FCC TEST REPORT (15.247)

REPORT NO.: RF150518C08

MODEL NO.: SAV-CRU-0600,SAV-CRU-0601

FCC ID: ASU-CRU0600

RECEIVED: May 18, 2015

TESTED: May 29, 2015 ~ Jun. 06, 2015

ISSUED: Jun. 18, 2015

APPLICANT: Savant Systems LLC

ADDRESS: 75 Perseverance Way Hyannis, MA 02635 USA

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: No. 19, Hwa Ya 2nd Rd, Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 333, Taiwan, R.O.C.

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF150518C08	Original release	Jun. 18, 2015

1. CERTIFICATION

PRODUCT:	Consumer Electornics
MODEL NO.:	SAV-CRU-0600,SAV-CRU-0601
BRAND:	Simple Host Controller
APPLICANT:	Savant Systems LLC
TESTED:	May 29, 2015 ~ Jun. 06, 2015
TEST SAMPLE:	Identical Prototype
STANDARDS:	**FCC Part 15, Subpart C (Section 15.247)**
	ANSI C63.10-2013

The above equipment (model: SAV-CRU-0600,SAV-CRU-0601) has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch,** and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

PREPARED BY : Gina Liu **, DATE :** Jun. 18, 2015

Gina Liu / Specialist

APPROVED BY : Kay Wu **, DATE :** Jun. 18, 2015

Kay Chen / Supervisor

2. SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC PART 15, SUBPART C (SECTION 15.247)			
STANDARD SECTION	**TEST TYPE**	**RESULT**	**REMARK**
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is -24.36dB at 0.31432MHz.
15.205 & 15.209	Radiated Emissions	PASS	Meet the requirement of limit. Minimum passing margin is -1.04dB at 2484MHz.
15.247(d)	Band Edge Measurement	PASS	Meet the requirement of limit.
15.247(d)	Antenna Port Emission	PASS	Meet the requirement of limit.
15.247(a)(2)	6dB bandwidth	PASS	Meet the requirement of limit.
15.247(b)	Conducted power	PASS	Meet the requirement of limit.
15.247(e)	Power Spectral Density	PASS	Meet the requirement of limit.
15.203	Antenna Requirement	PASS	No antenna connector is used.

2.1 MEASUREMENT UNCERTAINTY

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

MEASUREMENT	FREQUENCY	UNCERTAINTY
Conducted emissions	9kHz~30MHz	2.44 dB
Radiated emissions	30MHz ~ 200MHz	2.93 dB
	200MHz ~1000MHz	2.95 dB
	1GHz ~ 18GHz	2.26 dB
	18GHz ~ 40GHz	1.94 dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k = 2.

3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

EUT	Consumer Electornics
MODEL NO.	SAV-CRU-0600,SAV-CRU-0601
POWER SUPPLY	5.0Vdc (adapter)
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 MCS7
OPERATING FREQUENCY	2412 ~ 2462MHz
NUMBER OF CHANNEL	11 for 802.11b, 802.11g, 802.11n (20MHz)
OUTPUT POWER	136.123mW for 2412 ~ 2462MHz
ANTENNA TYPE	PIFA antenna with 0.83dBi gain
ANTENNA CONNECTOR	NA
DATA CABLE	Refer to Note as below
I/O PORTS	Refer to user's manual
ACCESSORY DEVICES	Refer to Note as below

NOTE:

1. All models are listed as below.

Brand	Model	Difference
Simple Host Controller	SAV-CRU-0600	All models are electrically identical, different model names are for marketing purpose.
	SAV-CRU-0601	

2. The EUT contains following accessory devices.

ITEM	BRAND	MODEL	SPECIFICATION
Adapter 1	SIAN POWER DEVICES INC.	WB-10E05FU	I/P: 100-240Vac, 50/60Hz, 0.4A O/P: 5Vdc, 2A
Adapter 2	CUI INC.	SWI10-5-N-I38-C1	I/P: 90-264Vac, 50/60Hz, 0.3A O/P: 5Vdc, 2A
WLAN Chip	Qualcomm Atheros	QCA6234X	--

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

MODULATION MODE	TX FUNCTION
802.11b	1TX
802.11g	1TX
802.11n (20MHz)	1TX, 2TX

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

3.2 DESCRIPTION OF TEST MODES

FOR 2.4GHz:

11 channels are provided for 802.11b, 802.11g and 802.11n (20MHz):

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

3.2.1 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

WLAN 2.4GHz:

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE≥1G	RE<1G	PLC	APCM	
A	√	√	√	√	Chain 1
B	√	-	-	-	Chain 0
C	√	-	-	√	Chain 0 + Chain 1

Where **RE≥1G:** Radiated Emission above 1GHz **RE<1G:** Radiated Emission below 1GHz
PLC: Power Line Conducted Emission **APCM:** Antenna Port Conducted Measurement

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

RADIATED EMISSION TEST (ABOVE 1GHz):

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

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

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
A	802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1.0
A	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0
B			11			
A, C	802.11n (20MHz)	1 to 11	1, 6, 11	OFDM	BPSK	MCS0

RADIATED EMISSION TEST (BELOW 1GHz):

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

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

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
A	802.11g	1 to 11	1	OFDM	BPSK	6.0

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	802.11g	1 to 11	1	OFDM	BPSK	6.0

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 11	1, 6, 11	DSSS	DBPSK	1.0
A	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0
A, C	802.11n (20MHz)	1 to 11	1, 6, 11	OFDM	BPSK	MCS0

ANTENNA PORT CONDUCTED MEASUREMENT:

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

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

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

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
A	802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1.0
A	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0
A, C	802.11n (20MHz)	1 to 11	1, 6, 11	OFDM	BPSK	MCS0

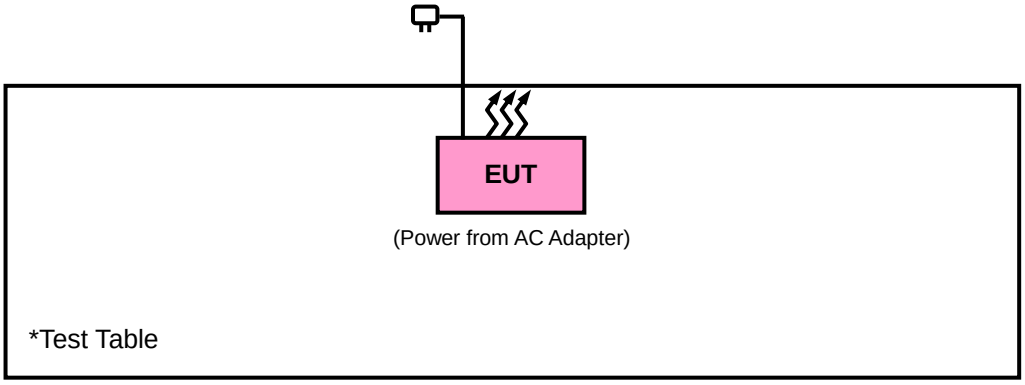
TEST CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE≥1G	25deg. C, 65%RH	120Vac, 60Hz	Hwa Chiang, Will Chen Charles Hsiao, Harry Hsueh
RE<1G	25deg. C, 65%RH	120Vac, 60Hz	Charles Hsiao
PLC	25deg. C, 65%RH	120Vac, 60Hz	Toby Tian
APCM	25deg. C, 65%RH	120Vac, 60Hz	Luke Chen

3.3 DESCRIPTION OF SUPPORT UNITS

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

3.3.1 CONFIGURATION OF SYSTEM UNDER TEST



3.4 DUTY CYCLE TEST SIGNAL

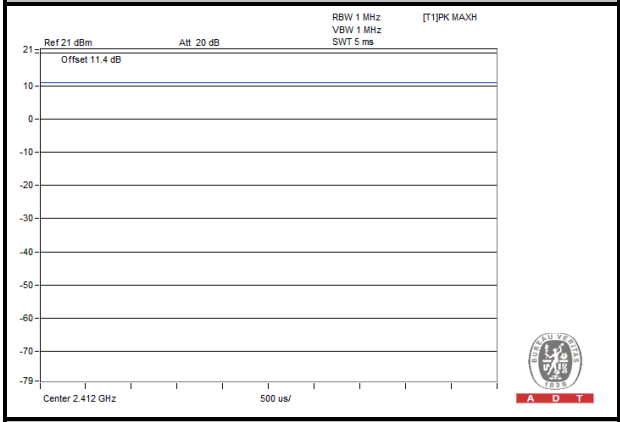
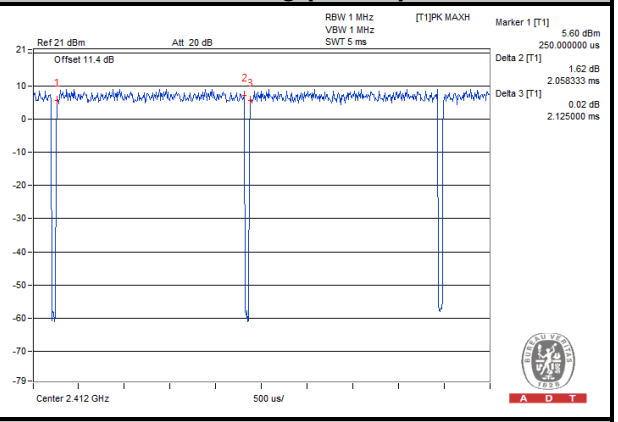
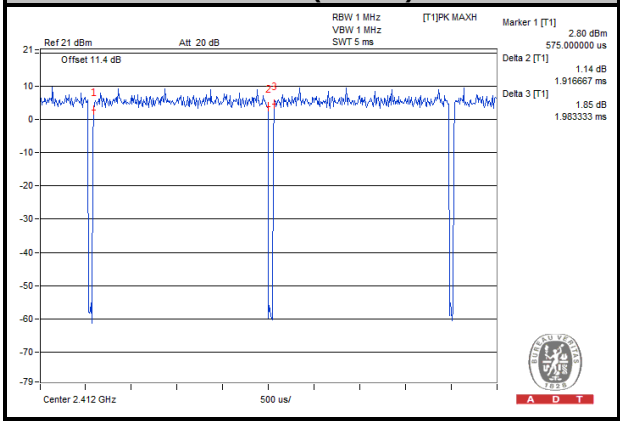
WLAN 2.4GHz

MODE A

802.11b: Duty cycle of test signal is 100 %

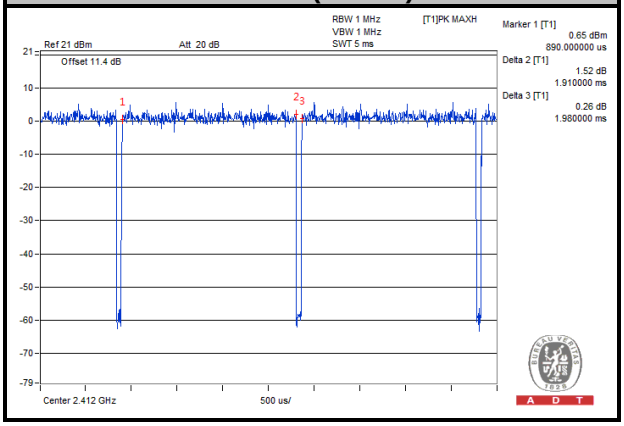
802.11g: Duty cycle of test signal is > 98 %

802.11n (20MHz): Duty cycle = 1.916/1.983 = 0.966, Duty factor = 10 * log(1/0.966) = 0.15

802.11b	802.11g (20MHz)
	
802.11n (20MHz)	
	

MODE C

802.11n (20MHz): Duty cycle = 1.91/1.98 = 0.965, Duty factor = 10 * log(1/0.965) = 0.16

802.11n (20MHz)


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 v03r02
662911 D01 Multiple Transmitter Output v02r01
ANSI C63.10-2013

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

NOTE: The EUT has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC). The test report has been issued separately.

