FCC Part 74 Subpart H

EMI TEST REPORT

of

E.U.T. : WIRELESS MICROPHONE
FCC ID. : DLAS404HDX
Model No. : S4.04-HDX; S4.10-HDX
Working Frequency : 506~608 MHz ; 614~698 MHz

for

APPLICANT : TOA Corporation
ADDRESS : 2-1 Takamatsu-cho, Takarazuka-shi, Hyogo-ken, 665-0043, Japan

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 : 16-03-RBF-036-01

TEST REPORT CERTIFICATION

Applicant	:	TOA Corporation 2-1 Takamatsu-cho, Takarazuka-shi, Hyogo-ken, 665-0043, Japan
Manufacturer	:	Dynatron Industrial Co., Ltd. No.89, Din Pin Rd., Ray Fong Industrial Area, Ray Fong Dist, New Taipei City, Taiwan
Description of EUT	:	
a) Type of EUT	:	WIRELESS MICROPHONE
b) Trade Name	:	TRANTEC
c) Model No.	:	S4.04-HDX; S4.10-HDX
d) FCC ID	:	DLAS404HDX
e) Working Frequency	:	506~608 MHz 614~698 MHz
f) Power Supply	:	DC 1.5V Battery

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 : May 31, 2016

Test Engineer : Peter Liao
(Peter Liao, 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	:	WIRELESS MICROPHONE
b) Trade Name	:	TRANTEC
c) Model No.	:	S4.04-HDX; S4.10-HDX
d) FCC ID	:	DLAS404HDX
e) Working Frequency	:	506~608 MHz, 614~698 MHz
f) Power Supply	:	DC 1.5V Battery
g) Emission Designator	:	119KF3E 2M+2DK=2x(0.7kHz)+2x(58.8kHz)x1=119kHz
h) Model Difference	:	Model: S4.10HDX and S4.04HDX are identical. They have the same design on the circuit and PCB layout. The only difference are the model name designation, the selectable channels(via firmware setting) and PAD switch(for microphone sensitivity adjustment). S4.04-HDX: 4 selectable channels, without PAD switch. S4.10-HDX: 16 selectable channels, with PAD switch.

1.2 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 Standsrds” 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

1.3 Test Facility

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

This site is FCC 2.948 listed and accepted in a letter dated Jan. 29, 2014.

Registration Number: 90589

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

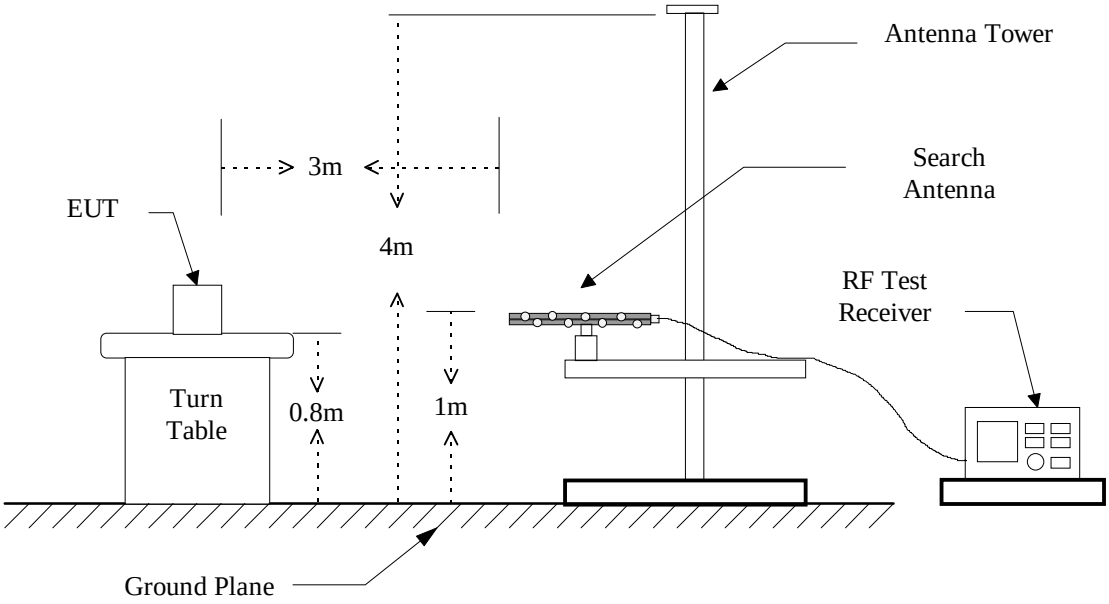
3.1 Provision Applicable

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

3.2 Measurement Procedure

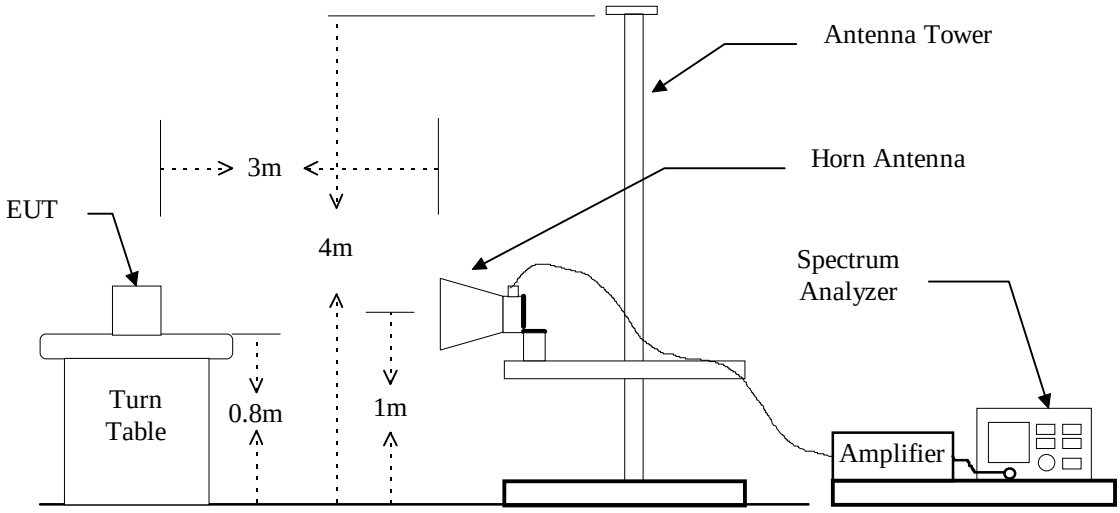
1. Setup the configuration per figure 1 and 2 for frequencies measured below and above 1 GHz respectively, adjusting the input voltage to produce the maximum power.
2. Adjust the analyzer for each frequency measured in chapter 6 on a 1 MHz frequency span and 1MHz resolution bandwidth.
3. The search antenna 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 °, and record the highest value indicated on spectrum analyzer as reference value.
4. Repeat step 3 until all frequencies need to be measured were complete.
5. Repeat step 4 with search antenna in vertical polarized orientations.
6. Replace the EUT with a tuned dipole antenna (horn antenna for above 1 GHz) relative to each frequency in horizontally polarized orientation and as the same polarized orientation with search antenna. Connect the tuned dipole antenna to a standard signal generator (SG) via a low loss cable. Power on the SG and tune the right frequency in measuring as well as set SG at a appreciated output level. Rise and lower the search antenna to get the highest value on spectrum analyzer, and then hold this position. Adjust the SG output to get a identical value derived from step 3 on spectrum analyzer. Record this value for result calculated.
7. Repeat step 6 until all frequencies need to be measured were complete.
8. Repeat step 7 with both dipole antenna (horn antenna for above 1 GHz) and search antenna in vertical polarized orientations.

Figure 1 : Frequencies measured below 1 GHz configuration



Note: For substitution method, replace the EUT with a tuned dipole antenna relative to each frequency and connect to a standard signal generator (SG) via a low loss cable.

Figure 2 : Frequencies measured above 1 GHz configuration



Note: For substitution method, replace the EUT with a horn antenna and connect to a standard signal generator (SG) via a low loss cable.

3.3 Test Data

Operated mode : TX Test Date : Apr. 25, 2016
Temperature : 25 °C Humidity : 65 %

Frequency (MHz)	Meter Reading (dBμV/m)	SG Reading (dBm)	Cable Loss (dB)	Antenna Gain	Result (dBm)	Output Power (mW)	Limit (mW)
506.000	83.9	11.0	2.0	----	9.0	7.943	250.0
538.000	82.4	9.3	2.2	----	7.1	5.129	250.0
576.000	84.0	9.8	2.2	----	7.6	5.754	250.0
607.925	81.8	11.1	2.2	----	8.9	7.762	250.0
614.075	83.0	10.5	2.3	----	8.2	6.607	250.0
668.000	82.9	11.7	2.3	----	9.4	8.710	250.0
697.925	81.9	9.2	2.3	----	6.9	4.898	250.0

Note: For measured frequency below 1GHz, a tuned dipole antenna is used.

3.4 Result Calculation

Result calculation is as following :

Result = SG Reading - Cable Loss + Antenna Gain Corrected

Antenna Gain Corrected : is used for antenna other than dipole to convert radiated power to ERP.

$$mW = \log^{-1}\left[\frac{Result(dBm)}{10}\right]$$

3.5 Test Equipment

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
EMI Test Receiver	Rohde & Schwarz	ESCI	2015/12/05	2016/12/04
Biconical Antenna	EMCO	3110	2015/11/17	2016/11/16
Log-periodic Antenna	EMCO	3146	2015/11/17	2016/11/16
Amplifier	HP	8447D	2015/12/17	2016/12/16
Signal generator	HP	83732B	2015/11/24	2016/11/23

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 3, 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.

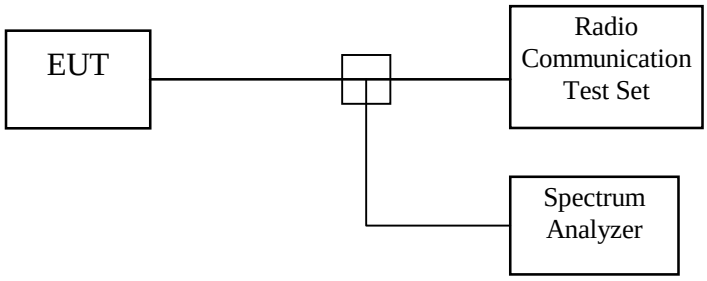
2. Repeat step 1 with changing the input frequency for 200, 500, 1000, 3000, and 5000 Hz in sequence.

