Supplemental “Transmit Simultaneously” Test Report

Report No.:	RF150814E01-2
FCC ID:	RRK-EA-7HW03AP1
Test Model:	EA-7HW03AP1W
Series Model:	EA-7HW03AP1T
Received Date:	Aug. 14, 2015
Test Date:	Aug. 24 to Nov. 05, 2015
Issued Date:	Dec. 24, 2015
Applicant:	Alpha Networks Inc.
Address:	No.8 Li-shing 7th Rd., Science-based Industrial Park, Hsinchu, Taiwan, R.O.C.
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Hsin Chu Laboratory
Lab Address:	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan R.O.C.
Test Location (1):	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan R.O.C.
Test Location (2):	No. 49, Ln. 206, Wende Rd., Shangshan Tsuen, Chiung Lin Hsiang, Hsin Chu Hsien 307, Taiwan R.O.C.

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Release Control Record

Issue No.	Description	Date Issued
RF150814E01-2	Original release.	Dec. 24, 2015

1 Certificate of Conformity

Product:	Wireless LAN Access Point
Brand:	Panasonic
Test Model:	EA-7HW03AP1W
Series Model:	EA-7HW03AP1T
Sample Status:	R&D SAMPLE
Applicant:	Alpha Networks Inc.
Test Date:	Aug. 24 to Nov. 05, 2015
Standards:	47 CFR FCC Part 15, Subpart C (Section 15.247) ANSI C63.10: 2013

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

Prepared by : _____ , **Date:** Dec. 24, 2015

Midoli Peng / Specialist

Approved by : _____ , **Date:** Dec. 24, 2015

May Chen / Manager

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (SECTION 15.247)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is -4.35dB at 0.29844MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -2.6dB at 15684.00MHz.

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	Expended Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.86 dB
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	5.37 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	3.65 dB
	6GHz ~ 18GHz	3.88 dB
	18GHz ~ 40GHz	4.11 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Wireless LAN Access Point
Brand	Panasonic
Test Model	EA-7HW03AP1W
Series Model	EA-7HW03AP1T
Status of EUT	R&D SAMPLE
Power Supply Rating	DC 24V from power adapter or DC 48V from POE
Modulation Type	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in 11ac mode and VHT (20/40) mode in 2.4GHz
Modulation Technology	DSSS, OFDM
Transfer Rate	802.11b: up to 11Mbps 802.11a/g: up to 54Mbps 802.11n: up to 800Mbps 802.11ac: up to 1733.3Mbps
Operating Frequency	**For 15.407** 5.18 ~ 5.24GHz, 5.745 ~ 5.825GHz
	For 15.247 2.412 ~ 2.462GHz
Number of Channel	**For 15.407** 9 for 802.11a, 802.11n (HT20), 802.11ac (VHT20) 4 for 802.11n (HT40), 802.11ac (VHT40) 2 for 802.11ac (VHT80)
	For 15.247 11 for 802.11b, 802.11g, 802.11n (HT20), VHT20 7 for 802.11n (HT40), VHT40
Output Power	**For 15.407(5.18 ~ 5.24GHz)** **CDD Mode** 802.11a: 390.156mW 802.11ac (VHT20): 366.747mW 802.11ac (VHT40): 392.29mW 802.11ac (VHT80): 57.137mW **Beamforming Mode** 802.11ac (VHT20): 358.26mW 802.11ac (VHT40): 384.651mW 802.11ac (VHT80): 54.684mW **For 15.407(5.745 ~ 5.825GHz)** **CDD Mode** 802.11a: 797.673mW 802.11ac (VHT20): 811.076mW 802.11ac (VHT40): 594.859mW 802.11ac (VHT80): 139.783mW **Beamforming Mode** 802.11ac (VHT20): 390.657mW 802.11ac (VHT40): 390.921mW 802.11ac (VHT80): 121.874mW
	For 15.247 802.11b: 973.865mW 802.11g: 851.922mW 802.11n(HT20): 801.309mW 802.11n(HT40): 206.802mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note

Accessory Device	Adapter x1
Data Cable Supplied	NA

Note:

1. There are 2.4GHz and 5GHz technology used for the EUT.
2. The EUT has two model names, which are identical to each other in all aspects except for the following table:

Brand	Product Name	Model No.	Difference
Panasonic	Wireless LAN Access Point	EA-7HW03AP1W	1. Different of color : Model: EA-7HW03AP1W (white) Model: EA-7HW03AP1T (brown) 2. For marketing requirement
		EA-7HW03AP1T	

From the above models, model: **EA-7HW03AP1W** was selected as representative model for the test and their data were recorded in this report.

3. The EUT must be supplied with POE or a power adapter as following table:

Adapter		
Brand Name	Model No.	Spec.
TAMURA	DVW2415N	Input: 100-240V, 1.0A, 50/60Hz AC intput cable: 1.3m, unshielded Output: 24V, 1.5A DC output cable: 1.25m, unshielded, with one core
POE (test only, not for sale)		
Brand Name	Model No.	Spec.
SGP	GRT-480125A	Input: 100-240V, 50/60Hz Output: 48V

4. The antennas provided to the EUT, please refer to the following table:

Transmitter Circuit	Brand	Model	Antenna Type	Antenna Gain (dBi)		Connector type
				2.4GHz	5GHz	
Chain (0)	Hong Lin INDUSTRIAL CO.,LTD	290-20211	PIFA	3	4	I-PEX
Chain (1)		290-20211		3	4	
Chain (2)		290-20212		3	4	
Chain (3)		290-20212		3	4	

5. The EUT was pre-tested under following test modes :

Pre-test Mode	Power
Mode A	Adapter mode
Mode B	**POE mode**

From the above modes, the worst radiated emission was found in **Mode B**. Therefore only the test data of the modes were recorded in this report.

