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FCC TEST REPORT (CO-LOCATED)

REPORT NO.: RF130314C08-2
MODEL NO.: ESR900 (Refer to item 3.1 for more details)
FCC ID: A8JESR900
RECEIVED: Mar. 14, 2013
TESTED: Apr. 29 ~ Apr. 30, 2013
ISSUED: May 02, 2013

APPLICANT: EnGenius Technologies

ADDRESS: 1580 Scenic Avenue, Costa Mesa, CA92626

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

LAB ADDRESS: No. 47, 14th Ling, Chia Pau Vil., Lin Kou Dist.,
New Taipei City, 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
RF130314C08-2	Original release	May 02, 2013



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1. CERTIFICATION

PRODUCT: Wireless Device
MODEL NO.: ESR900 (Refer to item 3.1 for more details)
BRAND: EnGenius
APPLICANT: EnGenius Technologies
TESTED: Apr. 29 ~ Apr. 30, 2013
TEST SAMPLE: ENGINEERING SAMPLE
STANDARDS: **FCC Part 15, Subpart C (Section 15.247)**
FCC Part 15, Subpart E (Section 15.407)
ANSI C63.10-2009

The above equipment (model: ESR900) 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 : Celine Chou , **DATE** : May 02, 2013
Celine Chou / Specialist

APPROVED BY : Ken Liu , **DATE** : May 02, 2013
Ken Liu / Senior 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 -4.76dB at 0.47789MHz.
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 4874.00MHz.

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	9kHz ~ 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 $k = 2$.



3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

EUT	Wireless Device
MODEL NO.	ESR900 (Refer to note for more details)
POWER SUPPLY	12Vdc from adapter
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 450.0Mbps
OPERATING FREQUENCY	2.4GHz: 2412 ~ 2462MHz 5.0GHz: 5180 ~ 5240MHz, 5745 ~ 5825MHz
NUMBER OF CHANNEL	2.4GHz: 11 for 802.11b, 802.11g, 802.11n (20MHz) 7 for 802.11n (40MHz) 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	880.491mW for 2412 ~ 2462MHz 40.410mW for 5180 ~ 5240MHz 832.979mW for 5745 ~ 5825MHz
ANTENNA TYPE	2.4GHz: PCB antenna with 2.45dBi gain 5.0GHz: PCB antenna with 5.51dBi gain
ANTENNA CONNECTOR	IPEX
DATA CABLE	NA
I/O PORTS	Refer to user's manual
ACCESSORY DEVICES	Adapter

NOTE:

1. The models as below are electrically identical, different models no. are for marketing purpose.

Brand	Model No.	Differentiation
EnGenius	ESR900	marketing differentiation
	ESR1200	
	ESR1750	



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2. The EUT incorporates a MIMO function. Physically, the EUT provides three completed transmitters and three receivers.

MODULATION MODE	TX FUNCTION
802.11b	3TX
802.11g	3TX
802.11a	3TX
802.11n (20MHz)	3TX
802.11n (40MHz)	3TX

3. The EUT consumes power from the following adapter.

ADAPTER	
BRAND:	I.T.E POWER SUPPLY
MODEL:	S24B12-120A150-04
INPUT:	100-240Vac, 50/60Hz, Max 0.7A
OUTPUT:	12Vdc, 1.5A
POWER LINE:	1.4m cable without core attached on adapter

4. 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

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
3	2422MHz	7	2442MHz
4	2427MHz	8	2447MHz
5	2432MHz	9	2452MHz
6	2437MHz		

FOR 5180 ~ 5240MHz

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

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

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

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
38	5190 MHz	46	5230 MHz

FOR 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



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3.2.1 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

EUT CONFIGURE MODE	APPLICABLE TO			DESCRIPTION
	RE≥1G	RE<1G	PLC	
-	√	√	√	-

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

PLC: Power Line Conducted Emission

NOTE: The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **Z-plane**.

