FCC Test Report (WLAN)

Report No.:	RF180911E19D
FCC ID:	2APLE18300410
Test Model:	VMC5040
Received Date:	Dec. 17, 2019
Test Date:	Jan. 21 to Feb. 17, 2020
Issued Date:	Feb. 27, 2020
Applicant:	Arlo Technologies, Inc.
Address:	2200 Faraday Ave. Suite 150, Carlsbad, CA 92008, United States
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Hsin Chu Laboratory
Lab Address:	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan
Test Location :	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan
FCC Registration / Designation Number:	723255 / TW2022

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Release Control Record

Issue No.	Description	Date Issued
RF180911E19D	Original release.	Feb. 27, 2020

1 Certificate of Conformity

Product:	arlo ULTRA
Brand:	Arlo
Test Model:	VMC5040
Sample Status:	ENGINEERING SAMPLE
Applicant:	Arlo Technologies, Inc.
Test Date:	Jan. 21 to Feb. 17, 2020
Standards:	47 CFR FCC Part 15, Subpart C (Section 15.247) ANSI C63.10: 2013

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

Prepared by : _____ , **Date:** Feb. 27, 2020

Claire Kuan / Specialist

Approved by : _____ , **Date:** Feb. 27, 2020

Clark Lin / Technical Manager

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is -11.20dB at 0.51924MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -0.1dB at 4924.00, 2483.50, 2390.00 MHz.
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.

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	1.8 dB
Conducted Emissions	-	3.1 dB
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	3.0 dB
	30MHz ~ 1GHz	4.9 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	5.1 dB
	6GHz ~ 18GHz	4.9 dB
	18GHz ~ 40GHz	5.2 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT (WLAN)

Product	arlo ULTRA
Brand	Arlo
Test Model	VMC5040
Status of EUT	ENGINEERING SAMPLE
Power Supply Rating	DC 5V from USB interface or DC 3.85V from battery
Modulation Type	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in 11ac mode only
Modulation Technology	DSSS,OFDM
Transfer Rate	802.11b: up to 11Mbps 802.11a/g: up to 54Mbps 802.11n: up to 72.2Mbps 802.11ac: up to 86.7Mbps
Operating Frequency	**2.4GHz:** 2.412 ~ 2.462GHz **5GHz:** 5.18GHz ~ 5.24GHz, 5.745GHz ~ 5.825GHz
Number of Channel	**2.4GHz:** 802.11b, 802.11g, 802.11n (HT20): 11 **5GHz:** 802.11a, 802.11n (HT20), 802.11ac (VHT20): 9
Output Power	**2.4GHz:** 306.196mW **5.18 ~ 5.24GHz:** 76.736mW **5.745 ~ 5.825GHz:** 66.834mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	Battery x 1
Cable Supplied	USB cable x 1 (Unshielded, 0.8m)

Note:

1. The EUT could be supplied from a battery as following table:

Brand	Model No.	Spec.
Arlo	A-4a	3.85Vdc, 18.48Wh, 4800mAh

2. The antennas provided to the EUT, please refer to the following table:

Antenna No	Antenna Net Gain (dBi)	Frequency range (GHz)	Antenna Type	Connector Type
Left	1.3	2.4~2.4835	Monopole	NA
	3.4	5.15~5.85	Monopole	NA
Right	1.5	2.4~2.4835	Monopole	NA
	3.5	5.15~5.85	Monopole	NA

3. The EUT was pre-tested under following test modes:

Pre-test Mode	Power
Mode A	**Power from USB adapter**
Mode B	Power from battery

From the above modes, the worst radiated emission was found in **Mode A**. Therefore only the test data of the modes were recorded in this report.

4. The EUT was pre-tested under following test modes:

Pre-test Mode	Power
Mode A	**Power from Laptop**
Mode B	Power from USB adapter

From the above modes, the worst conducted emission was found in **Mode A**. Therefore only the test data of the modes were recorded in this report.

5. The EUT incorporates a SISO function.

2.4GHz Band			
MODULATION MODE	**DATA RATE (MCS)**	**TX & RX CONFIGURATION**	
802.11b	1 ~ 11Mbps	1TX diversity	1RX
802.11g	6 ~ 54Mbps	1TX diversity	1RX
802.11n (HT20)	MCS 0~7	1TX diversity	1RX
5GHz Band			
MODULATION MODE	**DATA RATE (MCS)**	**TX & RX CONFIGURATION**	
802.11a	6 ~ 54Mbps	1TX diversity	1RX
802.11n (HT20)	MCS 0~7	1TX diversity	1RX
802.11ac (VHT20)	MCS0~8 Nss=1	1TX diversity	1RX

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

3.2 Description of Test Modes

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

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

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE≥1G	RE<1G	PLC	APCM	
-	√	√	√	√	PLC: Power from Laptop RE: Power from USB adapter

Where **RE≥1G:** Radiated Emission above 1GHz & Bandedge Measurement **RE<1G:** Radiated Emission below 1GHz

PLC: Power Line Conducted Emission **APCM:** Antenna Port Conducted Measurement

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

Radiated Emission Test (Above 1GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

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

Radiated Emission Test (Below 1GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

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

Power Line Conducted Emission Test:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

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

Antenna Port Conducted Measurement:

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

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

Test Condition:

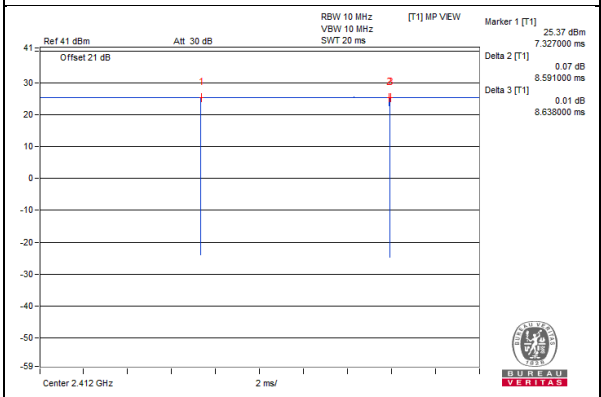
Applicable To	Environmental Conditions	Input Power (system)	Tested By
RE≥1G	25deg. C, 75%RH	120Vac, 60Hz	Gary Cheng
RE<1G	22deg. C, 64%RH	120Vac, 60Hz	Kevin Ko
PLC	25deg. C, 75%RH	120Vac, 60Hz	Andy Ho
APCM	25deg. C, 60%RH	120Vac, 60Hz	Jyunchun Lin

3.3 Duty Cycle of Test Signal

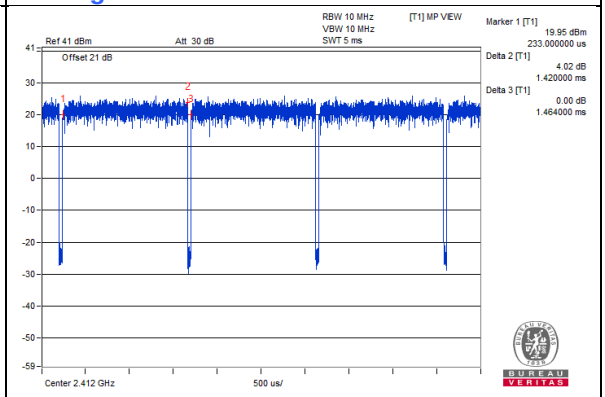
If duty cycle of test signal is ≥ 98 %, duty factor is not required.
If duty cycle of test signal is < 98%, duty factor shall be considered.

802.11b: Duty cycle = 8.591/8.638 = 0.995
802.11g: Duty cycle = 1.42/1.464 = 0.97, Duty factor = 10 * log(1/0.97) = 0.13
802.11n (HT20): Duty cycle = 1.336/1.382 = 0.967, Duty factor = 10 * log(1/0.967) = 0.15

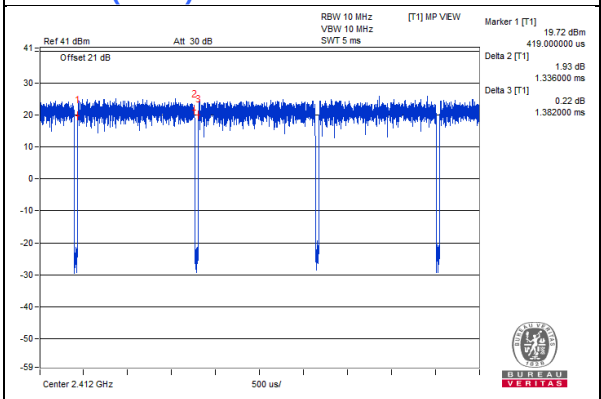
802.11b



802.11g



802.11n (HT20)



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.	USB Adapter	ASUS	EXA1205UA	NA	NA	Provided by Lab
B.	Laptop	HP	TPN-Q186	5CD8212YYG	FCC DoC	Provided by Lab

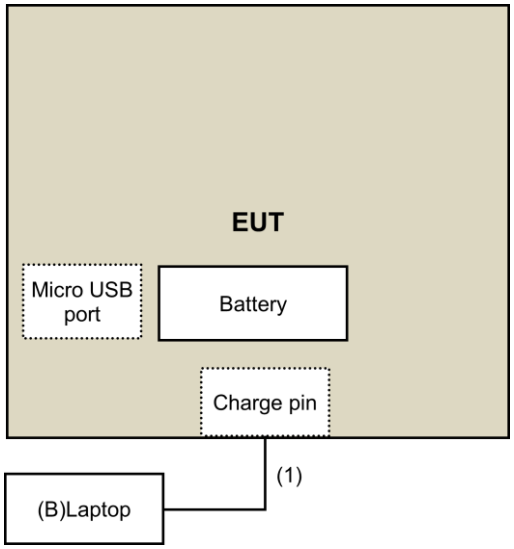
Note:

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

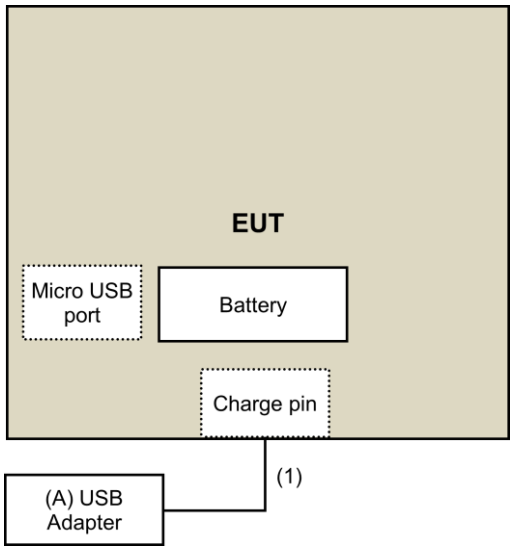
ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	USB Cable	1	0.8	No	0	Supplied by client

3.4.1 Configuration of System under Test

For Conducted Emission Test:



For Radiated Emission Test:



3.5 General Description of Applied Standards and references

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

Test standard:

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

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

References Test Guidance :

KDB 558074 D01 15.247 Meas Guidance v05r02

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

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

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

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

NOTE:

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

4.1.2 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Agilent	N9038A	MY51210202	Dec. 13, 2019	Dec. 12, 2020
Pre-Amplifier EMCI	EMC001340	980142	May 30, 2019	May 29, 2020
Loop Antenna Electro-Metrics	EM-6879	269	Sep. 16, 2019	Sep. 15, 2020
RF Cable	NA	LOOPCAB-001	Jan. 08, 2020	Jan. 07, 2021
RF Cable	NA	LOOPCAB-002	Jan. 08, 2020	Jan. 07, 2021
Pre-Amplifier Mini-Circuits	ZFL-1000VH2B	AMP-ZFL-01	Oct. 23, 2019	Oct. 22, 2020
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-406	Nov. 11, 2019	Nov. 10, 2020
RF Cable	8D	966-4-1	Mar. 19, 2019	Mar. 18, 2020
RF Cable	8D	966-4-2	Mar. 19, 2019	Mar. 18, 2020
RF Cable	8D	966-4-3	Mar. 19, 2019	Mar. 18, 2020
Fixed attenuator Mini-Circuits	UNAT-5+	PAD-3m-4-01	Sep. 26, 2019	Sep. 25, 2020
Horn_Antenna SCHWARZBECK	BBHA 9120D	9120D-783	Nov. 24, 2019	Nov. 23, 2020
Pre-Amplifier EMCI	EMC12630SE	980385	Aug. 15, 2019	Aug. 14, 2020
RF Cable	EMC104-SM-SM-1200	160923	Jan. 15, 2020	Jan. 14, 2021
RF Cable	104 RF cable	131215	Jan. 09, 2020	Jan. 08, 2021
RF Cable	EMC104-SM-SM-6000	180418	May 03, 2019	May 02, 2020
Pre-Amplifier EMCI	EMC184045SE	980387	Jan. 15, 2020	Jan. 14, 2021
Horn_Antenna SCHWARZBECK	BBHA 9170	BBHA9170519	Nov. 24, 2019	Nov. 23, 2020
RF Cable	EMC102-KM-KM-1200	160924	Jan. 15, 2020	Jan. 14, 2021
RF Cable	EMC102-KM-KM-4500	181205	Aug. 26, 2019	Aug. 25, 2020
Software	ADT_Radiated_V8.7.08	NA	NA	NA
Boresight Antenna Tower & Turn Table Max-Full	MF-7802BS	MF780208530	NA	NA
Spectrum Analyzer R&S	FSV40	100964	June 04, 2019	June 03, 2020
Power meter Anritsu	ML2495A	1014008	May 13, 2019	May 12, 2020
Power sensor Anritsu	MA2411B	0917122	May 13, 2019	May 12, 2020
Fixed Attenuator Mini-Circuits	MDCS18N-10	MDCS18N-10-01	Apr. 15, 2019	Apr. 14, 2020

Note:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in 966 Chamber No. 4.
3. Loop antenna was used for all emissions below 30 MHz.
4. The following table is for the measurement uncertainty, which is calculated as per the document CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.
5. Tested Date: Jan. 21 to Feb. 17, 2020

4.1.3 Test Procedures

For Radiated emission below 30MHz

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

Note:

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

For Radiated emission above 30MHz

a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

f. The test-receiver system was set to peak and average detects function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

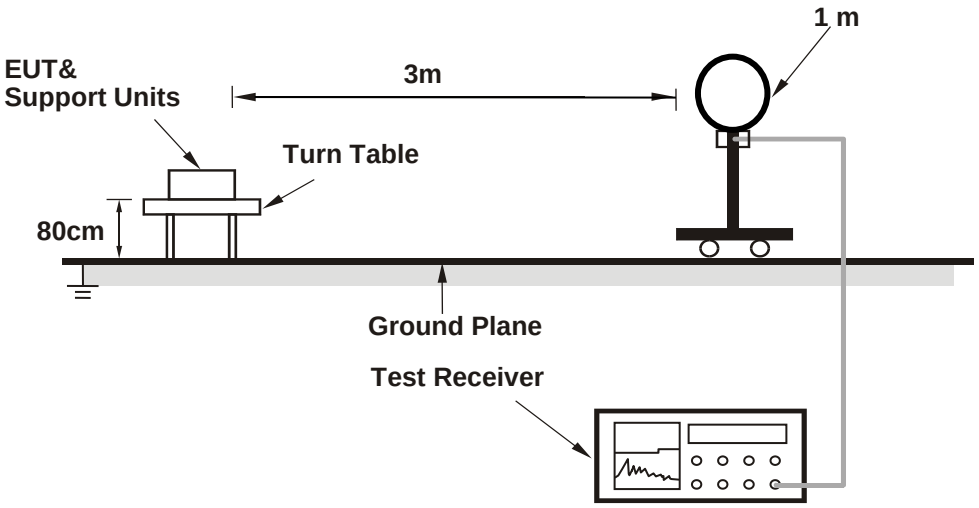
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

4.1.4 Deviation from Test Standard

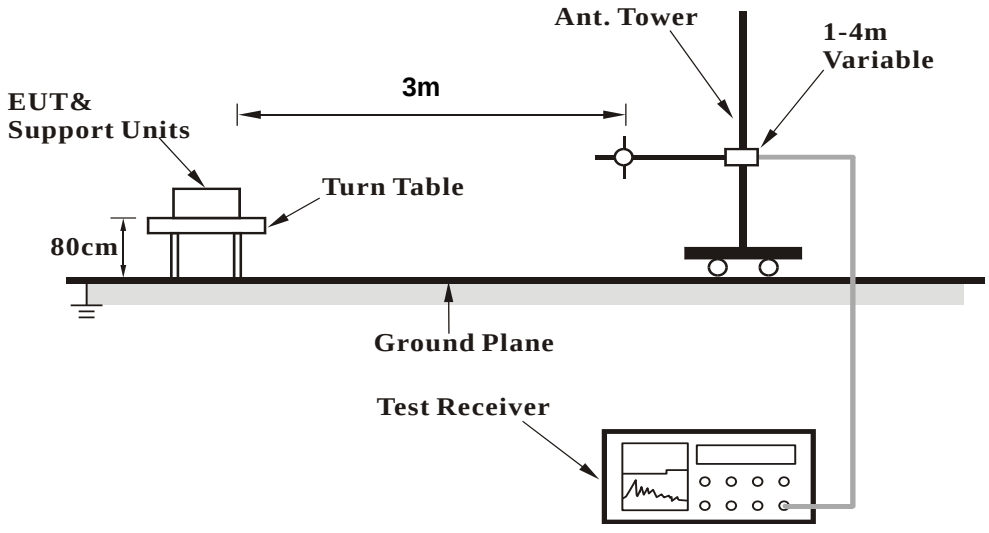
No deviation.

4.1.5 Test Setup

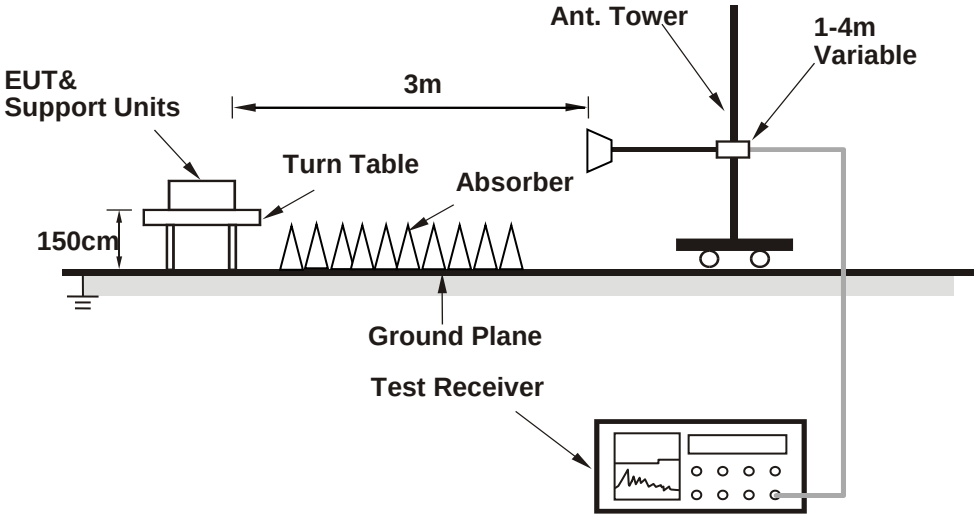
For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



For Radiated emission above 1GHz



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

4.1.6 EUT Operating Conditions

a. Placed the EUT on the testing table.
b. Controlling software (HyperTerminal paste Arlo Gen RF Commands.txt command) has been activated to set the EUT on specific status.

