FCC Test Report

Report No.:	RF181001E07
FCC ID:	Q87-WLS0403
Test Model:	WLS0403
Received Date:	Oct. 01, 2018
Test Date:	Nov. 08 to 14, 2018
Issued Date:	Jan. 15, 2019
Applicant:	LINKSYS LLC
Address:	121 Theory Drive Irvine California 92617 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 R.O.C.
Test Location :	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan R.O.C.
FCC Registration / Designation Number:	723255 / TW2022

Testing Laboratory
2022

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Release Control Record

Issue No.	Description	Date Issued
RF181001E07	Original release.	Jan. 15, 2019

1 Certificate of Conformity

Product:	Wifi Smart 3-Way Light Switch
Brand:	Wemo
Test Model:	WLS0403
Sample Status:	ENGINEERING SAMPLE
Applicant:	LINKSYS LLC
Test Date:	Nov. 08 to 14, 2018
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 : Mary Ko , **Date:** Jan. 15, 2019

Mary Ko / Specialist

Approved by : , **Date:** Jan. 15, 2019

May Chen / 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 -21.80dB at 0.15000MHz.
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 2390.00MHz, 2483.50MHz, 4824.00MHz, 4924.00MHz.
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	1.84 dB
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	5.53 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	5.08 dB
	6GHz ~ 18GHz	4.98 dB
	18GHz ~ 40GHz	5.19 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Wifi Smart 3-Way Light Switch
Brand	Wemo
Test Model	WLS0403
Status of EUT	ENGINEERING SAMPLE
Driver version	WeMo_WW_2.00.11072.DVT-OWRT-lightv2
Power Supply Rating	120V,60Hz,15A
Modulation Type	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
Modulation Technology	DSSS,OFDM
Transfer Rate	802.11b: up to 11Mbps 802.11g: up to 54Mbps 802.11n: up to 150Mbps
Operating Frequency	2.412 ~ 2.462GHz
Number of Channel	802.11b, 802.11g, 802.11n (HT20): 11 802.11n (HT40): 7
Output Power	415.911mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	NA
Data Cable Supplied	MA

Note:

1. The EUT must be supplied with an internal power supply, the information is as below table:

Brand Name	Input Power Spec.	Output Power Spec.
LEI	120Vac, 60Hz, 15A	120Vac, 15A, 600W

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

Ant. Net Gain (dBi)	Freq. range (GHz)	Ant. Type	Connector Type
0	2.4~2.4835	PCB	NA

3. The EUT incorporates a SISO function.

MODULATION MODE	DATA RATE (MCS)	TX & RX CONFIGURATION	
802.11b	1 ~ 11Mbps	1TX	1RX
802.11g	6 ~ 54Mbps	1TX	1RX
802.11n (HT20)	MCS 0~7	1TX	1RX
802.11n (HT40)	MCS 0~7	1TX	1RX

4. 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		

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≥1G	RE<1G	PLC	APCM	
-	√	√	√	√	-

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

Radiated Emission Test (Above 1GHz):

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

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

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

Radiated Emission Test (Below 1GHz):

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

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

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

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)
802.11g	1 to 11	6	OFDM	BPSK	6

Antenna Port Conducted Measurement:

☒ This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.

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

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

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

Test Condition:

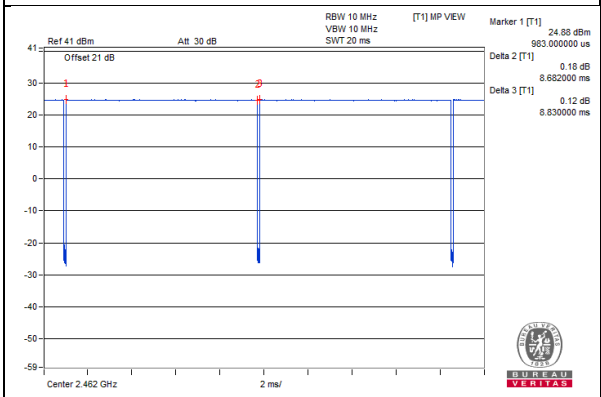
APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE≥1G	21deg. C, 67%RH	120Vac, 60Hz	Rey Chen
RE<1G	23deg. C, 68%RH	120Vac, 60Hz	Rey Chen
PLC	25deg. C, 76%RH	120Vac, 60Hz	Andy Ho
APCM	25deg. C, 60%RH	120Vac, 60Hz	Jyunchun Lin

3.3 Duty Cycle of Test Signal

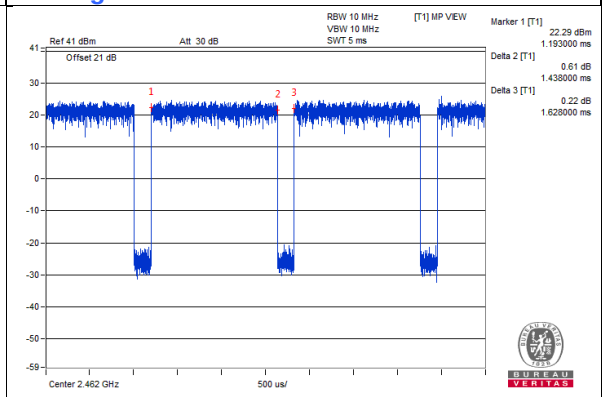
If duty cycle of test signal is ≥ 98 %, duty factor is not required.
If duty cycle of test signal is < 98%, duty factor shall be considered.

802.11b: Duty cycle = 8.682/ 8.83= 0.983
802.11g: Duty cycle = 1.438/ 1.628= 0.883, Duty factor = 10 * log(1/0.883) = 0.54
802.11n (HT20): Duty cycle = 1.348/1.483 = 0.909, Duty factor = 10 * log(1/0.909) = 0.41
802.11n (HT40): Duty cycle = 0.668/0.856 = 0.78, Duty factor = 10 * log(1/0.78) = 1.08

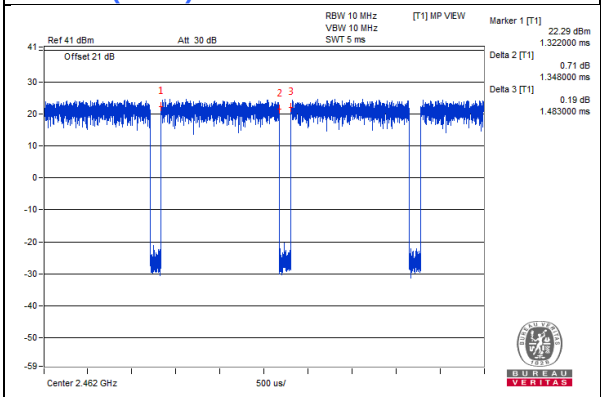
802.11b



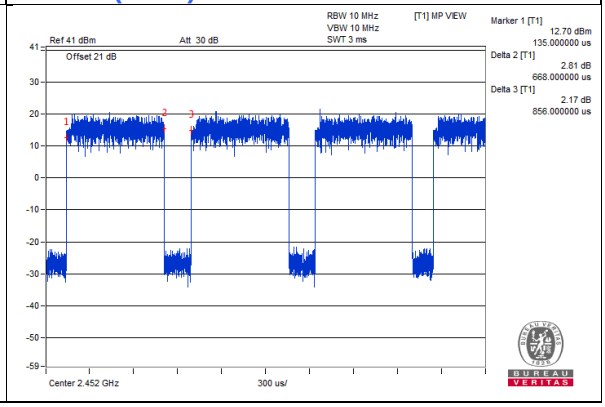
802.11g



802.11n (HT20)



802.11n (HT40)



3.4 Description of Support Units

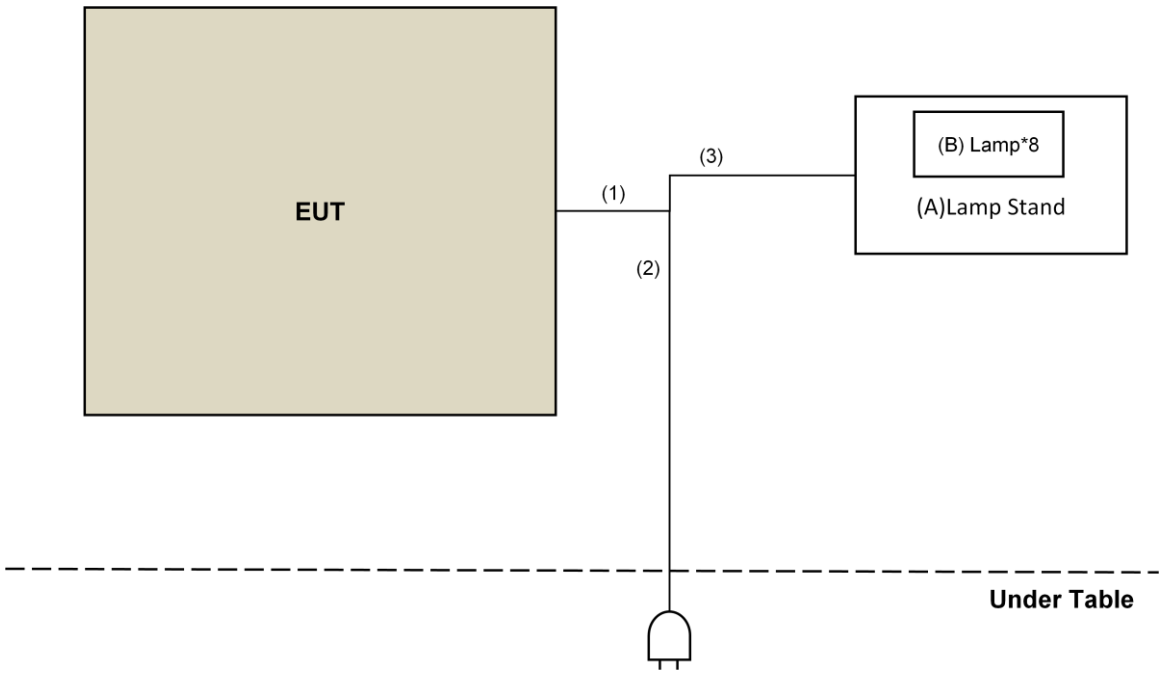
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Lamp Stand	NA	NA	NA	NA	Provided by Lab
B.	Lamp*8	NA	NA	NA	NA	Provided by Lab

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	AC Cable	1	0.1	No	0	Supplied by client
2.	AC Cable	1	1.8	No	0	Provided by Lab
3.	AC Cable	1	0.2	No	0	Provided by Lab

Note: The core(s) is(are) originally attached to the cable(s).