RADIATED EMISSION TEST (ABOVE 1GHz):

- 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)
-	802.11b	2412~2462	1 to 11	6 + 36	OFDM	BPSK	1.0
	802.11n (20MHz)	5180~5240	38 to 46				7.2
-	802.11b	2412~2462	1 to 11	6 + 157	OFDM	BPSK	1.0
	802.11a	5745~5825	149 to 165				6.0

RADIATED EMISSION TEST (BELOW 1GHz):

- 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)
-	802.11b	2412~2462	1 to 11	6 + 36	OFDM	BPSK	1.0
	802.11n (20MHz)	5180~5240	38 to 46				7.2
-	802.11b	2412~2462	1 to 11	6 + 157	OFDM	BPSK	1.0
	802.11a	5745~5825	149 to 165				6.0



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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)
-	802.11b	2412~2462	1 to 11	6 + 36	OFDM	BPSK	1.0
	802.11n (20MHz)	5180~5240	38 to 46				7.2
-	802.11b	2412~2462	1 to 11	6 + 157	OFDM	BPSK	1.0
	802.11a	5745~5825	149 to 165				6.0

TEST CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE \geq 1G	28deg. C, 67%RH	120Vac, 60Hz	Brad Tung
RE $<$ 1G	28deg. C, 67%RH	120Vac, 60Hz	Brad Tung
PLC	24deg. C, 90%RH	120Vac, 60Hz	Match Tsui

3.3 DESCRIPTION OF SUPPORT UNITS

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

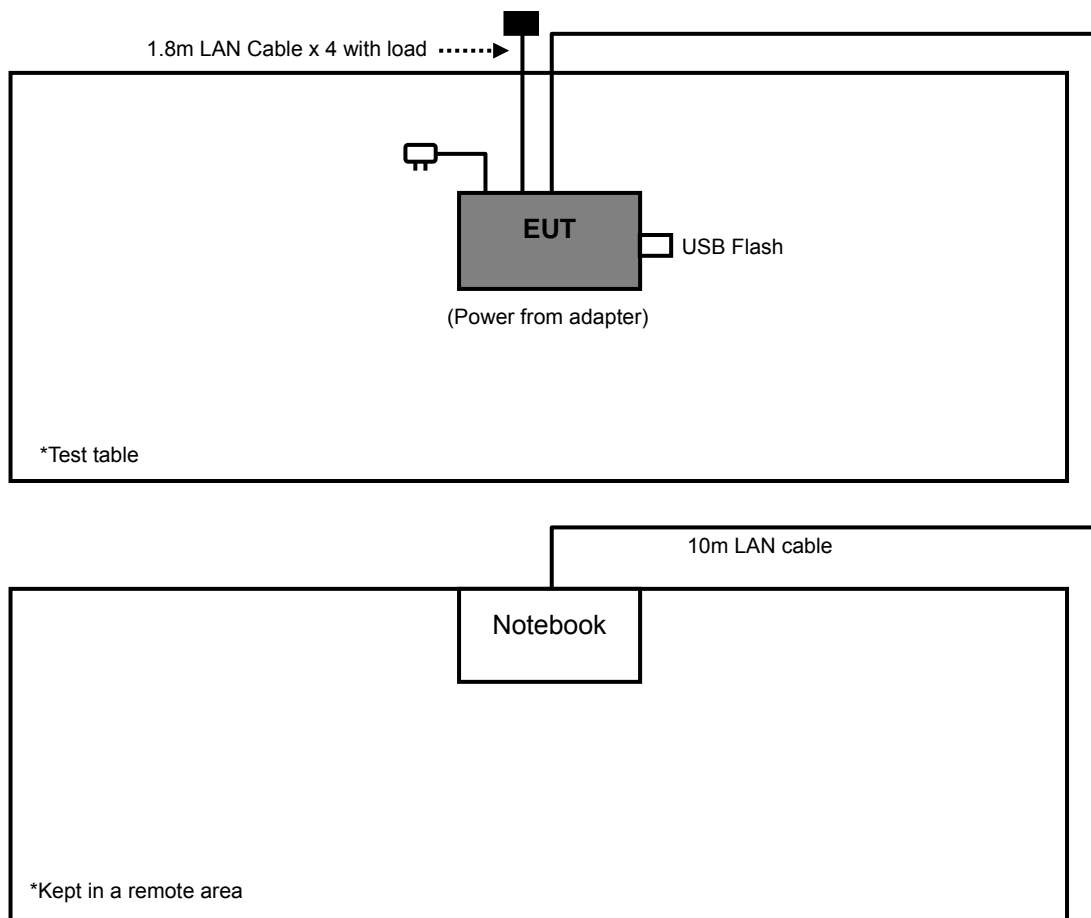
NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	NOTEBOOK	DELL	E5420	33MLMQ1	FCC Doc Approved
2	USB FLASH	Transcend	8G	NA	NA

