

FCC Test Report (Co-Located)

Report No.: RF170801C12-2

FCC ID: KA2WL6620APSA1

Test Model: DWL-6620APS

Received Date: Aug. 01, 2017

Test Date: Oct. 12, 2017

Issued Date: Oct. 17, 2017

Applicant: D-Link Corporation

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Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch

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**FCC Registration /
Designation Number:** 788550 / TW0003



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Release Control Record

Issue No.	Description	Date Issued
RF170801C12-2	Original release.	Oct. 17, 2017

1 Certificate of Conformity

Product: Unified AC Concurrent Dual-band PoE Access Point

Brand: D-Link Corporation

Test Model: DWL-6620APS

Sample Status: Identical Prototype

Applicant: D-Link Corporation

Test Date: Oct. 12, 2017

Standards: 47 CFR FCC Part 15, Subpart C (Section 15.247)
47 CFR FCC Part 15, Subpart E (Section 15.407)
ANSI C63.10-2013

The above equipment 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 RF characteristics under the conditions specified in this report.

Prepared by : Celine Chou , **Date:** Oct. 17, 2017
Celine Chou / Specialist

Approved by : Ken Liu , **Date:** Oct. 17, 2017
Ken Liu / Senior Manager

2 Summary of Test Results

Applied Standard:	47 CFR FCC Part 15, Subpart C (Section 15.247) 47 CFR FCC Part 15, Subpart E (Section 15.407)		
FCC Clause	Test Item	Result	Remarks
15.207 15.407(b)(6)	AC Power Conducted Emission	Pass	Meet the requirement of limit. Minimum passing margin is -15.26dB at 0.15000MHz.
15.205 / 15.209 / 15.247(d) 15.407(b) (1/2/3/4(i/ii)/6)	Radiated Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -2.5dB at 365.62MHz.

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	Expanded Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.94 dB
Radiated Emissions up to 1 GHz	30MHz ~ 200MHz	3.59 dB
	200MHz ~ 1000MHz	3.60 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	2.29 dB
	18GHz ~ 40GHz	2.29 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Unified AC Concurrent Dual-band PoE Access Point
Brand	D-Link Corporation
Test Model	DWL-6620APS
Status of EUT	Identical Prototype
Power Supply Rating	12Vdc from adapter 53Vdc from POE
Modulation Type	CCK, DQPSK, DBPSK for DSSS 256QAM, 64QAM, 16QAM, QPSK, BPSK for OFDM
Modulation Technology	DSSS, OFDM
Transfer Rate	802.11b: 11/5.5/2/1Mbps 802.11a/g: 54/48/36/24/18/12/9/6Mbps 802.11n: up to 300Mbps 802.11ac: up to 867Mbps
Operating Frequency	2.4GHz: 2412 ~ 2462MHz 5.0GHz: 5180 ~ 5240MHz, 5745 ~ 5825MHz
Number of Channel	2412 ~ 2462MHz: 11 for 802.11b, 802.11g, 802.11n (HT20) 7 for 802.11n (HT40) 5180 ~ 5240MHz: 4 for 802.11a, 802.11n (HT20), 802.11ac (VHT20) 2 for 802.11n (HT40), 802.11ac (VHT40) 1 for 802.11ac (VHT80) 5745 ~ 5825MHz: 5 for 802.11a, 802.11n (HT20), 802.11ac (VHT20) 2 for 802.11n (HT40), 802.11ac (VHT40) 1 for 802.11ac (VHT80)
Output Power	CDD Mode: 2412 ~ 2462MHz: 589.448mW 5180 ~ 5240MHz: 605.902mW 5745 ~ 5825MHz: 772.808mW Beamforming Mode: 2412 ~ 2462MHz: 283.832mW 5180 ~ 5240MHz: 302.972mW 5745 ~ 5825MHz: 386.430mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	Adapter
Data Cable Supplied	NA

Note:

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

Band	Modulation Mode	Beamforming Mode	TX Function
2.4GHz	802.11b	Not Support	2TX
	802.11g	Not Support	2TX
	802.11n (HT20)	Support	2TX
	802.11n (HT40)	Support	2TX
5GHz	802.11a	Not Support	2TX
	802.11n (HT20)	Support	2TX
	802.11n (HT40)	Support	2TX
	802.11ac (VHT20)	Support	2TX
	802.11ac (VHT40)	Support	2TX
	802.11ac (VHT80)	Support	2TX

* For 802.11n, CDD mode is the worst case for final radiated emission and power line conducted emission tests after pretesting CDD mode and beamforming mode.

