



FCC TEST REPORT (15.407)

REPORT NO.: RF130110C21-1

MODEL NO.: DIR-810L

FCC ID: KA2IR810LA1

RECEIVED: Dec. 28, 2012

TESTED: Dec. 28, 2012 ~ Feb. 04, 2013

ISSUED: Feb. 04, 2013

APPLICANT: D-Link Corporation

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U.S.A.

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

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TEST LOCATION: No. 19, Hwa Ya 2nd Rd, Wen Hwa Tsuen, Kwei
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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF130110C21-1	Original release	Feb. 04, 2013



1. CERTIFICATION

PRODUCT: Wireless AC750 Dual Band Cloud Router

MODEL: DIR-810L

BRAND: D-Link

APPLICANT: D-Link Corporation

TESTED: Dec. 28, 2012 ~ Feb. 04, 2013

TEST SAMPLE: ENGINEERING SAMPLE

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

ANSI C63.10-2009

The above equipment (model: DIR-810L) 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 : Suntee Liu , DATE : Feb. 04, 2013
Suntee Liu / Specialist

APPROVED BY : Ken Liu , DATE : Feb. 04, 2013
Ken Liu / Manager

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)			
STANDARD SECTION	TEST TYPE	RESULT	REMARK
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is -6.51dB at 0.15391MHz.
15.247(d) 15.209	Radiated Emissions	PASS	Meet the requirement of limit. Minimum passing margin is -1.0dB at 5150.00MHz, 5725.00MHz, 5470.00MHz.
15.247(d)	Band Edge Measurement	PASS	Meet the requirement of limit.
15.247(a)(2)	6dB bandwidth	PASS	Meet the requirement of limit.
15.247(b)	Conducted power	PASS	Meet the requirement of limit.
15.247(e)	Power Spectral Density	PASS	Meet the requirement of limit.
15.203	Antenna Requirement	PASS	Antenna connector is UFL not a standard connector.

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	2.93 dB
	200MHz ~1000MHz	2.95 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 AC750 Dual Band Cloud Router
MODEL NO.	DIR-810L
POWER SUPPLY	12Vdc (Adapter)
MODULATION TYPE	64QAM, 16QAM, QPSK, BPSK 256QAM for OFDM in 11ac mode only
MODULATION TECHNOLOGY	OFDM
TRANSFER RATE	802.11a: 54/48/36/24/18/12/9/6Mbps 802.11n: up to 150Mbps 802.11ac: up to 433Mbps
OPERATING FREQUENCY	5180 ~ 5240MHz
NUMBER OF CHANNEL	802.11a, 802.11n (20MHz), 802.11ac (20MHz): 4 802.11n (40MHz), 802.11ac (40MHz): 2 802.11ac (80MHz): 1
OUTPUT POWER	48.978mW
ANTENNA TYPE	Dipole antenna with 0dBi gain
ANTENNA CONNECTOR	UFL
DATA CABLE	NA
I/O PORTS	Refer to user's manual
ACCESSORY DEVICES	Adapter

NOTE:

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

MODULATION MODE	TX FUNCTION
802.11b	1TX
802.11g	1TX
802.11a	1TX
802.11n (20MHz) for 2.4GHz	2TX
802.11n (40MHz) for 2.4GHz	2TX
802.11n (20MHz) for 5GHz	1TX
802.11n (40MHz) for 5GHz	1TX
802.11ac (20MHz)	1TX
802.11ac (40MHz)	1TX
802.11ac (80MHz)	1TX

2. The EUT consumes power from the following adapters.

Adapter 1	
Brand	D-Link
Model	AMS9-1201000FU2
Input Power	100-240Vac, 50/60Hz, 0.5A/27VA
Output Power	12Vdc, 1A
Power Line	1.2m cable without core attached on adapter

Adapter 2	
Brand	D-Link
Model	F12W-120100SPAU L.P.S
Input Power	100-240Vac, 50/60Hz, 0.3A
Output Power	12Vdc, 1A
Power Line	1.2m cable without core attached on adapter

Adapter 3	
Brand	D-Link
Model	ADS012PM-W 120100
Input Power	100-240Vac, 50/60Hz, 0.5A
Output Power	12Vdc, 1A
Power Line	1.2m cable without core attached on adapter

3. 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

4 channels are provided for 802.11a, 802.11n (20MHz), 802.11ac (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), 802.11ac (40MHz):

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
38	5190 MHz	46	5230 MHz

1 channel is provided for 802.11ac (80MHz):

CHANNEL	FREQUENCY
42	5210MHz

3.2.1 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE \geq 1G	RE<1G	PLC	APCM	
A	√	√	√	√	Power from adapter 1
B	-	√	√	-	Power from adapter 2
C	-	√	√	-	Power from adapter 3

Where **RE \geq 1G**: Radiated Emission above 1GHz **RE<1G**: Radiated Emission below 1GHz
PLC: Power Line Conducted Emission **APCM**: Antenna Port Conducted Measurement

NOTE: "-" 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. BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
A	802.11a	5180-5240	36 to 48	36, 40, 48	OFDM	BPSK	6.0
A	802.11n (20MHz)		36 to 48	36, 40, 48	OFDM	BPSK	7.2
A	802.11n (40MHz)		38 to 46	38, 46	OFDM	BPSK	15.0
A	802.11ac (80MHz)	5210	42	42	OFDM	BPSK	97.5

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. BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
A, B, C	802.11n (20MHz)	5180-5240	36 to 48	40	OFDM	BPSK	7.2

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. BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
A, B, C	802.11n (20MHz)	5180-5240	36 to 48	40	OFDM	BPSK	7.2

ANTENNA PORT CONDUCTED MEASUREMENT:

- This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.
- 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.

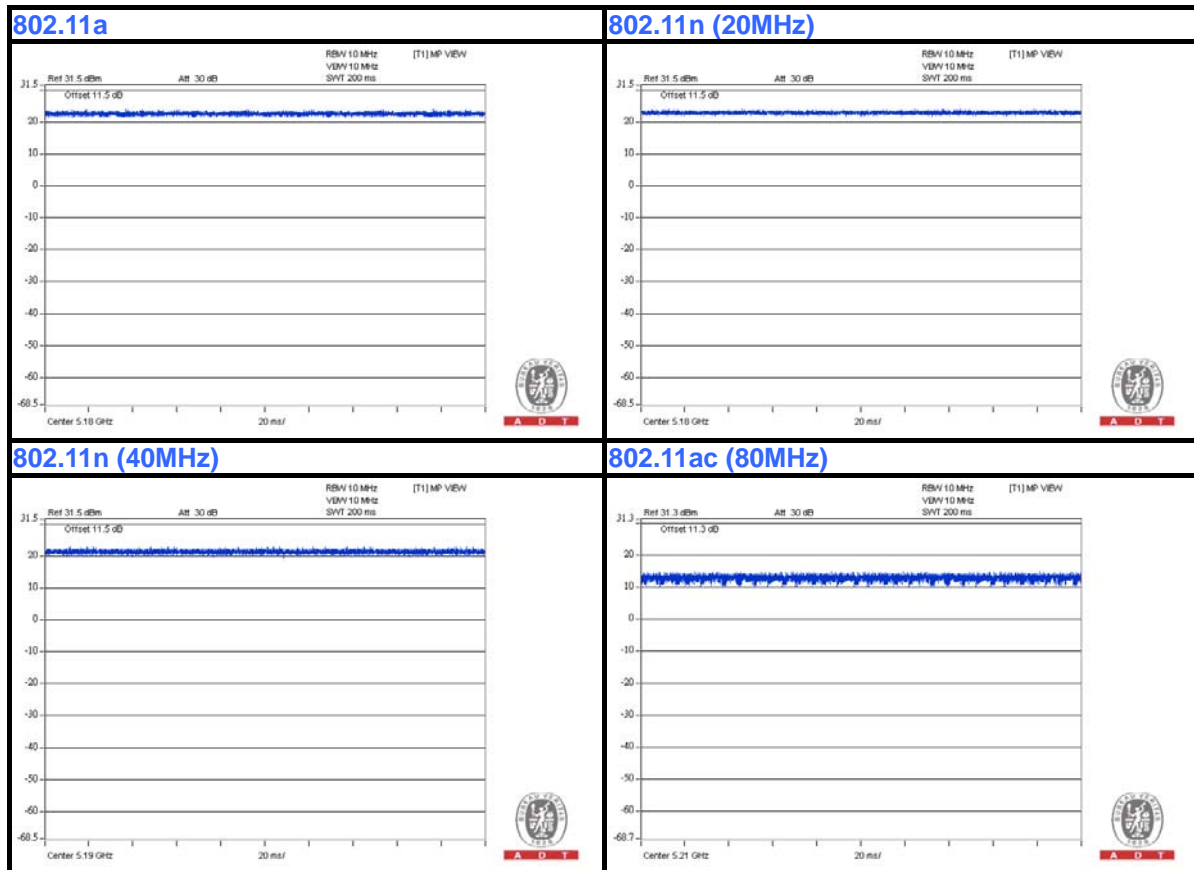
EUT CONFIGURE MODE	MODE	FREQ. BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
A	802.11a	5180-5240	36 to 48	36, 40, 48	OFDM	BPSK	6.0
A	802.11n (20MHz)		36 to 48	36, 40, 48	OFDM	BPSK	7.2
A	802.11n (40MHz)		38 to 46	38, 46	OFDM	BPSK	15.0
A	802.11ac (80MHz)	5210	42	42	OFDM	BPSK	97.5

TEST CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE≥1G	17deg. C, 65%RH	120Vac, 60Hz	Martin Lee
RE<1G	19deg. C, 66%RH	120Vac, 60Hz	Martin Lee
PLC	25deg. C, 68%RH	120Vac, 60Hz	Sun Lin
APCM	24deg. C, 64%RH	120Vac, 60Hz	Match Tsui

3.3 DUTY CYCLE OF TEST SIGNAL

Duty cycle of test signal is 100 %, duty factor is not required.



