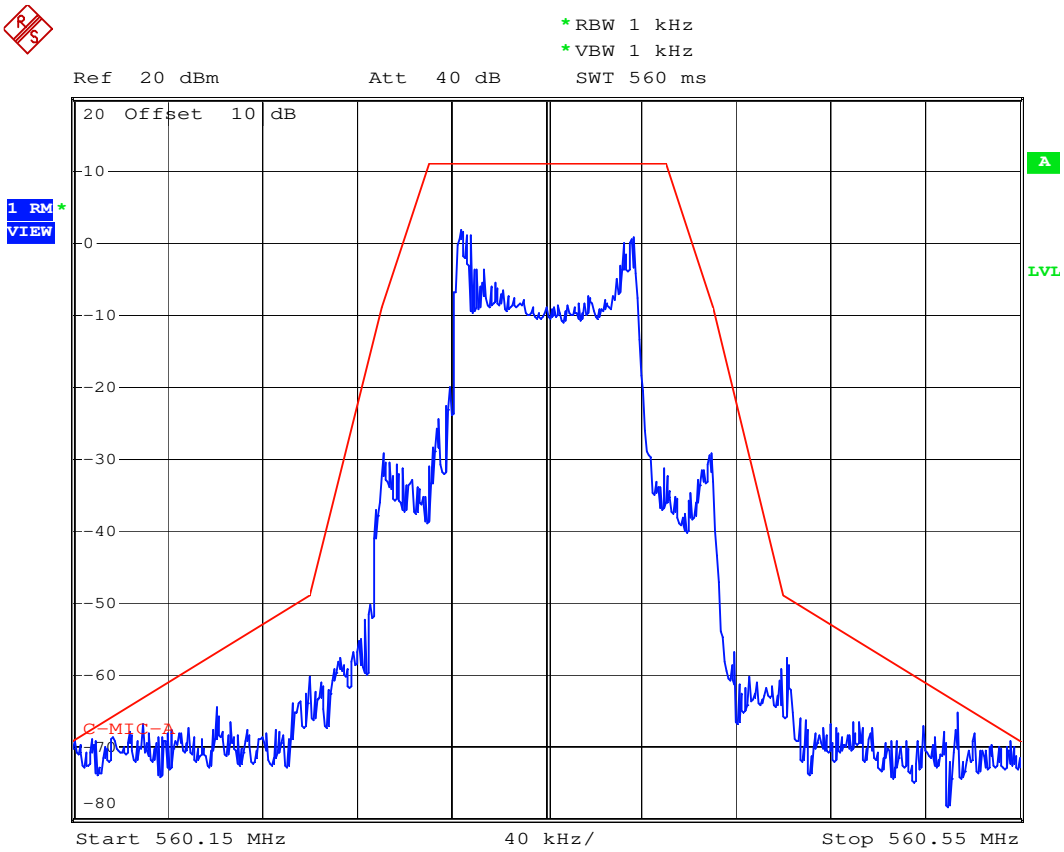


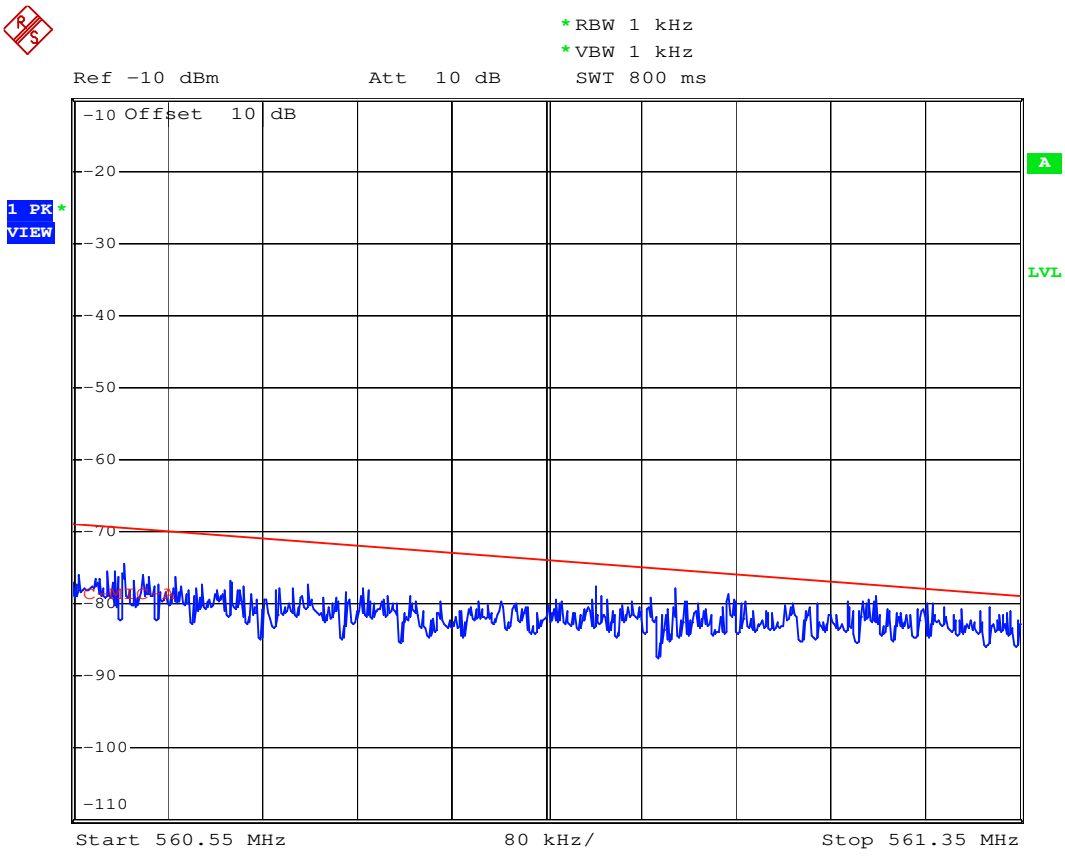



*RBW 1 kHz
*VBW 1 kHz
Ref -10 dBm
Att 10 dB
SWT 800 ms
-10 Offset 10 dB
-20
-30
-40
-50
-60
-70
-90
-100
-110
1 PK
VIEW
A
LVL
Start 548.45 MHz
80 kHz/
Stop 549.25 MHz

