FCC Test Report

Report No.:	RF180207C11-2
FCC ID:	MSQZ01RD
Test Model:	ASUS_Z01RD / ASUS_Z01RS
Received Date:	Feb. 07, 2018
Test Date:	Feb. 27, 2018 ~ Mar. 19, 2018
Issued Date:	May 02, 2018
Applicant:	ASUSTek COMPUTER INC.
Address:	4F, No. 150, LI-TE Rd., PEITOU, TAIPEI 112, TAIWAN
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Lab Address:	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan (R.O.C)
Test Location (1):	No. 19, Hwa Ya 2nd Rd, Wen Hwa Tsuen, Kwei Shan Hsiang, Taoyuan Hsien 333, Taiwan, R.O.C.
Test Location (2):	No.215, Sec. 3, Beixin Rd., Xindian Dist., New Taipei City 231, Taiwan, R.O.C
FCC Registration / Designation Number:	427177 / TW0011

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Table of Contents

Release Control Record **4**

1 Certificate of Conformity **5**

2 Summary of Test Results **6**

2.1 Measurement Uncertainty 6
2.2 Modification Record 6

3 General Information **7**

3.1 General Description of EUT 7
3.2 Description of Test Modes 8
3.2.1 Test Mode Applicability and Tested Channel Detail 9
3.3 Duty Cycle of Test Signal 11
3.4 Description of Support Units 12
3.4.1 Configuration of System under Test 12
3.5 General Description of Applied Standards 12

4 Test Types and Results **13**

4.1 Radiated Emission and Bandedge Measurement 13
4.1.1 Limits of Radiated Emission and Bandedge Measurement 13
4.1.2 Test Instruments 14
4.1.3 Test Procedures 15
4.1.4 Deviation from Test Standard 15
4.1.5 Test Set Up 16
4.1.6 EUT Operating Conditions 17
4.1.7 Test Results 18
4.2 Conducted Emission Measurement 35
4.2.1 Limits of Conducted Emission Measurement 35
4.2.2 Test Instruments 35
4.2.3 Test Procedures 36
4.2.4 Deviation from Test Standard 36
4.2.5 Test Setup 36
4.2.6 EUT Operating Conditions 36
4.2.7 Test Results 37
4.3 6 dB Bandwidth Measurement 39
4.3.1 Limits of 6 dB Bandwidth Measurement 39
4.3.2 Test Setup 39
4.3.3 Test Instruments 39
4.3.4 Test Procedure 39
4.3.5 Deviation fromTest Standard 39
4.3.6 EUT Operating Conditions 39
4.3.7 Test Result 40
4.4 Occupied Bandwidth Measurement 42
4.4.1 Test Setup 42
4.4.2 Test Instruments 42
4.4.3 Test Procedure 42
4.4.4 Deviation from Test Standard 42
4.4.5 EUT Operating Conditions 42
4.4.6 Test Results 43
4.5 Conducted Output Power Measurement 45
4.5.1 Limits of Conducted Output Power Measurement 45
4.5.2 Test Setup 45
4.5.3 Test Instruments 45
4.5.4 Test Procedures 45
4.5.5 Deviation from Test Standard 45
4.5.6 EUT Operating Conditions 45
4.5.7 Test Results 46

4.6 Power Spectral Density Measurement 47
4.6.1 Limits of Power Spectral Density Measurement 47
4.6.2 Test Setup 47
4.6.3 Test Instruments 47
4.6.4 Test Procedure 47
4.6.5 Deviation from Test Standard 47
4.6.6 EUT Operating Condition 47
4.6.7 Test Results 48
4.7 Conducted Out of Band Emission Measurement 51
4.7.1 Limits of Conducted Out of Band Emission Measurement 51
4.7.2 Test Setup 51
4.7.3 Test Instruments 51
4.7.4 Test Procedure 51
4.7.5 Deviation from Test Standard 51
4.7.6 EUT Operating Condition 51
4.7.7 Test Results 52

5 Pictures of Test Arrangements 70

Appendix – Information on the Testing Laboratories 71

Release Control Record

Issue No.	Description	Date Issued
RF180207C11-2	Original Release	May 02, 2018

1 Certificate of Conformity

Product: ASUS Phone

Brand: ASUS

Test Model: ASUS_Z01RD / ASUS_Z01RS

Sample Status: Production Unit

Applicant: ASUSTek COMPUTER INC.

Test Date: Feb. 27, 2018 ~ Mar. 19, 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:** May 02, 2018

Ivonne Wu / Supervisor

Approved by : _____ , **Date:** May 02, 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 -21.90 dB at 0.15391 MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -1.02 dB at 2483.56 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	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:

The listed uncertainties are the worst case uncertainty for the entire range of measurement. Please note that the uncertainty values are provided for informational purposes only and are not used in determining the PASS/FAIL results.

Measurement	Frequency	Expended 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	2.0153 dB
	200 MHz ~1000 MHz	2.0224 dB
Radiated Emissions above 1 GHz	1 GHz ~ 18 GHz	1.0121 dB
	18 GHz ~ 40 GHz	1.1508 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	ASUS Phone
Brand	ASUS
Test Model	ASUS_Z01RD / ASUS_Z01RS
Status of EUT	Production Unit
Power Supply Rating	5.0 Vdc or 9.0 Vdc (adapter) 5.0 Vdc (host equipment) 3.85 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 MCS15
Operating Frequency	2412 ~ 2472 MHz
Number of Channel	13 for 802.11b, 802.11g, 802.11n (HT20)
Output Power	209.428 mW
Antenna Type	PIFA antenna with -2.4 dBi gain (Main) PIFA antenna with -4.3 dBi gain (Aux.)
Antenna Connector	N/A
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	2TX
802.11g	2TX
802.11n (HT20)	2TX

2. All models are listed as below.

Brand	SKU	Model	Difference
ASUS	WW-5CA	ASUS_Z01RD	Dual SIM
	WW Operator-5CA	ASUS_Z01RS	Single SIM
* The models have the same layout, circuit, and components, but different SIM card slot, therefore, only ASUS_Z01RD was chosen for the final test.			

3. There're 2 configurations for the EUT listed as below.
   Main Sample: EUT + CPU 1 + Rear Camera 1 + Front Camera 1 + UFS 3 + DDR 3
   2nd Sample: EUT + CPU 2 + Rear Camera 2 + Front Camera 2 + UFS 3 + DDR 3
   ✧ Only the worst test data was presented in the report.
4. The EUT's accessories list refers to Ext. Pho.
5. 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

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

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2412	8	2447
2	2417	9	2452
3	2422	10	2457
4	2427	11	2462
5	2432	12	2467
6	2437	13	2472
7	2442		

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable To				Description
	RE≥1G	RE<1G	PLC	APCM	
A	√	√	√	√	Main Sample
B	-	√	-	-	2nd Sample

Where **RE≥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 **Z-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)
A	802.11b	1 to 13	1, 6, 11, 12, 13	DSSS	DBPSK	1.0
	802.11g	1 to 13	1, 6, 11, 12, 13	OFDM	BPSK	6.0
	802.11n (HT20)	1 to 13	1, 6, 11, 12, 13	OFDM	BPSK	13.0

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)
A, B	802.11n (HT20)	1 to 13	13	OFDM	BPSK	13.0

Power Line Conducted Emission Test:

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

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
A	802.11n (HT20)	1 to 13	13	OFDM	BPSK	13.0

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)
A	802.11b	1 to 13	1, 11, 12, 13	DSSS	DBPSK	1.0
	802.11g	1 to 13	1, 11, 12, 13	OFDM	BPSK	6.0
	802.11n (HT20)	1 to 13	1, 11, 12, 13	OFDM	BPSK	13.0

Antenna Port Conducted Measurement:

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

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
A	802.11b	1 to 13	1, 6, 11, 12, 13	DSSS	DBPSK	1.0
	802.11g	1 to 13	1, 6, 11, 12, 13	OFDM	BPSK	6.0
	802.11n (HT20)	1 to 13	1, 6, 11, 12, 13	OFDM	BPSK	13.0

Test Condition:

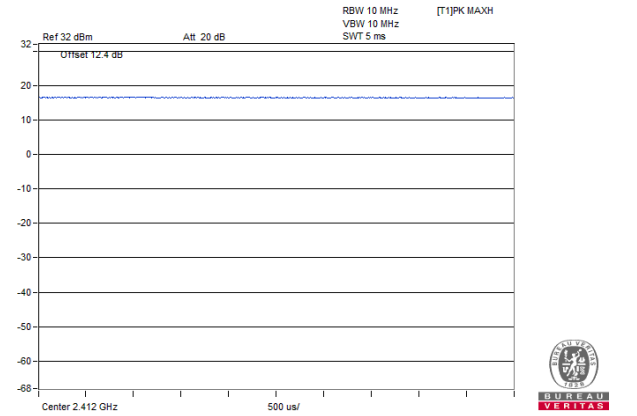
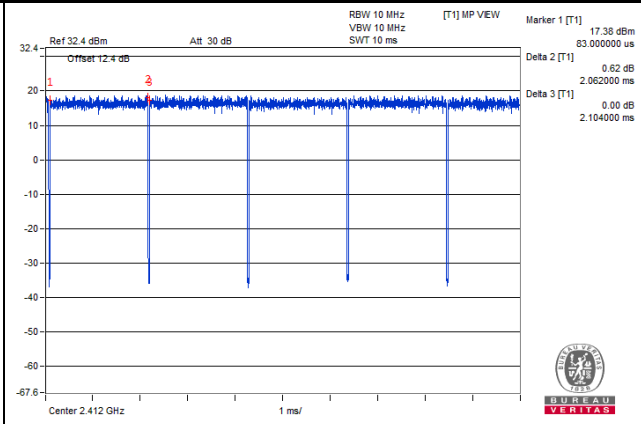
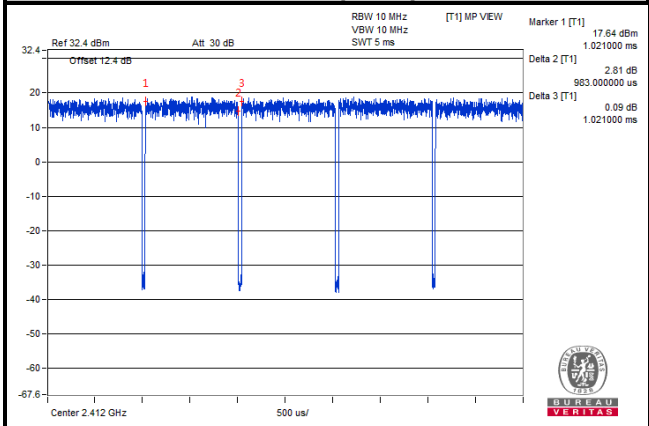
Applicable To	Environmental Conditions	Input Power	Tested by
RE≥1G	25 deg. C, 65 % RH	120 Vac, 60 Hz	Karl Lee
RE<1G	25 deg. C, 65 % RH	120 Vac, 60 Hz	Karl Lee
PLC	25 deg. C, 65 % RH	120 Vac, 60 Hz	Getaz Yang
APCM	25 deg. C, 65 % RH	3.85 Vdc	Vincent Huang

3.3 Duty Cycle of Test Signal

802.11b: Duty cycle of test signal is 100 %

802.11g: Duty cycle of test signal is > 98 %

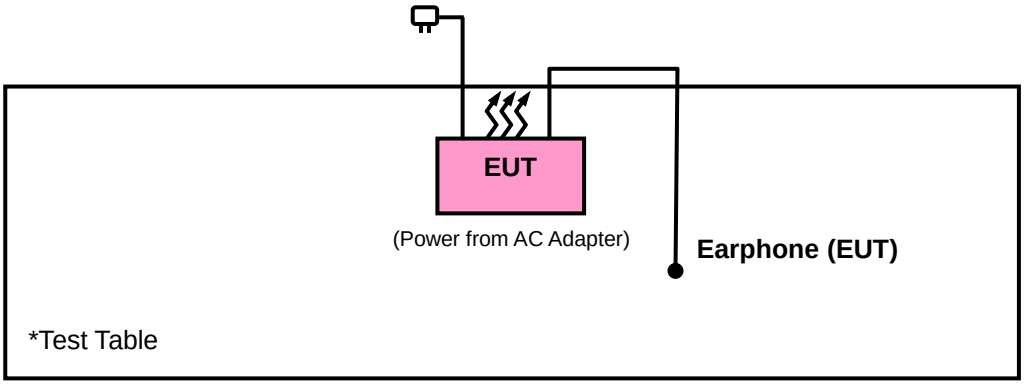
802.11n (HT20): Duty cycle = 983/1021 = 0.963, Duty factor = 10 * log(1/0.963) = 0.16

802.11b	802.11g
	
802.11n (HT20)	
	

3.4 Description of Support Units

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

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)
558074 D01 DTS Meas Guidance v04
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 & Manaufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver Agilent Technologies	N9038A	MY52260177	Jul. 05, 2017	Jul. 04, 2018
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	101261	Jan. 11, 2018	Jan. 10, 2019
Double Ridge Guide Horn Antenna EMCO	3115	5619	Nov. 30, 2017	Nov. 29, 2018
BILOG Antenna SCHWARZBECK	VULB 9168	9168-153	Dec. 06, 2017	Dec. 05, 2018
Fixed Attenuator Mini-Circuits	BW-N10W5+	NA	Jul. 07, 2017	Jul. 06, 2018
Loop Antenna	EM-6879	269	Aug. 11, 2017	Aug. 10, 2018
Preamplifier Agilent	310N	187226	Jun. 23, 2017	Jun. 22, 2018
Preamplifier Agilent	83017A	MY39501357	Jun. 23, 2017	Jun. 22, 2018
Power Meter Anritsu	ML2495A	1012010	Aug. 15, 2017	Aug. 14, 2018
Power Sensor Anritsu	MA2411B	1315050	Aug. 15, 2017	Aug. 14, 2018
RF signal cable ETS-LINDGREN	5D-FB	Cable-CH1-01(RFC-SMS-100-SMS-120+RFC-SMS-100-SMS-400)	Jun. 26, 2017	Jun. 25, 2018
RF signal cable ETS-LINDGREN	8D-FB	Cable-CH1-02(RFC-SMS-100-SMS-24)	Jun. 26, 2017	Jun. 25, 2018
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
Software BV ADT	E3 8.130425b	NA	NA	NA
Antenna Tower MF	NA	NA	NA	NA
Turn Table MF	NA	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 HsinTien Chamber 1.
3. The horn antenna and preamplifier (model: 83017A) are used only for the measurement of emission frequency above 1 GHz if tested.
4. The IC Site Registration No. is IC7450I-1.

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:

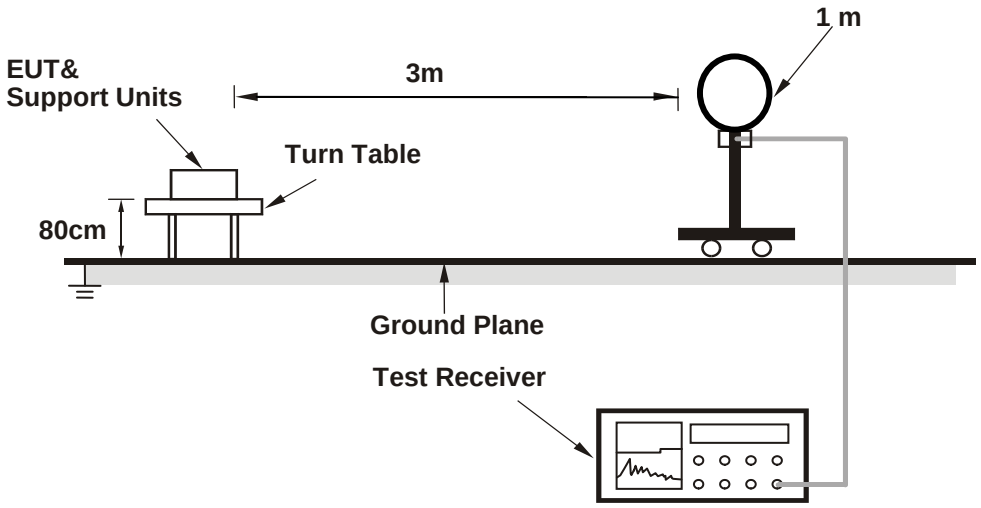
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) at frequency below 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1 GHz.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

4.1.4 Deviation from Test Standard

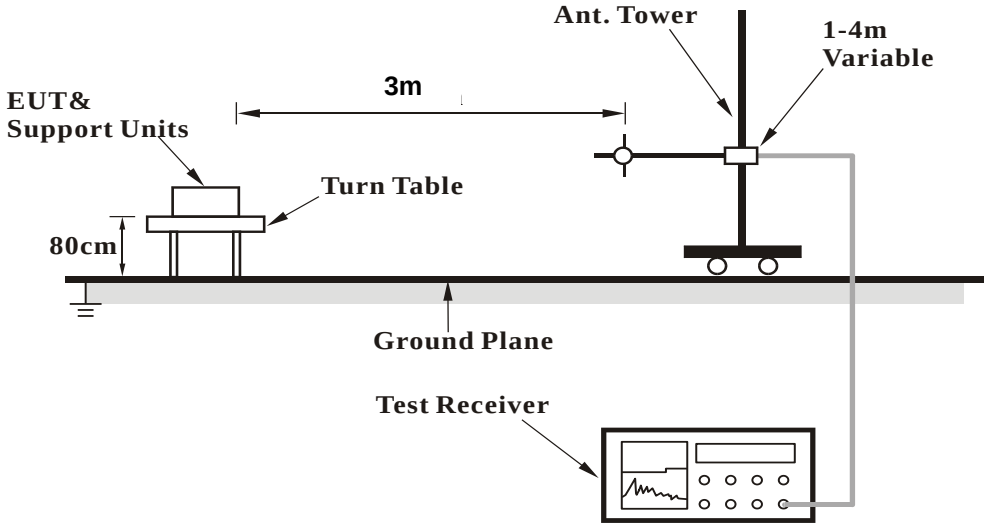
No deviation.

