



FCC TEST REPORT (15.407)

REPORT NO.: RF131111E02-1

MODEL NO.: DIR-518L

FCC ID: KA2IR518LA1

RECEIVED: Nov. 11, 2013

TESTED: Nov. 13 to 27, 2013

ISSUED: Dec. 05, 2013

APPLICANT: D-Link Corporation

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ISSUED BY: Bureau Veritas Consumer Products Services
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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF131111E02-1	Original release	Dec. 05, 2013



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1. CERTIFICATION

PRODUCT: Wireless AC600 Dual Band Wall-Plug Cloud Router
BRAND NAME: D-Link
MODEL NO.: DIR-518L
TEST SAMPLE: ENGINEERING SAMPLE
APPLICANT: D-Link Corporation
TESTED: Nov. 13 to 27, 2013
STANDARDS: **FCC Part 15, Subpart E (Section 15.407)**
ANSI C63.10-2009

The above equipment (Model: DIR-518L) 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 : Midoli Peng , **DATE:** Dec. 05, 2013
(Midoli Peng, Specialist)

APPROVED BY : May Chen , **DATE:** Dec. 05, 2013
(May Chen, Manager)



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2. SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

For 5GHz, 5150~5250MHz

APPLIED STANDARD: FCC PART 15, SUBPART E (SECTION 15.407)			
STANDARD SECTION	TEST TYPE	RESULT	REMARK
15.407(b)(6)	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is -11.77dB at 14.29688MHz
15.407(b/1/2/3) (b)(5)	Spurious Emissions	PASS	Meet the requirement of limit. Minimum passing margin is -0.3dB at 10480.00MHz & 5150.00MHz
15.407(a/1/2/3)	Transmit Power	PASS	Meet the requirement of limit.
15.407(a)(6)	Peak Power Excursion	PASS	Meet the requirement of limit.
15.407(a/1/2/3)	Peak Power Spectral Density	PASS	Meet the requirement of limit.
15.407(g)	Frequency Stability	PASS	Meet the requirement of limit.
15.203	Antenna Requirement	PASS	No antenna connector is used.

NOTE: The EUT was operating in 2.400 ~ 2.4835GHz, 5.15~5.25GHz and 5.725~5.850GHz frequencies band. This report was recorded the RF parameters including 5.15~5.25GHz. For the 2.400 ~ 2.4835GHz and 5.725~5.850GHz RF parameters was recorded in another test report.



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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:

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

Measurement	Value
Conducted emissions	2.98 dB
Radiated emissions (30MHz-1GHz)	5.46 dB
Radiated emissions (1GHz -6GHz)	3.54 dB
Radiated emissions (6GHz -18GHz)	4.08 dB
Radiated emissions (18GHz -40GHz)	4.11 dB



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3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	Wireless AC600 Dual Band Wall-Plug Cloud Router
MODEL NO.	DIR-518L
POWER SUPPLY	Internal Power Supply, Class II
MODULATION TYPE	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in 11ac mode only.
MODULATION TECHNOLOGY	DSSS,OFDM
TRANSFER RATE	802.11b: up to 11Mbps 802.11a/g: up to 54Mbps 802.11n: up to 150Mbps 802.11ac: up to 433.3Mbps
OPERATING FREQUENCY	For 15.407 5GHz: 5.18 ~ 5.24GHz For 15.247 2.4GHz: 2.412 ~ 2.462GHz 5GHz: 5.745 ~ 5.825GHz
NUMBER OF CHANNEL	For 15.407 4 for 802.11a, 802.11n (HT20), 802.11ac (VHT20) 2 for 802.11n (HT40), 802.11ac (VHT40) 1 for 802.11ac (VHT80) For 15.247 (2.4GHz) 11 for 802.11b, 802.11g, 802.11n (HT20) 7 for 802.11n (HT40) For 15.247 (5GHz) 5 for 802.11a, 802.11n (HT20), 802.11ac (VHT20) 2 for 802.11n (HT40), 802.11ac (VHT40) 1 for 802.11ac (VHT80)



MAXIMUM OUTPUT POWER	<p>For 15.407</p> <p>802.11a: 48.978mW 802.11ac (VHT20): 48.865mW 802.11ac (VHT40): 48.978mW 802.11ac (VHT80): 47.098mW</p> <p>For 15.247 (2.4GHz)</p> <p>802.11b: 60.395mW 802.11g: 160.325mW 802.11n (HT20): 156.315mW 802.11n (HT40): 131.826mW</p> <p>For 15.247 (5GHz)</p> <p>802.11a: 172.584mW 802.11ac (VHT20): 158.489mW 802.11ac (VHT40): 147.911mW 802.11ac (VHT80): 874.984mW</p>
ANTENNA TYPE	Please see NOTE
DATA CABLE	NA
I/O PORTS	Refer to user's manual
ASSOCIATED DEVICES	NA

NOTE:

1. The EUT is a 2.4GHz & 5GHz WLAN device.
2. The EUT must be supplied with power as following spec:
 ⚡ AC 100-240V, 50-60Hz, 0.4A
3. The antenna provided to the EUT, please refer to the following table:

For 5GHz					
Transmitter Circuit	Model	Gain (dBi) (Include cable loss)	Antenna Type	Connector Type	Frequency range (MHz to MHz)
Chain (0)	C037-511297-A (SRF2013149)	1.8	PIFA	NA	4900~5825
For 2.4GHz					
Transmitter Circuit	Model	Gain (dBi) (Include cable loss)	Antenna Type	Connector Type	Frequency range (MHz to MHz)
Chain (0)	290-20074	-0.43	PIFA	NA	2400~2500

4. The EUT incorporates a SISO function.

MODULATION MODE	TX/RX FUNCTION
802.11a	1TX/1RX
802.11b	1TX/1RX
802.11g	1TX/1RX
802.11n (HT20)	1TX/1RX
802.11n (HT40)	1TX/1RX
802.11ac (VHT20)	1TX/1RX
802.11ac (VHT40)	1TX/1RX
802.11ac (VHT80)	1TX/1RX

Note: The modulation and bandwidth are similar for 802.11n mode for 20MHz (40MHz) and 802.11ac mode for 20MHz (40MHz), therefore investigated worst case to representative mode in test report. (Final test mode refer section 3.2.1)

5. The EUT could be applied with one USB Cellular Modem, therefore emission tests are added for simultaneously transmit between WLAN and USB Cellular Modem. The emission tests have been performed at the worst channel of both WLAN and USB Cellular Modem, the spurious emission of the simultaneous operation (WLAN & USB Cellular Modem) has been evaluated and no non-compliance found. < USB Cellular Modem only for test, not for sale >

Brand name	Model name	FCC ID	Spec.	Testing mode
HUAWEI	E169u	QISE169	3.5G USB WIRELESS DEVICE	GPRS ch128, 824.2MHz

6. When the EUT operating in 802.11n, the software operation, which is defined by manufacturer, MCS (Modulation and Coding Schemes) from 0 to 7.
7. When the EUT operating in 802.11ac, the software operation, which is defined by manufacturer, MCS (Modulation and Coding Schemes) from 0 to 9.
8. Spurious emission of the simultaneous operation (WLAN & 3G Device) has been evaluated and no non-compliance was found.
9. 2.4GHz and 5GHz technology cannot transmit at same time.
10. The above EUT information was declared by the manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.



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3.2 DESCRIPTION OF TEST MODES

Operated in 5150 ~ 5250MHz band:

4 channels are provided for 802.11a, 802.11n (HT20), 802.11ac (VHT20):

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
36	5180 MHz	44	5220 MHz
40	5200 MHz	48	5240 MHz

2 channels are provided for 802.11n (HT40), 802.11ac (VHT40):

CHANNEL	FREQUENCY
38	5190 MHz
46	5230 MHz

1 channel is provided for 802.11ac (VHT80):

CHANNEL	FREQUENCY
42	5210 MHz



3.2.1 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	PLC	RE < 1G	RE ≥ 1G	APCM	
-	√	√	√	√	-

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

NOTE: 1. The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on Z-plane(below 1GHz) & X-plane(above 1GHz).

POWER LINE CONDUCTED EMISSION TEST:

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

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (MBPS)
802.11a	36 to 48	36	OFDM	BPSK	6

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.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11a	36 to 48	36	OFDM	BPSK	6



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.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11a	36 to 48	36, 40, 48	OFDM	BPSK	6
802.11ac (VHT20)	36 to 48	36, 40, 48	OFDM	BPSK	6.5
802.11ac (VHT40)	38 to 46	38, 46	OFDM	BPSK	13.5
802.11ac (VHT80)	42	42	OFDM	BPSK	29.3

ANTENNA PORT CONDUCTED 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.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11a	36 to 48	36, 40, 48	OFDM	BPSK	6
802.11ac (VHT20)	36 to 48	36, 40, 48	OFDM	BPSK	6.5
802.11ac (VHT40)	38 to 46	38, 46	OFDM	BPSK	13.5
802.11ac (VHT80)	42	42	OFDM	BPSK	29.3

TEST CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
PLC	25deg. C, 59%RH	120Vac, 60Hz	Bear Lee
RE<1G	25deg. C, 65%RH	120Vac, 60Hz	Nelson Teng
RE ³ 1G	23deg. C, 70%RH	120Vac, 60Hz	Tim Ho
APCM	25deg. C, 60%RH	120Vac, 60Hz	Chilin Lee

3.3 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 E (15.407)

789033 D01 General UNII Test Procedures v01 r03

ANSI C63.10-2009

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.



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3.4 DUTY CYCLE OF TEST SIGNAL

Duty cycle of test signal is 100 %, duty factor is not required.

