FCC Test Report

Report No.:	RF170224C10B
FCC ID:	MSQ-RPACRR00
Test Model:	RP-AC55
Series Model:	RP-AC1200 (Refer to item 3.1 for more details)
Received Date:	Dec. 13, 2017
Test Date:	Jan. 09 ~ Jan. 16, 2018
Issued Date:	Mar. 07, 2018
Applicant:	ASUSTeK COMPUTER INC.
Address:	4F, NO. 150,Li-Te Rd. Peitou,Taipei 112, Taiwan
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

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This report should not be used by the client to claim product certification, approval, or endorsement by TAF or any government agencies.

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Release Control Record

Issue No.	Description	Date Issued
RF170224C10B	Original release.	Mar. 07, 2018

1 Certificate of Conformity

Product: Dual-band Wireless Repeater

Brand: ASUS

Test Model: RP-AC55

Series Model: RP-AC1200 (Refer to item 3.1 for more details)

Sample Status: Engineering sample

Applicant: ASUSTeK COMPUTER INC.

Test Date: Jan. 09 ~ Jan. 16, 2018

Standards: 47 CFR FCC Part 15, Subpart C (Section 15.247)
ANSI C63.10:2013

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Prepared by : _____ , **Date:** Mar. 07, 2018
Polly Chien / Specialist

Approved by : _____ , **Date:** Mar. 07, 2018
Bruce Chen / Project Engineer

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	Pass	Meet the requirement of limit. Minimum passing margin is -19.06dB at 0.15781MHz.
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.
15.247(d)	Antenna Port Emission	Pass	Meet the requirement of limit.
15.247(a)(2)	6dB bandwidth	Pass	Meet the requirement of limit.
15.247(b)	Conducted power	Pass	Meet the requirement of limit.
15.247(e)	Power Spectral Density	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	Antenna connector is i-pex(MHF) not a standard connector.

2.1 Measurement Uncertainty

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

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.94 dB
Radiated Emissions up to 1 GHz	30MHz ~ 200MHz	3.59 dB
	200MHz ~1000MHz	3.60 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	Dual-band Wireless Repeater
Brand	ASUS
Test Model	RP-AC55
Series Model	RP-AC1200
Model Difference	Refer to note for more details
Sample Status	Engineering sample
Power Supply Rating	100-240Vac, 50/60Hz, 0.6-1.5A
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	CDD Mode: 225.639mW Beamforming Mode: 225.639mW
Antenna Type	Dipole antenna with 2.59dBi gain
Antenna Connector	i-pex(MHF)
Accessory Device	NA
Cable Supplied	NA

Note:

1. The following models are provided to this EUT. The model of the RP-AC55 was chosen for final test.

Brand	Model	Description
ASUS	RP-AC55	All models are electrically identical, different model names are for marketing purpose.
	RP-AC1200	

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

Modulation Mode	Beamforming Mode	TX Function
802.11b	Not Support	1TX (Fixed Chain 1)
802.11g	Not Support	2TX
802.11n (HT20)	Support	2TX
802.11n (HT40)	Support	2TX

* For 802.11n, CDD mode and Beamforming mode are presented in power output test item. For other test items, CDD mode is the worst case for final tests after pretesting.

3. The WLAN 2.4GHz can transmit with WLAN 5GHz at the same time except BT.

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	7.2
-	802.11n (HT40)	3 to 9	3, 6, 9	OFDM	BPSK	15.0

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)
-	802.11n (HT20)	1 to 11	6	OFDM	BPSK	7.2

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)
-	802.11n (HT20)	1 to 11	6	OFDM	BPSK	7.2

6dB Bandwidth, Power Spectral Density and Conducted Out of Band Emission 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	7.2
-	802.11n (HT40)	3 to 9	3, 6, 9	OFDM	BPSK	15.0

Conducted Output Power 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)
CDD Mode						
-	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
Beamforming Mode						
-	802.11n (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	6.5
-	802.11n (HT40)	3 to 9	3, 6, 9	OFDM	BPSK	13.5

Test Condition:

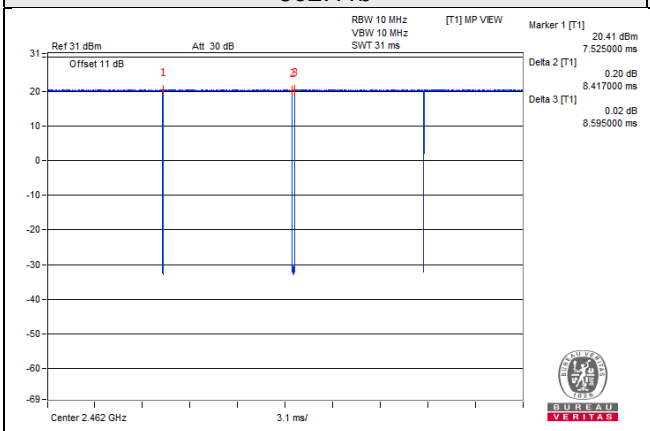
Applicable to	Environmental Conditions	Input Power	Tested by
RE≥1G	25 deg. C, 68% RH	120Vac, 60Hz	Matthew Yang
RE<1G	25 deg. C, 66% RH	120Vac, 60Hz	James Yang
PLC	25 deg. C, 75% RH	120Vac, 60Hz	Chris Lin
APCM	25 deg. C, 60% RH	120Vac, 60Hz	Chris Lin

3.3 Duty Cycle of Test Signal

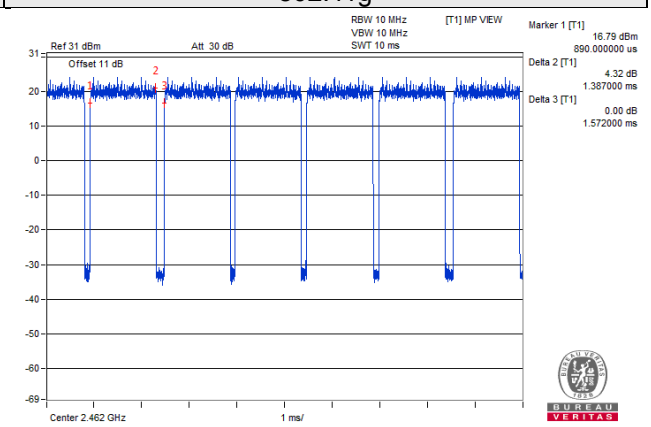
Duty cycle of test signal is < 98%, duty factor is required.

802.11b: Duty cycle = 8.417/8.595 = 0.979, Duty factor = 10 * log(1/0.979) = 0.09
802.11g: Duty cycle = 1.387/1.572 = 0.882, Duty factor = 10 * log(1/0.882) = 0.54
802.11n (HT20): Duty cycle = 1.303/1.405 = 0.927, Duty factor = 10 * log(1/0.927) = 0.33
802.11n (HT40): Duty cycle = 0.645/0.745 = 0.886, Duty factor = 10 * log(1/0.886) = 0.63

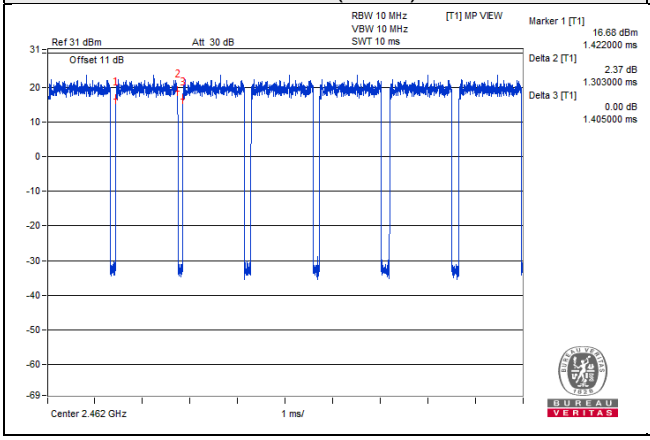
802.11b



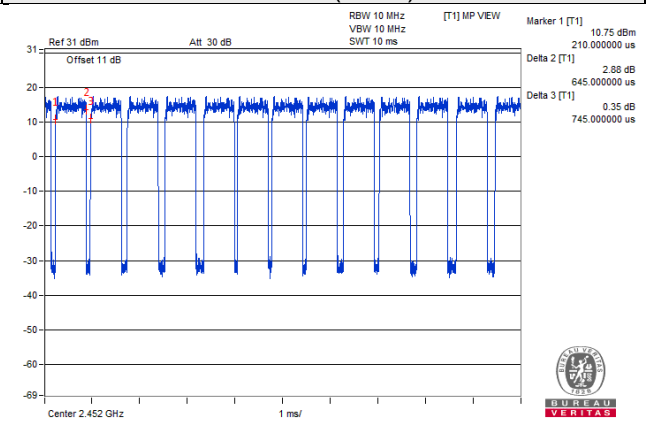
802.11g



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.

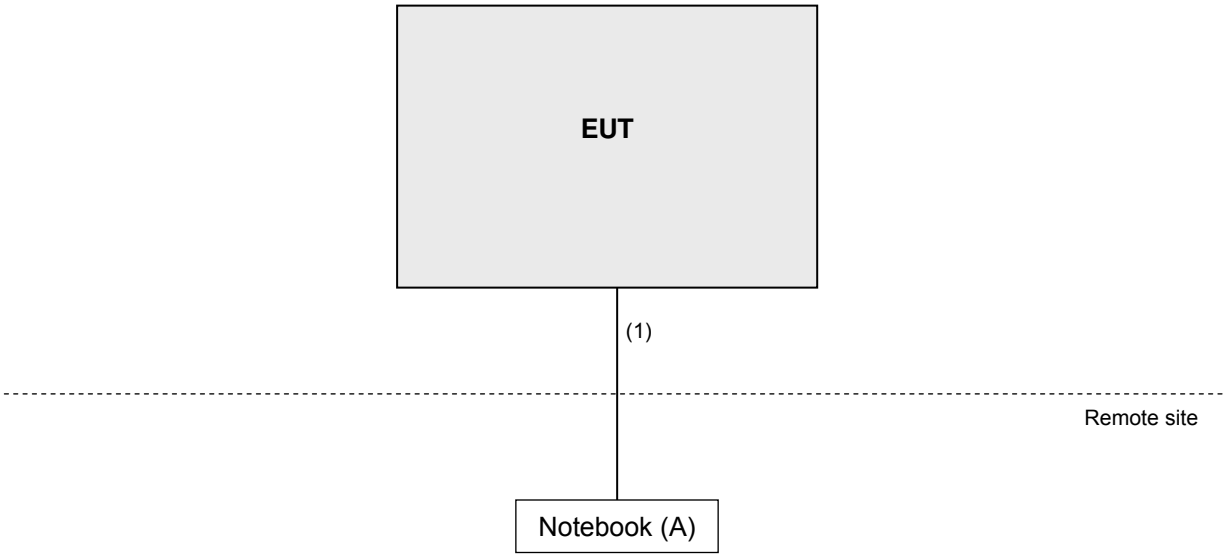
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Notebook	DELL	E5410	1HC2XM1	FCC DoC Approved	-

Note:

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

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	RJ45, Cat5e	1	5	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 KEYSIGHT	N9038A	MY55420137	Mar. 27, 2017	Mar. 26, 2018
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100269	May 11, 2017	May 10, 2018
BILOG Antenna SCHWARZBECK	VULB9168	9168-148	Dec. 11, 2017	Dec. 10, 2018
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-1169	Dec. 12, 2017	Dec. 11, 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	2944A10638	Aug. 08, 2017	Aug. 07, 2018
Preamplifier Agilent (Above 1GHz)	8449B	3008A01960	Aug. 08, 2017	Aug. 07, 2018
RF signal cable HUBER+SUHNER&EMCI	SUCOFLEX 104	MY 13380+295012/04	Aug. 08, 2017	Aug. 07, 2018
RF signal cable HUBER+SUHNER	SUCOFLEX 104	CABLE-CH9-(250795/4)	Aug. 08, 2017	Aug. 07, 2018
RF signal cable Woken	8D-FB	Cable-CH9-01	Aug. 01, 2017	Jul. 31, 2018
Software BV ADT	ADT_Radiated_ V7.6.15.9.4	NA	NA	NA
Antenna Tower EMCO	2070/2080	512.835.4684	NA	NA
Turn Table EMCO	2087-2.03	NA	NA	NA
Antenna Tower &Turn BV ADT	AT100	AT93021705	NA	NA
Turn Table BV ADT	TT100	TT93021705	NA	NA
Turn Table Controller BV ADT	SC100	SC93021705	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 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 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:

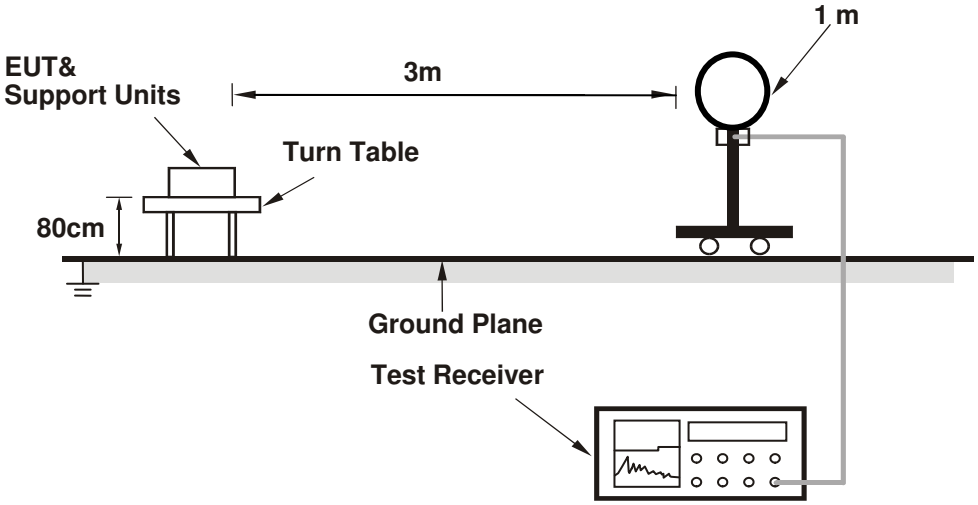
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

4.1.4 Deviation from Test Standard

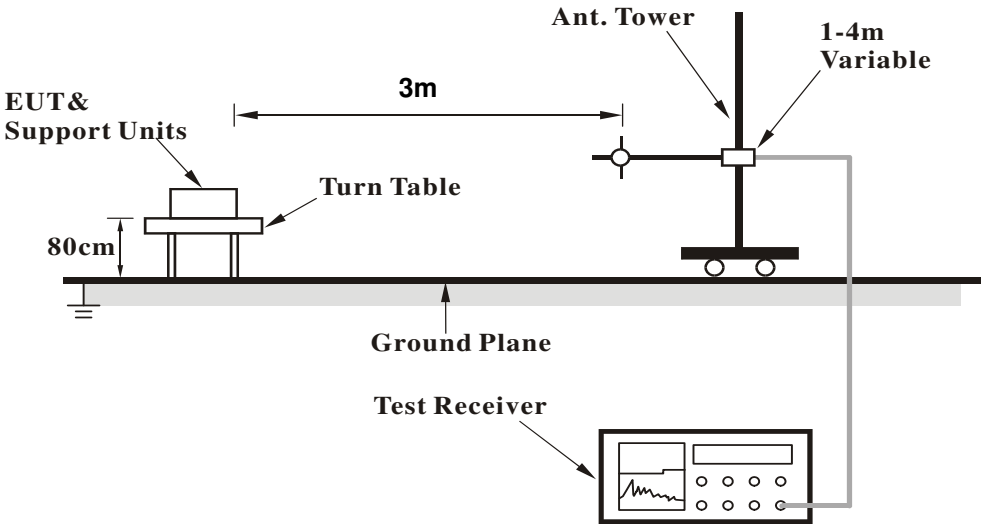
No deviation.

4.1.5 Test Setup

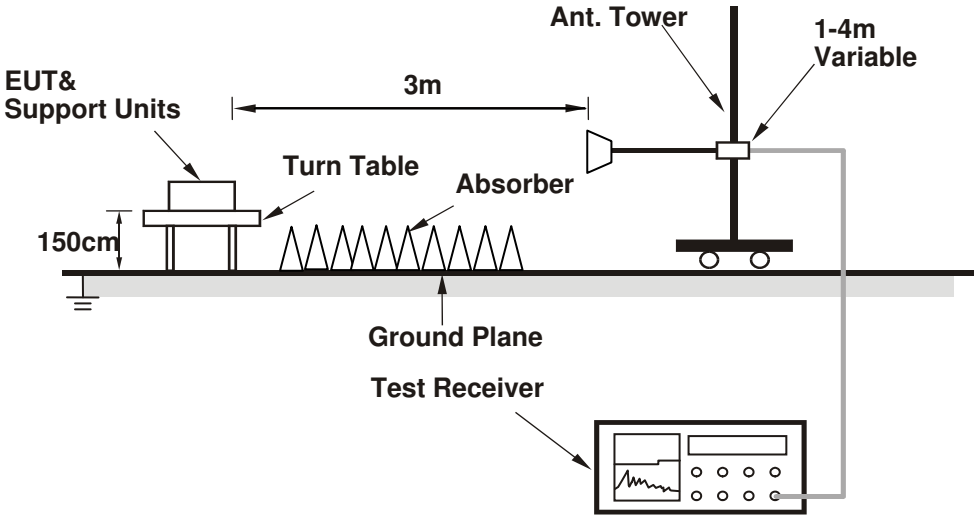
For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



For Radiated emission above 1GHz



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

4.1.6 EUT Operating Conditions

a. Placed the EUT on the testing table.
b. 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	57.8 PK	74.0	-16.2	1.33 H	304	24.20	33.60
2	2390.00	48.7 AV	54.0	-5.3	1.33 H	304	15.10	33.60
3	*2412.00	102.0 PK			1.31 H	297	68.50	33.50
4	*2412.00	98.3 AV			1.31 H	297	64.80	33.50
5	4824.00	51.0 PK	74.0	-23.0	1.72 H	174	47.30	3.70
6	4824.00	46.4 AV	54.0	-7.6	1.72 H	174	42.70	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	2390.00	61.0 PK	74.0	-13.0	3.34 V	163	27.40	33.60
2	2390.00	52.7 AV	54.0	-1.3	3.34 V	163	19.10	33.60
3	*2412.00	113.0 PK			3.16 V	160	79.50	33.50
4	*2412.00	109.2 AV			3.16 V	160	75.70	33.50
5	4824.00	52.9 PK	74.0	-21.1	3.32 V	247	49.20	3.70
6	4824.00	49.2 AV	54.0	-4.8	3.32 V	247	45.50	3.70

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) 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	105.1 PK			1.06 H	295	71.70	33.40
2	*2437.00	100.6 AV			1.06 H	295	67.20	33.40
3	4874.00	51.4 PK	74.0	-22.6	1.97 H	168	47.50	3.90
4	4874.00	46.8 AV	54.0	-7.2	1.97 H	168	42.90	3.90
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	114.7 PK			3.06 V	181	81.30	33.40
2	*2437.00	110.6 AV			3.06 V	181	77.20	33.40
3	4874.00	52.8 PK	74.0	-21.2	3.34 V	262	48.90	3.90
4	4874.00	49.5 AV	54.0	-4.5	3.34 V	262	45.60	3.90

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) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	104.1 PK			1.15 H	290	70.60	33.50
2	*2462.00	100.1 AV			1.15 H	290	66.60	33.50
3	2483.50	57.9 PK	74.0	-16.1	1.24 H	308	24.40	33.50
4	2483.50	47.6 AV	54.0	-6.4	1.24 H	308	14.10	33.50
5	4924.00	51.0 PK	74.0	-23.0	1.84 H	178	46.80	4.20
6	4924.00	46.0 AV	54.0	-8.0	1.84 H	178	41.80	4.20
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	113.0 PK			3.11 V	184	79.50	33.50
2	*2462.00	109.4 AV			3.11 V	184	75.90	33.50
3	2483.50	60.9 PK	74.0	-13.1	3.33 V	179	27.40	33.50
4	2483.50	52.6 AV	54.0	-1.4	3.33 V	179	19.10	33.50
5	4924.00	51.8 PK	74.0	-22.2	3.21 V	267	47.60	4.20
6	4924.00	48.1 AV	54.0	-5.9	3.21 V	267	43.90	4.20

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.

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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	60.3 PK	74.0	-13.7	1.09 H	279	26.70	33.60
2	2390.00	48.0 AV	54.0	-6.0	1.09 H	279	14.40	33.60
3	*2412.00	99.4 PK			1.01 H	300	65.90	33.50
4	*2412.00	90.4 AV			1.01 H	300	56.90	33.50
5	4824.00	46.8 PK	74.0	-27.2	1.80 H	54	43.10	3.70
6	4824.00	33.9 AV	54.0	-20.1	1.80 H	54	30.20	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	2390.00	65.1 PK	74.0	-8.9	3.81 V	232	31.50	33.60
2	2390.00	52.5 AV	54.0	-1.5	3.81 V	232	18.90	33.60
3	*2412.00	109.6 PK			3.08 V	227	76.10	33.50
4	*2412.00	100.2 AV			3.08 V	227	66.70	33.50
5	4824.00	47.1 PK	74.0	-26.9	3.22 V	121	43.40	3.70
6	4824.00	34.0 AV	54.0	-20.0	3.22 V	121	30.30	3.70

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) 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	104.3 PK			1.02 H	295	70.90	33.40
2	*2437.00	94.9 AV			1.02 H	295	61.50	33.40
3	4874.00	47.3 PK	74.0	-26.7	1.74 H	61	43.40	3.90
4	4874.00	34.9 AV	54.0	-19.1	1.74 H	61	31.00	3.90
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	114.0 PK			3.42 V	228	80.60	33.40
2	*2437.00	105.0 AV			3.42 V	228	71.60	33.40
3	4874.00	47.5 PK	74.0	-26.5	3.30 V	128	43.60	3.90
4	4874.00	35.1 AV	54.0	-18.9	3.30 V	128	31.20	3.90

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) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	99.5 PK			1.04 H	294	66.00	33.50
2	*2462.00	89.7 AV			1.04 H	294	56.20	33.50
3	2483.50	61.1 PK	74.0	-12.9	1.15 H	312	27.60	33.50
4	2483.50	46.8 AV	54.0	-7.2	1.15 H	312	13.30	33.50
5	4924.00	47.6 PK	74.0	-26.4	1.86 H	69	43.40	4.20
6	4924.00	34.5 AV	54.0	-19.5	1.86 H	69	30.30	4.20
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	110.4 PK			3.45 V	228	76.90	33.50
2	*2462.00	101.3 AV			3.45 V	228	67.80	33.50
3	2483.50	71.5 PK	74.0	-2.5	3.37 V	213	38.00	33.50
4	2483.50	52.5 AV	54.0	-1.5	3.37 V	213	19.00	33.50
5	4924.00	47.8 PK	74.0	-26.2	3.28 V	119	43.60	4.20
6	4924.00	34.7 AV	54.0	-19.3	3.28 V	119	30.50	4.20

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.

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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	60.7 PK	74.0	-13.3	1.14 H	271	27.10	33.60
2	2390.00	48.3 AV	54.0	-5.7	1.14 H	271	14.70	33.60
3	*2412.00	100.3 PK			1.19 H	303	66.80	33.50
4	*2412.00	90.9 AV			1.19 H	303	57.40	33.50
5	4824.00	46.9 PK	74.0	-27.1	1.66 H	50	43.20	3.70
6	4824.00	34.1 AV	54.0	-19.9	1.66 H	50	30.40	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	2390.00	67.2 PK	74.0	-6.8	3.36 V	234	33.60	33.60
2	2390.00	52.9 AV	54.0	-1.1	3.36 V	234	19.30	33.60
3	*2412.00	109.8 PK			3.16 V	225	76.30	33.50
4	*2412.00	99.4 AV			3.16 V	225	65.90	33.50
5	4824.00	47.2 PK	74.0	-26.8	3.45 V	110	43.50	3.70
6	4824.00	34.2 AV	54.0	-19.8	3.45 V	110	30.50	3.70

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) 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	105.0 PK			1.10 H	299	71.60	33.40
2	*2437.00	95.2 AV			1.10 H	299	61.80	33.40
3	4874.00	47.5 PK	74.0	-26.5	1.92 H	45	43.60	3.90
4	4874.00	35.0 AV	54.0	-19.0	1.92 H	45	31.10	3.90
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	114.9 PK			3.37 V	233	81.50	33.40
2	*2437.00	105.1 AV			3.37 V	233	71.70	33.40
3	4874.00	48.0 PK	74.0	-26.0	3.49 V	98	44.10	3.90
4	4874.00	35.2 AV	54.0	-18.8	3.49 V	98	31.30	3.90

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) 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	100.0 PK			1.12 H	298	66.50	33.50
2	*2462.00	89.9 AV			1.12 H	298	56.40	33.50
3	2483.50	61.4 PK	74.0	-12.6	1.18 H	310	27.90	33.50
4	2483.50	47.1 AV	54.0	-6.9	1.18 H	310	13.60	33.50
5	4924.00	47.7 PK	74.0	-26.3	1.88 H	59	43.50	4.20
6	4924.00	34.6 AV	54.0	-19.4	1.88 H	59	30.40	4.20
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	111.1 PK			3.21 V	226	77.60	33.50
2	*2462.00	101.5 AV			3.21 V	226	68.00	33.50
3	2483.50	72.5 PK	74.0	-1.5	3.25 V	227	39.00	33.50
4	2483.50	52.7 AV	54.0	-1.3	3.25 V	227	19.20	33.50
5	4924.00	48.1 PK	74.0	-25.9	3.33 V	102	43.90	4.20
6	4924.00	35.0 AV	54.0	-19.0	3.33 V	102	30.80	4.20

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.