4.1.5 Test Set Up

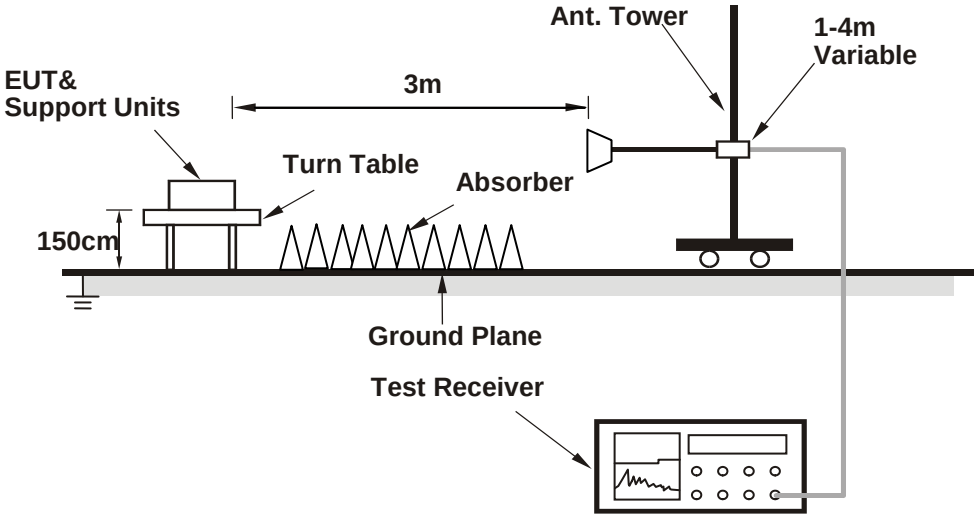
<Radiated Emission below 30 MHz>



<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

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

4.1.7 Test Results

Above 1 GHz Data：

802.11b

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**	Karl Lee

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**
2385.15	40.69	39	54	-13.31	31.78	5.4	35.49	199	28	Average
2385.15	51.83	50.14	74	-22.17	31.78	5.4	35.49	199	28	Peak
2412	101.2	99.43			31.81	5.43	35.47	197	29	Average
2412	104.18	102.41			31.81	5.43	35.47	197	29	Peak
4824	38.42	30.29	54	-15.58	33.97	8.26	34.1	109	231	Average
4824	48.01	39.88	74	-25.99	33.97	8.26	34.1	109	231	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**
2388.12	40.67	38.96	54	-13.33	31.8	5.4	35.49	204	91	Average
2388.12	51.65	49.94	74	-22.35	31.8	5.4	35.49	204	91	Peak
2412	100.1	98.33			31.81	5.43	35.47	204	91	Average
2412	103.44	101.67			31.81	5.43	35.47	204	91	Peak
4824	38.24	30.11	54	-15.76	33.97	8.26	34.1	147	134	Average
4824	47.66	39.53	74	-26.34	33.97	8.26	34.1	147	134	Peak

Remarks:

1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
   Margin value = Emission level – Limit value
2. 2412 MHz: Fundamental frequency.

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**	Karl Lee

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**
2389.02	40.78	39.07	54	-13.22	31.8	5.4	35.49	216	160	Average
2389.02	51.8	50.09	74	-22.2	31.8	5.4	35.49	216	160	Peak
2437	101.07	99.22			31.85	5.46	35.46	216	160	Average
2437	104.18	102.33			31.85	5.46	35.46	216	160	Peak
2485.16	41.26	39.27	54	-12.74	31.88	5.53	35.42	216	160	Average
2485.16	52.17	50.18	74	-21.83	31.88	5.53	35.42	216	160	Peak
4874	38.26	30.07	54	-15.74	33.98	8.27	34.06	164	181	Average
4874	49.59	41.4	74	-24.41	33.98	8.27	34.06	164	181	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**
2389.83	40.58	38.85	54	-13.42	31.8	5.4	35.47	241	93	Average
2389.83	51.11	49.38	74	-22.89	31.8	5.4	35.47	241	93	Peak
2437	100.5	98.65			31.85	5.46	35.46	241	93	Average
2437	103.23	101.38			31.85	5.46	35.46	241	93	Peak
2484.44	41.07	39.08	54	-12.93	31.88	5.53	35.42	241	93	Average
2484.44	51.96	49.97	74	-22.04	31.88	5.53	35.42	241	93	Peak
4874	38.23	30.04	54	-15.77	33.98	8.27	34.06	164	108	Average
4874	47.73	39.54	74	-26.27	33.98	8.27	34.06	164	108	Peak

Remarks:

1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
   Margin value = Emission level – Limit value
2. 2437 MHz: Fundamental frequency.

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**	Karl Lee

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	99.98	98.05			31.87	5.5	35.44	146	158	Average
2462	103.18	101.25			31.87	5.5	35.44	146	158	Peak
2484.76	41.57	39.58	54	-12.43	31.88	5.53	35.42	146	158	Average
2484.76	52.33	50.34	74	-21.67	31.88	5.53	35.42	146	158	Peak
4924	38.41	30.16	54	-15.59	33.99	8.28	34.02	156	293	Average
4924	48.94	40.69	74	-25.06	33.99	8.28	34.02	156	293	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	99.4	97.47			31.87	5.5	35.44	264	93	Average
2462	102.63	100.7			31.87	5.5	35.44	264	93	Peak
2485	41.2	39.21	54	-12.8	31.88	5.53	35.42	264	93	Average
2485	52.42	50.43	74	-21.58	31.88	5.53	35.42	264	93	Peak
4924	38.16	29.91	54	-15.84	33.99	8.28	34.02	124	83	Average
4924	48.4	40.15	74	-25.6	33.99	8.28	34.02	124	83	Peak

Remarks:

1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
   Margin value = Emission level – Limit value
2. 2462 MHz: Fundamental frequency.

EUT Test Condition		Measurement Detail	
Channel	Channel 12	**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**	Karl Lee

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**
2467	99.81	105.25			27.46	4.42	37.32	154	211	Average
2467	103.3	108.74			27.46	4.42	37.32	154	211	Peak
2484.04	46.61	51.97	54	-7.39	27.53	4.43	37.32	156	230	Average
2484.04	53.44	58.8	74	-20.56	27.53	4.43	37.32	156	230	Peak
4934	38.23	53.11	54	-15.77	31.12	6.89	52.89	125	87	Average
4934	48.24	63.12	74	-25.76	31.12	6.89	52.89	125	87	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**
2467	98.73	104.17			27.46	4.42	37.32	190	256	Average
2467	102.23	107.67			27.46	4.42	37.32	190	256	Peak
2483.52	45.2	50.56	54	-8.8	27.53	4.43	37.32	189	255	Average
2483.52	52.54	57.9	74	-21.46	27.53	4.43	37.32	189	255	Peak
4934	38.7	53.58	54	-15.3	31.12	6.89	52.89	155	303	Average
4934	48.8	63.68	74	-25.2	31.12	6.89	52.89	155	303	Peak

Remarks:

1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
   Margin value = Emission level – Limit value
2. 2467 MHz: Fundamental frequency.

EUT Test Condition		Measurement Detail	
Channel	Channel 13	**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**	Karl Lee

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**
2472	97.34	102.71			27.53	4.42	37.32	149	209	Average
2472	101.04	106.41			27.53	4.42	37.32	149	209	Peak
2483.52	52.81	58.17	54	-1.19	27.53	4.43	37.32	147	201	Average
2483.52	62.47	67.83	74	-11.53	27.53	4.43	37.32	147	201	Peak
4944	38.96	53.85	54	-15.04	31.14	6.89	52.92	122	84	Average
4944	48.29	63.18	74	-25.71	31.14	6.89	52.92	122	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**
2472	96.86	102.23			27.53	4.42	37.32	192	255	Average
2472	100.4	105.77			27.53	4.42	37.32	192	255	Peak
2483.52	52.19	57.55	54	-1.81	27.53	4.43	37.32	189	251	Average
2483.52	61.44	66.8	74	-12.56	27.53	4.43	37.32	189	251	Peak
4944	38.09	52.98	54	-15.91	31.14	6.89	52.92	159	295	Average
4944	47.86	62.75	74	-26.14	31.14	6.89	52.92	159	295	Peak

Remarks:

1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
   Margin value = Emission level – Limit value
2. 2472 MHz: Fundamental frequency.

802.11g

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**	Karl Lee

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**
2389.92	43.53	41.8	54	-10.47	31.8	5.4	35.47	230	158	Average
2389.92	54.25	52.52	74	-19.75	31.8	5.4	35.47	230	158	Peak
2412	97.19	95.42			31.81	5.43	35.47	194	158	Average
2412	105.26	103.49			31.81	5.43	35.47	194	158	Peak
4824	38.15	30.02	54	-15.85	33.97	8.26	34.1	164	227	Average
4824	47.35	39.22	74	-26.65	33.97	8.26	34.1	164	227	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**
2389.56	41.77	40.06	54	-12.23	31.8	5.4	35.49	229	105	Average
2389.56	52.43	50.72	74	-21.57	31.8	5.4	35.49	229	105	Peak
2412	96.44	94.67			31.81	5.43	35.47	220	87	Average
2412	104.49	102.72			31.81	5.43	35.47	220	87	Peak
4824	38.3	30.17	54	-15.7	33.97	8.26	34.1	134	172	Average
4824	47.55	39.42	74	-26.45	33.97	8.26	34.1	134	172	Peak

Remarks:

1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
   Margin value = Emission level – Limit value
2. 2412 MHz: Fundamental frequency.

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**	Karl Lee

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**
2389.92	41.91	40.18	54	-12.09	31.8	5.4	35.47	205	147	Average
2389.92	52.46	50.73	74	-21.54	31.8	5.4	35.47	205	147	Peak
2437	98.28	96.43			31.85	5.46	35.46	216	160	Average
2437	106.03	104.18			31.85	5.46	35.46	216	160	Peak
2483.8	41.65	39.69	54	-12.35	31.88	5.5	35.42	216	160	Average
2483.8	52.9	50.94	74	-21.1	31.88	5.5	35.42	216	160	Peak
4874	38.41	30.22	54	-15.59	33.98	8.27	34.06	167	243	Average
4874	47.62	39.43	74	-26.38	33.98	8.27	34.06	167	243	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**
2389.65	41.36	39.65	54	-12.64	31.8	5.4	35.49	241	93	Average
2389.65	52.44	50.73	74	-21.56	31.8	5.4	35.49	241	93	Peak
2437	97.07	95.22			31.85	5.46	35.46	241	93	Average
2437	105.3	103.45			31.85	5.46	35.46	241	93	Peak
2483.76	41.7	39.74	54	-12.3	31.88	5.5	35.42	241	93	Average
2483.76	52.71	50.75	74	-21.29	31.88	5.5	35.42	241	93	Peak
4874	38.25	30.06	54	-15.75	33.98	8.27	34.06	105	333	Average
4874	48.8	40.61	74	-25.2	33.98	8.27	34.06	105	333	Peak

Remarks:

1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
   Margin value = Emission level – Limit value
2. 2437 MHz: Fundamental frequency.

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**	Karl Lee

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	97.57	95.64			31.87	5.5	35.44	146	158	Average
2462	106.11	104.18			31.87	5.5	35.44	146	158	Peak
2483.52	48.35	46.39	54	-5.65	31.88	5.5	35.42	192	157	Average
2483.52	59.59	57.63	74	-14.41	31.88	5.5	35.42	192	157	Peak
4924	38.16	29.91	54	-15.84	33.99	8.28	34.02	196	231	Average
4924	48.05	39.8	74	-25.95	33.99	8.28	34.02	196	231	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	96.91	94.98			31.87	5.5	35.44	264	93	Average
2462	105.01	103.08			31.87	5.5	35.44	264	93	Peak
2483.6	46.84	44.88	54	-7.16	31.88	5.5	35.42	257	83	Average
2483.6	57.9	55.94	74	-16.1	31.88	5.5	35.42	257	83	Peak
4924	38.26	30.01	54	-15.74	33.99	8.28	34.02	132	180	Average
4924	48.83	40.58	74	-25.17	33.99	8.28	34.02	132	180	Peak

Remarks:

1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
   Margin value = Emission level – Limit value
2. 2462 MHz: Fundamental frequency.

EUT Test Condition		Measurement Detail	
Channel	Channel 12	**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**	Karl Lee

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**
2467	97.42	102.86			27.46	4.42	37.32	154	209	Average
2467	104.52	109.96			27.46	4.42	37.32	154	209	Peak
2483.52	52.8	58.16	54	-1.2	27.53	4.43	37.32	156	211	Average
2483.52	67.4	72.76	74	-6.6	27.53	4.43	37.32	156	211	Peak
4934	38.08	52.96	54	-15.92	31.12	6.89	52.89	126	88	Average
4934	48.92	63.8	74	-25.08	31.12	6.89	52.89	126	88	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**
2467	94.25	99.62			27.53	4.42	37.32	192	251	Average
2467	103.15	108.52			27.53	4.42	37.32	192	251	Peak
2483.52	52	57.36	54	-2	27.53	4.43	37.32	195	256	Average
2483.52	66.11	71.47	74	-7.89	27.53	4.43	37.32	195	256	Peak
4934	37.8	52.68	54	-16.2	31.12	6.89	52.89	139	305	Average
4934	47.51	62.39	74	-26.49	31.12	6.89	52.89	139	305	Peak

Remarks:

1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
   Margin value = Emission level – Limit value
2. 2467 MHz: Fundamental frequency.

EUT Test Condition		Measurement Detail	
Channel	Channel 13	**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**	Karl Lee

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**
2472	86.41	91.78			27.53	4.42	37.32	151	214	Average
2472	92.81	98.18			27.53	4.42	37.32	151	214	Peak
2483.52	52.4	57.76	54	-1.6	27.53	4.43	37.32	149	209	Average
2483.52	65.31	70.67	74	-8.69	27.53	4.43	37.32	149	209	Peak
4944	37.98	52.87	54	-16.02	31.14	6.89	52.92	131	95	Average
4944	47.84	62.73	74	-26.16	31.14	6.89	52.92	131	95	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**
2472	83.73	89.1			27.53	4.42	37.32	198	249	Average
2472	91.83	97.2			27.53	4.42	37.32	198	249	Peak
2483.52	51.77	57.13	54	-2.23	27.53	4.43	37.32	201	245	Average
2483.52	63.1	68.46	74	-10.9	27.53	4.43	37.32	201	245	Peak
4944	37.76	52.65	54	-16.24	31.14	6.89	52.92	159	308	Average
4944	47.64	62.53	74	-26.36	31.14	6.89	52.92	159	308	Peak

Remarks:

1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
   Margin value = Emission level – Limit value
2. 2472 MHz: Fundamental frequency.

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**	Karl Lee

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**
2389.83	44.78	43.05	54	-9.22	31.8	5.4	35.47	232	158	Average
2389.83	55.14	53.41	74	-18.86	31.8	5.4	35.47	232	158	Peak
2412	95.24	93.47			31.81	5.43	35.47	194	158	Average
2412	104.74	102.97			31.81	5.43	35.47	194	158	Peak
4824	38.54	30.41	54	-15.46	33.97	8.26	34.1	149	128	Average
4824	47.21	39.08	74	-26.79	33.97	8.26	34.1	149	128	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	43.62	41.89	54	-10.38	31.8	5.4	35.47	220	87	Average
2389.92	53.73	52	74	-20.27	31.8	5.4	35.47	220	87	Peak
2412	94.24	92.47			31.81	5.43	35.47	220	87	Average
2412	103.94	102.17			31.81	5.43	35.47	220	87	Peak
4824	38.2	30.07	54	-15.8	33.97	8.26	34.1	162	123	Average
4824	47.45	39.32	74	-26.55	33.97	8.26	34.1	162	123	Peak

Remarks:

1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
   Margin value = Emission level – Limit value
2. 2412 MHz: Fundamental frequency.

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**	Karl Lee

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**
2388.84	42.36	40.65	54	-11.64	31.8	5.4	35.49	192	160	Average
2388.84	53.27	51.56	74	-20.73	31.8	5.4	35.49	192	160	Peak
2437	97.63	95.78			31.85	5.46	35.46	216	160	Average
2437	106.05	104.2			31.85	5.46	35.46	216	160	Peak
2483.52	41.85	39.89	54	-12.15	31.88	5.5	35.42	216	160	Average
2483.52	52.42	50.46	74	-21.58	31.88	5.5	35.42	216	160	Peak
4874	38.27	30.08	54	-15.73	33.98	8.27	34.06	128	47	Average
4874	48.36	40.17	74	-25.64	33.98	8.27	34.06	128	47	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**
2388.93	41.49	39.78	54	-12.51	31.8	5.4	35.49	241	93	Average
2388.93	52.01	50.3	74	-21.99	31.8	5.4	35.49	241	93	Peak
2437	96.45	94.6			31.85	5.46	35.46	241	93	Average
2437	104.98	103.13			31.85	5.46	35.46	241	93	Peak
2483.8	41.8	39.84	54	-12.2	31.88	5.5	35.42	241	93	Average
2483.8	53.35	51.39	74	-20.65	31.88	5.5	35.42	241	93	Peak
4874	38.24	30.05	54	-15.76	33.98	8.27	34.06	196	305	Average
4874	47.88	39.69	74	-26.12	33.98	8.27	34.06	196	305	Peak

Remarks:

1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
   Margin value = Emission level – Limit value
2. 2437 MHz: Fundamental frequency.

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**	Karl Lee

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	97.15	95.22			31.87	5.5	35.44	146	158	Average
2462	105.61	103.68			31.87	5.5	35.44	146	158	Peak
2483.64	49.05	47.09	54	-4.95	31.88	5.5	35.42	140	158	Average
2483.64	59.87	57.91	74	-14.13	31.88	5.5	35.42	140	158	Peak
4924	38.37	30.12	54	-15.63	33.99	8.28	34.02	156	218	Average
4924	48.53	40.28	74	-25.47	33.99	8.28	34.02	156	218	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	96.61	94.68			31.87	5.5	35.44	264	93	Average
2462	105	103.07			31.87	5.5	35.44	264	93	Peak
2483.52	49.1	47.14	54	-4.9	31.88	5.5	35.42	242	73	Average
2483.52	59.89	57.93	74	-14.11	31.88	5.5	35.42	242	73	Peak
4924	38.31	30.06	54	-15.69	33.99	8.28	34.02	127	161	Average
4924	47.46	39.21	74	-26.54	33.99	8.28	34.02	127	161	Peak

Remarks:

1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
   Margin value = Emission level – Limit value
2. 2462 MHz: Fundamental frequency.

EUT Test Condition		Measurement Detail	
Channel	Channel 12	**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**	Karl Lee

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**
2467	94.28	99.72			27.46	4.42	37.32	152	214	Average
2467	103.45	108.89			27.46	4.42	37.32	152	214	Peak
2483.52	52.69	58.05	54	-1.31	27.53	4.43	37.32	151	219	Average
2483.52	67.03	72.39	74	-6.97	27.53	4.43	37.32	151	219	Peak
4934	37.11	51.99	54	-16.89	31.12	6.89	52.89	128	91	Average
4934	47.21	62.09	74	-26.79	31.12	6.89	52.89	128	91	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**
2467	92.62	98.06			27.46	4.42	37.32	198	248	Average
2467	101.45	106.89			27.46	4.42	37.32	198	248	Peak
2483.52	51.03	56.39	54	-2.97	27.53	4.43	37.32	195	234	Average
2483.52	64.22	69.58	74	-9.78	27.53	4.43	37.32	195	234	Peak
4934	37.99	52.87	54	-16.01	31.12	6.89	52.89	159	308	Average
4934	47.04	61.92	74	-26.96	31.12	6.89	52.89	159	308	Peak

Remarks:

1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
   Margin value = Emission level – Limit value
2. 2467 MHz: Fundamental frequency.

EUT Test Condition		Measurement Detail	
Channel	Channel 13	**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**	Karl Lee

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**
2472	84.41	89.78			27.53	4.42	37.32	151	214	Average
2472	90.81	96.18			27.53	4.42	37.32	151	214	Peak
2483.56	52.98	58.34	54	-1.02	27.53	4.43	37.32	153	208	Average
2483.56	69.34	74.7	74	-4.66	27.53	4.43	37.32	153	208	Peak
4944	37.09	51.98	54	-16.91	31.14	6.89	52.92	124	92	Average
4944	47.32	62.21	74	-26.68	31.14	6.89	52.92	124	92	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**
2472	80.56	85.93			27.53	4.42	37.32	192	253	Average
2472	88.61	93.98			27.53	4.42	37.32	192	253	Peak
2483.52	51.64	57	54	-2.36	27.53	4.43	37.32	189	246	Average
2483.52	66.95	72.31	74	-7.05	27.53	4.43	37.32	189	246	Peak
4944	38	52.89	54	-16	31.14	6.89	52.92	149	311	Average
4944	47.31	62.2	74	-26.69	31.14	6.89	52.92	149	311	Peak

Remarks:

1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
   Margin value = Emission level – Limit value
2. 2472 MHz: Fundamental frequency.

