Supplemental "Transmit Simultaneously" Test Report

REPORT NO.:	RF130725E04-2 R2
MODEL NO.:	MR34-HW
FCC ID:	UDX-60025010
RECEIVED:	July 25, 2013
TESTED:	Aug. 02 to Sep. 12, 2013
ISSUED:	Sep. 13, 2013
APPLICANT:	Cisco Systems, Inc.
ADDRESS:	170 West Tasman Drive, San Jose, CA 95134 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.

This report should not be used by the client to claim product certification, approval, or endorsement by TAF or any government agencies.

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF130725E04-2	Original release	Aug. 09, 2013
RF130725E04-2 R1	Modified description of section 3.2	Aug. 15, 2013
RF130725E04-2 R2	1. Revised radiated emission and bandedge data. 2. Added power spectral density section.	Sep. 13, 2013

1. CERTIFICATION

PRODUCT :	Cisco Meraki MR34
BRAND NAME :	Cisco
MODEL NO. :	MR34-HW
TEST ITEM:	R&D SAMPLE
APPLICANT :	Cisco Systems, Inc.
TESTED:	Aug. 02 to Sep. 12, 2013
STANDARDS :	FCC Part 15, Subpart C (Section 15.247)
	FCC Part 15, Subpart E (Section 15.407)
	ANSI C63.10-2009

The above equipment (Model: MR34-HW) 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:** Sep. 13, 2013
(Phoenix Huang, Specialist)

APPROVED BY : , **DATE:** Sep. 13, 2013
(May Chen, Manager)

2. SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC PART 15, SUBPART C (SECTION 15.247)			
STANDARD SECTION	**TEST TYPE**	**RESULT**	**REMARK**
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is -6.59dB at 0.50125MHz
15.247(d) 15.209	Radiated Emissions	PASS	Meet the requirement of limit. Minimum passing margin is -0.1dB at 2390.00MHz
15.247(b)	Conducted Output power	PASS	Meet the requirement of limit.
15.247(e)	Power Spectral Density	PASS	Meet the requirement of limit.

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 -6.59dB at 0.50125MHz
15.407(b/1/2/3) (b)(5)	Spurious Emissions	PASS	Meet the requirement of limit. Minimum passing margin is -0.1dB at 2390.00MHz
15.407(a/1/2/3)	Transmit Power	PASS	Meet the requirement of limit.
15.407(a/1/2/3)	Peak Power Spectral Density	PASS	Meet the requirement of limit.

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

3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	Cisco Meraki MR34
MODEL NO.	MR34-HW
POWER SUPPLY	DC 12V from power adapter, DC 37~57V_{dc}, 0.5~0.3A from POE
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 450Mbps 802.11ac: up to 1300Mbps
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	Please see NOTE
ANTENNA TYPE	Please see NOTE
DATA CABLE	NA
I/O PORTS	Refer to user's manual
ASSOCIATED DEVICES	Adapter x1

NOTE:

1. The maximum output power table as below table:

MAXIMUM OUTPUT POWER (mW)					
Radio Card 1					
15.247 (2.4GHz)		**15.247 (5GHz)**		**15.407**	
802.11b	158.855	**802.11a**	76.208	**802.11a**	9.772
802.11g	68.707	**802.11n (HT20)**	79.983	**802.11n (HT20)**	9.727
802.11n (HT20)	77.446	**802.11n (HT40)**	77.804	**802.11n (HT40)**	9.750
802.11n (HT40)	10.023				
Radio Card 0					
15.247 (5GHz)			**15.407**		
802.11a	714.410		**802.11a**	18.154	
802.11n (HT20)	679.235		**802.11n (HT20)**	36.543	
802.11n (HT40)	489.847		**802.11n (HT40)**	38.927	
802.11ac (VHT80)	234.328		**802.11ac (VHT80)**	38.785	
Radio Card 2					
15.247 (2.4GHz)					
802.11b	256.291				
802.11g	502.244				
802.11n (HT20)	510.234				
802.11n (HT40)	182.636				

2. The EUT is a 2.4GHz & 5GHz WLAN device.

3. The lower channel and higher channel of radio 1 will reduce 3dB from maximum power by software automatically when radio 1 and radio 2 transmit simultaneously at 2.4GHz mode.

4. The EUT must be supplied with a adapter or POE (only for test not for sale) as below information:

Adapter		
Brand	Model No.	Spec.
Powertron Electronics Corp.	PA1015-2HU	AC Input : 100-240V, 0.4A, 50-60Hz DC Output : 12V, 1.5A DC output cable(unshielded ,1.6m)
POE(only for test not for sale)		
Brand	Model No.	Spec.
Power Dsine	PD-9501G/AC	AC Input : 100-240V, 1.5A, 50-60Hz DC Output : 55V, 1.35A
For radiated emission: From above power sources, the worst case was found in Adapter (Model: **PA1015-2HU**). Therefore only the test data of the mode was recorded in this report.		

5. The three radio cards and antennas provided to the EUT, please refer to the following table:

Radio Card 0 (Single band 3Tx)					
Transmitter Circuit	Gain (dBi) (Include cable loss)	Antenna Type	Connecter Type	Frequency range (MHz to MHz)	Cable Length (mm)
Chain (0)	5.6	PIFA	IPEX	5150~5850	185
Chain (1)	5.5	PIFA	IPEX	5150~5850	270
Chain (2)	5.2	PIFA	IPEX	5150~5850	75
Radio Card 1 (Dual band 1Tx)					
Transmitter Circuit	Gain (dBi) (Include cable loss)	Antenna Type	Connecter Type	Frequency range (MHz to MHz)	Cable Length (mm)
Chain (0)	4.3	PIFA	IPEX	2400~2500	95
	5.4	PIFA	IPEX	5150~5850	95
Radio Card 2 (Single band 3Tx)					
Transmitter Circuit	Gain (dBi) (Include cable loss)	Antenna Type	Connecter Type	Frequency range (MHz to MHz)	Cable Length (mm)
Chain (0)	4.8	PIFA	IPEX	2400~2500	45
Chain (1)	2	PIFA	IPEX	2400~2500	195
Chain (2)	2.3	PIFA	IPEX	2400~2500	165

6. The EUT incorporates a MIMO function without beam forming.

MODULATION MODE	RADIO CARD	TX/RX FUNCTION
802.11b **802.11g** **802.11n (HT20) <2.4GHz>** **802.11n (HT40) <2.4GHz>**	Card 1	1Tx/1Rx
	Card 2	1Tx/1Rx (Diversity) 2Tx/2Rx (Diversity) 3Tx/3Rx
802.11a **802.11n (HT20) <5GHz>** **802.11n (HT40) <5GHz>**	Card 1	1Tx/1Rx
802.11a **802.11n (HT20) <5GHz>** **802.11n (HT40) <5GHz>** **802.11ac (VHT20)** **802.11ac (VHT40)** **802.11ac (VHT80)**	Card 0	1Tx/1Rx (Diversity) 2Tx/2Rx (Diversity) 3Tx/3Rx

7. When the EUT operating in 802.11n, the software operation, which is defined by manufacturer, MCS (Modulation and Coding Schemes) from 0 to 23.
8. When the EUT operating in 802.11ac, the software operation, which is defined by manufacturer, MCS (Modulation and Coding Schemes) from 0 to 9.
9. The above EUT information was declared by the manufacturer and for more detailed feature descriptions, please refer to the manufacturer's specifications or User's Manual.