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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	60.8 PK	74.0	-13.2	1.07 H	302	27.20	33.60
2	2390.00	47.8 AV	54.0	-6.2	1.07 H	302	14.20	33.60
3	*2422.00	93.8 PK			1.03 H	297	60.30	33.50
4	*2422.00	83.4 AV			1.03 H	297	49.90	33.50
5	4844.00	46.8 PK	74.0	-27.2	2.22 H	159	43.00	3.80
6	4844.00	34.2 AV	54.0	-19.8	2.22 H	159	30.40	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	2390.00	67.2 PK	74.0	-6.8	3.25 V	232	33.60	33.60
2	2390.00	52.7 AV	54.0	-1.3	3.25 V	232	19.10	33.60
3	*2422.00	104.4 PK			3.17 V	232	70.90	33.50
4	*2422.00	94.3 AV			3.17 V	232	60.80	33.50
5	4844.00	47.0 PK	74.0	-27.0	2.85 V	310	43.20	3.80
6	4844.00	34.4 AV	54.0	-19.6	2.85 V	310	30.60	3.80

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
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	60.8 PK	74.0	-13.2	1.05 H	288	27.20	33.60
2	2390.00	48.2 AV	54.0	-5.8	1.05 H	288	14.60	33.60
3	*2437.00	96.8 PK			1.02 H	299	63.40	33.40
4	*2437.00	86.8 AV			1.02 H	299	53.40	33.40
5	2483.50	57.9 PK	74.0	-16.1	1.11 H	280	24.40	33.50
6	2483.50	47.1 AV	54.0	-6.9	1.11 H	280	13.60	33.50
7	4874.00	47.8 PK	74.0	-26.2	2.20 H	149	43.90	3.90
8	4874.00	34.8 AV	54.0	-19.2	2.20 H	149	30.90	3.90
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	2390.00	66.7 PK	74.0	-7.3	3.17 V	230	33.10	33.60
2	**2390.00**	**53.0 AV**	**54.0**	**-1.0**	**3.17 V**	**230**	**19.40**	**33.60**
3	*2437.00	107.8 PK			3.19 V	229	74.40	33.40
4	*2437.00	97.6 AV			3.19 V	229	64.20	33.40
5	2483.50	64.1 PK	74.0	-9.9	3.22 V	225	30.60	33.50
6	2483.50	51.5 AV	54.0	-2.5	3.22 V	225	18.00	33.50
7	4874.00	48.2 PK	74.0	-25.8	2.89 V	315	44.30	3.90
8	4874.00	35.0 AV	54.0	-19.0	2.89 V	315	31.10	3.90

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) 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	94.0 PK			1.26 H	296	60.60	33.40
2	*2452.00	84.7 AV			1.26 H	296	51.30	33.40
3	2483.50	57.7 PK	74.0	-16.3	1.31 H	277	24.20	33.50
4	2483.50	46.7 AV	54.0	-7.3	1.31 H	277	13.20	33.50
5	4904.00	47.6 PK	74.0	-26.4	2.15 H	158	43.50	4.10
6	4904.00	34.5 AV	54.0	-19.5	2.15 H	158	30.40	4.10
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	*2452.00	105.3 PK			3.29 V	234	71.90	33.40
2	*2452.00	95.6 AV			3.29 V	234	62.20	33.40
3	2483.50	66.1 PK	74.0	-7.9	3.27 V	227	32.60	33.50
4	2483.50	52.5 AV	54.0	-1.5	3.27 V	227	19.00	33.50
5	4904.00	48.1 PK	74.0	-25.9	2.96 V	301	44.00	4.10
6	4904.00	34.9 AV	54.0	-19.1	2.96 V	301	30.80	4.10

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.

Below 1GHz worst-case data: 802.11n (HT20)

CHANNEL	TX Channel 6	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	30.00	35.6 QP	40.0	-4.4	1.99 H	349	50.70	-15.10
2	77.53	35.8 QP	40.0	-4.2	1.99 H	57	52.60	-16.80
3	146.40	27.2 QP	43.5	-16.3	1.00 H	280	40.70	-13.50
4	242.43	26.3 QP	46.0	-19.7	1.00 H	147	40.80	-14.50
5	480.08	30.7 QP	46.0	-15.3	1.99 H	324	40.10	-9.40
6	836.07	40.6 QP	46.0	-5.4	1.00 H	207	44.00	-3.40
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	36.09	29.4 QP	40.0	-10.6	1.00 V	217	44.10	-14.70
2	92.72	34.6 QP	43.5	-8.9	1.99 V	120	53.40	-18.80
3	115.36	39.5 QP	43.5	-4.0	1.00 V	106	55.60	-16.10
4	244.37	22.1 QP	46.0	-23.9	1.99 V	182	36.50	-14.40
5	480.08	32.5 QP	46.0	-13.5	1.00 V	203	41.90	-9.40
6	836.07	33.8 QP	46.0	-12.2	1.99 V	295	37.20	-3.40

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	ESCS 30	100288	Aug. 17, 2017	Aug. 16, 2018
RF signal cable (with 10dB PAD) Woken	5D-FB	Cable-cond2-01	Sep. 08, 2017	Sep. 07, 2018
LISN ROHDE & SCHWARZ (EUT)	ESH2-Z5	100100	Jan. 17, 2017	Jan. 16, 2018
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100312	Aug. 02, 2017	Aug. 01, 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 2.
3. The VCCI Site Registration No. is C-2047.

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.

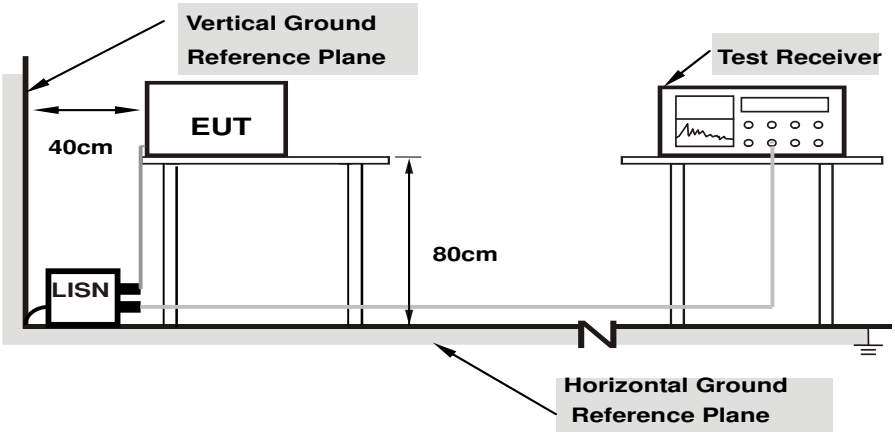
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

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

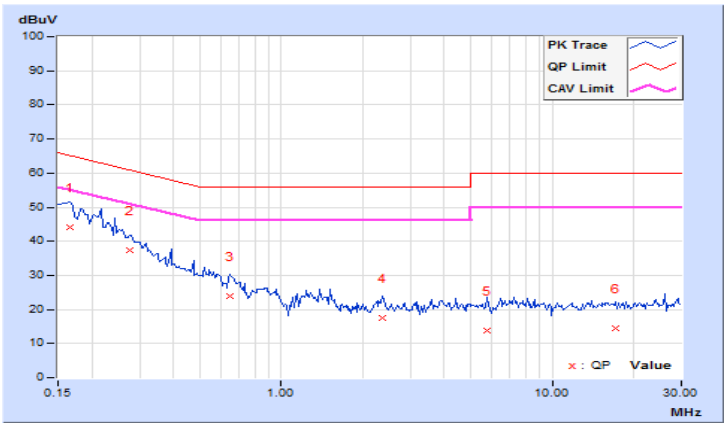
Worst-case data: 802.11n (HT20)

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

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16562	10.47	33.67	14.46	44.14	24.93	65.18	55.18	-21.04	-30.25
2	0.27500	10.38	26.93	11.77	37.31	22.15	60.97	50.97	-23.66	-28.82
3	0.65000	10.42	13.49	3.28	23.91	13.70	56.00	46.00	-32.09	-32.30
4	2.37500	10.44	7.02	1.82	17.46	12.26	56.00	46.00	-38.54	-33.74
5	5.76563	10.56	3.41	2.91	13.97	13.47	60.00	50.00	-46.03	-36.53
6	17.05469	10.78	3.65	3.00	14.43	13.78	60.00	50.00	-45.57	-36.22

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.

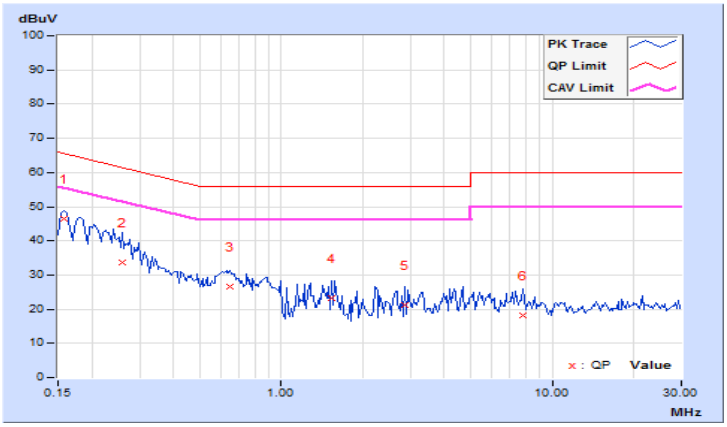


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	**0.15781**	**10.36**	**36.16**	**22.65**	**46.52**	**33.01**	**65.58**	**55.58**	**-19.06**	**-22.57**
2	0.25938	10.27	23.27	16.66	33.54	26.93	61.45	51.45	-27.91	-24.52
3	0.65000	10.38	16.37	5.15	26.75	15.53	56.00	46.00	-29.25	-30.47
4	1.53125	10.45	12.94	8.12	23.39	18.57	56.00	46.00	-32.61	-27.43
5	2.87109	10.58	10.67	2.19	21.25	12.77	56.00	46.00	-34.75	-33.23
6	7.78125	10.62	7.48	3.28	18.10	13.90	60.00	50.00	-41.90	-36.10

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.

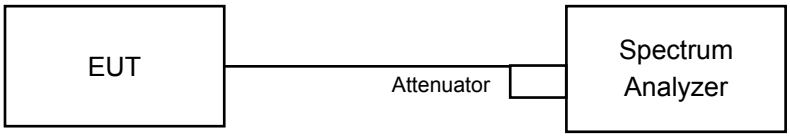


4.3 6dB Bandwidth Measurement

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	9.59	0.5	Pass
6	2437	9.60	0.5	Pass
11	2462	9.15	0.5	Pass

802.11g

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	16.32	16.09	0.5	Pass
6	2437	15.76	16.03	0.5	Pass
11	2462	16.09	16.08	0.5	Pass

802.11n (HT20)

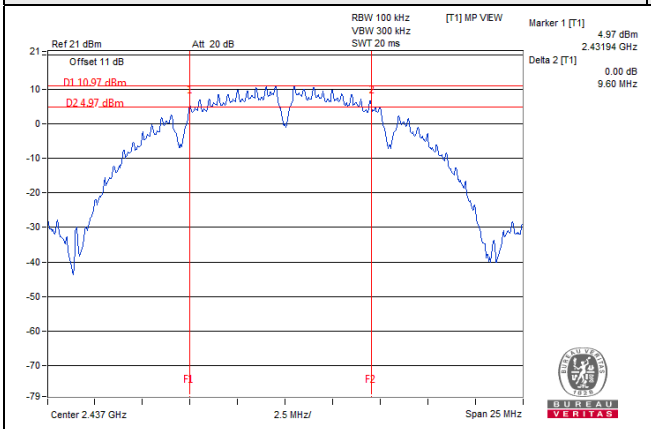
Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	16.57	16.72	0.5	Pass
6	2437	16.32	16.34	0.5	Pass
11	2462	16.35	16.56	0.5	Pass

802.11n (HT40)

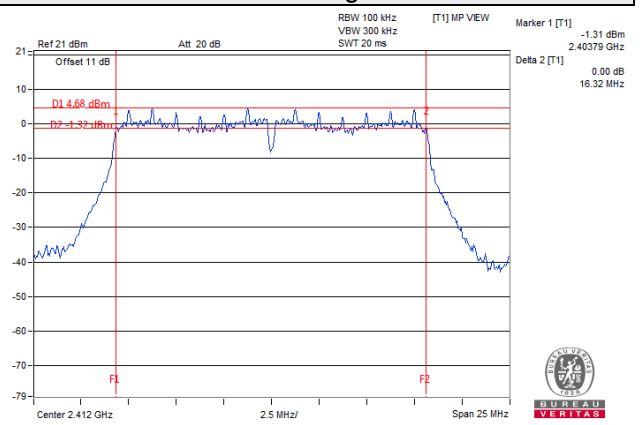
Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
3	2422	36.06	35.72	0.5	Pass
6	2437	35.73	35.68	0.5	Pass
9	2452	35.75	35.69	0.5	Pass

