FCC Part 74 Subpart H
Class II Permissive Change
TEST REPORT

of

E.U.T. : Dual Channel Transmitter
FCC ID. : Y4O-TWR1
Model No. : TWR1, STEALTH WIRELESS
Working Frequency : 520~608 MHz

for

APPLICANT : inMusic Brands, Inc.
ADDRESS : 200 SCENIC VIEW DRIVE, SUITE 201, CUMBERLAND, Rhode Island, 02864, 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 : 17-08-RBF-018-01

TEST REPORT CERTIFICATION

Applicant	:	inMusic Brands, Inc. 200 SCENIC VIEW DRIVE, SUITE 201, CUMBERLAND, Rhode Island, 02864, USA
Manufacturer	:	inMusic Brands, Inc. 200 SCENIC VIEW DRIVE, SUITE 201, CUMBERLAND, Rhode Island, 02864, USA
Description of EUT	:	
a) Type of EUT	:	Dual Channel Transmitter
b) Trade Name	:	Alto Professional
c) Model No.	:	TWR1, STEALTH WIRELESS
d) FCC ID		Y4O-TWR1
e) Working Frequency	:	520~608 MHz
f) Power Supply		I/P: 100-240Vac, 50/60Hz, 0.2A O/P: 12Vdc, 0.5A
g) Model Difference	:	The difference between the new serial models and the original sample is only the model name designation.

Regulation Applied: FCC Rules and Regulations Part 74 Subpart H

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.

Issued Date : Sep. 06 , 2017

Test Engineer : Brian Huang
(Brian Huang, Engineer)

Approve & Authorized Signer : S S Liou
S. S. Liou, Section Manager
EMC Dept. II of ELECTRONICS TESTING CENTER, TAIWAN

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1. GENERAL INFORMATION

1.1 Product Description

a) Type of EUT	:	Dual Channel Transmitter
b) Trade Name	:	Alto Professional
c) Model No.	:	TWR1, STEALTH WIRELESS
d) FCC ID		Y4O-TWR1
e) Working Frequency	:	520~608 MHz
f) Power Supply		I/P: 100-240Vac, 50/60Hz, 0.2A O/P: 12Vdc, 0.5A
g) Emission Designator	:	78K6F3E 2M+2DK=2x(11kHz)+2x(37.8kHz)x1=97.6kHz
h) Model Difference	:	The difference between the new serial models and the original sample is only the model name designation.

1.1 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.10-2013. Test also follow "TIA-603-D(2010)-Land Mobile FM or PM Communications Equipment Measurement and Performance Standards" and section 2.1046, 2.1047, 2.1049, 2.1051, 2.1053, and 2.1055 of Part 2 of CFR 47.

Measueement Software

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

1.2 Test Facility

Location of the Test site: 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

Intentional radiator:
A device that intentionally generates and emits radio frequency energy by radiation or induction.

2.2 Frequencies Available

According to sec. 74.802 of Part 74, the following frequencies are available for low power auxiliary station :

Frequencies (MHz)

26.100-26.480	455.000-456.000
54.000-72.000	470.000-488.000
76.000-88.000	488.000-494.000
161.625-161.775	494.000-608.000
174.000-216.000	614.000-806.000
450.000-451.000	944.000-952.000

2.3 Requirements for Radio Equipment on Certification

(1) RF Output Power
For transmitters, the power output shall be measured at the RF output terminals.

(2) Modulation Characteristics
For Voice Modulated Communication Equipment, a curve or equivalent data showing the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz shall be submitted.

(3) Occupied Bandwidth
For radiotelephone transmitter, other than single sideband or indenpent sideband transmitter, when modulateed by a 2.5kHz tone at an input level 16 dB greater than that necessary to produce 50 percent modulation.

(4) Spurious Emissions at Antenna Terminals
The radio frequency voltage or power generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminal when properly loaded with a suitable artificial antenna.

(5) Field Strength of Spurious Emissions

Measurements shall be made to detect spurious emission that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal condition of installation and operation.

(6) Frequencies Tolerance

a) The frequency stability shall be measured with variation of ambient temperature.
b) The frequency stability shall be measured with variation of primary supply voltage.

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）.

3. OUTPUT POWER MEASUREMENT

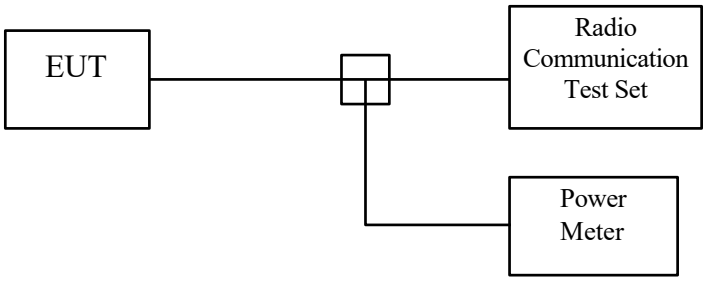
3.1 Provision Applicable

According to §74.861(e)(1)(ii), the output power shall not exceed 250 milliwatts.

3.2 Measurement Procedure

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 1, and Install new batteries in the EUT. Turn on the EUT ant set it to any one convenient frequency within its operating range.
3. Apply a 2.5 kHz modulation signal to EUT. Record the readings on the instrument.
4. Repeat above procedures until all frequencies measured were complete.

Figure 1: Transmit power measurement configuration.



3.3 Test Data

Operated mode : TX Test Date : Aug. 12, 2017
Temperature : 25°C Humidity : 55 %

Frequency (MHz)	Transmit Power		Limit (mW)
	(dBm)	(mW)	
520.175	11.48	14.060	250.0
563.950	11.41	13.836	250.0
607.700	9.36	8.630	250.0

3.4 Test Equipment

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
POWER METER +SENSOR	ANRITSU	ML2487A +MA2491A	2017/05/11	2018/05/10
Communications Service Monitor	AEROFLEX	2945B	2017/01/09	2018/01/08

4. MODULATION CHARACTERISTICS

4.1 Provisions Applicable

According to § 2.1047 (a), for Voice Modulated Communication Equipment, the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz shall be measured.

4.2 Measurement Method

A) Modulation Limit

1. Position the EUT as shown in figure 2, adjust the audio input frequency to 100 Hz and the input level from 0V to maximum permitted input voltage with recording each carrier frequency deviation responding to respective input level.

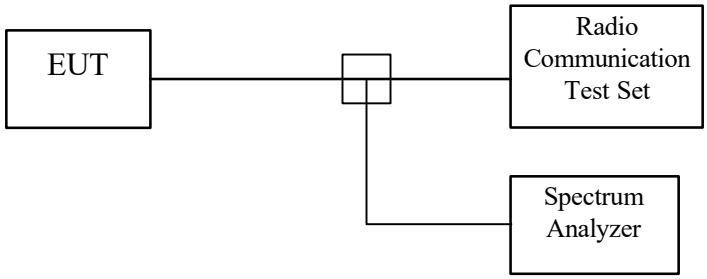
2. Repeat step 1 with changing the input frequency for 200, 500, 1000, 3000, and 5000 Hz in sequence.

B) Frequency response of all circuits

1. Position the EUT as shown in figure 2.

2. Vary the modulating frequency from 100 Hz to 15000 Hz with constant input voltage (derived from 5.4(a) of this test report), and observe the change in output.

Figure 2 : Modulation characteristic measurement configuration



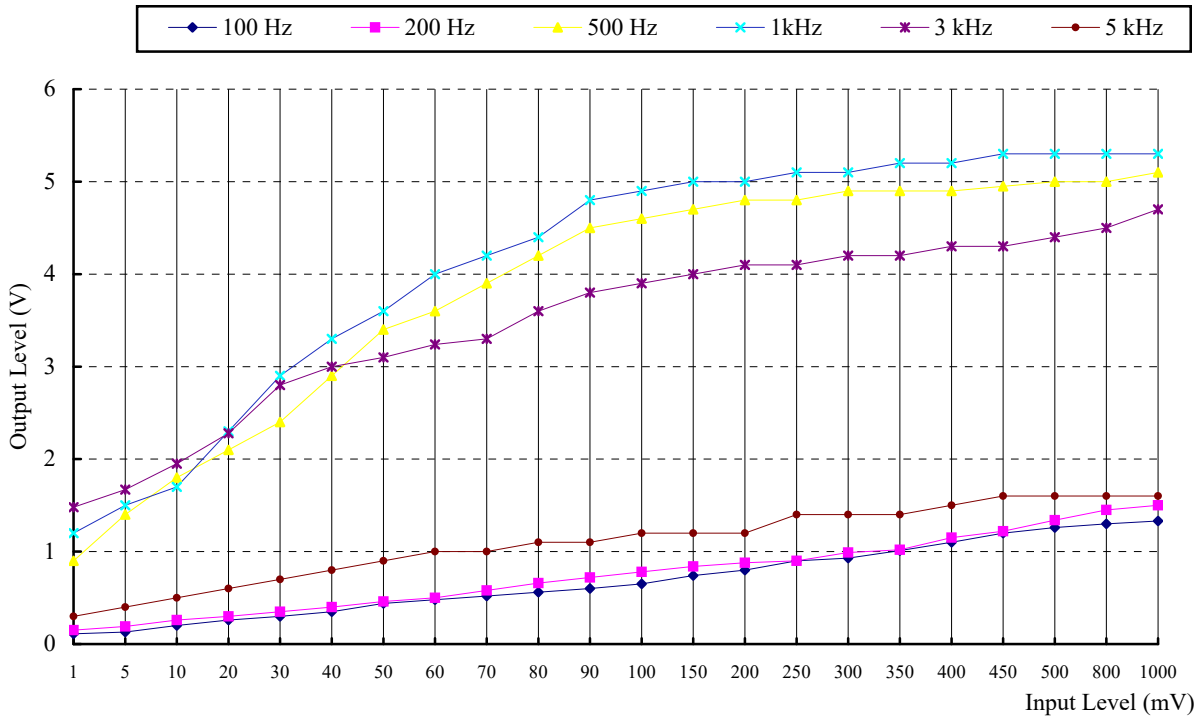
4.3 Measurement Instrument

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
Communications Service Monitor	AEROFLEX	2945B	2017/01/09	2018/01/08
Spectrum Analyzer	Rohde & Schwarz	FSP40	2016/10/03	2017/10/02

