

FCC Test Report (WLAN)

Report No.: RFBHQC-WTW-P20110170

FCC ID: B3QT99H209

Test Model: T99H209

Received Date: Nov. 12, 2020

Test Date: Nov. 26 to Dec. 14, 2020

Issued Date: Jan. 11, 2021

Applicant: BROTHER INDUSTRIES, LTD.

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**FCC Registration /
Designation Number:** 723255 / TW2022



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Table of Contents

Release Control Record	4
1 Certificate of Conformity	5
2 Summary of Test Results	6
2.1 Measurement Uncertainty	6
2.2 Modification Record	6
3 General Information	7
3.1 General Description of EUT (WLAN)	7
3.2 Description of Test Modes	9
3.2.1 Test Mode Applicability and Tested Channel Detail	10
3.3 Duty Cycle of Test Signal	12
3.4 Description of Support Units	13
3.4.1 Configuration of System under Test	14
3.5 General Description of Applied Standards and references	15
4 Test Types and Results	16
4.1 Radiated Emission and Bandedge Measurement	16
4.1.1 Limits of Radiated Emission and Bandedge Measurement	16
4.1.2 Test Instruments	17
4.1.3 Test Procedures	19
4.1.4 Deviation from Test Standard	20
4.1.5 Test Setup	20
4.1.6 EUT Operating Conditions	21
4.1.7 Test Results	22
4.2 Conducted Emission Measurement	36
4.2.1 Limits of Conducted Emission Measurement	36
4.2.2 Test Instruments	36
4.2.3 Test Procedures	37
4.2.4 Deviation from Test Standard	37
4.2.5 Test Setup	37
4.2.6 EUT Operating Conditions	37
4.2.7 Test Results	38
4.3 6dB Bandwidth Measurement	40
4.3.1 Limits of 6dB Bandwidth Measurement	40
4.3.2 Test Setup	40
4.3.3 Test Instruments	40
4.3.4 Test Procedure	40
4.3.5 Deviation from Test Standard	40
4.3.6 EUT Operating Conditions	40
4.3.7 Test Result	41
4.4 Conducted Output Power Measurement	43
4.4.1 Limits of Conducted Output Power Measurement	43
4.4.2 Test Setup	43
4.4.3 Test Instruments	43
4.4.4 Test Procedures	43
4.4.5 Deviation from Test Standard	43
4.4.6 EUT Operating Conditions	43
4.4.7 Test Results	44
4.5 Power Spectral Density Measurement	46
4.5.1 Limits of Power Spectral Density Measurement	46
4.5.2 Test Setup	46
4.5.3 Test Instruments	46
4.5.4 Test Procedure	46
4.5.5 Deviation from Test Standard	46
4.5.6 EUT Operating Condition	46

4.5.7 Test Results	47
4.6 Conducted Out of Band Emission Measurement	49
4.6.1 Limits of Conducted Out of Band Emission Measurement.....	49
4.6.2 Test Setup.....	49
4.6.3 Test Instruments	49
4.6.4 Test Procedure	49
4.6.5 Deviation from Test Standard	49
4.6.6 EUT Operating Condition	49
4.6.7 Test Results	49
5 Pictures of Test Arrangements.....	54
Annex A - Band-Edge Measurement.....	55
Appendix – Information of the Testing Laboratories	59

Release Control Record

Issue No.	Description	Date Issued
RFBHQC-WTW-P20110170	Original release.	Jan. 11, 2021

1 Certificate of Conformity

Product: IEEE802.11a/b/g/n/ac (1x1)+BT 5.0 Combo Module

Brand: Brother

Test Model: T99H209

Sample Status: Engineering sample

Applicant: BROTHER INDUSTRIES, LTD.

Test Date: Nov. 26 to Dec. 14, 2020

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 : Vivian Huang , **Date:** Jan. 11, 2021
Vivian Huang / Specialist

Approved by : Clark Lin , **Date:** Jan. 11, 2021
Clark Lin / Technical 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 -18.72dB at 0.16562MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -0.1dB at 2483.50MHz, 2484.53MHz.
15.247(d)	Antenna Port Emission	PASS	Meet the requirement of limit.
15.247(a)(2)	6dB bandwidth	PASS	Meet the requirement of limit.
15.247(b)	Conducted power	PASS	Meet the requirement of limit.
15.247(e)	Power Spectral Density	PASS	Meet the requirement of limit.
15.203	Antenna Requirement	PASS	No antenna connector is used.

Note:

- For 2.4GHz band compliance with rule 15.247(d) of the band-edge items, the test plots were recorded in Annex A. Test Procedures refer to report 4.1.3.
- Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

2.1 Measurement Uncertainty

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

Measurement	Frequency	Expanded Uncertainty (k=2) (\pm)
Conducted Emissions at mains ports	150kHz ~ 30MHz	1.9 dB
Conducted emissions	-	2.5 dB
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	3.1 dB
	30MHz ~ 1GHz	5.4 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	5.0 dB
	18GHz ~ 40GHz	5.3 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT (WLAN)

Product	IEEE802.11a/b/g/n/ac (1x1)+BT 5.0 Combo Module
Brand	Brother
Test Model	T99H209
Status of EUT	Engineering sample
Power Supply Rating	3.3Vdc from host equipment
Modulation Type	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in 11ac mode
Modulation Technology	DSSS, OFDM
Transfer Rate	802.11b: up to 11 Mbps 802.11a/g: up to 54 Mbps 802.11n: up to 150 Mbps 802.11ac: up to 433.3 Mbps
Operating Frequency	2.4GHz: 2.412 ~ 2.462GHz 5GHz: 5.18 ~ 5.32GHz, 5.50 ~ 5.72GHz, 5.745 ~ 5.825GHz
Number of Channel	2.4GHz: 802.11b, 802.11g, 802.11n (HT20): 11 802.11n (HT40): 7 5GHz: 802.11a, 802.11n (HT20), 802.11ac (VHT20): 25 802.11n (HT40), 802.11ac (VHT40): 12 802.11ac (VHT80): 6
Output Power	2.412 ~ 2.462 GHz: 380.189 mW 5.18 ~ 5.25 GHz: 123.88 mW 5.25 ~ 5.32GHz: 121.339 mW 5.50 ~ 5.72: 118.577 mW 5.745 ~ 5.825 GHz: 118.032 mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	NA
Cable Supplied	NA

Note:

1. The EUT must be supplied with two different types could be chosen:

Type No.	Description
Type 1	1st 16 pin
Type 2	2nd 8 pin

From the above pre-test types, the worse radiated emission was found in **Type 1**. Therefore only the test data of the mode was recorded in this report.

2. There are WLAN and Bluetooth technology used for the EUT. The EUT has two radios as following table:

Radio 1	Radio 2
WLAN 2.4GHz + 5GHz	Bluetooth

3. Simultaneously transmission condition.

Condition	Technology
1	WLAN 5GHz + Bluetooth

Note: The emission of the simultaneous operation has been evaluated and no non-compliance was found.

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

Antenna No.	Antenna Net Gain (dBi)	Frequency Range (GHz)	Antenna Type	Connector Type
1	3.65	2.4~2.4835	PCB	None
	3.98	5.15~5.85		

5. The EUT incorporates a SISO function:

2.4GHz Band		
MODULATION MODE	TX & RX CONFIGURATION	
802.11b	1TX	1RX
802.11g	1TX	1RX
802.11n (HT20)	1TX	1RX
802.11n (HT40)	1TX	1RX
5GHz Band		
MODULATION MODE	TX & RX CONFIGURATION	
802.11b	1TX	1RX
802.11g	1TX	1RX
802.11n (HT20)	1TX	1RX
802.11n (HT40)	1TX	1RX
802.11ac (VHT20)	1TX	1RX
802.11ac (VHT40)	1TX	1RX
802.11ac (VHT80)	1TX	1RX

6. The above EUT information was declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.

7. The above Antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.

3.2 Description of Test Modes

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

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

7 channels are provided for 802.11n (HT40)

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

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE \geq 1G	RE $<$ 1G	PLC	APCM	
-	√	√	√	√	-

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

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

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

Radiated Emission Test (Below 1GHz):

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

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11n (HT20)	1 to 11	6	OFDM	BPSK	6.5

Power Line Conducted Emission Test:

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

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11n (HT20)	1 to 11	6	OFDM	BPSK	6.5

Antenna Port Conducted Measurement:

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

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

Test Condition:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER (System)	TESTED BY
RE \geq 1G	25deg. C, 75%RH	120Vac, 60Hz	Benson Chao
RE $<$ 1G	21deg. C, 64%RH	120Vac, 60Hz	Benson Chao
PLC	25deg. C, 70%RH	120Vac, 60Hz	Sampon Chen
APCM	25deg. C, 60%RH	120Vac, 60Hz	Kevin Ko

3.3 Duty Cycle of Test Signal

Duty cycle of test signal is < 98 %, duty factor shall be considered.

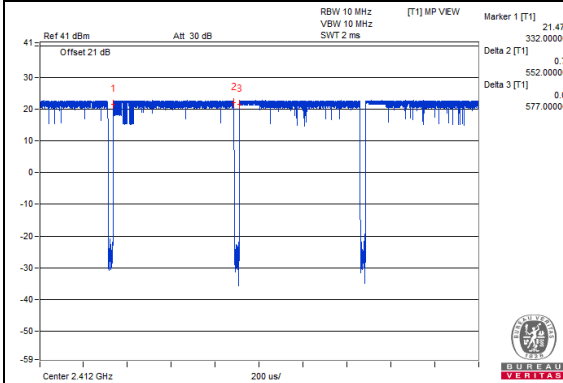
802.11b: Duty cycle = 0.552 ms/0.577 ms= 0.957, Duty factor = $10 \cdot \log(1/\text{Duty cycle}) = 0.19 \text{ dB}$

802.11g: Duty cycle = 1.427 ms/1.459 ms= 0.978, Duty factor = $10 \cdot \log(1/\text{Duty cycle}) = 0.10 \text{ dB}$

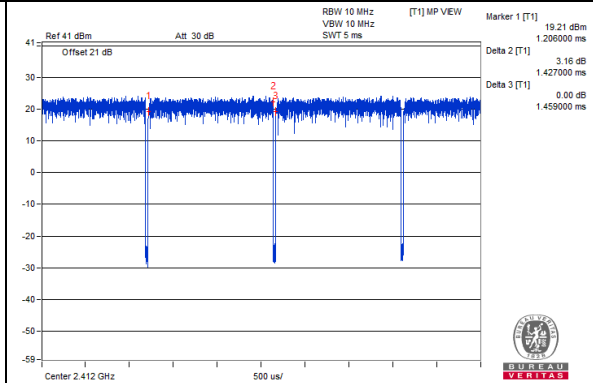
802.11n (HT20): Duty cycle = 1.34 ms /1.372 ms = 0.977, Duty factor = $10 \cdot \log(1/\text{Duty cycle}) = 0.10 \text{ dB}$

802.11n (HT40): Duty cycle = 0.664 ms /0.695 ms = 0.955, Duty factor = $10 \cdot \log(1/\text{Duty cycle}) = 0.20 \text{ dB}$

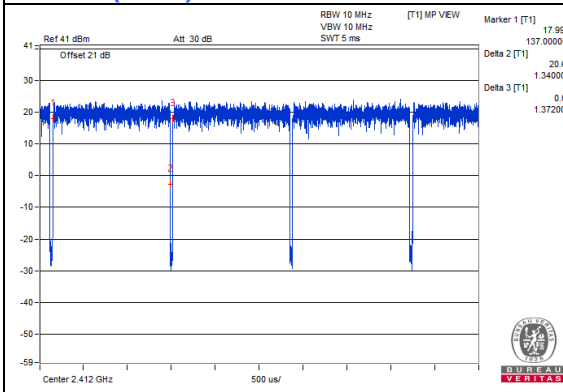
802.11b



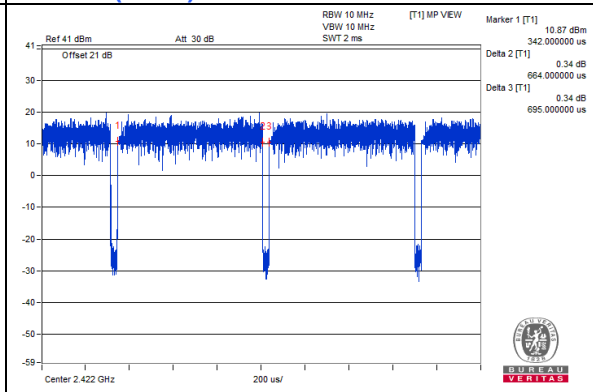
802.11g



802.11n (HT20)



802.11n (HT40)



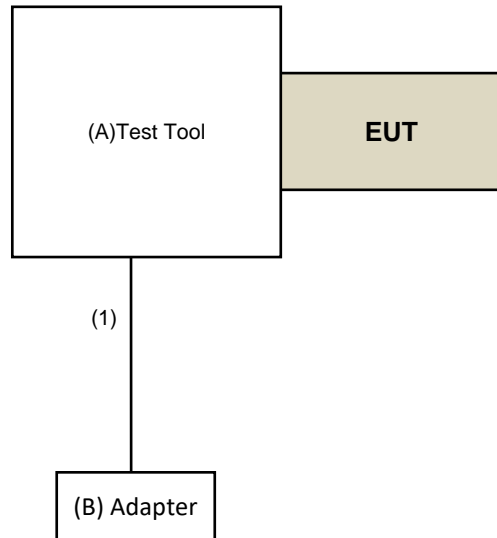
3.4 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Test Tool	soliton technologies	NA	NA	NA	Supplied by client(for RF Setup)
B.	Adapter	ASUS	EXA1205UA	NA	NA	Provided by Lab

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	Micro USB to USB Cable	1	1.4	Yes	0	Provided by Lab

3.4.1 Configuration of System under Test



3.5 General Description of Applied Standards and references

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards and references:

Test standard:

FCC Part 15, Subpart C (15.247)
ANSI C63.10-2013

All test items have been performed and recorded as per the above standards.