4.1.7 Test Results

Above 1GHz Data：

802.11b

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	**FREQ. (MHz)**	**EMISSION LEVEL (dBuV/m)**	**LIMIT (dBuV/m)**	**MARGIN (dB)**	**ANTENNA HEIGHT (m)**	**TABLE ANGLE (Degree)**	**RAW VALUE (dBuV)**	**CORRECTION FACTOR (dB/m)**
1	2390.00	58.4 PK	74.0	-15.6	1.14 H	118	60.1	-1.7
2	2390.00	47.5 AV	54.0	-6.5	1.14 H	118	49.2	-1.7
3	*2412.00	111.2 PK			1.14 H	118	113.0	-1.8
4	*2412.00	107.6 AV			1.14 H	118	109.4	-1.8
5	4824.00	56.5 PK	74.0	-17.5	1.09 H	173	54.2	2.3
6	4824.00	53.8 AV	54.0	-0.2	1.09 H	173	51.5	2.3
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	**FREQ. (MHz)**	**EMISSION LEVEL (dBuV/m)**	**LIMIT (dBuV/m)**	**MARGIN (dB)**	**ANTENNA HEIGHT (m)**	**TABLE ANGLE (Degree)**	**RAW VALUE (dBuV)**	**CORRECTION FACTOR (dB/m)**
1	2390.00	57.1 PK	74.0	-16.9	1.51 V	148	58.8	-1.7
2	2390.00	44.9 AV	54.0	-9.1	1.51 V	148	46.6	-1.7
3	*2412.00	108.1 PK			1.51 V	148	109.9	-1.8
4	*2412.00	105.6 AV			1.51 V	148	107.4	-1.8
5	4824.00	53.8 PK	74.0	-20.2	1.09 V	264	51.5	2.3
6	4824.00	51.5 AV	54.0	-2.5	1.09 V	264	49.2	2.3

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.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	57.5 PK	74.0	-16.5	1.05 H	106	59.2	-1.7
2	2390.00	45.0 AV	54.0	-9.0	1.05 H	106	46.7	-1.7
3	*2437.00	111.3 PK			1.05 H	106	113.0	-1.7
4	*2437.00	107.7 AV			1.05 H	106	109.4	-1.7
5	2483.50	61.6 PK	74.0	-12.4	1.05 H	106	63.3	-1.7
6	2483.50	46.2 AV	54.0	-7.8	1.05 H	106	47.9	-1.7
7	4874.00	55.8 PK	74.0	-18.2	1.08 H	184	53.6	2.2
8	4874.00	53.8 AV	54.0	-0.2	1.08 H	184	51.6	2.2
9	7311.00	47.6 PK	74.0	-26.4	1.08 H	147	38.5	9.1
10	7311.00	37.5 AV	54.0	-16.5	1.08 H	147	28.4	9.1
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	54.7 PK	74.0	-19.3	2.66 V	254	56.4	-1.7
2	2390.00	42.1 AV	54.0	-11.9	2.66 V	254	43.8	-1.7
3	*2437.00	108.7 PK			2.66 V	254	110.4	-1.7
4	*2437.00	104.9 AV			2.66 V	254	106.6	-1.7
5	2483.50	58.7 PK	74.0	-15.3	2.66 V	254	60.4	-1.7
6	2483.50	43.5 AV	54.0	-10.5	2.66 V	254	45.2	-1.7
7	4874.00	54.5 PK	74.0	-19.5	1.01 V	250	52.3	2.2
8	4874.00	51.9 AV	54.0	-2.1	1.01 V	250	49.7	2.2
9	7311.00	57.2 PK	74.0	-16.8	1.30 V	254	48.1	9.1
10	7311.00	50.6 AV	54.0	-3.4	1.30 V	254	41.5	9.1

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 FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	112.5 PK			1.06 H	110	114.2	-1.7
2	*2462.00	108.9 AV			1.06 H	110	110.6	-1.7
3	2483.50	62.7 PK	74.0	-11.3	1.06 H	110	64.4	-1.7
4	2483.50	49.2 AV	54.0	-4.8	1.06 H	110	50.9	-1.7
5	4924.00	55.3 PK	74.0	-18.7	1.04 H	174	52.9	2.4
6	**4924.00**	**53.9 AV**	**54.0**	**-0.1**	**1.04 H**	**174**	**51.5**	**2.4**
7	7386.00	46.9 PK	74.0	-27.1	1.05 H	140	37.4	9.5
8	7386.00	37.1 AV	54.0	-16.9	1.05 H	140	27.6	9.5
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	110.5 PK			1.99 V	110	112.2	-1.7
2	*2462.00	106.6 AV			1.99 V	110	108.3	-1.7
3	2483.50	60.1 PK	74.0	-13.9	1.99 V	110	61.8	-1.7
4	2483.50	46.2 AV	54.0	-7.8	1.99 V	110	47.9	-1.7
5	4924.00	54.0 PK	74.0	-20.0	1.04 V	249	51.6	2.4
6	4924.00	51.4 AV	54.0	-2.6	1.04 V	249	49.0	2.4
7	7386.00	57.6 PK	74.0	-16.4	1.32 V	240	48.1	9.5
8	7386.00	51.0 AV	54.0	-3.0	1.32 V	240	41.5	9.5

REMARKS:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	73.8 PK	74.0	-0.2	1.04 H	104	75.5	-1.7
2	2390.00	52.2 AV	54.0	-1.8	1.04 H	104	53.9	-1.7
3	*2412.00	111.7 PK			1.04 H	104	113.5	-1.8
4	*2412.00	102.0 AV			1.04 H	104	103.8	-1.8
5	4824.00	55.9 PK	74.0	-18.1	2.36 H	44	53.6	2.3
6	4824.00	44.6 AV	54.0	-9.4	2.36 H	44	42.3	2.3
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	70.8 PK	74.0	-3.2	1.00 V	134	72.5	-1.7
2	2390.00	49.8 AV	54.0	-4.2	1.00 V	134	51.5	-1.7
3	*2412.00	108.8 PK			1.00 V	134	110.6	-1.8
4	*2412.00	99.5 AV			1.00 V	134	101.3	-1.8
5	4824.00	48.3 PK	74.0	-25.7	2.50 V	312	46.0	2.3
6	4824.00	36.3 AV	54.0	-17.7	2.50 V	312	34.0	2.3

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.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	71.1 PK	74.0	-2.9	1.03 H	108	72.8	-1.7
2	2390.00	48.5 AV	54.0	-5.5	1.03 H	108	50.2	-1.7
3	*2437.00	115.7 PK			1.03 H	108	117.4	-1.7
4	*2437.00	105.5 AV			1.03 H	108	107.2	-1.7
5	2483.50	73.7 PK	74.0	-0.3	1.03 H	108	75.4	-1.7
6	2483.50	50.7 AV	54.0	-3.3	1.03 H	108	52.4	-1.7
7	4874.00	57.3 PK	74.0	-16.7	2.25 H	51	55.1	2.2
8	4874.00	45.7 AV	54.0	-8.3	2.25 H	51	43.5	2.2
9	7311.00	57.0 PK	74.0	-17.0	1.63 H	332	47.9	9.1
10	7311.00	45.3 AV	54.0	-8.7	1.63 H	332	36.2	9.1
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	68.1 PK	74.0	-5.9	1.88 V	177	69.8	-1.7
2	2390.00	46.0 AV	54.0	-8.0	1.88 V	177	47.7	-1.7
3	*2437.00	112.7 PK			1.88 V	177	114.4	-1.7
4	*2437.00	103.1 AV			1.88 V	177	104.8	-1.7
5	2483.50	71.2 PK	74.0	-2.8	1.88 V	177	72.9	-1.7
6	2483.50	48.4 AV	54.0	-5.6	1.88 V	177	50.1	-1.7
7	4874.00	47.3 PK	74.0	-26.7	1.53 V	1	45.1	2.2
8	4874.00	37.6 AV	54.0	-16.4	1.53 V	1	35.4	2.2
9	7311.00	66.0 PK	74.0	-8.0	1.09 V	79	56.9	9.1
10	7311.00	50.0 AV	54.0	-4.0	1.09 V	79	40.9	9.1

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 FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	111.9 PK			1.04 H	113	113.6	-1.7
2	*2462.00	102.1 AV			1.04 H	113	103.8	-1.7
3	**2483.50**	**73.9 PK**	**74.0**	**-0.1**	**1.04 H**	**113**	**75.6**	**-1.7**
4	2483.50	52.3 AV	54.0	-1.7	1.04 H	113	54.0	-1.7
5	4924.00	58.4 PK	74.0	-15.6	1.15 H	112	56.0	2.4
6	4924.00	46.3 AV	54.0	-7.7	1.15 H	112	43.9	2.4
7	7386.00	59.6 PK	74.0	-14.4	1.11 H	177	50.1	9.5
8	7386.00	45.4 AV	54.0	-8.6	1.11 H	177	35.9	9.5
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	109.8 PK			1.98 V	217	111.5	-1.7
2	*2462.00	99.3 AV			1.98 V	217	101.0	-1.7
3	2483.50	71.5 PK	74.0	-2.5	1.98 V	217	73.2	-1.7
4	2483.50	50.3 AV	54.0	-3.7	1.98 V	217	52.0	-1.7
5	4924.00	48.9 PK	74.0	-25.1	1.64 V	336	46.5	2.4
6	4924.00	37.5 AV	54.0	-16.5	1.64 V	336	35.1	2.4
7	7386.00	67.3 PK	74.0	-6.7	1.16 V	244	57.8	9.5
8	7386.00	51.3 AV	54.0	-2.7	1.16 V	244	41.8	9.5

REMARKS:

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

802.11n (HT20)

