

CO-TRANSMISSION

SUPPLEMENTARY TEST REPORT

REPORT NO.: RF980610H03-1

MODEL NO.: MBR1200

RECEIVED: July 23, 2009

TESTED: Aug. 03 to 11, 2009

ISSUED: Aug. 14, 2009

APPLICANT: Cradlepoint, Inc

ADDRESS: 1199 Shoreline Lane, Suite 301 Boise, ID 83702

ISSUED BY: Bureau Veritas Consumer Products Services
(H.K.) Ltd., Taoyuan Branch

LAB LOCATION: No. 81-1, Lu Liao Keng, 9th Ling,Wu Lung Tsuen,
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1 CERTIFICATION

PRODUCT : Wireless-B/G/N Mobile Broadband Router
BRAND NAME : cradlepoint
MODEL NO. : MBR1200
TESTED : Aug. 03 to 11, 2009
APPLICANT : Cradlepoint, Inc
TEST SAMPLE : PROTOTYPE
STANDARDS : 47 CFR Part 15, Subpart C (Section 15.247)
ANSI C63.4-2003

The above equipment (Model: MBR1200) 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 : Sunny Wen , **DATE:** Aug 14, 2009
(Sunny Wen, Specialist)

TECHNICAL ACCEPTANCE : Hank Chung , **DATE:** Aug 14, 2009
Responsible for RF (Hank Chung, Deputy Manager)

APPROVED BY : May Chen , **DATE:** Aug 14, 2009
(May Chen, Deputy Manager)

2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: 47 CFR Part 15, Subpart C			
Standard Section	Test Type and Limit	Result	REMARK
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is -1.26dB at 1.707MHz
15.247(d)	Transmitter Radiated Emissions Limit: Table 15.209	PASS	Meet the requirement of limit Minimum passing margin is -3.18 dB at 375.00 MHz

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	2.44 dB
Radiated emissions (30MHz-1GHz)	3.94 dB
Radiated emissions (1GHz -18GHz)	2.49 dB
Radiated emissions (18GHz -40GHz)	2.70 dB



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3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	Wireless-B/G/N Mobile Broadband Router
MODEL NO.	MBR1200
FCC ID	UXX-MBR1200
POWER SUPPLY	DC 12V from power adapter
MODULATION TYPE	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
MODULATION TECHNOLOGY	DSSS, OFDM
TRANSFER RATE	802.11b: 11 / 5.5 / 2 / 1Mbps 802.11g: 54 / 48 / 36 / 24 / 18 / 12 / 9 / 6Mbps Draft 802.11n (20MHz, 800ns GI MCS8~15): 130 / 117 / 104 / 78 / 52 / 39 / 26 / 13Mbps Draft 802.11n (20MHz, 800ns GI MCS0~7): 65 / 58.5 / 52 / 39 / 26 / 19.5 / 13 / 6.5Mbps Draft 802.11n (40MHz, 800ns GI MCS8~15): 270 / 243 / 216 / 162 / 108 / 81 / 54 / 27Mbps Draft 802.11n (40MHz, 800ns GI MCS0~7): 135 / 121.5 / 108 / 81 / 54 / 40.5 / 27 / 13.5Mbps Draft 802.11n (20MHz, 400ns GI MCS8~15): 144.444 / 130 / 115.556 / 86.667 / 57.778 / 43.333 / 28.889 / 14.444Mbps Draft 802.11n (20MHz, 400ns GI MCS0~7): 72.2 / 65 / 57.8 / 43.3 / 28.9 / 21.7 / 14.4 / 7.2Mbps Draft 802.11n (40MHz, 400ns GI MCS8~15): 300 / 270 / 240 / 180 / 120 / 90 / 60 / 30Mbps Draft 802.11n (40MHz, 400ns GI MCS0~7): 150 / 135 / 120 / 90 / 60 / 45 / 30 / 15Mbps
FREQUENCY RANGE	2412MHz ~ 2462MHz
NUMBER OF CHANNEL	11 for 802.11b, 802.11g, draft 802.11n (20MHz) 7 for draft 802.11n (40MHz)
MAXIMUM OUTPUT POWER	802.11b: 154.17mW 802.11g: 629.476mW draft 802.11n (20MHz): 521.073mW draft 802.11n (40MHz): 682.232mW
ANTENNA TYPE	Please see note 1
DATA CABLE	NA

I/O PORT	LAN (10/100/1000Mbps) port x 4, WAN (10/100/1000Mbps) port x 1, Pure USB port x 1 USB port for 1XEV-DO x 2, Express card for 1XEV-DO port x 1, CardBus for 1XEV-DO x 1
ASSOCIATED DEVICES	Adapter x 1

NOTE:

1. There are two sets antennas provided to this EUT, please refer to the following table:

Set No.	Transmitter Circuit	Antenna Type	Antenna Gain (dBi)	Antenna Connector
Set 1	Chain(0)	PIFA	3.47654	NA
	Chain(1)			
Set 2	Chain(0)	Dipole	4.98	MMCX
	Chain(1)			

From the above antennas, the worst case was found in set no. 2. Therefore only the test data of the mode was recorded in this report individually.

2. The EUT could be applied with three 3.5G 1XEV-DO cards and following four different models could be chosen; therefore emission tests are added for simultaneously transmit between wireless LAN and 3.5G 1XEV-DO function. The emission tests have been performed at the worst channel of both WLAN and 3.5G 1XEV-DO, and recorded in the report.

Interface	Brand	Model No.	FCC ID
Cardbus	KYOCERA	KPC650	OVFKWC-KPC650
USB port	SIERRA WIRELESS	AirCard 875U	N7N-MC8775U
		AirCard 595U	N7N-MC8725U
Express card	Sprint	AirCard 597E	N7NAC597E

From the above 3.5G 1XEV-DO cards, Model No.: **KPC650, AirCard 875U & AirCard 597E** were selected for testing. Only one card can transmit on different interface for 1XEV-DO.