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:

802.11n (HT20)

<Model A>

EUT Test Condition		Measurement Detail	
Channel	Channel 13	**Frequency Range**	30 MHz ~ 1 GHz
Input Power	120 Vac, 60 Hz	**Detector Function**	Peak (PK) Quasi-peak (QP)
Environmental Conditions	25 deg. C, 65 % RH	**Tested By**	Karl Lee

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**
77.25	24	46.78	40	-16	8.33	1.11	32.22	163	208	Peak
145.02	24.63	47.15	43.5	-18.87	8.37	1.38	32.27	196	354	Peak
231.69	23.88	42.38	46	-22.12	11.82	1.85	32.17	147	131	Peak
420.4	13.64	28.19	46	-32.36	15.23	2.41	32.19	168	312	Peak
759.9	19.67	28.67	46	-26.33	19.91	3.22	32.13	131	204	Peak
871.9	21.21	28.17	46	-24.79	21.26	3.44	31.66	195	262	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**
86.7	27.26	48.62	40	-12.74	9.44	1.11	31.91	129	134	Peak
173.64	18.02	39.33	43.5	-25.48	9.32	1.61	32.24	167	253	Peak
260.04	19.9	37.57	46	-26.1	12.49	1.94	32.1	151	240	Peak
348.3	13.23	28.92	46	-32.77	14.19	2.19	32.07	126	342	Peak
621.3	17.51	28.6	46	-28.49	18.15	2.93	32.17	149	127	Peak
786.5	21.49	30.1	46	-24.51	20.2	3.27	32.08	121	113	Peak

Remarks:

1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
   Margin value = Emission level – Limit value

<Model B>

EUT Test Condition		Measurement Detail	
Channel	Channel 13	**Frequency Range**	30 MHz ~ 1 GHz
Input Power	120 Vac, 60 Hz	**Detector Function**	Peak (PK) Quasi-peak (QP)
Environmental Conditions	25 deg. C, 65 % RH	**Tested By**	Karl Lee

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**
77.25	24	46.78	40	-16	8.33	1.11	32.22	163	208	Peak
145.02	24.63	47.15	43.5	-18.87	8.37	1.38	32.27	196	354	Peak
231.69	23.88	42.38	46	-22.12	11.82	1.85	32.17	147	131	Peak
420.4	13.64	28.19	46	-32.36	15.23	2.41	32.19	168	312	Peak
759.9	19.67	28.67	46	-26.33	19.91	3.22	32.13	131	204	Peak
871.9	21.21	28.17	46	-24.79	21.26	3.44	31.66	195	262	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**
86.7	27.26	48.62	40	-12.74	9.44	1.11	31.91	129	134	Peak
173.64	18.02	39.33	43.5	-25.48	9.32	1.61	32.24	167	253	Peak
260.04	19.9	37.57	46	-26.1	12.49	1.94	32.1	151	240	Peak
348.3	13.23	28.92	46	-32.77	14.19	2.19	32.07	126	342	Peak
621.3	17.51	28.6	46	-28.49	18.15	2.93	32.17	149	127	Peak
786.5	21.49	30.1	46	-24.51	20.2	3.27	32.08	121	113	Peak

Remarks:

1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
   Margin value = Emission level – Limit value

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 & Manaufacturer	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 (with 10dB PAD) Woken	5D-FB	Cable-cond1-01	Sep. 05, 2017	Sep. 04, 2018
LISN/AMN ROHDE & SCHWARZ (EUT)	ESH3-Z5	835239/001	Mar. 06, 2018	Mar. 05, 2019
LISN/AMN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Aug. 15, 2017	Aug. 14, 2018
Software ADT	BV ADT_Cond_ V7.3.7.3	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

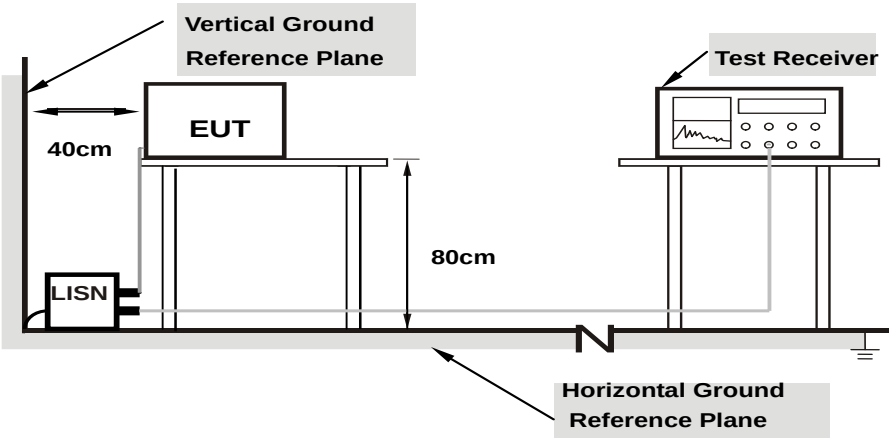
a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/50 uH of coupling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

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

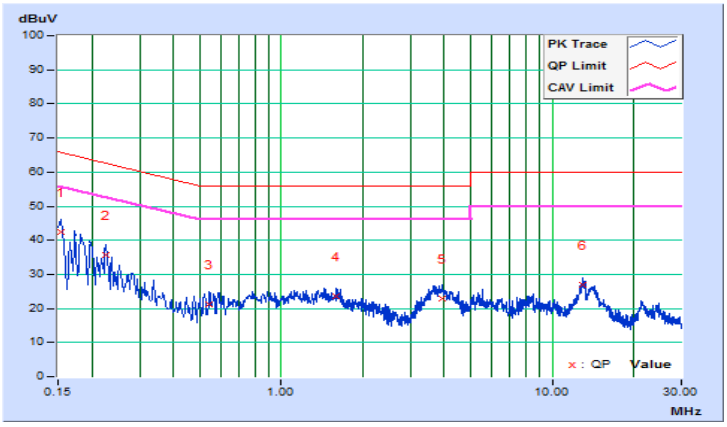
4.2.7 Test Results

Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25℃, 65%RH
Tested by	Getaz Yang	Test Date	2018/2/27

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	0.15391	10.10	32.48	18.99	42.58	29.09	65.79	55.79	-23.21	-26.70
2	0.22434	10.11	25.70	11.72	35.81	21.83	62.66	52.66	-26.85	-30.83
3	0.54089	10.12	11.18	9.94	21.30	20.06	56.00	46.00	-34.70	-25.94
4	1.59670	10.17	13.25	7.73	23.42	17.90	56.00	46.00	-32.58	-28.10
5	3.92315	10.28	12.50	7.42	22.78	17.70	56.00	46.00	-33.22	-28.30
6	12.97871	10.80	16.27	3.39	27.07	14.19	60.00	50.00	-32.93	-35.81

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

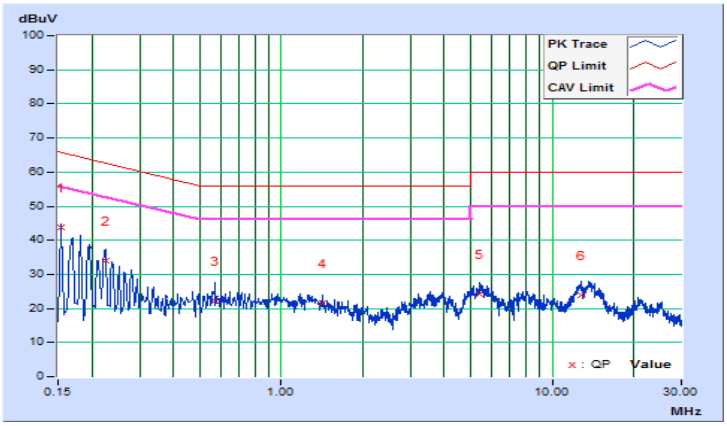


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25℃, 65%RH
Tested by	Getaz Yang	Test Date	2018/2/27

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	0.15391	10.10	33.79	20.68	43.89	30.78	65.79	55.79	-21.90	-25.01
2	0.22434	10.11	23.82	11.26	33.93	21.37	62.66	52.66	-28.73	-31.29
3	0.56837	10.12	11.99	7.11	22.11	17.23	56.00	46.00	-33.89	-28.77
4	1.41293	10.15	11.36	7.50	21.51	17.65	56.00	46.00	-34.49	-28.35
5	5.41286	10.33	13.90	9.22	24.23	19.55	60.00	50.00	-35.77	-30.45
6	12.75584	10.64	13.39	8.59	24.03	19.23	60.00	50.00	-35.97	-30.77

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

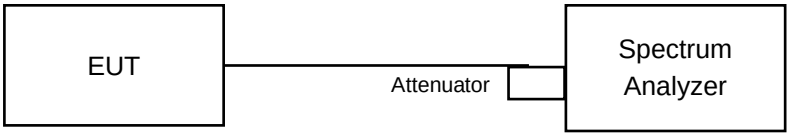


4.3 6 dB Bandwidth Measurement

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

a. Set resolution bandwidth (RBW) = 100 kHz
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)	6 dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	8.12	10.05	0.5	Pass
6	2437	8.12	8.12	0.5	Pass
11	2462	8.58	7.63	0.5	Pass
12	2467	9.08	8.64	0.5	Pass
13	2472	8.13	9.61	0.5	Pass

802.11g

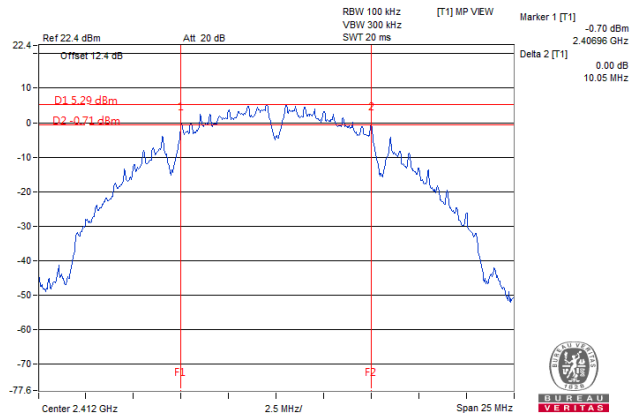
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	15.77	15.15	0.5	Pass
6	2437	15.61	16.11	0.5	Pass
11	2462	15.76	15.16	0.5	Pass
12	2467	15.97	15.76	0.5	Pass
13	2472	16.09	16.39	0.5	Pass

802.11n (HT20)

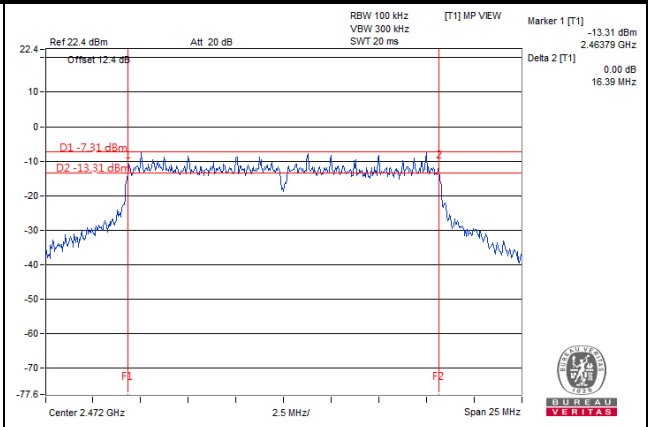
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	16.15	15.75	0.5	Pass
6	2437	16.02	17.21	0.5	Pass
11	2462	16.39	15.76	0.5	Pass
12	2467	16.93	16.39	0.5	Pass
13	2472	16.82	17.63	0.5	Pass

Spectrum Plot of Worst Value

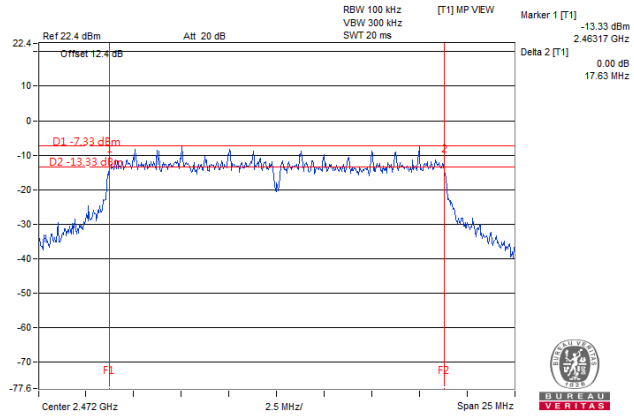
802.11b



802.11g

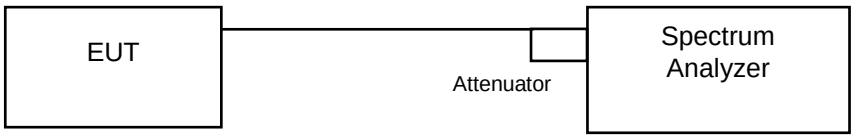


802.11n (HT20)



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

802.11b

Channel	Frequency (MHz)	Occupied Bandwidth (MHz)		Pass / Fail
		Chain 0	Chain 1	
1	2412	13.94	13.55	Pass
6	2437	13.80	13.95	Pass
11	2462	14.00	13.40	Pass
12	2467	14.04	13.85	Pass
13	2472	14.13	14.28	Pass

802.11g

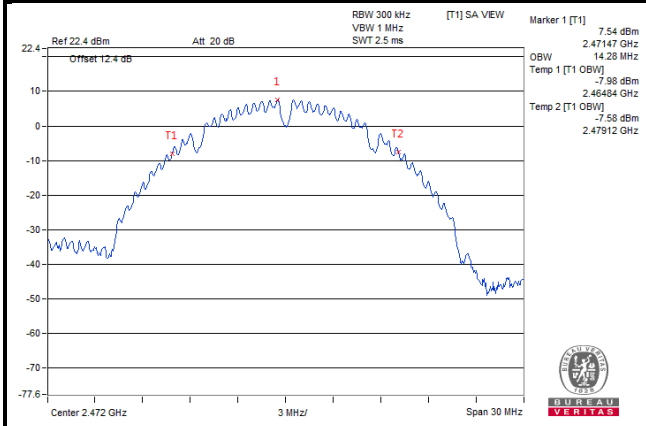
Channel	Frequency (MHz)	Occupied Bandwidth (MHz)		Pass / Fail
		Chain 0	Chain 1	
1	2412	16.97	16.59	Pass
6	2437	16.65	16.75	Pass
11	2462	16.85	16.55	Pass
12	2467	16.85	16.80	Pass
13	2472	16.85	17.05	Pass

802.11n (HT20)

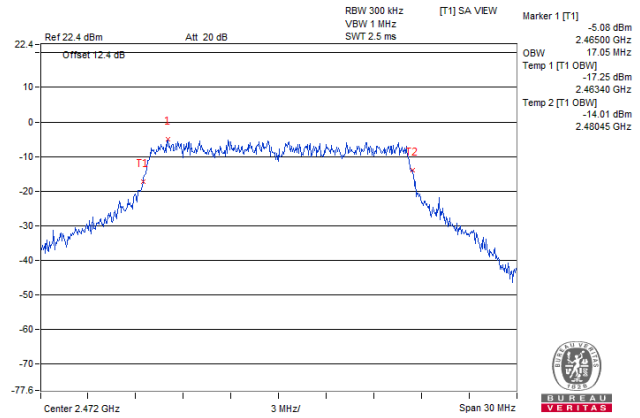
Channel	Frequency (MHz)	Occupied Bandwidth (MHz)		Pass / Fail
		Chain 0	Chain 1	
1	2412	17.94	17.69	Pass
6	2437	17.90	17.90	Pass
11	2462	18.00	17.65	Pass
12	2467	18.00	17.95	Pass
13	2472	18.05	18.20	Pass

Spectrum Plot of Worst Value

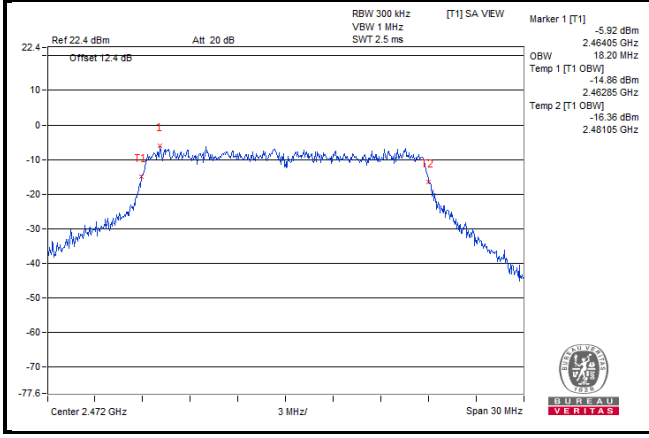
802.11b



802.11g



802.11n (HT20)



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,

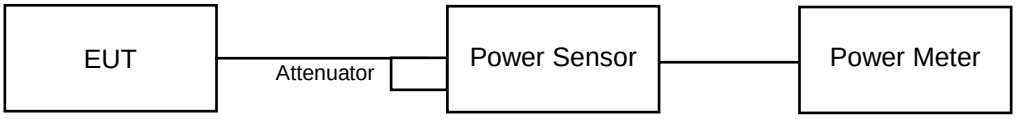
Array Gain = 0 dB (i.e., no array gain) for NANT ≤ 4;

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

Array Gain = 5 log(NANT/NSS) dB or 3 dB, whichever is less for 20 MHz channel widths with NANT ≥ 5.

For power measurements on all other devices: Array Gain = 10 log(NANT/NSS) 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

802.11b

Channel	Frequency (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	18.22	17.43	121.709	20.85	30	Pass
6	2437	17.85	17.62	118.764	20.75	30	Pass
11	2462	17.61	18.24	124.358	20.95	30	Pass
12	2467	17.52	18.10	121.059	20.83	30	Pass
13	2472	15.85	16.75	85.774	19.33	30	Pass

802.11g

Channel	Frequency (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	20.28	19.88	203.935	23.09	30	Pass
6	2437	20.21	20.14	208.23	23.19	30	Pass
11	2462	20.22	20.18	209.428	23.21	30	Pass
12	2467	17.74	18.67	133.05	21.24	30	Pass
13	2472	5.57	8.12	10.092	10.04	30	Pass

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	20.39	19.98	208.937	23.20	30	Pass
6	2437	20.16	20.08	205.612	23.13	30	Pass
11	2462	20.07	20.04	202.55	23.07	30	Pass
12	2467	17.77	18.24	126.522	21.02	30	Pass
13	2472	4.82	6.88	7.909	8.98	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

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.

