

# FCC TEST REPORT

REPORT NO.: RF991013C15A
 MODEL NO.: CTR35
 FCC ID: UXX-CTR35
 RECEIVED: Mar. 24, 2011
 TESTED: Mar. 28 ~ Mar. 29, 2011
 ISSUED: Apr. 06, 2011

**APPLICANT:** Cradlepoint, Inc.

ADDRESS: 805 West Franklin Street. Boise, ID 83702

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

- **LAB ADDRESS:** No. 47, 14th Ling, Chia Pau Tsuen, Lin Kou Hsiang, Taipei Hsien 244, Taiwan, R.O.C.
- **TEST LOCATION:** No. 19, Hwa Ya 2nd Rd, Wen Hwa Tsuen, Kwei Shan Hsiang, Taoyuan Hsien 333, Taiwan, R.O.C.

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### **RELEASE CONTROL RECORD**

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
Original release	N/A	Apr. 06, 2011



### 1. CERTIFICATION

PRODUCT: Cellular Travel Router MODEL: CTR35 BRAND: cradlepoint APPLICANT: Cradlepoint, Inc. TESTED: Mar. 28 ~ Mar. 29, 2011 TEST SAMPLE: ENGINEERING SAMPLE STANDARDS: FCC Part 15, Subpart C (Section 15.247) ANSI C63.4-2003 ANSI C63.10-2009

This report is issued as a supplementary report of RF991013C15. This report shall be used combined together with its original report.

PREPARED BY :	Folly Chien / Specialist	_ , DATE :	Apr. 06, 2011
APPROVED BY :	Gary Chang / Assistant Manage	_ , <b>DATE :</b>	Apr. 06, 2011
NOTE: The conducted em addendum. Refer	ission & radiated emission 30MHz ∼ to original report for the other test da	· 1GHz tests we ata.	re performed for the



## 2. SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications.

APPLIED STANDARD: FCC 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 -17.56dB at 0.150MHz.				
15.247(a)(2)	Refer to Note						
15.247(b)	Maximum Peak Output Power Limit: max. 30dBm	NA	Refer to Note				
15.247(d)	Radiated Emissions Limit: Table 15.209	PASS	Meet the requirement of limit. Minimum passing margin is -4.3dB at 480.97MHz.				
15.247(e)	Power Spectral Density Limit: max. 8dBm	NA	Refer to Note				
15.247(d)	Band Edge Measurement Limit: 20dB less than the peak value of fundamental frequency	NA	Refer to Note				
15.203	Antenna Requirement	NA	Refer to Note				

**NOTE:** The conducted emission & radiated emission 30MHz ~ 1GHz tests were performed for the addendum. Refer to original report for the other test data.

### 2.1 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

MEASUREMENT	FREQUENCY	UNCERTAINTY
Conducted emissions	150kHz~30MHz	2.44 dB
	30MHz ~ 200MHz	2.93 dB
Radiated emissions	200MHz ~1000MHz	2.95 dB
Radiated emissions	1GHz ~ 18GHz	2.26 dB
	18GHz ~ 40GHz	1.94 dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.



## 3. GENERAL INFORMATION

#### 3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	Cellular Travel Router
MODEL NO.	CTR35
FCC ID	UXX-CTR35
POWER SUPPLY	12Vdc (adapter)
MODULATION TYPE	CCK, DQPSK, DBPSK for DSSS
MODULATION TYPE	64QAM, 16QAM, QPSK, BPSK for OFDM
MODULATION TECHNOLOGY	DSSS, OFDM
	802.11b:11/5.5/2/1Mbps
TRANSFER RATE	802.11g: 54/48/36/24/18/12/9/6Mbps
	802.11n: up to 130Mbps
OPERATING FREQUENCY	2412MHz ~ 2462MHz
NUMBER OF CHANNEL	11 for 802.11b, 802.11g, 802.11n (20MHz)
NOMBER OF CHANNEE	7 for 802.11n (40MHz)
MAXIMUM OUTPUT POWER	107.2mW
ANTENNA TYPE	Printed antenna with 1dBi gain
ANTENNA CONNECTOR	NA
DATA CABLE	NA
I/O PORTS	Refer to user's manual
ACCESSORY DEVICES	Adapter

#### NOTE:

- This report is a supplementary report of RF991013C15. This report is prepared for FCC class II
  permissive change. The differences compared with original report are adding a FCC adapter and
  changing the applicant's address. Therefore the conducted emission & radiated emission 30MHz ~
  1GHz items are re-tested in this report.
- 2. The EUT provides one completed transmitter and one receiver.