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

Adapter 1	
Brand:	ELEMENTECH
Model No.:	Au-79AOn
Input power :	AC 100-240V, 600mA, 50-60Hz Cable:1.8m/unshielded/w/o core
Output power :	DC 12V, 2A Cable:1.5m/unshielded/with one core
Adapter 2	
Brand:	ELEMENTECH
Model No.:	AU79Dmu
Input power :	AC 100-240V, 0.5A, 50/60Hz
Output power :	DC 12V, 1.5A Cable:1.8m/unshielded/without core
Adapter 3	
Brand:	PHIHONG
Model No.:	PSA18R-120P
Input power :	AC100-240V, 50-60Hz, 0.5A
Output power :	DC 12V, 1.5A Cable:1.9m/unshielded/with one core
Adapter 4	
Brand:	JENTEC
Model No.:	AH1812-B
Input power :	AC100-240V, 50-60Hz, 0.4A
Output power :	DC 12V, 1.5A Cable:1.8m/unshielded/without core

4. The EUT was pre-tested under the following modes:

Test Mode	Description
Mode A	Level-set (Put on tabletop)
Mode B	Tower-set (Wall-mounted)

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

5. The EUT incorporates a MIMO function with 802.11g and draft 802.11n. Physically, the EUT provides two completed transmits and two completed receivers.
6. The EUT is 2 * 2 spatial MIMO without beam forming function. The antenna configuration is two transmitter antennas and two receiver antennas, as there are 2 PIFA or Dipole antennas. Spatial multiplexing modes for simultaneous transmission using 2 antennas, and for simultaneous receiver using 2 antennas. The 11b legacy mode is limited to single transmitter only.
7. When the EUT operating in draft 802.11n, the software operation, which is defined by manufacturer, MCS (Modulation and Coding Schemes) from 0 to 15.
8. The EUT complies with draft 802.11n standards and backwards compatible with 802.11b, 802.11g products.



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9. 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 2400 ~ 2483.5MHz band:

Eleven channels are provided for 802.11b, 802.11g:

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
1	2412MHz	7	2442MHz
2	2417MHz	8	2447MHz
3	2422MHz	9	2452MHz
4	2427MHz	10	2457MHz
5	2432MHz	11	2462MHz
6	2437MHz		

Seven channels are provided for draft 802.11n (40MHz):

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
1	2422MHz	5	2442MHz
2	2427MHz	6	2447MHz
3	2432MHz	7	2452MHz
4	2437MHz		

3.3 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL:

EUT configure mode	Applicable to			Description
	PLC	RE<1G	RE≥1G	
1	√	√	√	Co-located : Adapter 1 + Dipole antenna + Level-set + 3.5G 1XEV-DO Card Mode No.: KPC650
2	√	√	√	Co-located : Adapter 1 + Dipole antenna + Level-set + 3.5G 1XEV-DO Card Mode No.: AirCard 875U
3	√	√	√	Co-located : Adapter 1 + Dipole antenna + Level-set + 3.5G 1XEV-DO Card Mode No.: AirCard 597E

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

ANTENNA COMBINATION MODE:

COMBINATION MODE	OPERATION MODE	TX CHAIN(0)	TX CHAIN(1)
A	802.11b	√	
B	802.11g	√	√
C	DRAFT 802.11n(20MHz) for MCS 0~7	√	√
D	DRAFT 802.11n(20MHz) for MCS 8~15	√	√
E	DRAFT 802.11n(40MHz) for MCS 0~7	√	√
F	DRAFT 802.11n(40MHz) for MCS 8~15	√	√

Note:

1. The above information was declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.
2. Antenna 1~2 are Dipole antennas.
3. Mode A, E the worst modes, were selected as representative mode for the report.

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)	EUT CONFIGURE MODE
802.11b	1 to 11	1	DSSS	DBPSK	1	A

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)	EUT CONFIGURE MODE
Draft 802.11n (40MHz)	1 to 7	4	OFDM	BPSK	13.5	E

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)	EUT CONFIGURE MODE
Draft 802.11n (40MHz)	1 to 7	4	OFDM	BPSK	13.5	E

3.4 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a Wireless-B/G/N Mobile Broadband Router. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

