

## FCC Test Report

**Report No.:** RF160718C45

**FCC ID:** QYLRS500

**Test Model:** RS500

**Received Date:** Jul. 18, 2016

**Test Date:** Aug. 09, 2016 ~ Aug. 18, 2016

**Issued Date:** Aug. 19, 2016

**Applicant:** Getac Technology Corporation.

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**Issued By:** Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch

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### Release Control Record

Issue No.	Description	Date Issued
RF160718C45	Original Release	Aug. 19, 2016

## 1 Certificate of Conformity

**Product:** UHF RFID Module

**Brand:** Getac Technology Corporation.

**Test Model:** RS500

**Sample Status:** Identical Prototype

**Applicant:** Getac Technology Corporation.

**Test Date:** Aug. 09, 2016 ~ Aug. 18, 2016

**Standards:** 47 CFR FCC Part 15, Subpart C (Section 15.247)  
ANSI C63.10:2013

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

**Prepared by :**

*Gina Liu*

**Date:**

Aug. 19, 2016

Gina Liu / Specialist

**Approved by :**

*Stanley Wu*

**Date:**

Aug. 19, 2016

Stanley Wu / Assistant Manager

## 2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	Pass	Meet the requirement of limit. Minimum passing margin is -10.90 dB at 0.45889 MHz.
15.247(a)(1)(i)	Number of Hopping Frequency Used	Pass	Meet the requirement of limit.
15.247(a)(1)(i)	Dwell Time on Each Channel	Pass	Meet the requirement of limit.
15.247(a)(1)	1. Hopping Channel Separation 2. Spectrum Bandwidth of a Frequency Hopping Sequence Spread Spectrum System	Pass	Meet the requirement of limit.
15.247(b)	Maximum Peak Output Power	Pass	Meet the requirement of limit.
15.205 & 209	Radiated Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -6.02 dB at 151.25 MHz.
15.247(d)	Band Edge Measurement	Pass	Meet the requirement of limit.
15.247(d)	Antenna Port Emission	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	No antenna connector is used.

**NOTE:** If The Frequency Hopping System operating in 2400-2483.5 MHz band and the output power less than 125 mW. The hopping channel carrier frequencies separated by a minimum of 25 kHz or two-thirds of the 20 dB bandwidth of hopping channel whichever is greater.

### 2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT:

The listed uncertainties are the worst case uncertainty for the entire range of measurement. Please note that the uncertainty values are provided for informational purposes only and are not used in determining the PASS/FAIL results.

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150 kHz ~ 30 MHz	2.44 dB
Radiated Emissions up to 1 GHz	30 MHz ~ 200 MHz	2.93 dB
	200 MHz ~ 1000 MHz	2.95 dB
Radiated Emissions above 1 GHz	1 GHz ~ 18 GHz	2.26 dB
	18 GHz ~ 40 GHz	1.94 dB

### 2.2 Modification Record

There were no modifications required for compliance.

### 3 General Information

#### 3.1 General Description of EUT

<b>Product</b>	UHF RFID Module
<b>Brand</b>	Getac Technology Corporation.
<b>Test Model</b>	RS500
<b>Status of EUT</b>	Identical Prototype
<b>Power Supply Rating</b>	3.6 Vdc (host equipment)
<b>Modulation Type</b>	ASK
<b>Transfer Rate</b>	40 kbps
<b>Operating Frequency</b>	902.75 ~ 927.25 MHz
<b>Number of Channel</b>	50
<b>Output Power</b>	100 mW
<b>Antenna Type</b>	Module antenna with 4.41 dBi gain
<b>Antenna Connector</b>	N/A
<b>Accessory Device</b>	Refer to Note as below
<b>Data Cable Supplied</b>	Refer to Note as below

Note:

1. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.

### 3.2 Description of Test Modes

50 channels are provided to this EUT:

Ch	Freq. (MHz)	Ch	Freq. (MHz)	Ch	Freq. (MHz)	Ch	Freq. (MHz)	Ch	Freq. (MHz)
1	902.75	11	907.75	21	912.75	31	917.75	41	922.75
2	903.25	12	908.25	22	913.25	32	918.25	42	923.25
3	903.75	13	908.75	23	913.75	33	918.75	43	923.75
4	904.25	14	909.25	24	914.25	34	919.25	44	924.25
5	904.75	15	909.75	25	914.75	35	919.75	45	924.75
6	905.25	16	910.25	26	915.25	36	920.25	46	925.25
7	905.75	17	910.75	27	915.75	37	920.75	47	925.75
8	906.25	18	911.25	28	916.25	38	921.25	48	926.25
9	906.75	19	911.75	29	916.75	39	921.75	49	926.75
10	907.25	20	912.25	30	917.25	40	922.25	50	927.25



### 3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable To				Description
	RE $\geq$ 1G	RE $<$ 1G	PLC	APCM	
-	√	√	√	√	-

Where **RE $\geq$ 1G**: Radiated Emission above 1 GHz      **RE $<$ 1G**: Radiated Emission below 1 GHz  
**PLC**: Power Line Conducted Emission      **APCM**: Antenna Port Conducted Measurement

**NOTE:**

1. The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **Z-plane**.
2. "-" means no effect.

**Radiated Emission Test (Above 1 GHz):**

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Technology
-	1 to 50	1, 25, 50	ASK

**Radiated Emission Test (Below 1 GHz):**

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Technology
-	1 to 50	1, 25, 50	ASK

**Power Line Conducted Emission Test:**

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Technology
-	1 to 50	50	ASK

**Antenna Port Conducted Measurement:**

- This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.
- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Technology
-	1 to 50	1, 25, 50	ASK

**Test Condition:**

Applicable To	Environmental Conditions	Input Power	Tested by
RE $\geq$ 1G	25 deg. C, 65 % RH	120 Vac, 60 Hz	Anson Lin
RE $<$ 1G	25 deg. C, 65 % RH	120 Vac, 60 Hz	Anson Lin
PLC	25 deg. C, 65 % RH	120 Vac, 60 Hz	Toby Tian
APCM	25 deg. C, 65 % RH	3.6 Vdc	Taylor Liu

**3.3 Description of Support Units**

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

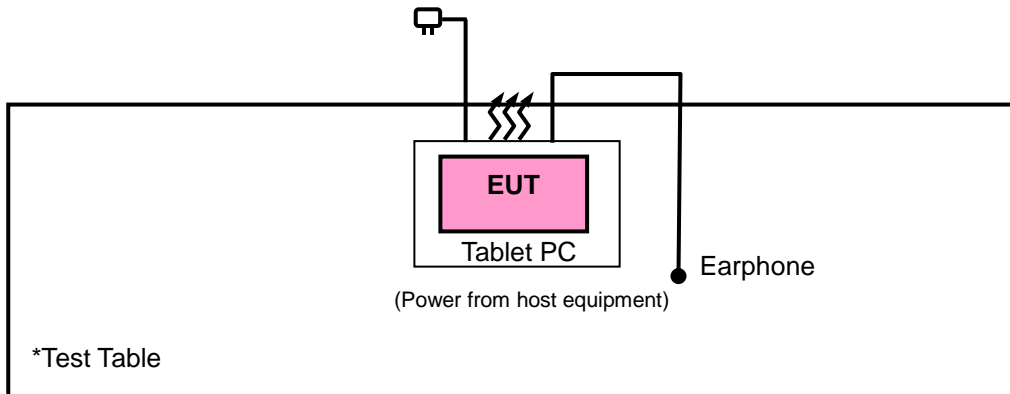
No.	Product	Brand	Model No.	Serial No.	FCC ID
1.	Tablet PC	Getac	T800	N/A	N/A
2.	Earphone	N/A	N/A	N/A	N/A

No.	Signal Cable Description Of The Above Support Units
1.	N/A
2.	N/A

Note:

1. All power cords of the above support units are non-shielded (1.8m).

**3.3.1 Configuration of System under Test**



### 3.4 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

#### **FCC Part 15, Subpart C (15.247)**

ANSI C63.10-2013

All test items have been performed and recorded as per the above standards.

