

FCC Test Report

Report No.: RF180329C04-1

FCC ID: WS2-WS2119A0

Test Model: WS2119-A0

Series Model: WS2119-F0

Received Date: Mar. 29, 2018

Test Date: May 04, 2018 ~ Jun. 13, 2018

Issued Date: Jun. 21, 2018

Applicant: JORJIN TECHNOLOGIES INC.

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

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(R.O.C)

Test Location: No. 19, Hwa Ya 2nd Rd, Wen Hwa Tsuen, Kwei Shan Hsiang, Taoyuan
Hsien 333, Taiwan, R.O.C.

**FCC Registration /
Designation Number:** 788550 / TW0003



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Table of Contents

Release Control Record	4
1 Certificate of Conformity	5
2 Summary of Test Results	6
2.1 Measurement Uncertainty	6
2.2 Modification Record	6
3 General Information	7
3.1 General Description of EUT	7
3.2 Description of Test Modes	8
3.2.1 Test Mode Applicability and Tested Channel Detail	9
3.3 Description of Support Units	11
3.3.1 Configuration of System under Test	11
3.4 General Description of Applied Standards	11
4 Test Types and Results	12
4.1 Radiated Emission and Bandedge Measurement	12
4.1.1 Limits of Radiated Emission and Bandedge Measurement	12
4.1.2 Test Instruments	13
4.1.3 Test Procedures	14
4.1.4 Deviation from Test Standard	14
4.1.5 Test Set Up	15
4.1.6 EUT Operating Conditions	16
4.1.7 Test Results	17
4.2 Conducted Emission Measurement	33
4.2.1 Limits of Conducted Emission Measurement	33
4.2.2 Test Instruments	33
4.2.3 Test Procedures	34
4.2.4 Deviation from Test Standard	34
4.2.5 Test Setup	34
4.2.6 EUT Operating Condition	34
4.2.7 Test Results	35
4.3 Number of Hopping Frequency Used	37
4.3.1 Limits of Hopping Frequency Used Measurement	37
4.3.2 Test Setup	37
4.3.3 Test Instruments	37
4.3.4 Test Procedure	37
4.3.5 Deviation from Test Standard	37
4.3.6 Test Results	38
4.4 Dwell Time on Each Channel	39
4.4.1 Limits of Dwell Time on Each Channel Measurement	39
4.4.2 Test Setup	39
4.4.3 Test Instruments	39
4.4.4 Test Procedures	39
4.4.5 Deviation from Test Standard	39
4.4.6 Test Results	40
4.5 Channel Bandwidth	41
4.5.1 Limits of Channel Bandwidth Measurement	41
4.5.2 Test Setup	41
4.5.3 Test Instruments	41
4.5.4 Test Procedure	41
4.5.5 Deviation from Test Standard	41
4.5.6 EUT Operating Condition	41
4.5.7 Test Results	42
4.6 Hopping Channel Separation	43
4.6.1 Limits of Hopping Channel Separation Measurement	43

4.6.2 Test Setup	43
4.6.3 Test Instruments	43
4.6.4 Test Procedure	43
4.6.5 Deviation from Test Standard	43
4.6.6 Test Results	44
4.7 Maximum Output Power	45
4.7.1 Limits of Maximum Output Power Measurement	45
4.7.2 Test Setup	45
4.7.3 Test Instruments	45
4.7.4 Test Procedure	45
4.7.5 Deviation from Test Standard	45
4.7.6 EUT Operating Condition	45
4.7.7 Test Results	46
4.8 Conducted Out of Band Emission Measurement	47
4.8.1 Limits Of Conducted Out Of Band Emission Measurement	47
4.8.2 Test Instruments	47
4.8.3 Test Procedure	47
4.8.4 Deviation from Test Standard	47
4.8.5 EUT Operating Condition	47
4.8.6 Test Results	47
5 Pictures of Test Arrangements.....	49
Appendix – Information on the Testing Laboratories	50

Release Control Record

Issue No.	Description	Date Issued
RF180329C04-1	Original Release	Jun. 21, 2018

1 Certificate of Conformity

Product: BLE and Sigfox wireless module

Brand: Jorjin

Test Model: WS2119-A0

Series Model: WS2119-F0

Sample Status: Engineering Sample

Applicant: JORJIN TECHNOLOGIES INC.

Test Date: May 04, 2018 ~ Jun. 13, 2018

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 RF characteristics under the conditions specified in this report.

Prepared by : Evonne Liu, **Date:** Jun. 21, 2018
Evonne Liu / Specialist

Approved by : Dylan Chiou, **Date:** Jun. 21, 2018
Dylan Chiou / Project Engineer

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 -12.44 dB at 0.18600 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 -0.8 dB at 1806.775 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

Product	BLE and Sigfox wireless module
Brand	Jorjin
Test Model	WS2119-A0
Series Model	WS2119-F0
Status of EUT	Engineering Sample
Power Supply Rating	DC 3.3 V (host equipment)
Modulation Type	DBPSK
Operating Frequency	902.1375 ~ 904.6625 MHz
Number of Channel	54
Output Power	338.065 mW
Antenna Type	Refer to Note as below
Antenna Connector	N/A
Accessory Device	Refer to Note as below
Data Cable Supplied	Refer to Note as below

Note:

1. All models are listed as below.

Brand	Model	Difference
Jorjin	WS2119-A0	All models are electrically identical, different model names and IC is for marketing purpose.
	WS2119-F0	

2. The antenna information is listed as below.

No	Ant. Type	Brand	Model No.	Connector Type	Antenna Gain (dBi)	
					BT LE	Sigfox
1	PCB	Unictron	H2B1BC2A1B0200	i-pex(MHF)	3.58	
2	PCB	Unictron	H2B1BE1A1B0200	i-pex(MHF)	4.13	
3	Dipole	WIESON	GPOT155-002	reverse SMA	2.61	
4	Dipole	SANAV	EEN-107	reverse SMA		3.53
5	PCB	Unictron	H2B1SD1A2C0100	i-pex(MHF)		1.9
6	PCB	Unictron	H2B1SG2A2C0100	i-pex(MHF)		1.8

3. This device has 4 configurations as below.

Mode A: Model: WS2119-A0 was chosen antenna no. 5 to test.

Mode B: Model: WS2119-A0 was chosen antenna no. 4 to test.

Mode C: Model: WS2119-F0 was chosen antenna no. 5 to test.

Mode D: Model: WS2119-F0 was chosen antenna no. 4 to test.

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

3.2 Description of Test Modes

54 channels are provided to this EUT:

CH	Freq. (MHz)	CH	Freq. (MHz)	CH	Freq. (MHz)	CH	Freq. (MHz)	CH	Freq. (MHz)	CH	Freq. (MHz)
0	902.1375	10	902.5375	20	903.0875	30	903.6375	40	904.0375	50	904.5875
1	902.1625	11	902.5625	21	903.1125	31	903.6625	41	904.0625	51	904.6125
2	902.1875	12	902.7375	22	903.1375	32	903.6875	42	904.2375	52	904.6375
3	902.2125	13	902.7625	23	903.1625	33	903.7125	43	904.2625	53	904.6625
4	902.2375	14	902.7875	24	903.3375	34	903.7375	44	904.2875		
5	902.2625	15	902.8125	25	903.3625	35	903.7625	45	904.3125		
6	902.4375	16	902.8375	26	903.3875	36	903.9375	46	904.3375		
7	902.4625	17	902.8625	27	903.4125	37	903.9625	47	904.3625		
8	902.4875	18	903.0375	28	903.4375	38	903.9875	48	904.5375		
9	902.5125	19	903.0625	29	903.4625	39	904.0125	49	904.5625		

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable To				Description
	RE \geq 1G	RE<1G	PLC	APCM	
A	√	√	√	√	-
B	√	√	-	-	-
C	√	√	-	-	-
D	√	√	-	-	-

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 Type
A, B	0 to 53	0, 26, 53	DBPSK
C, D	0 to 53	26	DBPSK

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 Type
A, B	0 to 53	0, 26, 53	DBPSK
C, D	0 to 53	26	DBPSK

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 Type
A	0 to 53	0, 26, 53	DBPSK

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 Type
A	0 to 53	0, 26, 53	DBPSK

Test Condition:

Applicable To	Environmental Conditions	Input Power	Tested by
RE \geq 1G	25 deg. C, 65 % RH	120 Vac, 60 Hz	Getaz Yang, Jisyong Wang
RE<1G	25 deg. C, 65 % RH	120 Vac, 60 Hz	Jisyong Wang
PLC	25 deg. C, 65 % RH	120 Vac, 60 Hz	Getaz Yang
APCM	25 deg. C, 65 % RH	120 Vac, 60 Hz	Frank Chiu

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.

