

FCC Test Report

Report No.: RF180709C05B-3

FCC ID: S9E-121600

Test Model: 121600

Received Date: Jul. 09, 2018

Test Date: Jul. 21, 2018 ~ Aug. 09, 2018

Issued Date: Aug. 28, 2018

Applicant: Trimble Navigation Limited

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Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch

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FCC Registration /
Designation Number: 788550 / TW0003



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Release Control Record

Issue No.	Description	Date Issued
RF180709C05B-3	Original Release	Aug. 28, 2018

1 Certificate of Conformity

Product: Handheld PC

Brand: Trimble

Test Model: 121600

Sample Status: Engineering Sample

Applicant: Trimble Navigation Limited

Test Date: Jul. 21, 2018 ~ Aug. 09, 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 RF characteristics under the conditions specified in this report.

Prepared by :



Date:

Aug. 28, 2018

Ivonne Wu / Supervisor

Approved by :



Date:

Aug. 28, 2018

Dylan Chiou / Project Engineer

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	Pass	Meet the requirement of limit. Minimum passing margin is -15.50 dB at 0.56418 MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -1.23 dB at 2483.52 MHz.
15.247(d)	Antenna Port Emission	Pass	Meet the requirement of limit.
15.247(a)(2)	6 dB Bandwidth	Pass	Meet the requirement of limit.
---	Occupied Bandwidth Measurement	Pass	Reference only
15.247(b)	Conducted power	Pass	Meet the requirement of limit.
15.247(e)	Power Spectral Density	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	Antenna connector is I-pex not a standard connector.

2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150 kHz ~ 30 MHz	2.44 dB
Radiated Emissions up to 1 GHz	30 MHz ~ 200 MHz	2.93 dB
	200 MHz ~ 1000 MHz	2.95 dB
Radiated Emissions above 1 GHz	1 GHz ~ 18 GHz	2.26 dB
	18 GHz ~ 40 GHz	1.94 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Handheld PC
Brand	Trimble
Test Model	121600
Status of EUT	Engineering Sample
Power Supply Rating	19 Vdc (Adapter) 7.27 Vdc (Battery)
Modulation Type	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
Modulation Technology	DSSS, OFDM
Transfer Rate	802.11b: 11.0 / 5.5 / 2.0 / 1.0 Mbps 802.11g: 54.0 / 48.0 / 36.0 / 24.0 / 18.0 / 12.0 / 9.0 / 6.0 Mbps 802.11n: up to 300.0 Mbps
Operating Frequency	2412 ~ 2462 MHz
Number of Channel	11 for 802.11b, 802.11g, 802.11n (HT20) 7 for 802.11n (HT40)
Output Power	474.114 mW
Antenna Type	PIFA antenna with 2.77 dBi gain (Main) PCB antenna with 0.48 dBi gain (Aux.)
Antenna Connector	I-pex
Accessory Device	Refer to Note as below
Data Cable Supplied	Refer to Note as below

Note:

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

Modulation Mode	Tx Function
802.11b	1TX
802.11g	1TX
802.11n (HT20)	2TX
802.11n (HT40)	2TX

* The modulation and bandwidth are similar for 802.11n mode for HT20 / HT40 and 802.11ac mode for HT20 / HT40, therefore investigated worst case to representative mode in test report. (Final test mode refer section 3.2.1)

2. The EUT contains following accessory devices.

Product	Brand	Model	Description
Adapter	DELTA Electronics, INC.	ADP-90MD H	I/P: 100-240 Vac, 50-60 Hz, 1.5 A O/P: 19 Vdc, 4.74 A 1.75m shielded cable with 1 core
Battery	Trimble	121300	7.27 Vdc, 3150 mAh, 22.9Wh
WWAN Module	AirPrime	EM7455	--
BT/WLAN Module	AzureWave	AW-CB260NF	--

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

3.2 Description of Test Modes

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

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

7 channels are provided for 802.11n (HT40):

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

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable To				Description
	RE $\geq$ 1G	RE<1G	PLC	APCM	
-	√	√	√	√	-

Where **RE $\geq$ 1G**: Radiated Emission above 1 GHz **RE<1G**: Radiated Emission below 1 GHz
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**.

NOTE: “-” means no effect.

Radiated Emission Test (Above 1 GHz):

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

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

Radiated Emission Test (Below 1 GHz):

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

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
-	802.11n (HT40)	3 to 9	6	OFDM	BPSK	13.5

Power Line Conducted Emission Test:

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

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
-	802.11n (HT40)	3 to 9	6	OFDM	BPSK	13.5

Bandedge Measurement:

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

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

Antenna Port Conducted Measurement:

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

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

Test Condition:

Applicable To	Environmental Conditions	Input Power	Tested by
RE $\geq$ 1G	25 deg. C, 65 % RH	120 Vac, 60 Hz	Thomas Wei
RE<1G	25 deg. C, 65 % RH	120 Vac, 60 Hz	Thomas Wei
PLC	25 deg. C, 65 % RH	120 Vac, 60 Hz	Jisyong Wang
APCM	25 deg. C, 65 % RH	7.27 Vdc	Vincent Huang

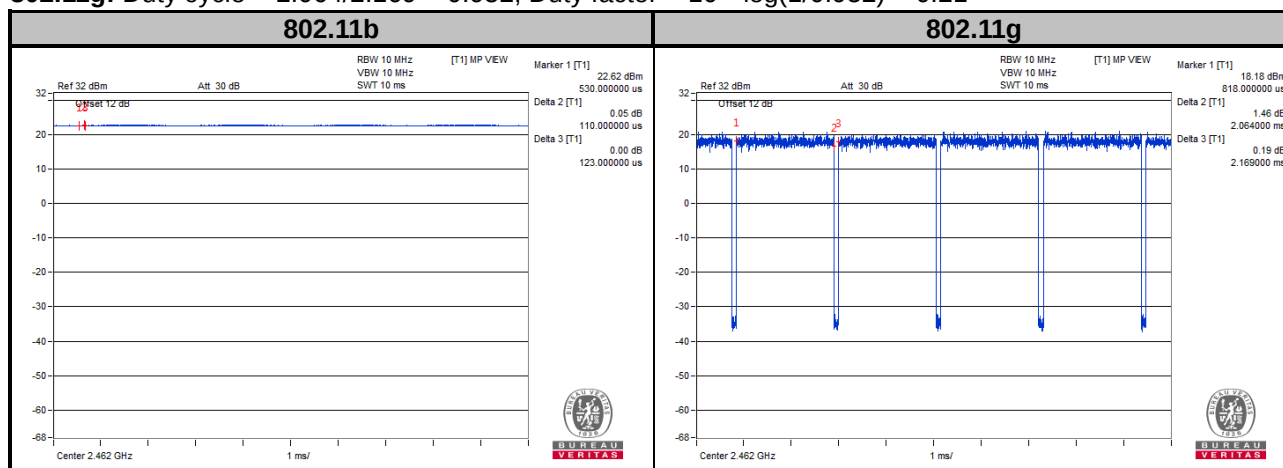
3.3 Duty Cycle of Test Signal

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

<SISO>

802.11b: Duty cycle is 100 %, duty factor is not required.

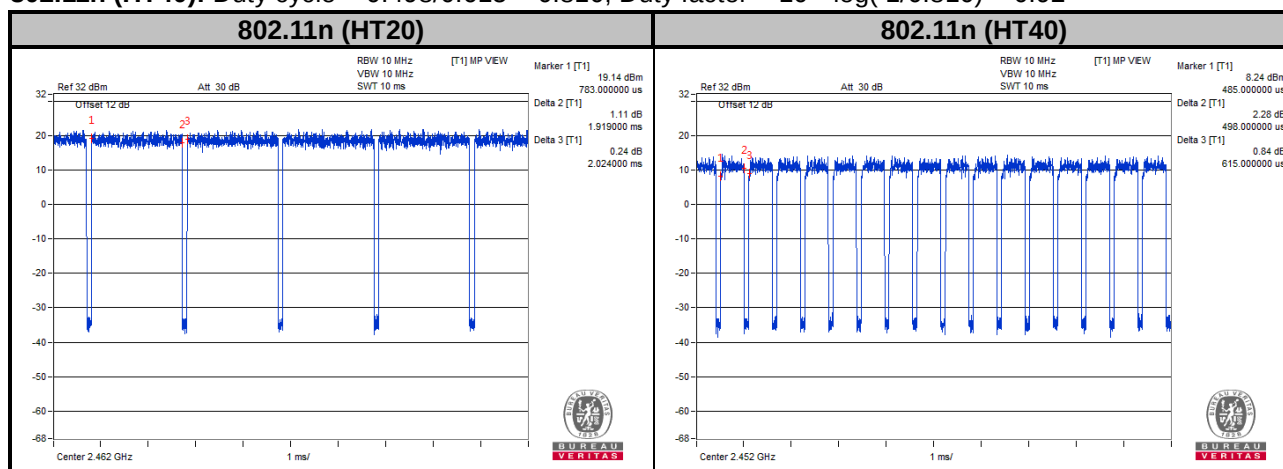
802.11g: Duty cycle = $2.064/2.169 = 0.952$, Duty factor = $10 * \log(1/0.952) = 0.21$



<MIMO>

802.11n (HT20): Duty cycle = $1.919/2.024 = 0.948$, Duty factor = $10 * \log(1/0.948) = 0.23$

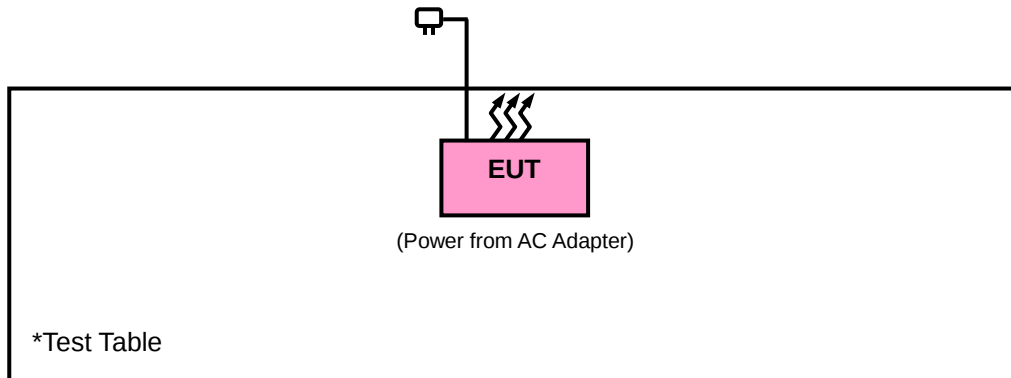
802.11n (HT40): Duty cycle = $0.498/0.615 = 0.810$, Duty factor = $10 * \log(1/0.810) = 0.92$



3.4 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units.

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 DTS Meas Guidance v04

KDB 662911 D01 Multiple Transmitter Output v02r01

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 20 dB below the highest level of the desired power:

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

NOTE:

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

4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver Agilent	N9038A	MY51210203	Mar. 16, 2018	Mar. 15, 2019
Spectrum Analyzer Agilent	N9010A	MY52220314	Nov. 24, 2017	Nov. 23, 2018
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	101261	Jan. 11, 2018	Jan. 10, 2019
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-969	Nov. 12, 2017	Nov. 11, 2018
HORN Antenna SCHWARZBECK	BBHA 9170	148	Dec. 13, 2017	Dec. 12, 2018
BILOG Antenna SCHWARZBECK	VULB 9168	9168-472	Dec. 06, 2017	Dec. 05, 2018
Loop Antenna	EM-6879	269	Aug. 11, 2017	Aug. 10, 2018
Preamplifier EMCI	EMC001340	980201	Nov. 01, 2017	Oct. 30, 2018
Preamplifier EMCI	EMC 012645	980115	Oct. 20, 2017	Oct. 19, 2018
Preamplifier EMCI	EMC 330H	980112	Oct. 13, 2017	Oct. 12, 2018
Power Meter Anritsu	ML2495A	1012010	Aug. 15, 2017	Aug. 14, 2018
Power Sensor Anritsu	MA2411B	1315050	Aug. 15, 2017	Aug. 14, 2018
RF Coaxial Cable HUBER+SUHNNER	EMC104-SM-SM-8 000&3000	140811+170717	Oct. 20, 2017	Oct. 19, 2018
RF Coaxial Cable HUBER+SUHNNER	SUCOFLEX 104	EMC104-SM-SM-1 000(140807)	Oct. 20, 2017	Oct. 19, 2018
RF Coaxial Cable Worken	8D-FB	Cable-Ch10-01	Oct. 20, 2017	Oct. 19, 2018
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
Software BV ADT	E3 6.120103	NA	NA	NA
Antenna Tower MF	MFA-440H	NA	NA	NA
Turn Table MF	MFT-201SS	NA	NA	NA
Antenna Tower & Turn Table Controller MF	MF-7802	NA	NA	NA

- Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HwaYa Chamber 10.
3. The horn antenna and preamplifier (model: EMC 184045) are used only for the measurement of emission frequency above 1 GHz if tested.
4. The IC Site Registration No. is IC7450F-10.