**NOTE:** The EUT has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC).

The test report has been issued separately.

## 4 Test Types and Results

### 4.1 Radiated Emission and Bandedge Measurement

#### 4.1.1 Limits of Radiated Emission and Bandedge Measurement

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20 dB below the highest level of the desired power:

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F (kHz)	300
0.490 ~ 1.705	24000/F (kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

**NOTE:**

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any condition of modulation.

## 4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver Agilent	N9038A	MY51210203	Jan. 21, 2016	Jan. 20, 2017
Spectrum Analyzer Agilent	N9010A	MY52220314	Sep. 03, 2015	Sep. 02, 2016
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	101261	Dec. 17, 2015	Dec. 16, 2016
BILOG Antenna SCHWARZBECK	VULB9168	9168-472	Jan. 07, 2016	Jan. 06, 2017
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-969	Jan. 04, 2016	Jan. 03, 2017
HORN Antenna SCHWARZBECK	BBHA 9170	9170-480	Jan. 08, 2016	Jan. 07, 2017
Preamplifier EMCI	EMC 012645	980115	Dec. 21, 2015	Dec. 20, 2016
Preamplifier EMCI	EMC 184045	980116	Dec. 21, 2015	Dec. 20, 2016
Preamplifier EMCI	EMC 330H	980112	Dec. 28, 2015	Dec. 27, 2016
Power Meter Anritsu	ML2495A	1232002	Sep. 21, 2015	Sep. 20, 2016
Power Sensor Anritsu	MA2411B	1207325	Sep. 21, 2015	Sep. 20, 2016
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	309219/4 2950114	Oct. 12, 2015	Oct. 11, 2016
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	250130/4	Oct. 12, 2015	Oct. 11, 2016
RF Coaxial Cable Worken	8D-FB	Cable-Ch10-01	Oct. 12, 2015	Oct. 11, 2016
Software BV ADT	E3 6.120103	NA	NA	NA
Antenna Tower MF	MFA-440H	NA	NA	NA
Turn Table MF	MFT-201SS	NA	NA	NA
Antenna Tower & Turn Table Controller MF	MF-7802	NA	NA	NA
ATTENUATOR HP	8496B	3247A18505	NA	NA

- Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HwaYa Chamber 10.
3. The horn antenna and preamplifier (model: EMC 184045) are used only for the measurement of emission frequency above 1 GHz if tested.
4. The FCC Site Registration No. is 690701.
5. The IC Site Registration No. is IC7450F-10.

#### 4.1.3 Test Procedures

- a. The EUT was placed on the top of a rotating table 0.8 meters (for below 1 GHz) / 1.5 meters (for above 1 GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. The test-receiver system was set to peak and average detected function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

**Note:**

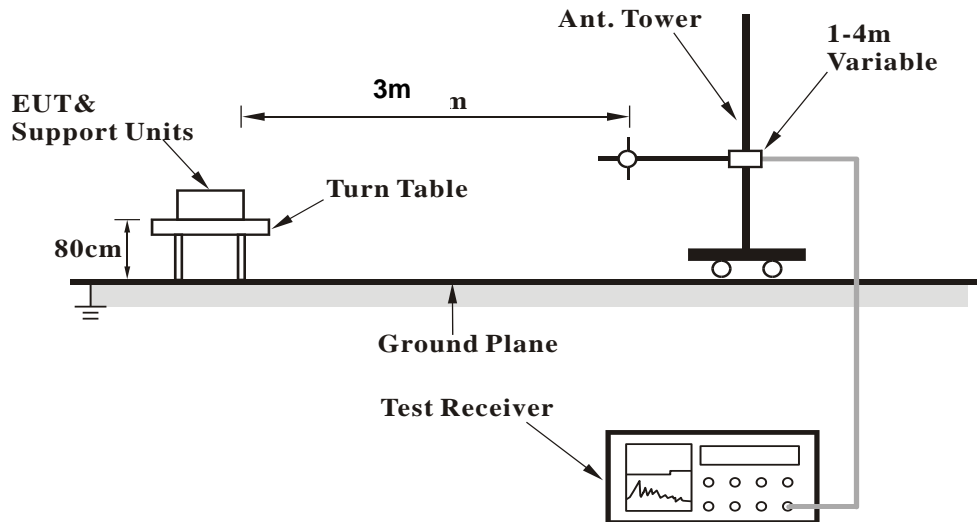
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection at frequency below 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth is 3 MHz for Peak detection at frequency above 1 GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is  $\geq 1/T$  (Duty cycle < 98 %) or 10 Hz (Duty cycle > 98 %) for Average detection (AV) at frequency above 1 GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.

#### 4.1.4 Deviation from Test Standard

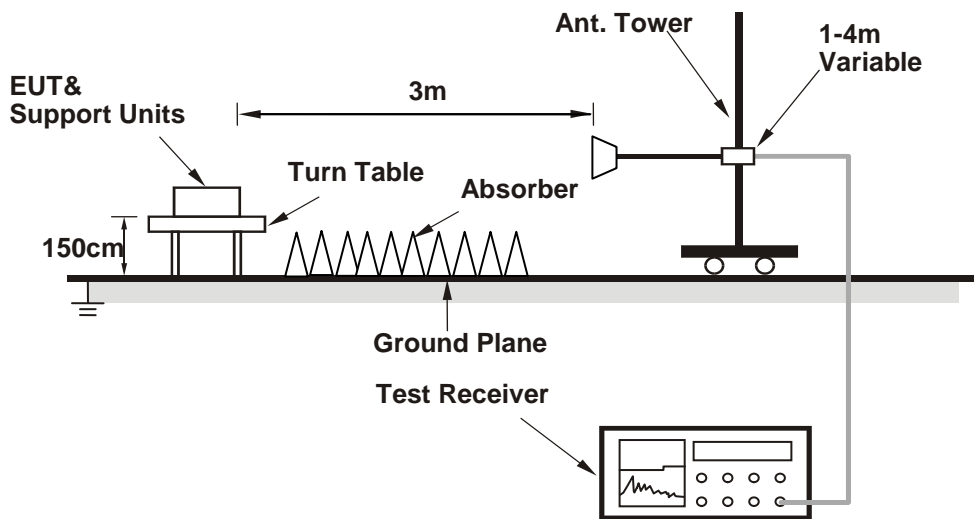
No deviation.

#### 4.1.5 Test Set Up

##### <Frequency Range below 1 GHz>



##### <Frequency Range above 1 GHz>



For the actual test configuration, please refer to the attached file (Test Setup Photo).

#### 4.1.6 EUT Operating Conditions

Set the EUT under transmission condition continuously at specific channel frequency.