4. TEST TYPES AND RESULTS (FOR 2.4GHz BAND)

4.1 RADIATED EMISSION AND BANDEDGE MEASUREMENT

4.1.1 LIMITS OF RADIATED EMISSION AND BANDEDGE MEASUREMENT

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

FREQUENCIES (MHz)	FIELD STRENGTH (microvolts/meter)	MEASUREMENT DISTANCE (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

NOTE:

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

4.1.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver Agilent	N9038A	MY51210203	Jan.21, 2015	Jan.21, 2016
Spectrum Analyzer Agilent	N9010A	MY52220314	Sep.03, 2014	Sep.02, 2015
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	101261	Dec. 10, 2014	Dec. 09, 2015
BILOG Antenna SCHWARZBECK	VULB9168	9168-472	Feb. 04, 2015	Feb. 04, 2016
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-969	Feb. 09, 2015	Feb. 09, 2016
HORN Antenna SCHWARZBECK	BBHA 9170	9170-480	Feb. 04, 2015	Feb. 04, 2016
Loop Antenna	EM-6879	269	Aug.13, 2014	Aug.12, 2015
Preamplifier EMCI	EMC 012645	980115	Dec. 12, 2014	Dec. 11, 2015
Preamplifier EMCI	EMC 184045	980116	Jan. 09, 2015	Jan. 08, 2016
Preamplifier EMCI	EMC 330H	980112	Dec. 27, 2014	Dec. 26, 2015
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	309219/4 2950114	Oct. 18, 2014	Oct. 17, 2015
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	250130/4	Oct. 18, 2014	Oct. 17, 2015
RF signal cable Worken	RG-213	NA	Nov. 07, 2014	Nov. 06, 2015
Software BV ADT	E3 6.120103	NA	NA	NA
Antenna Tower MF	MFA-440H	NA	NA	NA
Turn Table MF	MFT-201SS	NA	NA	NA
Antenna Tower &Turn Table Controller MF	MF-7802	NA	NA	NA
Bluetooth Tester	CBT	100980	Feb. 10, 2015	Feb. 09, 2016
Power Meter	ML2495A	1232002	Sep. 17, 2014	Sep. 16, 2015
Power Sensor	MA2411B	1207325	Sep. 17, 2014	Sep. 16, 2015

NOTE:
1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The calibration interval of the loop antenna is 24 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. The test was performed in HwaYa Chamber 10.
4. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
5. The FCC Site Registration No. is 690701.
6. The IC Site Registration No. is IC 7450F-10.

4.1.3 TEST PROCEDURES

a. The EUT was placed on the top of a rotating table 0.8 meters (for below 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. Height of receiving 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 Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
f. If the emission level of the EUT in peak mode was lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

NOTE:

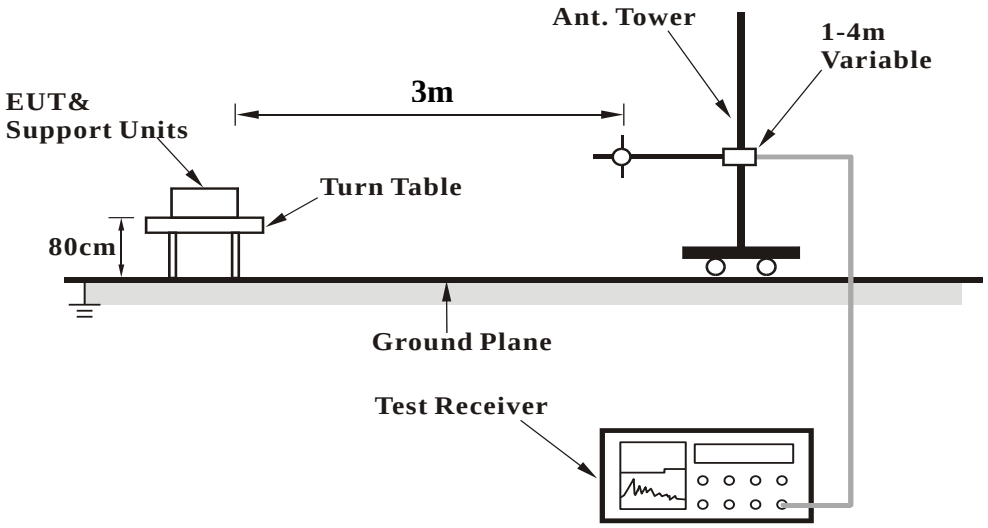
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
3. The resolution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

4.1.4 DEVIATION FROM TEST STANDARD

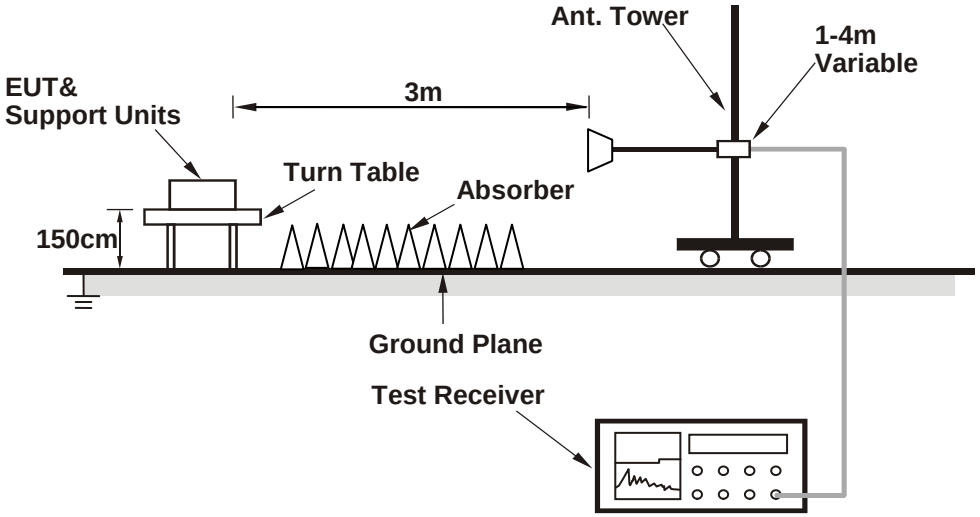
No deviation.

4.1.5 TEST SETUP

<Frequency Range 30MHz ~ 1GHz>



<Frequency Range above 1GHz>



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

4.1.6 EUT OPERATING CONDITIONS

a. Placed the EUT on 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 1GHz WORST-CASE DATA

MODE A

802.11b

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 1	FREQUENCY RANGE	1GHz ~ 25GHz
INPUT POWER	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Hwa Chiang

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (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
2386	49.83	48.12	54	-4.17	31.8	5.4	35.49	310	318	Average
2386	58.37	56.66	74	-15.63	31.8	5.4	35.49	310	318	Peak
2412	109.73	107.96			31.81	5.43	35.47	310	318	Average
2412	112.31	110.54			31.81	5.43	35.47	310	318	Peak
2490	42.2	40.19	54	-11.8	31.9	5.53	35.42	310	318	Average
2490	56.91	54.9	74	-17.09	31.9	5.53	35.42	310	318	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (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
2340	44.32	42.75	54	-9.68	31.74	5.33	35.5	100	312	Average
2340	56.43	54.86	74	-17.57	31.74	5.33	35.5	100	312	Peak
2412	105.27	103.5			31.81	5.43	35.47	100	312	Average
2412	107.94	106.17			31.81	5.43	35.47	100	312	Peak
2488	40.33	38.32	54	-13.67	31.9	5.53	35.42	100	312	Average
2488	55.45	53.44	74	-18.55	31.9	5.53	35.42	100	312	Peak

REMARKS:

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

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 6	FREQUENCY RANGE	1GHz ~ 25GHz
INPUT POWER	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Hwa Chiang

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (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
2384	41.17	39.48	54	-12.83	31.78	5.4	35.49	312	314	Average
2384	56.35	54.66	74	-17.65	31.78	5.4	35.49	312	314	Peak
2437	109.54	107.69			31.85	5.46	35.46	312	314	Average
2437	112.56	110.71			31.85	5.46	35.46	312	314	Peak
2484	41.18	39.22	54	-12.82	31.88	5.5	35.42	312	314	Average
2484	56.32	54.36	74	-17.68	31.88	5.5	35.42	312	314	Peak
4874	52.29	44.1	54	-1.71	33.98	8.27	34.06	111	113	Average
4874	54.49	46.3	74	-19.51	33.98	8.27	34.06	111	113	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (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
2358	41.12	39.49	54	-12.88	31.76	5.37	35.5	100	307	Average
2358	55.82	54.19	74	-18.18	31.76	5.37	35.5	100	307	Peak
2437	105.13	103.28			31.85	5.46	35.46	100	307	Average
2437	107.55	105.7			31.85	5.46	35.46	100	307	Peak
2484	41.18	39.22	54	-12.82	31.88	5.5	35.42	100	307	Average
2484	56.16	54.2	74	-17.84	31.88	5.5	35.42	100	307	Peak
4874	50.42	42.23	54	-3.58	33.98	8.27	34.06	100	42	Average
4874	52.47	44.28	74	-21.53	33.98	8.27	34.06	100	42	Peak

REMARKS:

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

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 11	FREQUENCY RANGE	1GHz ~ 25GHz
INPUT POWER	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Hwa Chiang

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (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
2326	39.91	38.4	54	-14.09	31.73	5.3	35.52	305	318	Average
2326	55.68	54.17	74	-18.32	31.73	5.3	35.52	305	318	Peak
2462	109.85	107.92			31.87	5.5	35.44	305	318	Average
2462	112.43	110.5			31.87	5.5	35.44	305	318	Peak
2484	52.65	50.69	54	-1.35	31.88	5.5	35.42	305	318	Average
2484	59.62	57.66	74	-14.38	31.88	5.5	35.42	305	318	Peak
4924	51.55	43.3	54	-2.45	33.99	8.28	34.02	101	114	Average
4924	55.04	46.79	74	-18.96	33.99	8.28	34.02	101	114	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (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
2368	39.54	37.9	54	-14.46	31.76	5.37	35.49	100	307	Average
2368	55.44	53.8	74	-18.56	31.76	5.37	35.49	100	307	Peak
2462	105.19	103.26			31.87	5.5	35.44	100	307	Average
2462	107.89	105.96			31.87	5.5	35.44	100	307	Peak
2488	46.83	44.82	54	-7.17	31.9	5.53	35.42	100	307	Average
2488	55.09	53.08	74	-18.91	31.9	5.53	35.42	100	307	Peak
4924	52.95	44.7	54	-1.05	33.99	8.28	34.02	119	358	Average
4924	55.66	47.41	74	-18.34	33.99	8.28	34.02	119	358	Peak

REMARKS:

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

802.11g

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 1	FREQUENCY RANGE	1GHz ~ 25GHz
INPUT POWER	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Will Chen

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (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
2390	52.6	50.87	54	-1.4	31.8	5.4	35.47	309	314	Average
2390	65.68	63.95	74	-8.32	31.8	5.4	35.47	309	314	Peak
2412	99.38	97.61			31.81	5.43	35.47	309	314	Average
2412	106.86	105.09			31.81	5.43	35.47	309	314	Peak
2492	41.75	39.73	54	-12.25	31.9	5.53	35.41	309	314	Average
2492	56.13	54.11	74	-17.87	31.9	5.53	35.41	309	314	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (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
2390	47.94	46.21	54	-6.06	31.8	5.4	35.47	100	298	Average
2390	59.59	57.86	74	-14.41	31.8	5.4	35.47	100	298	Peak
2412	93.65	91.88			31.81	5.43	35.47	100	298	Average
2412	101.32	99.55			31.81	5.43	35.47	100	298	Peak
2494	41.03	39.01	54	-12.97	31.9	5.53	35.41	100	298	Average
2494	55.65	53.63	74	-18.35	31.9	5.53	35.41	100	298	Peak

REMARKS:

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

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 6	FREQUENCY RANGE	1GHz ~ 25GHz
INPUT POWER	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Will Chen

