

FCC Test Report

Report No.: RF180201C11B

FCC ID: Q3N-RK25

Test Model: RK25

Received Date: Feb. 01, 2018

Test Date: Feb. 22 ~ Mar. 09, 2018

Issued Date: Apr. 10, 2018

Applicant: CIPHERLAB CO., LTD

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

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Test Location: No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, TAIWAN (R.O.C.)

FCC Registration / 788550 / TW0003
Designation Number:



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Release Control Record

Issue No.	Description	Date Issued
RF180201C11B	Original release.	Apr. 10, 2018

1 Certificate of Conformity

Product: Mobile Computer

Brand: CIPHERLAB

Test Model: RK25

Sample Status: Engineering sample

Applicant: CIPHERLAB CO., LTD

Test Date: Feb. 22 ~ Mar. 09, 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 :


Polly Chen / Specialist

Date: Apr. 10, 2018

Approved by :


Bruce Chen / Project Engineer

Date: Apr. 10, 2018

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	Pass	Meet the requirement of limit. Minimum passing margin is -10.57dB at 0.57620MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -1.0dB at 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 Spring 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) ($\pm$)
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.94 dB
Radiated Emissions up to 1 GHz	30MHz ~ 200MHz	3.86 dB
	200MHz ~ 1000MHz	3.87 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	2.29 dB
	18GHz ~ 40GHz	2.29 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Mobile Computer
Brand	CIPHERLAB
Test Model	RK25
Sample Status	Engineering sample
Power Supply Rating	5Vdc (adapter) 3.8Vdc (battery)
Modulation Type	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
Modulation Technology	DSSS, OFDM
Transfer Rate	802.11b: 11/5.5/2/1Mbps 802.11g: 54/48/36/24/18/12/9/6Mbps 802.11n: up to 150Mbps
Operating Frequency	2412 ~ 2462MHz
Number of Channel	802.11b, 802.11g, 802.11n (HT20): 11 802.11n (HT40): 7
Output Power	211.349mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	Adapter, Battery
Cable Supplied	1m shielded USB cable without core 1.6m non-shielded snap-on cable with one core

Note:

1. The EUT provides 1 completed transmitter and 1 receiver.

Modulation Mode	TX Function
802.11b	1TX
802.11g	1TX
802.11n (HT20)	1TX
802.11n (HT40)	1TX

2. The EUT uses following antennas.

WLAN / BT EDR / BT LE					
Brand	Arima		Model	330-0000-00453	
Antenna Type	Embedded inverted-F		Antenna Connector	Spring	
Gain (dBi)	Frequency (MHz)				
	2400	2442	2484	5150	5875
	-0.2	0.3	0.6	0.5	-0.1

* The max. gain among all 2.4GHz gains is chosen for final tests.

3. The EUT uses following accessory devices.

Component	Vendor	Model	Specification
Adapter	Sunny COMPUTER TECHNOLOGY CO.,LTD.	SYS1561-1005	I/P: 100-240Vac, 1.0A MAX, 50-60Hz O/P: +5Vdc, 2A, 10W MAX.
Battery	CIPHERLAB	BA-0124A0	Rating: 3.8Vdc, 4000mAh, 15.2Wh

4. WLAN 2.4GHz and WLAN 5GHz / WLAN and BT technologies can not transmit at same time.

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 $\geq$ 1G	RE<1G	PLC	APCM	
A	√	√	√	√	EUT + USB Cable + Adapter + Battery
B	-	√	√	-	EUT + Snapon Cable + Adapter + Battery

Where RE $\geq$ 1G: Radiated Emission above 1GHz & Bandedge Measurement

RE<1G: Radiated Emission below 1GHz

PLC: Power Line Conducted Emission

APCM: Antenna Port Conducted Measurement

Note:

1. The antenna had been pre-tested on the positioned of each 3 axis. The worst cases were found when positioned on X-plane.
2. "-" means no effect.

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.

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)	Remark
A	802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1.0	1TX
A	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0	1TX
A	802.11n (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	6.5	1TX
A	802.11n (HT40)	3 to 9	3, 6, 9	OFDM	BPSK	13.5	1TX

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.

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)	Remark
A, B	802.11b	1 to 11	11	DSSS	DBPSK	1.0	1TX

Power Line Conducted Emission Test:

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

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)	Remark
A, B	802.11b	1 to 11	11	DSSS	DBPSK	1.0	1TX

Antenna Port Conducted Measurement:

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

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)	Remark
A	802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1.0	1TX
A	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0	1TX
A	802.11n (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	6.5	1TX
A	802.11n (HT40)	3 to 9	3, 6, 9	OFDM	BPSK	13.5	1TX

Test Condition:

Applicable to	Environmental Conditions	Input Power	Tested by
RE $\geq$ 1G	25 deg. C, 70% RH	120Vac, 60Hz	Matthew Yang
RE<1G	25 deg. C, 65% RH	120Vac, 60Hz	Greg Lin
PLC	25 deg. C, 75% RH	120Vac, 60Hz	Greg Lin
APCM	25 deg. C, 60% RH	120Vac, 60Hz	Chris Lin