4.1.7 Test Results

**ABOVE 1 GHz DATA :**

EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Anson Lin

Antenna Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
1805.5	25.46	49.36	54	-28.54	25.72	3.97	53.59	135	264	Average
1805.5	35.4	59.3	74	-38.6	25.72	3.97	53.59	135	264	Peak
2708.25	27.69	48.61	54	-26.31	27.72	4.85	53.49	124	171	Average
2708.25	37.74	58.66	74	-36.26	27.72	4.85	53.49	124	171	Peak
3611	26.84	46.17	54	-27.16	28.99	5.72	54.04	109	25	Average
3611	38.43	57.76	74	-35.57	28.99	5.72	54.04	109	25	Peak

Antenna Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
1805.5	24.47	48.37	54	-29.53	25.72	3.97	53.59	129	311	Average
1805.5	35.46	59.36	74	-38.54	25.72	3.97	53.59	129	311	Peak
2708.25	27.33	48.25	54	-26.67	27.72	4.85	53.49	128	9	Average
2708.25	37.95	58.87	74	-36.05	27.72	4.85	53.49	128	9	Peak
3611	28.33	47.66	54	-25.67	28.99	5.72	54.04	130	287	Average
3611	37.81	57.14	74	-36.19	28.99	5.72	54.04	130	287	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value



EUT Test Condition		Measurement Detail	
Channel	Channel 25	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Anson Lin

Antenna Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
1829.5	24.65	48.52	54	-29.35	25.73	4	53.6	114	300	Average
1829.5	35.13	59	74	-38.87	25.73	4	53.6	114	300	Peak
2744.25	28.93	49.74	54	-25.07	27.85	4.88	53.54	115	329	Average
2744.25	38.92	59.73	74	-35.08	27.85	4.88	53.54	115	329	Peak
3659	29.73	48.86	54	-24.27	29.05	5.79	53.97	101	168	Average
3659	39.69	58.82	74	-34.31	29.05	5.79	53.97	101	168	Peak
Antenna Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
1829.5	26.01	49.88	54	-27.99	25.73	4	53.6	122	288	Average
1829.5	35.99	59.86	74	-38.01	25.73	4	53.6	122	288	Peak
2744.25	28.51	49.32	54	-25.49	27.85	4.88	53.54	134	351	Average
2744.25	38.27	59.08	74	-35.73	27.85	4.88	53.54	134	351	Peak
3659	29.63	48.76	54	-24.37	29.05	5.79	53.97	113	226	Average
3659	39.69	58.82	74	-34.31	29.05	5.79	53.97	113	226	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value

EUT Test Condition		Measurement Detail	
Channel	Channel 50	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Anson Lin

Antenna Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
1854.5	26.17	49.99	54	-27.83	25.74	4.04	53.6	127	177	Average
1854.5	36.1	59.92	74	-37.9	25.74	4.04	53.6	127	177	Peak
2781.75	26.17	46.96	54	-27.83	27.94	4.92	53.65	117	351	Average
2781.75	38.6	59.39	74	-35.4	27.94	4.92	53.65	117	351	Peak
3709	30.91	49.8	54	-23.09	29.13	5.87	53.89	100	38	Average
3709	40.91	59.8	74	-33.09	29.13	5.87	53.89	100	38	Peak
Antenna Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
1854.5	24.74	48.56	54	-29.26	25.74	4.04	53.6	129	181	Average
1854.5	36.03	59.85	74	-37.97	25.74	4.04	53.6	129	181	Peak
2781.75	27.17	47.96	54	-26.83	27.94	4.92	53.65	117	351	Average
2781.75	39.19	59.98	74	-34.81	27.94	4.92	53.65	117	351	Peak
3709	28.23	47.12	54	-25.77	29.13	5.87	53.89	100	38	Average
3709	39.58	58.47	74	-34.42	29.13	5.87	53.89	100	38	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value

**30 MHz ~ 1 GHz WORST-CASE DATA:**

EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	30 MHz ~ 1 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Anson Lin

Antenna Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
902	46.23	52.27	90.19	-43.96	23.52	2.46	32.02	100	201	Average
902	52.97	59.01	90.33	-37.36	23.52	2.46	32.02	100	201	Peak
902.75	110.19	116.22	-----	-----	23.53	2.46	32.02	100	201	Average
902.75	110.33	116.36	-----	-----	23.53	2.46	32.02	100	201	Peak

Antenna Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
902	46.47	52.51	92.92	-46.45	23.52	2.46	32.02	112	182	Average
902	52.2	58.24	93.06	-40.86	23.52	2.46	32.02	112	182	Peak
902.75	112.92	118.95	-----	-----	23.53	2.46	32.02	112	182	Average
902.75	113.06	119.09	-----	-----	23.53	2.46	32.02	112	182	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value

EUT Test Condition		Measurement Detail	
Channel	Channel 25	Frequency Range	30 MHz ~ 1 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Anson Lin

Antenna Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
914.75	107.71	113.66	-----	-----	23.59	2.49	32.03	215	147	Average
914.75	107.87	113.82	-----	-----	23.59	2.49	32.03	215	147	Peak
Antenna Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
914.75	110.66	116.61	-----	-----	23.59	2.49	32.03	114	161	Average
914.75	110.8	116.75	-----	-----	23.59	2.49	32.03	114	161	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value

EUT Test Condition		Measurement Detail	
Channel	Channel 50	Frequency Range	30 MHz ~ 1 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Anson Lin

Antenna Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
927.25	105.32	111.14	-----	-----	23.66	2.51	31.99	199	148	Average
927.25	105.49	111.31	-----	-----	23.66	2.51	31.99	199	148	Peak
928	46.05	51.86	85.32	-39.27	23.67	2.51	31.99	199	148	Average
928	52.84	58.65	85.49	-32.65	23.67	2.51	31.99	199	148	Peak

Antenna Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
927.25	109.11	114.93	-----	-----	23.66	2.51	31.99	109	158	Average
927.25	109.22	115.04	-----	-----	23.66	2.51	31.99	109	158	Peak
928	46.15	51.96	89.11	-42.96	23.67	2.51	31.99	109	158	Average
928	52.02	57.83	89.22	-37.2	23.67	2.51	31.99	109	158	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value

EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	30 MHz ~ 1 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Quasi-peak (QP)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Anson Lin

Antenna Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
199.75	36.52	57.64	43.5	-6.98	9.36	1.29	31.77	121	157	Peak
297.72	29.99	47.29	46	-16.01	12.88	1.63	31.81	130	291	Peak
394.72	29.66	44.63	46	-16.34	15.21	1.9	32.08	117	77	Peak
480.08	30.24	43.11	46	-15.76	16.93	2.05	31.85	138	246	Peak
600.36	33.45	43.83	46	-12.55	19.61	2.26	32.25	103	164	Peak
800.18	35.38	41.97	46	-10.62	22.23	2.61	31.43	105	177	Peak
Antenna Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
87.23	22.82	45.44	40	-17.18	8.25	0.95	31.82	135	56	Peak
177.44	36.45	56.06	43.5	-7.05	11.01	1.19	31.81	130	206	Peak
207.51	28.44	49.06	43.5	-15.06	9.69	1.33	31.64	127	333	Peak
256.01	25.5	44.23	46	-20.5	11.65	1.51	31.89	114	223	Peak
600.36	32.04	42.42	46	-13.96	19.61	2.26	32.25	117	257	Peak
800.18	35.47	42.06	46	-10.53	22.23	2.61	31.43	106	89	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value

EUT Test Condition		Measurement Detail	
Channel	Channel 25	Frequency Range	30 MHz ~ 1 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Quasi-peak (QP)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Anson Lin

