

FCC Test Report

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FCC ID: 2AH7L-UPSC

Test Model: PAS400

Received Date: Dec. 30, 2021

Test Date: Feb. 09 ~ Feb. 19, 2022

Issued Date: May 09, 2022

Applicant: Schneider Electric Industries SAS

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Release Control Record

Issue No.	Description	Date Issued
RFBGGV-WTW-P21120247	Original release	May 09, 2022

1 Certificate of Conformity

Product: EcoStruxure™ Panel Server Entry

Brand: Schneider Electric

Test Model: PAS400

Sample Status: Engineering sample

Applicant: Schneider Electric Industries SAS

Test Date: Feb. 09 ~ Feb. 19, 2022

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 :


Polly Chien / Specialist

Date:

May 09, 2022

Approved by :



Jeremy Lin / Project Engineer

Date:

May 09, 2022

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 -12.52dB at 0.15687MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -0.52dB 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	No antenna connector is used.

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) ($\pm$)
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.79 dB
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	3.00 dB
	30MHz ~ 200MHz	2.91 dB
	200MHz ~ 1000MHz	2.93 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	1.76 dB
	18GHz ~ 40GHz	1.77 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	EcoStruxure™ Panel Server Entry
Brand	Schneider Electric
Test Model	PAS400
Sample Status	Engineering sample
Power Supply rating	110-277Vac/dc with +/-10% tolerance
Modulation Type	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
Modulation Technology	DSSS, OFDM
Transfer Rate	802.11b:11/5.5/2/1Mbps 802.11g: 54/48/36/24/18/12/9/6Mbps 802.11n: up to 150Mbps
Operating Frequency	2412 ~ 2462MHz
Number of Channel	802.11b, 802.11g, 802.11n (HT20): 11 802.11n (HT40): 7
Output Power	44.157mW
Antenna Type	PCB antenna with 3.5 dBi gain
Antenna Connector	NA
Accessory Device	NA
Cable Supplied	NA

Note:

1. The EUT provide 1 completed transmitter and 1 receiver.

Modulation Mode	TX Function
802.11b	1TX
802.11g	1TX
802.11n (HT20)	1TX
802.11n (HT40)	1TX

2. 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. The WLAN 2.4GHz, 5GHz, Zigbee and BT of the device can transmit simultaneously but not WLAN 2.4GHz and 5GHz at the same time.
4. Spurious emission of the simultaneous operation (WLAN 2.4GHz, 5GHz, Zigbee and BT) has been evaluated and no non-compliance was found.

3.2 Description of Test Modes

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

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

7 channels are provided for 802.11n (HT40):

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

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable to				Description
	RE $\geq$ 1G	RE<1G	PLC	APCM	
A	√	√	√	√	EUT + AC power
B	-	-	√	-	EUT + DC power

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:

1. The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **Y-plane**.
2. Radiated emission (below 1GHz) and power line conducted emission test items chosen the worst maximum power.
3. "-" means no effect.

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)
A	802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1.0
A	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0
A	802.11n (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	6.5
A	802.11n (HT40)	3 to 9	3, 6, 9	OFDM	BPSK	13.5

Radiated Emission Test (Below 1GHz):

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

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

Power Line Conducted Emission Test:

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

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

Antenna Port Conducted Measurement:

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

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

Test Condition:

Applicable to	Environmental Conditions	Input Power (System)	Tested by
RE $\geq$ 1G	22 deg. C, 66% RH	120Vac, 60Hz	Hans Wu
RE<1G	22 deg. C, 66% RH	120Vac, 60Hz	Hans Wu
PLC	25 deg. C, 75% RH	120Vac, 60Hz, 277Vdc	Hans Wu, Raymond Lee
APCM	25 deg. C, 60% RH	120Vac, 60Hz	Ivan Tseng,

3.3 Duty Cycle of Test Signal

Duty cycle of test signal is $\geq 98\%$, duty factor is not required.

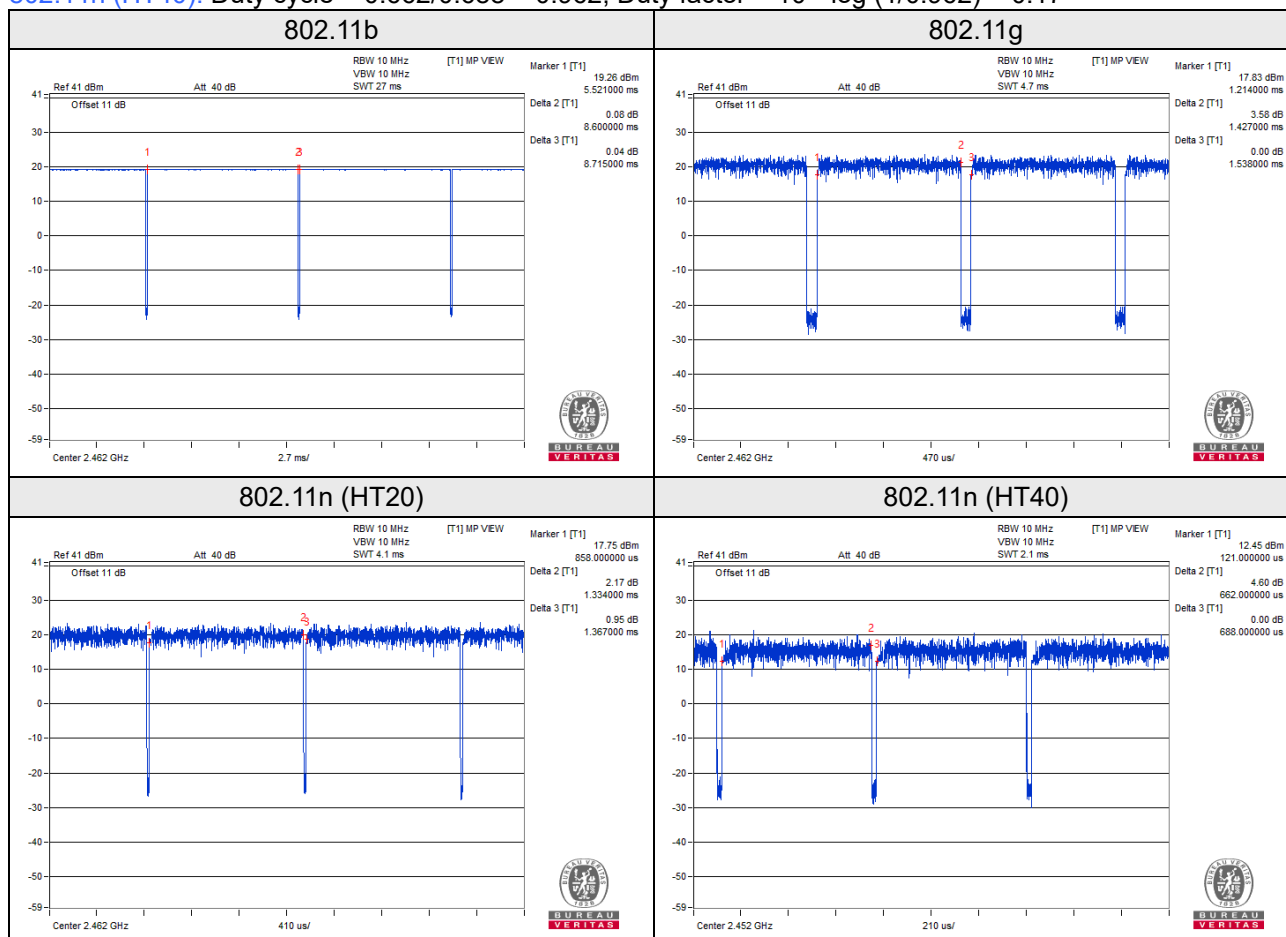
Duty cycle of test signal is $< 98\%$, duty factor shall be considered.

802.11b: Duty cycle = $8.600/8.715 = 0.987$

802.11g: Duty cycle = $1.427/1.538 = 0.928$, Duty factor = $10 * \log(1/0.928) = 0.33$

802.11n (HT20): Duty cycle = $1.334/1.367 = 0.976$, Duty factor = $10 * \log(1/0.976) = 0.11$

802.11n (HT40): Duty cycle = $0.662/0.688 = 0.962$, Duty factor = $10 * \log(1/0.962) = 0.17$



3.4 Description of Support Units

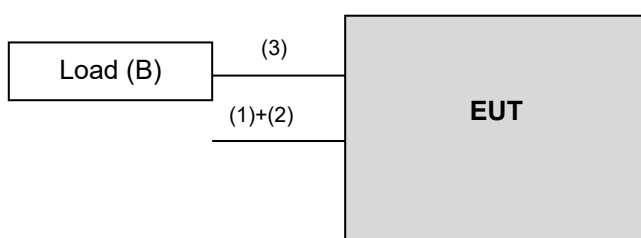
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	DC Power Supply	GW	GPR-25H20D	6040046	NA	-
B.	Load	NA	NA	NA	NA	-

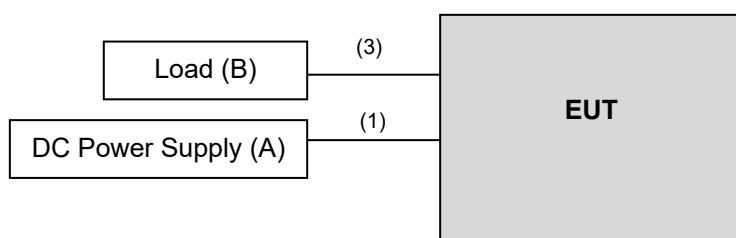
ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	Power cable	1	1	N	0	Provided by client
2.	Power cable	1	0.1	N	0	-
3.	LAN	1	1.5	N	0	RJ45, Cat5e

3.4.1 Configuration of System under Test

Mode A



Mode B



3.5 General Description of Applied Standards and References

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

Test standard:

FCC Part 15, Subpart C (15.247)

ANSI C63.10-2013

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

References Test Guidance:

KDB 558074 D01 15.247 Meas Guidance v05r02

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

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 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.	Cal. Date	Cal. Due
Spectrum Analyzer ROHDE & SCHWARZ	FSV40	100979	Mar. 29, 2021	Mar. 28, 2022
Test Receiver Rohde & Schwarz	ESR3	102782	Dec. 10, 2021	Dec. 09, 2022
Spectrum Analyzer Rohde & Schwarz	FSW43	101582	Apr. 01, 2021	Mar. 31, 2022
BILOG Antenna SCHWARZBECK	VULB9168	9168-1213	Oct. 27, 2021	Oct. 26, 2022
HORN Antenna RF SPIN	DRH18-E	210103A18E	Nov. 14, 2021	Nov. 13, 2022
HORN Antenna SCHWARZBECK	BBHA 9170	9170-1048	Nov. 14, 2021	Nov. 13, 2022
Loop Antenna TESEQ	HLA 6121	45745	Jul. 21, 2021	Jul. 20, 2022
Preamplifier EMCI	EMC330N	980782	Jan. 17, 2022	Jan. 16, 2023
Preamplifier EMCI	EMC118A45SE	980808	Dec. 30, 2021	Dec. 29, 2022
Preamplifier EMCI	EMC184045SE	980788	Jan. 17, 2022	Jan. 16, 2023
RF signal cable EMCI	EMC104-SM-SM-(9000+2000+1000)	201243+ 201231+ 210102	Jan. 17, 2022	Jan. 16, 2023
RF signal cable EMCI	EMCCFD400-NM-NM-(9000+300+500)	201236+ 201235+ 201233	Jan. 17, 2022	Jan. 16, 2023
RF signal cable EMCI	EMC101G-KM-KM-(5000+3000+2000)	201260+201257+201254	Jan. 17, 2022	Jan. 16, 2023
Software BV ADT	ADT_Radiated_V7.6.15.9.5	NA	NA	NA
Antenna Tower Max-Full	MFT-151SS-0.5T	NA	NA	NA
Turn Table Max-Full	MF-7802BS	NA	NA	NA
Turn Table Controller Max-Full	MF-7802BS	MF780208674	NA	NA
Peak Power Analyzer KEYSIGHT	8990B	MY51000485	Jan. 18, 2022	Jan. 17, 2023
Wideband Power Sensor KEYSIGHT	N1923A	MY58020002	Jan. 17, 2022	Jan. 16, 2023
PXA Signal Analyzer KEYSIGHT	N9030B	MY57140938	Mar. 09, 2021	Mar. 08, 2022
Boresight Antenna Fixture	FBA-01	FBA-SIP01	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 WM Chamber 8.