47 CFR Part 15, Subpart C. (15.247)
ANSI C63.4 : 2003

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



3.5 DESCRIPTION OF SUPPORT UNITS

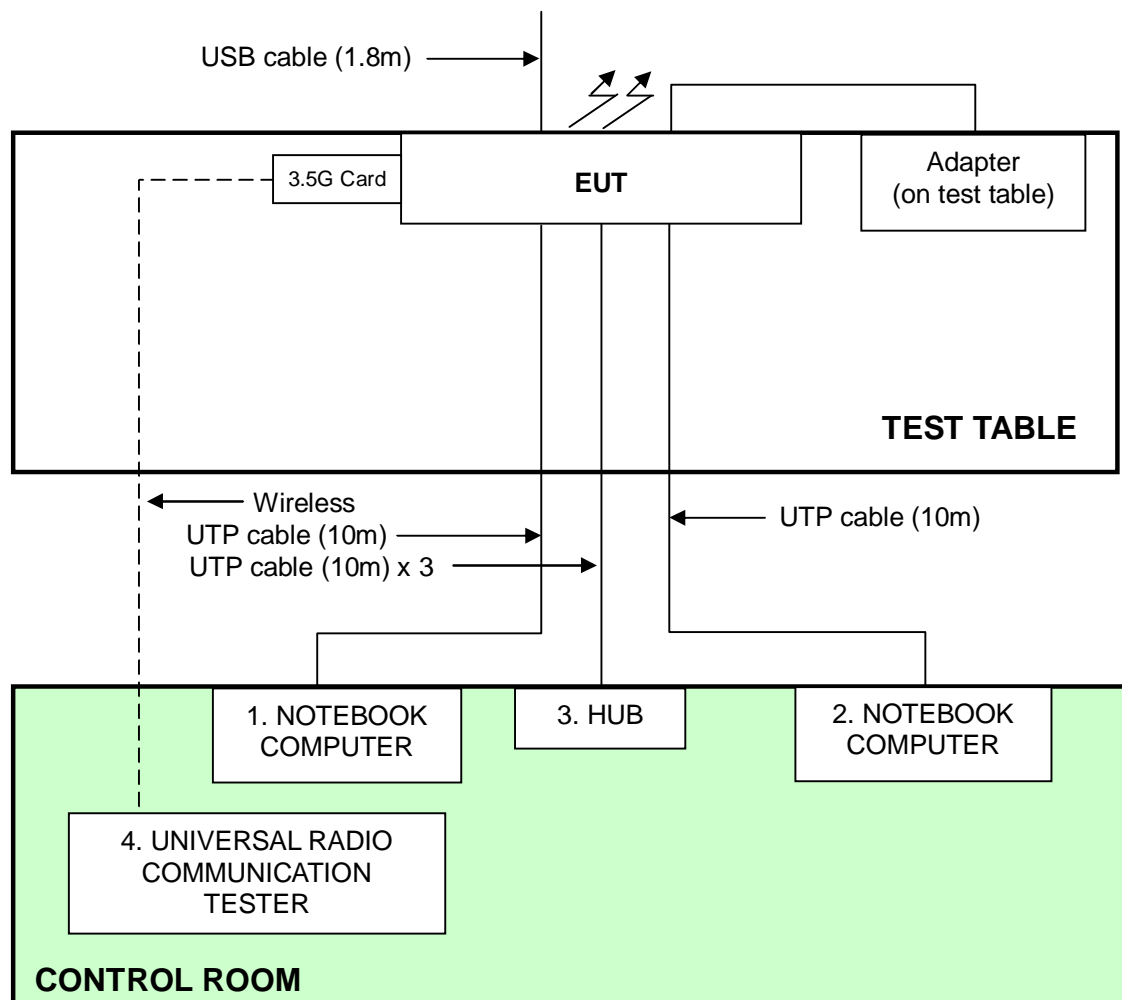
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	NOTEBOOK COMPUTER	DELL	PP18L	6976685584	DoC
2	NOTEBOOK COMPUTER	DELL	D531	CN-0XM006-48643-86L-4472	QDS-BRCM1019
3	HUB	ZyXEL	ES-116P	S060H02000215	DoC
4	UNIVERSAL RADIO COMMUNICATION TESTER	R&S	CMU200	104484	NA

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

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

3.6 CONFIGURATION OF SYSTEM UNDER 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 (dB μ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56	56 to 46
0.5-5	56	46
5-30	60	50

- NOTE:**
1. The lower limit shall apply at the transition frequencies.
 2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.
 3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

4.1.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver	ESCS 30	100375	Mar. 23, 2009	Mar. 22, 2010
Line-Impedance Stabilization Network (for Peripheral)	ENV-216	100071	Nov. 26, 2008	Nov. 25, 2009
Line-Impedance Stabilization Network (for EUT)	ESH3-Z5	848773/004	Nov. 05, 2008	Nov. 04, 2009
RF Cable (JYEBAO)	5DFB	COBCAB-001	Aug. 15, 2008	Aug. 14, 2009
50 ohms Terminator	50	3	Nov. 05, 2008	Nov. 04, 2009
Software	BV ADT_Cond_V7.3.7	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. B.
3. The VCCI Con B Registration No. is C-2193.

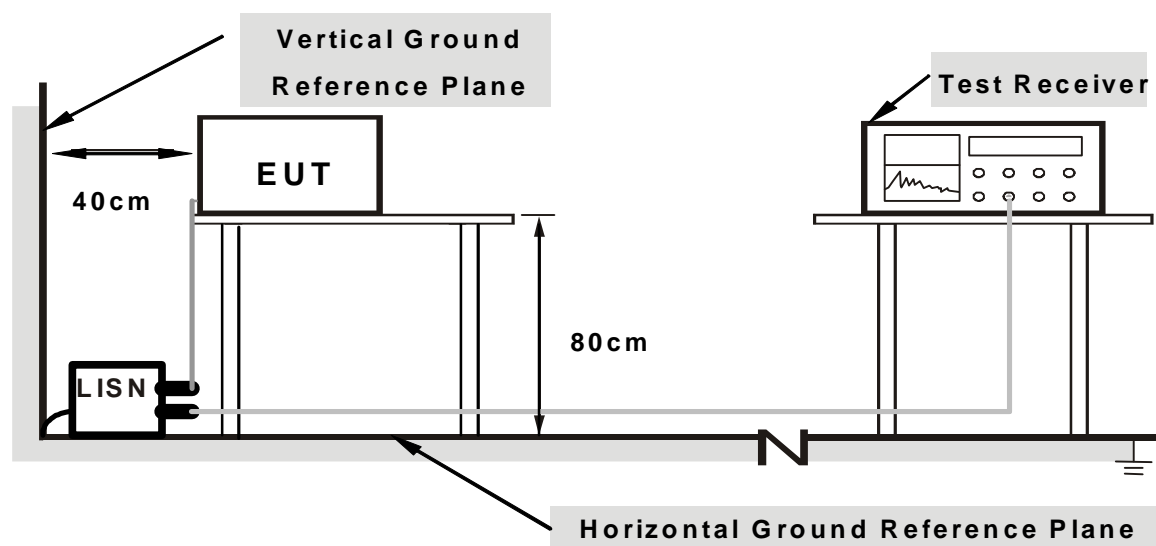
4.1.3 TEST PROCEDURES

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

4.1.4 DEVIATION FROM TEST STANDARD

No deviation

4.1.5 TEST SETUP



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

2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

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



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4.1.6 EUT OPERATING CONDITIONS

- a. Placed the EUT on testing table.
- b. The 3.5G card link support unit 4 (Universal Radio Communication Tester) via wireless.
- c. Prepared other computer systems (support unit 1 ~ 2) to act as communication partners and placed them outside of testing area.
- d. The communication partners run test program "art_v0_9_b7" to enable EUT under transmission/receiving condition continuously via UTP cables.
- e. Repeat steps b-e.

