FCC Test Report

Report No.: RF171027E06B

FCC ID: O6L-VM2506

Test Model: VM2506

Received Date: Nov. 10, 2017

Test Date: Dec. 14 to 15, 2017

Issued Date: July 06, 2018

Applicant: TRANWO TECHNOLOGY CORP.

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

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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

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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 Duty Cycle of Test Signal 11
3.4 Description of Support Units 12
3.4.1 Configuration of System under Test 12
3.5 General Description of Applied Standards 13

4 Test Types and Results 14

4.1 Radiated Emission and Bandedge Measurement 14
4.1.1 Limits of Radiated Emission and Bandedge Measurement 14
4.1.2 Test Instruments 15
4.1.3 Test Procedures 16
4.1.4 Deviation from Test Standard 17
4.1.5 Test Setup 17
4.1.6 EUT Operating Conditions 18
4.1.7 Test Results 19
4.2 Conducted Emission Measurement 32
4.2.1 Limits of Conducted Emission Measurement 32
4.2.2 Test Instruments 33
4.2.3 Test Procedures 33
4.2.4 Deviation from Test Standard 33
4.2.5 Test Setup 34
4.2.6 EUT Operating Conditions 34
4.2.7 Test Results 35
4.3 6dB Bandwidth Measurement 37
4.3.1 Limits of 6dB Bandwidth Measurement 37
4.3.2 Test Setup 37
4.3.3 Test Instruments 37
4.3.4 Test Procedure 37
4.3.5 Deviation fromTest Standard 37
4.3.6 EUT Operating Conditions 37
4.3.7 Test Result 38
4.4 Conducted Output Power Measurement 40
4.4.1 Limits of Conducted Output Power Measurement 40
4.4.2 Test Setup 40
4.4.3 Test Instruments 40
4.4.4 Test Procedures 40
4.4.5 Deviation from Test Standard 40
4.4.6 EUT Operating Conditions 40
4.4.7 Test Results 41
4.5 Power Spectral Density Measurement 43
4.5.1 Limits of Power Spectral Density Measurement 43
4.5.2 Test Setup 43
4.5.3 Test Instruments 43
4.5.4 Test Procedure 43
4.5.5 Deviation from Test Standard 43
4.5.6 EUT Operating Condition 43

4.5.7 Test Results 44
4.6 Conducted Out of Band Emission Measurement 46
4.6.1 Limits of Conducted Out of Band Emission Measurement 46
4.6.2 Test Setup 46
4.6.3 Test Instruments 46
4.6.4 Test Procedure 46
4.6.5 Deviation from Test Standard 46
4.6.6 EUT Operating Condition 46
4.6.7 Test Results 46

5 Pictures of Test Arrangements 51

Appendix – Information on the Testing Laboratories 52

Release Control Record

Issue No.	Description	Date Issued
RF171027E06B	Original release.	July 06, 2018

1 Certificate of Conformity

Product: 2.4GHz Digital RF Module

Brand: TRANWO

Test Model: VM2506

Sample Status: ENGINEERING SAMPLE

Applicant: TRANWO TECHNOLOGY CORP.

Test Date: Dec. 14 to 15, 2017

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:** July 06, 2018
Claire Kuan / Specialist

Approved by : _____ , **Date:** July 06, 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 -2.80dB at 0.58359MHz.
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 2483.50MHz, 2390.00MHz, 4874.00MHz and 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	Antenna connector is i-pex(MHF) not a standard connector.

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	5.30 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	5.16 dB
	6GHz ~ 18GHz	4.91 dB
	18GHz ~ 40GHz	5.30 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	2.4GHz Digital RF Module
Brand	TRANWO
Test Model	VM2506
Status of EUT	ENGINEERING SAMPLE
Power Supply Rating	DC 3.3V from host equipment
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	506.991mW
Antenna Type	Refer to note
Antenna Connector	Refer to note
Accessory Device	NA
Data Cable Supplied	NA

Note:

1. The antennas provided to the EUT, please refer to the following table:

Model Name	Antenna Net Gain (dBi)	Frequency range (GHz)	Antenna Type	Connecter Type
VM2506RX(202-000520-00)	2	2.4~2.5	Dipole	i-pex(MHF)
VM2506TX(202-000521-00)	2	2.4~2.5	Dipole	i-pex(MHF)
From above antennas, VM2506RX(202-000520-00) was chosen for final test.				

2. 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

3. 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

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)
802.11g	1 to 11	6	OFDM	BPSK	6

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)
802.11g	1 to 11	6	OFDM	BPSK	6

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:

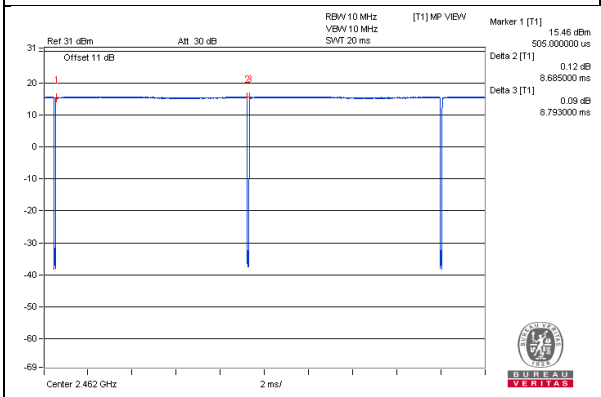
APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER (SYSTEM)	TESTED BY
RE≥1G	23deg. C, 68%RH	120Vac, 60Hz	Rey Chen
RE<1G	23deg. C, 68%RH	120Vac, 60Hz	Rey Chen
PLC	23deg. C, 76%RH	120Vac, 60Hz	Andy Ho
APCM	25deg. C, 60%RH	120Vac, 60Hz	Robert Cheng

3.3 Duty Cycle of Test Signal

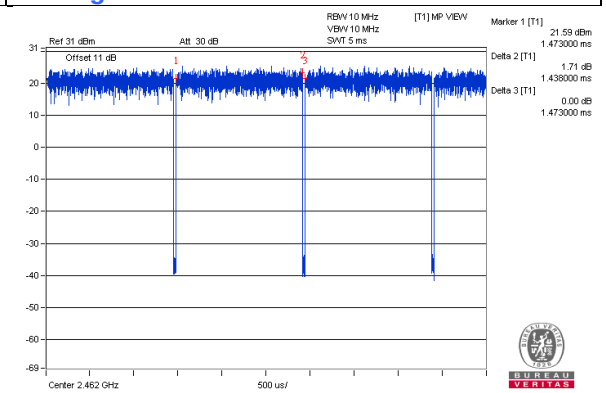
If duty cycle of test signal is ≥ 98 %, duty factor is not required.
If duty cycle of test signal is < 98%, duty factor shall be considered.

802.11b: Duty cycle = 8.685/8.793 = 0.988
802.11g: Duty cycle = 1.438/1.473 = 0.976, Duty factor = 10 * log(1/0.976) = 0.1
802.11n (HT20): Duty cycle = 1.346/1.381 = 0.975, Duty factor = 10 * log(1/0.975) = 0.11
802.11n (HT40): Duty cycle = 0.667/0.699 = 0.954, Duty factor = 10 * log(1/0.954) = 0.2

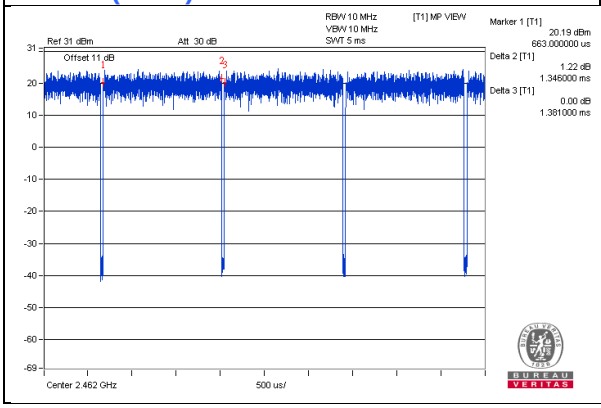
802.11b



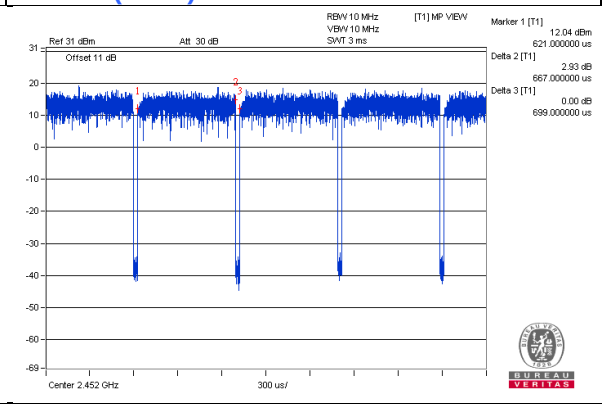
802.11g



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.

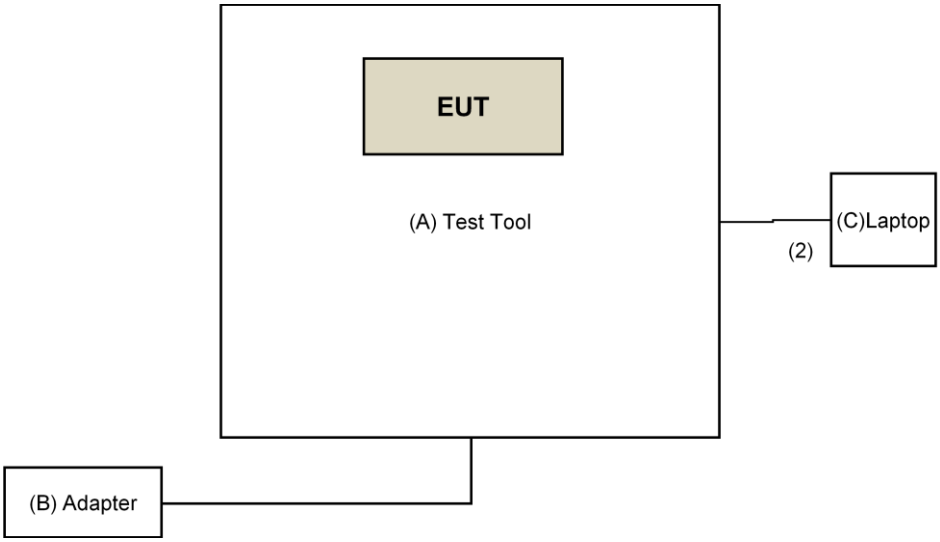
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Test Tool	TRANWO	NA	NA	NA	Supplied by client
B.	Adapter	NA	CS12N050200FGF	CC4JMFL0F4T1	NA	Supplied by client
C.	Laptop	DELL	E6420	482T3R1	FCC DoC	Provided by Lab