6. The EUT incorporates a MIMO function with beamforming.

2.4GHz Band			
MODULATION MODE	**DATA RATE (MCS)**	**TX & RX CONFIGURATION**	
802.11b	1 ~ 11Mbps	4TX	4RX
802.11g	6 ~ 54Mbps	4TX	4RX
802.11n (HT20)	MCS 0~7	4TX	4RX
	MCS 8~15	4TX	4RX
	MCS 16~23	4TX	4RX
	MCS 24~31	4TX	4RX
802.11n (HT40)	MCS 0~7	4TX	4RX
	MCS 8~15	4TX	4RX
	MCS 16~23	4TX	4RX
	MCS 24~31	4TX	4RX
VHT20	MCS0~8 Nss=1	4TX	4RX
	MCS0~8 Nss=2	4TX	4RX
	MCS0~9 Nss=3	4TX	4RX
	MCS0~8 Nss=4	4TX	4RX
VHT40	MCS0~9 Nss=1	4TX	4RX
	MCS0~9 Nss=2	4TX	4RX
	MCS0~9 Nss=3	4TX	4RX
	MCS0~9 Nss=4	4TX	4RX
5GHz Band			
MODULATION MODE	**DATA RATE (MCS)**	**TX & RX CONFIGURATION**	
802.11a	6 ~ 54Mbps	4TX	4RX
802.11n (HT20)	MCS 0~7	4TX	4RX
	MCS 8~15	4TX	4RX
	MCS 16~23	4TX	4RX
	MCS 24~31	4TX	4RX
802.11n (HT40)	MCS 0~7	4TX	4RX
	MCS 8~15	4TX	4RX
	MCS 16~23	4TX	4RX
	MCS 24~31	4TX	4RX
802.11ac (VHT20)	MCS0~8 Nss=1	4TX	4RX
	MCS0~8 Nss=2	4TX	4RX
	MCS0~9 Nss=3	4TX	4RX
	MCS0~8 Nss=4	4TX	4RX
802.11ac (VHT40)	MCS0~9 Nss=1	4TX	4RX
	MCS0~9 Nss=2	4TX	4RX
	MCS0~9 Nss=3	4TX	4RX
	MCS0~9 Nss=4	4TX	4RX
802.11ac (VHT80)	MCS0~9 Nss=1	4TX	4RX
	MCS0~9 Nss=2	4TX	4RX
	MCS0~9 Nss=3	4TX	4RX
	MCS0~9 Nss=4	4TX	4RX
Note: 1. 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. 2. All of modulation mode support beamforming function except 2.4GHz & 802.11a/n modulation mode.			

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

3.2 Test Mode Applicability and Tested Channel Detail

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE≥1G	RE<1G	PLC	OB	
1	-	-	√	-	With adapter
2	√	√	√	√	With POE

Where **RE≥1G:** Radiated Emission above 1GHz **RE<1G:** Radiated Emission below 1GHz
PLC: Power Line Conducted Emission **OB:** Conducted Out-Band Emission Measurement

NOTE: 1. The EUT had been pre-tested on the positioned of each 2 axis. The worst case was found when positioned on **X-plane (below 1GHz) &Y-plane (above 1GHz)**
2. "-"means no effect.

Radiated Emission Test (Above 1GHz):

☒ 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)
2.4GHz (802.11b) + 5GHz (802.11ac (VHT20))	1 to 11	6	DSSS	DBPSK	1
	149 to 157	157	OFDM	BPSK	6.5

Radiated Emission Test (Below 1GHz):

☒ 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)
2.4GHz (802.11b) + 5GHz (802.11ac (VHT20))	1 to 11	6	DSSS	DBPSK	1
	149 to 157	157	OFDM	BPSK	6.5

Power Line Conducted Emission Test:

☒ 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)
2.4GHz (802.11b) + 5GHz (802.11ac (VHT20))	1 to 11	6	DSSS	DBPSK	1
	149 to 157	157	OFDM	BPSK	6.5

Conducted Out-Band Emission Measurement:

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

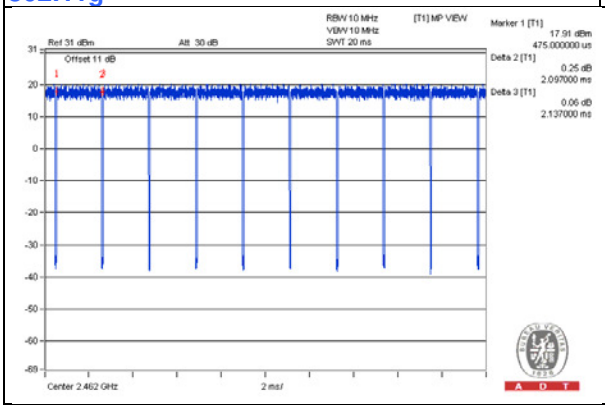
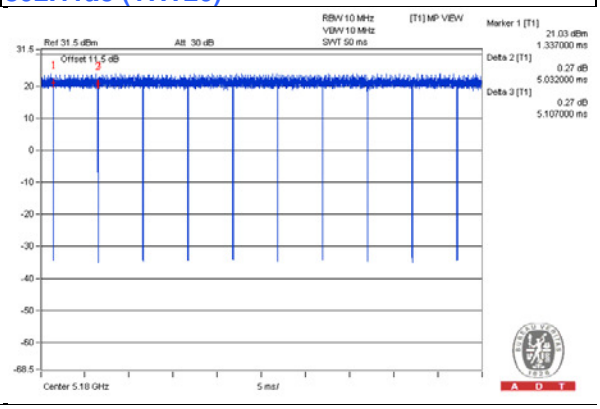
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
2.4GHz (802.11b) + 5GHz (802.11ac (VHT20))	1 to 11	6	DSSS	DBPSK	1
	149 to 157	157	OFDM	BPSK	6.5