3.4.1 Configuration of System under Test



3.5 General Description of Applied Standards

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

FCC Part 15, Subpart C (15.247)
KDB 558074 D01 15.247 Meas Guidance v05
ANSI C63.10-2013

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

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	MY50010156	July 12, 2018	July 11, 2019
Pre-Amplifier EMCI	EMC001340	980142	Feb. 09, 2018	Feb. 08, 2019
Loop Antenna(*) Electro-Metrics	EM-6879	264	Dec. 16, 2016	Dec. 15, 2018
RF Cable	NA	LOOPCAB-001	Jan. 15, 2018	Jan. 14, 2019
RF Cable	NA	LOOPCAB-002	Jan. 15, 2018	Jan. 14, 2019
Pre-Amplifier Mini-Circuits	ZFL-1000VH2B	AMP-ZFL-05	May 05, 2018	May 04, 2019
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-361	Nov. 29, 2017	Nov. 28, 2018
RF Cable	8D	966-3-1	Mar. 20, 2018	Mar. 19, 2019
RF Cable	8D	966-3-2	Mar. 20, 2018	Mar. 19, 2019
RF Cable	8D	966-3-3	Mar. 20, 2018	Mar. 19, 2019
Fixed attenuator Mini-Circuits	UNAT-5+	PAD-3m-3-01	Sep. 27, 2018	Sep. 26, 2019
Horn_Antenna SCHWARZBECK	BBHA9120-D	9120D-406	Dec. 12, 2017	Dec. 11, 2018
Pre-Amplifier EMCI	EMC12630SE	980384	Jan. 29, 2018	Jan. 28, 2019
RF Cable	EMC104-SM-SM-1200	160922	Jan. 29, 2018	Jan. 28, 2019
RF Cable	EMC104-SM-SM-2000	150317	Jan. 29, 2018	Jan. 28, 2019
RF Cable	EMC104-SM-SM-5000	150322	Jan. 29, 2018	Jan. 28, 2019
Spectrum Analyzer Keysight	N9030A	MY54490679	July 23, 2018	July 22, 2019
Pre-Amplifier EMCI	EMC184045SE	980386	Jan. 29, 2018	Jan. 28, 2019
Horn_Antenna SCHWARZBECK	BBHA 9170	BBHA9170608	Dec. 14, 2017	Dec. 13, 2018
RF Cable	EMC102-KM-KM-1200	160924	Jan. 29, 2018	Jan. 28, 2019
Software	ADT_Radiated_V8.7.08	NA	NA	NA
Antenna Tower & Turn Table Max-Full	MF-7802	MF780208406	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
Spectrum Analyzer R&S	FSV40	100964	June 20, 2018	June 19, 2019
Power meter Anritsu	ML2495A	1014008	May 09, 2018	May 08, 2019
Power sensor Anritsu	MA2411B	0917122	May 09, 2018	May 08, 2019

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 calibration interval of the above test instruments is 24 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. The test was performed in 966 Chamber No. 3.
4. The CANADA Site Registration No. is 20331-1
5. Loop antenna was used for all emissions below 30 MHz.
6. Tested Date: Nov. 08 to 12, 2018

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:

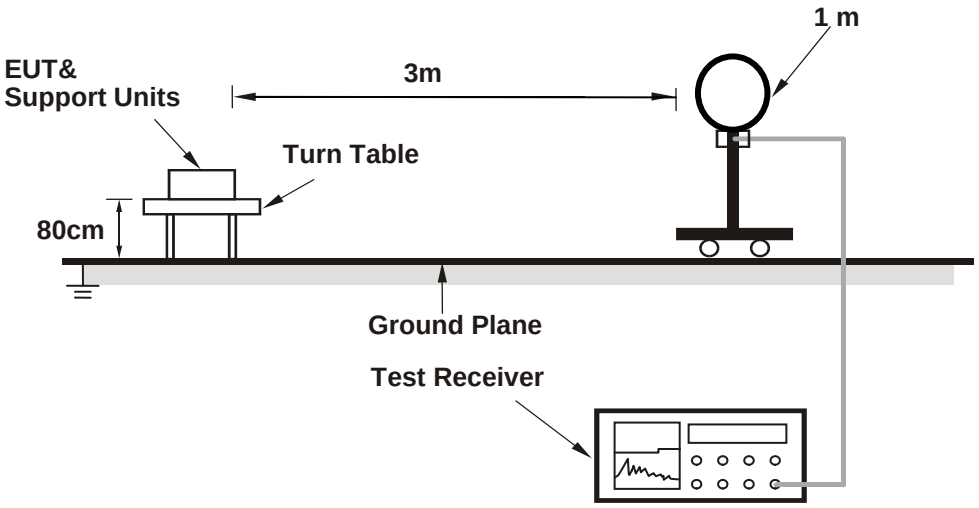
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
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

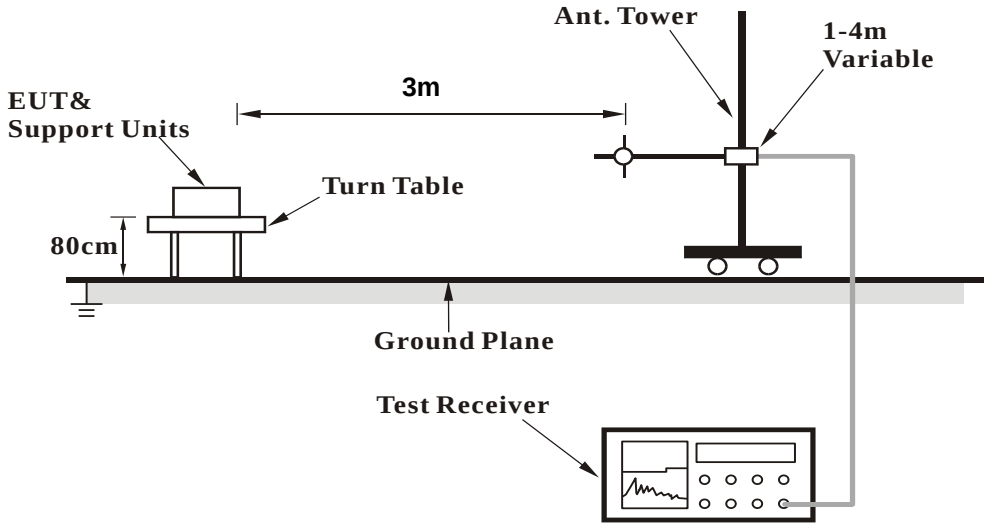
No deviation.

4.1.5 Test Setup

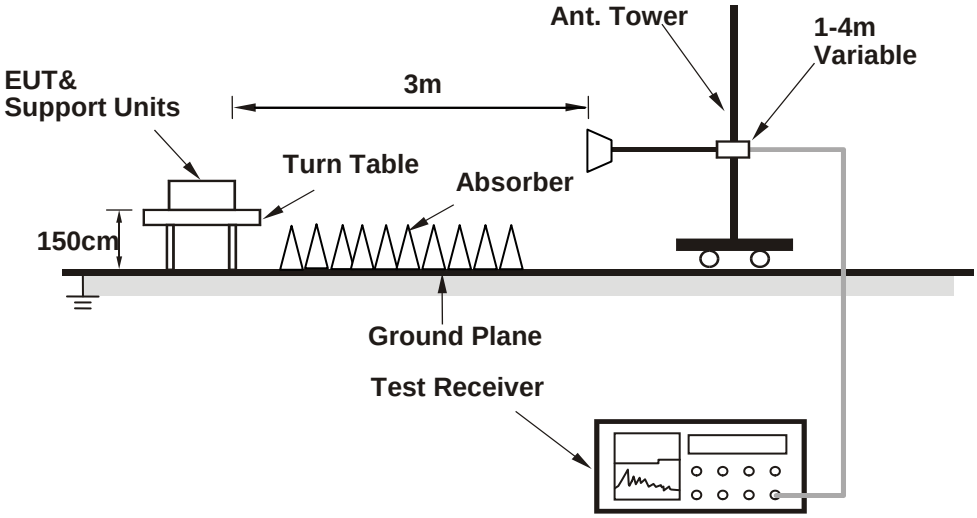
For Radiated emission below 30MHz



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. Connected the EUT with the Laptop which is placed on the testing table.
b. Controlling software (HyperTerminal paste F7C076_2.4G Tx_CMD.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	2386.20	61.4 PK	74.0	-12.6	1.76 H	294	64.1	-2.7
2	2386.20	49.4 AV	54.0	-4.6	1.76 H	294	52.1	-2.7
3	2390.00	57.9 PK	74.0	-16.1	1.76 H	294	60.6	-2.7
4	2390.00	47.2 AV	54.0	-6.8	1.76 H	294	49.9	-2.7
5	*2412.00	110.0 PK			1.76 H	294	112.7	-2.7
6	*2412.00	106.9 AV			1.76 H	294	109.6	-2.7
7	4824.00	52.0 PK	74.0	-22.0	1.15 H	204	50.4	1.6
8	4824.00	50.6 AV	54.0	-3.4	1.15 H	204	49.0	1.6
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	2386.20	59.7 PK	74.0	-14.3	1.15 V	67	62.4	-2.7
2	2386.20	48.4 AV	54.0	-5.6	1.15 V	67	51.1	-2.7
3	2390.00	54.8 PK	74.0	-19.2	1.27 V	26	57.5	-2.7
4	2390.00	44.7 AV	54.0	-9.3	1.27 V	26	47.4	-2.7
5	*2412.00	106.5 PK			1.15 V	67	109.2	-2.7
6	*2412.00	103.8 AV			1.15 V	67	106.5	-2.7
7	4824.00	55.4 PK	74.0	-18.6	1.25 V	87	53.8	1.6
8	**4824.00**	**53.9 AV**	**54.0**	**-0.1**	**1.25 V**	**87**	**52.3**	**1.6**

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. 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) 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	*2437.00	109.3 PK			1.79 H	314	112.3	-3.0
2	*2437.00	106.6 AV			1.79 H	314	109.6	-3.0
3	4874.00	52.7 PK	74.0	-21.3	1.05 H	197	51.1	1.6
4	4874.00	50.8 AV	54.0	-3.2	1.05 H	197	49.2	1.6
5	7311.00	49.2 PK	74.0	-24.8	2.84 H	129	41.5	7.7
6	7311.00	41.7 AV	54.0	-12.3	2.84 H	129	34.0	7.7
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	*2437.00	106.8 PK			2.91 V	301	109.8	-3.0
2	*2437.00	104.1 AV			2.91 V	301	107.1	-3.0
3	4874.00	54.9 PK	74.0	-19.1	1.38 V	199	53.3	1.6
4	4874.00	53.5 AV	54.0	-0.5	1.38 V	199	51.9	1.6
5	7311.00	49.3 PK	74.0	-24.7	1.49 V	360	41.6	7.7
6	7311.00	40.0 AV	54.0	-14.0	1.49 V	360	32.3	7.7