4.1.3 Test Procedures

For Radiated Emission below 30 MHz

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

Note:

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

For Radiated Emission above 30 MHz

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

Note:

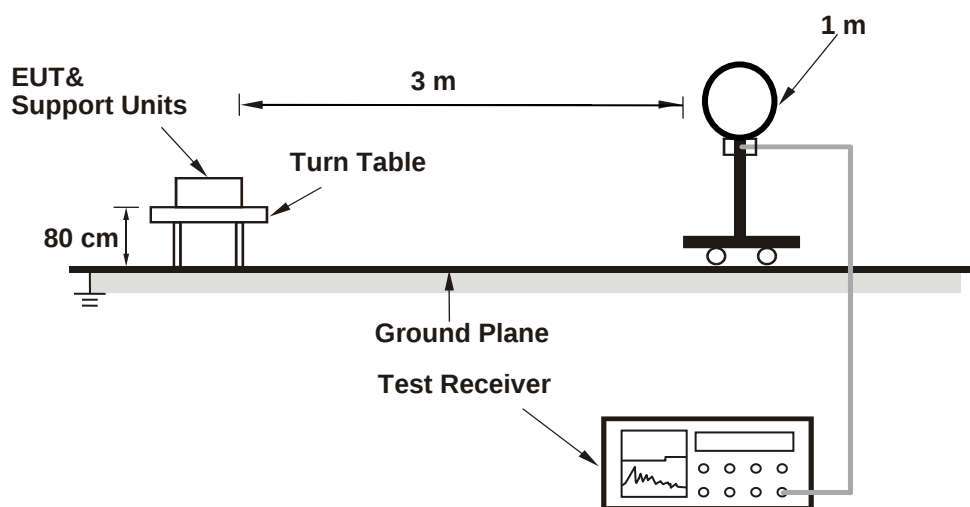
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) at frequency below 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1 GHz.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

4.1.4 Deviation from Test Standard

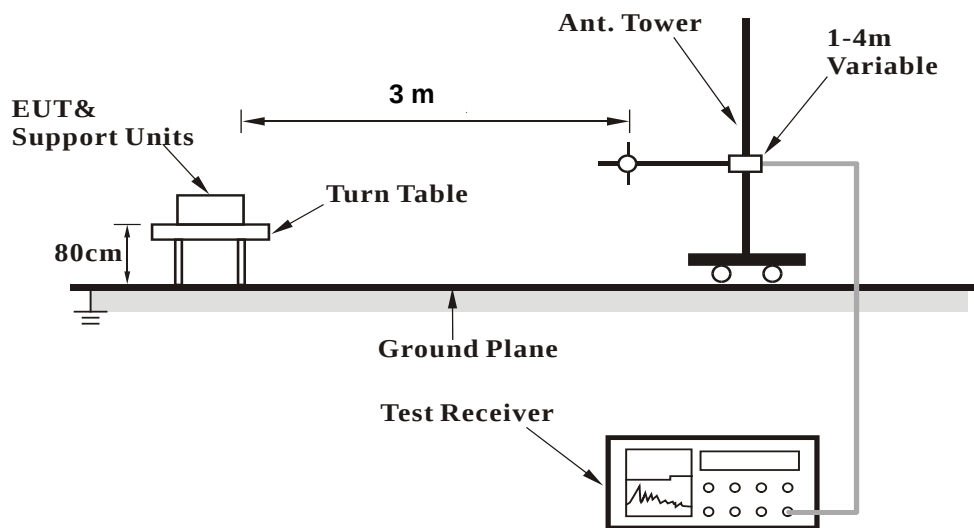
No deviation.

4.1.5 Test Set Up

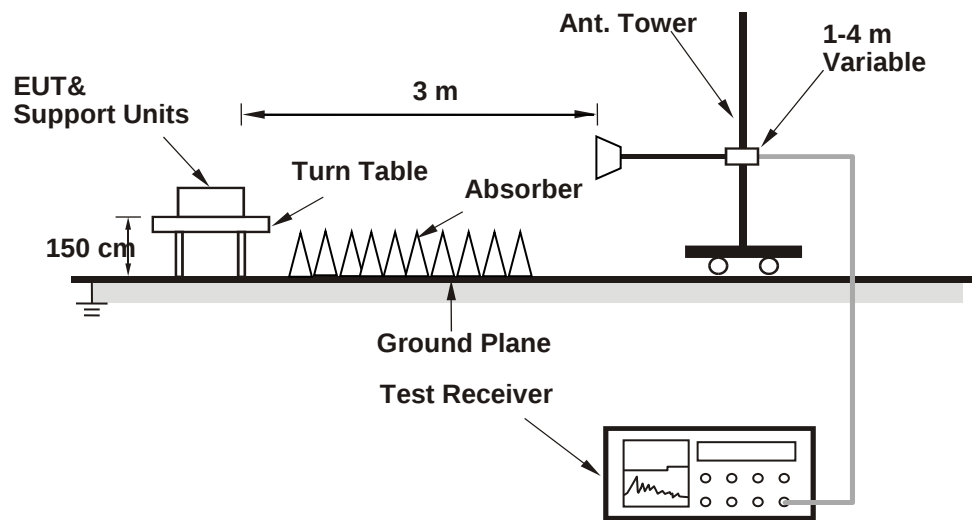
<Radiated Emission below 30 MHz>



<Radiated Emission 30 MHz to 1 GHz>



<Radiated Emission above 1 GHz>



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

4.1.6 EUT Operating Conditions

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

4.1.7 Test Results

Above 1 GHz Data :

<SISO>

802.11b

PIFA Antenna

EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Thomas Wei

Antennal Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2382.38	45.86	51.93	54	-8.14	27.08	4.35	37.5	104	108	Average
2382.38	57.42	63.49	74	-16.58	27.08	4.35	37.5	104	108	Peak
2412	106.75	112.66			27.23	4.38	37.52	104	108	Average
2412	111.12	117.03			27.23	4.38	37.52	104	108	Peak
4824	36.31	51.22	54	-17.69	31.17	6.81	52.89	142	203	Average
4824	44.75	59.66	74	-29.25	31.17	6.81	52.89	142	203	Peak
Antennal Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2389.94	37.67	43.67	54	-16.33	27.16	4.36	37.52	110	129	Average
2389.94	50.87	56.87	74	-23.13	27.16	4.36	37.52	110	129	Peak
2412	98.67	104.58			27.23	4.38	37.52	110	129	Average
2412	102.95	108.86			27.23	4.38	37.52	110	129	Peak
4824	35.42	50.33	54	-18.58	31.17	6.81	52.89	116	183	Average
4824	43.58	58.49	74	-30.42	31.17	6.81	52.89	116	183	Peak

Remarks:

1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
2. 2412 MHz: Fundamental frequency.
3. The emission levels of other frequencies were very low against the limit.

EUT Test Condition		Measurement Detail	
Channel	Channel 6	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Thomas Wei

Antennal Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2389.8	40.48	46.48	54	-13.52	27.16	4.36	37.52	101	150	Average
2389.8	53.61	59.61	74	-20.39	27.16	4.36	37.52	101	150	Peak
2437	108.45	114.13			27.38	4.4	37.46	101	150	Average
2437	112.68	118.36			27.38	4.4	37.46	101	150	Peak
2483.52	40.82	46.18	54	-13.18	27.53	4.43	37.32	101	150	Average
2483.52	54.44	59.8	74	-19.56	27.53	4.43	37.32	101	150	Peak
4874	37.82	52.57	54	-16.18	31.25	6.86	52.86	133	46	Average
4874	44.48	59.23	74	-29.52	31.25	6.86	52.86	133	46	Peak
Antennal Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2389.8	35.28	41.28	54	-18.72	27.16	4.36	37.52	111	80	Average
2389.8	48.22	54.22	74	-25.78	27.16	4.36	37.52	111	80	Peak
2437	97.88	66.1			27.38	4.4	0	111	80	Average
2437	102.09	70.31			27.38	4.4	0	111	80	Peak
2484.32	35.54	40.9	54	-18.46	27.53	4.43	37.32	111	80	Average
2484.32	48.76	54.12	74	-25.24	27.53	4.43	37.32	111	80	Peak
4874	37.04	51.79	54	-16.96	31.25	6.86	52.86	151	174	Average
4874	44.69	59.44	74	-29.31	31.25	6.86	52.86	151	174	Peak

Remarks:

1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
2. 2437 MHz: Fundamental frequency.
3. The emission levels of other frequencies were very low against the limit.

EUT Test Condition		Measurement Detail	
Channel	Channel 11	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Thomas Wei

Antennal Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2462	108.78	114.3			27.46	4.41	37.39	115	106	Average
2462	113.2	118.72			27.46	4.41	37.39	115	106	Peak
2484.12	45.62	50.98	54	-8.38	27.53	4.43	37.32	115	106	Average
2484.12	58.98	64.34	74	-15.02	27.53	4.43	37.32	115	106	Peak
4924	37.28	51.94	54	-16.72	31.34	6.89	52.89	29	207	Average
4924	45.13	59.79	74	-28.87	31.34	6.89	52.89	29	207	Peak
Antennal Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2462	96.48	102			27.46	4.41	37.39	121	143	Average
2462	100.87	106.39			27.46	4.41	37.39	121	143	Peak
2484.4	36.37	41.73	54	-17.63	27.53	4.43	37.32	121	143	Average
2484.4	49.46	54.82	74	-24.54	27.53	4.43	37.32	121	143	Peak
4924	37.4	52.06	54	-16.6	31.34	6.89	52.89	137	206	Average
4924	45.44	60.1	74	-28.56	31.34	6.89	52.89	137	206	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- 2462 MHz: Fundamental frequency.
- The emission levels of other frequencies were very low against the limit.

PCB Antenna

EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Thomas Wei

Antennal Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2389.66	45.25	51.32	54	-8.75	27.08	4.35	37.5	132	127	Average
2389.66	57.2	63.27	74	-16.8	27.08	4.35	37.5	132	127	Peak
2412	106.31	112.22			27.23	4.38	37.52	132	127	Average
2412	110.75	116.66			27.23	4.38	37.52	132	127	Peak
4824	35.71	50.62	54	-18.29	31.17	6.81	52.89	155	67	Average
4824	44.23	59.14	74	-29.77	31.17	6.81	52.89	155	67	Peak
Antennal Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2387.11	36.87	42.87	54	-17.13	27.16	4.36	37.52	141	227	Average
2387.11	49.73	55.73	74	-24.27	27.16	4.36	37.52	141	227	Peak
2412	97.71	103.62			27.23	4.38	37.52	141	227	Average
2412	102.04	107.95			27.23	4.38	37.52	141	227	Peak
4824	35.21	50.12	54	-18.79	31.17	6.81	52.89	136	144	Average
4824	43.01	57.92	74	-30.99	31.17	6.81	52.89	136	144	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- 2412 MHz: Fundamental frequency.
- The emission levels of other frequencies were very low against the limit.

EUT Test Condition		Measurement Detail	
Channel	Channel 6	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Thomas Wei

Antennal Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2388.61	39.66	45.66	54	-14.34	27.16	4.36	37.52	133	172	Average
2388.61	53.25	59.25	74	-20.75	27.16	4.36	37.52	133	172	Peak
2437	106.89	112.57			27.38	4.4	37.46	133	172	Average
2437	111.19	116.87			27.38	4.4	37.46	133	172	Peak
2483.84	38.93	44.29	54	-15.07	27.53	4.43	37.32	133	172	Average
2483.84	53.62	58.98	74	-20.38	27.53	4.43	37.32	133	172	Peak
4874	37.29	52.04	54	-16.71	31.25	6.86	52.86	141	312	Average
4874	43.53	58.28	74	-30.47	31.25	6.86	52.86	141	312	Peak
Antennal Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2389.92	34.62	40.62	54	-19.38	27.16	4.36	37.52	123	337	Average
2389.92	47.52	53.52	74	-26.48	27.16	4.36	37.52	123	337	Peak
2437	95.99	64.21			27.38	4.4	0	123	337	Average
2437	100.89	69.11			27.38	4.4	0	123	337	Peak
2483.92	34.75	40.11	54	-19.25	27.53	4.43	37.32	123	337	Average
2483.92	48.03	53.39	74	-25.97	27.53	4.43	37.32	123	337	Peak
4874	36.24	50.99	54	-17.76	31.25	6.86	52.86	129	131	Average
4874	43.92	58.67	74	-30.08	31.25	6.86	52.86	129	131	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- 2437 MHz: Fundamental frequency.
- The emission levels of other frequencies were very low against the limit.

EUT Test Condition		Measurement Detail	
Channel	Channel 11	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Thomas Wei

Antennal Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2462	106.88	112.4			27.46	4.41	37.39	135	223	Average
2462	111.7	117.22			27.46	4.41	37.39	135	223	Peak
2483.84	43.92	49.28	54	-10.08	27.53	4.43	37.32	135	223	Average
2483.84	57.55	62.91	74	-16.45	27.53	4.43	37.32	135	223	Peak
4924	36.44	51.1	54	-17.56	31.34	6.89	52.89	157	126	Average
4924	44.64	59.3	74	-29.36	31.34	6.89	52.89	157	126	Peak
Antennal Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2462	95.24	100.76			27.46	4.41	37.39	147	132	Average
2462	99.51	105.03			27.46	4.41	37.39	147	132	Peak
2485.12	35.58	40.94	54	-18.42	27.53	4.43	37.32	147	132	Average
2485.12	48.4	53.76	74	-25.6	27.53	4.43	37.32	147	132	Peak
4924	36.25	50.91	54	-17.75	31.34	6.89	52.89	109	281	Average
4924	44.6	59.26	74	-29.4	31.34	6.89	52.89	109	281	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- 2462 MHz: Fundamental frequency.
- The emission levels of other frequencies were very low against the limit.

802.11g

PIFA Antenna

EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Thomas Wei

Antennal Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2389.94	47.94	53.94	54	-6.06	27.16	4.36	37.52	118	104	Average
2389.94	61.97	67.97	74	-12.03	27.16	4.36	37.52	118	104	Peak
2412	97.46	103.37			27.23	4.38	37.52	118	104	Average
2412	110	115.91			27.23	4.38	37.52	118	104	Peak
4824	31.68	46.59	54	-22.32	31.17	6.81	52.89	134	140	Average
4824	42.1	57.01	74	-31.9	31.17	6.81	52.89	134	140	Peak
Antennal Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2389.94	40.8	46.8	54	-13.2	27.16	4.36	37.52	185	350	Average
2389.94	55.16	61.16	74	-18.84	27.16	4.36	37.52	185	350	Peak
2412	89.87	58.26			27.23	4.38	0	185	350	Average
2412	102.14	70.53			27.23	4.38	0	185	350	Peak
4824	32.31	47.22	54	-21.69	31.17	6.81	52.89	112	326	Average
4824	44.21	59.12	74	-29.79	31.17	6.81	52.89	112	326	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- 2412 MHz: Fundamental frequency.
- The emission levels of other frequencies were very low against the limit.

