FCC Test Report

Report No.:	RF170731C02
FCC ID:	2ACTO-7922DMC
Test Model:	7922DMC
Received Date:	Jul. 31, 2017
Test Date:	Oct. 17 ~ Nov. 03, 2017
Issued Date:	Dec. 12, 2017
Applicant:	Sophos Ltd
Address:	The Pentagon, Abingdon, OX14 3YP, United Kingdom
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Lab Address:	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan (R.O.C.)
Test Location:	No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, TAIWAN (R.O.C.)
FCC Registration / Designation Number:	788550 / TW0003

Testing Laboratory
2021

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Release Control Record

Issue No.	Description	Date Issued
RF170731C02	Original release.	Dec. 12, 2017

1 Certificate of Conformity

Product:	2T2R Wireless 802.11ac/abgn Dual Band Selectable PCIe Module
Brand:	Sophos
Test Model:	7922DMC
Sample Status:	Engineering sample
Applicant:	Sophos Ltd
Test Date:	Oct. 16 ~ Nov. 03, 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 : Celine Chou , **Date:** Dec. 12, 2017

Celine Chou / Specialist

Approved by : Ken Liu , **Date:** Dec. 12, 2017

Ken Liu / Senior 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 -19.02dB at 0.15391MHz.
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 2390.00MHz and 2483.50MHz.
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 SMA Jack reverse 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	2.94 dB
Radiated Emissions up to 1 GHz	30MHz ~ 200MHz	3.63 dB
	200MHz ~1000MHz	3.64 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	2T2R Wireless 802.11ac/abgn Dual Band Selectable PCIe Module
Brand	Sophos
Test Model	7922DMC
Sample Status	Engineering sample
Power Supply Rating	3.3Vdc
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 300Mbps
Operating Frequency	2412 ~ 2462MHz
Number of Channel	802.11b, 802.11g, 802.11n (HT20): 11 802.11n (HT40): 7
Output Power	183.262mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	Refer to Note
Cable Supplied	N/A

Note:

1. The EUT incorporates a MIMO function. Physically, the EUT provides 2 completed transmitters and 2 receivers.

Modulation Mode	TX Function
802.11b	1TX (Fixed Chain 0)
802.11g	1TX (Fixed Chain 0)
802.11n (HT20)	2TX
802.11n (HT40)	2TX

2. Accessory devices of EUT are list as below.

	Part Number	Spec.
Antenna	C059-510394-A	Antenna+RG-178+SMA Straight Plug Reverse Dual band
Antenna cable	C059-510395-A	RF CABLE+ ϕ 1.13mm(Gray) SMA Jack reverse+MHF L=250mm
	C059-510396-A	RF CABLE+ ϕ 1.13mm(Gray) SMA Jack reverse+MHF L=400mm
	C059-510397-A	RF CABLE+ ϕ 1.13mm(Gray) SMA Jack reverse(1080)+I-PEX L=100mm

* After pre-test three antanna cables, C059-510397-A antenna cable was the worst case and chosen for final test and presented in the test report

3. The EUT uses following antennas.

Type	Dipole			Connector		SMA Jack reverse	
Gain (dBi)	Frequency (MHz)						
	2400	2450	2500	5150	5350	5750	5825
	3.1	3.5	3.9	2.7	3.7	4.2	4.4

4. 2.4GHz & 5GHz technology cannot 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≥1G	RE<1G	PLC	APCM	
-	√	√	√	√	-

Where RE≥1G: Radiated Emission above 1GHz & Bandedge Measurement RE<1G: Radiated Emission below 1GHz
PLC: Power Line Conducted Emission APCM: Antenna Port Conducted Measurement

Note: The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **X-plane**.

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)
-	802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1.0
-	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0
-	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.

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
-	802.11b	1 to 11	1	DSSS	DBPSK	1.0

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)
-	802.11b	1 to 11	1	DSSS	DBPSK	1.0

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)
-	802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1.0
-	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0
-	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:

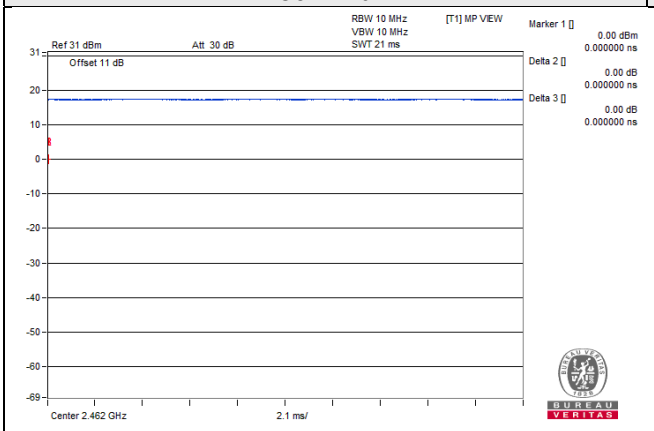
Applicable to	Environmental Conditions	Input Power (System)	Tested by
RE≥1G	25 deg. C, 70% RH	120Vac, 60Hz	Matthew Yang
RE<1G	25 deg. C, 70% RH	120Vac, 60Hz	Matthew Yang
PLC	25 deg. C, 75% RH	120Vac, 60Hz	Matthew Yang
APCM	25 deg. C, 60% RH	120Vac, 60Hz	Han Wu

3.3 Duty Cycle of Test Signal

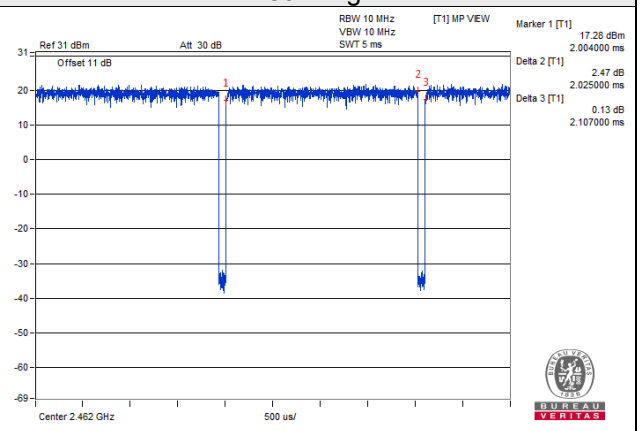
802.11b: Duty cycle of test signal is 100%, duty factor is not required.
802.11g, 802.11n (HT20), 802.11n (HT40): Duty cycle of test signal is < 98%, duty factor is required.

802.11g: Duty cycle = 2.025/2.107 = 0.961, Duty factor = 10 * log(1/0.961) = 0.17
802.11n (HT20): Duty cycle = 1.888/1.975 = 0.956, Duty factor = 10 * log(1/0.956) = 0.20
802.11n (HT40): Duty cycle = 0.928/1.002 = 0.926, Duty factor = 10 * log(1/0.926) = 0.33

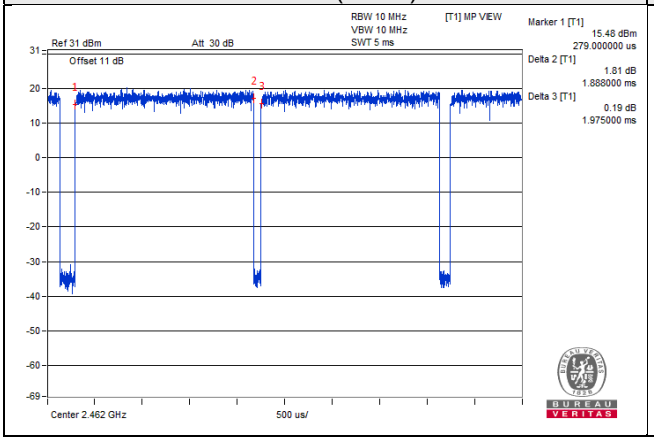
802.11b



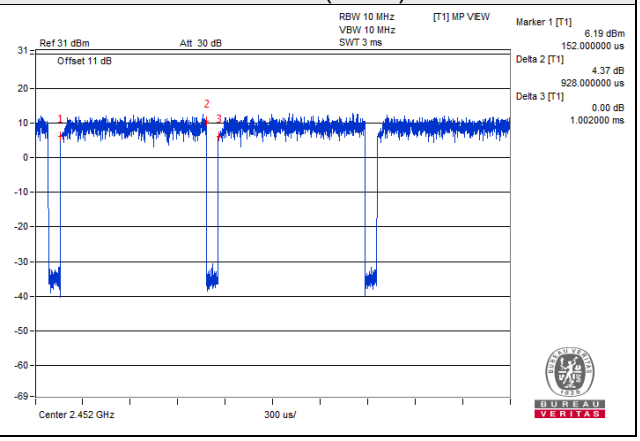
802.11g



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.

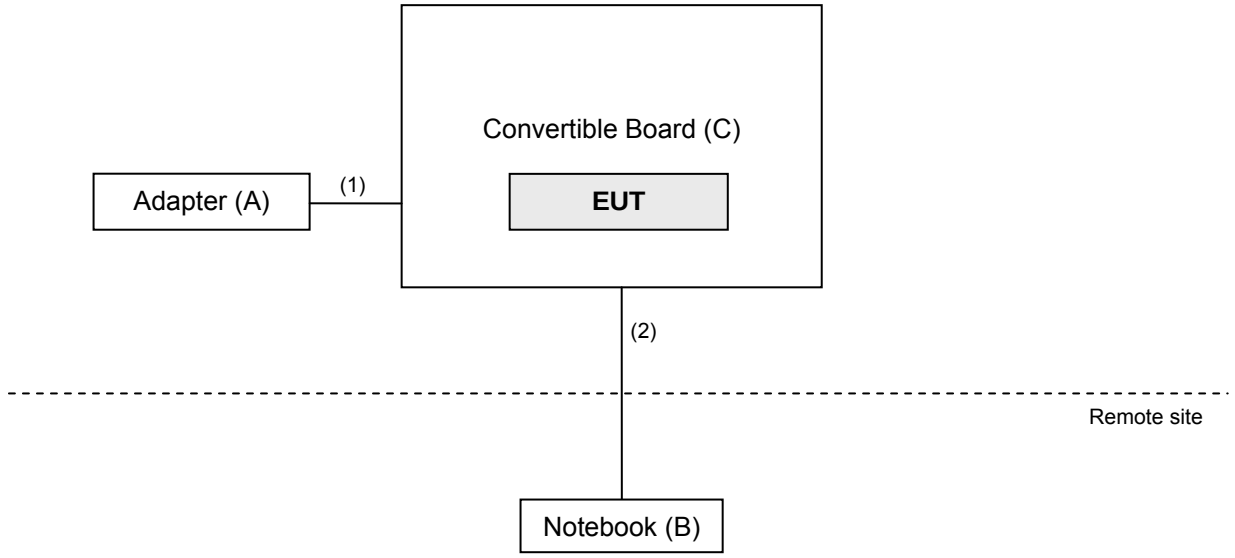
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Adapter	DVE	DSA-36PFH-12FUS	N/A	N/A	Provided by client
B.	Notebook	DELL	E5410	6RP2YM1	FCC DoC Approved	-
C.	Convertible Board	N/A	N/A	N/A	N/A	Provided by client

Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. Item B acted as a communication partner to transfer data.

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	DC cable	1	1.5	N	0	Provided by client
2.	RJ45, Cat5e	1	3	N	0	-

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
KDB 662911 D01 Multiple Transmitter Output v02r01
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 30dB below the highest level of the desired power:

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

Note:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 30dB under any condition of modulation.

4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESCI	100424	Oct. 17, 2017	Oct. 16, 2018
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100040	Aug. 18, 2017	Aug. 17, 2018
BILOG Antenna SCHWARZBECK	VULB9168	9168-155	Dec. 11, 2016	Dec. 10, 2017
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-1170	Dec. 15, 2016	Dec. 14, 2017
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Dec. 14, 2016	Dec. 13, 2017
Loop Antenna EMCI	EM-6879	269	Aug. 11, 2017	Aug. 10, 2018
Preamplifier Agilent (Below 1GHz)	8447D	2944A10631	Aug. 08, 2017	Aug. 07, 2018
Preamplifier Agilent (Above 1GHz)	8449B	3008A01960	Aug. 08, 2017	Aug. 07, 2018
RF signal cable HUBER+SUHNER	SUCOFLEX 104	MY 13380+295012/04	Aug. 08, 2017	Aug. 07, 2018
RF signal cable HUBER+SUHNER	SUCOFLEX 104	Cable-CH4-03 (250724)	Aug. 08, 2017	Aug. 07, 2018
Software BV ADT	ADT_Radiated_ V7.6.15.9.4	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	010303	NA	NA
Antenna Tower Controller BV ADT	AT100	AT93021703	NA	NA
Turn Table BV ADT	TT100	TT93021703	NA	NA
Turn Table Controller BV ADT	SC100	SC93021703	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 4.
3. The FCC Designation Number is TW0003. The number will be varied with the Lab location and scope as attached.
4. The IC Site Registration No. is IC7450F-4.