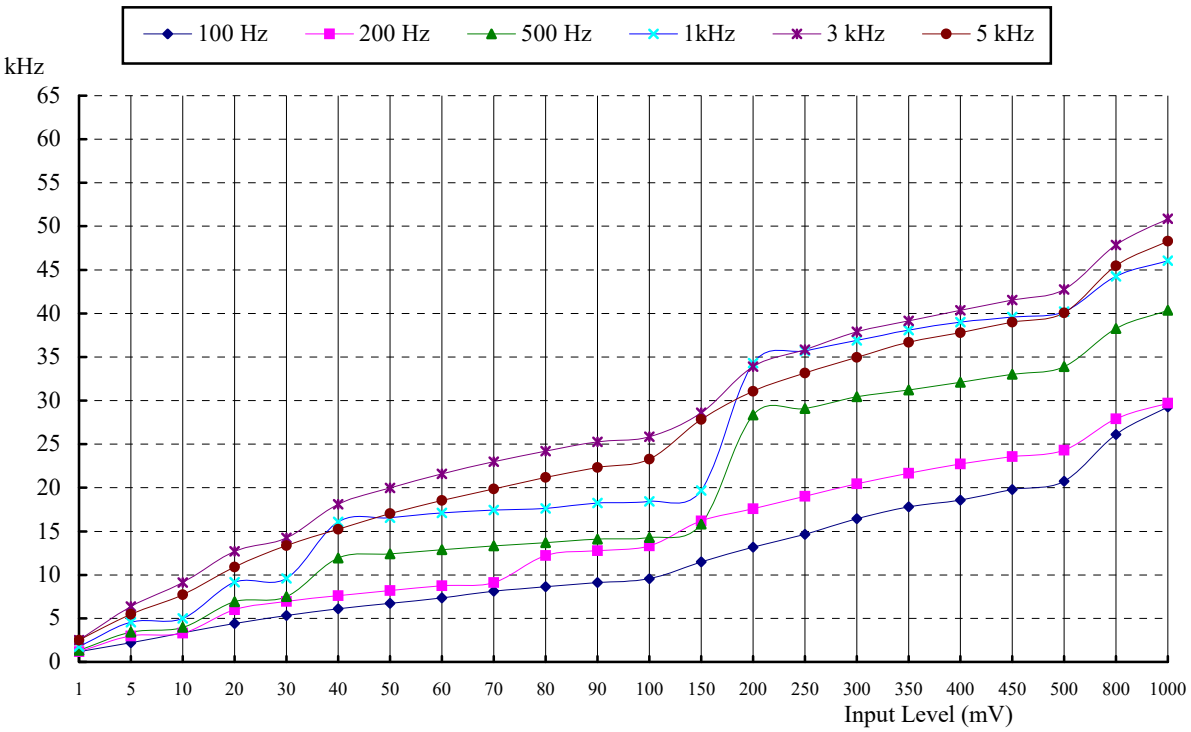
4.4 Measurement Result

RF Frequency : 520.175MHz

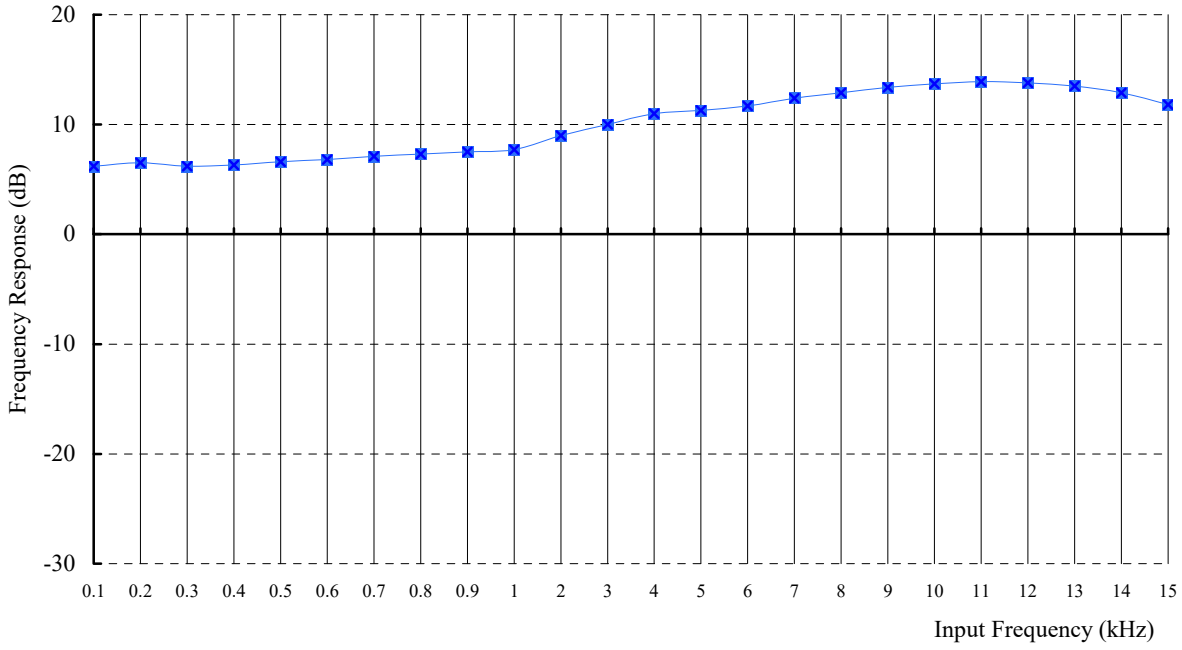
A). Frequency response



B). Modulation Limit



C). Frequency response of all circuits



5. OCCUPIED BANDWIDTH OF EMISSION

5.1 Provisions Applicable

According to §2.1049 (c)(1), For radiotelephone transmitter, other than single sideband or indenpent sideband transmitter, when modulateed by a 2.5kHz tone at an input level 16 dB greater than that necessary to produce 50 percent modulation.
According to §74.861(e)(5), the frequency emission bandwidth shall not exceed 200 kHz.

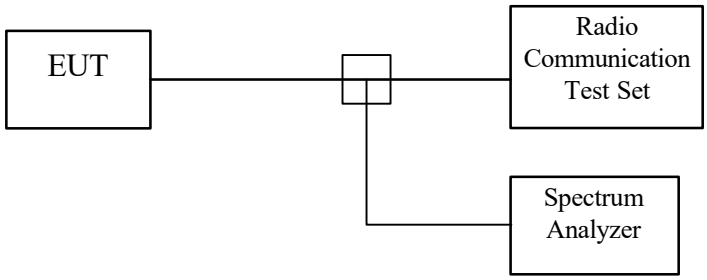
5.2 Measurement Method

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 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 2.5 kHz 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.

Figure 3 : Occupied bandwidth measurement configuration



5.3 Occupied Bandwidth Test Equipment

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
Communications Service Monitor	AEROFLEX	2945B	2017/01/09	2018/01/08
Spectrum Analyzer	Rohde & Schwarz	FSP40	2016/10/03	2017/10/02