3.2 TEST MODE APPLICABLITY AND TESTED CHANNEL DETAIL:

EUT CONFIGURE MODE	APPLICABLE TO		DESCRIPTION
	PLC	RE	
1	√	√	Radio Card 1 (2.4G) + Radio Card 2 + Radio Card 0 with Adapter
2	√	√	Radio Card 1 (5G) + Radio Card 2 + Radio Card 0 with Adapter
3	√	-	Radio Card 1 (2.4G) + Radio Card 2 + Radio Card 0 with POE
4	√	-	Radio Card 1 (5G) + Radio Card 2 + Radio Card 0 with POE
5	-	√	Radio Card 1 (2.4G) + Radio Card 2 with Adapter
EUT CONFIGURE MODE	**APPLICABLE TO**		**DESCRIPTION**
	APCM		
1	√		Radio Card 1 (2.4G) + Radio Card 2 with Adapter
2	√		Radio Card 1 (5G) + Radio Card 0 with Adapter

Where **PLC:** Power Line Conducted Emission **RE:** Radiated Emission

APCM: Antenna Port Conducted 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** (for below 1GHz) and **Z-plane** (for 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)
For 2.4 GHz 802.11n (HT20) (Radio Card 2) + 802.11a (Radio Card 0) + 802.11b (Radio Card 1)	1 to 11	6	OFDM	BPSK	19.5
	149 to 165	157	OFDM	BPSK	6
	1 to 11	6	DSSS	DBPSK	1
For 2.4 GHz 802.11n (HT20) (Radio Card 2) + 802.11a (Radio Card 0) + For 5 GHz 802.11n (HT20) (Radio Card 1)	1 to 11	6	OFDM	BPSK	19.5
	149 to 165	157	OFDM	BPSK	6
	149 to 165	157	OFDM	BPSK	6.5

RADIATED 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)
For 2.4 GHz 802.11n (HT20) (Radio Card 2) + 802.11a (Radio Card 0) + 802.11b (Radio Card 1)	1 to 11	6	OFDM	BPSK	19.5
	149 to 165	157	OFDM	BPSK	6
	1 to 11	6	DSSS	DBPSK	1
For 2.4 GHz 802.11n (HT20) (Radio Card 2) + 802.11a (Radio Card 0) + For 5 GHz 802.11n (HT20) (Radio Card 1)	1 to 11	6	OFDM	BPSK	19.5
	149 to 165	157	OFDM	BPSK	6
	149 to 165	157	OFDM	BPSK	6.5
For 2.4 GHz 802.11n (HT40) (Radio Card 2) + For 2.4 GHz 802.11n (HT20) (Radio Card 1)	3 to 9	3	OFDM	BPSK	40.5
	1 to 11	1	OFDM	BPSK	6.5
For 2.4 GHz 802.11n (HT40) (Radio Card 2) + For 2.4 GHz 802.11n (HT40) (Radio Card 1)	3 to 9	9	OFDM	BPSK	40.5
	3 to 9	9	OFDM	BPSK	13.5

Note: The lower channel and higher channel of radio 1 will reduce 3dB from maximum power by software automatically when radio 1 and radio 2 transmit simultaneously at 2.4GHz mode.

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)
802.11b (Radio Card 1) + For 2.4 GHz 802.11n (HT20) (Radio Card 2)	1 to 11	6	DSSS	DBPSK	1
	1 to 11	6	OFDM	BPSK	19.5
For 5 GHz 802.11n (HT20) (Radio Card 1) + 802.11a (Radio Card 0)	149 to 165	157	OFDM	BPSK	6.5
	149 to 165	157	OFDM	BPSK	6
802.11a (Radio Card 1) + For 5 GHz 802.11n (HT40) (Radio Card 0)	36 to 48	40	OFDM	BPSK	6
	38 to 46	38	OFDM	BPSK	40.5

TEST CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
PLC	26deg. C,66%RH	120Vac, 60Hz	JyunChun Lin
RE	23deg. C, 68%RH	120Vac, 60Hz	Tim Ho
APCM	25deg. C, 60%RH	120Vac, 60Hz	Robert Cheng

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.

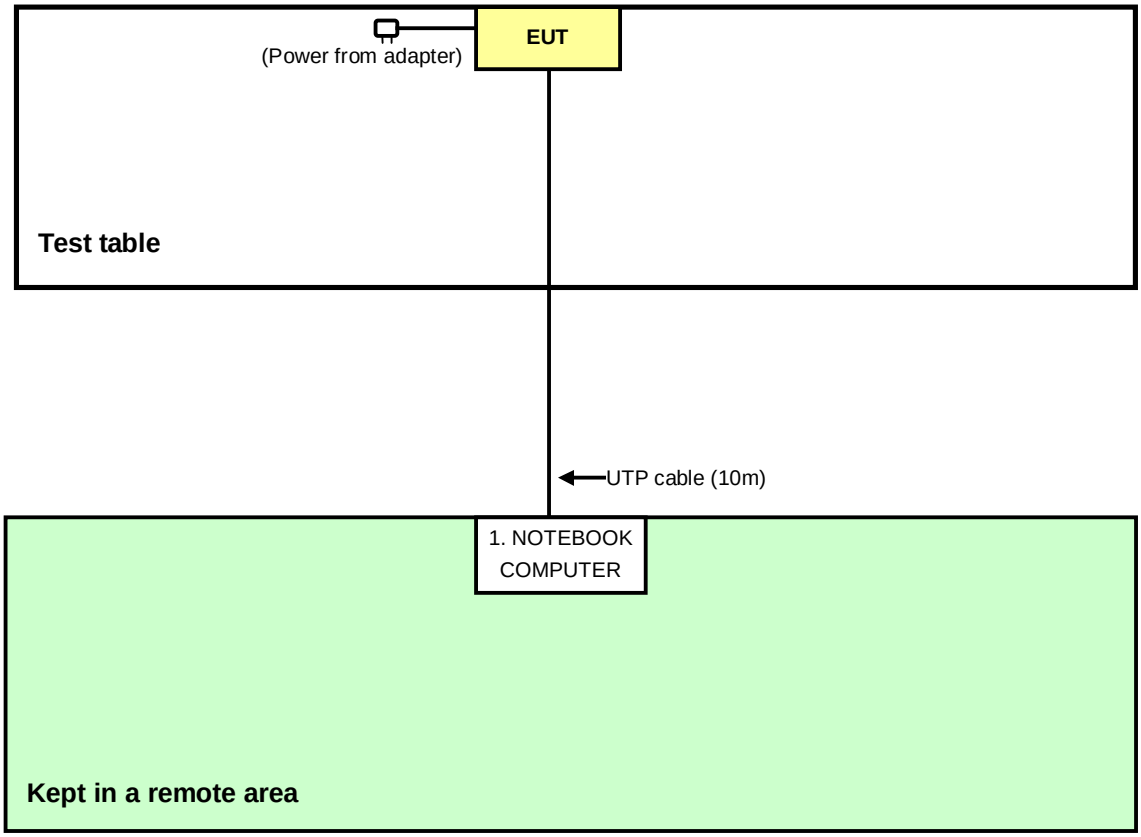
NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	NOTEBOOK COMPUTER	DELL	PP32LA	FSLB32S	FCC DoC
2	POE	Power Dsine	PD-9501G/AC	NA	NA

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

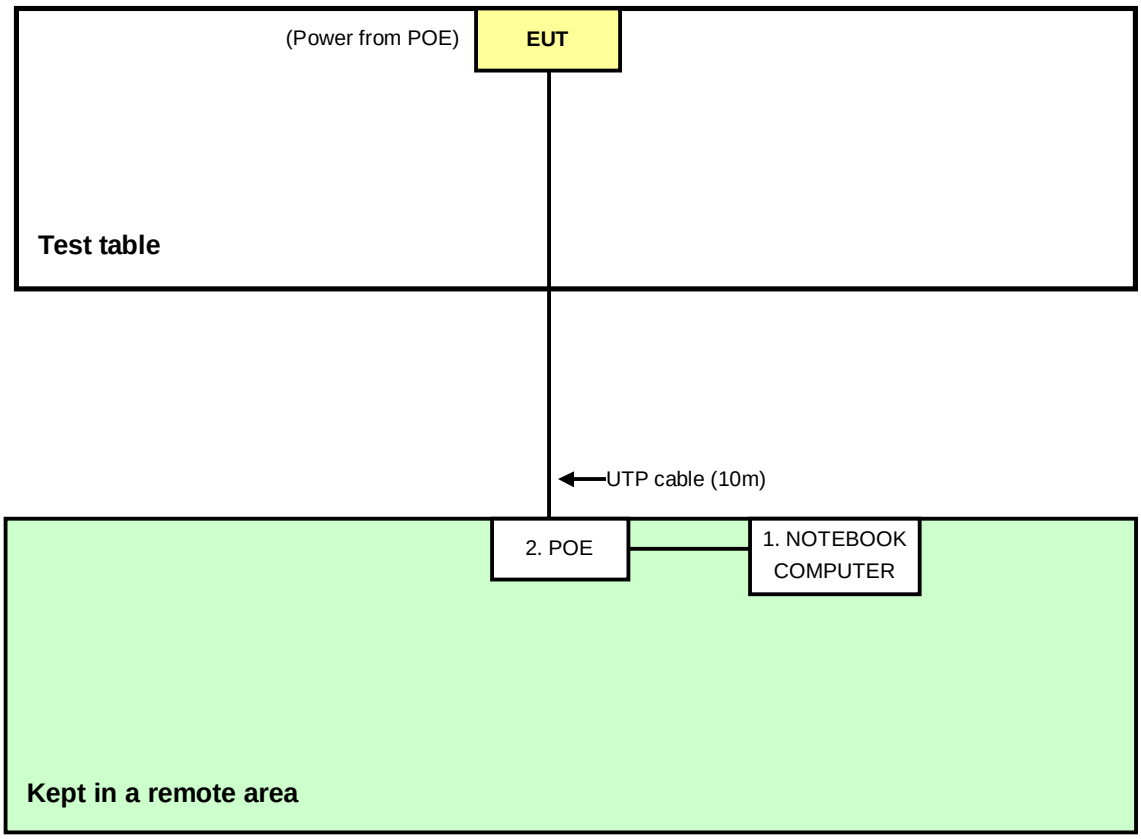
NOTE: All power cords of the above support units are non shielded (1.8m).

