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FCC TEST REPORT (CO-LOCATED)

REPORT NO.: RF991013C07-2

MODEL NO.: MR16

FCC ID: UDX-60012010

RECEIVED: Oct. 14, 2010

TESTED: Oct. 20 ~ Oct. 25, 2010

ISSUED: Nov. 01, 2010

APPLICANT: Meraki Inc.

ADDRESS: 99 Rhode Island St, 2nd floor San Francisco, CA 94103

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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1. CERTIFICATION

PRODUCT: Wireless 802.11 abgn AP

MODEL: MR16

BRAND: Meraki

APPLICANT: Meraki Inc.

TEST SAMPLE: ENGINEERING SAMPLE

TESTED: Oct. 20 ~ Oct. 25, 2010

STANDARDS: FCC Part 15, Subpart C (Section 15.247)

FCC Part 15, Subpart E (Section 15.407)

ANSI C63.4-2003

The above equipment (Model: MR16) 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 : Pettie Chen , **DATE** : Nov. 01, 2010
Pettie Chen / Specialist

**TECHNICAL
ACCEPTANCE** : Long Chen , **DATE** : Nov. 01, 2010
Responsible for RF : Long Chen / Senior Engineer

APPROVED BY : Gary Chang , **DATE** : Nov. 01, 2010
Gary Chang / Assistant Manager



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2. SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC PART 15, SUBPART C (SECTION 15.247) FCC PART 15, SUBPART E (SECTION 15.407)			
STANDARD SECTION	TEST TYPE AND LIMIT	RESULT	REMARK
15.207 15.407(b)(5)	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is -11.52dB at 18.244MHz.
15.247(d) 15.407(b/1/2/3) (b)(5)	Radiated Emissions	PASS	Meet the requirement of limit. Minimum passing margin is -1.0dB at 48.35 & 49.43MHz.

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
Radiated emissions	30MHz ~ 200MHz	3.34 dB
	200MHz ~1000MHz	3.35 dB
	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 $k = 2$.



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3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

EUT	Wireless 802.11 abgn AP
MODEL NO.	MR16
FCC ID	UDX-60012010
POWER SUPPLY	12Vdc (adapter) 48Vdc (POE)
MODULATION TYPE	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
MODULATION TECHNOLOGY	DSSS, OFDM
TRANSFER RATE	802.11b: 11.0/ 5.5/ 2.0/ 1.0Mbps 802.11g: 54.0/ 48.0/ 36.0/ 24.0/ 18.0/ 12.0/ 9.0/ 6.0Mbps 802.11a: 54.0/ 48.0/ 36.0/ 24.0/ 18.0/ 12.0/ 9.0/ 6.0Mbps 802.11n: up to 300.0Mbps
OPERATING FREQUENCY	2.4GHz: 2412 ~ 2462MHz 5.0GHz: 5180 ~ 5240MHz, 5745 ~ 5825MHz
NUMBER OF CHANNEL	2.4GHz: 11 for 802.11b, 802.11g 5.0GHz: 5180 ~ 5240MHz: 4 for 802.11a, 802.11n (20MHz) 2 for 802.11n (40MHz) 5745 ~ 5825MHz: 5 for 802.11a, 802.11n (20MHz) 2 for 802.11n (40MHz)
OUTPUT POWER	883.67mW for 2412 ~ 2462MHz 44.29mW for 5180 ~ 5240MHz 925.31mW for 5745 ~ 5825MHz
ANTENNA TYPE	PIFA antenna with 3dBi gain
DATA CABLE	NA
I/O PORTS	RJ45
ACCESSORY DEVICES	NA



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NOTE:

1. The frequency bands used in this EUT are listed as follows:

Frequency Band (MHz)	2412~2462	5180~5240	5745~5825
802.11b	√		
802.11g	√		
802.11a		√	√
802.11n (20MHz)	√	√	√
802.11n (40MHz)	√	√	√

2. The EUT were powered by the following adapter & POE:

ADAPTER	
MODEL:	AM-12100
INPUT:	120Vac, 60Hz, 20W
OUTPUT:	12Vdc, 1A
POWER LINE:	1.8m non-shielded cable without core

POE	
BRAND:	PowerDsine
MODEL:	PD-3001/AC
INPUT:	100-250Vac, 50/60Hz, 0.5A
OUTPUT:	48Vdc, 0.35A

* All as above are provided as support unit only.

3. The EUT incorporates a MIMO function. Physically, the EUT provides two completed transmitters and two receivers.

MODULATION MODE	TX FUNCTION
802.11b	2TX
802.11g	2TX
802.11a	2TX
802.11n (20MHz)	2TX
802.11n (40MHz)	2TX

4. 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.



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3.2 DESCRIPTION OF TEST MODES

FOR 2.4GHz:

11 channels are provided for 802.11b, 802.11g and 802.11n (20MHz):

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		

7 channels are provided for 802.11n (40MHz):

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

Operated in 5180 ~ 5240MHz

4 channels are provided for 802.11a, 802.11n (20MHz):

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

2 channels are provided for 802.11n (40MHz):

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
38	5190MHz	46	5230MHz



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Operated in 5745 ~ 5825MHz

5 channels are provided for 802.11a, 802.11n (20MHz):

