Supplemental “Transmit Simultaneously” Test Report

Report No.:	RF150720E02-2
FCC ID:	UXX-S4A542A
Test Model:	S4A543A
Series Model:	S4A542A
Received Date:	July 20, 2015
Test Date:	July 22 to Aug. 07, 2015
Issued Date:	Aug. 20, 2015
Applicant:	Cradlepoint, Inc
Address:	1111 W. Jefferson Street, Suite 400,Boise, ID 83702 USA
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Hsin Chu Laboratory
Lab Address:	No. 81-1, Lu Liao Keng, 9th Ling,Wu Lung Tsuen, Chiung Lin Hsiang, Hsin Chu Hsien 307, Taiwan R.O.C.
Test Location (1):	No. 81-1, Lu Liao Keng, 9th Ling,Wu Lung Tsuen, Chiung Lin Hsiang, Hsin Chu Hsien 307, 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.
Test Location (3):	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City, Taiwan R.O.C.

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Release Control Record

Issue No.	Description	Date Issued
RF150720E02-2	Original release.	Aug. 20, 2015

1 Certificate of Conformity

Product:	Advanced Edge Router
Brand:	cradlepoint
Test Model:	S4A543A
Series Model:	S4A542A
Sample Status:	ENGINEERING SAMPLE
Applicant:	Cradlepoint, Inc
Test Date:	July 22 to Aug. 07, 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 : Phoenix Huang , **Date:** Aug. 20, 2015

Phoenix Huang / Specialist

Approved by : , **Date:** Aug. 20, 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 -1.80dB at 0.15781MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -4.2dB at 76.415MHz.

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	Advanced Edge Router
Brand	cradlepoint
Test Model	S4A543A
Series Model	S4A542A
Status of EUT	ENGINEERING SAMPLE
Power Supply Rating	12Vdc from power adapter
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 300Mbps 802.11ac: up to 866.7Mbps
Operating Frequency	**2.4GHz:** 2.412GHz ~ 2.462GHz **5GHz:** 5.18GHz ~ 5.24GHz, 5.745GHz ~ 5.825GHz
Number of Channel	**2.4GHz:** 802.11b, 802.11g, 802.11n (HT20): 11 802.11n (HT40): 7 **5GHz:** 802.11a, 802.11n (HT20), 802.11ac (VHT20): 9 802.11n (HT40), 802.11ac (VHT40): 4 802.11ac (VHT80): 2
Output Power	**CDD Mode** **2.4GHz:** 802.11b: 710.332mW 802.11g: 643.541mW 802.11n (HT20): 636.651mW 802.11n (HT40): 195.239mW **5GHz:** 802.11a: 462.954mW 802.11ac (VHT20): 414.506mW 802.11ac (VHT40): 333.183mW 802.11ac (VHT80): 53.35mW **Beamforming Mode** **2.4GHz:** 802.11n (HT20): 636.651mW 802.11n (HT40): 195.239mW **5GHz:** 802.11ac (VHT20): 414.506mW 802.11ac (VHT40): 333.183mW 802.11ac (VHT80): 53.35mW

Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	Adapter x 1
Data Cable Supplied	RJ45 cable (1.5m, unshielded) x 1

Note:

1. There are WLAN and 3G/LTE technology used for the EUT.
2. WLAN/3G/LTE coexistence mode:

Condition	Technology			
1	WLAN(2.4GHz)	WLAN(5GHz)	3G (Model No.: MC7354)	3G (Model No.: MC400LPE)
2	WLAN(2.4GHz)	WLAN(5GHz)	3G (Model No.: MC7354)	LTE (Model No.: MC400LPE)
3	WLAN(2.4GHz)	WLAN(5GHz)	LTE (Model No.: MC7354)	3G (Model No.: MC400LPE)
4	WLAN(2.4GHz)	WLAN(5GHz)	LTE (Model No.: MC7354)	LTE (Model No.: MC400LPE)
Note: The emission of the simultaneous operation has been evaluated and no non-compliance was found.				

3. The EUT has two model names which are identical to each other in all aspects except for the following table: (USB device apply for mobile AP with 4G module, Model No.: MC400LPE test only not sale together)

Model No.	WiFi Function	3G/LTE (contains certified module_Model No.: MC7354 (FCC ID: N7NMC7355))	3G/LTE (with optional Model No.: MC400LPE (FCC ID: N7NMC7355))
S4A542A	V	-	V
S4A543A	V	V	V
From the above models, model: **S4A543A** was selected as the representative model for the test and its data is recorded in this report.			

4. The EUT must be supplied with a power adapter and following four different models could be chosen as following table:

No	Brand Name	Model No.	Spec.
1	Ktec	KSAS0361200300D5	Input: 100-240Vac, 50/60Hz, 1.0A Output: 12Vdc, 3000mA DC output cable: 1.8m, unshielded
2	Ktec	KSAS0501200400M2	Input: 100-240Vac, 50/60Hz, 1.2A AC output cable: 2m, unshielded Output: 12Vdc, 4000mA DC output cable: 1.2m, unshielded
3	FSP GROUP, INC.	FSP040-DHMN2	Input: 100-240Vac, 50/60Hz, 1.2A Output: 12Vdc, 3400mA DC output cable: 1.5m, unshielded
4	FSP GROUP, INC.	FSP048-RHAN2	Input: 100-240Vac, 50/60Hz, 1.5A AC output cable: 1.8m, unshielded Output: 12Vdc, 4000mA DC output cable: 1.55m, unshielded with one core
From the above adapters, the worst radiated emissions test was found in **Adapter 4**. Therefore only the test data of the mode was recorded in this report.			

5. The EUT incorporates a MIMO function with beamforming.

For 2.4GHz Band			
MODULATION MODE	**DATA RATE (MCS)**	**TX & RX CONFIGURATION**	
802.11b	1 ~ 11Mbps	2TX	2RX
802.11g	6 ~ 54Mbps	2TX	2RX
802.11n (HT20) & 802.11n (HT40)	MCS 0~7	2TX	2RX
	MCS 8~15	2TX	2RX
For 5GHz Band			
802.11a	6 ~ 54Mbps	2TX	2RX
802.11n (HT20) & 802.11n (HT40)	MCS 0~7	2TX	2RX
	MCS 8~15	2TX	2RX
802.11ac (VHT20)	MCS0~8 Nss=1	2TX	2RX
	MCS0~8 Nss=2	2TX	2RX
802.11ac (VHT40) & 802.11ac (VHT80)	MCS0~9 Nss=1	2TX	2RX
	MCS0~9 Nss=2	2TX	2RX
Note: 1. From the above modulation modes, the 802.11a, b, g without beamforming.			