EUT Test Condition		Measurement Detail	
Channel	Channel 6	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Thomas Wei

Antennal Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2389.94	41.05	47.05	54	-12.95	27.16	4.36	37.52	165	149	Average
2389.94	53.8	59.8	74	-20.2	27.16	4.36	37.52	165	149	Peak
2437	101.64	107.32			27.38	4.4	37.46	165	149	Average
2437	114.51	120.19			27.38	4.4	37.46	165	149	Peak
2483.52	41.33	46.69	54	-12.67	27.53	4.43	37.32	165	149	Average
2483.52	54.26	59.62	74	-19.74	27.53	4.43	37.32	165	149	Peak
4874	31.98	46.73	54	-22.02	31.25	6.86	52.86	117	104	Average
4874	44.73	59.48	74	-29.27	31.25	6.86	52.86	117	104	Peak
Antennal Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2389.94	35.81	41.81	54	-18.19	27.16	4.36	37.52	202	284	Average
2389.94	48.22	54.22	74	-25.78	27.16	4.36	37.52	202	284	Peak
2437	93.85	99.53			27.38	4.4	37.46	202	284	Average
2437	106.18	111.86			27.38	4.4	37.46	202	284	Peak
2483.68	36.72	42.08	54	-17.28	27.53	4.43	37.32	202	284	Average
2483.68	50.42	55.78	74	-23.58	27.53	4.43	37.32	202	284	Peak
4874	32.58	47.33	54	-21.42	31.25	6.86	52.86	147	221	Average
4874	44.24	58.99	74	-29.76	31.25	6.86	52.86	147	221	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- 2437 MHz: Fundamental frequency.
- The emission levels of other frequencies were very low against the limit.

EUT Test Condition		Measurement Detail	
Channel	Channel 11	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Thomas Wei

Antennal Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2462	97.22	102.74			27.46	4.41	37.39	161	151	Average
2462	110	115.52			27.46	4.41	37.39	161	151	Peak
2483.52	46.54	51.9	54	-7.46	27.53	4.43	37.32	161	151	Average
2483.52	59.75	65.11	74	-14.25	27.53	4.43	37.32	161	151	Peak
4924	32.93	47.59	54	-21.07	31.34	6.89	52.89	171	84	Average
4924	43.6	58.26	74	-30.4	31.34	6.89	52.89	171	84	Peak
Antennal Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2462	86.87	92.39			27.46	4.41	37.39	124	124	Average
2462	98.61	104.13			27.46	4.41	37.39	124	124	Peak
2483.52	36.24	41.6	54	-17.76	27.53	4.43	37.32	124	124	Average
2483.52	49.07	54.43	74	-24.93	27.53	4.43	37.32	124	124	Peak
4924	33.17	47.83	54	-20.83	31.34	6.89	52.89	144	263	Average
4924	44.02	58.68	74	-29.98	31.34	6.89	52.89	144	263	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- 2462 MHz: Fundamental frequency.
- The emission levels of other frequencies were very low against the limit.

PCB Antenna

EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Thomas Wei

Antennal Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2388.76	45.84	51.84	54	-8.16	27.16	4.36	37.52	127	166	Average
2388.76	59.92	65.92	74	-14.08	27.16	4.36	37.52	127	166	Peak
2412	95.96	101.87			27.23	4.38	37.52	127	166	Average
2412	108.14	114.05			27.23	4.38	37.52	127	166	Peak
4824	32.21	47.12	54	-21.79	31.17	6.81	52.89	155	206	Average
4824	41.84	56.75	74	-32.16	31.17	6.81	52.89	155	206	Peak
Antennal Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2387.21	39.45	45.45	54	-14.55	27.16	4.36	37.52	162	269	Average
2387.21	53.88	59.88	74	-20.12	27.16	4.36	37.52	162	269	Peak
2412	87.91	56.3			27.23	4.38	0	162	269	Average
2412	100.43	68.82			27.23	4.38	0	162	269	Peak
4824	32.6	47.51	54	-21.4	31.17	6.81	52.89	139	220	Average
4824	44.63	59.54	74	-29.37	31.17	6.81	52.89	139	220	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- 2412 MHz: Fundamental frequency.
- The emission levels of other frequencies were very low against the limit.

EUT Test Condition		Measurement Detail	
Channel	Channel 6	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Thomas Wei

Antennal Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2388.69	34.98	40.98	54	-19.02	27.16	4.36	37.52	172	194	Average
2388.69	50.9	56.9	74	-23.1	27.16	4.36	37.52	172	194	Peak
2437	98.49	104.17			27.38	4.4	37.46	172	194	Average
2437	110.9	116.58			27.38	4.4	37.46	172	194	Peak
2483.77	39.12	44.48	54	-14.88	27.53	4.43	37.32	172	194	Average
2483.77	51.84	57.2	74	-22.16	27.53	4.43	37.32	172	194	Peak
4874	32.54	47.29	54	-21.46	31.25	6.86	52.86	157	269	Average
4874	44.99	59.74	74	-29.01	31.25	6.86	52.86	157	269	Peak
Antennal Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2389.92	34.62	40.62	54	-19.38	27.16	4.36	37.52	224	251	Average
2389.92	46.92	52.92	74	-27.08	27.16	4.36	37.52	224	251	Peak
2437	91.93	97.61			27.38	4.4	37.46	224	251	Average
2437	105.08	110.76			27.38	4.4	37.46	224	251	Peak
2485.27	35	40.36	54	-19	27.53	4.43	37.32	224	251	Average
2485.27	49.18	54.54	74	-24.82	27.53	4.43	37.32	224	251	Peak
4874	31.8	46.55	54	-22.2	31.25	6.86	52.86	118	55	Average
4874	43.59	58.34	74	-30.41	31.25	6.86	52.86	118	55	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- 2437 MHz: Fundamental frequency.
- The emission levels of other frequencies were very low against the limit.

EUT Test Condition		Measurement Detail	
Channel	Channel 11	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Thomas Wei

Antennal Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2462	95.7	101.22			27.46	4.41	37.39	182	219	Average
2462	108.94	114.46			27.46	4.41	37.39	182	219	Peak
2483.93	44.89	50.25	54	-9.11	27.53	4.43	37.32	182	219	Average
2483.93	57.99	63.35	74	-16.01	27.53	4.43	37.32	182	219	Peak
4924	32.05	46.71	54	-21.95	31.34	6.89	52.89	138	307	Average
4924	42.95	57.61	74	-31.05	31.34	6.89	52.89	138	307	Peak
Antennal Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2462	85.24	90.76			27.46	4.41	37.39	139	164	Average
2462	96.83	102.35			27.46	4.41	37.39	139	164	Peak
2483.52	35.95	41.31	54	-18.05	27.53	4.43	37.32	139	164	Average
2483.52	48.27	53.63	74	-25.73	27.53	4.43	37.32	139	164	Peak
4924	32.65	47.31	54	-21.35	31.34	6.89	52.89	201	116	Average
4924	45.19	59.85	74	-28.81	31.34	6.89	52.89	201	116	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- 2462 MHz: Fundamental frequency.
- The emission levels of other frequencies were very low against the limit.

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802.11n (HT20)

EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Thomas Wei

Antennal Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2389.94	51.87	57.87	54	-2.13	27.16	4.36	37.52	168	153	Average
2389.94	63.45	69.45	74	-10.55	27.16	4.36	37.52	168	153	Peak
2412	101.21	107.12			27.23	4.38	37.52	168	153	Average
2412	111.26	117.17			27.23	4.38	37.52	168	153	Peak
4824	33.38	48.29	54	-20.62	31.17	6.81	52.89	160	238	Average
4824	42.92	57.83	74	-31.08	31.17	6.81	52.89	160	238	Peak
Antennal Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2389.8	43.58	49.58	54	-10.42	27.16	4.36	37.52	112	94	Average
2389.8	54.77	60.77	74	-19.23	27.16	4.36	37.52	112	94	Peak
2412	93.01	98.92			27.23	4.38	37.52	112	94	Average
2412	104.44	110.35			27.23	4.38	37.52	112	94	Peak
4824	33.06	47.97	54	-20.94	31.17	6.81	52.89	128	329	Average
4824	43.36	58.27	74	-30.64	31.17	6.81	52.89	128	329	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- 2412 MHz: Fundamental frequency.
- The emission levels of other frequencies were very low against the limit.

EUT Test Condition		Measurement Detail	
Channel	Channel 6	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Thomas Wei

Antennal Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2389.8	42.6	48.6	54	-11.4	27.16	4.36	37.52	165	151	Average
2389.8	53.57	59.57	74	-20.43	27.16	4.36	37.52	165	151	Peak
2437	105.08	110.76			27.38	4.4	37.46	165	151	Average
2437	114.63	120.31			27.38	4.4	37.46	165	151	Peak
2483.52	42.33	47.69	54	-11.67	27.53	4.43	37.32	165	151	Average
2483.52	53.83	59.19	74	-20.17	27.53	4.43	37.32	165	151	Peak
4874	36.91	51.66	54	-17.09	31.25	6.86	52.86	137	159	Average
4874	46.15	60.9	74	-27.85	31.25	6.86	52.86	137	159	Peak
Antennal Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2389.1	36.59	42.57	54	-17.41	27.16	4.36	37.5	106	89	Average
2389.1	48.23	54.21	74	-25.77	27.16	4.36	37.5	106	89	Peak
2437	94.78	100.46			27.38	4.4	37.46	106	89	Average
2437	105.62	111.3			27.38	4.4	37.46	106	89	Peak
2484.76	38.41	43.77	54	-15.59	27.53	4.43	37.32	106	89	Average
2484.76	50.17	55.53	74	-23.83	27.53	4.43	37.32	106	89	Peak
4874	37.36	52.11	54	-16.64	31.25	6.86	52.86	167	233	Average
4874	45.08	59.83	74	-28.92	31.25	6.86	52.86	167	233	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- 2437 MHz: Fundamental frequency.
- The emission levels of other frequencies were very low against the limit.

EUT Test Condition		Measurement Detail	
Channel	Channel 11	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Thomas Wei

Antennal Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2462	98.04	103.56			27.46	4.41	37.39	145	10	Average
2462	107.98	113.5			27.46	4.41	37.39	145	10	Peak
2483.52	52.64	58	54	-1.36	27.53	4.43	37.32	145	10	Average
2483.52	66.22	71.58	74	-7.78	27.53	4.43	37.32	145	10	Peak
4924	34.01	48.67	54	-19.99	31.34	6.89	52.89	155	311	Average
4924	43	57.66	74	-31	31.34	6.89	52.89	155	311	Peak
Antennal Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2462	96.3	101.82			27.46	4.41	37.39	227	257	Average
2462	107.5	113.02			27.46	4.41	37.39	227	257	Peak
2483.52	51.85	57.21	54	-2.15	27.53	4.43	37.32	227	257	Average
2483.52	64.36	69.72	74	-9.64	27.53	4.43	37.32	227	257	Peak
4924	33.83	48.49	54	-20.17	31.34	6.89	52.89	124	191	Average
4924	44.47	59.13	74	-29.53	31.34	6.89	52.89	124	191	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- 2462 MHz: Fundamental frequency.
- The emission levels of other frequencies were very low against the limit.

802.11n (HT40)

EUT Test Condition		Measurement Detail	
Channel	Channel 3	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Thomas Wei

Antennal Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2389.38	46.66	52.64	54	-7.34	27.16	4.36	37.5	103	94	Average
2389.38	70.62	76.6	74	-3.38	27.16	4.36	37.5	103	94	Peak
2422	92.98	98.74			27.31	4.39	37.46	103	94	Average
2422	104.33	110.09			27.31	4.39	37.46	103	94	Peak
2484.4	41.32	46.68	54	-12.68	27.53	4.43	37.32	103	94	Average
2484.4	61.04	66.4	74	-12.96	27.53	4.43	37.32	103	94	Peak
4844	32.9	47.75	54	-21.1	31.2	6.83	52.88	127	98	Average
4844	42.74	57.59	74	-31.26	31.2	6.83	52.88	127	98	Peak
Antennal Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2389.94	42.46	48.46	54	-11.54	27.16	4.36	37.52	152	246	Average
2389.94	64.85	70.85	74	-9.15	27.16	4.36	37.52	152	246	Peak
2422	87.19	92.95			27.31	4.39	37.46	152	246	Average
2422	98.39	104.15			27.31	4.39	37.46	152	246	Peak
2483.84	38.82	44.18	54	-15.18	27.53	4.43	37.32	152	246	Average
2483.84	56.63	61.99	74	-17.37	27.53	4.43	37.32	152	246	Peak
4844	33.34	48.19	54	-20.66	31.2	6.83	52.88	136	161	Average
4844	43.86	58.71	74	-30.14	31.2	6.83	52.88	136	161	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- 2422 MHz: Fundamental frequency.
- The emission levels of other frequencies were very low against the limit.

EUT Test Condition		Measurement Detail	
Channel	Channel 6	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Thomas Wei

Antennal Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2389.94	45.83	51.83	54	-8.17	27.16	4.36	37.52	100	333	Average
2389.94	66.32	72.32	74	-7.68	27.16	4.36	37.52	100	333	Peak
2437	93.78	99.46			27.38	4.4	37.46	100	333	Average
2437	105.02	110.7			27.38	4.4	37.46	100	333	Peak
2483.84	51.92	57.28	54	-2.08	27.53	4.43	37.32	100	333	Average
2483.84	66.2	71.56	74	-7.8	27.53	4.43	37.32	100	333	Peak
4874	33.06	47.81	54	-20.94	31.25	6.86	52.86	149	167	Average
4874	44.2	58.95	74	-29.8	31.25	6.86	52.86	149	167	Peak
Antennal Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2389.66	44.17	50.15	54	-9.83	27.16	4.36	37.5	224	255	Average
2389.66	66.07	72.05	74	-7.93	27.16	4.36	37.5	224	255	Peak
2437	93.49	99.17			27.38	4.4	37.46	224	255	Average
2437	105.11	110.79			27.38	4.4	37.46	224	255	Peak
2483.52	52.77	58.13	54	-1.23	27.53	4.43	37.32	224	255	Average
2483.52	70.32	75.68	74	-3.68	27.53	4.43	37.32	224	255	Peak
4874	33.31	48.06	54	-20.69	31.25	6.86	52.86	141	283	Average
4874	44.43	59.18	74	-29.57	31.25	6.86	52.86	141	283	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- 2437 MHz: Fundamental frequency.
- The emission levels of other frequencies were very low against the limit.