MODULATION MODE	TX FUNCTION
802.11b	1TX
802.11g	1TX
802.11n (20MHz)	1TX
802.11n (40MHz)	1TX

3. Co-transmitting emission of WiLAN and 3G/4G dongle have been evaluated and no non-compliance detected.



4. The EUT was powered by the following adapter:

Adapter (New)	
BRAND:	TENPAO
MODEL:	S018EM1200150
INPUT:	100-240Vac, 50/60Hz, 500mA
OUTPUT:	12Vdc, 1500mA
POWER LINE:	1.8m non-shielded cable without core

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

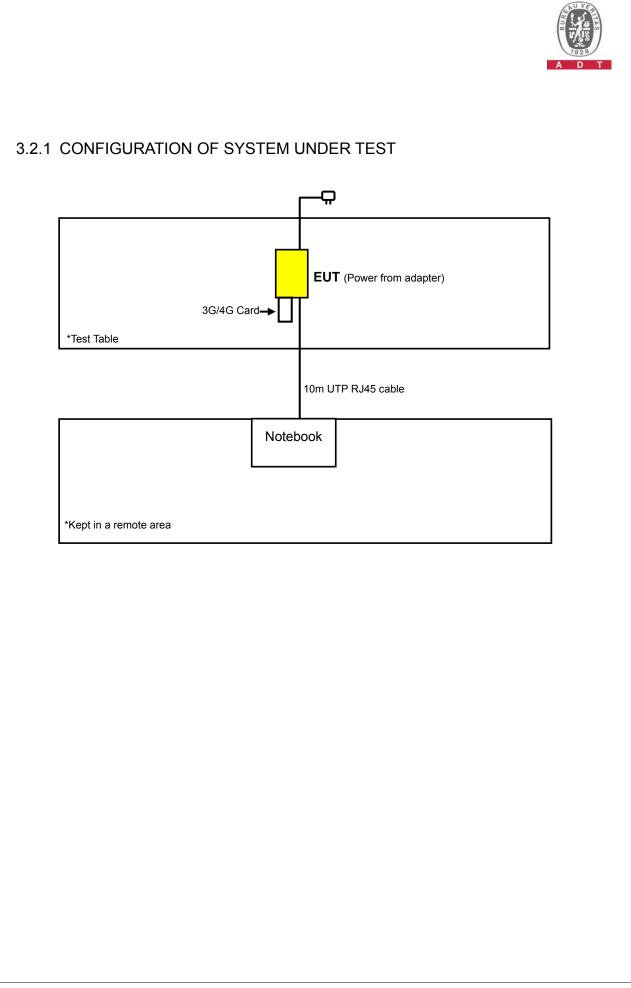
#### 3.2 DESCRIPTION OF TEST MODES

Eleven channels are provided for 802.11b, 802.11g and draft 802.11n (20MHz).

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
1	2412MHz	7	2442MHz
2	2417MHz	8	2447MHz
3	3 2422MHz		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		





### 3.2.2 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

	EUT		APPLICA	BLE TO						
	CONFIGURE MODE	F	RE<1G	PLC			DESCRIPTIO			
	-		$\checkmark$	$\checkmark$		-				
	Where         PLC: Power Line Conducted Emission         RE<1G: Radiated Emission below 1GHz									
RAD	RADIATED EMISSION TEST (BELOW 1 GHz):									
$\boxtimes$	Pre-Scan has been conducted to determine the worst-case mode from all possible combinations									
	between availa			data rates,	XYZ a>	is and	antenna ports	s (if EUT	with a	ntenna
$\boxtimes$	diversity archit Following cha			selected for	or the fi	nal tes	t as listed belo	ow.		
				TEATED	MODUL	ATION		DATA		1
	MODE		AVAILABLE CHANNEL	TESTED CHANNEL			MODULATION TYPE	RATE	AXIS	
	802.11n (20M	IHz)	1 to 11	11	OF	DM	BPSK	(Mbps) 6.5	Y	
		,					-	-		1
POV	ER LINE CON	IDUCT	FED EMISSI	<u>ON TEST:</u>						
$\boxtimes$	Pre-Scan has between availa							•		
	architecture).						, , , , , , , , , , , , , , , , , , ,		nna ui	versity
$\boxtimes$	Following cha	nnel(s								1
	MODE		AVAILABLE CHANNEL	TESTED CHANNEL		-	MODULATION TYPE	DATA F (Mbj		
	802.11n (20N	IHz)	1 to 11	11	OF	DM	BPSK	6.5	5	
										•
TEO		_								
153	T CONDITION:	_								
	APPLICABLE	то	ENVIRONMEN		TIONS	INP	UT POWER	TESTE	D BY	
	RE<1G		25 deg. C, 6	8% RH, 1002	hPa	12	0Vac, 60Hz	Sun	Lin	
	PLC		23 deg. C, 63% RH, 1005 hPa		120Vac, 60Hz		Brad	Wu		
										•