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

For WLAN used						
Antenna No.	Transmitter Circuit	Model	Antenna Gain(dBi)	Frequency range	Antenna Type	Connecter Type
WIFI Antenna 1	2.4G Chain 0	RFA-25-G170-70B-154	3.5	2400~24835MHz	Dipole	i-pex(MHF)
	5G Chain 1		4.9	5150~5250MHz		
			4.9	5725~5850MHz		
WIFI Antenna 2	2.4G Chain 1	RFA-25-G170-70-64	3.5	2400~24835MHz	Dipole	
	5G Chain 0		4.9	5150~5250MHz		
			4.9	5725~5850MHz		
For LTE used						
Antenna No.		Model	Antenna Gain(dBi)	Frequency range	Antenna Type	Connecter Type
LTE Antenna 1		YWX-6241SAXX-711C	2	698~960MHz	Dipole	SMA
LTE Antenna 1			3	1710~2700MHz	Dipole	SMA
LTE Antenna 2		RFA-LTE-T196-U-B70	-2	698~960MHz	Dipole	SMA
LTE Antenna 2			1	1710~2700MHz	Dipole	SMA
Note: 1. For LTE: Antenna No.: 1 was selected as representative antenna for the test.						

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.

3.1.1 Test Mode Applicability and Tested Channel Detail

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE≥1G	RE<1G	PLC	OB	
1	√	√	√	√	With Adapter 4
2	-	-	√	-	With Adapter 1
3	-	-	√	-	With Adapter 2
4	-	-	√	-	With Adapter 3

Where **RE≥1G:** Radiated Emission above 1GHz & Bandedge Measurement **RE<1G:** Radiated Emission below 1GHz

PLC: Power Line Conducted Emission **OB:** Conducted Out-Band Emission Measurement

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)
2.4 GHz (802.11b) + 5 GHz (802.11a) + 3G	1 to 11	6	DSSS	DBPSK	1
	36 to 48 149 to 165	48	OFDM	BPSK	6
	AVAILABLE CHANNEL			MODULATION TYPE	
	128 to 251			GMSK	

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)
2.4 GHz (802.11b) + 5 GHz (802.11a) + 3G	1 to 11	6	DSSS	DBPSK	1
	36 to 48 149 to 165	48	OFDM	BPSK	6
	AVAILABLE CHANNEL			MODULATION TYPE	
	128 to 251			GMSK	

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)
2.4 GHz (802.11b) + 5 GHz (802.11a) + 3G	1 to 11	6	DSSS	DBPSK	1
	36 to 48 149 to 165	48	OFDM	BPSK	6
	AVAILABLE CHANNEL			MODULATION TYPE	
	128 to 251			GMSK	

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)
2.4 GHz (802.11b) + 5 GHz (802.11a) + 3G	1 to 11	6	DSSS	DBPSK	1
	36 to 48 149 to 165	48	OFDM	BPSK	6
	AVAILABLE CHANNEL			MODULATION TYPE	
	128 to 251			GMSK	

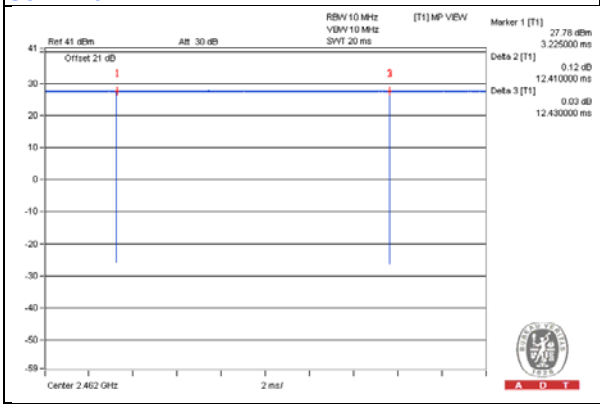
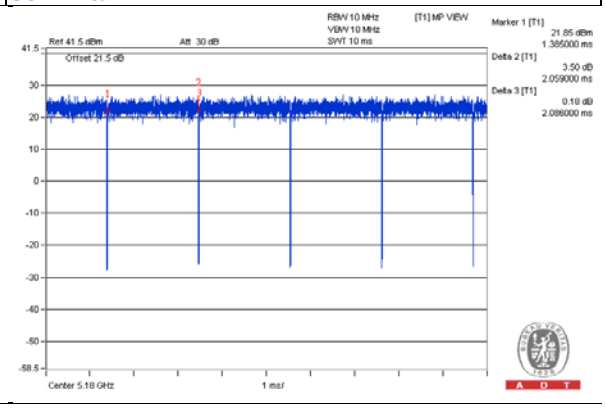
Test Condition:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER (SYSTEM)	TESTED BY
RE≥1G	21deg. C, 61%RH	120Vac, 60Hz	Weiwei Lo
RE<1G	25deg. C, 68%RH	120Vac, 60Hz	Weiwei Lo
PLC	25deg. C, 65%RH	120Vac, 60Hz	JyunChun Lin
OB	25deg. C, 60%RH	120Vac, 60Hz	Weiwei Lo

3.2 Duty Cycle of Test Signal

Duty cycle of test signal is ≥ 98 %, duty factor is not required.
2.4GHz_802.11b: Duty cycle = 12.41/12.43 = 0.998

5GHz Band_802.11a: Duty cycle = 2.059 ms/2.086 ms = 0.987

802.11b	802.11a
	

3.3 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.	iPod shuffle	Apple	MC749TA/A	CC4DMFJUDFDM	NA	Provided by Lab
B.	NOTEBOOK COMPUTER	DELL	E5430	4YV4VY1	FCC DoC	Provided by Lab
C.	NOTEBOOK COMPUTER	DELL	E5430	HYV4VY1	FCC DoC	Provided by Lab
D.	HUB	ZyXEL	ES-116P	S060H02000215	FCC DoC	Provided by Lab
E.	USB device apply for mobile AP with 4G module	cradlepoint	MC400LPE	NA	N7NMC7355	Supplied by Client
F.	Radio Communication Analyzer	Anritsu	MT8820C	6201127458	NA	Provided by Lab
G.	Radio Communication Analyzer extended TDD function	Anritsu	MT8820C	6201127458	NA	Provided by Lab

Note:

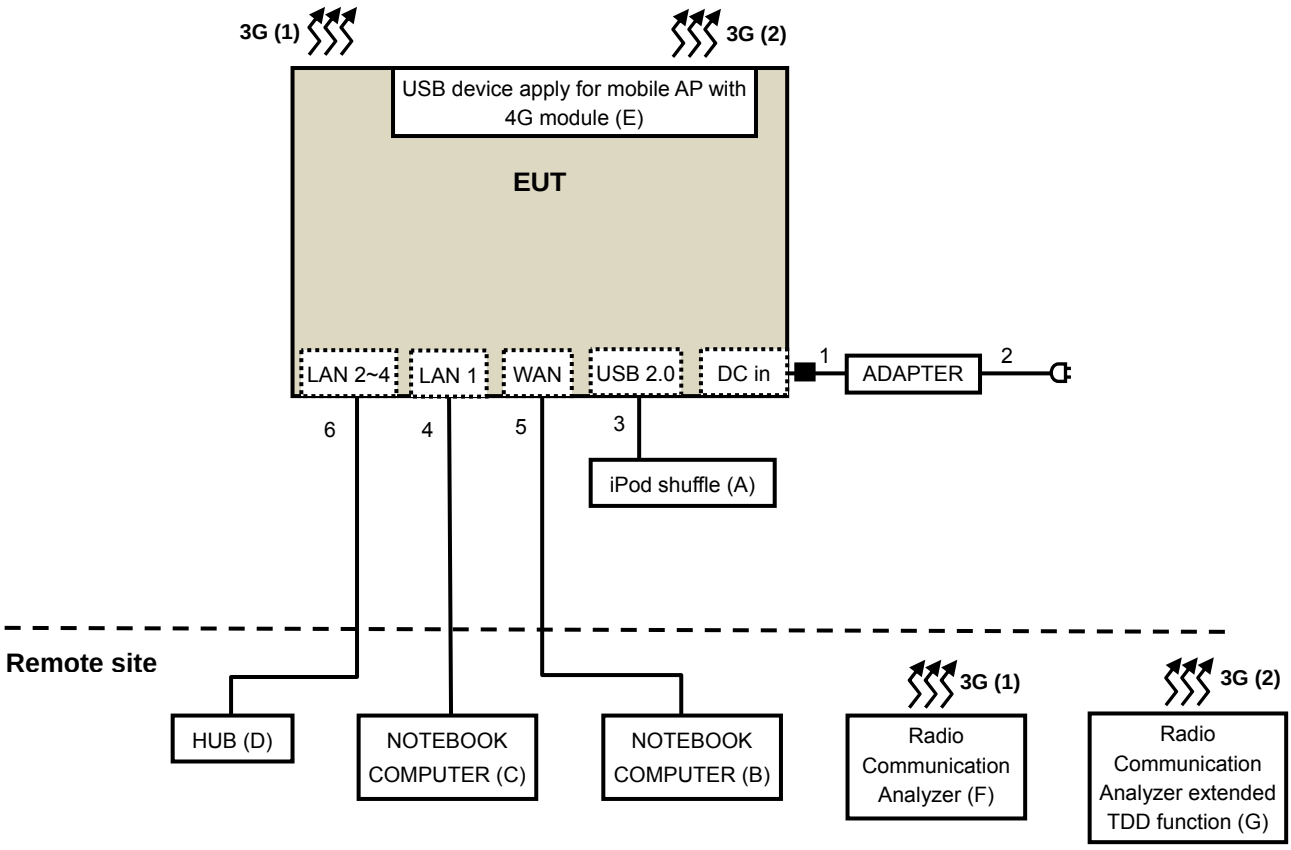
1. All power cords of the above support units are non-shielded (1.8m).

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	DC (for Mode 1)	1	1.55	No	1	Supplied by Client
	DC (for Mode 2)	1	1.8	No	0	Supplied by Client
	DC (for Mode 3)	1	1.2	No	0	Supplied by Client
	DC (for Mode 4)	1	1.5	No	0	Supplied by Client
2.	AC (for Mode 1)	1	1.8	No	0	Supplied by Client
	AC (for Mode 3)	1	2	No	0	Supplied by Client
3.	USB	1	0.1	Yes	0	Provided by Lab
4.	RJ-45	1	10	No	0	Provided by Lab
5.	RJ-45	1	10	No	0	Provided by Lab
6.	RJ-45	3	10	No	0	Provided by Lab

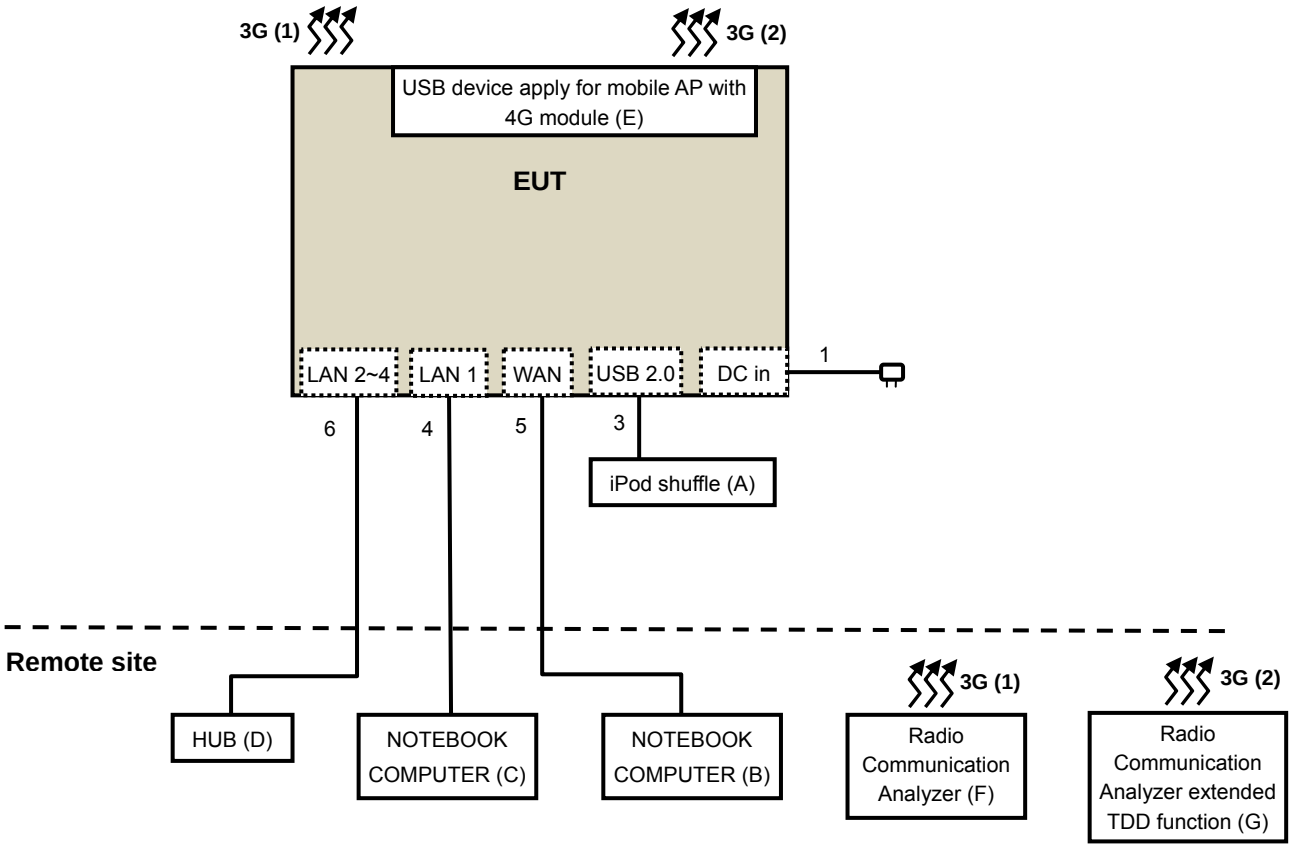
Note: The core(s) is(are) originally attached to the cable(s).