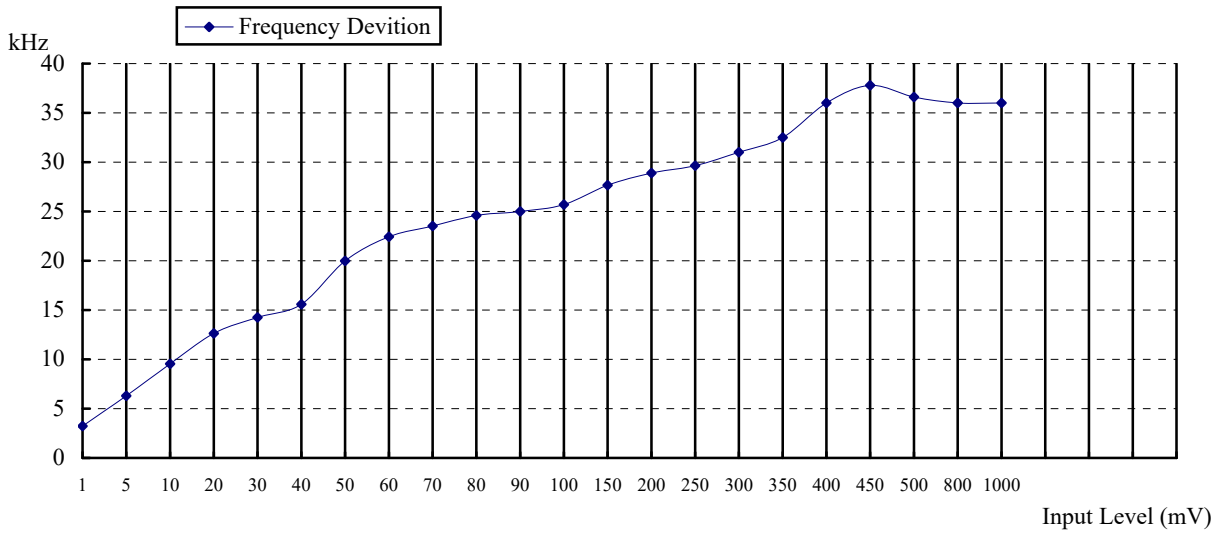
5.4 Bandwidth Measured

5.4.1 Input Level Derived

RF Frequency : 520.175MHz

Test Date : Aug. 12, 2017 Temperature : 25 °C Humidity : 55 %

Input Audio Frequency : 2.5 kHz, Sine Wave

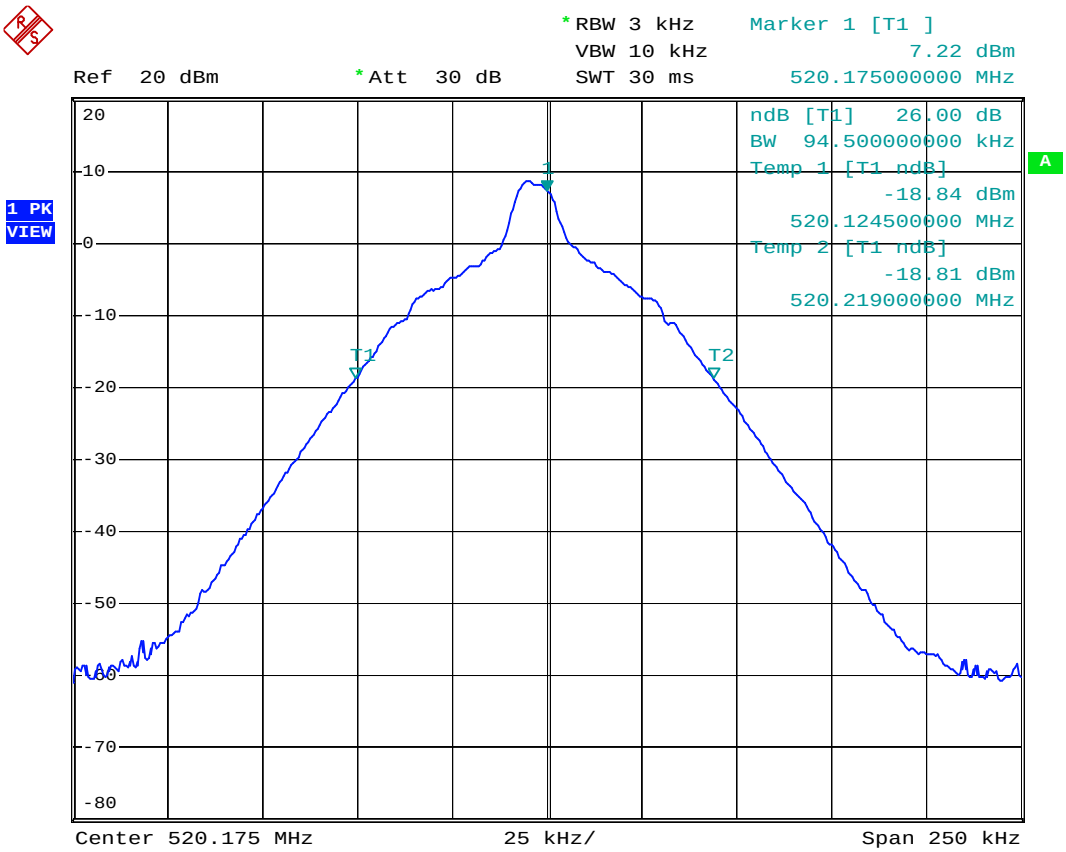


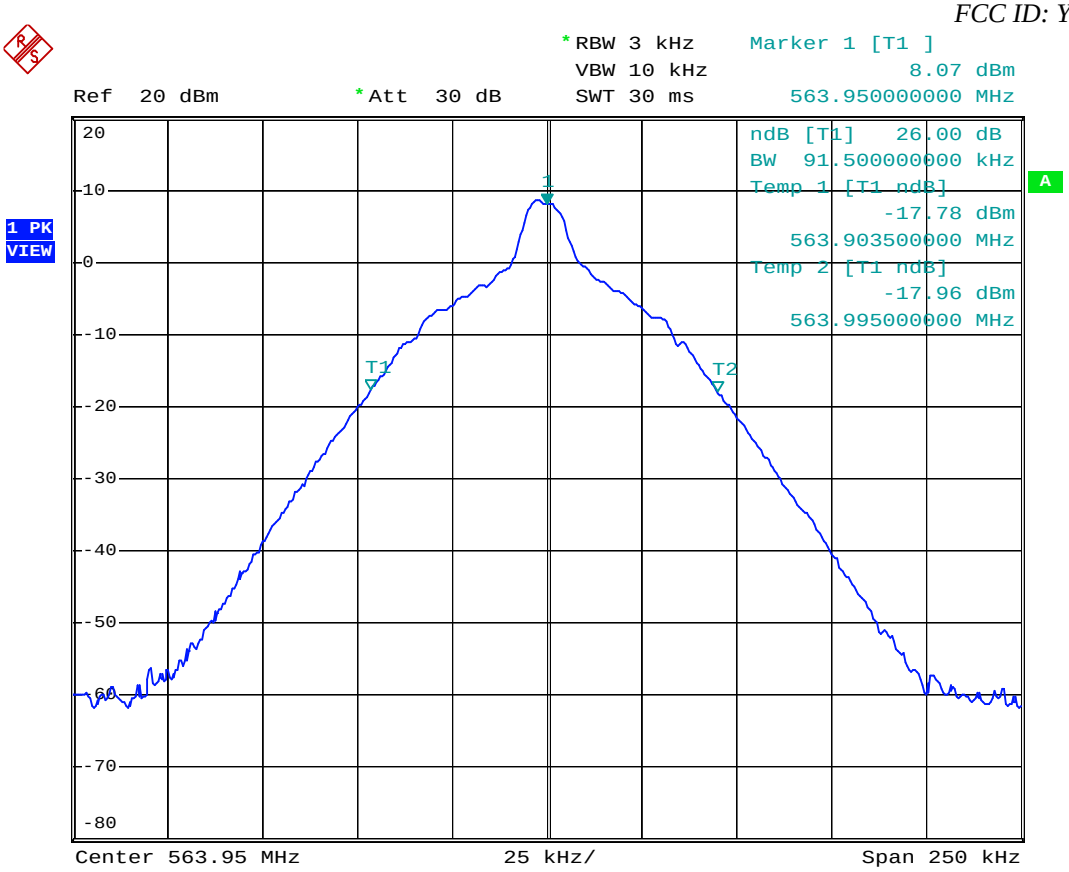
The Level input to produce 50% modulation is 50 mV, therefore the magnitude 16 dB greater than it is 316 mV.

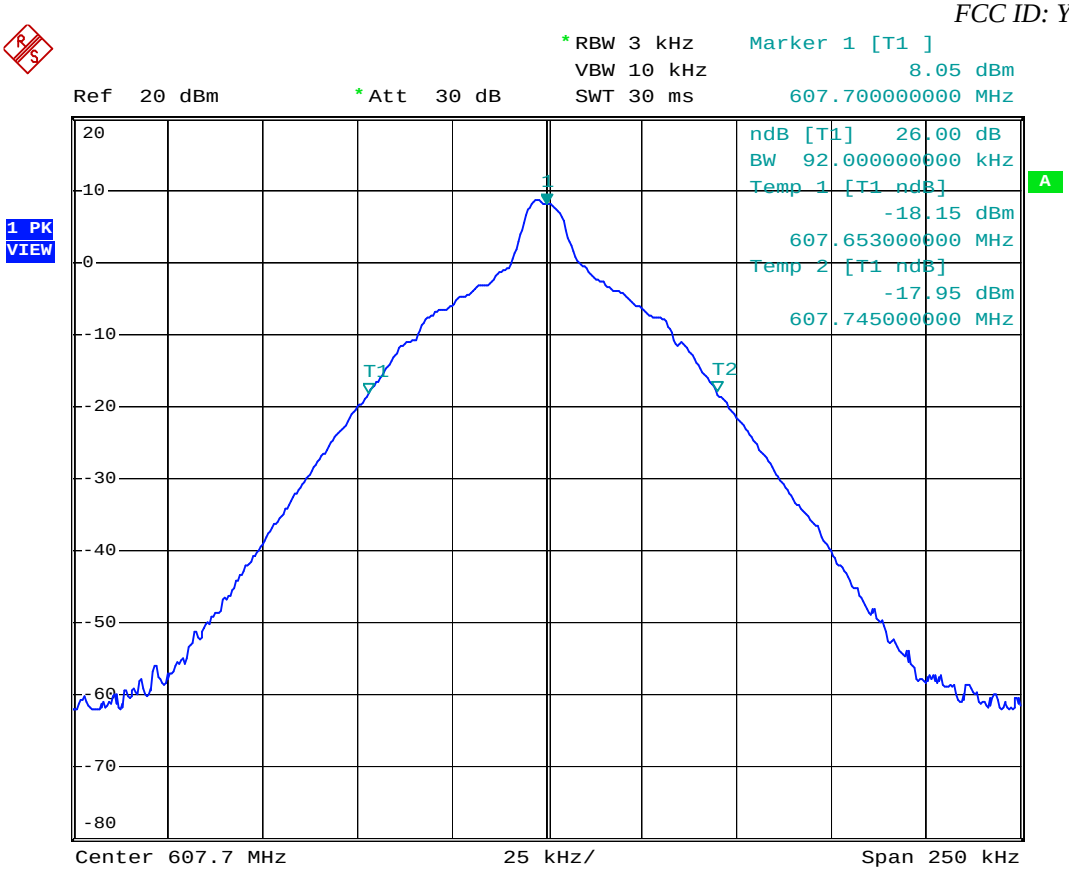
5.4.2 Occupied Bandwidth Plotted

Test Date : Aug. 29, 2017 Temperature : 25 °C Humidity : 55 %

RF Frequency (MHz)	26 dB Bandwidth (kHz)
520.175	94.5
563.950	91.5
607.700	92.0


*RBW 3 kHz
VBW 10 kHz
SWT 30 ms
Marker 1 [T1]
7.22 dBm
520.175000000 MHz
Ref 20 dBm
*Att 30 dB
ndB [T1] 26.00 dB
BW 94.500000000 kHz
Temp 1 [T1 ndB]
-18.84 dBm
520.124500000 MHz
Temp 2 [T1 ndB]
-18.81 dBm
520.219000000 MHz
1 PK
VIEW
A
T1
T2
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 520.175 MHz
25 kHz/
Span 250 kHz