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.	DC Cable	1	1.5	No	0	Supplied by client
2.	USB Cable	1	0.2	No	0	Supplied by client(for RF Setup)

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 DTS Meas Guidance v04
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 20dB 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

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Keysight	N9038A	MY54450088	July 08, 2017	July 07, 2018
Pre-Amplifier(*) EMCI	EMC001340	980142	Jan. 20, 2016	Jan. 19, 2018
Loop Antenna(*) Electro-Metrics	EM-6879	264	Dec. 16, 2016	Dec. 15, 2018
RF Cable	NA	LOOPCAB-001 LOOPCAB-002	Jan. 17, 2017	Jan. 16, 2018
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	966-4-1 966-4-2 966-4-3	Apr. 01, 2017	Mar. 31, 2018
Fixed attenuator Mini-Circuits	UNAT-5+	PAD-3m-4-01	Oct. 03, 2017	Oct. 02, 2018
Horn_Antenna SCHWARZBECK	BBHA 9120D	9120D-783	Dec. 27, 2016	Dec. 26, 2017
Pre-Amplifier EMCI	EMC12630SE	980385	Feb. 02, 2017	Feb. 01, 2018
RF Cable	EMC104-SM-SM-1200 EMC104-SM-SM-2000 EMC104-SM-SM-5000	160923 150318 150321	Feb. 02, 2017 Mar. 29, 2017 Mar. 29, 2017	Feb. 01, 2018 Mar. 28, 2018 Mar. 28, 2018
Pre-Amplifier EMCI	EMC184045SE	980387	Feb. 02, 2017	Feb. 01, 2018
Horn_Antenna SCHWARZBECK	BBHA 9170	BBHA9170608	Dec. 14, 2017	Dec. 13, 2018
RF Cable	SUCOFLEX 102	36432/2 36433/2	Jan. 15, 2017	Jan. 14, 2018
Software	ADT_Radiated_V8.7.08	NA	NA	NA
Antenna Tower & Turn Table Max-Full	MF-7802	MF780208410	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP02	NA	NA
Spectrum Analyzer Agilent	E4446A	MY48250254	Nov. 21, 2017	Nov. 20, 2018
Power meter Anritsu	ML2495A	1014008	May 11, 2017	May 10, 2018
Power sensor Anritsu	MA2411B	0917122	May 11, 2017	May 10, 2018

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: Dec. 14 to 15, 2017

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 detect 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:

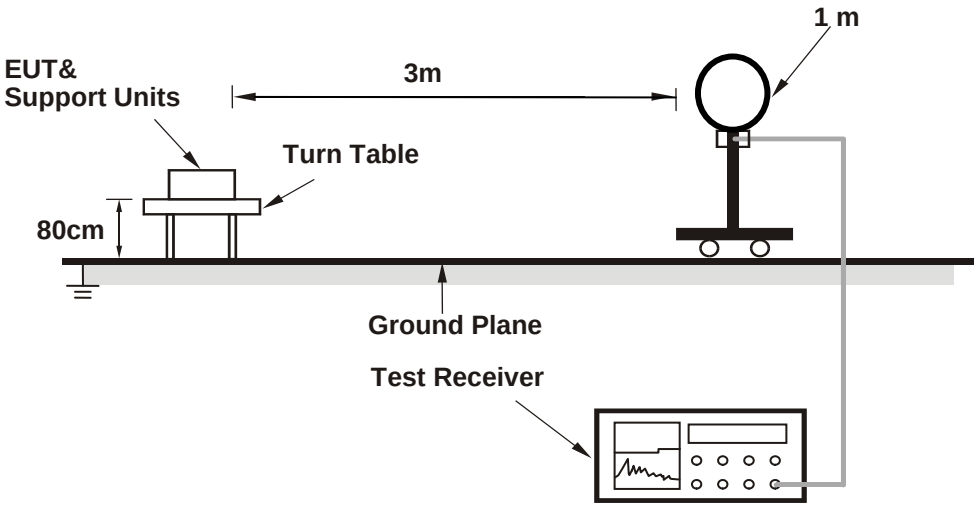
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
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

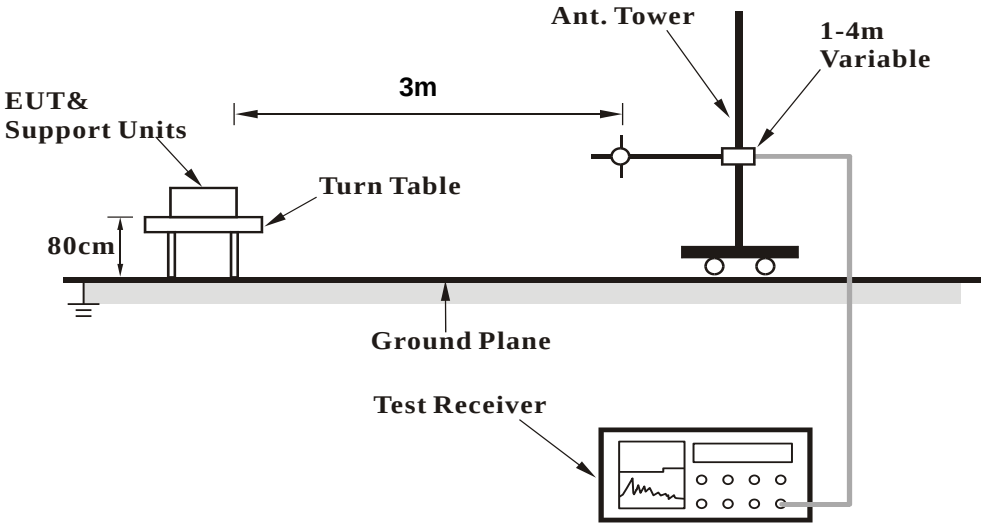
No deviation.

4.1.5 Test Setup

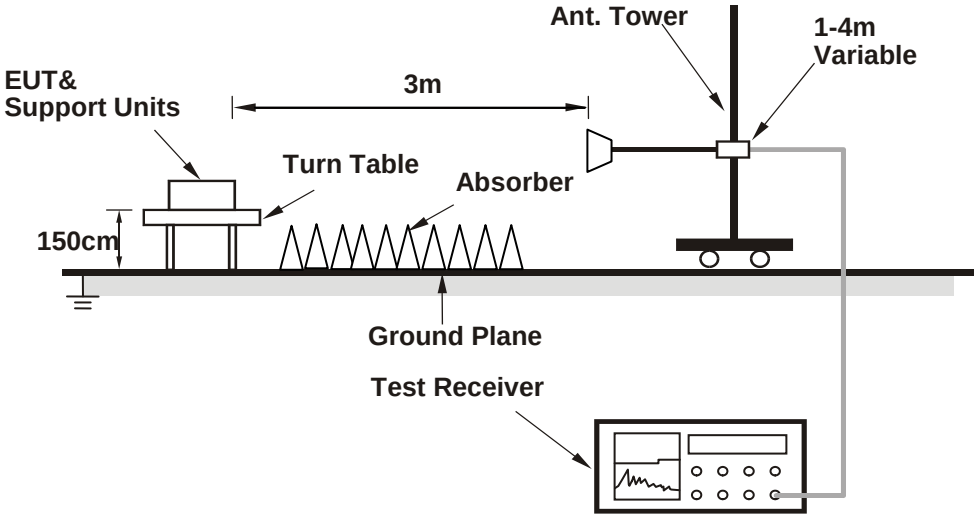
For Radiated emission below 30MHz



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. Connected the EUT with the Laptop.

b. Controlling software (RT3x7xQA.exe VER 1.5.6.7) 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	53.7 PK	74.0	-20.3	1.45 H	360	55.0	-1.3
2	2390.00	42.0 AV	54.0	-12.0	1.45 H	360	43.3	-1.3
3	*2412.00	97.0 PK			1.45 H	360	98.1	-1.1
4	*2412.00	94.3 AV			1.45 H	360	95.4	-1.1
5	4824.00	54.8 PK	74.0	-19.2	1.23 H	76	51.6	3.2
6	**4824.00**	**53.9 AV**	**54.0**	**-0.1**	**1.23 H**	**76**	**50.7**	**3.2**
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	55.1 PK	74.0	-18.9	1.07 V	356	56.4	-1.3
2	2390.00	43.1 AV	54.0	-10.9	1.07 V	356	44.4	-1.3
3	*2412.00	104.1 PK			1.07 V	356	105.2	-1.1
4	*2412.00	101.7 AV			1.07 V	356	102.8	-1.1
5	4824.00	54.2 PK	74.0	-19.8	1.49 V	77	51.0	3.2
6	4824.00	53.1 AV	54.0	-0.9	1.49 V	77	49.9	3.2

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) 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	53.8 PK	74.0	-20.2	1.41 H	357	55.1	-1.3
2	2390.00	41.7 AV	54.0	-12.3	1.41 H	357	43.0	-1.3
3	*2437.00	96.2 PK			1.41 H	357	97.4	-1.2
4	*2437.00	93.6 AV			1.41 H	357	94.8	-1.2
5	2483.50	54.8 PK	74.0	-19.2	1.41 H	357	55.8	-1.0
6	2483.50	42.7 AV	54.0	-11.3	1.41 H	357	43.7	-1.0
7	4874.00	54.8 PK	74.0	-19.2	1.19 H	73	51.5	3.3
8	4874.00	53.5 AV	54.0	-0.5	1.19 H	73	50.2	3.3
9	7311.00	45.1 PK	74.0	-28.9	3.99 H	284	35.3	9.8
10	7311.00	36.3 AV	54.0	-17.7	3.99 H	284	26.5	9.8
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	55.2 PK	74.0	-18.8	1.01 V	354	56.5	-1.3
2	2390.00	42.5 AV	54.0	-11.5	1.01 V	354	43.8	-1.3
3	*2437.00	103.3 PK			1.01 V	354	104.5	-1.2
4	*2437.00	101.0 AV			1.01 V	354	102.2	-1.2
5	2483.50	56.4 PK	74.0	-17.6	1.01 V	354	57.4	-1.0
6	2483.50	43.6 AV	54.0	-10.4	1.01 V	354	44.6	-1.0
7	4874.00	54.9 PK	74.0	-19.1	1.34 V	38	51.6	3.3
8	**4874.00**	**53.9 AV**	**54.0**	**-0.1**	**1.34 V**	**38**	**50.6**	**3.3**
9	7311.00	46.8 PK	74.0	-27.2	2.03 V	127	37.0	9.8
10	7311.00	37.4 AV	54.0	-16.6	2.03 V	127	27.6	9.8