3.3 Duty Cycle of Test Signal

Duty cycle of test signal is $\geq 98\%$

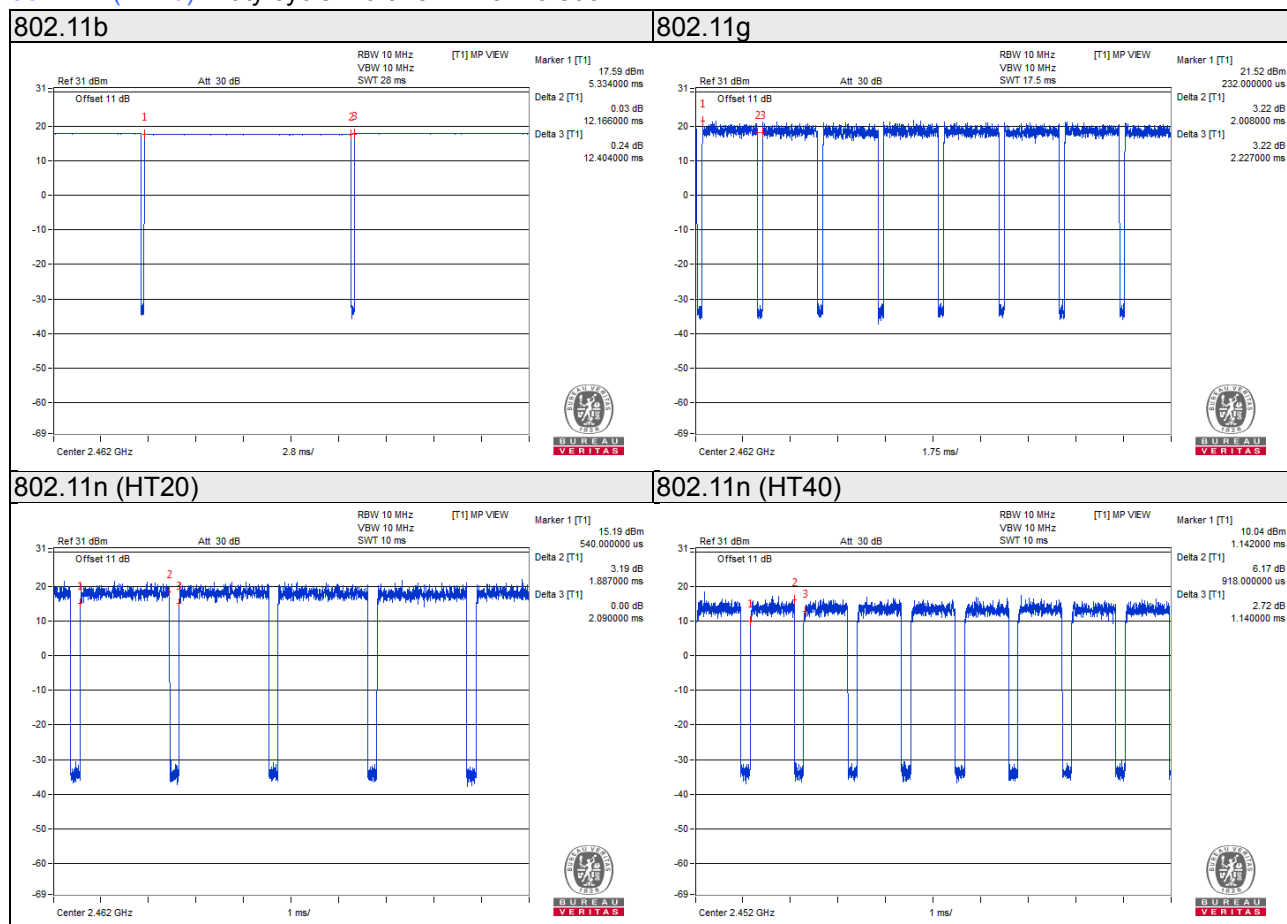
Duty cycle of test signal is $< 98\%$

802.11b: Duty cycle = $12.166/12.404 = 0.981$

802.11g: Duty cycle = $2.008/2.227 = 0.902$

802.11n (HT20): Duty cycle = $1.887/2.090 = 0.903$

802.11n (HT40): Duty cycle = $0.918/1.140 = 0.805$

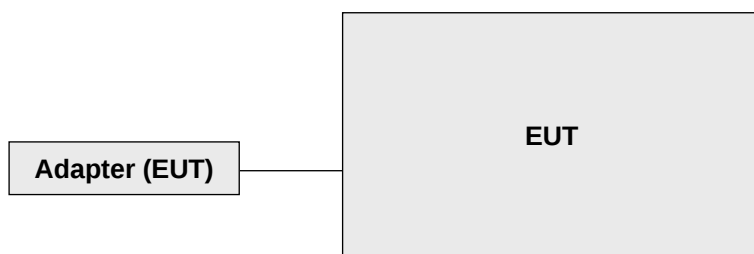


3.4 Description of Support Units

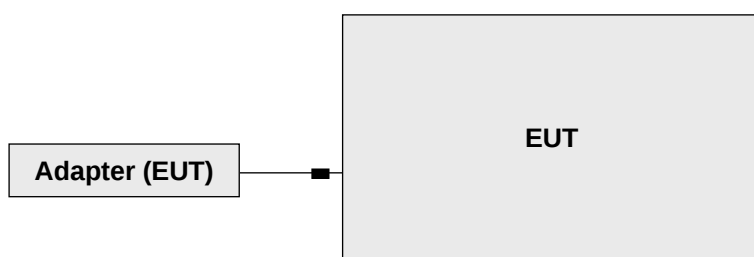
The EUT has been tested as an independent unit together with other necessary accessories or support units.

3.4.1 Configuration of System under Test

Mode A



Mode B



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.

Note: The EUT has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC).
The test report has been issued separately.

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 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.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESIB7	100187	May 02, 2017	May 01, 2018
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100041	Dec. 12, 2017	Dec. 11, 2018
BILOG Antenna SCHWARZBECK	VULB9168	9168-171	Dec. 11, 2017	Dec. 10, 2018
HORN Antenna SCHWARZBECK	9120D	209	Dec. 13, 2017	Dec. 12, 2018
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Dec. 01, 2017	Nov. 30, 2018
Loop Antenna EMCI	EM-6879	269	Aug. 11, 2017	Aug. 10, 2018
Preamplifier Agilent (Below 1GHz)	8447D	2944A10738	Aug. 21, 2017	Aug. 20, 2018
Preamplifier Agilent (Above 1GHz)	8449B	3008A02465	Apr. 05, 2017	Apr. 04, 2018
RF signal cable HUBER+SUHNER	SUCOFLEX 104	Cable-CH3-03 (223653/4)	Aug. 21, 2017	Aug. 20, 2018
RF signal cable HUBER+SUHNER& EMCI	SUCOFLEX 104&EMC104-SM-S M-8000	Cable-CH3-03 (309224+170907)	Sep.11, 2017	Sep. 10, 2018
Software BV ADT	ADT_Radiated_ V7.6.15.9.4	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	013303	NA	NA
Antenna Tower Controller BV ADT	AT100	AT93021702	NA	NA
Turn Table BV ADT	TT100	TT93021702	NA	NA
Turn Table Controller BV ADT	SC100	SC93021702	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
High Speed Peak Power Meter	ML2495A	0824012	Aug. 18, 2017	Aug. 17, 2018
Power Sensor	MA2411B	0738171	Aug. 18, 2017	Aug. 17, 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 test was performed in HwaYa Chamber 3.
 3. The horn antenna and preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
 4. The FCC Designation Number is TW0003. The number will be varied with the Lab location and scope as attached.
 5. The IC Site Registration No. is IC 7450F-3.

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:

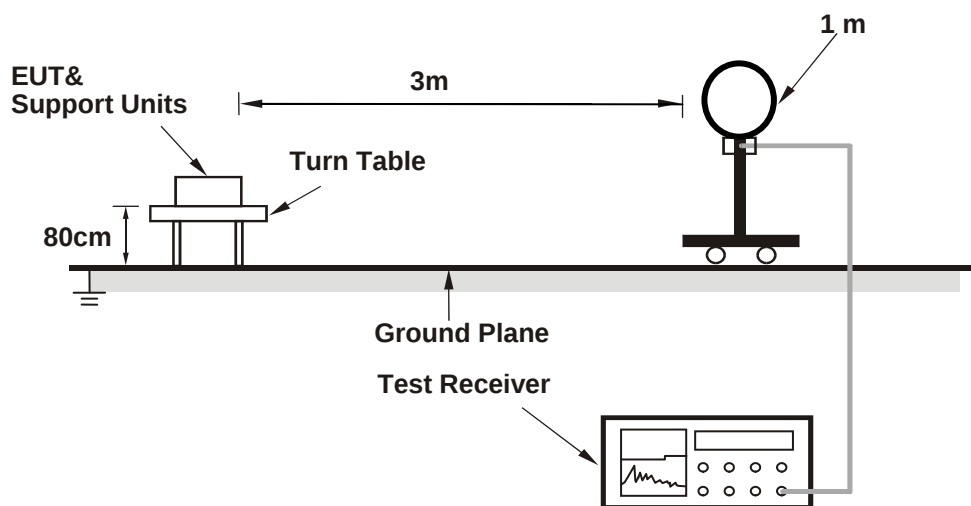
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is $\geq 1/T$ (Duty cycle < 98%) or 3 x RBW (Duty cycle $\geq 98\%$) 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

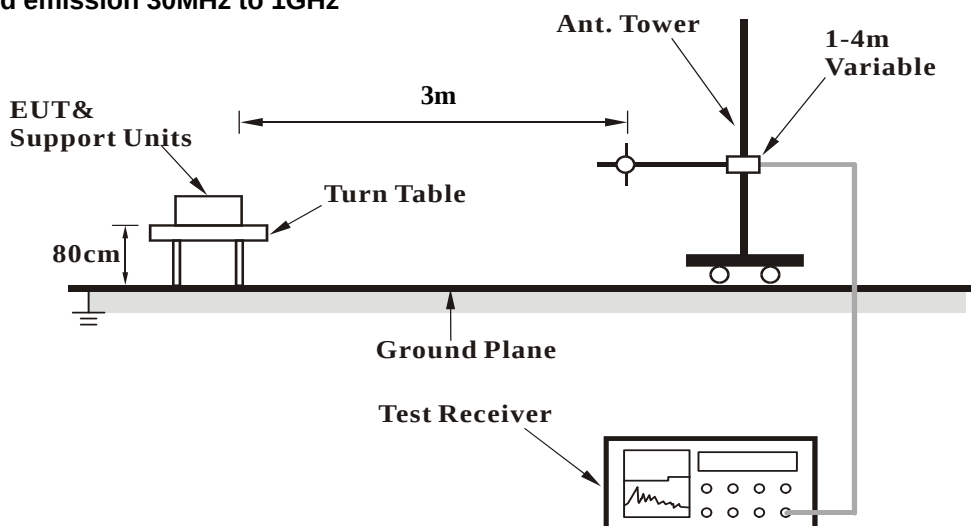
No deviation.

4.1.5 Test Setup

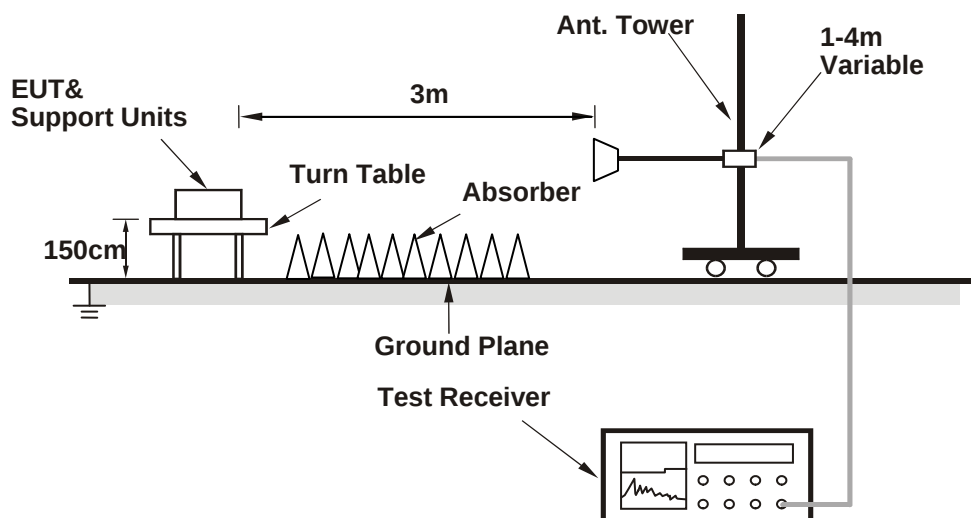
For Radiated emission below 30MHz



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

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

4.1.7 Test Results

Above 1GHz worst-Case data:

802.11b

CHANNEL	TX Channel 1	DETECTOR	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz	FUNCTION	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	55.8 PK	74.0	-18.2	2.44 H	199	23.60	32.20
2	2390.00	44.5 AV	54.0	-9.5	2.44 H	199	12.30	32.20
3	*2412.00	97.6 PK			2.60 H	215	65.50	32.10
4	*2412.00	93.7 AV			2.60 H	215	61.60	32.10
5	4824.00	55.1 PK	74.0	-18.9	1.14 H	209	53.40	1.70
6	4824.00	52.7 AV	54.0	-1.3	1.14 H	209	51.00	1.70
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	55.6 PK	74.0	-18.4	1.08 V	282	23.40	32.20
2	2390.00	44.3 AV	54.0	-9.7	1.08 V	282	12.10	32.20
3	*2412.00	95.2 PK			1.00 V	263	63.10	32.10
4	*2412.00	91.3 AV			1.00 V	263	59.20	32.10
5	4824.00	54.2 PK	74.0	-19.8	1.00 V	311	52.50	1.70
6	4824.00	51.7 AV	54.0	-2.3	1.00 V	311	50.00	1.70

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	*2437.00	98.0 PK			2.52 H	214	66.00	32.00
2	*2437.00	94.5 AV			2.52 H	214	62.50	32.00
3	4874.00	54.7 PK	74.0	-19.3	1.35 H	258	52.80	1.90
4	4874.00	52.5 AV	54.0	-1.5	1.35 H	258	50.60	1.90
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	97.6 PK			1.22 V	252	65.60	32.00
2	*2437.00	94.0 AV			1.22 V	252	62.00	32.00
3	4874.00	54.4 PK	74.0	-19.6	1.07 V	299	52.50	1.90
4	4874.00	52.3 AV	54.0	-1.7	1.07 V	299	50.40	1.90

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	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz	FUNCTION	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	*2462.00	98.5 PK			2.44 H	242	66.40	32.10
2	*2462.00	94.9 AV			2.44 H	242	62.80	32.10
3	2483.50	55.8 PK	74.0	-18.2	2.50 H	219	23.70	32.10
4	2483.50	44.5 AV	54.0	-9.5	2.50 H	219	12.40	32.10
5	4924.00	55.7 PK	74.0	-18.3	1.15 H	192	53.60	2.10
6	4924.00	53.0 AV	54.0	-1.0	1.15 H	192	50.90	2.10
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	97.4 PK			1.06 V	258	65.30	32.10
2	*2462.00	93.6 AV			1.06 V	258	61.50	32.10
3	2483.50	55.6 PK	74.0	-18.4	1.12 V	268	23.50	32.10
4	2483.50	44.2 AV	54.0	-9.8	1.12 V	268	12.10	32.10
5	4924.00	54.0 PK	74.0	-20.0	1.45 V	316	51.90	2.10
6	4924.00	51.2 AV	54.0	-2.8	1.45 V	316	49.10	2.10

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)
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	56.6 PK	74.0	-17.4	1.33 H	203	24.40	32.20
2	2390.00	44.5 AV	54.0	-9.5	1.33 H	203	12.30	32.20
3	*2412.00	98.3 PK			2.06 H	192	66.20	32.10
4	*2412.00	88.3 AV			2.06 H	192	56.20	32.10
5	4824.00	52.4 PK	74.0	-21.6	1.26 H	188	50.70	1.70
6	4824.00	39.7 AV	54.0	-14.3	1.26 H	188	38.00	1.70
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	56.1 PK	74.0	-17.9	1.06 V	280	23.90	32.20
2	2390.00	44.3 AV	54.0	-9.7	1.06 V	280	12.10	32.20
3	*2412.00	97.3 PK			1.03 V	262	65.20	32.10
4	*2412.00	87.5 AV			1.03 V	262	55.40	32.10
5	4824.00	52.0 PK	74.0	-22.0	1.01 V	296	50.30	1.70
6	4824.00	39.2 AV	54.0	-14.8	1.01 V	296	37.50	1.70

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	*2437.00	100.4 PK			2.05 H	194	68.40	32.00
2	*2437.00	89.9 AV			2.05 H	194	57.90	32.00
3	4874.00	52.0 PK	74.0	-22.0	1.32 H	254	50.10	1.90
4	4874.00	39.3 AV	54.0	-14.7	1.32 H	254	37.40	1.90
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	97.6 PK			1.04 V	242	65.60	32.00
2	*2437.00	87.6 AV			1.04 V	242	55.60	32.00
3	4874.00	50.6 PK	74.0	-23.4	1.14 V	321	48.70	1.90
4	4874.00	38.1 AV	54.0	-15.9	1.14 V	321	36.20	1.90

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)
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	*2462.00	100.4 PK			1.73 H	193	68.30	32.10
2	*2462.00	89.9 AV			1.73 H	193	57.80	32.10
3	2483.50	57.7 PK	74.0	-16.3	1.89 H	206	25.60	32.10
4	2483.50	44.6 AV	54.0	-9.4	1.89 H	206	12.50	32.10
5	4924.00	51.4 PK	74.0	-22.6	1.19 H	258	49.30	2.10
6	4924.00	39.0 AV	54.0	-15.0	1.19 H	258	36.90	2.10
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	98.0 PK			1.06 V	248	65.90	32.10
2	*2462.00	87.9 AV			1.06 V	248	55.80	32.10
3	2483.50	57.0 PK	74.0	-17.0	1.10 V	261	24.90	32.10
4	2483.50	44.4 AV	54.0	-9.6	1.10 V	261	12.30	32.10
5	4924.00	49.9 PK	74.0	-24.1	1.22 V	267	47.80	2.10
6	4924.00	38.0 AV	54.0	-16.0	1.22 V	267	35.90	2.10

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)
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	55.8 PK	74.0	-18.2	2.18 H	184	23.60	32.20
2	2390.00	44.4 AV	54.0	-9.6	2.18 H	184	12.20	32.20
3	*2412.00	98.0 PK			2.36 H	194	65.90	32.10
4	*2412.00	88.5 AV			2.36 H	194	56.40	32.10
5	4824.00	52.1 PK	74.0	-21.9	1.34 H	185	50.40	1.70
6	4824.00	38.4 AV	54.0	-15.6	1.34 H	185	36.70	1.70
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	55.5 PK	74.0	-18.5	1.07 V	247	23.30	32.20
2	2390.00	44.3 AV	54.0	-9.7	1.07 V	247	12.10	32.20
3	*2412.00	97.1 PK			1.04 V	266	65.00	32.10
4	*2412.00	87.4 AV			1.04 V	266	55.30	32.10
5	4824.00	51.0 PK	74.0	-23.0	1.00 V	303	49.30	1.70
6	4824.00	37.7 AV	54.0	-16.3	1.00 V	303	36.00	1.70

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	*2437.00	98.5 PK			1.54 H	201	66.50	32.00
2	*2437.00	88.8 AV			1.54 H	201	56.80	32.00
3	4874.00	50.5 PK	74.0	-23.5	1.14 H	261	48.60	1.90
4	4874.00	37.1 AV	54.0	-16.9	1.14 H	261	35.20	1.90
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	97.3 PK			1.02 V	263	65.30	32.00
2	*2437.00	87.5 AV			1.02 V	263	55.50	32.00
3	4874.00	49.6 PK	74.0	-24.4	1.00 V	310	47.70	1.90
4	4874.00	36.8 AV	54.0	-17.2	1.00 V	310	34.90	1.90

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)
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	*2462.00	98.4 PK			2.01 H	193	66.30	32.10
2	*2462.00	88.7 AV			2.01 H	193	56.60	32.10
3	2483.50	55.9 PK	74.0	-18.1	2.11 H	198	23.80	32.10
4	2483.50	44.5 AV	54.0	-9.5	2.11 H	198	12.40	32.10
5	4924.00	51.2 PK	74.0	-22.8	1.29 H	194	49.10	2.10
6	4924.00	38.0 AV	54.0	-16.0	1.29 H	194	35.90	2.10
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	97.3 PK			1.09 V	257	65.20	32.10
2	*2462.00	87.7 AV			1.09 V	257	55.60	32.10
3	2483.50	55.6 PK	74.0	-18.4	1.01 V	250	23.50	32.10
4	2483.50	44.3 AV	54.0	-9.7	1.01 V	250	12.20	32.10
5	4924.00	50.5 PK	74.0	-23.5	1.00 V	322	48.40	2.10
6	4924.00	37.4 AV	54.0	-16.6	1.00 V	322	35.30	2.10