*RBW 3 kHz
VBW 10 kHz
SWT 30 ms
Marker 1 [T1]
8.07 dBm
563.950000000 MHz
Ref 20 dBm
*Att 30 dB
ndB [T1] 26.00 dB
BW 91.500000000 kHz
Temp 1 [T1 ndB]
-17.78 dBm
563.903500000 MHz
Temp 2 [T1 ndB]
-17.96 dBm
563.995000000 MHz
1 PK
VIEW
A
T1
T2
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 563.95 MHz
25 kHz/
Span 250 kHz


*RBW 3 kHz
VBW 10 kHz
SWT 30 ms
Marker 1 [T1]
8.05 dBm
607.700000000 MHz
Ref 20 dBm
*Att 30 dB
ndB [T1] 26.00 dB
BW 92.000000000 kHz
Temp 1 [T1 ndB]
-18.15 dBm
607.653000000 MHz
Temp 2 [T1 ndB]
-17.95 dBm
607.745000000 MHz
1 PK
VIEW
A
T1
T2
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 607.7 MHz
25 kHz/
Span 250 kHz

6. FIELD STRENGTH OF EMISSION

6.1 Provisions Applicable

According to §2.1053, measurements shall be made to detect spurious emission that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal condition of installation and operation. Information submitted shall include the relative radiated power of spurious emission with reference to the rated power output of the transmitter, assuming all emissions are radiated from a halfwave dipole antenna.

According to §74.861(e)(6), the mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the follwing sceedule:

(i) on any frequency removed from the operating frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: at least 25 dB.

(ii) on any frequency removed from the operating frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: at least 35 dB.

(iii) on any frequency removed from the operating frequency by more than 250 percent of the authorized bandwidth shall be attenuated below the unmodulated carrier by at least 43 plus 10 Log(output power in watts) dB.

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:

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

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

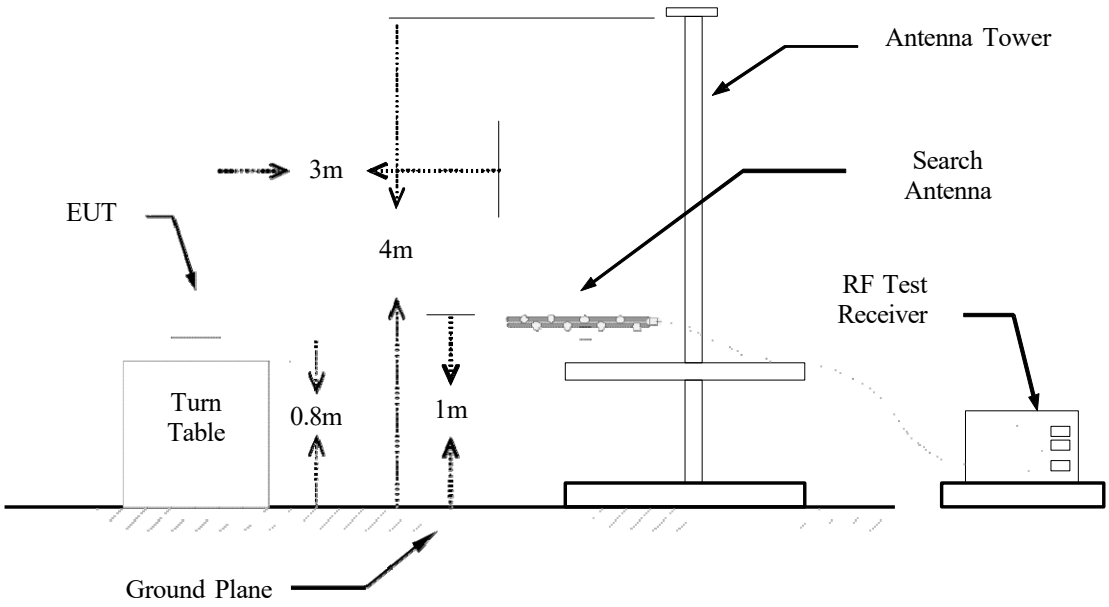
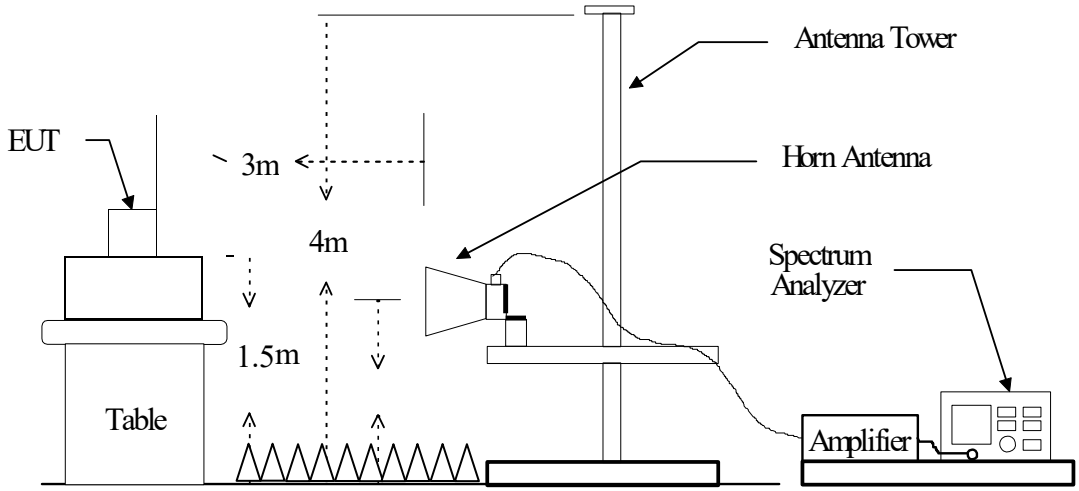


Figure 5 : Frequencies measured above 1 GHz configuration



6.3 Measuring Instrument

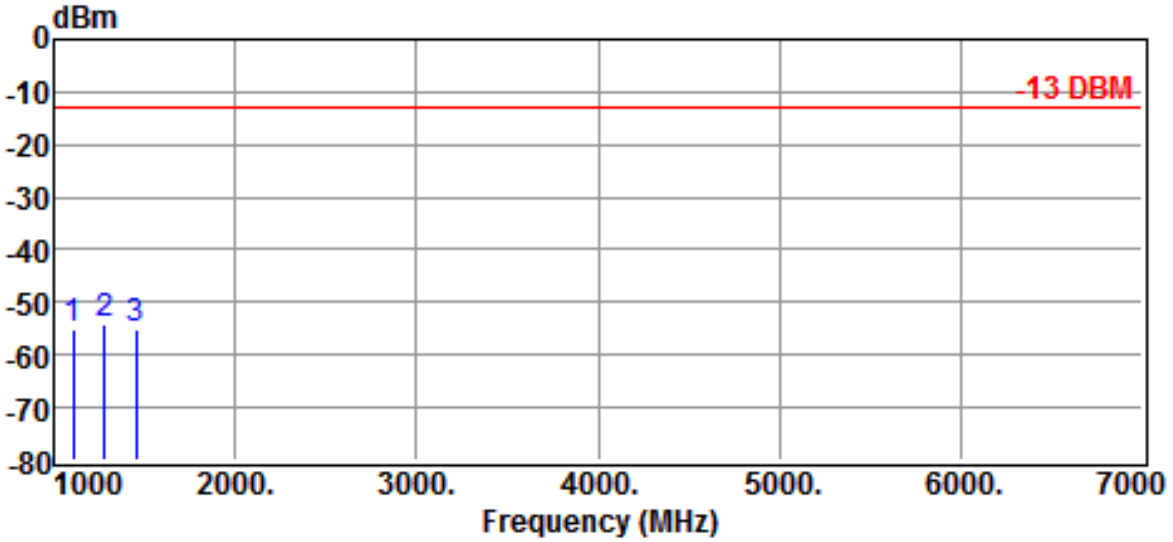
Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
Spectrum Analyzer	Rohde & Schwarz	FSP40	2016/10/03	2017/10/02
Double Ridged Antenna	EMCO	3115	2016/10/05	2017/10/04
Log-periodic Antenna	EMCO	3146	2017/08/10	2018/08/09
Biconical Antenna	EMCO	3110	2017/07/04	2018/07/03
Amplifier	HP	8449B	2016/10/14	2017/10/13
Amplifier	HP	8447D	2016/12/05	2017/12/04
Signal generator	HP	83732B	2016/12/06	2017/12/05

Measuring instrument setup in frequency band measured is as following :