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	**2390.00**	**73.9 PK**	**74.0**	**-0.1**	**1.05 H**	**105**	**75.6**	**-1.7**
2	2390.00	52.8 AV	54.0	-1.2	1.05 H	105	54.5	-1.7
3	*2412.00	112.8 PK			1.05 H	105	114.6	-1.8
4	*2412.00	102.6 AV			1.05 H	105	104.4	-1.8
5	4824.00	56.5 PK	74.0	-17.5	1.02 H	317	54.2	2.3
6	4824.00	45.3 AV	54.0	-8.7	1.02 H	317	43.0	2.3
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	71.7 PK	74.0	-2.3	2.24 V	242	73.4	-1.7
2	2390.00	49.9 AV	54.0	-4.1	2.24 V	242	51.6	-1.7
3	*2412.00	110.8 PK			2.24 V	242	112.6	-1.8
4	*2412.00	100.5 AV			2.24 V	242	102.3	-1.8
5	4824.00	47.3 PK	74.0	-26.7	1.25 V	304	45.0	2.3
6	4824.00	37.0 AV	54.0	-17.0	1.25 V	304	34.7	2.3

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.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	72.4 PK	74.0	-1.6	1.05 H	112	74.1	-1.7
2	2390.00	49.7 AV	54.0	-4.3	1.05 H	112	51.4	-1.7
3	*2437.00	116.2 PK			1.05 H	112	117.9	-1.7
4	*2437.00	105.3 AV			1.05 H	112	107.0	-1.7
5	2483.50	73.7 PK	74.0	-0.3	1.05 H	112	75.4	-1.7
6	2483.50	51.4 AV	54.0	-2.6	1.05 H	112	53.1	-1.7
7	4874.00	57.9 PK	74.0	-16.1	1.24 H	114	55.7	2.2
8	4874.00	46.2 AV	54.0	-7.8	1.24 H	114	44.0	2.2
9	7311.00	57.8 PK	74.0	-16.2	1.12 H	180	48.7	9.1
10	7311.00	45.9 AV	54.0	-8.1	1.12 H	180	36.8	9.1
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	70.1 PK	74.0	-3.9	2.45 V	222	71.8	-1.7
2	2390.00	46.8 AV	54.0	-7.2	2.45 V	222	48.5	-1.7
3	*2437.00	114.2 PK			2.45 V	222	115.9	-1.7
4	*2437.00	103.3 AV			2.45 V	222	105.0	-1.7
5	2483.50	71.4 PK	74.0	-2.6	2.45 V	222	73.1	-1.7
6	2483.50	49.3 AV	54.0	-4.7	2.45 V	222	51.0	-1.7
7	4874.00	49.5 PK	74.0	-24.5	1.64 V	348	47.3	2.2
8	4874.00	38.1 AV	54.0	-15.9	1.64 V	348	35.9	2.2
9	7311.00	66.4 PK	74.0	-7.6	1.13 V	245	57.3	9.1
10	7311.00	50.5 AV	54.0	-3.5	1.13 V	245	41.4	9.1

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 FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	110.7 PK			1.05 H	113	112.4	-1.7
2	*2462.00	100.8 AV			1.05 H	113	102.5	-1.7
3	**2483.50**	**73.9 PK**	**74.0**	**-0.1**	**1.05 H**	**113**	**75.6**	**-1.7**
4	2483.50	50.5 AV	54.0	-3.5	1.05 H	113	52.2	-1.7
5	4924.00	56.2 PK	74.0	-17.8	1.72 H	62	53.8	2.4
6	4924.00	45.5 AV	54.0	-8.5	1.72 H	62	43.1	2.4
7	7386.00	56.0 PK	74.0	-18.0	1.09 H	248	46.5	9.5
8	7386.00	44.3 AV	54.0	-9.7	1.09 H	248	34.8	9.5
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	108.0 PK			2.62 V	147	109.7	-1.7
2	*2462.00	98.5 AV			2.62 V	147	100.2	-1.7
3	2483.50	71.1 PK	74.0	-2.9	2.62 V	147	72.8	-1.7
4	2483.50	48.3 AV	54.0	-5.7	2.62 V	147	50.0	-1.7
5	4924.00	48.5 PK	74.0	-25.5	1.32 V	198	46.1	2.4
6	4924.00	37.6 AV	54.0	-16.4	1.32 V	198	35.2	2.4
7	7386.00	65.0 PK	74.0	-9.0	1.69 V	251	55.5	9.5
8	7386.00	50.7 AV	54.0	-3.3	1.69 V	251	41.2	9.5

REMARKS:

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

Below 1GHz Data:

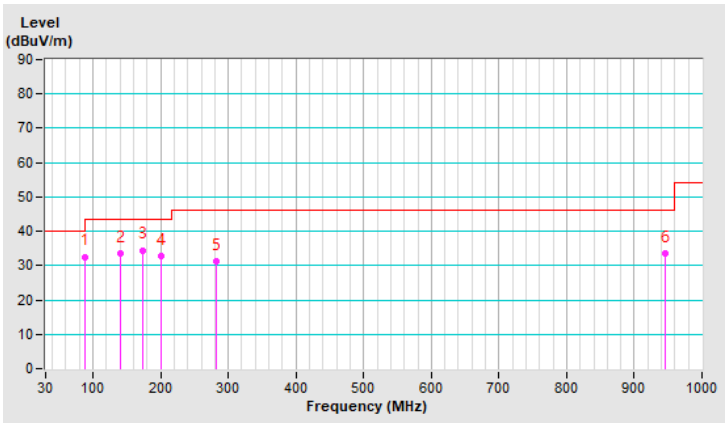
802.11n (HT20)

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	**FREQ. (MHz)**	**EMISSION LEVEL (dBuV/m)**	**LIMIT (dBuV/m)**	**MARGIN (dB)**	**ANTENNA HEIGHT (m)**	**TABLE ANGLE (Degree)**	**RAW VALUE (dBuV)**	**CORRECTION FACTOR (dB/m)**
1	87.43	32.6 QP	40.0	-7.4	1.00 H	242	46.2	-13.6
2	140.00	33.4 QP	43.5	-10.1	1.50 H	255	41.6	-8.2
3	174.50	34.5 QP	43.5	-9.0	2.00 H	301	43.2	-8.7
4	201.40	32.8 QP	43.5	-10.7	2.00 H	55	43.9	-11.1
5	282.78	31.4 QP	46.0	-14.6	1.00 H	55	38.9	-7.5
6	946.31	33.5 QP	46.0	-12.5	1.00 H	110	27.3	6.2

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The 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.

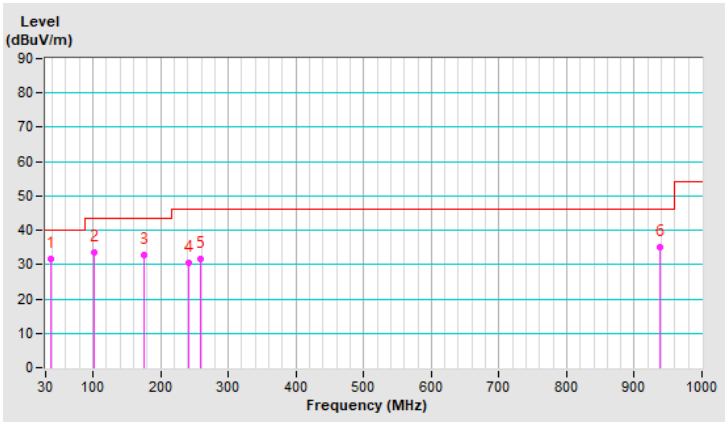


CHANNEL	TX Channel 6	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

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	36.87	31.7 QP	40.0	-8.3	1.00 V	252	40.4	-8.7
2	101.10	33.5 QP	43.5	-10.0	1.00 V	114	45.6	-12.1
3	174.99	32.8 QP	43.5	-10.7	1.50 V	58	41.6	-8.8
4	241.68	30.6 QP	46.0	-15.4	1.00 V	55	39.9	-9.3
5	259.74	31.6 QP	46.0	-14.4	1.50 V	300	40.2	-8.6
6	937.50	35.2 QP	46.0	-10.8	1.00 V	266	29.1	6.1

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 emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



4.2 Conducted Emission Measurement

4.2.1 Limits of Conducted Emission Measurement

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

Note: 1. The lower limit shall apply at the transition frequencies.
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

4.2.2 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver R&S	ESCS 30	847124/029	Oct. 23, 2019	Oct. 22, 2020
Line-Impedance Stabilization Network (for EUT) R&S	ESH3-Z5	848773/004	Oct. 23, 2019	Oct. 22, 2020
Line-Impedance Stabilization Network (for Peripheral) R&S	ESH3-Z5	835239/001	Mar. 17, 2019	Mar. 16, 2020
50 ohms Terminator	50	3	Oct. 23, 2019	Oct. 22, 2020
RF Cable	5D-FB	COCCAB-001	Sep. 27, 2019	Sep. 26, 2020
Fixed attenuator EMCI	STI02-2200-10	003	Mar. 14, 2019	Mar. 13, 2020
Software BVADT	BVADT_Cond_ V7.3.7.4	NA	NA	NA

Note:

1. The calibration interval of the above test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Conduction 1.
3 The measurement uncertainty is 1.8 dB, which is calculated as per the document CISPR 16-4-2 This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.
4 Tested Date: Jan. 21, 2020

4.2.3 Test Procedures

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

b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

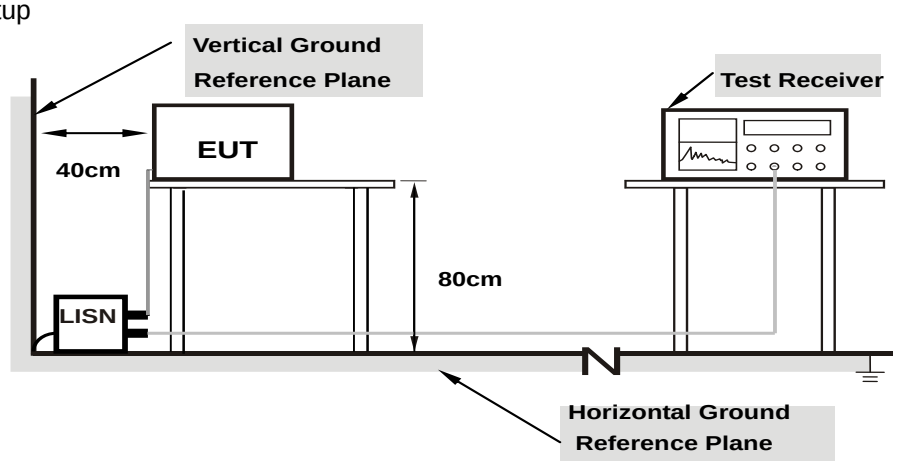
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

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

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 Test Setup



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

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

4.2.6 EUT Operating Conditions

Same as 4.1.6.

