

FCC Test Report

Report No.: RFBEAD-WTW-P21030489 R2

FCC ID: 2AWAYSFCS1

Test Model: SFCS1

Received Date: Mar. 13, 2021

Test Date: Apr. 08 ~ Apr. 22, 2021

Issued Date: Sep. 22, 2021

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FCC Registration /
Designation Number: 788550 / TW0003



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Release Control Record

Issue No.	Description	Date Issued
RFBEAD-WTW-P21030489	Original Release	May 13, 2021
RFBEAD-WTW-P21030489 R1	Updated product, brand, model and applicant.	Aug. 24, 2021
RFBEAD-WTW-P21030489 R2	Added manufacturer and MPN on antenna information.	Sep. 22, 2021

1 Certificate of Conformity

Product: BioFire SpotFire

Brand: bioMérieux

Test Model: SFCS1

Sample Status: Engineering Sample

Applicant: BioFire Diagnostics, LLC

Test Date: Apr. 08 ~ Apr. 22, 2021

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 RF characteristics under the conditions specified in this report.

Prepared by : Gina Liu, **Date:** Sep. 22, 2021
Gina Liu / Specialist

Approved by : Dylan Chiou, **Date:** Sep. 22, 2021
Dylan Chiou / Senior 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 -4.35 dB at 0.70238 MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -0.8 dB at 2390 MHz, 2483.5 MHz.
15.247(d)	Antenna Port Emission	Pass	Meet the requirement of limit.
15.247(a)(2)	6 dB Bandwidth	Pass	Meet the requirement of limit.
---	Occupied Bandwidth Measurement	Pass	Reference only
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 RSMA not a standard connector.

Note:

- For 2.4G 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) (±)
Conducted Emissions at mains ports	150 kHz ~ 30 MHz	2.79 dB
Radiated Emissions up to 1 GHz	9 kHz ~ 30 MHz	3.04 dB
	30 MHz ~ 200 MHz	3.86 dB
	200 MHz ~ 1000 MHz	3.87 dB
Radiated Emissions above 1 GHz	1 GHz ~ 18 GHz	2.29 dB
	18 GHz ~ 40 GHz	2.29 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	BioFire SpotFire
Brand	bioMérieux
Test Model	SFCS1
Status of EUT	Engineering Sample
Power Supply Rating	100-240Vac
Modulation Type	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
Modulation Technology	DSSS, OFDM
Transfer Rate	802.11b: 11.0 / 5.5 / 2.0 / 1.0 Mbps 802.11g: 54.0 / 48.0 / 36.0 / 24.0 / 18.0 / 12.0 / 9.0 / 6.0 Mbps 802.11n: up to 300.0 Mbps
Operating Frequency	2412 ~ 2462 MHz
Number of Channel	11 for 802.11b, 802.11g, 802.11n (HT20) 7 for 802.11n (HT40)
Output Power	213.21 mW
Antenna Type	Refer to Note as below
Antenna Connector	Refer to Note as below
Accessory Device	1.83m shielded power cable without core
Data Cable Supplied	Refer to Note as below

Note:

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

Modulation Mode	Tx Function
802.11b	2TX
802.11g	2TX
802.11n (HT20)	2TX
802.11n (HT40)	2TX

- The following antennas were provided to the EUT.

No.	Antenna Type	Manufacturer	MPN	Connector	Gain (dBi)	
					2.4-2.5GHz	5.150-5.850GHz
1	Dipole	BJTEK NAVIGATION, INC.	BJHOT160000043B00B-B	RP-SMA(M)	2.5	3.0
2	Dipole	Joinsoon Electronics Manufacturing CO., LTD. (JEM)	1510-0237-0041	RSMA	3.74	3.70

*The maximum antenna gain is chosen for final test.

*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.

- We had pre-tested all modes at 240V/60Hz and 120V/60Hz, test mode at 120V/60Hz was the worst case and only this mode was presented in the report.
- The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or user's manual.

3.2 Description of Test Modes

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

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

7 channels are provided for 802.11n (HT40):

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

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 1 GHz
PLC: Power Line Conducted Emission

RE<1G: Radiated Emission below 1 GHz
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 **Z-plane**.
NOTE: "-" means no effect.

Radiated Emission Test (Above 1 GHz):

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

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

Radiated Emission Test (Below 1 GHz):

- ☒ 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 (HT40)	3 to 9	3	OFDM	BPSK	13.5

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.

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
-	802.11n (HT40)	3 to 9	3	OFDM	BPSK	13.5

Bandedge Measurement:

- ☒ 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, 11	DSSS	DBPSK	1.0
-	802.11g	1 to 11	1, 11	OFDM	BPSK	6.0
-	802.11n (HT20)	1 to 11	1, 11	OFDM	BPSK	6.5
-	802.11n (HT40)	3 to 9	3, 9	OFDM	BPSK	13.5

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.

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

Test Condition:

Applicable To	Environmental Conditions	Input Power	Tested by
RE $\geq$ 1G	25 deg. C, 70 % RH	120 Vac, 60 Hz	Noah Chang
RE<1G	19 deg. C, 68 % RH	120 Vac, 60 Hz	Noah Chang
PLC	24 deg. C, 69 % RH	120 Vac, 60 Hz	Edison Lee
APCM	25 deg. C, 60 % RH	120 Vac, 60 Hz	Ivan Tseng

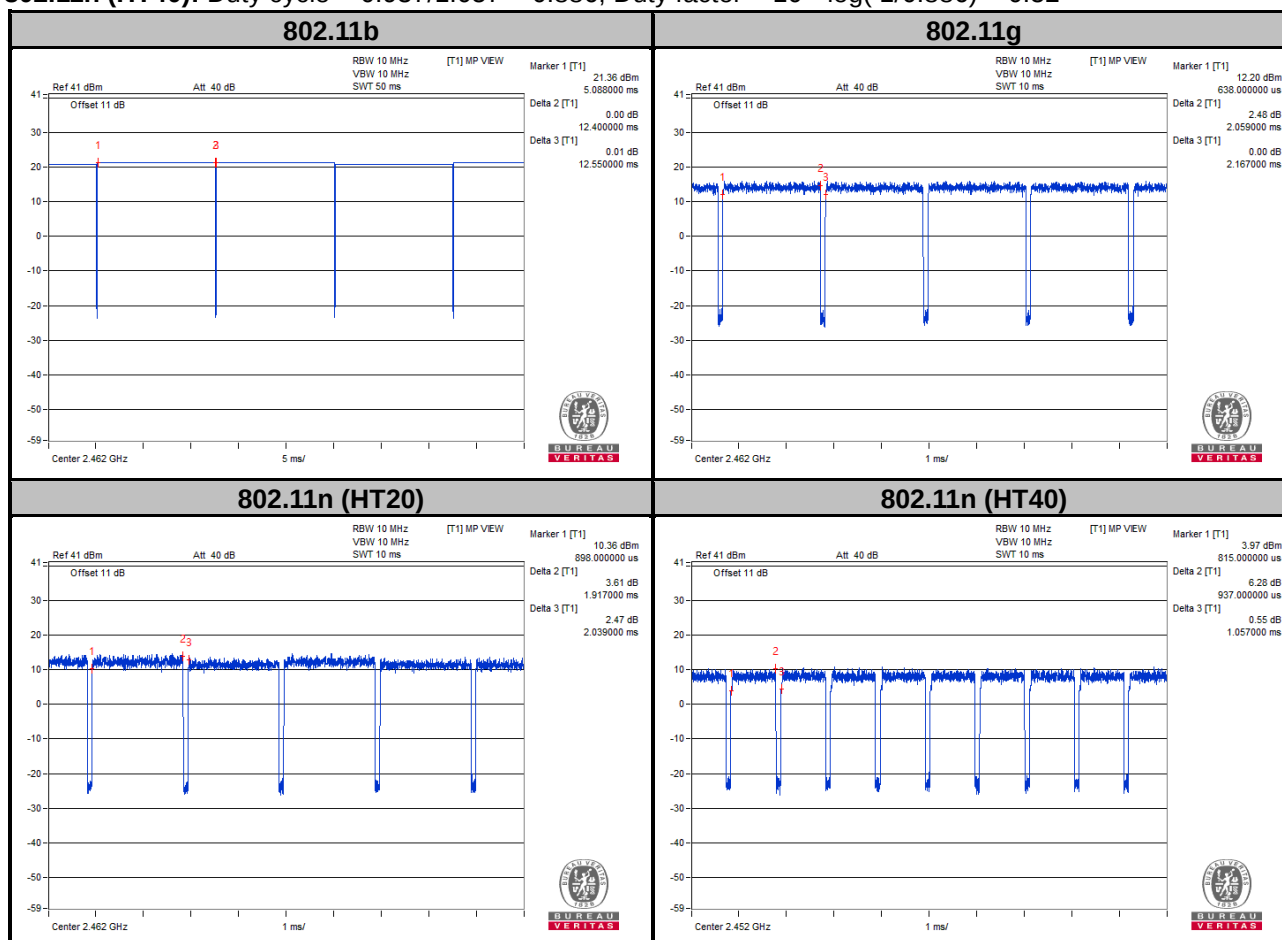
3.3 Duty Cycle of Test Signal

802.11b: Duty cycle = $12.4/12.55 = 0.988$, Duty cycle of test signal is $\geq 98\%$, duty factor is not required.
Duty cycle of test signal is $< 98\%$, duty factor shall be considered.

802.11g: Duty cycle = $2.059/2.167 = 0.950$, Duty factor = $10 * \log(1/0.950) = 0.22$

802.11n (HT20): Duty cycle = $1.917/2.039 = 0.94$, Duty factor = $10 * \log(1/0.94) = 0.27$

802.11n (HT40): Duty cycle = $0.937/1.057 = 0.886$, Duty factor = $10 * \log(1/0.886) = 0.52$



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.

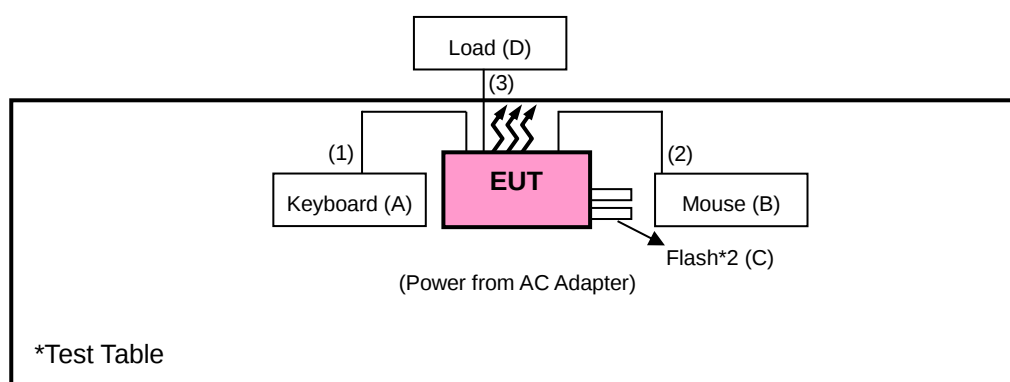
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Keyboard	DELL	RT7D50	CN-0J4624-37172-44T-000M	DOC	--
B.	USB MOUSE	Microsoft	ITE78CJ	N/A	FCC DoC Approved	--
C.	Flash*2	HP	v250W	05	N/A	--
				09		
D.	Load	N/A	N/A	N/A	N/A	--

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	USB Cable	1	1.8	N	0	--
2.	USB Cable	1	1.8	N	0	--
3.	LAN Cable	1	1.5	N	0	RJ45

Note:

1. All power cords of the above support units are non-shielded (1.8m).

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 Meas Guidance v05r02

KDB 662911 D01 Multiple Transmitter Output v02r01

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 20 dB 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 1000 MHz, 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 20 dB under any condition of modulation.

4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver ROHDE & SCHWARZ	ESCI	100424	Dec. 31, 2020	Dec. 30, 2021
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100040	Sep. 16, 2020	Sep. 15, 2021
BILOG Antenna SCHWARZBECK	VULB9168	9168-155	Nov. 03, 2020	Nov. 02, 2021
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-1170	Nov. 22, 2020	Nov. 21, 2021
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Nov. 22, 2020	Nov. 21, 2021
Loop Antenna EMCI	EM-6879	269	Sep. 17, 2020	Sep. 16, 2021
Loop Antenna TESEQ	HLA 6121	45745	Jul. 06, 2020	Jul. 05, 2021
Preamplifier Agilent (Below 1GHz)	8447D	2944A10631	Jun. 08, 2020	Jun. 07, 2021
Preamplifier KEYSIGHT (Above 1GHz)	83017A	MY53270295	Jun. 08, 2020	Jun. 07, 2021
RF Coaxial Cable WOKEN With 5dB PAD	8D-FB	Cable-CH4-01	Aug. 16, 2020	Aug. 15, 2021
RF Coaxial Cable EMCI	EMC102-KM-KM-3000	150929	Aug. 16, 2020	Aug. 15, 2021
RF Coaxial Cable EMCI	EMC102-KM-KM-600	150928	Aug. 16, 2020	Aug. 15, 2021
RF signal cable HUBER+SUHNER	SUCOFLEX 104	MY 13380+295012/04	Jun. 08, 2020	Jun. 07, 2021
RF signal cable HUBER+SUHNER	SUCOFLEX 104	Cable-CH4-03 (250724)	Jun. 08, 2020	Jun. 07, 2021
Software BV ADT	ADT_Radiated_V7.6.15.9.5	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	010303	NA	NA
Antenna Tower Controller BV ADT	AT100	AT93021703	NA	NA
Turn Table BV ADT	TT100	TT93021703	NA	NA
Turn Table Controller BV ADT	SC100	SC93021703	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
Pre-amplifier (18GHz-40GHz) EMC	EMC184045B	980175	Sep. 04, 2020	Sep. 03, 2021
USB Wideband Power Sensor KEYSIGHT	U2021XA	MY55050005/MY55190004/MY55190007/MY55210005	Jul. 13, 2020	Jul. 12, 2021

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.

4.1.3 Test Procedures

For Radiated Emission below 30 MHz

- 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 9 kHz at frequency below 30 MHz.

For Radiated Emission above 30 MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30 MHz ~ 1 GHz) / 1.5 meters (for above 1 GHz) 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 detected 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:

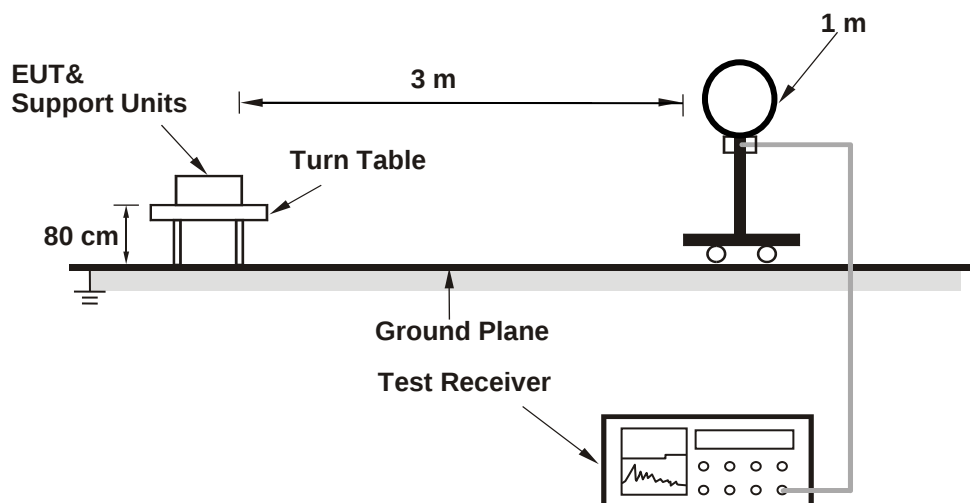
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) or Peak detection (PK) at frequency below 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1 GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is $\geq 1/T$ (Duty cycle $< 98\%$) or 10 Hz (Duty cycle $\geq 98\%$) for Average detection (AV) at frequency above 1 GHz.
(11b: RBW = 1 MHz, VBW = 10 Hz ; 11g: RBW = 1 MHz, VBW = 1 kHz ;
11n (HT20): RBW = 1 MHz, VBW = 1 kHz ; 11n (HT40): RBW = 1 MHz, VBW = 3 kHz)
4. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

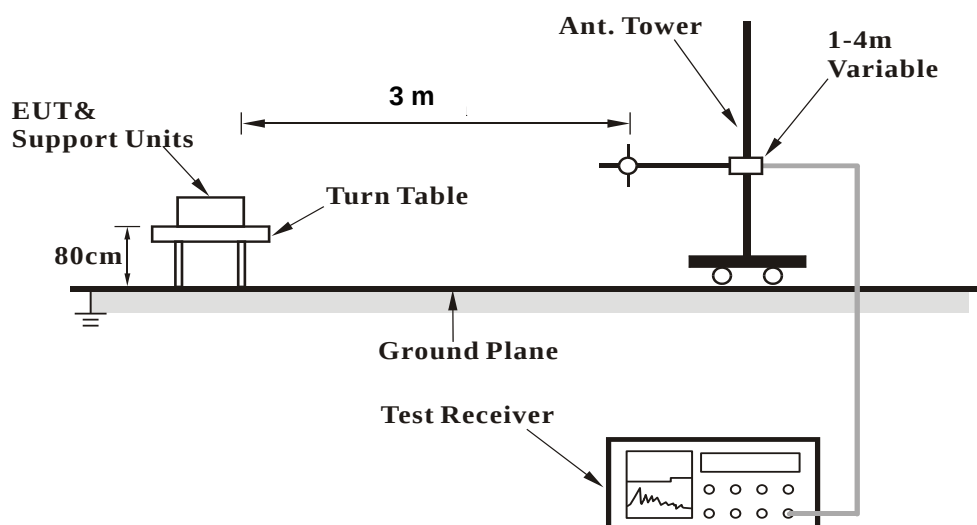
No deviation.