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

6.4 Measuring Data

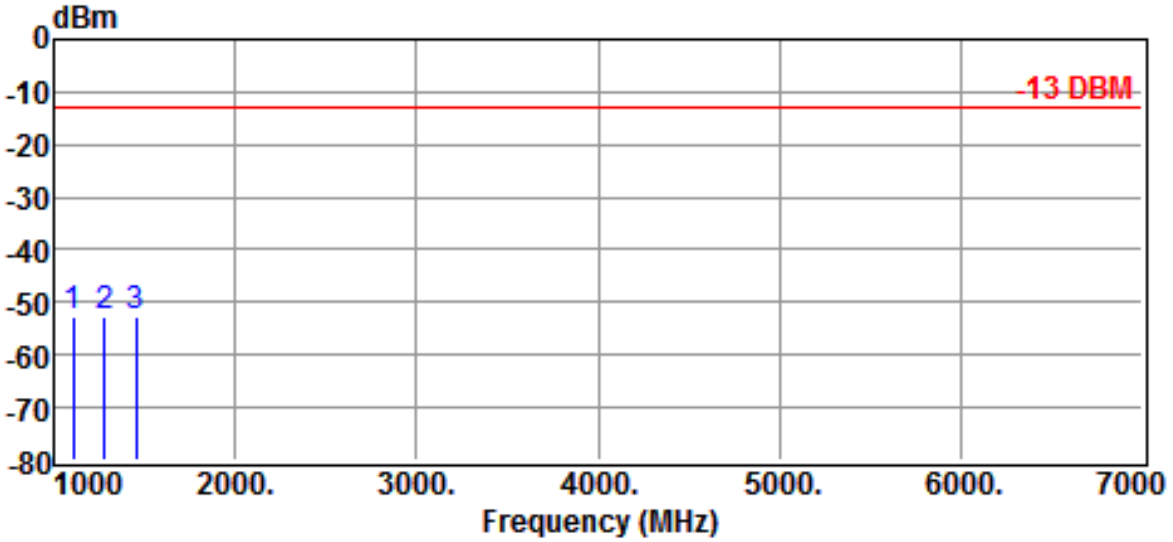
6.4.1. Harmonic Frequencies



Site	:CHAMBER #2	Date	:2017-08-30
Limit	:-13 DBM	Ant. Pol.	:HORIZONTAL
EUT	: Dual Channel Transmitter	Model	:TWR1
Power Rating	:AC 120Vac60Hz	Temp.	:22˚C
Engineer	: Brian Huang	Humi.	:53 %
Test Mode	:TX Mode		

Freq MHz	Reading dBuV	Correction Factor dB	Result dBm	Limits dBm	Over limit dB	Detector
1104.9000	53.24	-108.29	-55.05	-13.00	-42.05	Peak
1280.0000	53.42	-107.79	-54.37	-13.00	-41.37	Peak
1455.0000	52.43	-107.28	-54.85	-13.00	-41.85	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)}
{ERP = EIRP – 2.15dB}
3. The margin value=Limit - Result

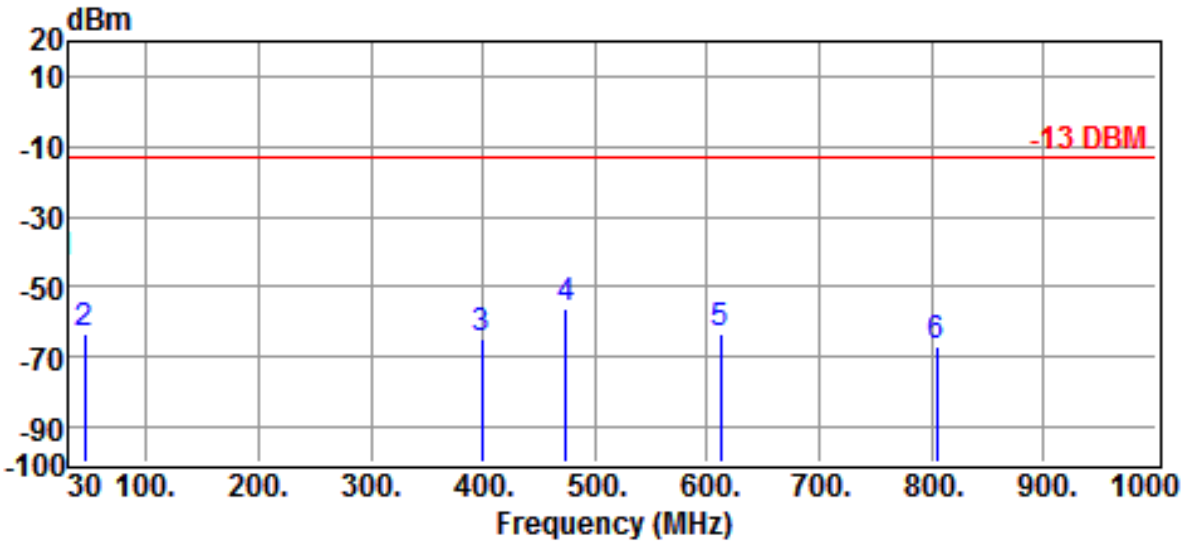


Site	:CHAMBER #2	Date	:2017-08-30
Limit	:-13 DBM	Ant. Pol.	:VERTICAL
EUT	: Dual Channel Transmitter	Model	:TWR1
Power Rating	:AC 120Vac60Hz	Temp.	:22˚C
Engineer	: Brian Huang	Humi.	:53 %
Test Mode	:TX Mode		

Freq MHz	Reading dBuV	Correction Factor dB	Result dBm	Limits dBm	Over limit dB	Detector
1104.9000	55.83	-108.29	-52.46	-13.00	-39.46	Peak
1280.0000	54.99	-107.79	-52.80	-13.00	-39.80	Peak
1455.0000	54.36	-107.28	-52.92	-13.00	-39.92	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)}
{ERP = EIRP – 2.15dB}
3. The margin value=Limit - Result

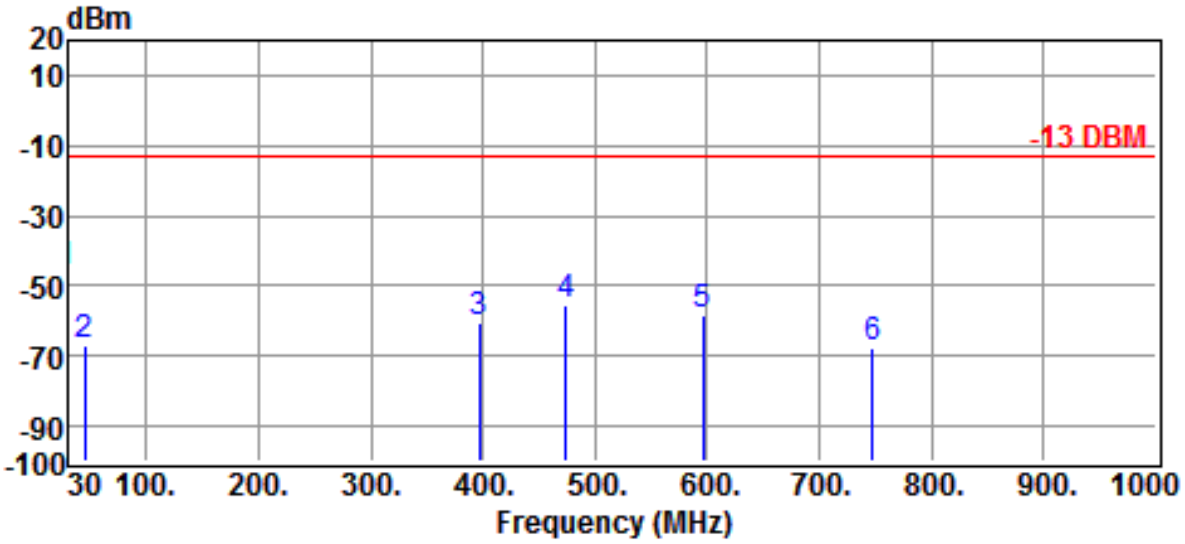
6.4.2 Spurious Emissions



Site	:CHAMBER #2	Date	:2017-08-29
Limit	:-13 DBM	Ant. Pol.	:HORIZONTAL
EUT	: Dual Channel Transmitter	Model	:TWR1
Power Rating	:AC 120Vac60Hz	Temp.	:22˚C
Engineer	: Brian Huang	Humi.	:53 %
Test Mode	:TX Mode		

Freq MHz	Reading dBuV	Correction Factor dB	Result dBm	Limits dBm	Over limit dB	Detector
30.0000	60.13	-103.05	-42.92	-13.00	-29.92	Peak
45.5200	48.08	-111.19	-63.11	-13.00	-50.11	Peak
399.5700	38.59	-103.08	-64.49	-13.00	-51.49	Peak
474.2600	46.23	-102.40	-56.17	-13.00	-43.17	Peak
612.0000	37.13	-100.50	-63.37	-13.00	-50.37	Peak
805.0300	30.32	-97.24	-66.92	-13.00	-53.92	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)}
{ERP = EIRP – 2.15dB}
3. The margin value=Limit - Result

