

FCC Test Report

Report No.: RFBHJS-WTW-P20080454

FCC ID: PD5-NSE1000

Test Model: NSE1000

Received Date: Aug. 24, 2020

Test Date: Sep. 03 ~ Sep. 25, 2020

Issued Date: Dec. 28, 2020

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Release Control Record

Issue No.	Description	Date Issued
RFBHJS-WTW-P20080454	Original release	Dec. 28, 2020

1 Certificate of Conformity

Product: Wireless Access Point
Brand: Nile Global
Test Model: NSE1000
Sample Status: Engineering sample
Applicant: Delta Electronics, Inc.
Test Date: Sep. 03 ~ Sep. 25, 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 RF characteristics under the conditions specified in this report.

Prepared by : Pettie Chen, **Date:** Dec. 28, 2020
Pettie Chen / Senior Specialist

Approved by : Bruce Chen, **Date:** Dec. 28, 2020
Bruce Chen / 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 -14.73dB at 0.53800MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -0.7dB at 2483.50MHz.
15.247(d)	Antenna Port Emission	Pass	Meet the requirement of limit.
15.247(a)(2)	6dB bandwidth	Pass	Meet the requirement of limit.
15.247(b)	Conducted power	Pass	Meet the requirement of limit.
15.247(e)	Power Spectral Density	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	Antenna connector is i-pex (MHF) 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	150kHz ~ 30MHz	2.79 dB
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	3.04 dB
	30MHz ~ 200MHz	3.86 dB
Radiated Emissions above 1 GHz	200MHz ~ 1000MHz	3.87 dB
	1GHz ~ 18GHz	2.29 dB
	18GHz ~ 40GHz	2.29 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Wireless Access Point
Brand	Nile Global
Test Model	NSE1000
Sample Status	Engineering sample
Power Supply Rating	100-240Vac, 50-60Hz, 0.5A Max
Modulation Type	CCK, DQPSK, DBPSK for DSSS 256QAM, 64QAM, 16QAM, QPSK, BPSK for OFDM
Modulation Technology	DSSS, OFDM
Transfer Rate	802.11b: 11/5.5/2/1Mbps 802.11g: 54/48/36/24/18/12/9/6Mbps 802.11n (HT20/40): up to 300Mbps 802.11n (VHT20/40): up to 400Mbps
Operating Frequency	2412~2462MHz
Number of Channel	802.11b, 802.11g, 802.11n (HT20), 802.11n (VHT20): 11 802.11n (HT40), 802.11n (VHT40): 7
Output Power	CDD Mode: 618.791mW Beamforming Mode: 526.668mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	NA
Cable Supplied	NA

Note:

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

Modulation Mode	CDD Mode	Beamforming Mode	TX Function
802.11b	Support	Not Support	2TX
802.11g	Support	Not Support	2TX
802.11n (HT20)	Support	Support	2TX
802.11n (HT40)	Support	Support	2TX
802.11n (VHT20)	Support	Support	2TX
802.11n (VHT40)	Support	Support	2TX

* The bandwidth and modulation are similar for HT20/HT40 on 802.11n mode and VHT20/VHT40 on 802.11n mode. Therefore the investigated worst case is the representative mode in test report. (Final test mode refer section 3.2.1)

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

2. The EUT uses following antennas.

Ant. Type	PIFA		
Ant. Connector	i-pex (MHF)		
Antenna Gain (dBi)			
Ant. No.	WLAN (2.4GHz Band)	WLAN (5.0GHz Band)	Bluetooth
Ant. 0	2.19	4.86	-
Ant. 1	2.86	3.70	-
Ant. 2	-	-	2.42

*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. WLAN 2.4GHz and WLAN 5GHz technologies can transmit simultaneously.

WLAN 5GHz and Bluetooth technologies can transmit simultaneously.

3.2 Description of Test Modes

11 channels are provided for 802.11b, 802.11g, 802.11n (HT20), 802.11n (VHT20):

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), 802.11n (VHT40):

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 **Z-plane**.

Radiated Emission Test (Above 1GHz):

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

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)	Remark
-	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 (VHT20)	1 to 11	1, 6, 11	OFDM	BPSK	6.5	-
	802.11n (VHT40)	3 to 9	3, 6, 9	OFDM	BPSK	13.5	-

Radiated Emission Test (Below 1GHz):

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

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)	Remark
-	802.11g	1 to 11	6	OFDM	BPSK	6.0	-

Power Line Conducted Emission Test:

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

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)	Remark
-	802.11g	1 to 11	6	OFDM	BPSK	6.0	-

Antenna Port Conducted Measurement:

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

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)	Remark
-	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	-
	802.11n (VHT20)	1 to 11	1, 6, 11	OFDM	BPSK	6.5	-
	802.11n (VHT40)	3 to 9	3, 6, 9	OFDM	BPSK	13.5	-

*802.11n (HT20), 802.11n (HT40) are for Conducted Output Power Measurement only.

Test Condition:

Applicable to	Environmental Conditions	Input Power	Tested by
RE $\geq$ 1G	25 deg. C, 70% RH	120Vac, 60Hz	Luis Lee
RE<1G	25 deg. C, 70% RH	120Vac, 60Hz	Noah Chang
PLC	25 deg. C, 75% RH	120Vac, 60Hz	Noah Chang
APCM	25 deg. C, 76% RH	120Vac, 60Hz	Jisyong Wang

3.3 Duty Cycle of Test Signal

Duty cycle of test signal is > 98%, duty factor is not required.

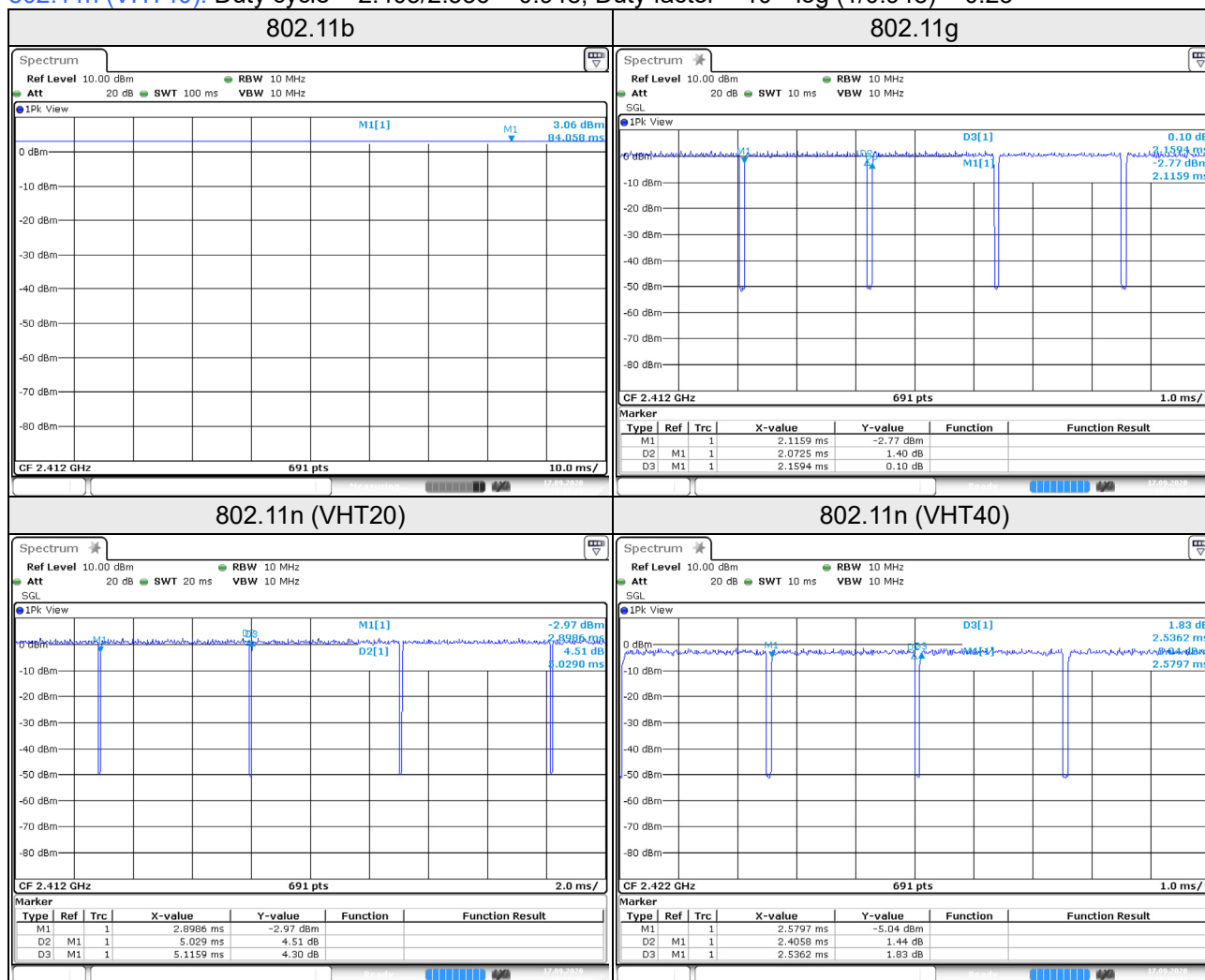
Duty cycle of test signal is < 98%, duty factor is required.

802.11b: Duty cycle = 100%

802.11g: Duty cycle = $2.072/2.159 = 0.96$, Duty factor = $10 * \log(1/0.96) = 0.18$

802.11n (VHT20): Duty cycle = $5.029/5.115 = 0.983$

802.11n (VHT40): Duty cycle = $2.405/2.536 = 0.948$, Duty factor = $10 * \log(1/0.948) = 0.23$



3.4 Description of Support Units

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

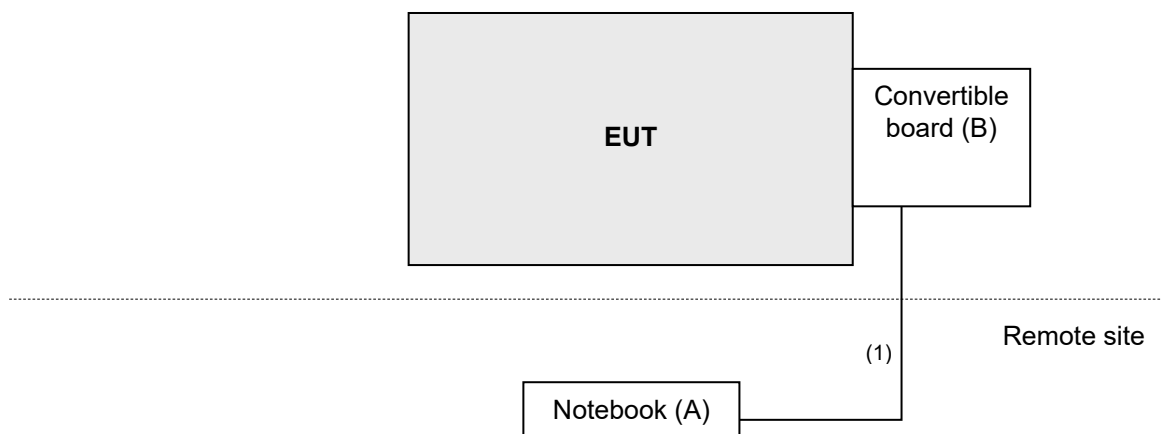
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Notebook	DELL	E5410	1HC2XM1	FCC DoC Approved	-
B.	Convertible board	NA	NA	NA	NA	Provided by client

Note:

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

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	LAN	1	10	N	0	RJ45, Cat5e

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

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 30dB below the highest level of the desired power:

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

Note:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB 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, 2019	Dec. 30, 2020
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100269	Jun. 09, 2020	Jun. 08, 2021
BILOG Antenna SCHWARZBECK	VULB9168	9168-171	Nov. 11, 2019	Nov. 10, 2020
HORN Antenna SCHWARZBECK	9120D	209	Nov. 24, 2019	Nov. 23, 2020
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Nov. 24, 2019	Nov. 23, 2020
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-3 000	150929	Aug. 16, 2020	Aug. 15, 2021
RF Coaxial Cable EMCI	EMC102-KM-KM-6 00	150928	Aug. 16, 2020	Aug. 15, 2021
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	013303	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
USB Wideband Power Sensor KEYSIGHT	U2021XA	MY55050005/MY5 5190004/MY55190 007/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 30MHz

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

Note:

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

For Radiated emission above 30MHz

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

Note:

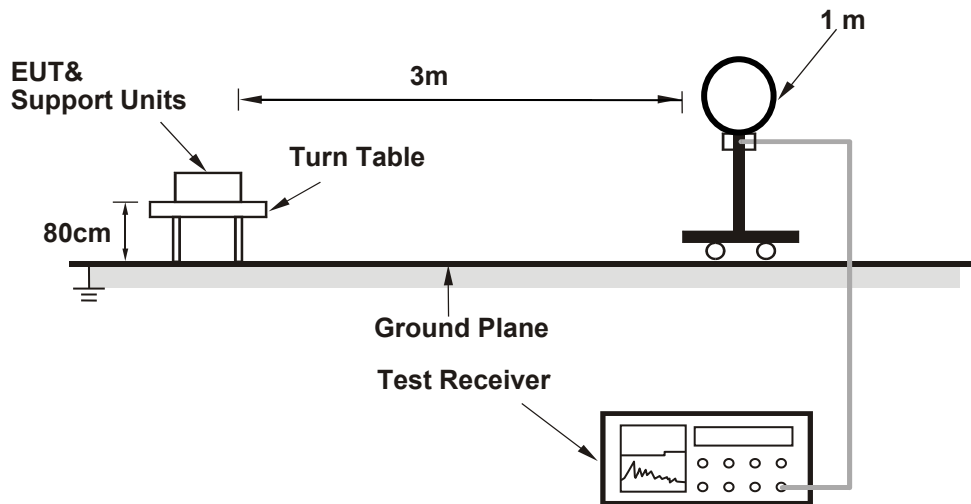
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 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. (802.11b: RBW = 1MHz, VBW = 10Hz; 802.11g: RBW = 1MHz, VBW = 1kHz ; 802.11n (VHT20): RBW = 1MHz, VBW = 10Hz; 802.11n (VHT40): RBW = 1MHz, VBW = 1kHz)
4. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

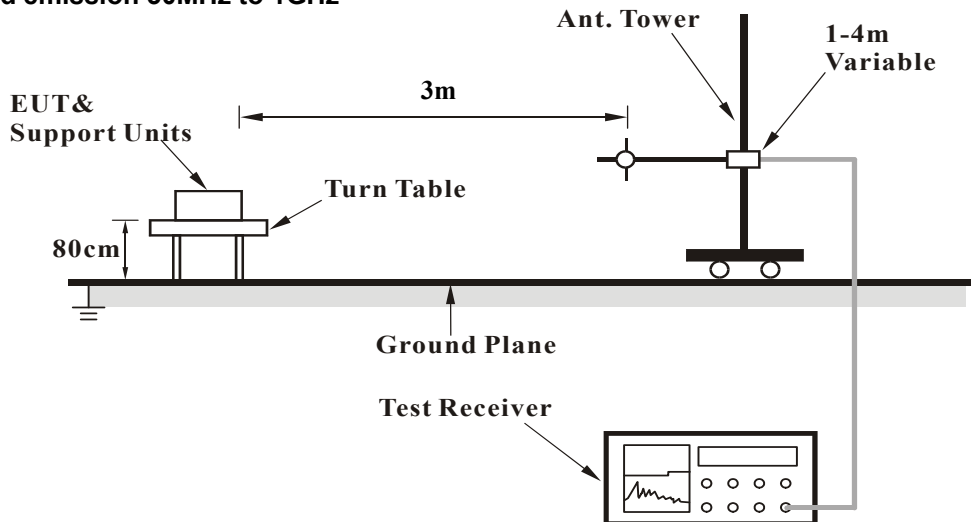
No deviation.