B) Frequency response of all circuits

1. Position the EUT as shown in figure 3.

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 3 : Modulation characteristic measurement configuration



4.3 Measurement Instrument

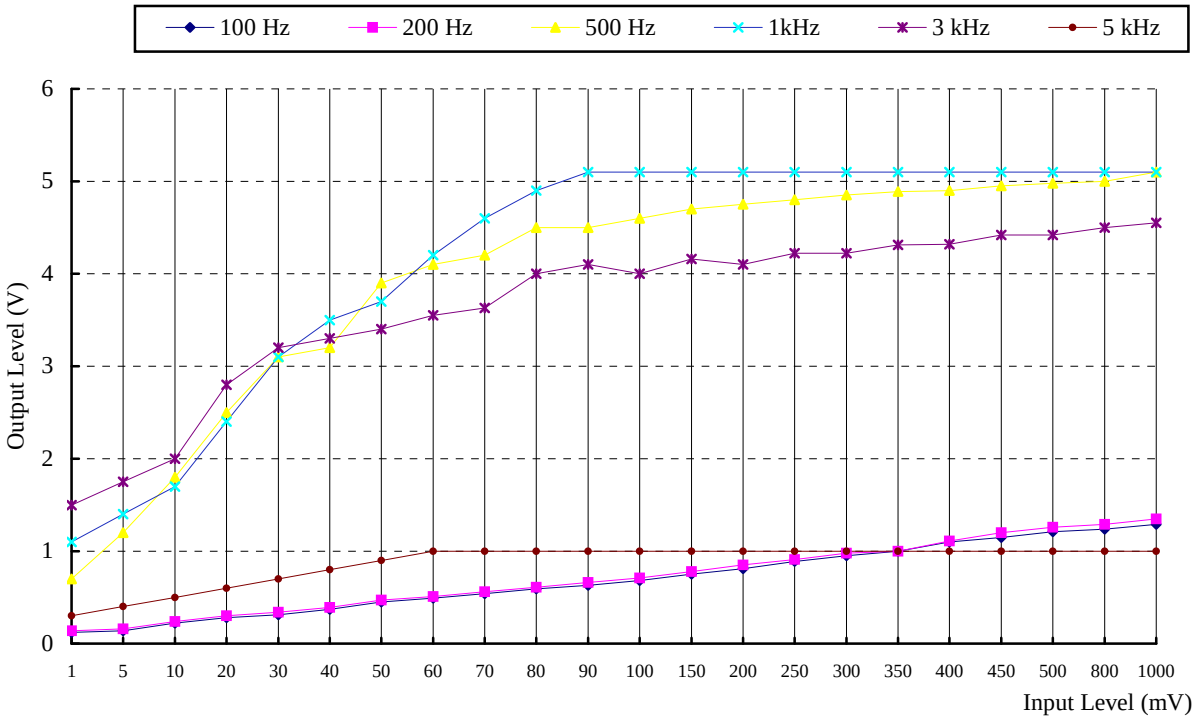
Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
Communications Service Monitor	AEROFLEX	2945B	2015/11/19	2016/11/18
Spectrum Analyzer	Rohde & Schwarz	FSP40	2015/07/06	2016/07/05

4.4 Measurement Result

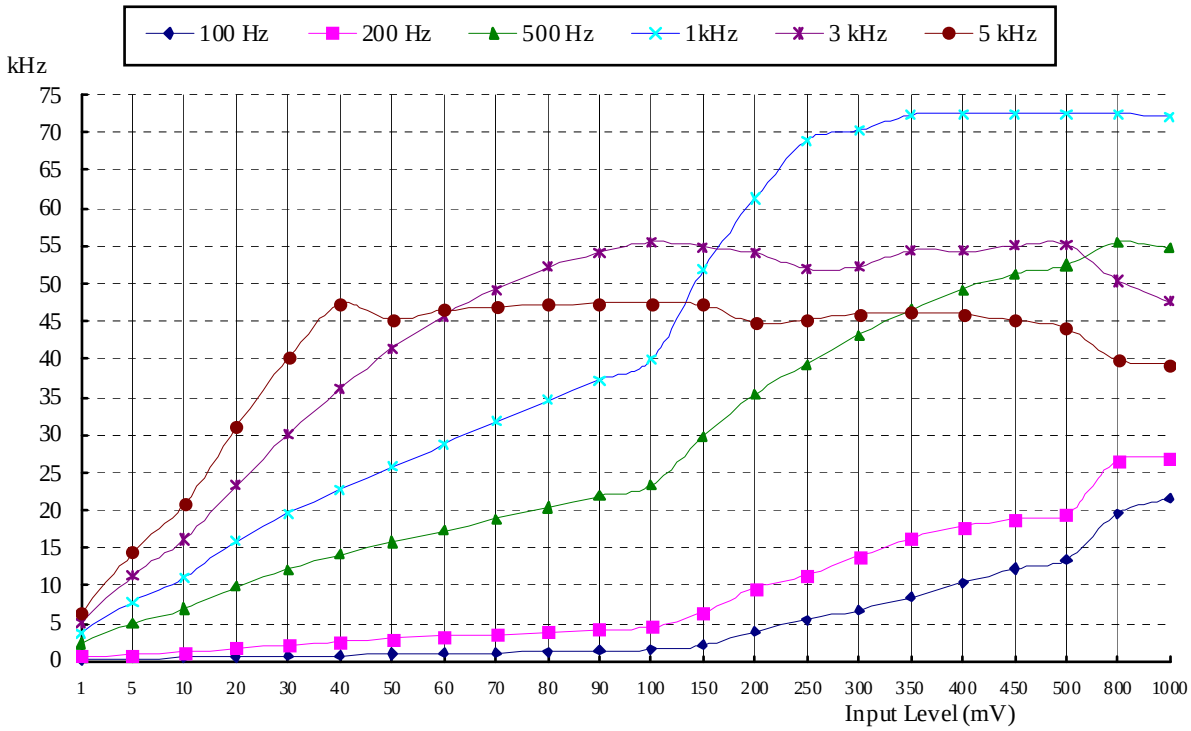
RF Frequency : 506MHz;

Test Date : Apr. 25, 2016 Temperature : 25 °C Humidity : 63 %

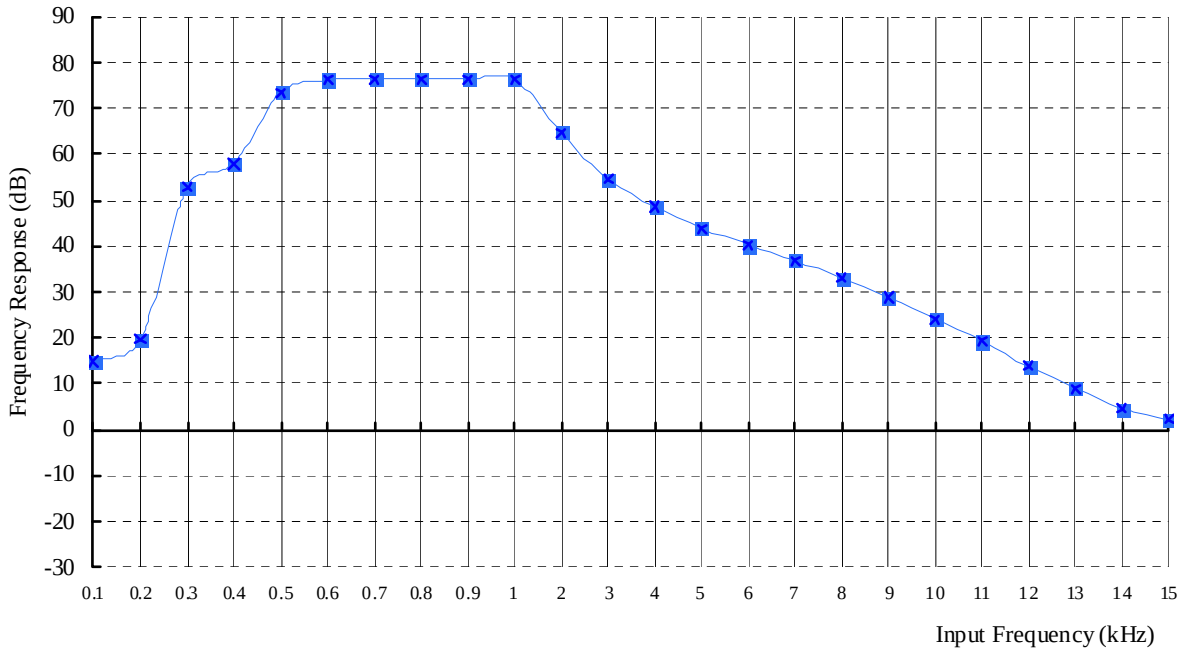
A). Frequency response



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.

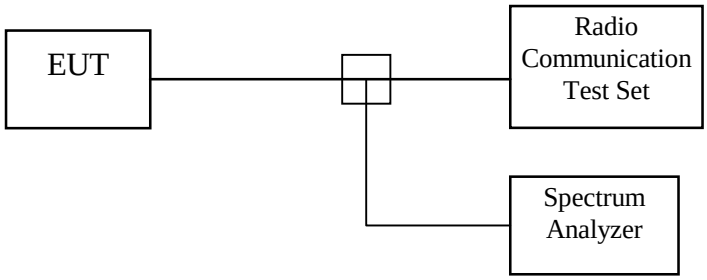
5.2 Measurement Method

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 4, 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 4 : Occupied bandwidth measurement configuration



5.3 Occupied Bandwidth Test Equipment

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
Communications Service Monitor	AEROFLEX	2945B	2015/11/19	2016/11/18
Spectrum Analyzer	Rohde & Schwarz	FSP40	2015/07/06	2016/07/05

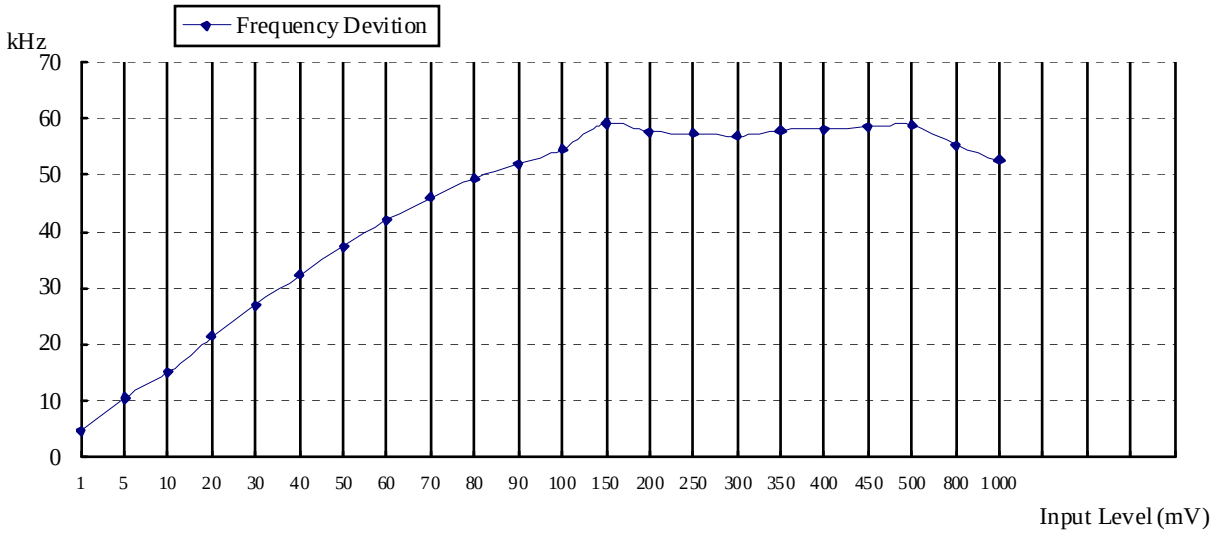
5.4 Bandwidth Measured

5.4.1 Input Level Derived

RF Frequency : 506MHz;