Test Condition:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE≥1G	24deg. C, 69%RH	120Vac, 60Hz	Gary Cheng
RE<1G	24deg. C, 69%RH	120Vac, 60Hz	Weiwei Lo
PLC	26deg. C, 76%RH	120Vac, 60Hz	Jyunchun Lin
OB	25deg. C, 60%RH	120Vac, 60Hz	Anderson Chen

3.3 Duty Cycle of Test Signal

If duty cycle of test signal is ≥ 98 %, duty factor is not required.
802.11g: Duty cycle = 2.097ms/2.137ms = 0.981
802.11ac (VHT20): Duty cycle = 5.032 ms/5.107 ms = 0.985

802.11g	802.11ac (VHT20)
	

3.4 Description of Support Units

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

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	NOTEBOOK COMPUTER	DELL	E6440	F9LYQ32	FCC DoC	Provided by Lab
B.	HUB	ZyXEL	ES-116P	S060H02000215	FCC DoC	Provided by Lab
C.	POE	SGP	GRT-480125A	NA	NA	Supplied by Client
D.	USB 3.0 DONGLE	Transcend	NA	NA	NA	Provided by Lab
E.	USB 3.0 DONGLE	Transcend	NA	NA	NA	Provided by Lab

Note:

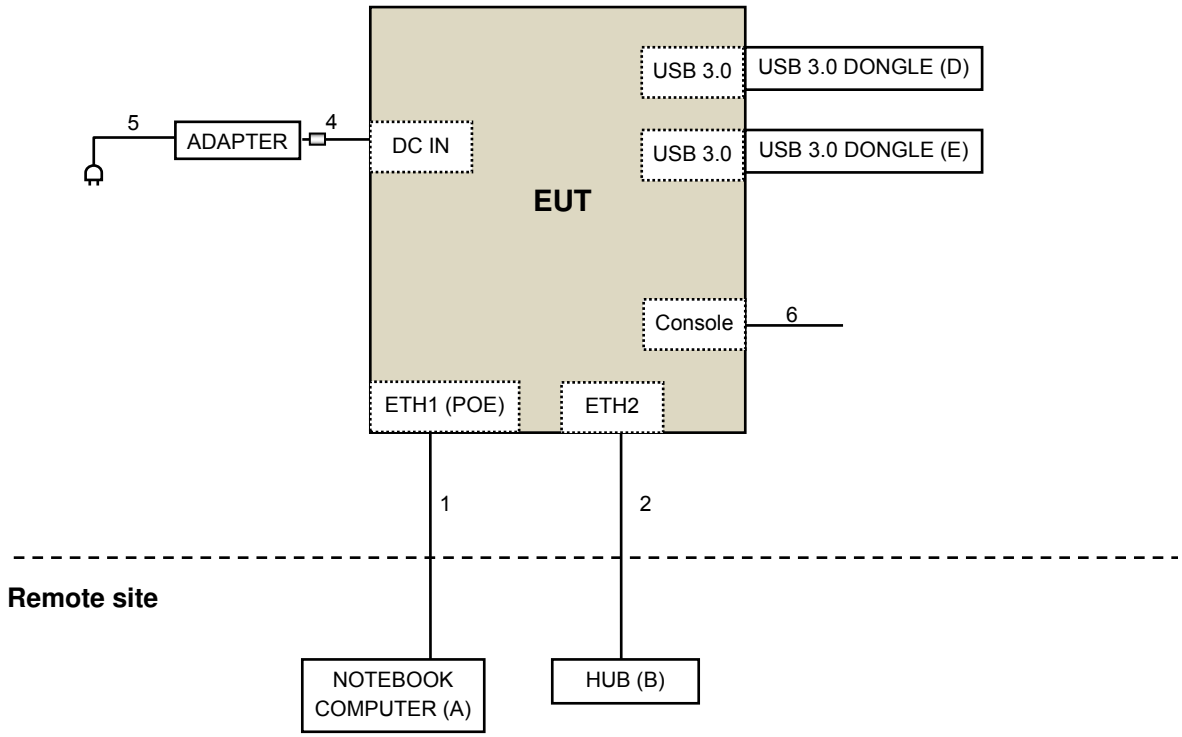
1. All power cords of the above support units are non-shielded (1.8m).