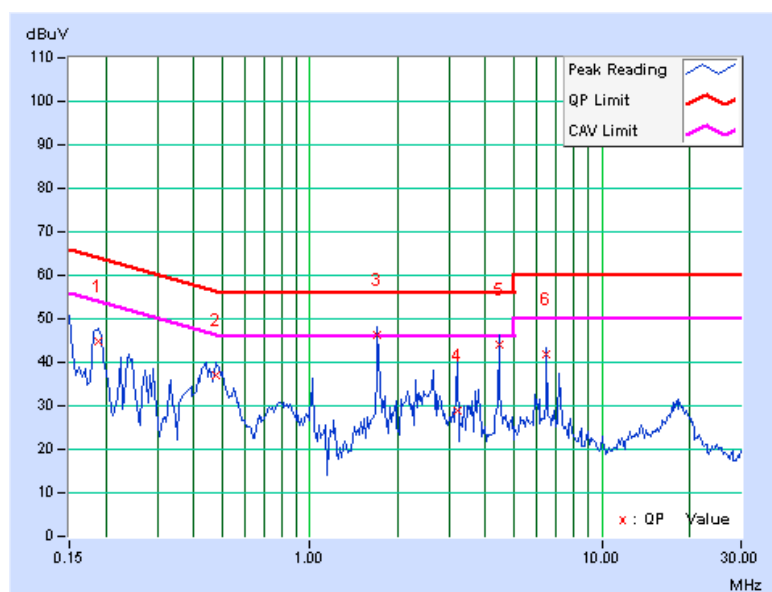
4.1.7 TEST RESULTS

DRAFT 802.11b DSSS MODULATION (Mode 1)

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 1	PHASE	Line (L)
INPUT POWER	120Vac, 60 Hz	6dB BANDWIDTH	9 kHz
ENVIRONMENTAL CONDITIONS	26deg. C, 58%RH, 972hPa	TESTED BY	Eric Lee

No	Freq.	Corr.	Reading Value		Emission Level		Limit		Margin	
	[MHz]	Factor	[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
		(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.189	0.21	44.51	-	44.72	-	64.08	54.08	-19.35	-
2	0.478	0.44	36.49	-	36.93	-	56.37	46.37	-19.44	-
3	1.707	0.37	45.83	44.13	46.20	44.50	56.00	46.00	-9.80	-1.50
4	3.188	0.51	28.43	-	28.94	-	56.00	46.00	-27.06	-
5	4.441	0.59	43.56	-	44.15	-	56.00	46.00	-11.85	-
6	6.484	0.63	41.33	-	41.96	-	60.00	50.00	-18.04	-

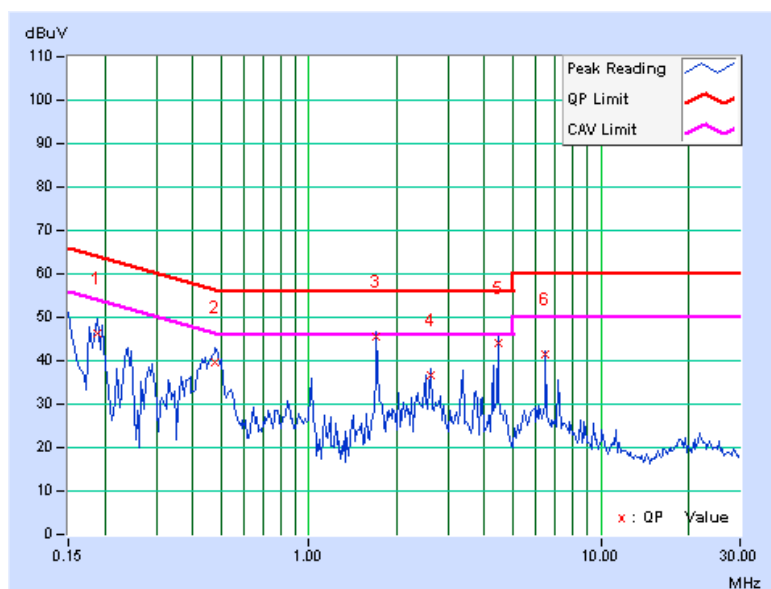
- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
 2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
 3. The emission levels of other frequencies were very low against the limit.
 4. Margin value = Emission level - Limit value
 5. Correction factor = Insertion loss + Cable loss
 6. Emission Level = Correction Factor + Reading Value.



EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 1	PHASE	Neutral (N)
INPUT POWER	120Vac, 60 Hz	6dB BANDWIDTH	9 kHz
ENVIRONMENTAL CONDITIONS	26deg. C, 58%RH, 972hPa	TESTED BY	Eric Lee

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.189	0.14	46.16	-	46.30	-	64.08	54.08	-17.77	-
2	0.478	0.37	39.36	-	39.73	-	56.37	46.37	-16.64	-
3	1.707	0.29	45.41	-	45.70	-	56.00	46.00	-10.30	-
4	2.609	0.38	36.14	-	36.52	-	56.00	46.00	-19.48	-
5	4.438	0.51	43.48	-	43.99	-	56.00	46.00	-12.01	-
6	6.484	0.53	41.11	-	41.64	-	60.00	50.00	-18.36	-

- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
 2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
 3. The emission levels of other frequencies were very low against the limit.
 4. Margin value = Emission level - Limit value
 5. Correction factor = Insertion loss + Cable loss
 6. Emission Level = Correction Factor + Reading Value.

