FCC TEST REPORT (15.407)

REPORT NO.:	RF130321E05-1
MODEL NO.:	WAP5110-L, WAP5110, ECW5110-L, ECW5110, EAP9112A-FLF-17
FCC ID:	YZKWAP5110
RECEIVED:	Mar. 21, 2013
TESTED:	Mar. 26 to Apr. 15, 2013
ISSUED:	Apr. 23, 2013

APPLICANT:	Edgecore Networks Corporation.
ADDRESS:	No.1, Creation Rd. III, Hsinchu Science Park, Hsinchu 30077, Taiwan, R.O.C

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
RF130321E05-1	Original release	Apr. 23, 2013

1. CERTIFICATION

PRODUCT:	IEEE 802.11a/b/g/n Enterprise Access Point
BRAND NAME:	SMC, Edge-corE, Accton
MODEL NO.:	WAP5110-L, WAP5110, ECW5110-L, ECW5110, EAP9112A-FLF-17
TEST SAMPLE:	R&D SAMPLE
APPLICANT:	Edgecore Networks Corporation.
TESTED:	Mar. 26 to Apr. 15, 2013
STANDARDS:	**FCC Part 15, Subpart E (Section 15.407)**
	ANSI C63.10-2009

The above equipment (Model: WAP5110-L) 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:** Apr. 23, 2013
(Midoli Peng, Specialist)

APPROVED BY : _____ , **DATE:** Apr. 23, 2013
(May Chen, Manager)

2. SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

For 5GHz, 5150~5250MHz

APPLIED STANDARD: FCC PART 15, SUBPART E (SECTION 15.407)			
STANDARD SECTION	**TEST TYPE**	**RESULT**	**REMARK**
15.407(b)(6)	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is -5.10dB at 0.43125MHz
15.407(b/1/2/3) (b)(5)	Spurious Emissions	PASS	Meet the requirement of limit. Minimum passing margin is -0.5dB at 5150.00MHz
15.407(a/1/2/3)	Transmit Power	PASS	Meet the requirement of limit.
15.407(a)(6)	Peak Power Excursion	PASS	Meet the requirement of limit.
15.407(a/1/2/3)	Peak Power Spectral Density	PASS	Meet the requirement of limit.
15.407(g)	Frequency Stability	PASS	Meet the requirement of limit.
15.203	Antenna Requirement	PASS	Antenna connector is MHF not a standard connector.

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

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)	5.59 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	IEEE 802.11a/b/g/n Enterprise Access Point
MODEL NO.	WAP5110-L, WAP5110, ECW5110-L, ECW5110, EAP9112A-FLF-17
POWER SUPPLY	DC 12V from Power adapter, DC 48V or 55V from POE
MODULATION TYPE	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
MODULATION TECHNOLOGY	DSSS,OFDM
TRANSFER RATE	802.11b: up to 11Mbps 802.11a/g: up to 54Mbps 802.11n: up to 300Mbps
OPERATING FREQUENCY	**For 15.407** 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) 2 for 802.11n (HT40)
	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) 2 for 802.11n (HT40)

MAXIMUM OUTPUT POWER	**For 15.407** 802.11a: 43.351mW 802.11n (HT20): 43.315mW 802.11n (HT40): 44.940mW **For 15.247 (2.4GHz)** 802.11b: 366.438mW 802.11g: 248.886mW 802.11n (HT20): 449.741mW 802.11n (HT40): 103.992mW **For 15.247 (5GHz)** 802.11a: 223.357mW 802.11n (HT20): 175.224mW 802.11n (HT40): 176.243mW
ANTENNA TYPE	Please see NOTE
DATA CABLE	NA
I/O PORTS	Console port x1 GE1/PoE port x1(10/100/1000Mbps)
ASSOCIATED DEVICES	Adapter x 1

NOTE:

1. The EUT has three brand names and five model names which are identical to each other in all aspects except for the following table:

Brand Name	Model No.	Different
SMC	WAP5110-L	Difference with FW Code. (only modify the webpage for difference customer, no any impact of RF parameter)
SMC	WAP5110	
Edge-corE	ECW5110-L	
Edge-corE	ECW5110	
Accton	EAP9112A-FLF-17	

From the above models, model: **WAP5110-L** was selected as representative model for the test and its data was recorded in this report.

2. The EUT must be supplied with a adapter or POE as below information:

Adapter		
Brand	Model No.	Spec.
Sunny	SYS1308-2412-W2	AC Input : 100-240V, 1.0A, 50-60Hz DC Output : 12V, 2.0A DC output cable(unshielded ,1.4m)

POE(only for test not for sale)			
No.	Brand	Model No.	Spec.
1	PowerDsine Ltd.	PD-3501G/AC	AC Input : 100-240V, 0.5A, 50-60Hz DC Output : 48V, 0.35A
2	MOTOROLA	PD-7001G	AC Input : 100-240V, 0.8A, 50-60Hz DC Output : 55V, 0.57A

For radiated emission: From above power sources, the worst case was found in POE (Model: PD-7001G). Therefore only the test data of the mode was recorded in this report.

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

2.4GHz							
Transmitter Circuit	Brand	Model name	Gain (dBi) Include cable loss	Antenna Type	Connector	Frequency range (MHz to MHz)	Cable Loss (dB)
Chain (0)	Accton	120G00000028A	3.90	PCB	MHF	2412~2483.5	N/A
Chain (1)	Accton	120G00000029A	2.51	PCB	MHF	2412~2483.5	N/A
5GHz							
Transmitter Circuit	Brand	Model name	Gain (dBi) Include cable loss	Antenna Type	Connector	Frequency range (MHz to MHz)	Cable Loss (dB)
Chain (0)	Accton	120G00000030A	4.66	PCB	MHF	5150~5850	N/A
Chain (1)	Accton	120G00000031A	4.05	PCB	MHF	5150~5850	N/A
Note: For 802.11abg mode will fix transmission on Chain (0).							

4. Spurious emission of the simultaneous operation (2.4GHz & 5GHz) has been evaluated and no non-compliance was found.

5. The EUT incorporates a MIMO function.

MODULATION MODE	TX/RX FUNCTION
802.11a	1TX/2RX
802.11b	1TX/2RX
802.11g	1TX/2RX
802.11n (HT20)	2TX/2RX
802.11n (HT40)	2TX/2RX

6. When the EUT operating in 802.11n, the software operation, which is defined by manufacturer, MCS (Modulation and Coding Schemes) from 0 to 15.

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

3.2 DESCRIPTION OF TEST MODES

Operated in 5150 ~ 5250MHz band:

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

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

2 channels are provided for 802.11n (HT40):

CHANNEL	FREQUENCY
38	5190 MHz
46	5230 MHz

3.2.1 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	PLC	RE < 1G	RE ³ 1G	APCM	
1	√	-	-	-	Adapter
2	√	-	-	-	POE(PD-3501G/AC)
3	-	√	√	√	POE(PD-7001G)

Where **PLC:** Power Line Conducted Emission **RE < 1G:** Radiated Emission below 1GHz

RE ³ 1G: Radiated Emission above 1GHz **APCM:** Antenna Port Conducted Measurement

Note: 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).