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.

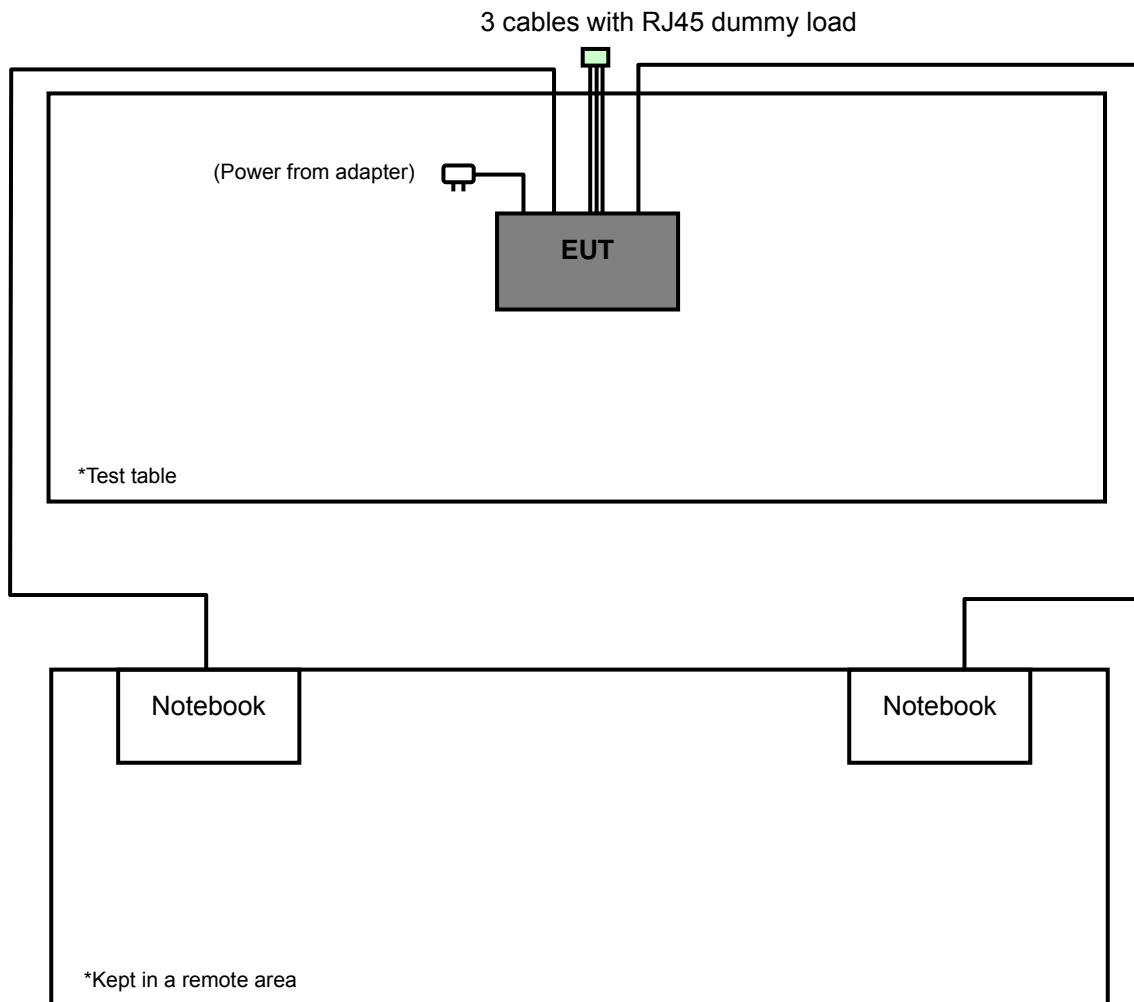
NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	Dummy Load	NA	NA	NA	NA
2	Notebook	DELL	D600	CN-0G5152-48643-47H-7677	FCC DoC Approved
3	Notebook	DELL	D531	CN-0XM006-48643-81U-2973	QDS-BRCM1020

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	1.8m RJ45 UTP cable x 3 with load connected to EUT
2	10m RJ45 UTP cable
3	10m RJ45 UTP cable

NOTE:

1. All power cords of the above support units are non-shielded (1.8m).
2. Items 2-3 acted as communication partners to transfer data.

3.4.1 CONFIGURATION OF SYSTEM UNDER TEST



3.5 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 E (15.407)

789033 D01 General UNII Test Procedures v01 r02

662911 D01 Multiple Transmitter Output v01 r02

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

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table:

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	ESCI	100744	Apr. 19, 2012	Apr. 18, 2013
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100269	Jan. 30, 2012	Jan. 29, 2013
BILOG Antenna SCHWARZBECK	VULB9168	9168-156	Apr. 03, 2012	Apr. 02, 2013
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-563	Sep. 12, 2012	Sep. 11, 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	8449B	3008A01911	Oct. 25, 2012	Oct. 24, 2013
Preamplifier Agilent	8447D	2944A10638	Oct. 25, 2012	Oct. 24, 2013
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	295013/4 283403/4	Aug. 28, 2012	Aug. 27, 2013
RF signal cable Worken	8D-FB	Cable-HYCH9-01	Aug. 11, 2012	Aug. 10, 2013
Software	ADT_Radiated_ V7.6.15.9.2	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 Table Controller EMCO	2090	NA	NA	NA
26GHz ~ 40GHz Amplifier	EM26400	815221	Oct. 25, 2012	Oct. 24, 2013
High Speed Peak Power Meter	ML2495A	0842014	Apr. 28, 2012	Apr. 27, 2013
Power Sensor	MA2411B	0738404	Apr. 28, 2012	Apr. 27, 2013
WIT Standard Temperature And Humidity Chamber	TH-4S-C	W981030	Jun. 13, 2012	Jun. 12, 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 9.
 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 460141.
 6. The IC Site Registration No. is IC 7450F-4.

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 meter 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 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

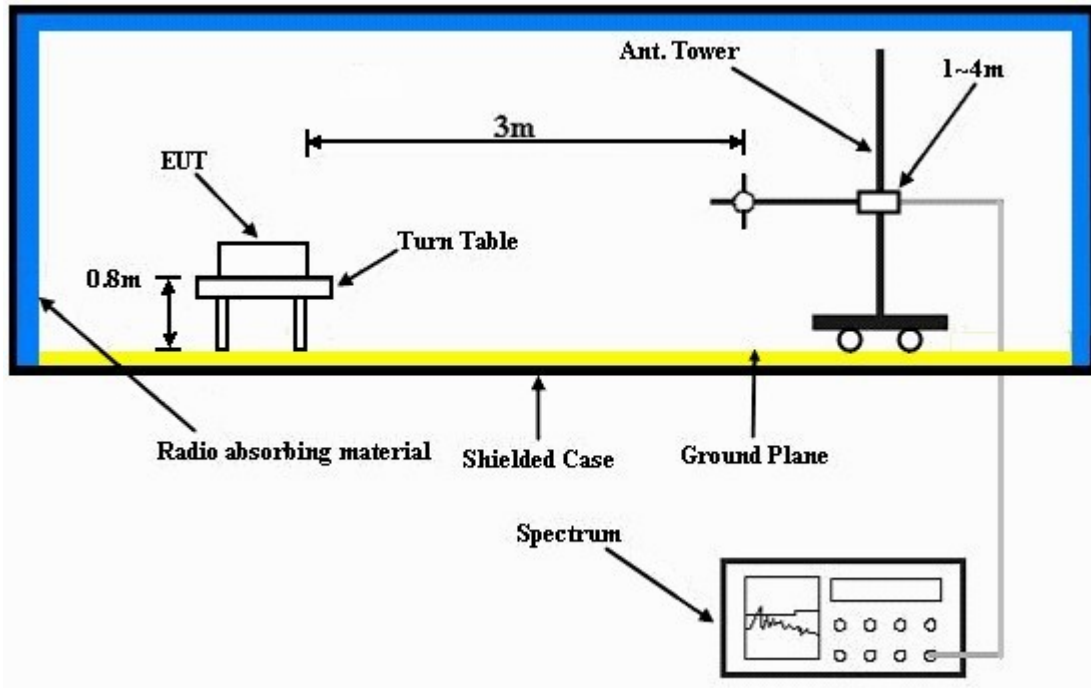
NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Peak detection (PK) and Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 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 CONDITION