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	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz	FUNCTION	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	56.6 PK	74.0	-17.4	2.13 H	200	24.40	32.20
2	2390.00	44.7 AV	54.0	-9.3	2.13 H	200	12.50	32.20
3	*2422.00	95.0 PK			2.04 H	195	62.90	32.10
4	*2422.00	84.5 AV			2.04 H	195	52.40	32.10
5	4844.00	48.2 PK	74.0	-25.8	1.13 H	193	46.50	1.70
6	4844.00	35.1 AV	54.0	-18.9	1.13 H	193	33.40	1.70
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	56.2 PK	74.0	-17.8	1.09 V	264	24.00	32.20
2	2390.00	44.5 AV	54.0	-9.5	1.09 V	264	12.30	32.20
3	*2422.00	93.9 PK			1.02 V	255	61.80	32.10
4	*2422.00	83.5 AV			1.02 V	255	51.40	32.10
5	4844.00	46.2 PK	74.0	-27.8	1.25 V	324	44.50	1.70
6	4844.00	33.8 AV	54.0	-20.2	1.25 V	324	32.10	1.70

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	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz	FUNCTION	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	*2437.00	95.4 PK			2.09 H	191	63.40	32.00
2	*2437.00	84.6 AV			2.09 H	191	52.60	32.00
3	4874.00	47.1 PK	74.0	-26.9	1.16 H	184	45.20	1.90
4	4874.00	34.7 AV	54.0	-19.3	1.16 H	184	32.80	1.90
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	94.1 PK			1.05 V	259	62.10	32.00
2	*2437.00	83.8 AV			1.05 V	259	51.80	32.00
3	4874.00	46.3 PK	74.0	-27.7	1.28 V	317	44.40	1.90
4	4874.00	33.7 AV	54.0	-20.3	1.28 V	317	31.80	1.90

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)
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	*2452.00	96.0 PK			1.80 H	194	64.00	32.00
2	*2452.00	85.8 AV			1.80 H	194	53.80	32.00
3	2483.50	56.2 PK	74.0	-17.8	1.87 H	213	24.10	32.10
4	2483.50	44.7 AV	54.0	-9.3	1.87 H	213	12.60	32.10
5	4904.00	48.4 PK	74.0	-25.6	1.80 H	185	46.40	2.00
6	4904.00	34.6 AV	54.0	-19.4	1.80 H	185	32.60	2.00
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	94.6 PK			1.07 V	261	62.60	32.00
2	*2452.00	84.1 AV			1.07 V	261	52.10	32.00
3	2483.50	55.9 PK	74.0	-18.1	1.11 V	274	23.80	32.10
4	2483.50	44.4 AV	54.0	-9.6	1.11 V	274	12.30	32.10
5	4904.00	46.9 PK	74.0	-27.1	1.30 V	316	44.90	2.00
6	4904.00	33.8 AV	54.0	-20.2	1.30 V	316	31.80	2.00

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 worst-case data: 802.11b

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

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	30.00	31.6 QP	40.0	-8.4	1.00 H	213	46.70	-15.10
2	55.22	25.4 QP	40.0	-14.6	1.25 H	199	38.90	-13.50
3	187.14	30.3 QP	43.5	-13.2	1.50 H	326	45.80	-15.50
4	293.84	26.9 QP	46.0	-19.1	1.00 H	307	39.40	-12.50
5	710.94	26.4 QP	46.0	-19.6	1.50 H	283	32.10	-5.70
6	806.00	28.6 QP	46.0	-17.4	1.00 H	46	32.40	-3.80
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	55.22	33.6 QP	40.0	-6.4	1.50 V	285	47.10	-13.50
2	80.44	23.4 QP	40.0	-16.6	1.00 V	213	41.00	-17.60
3	167.74	25.0 QP	43.5	-18.5	1.00 V	23	38.60	-13.60
4	373.38	21.2 QP	46.0	-24.8	1.00 V	19	32.30	-11.10
5	604.24	24.9 QP	46.0	-21.1	1.25 V	18	32.10	-7.20
6	885.54	29.4 QP	46.0	-16.6	2.00 V	46	32.20	-2.80

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

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

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	31.94	29.6 QP	40.0	-10.4	1.00 H	200	44.50	-14.90
2	74.62	22.8 QP	40.0	-17.2	1.00 H	176	38.80	-16.00
3	192.96	26.2 QP	43.5	-17.3	1.25 H	290	42.20	-16.00
4	369.50	23.0 QP	46.0	-23.0	1.25 H	139	34.20	-11.20
5	528.58	23.6 QP	46.0	-22.4	1.50 H	303	32.50	-8.90
6	809.88	28.0 QP	46.0	-18.0	1.50 H	11	31.70	-3.70
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	35.82	32.2 QP	40.0	-7.8	1.50 V	334	46.90	-14.70
2	163.86	25.1 QP	43.5	-18.4	1.25 V	237	38.50	-13.40
3	371.44	24.7 QP	46.0	-21.3	1.50 V	122	35.90	-11.20
4	567.38	23.5 QP	46.0	-22.5	1.25 V	110	31.90	-8.40
5	769.14	27.6 QP	46.0	-18.4	1.00 V	357	32.00	-4.40
6	990.30	31.9 QP	54.0	-22.1	1.00 V	118	33.00	-1.10

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.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESCI	100613	Nov. 23, 2017	Nov. 22, 2018
RF signal cable (with 10dB PAD) Woken	5D-FB	Cable-cond1-01	Sep. 05, 2017	Sep. 04, 2018
LISN ROHDE & SCHWARZ (EUT)	ESH3-Z5	835239/001	Mar. 10, 2017	Mar. 09, 2018
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Aug. 15, 2017	Aug. 14, 2018
Software ADT	BV ADT_Conc_ V7.3.7.3	NA	NA	NA

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

4.2.3 Test Procedures

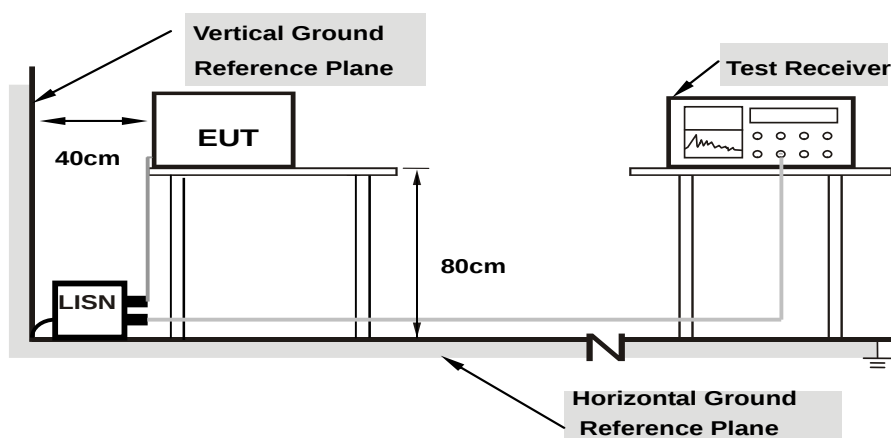
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance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

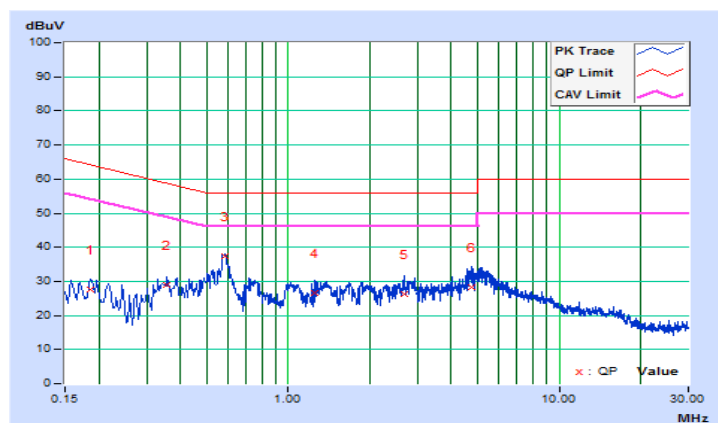
Worst-case data: 802.11b

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

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.18557	10.45	17.30	9.59	27.75	20.04	64.23	54.23	-36.48	-34.19
2	0.35723	10.48	18.34	12.81	28.82	23.29	58.79	48.79	-29.97	-25.50
3	0.58384	10.48	27.00	21.97	37.48	32.45	56.00	46.00	-18.52	-13.55
4	1.24480	10.47	16.27	10.61	26.74	21.08	56.00	46.00	-29.26	-24.92
5	2.67195	10.56	15.71	9.34	26.27	19.90	56.00	46.00	-29.73	-26.10
6	4.75598	10.65	17.70	11.51	28.35	22.16	56.00	46.00	-27.65	-23.84

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.