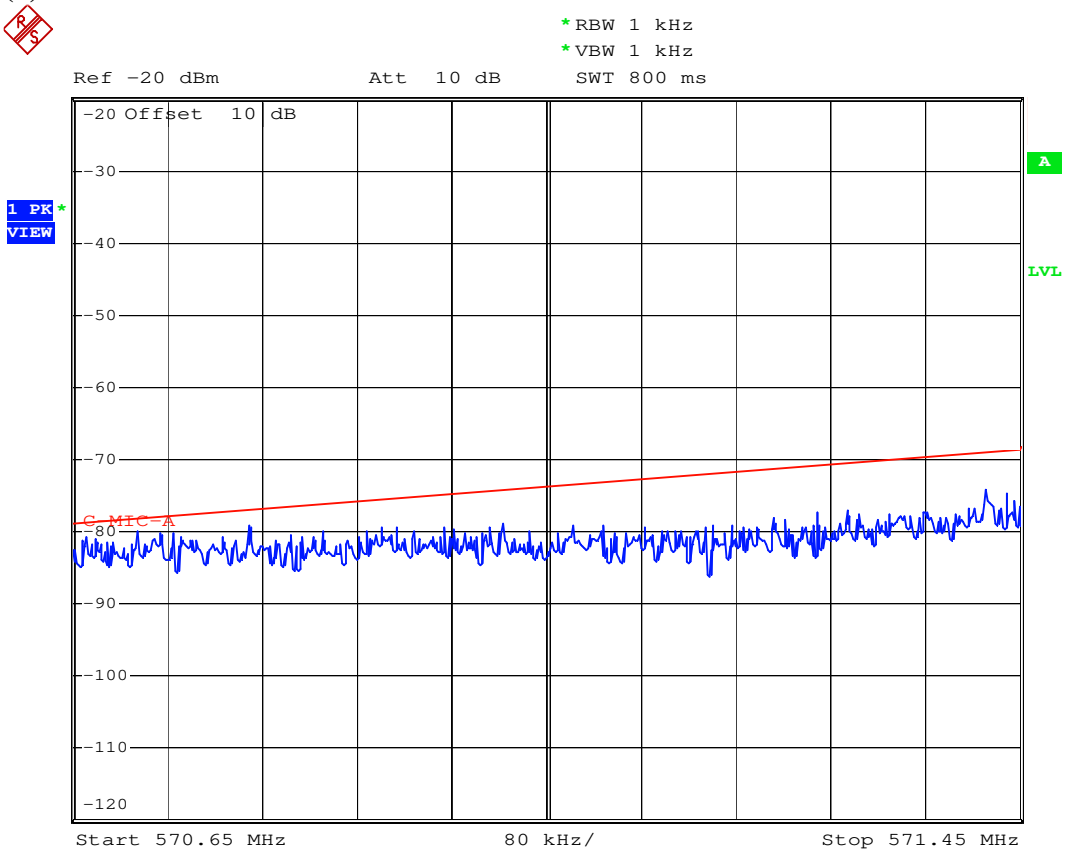
(2)560.35 MHz

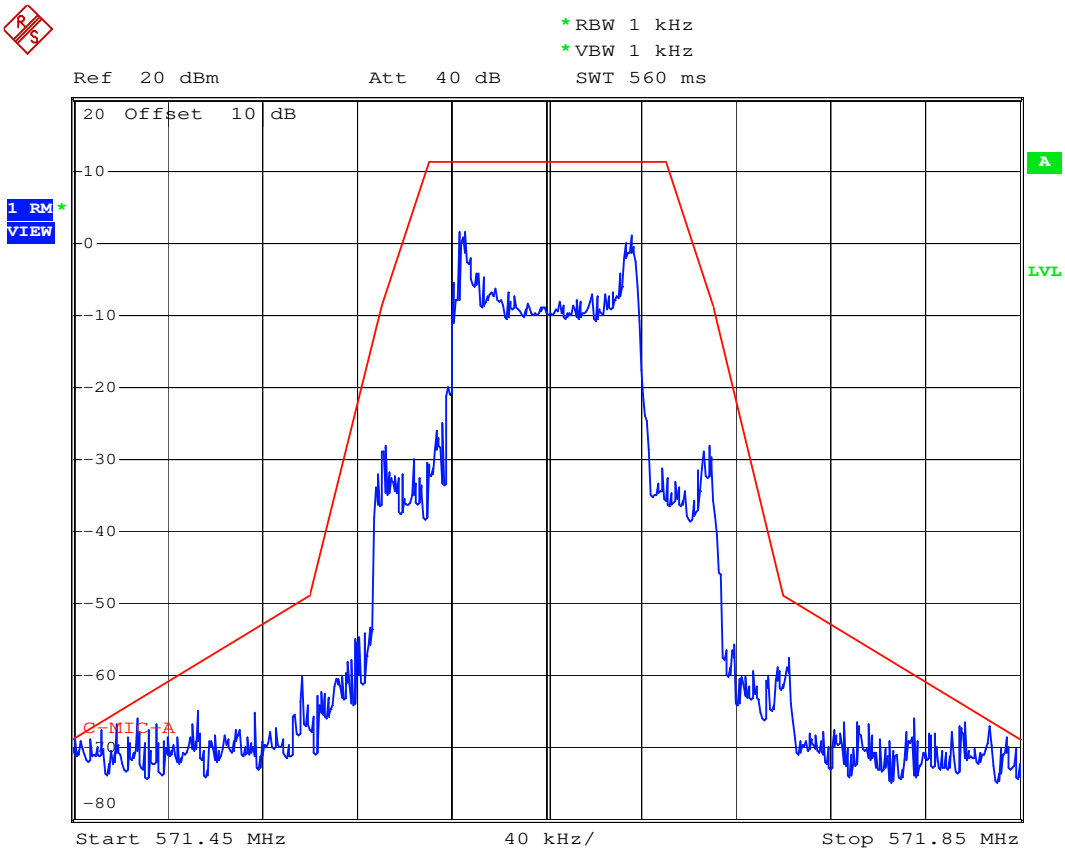

*RBW 1 kHz
*VBW 1 kHz
Ref -10 dBm
Att 10 dB
SWT 800 ms
-10 Offset 10 dB
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
1 PK *
VIEW
A
LVL
C-MIC-A
Start 559.35 MHz
80 kHz/
Stop 560.15 MHz