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

4.1.8 TEST RESULTS

802.11a

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 36	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	17deg. C, 65%RH	TESTED BY	Martin Lee

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	50.8 PK	74.0	-23.2	1.08 H	2	13.00	37.80
2	5150.00	38.5 AV	54.0	-15.5	1.08 H	2	0.70	37.80
3	*5180.00	99.8 PK			1.08 H	2	62.00	37.80
4	*5180.00	90.5 AV			1.08 H	2	52.70	37.80
5	#10360.00	55.8 PK	74.0	-18.2	1.34 H	58	7.00	48.80
6	#10360.00	43.6 AV	54.0	-10.4	1.34 H	58	-5.20	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	5150.00	54.1 PK	74.0	-19.9	1.21 V	119	16.30	37.80
2	5150.00	42.6 AV	54.0	-11.4	1.21 V	119	4.80	37.80
3	*5180.00	103.5 PK			1.08 V	121	65.70	37.80
4	*5180.00	94.8 AV			1.08 V	121	57.00	37.80
5	#10360.00	56.0 PK	74.0	-18.0	1.20 V	152	7.20	48.80
6	#10360.00	43.9 AV	54.0	-10.1	1.20 V	152	-4.90	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 of the restricted band.



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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 40	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	17deg. C, 65%RH	TESTED BY	Martin Lee

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5200.00	99.7 PK			1.02 H	2	61.80	37.90
2	*5200.00	90.6 AV			1.02 H	2	52.70	37.90
3	#10400.00	53.0 PK	74.0	-21.0	1.32 H	48	4.20	48.80
4	#10400.00	43.9 AV	54.0	-10.1	1.32 H	48	-4.90	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	*5200.00	103.1 PK			1.34 V	141	65.20	37.90
2	*5200.00	94.1 AV			1.34 V	141	56.20	37.90
3	#10400.00	55.4 PK	74.0	-18.6	1.15 V	165	6.60	48.80
4	#10400.00	44.5 AV	54.0	-9.5	1.15 V	165	-4.30	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 of the restricted band.



A D T

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 48	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	17deg. C, 65%RH	TESTED BY	Martin Lee

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5240.00	99.5 PK			1.08 H	8	61.60	37.90
2	*5240.00	90.2 AV			1.08 H	8	52.30	37.90
3	#10480.00	52.8 PK	74.0	-21.2	1.29 H	52	3.80	49.00
4	#10480.00	43.8 AV	54.0	-10.2	1.29 H	52	-5.20	49.00
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	*5240.00	102.8 PK			1.28 V	135	64.90	37.90
2	*5240.00	93.6 AV			1.28 V	135	55.70	37.90
3	#10480.00	55.2 PK	74.0	-18.8	1.08 V	168	6.20	49.00
4	#10480.00	44.8 AV	54.0	-9.2	1.08 V	168	-4.20	49.00

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 radiated frequency is out of the restricted band.

802.11n (20MHz)

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 36	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	17deg. C, 65%RH	TESTED BY	Martin Lee

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	51.2 PK	74.0	-22.8	1.04 H	8	13.40	37.80
2	5150.00	38.8 AV	54.0	-15.2	1.04 H	8	1.00	37.80
3	*5180.00	99.6 PK			1.04 H	8	61.80	37.80
4	*5180.00	90.2 AV			1.04 H	8	52.40	37.80
5	#10360.00	55.4 PK	74.0	-18.6	1.27 H	62	6.60	48.80
6	#10360.00	43.2 AV	54.0	-10.8	1.27 H	62	-5.60	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	5150.00	57.0 PK	74.0	-17.0	1.08 V	120	19.20	37.80
2	5150.00	43.0 AV	54.0	-11.0	1.08 V	120	5.20	37.80
3	*5180.00	103.6 PK			1.08 V	120	65.80	37.80
4	*5180.00	94.6 AV			1.08 V	120	56.80	37.80
5	#10360.00	55.4 PK	74.0	-18.6	1.22 V	215	6.60	48.80
6	#10360.00	42.7 AV	54.0	-11.3	1.22 V	215	-6.10	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 of the restricted band.



A D T

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 40	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	17deg. C, 65%RH	TESTED BY	Martin Lee

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5200.00	99.6 PK			1.05 H	8	61.70	37.90
2	*5200.00	90.4 AV			1.05 H	8	52.50	37.90
3	#10400.00	53.4 PK	74.0	-20.6	1.35 H	67	4.60	48.80
4	#10400.00	44.1 AV	54.0	-9.9	1.35 H	67	-4.70	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	*5200.00	103.4 PK			1.45 V	118	65.50	37.90
2	*5200.00	93.8 AV			1.45 V	118	55.90	37.90
3	#10400.00	55.8 PK	74.0	-18.2	1.21 V	189	7.00	48.80
4	#10400.00	44.8 AV	54.0	-9.2	1.21 V	189	-4.00	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 of the restricted band.



A D T

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 48	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	17deg. C, 65%RH	TESTED BY	Martin Lee

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5240.00	99.2 PK			1.12 H	4	61.30	37.90
2	*5240.00	90.0 AV			1.12 H	4	52.10	37.90
3	#10480.00	53.2 PK	74.0	-20.8	1.36 H	47	4.20	49.00
4	#10480.00	43.5 AV	54.0	-10.5	1.36 H	47	-5.50	49.00
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	*5240.00	103.1 PK			1.18 V	148	65.20	37.90
2	*5240.00	93.7 AV			1.18 V	148	55.80	37.90
3	#10480.00	54.8 PK	74.0	-19.2	1.15 V	175	5.80	49.00
4	#10480.00	44.9 AV	54.0	-9.1	1.15 V	175	-4.10	49.00

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 radiated frequency is out of the restricted band.



802.11n (40MHz)

EUT TEST CONDITION		MEBSUREMENT DETBIL	
CHBNNEL	Channel 38	FREQUENCY RBNGE	1 ~ 40GHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTBL CONDITIONS	17deg. C, 65%RH	TESTED BY	Martin Lee

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	58.9 PK	74.0	-15.1	1.04 H	2	21.10	37.80
2	5150.00	46.8 AV	54.0	-7.2	1.04 H	2	9.00	37.80
3	*5190.00	97.5 PK			1.04 H	2	59.70	37.80
4	*5190.00	88.2 AV			1.04 H	2	50.40	37.80
5	#10380.00	55.2 PK	74.0	-18.8	1.28 H	47	6.40	48.80
6	#10380.00	43.8 AV	54.0	-10.2	1.28 H	47	-5.00	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	5150.00	65.5 PK	74.0	-8.5	1.00 V	149	27.70	37.80
2	5150.00	49.9 AV	54.0	-4.1	1.00 V	149	12.10	37.80
3	*5190.00	101.7 PK			1.00 V	150	63.90	37.80
4	*5190.00	92.1 AV			1.00 V	150	54.30	37.80
5	#10380.00	55.0 PK	74.0	-19.0	1.36 V	44	6.20	48.80
6	#10380.00	43.9 AV	54.0	-10.1	1.36 V	44	-4.90	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 of the restricted band.



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EUT TEST CONDITION		MEBSUREMENT DETBIL	
CHBNNEL	Channel 46	FREQUENCY RBNGE	1 ~ 40GHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTBL CONDITIONS	17deg. C, 65%RH	TESTED BY	Martin Lee

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*5230.00	97.8 PK			1.08 H	8	59.90	37.90
2	*5230.00	88.3 AV			1.08 H	8	50.40	37.90
3	#10460.00	54.8 PK	74.0	-19.2	1.18 H	52	5.80	49.00
4	#10460.00	43.6 AV	54.0	-10.4	1.18 H	52	-5.40	49.00
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	*5230.00	101.9 PK			1.28 V	124	64.00	37.90
2	*5230.00	92.2 AV			1.28 V	124	54.30	37.90
3	#10460.00	54.2 PK	74.0	-19.8	1.45 V	58	5.20	49.00
4	#10460.00	43.5 AV	54.0	-10.5	1.45 V	58	-5.50	49.00

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 radiated frequency is out of the restricted band.