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. Both X and Y axes 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:

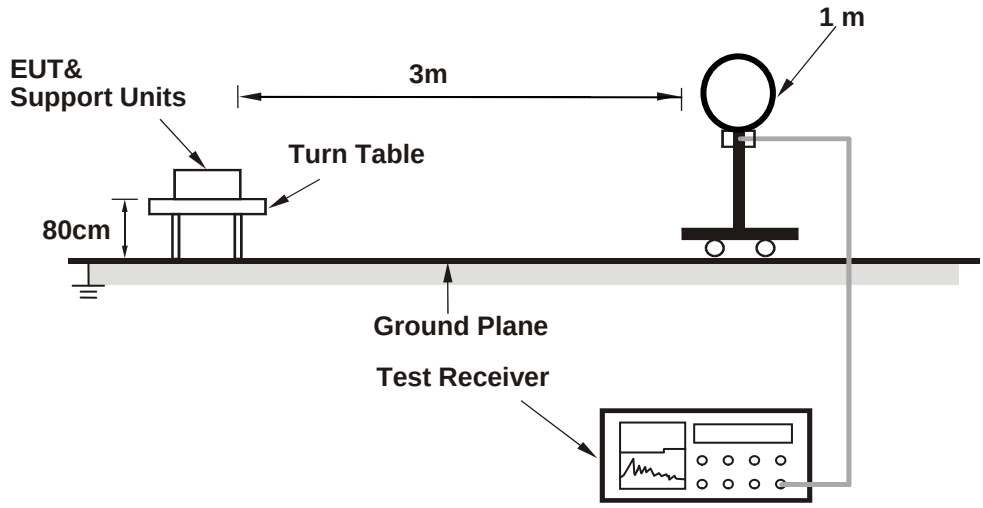
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) or 10 Hz (Duty cycle ≥ 98%) for Peak detection 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

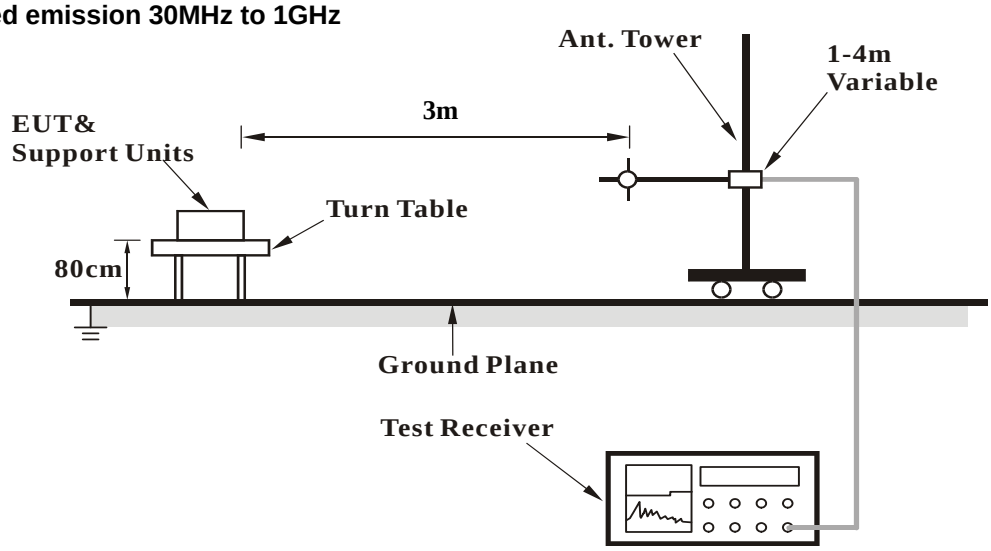
No deviation.

4.1.5 Test Setup

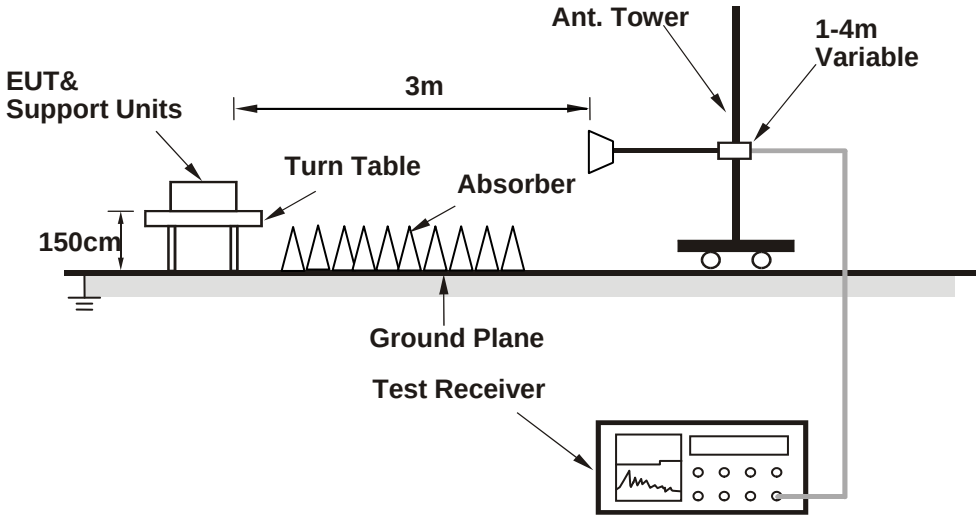
For Radiated emission below 30MHz



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. Conntected EUT with convertible board and placed the EUT on the testing table.
b. Prepared a notebook to act as a communication partner and placed it outside of testing area.
c. The communication partner connected with EUT via a RJ45 cable and ran a test program (provided by manufacturer) to enable EUT under transmission condition continuously at specific channel frequency.
d. The communication partner sent data to EUT by command "PING".

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	58.3 PK	74.0	-15.7	1.12 H	233	24.8	33.5
2	2390.00	46.0 AV	54.0	-8.0	1.12 H	233	12.5	33.5
3	*2412.00	98.8 PK			1.05 H	225	65.3	33.5
4	*2412.00	95.3 AV			1.05 H	225	61.8	33.5
5	4824.00	53.8 PK	74.0	-20.2	1.04 H	106	45.8	8.0
6	4824.00	47.8 AV	54.0	-6.2	1.04 H	106	39.8	8.0
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	1.69 V	314	27.6	33.5
2	2390.00	52.6 AV	54.0	-1.4	1.69 V	314	19.1	33.5
3	*2412.00	112.0 PK			1.53 V	296	78.5	33.5
4	*2412.00	108.3 AV			1.53 V	296	74.8	33.5
5	4824.00	56.2 PK	74.0	-17.8	1.43 V	88	48.2	8.0
6	4824.00	52.2 AV	54.0	-1.8	1.43 V	88	44.2	8.0

Remarks:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2437.00	96.6 PK			1.20 H	224	63.0	33.6
2	*2437.00	92.8 AV			1.20 H	224	59.2	33.6
3	4874.00	53.8 PK	74.0	-20.2	1.33 H	104	45.7	8.1
4	4874.00	46.1 AV	54.0	-7.9	1.33 H	104	38.0	8.1
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	*2437.00	111.0 PK			1.72 V	243	77.4	33.6
2	*2437.00	107.1 AV			1.72 V	243	73.5	33.6
3	4874.00	57.1 PK	74.0	-16.9	1.21 V	86	49.0	8.1
4	4874.00	52.7 AV	54.0	-1.3	1.21 V	86	44.6	8.1

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	96.2 PK			1.00 H	221	62.4	33.8
2	*2462.00	92.7 AV			1.00 H	221	58.9	33.8
3	2483.50	58.4 PK	74.0	-15.6	1.06 H	229	24.5	33.9
4	2483.50	46.1 AV	54.0	-7.9	1.06 H	229	12.2	33.9
5	4924.00	53.8 PK	74.0	-20.2	1.13 H	103	45.5	8.3
6	4924.00	47.4 AV	54.0	-6.6	1.13 H	103	39.1	8.3
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	109.0 PK			1.53 V	294	75.2	33.8
2	*2462.00	105.6 AV			1.53 V	294	71.8	33.8
3	2483.50	59.1 PK	74.0	-14.9	1.66 V	308	25.2	33.9
4	2483.50	47.7 AV	54.0	-6.3	1.66 V	308	13.8	33.9
5	4924.00	57.4 PK	74.0	-16.6	1.20 V	90	49.1	8.3
6	4924.00	52.9 AV	54.0	-1.1	1.20 V	90	44.6	8.3

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	58.3 PK	74.0	-15.7	1.38 H	238	24.8	33.5
2	2390.00	46.2 AV	54.0	-7.8	1.38 H	238	12.7	33.5
3	*2412.00	98.6 PK			1.34 H	223	65.1	33.5
4	*2412.00	89.2 AV			1.34 H	223	55.7	33.5
5	4824.00	50.2 PK	74.0	-23.8	1.10 H	81	42.2	8.0
6	4824.00	37.5 AV	54.0	-16.5	1.10 H	81	29.5	8.0
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	2.23 V	311	34.7	33.5
2	2390.00	52.8 AV	54.0	-1.2	2.23 V	311	19.3	33.5
3	*2412.00	110.8 PK			1.33 V	272	77.3	33.5
4	*2412.00	101.0 AV			1.33 V	272	67.5	33.5
5	4824.00	51.8 PK	74.0	-22.2	1.15 V	89	43.8	8.0
6	4824.00	38.2 AV	54.0	-15.8	1.15 V	89	30.2	8.0

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	58.1 PK	74.0	-15.9	1.25 H	231	24.6	33.5
2	2390.00	46.6 AV	54.0	-7.4	1.25 H	231	13.1	33.5
3	*2437.00	104.8 PK			1.20 H	227	71.2	33.6
4	*2437.00	94.0 AV			1.20 H	227	60.4	33.6
5	2483.50	58.6 PK	74.0	-15.4	1.17 H	222	24.7	33.9
6	2483.50	46.2 AV	54.0	-7.8	1.17 H	222	12.3	33.9
7	4874.00	51.8 PK	74.0	-22.2	1.14 H	83	43.7	8.1
8	4874.00	38.6 AV	54.0	-15.4	1.14 H	83	30.5	8.1
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	2390.00	70.0 PK	74.0	-4.0	1.36 V	269	36.5	33.5
2	2390.00	52.8 AV	54.0	-1.2	1.36 V	269	19.3	33.5
3	*2437.00	116.9 PK			1.68 V	273	83.3	33.6
4	*2437.00	107.1 AV			1.68 V	273	73.5	33.6
5	2483.50	66.6 PK	74.0	-7.4	1.38 V	271	32.7	33.9
6	2483.50	51.6 AV	54.0	-2.4	1.38 V	271	17.7	33.9
7	4874.00	57.5 PK	74.0	-16.5	1.21 V	88	49.4	8.1
8	4874.00	44.2 AV	54.0	-9.8	1.21 V	88	36.1	8.1

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	100.1 PK			2.45 H	221	66.3	33.8
2	*2462.00	89.8 AV			2.45 H	221	56.0	33.8
3	2483.50	58.6 PK	74.0	-15.4	2.38 H	215	24.7	33.9
4	2483.50	46.5 AV	54.0	-7.5	2.38 H	215	12.6	33.9
5	4924.00	51.1 PK	74.0	-22.9	2.10 H	110	42.8	8.3
6	4924.00	37.9 AV	54.0	-16.1	2.10 H	110	29.6	8.3
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	110.9 PK			1.41 V	246	77.1	33.8
2	*2462.00	101.4 AV			1.41 V	246	67.6	33.8
3	2483.50	67.0 PK	74.0	-7.0	1.84 V	271	33.1	33.9
4	2483.50	52.8 AV	54.0	-1.2	1.84 V	271	18.9	33.9
5	4924.00	52.5 PK	74.0	-21.5	1.18 V	92	44.2	8.3
6	4924.00	38.8 AV	54.0	-15.2	1.18 V	92	30.5	8.3