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:

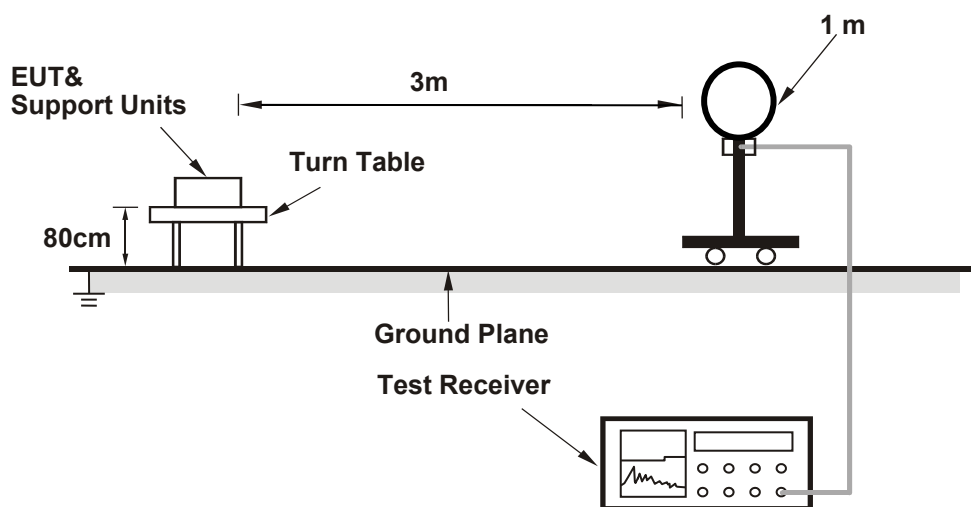
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
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 (HT20): RBW = 1MHz, VBW = 1kHz; 802.11n (HT40): RBW = 1MHz, VBW = 3kHz)
4. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

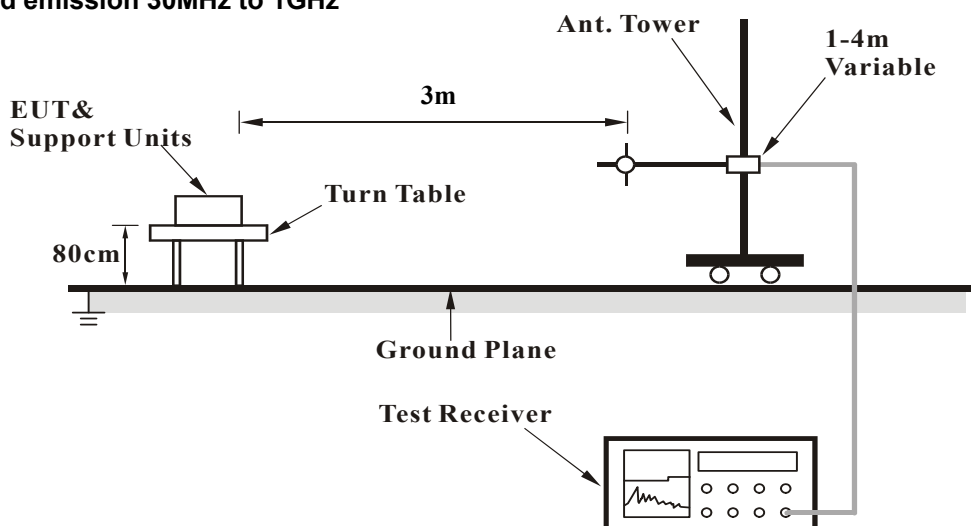
No deviation.

4.1.5 Test Setup

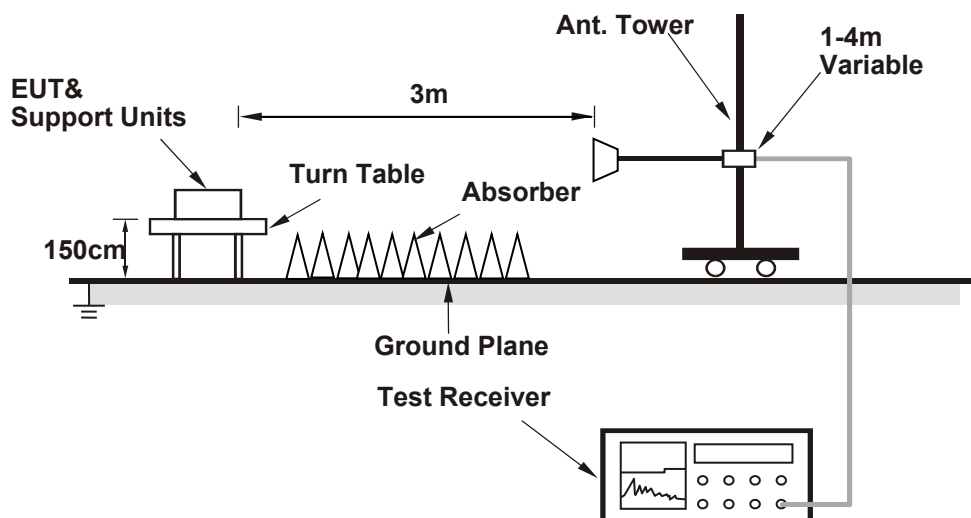
For Radiated emission below 30MHz



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.
- Set the EUT under transmission condition continuously at specific channel frequency.

4.1.7 Test Results

Above 1GHz Data:

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

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	57.60 PK	74.00	-16.40	2.43 H	313	25.56	32.04
2	2390.00	47.24 AV	54.00	-6.76	2.43 H	313	15.20	32.04
3	*2412.00	104.65 PK			2.43 H	313	72.64	32.01
4	*2412.00	102.08 AV			2.43 H	313	70.07	32.01
5	4824.00	46.71 PK	74.00	-27.29	2.41 H	263	43.55	3.16
6	4824.00	35.95 AV	54.00	-18.05	2.41 H	263	32.79	3.16
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	59.01 PK	74.00	-14.99	1.67 V	271	26.97	32.04
2	2390.00	47.82 AV	54.00	-6.18	1.67 V	271	15.78	32.04
3	*2412.00	107.25 PK			1.67 V	271	75.24	32.01
4	*2412.00	104.43 AV			1.67 V	271	72.42	32.01
5	4824.00	47.45 PK	74.00	-26.55	1.53 V	29	44.29	3.16
6	4824.00	37.98 AV	54.00	-16.02	1.53 V	29	34.82	3.16

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	104.98 PK			2.45 H	308	73.02	31.96
2	*2437.00	102.44 AV			2.45 H	308	70.48	31.96
3	4874.00	46.91 PK	74.00	-27.09	2.32 H	269	43.70	3.21
4	4874.00	36.06 AV	54.00	-17.94	2.32 H	269	32.85	3.21
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	107.21 PK			1.65 V	272	75.25	31.96
2	*2437.00	104.85 AV			1.65 V	272	72.89	31.96
3	4874.00	48.34 PK	74.00	-25.66	1.52 V	28	45.13	3.21
4	4874.00	38.17 AV	54.00	-15.83	1.52 V	28	34.96	3.21

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	103.80 PK			2.57 H	314	71.84	31.96
2	*2462.00	101.66 AV			2.57 H	314	69.70	31.96
3	2483.50	59.13 PK	74.00	-14.87	2.57 H	314	27.12	32.01
4	2483.50	48.76 AV	54.00	-5.24	2.57 H	314	16.75	32.01
5	4924.00	46.50 PK	74.00	-27.50	2.37 H	283	43.26	3.24
6	4924.00	35.91 AV	54.00	-18.09	2.37 H	283	32.67	3.24
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	106.80 PK			1.69 V	272	74.84	31.96
2	*2462.00	104.38 AV			1.69 V	272	72.42	31.96
3	2483.50	59.87 PK	74.00	-14.13	1.69 V	272	27.86	32.01
4	2483.50	51.54 AV	54.00	-2.46	1.69 V	272	19.53	32.01
5	4924.00	47.91 PK	74.00	-26.09	1.50 V	31	44.67	3.24
6	4924.00	38.14 AV	54.00	-15.86	1.50 V	31	34.90	3.24

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	69.26 PK	74.00	-4.74	3.12 H	312	37.22	32.04
2	2390.00	51.77 AV	54.00	-2.23	3.12 H	312	19.73	32.04
3	*2412.00	104.98 PK			3.12 H	312	72.97	32.01
4	*2412.00	95.39 AV			3.12 H	312	63.38	32.01
5	4824.00	47.34 PK	74.00	-26.66	2.04 H	256	44.18	3.16
6	4824.00	35.55 AV	54.00	-18.45	2.04 H	256	32.39	3.16

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	71.90 PK	74.00	-2.10	1.72 V	270	39.86	32.04
2	2390.00	53.19 AV	54.00	-0.81	1.72 V	270	21.15	32.04
3	*2412.00	107.31 PK			1.72 V	270	75.30	32.01
4	*2412.00	97.60 AV			1.72 V	270	65.59	32.01
5	4824.00	46.92 PK	74.00	-27.08	1.64 V	30	43.76	3.16
6	4824.00	35.89 AV	54.00	-18.11	1.64 V	30	32.73	3.16

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	107.47 PK			2.97 H	317	75.51	31.96
2	*2437.00	98.45 AV			2.97 H	317	66.49	31.96
3	4874.00	47.06 PK	74.00	-26.94	2.02 H	274	43.85	3.21
4	4874.00	35.67 AV	54.00	-18.33	2.02 H	274	32.46	3.21
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	110.35 PK			1.88 V	272	78.39	31.96
2	*2437.00	100.85 AV			1.88 V	272	68.89	31.96
3	4874.00	47.03 PK	74.00	-26.97	1.62 V	27	43.82	3.21
4	4874.00	36.11 AV	54.00	-17.89	1.62 V	27	32.90	3.21

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	107.85 PK			2.96 H	313	75.89	31.96
2	*2462.00	98.32 AV			2.96 H	313	66.36	31.96
3	2483.50	67.44 PK	74.00	-6.56	2.96 H	313	35.43	32.01
4	2483.50	51.28 AV	54.00	-2.72	2.96 H	313	19.27	32.01
5	4924.00	46.87 PK	74.00	-27.13	2.18 H	263	43.63	3.24
6	4924.00	35.75 AV	54.00	-18.25	2.18 H	263	32.51	3.24
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2462.00	109.43 PK			1.93 V	272	77.47	31.96
2	*2462.00	99.85 AV			1.93 V	272	67.89	31.96
3	2483.50	69.08 PK	74.00	-4.92	1.93 V	272	37.07	32.01
4	2483.50	53.31 AV	54.00	-0.69	1.93 V	272	21.30	32.01
5	4924.00	47.12 PK	74.00	-26.88	1.66 V	25	43.88	3.24
6	4924.00	36.40 AV	54.00	-17.60	1.66 V	25	33.16	3.24

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	70.73 PK	74.00	-3.27	2.97 H	314	38.69	32.04
2	2390.00	52.37 AV	54.00	-1.63	2.97 H	314	20.33	32.04
3	*2412.00	105.30 PK			2.97 H	314	73.29	32.01
4	*2412.00	95.72 AV			2.97 H	314	63.71	32.01
5	4824.00	46.81 PK	74.00	-27.19	2.22 H	285	43.65	3.16
6	4824.00	35.56 AV	54.00	-18.44	2.22 H	285	32.40	3.16
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	70.64 PK	74.00	-3.36	1.98 V	275	38.60	32.04
2	2390.00	53.36 AV	54.00	-0.64	1.98 V	275	21.32	32.04
3	*2412.00	107.57 PK			1.98 V	275	75.56	32.01
4	*2412.00	97.20 AV			1.98 V	275	65.19	32.01
5	4824.00	47.73 PK	74.00	-26.27	1.68 V	41	44.57	3.16
6	4824.00	37.36 AV	54.00	-16.64	1.68 V	41	34.20	3.16

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	107.68 PK			2.94 H	312	75.72	31.96
2	*2437.00	98.24 AV			2.94 H	312	66.28	31.96
3	4874.00	46.64 PK	74.00	-27.36	2.15 H	254	43.43	3.21
4	4874.00	35.65 AV	54.00	-18.35	2.15 H	254	32.44	3.21
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	109.46 PK			1.95 V	274	77.50	31.96
2	*2437.00	99.82 AV			1.95 V	274	67.86	31.96
3	4874.00	47.43 PK	74.00	-26.57	1.63 V	20	44.22	3.21
4	4874.00	36.46 AV	54.00	-17.54	1.63 V	20	33.25	3.21