### 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 C (15.247) ANSI C63.4-2003 ANSI C63.10-2009

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

**NOTE**: The EUT is also considered as a kind of computer peripheral, because the connection to computer is necessary for typical use. It 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 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	DELL	D531	CN-0XM006-48643 -81U-2610	QDS-BRCM1020
2	3G/4G Card	SPRINT	CMU-300	NA	TARCMU-300

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	10m UTP RJ45 cable.
2	NA

#### NOTE:

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

- 2. Item 1 acted as a communication partner to transfer data.
- 3. Item 2 was provided by the client.



## 4. TEST TYPES AND RESULTS

#### 4.1 RADIATED EMISSION MEASUREMENT

#### 4.1.1 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.



#### 4.1.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver ROHDE & SCHWARZ	FSCI		Aug. 04, 2010	Aug. 03, 2011
Spectrum Analyzer ROHDE & SCHWARZ		100041	Jul. 09, 2010	Jul. 08, 2011
BILOG Antenna VULB9168 SCHWARZBECK		9168-156	Apr. 30, 2010	Apr. 29, 2011
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-209	Aug. 02, 2010	Aug. 01, 2011
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170243	Dec. 27, 2010	Dec. 26, 2011
Preamplifier Agilent	8449B	3008A01910	Sep. 09, 2010	Sep. 08, 2011
Preamplifier Agilent	8447D	2944A10638	Nov. 03, 2010	Nov. 02, 2011
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	218190/4 231241/4	May 14, 2010	May 13, 2011
RF signal cable Worken	8D-FB	Cable-HYCH9-01	Aug. 20, 2010	Aug. 19, 2011
Software	oftware ADT_Radiated_ V7.6.15.9.2		NA	NA
Antenna Tower EMCO	2070/2080		NA	NA
Turn Table EMCO	2087-2.03	NA	NA	NA
Antenna Tower &Turn Table Controller EMCO	2090	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 HwaYa Chamber 9.
- 3. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
- 4. The FCC Site Registration No. is 460141.
- 5. The IC Site Registration No. is IC 7450F-4.



#### 4.1.3 TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meters semi-anechoic chamber. 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 lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

#### NOTE:

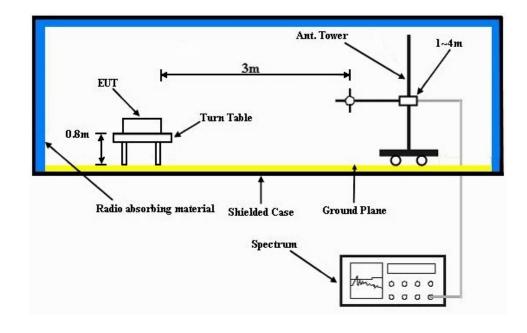
- 1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Peak detection (PK) and Quasi-peak detection (QP) at frequency below 1GHz.
- 2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth is 3MHz for Peak detection at frequency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

#### 4.1.4 DEVIATION FROM TEST STANDARD

No deviation.



### 4.1.5 TEST SETUP



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

### 4.1.6 EUT OPERATING CONDITIONS

- a. Placed the EUT on the testing table.
- b. Prepared notebook system to act as a communication partner and placed it outside of testing area.
- c. The communication partner connected with EUT via a RJ45 cable and run a test program (provided by manufacturer) to enable EUT under transmission condition continuously at specific channel frequency.
- d. The necessary accessories enable the EUT in full functions.