2. The EUT uses following antennas.

Type	Connector	Gain (dBi)	
		2.4GHz	5GHz
Smart Antenna	I-pex	4.90	6.10

3. The EUT consumes power from the following adapters and POE. (POE for support unit only)

Adapter 1	
Brand	D-Link
Model	AMS115-1202000FU
Input Power	100-240Vac, 50-60Hz, 0.8A
Output Power	12Vdc, 2A
Power Line	1.2m power cable without core attached on adapter

Adapter 2	
Brand	D-Link
Model	WA-24Q12R
Input Power	100-240Vac, 50-60Hz, 0.7A
Output Power	12Vdc, 2A
Power Line	1.2m power cable without core attached on adapter

POE	
Brand	D-Link
Model	PGS-1210-10P
Input Power	100-240Vac
Output Power	53Vdc

3.2 Description of Test Modes

For 2.4GHz

11 channels are provided for 802.11b, 802.11g and 802.11n (HT20):

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 (HT40):

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 (HT20), 802.11ac (VHT20):

Channel	Frequency	Channel	Frequency
36	5180 MHz	44	5220 MHz
40	5200 MHz	48	5240 MHz

2 channels are provided for 802.11n (HT40), 802.11ac (VHT40):

Channel	Frequency	Channel	Frequency
38	5190 MHz	46	5230 MHz

1 channel is provided for 802.11ac (VHT80):

Channel	Frequency
42	5210MHz

5745~5825MHz:

5 channels are provided for 802.11a, 802.11n (HT20), 802.11ac (VHT20):

Channel	Frequency	Channel	Frequency
149	5745MHz	161	5805MHz
153	5765MHz	165	5825MHz
157	5785MHz		

2 channels are provided for 802.11n (HT40), 802.11ac (VHT40):

Channel	Frequency	Channel	Frequency
151	5755MHz	159	5795MHz

1 channel is provided for 802.11ac (VHT80):

Channel	Frequency
155	5775MHz

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable to			Description
	RE $\geq$ 1G	RE $<$ 1G	PLC	
A	√	√	√	Power from adapter 1
B	-	√	√	Power from adapter 2
C	-	√	√	Power from POE

Where **RE $\geq$ 1G**: Radiated Emission above 1GHz & Bandedge Measurement
RE $<$ 1G: Radiated Emission below 1GHz
PLC: Power Line Conducted Emission

Note:

1. The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **X-plane**.
2. "-" means no effect.

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
A	802.11n (HT20) + 802.11n (HT20)	2412 ~ 2462	1 to 11	6 + 40	BPSK
		5180 ~ 5240	36 to 48		OFDM

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
A, B, C	802.11n (HT20) + 802.11n (HT20)	2412 ~ 2462	1 to 11	6 + 40	BPSK
		5180 ~ 5240	36 to 48		OFDM

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.

EUT Configure Mode	Mode	Freq. Range (MHz)	Available Channel	Tested Channel	Modulation Technology
A, B, C	802.11n (HT20) + 802.11n (HT20)	2412 ~ 2462	1 to 11	6 + 40	BPSK
		5180 ~ 5240	36 to 48		OFDM

Test Condition:

Applicable to	Environmental Conditions	Input Power	Tested by
RE $\geq$ 1G	25 deg. C, 66% RH	120Vac, 60Hz	Chris Lin
RE<1G	25 deg. C, 66% RH	120Vac, 60Hz 53Vdc	Chris Lin
PLC	25 deg. C, 65% RH	120Vac, 60Hz 53Vdc	Chris Lin

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.

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Notebook	DELL	E5410	6RP2YM1	FCC DoC Approved	-
B.	Load	NA	NA	NA	NA	-
C.	POE	D-Link	PGS-1210-10P	NA	NA	Provided by manufacturer

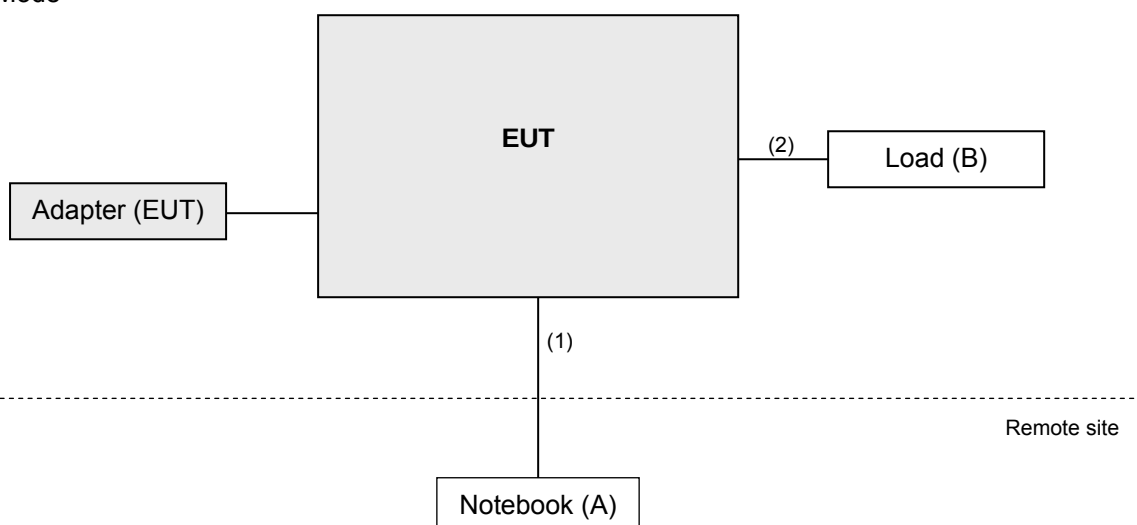
Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. Item A acted as a communication partner to transfer data.