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	106.58 PK			2.92 H	313	74.62	31.96
2	*2462.00	97.15 AV			2.92 H	313	65.19	31.96
3	2483.50	69.65 PK	74.00	-4.35	2.92 H	313	37.64	32.01
4	2483.50	50.46 AV	54.00	-3.54	2.92 H	313	18.45	32.01
5	4924.00	46.54 PK	74.00	-27.46	2.22 H	293	43.30	3.24
6	4924.00	35.85 AV	54.00	-18.15	2.22 H	293	32.61	3.24
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2462.00	109.30 PK			1.66 V	290	77.34	31.96
2	*2462.00	98.43 AV			1.66 V	290	66.47	31.96
3	2483.50	72.11 PK	74.00	-1.89	1.66 V	290	40.10	32.01
4	2483.50	53.17 AV	54.00	-0.83	1.66 V	290	21.16	32.01
5	4924.00	46.89 PK	74.00	-27.11	1.70 V	29	43.65	3.24
6	4924.00	36.31 AV	54.00	-17.69	1.70 V	29	33.07	3.24

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	70.23 PK	74.00	-3.77	2.94 H	312	38.19	32.04
2	2390.00	49.80 AV	54.00	-4.20	2.94 H	312	17.76	32.04
3	*2422.00	100.98 PK			2.94 H	312	68.99	31.99
4	*2422.00	91.75 AV			2.94 H	312	59.76	31.99
5	4844.00	46.69 PK	74.00	-27.31	2.96 H	308	43.52	3.17
6	4844.00	36.57 AV	54.00	-17.43	2.96 H	308	33.40	3.17
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	73.31 PK	74.00	-0.69	1.96 V	273	41.27	32.04
2	2390.00	51.08 AV	54.00	-2.92	1.96 V	273	19.04	32.04
3	*2422.00	102.36 PK			1.96 V	273	70.37	31.99
4	*2422.00	92.37 AV			1.96 V	273	60.38	31.99
5	4844.00	46.75 PK	74.00	-27.25	1.62 V	32	43.58	3.17
6	4844.00	36.63 AV	54.00	-17.37	1.62 V	32	33.46	3.17

Remarks:

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

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

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	66.42 PK	74.00	-7.58	2.97 H	313	34.38	32.04
2	2390.00	51.11 AV	54.00	-2.89	2.97 H	313	19.07	32.04
3	*2437.00	102.42 PK			2.97 H	313	70.46	31.96
4	*2437.00	93.44 AV			2.97 H	313	61.48	31.96
5	4874.00	46.78 PK	74.00	-27.22	2.66 H	329	43.57	3.21
6	4874.00	36.69 AV	54.00	-17.31	2.66 H	329	33.48	3.21
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	71.44 PK	74.00	-2.56	1.92 V	274	39.40	32.04
2	2390.00	53.38 AV	54.00	-0.62	1.92 V	274	21.34	32.04
3	*2437.00	105.75 PK			1.92 V	274	73.79	31.96
4	*2437.00	95.71 AV			1.92 V	274	63.75	31.96
5	4874.00	46.71 PK	74.00	-27.29	1.73 V	24	43.50	3.21
6	4874.00	36.52 AV	54.00	-17.48	1.73 V	24	33.31	3.21

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	101.01 PK			2.87 H	308	69.08	31.93
2	*2452.00	91.79 AV			2.87 H	308	59.86	31.93
3	2483.50	67.35 PK	74.00	-6.65	2.87 H	308	35.34	32.01
4	2483.50	50.60 AV	54.00	-3.40	2.87 H	308	18.59	32.01
5	4904.00	46.89 PK	74.00	-27.11	2.92 H	285	43.66	3.23
6	4904.00	37.53 AV	54.00	-16.47	2.92 H	285	34.30	3.23
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	104.53 PK			1.72 V	271	72.60	31.93
2	*2452.00	94.88 AV			1.72 V	271	62.95	31.93
3	2483.50	69.92 PK	74.00	-4.08	1.72 V	271	37.91	32.01
4	2483.50	53.48 AV	54.00	-0.52	1.72 V	271	21.47	32.01
5	4904.00	46.87 PK	74.00	-27.13	1.71 V	28	43.64	3.23
6	4904.00	36.82 AV	54.00	-17.18	1.71 V	28	33.59	3.23

Remarks:

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

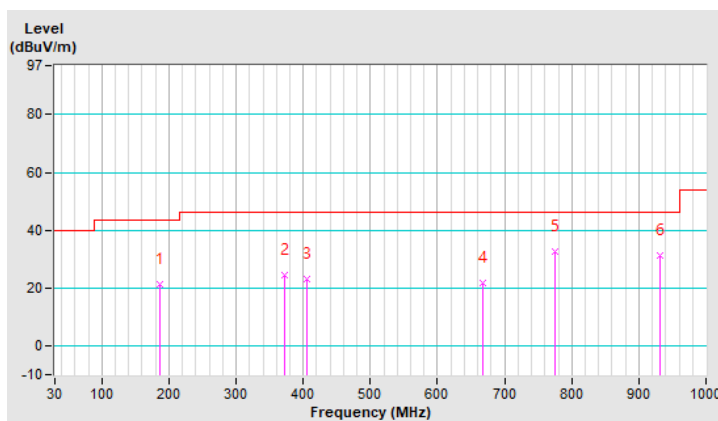
Below 1GHz worst-case data:

RF Mode	TX 802.11b	Channel	CH 11 : 2462 MHz
Frequency Range	9kHz ~ 1GHz	Detector Function	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	186.17	21.50 QP	43.50	-22.00	1.51 H	246	41.89	-20.39
2	371.44	24.46 QP	46.00	-21.54	1.01 H	294	40.10	-15.64
3	405.39	23.09 QP	46.00	-22.91	1.01 H	230	37.97	-14.88
4	668.26	21.55 QP	46.00	-24.45	1.51 H	18	31.12	-9.57
5	774.96	32.80 QP	46.00	-13.20	1.01 H	267	40.83	-8.03
6	932.10	31.24 QP	46.00	-14.76	1.01 H	236	36.97	-5.73

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 of frequency range 30MHz ~ 1000MHz.
4. Margin value = Emission Level – Limit value.
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.

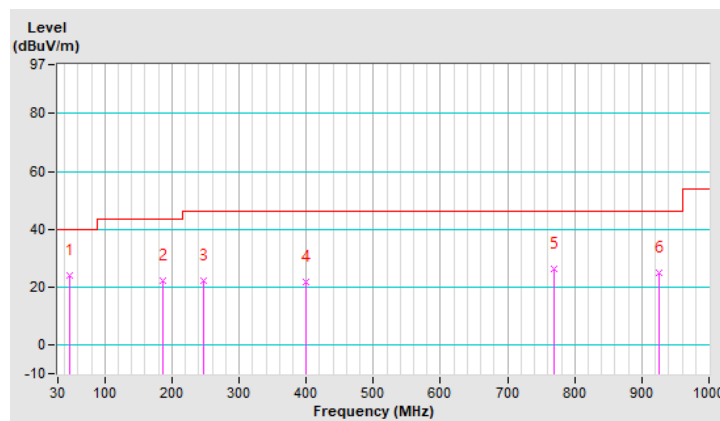


RF Mode	TX 802.11b	Channel	CH 11 : 2462 MHz
Frequency Range	9kHz ~ 1GHz	Detector Function	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	48.43	23.90 QP	40.00	-16.10	1.00 V	180	41.97	-18.07
2	187.14	22.02 QP	43.50	-21.48	1.00 V	34	42.54	-20.52
3	246.31	22.03 QP	46.00	-23.97	1.99 V	323	41.36	-19.33
4	400.54	21.70 QP	46.00	-24.30	1.49 V	102	36.69	-14.99
5	770.11	26.27 QP	46.00	-19.73	1.00 V	299	34.28	-8.01
6	925.31	24.96 QP	46.00	-21.04	1.00 V	202	30.80	-5.84

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 of frequency range 30MHz ~ 1000MHz.
4. Margin value = Emission Level – Limit value.
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	ESR3	102412	Jan. 22, 2022	Jan. 21, 2023
RF signal cable (with 10dB PAD) Woken	5D-FB	Cable-cond2-01	Sep. 04, 2021	Sep. 03, 2022
V-LISN SCHWARZBECK (EUT)	NNBL 8226-2	8226-142	Aug. 20, 2021	Aug. 19, 2022
LISN ROHDE & SCHWARZ (Peripheral)	ENV216	101196	Apr. 26, 2021	Apr. 25, 2022
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 2 (Conduction 2).

3. The VCCI Site Registration No. is C-12047.

4. Tested date: Feb. 10 ~ Feb 11, 2022

4.2.3 Test Procedures

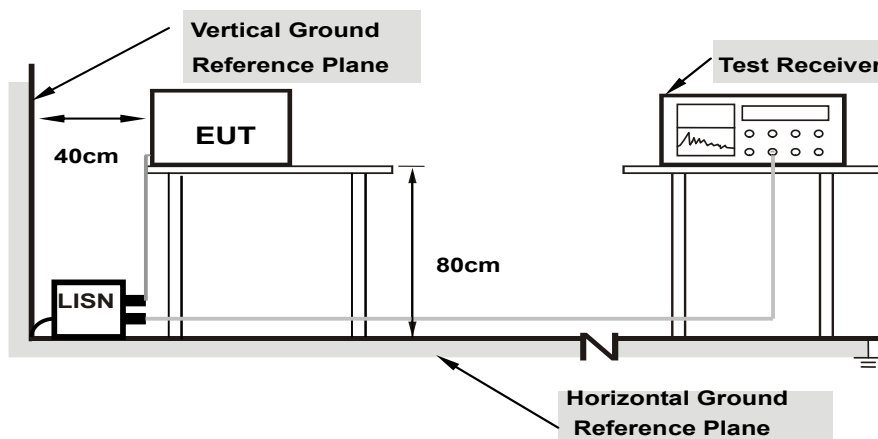
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance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

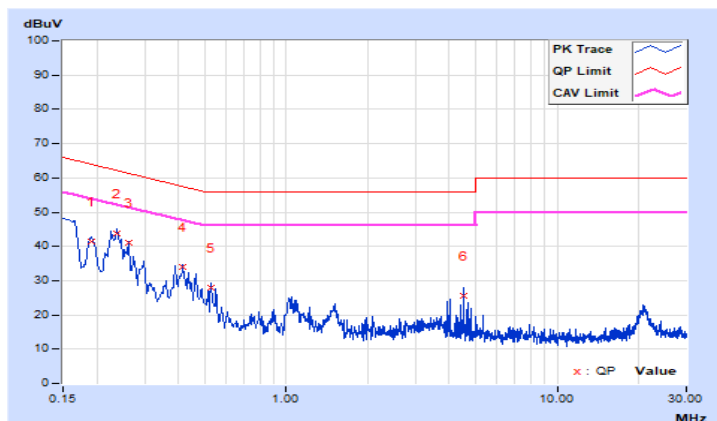
802.11b

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	A (120Vac)		

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	0.19000	10.09	31.30	29.54	41.39	39.63	64.04	54.04	-22.65	-14.41
2	0.23723	10.08	33.63	15.27	43.71	25.35	62.19	52.19	-18.48	-26.84
3	0.26200	10.07	30.86	15.68	40.93	25.75	61.37	51.37	-20.44	-25.62
4	0.41400	10.06	24.09	11.30	34.15	21.36	57.57	47.57	-23.42	-26.21
5	0.52600	10.06	17.91	10.06	27.97	20.12	56.00	46.00	-28.03	-25.88
6	4.51800	10.07	15.66	10.13	25.73	20.20	56.00	46.00	-30.27	-25.80

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.