EUT Test Condition		Measurement Detail	
Channel	Channel 9	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Thomas Wei

Antennal Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2387.98	38.83	44.81	54	-15.17	27.16	4.36	37.5	183	22	Average
2387.98	61.19	67.17	74	-12.81	27.16	4.36	37.5	183	22	Peak
2452	90.35	95.95			27.38	4.41	37.39	183	22	Average
2452	102.45	108.05			27.38	4.41	37.39	183	22	Peak
2483.52	49.37	54.73	54	-4.63	27.53	4.43	37.32	183	22	Average
2483.52	68.64	74	74	-5.36	27.53	4.43	37.32	183	22	Peak
4904	33.22	47.88	54	-20.78	31.31	6.88	52.85	116	267	Average
4904	45.49	60.15	74	-28.51	31.31	6.88	52.85	116	267	Peak
Antennal Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2389.94	37.72	43.72	54	-16.28	27.16	4.36	37.52	226	255	Average
2389.94	58.71	64.71	74	-15.29	27.16	4.36	37.52	226	255	Peak
2452	89.14	94.74			27.38	4.41	37.39	226	255	Average
2452	101.43	107.03			27.38	4.41	37.39	226	255	Peak
2483.56	48.19	53.55	54	-5.81	27.53	4.43	37.32	226	255	Average
2483.56	67.66	73.02	74	-6.34	27.53	4.43	37.32	226	255	Peak
4904	32.56	47.22	54	-21.44	31.31	6.88	52.85	133	205	Average
4904	44.13	58.79	74	-29.87	31.31	6.88	52.85	133	205	Peak

Remarks:

1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
2. 2452 MHz: Fundamental frequency.
3. The emission levels of other frequencies were very low against the limit.

9 kHz ~ 30 MHz Data:

The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

30 MHz ~ 1 GHz Worst-Case Data:

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802.11n (HT40)

EUT Test Condition		Measurement Detail	
Channel	Channel 6	Frequency Range	30 MHz ~ 1 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Thomas Wei

Antennal Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
43.58	29.86	46.88	40	-10.14	13.59	0.5	31.11	152	111	Peak
124.09	21.49	41.24	43.5	-22.01	11.28	0.86	31.89	252	125	Peak
270.56	22.06	40.46	46	-23.94	12.08	1.53	32.01	132	256	Peak
562.53	22.88	33.45	46	-23.12	18.75	2.75	32.07	111	152	Peak
859.35	28.12	33.14	46	-17.88	22.99	3.89	31.9	147	185	Peak
932.1	29.26	33.38	46	-16.74	23.69	4.17	31.98	202	256	Peak
Antennal Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
44.55	29.84	46.87	40	-10.16	13.6	0.51	31.14	111	132	Peak
120.21	28.74	48.78	43.5	-14.76	11.02	0.84	31.9	251	111	Peak
385.02	20.13	35.12	46	-25.87	14.98	2.03	32	202	256	Peak
559.62	23.35	34	46	-22.65	18.68	2.73	32.06	231	251	Peak
658.56	24.42	32.93	46	-21.58	20.31	3.14	31.96	221	165	Peak
859.35	29.2	34.22	46	-16.8	22.99	3.89	31.9	185	265	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value.
- The emission levels of other frequencies were very low against the limit.

4.2 Conducted Emission Measurement

4.2.1 Limits of Conducted Emission Measurement

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

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

4.2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver ROHDE & SCHWARZ	ESCI	100613	Nov. 23, 2017	Nov. 22, 2018
RF signal cable Woken	5D-FB	Cable-cond1-01	Sep. 05, 2017	Sep. 04, 2018
LISN/AMN ROHDE & SCHWARZ (EUT)	ENV216	101826	Feb. 26, 2018	Feb. 25, 2019
LISN/AMN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Aug. 15, 2017	Aug. 14, 2018
Software ADT	BV ADT_Cond_ V7.3.7.4	NA	NA	NA

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
 2. The test was performed in HwaYa Shielded Room 1.
 3. The VCCI Site Registration No. is C-2040.

4.2.3 Test Procedures

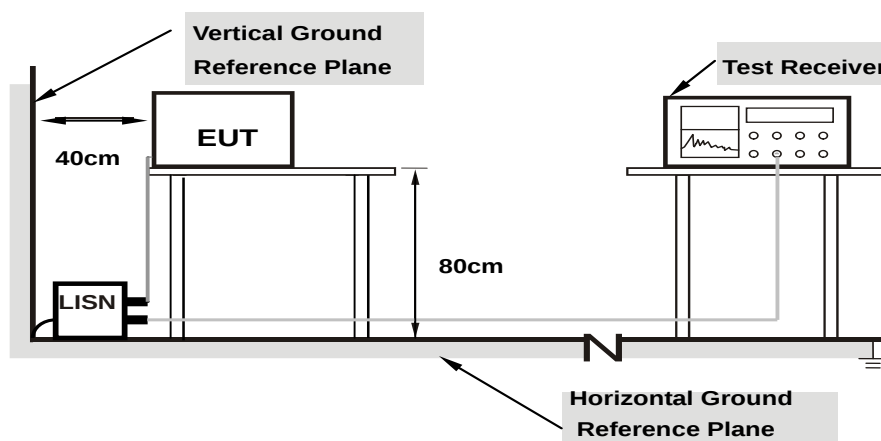
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/50 uH of coupling impedance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

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

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 Test Setup



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

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

4.2.6 EUT Operating Conditions

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

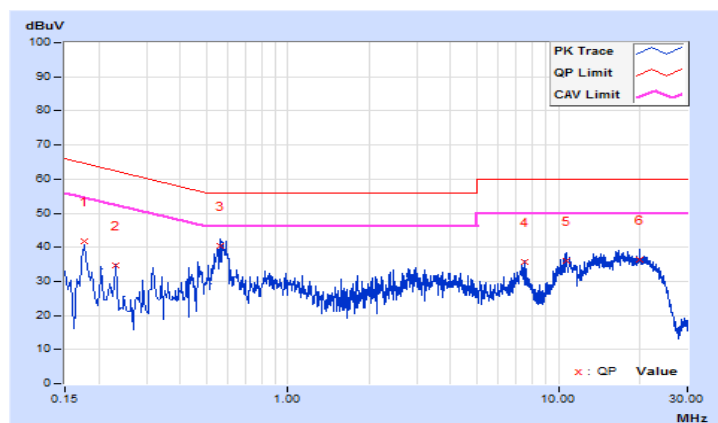
4.2.7 Test Results

Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25°C, 65%RH
Tested by	Jisyong Wang	Test Date	2018/7/21

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	0.17605	9.67	32.05	18.27	41.72	27.94	64.67	54.67	-22.95	-26.73
2	0.23216	9.67	25.11	5.12	34.78	14.79	62.37	52.37	-27.59	-37.58
3	0.56418	9.67	30.83	18.07	40.50	27.74	56.00	46.00	-15.50	-18.26
4	7.47734	9.82	25.95	11.50	35.77	21.32	60.00	50.00	-24.23	-28.68
5	10.66008	9.88	26.02	11.26	35.90	21.14	60.00	50.00	-24.10	-28.86
6	19.99325	9.95	26.39	13.12	36.34	23.07	60.00	50.00	-23.66	-26.93

Remarks:

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

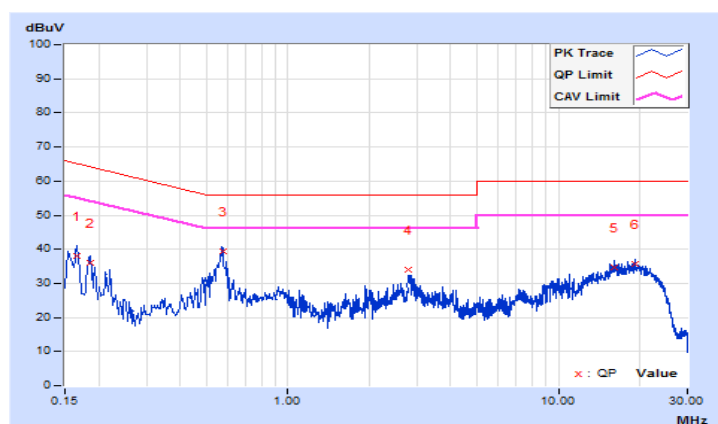


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25°C, 65%RH
Tested by	Jisyong Wang	Test Date	2018/7/21

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	0.16569	9.68	28.50	12.24	38.18	21.92	65.17	55.17	-26.99	-33.25
2	0.18508	9.68	26.42	13.30	36.10	22.98	64.25	54.25	-28.15	-31.27
3	0.57317	9.68	29.73	15.51	39.41	25.19	56.00	46.00	-16.59	-20.81
4	2.78925	9.73	24.28	10.68	34.01	20.41	56.00	46.00	-21.99	-25.59
5	16.17709	9.99	24.79	10.48	34.78	20.47	60.00	50.00	-25.22	-29.53
6	19.28945	10.03	25.57	10.32	35.60	20.35	60.00	50.00	-24.40	-29.65

Remarks:

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

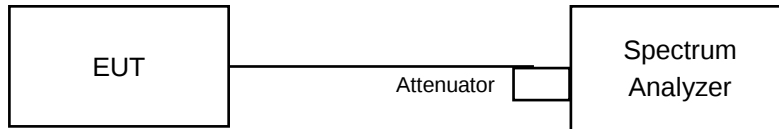


4.3 6 dB Bandwidth Measurement

4.3.1 Limits of 6 dB Bandwidth Measurement

The minimum of 6 dB Bandwidth Measurement is 0.5 MHz.

4.3.2 Test Setup



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedure

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

4.3.5 Deviation from Test Standard

No deviation.

4.3.6 EUT Operating Conditions

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

4.3.7 Test Results

<SISO>

802.11b

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	8.09	0.5	Pass
6	2437	7.60	0.5	Pass
11	2462	7.61	0.5	Pass

802.11g

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	15.13	0.5	Pass
6	2437	15.17	0.5	Pass
11	2462	15.18	0.5	Pass

<MIMO>

802.11n (HT20)

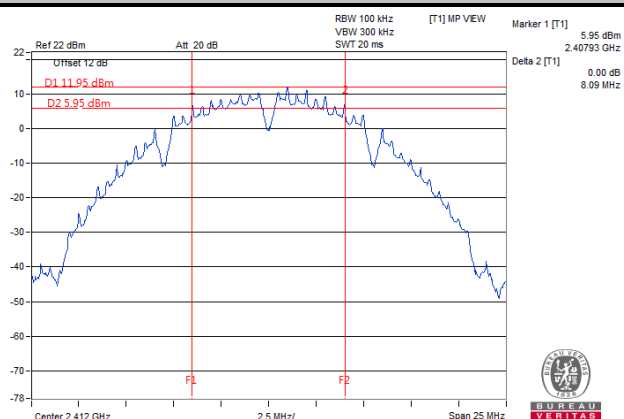
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	15.12	16.32	0.5	Pass
6	2437	15.17	16.31	0.5	Pass
11	2462	15.16	16.27	0.5	Pass

802.11n (HT40)

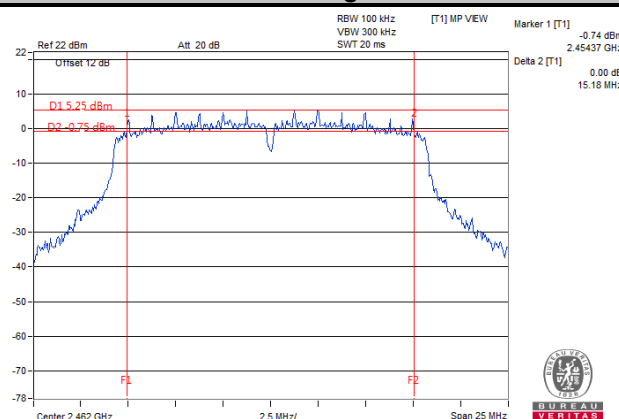
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
3	2422	35.14	35.16	0.5	Pass
6	2437	35.18	35.14	0.5	Pass
9	2452	35.18	35.16	0.5	Pass

Spectrum Plot of Worst Value

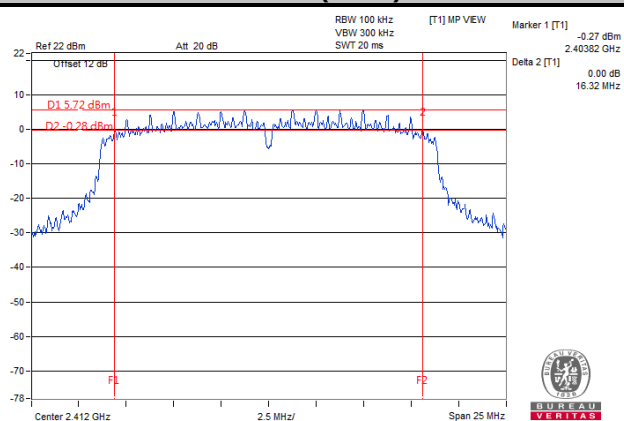
802.11b



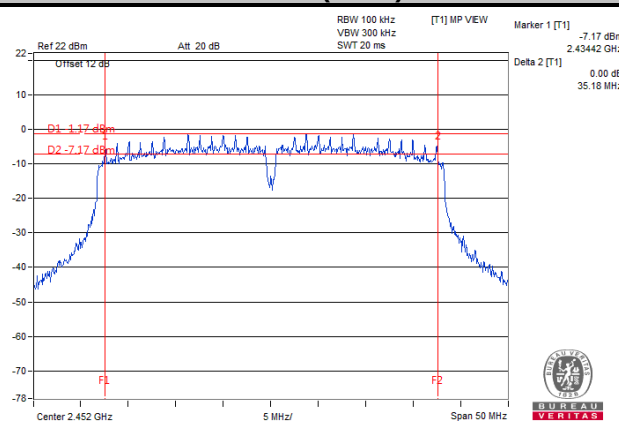
802.11g



802.11n (HT20)



802.11n (HT40)



4.4 Occupied Bandwidth Measurement

4.4.1 Test Setup



4.4.2 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.4.3 Test Procedure

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

4.4.4 Deviation from Test Standard

No deviation.