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (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
2390	44.37	42.64	54	-9.63	31.8	5.4	35.47	305	322	Average
2390	57.27	55.54	74	-16.73	31.8	5.4	35.47	305	322	Peak
2437	103.53	101.68			31.85	5.46	35.46	305	322	Average
2437	111.31	109.46			31.85	5.46	35.46	305	322	Peak
2484	45.93	43.97	54	-8.07	31.88	5.5	35.42	305	322	Average
2484	58.88	56.92	74	-15.12	31.88	5.5	35.42	305	322	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (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
2384	41.69	40	54	-12.31	31.78	5.4	35.49	100	310	Average
2384	56.79	55.1	74	-17.21	31.78	5.4	35.49	100	310	Peak
2437	98.31	96.46			31.85	5.46	35.46	100	310	Average
2437	106.29	104.44			31.85	5.46	35.46	100	310	Peak
2484	42.65	40.69	54	-11.35	31.88	5.5	35.42	100	310	Average
2484	56.27	54.31	74	-17.73	31.88	5.5	35.42	100	310	Peak

REMARKS:

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

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 11	FREQUENCY RANGE	1GHz ~ 25GHz
INPUT POWER	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Hwa Chiang

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (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
2332	40.69	39.15	54	-13.31	31.73	5.33	35.52	304	317	Average
2332	55.59	54.05	74	-18.41	31.73	5.33	35.52	304	317	Peak
2462	98.88	96.95			31.87	5.5	35.44	304	317	Average
2462	106.79	104.86			31.87	5.5	35.44	304	317	Peak
2484	52.96	51	54	-1.04	31.88	5.5	35.42	304	317	Average
2484	65.54	63.58	74	-8.46	31.88	5.5	35.42	304	317	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (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
2374	40.25	38.59	54	-13.75	31.78	5.37	35.49	100	315	Average
2374	56.37	54.71	74	-17.63	31.78	5.37	35.49	100	315	Peak
2462	93.4	91.47			31.87	5.5	35.44	100	315	Average
2462	101.58	99.65			31.87	5.5	35.44	100	315	Peak
2484	48.59	46.63	54	-5.41	31.88	5.5	35.42	100	315	Average
2484	61.46	59.5	74	-12.54	31.88	5.5	35.42	100	315	Peak

REMARKS:

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

802.11n (20MHz)

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 1	FREQUENCY RANGE	1GHz ~ 25GHz
INPUT POWER	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Will Chen

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (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
2390	52.7	50.97	54	-1.3	31.8	5.4	35.47	309	319	Average
2390	65.44	63.71	74	-8.56	31.8	5.4	35.47	309	319	Peak
2412	97.41	95.64			31.81	5.43	35.47	309	319	Average
2412	105.22	103.45			31.81	5.43	35.47	309	319	Peak
2488	41.74	39.73	54	-12.26	31.9	5.53	35.42	309	319	Average
2488	56.28	54.27	74	-17.72	31.9	5.53	35.42	309	319	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (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
2390	47.44	45.71	54	-6.56	31.8	5.4	35.47	100	298	Average
2390	59.71	57.98	74	-14.29	31.8	5.4	35.47	100	298	Peak
2412	92.77	91			31.81	5.43	35.47	100	298	Average
2412	100.38	98.61			31.81	5.43	35.47	100	298	Peak
2492	41.08	39.06	54	-12.92	31.9	5.53	35.41	100	298	Average
2492	56.37	54.35	74	-17.63	31.9	5.53	35.41	100	298	Peak

REMARKS:

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

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 6	FREQUENCY RANGE	1GHz ~ 25GHz
INPUT POWER	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Will Chen

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (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
2390	43.35	41.62	54	-10.65	31.8	5.4	35.47	304	319	Average
2390	55.71	53.98	74	-18.29	31.8	5.4	35.47	304	319	Peak
2437	102.04	100.19			31.85	5.46	35.46	304	319	Average
2437	110.08	108.23			31.85	5.46	35.46	304	319	Peak
2484	44.19	42.23	54	-9.81	31.88	5.5	35.42	304	319	Average
2484	57.41	55.45	74	-16.59	31.88	5.5	35.42	304	319	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (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
2354	41.05	39.46	54	-12.95	31.76	5.33	35.5	100	309	Average
2354	56.42	54.83	74	-17.58	31.76	5.33	35.5	100	309	Peak
2437	97.83	95.98			31.85	5.46	35.46	100	309	Average
2437	105.75	103.9			31.85	5.46	35.46	100	309	Peak
2490	41.94	39.93	54	-12.06	31.9	5.53	35.42	100	309	Average
2490	56.08	54.07	74	-17.92	31.9	5.53	35.42	100	309	Peak

REMARKS:

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

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 11	FREQUENCY RANGE	1GHz ~ 25GHz
INPUT POWER	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Will Chen

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (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
2338	40.74	39.19	54	-13.26	31.74	5.33	35.52	304	319	Average
2338	55.45	53.9	74	-18.55	31.74	5.33	35.52	304	319	Peak
2462	97.48	95.55			31.87	5.5	35.44	304	319	Average
2462	105.35	103.42			31.87	5.5	35.44	304	319	Peak
2484	52.9	50.94	54	-1.1	31.88	5.5	35.42	304	319	Average
2484	65.39	63.43	74	-8.61	31.88	5.5	35.42	304	319	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (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
2380	40.42	38.76	54	-13.58	31.78	5.37	35.49	100	315	Average
2380	55.5	53.84	74	-18.5	31.78	5.37	35.49	100	315	Peak
2462	92.01	90.08			31.87	5.5	35.44	100	315	Average
2462	100.26	98.33			31.87	5.5	35.44	100	315	Peak
2484	48.54	46.58	54	-5.46	31.88	5.5	35.42	100	315	Average
2484	62.3	60.34	74	-11.7	31.88	5.5	35.42	100	315	Peak

REMARKS:

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

MODE B

802.11g

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 11	FREQUENCY RANGE	1GHz ~ 25GHz
INPUT POWER	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Charles Hsiao

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (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
2364	40.23	38.6	54	-13.77	31.76	5.37	35.5	168	329	Average
2364	56.28	54.65	74	-17.72	31.76	5.37	35.5	168	329	Peak
2462	93.56	91.63			31.87	5.5	35.44	168	329	Average
2462	101.79	99.86			31.87	5.5	35.44	168	329	Peak
2484	52.38	50.42	54	-1.62	31.88	5.5	35.42	168	329	Average
2484	65.47	63.51	74	-8.53	31.88	5.5	35.42	168	329	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (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
2314	40.21	38.72	54	-13.79	31.71	5.3	35.52	112	63	Average
2314	55.47	53.98	74	-18.53	31.71	5.3	35.52	112	63	Peak
2462	98.72	96.79			31.87	5.5	35.44	112	63	Average
2462	106.48	104.55			31.87	5.5	35.44	112	63	Peak
2484	52.95	50.99	54	-1.05	31.88	5.5	35.42	112	63	Average
2484	66.5	64.54	74	-7.5	31.88	5.5	35.42	112	63	Peak

REMARKS:

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

MODE C

802.11n (20MHz)

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 1	FREQUENCY RANGE	1GHz ~ 25GHz
INPUT POWER	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Harry Hsueh

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (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
2390	52.18	50.45	54	-1.82	31.8	5.4	35.47	286	315	Average
2390	64.28	62.55	74	-9.72	31.8	5.4	35.47	286	315	Peak
2412	97.74	95.97			31.81	5.43	35.47	281	309	Average
2412	105.69	103.92			31.81	5.43	35.47	281	309	Peak
2486	41.27	39.28	54	-12.73	31.88	5.53	35.42	281	309	Average
2486	55.51	53.52	74	-18.49	31.88	5.53	35.42	281	309	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (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
2390	46.94	45.21	54	-7.06	31.8	5.4	35.47	100	199	Average
2390	58.94	57.21	74	-15.06	31.8	5.4	35.47	100	199	Peak
2412	93.34	91.57			31.81	5.43	35.47	114	194	Average
2412	100.96	99.19			31.81	5.43	35.47	114	194	Peak
2488	40.91	38.9	54	-13.09	31.9	5.53	35.42	114	194	Average
2488	56.22	54.21	74	-17.78	31.9	5.53	35.42	114	194	Peak

REMARKS:

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

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 6	FREQUENCY RANGE	1GHz ~ 25GHz
INPUT POWER	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Harry Hsueh

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (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
2390	42.72	40.99	54	-11.28	31.8	5.4	35.47	281	309	Average
2390	55.85	54.12	74	-18.15	31.8	5.4	35.47	281	309	Peak
2437	101.84	99.99			31.85	5.46	35.46	281	309	Average
2437	110.14	108.29			31.85	5.46	35.46	281	309	Peak
2498	41.96	39.94	54	-12.04	31.9	5.53	35.41	281	309	Average
2498	55.12	53.1	74	-18.88	31.9	5.53	35.41	281	309	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (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
2312	41.64	40.16	54	-12.36	31.71	5.3	35.53	100	190	Average
2312	55.73	54.25	74	-18.27	31.71	5.3	35.53	100	190	Peak
2437	97.17	95.32			31.85	5.46	35.46	100	190	Average
2437	105.54	103.69			31.85	5.46	35.46	100	190	Peak
2488	41.16	39.15	54	-12.84	31.9	5.53	35.42	100	190	Average
2488	56.57	54.56	74	-17.43	31.9	5.53	35.42	100	190	Peak

REMARKS:

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

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 11	FREQUENCY RANGE	1GHz ~ 25GHz
INPUT POWER	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Harry Hsueh

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (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
2334	41.59	40.05	54	-12.41	31.73	5.33	35.52	303	312	Average
2334	54.81	53.27	74	-19.19	31.73	5.33	35.52	303	312	Peak
2462	98.6	96.67			31.87	5.5	35.44	303	312	Average
2462	106.37	104.44			31.87	5.5	35.44	303	312	Peak
2483.5	52.48	50.52	54	-1.52	31.88	5.5	35.42	280	328	Average
2483.5	64.68	62.72	74	-9.32	31.88	5.5	35.42	280	328	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (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
2368	40.77	39.13	54	-13.23	31.76	5.37	35.49	102	305	Average
2368	55.53	53.89	74	-18.47	31.76	5.37	35.49	102	305	Peak
2462	92.86	90.93			31.87	5.5	35.44	102	305	Average
2462	101.09	99.16			31.87	5.5	35.44	102	305	Peak
2483.5	52.75	50.79	54	-1.25	31.88	5.5	35.42	102	305	Average
2483.5	65.05	63.09	74	-8.95	31.88	5.5	35.42	102	305	Peak

REMARKS:

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

BELOW 1GHz WORST-CASE DATA:

MODE A

802.11g

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 11	**FREQUENCY RANGE**	30MHz ~ 1GHz
INPUT POWER	120Vac, 60 Hz	**DETECTOR FUNCTION**	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	**TESTED BY**	Charles Hsiao

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (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
98.85	26.45	45.23	43.5	-17.05	12.15	1.28	32.21	198	154	Peak
148.26	26.1	48.46	43.5	-17.4	8.39	1.52	32.27	182	146	Peak
297.03	38.03	55.13	46	-7.97	13	2.03	32.13	130	203	Peak
346.2	34.24	49.96	46	-11.76	14.16	2.19	32.07	146	250	Peak
395.9	33.13	48.09	46	-12.87	14.91	2.34	32.21	109	175	Peak
544.3	26.88	39.35	46	-19.12	16.96	2.76	32.19	169	276	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (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
30.81	36.32	56.23	40	-3.68	11.61	0.74	32.26	116	74	Peak
49.44	27.18	43.95	40	-12.82	14.55	0.9	32.22	101	224	Peak
247.62	25	43.01	46	-21	12.25	1.85	32.11	185	279	Peak
395.9	27.13	42.09	46	-18.87	14.91	2.34	32.21	141	145	Peak
544.3	29.52	41.99	46	-16.48	16.96	2.76	32.19	166	263	Peak
643	24.84	35.67	46	-21.16	18.34	2.99	32.16	184	221	Peak

REMARKS: 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 OF EMISSION (MHz)	CONDUCTED LIMIT (dBμV)	
	Quasi-peak	Average
0.15 ~ 0.5	66 to 56	56 to 46
0.5 ~ 5	56	46
5 ~ 30	60	50

NOTE: 1. The lower limit shall apply at the transition frequencies.