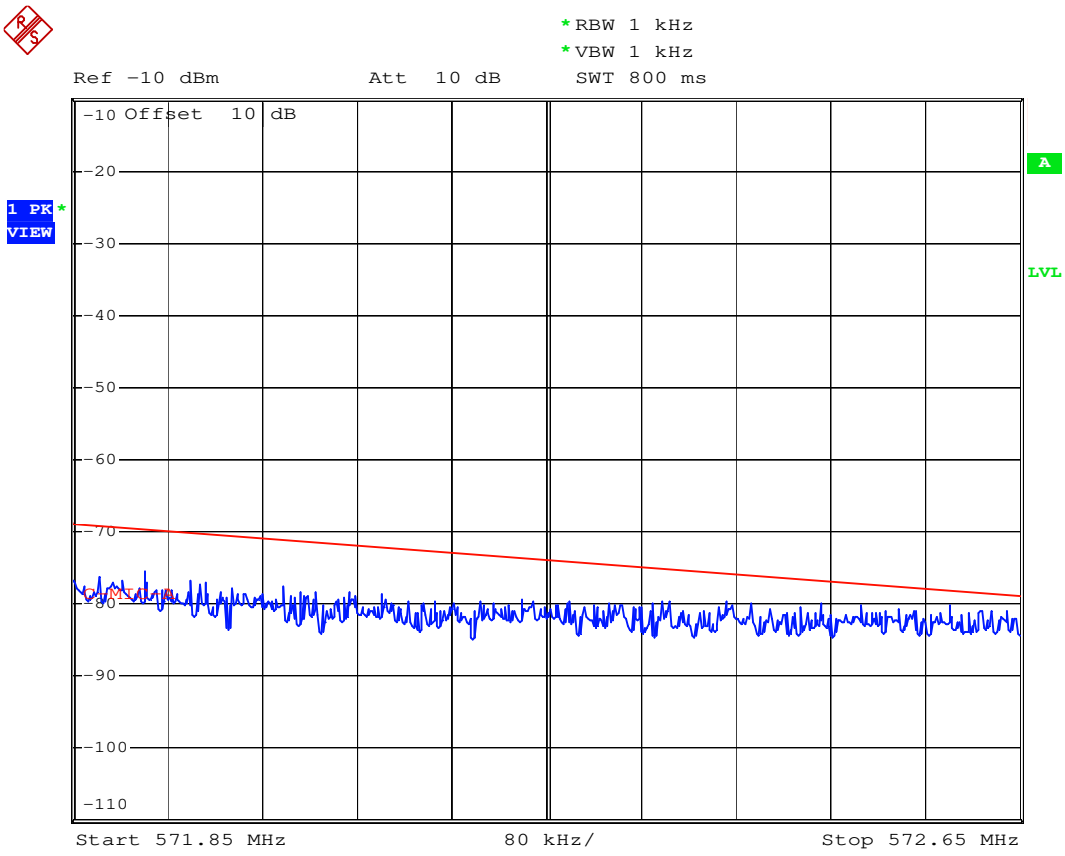

*RBW 1 kHz
*VBW 1 kHz
Ref 20 dBm
Att 40 dB
SWT 560 ms
20 Offset 10 dB
10
0
-10
-20
-30
-40
-50
-60
-70
-80
1 RM *
VIEW
A
LVL
C-MIC-A
Start 560.15 MHz
40 kHz/
Stop 560.55 MHz


*RBW 1 kHz
*VBW 1 kHz
Ref -10 dBm
Att 10 dB
SWT 800 ms
-10 Offset 10 dB
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
1 PK
VIEW
A
LVL
Start 560.55 MHz
80 kHz/
Stop 561.35 MHz

(3)571.65 MHz


*RBW 1 kHz
*VBW 1 kHz
Ref -20 dBm
Att 10 dB
SWT 800 ms
-20 Offset 10 dB
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
1 PK *
VIEW
A
LVL
C MIC-A
Start 570.65 MHz
80 kHz/
Stop 571.45 MHz


*RBW 1 kHz
*VBW 1 kHz
Ref 20 dBm
Att 40 dB
SWT 560 ms
20 Offset 10 dB
10
0
-10
-20
-30
-40
-50
-60
-70
-80
1 RM *
VIEW
A
LVL
C MIC-A
Start 571.45 MHz
40 kHz/
Stop 571.85 MHz


*RBW 1 kHz
*VBW 1 kHz
Ref -10 dBm
Att 10 dB
SWT 800 ms
-10 Offset 10 dB
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
1 PK
VIEW
A
LVL
Start 571.85 MHz
80 kHz/
Stop 572.65 MHz

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:

$E[dB\mu V/m] = EIRP[dBm] + 95.2$, 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 4 : Frequencies measured below 1 GHz configuration