4.4.5 EUT Operating Conditions

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

4.4.6 Test Results

<SISO>

802.11b

Channel	Frequency (MHz)	Occupied Bandwidth (MHz)	Pass / Fail
1	2412	12.98	Pass
6	2437	12.98	Pass
11	2462	13.08	Pass

802.11g

Channel	Frequency (MHz)	Occupied Bandwidth (MHz)	Pass / Fail
1	2412	16.34	Pass
6	2437	16.34	Pass
11	2462	16.25	Pass

<MIMO>

802.11n (HT20)

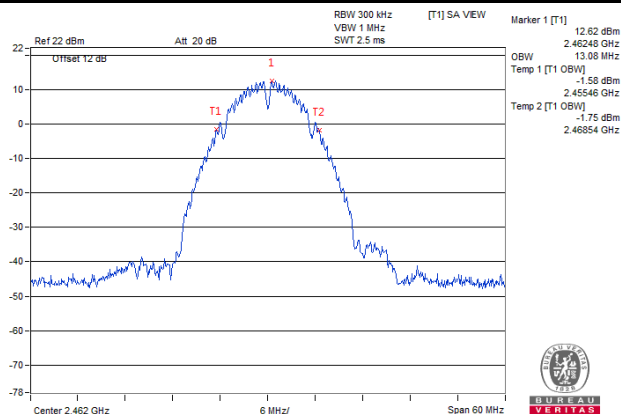
Channel	Frequency (MHz)	Occupied Bandwidth (MHz)		Pass / Fail
		Chain 0	Chain 1	
1	2412	17.50	17.50	Pass
6	2437	17.50	17.79	Pass
11	2462	17.40	17.50	Pass

802.11n (HT40)

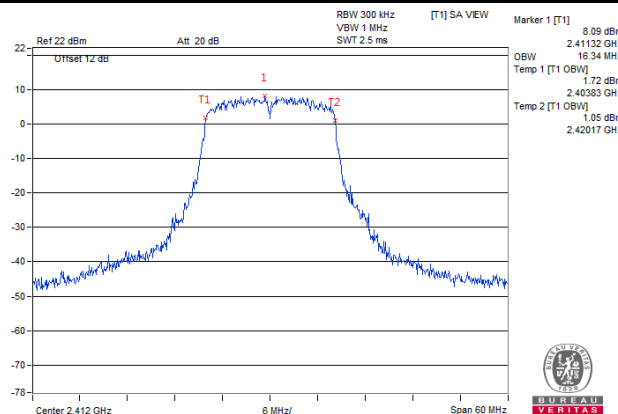
Channel	Frequency (MHz)	Occupied Bandwidth (MHz)		Pass / Fail
		Chain 0	Chain 1	
3	2422	36.06	36.06	Pass
6	2437	36.16	36.25	Pass
9	2452	36.06	36.16	Pass

Spectrum Plot of Worst Value

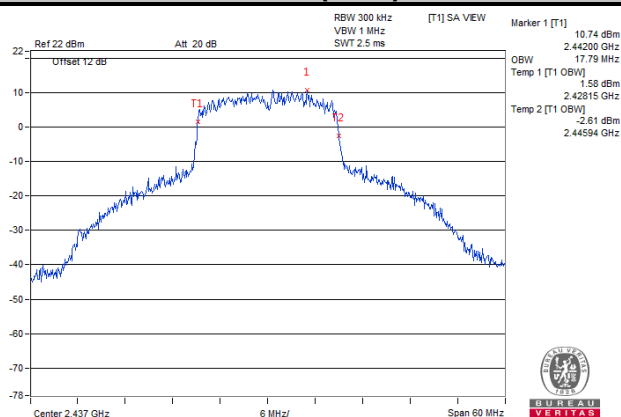
802.11b



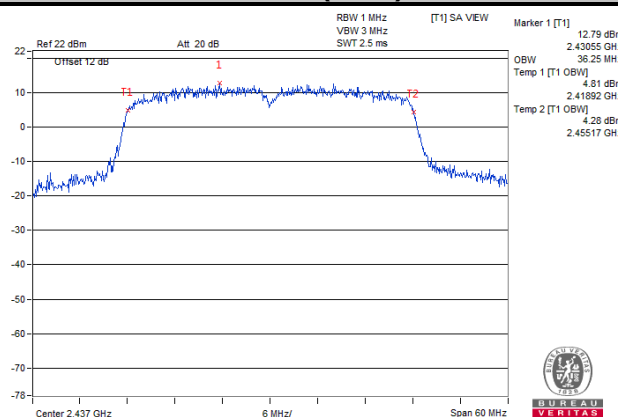
802.11g



802.11n (HT20)



802.11n (HT40)



4.5 Conducted Output Power Measurement

4.5.1 Limits of Conducted Output Power Measurement

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

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

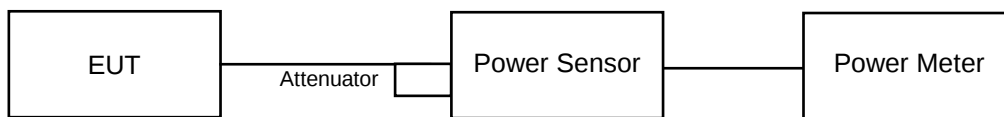
Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;

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

Array Gain = $5 \log(N_{ANT}/N_{SS})$ dB or 3 dB, whichever is less for 20 MHz channel widths with $N_{ANT} \geq 5$.

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

4.5.2 Test Setup



4.5.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.5.4 Test Procedures

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.

4.5.5 Deviation from Test Standard

No deviation.

4.5.6 EUT Operating Conditions

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

4.5.7 Test Results

<SISO>

802.11b

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	171.396	22.34	30	Pass
6	2437	186.638	22.71	30	Pass
11	2462	174.985	22.43	30	Pass

802.11g

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	175.792	22.45	30	Pass
6	2437	229.087	23.60	30	Pass
11	2462	141.906	21.52	30	Pass

<MIMO>

802.11n (HT20)

Channel	Frequency (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	22.24	22.84	359.803	25.56	30	Pass
6	2437	23.57	23.92	474.114	26.76	30	Pass
11	2462	21.43	21.67	285.888	24.56	30	Pass

802.11n (HT40)

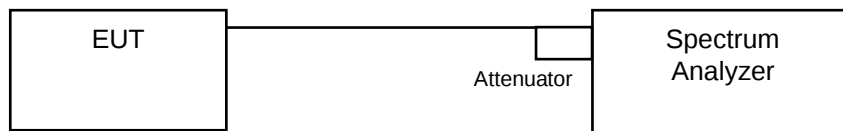
Channel	Frequency (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
3	2422	19.71	19.63	185.374	22.68	30	Pass
6	2437	22.34	22.71	358.034	25.54	30	Pass
9	2452	18.77	18.17	140.951	21.49	30	Pass

4.6 Power Spectral Density Measurement

4.6.1 Limits of Power Spectral Density Measurement

The Maximum of Power Spectral Density Measurement is 8 dBm.

4.6.2 Test Setup



4.6.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.6.4 Test Procedure

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

4.6.5 Deviation from Test Standard

No deviation.

4.6.6 EUT Operating Condition

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

4.6.7 Test Results

<SISO>

802.11b

Channel	Frequency (MHz)	PSD (dBm/3 kHz)	Limit (dBm/3 kHz)	Pass / Fail
1	2412	1.31	8	Pass
6	2437	-1.59	8	Pass
11	2462	-3.93	8	Pass

802.11g

Channel	Frequency (MHz)	PSD (dBm/3 kHz)	Limit (dBm/3 kHz)	Pass / Fail
1	2412	-7.79	8	Pass
6	2437	-5.36	8	Pass
11	2462	-9.01	8	Pass

<MIMO>

802.11n (HT20)

TX Chain	Channel	Freq. (MHz)	PSD (dBm/3 kHz)	10 log (N=2) dB	Total PSD (dBm/3 kHz)	Limit (dBm/3 kHz)	Pass / Fail
0	1	2412	-9.22	3.01	-6.21	8	Pass
	6	2437	-6.28	3.01	-3.27	8	Pass
	11	2462	-14.28	3.01	-11.27	8	Pass
1	1	2412	-8.40	3.01	-5.39	8	Pass
	6	2437	-7.41	3.01	-4.40	8	Pass
	11	2462	-11.24	3.01	-8.23	8	Pass

NOTE: Directional gain = $10\log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / N_{ANT}] = 4.71 \text{ dBi} < 6 \text{ dBi}$, so the limit no need to reduced.

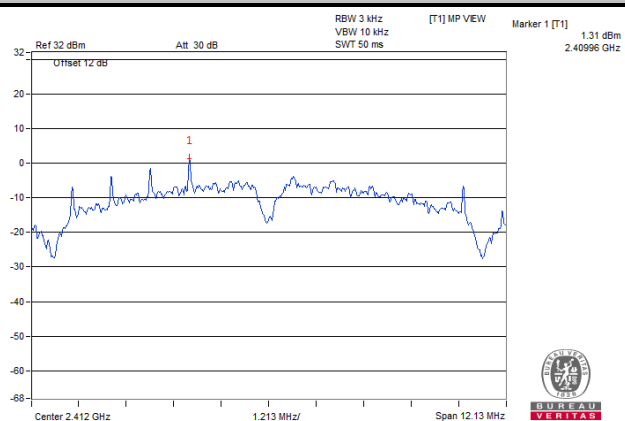
802.11n (HT40)

TX Chain	Channel	Freq. (MHz)	PSD (dBm/3 kHz)	10 log (N=2) dB	Total PSD (dBm/3 kHz)	Limit (dBm/3 kHz)	Pass / Fail
0	3	2422	-16.11	3.01	-13.10	8	Pass
	6	2437	-9.70	3.01	-6.69	8	Pass
	9	2452	-17.35	3.01	-14.34	8	Pass
1	3	2422	-16.41	3.01	-13.40	8	Pass
	6	2437	-10.98	3.01	-7.97	8	Pass
	9	2452	-13.36	3.01	-10.35	8	Pass

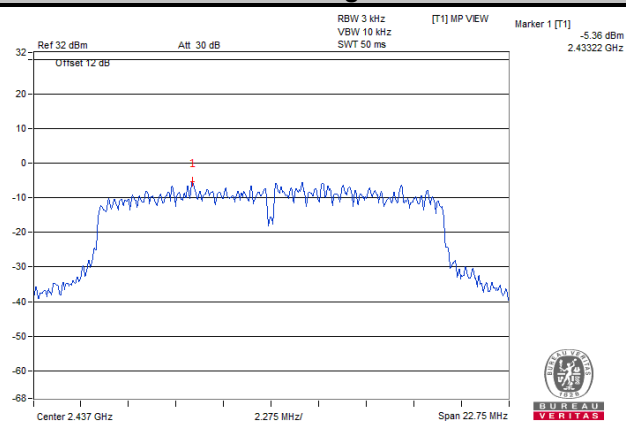
NOTE: Directional gain = $10\log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / N_{ANT}] = 4.71 \text{ dBi} < 6 \text{ dBi}$, so the limit no need to reduced.

Spectrum Plot of Worst Value

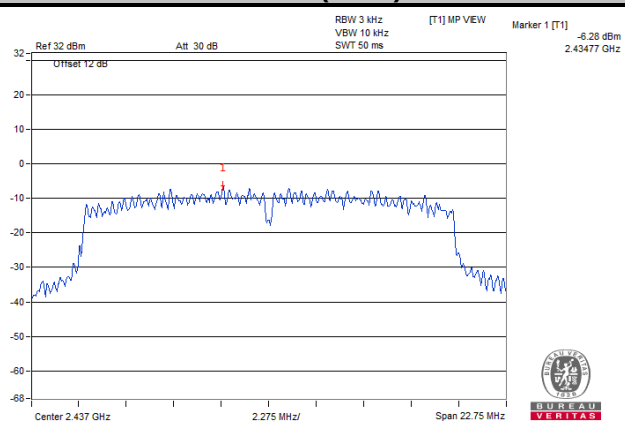
802.11b



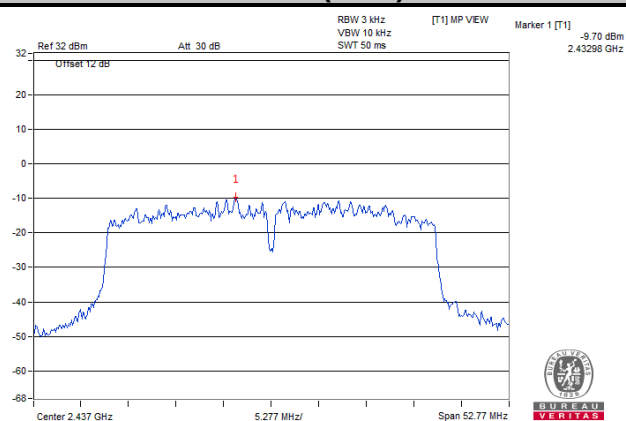
802.11g



802.11n (HT20)



802.11n (HT40)

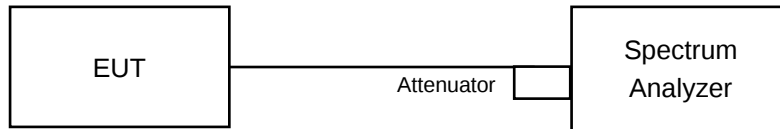


4.7 Conducted Out of Band Emission Measurement

4.7.1 Limits of Conducted Out of Band Emission Measurement

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

4.7.2 Test Setup



4.7.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.7.4 Test Procedure

MEASUREMENT PROCEDURE REF

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

MEASUREMENT PROCEDURE OOB

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

4.7.5 Deviation from Test Standard

No deviation.