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	109.6 PK			1.82 H	309	112.6	-3.0
2	*2462.00	106.8 AV			1.82 H	309	109.8	-3.0
3	2483.50	57.1 PK	74.0	-16.9	1.82 H	309	60.1	-3.0
4	2483.50	47.3 AV	54.0	-6.7	1.82 H	309	50.3	-3.0
5	2487.30	60.4 PK	74.0	-13.6	1.82 H	309	63.3	-2.9
6	2487.30	50.8 AV	54.0	-3.2	1.82 H	309	53.7	-2.9
7	4924.00	52.2 PK	74.0	-21.8	1.10 H	204	50.5	1.7
8	4924.00	50.6 AV	54.0	-3.4	1.10 H	204	48.9	1.7
9	7386.00	49.3 PK	74.0	-24.7	2.87 H	143	41.4	7.9
10	7386.00	42.0 AV	54.0	-12.0	2.87 H	143	34.1	7.9
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	107.6 PK			1.09 V	69	110.6	-3.0
2	*2462.00	104.9 AV			1.09 V	69	107.9	-3.0
3	2483.50	56.0 PK	74.0	-18.0	1.09 V	69	59.0	-3.0
4	2483.50	47.2 AV	54.0	-6.8	1.09 V	69	50.2	-3.0
5	2487.30	60.3 PK	74.0	-13.7	1.09 V	69	63.2	-2.9
6	2487.30	50.7 AV	54.0	-3.3	1.09 V	69	53.6	-2.9
7	4924.00	55.1 PK	74.0	-18.9	1.29 V	76	53.4	1.7
8	**4924.00**	**53.9 AV**	**54.0**	**-0.1**	**1.29 V**	**76**	**52.2**	**1.7**
9	7386.00	48.9 PK	74.0	-25.1	1.45 V	355	41.0	7.9
10	7386.00	39.8 AV	54.0	-14.2	1.45 V	355	31.9	7.9

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. 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	68.6 PK	74.0	-5.4	1.63 H	212	71.3	-2.7
2	**2390.00**	**53.9 AV**	**54.0**	**-0.1**	**1.63 H**	**212**	**56.6**	**-2.7**
3	*2412.00	109.6 PK			1.63 H	212	112.3	-2.7
4	*2412.00	100.3 AV			1.63 H	212	103.0	-2.7
5	4824.00	50.1 PK	74.0	-23.9	1.18 H	211	48.5	1.6
6	4824.00	36.9 AV	54.0	-17.1	1.18 H	211	35.3	1.6
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	65.3 PK	74.0	-8.7	1.05 V	62	68.0	-2.7
2	2390.00	50.8 AV	54.0	-3.2	1.05 V	62	53.5	-2.7
3	*2412.00	107.2 PK			1.05 V	62	109.9	-2.7
4	*2412.00	97.5 AV			1.05 V	62	100.2	-2.7
5	4824.00	49.4 PK	74.0	-24.6	1.29 V	53	47.8	1.6
6	4824.00	36.5 AV	54.0	-17.5	1.29 V	53	34.9	1.6

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. 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) 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	*2437.00	111.8 PK			1.58 H	212	114.8	-3.0
2	*2437.00	102.7 AV			1.58 H	212	105.7	-3.0
3	4874.00	49.2 PK	74.0	-24.8	1.15 H	201	47.6	1.6
4	4874.00	36.3 AV	54.0	-17.7	1.15 H	201	34.7	1.6
5	7311.00	49.1 PK	74.0	-24.9	2.82 H	155	41.4	7.7
6	7311.00	41.9 AV	54.0	-12.1	2.82 H	155	34.2	7.7
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	*2437.00	107.9 PK			1.16 V	69	110.9	-3.0
2	*2437.00	99.0 AV			1.16 V	69	102.0	-3.0
3	4874.00	52.1 PK	74.0	-21.9	1.24 V	69	50.5	1.6
4	4874.00	39.6 AV	54.0	-14.4	1.24 V	69	38.0	1.6
5	7311.00	48.7 PK	74.0	-25.3	1.42 V	344	41.0	7.7
6	7311.00	39.4 AV	54.0	-14.6	1.42 V	344	31.7	7.7

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	109.4 PK			2.22 H	210	112.4	-3.0
2	*2462.00	100.4 AV			2.22 H	210	103.4	-3.0
3	2483.50	66.8 PK	74.0	-7.2	2.22 H	210	69.8	-3.0
4	**2483.50**	**53.9 AV**	**54.0**	**-0.1**	**2.22 H**	**210**	**56.9**	**-3.0**
5	4924.00	49.6 PK	74.0	-24.4	1.18 H	203	47.9	1.7
6	4924.00	36.7 AV	54.0	-17.3	1.18 H	203	35.0	1.7
7	7386.00	48.7 PK	74.0	-25.3	2.82 H	151	40.8	7.9
8	7386.00	39.0 AV	54.0	-15.0	2.82 H	151	31.1	7.9
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	106.5 PK			1.09 V	83	109.5	-3.0
2	*2462.00	97.0 AV			1.09 V	83	100.0	-3.0
3	2483.50	65.3 PK	74.0	-8.7	1.09 V	83	68.3	-3.0
4	2483.50	50.9 AV	54.0	-3.1	1.09 V	83	53.9	-3.0
5	4924.00	49.5 PK	74.0	-24.5	1.28 V	61	47.8	1.7
6	4924.00	36.4 AV	54.0	-17.6	1.28 V	61	34.7	1.7
7	7386.00	48.9 PK	74.0	-25.1	1.39 V	350	41.0	7.9
8	7386.00	39.3 AV	54.0	-14.7	1.39 V	350	31.4	7.9

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. 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	68.5 PK	74.0	-5.5	1.60 H	226	71.2	-2.7
2	**2390.00**	**53.9 AV**	**54.0**	**-0.1**	**1.60 H**	**226**	**56.6**	**-2.7**
3	*2412.00	109.7 PK			1.60 H	226	112.4	-2.7
4	*2412.00	100.4 AV			1.60 H	226	103.1	-2.7
5	4824.00	49.4 PK	74.0	-24.6	1.22 H	195	47.8	1.6
6	4824.00	36.4 AV	54.0	-17.6	1.22 H	195	34.8	1.6
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	65.0 PK	74.0	-9.0	1.10 V	62	67.7	-2.7
2	2390.00	50.5 AV	54.0	-3.5	1.10 V	62	53.2	-2.7
3	*2412.00	107.7 PK			1.10 V	62	110.4	-2.7
4	*2412.00	97.7 AV			1.10 V	62	100.4	-2.7
5	4824.00	49.7 PK	74.0	-24.3	1.31 V	75	48.1	1.6
6	4824.00	36.5 AV	54.0	-17.5	1.31 V	75	34.9	1.6

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. 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) 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	*2437.00	111.6 PK			1.56 H	217	114.6	-3.0
2	*2437.00	102.2 AV			1.56 H	217	105.2	-3.0
3	4874.00	49.5 PK	74.0	-24.5	1.12 H	190	47.9	1.6
4	4874.00	36.7 AV	54.0	-17.3	1.12 H	190	35.1	1.6
5	7311.00	49.2 PK	74.0	-24.8	2.79 H	169	41.5	7.7
6	7311.00	42.1 AV	54.0	-11.9	2.79 H	169	34.4	7.7
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	*2437.00	108.0 PK			1.06 V	70	111.0	-3.0
2	*2437.00	98.9 AV			1.06 V	70	101.9	-3.0
3	4874.00	48.9 PK	74.0	-25.1	1.32 V	59	47.3	1.6
4	4874.00	35.9 AV	54.0	-18.1	1.32 V	59	34.3	1.6
5	7311.00	48.7 PK	74.0	-25.3	1.42 V	336	41.0	7.7
6	7311.00	38.9 AV	54.0	-15.1	1.42 V	336	31.2	7.7

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	109.0 PK			2.17 H	215	112.0	-3.0
2	*2462.00	100.3 AV			2.17 H	215	103.3	-3.0
3	2483.50	67.4 PK	74.0	-6.6	2.17 H	215	70.4	-3.0
4	2483.50	53.8 AV	54.0	-0.2	2.17 H	215	56.8	-3.0
5	4924.00	49.7 PK	74.0	-24.3	1.24 H	212	48.0	1.7
6	4924.00	36.8 AV	54.0	-17.2	1.24 H	212	35.1	1.7
7	7386.00	48.5 PK	74.0	-25.5	2.86 H	135	40.6	7.9
8	7386.00	38.9 AV	54.0	-15.1	2.86 H	135	31.0	7.9
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	107.5 PK			1.11 V	78	110.5	-3.0
2	*2462.00	97.7 AV			1.11 V	78	100.7	-3.0
3	2483.50	64.9 PK	74.0	-9.1	1.11 V	78	67.9	-3.0
4	2483.50	50.6 AV	54.0	-3.4	1.11 V	78	53.6	-3.0
5	4924.00	49.9 PK	74.0	-24.1	1.30 V	54	48.2	1.7
6	4924.00	36.7 AV	54.0	-17.3	1.30 V	54	35.0	1.7
7	7386.00	48.8 PK	74.0	-25.2	1.36 V	357	40.9	7.9
8	7386.00	39.4 AV	54.0	-14.6	1.36 V	357	31.5	7.9

REMARKS:

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

802.11n (HT40)

CHANNEL	TX Channel 3	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	68.1 PK	74.0	-5.9	2.34 H	210	70.8	-2.7
2	2390.00	53.8 AV	54.0	-0.2	2.34 H	210	56.5	-2.7
3	*2422.00	102.2 PK			2.34 H	210	105.1	-2.9
4	*2422.00	93.9 AV			2.34 H	210	96.8	-2.9
5	4844.00	48.8 PK	74.0	-25.2	1.17 H	203	47.2	1.6
6	4844.00	36.2 AV	54.0	-17.8	1.17 H	203	34.6	1.6
7	7266.00	49.5 PK	74.0	-24.5	2.83 H	168	41.7	7.8
8	7266.00	42.3 AV	54.0	-11.7	2.83 H	168	34.5	7.8
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	65.1 PK	74.0	-8.9	1.09 V	55	67.8	-2.7
2	2390.00	51.0 AV	54.0	-3.0	1.09 V	55	53.7	-2.7
3	*2422.00	99.1 PK			1.09 V	55	102.0	-2.9
4	*2422.00	90.5 AV			1.09 V	55	93.4	-2.9
5	4844.00	49.8 PK	74.0	-24.2	1.25 V	74	48.2	1.6
6	4844.00	36.5 AV	54.0	-17.5	1.25 V	74	34.9	1.6
7	7266.00	48.8 PK	74.0	-25.2	1.43 V	360	41.0	7.8
8	7266.00	38.9 AV	54.0	-15.1	1.43 V	360	31.1	7.8