4.6.5 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

802.11b

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	-10.58	3.01	-7.57	8	Pass
	6	2437	-10.86	3.01	-7.85	8	Pass
	11	2462	-10.09	3.01	-7.08	8	Pass
	12	2467	-10.85	3.01	-7.84	8	Pass
	13	2472	-12.36	3.01	-9.35	8	Pass
1	1	2412	-10.59	3.01	-7.58	8	Pass
	6	2437	-10.75	3.01	-7.74	8	Pass
	11	2462	-10.18	3.01	-7.17	8	Pass
	12	2467	-8.25	3.01	-5.24	8	Pass
	13	2472	-10.15	3.01	-7.14	8	Pass

NOTE: Directional gain = $10\log[(10^{G1/20} + 10^{G2/20} + \ldots + 10^{GN/20})^2 / N_{ANT}]$ = -0.29 dBi < 6 dBi, so the limit no need to reduced.

802.11g

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	-10.42	3.01	-7.41	8	Pass
	6	2437	-10.56	3.01	-7.55	8	Pass
	11	2462	-10.50	3.01	-7.49	8	Pass
	12	2467	-13.68	3.01	-10.67	8	Pass
	13	2472	-26.05	3.01	-23.04	8	Pass
1	1	2412	-10.77	3.01	-7.76	8	Pass
	6	2437	-10.84	3.01	-7.83	8	Pass
	11	2462	-10.77	3.01	-7.76	8	Pass
	12	2467	-12.77	3.01	-9.76	8	Pass
	13	2472	-23.90	3.01	-20.89	8	Pass

NOTE: Directional gain = $10\log[(10^{G1/20} + 10^{G2/20} + \ldots + 10^{GN/20})^2 / N_{ANT}]$ = -0.29 dBi < 6 dBi, so the limit no need to reduced.

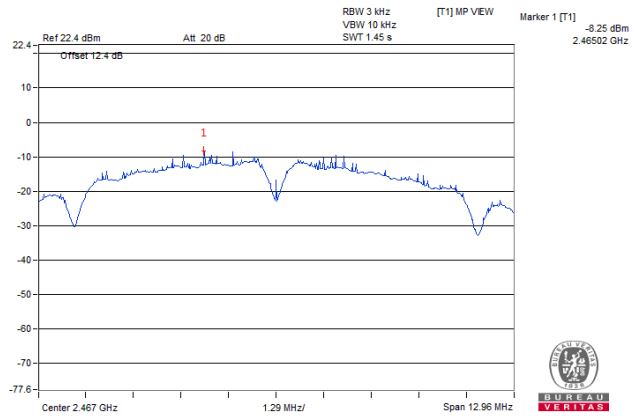
802.11n (HT20)

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	-10.94	3.01	-7.93	8	Pass
	6	2437	-10.64	3.01	-7.63	8	Pass
	11	2462	-10.83	3.01	-7.82	8	Pass
	12	2467	-12.59	3.01	-9.58	8	Pass
	13	2472	-26.16	3.01	-23.15	8	Pass
1	1	2412	-11.20	3.01	-8.19	8	Pass
	6	2437	-10.74	3.01	-7.73	8	Pass
	11	2462	-11.11	3.01	-8.10	8	Pass
	12	2467	-12.64	3.01	-9.63	8	Pass
	13	2472	-24.35	3.01	-21.34	8	Pass

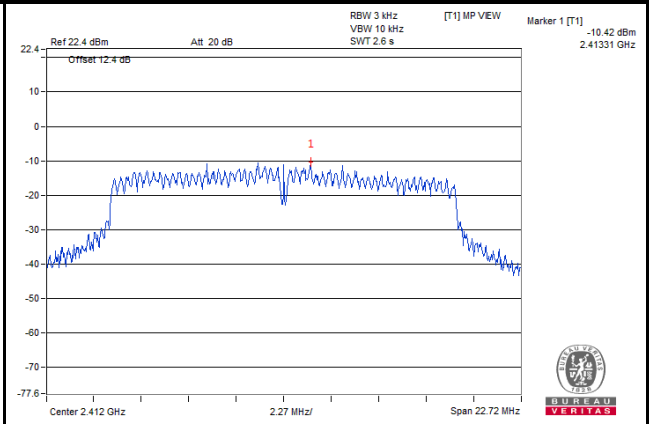
NOTE: Directional gain = $10\log[(10^{G1/20} + 10^{G2/20} + \ldots + 10^{GN/20})^2 / N_{ANT}]$ = -0.29 dBi < 6 dBi, so the limit no need to reduced.

Spectrum Plot of Worst Value

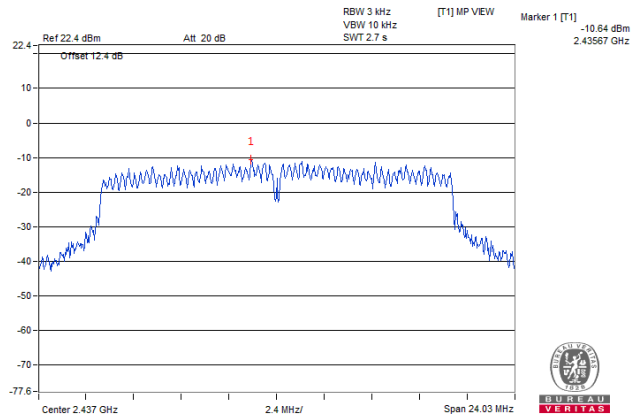
802.11b



802.11g



802.11n (HT20)

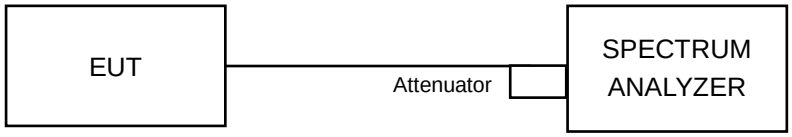


4.7 Conducted Out of Band Emission Measurement

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 ≥ 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.

4.7.5 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.

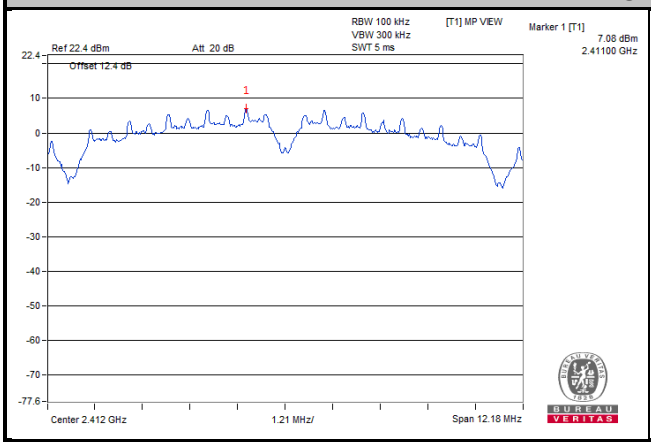
4.7.7 Test Results

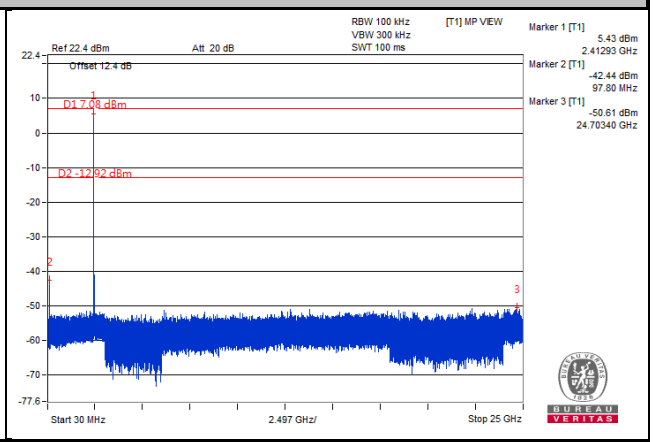
The spectrum plots are attached on the following images. D1 line indicates the highest level, and D2 line indicates the 20 dB offset below D1. It shows compliance with the requirement.

802.11b

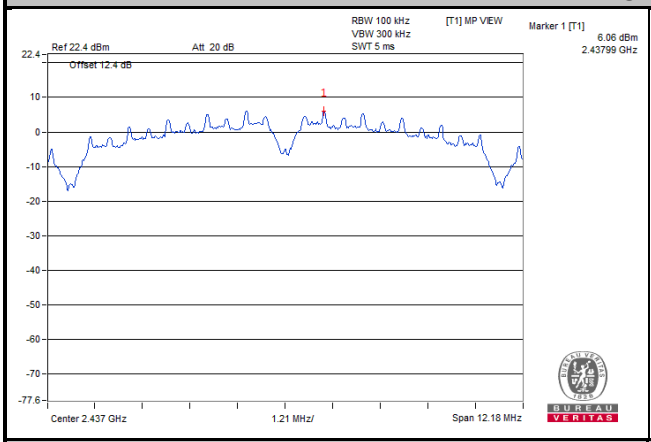
CHAIN 0

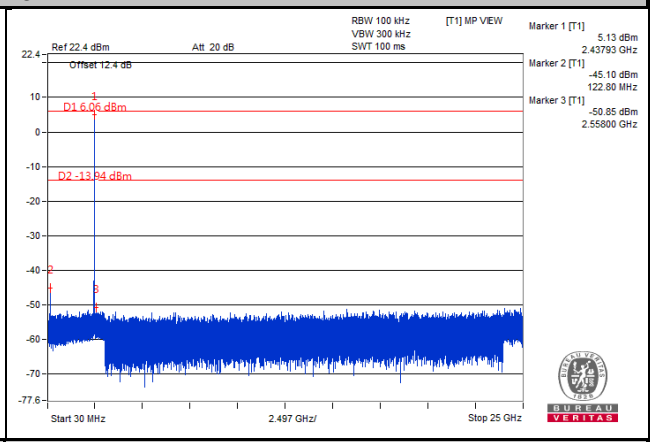
Ch 1



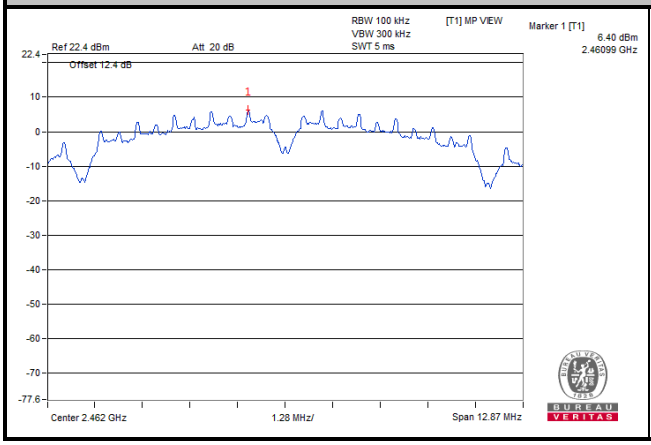


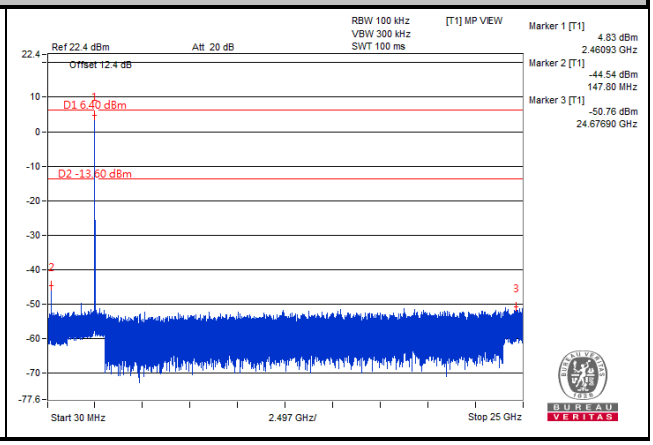
Ch 6



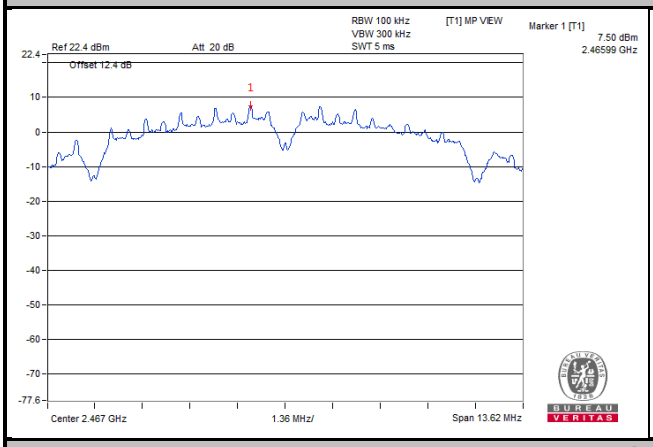


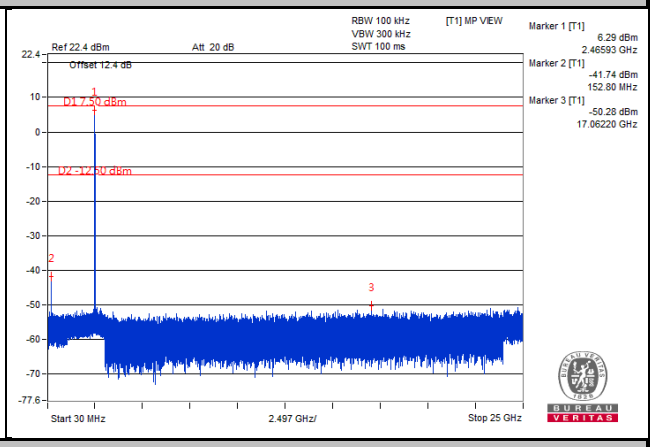
Ch 11



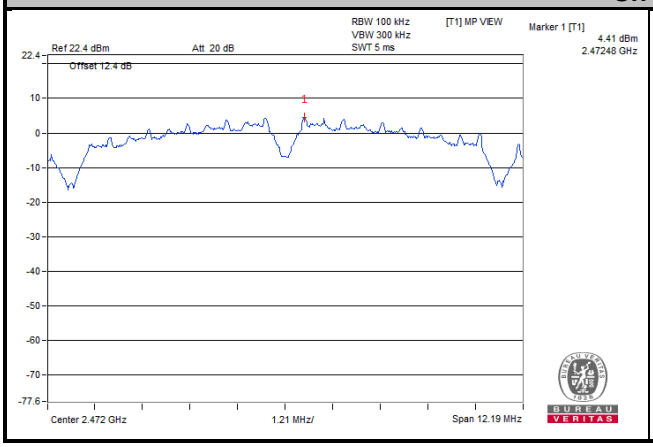


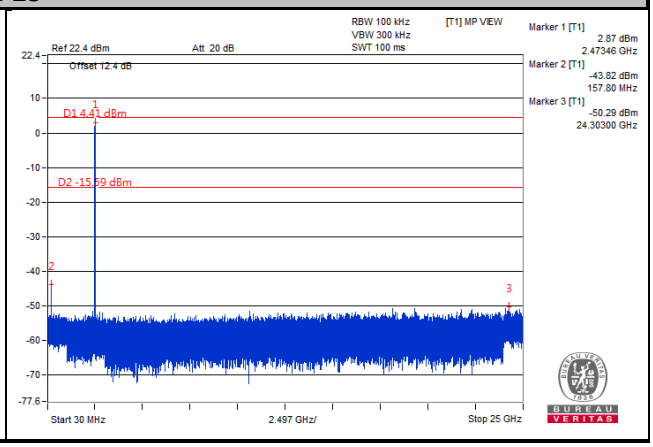
Ch 12


RBW 100 kHz
VBW 300 kHz
SWT 5 ms
[T1] MP VIEW
Marker 1 [T1]
7.50 dBm
2.46599 GHz
Ref 22.4 dBm
Att 20 dB
Offset 12.4 dB
Center 2.467 GHz
1.36 MHz/
Span 13.62 MHz

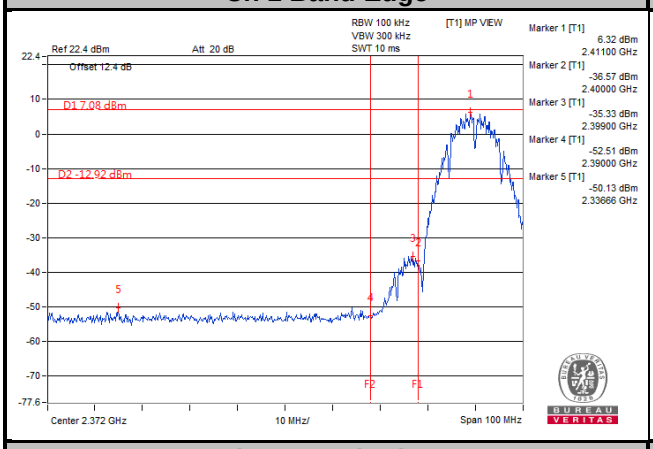

RBW 100 kHz
VBW 300 kHz
SWT 100 ms
[T1] MP VIEW
Marker 1 [T1]
6.29 dBm
2.46593 GHz
Marker 2 [T1]
-41.74 dBm
152.80 MHz
Marker 3 [T1]
-50.28 dBm
17.06220 GHz
Ref 22.4 dBm
Att 20 dB
Offset 12.4 dB
D1 7.50 dBm
D2 -12.50 dBm
Start 30 MHz
2.497 GHz/
Stop 25 GHz

Ch 13

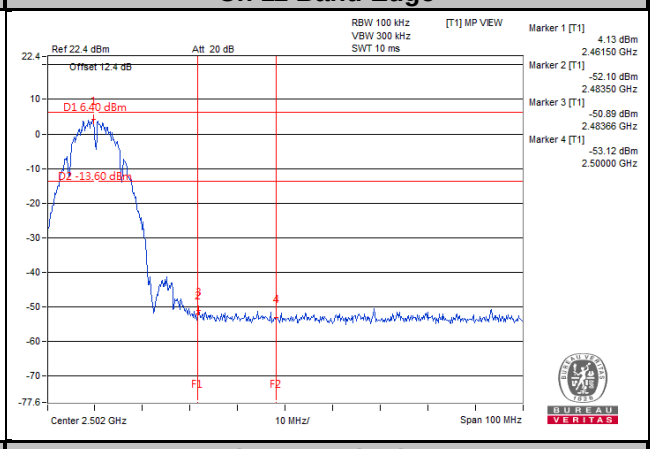

RBW 100 kHz
VBW 300 kHz
SWT 5 ms
[T1] MP VIEW
Marker 1 [T1]
4.41 dBm
2.47248 GHz
Ref 22.4 dBm
Att 20 dB
Offset 12.4 dB
Center 2.472 GHz
1.21 MHz/
Span 12.19 MHz


RBW 100 kHz
VBW 300 kHz
SWT 100 ms
[T1] MP VIEW
Marker 1 [T1]
2.87 dBm
2.47346 GHz
Marker 2 [T1]
-43.82 dBm
157.80 MHz
Marker 3 [T1]
-50.29 dBm
24.30300 GHz
Ref 22.4 dBm
Att 20 dB
Offset 12.4 dB
D1 4.41 dBm
D2 -15.59 dBm
Start 30 MHz
2.497 GHz/
Stop 25 GHz