POWER LINE CONDUCTED EMISSION TEST:

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

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

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (MBPS)
802.11a	36 to 48	40	OFDM	BPSK	6

RADIATED EMISSION TEST (BELOW 1 GHz):

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

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

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11a	36 to 48	40	OFDM	BPSK	6

RADIATED EMISSION TEST (ABOVE 1 GHz):

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

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

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11a	36 to 48	36, 40, 48	OFDM	BPSK	6
802.11n (HT20)	36 to 48	36, 40, 48	OFDM	BPSK	6.5
802.11n (HT40)	38 to 46	38, 46	OFDM	BPSK	13.5

ANTENNA PORT CONDUCTED MEASUREMENT:

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

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

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11a	36 to 48	36, 40, 48	OFDM	BPSK	6
802.11n (HT20)	36 to 48	36, 40, 48	OFDM	BPSK	6.5
802.11n (HT40)	38 to 46	38, 46	OFDM	BPSK	13.5

TEST CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
PLC	25deg. C,58%RH	120Vac, 60Hz	Anderson Chen
RE<1G	22deg. C, 75%RH	120Vac, 60Hz	Robert Cheng
RE≥1G	25deg. C, 65%RH	120Vac, 60Hz	Nelson Teng
APCM	25deg. C, 60%RH	120Vac, 60Hz	James Chan

3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a RF product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC Part 15, Subpart E (15.407)

789033 D01 General UNII Test Procedures v01 r02

662911 D01 Multiple Transmitter Output v01 r02

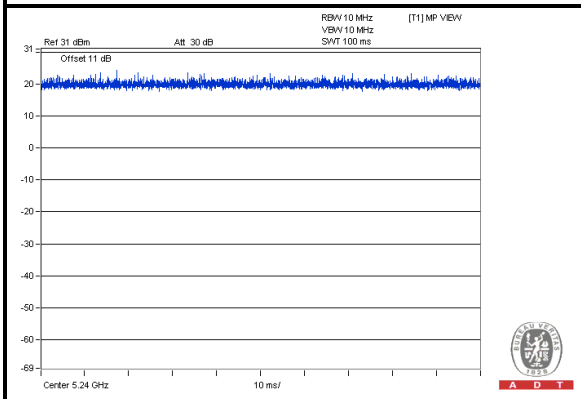
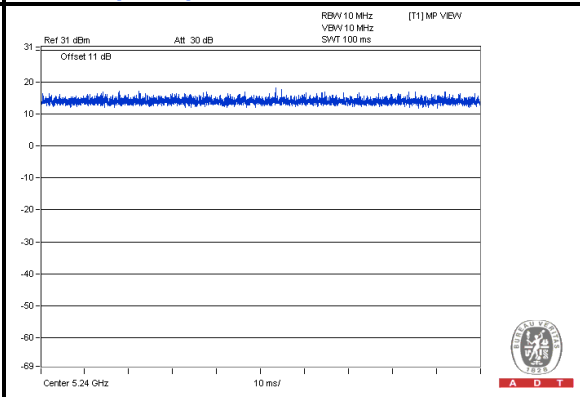
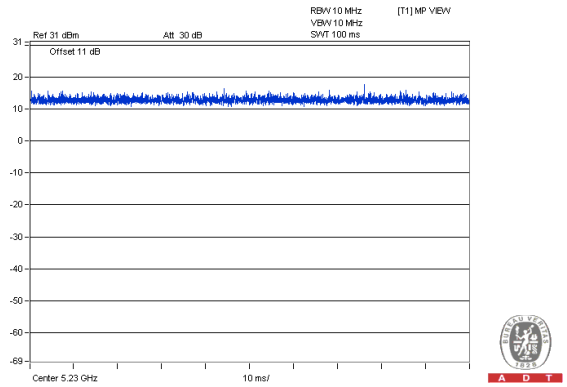
ANSI C63.10-2009

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

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

3.4 DUTY CYCLE OF TEST SIGNAL

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

802.11a	802.11n (HT20)
	
802.11n (HT40)	
	

3.5 DESCRIPTION OF SUPPORT UNITS

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

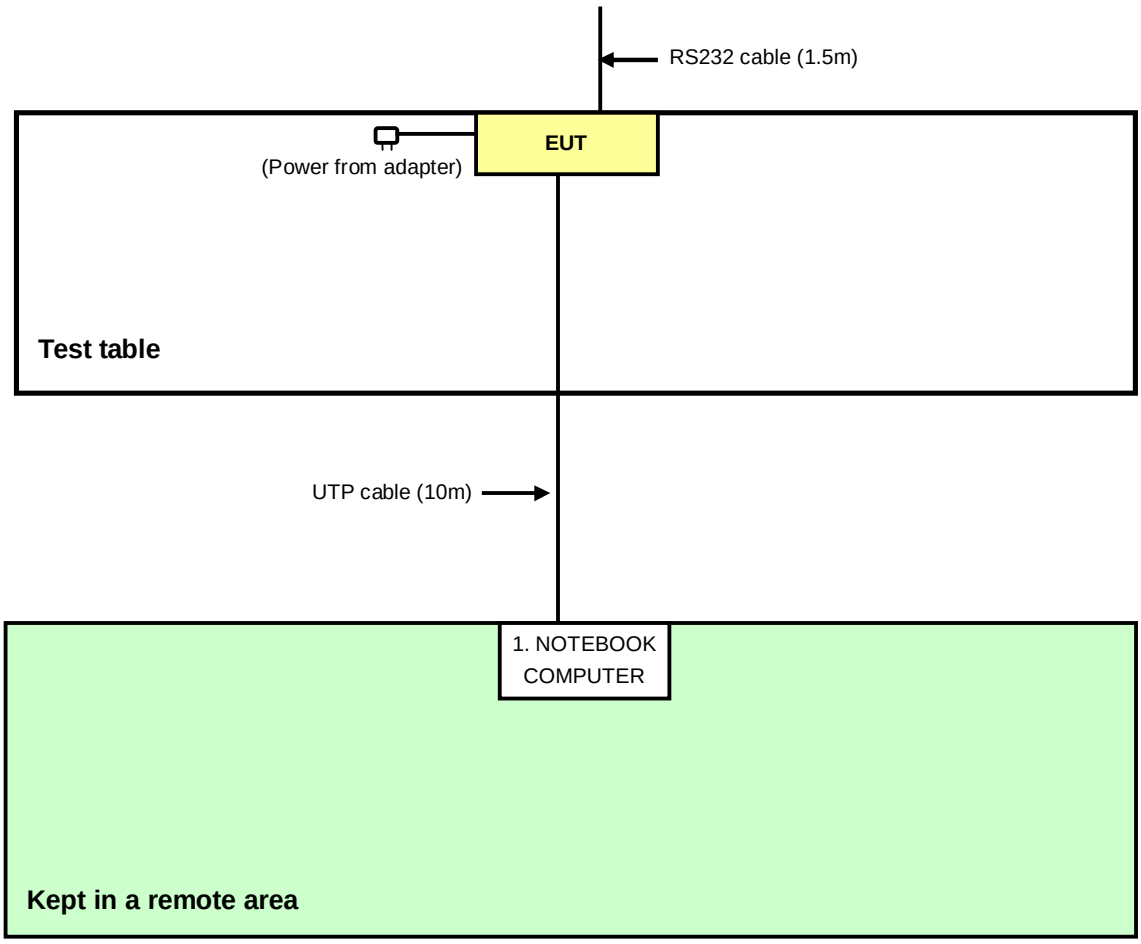
For conducted emission test					
NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	NOTEBOOK COMPUTER	DELL	E6420	B92T3R1	FCC DoC
For other test items					
NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	NOTEBOOK COMPUTER	DELL	PP32LA	FSLB32S	FCC DoC

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	UTP cable(10m), UTP cable(3m)