Spectrum Plot of Worst Value

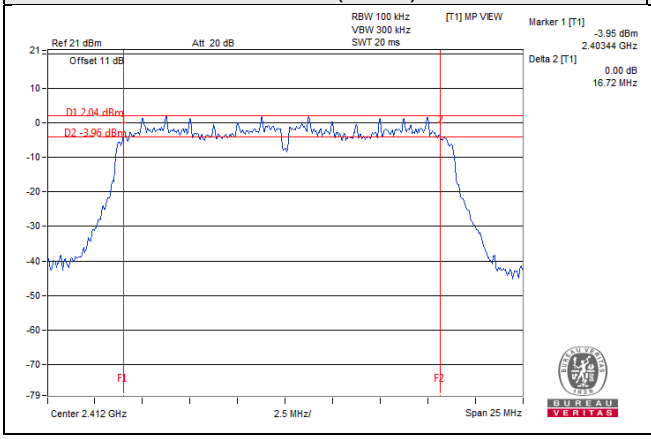
802.11b



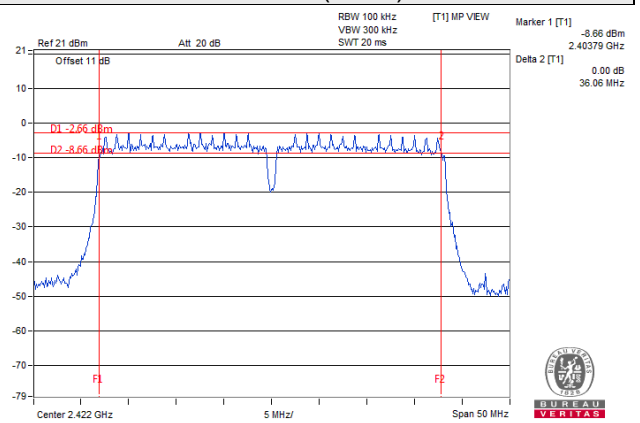
802.11g



802.11n (HT20)



802.11n (HT40)



4.4 Conducted Output Power Measurement

4.4.1 Limits of Conducted Output Power Measurement

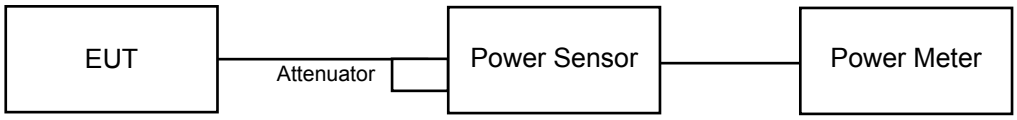
For systems using digital modulation in the 2400–2483.5 MHz bands: 1 Watt (30dBm)

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

CDD Mode

802.11b

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	97.051	19.87	30.00	Pass
6	2437	133.968	21.27	30.00	Pass
11	2462	105.925	20.25	30.00	Pass

802.11g

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	14.57	14.30	55.557	17.45	30.00	Pass
6	2437	20.31	20.38	216.543	23.36	30.00	Pass
11	2462	15.04	15.00	63.538	18.03	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	14.45	14.54	56.306	17.51	30.00	Pass
6	2437	20.10	20.91	**225.639**	23.53	30.00	Pass
11	2462	15.08	15.70	69.365	18.41	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	10.61	11.13	24.480	13.89	30.00	Pass
6	2437	15.12	15.55	68.401	18.35	30.00	Pass
9	2452	12.53	12.57	35.978	15.56	30.00	Pass

Beamforming Mode

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	14.45	14.54	56.306	17.51	30.00	Pass
6	2437	20.10	20.91	**225.639**	23.53	30.00	Pass
11	2462	15.08	15.70	69.365	18.41	30.00	Pass

Note: Directional gain = 2.59dBi+10log(2)=5.60dBi < 6dBi, so the limit no need to be reduced.

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	10.61	11.13	24.480	13.89	30.00	Pass
6	2437	15.12	15.55	68.401	18.35	30.00	Pass
9	2452	12.53	12.57	35.978	15.56	30.00	Pass

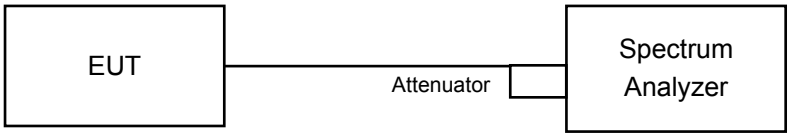
Note: Directional gain = 2.59dBi+10log(2)=5.60dBi < 6dBi, so the limit no need to be reduced.

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 w/o Duty Factor (dBm/10kHz)	Duty Factor (dB)	Total PSD With Duty Factor (dBm/10kHz)	Limit (dBm/3kHz)	Pass / Fail
1	2412	-11.93	0.09	-11.84	8.00	Pass
6	2437	-8.01	0.09	-7.92	8.00	Pass
11	2462	-11.78	0.09	-11.69	8.00	Pass

Note: Directional gain = 2.59dBi+10log(2)=5.60dBi < 6dBi, so the limit no need to reduced.

802.11g

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	-15.73	3.01	0.54	-12.18	8.00	Pass
	6	2437	-7.63	3.01	0.54	-4.08	8.00	Pass
	11	2462	-13.66	3.01	0.54	-10.11	8.00	Pass
1	1	2412	-16.96	3.01	0.54	-13.41	8.00	Pass
	6	2437	-10.44	3.01	0.54	-6.89	8.00	Pass
	11	2462	-15.81	3.01	0.54	-12.26	8.00	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 = 2.59dBi+10log(2)=5.60dBi < 6dBi, so the limit no need to reduced.
3. 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	-15.15	3.01	0.33	-11.81	8.00	Pass
	6	2437	-8.53	3.01	0.33	-5.19	8.00	Pass
	11	2462	-18.16	3.01	0.33	-14.82	8.00	Pass
1	1	2412	-17.12	3.01	0.33	-13.78	8.00	Pass
	6	2437	-10.49	3.01	0.33	-7.15	8.00	Pass
	11	2462	-16.62	3.01	0.33	-13.28	8.00	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 = 2.59dBi+10log(2)=5.60dBi < 6dBi, so the limit no need to reduced.
3. Refer to section 3.3 for duty cycle spectrum plot.

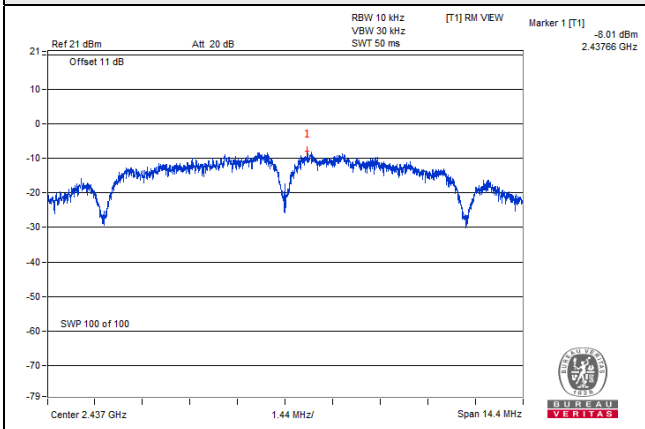
802.11n (HT40)

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	-22.17	3.01	0.63	-18.53	8.00	Pass
	6	2437	-17.49	3.01	0.63	-13.85	8.00	Pass
	9	2452	-20.11	3.01	0.63	-16.47	8.00	Pass
1	3	2422	-24.58	3.01	0.63	-20.94	8.00	Pass
	6	2437	-19.15	3.01	0.63	-15.51	8.00	Pass
	9	2452	-21.74	3.01	0.63	-18.10	8.00	Pass

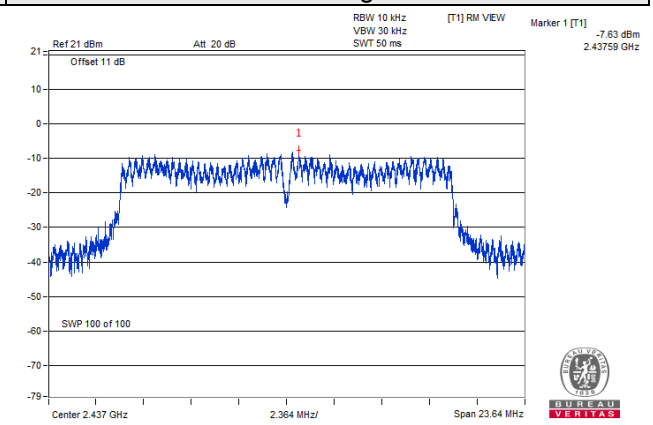
Note:
1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = 2.59dBi+10log(2)=5.60dBi < 6dBi, so the limit no need to reduced.
3. Refer to section 3.3 for duty cycle spectrum plot.

Spectrum Plot of Worst Value

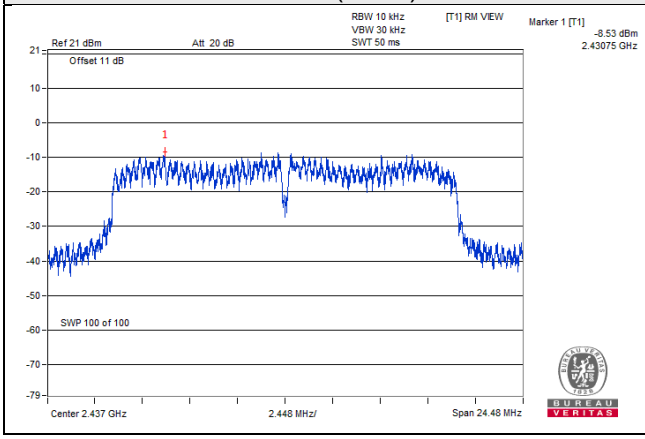
802.11b



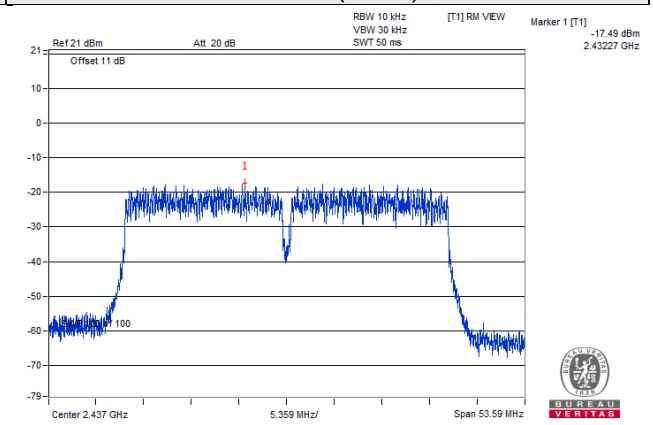
802.11g



802.11n (HT20)



802.11n (HT40)

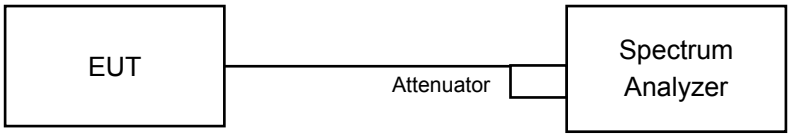


4.6 Conducted Out of Band Emission Measurement

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

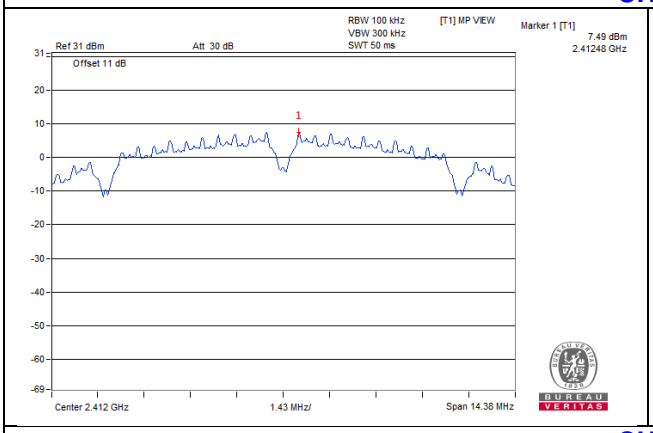
Same as item 4.3.6

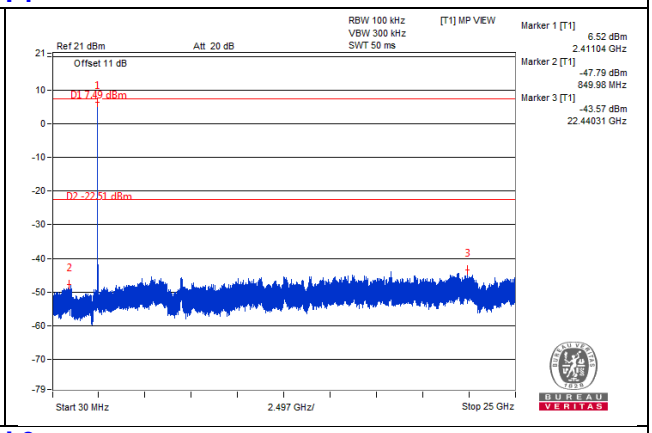
4.6.7 Test Results

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.

