FCC Test Report

Report No.:	RF180718D12-4
FCC ID:	PPQ-HUB01
Test Model:	HUB01
Received Date:	July 18, 2018
Test Date:	Aug. 05 to Sep. 12, 2018
Issued Date:	Oct. 26, 2018
Applicant:	LITE-ON Technology Corp.
Address:	Bldg. C, 90, Chien 1 Rd., Chung-Ho,New Taipei City,23585,Taiwan
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Hsin Chu Laboratory
Lab Address:	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan R.O.C.
Test Location:	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan R.O.C.
FCC Registration / Designation Number:	723255 / TW2022

Testing Laboratory
2022

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 9
3.2.1 Test Mode Applicability and Tested Channel Detail 10
3.3 Duty Cycle of Test Signal 12
3.4 Description of Support Units 13
3.4.1 Configuration of System under Test 13
3.5 General Description of Applied Standards 14

4 Test Types and Results 15

4.1 Radiated Emission and Bandedge Measurement 15
4.1.1 Limits of Radiated Emission and Bandedge Measurement 15
4.1.2 Test Instruments 16
4.1.3 Test Procedures 18
4.1.4 Deviation from Test Standard 18
4.1.5 Test Setup 19
4.1.6 EUT Operating Conditions 20
4.1.7 Test Results 21
4.2 Conducted Emission Measurement 35
4.2.1 Limits of Conducted Emission Measurement 35
4.2.2 Test Instruments 35
4.2.3 Test Procedures 36
4.2.4 Deviation from Test Standard 36
4.2.5 Test Setup 36
4.2.6 EUT Operating Conditions 36
4.2.7 Test Results 37
4.3 6dB Bandwidth Measurement 39
4.3.1 Limits of 6dB Bandwidth Measurement 39
4.3.2 Test Setup 39
4.3.3 Test Instruments 39
4.3.4 Test Procedure 39
4.3.5 Deviation fromTest Standard 39
4.3.6 EUT Operating Conditions 39
4.3.7 Test Result 40
4.4 Conducted Output Power Measurement 42
4.4.1 Limits of Conducted Output Power Measurement 42
4.4.2 Test Setup 42
4.4.3 Test Instruments 42
4.4.4 Test Procedures 42
4.4.5 Deviation from Test Standard 42
4.4.6 EUT Operating Conditions 42
4.4.7 Test Results 43
4.5 Power Spectral Density Measurement 45
4.5.1 Limits of Power Spectral Density Measurement 45
4.5.2 Test Setup 45
4.5.3 Test Instruments 45
4.5.4 Test Procedure 45
4.5.5 Deviation from Test Standard 45
4.5.6 EUT Operating Condition 45

4.5.7 Test Results 46
4.6 Conducted Out of Band Emission Measurement 48
4.6.1 Limits of Conducted Out of Band Emission Measurement 48
4.6.2 Test Setup 48
4.6.3 Test Instruments 48
4.6.4 Test Procedure 48
4.6.5 Deviation from Test Standard 48
4.6.6 EUT Operating Condition 48
4.6.7 Test Results 48
5 Pictures of Test Arrangements 53
Appendix – Information on the Testing Laboratories 54

Release Control Record

Issue No.	Description	Date Issued
RF180718D12-4	Original release.	Oct. 26, 2018

1 Certificate of Conformity

Product:	Norman Hub
Brand:	NORMAN®
Test Model:	HUB01
Sample Status:	ENGINEERING SAMPLE
Applicant:	LITE-ON Technology Corp.
Test Date:	Aug. 05 to Sep. 12, 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 EMC characteristics under the conditions specified in this report.

Prepared by : _____ , **Date:** Oct. 26, 2018

Claire Kuan / Specialist

Approved by : _____ , **Date:** Oct. 26, 2018

May Chen / 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 -3.09dB at 0.42988MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -0.1dB at 4824.00MHz & 4924.00MHz.
15.247(d)	Antenna Port Emission	PASS	Meet the requirement of limit.
15.247(a)(2)	6dB bandwidth	PASS	Meet the requirement of limit.
15.247(b)	Conducted power	PASS	Meet the requirement of limit.
15.247(e)	Power Spectral Density	PASS	Meet the requirement of limit.
15.203	Antenna Requirement	PASS	No antenna connector is used.

2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	1.84 dB
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	5.33 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	5.10 dB
	6GHz ~ 18GHz	4.85 dB
	18GHz ~ 40GHz	5.24 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Norman Hub
Brand	NORMAN®
Test Model	HUB01
Status of EUT	ENGINEERING SAMPLE
Power Supply Rating	5Vdc from power adapter
Modulation Type	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
Modulation Technology	DSSS,OFDM
Transfer Rate	802.11b: up to 11Mbps 802.11g: up to 54Mbps 802.11n: up to 150Mbps
Operating Frequency	2.412 ~ 2.462GHz
Number of Channel	802.11b, 802.11g, 802.11n (HT20): 11 802.11n (HT40): 7
Output Power	232.809mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	Adapter x 1
Data Cable Supplied	USB Cable x 1 (Shielded, 1.0m) RJ45 Cable x 1 (UnShielded, 1.0m)

Note:

1. Simultaneously transmission condition.

Condition	Technology	
1	WLAN 2.4GHz	GFSK
Note: The emission of the simultaneous operation has been evaluated and no non-compliance was found.		

2. The EUT could be supplied with a power adapter as the following table:

No.	Brand	Model No.	Spec.	Plug
1	Shenzhen Keyu Power Supply Technology Co., Ltd.	KA0601A-0501000BSU	Input: 100-240V, 50/60Hz, 0.2A Max Output: 5V, 1000mA DC output cable: Unshielded, 1.0m	UK
2	Shenzhen Keyu Power Supply Technology Co., Ltd.	KA0601A-0501000EUU	Input: 100-240V, 50/60Hz, 0.2A Max Output: 5V, 1000mA DC output cable: Unshielded, 1.0m	EU
3	Shenzhen Keyu Power Supply Technology Co., Ltd.	KA0601A-0501000USU	Input: 100-240V, 50/60Hz, 0.2A Max Output: 5V, 1000mA DC output cable: Unshielded, 1.0m	FCC

Note:
1. The adapter 1, 2 is as same as adapter 3; except for plug shape is different.
2. From the above adapters, Adapter 3 was selected as representative adapter for the test and its data was recorded in this report.

3. The antenna provided to the EUT, please refer to the following table:

Brand	Model	Antenna Gain (dBi)	Frequency range(GHz)	Antenna Type	Connecter Type
Unictron	AA055A	2.5	2.4-2.4835	Chip Antenna	NA

4. The EUT incorporates a SISO function.

MODULATION MODE	DATA RATE (MCS)	TX & RX CONFIGURATION	
802.11b	1 ~ 11Mbps	1TX	1RX
802.11g	6 ~ 54Mbps	1TX	1RX
802.11n (HT20)	MCS 0~7	1TX	1RX
802.11n (HT40)	MCS 0~7	1TX	1RX

5. 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

11 channels are provided for 802.11b, 802.11g and 802.11n (HT20):

Channel	Frequency	Channel	Frequency
1	2412MHz	7	2442MHz
2	2417MHz	8	2447MHz
3	2422MHz	9	2452MHz
4	2427MHz	10	2457MHz
5	2432MHz	11	2462MHz
6	2437MHz		

7 channels are provided for 802.11n (HT40):

Channel	Frequency	Channel	Frequency
3	2422MHz	7	2442MHz
4	2427MHz	8	2447MHz
5	2432MHz	9	2452MHz
6	2437MHz		

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable To				Description
	RE≥1G	RE<1G	PLC	APCM	
-	√	√	√	√	-

Where **RE≥1G:** Radiated Emission above 1GHz & Bandedge Measurement **RE<1G:** Radiated Emission below 1GHz

PLC: Power Line Conducted Emission **APCM:** Antenna Port Conducted Measurement

NOTE: The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **X-plane for below 1GHz & Z-plane for above 1GHz**.

Radiated Emission Test (Above 1GHz):

☒ 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.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1
802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6
802.11n (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	6.5
802.11n (HT40)	3 to 9	3, 6, 9	OFDM	BPSK	13.5

Radiated Emission Test (Below 1GHz):

☒ 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.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11b	1 to 11	11	DSSS	DBPSK	1

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.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11b	1 to 11	11	DSSS	DBPSK	1

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.

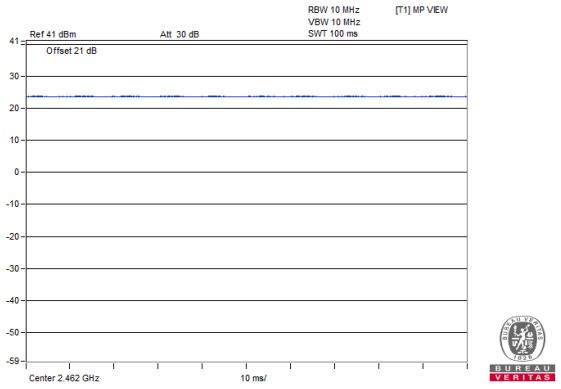
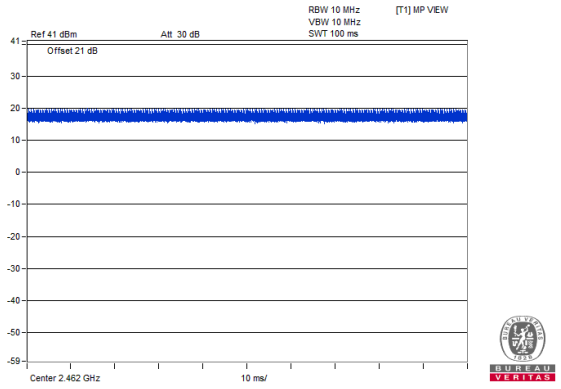
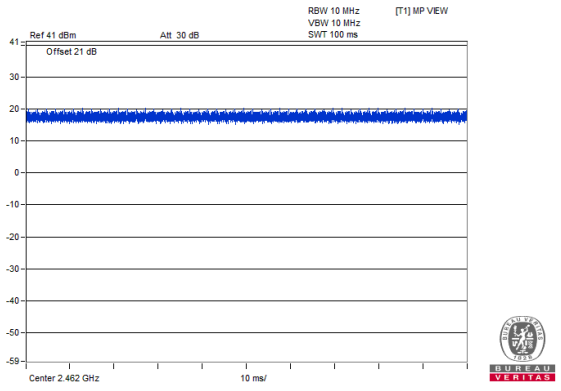
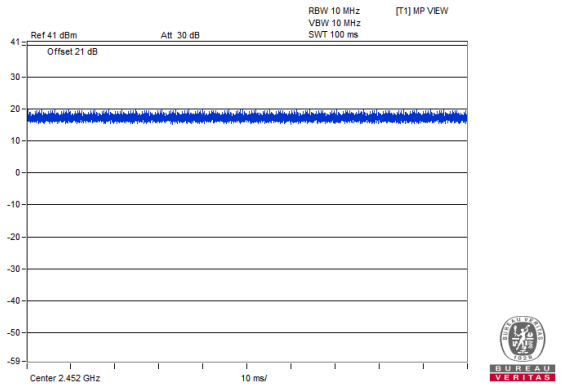
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1
802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6
802.11n (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	6.5
802.11n (HT40)	3 to 9	3, 6, 9	OFDM	BPSK	13.5

Test Condition:

Applicable To	Environmental Conditions	Input Power	Tested By
RE≥1G	23deg. C, 69%RH	120Vac, 60Hz	Steven Chiang
RE<1G	22deg. C, 65%RH	120Vac, 60Hz	Steven Chiang
PLC	23deg. C, 74%RH	120Vac, 60Hz	Andy Ho
APCM	25deg. C, 60%RH	120Vac, 60Hz	Jyunchun Lin

3.3 Duty Cycle of Test Signal

Duty cycle of test signal is 100 %, duty factor is not required.