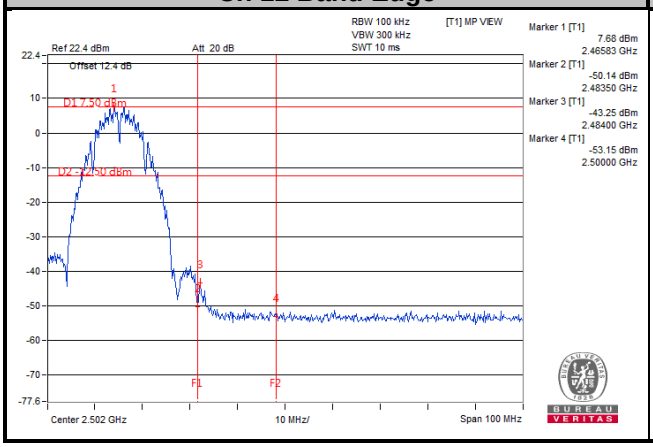
Ch 1 Band Edge



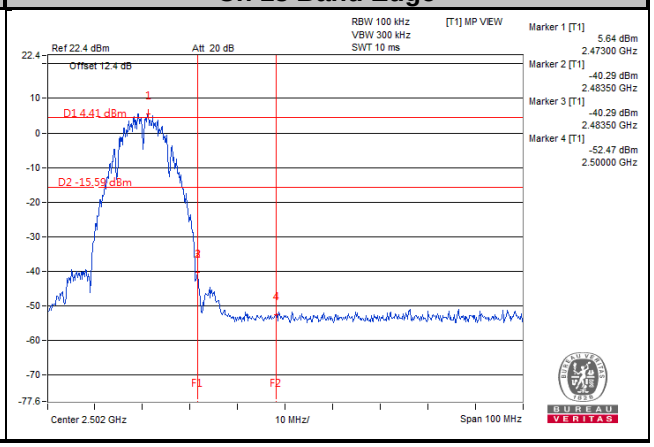
Ch 11 Band Edge



Ch 12 Band Edge

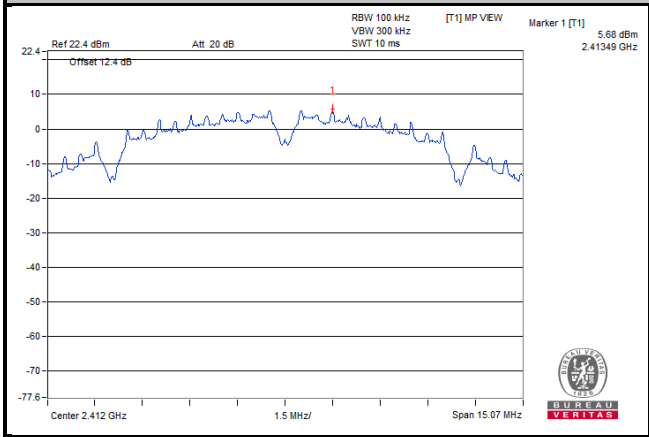


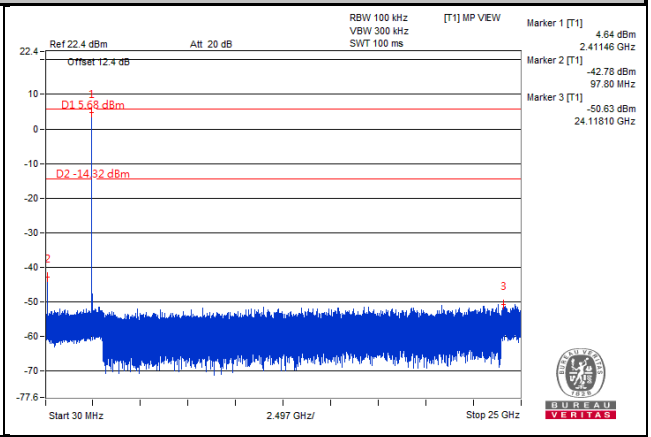
Ch 13 Band Edge



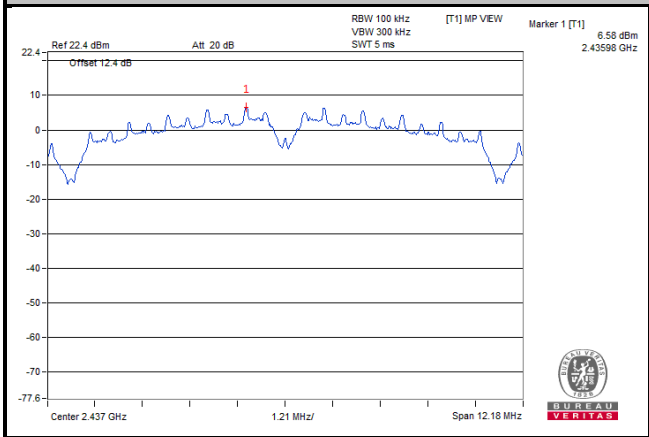
CHAIN 1

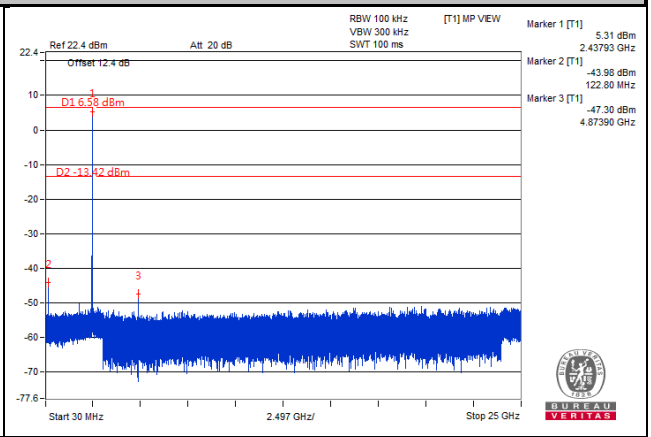
Ch 1



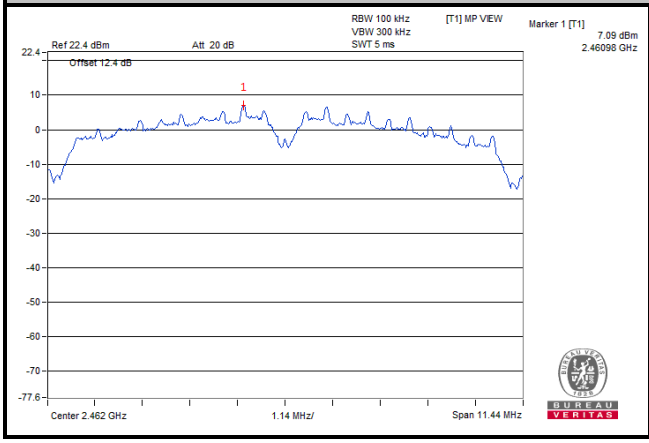


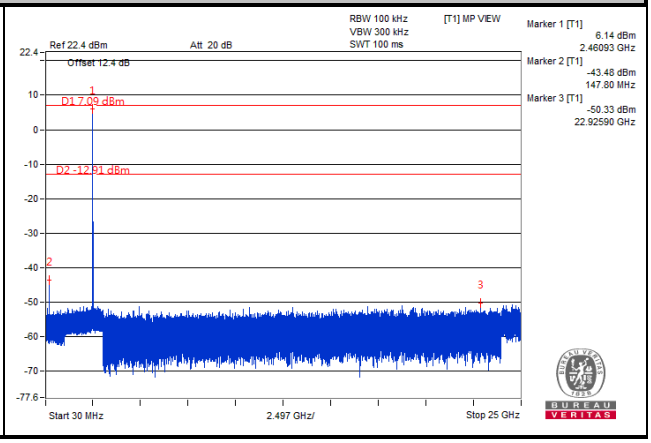
Ch 6



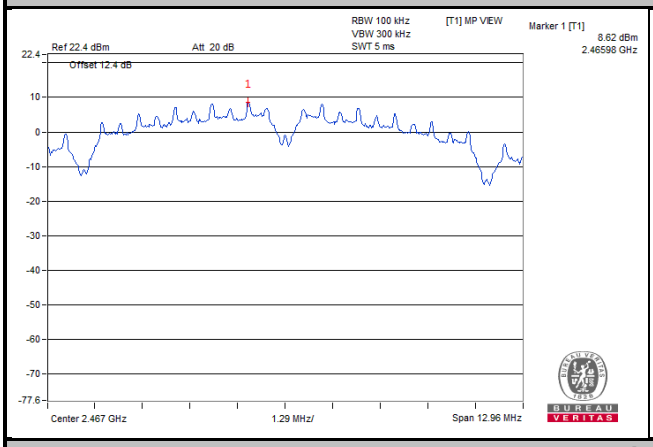


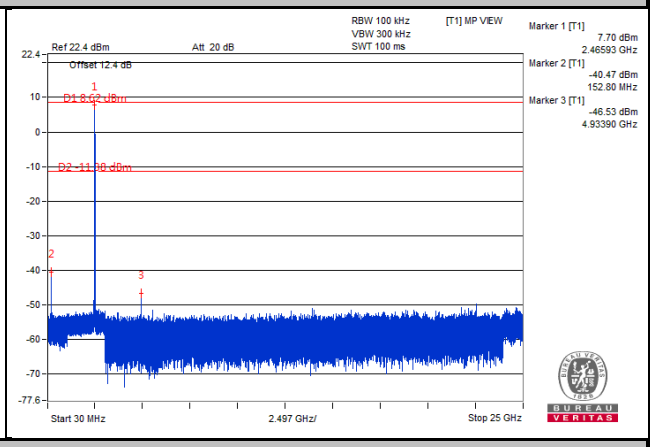
Ch 11



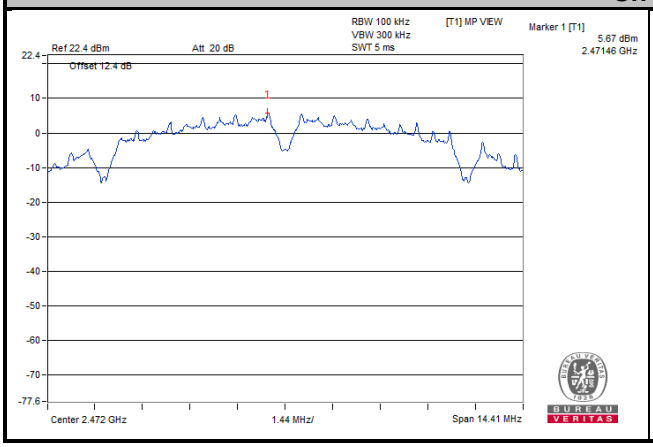


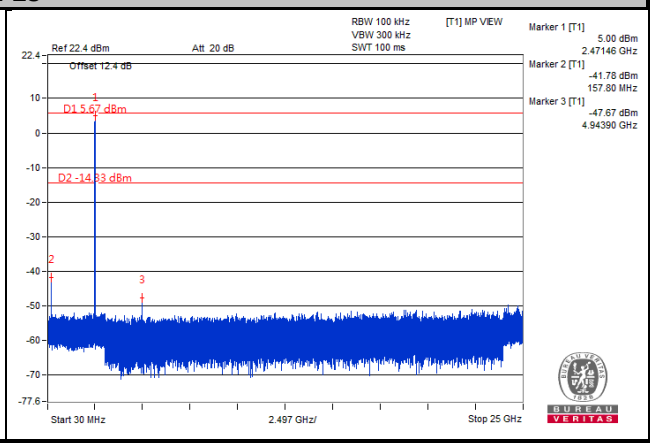
Ch 12


RBW 100 kHz
VBW 300 kHz
SWT 5 ms
[T1] MP VIEW
Marker 1 [T1]
8.62 dBm
2.46598 GHz
Ref 22.4 dBm
Att 20 dB
Offset 12.4 dB
Center 2.467 GHz
1.29 MHz/
Span 12.96 MHz

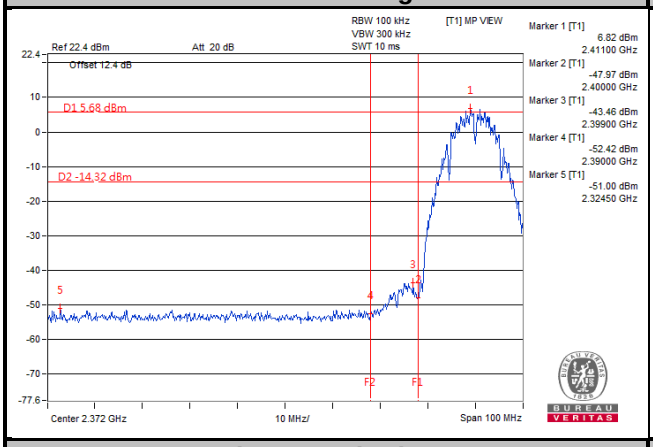

RBW 100 kHz
VBW 300 kHz
SWT 100 ms
[T1] MP VIEW
Marker 1 [T1]
7.70 dBm
2.46593 GHz
Marker 2 [T1]
-40.47 dBm
152.80 MHz
Marker 3 [T1]
-46.53 dBm
4.93390 GHz
Ref 22.4 dBm
Att 20 dB
Offset 12.4 dB
D1 8.62 dBm
D2 -11.38 dBm
Start 30 MHz
2.497 GHz/
Stop 25 GHz

Ch 13

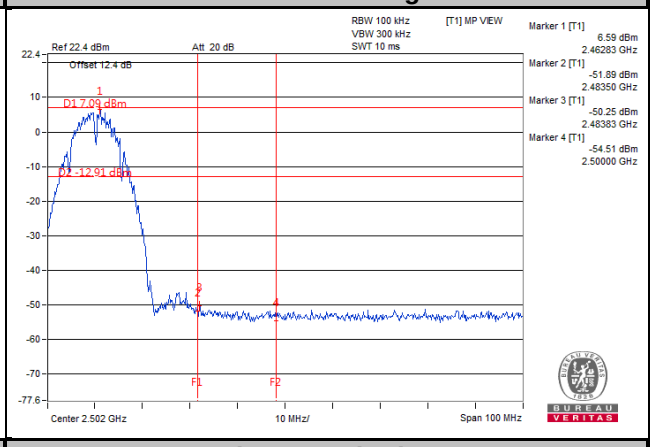

RBW 100 kHz
VBW 300 kHz
SWT 5 ms
[T1] MP VIEW
Marker 1 [T1]
5.67 dBm
2.47146 GHz
Ref 22.4 dBm
Att 20 dB
Offset 12.4 dB
Center 2.472 GHz
1.44 MHz/
Span 14.41 MHz


RBW 100 kHz
VBW 300 kHz
SWT 100 ms
[T1] MP VIEW
Marker 1 [T1]
5.00 dBm
2.47146 GHz
Marker 2 [T1]
-41.78 dBm
157.80 MHz
Marker 3 [T1]
-47.67 dBm
4.94390 GHz
Ref 22.4 dBm
Att 20 dB
Offset 12.4 dB
D1 5.67 dBm
D2 -14.33 dBm
Start 30 MHz
2.497 GHz/
Stop 25 GHz