3.3.1 Configuration of System under Test

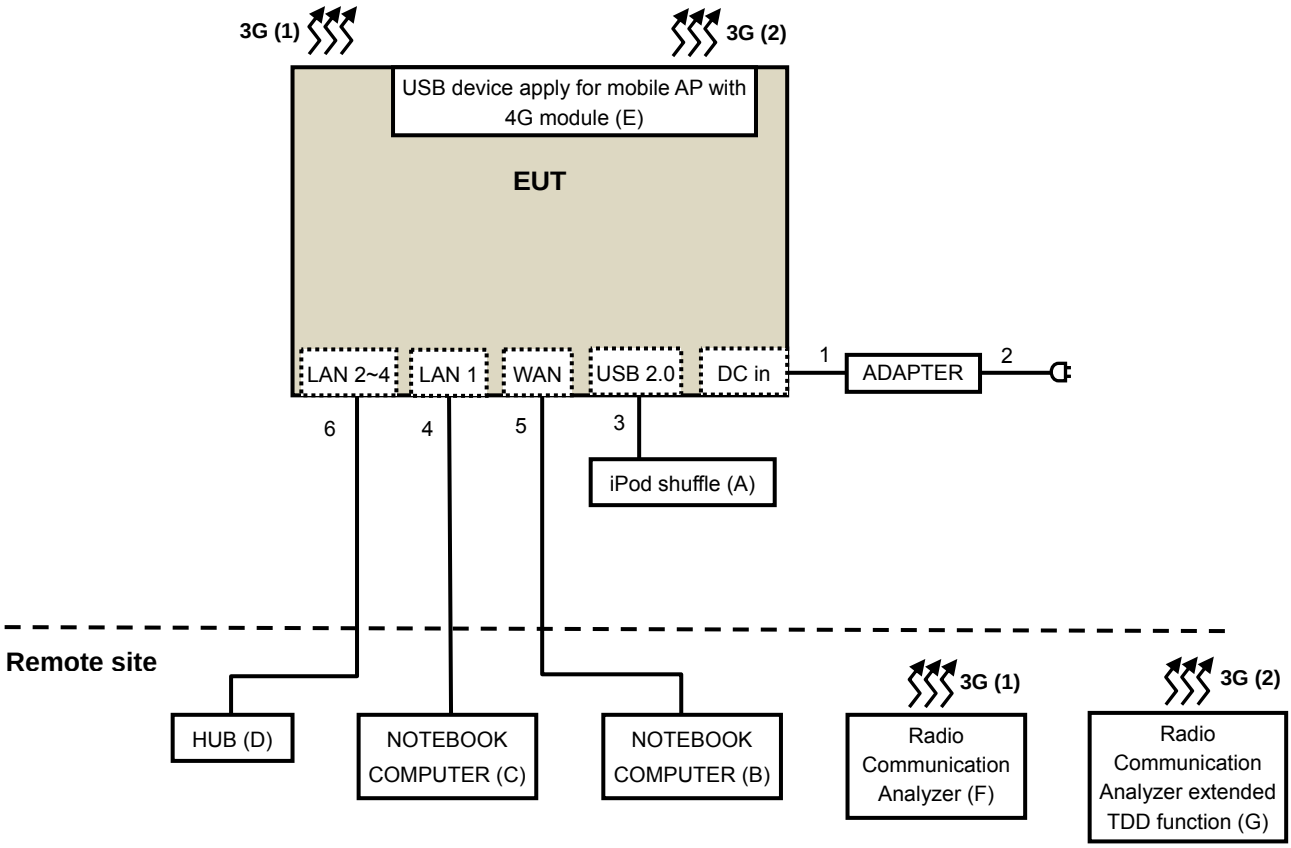
For Mode 1:



For Mode 2, 4:


3G (1)
3G (2)
USB device apply for mobile AP with 4G module (E)
EUT
LAN 2~4
LAN 1
WAN
USB 2.0
DC in
1
6
4
5
3
iPod shuffle (A)
Remote site
HUB (D)
NOTEBOOK COMPUTER (C)
NOTEBOOK COMPUTER (B)
3G (1)
Radio Communication Analyzer (F)
3G (2)
Radio Communication Analyzer extended TDD function (G)

For Mode 3:


3G (1)
3G (2)
USB device apply for mobile AP with 4G module (E)
EUT
LAN 2~4
LAN 1
WAN
USB 2.0
DC in
1
ADAPTER
2
6
4
5
3
iPod shuffle (A)
Remote site
HUB (D)
NOTEBOOK COMPUTER (C)
NOTEBOOK COMPUTER (B)
3G (1)
Radio Communication Analyzer (F)
3G (2)
Radio Communication Analyzer extended TDD function (G)

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 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	0000320091110	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
SPECTRUM ANALYZER R&S	FSP 40	100060	May 08, 2015	May 07, 2016
Power meter Anritsu	ML2495A	1014008	Apr. 28, 2015	Apr. 27, 2016
Power sensor Anritsu	MA2411B	0917122	Apr. 28, 2015	Apr. 27, 2016
Temperature & Humidity Chamber GIANTFORCE	GTH-150-40-SP-AR	MAA0812-008	Jan. 12, 2015	Jan. 11, 2016