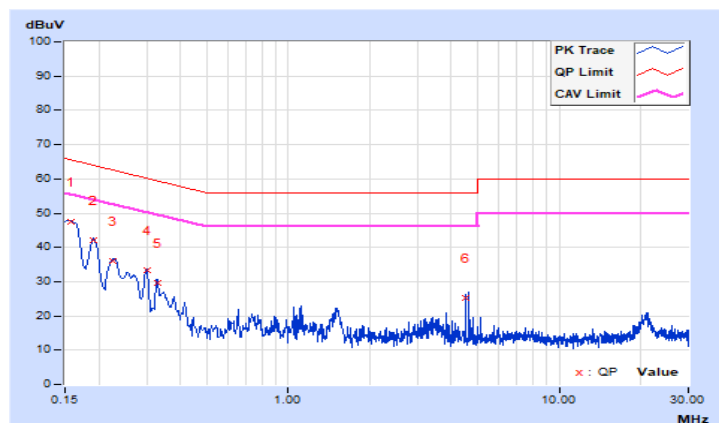


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	A (120Vac)		

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
	[MHz]	(dB)	[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15687	10.10	37.54	33.01	47.64	43.11	65.63	55.63	-17.99	-12.52
2	0.19000	10.08	31.85	29.91	41.93	39.99	64.04	54.04	-22.11	-14.05
3	0.22505	10.07	25.93	25.67	36.00	35.74	62.63	52.63	-26.63	-16.89
4	0.29992	10.06	23.13	20.81	33.19	30.87	60.25	50.25	-27.06	-19.38
5	0.32802	10.06	19.48	14.71	29.54	24.77	59.50	49.50	-29.96	-24.73
6	4.52200	10.06	15.25	10.30	25.31	20.36	56.00	46.00	-30.69	-25.64

Remarks:

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

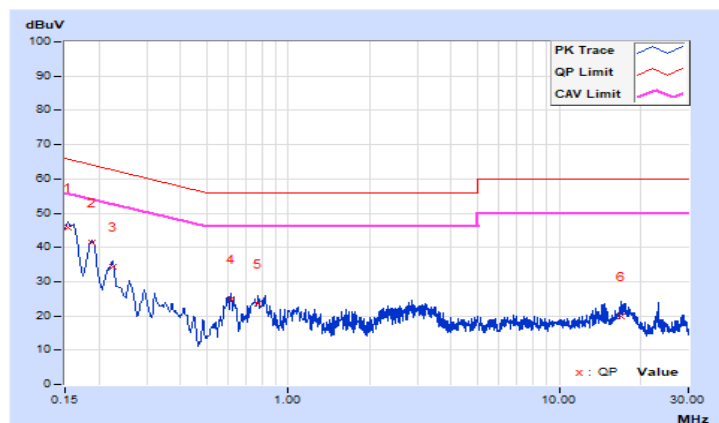


Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	B (277Vdc)		

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
	[MHz]	(dB)	[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15391	10.11	35.83	31.91	45.94	42.02	65.79	55.79	-19.85	-13.77
2	0.18853	10.09	31.42	30.27	41.51	40.36	64.10	54.10	-22.59	-13.74
3	0.22429	10.08	24.23	20.81	34.31	30.89	62.66	52.66	-28.35	-21.77
4	0.61529	10.06	14.81	8.48	24.87	18.54	56.00	46.00	-31.13	-27.46
5	0.77560	10.06	13.54	6.95	23.60	17.01	56.00	46.00	-32.40	-28.99
6	16.83788	10.14	9.81	4.57	19.95	14.71	60.00	50.00	-40.05	-35.29

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.

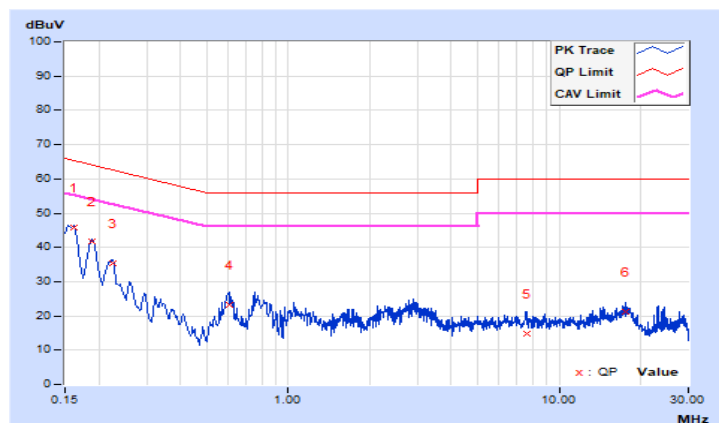


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	B (277Vdc)		

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	0.16139	10.09	35.54	32.15	45.63	42.24	65.39	55.39	-19.76	-13.15
2	0.18853	10.08	31.69	30.30	41.77	40.38	64.10	54.10	-22.33	-13.72
3	0.22429	10.07	25.27	21.82	35.34	31.89	62.66	52.66	-27.32	-20.77
4	0.60356	10.05	13.20	6.65	23.25	16.70	56.00	46.00	-32.75	-29.30
5	7.61419	10.08	4.66	0.22	14.74	10.30	60.00	50.00	-45.26	-39.70
6	17.69026	10.17	11.19	5.73	21.36	15.90	60.00	50.00	-38.64	-34.10

Remarks:

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

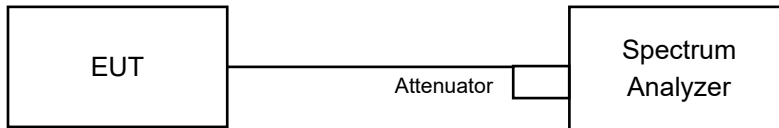


4.3 6dB Bandwidth Measurement

4.3.1 Limits of 6dB Bandwidth Measurement

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

4.3.2 Test Setup



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedure

- 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
1	2412	8.62	0.5	Pass
6	2437	9.11	0.5	Pass
11	2462	9.08	0.5	Pass

802.11g

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	16.14	0.5	Pass
6	2437	16.10	0.5	Pass
11	2462	16.10	0.5	Pass

802.11n (HT20)

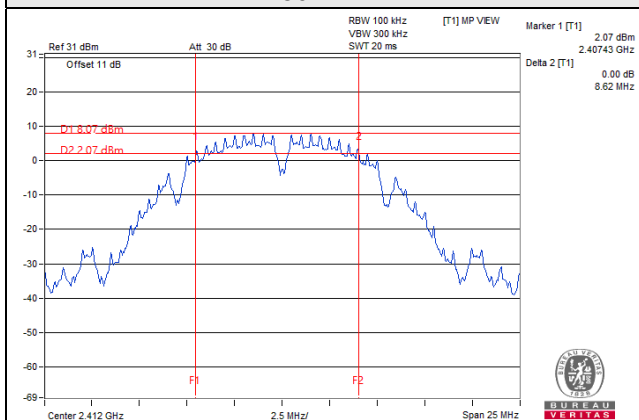
Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	16.58	0.5	Pass
6	2437	17.21	0.5	Pass
11	2462	16.17	0.5	Pass

802.11n (HT40)

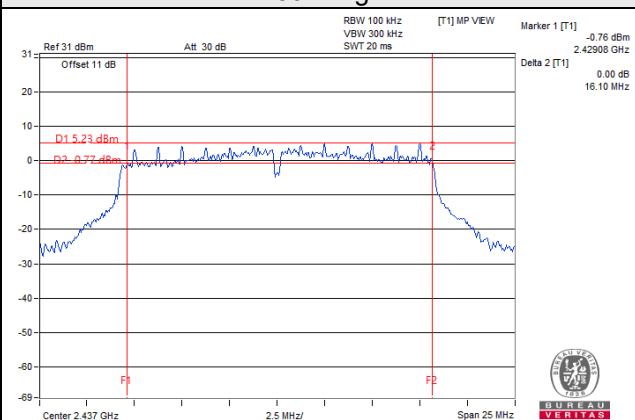
Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
3	2422	35.89	0.5	Pass
6	2437	35.87	0.5	Pass
9	2452	35.30	0.5	Pass

Spectrum Plot of Worst Value

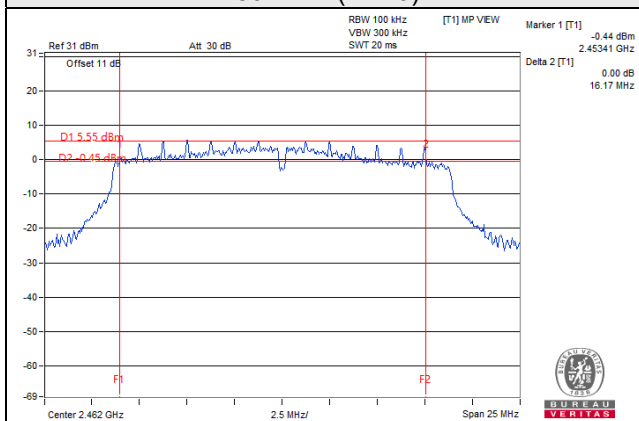
802.11b



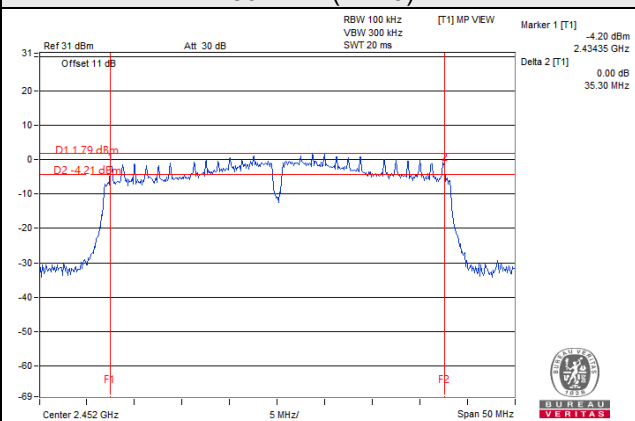
802.11g



802.11n (HT20)



802.11n (HT40)

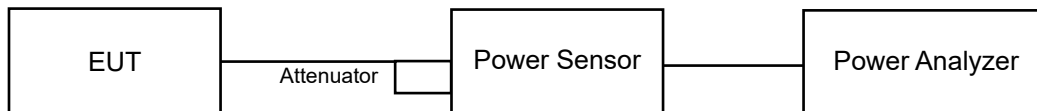


4.4 Conducted Output Power Measurement

4.4.1 Limits of Conducted Output Power Measurement

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

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

802.11b

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	44.055	16.44	30.00	Pass
6	2437	41.783	16.21	30.00	Pass
11	2462	44.157	16.45	30.00	Pass

802.11g

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	30.061	14.78	30.00	Pass
6	2437	39.994	16.02	30.00	Pass
11	2462	39.446	15.96	30.00	Pass

802.11n (HT20)

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	33.037	15.19	30.00	Pass
6	2437	42.560	16.29	30.00	Pass
11	2462	43.853	16.42	30.00	Pass

802.11n (HT40)

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)	Limit (dBm)	Pass / Fail
3	2422	15.417	11.88	30.00	Pass
6	2437	34.914	15.43	30.00	Pass
9	2452	31.550	14.99	30.00	Pass

4.5 Power Spectral Density Measurement

4.5.1 Limits of Power Spectral Density Measurement

The Maximum of Power Spectral Density Measurement is 8dBm per 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

Channel	Frequency (MHz)	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass / Fail
1	2412	-18.05	8.00	Pass
6	2437	-18.37	8.00	Pass
11	2462	-18.00	8.00	Pass

802.11g

Channel	Frequency (MHz)	PSD W/O Duty Factor (dBm/3kHz)	Duty Factor (dB)	Total PSD With Duty Factor (dBm/3kHz)	Limit (dBm/3kHz)	Pass / Fail
1	2412	-21.20	0.33	-20.87	8.00	Pass
6	2437	-19.03	0.33	-18.70	8.00	Pass
11	2462	-19.19	0.33	-18.86	8.00	Pass

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

802.11n (HT20)

Channel	Frequency (MHz)	PSD W/O Duty Factor (dBm/3kHz)	Duty Factor (dB)	Total PSD With Duty Factor (dBm/3kHz)	Limit (dBm/3kHz)	Pass / Fail
1	2412	-20.41	0.11	-20.30	8.00	Pass
6	2437	-19.23	0.11	-19.12	8.00	Pass
11	2462	-19.32	0.11	-19.22	8.00	Pass

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

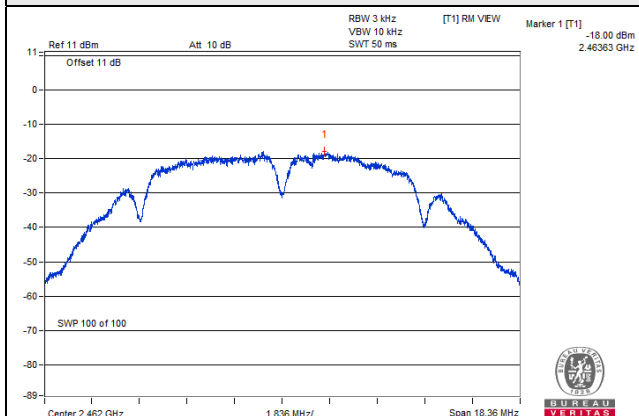
802.11n (HT40)

Channel	Frequency (MHz)	PSD W/O Duty Factor (dBm/3kHz)	Duty Factor (dB)	Total PSD With Duty Factor (dBm/3kHz)	Limit (dBm/3kHz)	Pass / Fail
3	2422	-28.19	0.17	-28.02	8.00	Pass
6	2437	-24.63	0.17	-24.46	8.00	Pass
9	2452	-24.93	0.17	-24.76	8.00	Pass

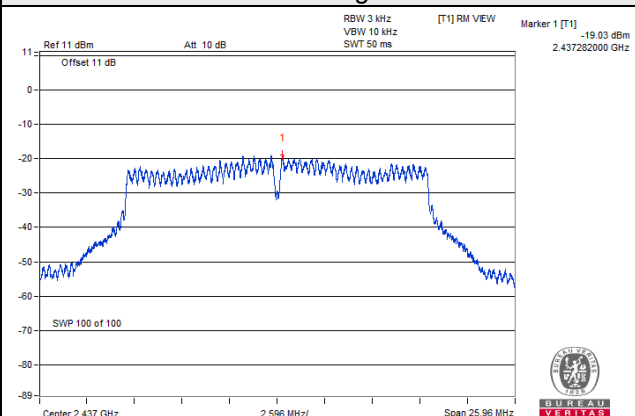
Note: Refer to section 3.3 for duty cycle spectrum plot.