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	RJ45	1	10	No	0	Provided by Lab
2.	RJ45	1	10	No	0	Provided by Lab
3.	RJ45	1	1	No	0	Provided by Lab
4.	DC	1	1.25	No	1	Supplied by client
5.	AC	1	1.3	No	0	Supplied by client
6.	RJ45 to Console	1	1.5	No	0	Provided by Lab

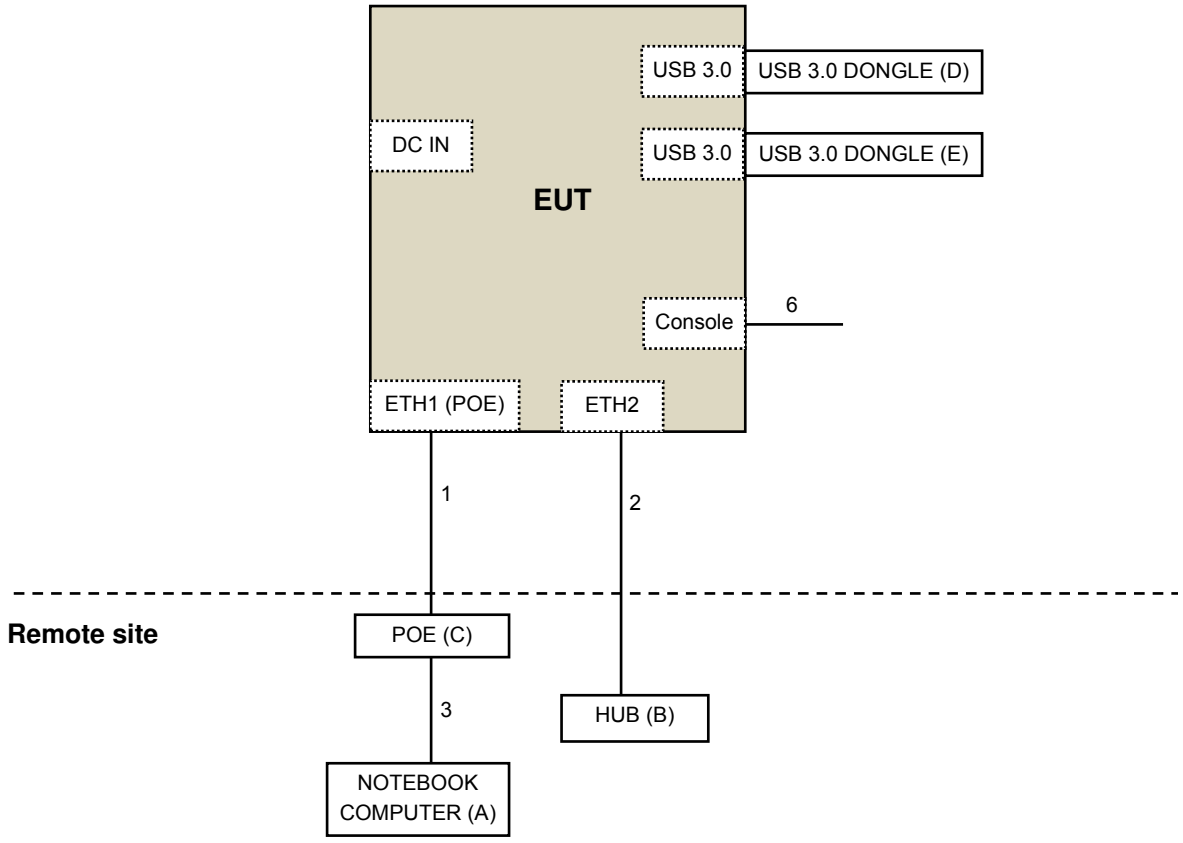
Note: The core(s) is(are) originally attached to the cable(s).

3.4.1 Configuration of System under Test

Adapter Mode:



POE Mode:


USB 3.0
USB 3.0 DONGLE (D)
DC IN
USB 3.0
USB 3.0 DONGLE (E)
EUT
Console
6
ETH1 (POE)
ETH2
1
2
Remote site
POE (C)
3
HUB (B)
NOTEBOOK
COMPUTER (A)

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)
ANSI C63.10-2013

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

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 30dB 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

For below 1GHz:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Agilent	N9038A	MY51210105	July 24, 2015	July 23, 2016
Pre-Amplifier Mini-Circuits	ZFL-1000VH2B	AMP-ZFL-03	Nov. 12, 2014	Nov. 11, 2015
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-360	Feb. 06, 2015	Feb. 05, 2016
RF Cable	8D-FB	CHGCAB-001-1 CHGCAB-001-2	Oct. 04, 2014	Oct. 03, 2015
	RF-141	CHGCAB-004	Oct. 04, 2014	Oct. 03, 2015
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 test was performed in 966 Chamber No. G.
3. The FCC Site Registration No. is 966073.
4. The VCCI Site Registration No. is G-137.
5. The CANADA Site Registration No. is IC 7450H-2.
6. Tested Date: Sep. 01, 2015

For above 1GHz:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Agilent	N9038A	MY51210105	July 24, 2015	July 23, 2016
Horn_Antenna AISI	AIH.8018	000032009111 0	Feb. 09, 2015	Feb. 08, 2016
Pre-Amplifier Agilent	8449B	3008A02578	June 23, 2015	June 22, 2016
RF Cable	NA	131205 131216 131217 SNMY23684/ 4	Jan. 16, 2015	Jan. 15, 2016
Spectrum Analyzer R&S	FSV40	100964	June 26, 2015	June 25, 2016
Pre-Amplifier SPACEK LABS	SLKKa-48-6	9K16	Dec. 12, 2014	Dec. 11, 2015
Horn_Antenna SCHWARZBECK	BBHA 9170	9170-424	Feb. 05, 2015	Feb. 04, 2016
RF Cable	NA	329751/4 RF104-204	Dec. 11, 2014	Dec. 10, 2015
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 test was performed in 966 Chamber No. G.
3. The FCC Site Registration No. is 966073.
4. The VCCI Site Registration No. is G-137.
5. The CANADA Site Registration No. is IC 7450H-2.
6. Tested Date: Nov. 05, 2015