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	68.0 PK	74.0	-6.0	2.25 H	212	70.7	-2.7
2	**2390.00**	**53.9 AV**	**54.0**	**-0.1**	**2.25 H**	**212**	**56.6**	**-2.7**
3	*2437.00	107.0 PK			2.25 H	212	110.0	-3.0
4	*2437.00	98.8 AV			2.25 H	212	101.8	-3.0
5	2483.50	66.4 PK	74.0	-7.6	2.25 H	212	69.4	-3.0
6	2483.50	52.8 AV	54.0	-1.2	2.25 H	212	55.8	-3.0
7	4874.00	49.0 PK	74.0	-25.0	1.20 H	215	47.4	1.6
8	4874.00	36.3 AV	54.0	-17.7	1.20 H	215	34.7	1.6
9	7311.00	49.0 PK	74.0	-25.0	2.81 H	146	41.3	7.7
10	7311.00	39.4 AV	54.0	-14.6	2.81 H	146	31.7	7.7
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	64.8 PK	74.0	-9.2	1.07 V	71	67.5	-2.7
2	2390.00	50.3 AV	54.0	-3.7	1.07 V	71	53.0	-2.7
3	*2437.00	103.7 PK			1.07 V	71	106.7	-3.0
4	*2437.00	95.6 AV			1.07 V	71	98.6	-3.0
5	2483.50	63.1 PK	74.0	-10.9	1.07 V	71	66.1	-3.0
6	2483.50	49.6 AV	54.0	-4.4	1.07 V	71	52.6	-3.0
7	4874.00	49.4 PK	74.0	-24.6	1.27 V	54	47.8	1.6
8	4874.00	36.3 AV	54.0	-17.7	1.27 V	54	34.7	1.6
9	7311.00	49.4 PK	74.0	-24.6	1.42 V	347	41.7	7.7
10	7311.00	39.6 AV	54.0	-14.4	1.42 V	347	31.9	7.7

REMARKS:

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

CHANNEL	TX Channel 9	DETECTOR 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	*2452.00	104.5 PK			2.24 H	211	107.5	-3.0
2	*2452.00	94.8 AV			2.24 H	211	97.8	-3.0
3	2483.50	69.1 PK	74.0	-4.9	2.24 H	211	72.1	-3.0
4	**2483.50**	**53.9 AV**	**54.0**	**-0.1**	**2.24 H**	**211**	**56.9**	**-3.0**
5	4904.00	49.6 PK	74.0	-24.4	1.14 H	212	47.9	1.7
6	4904.00	36.9 AV	54.0	-17.1	1.14 H	212	35.2	1.7
7	7356.00	48.6 PK	74.0	-25.4	2.79 H	144	40.7	7.9
8	7356.00	38.7 AV	54.0	-15.3	2.79 H	144	30.8	7.9
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	*2452.00	100.2 PK			1.14 V	53	103.2	-3.0
2	*2452.00	91.3 AV			1.14 V	53	94.3	-3.0
3	2483.50	64.9 PK	74.0	-9.1	1.14 V	53	67.9	-3.0
4	2483.50	50.5 AV	54.0	-3.5	1.14 V	53	53.5	-3.0
5	4904.00	49.1 PK	74.0	-24.9	1.27 V	74	47.4	1.7
6	4904.00	36.0 AV	54.0	-18.0	1.27 V	74	34.3	1.7
7	7356.00	48.3 PK	74.0	-25.7	1.42 V	360	40.4	7.9
8	7356.00	38.9 AV	54.0	-15.1	1.42 V	360	31.0	7.9

REMARKS:

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

Below 1GHz Data:

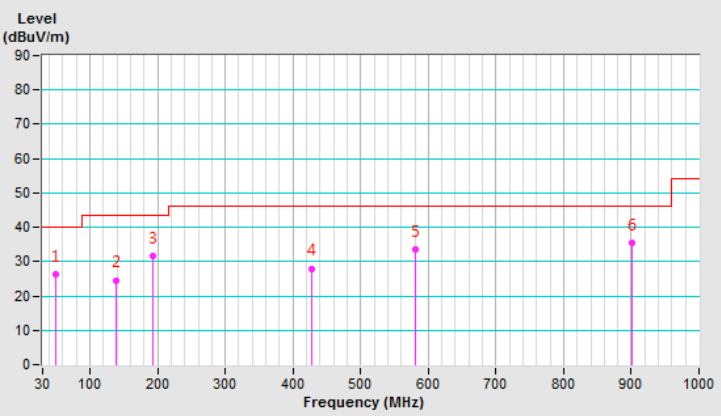
802.11g

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	**FREQ. (MHz)**	**EMISSION LEVEL (dBuV/m)**	**LIMIT (dBuV/m)**	**MARGIN (dB)**	**ANTENNA HEIGHT (m)**	**TABLE ANGLE (Degree)**	**RAW VALUE (dBuV)**	**CORRECTION FACTOR (dB/m)**
1	49.55	26.2 QP	40.0	-13.8	2.50 H	0	34.1	-7.9
2	138.13	24.6 QP	43.5	-18.9	2.50 H	287	32.8	-8.2
3	193.32	31.6 QP	43.5	-11.9	1.50 H	0	42.2	-10.6
4	428.06	28.0 QP	46.0	-18.0	1.00 H	120	31.4	-3.4
5	580.01	33.5 QP	46.0	-12.5	3.00 H	299	33.8	-0.3
6	901.52	35.5 QP	46.0	-10.5	1.50 H	213	30.5	5.0

REMARKS:

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

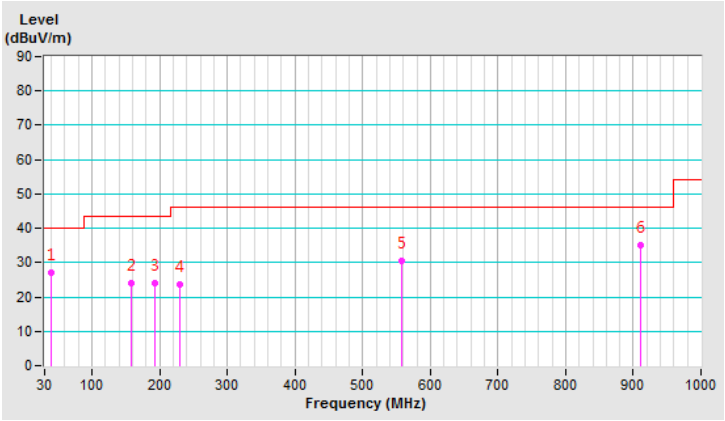


CHANNEL	TX Channel 6	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

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	39.19	27.0 QP	40.0	-13.0	2.50 V	185	35.4	-8.4
2	158.43	24.1 QP	43.5	-19.4	1.50 V	125	31.8	-7.7
3	193.30	24.0 QP	43.5	-19.5	2.00 V	138	34.6	-10.6
4	229.09	23.7 QP	46.0	-22.3	3.50 V	153	34.2	-10.5
5	558.43	30.5 QP	46.0	-15.5	3.50 V	243	31.4	-0.9
6	911.39	35.0 QP	46.0	-11.0	3.50 V	112	29.9	5.1

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. 24, 2018	Oct. 23, 2019
Line-Impedance Stabilization Network (for EUT) R&S	ESH3-Z5	835239/001	Mar. 06, 2018	Mar. 05, 2019
Line-Impedance Stabilization Network (for Peripheral) R&S	ENV216	100072	June 04, 2018	June 03, 2019
50 ohms Terminator	50	3	Oct. 22, 2018	Oct. 21, 2019
RF Cable	5D-FB	COCCAB-001	Sep. 28, 2018	Sep. 27, 2019
Fixed attenuator EMCI	STI02-2200-10	003	Mar. 16, 2018	Mar. 15, 2019
Software BVADT	BVADT_Cond_ V7.3.7.4	NA	NA	NA

Note:
1. The calibration interval of the above test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Conduction 1.
3. Tested Date: Nov. 14, 2018

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.

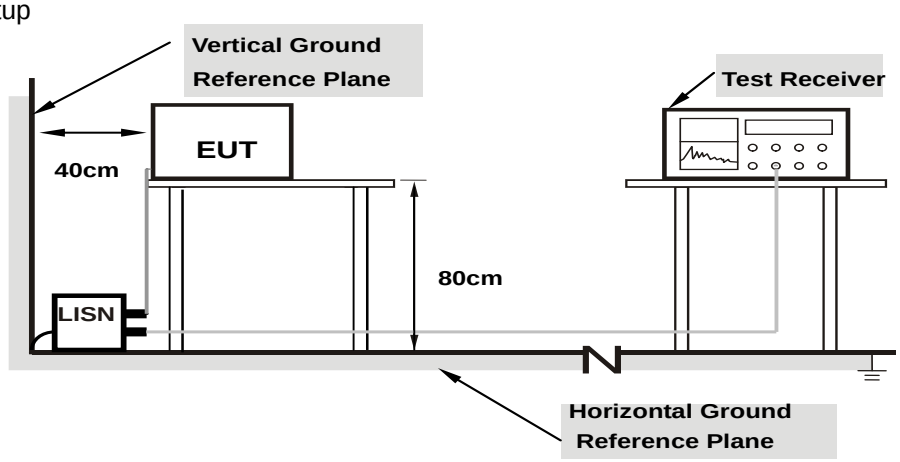
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

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.

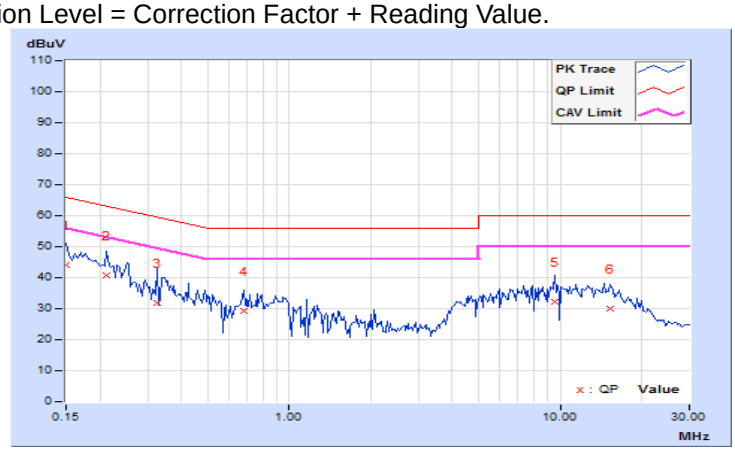
4.2.7 Test Results

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

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	**0.15000**	**10.02**	**34.18**	**20.32**	**44.20**	**30.34**	**66.00**	**56.00**	**-21.80**	**-25.66**
2	0.21250	10.04	30.54	16.76	40.58	26.80	63.11	53.11	-22.53	-26.31
3	0.32578	10.06	21.94	7.59	32.00	17.65	59.56	49.56	-27.56	-31.91
4	0.67734	10.09	19.00	7.87	29.09	17.96	56.00	46.00	-26.91	-28.04
5	9.59375	10.51	21.89	10.49	32.40	21.00	60.00	50.00	-27.60	-29.00
6	15.39453	10.82	19.00	5.71	29.82	16.53	60.00	50.00	-30.18	-33.47

REMARKS:

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

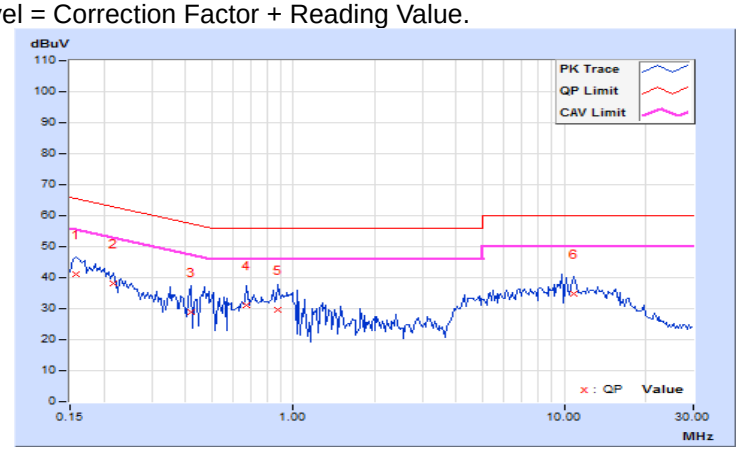


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15781	9.93	31.13	17.70	41.06	27.63	65.58	55.58	-24.52	-27.95
2	0.21641	9.94	28.26	14.71	38.20	24.65	62.96	52.96	-24.76	-28.31
3	0.41953	9.96	18.87	4.04	28.83	14.00	57.46	47.46	-28.63	-33.46
4	0.67344	9.97	21.05	10.60	31.02	20.57	56.00	46.00	-24.98	-25.43
5	0.88047	9.98	19.57	6.09	29.55	16.07	56.00	46.00	-26.45	-29.93
6	10.87891	10.42	24.21	13.87	34.63	24.29	60.00	50.00	-25.37	-25.71

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.