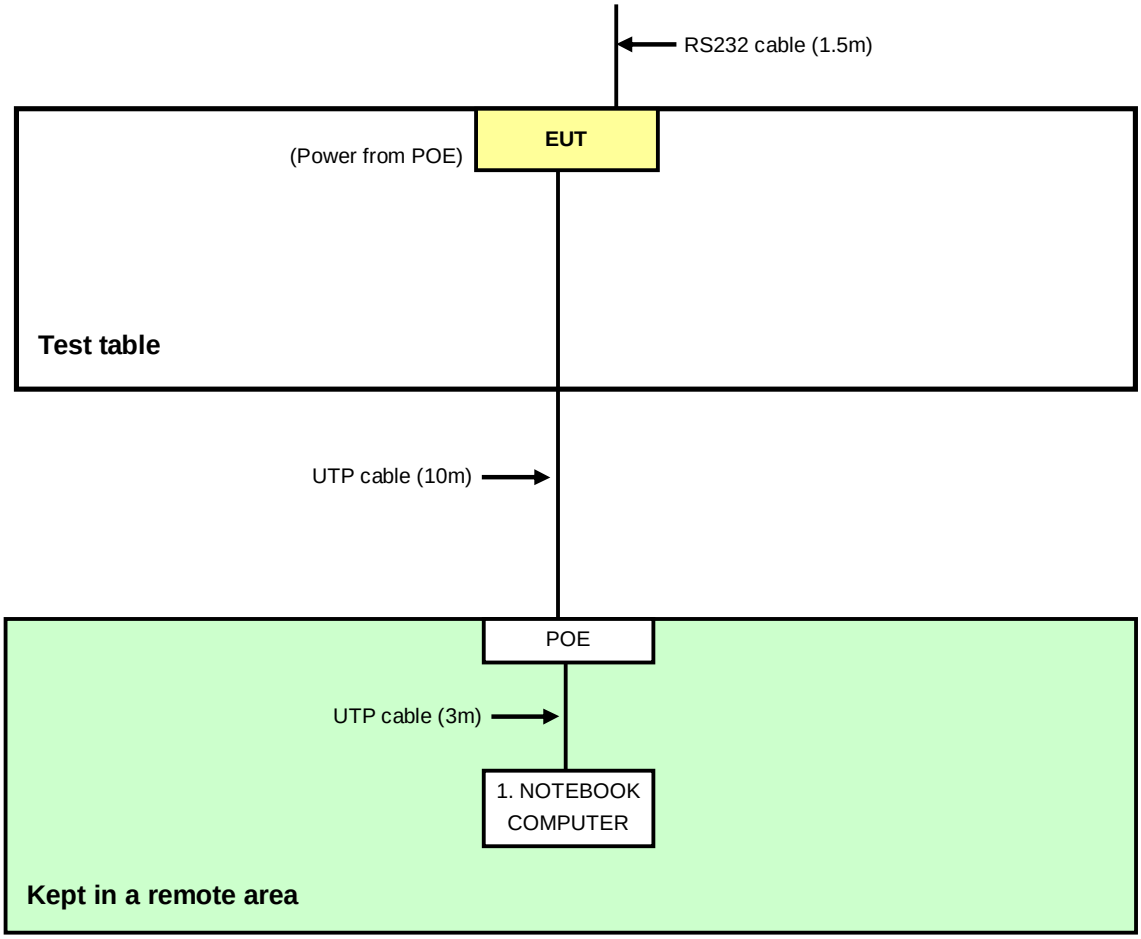
NOTE: All power cords of the above support units are non shielded (1.8m).

3.6 CONFIGURATION OF SYSTEM UNDER TEST

For adapter mode :



For POE mode :


RS232 cable (1.5m)
EUT
(Power from POE)
Test table
UTP cable (10m)
POE
UTP cable (3m)
1. NOTEBOOK COMPUTER
Kept in a remote area

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 0.5-5 5-30	66 to 56 56 60	56 to 46 46 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	100287	Feb. 28, 2013	Feb. 27, 2014
Line-Impedance Stabilization Network (for EUT) SCHWARZBECK	NSLK 8127	8127-523	Sep. 19, 2012	Sep. 20, 2013
Line-Impedance Stabilization Network (for Peripheral) ROHDE & SCHWARZ	ESH3-Z5	848773/004	Oct. 29, 2012	Oct. 28, 2013
RF Cable (JYEBAO)	5DFB	COACAB-002	Aug. 05, 2012	Aug. 04, 2013
50 ohms Terminator	50	3	Oct. 23, 2012	Oct. 22, 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. A.
3 The VCCI Con A Registration No. is C-817.
4. Tested Date: Mar. 26, 2013

4.1.3 TEST PROCEDURES

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

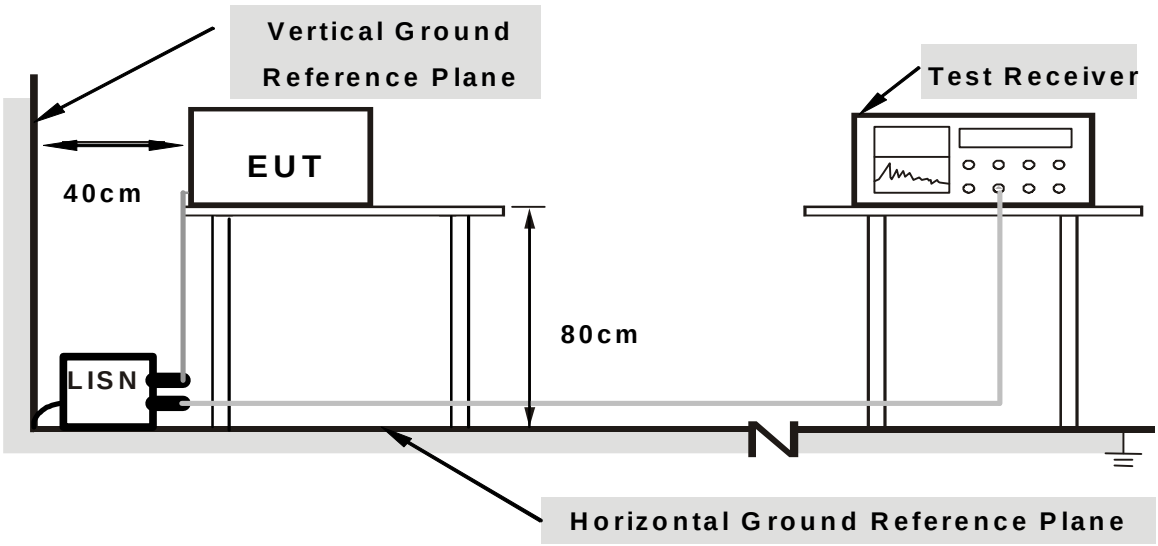
NOTE:

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

4.1.4 DEVIATION FROM TEST STANDARD

No deviation

4.1.5 TEST SETUP



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

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

4.1.6 EUT OPERATING CONDITIONS

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

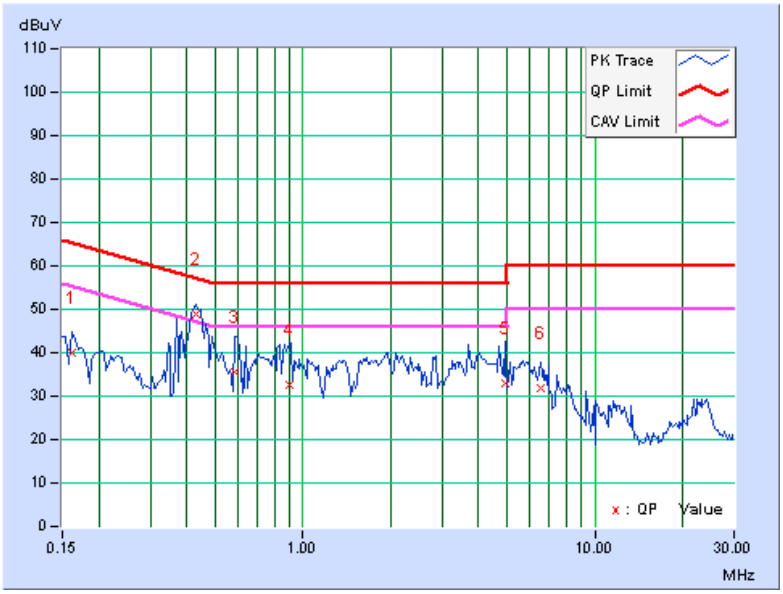
4.1.7 TEST RESULTS(Mode 1)