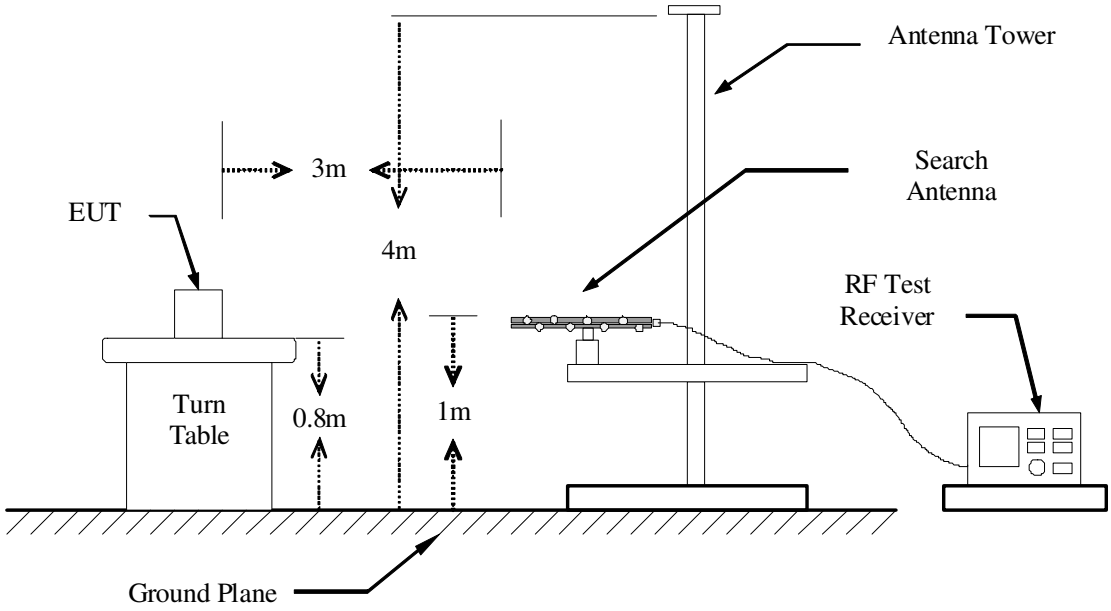
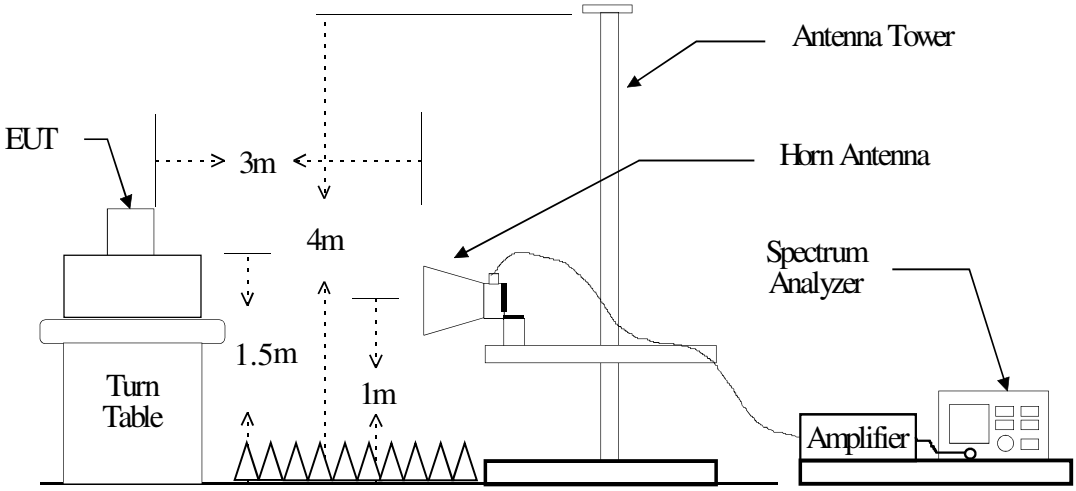


Figure 5 : Frequencies measured above 1 GHz configuration



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 :

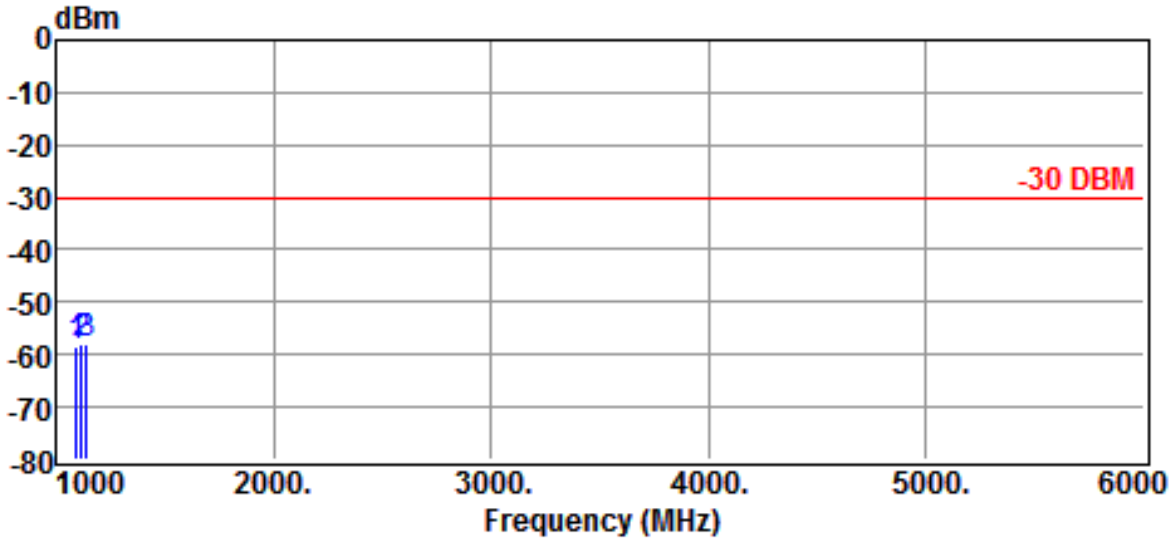
Frequency Band (MHz)	Instrument	Function	Resolution bandwidth	Video Bandwidth
25 to 30	Spectrum Analyzer	Peak	9kHz to 10kHz	9kHz to 10kHz
30 to 1000	Spectrum Analyzer	Peak	100kHz to 120kHz	100kHz to 120kHz
Above 1000	Spectrum Analyzer	Peak	1 MHz	1 MHz