4.7.6 EUT Operating Condition

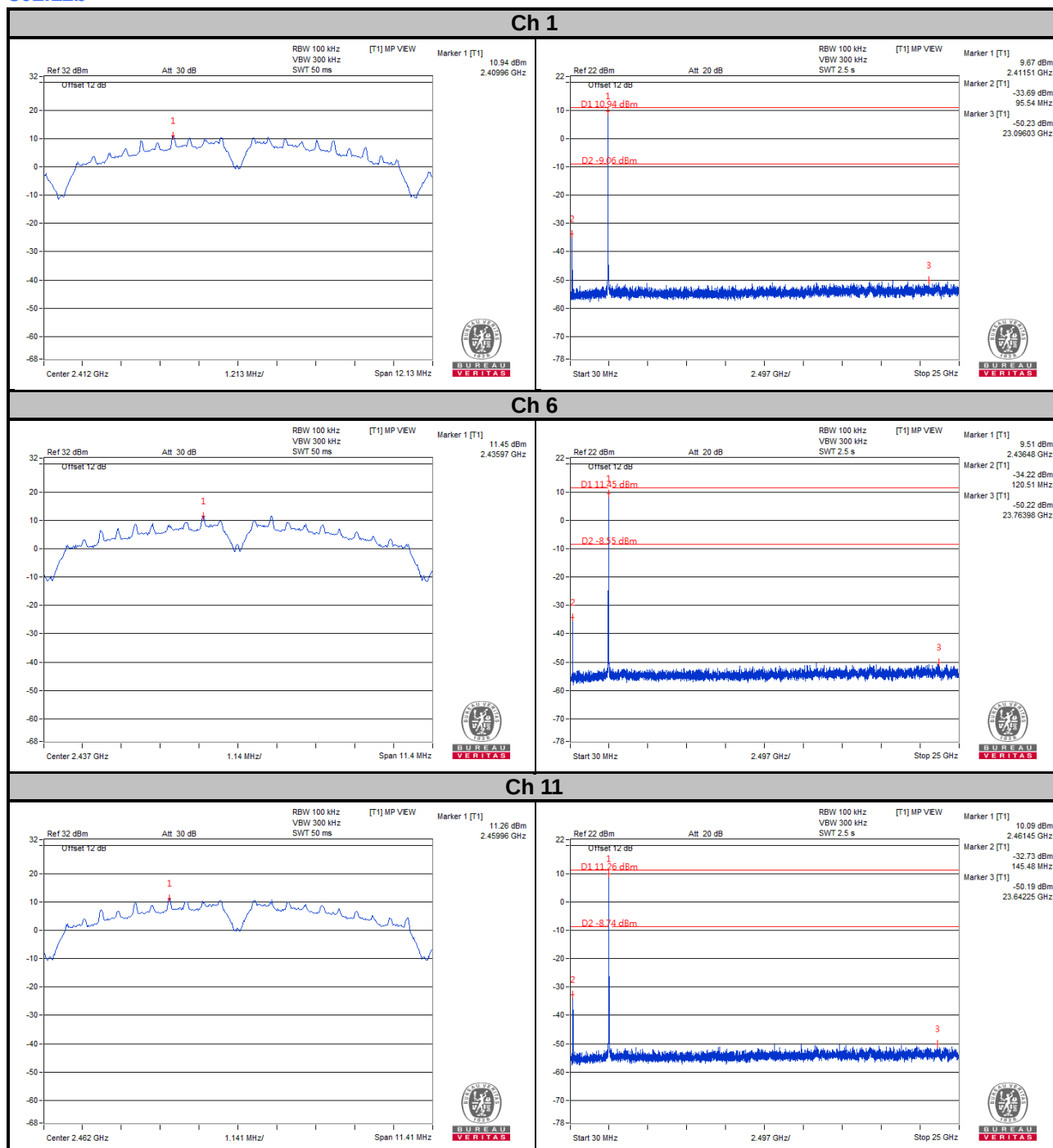
The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

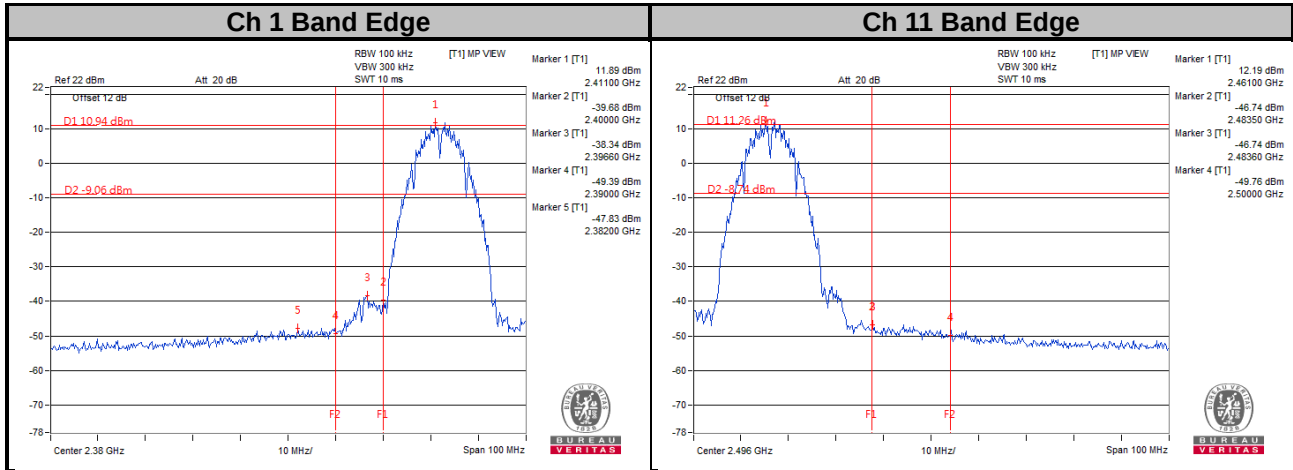
4.7.7 Test Results

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

<SISO>

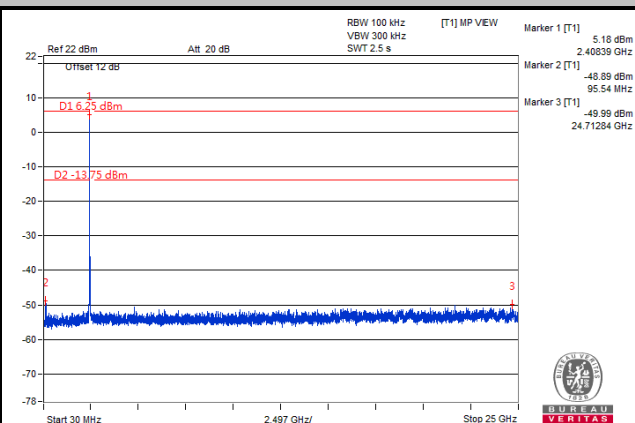
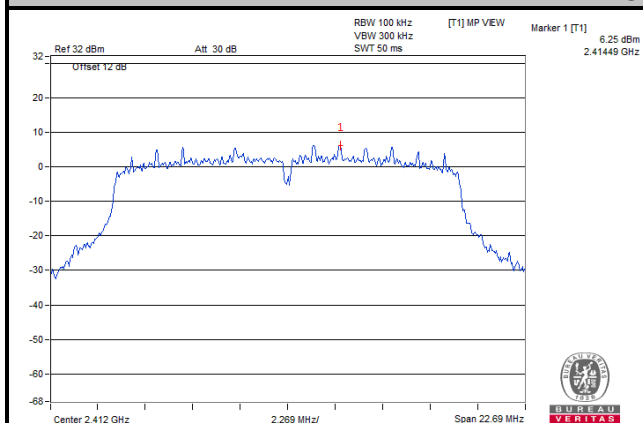
802.11b



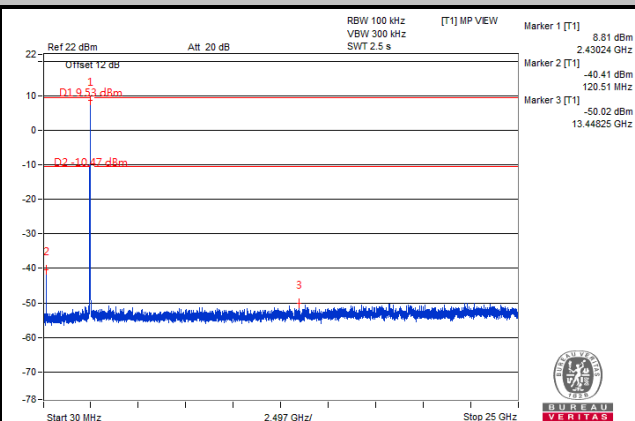
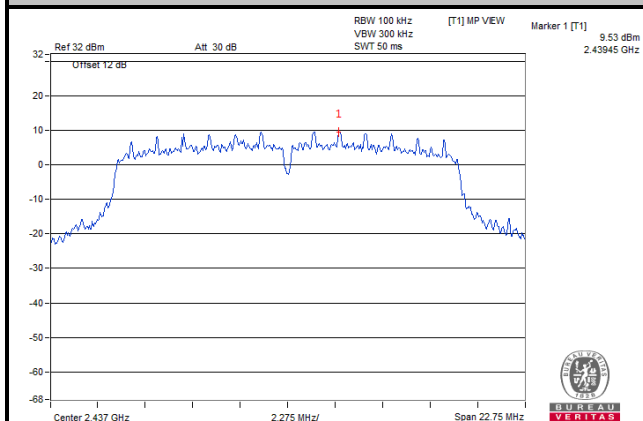


802.11g

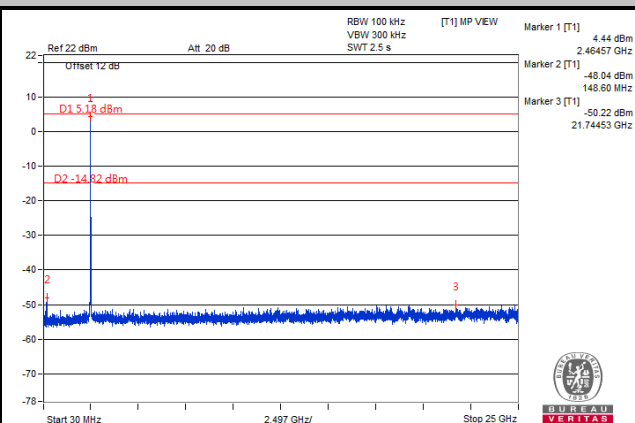
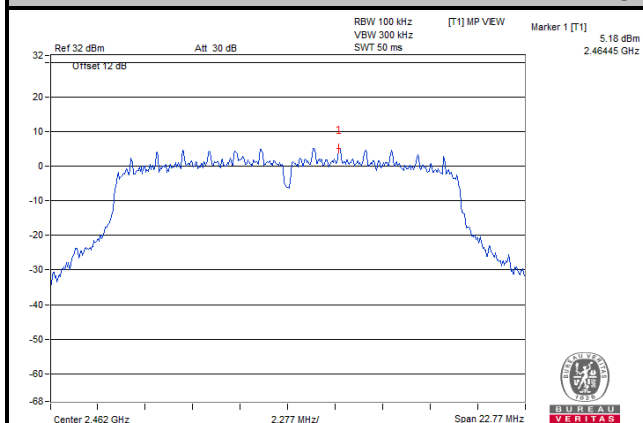
Ch 1

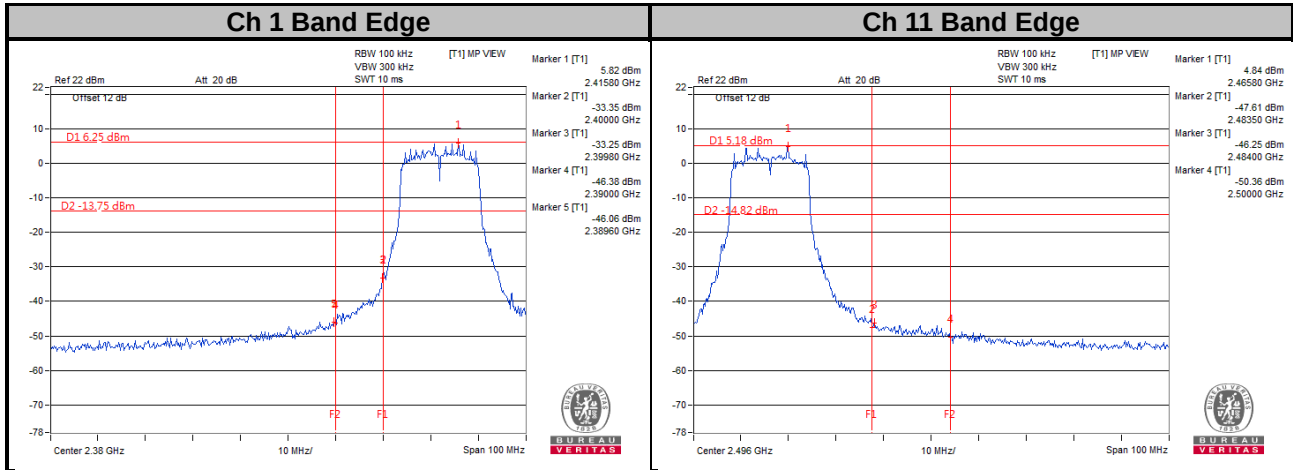


Ch 6



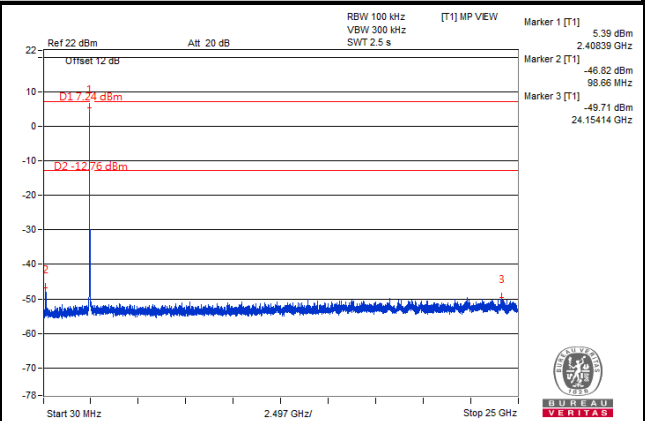
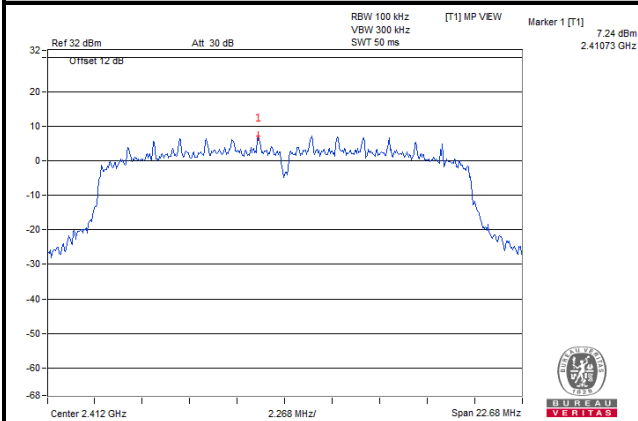
Ch 11