802.11b	802.11g
	
802.11n (HT20)	**802.11n (HT40)**
	

3.4 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.

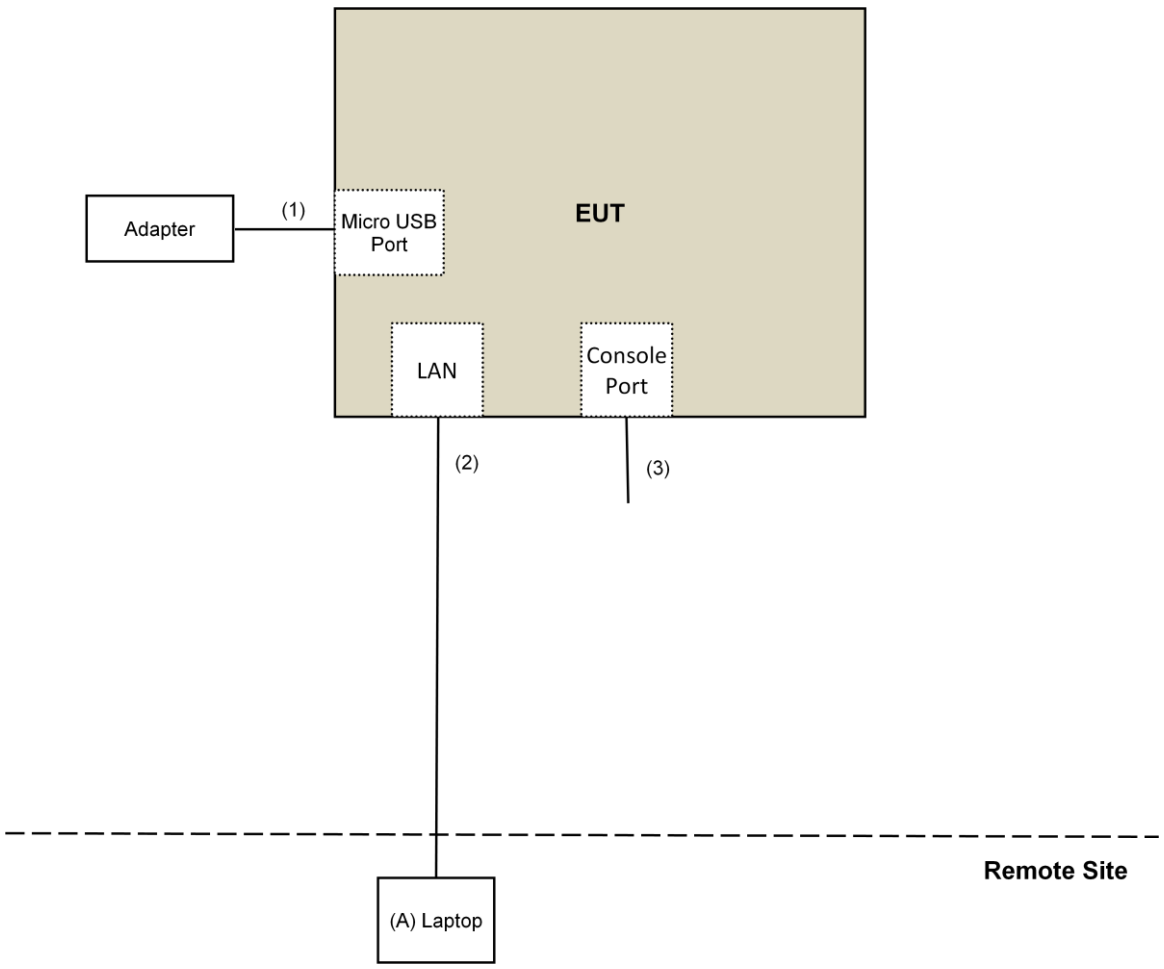
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Laptop	DELL	E6420	B92T3R1	FCC DoC	Provided by Lab

Note:

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

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	USB Cable	1	1	Yes	0	Supplied by client
2.	RJ-45 Cable	1	10	No	0	Provided by Lab
3.	Console Cable	1	1.5	No	0	Provided by Lab

3.4.1 Configuration of System under Test



3.5 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)
KDB 558074 D01 15.247 Meas Guidance v05
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 30dB 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 1000MHz, 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 20dB under any condition of modulation.

4.1.2 Test Instruments

For below 1GHz test:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Keysight	N9038A	MY54450088	July 05, 2018	July 04, 2019
Pre-Amplifier EMCI	EMC001340	980142	Feb. 09, 2018	Feb. 08, 2019
Loop Antenna(*) Electro-Metrics	EM-6879	264	Dec. 16, 2016	Dec. 15, 2018
RF Cable	NA	LOOPCAB-001	Jan. 15, 2018	Jan. 14, 2019
RF Cable	NA	LOOPCAB-002	Jan. 15, 2018	Jan. 14, 2019
Pre-Amplifier Mini-Circuits	ZFL-1000VH2B	AMP-ZFL-01	Nov. 09, 2017	Nov. 08, 2018
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-406	Nov. 29, 2017	Nov. 28, 2018
RF Cable	8D	966-4-1	Mar. 21, 2018	Mar. 20, 2019
RF Cable	8D	966-4-2	Mar. 21, 2018	Mar. 20, 2019
RF Cable	8D	966-4-3	Mar. 21, 2018	Mar. 20, 2019
Fixed attenuator Mini-Circuits	UNAT-5+	PAD-3m-4-01	Oct. 03, 2017	Oct. 02, 2018
Software	ADT_Radiated_V8.7.08	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 calibration interval of the above test instruments is 24 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. The test was performed in 966 Chamber No. 4.
4. The CANADA Site Registration No. is 20331-2
5. Loop antenna was used for all emissions below 30 MHz.
6. Tested Date: Sep. 07, 2018

For above 1GHz test:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Keysight	N9038A	MY54450088	July 05, 2018	July 04, 2019
Horn_Antenna SCHWARZBECK	BBHA 9120D	9120D-783	Dec. 12, 2017	Dec. 11, 2018
Pre-Amplifier Mini-Circuits	ZVA-183-S+	AMP-ZVA-03	May 10, 2018	May 09, 2019
RF Cable	EMC104-SM-SM-1200	160923	Jan. 29, 2018	Jan. 28, 2019
RF Cable	EMC104-SM-SM-2000	150318	Jan. 29, 2018	Jan. 28, 2019
RF Cable	EMC104-SM-SM-5000	150321	Jan. 29, 2018	Jan. 28, 2019
Pre-Amplifier EMCI	EMC184045SE	980387	Jan. 29, 2018	Jan. 28, 2019
Horn_Antenna SCHWARZBECK	BBHA 9170	BBHA9170608	Dec. 14, 2017	Dec. 13, 2018
RF Cable	EMC102-KM-KM-1200	160925	Jan. 29, 2018	Jan. 28, 2019
Software	ADT_Radiated_V8.7.08	NA	NA	NA
Boresight Antenna Tower & Turn Table Max-Full	MF-7802BS	MF780208530	NA	NA
Spectrum Analyzer R&S	FSV40	100964	June 20, 2018	June 19, 2019
Power meter Anritsu	ML2495A	1014008	May 09, 2018	May 08, 2019
Power sensor Anritsu	MA2411B	0917122	May 09, 2018	May 08, 2019

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 966 Chamber No. 4.
3. The CANADA Site Registration No. is 20331-2
4. Tested Date: Sep. 07, 2018

4.1.3 Test Procedures

For Radiated emission below 30MHz

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. 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 9kHz at frequency below 30MHz.

For Radiated emission above 30MHz

a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) 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 detects 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:

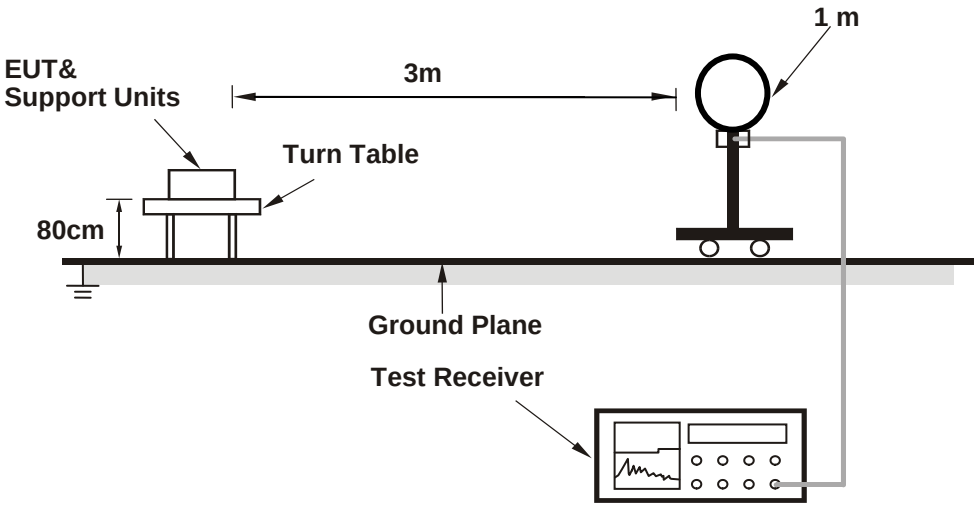
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

4.1.4 Deviation from Test Standard

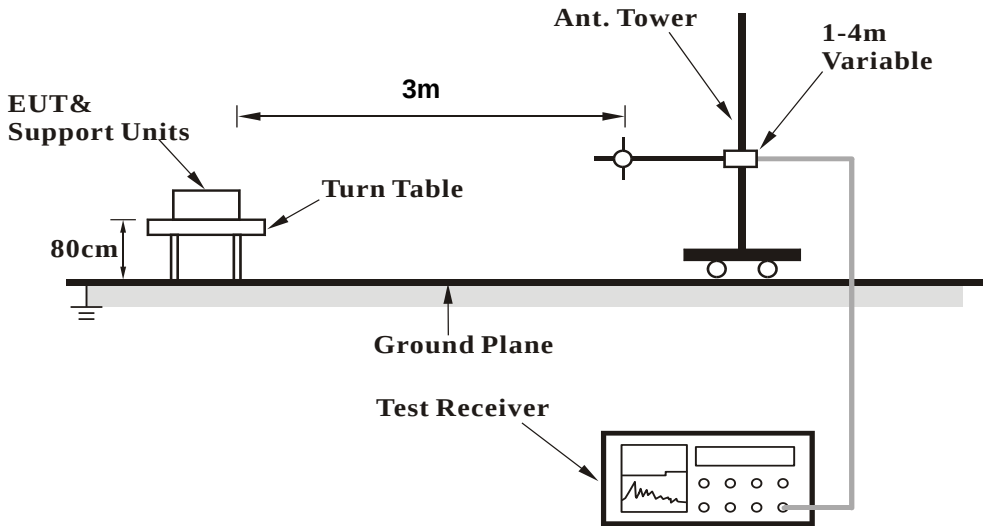
No deviation.