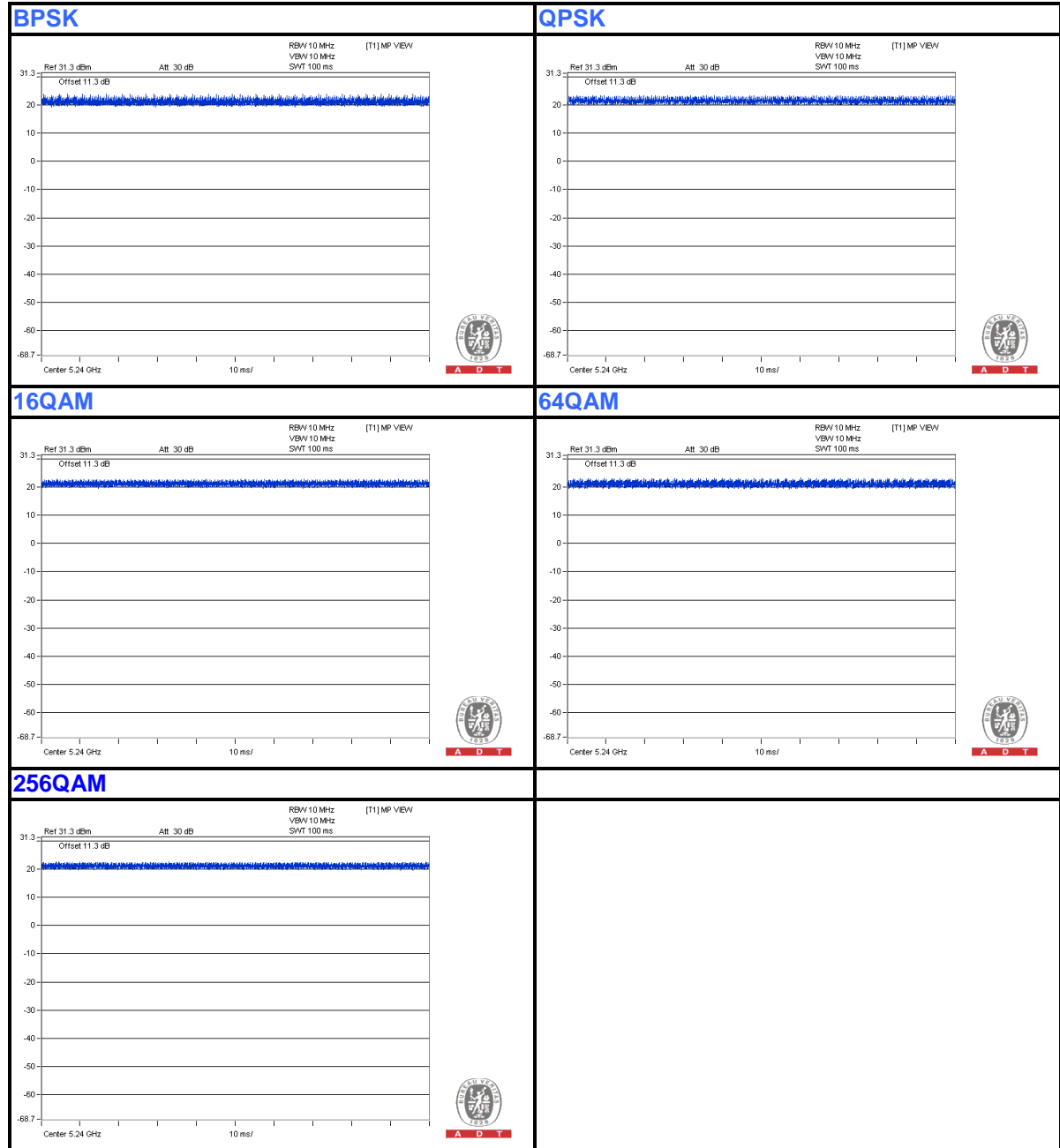
802.11a





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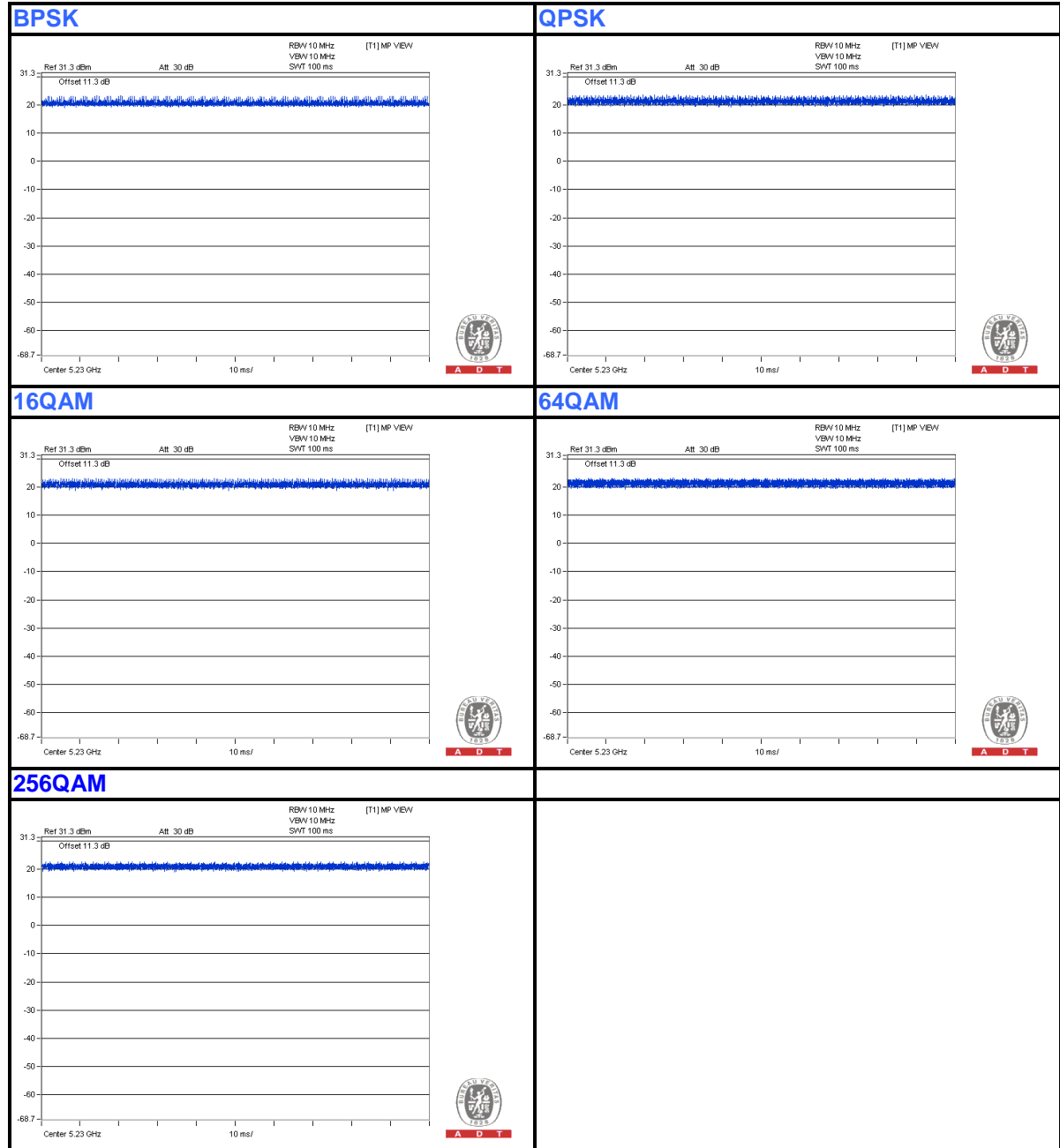
802.11ac (VHT20)





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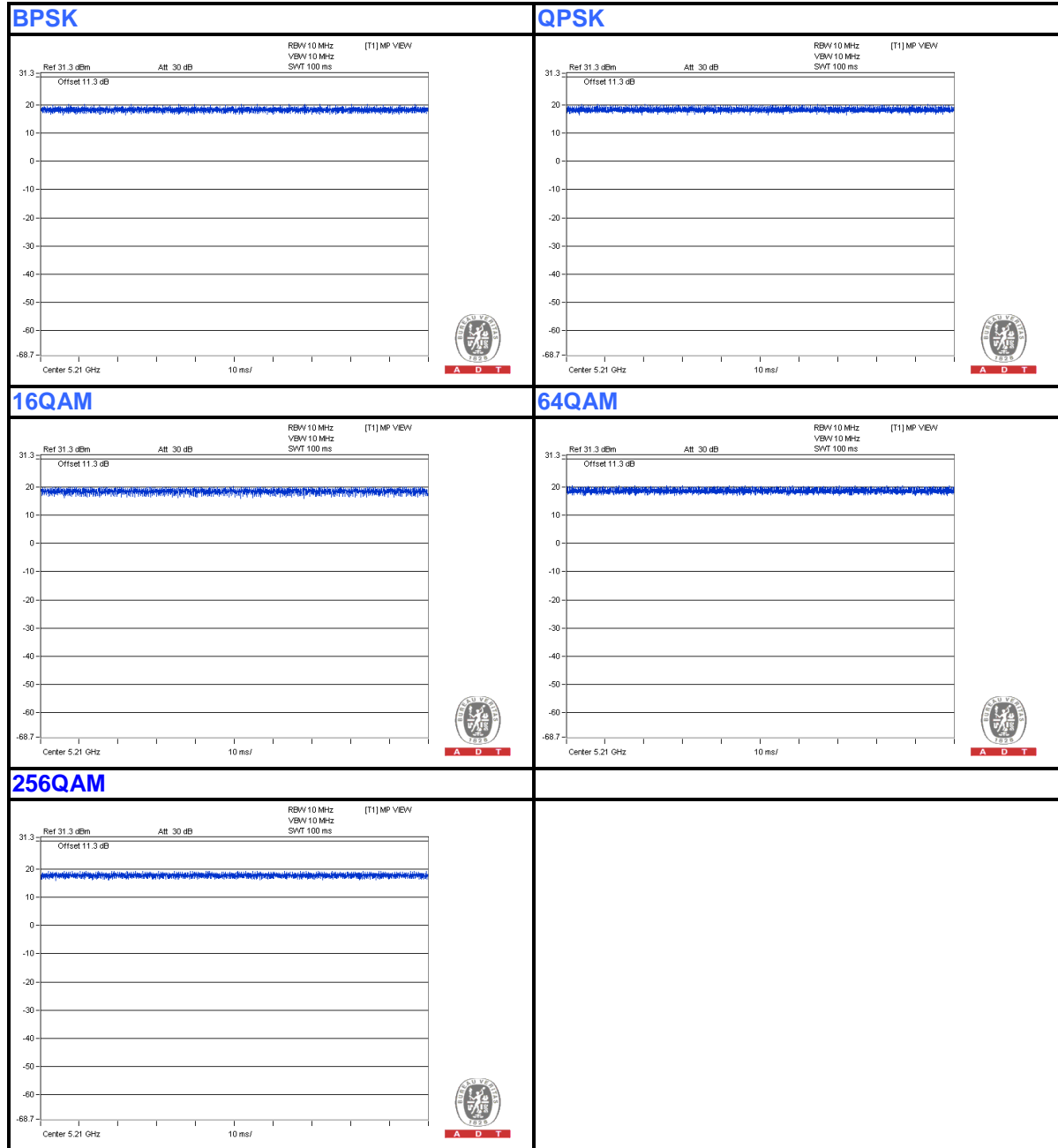
802.11ac (VHT40)