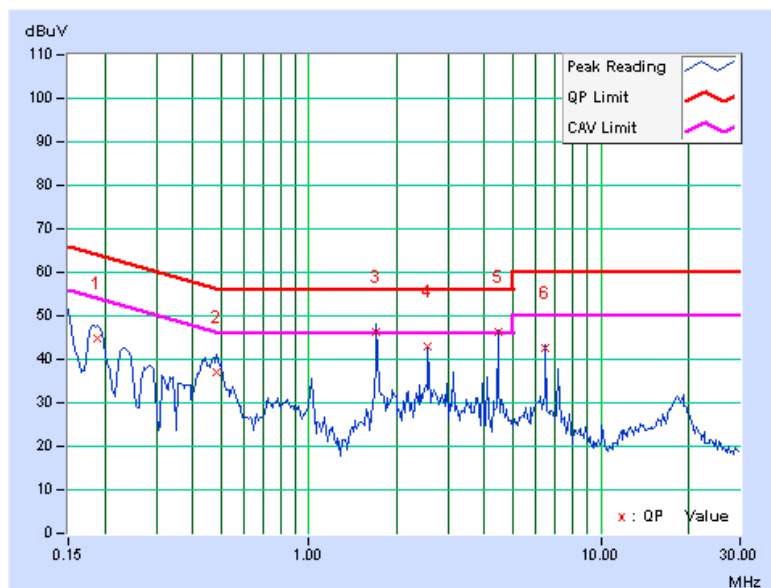


DRAFT 802.11b DSSS MODULATION (Mode 2)

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 1	PHASE	Line (L)
INPUT POWER	120Vac, 60 Hz	6dB BANDWIDTH	9 kHz
ENVIRONMENTAL CONDITIONS	26deg. C, 58%RH, 972hPa	TESTED BY	Eric Lee

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.189	0.21	44.45	-	44.66	-	64.08	54.08	-19.41	-
2	0.482	0.44	36.59	-	37.03	-	56.30	46.30	-19.28	-
3	1.707	0.37	46.03	44.37	46.40	44.74	56.00	46.00	-9.60	-1.26
4	2.566	0.46	42.32	-	42.78	-	56.00	46.00	-13.22	-
5	4.441	0.59	45.74	44.11	46.33	44.70	56.00	46.00	-9.67	-1.30
6	6.488	0.63	42.04	-	42.67	-	60.00	50.00	-17.33	-

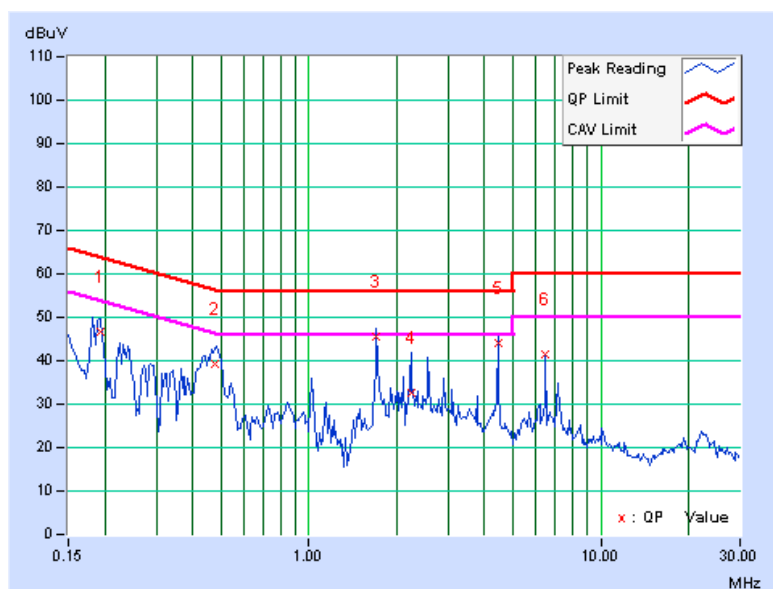
- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
 2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
 3. The emission levels of other frequencies were very low against the limit.
 4. Margin value = Emission level - Limit value
 5. Correction factor = Insertion loss + Cable loss
 6. Emission Level = Correction Factor + Reading Value.



EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 1	PHASE	Neutral (N)
INPUT POWER	120Vac, 60 Hz	6dB BANDWIDTH	9 kHz
ENVIRONMENTAL CONDITIONS	26deg. C, 58%RH, 972hPa	TESTED BY	Eric Lee

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.193	0.15	46.44	-	46.59	-	63.91	53.91	-17.32	-
2	0.478	0.37	38.75	-	39.12	-	56.37	46.37	-17.25	-
3	1.707	0.29	45.14	-	45.43	-	56.00	46.00	-10.57	-
4	2.234	0.35	32.17	-	32.52	-	56.00	46.00	-23.48	-
5	4.441	0.51	43.71	-	44.22	-	56.00	46.00	-11.78	-
6	6.488	0.53	40.82	-	41.35	-	60.00	50.00	-18.65	-

- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
 2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
 3. The emission levels of other frequencies were very low against the limit.
 4. Margin value = Emission level - Limit value
 5. Correction factor = Insertion loss + Cable loss
 6. Emission Level = Correction Factor + Reading Value.

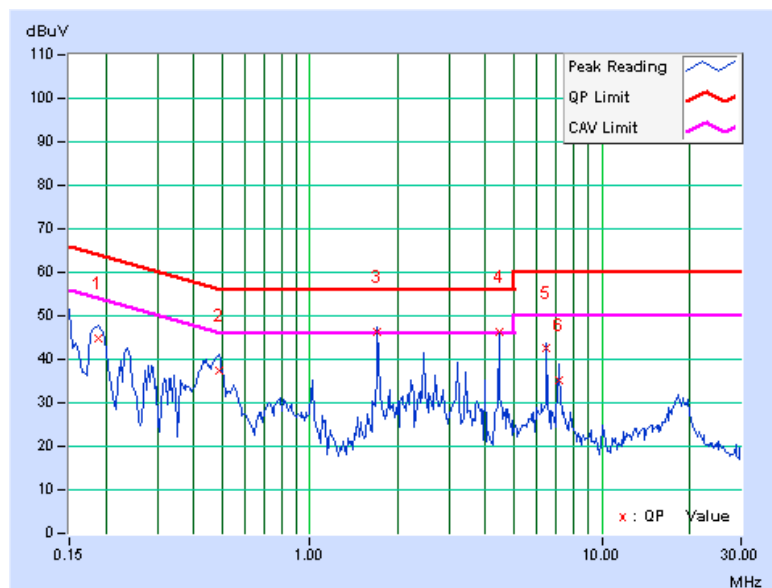


DRAFT 802.11b DSSS MODULATION (Mode 3)