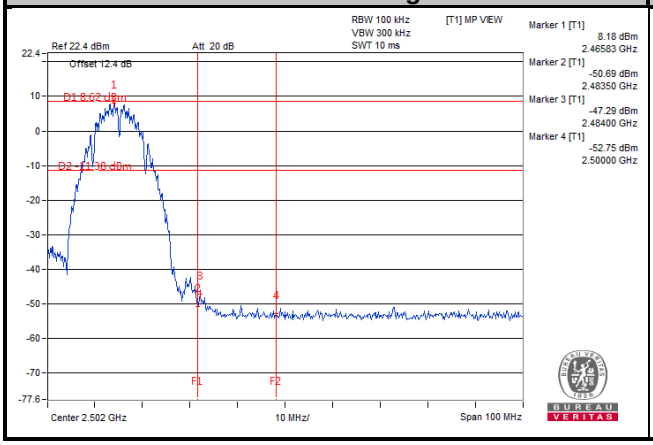
Ch 1 Band Edge



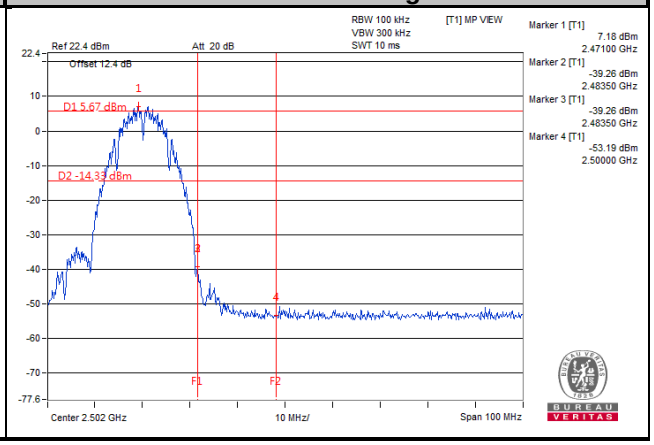
Ch 11 Band Edge



Ch 12 Band Edge



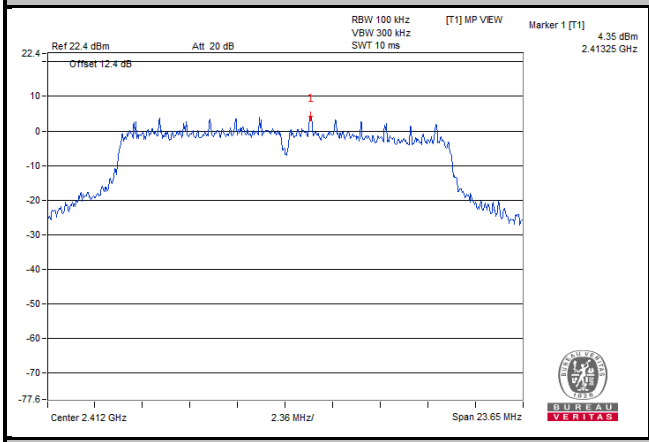
Ch 13 Band Edge

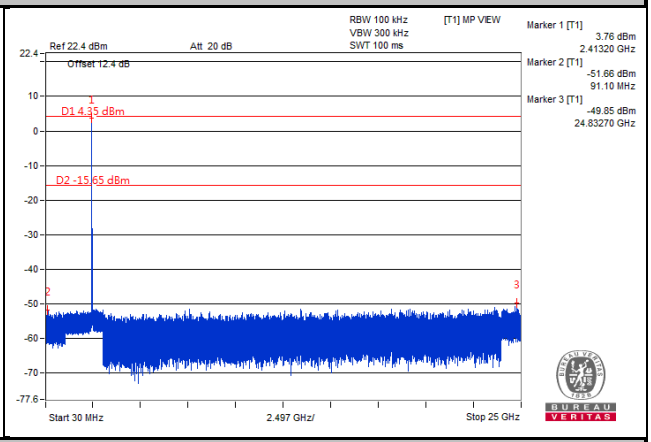


802.11g

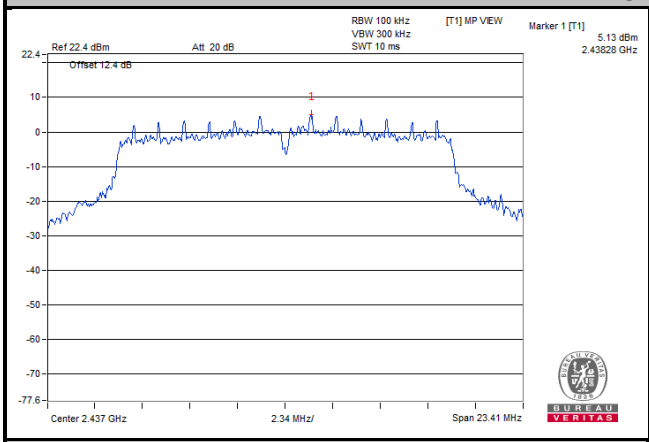
CHAIN 0

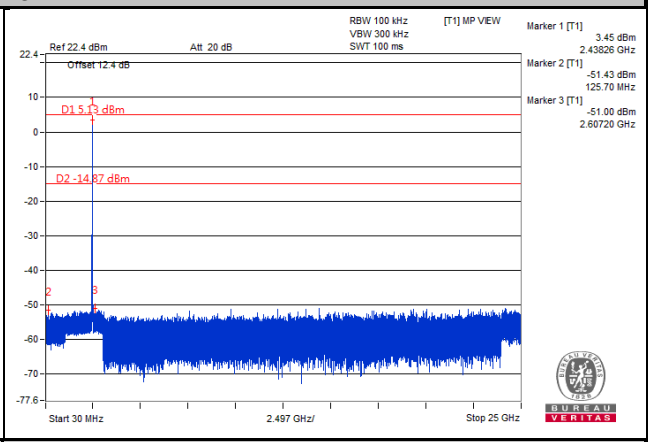
Ch 1



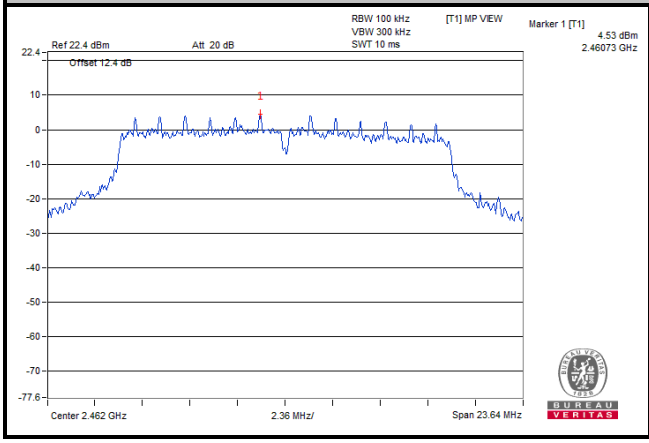


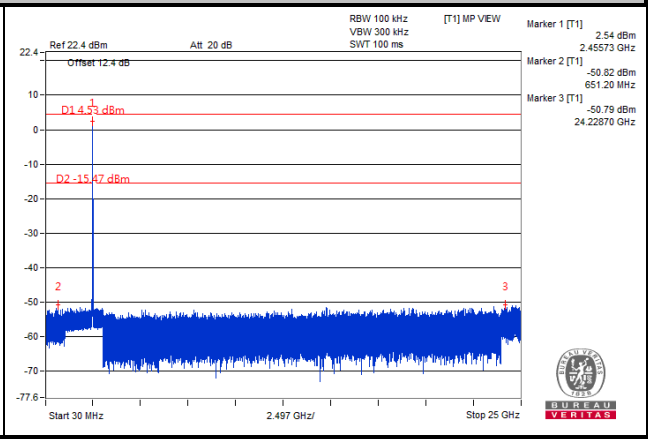
Ch 6



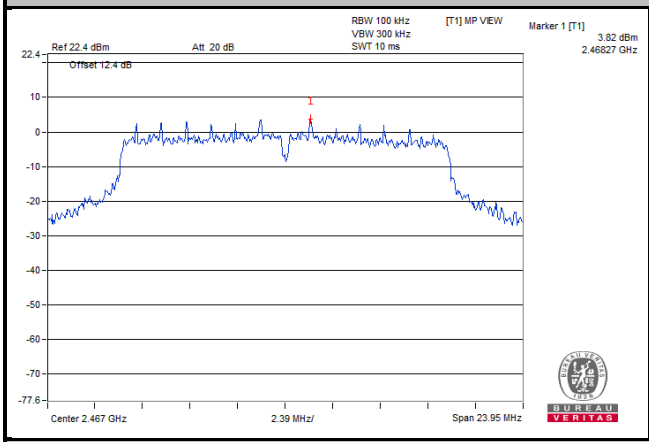


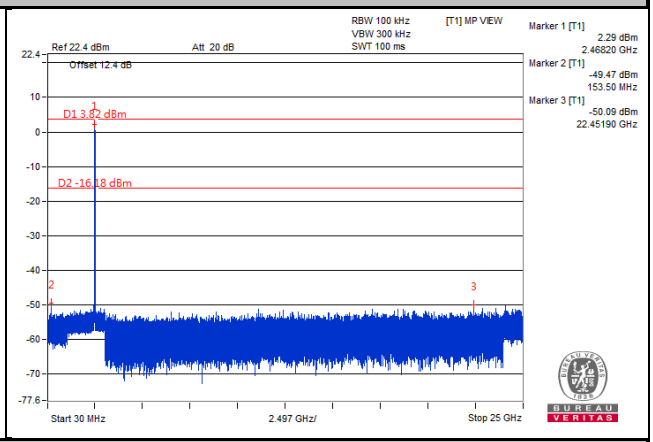
Ch 11



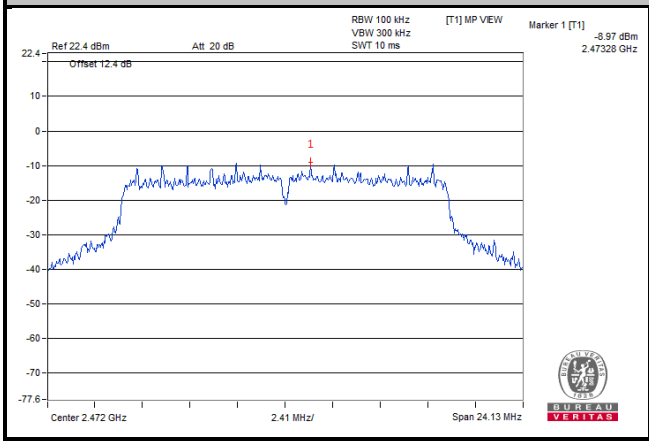


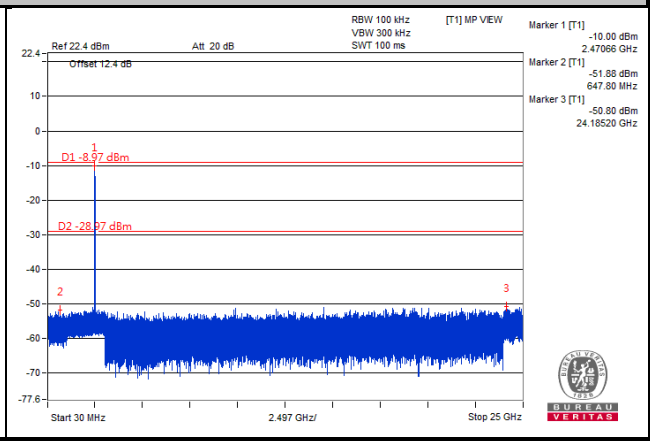
Ch 12


RBW 100 kHz
VBW 300 kHz
SWT 10 ms
[T1] MP VIEW
Marker 1 [T1]
3.82 dBm
2.46827 GHz
Ref 22.4 dBm
Att 20 dB
Offset 12.4 dB
Center 2.467 GHz
2.39 MHz/
Span 23.95 MHz

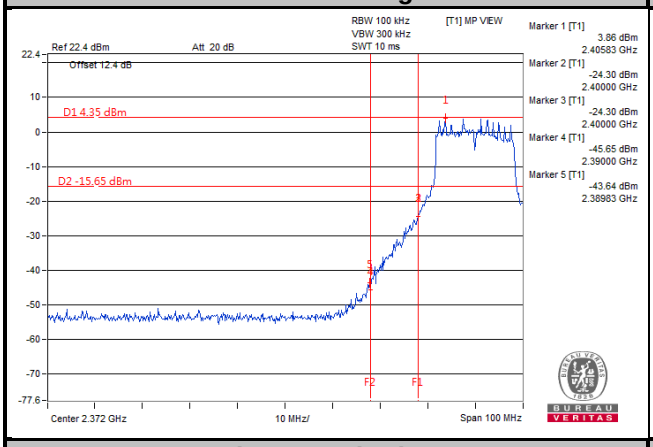

RBW 100 kHz
VBW 300 kHz
SWT 100 ms
[T1] MP VIEW
Marker 1 [T1]
2.29 dBm
2.46820 GHz
Marker 2 [T1]
-49.47 dBm
153.50 MHz
Marker 3 [T1]
-50.09 dBm
22.45190 GHz
Ref 22.4 dBm
Att 20 dB
Offset 12.4 dB
D1 3.82 dBm
D2 -16.18 dBm
Start 30 MHz
2.497 GHz/
Stop 25 GHz

Ch 13

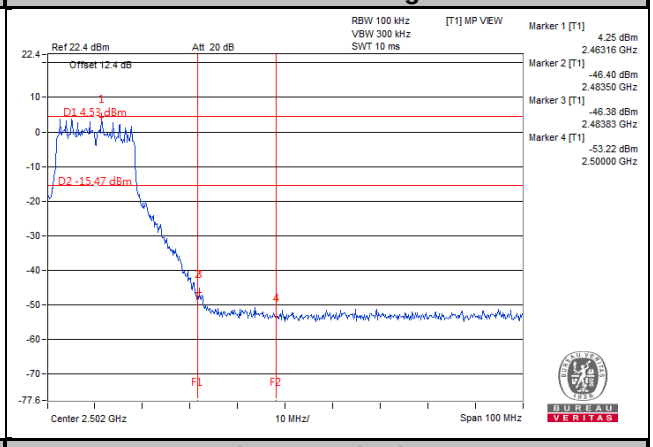

RBW 100 kHz
VBW 300 kHz
SWT 10 ms
[T1] MP VIEW
Marker 1 [T1]
-8.97 dBm
2.47328 GHz
Ref 22.4 dBm
Att 20 dB
Offset 12.4 dB
Center 2.472 GHz
2.41 MHz/
Span 24.13 MHz


RBW 100 kHz
VBW 300 kHz
SWT 100 ms
[T1] MP VIEW
Marker 1 [T1]
-10.00 dBm
2.47066 GHz
Marker 2 [T1]
-51.88 dBm
647.80 MHz
Marker 3 [T1]
-50.80 dBm
24.18520 GHz
Ref 22.4 dBm
Att 20 dB
Offset 12.4 dB
D1 -8.97 dBm
D2 -28.97 dBm
Start 30 MHz
2.497 GHz/
Stop 25 GHz