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: July 24 to Aug. 06, 2015

For Below 1GHz:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Agilent	N9038A	MY51210202	Dec. 12, 2014	Dec. 11, 2015
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 CANADA Site Registration No. is IC 7450H-2.
5. Tested Date: July 22, 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:

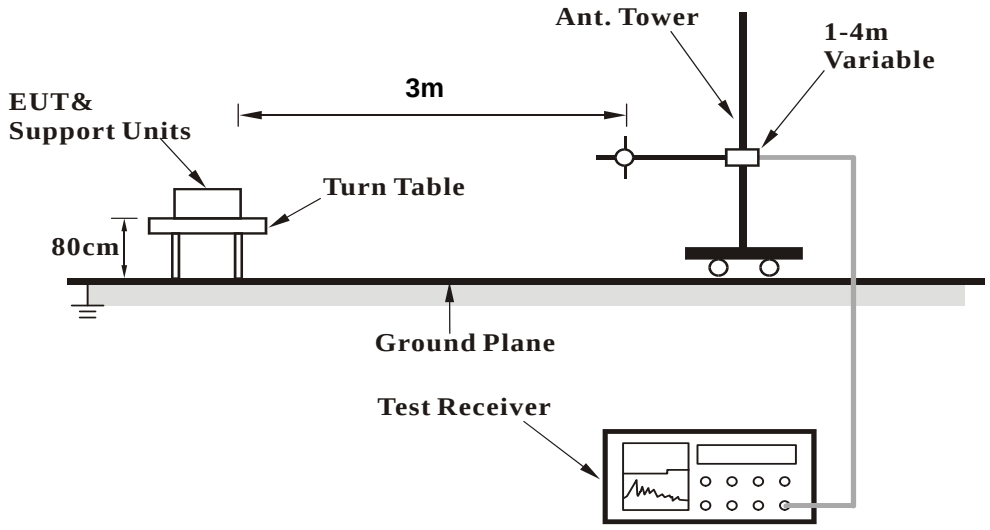
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is ≥ 1/T (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

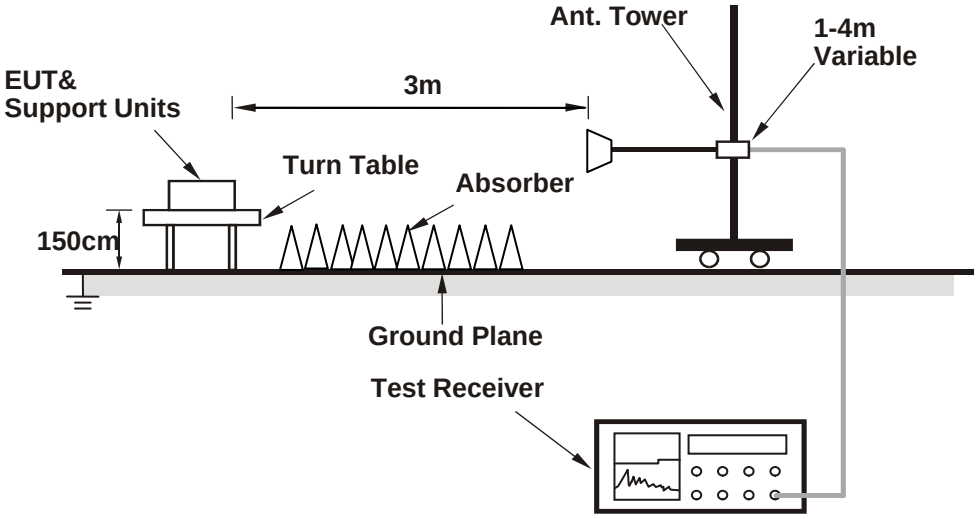
No deviation.

4.1.5 Test Setup

<Frequency Range 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. Placed the EUT on the testing table.
2. Connect the EUT with the support unit C (Notebook Computer) which is placed on a testing table.
3. The communication partner run test program “Mtool.exe[v2.0.1.0]” to enable EUT under transmission/receiving condition continuously at specific channel frequency.
4. The support unit F (Radio Communication Analyzer) & support unit G (Radio Communication Analyzer extended TDD function) link the EUT by 3G wireless transmission.

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	45.8 PK	74.0	-28.2	1.49 H	50	38.55	7.25
2	4874.00	37.5 AV	54.0	-16.5	1.49 H	50	30.25	7.25
3	7311.00	50.8 PK	74.0	-23.2	1.03 H	245	36.35	14.45
4	7311.00	42.9 AV	54.0	-11.1	1.03 H	245	28.45	14.45
5	#10480.00	54.8 PK	74.0	-19.2	1.35 H	279	40.33	14.47
6	#10480.00	43.8 AV	54.0	-10.2	1.35 H	279	29.33	14.47
7	15720.00	60.0 PK	74.0	-14.0	1.53 H	278	40.96	19.04
8	15720.00	49.5 AV	54.0	-4.5	1.53 H	278	30.46	19.04
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	44.7 PK	74.0	-29.3	1.06 V	7	37.45	7.25
2	4874.00	36.2 AV	54.0	-17.8	1.06 V	7	28.95	7.25
3	7311.00	51.8 PK	74.0	-22.2	1.01 V	149	37.35	14.45
4	7311.00	39.8 AV	54.0	-14.2	1.01 V	149	25.35	14.45
5	#10480.00	56.0 PK	74.0	-18.0	1.60 V	294	41.53	14.47
6	#10480.00	44.3 AV	54.0	-9.7	1.60 V	294	29.83	14.47
7	15720.00	59.8 PK	74.0	-14.2	1.37 V	215	40.76	19.04
8	15720.00	49.3 AV	54.0	-4.7	1.37 V	215	30.26	19.04