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802.11ac (VHT80)





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3.5 DESCRIPTION OF SUPPORT UNITS

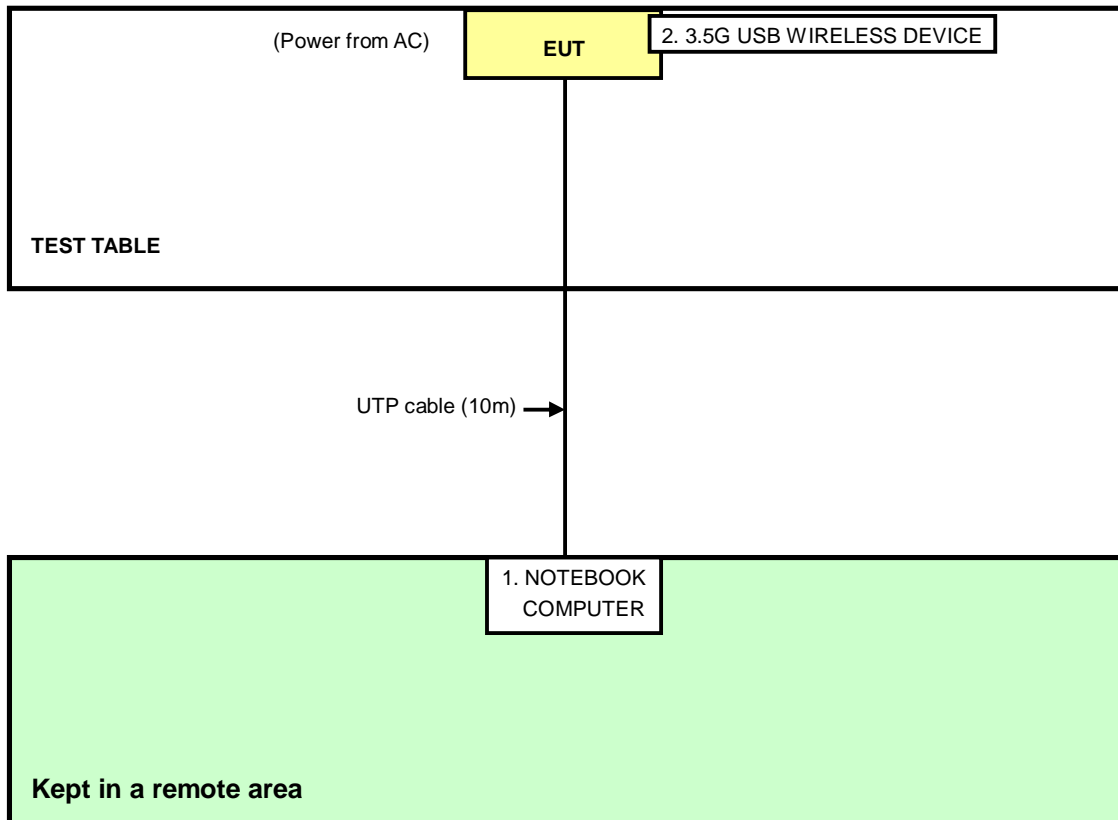
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	NOTEBOOK COMPUTER	DELL	PP32LA	FSLB32S	FCC DoC
2	3.5G USB WIRELESS DEVICE	HUAWEI	E169u	Q54CAB1042404 880	QISE169

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	UTP cable, 10m
2	NA

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

3.6 CONFIGURATION OF SYSTEM UNDER TEST





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4. TEST TYPES AND RESULTS

4.1 CONDUCTED EMISSION MEASUREMENT

4.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dB μ V)	
	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 0.50 MHz.

4.1.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver ROHDE & SCHWARZ	ESCS 30	100375	Mar. 08, 2013	Mar. 07, 2014
Line-Impedance Stabilization Network (for EUT) SCHWARZBECK	NSLK8127	8127-522	Sep. 05, 2013	Sep. 04, 2014
Line-Impedance Stabilization Network (for Peripheral)	ENV216	100072	June 06, 2013	June 05, 2014
RF Cable (JYEBAO)	5DFB	COCCAB-001	Mar. 11, 2013	Mar. 10, 2014
50 ohms Terminator	50	EMC-03	Sep. 24, 2013	Sep. 23, 2014
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 Shielded Room No. C.
3. The VCCI Con C Registration No. is C-3611.
4. Tested Date: Nov. 27, 2013

4.1.3 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.
- b. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- c. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- d. The frequency range from 150kHz to 30MHz was searched. Emission level under (Limit – 20dB) was not recorded.

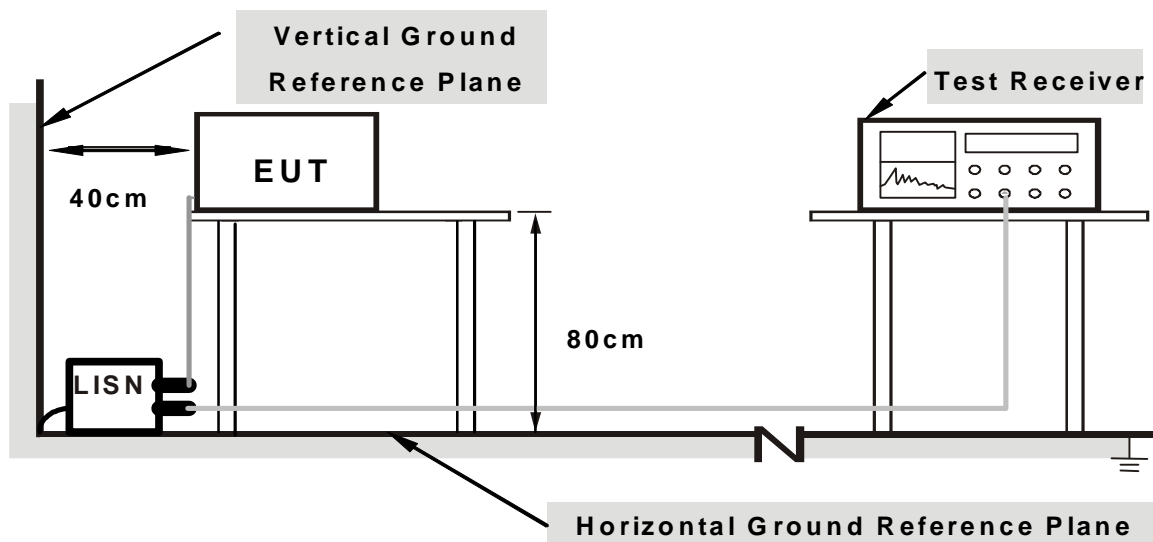
NOTE:

1. The resolution bandwidth of test receiver is 9kHz for Quasi-peak detection (QP) & Average detection (AV).

4.1.4 DEVIATION FROM TEST STANDARD

No deviation

4.1.5 TEST SETUP



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

For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

4.1.6 EUT OPERATING CONDITIONS

1. Placed the EUT on testing table.
2. Prepared computer system (support unit 1) to act as communication partner.
3. The communication partner ran test program “MP. TOOL.exe” to enable EUT under transmission/receiving condition continuously.

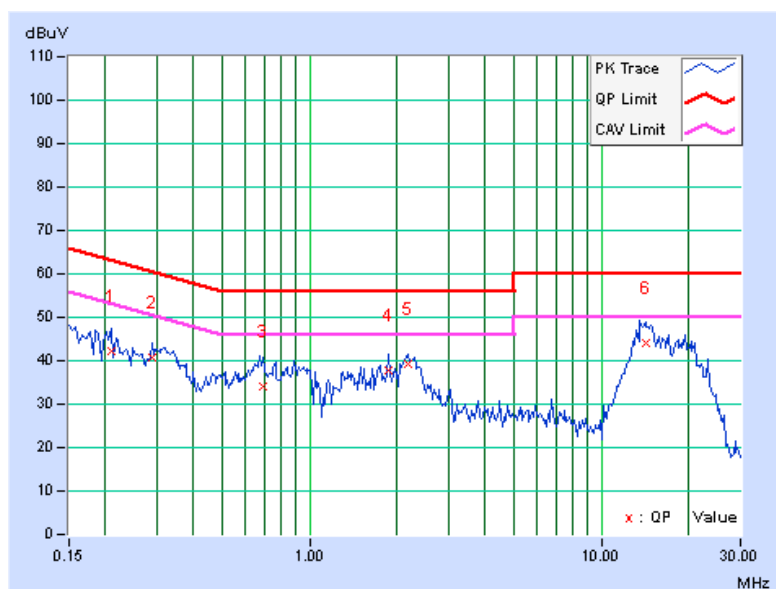
4.1.7 TEST RESULTS

PHASE	Line (L)	DETECTOR FUNCTION	Quasi-Peak (QP) / Average (AV)
-------	----------	-------------------	--------------------------------

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.20859	0.11	42.22	34.18	42.33	34.29	63.26	53.26	-20.93	-18.97
2	0.29063	0.13	40.63	33.74	40.76	33.87	60.51	50.51	-19.74	-16.63
3	0.69297	0.18	34.04	27.38	34.22	27.56	56.00	46.00	-21.78	-18.44
4	1.86719	0.26	37.36	30.79	37.62	31.05	56.00	46.00	-18.38	-14.95
5	2.17188	0.28	39.13	32.95	39.41	33.23	56.00	46.00	-16.59	-12.77
6	14.14063	0.91	43.24	36.73	44.15	37.64	60.00	50.00	-15.85	-12.36