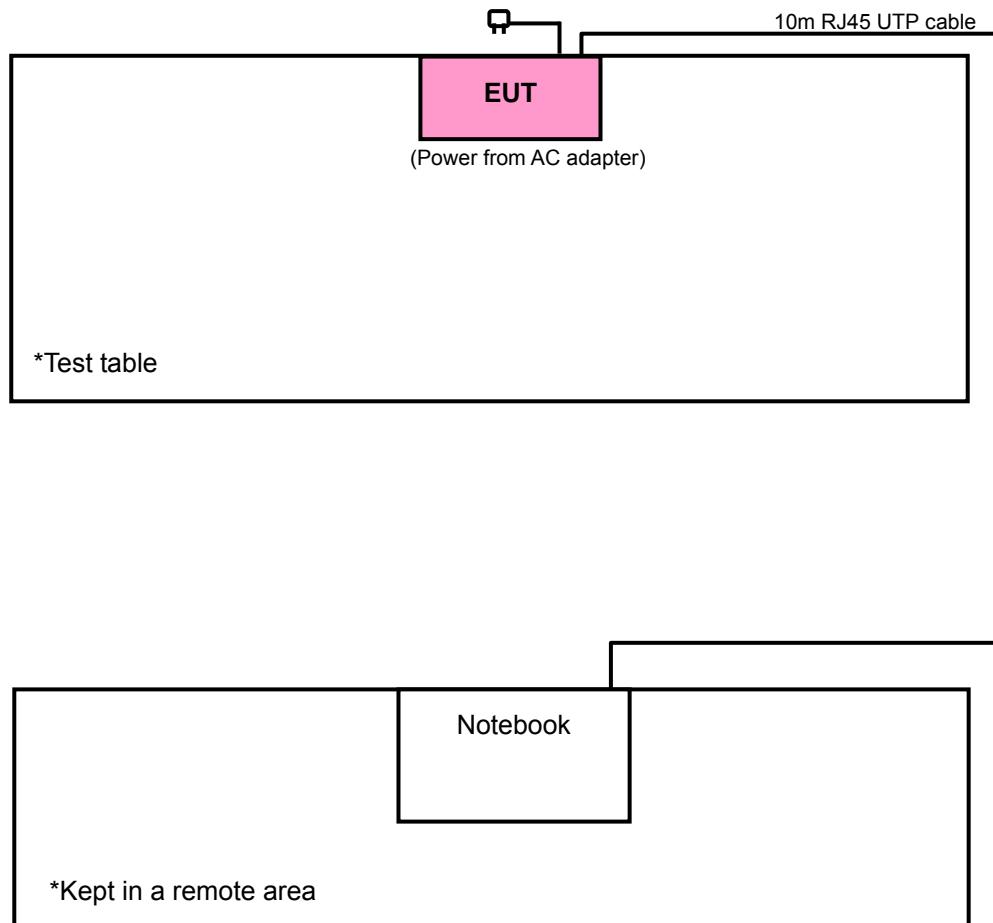
CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
149	5745MHz	161	5805MHz
153	5765MHz	165	5825MHz
157	5785MHz		

2 channels are provided for 802.11n (40MHz):

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
151	5755MHz	159	5795MHz

3.2.1 CONFIGURATION OF SYSTEM UNDER TEST

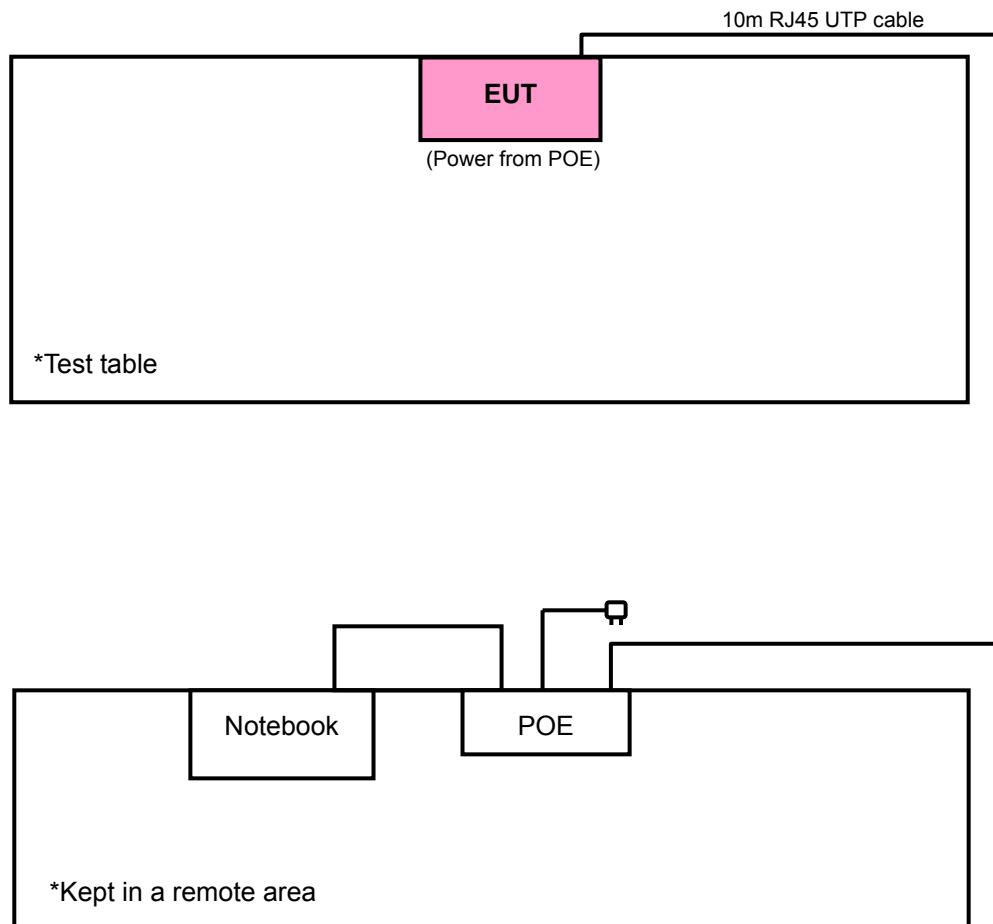
Test Mode A





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Test Mode B





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3.2.2 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

EUT CONFIGURE MODE	APPLICABLE TO			DESCRIPTION
	RE≥1G	RE<1G	CE	
A	√	-	-	Power from adapter
B	-	√	√	Power from POE

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

CE: Conducted Emission Measurement

NOTE: “-”: Means no effect.