802.11ac (80MHz)

EUT TEST CONDITION		MEBSUREMENT DETBIL	
CHBNNEL	Channel 42	FREQUENCY RBNGE	1 ~ 40GHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTBL CONDITIONS	17deg. C, 65%RH	TESTED BY	Martin Lee

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5150.00	61.2 PK	74.0	-12.8	1.00 H	24	23.40	37.80
2	5150.00	47.2 AV	54.0	-6.8	1.00 H	24	9.40	37.80
3	*5210.00	94.8 PK			1.00 H	24	56.90	37.90
4	*5210.00	84.6 AV			1.00 H	24	46.70	37.90
5	#10420.00	52.6 PK	74.0	-21.4	1.29 H	61	3.70	48.90
6	#10420.00	42.8 AV	54.0	-11.2	1.29 H	61	-6.10	48.90
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	5150.00	58.3 PK	74.0	-15.7	1.24 V	141	20.50	37.80
2	5150.00	53.0 AV	54.0	-1.0	1.24 V	141	15.20	37.80
3	*5210.00	97.7 PK			1.24 V	141	59.80	37.90
4	*5210.00	87.7 AV			1.24 V	141	49.80	37.90
5	#10420.00	55.0 PK	74.0	-19.0	1.12 V	352	6.10	48.90
6	#10420.00	44.0 AV	54.0	-10.0	1.12 V	352	-4.90	48.90

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 radiated frequency is out of the restricted band.

BELOW 1GHz WORST-CASE DATA :

802.11n (20MHz)

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 40	FREQUENCY RANGE	Below 1000MHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	DETECTOR FUNCTION	Quasi-Peak
ENVIRONMENTAL CONDITIONS	19deg. C, 66%RH	TESTED BY	Martin Lee
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	100.39	36.8 QP	43.5	-6.7	1.75 H	254	27.80	9.00
2	224.51	35.6 QP	46.0	-10.4	1.25 H	312	23.70	11.90
3	250.47	36.0 QP	46.0	-10.0	1.25 H	158	23.00	13.00
4	302.92	31.9 QP	46.0	-14.1	1.25 H	315	16.90	15.00
5	579.85	30.6 QP	46.0	-15.4	1.25 H	214	8.70	21.90
6	777.67	32.3 QP	46.0	-13.7	1.25 H	298	7.60	24.70

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	30.17	35.3 QP	40.0	-4.7	1.25 V	34	23.10	12.20
2	54.95	36.3 QP	40.0	-3.7	1.25 V	58	23.00	13.30
3	106.85	38.0 QP	43.5	-5.5	1.25 V	352	28.20	9.80
4	141.78	29.5 QP	43.5	-14.0	1.25 V	168	16.40	13.10
5	224.61	36.2 QP	46.0	-9.8	1.75 V	302	24.30	11.90
6	300.04	33.3 QP	46.0	-12.7	1.75 V	258	18.40	14.90

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.



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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 40	FREQUENCY RANGE	Below 1000MHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	DETECTOR FUNCTION	Quasi-Peak
ENVIRONMENTAL CONDITIONS	19deg. C, 66%RH	TESTED BY	Martin Lee
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	100.39	38.2 QP	43.5	-5.3	1.75 H	168	29.20	9.00
2	141.41	30.4 QP	43.5	-13.1	1.75 H	96	17.30	13.10
3	234.12	35.0 QP	46.0	-11.0	1.50 H	221	22.70	12.30
4	254.42	34.7 QP	46.0	-11.3	1.50 H	108	21.60	13.10
5	308.62	35.1 QP	46.0	-10.9	1.25 H	305	20.00	15.10
6	374.12	31.6 QP	46.0	-14.4	1.50 H	305	14.90	16.70
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	30.01	35.0 QP	40.0	-5.0	1.25 V	253	22.80	12.20
2	60.41	36.0 QP	40.0	-4.0	1.54 V	315	22.80	13.20
3	106.41	38.2 QP	43.5	-5.3	1.50 V	225	28.50	9.70
4	320.37	36.0 QP	46.0	-10.0	1.75 V	189	20.60	15.40
5	382.64	34.2 QP	46.0	-11.8	1.50 V	185	17.30	16.90
6	417.35	35.2 QP	46.0	-10.8	1.50 V	245	17.40	17.80

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.



A D T

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 40	FREQUENCY RANGE	Below 1000MHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	DETECTOR FUNCTION	Quasi-Peak
ENVIRONMENTAL CONDITIONS	19deg. C, 66%RH	TESTED BY	Martin Lee
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	101.05	34.2 QP	43.5	-9.3	1.75 H	154	25.10	9.10
2	142.69	31.7 QP	43.5	-11.8	1.25 H	185	18.50	13.20
3	310.45	37.2 QP	46.0	-8.8	1.25 H	296	22.00	15.20
4	419.22	34.6 QP	46.0	-11.4	1.75 H	142	16.70	17.90
5	580.41	32.2 QP	46.0	-13.8	1.50 H	96	10.30	21.90
6	754.51	32.1 QP	46.0	-13.9	1.25 H	295	7.80	24.30

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	100.47	36.5 QP	43.5	-7.0	1.75 V	52	27.50	9.00
2	141.22	31.7 QP	43.5	-11.8	1.75 V	152	18.60	13.10
3	310.51	36.0 QP	46.0	-10.0	1.25 V	269	20.80	15.20
4	417.22	36.1 QP	46.0	-9.9	1.75 V	245	18.30	17.80
5	579.62	32.6 QP	46.0	-13.4	1.75 V	18	10.70	21.90
6	775.08	32.4 QP	46.0	-13.6	1.75 V	304	7.70	24.70

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 0.50MHz.
 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. 07, 2012	Feb. 06, 2013
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.

4.2.3 TEST PROCEDURES

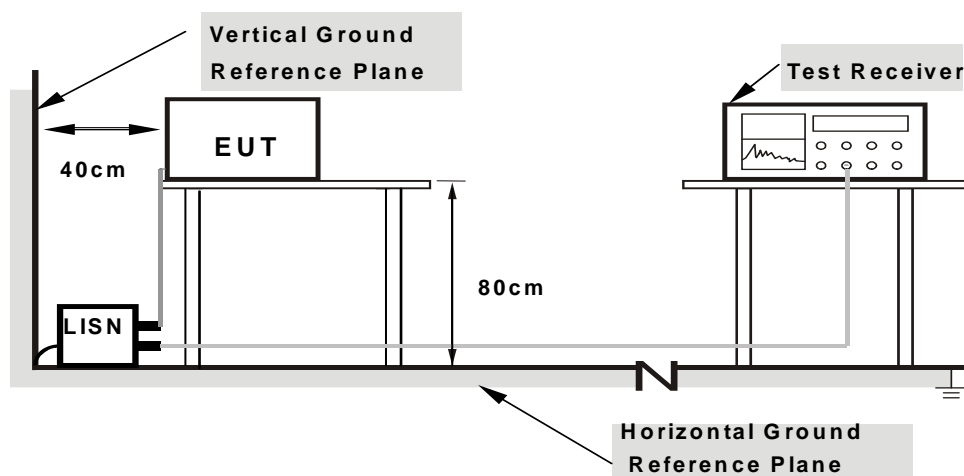
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance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

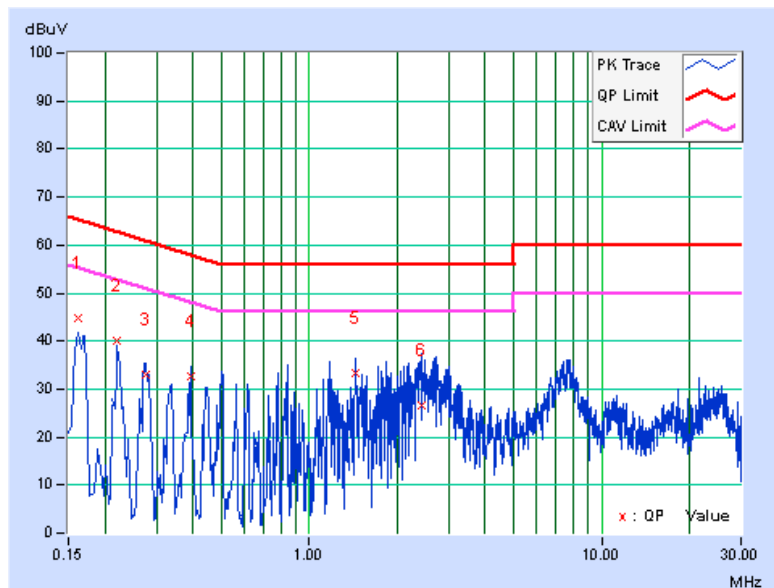
802.11n (20MHz)

PHASE	Line 1	6dB BANDWIDTH	9kHz
CHANNEL	Channel 40	TEST MODE	A

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	0.16181	0.12	44.74	33.88	44.86	34.00	65.37	55.37	-20.51	-21.37
2	0.22038	0.13	39.78	30.56	39.91	30.69	62.80	52.80	-22.89	-22.11
3	0.27480	0.14	32.82	24.35	32.96	24.49	60.97	50.97	-28.01	-26.48
4	0.39242	0.15	32.35	22.30	32.50	22.45	58.01	48.01	-25.51	-25.56
5	1.44812	0.24	33.19	18.89	33.43	19.13	56.00	46.00	-22.57	-26.87
6	2.40998	0.32	26.17	5.09	26.49	5.41	56.00	46.00	-29.51	-40.59

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.