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





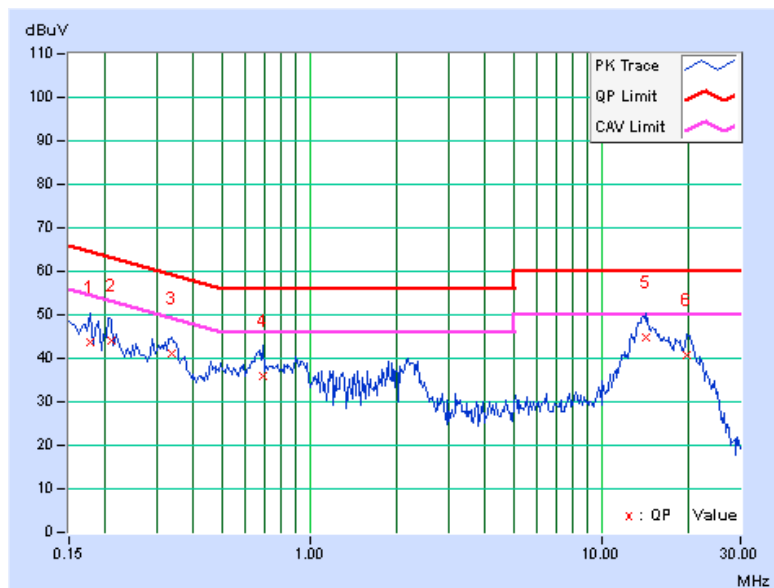
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PHASE	Neutral (N)	DETECTOR FUNCTION	Quasi-Peak (QP) / Average (AV)
-------	-------------	-------------------	--------------------------------

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.17734	0.11	43.73	37.29	43.84	37.40	64.61	54.61	-20.77	-17.21
2	0.20859	0.11	43.95	36.68	44.06	36.79	63.26	53.26	-19.20	-16.47
3	0.33750	0.14	41.03	35.36	41.17	35.50	59.26	49.26	-18.09	-13.76
4	0.68906	0.17	35.80	29.12	35.97	29.29	56.00	46.00	-20.03	-16.71
5	14.29688	0.89	43.74	37.34	44.63	38.23	60.00	50.00	-15.37	-11.77
6	19.52734	1.08	39.73	32.35	40.81	33.43	60.00	50.00	-19.19	-16.57

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





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4.2 RADIATED EMISSION AND BANDEGE MEASUREMENT

4.2.1 LIMITS OF RADIATED EMISSION AND BANDEGE MEASUREMENT

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table:

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.

4.2.2 LIMITS OF UNWANTED EMISSION OUT OF THE RESTRICTED BANDS

APPLICABLE TO	LIMIT	
√	FIELD STRENGTH AT 3m (dBμV/m)	
	PK	AV
	74	54
-	EIRP LIMIT (dBm)	EQUIVALENT FIELD STRENGTH AT 3m (dBμV/m)
	PK	PK
	-27	68.3

NOTE:

1. The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength:

$$E = \frac{1000000\sqrt{30P}}{3} \mu\text{V/m, where P is the eirp (Watts).$$



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4.2.3 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
MXE EMI Receiver Agilent	N9038A	MY50010156	Jan. 16, 2013	Jan. 15, 2014
Pre-Amplifier Mini-Circuits	ZFL-1000VH2 B	AMP-ZFL-04	Nov. 13, 2013	Nov. 12, 2014
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-361	Mar. 25, 2013	Mar. 24, 2014
RF Cable	NA	CHHCAB_001	Oct. 06, 2013	Oct. 05, 2014
Horn_Antenna AISI	AIH.8018	0000220091110	Nov. 27, 2012	Nov. 26, 2013
Pre-Amplifier Agilent	8449B	3008A01923	Oct. 29, 2013	Oct. 28, 2014
RF Cable	NA	RF104-205 RF104-207 RF104-202	Dec. 26, 2012	Dec. 25, 2013
Spectrum Analyzer Agilent	E4446A	MY48250253	Aug. 28, 2013	Aug. 27, 2014
Pre-Amplifier SPACEK LABS	SLKka-48-6	9K16	Nov. 13, 2013	Nov. 12, 2014
Horn_Antenna SCHWARZBECK	BBHA 9170	9170-424	Oct. 08, 2013	Oct. 07, 2014
Software	ADT_Radiated _V8.7.07	NA	NA	NA
Antenna Tower & Turn Table CT	NA	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 horn antenna, preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
- 3 The test was performed in 966 Chamber No. H.
4. The FCC Site Registration No. is 797305.
- 5 The CANADA Site Registration No. is IC 7450H-3.
- 6 Tested Date: Nov. 14 to 15, 2013

4.2.4 TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 0.8 meters 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 detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

NOTE:

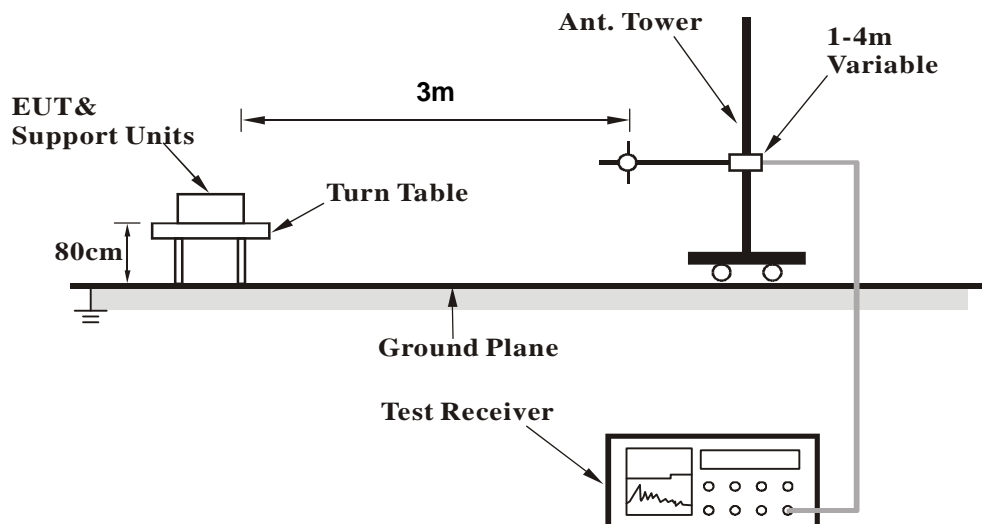
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

4.2.5 DEVIATION FROM TEST STANDARD

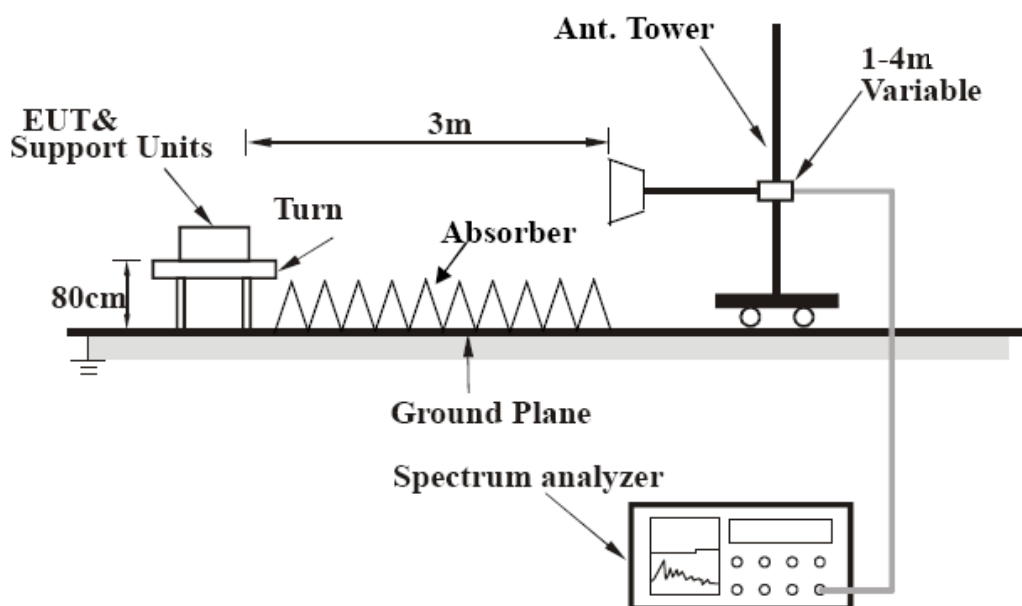
No deviation

4.2.6 TEST SETUP

<Frequency Range below 1GHz>



<Frequency Range above 1GHz>



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

4.2.7 EUT OPERATING CONDITION

Same as 4.1.6



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4.2.8 TEST RESULTS

BELOW 1GHz WORST-CASE DATA

802.11a

CHANNEL	TX Channel 36	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	Below 1GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	91.79	34.6 QP	43.5	-8.9	1.75 H	100	52.97	-18.38
2	108.05	40.8 QP	43.5	-2.7	1.50 H	275	56.49	-15.73
3	120.13	39.2 QP	43.5	-4.3	1.50 H	100	53.80	-14.61
4	219.95	28.9 QP	46.0	-17.1	1.25 H	150	44.42	-15.52
5	581.71	36.5 QP	46.0	-9.5	1.75 H	0	41.61	-5.12
6	775.08	35.4 QP	46.0	-10.6	1.25 H	5	36.59	-1.16

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	37.77	37.3 QP	40.0	-2.7	1.00 V	57	50.79	-13.53
2	91.61	38.6 QP	43.5	-4.9	1.25 V	0	56.96	-18.40
3	108.51	41.0 QP	43.5	-2.6	1.25 V	255	56.56	-15.61
4	400.18	33.1 QP	46.0	-12.9	1.00 V	50	42.45	-9.36
5	445.14	36.7 QP	46.0	-9.3	1.25 V	55	44.68	-7.96
6	775.37	34.3 QP	46.0	-11.8	1.25 V	50	35.42	-1.17

REMARKS:

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

ABOVE 1GHz DATA
802.11a

CHANNEL	TX Channel 36	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 40GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	55.9 PK	74.0	-18.1	1.32 H	56	49.06	6.84
2	5150.00	41.9 AV	54.0	-12.1	1.32 H	56	35.06	6.84
3	*5180.00	101.4 PK			1.32 H	56	94.47	6.93
4	*5180.00	92.1 AV			1.32 H	56	85.17	6.93
5	#10360.00	58.0 PK	74.0	-16.0	1.02 H	352	44.07	13.93
6	#10360.00	45.5 AV	54.0	-8.5	1.02 H	352	31.57	13.93
7	15540.00	57.7 PK	74.0	-16.3	1.29 H	149	38.52	19.18
8	15540.00	44.1 AV	54.0	-9.9	1.29 H	149	24.92	19.18

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	63.7 PK	74.0	-10.3	1.39 V	136	56.86	6.84
2	5150.00	47.7 AV	54.0	-6.3	1.39 V	136	40.86	6.84
3	*5180.00	105.6 PK			1.39 V	136	98.67	6.93
4	*5180.00	97.0 AV			1.39 V	136	90.07	6.93
5	#10360.00	67.7 PK	74.0	-6.3	1.23 V	3	53.77	13.93
6	#10360.00	53.6 AV	54.0	-0.4	1.23 V	3	39.67	13.93
7	15540.00	59.0 PK	74.0	-15.0	1.07 V	139	39.82	19.18
8	15540.00	45.2 AV	54.0	-8.8	1.07 V	139	26.02	19.18

REMARKS:

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



A D T

CHANNEL	TX Channel 40	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 40GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5200.00	100.1 PK			1.37 H	45	93.11	6.99
2	*5200.00	89.5 AV			1.37 H	45	82.51	6.99
3	5399.00	50.9 PK	74.0	-23.1	1.37 H	45	43.47	7.43
4	5399.00	39.0 AV	54.0	-15.0	1.37 H	45	31.57	7.43
5	#10400.00	58.6 PK	74.0	-15.4	1.00 H	336	44.72	13.88
6	#10400.00	45.8 AV	54.0	-8.2	1.00 H	336	31.92	13.88
7	15600.00	57.7 PK	74.0	-16.3	1.31 H	149	38.61	19.09
8	15600.00	44.3 AV	54.0	-9.7	1.31 H	149	25.21	19.09

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5200.00	104.4 PK			1.38 V	135	97.41	6.99
2	*5200.00	95.6 AV			1.38 V	135	88.61	6.99
3	5399.00	52.4 PK	74.0	-21.6	1.38 V	207	44.97	7.43
4	5399.00	42.3 AV	54.0	-11.7	1.38 V	207	34.87	7.43
5	#10400.00	68.0 PK	74.0	-6.0	1.23 V	0	54.12	13.88
6	#10400.00	53.6 AV	54.0	-0.4	1.23 V	0	39.72	13.88
7	15600.00	59.2 PK	74.0	-14.8	1.09 V	132	40.11	19.09
8	15600.00	45.7 AV	54.0	-8.3	1.09 V	132	26.61	19.09

REMARKS:

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



A D T

CHANNEL	TX Channel 48	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 40GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5240.00	100.0 PK			1.39 H	42	92.92	7.08
2	*5240.00	89.2 AV			1.39 H	42	82.12	7.08
3	5439.00	51.2 PK	74.0	-22.8	1.39 H	42	43.73	7.47
4	5439.00	39.6 AV	54.0	-14.4	1.39 H	42	32.13	7.47
5	#10480.00	58.4 PK	74.0	-15.6	1.05 H	328	44.19	14.21
6	#10480.00	45.6 AV	54.0	-8.4	1.05 H	328	31.39	14.21
7	15720.00	57.0 PK	74.0	-17.0	1.30 H	154	37.84	19.16
8	15720.00	43.9 AV	54.0	-10.1	1.30 H	154	24.74	19.16

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5240.00	104.0 PK			1.34 V	136	96.92	7.08
2	*5240.00	95.4 AV			1.34 V	136	88.32	7.08
3	5439.00	53.9 PK	74.0	-20.1	1.34 V	208	46.43	7.47
4	5439.00	43.0 AV	54.0	-11.0	1.34 V	208	35.53	7.47
5	#10480.00	67.5 PK	74.0	-6.5	1.28 V	3	53.29	14.21
6	#10480.00	53.0 AV	54.0	-1.0	1.28 V	3	38.79	14.21
7	15720.00	59.0 PK	74.0	-15.0	1.04 V	143	39.84	19.16
8	15720.00	45.4 AV	54.0	-8.6	1.04 V	143	26.24	19.16

REMARKS:

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



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802.11ac (VHT20)

CHANNEL	TX Channel 36	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 40GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	60.6 PK	74.0	-13.4	1.49 H	46	53.76	6.84
2	5150.00	43.3 AV	54.0	-10.7	1.49 H	46	36.46	6.84
3	*5180.00	101.1 PK			1.49 H	46	94.17	6.93
4	*5180.00	92.0 AV			1.49 H	46	85.07	6.93
5	#10360.00	61.2 PK	74.0	-12.8	1.08 H	337	47.27	13.93
6	#10360.00	48.3 AV	54.0	-5.7	1.08 H	337	34.37	13.93
7	15540.00	50.6 PK	74.0	-23.4	1.14 H	99	31.42	19.18
8	15540.00	37.4 AV	54.0	-16.6	1.14 H	99	18.22	19.18

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	69.5 PK	74.0	-4.5	1.07 V	262	62.66	6.84
2	5150.00	49.5 AV	54.0	-4.5	1.07 V	262	42.66	6.84
3	*5180.00	108.4 PK			1.07 V	262	101.47	6.93
4	*5180.00	97.4 AV			1.07 V	262	90.47	6.93
5	#10360.00	68.5 PK	74.0	-5.5	1.11 V	360	54.57	13.93
6	#10360.00	53.1 AV	54.0	-0.9	1.11 V	360	39.17	13.93
7	15540.00	52.1 PK	74.0	-21.9	1.11 V	53	32.92	19.18
8	15540.00	38.8 AV	54.0	-15.2	1.11 V	53	19.62	19.18

REMARKS:

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



A D T

CHANNEL	TX Channel 40	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 40GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5200.00	100.9 PK			1.48 H	45	93.91	6.99
2	*5200.00	91.7 AV			1.48 H	45	84.71	6.99
3	5399.00	51.6 PK	74.0	-22.4	1.48 H	45	44.17	7.43
4	5399.00	40.2 AV	54.0	-13.8	1.48 H	45	32.77	7.43
5	#10400.00	60.9 PK	74.0	-13.1	1.06 H	333	47.02	13.88
6	#10400.00	48.2 AV	54.0	-5.8	1.06 H	333	34.32	13.88
7	15600.00	50.5 PK	74.0	-23.5	1.10 H	101	31.41	19.09
8	15600.00	37.5 AV	54.0	-16.5	1.10 H	101	18.41	19.09

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5200.00	105.5 PK			1.29 V	171	98.51	6.99
2	*5200.00	96.5 AV			1.29 V	171	89.51	6.99
3	5399.00	53.1 PK	74.0	-20.9	1.29 V	175	45.67	7.43
4	5399.00	42.3 AV	54.0	-11.7	1.29 V	175	34.87	7.43
5	#10400.00	68.5 PK	74.0	-5.5	1.22 V	360	54.62	13.88
6	#10400.00	52.9 AV	54.0	-1.1	1.22 V	360	39.02	13.88
7	15600.00	52.0 PK	74.0	-22.0	1.06 V	60	32.91	19.09
8	15600.00	38.4 AV	54.0	-15.6	1.06 V	60	19.31	19.09

REMARKS:

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



A D T

CHANNEL	TX Channel 48	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 40GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5240.00	102.0 PK			1.46 H	50	94.92	7.08
2	*5240.00	92.8 AV			1.46 H	50	85.72	7.08
3	5440.00	52.7 PK	74.0	-21.3	1.46 H	50	45.23	7.47
4	5440.00	42.4 AV	54.0	-11.6	1.46 H	50	34.93	7.47
5	#10480.00	61.5 PK	74.0	-12.5	1.08 H	336	47.29	14.21
6	#10480.00	48.6 AV	54.0	-5.4	1.08 H	336	34.39	14.21
7	15720.00	50.2 PK	74.0	-23.8	1.04 H	101	31.04	19.16
8	15720.00	37.4 AV	54.0	-16.6	1.04 H	101	18.24	19.16

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5240.00	106.4 PK			1.26 V	173	99.32	7.08
2	*5240.00	97.4 AV			1.26 V	173	90.32	7.08
3	5440.00	54.0 PK	74.0	-20.0	1.26 V	173	46.53	7.47
4	5440.00	44.5 AV	54.0	-9.5	1.26 V	173	37.03	7.47
5	#10480.00	67.4 PK	74.0	-6.6	1.14 V	360	53.19	14.21
6	#10480.00	53.7 AV	54.0	-0.3	1.14 V	360	39.49	14.21
7	15720.00	52.2 PK	74.0	-21.8	1.02 V	70	33.04	19.16
8	15720.00	38.4 AV	54.0	-15.6	1.02 V	70	19.24	19.16

REMARKS:

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



A D T

802.11ac (VHT40)

CHANNEL	TX Channel 38	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 40GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	58.4 PK	74.0	-15.6	1.30 H	40	51.56	6.84
2	5150.00	46.0 AV	54.0	-8.0	1.30 H	40	39.16	6.84
3	*5190.00	96.6 PK			1.30 H	40	89.64	6.96
4	*5190.00	86.5 AV			1.30 H	40	79.54	6.96
5	#10380.00	61.9 PK	74.0	-12.1	1.15 H	335	47.99	13.91
6	#10380.00	48.9 AV	54.0	-5.1	1.15 H	335	34.99	13.91
7	15570.00	51.3 PK	74.0	-22.7	1.01 H	126	32.17	19.13
8	15570.00	38.7 AV	54.0	-15.3	1.01 H	126	19.57	19.13

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	69.7 PK	74.0	-4.3	1.06 V	261	62.86	6.84
2	5150.00	53.7 AV	54.0	-0.3	1.06 V	261	46.86	6.84
3	*5190.00	106.1 PK			1.06 V	261	99.14	6.96
4	*5190.00	92.5 AV			1.06 V	261	85.54	6.96
5	#10380.00	64.4 PK	74.0	-9.6	1.00 V	23	50.49	13.91
6	#10380.00	52.2 AV	54.0	-1.8	1.00 V	23	38.29	13.91
7	15570.00	52.7 PK	74.0	-21.3	1.11 V	104	33.57	19.13
8	15570.00	38.7 AV	54.0	-15.3	1.11 V	104	19.57	19.13