4.1.5 Test Setup

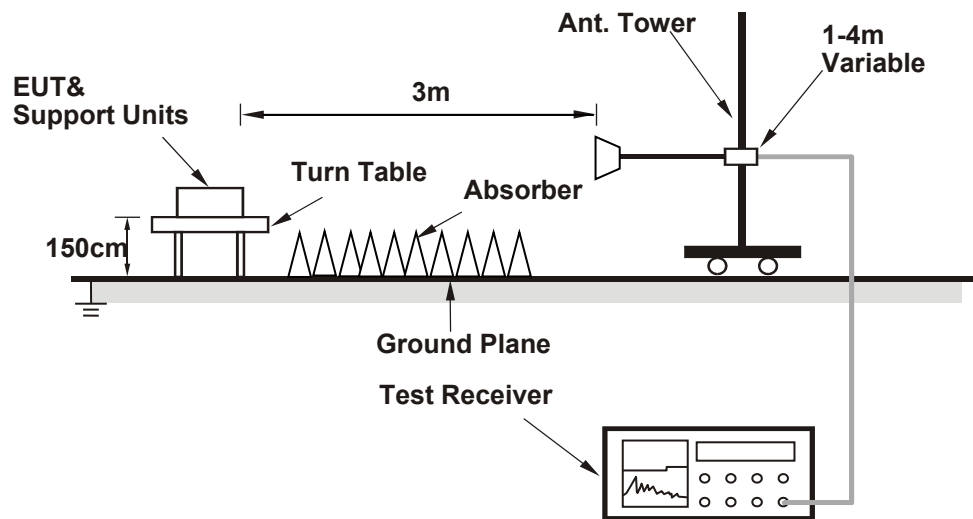
For Radiated emission below 30MHz



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

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

4.1.7 Test Results

Above 1GHz worst-Case data:

802.11b

CHANNEL	TX Channel 1	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		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	2387.40	61.3 PK	74.0	-12.7	1.32 H	32	28.3	33.0
2	2387.40	52.7 AV	54.0	-1.3	1.32 H	32	19.7	33.0
3	*2412.00	111.7 PK			1.32 H	32	78.7	33.0
4	*2412.00	109.6 AV			1.32 H	32	76.6	33.0
5	4824.00	48.5 PK	74.0	-25.5	1.15 H	263	37.3	11.2
6	4824.00	37.5 AV	54.0	-16.5	1.15 H	263	26.3	11.2
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	2387.40	59.7 PK	74.0	-14.3	3.74 V	264	26.7	33.0
2	2387.40	48.3 AV	54.0	-5.7	3.74 V	264	15.3	33.0
3	*2412.00	106.5 PK			3.74 V	264	73.5	33.0
4	*2412.00	104.2 AV			3.74 V	264	71.2	33.0
5	4824.00	48.0 PK	74.0	-26.0	1.93 V	225	36.8	11.2
6	4824.00	37.1 AV	54.0	-16.9	1.93 V	225	25.9	11.2

Remarks:

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

CHANNEL	TX Channel 6	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		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	111.5 PK			1.30 H	32	78.5	33.0
2	*2437.00	109.3 AV			1.30 H	32	76.3	33.0
3	4874.00	48.6 PK	74.0	-25.4	1.20 H	287	37.5	11.1
4	4874.00	37.6 AV	54.0	-16.4	1.20 H	287	26.5	11.1
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	*2437.00	106.5 PK			3.79 V	261	73.5	33.0
2	*2437.00	104.4 AV			3.79 V	261	71.4	33.0
3	4874.00	47.8 PK	74.0	-26.2	2.31 V	142	36.7	11.1
4	4874.00	36.7 AV	54.0	-17.3	2.31 V	142	25.6	11.1

Remarks:

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

CHANNEL	TX Channel 11	DETECTOR	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz	FUNCTION	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	111.1 PK			1.25 H	29	78.1	33.0
2	*2462.00	108.9 AV			1.25 H	29	75.9	33.0
3	2486.60	62.1 PK	74.0	-11.9	1.25 H	29	28.9	33.2
4	2486.60	52.8 AV	54.0	-1.2	1.25 H	29	19.6	33.2
5	4924.00	48.9 PK	74.0	-25.1	1.69 H	225	37.8	11.1
6	4924.00	37.8 AV	54.0	-16.2	1.69 H	225	26.7	11.1
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	*2462.00	106.2 PK			3.70 V	269	73.2	33.0
2	*2462.00	104.1 AV			3.70 V	269	71.1	33.0
3	2486.60	60.8 PK	74.0	-13.2	3.70 V	269	27.6	33.2
4	2486.60	50.2 AV	54.0	-3.8	3.70 V	269	17.0	33.2
5	4924.00	47.8 PK	74.0	-26.2	1.74 V	206	36.7	11.1
6	4924.00	36.7 AV	54.0	-17.3	1.74 V	206	25.6	11.1

Remarks:

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

802.11g

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

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	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	65.1 PK	74.0	-8.9	1.34 H	32	32.2	32.9
2	2390.00	52.7 AV	54.0	-1.3	1.34 H	32	19.8	32.9
3	*2412.00	111.5 PK			1.34 H	32	78.5	33.0
4	*2412.00	100.6 AV			1.34 H	32	67.6	33.0
5	4824.00	48.4 PK	74.0	-25.6	1.29 H	228	37.2	11.2
6	4824.00	37.5 AV	54.0	-16.5	1.29 H	228	26.3	11.2
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	2390.00	62.1 PK	74.0	-11.9	3.77 V	261	29.2	32.9
2	2390.00	49.0 AV	54.0	-5.0	3.77 V	261	16.1	32.9
3	*2412.00	106.3 PK			3.77 V	261	73.3	33.0
4	*2412.00	95.8 AV			3.77 V	261	62.8	33.0
5	4824.00	47.9 PK	74.0	-26.1	2.26 V	190	36.7	11.2
6	4824.00	37.0 AV	54.0	-17.0	2.26 V	190	25.8	11.2

Remarks:

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

CHANNEL	TX Channel 6	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		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	115.5 PK			1.29 H	34	82.5	33.0
2	*2437.00	104.8 AV			1.29 H	34	71.8	33.0
3	4874.00	48.6 PK	74.0	-25.4	2.19 H	163	37.5	11.1
4	4874.00	37.5 AV	54.0	-16.5	2.19 H	163	26.4	11.1
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	*2437.00	110.2 PK			3.69 V	271	77.2	33.0
2	*2437.00	99.5 AV			3.69 V	271	66.5	33.0
3	4874.00	47.6 PK	74.0	-26.4	2.33 V	105	36.5	11.1
4	4874.00	36.9 AV	54.0	-17.1	2.33 V	105	25.8	11.1

Remarks:

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

CHANNEL	TX Channel 11	DETECTOR	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz	FUNCTION	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	108.2 PK			1.25 H	33	75.2	33.0
2	*2462.00	97.4 AV			1.25 H	33	64.4	33.0
3	2483.50	66.4 PK	74.0	-7.6	1.25 H	33	33.2	33.2
4	2483.50	52.7 AV	54.0	-1.3	1.25 H	33	19.5	33.2
5	4924.00	48.6 PK	74.0	-25.4	1.99 H	304	37.5	11.1
6	4924.00	37.7 AV	54.0	-16.3	1.99 H	304	26.6	11.1
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	*2462.00	102.6 PK			3.75 V	263	69.6	33.0
2	*2462.00	92.3 AV			3.75 V	263	59.3	33.0
3	2483.50	62.4 PK	74.0	-11.6	3.75 V	263	29.2	33.2
4	2483.50	49.5 AV	54.0	-4.5	3.75 V	263	16.3	33.2
5	4924.00	47.6 PK	74.0	-26.4	2.36 V	118	36.5	11.1
6	4924.00	36.8 AV	54.0	-17.2	2.36 V	118	25.7	11.1

Remarks:

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

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CHANNEL	TX Channel 1	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		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	64.5 PK	74.0	-9.5	1.14 H	28	31.6	32.9
2	2390.00	52.6 AV	54.0	-1.4	1.14 H	28	19.7	32.9
3	*2412.00	110.0 PK			1.14 H	28	77.0	33.0
4	*2412.00	99.7 AV			1.14 H	28	66.7	33.0
5	4824.00	48.6 PK	74.0	-25.4	2.31 H	118	37.4	11.2
6	4824.00	37.8 AV	54.0	-16.2	2.31 H	118	26.6	11.2
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	2390.00	61.3 PK	74.0	-12.7	3.79 V	270	28.4	32.9
2	2390.00	49.2 AV	54.0	-4.8	3.79 V	270	16.3	32.9
3	*2412.00	105.5 PK			3.79 V	270	72.5	33.0
4	*2412.00	94.7 AV			3.79 V	270	61.7	33.0
5	4824.00	47.7 PK	74.0	-26.3	1.99 V	275	36.5	11.2
6	4824.00	36.6 AV	54.0	-17.4	1.99 V	275	25.4	11.2

Remarks:

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

CHANNEL	TX Channel 6	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		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	115.4 PK			1.10 H	39	82.4	33.0
2	*2437.00	104.6 AV			1.10 H	39	71.6	33.0
3	2483.50	69.7 PK	74.0	-4.3	1.10 H	39	36.5	33.2
4	2483.50	53.3 AV	54.0	-0.7	1.10 H	39	20.1	33.2
5	4874.00	48.6 PK	74.0	-25.4	2.51 H	196	37.5	11.1
6	4874.00	37.5 AV	54.0	-16.5	2.51 H	196	26.4	11.1
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	*2437.00	110.2 PK			3.75 V	269	77.2	33.0
2	*2437.00	99.4 AV			3.75 V	269	66.4	33.0
3	2483.50	66.6 PK	74.0	-7.4	3.75 V	269	33.4	33.2
4	2483.50	50.2 AV	54.0	-3.8	3.75 V	269	17.0	33.2
5	4874.00	47.7 PK	74.0	-26.3	2.64 V	182	36.6	11.1
6	4874.00	36.8 AV	54.0	-17.2	2.64 V	182	25.7	11.1

Remarks:

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

CHANNEL	TX Channel 11	DETECTOR	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz	FUNCTION	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	107.3 PK			1.12 H	15	74.3	33.0
2	*2462.00	96.7 AV			1.12 H	15	63.7	33.0
3	2483.50	65.4 PK	74.0	-8.6	1.12 H	15	32.2	33.2
4	2483.50	53.0 AV	54.0	-1.0	1.12 H	15	19.8	33.2
5	4924.00	48.9 PK	74.0	-25.1	3.15 H	174	37.8	11.1
6	4924.00	37.6 AV	54.0	-16.4	3.15 H	174	26.5	11.1
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	*2462.00	103.1 PK			3.74 V	264	70.1	33.0
2	*2462.00	91.9 AV			3.74 V	264	58.9	33.0
3	2483.50	63.2 PK	74.0	-10.8	3.74 V	264	30.0	33.2
4	2483.50	50.1 AV	54.0	-3.9	3.74 V	264	16.9	33.2
5	4924.00	47.6 PK	74.0	-26.4	1.18 V	254	36.5	11.1
6	4924.00	36.4 AV	54.0	-17.6	1.18 V	254	25.3	11.1

Remarks:

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

802.11n (VHT40)

CHANNEL	TX Channel 3	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		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	66.7 PK	74.0	-7.3	1.35 H	36	33.8	32.9
2	2390.00	52.6 AV	54.0	-1.4	1.35 H	36	19.7	32.9
3	*2422.00	105.3 PK			1.35 H	36	72.3	33.0
4	*2422.00	96.0 AV			1.35 H	36	63.0	33.0
5	4844.00	48.7 PK	74.0	-25.3	1.63 H	225	37.6	11.1
6	4844.00	37.5 AV	54.0	-16.5	1.63 H	225	26.4	11.1

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	2390.00	62.7 PK	74.0	-11.3	3.71 V	261	29.8	32.9
2	2390.00	49.6 AV	54.0	-4.4	3.71 V	261	16.7	32.9
3	*2422.00	101.7 PK			3.71 V	261	68.7	33.0
4	*2422.00	90.8 AV			3.71 V	261	57.8	33.0
5	4844.00	47.6 PK	74.0	-26.4	1.22 V	185	36.5	11.1
6	4844.00	36.7 AV	54.0	-17.3	1.22 V	185	25.6	11.1

Remarks:

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

CHANNEL	TX Channel 6	DETECTOR	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz	FUNCTION	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	106.5 PK			1.28 H	33	73.5	33.0
2	*2437.00	96.3 AV			1.28 H	33	63.3	33.0
3	2483.50	67.4 PK	74.0	-6.6	1.28 H	33	34.2	33.2
4	2483.50	53.0 AV	54.0	-1.0	1.28 H	33	19.8	33.2
5	4874.00	48.6 PK	74.0	-25.4	1.96 H	274	37.5	11.1
6	4874.00	37.5 AV	54.0	-16.5	1.96 H	274	26.4	11.1
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	*2437.00	101.2 PK			1.00 V	271	68.2	33.0
2	*2437.00	91.2 AV			1.00 V	271	58.2	33.0
3	2483.50	63.7 PK	74.0	-10.3	3.80 V	271	30.5	33.2
4	2483.50	50.0 AV	54.0	-4.0	3.80 V	271	16.8	33.2
5	4874.00	47.4 PK	74.0	-26.6	1.28 V	241	36.3	11.1
6	4874.00	36.5 AV	54.0	-17.5	1.28 V	241	25.4	11.1

Remarks:

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

CHANNEL	TX Channel 9	DETECTOR	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz	FUNCTION	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	105.8 PK			1.35 H	32	72.9	32.9
2	*2452.00	95.9 AV			1.35 H	32	63.0	32.9
3	2483.50	66.5 PK	74.0	-7.5	1.35 H	32	33.3	33.2
4	2483.50	52.9 AV	54.0	-1.1	1.35 H	32	19.7	33.2
5	4904.00	48.4 PK	74.0	-25.6	1.99 H	287	37.2	11.2
6	4904.00	37.5 AV	54.0	-16.5	1.99 H	287	26.3	11.2
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	*2452.00	100.6 PK			3.79 V	264	67.7	32.9
2	*2452.00	90.8 AV			3.79 V	264	57.9	32.9
3	2483.50	63.1 PK	74.0	-10.9	3.79 V	264	29.9	33.2
4	2483.50	49.6 AV	54.0	-4.4	3.79 V	264	16.4	33.2
5	4904.00	47.6 PK	74.0	-26.4	3.11 V	174	36.4	11.2
6	4904.00	37.0 AV	54.0	-17.0	3.11 V	174	25.8	11.2

Remarks:

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

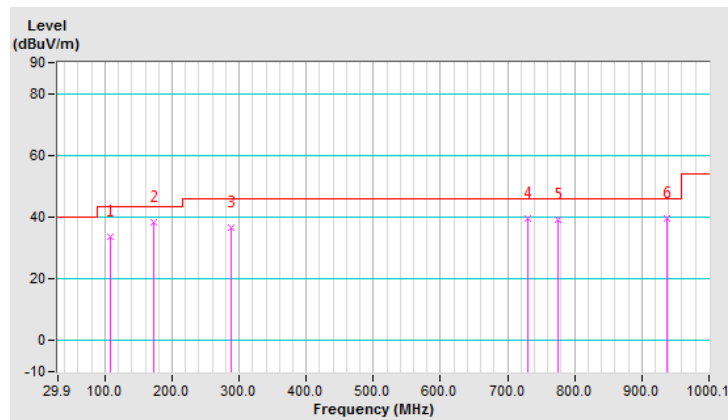
Below 1GHz worst-case data: 802.11g

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	107.52	33.7 QP	43.5	-9.8	1.50 H	63	45.9	-12.2
2	173.49	38.2 QP	43.5	-5.3	1.00 H	67	47.7	-9.5
3	287.97	36.4 QP	46.0	-9.6	1.00 H	65	44.3	-7.9
4	730.38	39.7 QP	46.0	-6.3	1.00 H	23	37.7	2.0
5	775.01	39.2 QP	46.0	-6.8	1.50 H	215	35.6	3.6
6	938.01	39.5 QP	46.0	-6.5	1.00 H	275	32.4	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 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.