Antenna Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
169.68	33.13	51.93	43.5	-10.37	11.76	1.17	31.73	121	347	Peak
199.75	37.19	58.31	43.5	-6.31	9.36	1.29	31.77	105	323	Peak
302.57	30.32	47.54	46	-15.68	13.01	1.64	31.87	128	265	Peak
399.57	28.66	43.55	46	-17.34	15.33	1.91	32.13	123	39	Peak
600.36	31.82	42.2	46	-14.18	19.61	2.26	32.25	133	319	Peak
800.18	37.59	44.18	46	-8.41	22.23	2.61	31.43	115	337	Peak
Antenna Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
88.2	23.1	45.75	43.5	-20.4	8.27	0.95	31.87	135	244	Peak
177.44	35.36	54.97	43.5	-8.14	11.01	1.19	31.81	121	269	Peak
252.13	27.54	46.43	46	-18.46	11.54	1.49	31.92	100	18	Peak
399.57	25.81	40.7	46	-20.19	15.33	1.91	32.13	109	239	Peak
600.36	31.82	42.2	46	-14.18	19.61	2.26	32.25	134	185	Peak
800.18	37.01	43.6	46	-8.99	22.23	2.61	31.43	100	10	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value

EUT Test Condition		Measurement Detail	
Channel	Channel 50	Frequency Range	30 MHz ~ 1 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Quasi-peak (QP)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Anson Lin

Antenna Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
151.25	37.48	55.29	43.5	-6.02	12.71	1.12	31.64	109	267	Peak
176.47	37.37	56.9	43.5	-6.13	11.1	1.17	31.8	110	98	Peak
258.92	30.17	48.77	46	-15.83	11.74	1.52	31.86	139	326	Peak
410.24	19.44	33.96	46	-26.56	15.54	1.93	31.99	106	236	Peak
629.46	25.33	35.2	46	-20.67	19.96	2.31	32.14	125	179	Peak
800.18	31.21	37.8	46	-14.79	22.23	2.61	31.43	132	70	Peak
Antenna Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
120.21	24.92	44.64	43.5	-18.58	11.02	1.16	31.9	122	161	Peak
159.01	36.1	54.08	43.5	-7.4	12.73	1.14	31.85	126	358	Peak
203.63	32.83	53.7	43.5	-10.67	9.52	1.31	31.7	104	322	Peak
236.61	23.62	43.07	46	-22.38	10.91	1.44	31.8	114	40	Peak
629.46	25.08	34.95	46	-20.92	19.96	2.31	32.14	125	210	Peak
800.18	30.01	36.6	46	-15.99	22.23	2.61	31.43	114	160	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value



## 4.2 Conducted Emission Measurement

### 4.2.1 Limits of Conducted Emission Measurement

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

- Note: 1. The lower limit shall apply at the transition frequencies.  
 2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.  
 3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

### 4.2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date Of Calibration	Due Date Of Calibration
Test Receiver ROHDE & SCHWARZ	ESCI	100613	Nov. 16, 2015	Nov. 15, 2016
RF signal cable (with 10dB PAD) Woken	5D-FB	Cable-cond1-01	Dec. 26, 2015	Dec. 25, 2016
LISN ROHDE & SCHWARZ (EUT)	ESH3-Z5	835239/001	Feb. 26, 2016	Feb. 25, 2017
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Jul. 28, 2016	Jul. 27, 2017
Software ADT	BV ADT_Cond_ V7.3.7.3	NA	NA	NA

- Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.  
 2. The test was performed in HwaYa Shielded Room 1.  
 3. The VCCI Site Registration No. is C-2040.

#### 4.2.3 Test Procedures

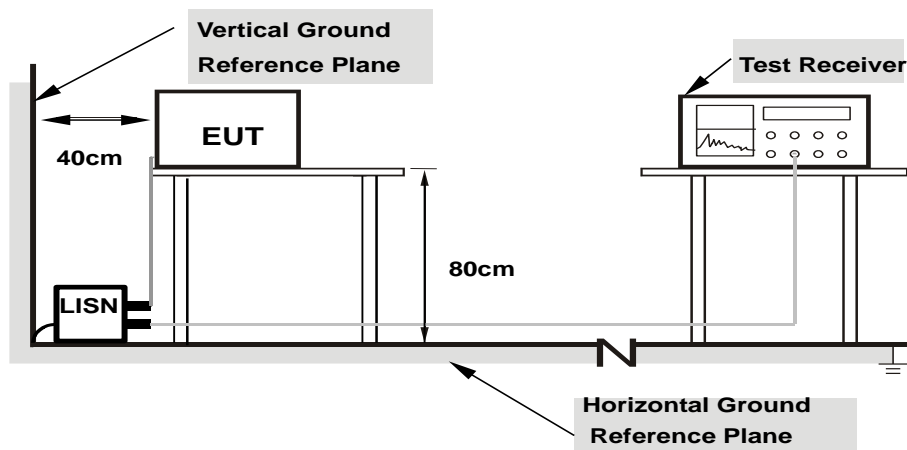
- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50 uH of coupling impedance for the measuring instrument.
- b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- c. The frequency range from 150 kHz to 30 MHz was searched. Emission levels under (Limit – 20 dB) was not recorded.

**NOTE:** All modes of operation were investigated and the worst-case emissions are reported.

#### 4.2.4 Deviation from Test Standard

No deviation.

#### 4.2.5 Test Setup



- Note:**
1. Support units were connected to second LISN.
  2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

For the actual test configuration, please refer to the attached file (Test Setup Photo).

#### 4.2.6 EUT Operating Condition

Set the EUT under transmission condition continuously at specific channel frequency.

#### 4.2.7 Test Results

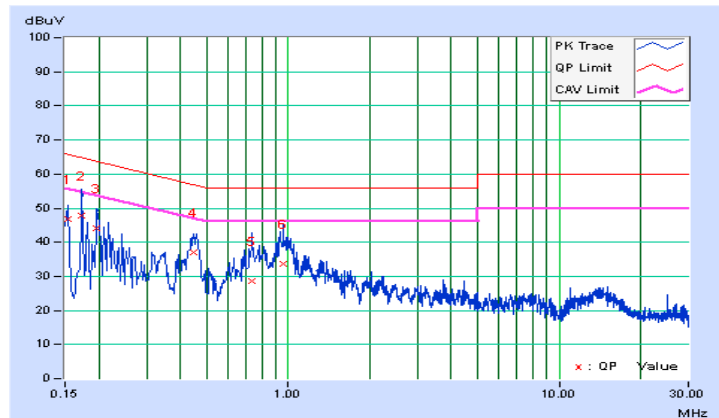
#### CONDUCTED WORST-CASE DATA :

Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25°C, 65%RH
Tested by	Toby Tian	Test Date	2016/8/18

Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15391	10.02	36.85	18.12	46.87	28.14	65.79	55.79	-18.92	-27.65
2	0.17346	10.02	37.68	18.55	47.70	28.57	64.79	54.79	-17.09	-26.22
3	0.19692	10.03	34.04	16.29	44.07	26.32	63.74	53.74	-19.67	-27.42
4	0.44716	10.13	26.96	17.94	37.09	28.07	56.93	46.93	-19.84	-18.86
5	0.73259	10.16	18.37	12.95	28.53	23.11	56.00	46.00	-27.47	-22.89
6	0.95937	10.19	23.33	17.75	33.52	27.94	56.00	46.00	-22.48	-18.06

#### Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

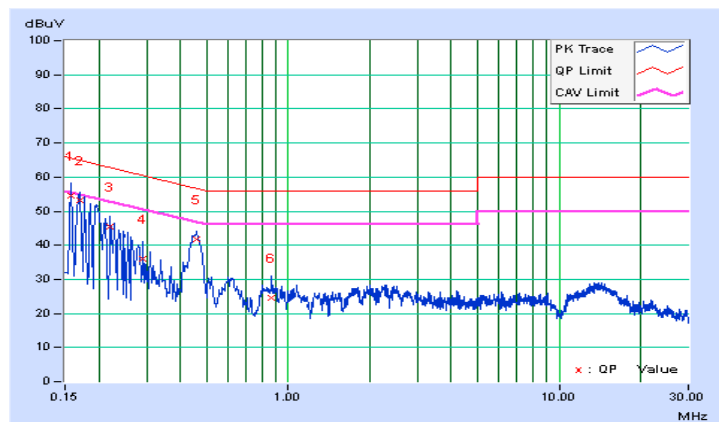


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25°C, 65%RH
Tested by	Toby Tian	Test Date	2016/8/18

Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15782	10.03	44.62	25.60	54.65	35.63	65.58	55.58	-10.93	-19.95
2	0.16955	10.03	43.19	26.81	53.22	36.84	64.98	54.98	-11.76	-18.14
3	0.22038	10.05	35.47	19.17	45.52	29.22	62.80	52.80	-17.28	-23.58
4	0.29076	10.08	25.95	12.72	36.03	22.80	60.50	50.50	-24.47	-27.70
<b>5</b>	<b>0.45889</b>	<b>10.14</b>	<b>31.69</b>	<b>25.67</b>	<b>41.83</b>	<b>35.81</b>	<b>56.71</b>	<b>46.71</b>	<b>-14.88</b>	<b>-10.90</b>
6	0.86944	10.19	14.24	8.01	24.43	18.20	56.00	46.00	-31.57	-27.80

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

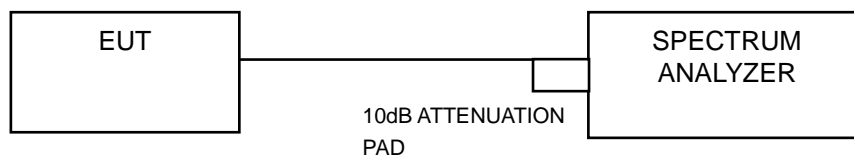


### 4.3 Number of Hopping Frequency Used

#### 4.3.1 Limits of Hopping Frequency Used Measurement

At least 50 channels frequencies, and should be equally spaced.

#### 4.3.2 Test Setup



#### 4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

#### 4.3.4 Test Procedure

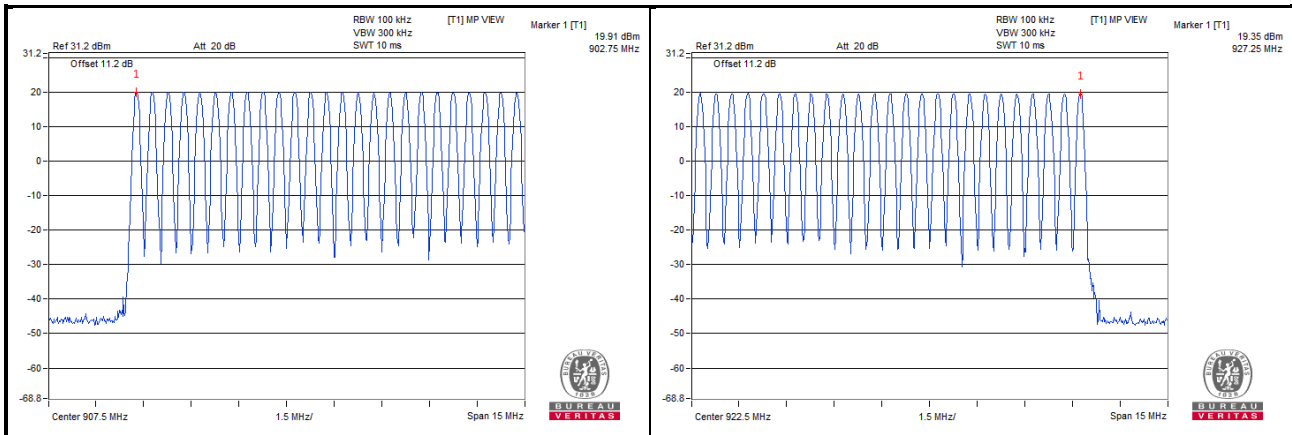
- Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
- Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
- Set the SA on MaxHold Mode, and then keep the EUT in hopping mode. Record all the signals from each channel until each one has been recorded.
- Set the SA on View mode and then plot the result on SA screen.
- Repeat above procedures until all frequencies measured were complete.

#### 4.3.5 Deviation from Test Standard

No deviation.

### 4.3.6 Test Results

There are 50 hopping frequencies in the hopping mode. Please refer to next page for the test result. On the plots, it shows that the hopping frequencies are equally spaced.

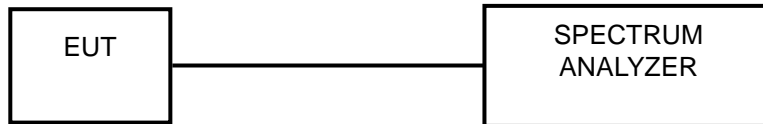


#### 4.4 Dwell Time on Each Channel

##### 4.4.1 Limits of Dwell Time on Each Channel Measurement

The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period.

##### 4.4.2 Test Setup



##### 4.4.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

##### 4.4.4 Test Procedures

- a. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
- b. Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
- c. Adjust the center frequency of SA on any frequency be measured and set SA to zero span mode. And then, set RBW and VBW of spectrum analyzer to proper value.
- d. Measure the time duration of one transmission on the measured frequency. And then plot the result with time difference of this time duration.
- e. Repeat above procedures until all different time-slot modes have been completed.

##### 4.4.5 Deviation from Test Standard

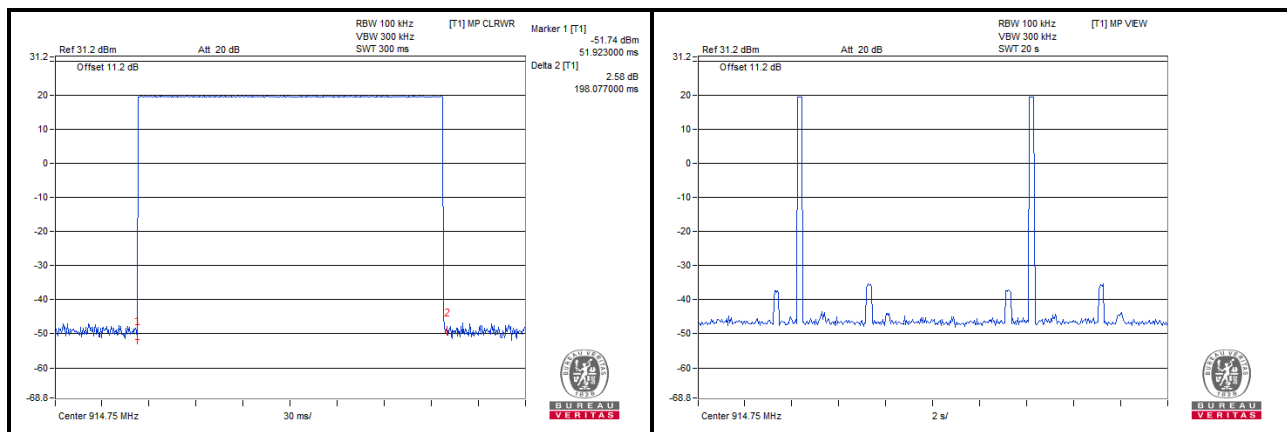
No deviation.