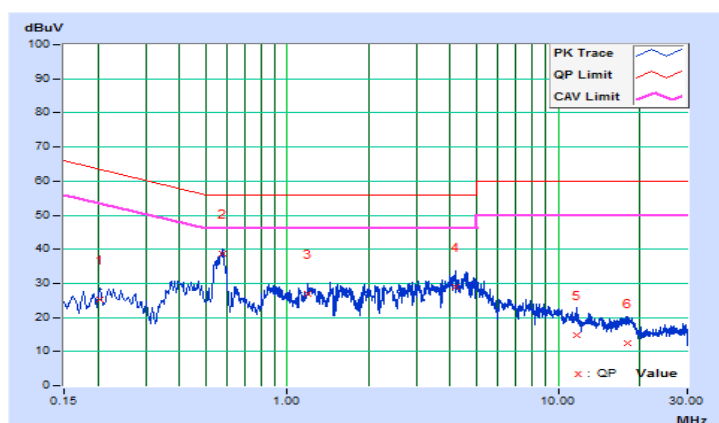


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Tset Mode	A		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.20458	10.22	14.94	10.35	25.16	20.57	63.42	53.42	-38.26	-32.85
2	0.58010	10.25	28.46	24.55	38.71	34.80	56.00	46.00	-17.29	-11.20
3	1.18615	10.27	16.61	12.39	26.88	22.66	56.00	46.00	-29.12	-23.34
4	4.16948	10.41	18.52	11.36	28.93	21.77	56.00	46.00	-27.07	-24.23
5	11.64931	10.70	4.18	1.49	14.88	12.19	60.00	50.00	-45.12	-37.81
6	18.04216	10.96	1.47	0.97	12.43	11.93	60.00	50.00	-47.57	-38.07

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.

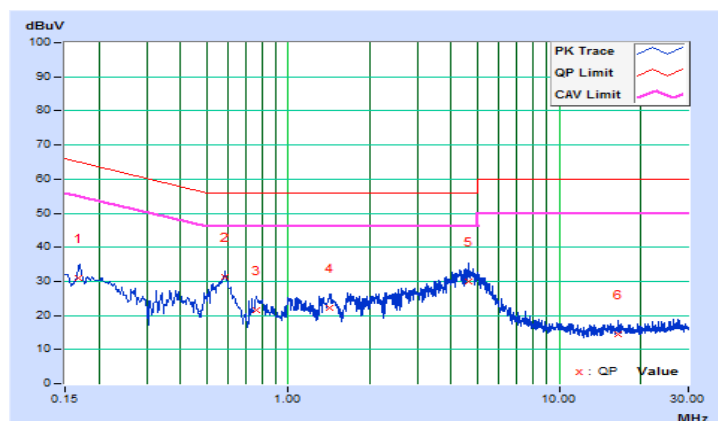


Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
Tset Mode	B		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16834	10.45	20.53	12.44	30.98	22.89	65.04	55.04	-34.06	-32.15
2	0.58384	10.48	20.74	11.38	31.22	21.86	56.00	46.00	-24.78	-24.14
3	0.75984	10.47	11.08	3.24	21.55	13.71	56.00	46.00	-34.45	-32.29
4	1.42075	10.48	11.71	3.28	22.19	13.76	56.00	46.00	-33.81	-32.24
5	4.61937	10.64	19.39	7.78	30.03	18.42	56.00	46.00	-25.97	-27.58
6	16.60328	11.22	3.20	1.42	14.42	12.64	60.00	50.00	-45.58	-37.36

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.

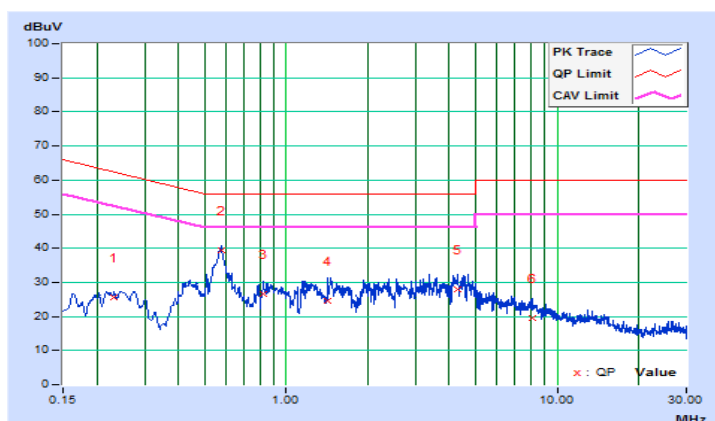


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Tset Mode	B		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.23216	10.23	15.49	11.71	25.72	21.94	62.37	52.37	-36.65	-30.43
2	0.57620	10.25	29.00	25.18	39.25	35.43	56.00	46.00	-16.75	-10.57
3	0.82018	10.26	16.31	11.25	26.57	21.51	56.00	46.00	-29.43	-24.49
4	1.42466	10.27	14.36	8.80	24.63	19.07	56.00	46.00	-31.37	-26.93
5	4.29851	10.42	17.42	10.41	27.84	20.83	56.00	46.00	-28.16	-25.17
6	8.11076	10.56	9.12	4.32	19.68	14.88	60.00	50.00	-40.32	-35.12

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.

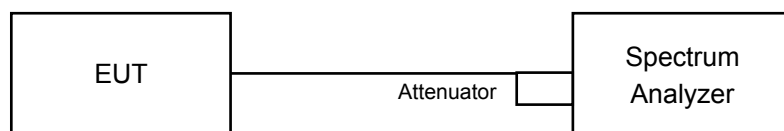


4.3 6dB Bandwidth Measurement

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

- Set resolution bandwidth (RBW) = 100kHz.
- Set the video bandwidth (VBW) $\geq 3 \times$ RBW, Detector = average.
- Trace mode = max hold.
- Sweep = auto couple.
- 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 from Test 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	8.10	0.5	Pass
6	2437	8.56	0.5	Pass
11	2462	9.08	0.5	Pass

802.11g

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	16.46	0.5	Pass
6	2437	16.44	0.5	Pass
11	2462	16.50	0.5	Pass

802.11n (HT20)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	17.66	0.5	Pass
6	2437	17.63	0.5	Pass
11	2462	17.63	0.5	Pass

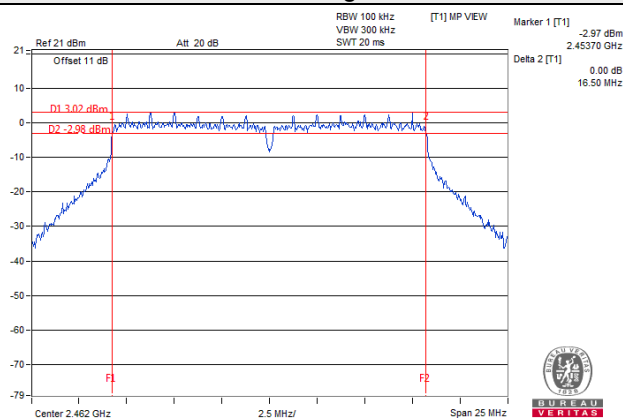
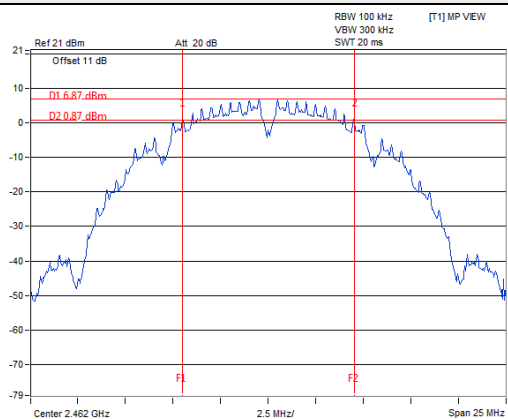
802.11n (HT40)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
3	2422	35.31	0.5	Pass
6	2437	35.41	0.5	Pass
9	2452	35.68	0.5	Pass

Spectrum Plot of Worst Value

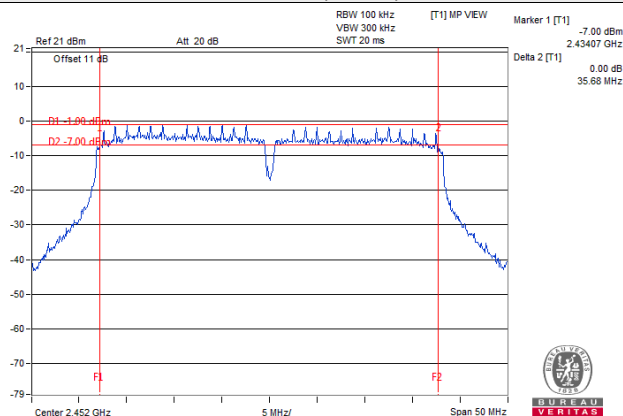
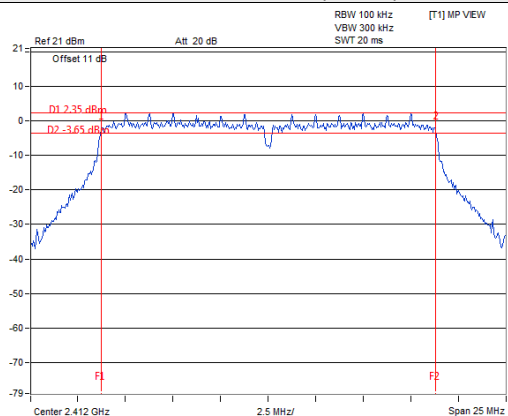
802.11b

802.11g



802.11n (HT20)

802.11n (HT40)

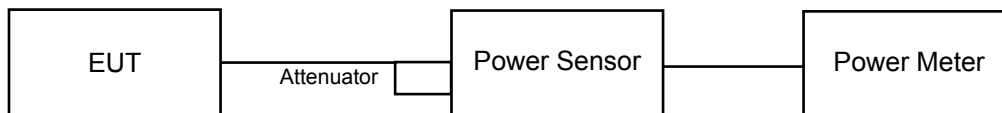


4.4 Conducted Output Power Measurement

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.