REMARKS:

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

CHANNEL	TX Channel 46	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 40GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5230.00	98.0 PK			1.32 H	41	90.94	7.06
2	*5230.00	88.8 AV			1.32 H	41	81.74	7.06
3	5429.00	52.7 PK	74.0	-21.3	1.32 H	41	45.24	7.46
4	5429.00	40.9 AV	54.0	-13.1	1.32 H	41	33.44	7.46
5	#10460.00	61.8 PK	74.0	-12.2	1.21 H	329	47.68	14.12
6	#10460.00	48.9 AV	54.0	-5.1	1.21 H	329	34.78	14.12
7	15690.00	50.7 PK	74.0	-23.3	1.00 H	125	31.53	19.17
8	15690.00	38.4 AV	54.0	-15.6	1.00 H	125	19.23	19.17

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5230.00	104.1 PK			1.13 V	171	97.04	7.06
2	*5230.00	94.4 AV			1.13 V	171	87.34	7.06
3	5429.00	56.1 PK	74.0	-17.9	1.13 V	171	48.64	7.46
4	5429.00	46.4 AV	54.0	-7.6	1.13 V	171	38.94	7.46
5	#10460.00	64.4 PK	74.0	-9.6	1.00 V	20	50.28	14.12
6	#10460.00	52.2 AV	54.0	-1.8	1.00 V	20	38.08	14.12
7	15690.00	53.3 PK	74.0	-20.7	1.14 V	89	34.13	19.17
8	15690.00	39.0 AV	54.0	-15.0	1.14 V	89	19.83	19.17

REMARKS:

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



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802.11ac (VHT80)

CHANNEL	TX Channel 42	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 40GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	59.7 PK	74.0	-14.3	1.35 H	43	52.86	6.84
2	5150.00	47.0 AV	54.0	-7.0	1.35 H	43	40.16	6.84
3	*5210.00	93.8 PK			1.35 H	43	86.79	7.01
4	*5210.00	84.4 AV			1.35 H	43	77.39	7.01
5	5350.00	54.1 PK	74.0	-19.9	1.35 H	43	46.77	7.33
6	5350.00	40.8 AV	54.0	-13.2	1.35 H	43	33.47	7.33
7	#10420.00	62.8 PK	74.0	-11.2	1.21 H	332	48.84	13.96
8	#10420.00	49.9 AV	54.0	-4.1	1.21 H	332	35.94	13.96
9	15630.00	51.1 PK	74.0	-22.9	1.00 H	107	31.98	19.12
10	15630.00	38.7 AV	54.0	-15.3	1.00 H	107	19.58	19.12

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	70.4 PK	74.0	-3.6	1.06 V	263	63.56	6.84
2	5150.00	53.6 AV	54.0	-0.4	1.06 V	263	46.76	6.84
3	*5210.00	103.3 PK			1.06 V	263	96.29	7.01
4	*5210.00	88.6 AV			1.06 V	263	81.59	7.01
5	5350.00	57.5 PK	74.0	-16.5	1.06 V	263	50.17	7.33
6	5350.00	44.3 AV	54.0	-9.7	1.06 V	263	36.97	7.33
7	#10420.00	62.2 PK	74.0	-11.8	1.00 V	22	48.24	13.96
8	#10420.00	50.1 AV	54.0	-3.9	1.00 V	22	36.14	13.96
9	15630.00	52.0 PK	74.0	-22.0	1.20 V	110	32.88	19.12
10	15630.00	38.4 AV	54.0	-15.6	1.20 V	110	19.28	19.12

REMARKS:

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

4.3 TRANSMIT POWER MEASUREMENT

4.3.1 LIMITS OF TRANSMIT POWER MEASUREMENT

Frequency Band	Limit
5.15 – 5.25GHz	The lesser of 50mW (17dBm) or 4dBm + 10logB
5.25 – 5.35GHz	The lesser of 250mW (24dBm) or 11dBm + 10logB
5.47 – 5.725GHz	The lesser of 250mW (24dBm) or 11dBm + 10logB
5.725 – 5.825GHz	The lesser of 1W (30dBm) or 17dBm + 10logB

Note: Where B is the 26dB emission bandwidth in MHz.

4.3.2 TEST INSTRUMENTS

FOR POWER OUTPUT MEASUREMENT

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Power meter Anritsu	ML2495A	0824006	May 20, 2013	May 19, 2014
Power sensor Anritsu	MA2411B	0738172	May 20, 2013	May 19, 2014

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. Tested date : Nov. 13, 2013



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FOR 26dB OCCUPIED BANDWIDTH

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer R&S	FSP 40	100036	Jan. 21, 2013	Jan. 20, 2014

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. Tested date : Nov. 13, 2013

4.3.3 TEST PROCEDURE

FOR POWER OUTPUT MEASUREMENT

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

FOR 26dB OCCUPIED BANDWIDTH

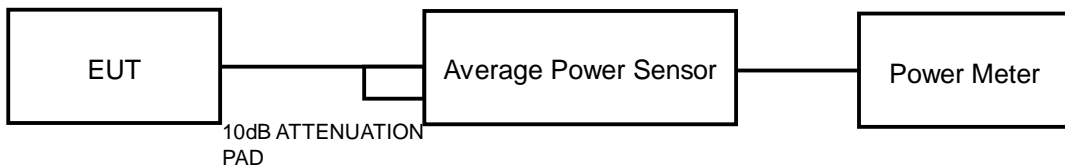
1. Set RBW = approximately 1% of the emission bandwidth.
2. Set the VBW > RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Measure the maximum width of the emission that is 26 dB down from the peak of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

4.3.4 DEVIATION FROM TEST STANDARD

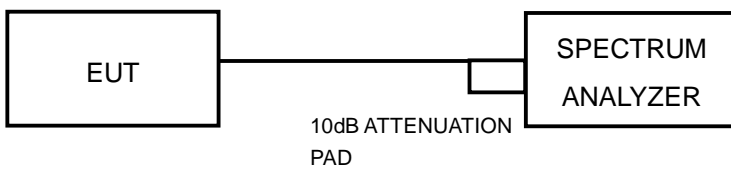
No deviation

4.3.5 TEST SETUP

FOR POWER OUTPUT MEASUREMENT



FOR 26dB OCCUPIED BANDWIDTH



4.3.6 EUT OPERATING CONDITIONS

The software provided by client to enable the EUT under transmission condition continuously at specific channel frequencies individually.



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4.3.7 TEST RESULTS

802.11a

CONDUCTED POWER:

CHANNEL	CHANNEL FREQUENCY (MHz)	AVERAGE POWER (mW)	AVERAGE POWER (dBm)	POWER LIMIT (dBm)	PASS/FAIL
36	5180	48.978	16.90	17	PASS
40	5200	48.417	16.85	17	PASS
48	5240	44.875	16.52	17	PASS

26dB OCCUPIED BANDWIDTH:

CHANNEL	CHANNEL FREQUENCY (MHz)	26dBc BANDWIDTH (MHz)
36	5180	21.59
40	5200	21.64
48	5240	21.61

Note: For FCC output power limitation is determined based on 26dBc bandwidth.

Power Limit = $4\text{dBm} + 10\log B$ < UNII Band 1 >			
Channel Number	Freq.(MHz)	Min. B(MHz)	Determined Conducted Limit (dBm)
36	5180	21.59	17.34 > 17
40	5200	21.64	17.35 > 17
48	5240	21.61	17.34 > 17



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802.11ac (VHT20)

CONDUCTED POWER:

CHANNEL	CHANNEL FREQUENCY (MHz)	AVERAGE POWER (mW)	AVERAGE POWER (dBm)	POWER LIMIT (dBm)	PASS/FAIL
36	5180	46.559	16.68	17	PASS
40	5200	48.865	16.89	17	PASS
48	5240	43.053	16.34	17	PASS

26dB OCCUPIED BANDWIDTH:

CHANNEL	CHANNEL FREQUENCY (MHz)	26dBc BANDWIDTH (MHz)
36	5180	22.32
40	5200	22.35
48	5240	22.42

Note: For FCC output power limitation is determined based on 26dBc bandwidth.

Power Limit = $4\text{dBm} + 10\log B$ < UNII Band 1 >			
Channel Number	Freq.(MHz)	Min. B(MHz)	Determined Conducted Limit (dBm)
36	5180	22.32	17.48 > 17
40	5200	22.35	17.49 > 17
48	5240	22.42	17.5 > 17



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802.11ac (VHT40)

CONDUCTED POWER:

CHANNEL	CHANNEL FREQUENCY (MHz)	AVERAGE POWER (mW)	AVERAGE POWER (dBm)	POWER LIMIT (dBm)	PASS/FAIL
38	5190	48.978	16.90	17	PASS
46	5230	47.863	16.80	17	PASS

26dB OCCUPIED BANDWIDTH:

CHANNEL	CHANNEL FREQUENCY (MHz)	26dBc BANDWIDTH (MHz)
38	5190	45.38
46	5230	45.13

Note: For FCC output power limitation is determined based on 26dBc bandwidth.

Power Limit = $4\text{dBm} + 10\log B$ < UNII Band 1 >			
Channel Number	Freq.(MHz)	Min. B(MHz)	Determined Conducted Limit (dBm)
38	5190	45.38	20.56 > 17
46	5230	45.13	20.54 > 17



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802.11ac (VHT80)

CONDUCTED POWER:

CHANNEL	CHANNEL FREQUENCY (MHz)	AVERAGE POWER (mW)	AVERAGE POWER (dBm)	POWER LIMIT (dBm)	PASS/FAIL
42	5210	47.098	16.73	17	PASS

26dB OCCUPIED BANDWIDTH:

CHANNEL	CHANNEL FREQUENCY (MHz)	26dBc BANDWIDTH (MHz)
42	5210	84.68

Note: For FCC output power limitation is determined based on 26dBc bandwidth.