3.4 CONFIGURATION OF SYSTEM UNDER TEST

For Conducted Emission (Mode 1~2) / Radiated Emission test:



For Conducted Emission (Mode 3~4) test:



4. TEST TYPES AND RESULTS

4.1 CONDUCTED EMISSION MEASUREMENT

4.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

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

NOTE: 1. The lower limit shall apply at the transition frequencies.
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 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. 06, 2012	Sep. 05, 2013
Line-Impedance Stabilization Network (for Peripheral)	ENV216	100072	June 07,2013	June 06,2014
RF Cable (JYEBAO)	5DFB	COCCAB-001	Mar. 11, 2013	Mar. 10, 2014
50 ohms Terminator	50	EMC-3	Sep. 25, 2012	Sep. 24, 2013
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: Aug. 02 to 05, 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 levels under (Limit - 20dB) were not recorded.

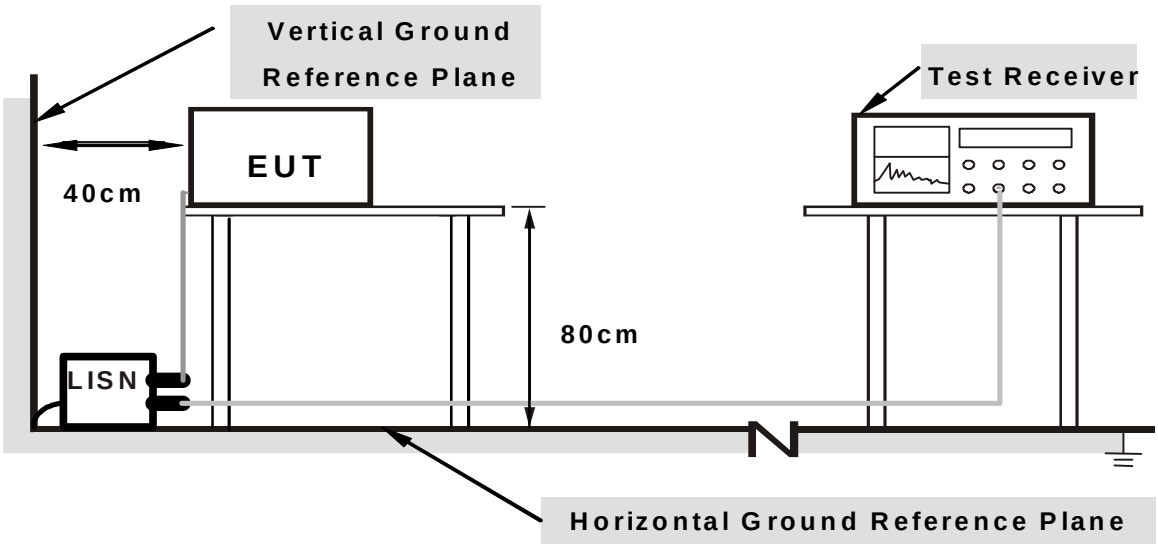
NOTE:

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. Turn on the power of EUT.
2. The communication partner run test program “MTool V1.0.0.10.exe” to enable EUT under transmission/receiving condition continuously at specific channel frequency.

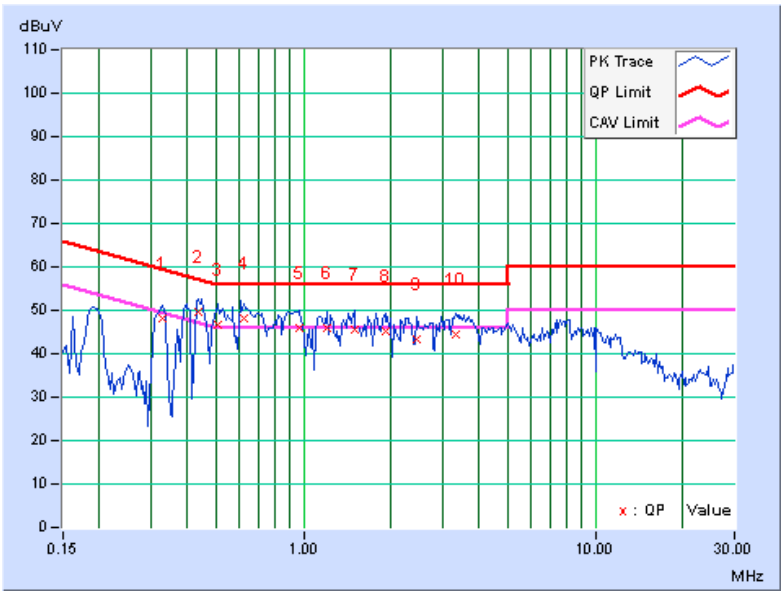
4.1.7 TEST RESULTS (MODE 1)

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

	Freq.	Corr.	Reading Value		Emission Level		Limit		Margin	
No		Factor	[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.32969	0.18	48.15	37.96	48.33	38.14	59.46	49.46	-11.13	-11.32
2	0.43516	0.20	49.46	39.04	49.66	39.24	57.15	47.15	-7.49	-7.91
3	0.50938	0.21	46.53	35.99	46.74	36.20	56.00	46.00	-9.26	-9.80
4	0.62266	0.22	47.86	35.92	48.08	36.14	56.00	46.00	-7.92	-9.86
5	0.96641	0.25	45.53	31.27	45.78	31.52	56.00	46.00	-10.22	-14.48
6	1.21094	0.27	45.77	31.39	46.04	31.66	56.00	46.00	-9.96	-14.34
7	1.49219	0.29	45.42	32.52	45.71	32.81	56.00	46.00	-10.29	-13.19
8	1.90234	0.33	44.70	32.84	45.03	33.17	56.00	46.00	-10.97	-12.83
9	2.44141	0.37	43.03	31.18	43.40	31.55	56.00	46.00	-12.60	-14.45
10	3.34375	0.43	44.06	33.09	44.49	33.52	56.00	46.00	-11.51	-12.48

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

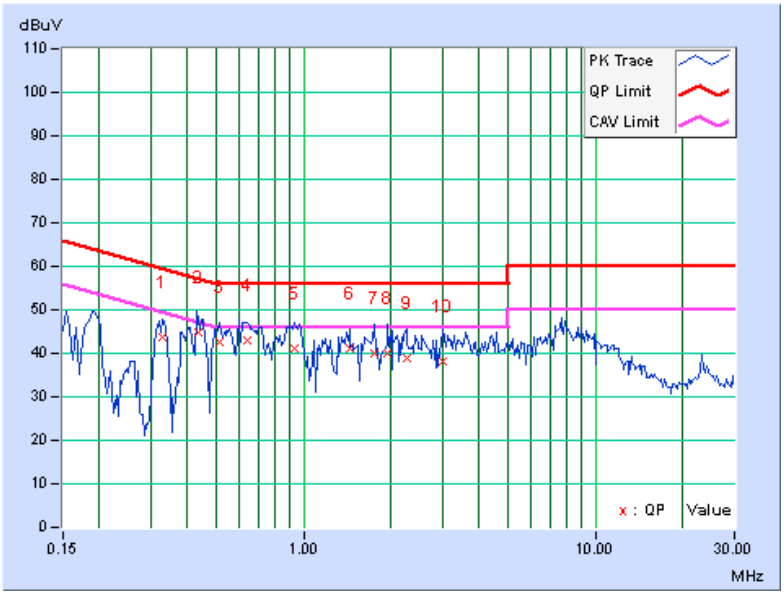


PHASE	Neutral (N)	DETECTOR FUNCTION	Quasi-Peak (QP) / Average (AV)

	Freq.	Corr.	Reading Value		Emission Level		Limit		Margin	
No		Factor	[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.32969	0.17	43.65	32.70	43.82	32.87	59.46	49.46	-15.64	-16.59
2	0.43500	0.19	44.80	33.79	44.99	33.98	57.16	47.16	-12.16	-13.17
3	0.51328	0.20	42.23	31.11	42.43	31.31	56.00	46.00	-13.57	-14.69
4	0.63828	0.20	42.63	31.03	42.83	31.23	56.00	46.00	-13.17	-14.77
5	0.92734	0.22	40.85	29.12	41.07	29.34	56.00	46.00	-14.93	-16.66
6	1.43359	0.25	40.75	29.11	41.00	29.36	56.00	46.00	-15.00	-16.64
7	1.75000	0.28	39.86	26.38	40.14	26.66	56.00	46.00	-15.86	-19.34
8	1.94531	0.30	39.75	27.82	40.05	28.12	56.00	46.00	-15.95	-17.88
9	2.25000	0.32	38.48	25.55	38.80	25.87	56.00	46.00	-17.20	-20.13
10	3.01172	0.37	37.84	26.22	38.21	26.59	56.00	46.00	-17.79	-19.41