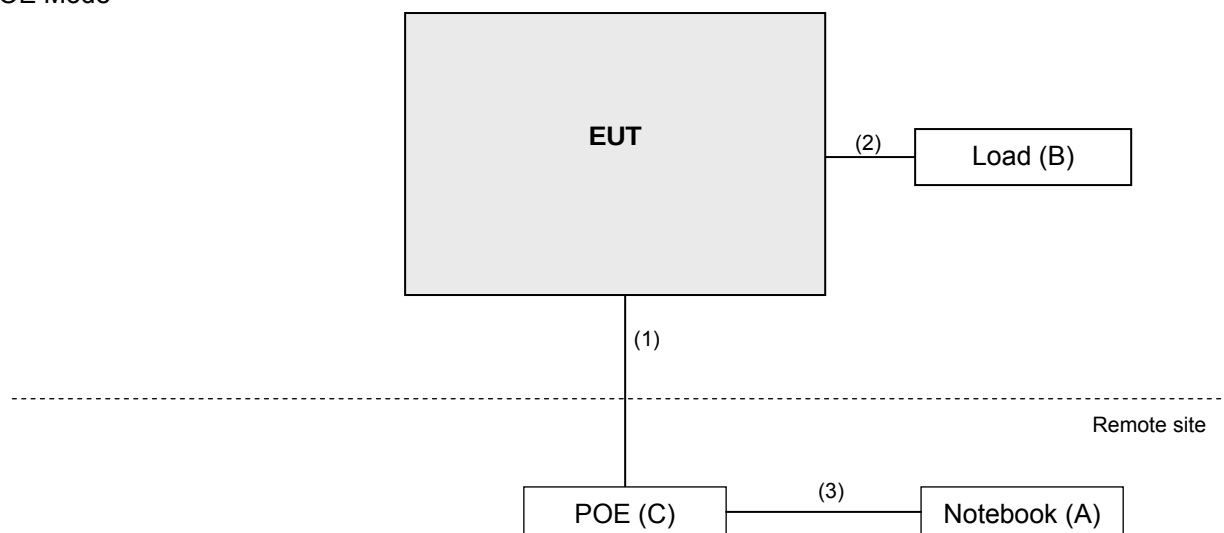
ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	RJ45, Cat5e	1	3	N	0	-
2.	RJ45, Cat5e	2	1.8	N	0	-
3.	RJ45, Cat5e	1	1.8	N	0	-

3.3.1 Configuration of System under Test

Adapter Mode



POE Mode



3.4 General Description of Applied Standards

The EUT is a RF Product. According to the specification of the EUT declared by the manufacturer, it must comply with the requirements of the following standards:

FCC Part 15, Subpart C (15.247)

FCC Part 15, Subpart E (15.407)

ANSI C63.10-2013

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

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20dB below the highest level of the desired power:

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.

Limits of unwanted emission out of the restricted bands

Applicable To			Limit	
789033 D02 General UNII Test Procedure New Rules v02r01			Field Strength at 3m	
			PK: 74 (dBµV/m)	AV: 54 (dBµV/m)
Frequency Band	Applicable To		EIRP Limit	Equivalent Field Strength at 3m
5150~5250 MHz	15.407(b)(1)		PK: -27 (dBm/MHz)	PK: 68.2(dBµV/m)
5250~5350 MHz	15.407(b)(2)			
5470~5725 MHz	15.407(b)(3)			
5725~5850 MHz	☒	15.407(b)(4)(i)	PK: -27 (dBm/MHz) ^{*1} PK: 10 (dBm/MHz) ^{*2} PK: 15.6 (dBm/MHz) ^{*3} PK: 27 (dBm/MHz) ^{*4}	PK: 68.2(dBµV/m) ^{*1} PK: 105.2 (dBµV/m) ^{*2} PK: 110.8(dBµV/m) ^{*3} PK: 122.2 (dBµV/m) ^{*4}
	☐	15.407(b)(4)(ii)	Emission limits in section 15.247(d)	
^{*1} beyond 75 MHz or more above of the band edge.			^{*2} below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above.	
^{*3} below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above.			^{*4} from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.	