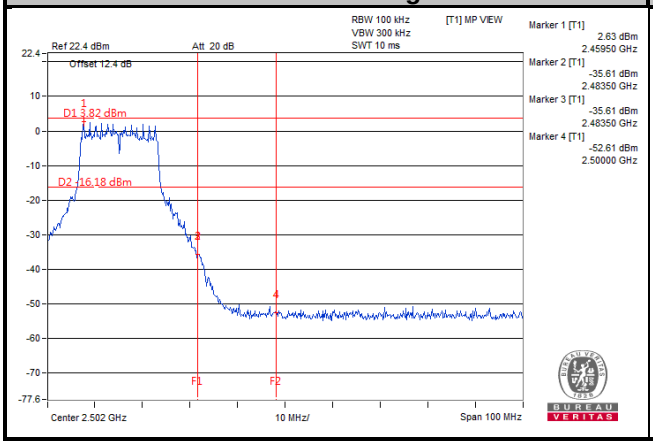
Ch 1 Band Edge



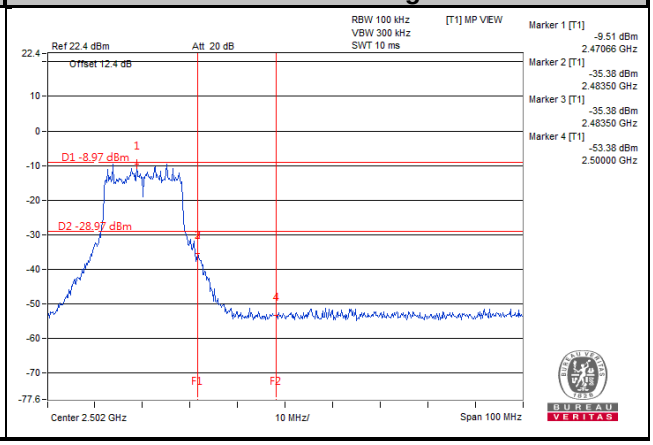
Ch 11 Band Edge



Ch 12 Band Edge

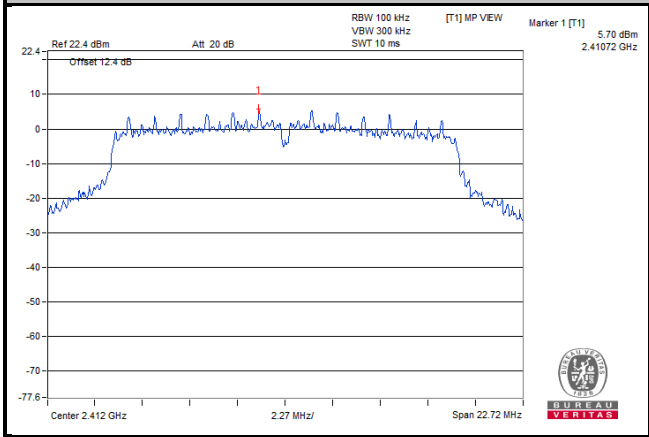


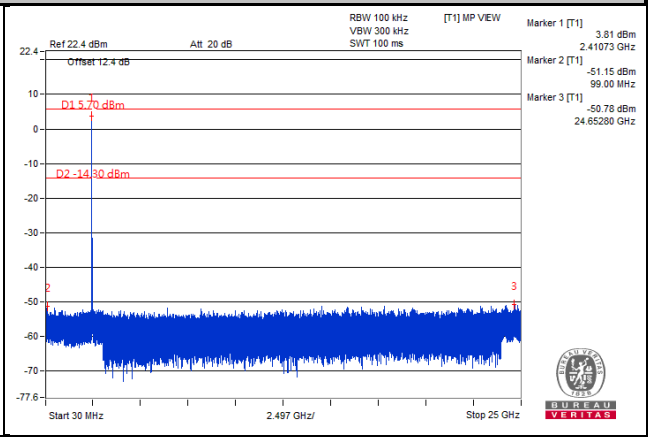
Ch 13 Band Edge



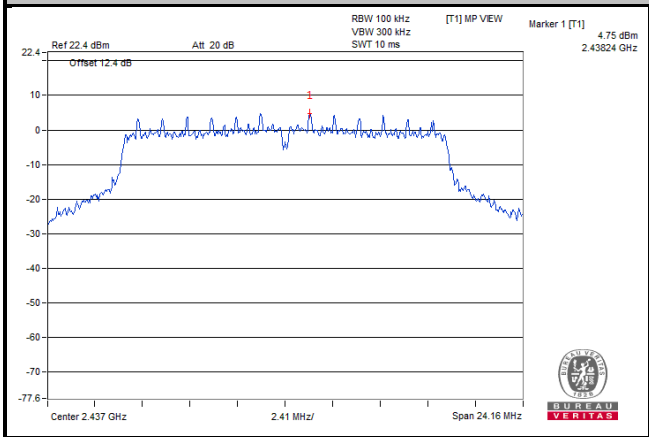
CHAIN 1

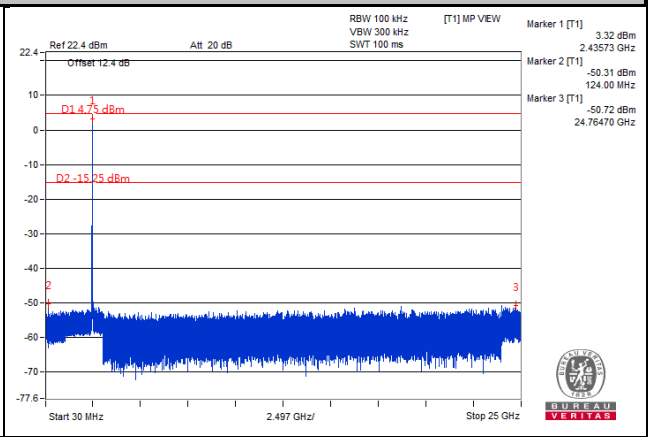
Ch 1



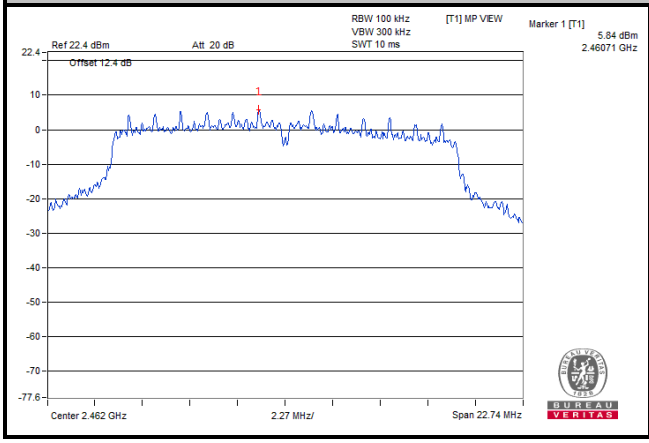


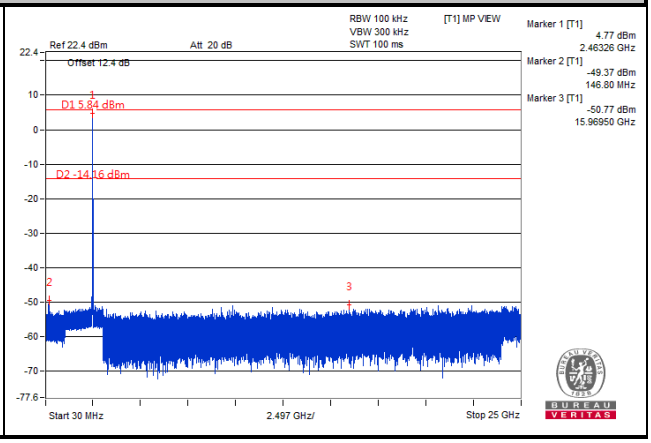
Ch 6



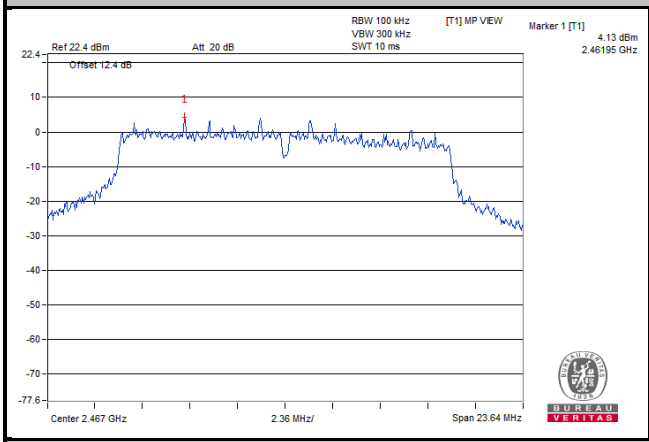


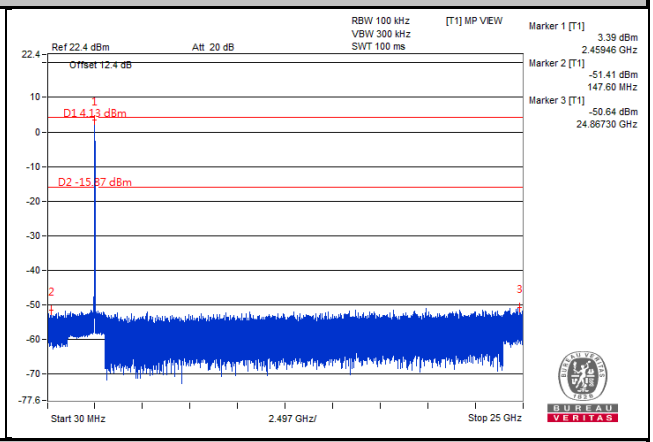
Ch 11



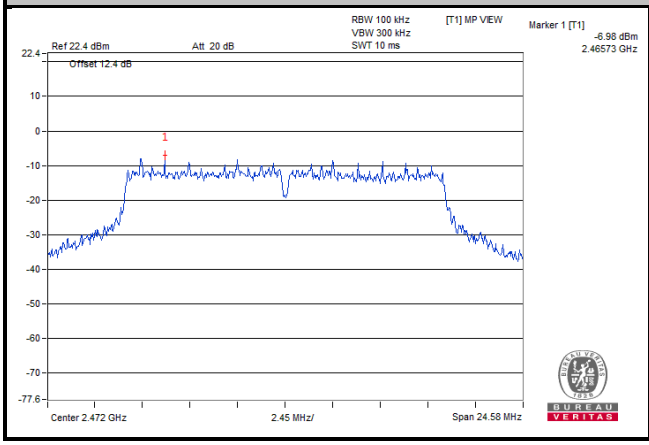


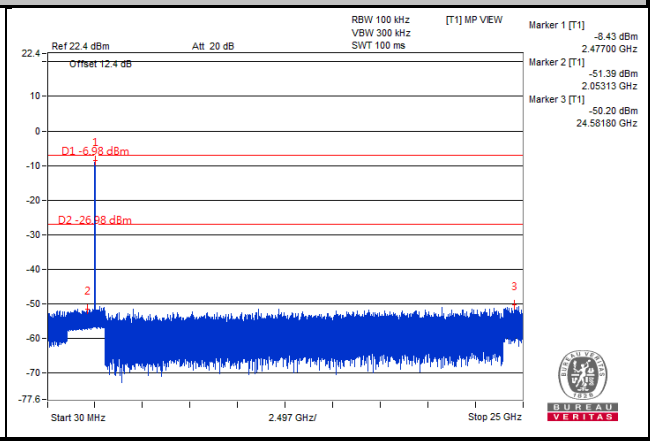
Ch 12


RBW 100 kHz
VBW 300 kHz
SWT 10 ms
[T1] MP VIEW
Marker 1 [T1]
4.13 dBm
2.46195 GHz
Ref 22.4 dBm
Att 20 dB
Offset 12.4 dB
Center 2.467 GHz
2.36 MHz/
Span 23.64 MHz

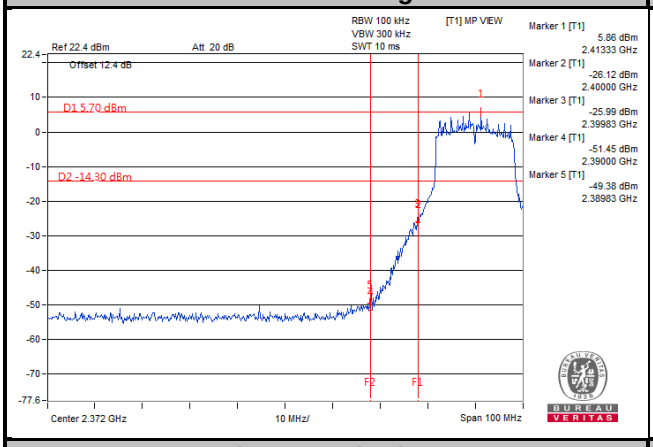

RBW 100 kHz
VBW 300 kHz
SWT 100 ms
[T1] MP VIEW
Marker 1 [T1]
3.39 dBm
2.45946 GHz
Marker 2 [T1]
-51.41 dBm
147.60 MHz
Marker 3 [T1]
-50.64 dBm
24.86730 GHz
Ref 22.4 dBm
Att 20 dB
Offset 12.4 dB
D1 4.13 dBm
D2 -15.87 dBm
Start 30 MHz
2.497 GHz/
Stop 25 GHz

Ch 13

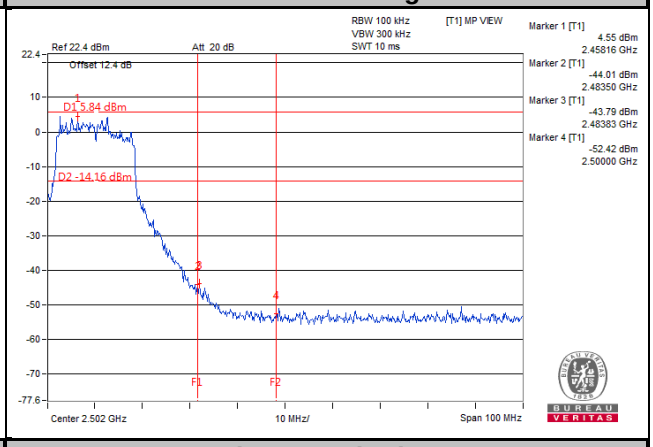

RBW 100 kHz
VBW 300 kHz
SWT 10 ms
[T1] MP VIEW
Marker 1 [T1]
-6.98 dBm
2.46573 GHz
Ref 22.4 dBm
Att 20 dB
Offset 12.4 dB
Center 2.472 GHz
2.45 MHz/
Span 24.58 MHz


RBW 100 kHz
VBW 300 kHz
SWT 100 ms
[T1] MP VIEW
Marker 1 [T1]
-8.43 dBm
2.47700 GHz
Marker 2 [T1]
-51.39 dBm
2.05313 GHz
Marker 3 [T1]
-50.20 dBm
24.58180 GHz
Ref 22.4 dBm
Att 20 dB
Offset 12.4 dB
D1 -6.98 dBm
D2 -26.98 dBm
Start 30 MHz
2.497 GHz/
Stop 25 GHz

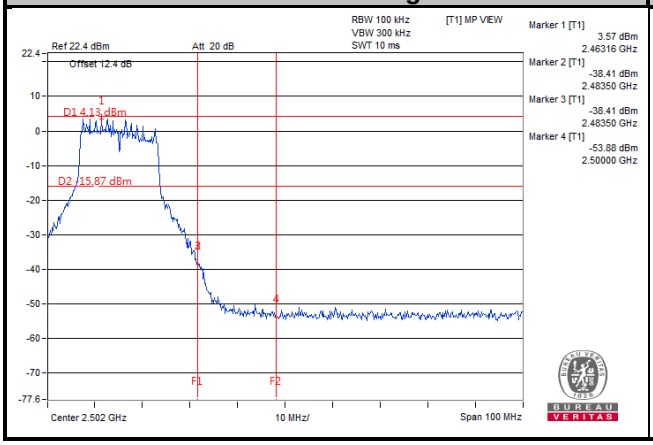
Ch 1 Band Edge



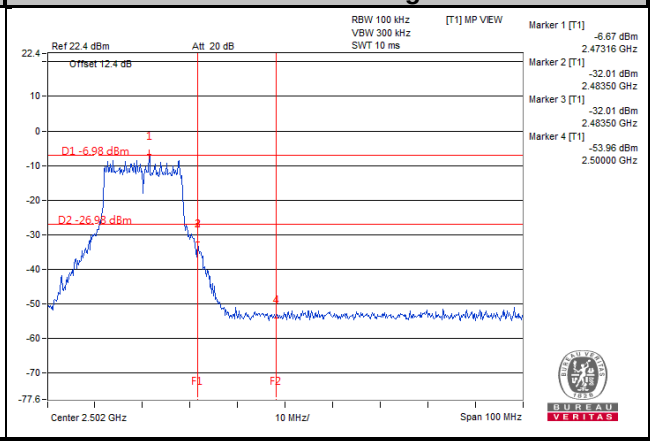
Ch 11 Band Edge



Ch 12 Band Edge



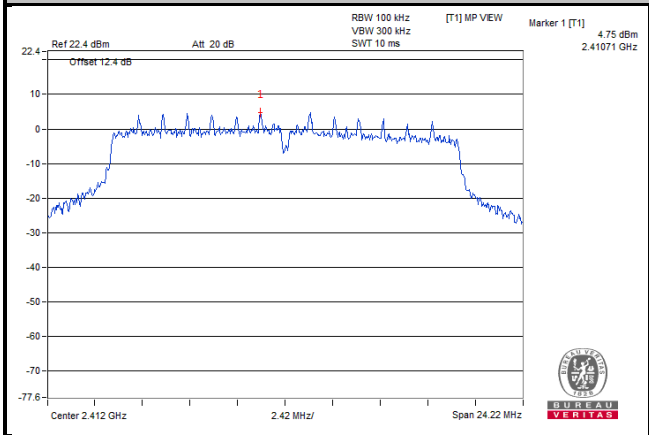
Ch 13 Band Edge

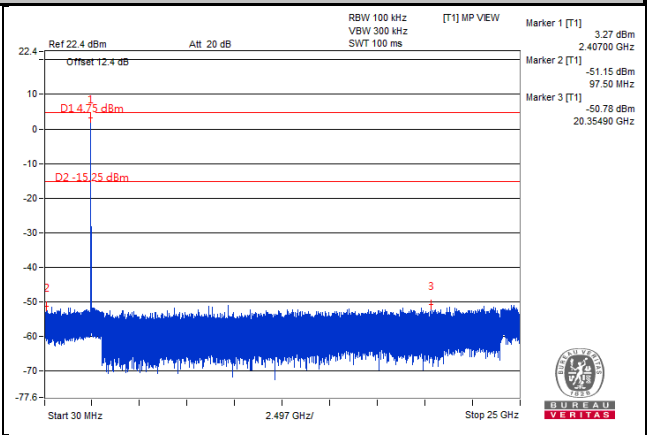


802.11n (HT20)

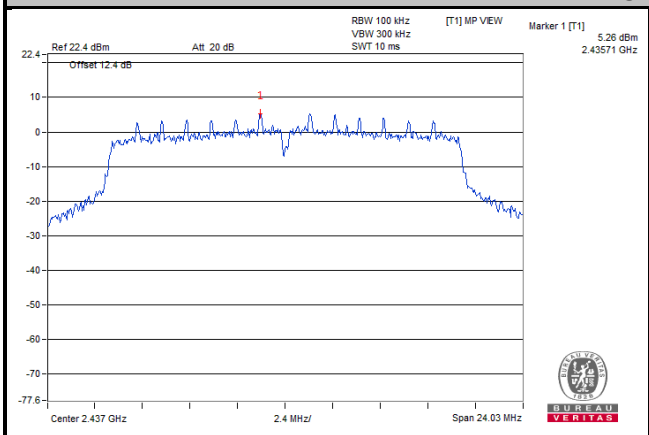
CHAIN 0

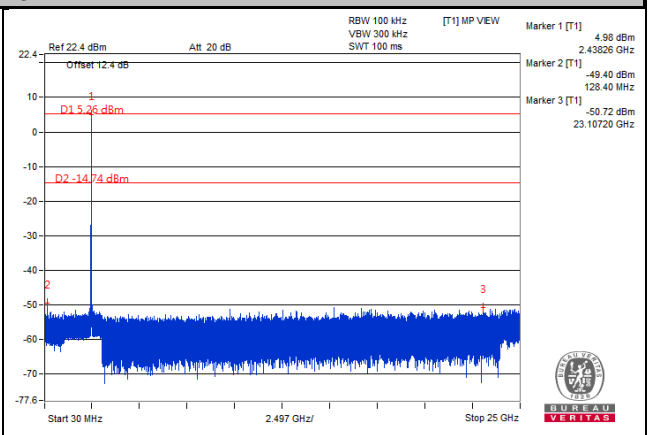
Ch 1



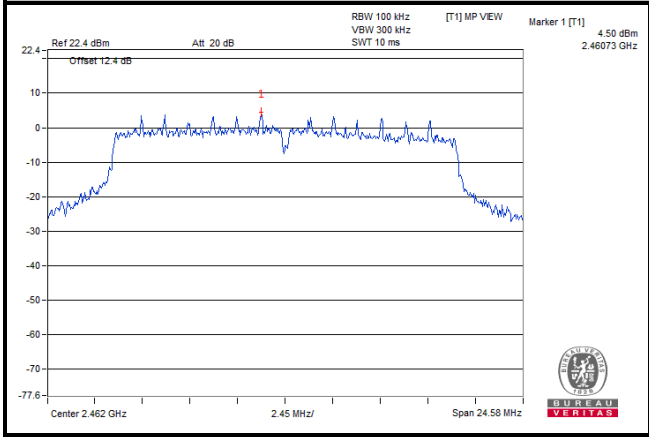


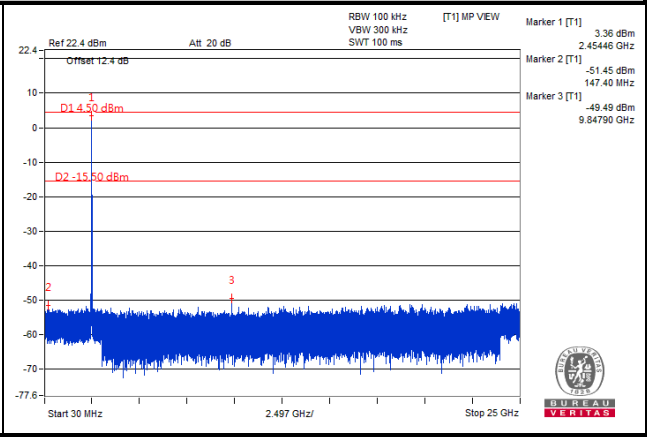
Ch 6



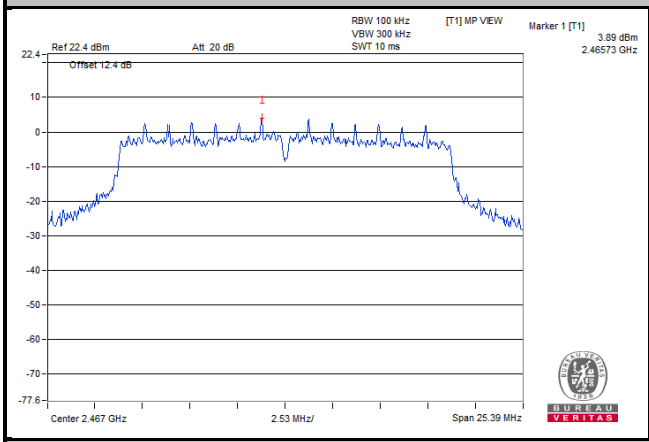


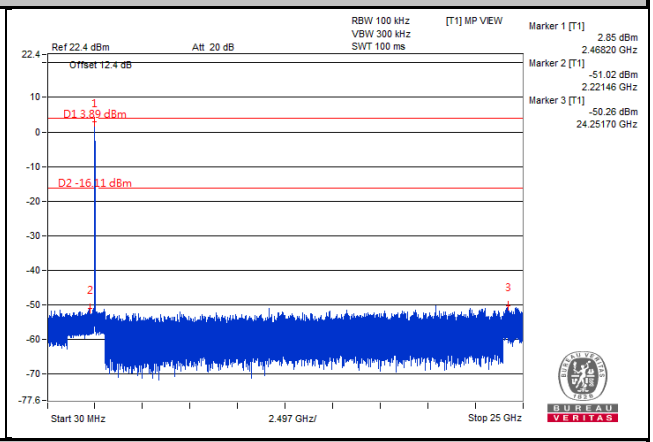
Ch 11



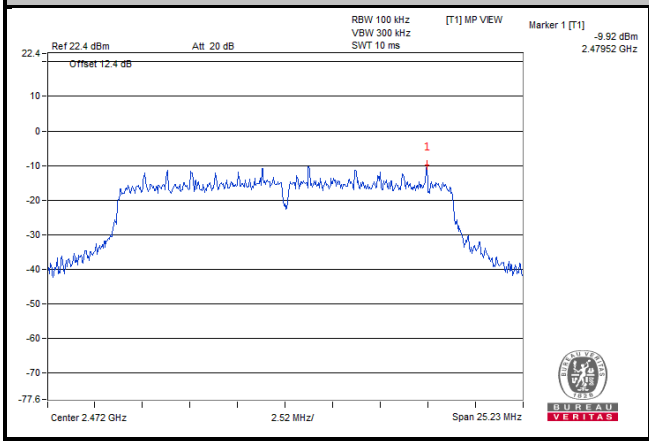


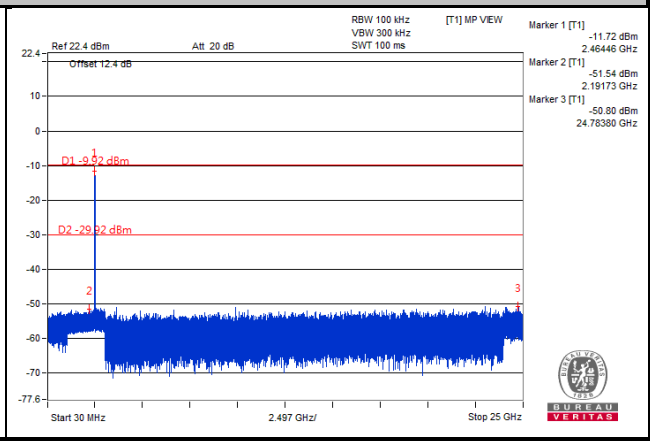
Ch 12


RBW 100 kHz
VBW 300 kHz
SWT 10 ms
[T1] MP VIEW
Marker 1 [T1]
3.89 dBm
2.46573 GHz
Ref 22.4 dBm
Att 20 dB
Offset 12.4 dB
Center 2.467 GHz
2.53 MHz/
Span 25.39 MHz

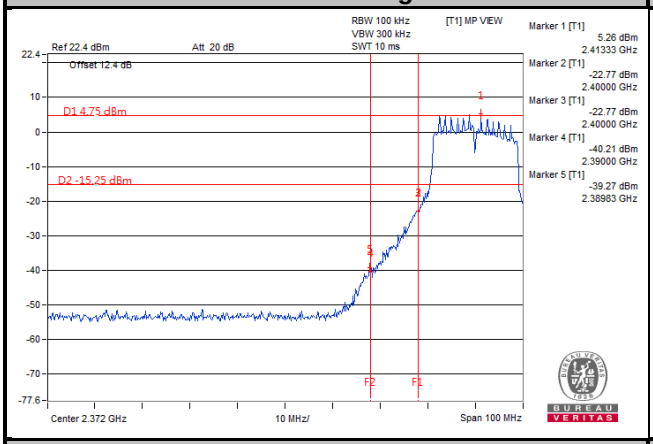

RBW 100 kHz
VBW 300 kHz
SWT 100 ms
[T1] MP VIEW
Marker 1 [T1]
2.85 dBm
2.46820 GHz
Marker 2 [T1]
-51.02 dBm
2.22146 GHz
Marker 3 [T1]
-50.26 dBm
24.25170 GHz
Ref 22.4 dBm
Att 20 dB
Offset 12.4 dB
D1 3.89 dBm
D2 -16.11 dBm
Start 30 MHz
2.497 GHz/
Stop 25 GHz