4.1.5 Test Setup

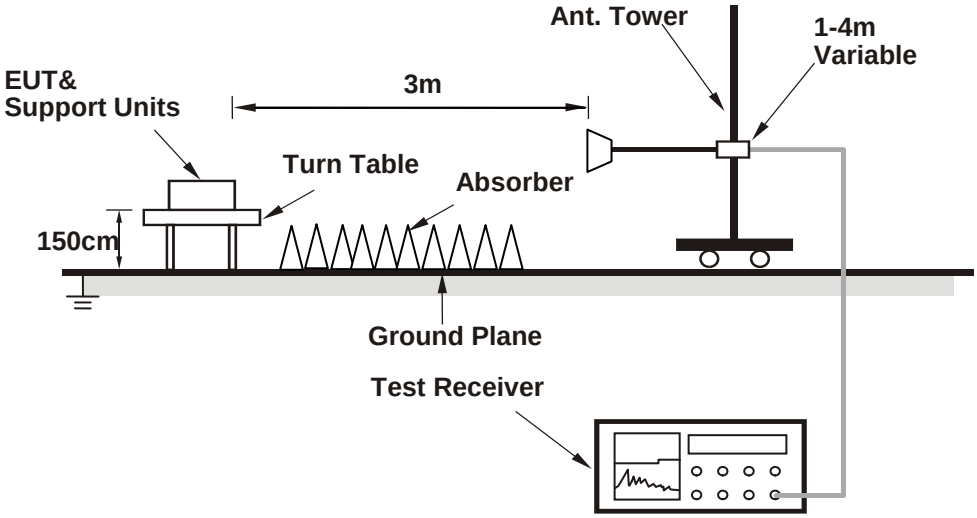
For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



For Radiated emission above 1GHz



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

4.1.6 EUT Operating Conditions

a. Placed the EUT on the testing table.
b. Controlling software (Console Port use “Test command”) has been activated to set the EUT on specific status.

4.1.7 Test Results

Above 1GHz Data：

802.11b

CHANNEL	TX Channel 1	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	57.6 PK	74.0	-16.4	2.40 H	292	59.8	-2.2
2	2390.00	44.2 AV	54.0	-9.8	2.40 H	292	46.4	-2.2
3	*2412.00	101.8 PK			2.40 H	292	104.2	-2.4
4	*2412.00	99.5 AV			2.40 H	292	101.9	-2.4
5	4824.00	50.6 PK	74.0	-23.4	2.22 H	320	48.8	1.8
6	4824.00	48.6 AV	54.0	-5.4	2.22 H	320	46.8	1.8
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	58.2 PK	74.0	-15.8	1.24 V	64	60.4	-2.2
2	2390.00	46.1 AV	54.0	-7.9	1.24 V	64	48.3	-2.2
3	*2412.00	102.4 PK			1.24 V	64	104.8	-2.4
4	*2412.00	100.5 AV			1.24 V	64	102.9	-2.4
5	4824.00	54.9 PK	74.0	-19.1	2.51 V	321	53.1	1.8
6	**4824.00**	**53.9 AV**	**54.0**	**-0.1**	**2.51 V**	**321**	**52.1**	**1.8**

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

CHANNEL	TX Channel 6	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2437.00	101.9 PK			2.57 H	281	104.5	-2.6
2	*2437.00	99.3 AV			2.57 H	281	101.9	-2.6
3	4874.00	50.8 PK	74.0	-23.2	2.13 H	314	48.8	2.0
4	4874.00	48.9 AV	54.0	-5.1	2.13 H	314	46.9	2.0
5	7311.00	50.3 PK	74.0	-23.7	1.45 H	29	41.9	8.4
6	7311.00	43.2 AV	54.0	-10.8	1.45 H	29	34.8	8.4
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2437.00	103.3 PK			1.54 V	171	105.9	-2.6
2	*2437.00	101.0 AV			1.54 V	171	103.6	-2.6
3	4874.00	54.9 PK	74.0	-19.1	2.48 V	310	52.9	2.0
4	4874.00	53.8 AV	54.0	-0.2	2.48 V	310	51.8	2.0
5	7311.00	45.4 PK	74.0	-28.6	1.54 V	254	37.0	8.4
6	7311.00	36.6 AV	54.0	-17.4	1.54 V	254	28.2	8.4

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

CHANNEL	TX Channel 11	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	102.5 PK			2.60 H	293	105.1	-2.6
2	*2462.00	99.7 AV			2.60 H	293	102.3	-2.6
3	2483.50	56.8 PK	74.0	-17.2	2.60 H	293	59.2	-2.4
4	2483.50	46.1 AV	54.0	-7.9	2.60 H	293	48.5	-2.4
5	4924.00	50.8 PK	74.0	-23.2	2.17 H	318	48.8	2.0
6	4924.00	48.9 AV	54.0	-5.1	2.17 H	318	46.9	2.0
7	7386.00	50.2 PK	74.0	-23.8	1.45 H	15	41.6	8.6
8	7386.00	42.9 AV	54.0	-11.1	1.45 H	15	34.3	8.6
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	103.3 PK			1.49 V	173	105.9	-2.6
2	*2462.00	101.2 AV			1.49 V	173	103.8	-2.6
3	2483.50	57.8 PK	74.0	-16.2	1.49 V	173	60.2	-2.4
4	2483.50	48.2 AV	54.0	-5.8	1.49 V	173	50.6	-2.4
5	4924.00	54.9 PK	74.0	-19.1	2.52 V	322	52.9	2.0
6	**4924.00**	**53.9 AV**	**54.0**	**-0.1**	**2.52 V**	**322**	**51.9**	**2.0**
7	7386.00	45.7 PK	74.0	-28.3	1.58 V	263	37.1	8.6
8	7386.00	36.8 AV	54.0	-17.2	1.58 V	263	28.2	8.6

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

802.11g

CHANNEL	TX Channel 1	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	63.9 PK	74.0	-10.1	2.39 H	291	66.1	-2.2
2	2390.00	45.7 AV	54.0	-8.3	2.39 H	291	47.9	-2.2
3	*2412.00	96.2 PK			2.39 H	291	98.6	-2.4
4	*2412.00	88.2 AV			2.39 H	291	90.6	-2.4
5	4824.00	45.0 PK	74.0	-29.0	2.22 H	293	43.2	1.8
6	4824.00	34.0 AV	54.0	-20.0	2.22 H	293	32.2	1.8
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	65.8 PK	74.0	-8.2	1.50 V	172	68.0	-2.2
2	2390.00	47.9 AV	54.0	-6.1	1.50 V	172	50.1	-2.2
3	*2412.00	98.5 PK			1.50 V	172	100.9	-2.4
4	*2412.00	90.0 AV			1.50 V	172	92.4	-2.4
5	4824.00	47.6 PK	74.0	-26.4	1.55 V	221	45.8	1.8
6	4824.00	36.7 AV	54.0	-17.3	1.55 V	221	34.9	1.8

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

CHANNEL	TX Channel 6	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	57.1 PK	74.0	-16.9	2.36 H	307	59.3	-2.2
2	2390.00	44.5 AV	54.0	-9.5	2.36 H	307	46.7	-2.2
3	*2437.00	97.8 PK			2.36 H	307	100.4	-2.6
4	*2437.00	88.6 AV			2.36 H	307	91.2	-2.6
5	2483.50	62.3 PK	74.0	-11.7	2.36 H	307	64.7	-2.4
6	2483.50	46.2 AV	54.0	-7.8	2.36 H	307	48.6	-2.4
7	4874.00	44.9 PK	74.0	-29.1	2.21 H	307	42.9	2.0
8	4874.00	33.8 AV	54.0	-20.2	2.21 H	307	31.8	2.0
9	7311.00	42.0 PK	74.0	-32.0	1.45 H	11	33.6	8.4
10	7311.00	32.5 AV	54.0	-21.5	1.45 H	11	24.1	8.4
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	58.9 PK	74.0	-15.1	1.49 V	173	61.1	-2.2
2	2390.00	46.1 AV	54.0	-7.9	1.49 V	173	48.3	-2.2
3	*2437.00	99.7 PK			1.49 V	173	102.3	-2.6
4	*2437.00	90.5 AV			1.49 V	173	93.1	-2.6
5	2483.50	63.1 PK	74.0	-10.9	1.49 V	173	65.5	-2.4
6	2483.50	48.3 AV	54.0	-5.7	1.49 V	173	50.7	-2.4
7	4874.00	47.7 PK	74.0	-26.3	1.53 V	235	45.7	2.0
8	4874.00	36.8 AV	54.0	-17.2	1.53 V	235	34.8	2.0
9	7311.00	43.5 PK	74.0	-30.5	1.23 V	345	35.1	8.4
10	7311.00	34.0 AV	54.0	-20.0	1.23 V	345	25.6	8.4

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

CHANNEL	TX Channel 11	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	99.7 PK			2.38 H	303	102.3	-2.6
2	*2462.00	90.1 AV			2.38 H	303	92.7	-2.6
3	2483.50	68.6 PK	74.0	-5.4	2.38 H	303	71.0	-2.4
4	2483.50	51.8 AV	54.0	-2.2	2.38 H	303	54.2	-2.4
5	4924.00	44.9 PK	74.0	-29.1	2.18 H	321	42.9	2.0
6	4924.00	33.9 AV	54.0	-20.1	2.18 H	321	31.9	2.0
7	7386.00	42.2 PK	74.0	-31.8	1.47 H	11	33.6	8.6
8	7386.00	32.7 AV	54.0	-21.3	1.47 H	11	24.1	8.6
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	101.5 PK			1.39 V	171	104.1	-2.6
2	*2462.00	91.9 AV			1.39 V	171	94.5	-2.6
3	2483.50	70.4 PK	74.0	-3.6	1.39 V	171	72.8	-2.4
4	2483.50	53.5 AV	54.0	-0.5	1.39 V	171	55.9	-2.4
5	4924.00	47.3 PK	74.0	-26.7	1.55 V	229	45.3	2.0
6	4924.00	36.4 AV	54.0	-17.6	1.55 V	229	34.4	2.0
7	7386.00	43.4 PK	74.0	-30.6	1.24 V	331	34.8	8.6
8	7386.00	33.9 AV	54.0	-20.1	1.24 V	331	25.3	8.6

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

802.11n (HT20)

CHANNEL	TX Channel 1	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	63.8 PK	74.0	-10.2	2.39 H	294	66.0	-2.2
2	2390.00	45.2 AV	54.0	-8.8	2.39 H	294	47.4	-2.2
3	*2412.00	96.5 PK			2.39 H	294	98.9	-2.4
4	*2412.00	87.4 AV			2.39 H	294	89.8	-2.4
5	4824.00	45.2 PK	74.0	-28.8	2.22 H	295	43.4	1.8
6	4824.00	34.2 AV	54.0	-19.8	2.22 H	295	32.4	1.8
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	66.0 PK	74.0	-8.0	1.45 V	172	68.2	-2.2
2	2390.00	47.8 AV	54.0	-6.2	1.45 V	172	50.0	-2.2
3	*2412.00	98.7 PK			1.45 V	172	101.1	-2.4
4	*2412.00	89.7 AV			1.45 V	172	92.1	-2.4
5	4824.00	48.4 PK	74.0	-25.6	1.50 V	220	46.6	1.8
6	4824.00	37.2 AV	54.0	-16.8	1.50 V	220	35.4	1.8