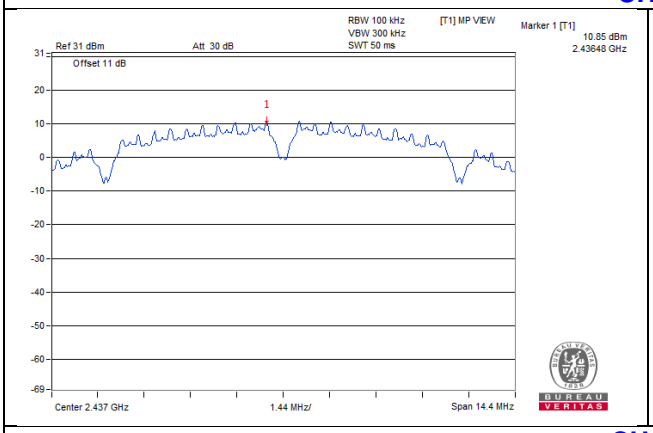
802.11b

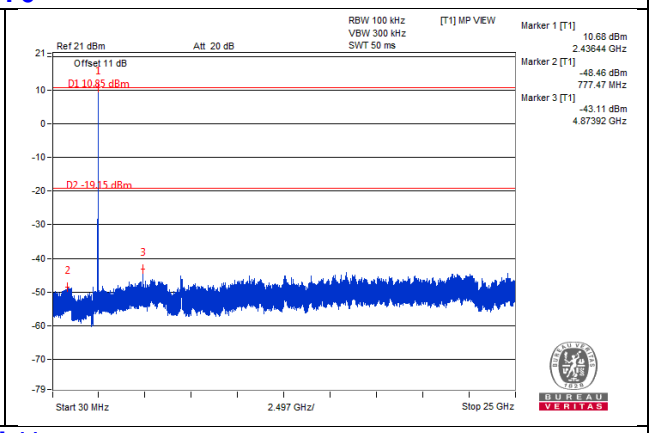
CH 1



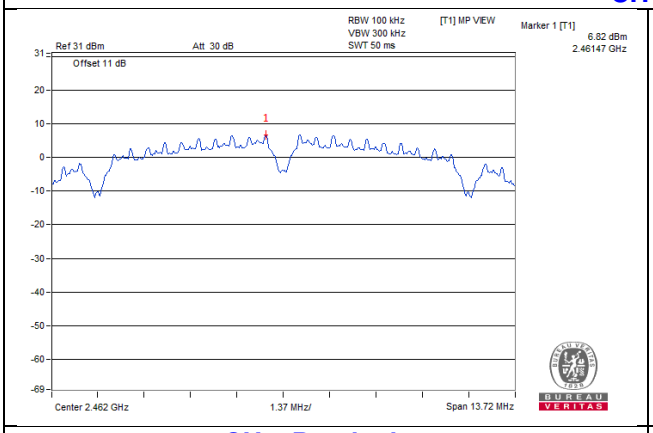


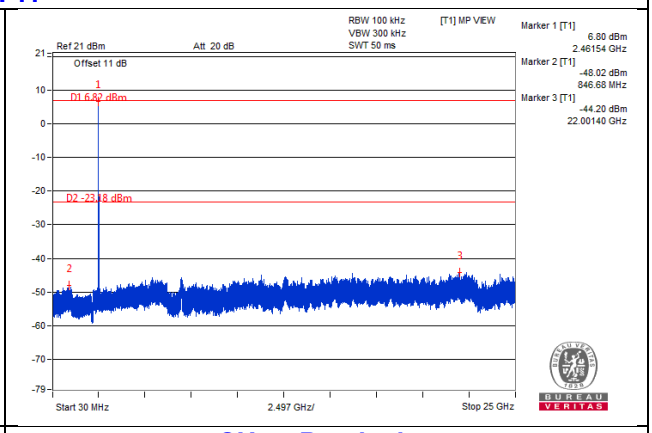
CH 6



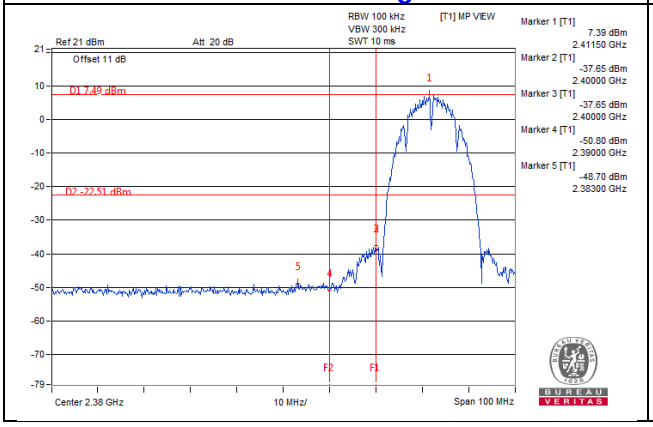


CH 11

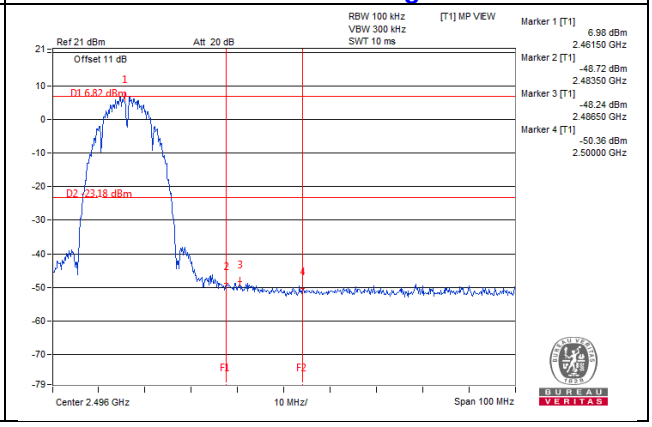




CH 1 Band edge

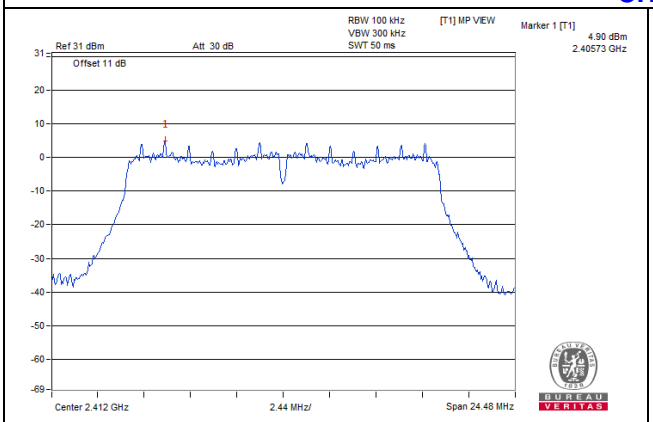


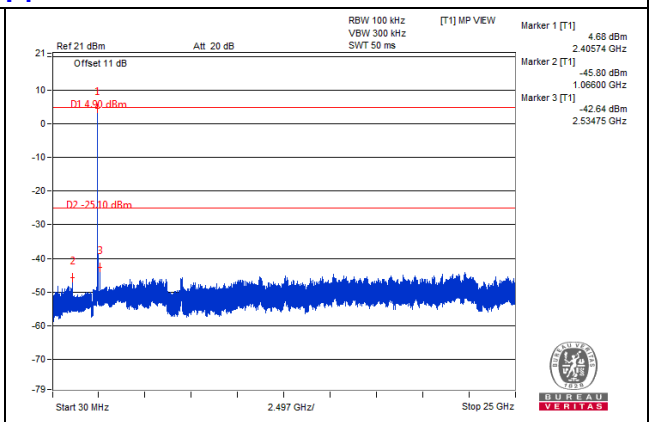
CH 11 Band edge



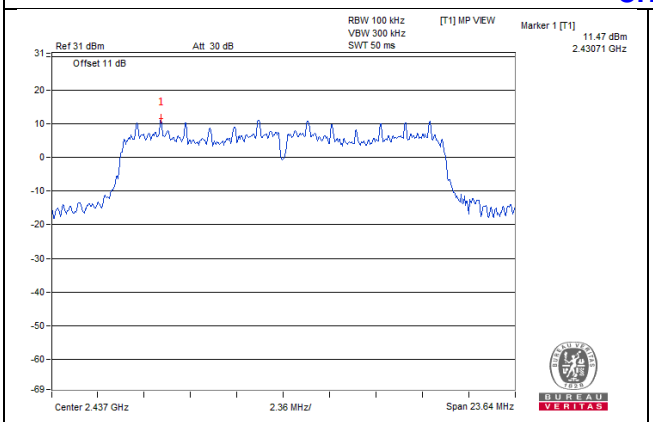
802.11g_Chain 0

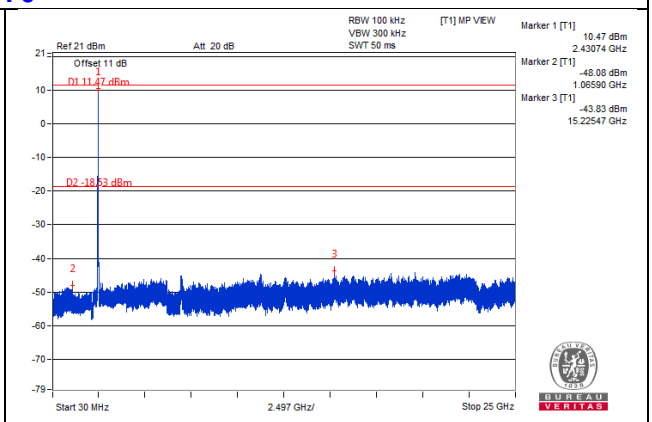
CH 1



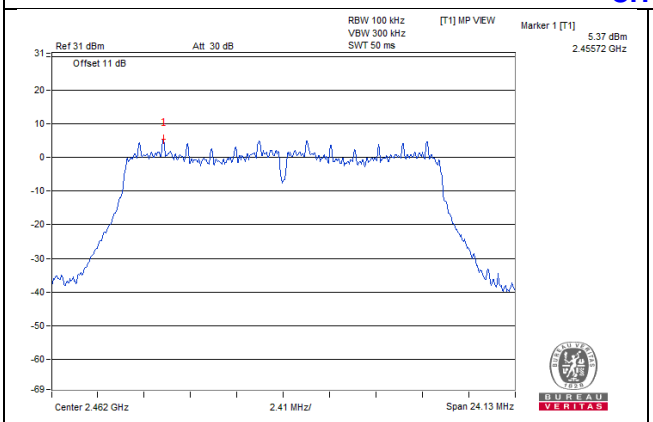


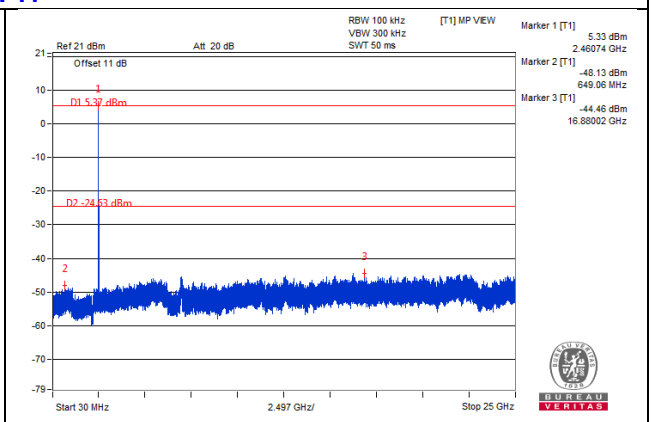
CH 6



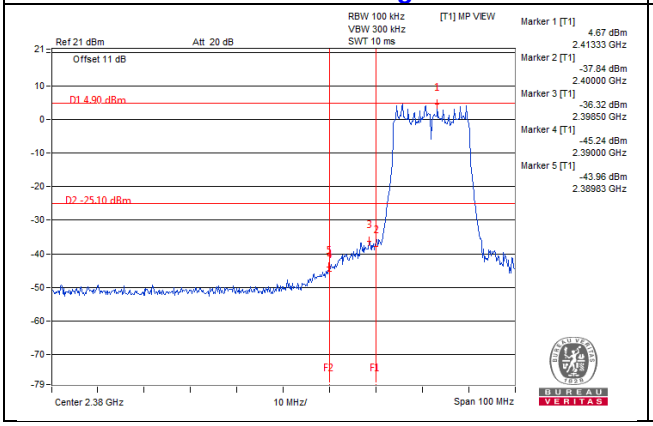


CH 11





CH 1 Band edge



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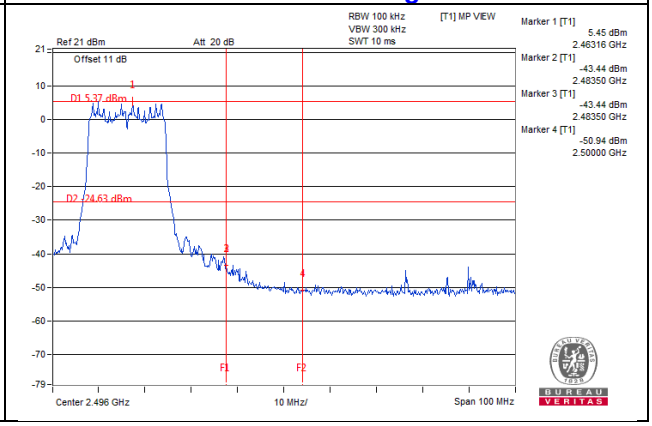
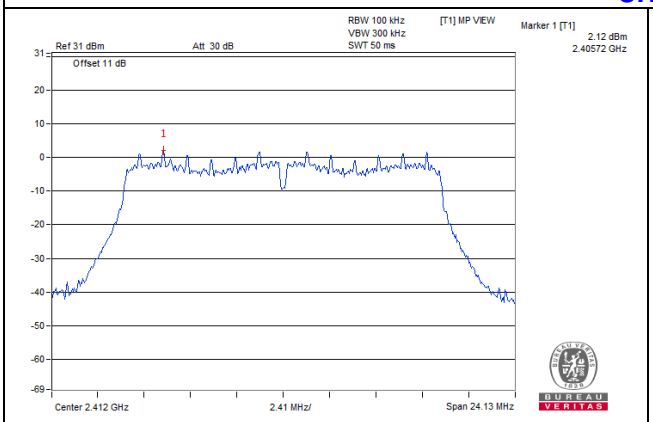
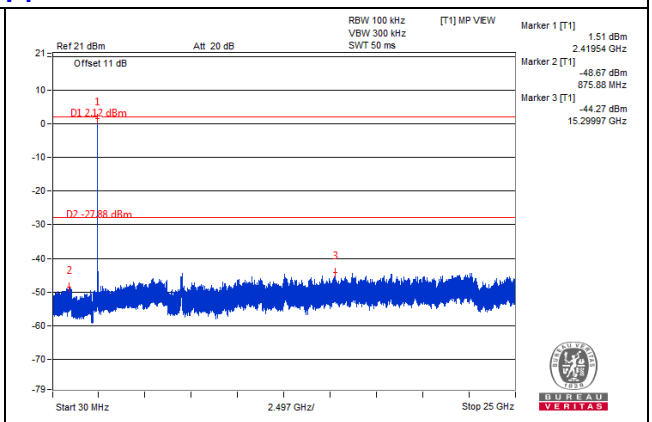