Spectrum Plot of Worst Value

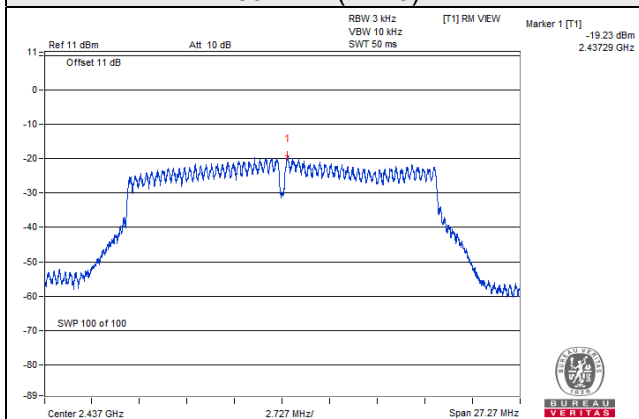
802.11b



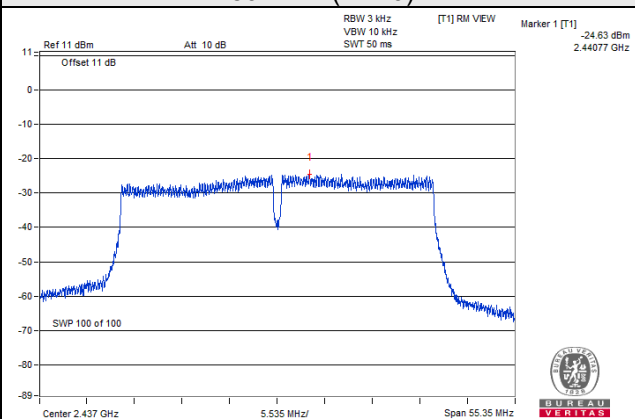
802.11g



802.11n (HT20)



802.11n (HT40)



4.6 Conducted Out of Band Emission Measurement

4.6.1 Limits of Conducted Out of Band Emission Measurement

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

4.6.2 Test Setup



4.6.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.6.4 Test Procedure

MEASUREMENT PROCEDURE REF

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

MEASUREMENT PROCEDURE OOB

- Set RBW = 100 kHz.
- Set VBW $\geq$ 300 kHz.
- Detector = peak.
- Sweep = auto couple.
- Trace Mode = max hold.
- Allow trace to fully stabilize.
- Use the peak marker function to determine the maximum amplitude level.

4.6.5 Deviation from Test Standard

No deviation.

4.6.6 EUT Operating Condition

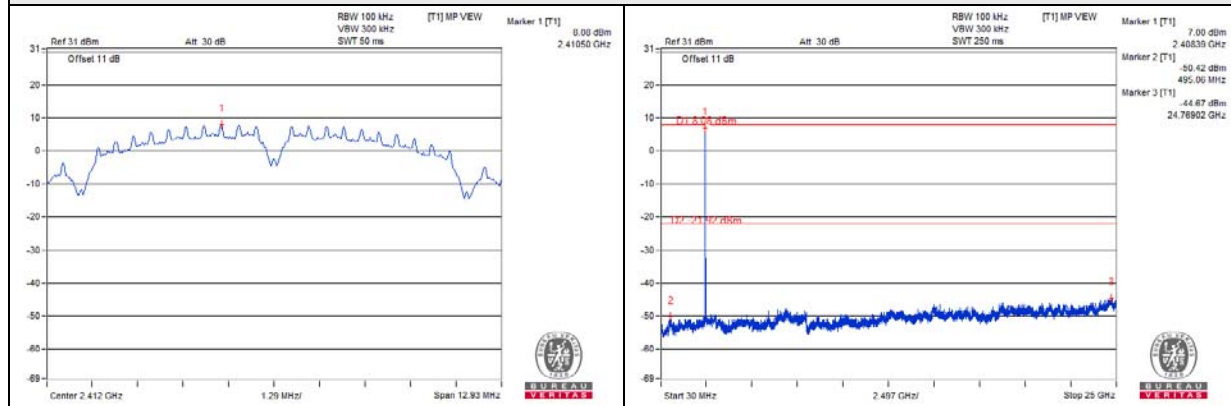
Same as item 4.3.6

4.6.7 Test Results

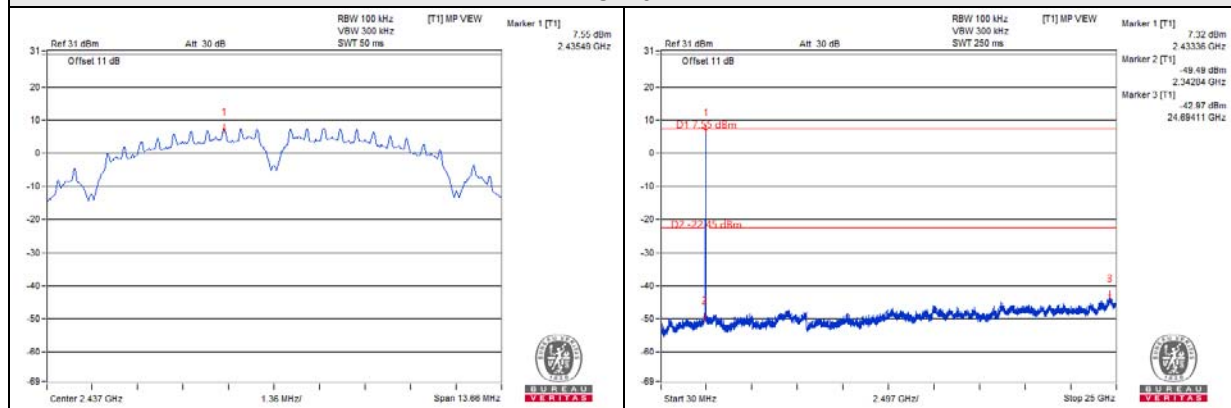
The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 30dB offset below D1. It shows compliance with the requirement.

802.11b

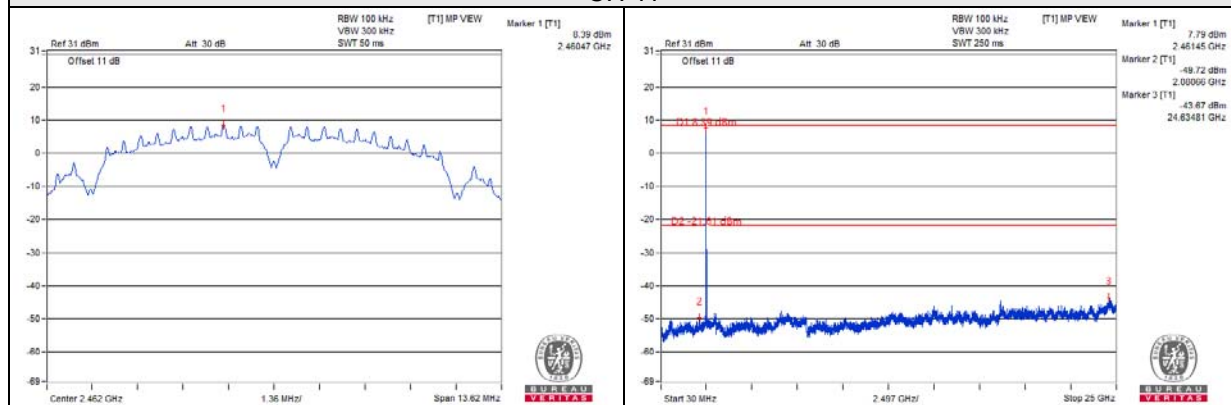
CH 1



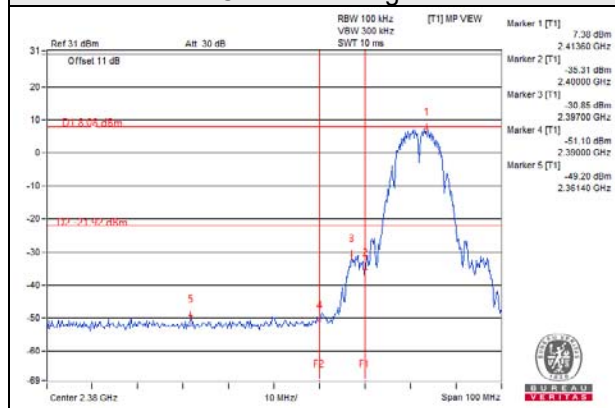
CH 6



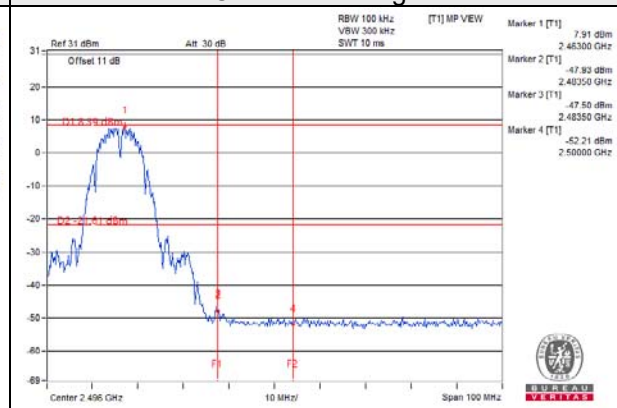
CH 11



CH 1 Band edge

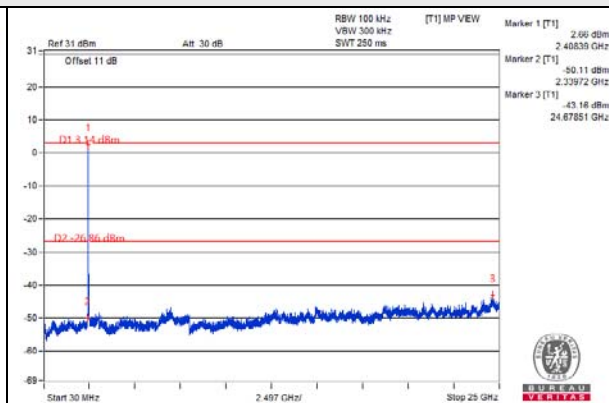
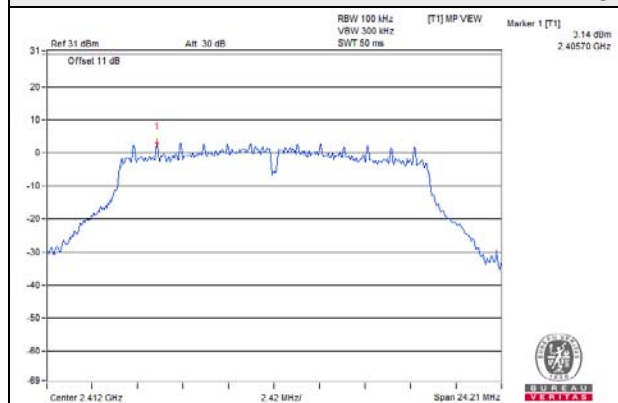