NOTE: Test modes as below are composed of the max output power channel of each band.

RADIATED EMISSION TEST (ABOVE 1GHz):

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, XYZ axis, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	MODE	FREQ. RANGE (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)	AXIS
A	802.11n (20MHz) +802.11an (20MHz)	2412~2462 5180-5240	1 to 11 36 to 48	6 + 36	OFDM OFDM	BPSK BPSK	6.5 6.0	Z
A	802.11n (20MHz) +802.11an (20MHz)	2412~2462 5745~5825	1 to 11 149 to 165	6 + 149	OFDM OFDM	BPSK BPSK	6.5 6.0	Z

RADIATED EMISSION TEST (BELOW 1GHz):

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, XYZ axis, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	MODE	FREQ. RANGE (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)	AXIS
B	802.11n (20MHz) +802.11an (20MHz)	2412~2462 5180-5240	1 to 11 36 to 48	6 + 36	OFDM OFDM	BPSK BPSK	6.5 6.0	Z
B	802.11n (20MHz) +802.11an (20MHz)	2412~2462 5745~5825	1 to 11 149 to 165	6 + 149	OFDM OFDM	BPSK BPSK	6.5 6.0	Z



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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.

EUT CONFIGURE MODE	MODE	FREQ. RANGE (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)	AXIS
B	802.11n (20MHz) +802.11an (20MHz)	2412~2462 5180-5240	1 to 11 36 to 48	6 + 36	OFDM OFDM	BPSK BPSK	6.5 6.0	Z
B	802.11n (20MHz) +802.11an (20MHz)	2412~2462 5745~5825	1 to 11 149 to 165	6 + 149	OFDM OFDM	BPSK BPSK	6.5 6.0	Z

TEST CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE \geq 1G	25deg. C, 65%RH, 1006 hPa	120Vac, 60Hz	Frank Wang
RE<1G	25deg. C, 65%RH, 1006 hPa	120Vac, 60Hz	Frank Wang
PLC	25deg. C, 65%RH, 1006 hPa	120Vac, 60Hz	Long Chen



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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 (Section 15.247)

FCC Part 15, Subpart E (Section 15.407)

ANSI C63.4-2003

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	HP	NC6000	CNU4110Y6Q	FCC DoC Approved

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

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.



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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 (dB_uV/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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4.1.2 LIMITS OF UNWANTED EMISSION OUT OF THE RESTRICTED BANDS

FREQUENCIES (MHz)	EIRP LIMIT (dBm)	EQUIVALENT FIELD STRENGTH AT 3m (dB μ V/m) *NOTE 3
	PK	PK
5150 ~ 5250	-27	68.3
5250 ~ 5350	-27	68.3
5470 ~ 5725	-27	68.3

NOTE:

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

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



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4.1.3 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver ROHDE & SCHWARZ	ESIB7	100188	Dec. 21, 2009	Dec. 20, 2010
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100269	Dec. 31, 2009	Dec. 30, 2010
BILOG Antenna SCHWARZBECK	VULB9168	9168-160	Apr. 27, 2010	Apr. 26, 2011
HORN Antenna SCHWARZBECK	9120D	9120D-405	Feb. 03, 2010	Feb. 02, 2011
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170243	Dec. 25, 2009	Dec. 24, 2010
Preamplifier Agilent	8447D	2944A10633	Nov. 10, 2009	Nov. 09, 2010
Preamplifier Agilent	8449B	3008A01964	Nov. 09, 2009	Nov. 08, 2010
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	238141/4	May 14, 2010	May 13, 2011
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	12738/6	May 14, 2010	May 13, 2011
Software ADT.	ADT_Radiated_ V7.6.15.9.2	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	013303	NA	NA
Antenna Tower Controller inn-co GmbH	CO2000	017303	NA	NA
Turn Table ADT.	TT100.	TT93021703	NA	NA
Turn Table Controller ADT.	SC100.	SC93021703	NA	NA
26GHz ~ 40GHz Amplifier	EM26400	07026401	Aug. 25, 2010	Aug. 24, 2011

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 3.
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 988962.
5. The IC Site Registration No. is IC 7450F-3.



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4.1.4 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.

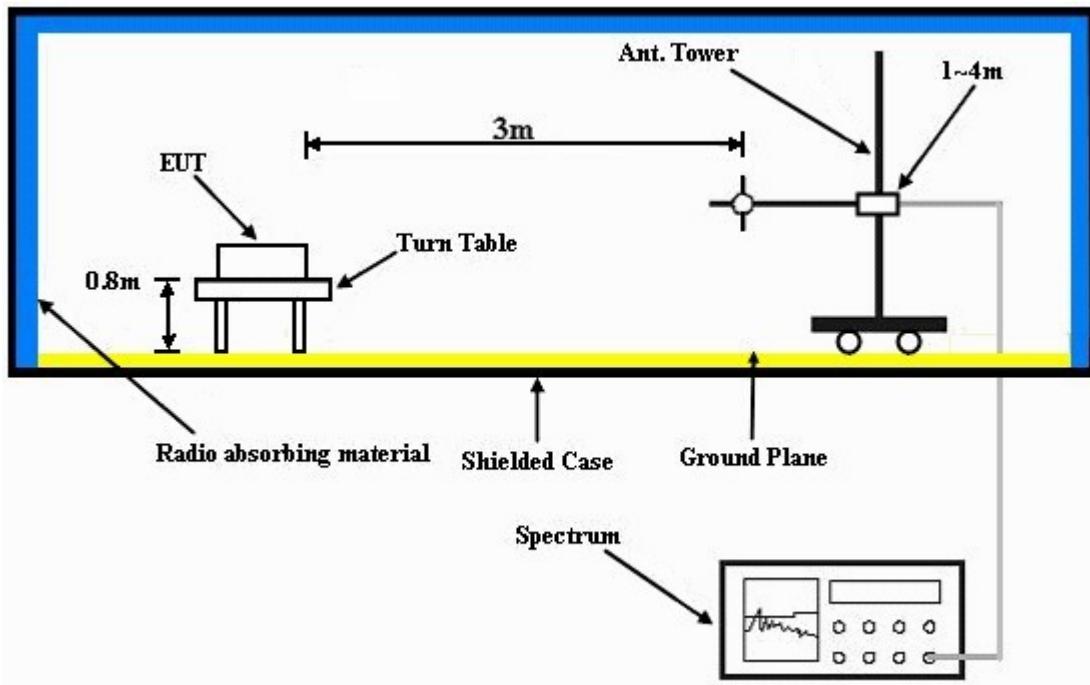
NOTE:

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

4.1.5 DEVIATION FROM TEST STANDARD

No deviation

4.1.6 TEST SETUP



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

4.1.7 EUT OPERATING CONDITIONS

- a. Placed the EUT on the testing table.
- b. Prepared notebook system outside of testing area to act as a communication partners.
- c. The communication partner connected with EUT via a RJ45 UTP cable and run a test program (provided by manufacturer) to enable EUT under transmission condition continuously at specific channel frequency.
- d. The communication partner sent data to EUT by command "PING".



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4.1.8 TEST RESULTS

802.11n (20MHz) + 802.11an (20MHz)

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	CH 6 + CH 36	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	26deg. C, 65%RH 1006 hPa	TESTED BY	Frank Wang

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	59.5 PK	74.0	-14.5	1.35 H	80	29.00	30.50
2	2390.00	44.5 AV	54.0	-9.5	1.35 H	80	14.00	30.50
3	*2437.00	115.3 PK			1.35 H	80	84.70	30.60
4	*2437.00	104.0 AV			1.35 H	80	73.40	30.60
5	2483.50	63.1 PK	74.0	-10.9	1.77 H	80	32.30	30.80
6	2483.50	46.3 AV	54.0	-7.7	1.77 H	80	15.50	30.80
7	4874.00	45.3 PK	74.0	-28.7	1.42 H	269	9.10	36.20
8	4874.00	31.0 AV	54.0	-23.0	1.42 H	269	-5.20	36.20
9	5150.00	54.6 PK	74.0	-19.4	1.08 H	22	17.90	36.70
10	5150.00	40.1 AV	54.0	-13.9	1.08 H	22	3.40	36.70
11	*5180.00	105.6 PK			1.10 H	33	68.80	36.80
12	*5180.00	93.8 AV			1.10 H	33	57.00	36.80
13	#10360.00	63.4 PK	68.3	-4.9	1.12 H	293	15.50	47.90

- 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 limit value is defined as per 15.247.
 7. "#": The radiated frequency is out the restricted band.



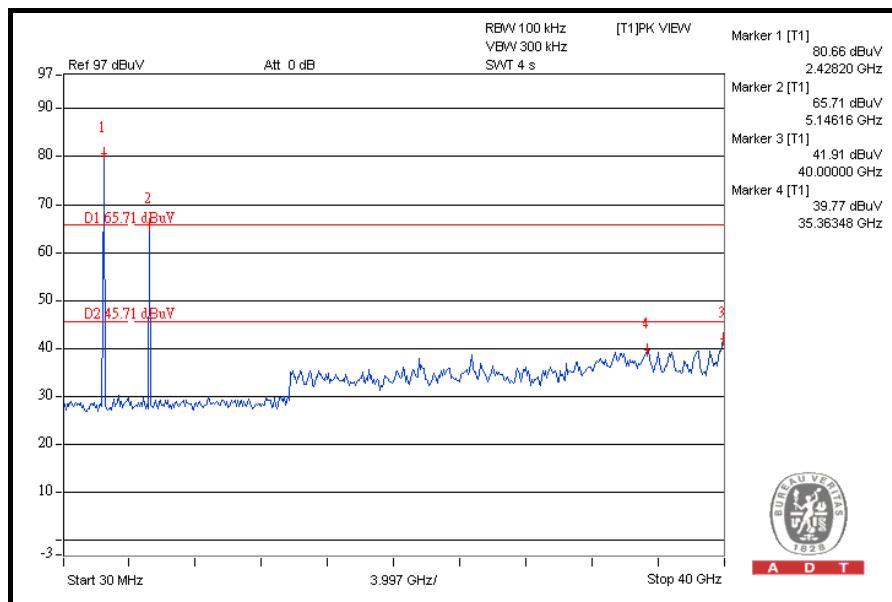
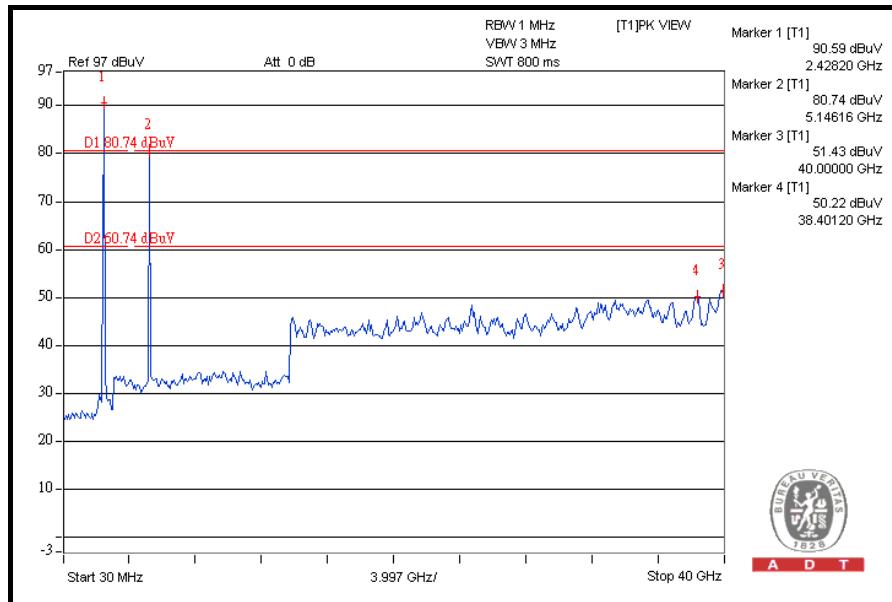
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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	CH 6 + CH 36	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	26deg. C, 65%RH 1006 hPa	TESTED BY	Frank Wang