4.1.5 Test Set Up

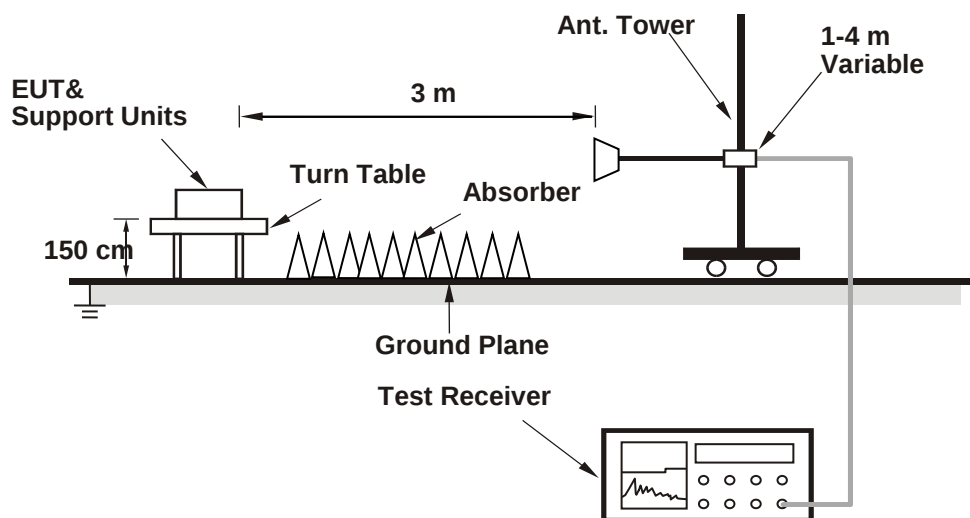
<Radiated Emission below 30 MHz>



<Radiated Emission 30 MHz to 1 GHz>



<Radiated Emission above 1 GHz>



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

4.1.6 EUT Operating Conditions

- Placed the EUT on a testing table.
- Use the software to control the EUT under transmission condition continuously at specific channel frequency.

4.1.7 Test Results

Above 1 GHz 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	2390.00	60.0 PK	74.0	-14.0	1.54 H	305	25.5	34.5
2	2390.00	47.6 AV	54.0	-6.4	1.54 H	305	13.1	34.5
3	*2412.00	110.3 PK			1.54 H	305	75.8	34.5
4	*2412.00	109.1 AV			1.54 H	305	74.6	34.5
5	4824.00	47.4 PK	74.0	-26.6	1.53 H	137	45.0	2.4
6	4824.00	42.2 AV	54.0	-11.8	1.53 H	137	39.8	2.4
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	2383.70	65.7 PK	74.0	-8.3	1.97 V	171	31.1	34.6
2	2383.70	53.1 AV	54.0	-0.9	1.97 V	171	18.5	34.6
3	*2412.00	121.2 PK			1.97 V	171	86.7	34.5
4	*2412.00	118.7 AV			1.97 V	171	84.2	34.5
5	4824.00	50.3 PK	74.0	-23.7	1.50 V	217	47.9	2.4
6	4824.00	45.6 AV	54.0	-8.4	1.50 V	217	43.2	2.4

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	*2437.00	111.6 PK			1.55 H	300	77.1	34.5
2	*2437.00	110.6 AV			1.55 H	300	76.1	34.5
3	4874.00	45.2 PK	74.0	-28.8	1.65 H	133	42.7	2.5
4	4874.00	37.0 AV	54.0	-17.0	1.65 H	133	34.5	2.5
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	*2437.00	121.8 PK			2.26 V	170	87.3	34.5
2	*2437.00	120.7 AV			2.26 V	170	86.2	34.5
3	4874.00	47.7 PK	74.0	-26.3	1.67 V	217	45.2	2.5
4	4874.00	42.4 AV	54.0	-11.6	1.67 V	217	39.9	2.5

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.
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	108.6 PK			1.65 H	308	74.2	34.4
2	*2462.00	107.1 AV			1.65 H	308	72.7	34.4
3	2483.50	60.1 PK	74.0	-13.9	1.65 H	308	25.7	34.4
4	2483.50	48.1 AV	54.0	-5.9	1.65 H	308	13.7	34.4
5	4924.00	49.1 PK	74.0	-24.9	1.59 H	120	46.6	2.5
6	4924.00	40.1 AV	54.0	-13.9	1.59 H	120	37.6	2.5
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	120.0 PK			1.89 V	167	85.6	34.4
2	*2462.00	119.0 AV			1.89 V	167	84.6	34.4
3	2483.50	65.7 PK	74.0	-8.3	1.89 V	167	31.3	34.4
4	2483.50	53.0 AV	54.0	-1.0	1.89 V	167	18.6	34.4
5	4924.00	52.6 PK	74.0	-21.4	1.59 V	210	50.1	2.5
6	4924.00	44.7 AV	54.0	-9.3	1.59 V	210	42.2	2.5

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.
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	2390.00	59.9 PK	74.0	-14.1	1.66 H	305	25.4	34.5
2	2390.00	47.2 AV	54.0	-6.8	1.66 H	305	12.7	34.5
3	*2412.00	105.6 PK			1.66 H	305	71.1	34.5
4	*2412.00	95.9 AV			1.66 H	305	61.4	34.5
5	4824.00	44.0 PK	74.0	-30.0	2.15 H	33	41.6	2.4
6	4824.00	33.1 AV	54.0	-20.9	2.15 H	33	30.7	2.4
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	65.2 PK	74.0	-8.8	1.68 V	170	30.7	34.5
2	2390.00	53.2 AV	54.0	-0.8	1.68 V	170	18.7	34.5
3	*2412.00	117.9 PK			1.68 V	170	83.4	34.5
4	*2412.00	108.0 AV			1.68 V	170	73.5	34.5
5	4824.00	45.3 PK	74.0	-28.7	1.59 V	206	42.9	2.4
6	4824.00	34.1 AV	54.0	-19.9	1.59 V	206	31.7	2.4

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	*2437.00	109.8 PK			1.60 H	300	75.3	34.5
2	*2437.00	100.4 AV			1.60 H	300	65.9	34.5
3	2483.50	59.9 PK	74.0	-14.1	1.60 H	300	25.5	34.4
4	2483.50	47.3 AV	54.0	-6.7	1.60 H	300	12.9	34.4
5	4874.00	43.0 PK	74.0	-31.0	1.00 H	306	40.5	2.5
6	4874.00	33.5 AV	54.0	-20.5	1.00 H	306	31.0	2.5
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	*2437.00	121.5 PK			1.56 V	166	87.0	34.5
2	*2437.00	111.9 AV			1.56 V	166	77.4	34.5
3	2483.50	64.8 PK	74.0	-9.2	1.56 V	166	30.4	34.4
4	2483.50	52.5 AV	54.0	-1.5	1.56 V	166	18.1	34.4
5	4874.00	44.1 PK	74.0	-29.9	1.36 V	211	41.6	2.5
6	4874.00	34.0 AV	54.0	-20.0	1.36 V	211	31.5	2.5

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.
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	103.0 PK			1.69 H	301	68.6	34.4
2	*2462.00	93.4 AV			1.69 H	301	59.0	34.4
3	2483.50	60.5 PK	74.0	-13.5	1.69 H	301	26.1	34.4
4	2483.50	47.6 AV	54.0	-6.4	1.69 H	301	13.2	34.4
5	4924.00	43.6 PK	74.0	-30.4	3.18 H	25	41.1	2.5
6	4924.00	33.5 AV	54.0	-20.5	3.18 H	25	31.0	2.5
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	115.1 PK			1.46 V	191	80.7	34.4
2	*2462.00	105.3 AV			1.46 V	191	70.9	34.4
3	2483.50	66.7 PK	74.0	-7.3	1.46 V	191	32.3	34.4
4	2483.50	53.2 AV	54.0	-0.8	1.46 V	191	18.8	34.4
5	4924.00	44.1 PK	74.0	-29.9	3.16 V	216	41.6	2.5
6	4924.00	34.3 AV	54.0	-19.7	3.16 V	216	31.8	2.5

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.
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	2390.00	60.1 PK	74.0	-13.9	1.69 H	310	25.6	34.5
2	2390.00	47.2 AV	54.0	-6.8	1.69 H	310	12.7	34.5
3	*2412.00	103.7 PK			1.69 H	310	69.2	34.5
4	*2412.00	93.2 AV			1.69 H	310	58.7	34.5
5	4824.00	43.6 PK	74.0	-30.4	1.50 H	315	41.2	2.4
6	4824.00	33.0 AV	54.0	-21.0	1.50 H	315	30.6	2.4
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	66.5 PK	74.0	-7.5	1.78 V	166	32.0	34.5
2	2390.00	53.0 AV	54.0	-1.0	1.78 V	166	18.5	34.5
3	*2412.00	114.9 PK			1.78 V	166	80.4	34.5
4	*2412.00	105.4 AV			1.78 V	166	70.9	34.5
5	4824.00	44.4 PK	74.0	-29.6	1.20 V	211	42.0	2.4
6	4824.00	33.6 AV	54.0	-20.4	1.20 V	211	31.2	2.4

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	*2437.00	109.7 PK			1.50 H	319	75.2	34.5
2	*2437.00	99.7 AV			1.50 H	319	65.2	34.5
3	2483.50	60.1 PK	74.0	-13.9	1.50 H	319	25.7	34.4
4	2483.50	47.1 AV	54.0	-6.9	1.50 H	319	12.7	34.4
5	4874.00	43.2 PK	74.0	-30.8	1.21 H	300	40.7	2.5
6	4874.00	33.0 AV	54.0	-21.0	1.21 H	300	30.5	2.5
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	*2437.00	121.2 PK			1.97 V	165	86.7	34.5
2	*2437.00	111.8 AV			1.97 V	165	77.3	34.5
3	2483.50	63.7 PK	74.0	-10.3	1.97 V	165	29.3	34.4
4	2483.50	52.5 AV	54.0	-1.5	1.97 V	165	18.1	34.4
5	4874.00	43.6 PK	74.0	-30.4	3.21 V	203	41.1	2.5
6	4874.00	33.5 AV	54.0	-20.5	3.21 V	203	31.0	2.5

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.
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	100.9 PK			1.60 H	308	66.5	34.4
2	*2462.00	92.2 AV			1.60 H	308	57.8	34.4
3	2483.50	60.8 PK	74.0	-13.2	1.60 H	308	26.4	34.4
4	2483.50	47.7 AV	54.0	-6.3	1.60 H	308	13.3	34.4
5	4924.00	42.6 PK	74.0	-31.4	1.33 H	310	40.1	2.5
6	4924.00	32.8 AV	54.0	-21.2	1.33 H	310	30.3	2.5
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	113.1 PK			1.99 V	166	78.7	34.4
2	*2462.00	103.4 AV			1.99 V	166	69.0	34.4
3	2483.50	63.9 PK	74.0	-10.1	1.99 V	166	29.5	34.4
4	2483.50	52.6 AV	54.0	-1.4	1.99 V	166	18.2	34.4
5	4924.00	43.1 PK	74.0	-30.9	1.52 V	218	40.6	2.5
6	4924.00	33.2 AV	54.0	-20.8	1.52 V	218	30.7	2.5

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.
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	2390.00	62.4 PK	74.0	-11.6	1.63 H	302	27.9	34.5
2	2390.00	47.2 AV	54.0	-6.8	1.63 H	302	12.7	34.5
3	*2422.00	97.5 PK			1.63 H	302	63.1	34.4
4	*2422.00	88.1 AV			1.63 H	302	53.7	34.4
5	4844.00	42.6 PK	74.0	-31.4	2.16 H	203	40.0	2.6
6	4844.00	32.8 AV	54.0	-21.2	2.16 H	203	30.2	2.6
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	72.8 PK	74.0	-1.2	1.58 V	166	38.3	34.5
2	2390.00	53.2 AV	54.0	-0.8	1.58 V	166	18.7	34.5
3	*2422.00	108.4 PK			1.58 V	166	74.0	34.4
4	*2422.00	99.8 AV			1.58 V	166	65.4	34.4
5	4844.00	42.8 PK	74.0	-31.2	1.31 V	200	40.2	2.6
6	4844.00	33.3 AV	54.0	-20.7	1.31 V	200	30.7	2.6

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.
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	*2437.00	97.1 PK			1.60 H	308	62.6	34.5
2	*2437.00	88.0 AV			1.60 H	308	53.5	34.5
3	2483.50	60.2 PK	74.0	-13.8	1.60 H	308	25.8	34.4
4	2483.50	47.3 AV	54.0	-6.7	1.60 H	308	12.9	34.4
5	4874.00	44.3 PK	74.0	-29.7	2.33 H	316	41.8	2.5
6	4874.00	33.6 AV	54.0	-20.4	2.33 H	316	31.1	2.5
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	*2437.00	109.3 PK			1.83 V	168	74.8	34.5
2	*2437.00	100.2 AV			1.83 V	168	65.7	34.5
3	2483.50	66.8 PK	74.0	-7.2	1.68 V	183	32.4	34.4
4	2483.50	52.6 AV	54.0	-1.4	1.68 V	183	18.2	34.4
5	4874.00	44.8 PK	74.0	-29.2	2.00 V	217	42.3	2.5
6	4874.00	34.5 AV	54.0	-19.5	2.00 V	217	32.0	2.5

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.
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	95.5 PK			1.66 H	315	61.1	34.4
2	*2452.00	86.5 AV			1.66 H	315	52.1	34.4
3	2483.50	60.3 PK	74.0	-13.7	1.66 H	315	25.9	34.4
4	2483.50	47.4 AV	54.0	-6.6	1.66 H	315	13.0	34.4
5	4904.00	43.2 PK	74.0	-30.8	1.66 H	323	40.6	2.6
6	4904.00	33.3 AV	54.0	-20.7	1.66 H	323	30.7	2.6
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	108.2 PK			1.64 V	165	73.8	34.4
2	*2452.00	98.8 AV			1.64 V	165	64.4	34.4
3	2483.50	71.8 PK	74.0	-2.2	1.64 V	165	37.4	34.4
4	2483.50	52.8 AV	54.0	-1.2	1.64 V	165	18.4	34.4
5	4904.00	42.8 PK	74.0	-31.2	3.16 V	212	40.2	2.6
6	4904.00	32.7 AV	54.0	-21.3	3.16 V	212	30.1	2.6

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.
5. " * ": Fundamental frequency.