Power Limit = 4dBm + 10logB < UNII Band 1 >			
Channel Number	Freq.(MHz)	Min. B(MHz)	Determined Conducted Limit (dBm)
42	5210	84.68	23.27 > 17



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4.4 PEAK POWER SPECTRAL DENSITY MEASUREMENT

4.4.1 LIMITS OF PEAK POWER SPECTRAL DENSITY MEASUREMENT

Frequency Band	Limit
5.15 ~ 5.25GHz	4dBm
5.25 ~ 5.35GHz	11dBm
5.47 ~ 5.725GHz	11dBm
5.725 ~ 5.825GHz	17dBm

4.4.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer R&S	FSP 40	100036	Jan. 21, 2013	Jan. 20, 2014

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. Tested date : Nov. 13, 2013

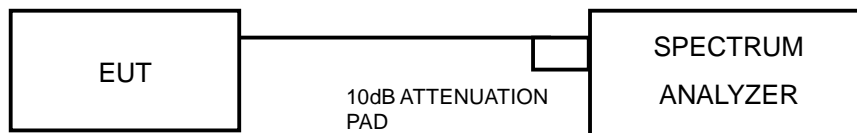
4.4.3 TEST PROCEDURES

1. Set span to encompass the entire emission bandwidth (EBW) of the signal.
2. Set RBW = 1 MHz, Set VBW \geq 3 MHz, Detector = RMS
3. Sweep time = auto, trigger set to "free run".
4. Trace average at least 100 traces in power averaging mode.
5. Record the max value and for duty cycle of test signal is $< 98\%$ add $10 \log (1/\text{duty cycle})$

4.4.4 DEVIATION FROM TEST STANDARD

No deviation

4.4.5 TEST SETUP



4.4.6 EUT OPERATING CONDITIONS

Same as 4.3.6



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4.4.7 TEST RESULTS

802.11a

CHANNEL	FREQUENCY (MHz)	PSD (dBm)	MAXIMUM LIMIT (dBm)	PASS/FAIL
36	5180	3.71	4	PASS
40	5200	3.36	4	PASS
48	5240	3.63	4	PASS

802.11ac (VHT20)

CHANNEL	FREQUENCY (MHz)	PSD (dBm)	MAXIMUM LIMIT (dBm)	PASS/FAIL
36	5180	3.58	4	PASS
40	5200	3.08	4	PASS
48	5240	3.77	4	PASS

802.11ac (VHT40)

CHANNEL	FREQUENCY (MHz)	PSD (dBm)	MAXIMUM LIMIT (dBm)	PASS/FAIL
38	5190	-0.17	4	PASS
46	5230	0.27	4	PASS

802.11ac (VHT80)

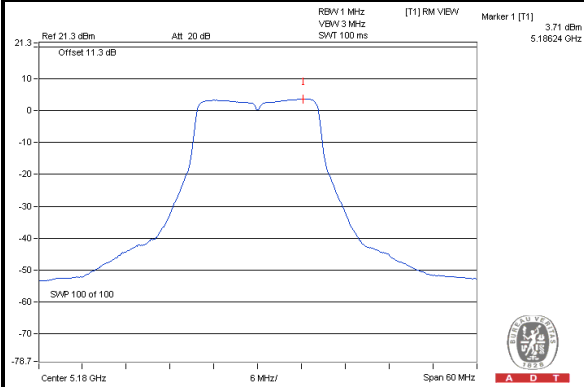
CHANNEL	FREQUENCY (MHz)	PSD (dBm)	MAXIMUM LIMIT (dBm)	PASS/FAIL
42	5210	-0.95	4	PASS



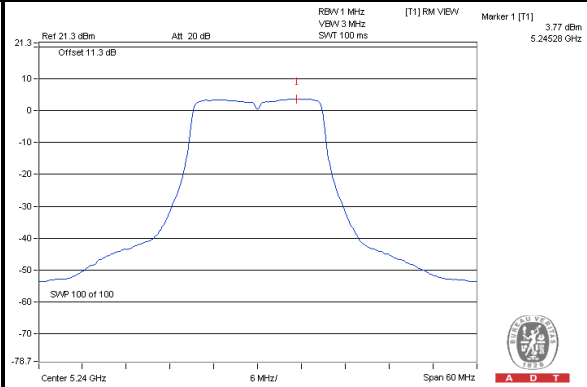
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SPECTRUM PLOT OF WORST VALUE

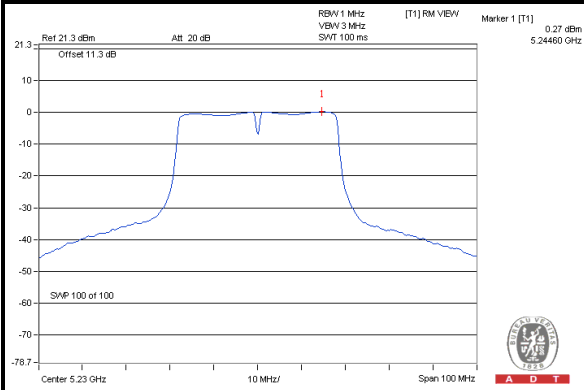
802.11a / CH36



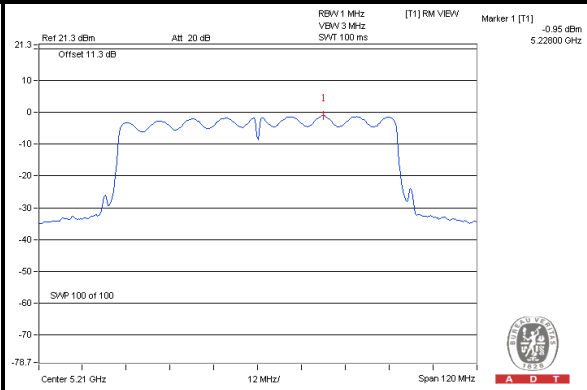
802.11ac (VHT20) / CH48



802.11ac (VHT40) / CH46



802.11ac (VHT80) / CH42



4.5 PEAK POWER EXCURSION MEASUREMENT

4.5.1 LIMITS OF PEAK POWER EXCURSION MEASUREMENT

Shall not exceed 13 dB

4.5.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer R&S	FSP 40	100036	Jan. 21, 2013	Jan. 20, 2014

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. Tested date : Nov. 13, 2013

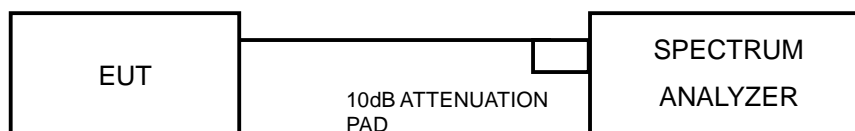
4.5.3 TEST PROCEDURE

1. Set RBW = 1 MHz, VBW \geq 3 MHz, Detector = peak.
2. Trace mode = max-hold. Allow the sweeps to continue until the trace stabilizes.
3. Use the peak search function to find the peak of the spectrum.
4. Measure the PPSD.
5. Compute the ratio of the maximum of the peak-max-hold spectrum to the PPSD.

4.5.4 DEVIATION FROM TEST STANDARD

No deviation

4.5.5 TEST SETUP



4.5.6 EUT OPERATING CONDITIONS

The software provided by client to enable the EUT under transmission condition continuously at specific channel frequencies individually.



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4.5.7 TEST RESULTS

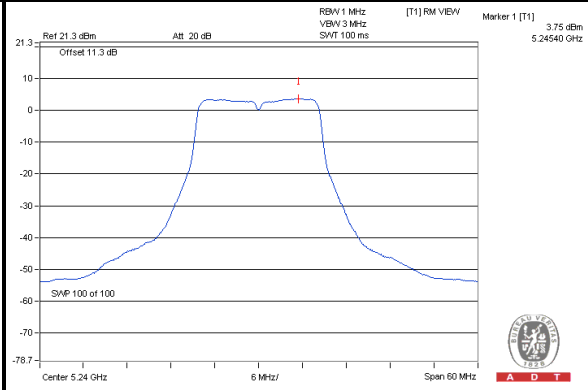
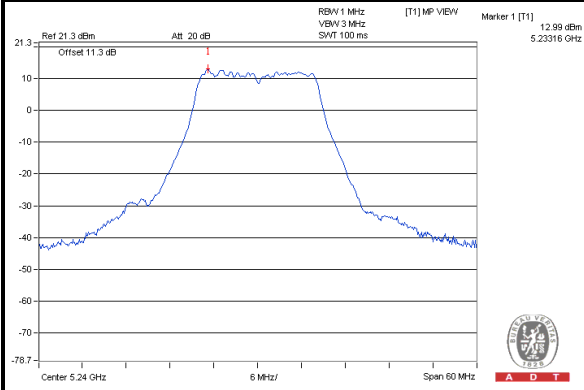
MODULATION MODE	MODULATION TYPE	CHANNEL FREQUENCY (MHz)	PEAK VALUE (dBm)	PPSD (dBm)	PEAK EXCURSION (dB)	LIMIT (dB)	PASS/ FAIL
802.11a	BPSK	5240	11.46	3.63	7.83	13	PASS
	QPSK		13.07	3.93	9.14	13	PASS
	16QAM		12.43	3.73	8.7	13	PASS
	64QAM		12.99	3.75	9.24	13	PASS
802.11ac (VHT20)	BPSK	5240	11.49	3.77	7.72	13	PASS
	QPSK		11.87	3.65	8.22	13	PASS
	16QAM		12.84	3.71	9.13	13	PASS
	64QAM		13.26	3.72	9.54	13	PASS
	256QAM		12.55	3.68	8.87	13	PASS
802.11ac (VHT40)	BPSK	5230	8.09	0.27	7.82	13	PASS
	QPSK		8.47	-0.28	8.75	13	PASS
	16QAM		8.73	-0.29	9.02	13	PASS
	64QAM		9.44	-0.24	9.68	13	PASS
	256QAM		9.52	0.02	9.50	13	PASS
802.11ac (VHT80)	BPSK	5210	7.11	-0.95	8.06	13	PASS
	QPSK		7.06	-1.36	8.42	13	PASS
	16QAM		7.62	-1.4	9.02	13	PASS
	64QAM		6.78	-1.56	8.34	13	PASS
	256QAM		7.52	-1.45	8.97	13	PASS