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	57.2 PK	74.0	-16.8	1.09 V	335	26.70	30.50
2	2390.00	43.6 AV	54.0	-10.4	1.09 V	335	13.10	30.50
3	*2437.00	112.9 PK			1.09 V	335	82.30	30.60
4	*2437.00	101.2 AV			1.09 V	335	70.60	30.60
5	2483.50	59.8 PK	74.0	-14.2	1.09 V	335	29.00	30.80
6	2483.50	45.5 AV	54.0	-8.5	1.09 V	335	14.70	30.80
7	4874.00	44.2 PK	74.0	-29.8	1.07 V	239	8.00	36.20
8	4874.00	30.5 AV	54.0	-23.5	1.07 V	239	-5.70	36.20
9	5150.00	54.1 PK	74.0	-19.9	1.03 V	81	17.40	36.70
10	5150.00	39.2 AV	54.0	-14.8	1.03 V	81	2.50	36.70
11	*5180.00	105.1 PK			1.12 V	52	68.30	36.80
12	*5180.00	93.5 AV			1.12 V	52	56.70	36.80
13	#10360.00	62.3 PK	68.3	-6.0	1.14 V	81	14.40	47.90

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 limit value is defined as per 15.247.
7. "#": The radiated frequency is out the restricted band.





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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	CH 6 + CH 149	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	26deg. C, 65%RH 1006 hPa	TESTED BY	Frank Wang

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	59.2 PK	74.0	-14.8	1.05 H	37	28.70	30.50
2	2390.00	44.5 AV	54.0	-9.5	1.05 H	37	14.00	30.50
3	*2437.00	115.5 PK			1.05 H	37	84.90	30.60
4	*2437.00	104.1 AV			1.05 H	37	73.50	30.60
5	2483.50	62.9 PK	74.0	-11.1	1.85 H	37	32.10	30.80
6	2483.50	46.3 AV	54.0	-7.7	1.85 H	37	15.50	30.80
7	4874.00	45.2 PK	74.0	-28.8	1.18 H	283	9.00	36.20
8	4874.00	31.4 AV	54.0	-22.6	1.18 H	283	-4.80	36.20
9	#5725.00	90.1 PK	98.2	-8.1	1.05 H	305	52.10	38.00
10	#5725.00	68.3 AV	86.0	-17.7	1.05 H	305	30.30	38.00
11	*5745.00	118.2 PK			1.05 H	305	80.20	38.00
12	*5745.00	106.0 AV			1.05 H	305	68.00	38.00
13	11490.00	57.8 PK	74.0	-16.2	1.53 H	223	9.80	48.00
14	11490.00	45.2 AV	54.0	-8.8	1.53 H	223	-2.80	48.00

- 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 limit value is defined as per 15.247.
 7. "#": The radiated frequency is out the restricted band.



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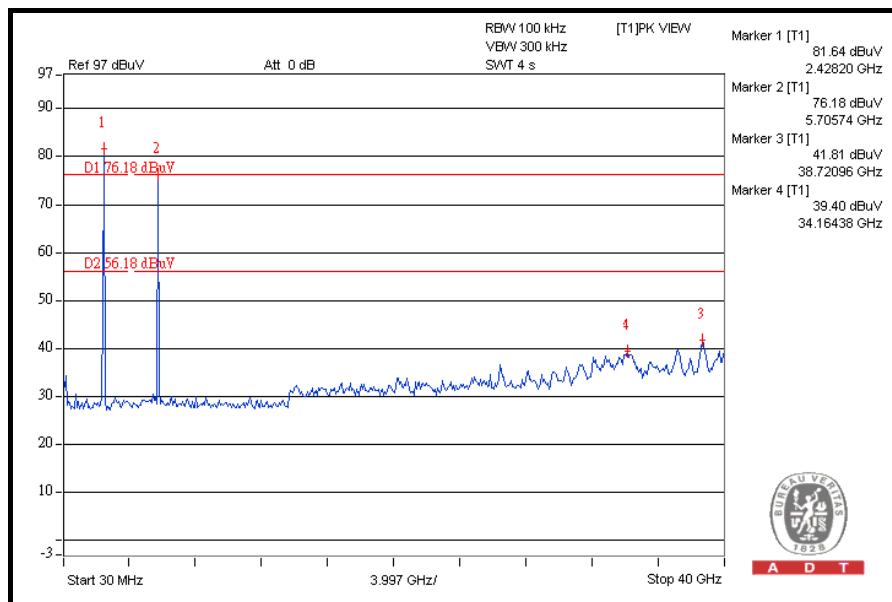
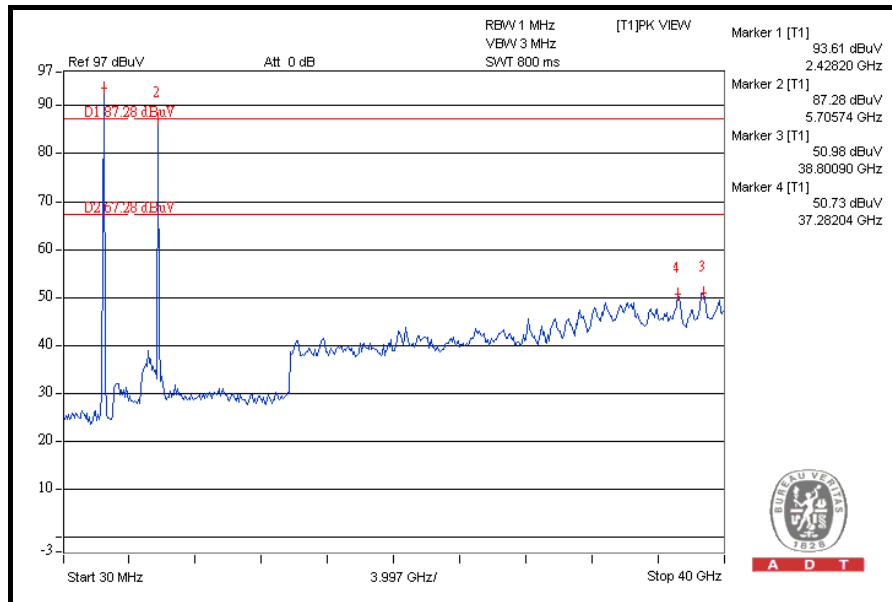
EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	CH 6 + CH 149	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	26deg. C, 65%RH 1006 hPa	TESTED BY	Frank Wang