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 μW (-30dBm)
Standby	2 nW (-57dBm)	2 nW (-57dBm)	20 nW(-47dBm)

6.4 Measuring Data

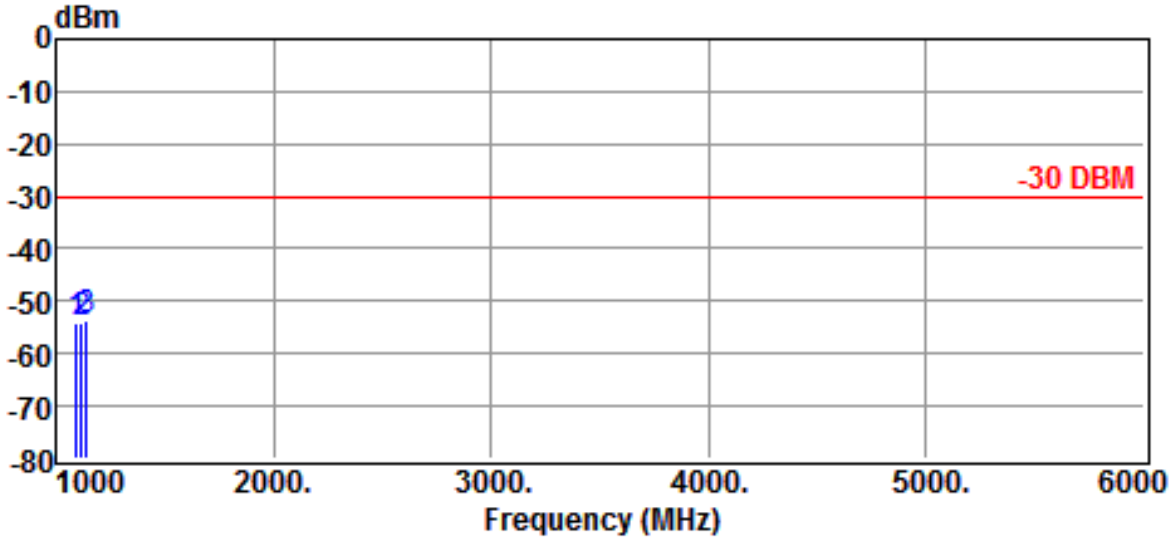
6.4.1. Harmonic Frequencies



Site	:CHAMBER #2	Date	:2018-12-21
Limit	:-30 DBM	Ant. Pol.	:HORIZONTAL
EUT	: XS WIRELESS	Model	:SKM-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	49.16	-107.77	-58.61	-30.00	-28.61	Peak
1120.7000	49.60	-107.78	-58.18	-30.00	-28.18	Peak
1143.3000	49.65	-107.77	-58.12	-30.00	-28.12	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

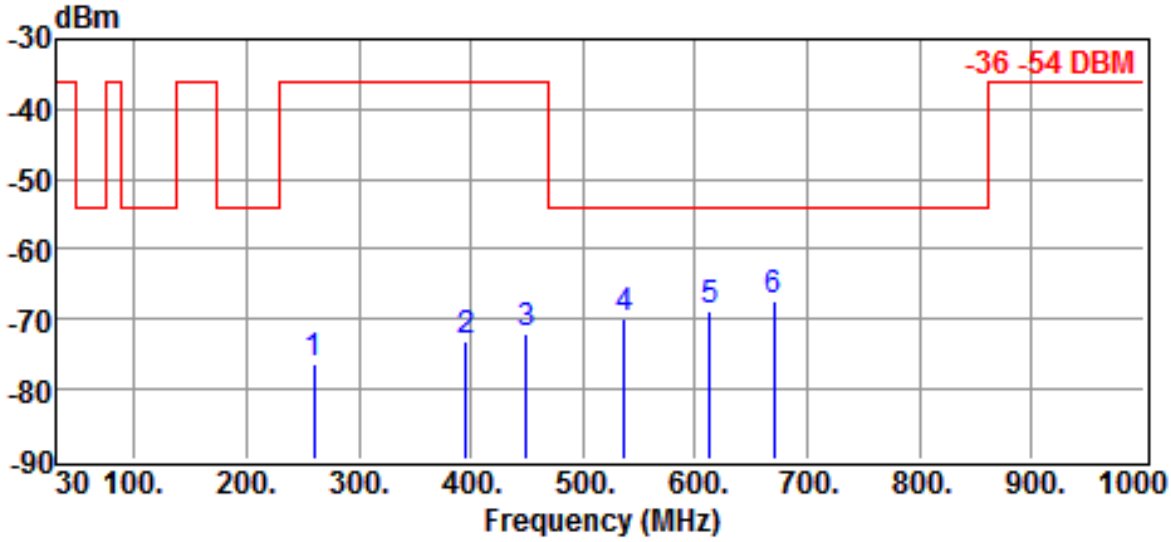


Site	:CHAMBER #2	Date	:2018-12-21
Limit	:-30 DBM	Ant. Pol.	:VERTICAL
EUT	: XS WIRELESS	Model	:SKM-XSW
Power Rating	:Battery 3V	Temp.	:18˚C
Engineer	: Brian Huang	Humi.	:53 %
Test Mode	:Link		