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	39.99	28.3 QP	40.0	-11.7	1.05 H	175	41.80	-13.48
2	148.73	34.6 QP	43.5	-8.9	1.25 H	81	47.38	-12.81
3	224.92	35.0 QP	46.0	-11.0	1.25 H	269	50.74	-15.71
4	341.13	27.8 QP	46.0	-18.2	1.25 H	360	38.69	-10.87
5	426.54	27.3 QP	46.0	-18.7	1.05 H	0	35.61	-8.28
6	749.98	25.2 QP	46.0	-20.9	1.05 H	43	26.36	-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	**76.42**	**35.8 QP**	**40.0**	**-4.2**	**1.15 V**	**282**	**52.58**	**-16.75**
2	165.46	31.6 QP	43.5	-11.9	1.30 V	104	44.67	-13.09
3	229.09	30.5 QP	46.0	-15.6	1.15 V	104	46.01	-15.56
4	400.01	26.5 QP	46.0	-19.5	1.15 V	7	35.77	-9.27
5	594.01	24.0 QP	46.0	-22.0	1.30 V	27	28.42	-4.41
6	958.48	27.5 QP	46.0	-18.5	1.30 V	74	25.78	1.75

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	100375	May 06, 2015	May 05, 2016
Line-Impedance Stabilization Network (for EUT) SCHWARZBECK	NSLK-8127	8127-522	Sep. 15, 2014	Sep. 14, 2015
Line-Impedance Stabilization Network (for Peripheral) R&S	ENV216	100072	June 11, 2015	June 10, 2016
RF Cable	5D-FB	COCCAB-001	Mar. 09, 2015	Mar. 08, 2016
50 ohms Terminator	N/A	EMC-03	Sep. 22, 2014	Sep. 21, 2015
50 ohms Terminator	N/A	EMC-02	Sep. 30, 2014	Sep. 29, 2015
Software BVADT	BVADT_Cond_ V7.3.7.3	NA	NA	NA

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. C.
3 The VCCI Con C Registration No. is C-3611.
4 Tested Date: July 24 to 27, 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.

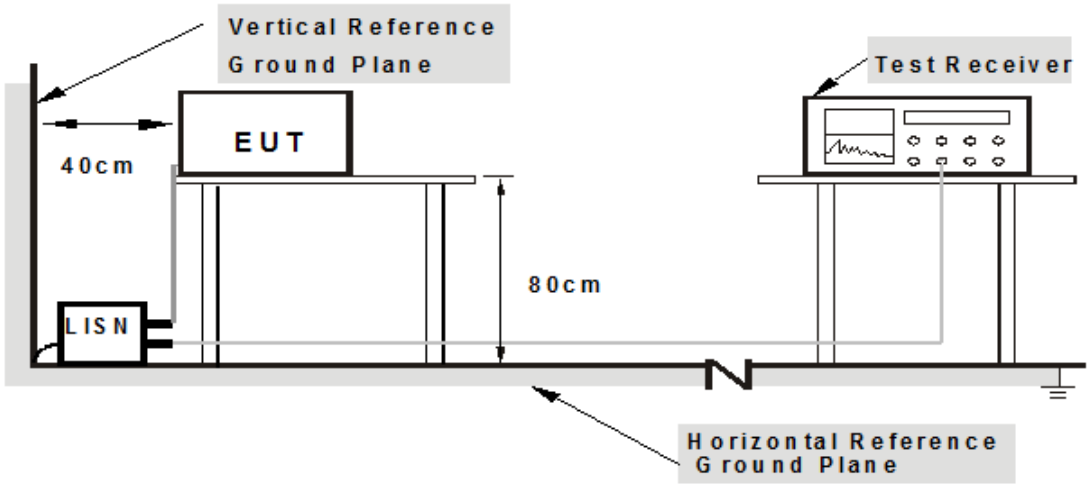
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

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.

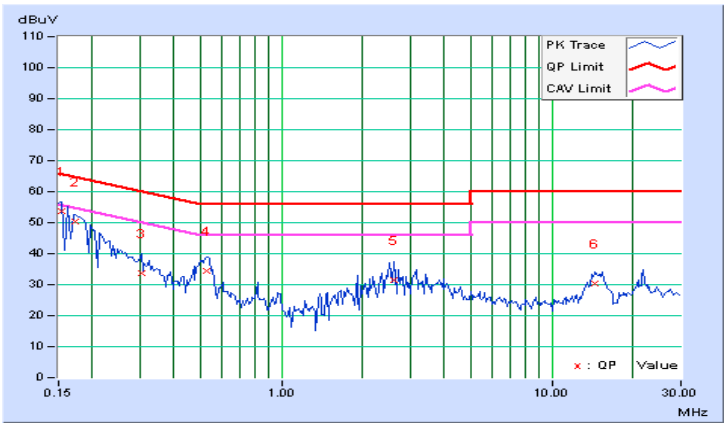
4.2.7 Test Results (Mode 1)

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

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	0.08	53.66	34.40	53.74	34.48	65.79	55.79	-12.05	-21.31
2	0.17344	0.08	50.39	35.10	50.47	35.18	64.79	54.79	-14.32	-19.61
3	0.30234	0.10	33.69	16.54	33.79	16.64	60.18	50.18	-26.39	-33.54
4	0.52891	0.11	34.23	25.50	34.34	25.61	56.00	46.00	-21.66	-20.39
5	2.61719	0.19	31.44	21.06	31.63	21.25	56.00	46.00	-24.37	-24.75
6	14.50000	0.56	29.86	22.39	30.42	22.95	60.00	50.00	-29.58	-27.05

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

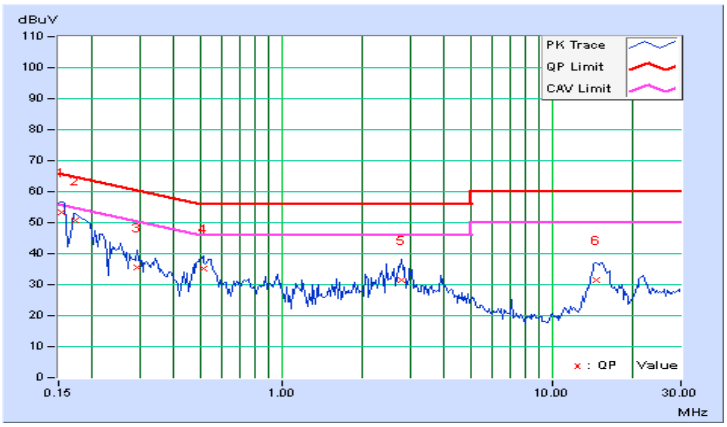


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)

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	0.08	53.33	34.78	53.41	34.86	65.79	55.79	-12.38	-20.93
2	0.17344	0.08	50.57	36.54	50.65	36.62	64.79	54.79	-14.14	-18.17
3	0.29453	0.09	35.59	20.17	35.68	20.26	60.40	50.40	-24.72	-30.14
4	0.51328	0.11	34.90	25.94	35.01	26.05	56.00	46.00	-20.99	-19.95
5	2.76953	0.19	31.38	21.42	31.57	21.61	56.00	46.00	-24.43	-24.39
6	14.60547	0.59	31.04	23.51	31.63	24.10	60.00	50.00	-28.37	-25.90