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	0.16172	0.10	39.72	38.86	39.82	38.96	65.38	55.38	-25.56	-16.42
2	**0.43125**	**0.16**	**48.78**	**41.97**	**48.94**	**42.13**	**57.23**	**47.23**	**-8.29**	**-5.10**
3	0.58750	0.17	35.57	19.08	35.74	19.25	56.00	46.00	-20.26	-26.75
4	0.89609	0.18	32.31	22.25	32.49	22.43	56.00	46.00	-23.51	-23.57
5	4.92578	0.36	32.58	25.02	32.94	25.38	56.00	46.00	-23.06	-20.62
6	6.52734	0.43	31.54	25.77	31.97	26.20	60.00	50.00	-28.03	-23.80

REMARKS:

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

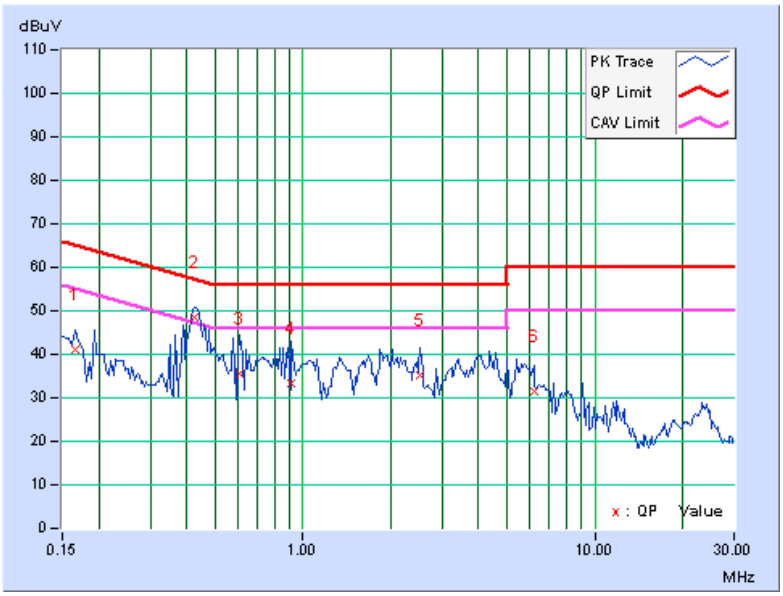


PHASE	Neutral (N)	DETECTOR FUNCTION	Quasi-Peak (QP) / Average (AV)

	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	0.16562	0.15	41.13	39.34	41.28	39.49	65.18	55.18	-23.90	-15.69
2	0.42344	0.19	48.32	40.61	48.51	40.80	57.38	47.38	-8.87	-6.58
3	0.60313	0.20	35.31	21.45	35.51	21.65	56.00	46.00	-20.49	-24.35
4	0.91172	0.22	33.16	23.81	33.38	24.03	56.00	46.00	-22.62	-21.97
5	2.52734	0.29	34.78	28.93	35.07	29.22	56.00	46.00	-20.93	-16.78
6	6.17969	0.42	30.98	25.21	31.40	25.63	60.00	50.00	-28.60	-24.37

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



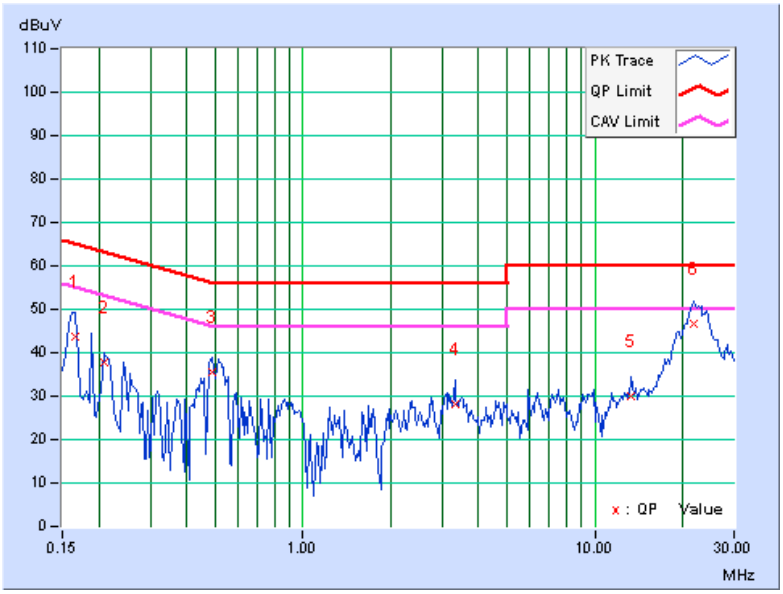
4.1.8 TEST RESULTS(Mode 2)

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	0.16562	0.10	43.70	39.46	43.80	39.56	65.18	55.18	-21.38	-15.62
2	0.20859	0.11	37.49	28.70	37.60	28.81	63.26	53.26	-25.66	-24.45
3	0.48594	0.16	35.40	28.83	35.56	28.99	56.24	46.24	-20.67	-17.24
4	3.32031	0.29	27.76	20.69	28.05	20.98	56.00	46.00	-27.95	-25.02
5	13.38281	0.72	29.41	23.82	30.13	24.54	60.00	50.00	-29.87	-25.46
6	21.97266	1.06	45.46	39.02	46.52	40.08	60.00	50.00	-13.48	-9.92

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

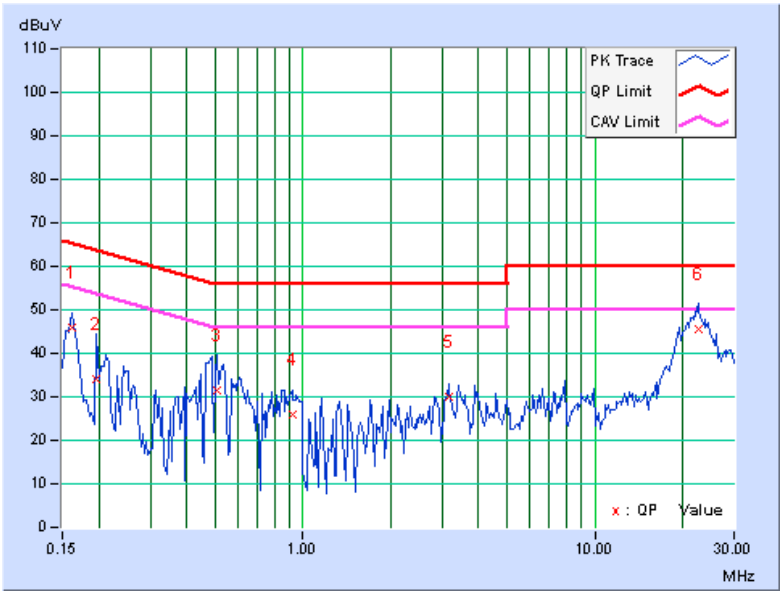


PHASE	Neutral (N)	DETECTOR FUNCTION	Quasi-Peak (QP) / Average (AV)