Freq MHz	Reading dBuV	Correction Factor dB	Result dBm	Limits dBm	Over limit dB	Detector
1096.5000	53.40	-107.77	-54.37	-30.00	-24.37	Peak
1120.7000	53.64	-107.78	-54.14	-30.00	-24.14	Peak
1143.3000	54.22	-107.77	-53.55	-30.00	-23.55	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

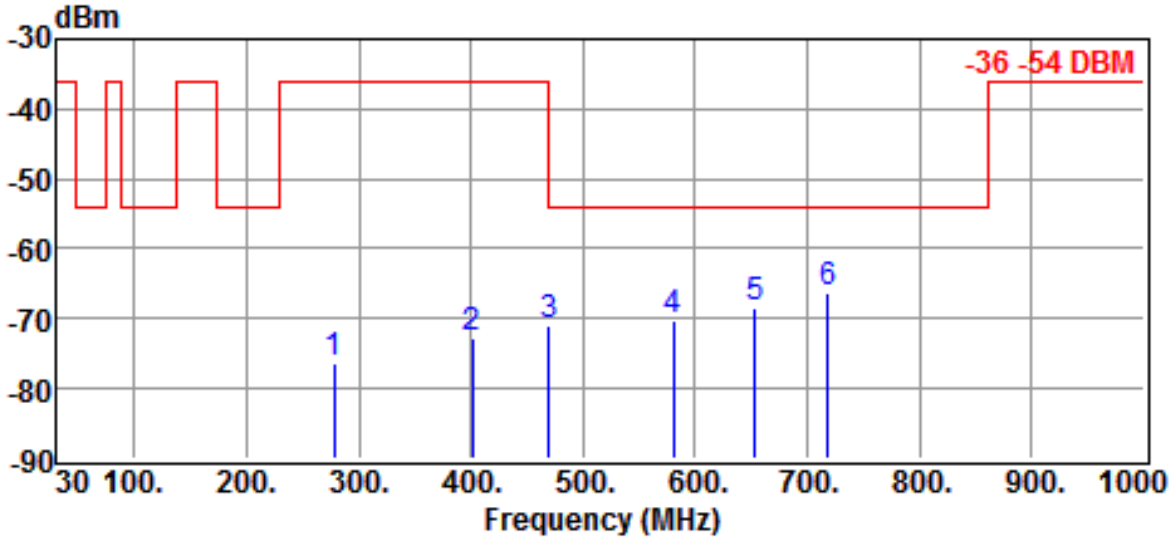
6.4.2 Spurious Emissions frequencies below 1 GHz



Site	:CHAMBER #2	Date	:2018-12-21
Limit	:-36 -54 DBM	Ant. Pol.	:HORIZONTAL
EUT	: XS WIRELESS	Model	:SKM-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
259.8900	29.81	-106.33	-76.52	-36.00	-40.52	Peak
395.6900	30.23	-103.29	-73.06	-36.00	-37.06	Peak
450.0100	30.43	-102.39	-71.96	-36.00	-35.96	Peak
536.3400	31.02	-100.86	-69.84	-54.00	-15.84	Peak
612.9700	30.75	-99.62	-68.87	-54.00	-14.87	Peak
670.2000	30.64	-97.95	-67.31	-54.00	-13.31	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	:-36 -54 DBM	Ant. Pol.	:VERTICAL
EUT	: XS WIRELESS	Model	:SKM-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
278.3200	29.52	-105.77	-76.25	-36.00	-40.25	Peak
401.5100	30.52	-103.21	-72.69	-36.00	-36.69	Peak
469.4100	31.21	-102.07	-70.86	-36.00	-34.86	Peak
580.9600	30.08	-100.31	-70.23	-54.00	-16.23	Peak
653.7100	30.04	-98.45	-68.41	-54.00	-14.41	Peak
718.7000	31.06	-97.48	-66.42	-54.00	-12.42	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 ±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.