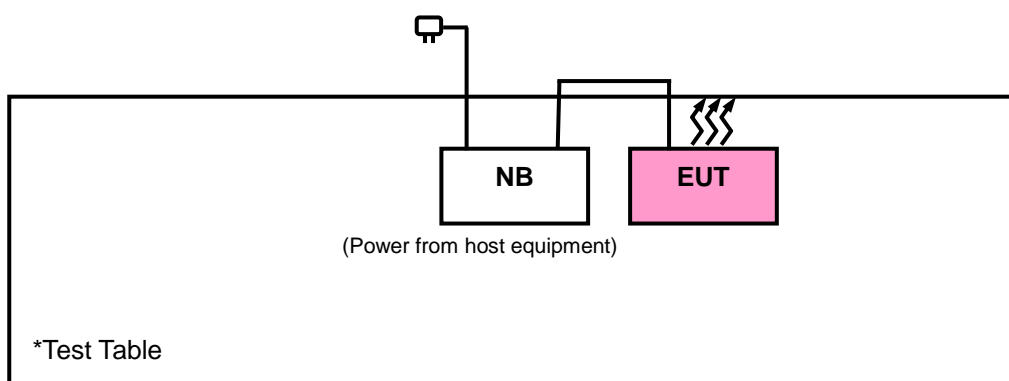
No.	Product	Brand	Model No.	Serial No.	FCC ID
1.	Notebook	N/A	N/A	N/A	N/A

No.	Signal Cable Description Of The Above Support Units
1.	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)

FCC Public Notice DA 00-705

ANSI C63.10-2013

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

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 ROHDE & SCHWARZ	ESCI	100424	Oct. 17, 2017	Oct. 16, 2018
Spectrum Analyzer Agilent	N9010A	MY52220207	Dec. 07, 2017	Dec. 06, 2018
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100041	Dec. 12, 2017	Dec. 11, 2018
BILOG Antenna SCHWARZBECK	VULB9168	9168-171	Dec. 11, 2017	Dec. 10, 2018
HORN Antenna SCHWARZBECK	9120D	209	Dec. 13, 2017	Dec. 12, 2018
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Dec. 01, 2017	Nov. 30, 2018
Fixed Attenuator Mini-Circuits	BW-N10W5+	NA	Jul. 07, 2017	Jul. 06, 2018
Loop Antenna	EM-6879	269	Aug. 11, 2017	Aug. 10, 2018
Preamplifier EMCI	EMC001340	980201	Nov. 01, 2017	Oct. 31, 2018
Preamplifier EMCI	EMC 012645	980115	Oct. 20, 2017	Oct. 19, 2018
Preamplifier EMCI	EMC 184045	980116	Oct. 20, 2017	Oct. 19, 2018
Preamplifier EMCI	EMC 330H	980112	Oct. 20, 2017	Oct. 19, 2018
Power Meter Anritsu	ML2495A	1012010	Aug. 15, 2017	Aug. 14, 2018
Power Sensor Anritsu	MA2411B	1315050	Aug. 15, 2017	Aug. 14, 2018
RF Coaxial Cable	8D-FB	Cable-RF3-04	Oct. 19, 2017	Oct. 18, 2018
RF signal cable HUBER+SUHNER	SUCOFLEX 104	230129/4	Oct. 19, 2017	Oct. 18, 2018
RF signal cable HUBER+SUHNER	SUCOFLEX 104	250723/4	Oct. 19, 2017	Oct. 18, 2018
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

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 IC Site Registration No. is IC7450F-10.

4.1.3 Test Procedures

For Radiated Emission below 30 MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. 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. Both Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case 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.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9 kHz at frequency below 30 MHz.

For Radiated Emission above 30 MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30 MHz ~ 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:

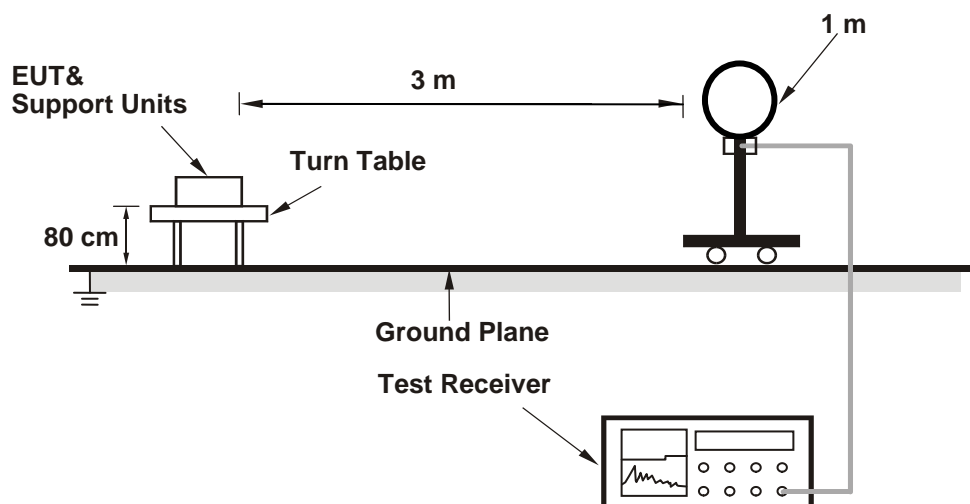
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) at frequency below 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1 GHz.
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. (RBW = 1 MHz, VBW = 1 kHz)
4. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

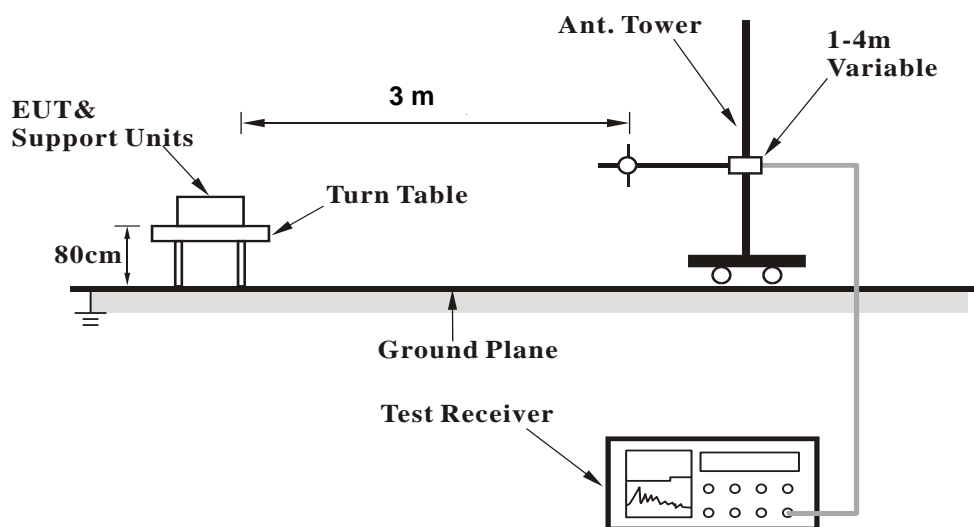
No deviation.