### 4.1.7 TEST RESULTS

#### BELOW 1GHz WORST-CASE DATA : 802.11n (20MHz)

EUT TEST CONDITION		MEASUREMENT DETAIL			
CHANNEL	CHANNEL Channel 11		Below 1000MHz		
INPUT POWER	120\/ac_60Hz	DETECTOR FUNCTION	Quasi-Peak		
ENVIRONMENTAL CONDITIONS	25deg. C, 68%RH 1002 hPa	TESTED BY	Sun Lin		

	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	94.06	34.1 QP	43.5	-9.4	2.00 H	226	24.80	9.30			
2	187.39	32.3 QP	43.5	-11.2	1.25 H	253	20.60	11.70			
3	265.16	40.2 QP	46.0	-5.8	1.50 H	286	27.10	13.10			
4	356.54	37.0 QP	46.0	-9.0	1.50 H	148	21.90	15.10			
5	401.26	31.6 QP	46.0	-14.4	1.25 H	91	15.40	16.20			
6	480.97	34.3 QP	46.0	-11.7	1.50 H	10	15.60	18.70			
	ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	Correction Factor (dB/m)			
1	37.40	32.4 QP	40.0	-7.6	1.01 V	121	20.10	12.30			
2	94.06	35.6 QP	43.5	-7.9	1.00 V	178	26.30	9.30			
3	265.16	37.1 QP	46.0	-8.9	1.00 V	58	24.00	13.10			
4	354.60	40.4 QP	46.0	-5.6	1.50 V	10	25.40	15.00			
5	480.97	41.7 QP	46.0	-4.3	1.00 V	223	23.00	18.70			
6	801.78	37.4 QP	46.0	-8.6	1.25 V	112	12.00	25.40			

**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.



#### 4.2 CONDUCTED EMISSION MEASUREMENT

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

#### 4.2.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

**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.

### 4.2.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver ROHDE & SCHWARZ	ESCS30	100289	Nov. 23, 2010	Nov. 22, 2011
RF signal cable Woken	5D-FB	Cable-HYCO2-01	Dec. 30, 2010	Dec. 29, 2011
LISN ROHDE & SCHWARZ	ESH2-Z5	100100	Jan. 06, 2011	Jan. 05, 2012
LISN ROHDE & SCHWARZ	ESH3-Z5	100311	Jul. 08, 2010	Jul. 07, 2011
Software ADT	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 HwaYa Shielded Room 2.
- 3. The VCCI Site Registration No. is C-2047.