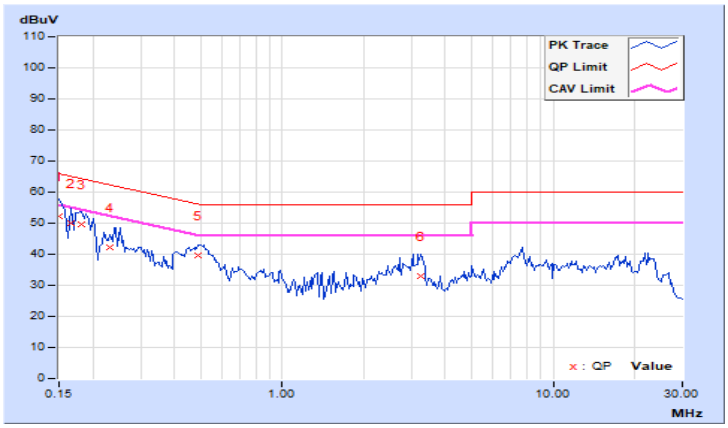
4.2.7 Test Results

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

Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	9.97	42.33	26.07	52.30	36.04	66.00	56.00	-13.70	-19.96
2	0.16647	9.97	40.19	22.43	50.16	32.40	65.13	55.13	-14.97	-22.73
3	0.18194	9.97	39.51	25.44	49.48	35.41	64.40	54.40	-14.92	-18.99
4	0.23175	9.97	32.21	17.44	42.18	27.41	62.39	52.39	-20.21	-24.98
5	0.48995	9.99	29.51	17.84	39.50	27.83	56.17	46.17	-16.67	-18.34
6	3.25144	10.13	22.94	17.44	33.07	27.57	56.00	46.00	-22.93	-18.43

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.

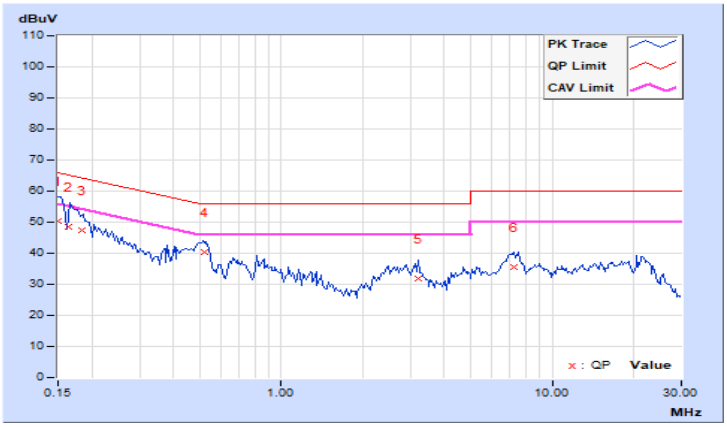


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)

Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	9.97	40.47	17.22	50.44	27.19	66.00	56.00	-15.56	-28.81
2	0.16435	9.97	38.52	23.79	48.49	33.76	65.24	55.24	-16.75	-21.48
3	0.18297	9.97	37.51	20.45	47.48	30.42	64.35	54.35	-16.87	-23.93
4	**0.51924**	**9.99**	**30.41**	**24.81**	**40.40**	**34.80**	**56.00**	**46.00**	**-15.60**	**-11.20**
5	3.21981	10.11	21.91	17.54	32.02	27.65	56.00	46.00	-23.98	-18.35
6	7.26441	10.28	25.44	20.55	35.72	30.83	60.00	50.00	-24.28	-19.17

REMARKS:

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

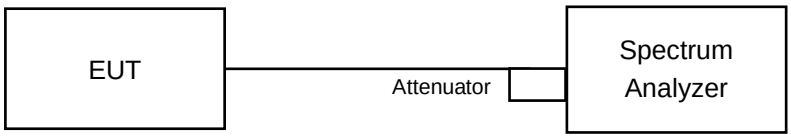


4.3 6dB Bandwidth Measurement

4.3.1 Limits of 6dB Bandwidth Measurement

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

4.3.2 Test Setup



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedure

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

4.3.5 Deviation fromTest Standard

No deviation.

4.3.6 EUT Operating Conditions

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

4.3.7 Test Result

802.11b

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Pass / Fail
			Minimum	
1	2412	9.04	0.5	PASS
6	2437	8.61	0.5	PASS
11	2462	9.08	0.5	PASS

802.11g

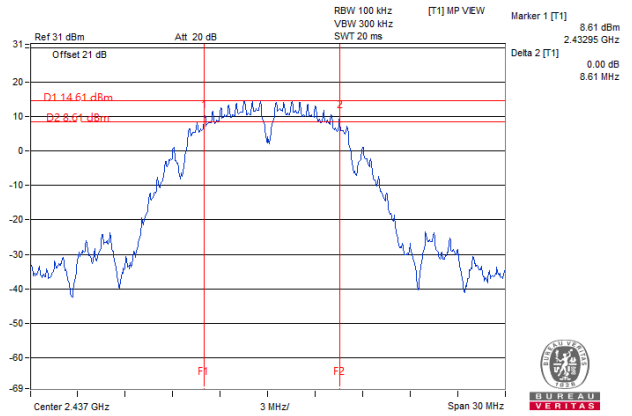
Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Pass / Fail
			Minimum	
1	2412	16.45	0.5	PASS
6	2437	16.45	0.5	PASS
11	2462	16.45	0.5	PASS

802.11n (HT20)

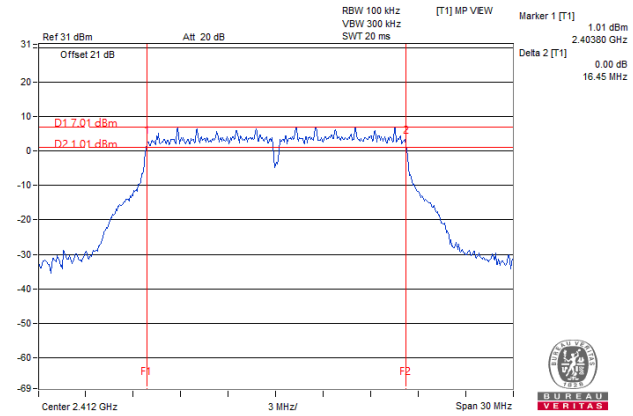
Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Pass / Fail
			Minimum	
1	2412	17.7	0.5	PASS
6	2437	17.68	0.5	PASS
11	2462	17.71	0.5	PASS

Spectrum Plot of Worst Value

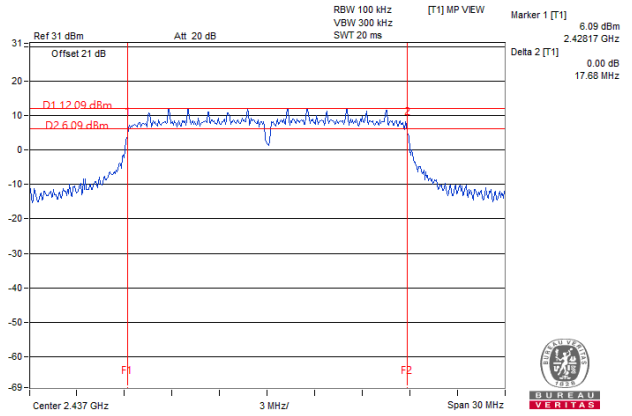
802.11b / CH6



802.11g / CH1



802.11n (HT20) / CH6

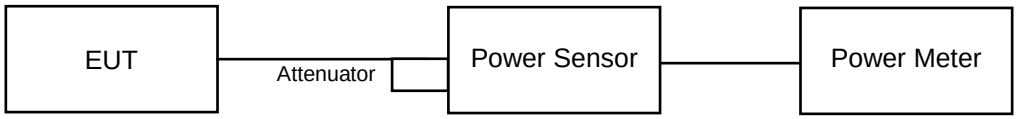


4.4 Conducted Output Power Measurement

4.4.1 Limits of Conducted Output Power Measurement

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

4.4.2 Test Setup



4.4.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.4.4 Test Procedures

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

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

4.4.5 Deviation from Test Standard

No deviation.

4.4.6 EUT Operating Conditions

Same as Item 4.3.6.