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	69.823	18.44	30	Pass
6	2437	102.802	20.12	30	Pass
11	2462	100.231	20.01	30	Pass

802.11g

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	202.302	23.06	30	Pass
6	2437	211.349	23.25	30	Pass
11	2462	207.491	23.17	30	Pass

802.11n (HT20)

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	170.608	22.32	30	Pass
6	2437	188.365	22.75	30	Pass
11	2462	184.077	22.65	30	Pass

802.11n (HT40)

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass / Fail
3	2422	194.089	22.88	30	Pass
6	2437	184.927	22.67	30	Pass
9	2452	188.365	22.75	30	Pass

FOR AVERAGE POWER

802.11b

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	28.774	14.59
6	2437	46.989	16.72
11	2462	46.666	16.69

802.11g

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	33.266	15.22
6	2437	33.037	15.19
11	2462	32.810	15.16

802.11n (HT20)

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	27.990	14.47
6	2437	27.479	14.39
11	2462	27.606	14.41

802.11n (HT40)

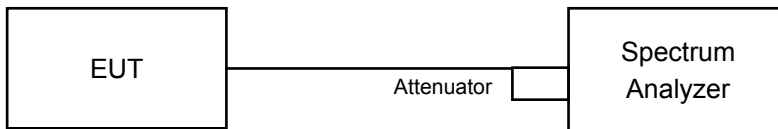
Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
3	2422	21.528	13.33
6	2437	21.677	13.36
9	2452	21.627	13.35

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

- Set analyzer center frequency to DTS channel center frequency.
- Set the span to 1.5 times the DTS bandwidth.
- Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- Set the VBW $\geq 3 \times \text{RBW}$.
- Detector = peak.
- Sweep time = auto couple.
- Trace mode = max hold.
- Allow trace to fully stabilize.
- 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	-7.20	8	Pass
6	2437	-5.84	8	Pass
11	2462	-7.18	8	Pass

802.11g

Channel	Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass/Fail
1	2412	-10.67	8	Pass
6	2437	-10.64	8	Pass
11	2462	-10.45	8	Pass

802.11n (HT20)

Channel	Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass/Fail
1	2412	-11.52	8	Pass
6	2437	-11.12	8	Pass
11	2462	-10.81	8	Pass

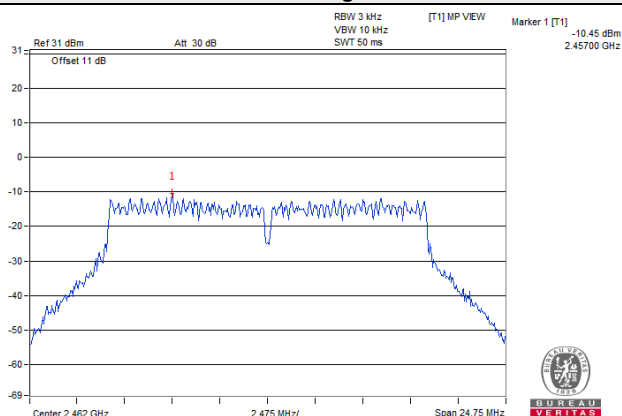
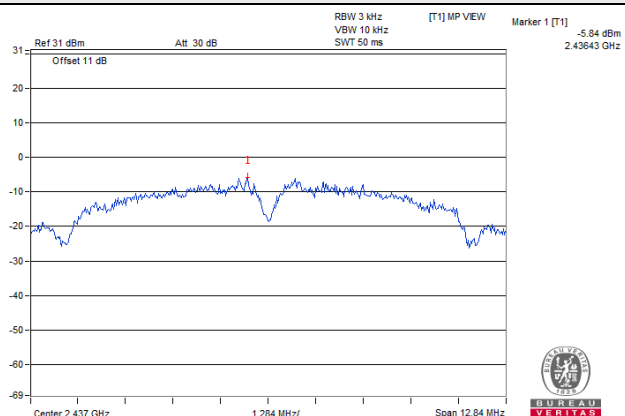
802.11n (HT40)

Channel	Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass/Fail
3	2422	-17.37	8	Pass
6	2437	-15.09	8	Pass
9	2452	-15.70	8	Pass

Spectrum Plot of Worst Value

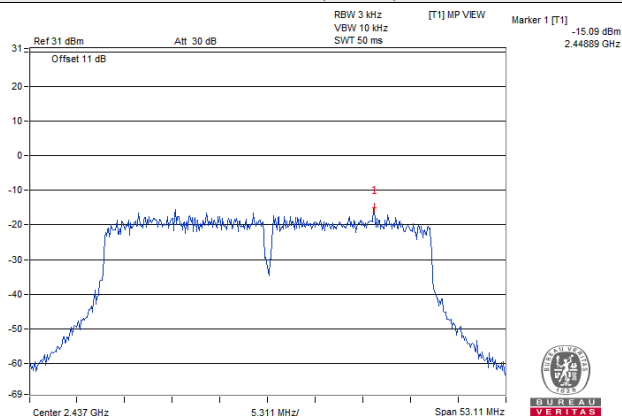
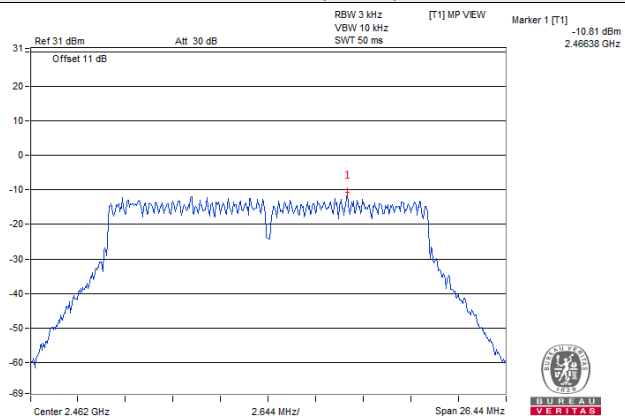
802.11b

802.11g



802.11n (HT20)

802.11n (HT40)

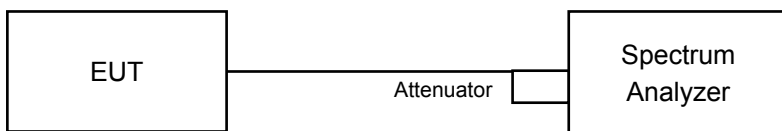


4.6 Conducted Out of Band Emission Measurement

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 $\geq$ 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 OOB

1. Set RBW = 100 kHz.
2. Set VBW $\geq$ 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

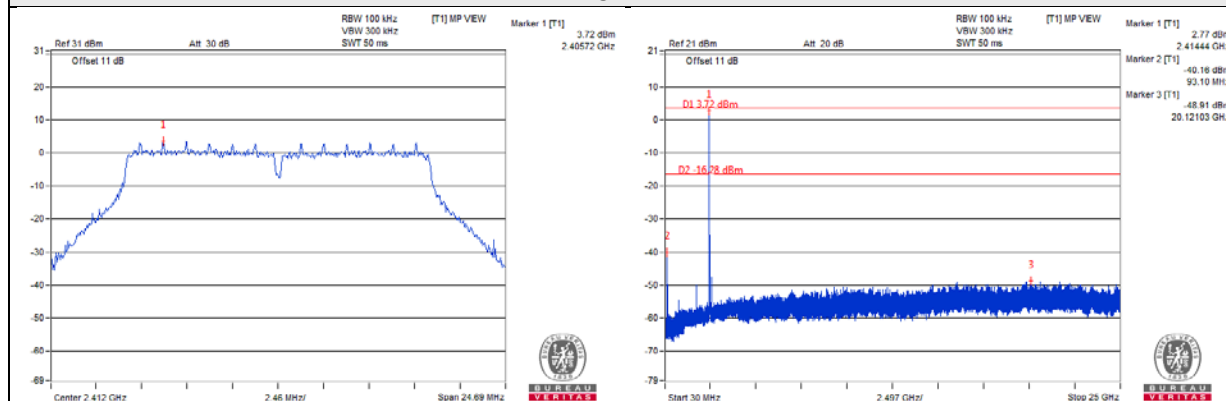
Same as item 4.3.6

4.6.7 Test Results

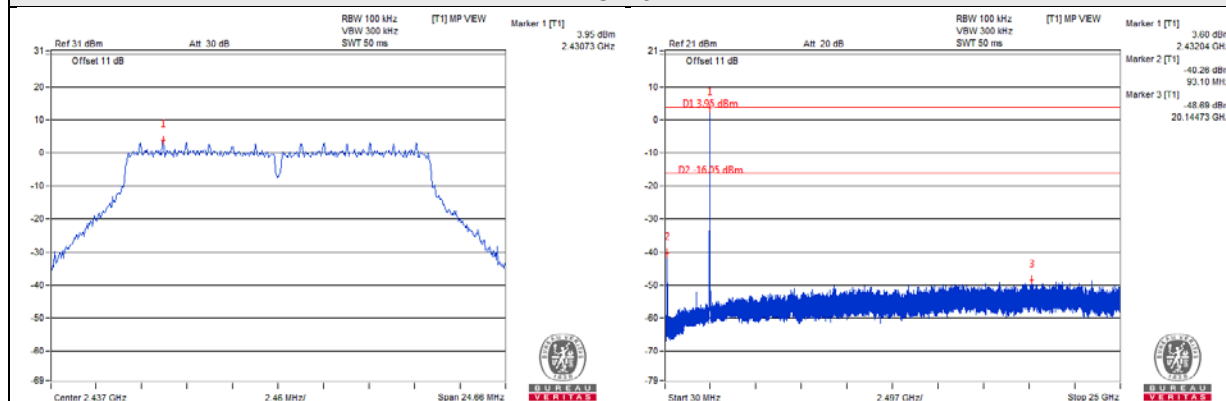
The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 20dB offset below D1. It shows compliance with the requirement.