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

CHANNEL	TX Channel 6	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	57.7 PK	74.0	-16.3	2.45 H	292	59.9	-2.2
2	2390.00	45.2 AV	54.0	-8.8	2.45 H	292	47.4	-2.2
3	*2437.00	97.9 PK			2.45 H	292	100.5	-2.6
4	*2437.00	88.7 AV			2.45 H	292	91.3	-2.6
5	2483.50	60.5 PK	74.0	-13.5	2.45 H	292	62.9	-2.4
6	2483.50	45.8 AV	54.0	-8.2	2.45 H	292	48.2	-2.4
7	4874.00	44.4 PK	74.0	-29.6	2.23 H	298	42.4	2.0
8	4874.00	33.6 AV	54.0	-20.4	2.23 H	298	31.6	2.0
9	7311.00	41.7 PK	74.0	-32.3	1.50 H	12	33.3	8.4
10	7311.00	32.0 AV	54.0	-22.0	1.50 H	12	23.6	8.4
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	59.5 PK	74.0	-14.5	1.45 V	172	61.7	-2.2
2	2390.00	47.0 AV	54.0	-7.0	1.45 V	172	49.2	-2.2
3	*2437.00	99.8 PK			1.45 V	172	102.4	-2.6
4	*2437.00	90.6 AV			1.45 V	172	93.2	-2.6
5	2483.50	62.8 PK	74.0	-11.2	1.45 V	172	65.2	-2.4
6	2483.50	48.1 AV	54.0	-5.9	1.45 V	172	50.5	-2.4
7	4874.00	48.1 PK	74.0	-25.9	1.59 V	246	46.1	2.0
8	4874.00	37.3 AV	54.0	-16.7	1.59 V	246	35.3	2.0
9	7311.00	43.2 PK	74.0	-30.8	1.21 V	354	34.8	8.4
10	7311.00	33.6 AV	54.0	-20.4	1.21 V	354	25.2	8.4

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

CHANNEL	TX Channel 11	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	99.1 PK			2.34 H	290	101.7	-2.6
2	*2462.00	89.6 AV			2.34 H	290	92.2	-2.6
3	2483.50	68.9 PK	74.0	-5.1	2.34 H	290	71.3	-2.4
4	2483.50	51.6 AV	54.0	-2.4	2.34 H	290	54.0	-2.4
5	4924.00	44.8 PK	74.0	-29.2	2.23 H	309	42.8	2.0
6	4924.00	33.4 AV	54.0	-20.6	2.23 H	309	31.4	2.0
7	7386.00	41.7 PK	74.0	-32.3	1.46 H	8	33.1	8.6
8	7386.00	32.1 AV	54.0	-21.9	1.46 H	8	23.5	8.6
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	101.3 PK			1.42 V	171	103.9	-2.6
2	*2462.00	92.0 AV			1.42 V	171	94.6	-2.6
3	2483.50	70.6 PK	74.0	-3.4	1.42 V	171	73.0	-2.4
4	2483.50	53.5 AV	54.0	-0.5	1.42 V	171	55.9	-2.4
5	4924.00	47.4 PK	74.0	-26.6	1.47 V	245	45.4	2.0
6	4924.00	36.7 AV	54.0	-17.3	1.47 V	245	34.7	2.0
7	7386.00	43.8 PK	74.0	-30.2	1.26 V	349	35.2	8.6
8	7386.00	34.3 AV	54.0	-19.7	1.26 V	349	25.7	8.6

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

802.11n (HT40)

CHANNEL	TX Channel 3	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	63.9 PK	74.0	-10.1	2.45 H	289	66.1	-2.2
2	2390.00	49.3 AV	54.0	-4.7	2.45 H	289	51.5	-2.2
3	*2422.00	96.6 PK			2.45 H	289	99.1	-2.5
4	*2422.00	86.8 AV			2.45 H	289	89.3	-2.5
5	4844.00	44.9 PK	74.0	-29.1	2.19 H	300	43.1	1.8
6	4844.00	33.7 AV	54.0	-20.3	2.19 H	300	31.9	1.8
7	7266.00	42.8 PK	74.0	-31.2	1.41 H	2	34.6	8.2
8	7266.00	33.0 AV	54.0	-21.0	1.41 H	2	24.8	8.2
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	65.6 PK	74.0	-8.4	1.22 V	57	67.8	-2.2
2	2390.00	51.0 AV	54.0	-3.0	1.22 V	57	53.2	-2.2
3	*2422.00	98.6 PK			1.22 V	57	101.1	-2.5
4	*2422.00	88.9 AV			1.22 V	57	91.4	-2.5
5	4844.00	47.0 PK	74.0	-27.0	1.53 V	247	45.2	1.8
6	4844.00	36.3 AV	54.0	-17.7	1.53 V	247	34.5	1.8
7	7266.00	43.6 PK	74.0	-30.4	1.27 V	331	35.4	8.2
8	7266.00	34.2 AV	54.0	-19.8	1.27 V	331	26.0	8.2

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

CHANNEL	TX Channel 6	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	57.8 PK	74.0	-16.2	2.42 H	298	60.0	-2.2
2	2390.00	44.6 AV	54.0	-9.4	2.42 H	298	46.8	-2.2
3	*2437.00	96.7 PK			2.42 H	298	99.3	-2.6
4	*2437.00	86.8 AV			2.42 H	298	89.4	-2.6
5	2483.50	61.5 PK	74.0	-12.5	2.42 H	298	63.9	-2.4
6	2483.50	46.7 AV	54.0	-7.3	2.42 H	298	49.1	-2.4
7	4874.00	45.1 PK	74.0	-28.9	2.19 H	295	43.1	2.0
8	4874.00	33.9 AV	54.0	-20.1	2.19 H	295	31.9	2.0
9	7311.00	41.8 PK	74.0	-32.2	1.43 H	24	33.4	8.4
10	7311.00	32.3 AV	54.0	-21.7	1.43 H	24	23.9	8.4
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	59.3 PK	74.0	-14.7	1.29 V	53	61.5	-2.2
2	2390.00	46.5 AV	54.0	-7.5	1.29 V	53	48.7	-2.2
3	*2437.00	98.9 PK			1.29 V	53	101.5	-2.6
4	*2437.00	88.8 AV			1.29 V	53	91.4	-2.6
5	2483.50	63.2 PK	74.0	-10.8	1.29 V	53	65.6	-2.4
6	2483.50	48.6 AV	54.0	-5.4	1.29 V	53	51.0	-2.4
7	4874.00	47.4 PK	74.0	-26.6	1.55 V	244	45.4	2.0
8	4874.00	36.7 AV	54.0	-17.3	1.55 V	244	34.7	2.0
9	7311.00	43.4 PK	74.0	-30.6	1.19 V	344	35.0	8.4
10	7311.00	33.8 AV	54.0	-20.2	1.19 V	344	25.4	8.4

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

CHANNEL	TX Channel 9	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2452.00	97.0 PK			2.41 H	277	99.6	-2.6
2	*2452.00	86.9 AV			2.41 H	277	89.5	-2.6
3	2483.50	67.9 PK	74.0	-6.1	2.41 H	277	70.3	-2.4
4	2483.50	51.8 AV	54.0	-2.2	2.41 H	277	54.2	-2.4
5	4904.00	45.0 PK	74.0	-29.0	2.19 H	289	43.0	2.0
6	4904.00	34.0 AV	54.0	-20.0	2.19 H	289	32.0	2.0
7	7356.00	42.7 PK	74.0	-31.3	1.47 H	18	34.1	8.6
8	7356.00	33.0 AV	54.0	-21.0	1.47 H	18	24.4	8.6
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2452.00	98.8 PK			1.02 V	53	101.4	-2.6
2	*2452.00	88.6 AV			1.02 V	53	91.2	-2.6
3	2483.50	69.7 PK	74.0	-4.3	1.02 V	53	72.1	-2.4
4	2483.50	53.5 AV	54.0	-0.5	1.02 V	53	55.9	-2.4
5	4904.00	46.9 PK	74.0	-27.1	1.56 V	226	44.9	2.0
6	4904.00	36.3 AV	54.0	-17.7	1.56 V	226	34.3	2.0
7	7356.00	43.5 PK	74.0	-30.5	1.20 V	350	34.9	8.6
8	7356.00	34.0 AV	54.0	-20.0	1.20 V	350	25.4	8.6

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

Below 1GHz Data:

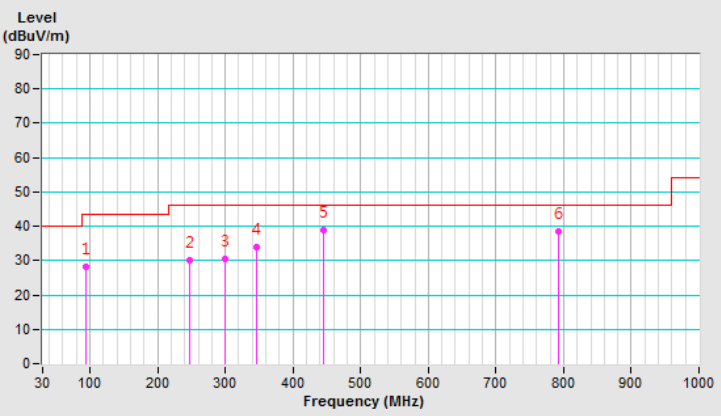
802.11b

CHANNEL	TX Channel 11	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	94.38	28.3 QP	43.5	-15.2	2.00 H	90	41.5	-13.2
2	247.50	30.0 QP	46.0	-16.0	1.00 H	36	38.9	-8.9
3	300.00	30.6 QP	46.0	-15.4	1.00 H	88	37.7	-7.1
4	346.51	33.8 QP	46.0	-12.2	1.00 H	200	39.6	-5.8
5	445.50	38.8 QP	46.0	-7.2	2.00 H	324	41.5	-2.7
6	791.98	38.6 QP	46.0	-7.4	1.00 H	347	34.8	3.8

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

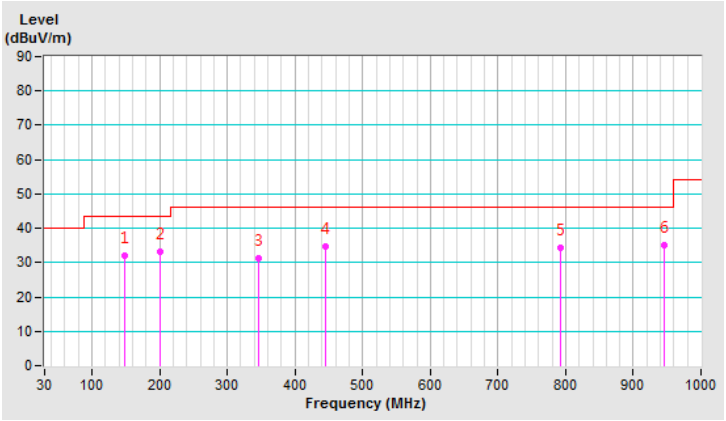


CHANNEL	TX Channel 11	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	148.51	32.0 QP	43.5	-11.5	1.50 V	27	39.7	-7.7
2	199.99	33.2 QP	43.5	-10.3	1.50 V	0	44.3	-11.1
3	346.49	31.2 QP	46.0	-14.8	2.00 V	360	37.0	-5.8
4	445.50	34.6 QP	46.0	-11.4	1.50 V	300	37.3	-2.7
5	791.96	34.3 QP	46.0	-11.7	2.00 V	360	30.5	3.8
6	945.97	34.9 QP	46.0	-11.1	1.00 V	302	28.7	6.2

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



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 0.50MHz.