Ch 13

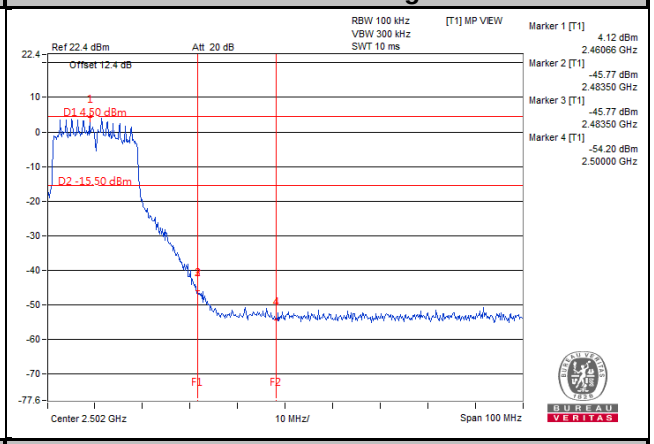

RBW 100 kHz
VBW 300 kHz
SWT 10 ms
[T1] MP VIEW
Marker 1 [T1]
-9.92 dBm
2.47952 GHz
Ref 22.4 dBm
Att 20 dB
Offset 12.4 dB
Center 2.472 GHz
2.52 MHz/
Span 25.23 MHz


RBW 100 kHz
VBW 300 kHz
SWT 100 ms
[T1] MP VIEW
Marker 1 [T1]
-11.72 dBm
2.46446 GHz
Marker 2 [T1]
-51.54 dBm
2.19173 GHz
Marker 3 [T1]
-50.80 dBm
24.78380 GHz
Ref 22.4 dBm
Att 20 dB
Offset 12.4 dB
D1 -9.92 dBm
D2 -29.92 dBm
Start 30 MHz
2.497 GHz/
Stop 25 GHz

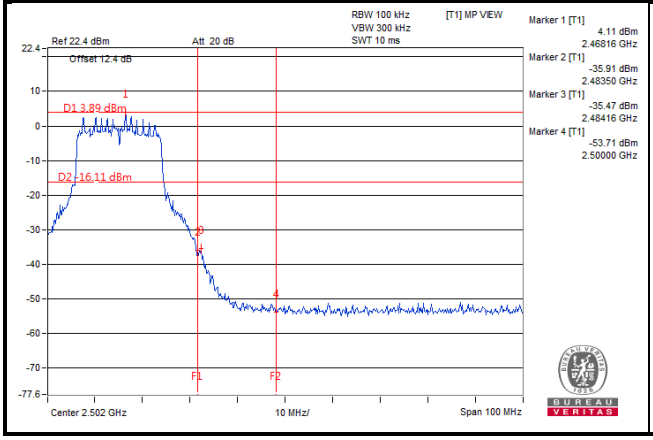
Ch 1 Band Edge



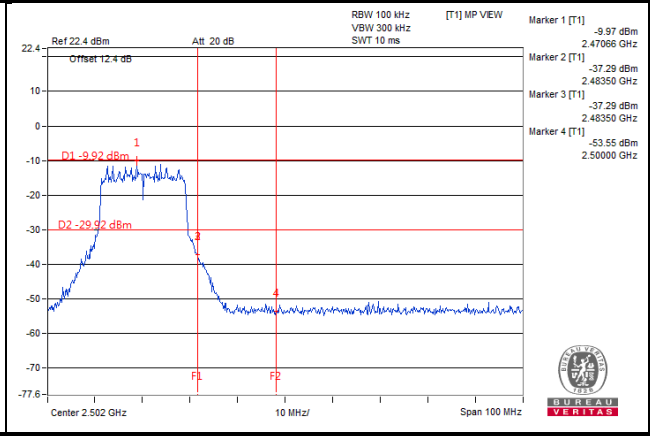
Ch 11 Band Edge



Ch 12 Band Edge

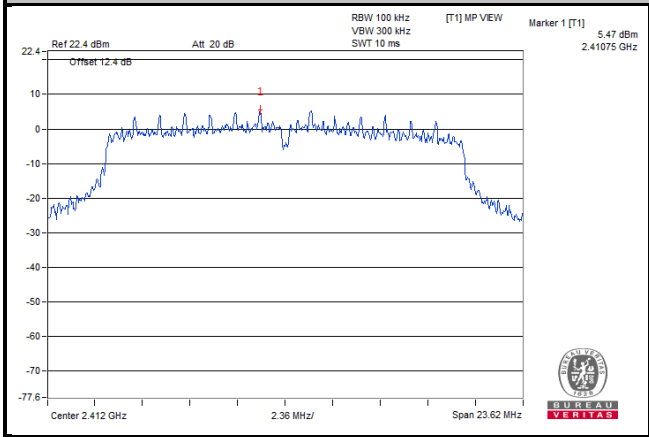


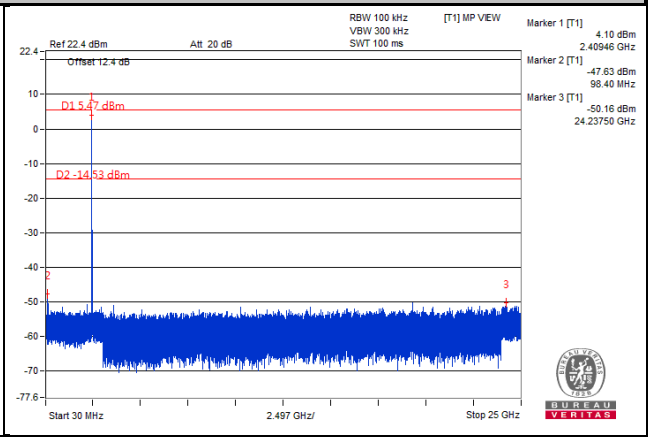
Ch 13 Band Edge



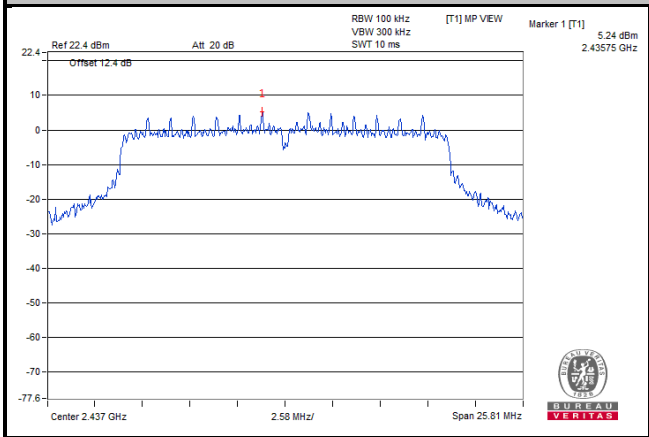
CHAIN 1

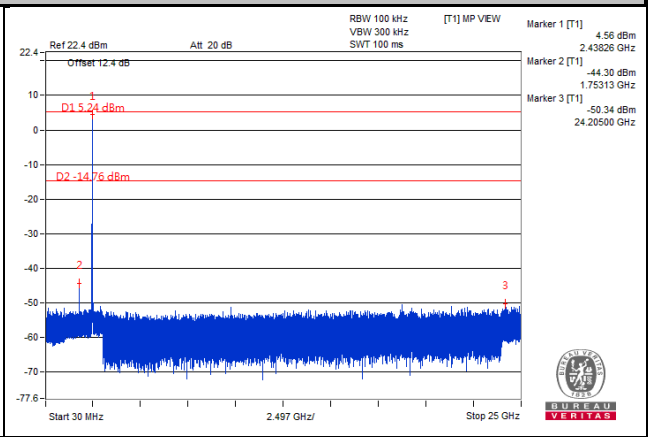
Ch 1



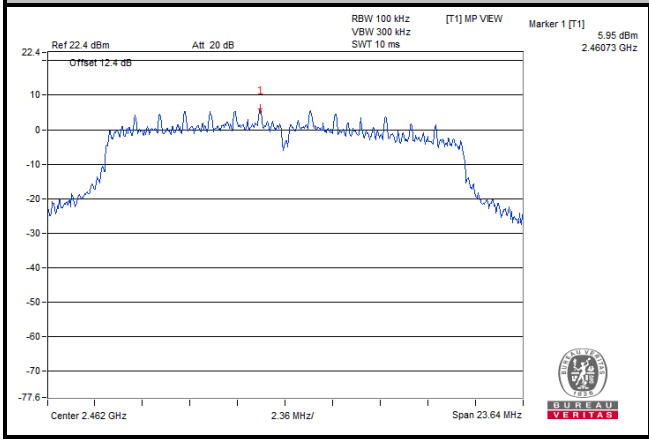


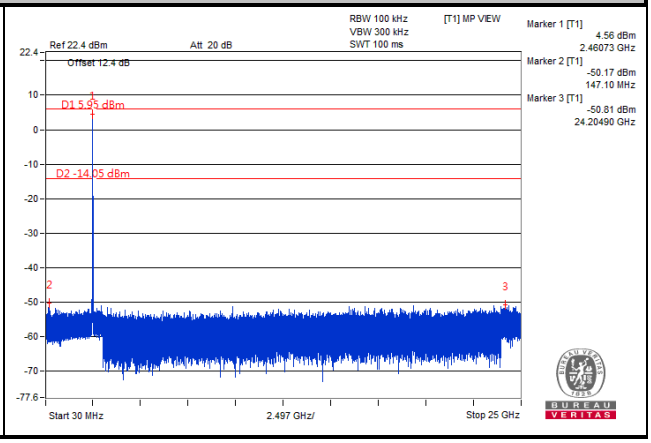
Ch 6



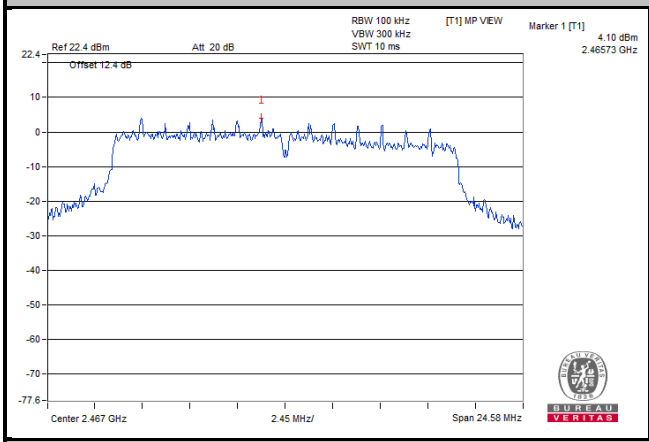


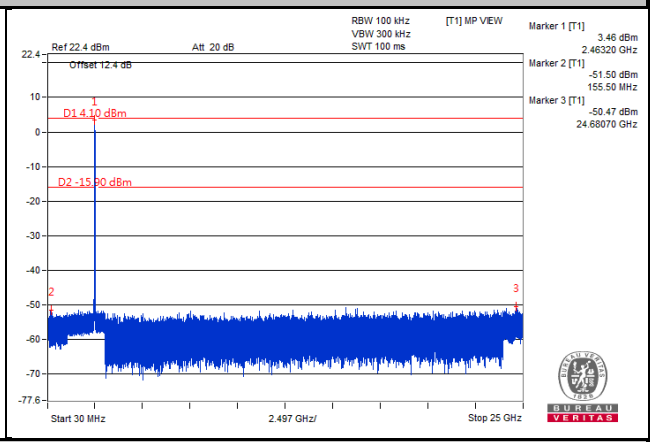
Ch 11



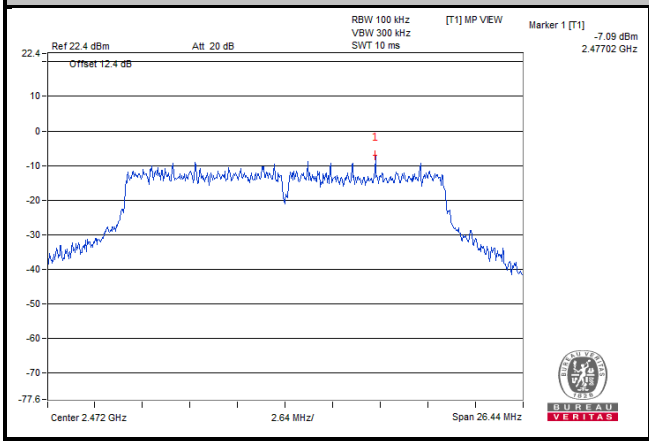


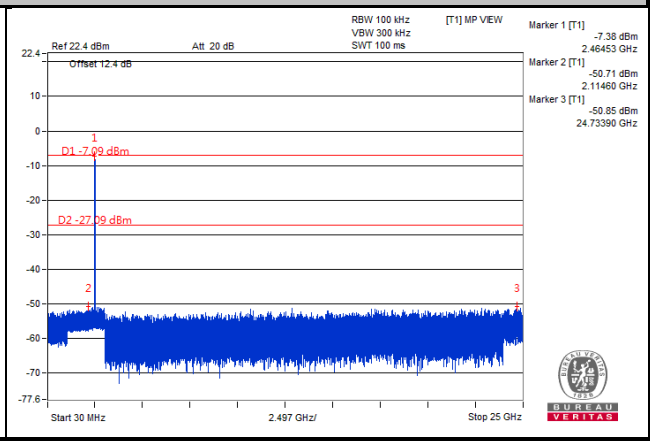
Ch 12


RBW 100 kHz
VBW 300 kHz
SWT 10 ms
[T1] MP VIEW
Marker 1 [T1]
4.10 dBm
2.46573 GHz
Ref 22.4 dBm
Att 20 dB
Offset 12.4 dB
Center 2.467 GHz
2.45 MHz/
Span 24.58 MHz

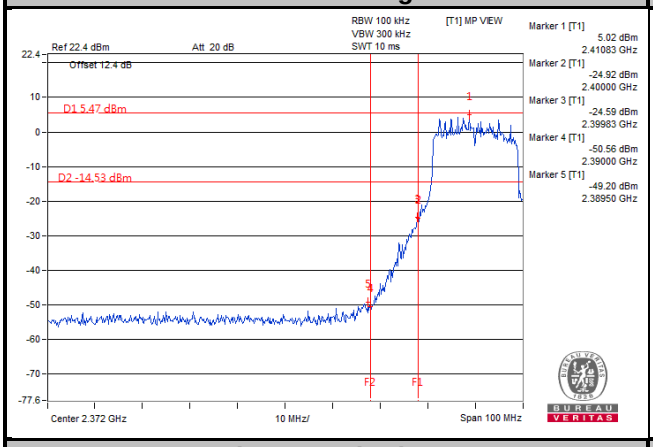

RBW 100 kHz
VBW 300 kHz
SWT 100 ms
[T1] MP VIEW
Marker 1 [T1]
3.46 dBm
2.46320 GHz
Marker 2 [T1]
-51.50 dBm
155.50 MHz
Marker 3 [T1]
-50.47 dBm
24.68070 GHz
Ref 22.4 dBm
Att 20 dB
Offset 12.4 dB
D1 4.10 dBm
D2 -15.90 dBm
Start 30 MHz
2.497 GHz/
Stop 25 GHz

Ch 13

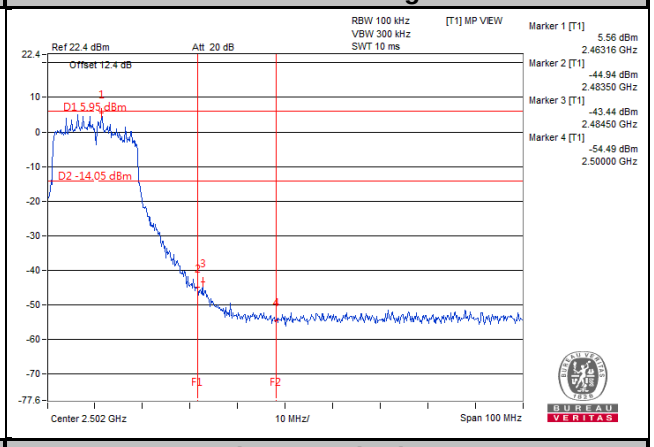

RBW 100 kHz
VBW 300 kHz
SWT 10 ms
[T1] MP VIEW
Marker 1 [T1]
-7.09 dBm
2.47702 GHz
Ref 22.4 dBm
Att 20 dB
Offset 12.4 dB
Center 2.472 GHz
2.64 MHz/
Span 26.44 MHz


RBW 100 kHz
VBW 300 kHz
SWT 100 ms
[T1] MP VIEW
Marker 1 [T1]
-7.38 dBm
2.46453 GHz
Marker 2 [T1]
-50.71 dBm
2.11460 GHz
Marker 3 [T1]
-50.85 dBm
24.73390 GHz
Ref 22.4 dBm
Att 20 dB
Offset 12.4 dB
D1 -7.09 dBm
D2 -27.09 dBm
Start 30 MHz
2.497 GHz/
Stop 25 GHz

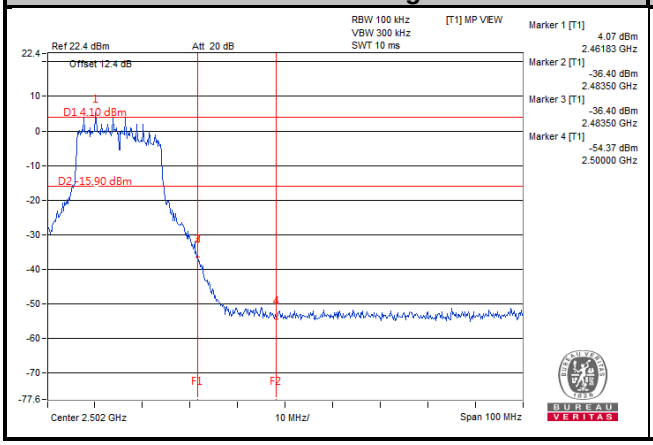
Ch 1 Band Edge



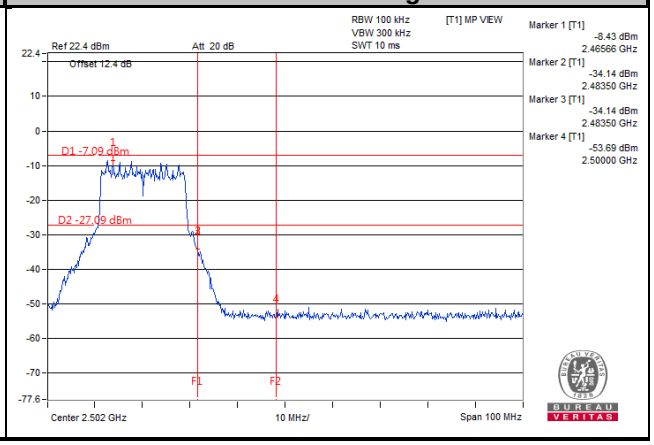
Ch 11 Band Edge



Ch 12 Band Edge



Ch 13 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:

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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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