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	10m non-shielded LAN 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.

3.3.1 CONFIGURATION OF SYSTEM UNDER TEST





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3.4 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 C63.10-2009

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.



4. TEST TYPES AND RESULTS

4.1 RADIATED EMISSION AND BANDEDGE MEASUREMENT

4.1.1 LIMITS OF RADIATED EMISSION AND BANDEDGE 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. 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 LIMITS OF UNWANTED EMISSION OUT OF THE RESTRICTED BANDS

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

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

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



4.1.3 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver ROHDE & SCHWARZ	ESIB7	100212	Aug. 06, 2012	Aug. 05, 2013
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100039	Jan. 31, 2013	Jan. 30, 2014
BILOG Antenna SCHWARZBECK	VULB9168	9168-160	Mar. 20, 2013	Mar. 19, 2014
HORN Antenna SCHWARZBECK	9120D	209	Sep. 03, 2012	Sep. 02, 2013
HORN Antenna SCHWARZBECK	BBHA 9170	148	Jul. 11, 2012	Jul. 10, 2013
Loop Antenna	HFH2-Z2	100070	Jan. 31, 2012	Jan. 30, 2014
Preamplifier Agilent	8447D	2944A10633	Oct. 25, 2012	Oct. 24, 2013
Preamplifier Agilent	8449B	3008A01964	Oct. 25, 2012	Oct. 24, 2013
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	250723/4	Aug. 28, 2012	Aug. 27, 2013
RF signal cable HUBER+SUHNNER	SUCOFLEX 106	12738/6+309224/ 4	Aug. 28, 2012	Aug. 27, 2013
Software BV 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 BV ADT	TT100	TT93021703	NA	NA
Turn Table Controller BV ADT	SC100	SC93021703	NA	NA
26GHz ~ 40GHz Amplifier	EM26400	815221	Oct. 25, 2012	Oct. 24, 2013

- NOTE:**
1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
 2. The calibration interval of the loop antenna is 24 months and the calibrations are traceable to NML/ROC and NIST/USA.
 3. The test was performed in HwaYa Chamber 3.
 4. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
 5. The FCC Site Registration No. is 988962.
 6. 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.