#### 4.4.6 Test Results

Average Hopping Channel	Package Transfer Time (ms)	Result (sec)	Limit (sec) / 20s
0.10	198.08	0.396	0.4

**NOTE:**

1. Dwell Time=12(channels) x 0.4(s) x average hopping channel x package transfer time
2. 12 channels come from the Hopping Channel number
3. Average Hopping Channel = hops/sweep time
4. t: Package Transfer Time(ms)
5. Test plots of the transmitting time slot are shown as below.



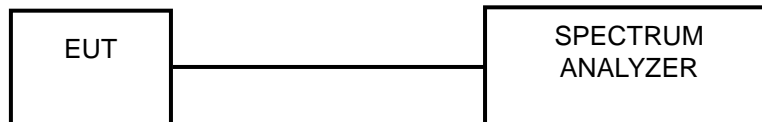


## 4.5 Channel Bandwidth

### 4.5.1 Limits of Channel Bandwidth Measurement

The 20 dB bandwidth of the hopping channel shall be less than 250 kHz.

### 4.5.2 Test Setup



### 4.5.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

### 4.5.4 Test Procedure

- Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- Turn on the EUT and connect it to measurement instrument. Then 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.
- Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
- Repeat above procedures until all frequencies measured were complete.

### 4.5.5 Deviation from Test Standard

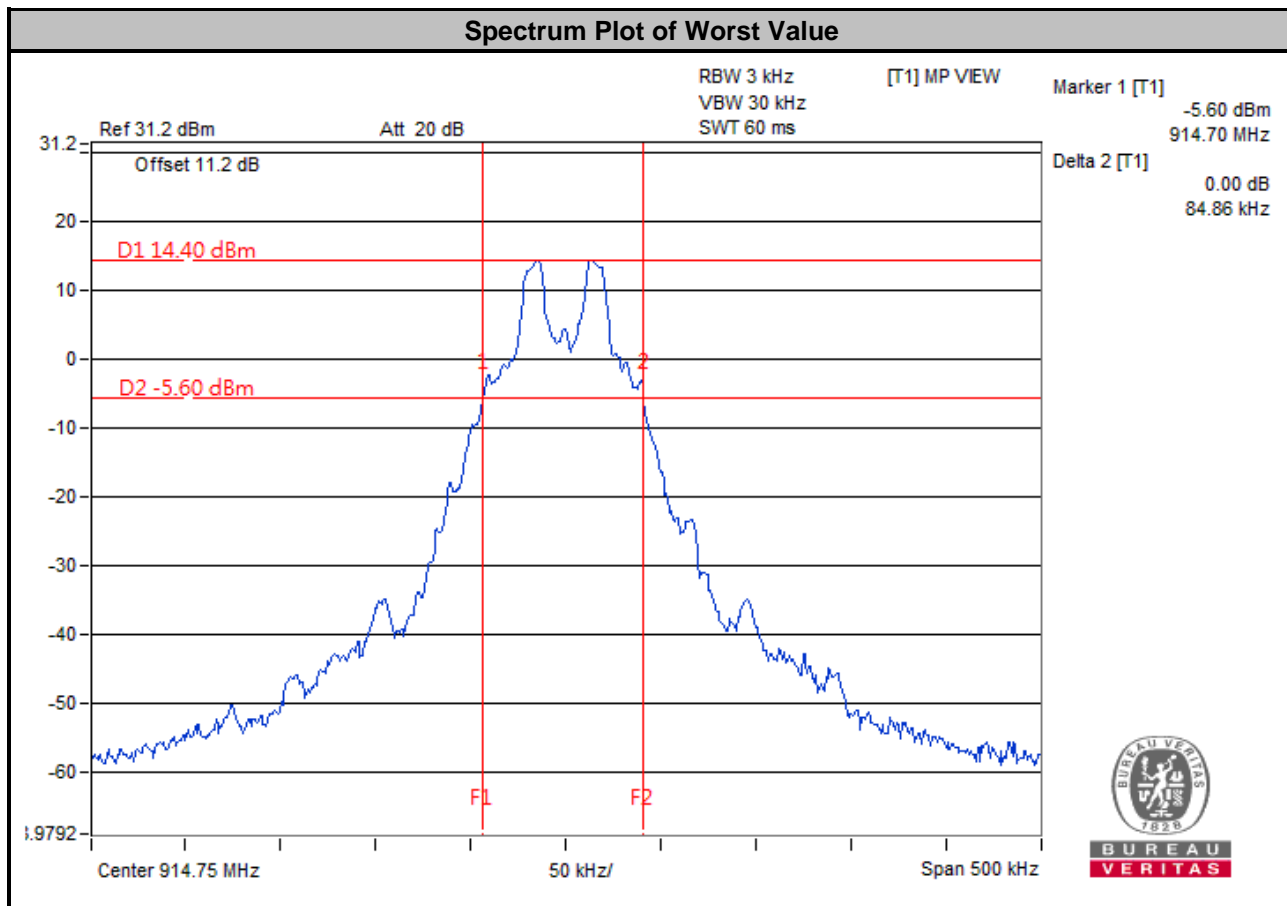
No deviation.

### 4.5.6 EUT Operating Condition

The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

#### 4.5.7 Test Results

Channel	Frequency (MHz)	20 dB Bandwidth (KHz)	Limiti (kHz)
1	902.75	84.73	250
25	914.75	84.86	250
50	927.25	84.78	250

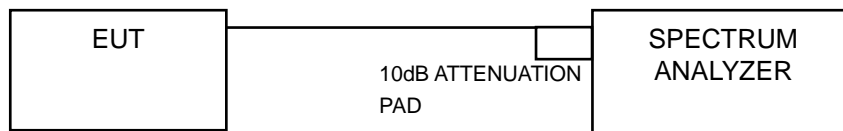


## 4.6 Hopping Channel Separation

### 4.6.1 Limits of Hopping Channel Separation Measurement

At least 25 kHz or two-third of 20 dB hopping channel bandwidth (whichever is greater).