References Test Guidance :

KDB 558074 D01 15.247 Meas Guidance v05r02

All test items have been performed as a reference to the above KDB test guidance.

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20dB below the highest level of the desired power:

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

Note:

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

4.1.2 Test Instruments

For Radiated Emission & Bandedge test:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver R&S	ESR7	102026	Apr. 22, 2020	Apr. 21, 2021
Spectrum Analyzer Keysight	N9030B	MY57141948	May 22, 2020	May 21, 2021
Pre-Amplifier EMCi	EMC001340	980142	May 25, 2020	May 24, 2021
Loop Antenna Electro-Metrics	EM-6879	264	Feb. 18, 2020	Feb. 17, 2021
RF Cable	NA	LOOPCAB-001	Jan. 08, 2020	Jan. 07, 2021
RF Cable	NA	LOOPCAB-002	Jan. 08, 2020	Jan. 07, 2021
Pre-Amplifier EMCi	EMC330N	980538	Apr. 28, 2020	Apr. 27, 2021
Trilog Broadband Antenna SCHWARZBECK	VULB9168	9168-0842	Nov. 03, 2020	Nov. 02, 2021
RF Cable	8D	966-5-1	Apr. 29, 2020	Apr. 28, 2021
RF Cable	8D	966-5-2	Apr. 29, 2020	Apr. 28, 2021
RF Cable	8D	966-5-3	Apr. 29, 2020	Apr. 28, 2021
Fixed attenuator Mini-Circuits	UNAT-5+	PAD-ATT5-02	Jan. 14, 2020	Jan. 13, 2021
Horn_Antenna SCHWARZBECK	BBHA 9120D	9120D-1819	Nov. 22, 2020	Nov. 21, 2021
Pre-Amplifier EMCi	EMC12630SE	980509	Apr. 29, 2020	Apr. 28, 2021
RF Cable EMCi	EMC104-SM-SM-1500	180503	Apr. 29, 2020	Apr. 28, 2021
RF Cable EMCi	EMC104-SM-SM-2000	180501	Apr. 29, 2020	Apr. 28, 2021
RF Cable EMCi	EMC104-SM-SM-6000	180506	Apr. 29, 2020	Apr. 28, 2021
Pre-Amplifier EMCi	EMC184045SE	980387	Jan. 15, 2020	Jan. 14, 2021
Horn_Antenna SCHWARZBECK	BBHA 9170	BBHA9170519	Nov. 22, 2020	Nov. 21, 2021
RF Cable	EMC102-KM-KM-1200	160924	Jan. 15, 2020	Jan. 14, 2021
RF Cable	EMC-KM-KM-4000	200214	Mar. 11, 2020	Mar. 10, 2021
Software	ADT_Radiated_V8.7.08	NA	NA	NA
Boresight Antenna Tower & Turn Table Max-Full	MF-7802BS	MF780208530	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 966 Chamber No. 5.
3. Tested Date: Nov. 26 to Dec. 12, 2020

For other test:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer R&S	FSV40	100964	May 29, 2020	May 28, 2021
Power meter Anritsu	ML2495A	1529002	July 22, 2020	July 21, 2021
Power sensor Anritsu	MA2411B	1339443	July 22, 2020	July 21, 2021
Fixed Attenuator Mini-Circuits	MDCS18N-10	MDCS18N-10-01	Apr. 14, 2020	Apr. 13, 2021
Software	ADT_RF Test Software V6.6.5.4	NA	NA	NA

- NOTE:**
1. The test was performed in Oven room 2.
 2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
 3. Tested Date: Dec. 04, 2020

4.1.3 Test Procedures

For Radiated emission below 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

For Radiated emission above 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. The test-receiver system was set to peak and average detects function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

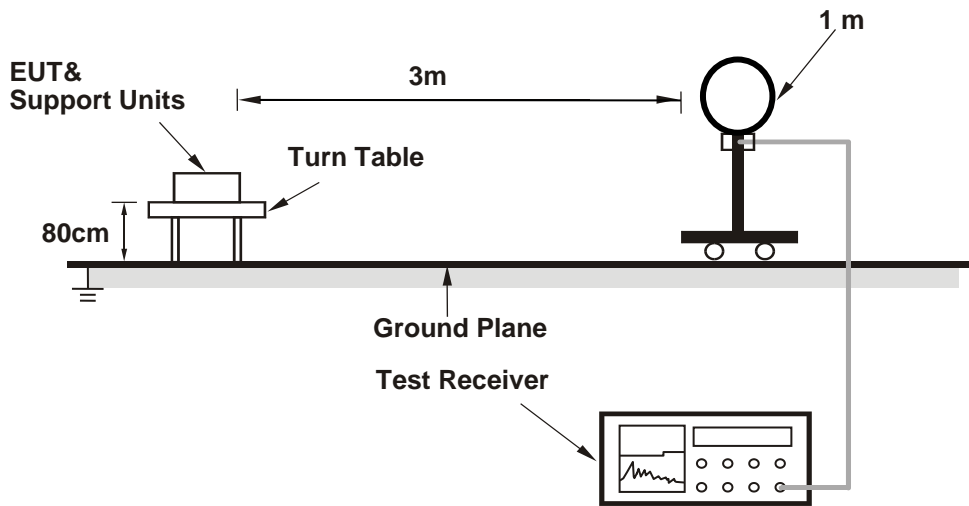
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

4.1.4 Deviation from Test Standard

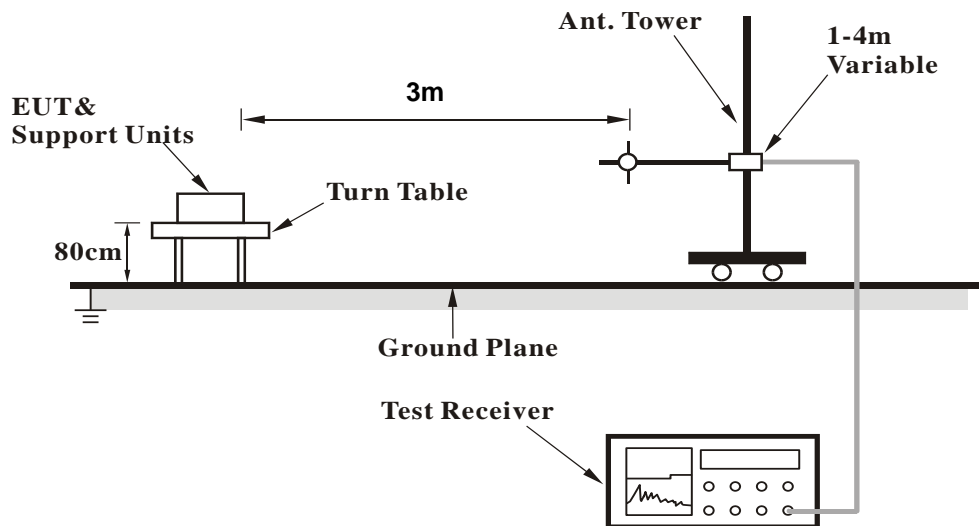
No deviation.

4.1.5 Test Setup

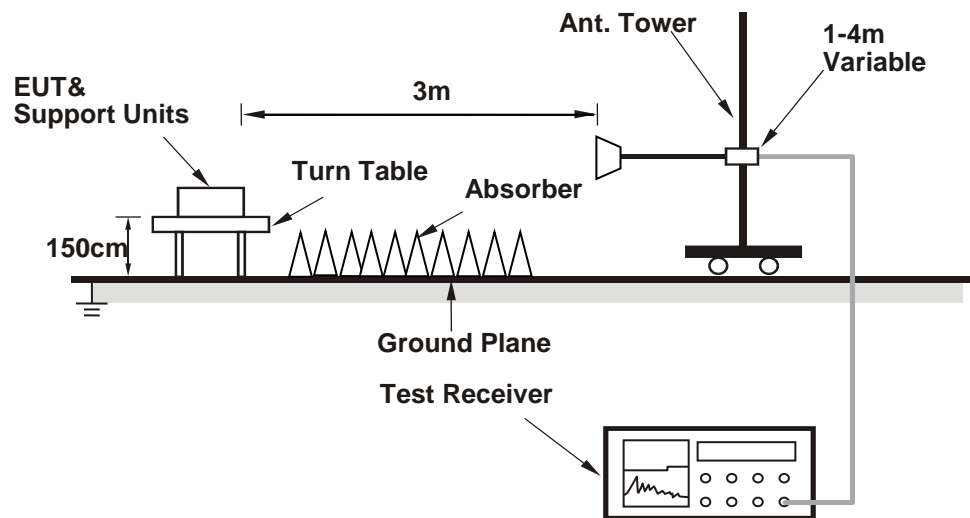
For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



For Radiated emission above 1GHz



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

4.1.6 EUT Operating Conditions

- a. Placed the EUT on the testing table.
- b. Controlling software (Terminal paste "TXRX script command") has been activated to set the EUT under transmission condition continuously.

4.1.7 Test Results

ABOVE 1GHz DATA

RF Mode	TX 802.11b	Channel	CH 1 : 2412 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2389.78	62.0 PK	74.0	-12.0	1.67 H	132	65.0	-3.0
2	2389.78	53.5 AV	54.0	-0.5	1.67 H	132	56.5	-3.0
3	*2412.00	110.7 PK			1.67 H	132	113.6	-2.9
4	*2412.00	106.6 AV			1.67 H	132	109.5	-2.9
5	4824.00	46.5 PK	74.0	-27.5	2.80 H	204	45.1	1.4
6	4824.00	39.3 AV	54.0	-14.7	2.80 H	204	37.9	1.4
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	59.5 PK	74.0	-14.5	1.68 V	298	62.5	-3.0
2	2390.00	52.6 AV	54.0	-1.4	1.68 V	298	55.6	-3.0
3	*2412.00	108.0 PK			1.68 V	298	110.9	-2.9
4	*2412.00	104.0 AV			1.68 V	298	106.9	-2.9
5	4824.00	44.0 PK	74.0	-30.0	3.14 V	206	42.6	1.4
6	4824.00	38.1 AV	54.0	-15.9	3.14 V	206	36.7	1.4

Remarks:

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

RF Mode	TX 802.11b	Channel	CH 6 : 2437 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m

No	Frequency (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	54.7 PK	74.0	-19.3	1.50 H	148	57.7	-3.0
2	2390.00	45.6 AV	54.0	-8.4	1.50 H	148	48.6	-3.0
3	*2437.00	110.5 PK			1.50 H	148	113.4	-2.9
4	*2437.00	106.4 AV			1.50 H	148	109.3	-2.9
5	2483.50	51.2 PK	74.0	-22.8	1.50 H	148	54.2	-3.0
6	2483.50	39.8 AV	54.0	-14.2	1.50 H	148	42.8	-3.0
7	4874.00	46.1 PK	74.0	-27.9	3.56 H	198	44.8	1.3
8	4874.00	42.0 AV	54.0	-12.0	3.56 H	198	40.7	1.3
9	7311.00	43.1 PK	74.0	-30.9	1.50 H	168	36.2	6.9
10	7311.00	31.6 AV	54.0	-22.4	1.50 H	168	24.7	6.9

Antenna Polarity & Test Distance : Vertical at 3 m

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	57.6 PK	74.0	-16.4	1.84 V	287	60.6	-3.0
2	2390.00	47.6 AV	54.0	-6.4	1.84 V	287	50.6	-3.0
3	*2437.00	108.0 PK			1.84 V	287	110.9	-2.9
4	*2437.00	104.0 AV			1.84 V	287	106.9	-2.9
5	2483.50	54.6 PK	74.0	-19.4	1.84 V	287	57.6	-3.0
6	2483.50	43.9 AV	54.0	-10.1	1.84 V	287	46.9	-3.0
7	4874.00	43.4 PK	74.0	-30.6	1.50 V	212	42.1	1.3
8	4874.00	37.7 AV	54.0	-16.3	1.50 V	212	36.4	1.3
9	7311.00	43.5 PK	74.0	-30.5	2.73 V	170	36.6	6.9
10	7311.00	31.5 AV	54.0	-22.5	2.73 V	170	24.6	6.9

Remarks:

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

RF Mode	TX 802.11b	Channel	CH 11 : 2462 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m

No	Frequency (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	108.8 PK			1.63 H	134	111.8	-3.0
2	*2462.00	105.1 AV			1.63 H	134	108.1	-3.0
3	2483.78	57.9 PK	74.0	-16.1	1.63 H	134	60.9	-3.0
4	2483.78	49.3 AV	54.0	-4.7	1.63 H	134	52.3	-3.0
5	4924.00	46.0 PK	74.0	-28.0	1.49 H	298	44.5	1.5
6	4924.00	42.6 AV	54.0	-11.4	1.49 H	298	41.1	1.5
7	7386.00	44.1 PK	74.0	-29.9	1.75 H	181	36.9	7.2
8	7386.00	32.2 AV	54.0	-21.8	1.75 H	181	25.0	7.2

Antenna Polarity & Test Distance : Vertical at 3 m

No	Frequency (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	107.9 PK			1.39 V	292	110.9	-3.0
2	*2462.00	104.6 AV			1.39 V	292	107.6	-3.0
3	2483.80	60.1 PK	74.0	-13.9	1.39 V	292	63.1	-3.0
4	2483.80	49.8 AV	54.0	-4.2	1.39 V	292	52.8	-3.0
5	4924.00	43.3 PK	74.0	-30.7	1.13 V	212	41.8	1.5
6	4924.00	37.5 AV	54.0	-16.5	1.13 V	212	36.0	1.5
7	7386.00	40.3 PK	74.0	-33.7	1.96 V	219	33.1	7.2
8	7386.00	31.8 AV	54.0	-22.2	1.96 V	219	24.6	7.2

Remarks:

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

RF Mode	TX 802.11g	Channel	CH 1 : 2412 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2389.77	71.4 PK	74.0	-2.6	1.71 H	135	74.4	-3.0
2	2389.77	53.6 AV	54.0	-0.4	1.71 H	135	56.6	-3.0
3	*2412.00	109.7 PK			1.71 H	135	112.6	-2.9
4	*2412.00	98.7 AV			1.71 H	135	101.6	-2.9
5	4824.00	45.7 PK	74.0	-28.3	1.46 H	298	44.3	1.4
6	4824.00	33.6 AV	54.0	-20.4	1.46 H	298	32.2	1.4

Antenna Polarity & Test Distance : Vertical at 3 m

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2389.76	73.7 PK	74.0	-0.3	1.47 V	295	76.7	-3.0
2	2389.76	53.8 AV	54.0	-0.2	1.47 V	295	56.8	-3.0
3	*2412.00	110.0 PK			1.47 V	295	112.9	-2.9
4	*2412.00	99.5 AV			1.47 V	295	102.4	-2.9
5	4824.00	43.8 PK	74.0	-30.2	1.32 V	246	42.4	1.4
6	4824.00	32.5 AV	54.0	-21.5	1.32 V	246	31.1	1.4

Remarks:

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

RF Mode	TX 802.11g	Channel	CH 6 : 2437 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m

No	Frequency (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	69.2 PK	74.0	-4.8	3.06 H	228	72.2	-3.0
2	2390.00	53.6 AV	54.0	-0.4	3.06 H	228	56.6	-3.0
3	*2437.00	115.6 PK			3.06 H	228	118.5	-2.9
4	*2437.00	106.4 AV			3.06 H	228	109.3	-2.9
5	2483.50	64.7 PK	74.0	-9.3	3.06 H	228	67.7	-3.0
6	2483.50	50.7 AV	54.0	-3.3	3.06 H	228	53.7	-3.0
7	4874.00	48.0 PK	74.0	-26.0	1.48 H	300	46.7	1.3
8	4874.00	33.0 AV	54.0	-21.0	1.48 H	300	31.7	1.3
9	7311.00	45.1 PK	74.0	-28.9	1.71 H	214	38.2	6.9
10	7311.00	32.2 AV	54.0	-21.8	1.71 H	214	25.3	6.9

Antenna Polarity & Test Distance : Vertical at 3 m

No	Frequency (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	66.2 PK	74.0	-7.8	3.43 V	177	69.2	-3.0
2	2390.00	51.2 AV	54.0	-2.8	3.43 V	177	54.2	-3.0
3	*2437.00	115.3 PK			3.43 V	177	118.2	-2.9
4	*2437.00	106.3 AV			3.43 V	177	109.2	-2.9
5	2483.50	64.0 PK	74.0	-10.0	3.43 V	177	67.0	-3.0
6	2483.50	50.2 AV	54.0	-3.8	3.43 V	177	53.2	-3.0
7	4874.00	46.1 PK	74.0	-27.9	1.48 V	214	44.8	1.3
8	4874.00	35.3 AV	54.0	-18.7	1.48 V	214	34.0	1.3
9	7311.00	42.2 PK	74.0	-31.8	1.84 V	298	35.3	6.9
10	7311.00	30.8 AV	54.0	-23.2	1.84 V	298	23.9	6.9

Remarks:

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

RF Mode	TX 802.11g	Channel	CH 11 : 2462 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m

No	Frequency (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	109.2 PK			1.56 H	313	112.2	-3.0
2	*2462.00	98.5 AV			1.56 H	313	101.5	-3.0
3	2483.61	66.1 PK	74.0	-7.9	1.56 H	313	69.1	-3.0
4	2483.61	53.4 AV	54.0	-0.6	1.56 H	313	56.4	-3.0
5	4924.00	45.3 PK	74.0	-28.7	1.39 H	298	43.8	1.5
6	4924.00	34.3 AV	54.0	-19.7	1.39 H	298	32.8	1.5
7	7386.00	44.8 PK	74.0	-29.2	1.94 H	206	37.6	7.2
8	7386.00	31.3 AV	54.0	-22.7	1.94 H	206	24.1	7.2

Antenna Polarity & Test Distance : Vertical at 3 m

No	Frequency (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	109.5 PK			1.42 V	297	112.5	-3.0
2	*2462.00	99.2 AV			1.42 V	297	102.2	-3.0
3	2483.52	73.6 PK	74.0	-0.4	1.42 V	297	76.6	-3.0
4	2483.52	53.8 AV	54.0	-0.2	1.42 V	297	56.8	-3.0
5	4924.00	42.6 PK	74.0	-31.4	1.35 V	231	41.1	1.5
6	4924.00	32.0 AV	54.0	-22.0	1.35 V	231	30.5	1.5
7	7386.00	41.2 PK	74.0	-32.8	2.18 V	318	34.0	7.2
8	7386.00	30.7 AV	54.0	-23.3	2.18 V	318	23.5	7.2

Remarks:

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

RF Mode	TX 802.11n (HT20)	Channel	CH 1 : 2412 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2389.77	73.6 PK	74.0	-0.4	1.85 H	132	76.6	-3.0
2	2389.77	53.6 AV	54.0	-0.4	1.85 H	132	56.6	-3.0
3	*2412.00	108.8 PK			1.85 H	132	111.7	-2.9
4	*2412.00	97.9 AV			1.85 H	132	100.8	-2.9
5	4824.00	42.3 PK	74.0	-31.7	1.35 H	242	40.9	1.4
6	4824.00	32.5 AV	54.0	-21.5	1.35 H	242	31.1	1.4

Antenna Polarity & Test Distance : Vertical at 3 m

No	Frequency (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	1.39 V	294	70.6	-3.0
2	2390.00	53.8 AV	54.0	-0.2	1.39 V	294	56.8	-3.0
3	*2412.00	107.8 PK			1.39 V	294	110.7	-2.9
4	*2412.00	98.4 AV			1.39 V	294	101.3	-2.9
5	4824.00	40.8 PK	74.0	-33.2	1.84 V	229	39.4	1.4
6	4824.00	32.1 AV	54.0	-21.9	1.84 V	229	30.7	1.4

Remarks:

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

RF Mode	TX 802.11n (HT20)	Channel	CH 6 : 2437 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	65.0 PK	74.0	-9.0	3.27 H	220	68.0	-3.0
2	2390.00	53.6 AV	54.0	-0.4	3.27 H	220	56.6	-3.0
3	*2437.00	114.5 PK			3.27 H	220	117.4	-2.9
4	*2437.00	106.7 AV			3.27 H	220	109.6	-2.9
5	2483.50	64.9 PK	74.0	-9.1	3.27 H	220	67.9	-3.0
6	2483.50	51.6 AV	54.0	-2.4	3.27 H	220	54.6	-3.0
7	4874.00	47.6 PK	74.0	-26.4	1.84 H	304	46.3	1.3
8	4874.00	41.1 AV	54.0	-12.9	1.84 H	304	39.8	1.3
9	7311.00	45.7 PK	74.0	-28.3	1.25 H	314	38.8	6.9
10	7311.00	33.0 AV	54.0	-21.0	1.25 H	314	26.1	6.9

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	63.1 PK	74.0	-10.9	3.06 V	138	66.1	-3.0
2	2390.00	52.7 AV	54.0	-1.3	3.06 V	138	55.7	-3.0
3	*2437.00	114.3 PK			3.06 V	138	117.2	-2.9
4	*2437.00	106.2 AV			3.06 V	138	109.1	-2.9
5	2483.50	64.2 PK	74.0	-9.8	3.06 V	138	67.2	-3.0
6	2483.50	51.5 AV	54.0	-2.5	3.06 V	138	54.5	-3.0
7	4874.00	45.4 PK	74.0	-28.6	2.98 V	329	44.1	1.3
8	4874.00	35.6 AV	54.0	-18.4	2.98 V	329	34.3	1.3
9	7311.00	42.3 PK	74.0	-31.7	1.84 V	304	35.4	6.9
10	7311.00	30.6 AV	54.0	-23.4	1.84 V	304	23.7	6.9

Remarks:

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

RF Mode	TX 802.11n (HT20)	Channel	CH 11 : 2462 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2462.00	110.4 PK			1.97 H	307	113.4	-3.0
2	*2462.00	98.3 AV			1.97 H	307	101.3	-3.0
3	2484.12	69.3 PK	74.0	-4.7	1.97 H	307	72.3	-3.0
4	2484.12	53.1 AV	54.0	-0.9	1.97 H	307	56.1	-3.0
5	4924.00	45.4 PK	74.0	-28.6	1.69 H	234	43.9	1.5
6	4924.00	35.4 AV	54.0	-18.6	1.69 H	234	33.9	1.5
7	7386.00	41.4 PK	74.0	-32.6	1.94 H	312	34.2	7.2
8	7386.00	32.3 AV	54.0	-21.7	1.94 H	312	25.1	7.2

Antenna Polarity & Test Distance : Vertical at 3 m

No	Frequency (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	109.8 PK			1.36 V	291	112.8	-3.0
2	*2462.00	99.1 AV			1.36 V	291	102.1	-3.0
3	2483.50	68.4 PK	74.0	-5.6	1.36 V	291	71.4	-3.0
4	2483.50	53.9 AV	54.0	-0.1	1.36 V	291	56.9	-3.0
5	4924.00	44.7 PK	74.0	-29.3	2.19 V	255	43.2	1.5
6	4924.00	34.9 AV	54.0	-19.1	2.19 V	255	33.4	1.5
7	7386.00	41.2 PK	74.0	-32.8	1.64 V	348	34.0	7.2
8	7386.00	32.1 AV	54.0	-21.9	1.64 V	348	24.9	7.2

Remarks:

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

RF Mode	TX 802.11n (HT40)	Channel	CH 3 : 2422 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2389.85	71.5 PK	74.0	-2.5	2.17 H	306	74.5	-3.0
2	2389.85	53.2 AV	54.0	-0.8	2.17 H	306	56.2	-3.0
3	*2422.00	103.4 PK			2.17 H	306	106.3	-2.9
4	*2422.00	93.9 AV			2.17 H	306	96.8	-2.9
5	4844.00	45.6 PK	74.0	-28.4	1.80 H	290	44.2	1.4
6	4844.00	35.7 AV	54.0	-18.3	1.80 H	290	34.3	1.4
7	7266.00	41.8 PK	74.0	-32.2	1.40 H	311	34.8	7.0
8	7266.00	32.5 AV	54.0	-21.5	1.40 H	311	25.5	7.0

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2389.20	59.0 PK	74.0	-15.0	1.21 V	300	62.0	-3.0
2	2389.20	50.0 AV	54.0	-4.0	1.21 V	300	53.0	-3.0
3	*2422.00	100.8 PK			1.21 V	300	103.7	-2.9
4	*2422.00	91.1 AV			1.21 V	300	94.0	-2.9
5	4844.00	42.6 PK	74.0	-31.4	1.84 V	342	41.2	1.4
6	4844.00	34.5 AV	54.0	-19.5	1.84 V	342	33.1	1.4
7	7266.00	41.8 PK	74.0	-32.2	1.37 V	328	34.8	7.0
8	7266.00	32.4 AV	54.0	-21.6	1.37 V	328	25.4	7.0

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. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

RF Mode	TX 802.11n (HT40)	Channel	CH 6 : 2437 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (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	69.8 PK	74.0	-4.2	3.18 H	228	72.8	-3.0
2	2390.00	53.4 AV	54.0	-0.6	3.18 H	228	56.4	-3.0
3	*2437.00	107.3 PK			3.18 H	228	110.2	-2.9
4	*2437.00	99.5 AV			3.18 H	228	102.4	-2.9
5	2483.50	67.6 PK	74.0	-6.4	3.18 H	228	70.6	-3.0
6	2483.50	53.8 AV	54.0	-0.2	3.18 H	228	56.8	-3.0
7	4874.00	44.3 PK	74.0	-29.7	1.78 H	327	43.0	1.3
8	4874.00	34.4 AV	54.0	-19.6	1.78 H	327	33.1	1.3
9	7311.00	40.9 PK	74.0	-33.1	1.28 H	315	34.0	6.9
10	7311.00	32.4 AV	54.0	-21.6	1.28 H	315	25.5	6.9

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	64.5 PK	74.0	-9.5	1.35 V	287	67.5	-3.0
2	2390.00	50.5 AV	54.0	-3.5	1.35 V	287	53.5	-3.0
3	*2437.00	106.1 PK			1.35 V	287	109.0	-2.9
4	*2437.00	97.9 AV			1.35 V	287	100.8	-2.9
5	2483.50	63.1 PK	74.0	-10.9	1.35 V	287	66.1	-3.0
6	2483.50	50.3 AV	54.0	-3.7	1.35 V	287	53.3	-3.0
7	4874.00	44.0 PK	74.0	-30.0	1.85 V	327	42.7	1.3
8	4874.00	34.3 AV	54.0	-19.7	1.85 V	327	33.0	1.3
9	7311.00	40.4 PK	74.0	-33.6	1.27 V	310	33.5	6.9
10	7311.00	32.2 AV	54.0	-21.8	1.27 V	310	25.3	6.9

Remarks:

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

RF Mode	TX 802.11n (HT40)	Channel	CH 9 : 2452 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (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	102.9 PK			1.79 H	125	105.8	-2.9
2	*2452.00	93.3 AV			1.79 H	125	96.2	-2.9
3	2484.53	66.7 PK	74.0	-7.3	1.79 H	125	69.7	-3.0
4	2484.53	53.2 AV	54.0	-0.8	1.79 H	125	56.2	-3.0
5	4904.00	44.2 PK	74.0	-29.8	2.15 H	347	42.8	1.4
6	4904.00	34.5 AV	54.0	-19.5	2.15 H	347	33.1	1.4
7	7356.00	40.8 PK	74.0	-33.2	1.52 H	323	33.7	7.1
8	7356.00	32.4 AV	54.0	-21.6	1.52 H	323	25.3	7.1