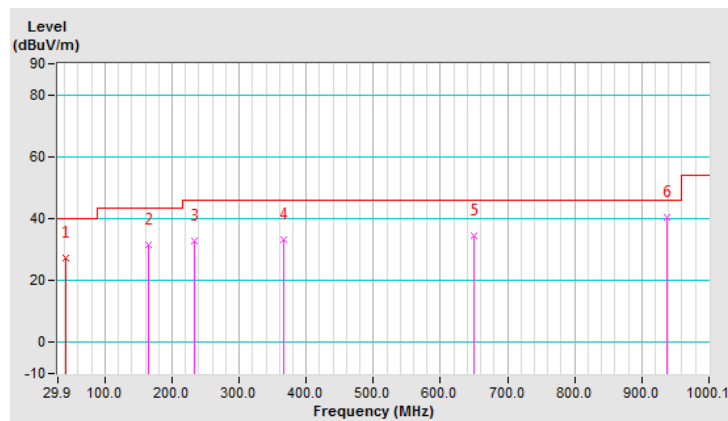


CHANNEL	TX Channel 6	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	42.48	27.4 QP	40.0	-12.6	1.00 V	90	36.5	-9.1
2	165.73	31.7 QP	43.5	-11.8	1.00 V	16	40.6	-8.9
3	233.64	32.6 QP	46.0	-13.4	1.50 V	25	43.3	-10.7
4	365.59	33.1 QP	46.0	-12.9	1.00 V	51	39.4	-6.3
5	650.83	34.5 QP	46.0	-11.5	1.00 V	87	34.6	-0.1
6	938.01	40.4 QP	46.0	-5.6	1.00 V	151	33.3	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 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.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESCI	100424	Dec. 31, 2019	Dec. 30, 2020
RF signal cable Woken	5D-FB	Cable-cond1-01	Sep. 04, 2020	Sep. 03, 2021
LISN/AMN ROHDE & SCHWARZ (EUT)	ENV216	101826	Feb. 20, 2020	Feb. 19, 2021
LISN/AMN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Aug. 28, 2020	Aug. 27, 2021
Software ADT	BV ADT_Conc_ 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. Test Date: Sep. 04, 2020

4.2.3 Test Procedures

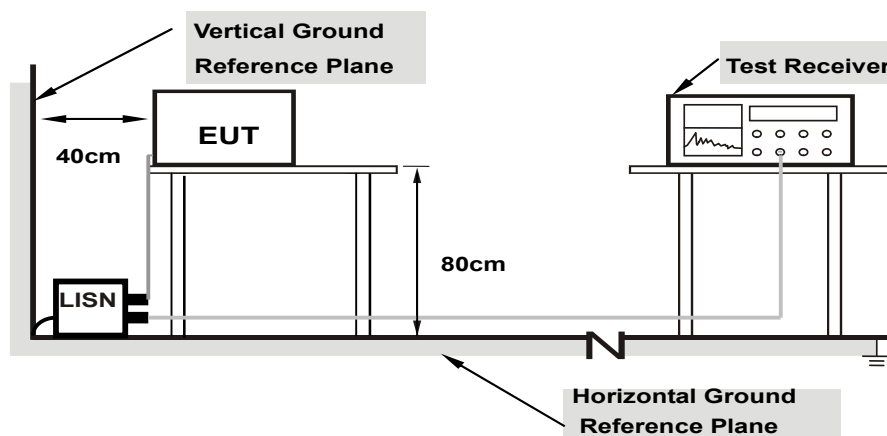
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance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

Worst-case data:

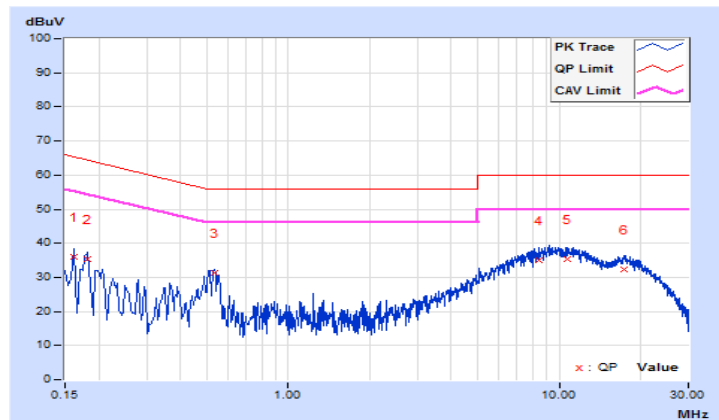
802.11g

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

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16200	9.63	26.33	18.13	35.96	27.76	65.36	55.36	-29.40	-27.60
2	0.18200	9.62	25.61	18.23	35.23	27.85	64.39	54.39	-29.16	-26.54
3	0.53264	9.66	21.54	15.93	31.20	25.59	56.00	46.00	-24.80	-20.41
4	8.42600	9.85	25.04	16.97	34.89	26.82	60.00	50.00	-25.11	-23.18
5	10.65800	9.87	25.41	18.27	35.28	28.14	60.00	50.00	-24.72	-21.86
6	17.30200	9.90	22.39	16.36	32.29	26.26	60.00	50.00	-27.71	-23.74

Remarks:

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

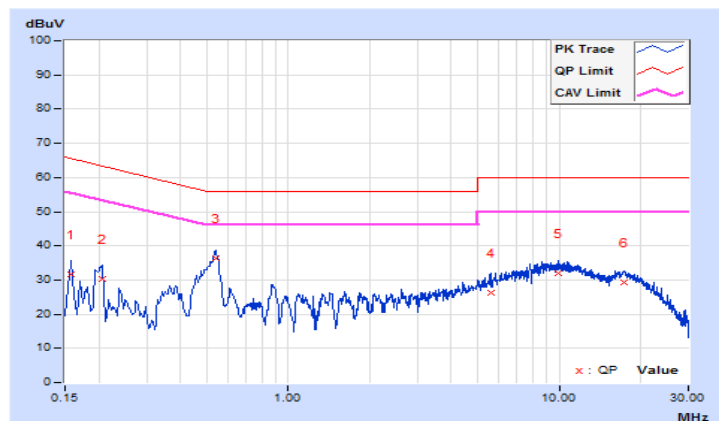


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
-------	-------------	-------------------	--------------------------------

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15800	9.66	21.97	6.71	31.63	16.37	65.57	55.57	-33.94	-39.20
2	0.20577	9.64	20.65	8.71	30.29	18.35	63.37	53.37	-33.08	-35.02
3	0.53800	9.68	26.60	21.59	36.28	31.27	56.00	46.00	-19.72	-14.73
4	5.60200	9.84	16.38	11.06	26.22	20.90	60.00	50.00	-33.78	-29.10
5	9.91000	9.91	21.97	15.96	31.88	25.87	60.00	50.00	-28.12	-24.13
6	17.29400	10.00	19.13	14.16	29.13	24.16	60.00	50.00	-30.87	-25.84

Remarks:

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

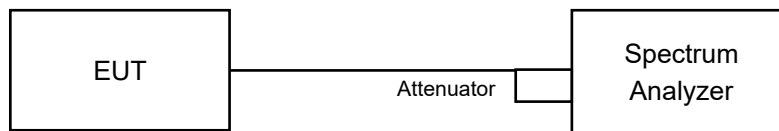


4.3 6dB Bandwidth Measurement

4.3.1 Limits of 6dB Bandwidth Measurement

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

4.3.2 Test Setup



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedure

- Set resolution bandwidth (RBW) = 100kHz.
- Set the video bandwidth (VBW) $\geq 3 \times$ RBW, Detector = 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 Result

802.11b

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	8.13	8.11	0.5	Pass
6	2437	12.09	12.08	0.5	Pass
11	2462	8.12	8.12	0.5	Pass

802.11g

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	16.38	16.37	0.5	Pass
6	2437	16.36	16.36	0.5	Pass
11	2462	16.40	16.40	0.5	Pass

802.11n (VHT20)

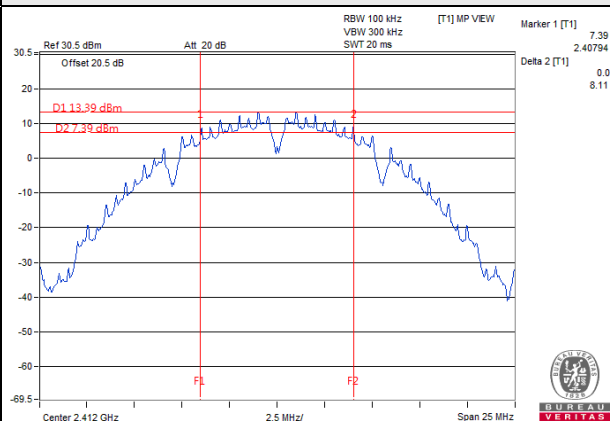
Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	17.59	17.59	0.5	Pass
6	2437	17.60	17.62	0.5	Pass
11	2462	17.59	17.59	0.5	Pass

802.11n (VHT40)

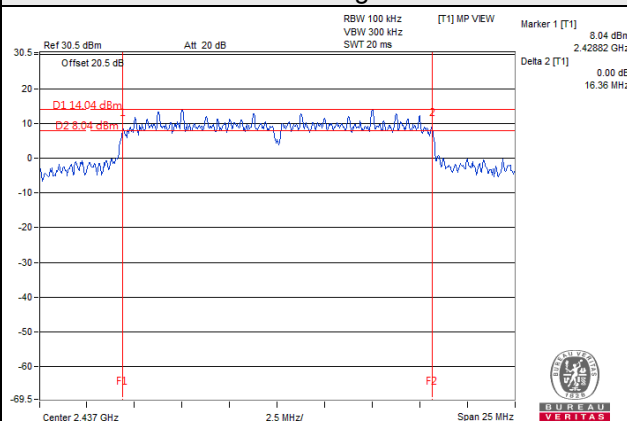
Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
3	2422	35.27	35.28	0.5	Pass
6	2437	35.18	35.22	0.5	Pass
9	2452	35.24	35.22	0.5	Pass

Spectrum Plot of Worst Value

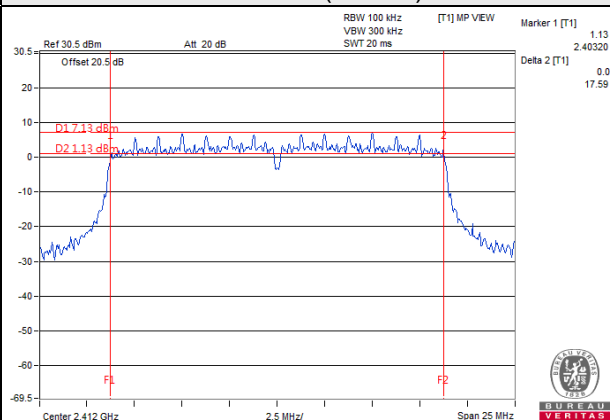
802.11b



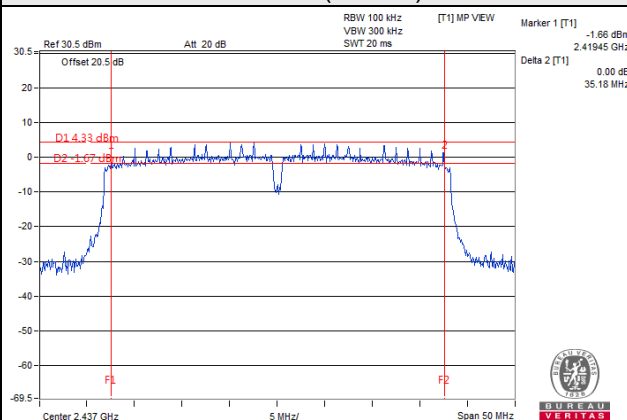
802.11g



802.11n (VHT20)



802.11n (VHT40)



4.4 Conducted Output Power Measurement

4.4.1 Limits of Conducted Output Power Measurement

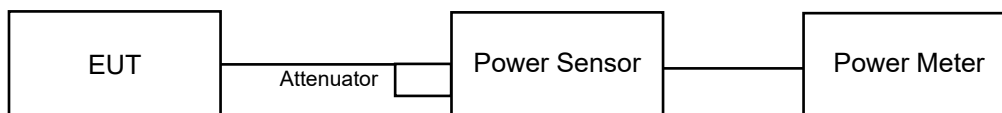
For systems using digital modulation in the 2400–2483.5 MHz bands: 1 Watt (30dBm)

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

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

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

4.4.2 Test Setup



4.4.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.4.4 Test Procedures

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

CDD Mode

802.11b

Chan.	Freq. (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	23.05	23.10	406.010	26.09	30	Pass
6	2437	24.94	24.87	618.791	27.92	30	Pass
11	2462	21.63	21.38	282.950	24.52	30	Pass

802.11g

Chan.	Freq. (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	18.32	18.30	135.529	21.32	30	Pass
6	2437	24.27	24.18	529.119	27.24	30	Pass
11	2462	15.95	15.65	76.083	18.81	30	Pass

802.11n (HT20)

Chan.	Freq. (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	18.12	18.49	135.495	21.32	30	Pass
6	2437	24.21	24.16	524.248	27.20	30	Pass
11	2462	16.43	16.00	83.765	19.23	30	Pass

802.11n (HT40)

Chan.	Freq. (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
3	2422	17.03	17.20	102.947	20.13	30	Pass
6	2437	18.38	18.41	138.208	21.41	30	Pass
9	2452	17.26	17.15	105.091	20.22	30	Pass

802.11n (VHT20)

Chan.	Freq. (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	18.14	18.50	135.957	21.33	30	Pass
6	2437	24.23	24.18	526.668	27.22	30	Pass
11	2462	16.44	16.02	84.050	19.25	30	Pass

802.11n (VHT40)

Chan.	Freq. (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
3	2422	17.06	17.23	103.660	20.16	30	Pass
6	2437	18.40	18.43	138.846	21.43	30	Pass
9	2452	17.28	17.17	105.576	20.24	30	Pass

Beamforming Mode

802.11n (HT20)

Chan.	Freq. (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	18.10	18.46	134.711	21.29	30.00	Pass
6	2437	24.20	24.14	522.445	27.18	30.00	Pass
11	2462	16.41	15.98	83.380	19.21	30.00	Pass

Note: Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2/2] = 5.54\text{dBi} < 6\text{dBi}$, so the limit no need to reduced.

802.11n (HT40)

Chan.	Freq. (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
3	2422	17.01	17.18	102.474	20.11	30.00	Pass
6	2437	18.36	18.40	137.732	21.39	30.00	Pass
9	2452	17.24	17.13	104.608	20.20	30.00	Pass

Note: Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2/2] = 5.54\text{dBi} < 6\text{dBi}$, so the limit no need to reduced.

802.11n (VHT20)

Chan.	Freq. (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	18.14	18.50	135.957	21.33	30.00	Pass
6	2437	24.23	24.18	526.668	27.22	30.00	Pass
11	2462	16.44	16.02	84.050	19.25	30.00	Pass

Note: Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2/2] = 5.54\text{dBi} < 6\text{dBi}$, so the limit no need to reduced.

802.11n (VHT40)

Chan.	Freq. (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
3	2422	17.06	17.23	103.660	20.16	30.00	Pass
6	2437	18.40	18.43	138.846	21.43	30.00	Pass
9	2452	17.28	17.17	105.576	20.24	30.00	Pass

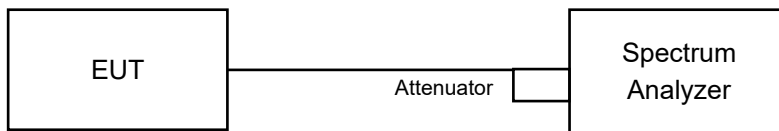
Note: Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2/2] = 5.54\text{dBi} < 6\text{dBi}$, so the limit no need to reduced.

4.5 Power Spectral Density Measurement

4.5.1 Limits of Power Spectral Density Measurement

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

4.5.2 Test Setup



4.5.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.5.4 Test Procedure

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

- 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 $< 98\%$)

- Measure the duty cycle (x).
- 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.
- Do not use sweep triggering. Allow sweep to "free run".
- Employ trace averaging (RMS) mode over a minimum of 100 traces.
- Use the peak marker function to determine the maximum amplitude level.
- Add $10 \log(1/x)$, where x is the duty cycle measured in step (a), to the measured PSD to compute the average PSD during the actual transmission time.

4.5.5 Deviation from Test Standard

No deviation.

4.5.6 EUT Operating Condition

Same as item 4.3.6.

4.5.7 Test Results

802.11b

TX chain	Chan.	Frequency (MHz)	PSD (dBm/10kHz)	PSD (dBm/3kHz)	10 log (N=2) dB	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass / Fail
0	1	2412	-5.99	-11.22	3.01	-8.21	8	Pass
	6	2437	-4.07	-9.30	3.01	-6.29	8	Pass
	11	2462	-5.95	-11.18	3.01	-8.17	8	Pass
1	1	2412	-5.60	-10.83	3.01	-7.82	8	Pass
	6	2437	-3.67	-8.90	3.01	-5.89	8	Pass
	11	2462	-5.82	-11.05	3.01	-8.04	8	Pass

Note:

1. Method E) 2) c) of power density measurement of KDB 662911 is using for calculating total power density.
2. Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2/2] = 5.54\text{dBi} < 6\text{dBi}$, so the limit no need to reduced.