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. 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:

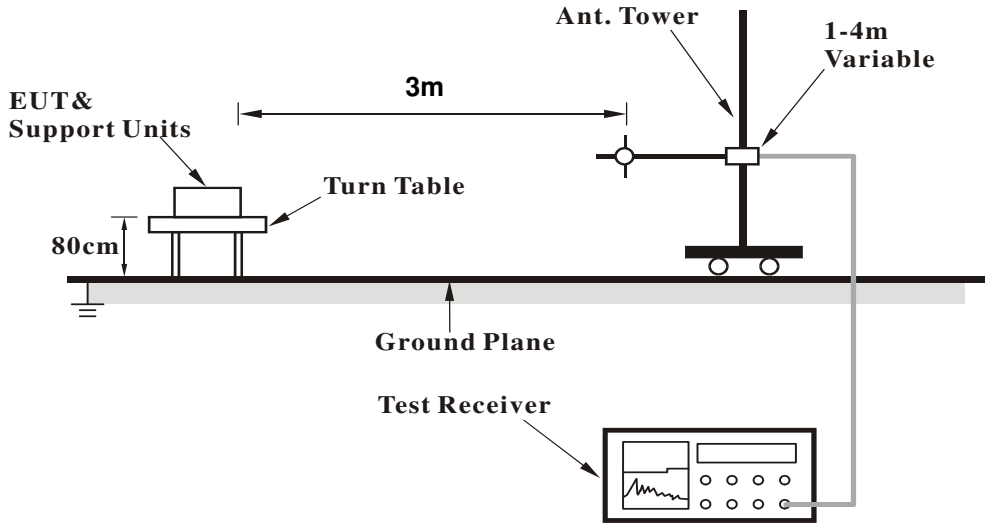
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for RMS Average (Duty cycle < 98%) for Average detection (AV) at frequency above 1GHz, then the measurement results was added to a correction factor (10 log(1/duty cycle)).
4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz (Duty cycle ≥ 98%) for Average detection (AV) at frequency above 1GHz.
5. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

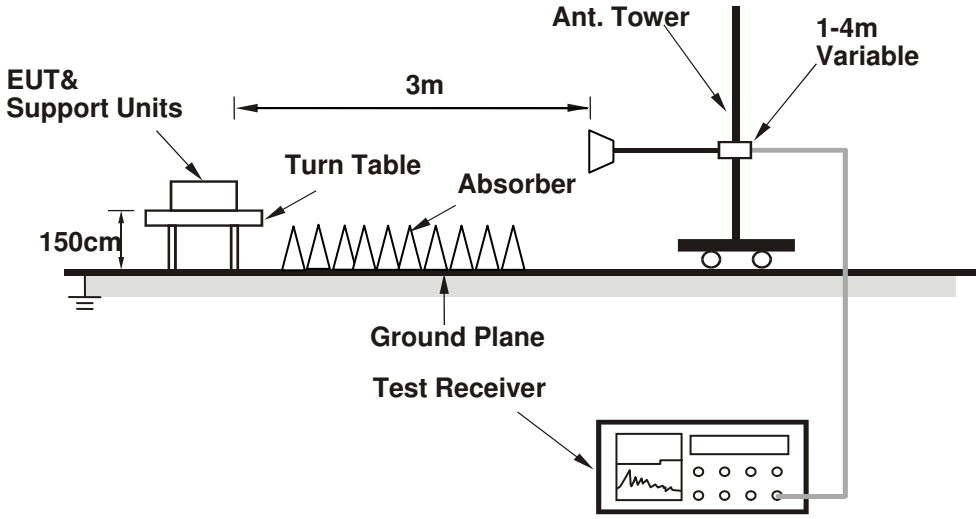
No deviation.

4.1.5 Test Setup

<Frequency Range below 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

1. Connect the EUT with the support unit A (Notebook Computer) which is placed on remote site.
2. Controlling software (QCART.EXE V3.0.93.0) has been activated to set the EUT on specific status.

4.1.7 Test Results

Above 1GHz Data:

FREQUENCY RANGE	1GHz ~ 40GHz	DETECTOR FUNCTION	Peak (PK) 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	4874.00	51.4 PK	74.0	-22.6	1.24 H	198	46.67	4.73
2	4874.00	48.6 AV	54.0	-5.4	1.24 H	198	43.87	4.73
3	7311.00	49.6 PK	74.0	-24.4	1.47 H	99	40.26	9.34
4	7311.00	44.4 AV	54.0	-9.6	1.47 H	99	35.06	9.34
5	#10456.00	54.2 PK	74.0	-19.8	1.41 H	105	42.15	12.05
6	#10456.00	43.2 AV	54.0	-10.8	1.41 H	105	31.15	12.05
7	15684.00	54.0 PK	74.0	-20.0	1.33 H	242	37.97	16.03
8	**15684.00**	**51.4 AV**	**54.0**	**-2.6**	**1.33 H**	**242**	**35.37**	**16.03**
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	4874.00	45.6 PK	74.0	-28.4	1.97 V	239	40.87	4.73
2	4874.00	40.6 AV	54.0	-13.4	1.97 V	239	35.87	4.73
3	7311.00	53.2 PK	74.0	-20.8	1.82 V	292	43.86	9.34
4	7311.00	40.0 AV	54.0	-14.0	1.82 V	292	30.66	9.34
5	#10456.00	55.6 PK	74.0	-18.4	1.96 V	100	43.55	12.05
6	#10456.00	44.1 AV	54.0	-9.9	1.96 V	100	32.05	12.05
7	15684.00	67.0 PK	74.0	-7.0	2.01 V	103	50.97	16.03
8	15684.00	51.3 AV	54.0	-2.7	2.01 V	103	35.27	16.03