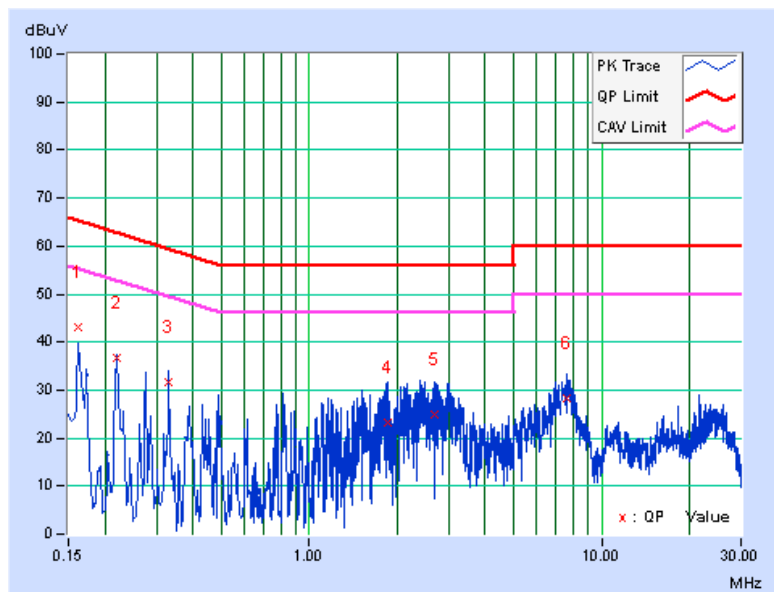


PHASE	Line 2	6dB BANDWIDTH	9kHz
CHANNEL	Channel 40	TEST MODE	A

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	0.16181	0.14	43.12	31.79	43.26	31.93	65.37	55.37	-22.11	-23.44
2	0.22024	0.15	36.70	28.14	36.85	28.29	62.81	52.81	-25.96	-24.52
3	0.32986	0.18	31.50	18.49	31.68	18.67	59.45	49.45	-27.78	-30.79
4	1.86258	0.25	22.85	5.65	23.10	5.90	56.00	46.00	-32.90	-40.10
5	2.68368	0.29	24.46	6.30	24.75	6.59	56.00	46.00	-31.25	-39.41
6	7.62592	0.51	27.85	11.64	28.36	12.15	60.00	50.00	-31.64	-37.85

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.





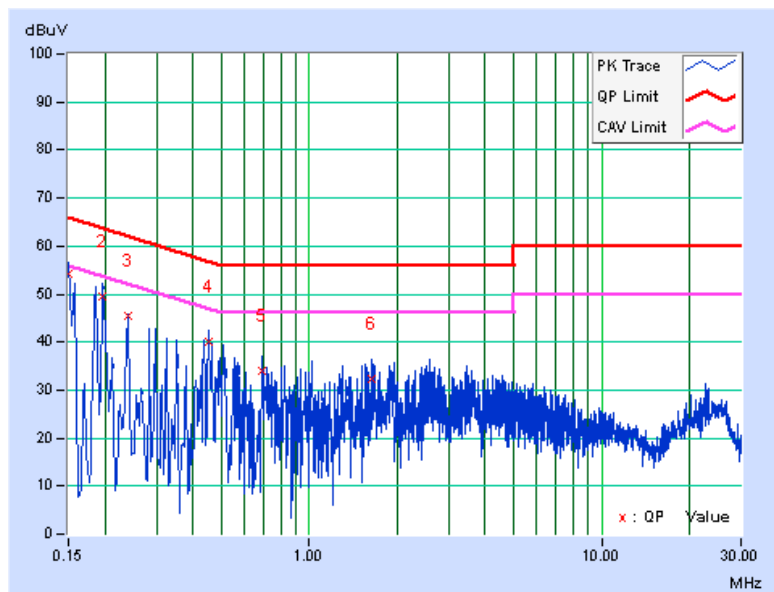
A D T

PHASE	Line 1	6dB BANDWIDTH	9kHz
CHANNEL	Channel 40	TEST MODE	B

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	0.15000	0.11	54.23	40.73	54.34	40.84	66.00	56.00	-11.66	-15.16
2	0.19692	0.13	49.50	33.23	49.63	33.36	63.74	53.74	-14.11	-20.38
3	0.23993	0.13	45.36	27.49	45.49	27.62	62.10	52.10	-16.60	-24.47
4	0.45107	0.15	39.79	22.42	39.94	22.57	56.86	46.86	-16.91	-24.28
5	0.68958	0.17	33.86	14.22	34.03	14.39	56.00	46.00	-21.97	-31.61
6	1.62798	0.26	31.99	12.97	32.25	13.23	56.00	46.00	-23.75	-32.77

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.





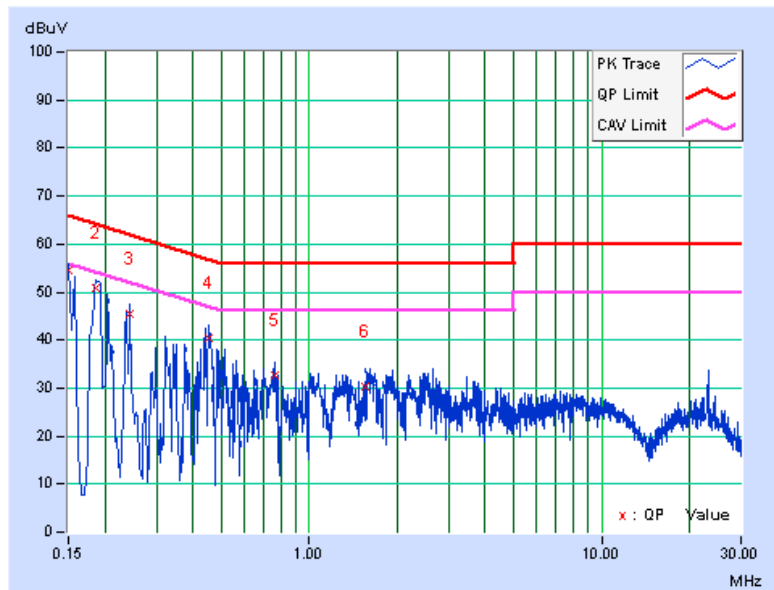
A D T

PHASE	Line 2	6dB BANDWIDTH	9kHz
CHANNEL	Channel 40	TEST MODE	B

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	0.15000	0.12	54.37	39.52	54.49	39.64	66.00	56.00	-11.51	-16.36
2	0.18557	0.14	50.60	32.80	50.74	32.94	64.23	54.23	-13.50	-21.30
3	0.24384	0.15	45.26	27.61	45.41	27.76	61.96	51.96	-16.56	-24.21
4	0.45498	0.17	40.08	26.86	40.25	27.03	56.78	46.78	-16.53	-19.75
5	0.75984	0.20	32.38	18.57	32.58	18.77	56.00	46.00	-23.42	-27.23
6	1.56151	0.26	29.97	14.50	30.23	14.76	56.00	46.00	-25.77	-31.24

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.





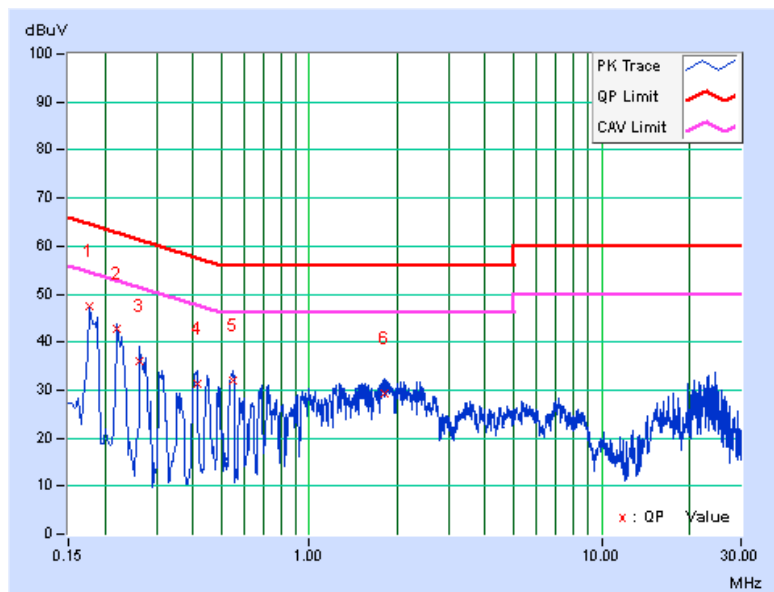
A D T

PHASE	Line 1	6dB BANDWIDTH	9kHz
CHANNEL	Channel 40	TEST MODE	C

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	0.17744	0.12	47.42	37.83	47.54	37.95	64.60	54.60	-17.06	-16.65
2	0.22038	0.13	42.65	31.95	42.78	32.08	62.80	52.80	-20.02	-20.72
3	0.26346	0.14	36.01	23.42	36.15	23.56	61.32	51.32	-25.18	-27.77
4	0.41197	0.15	31.27	20.16	31.42	20.31	57.61	47.61	-26.19	-27.30
5	0.54491	0.16	31.91	23.73	32.07	23.89	56.00	46.00	-23.93	-22.11
6	1.80803	0.27	28.95	17.62	29.22	17.89	56.00	46.00	-26.78	-28.11

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.