802.11g

TX chain	Chan.	Frequency (MHz)	PSD (dBm/10kHz)	PSD (dBm/3kHz)	10 log (N=2) dB	Duty Factor (dB)	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass / Fail
0	1	2412	-12.35	-17.58	3.01	0.18	-14.39	8	Pass
	6	2437	-6.40	-11.63	3.01	0.18	-8.44	8	Pass
	11	2462	-15.17	-20.40	3.01	0.18	-17.21	8	Pass
1	1	2412	-12.70	-17.93	3.01	0.18	-14.74	8	Pass
	6	2437	-6.53	-11.76	3.01	0.18	-8.57	8	Pass
	11	2462	-14.98	-20.21	3.01	0.18	-17.02	8	Pass

Note:

1. Method E) 2) c) of power density measurement of KDB 662911 is using for calculating total power density.
2. Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2/2] = 5.54\text{dBi} < 6\text{dBi}$, so the limit no need to reduced.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11n (VHT20)

TX chain	Chan.	Frequency (MHz)	PSD (dBm/10kHz)	PSD (dBm/3kHz)	10 log (N=2) dB	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass / Fail
0	1	2412	-11.37	-16.60	3.01	-13.59	8	Pass
	6	2437	-6.27	-11.50	3.01	-8.49	8	Pass
	11	2462	-14.16	-19.39	3.01	-16.38	8	Pass
1	1	2412	-11.53	-16.76	3.01	-13.75	8	Pass
	6	2437	-6.16	-11.39	3.01	-8.38	8	Pass
	11	2462	-14.07	-19.30	3.01	-16.29	8	Pass

Note:

1. Method E) 2) c) of power density measurement of KDB 662911 is using for calculating total power density.
2. Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2/2] = 5.54\text{dBi} < 6\text{dBi}$, so the limit no need to reduced.

802.11n (VHT40)

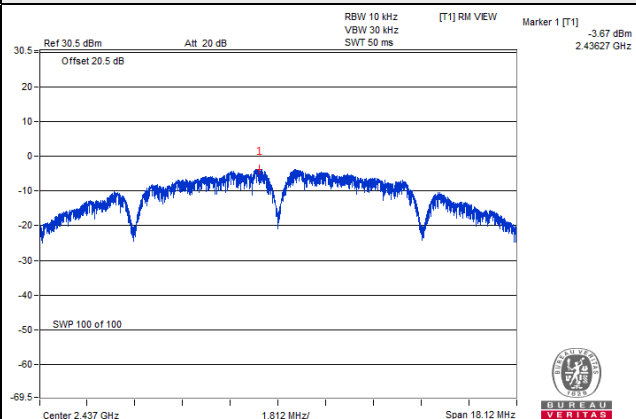
TX chain	Chan.	Frequency (MHz)	PSD (dBm/10kHz)	PSD (dBm/3kHz)	10 log (N=2) dB	Duty Factor (dB)	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass / Fail
0	3	2422	-15.58	-20.81	3.01	0.23	-17.57	8	Pass
	6	2437	-15.24	-20.47	3.01	0.23	-17.23	8	Pass
	9	2452	-15.97	-21.20	3.01	0.23	-17.96	8	Pass
1	3	2422	-14.44	-19.67	3.01	0.23	-16.43	8	Pass
	6	2437	-14.66	-19.89	3.01	0.23	-16.65	8	Pass
	9	2452	-16.42	-21.65	3.01	0.23	-18.41	8	Pass

Note:

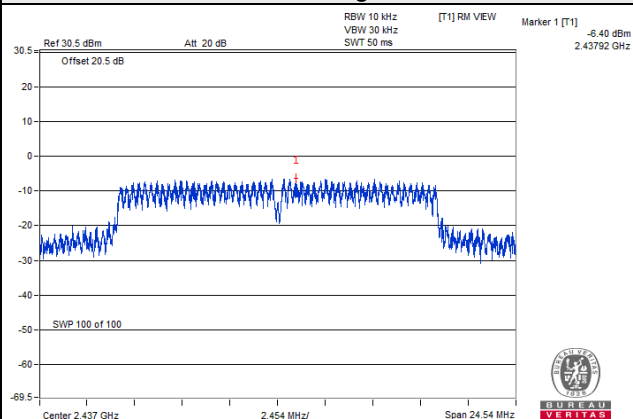
1. Method E) 2) c) of power density measurement of KDB 662911 is using for calculating total power density.
2. Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2/2] = 5.54\text{dBi} < 6\text{dBi}$, so the limit no need to reduced.
3. Refer to section 3.3 for duty cycle spectrum plot.

Spectrum Plot of Worst Value

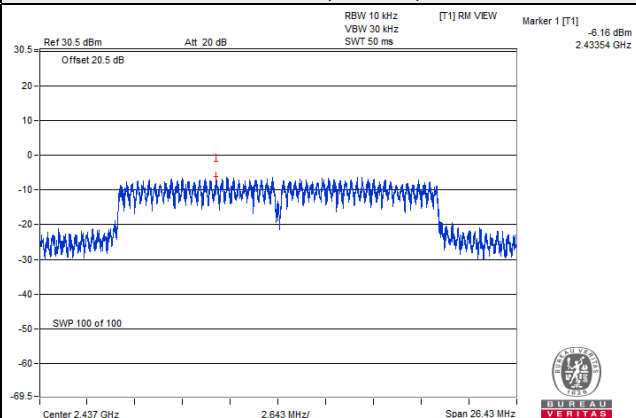
802.11b



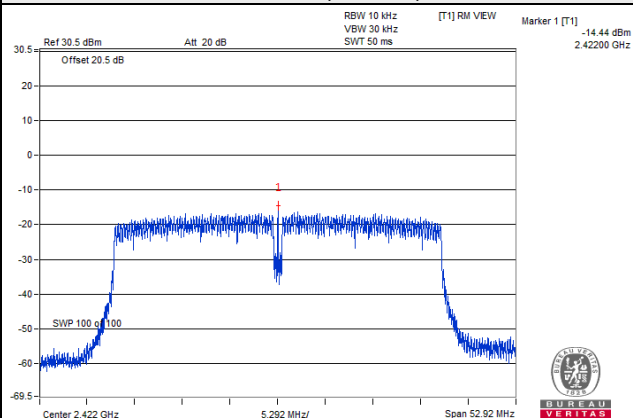
802.11g



802.11n (VHT20)



802.11n (VHT40)



4.6 Conducted Out of Band Emission Measurement

4.6.1 Limits of Conducted Out of Band Emission Measurement

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

4.6.2 Test Setup



4.6.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.6.4 Test Procedure

MEASUREMENT PROCEDURE REF

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.

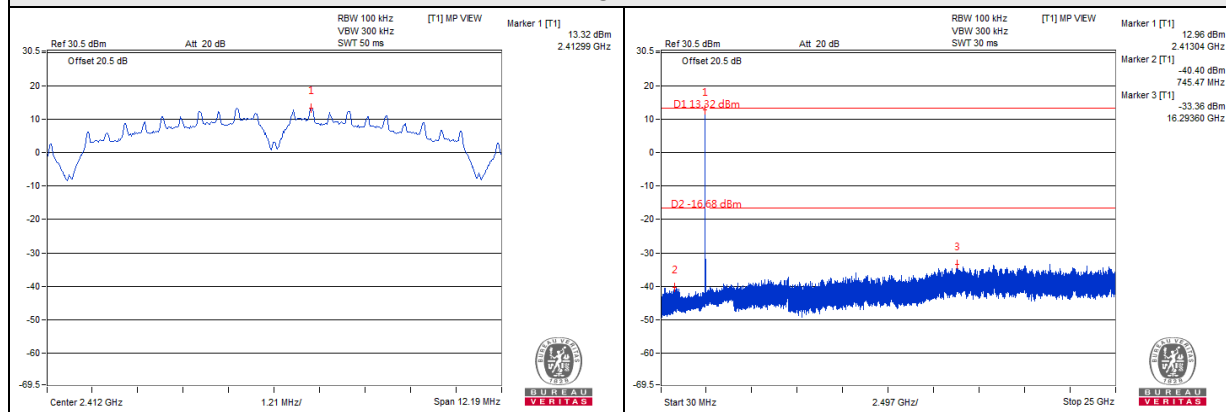
4.6.7 Test Results

The conducted emission test is performed on each TX port of operating mode without summing or adding 10log (N) since the limit is relative emission limit.

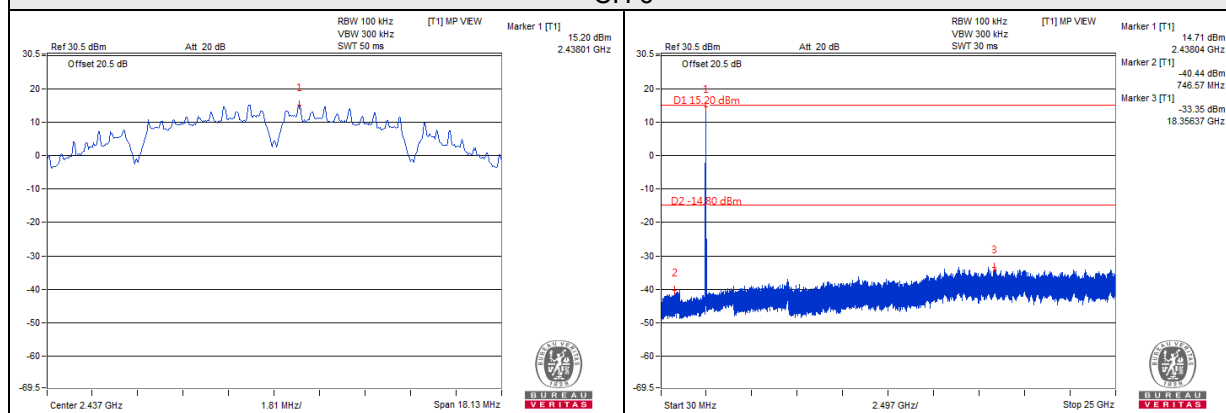
The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 30dB offset below D1. It shows compliance with the requirement.