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



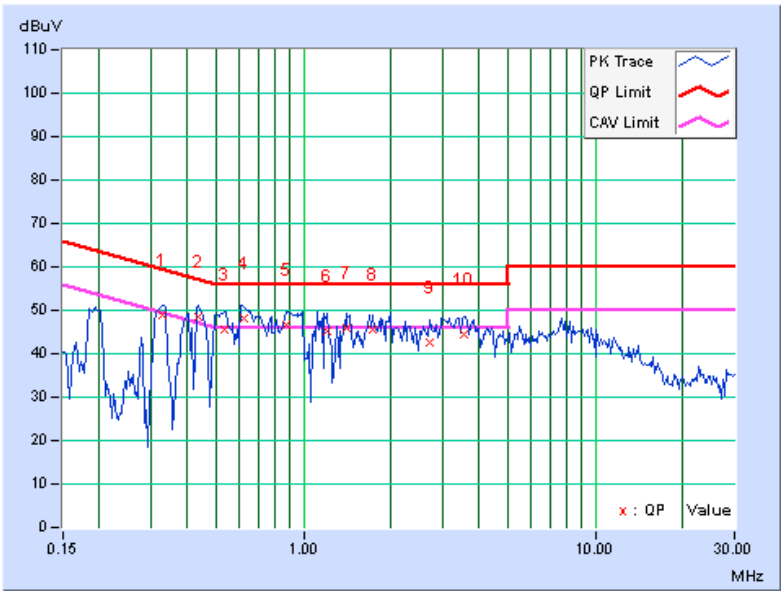
4.1.8 TEST RESULTS (MODE 2)

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

	Freq.	Corr.	Reading Value		Emission Level		Limit		Margin	
No		Factor	[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.32969	0.18	48.68	39.12	48.86	39.30	59.46	49.46	-10.60	-10.16
2	0.43516	0.20	48.27	36.50	48.47	36.70	57.15	47.15	-8.68	-10.45
3	0.53672	0.21	45.25	30.46	45.46	30.67	56.00	46.00	-10.54	-15.33
4	0.62266	0.22	48.10	35.52	48.32	35.74	56.00	46.00	-7.68	-10.26
5	0.87266	0.24	46.28	34.22	46.52	34.46	56.00	46.00	-9.48	-11.54
6	1.20703	0.27	45.04	31.45	45.31	31.72	56.00	46.00	-10.69	-14.28
7	1.41406	0.29	45.79	32.85	46.08	33.14	56.00	46.00	-9.92	-12.86
8	1.73047	0.32	45.12	31.95	45.44	32.27	56.00	46.00	-10.56	-13.73
9	2.70313	0.39	42.29	29.75	42.68	30.14	56.00	46.00	-13.32	-15.86
10	3.53906	0.44	44.11	33.06	44.55	33.50	56.00	46.00	-11.45	-12.50

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

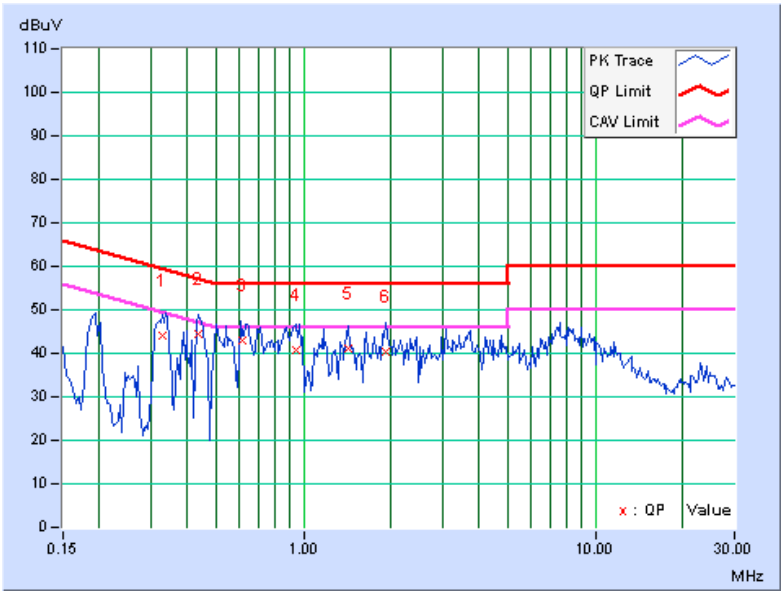


PHASE	Neutral (N)	DETECTOR FUNCTION	Quasi-Peak (QP) / Average (AV)

	Freq.	Corr.	Reading Value		Emission Level		Limit		Margin	
No		Factor	[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.32800	0.17	43.75	33.91	43.92	34.08	59.50	49.50	-15.58	-15.42
2	0.43516	0.19	44.30	32.88	44.49	33.07	57.15	47.15	-12.66	-14.08
3	0.62003	0.20	42.82	29.74	43.02	29.94	56.00	46.00	-12.98	-16.06
4	0.94688	0.22	40.44	26.43	40.66	26.65	56.00	46.00	-15.34	-19.35
5	1.42188	0.25	40.94	29.07	41.19	29.32	56.00	46.00	-14.81	-16.68
6	1.92188	0.29	39.97	28.38	40.26	28.67	56.00	46.00	-15.74	-17.33

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



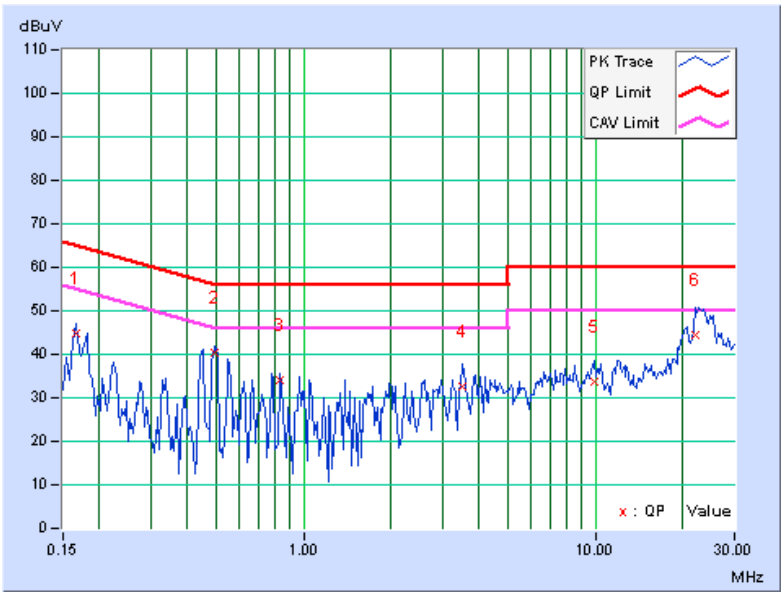
4.1.9 TEST RESULTS (MODE 3)

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

	Freq.	Corr.	Reading Value		Emission Level		Limit		Margin	
No		Factor	[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16562	0.13	44.57	36.98	44.70	37.11	65.18	55.18	-20.48	-18.07
2	0.49866	0.19	40.28	38.46	40.47	38.65	56.02	46.02	-15.56	-7.38
3	0.82969	0.21	33.74	29.48	33.95	29.69	56.00	46.00	-22.05	-16.31
4	3.51953	0.34	32.29	25.14	32.63	25.48	56.00	46.00	-23.37	-20.52
5	9.91016	0.66	33.00	26.53	33.66	27.19	60.00	50.00	-26.34	-22.81
6	22.10156	1.10	43.33	37.67	44.43	38.77	60.00	50.00	-15.57	-11.23