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	57.2 PK	74.0	-16.8	1.09 V	305	26.70	30.50
2	2390.00	43.8 AV	54.0	-10.2	1.09 V	305	13.30	30.50
3	*2437.00	113.2 PK			1.09 V	305	82.60	30.60
4	*2437.00	101.3 AV			1.09 V	305	70.70	30.60
5	2483.50	59.8 PK	74.0	-14.2	1.08 V	331	29.00	30.80
6	2483.50	46.0 AV	54.0	-8.0	1.08 V	331	15.20	30.80
7	4874.00	44.1 PK	74.0	-29.9	1.17 V	93	7.90	36.20
8	4874.00	30.8 AV	54.0	-23.2	1.17 V	93	-5.40	36.20
9	#5725.00	84.8 PK	93.5	-8.7	1.08 V	43	46.80	38.00
10	#5725.00	63.2 AV	81.7	-18.5	1.08 V	43	25.20	38.00
11	*5745.00	113.5 PK			1.05 V	93	75.50	38.00
12	*5745.00	101.7 AV			1.05 V	93	63.70	38.00
13	11490.00	56.5 PK	74.0	-17.5	1.12 V	28	8.50	48.00
14	11490.00	44.7 AV	54.0	-9.3	1.12 V	28	-3.30	48.00

- 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 limit value is defined as per 15.247.
 7. "#": The radiated frequency is out the restricted band.



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

EUT TEST CONDITION		MEASUREMENT DETAIL		
CHANNEL		FREQUENCY RANGE		Below 1000MHz
INPUT POWER (SYSTEM)		DETECTOR FUNCTION		Quasi-Peak
ENVIRONMENTAL CONDITIONS		TESTED BY		Frank Wang

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	340.99	41.3 QP	46.0	-4.7	1.00 H	295	25.60	15.70
2	375.98	40.0 QP	46.0	-6.0	1.00 H	295	23.50	16.50
3	626.80	33.9 QP	46.0	-12.1	1.25 H	214	11.50	22.40
4	681.24	35.4 QP	46.0	-10.6	1.25 H	31	12.10	23.30
5	751.23	39.3 QP	46.0	-6.7	1.00 H	166	15.20	24.10
6	877.61	38.7 QP	46.0	-7.3	1.25 H	166	13.10	25.60
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	49.43	39.0 QP	40.0	-1.0	1.00 V	133	24.50	14.50
2	66.84	35.6 QP	40.0	-4.4	1.00 V	94	23.20	12.40
3	340.99	38.7 QP	46.0	-7.3	1.25 V	7	23.00	15.70
4	375.98	40.5 QP	46.0	-5.5	1.00 V	10	24.00	16.50
5	626.80	39.7 QP	46.0	-6.3	1.00 V	187	17.30	22.40
6	751.23	38.5 QP	46.0	-7.5	1.25 V	196	14.40	24.10

- 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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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	CH 6 + CH 149	FREQUENCY RANGE	Below 1000MHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	DETECTOR FUNCTION	Quasi-Peak
ENVIRONMENTAL CONDITIONS	26deg. C, 65%RH 1006 hPa	TESTED BY	Frank Wang

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	340.99	41.8 QP	46.0	-4.2	1.00 H	307	26.10	15.70
2	375.98	39.4 QP	46.0	-6.6	1.00 H	307	22.90	16.50
3	626.80	34.6 QP	46.0	-11.4	1.25 H	190	12.20	22.40
4	681.24	36.1 QP	46.0	-9.9	1.00 H	31	12.80	23.30
5	751.23	39.5 QP	46.0	-6.5	1.00 H	193	15.40	24.10
6	877.61	37.6 QP	46.0	-8.4	1.00 H	160	12.00	25.60
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	48.35	39.0 QP	40.0	-1.0	1.06 V	128	24.60	14.40
2	68.79	35.6 QP	40.0	-4.4	1.25 V	205	23.50	12.10
3	375.98	40.2 QP	46.0	-5.8	1.25 V	10	23.70	16.50
4	626.80	40.1 QP	46.0	-5.9	1.00 V	175	17.70	22.40
5	751.23	39.8 QP	46.0	-6.2	1.25 V	187	15.70	24.10
6	869.83	40.1 QP	46.0	-5.9	1.00 V	10	14.60	25.50

- 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 CONDUCTED EMISSION MEASUREMENT

4.2.1 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.

4.2.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver ROHDE & SCHWARZ	ESCS30	100289	Nov. 23, 2009	Nov. 22, 2010
RF signal cable Woken	5D-FB	Cable-HYCO2-01	Dec. 31, 2009	Dec. 30, 2010
LISN ROHDE & SCHWARZ	ESH2-Z5	100100	Dec. 25, 2009	Dec. 24, 2010
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.