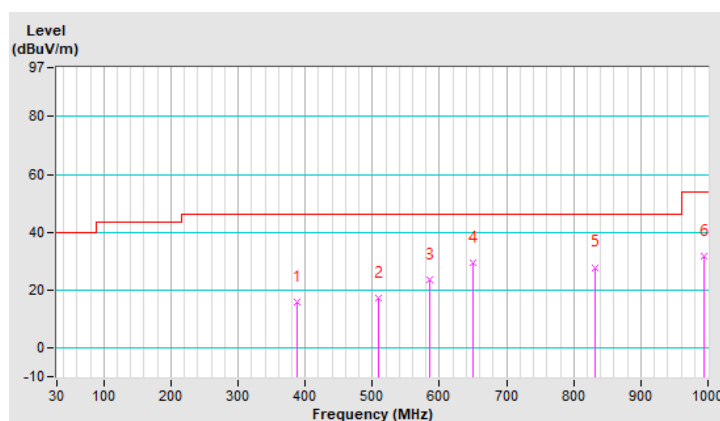
9 kHz ~ 1 GHz Worst-Case Data:

RF Mode	TX 802.11n (HT40)	Channel	CH 3 : 2422 MHz
Frequency Range	30MHz ~ 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	386.96	15.8 QP	46.0	-30.2	2.00 H	306	31.7	-15.9
2	508.21	17.0 QP	46.0	-29.0	1.01 H	2	30.2	-13.2
3	584.84	23.7 QP	46.0	-22.3	1.01 H	2	35.3	-11.6
4	649.83	29.5 QP	46.0	-16.5	1.01 H	206	39.9	-10.4
5	832.19	27.9 QP	46.0	-18.1	1.01 H	16	35.5	-7.6
6	993.21	31.8 QP	54.0	-22.2	1.50 H	310	37.4	-5.6

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.

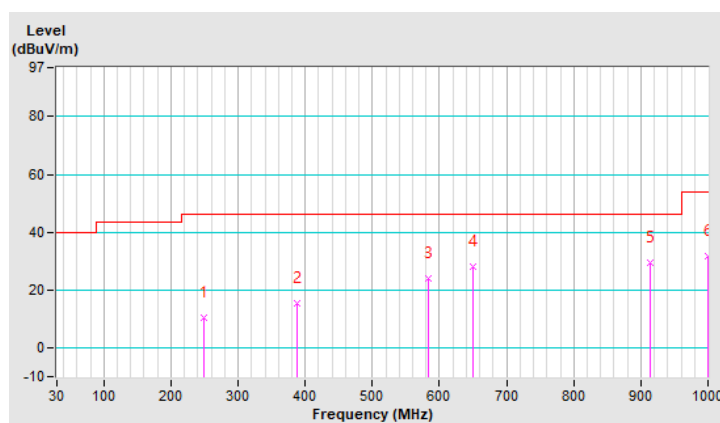


RF Mode	TX 802.11n (HT40)	Channel	CH 3 : 2422 MHz
Frequency Range	30MHz ~ 1GHz	Detector Function	Quasi-Peak (QP)

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	248.25	10.4 QP	46.0	-35.6	1.50 V	227	30.3	-19.9
2	386.96	15.5 QP	46.0	-30.5	1.01 V	125	31.4	-15.9
3	583.87	23.8 QP	46.0	-22.2	1.01 V	5	35.4	-11.6
4	650.80	28.1 QP	46.0	-17.9	1.01 V	207	38.5	-10.4
5	913.67	29.6 QP	46.0	-16.4	2.00 V	238	36.4	-6.8
6	999.03	31.9 QP	54.0	-22.1	1.01 V	177	37.4	-5.5

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 0.50 MHz.

4.2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver ROHDE & SCHWARZ	ESCI	100613	Dec. 04, 2020	Dec. 03, 2021
RF signal cable (with 10dB PAD) Woken	5D-FB	Cable-cond1-01	Jan. 16, 2021	Jan. 15, 2022
LISN/AMN ROHDE & SCHWARZ (EUT)	ENV216	101826	Feb. 25, 2021	Feb. 24, 2022
LISN/AMN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Aug. 28, 2020	Aug. 27, 2021
Software ADT	BV ADT_Cond_ V7.3.7.4	NA	NA	NA

- Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
 2. The test was performed in HwaYa Shielded Room 1 (Conduction 1).
 3. The VCCI Site Registration No. is C-12040.

4.2.3 Test Procedures

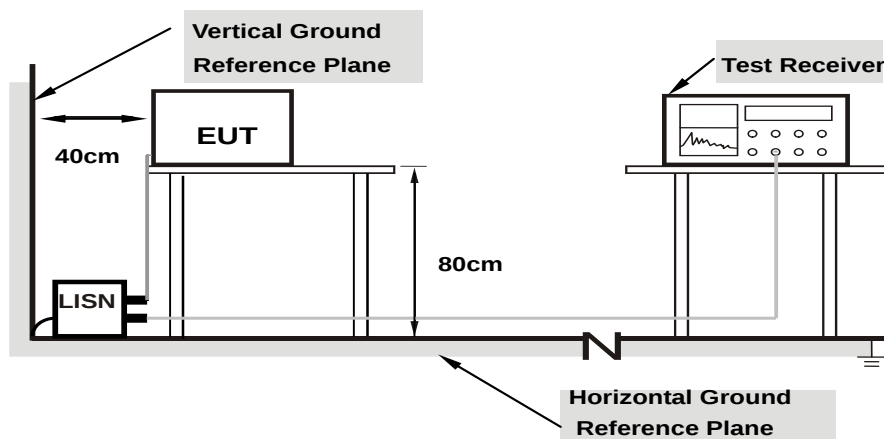
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/50 uH of coupling impedance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

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

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

- Placed the EUT on a testing table.
- Use the software to control the EUT under transmission condition continuously at specific channel frequency.

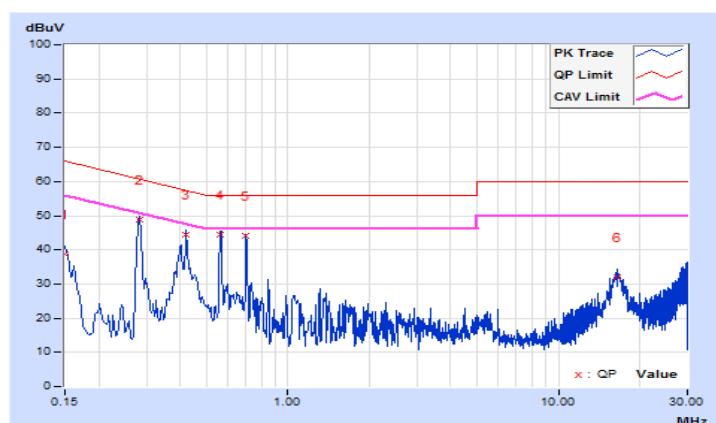
4.2.7 Test Results

Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	24°C, 69%RH
Tested by	Edison Lee	Test Date	2021/4/17

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	0.15000	9.75	28.92	22.55	38.67	32.30	66.00	56.00	-27.33	-23.70
2	0.28200	9.79	39.19	35.59	48.98	45.38	60.76	50.76	-11.78	-5.38
3	0.42200	9.83	34.54	31.17	44.37	41.00	57.41	47.41	-13.04	-6.41
4	0.56442	9.85	34.65	29.56	44.50	39.41	56.00	46.00	-11.50	-6.59
5	0.70200	9.87	34.08	30.84	43.95	40.71	56.00	46.00	-12.05	-5.29
6	16.45800	10.06	21.89	8.87	31.95	18.93	60.00	50.00	-28.05	-31.07

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

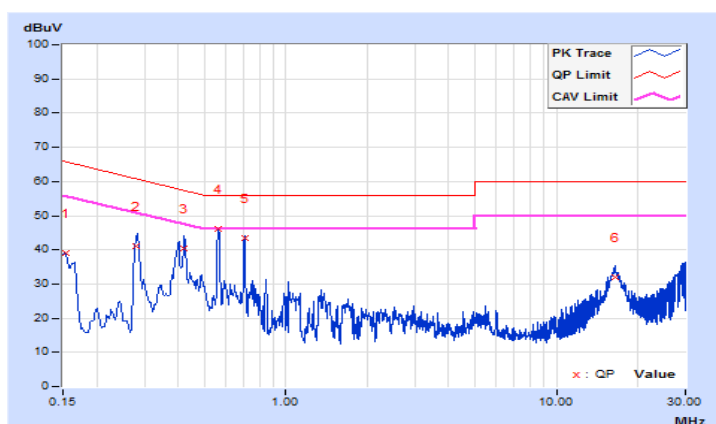


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	24°C, 69%RH
Tested by	Edison Lee	Test Date	2021/4/17

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	0.15400	9.81	29.17	18.55	38.98	28.36	65.78	55.78	-26.80	-27.42
2	0.28080	9.86	31.25	26.88	41.11	36.74	60.79	50.79	-19.68	-14.05
3	0.42200	9.90	30.58	29.52	40.48	39.42	57.41	47.41	-16.93	-7.99
4	0.56200	9.92	36.11	30.98	46.03	40.90	56.00	46.00	-9.97	-5.10
5	0.70238	9.93	33.58	31.72	43.51	41.65	56.00	46.00	-12.49	-4.35
6	16.42200	10.22	21.72	10.16	31.94	20.38	60.00	50.00	-28.06	-29.62

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

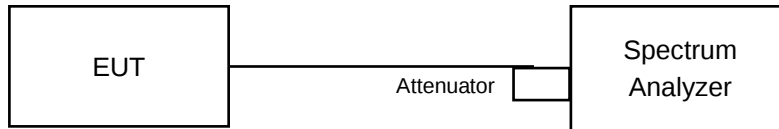


4.3 6 dB Bandwidth Measurement

4.3.1 Limits of 6 dB Bandwidth Measurement

The minimum of 6 dB Bandwidth Measurement is 0.5 MHz.

4.3.2 Test Setup



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedure

- Set resolution bandwidth (RBW) = 100 kHz
- Set the video bandwidth (VBW) $\geq 3 \times$ RBW, Detector = Peak.
- Trace mode = max hold.
- Sweep = auto couple.
- Measure the maximum width of the emission that is constrained by the frequencies associated with the two amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission

4.3.5 Deviation from Test Standard

No deviation.

4.3.6 EUT Operating Conditions

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

4.3.7 Test Results

802.11b

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	8.08	8.11	0.5	Pass
6	2437	9.57	8.12	0.5	Pass
11	2462	8.08	7.64	0.5	Pass

802.11g

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	15.18	15.20	0.5	Pass
6	2437	15.18	15.19	0.5	Pass
11	2462	15.38	15.57	0.5	Pass

802.11n (HT20)

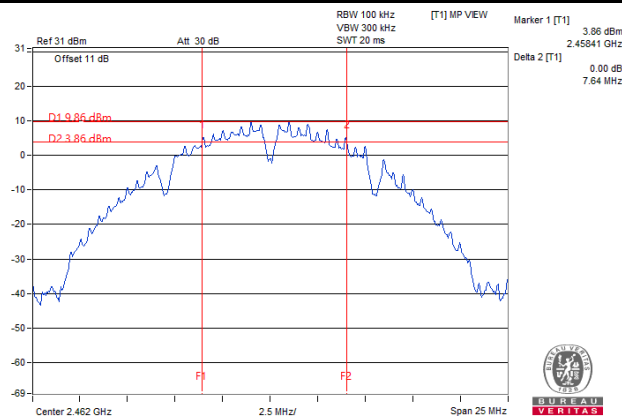
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	15.18	15.18	0.5	Pass
6	2437	15.17	15.17	0.5	Pass
11	2462	15.19	15.18	0.5	Pass

802.11n (HT40)

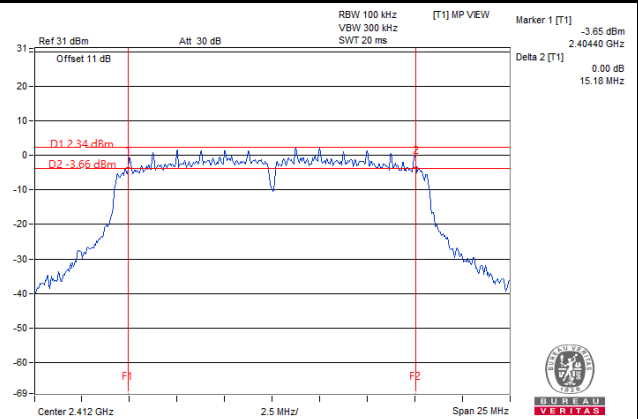
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
3	2422	35.20	35.23	0.5	Pass
6	2437	35.22	35.26	0.5	Pass
9	2452	35.28	35.27	0.5	Pass

Spectrum Plot of Worst Value

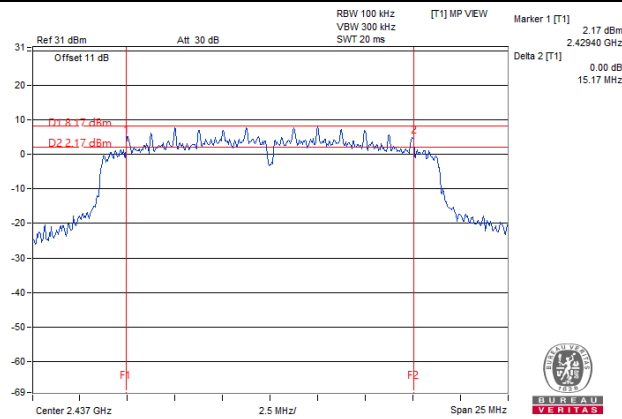
802.11b



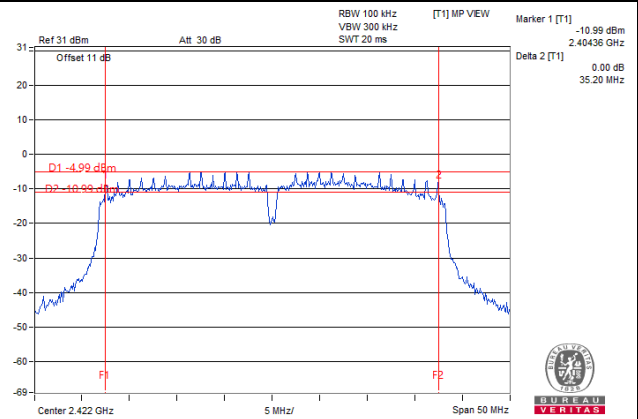
802.11g



802.11n (HT20)

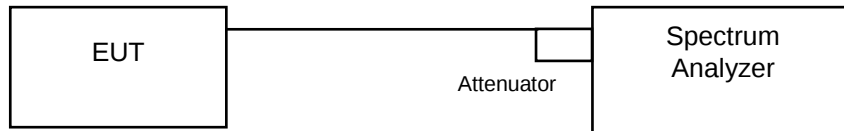


802.11n (HT40)



4.4 Occupied Bandwidth Measurement

4.4.1 Test Setup



4.4.2 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.4.3 Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with resolution bandwidth in the range of 1 % to 5 % of the anticipated emission bandwidth, and a video bandwidth at least 3x the resolution bandwidth and set the detector to sampling. The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5 % of the total mean power of a given emission.

4.4.4 Deviation from Test Standard

No deviation.