4.4.7 Test Results

FOR PEAK POWER

802.11b

Chan.	Chan. Freq. (MHz)	Peak Power (dBm)	Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	24.26	266.686	24.26	30.00	PASS
6	2437	24.52	283.139	24.52	30.00	PASS
11	2462	24.66	292.415	24.66	30.00	PASS

802.11g

Chan.	Chan. Freq. (MHz)	Peak Power (dBm)	Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	24.16	260.615	24.16	30.00	PASS
6	2437	24.75	298.538	24.75	30.00	PASS
11	2462	24.00	251.189	24.00	30.00	PASS

802.11n (HT20)

Chan.	Chan. Freq. (MHz)	Peak Power (dBm)	Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	24.18	261.818	24.18	30.00	PASS
6	2437	24.86	306.196	24.86	30.00	PASS
11	2462	24.12	258.226	24.12	30.00	PASS

FOR AVERAGE POWER

802.11b

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	206.538	23.15
6	2437	204.174	23.10
11	2462	215.278	23.33

802.11g

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	75.683	18.79
6	2437	216.272	23.35
11	2462	68.549	18.36

802.11n (HT20)

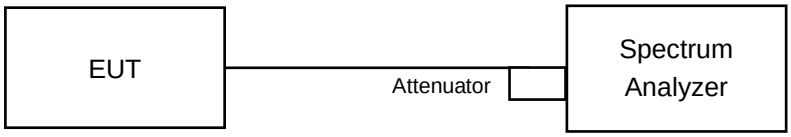
Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	75.858	18.80
6	2437	218.273	23.39
11	2462	69.823	18.44

4.5 Power Spectral Density Measurement

4.5.1 Limits of Power Spectral Density Measurement

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

4.5.2 Test Setup



4.5.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.5.4 Test Procedure

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

4.5.5 Deviation from Test Standard

No deviation.

4.5.6 EUT Operating Condition

Same as Item 4.3.6

4.5.7 Test Results

802.11b

Chan.	Chan. Freq. (MHz)	PSD (dBm/3kHz)	Total PSD (mW/3kHz)	Total PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)	Pass / Fail
1	2412	1.29	1.346	1.29	8.00	PASS
6	2437	1.56	1.432	1.56	8.00	PASS
11	2462	1.15	1.303	1.15	8.00	PASS

802.11g

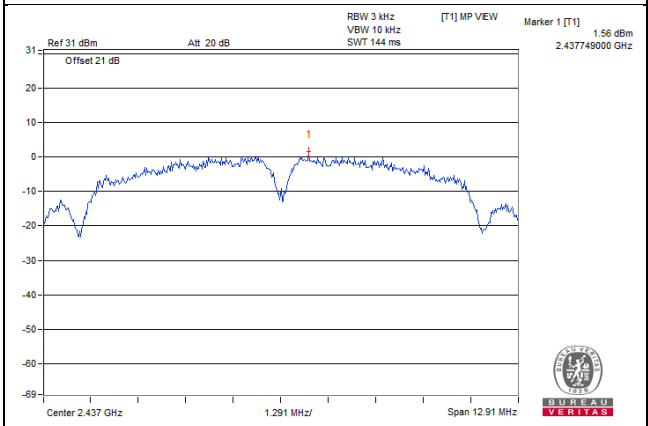
Chan.	Chan. Freq. (MHz)	PSD (dBm/3kHz)	Total PSD (mW/3kHz)	Total PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)	Pass / Fail
1	2412	-6.12	0.2443	-6.12	8.00	PASS
6	2437	-1.30	0.7413	-1.30	8.00	PASS
11	2462	-6.29	0.235	-6.29	8.00	PASS

802.11n (HT20)

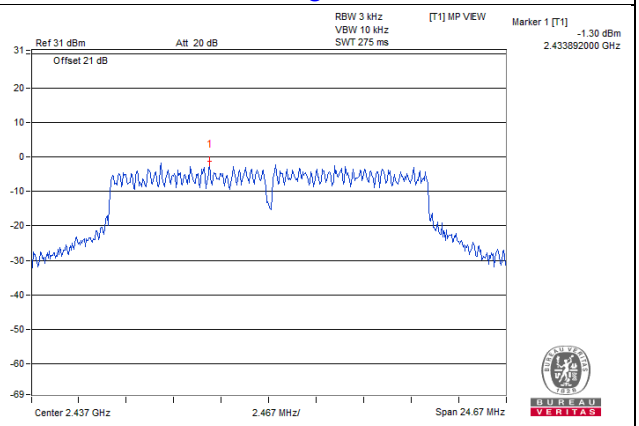
Chan.	Chan. Freq. (MHz)	PSD (dBm/3kHz)	Total PSD (mW/3kHz)	Total PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)	Pass / Fail
1	2412	-6.55	0.2213	-6.55	8.00	PASS
6	2437	-1.68	0.6792	-1.68	8.00	PASS
11	2462	-6.31	0.2339	-6.31	8.00	PASS

Spectrum Plot of Worst Value

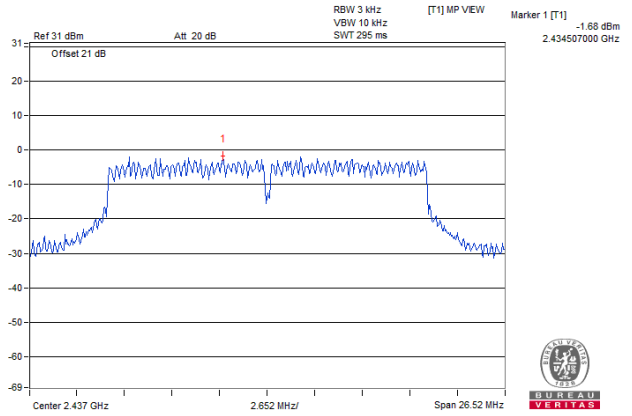
802.11b / CH6



802.11g / CH6



802.11n (HT20) / CH6

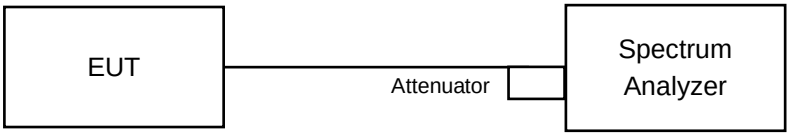


4.6 Conducted Out of Band Emission Measurement

4.6.1 Limits of Conducted Out of Band Emission Measurement

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

4.6.2 Test Setup



4.6.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.6.4 Test Procedure

MEASUREMENT PROCEDURE REF

1. Set the RBW = 100 kHz.
2. Set the VBW ≥ 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 OOBE

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

4.6.5 Deviation from Test Standard

No deviation.