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 1	PHASE	Line (L)
INPUT POWER	120Vac, 60 Hz	6dB BANDWIDTH	9 kHz
ENVIRONMENTAL CONDITIONS	26deg. C, 58%RH, 972hPa	TESTED BY	Eric Lee

No	Freq.	Corr.	Reading Value		Emission Level		Limit		Margin	
	[MHz]	Factor	[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.189	0.21	44.47	-	44.68	-	64.08	54.08	-19.39	-
2	0.486	0.44	36.90	-	37.34	-	56.24	46.24	-18.90	-
3	1.707	0.37	45.97	44.31	46.34	44.68	56.00	46.00	-9.66	-1.32
4	4.438	0.59	45.66	44.02	46.25	44.61	56.00	46.00	-9.75	-1.39
5	6.484	0.63	41.81	-	42.44	-	60.00	50.00	-17.56	-
6	7.164	0.65	34.63	-	35.28	-	60.00	50.00	-24.72	-

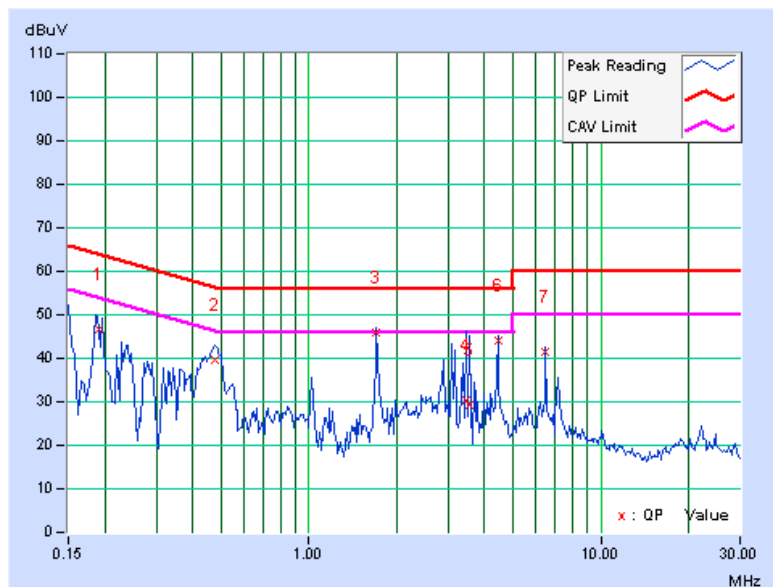
- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
 2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
 3. The emission levels of other frequencies were very low against the limit.
 4. Margin value = Emission level - Limit value
 5. Correction factor = Insertion loss + Cable loss
 6. Emission Level = Correction Factor + Reading Value.



EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 1	PHASE	Neutral (N)
INPUT POWER	120Vac, 60 Hz	6dB BANDWIDTH	9 kHz
ENVIRONMENTAL CONDITIONS	26deg. C, 58%RH, 972hPa	TESTED BY	Eric Lee

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.190	0.14	46.57	-	46.71	-	64.02	54.02	-17.31	-
2	0.474	0.38	39.14	-	39.52	-	56.44	46.44	-16.92	-
3	1.707	0.29	45.47	-	45.76	-	56.00	46.00	-10.24	-
4	3.457	0.46	29.89	-	30.35	-	56.00	46.00	-25.65	-
5	3.551	0.47	28.86	-	29.33	-	56.00	46.00	-26.67	-
6	4.441	0.51	43.55	-	44.06	-	56.00	46.00	-11.94	-
7	6.488	0.53	40.80	-	41.33	-	60.00	50.00	-18.67	-

- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
 2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
 3. The emission levels of other frequencies were very low against the limit.
 4. Margin value = Emission level - Limit value
 5. Correction factor = Insertion loss + Cable loss
 6. Emission Level = Correction Factor + Reading Value.



4.2 RADIATED EMISSION MEASUREMENT

4.2.1 LIMITS OF RADIATED EMISSION MEASUREMENT

Emissions radiated outside of the specified bands, shall be according to the general radiated limits in 15.209 as following:

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. As shown in 15.35(b), 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.



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4.2.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
ROHDE & SCHWARZ Spectrum Analyzer	FSP40	100036	Dec. 09, 2008	Dec. 08, 2009
Agilent PSA Spectrum Analyzer	E4446A	MY46180622	Apr. 24 , 2009	Apr. 23 , 2010
HP Pre_Amplifier	8449B	3008A01923	Nov. 10, 2008	Nov. 09, 2009
ROHDE & SCHWARZ Test Receiver	ESCS30	847124/029	Sep. 09, 2008	Sep. 08, 2009
SCHWARZBECK TRILOG Broadband Antenna	VULB 9168	138	April 29, 2009	April 28, 2010
Schwarzbeck Horn_Antenna	BBHA9120	D124	Dec. 09, 2008	Dec. 08, 2009
Schwarzbeck Horn_Antenna	BBHA 9170	BBHA9170153	Jan. 22, 2009	Jan. 21, 2010
RF Switches	EMH-011	08009	Oct. 07, 2008	Oct. 06, 2009
RF CABLE (Chaintek)	Sucoflex 106	28077	Aug. 15, 2008	Aug. 14, 2009
RF Cable	8DFB	STCCAB-30M-1GHz	Oct. 07, 2008	Oct. 06, 2009
Software	ADT_Radiated_V7.6.15.9.2	NA	NA	NA
CT Antenna Tower & Turn Table	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, HP preamplifier (model: 8449B) and Spectrum Analyzer (model: FSP40) are used only for the measurement of emission frequency above 1GHz if tested.