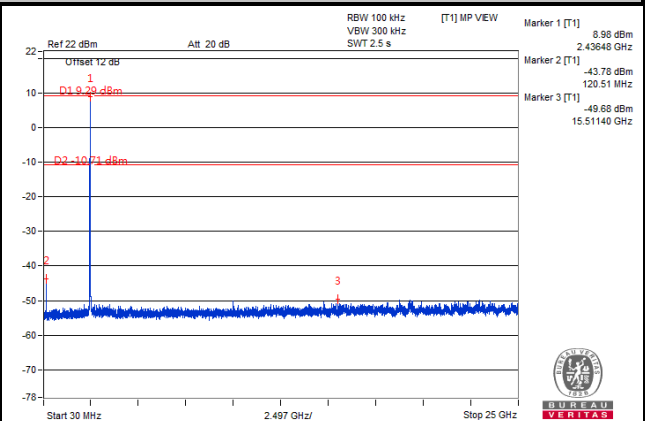
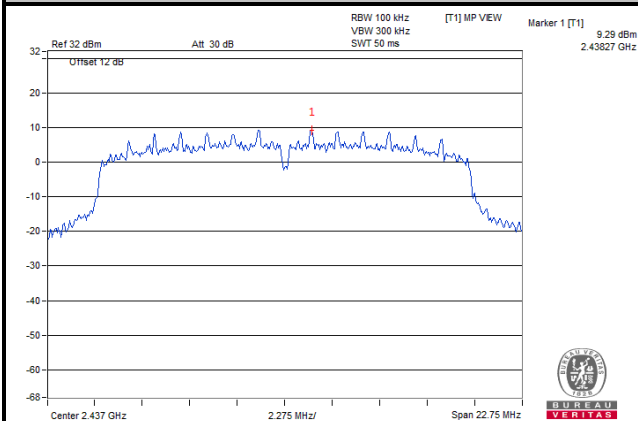


<MIMO>
802.11n (HT20)
CHAIN 0

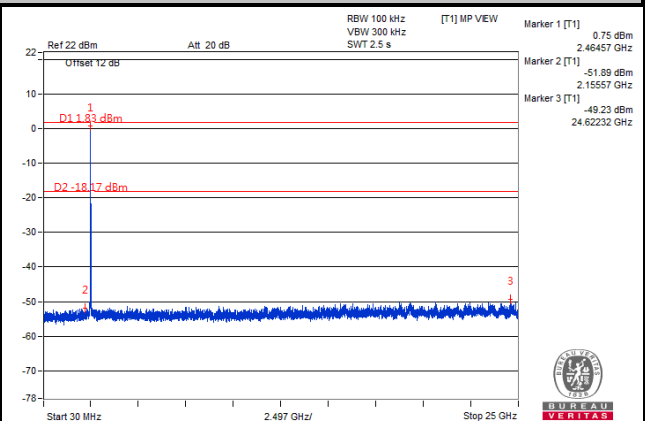
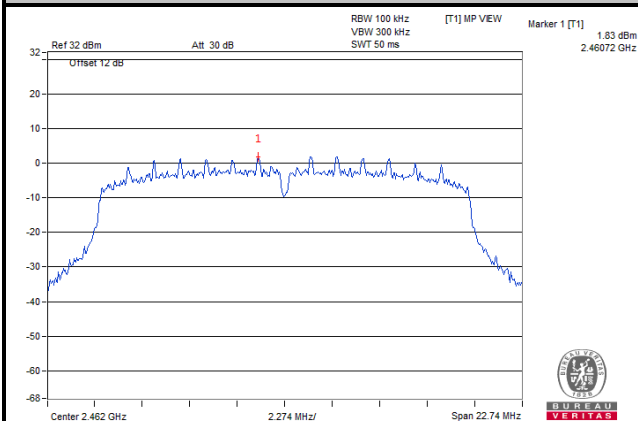
Ch 1

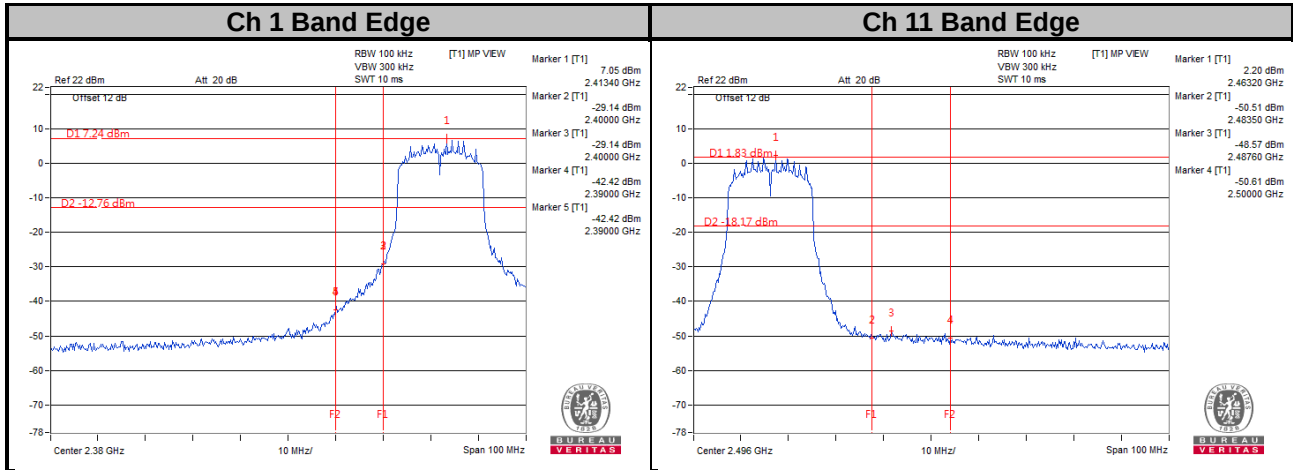


Ch 6



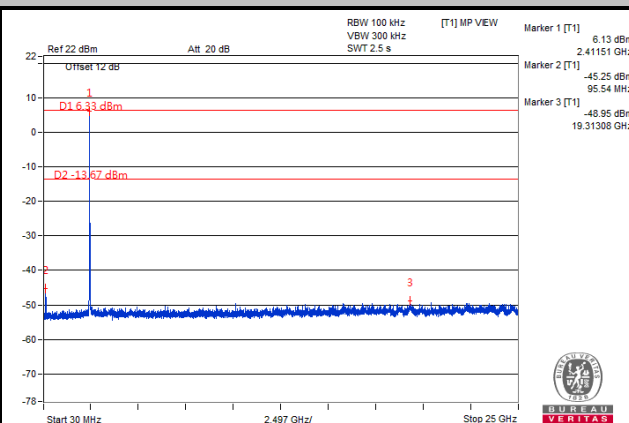
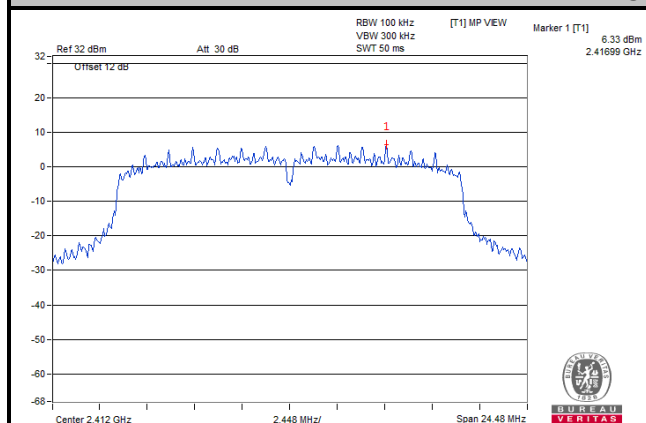
Ch 11



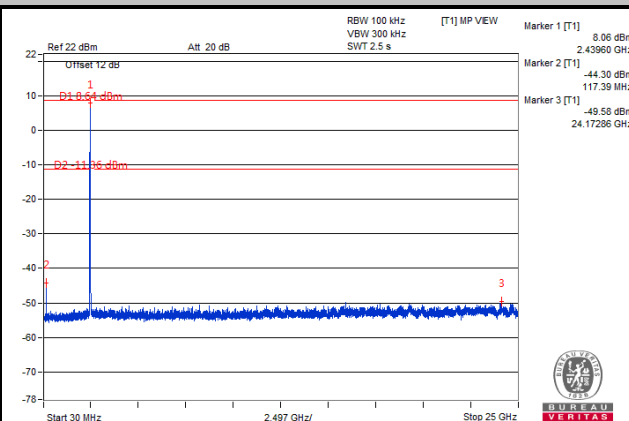
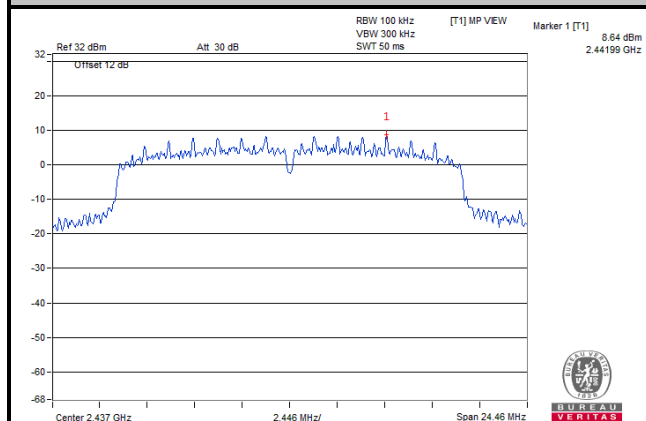


CHAIN 1

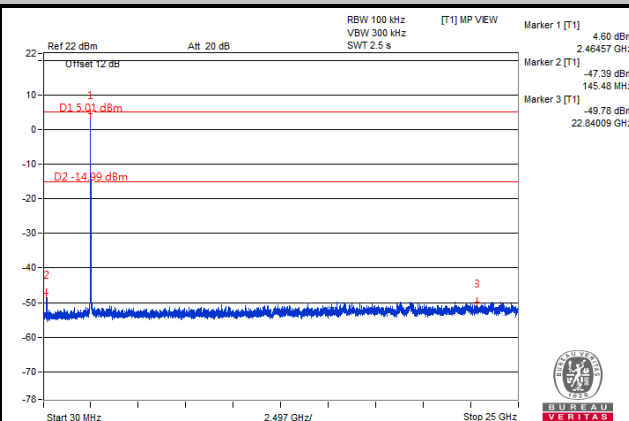
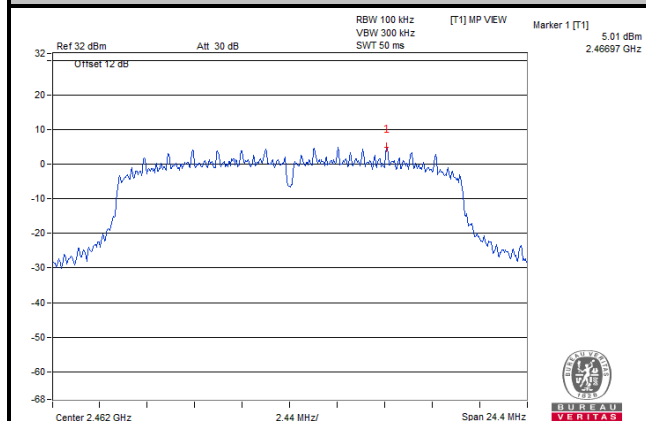
Ch 1

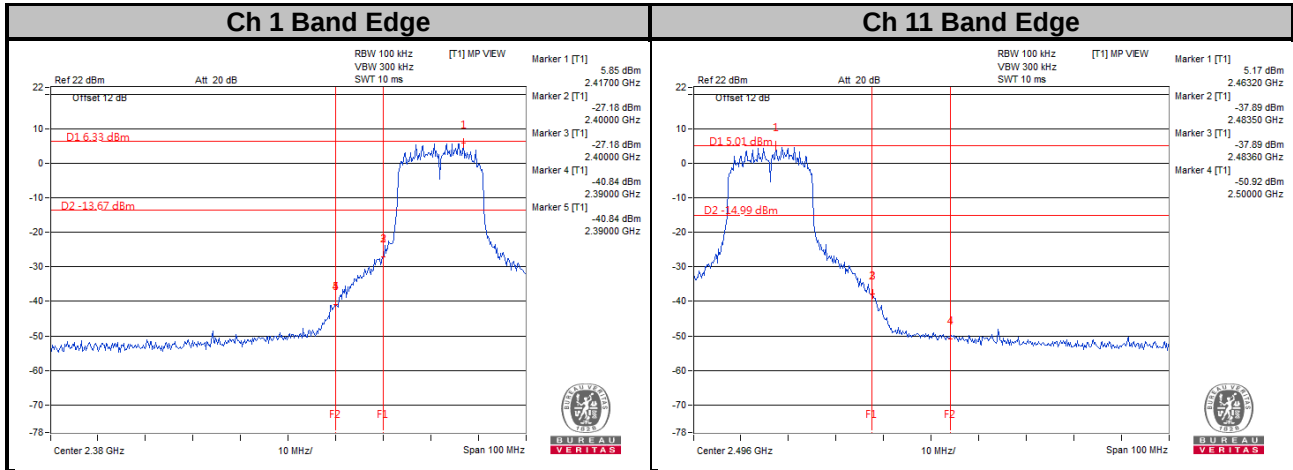


Ch 6



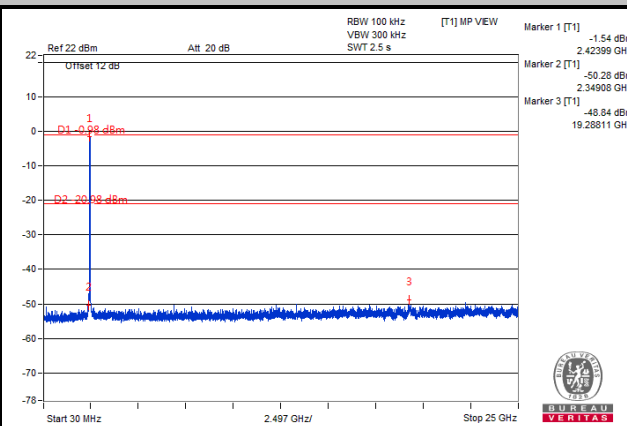
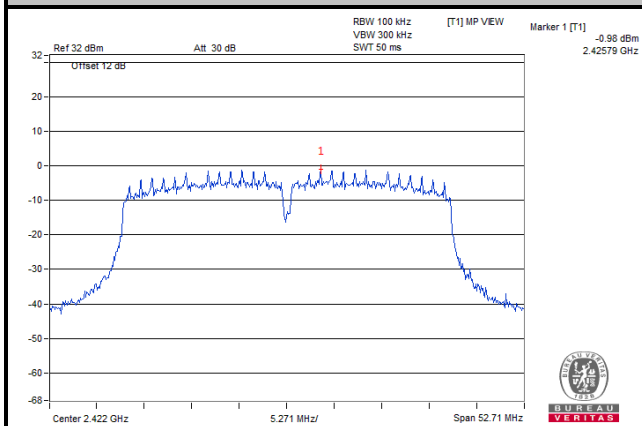
Ch 11