4.1.5 Test Set Up

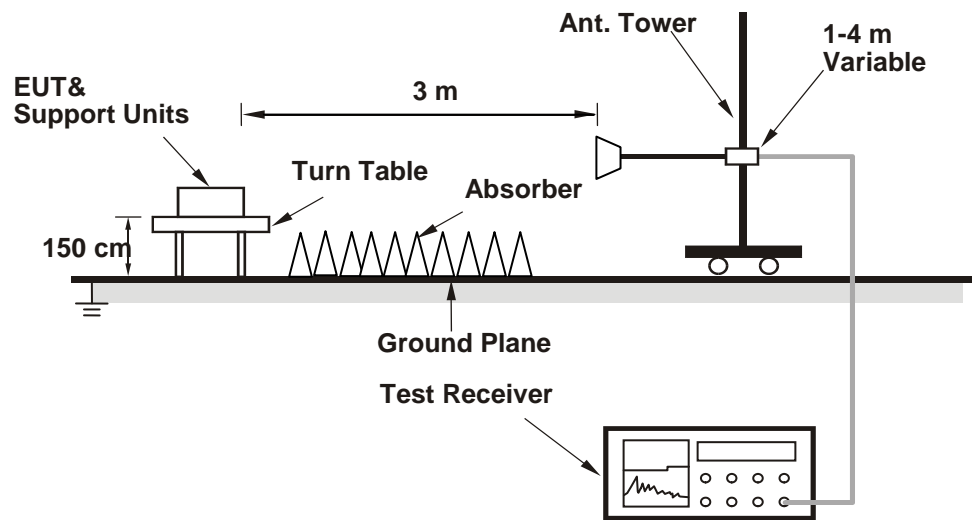
<Radiated Emission below 30 MHz>



<Radiated Emission 30 MHz to 1 GHz>



<Radiated Emission 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 :

Mode A

EUT Test Condition		Measurement Detail	
Channel	Channel 0	Frequency Range	1 GHz ~ 10 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Jisyong Wang

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
*1804.275	46.52	70.84	93.25	-46.73	25.4	4.22	53.94	201	121	Average
*1804.275	49.69	74.01	94.69	-45	25.4	4.22	53.94	201	121	Peak
2706.413	46.52	67.5	54	-7.48	27.93	5.14	54.05	135	162	Average
2706.413	45.85	66.83	74	-28.15	27.93	5.14	54.05	135	162	Peak
3608.55	41.01	60.19	54	-12.99	28.96	5.88	54.02	222	295	Average
3608.55	43.85	63.03	74	-30.15	28.96	5.88	54.02	222	295	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
*1804.275	46.52	70.84	91.65	-45.13	25.4	4.22	53.94	111	152	Average
*1804.275	48.65	72.97	93.05	-44.4	25.4	4.22	53.94	111	152	Peak
2706.413	46.96	67.94	54	-7.04	27.93	5.14	54.05	201	265	Average
2706.413	50.58	71.56	74	-23.42	27.93	5.14	54.05	201	265	Peak
4510.688	41.52	57.9	54	-12.48	30.64	6.62	53.64	174	154	Average
4510.688	45.69	62.07	74	-28.31	30.64	6.62	53.64	174	154	Peak
8119.237	53.16	59.47	54	-0.84	37.08	8.85	52.24	212	340	Average
8119.237	56.74	63.05	74	-17.26	37.08	8.85	52.24	212	340	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- *: Out of Restricted Band

EUT Test Condition		Measurement Detail	
Channel	Channel 26	Frequency Range	1 GHz ~ 10 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Jisyong Wang

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
*1806.775	50.01	74.33	93.52	-43.51	25.4	4.22	53.94	152	258	Average
*1806.775	52.36	76.68	95.69	-43.33	25.4	4.22	53.94	152	258	Peak
2710.163	48.63	69.59	54	-5.37	27.95	5.14	54.05	201	265	Average
2710.163	49.01	69.97	74	-24.99	27.95	5.14	54.05	201	265	Peak
3613.55	43.25	62.39	54	-10.75	28.99	5.89	54.02	111	165	Average
3613.55	45.37	64.51	74	-28.63	28.99	5.89	54.02	111	165	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
*1806.775	50.25	74.57	93.62	-43.37	25.4	4.22	53.94	152	123	Average
*1806.775	51.23	75.55	95.85	-44.62	25.4	4.22	53.94	152	123	Peak
2710.163	49.36	70.32	54	-4.64	27.95	5.14	54.05	231	145	Average
2710.163	51.02	71.98	74	-22.98	27.95	5.14	54.05	231	145	Peak
*4516.938	43.58	59.96	93.62	-50.04	30.64	6.62	53.64	195	256	Average
*4516.938	46.85	63.23	95.85	-49	30.64	6.62	53.64	195	256	Peak
*8130.487	50.01	56.33	93.62	-43.61	37.08	8.85	52.25	174	185	Average
*8130.487	54.58	60.9	95.85	-41.27	37.08	8.85	52.25	174	185	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- *: Out of Restricted Band

EUT Test Condition		Measurement Detail	
Channel	Channel 53	Frequency Range	1 GHz ~ 10 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Jisyong Wang

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
*1809.325	50.14	74.45	94.58	-44.44	25.41	4.22	53.94	185	121	Average
*1809.325	51.25	75.56	95.69	-44.44	25.41	4.22	53.94	185	121	Peak
2713.988	43.52	64.47	54	-10.48	27.95	5.15	54.05	165	123	Average
2713.988	45.98	66.93	74	-28.02	27.95	5.15	54.05	165	123	Peak
3618.65	42.69	61.85	54	-11.31	28.99	5.89	54.04	201	145	Average
3618.65	43.85	63.01	74	-30.15	28.99	5.89	54.04	201	145	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
*1809.325	49.25	73.56	93.52	-44.27	25.41	4.22	53.94	185	265	Average
*1809.325	50.26	74.57	95.51	-45.25	25.41	4.22	53.94	185	265	Peak
2713.988	48.62	69.57	54	-5.38	27.95	5.15	54.05	145	152	Average
2713.988	49.78	70.73	74	-24.22	27.95	5.15	54.05	145	152	Peak
3618.65	43.65	62.81	54	-10.35	28.99	5.89	54.04	201	265	Average
3618.65	45.01	64.17	74	-28.99	28.99	5.89	54.04	201	265	Peak
4523.313	43.85	60.23	54	-10.15	30.64	6.62	53.64	311	145	Average
4523.313	46.98	63.36	74	-27.02	30.64	6.62	53.64	311	145	Peak

Remarks:

1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
2. *: Out of Restricted Band

Mode B

EUT Test Condition		Measurement Detail	
Channel	Channel 0	Frequency Range	1 GHz ~ 10 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Getaz Yang

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
*1809.325	52.73	77.04	96.56	-43.83	25.41	4.22	53.94	178	143	Average
*1809.325	53.18	77.49	97.92	-44.74	25.41	4.22	53.94	178	143	Peak
2713.988	48.97	69.92	54	-5.03	27.95	5.15	54.05	168	173	Average
2713.988	49.39	70.34	74	-24.61	27.95	5.15	54.05	168	173	Peak
3618.65	44.74	63.9	54	-9.26	28.99	5.89	54.04	193	123	Average
3618.65	45.38	64.54	74	-28.62	28.99	5.89	54.04	193	123	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
*1809.325	51.33	75.64	95.8	-44.47	25.41	4.22	53.94	198	240	Average
*1809.325	51.35	75.66	97.09	-45.74	25.41	4.22	53.94	198	240	Peak
2713.988	50.2	71.15	54	-3.8	27.95	5.15	54.05	193	247	Average
2713.988	51.52	72.47	74	-22.48	27.95	5.15	54.05	193	247	Peak
3618.65	45.77	64.93	54	-8.23	28.99	5.89	54.04	204	231	Average
3618.65	47.45	66.61	74	-26.55	28.99	5.89	54.04	204	231	Peak
4523.313	45.2	61.58	54	-8.8	30.64	6.62	53.64	234	301	Average
4523.313	49.78	66.16	74	-24.22	30.64	6.62	53.64	234	301	Peak
8141.962	50.84	57.19	54	-3.16	37.05	8.85	52.25	211	340	Average
8141.962	56.08	62.43	74	-17.92	37.05	8.85	52.25	211	340	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- *: Out of Restricted Band

EUT Test Condition		Measurement Detail	
Channel	Channel 26	Frequency Range	1 GHz ~ 10 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Getaz Yang

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
*1806.775	53.2	77.52	9.53	43.67	25.4	4.22	53.94	180	134	Average
*1806.775	53.47	77.79	96.82	-43.35	25.4	4.22	53.94	180	134	Peak
2710.163	50.42	71.38	54	-3.58	27.95	5.14	54.05	168	169	Average
2710.163	49.4	70.36	74	-24.6	27.95	5.14	54.05	168	169	Peak
3613.55	45.5	64.64	54	-8.5	28.99	5.89	54.02	194	123	Average
3613.55	45.37	64.51	74	-28.63	28.99	5.89	54.02	194	123	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
*1806.775	52.34	76.66	96.8	-44.46	25.4	4.22	53.94	198	240	Average
*1806.775	52.59	76.91	98.08	-45.49	25.4	4.22	53.94	198	240	Peak
2710.163	50.34	71.3	54	-3.66	27.95	5.14	54.05	196	245	Average
2710.163	52.99	73.95	74	-21.01	27.95	5.14	54.05	196	245	Peak
4516.938	45.17	61.55	54	-8.83	30.64	6.62	53.64	234	300	Average
4516.938	48.75	65.13	74	-25.25	30.64	6.62	53.64	234	300	Peak
8130.487	51.92	58.24	54	-2.08	37.08	8.85	52.25	211	340	Average
8130.487	56.34	62.66	74	-17.66	37.08	8.85	52.25	211	340	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- *: Out of Restricted Band