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



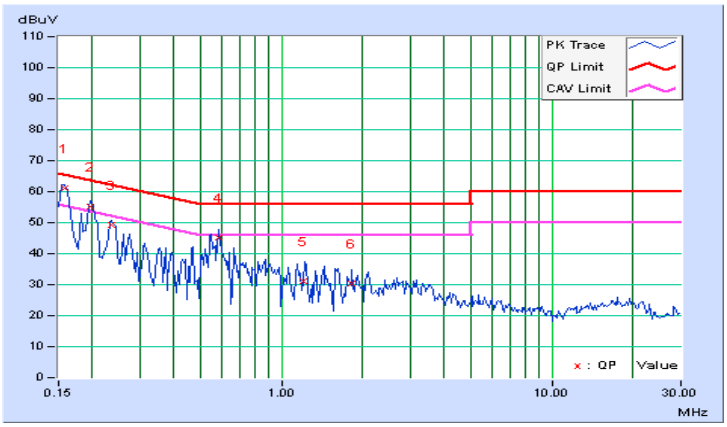
4.2.8 Test Results (Mode 2)

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

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	0.14	61.09	53.01	61.23	53.15	65.58	55.58	-4.35	-2.43
2	0.19687	0.15	54.88	47.07	55.03	47.22	63.74	53.74	-8.71	-6.52
3	0.23594	0.15	48.99	40.65	49.14	40.80	62.24	52.24	-13.09	-11.43
4	0.58750	0.18	45.16	41.03	45.34	41.21	56.00	46.00	-10.66	-4.79
5	1.21231	0.21	30.86	22.23	31.07	22.44	56.00	46.00	-24.93	-23.56
6	1.81641	0.25	30.24	20.32	30.49	20.57	56.00	46.00	-25.51	-25.43

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

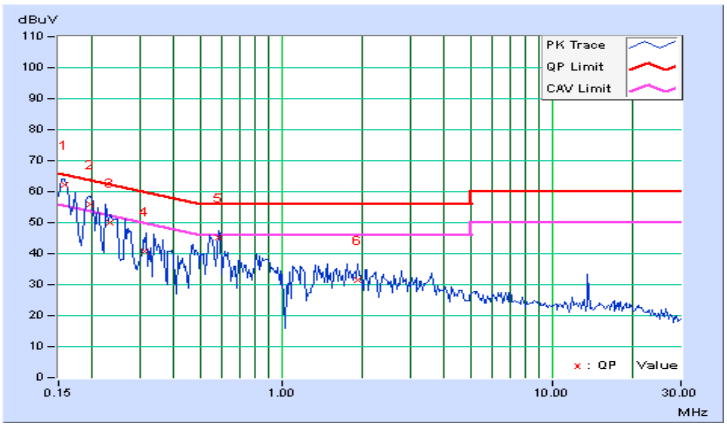


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)

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**	**0.14**	**61.93**	**53.64**	**62.07**	**53.78**	**65.58**	**55.58**	**-3.51**	**-1.80**
2	0.19687	0.15	55.74	47.84	55.89	47.99	63.74	53.74	-7.85	-5.75
3	0.23309	0.16	49.67	40.88	49.83	41.04	62.34	52.34	-12.51	-11.30
4	0.31322	0.17	40.59	32.78	40.76	32.95	59.88	49.88	-19.12	-16.93
5	0.58622	0.21	45.04	40.66	45.25	40.87	56.00	46.00	-10.75	-5.13
6	1.91500	0.29	31.02	24.57	31.31	24.86	56.00	46.00	-24.69	-21.14

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



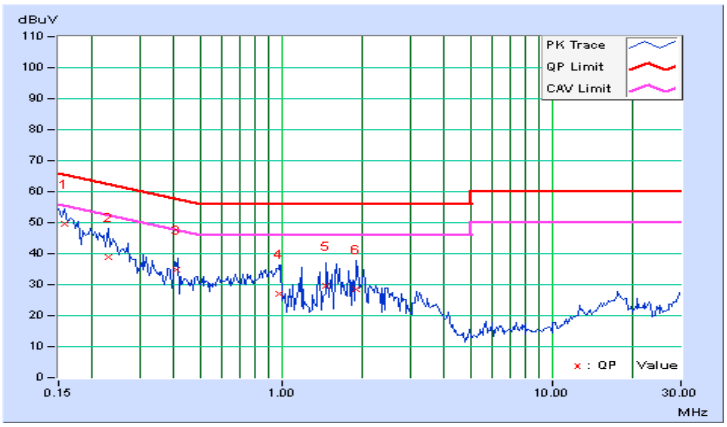
4.2.9 Test Results (Mode 3)

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

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	0.08	49.53	35.42	49.61	35.50	65.58	55.58	-15.97	-20.08
2	0.22812	0.09	38.83	25.29	38.92	25.38	62.52	52.52	-23.60	-27.14
3	0.40684	0.10	34.55	28.00	34.65	28.10	57.71	47.71	-23.06	-19.61
4	0.98594	0.13	26.85	17.96	26.98	18.09	56.00	46.00	-29.02	-27.91
5	1.46875	0.15	29.39	17.56	29.54	17.71	56.00	46.00	-26.46	-28.29
6	1.89453	0.17	28.45	18.17	28.62	18.34	56.00	46.00	-27.38	-27.66

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

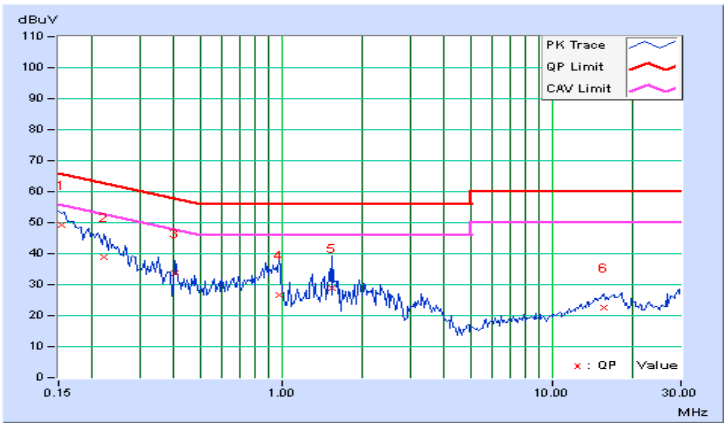


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)