4.4.5 EUT Operating Conditions

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

4.4.6 Test Results

802.11b

Channel	Frequency (MHz)	Occupied Bandwidth (MHz)		Pass / Fail
		Chain 0	Chain 1	
1	2412	13.13	13.48	Pass
6	2437	13.92	14.04	Pass
11	2462	13.32	13.32	Pass

802.11g

Channel	Frequency (MHz)	Occupied Bandwidth (MHz)		Pass / Fail
		Chain 0	Chain 1	
1	2412	16.32	16.32	Pass
6	2437	16.56	16.44	Pass
11	2462	16.32	16.32	Pass

802.11n (HT20)

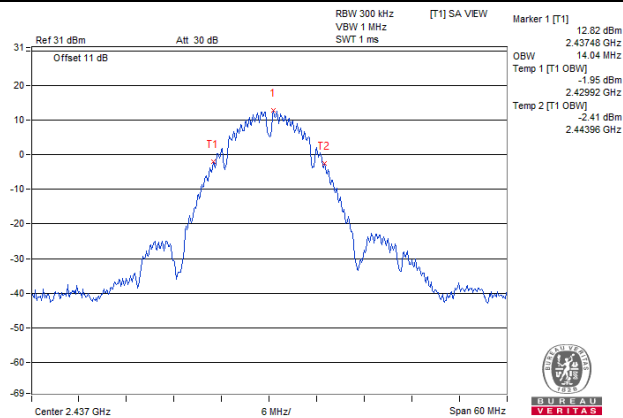
Channel	Frequency (MHz)	Occupied Bandwidth (MHz)		Pass / Fail
		Chain 0	Chain 1	
1	2412	17.40	17.40	Pass
6	2437	17.52	17.52	Pass
11	2462	17.40	17.40	Pass

802.11n (HT40)

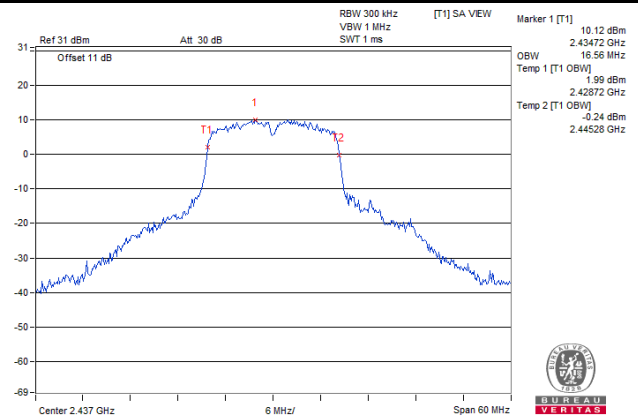
Channel	Frequency (MHz)	Occupied Bandwidth (MHz)		Pass / Fail
		Chain 0	Chain 1	
3	2422	36.12	36.12	Pass
6	2437	36.00	36.00	Pass
9	2452	36.00	36.12	Pass

Spectrum Plot of Worst Value

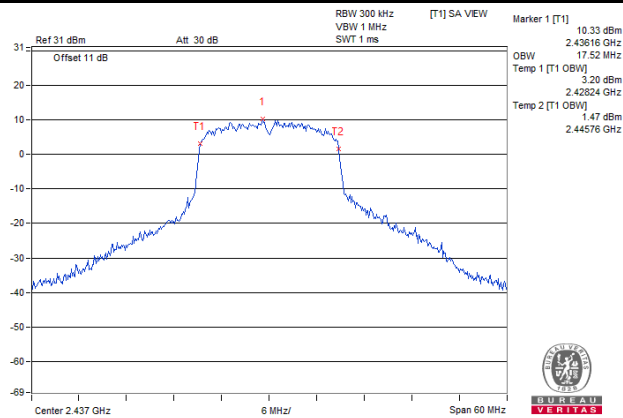
802.11b



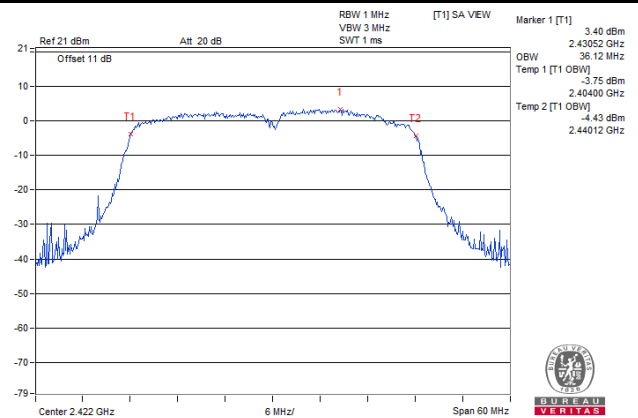
802.11g



802.11n (HT20)



802.11n (HT40)



4.5 Conducted Output Power Measurement

4.5.1 Limits of Conducted Output Power Measurement

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

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

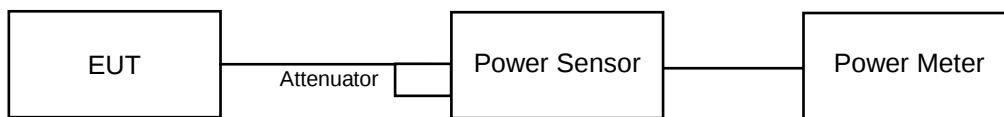
Array Gain = 0 dB (i.e., no array gain) for $NANT \leq 4$;

Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any NANT;

Array Gain = $5 \log(NANT/NSS)$ dB or 3 dB, whichever is less for 20 MHz channel widths with $NANT \geq 5$.

For power measurements on all other devices: Array Gain = $10 \log(NANT/NSS)$ dB.

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 Procedures

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.

4.5.5 Deviation from Test Standard

No deviation.

4.5.6 EUT Operating Conditions

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

4.5.7 Test Results

802.11b

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	18.09	18.62	137.195	21.37	30	Pass
6	2437	20.53	20.01	213.21	23.29	30	Pass
11	2462	18.53	18.35	139.676	21.45	30	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	12.50	13.56	40.481	16.07	30	Pass
6	2437	18.13	17.84	125.826	21.00	30	Pass
11	2462	11.24	11.07	26.098	14.17	30	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	10.30	11.32	24.267	13.85	30	Pass
6	2437	17.92	17.82	122.478	20.88	30	Pass
11	2462	9.30	9.03	16.51	12.18	30	Pass

802.11n (HT40)

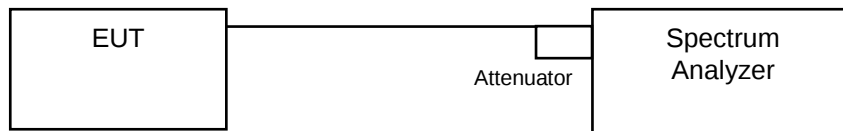
Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
3	2422	8.80	9.16	15.827	11.99	30	Pass
6	2437	9.23	8.90	16.138	12.08	30	Pass
9	2452	7.46	7.23	10.856	10.36	30	Pass

4.6 Power Spectral Density Measurement

4.6.1 Limits of Power Spectral Density Measurement

The Maximum of Power Spectral Density Measurement is 8 dBm in any 3 kHz band during any time interval of continuous transmission.

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

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

For Average Power (Duty cycle $\geq 98\%$)

- Set instrument center frequency to DTS channel center frequency.
- Set span to at least 1.5 times the OBW.
- Set RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- Set VBW $\geq 3 \times \text{RBW}$.
- Detector = power averaging (RMS) or sample detector (when RMS not available).
- Ensure that the number of measurement points in the sweep $\geq 2 \times \text{span/RBW}$.
- Sweep time = auto couple.
- Employ trace averaging (RMS) mode over a minimum of 100 traces.
- 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: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- e. Set VBW $\geq 3 \times \text{RBW}$.
- f. Detector = power averaging (RMS) or sample detector (when RMS not available).
- g. Ensure that the number of measurement points in the sweep $\geq 2 \times \text{span/RBW}$.
- 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.

4.6.5 Deviation from Test Standard

No deviation.

4.6.6 EUT Operating Condition

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

4.6.7 Test Results

802.11b

TX Chain	Channel	Freq. (MHz)	PSD (dBm/3 kHz)	10 log (N=2) dB	Total PSD (dBm/3 kHz)	Limit (dBm/3 kHz)	Pass / Fail
0	1	2412	-14.05	3.01	-11.04	7.25	Pass
	6	2437	-12.44	3.01	-9.43	7.25	Pass
	11	2462	-14.56	3.01	-11.55	7.25	Pass
1	1	2412	-13.67	3.01	-10.66	7.25	Pass
	6	2437	-12.16	3.01	-9.15	7.25	Pass
	11	2462	-14.66	3.01	-11.65	7.25	Pass

NOTE:

1. Directional gain = 3.74 dBi + 10log(2) = 6.75 dBi > 6 dBi , so the power density limit shall be reduced to 8-(6.75-6) = 7.25 dBm.
2. Method 2) C) of power density measurement of KDB 662911 is using for calculating total power density.

802.11g

TX Chain	Channel	Freq. (MHz)	PSD (dBm/3 kHz)	10 log (N=2) dB	Duty Factor (dB)	Total PSD (dBm/3 kHz)	Limit (dBm/3 kHz)	Pass / Fail
0	1	2412	-23.04	3.01	0.22	-19.81	7.25	Pass
	6	2437	-17.72	3.01	0.22	-14.49	7.25	Pass
	11	2462	-24.85	3.01	0.22	-21.62	7.25	Pass
1	1	2412	-21.97	3.01	0.22	-18.74	7.25	Pass
	6	2437	-18.59	3.01	0.22	-15.36	7.25	Pass
	11	2462	-25.88	3.01	0.22	-22.65	7.25	Pass

NOTE:

1. Directional gain = 3.74 dBi + 10log(2) = 6.75 dBi > 6 dBi , so the power density limit shall be reduced to 8-(6.75-6) = 7.25 dBm.
2. Method E) 2) c) of power density measurement of KDB 662911 is using for calculating total power density.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11n (HT20)

TX Chain	Channel	Freq. (MHz)	PSD (dBm/3 kHz)	10 log (N=2) dB	Duty Factor (dB)	Total PSD (dBm/3 kHz)	Limit (dBm/3 kHz)	Pass / Fail
0	1	2412	-24.9	3.01	0.27	-21.62	7.25	Pass
	6	2437	-18.13	3.01	0.27	-14.85	7.25	Pass
	11	2462	-27.78	3.01	0.27	-24.5	7.25	Pass
1	1	2412	-24.24	3.01	0.27	-20.96	7.25	Pass
	6	2437	-18.51	3.01	0.27	-15.23	7.25	Pass
	11	2462	-28.21	3.01	0.27	-24.93	7.25	Pass

NOTE:

- Directional gain = 3.74 dBi + 10log(2) = 6.75 dBi > 6 dBi , so the power density limit shall be reduced to 8-(6.75-6) = 7.25 dBm.
- Method E) 2) c) of power density measurement of KDB 662911 is using for calculating total power density.
- Refer to section 3.3 for duty cycle spectrum plot.

802.11n (HT40)

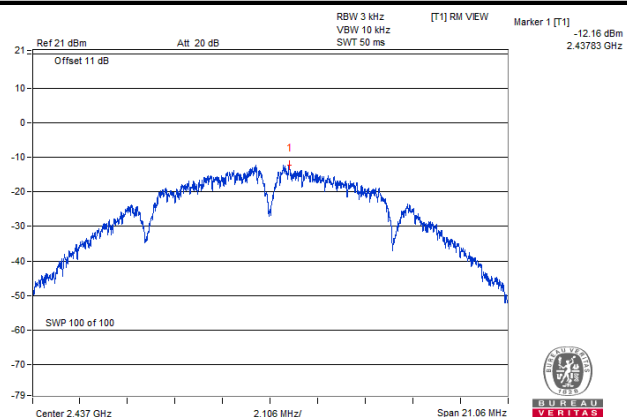
TX Chain	Channel	Freq. (MHz)	PSD (dBm/3 kHz)	10 log (N=2) dB	Duty Factor (dB)	Total PSD (dBm/3 kHz)	Limit (dBm/3 kHz)	Pass / Fail
0	3	2422	-30.71	3.01	0.52	-27.18	7.25	Pass
	6	2437	-30.81	3.01	0.52	-27.28	7.25	Pass
	9	2452	-32.77	3.01	0.52	-29.24	7.25	Pass
1	3	2422	-30.63	3.01	0.52	-27.1	7.25	Pass
	6	2437	-31.09	3.01	0.52	-27.56	7.25	Pass
	9	2452	-33.57	3.01	0.52	-30.04	7.25	Pass

NOTE:

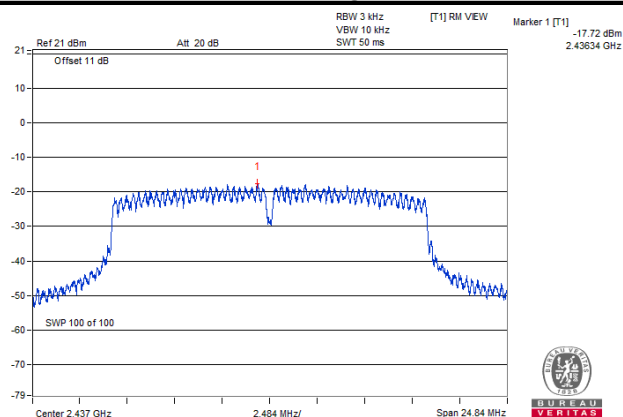
- Directional gain = 3.74 dBi + 10log(2) = 6.75 dBi > 6 dBi , so the power density limit shall be reduced to 8-(6.75-6) = 7.25 dBm.
- Method E) 2) c) of power density measurement of KDB 662911 is using for calculating total power density.
- Refer to section 3.3 for duty cycle spectrum plot.

Spectrum Plot of Worst Value

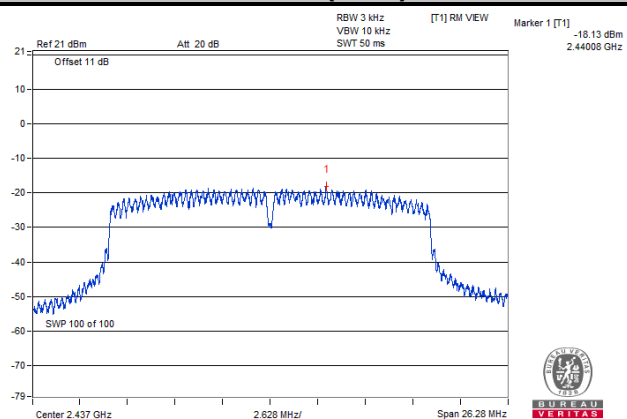
802.11b



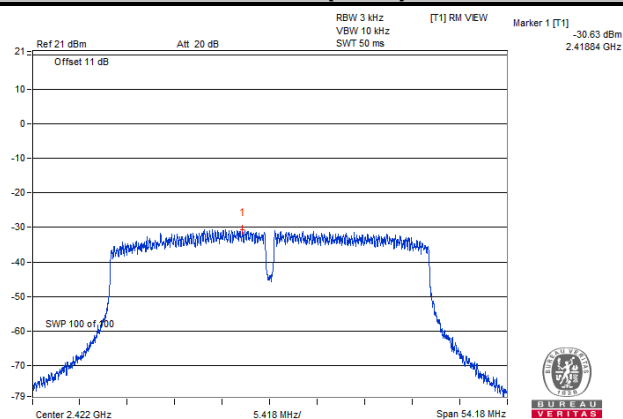
802.11g



802.11n (HT20)



802.11n (HT40)

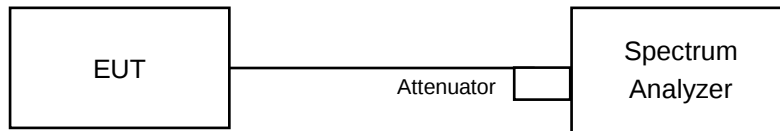


4.7 Conducted Out of Band Emission Measurement

4.7.1 Limits of Conducted Out of Band Emission Measurement

Below -30 dB of the highest emission level of operating band (in 100 kHz Resolution Bandwidth).

4.7.2 Test Setup



4.7.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.7.4 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.

4.7.5 Deviation from Test Standard

No deviation.