EUT Test Condition		Measurement Detail	
Channel	Channel 53	Frequency Range	1 GHz ~ 10 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Getaz Yang

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
*1809.325	52.73	77.04	96.56	-43.83	25.41	4.22	53.94	178	143	Average
*1809.325	53.18	77.49	97.92	-44.74	25.41	4.22	53.94	178	143	Peak
2713.988	48.97	69.92	54	-5.03	27.95	5.15	54.05	168	173	Average
2713.988	49.39	70.34	74	-24.61	27.95	5.15	54.05	168	173	Peak
3618.65	44.74	63.9	54	-9.26	28.99	5.89	54.04	193	123	Average
3618.65	45.38	64.54	74	-28.62	28.99	5.89	54.04	193	123	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
*1809.325	51.33	75.64	95.8	-44.47	25.41	4.22	53.94	198	240	Average
*1809.325	51.35	75.66	97.09	-45.74	25.41	4.22	53.94	198	240	Peak
2713.988	50.2	71.15	54	-3.8	27.95	5.15	54.05	193	247	Average
2713.988	51.52	72.47	74	-22.48	27.95	5.15	54.05	193	247	Peak
3618.65	45.77	64.93	54	-8.23	28.99	5.89	54.04	204	231	Average
3618.65	47.45	66.61	74	-26.55	28.99	5.89	54.04	204	231	Peak
4523.313	45.2	61.58	54	-8.8	30.64	6.62	53.64	234	301	Average
4523.313	49.78	66.16	74	-24.22	30.64	6.62	53.64	234	301	Peak
8141.962	50.84	57.19	54	-3.16	37.05	8.85	52.25	211	340	Average
8141.962	56.08	62.43	74	-17.92	37.05	8.85	52.25	211	340	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- *: Out of Restricted Band

Mode C

EUT Test Condition		Measurement Detail	
Channel	Channel 26	Frequency Range	1 GHz ~ 10 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Jisyong Wang

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
*1806.775	50.01	74.33	93.52	-43.51	25.4	4.22	53.94	152	258	Average
*1806.775	52.36	76.68	95.69	-43.33	25.4	4.22	53.94	152	258	Peak
2710.163	48.63	69.59	54	-5.37	27.95	5.14	54.05	201	265	Average
2710.163	49.01	69.97	74	-24.99	27.95	5.14	54.05	201	265	Peak
3613.55	43.25	62.39	54	-10.75	28.99	5.89	54.02	111	165	Average
3613.55	45.37	64.51	74	-28.63	28.99	5.89	54.02	111	165	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
*1806.775	50.25	74.57	93.62	-43.37	25.4	4.22	53.94	152	123	Average
*1806.775	51.23	75.55	95.85	-44.62	25.4	4.22	53.94	152	123	Peak
2710.163	49.36	70.32	54	-4.64	27.95	5.14	54.05	231	145	Average
2710.163	51.02	71.98	74	-22.98	27.95	5.14	54.05	231	145	Peak
*4516.938	43.58	59.96	93.62	-50.04	30.64	6.62	53.64	195	256	Average
*4516.938	46.85	63.23	95.85	-49	30.64	6.62	53.64	195	256	Peak
*8130.487	50.01	56.33	93.62	-43.61	37.08	8.85	52.25	174	185	Average
*8130.487	54.58	60.9	95.85	-41.27	37.08	8.85	52.25	174	185	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- *: Out of Restricted Band

Mode D

EUT Test Condition		Measurement Detail	
Channel	Channel 26	Frequency Range	1 GHz ~ 10 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Jisyong Wang

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
*1806.775	52.01	76.33	93.01	-41	25.4	4.22	53.94	141	151	Average
*1806.775	52.16	76.48	95.03	-42.87	25.4	4.22	53.94	141	151	Peak
2710.163	48.03	68.99	54	-5.97	27.95	5.14	54.05	165	111	Average
2710.163	48.57	69.53	74	-25.43	27.95	5.14	54.05	165	111	Peak
3613.55	43.69	62.83	54	-10.31	28.99	5.89	54.02	174	154	Average
3613.55	44.58	63.72	74	-29.42	28.99	5.89	54.02	174	154	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
*1806.775	51.01	75.33	94.26	-43.25	25.4	4.22	53.94	185	145	Average
*1806.775	51.26	75.58	96.02	-44.76	25.4	4.22	53.94	185	145	Peak
2710.163	49.03	69.99	54	-4.97	27.95	5.14	54.05	132	256	Average
2710.163	50.74	71.7	74	-23.26	27.95	5.14	54.05	132	256	Peak
4516.938	43.65	60.03	54	-10.35	30.64	6.62	53.64	102	251	Average
4516.938	47.03	63.41	74	-26.97	30.64	6.62	53.64	102	251	Peak
8130.487	50.25	56.57	54	-3.75	37.08	8.85	52.25	169	111	Average
8130.487	54.62	60.94	74	-19.38	37.08	8.85	52.25	169	111	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- *: Out of Restricted Band

9 kHz ~ 30 MHz Data:

The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

30 MHz ~ 1 GHz Worst-Case Data:

Mode A

EUT Test Condition		Measurement Detail	
Channel	Channel 0	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	Jisyong Wang

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	75.26	79.71	93.25	-17.99	23.52	4.05	32.02	152	121	Average
902	78.65	83.1	94.69	-16.04	23.52	4.05	32.02	152	121	QP
902.138	113.25	117.7	-----	-----	23.52	4.05	32.02	152	121	Average
902.138	114.69	119.14	-----	-----	23.52	4.05	32.02	152	121	QP
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	67.25	71.7	91.65	-24.4	23.52	4.05	32.02	141	111	Average
902	70.52	74.97	93.05	-22.53	23.52	4.05	32.02	141	111	QP
902.138	111.65	116.1	-----	-----	23.52	4.05	32.02	141	111	Average
902.138	113.05	117.5	-----	-----	23.52	4.05	32.02	141	111	QP

Remarks:

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

EUT Test Condition		Measurement Detail	
Channel	Channel 26	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	Jisyong Wang

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	30.52	34.97	93.52	-63	23.52	4.05	32.02	111	147	Average
902	56.52	60.97	95.69	-39.17	23.52	4.05	32.02	111	147	QP
903.388	113.52	117.96	-----	-----	23.53	4.05	32.02	111	147	Average
903.388	115.69	120.13	-----	-----	23.53	4.05	32.02	111	147	QP
928	16.85	21.01	93.52	-76.67	23.67	4.16	31.99	111	147	Average
928	42.69	46.85	95.69	-53	23.67	4.16	31.99	111	147	QP
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	30.01	34.46	93.62	-63.61	23.52	4.05	32.02	152	111	Average
902	57.85	62.3	95.85	-38	23.52	4.05	32.02	152	111	QP
903.388	113.62	118.06	-----	-----	23.53	4.05	32.02	152	111	Average
903.388	115.85	120.29	-----	-----	23.53	4.05	32.02	152	111	QP
928	16.52	20.68	93.62	-77.1	23.67	4.16	31.99	152	111	Average
928	36.85	41.01	95.85	-59	23.67	4.16	31.99	152	111	QP

Remarks:

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

EUT Test Condition		Measurement Detail	
Channel	Channel 53	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	Jisyong Wang

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
904.663	114.58	119.02	-----	-----	23.54	4.05	32.03	256	211	Average
904.663	115.69	120.13	-----	-----	23.54	4.05	32.03	256	211	QP
928	40.74	44.9	94.58	-53.84	23.67	4.16	31.99	256	211	Average
928	41.52	45.68	95.69	-54.17	23.67	4.16	31.99	256	211	QP
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
904.663	113.52	117.96	-----	-----	23.54	4.05	32.03	152	213	Average
904.663	115.51	119.95	-----	-----	23.54	4.05	32.03	152	213	QP
928	34.69	38.85	93.52	-58.83	23.67	4.16	31.99	152	213	Average
928	40.58	44.74	95.51	-54.93	23.67	4.16	31.99	152	213	QP

Remarks:

1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor

Mode B

EUT Test Condition		Measurement Detail	
Channel	Channel 0	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	Getaz Yang

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	77.29	81.74	94.44	-17.15	23.52	4.05	32.02	168	198	Average
902	81.15	85.6	97.15	-16	23.52	4.05	32.02	168	198	QP
902.138	115.56	120.01	-----	-----	23.52	4.05	32.02	168	198	Average
902.138	117.15	121.6	-----	-----	23.52	4.05	32.02	168	198	QP
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	70.8	75.25	95.57	-24.77	23.52	4.05	32.02	117	335	Average
902	74.25	78.7	97.43	-23.18	23.52	4.05	32.02	117	335	QP
902.138	115.57	120.02	-----	-----	23.52	4.05	32.02	117	335	Average
902.138	117.43	121.88	-----	-----	23.52	4.05	32.02	117	335	QP

Remarks:

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

EUT Test Condition		Measurement Detail	
Channel	Channel 26	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	Getaz Yang

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	32.22	36.67	95.56	-63.34	23.52	4.05	32.02	159	202	Average
902	58.31	62.76	97.52	-39.21	23.52	4.05	32.02	159	202	QP
903.388	115.56	120	-----	-----	23.53	4.05	32.02	159	202	Average
903.388	117.52	121.96	-----	-----	23.53	4.05	32.02	159	202	QP
928	17.01	21.17	95.56	-78.55	23.67	4.16	31.99	159	202	Average
928	44.54	48.7	97.52	-52.98	23.67	4.16	31.99	159	202	QP
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	31.74	36.19	95.58	-63.84	23.52	4.05	32.02	113	329	Average
902	59.71	64.16	97.15	-37.44	23.52	4.05	32.02	113	329	QP
903.388	115.58	120.02	-----	-----	23.53	4.05	32.02	113	329	Average
903.388	117.15	121.59	-----	-----	23.53	4.05	32.02	113	329	QP
928	17.22	21.38	95.58	-78.36	23.67	4.16	31.99	113	329	Average
928	38.51	42.67	97.15	-58.64	23.67	4.16	31.99	113	329	QP

Remarks:

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

EUT Test Condition		Measurement Detail	
Channel	Channel 53	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	Getaz Yang

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
904.663	116.56	121	-----	-----	23.54	4.05	32.03	158	201	Average
904.663	117.92	122.36	-----	-----	23.54	4.05	32.03	158	201	QP
928	42.99	47.15	96.56	-53.57	23.67	4.16	31.99	158	201	Average
928	42.85	47.01	97.92	-55.07	23.67	4.16	31.99	158	201	QP
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
904.663	115.8	120.24	-----	-----	23.54	4.05	32.03	118	331	Average
904.663	117.09	121.53	-----	-----	23.54	4.05	32.03	118	331	QP
928	36.94	41.1	95.8	-58.86	23.67	4.16	31.99	118	331	Average
928	42.63	46.79	97.09	-54.46	23.67	4.16	31.99	118	331	QP

Remarks:

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

Mode C

EUT Test Condition		Measurement Detail	
Channel	Channel 26	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	Jisyong Wang

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)	Preamplifier Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
902	30.52	34.97	93.52	-63	23.52	4.05	32.02	111	147	Average
902	56.52	60.97	95.69	-39.17	23.52	4.05	32.02	111	147	QP
903.388	113.52	117.96	-----	-----	23.53	4.05	32.02	111	147	Average
903.388	115.69	120.13	-----	-----	23.53	4.05	32.02	111	147	QP
928	16.85	21.01	93.52	-76.67	23.67	4.16	31.99	111	147	Average
928	42.69	46.85	95.69	-53	23.67	4.16	31.99	111	147	QP
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)	Preamplifier Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
902	30.01	34.46	93.62	-63.61	23.52	4.05	32.02	152	111	Average
902	57.85	62.3	95.85	-38	23.52	4.05	32.02	152	111	QP
903.388	113.62	118.06	-----	-----	23.53	4.05	32.02	152	111	Average
903.388	115.85	120.29	-----	-----	23.53	4.05	32.02	152	111	QP
928	16.52	20.68	93.62	-77.1	23.67	4.16	31.99	152	111	Average
928	36.85	41.01	95.85	-59	23.67	4.16	31.99	152	111	QP

Remarks:

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

Mode D

EUT Test Condition		Measurement Detail	
Channel	Channel 26	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	Jisyong Wang

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)	Preamplifier Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
902	29.52	33.97	93.01	-63.49	23.52	4.05	32.02	147	141	Average
902	56.01	60.46	95.03	-39.02	23.52	4.05	32.02	147	141	QP
903.388	113.01	117.45	-----	-----	23.53	4.05	32.02	147	141	Average
903.388	115.03	119.47	-----	-----	23.53	4.05	32.02	147	141	QP
928	15.01	19.17	93.01	-78	23.67	4.16	31.99	147	141	Average
928	42.01	46.17	95.03	-53.02	23.67	4.16	31.99	147	141	QP
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)	Preamplifier Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
902	30.52	34.97	94.26	-63.74	23.52	4.05	32.02	251	121	Average
902	58.06	62.51	96.02	-37.96	23.52	4.05	32.02	251	121	QP
903.388	114.26	118.7	-----	-----	23.53	4.05	32.02	251	121	Average
903.388	116.02	120.46	-----	-----	23.53	4.05	32.02	251	121	QP
928	16.25	20.41	94.26	-78.01	23.67	4.16	31.99	251	121	Average
928	37.62	41.78	96.02	-58.4	23.67	4.16	31.99	251	121	QP

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	ESR3	102412	Feb. 08, 2018	Feb. 07, 2019
RF signal cable (with 10dB PAD) Woken	5D-FB	Cable-cond2-01	Sep. 08, 2017	Sep. 07, 2018
LISN/AMN ROHDE & SCHWARZ (EUT)	ESH2-Z5	100100	Feb. 05, 2018	Feb. 04, 2019
LISN/AMN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100312	Aug. 02, 2017	Aug. 01, 2018
Software ADT	BV ADT_Cond_ V7.3.7.4	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 2.
 3. The VCCI Site Registration No. is C-2047.

4.2.3 Test Procedures

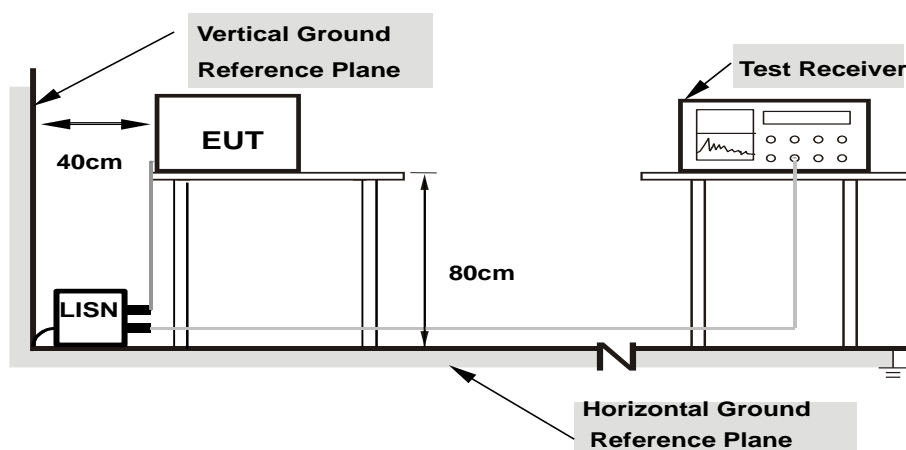
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50 uH of coupling impedance for the measuring instrument.
- Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- 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:**
- Support units were connected to second LISN.
 - 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

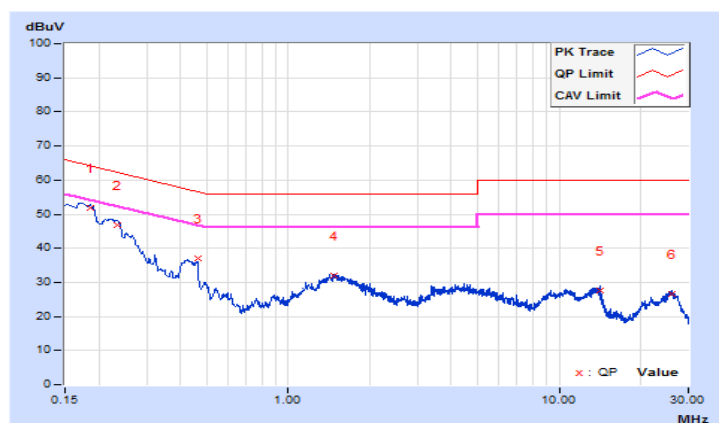
CONDUCTED WORST-CASE DATA :