4.2.2 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver R&S	ESCS 30	847124/029	Nov. 01, 2017	Oct. 31, 2018
Line-Impedance Stabilization Network (for EUT) R&S	ESH3-Z5	848773/004	Nov. 15, 2017	Nov. 14, 2018
Line-Impedance Stabilization Network (for Peripheral) R&S	ENV216	100072	June 04, 2018	June 03, 2019
50 ohms Terminator	N/A	EMC-04	Nov. 01, 2017	Oct. 31, 2018
RF Cable	5D-FB	COCCAB-001	Sep. 29, 2017	Sep. 28, 2018
Fixed attenuator EMCI	STI02-2200-10	003	Mar. 16, 2018	Mar. 15, 2019
Software BVADT	BVADT_Cond_ V7.3.7.4	NA	NA	NA

Note:
1. The calibration interval of the above test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Conduction 1.
3. Tested Date: Aug. 05, 2018

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/ 50uH of coupling impedance for the measuring instrument.

b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

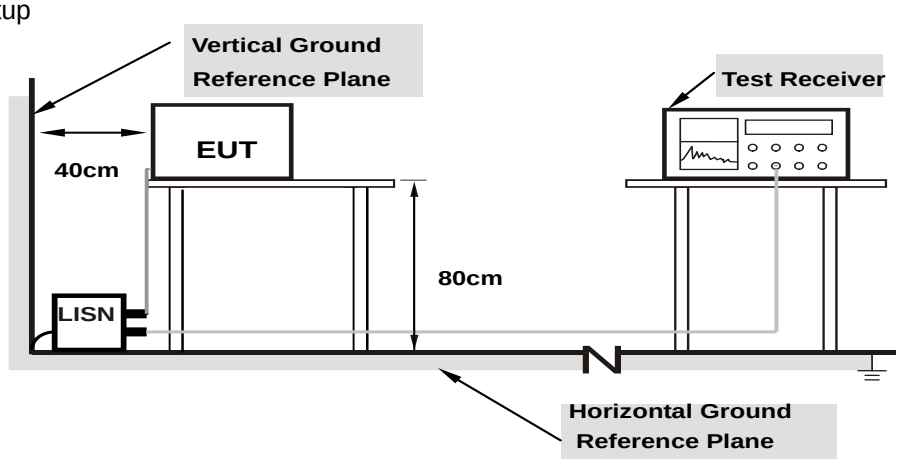
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

NOTE: The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 Test Setup



Note: 1.Support units were connected to second LISN.

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

4.2.6 EUT Operating Conditions

Same as 4.1.6.

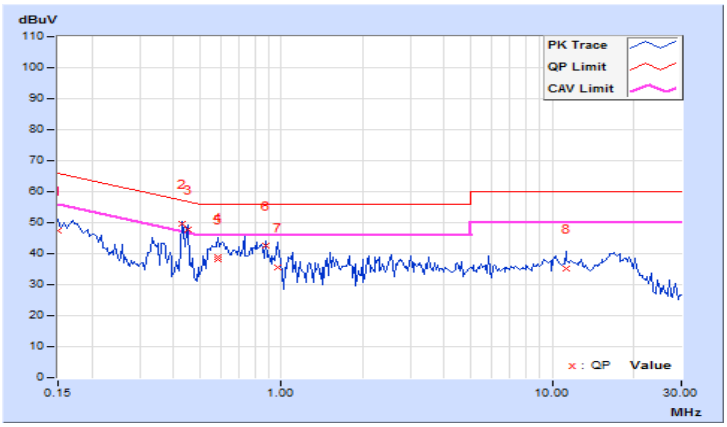
4.2.7 Test Results

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	10.05	37.45	23.05	47.50	33.10	66.00	56.00	-18.50	-22.90
2	**0.42988**	**10.12**	**39.41**	**34.05**	**49.53**	**44.17**	**57.26**	**47.26**	**-7.73**	**-3.09**
3	0.45078	10.12	37.71	32.41	47.83	42.53	56.86	46.86	-9.03	-4.33
4	0.58750	10.14	28.72	18.67	38.86	28.81	56.00	46.00	-17.14	-17.19
5	0.58750	10.14	27.88	17.86	38.02	28.00	56.00	46.00	-17.98	-18.00
6	0.88047	10.16	32.41	23.31	42.57	33.47	56.00	46.00	-13.43	-12.53
7	0.96641	10.17	25.40	16.33	35.57	26.50	56.00	46.00	-20.43	-19.50
8	11.20703	10.79	24.44	14.94	35.23	25.73	60.00	50.00	-24.77	-24.27

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.

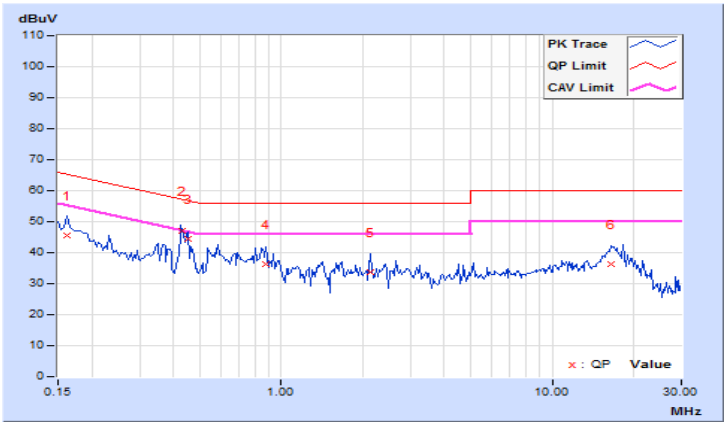


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16172	9.96	35.47	22.06	45.43	32.02	65.38	55.38	-19.95	-23.36
2	0.42972	10.02	37.15	28.72	47.17	38.74	57.26	47.26	-10.09	-8.52
3	0.45078	10.02	34.42	26.96	44.44	36.98	56.86	46.86	-12.42	-9.88
4	0.88047	10.04	26.18	17.33	36.22	27.37	56.00	46.00	-19.78	-18.63
5	2.12500	10.11	23.65	13.68	33.76	23.79	56.00	46.00	-22.24	-22.21
6	16.41016	10.95	25.49	14.76	36.44	25.71	60.00	50.00	-23.56	-24.29

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.

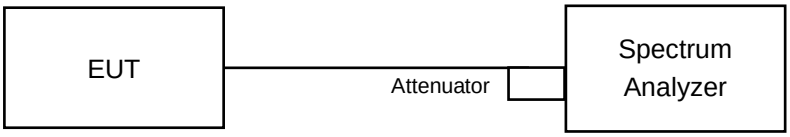


4.3 6dB Bandwidth Measurement

4.3.1 Limits of 6dB Bandwidth Measurement

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

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

a. Set resolution bandwidth (RBW) = 100kHz
b. Set the video bandwidth (VBW) ≥ 3 x RBW, Detector = Peak.
c. Trace mode = max hold.
d. Sweep = auto couple.
e. Measure the maximum width of the emission that is constrained by the frequencies associated with the two amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission

4.3.5 Deviation fromTest Standard

No deviation.

4.3.6 EUT Operating Conditions

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.3.7 Test Result

802.11b

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	10.13	0.5	Pass
6	2437	10.11	0.5	Pass
11	2462	9.65	0.5	Pass

802.11g

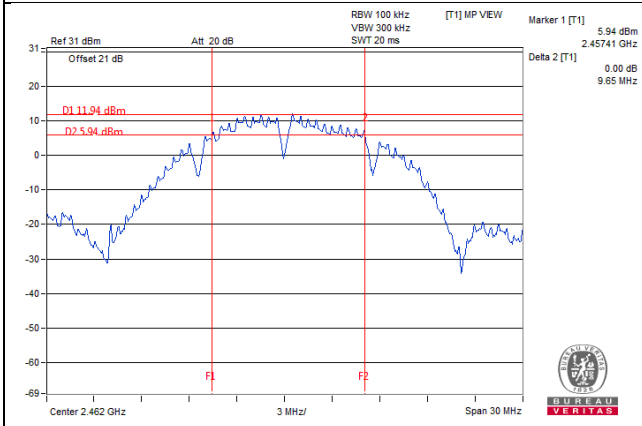
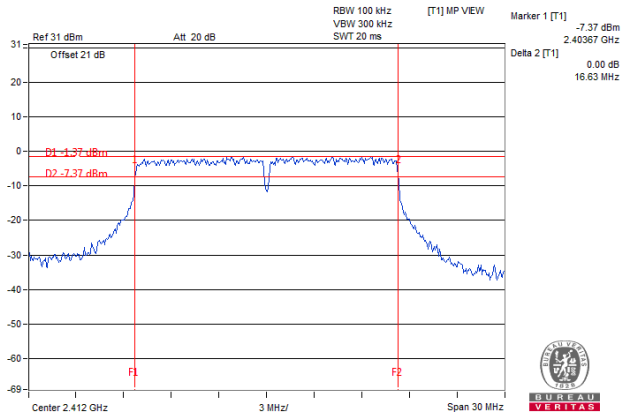
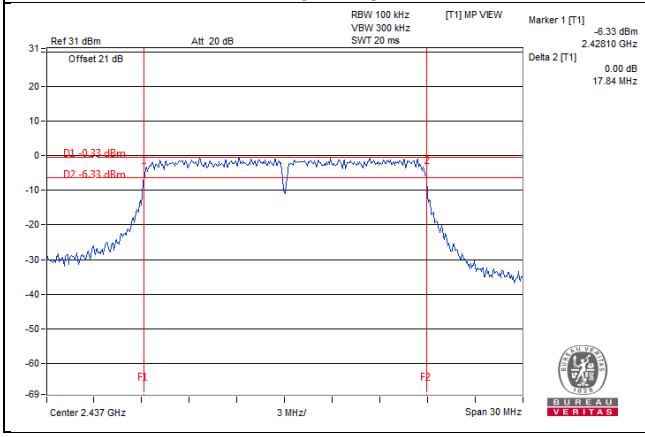
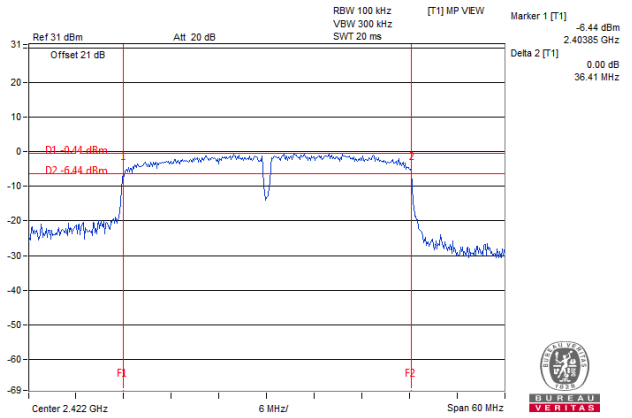
Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	16.63	0.5	Pass
6	2437	16.64	0.5	Pass
11	2462	16.63	0.5	Pass

802.11n (HT20)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	17.86	0.5	Pass
6	2437	17.84	0.5	Pass
11	2462	17.85	0.5	Pass

802.11n (HT40)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
3	2422	36.41	0.5	Pass
6	2437	36.51	0.5	Pass
9	2452	36.51	0.5	Pass

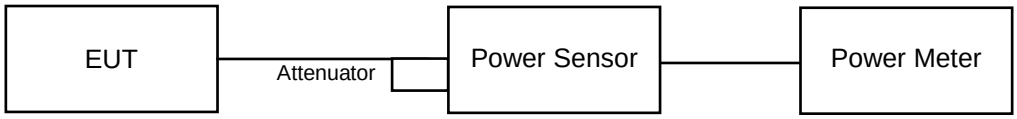
Spectrum Plot of Worst Value	
802.11b / CH11	**802.11g / CH1**
	
802.11n (HT20) / CH6	**802.11n (HT40) / CH3**
	

4.4 Conducted Output Power Measurement

4.4.1 Limits of Conducted Output Power Measurement

For systems using digital modulation in the 2400–2483.5 MHz bands: 1 Watt (30dBm)

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 peak power sensor was used on the output port of the EUT. A power meter was used to read the response of the peak power sensor. Record the power level.