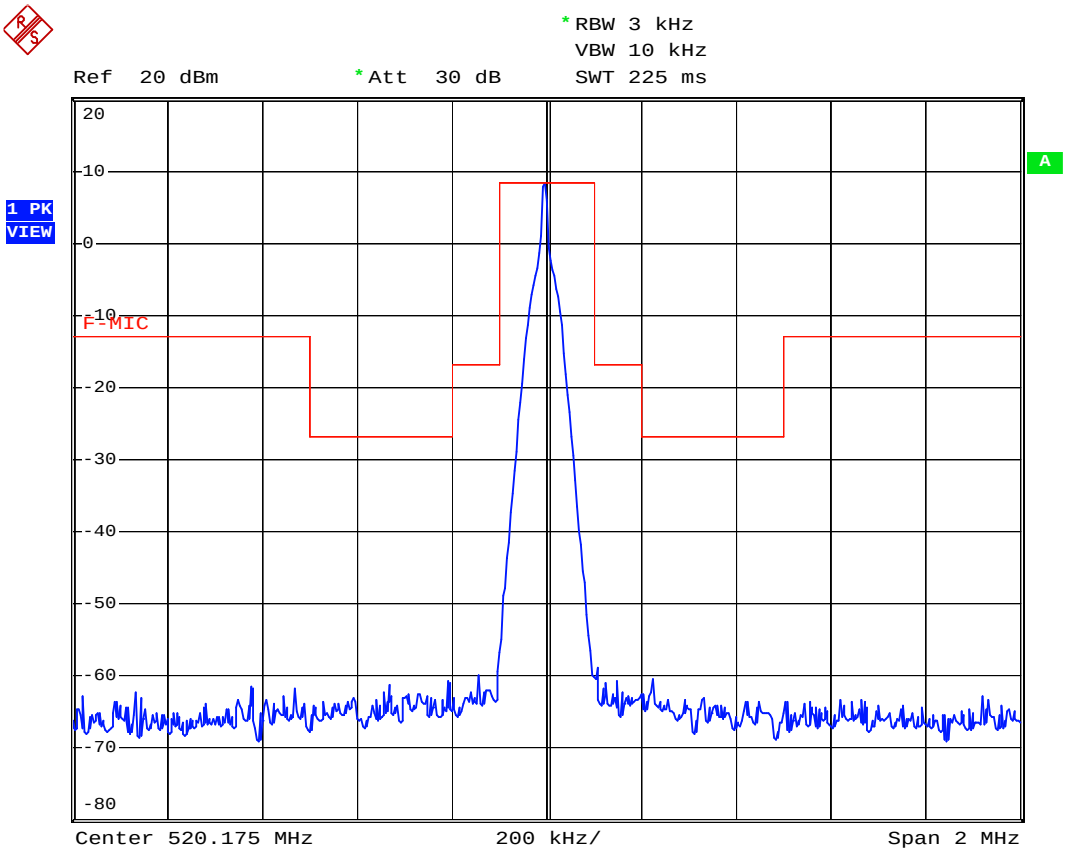


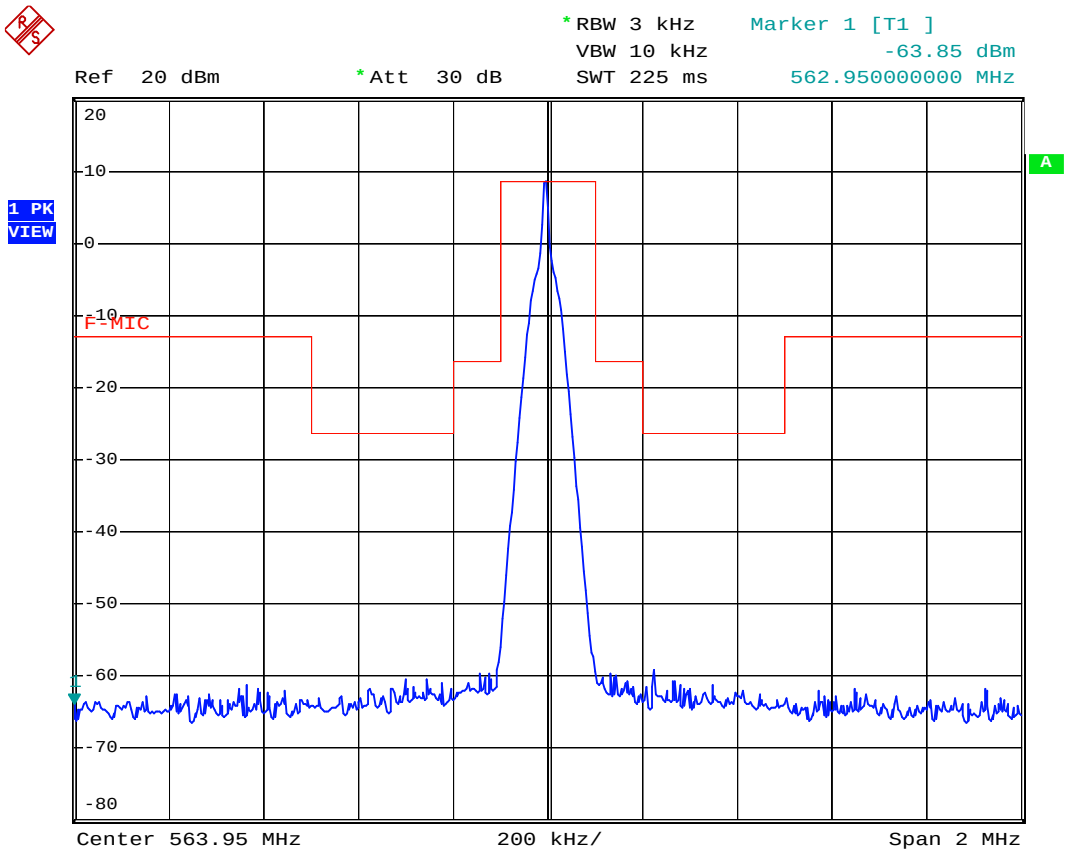
Site	:CHAMBER #2	Date	:2017-08-29
Limit	:-13 DBM	Ant. Pol.	:VERTICAL
EUT	: Dual Channel Transmitter	Model	:TWR1
Power Rating	:AC 120Vac60Hz	Temp.	:22˚C
Engineer	: Brian Huang	Humi.	:53 %
Test Mode	:TX Mode		

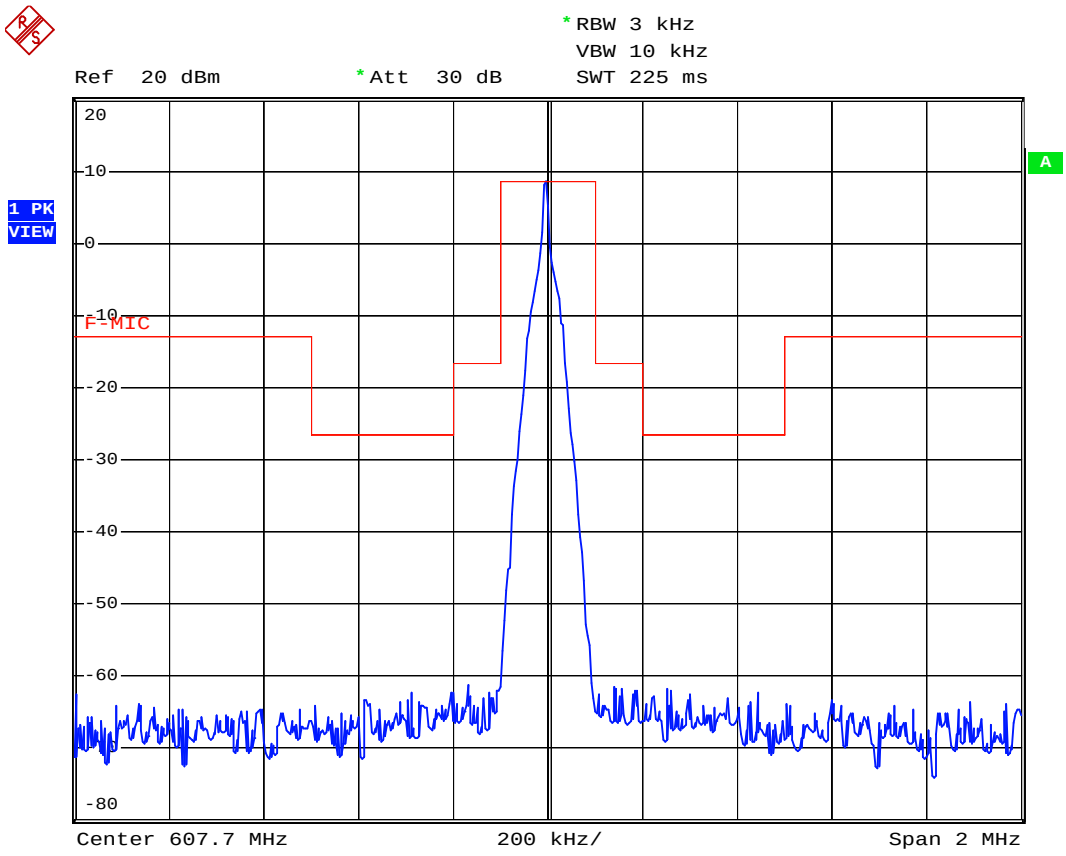
Freq MHz	Reading dBuV	Correction Factor dB	Result dBm	Limits dBm	Over limit dB	Detector
30.0000	56.72	-103.05	-46.33	-13.00	-33.33	Peak
45.5200	44.43	-111.19	-66.76	-13.00	-53.76	Peak
396.6600	42.69	-103.17	-60.48	-13.00	-47.48	Peak
474.2600	46.91	-102.40	-55.49	-13.00	-42.49	Peak
596.4800	42.38	-100.84	-58.46	-13.00	-45.46	Peak
747.8000	30.76	-98.56	-67.80	-13.00	-54.80	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)}
{ERP = EIRP – 2.15dB}
3. The margin value=Limit - Result