### 4.6.2 Test Setup



### 4.6.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

### 4.6.4 Test Procedure

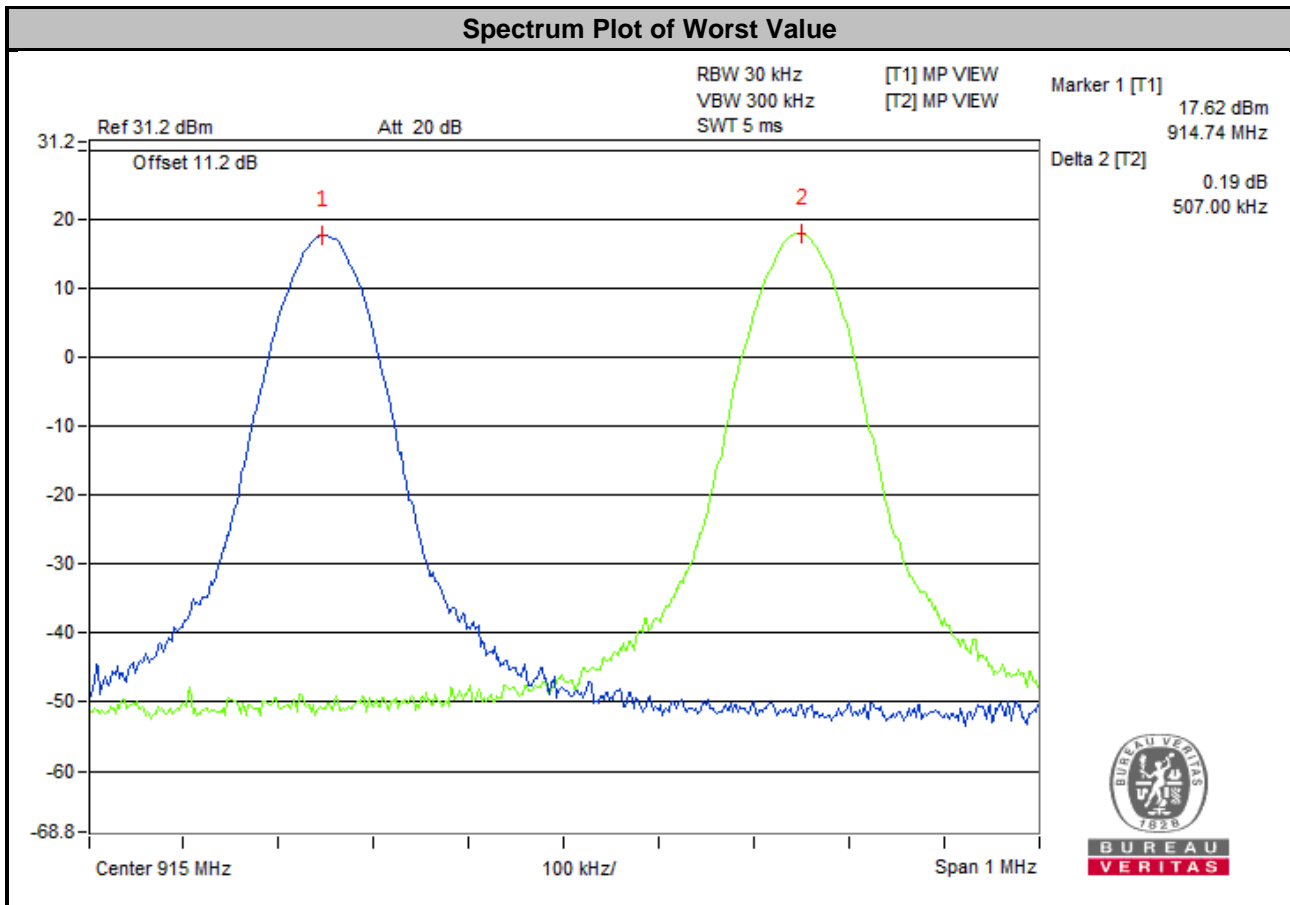
- Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range.
- By using the MaxHold function record the separation of two adjacent channels.
- Measure the frequency difference of these two adjacent channels by SA MARK function. And then plot the result on SA screen.
- Repeat above procedures until all frequencies measured were complete.

### 4.6.5 Deviation from Test Standard

No deviation.

4.6.6 Test Results

Channel	Freq. (MHz)	Adjacent Channel Separation (KHz)	20 dB Bandwidth (KHz)	Minimum Limit (KHz)	Pass / Fail
1	902.75	501	84.73	25	Pass
25	914.75	507	84.86	25	Pass
50	927.25	504	84.78	25	Pass

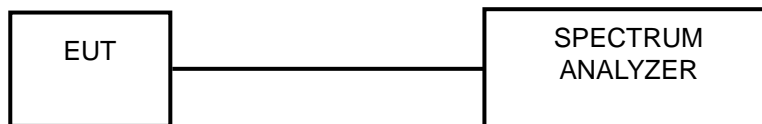


## 4.7 Maximum Output Power

### 4.7.1 Limits of Maximum Output Power Measurement

The Maximum Output Power Measurement is 30 dBm.

### 4.7.2 Test Setup



### 4.7.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

### 4.7.4 Test Procedure

- a. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- b. Turn on the EUT and connect it to measurement instrument. Then 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.
- c. The center frequency of the spectrum analyzer is set to the fundamental frequency and using 3 MHz RBW and 10 MHz VBW.
- d. Measure the captured power within the band and recording the plot.
- e. Repeat above procedures until all frequencies required were complete.

### 4.7.5 Deviation from Test Standard

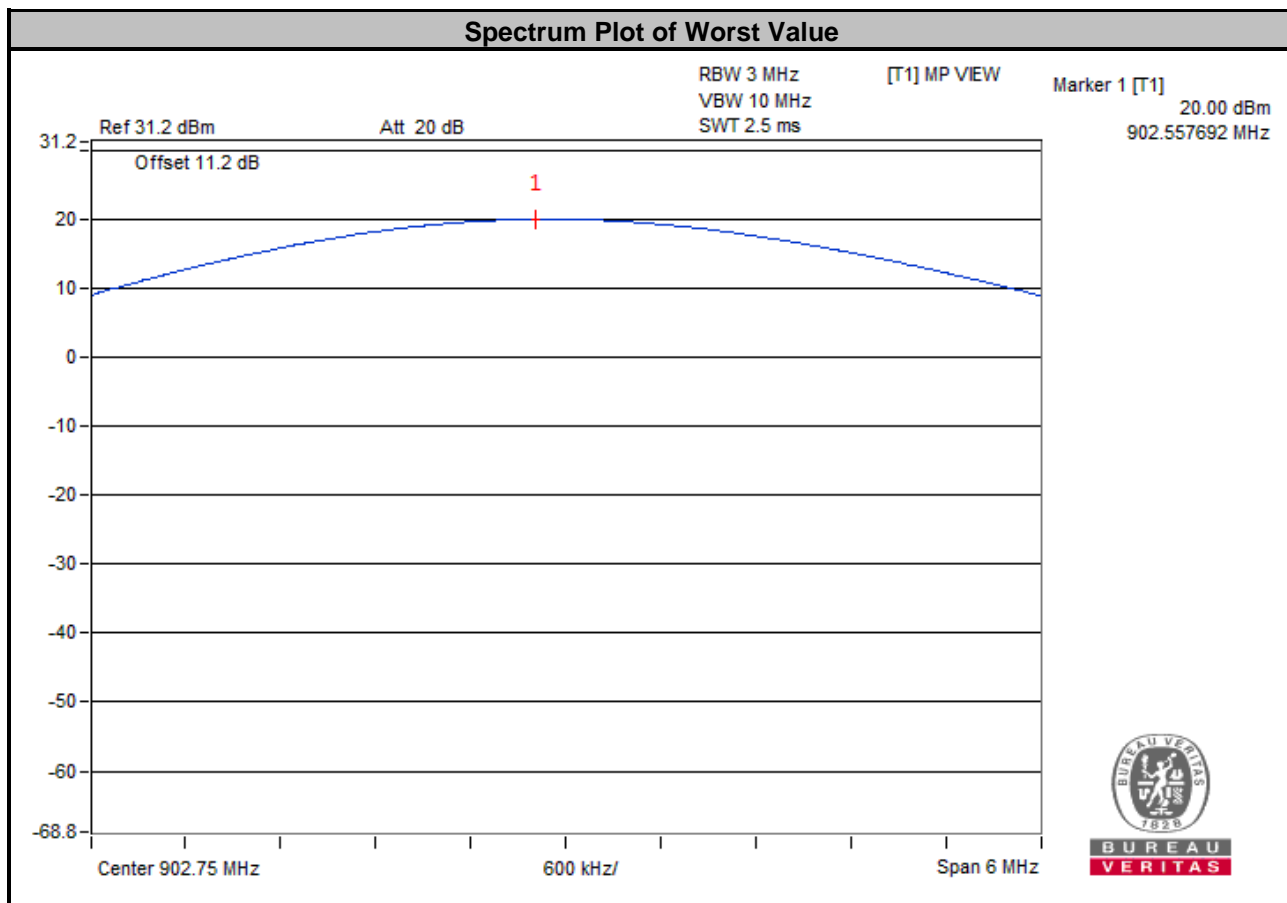
No deviation.