2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

4.2.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver ROHDE & SCHWARZ	ESCI	100613	Nov. 11, 2014	Nov. 10, 2015
RF signal cable Woken	5D-FB	Cable-HYC01-01	Dec. 26, 2014	Dec. 25, 2015
LISN ROHDE & SCHWARZ (EUT)	ESH3-Z5	835239/001	Mar. 02, 2015	Mar. 01, 2016
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Jul. 21, 2014	Jul. 20, 2015
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

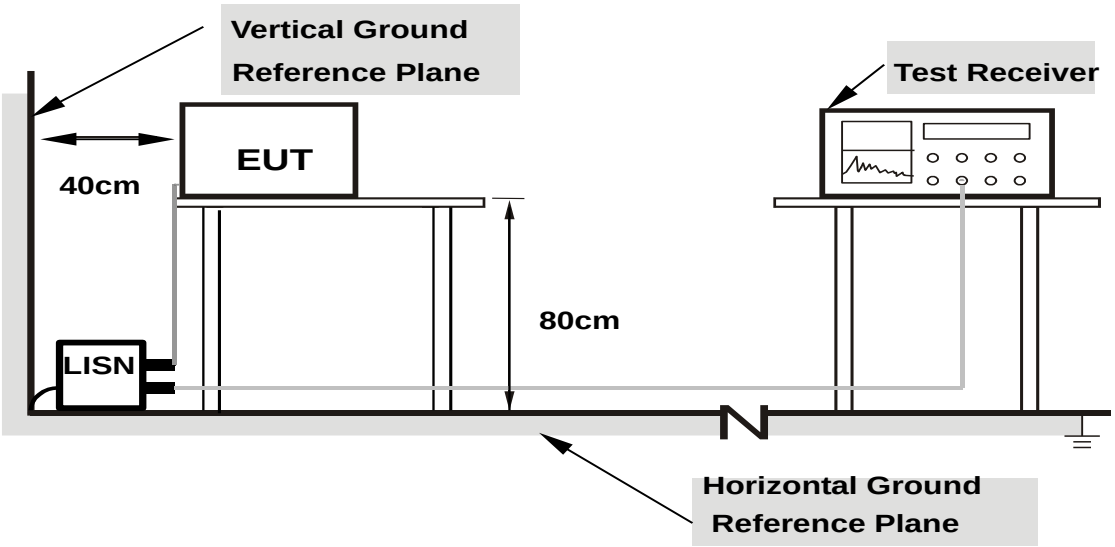
a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling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

NOTE: All modes of operation were investigated and the worst-case emissions are reported.

4.2.4 DEVIATION FROM TEST STANDARD

No deviation.

4.2.5 TEST SETUP



Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

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

4.2.6 EUT OPERATING CONDITIONS

Same as section 4.1.6.

4.2.7 TEST RESULTS

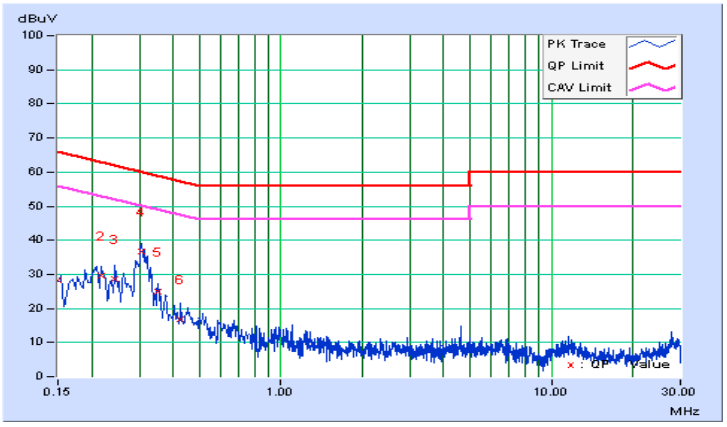
CONDUCTED WORST-CASE DATA：

PHASE	Line 1	**6dB BANDWIDTH**	9kHz

Phase Of Power : Line (L)										
No	Frequency	Correction Factor	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
	(MHz)	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	0.05	28.33	21.94	28.38	21.99	66.00	56.00	-37.62	-34.01
2	0.21647	0.06	29.47	16.60	29.53	16.66	62.95	52.95	-33.42	-36.29
3	0.24384	0.06	28.46	15.84	28.52	15.90	61.96	51.96	-33.44	-36.06
4	**0.30640**	**0.06**	**36.77**	**25.80**	**36.83**	**25.86**	**60.07**	**50.07**	**-23.24**	**-24.21**
5	0.34941	0.06	24.75	12.55	24.81	12.61	58.98	48.98	-34.17	-36.37
6	0.42761	0.06	16.79	6.44	16.85	6.50	57.30	47.30	-40.45	-40.80

Remarks:

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

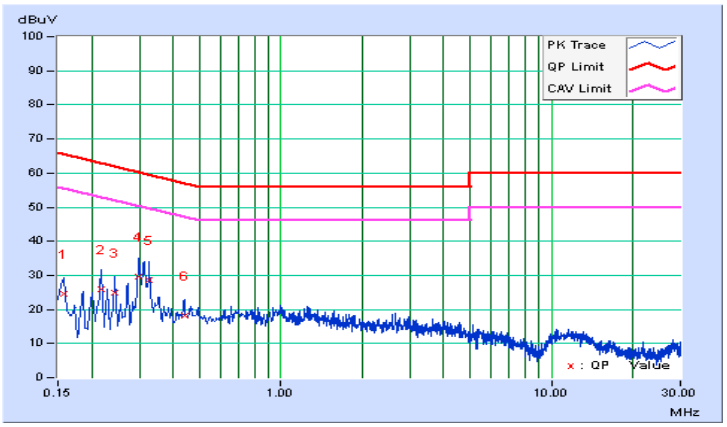


PHASE	Line 2	6dB BANDWIDTH	9kHz

Phase Of Power : Neutral (N)										
No	Frequency	Correction Factor	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
	(MHz)	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15760	0.05	24.42	15.21	24.47	15.26	65.59	55.59	-41.12	-40.33
2	0.21647	0.05	25.90	10.25	25.95	10.30	62.95	52.95	-37.00	-42.65
3	0.24384	0.05	24.88	10.34	24.93	10.39	61.96	51.96	-37.03	-41.57
4	0.29858	0.05	29.49	16.75	29.54	16.80	60.28	50.28	-30.74	-33.48
5	0.32595	0.06	28.64	17.91	28.70	17.97	59.55	49.55	-30.86	-31.59
6	0.43924	0.06	18.24	9.52	18.30	9.58	57.08	47.08	-38.77	-37.49

Remarks:

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

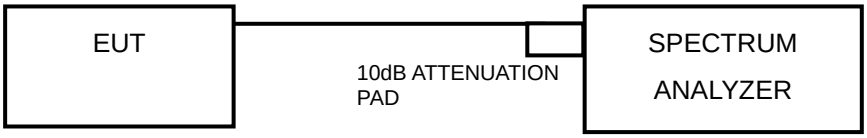


4.3 6dB BANDWIDTH MEASUREMENT

4.3.1 LIMITS OF 6dB BANDWIDTH MEASUREMENT

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

4.3.2 TEST SETUP



4.3.3 TEST INSTRUMENTS

Refer to section 4.1.2 to get information of above instrument.

4.3.4 TEST PROCEDURE

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

4.3.5 DEVIATION FROM TEST STANDARD

No deviation.

4.3.6 EUT OPERATING CONDITIONS

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

4.3.7 TEST RESULTS

MODE A

802.11b

CHANNEL	FREQUENCY (MHz)	6dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
1	2412	7.13	0.5	PASS
6	2437	7.15	0.5	PASS
11	2462	7.15	0.5	PASS

802.11g

CHANNEL	FREQUENCY (MHz)	6dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
1	2412	16.34	0.5	PASS
6	2437	16.35	0.5	PASS
11	2462	16.36	0.5	PASS

802.11n (20MHz)

CHANNEL	FREQUENCY (MHz)	6dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
1	2412	17.32	0.5	PASS
6	2437	17.22	0.5	PASS
11	2462	17.25	0.5	PASS

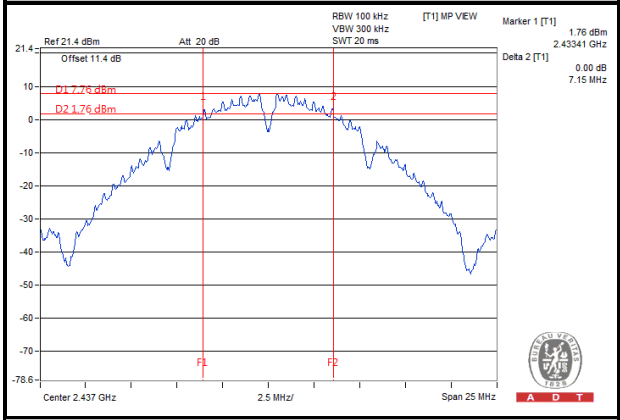
MODE C

802.11n (20MHz)

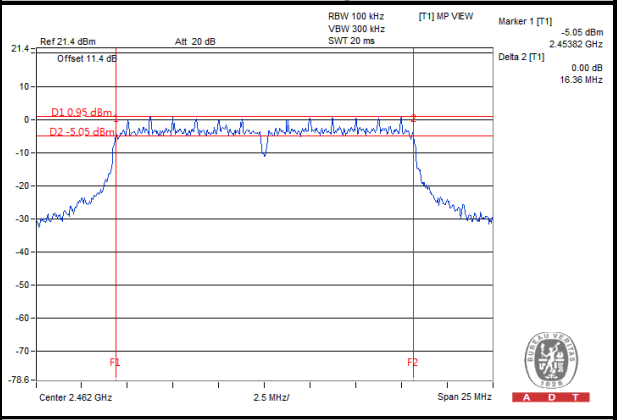
CHANNEL	FREQUENCY (MHz)	6dB BANDWIDTH (MHz)		MINIMUM LIMIT (MHz)	PASS / FAIL
		CHAIN 0	CHAIN 1		
1	2412	17.55	16.87	0.5	PASS
6	2437	17.22	17.21	0.5	PASS
11	2462	17.59	17.23	0.5	PASS

SPECTRUM PLOT OF WORST VALUE

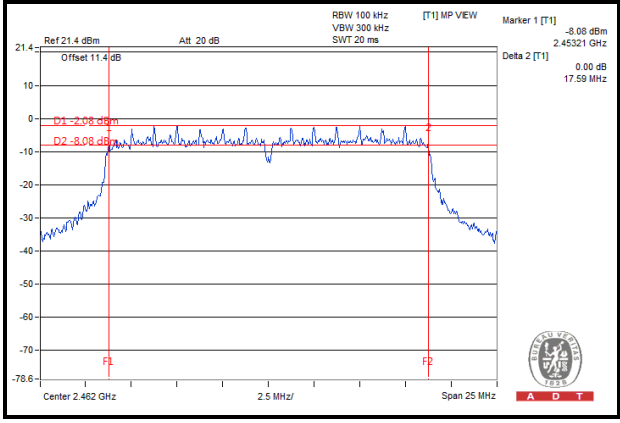
802.11b



802.11g



802.11n (20MHz)



4.4 CONDUCTED OUTPUT POWER

4.4.1 LIMITS OF CONDUCTED OUTPUT POWER MEASUREMENT

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

Per KDB 662911 D01 Multiple Transmitter Output v02r01 Method of conducted output power measurement on IEEE 802.11 devices,

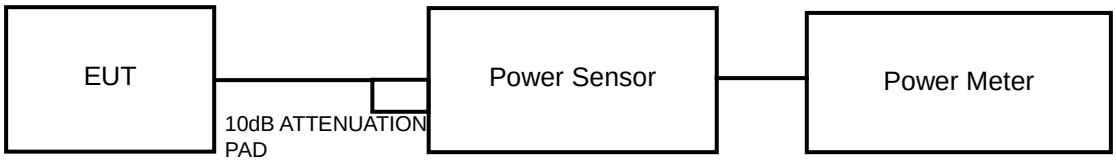
Array Gain = 0 dB (i.e., no array gain) for NANT ≤ 4;

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.