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

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

4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver KEYSIGHT	N9038A	MY55420137	Mar. 27, 2017	Mar. 26, 2018
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100269	May. 11, 2017	May. 10, 2018
BILOG Antenna SCHWARZBECK	VULB9168	9168-148	Dec. 28, 2016	Dec. 27, 2017
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-1169	Dec. 27, 2016	Dec. 26, 2017
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Dec. 14, 2016	Dec. 13, 2017
Loop Antenna EMCI	EM-6879	269	Aug. 11, 2017	Aug. 10, 2018
Preamplifier Agilent	8449B	3008A01638	Feb. 22, 2017	Feb. 21, 2018
Preamplifier Agilent	8447D	2944A10638	Aug. 08, 2017	Aug. 07, 2018
RF signal cable HUBER+SUHNER	SUCOFLEX 104	CABLE-CH9-02 (248780+MY13377)	Aug. 08, 2017	Aug. 07, 2018
RF signal cable HUBER+SUHNER	SUCOFLEX 104	CABLE-CH9-(250795/4)	Aug. 08, 2017	Aug. 07, 2018
RF signal cable Woken	8D-FB	Cable-CH9-01	Aug. 01, 2017	Jul. 31, 2018
Software BV ADT	ADT_Radiated_ V7.6.15.9.4	NA	NA	NA
Antenna Tower EMCO	2070/2080	512.835.4684	NA	NA
Turn Table EMCO	2087-2.03	NA	NA	NA
Antenna Tower & Turn BV ADT	AT100	AT93021705	NA	NA
Turn Table BV ADT	TT100	TT93021705	NA	NA
Turn Table Controller BV ADT	SC100	SC93021705	NA	NA
26GHz ~ 40GHz Amplifier	EM26400	815221	Oct. 17, 2016	Oct. 16, 2017

- 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 preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
 4. The FCC Designation Number is TW0003. The number will be varied with the Lab location and scope as attached.
 5. The IC Site Registration No. is IC 7450F-9.

4.1.3 Test Procedures

For Radiated emission below 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. 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. Both X and Y axes of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

For Radiated emission above 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

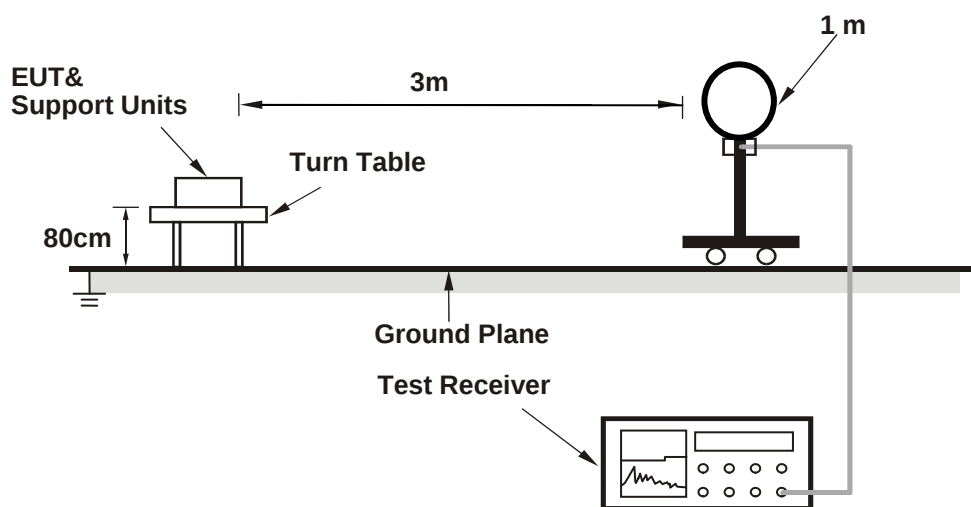
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is $\geq 1/T$ (Duty cycle < 98%) or 10Hz (Duty cycle $\geq 98\%$) 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

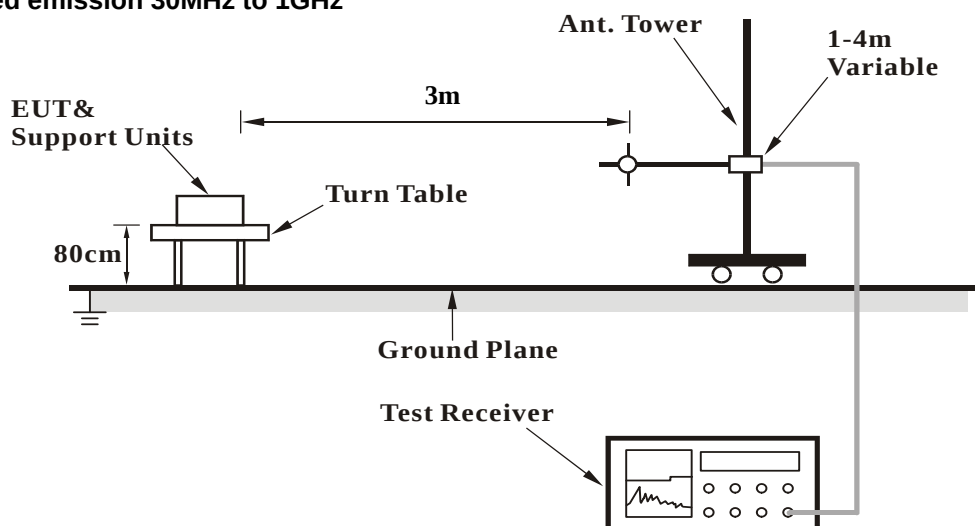
No deviation.