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	57.9 PK	74.0	-16.1	3.82 H	326	24.4	33.5
2	2390.00	45.8 AV	54.0	-8.2	3.82 H	326	12.3	33.5
3	*2412.00	96.6 PK			3.78 H	321	63.1	33.5
4	*2412.00	86.8 AV			3.78 H	321	53.3	33.5
5	4824.00	49.9 PK	74.0	-24.1	2.89 H	201	41.9	8.0
6	4824.00	37.0 AV	54.0	-17.0	2.89 H	201	29.0	8.0
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	69.4 PK	74.0	-4.6	1.54 V	274	35.9	33.5
2	**2390.00**	**53.0 AV**	**54.0**	**-1.0**	**1.54 V**	**274**	**19.5**	**33.5**
3	*2412.00	111.0 PK			1.50 V	338	77.5	33.5
4	*2412.00	101.6 AV			1.50 V	338	68.1	33.5
5	4824.00	50.5 PK	74.0	-23.5	1.27 V	35	42.5	8.0
6	4824.00	37.6 AV	54.0	-16.4	1.27 V	35	29.6	8.0

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	58.0 PK	74.0	-16.0	3.58 H	303	24.5	33.5
2	2390.00	46.9 AV	54.0	-7.1	3.58 H	303	13.4	33.5
3	*2437.00	104.9 PK			3.64 H	298	71.3	33.6
4	*2437.00	94.1 AV			3.64 H	298	60.5	33.6
5	2483.50	59.1 PK	74.0	-14.9	3.77 H	315	25.2	33.9
6	2483.50	47.5 AV	54.0	-6.5	3.77 H	315	13.6	33.9
7	4874.00	51.4 PK	74.0	-22.6	2.96 H	218	43.3	8.1
8	4874.00	38.2 AV	54.0	-15.8	2.96 H	218	30.1	8.1
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	2390.00	70.4 PK	74.0	-3.6	2.07 V	339	36.9	33.5
2	2390.00	52.7 AV	54.0	-1.3	2.07 V	339	19.2	33.5
3	*2437.00	118.8 PK			2.02 V	349	85.2	33.6
4	*2437.00	108.3 AV			2.02 V	349	74.7	33.6
5	2483.50	67.7 PK	74.0	-6.3	2.12 V	332	33.8	33.9
6	2483.50	51.7 AV	54.0	-2.3	2.12 V	332	17.8	33.9
7	4874.00	53.2 PK	74.0	-20.8	1.35 V	44	45.1	8.1
8	4874.00	40.9 AV	54.0	-13.1	1.35 V	44	32.8	8.1

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	98.9 PK			3.90 H	315	65.1	33.8
2	*2462.00	89.0 AV			3.90 H	315	55.2	33.8
3	2483.50	57.4 PK	74.0	-16.6	3.78 H	322	23.5	33.9
4	2483.50	46.4 AV	54.0	-7.6	3.78 H	322	12.5	33.9
5	4924.00	50.5 PK	74.0	-23.5	3.07 H	225	42.2	8.3
6	4924.00	37.4 AV	54.0	-16.6	3.07 H	225	29.1	8.3
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	113.1 PK			1.92 V	332	79.3	33.8
2	*2462.00	103.3 AV			1.92 V	332	69.5	33.8
3	2483.50	66.4 PK	74.0	-7.6	1.53 V	247	32.5	33.9
4	2483.50	52.9 AV	54.0	-1.1	1.53 V	247	19.0	33.9
5	4924.00	51.1 PK	74.0	-22.9	1.31 V	39	42.8	8.3
6	4924.00	38.2 AV	54.0	-15.8	1.31 V	39	29.9	8.3

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	58.0 PK	74.0	-16.0	3.66 H	302	24.5	33.5
2	2390.00	45.8 AV	54.0	-8.2	3.66 H	302	12.3	33.5
3	*2422.00	89.2 PK			3.69 H	307	55.6	33.6
4	*2422.00	79.8 AV			3.69 H	307	46.2	33.6
5	4844.00	50.1 PK	74.0	-23.9	2.88 H	191	42.1	8.0
6	4844.00	37.8 AV	54.0	-16.2	2.88 H	191	29.8	8.0
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	65.3 PK	74.0	-8.7	2.08 V	338	31.8	33.5
2	2390.00	52.8 AV	54.0	-1.2	2.08 V	338	19.3	33.5
3	*2422.00	106.3 PK			2.11 V	335	72.7	33.6
4	*2422.00	96.6 AV			2.11 V	335	63.0	33.6
5	4844.00	51.1 PK	74.0	-22.9	1.48 V	56	43.1	8.0
6	4844.00	38.2 AV	54.0	-15.8	1.48 V	56	30.2	8.0

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	58.0 PK	74.0	-16.0	3.76 H	333	24.5	33.5
2	2390.00	46.6 AV	54.0	-7.4	3.76 H	333	13.1	33.5
3	*2437.00	94.8 PK			3.80 H	322	61.2	33.6
4	*2437.00	85.0 AV			3.80 H	322	51.4	33.6
5	2483.50	58.2 PK	74.0	-15.8	3.72 H	319	24.3	33.9
6	2483.50	47.2 AV	54.0	-6.8	3.72 H	319	13.3	33.9
7	4874.00	50.6 PK	74.0	-23.4	2.81 H	189	42.5	8.1
8	4874.00	38.4 AV	54.0	-15.6	2.81 H	189	30.3	8.1
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	2390.00	67.6 PK	74.0	-6.4	1.51 V	302	34.1	33.5
2	2390.00	52.9 AV	54.0	-1.1	1.51 V	302	19.4	33.5
3	*2437.00	111.3 PK			1.70 V	299	77.7	33.6
4	*2437.00	101.1 AV			1.70 V	299	67.5	33.6
5	2483.50	62.8 PK	74.0	-11.2	1.55 V	310	28.9	33.9
6	2483.50	49.9 AV	54.0	-4.1	1.55 V	310	16.0	33.9
7	4874.00	52.3 PK	74.0	-21.7	1.31 V	59	44.2	8.1
8	4874.00	39.6 AV	54.0	-14.4	1.31 V	59	31.5	8.1

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	89.1 PK			3.94 H	316	55.3	33.8
2	*2452.00	79.6 AV			3.94 H	316	45.8	33.8
3	2483.50	58.1 PK	74.0	-15.9	3.85 H	319	24.2	33.9
4	2483.50	46.1 AV	54.0	-7.9	3.85 H	319	12.2	33.9
5	4904.00	50.3 PK	74.0	-23.7	2.77 H	186	42.1	8.2
6	4904.00	37.4 AV	54.0	-16.6	2.77 H	186	29.2	8.2
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2452.00	105.4 PK			2.16 V	332	71.6	33.8
2	*2452.00	95.7 AV			2.16 V	332	61.9	33.8
3	2483.50	68.2 PK	74.0	-5.8	1.66 V	296	34.3	33.9
4	**2483.50**	**53.0 AV**	**54.0**	**-1.0**	**1.66 V**	**296**	**19.1**	**33.9**
5	4904.00	51.2 PK	74.0	-22.8	1.44 V	62	43.0	8.2
6	4904.00	38.5 AV	54.0	-15.5	1.44 V	62	30.3	8.2

Remarks:

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

Below 1GHz worst-case data: 802.11b

CHANNEL	TX Channel 1	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	192.89	29.2 QP	43.5	-14.3	1.51 H	267	45.2	-16.0
2	313.20	41.3 QP	46.0	-4.7	1.01 H	70	53.0	-11.7
3	625.60	33.1 QP	46.0	-12.9	1.01 H	179	38.4	-5.3
4	749.79	37.1 QP	46.0	-8.9	1.01 H	164	39.9	-2.8
5	839.05	36.3 QP	46.0	-9.7	1.01 H	238	37.7	-1.4
6	934.13	39.8 QP	46.0	-6.2	2.00 H	242	39.6	0.2
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	51.24	27.7 QP	40.0	-12.3	1.00 V	37	42.1	-14.4
2	142.44	23.0 QP	43.5	-20.5	1.00 V	62	37.0	-14.0
3	322.90	37.8 QP	46.0	-8.2	1.49 V	122	49.2	-11.4
4	765.31	31.8 QP	46.0	-14.2	1.00 V	191	34.3	-2.5
5	839.05	38.8 QP	46.0	-7.2	1.49 V	221	40.2	-1.4
6	934.13	40.1 QP	46.0	-5.9	2.00 V	17	39.9	0.2

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

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, 2016	Nov. 22, 2017
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_Cond_ V7.3.7.3	NA	NA	NA

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

4.2.3 Test Procedures

a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 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.

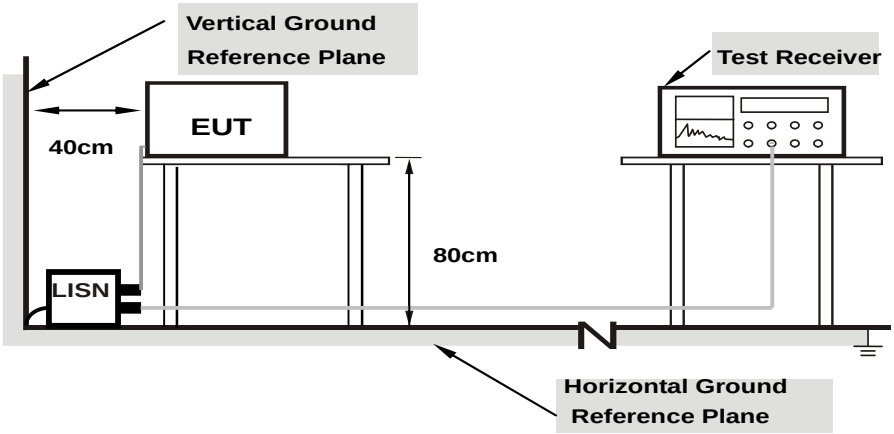
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

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

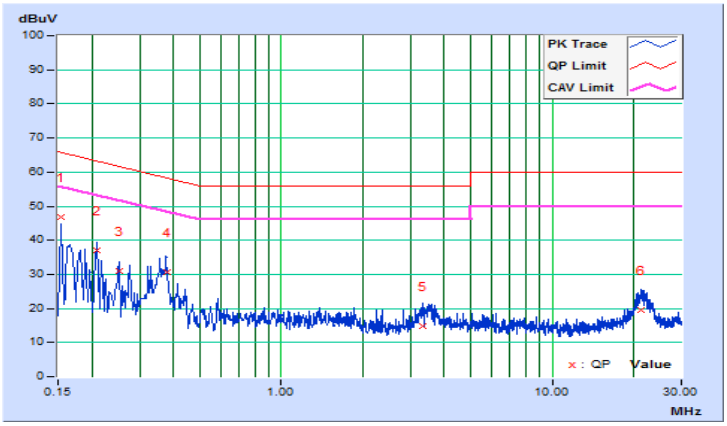
Worst-case data: 802.11b

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	**0.15391**	**10.45**	**36.32**	**15.95**	**46.77**	**26.40**	**65.79**	**55.79**	**-19.02**	**-29.39**
2	0.20865	10.46	26.49	9.43	36.95	19.89	63.26	53.26	-26.31	-33.37
3	0.25166	10.47	20.65	5.05	31.12	15.52	61.70	51.70	-30.58	-36.18
4	0.37700	10.51	20.17	10.32	30.68	20.83	58.35	48.35	-27.67	-27.52
5	3.34447	10.61	4.17	-1.74	14.78	8.87	56.00	46.00	-41.22	-37.13
6	21.26791	11.47	8.09	0.89	19.56	12.36	60.00	50.00	-40.44	-37.64

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.