4.4.2 TEST SETUP



4.4.3 TEST INSTRUMENTS

Refer to section 4.1.2 to get information of above instrument.

4.4.4 TEST PROCEDURES

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

4.4.5 DEVIATION FROM TEST STANDARD

No deviation.

4.4.6 EUT OPERATING CONDITIONS

Same as section 4.3.6.

4.4.7 TEST RESULTS

MODE A

802.11b

CHANNEL	FREQUENCY (MHz)	PEAK POWER (mW)	PEAK POWER (dBm)	LIMIT (dBm)	PASS / FAIL
1	2412	92.47	19.66	30	PASS
6	2437	93.33	19.70	30	PASS
11	2462	90.78	19.58	30	PASS

802.11g

CHANNEL	FREQUENCY (MHz)	PEAK POWER (mW)	PEAK POWER (dBm)	LIMIT (dBm)	PASS / FAIL
1	2412	41.50	16.18	30	PASS
6	2437	123.31	20.91	30	PASS
11	2462	31.92	15.04	30	PASS

802.11n (20MHz)

CHANNEL	FREQUENCY (MHz)	PEAK POWER (mW)	PEAK POWER (dBm)	LIMIT (dBm)	PASS / FAIL
1	2412	36.22	15.59	30	PASS
6	2437	111.94	20.49	30	PASS
11	2462	26.42	14.22	30	PASS

MODE C

802.11n (20MHz)

CHAN.	FREQ. (MHz)	PEAK POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)	LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1				
1	2412	11.68	14.25	41.330	16.16	30	PASS
6	2437	18.04	18.60	136.123	21.34	30	PASS
11	2462	14.57	14.54	57.086	17.57	30	PASS

MODE A

802.11b

CHANNEL	FREQUENCY (MHz)	AVERAGE POWER (mW)	AVERAGE POWER (dBm)	LIMIT (dBm)	PASS / FAIL
1	2412	92.47	16.89	30	PASS
6	2437	93.33	16.93	30	PASS
11	2462	90.78	16.87	30	PASS

802.11g

CHANNEL	FREQUENCY (MHz)	AVERAGE POWER (mW)	AVERAGE POWER (dBm)	LIMIT (dBm)	PASS / FAIL
1	2412	11.56	10.63	30	PASS
6	2437	39.08	15.92	30	PASS
11	2462	8.13	9.1	30	PASS

802.11n (20MHz)

CHANNEL	FREQUENCY (MHz)	AVERAGE POWER (mW)	AVERAGE POWER (dBm)	LIMIT (dBm)	PASS / FAIL
1	2412	8.99	9.54	30	PASS
6	2437	30.90	14.9	30	PASS
11	2462	6.35	8.03	30	PASS

MODE C

802.11n (20MHz)

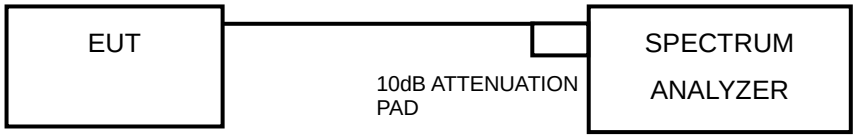
CHAN.	FREQ. (MHz)	AVERAGE POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)	LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1				
1	2412	5.76	8.18	10.35	10.15	30	PASS
6	2437	11.69	12.73	33.50	15.25	30	PASS
11	2462	8.79	8.41	14.49	11.61	30	PASS

4.5 POWER SPECTRAL DENSITY MEASUREMENT

4.5.1 LIMITS OF POWER SPECTRAL DENSITY MEASUREMENT

The Maximum of Power Spectral Density Measurement is 8dBm.

4.5.2 TEST SETUP



4.5.3 TEST INSTRUMENTS

Refer to section 4.1.2 to get information of above instrument.

4.5.4 TEST PROCEDURE

a. Set the RBW = 3 kHz, VBW =10 kHz, Detector = peak.
b. Sweep time = auto couple, Trace mode = max hold, allow trace to fully stabilize.
c. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

4.5.5 DEVIATION FROM TEST STANDARD

No deviation.

4.5.6 EUT OPERATING CONDITION

Same as section 4.3.6.

4.5.7 TEST RESULTS

MODE A

802.11b

CHANNEL	FREQUENCY (MHz)	PSD (dBm/3kHz)	LIMIT (dBm/3kHz)	PASS / FAIL
1	2412	-6.56	8	PASS
6	2437	-7.06	8	PASS
11	2462	-7.12	8	PASS

802.11g

CHANNEL	FREQUENCY (MHz)	PSD (dBm/3kHz)	LIMIT (dBm/3kHz)	PASS / FAIL
1	2412	-16.63	8	PASS
6	2437	-9.50	8	PASS
11	2462	-16.44	8	PASS

802.11n (20MHz)

CHANNEL	FREQUENCY (MHz)	PSD (dBm/3kHz)	LIMIT (dBm/3kHz)	PASS / FAIL
1	2412	-16.51	8	PASS
6	2437	-10.56	8	PASS
11	2462	-16.37	8	PASS

MODE C

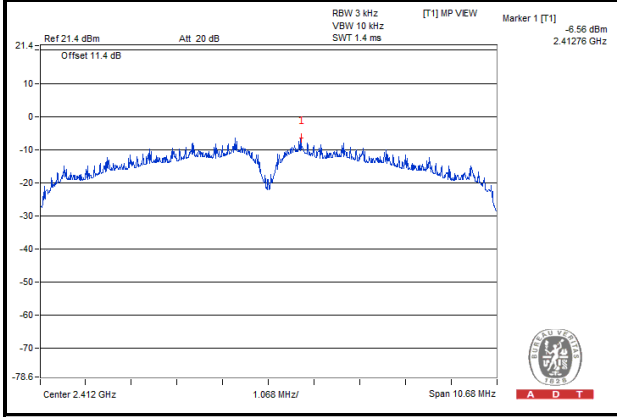
802.11n (20MHz)

TX Chain	Channel	Freq. (MHz)	PSD (dBm/3kHz)	10 log (N=2) dB	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	PASS /FAIL
0	1	2412	-20.62	3.01	-17.61	6	PASS
	6	2437	-15.34	3.01	-12.33	6	PASS
	11	2462	-18.92	3.01	-15.91	6	PASS
1	1	2412	-19.51	3.01	-16.50	6	PASS
	6	2437	-13.41	3.01	-10.40	6	PASS
	11	2462	-19.70	3.01	-16.69	6	PASS

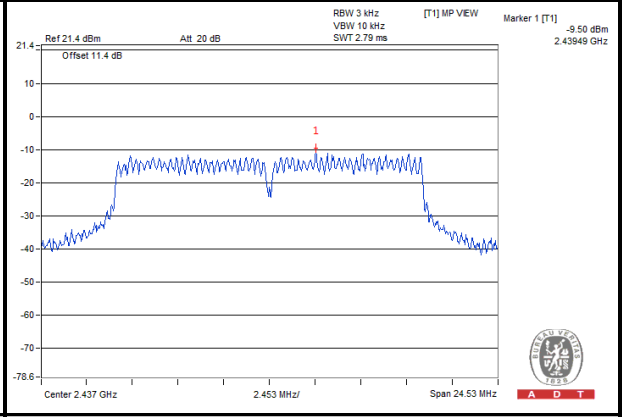
NOTE: Directional gain = 0.83dBi + 10log(2) = 3.84dBi < 6dBi, so the limit no need to reduced.

SPECTRUM PLOT OF WORST VALUE

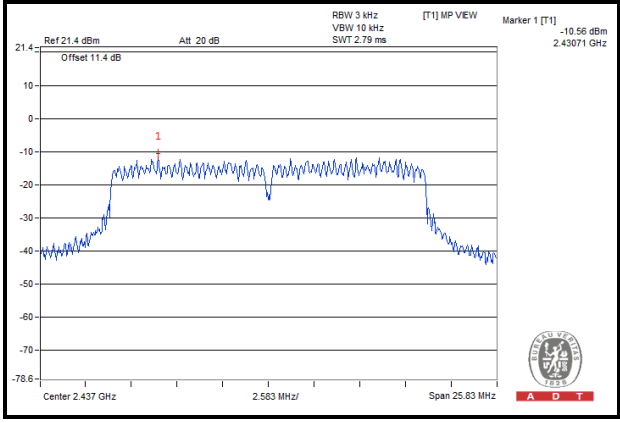
802.11b



802.11g



802.11n (20MHz)



802.11n (40MHz)

4.6 CONDUCTED OUT OF BAND EMISSION MEASUREMENT

4.6.1 LIMITS OF CONDUCTED OUT OF BAND EMISSION MEASUREMENT

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

4.6.2 TEST SETUP

4.6.3 TEST INSTRUMENTS

Refer to section 4.1.2 to get information of above instrument.

4.6.4 TEST PROCEDURE

MEASUREMENT PROCEDURE REF

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

MEASUREMENT PROCEDURE OOBE

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

4.6.5 DEVIATION FROM TEST STANDARD

No deviation.

4.6.6 EUT OPERATING CONDITION

Same as section 4.3.6.

4.6.7 TEST RESULTS

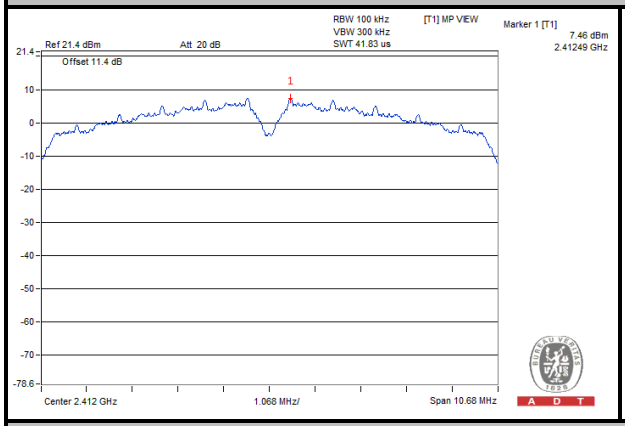
The conducted emission test is performed on each TX port of operating mode without summing or adding 10log (N) since the limit is relative emission limit.

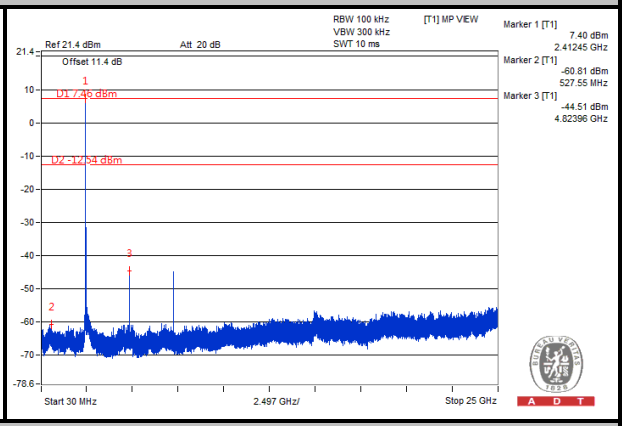
The spectrum plots are attached on the following images. D1 line indicates the highest level, and D2 line indicates the 20dB offset below D1. It shows compliance with the requirement.