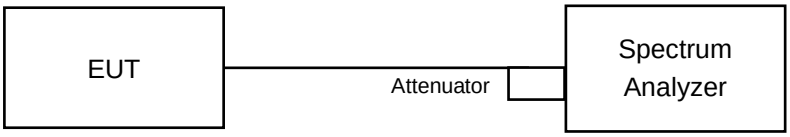


4.3 6dB Bandwidth Measurement

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)	Minimum Limit (MHz)	Pass / Fail
1	2412	10.13	0.5	PASS
6	2437	10.12	0.5	PASS
11	2462	10.11	0.5	PASS

802.11g

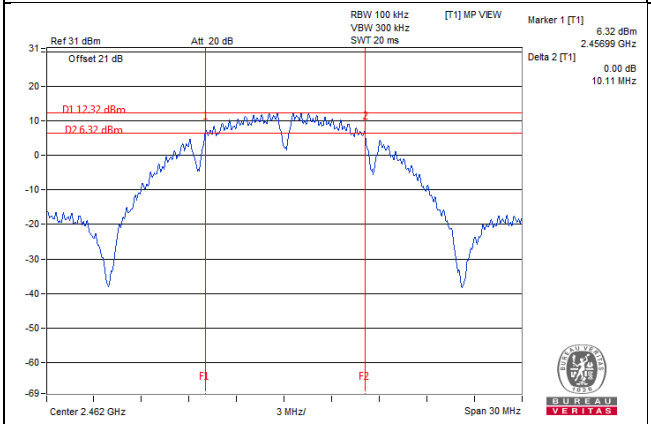
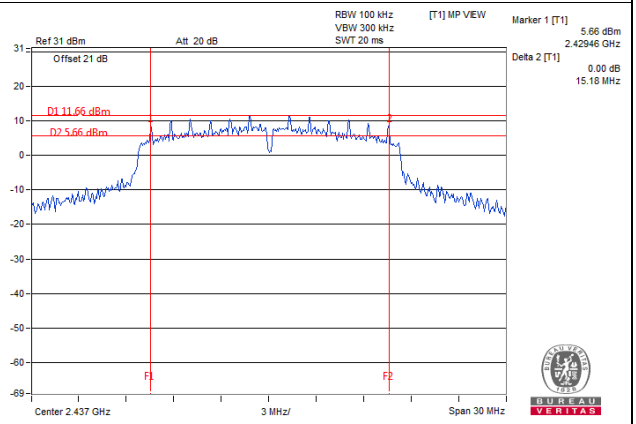
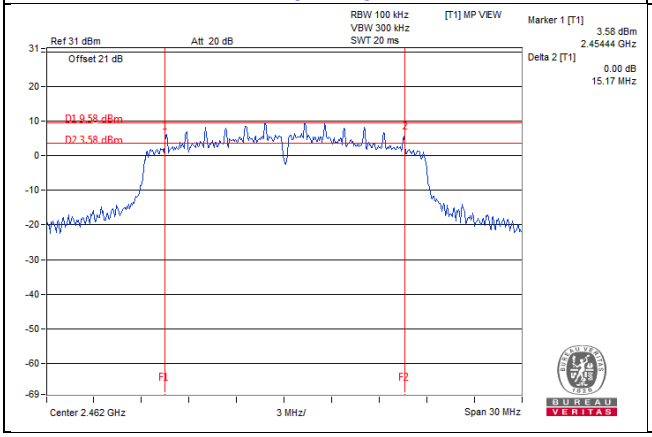
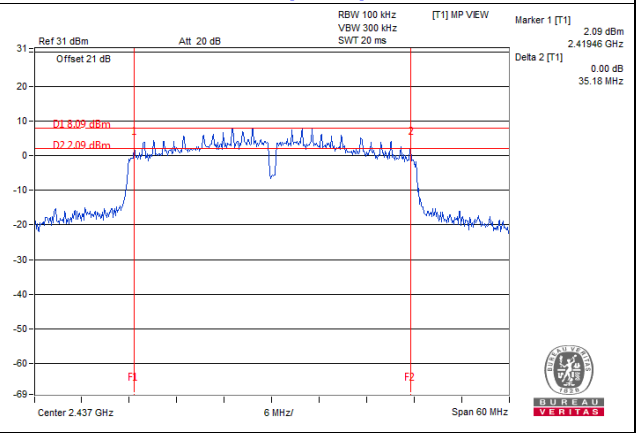
Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	15.19	0.5	PASS
6	2437	15.18	0.5	PASS
11	2462	15.19	0.5	PASS

802.11n (HT20)

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

802.11n (HT40)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
3	2422	35.20	0.5	Pass
6	2437	35.18	0.5	Pass
9	2452	35.20	0.5	Pass

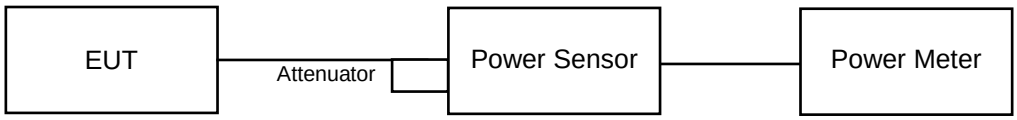
Spectrum Plot of Worst Value	
802.11b / CH11	**802.11g / CH6**
	
802.11n (HT20) / CH11	**802.11n (HT40) / CH6**
	

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

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
1	2412	245.471	23.90	30	Pass
6	2437	240.436	23.81	30	Pass
11	2462	247.742	23.94	30	Pass

802.11g

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
1	2412	366.438	25.64	30	Pass
6	2437	415.911	26.19	30	Pass
11	2462	325.837	25.13	30	Pass

802.11n (HT20)

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
1	2412	377.572	25.77	30	Pass
6	2437	404.576	26.07	30	Pass
11	2462	331.131	25.20	30	Pass

802.11n (HT40)

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
3	2422	219.28	23.41	30	Pass
6	2437	364.754	25.62	30	Pass
9	2452	224.905	23.52	30	Pass

FOR AVERAGE POWER

802.11b

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	165.959	22.20
6	2437	165.577	22.19
11	2462	168.655	22.27

802.11g

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	97.949	19.91
6	2437	143.88	21.58
11	2462	86.497	19.37

802.11n (HT20)

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	92.897	19.68
6	2437	139.316	21.44
11	2462	84.14	19.25

802.11n (HT40)

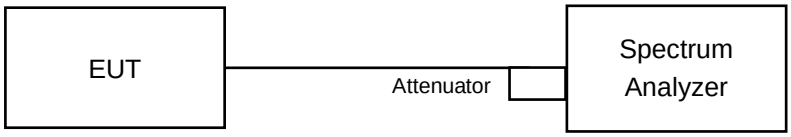
Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
3	2422	39.264	15.94
6	2437	112.46	20.51
9	2452	47.424	16.76

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

Channel	Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
1	2412	-3.72	8	Pass
6	2437	-4.05	8	Pass
11	2462	-3.92	8	Pass

802.11g

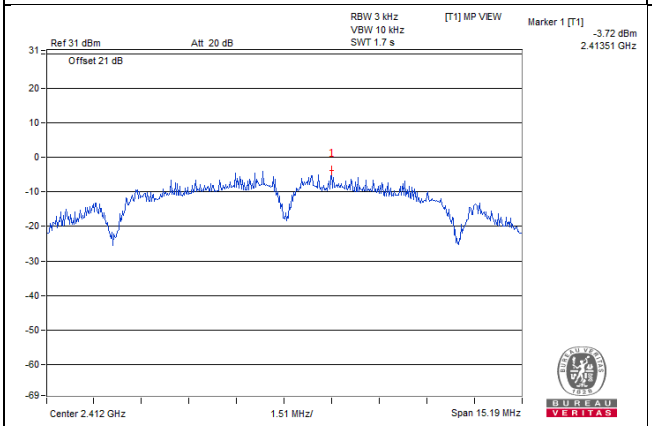
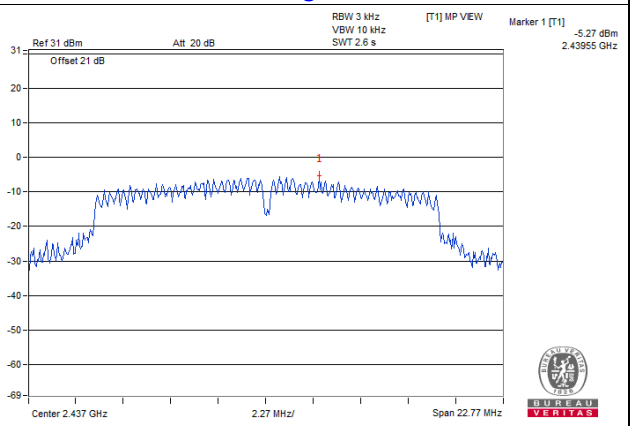
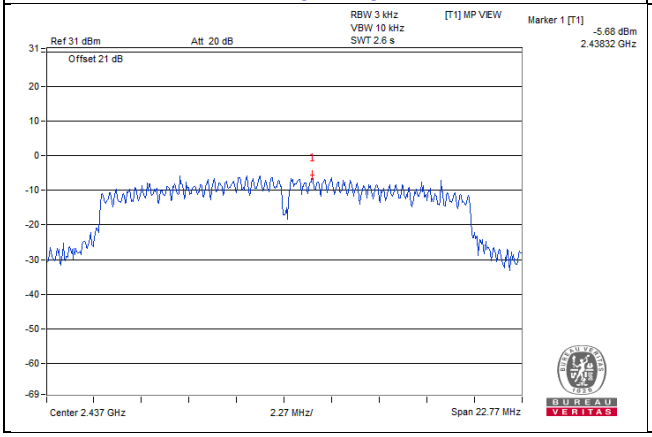
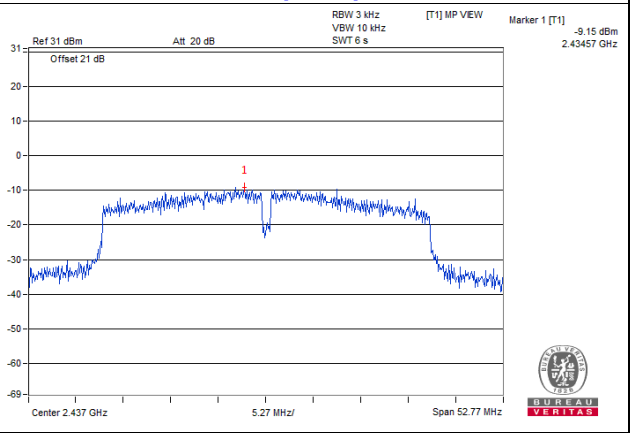
Channel	Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
1	2412	-5.86	8	Pass
6	2437	-5.27	8	Pass
11	2462	-7.57	8	Pass