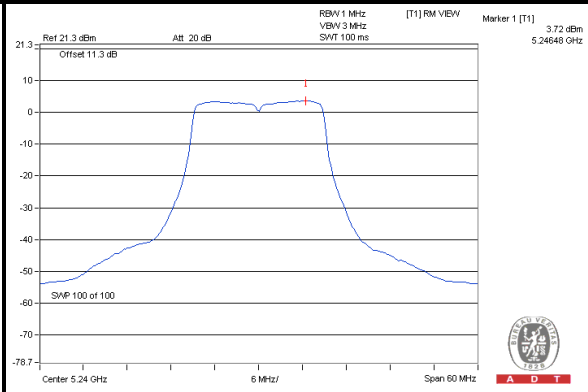
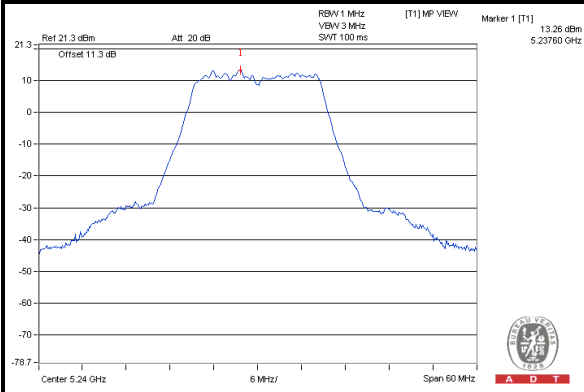
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SPECTRUM PLOT OF WORST VALUE

802.11a / 64QAM



802.11ac (VHT20) / 64QAM

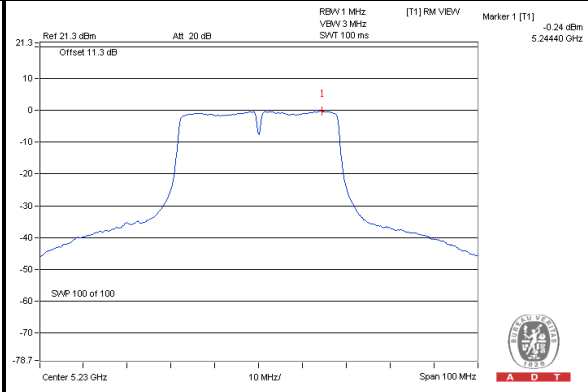
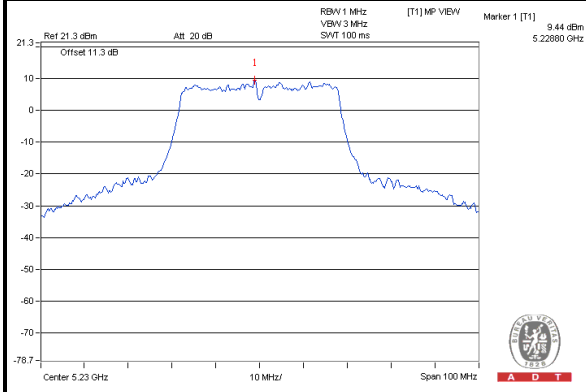




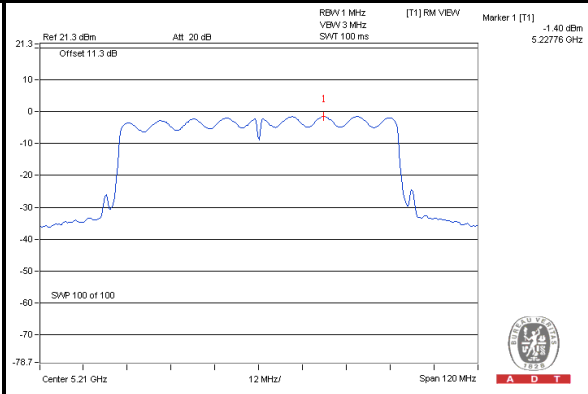
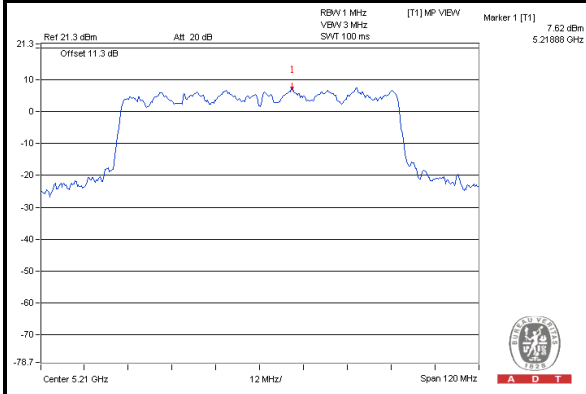
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SPECTRUM PLOT OF WORST VALUE

802.11ac (VHT40) / 64QAM



802.11ac (VHT80) / 16QAM





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4.6 FREQUENCY STABILITY

4.6.1 LIMITS OF FREQUENCY STABILITY MEASUREMENT

The frequency of the carrier signal shall be maintained within band of operation

4.6.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer R&S	FSP 40	100036	Jan. 21, 2013	Jan. 20, 2014
Temperature & Humidity Chamber GIANTFORCE	GTH-150-40 -SP-AR	MAA0812-008	Jan. 17, 2013	Jan. 16, 2014

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. Tested date : Nov. 13, 2013

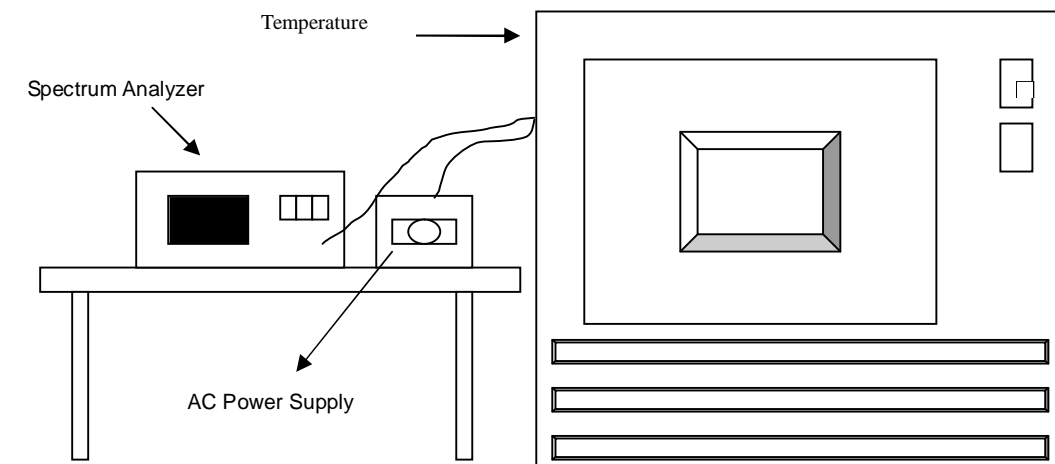
4.6.3 TEST PROCEDURE

1. The EUT was placed inside the environmental test chamber and powered by nominal AC voltage.
2. Turn the EUT on and couple its output to a spectrum analyzer.
3. Turn the EUT off and set the chamber to the highest temperature specified.
4. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT on and measure the operating frequency after 2, 5, and 10 minutes.
5. Repeat step 2 and 3 with the temperature chamber set to the lowest temperature.
6. The test chamber was allowed to stabilize at +20 degree C for a minimum of 30 minutes. The supply voltage was then adjusted on the EUT from 85% to 115% and the frequency record.

4.6.4 DEVIATION FROM TEST STANDARD

No deviation

4.6.5 TEST SETUP



4.6.6 EUT OPERATING CONDITION

Set the EUT transmit at un-modulation mode to test frequency stability.



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4.6.7 TEST RESULTS

FREQUENCY STABILITY VERSUS TEMP.									
OPERATING FREQUENCY: 5240MHz									
TEMP. (°C)	POWER SUPPLY (Vac)	0 MINUTE		2 MINUTE		5 MINUTE		10 MINUTE	
		Measured Frequency	Frequency Drift	Measured Frequency	Frequency Drift	Measured Frequency	Frequency Drift	Measured Frequency	Frequency Drift
		(MHz)	%	(MHz)	%	(MHz)	%	(MHz)	%
50	120	5239.9771	-0.00044	5239.9711	-0.00055	5239.9757	-0.00046	5239.9752	-0.00047
40	120	5239.9901	-0.00019	5239.9919	-0.00015	5239.9904	-0.00018	5239.9912	-0.00017
30	120	5239.9971	-0.00006	5239.9932	-0.00013	5239.9969	-0.00006	5239.9951	-0.00009
20	120	5240.0075	0.00014	5240.0027	0.00005	5239.9998	0.00000	5240.007	0.00013
10	120	5239.9877	-0.00023	5239.9794	-0.00039	5239.9839	-0.00031	5239.9836	-0.00031
0	120	5240.0135	0.00026	5240.0045	0.00009	5240.0046	0.00009	5240.0053	0.00010
-10	120	5240.0243	0.00046	5240.0258	0.00049	5240.0279	0.00053	5240.0208	0.00040
-20	120	5239.9865	-0.00026	5239.9817	-0.00035	5239.9824	-0.00034	5239.9888	-0.00021
-30	120	5240.007	0.00013	5240.0107	0.00020	5240.0168	0.00032	5240.0059	0.00011

FREQUENCY STABILITY VERSUS VOLTAGE									
OPERATING FREQUENCY: 5240MHz									
TEMP. (°C)	POWER SUPPLY (Vac)	0 MINUTE		2 MINUTE		5 MINUTE		10 MINUTE	
		Measured Frequency	Frequency Drift	Measured Frequency	Frequency Drift	Measured Frequency	Frequency Drift	Measured Frequency	Frequency Drift
		(MHz)	%	(MHz)	%	(MHz)	%	(MHz)	%
20	138	5240.0068	0.00013	5240.0026	0.00005	5239.9999	0.00000	5240.0068	0.00013
	120	5240.0075	0.00014	5240.0027	0.00005	5239.9998	0.00000	5240.007	0.00013
	102	5240.007	0.00013	5240.0019	0.00004	5240.0007	0.00001	5240.0079	0.00015



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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:

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Web Site: www.bureauveritas-adt.com

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



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

No modifications were made to the EUT by the lab during the test.

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