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

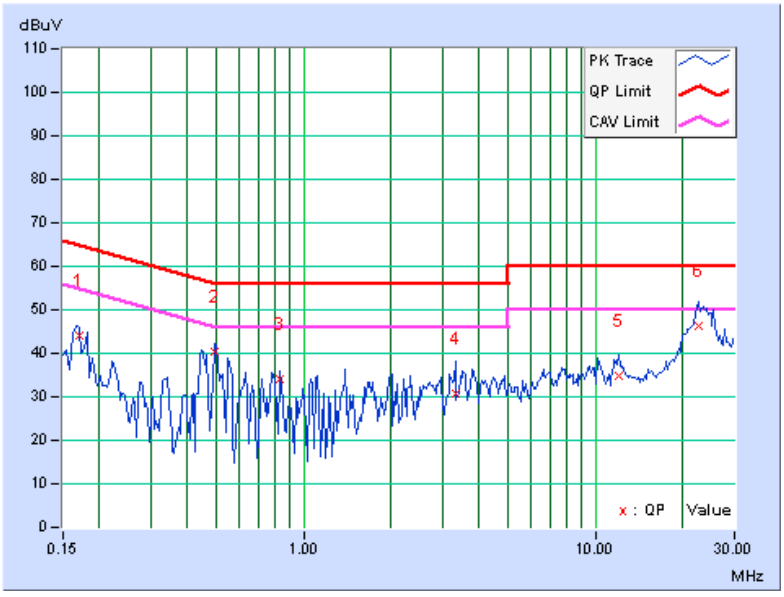


PHASE	Neutral (N)	DETECTOR FUNCTION	Quasi-Peak (QP) / Average (AV)

	Freq.	Corr.	Reading Value		Emission Level		Limit		Margin	
No		Factor	[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16953	0.11	43.94	36.39	44.05	36.50	64.98	54.98	-20.94	-18.49
2	0.49881	0.17	40.22	38.34	40.39	38.51	56.02	46.02	-15.62	-7.50
3	0.82969	0.19	33.78	30.18	33.97	30.37	56.00	46.00	-22.03	-15.63
4	3.30859	0.31	30.46	22.51	30.77	22.82	56.00	46.00	-25.23	-23.18
5	12.01172	0.57	34.14	28.58	34.71	29.15	60.00	50.00	-25.29	-20.85
6	22.64063	0.78	45.34	39.50	46.12	40.28	60.00	50.00	-13.88	-9.72

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



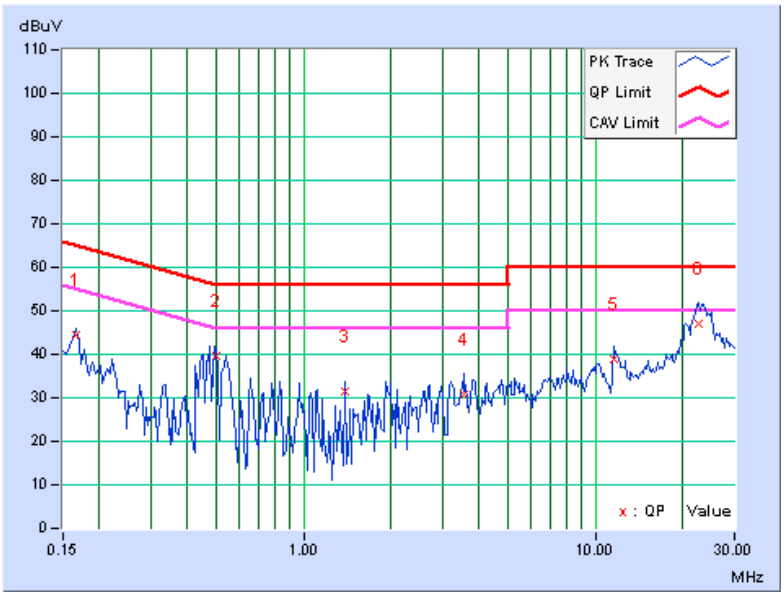
4.1.10 TEST RESULTS (MODE 4)

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

	Freq.	Corr.	Reading Value		Emission Level		Limit		Margin	
No		Factor	[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16562	0.13	44.23	36.33	44.36	36.46	65.18	55.18	-20.82	-18.72
2	0.50156	0.19	39.34	38.60	39.53	38.79	56.00	46.00	-16.47	-7.21
3	1.39453	0.24	31.22	25.91	31.46	26.15	56.00	46.00	-24.54	-19.85
4	3.55469	0.34	30.26	22.17	30.60	22.51	56.00	46.00	-25.40	-23.49
5	11.61328	0.73	38.21	35.64	38.94	36.37	60.00	50.00	-21.06	-13.63
6	22.69141	1.11	45.78	39.68	46.89	40.79	60.00	50.00	-13.11	-9.21

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

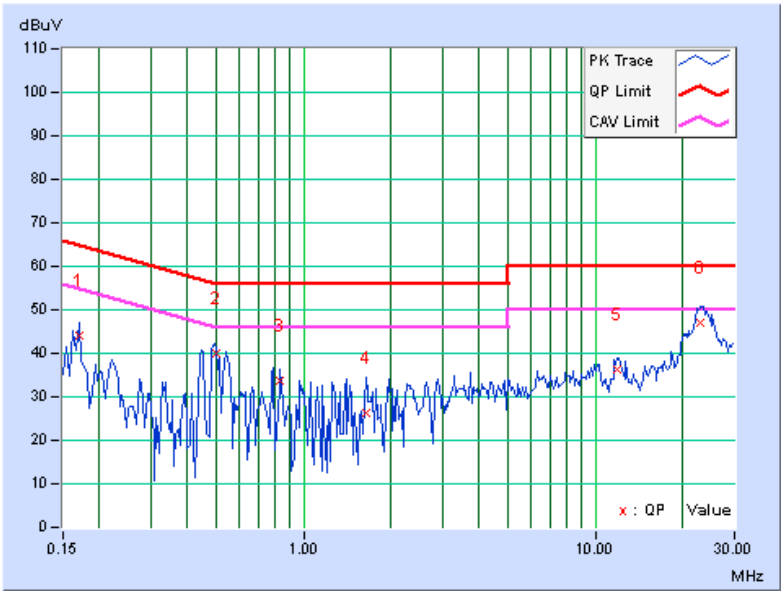


PHASE	Neutral (N)	DETECTOR FUNCTION	Quasi-Peak (QP) / Average (AV)

	Freq.	Corr.	Reading Value		Emission Level		Limit		Margin	
No		Factor	[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16953	0.11	43.82	36.17	43.93	36.28	64.98	54.98	-21.06	-18.71
2	**0.50125**	**0.18**	**39.92**	**39.23**	**40.10**	**39.41**	**56.00**	**46.00**	**-15.90**	**-6.59**
3	0.82969	0.19	33.63	30.33	33.82	30.52	56.00	46.00	-22.18	-15.48
4	1.63281	0.24	25.98	14.64	26.22	14.88	56.00	46.00	-29.78	-31.12
5	11.88672	0.57	35.75	31.02	36.32	31.59	60.00	50.00	-23.68	-18.41
6	23.01953	0.79	46.16	40.20	46.95	40.99	60.00	50.00	-13.05	-9.01

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 RADIATED EMISSION AND BANDEDGE MEASUREMENT

4.2.1 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.

4.2.2 TEST INSTRUMENTS

For Mode 1~2:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer Agilent	E4446A	MY48250253	Sep. 03, 2012	Sep. 02, 2013
MXE EMI Receiver Agilent	N9038A	MY50010156	Jan. 16, 2013	Jan. 15, 2014
Pre-Amplifier Mini-Circuits	ZFL-1000VH2B	AMP-ZFL-04	Nov. 14, 2012	Nov. 13, 2013
Pre-Amplifier Agilent	8449B	3008A01923	Oct. 30, 2012	Oct. 29, 2013
Pre-Amplifier SPACEK LABS	SLKKa-48-6	9K16	Nov. 14, 2012	Nov. 13, 2013
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-361	Mar. 25, 2013	Mar. 24, 2014
Horn_Antenna AISI	AIH.8018	0000220091110	Nov. 27, 2012	Nov. 26, 2013
Horn_Antenna SCHWARZBECK	BBHA 9170	9170-424	Oct. 12, 2012	Oct. 11, 2013
RF Cable	NA	RF104-205 RF104-207 RF104-202	Dec. 26, 2012	Dec. 25, 2013
RF Cable	NA	CHHCAB_001	Oct. 07, 2012	Oct. 06, 2013
Software	ADT_Radiated_V8.7.05	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: Aug. 05, 2013

For Mode 5:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer Agilent	E4446A	MY48250253	Aug. 28, 2013	Aug. 27, 2014
MXE EMI Receiver Agilent	N9038A	MY51210105	Jan. 29,2013	Jan. 28,2014
Pre-Amplifier Mini-Circuits	ZFL-1000VH2B	AMP-ZFL-03	Nov. 14, 2012	Nov. 13, 2013
Pre-Amplifier Agilent	8449B	3008A02578	June 25, 2013	June 24, 2014
Pre-Amplifier SPACEK LABS	SLKKa-48-6	9K16	Nov. 14, 2012	Nov. 13, 2013
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-360	Mar. 19, 2013	Mar. 18, 2014
Horn_Antenna AISI	AIH.8018	0000320091110	Nov. 19, 2012	Nov. 18, 2013
Horn_Antenna SCHWARZBECK	BBHA 9170	9170-424	Oct. 12, 2012	Oct. 11, 2013
RF Cable	NA	RF104-201 RF104-203 RF104-204	Dec. 25, 2012	Dec. 24, 2013
RF Cable	NA	CHGCAB_001	Oct. 06, 2012	Oct. 05, 2013
Software	ADT_Radiated_V8.7.05	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. G.
4. The FCC Site Registration No. is 966073.
5 The VCCI Site Registration No. is G-137.
6 The CANADA Site Registration No. is IC 7450H-2.
7 Tested Date: Sep. 12, 2013