MODE A

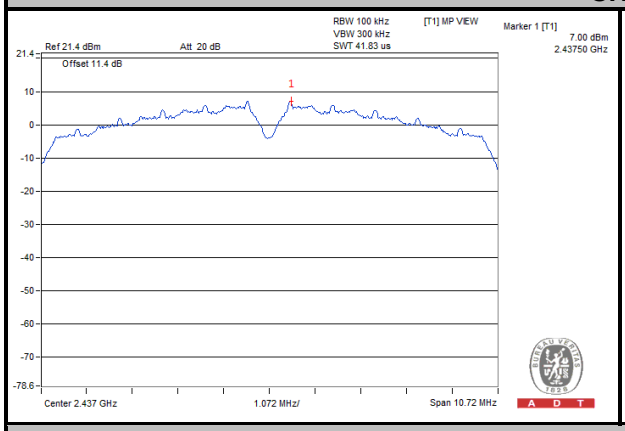
802.11b

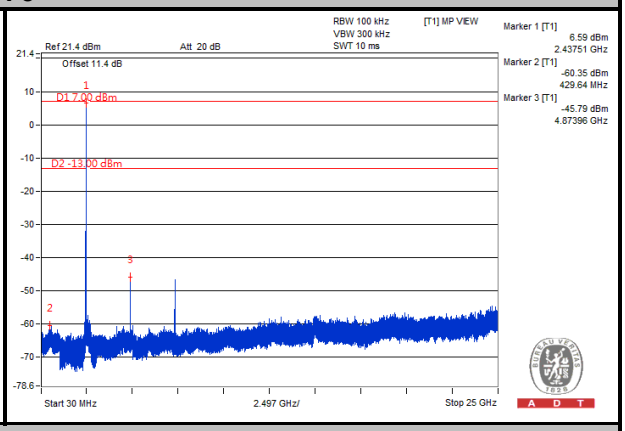
CH 1



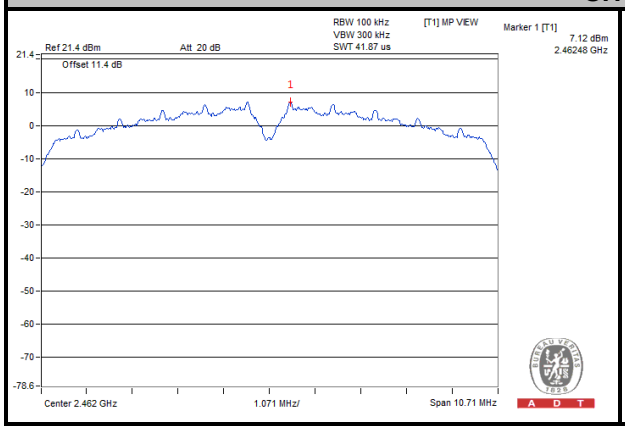


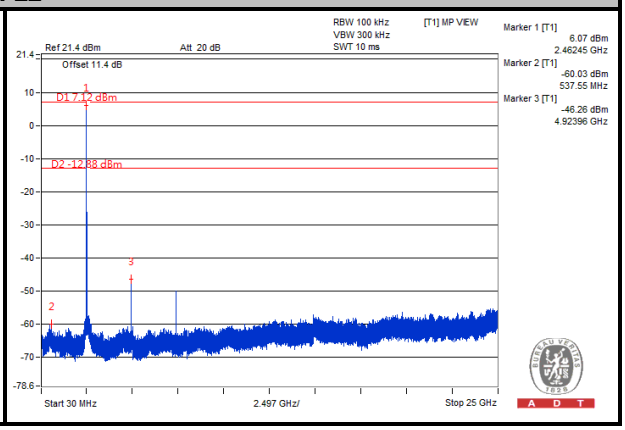
CH 6

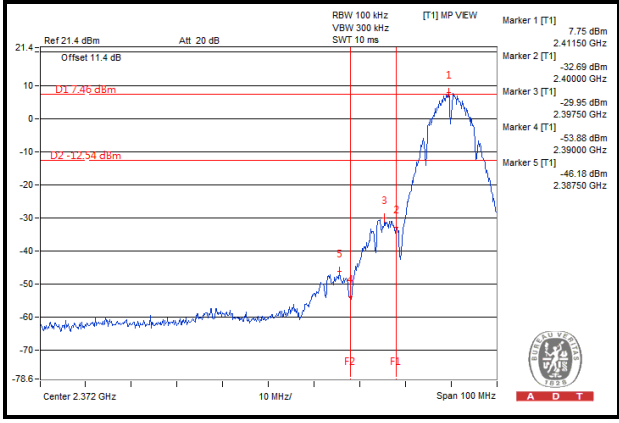
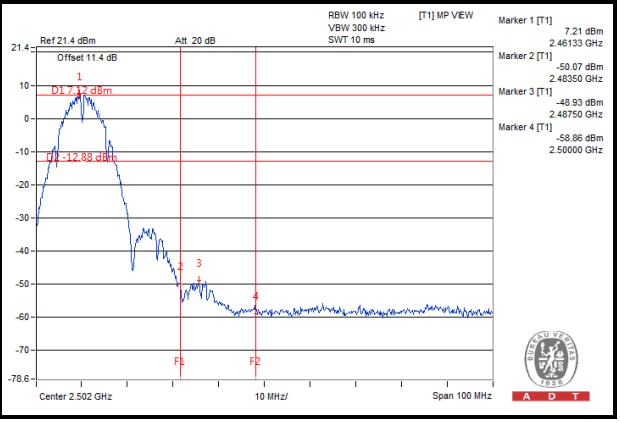




CH 11

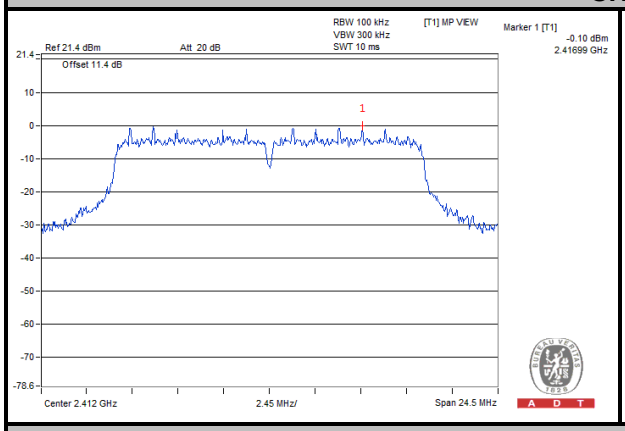


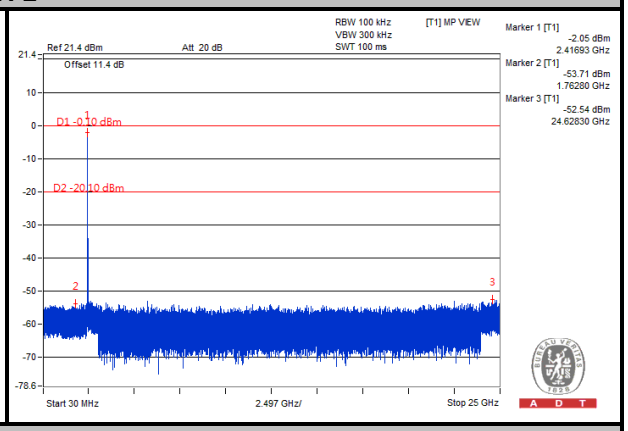


CH 1 Band edge	CH 11 Band edge
	

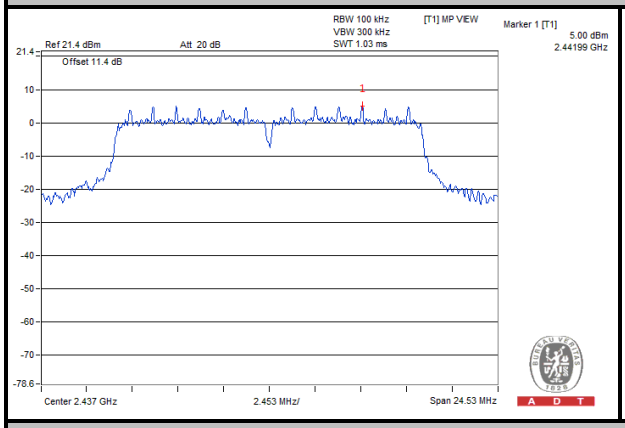
802.11g

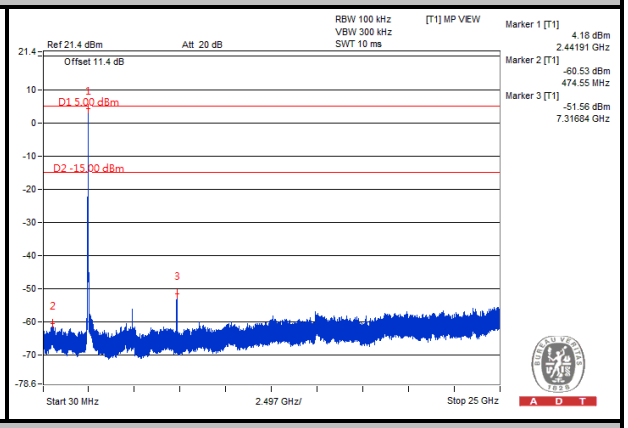
CH 1



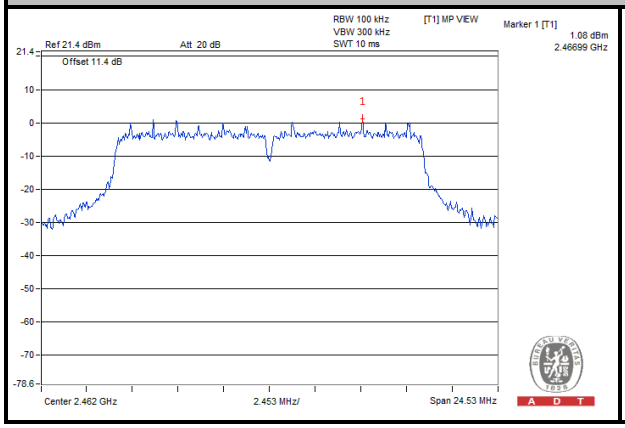


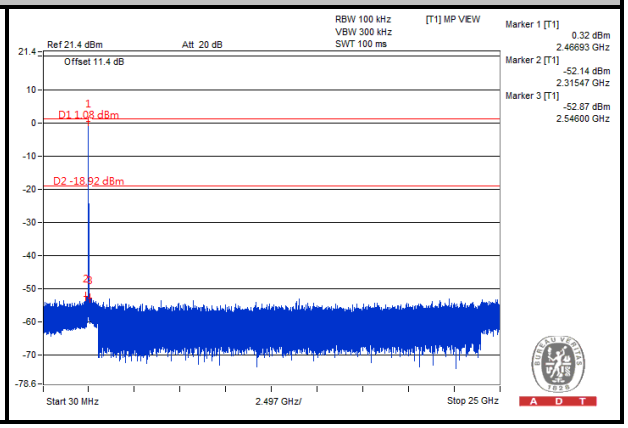
CH 6

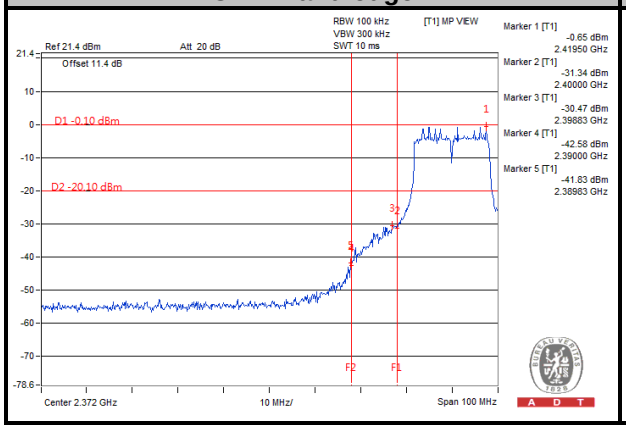
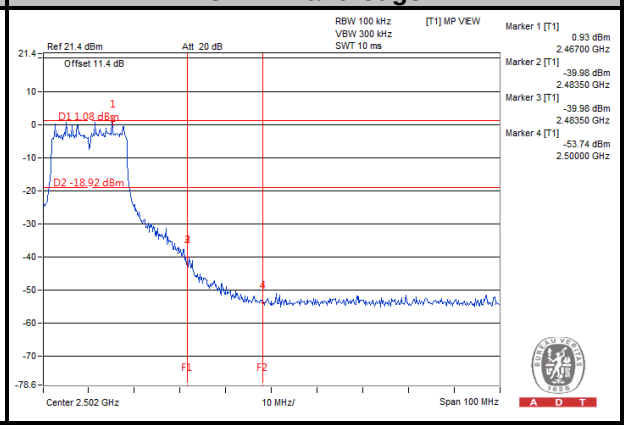