CH 11 Band edge

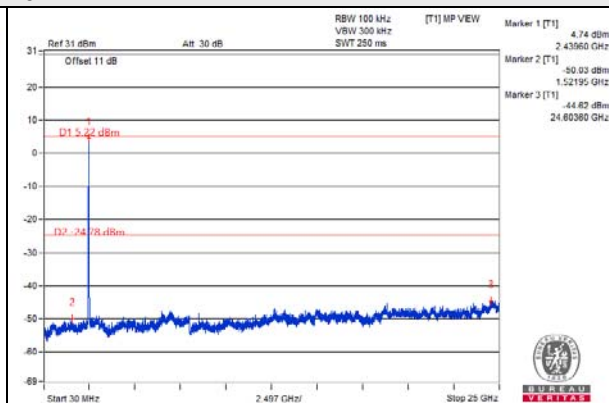
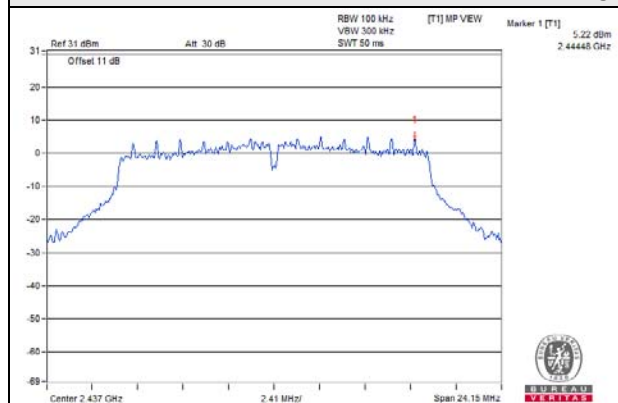


802.11g

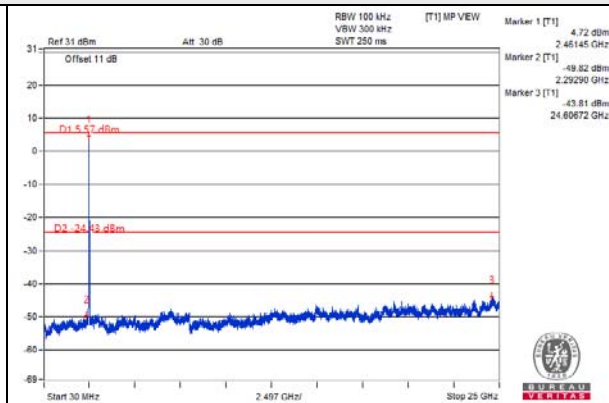
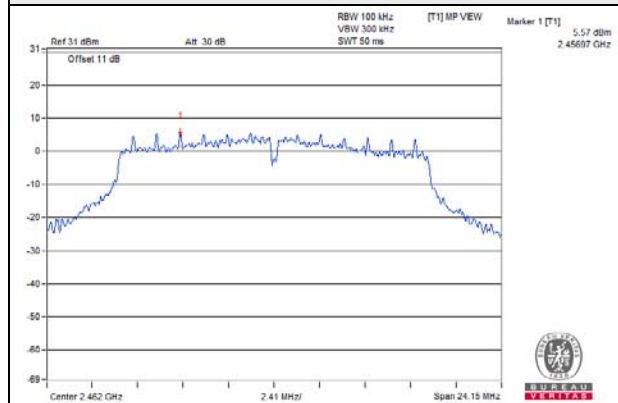
CH 1



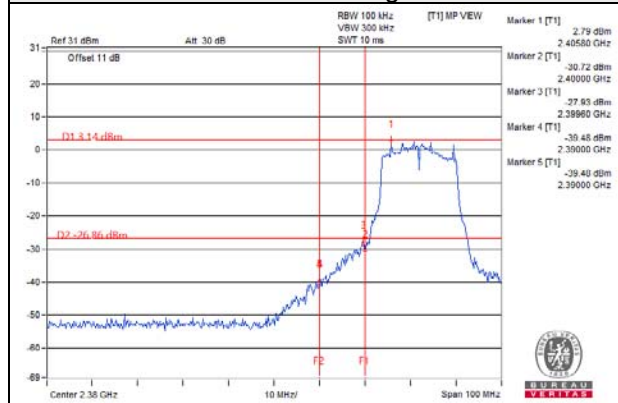
CH 6



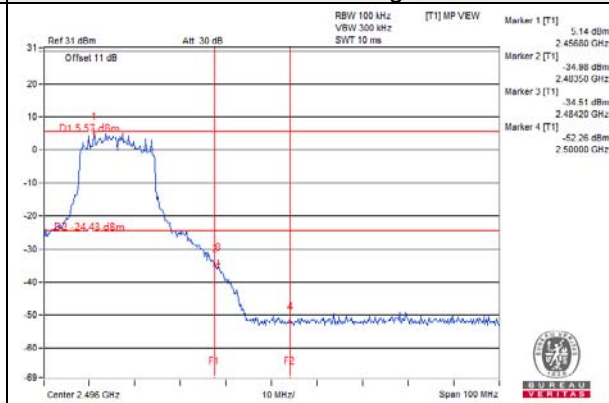
CH 11



CH 1 Band edge

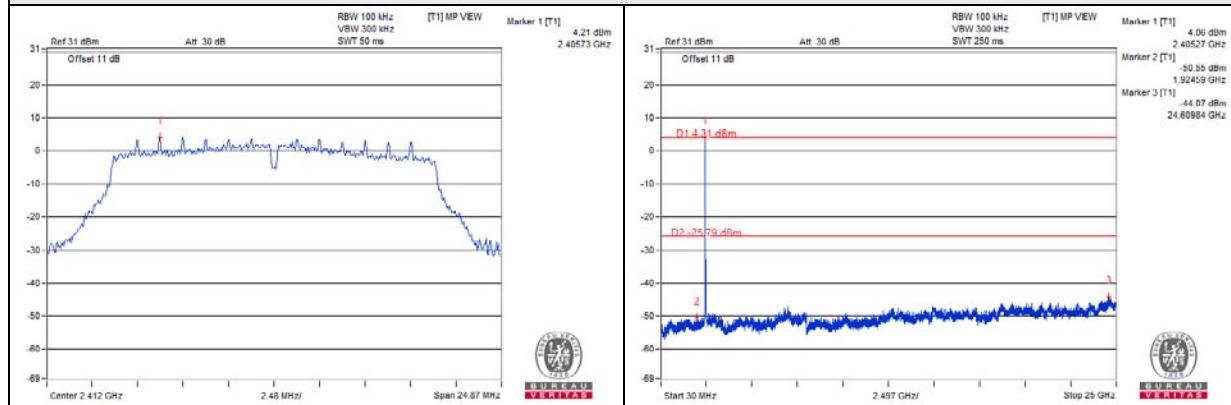


CH 11 Band edge

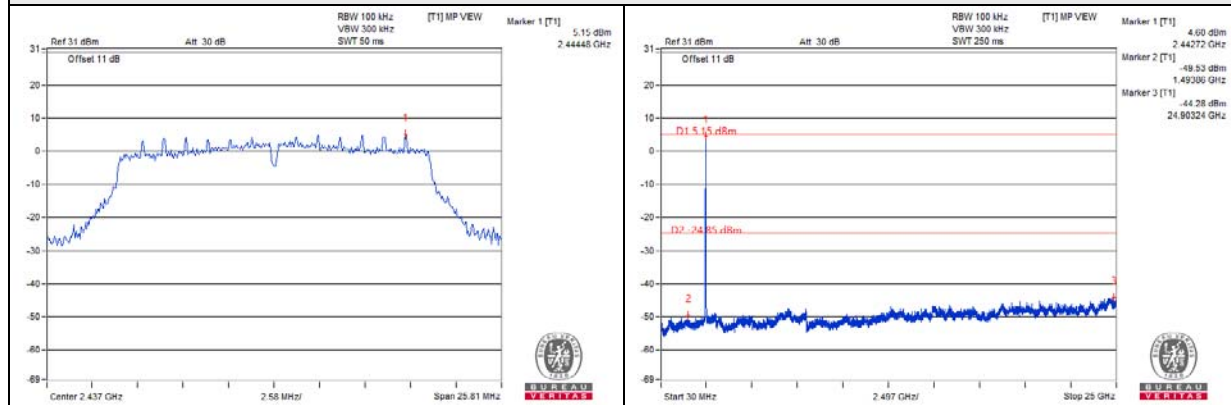


802.11n (HT20)