802.11b_Chain 0

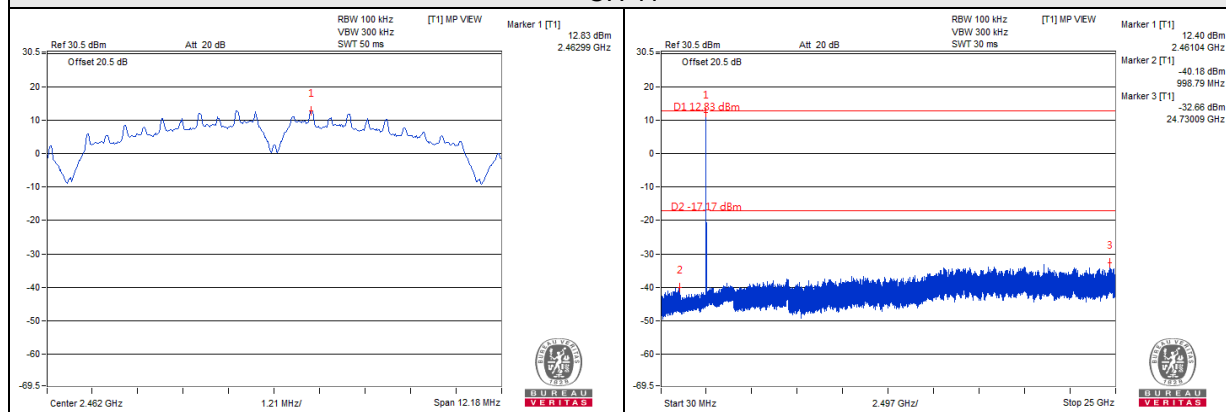
CH 1



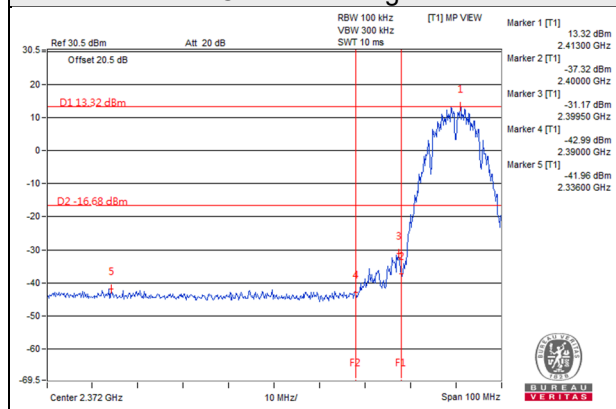
CH 6



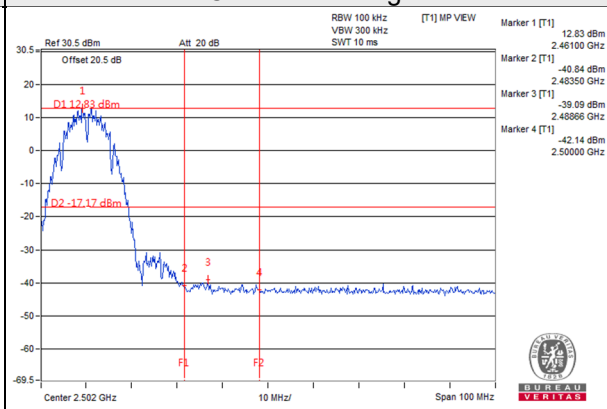
CH 11



CH 1 Band edge

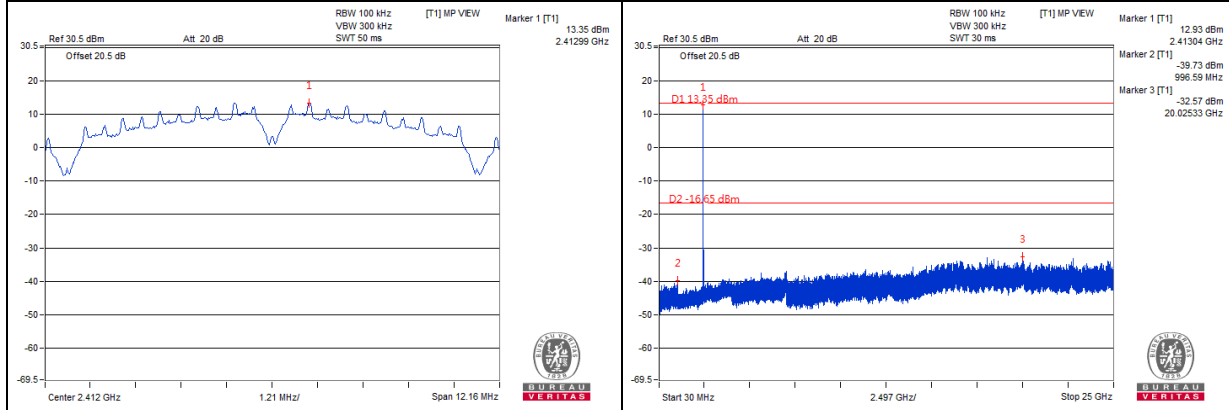


CH 11 Band edge

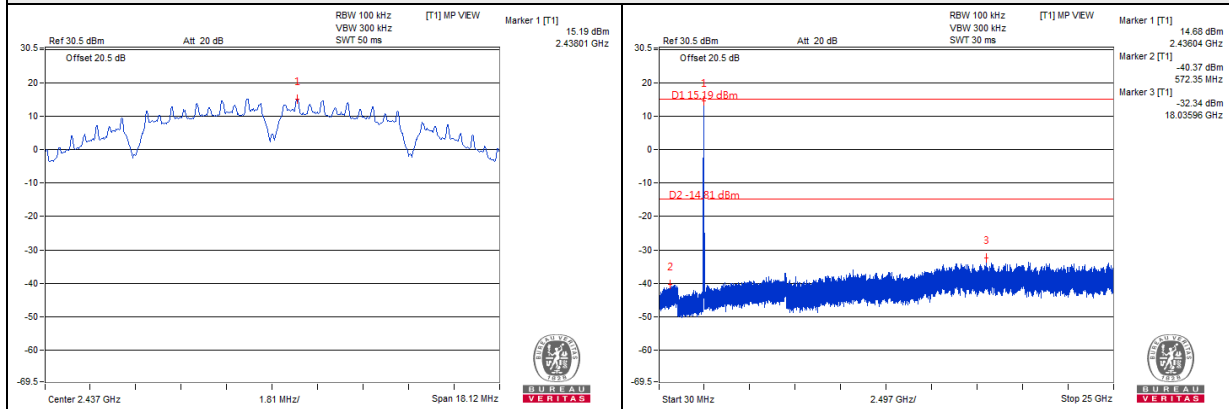


802.11b_Chain 1

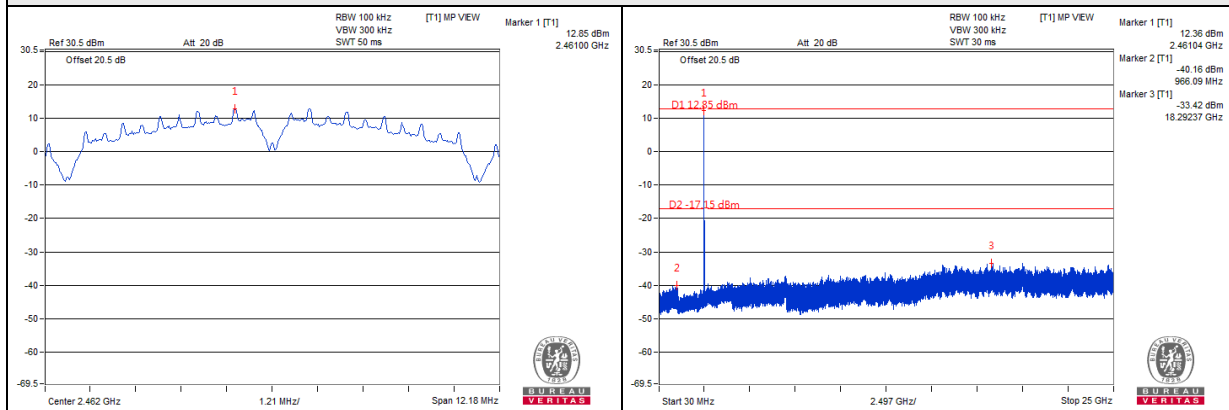
CH 1



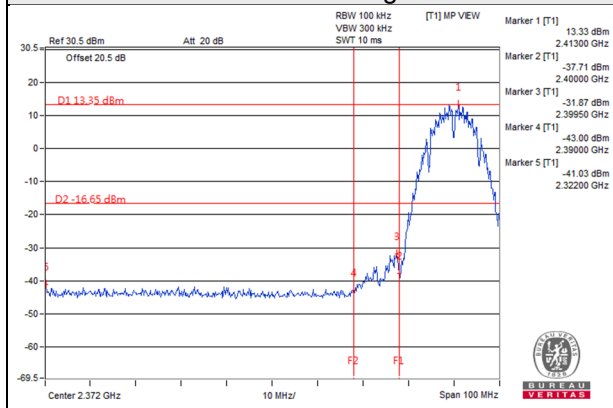
CH 6



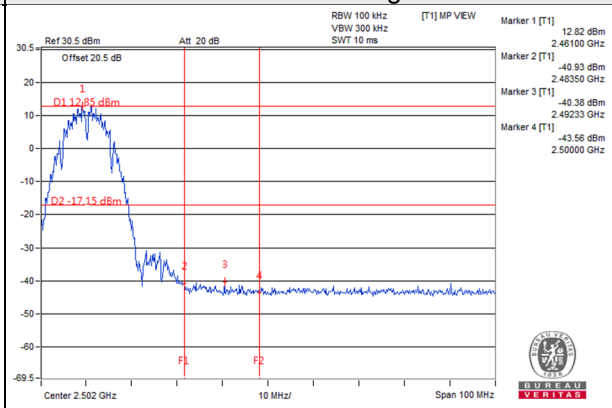
CH 11



CH 1 Band edge

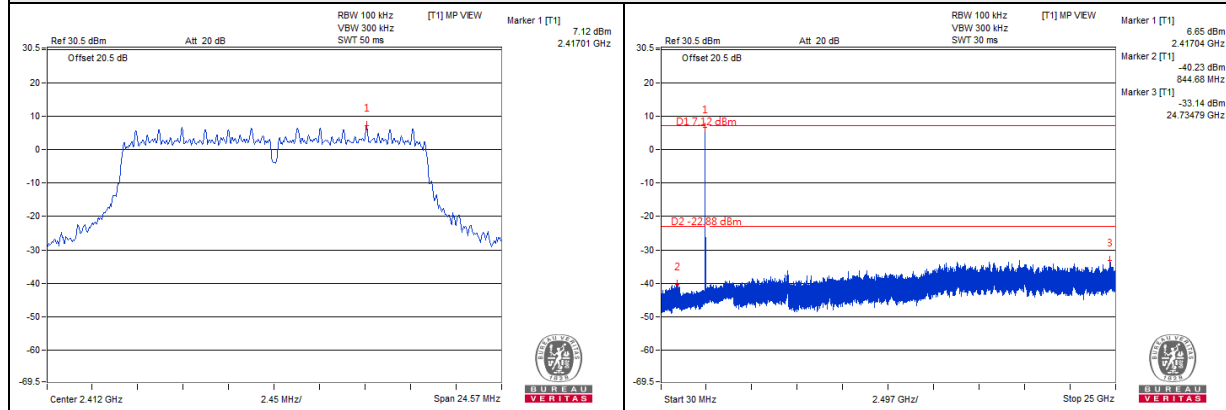


CH 11 Band edge

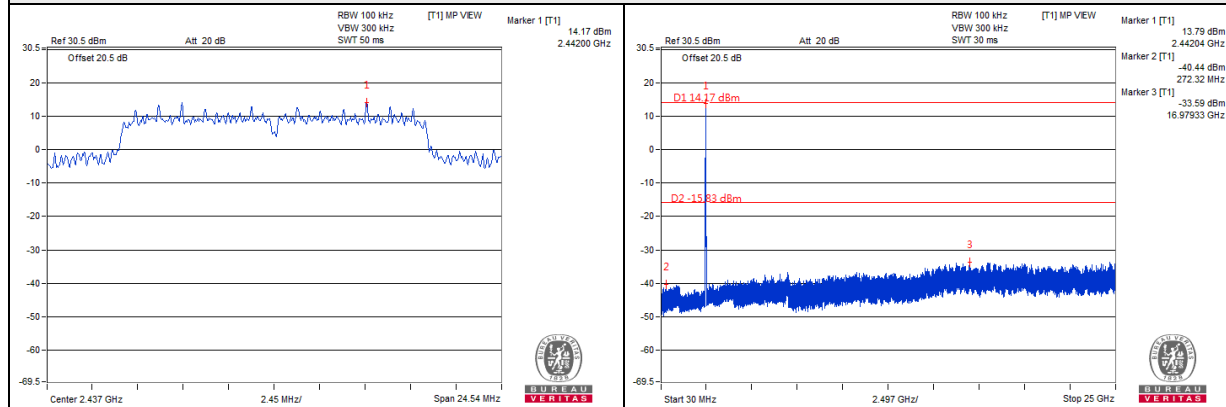


802.11g_Chain 0

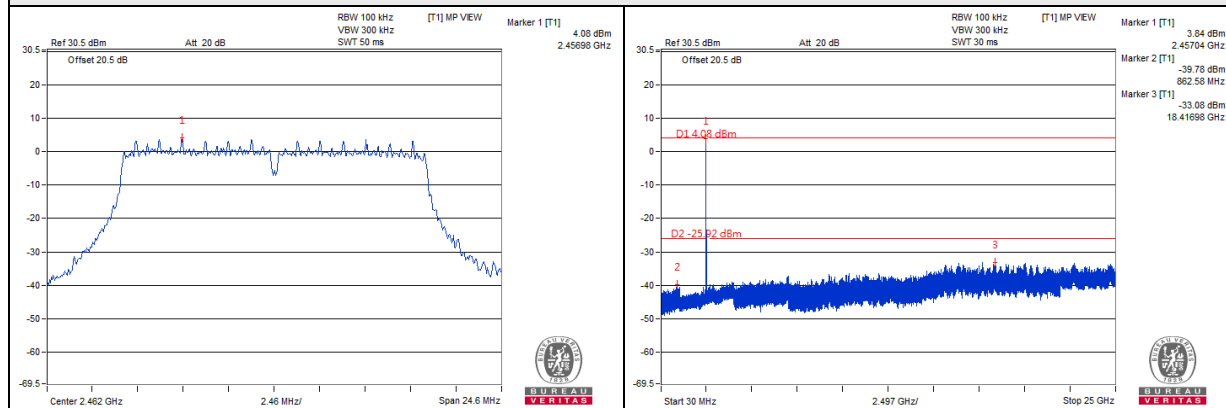
CH 1



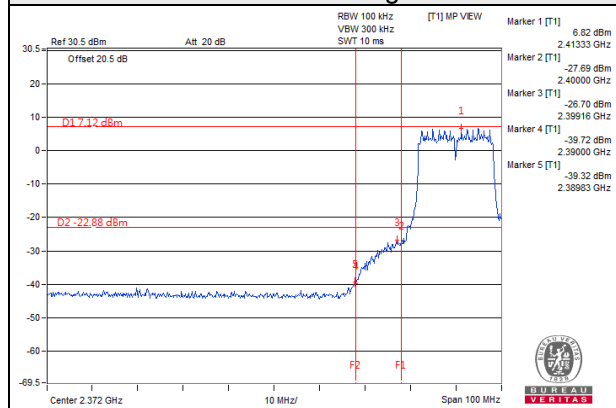
CH 6



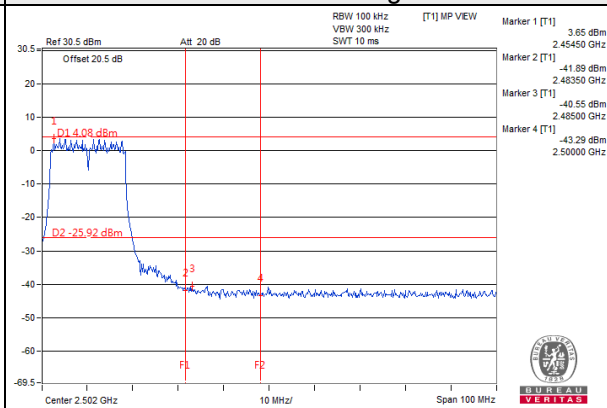