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 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	96.0 PK			1.44 H	345	97.1	-1.1
2	*2462.00	93.4 AV			1.44 H	345	94.5	-1.1
3	2483.50	53.8 PK	74.0	-20.2	1.44 H	345	54.8	-1.0
4	2483.50	43.0 AV	54.0	-11.0	1.44 H	345	44.0	-1.0
5	4924.00	54.2 PK	74.0	-19.8	1.51 H	80	50.7	3.5
6	4924.00	53.4 AV	54.0	-0.6	1.51 H	80	49.9	3.5
7	7386.00	44.6 PK	74.0	-29.4	3.93 H	342	34.7	9.9
8	7386.00	34.2 AV	54.0	-19.8	3.93 H	342	24.3	9.9
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	103.1 PK			1.01 V	354	104.2	-1.1
2	*2462.00	100.8 AV			1.01 V	354	101.9	-1.1
3	2483.50	55.4 PK	74.0	-18.6	1.01 V	354	56.4	-1.0
4	2483.50	43.9 AV	54.0	-10.1	1.01 V	354	44.9	-1.0
5	4924.00	54.6 PK	74.0	-19.4	1.30 V	37	51.1	3.5
6	**4924.00**	**53.9 AV**	**54.0**	**-0.1**	**1.30 V**	**37**	**50.4**	**3.5**
7	7386.00	46.5 PK	74.0	-27.5	1.38 V	66	36.6	9.9
8	7386.00	37.2 AV	54.0	-16.8	1.38 V	66	27.3	9.9

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	64.5 PK	74.0	-9.5	1.46 H	341	65.8	-1.3
2	2390.00	52.7 AV	54.0	-1.3	1.46 H	341	54.0	-1.3
3	*2412.00	102.7 PK			1.46 H	341	103.8	-1.1
4	*2412.00	92.5 AV			1.46 H	341	93.6	-1.1
5	4824.00	55.6 PK	74.0	-18.4	1.29 H	71	52.4	3.2
6	4824.00	43.4 AV	54.0	-10.6	1.29 H	71	40.2	3.2
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	65.9 PK	74.0	-8.1	1.05 V	355	67.2	-1.3
2	2390.00	53.8 AV	54.0	-0.2	1.05 V	355	55.1	-1.3
3	*2412.00	109.8 PK			1.05 V	355	110.9	-1.1
4	*2412.00	99.9 AV			1.05 V	355	101.0	-1.1
5	4824.00	57.2 PK	74.0	-16.8	1.42 V	27	54.0	3.2
6	4824.00	44.7 AV	54.0	-9.3	1.42 V	27	41.5	3.2

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) 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	59.7 PK	74.0	-14.3	1.37 H	360	61.0	-1.3
2	2390.00	48.7 AV	54.0	-5.3	1.37 H	360	50.0	-1.3
3	*2437.00	106.3 PK			1.37 H	360	107.5	-1.2
4	*2437.00	96.0 AV			1.37 H	360	97.2	-1.2
5	2483.50	61.9 PK	74.0	-12.1	1.37 H	360	62.9	-1.0
6	2483.50	51.2 AV	54.0	-2.8	1.37 H	360	52.2	-1.0
7	4874.00	57.9 PK	74.0	-16.1	1.32 H	73	54.6	3.3
8	4874.00	45.8 AV	54.0	-8.2	1.32 H	73	42.5	3.3
9	7311.00	60.1 PK	74.0	-13.9	3.71 H	282	50.3	9.8
10	7311.00	46.9 AV	54.0	-7.1	3.71 H	282	37.1	9.8
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	61.1 PK	74.0	-12.9	1.04 V	353	62.4	-1.3
2	2390.00	49.8 AV	54.0	-4.2	1.04 V	353	51.1	-1.3
3	*2437.00	113.4 PK			1.04 V	353	114.6	-1.2
4	*2437.00	103.4 AV			1.04 V	353	104.6	-1.2
5	2483.50	63.5 PK	74.0	-10.5	1.04 V	353	64.5	-1.0
6	2483.50	52.1 AV	54.0	-1.9	1.04 V	353	53.1	-1.0
7	4874.00	58.5 PK	74.0	-15.5	1.46 V	39	55.2	3.3
8	4874.00	46.2 AV	54.0	-7.8	1.46 V	39	42.9	3.3
9	7311.00	60.5 PK	74.0	-13.5	2.15 V	126	50.7	9.8
10	7311.00	47.3 AV	54.0	-6.7	2.15 V	126	37.5	9.8

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 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	104.8 PK			1.36 H	359	105.9	-1.1
2	*2462.00	94.4 AV			1.36 H	359	95.5	-1.1
3	2483.50	68.0 PK	74.0	-6.0	1.36 H	359	69.0	-1.0
4	2483.50	53.0 AV	54.0	-1.0	1.36 H	359	54.0	-1.0
5	4924.00	57.2 PK	74.0	-16.8	1.30 H	80	53.7	3.5
6	4924.00	44.9 AV	54.0	-9.1	1.30 H	80	41.4	3.5
7	7386.00	59.2 PK	74.0	-14.8	3.76 H	275	49.3	9.9
8	7386.00	45.9 AV	54.0	-8.1	3.76 H	275	36.0	9.9
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	111.9 PK			1.03 V	352	113.0	-1.1
2	*2462.00	101.8 AV			1.03 V	352	102.9	-1.1
3	2483.50	69.6 PK	74.0	-4.4	1.03 V	352	70.6	-1.0
4	**2483.50**	**53.9 AV**	**54.0**	**-0.1**	**1.03 V**	**352**	**54.9**	**-1.0**
5	4924.00	57.4 PK	74.0	-16.6	1.46 V	40	53.9	3.5
6	4924.00	44.9 AV	54.0	-9.1	1.46 V	40	41.4	3.5
7	7386.00	59.9 PK	74.0	-14.1	2.16 V	134	50.0	9.9
8	7386.00	46.6 AV	54.0	-7.4	2.16 V	134	36.7	9.9

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	67.5 PK	74.0	-6.5	1.45 H	356	68.8	-1.3
2	2390.00	52.8 AV	54.0	-1.2	1.45 H	356	54.1	-1.3
3	*2412.00	102.2 PK			1.45 H	356	103.3	-1.1
4	*2412.00	92.0 AV			1.45 H	356	93.1	-1.1
5	4824.00	55.6 PK	74.0	-18.4	1.30 H	80	52.4	3.2
6	4824.00	43.6 AV	54.0	-10.4	1.30 H	80	40.4	3.2
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	68.9 PK	74.0	-5.1	1.03 V	355	70.2	-1.3
2	**2390.00**	**53.9 AV**	**54.0**	**-0.1**	**1.03 V**	**355**	**55.2**	**-1.3**
3	*2412.00	109.3 PK			1.03 V	355	110.4	-1.1
4	*2412.00	99.4 AV			1.03 V	355	100.5	-1.1
5	4824.00	56.9 PK	74.0	-17.1	1.43 V	12	53.7	3.2
6	4824.00	44.3 AV	54.0	-9.7	1.43 V	12	41.1	3.2

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) 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	58.3 PK	74.0	-15.7	1.38 H	360	59.6	-1.3
2	2390.00	48.3 AV	54.0	-5.7	1.38 H	360	49.6	-1.3
3	*2437.00	104.5 PK			1.38 H	360	105.7	-1.2
4	*2437.00	94.2 AV			1.38 H	360	95.4	-1.2
5	2488.00	60.9 PK	74.0	-13.1	1.38 H	360	61.9	-1.0
6	2488.00	50.5 AV	54.0	-3.5	1.38 H	360	51.5	-1.0
7	4874.00	57.1 PK	74.0	-16.9	1.30 H	74	53.8	3.3
8	4874.00	43.8 AV	54.0	-10.2	1.30 H	74	40.5	3.3
9	7311.00	53.9 PK	74.0	-20.1	3.72 H	340	44.1	9.8
10	7311.00	39.9 AV	54.0	-14.1	3.72 H	340	30.1	9.8
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	59.7 PK	74.0	-14.3	1.02 V	354	61.0	-1.3
2	2390.00	49.4 AV	54.0	-4.6	1.02 V	354	50.7	-1.3
3	*2437.00	111.6 PK			1.02 V	354	112.8	-1.2
4	*2437.00	101.6 AV			1.02 V	354	102.8	-1.2
5	2488.00	62.5 PK	74.0	-11.5	1.02 V	354	63.5	-1.0
6	2488.00	51.4 AV	54.0	-2.6	1.02 V	354	52.4	-1.0
7	4874.00	56.7 PK	74.0	-17.3	1.35 V	37	53.4	3.3
8	4874.00	43.3 AV	54.0	-10.7	1.35 V	37	40.0	3.3
9	7311.00	55.8 PK	74.0	-18.2	4.00 V	151	46.0	9.8
10	7311.00	41.3 AV	54.0	-12.7	4.00 V	151	31.5	9.8

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 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	103.3 PK			1.44 H	360	104.4	-1.1
2	*2462.00	93.1 AV			1.44 H	360	94.2	-1.1
3	2483.50	68.6 PK	74.0	-5.4	1.44 H	360	69.6	-1.0
4	2483.50	52.9 AV	54.0	-1.1	1.44 H	360	53.9	-1.0
5	4924.00	56.8 PK	74.0	-17.2	1.31 H	65	53.3	3.5
6	4924.00	44.4 AV	54.0	-9.6	1.31 H	65	40.9	3.5
7	7386.00	58.7 PK	74.0	-15.3	3.78 H	271	48.8	9.9
8	7386.00	45.5 AV	54.0	-8.5	3.78 H	271	35.6	9.9
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	110.4 PK			1.05 V	353	111.5	-1.1
2	*2462.00	100.5 AV			1.05 V	353	101.6	-1.1
3	2483.50	70.2 PK	74.0	-3.8	1.05 V	353	71.2	-1.0
4	2483.50	53.8 AV	54.0	-0.2	1.05 V	353	54.8	-1.0
5	4924.00	57.3 PK	74.0	-16.7	1.50 V	44	53.8	3.5
6	4924.00	44.8 AV	54.0	-9.2	1.50 V	44	41.3	3.5
7	7386.00	60.4 PK	74.0	-13.6	2.22 V	134	50.5	9.9
8	7386.00	47.0 AV	54.0	-7.0	2.22 V	134	37.1	9.9