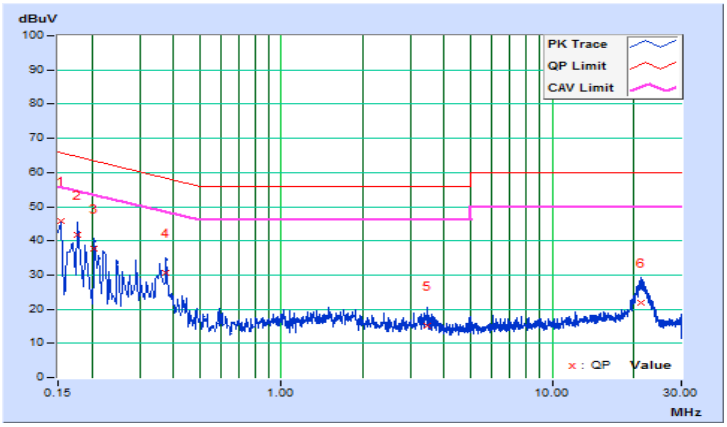


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)

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	0.15391	10.21	35.54	15.58	45.75	25.79	65.79	55.79	-20.04	-30.00
2	0.17737	10.21	31.63	12.54	41.84	22.75	64.61	54.61	-22.77	-31.86
3	0.20474	10.22	27.55	10.70	37.77	20.92	63.42	53.42	-25.65	-32.50
4	0.37678	10.23	20.26	11.01	30.49	21.24	58.35	48.35	-27.86	-27.11
5	3.45786	10.38	4.76	-2.07	15.14	8.31	56.00	46.00	-40.86	-37.69
6	21.27182	11.09	10.64	2.40	21.73	13.49	60.00	50.00	-38.27	-36.51

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.

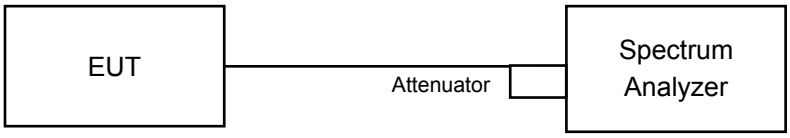


4.3 6dB Bandwidth Measurement

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 = average.

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	10.09	0.5	Pass
6	2437	10.12	0.5	Pass
11	2462	10.12	0.5	Pass

802.11g

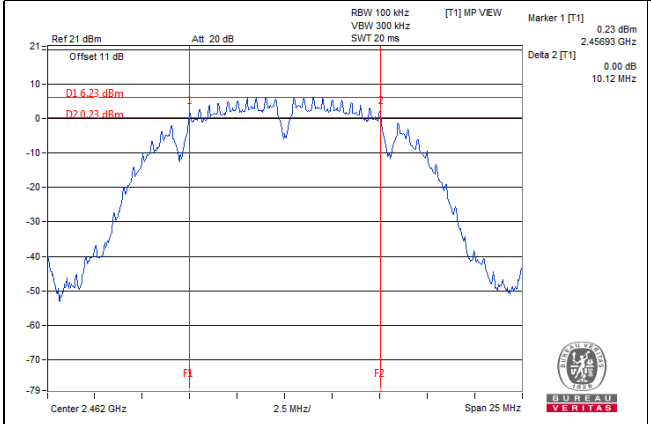
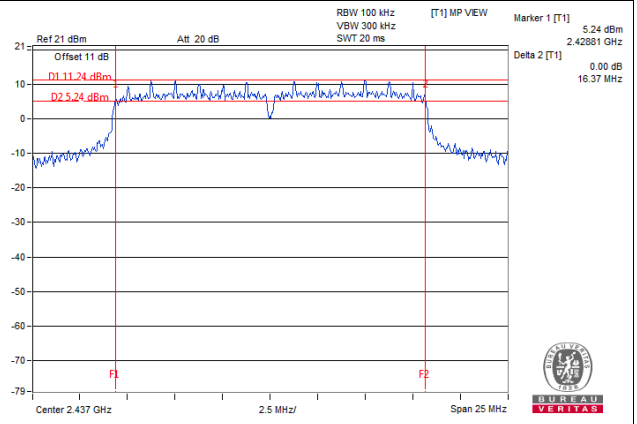
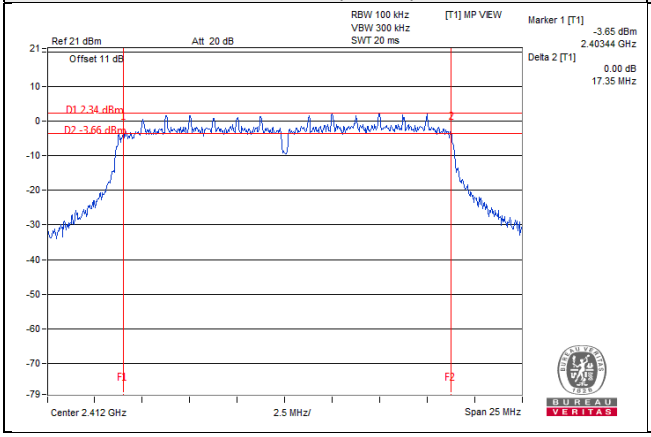
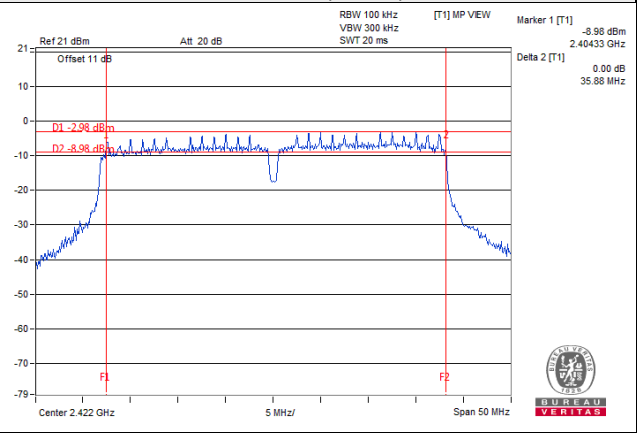
Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	16.35	0.5	Pass
6	2437	16.37	0.5	Pass
11	2462	16.35	0.5	Pass

802.11n (HT20)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	17.35	16.97	0.5	Pass
6	2437	17.33	16.70	0.5	Pass
11	2462	17.35	17.35	0.5	Pass

802.11n (HT40)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
3	2422	35.85	35.88	0.5	Pass
6	2437	35.82	35.81	0.5	Pass
9	2452	35.82	35.81	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

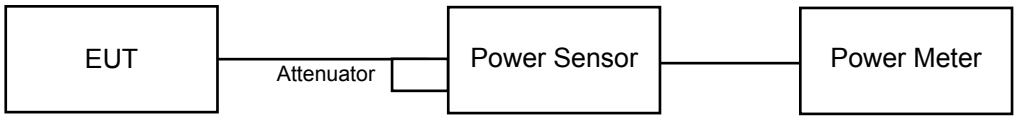
For systems using digital modulation in the 2400–2483.5 MHz bands: 1 Watt (30dBm)

Per KDB 662911 D01 Multiple Transmitter Output Method of conducted output power measurement on IEEE 802.11 devices,

Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;
Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any N_{ANT};
Array Gain = 5 log(N_{ANT}/N_{SS}) dB or 3 dB, whichever is less for 20-MHz channel widths with $N_{ANT} \geq 5$.

For power measurements on all other devices: Array Gain = 10 log(N_{ANT}/N_{SS}) dB.

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

An average power sensor was used on the output port of the EUT. A power meter was used to read the response of the 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

802.11b

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	58.614	17.68	30.00	Pass
6	2437	45.082	16.54	30.00	Pass
11	2462	44.157	16.45	30.00	Pass

802.11g

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	34.119	15.33	30.00	Pass
6	2437	133.66	21.26	30.00	Pass
11	2462	44.463	16.48	30.00	Pass

802.11n (HT20)

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	12.37	12.55	35.247	15.47	30.00	Pass
6	2437	19.56	19.68	**183.262**	22.63	30.00	Pass
11	2462	14.23	14.58	55.193	17.42	30.00	Pass

802.11n (HT40)

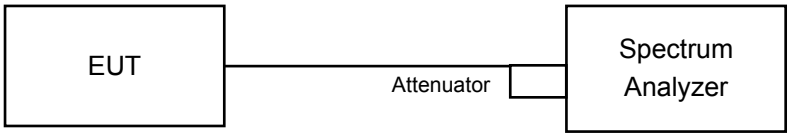
Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
3	2422	9.23	9.42	17.125	12.34	30.00	Pass
6	2437	14.02	14.31	52.212	17.18	30.00	Pass
9	2452	9.36	9.58	17.708	12.48	30.00	Pass

4.5 Power Spectral Density Measurement

4.5.1 Limits of Power Spectral Density Measurement

The Maximum of Power Spectral Density Measurement is 8dBm.

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

For Average Power (Duty cycle ≥ 98%)

a. Set instrument center frequency to DTS channel center frequency.
b. Set span to at least 1.5 times the OBW.
c. Set RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
d. Set VBW ≥3 x RBW.
e. Detector = power averaging (RMS) or sample detector (when RMS not available).
f. Ensure that the number of measurement points in the sweep ≥ 2 x span/RBW.
g. Sweep time = auto couple.
h. Employ trace averaging (RMS) mode over a minimum of 100 traces.
i. Use the peak marker function to determine the maximum amplitude level.

For Average Power (Duty cycle < 98%)

a. Measure the duty cycle (x).
b. Set instrument center frequency to DTS channel center frequency.
c. Set span to at least 1.5 times the OBW.
d. Set RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
e. Set VBW ≥3 x RBW.
f. Detector = power averaging (RMS) or sample detector (when RMS not available).
g. Ensure that the number of measurement points in the sweep ≥ 2 x span/RBW.
h. Sweep time = auto couple.
i. Do not use sweep triggering. Allow sweep to “free run”.
j. Employ trace averaging (RMS) mode over a minimum of 100 traces.
k. Use the peak marker function to determine the maximum amplitude level.
l. Add 10 log (1/x), where x is the duty cycle measured in step (a, to the measured PSD to compute the average PSD during the actual transmission time.

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	Frequency (MHz)	PSD (dBm/10kHz)	Limit (dBm/3kHz)	Pass / Fail
1	2412	-11.07	8.00	Pass
6	2437	-12.55	8.00	Pass
11	2462	-13.50	8.00	Pass

802.11g

Channel	Frequency (MHz)	PSD w/o Duty Factor (dBm/10kHz)	Duty Factor (dB)	Total PSD With Duty Factor (dBm/10kHz)	Limit (dBm/3kHz)	Pass / Fail
1	2412	-15.26	0.17	-15.09	8.00	Pass
6	2437	-9.00	0.17	-8.83	8.00	Pass
11	2462	-14.61	0.17	-14.44	8.00	Pass

Note: Refer to section 3.3 for duty cycle spectrum plot.