Test Date : Apr. 25, 2016 Temperature : 25 °C Humidity : 63 %

Input Audio Frequency : 2.5 kHz, Sine Wave

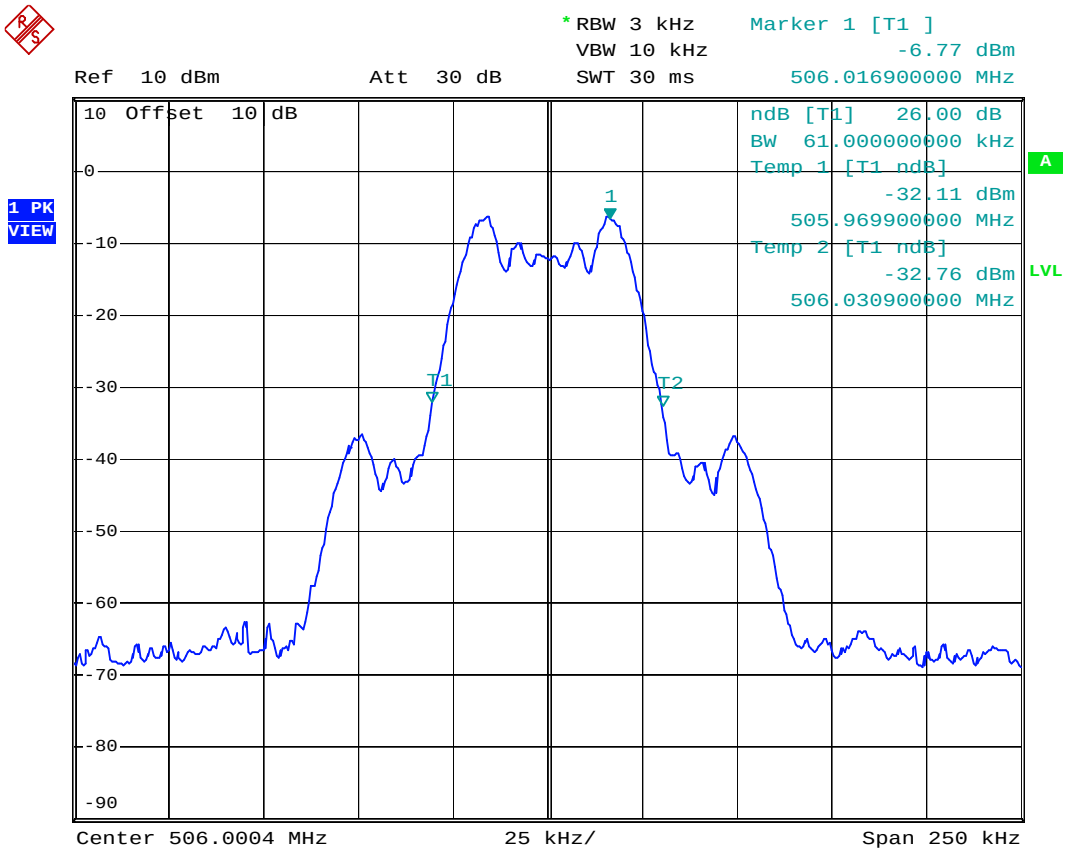


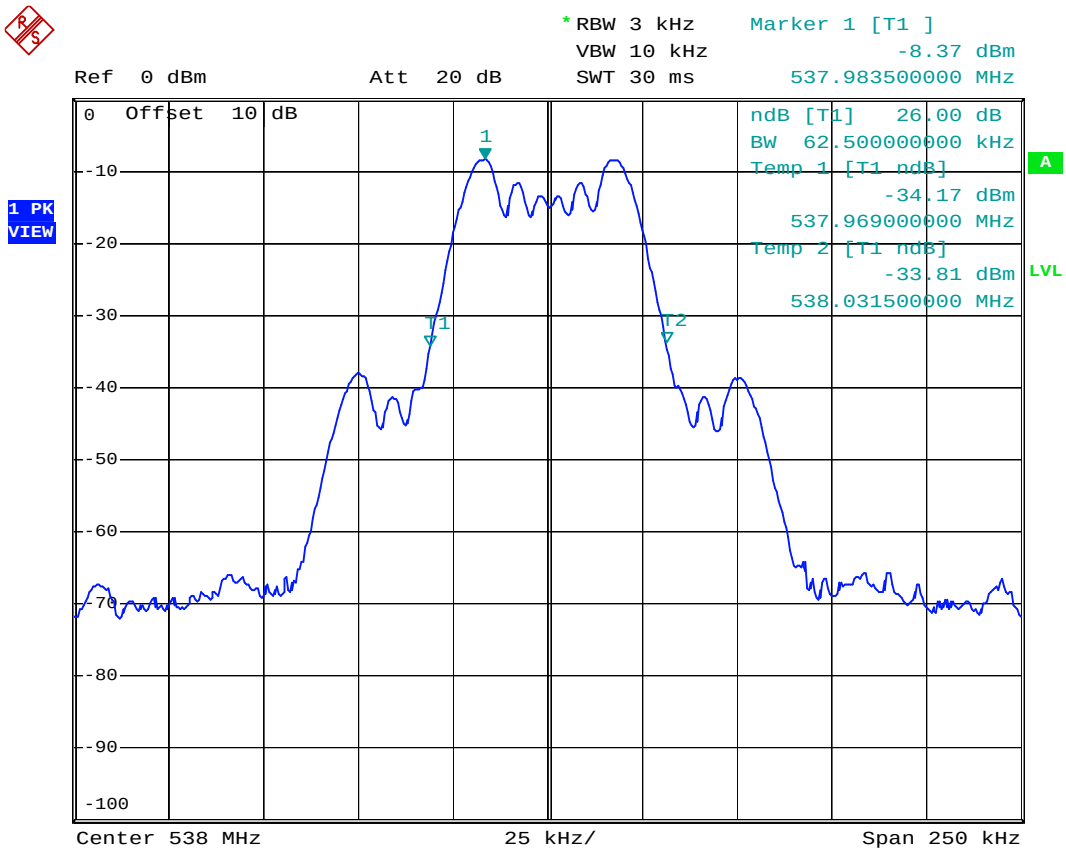
The Level input to produce 50% modulation is 40 mV, therefore the magnitude 16 dB greater than it is 252 mV.

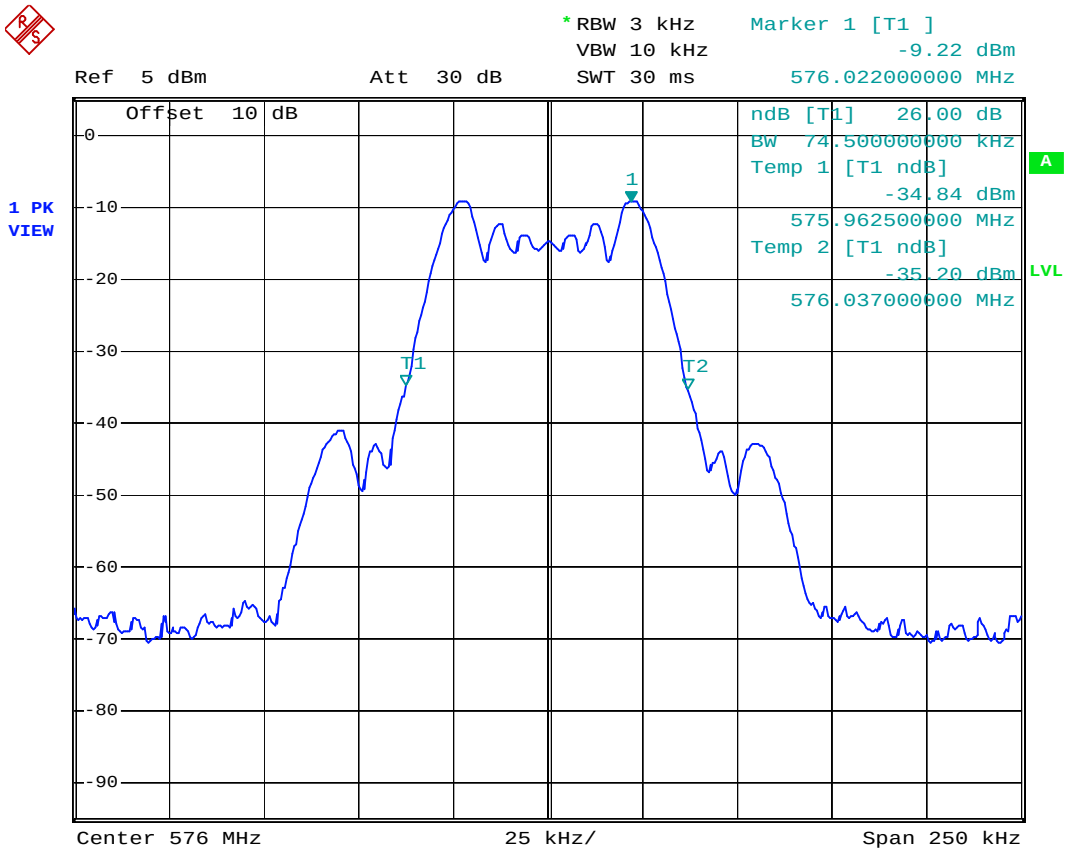
5.4.2 Occupied Bandwidth Plotted

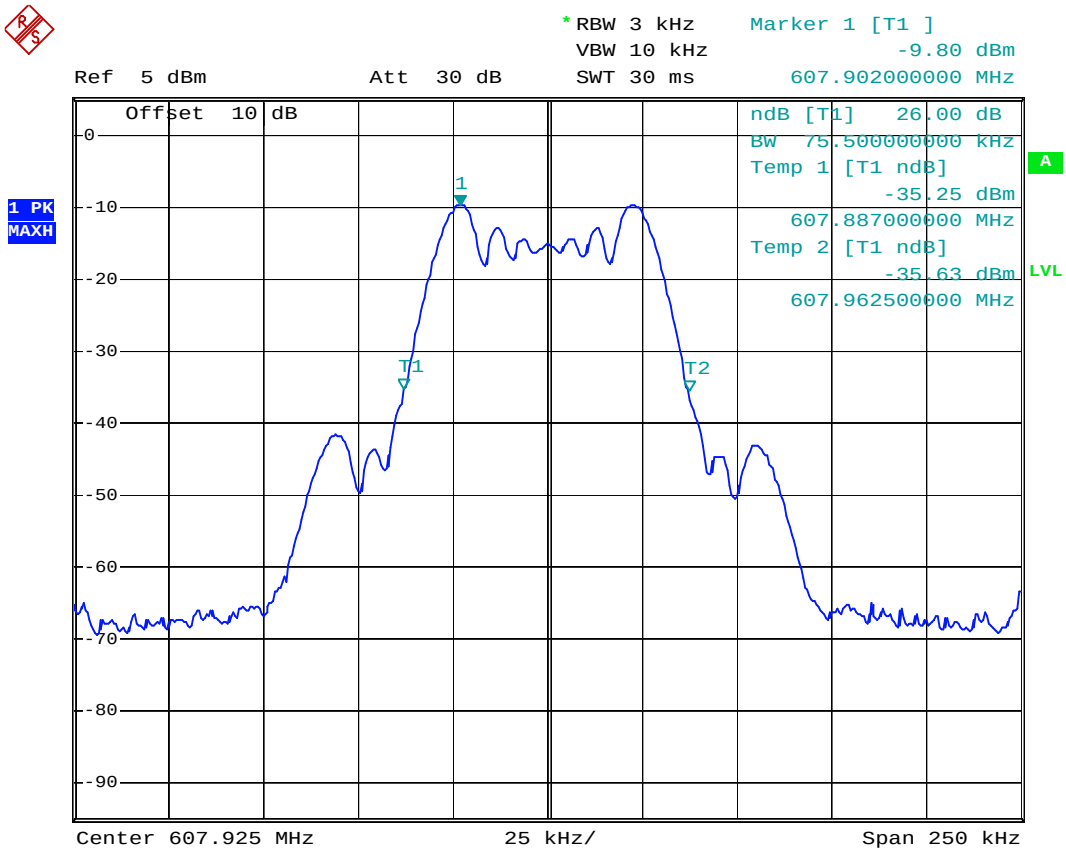
Test Date : Apr. 25, 2016 Temperature : 25 °C Humidity : 63 %