	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	0.16172	0.15	45.84	40.50	45.99	40.65	65.38	55.38	-19.39	-14.73
2	0.19687	0.15	34.02	11.49	34.17	11.64	63.74	53.74	-29.57	-42.10
3	0.50938	0.20	31.10	10.37	31.30	10.57	56.00	46.00	-24.70	-35.43
4	0.91953	0.22	25.54	13.35	25.76	13.57	56.00	46.00	-30.24	-32.43
5	3.15625	0.32	29.82	23.06	30.14	23.38	56.00	46.00	-25.86	-22.62
6	22.68359	0.85	44.60	38.40	45.45	39.25	60.00	50.00	-14.55	-10.75

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:

Frequencies (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

NOTE:

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

4.2.2 LIMITS OF UNWANTED EMISSION OUT OF THE RESTRICTED BANDS

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

NOTE:

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

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

4.2.3 TEST INSTRUMENTS

Below 1GHz test

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	MY51210105	Jan. 29,2013	Jan. 28,2014
Pre-Amplifier Mini-Circuits	ZFL-1000VH2 B	AMP-ZFL-03	Nov. 14, 2012	Nov. 13, 2013
Pre-Amplifier Agilent	8449B	3008A02578	June 26, 2012	June 25, 2013
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: Mar. 27, 2013

Above 1GHz test

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: Apr. 12, 2013

4.2.4 TEST PROCEDURES

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

f. The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

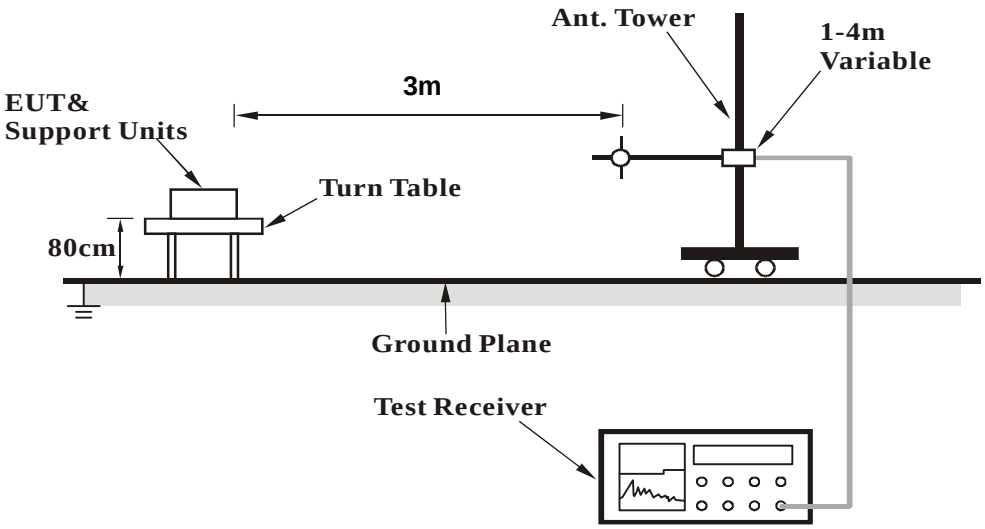
NOTE:

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

4.2.5 DEVIATION FROM TEST STANDARD

No deviation

4.2.6 TEST SETUP



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

4.2.7 EUT OPERATING CONDITION

Same as 4.1.6

4.2.8 TEST RESULTS

BELOW 1GHz WORST-CASE DATA

802.11a

CHANNEL	TX Channel 40	**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	47.80	19.3 QP	40.0	-20.7	1.00 H	244	32.87	-13.53
2	104.74	27.0 QP	43.5	-16.5	2.00 H	84	43.91	-16.90
3	148.15	29.0 QP	43.5	-14.5	2.00 H	283	42.55	-13.57
4	173.41	26.5 QP	43.5	-17.0	2.00 H	89	40.74	-14.22
5	325.03	23.4 QP	46.0	-22.6	1.00 H	46	34.73	-11.35
6	400.01	25.6 QP	46.0	-20.4	2.00 H	319	35.58	-9.98
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	32.62	32.3 QP	40.0	-7.7	1.00 V	4	47.22	-14.91
2	58.71	29.0 QP	40.0	-11.0	1.00 V	58	43.04	-14.06
3	101.93	26.5 QP	43.5	-17.1	1.00 V	50	43.73	-17.28
4	148.15	27.5 QP	43.5	-16.0	1.00 V	315	41.03	-13.57
5	294.47	27.9 QP	46.0	-18.1	1.50 V	340	40.32	-12.44
6	850.04	27.0 QP	46.0	-19.0	1.00 V	326	28.25	-1.27

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)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value

ABOVE 1GHz DATA

802.11a

CHANNEL	TX Channel 36	**DETECTOR FUNCTION**	Peak (PK) 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	5150.00	61.3 PK	74.0	-12.7	1.21 H	100	18.73	42.57
2	5150.00	50.7 AV	54.0	-3.3	1.21 H	100	8.13	42.57
3	*5180.00	111.8 PK			1.21 H	100	69.13	42.67
4	*5180.00	103.3 AV			1.21 H	100	60.63	42.67
5	#10360.00	58.5 PK	74.0	-15.5	1.07 H	174	9.09	49.41
6	#10360.00	46.2 AV	54.0	-7.8	1.07 H	174	-3.21	49.41
7	15540.00	62.0 PK	74.0	-12.0	1.08 H	243	6.55	55.45
8	15540.00	50.8 AV	54.0	-3.2	1.08 H	243	-4.65	55.45
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	**FREQ. (MHz)**	**EMISSION LEVEL (dBuV/m)**	**LIMIT (dBuV/m)**	**MARGIN (dB)**	**ANTENNA HEIGHT (m)**	**TABLE ANGLE (Degree)**	**RAW VALUE (dBuV)**	**CORRECTION FACTOR (dB/m)**
1	5150.00	61.1 PK	74.0	-12.9	1.00 V	101	18.53	42.57
2	5150.00	50.0 AV	54.0	-4.0	1.00 V	101	7.43	42.57
3	*5180.00	108.4 PK			1.00 V	101	65.73	42.67
4	*5180.00	100.3 AV			1.00 V	101	57.63	42.67
5	#10360.00	57.4 PK	74.0	-16.6	1.05 V	159	7.99	49.41
6	#10360.00	46.2 AV	54.0	-7.8	1.05 V	159	-3.21	49.41
7	15540.00	61.9 PK	74.0	-12.1	1.02 V	222	6.45	55.45
8	15540.00	50.3 AV	54.0	-3.7	1.02 V	222	-5.15	55.45

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)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5200.00	111.6 PK			1.16 H	103	68.87	42.73
2	*5200.00	103.0 AV			1.16 H	103	60.27	42.73
3	#10400.00	58.7 PK	74.0	-15.3	1.07 H	178	9.67	49.03
4	#10400.00	46.2 AV	54.0	-7.8	1.07 H	178	-2.83	49.03
5	15600.00	61.8 PK	74.0	-12.2	1.11 H	249	6.55	55.25
6	15600.00	50.4 AV	54.0	-3.6	1.11 H	249	-4.85	55.25
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5200.00	108.5 PK			1.06 V	103	65.77	42.73
2	*5200.00	100.4 AV			1.06 V	103	57.67	42.73
3	#10400.00	57.9 PK	74.0	-16.1	1.06 V	153	8.87	49.03
4	#10400.00	46.6 AV	54.0	-7.4	1.06 V	153	-2.43	49.03
5	15600.00	61.8 PK	74.0	-12.2	1.01 V	222	6.55	55.25
6	15600.00	50.4 AV	54.0	-3.6	1.01 V	222	-4.85	55.25