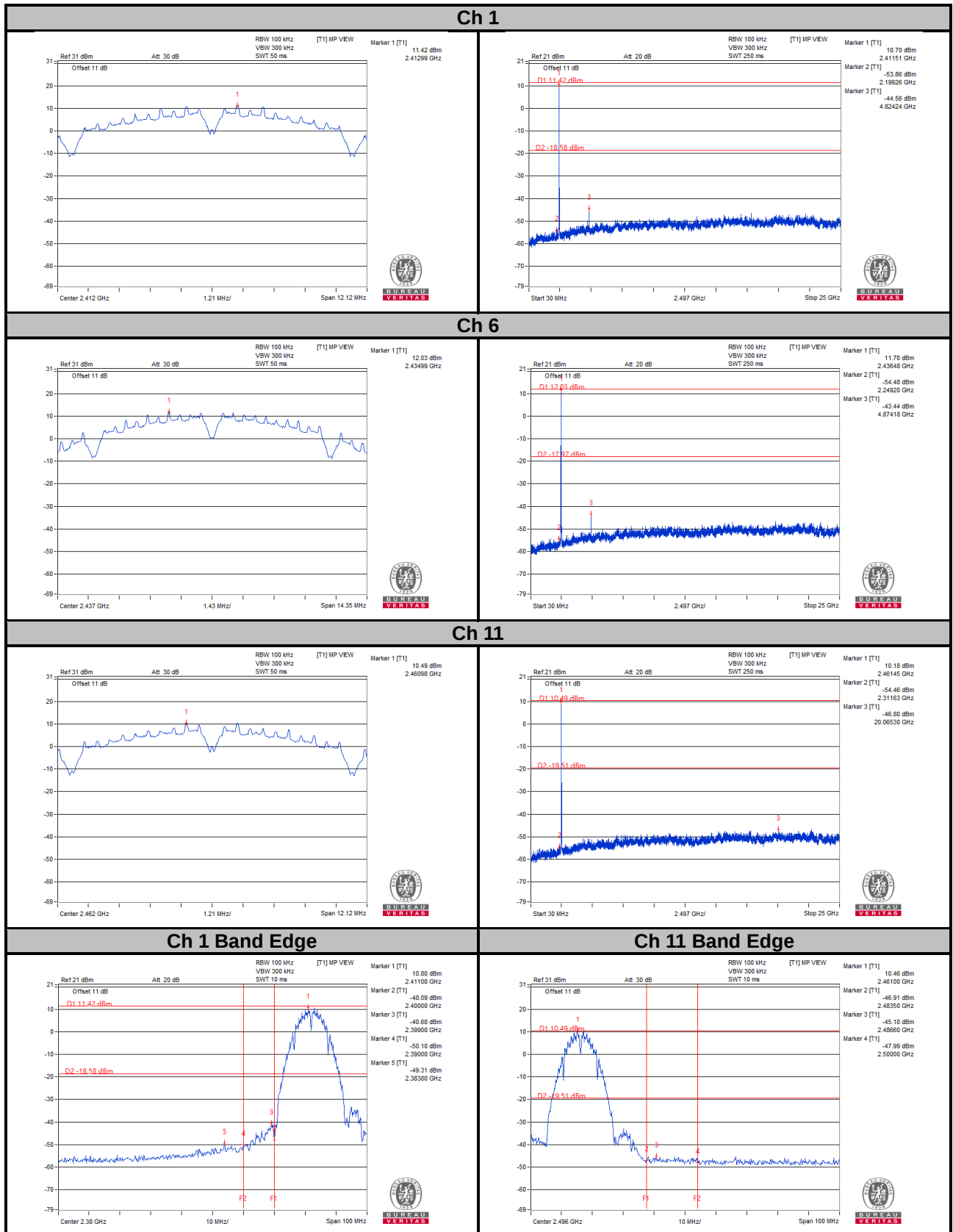
4.7.6 EUT Operating Condition

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

4.7.7 Test Results

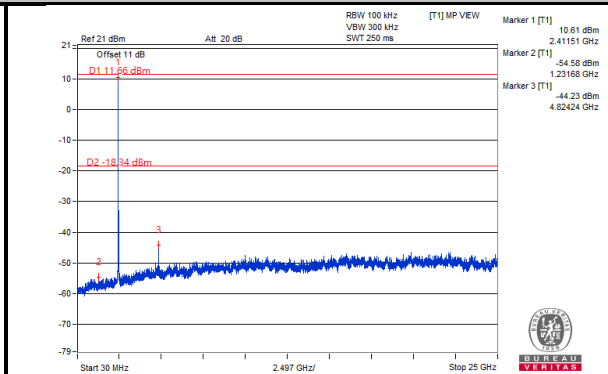
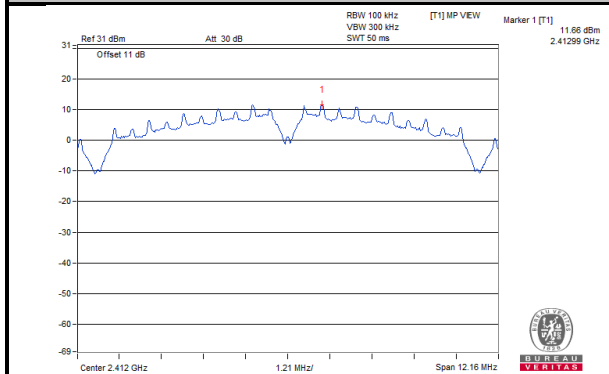
The spectrum plots are attached on the following images. D1 line indicates the highest level, and D2 line indicates the 30 dB offset below D1. It shows compliance with the requirement.

802.11b CHAIN 0

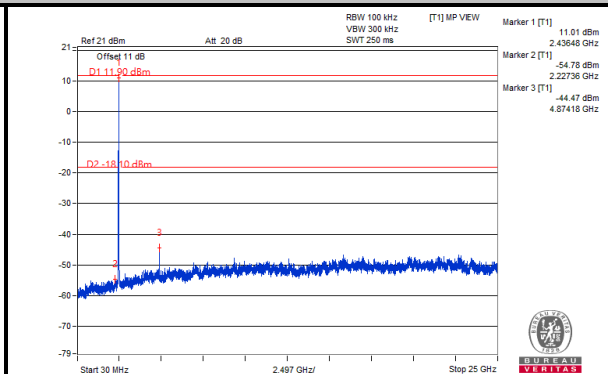
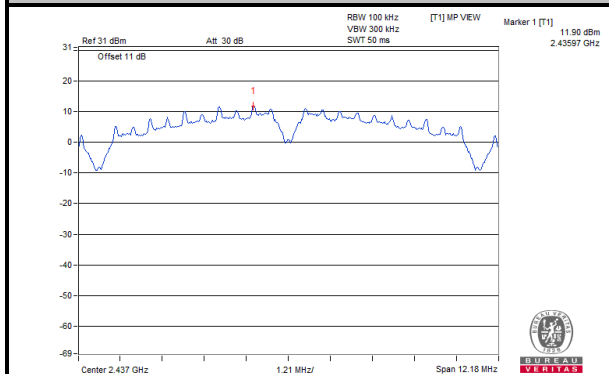


CHAIN 1

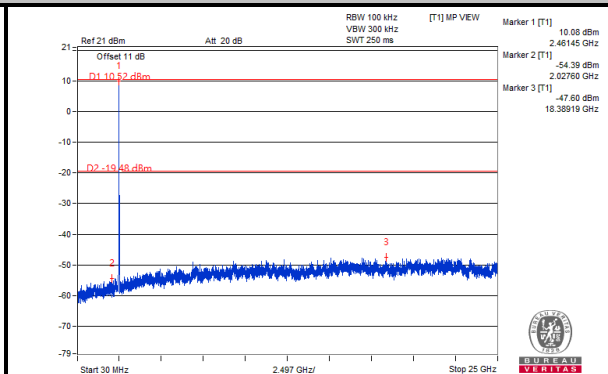
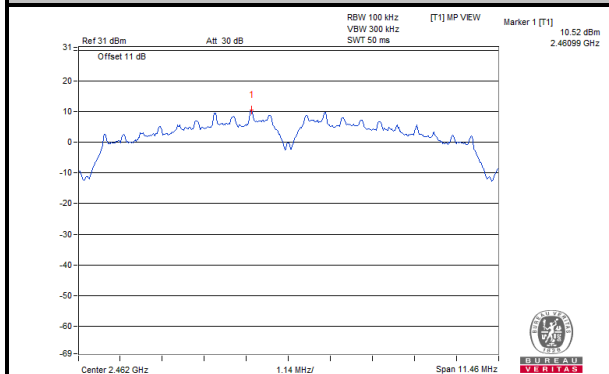
Ch 1



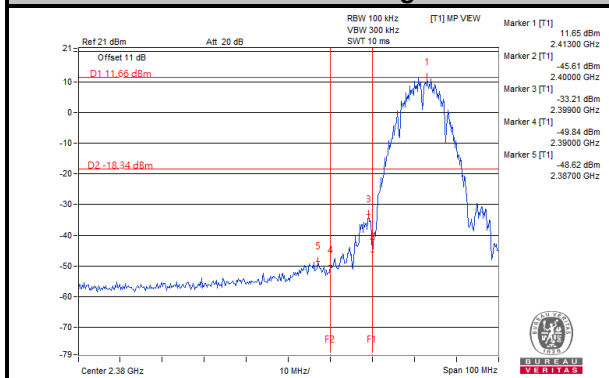
Ch 6



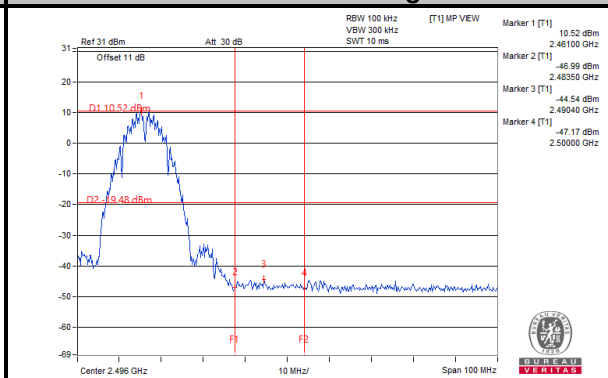
Ch 11



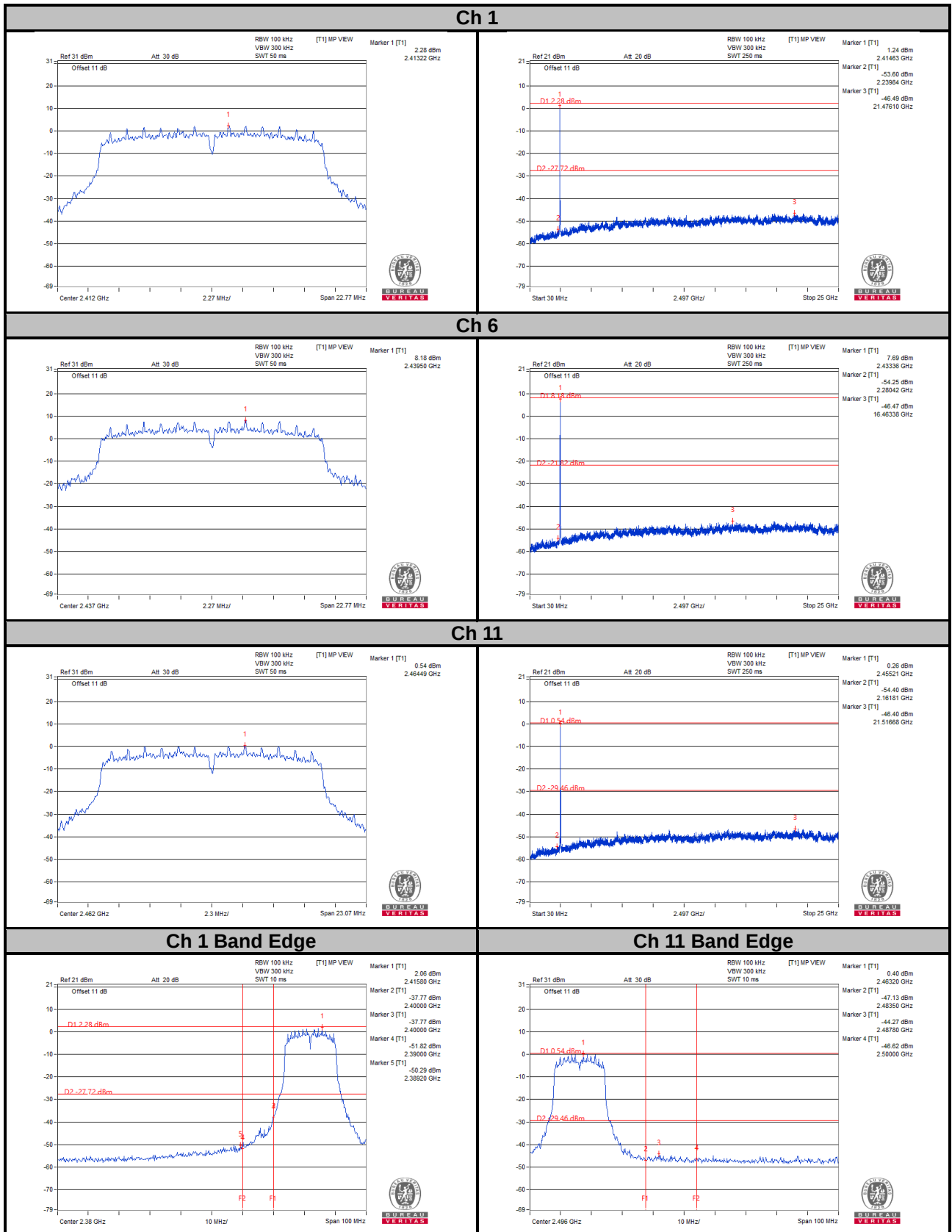
Ch 1 Band Edge



Ch 11 Band Edge

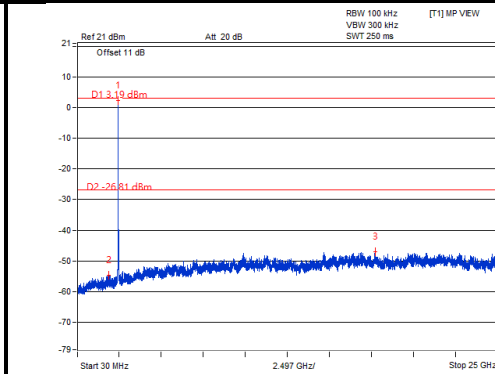
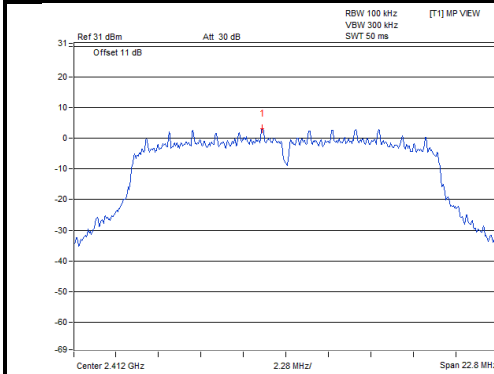


802.11g CHAIN 0

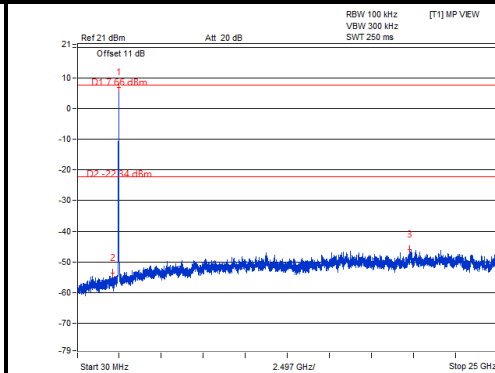
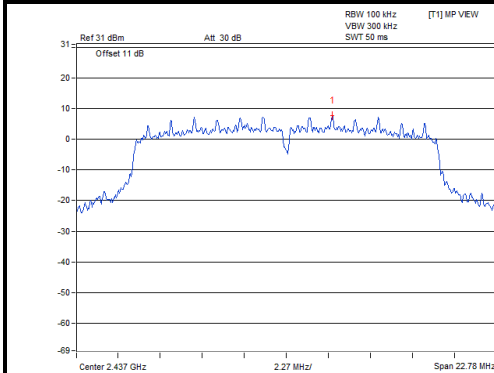