802.11g

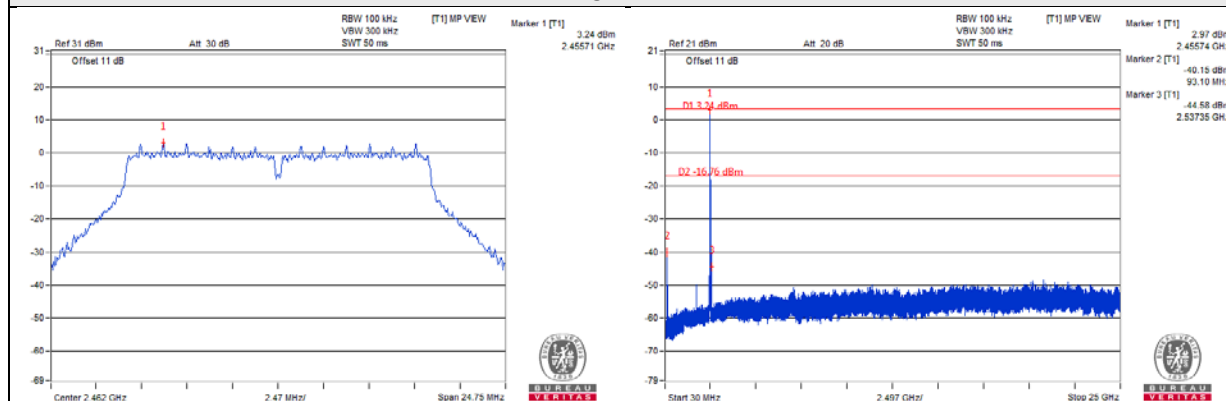
CH 1



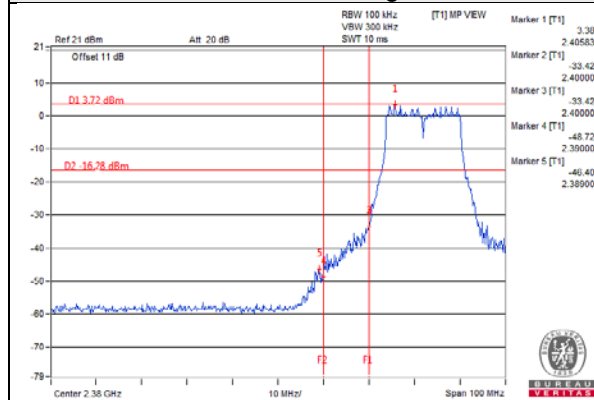
CH 6



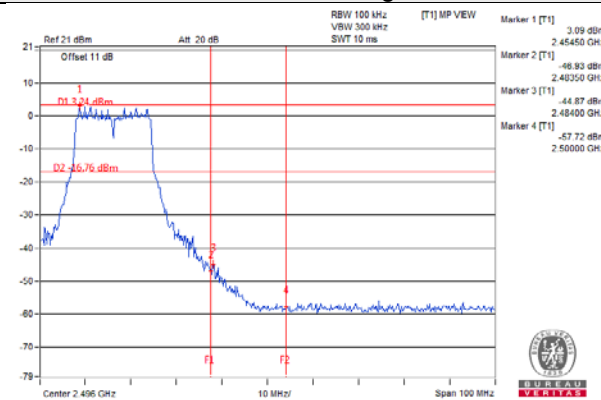
CH 11



CH 1 Band edge

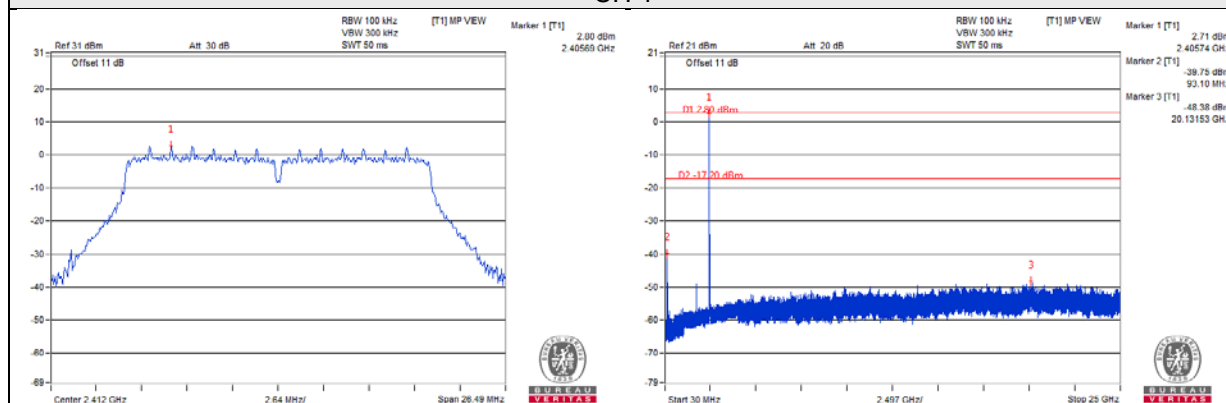


CH 11 Band edge

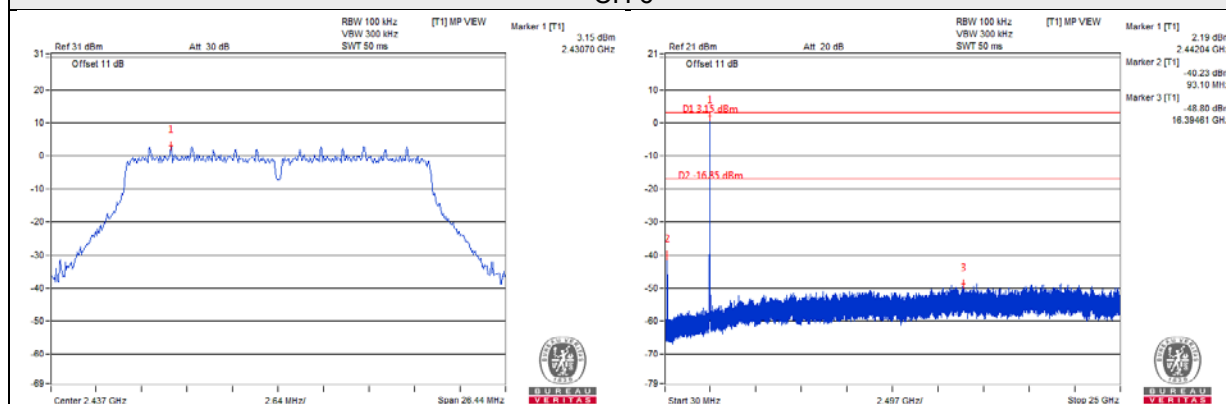


802.11n (HT20)