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	66.8 PK	74.0	-7.2	1.35 H	360	68.1	-1.3
2	2390.00	52.8 AV	54.0	-1.2	1.35 H	360	54.1	-1.3
3	*2422.00	97.5 PK			1.35 H	360	98.8	-1.3
4	*2422.00	87.1 AV			1.35 H	360	88.4	-1.3
5	4844.00	54.7 PK	74.0	-19.3	1.37 H	83	51.4	3.3
6	4844.00	41.3 AV	54.0	-12.7	1.37 H	83	38.0	3.3
7	7266.00	50.6 PK	74.0	-23.4	3.64 H	331	40.8	9.8
8	7266.00	37.2 AV	54.0	-16.8	3.64 H	331	27.4	9.8
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	68.2 PK	74.0	-5.8	1.03 V	354	69.5	-1.3
2	**2390.00**	**53.9 AV**	**54.0**	**-0.1**	**1.03 V**	**354**	**55.2**	**-1.3**
3	*2422.00	104.6 PK			1.03 V	354	105.9	-1.3
4	*2422.00	94.5 AV			1.03 V	354	95.8	-1.3
5	4844.00	54.6 PK	74.0	-19.4	1.39 V	50	51.3	3.3
6	4844.00	41.0 AV	54.0	-13.0	1.39 V	50	37.7	3.3
7	7266.00	53.7 PK	74.0	-20.3	3.94 V	135	43.9	9.8
8	7266.00	39.2 AV	54.0	-14.8	3.94 V	135	29.4	9.8

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	2390.00	65.0 PK	74.0	-9.0	1.37 H	356	66.3	-1.3
2	2390.00	50.2 AV	54.0	-3.8	1.37 H	356	51.5	-1.3
3	*2437.00	101.7 PK			1.37 H	356	102.9	-1.2
4	*2437.00	90.9 AV			1.37 H	356	92.1	-1.2
5	2483.50	62.8 PK	74.0	-11.2	1.37 H	356	63.8	-1.0
6	2483.50	48.5 AV	54.0	-5.5	1.37 H	356	49.5	-1.0
7	4874.00	56.6 PK	74.0	-17.4	1.34 H	71	53.3	3.3
8	4874.00	43.5 AV	54.0	-10.5	1.34 H	71	40.2	3.3
9	7311.00	53.2 PK	74.0	-20.8	3.67 H	325	43.4	9.8
10	7311.00	39.5 AV	54.0	-14.5	3.67 H	325	29.7	9.8
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	66.4 PK	74.0	-7.6	1.11 V	353	67.7	-1.3
2	2390.00	51.3 AV	54.0	-2.7	1.11 V	353	52.6	-1.3
3	*2437.00	108.8 PK			1.11 V	353	110.0	-1.2
4	*2437.00	98.3 AV			1.11 V	353	99.5	-1.2
5	2483.50	64.4 PK	74.0	-9.6	1.11 V	353	65.4	-1.0
6	2483.50	49.4 AV	54.0	-4.6	1.11 V	353	50.4	-1.0
7	4874.00	56.1 PK	74.0	-17.9	1.37 V	47	52.8	3.3
8	4874.00	42.8 AV	54.0	-11.2	1.37 V	47	39.5	3.3
9	7311.00	55.7 PK	74.0	-18.3	3.99 V	137	45.9	9.8
10	7311.00	41.4 AV	54.0	-12.6	3.99 V	137	31.6	9.8

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 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	98.3 PK			1.42 H	355	99.4	-1.1
2	*2452.00	87.8 AV			1.42 H	355	88.9	-1.1
3	2483.50	69.2 PK	74.0	-4.8	1.42 H	355	70.2	-1.0
4	2483.50	53.0 AV	54.0	-1.0	1.42 H	355	54.0	-1.0
5	4904.00	54.7 PK	74.0	-19.3	1.36 H	65	51.2	3.5
6	4904.00	41.4 AV	54.0	-12.6	1.36 H	65	37.9	3.5
7	7356.00	51.7 PK	74.0	-22.3	3.71 H	317	41.8	9.9
8	7356.00	37.9 AV	54.0	-16.1	3.71 H	317	28.0	9.9
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	105.4 PK			1.01 V	352	106.5	-1.1
2	*2452.00	95.2 AV			1.01 V	352	96.3	-1.1
3	2483.50	70.8 PK	74.0	-3.2	1.01 V	352	71.8	-1.0
4	**2483.50**	**53.9 AV**	**54.0**	**-0.1**	**1.01 V**	**352**	**54.9**	**-1.0**
5	4904.00	53.8 PK	74.0	-20.2	1.37 V	44	50.3	3.5
6	4904.00	40.7 AV	54.0	-13.3	1.37 V	44	37.2	3.5
7	7356.00	53.8 PK	74.0	-20.2	3.98 V	128	43.9	9.9
8	7356.00	39.4 AV	54.0	-14.6	3.98 V	128	29.5	9.9

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:

802.11g

CHANNEL	TX Channel 6	**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	134.54	33.0 QP	43.5	-10.5	1.00 H	298	41.7	-8.7
2	479.98	36.8 QP	46.0	-9.2	1.00 H	230	39.3	-2.5
3	659.99	33.2 QP	46.0	-12.8	2.00 H	342	32.3	0.9
4	719.86	36.5 QP	46.0	-9.5	1.00 H	104	35.1	1.4
5	796.64	33.7 QP	46.0	-12.3	3.00 H	320	30.7	3.0
6	959.99	41.6 QP	46.0	-4.4	1.00 H	335	36.5	5.1
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	59.97	34.0 QP	40.0	-6.0	1.00 V	360	42.2	-8.2
2	124.43	33.7 QP	43.5	-9.8	1.00 V	360	43.1	-9.4
3	237.80	40.5 QP	46.0	-5.5	1.00 V	66	50.1	-9.6
4	480.01	31.1 QP	46.0	-14.9	2.00 V	210	33.6	-2.5
5	597.45	30.5 QP	46.0	-15.5	1.00 V	360	30.3	0.2
6	826.64	31.3 QP	46.0	-14.7	2.00 V	274	27.9	3.4

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

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, 20167	Nov. 14, 2018
Line-Impedance Stabilization Network (for Peripheral) R&S	ENV216	100072	June 03, 2017	June 02, 2018
50 ohms Terminator	N/A	EMC-02	Sep. 22, 2017	Sep. 21, 2018
RF Cable	5D-FB	COCCAB-001	Sep. 29, 2017	Sep. 28, 2018
10 dB PAD Mini-Circuits	HAT-10+	CONATT-004	June 18, 2017	June 17, 2018
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 Shielded Room No. 1.
3. Tested Date: Dec. 15, 2017

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.

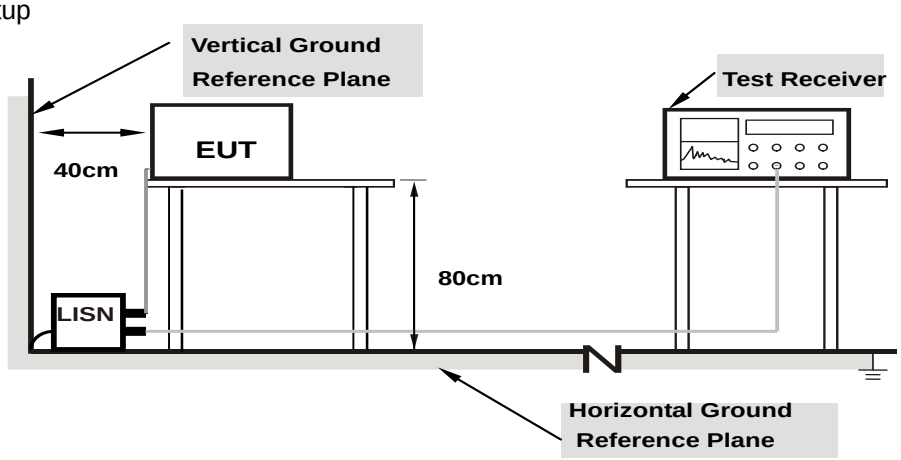
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

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.

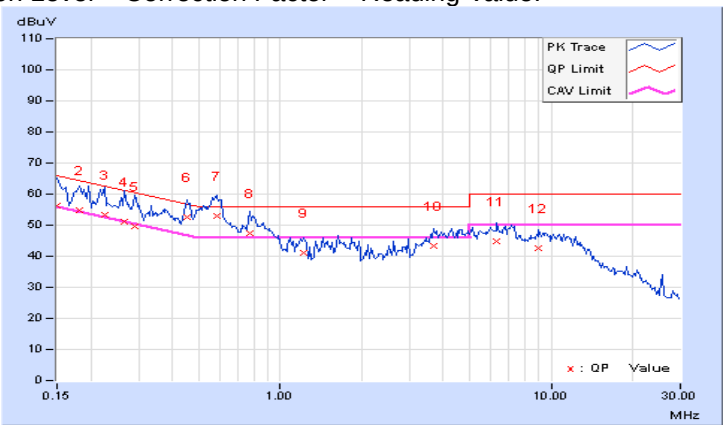
4.2.7 Test Results

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	10.09	46.14	34.64	56.23	44.73	66.00	56.00	-9.77	-11.27
2	0.18125	10.08	44.69	34.12	54.77	44.20	64.43	54.43	-9.66	-10.23
3	0.22422	10.08	43.39	33.16	53.47	43.24	62.66	52.66	-9.19	-9.42
4	0.26719	10.09	40.84	31.35	50.93	41.44	61.20	51.20	-10.27	-9.76
5	0.29063	10.09	39.61	29.78	49.70	39.87	60.51	50.51	-10.81	-10.64
6	0.45469	10.12	42.52	33.18	52.64	43.30	56.79	46.79	-4.15	-3.49
7	**0.58359**	**10.14**	**42.69**	**33.06**	**52.83**	**43.20**	**56.00**	**46.00**	**-3.17**	**-2.80**
8	0.77500	10.15	37.21	26.94	47.36	37.09	56.00	46.00	-8.64	-8.91
9	1.22266	10.17	30.95	21.55	41.12	31.72	56.00	46.00	-14.88	-14.28
10	3.69141	10.33	32.98	24.78	43.31	35.11	56.00	46.00	-12.69	-10.89
11	6.32031	10.53	34.25	26.30	44.78	36.83	60.00	50.00	-15.22	-13.17
12	9.01953	10.72	31.75	24.11	42.47	34.83	60.00	50.00	-17.53	-15.17

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.