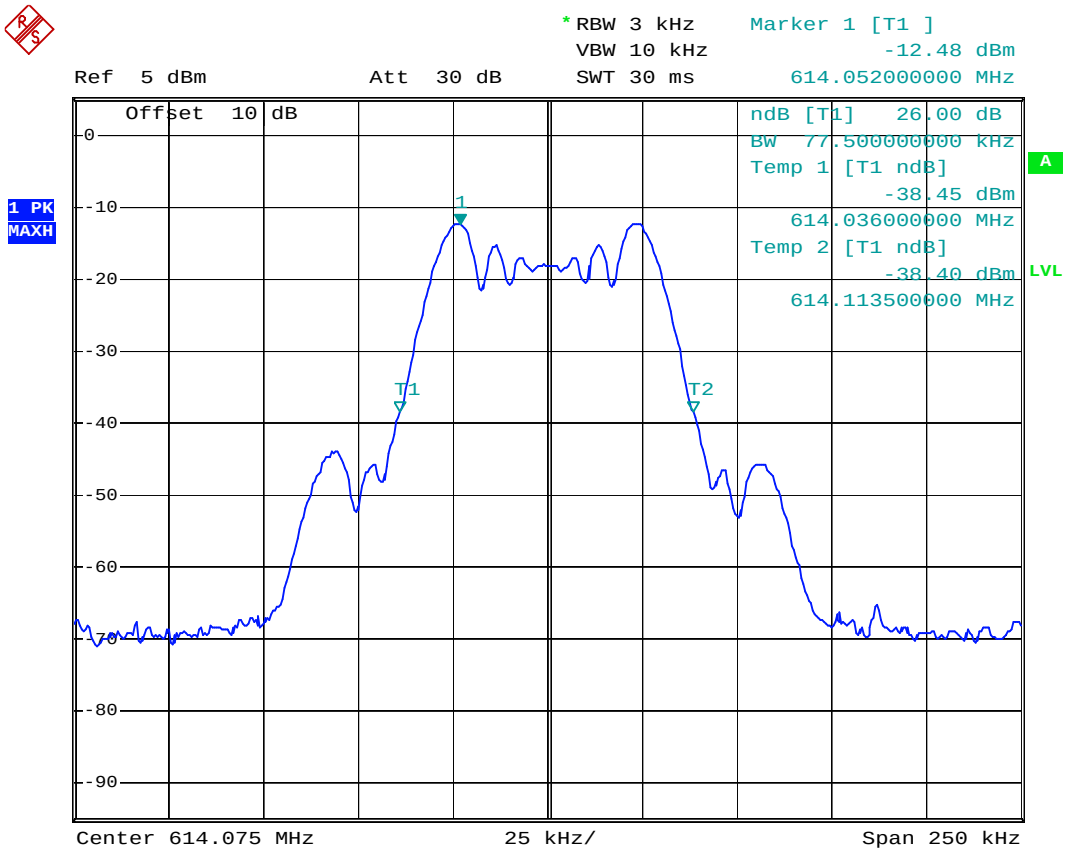
RF Frequency (MHz)	26 dB Bandwidth (kHz)
506.000	61.0
538.000	62.5
576.000	74.5
607.925	75.5
614.075	77.5
668.000	75.5
697.925	77.0

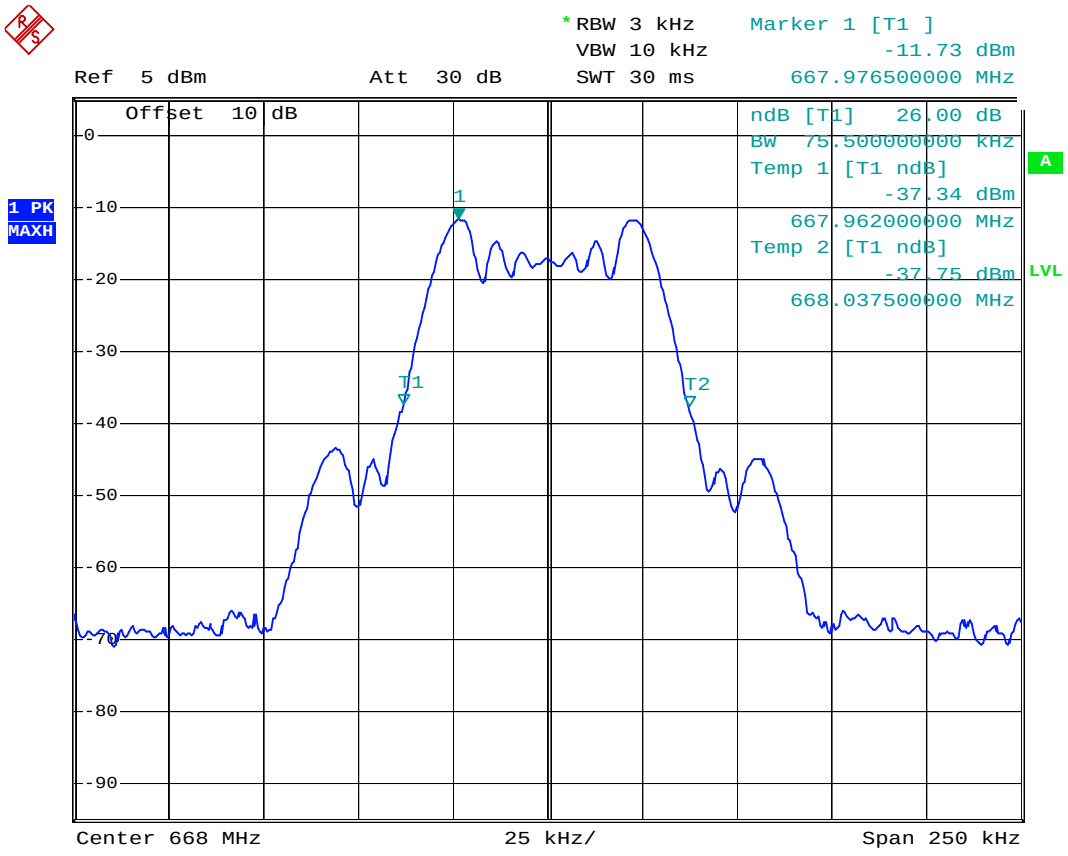

*RBW 3 kHz
VBW 10 kHz
SWT 30 ms
Marker 1 [T1]
-6.77 dBm
506.016900000 MHz
Ref 10 dBm
Att 30 dB
10 Offset 10 dB
ndB [T1] 26.00 dB
BW 61.000000000 kHz
Temp 1 [T1 ndB]
-32.11 dBm
505.969900000 MHz
Temp 2 [T1 ndB]
-32.76 dBm
506.030900000 MHz
1 PK
VIEW
A
LVL
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
T1
T2
1
Center 506.0004 MHz
25 kHz/
Span 250 kHz

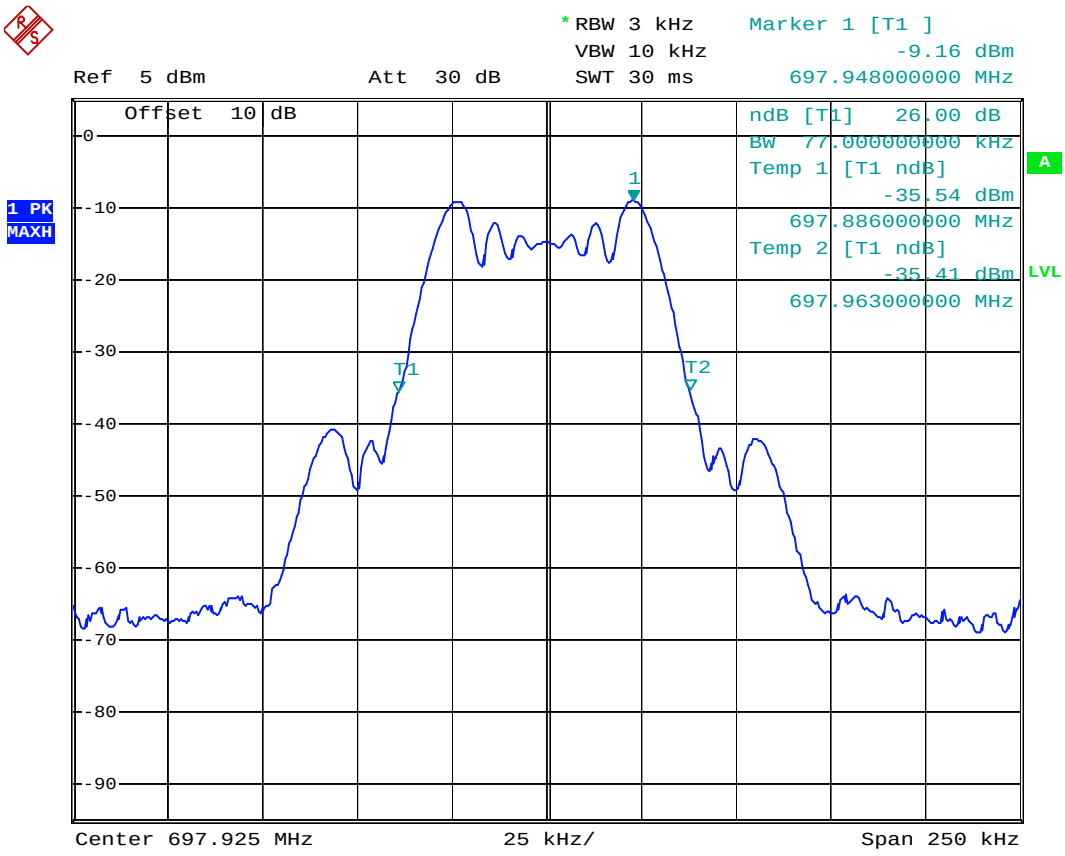

*RBW 3 kHz
VBW 10 kHz
SWT 30 ms
Marker 1 [T1]
-8.37 dBm
537.983500000 MHz
Ref 0 dBm
Att 20 dB
0 Offset 10 dB
ndB [T1] 26.00 dB
BW 62.500000000 kHz
Temp 1 [T1 ndB]
-34.17 dBm
537.969000000 MHz
Temp 2 [T1 ndB]
-33.81 dBm
538.031500000 MHz
1 PK VIEW
A
LVL
T1
T2
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
Center 538 MHz
25 kHz/
Span 250 kHz


*RBW 3 kHz
VBW 10 kHz
SWT 30 ms
Marker 1 [T1]
-9.22 dBm
576.022000000 MHz
Ref 5 dBm
Att 30 dB
Offset 10 dB
ndB [T1] 26.00 dB
BW 74.500000000 kHz
Temp 1 [T1 ndB]
-34.84 dBm
575.962500000 MHz
Temp 2 [T1 ndB]
-35.20 dBm
576.037000000 MHz
1 PK
VIEW
A
LVL
T1
T2
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
Center 576 MHz
25 kHz/
Span 250 kHz


*RBW 3 kHz
VBW 10 kHz
SWT 30 ms
Marker 1 [T1]
-9.80 dBm
607.902000000 MHz
Ref 5 dBm
Att 30 dB
Offset 10 dB
ndB [T1] 26.00 dB
BW 75.500000000 kHz
Temp 1 [T1 ndB]
-35.25 dBm
607.887000000 MHz
Temp 2 [T1 ndB]
-35.63 dBm
607.962500000 MHz
1 PK
MAXH
A
LVL
T1
T2
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
Center 607.925 MHz
25 kHz/
Span 250 kHz