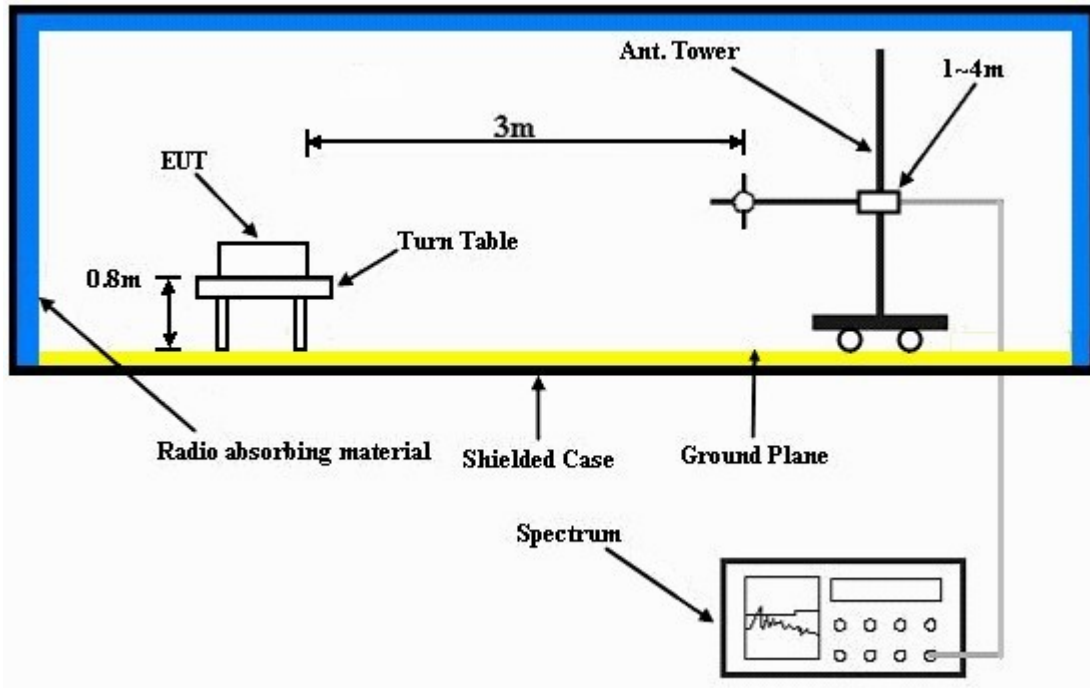
NOTE:

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 100kHz and video bandwidth is 300kHz for Peak detection at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 1kHz for Average detection (AV) at frequency above 1GHz.
4. 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

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



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4.1.8 TEST RESULTS

ABOVE 1GHz DATA :

802.11b + 802.11n (20MHz)

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	CH 6 + CH 36	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	28deg. C, 67%RH	TESTED BY	Brad Tung

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	*2437.00	115.8 PK			1.00 H	330	84.80	31.00
2	*2437.00	112.5 AV			1.00 H	330	81.50	31.00
3	4874.00	56.0 PK	74.0	-18.0	1.03 H	130	18.90	37.10
4	4874.00	53.0 AV	54.0	-1.0	1.03 H	130	15.90	37.10
5	5150.00	58.0 PK	74.0	-16.0	1.10 H	180	20.30	37.70
6	5150.00	45.4 AV	54.0	-8.6	1.10 H	180	7.70	37.70
7	*5180.00	113.9 PK			1.07 H	169	76.20	37.70
8	*5180.00	103.4 AV			1.07 H	169	65.70	37.70
9	#10360.00	62.5 PK	74.0	-11.5	1.32 H	30	13.70	48.80
10	#10360.00	50.9 AV	54.0	-3.1	1.32 H	30	2.10	48.80

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	*2437.00	107.2 PK			1.04 V	280	76.20	31.00
2	*2437.00	104.0 AV			1.04 V	280	73.00	31.00
3	4874.00	51.6 PK	74.0	-22.4	1.18 V	241	14.50	37.10
4	4874.00	46.0 AV	54.0	-8.0	1.18 V	241	8.90	37.10
5	5150.00	57.0 PK	74.0	-17.0	1.12 V	162	19.30	37.70
6	5150.00	44.4 AV	54.0	-9.6	1.12 V	162	6.70	37.70
7	*5180.00	111.9 PK			1.16 V	155	74.20	37.70
8	*5180.00	102.0 AV			1.16 V	155	64.30	37.70
9	#10360.00	61.5 PK	74.0	-12.5	1.21 V	149	12.70	48.80
10	#10360.00	49.0 AV	54.0	-5.0	1.21 V	149	0.20	48.80

REMARKS:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. “ * “: Fundamental frequency.
6. “#”: The radiated frequency is out the restricted band.