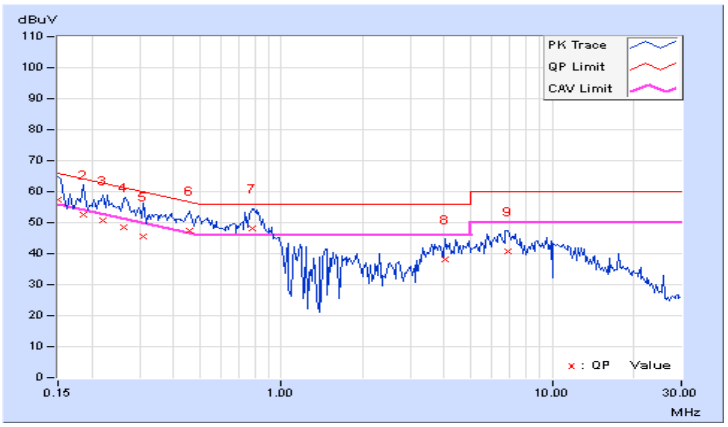


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)

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	0.15000	10.08	47.23	27.78	57.31	37.86	66.00	56.00	-8.69	-18.14
2	0.18516	10.05	42.43	24.54	52.48	34.59	64.25	54.25	-11.77	-19.66
3	0.22031	10.05	40.63	23.80	50.68	33.85	62.81	52.81	-12.13	-18.96
4	0.26328	10.07	38.31	21.54	48.38	31.61	61.33	51.33	-12.95	-19.72
5	0.31016	10.08	35.43	18.62	45.51	28.70	59.97	49.97	-14.46	-21.27
6	0.45859	10.12	37.21	22.65	47.33	32.77	56.72	46.72	-9.39	-13.95
7	0.77891	10.13	38.02	22.85	48.15	32.98	56.00	46.00	-7.85	-13.02
8	4.02734	10.26	28.03	15.32	38.29	25.58	56.00	46.00	-17.71	-20.42
9	6.88672	10.48	30.18	16.52	40.66	27.00	60.00	50.00	-19.34	-23.00

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.

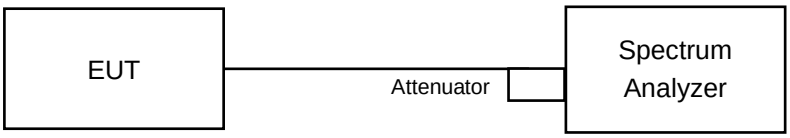


4.3 6dB Bandwidth Measurement

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	10.23	0.5	PASS
6	2437	10.17	0.5	PASS
11	2462	10.17	0.5	PASS

802.11g

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	16.37	0.5	PASS
6	2437	16.34	0.5	PASS
11	2462	16.34	0.5	PASS

802.11n (HT20)

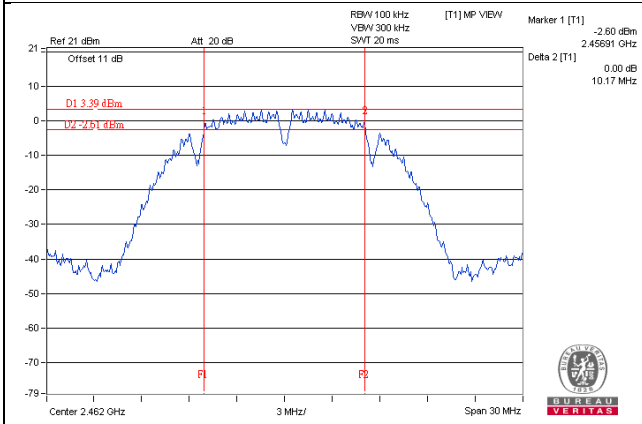
Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	16.97	0.5	Pass
6	2437	17.05	0.5	Pass
11	2462	17.06	0.5	Pass

802.11n (HT40)

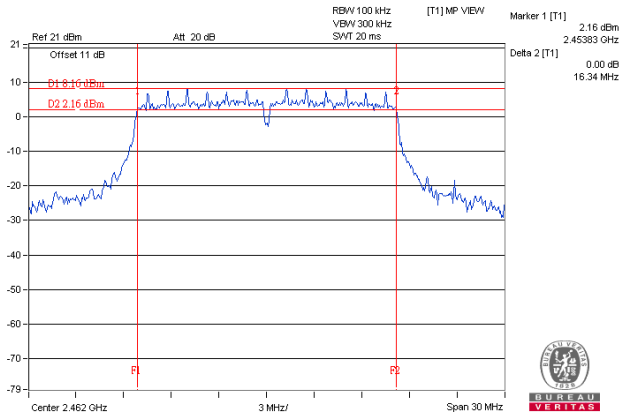
Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
3	2422	35.27	0.5	Pass
6	2437	35.29	0.5	Pass
9	2452	35.42	0.5	Pass

Spectrum Plot of Worst Value

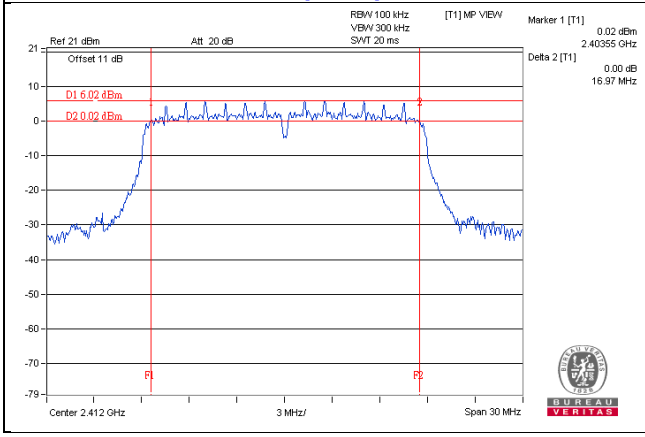
802.11b: CH11



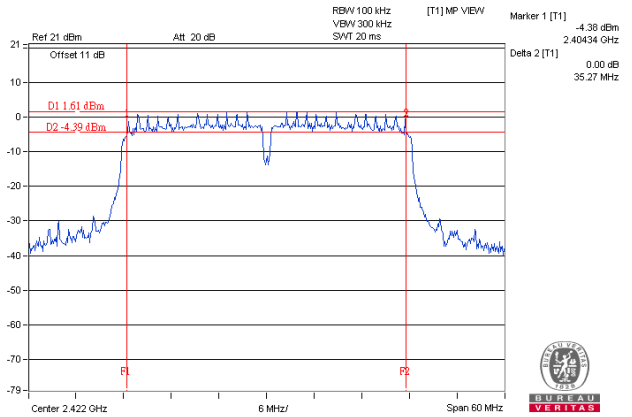
802.11g: CH11



802.11n (HT20): CH1



802.11n (HT40): CH3

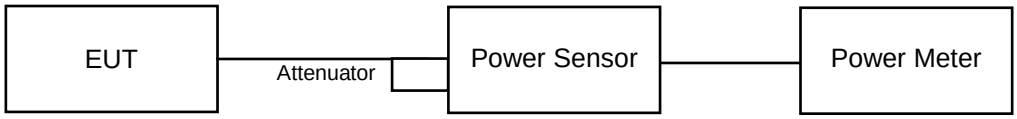


4.4 Conducted Output Power Measurement

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

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	54.075	17.33	30	Pass
6	2437	44.055	16.44	30	Pass
11	2462	40.551	16.08	30	Pass

802.11g

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
1	2412	317.687	25.02	30	Pass
6	2437	506.991	27.05	30	Pass
11	2462	399.025	26.01	30	Pass

802.11n (HT20)

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
1	2412	235.505	23.72	30	Pass
6	2437	402.717	26.05	30	Pass
11	2462	293.089	24.67	30	Pass

802.11n (HT40)

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
3	2422	190.985	22.81	30	Pass
6	2437	399.025	26.01	30	Pass
9	2452	233.884	23.69	30	Pass

FOR AVERAGE POWER

802.11b

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	30.061	14.78
6	2437	22.336	13.49
11	2462	22.131	13.45

802.11g

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	71.45	18.54
6	2437	110.662	20.44
11	2462	90.365	19.56

802.11n (HT20)

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	53.333	17.27
6	2437	82.414	19.16
11	2462	68.391	18.35

802.11n (HT40)

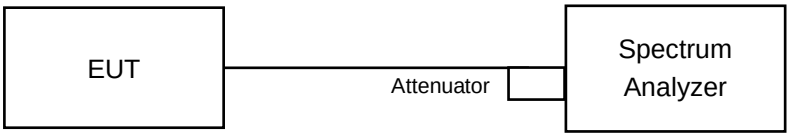
Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
3	2422	38.815	15.89
6	2437	80.168	19.04
9	2452	47.098	16.73

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	-12.31	8	Pass
6	2437	-12.63	8	Pass
11	2462	-13.70	8	Pass

802.11g

Channel	Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
1	2412	-9.44	8	Pass
6	2437	-7.52	8	Pass
11	2462	-6.65	8	Pass

802.11n (HT20)

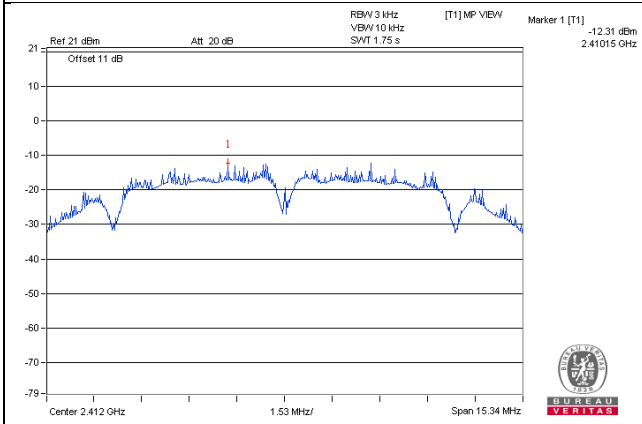
Channel	Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
1	2412	-10.73	8	Pass
6	2437	-7.89	8	Pass
11	2462	-8.54	8	Pass

802.11n (HT40)

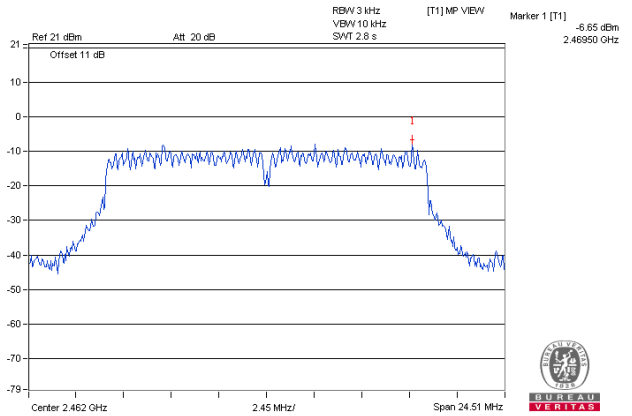
Channel	Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
3	2422	-14.37	8	Pass
6	2437	-10.34	8	Pass
9	2452	-13.33	8	Pass