4.1.5 Test Setup

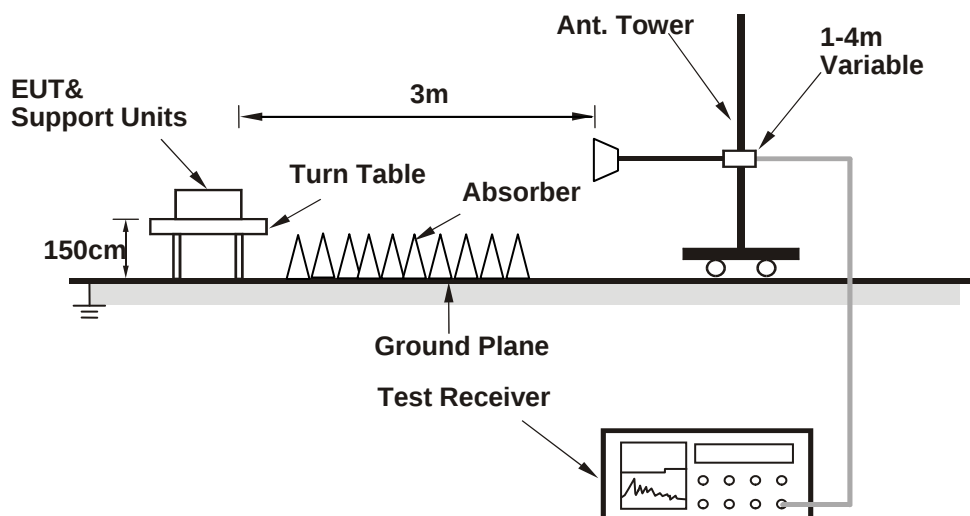
For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



For Radiated emission above 1GHz



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

4.1.6 EUT Operating Conditions

- Placed the EUT on the testing table.
- Prepared a notebook to act as a 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".

4.1.7 Test Results

Above 1GHz Data:

802.11n (HT20) + 802.11n (HT20)

CHANNEL	CH 6 + CH 40	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2437.00	113.9 PK			3.32 H	292	80.3	33.6
2	*2437.00	103.0 AV			3.32 H	292	69.4	33.6
3	4874.00	60.0 PK	74.0	-14.0	3.19 H	189	56.1	3.9
4	4874.00	45.2 AV	54.0	-8.8	3.19 H	189	41.3	3.9
5	5150.00	58.7 PK	74.0	-15.3	2.71 H	283	54.8	3.9
6	5150.00	45.2 AV	54.0	-8.8	2.71 H	283	41.3	3.9
7	*5200.00	115.5 PK			2.67 H	278	74.7	40.8
8	*5200.00	104.2 AV			2.67 H	278	63.4	40.8
9	#10400.00	58.3 PK	74.0	-15.7	1.86 H	137	42.8	15.5
10	#10400.00	45.1 AV	54.0	-8.9	1.86 H	137	29.6	15.5
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	123.7 PK			3.21 V	18	90.1	33.6
2	*2437.00	112.4 AV			3.21 V	18	78.8	33.6
3	4874.00	57.3 PK	74.0	-16.7	1.13 V	281	53.4	3.9
4	4874.00	49.8 AV	54.0	-4.2	1.13 V	281	45.9	3.9
5	5150.00	67.4 PK	74.0	-6.6	2.38 V	327	63.5	3.9
6	5150.00	51.1 AV	54.0	-2.9	2.38 V	327	47.2	3.9
7	*5200.00	124.4 PK			2.62 V	314	83.6	40.8
8	*5200.00	113.5 AV			2.62 V	314	72.7	40.8
9	#10400.00	60.1 PK	74.0	-13.9	1.74 V	285	44.6	15.5
10	#10400.00	46.3 AV	54.0	-7.7	1.74 V	285	30.8	15.5

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

Below 1GHz data

802.11n (HT20) + 802.11n (HT20)

CHANNEL	CH 6 + CH 40	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		
TEST MODE	A		

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	59.10	28.2 QP	40.0	-11.8	1.00 H	50	42.2	-14.0
2	224.00	30.1 QP	46.0	-15.9	1.49 H	111	46.1	-16.0
3	311.30	40.1 QP	46.0	-5.9	1.00 H	277	52.2	-12.1
4	377.26	37.4 QP	46.0	-8.6	1.00 H	172	48.7	-11.3
5	687.66	31.4 QP	46.0	-14.6	1.00 H	156	37.6	-6.2
6	924.34	28.9 QP	46.0	-17.1	1.99 H	223	31.3	-2.4
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	33.88	31.0 QP	40.0	-9.0	1.00 V	12	46.0	-15.0
2	224.00	30.1 QP	46.0	-15.9	1.49 V	111	46.1	-16.0
3	369.50	42.8 QP	46.0	-3.2	1.00 V	167	54.2	-11.4
4	538.28	39.7 QP	46.0	-6.3	1.49 V	166	48.7	-9.0
5	672.14	30.8 QP	46.0	-15.2	1.00 V	190	37.2	-6.4
6	939.86	37.2 QP	46.0	-8.8	1.00 V	225	39.4	-2.2

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) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

CHANNEL	CH 6 + CH 40	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		
TEST MODE	B		