CH 11

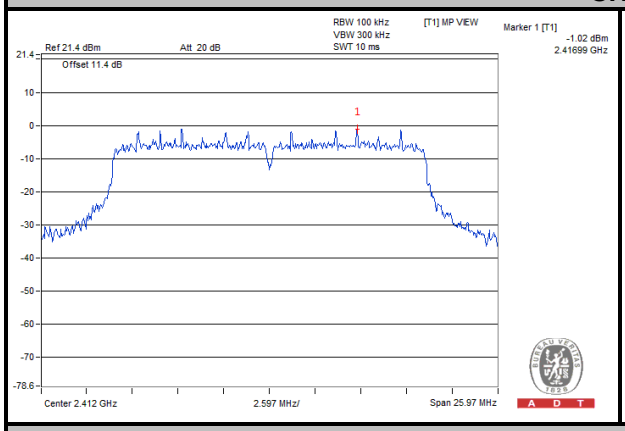


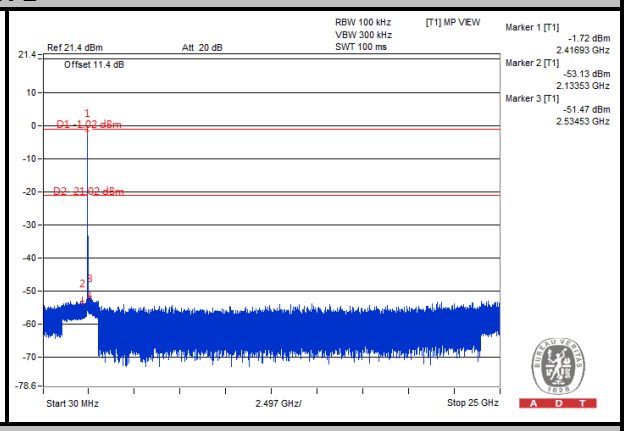


CH 1 Band edge	CH 11 Band edge
	

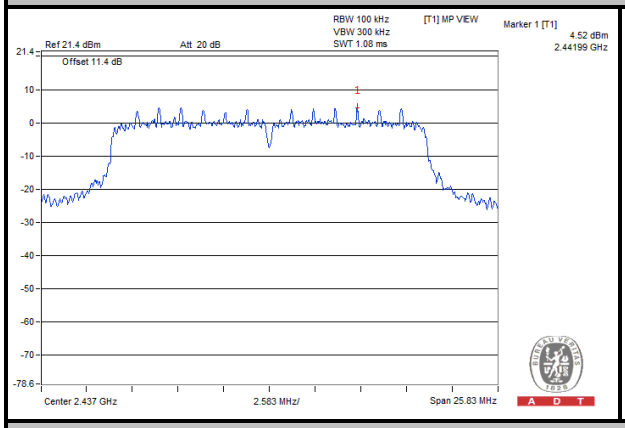
802.11n (20MHz)

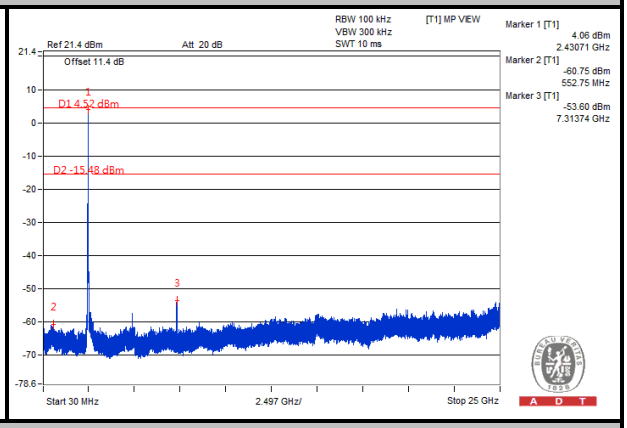
CH 1



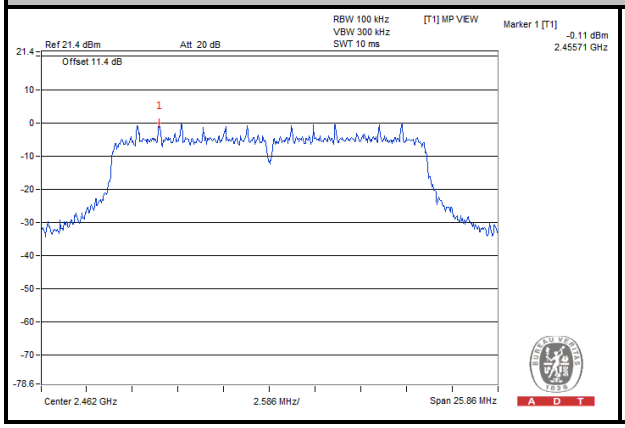


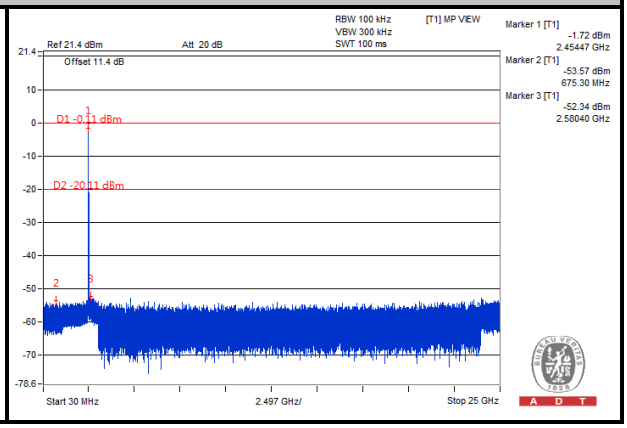
CH 6

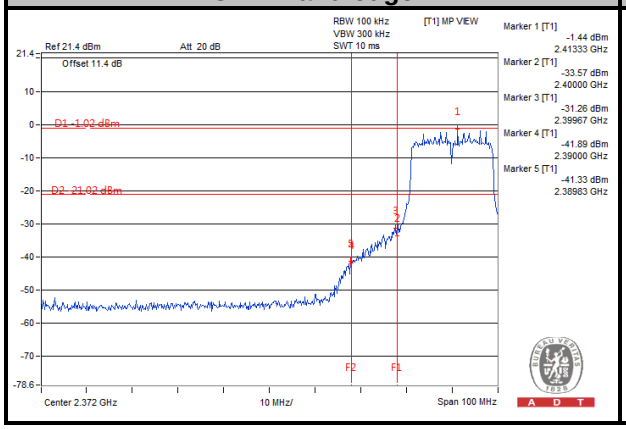
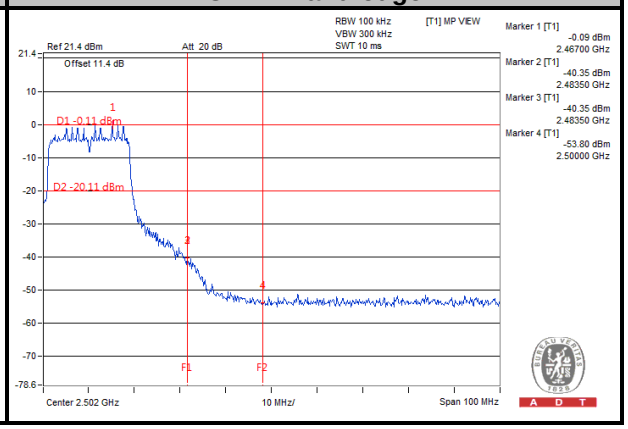




CH 11





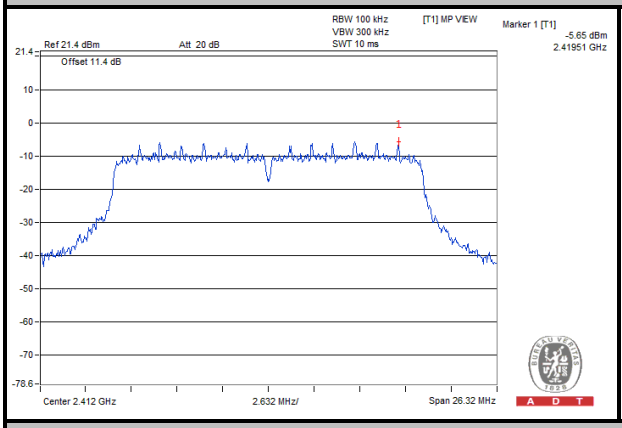
CH 1 Band edge	CH 11 Band edge
	

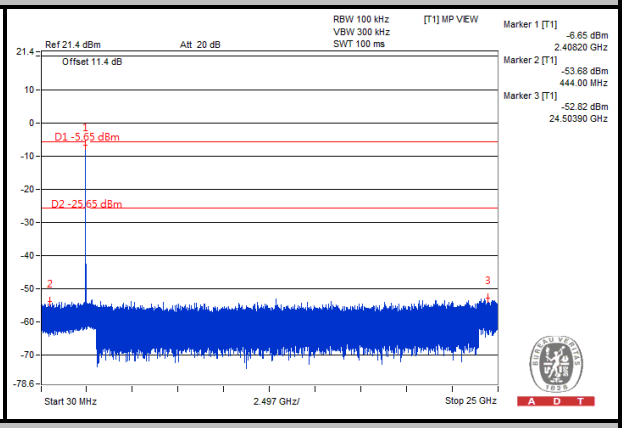
MODE C

802.11n (20MHz)