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (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	103.8 PK			1.34 V	291	106.7	-2.9
2	*2452.00	94.3 AV			1.34 V	291	97.2	-2.9
3	2484.53	70.1 PK	74.0	-3.9	1.34 V	291	73.1	-3.0
4	2484.53	53.9 AV	54.0	-0.1	1.34 V	291	56.9	-3.0
5	4904.00	44.1 PK	74.0	-29.9	1.84 V	284	42.7	1.4
6	4904.00	34.1 AV	54.0	-19.9	1.84 V	284	32.7	1.4
7	7356.00	40.2 PK	74.0	-33.8	1.28 V	304	33.1	7.1
8	7356.00	32.8 AV	54.0	-21.2	1.28 V	304	25.7	7.1

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. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

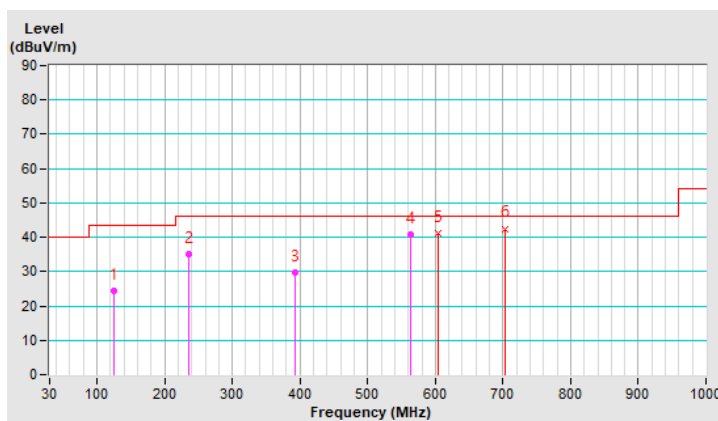
Below 1GHz Data:

RF Mode	TX 802.11n (HT20)	Channel	CH 6 : 2437 MHz
Frequency Range	9kHz ~ 1GHz	Detector Function	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	125.26	24.4 QP	43.5	-19.1	1.50 H	92	38.9	-14.5
2	235.31	35.1 QP	46.0	-10.9	1.00 H	121	49.8	-14.7
3	391.93	29.6 QP	46.0	-16.4	1.00 H	188	39.6	-10.0
4	564.01	40.9 QP	46.0	-5.1	1.50 H	360	47.2	-6.3
5	605.00	41.0 QP	46.0	-5.0	1.50 H	36	45.9	-4.9
6	704.14	42.5 QP	46.0	-3.5	1.23 H	75	46.1	-3.6

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



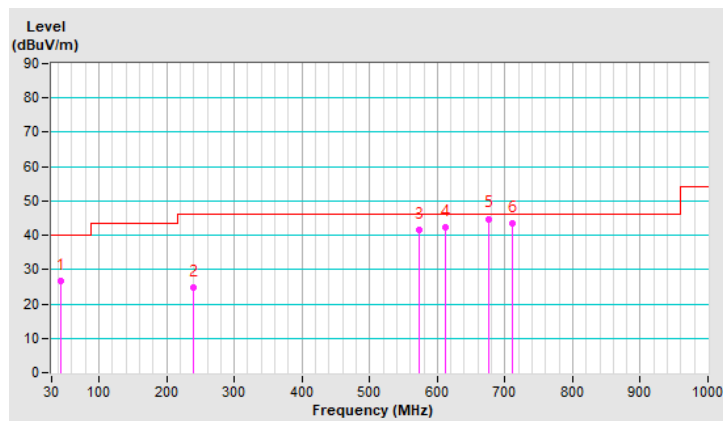
RF Mode	TX 802.11n (HT20)	Channel	CH 6 : 2437 MHz
Frequency Range	9kHz ~ 1GHz	Detector Function	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Vertical at 3 m

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	43.63	26.8 QP	40.0	-13.2	1.00 V	172	39.7	-12.9
2	239.48	24.9 QP	46.0	-21.1	1.00 V	231	39.3	-14.4
3	573.62	41.5 QP	46.0	-4.5	1.00 V	293	47.5	-6.0
4	611.25	42.4 QP	46.0	-3.6	1.00 V	360	47.1	-4.7
5	676.59	44.8 QP	46.0	-1.2	1.50 V	218	49.0	-4.2
6	710.05	43.4 QP	46.0	-2.6	1.00 V	360	46.9	-3.5

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



4.2 Conducted Emission Measurement

4.2.1 Limits of Conducted Emission Measurement

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

Note: 1. The lower limit shall apply at the transition frequencies.

2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

4.2.2 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver R&S	ESCS 30	847124/029	Oct. 20, 2020	Oct. 19, 2021
Line-Impedance Stabilization Network (for EUT) R&S	ESH3-Z5	848773/004	Oct. 27, 2020	Oct. 26, 2021
Line-Impedance Stabilization Network (for Peripheral) R&S	ESH3-Z5	835239/001	Mar. 19, 2020	Mar. 18, 2021
50 ohms Terminator	50	3	Oct. 26, 2020	Oct. 25, 2021
RF Cable	5D-FB	COCCAB-001	Sep. 26, 2020	Sep. 25, 2021
Fixed attenuator EMCI	STI02-2200-10	005	Aug. 29, 2020	Aug. 28, 2021
Software BVADT	BVADT_Cond_ V7.3.7.4	NA	NA	NA

Note:

1. The calibration interval of the above test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Conduction 1.
3. Tested Date: Dec. 14, 2020

4.2.3 Test Procedures

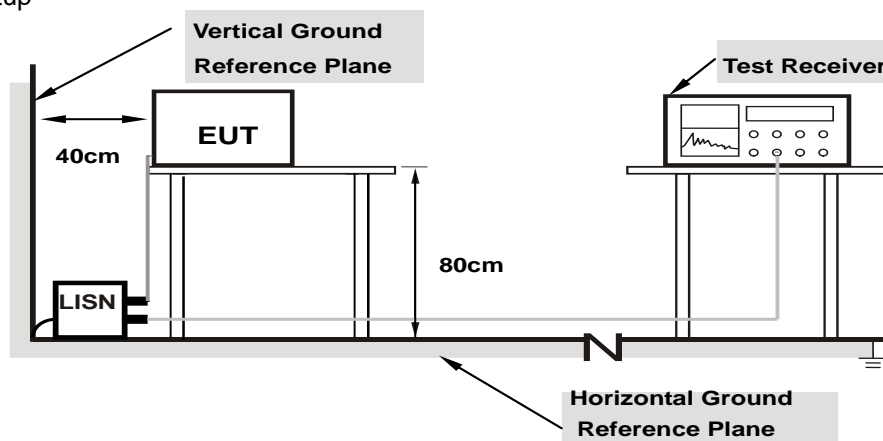
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

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

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 Test Setup



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

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

4.2.6 EUT Operating Conditions

Same as 4.1.6.

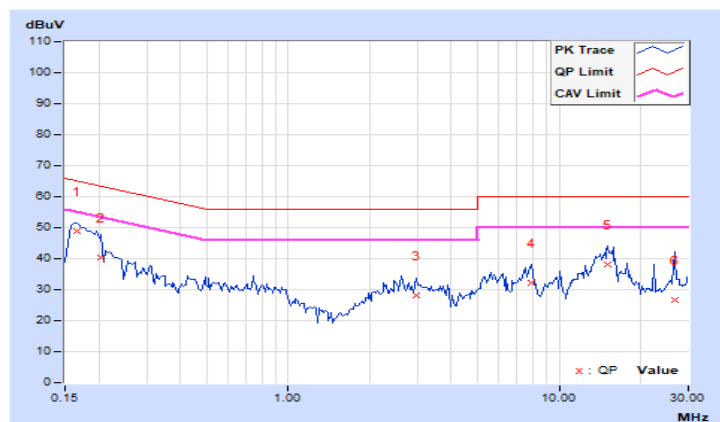
4.2.7 Test Results

RF Mode	TX 802.11n (HT20)	Channel	CH 6 : 2437 MHz
Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz

Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16562	9.97	38.80	26.49	48.77	36.46	65.18	55.18	-16.41	-18.72
2	0.20469	9.99	30.52	13.23	40.51	23.22	63.42	53.42	-22.91	-30.20
3	2.95703	10.21	17.83	11.43	28.04	21.64	56.00	46.00	-27.96	-24.36
4	7.89453	10.57	21.70	15.86	32.27	26.43	60.00	50.00	-27.73	-23.57
5	15.10156	11.10	27.07	16.93	38.17	28.03	60.00	50.00	-21.83	-21.97
6	26.62500	11.65	14.90	9.98	26.55	21.63	60.00	50.00	-33.45	-28.37

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

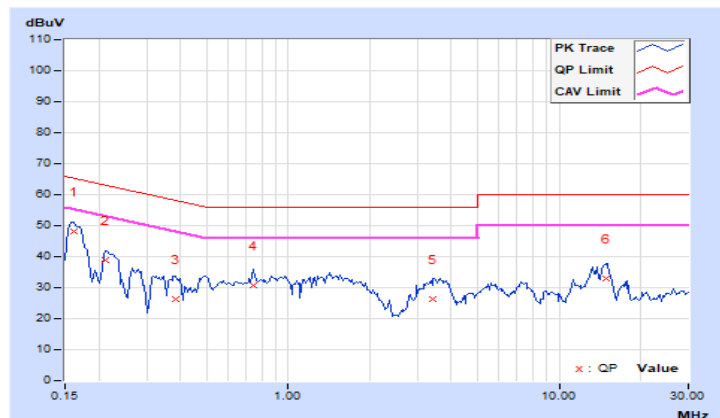


RF Mode	TX 802.11n (HT20)	Channel	CH 6 : 2437 MHz
Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz

Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16172	9.95	38.36	26.91	48.31	36.86	65.38	55.38	-17.07	-18.52
2	0.21250	9.98	29.01	16.97	38.99	26.95	63.11	53.11	-24.12	-26.16
3	0.38438	10.01	16.22	4.18	26.23	14.19	58.18	48.18	-31.95	-33.99
4	0.74375	10.04	20.81	18.94	30.85	28.98	56.00	46.00	-25.15	-17.02
5	3.42969	10.22	16.09	11.21	26.31	21.43	56.00	46.00	-29.69	-24.57
6	15.00391	10.91	22.20	11.53	33.11	22.44	60.00	50.00	-26.89	-27.56

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

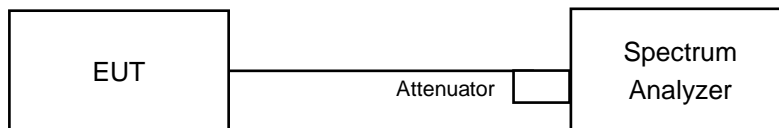


4.3 6dB Bandwidth Measurement

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) $\geq 3 \times$ RBW, Detector = Peak.
- c. Trace mode = max hold.
- d. Sweep = auto couple.
- e. Measure the maximum width of the emission that is constrained by the frequencies associated with the two amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission

4.3.5 Deviation from Test Standard

No deviation.

4.3.6 EUT Operating Conditions

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

4.3.7 Test Result

802.11b

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	8.85	0.5	Pass
6	2437	9.27	0.5	Pass
11	2462	8.42	0.5	Pass

802.11g

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	16.39	0.5	Pass
6	2437	16.37	0.5	Pass
11	2462	16.35	0.5	Pass

802.11n (HT20)

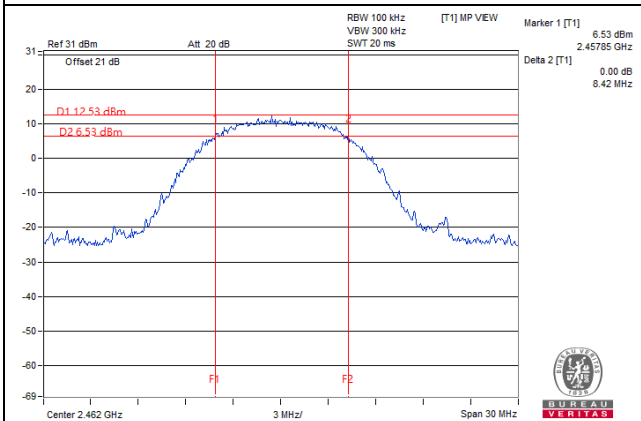
Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	17.61	0.5	Pass
6	2437	17.59	0.5	Pass
11	2462	17.61	0.5	Pass

802.11n (HT40)

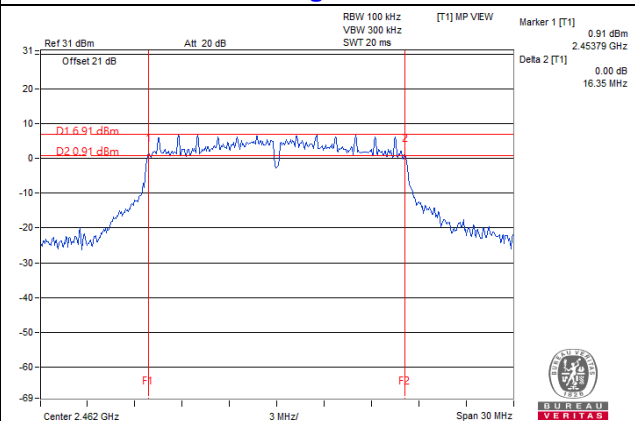
Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
3	2422	36.11	0.5	Pass
6	2437	36.15	0.5	Pass
9	2452	36.19	0.5	Pass

Spectrum Plot of Worst Value

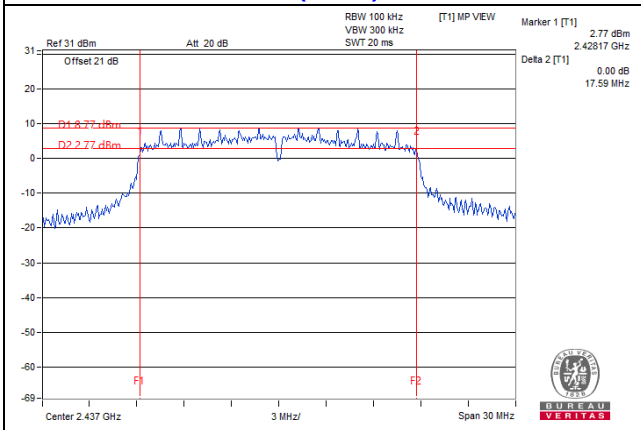
802.11b / CH11



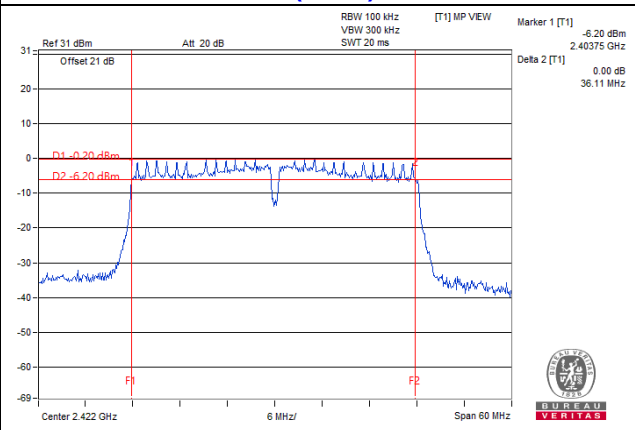
802.11g / CH11



802.11n (HT20) / CH6



802.11n (HT40) / CH3

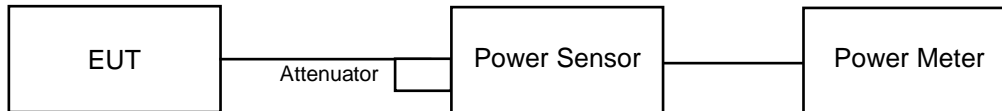


4.4 Conducted Output Power Measurement

4.4.1 Limits of Conducted Output Power Measurement

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

4.4.2 Test Setup



4.4.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.4.4 Test Procedures

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

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

4.4.5 Deviation from Test Standard

No deviation.