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802.11b + 802.11a

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	CH 6 + CH 157	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	28deg. C, 67%RH	TESTED BY	Brad Tung

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	*2437.00	115.5 PK			1.07 H	317	84.50	31.00
2	*2437.00	112.1 AV			1.07 H	317	81.10	31.00
3	4874.00	56.0 PK	74.0	-18.0	1.07 H	122	18.90	37.10
4	4874.00	52.9 AV	54.0	-1.1	1.07 H	122	15.80	37.10
5	*5785.00	120.1 PK			1.33 H	333	81.30	38.80
6	*5785.00	108.0 AV			1.33 H	333	69.20	38.80
7	11570.00	66.0 PK	74.0	-8.0	1.00 H	200	16.60	49.40
8	11570.00	52.0 AV	54.0	-2.0	1.00 H	200	2.60	49.40

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	*2437.00	107.5 PK			1.00 V	288	76.50	31.00
2	*2437.00	104.1 AV			1.00 V	288	73.10	31.00
3	4874.00	52.0 PK	74.0	-22.0	1.25 V	263	14.90	37.10
4	4874.00	46.9 AV	54.0	-7.1	1.25 V	263	9.80	37.10
5	*5785.00	117.7 PK			1.10 V	286	78.90	38.80
6	*5785.00	105.8 AV			1.10 V	286	67.00	38.80
7	11570.00	65.4 PK	74.0	-8.6	1.50 V	180	16.00	49.40
8	11570.00	51.0 AV	54.0	-3.0	1.50 V	180	1.60	49.40

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.
5. “ * “: Fundamental frequency.
6. “#“: The radiated frequency is out the restricted band.



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BELOW 1GHz DATA :

802.11b + 802.11n (20MHz)

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	CH 6 + CH 36	FREQUENCY RANGE	Below 1000MHz
INPUT POWER	120Vac, 60Hz	DETECTOR FUNCTION	Quasi-Peak
ENVIRONMENTAL CONDITIONS	28deg. C, 67%RH	TESTED BY	Brad Tung

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	60.11	23.2 QP	40.0	-16.8	1.50 H	240	9.80	13.40
2	158.86	24.7 QP	43.5	-18.8	1.50 H	135	10.70	14.00
3	212.01	35.7 QP	43.5	-7.8	1.25 H	201	24.10	11.60
4	270.04	41.3 QP	46.0	-4.7	1.50 H	9	27.30	14.00
5	352.00	40.7 QP	46.0	-5.3	1.50 H	128	24.30	16.40
6	374.99	32.8 QP	46.0	-13.2	2.00 H	96	15.90	16.90

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	62.86	23.3 QP	40.0	-16.7	1.25 V	201	10.10	13.20
2	168.53	28.7 QP	43.5	-14.8	1.25 V	163	15.20	13.50
3	219.24	36.0 QP	46.0	-10.0	2.00 V	55	24.10	11.90
4	352.00	40.7 QP	46.0	-5.3	1.50 V	128	24.30	16.40
5	374.98	33.0 QP	46.0	-13.0	1.50 V	116	16.10	16.90
6	800.21	38.0 QP	46.0	-8.0	1.00 V	70	12.40	25.60

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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802.11b + 802.11a

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	CH 6 + CH 157	FREQUENCY RANGE	Below 1000MHz
INPUT POWER	120Vac, 60Hz	DETECTOR FUNCTION	Quasi-Peak
ENVIRONMENTAL CONDITIONS	28deg. C, 67%RH	TESTED BY	Brad Tung

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	68.96	26.2 QP	40.0	-13.8	1.25 H	241	13.70	12.50
2	151.75	28.9 QP	43.5	-14.6	2.00 H	110	15.00	13.90
3	249.99	36.2 QP	46.0	-9.8	1.25 H	66	23.00	13.20
4	375.04	34.0 QP	46.0	-12.0	1.00 H	139	17.10	16.90
5	446.20	37.3 QP	46.0	-8.7	1.25 H	8	18.60	18.70
6	825.01	36.2 QP	46.0	-9.8	1.00 H	24	10.30	25.90

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	59.24	23.5 QP	40.0	-16.5	1.00 V	300	10.00	13.50
2	163.85	28.4 QP	43.5	-15.1	1.50 V	96	14.60	13.80
3	223.29	36.6 QP	46.0	-9.4	1.50 V	156	24.60	12.00
4	337.06	39.3 QP	46.0	-6.7	2.00 V	125	23.30	16.00
5	375.14	33.6 QP	46.0	-12.4	1.25 V	96	16.70	16.90
6	800.05	38.4 QP	46.0	-7.6	1.00 V	300	12.80	25.60