6.4.3 Emission mask plots

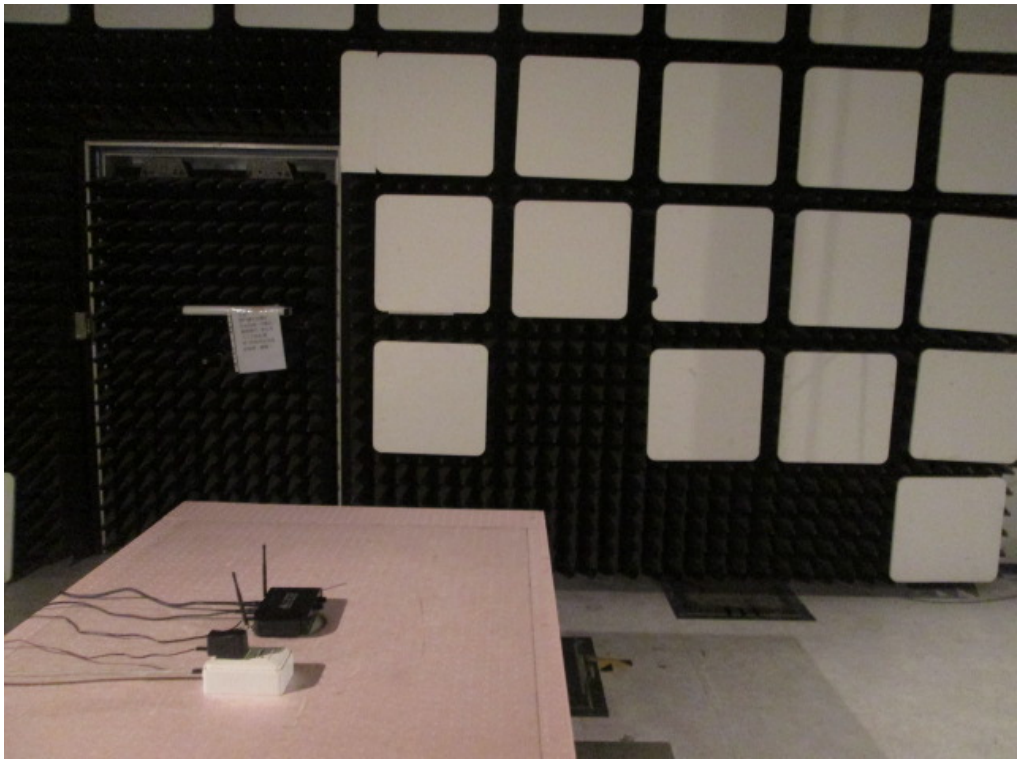



*RBW 3 kHz
VBW 10 kHz
SWT 225 ms
Marker 1 [T1]
-63.85 dBm
562.950000000 MHz
Ref 20 dBm
*Att 30 dB
1 PK
VIEW
A
F-MIC
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 563.95 MHz
200 kHz/
Span 2 MHz

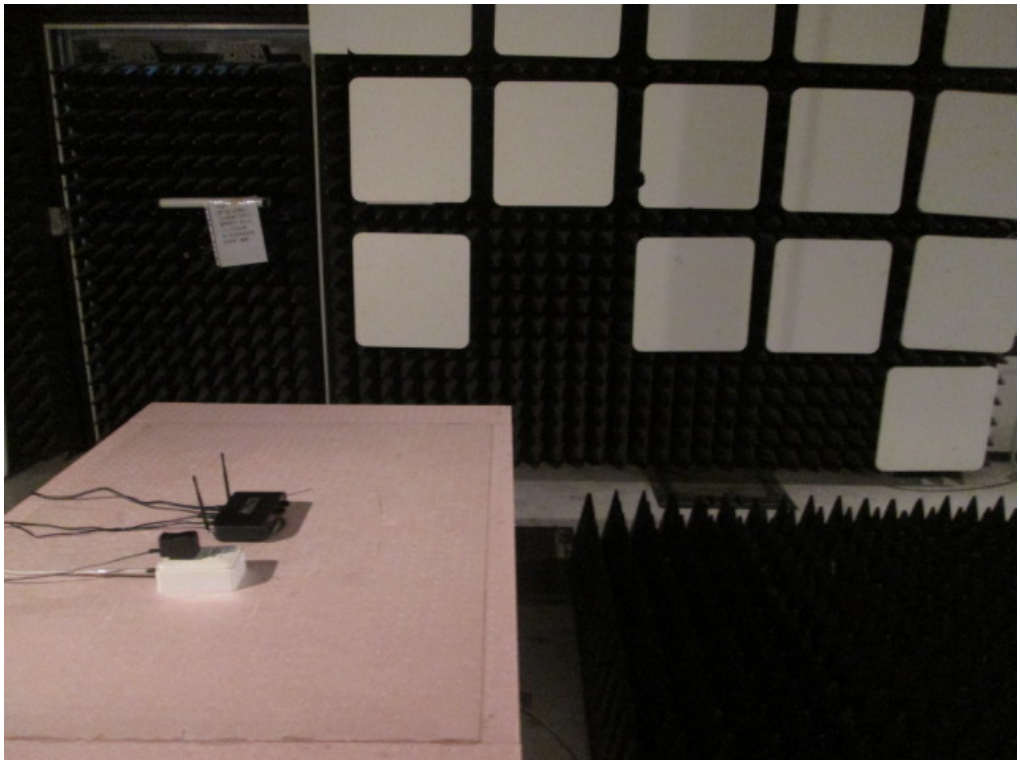

*RBW 3 kHz
VBW 10 kHz
Ref 20 dBm
*Att 30 dB
SWT 225 ms
1 PK
VIEW
A
F-MIC
20
10
0
-10
-20
-30
-40
-50
-60
-80
Center 607.7 MHz
200 kHz/
Span 2 MHz

6.5 Radiated Measurement Photos

(Below 1GHz)



(Above 1GHz)



7. FREQUENCY STABILITY MEASUREMENT

7.1 Provisions Applicable

According to §2.1055 (a)(1), the frequency stability shall be measured with variation of ambient temperature from -30 to +50 centigrade.
According to §2.1055 (d)(1), the frequency stability shall be measured with variation of primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.
According to § 2.1055 (d)(2), for hand carried, battery powered equipment, reduce primary supply voltage to the battery operating end point which shall be specified by the manufacturer.

According to §74.861(e)(4), the frequency tolerance of the transmitter shall be 0.005 percent.

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.

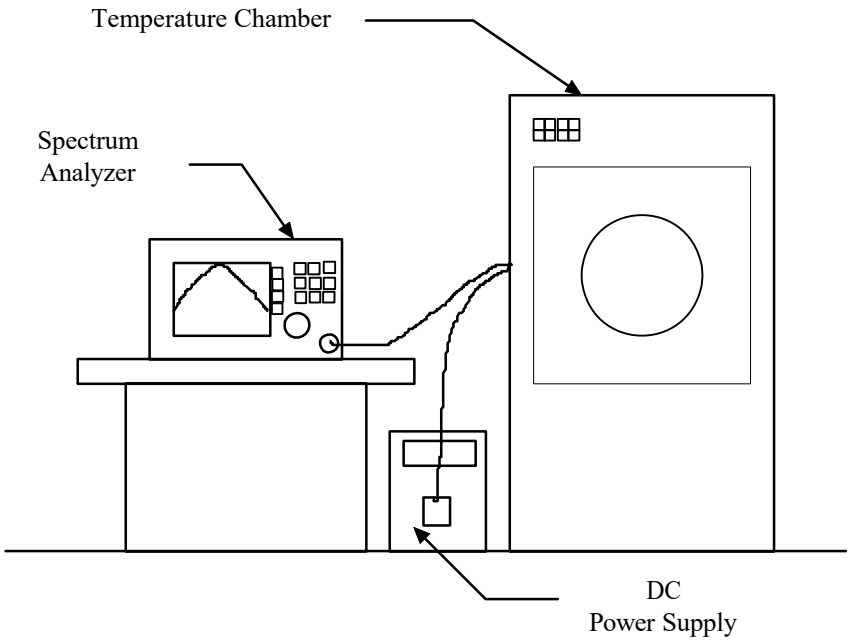
B) Frequency stability versus input voltage

1. Setup the configuration per figure 6 for frequencies measured at an environmental chamber set for a temperature of 20℃.

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 Measurement Instrument

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
Spectrum Analyzer	Rohde & Schwarz	FSP40	2016/10/03	2017/10/02
Temperature Chamber	ESPEC	EFL-3	2017/05/09	2017/05/08

7.4 Measurement Data

Test Date : Aug. 19, 2017 Temperature : 25 °C Humidity : 55 %

A. Tx Frequency 520.175MHz

A1. Frequency stability versus environment temperature

Reference Frequency : 520.175 MHz		Limit：0.005%							
Environment	Power	Frequency measured with time elapsed							
Temperature	Supplied	Startup		2 minute		5 minute		10 minute	
(°C)	(Vac)	(MHz)	(%)	(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
50	120	520.1654	-0.00185	520.1654	-0.00185	520.1655	-0.00183	520.1655	-0.00183
40		520.1689	-0.00117	520.1690	-0.00115	520.1690	-0.00115	520.1690	-0.00115
30		520.1710	-0.00077	520.1711	-0.00075	520.1711	-0.00075	520.1712	-0.00073
20		520.1733	-0.00033	520.1733	-0.00033	520.1734	-0.00031	520.1734	-0.00031
10		520.1747	-0.00006	520.1747	-0.00006	520.1747	-0.00006	520.1748	-0.00004
0		520.1756	0.00012	520.1756	0.00012	520.1756	0.00012	520.1756	0.00012
-10		520.1771	0.00040	520.1771	0.00040	520.1772	0.00042	520.1772	0.00042
-20		520.1797	0.00090	520.1798	0.00092	520.1798	0.00092	520.1798	0.00092

A2. Frequency stability versus supplied voltage

Reference Frequency : 520.175 MHz		Limit：0.005%	
Environment Temperature (℃)	Power Supplied (Vac)	(MHz)	(%)
20	102	520.1734	-0.00031
20	120	520.1734	-0.00031
20	138	520.1733	-0.00033