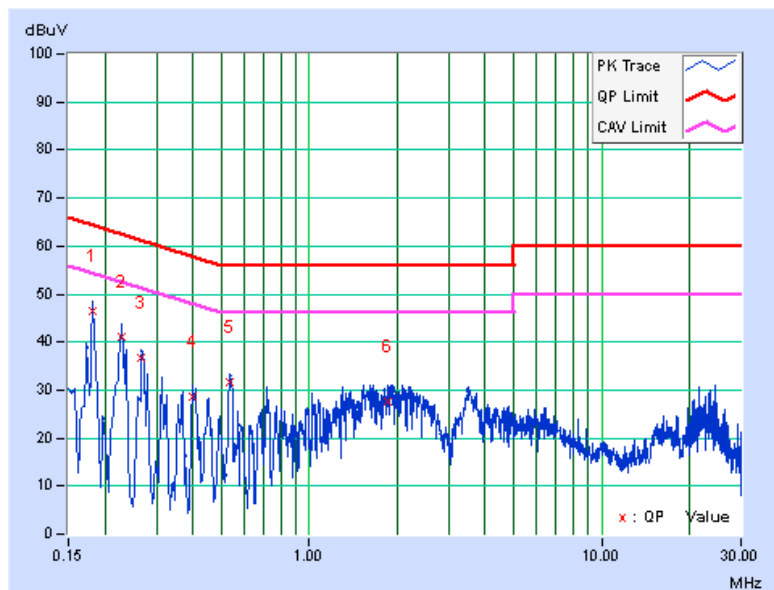
A D T

PHASE	Line 2	6dB BANDWIDTH	9kHz
CHANNEL	Channel 40	TEST MODE	C

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	0.18128	0.13	46.50	33.66	46.63	33.79	64.43	54.43	-17.79	-20.63
2	0.22820	0.14	40.80	29.18	40.94	29.32	62.51	52.51	-21.57	-23.19
3	0.26730	0.15	36.68	27.52	36.83	27.67	61.20	51.20	-24.37	-23.53
4	0.40024	0.17	28.56	21.82	28.73	21.99	57.85	47.85	-29.12	-25.86
5	0.53709	0.18	31.56	25.25	31.74	25.43	56.00	46.00	-24.26	-20.57
6	1.85476	0.29	27.31	15.45	27.60	15.74	56.00	46.00	-28.40	-30.26

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.



4.3 PEAK TRANSMIT POWER MEASUREMENT

4.3.1 LIMITS OF PEAK TRANSMIT POWER MEASUREMENT

FREQUENCY BAND	LIMIT
5.150 ~ 5.250GHz	The lesser of 50mW (17dBm) or 4dBm + 10logB

NOTE: Where B is the 26dB emission bandwidth in MHz.

Per KDB 662911 D01 Multiple Transmitter Output v01r02 Method of conducted output power measurement on IEEE 802.11 devices,

Array Gain = 0 dB (i.e., no array gain) for NANT ≤ 4;

Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any NANT;

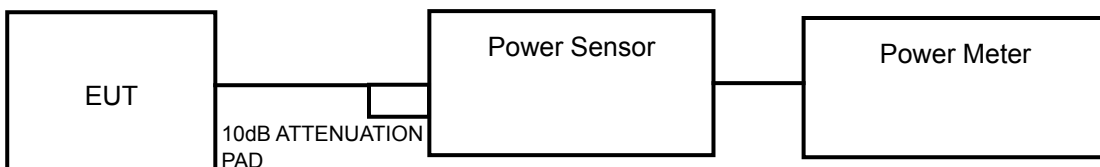
Array Gain = 5 log(NANT/NSS) dB or 3 dB, whichever is less for 20-MHz channel widths with NANT ≥ 5.

For power measurements on all other devices: Array Gain = 10 log(NANT/NSS) dB.

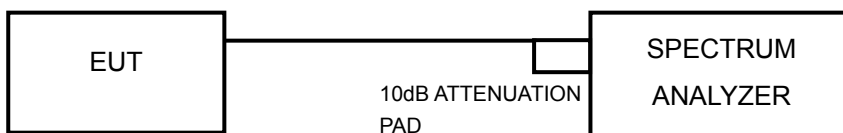
4.3.2 TEST SETUP

FOR POWER OUTPUT MEASUREMENT

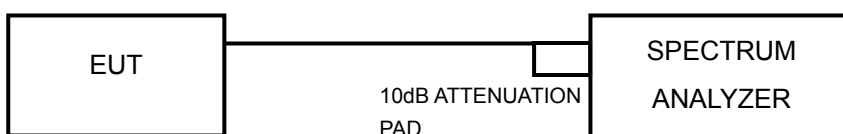
For 802.11a, 802.11n (20MHz), 802.11n (40MHz)



For 802.11ac (80MHz)



FOR 26dB BANDWIDTH



4.3.3 TEST INSTRUMENTS

Refer to section 4.1.3 to get information of above instrument.

4.3.4 TEST PROCEDURE

FOR AVERAGE POWER MEASUREMENT

For 802.11a, 802.11n (20MHz), 802.11n (40MHz)

Method PM is used to perform output power measurement, trigger and gating function of wide band power meter is enabled to measure max output power of TX on burst. Duty factor is not added to measured value.

For 802.11ac (80MHz)

Method SA-1

- 1) Set span to encompass the entire emission bandwidth (EBW) of the signal.
- 2) Set RBW = 1 MHz.
- 3) Set VBW \geq 3 MHz.
- 4) Number of points in sweep \geq 2 Span / RBW.
- 5) Sweep time = auto.
- 6) Set trigger to free run (duty cycle \geq 98 percent); Set video trigger (duty cycle $<$ 98 percent)
- 7) Detector = RMS.
- 8) Trace average at least 100 traces in power averaging mode
- 9) Compute power by integrating the spectrum across the 26 dB EBW of the signal.

FOR 26dB BANDWIDTH

- 1) Set RBW = approximately 1% of the emission bandwidth.
- 2) Set the VBW $>$ RBW.
- 3) Detector = Peak.
- 4) Trace mode = max hold.
- 5) Measure the maximum width of the emission that is 26 dB down from the peak of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

4.3.5 DEVIATION FROM TEST STANDARD

No deviation.

4.3.6 EUT OPERATING CONDITIONS

The software provided by client to enable the EUT under transmission condition continuously at specific channel frequencies individually.

4.3.7 TEST RESULTS

POWER OUTPUT:

802.11a

CHANNEL	CHANNEL FREQUENCY (MHz)	AVERAGE POWER (mW)	AVERAGE POWER (dBm)	POWER LIMIT (dBm)	PASS/FAIL
36	5180	47.863	16.80	17	PASS
40	5200	48.978	16.90	17	PASS
48	5240	46.774	16.70	17	PASS

802.11n (20MHz)

CHANNEL	CHANNEL FREQUENCY (MHz)	AVERAGE POWER (mW)	AVERAGE POWER (dBm)	POWER LIMIT (dBm)	PASS/FAIL
36	5180	36.224	15.59	17	PASS
40	5200	36.983	15.68	17	PASS
48	5240	37.325	15.72	17	PASS

802.11n (40MHz)

CHANNEL	CHANNEL FREQUENCY (MHz)	AVERAGE POWER (mW)	AVERAGE POWER (dBm)	POWER LIMIT (dBm)	PASS/FAIL
38	5190	48.978	16.90	17	PASS
46	5230	48.978	16.90	17	PASS

802.11ac (80MHz)

CHANNEL	CHANNEL FREQUENCY (MHz)	AVERAGE POWER (mW)	AVERAGE POWER (dBm)	POWER LIMIT (dBm)	PASS/FAIL
42	5210	48.978	16.90	17	PASS