4.6.6 EUT Operating Condition

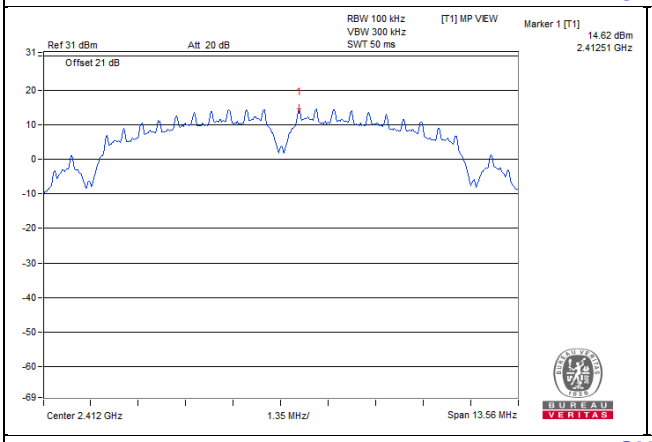
Same as Item 4.3.6

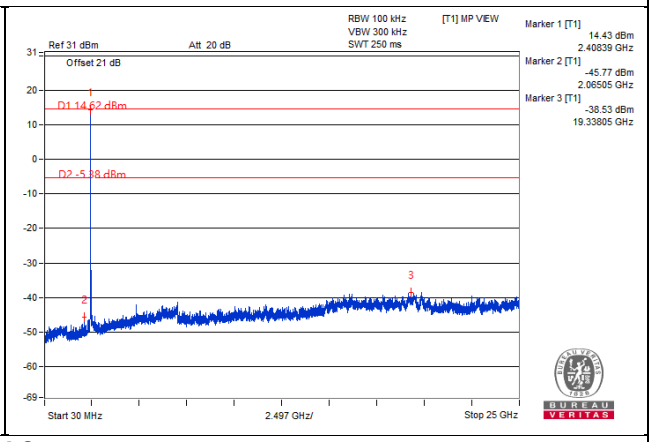
4.6.7 Test Results

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

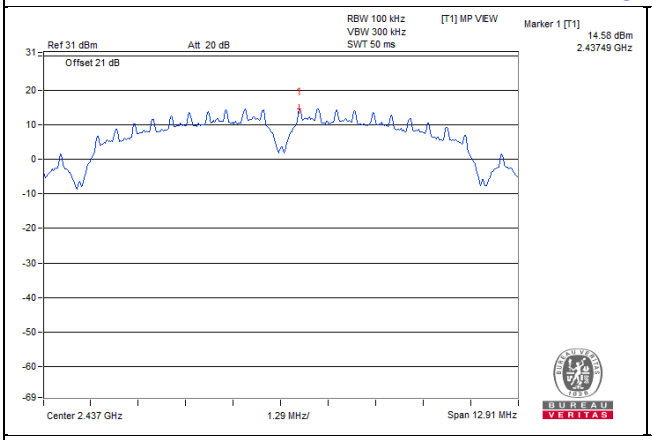
802.11b

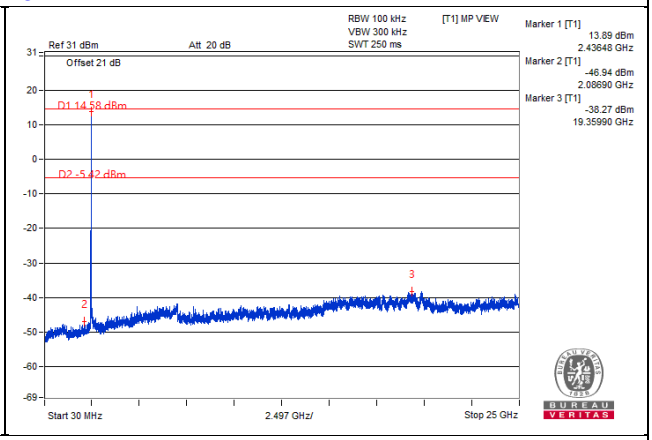
CH 1



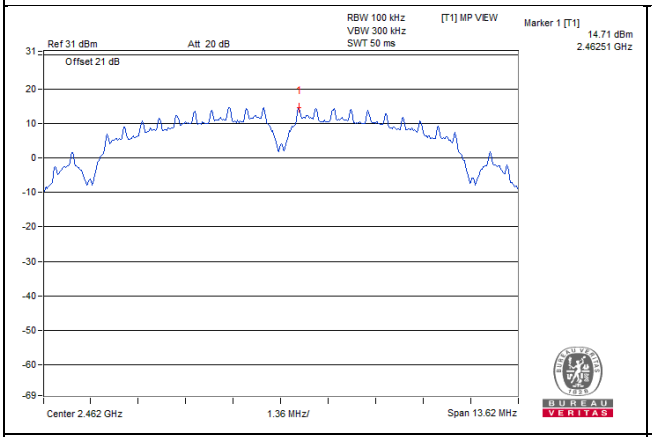


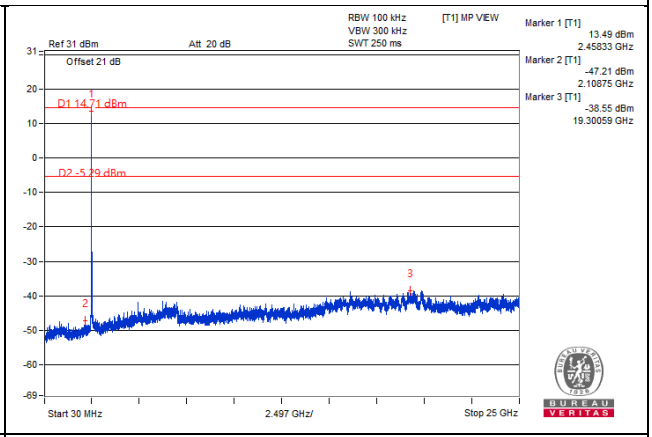
CH 6



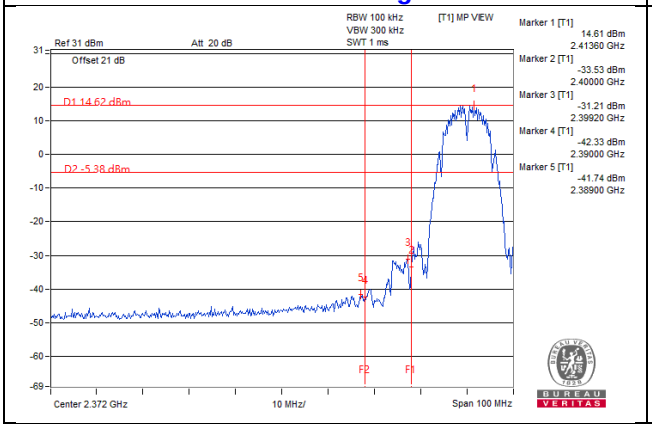


CH 11

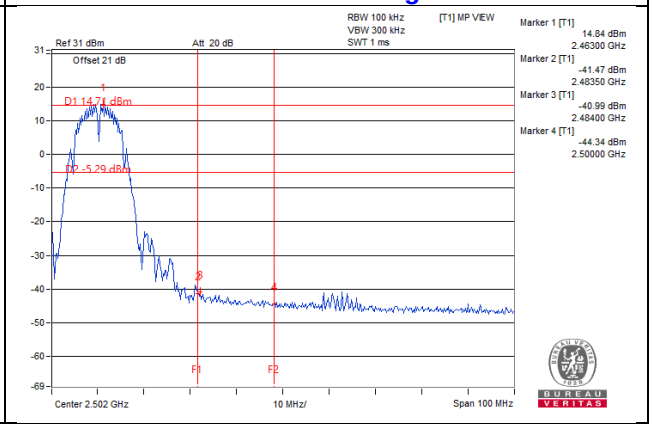




CH 1 Band edge

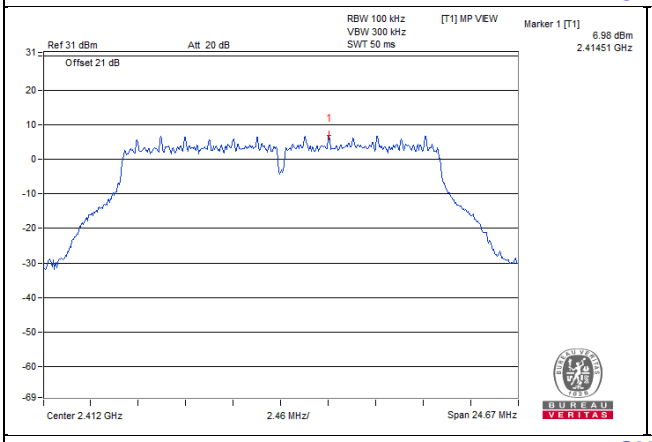


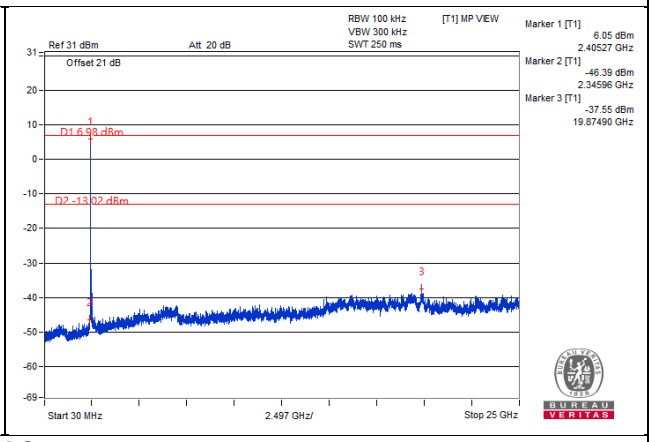
CH 11 Band edge



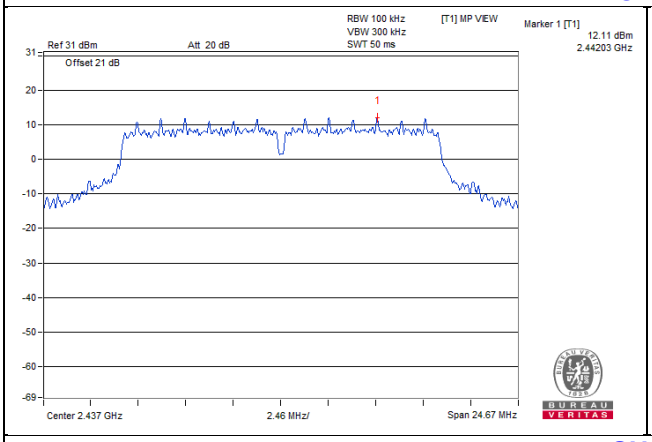
802.11g

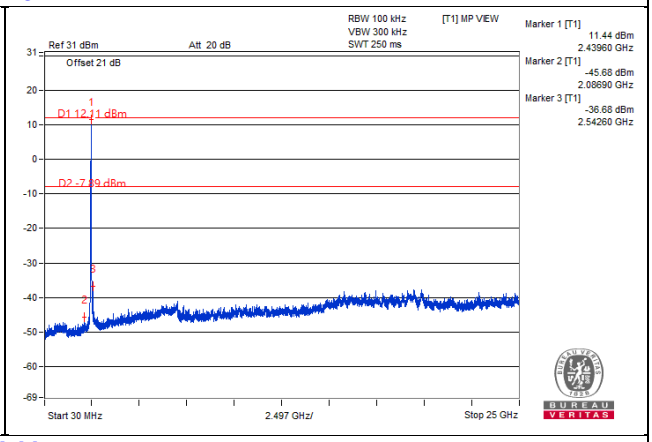
CH 1



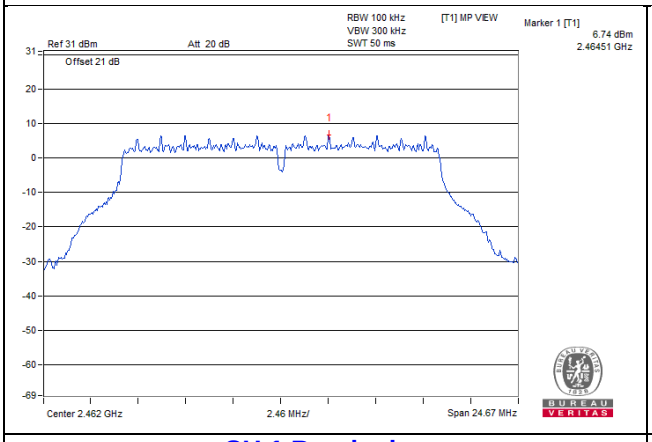


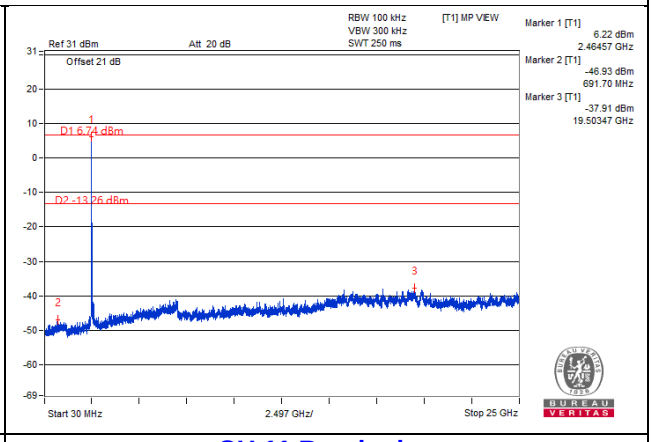
CH 6



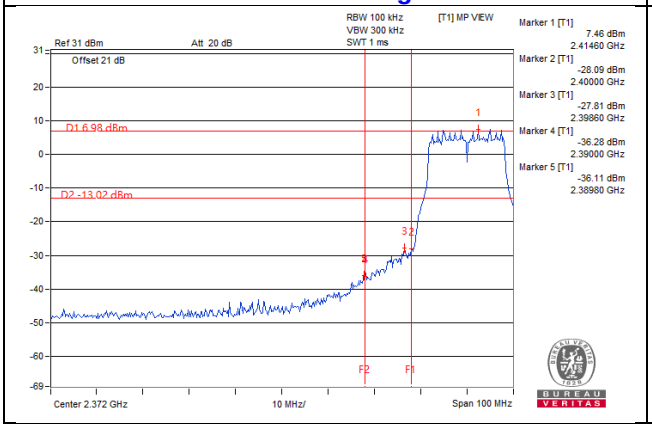


CH 11





CH 1 Band edge