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	Getaz Yang	Test Date	2018/5/4

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	0.18600	10.25	41.52	20.43	51.77	30.68	64.21	54.21	-12.44	-23.53
2	0.23325	10.26	36.69	16.18	46.95	26.44	62.33	52.33	-15.38	-25.89
3	0.46271	10.28	26.65	12.03	36.93	22.31	56.64	46.64	-19.71	-24.33
4	1.48425	10.35	21.56	8.75	31.91	19.10	56.00	46.00	-24.09	-26.90
5	14.13825	10.67	17.02	6.81	27.69	17.48	60.00	50.00	-32.31	-32.52
6	25.98450	10.71	16.03	4.98	26.74	15.69	60.00	50.00	-33.26	-34.31

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

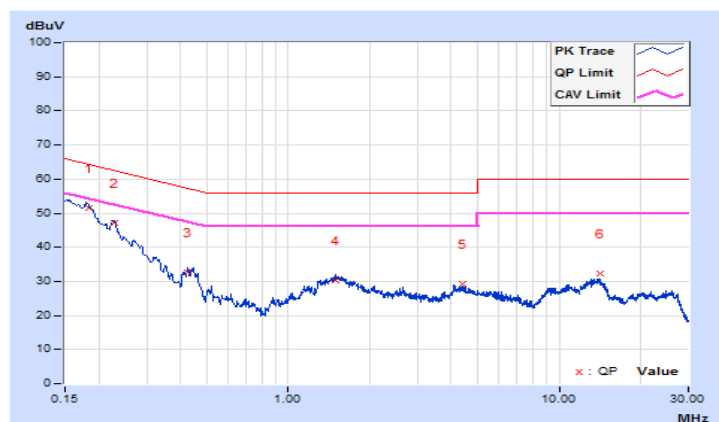


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25°C, 65%RH
Tested by	Getaz Yang	Test Date	2018/5/4

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	0.18375	10.26	41.12	19.92	51.38	30.18	64.31	54.31	-12.93	-24.13
2	0.22683	10.27	36.86	18.72	47.13	28.99	62.56	52.56	-15.43	-23.57
3	0.42522	10.28	22.25	8.57	32.53	18.85	57.35	47.35	-24.82	-28.50
4	1.49775	10.36	19.83	8.86	30.19	19.22	56.00	46.00	-25.81	-26.78
5	4.41600	10.48	18.65	7.47	29.13	17.95	56.00	46.00	-26.87	-28.05
6	14.14500	10.78	21.47	6.35	32.25	17.13	60.00	50.00	-27.75	-32.87

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

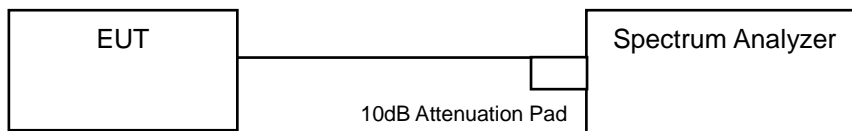


4.3 Number of Hopping Frequency Used

4.3.1 Limits of Hopping Frequency Used Measurement

At least 15 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

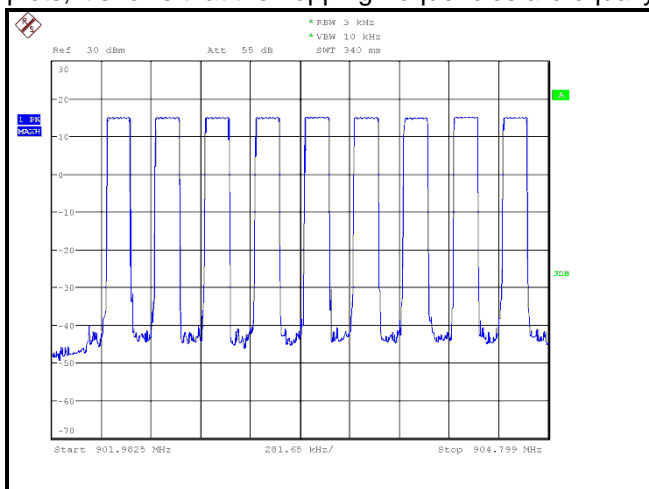
- Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
- Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make 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 54 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.

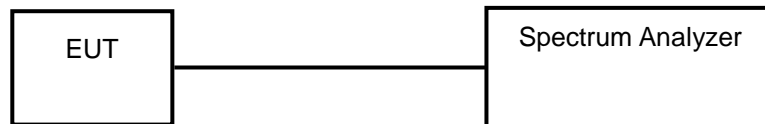


4.4 Dwell Time on Each Channel

4.4.1 Limits of Dwell Time on Each Channel Measurement

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

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

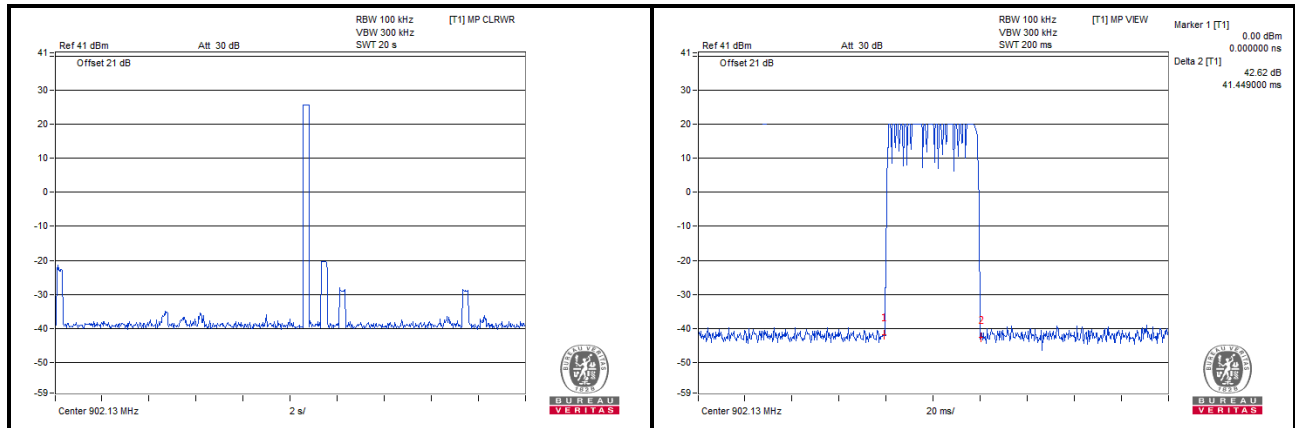
No deviation.

4.4.6 Test Results

Average Hopping Channel	Package Transfer Time (msec)	Result (msec)	Limit (sec)
54	41.44	44.76	0.4

NOTE:

- Test plots of the transmitting time slot are shown as below.