CHAIN 1

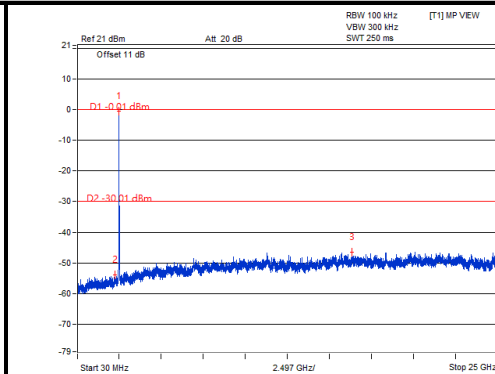
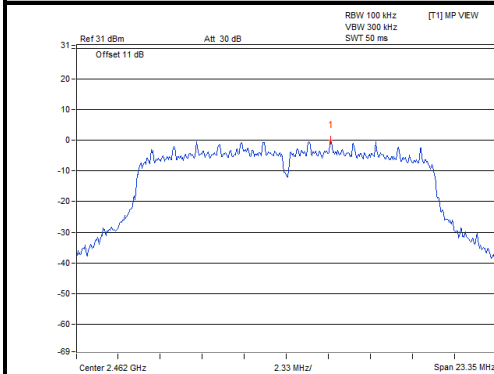
Ch 1



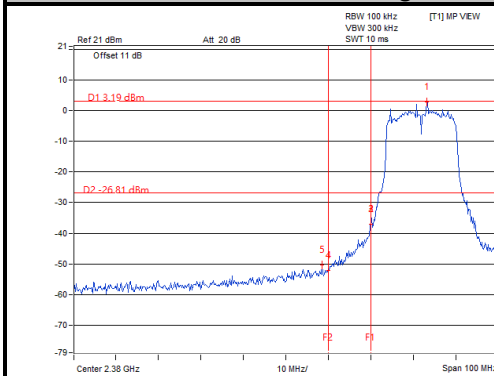
Ch 6



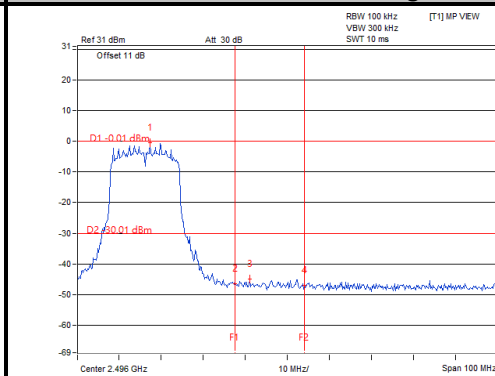
Ch 11



Ch 1 Band Edge

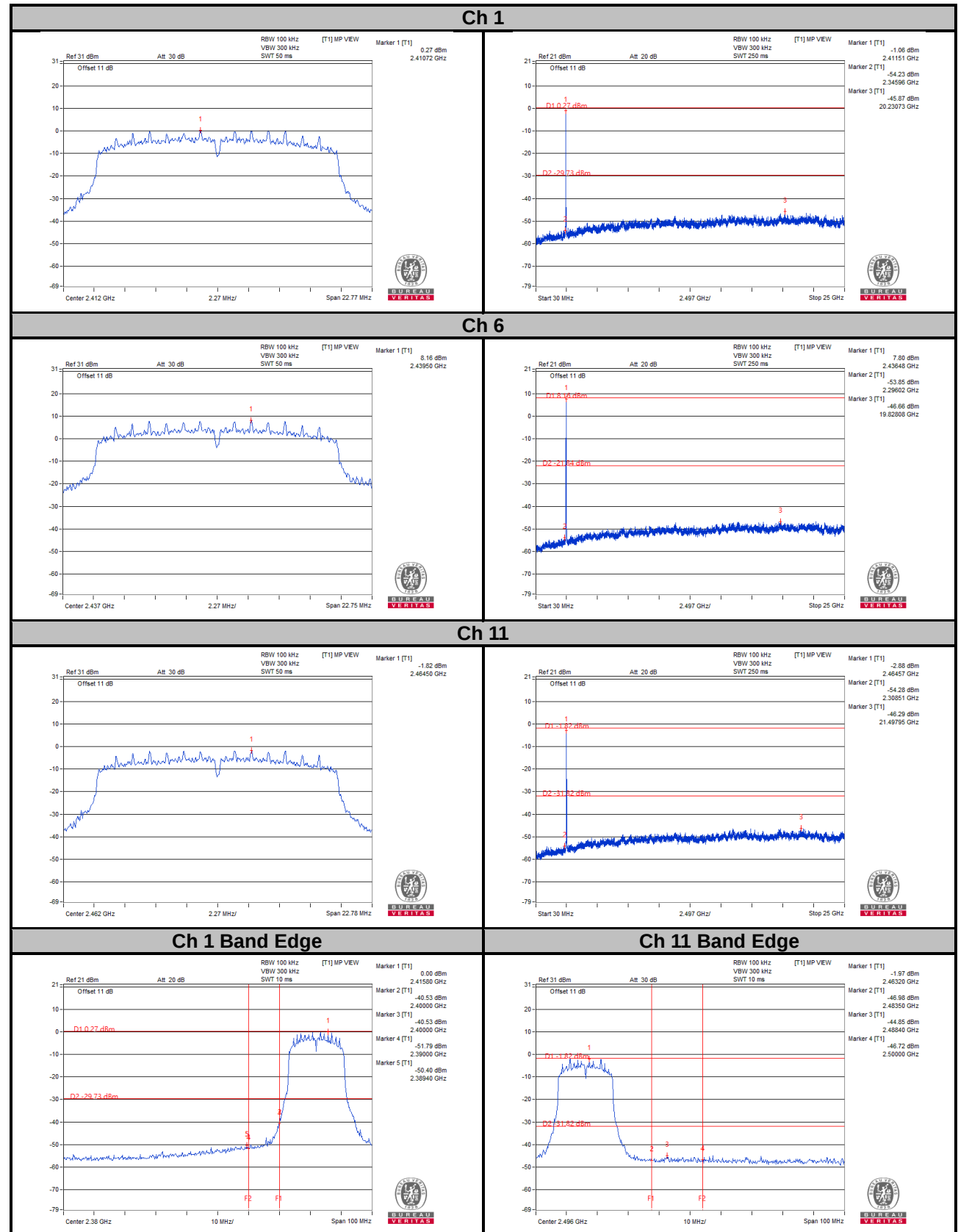


Ch 11 Band Edge



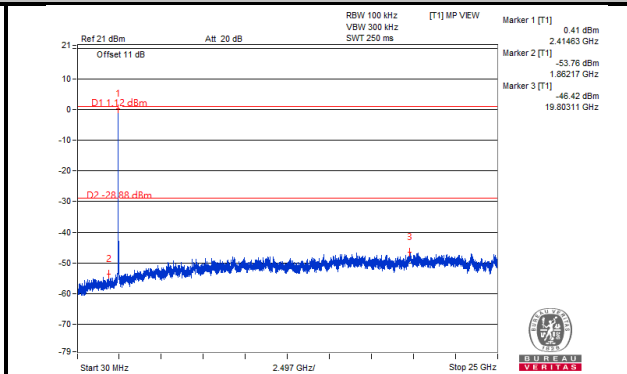
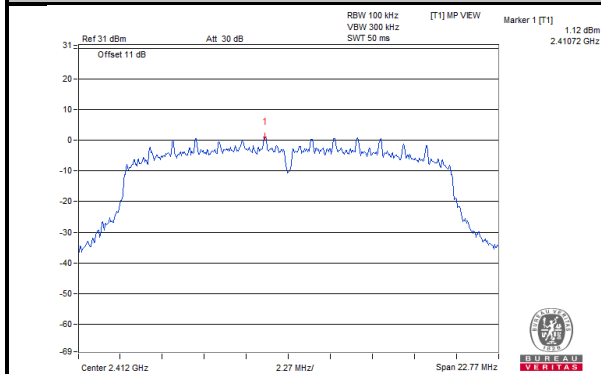
802.11n (HT20)

CHAIN 0

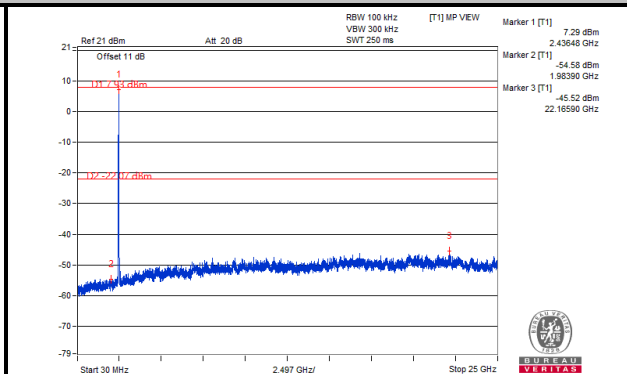
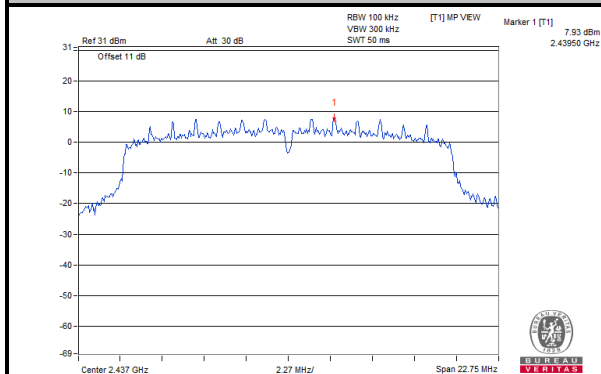


CHAIN 1

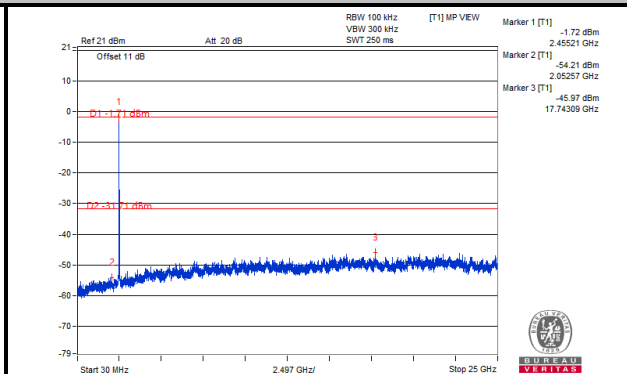
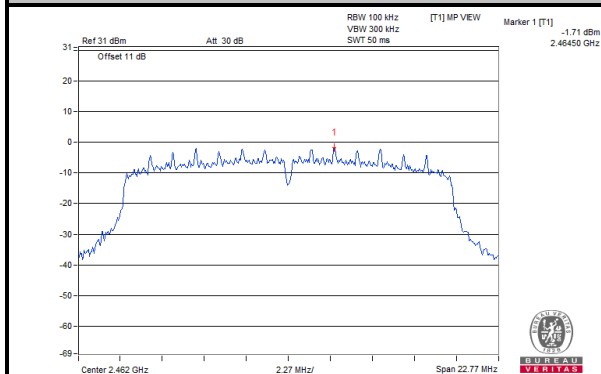
Ch 1



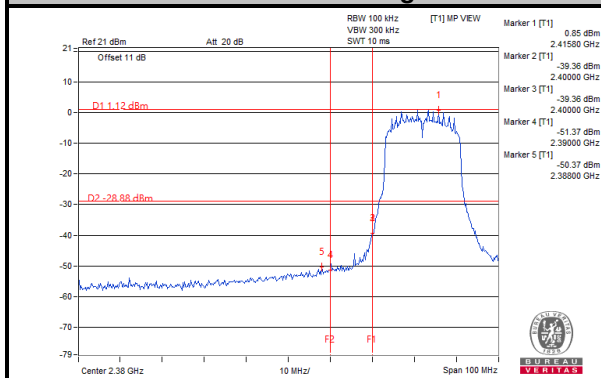
Ch 6



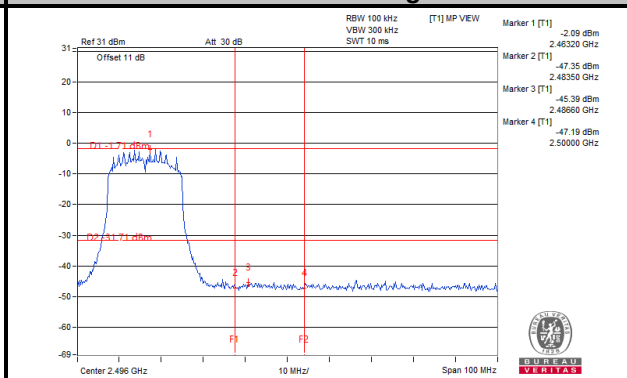
Ch 11



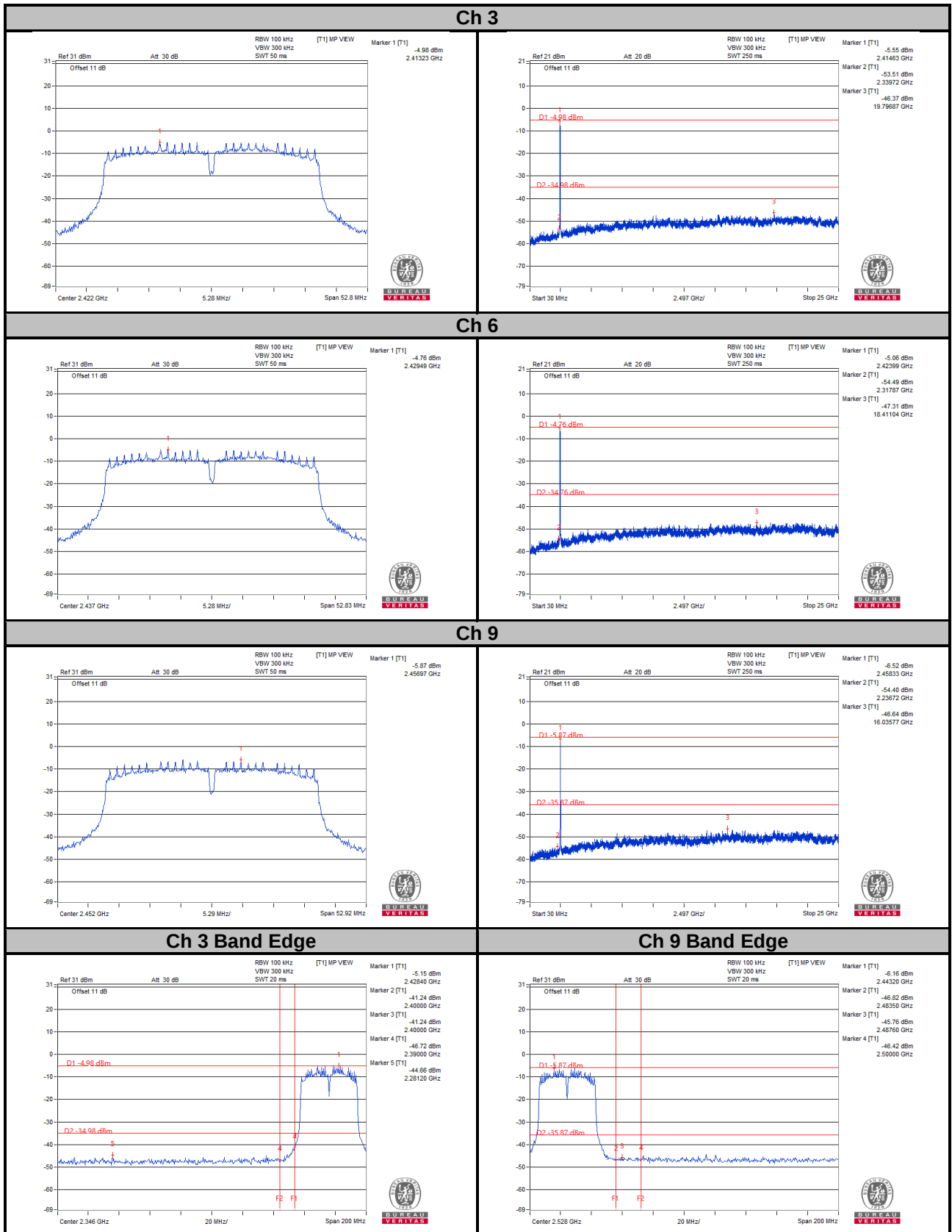
Ch 1 Band Edge



Ch 11 Band Edge

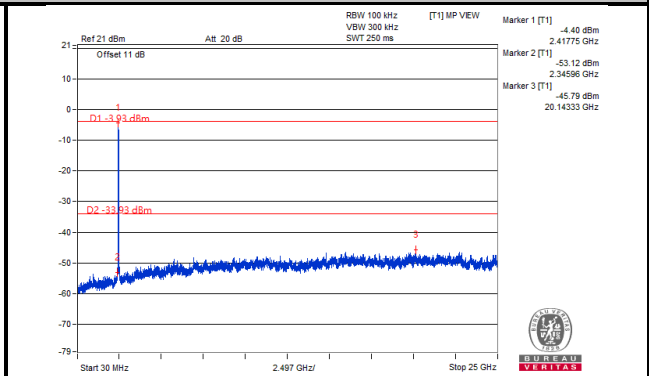
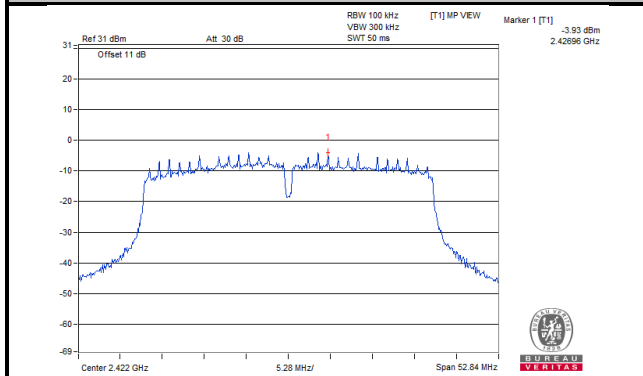