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)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5240.00	112.6 PK			1.19 H	99	69.83	42.77
2	*5240.00	103.3 AV			1.19 H	99	60.53	42.77
3	5350.00	61.8 PK	74.0	-12.2	1.19 H	99	18.97	42.83
4	5350.00	50.8 AV	54.0	-3.2	1.19 H	99	7.97	42.83
5	#10480.00	58.1 PK	74.0	-15.9	1.02 H	177	8.51	49.59
6	#10480.00	46.0 AV	54.0	-8.0	1.02 H	177	-3.59	49.59
7	15720.00	61.8 PK	74.0	-12.2	1.05 H	231	6.96	54.84
8	15720.00	50.6 AV	54.0	-3.4	1.05 H	231	-4.24	54.84
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5240.00	108.2 PK			1.00 V	111	65.43	42.77
2	*5240.00	100.0 AV			1.00 V	111	57.23	42.77
3	5350.00	61.4 PK	74.0	-12.6	1.00 V	111	18.57	42.83
4	5350.00	50.4 AV	54.0	-3.6	1.00 V	111	7.57	42.83
5	#10480.00	57.7 PK	74.0	-16.3	1.06 V	148	8.11	49.59
6	#10480.00	46.5 AV	54.0	-7.5	1.06 V	148	-3.09	49.59
7	15720.00	62.1 PK	74.0	-11.9	1.00 V	226	7.26	54.84
8	15720.00	50.6 AV	54.0	-3.4	1.00 V	226	-4.24	54.84

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)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

802.11n (HT20)

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5120.00	61.2 PK	74.0	-12.8	1.00 H	265	18.73	42.47
2	5120.00	50.3 AV	54.0	-3.7	1.00 H	265	7.83	42.47
3	*5180.00	109.0 PK			1.00 H	265	66.33	42.67
4	*5180.00	100.8 AV			1.00 H	265	58.13	42.67
5	#10360.00	58.9 PK	74.0	-15.1	1.06 H	180	9.49	49.41
6	#10360.00	46.6 AV	54.0	-7.4	1.06 H	180	-2.81	49.41
7	15540.00	62.1 PK	74.0	-11.9	1.12 H	249	6.65	55.45
8	15540.00	50.8 AV	54.0	-3.2	1.12 H	249	-4.65	55.45
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	61.0 PK	74.0	-13.0	1.00 V	96	18.43	42.57
2	5150.00	50.1 AV	54.0	-3.9	1.00 V	96	7.53	42.57
3	*5180.00	104.2 PK			1.03 V	102	61.53	42.67
4	*5180.00	96.0 AV			1.03 V	102	53.33	42.67
5	#10360.00	58.0 PK	74.0	-16.0	1.02 V	163	8.59	49.41
6	#10360.00	46.7 AV	54.0	-7.3	1.02 V	163	-2.71	49.41
7	15540.00	61.4 PK	74.0	-12.6	1.00 V	226	5.95	55.45
8	15540.00	50.2 AV	54.0	-3.8	1.00 V	226	-5.25	55.45

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)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5200.00	108.5 PK			1.00 H	250	65.77	42.73
2	*5200.00	100.3 AV			1.00 H	250	57.57	42.73
3	5360.00	62.5 PK	74.0	-11.5	1.04 H	274	19.67	42.83
4	5360.00	51.4 AV	54.0	-2.6	1.04 H	274	8.57	42.83
5	#10400.00	58.1 PK	74.0	-15.9	1.04 H	193	9.07	49.03
6	#10400.00	45.8 AV	54.0	-8.2	1.04 H	193	-3.23	49.03
7	15600.00	61.7 PK	74.0	-12.3	1.12 H	236	6.45	55.25
8	15600.00	50.6 AV	54.0	-3.4	1.12 H	236	-4.65	55.25
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5200.00	104.2 PK			1.02 V	94	61.47	42.73
2	*5200.00	96.0 AV			1.02 V	94	53.27	42.73
3	#10400.00	57.6 PK	74.0	-16.4	1.09 V	152	8.57	49.03
4	#10400.00	46.5 AV	54.0	-7.5	1.09 V	152	-2.53	49.03
5	15600.00	61.7 PK	74.0	-12.3	1.05 V	233	6.45	55.25
6	15600.00	50.1 AV	54.0	-3.9	1.05 V	233	-5.15	55.25

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)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5240.00	109.3 PK			1.03 H	284	66.53	42.77
2	*5240.00	101.2 AV			1.03 H	284	58.43	42.77
3	5360.00	62.8 PK	74.0	-11.2	1.00 H	269	19.97	42.83
4	5360.00	51.6 AV	54.0	-2.4	1.00 H	269	8.77	42.83
5	#10480.00	59.0 PK	74.0	-15.0	1.12 H	183	9.41	49.59
6	#10480.00	46.4 AV	54.0	-7.6	1.12 H	183	-3.19	49.59
7	15720.00	61.9 PK	74.0	-12.1	1.14 H	234	7.06	54.84
8	15720.00	50.7 AV	54.0	-3.3	1.14 H	234	-4.14	54.84
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5240.00	104.5 PK			1.00 V	106	61.73	42.77
2	*5240.00	96.4 AV			1.00 V	106	53.63	42.77
3	5350.00	61.3 PK	74.0	-12.7	1.00 V	106	18.47	42.83
4	5350.00	50.2 AV	54.0	-3.8	1.00 V	106	7.37	42.83
5	#10480.00	57.5 PK	74.0	-16.5	1.09 V	151	7.91	49.59
6	#10480.00	46.1 AV	54.0	-7.9	1.09 V	151	-3.49	49.59
7	15720.00	61.8 PK	74.0	-12.2	1.00 V	232	6.96	54.84
8	15720.00	50.3 AV	54.0	-3.7	1.00 V	232	-4.54	54.84

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)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

802.11n (HT40)

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	64.4 PK	74.0	-9.6	1.20 H	118	21.83	42.57
2	**5150.00**	**53.5 AV**	**54.0**	**-0.5**	**1.20 H**	**118**	**10.93**	**42.57**
3	*5190.00	106.8 PK			1.20 H	111	64.10	42.70
4	*5190.00	97.8 AV			1.20 H	111	55.10	42.70
5	#10380.00	59.3 PK	74.0	-14.7	1.16 H	172	10.08	49.22
6	#10380.00	46.5 AV	54.0	-7.5	1.16 H	172	-2.72	49.22
7	15570.00	61.7 PK	74.0	-12.3	1.16 H	240	6.35	55.35
8	15570.00	50.2 AV	54.0	-3.8	1.16 H	240	-5.15	55.35
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	61.2 PK	74.0	-12.8	1.00 V	60	18.63	42.57
2	5150.00	51.1 AV	54.0	-2.9	1.00 V	60	8.53	42.57
3	*5190.00	102.1 PK			1.00 V	60	59.40	42.70
4	*5190.00	94.2 AV			1.00 V	60	51.50	42.70
5	#10380.00	57.4 PK	74.0	-16.6	1.10 V	145	8.18	49.22
6	#10380.00	45.9 AV	54.0	-8.1	1.10 V	145	-3.32	49.22
7	15570.00	61.2 PK	74.0	-12.8	1.03 V	248	5.85	55.35
8	15570.00	49.9 AV	54.0	-4.1	1.03 V	248	-5.45	55.35