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. " # ": The radiated frequency is out of the restricted band.

Below 1GHz Data:

FREQUENCY RANGE	Below 1GHz	DETECTOR FUNCTION	Quasi-Peak (QP)

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	102.70	30.1 QP	43.5	-13.4	1.50 H	68	47.22	-17.14
2	148.92	31.3 QP	43.5	-12.2	1.50 H	56	44.24	-12.94
3	271.00	36.0 QP	46.0	-10.0	1.00 H	43	49.09	-13.06
4	600.02	32.0 QP	46.0	-14.1	1.50 H	34	36.25	-4.30
5	625.00	34.8 QP	46.0	-11.2	1.50 H	13	38.57	-3.74
6	750.03	30.4 QP	46.0	-15.6	1.00 H	30	31.57	-1.21
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	146.74	29.8 QP	43.5	-13.7	1.00 V	312	42.81	-13.04
2	272.16	32.5 QP	46.0	-13.5	1.00 V	139	45.51	-13.00
3	600.02	28.9 QP	46.0	-17.1	1.50 V	360	33.24	-4.30
4	625.00	34.7 QP	46.0	-11.3	1.00 V	227	38.40	-3.74
5	749.98	33.1 QP	46.0	-12.9	1.50 V	22	34.30	-1.21
6	875.02	31.5 QP	46.0	-14.5	1.50 V	0	31.26	0.24

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

4.2 Conducted Emission Measurement

4.2.1 Limits of Conducted Emission Measurement

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

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

4.2.2 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver R&S	ESCS 30	100287	Apr. 17, 2015	Apr. 16, 2016
Line-Impedance Stabilization Network (for EUT) R&S	ENV216	100071	Nov. 10, 2014	Nov. 09, 2015
RF Cable	5D-FB	COACAB-001	May 25, 2015	May 24, 2016
50 ohms Terminator	50	3	Oct. 17, 2014	Oct. 16, 2015
50 ohms Terminator	N/A	EMC-04	Oct. 21, 2014	Oct. 20, 2015
Software BVADT	BVADT_Cond_ V7.3.7.3	NA	NA	NA
Line-Impedance Stabilization Network (for Peripheral) R&S	ENV216	100072	June 11, 2015	June 10, 2016

Note:

1. The calibration interval of the above test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Shielded Room No. A.
3. The VCCI Con A Registration No. is C-817.
4. Tested Date: Aug. 24, 2015

4.2.3 Test Procedures

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

b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

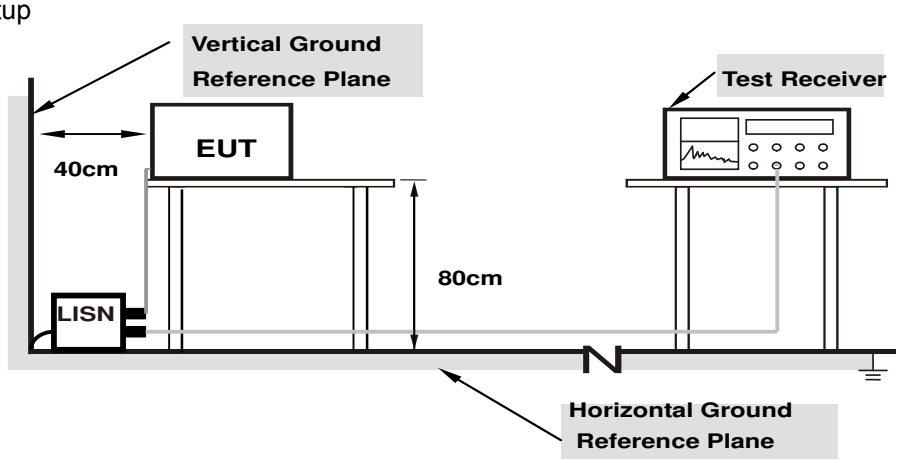
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

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

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 Test Setup



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

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

4.2.6 EUT Operating Conditions

Same as 4.1.6.