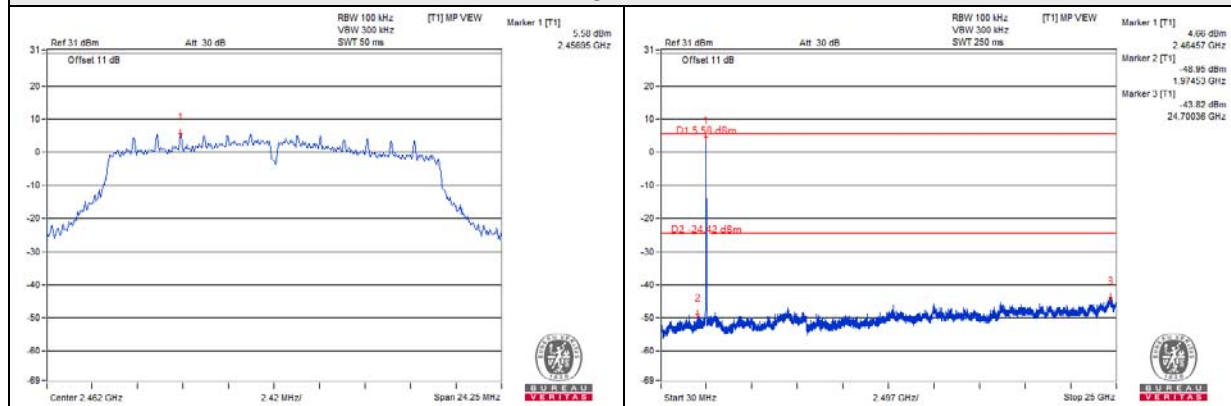
CH 1



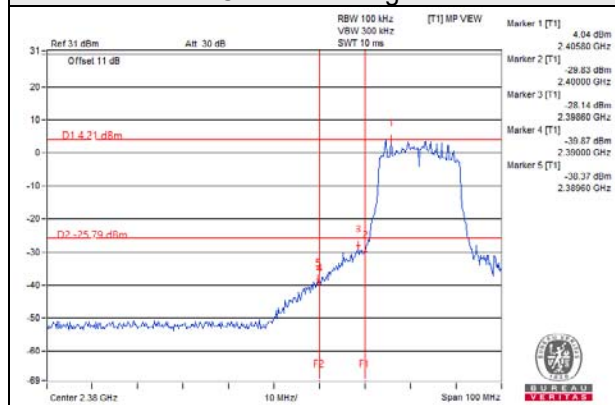
CH 6



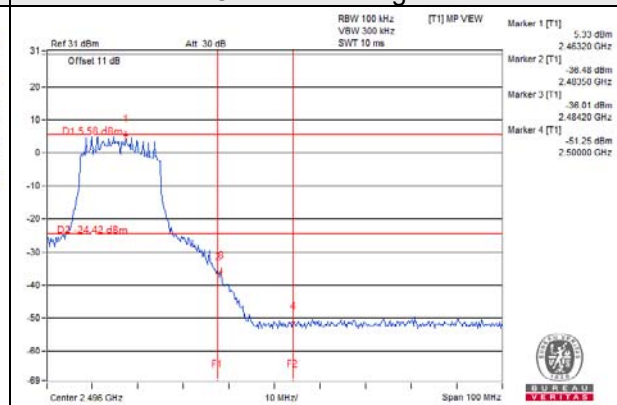
CH 11



CH 1 Band edge

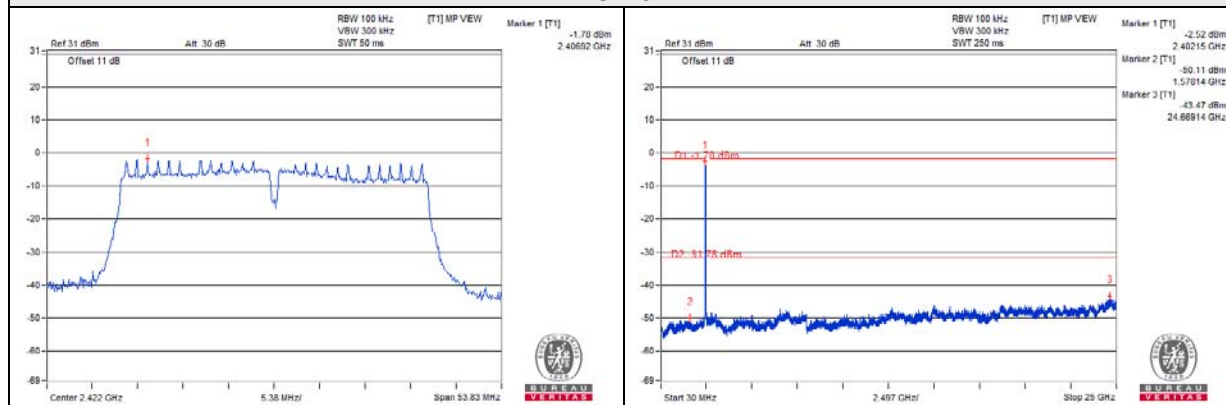


CH 11 Band edge

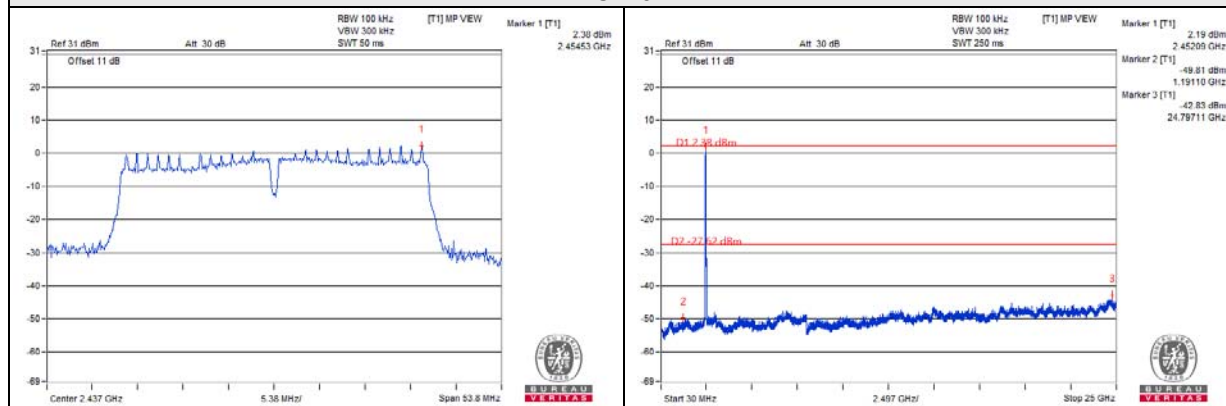


802.11n (HT40)