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)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5230.00	107.3 PK			1.17 H	271	64.54	42.76
2	*5230.00	97.6 AV			1.17 H	271	54.84	42.76
3	5400.00	62.9 PK	74.0	-11.1	1.17 H	271	20.07	42.83
4	5400.00	52.0 AV	54.0	-2.0	1.17 H	271	9.17	42.83
5	#10460.00	58.9 PK	74.0	-15.1	1.08 H	183	9.45	49.45
6	#10460.00	46.3 AV	54.0	-7.7	1.08 H	183	-3.15	49.45
7	15690.00	61.8 PK	74.0	-12.2	1.16 H	224	6.96	54.84
8	15690.00	50.6 AV	54.0	-3.4	1.16 H	224	-4.24	54.84
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5230.00	102.2 PK			1.06 V	64	59.44	42.76
2	*5230.00	94.0 AV			1.06 V	64	51.24	42.76
3	5350.00	61.9 PK	74.0	-12.1	1.06 V	69	19.07	42.83
4	5350.00	51.6 AV	54.0	-2.4	1.06 V	69	8.77	42.83
5	#10460.00	57.4 PK	74.0	-16.6	1.14 V	165	7.95	49.45
6	#10460.00	46.1 AV	54.0	-7.9	1.14 V	165	-3.35	49.45
7	15690.00	61.9 PK	74.0	-12.1	1.00 V	220	7.06	54.84
8	15690.00	50.7 AV	54.0	-3.3	1.00 V	220	-4.14	54.84

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)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

4.3 TRANSMIT POWER MEASUREMENT

4.3.1 LIMITS OF TRANSMIT POWER MEASUREMENT

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

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

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 TEST INSTRUMENTS

FOR POWER OUTPUT MEASUREMENT

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Power Meter	ML2495A	0824006	May 10, 2012	May 09, 2013
Power Sensor	MA2411B	0738172	May 10, 2012	May 09, 2013

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 : Apr. 15, 2013

FOR 26dB EMISSION BANDWIDTH MEASUREMENT

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S Spectrum Analyzer	FSP40	100037	Nov. 01, 2012	Oct. 31, 2013

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 : Apr. 15, 2013

4.3.3 TEST PROCEDURE

FOR POWER OUTPUT MEASUREMENT

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

FOR 26dB EMISSION BANDWIDTH MEASUREMENT

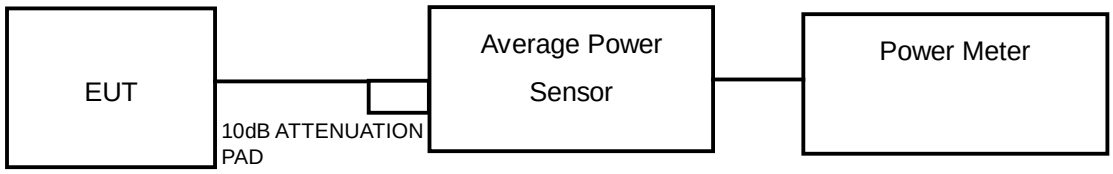
1. Set RBW = approximately 1% of the emission bandwidth.
2. Set the VBW > RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Measure the maximum width of the emission that is 26 dB down from the peak of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement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

4.3.4 DEVIATION FROM TEST STANDARD

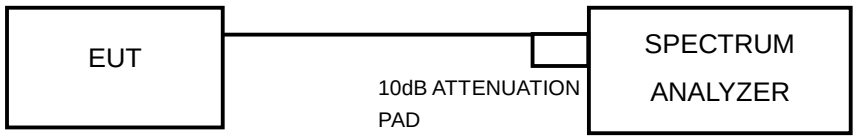
No deviation

4.3.5 TEST SETUP

FOR POWER OUTPUT MEASUREMENT



FOR 99% OCCUPIED BANDWIDTH



4.3.6 EUT OPERATING CONDITIONS

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

4.3.7 TEST RESULTS

POWER OUTPUT:

802.11a

CHANNEL	CHANNEL FREQUENCY (MHz)	AVERAGE POWER (mW)	AVERAGE POWER (dBm)	POWER LIMIT (dBm)	PASS/FAIL
36	5180	41.687	16.20	17	PASS
40	5200	43.351	16.37	17	PASS
48	5240	42.462	16.28	17	PASS

802.11n (HT20)

CHAN.	CHAN. FREQ. (MHz)	AVERAGE POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)	POWER LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1				
36	5180	13.07	13.38	42.054	16.24	17	PASS
40	5200	13.26	13.45	43.315	16.37	17	PASS
48	5240	12.83	13.49	41.523	16.18	17	PASS

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				
38	5190	13.31	12.85	40.704	16.10	17	PASS
46	5230	13.42	13.61	44.940	16.53	17	PASS

26dB EMISSION BANDWIDTH MEASUREMENT

802.11a

CHANNEL	CHANNEL FREQUENCY (MHz)	26dBc BANDWIDTH (MHz)
36	5180	21.66
40	5200	20.36
48	5240	21.25

802.11n (HT20)

CHANNEL	CHANNEL FREQUENCY (MHz)	26dBc BANDWIDTH (MHz)	
		CHAIN 0	CHAIN 1
36	5180	21.46	21.17
40	5200	21.69	21.56
48	5240	21.87	21.47

802.11n (HT40)

CHANNEL	CHANNEL FREQUENCY (MHz)	26dBc BANDWIDTH (MHz)	
		CHAIN 0	CHAIN 1
38	5190	51.43	51.04
46	5230	52.77	51.29

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
R&S Spectrum Analyzer	FSP40	100037	Nov. 01, 2012	Oct. 31, 2013

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 : Apr. 15, 2013

4.4.3 TEST PROCEDURES

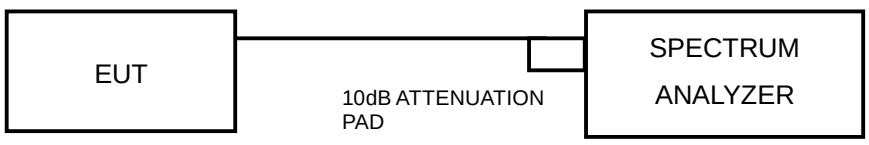
Using method SA-1

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

4.4.4 DEVIATION FROM TEST STANDARD

No deviation

4.4.5 TEST SETUP



4.4.6 EUT OPERATING CONDITIONS

Same as 4.3.6

4.4.7 TEST RESULTS

802.11a

CHANNEL	FREQUENCY (MHz)	PSD (dBm)	MAXIMUM LIMIT (dBm)	PASS/FAIL
36	5180	2.43	4	PASS
40	5200	2.06	4	PASS
48	5240	2.15	4	PASS

NOTE:
1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.