26dB BANDWIDTH: 802.11a

802.11a

CHANNEL	CHANNEL FREQUENCY (MHz)	26dBc BANDWIDTH (MHz)	PASS / FAIL
36	5180	20.37	PASS
40	5200	20.32	PASS
48	5240	20.53	PASS

802.11n (20MHz)

CHANNEL	CHANNEL FREQUENCY (MHz)	26dBc BANDWIDTH (MHz)	PASS / FAIL
36	5180	19.46	PASS
40	5200	19.64	PASS
48	5240	19.55	PASS

802.11n (40MHz)

CHANNEL	CHANNEL FREQUENCY (MHz)	26dBc BANDWIDTH (MHz)	PASS / FAIL
38	5190	49.74	PASS
46	5230	52.73	PASS

802.11ac (80MHz)

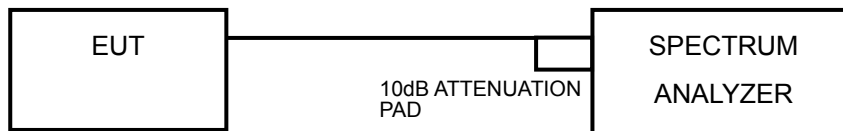
CHANNEL	CHANNEL FREQUENCY (MHz)	26dBc BANDWIDTH (MHz)	PASS / FAIL
42	5210	117.44	PASS

4.4 PEAK POWER SPECTRAL DENSITY MEASUREMENT

4.4.1 LIMITS OF PEAK POWER SPECTRAL DENSITY MEASUREMENT

FREQUENCY BAND	LIMIT
5.150 ~ 5.250GHz	4dBm

4.4.2 TEST SETUP



4.4.3 TEST INSTRUMENTS

Refer to section 4.1.3 to get information of above instrument.

4.4.4 TEST PROCEDURES

Using method SA-1

- 1) Set span to encompass the entire emission bandwidth (EBW) of the signal.
- 2) Set RBW = 30 KHz, Set VBW \geq 1 MHz, Detector = RMS
- 3) Set Channel power measure = 1MHz
- 4) Sweep time = auto, trigger set to "free run".
- 5) Trace average at least 100 traces in power averaging mode.
- 6) Record the max value.

4.4.5 DEVIATION FROM TEST STANDARD

No deviation.

4.4.6 EUT OPERATING CONDITIONS

Same as 4.3.6.

4.4.7 TEST RESULTS

802.11a

CHANNEL	FREQUENCY (MHz)	PSD (dBm)	MAXIMUM LIMIT (dBm)	PASS/FAIL
36	5180	3.70	4	PASS
40	5200	3.52	4	PASS
48	5240	3.42	4	PASS

802.11n (20MHz)

CHANNEL	FREQUENCY (MHz)	PSD (dBm)	MAXIMUM LIMIT (dBm)	PASS/FAIL
36	5180	3.70	4	PASS
40	5200	3.74	4	PASS
48	5240	3.76	4	PASS

802.11n (40MHz)

CHANNEL	FREQUENCY (MHz)	PSD (dBm)	MAXIMUM LIMIT (dBm)	PASS/FAIL
38	5190	1.11	4	PASS
46	5230	0.94	4	PASS

802.11ac (80MHz)

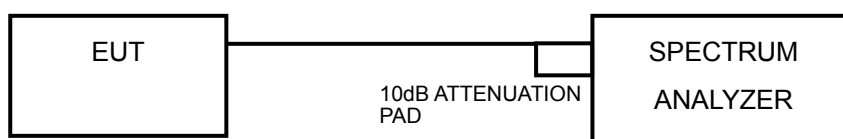
CHANNEL	FREQUENCY (MHz)	PSD (dBm)	MAXIMUM LIMIT (dBm)	PASS/FAIL
42	5210	-1.30	4	PASS

4.5 PEAK POWER EXCURSION MEASUREMENT

4.5.1 LIMITS OF PEAK POWER EXCURSION MEASUREMENT

Shall not exceed 13 dB.

4.5.2 TEST SETUP



4.5.3 TEST INSTRUMENTS

Refer to section 4.1.3 to get information of above instrument.

4.5.4 TEST PROCEDURE

- 1) Set RBW = 1 MHz, VBW \geq 3 MHz, Detector = peak.
- 2) Trace mode = max-hold. Allow the sweeps to continue until the trace stabilizes.
- 3) Use the peak search function to find the peak of the spectrum.
- 4) Measure the PPSD.
- 5) Compute the ratio of the maximum of the peak-max-hold spectrum to the PPSD.

4.5.5 DEVIATION FROM TEST STANDARD

No deviation.

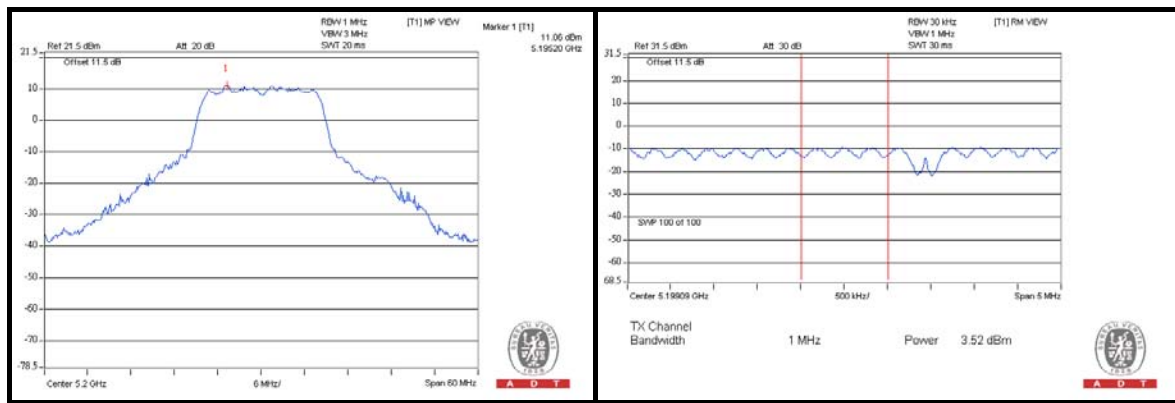
4.5.6 EUT OPERATING CONDITIONS

Same as 4.2.6

4.5.7 TEST RESULTS

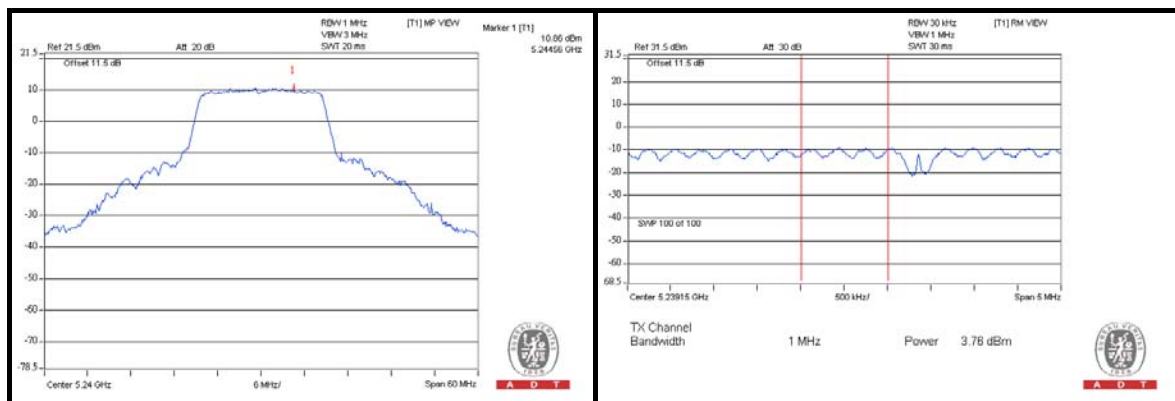
802.11a

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK VALUE (dBm)	PPSD (dBm)	PEAK EXCURSION (dB)	LIMIT (dB)	PASS/FAIL
36	5180	11.02	3.70	7.32	13	PASS
40	5200	11.06	3.52	7.54	13	PASS
48	5240	10.81	3.42	7.39	13	PASS



802.11n (20MHz)

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK VALUE (dBm)	PPSD (dBm)	PEAK EXCURSION (dB)	LIMIT (dB)	PASS/FAIL
36	5180	10.37	3.70	6.67	13	PASS
40	5200	10.38	3.74	6.64	13	PASS
48	5240	10.86	3.76	7.10	13	PASS