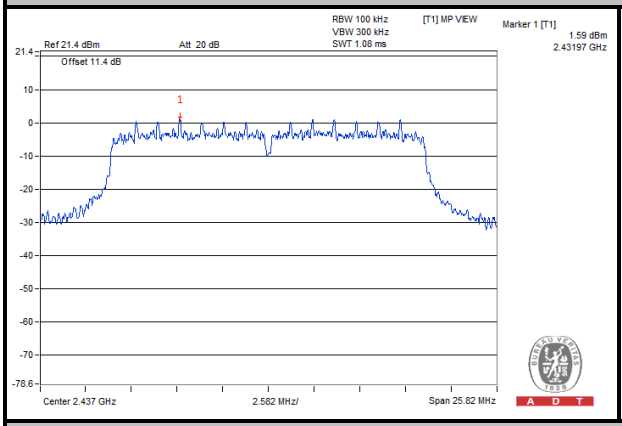
CHAIN 0

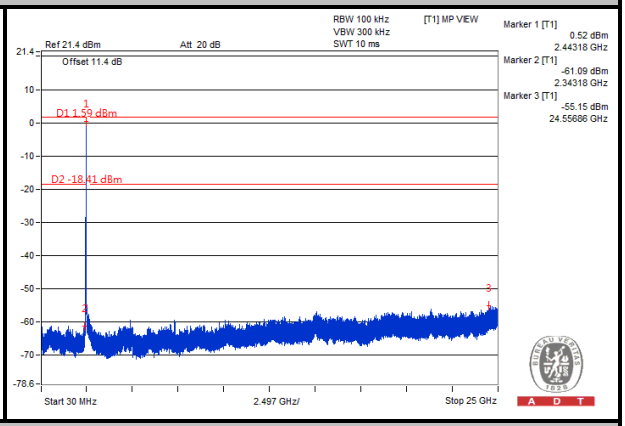
CH 1



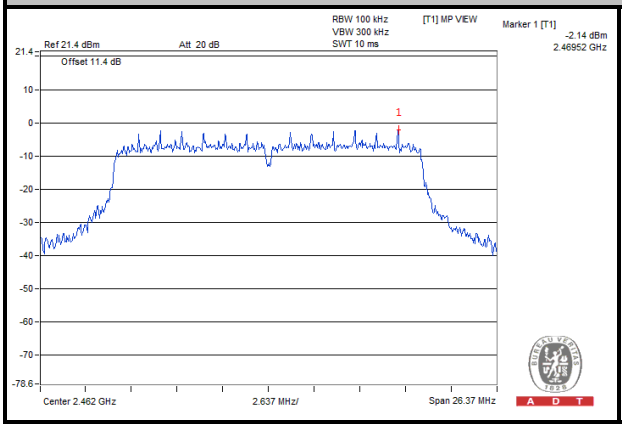


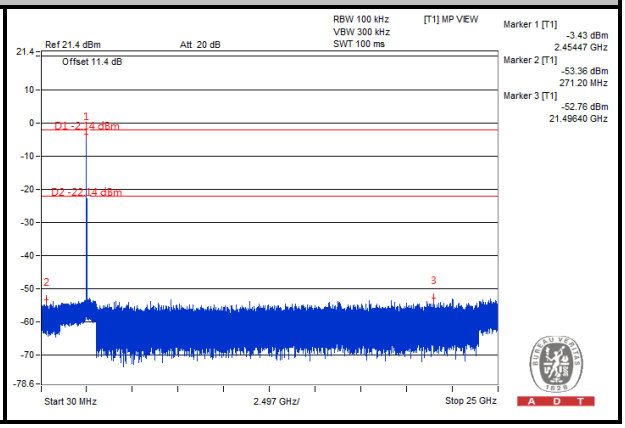
CH 6

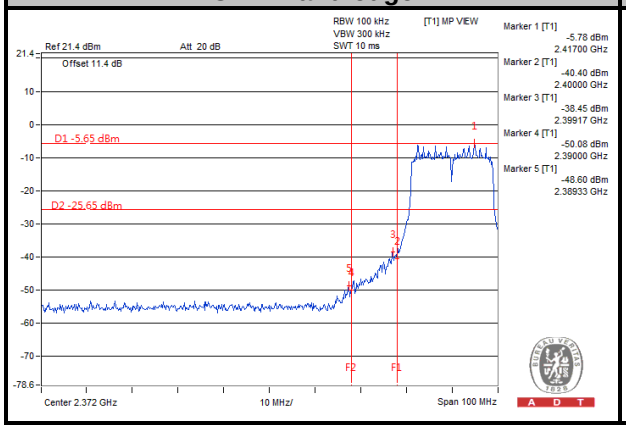
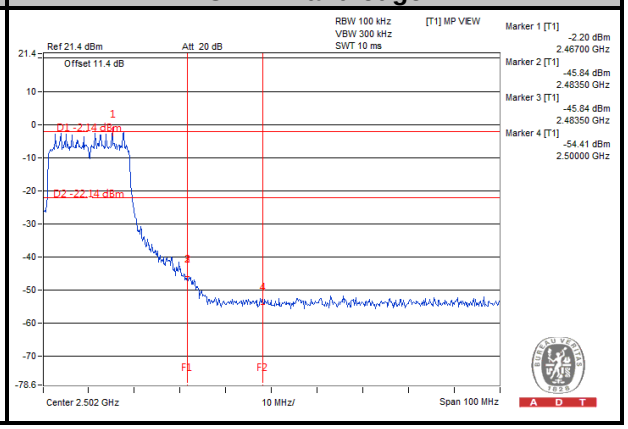




CH 11

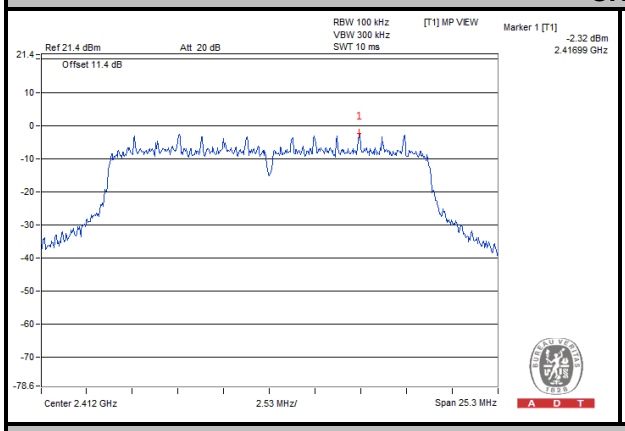


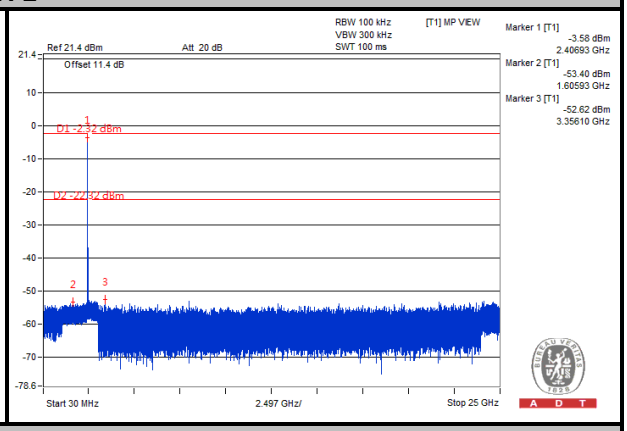


CH 1 Band edge	CH 11 Band edge
	

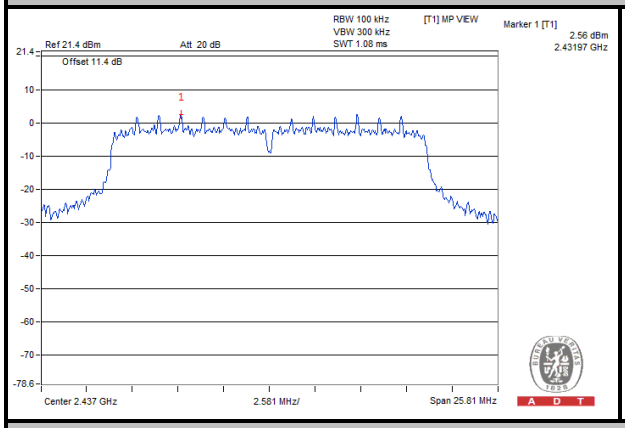
CHAIN 1

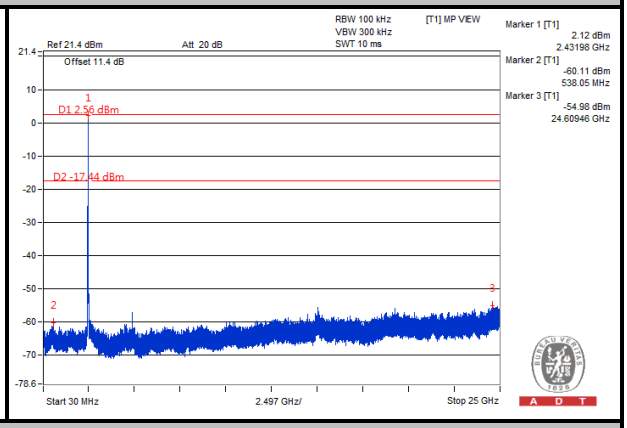
CH 1



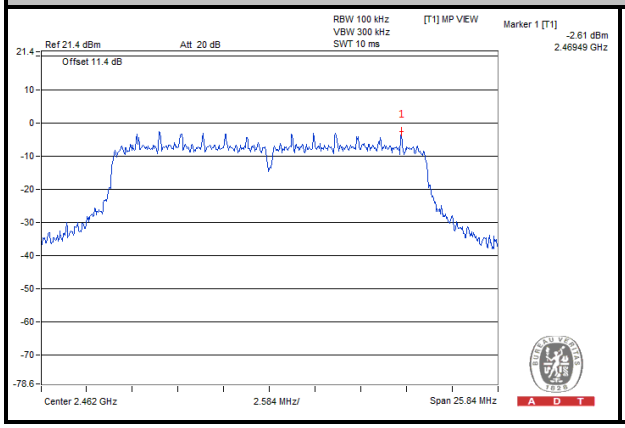


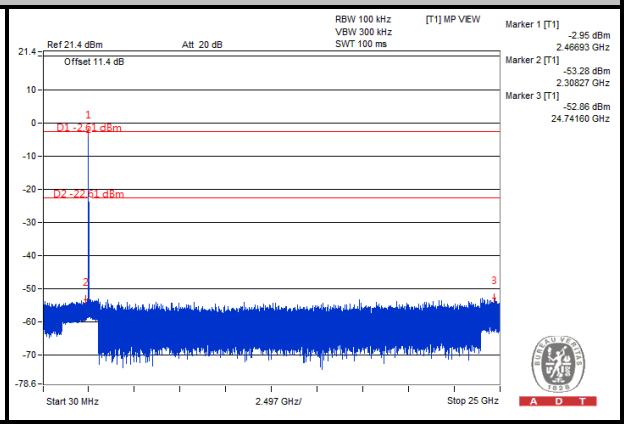
CH 6

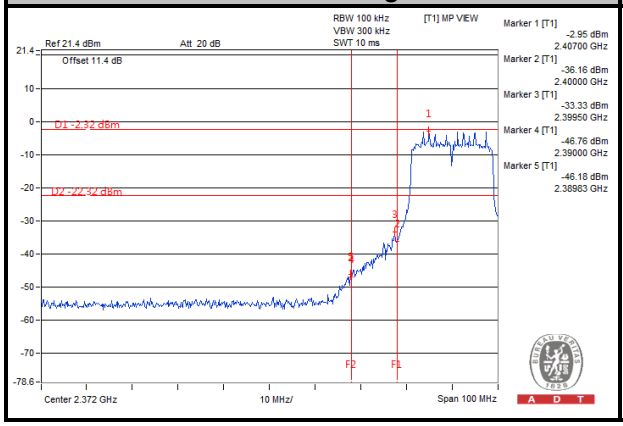
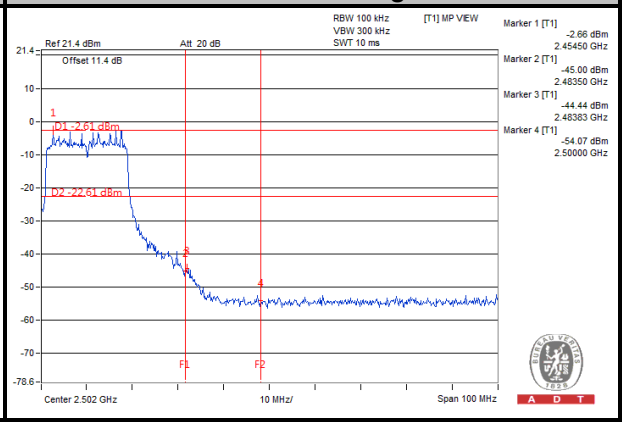




CH 11





CH 1 Band edge	CH 11 Band edge
	

5. PHOTOGRAPHS OF THE TEST CONFIGURATION

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

6. 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 accredited and approved according to ISO/IEC 17025.
If you have any comments, please feel free to contact us at the following:

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

Hsin Chu EMC/RF/Telecom Lab:
Tel: 886-3-5935343
Fax: 886-3-5935342

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

Email: service.adt@tw.bureauveritas.com
Web Site: www.bureauveritas-adt.com

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

7. APPENDIX A – MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No any modifications are made to the EUT by the lab during the test.

---END---