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4.2.3 TEST PROCEDURES

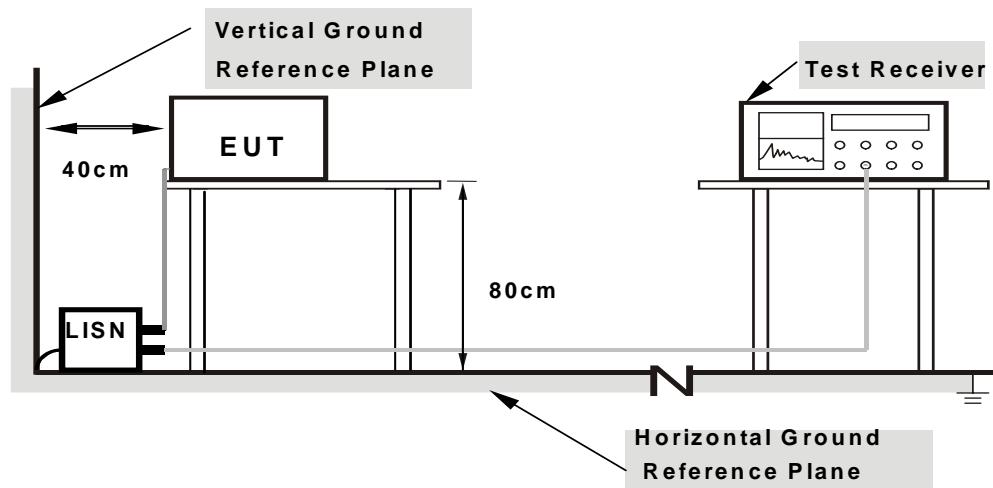
- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling 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.

4.2.5 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 cm from other units and other metal planes

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

4.2.6 EUT OPERATING CONDITIONS

Same as 4.1.6.

4.2.7 TEST RESULTS

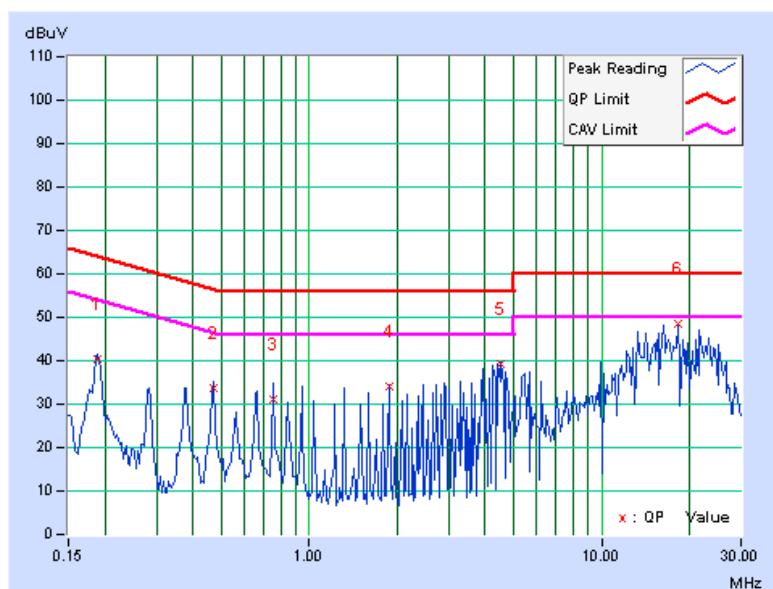
CONDUCTED WORST-CASE DATA: 802.11n (20MHz) + 802.11an (20MHz)

EUT TEST CONDITION			MEASUREMENT DETAIL	
CHANNEL		CH 6 + CH 36	PHASE	
INPUT POWER (SYSTEM)		120Vac, 60Hz	6dB BANDWIDTH	
ENVIRONMENTAL CONDITIONS		25deg. C, 65%RH, 1013hPa	TESTED BY	Long Chen

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.189	0.16	40.20	-	40.36	-	64.08	54.08	-23.72	-
2	0.470	0.19	33.59	-	33.78	-	56.51	46.51	-22.73	-
3	0.755	0.21	30.93	-	31.14	-	56.00	46.00	-24.86	-
4	1.883	0.30	33.70	-	34.00	-	56.00	46.00	-22.00	-
5	4.516	0.35	39.08	-	39.43	-	56.00	46.00	-16.57	-
6	18.244	0.62	47.86	-	48.48	-	60.00	50.00	-11.52	-

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.

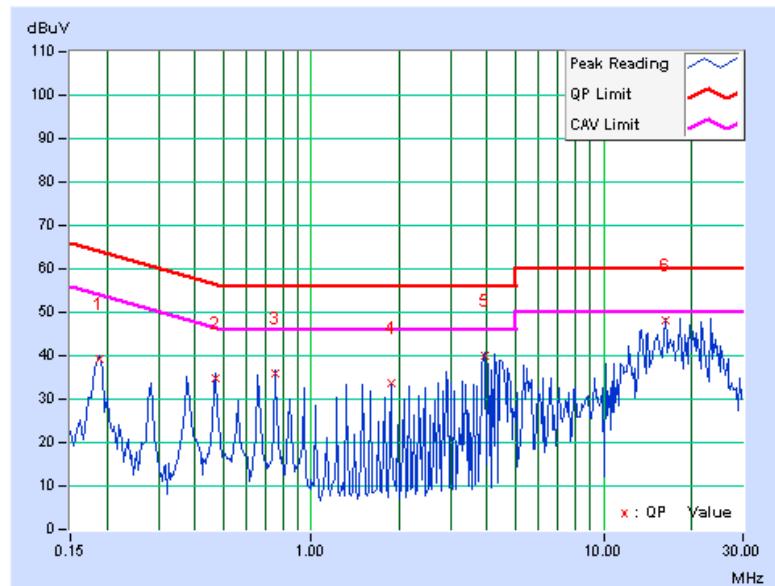


EUT TEST CONDITION			MEASUREMENT DETAIL		
CHANNEL	CH 6 + CH 36		PHASE	Line 2	
INPUT POWER (SYSTEM)	120Vac, 60Hz		6dB BANDWIDTH	9kHz	
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH, 1013hPa		TESTED BY	Long Chen	