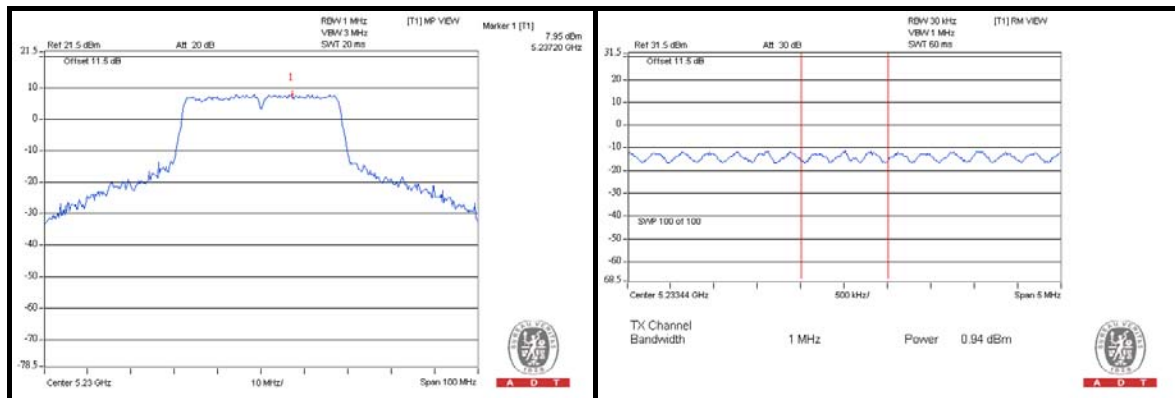




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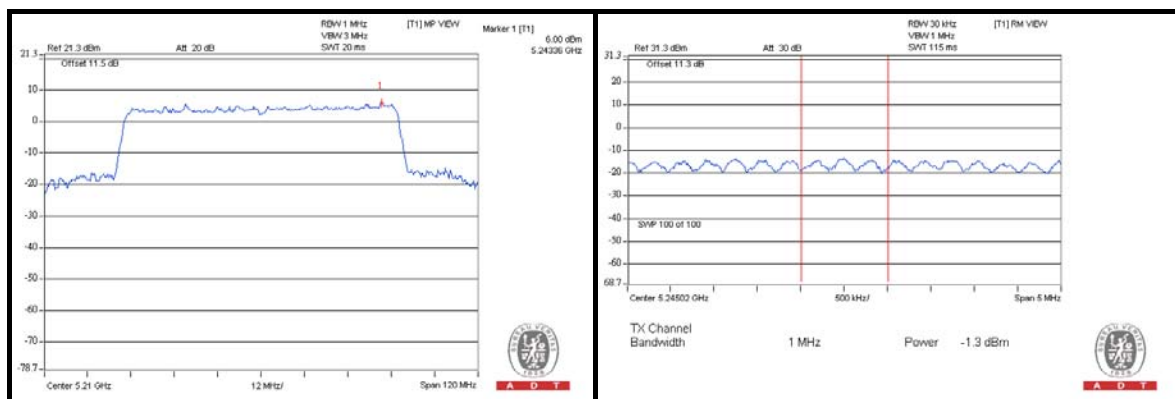
802.11n (40MHz)

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK VALUE (dBm)	PPSD (dBm)	PEAK EXCURSION (dB)	LIMIT (dB)	PASS/FAIL
38	5190	7.89	1.11	6.78	13	PASS
46	5230	7.95	0.94	7.01	13	PASS



802.11ac (80MHz)

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK VALUE (dBm)	PPSD (dBm)	PEAK EXCURSION (dB)	LIMIT (dB)	PASS/FAIL
42	5210	6.00	-1.30	7.30	13	PASS

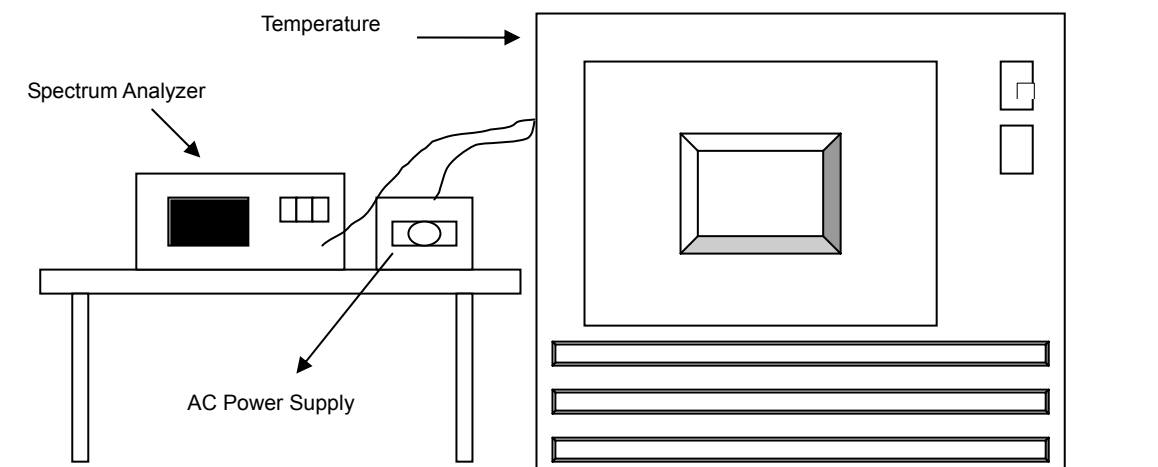


4.6 FREQUENCY STABILITY

4.6.1 LIMITS OF FREQUENCY STABILITY MEASUREMENT

The frequency of the carrier signal shall be maintained within band of operation

4.6.2 TEST SETUP



4.6.3 TEST INSTRUMENTS

Refer to section 4.1.3 to get information of above instrument.

4.6.4 TEST PROCEDURE

- a. The EUT was placed inside the environmental test chamber and powered by nominal AC voltage.
- b. Turn the EUT on and couple its output to a spectrum analyzer.
- c. Turn the EUT off and set the chamber to the highest temperature specified.
- d. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT on and measure the operating frequency after 2, 5, and 10 minutes.
- e. Repeat step 2 and 3 with the temperature chamber set to the lowest temperature.
- f. The test chamber was allowed to stabilize at +20 degree C for a minimum of 30 minutes. The supply voltage was then adjusted on the EUT from 85% to 115% and the frequency record.

4.6.5 DEVIATION FROM TEST STANDARD

No deviation.

4.6.6 EUT OPERATING CONDITION

Set the EUT transmit at un-modulation mode to test frequency stability.



4.6.7 TEST RESULTS

FREQUENCY STABILITY VERSUS TEMP.									
OPERATING FREQUENCY: 5180MHz									
TEMP. (°C)	POWER SUPPLY (Vac)	0 MINUTE		2 MINUTE		5 MINUTE		10 MINUTE	
		Measured Frequency (MHz)	Frequency Drift (ppm)	Measured Frequency (MHz)	Frequency Drift (ppm)	Measured Frequency (MHz)	Frequency Drift (ppm)	Measured Frequency (MHz)	Frequency Drift (ppm)
50	120	5180.0065	1.2548	5179.9917	-1.6023	5180.0061	1.1776	5179.9961	-0.7529
40	120	5180.0004	0.0772	5180.0090	1.7375	5180.0090	1.7375	5180.0025	0.4826
30	120	5180.0100	1.9305	5179.9998	-0.0386	5179.9920	-1.5444	5180.0070	1.3514
20	120	5179.9975	-0.4826	5180.0003	0.0579	5180.0078	1.5058	5179.9960	-0.7722
10	120	5180.0057	1.1004	5179.9990	-0.1931	5180.0038	0.7336	5179.9918	-1.5830
0	120	5179.9959	-0.7915	5180.0018	0.3475	5179.9986	-0.2703	5179.9954	-0.8880
-10	120	5179.9916	-1.6216	5180.0092	1.7761	5180.0117	2.2587	5180.0107	2.0656
-20	120	5180.0062	1.1969	5180.0015	0.2896	5180.0114	2.2008	5179.9978	-0.4247
-30	120	5180.0023	0.4440	5180.0026	0.5019	5180.0039	0.7529	5180.0119	2.2973

FREQUENCY STABILITY VERSUS VOLTAGE									
OPERATING FREQUENCY: 5180MHz									
TEMP. (°C)	POWER SUPPLY (Vac)	0 MINUTE		2 MINUTE		5 MINUTE		10 MINUTE	
		Measured Frequency (MHz)	Frequency Drift (ppm)	Measured Frequency (MHz)	Frequency Drift (ppm)	Measured Frequency (MHz)	Frequency Drift (ppm)	Measured Frequency (MHz)	Frequency Drift (ppm)
20	138	5180.0055	1.0618	5179.9970	-0.5792	5179.9966	-0.6564	5179.9889	-2.1429
	120	5179.9913	-1.6795	5180.0089	1.7181	5179.9922	-1.5058	5179.9927	-1.4093
	102	5179.9924	-1.4672	5180.0026	0.5019	5179.9998	-0.0386	5180.0039	0.7529



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5. PHOTOGRAPHS OF THE TEST CONFIGURATION

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



6. INFORMATION ON THE TESTING LABORATORIES

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

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

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

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.

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