4.4.6 EUT Operating Conditions

Same as Item 4.3.6.

4.4.7 Test Results

FOR PEAK POWER

802.11b

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
1	2412	212.324	23.27	30	Pass
6	2437	209.411	23.21	30	Pass
11	2462	204.174	23.10	30	Pass

802.11g

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
1	2412	366.438	25.64	30	Pass
6	2437	374.111	25.73	30	Pass
11	2462	339.625	25.31	30	Pass

802.11n (HT20)

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
1	2412	324.34	25.11	30	Pass
6	2437	380.189	25.80	30	Pass
11	2462	340.408	25.32	30	Pass

802.11n (HT40)

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
3	2422	225.944	23.54	30	Pass
6	2437	296.483	24.72	30	Pass
9	2452	243.781	23.87	30	Pass

FOR AVERAGE POWER

802.11b

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	116.413	20.66
6	2437	115.611	20.63
11	2462	113.763	20.56

802.11g

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	77.09	18.87
6	2437	122.18	20.87
11	2462	70.146	18.46

802.11n (HT20)

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	53.088	17.25
6	2437	123.31	20.91
11	2462	63.533	18.03

802.11n (HT40)

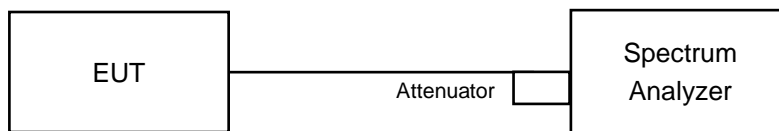
Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
3	2422	29.923	14.76
6	2437	47.315	16.75
9	2452	37.325	15.72

4.5 Power Spectral Density Measurement

4.5.1 Limits of Power Spectral Density Measurement

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

4.5.2 Test Setup



4.5.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.5.4 Test Procedure

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

4.5.5 Deviation from Test Standard

No deviation.

4.5.6 EUT Operating Condition

Same as Item 4.3.6

4.5.7 Test Results

802.11b

Channel	Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
1	2412	-2.68	8	Pass
6	2437	-2.39	8	Pass
11	2462	-2.89	8	Pass

802.11g

Channel	Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
1	2412	-5.66	8	Pass
6	2437	-3.85	8	Pass
11	2462	-5.59	8	Pass

802.11n (HT20)

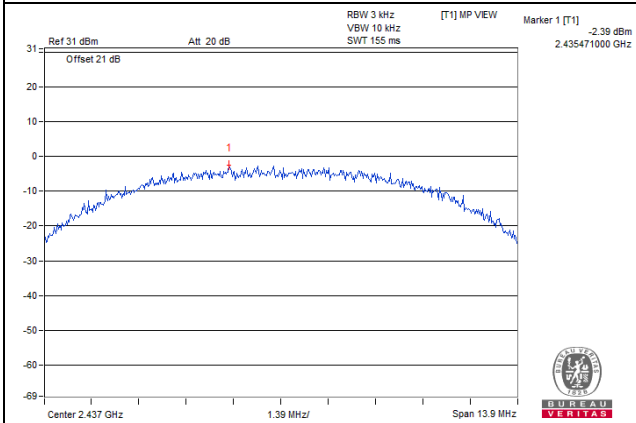
Channel	Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
1	2412	-6.70	8	Pass
6	2437	-4.19	8	Pass
11	2462	-6.35	8	Pass

802.11n (HT40)

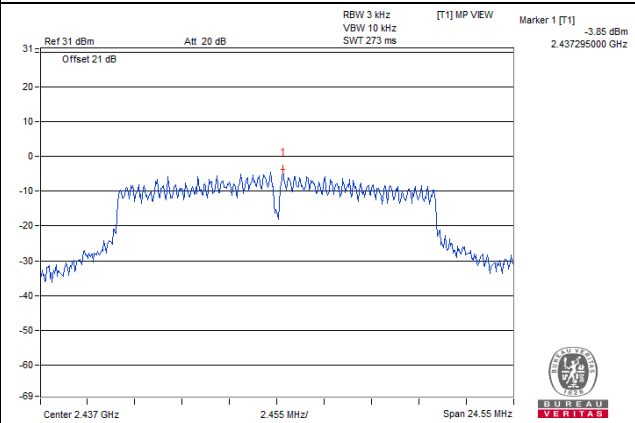
Channel	Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
3	2422	-12.88	8	Pass
6	2437	-10.69	8	Pass
9	2452	-11.22	8	Pass

Spectrum Plot of Worst Value

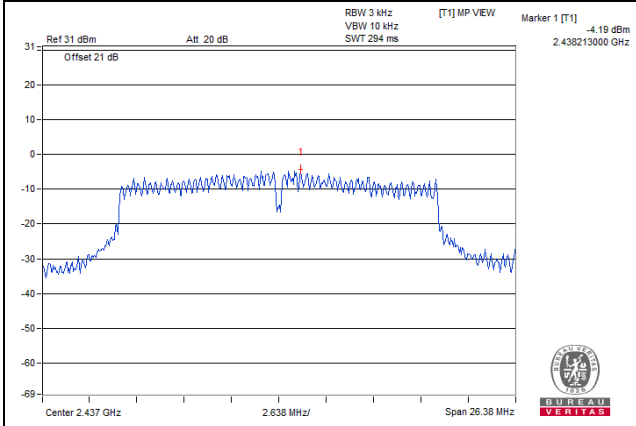
802.11b / CH6



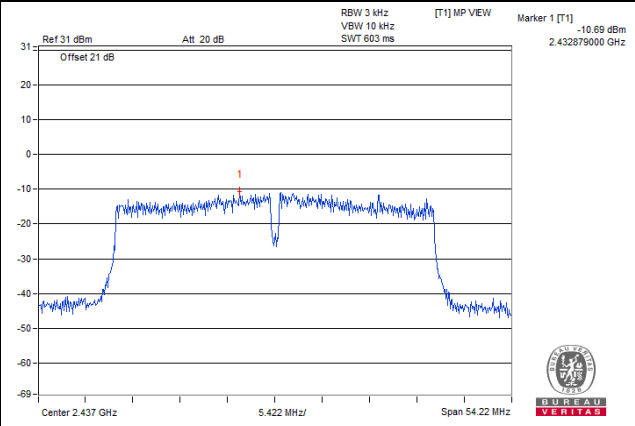
802.11g / CH6



802.11n (HT20) / CH6



802.11n (HT40) / CH6

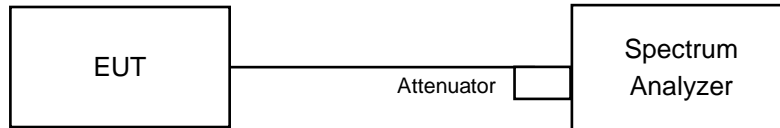


4.6 Conducted Out of Band Emission Measurement

4.6.1 Limits of Conducted Out of Band Emission Measurement

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

4.6.2 Test Setup



4.6.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.6.4 Test Procedure

MEASUREMENT PROCEDURE REF

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

MEASUREMENT PROCEDURE OOB

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

4.6.5 Deviation from Test Standard

No deviation.

4.6.6 EUT Operating Condition

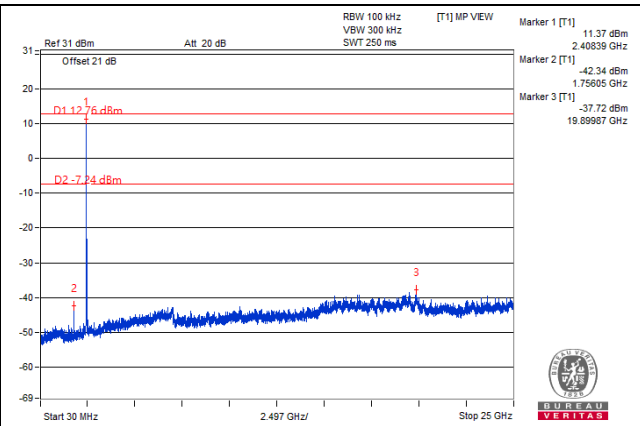
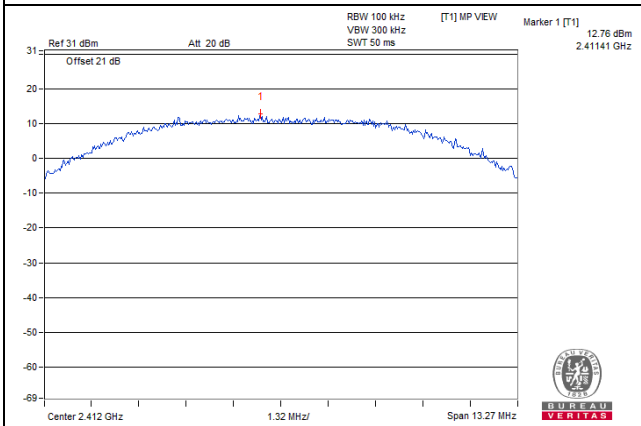
Same as Item 4.3.6

4.6.7 Test Results

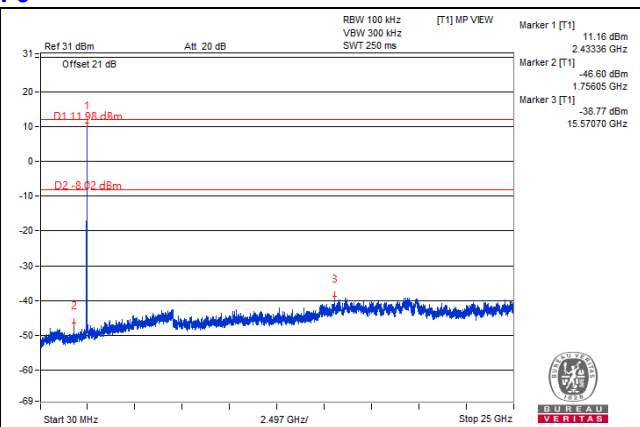
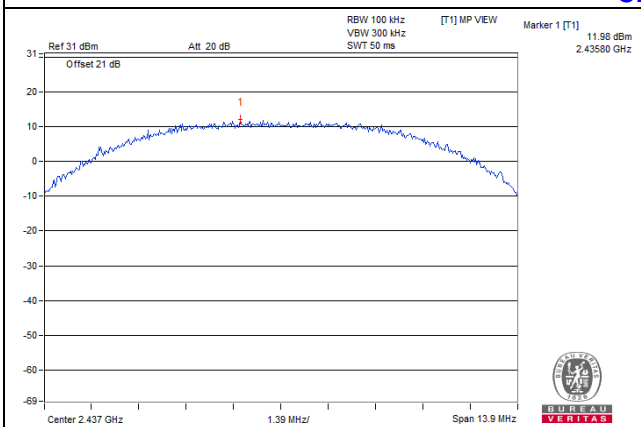
The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 20dB offset below D1. It shows compliance with the requirement.