802.11n (HT20)

TX chain	Channel	Frequency (MHz)	PSD w/o Duty Factor (dBm/10kHz)	10 log (N=2) dB	Duty Factor (dB)	Total PSD With Duty Factor (dBm/10kHz)	Limit (dBm/3kHz)	Pass / Fail
0	1	2412	-18.38	3.01	0.20	-15.17	7.09	Pass
	6	2437	-10.91	3.01	0.20	-7.70	7.09	Pass
	11	2462	-16.50	3.01	0.20	-13.29	7.09	Pass
1	1	2412	-17.42	3.01	0.20	-14.21	7.09	Pass
	6	2437	-9.95	3.01	0.20	-6.74	7.09	Pass
	11	2462	-15.84	3.01	0.20	-12.63	7.09	Pass

Note:
1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = 3.9dBi + 10log(2) = 6.91dBi > 6dBi, so the power density limit shall be reduced to 8-(6.91-6) = 7.09dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

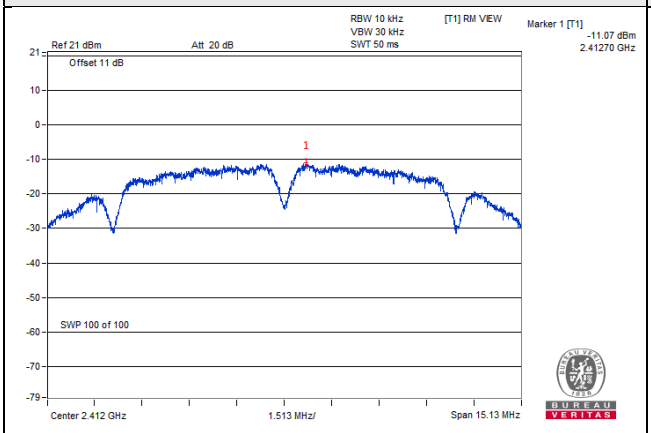
802.11n (HT40)

TX chain	Channel	Frequency (MHz)	PSD w/o Duty Factor (dBm/10kHz)	10 log (N=2) dB	Duty Factor (dB)	Total PSD With Duty Factor (dBm/10kHz)	Limit (dBm/3kHz)	Pass / Fail
0	3	2422	-24.51	3.01	0.33	-21.17	7.09	Pass
	6	2437	-18.53	3.01	0.33	-15.19	7.09	Pass
	9	2452	-23.61	3.01	0.33	-20.27	7.09	Pass
1	3	2422	-22.44	3.01	0.33	-19.10	7.09	Pass
	6	2437	-18.70	3.01	0.33	-15.36	7.09	Pass
	9	2452	-24.00	3.01	0.33	-20.66	7.09	Pass

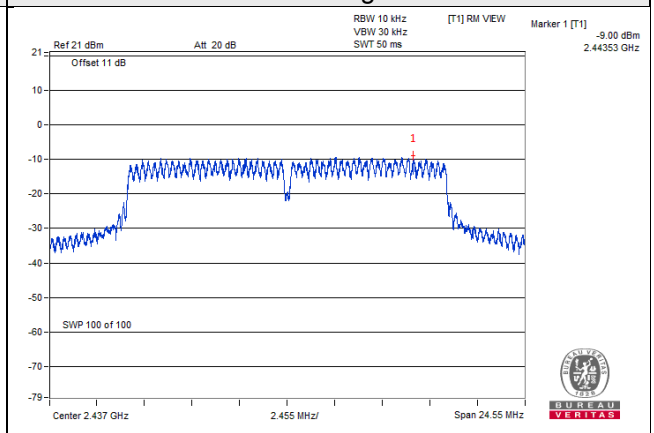
Note:
1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = 3.9dBi + 10log(2) = 6.91dBi > 6dBi, so the power density limit shall be reduced to 8-(6.91-6) = 7.09dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

Spectrum Plot of Worst Value

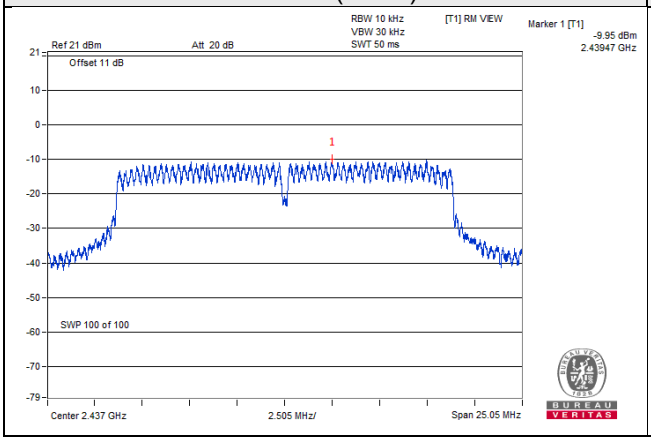
802.11b



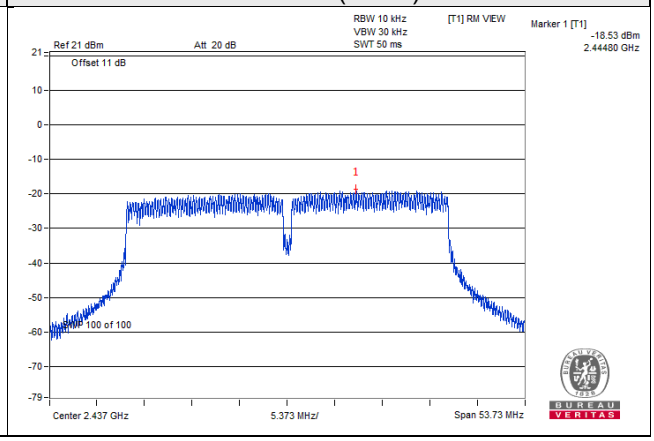
802.11g



802.11n (HT20)



802.11n (HT40)

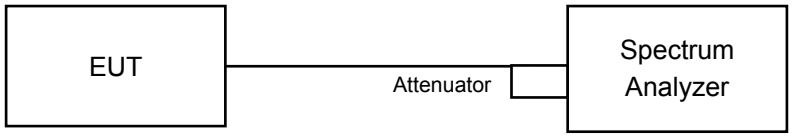


4.6 Conducted Out of Band Emission Measurement

4.6.1 Limits of Conducted Out of Band Emission Measurement

Below 30dB 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

a. Set the RBW = 100 kHz.
b. Set the VBW ≥ 300 kHz.
c. Detector = average.
d. Sweep time = auto couple.
e. Trace mode = max hold.
f. Allow trace to fully stabilize.
g. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

MEASUREMENT PROCEDURE OOBE

a. Set RBW = 100 kHz.
b. Set VBW ≥ 300 kHz.
c. Detector = average.
d. Sweep = auto couple.
e. Trace Mode = max hold.
f. Allow trace to fully stabilize.
g. 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

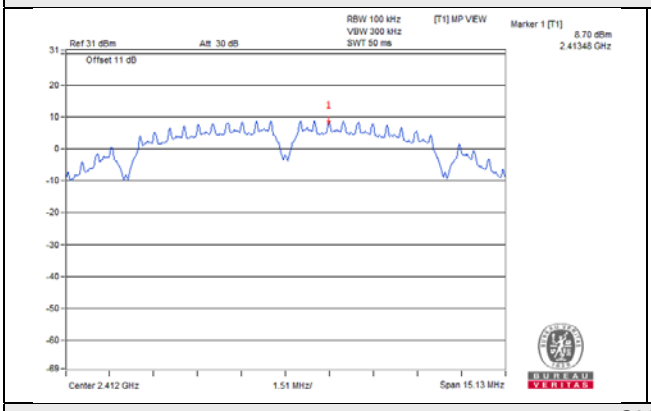
Same as item 4.3.6

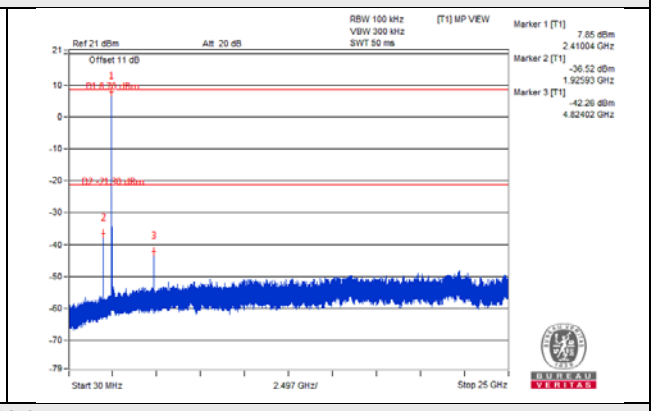
4.6.7 Test Results

The conducted emission test is performed on each TX port of operating mode without summing or adding 10log (N) since the limit is relative emission limit.
The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 30dB offset below D1. It shows compliance with the requirement.