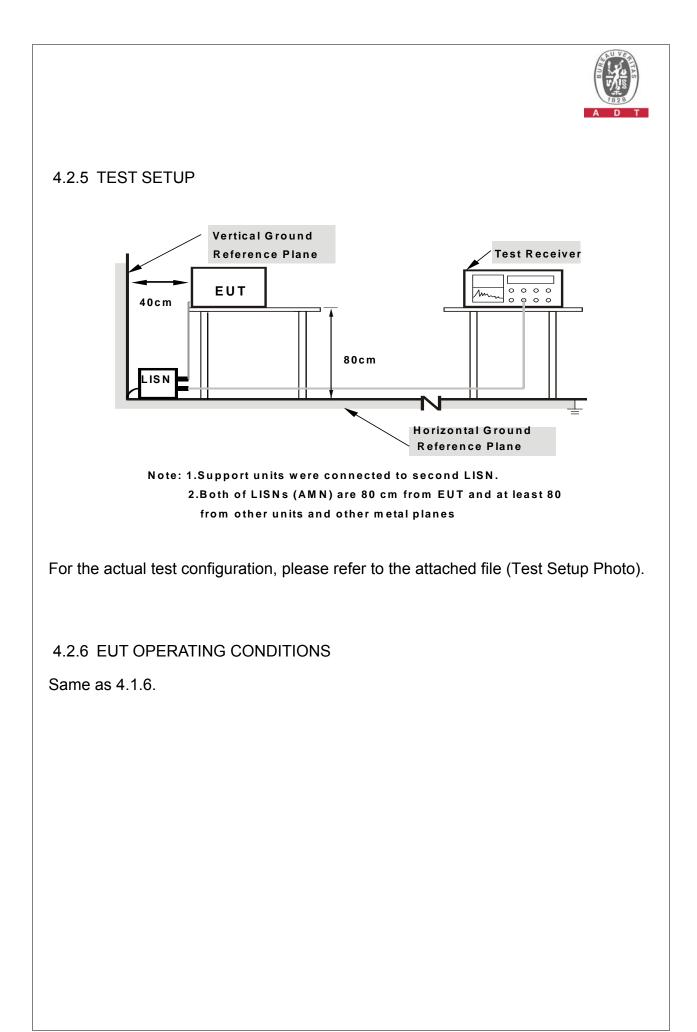
#### 4.2.3 TEST PROCEDURES

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

**NOTE:** All modes of operation were investigated and the worst-case emissions are reported.

#### 4.2.4 DEVIATION FROM TEST STANDARD

No deviation.





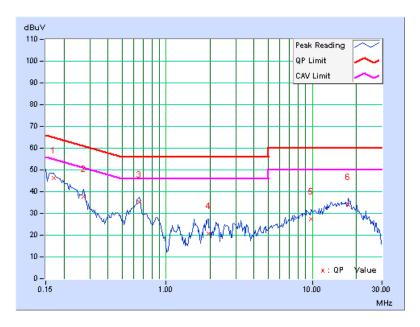
#### 4.2.7 TEST RESULTS

CONDUCTED WORST-CASE DATA: 802.11h (20MHZ)											
PHASE Line		Line 1	1			6dB BANDWIDTH			kHz		
No Freq.		Corr.	Readin	g Value		ission evel	Lir	nit	Mar	gin	
NO		Factor	[dB(	(uV)]	[dB	(uV)]	[dB	(uV)]	(d	3)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	. Q.P.	AV.	
1	0.170	0.15	46.30	-	46.45	-	64.98	54.9	8 -18.54	-	
2	0.271	0.16	37.70	-	37.86	-	61.08	51.0	8 -23.23	-	
3	0.658	0.18	35.10	-	35.28	-	56.00	46.0	0 -20.72	-	
4	1.953	0.22	20.70	-	20.92	-	56.00	46.0	0 -35.08	-	
5	9.805	0.55	26.96	-	27.51	-	60.00	50.0	0 -32.49	-	
6	17.695	1.02	33.02	-	34.04	-	60.00	50.0	0 -25.96	-	

#### CONDUCTED WORST-CASE DATA: 802.11n (20MHz)

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.



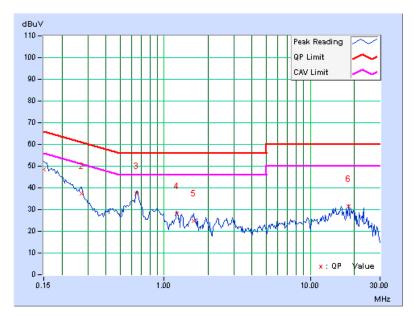


|--|

No	Freq.	Corr.	Reading	g Value		sion vel	Lir	nit	Mar	gin
		Factor	[dB (	(uV)]	[dB (	(uV)]	[dB	(uV)]	(dl	B)
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.150	0.16	48.28	-	48.44	-	66.00	56.00	-17.56	-
2	0.271	0.18	37.23	-	37.41	-	61.08	51.08	-23.68	-
3	0.650	0.20	37.28	-	37.48	-	56.00	46.00	-18.52	-
4	1.219	0.21	27.83	-	28.04	-	56.00	46.00	-27.96	-
5	1.602	0.22	24.54	-	24.76	-	56.00	46.00	-31.24	-
6	18.246	0.85	30.53	-	31.38	-	60.00	50.00	-28.62	-

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.





## 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.

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

Linko EMC/RF Lab Tel: 886-2-26052180 Fax: 886-2-26051924 Hsin Chu EMC/RF Lab Tel: 886-3-5935343 Fax: 886-3-5935342

Hwa Ya EMC/RF/Safety/Telecom Lab Tel: 886-3-3183232 Fax: 886-3-3185050

Email: <u>service@adt.com.tw</u> Web Site: <u>www.adt.com.tw</u>

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



### 7. APPENDIX A – MODIFICATION RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

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

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