802.11b

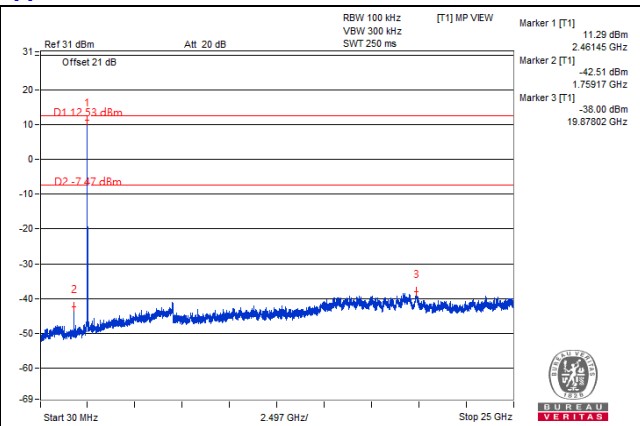
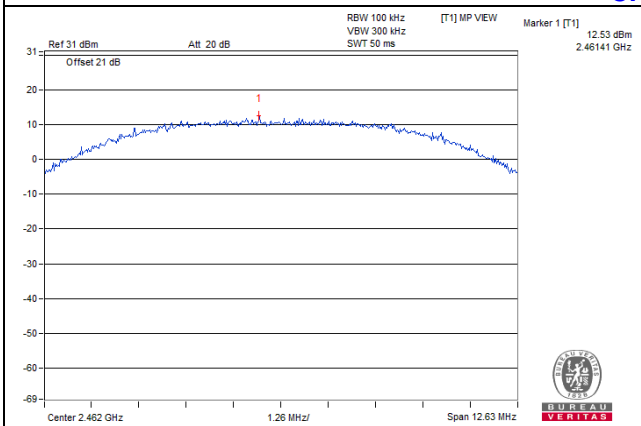
CH 1



CH 6

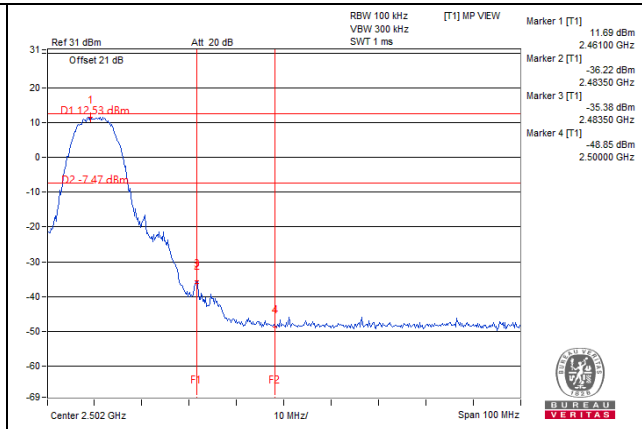
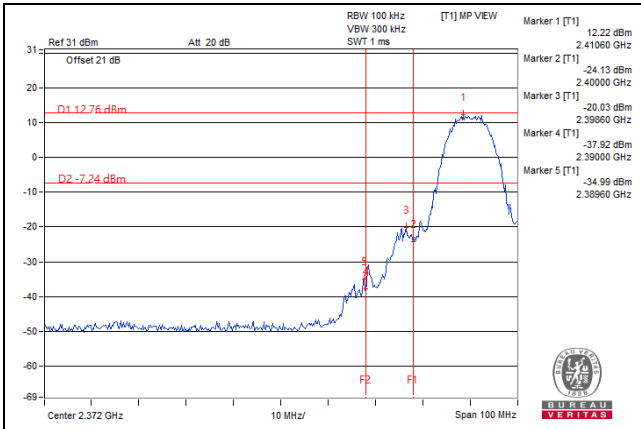


CH 11



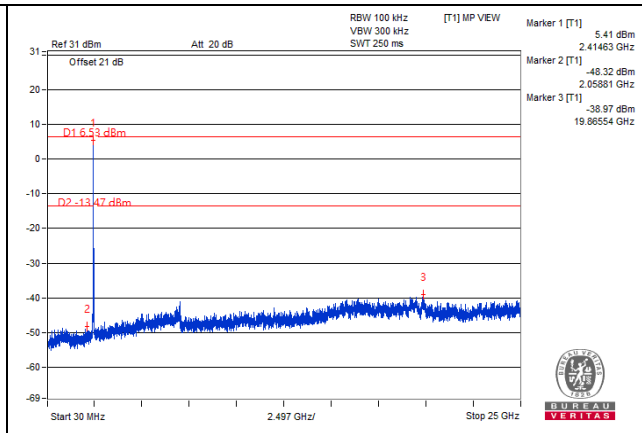
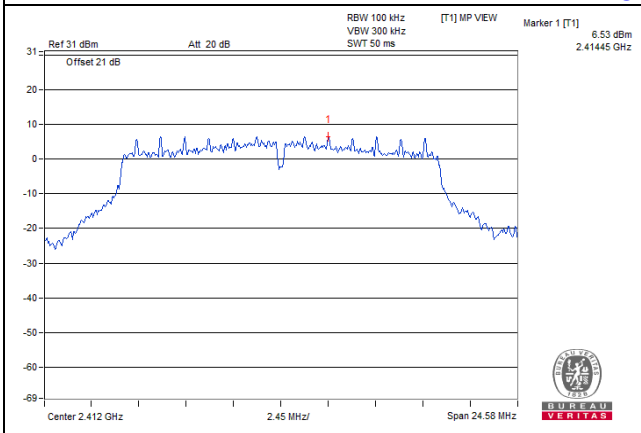
CH 1 Band edge

CH 11 Band edge

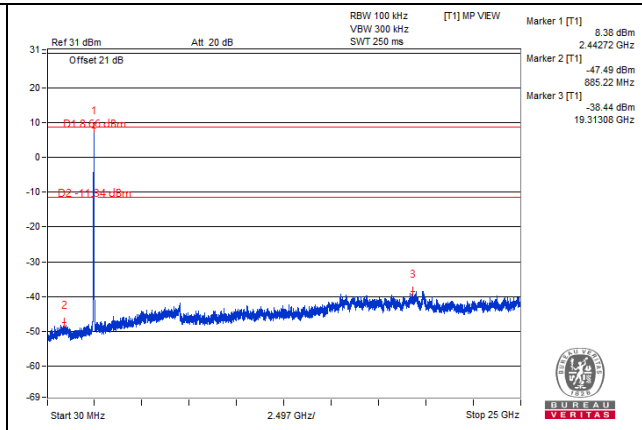
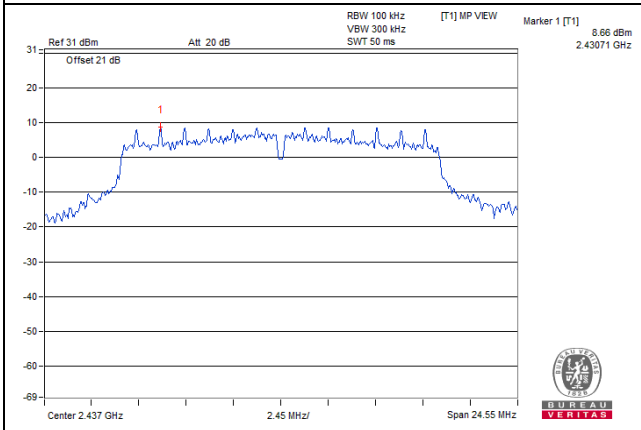


802.11g

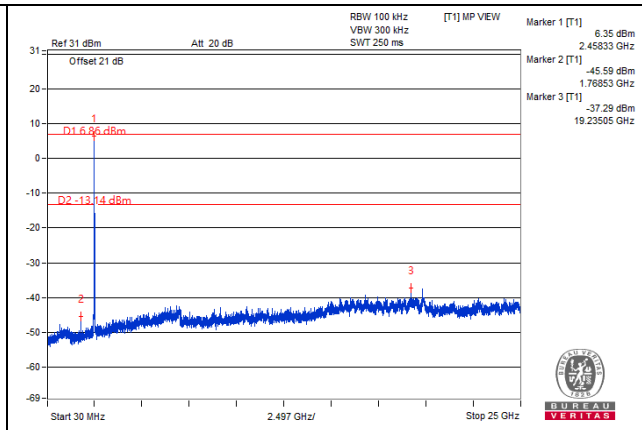
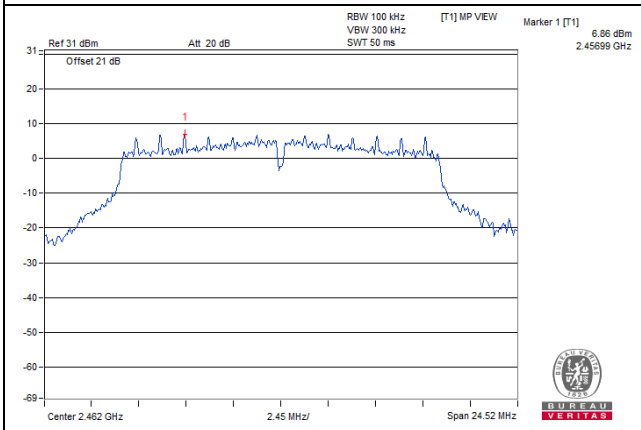
CH 1



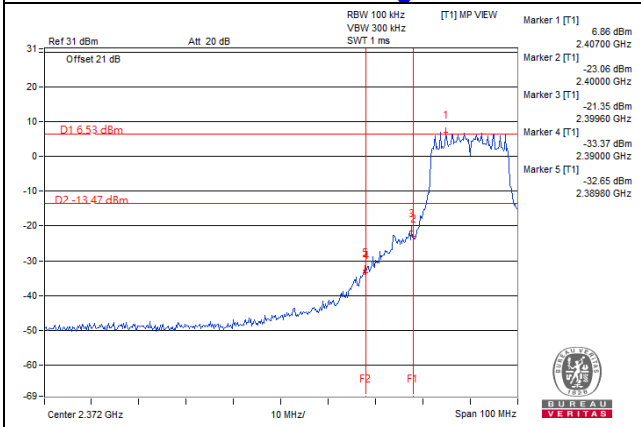
CH 6



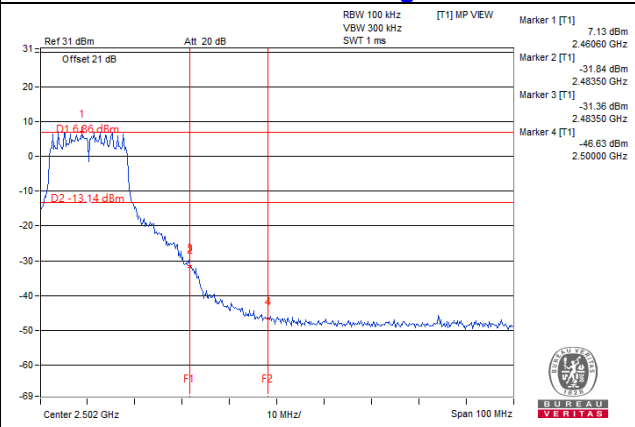
CH 11



CH 1 Band edge

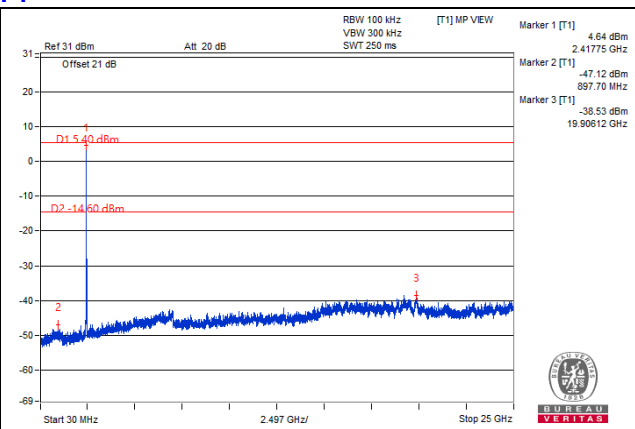
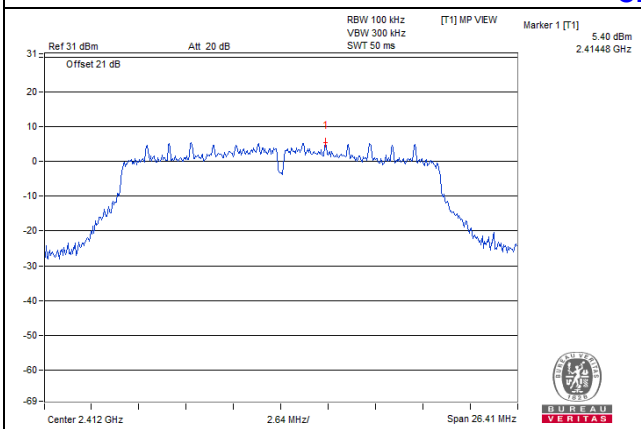


CH 11 Band edge

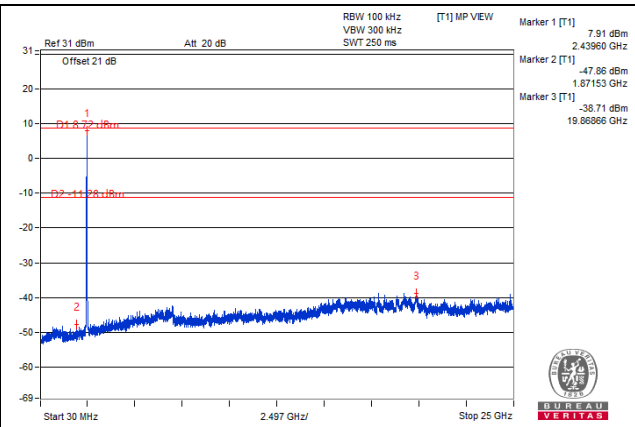
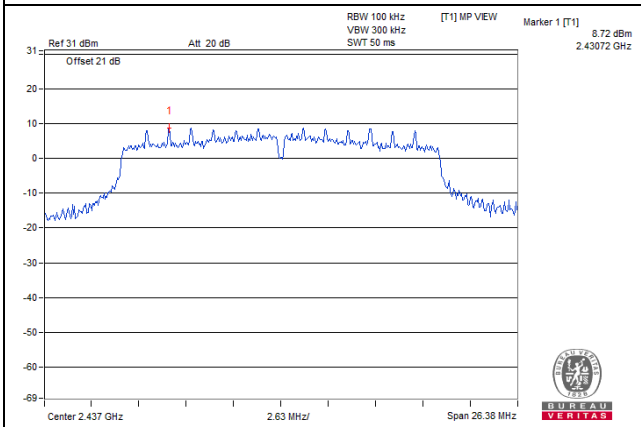


802.11n (HT20)