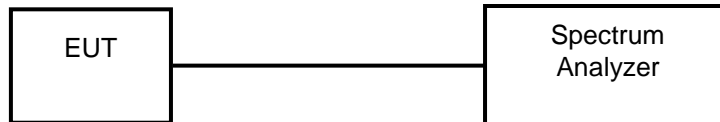


4.5 Channel Bandwidth

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

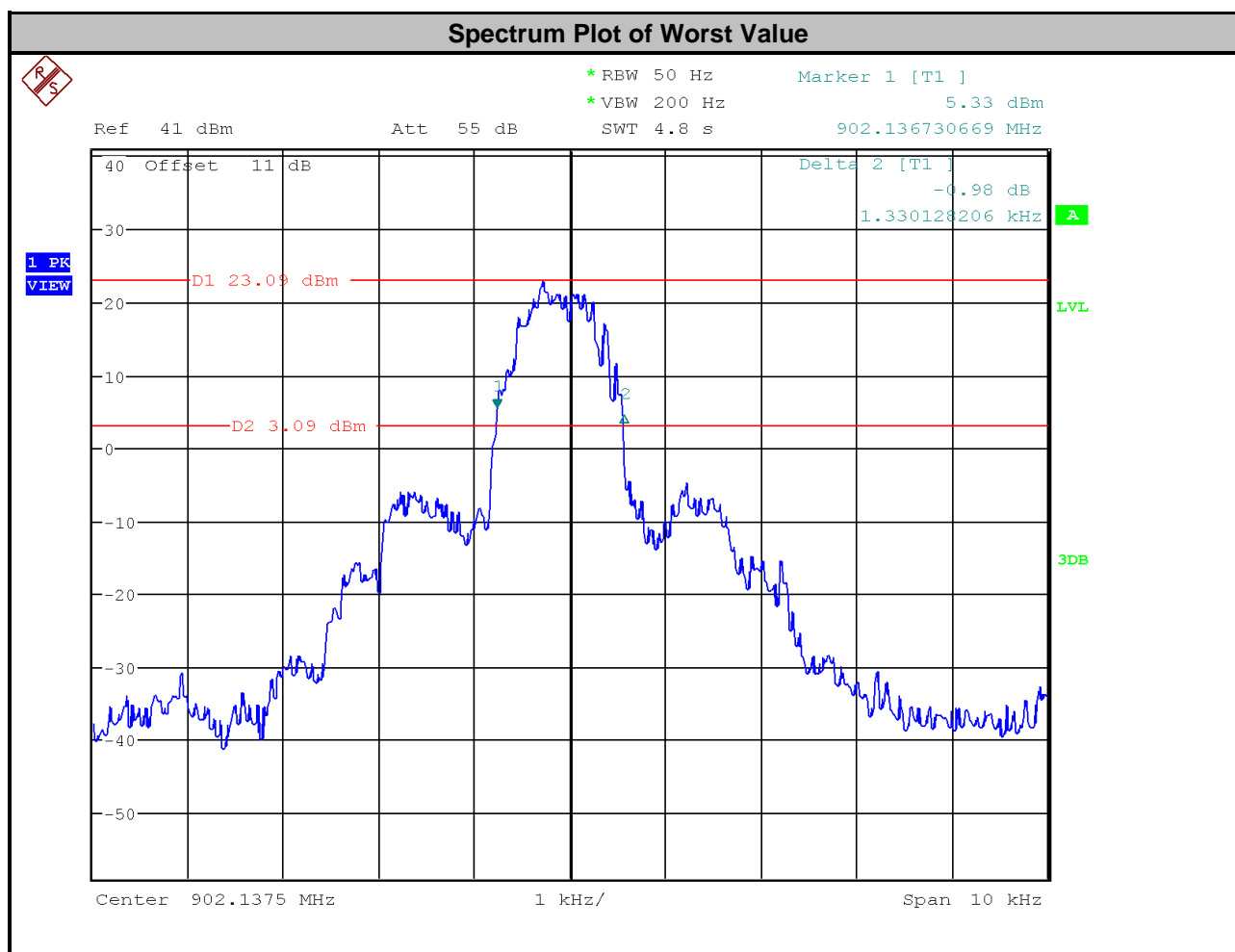
No deviation.

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 (MHz)	Limit (kHz)
0	902.1375	0.01	250
26	903.3875	0.01	250
53	904.6625	0.01	250

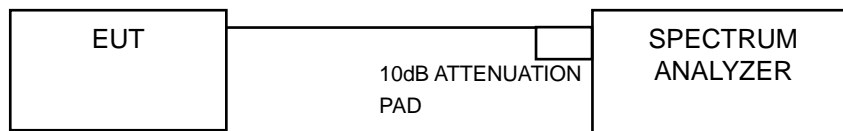


4.6 Hopping Channel Separation

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

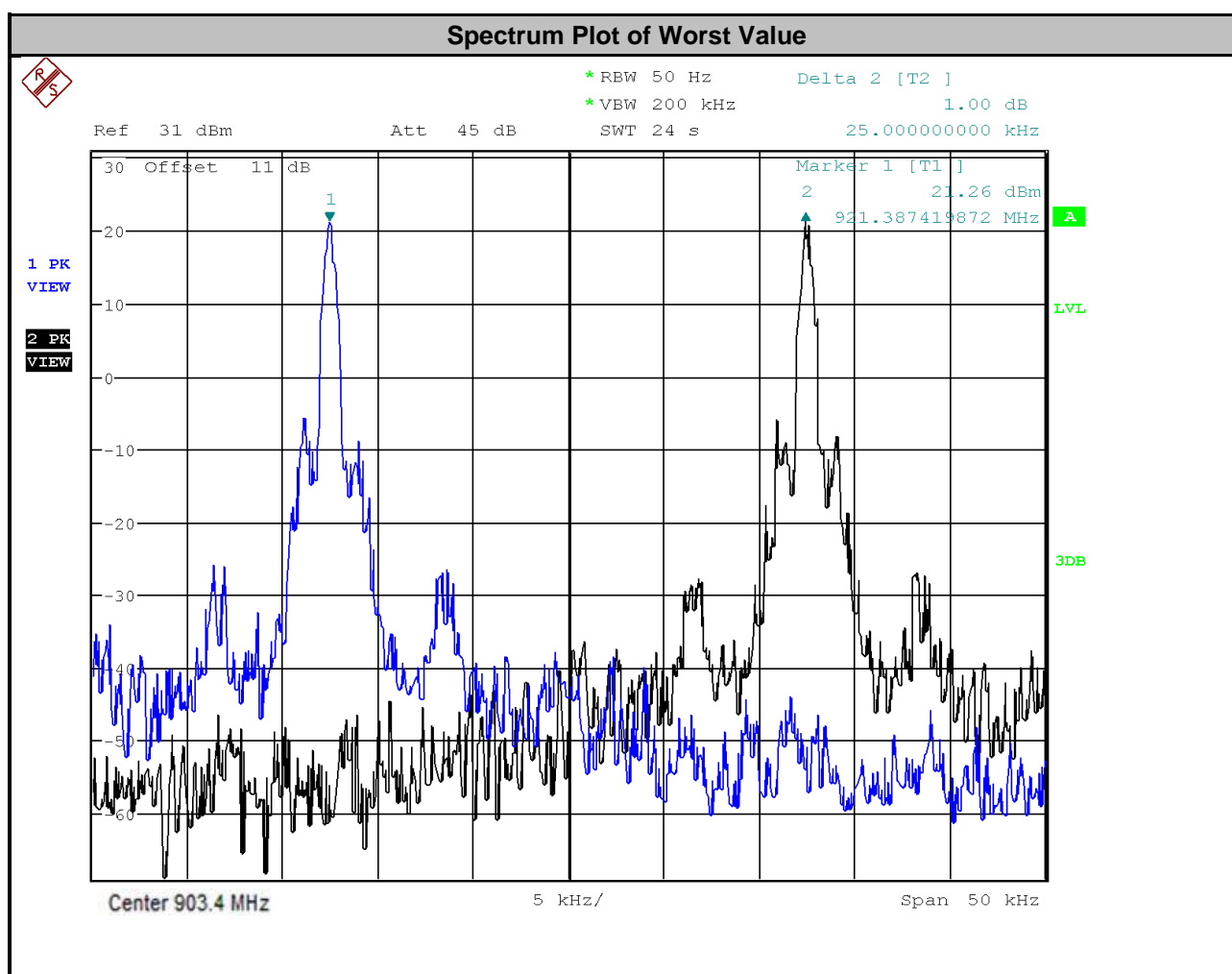
- Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range.
- By using the MaxHold function record 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 (MHz)	20 dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
0	902.1375	0.025	0.01	0.025	Pass
26	903.3875	0.025	0.01	0.025	Pass
53	904.6625	0.025	0.01	0.025	Pass

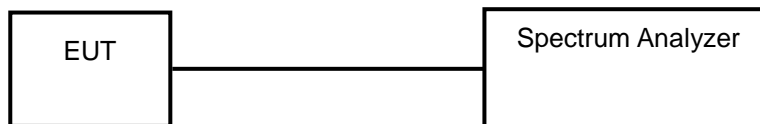


4.7 Maximum Output Power

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

- 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.
- The center frequency of the spectrum analyzer is set to the fundamental frequency and using 3 MHz RBW and 10 MHz VBW.
- Measure the captured power within the band and recording the plot.
- Repeat above procedures until all frequencies required were complete.