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	59.10	30.4 QP	40.0	-9.6	2.00 H	108	44.4	-14.0
2	222.06	34.3 QP	46.0	-11.7	1.00 H	298	50.3	-16.0
3	352.04	41.6 QP	46.0	-4.4	1.00 H	163	53.3	-11.7
4	532.46	37.8 QP	46.0	-8.2	1.51 H	173	46.9	-9.1
5	672.14	31.5 QP	46.0	-14.5	1.00 H	16	37.9	-6.4
6	974.78	30.3 QP	54.0	-23.7	2.00 H	201	31.8	-1.5
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	33.88	28.7 QP	40.0	-11.3	1.51 V	221	43.7	-15.0
2	222.06	34.3 QP	46.0	-11.7	1.00 V	298	50.3	-16.0
3	365.62	41.9 QP	46.0	-4.1	1.00 V	147	53.4	-11.5
4	573.20	41.3 QP	46.0	-4.7	1.51 V	184	49.6	-8.3
5	672.14	31.5 QP	46.0	-14.5	1.00 V	16	37.9	-6.4
6	747.80	38.2 QP	46.0	-7.8	2.00 V	194	43.3	-5.1

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) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

CHANNEL	CH 6 + CH 40	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		
TEST MODE	C		

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	144.46	31.7 QP	43.5	-11.8	2.00 H	109	45.4	-13.7
2	241.46	30.6 QP	46.0	-15.4	1.00 H	124	45.1	-14.5
3	371.44	40.6 QP	46.0	-5.4	1.00 H	211	52.0	-11.4
4	501.42	34.5 QP	46.0	-11.5	1.51 H	188	43.9	-9.4
5	672.14	31.5 QP	46.0	-14.5	1.00 H	16	37.9	-6.4
6	747.80	38.2 QP	46.0	-7.8	2.00 H	194	43.3	-5.1
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	68.80	31.8 QP	40.0	-8.2	1.00 V	89	47.0	-15.2
2	222.06	33.3 QP	46.0	-12.7	1.49 V	132	49.3	-16.0
3	365.62	43.5 QP	46.0	-2.5	1.00 V	79	55.0	-11.5
4	582.90	37.6 QP	46.0	-8.4	1.49 V	15	45.6	-8.0
5	747.80	39.0 QP	46.0	-7.0	1.00 V	63	44.1	-5.1
6	937.92	30.4 QP	46.0	-15.6	2.00 V	236	32.6	-2.2

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) – Pre-Amplifier 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 (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	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 0.50MHz.

4.2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESCS 30	100288	Aug.17, 2017	Aug. 16, 2018
RF signal cable (with 10dB PAD) Woken	5D-FB	Cable-cond2-01	Sep. 09, 2017	Sep. 08, 2018
LISN ROHDE & SCHWARZ (EUT)	ESH2-Z5	100100	Jan. 17, 2017	Jan. 16, 2018
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100312	Aug. 02, 2017	Aug. 01, 2018
Software ADT	BV ADT_Conc_ 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 2.
 3. The VCCI Site Registration No. is C-2047.

4.2.3 Test Procedures

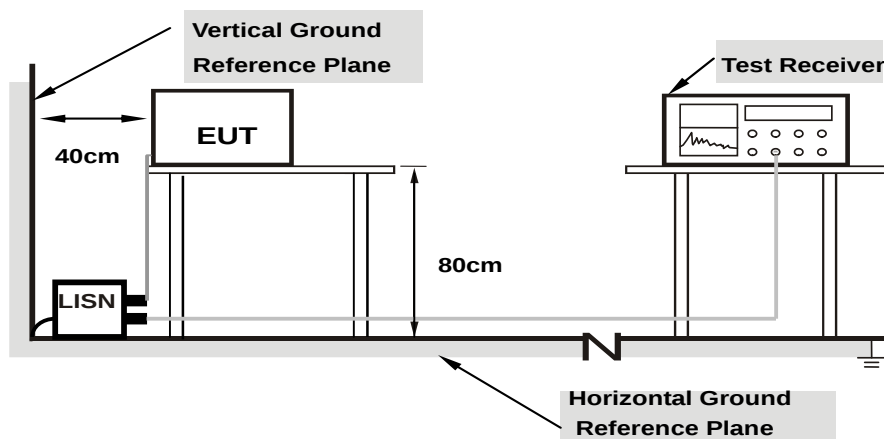
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance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

NOTE: The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 Test Setup



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

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

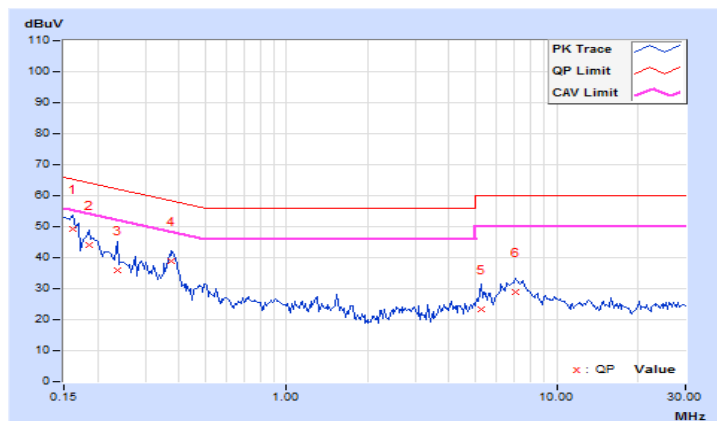
802.11n (HT20) + 802.11n (HT20)