Average power sensor was used to perform output power measurement, trigger and gating function of wide band power meter is enabled to measure max output power of TX on burst. Duty factor is not added to measured value.

4.4.5 Deviation from Test Standard

No deviation.

4.4.6 EUT Operating Conditions

Same as Item 4.3.6.

4.4.7 Test Results

FOR PEAK POWER

802.11b

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
1	2412	163.305	22.13	30	Pass
6	2437	194.536	22.89	30	Pass
11	2462	232.809	23.67	30	Pass

802.11g

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
1	2412	141.906	21.52	30	Pass
6	2437	156.315	21.94	30	Pass
11	2462	174.181	22.41	30	Pass

802.11n (HT20)

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
1	2412	142.233	21.53	30	Pass
6	2437	162.93	22.12	30	Pass
11	2462	188.365	22.75	30	Pass

802.11n (HT40)

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
3	2422	173.78	22.40	30	Pass
6	2437	192.309	22.84	30	Pass
9	2452	214.289	23.31	30	Pass

FOR AVERAGE POWER

802.11b

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	111.686	20.48
6	2437	135.831	21.33
11	2462	158.125	21.99

802.11g

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	21.232	13.27
6	2437	25.003	13.98
11	2462	24.774	13.94

802.11n (HT20)

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	20.797	13.18
6	2437	24.774	13.94
11	2462	26.915	14.30

802.11n (HT40)

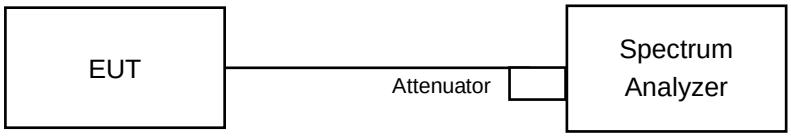
Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
3	2422	45.92	16.62
6	2437	51.523	17.12
9	2452	50.35	17.02

4.5 Power Spectral Density Measurement

4.5.1 Limits of Power Spectral Density Measurement

The Maximum of Power Spectral Density Measurement is 8dBm in any 3 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

a. Set analyzer center frequency to DTS channel center frequency.
b. Set the span to 1.5 times the DTS bandwidth.
c. Set the RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
d. Set the VBW ≥ 3 × RBW.
e. Detector = peak.
f. Sweep time = auto couple.
g. Trace mode = max hold.
h. Allow trace to fully stabilize.
i. Use the peak marker function to determine the maximum amplitude level within the RBW.

4.5.5 Deviation from Test Standard

No deviation.

4.5.6 EUT Operating Condition

Same as Item 4.3.6

4.5.7 Test Results

802.11b

Channel	Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
1	2412	-10.24	8	Pass
6	2437	-9.56	8	Pass
11	2462	-8.23	8	Pass

802.11g

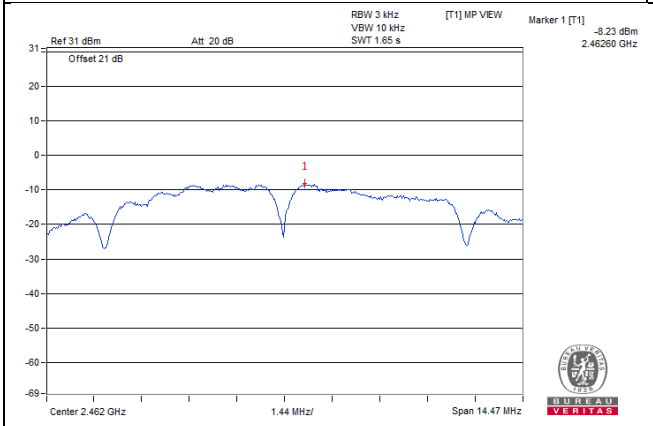
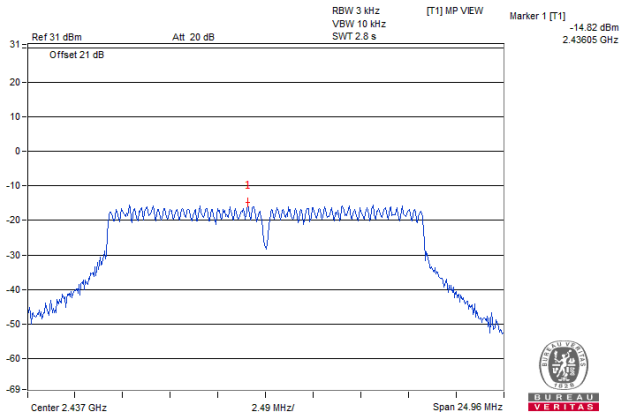
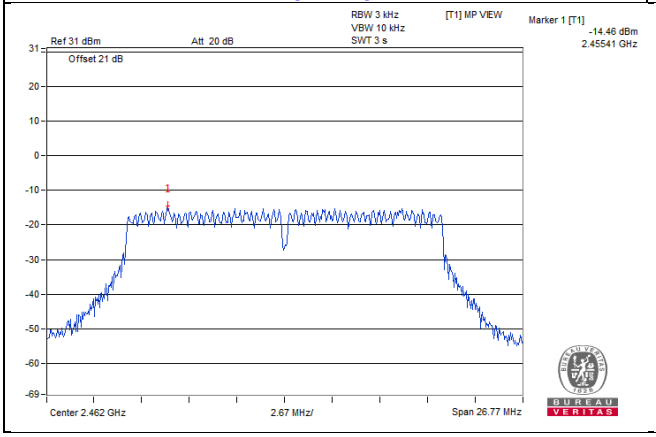
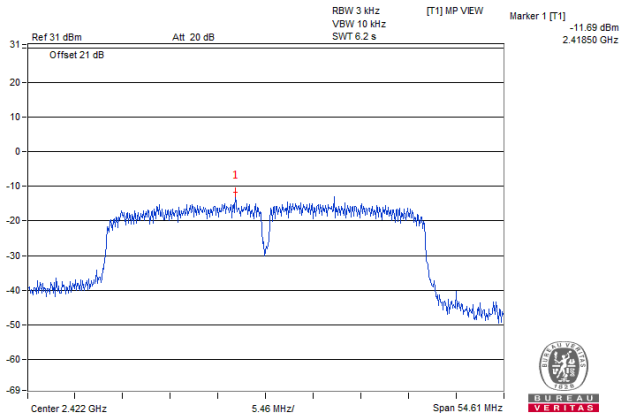
Channel	Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
1	2412	-16.00	8	Pass
6	2437	-14.82	8	Pass
11	2462	-14.83	8	Pass

802.11n (HT20)

Channel	Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
1	2412	-15.26	8	Pass
6	2437	-14.77	8	Pass
11	2462	-14.46	8	Pass

802.11n (HT40)

Channel	Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
3	2422	-11.69	8	Pass
6	2437	-13.73	8	Pass
9	2452	-11.84	8	Pass

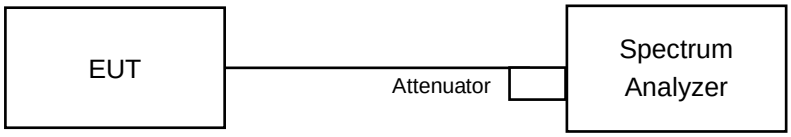
Spectrum Plot of Worst Value	
802.11b / CH11	**802.11g / CH6**
	
802.11n (HT20) / CH11	**802.11n (HT40) / CH3**
	

4.6 Conducted Out of Band Emission Measurement

4.6.1 Limits of Conducted Out of Band Emission Measurement

Below 20dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).

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

MEASUREMENT PROCEDURE REF

1. Set the RBW = 100 kHz.
2. Set the VBW ≥ 300 kHz.
3. Detector = peak.
4. Sweep time = auto couple.
5. Trace mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

MEASUREMENT PROCEDURE OOBE

1. Set RBW = 100 kHz.
2. Set VBW ≥ 300 kHz.
3. Detector = peak.
4. Sweep = auto couple.
5. Trace Mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum amplitude level.

4.6.5 Deviation from Test Standard

No deviation.