802.11n (HT20)

Channel	Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
1	2412	-6.22	8	Pass
6	2437	-5.68	8	Pass
11	2462	-7.31	8	Pass

802.11n (HT40)

Channel	Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
3	2422	-13.15	8	Pass
6	2437	-9.15	8	Pass
9	2452	-12.16	8	Pass

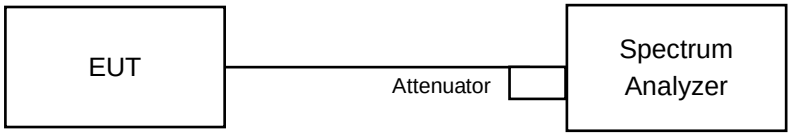
Spectrum Plot of Worst Value	
802.11b / CH1	**802.11g / CH6**
	
802.11n (HT20) / CH6	**802.11n (HT40) / CH6**
	

4.6 Conducted Out of Band Emission Measurement

4.6.1 Limits of Conducted Out of Band Emission Measurement

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

4.6.2 Test Setup



4.6.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.6.4 Test Procedure

MEASUREMENT PROCEDURE REF

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

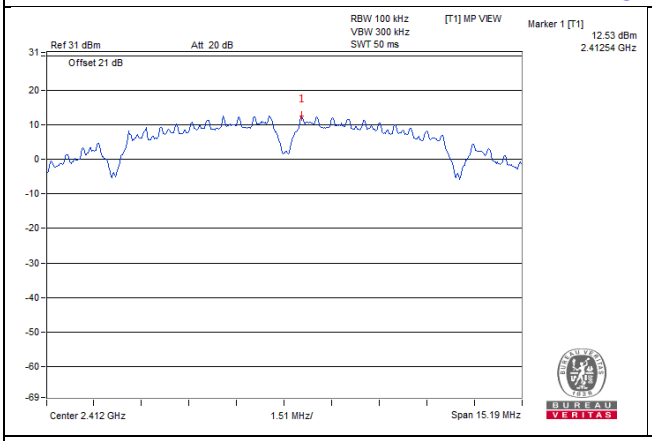
Same as Item 4.3.6

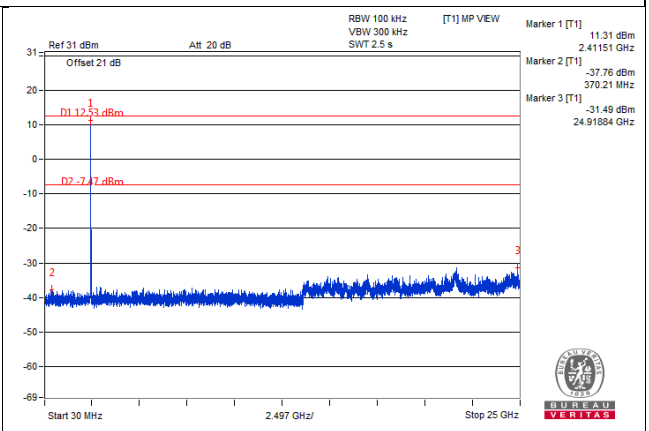
4.6.7 Test Results

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.