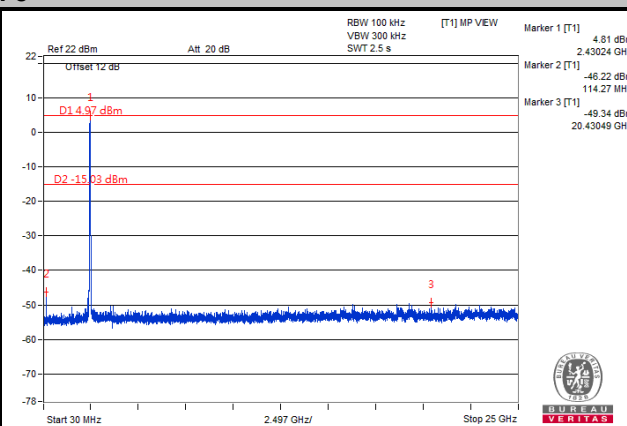
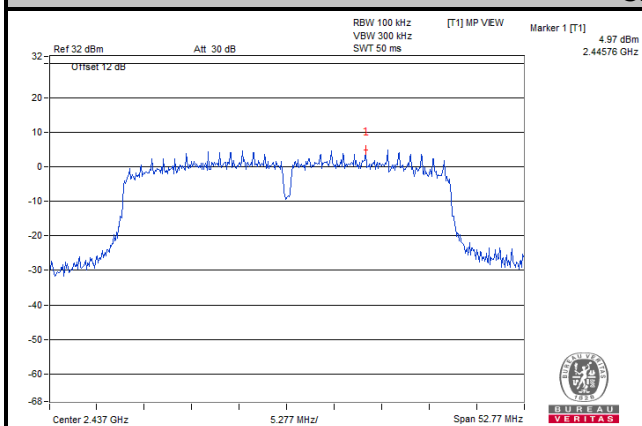


802.11n (HT40) CHAIN 0

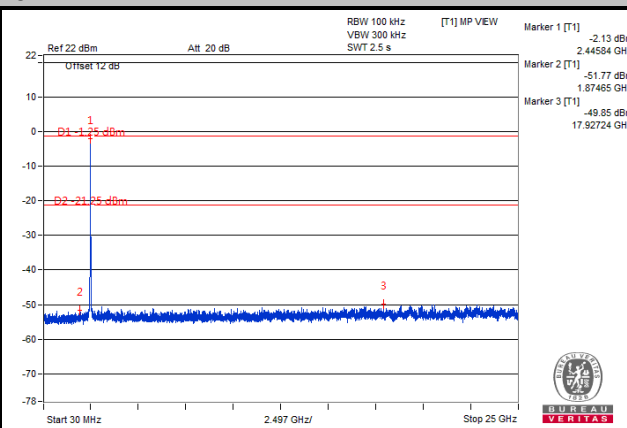
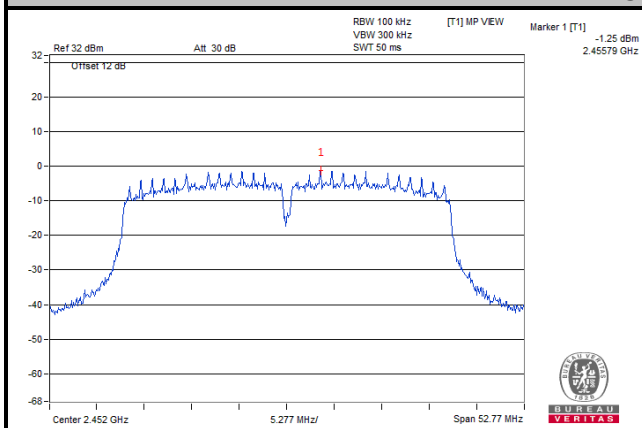
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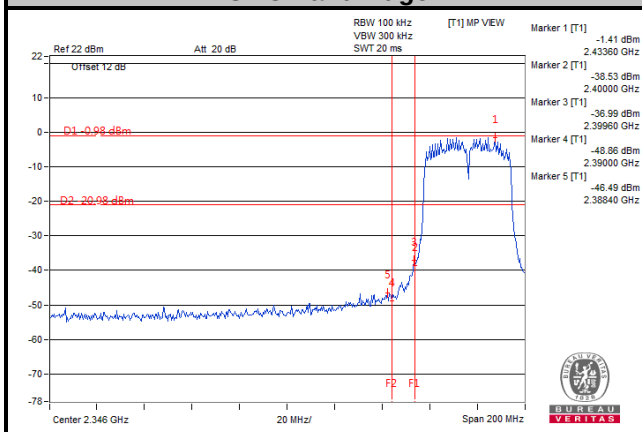
Ch 6



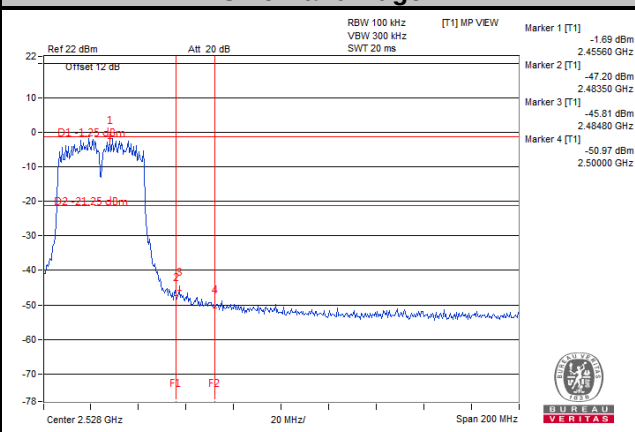
Ch 9



Ch 3 Band Edge

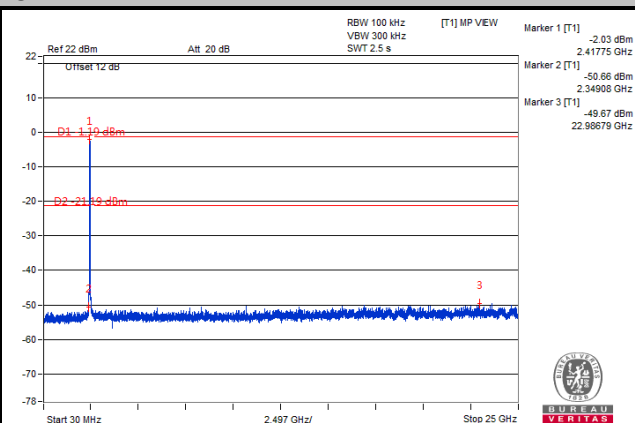
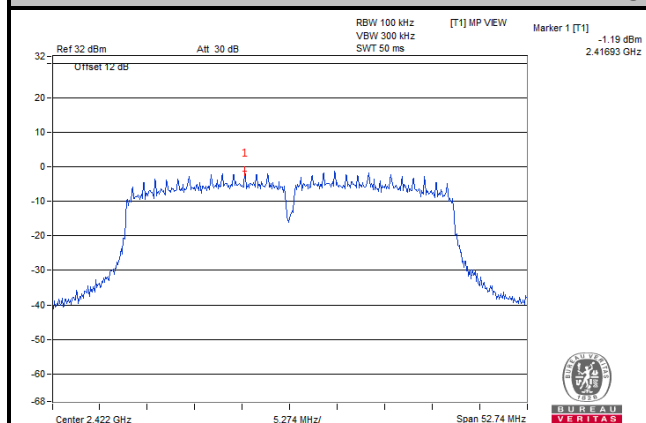


Ch 9 Band Edge

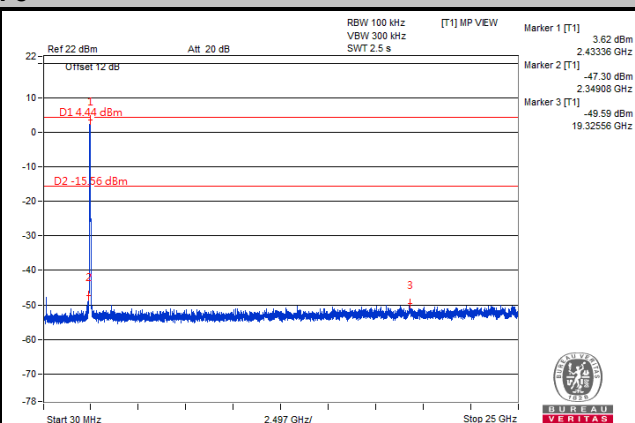
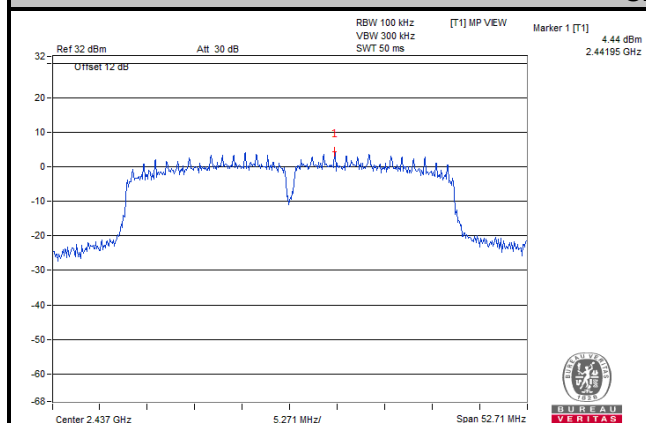


CHAIN 1

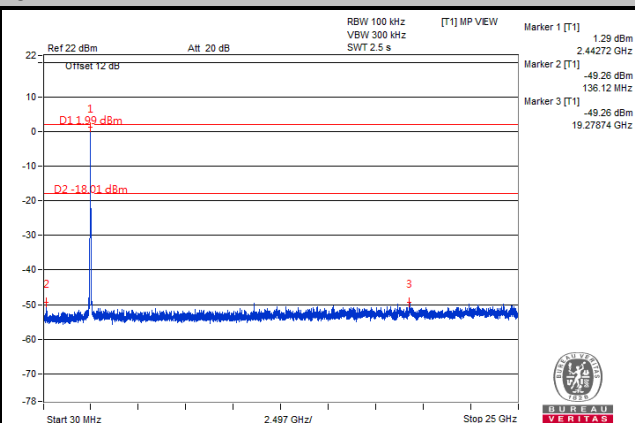
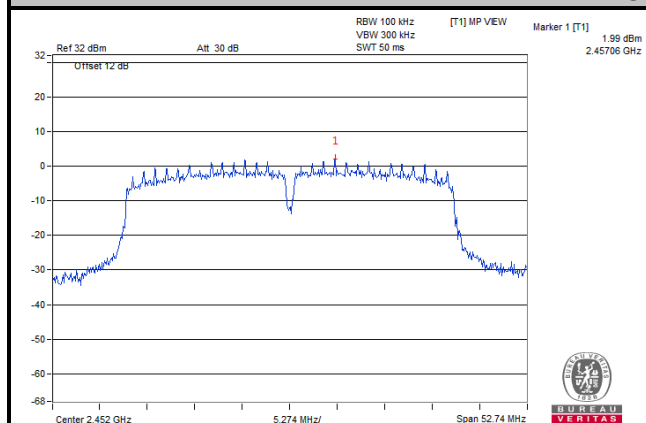
Ch 3

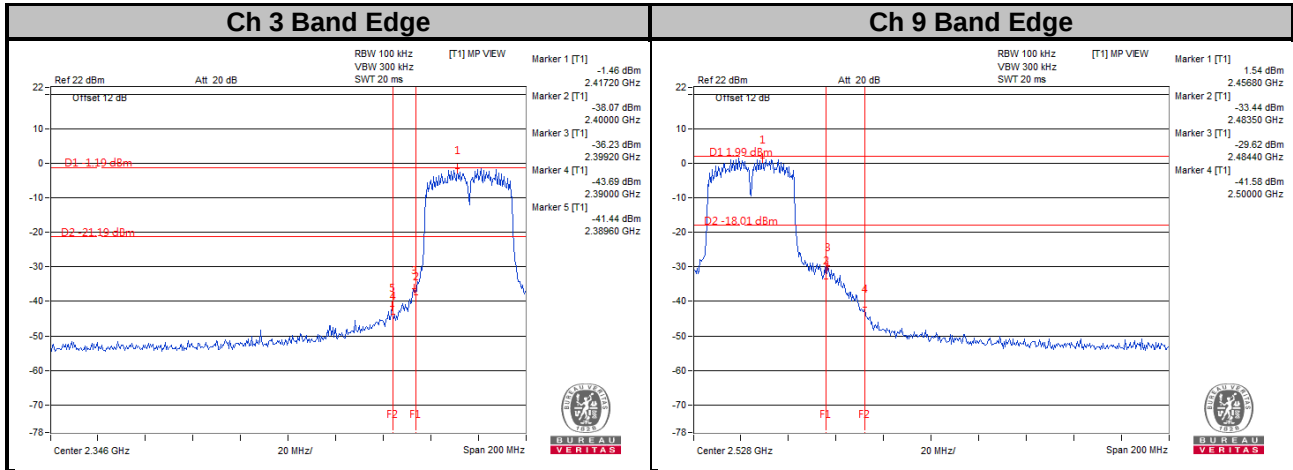


Ch 6



Ch 9





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:

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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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