802.11n (HT20)

CHAN.	CHAN. FREQ. (MHz)	PSD (dBm)		TOTAL POWER DENSITY (dBm)	MAX. LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1			
36	5180	-1.62	-1.60	1.40	2.63	PASS
40	5200	-1.37	-1.50	1.58	2.63	PASS
48	5240	-1.50	-2.55	1.02	2.63	PASS

NOTE:
1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = 10 log[$(10^{G1/20} + 10^{G2/20})^2$ / 2] = 7.37dBi > 6dBi , so the power density limit shall be reduced to 8-(7.33-6) = 2.63dBm

802.11n (HT40)

CHAN.	CHAN. FREQ. (MHz)	PSD (dBm)		TOTAL POWER DENSITY (dBm)	MAX. LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1			
38	5190	-3.81	-5.21	-1.44	2.63	PASS
46	5230	-3.94	-3.89	-0.90	2.63	PASS

NOTE:
1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = 10 log[$(10^{G1/20} + 10^{G2/20})^2$ / 2] = 7.37dBi > 6dBi , so the power density limit shall be reduced to 8-(7.33-6) = 2.63dBm

4.5 PEAK POWER EXCURSION MEASUREMENT

4.5.1 LIMITS OF PEAK POWER EXCURSION MEASUREMENT

Shall not exceed 13 dB

4.5.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S Spectrum Analyzer	FSP40	100037	Nov. 01, 2012	Oct. 31, 2013

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 : Apr. 15, 2013

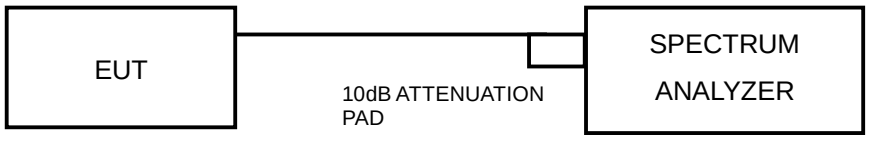
4.5.3 TEST PROCEDURE

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

4.5.4 DEVIATION FROM TEST STANDARD

No deviation

4.5.5 TEST SETUP



4.5.6 EUT OPERATING CONDITIONS

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

4.5.7 TEST RESULTS

802.11a

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK VALUE (dBm)	PPSD (dBm)	PEAK EXCURSION (dB)	LIMIT (dB)	PASS/FAIL
36	5180	11.57	2.43	9.14	13	PASS
40	5200	12.45	2.06	10.39	13	PASS
48	5240	11.27	2.15	9.12	13	PASS

802.11n (HT20)

CHAN.	CHAN. FREQ. (MHz)	PEAK VALUE (dBm)		PPSD (dBm)		PEAK EXCURSION (dB)		LIMIT (dB)	PASS/ FAIL
		CHAIN 0	CHAIN 1	CHAIN 0	CHAIN 1	CHAIN 0	CHAIN 1		
36	5180	7.73	7.55	-1.62	-1.60	9.35	9.15	13	PASS
40	5200	8.17	7.49	-1.37	-1.50	9.54	8.99	13	PASS
48	5240	8.00	7.25	-1.50	-2.55	9.50	9.80	13	PASS

802.11n (HT40)

CHAN.	CHAN. FREQ. (MHz)	PEAK VALUE (dBm)		PPSD (dBm)		PEAK EXCURSION (dB)		LIMIT (dB)	PASS/ FAIL
		CHAIN 0	CHAIN 1	CHAIN 0	CHAIN 1	CHAIN 0	CHAIN 1		
38	5190	5.90	5.09	-3.81	-5.21	9.71	10.30	13	PASS
46	5230	5.06	5.11	-3.94	-3.89	9.00	9.00	13	PASS

4.6 FREQUENCY STABILITY

4.6.1 LIMITS OF FREQUENCY STABILITY MEASUREMENT

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

4.6.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S Spectrum Analyzer	FSP40	100037	Nov. 01, 2012	Oct. 31, 2013

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 : Apr. 15, 2013

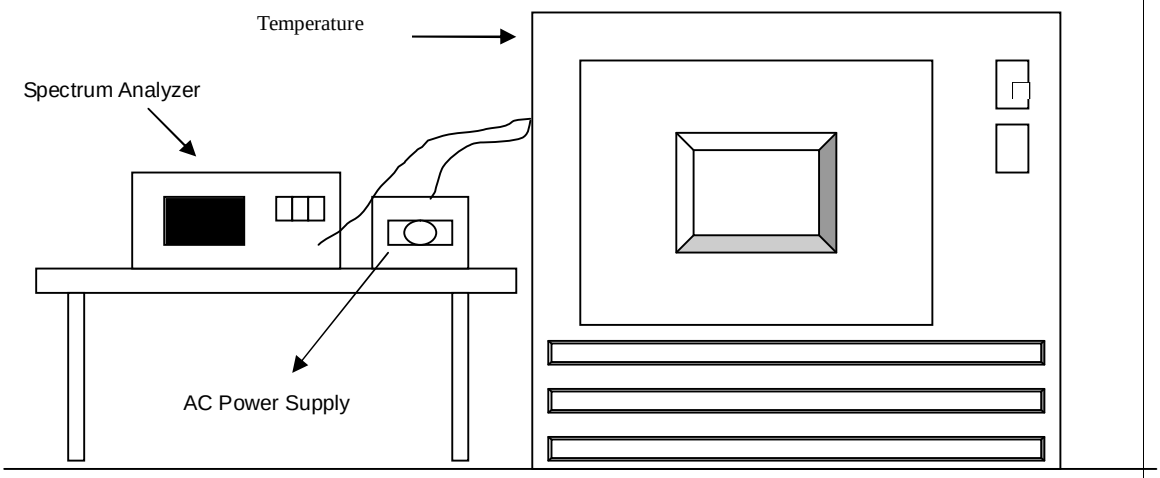
4.6.3 TEST PROCEDURE

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

4.6.4 DEVIATION FROM TEST STANDARD

No deviation

4.6.5 TEST SETUP



4.6.6 EUT OPERATING CONDITION

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

4.6.7 TEST RESULTS

FREQUEMCY STABILITY VERSUS TEMP.									
OPERATING FREQUENCY: 5240MHz									
TEMP. (℃)	POWER SUPPLY (Vac)	0 MINUTE		2 MINUTE		5 MINUTE		10 MINUTE	
		Measured Frequency	Frequency Drift	Measured Frequency	Frequency Drift	Measured Frequency	Frequency Drift	Measured Frequency	Frequency Drift
		(MHz)	ppm	(MHz)	ppm	(MHz)	ppm	(MHz)	ppm
50	120	5240.015	2.8626	5240.0101	1.9275	5240.0176	3.3588	5240.0103	1.9656
40	120	5240.009	1.7176	5240.0137	2.6145	5240.0076	1.4504	5240.0156	2.9771
30	120	5240.011	2.0992	5240.0041	0.7824	5240.011	2.0992	5240.0082	1.5649
20	120	5240.016	3.0534	5240.0197	3.7595	5240.0185	3.5305	5240.0233	4.4466
10	120	5240.0094	1.7939	5240.0097	1.8511	5240.0104	1.9847	5240.0155	2.9580
0	120	5240.0252	4.8092	5240.0222	4.2366	5240.0258	4.9237	5240.024	4.5802
-10	120	5240.0157	2.9962	5240.0106	2.0229	5240.0174	3.3206	5240.0156	2.9771
-20	120	5240.0244	4.6565	5240.0237	4.5229	5240.0254	4.8473	5240.0283	5.4008
-30	120	5239.9738	-5.0000	5239.9789	-4.0267	5239.9797	-3.8740	5239.982	-3.4351

FREQUEMCY STABILITY VERSUS VOLTAGE									
OPERATING FREQUENCY: 5240MHz									
TEMP. (℃)	POWER SUPPLY (Vac)	0 MINUTE		2 MINUTE		5 MINUTE		10 MINUTE	
		Measured Frequency	Frequency Drift	Measured Frequency	Frequency Drift	Measured Frequency	Frequency Drift	Measured Frequency	Frequency Drift
		(MHz)	ppm	(MHz)	ppm	(MHz)	ppm	(MHz)	ppm
20	138	5240.0161	3.0725	5240.0199	3.7977	5240.0194	3.7023	5240.0225	4.2939
	120	5240.016	3.0534	5240.0197	3.7595	5240.0185	3.5305	5240.0233	4.4466
	102	5240.015	2.8626	5240.0189	3.6069	5240.0195	3.7214	5240.0222	4.2366

5. PHOTOGRAPHS OF THE TEST CONFIGURATION

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

6. INFORMATION ON THE TESTING LABORATORIES

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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Web Site: www.bureauveritas-adt.com

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

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

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

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