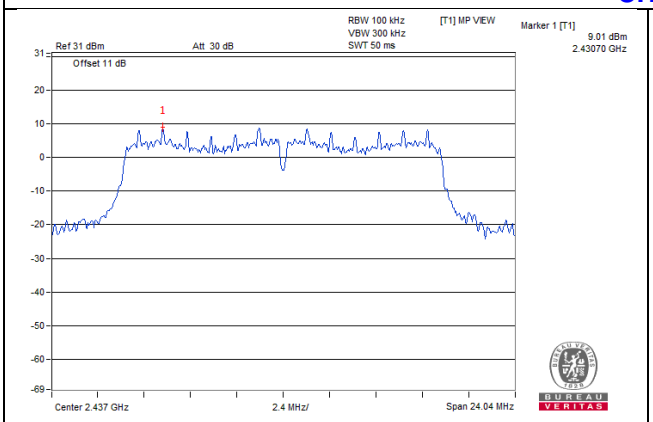
802.11g_Chain 1

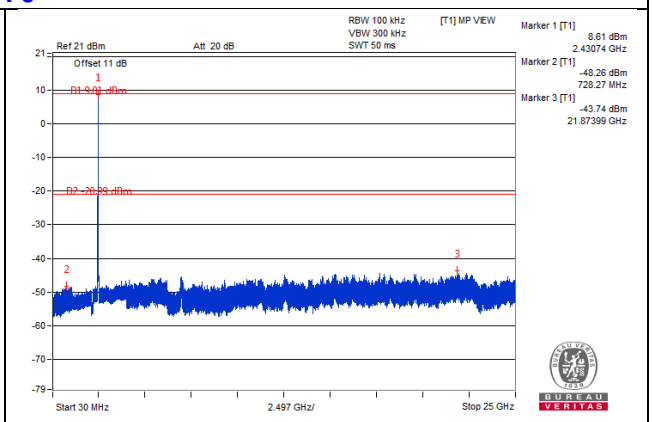
CH 1



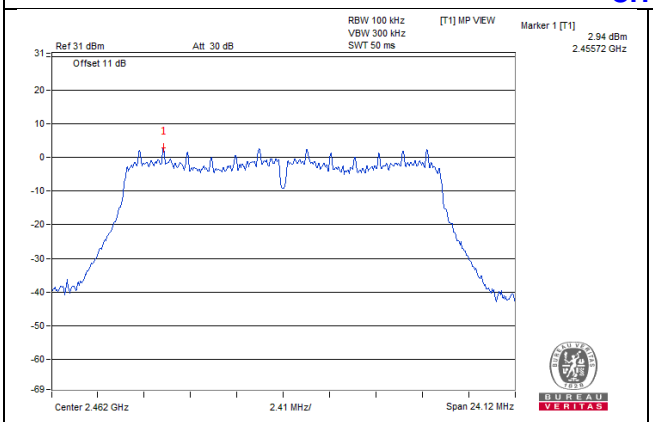


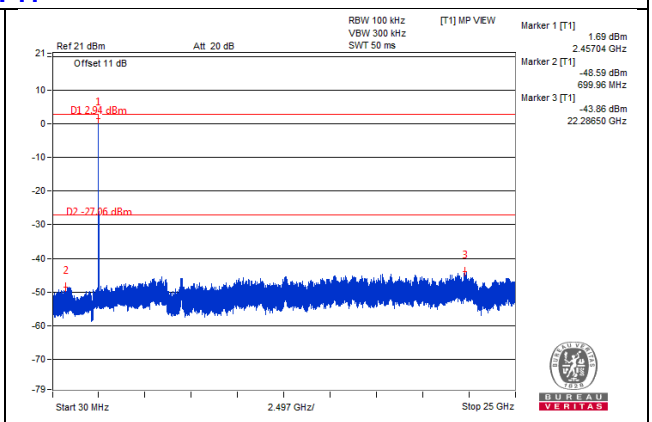
CH 6



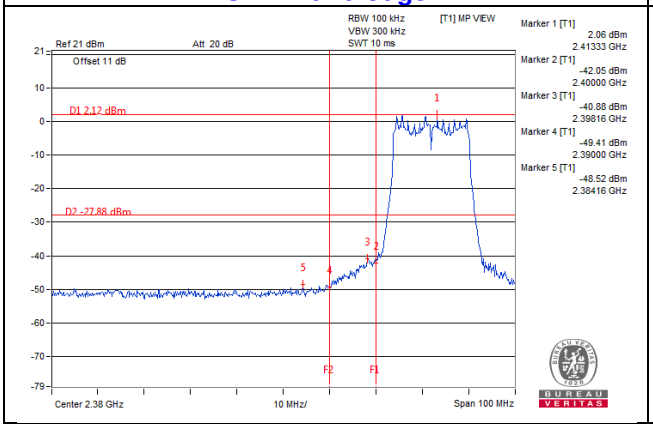


CH 11

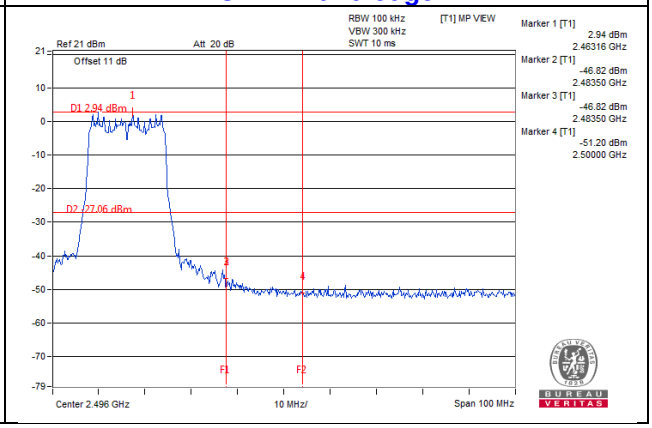




CH 1 Band edge

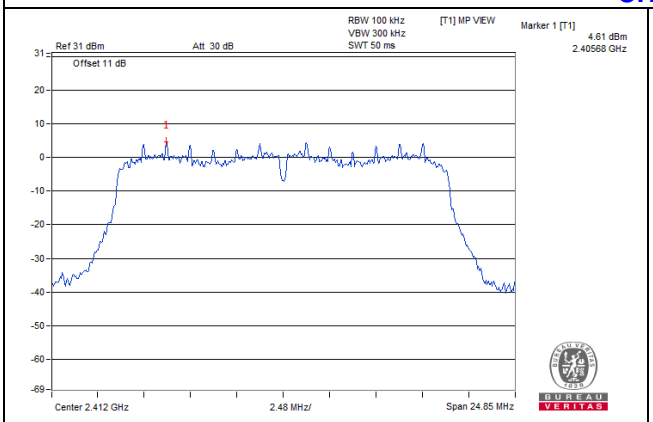


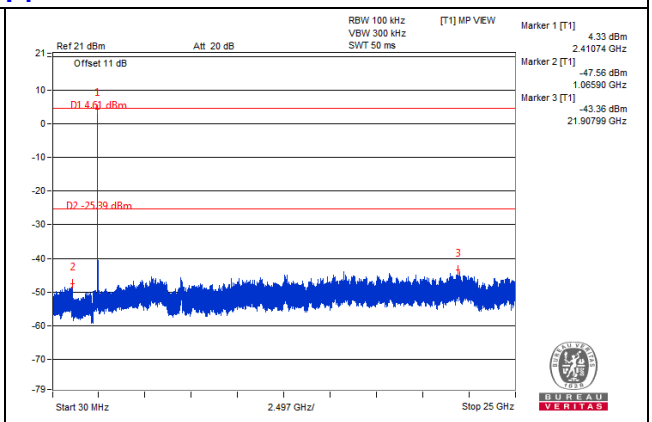
CH 11 Band edge



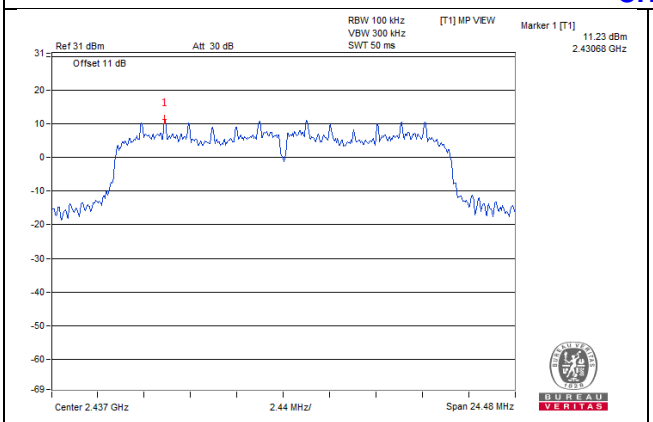
802.11n (HT20)_Chain 0

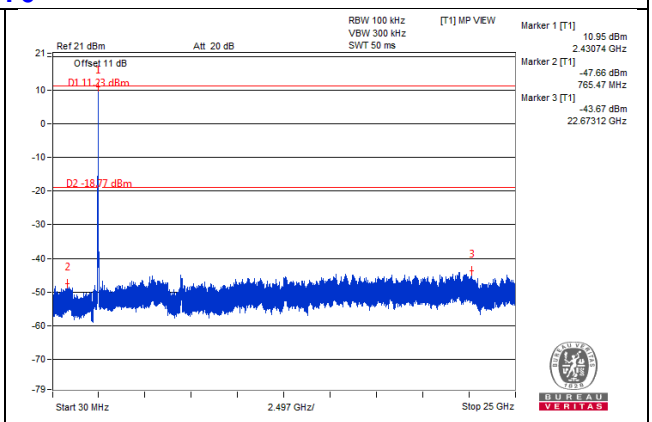
CH 1



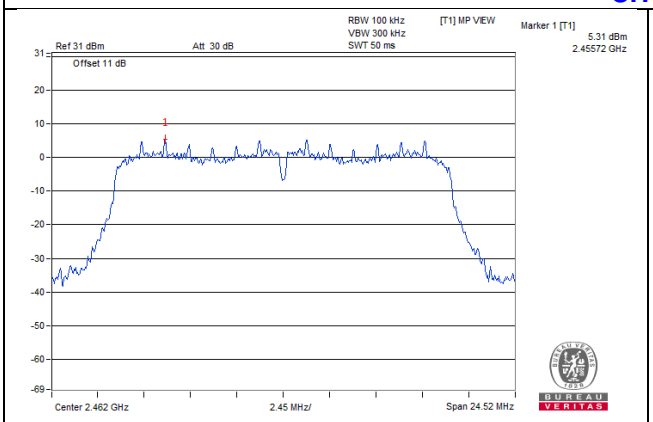


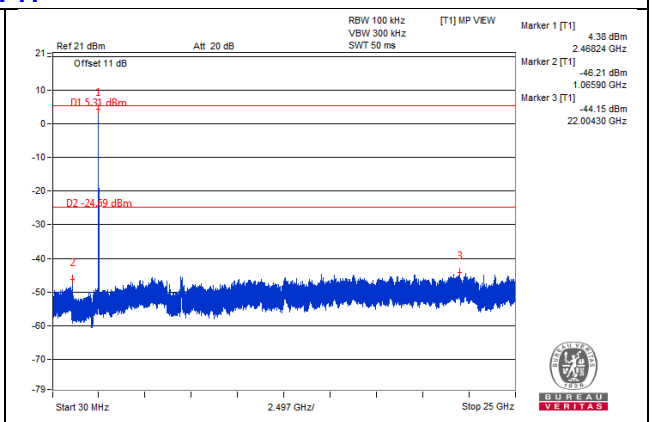
CH 6



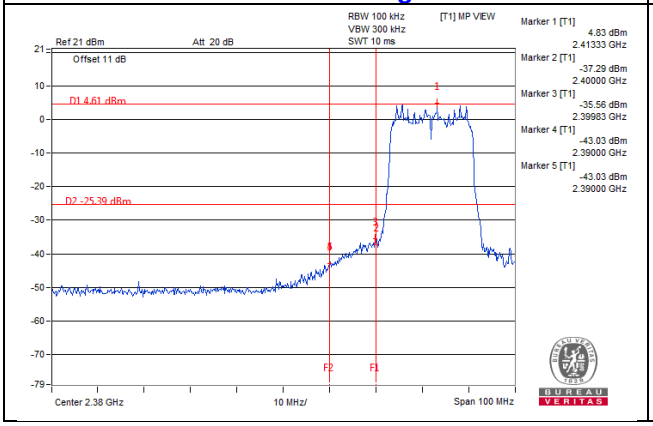


CH 11

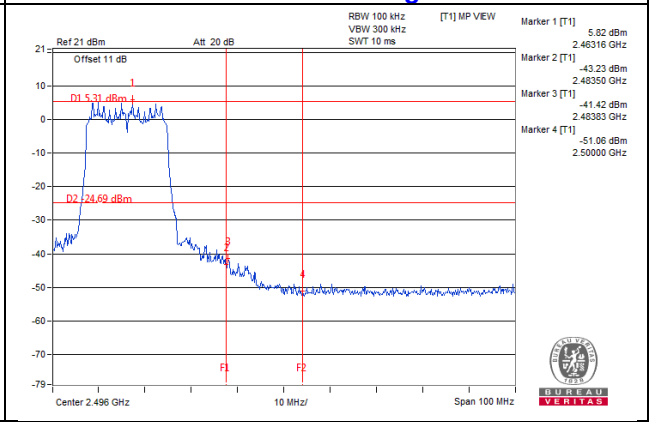




CH 1 Band edge

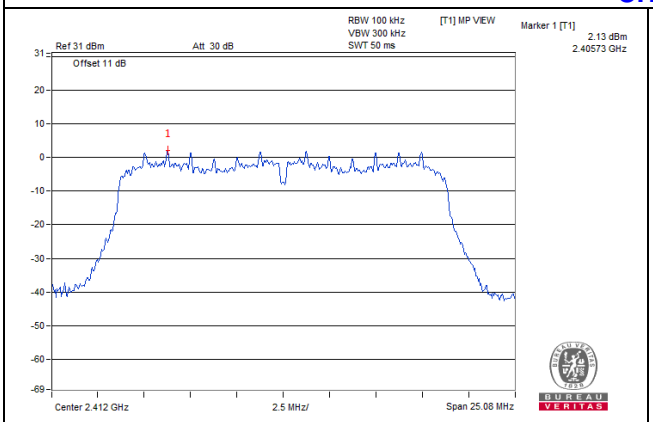


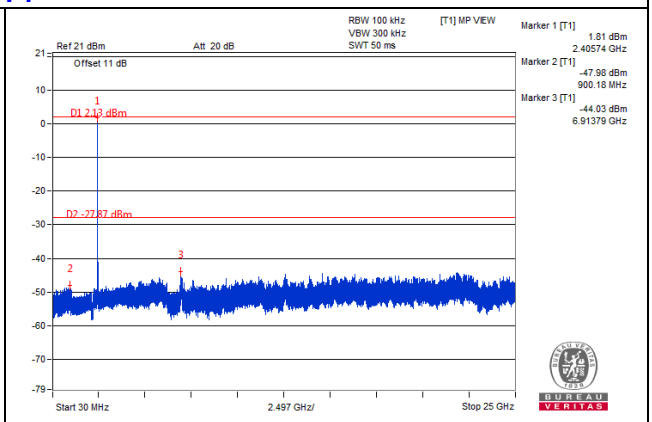