4.2.3 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:

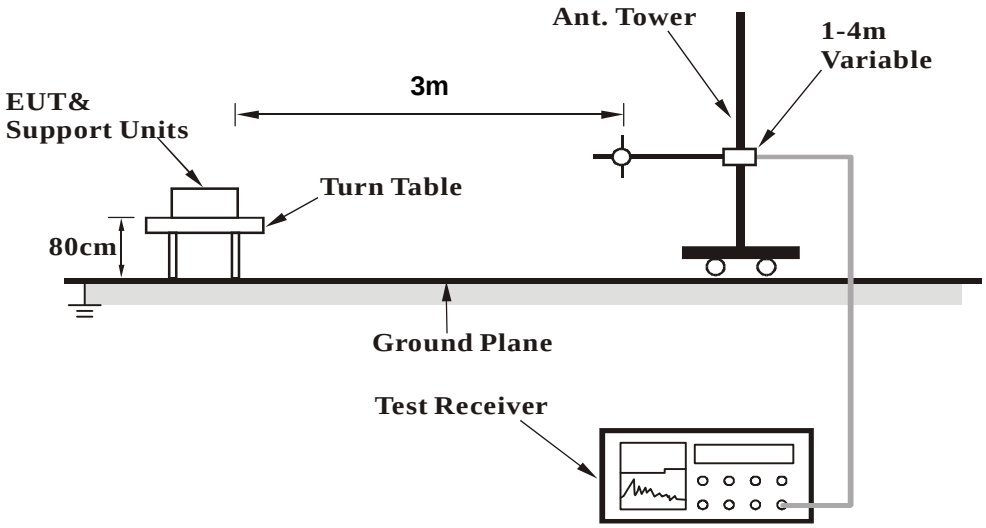
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

4.2.4 DEVIATION FROM TEST STANDARD

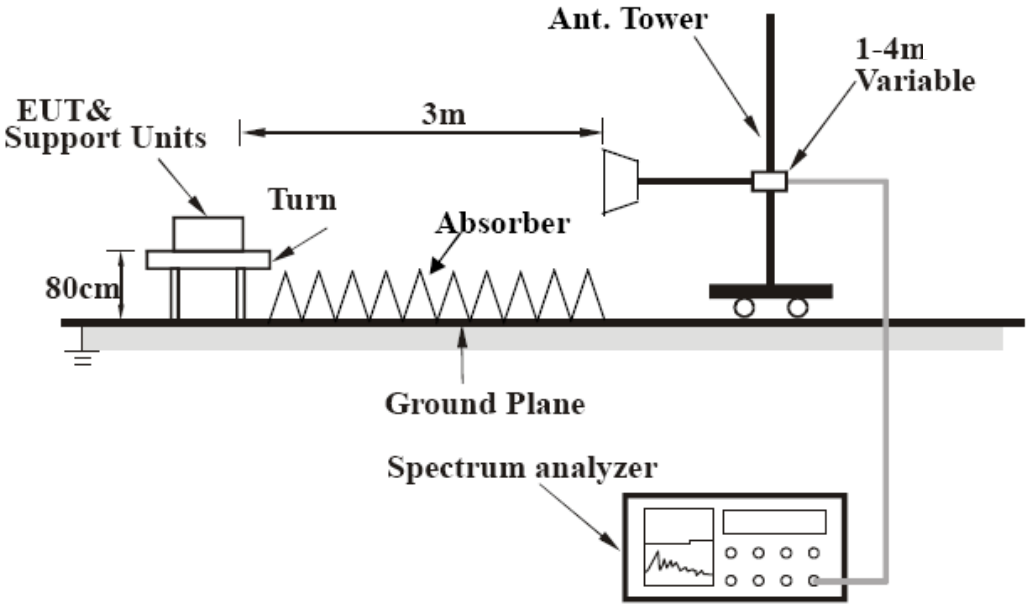
No deviation

4.2.5 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.

4.2.6 EUT OPERATING CONDITIONS

Same as 4.1.6

4.2.7 TEST RESULTS (MODE 1)

BELOW 1GHz DATA：

CHANNEL	For 2.4 GHz 802.11n (HT20) (Radio Card 2): Channel 6 +802.11a (Radio Card 0): Channel 157 +802.11b (Radio Card 1): Channel 6	**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	89.84	32.4 QP	43.5	-11.1	2.00 H	106	51.54	-19.14
2	153.68	35.4 QP	43.5	-8.1	2.00 H	214	48.00	-12.62
3	375.03	31.9 QP	46.0	-14.1	2.00 H	165	42.24	-10.30
4	625.00	37.8 QP	46.0	-8.2	1.50 H	322	42.62	-4.78
5	866.72	39.7 QP	46.0	-6.3	1.00 H	115	40.68	-0.98
6	1000.00	38.4 QP	54.0	-15.6	1.00 H	162	36.92	1.48
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	38.24	34.2 QP	40.0	-5.8	1.00 V	194	47.99	-13.79
2	333.37	36.7 QP	46.0	-9.3	1.00 V	164	47.76	-11.06
3	466.69	36.1 QP	46.0	-9.9	1.00 V	211	44.35	-8.21
4	625.00	35.1 QP	46.0	-11.0	1.50 V	281	39.83	-4.78
5	750.03	36.4 QP	46.0	-9.6	1.00 V	286	38.95	-2.55
6	875.02	39.3 QP	46.0	-6.7	1.00 V	118	40.14	-0.82

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

CHANNEL	For 2.4 GHz 802.11n (HT20) (Radio Card 2): Channel 6 +802.11a (Radio Card 0): Channel 157 +802.11b (Radio Card 1): Channel 6	**DETECTOR FUNCTION**	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

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	2390.00	70.5 PK	74.0	-3.5	1.00 H	51	37.80	32.70
2	2390.00	53.4 AV	54.0	-0.6	1.00 H	51	20.70	32.70
3	2483.50	70.9 PK	74.0	-3.1	1.04 H	7	37.89	33.01
4	2483.50	52.7 AV	54.0	-1.3	1.04 H	7	19.69	33.01
5	4874.00	60.8 PK	74.0	-13.2	1.06 H	270	20.17	40.63
6	4874.00	47.2 AV	54.0	-6.8	1.06 H	270	6.57	40.63
7	7311.00	65.4 PK	74.0	-8.6	1.29 H	71	16.93	48.47
8	7311.00	51.5 AV	54.0	-2.5	1.29 H	71	3.03	48.47
9	11570.00	59.7 PK	74.0	-14.3	1.02 H	59	10.21	49.49
10	11570.00	46.7 AV	54.0	-7.3	1.02 H	59	-2.79	49.49
11	12185.00	65.2 PK	74.0	-8.8	1.24 H	26	14.84	50.36
12	12185.00	52.0 AV	54.0	-2.0	1.24 H	26	1.64	50.36

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

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	2390.00	67.5 PK	74.0	-6.5	1.09 V	68	34.80	32.70
2	2390.00	50.2 AV	54.0	-3.8	1.09 V	68	17.50	32.70
3	2483.50	66.6 PK	74.0	-7.4	1.07 V	73	33.59	33.01
4	2483.50	48.9 AV	54.0	-5.1	1.07 V	73	15.89	33.01
5	4874.00	57.9 PK	74.0	-16.1	1.01 V	360	17.27	40.63
6	4874.00	44.5 AV	54.0	-9.5	1.01 V	360	3.87	40.63
7	7311.00	60.5 PK	74.0	-13.5	1.20 V	320	12.03	48.47
8	7311.00	47.3 AV	54.0	-6.7	1.20 V	320	-1.17	48.47
9	11570.00	59.9 PK	74.0	-14.1	1.00 V	71	10.41	49.49
10	11570.00	46.9 AV	54.0	-7.1	1.00 V	71	-2.59	49.49
11	12185.00	62.4 PK	74.0	-11.6	1.24 V	144	12.04	50.36
12	12185.00	48.8 AV	54.0	-5.2	1.24 V	144	-1.56	50.36