802.11n (HT40) CHAIN 0

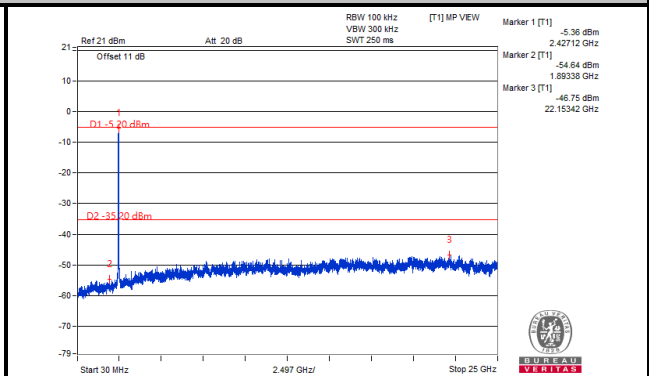
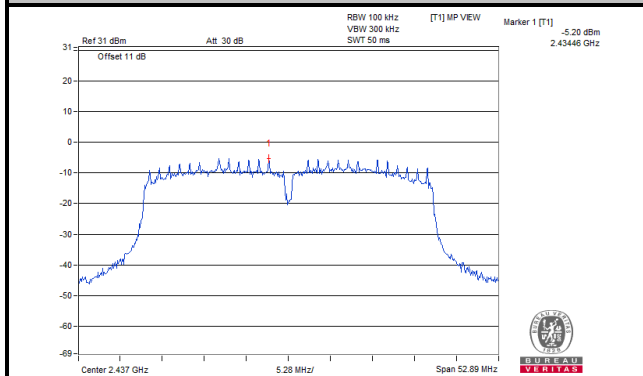


CHAIN 1

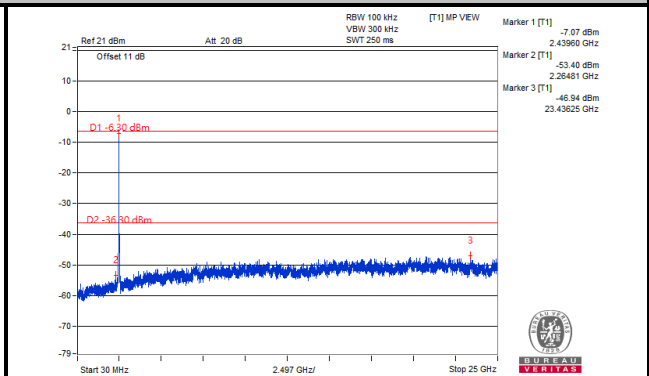
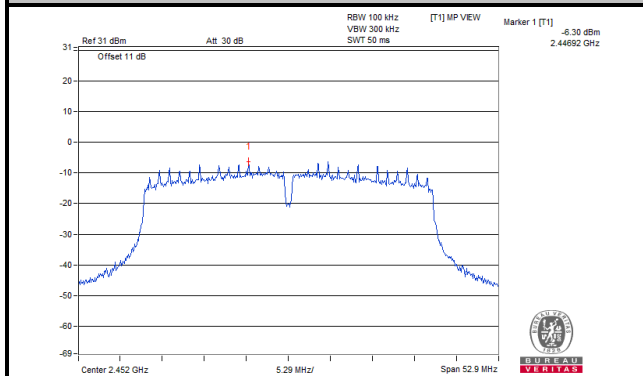
Ch 3