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

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. 16, 2012	Nov. 15, 2013
RF signal cable Woken	5D-FB	Cable-HYC01-01	Dec. 28, 2012	Dec. 27, 2013
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100312	Jul. 02, 2012	Jul. 01, 2013
LISN ROHDE & SCHWARZ (EUT)	ESH3-Z5	835239/001	Feb. 04, 2013	Feb. 03, 2014
Software ADT	BV ADT_Cond_ V7.3.7.3	NA	NA	NA

- NOTE:**
1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
 2. The test was performed in HwaYa Shielded Room 1.
 3. The VCCI Site Registration No. is C-2040.



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4.2.3 TEST PROCEDURES

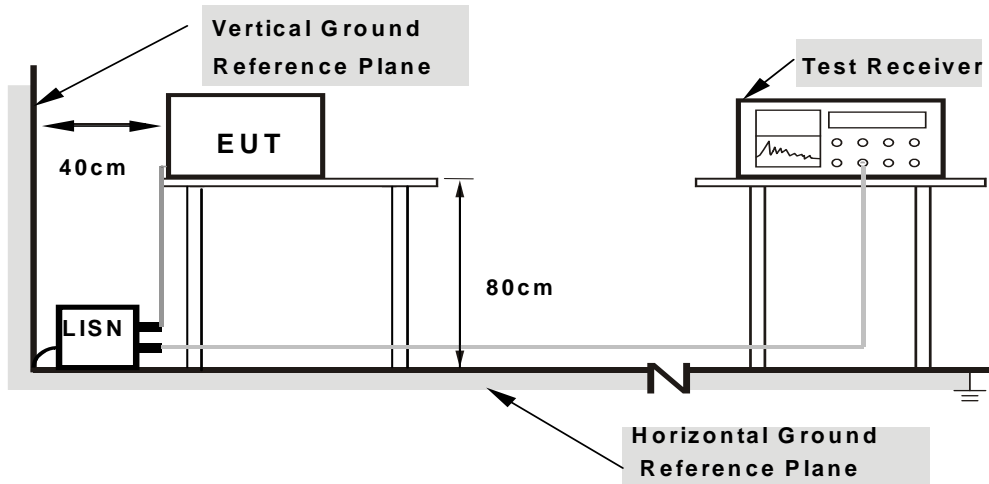
- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling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

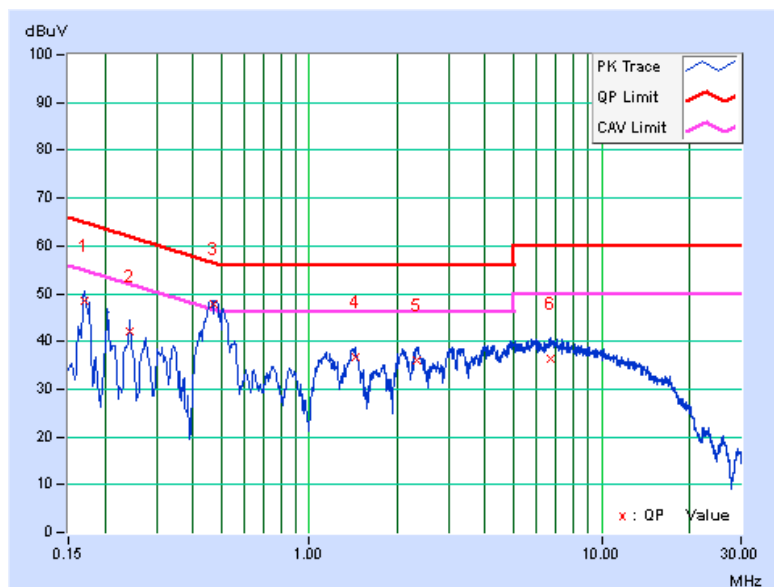
802.11b + 802.11n (20MHz)