CH 11 Band edge



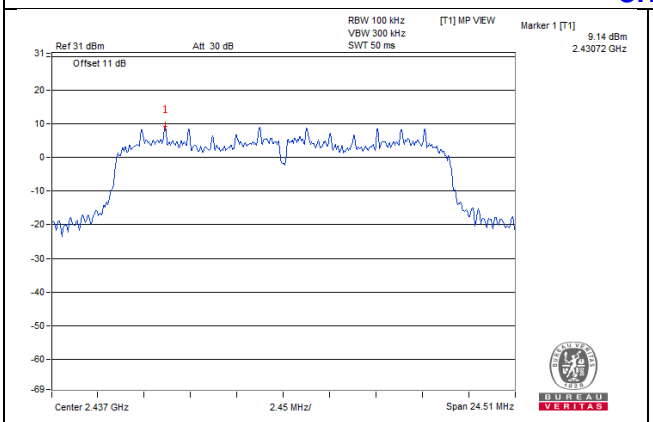
802.11n (HT20)_Chain 1

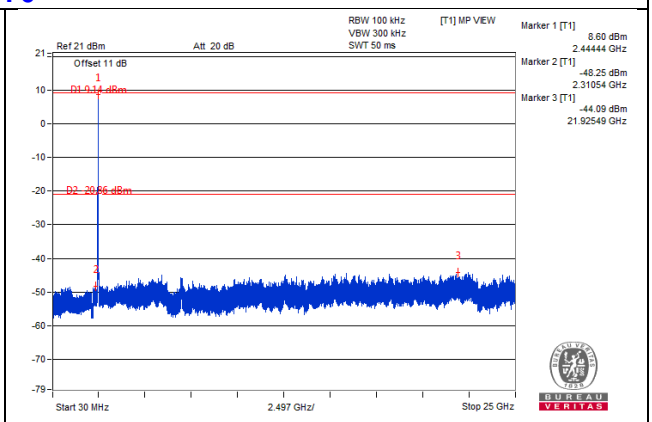
CH 1



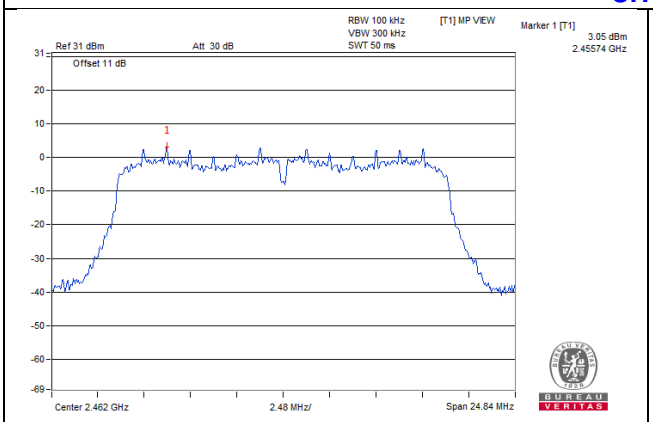


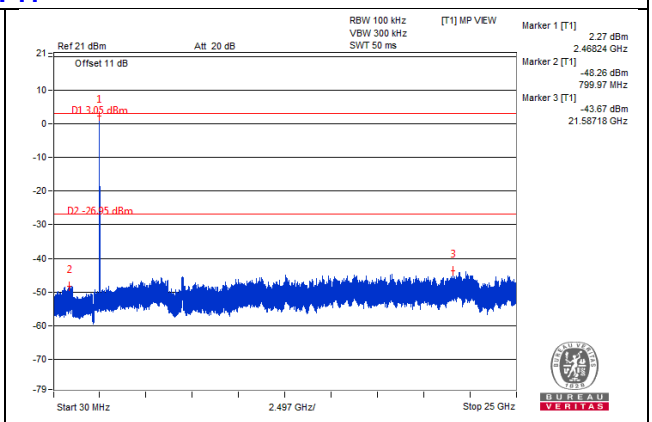
CH 6



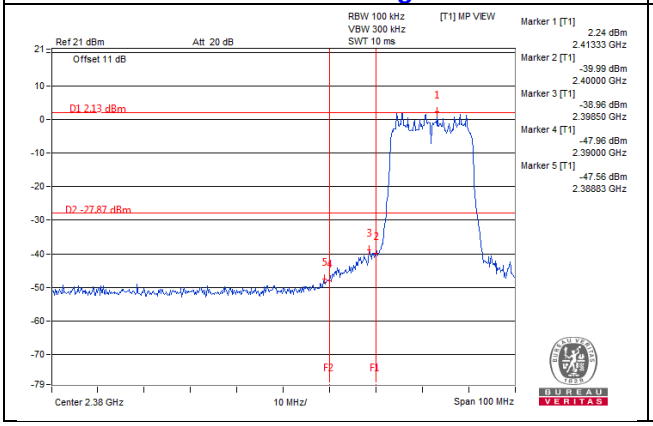


CH 11

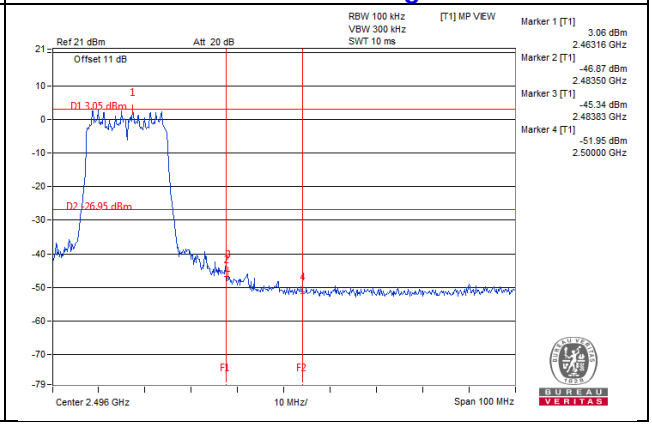




CH 1 Band edge

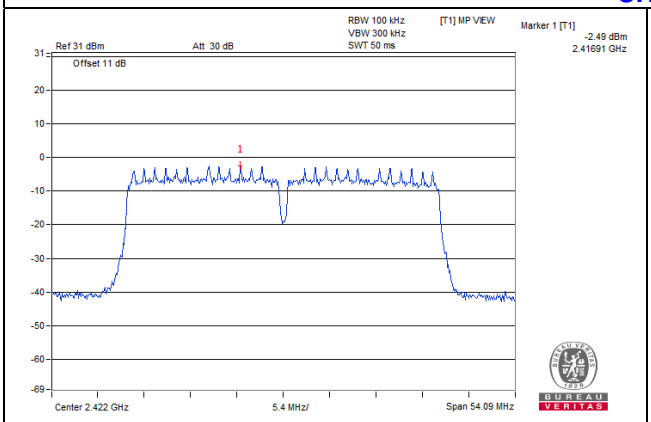


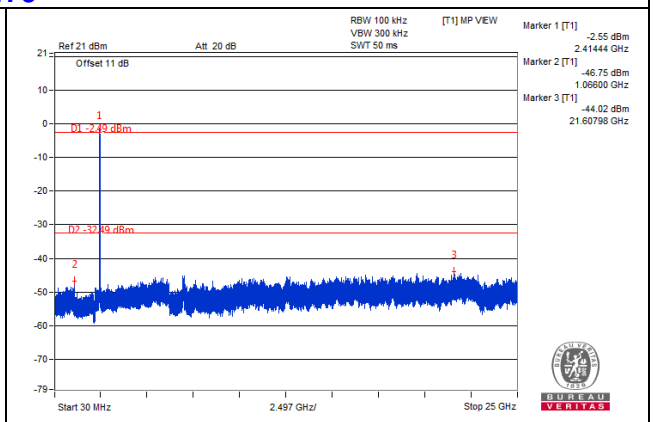
CH 11 Band edge



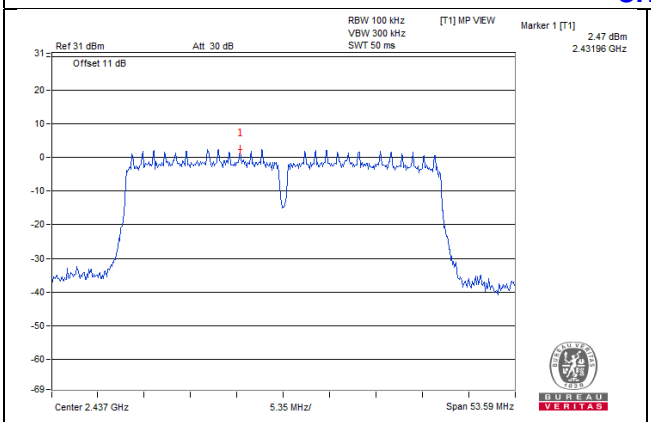
802.11n (HT40)_Chain 0

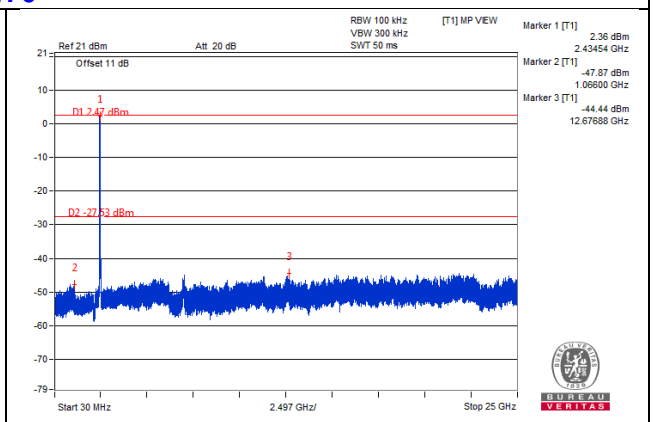
CH 3



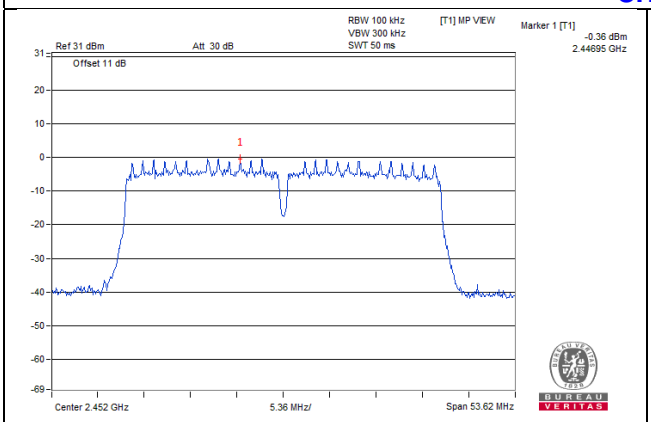


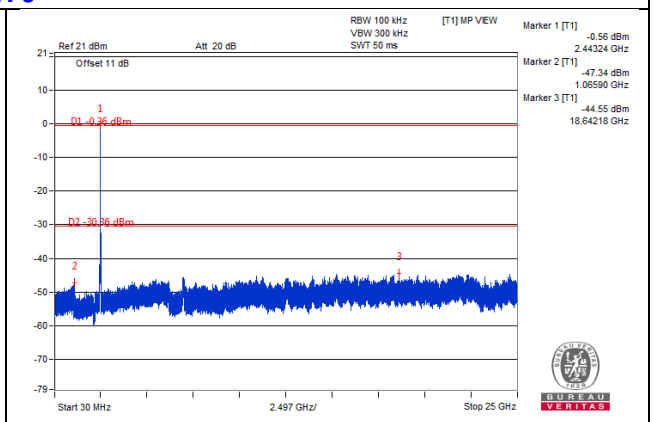
CH 6



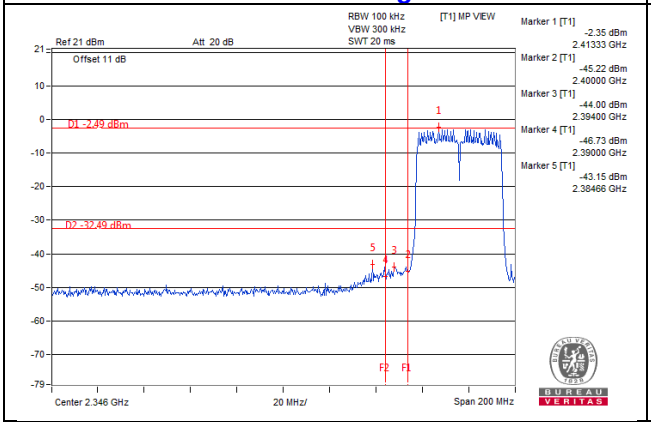


CH 9

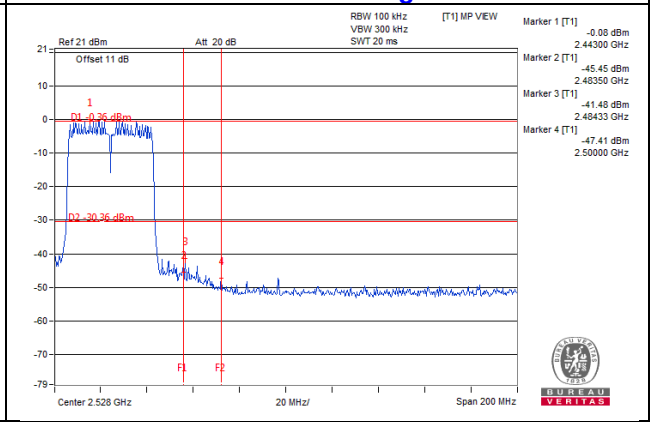




CH 3 Band edge

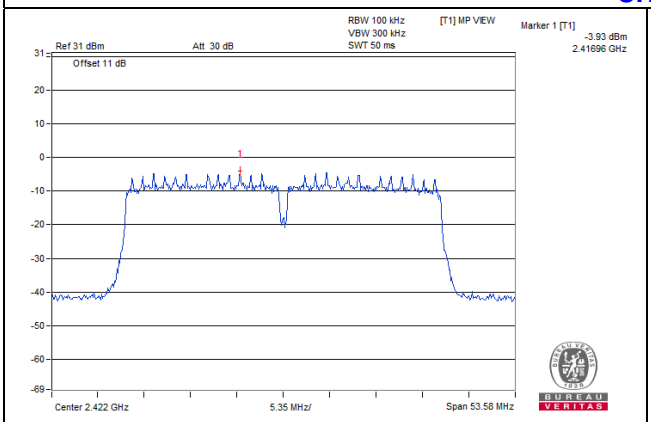