4.7.5 Deviation from Test Standard

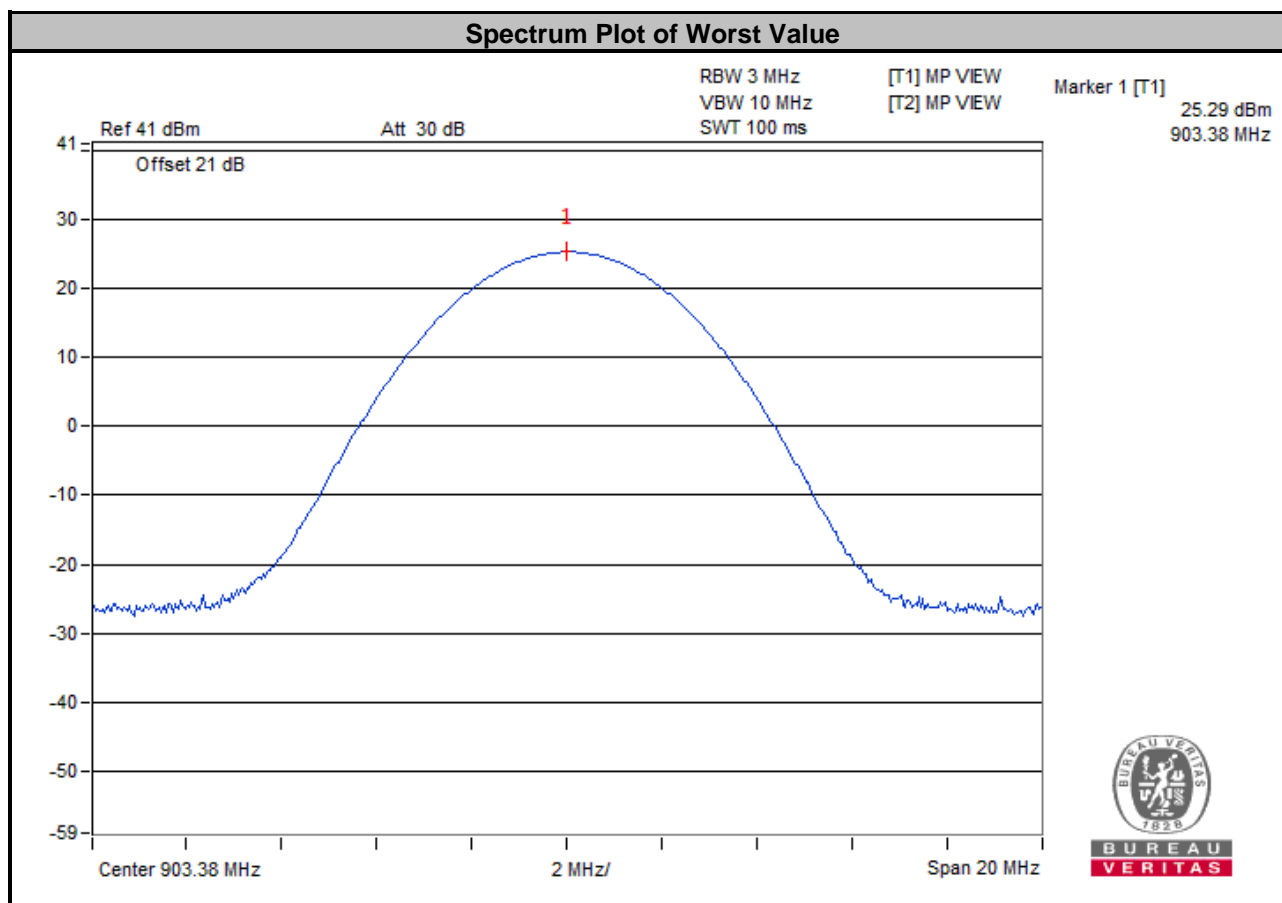
No deviation.

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
0	902.1375	334.195	25.24	30	PASS
26	903.3875	338.065	25.29	30	PASS
53	904.6625	334.195	25.24	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.

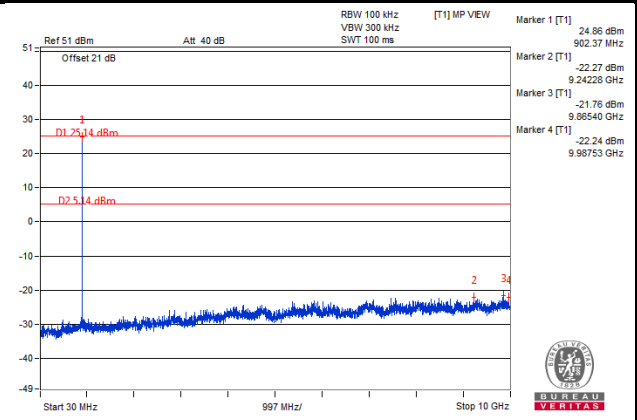
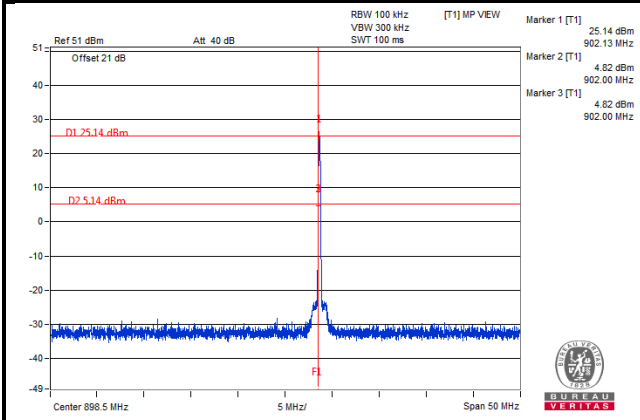
4.8.5 EUT Operating Condition

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

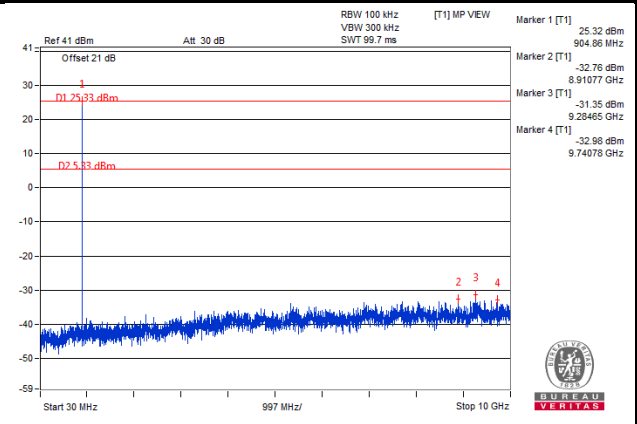
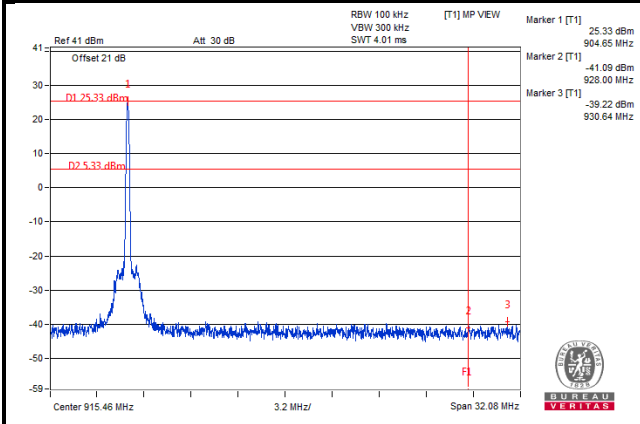
4.8.6 Test Results

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.

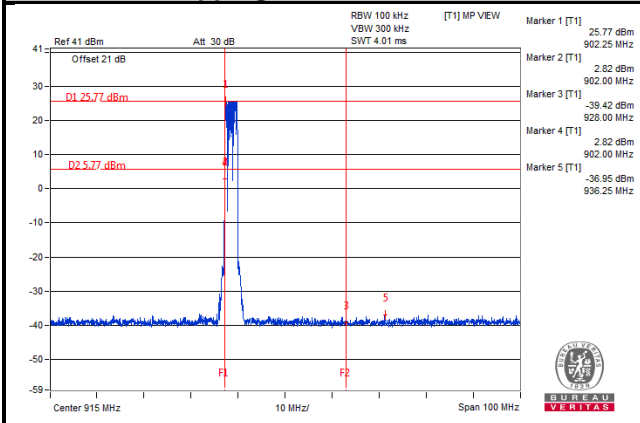
Hopping Disabled_Low Channel



Hopping Disabled_High Channel



Hopping Enabled Channel



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 FCC recognized accredited test firms and accredited 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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