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

4.2.8 TEST RESULTS (MODE 2)

BELOW 1GHz DATA：

CHANNEL	For 2.4 GHz 802.11n (HT20) (Radio Card 2): Channel 6 +802.11a (Radio Card 0): Channel 157 +For 5 GHz 802.11n (HT20) (Radio Card 1): Channel 157	**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	89.85	32.5 QP	43.5	-11.0	2.00 H	128	51.65	-19.14
2	153.68	35.4 QP	43.5	-8.2	2.00 H	178	47.97	-12.62
3	400.01	30.3 QP	46.0	-15.7	2.00 H	106	40.20	-9.92
4	625.00	38.1 QP	46.0	-7.9	1.50 H	224	42.90	-4.78
5	866.72	39.7 QP	46.0	-6.3	1.00 H	308	40.72	-0.98
6	1000.00	39.6 QP	54.0	-14.4	1.50 H	229	38.08	1.48
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	37.66	33.7 QP	40.0	-6.3	1.00 V	213	47.44	-13.70
2	333.34	36.8 QP	46.0	-9.2	1.00 V	206	47.88	-11.06
3	466.69	36.6 QP	46.0	-9.4	1.00 V	128	44.83	-8.21
4	750.03	38.4 QP	46.0	-7.6	1.00 V	218	40.95	-2.55
5	875.02	39.8 QP	46.0	-6.2	1.00 V	75	40.60	-0.82
6	1000.00	41.5 QP	54.0	-12.5	1.00 V	206	40.02	1.48

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

CHANNEL	For 2.4 GHz 802.11n (HT20) (Radio Card 2): Channel 6 +802.11a (Radio Card 0): Channel 157 +For 5 GHz 802.11n (HT20) (Radio Card 1): Channel 157	**DETECTOR FUNCTION**	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

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	2390.00	70.3 PK	74.0	-3.7	1.00 H	37	37.60	32.70
2	2390.00	53.1 AV	54.0	-0.9	1.00 H	37	20.40	32.70
3	2483.50	70.1 PK	74.0	-3.9	1.03 H	20	37.09	33.01
4	2483.50	52.1 AV	54.0	-1.9	1.03 H	20	19.09	33.01
5	4874.00	60.9 PK	74.0	-13.1	1.01 H	286	20.27	40.63
6	4874.00	47.3 AV	54.0	-6.7	1.01 H	286	6.67	40.63
7	7311.00	65.0 PK	74.0	-9.0	1.27 H	82	16.53	48.47
8	7311.00	50.8 AV	54.0	-3.2	1.27 H	82	2.33	48.47
9	11570.00	60.1 PK	74.0	-13.9	1.06 H	57	10.61	49.49
10	11570.00	47.4 AV	54.0	-6.6	1.06 H	57	-2.09	49.49
11	12185.00	64.5 PK	74.0	-9.5	1.26 H	35	14.14	50.36
12	12185.00	51.5 AV	54.0	-2.5	1.26 H	35	1.14	50.36

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

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	2390.00	67.9 PK	74.0	-6.1	1.05 V	76	35.20	32.70
2	2390.00	50.5 AV	54.0	-3.5	1.05 V	76	17.80	32.70
3	2483.50	66.5 PK	74.0	-7.5	1.03 V	66	33.49	33.01
4	2483.50	48.6 AV	54.0	-5.4	1.03 V	66	15.59	33.01
5	4874.00	58.3 PK	74.0	-15.7	1.01 V	349	17.67	40.63
6	4874.00	44.7 AV	54.0	-9.3	1.01 V	349	4.07	40.63
7	7311.00	60.3 PK	74.0	-13.7	1.14 V	317	11.83	48.47
8	7311.00	47.2 AV	54.0	-6.8	1.14 V	317	-1.27	48.47
9	11570.00	61.3 PK	74.0	-12.7	1.02 V	76	11.81	49.49
10	11570.00	48.1 AV	54.0	-5.9	1.02 V	76	-1.39	49.49
11	12185.00	62.5 PK	74.0	-11.5	1.20 V	141	12.14	50.36
12	12185.00	49.0 AV	54.0	-5.0	1.20 V	141	-1.36	50.36

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

4.2.9 TEST RESULTS (MODE 5)

ABOVE 1GHz DATA

CHANNEL	For 2.4 GHz 802.11n (HT40) (Radio Card 2): Channel 3 +For 2.4 GHz 802.11n (HT20) (Radio Card 1): Channel 1	**DETECTOR FUNCTION**	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

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	**2390.00**	**73.9 PK**	**74.0**	**-0.1**	**1.00 H**	**168**	**76.05**	**-2.15**
2	2390.00	52.1 AV	54.0	-1.9	1.00 H	168	54.25	-2.15
3	4824.00	60.2 PK	74.0	-13.8	1.00 H	307	54.12	6.08
4	4824.00	46.7 AV	54.0	-7.3	1.00 H	307	40.62	6.08
5	4844.00	65.1 PK	74.0	-8.9	1.28 H	85	58.96	6.14
6	4844.00	50.6 AV	54.0	-3.4	1.28 H	85	44.46	6.14
7	7266.00	70.6 PK	74.0	-3.4	1.00 H	17	56.54	14.06
8	7266.00	53.1 AV	54.0	-0.9	1.00 H	17	39.04	14.06
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	2390.00	68.1 PK	74.0	-5.9	1.28 V	204	70.25	-2.15
2	2390.00	40.6 AV	54.0	-13.4	1.28 V	204	42.75	-2.15
3	4824.00	58.3 PK	74.0	-15.7	1.01 V	341	52.22	6.08
4	4824.00	44.9 AV	54.0	-9.1	1.01 V	341	38.82	6.08
5	4844.00	60.3 PK	74.0	-13.7	1.17 V	316	54.16	6.14
6	4844.00	47.2 AV	54.0	-6.8	1.17 V	316	41.06	6.14
7	7266.00	67.3 PK	74.0	-6.7	1.06 V	81	53.24	14.06
8	7266.00	50.0 AV	54.0	-4.0	1.06 V	81	35.94	14.06

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

CHANNEL	For 2.4 GHz 802.11n (HT40) (Radio Card 2): Channel 9 +For 2.4 GHz 802.11n (HT40) (Radio Card 1): Channel 9	**DETECTOR FUNCTION**	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

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	2483.50	73.1 PK	74.0	-0.9	1.00 H	141	73.90	-0.80
2	2483.50	53.5 AV	54.0	-0.5	1.00 H	141	54.30	-0.80
3	4844.00	54.2 PK	74.0	-19.8	1.11 H	235	46.54	7.66
4	4844.00	44.4 AV	54.0	-9.6	1.11 H	235	36.74	7.66
5	7266.00	54.3 PK	74.0	-19.7	1.24 H	243	38.79	15.51
6	7266.00	44.5 AV	54.0	-9.5	1.24 H	243	28.99	15.51
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	2483.50	61.7 PK	74.0	-12.3	1.00 V	84	62.50	-0.80
2	2483.50	40.6 AV	54.0	-13.4	1.00 V	84	41.40	-0.80
3	4844.00	54.8 PK	74.0	-19.2	1.31 V	248	47.14	7.66
4	4844.00	45.2 AV	54.0	-8.8	1.31 V	248	37.54	7.66
5	7266.00	54.1 PK	74.0	-19.9	1.09 V	260	38.59	15.51
6	7266.00	44.5 AV	54.0	-9.5	1.09 V	260	28.99	15.51

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

4.3 CONDUCTED OUTPUT POWER MEASUREMENT

4.3.1 LIMITS OF CONDUCTED OUTPUT POWER MEASUREMENT

TEST STANDARD: FCC Part 15, Subpart C (Section 15.247)

For systems using digital modulation in the 2400–2483.5 MHz band and 5725 –5850 MHz band: 1 Watt (30dBm)

TEST STANDARD: FCC Part 15, Subpart E (Section 15.407)

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.

Per KDB 662911 D01 Multiple Transmitter Output v01r02 Method of conducted output power measurement on IEEE 802.11 devices,

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

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

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

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

4.3.2 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 : Aug. 02 to 03, 2013

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 : Aug. 02 to 03, 2013

4.3.3 TEST PROCEDURES

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.