CHANNEL	CH 6 + CH 36	6dB BANDWIDTH	9kHz
PHASE	Line 1		

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	0.16955	0.18	48.42	39.36	48.60	39.54	64.98
2	0.24384	0.23	41.88	34.33	42.11	34.56	61.96	51.96	-19.86	-17.41
3	0.47163	0.21	47.58	38.83	47.79	39.04	56.49	46.49	-8.69	-7.44
4	1.43639	0.24	36.33	29.24	36.57	29.48	56.00	46.00	-19.43	-16.52
5	2.32005	0.27	35.77	29.02	36.04	29.29	56.00	46.00	-19.96	-16.71
6	6.68361	0.45	36.06	29.31	36.51	29.76	60.00	50.00	-23.49	-20.24

REMARKS:

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





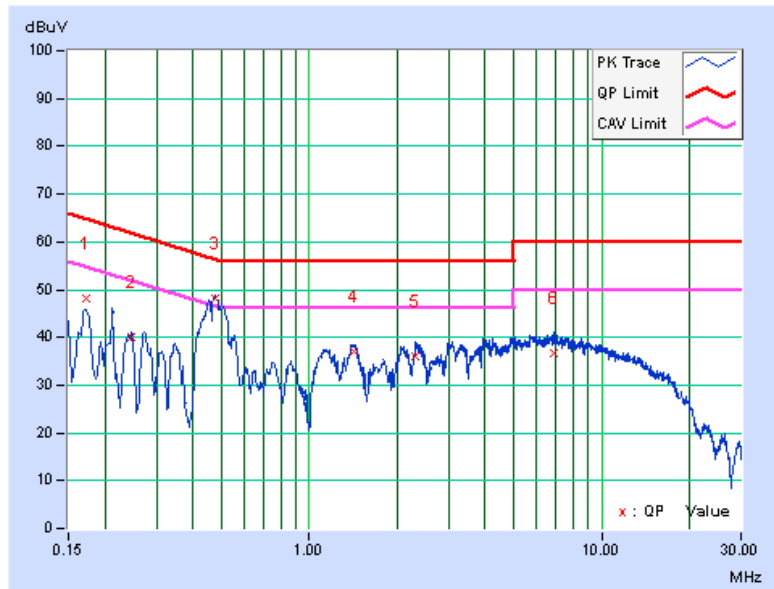
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CHANNEL	CH 6 + CH 36	6dB BANDWIDTH	9kHz
PHASE	Line 2		

No	Freq.	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]		Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
	1		0.17346	0.28	47.94	39.45	48.22	39.73	64.79	54.79
2	0.24775	0.31	39.73	29.52	40.04	29.83	61.83	51.83	-21.79	-22.00
3	0.47412	0.30	47.76	40.24	48.06	40.54	56.44	46.44	-8.38	-5.90
4	1.41882	0.33	36.73	29.65	37.06	29.98	56.00	46.00	-18.94	-16.02
5	2.31617	0.38	35.49	28.44	35.87	28.82	56.00	46.00	-20.13	-17.18
6	6.85956	0.56	35.98	29.63	36.54	30.19	60.00	50.00	-23.46	-19.81

REMARKS:

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





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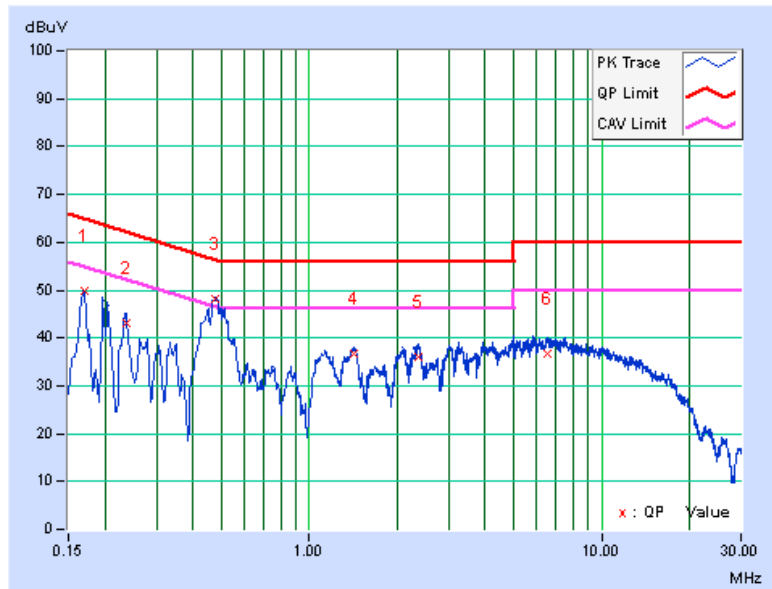
802.11b + 802.11a