8 CONDUCTED EMISSION MEASUREMENT

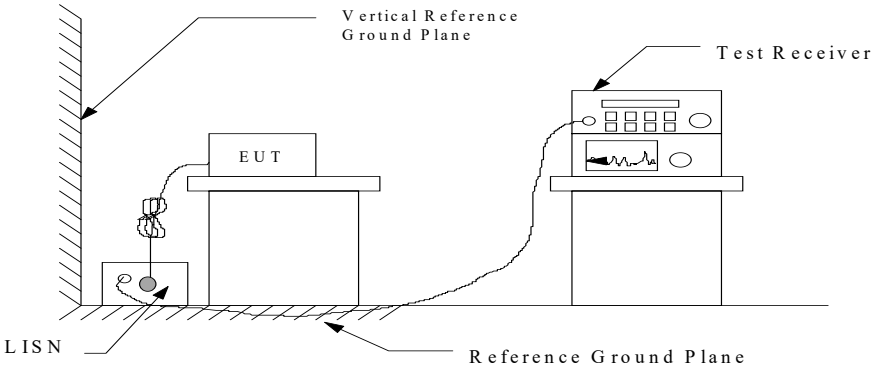
8.1 Standard Applicable

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

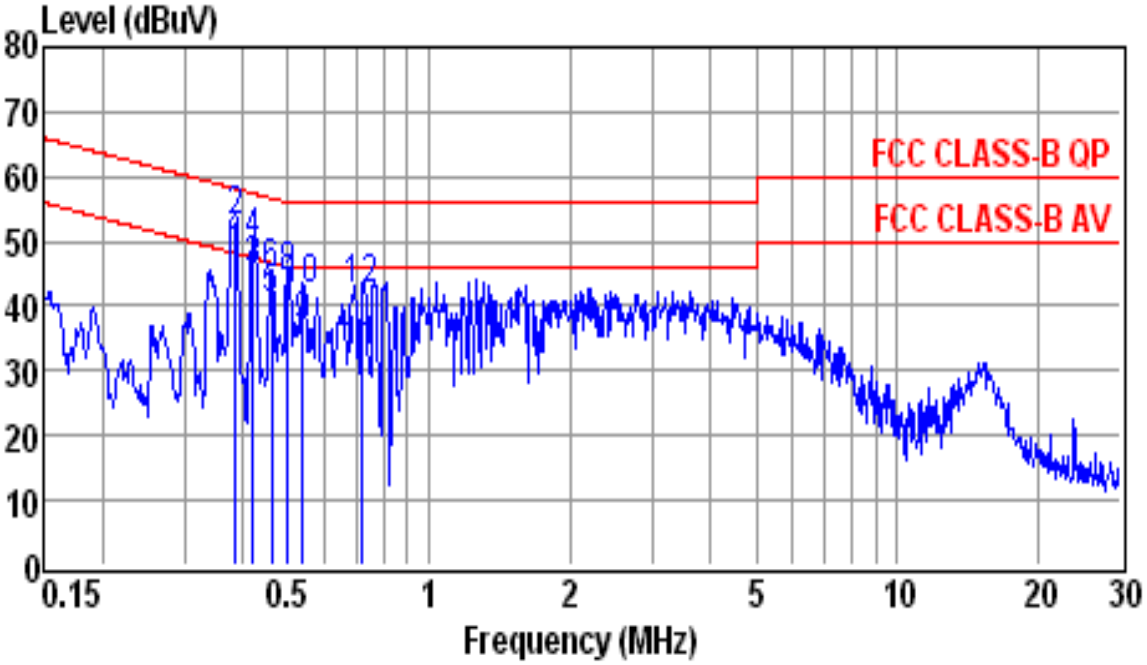
8.2 Measurement Procedure

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 records 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



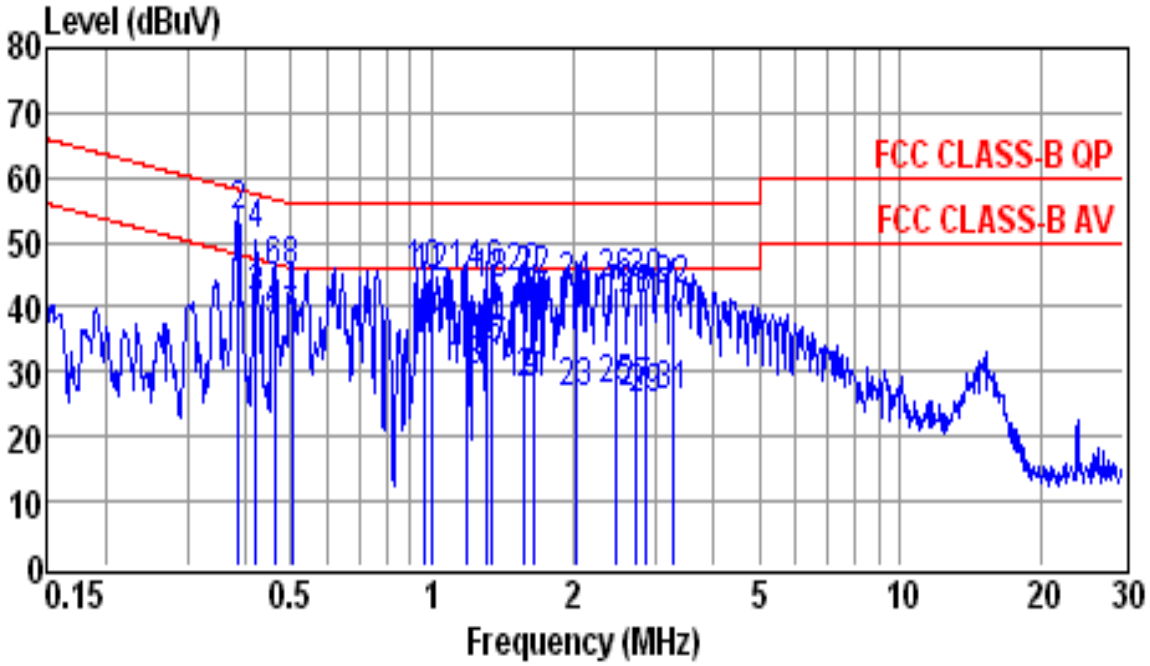
8.3 Conducted Emission Data



Site	: conducted #1	Date	: 08-31-2017
Condition	: CLASS-B QP	LISN	: NEUTRAL
Tem / Hum	: 24 ℃ / 53%	Test Mode	: Tx MODE
EUT	: TWR1	Power Rating	: 120Vac/60Hz

Freq (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV)	Limit Line (dBuV)	Over Limit (dB)	Remark
0.3852	36.82	10.19	47.01	48.17	-1.16	Average
0.3852	42.68	10.19	52.87	58.17	-5.30	QP
0.4215	35.02	10.19	45.21	47.42	-2.21	Average
0.4215	38.95	10.19	49.14	57.42	-8.28	QP
0.4612	30.57	10.19	40.76	46.67	-5.91	Average
0.4612	34.36	10.19	44.55	56.67	-12.12	QP
0.4994	30.24	10.19	40.43	46.01	-5.58	Average
0.4994	34.09	10.19	44.28	56.01	-11.73	QP
0.5378	26.32	10.20	36.52	46.00	-9.48	Average
0.5378	32.01	10.20	42.21	56.00	-13.79	QP
0.7198	22.23	10.19	32.42	46.00	-13.58	Average
0.7198	32.19	10.19	42.38	56.00	-13.62	QP

Note :
1. Result = Reading + Factor
2. Factor = LISN Factor + Cable Loss



Site	: conducted #1	Date	: 08-31-2017
Condition	: CLASS-B QP	LISN	: LINE
Tem / Hum	: 24 ℃ / 53%	Test Mode	: Tx MODE
EUT	: TWR1	Power Rating	: 120Vac/60Hz

Freq (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV)	Limit Line (dBuV)	Over Limit (dB)	Remark
0.3852	32.62	10.18	42.80	48.17	-5.37	Average
0.3852	43.28	10.18	53.46	58.17	-4.71	QP
0.4215	30.35	10.18	40.53	47.42	-6.89	Average
0.4215	40.73	10.18	50.91	57.42	-6.51	QP
0.4612	27.31	10.18	37.49	46.67	-9.18	Average
0.4612	34.68	10.18	44.86	56.67	-11.81	QP
0.5020	27.39	10.19	37.58	46.00	-8.42	Average
0.5020	34.83	10.19	45.02	56.00	-10.98	QP
0.9633	25.04	10.20	35.24	46.00	-10.76	Average
0.9633	34.38	10.20	44.58	56.00	-11.42	QP
0.9997	24.15	10.20	34.35	46.00	-11.65	Average
0.9997	34.04	10.20	44.24	56.00	-11.76	QP
1.1840	19.32	10.21	29.53	46.00	-16.47	Average
1.1840	34.16	10.21	44.37	56.00	-11.63	QP
1.3030	22.70	10.23	32.93	46.00	-13.07	Average
1.3030	34.44	10.23	44.67	56.00	-11.33	QP
1.3450	22.57	10.23	32.80	46.00	-13.20	Average
1.3450	33.11	10.23	43.34	56.00	-12.66	QP
1.5680	17.55	10.24	27.79	46.00	-18.21	Average
1.5680	33.72	10.24	43.96	56.00	-12.04	QP
1.6450	17.46	10.24	27.70	46.00	-18.30	Average
1.6450	33.45	10.24	43.69	56.00	-12.31	QP

2.0330	15.97	10.26	26.23	46.00	-19.77	Average
2.0330	32.37	10.26	42.63	56.00	-13.37	QP
2.4870	16.39	10.29	26.68	46.00	-19.32	Average
2.4870	32.83	10.29	43.12	56.00	-12.88	QP
2.7210	16.11	10.31	26.42	46.00	-19.58	Average
2.7210	30.26	10.31	40.57	56.00	-15.43	QP
2.8690	15.26	10.31	25.57	46.00	-20.43	Average
2.8690	32.63	10.31	42.94	56.00	-13.06	QP
3.2580	15.55	10.33	25.88	46.00	-20.12	Average
3.2580	31.86	10.33	42.19	56.00	-13.81	QP

Note :
1. Result = Reading + Factor
2. Factor = LISN Factor + Cable Loss

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 μ V is obtained, and LISN Factor is 0.1 dB, then the total of disturbance voltage is 22.6 dB μ V.

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

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	2016/12/05	2017/12/05
LISN	Shibasoku	563	2017/05/15	2018/05/14
LISN	Rohde & Schwarz	ESH2-Z5	2017/04/01	2018/03/31

8.6 Photos of Conduction Measuring Setup