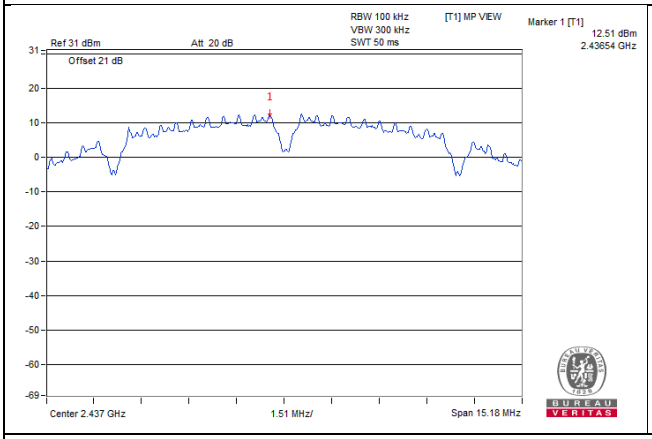
802.11b

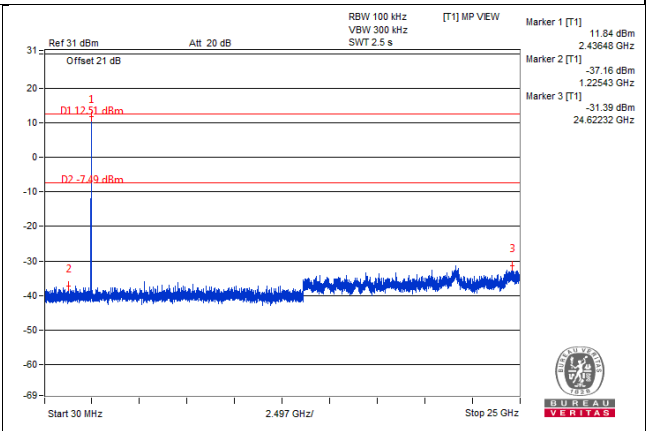
CH 1



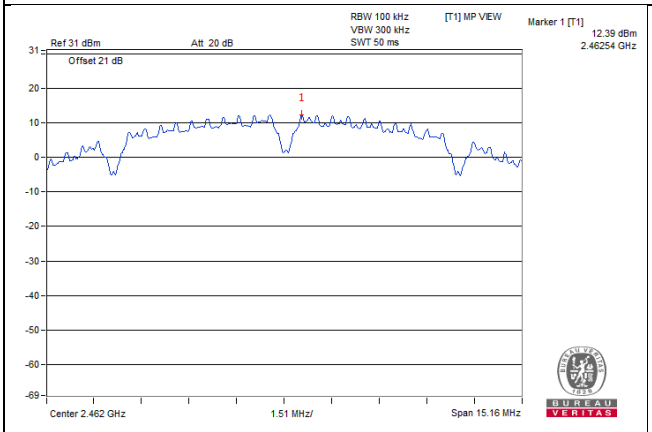


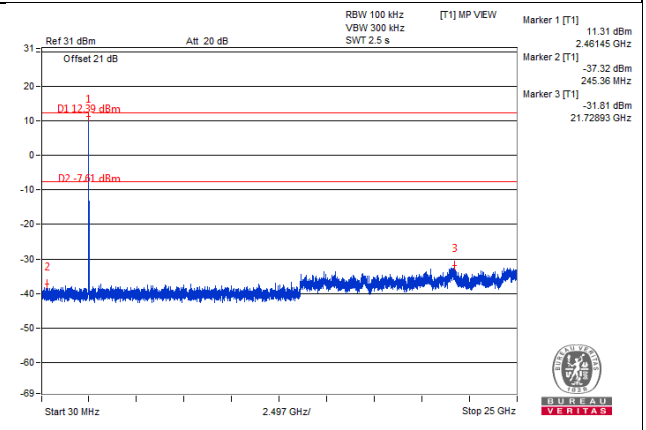
CH 6



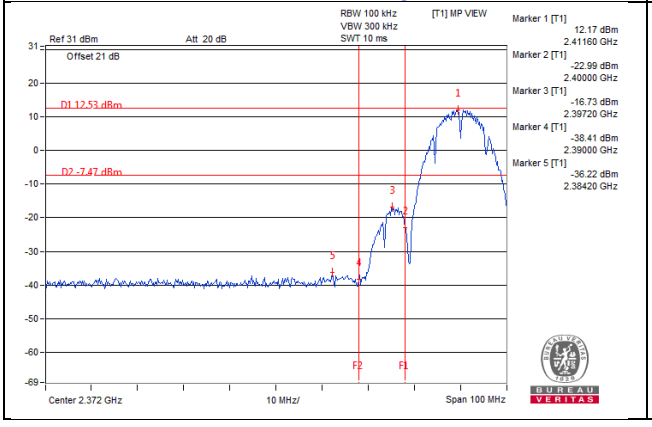


CH 11

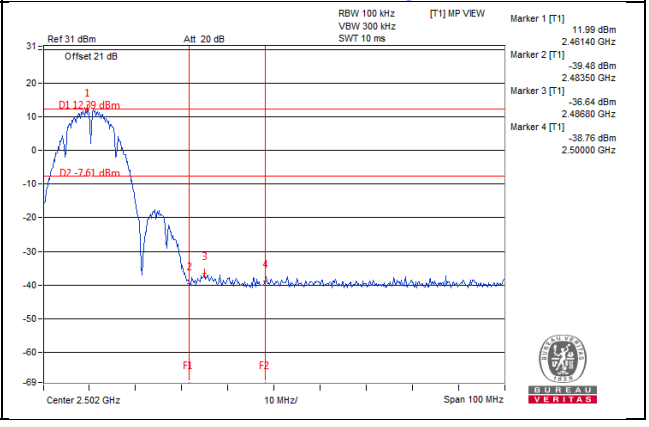




CH 1 Band edge

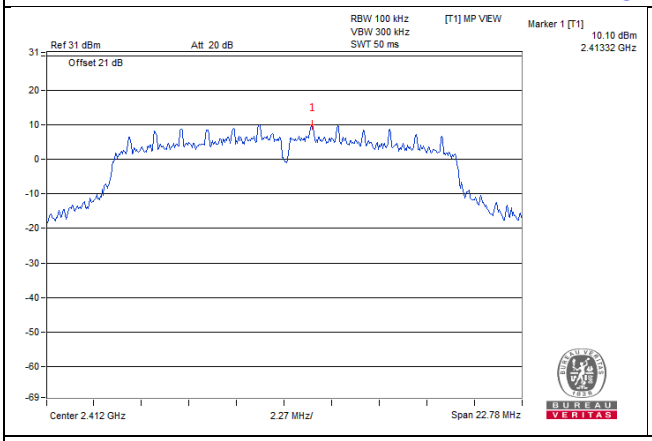


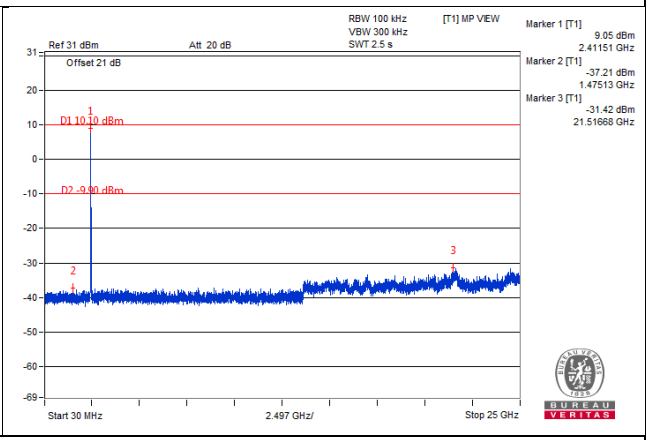
CH 11 Band edge



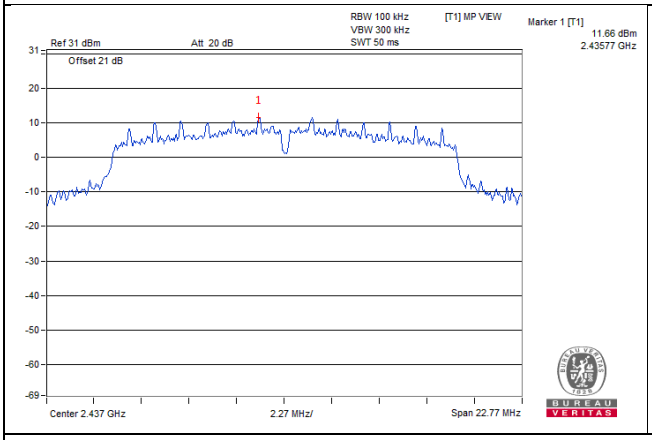
802.11g

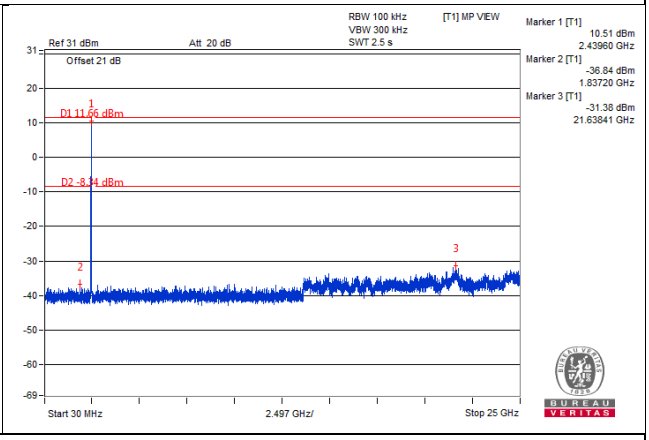
CH 1





CH 6





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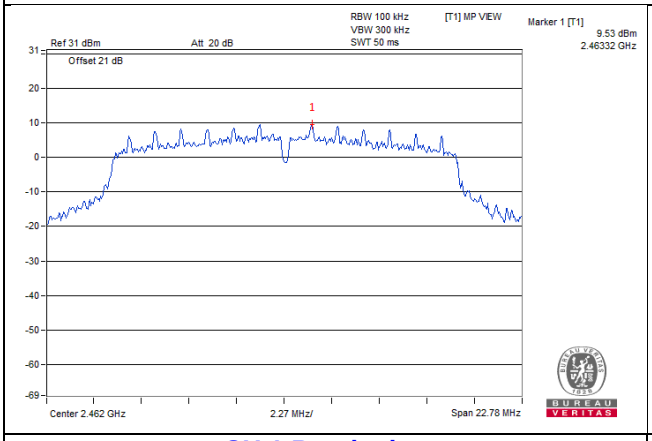
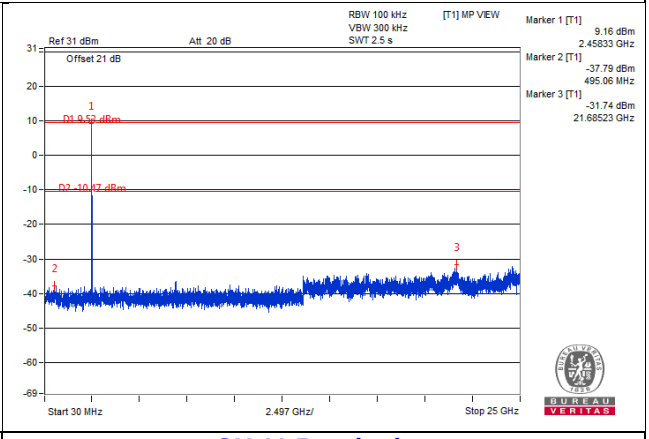
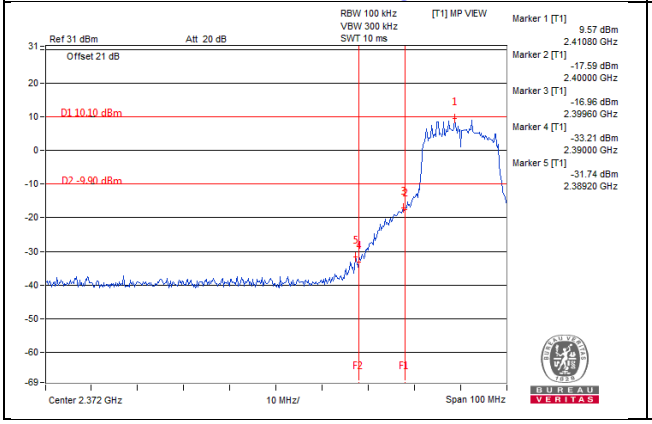
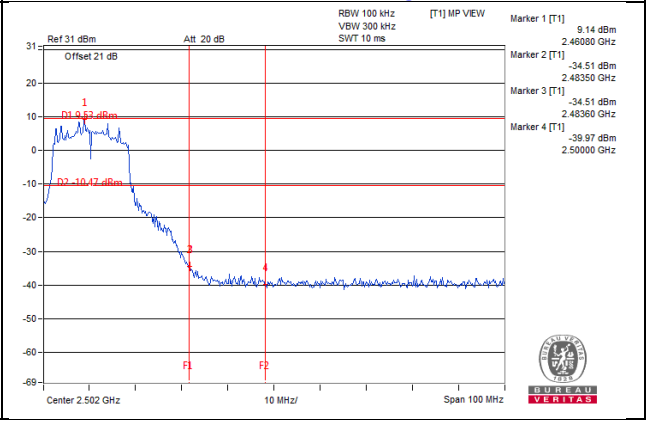




CH 1 Band edge

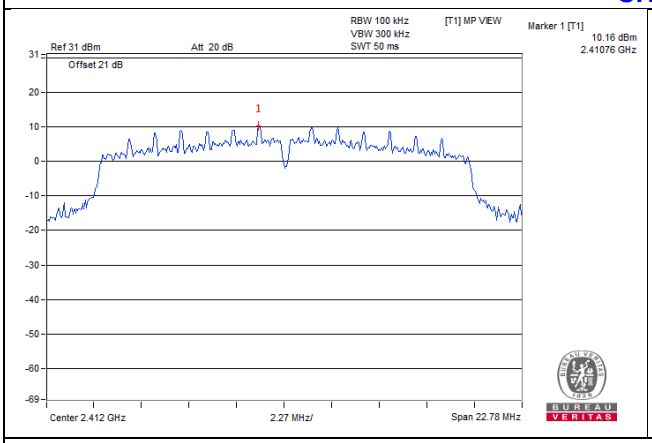


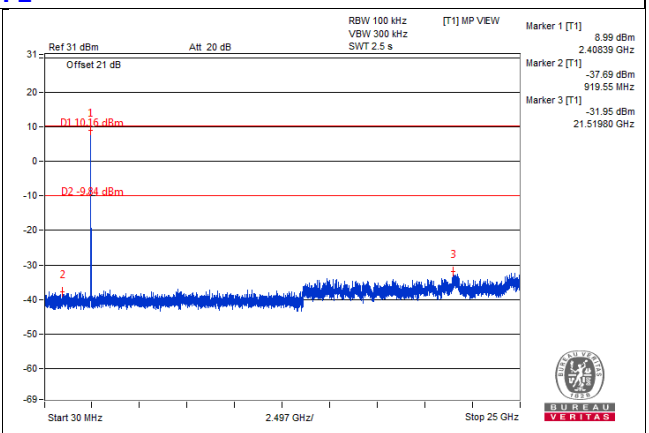
CH 11 Band edge



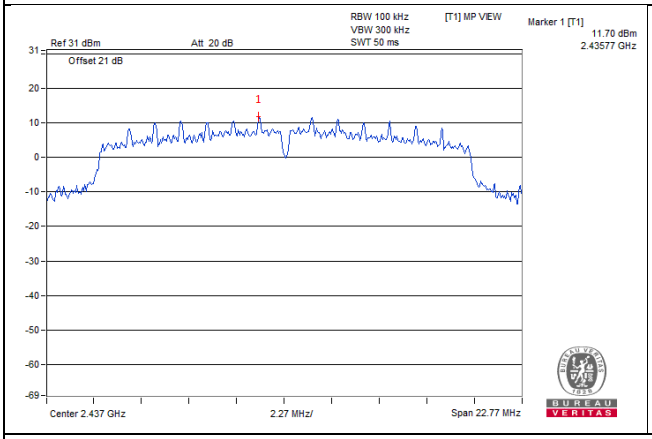
802.11n (HT20)