Spectrum Plot of Worst Value

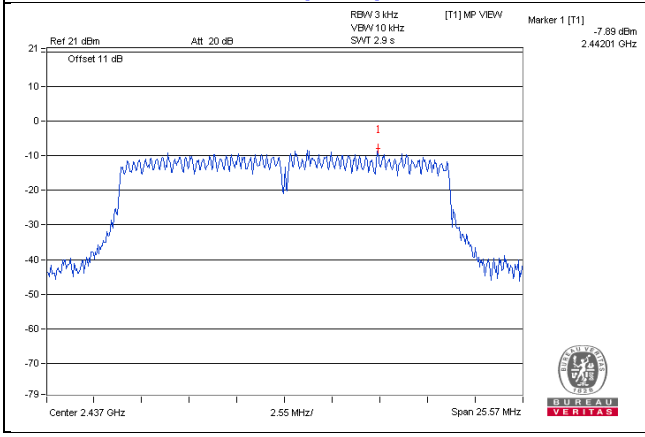
802.11b: CH1



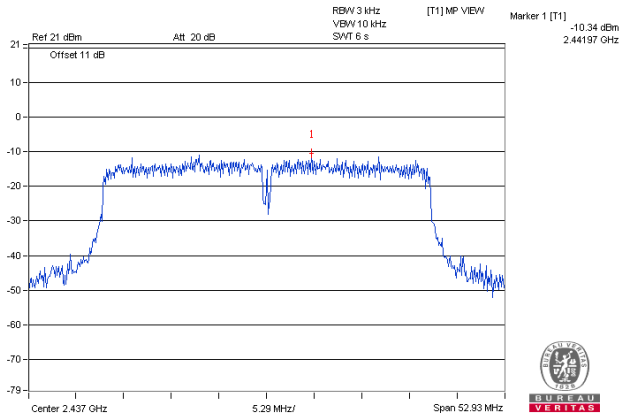
802.11g: CH11



802.11n (HT20): CH6



802.11n (HT40): CH6

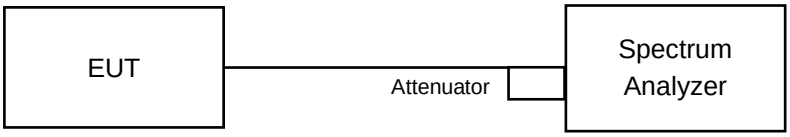


4.6 Conducted Out of Band Emission Measurement

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

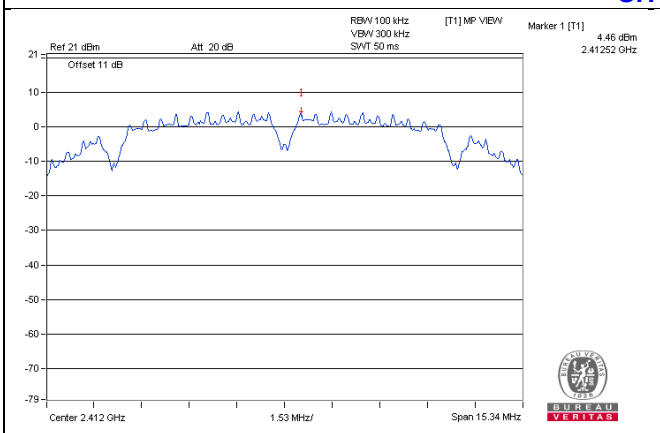
Same as Item 4.3.6

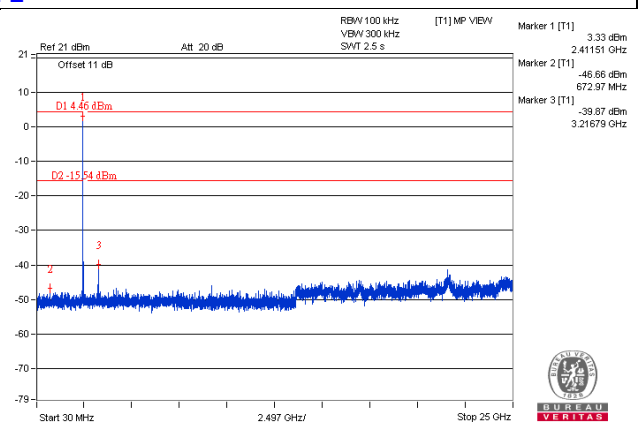
4.6.7 Test Results

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 the requirement.