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
Channel	CH 6 + CH 40	Test Mode	A

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	0.16172	10.40	38.80	23.19	49.20	33.59	65.38	55.38	-16.18	-21.79
2	0.18516	10.41	33.79	19.09	44.20	29.50	64.25	54.25	-20.05	-24.75
3	0.23594	10.42	25.65	10.67	36.07	21.09	62.24	52.24	-26.17	-31.15
4	0.37656	10.41	28.39	20.02	38.80	30.43	58.35	48.35	-19.55	-17.92
5	5.28125	10.62	12.67	6.87	23.29	17.49	60.00	50.00	-36.71	-32.51
6	7.03906	10.65	18.22	12.58	28.87	23.23	60.00	50.00	-31.13	-26.77

Remarks:

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

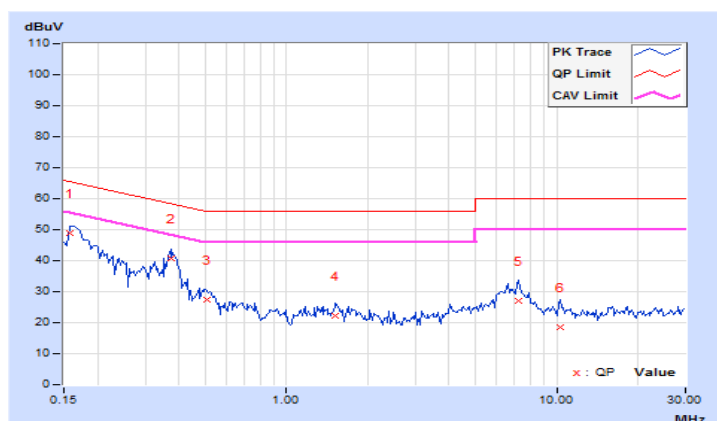


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Channel	CH 6 + CH 40	Test Mode	A

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	0.15781	10.42	38.57	21.62	48.99	32.04	65.58	55.58	-16.59	-23.54
2	0.37656	10.37	30.23	22.61	40.60	32.98	58.35	48.35	-17.75	-15.37
3	0.50547	10.40	17.17	9.20	27.57	19.60	56.00	46.00	-28.43	-26.40
4	1.52344	10.49	11.76	6.14	22.25	16.63	56.00	46.00	-33.75	-29.37
5	7.24219	10.63	16.55	11.51	27.18	22.14	60.00	50.00	-32.82	-27.86
6	10.30469	10.66	7.74	1.86	18.40	12.52	60.00	50.00	-41.60	-37.48

Remarks:

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

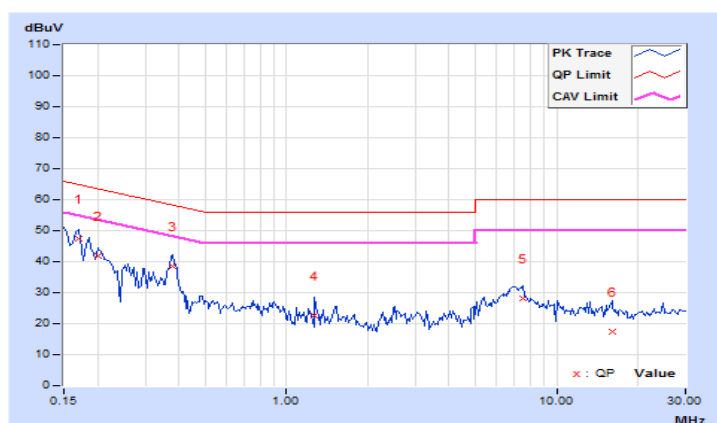


Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
Channel	CH 6 + CH 40	Test Mode	B

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	0.16953	10.40	37.04	21.86	47.44	32.26	64.98	54.98	-17.54	-22.72
2	0.20078	10.42	31.36	16.39	41.78	26.81	63.58	53.58	-21.80	-26.77
3	0.38047	10.41	27.96	20.00	38.37	30.41	58.27	48.27	-19.90	-17.86
4	1.26563	10.50	12.16	6.42	22.66	16.92	56.00	46.00	-33.34	-29.08
5	7.46875	10.66	17.58	12.10	28.24	22.76	60.00	50.00	-31.76	-27.24
6	16.02734	10.81	6.61	0.86	17.42	11.67	60.00	50.00	-42.58	-38.33

Remarks:

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

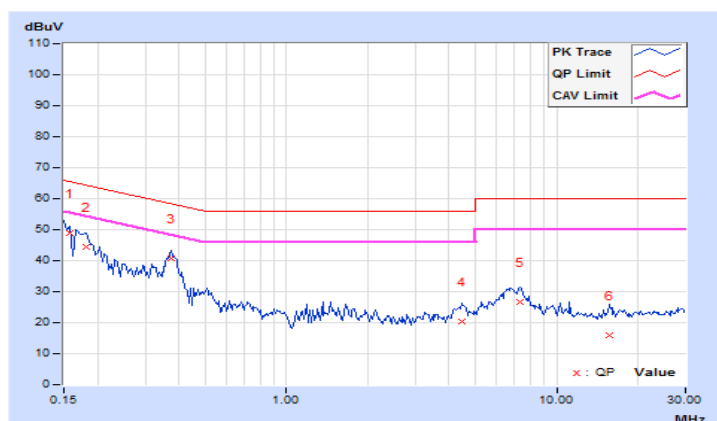


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Channel	CH 6 + CH 40	Test Mode	B

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	0.15781	10.42	38.34	21.05	48.76	31.47	65.58	55.58	-16.82	-24.11
2	0.18125	10.38	34.01	18.37	44.39	28.75	64.43	54.43	-20.04	-25.68
3	0.37266	10.37	30.21	21.86	40.58	32.23	58.44	48.44	-17.86	-16.21
4	4.46484	10.61	9.81	4.97	20.42	15.58	56.00	46.00	-35.58	-30.42
5	7.36719	10.63	16.21	11.50	26.84	22.13	60.00	50.00	-33.16	-27.87
6	15.59375	10.83	5.06	0.38	15.89	11.21	60.00	50.00	-44.11	-38.79

Remarks:

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

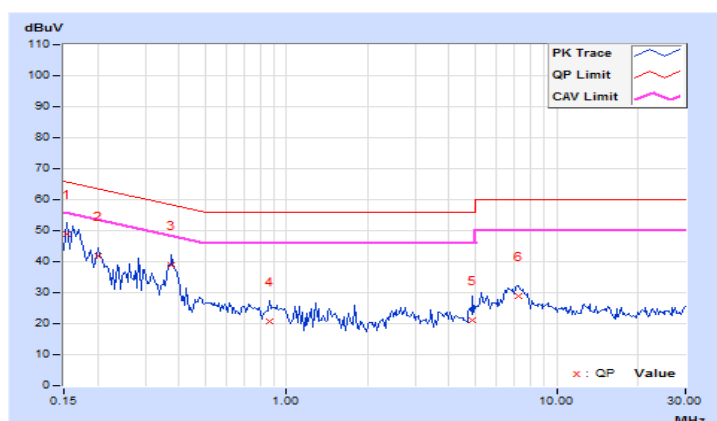


Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
Channel	CH 6 + CH 40	Test Mode	C

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	0.15391	10.39	38.38	21.21	48.77	31.60	65.79	55.79	-17.02	-24.19
2	0.20078	10.42	31.28	16.23	41.70	26.65	63.58	53.58	-21.88	-26.93
3	0.37656	10.41	28.43	20.20	38.84	30.61	58.35	48.35	-19.51	-17.74
4	0.86875	10.47	10.31	3.13	20.78	13.60	56.00	46.00	-35.22	-32.40
5	4.89453	10.62	10.31	0.75	20.93	11.37	56.00	46.00	-35.07	-34.63
6	7.26172	10.66	18.23	13.06	28.89	23.72	60.00	50.00	-31.11	-26.28

Remarks:

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

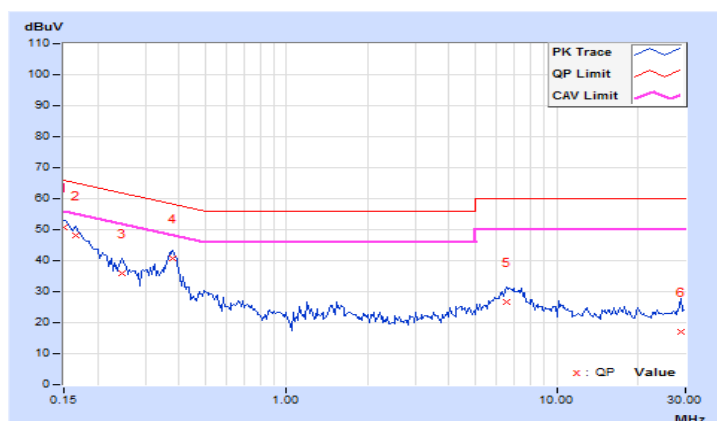


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Channel	CH 6 + CH 40	Test Mode	C

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	0.15000	10.43	40.31	23.29	50.74	33.72	66.00	56.00	-15.26	-22.28
2	0.16562	10.41	37.67	22.33	48.08	32.74	65.18	55.18	-17.10	-22.44
3	0.24766	10.36	25.54	12.74	35.90	23.10	61.84	51.84	-25.94	-28.74
4	0.38047	10.37	30.24	22.54	40.61	32.91	58.27	48.27	-17.66	-15.36
5	6.52734	10.62	16.11	12.83	26.73	23.45	60.00	50.00	-33.27	-26.55
6	28.75391	10.73	6.18	1.48	16.91	12.21	60.00	50.00	-43.09	-37.79

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



5 Pictures of Test Arrangements

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

Appendix – 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 FCC recognized accredited test firms and accredited and approved according to ISO/IEC 17025.

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

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Web Site: www.bureauveritas-adt.com

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

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