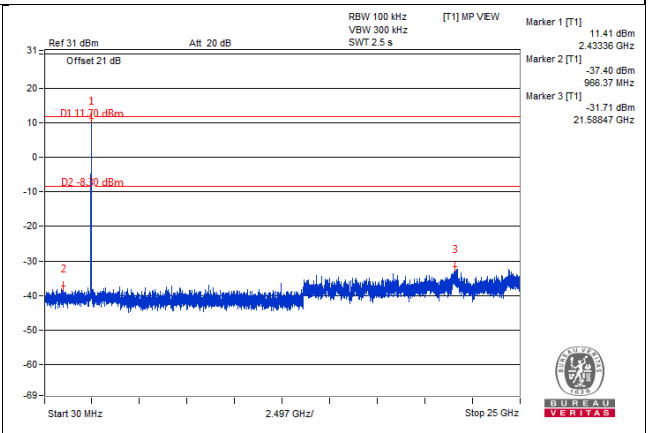
CH 1



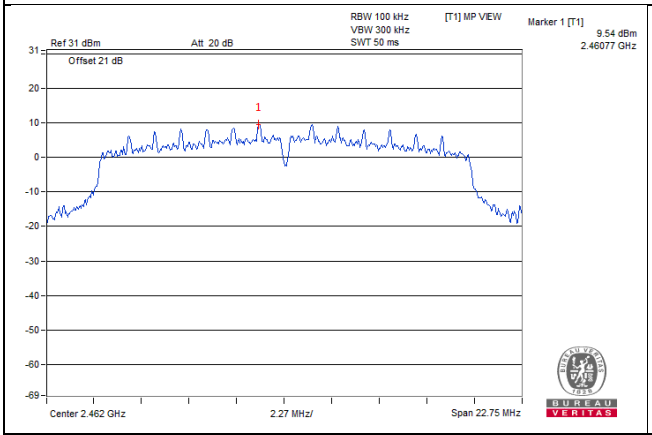


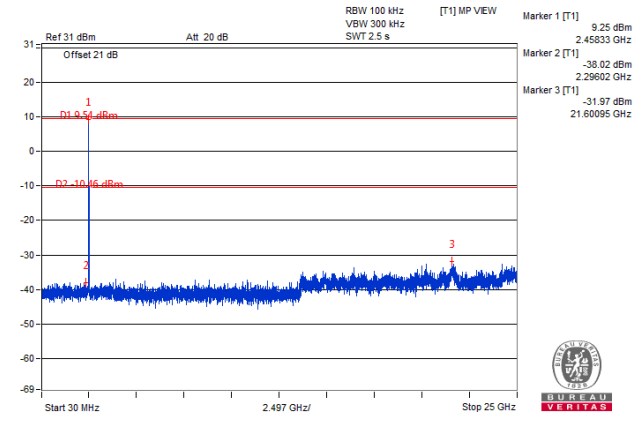
CH 6



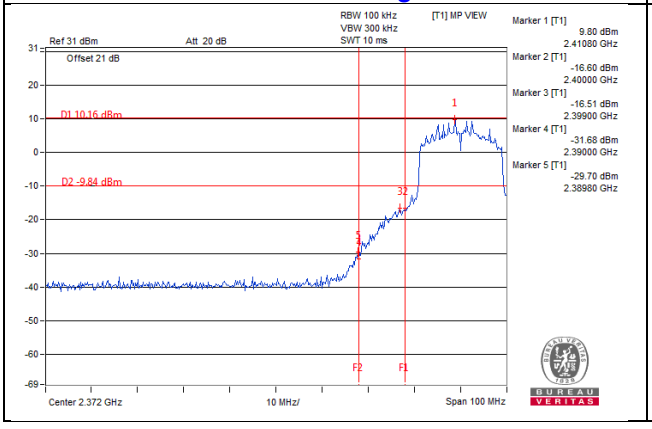


CH 11

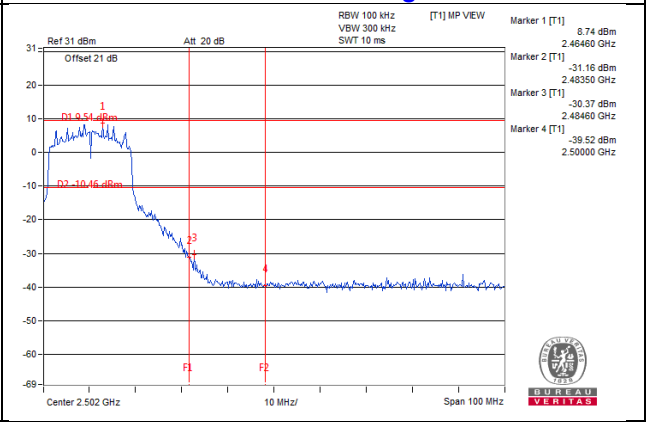




CH 1 Band edge

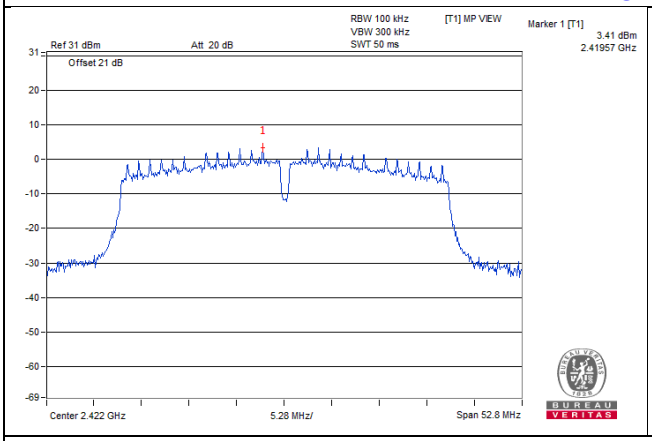


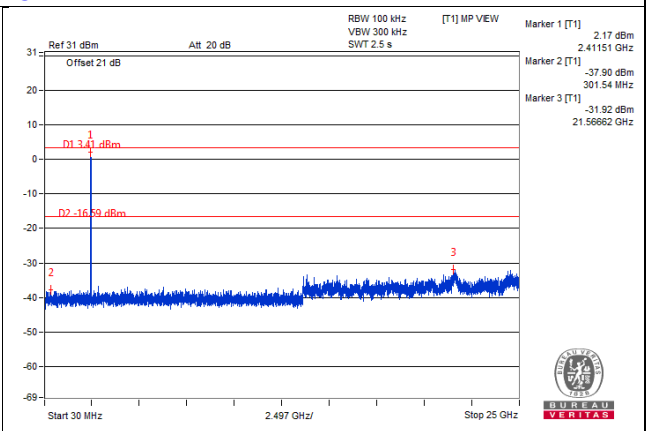
CH 11 Band edge



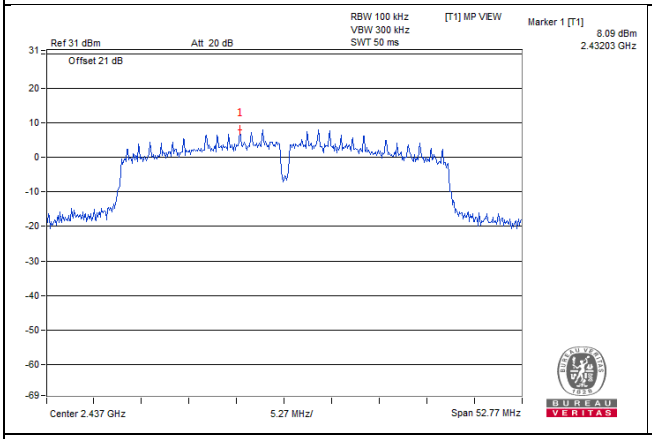
802.11n (HT40)

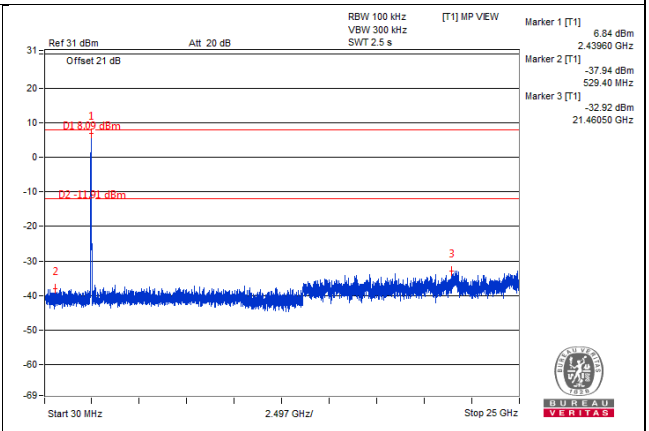
CH 3



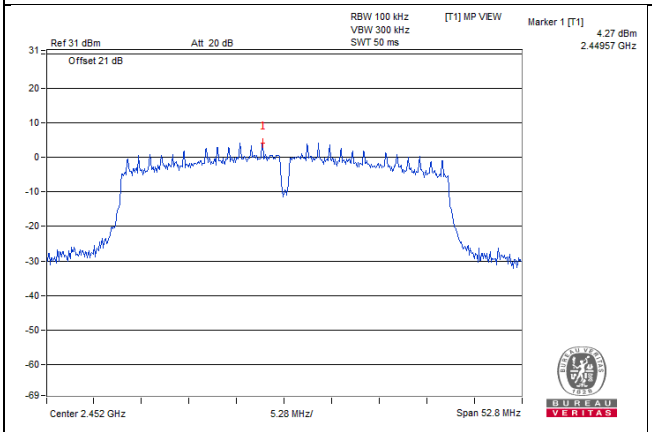


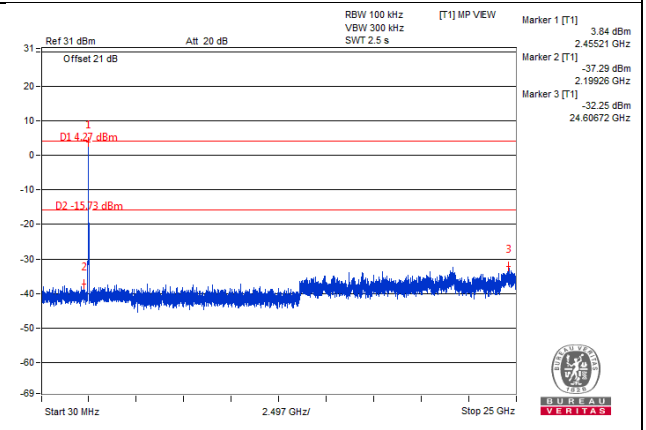
CH 6



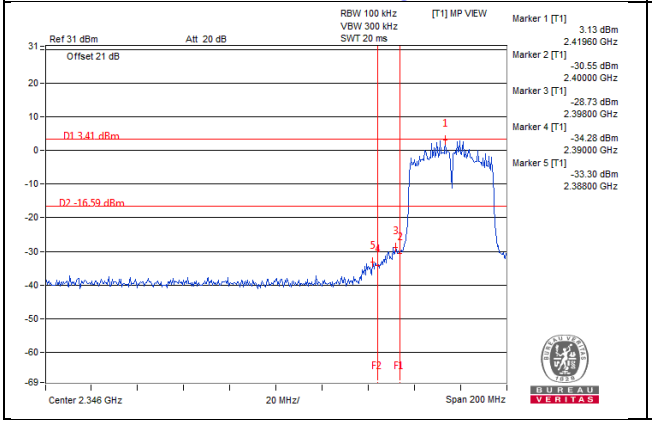


CH 9

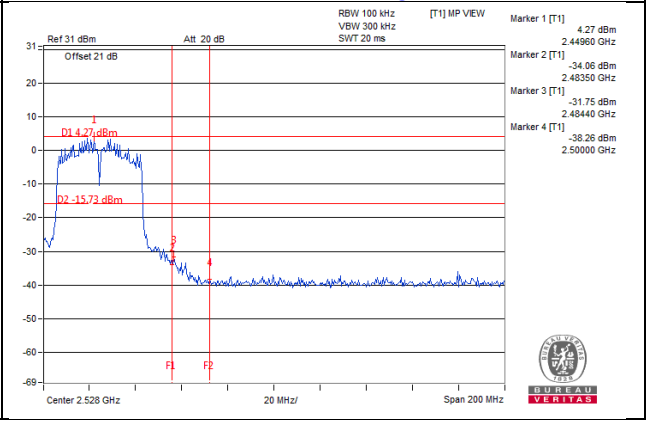




CH 3 Band edge



CH 9 Band edge



5 Pictures of Test Arrangements

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

Appendix – Information on the Testing Laboratories

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

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

Linkou EMC/RF Lab
Tel: 886-2-26052180
Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab
Tel: 886-3-6668565
Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety Lab
Tel: 886-3-3183232
Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com
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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