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	0.08	49.25	35.47	49.33	35.55	65.79	55.79	-16.46	-20.24
2	0.22031	0.08	38.91	28.23	38.99	28.31	62.81	52.81	-23.82	-24.50
3	0.40391	0.10	33.60	25.55	33.70	25.65	57.77	47.77	-24.07	-22.12
4	0.97813	0.13	26.65	18.63	26.78	18.76	56.00	46.00	-29.22	-27.24
5	1.54688	0.15	28.89	18.16	29.04	18.31	56.00	46.00	-26.96	-27.69
6	15.53906	0.62	22.12	17.45	22.74	18.07	60.00	50.00	-37.26	-31.93

Remarks:

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



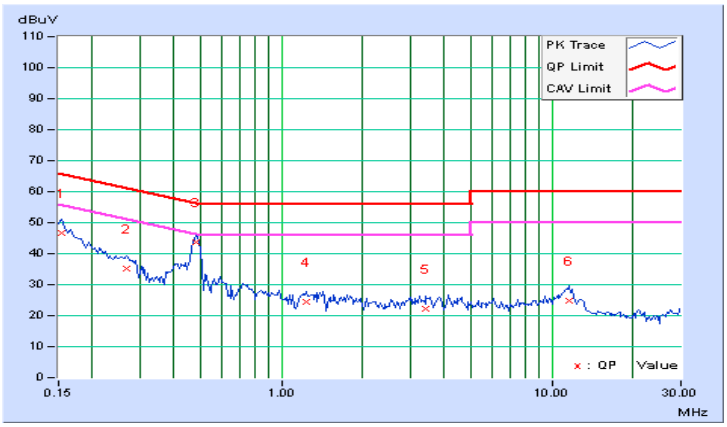
4.2.10 Test Results (Mode 4)

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

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	0.14	46.59	34.38	46.73	34.52	65.79	55.79	-19.06	-21.27
2	0.26719	0.16	35.02	27.31	35.18	27.47	61.20	51.20	-26.03	-23.74
3	0.48594	0.17	43.44	38.82	43.61	38.99	56.24	46.24	-12.62	-7.24
4	1.23438	0.21	24.05	18.57	24.26	18.78	56.00	46.00	-31.74	-27.22
5	3.41797	0.35	21.97	16.60	22.32	16.95	56.00	46.00	-33.68	-29.05
6	11.51172	0.80	23.86	19.69	24.66	20.49	60.00	50.00	-35.34	-29.51

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

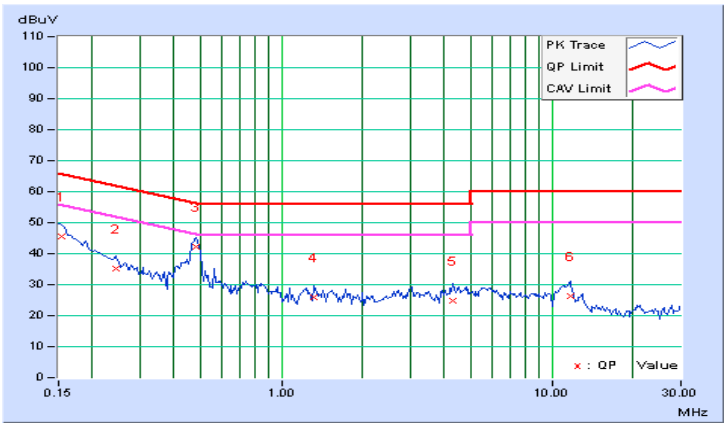


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)

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	0.14	45.57	33.27	45.71	33.41	65.79	55.79	-20.08	-22.38
2	0.24375	0.16	34.89	27.26	35.05	27.42	61.97	51.97	-26.92	-24.55
3	0.48594	0.20	41.89	37.51	42.09	37.71	56.24	46.24	-14.15	-8.53
4	1.32031	0.26	25.52	20.89	25.78	21.15	56.00	46.00	-30.22	-24.85
5	4.28516	0.44	24.46	18.97	24.90	19.41	56.00	46.00	-31.10	-26.59
6	11.67578	0.86	25.35	20.76	26.21	21.62	60.00	50.00	-33.79	-28.38

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

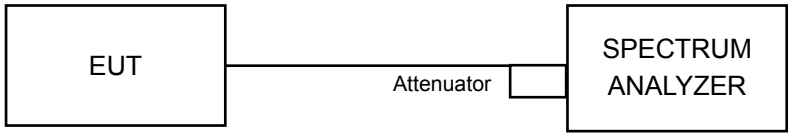


4.3 Conducted Out of Band Emission Measurement

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 Procedures

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.

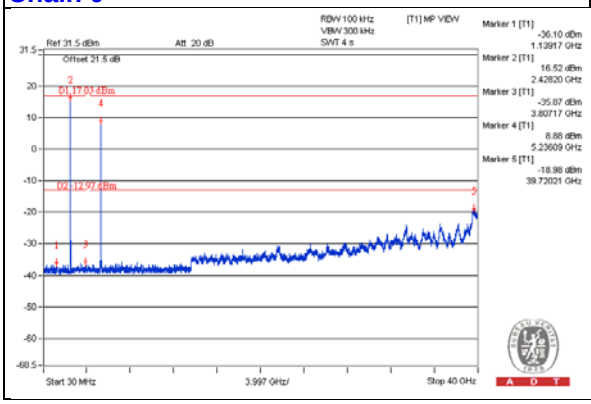
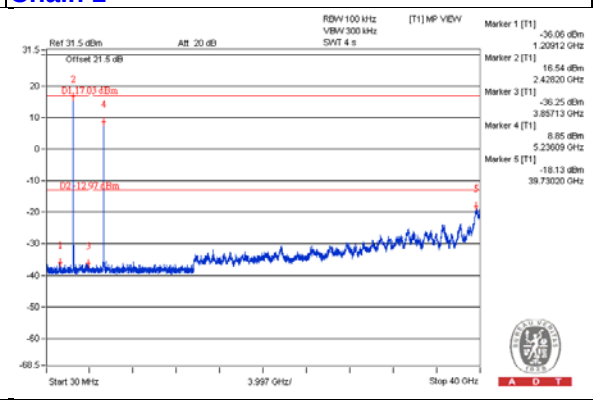
4.3.6 EUT Operating Conditions

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

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 CH6 + 5GHz_802.11a CH48 + 3G

Chain 0	Chain 1
	

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:

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