4.6.6 EUT Operating Condition

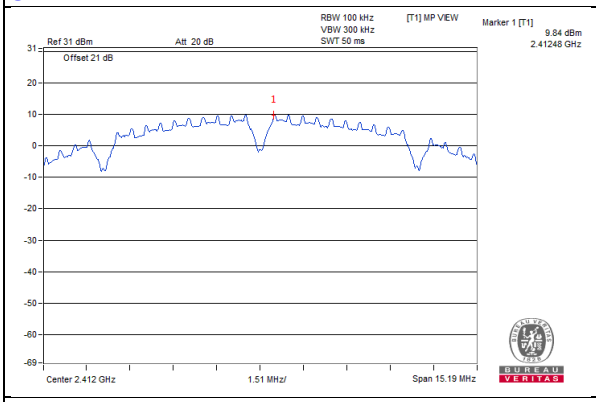
Same as Item 4.3.6

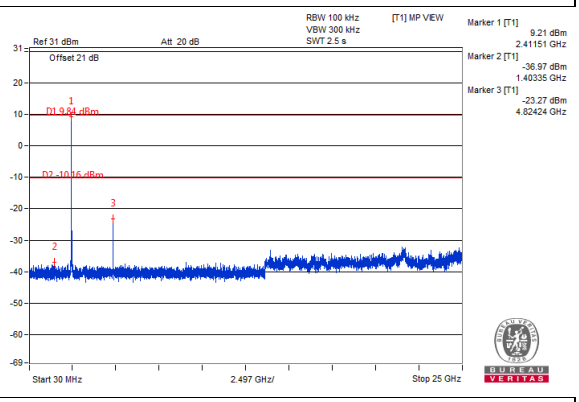
4.6.7 Test Results

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

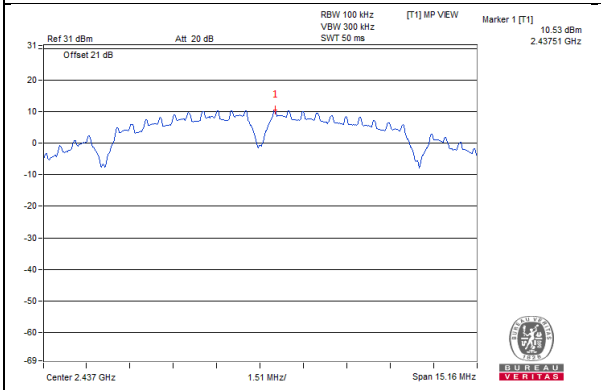
802.11b

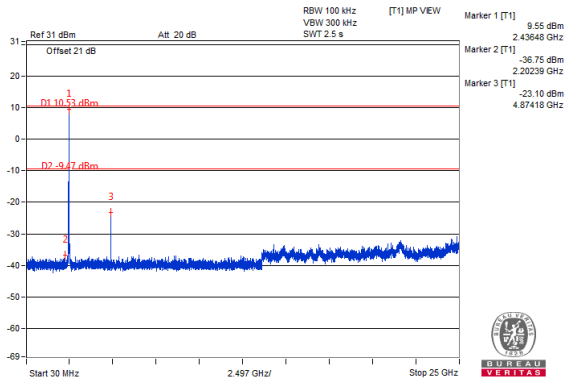
CH 1



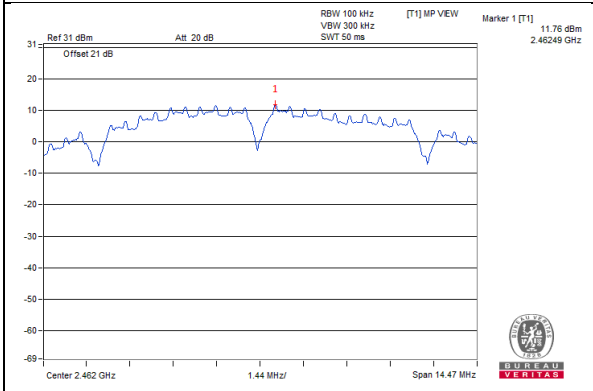


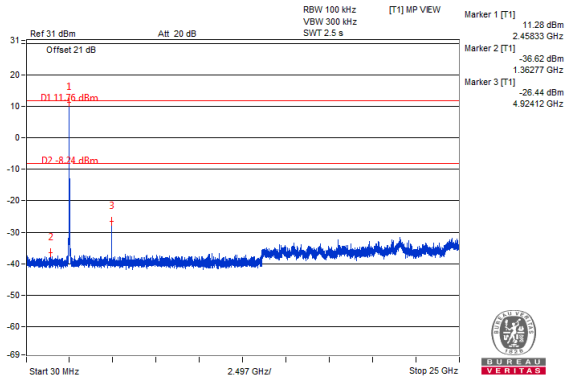
CH 6



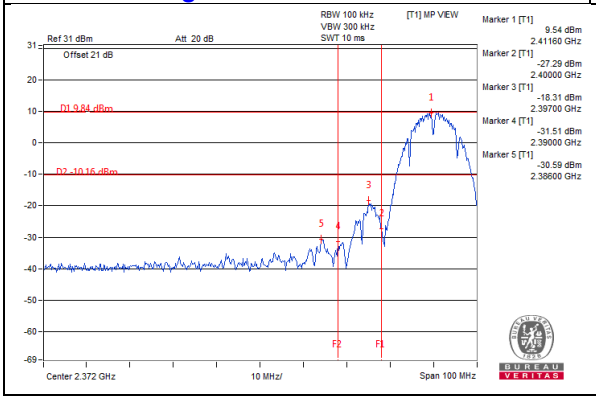


CH 11

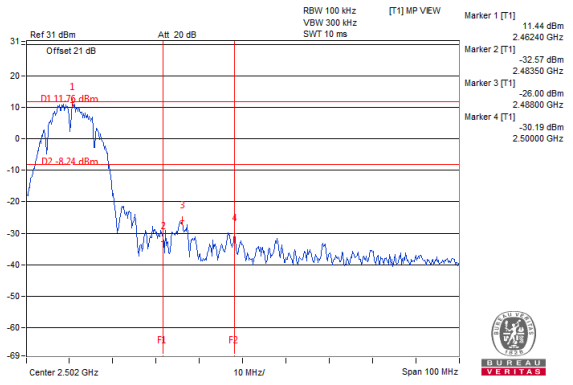




CH 1 Band edge

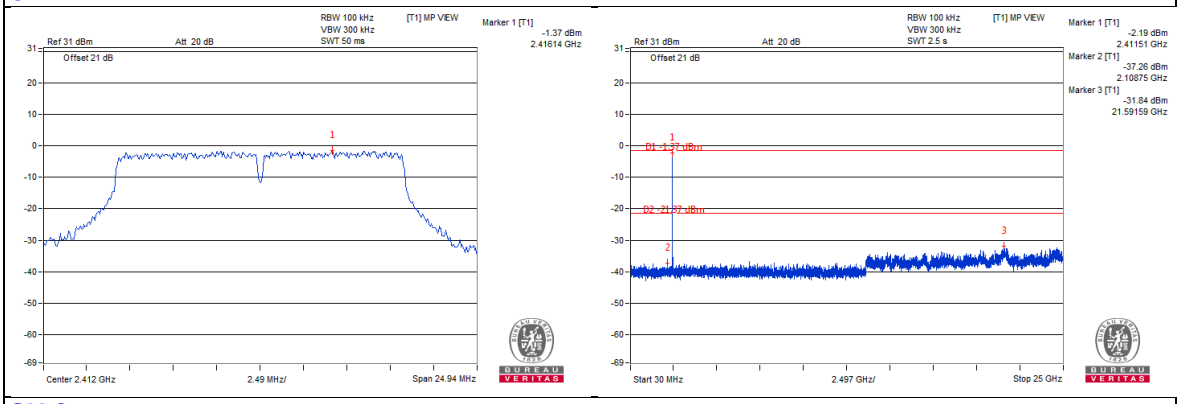


CH 11 Band edge

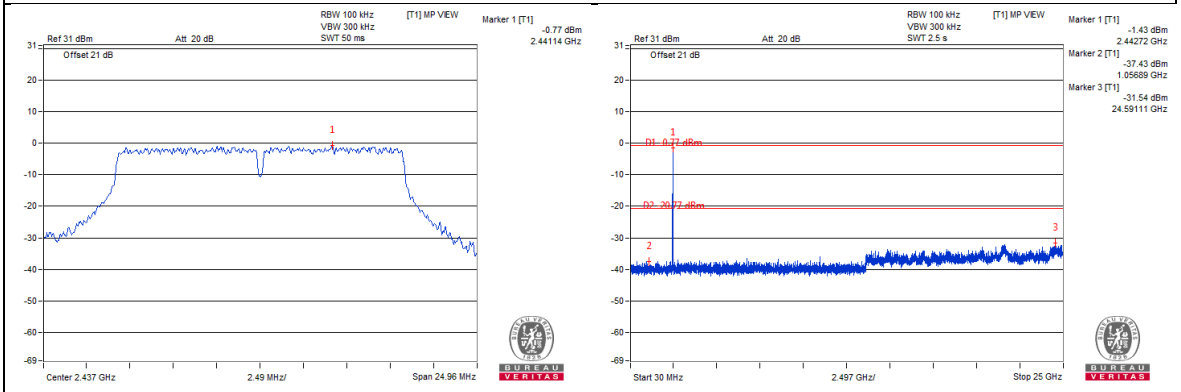


802.11g

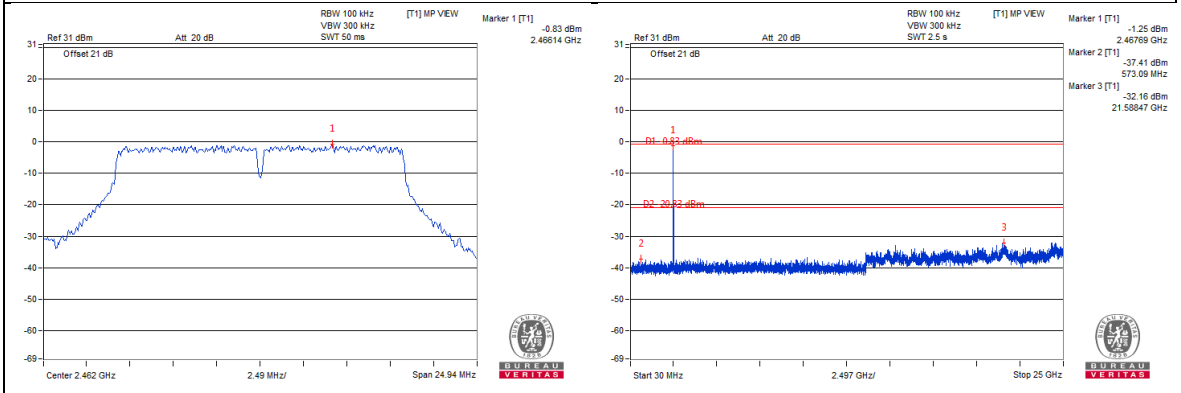
CH 1



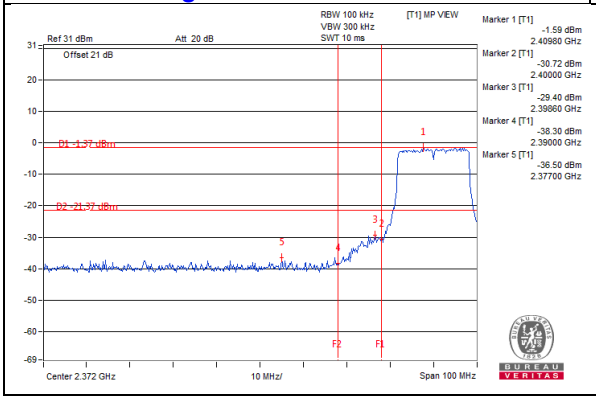
CH 6



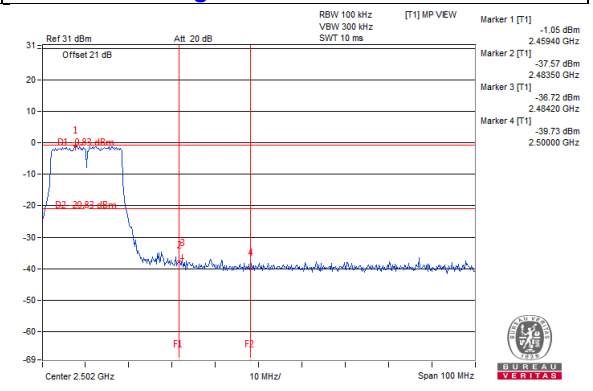
CH 11



CH 1 Band edge

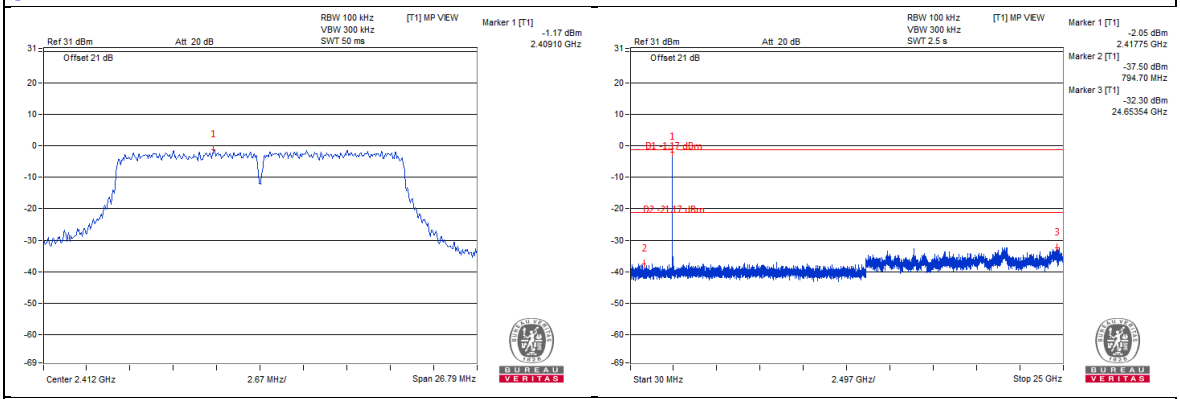


CH 11 Band edge

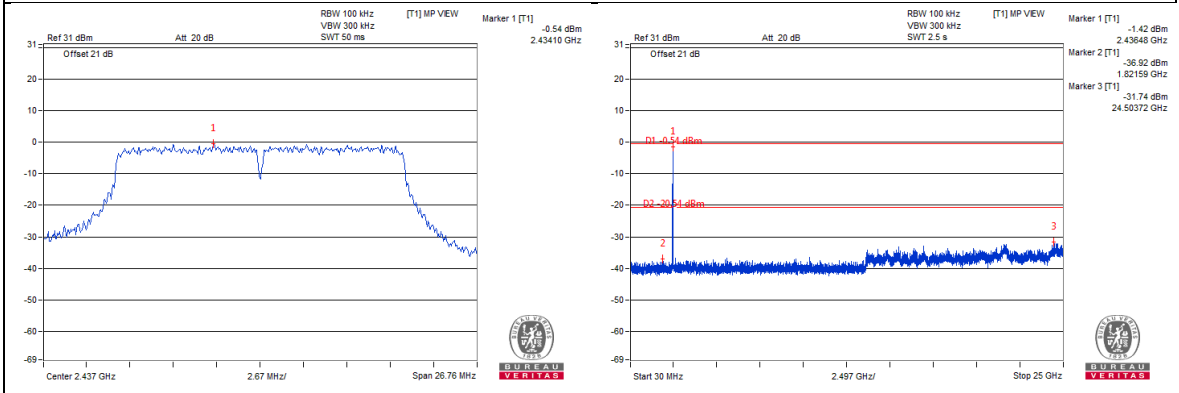


802.11n (HT20)

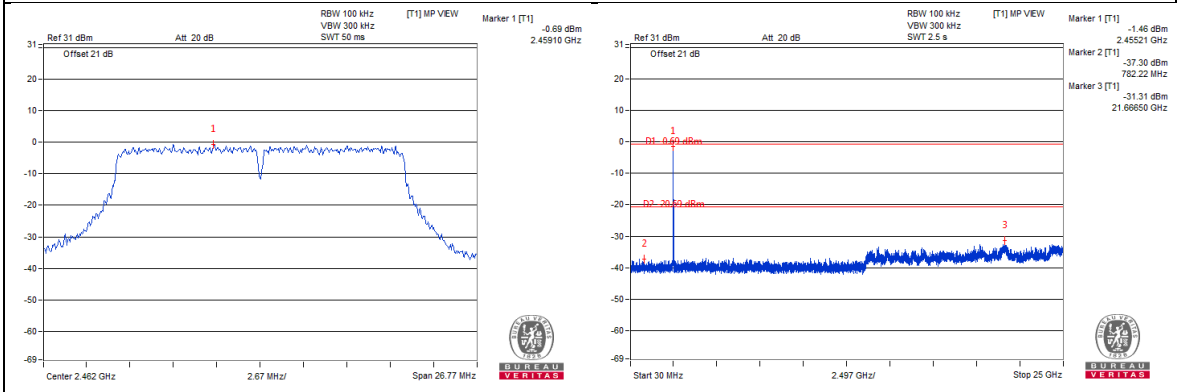
CH 1