CHANNEL	CH 6 + CH 157	6dB BANDWIDTH	9kHz
PHASE	Line 1		

No	Freq.	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]		Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
	1		0.16955	0.18	49.65	40.77	49.83	40.95	64.98	54.98
2	0.23586	0.23	42.79	34.44	43.02	34.67	62.24	52.24	-19.22	-17.57
3	0.47789	0.21	47.91	41.40	48.12	41.61	56.38	46.38	-8.25	-4.76
4	1.41293	0.24	36.55	29.66	36.79	29.90	56.00	46.00	-19.21	-16.10
5	2.36697	0.28	35.81	29.85	36.09	30.13	56.00	46.00	-19.91	-15.87
6	6.55809	0.45	36.12	29.65	36.57	30.10	60.00	50.00	-23.43	-19.90

REMARKS:

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





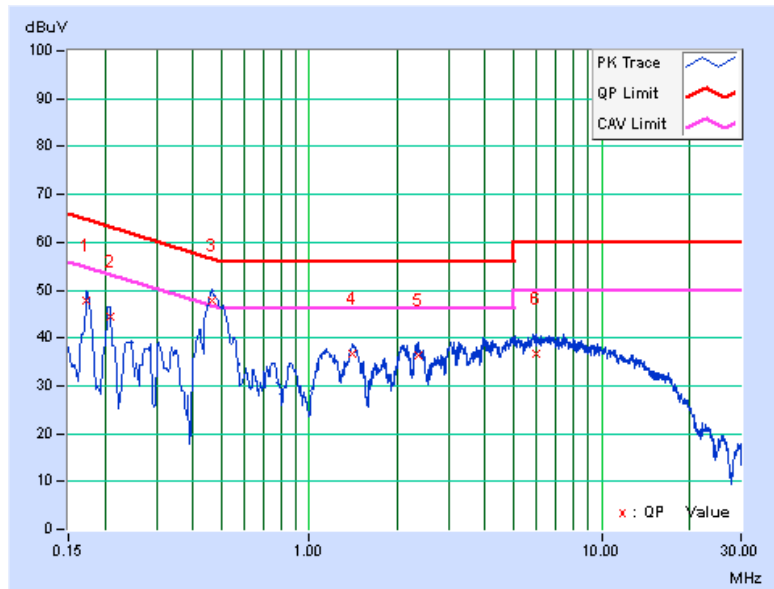
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CHANNEL	CH 6 + CH 157	6dB BANDWIDTH	9kHz
PHASE	Line 2		

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	0.17346	0.28	47.66	39.33	47.94	39.61	64.79
2	0.20865	0.31	44.17	35.74	44.48	36.05	63.26	53.26	-18.78	-17.21
3	0.46669	0.30	47.58	35.64	47.88	35.94	56.57	46.57	-8.69	-10.63
4	1.40902	0.33	36.48	29.17	36.81	29.50	56.00	46.00	-19.19	-16.50
5	2.35524	0.38	36.00	29.98	36.38	30.36	56.00	46.00	-19.62	-15.64
6	6.00718	0.53	36.01	29.11	36.54	29.64	60.00	50.00	-23.46	-20.36

REMARKS:

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





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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.

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

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Fax: 886-2-26051924

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Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com

Web Site: www.bureauveritas-adt.com

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 modifications were made to the EUT by the lab during the test.

---END---