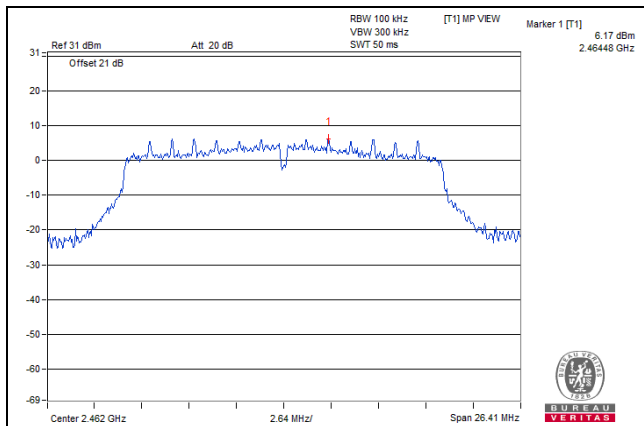
CH 1



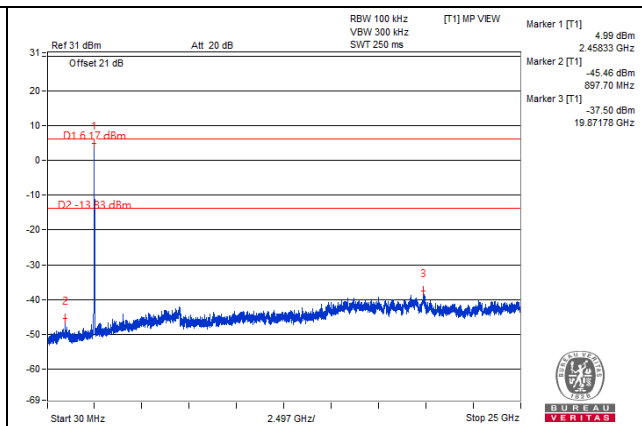
CH 6



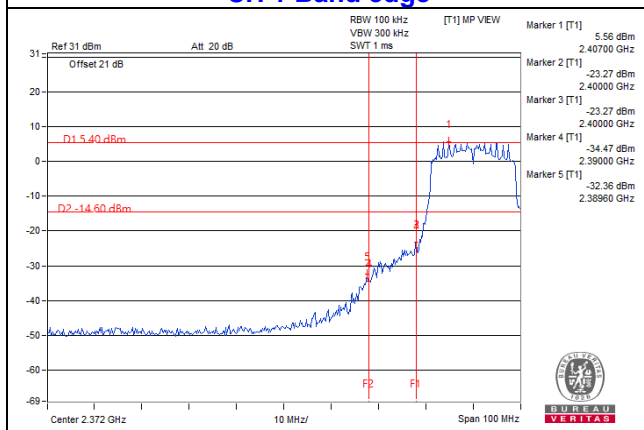
CH 11



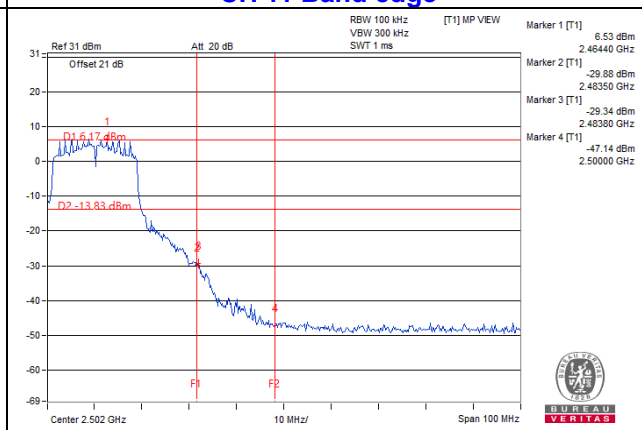
CH 1 Band edge



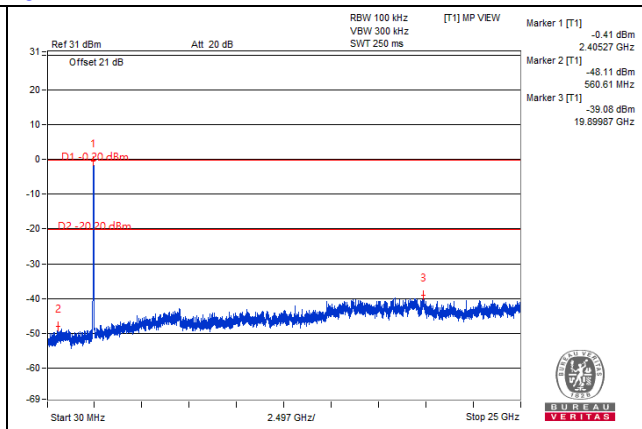
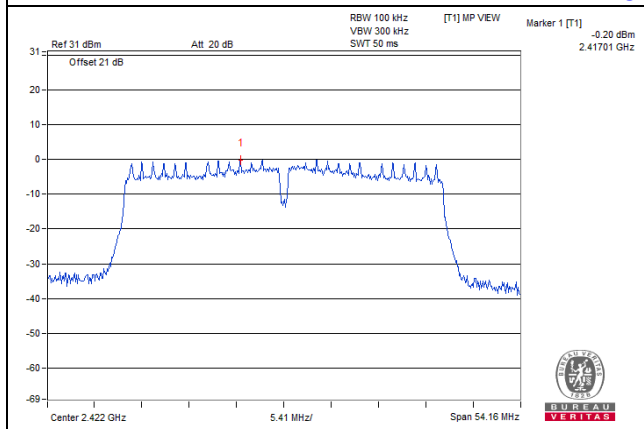
CH 11 Band edge



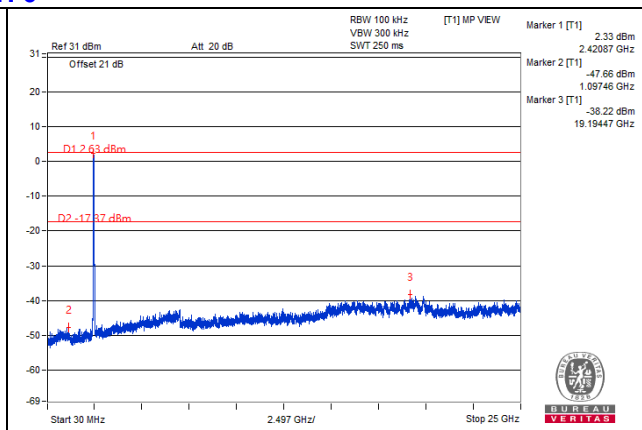
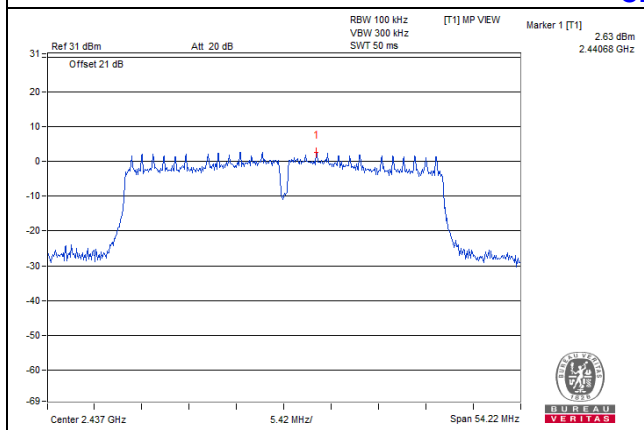
802.11n (HT40)



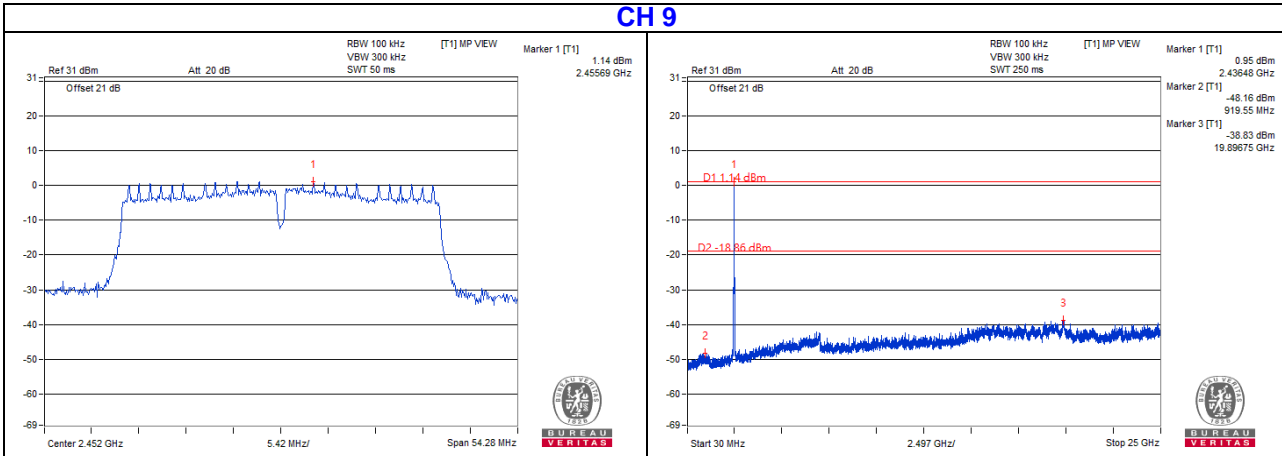
CH 3



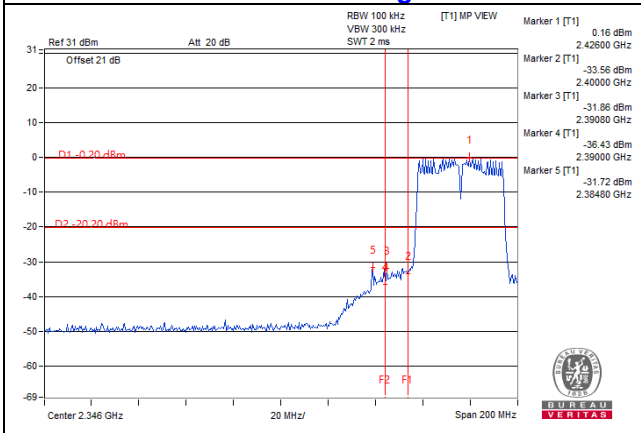
CH 6



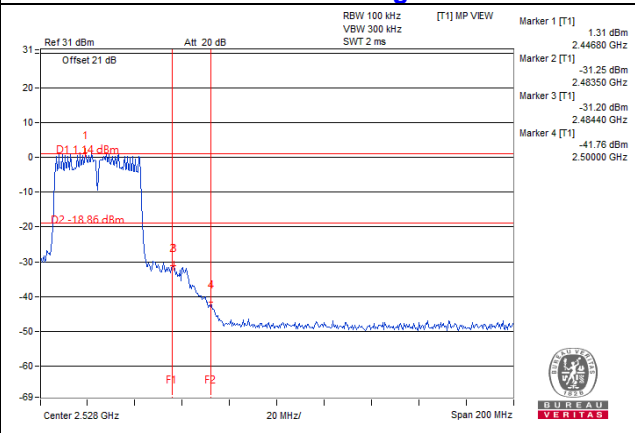
CH 9



CH 3 Band edge



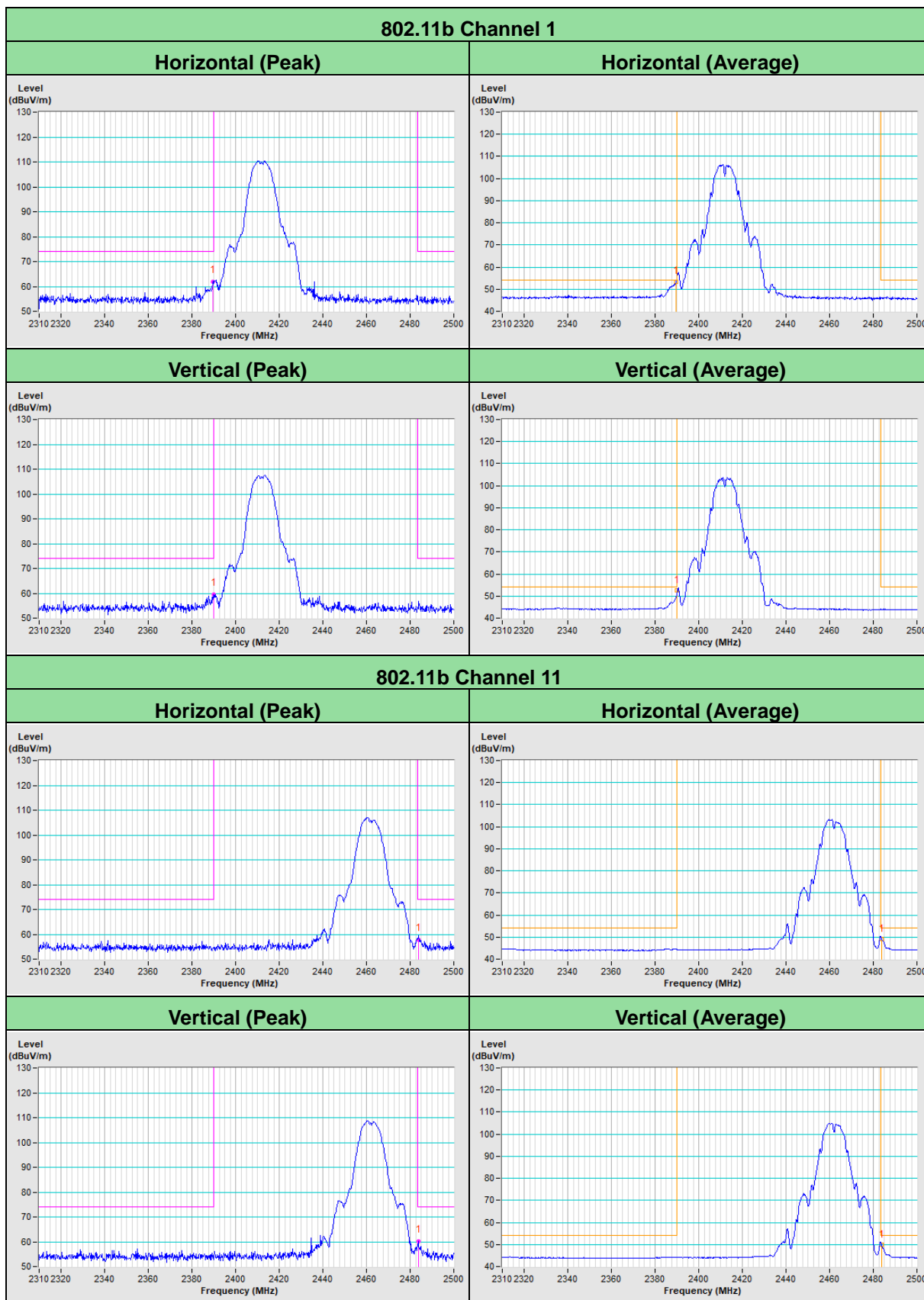
CH 9 Band edge



5 Pictures of Test Arrangements

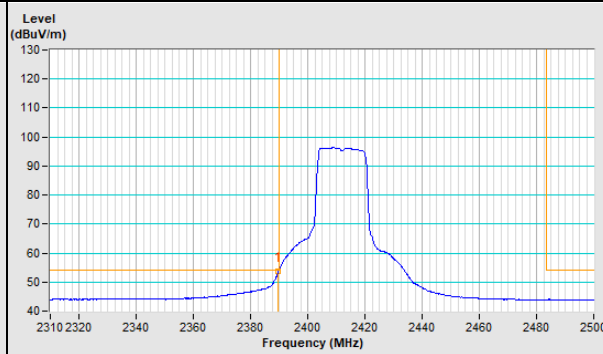
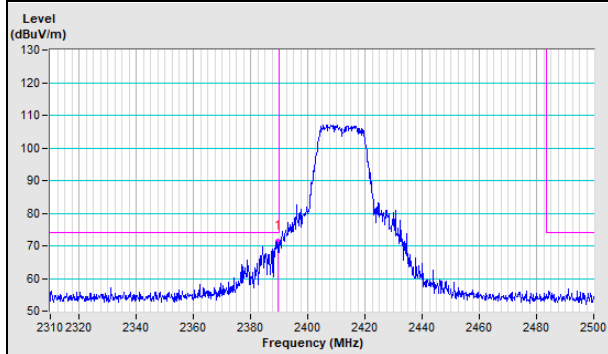
Please refer to the attached file (Test Setup Photo).