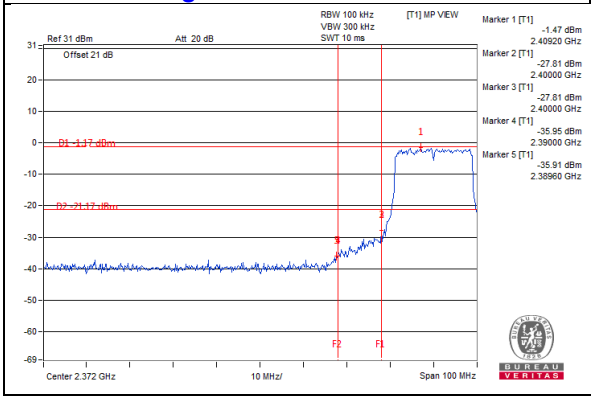
CH 6



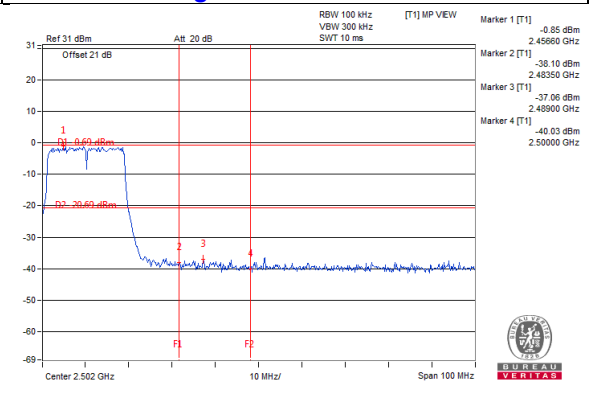
CH 11



CH 1 Band edge

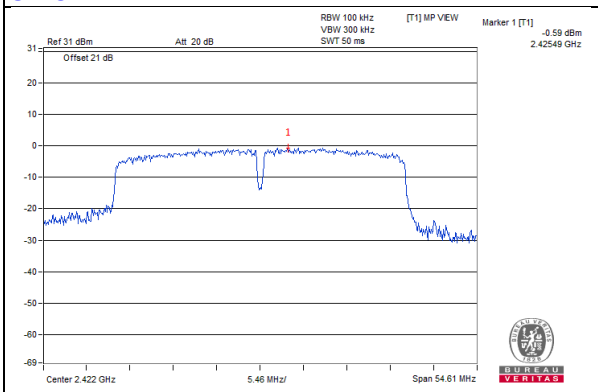


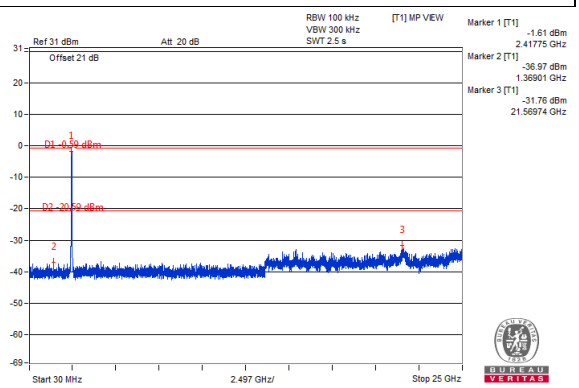
CH 11 Band edge



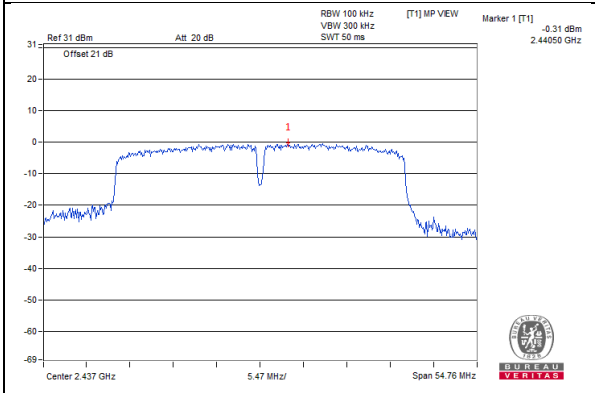
802.11n (HT40)

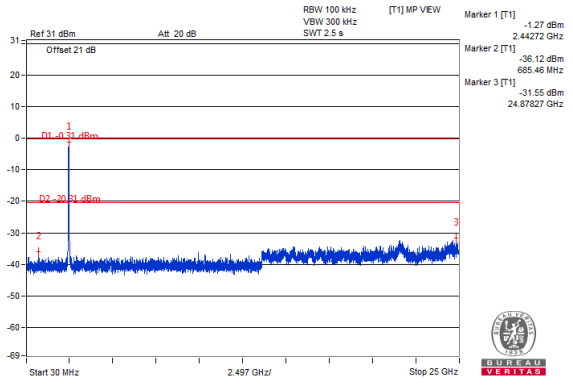
CH 3



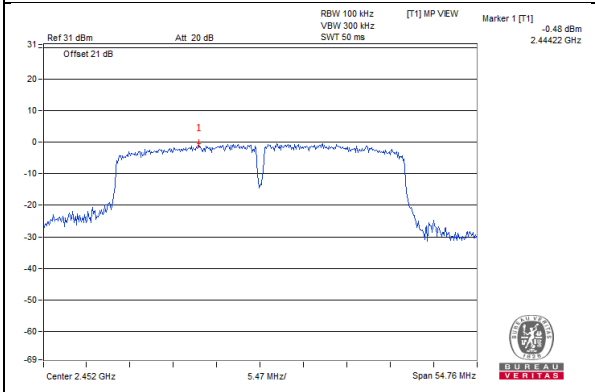


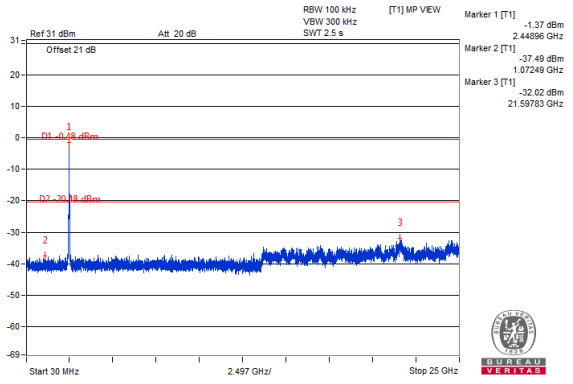
CH 6



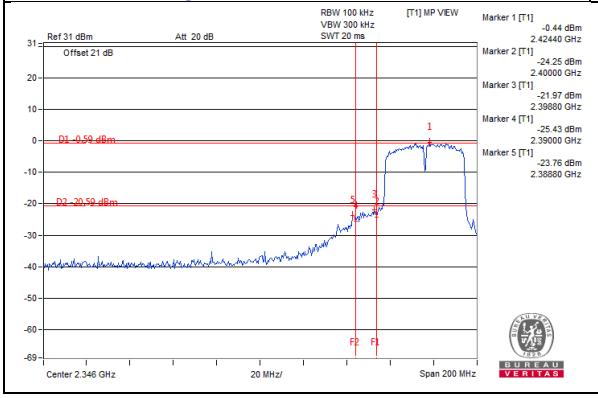


CH 9

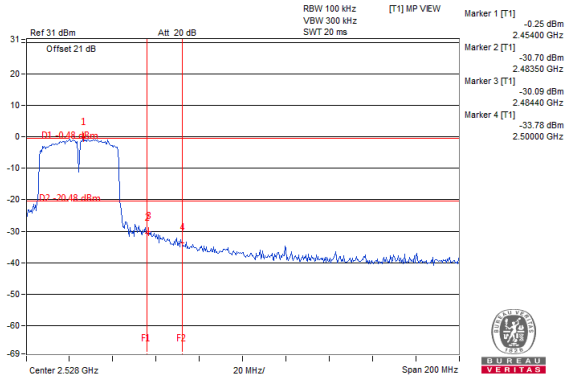




CH 3 Band edge



CH 9 Band edge



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:

Linkou EMC/RF Lab
Tel: 886-2-26052180
Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab
Tel: 886-3-6668565
Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety Lab
Tel: 886-3-3183232
Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com
Web Site: www.bureauveritas-adt.com

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

--- END ---