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.189	0.13	39.07	-	39.20	-	64.08	54.08	-24.88	-
2	0.470	0.17	34.47	-	34.64	-	56.51	46.51	-21.87	-
3	0.752	0.20	35.55	-	35.75	-	56.00	46.00	-20.25	-
4	1.879	0.29	33.27	-	33.56	-	56.00	46.00	-22.44	-
5	3.949	0.36	39.65	-	40.01	-	56.00	46.00	-15.99	-
6	16.227	0.72	47.47	-	48.19	-	60.00	50.00	-11.81	-

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.





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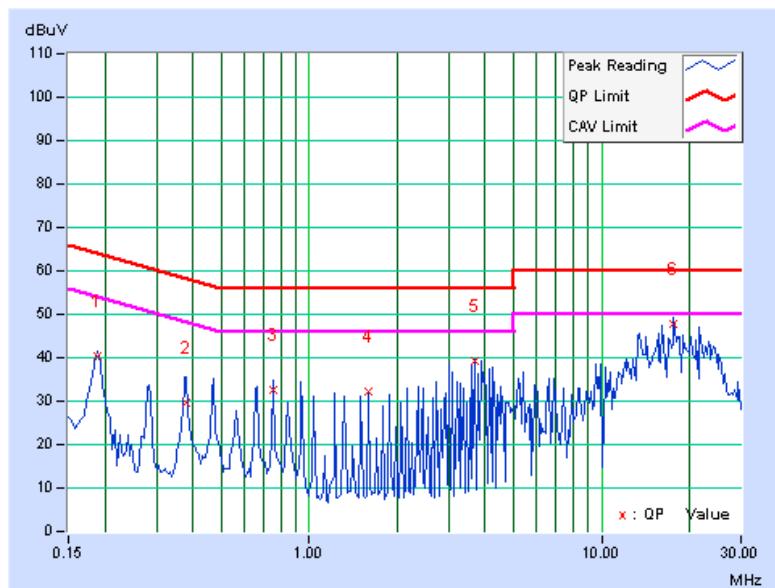
802.11n (20MHz) + 802.11an (20MHz)

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	CH 6 + CH 149	PHASE	Line 1
INPUT POWER (SYSTEM)	120Vac, 60Hz	6dB BANDWIDTH	9kHz
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH, 1013hPa	TESTED BY	Long Chen

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	0.16	40.32	-	40.48	-	64.08	54.08	-23.60	-
2	0.380	0.18	29.54	-	29.72	-	58.27	48.27	-28.55	-
3	0.752	0.21	32.25	-	32.46	-	56.00	46.00	-23.54	-
4	1.598	0.28	31.99	-	32.27	-	56.00	46.00	-23.73	-
5	3.672	0.34	38.77	-	39.11	-	56.00	46.00	-16.89	-
6	17.695	0.60	47.19	-	47.79	-	60.00	50.00	-12.21	-

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.

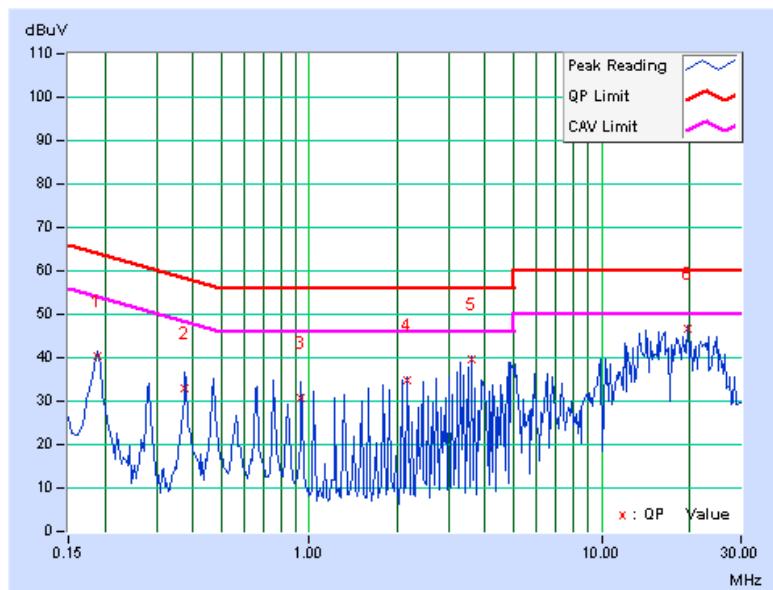


EUT TEST CONDITION			MEASUREMENT DETAIL		
CHANNEL	CH 6 + CH 149		PHASE	Line 2	
INPUT POWER (SYSTEM)	120Vac, 60Hz		6dB BANDWIDTH	9kHz	
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH, 1013hPa		TESTED BY	Long Chen	

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.189	0.13	40.32	-	40.45	-	64.08	54.08	-23.63	-
2	0.377	0.16	32.67	-	32.83	-	58.35	48.35	-25.53	-
3	0.939	0.21	30.48	-	30.69	-	56.00	46.00	-25.31	-
4	2.164	0.30	34.34	-	34.64	-	56.00	46.00	-21.36	-
5	3.578	0.35	39.31	-	39.66	-	56.00	46.00	-16.34	-
6	19.711	0.90	45.64	-	46.54	-	60.00	50.00	-13.46	-

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.





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5. PHOTOGRAPHS OF THE TEST CONFIGURATION

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



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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:

www.adt.com.tw/index.5/phtml. 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

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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7. 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.

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