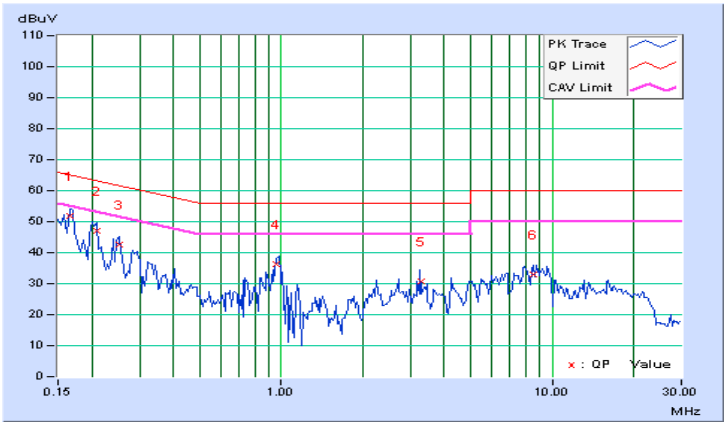
4.2.7 Test Results (Mode 1)

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

Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16562	0.10	51.88	40.43	51.98	40.53	65.18	55.18	-13.20	-14.65
2	0.20859	0.10	47.09	33.33	47.19	33.43	63.26	53.26	-16.07	-19.83
3	0.25156	0.12	42.56	28.20	42.68	28.32	61.71	51.71	-19.03	-23.39
4	0.96428	0.23	35.95	35.18	36.18	35.41	56.00	46.00	-19.82	-10.59
5	3.26997	0.32	30.46	24.01	30.78	24.33	56.00	46.00	-25.22	-21.67
6	8.47656	0.49	32.46	27.21	32.95	27.70	60.00	50.00	-27.05	-22.30

Remarks:

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

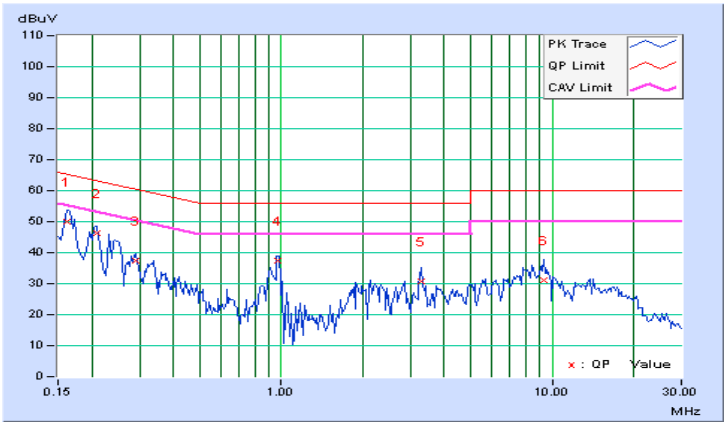


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)

Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16172	0.09	49.83	38.38	49.92	38.47	65.38	55.38	-15.46	-16.91
2	0.20859	0.10	46.07	33.68	46.17	33.78	63.26	53.26	-17.09	-19.48
3	0.29063	0.12	37.40	23.97	37.52	24.09	60.51	50.51	-22.98	-26.41
4	0.96675	0.21	37.32	37.29	37.53	37.50	56.00	46.00	-18.47	-8.50
5	3.26953	0.29	30.32	22.68	30.61	22.97	56.00	46.00	-25.39	-23.03
6	9.26953	0.49	30.65	25.46	31.14	25.95	60.00	50.00	-28.86	-24.05

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



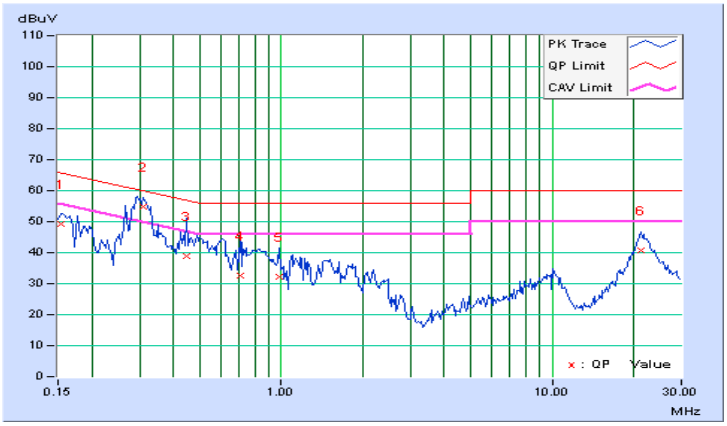
4.2.8 Test Results (Mode 2)

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

Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15391	0.10	49.00	35.46	49.10	35.56	65.79	55.79	-16.69	-20.23
2	0.31016	0.13	54.80	41.67	54.93	41.80	59.97	49.97	-5.03	-8.16
3	0.44688	0.17	38.90	28.13	39.07	28.30	56.93	46.93	-17.87	-18.64
4	0.70469	0.20	32.49	22.68	32.69	22.88	56.00	46.00	-23.31	-23.12
5	0.98594	0.23	31.99	22.30	32.22	22.53	56.00	46.00	-23.78	-23.47
6	21.19922	0.79	39.91	34.70	40.70	35.49	60.00	50.00	-19.30	-14.51

Remarks:

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

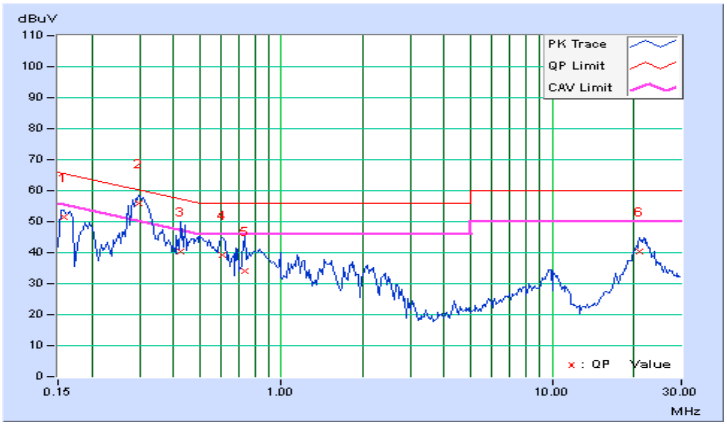


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)

Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15781	0.09	51.38	39.63	51.47	39.72	65.58	55.58	-14.11	-15.86
2	**0.29844**	**0.12**	**55.81**	**42.41**	**55.93**	**42.53**	**60.29**	**50.29**	**-4.35**	**-7.75**
3	0.42734	0.15	40.14	30.00	40.29	30.15	57.30	47.30	-17.01	-17.15
4	0.60703	0.17	39.09	26.51	39.26	26.68	56.00	46.00	-16.74	-19.32
5	0.73203	0.18	34.06	24.89	34.24	25.07	56.00	46.00	-21.76	-20.93
6	21.03906	0.78	39.54	34.27	40.32	35.05	60.00	50.00	-19.68	-14.95

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

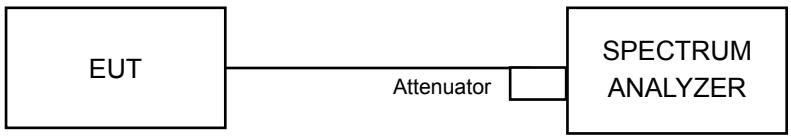


4.3 Conducted Out of Band Emission Measurement

4.3.1 Limits of Conducted Out of Band Emission Measurement

Below 30dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).

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

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.

4.3.5 Deviation from Test Standard

No deviation.

4.3.6 EUT Operating Condition

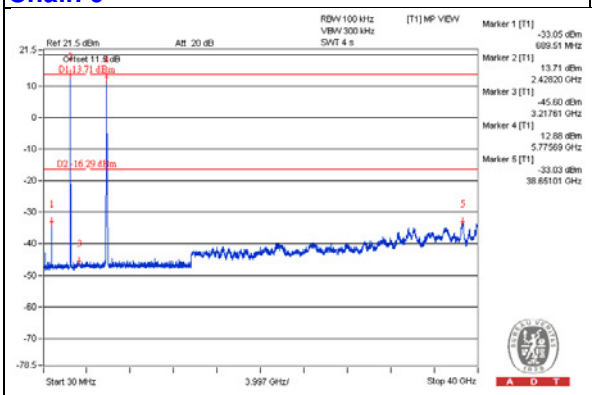
Same as Item 4.3.6

4.3.7 Test Results

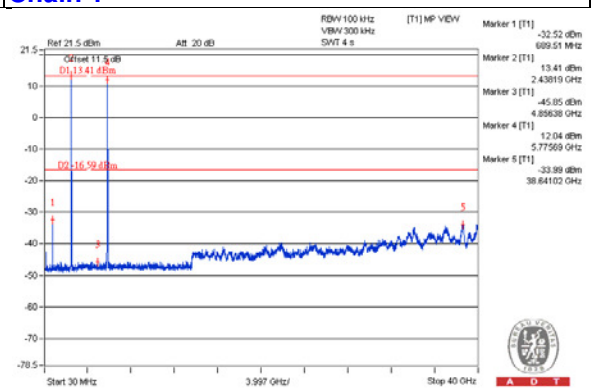
The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 30dB offset below D1. It shows compliance with the requirement.

2.4GHz 802.11b CH 6 + 5GHz (802.11ac (VHT20)) CH 157

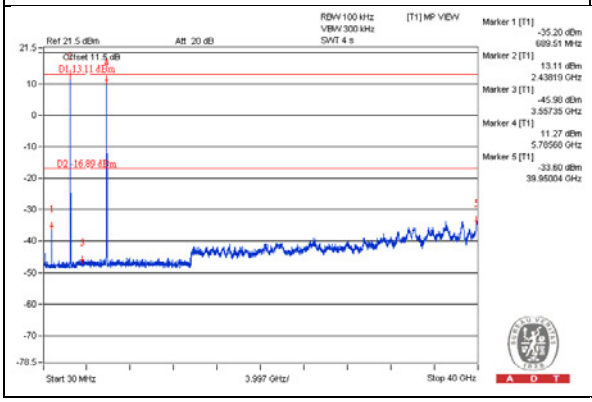
Chain 0



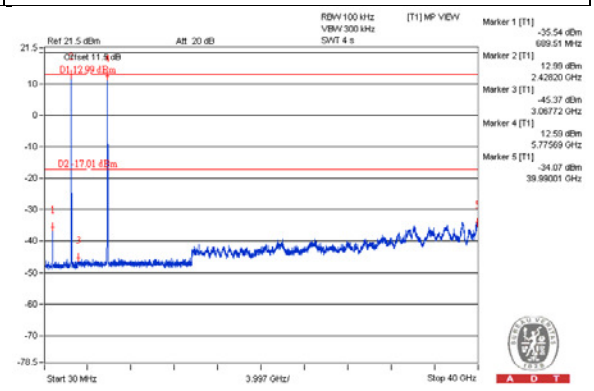
Chain 1



Chain 2



Chain 3



5 Pictures of Test Arrangements

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

Appendix – Information on the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are 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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The address and road map of all our labs can be found in our web site also.

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