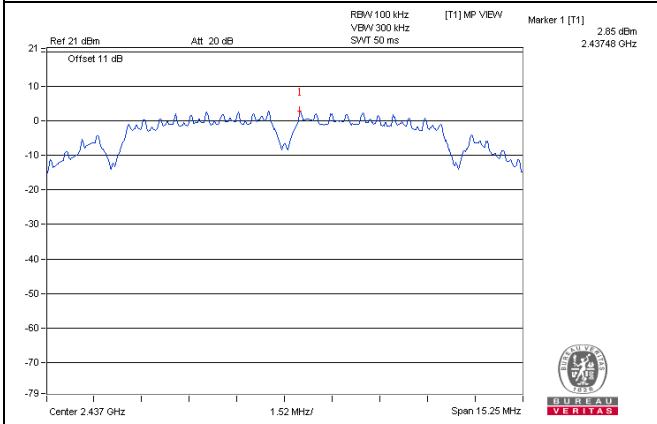
802.11b

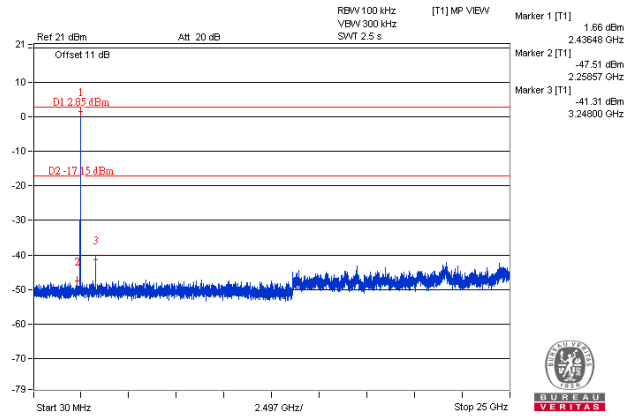
CH 1



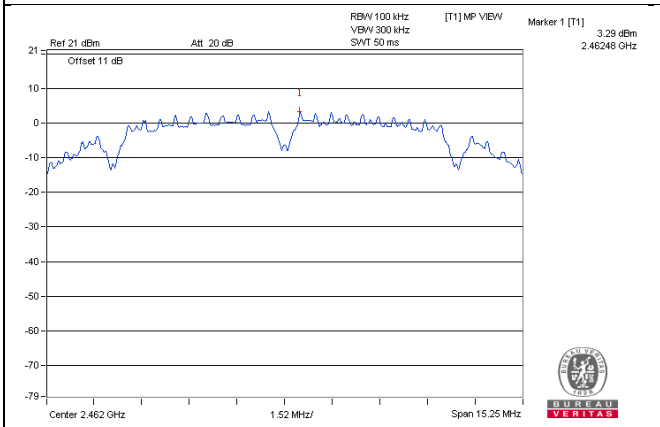


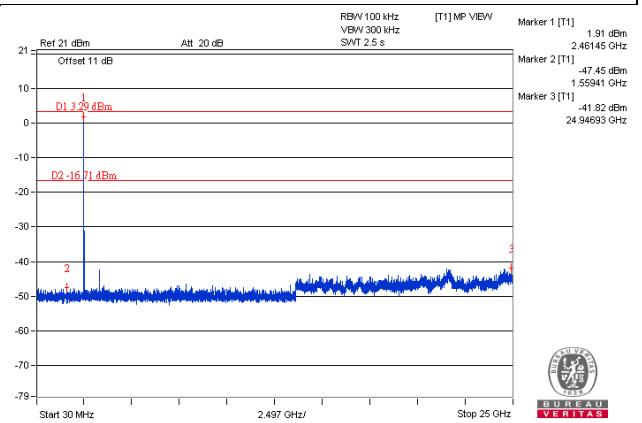
CH 6



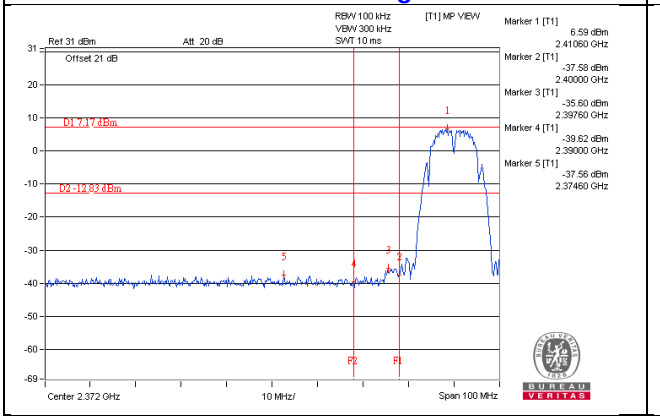


CH 11

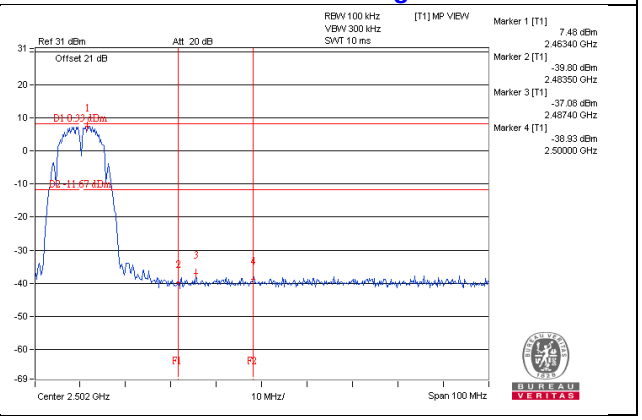




CH 1 Band edge

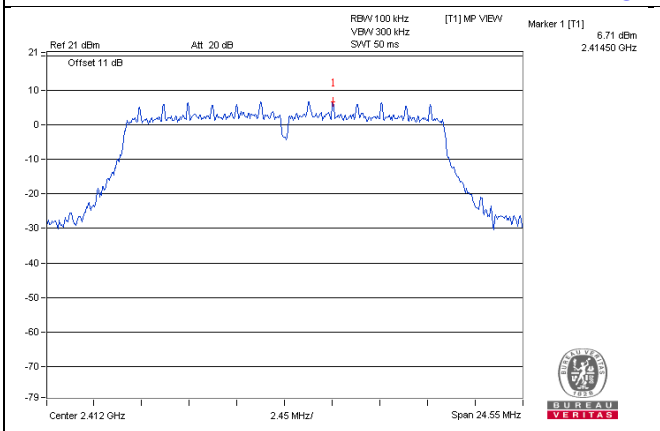


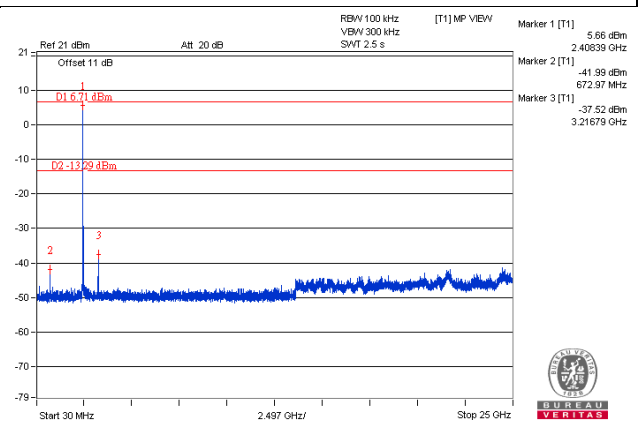
CH 11 Band edge



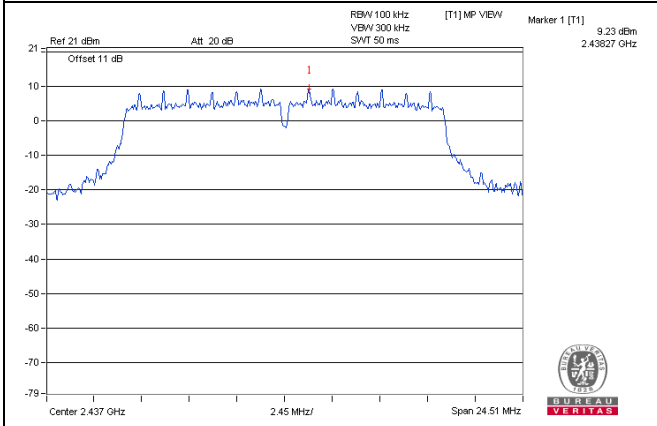
802.11g

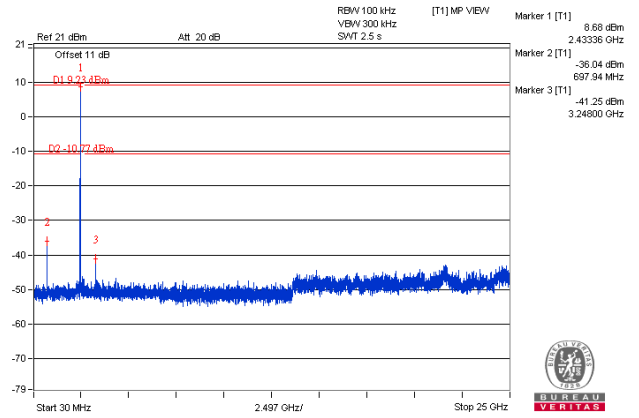
CH 1



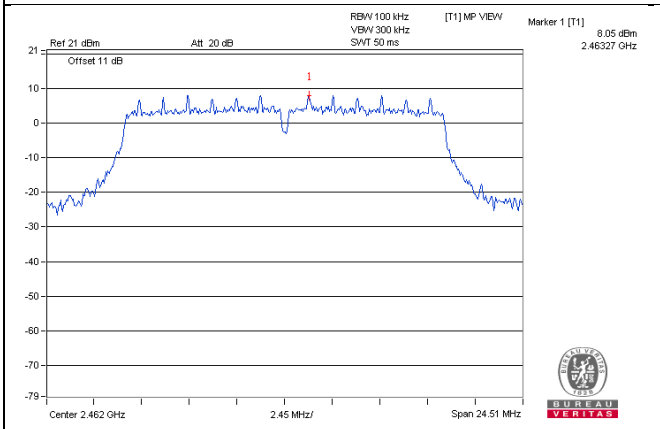


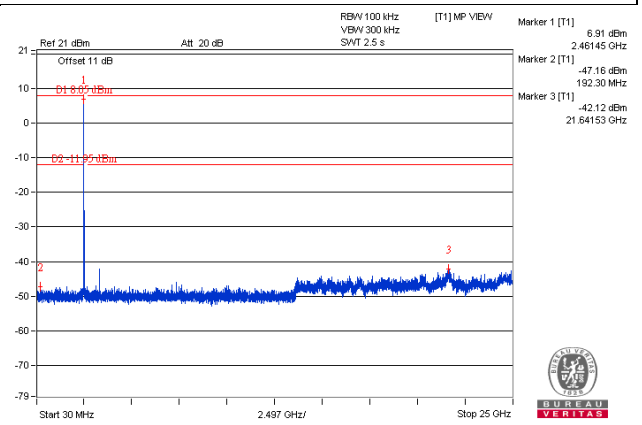
CH 6



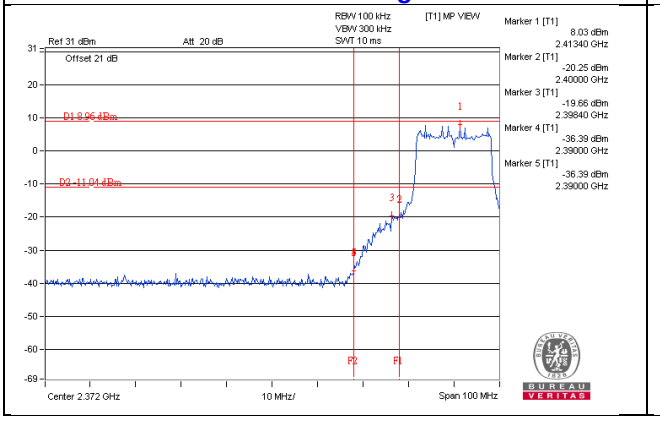


CH 11

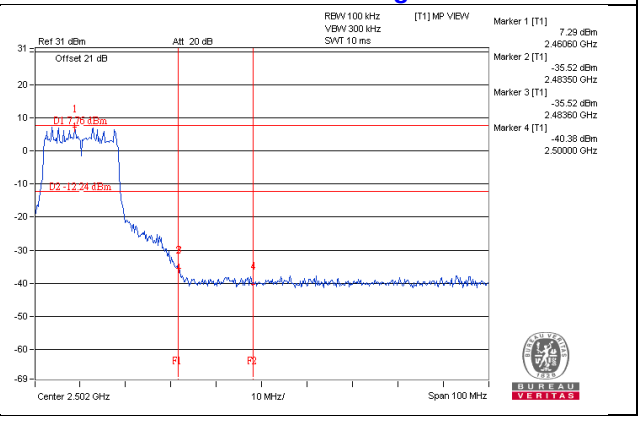




CH 1 Band edge

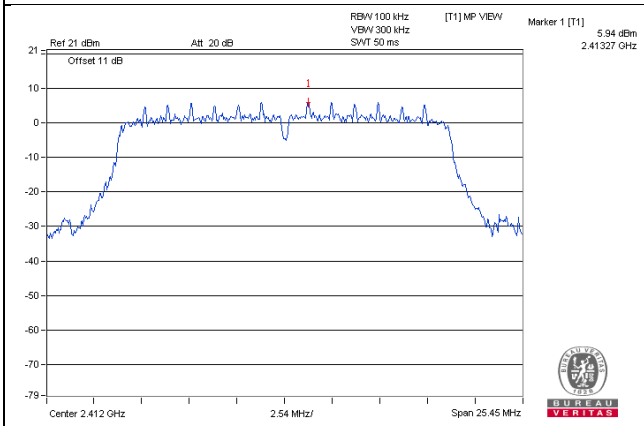


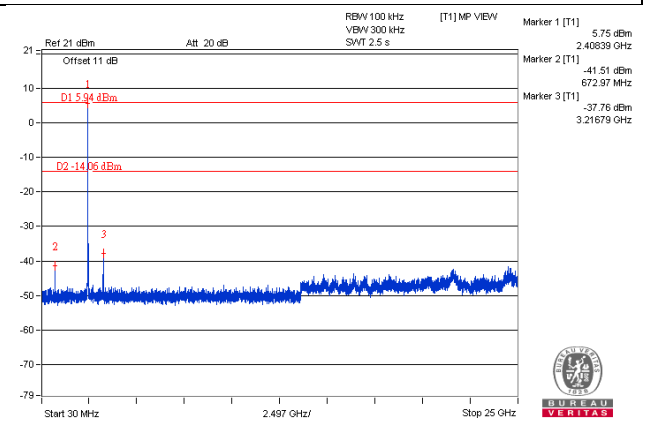
CH 11 Band edge



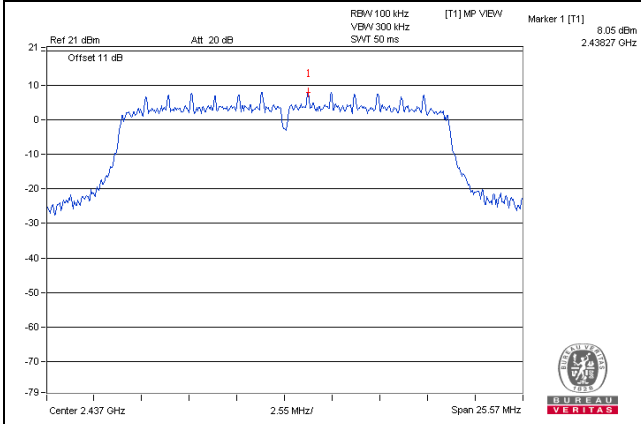
802.11n (HT20)