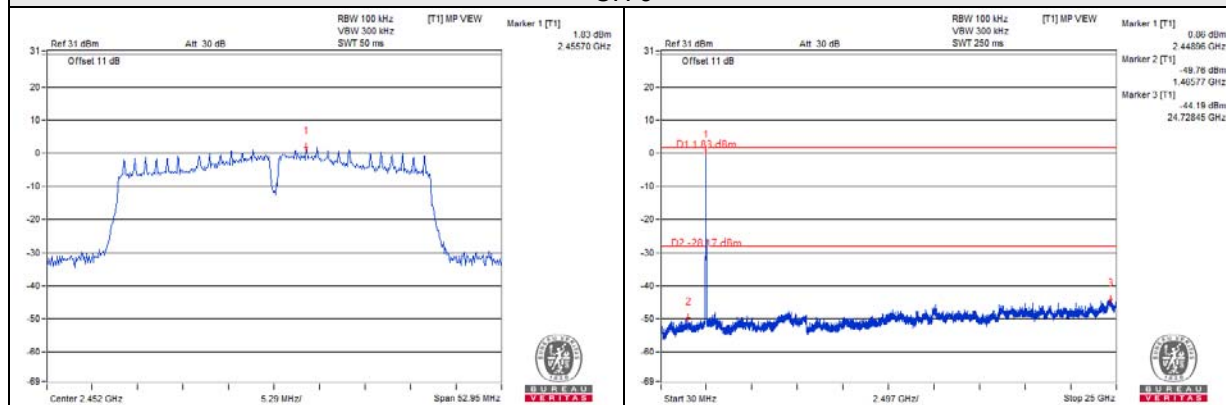
CH 3



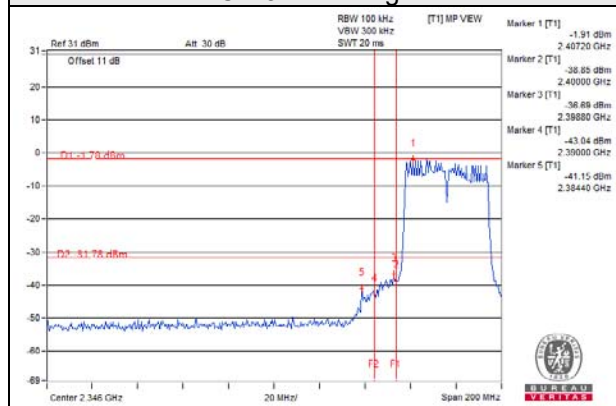
CH 6



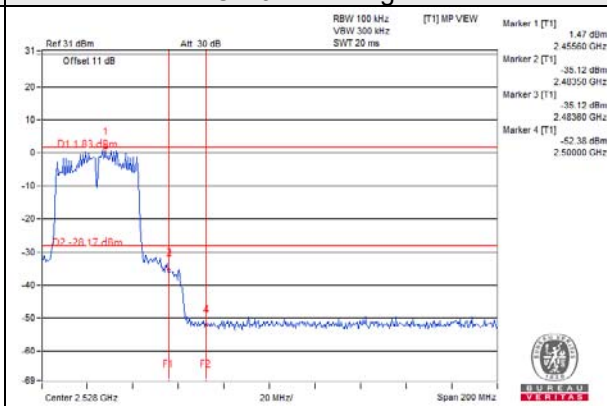
CH 9



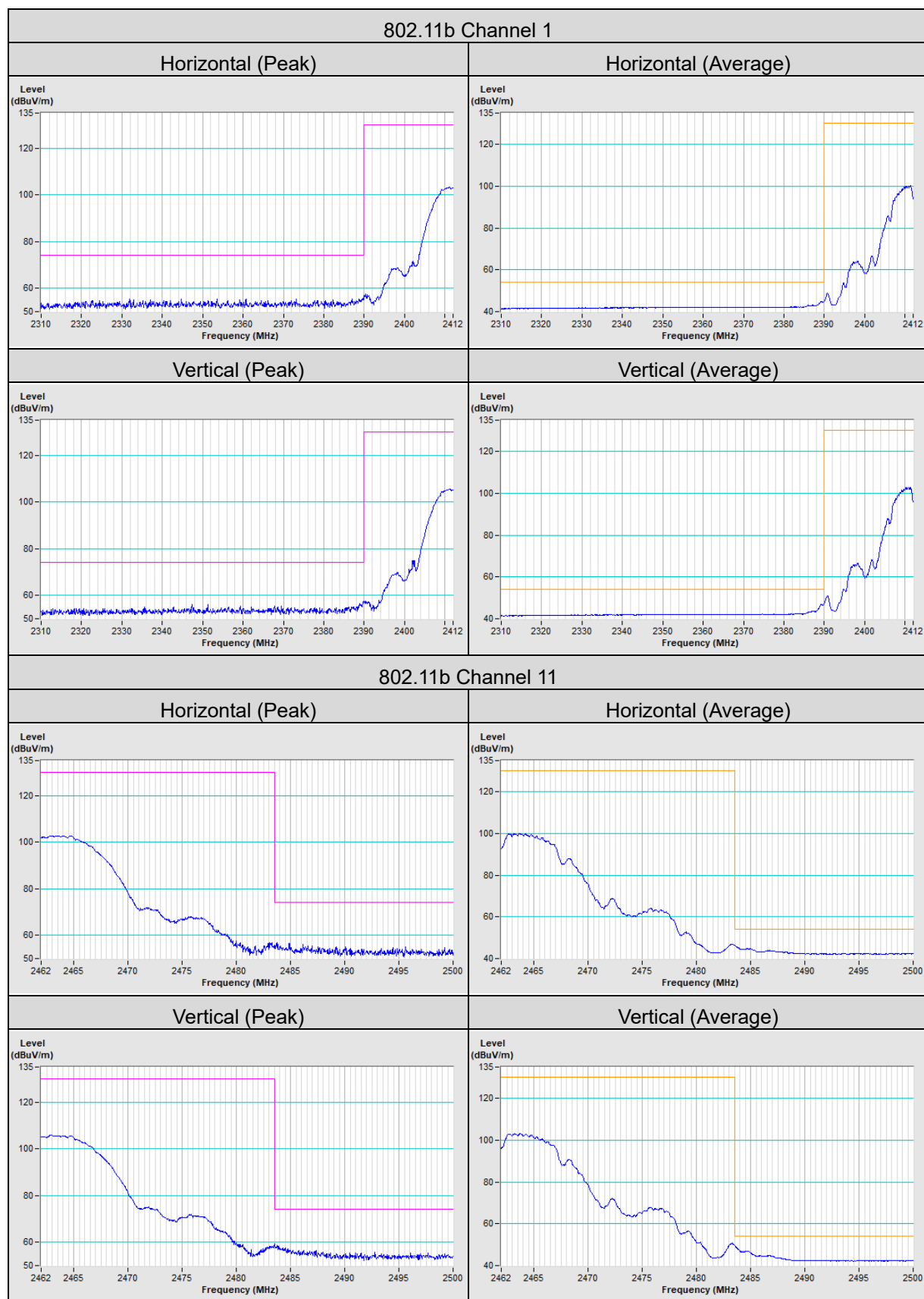
CH 3 Band edge

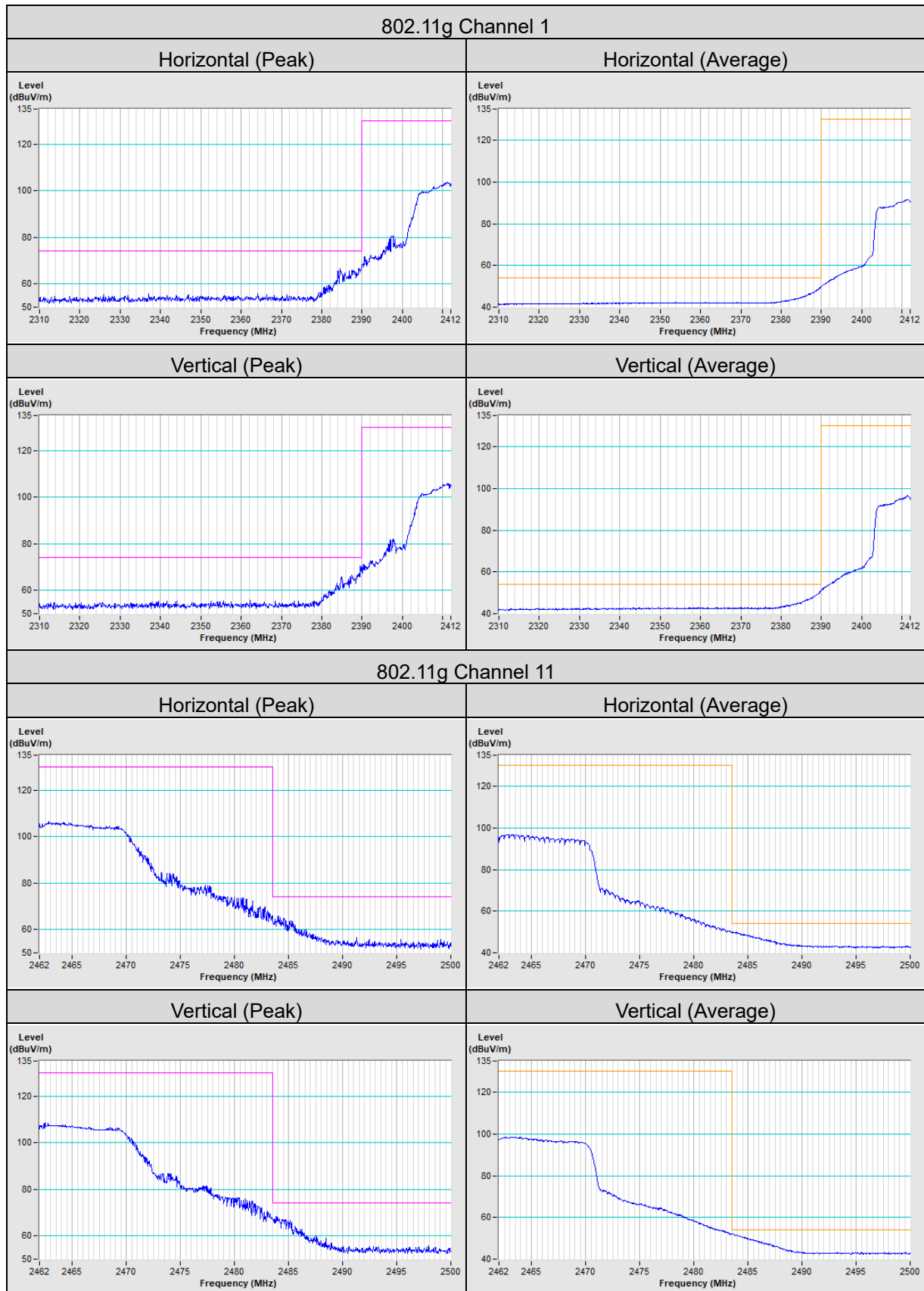


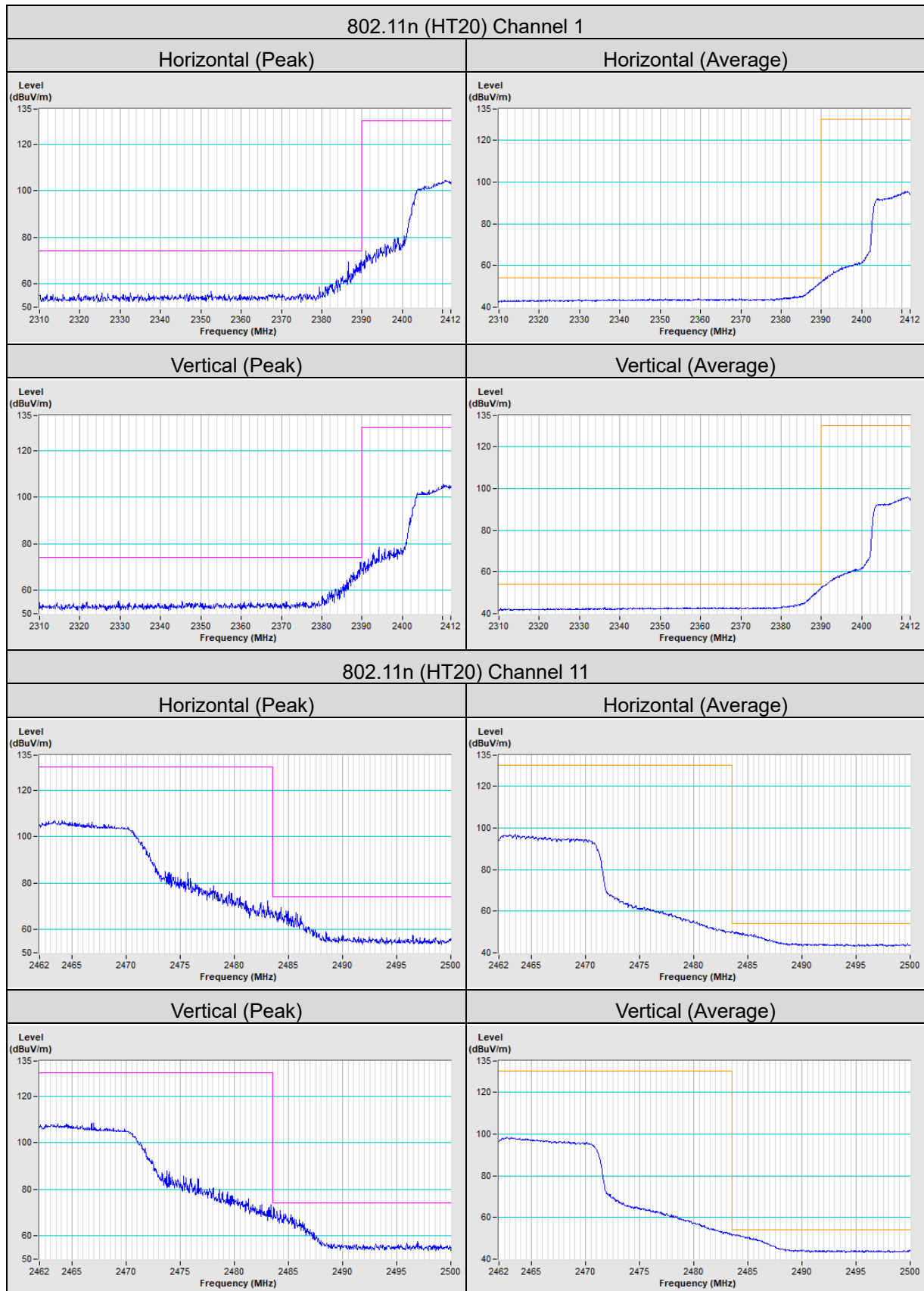
CH 9 Band edge

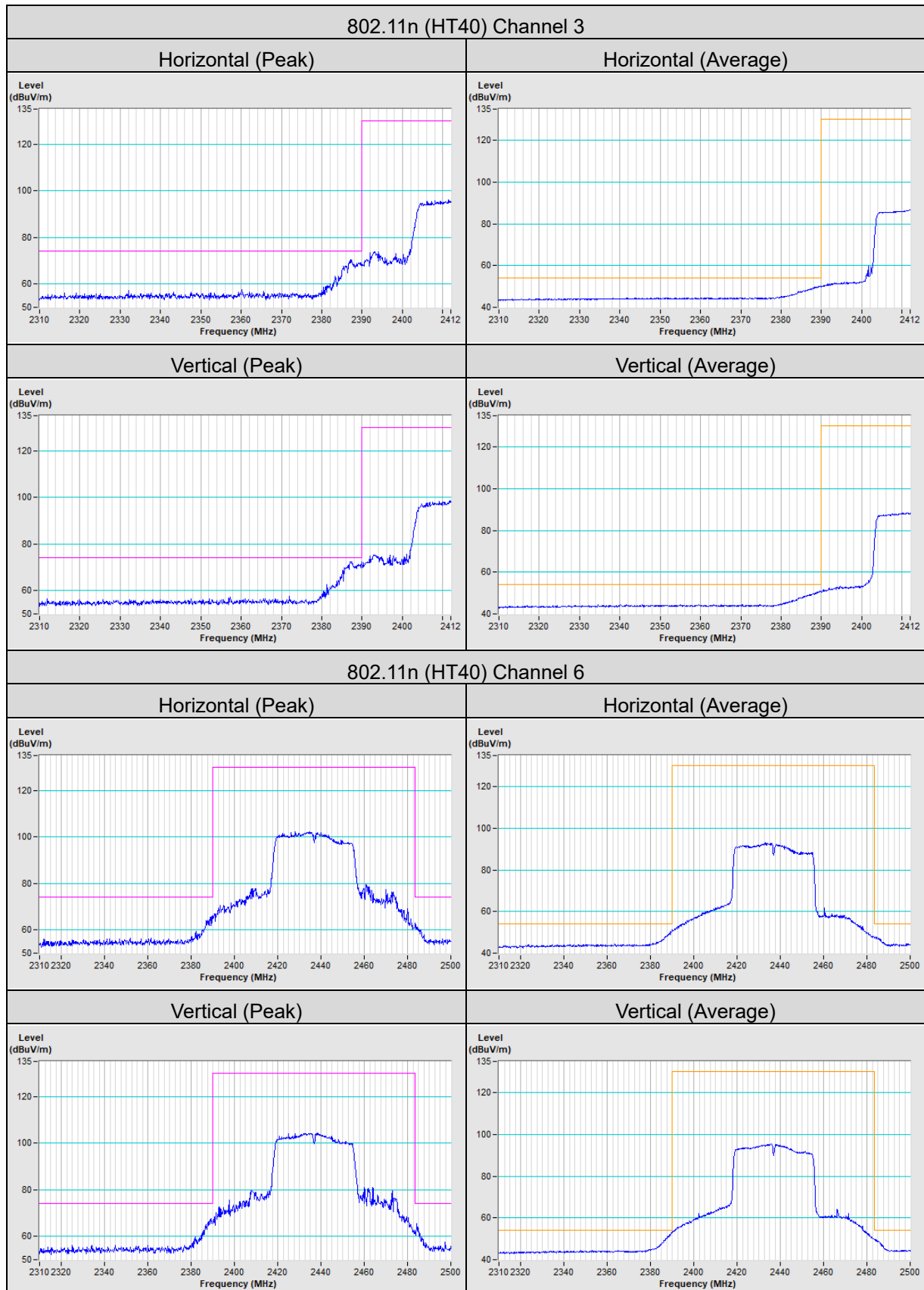


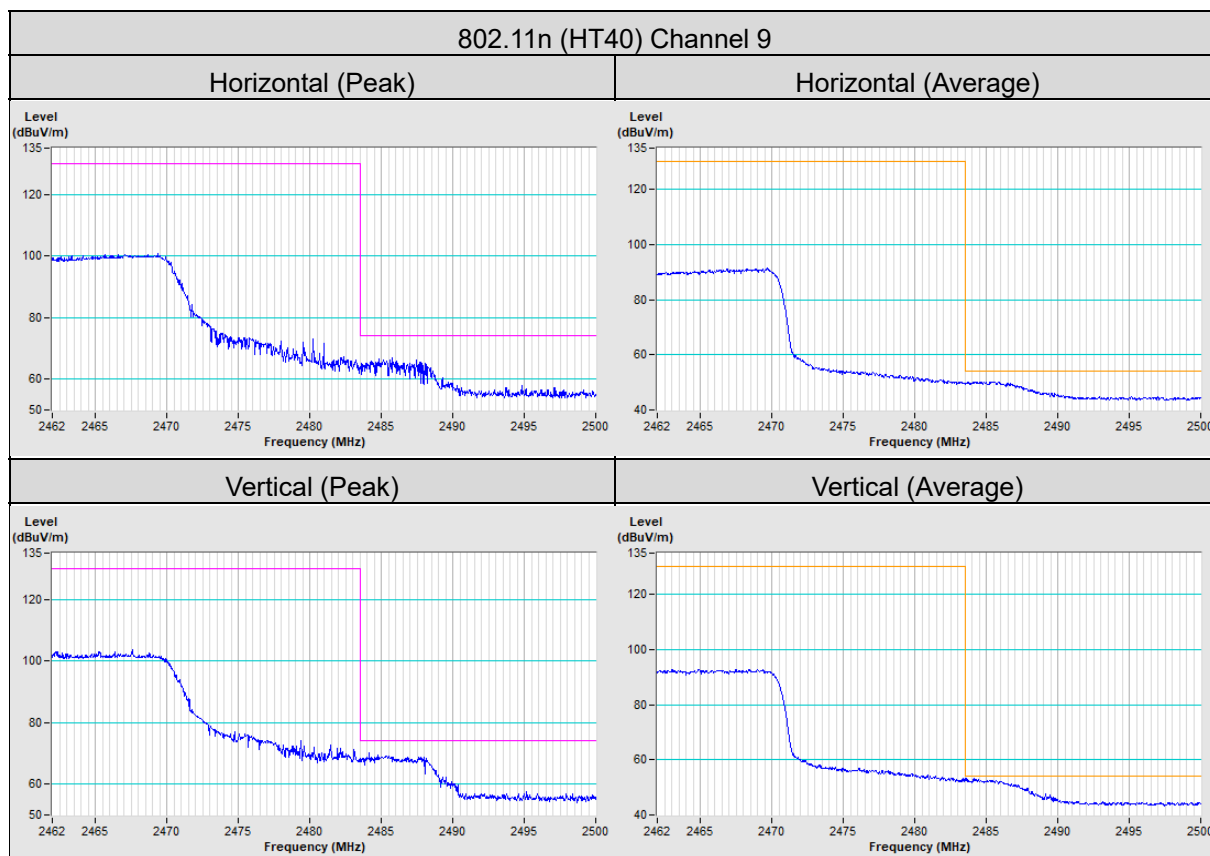
Annex A- Band Edge Measurement











5 Pictures of Test Arrangements

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

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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Web Site: www.bureauveritas-adt.com

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

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