*RBW 3 kHz
VBW 10 kHz
SWT 30 ms
Marker 1 [T1]
-12.48 dBm
614.052000000 MHz
Ref 5 dBm
Att 30 dB
Offset 10 dB
ndB [T1] 26.00 dB
BW 77.500000000 kHz
Temp 1 [T1 ndB]
-38.45 dBm
614.036000000 MHz
Temp 2 [T1 ndB]
-38.40 dBm
614.113500000 MHz
1 PK
MAXH
A
LVL
T1
T2
Center 614.075 MHz
25 kHz/
Span 250 kHz


*RBW 3 kHz
VBW 10 kHz
SWT 30 ms
Marker 1 [T1]
-11.73 dBm
667.976500000 MHz
Ref 5 dBm
Att 30 dB
Offset 10 dB
ndB [T1] 26.00 dB
BW 75.500000000 kHz
Temp 1 [T1 ndB]
-37.34 dBm
667.962000000 MHz
Temp 2 [T1 ndB]
-37.75 dBm
668.037500000 MHz
1 PK
MAXH
A
LVL
T1
T2
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
Center 668 MHz
25 kHz/
Span 250 kHz


*RBW 3 kHz
VBW 10 kHz
SWT 30 ms
Marker 1 [T1]
-9.16 dBm
697.948000000 MHz
Ref 5 dBm
Att 30 dB
Offset 10 dB
ndB [T1] 26.00 dB
BW 77.000000000 kHz
Temp 1 [T1 ndB]
-35.54 dBm
697.886000000 MHz
Temp 2 [T1 ndB]
-35.41 dBm
697.963000000 MHz
1 PK
MAXH
A
LVL
T1
T2
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
Center 697.925 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 1 and 2 for frequencies measured below and above 1 GHz respectively, adjusting the input voltage to produce the maximum power as measured in chapter 3.
2. Adjust the analyzer for each frequency measured in chapter 6 on a 1 MHz frequency span and 1MHz resolution bandwidth.
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 °, and record the highest value indicated on spectrum analyzer as reference value.
4. Repeat step 3 until all frequencies need to be measured were complete.
5. Repeat step 4 with search antenna in vertical polarized orientations.
6. Replace the EUT with a tuned dipole antenna (horn antenna for above 1 GHz) relative to each frequency in horizontally polarized orientation and as the same polarized orientation with search antenna. Connect the tuned dipole antenna to a standard signal generator (SG) via a low loss cable. Power on the SG and tune the right frequency in measuring as well as set SG at a appreciated output level. Rise and lower the search antenna to get the highest value on spectrum analyzer, and then hold this position. Adjust the SG output to get a identical value derived from step 3 on spectrum analyzer. Record this value for result calculated.

7. Repeat step 6 until all frequencies need to be measured were complete.
8. Repeat step 7 with both dipole antenna (horn antenna for above 1 GHz) and search antenna in vertical polarized orientations.

6.3 Measuring Instrument

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
Spectrum Analyzer	Rohde & Schwarz	FSP40	2015/07/06	2016/07/05
Double Ridged Antenna	EMCO	3115	2015/10/08	2016/10/07
Log-periodic Antenna	EMCO	3146	2015/11/17	2016/11/16
Biconical Antenna	EMCO	3110	2015/11/17	2016/11/16
Amplifier	HP	8449B	2015/10/06	2016/10/05
Amplifier	HP	8447D	2015/08/10	2016/08/09
Signal generator	HP	83732B	2015/11/24	2016/11/23

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. Emission Test Data

a. Tx Frequency: 506.000MHz

Operated mode : TX Test Date :Apr. 25, 2016
Temperature : 25°C Humidity : 63%

Unmodulated carrier output power is 9.0 dBm , or 7.943 mW (ERP).
The limit of spurious or harmonics is calculated as following :

9.0-[43+10log(carrier output power in W)], or -13dBm

Frequency (MHz)	Meter Reading (dBuV) H	V	SG Reading (dBm) H	V	Antenna Gain	Antenna Gain Corr'	Cable Loss (dB)	Result (dBm) H	V	Limit (dBm)	Margin (dB)
1012.000	72.3	70.6	-40.3	-41.9	5.8	-2.0	2.1	-38.6	-40.2	-13.0	-25.6
1518.000	63.8	63.0	-46.5	-47.3	8.2	-2.0	2.6	-42.9	-43.7	-13.0	-29.9
2024.000	---	---	---	---	8.3	-2.0	3.0	---	---	-13.0	---
2530.000	63.6	62.7	-42.7	-43.5	9.6	-2.0	3.4	-38.5	-39.3	-13.0	-25.5
3036.000	58.9	57.9	-45.7	-46.6	9.2	-2.0	3.7	-42.2	-43.1	-13.0	-29.2
3542.000	---	---	---	---	9.3	-2.0	4.1	---	---	-13.0	---
4048.000	---	---	---	---	9.5	-2.0	4.4	---	---	-13.0	---
4554.000	---	---	---	---	10.5	-2.0	4.7	---	---	-13.0	---
5060.000	---	---	---	---	10.0	-2.0	4.9	---	---	-13.0	---

Note :

1. Remark "---" means that the emission level is too weak to be detected.
2. For measured frequency below 1GHz, a tuned dipole antenna is used.
3. Result calculation is as following :

   Result = SG Reading - Cable Loss + Antenna Gain + Antenna Gain Corrected

   Antenna Gain Corrected : is used for antenna other than dipole to convert radiated power to ERP.

b. Tx Frequency: 538.000 MHz

Operated mode : TX Test Date :Apr. 25, 2016
Temperature : 25°C Humidity : 63%

Unmodulated carrier output power is 7.1 dBm , or 5.129 mW (ERP).
The limit of spurious or harmonics is calculated as following :

7.1-[43+10log(carrier output power in W)], or -13dBm

Frequency (MHz)	Meter Reading (dBuV) H	V	SG Reading (dBm) H	V	Antenna Gain	Antenna Gain Corr'	Cable Loss (dB)	Result (dBm) H	V	Limit (dBm)	Margin (dB)
1076.000	70.2	68.7	-42.1	-43.6	6.1	-2.0	2.2	-40.2	-41.7	-13.0	-27.2
1614.000	61.7	60.9	-48.2	-48.9	8.2	-2.0	2.7	-44.7	-45.4	-13.0	-31.7
2152.000	---	---	---	---	8.6	-2.0	3.1	---	---	-13.0	---
2690.000	61.5	60.5	-44.3	-45.2	9.5	-2.0	3.5	-40.3	-41.2	-13.0	-27.3
3228.000	56.8	55.8	-47.0	-48.0	9.2	-2.0	3.9	-43.7	-44.7	-13.0	-30.7
3766.000	---	---	---	---	9.4	-2.0	4.2	---	---	-13.0	---
4304.000	---	---	---	---	10.1	-2.0	4.5	---	---	-13.0	---
4842.000	---	---	---	---	10.2	-2.0	4.8	---	---	-13.0	---
5380.000	---	---	---	---	10.3	-2.0	5.1	---	---	-13.0	---

Note :

1. Remark "---" means that the emission level is too weak to be detected.
2. For measured frequency below 1GHz, a tuned dipole antenna is used.
3. Result calculation is as following :

   Result = SG Reading - Cable Loss + Antenna Gain + Antenna Gain Corrected

   Antenna Gain Corrected : is used for antenna other than dipole to convert radiated power to ERP.

c. Tx Frequency: 576.000 MHz

Operated mode : TX Test Date :Apr. 25, 2016
Temperature : 25°C Humidity : 63%

Unmodulated carrier output power is 7.6 dBm , or 5.754 mW (ERP).
The limit of spurious or harmonics is calculated as following :

7.6-[43+10log(carrier output power in W)], or -13dBm

Frequency (MHz)	Meter Reading (dBuV) H	V	SG Reading (dBm) H	V	Antenna Gain	Antenna Gain Corr'	Cable Loss (dB)	Result (dBm) H	V	Limit (dBm)	Margin (dB)
1152.000	64.1	62.9	-47.8	-49.0	6.5	-2.0	2.2	-45.5	-46.7	-13.0	-32.5
1728.000	55.6	54.9	-53.8	-54.4	8.2	-2.0	2.8	-50.4	-51.0	-13.0	-37.4
2304.000	---	---	---	---	9.0	-2.0	3.2	---	---	-13.0	---
2880.000	56.4	54.3	-48.8	-50.8	9.3	-2.0	3.6	-45.1	-47.1	-13.0	-32.1
3456.000	51.3	49.7	-51.6	-53.3	9.3	-2.0	4.0	-48.3	-50.0	-13.0	-35.3
4032.000	---	---	---	---	9.5	-2.0	4.4	---	---	-13.0	---
4608.000	---	---	---	---	10.5	-2.0	4.7	---	---	-13.0	---
5184.000	---	---	---	---	10.1	-2.0	5.0	---	---	-13.0	---
5760.000	---	---	---	---	10.7	-2.0	5.3	---	---	-13.0	---

Note :

1. Remark "---" means that the emission level is too weak to be detected.
2. For measured frequency below 1GHz, a tuned dipole antenna is used.
3. Result calculation is as following :

   Result = SG Reading - Cable Loss + Antenna Gain + Antenna Gain Corrected

   Antenna Gain Corrected : is used for antenna other than dipole to convert radiated power to ERP.

d. Tx Frequency: 607.925 MHz

Operated mode : TX Test Date :Apr. 25, 2016
Temperature : 25°C Humidity : 63%

Unmodulated carrier output power is 8.9 dBm , or 7.762 mW (ERP).
The limit of spurious or harmonics is calculated as following :

8.9-[43+10log(carrier output power in W)], or -13dBm

Frequency (MHz)	Meter Reading (dBuV) H	V	SG Reading (dBm) H	V	Antenna Gain	Antenna Gain Corr'	Cable Loss (dB)	Result (dBm) H	V	Limit (dBm)	Margin (dB)
1215.850	68.0	66.9	-43.7	-44.7	6.8	-2.0	2.3	-41.2	-42.2	-13.0	-28.2
1823.775	59.8	59.0	-49.1	-49.9	8.2	-2.0	2.9	-45.8	-46.6	-13.0	-32.8
2431.700	---	---	---	---	9.4	-2.0	3.3	---	---	-13.0	---
3039.625	60.5	58.6	-44.1	-45.9	9.2	-2.0	3.7	-40.6	-42.4	-13.0	-27.6
3647.550	55.4	53.8	-46.7	-48.5	9.3	-2.0	4.1	-43.5	-45.3	-13.0	-30.5
4255.475	---	---	---	---	10.0	-2.0	4.5	---	---	-13.0	---
4863.400	---	---	---	---	10.2	-2.0	4.8	---	---	-13.0	---
5471.325	---	---	---	---	10.4	-2.0	5.2	---	---	-13.0	---
6079.250	---	---	---	---	11.0	-2.0	5.4	---	---	-13.0	---

Note :

1. Remark "---" means that the emission level is too weak to be detected.
2. For measured frequency below 1GHz, a tuned dipole antenna is used.
3. Result calculation is as following :

   Result = SG Reading - Cable Loss + Antenna Gain + Antenna Gain Corrected

   Antenna Gain Corrected : is used for antenna other than dipole to convert radiated power to ERP.

e. Tx Frequency: 614.075 MHz

Operated mode : TX Test Date :Apr. 25, 2016
Temperature : 25°C Humidity : 63%

Unmodulated carrier output power is 8.2 dBm , or 6.607 mW (ERP).
The limit of spurious or harmonics is calculated as following :