CH 11



CH 1 Band edge

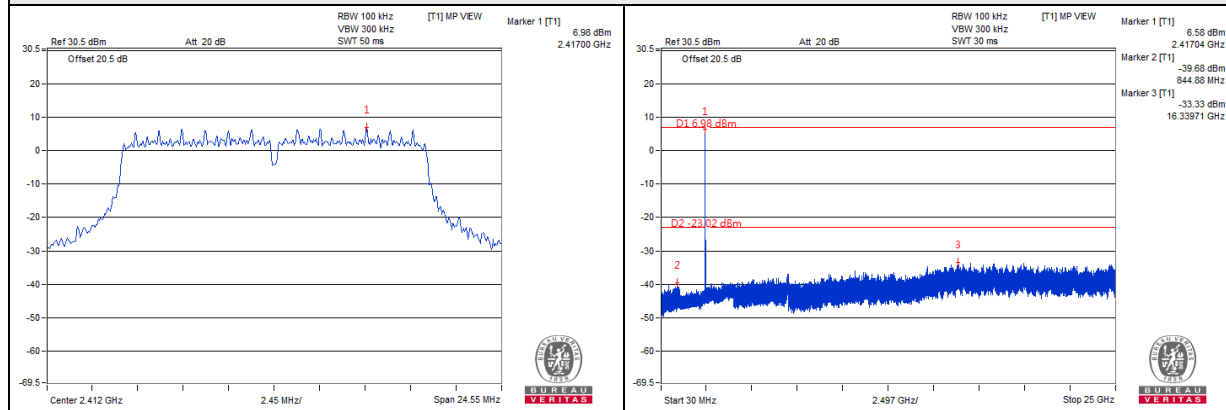


CH 11 Band edge

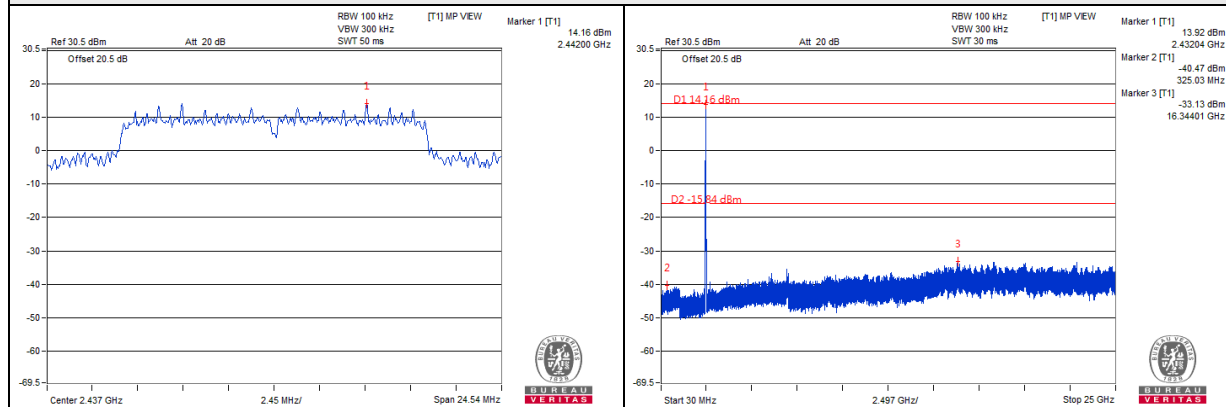


802.11g_Chain 1

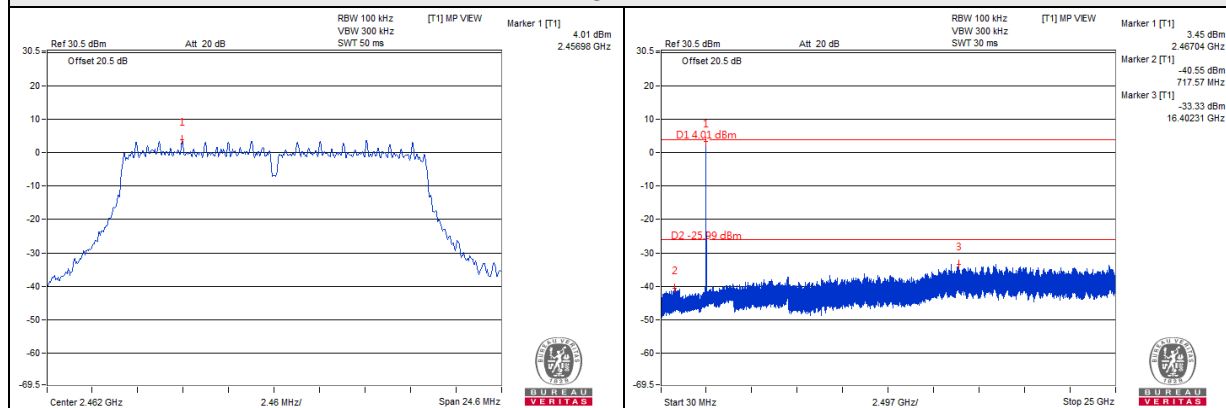
CH 1



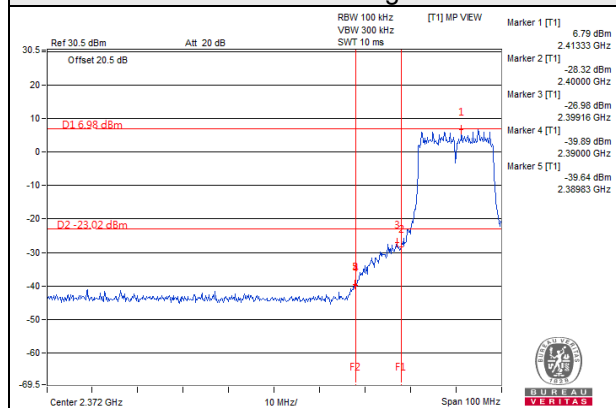
CH 6



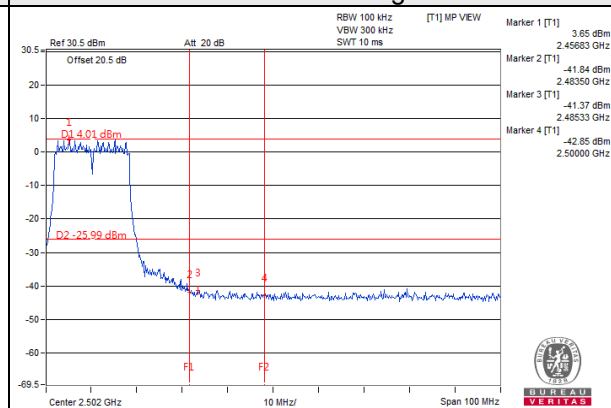
CH 11



CH 1 Band edge

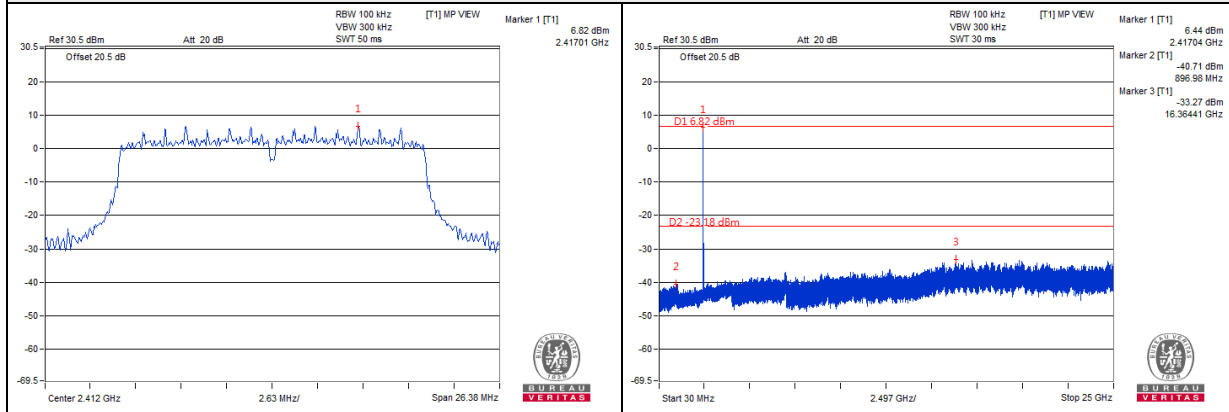


CH 11 Band edge

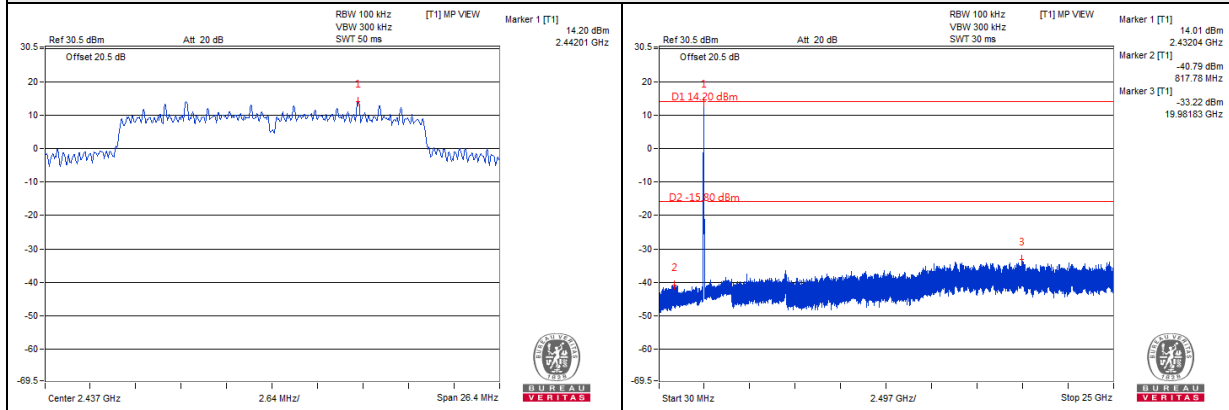


802.11n (VHT20)_Chain 0

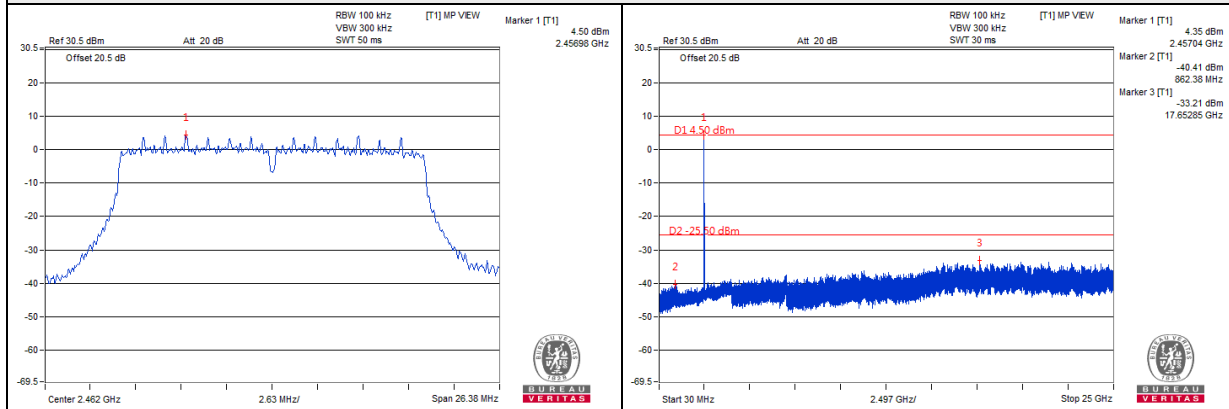
CH 1



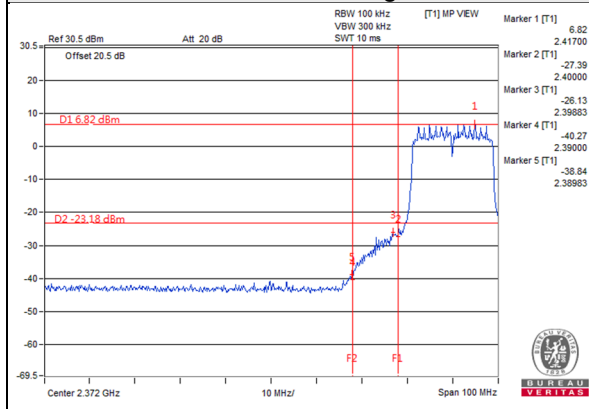
CH 6



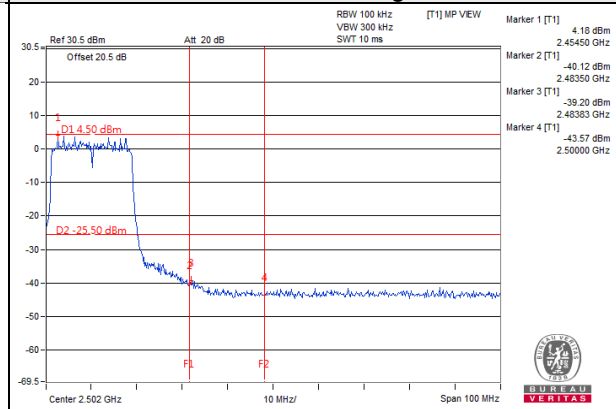
CH 11



CH 1 Band edge

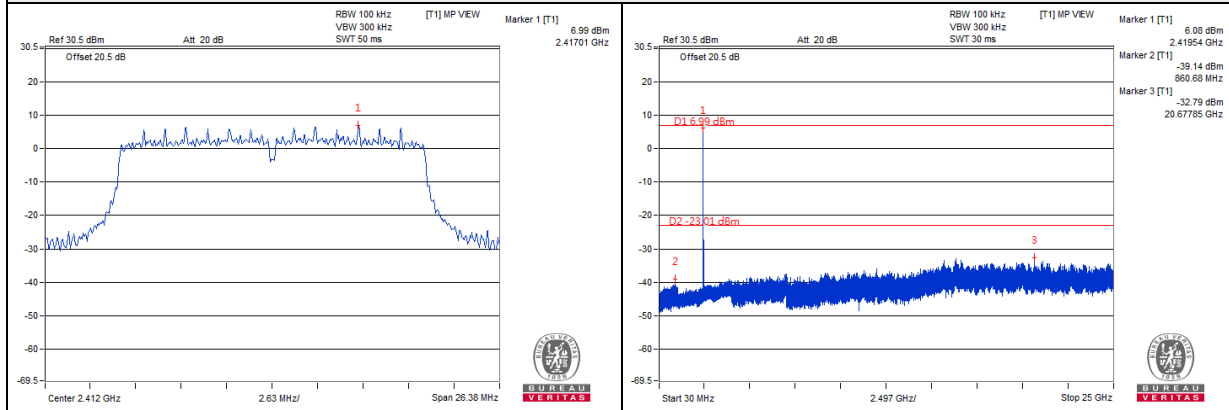


CH 11 Band edge

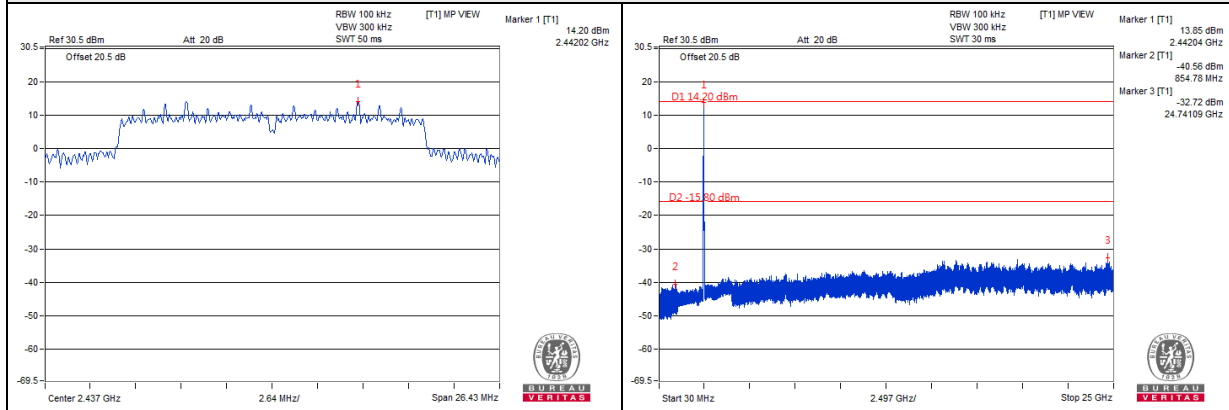