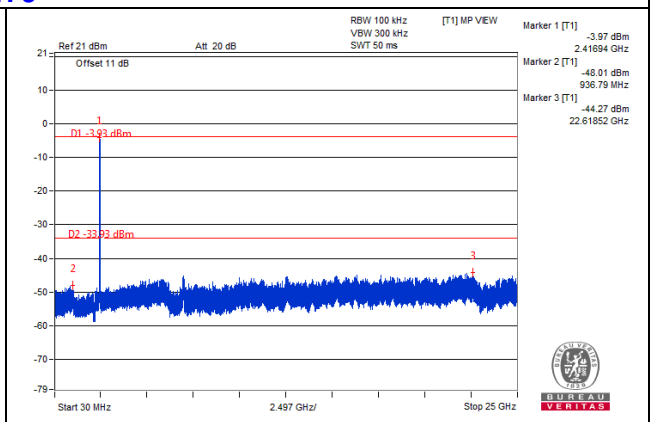
CH 9 Band edge



802.11n (HT40)_Chain 1

CH 3





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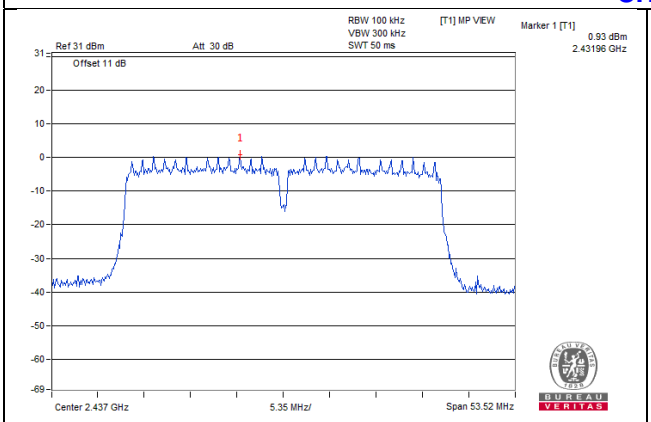
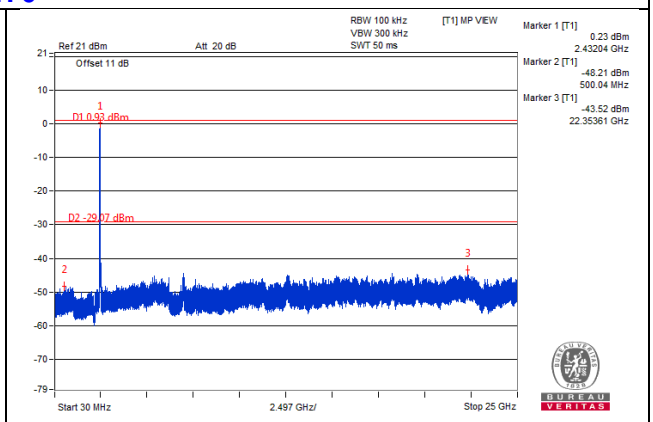
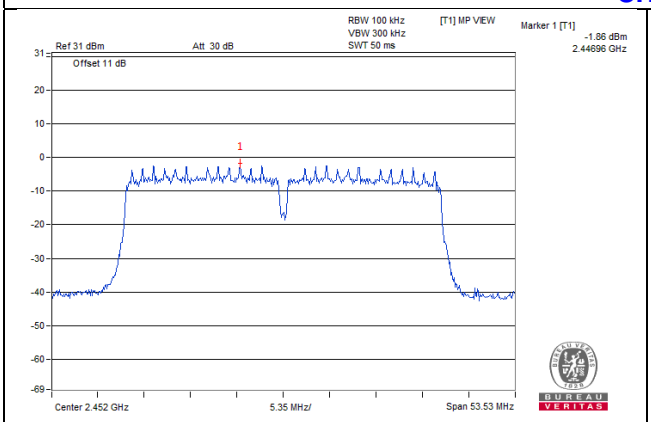
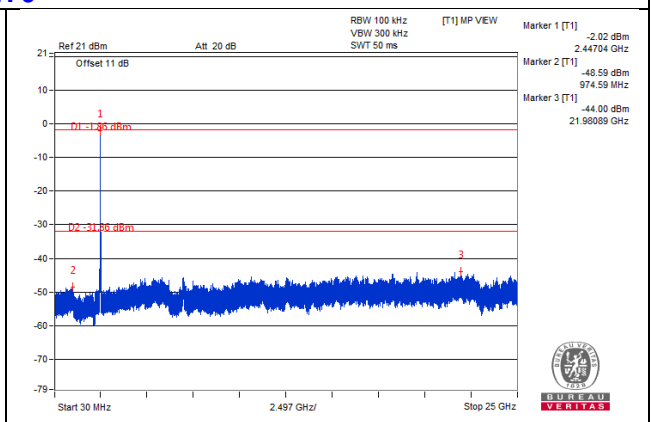


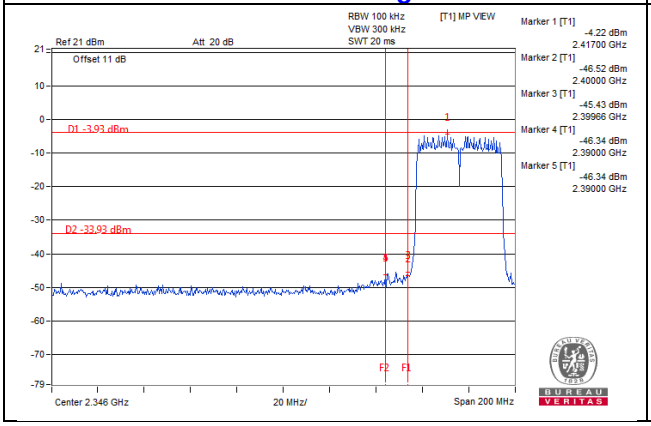


CH 9

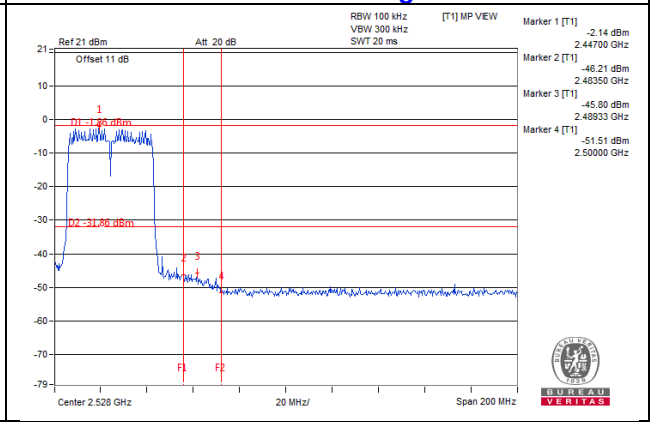




CH 3 Band edge



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:

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

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

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

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

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

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