Annex A - Band-Edge Measurement

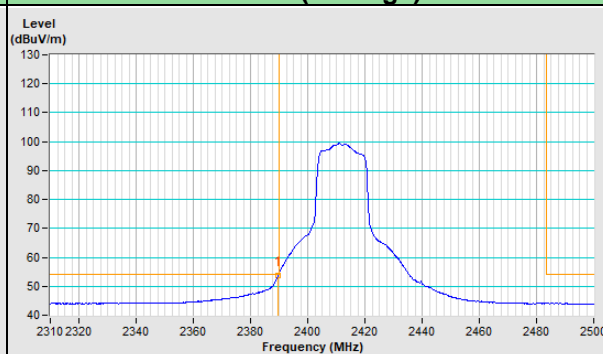
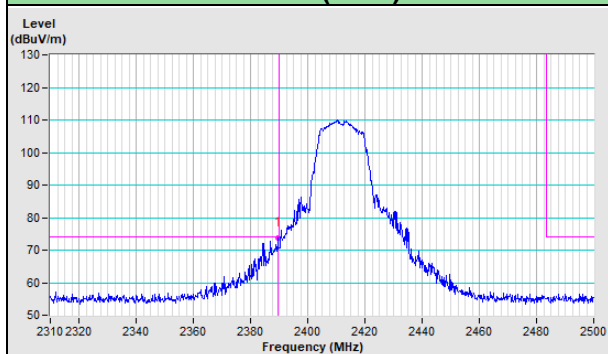


802.11g Channel 1

Horizontal (Peak)	Horizontal (Average)
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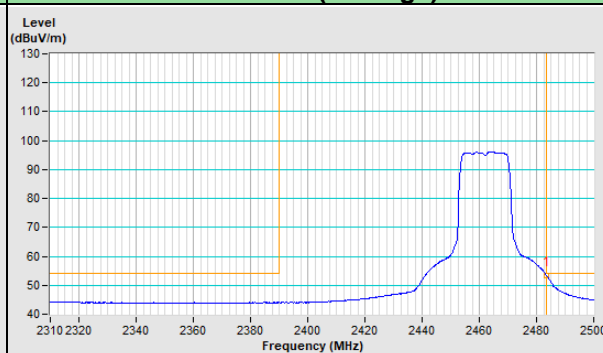
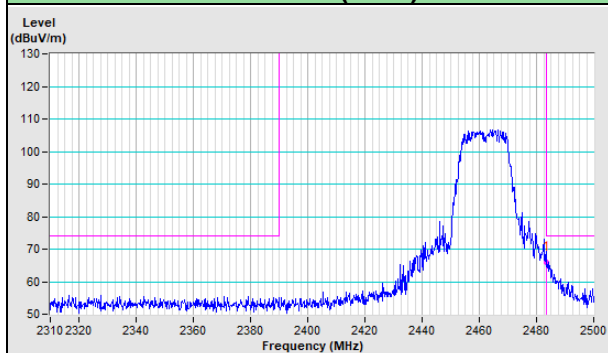


Vertical (Peak)	Vertical (Average)
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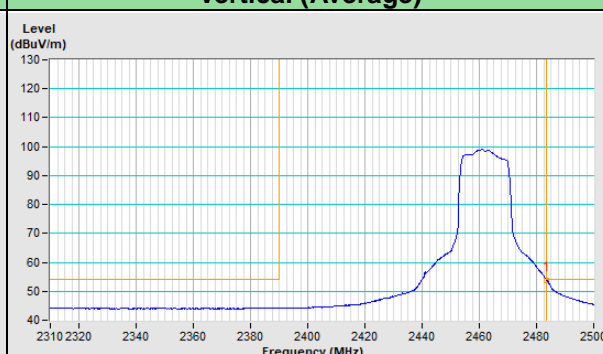
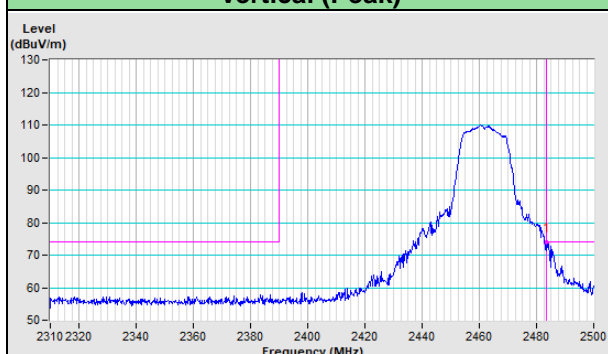


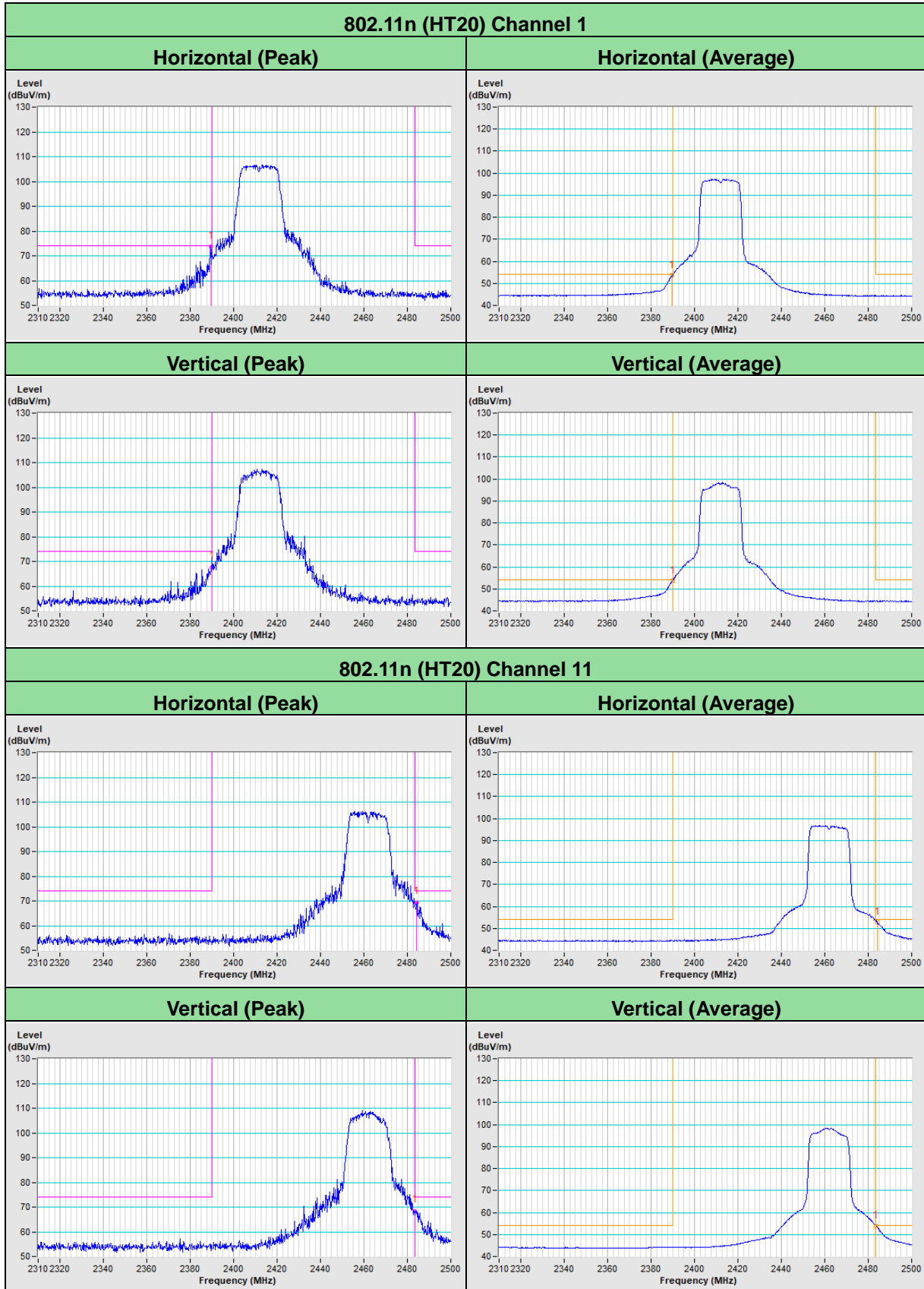
802.11g Channel 11

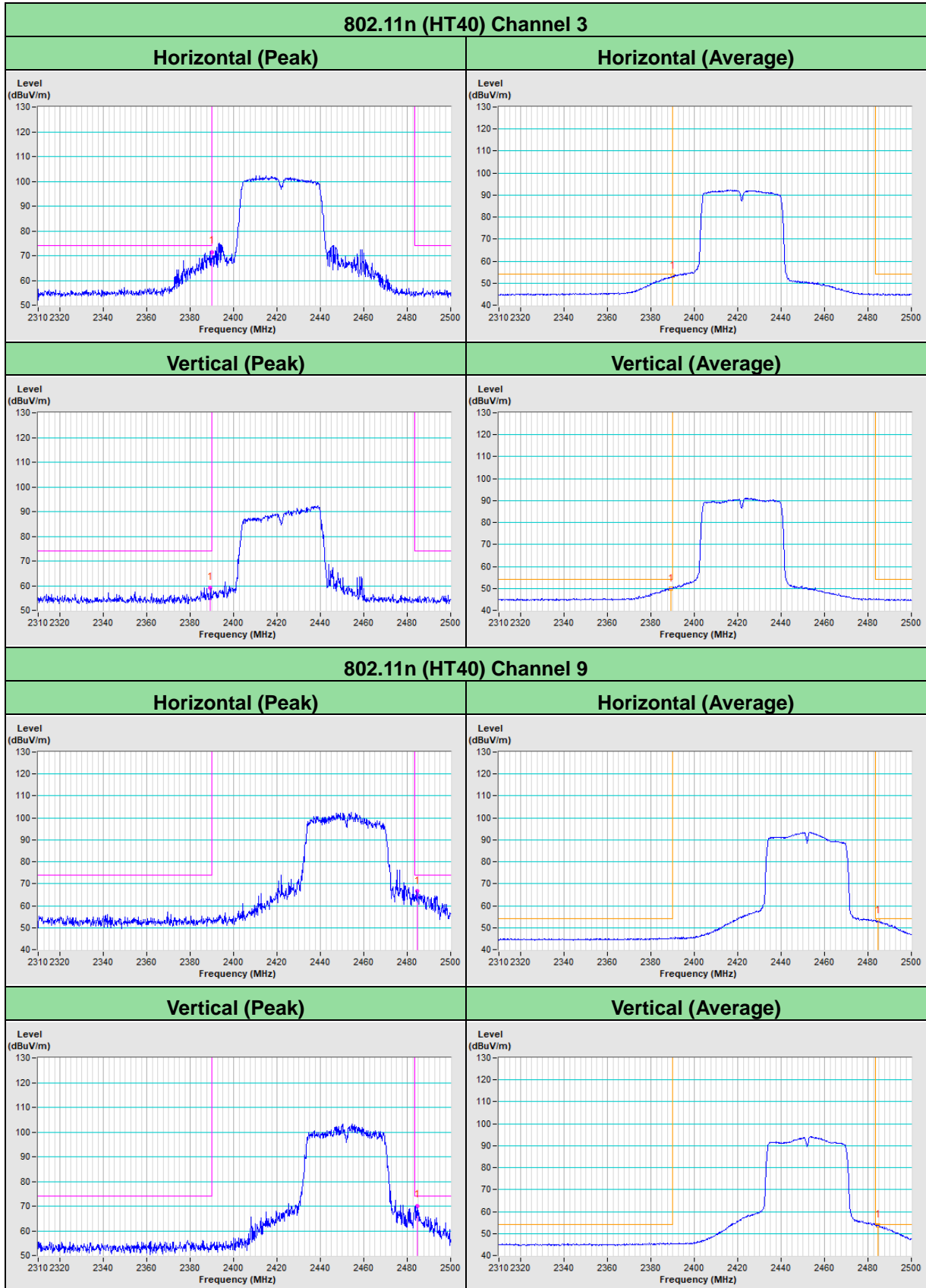
Horizontal (Peak)	Horizontal (Average)
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Vertical (Peak)	Vertical (Average)
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Appendix – Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited according to ISO/IEC 17025.

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

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