802.11n (VHT20)_Chain 1

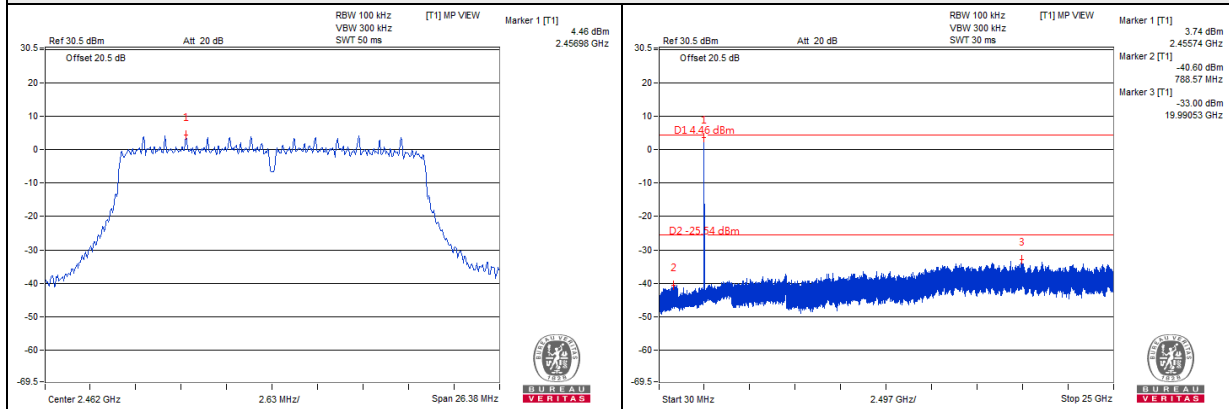
CH 1



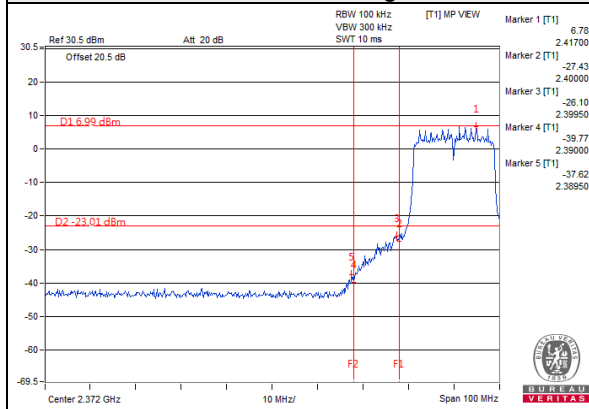
CH 6



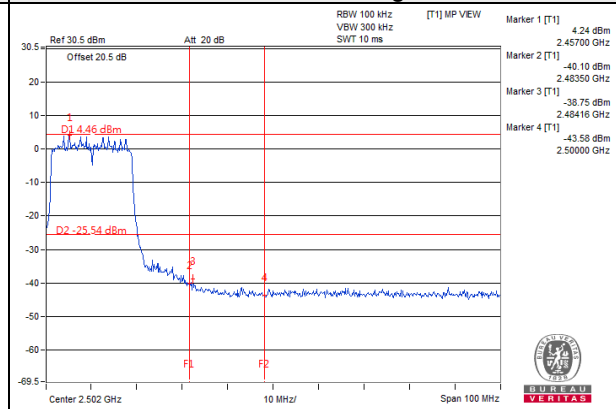
CH 11



CH 1 Band edge

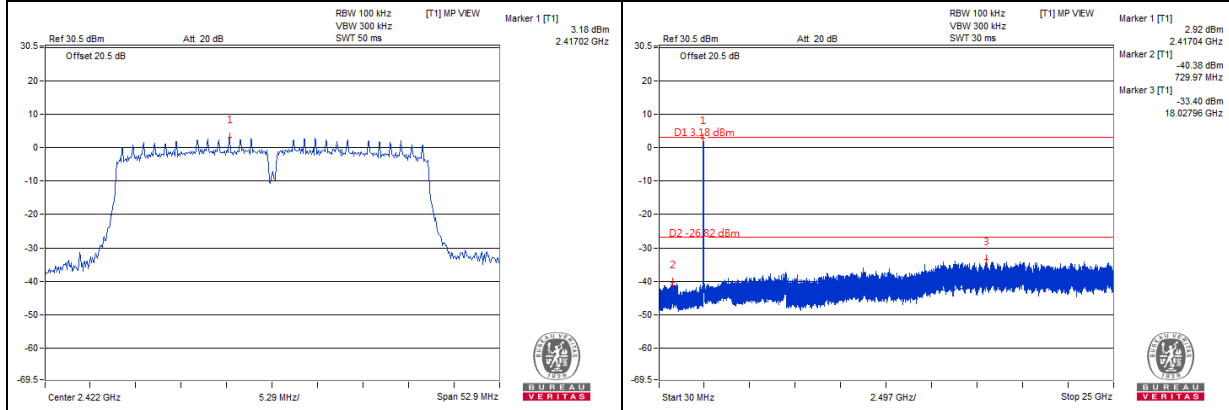


CH 11 Band edge

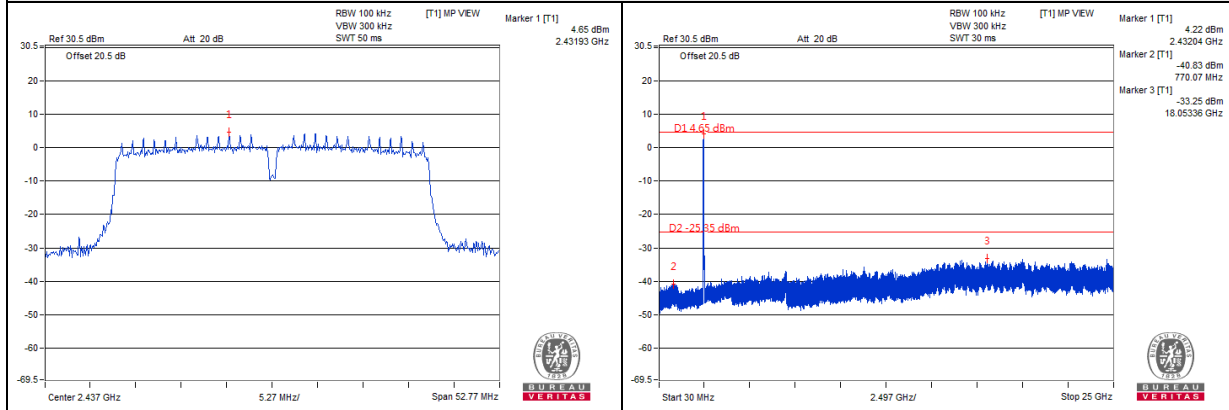


802.11n (VHT40) Chain 0

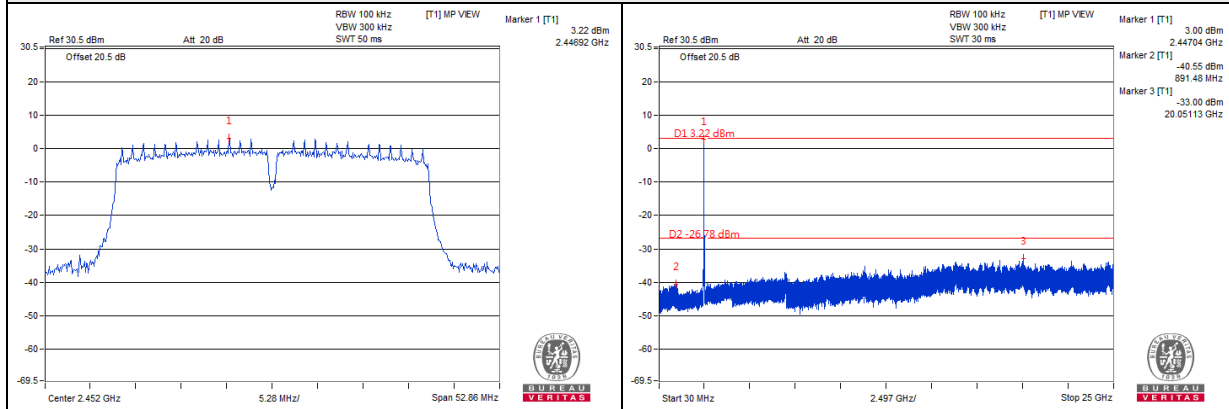
CH 3



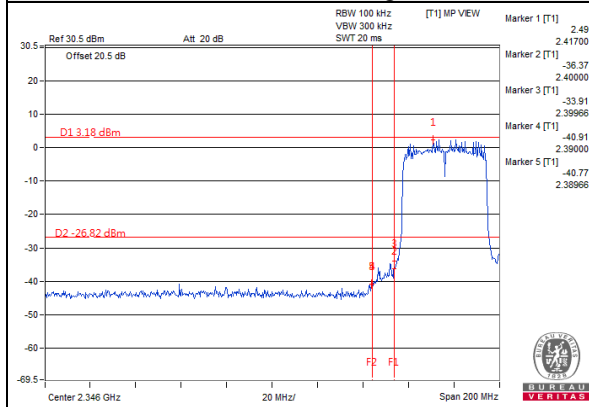
CH 6



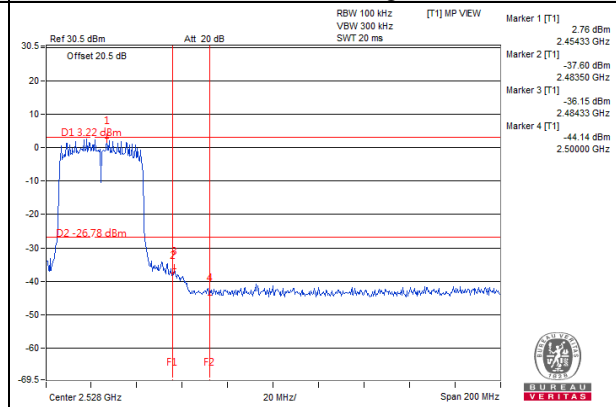
CH 9



CH 3 Band edge

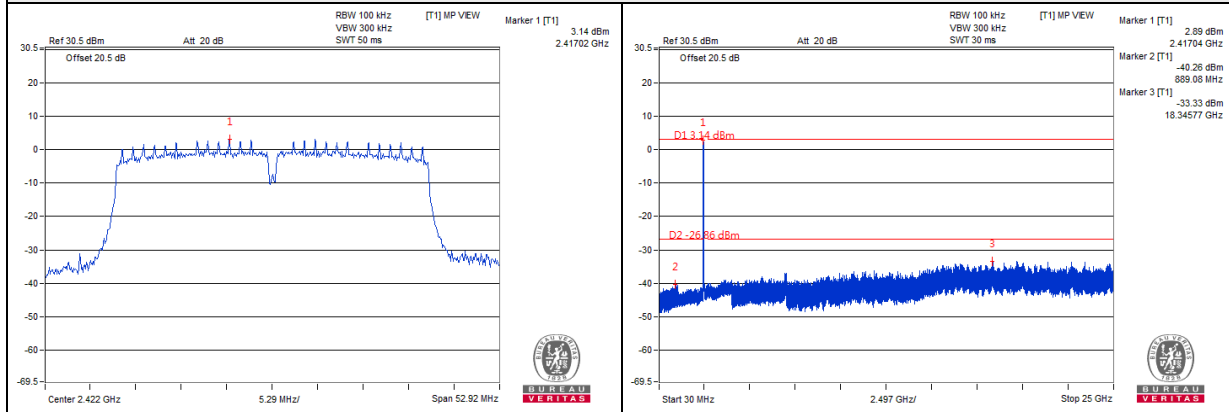


CH 9 Band edge

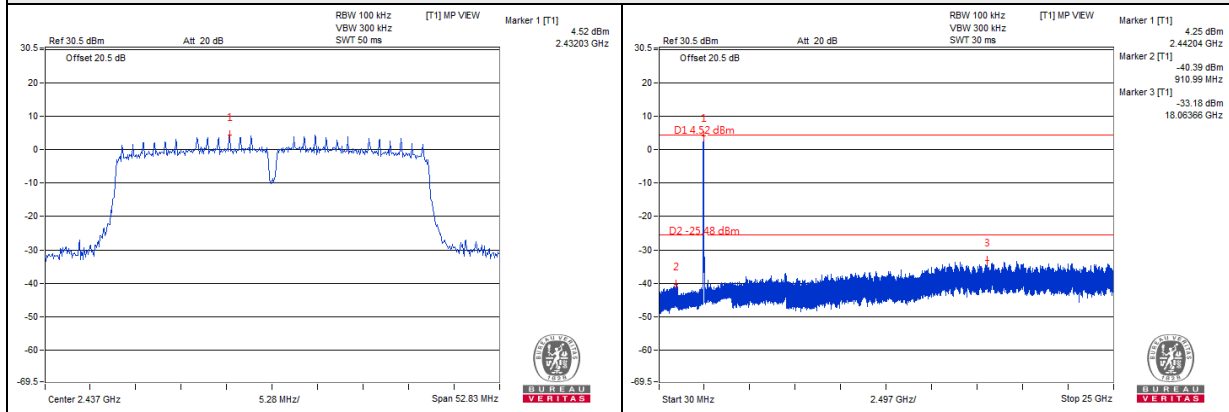


802.11n (VHT40) Chain 1

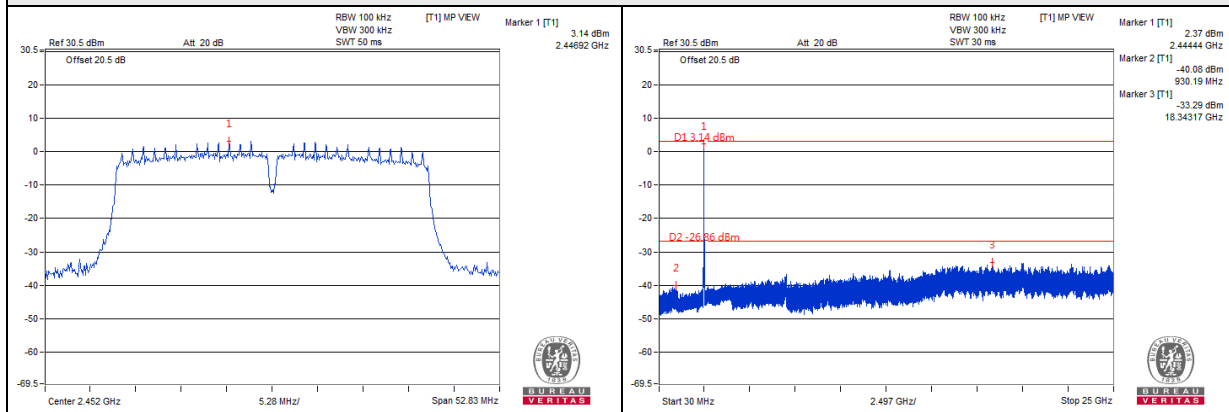
CH 3



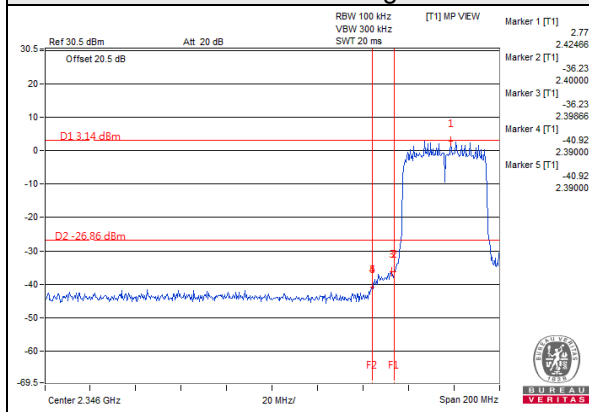