3. The test was performed in Open Site No. C.

4. The FCC Site Registration No. is 656396.

5. The VCCI Site Registration No. is R-1626.

6. The CANADA Site Registration No. is IC 7450G-3.

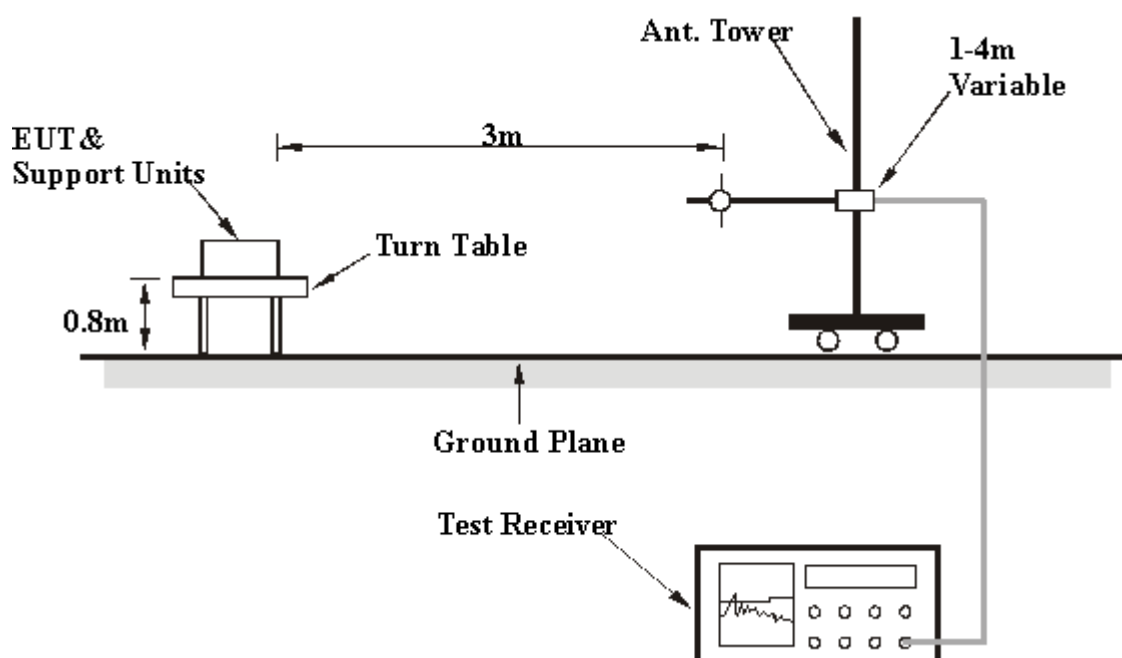
4.2.3 TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10 meter open area test site. 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 antenna is a broadband antenna, and its height 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 Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

NOTE:

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

4.2.4 TEST SETUP



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

4.2.5 EUT OPERATING CONDITIONS

Same as 4.1.6



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4.2.6 TEST RESULTS

BELOW 1GHz WORST-CASE DATA : DRAFT 802.11n (40MHz) OFDM MODULATION (Mode 1)

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 4	FREQUENCY RANGE	30-1000 MHz
INPUT POWER	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	31deg. C, 57%RH 972hPa	TESTED BY	Eric Lee

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	250.00	40.55 QP	46.00	-5.45	1.00 H	69	26.30	14.25
2	375.00	39.11 QP	46.00	-6.89	1.23 H	62	20.30	18.81
3	500.00	37.69 QP	46.00	-8.31	1.11 H	116	15.20	22.49
4	625.00	37.48 QP	46.00	-8.52	1.01 H	85	12.20	25.29
5	750.00	37.11 QP	46.00	-8.89	1.09 H	78	10.20	26.91
6	1000.00	42.44 QP	54.00	-11.56	1.00 H	99	11.70	30.74

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	250.00	39.05 QP	46.00	-6.95	1.20 V	148	24.80	14.25
2	375.00	38.51 QP	46.00	-7.49	1.58 V	61	19.70	18.81
3	500.00	35.59 QP	46.00	-10.41	1.58 V	66	13.10	22.49
4	625.00	37.59 QP	46.00	-8.41	1.32 V	240	12.30	25.29
5	750.00	37.91 QP	46.00	-8.09	1.33 V	62	11.00	26.91
6	875.00	34.29 QP	46.00	-11.71	1.71 V	135	5.00	29.29
7	1000.00	40.64 QP	54.00	-13.36	1.01 V	212	9.90	30.74

- 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.



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BELOW 1GHz WORST-CASE DATA : DRAFT 802.11n (40MHz) OFDM MODULATION (Mode 2)

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 4	FREQUENCY RANGE	30-1000 MHz
INPUT POWER	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	31deg. C, 57%RH 972hPa	TESTED BY	Eric Lee

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	250.00	39.87 QP	46.00	-6.13	1.19 H	72	25.62	14.25
2	375.00	42.82 QP	46.00	-3.18	1.00 H	194	24.01	18.81
3	500.00	36.86 QP	46.00	-9.14	1.33 H	243	14.37	22.49
4	625.00	39.22 QP	46.00	-6.78	1.08 H	199	13.93	25.29
5	750.00	38.57 QP	46.00	-7.43	1.14 H	107	11.66	26.91
6	875.00	33.54 QP	46.00	-12.46	1.14 H	20	4.25	29.29

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	125.00	30.68 QP	43.50	-12.82	1.03 V	150	17.61	13.07
2	250.00	40.45 QP	46.00	-5.55	1.58 V	135	26.20	14.25
3	375.00	34.40 QP	46.00	-11.60	1.03 V	126	15.59	18.81
4	500.00	38.09 QP	46.00	-7.91	1.38 V	247	15.60	22.49
5	625.00	38.55 QP	46.00	-7.45	1.38 V	181	13.27	25.29
6	750.00	39.23 QP	46.00	-6.77	1.11 V	267	12.32	26.91

- 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.