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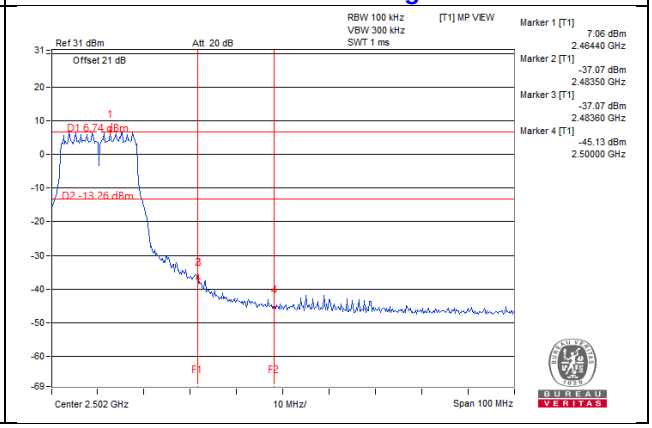
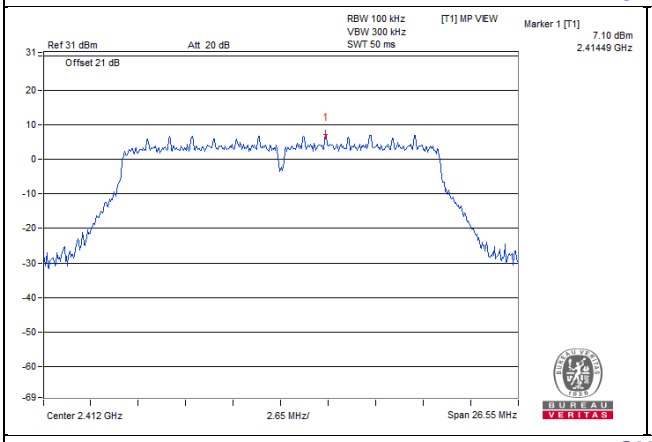
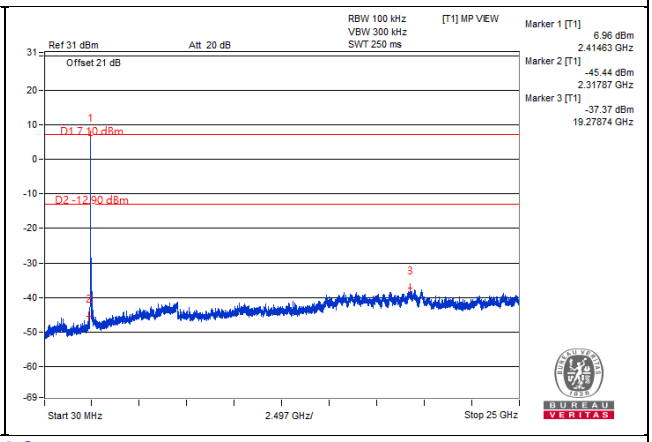


802.11n (HT20)

CH 1





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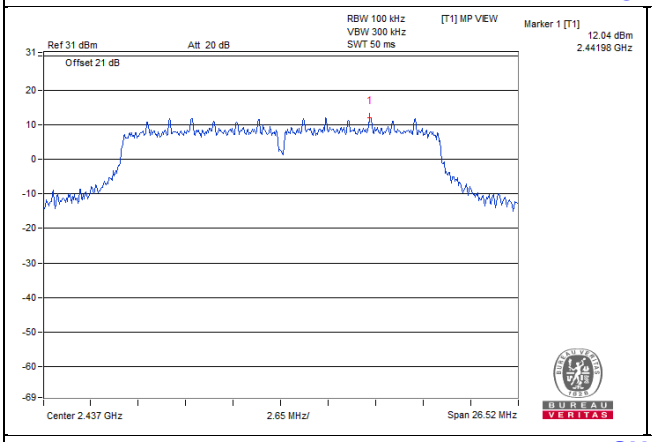

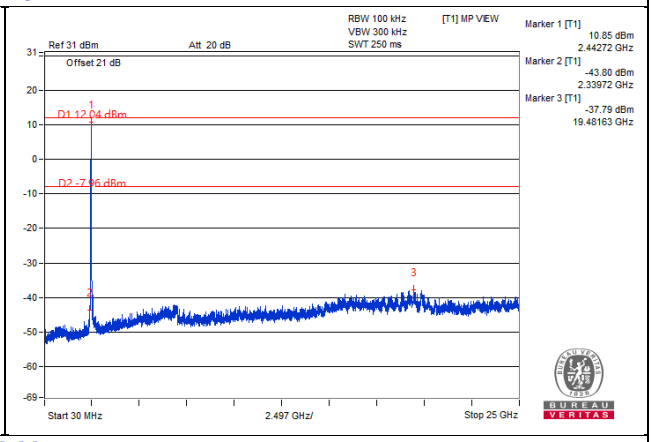

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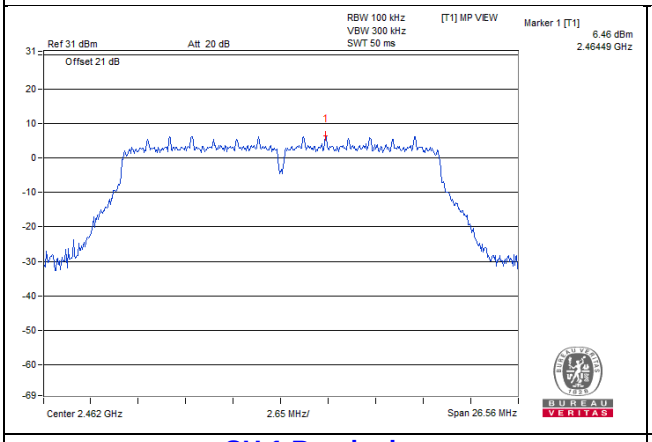

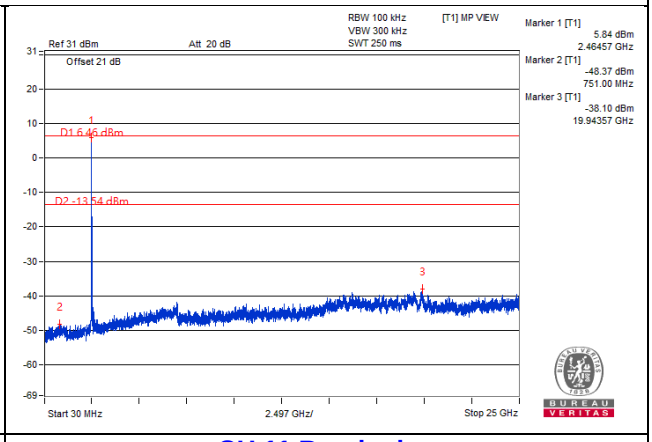

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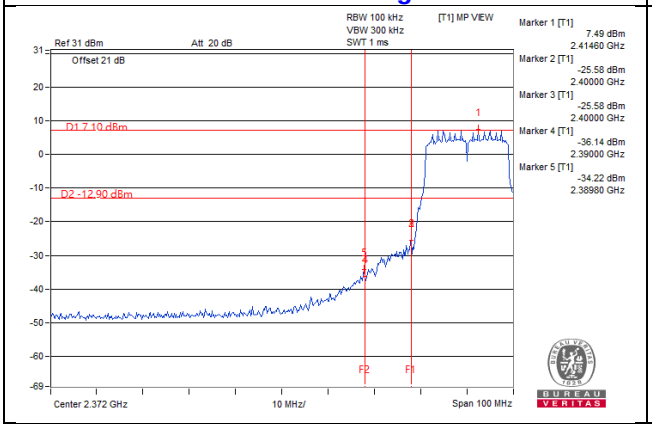

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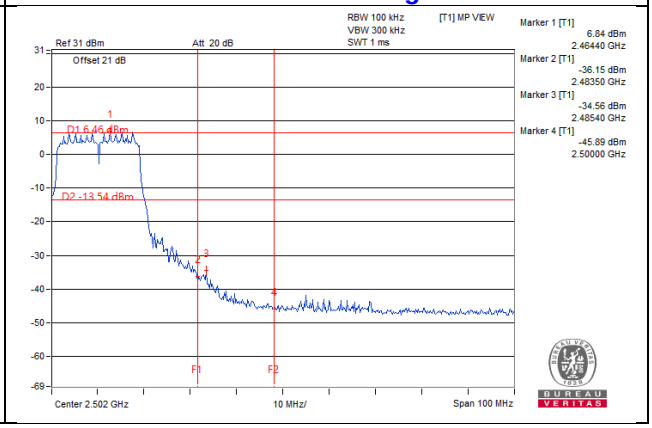

5 Pictures of Test Arrangements

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 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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