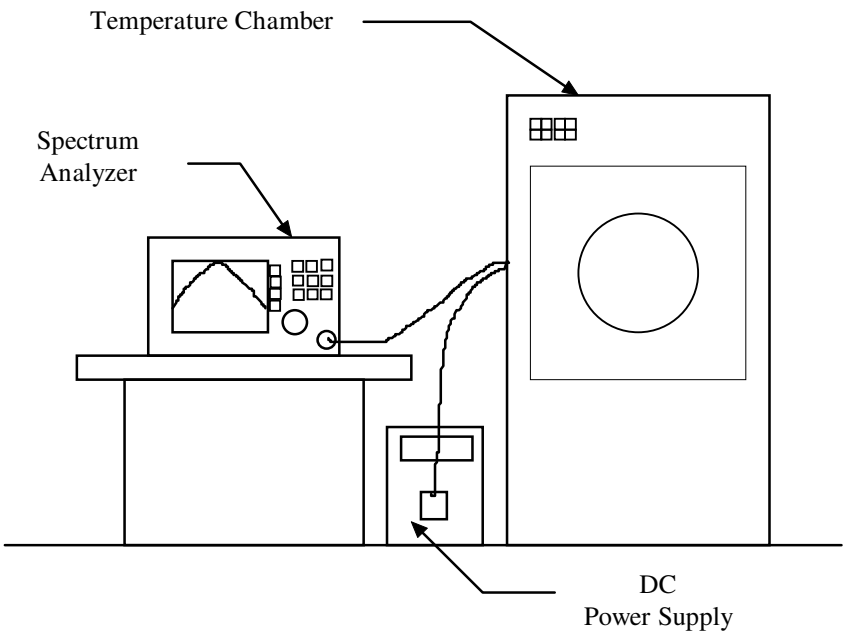
B) Frequency stability versus input voltage

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	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 °C Humidity : 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	548.2644	0.00263	548.2522	0.00040	548.2377	-0.00224	548.2644	0.00263
40		548.2336	-0.00299	548.2602	0.00186	548.2528	0.00051	548.2336	-0.00299
30		548.2613	0.00206	548.2347	-0.00279	548.2631	0.00239	548.2613	0.00206
20		548.2372	-0.00233	548.2557	0.00104	548.2311	-0.00345	548.2372	-0.00233
10		548.2482	-0.00033	548.2448	-0.00095	548.2437	-0.00115	548.2482	-0.00033
0		548.2417	-0.00151	548.2355	-0.00264	548.2693	0.00352	548.2417	-0.00151
-10		548.2359	-0.00257	548.2416	-0.00153	548.2643	0.00261	548.2359	-0.00257
-20		548.2314	-0.00339	548.2667	0.00305	548.2557	0.00104	548.2314	-0.00339

A2. Frequency stability versus supplied voltage

Reference Frequency : 548.25 MHz		Limit：0.005%	
Environment Temperature (℃)	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	560.3637	-0.00291	560.3830	0.00054	560.3869	0.00123	560.3637	-0.00291
40		560.3808	0.00014	560.3598	-0.00360	560.3662	-0.00246	560.3808	0.00014
30		560.3608	-0.00343	560.3963	0.00291	560.3624	-0.00314	560.3608	-0.00343
20		560.3861	0.00109	560.3967	0.00298	560.3982	0.00325	560.3861	0.00109
10		560.3823	0.00041	560.3687	-0.00202	560.3772	-0.00050	560.3823	0.00041
0		560.3923	0.00219	560.3786	-0.00025	560.3802	0.00004	560.3923	0.00219
-10		560.3715	-0.00152	560.3704	-0.00171	560.3634	-0.00296	560.3715	-0.00152
-20		560.3627	-0.00309	560.3609	-0.00341	560.3827	0.00048	560.3627	-0.00309

B2. Frequency stability versus supplied voltage

Reference Frequency : 560.35 MHz		Limit：0.005%	
Environment Temperature (℃)	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	571.6593	0.00163	571.6376	-0.00217	571.6609	0.00191	571.6593	0.00163
40		571.6306	-0.00339	571.6698	0.00346	571.6531	0.00054	571.6306	-0.00339
30		571.6716	0.00378	571.6618	0.00206	571.6416	-0.00147	571.6716	0.00378
20		571.6472	-0.00049	571.6599	0.00173	571.6505	0.00009	571.6472	-0.00049
10		571.6605	0.00184	571.6555	0.00096	571.6376	-0.00217	571.6605	0.00184
0		571.6674	0.00304	571.6493	-0.00012	571.6623	0.00215	571.6674	0.00304
-10		571.6613	0.00198	571.6370	-0.00227	571.6670	0.00297	571.6613	0.00198
-20		571.6707	0.00362	571.6621	0.00212	571.6661	0.00282	571.6707	0.00362

C2. Frequency stability versus supplied voltage

Reference Frequency : 517.65 MHz		Limit：0.005%	
Environment Temperature (℃)	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.

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