8.2-[43+10log(carrier output power in W)], or -13dBm

Frequency (MHz)	Meter Reading (dBuV) H	V	SG Reading (dBm) H	V	Antenna Gain	Antenna Gain Corr'	Cable Loss (dB)	Result (dBm) H	V	Limit (dBm)	Margin (dB)
1228.150	69.2	68.0	-42.4	-43.6	6.9	-2.0	2.3	-39.8	-41.0	-13.0	-26.8
1842.225	60.9	60.1	-47.9	-48.7	8.2	-2.0	2.9	-44.6	-45.4	-13.0	-31.6
2456.300	---	---	---	---	9.5	-2.0	3.3	---	---	-13.0	---
3070.375	61.7	59.9	-42.7	-44.5	9.2	-2.0	3.8	-39.3	-41.1	-13.0	-26.3
3684.450	56.4	55.0	-45.6	-47.2	9.3	-2.0	4.2	-42.5	-44.1	-13.0	-29.5
4298.525	---	---	---	---	10.1	-2.0	4.5	---	---	-13.0	---
4912.600	---	---	---	---	10.1	-2.0	4.9	---	---	-13.0	---
5526.675	---	---	---	---	10.4	-2.0	5.2	---	---	-13.0	---
6140.750	---	---	---	---	11.0	-2.0	5.5	---	---	-13.0	---

Note :

1. Remark "---" means that the emission level is too weak to be detected.
2. For measured frequency below 1GHz, a tuned dipole antenna is used.
3. Result calculation is as following :

   Result = SG Reading - Cable Loss + Antenna Gain + Antenna Gain Corrected

   Antenna Gain Corrected : is used for antenna other than dipole to convert radiated power to ERP.

f. Tx Frequency: 668.000 MHz

Operated mode : TX Test Date :Apr. 25, 2016
Temperature : 25°C Humidity : 63%

Unmodulated carrier output power is 9.4 dBm , or 8.710 mW (ERP).
The limit of spurious or harmonics is calculated as following :

9.4-[43+10log(carrier output power in W)], or -13dBm

Frequency (MHz)	Meter Reading (dBuV) H	V	SG Reading (dBm) H	V	Antenna Gain	Antenna Gain Corr'	Cable Loss (dB)	Result (dBm) H	V	Limit (dBm)	Margin (dB)
1336.000	69.5	68.2	-41.6	-42.9	7.4	-2.0	2.4	-38.6	-39.9	-13.0	-25.6
2004.000	61.2	60.3	-46.9	-47.8	8.2	-2.0	3.0	-43.7	-44.6	-13.0	-30.7
2672.000	---	---	---	---	9.5	-2.0	3.5	---	---	-13.0	---
3340.000	61.9	60.1	-41.4	-43.3	9.3	-2.0	4.0	-38.1	-40.0	-13.0	-25.1
4008.000	56.8	55.3	-43.9	-45.7	9.4	-2.0	4.4	-40.9	-42.7	-13.0	-27.9
4676.000	---	---	---	---	10.4	-2.0	4.7	---	---	-13.0	---
5344.000	---	---	---	---	10.3	-2.0	5.1	---	---	-13.0	---
6012.000	---	---	---	---	10.9	-2.0	5.4	---	---	-13.0	---
6680.000	---	---	---	---	11.2	-2.0	5.7	---	---	-13.0	---

Note :

1. Remark "---" means that the emission level is too weak to be detected.
2. For measured frequency below 1GHz, a tuned dipole antenna is used.
3. Result calculation is as following :

   Result = SG Reading - Cable Loss + Antenna Gain + Antenna Gain Corrected

   Antenna Gain Corrected : is used for antenna other than dipole to convert radiated power to ERP.

g. Tx Frequency: 697.925 MHz

Operated mode : TX Test Date :Apr. 25, 2016
Temperature : 25°C Humidity : 63%

Unmodulated carrier output power is -6.9 dBm , or 4.898 mW (ERP).
The limit of spurious or harmonics is calculated as following :

6.9-[43+10log(carrier output power in W)], or -13dBm

Frequency (MHz)	Meter Reading (dBuV) H	V	SG Reading (dBm) H	V	Antenna Gain	Antenna Gain Corr'	Cable Loss (dB)	Result (dBm) H	V	Limit (dBm)	Margin (dB)
1395.850	68.6	67.1	-42.5	-44.0	7.4	-2.0	2.4	-39.5	-41.0	-13.0	-26.5
2093.775	60.3	59.3	-47.8	-48.8	8.2	-2.0	3.0	-44.6	-45.6	-13.0	-31.6
2791.700	---	---	---	---	9.5	-2.0	3.5	---	---	-13.0	---
3489.625	61.0	59.1	-42.3	-44.3	9.3	-2.0	4.0	-39.0	-41.0	-13.0	-26.0
4187.550	55.9	54.6	-44.8	-46.4	9.4	-2.0	4.4	-41.8	-43.4	-13.0	-28.8
4885.475	---	---	---	---	10.4	-2.0	4.7	---	---	-13.0	---
5583.400	---	---	---	---	10.3	-2.0	5.1	---	---	-13.0	---
6281.325	---	---	---	---	10.9	-2.0	5.4	---	---	-13.0	---
6979.250	---	---	---	---	11.2	-2.0	5.7	---	---	-13.0	---

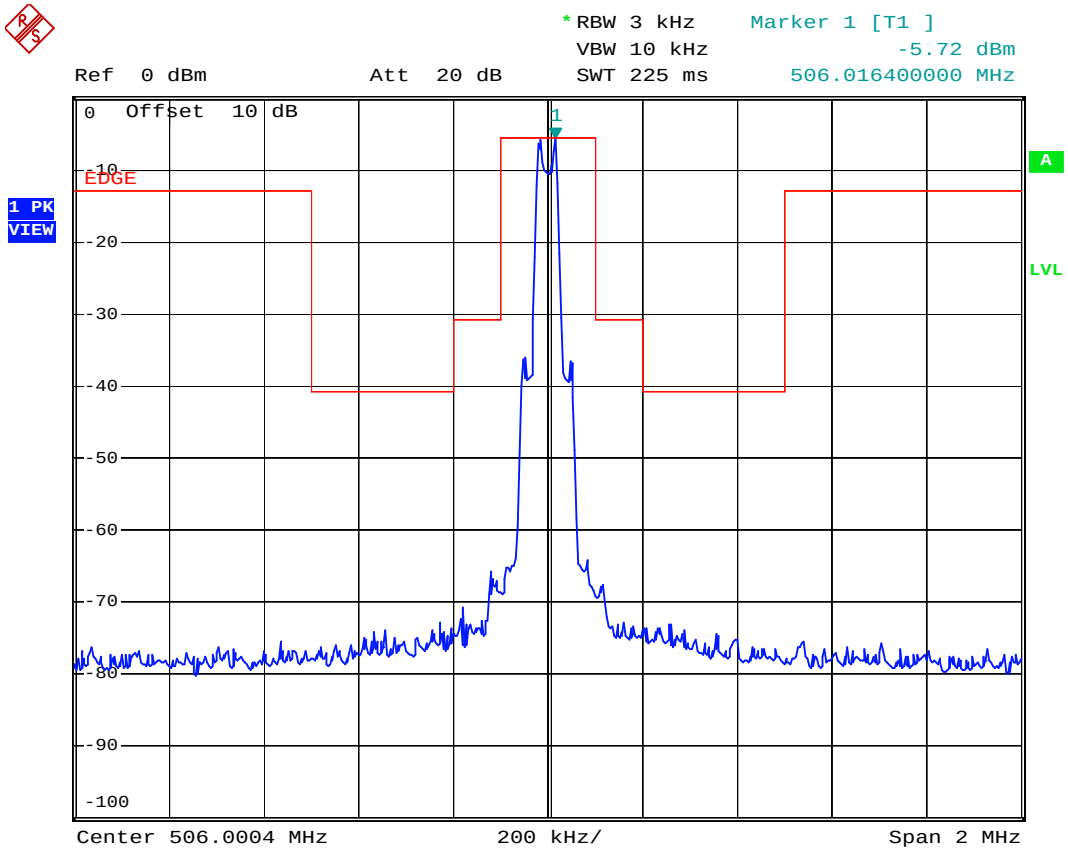
Note :

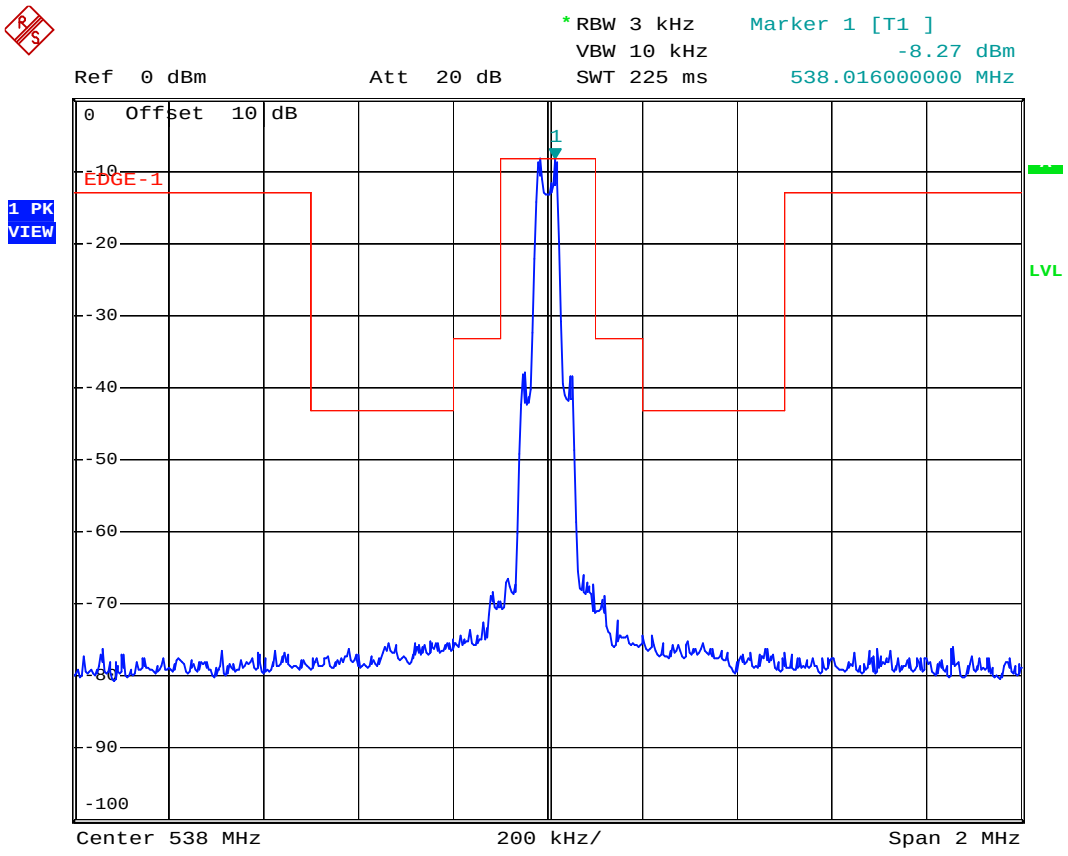
1. Remark "---" means that the emission level is too weak to be detected.
2. For measured frequency below 1GHz, a tuned dipole antenna is used.
3. Result calculation is as following :