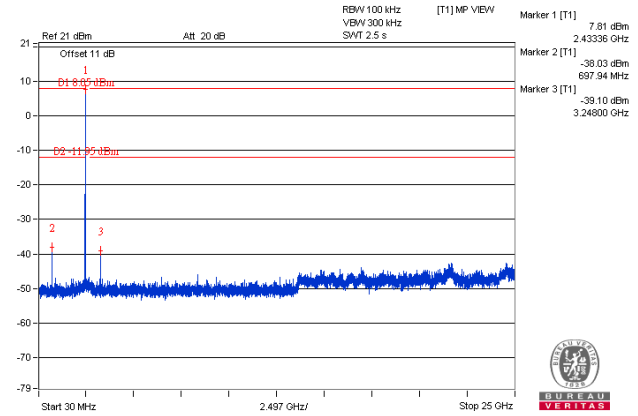
CH 1



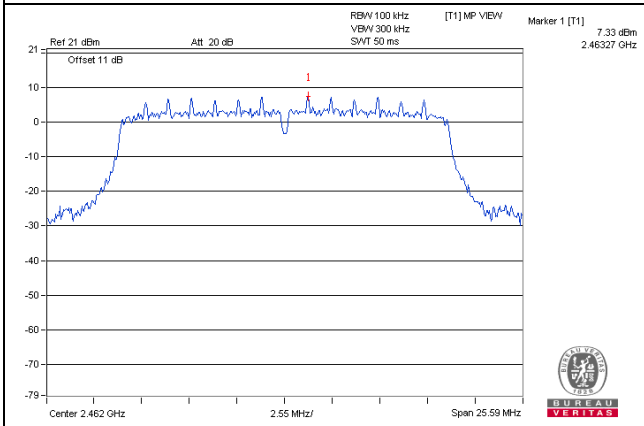


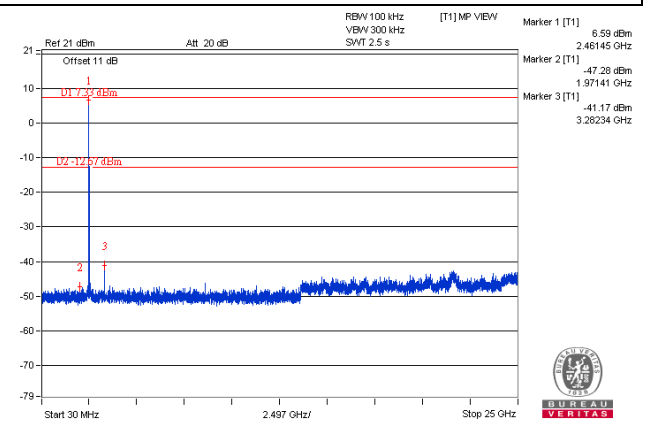
CH 6



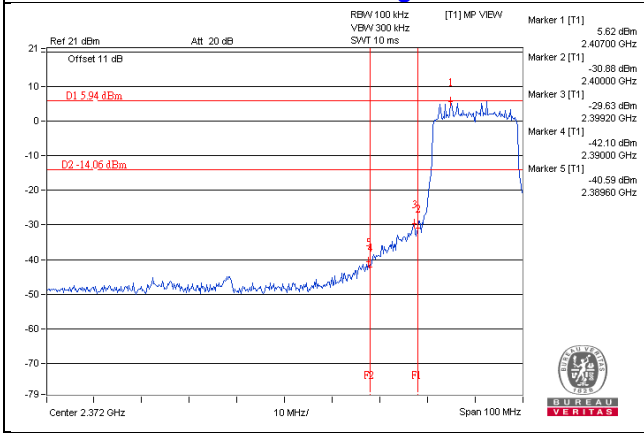


CH 11

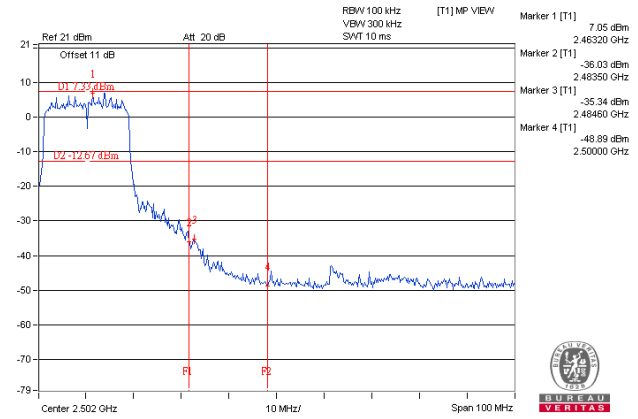




CH 1 Band edge

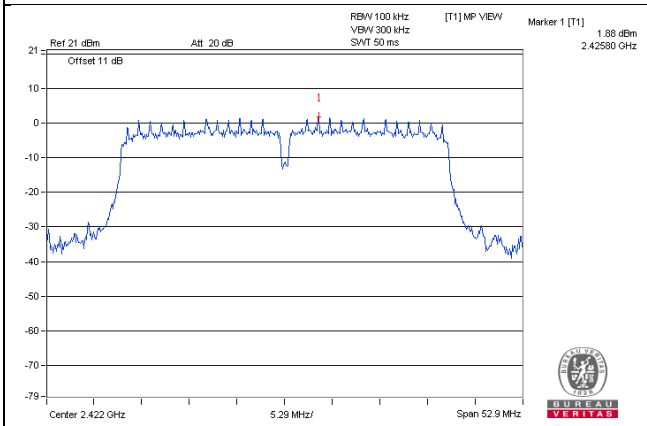


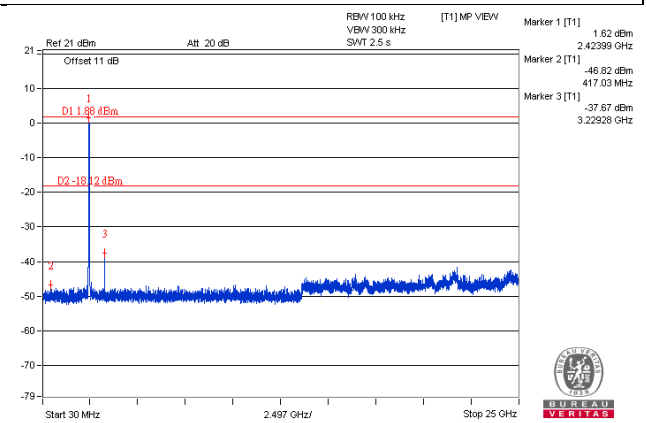
CH 11 Band edge



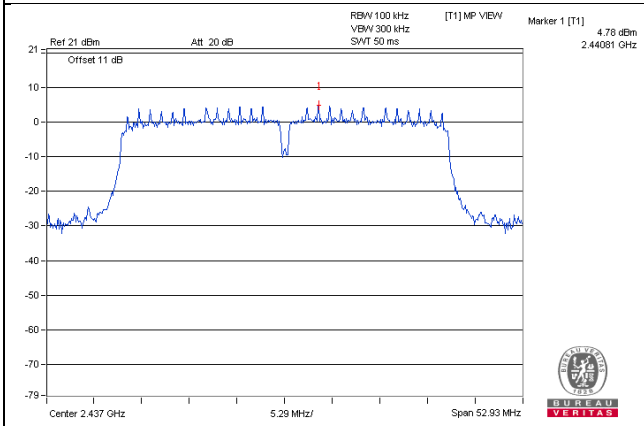
802.11n (HT40)

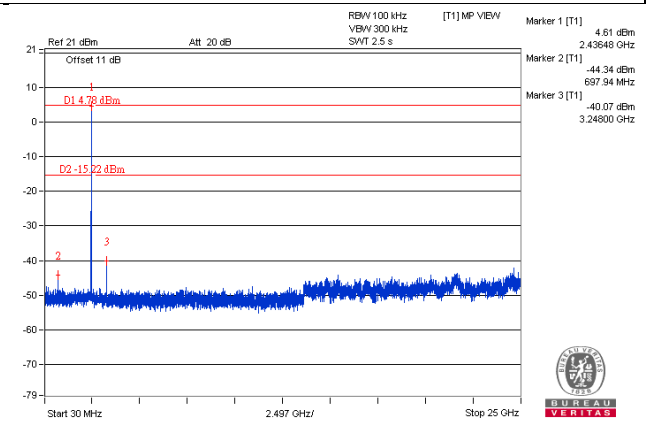
CH 3



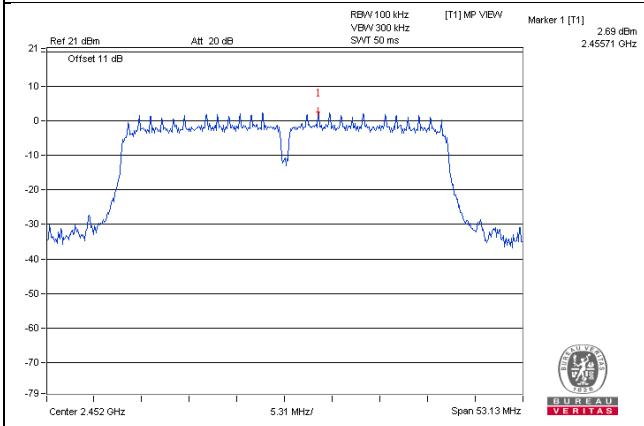


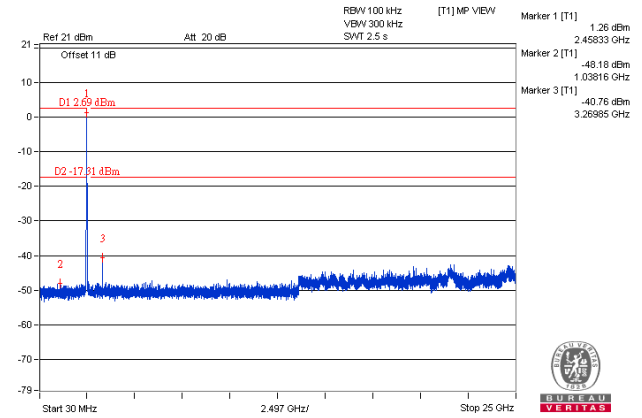
CH 6



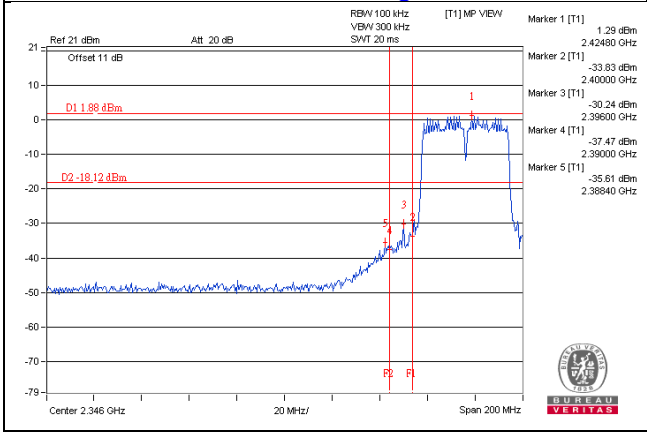


CH 9

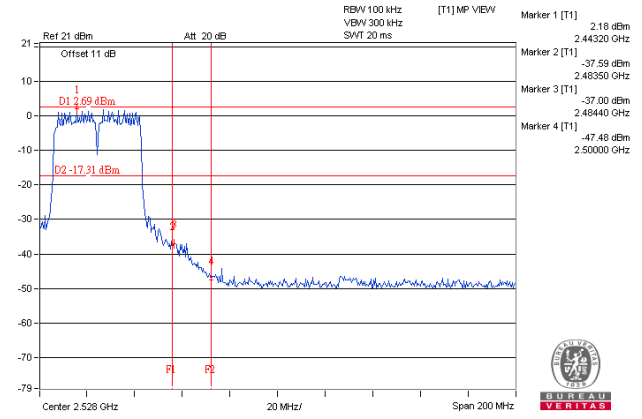




CH 3 Band edge



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:

Linko 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 ---