### 4.7.6 EUT Operating Condition

The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

4.7.7 Test Results

Channel	Frequency (MHz)	Output Power (mW)	Output Power (dBm)	Power Limit (dBm)	Pass / Fail
1	902.75	100.000	20.00	30	PASS
25	914.75	88.716	19.48	30	PASS
50	927.25	72.611	18.61	30	PASS



## 4.8 Conducted Out of Band Emission Measurement

### 4.8.1 Limits Of Conducted Out Of Band Emission Measurement

Below  $-20$  dB of the highest emission level of operating band (in 100 kHz RBW).

### 4.8.2 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

### 4.8.3 Test Procedure

The transmitter output was connected to the spectrum analyzer via a low lose cable. Set both RBW and VBW of spectrum analyzer to 100 kHz and 300 kHz with suitable frequency span including 100 MHz bandwidth from band edge. The band edges was measured and recorded.

### 4.8.4 Deviation from Test Standard

No deviation.

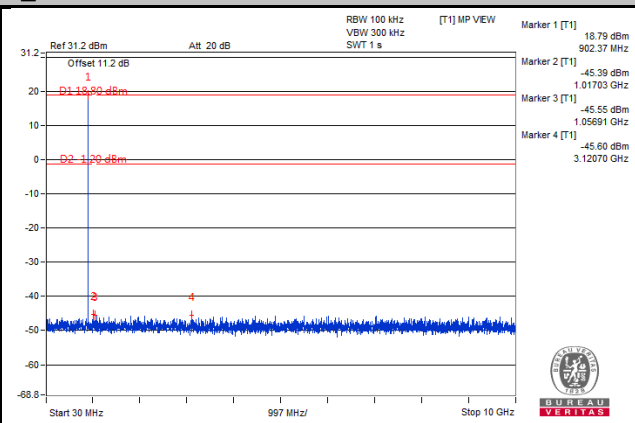
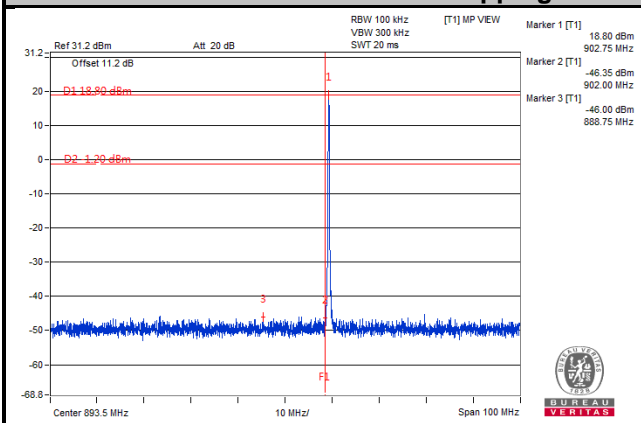
### 4.8.5 EUT Operating Condition

The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

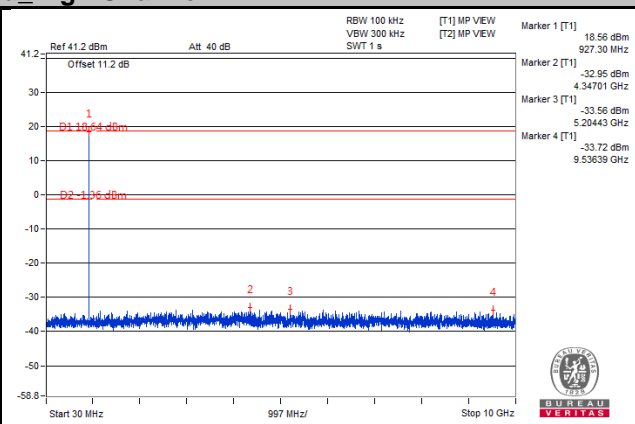
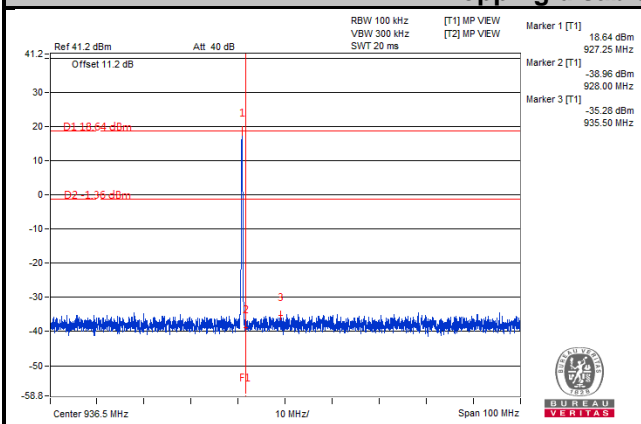
### 4.8.6 Test Results

The spectrum plots are attached on the following images. D1 line indicates the highest level, D2 line indicates the 20 dB offset below D1. It shows compliance with the requirement.

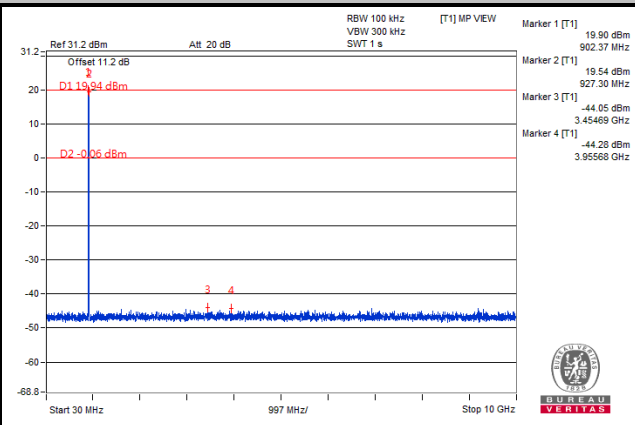
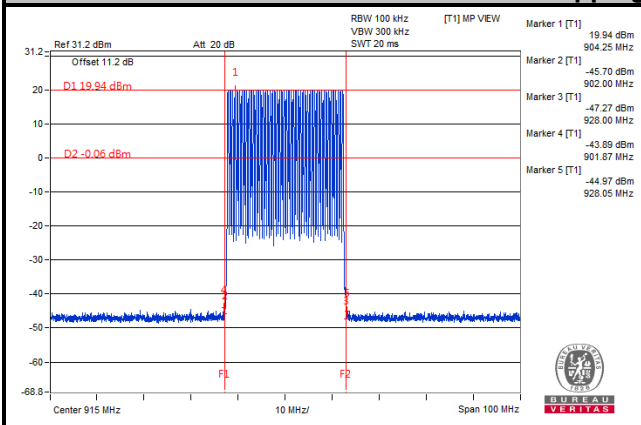
### Hopping disabled\_Low Channel



### Hopping disabled\_High Channel



### Hopping enabled





## 5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

## Appendix – Information on the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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The address and road map of all our labs can be found in our web site also.

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