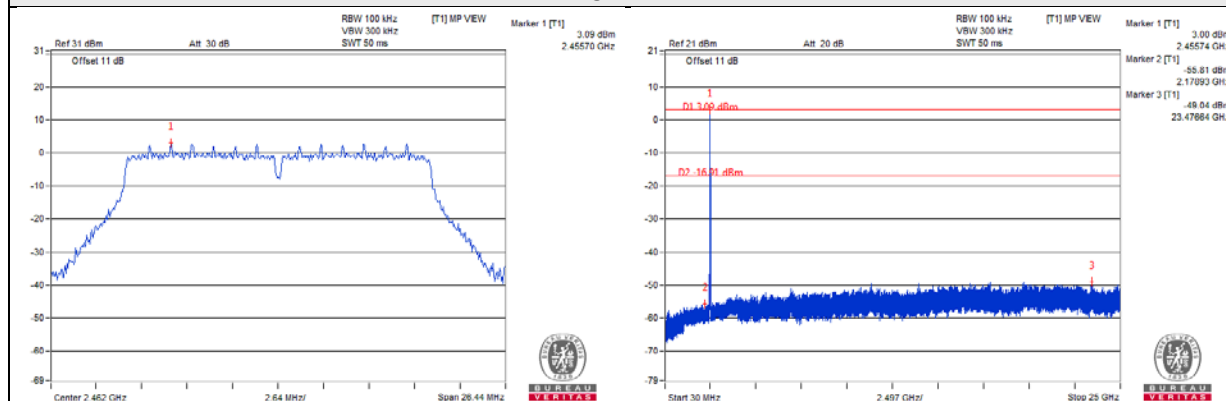
CH 1



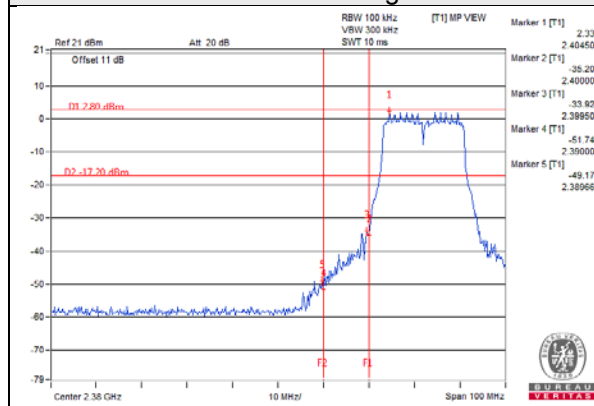
CH 6



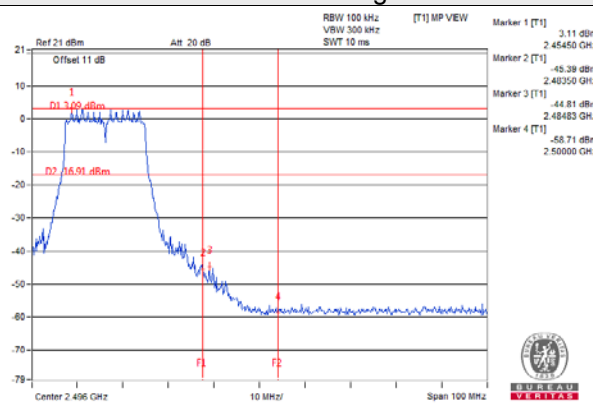
CH 11



CH 1 Band edge

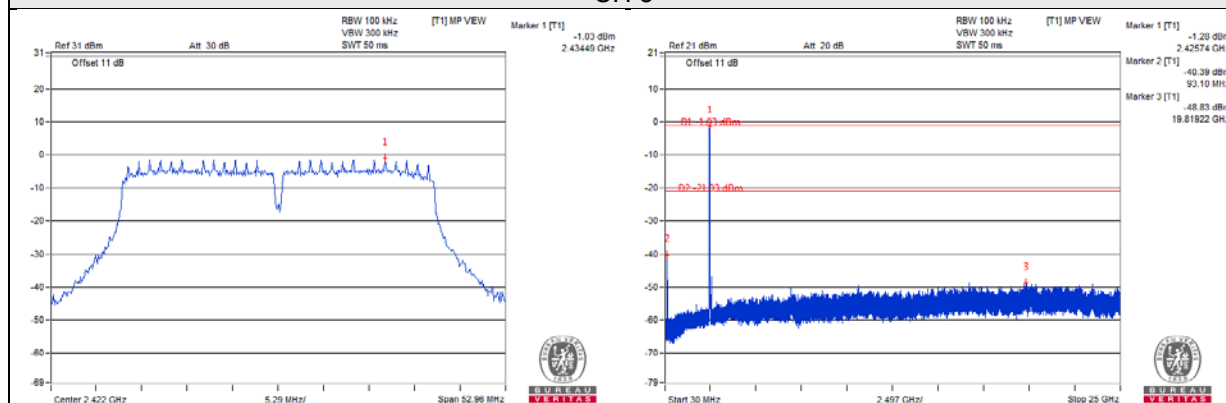


CH 11 Band edge

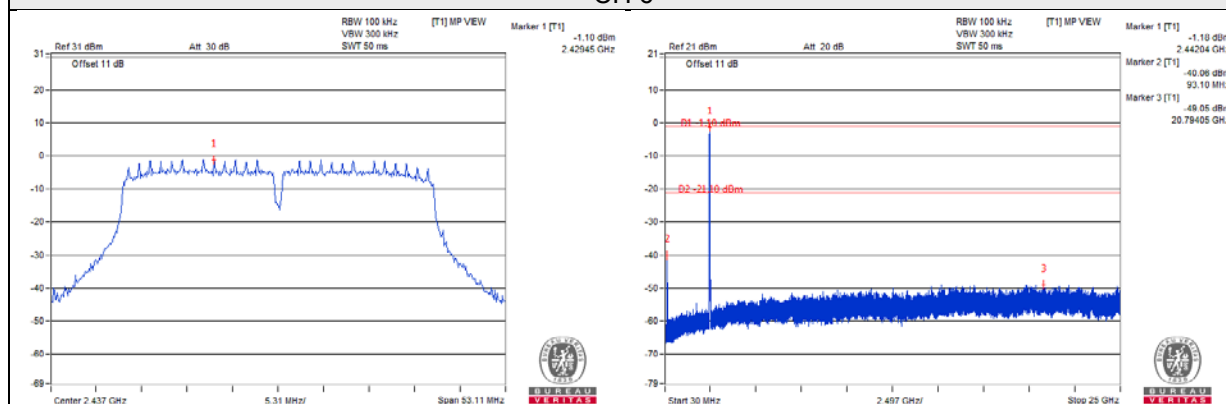


802.11n (HT40)

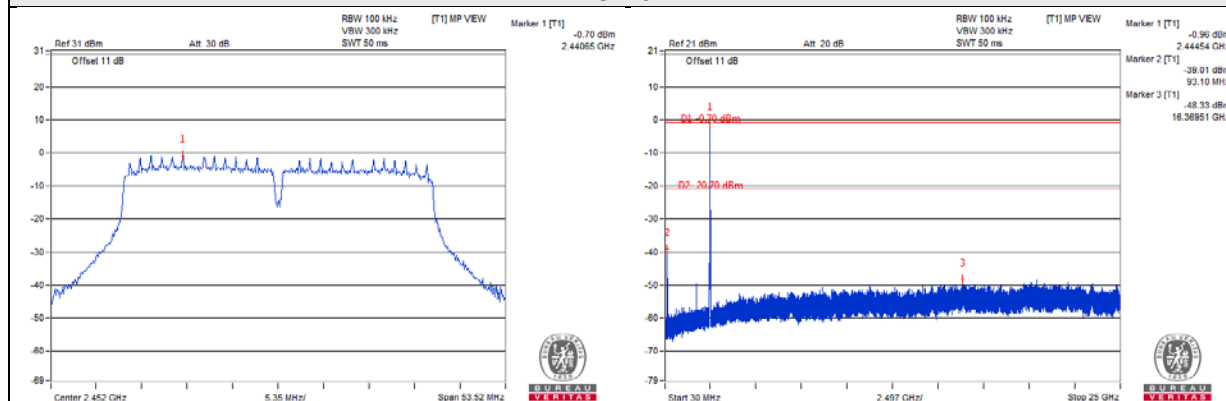
CH 3



CH 6

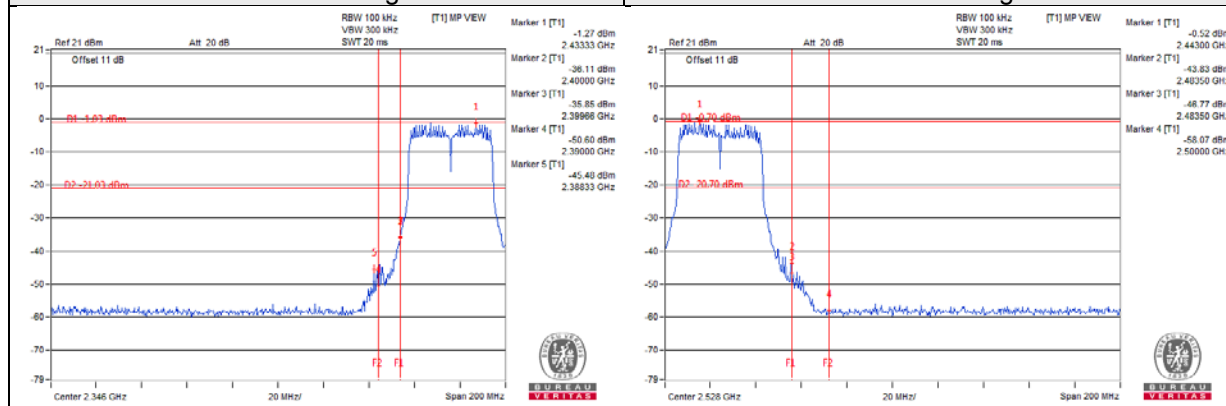


CH 9



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 and approved according to ISO/IEC 17025.

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

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Web Site: www.bureauveritas-adt.com

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

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