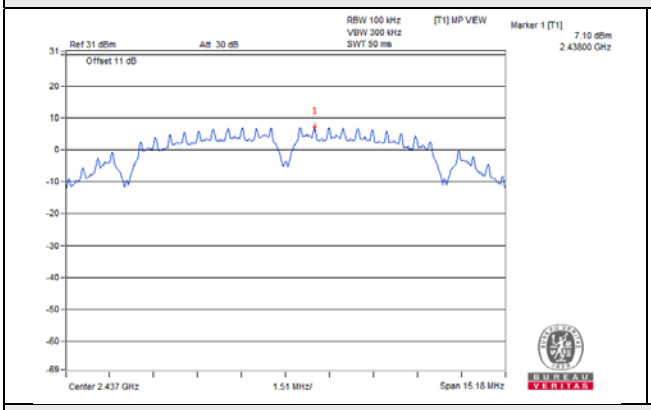
802.11b

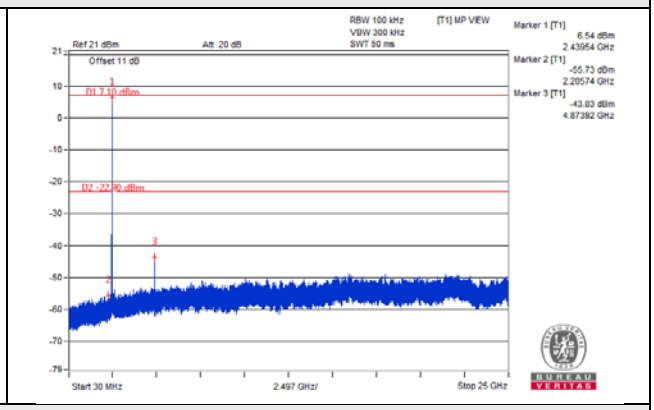
CH 1



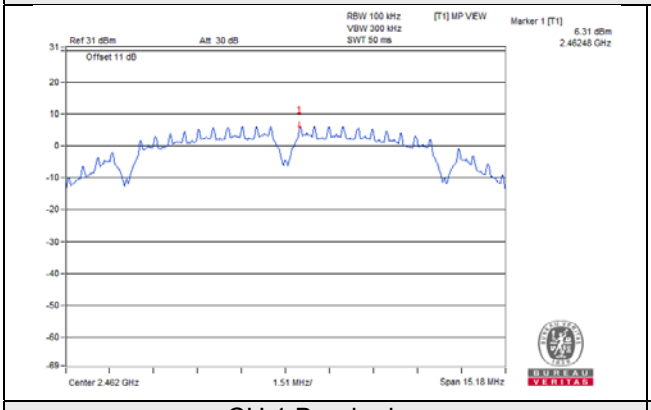


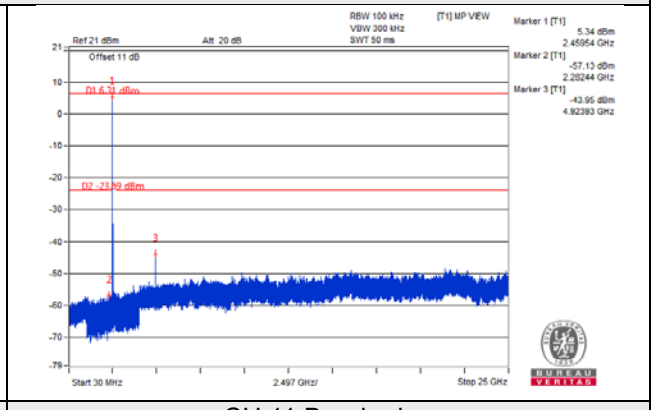
CH 6



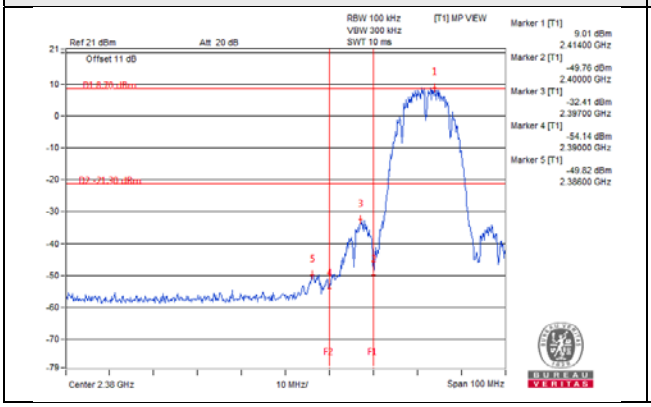


CH 11

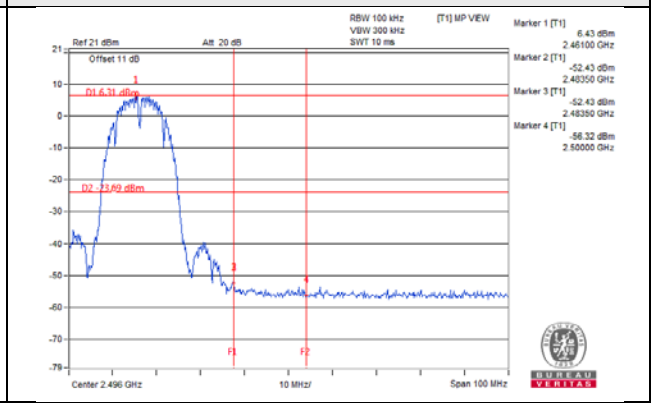




CH 1 Band edge

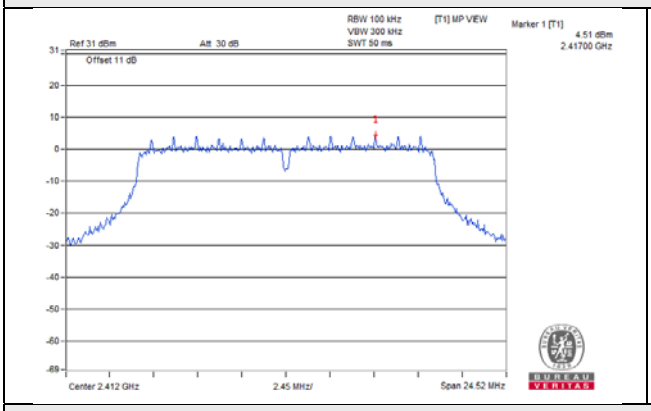


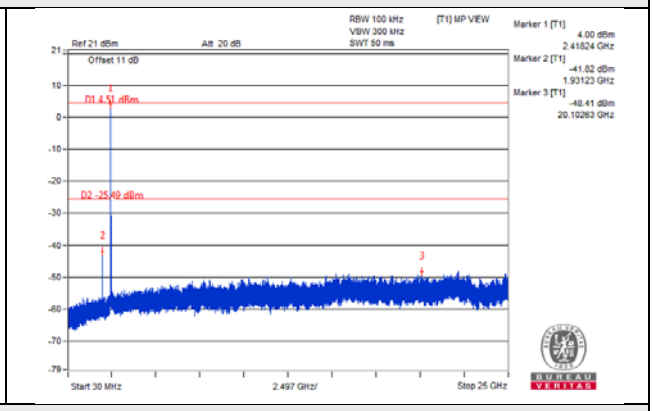
CH 11 Band edge



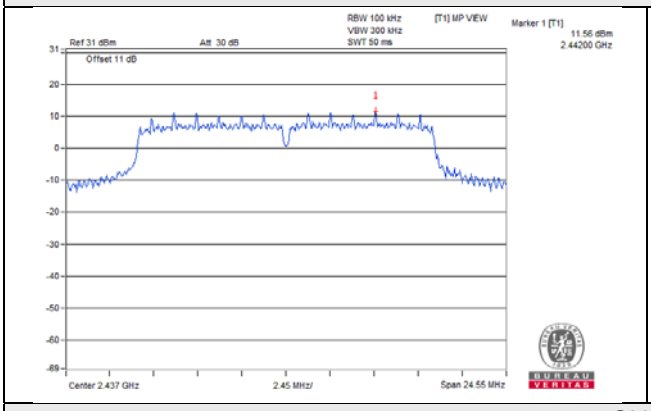
802.11g

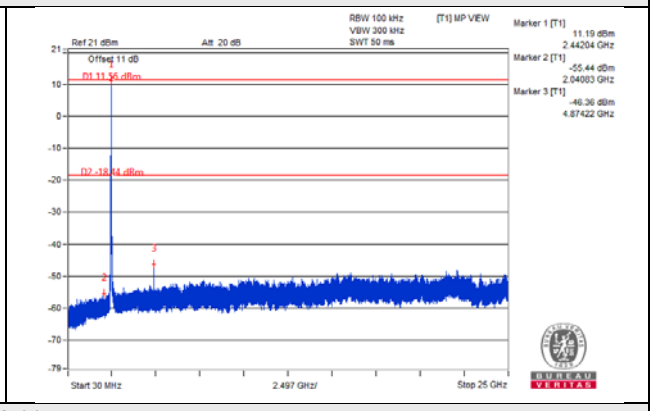
CH 1



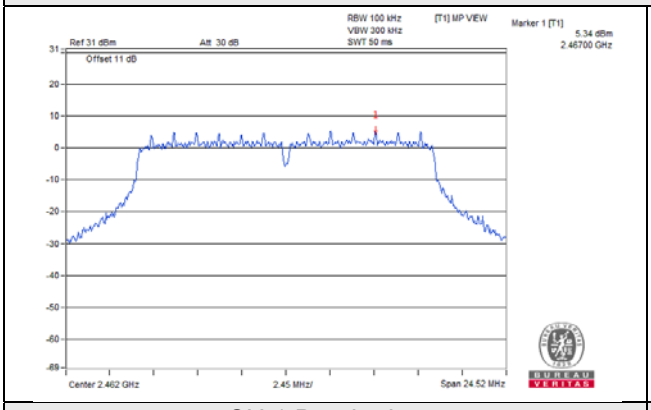


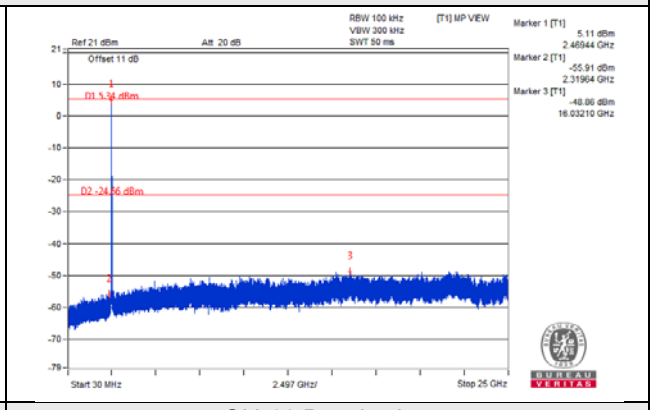
CH 6



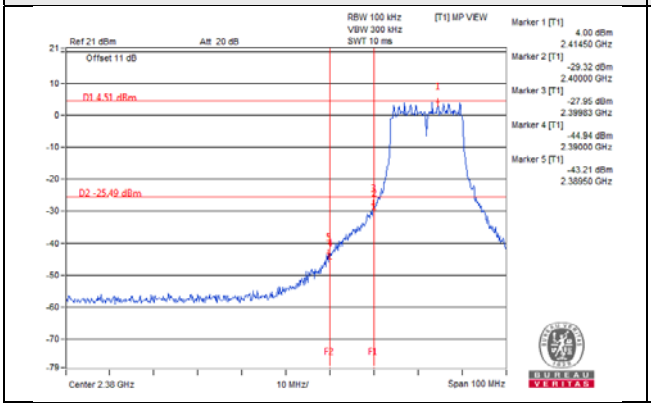


CH 11

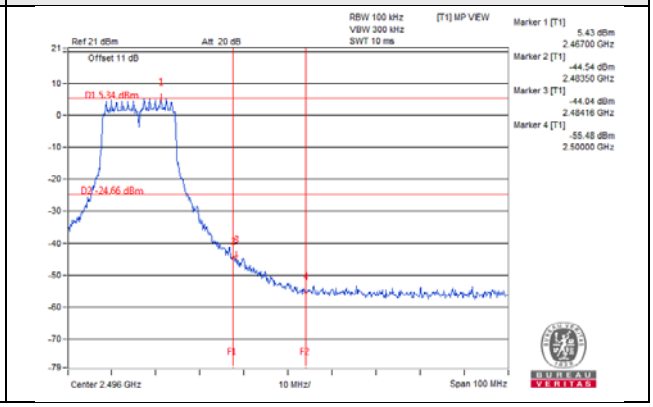




CH 1 Band edge

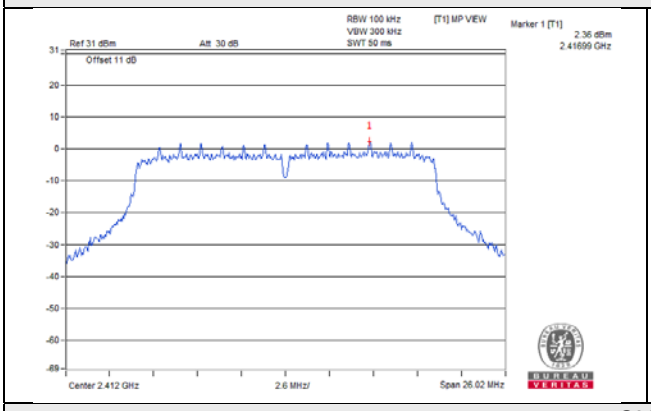


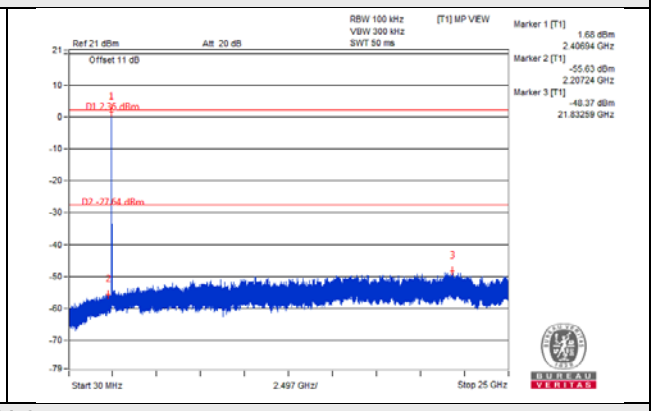
CH 11 Band edge



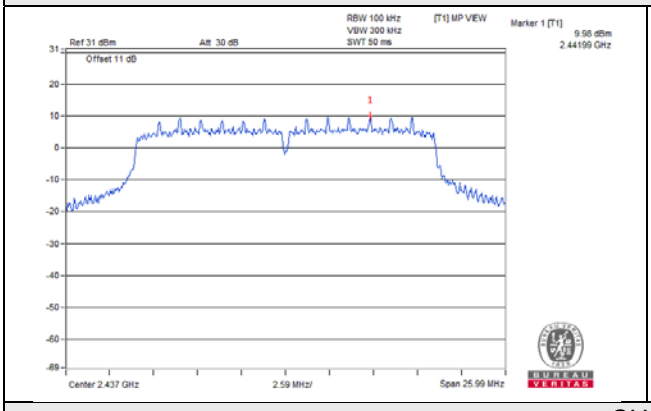
802.11n (HT20)_Chain 0