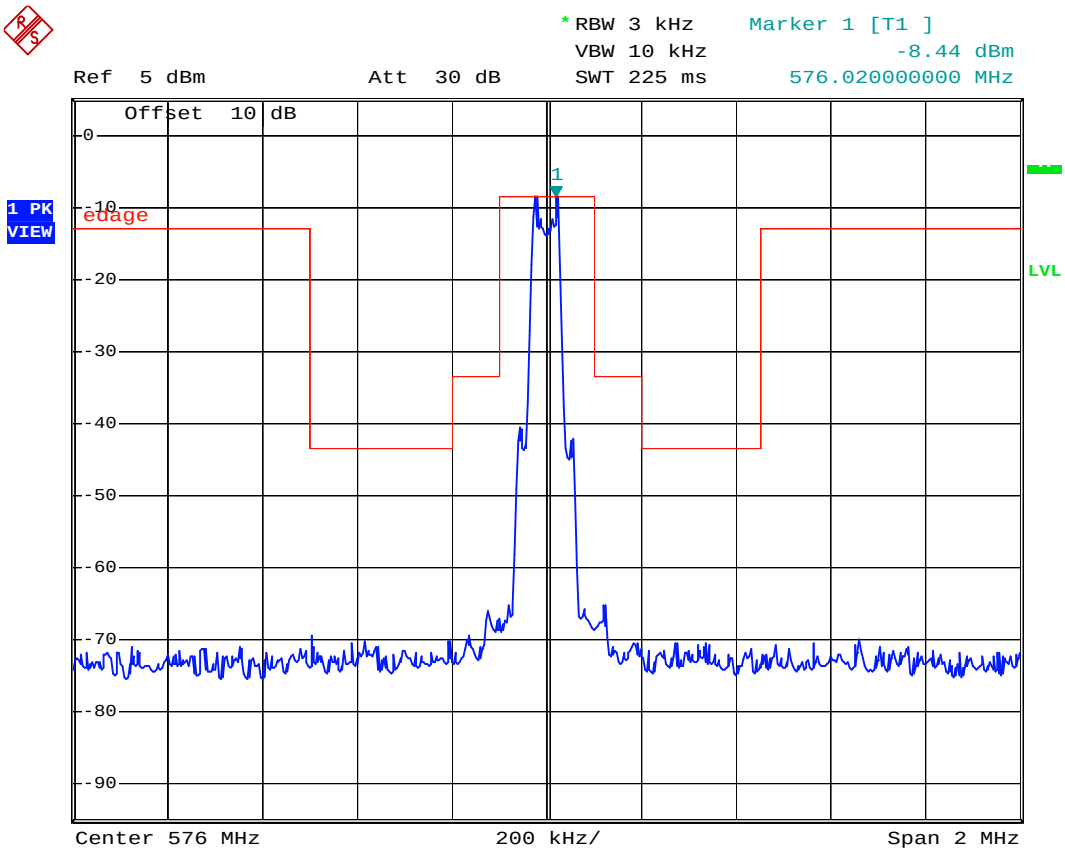
   Result = SG Reading - Cable Loss + Antenna Gain + Antenna Gain Corrected

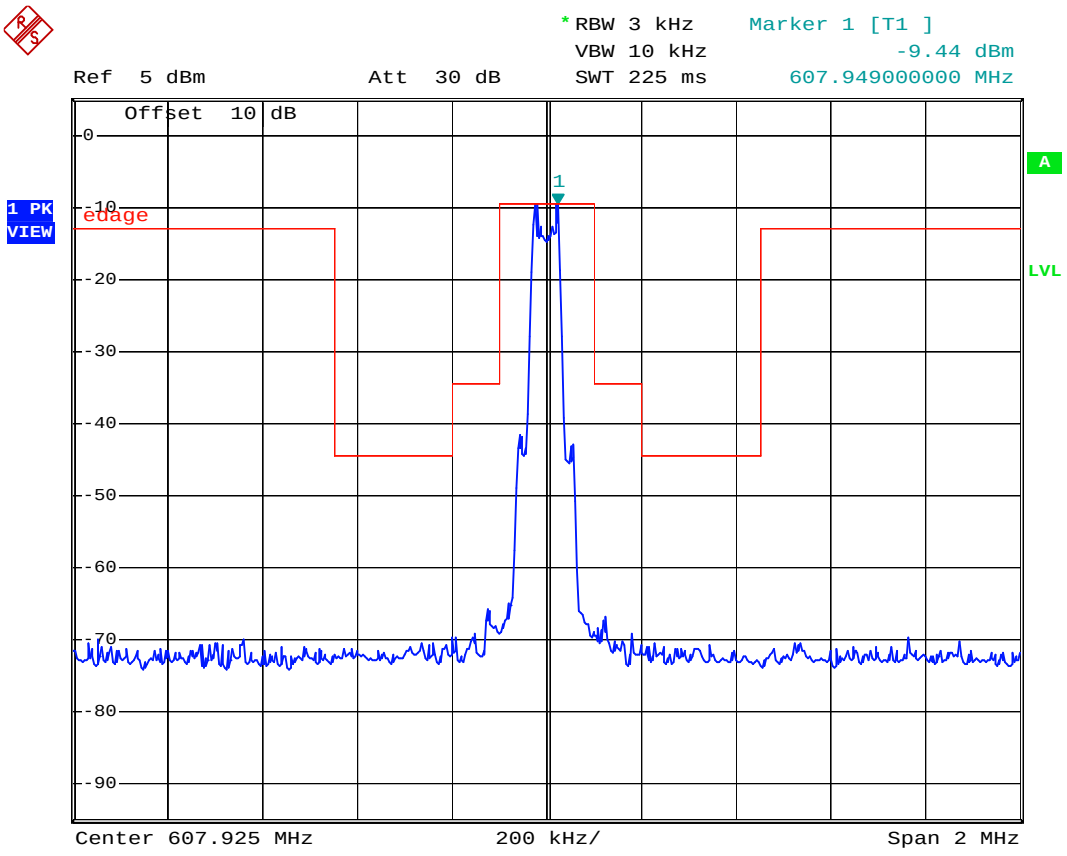
   Antenna Gain Corrected : is used for antenna other than dipole to convert radiated power to ERP.