CH 6



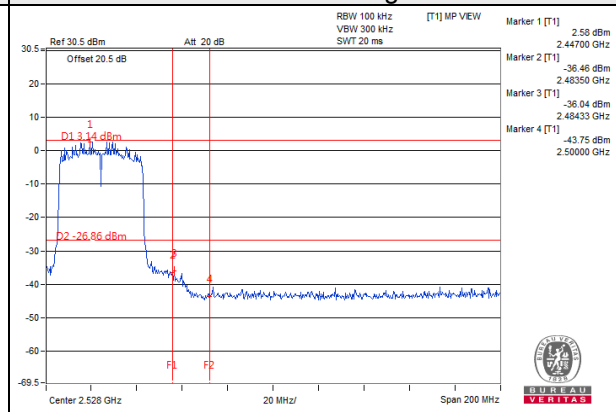
CH 9



CH 3 Band edge



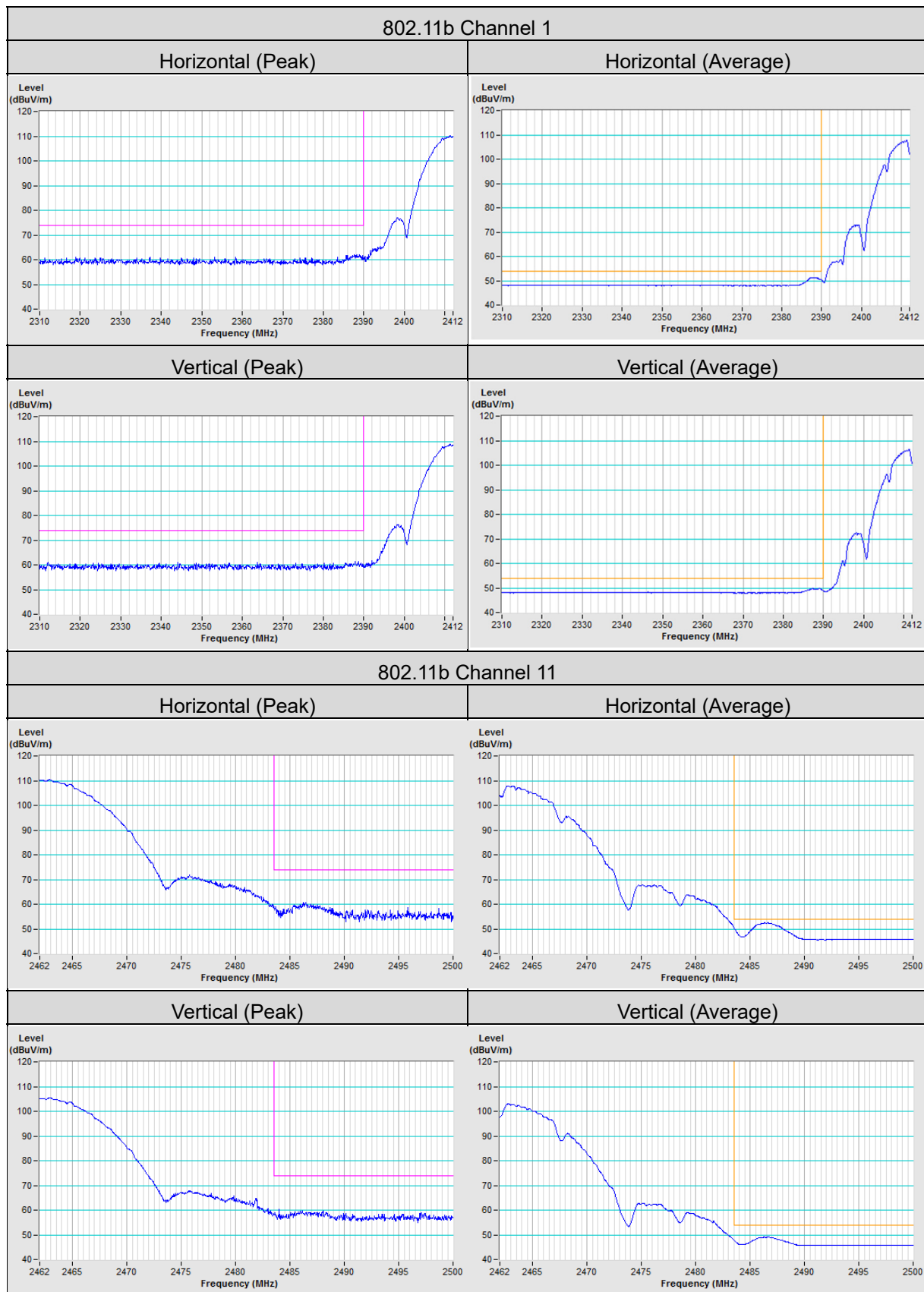
CH 9 Band edge

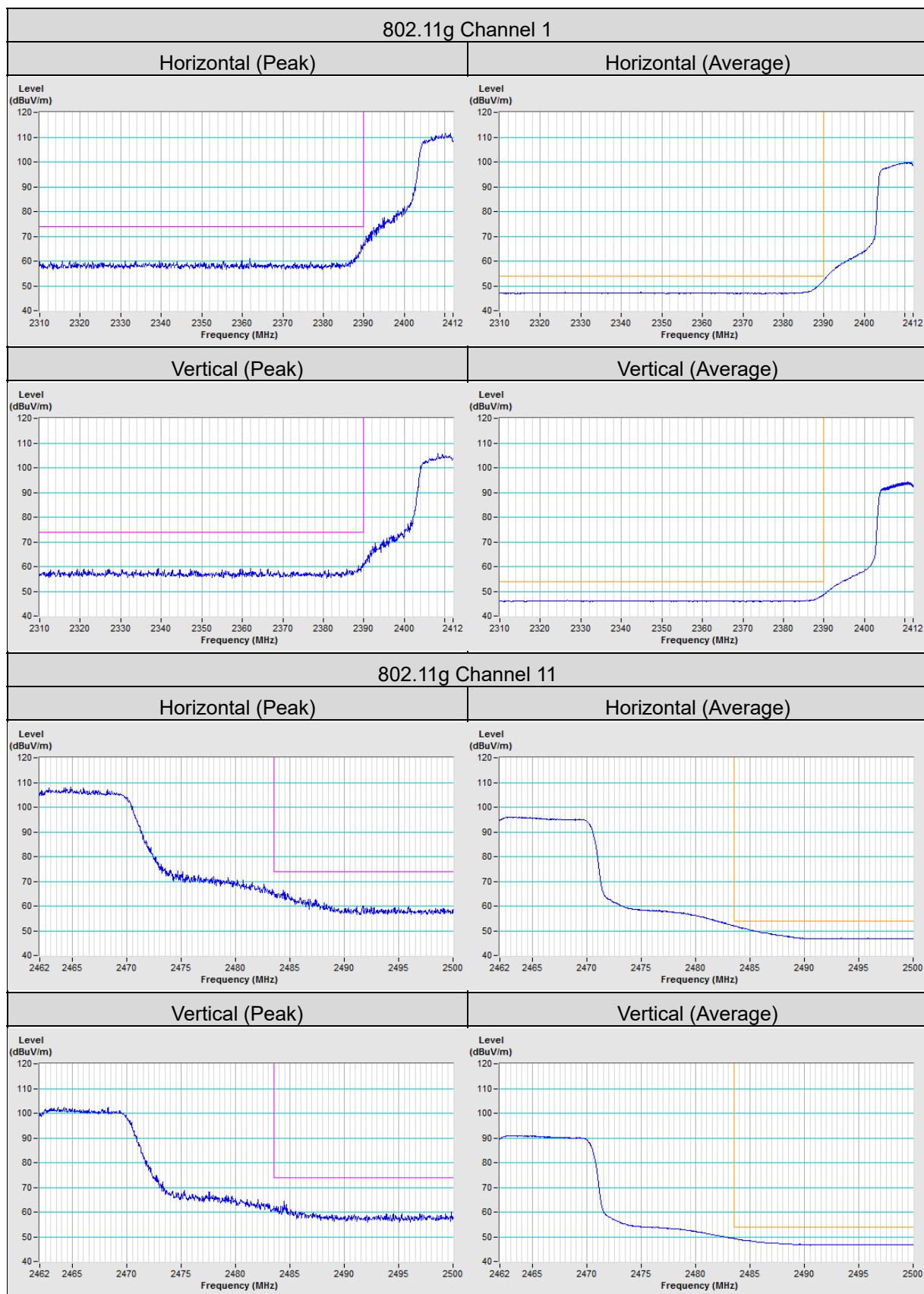


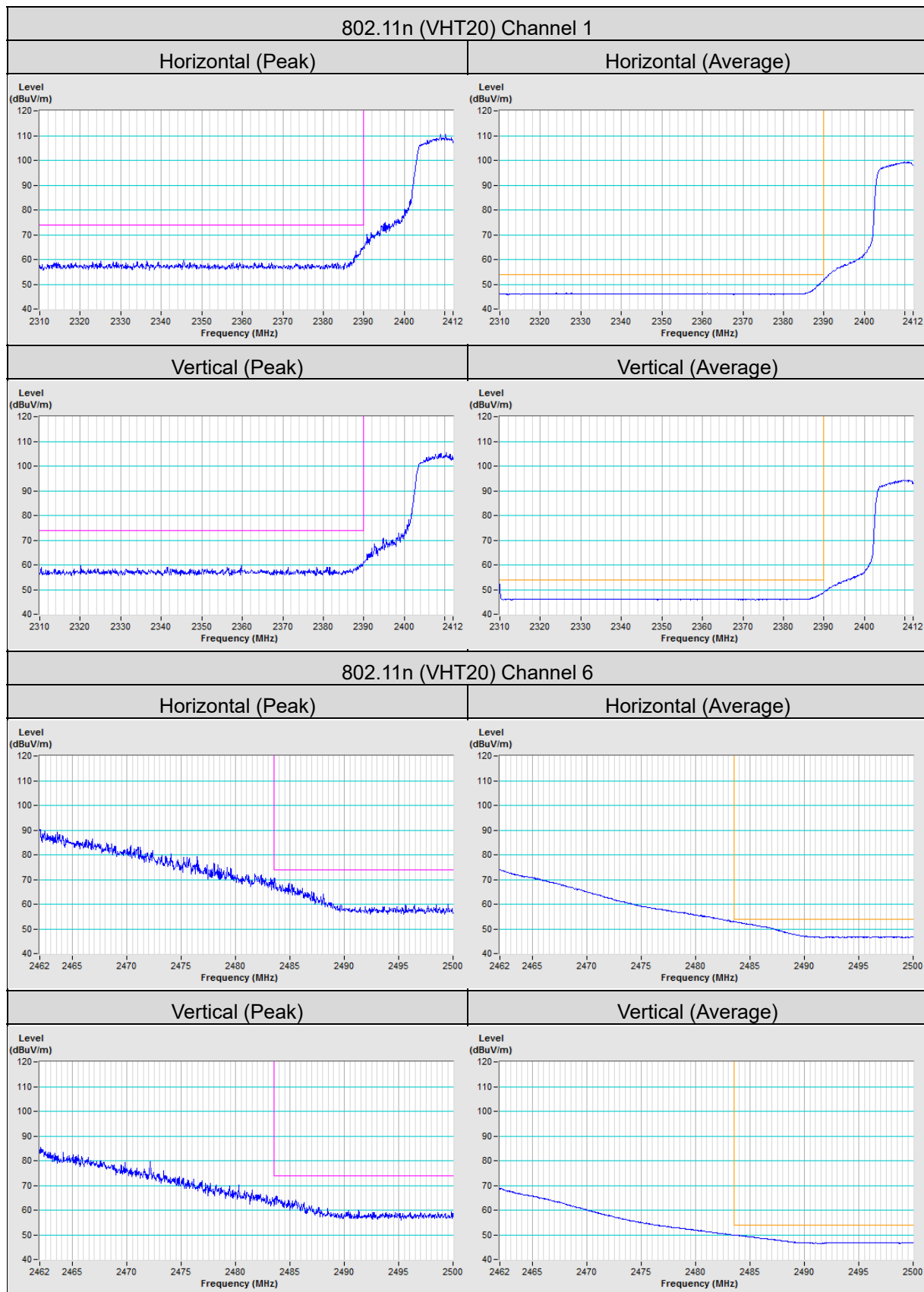
5 Pictures of Test Arrangements

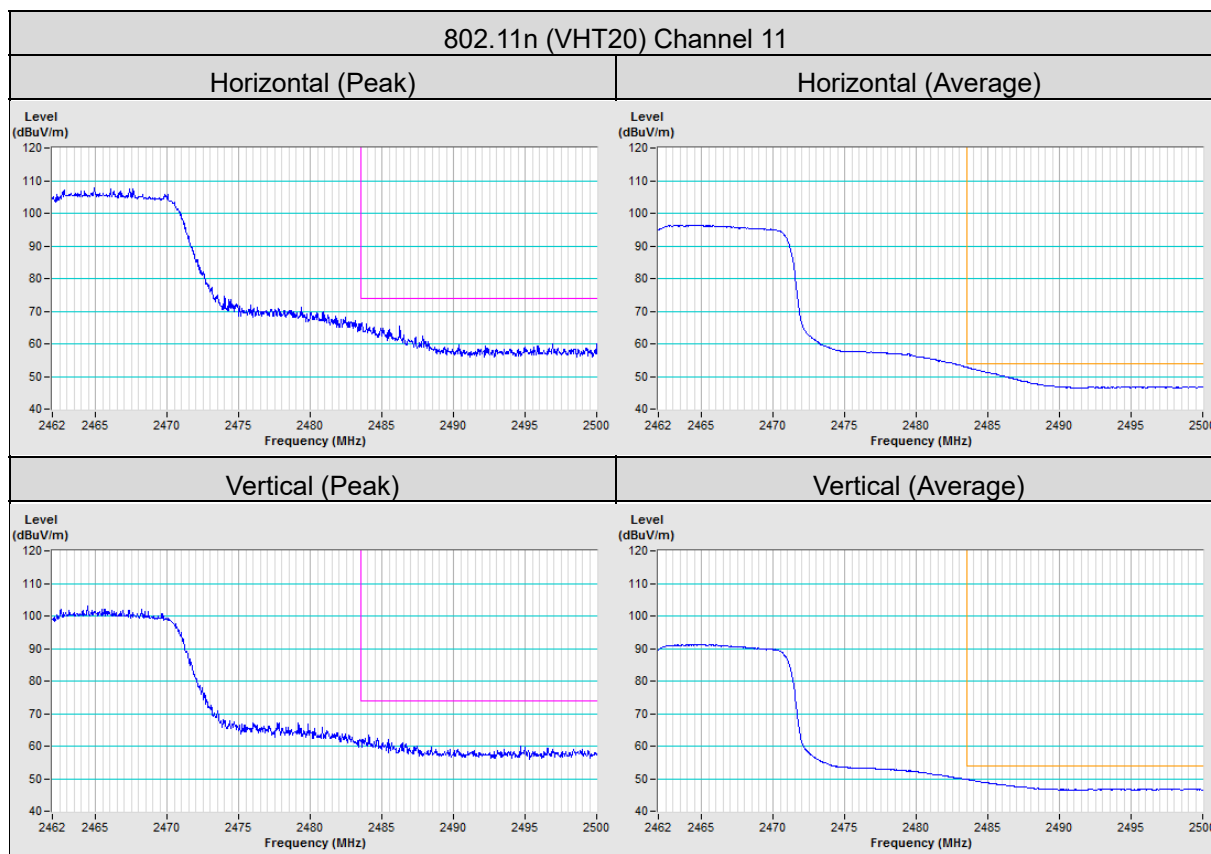
Please refer to the attached file (Test Setup Photo).

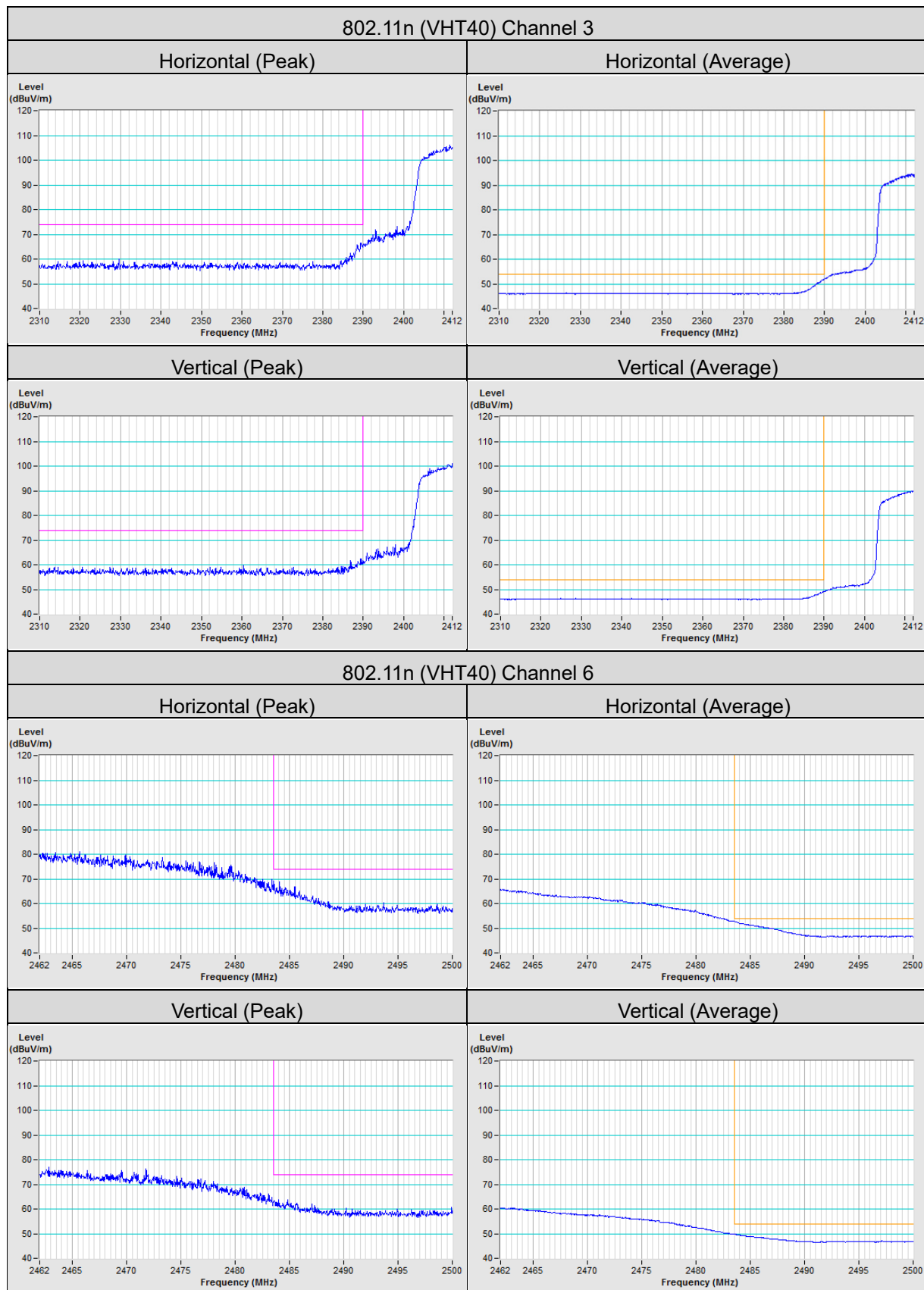
Annex A- Band Edge Measurement

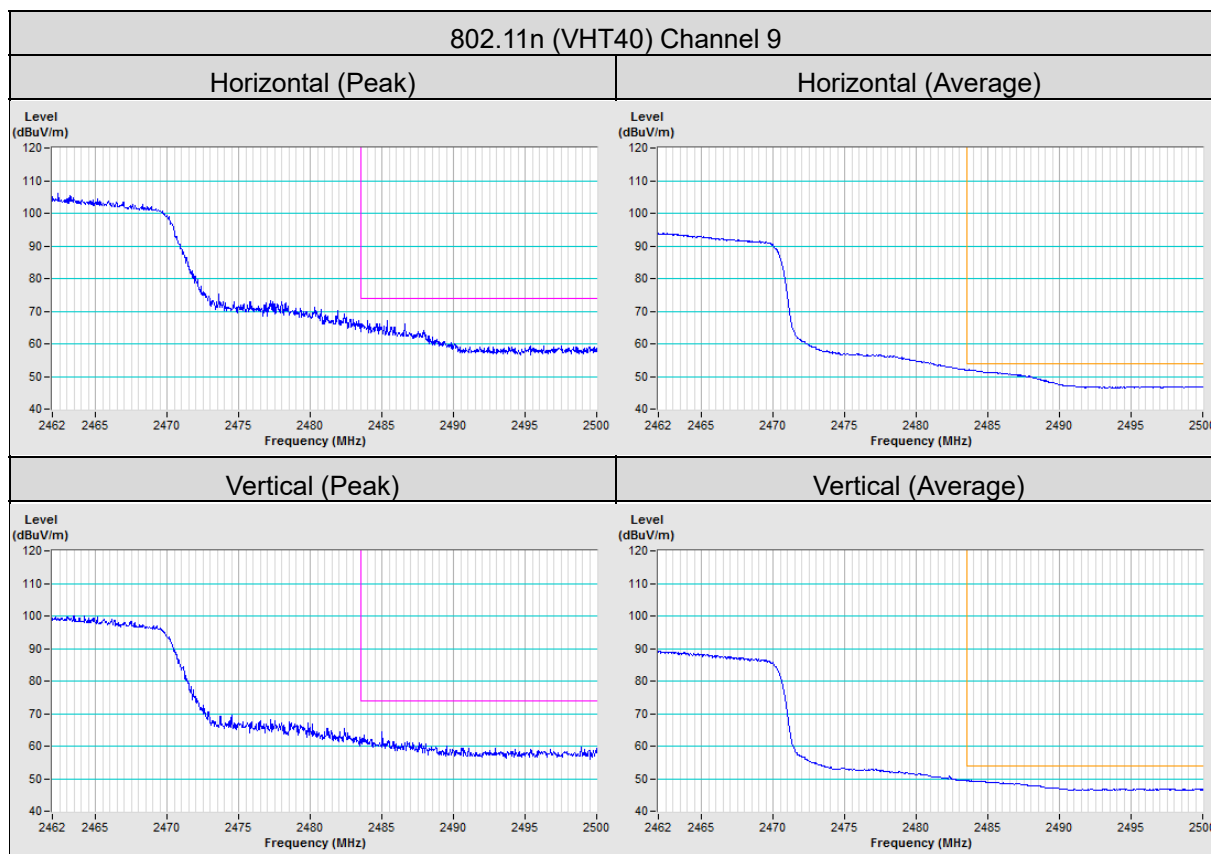












Appendix – Information of the Testing Laboratories

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 and approved 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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