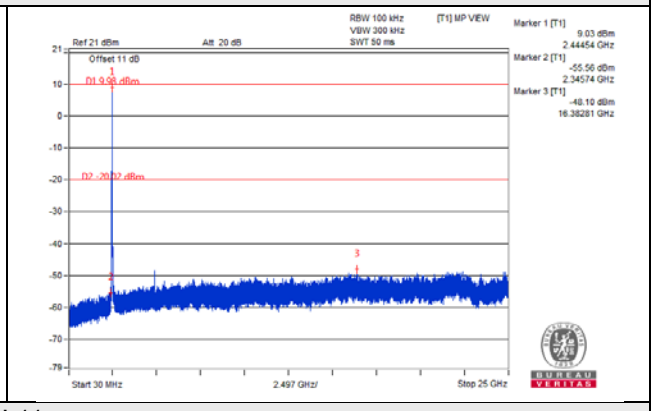
CH 1



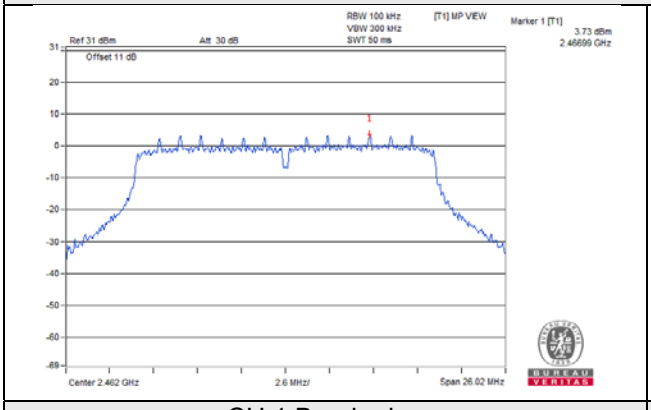


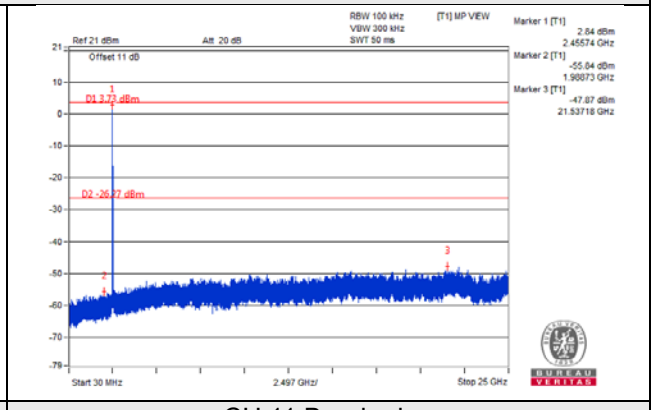
CH 6



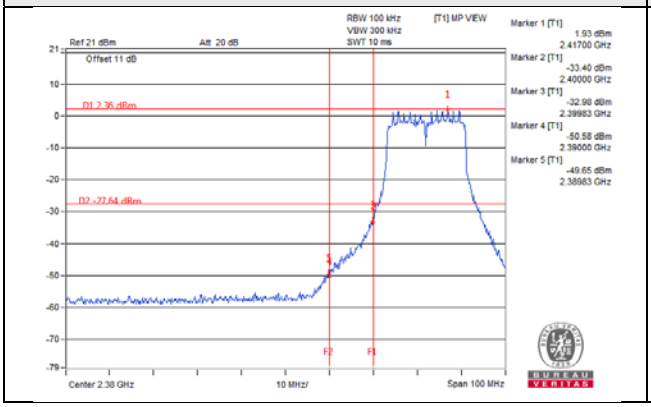


CH 11

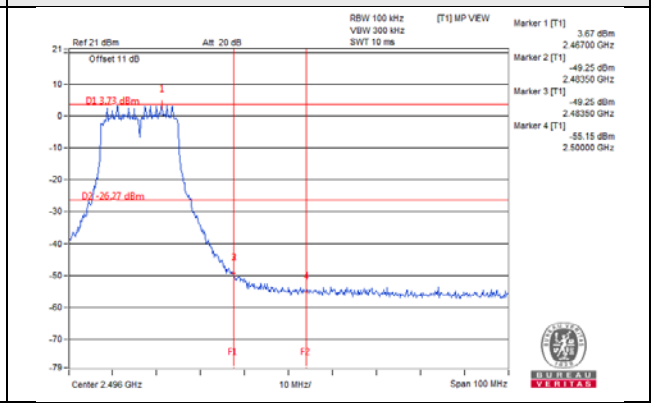




CH 1 Band edge

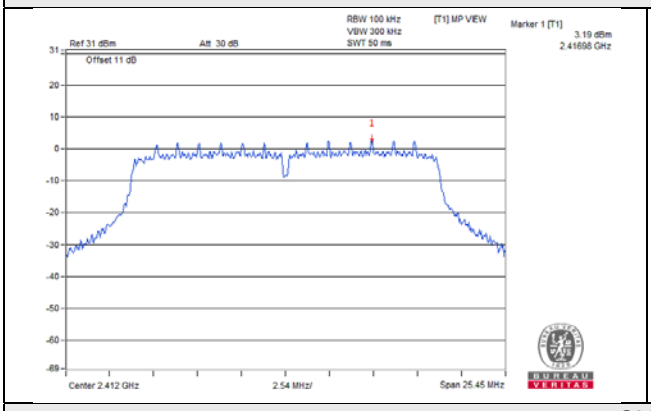


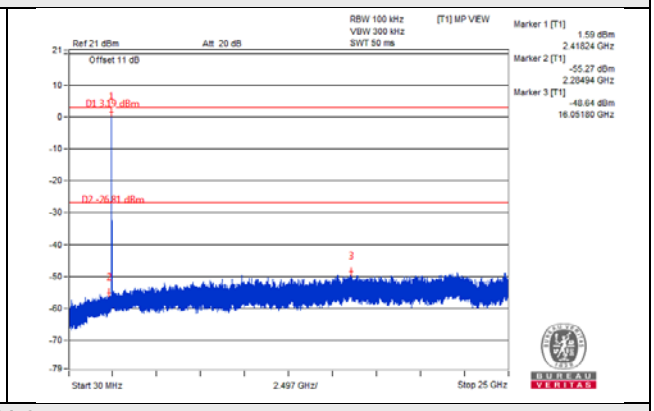
CH 11 Band edge



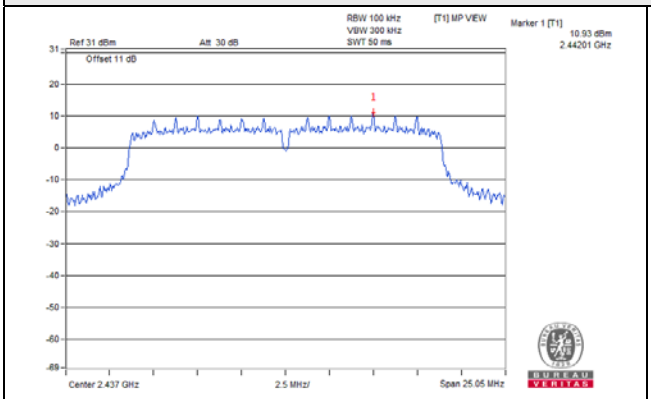
802.11n (HT20)_Chain 1

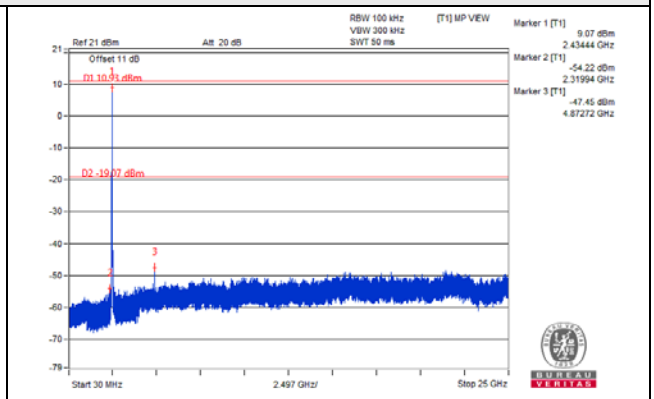
CH 1



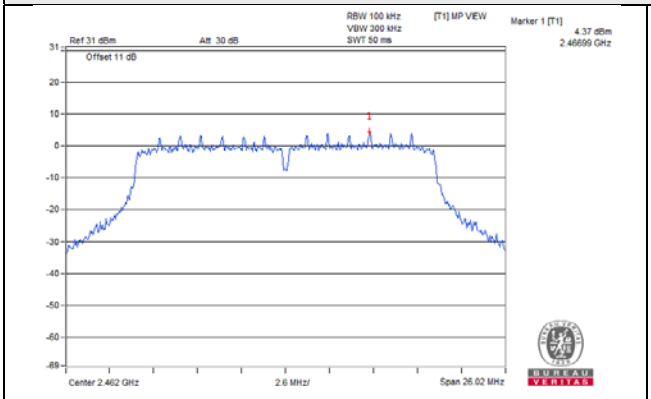


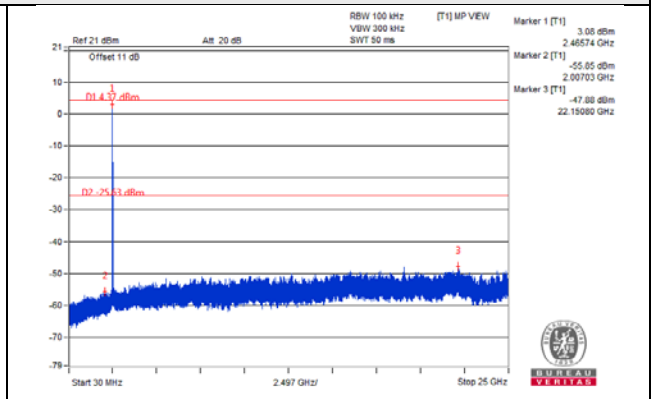
CH 6



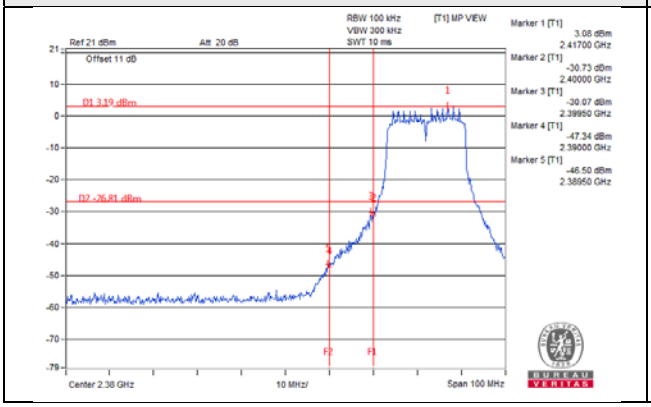


CH 11

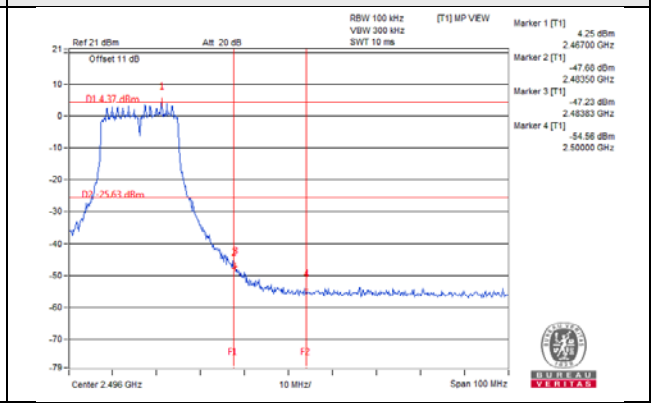




CH 1 Band edge

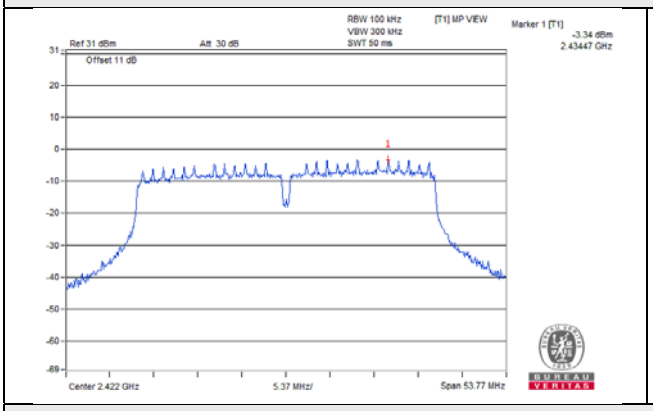


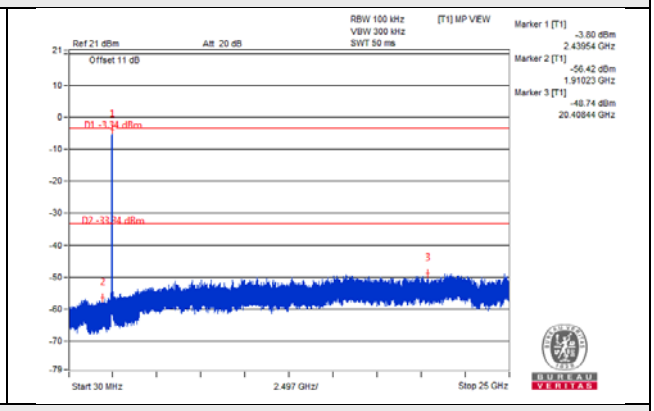
CH 11 Band edge



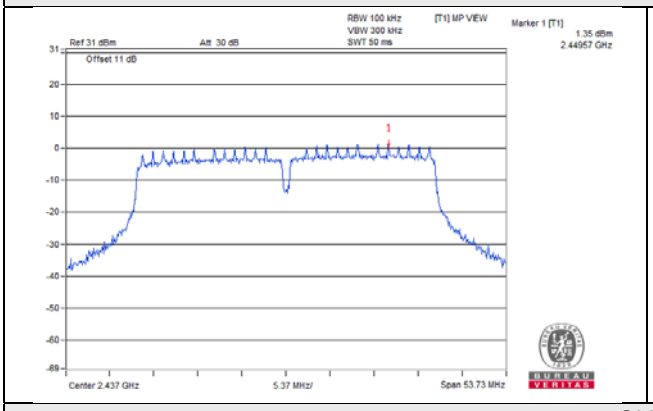
802.11n (HT40)_Chain 0