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BELOW 1GHz WORST-CASE DATA : DRAFT 802.11n (40MHz) OFDM MODULATION (Mode 3)

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 4	FREQUENCY RANGE	30-1000 MHz
INPUT POWER	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	31deg. C, 57%RH 972hPa	TESTED BY	Eric Lee

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	250.00	39.95 QP	46.00	-6.05	1.00 H	58	25.70	14.25
2	375.00	38.61 QP	46.00	-7.39	1.00 H	252	19.80	18.81
3	500.00	38.79 QP	46.00	-7.21	1.20 H	256	16.30	22.49
4	625.00	37.48 QP	46.00	-8.52	1.00 H	205	12.20	25.29
5	750.00	36.71 QP	46.00	-9.29	1.02 H	37	9.80	26.91
6	1000.00	38.74 QP	54.00	-15.26	1.21 H	225	8.00	30.74

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	250.00	37.05 QP	46.00	-8.95	1.20 V	326	22.80	14.25
2	375.00	37.01 QP	46.00	-8.99	1.11 V	85	18.20	18.81
3	500.00	36.82 QP	46.00	-9.18	1.69 V	95	14.33	22.49
4	625.00	37.19 QP	46.00	-8.81	1.87 V	96	11.90	25.29
5	750.00	40.11 QP	46.00	-5.89	1.62 V	65	13.20	26.91
6	875.00	35.29 QP	46.00	-10.71	1.25 V	41	6.00	29.29
7	1000.00	40.84 QP	54.00	-13.16	1.11 V	155	10.10	30.74

- 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.



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4.2.7 TEST RESULTS

Above 1GHz WORST-CASE DATA : DRAFT 802.11n (40MHz) OFDM MODULATION (Mode 1)

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 4	FREQUENCY RANGE	1 ~ 17.5GHz
INPUT POWER	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	28deg. C, 65%RH 972hPa	TESTED BY	Eric Lee

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	4874.00	44.50 PK	74.00	-29.50	1.31 H	271	7.58	36.92
2	4874.00	32.60 AV	54.00	-21.40	1.31 H	271	-4.32	36.92
3	7311.00	59.40 PK	74.00	-14.60	1.22 H	36	16.26	43.14
4	7311.00	46.50 AV	54.00	-7.50	1.22 H	36	3.36	43.14

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	4874.00	44.10 PK	74.00	-29.90	1.41 V	97	7.18	36.92
2	4874.00	34.12 AV	54.00	-19.88	1.41 V	97	-2.80	36.92
3	7311.00	63.80 PK	74.00	-10.20	1.00 V	38	20.66	43.14
4	7311.00	49.10 AV	54.00	-4.90	1.00 V	38	5.96	43.14

- 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.



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Above 1GHz WORST-CASE DATA : DRAFT 802.11n (40MHz) OFDM MODULATION (Mode 2)

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 4	FREQUENCY RANGE	1 ~ 17.5GHz
INPUT POWER	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	28deg. C, 65%RH 972hPa	TESTED BY	Eric Lee

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	4874.00	43.28 PK	74.00	-30.72	1.47 H	123	6.36	36.92
2	4874.00	33.14 AV	54.00	-20.86	1.47 H	123	-3.78	36.92
3	7311.00	58.37 PK	74.00	-15.63	1.33 H	284	15.23	43.14
4	7311.00	45.38 AV	54.00	-8.62	1.33 H	284	2.24	43.14

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	4874.00	43.28 PK	74.00	-30.72	1.05 V	28	6.36	36.92
2	4874.00	33.14 AV	54.00	-20.86	1.05 V	28	-3.78	36.92
3	7311.00	62.04 PK	74.00	-11.96	1.51 V	47	18.90	43.14
4	7311.00	48.64 AV	54.00	-5.36	1.51 V	47	5.50	43.14

- 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.



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Above 1GHz WORST-CASE DATA : DRAFT 802.11n (40MHz) OFDM MODULATION (Mode 3)

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 4	FREQUENCY RANGE	1 ~ 17.5GHz
INPUT POWER	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	28deg. C, 65%RH 972hPa	TESTED BY	Eric Lee

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	4874.00	44.30 PK	74.00	-29.70	1.37 H	158	7.38	36.92
2	4874.00	33.70 AV	54.00	-20.30	1.37 H	158	-3.22	36.92
3	7311.00	58.11 PK	74.00	-15.89	1.39 H	169	14.97	43.14
4	7311.00	46.64 AV	54.00	-7.36	1.39 H	169	3.50	43.14

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	4874.00	43.24 PK	74.00	-30.76	1.46 V	251	6.32	36.92
2	4874.00	33.95 AV	54.00	-20.05	1.46 V	251	-2.97	36.92
3	7311.00	62.11 PK	74.00	-11.89	1.28 V	37	18.97	43.14
4	7311.00	48.31 AV	54.00	-5.69	1.28 V	37	5.17	43.14

- 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.



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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 by the following approval agencies according to ISO/IEC 17025.

USA	FCC, NVLAP
Germany	TUV Rheinland
Japan	VCCI
Norway	NEMKO
Canada	INDUSTRY CANADA , CSA
R.O.C.	TAF, BSMI, NCC
Netherlands	Telefication
Singapore	GOST-ASIA(MOU)
Russia	CERTIS(MOU)

Copies of accreditation certificates of our laboratories obtained from approval agencies can be downloaded from our web site: www.adt.com.tw/index.5/phtml.
If you have any comments, please feel free to contact us at the following:

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Hsin Chu EMC/RF Lab:

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Email: service@adt.com.tw

Web Site: www.adt.com.tw

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



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

No any modifications are made to the EUT by the lab during the test.

--- END ---