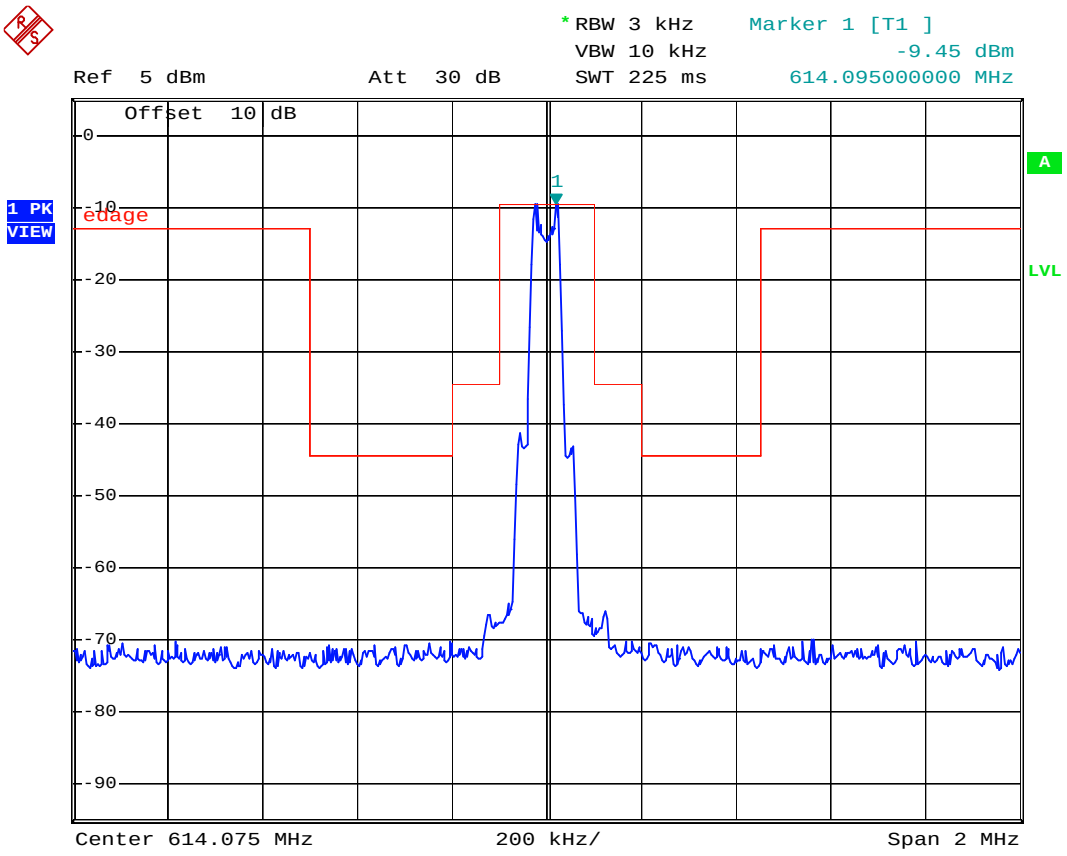
6.4.2 Emission mask plots

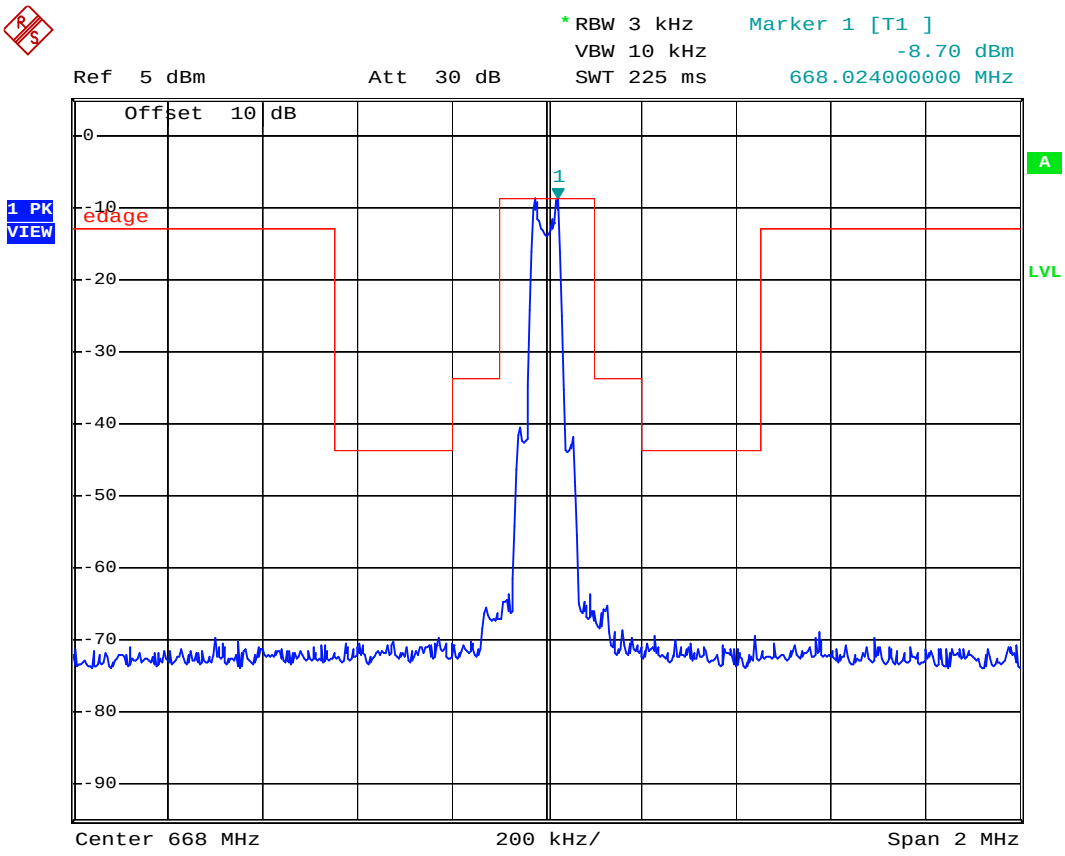


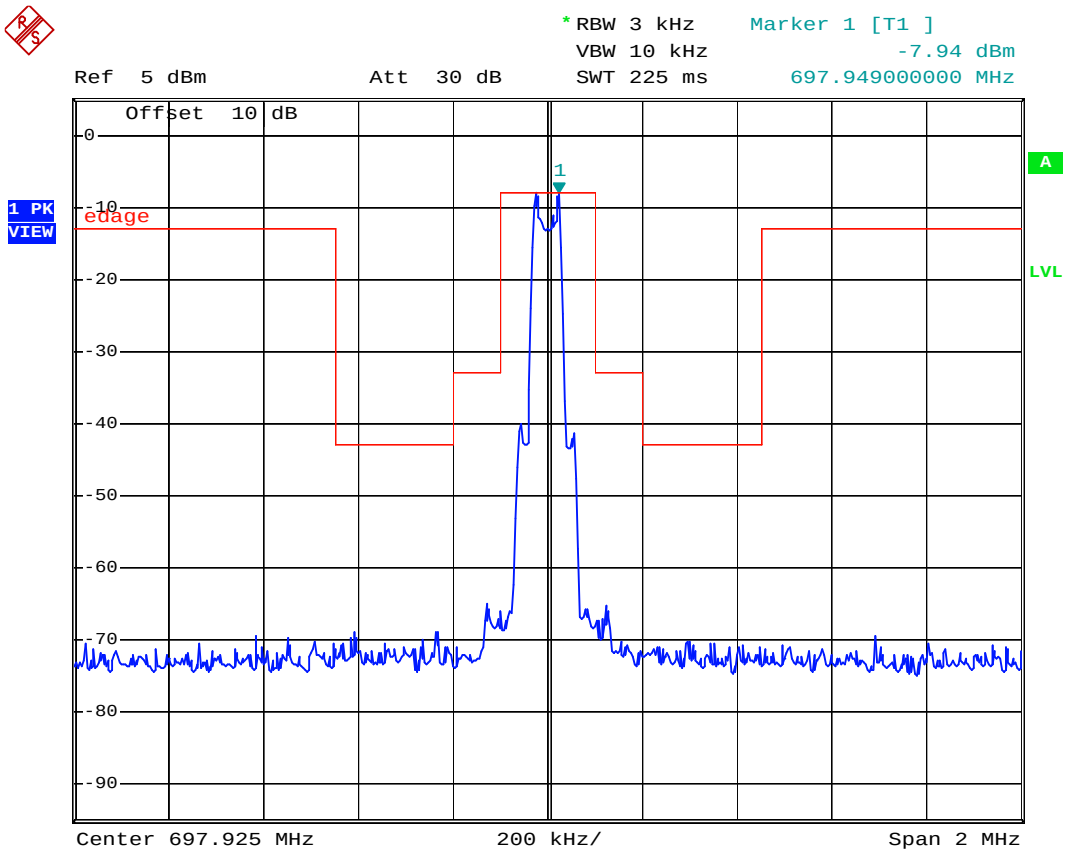

*RBW 3 kHz
VBW 10 kHz
SWT 225 ms
Marker 1 [T1]
-8.27 dBm
538.016000000 MHz
Ref 0 dBm
Att 20 dB
0 Offset 10 dB
EDGE-1
1 PK
VIEW
LVL
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
Center 538 MHz
200 kHz/
Span 2 MHz


*RBW 3 kHz
VBW 10 kHz
SWT 225 ms
Marker 1 [T1]
-8.44 dBm
576.020000000 MHz
Ref 5 dBm
Att 30 dB
Offset 10 dB
1 PK
VIEW
edage
LVL
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
Center 576 MHz
200 kHz/
Span 2 MHz


*RBW 3 kHz
VBW 10 kHz
SWT 225 ms
Marker 1 [T1]
-9.44 dBm
607.949000000 MHz
Ref 5 dBm
Att 30 dB
Offset 10 dB
1 PK
VIEW
edage
A
LVL
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
Center 607.925 MHz
200 kHz/
Span 2 MHz


*RBW 3 kHz
VBW 10 kHz
SWT 225 ms
Marker 1 [T1]
-9.45 dBm
614.095000000 MHz
Ref 5 dBm
Att 30 dB
Offset 10 dB
1 PK
VIEW
edage
A
LVL
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
Center 614.075 MHz
200 kHz/
Span 2 MHz


*RBW 3 kHz
VBW 10 kHz
SWT 225 ms
Marker 1 [T1]
-8.70 dBm
668.024000000 MHz
Ref 5 dBm
Att 30 dB
Offset 10 dB
1 PK
VIEW
edage
A
LVL
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
Center 668 MHz
200 kHz/
Span 2 MHz


*RBW 3 kHz
VBW 10 kHz
SWT 225 ms
Marker 1 [T1]
-7.94 dBm
697.949000000 MHz
Ref 5 dBm
Att 30 dB
Offset 10 dB
1 PK
VIEW
edage
A
LVL
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
Center 697.925 MHz
200 kHz/
Span 2 MHz

6.5 Other Emission

Test Date : Apr. 25, 2016 Temperature : 25°C Humidity : 63 %

a) Emission frequencies below 1 GHz

Radiated emission frequencies below 1 GHz were too low to be measured with a pre-amplifier of 26 dB.

b) Emission frequencies above 1 GHz

Radiated emission frequencies above 1 GHz to 25 GHz were too low to be measured with a pre-amplifier of 35 dB.

6.6 Radiated Measurement Photos

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, and according to §2.1055 (d)(2), 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 §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 5 for frequencies measured at ambient temperature if it is within 15℃to 25℃. Otherwise, an environmental chamber set for a temperature of 20℃shall be used.

2. Turn on EUT and 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. Record this frequency to be a reference.

3. Set the temperature of chamber to 50℃. Allow sufficient time (approximately 30 min) 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.

4. Repeat step 2 with a 10℃decreased per stage until the lowest temperature -30℃is measured, record all measurement frequencies.

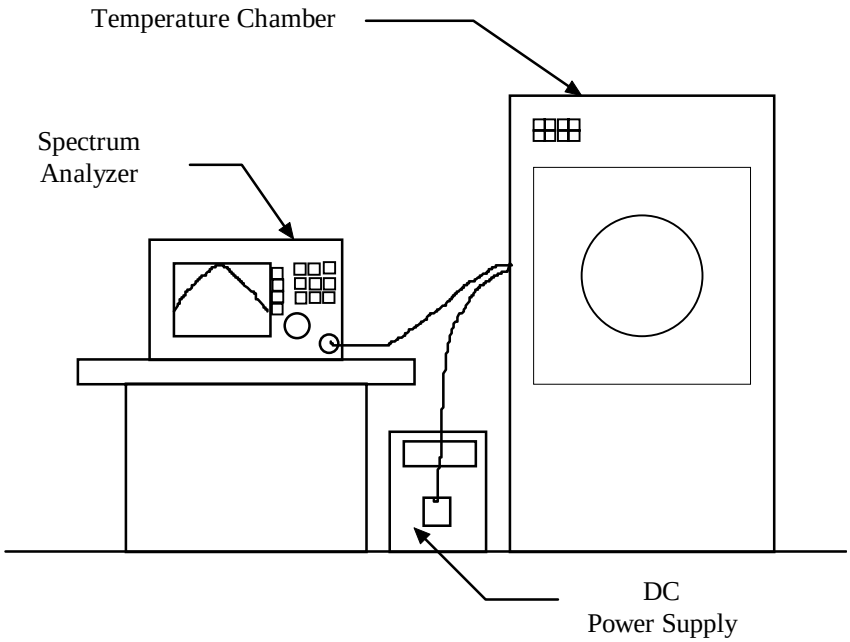
B) Frequency stability versus input voltage

1. Setup the configuration per figure 7 for frequencies measured at ambient temperature if it is within 15℃to 25℃. Otherwise, an environmental chamber set for a temperature of 20℃shall be used. Install new batteries in the EUT.

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. Record this frequency to be a reference.

3. For non hand carried, battery operated device, supply the EUT primary voltage with 85 and 115 percent of the nominal value and record the frequency.

Figure 5 : Frequency stability measurement configuration



7.3 Measurement Instrument

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
Spectrum Analyzer	Rohde & Schwarz	FSP40	2015/07/06	2016/07/05
Temperature Chamber	MALLIER	MCT-2X-M	2015/12/15	2016/12/14

7.4 Measurement Data

Test Date : Apr. 25, 2016 Temperature : 25 °C Humidity : 63 %

A. Tx Frequency 506.000MHz

A1. Frequency stability versus enviroment tempture

Reference Frequency :506.000 MHz		Limit：0.005%					
Enviroment Tempture (℃)	Power Supplied (Vdc)	Frequency measured with time elapsed					
		2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
50	1.5	506.0121	0.00239	506.0121	0.00239	506.0122	0.00241
40		506.0104	0.00206	506.0104	0.00206	506.0106	0.00209
30		506.0082	0.00162	506.0084	0.00166	506.0085	0.00168
20		506.0028	0.00055	506.0028	0.00055	506.0029	0.00057
10		506.0005	0.00010	506.0006	0.00012	506.0007	0.00014
0		505.9972	-0.00055	505.9972	-0.00055	505.9973	-0.00053
-10		505.9952	-0.00095	505.9954	-0.00091	505.9954	-0.00091
-20		505.9920	-0.00158	505.9922	-0.00154	505.9922	-0.00154
-30		505.9885	-0.00227	505.9885	-0.00227	505.9886	-0.00225

A2. Frequency stability versus supplied voltage

Reference Frequency : 506.000 MHz		Limit：0.005%					
Enviroment Tempture (℃)	Power Supplied (Vdc)	Frequency measured with time elapsed					
		2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
25	1.2	506.0068	0.00134	506.0068	0.00134	506.0069	0.00136
25	1.7	506.0067	0.00132	506.0068	0.00134	506.0069	0.00136

Test Date : Apr. 25, 2016 Temperature : 25 °C Humidity : 63 %

B. Tx Frequency 697.925MHz

B1. Frequency stability versus enviroment tempture

Reference Frequency : 697.925 MHz		Limit：0.005%					
Enviroment Tempture (℃)	Power Supplied (Vdc)	Frequency measured with time elapsed					
		2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
50	1.5	697.9470	0.00315	697.9471	0.00317	697.9473	0.00320
40		697.9404	0.00221	697.9405	0.00222	697.9405	0.00222
30		697.9364	0.00163	697.9364	0.00163	697.9365	0.00165
20		697.9292	0.00060	697.9293	0.00062	697.9293	0.00062
10		697.9259	0.00013	697.9260	0.00014	697.9261	0.00016
0		697.9239	-0.00016	697.9240	-0.00014	697.9242	-0.00011
-10		697.9164	-0.00123	697.9165	-0.00122	697.9165	-0.00122
-20		697.9140	-0.00158	697.9140	-0.00158	697.9142	-0.00155
-30		697.9096	-0.00221	697.9097	-0.00219	697.9097	-0.00219

B2. Frequency stability versus supplied voltage

Reference Frequency : 697.925 MHz		Limit：0.005%					
Enviroment Tempture (℃)	Power Supplied (Vdc)	Frequency measured with time elapsed					
		2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
25	1.2	697.9318	0.00097	697.9318	0.00097	697.9318	0.00097
25	1.7	697.9318	0.00097	697.9319	0.00099	697.9319	0.00099

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.