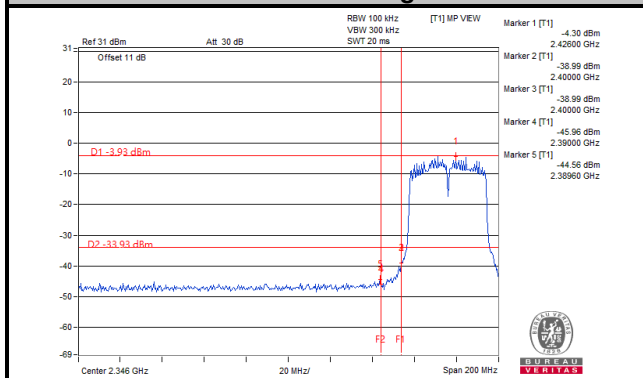
Ch 6



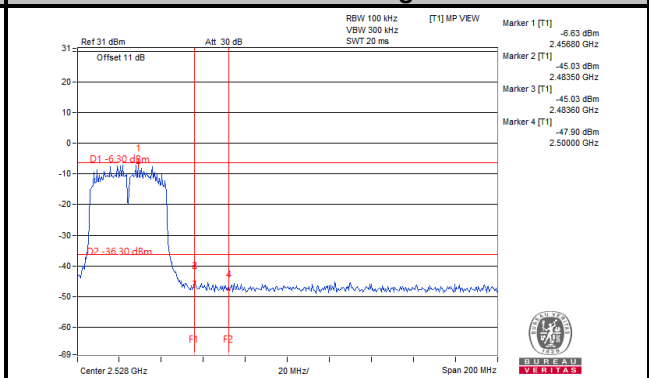
Ch 9



Ch 3 Band Edge



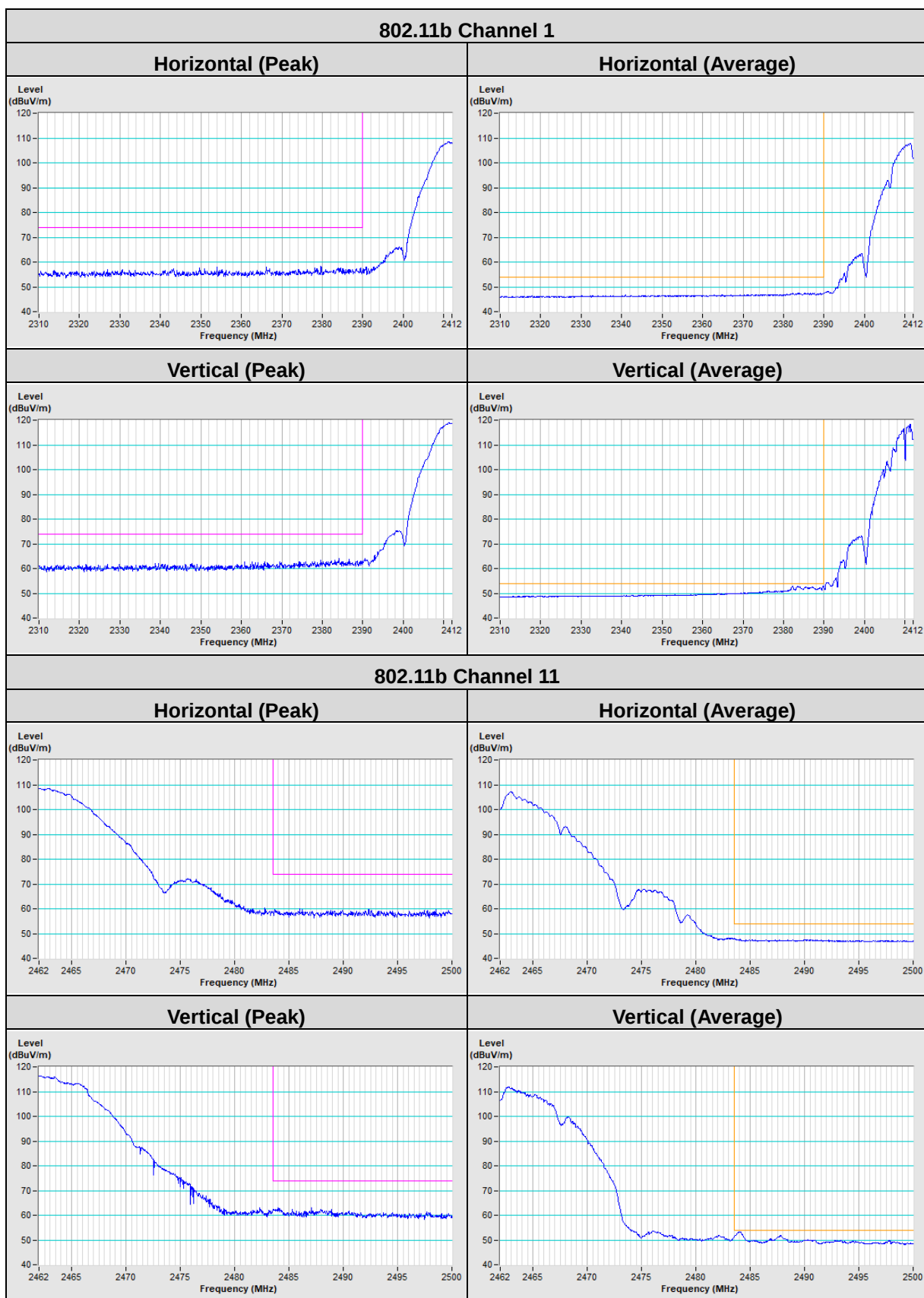
Ch 9 Band Edge

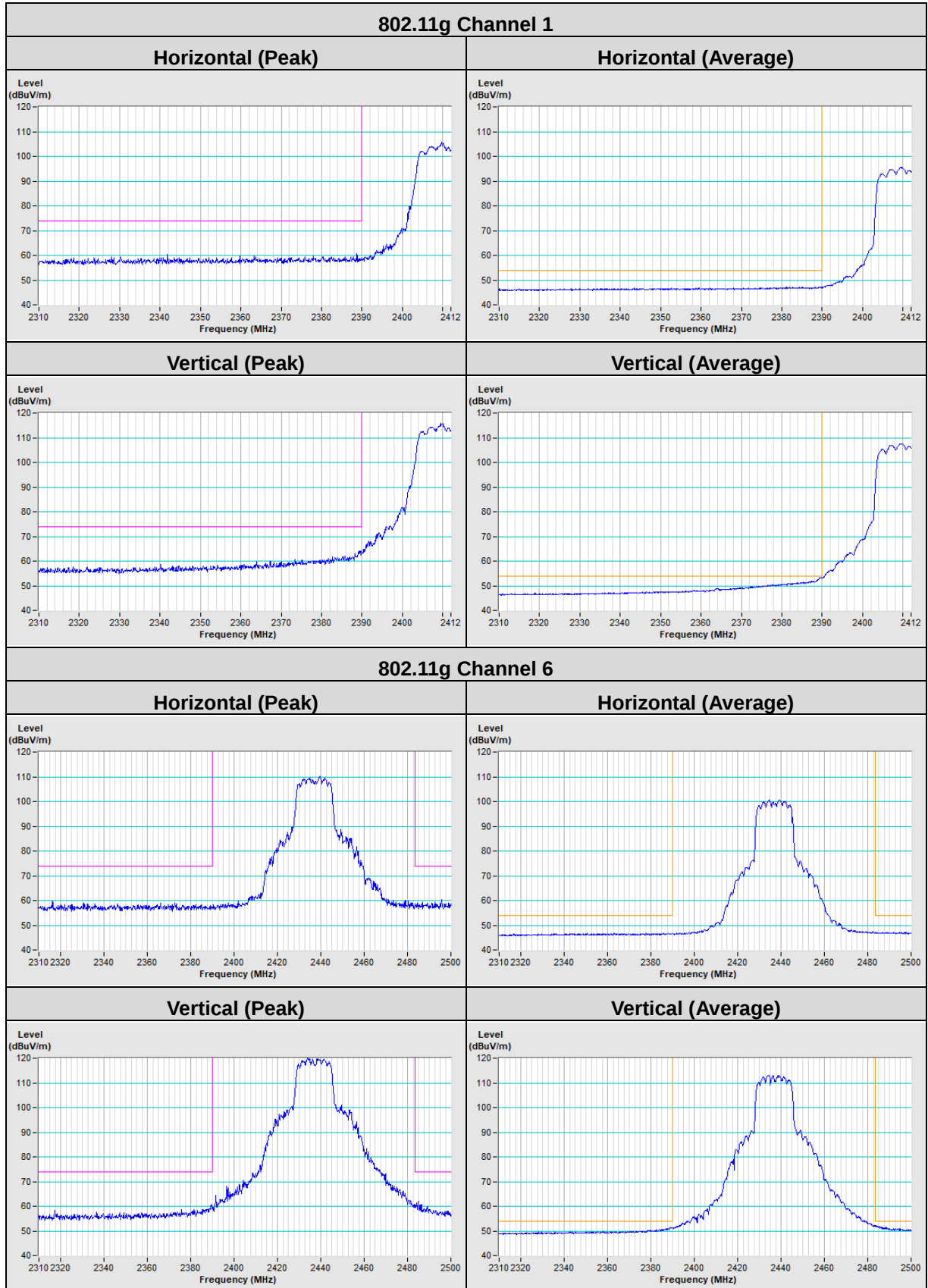


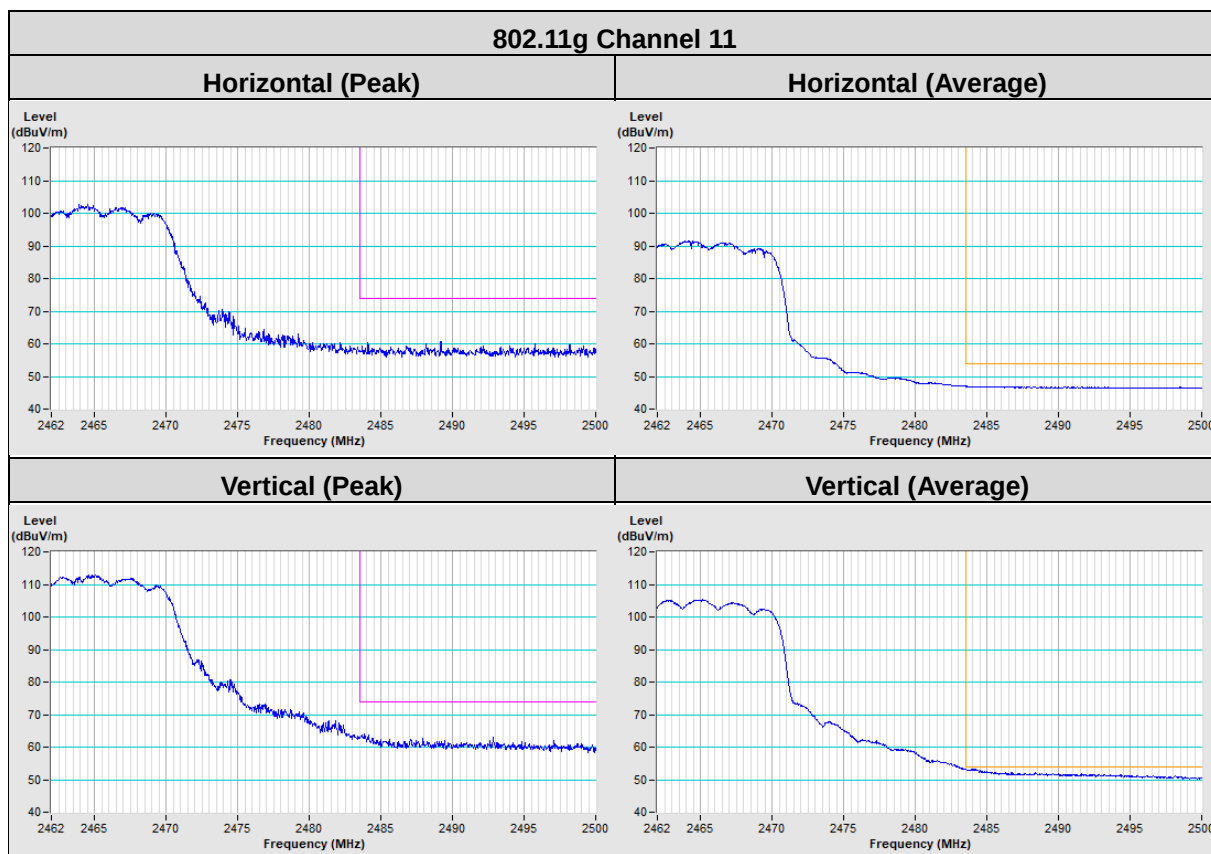
5 Pictures of Test Arrangements

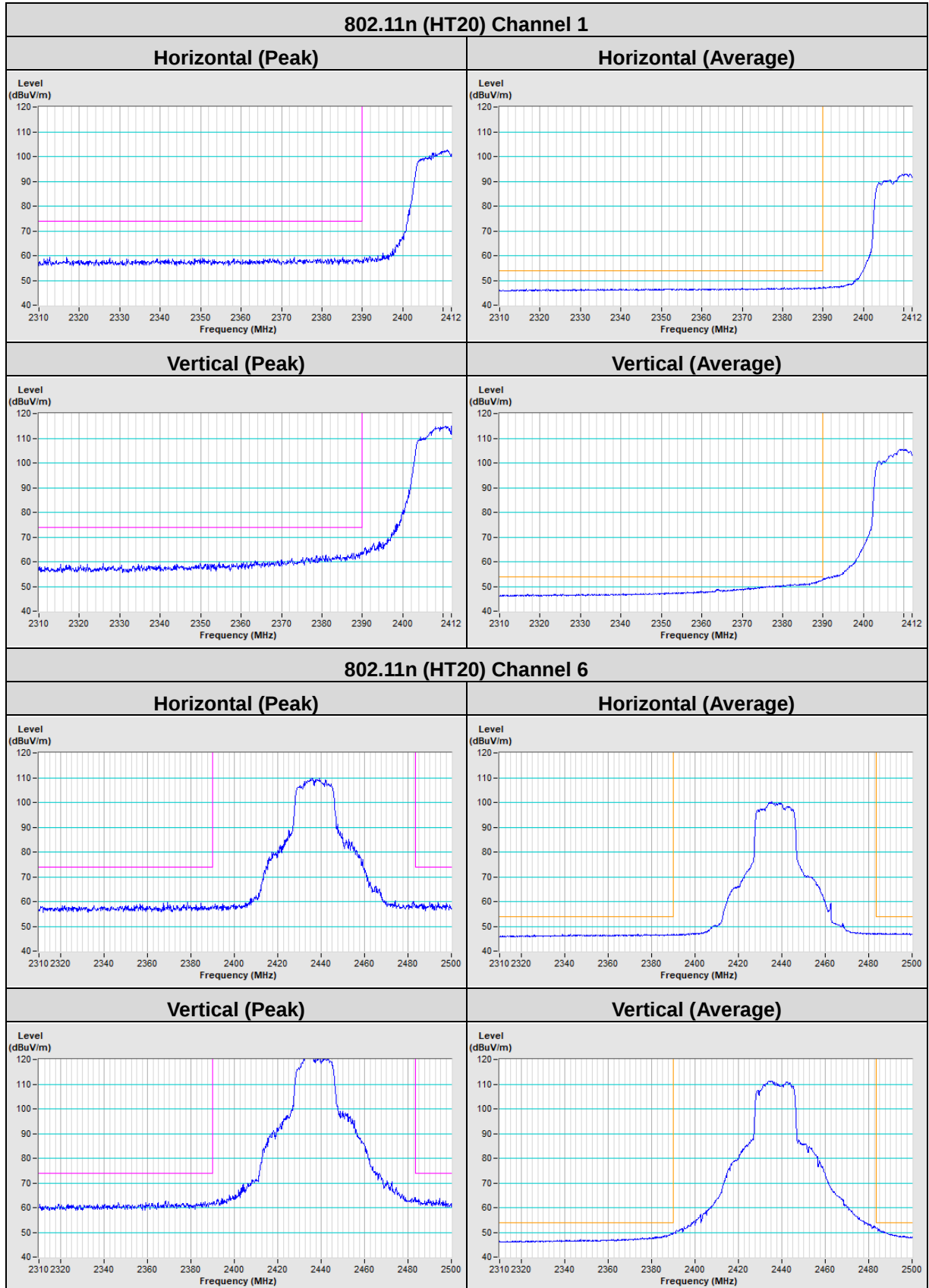
Please refer to the attached file (Test Setup Photo).

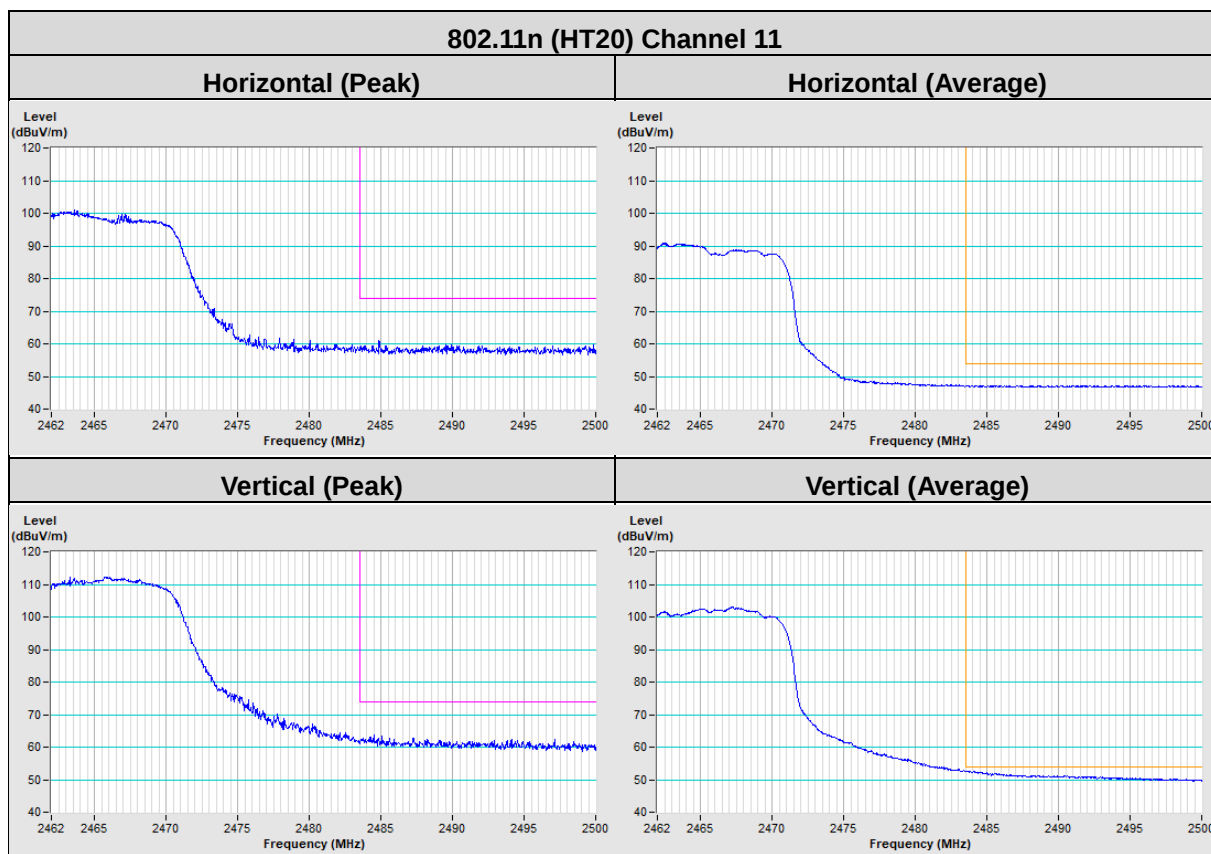
Annex A- Band Edge Measurement

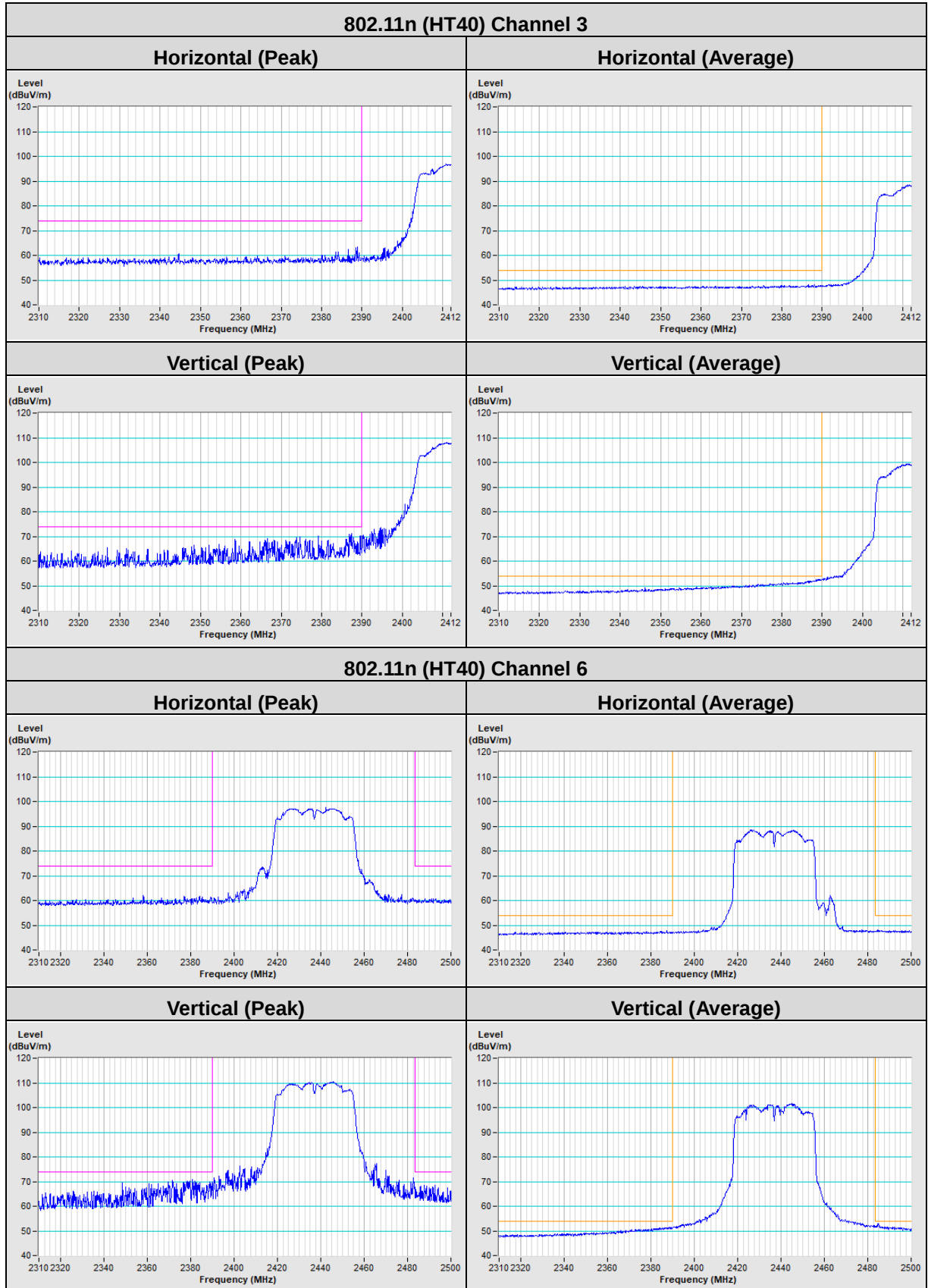


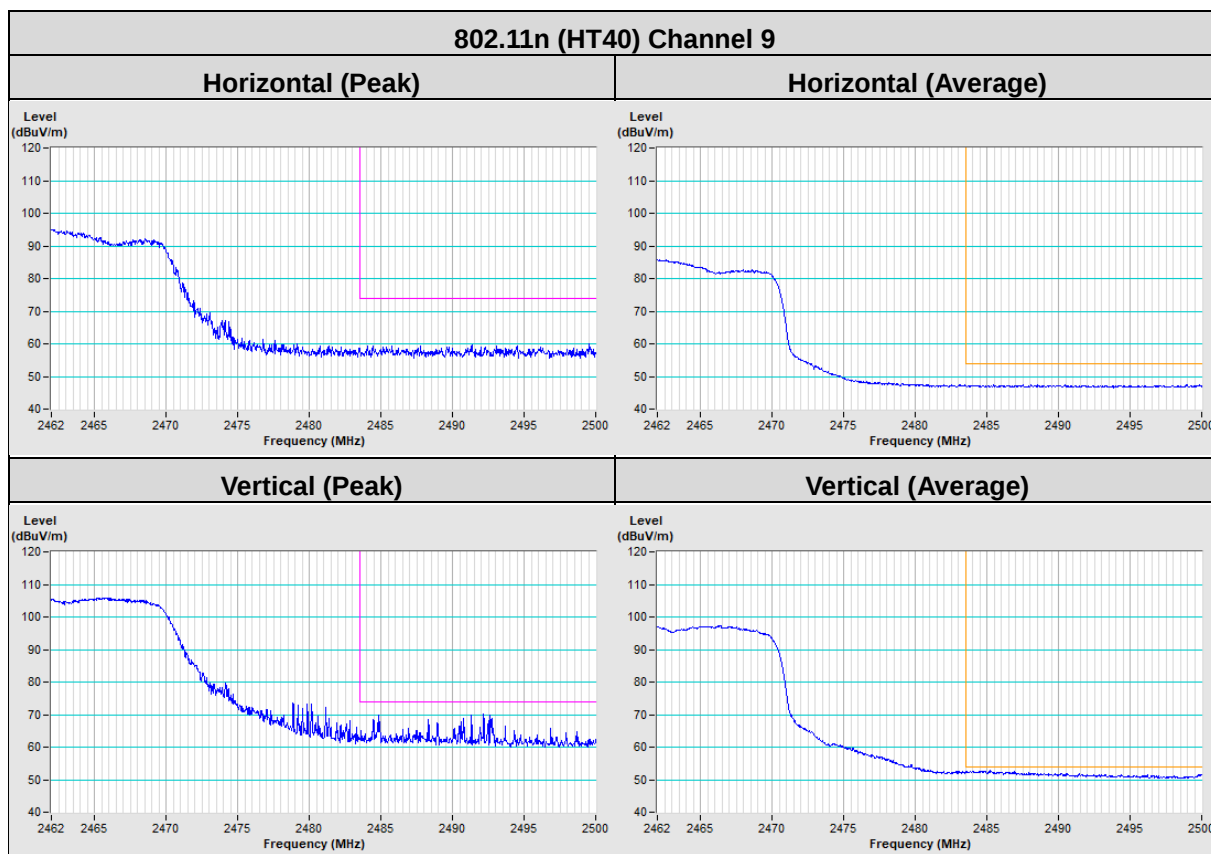












Appendix – Information of the Testing Laboratories

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.

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

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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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