Duty cycle of test signal is < 98 %. 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

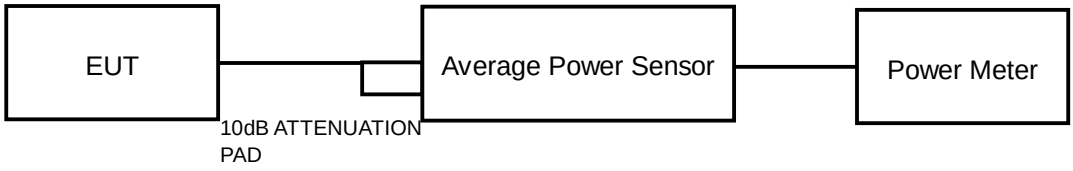
1. Set RBW = approximately 1% of the emission bandwidth.
2. Set the VBW > RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Measure the maximum width of the emission that is 26 dB down from the peak of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement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

4.3.4 DEVIATION FROM TEST STANDARD

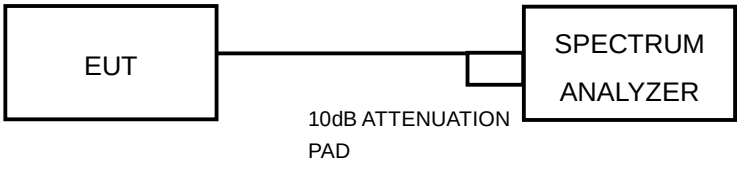
No deviation.

4.3.5 TEST SETUP

FOR POWER OUTPUT MEASUREMENT



FOR 26dB OCCUPIED BANDWIDTH



4.3.6 EUT OPERATING CONDITIONS

Same as Item 4.1.6

4.3.7 TEST RESULTS (MODE 1)

For Radio Card 1 (2.4G):

802.11b

CHANNEL	FREQUENCY (MHz)	AVERAGE POWER (mW)	AVERAGE POWER (dBm)	LIMIT (dBm)	PASS/FAIL
6	2437	158.855	22.01	30	PASS

For Radio Card 2:

802.11n (HT20)

CHANNEL	FREQUENCY (MHz)	AVERAGE POWER (dBm)			TOTAL POWER (mW)	TOTAL POWER (dBm)	LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1	CHAIN 2				
6	2437	22.91	21.99	21.95	510.234	27.08	30	PASS

Transmit Simultaneously Power:

For Radio Card 1 (2.4G) + Radio Card 2:

AVERAGE POWER (mW)	AVERAGE POWER (dBm)	LIMIT (dBm)	PASS/FAIL
669.089	28.26	30	PASS

For Radio Card 1 (5G):

802.11n (HT20)

CHANNEL	FREQUENCY (MHz)	AVERAGE POWER (mW)	AVERAGE POWER (dBm)	LIMIT (dBm)	PASS/FAIL
157	5785	79.983	19.03	30	PASS

For Radio Card 0:

802.11a

CHANNEL	FREQUENCY (MHz)	AVERAGE POWER (dBm)			TOTAL POWER (mW)	TOTAL POWER (dBm)	LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1	CHAIN 2				
157	5785	23.30	24.50	23.40	714.410	28.54	30	PASS

Transmit Simultaneously Power:

For Radio Card 1 (5G) + Radio Card 0:

AVERAGE POWER (mW)	AVERAGE POWER (dBm)	LIMIT (dBm)	PASS/FAIL
794.393	29.00	30	PASS

4.3.8 TEST RESULTS (MODE 2)

For Radio Card 1 (5G):

POWER OUTPUT:

802.11a

CHANNEL	CHANNEL FREQUENCY (MHz)	AVERAGE POWER (mW)	AVERAGE POWER (dBm)	POWER LIMIT (dBm)	PASS/FAIL
40	5200	9.772	9.90	16.92	PASS

26dB OCCUPIED BANDWIDTH:

CHANNEL	CHANNEL FREQUENCY (MHz)	26dBc BANDWIDTH (MHz)
40	5200	19.62

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

Power Limit = 4dBm + 10logB < Band 1>			
Channel Number	Freq.(MHz)	Min. B(MHz)	Determined Limit (dBm)
40	5200	19.62	16.92 < 17

For Radio Card 0:

POWER OUTPUT:
802.11n (HT40)

CHAN.	CHAN. FREQ. (MHz)	AVERAGE POWER (dBm)			TOTAL POWER (mW)	TOTAL POWER (dBm)	POWER LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1	CHAIN 2				
38	5190	11.13	11.26	11.00	38.927	15.90	17	PASS

26dB OCCUPIED BANDWIDTH:

CHANNEL	CHANNEL FREQUENCY (MHz)	26dBc BANDWIDTH (MHz)		
		CHAIN 0	CHAIN 1	CHAIN 2
38	5190	41.44	41.35	41.10

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

Power Limit = 4dBm + 10logB < Band 1>			
Channel Number	Freq.(MHz)	Min. B(MHz)	Determined Limit (dBm)
38	5190	41.10	20.13 > 17

Transmit Simultaneously Power:

For Radio Card 1 (5G) + Radio Card 0:

AVERAGE POWER (mW)	AVERAGE POWER (dBm)	LIMIT (dBm)	PASS/FAIL
48.699	16.875	16.92	PASS

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 : Aug. 02 to Sep. 12, 2013

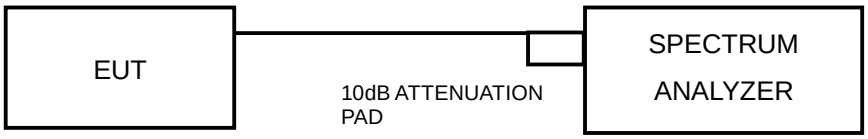
4.4.3 TEST PROCEDURES

1. Set span to encompass the entire emission bandwidth (EBW) of the signal.
2. Set RBW = 1 MHz, Set VBW ≥ 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/duty cycle)

4.4.4 DEVIATION FROM TEST STANDARD

No deviation

4.4.5 TEST SETUP



4.4.6 EUT OPERATING CONDITIONS

Same as 4.1.6

4.4.7 TEST RESULTS (MODE 1)

For Radio Card 1 (2.4G):

802.11b

CHANNEL	CHANNEL FREQUENCY (MHz)	PSD (dBm)	LIMIT (dBm)	PASS/FAIL
6	2437	-1.59	8	PASS

For Radio Card 2:

802.11g

TX CHAIN	CHANNEL	CHANNEL FREQUENCY (MHz)	PSD (dBm)	10 log (N=3) dB	TOTAL PSD (dBm)	LIMIT (dBm)	PASS /FAIL
0	6	2437	-3.97	4.77	0.80	6.1	PASS

NOTE: 1. Directional gain = 10 log[(10G1/20 + 10G2/20 + 10G3/20)^2 / 3] = 7.9dBi > 6dBi , so the power density limit shall be reduced to 8-(7.9-6) = 6.1dBm.

Transmit Simultaneously Power:

For Radio Card 1 (2.4G) + Radio Card 2:

PSD (mW)	PSD (dBm)	LIMIT (dBm)	PASS/FAIL
1.895	2.776	8	PASS

For Radio Card 1 (5G):

802.11n (HT20)

CHANNEL	CHANNEL FREQUENCY (MHz)	PSD (dBm)	LIMIT (dBm)	PASS/FAIL
157	5785	-4.98	8	PASS

For Radio Card 0:

802.11n (HT20)

TX CHAIN	CHANNEL	CHANNEL FREQUENCY (MHz)	PSD W/O DUTY FACTOR (dBm)	10 log (N=3) dB	DUTY FACTOR (dB)	TOTAL PSD WITH DUTY FACTOR (dBm)	LIMIT (dBm)	PASS /FAIL
0	157	5785	-2.04	4.77	0.12	2.85	8	PASS

NOTE: 1. Duty cycle = 0.675 ms/0.694 ms = 0.973, Duty factor = 10 * log(1/0.973) = 0.12

Transmit Simultaneously Power:

For Radio Card 1 (5G) + Radio Card 0:

PSD (mW)	PSD (dBm)	LIMIT (dBm)	PASS/FAIL
2.246	3.514	8	PASS

4.4.8 TEST RESULTS (MODE 2)

For Radio Card 1 (5G):

802.11a

CHANNEL	CHANNEL FREQUENCY (MHz)	PSD (dBm)	MAXIMUM LIMIT (dBm)	PASS/FAIL
40	5200	-1.78	4	PASS

For Radio Card 0:

802.11n (HT20)

CHANNEL	CHANNEL FREQUENCY (MHz)	PSD W/O DUTY FACTOR (dBm)			DUTY FACTOR (dB)	TOTAL PSD WITH DUTY FACTOR (dBm)	MAX. LIMIT (dBm)	PASS/FAIL
		CHAIN 0	CHAIN 1	CHAIN 2				
48	5240	-2.42	-2.43	-2.51	0.1	2.42	4	PASS

NOTE: 1. Duty cycle = 0.798 ms/0.817 ms = 0.977, Duty factor = 10 * log(1/0.977) = 0.1

Transmit Simultaneously Power:

For Radio Card 1 (5G) + Radio Card 0:

PSD (mW)	PSD (dBm)	LIMIT (dBm)	PASS/FAIL
2.410	3.820	4	PASS

5. 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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