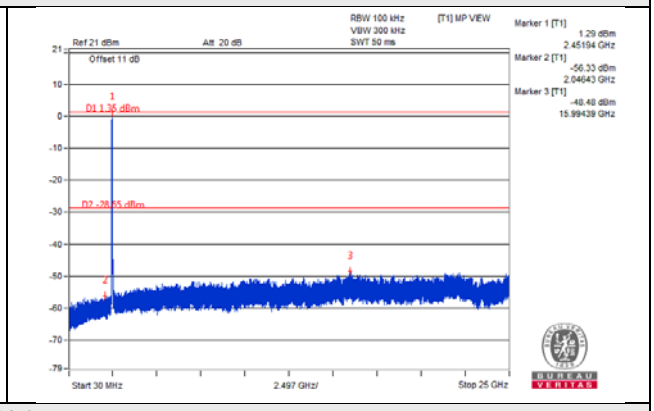
CH 3



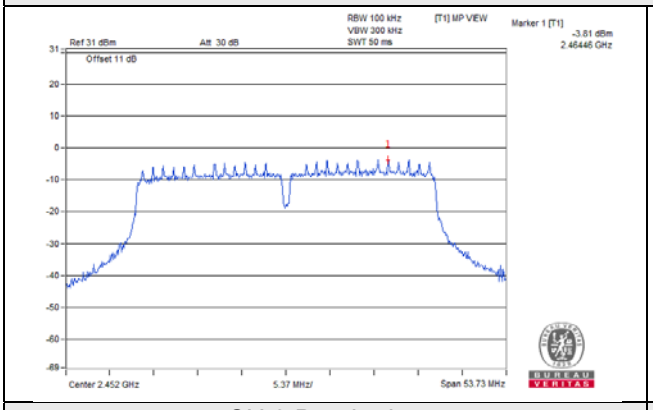


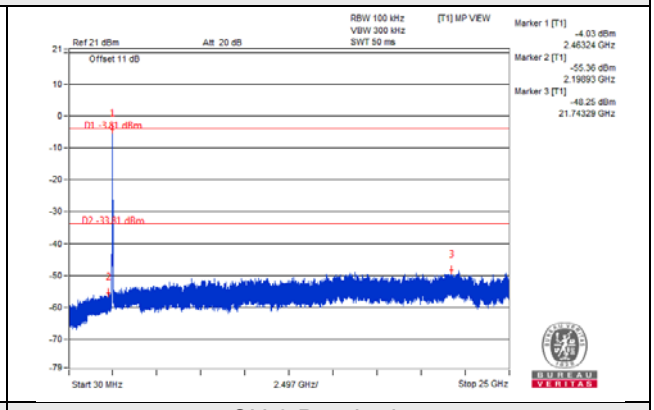
CH 6



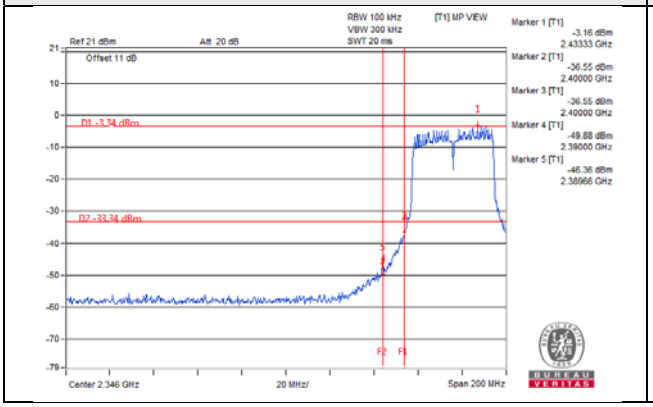


CH 9

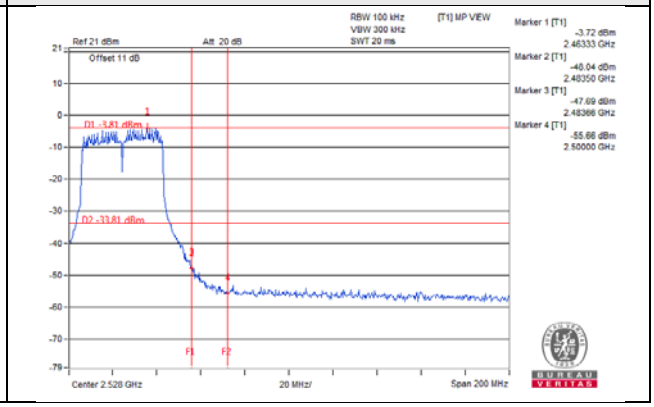




CH 3 Band edge

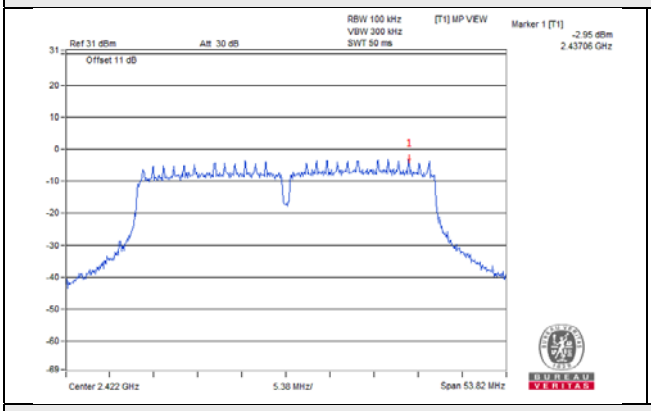


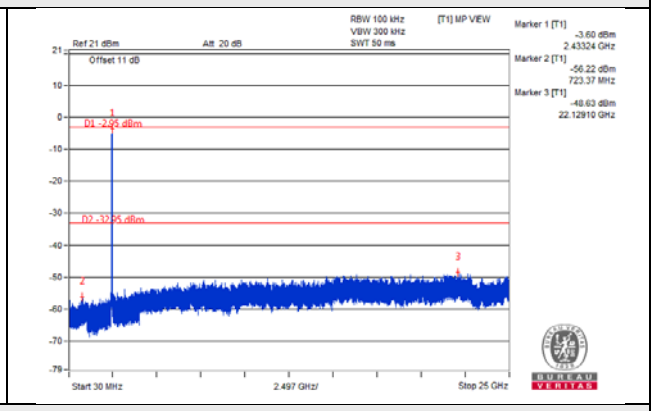
CH 9 Band edge



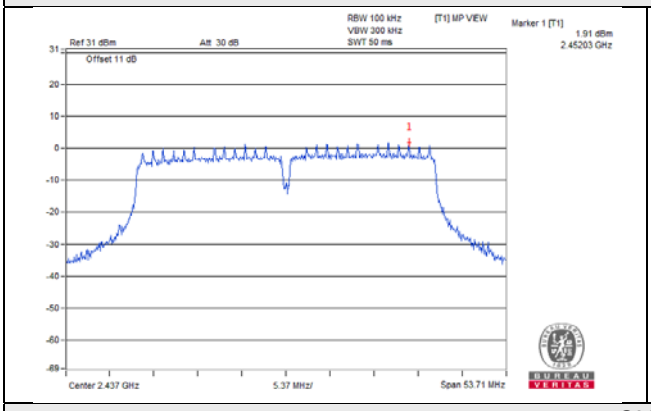
802.11n (HT40)_Chain 1

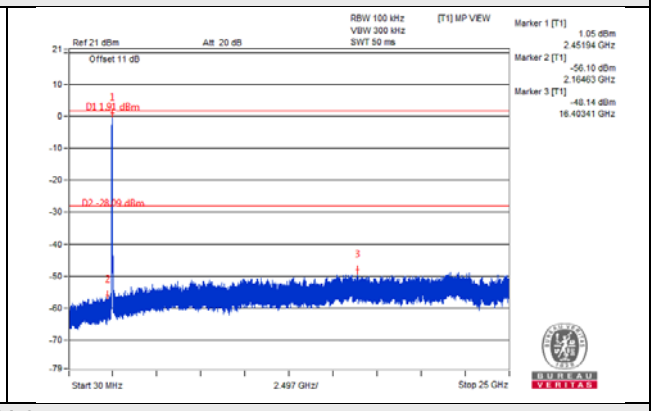
CH 3



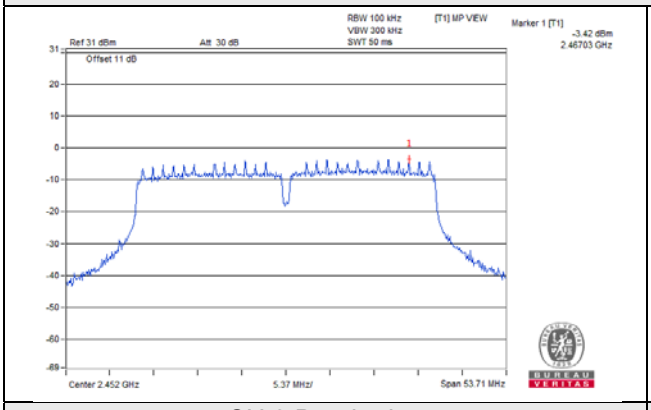


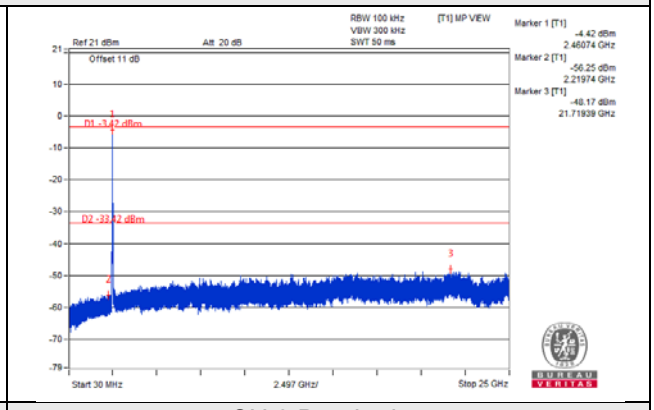
CH 6



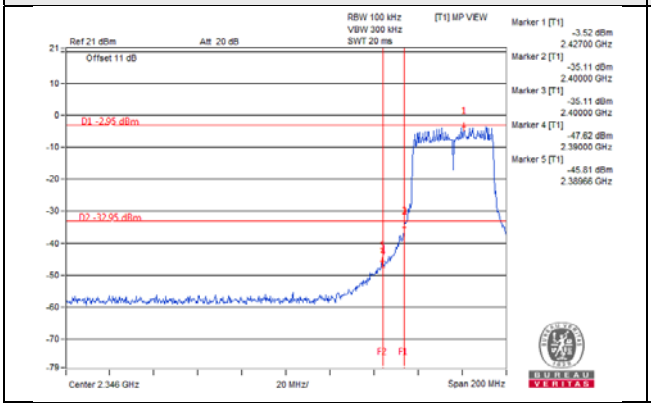


CH 9

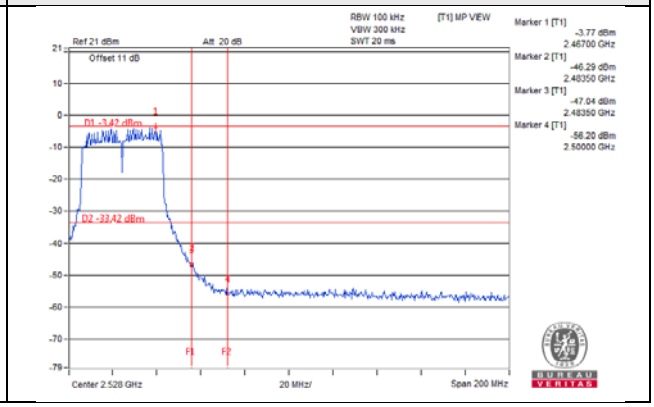




CH 3 Band edge



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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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.

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