

FCC TEST REPORT (15.407)

REPORT NO.: RF140120C29B

MODEL NO.: HEOS Extend

FCC ID: U2M-MBRIDGEDM

RECEIVED: Mar. 12, 2014

TESTED: Apr. 11 ~ Apr. 15, 2014

ISSUED: Apr. 28, 2014

APPLICANT: Senao Networks, Inc.

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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 Shan Hsiang, Taoyuan Hsien 333, Taiwan, R.O.C.

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF140120C29B	Original release	Apr. 28, 2014

1. CERTIFICATION

PRODUCT: 802.11 abgn device

MODEL: HEOS Extend

BRAND: DENON

APPLICANT: Senao Networks, Inc.

TESTED: Apr. 11 ~ Apr. 15, 2014

TEST SAMPLE: ENGINEERING SAMPLE

STANDARDS: FCC Part 15, Subpart E (Section 15.407)

ANSI C63.10-2009

The above equipment (model: HEOS Extend) 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 : Ivy Lin , **DATE :** Apr. 28, 2014
Ivy Lin / Specialist

APPROVED BY : Ken Liu , **DATE :** Apr. 28, 2014
Ken Liu / Senior Manager

2. SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC PART 15, SUBPART E (SECTION 15.407)			
STANDARD SECTION	TEST TYPE	RESULT	REMARK
15.407(b)(6)	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is -4.61dB at 0.36875MHz.
15.407(b/1/2/3) (b)(6)	Radiated Emissions	PASS	Meet the requirement of limit. Minimum passing margin is -1.0dB at 5350.00MHz, 5470.00MHz, 10520.00MHz,
15.407(a/1/2)	Max Average Transmit Power	PASS	Meet the requirement of limit.
15.407(a)(6)	Peak Power Excursion	PASS	Meet the requirement of limit.
15.407(a/1/2)	Peak Power Spectral Density	PASS	Meet the requirement of limit.
15.407(g)	Frequency Stability	PASS	Meet the requirement of limit.
15.203	Antenna Requirement	PASS	No antenna connector is used.

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	802.11 abgn device
MODEL NO.	HEOS Extend
POWER SUPPLY	12Vdc (Adapter)
MODULATION TYPE	64QAM, 16QAM, QPSK, BPSK
MODULATION TECHNOLOGY	OFDM
TRANSFER RATE	802.11a: 54.0/ 48.0/ 36.0/ 24.0/ 18.0/ 12.0/ 9.0/ 6.0Mbps 802.11n: up to 300Mbps
OPERATING FREQUENCY	5260 ~ 5320MHz & 5500 ~ 5700MHz
NUMBER OF CHANNEL	5260 ~ 5320MHz: 4 for 802.11a, 802.11n (20MHz) 2 for 802.11n (40MHz) 5500 ~ 5700MHz: 8 for 802.11a, 802.11n (20MHz) 3 for 802.11n (40MHz)
OUTPUT POWER	226.397mW for 5260 ~ 5320MHz 241.179mW for 5500 ~ 5700MHz
ANTENNA TYPE	PIFA antenna with 5.5dBi gain
ANTENNA CONNECTOR	NA
DATA CABLE	NA
I/O PORTS	Refer to user's manual
ACCESSORY DEVICES	Refer to Note as below

NOTE:

1. This report is prepared for FCC class II permissive change. This report is issued as a supplementary report to the original BV ADT report no.: RF140120C29-1. The difference compared with original report is adding 5260 ~ 5320MHz & 5500 ~ 5700MHz. Therefore, the EUT was re-tested in this report.
2. The EUT incorporates a MIMO function. Physically, the EUT provides two completed transmitters and two receivers.

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

3. The EUT consumes power from the following adapter.

BRAND:	Powertron Electronics Corp.
MODEL:	PA1015-2I PA1015-2I120125
INPUT:	100-240Vac, 50-60Hz, 0.4A
OUTPUT:	12Vdc, 1.25A, 15W Max
POWER LINE:	DC: 1.5m 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 5260 ~ 5320MHz

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

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
52	5260 MHz	60	5300 MHz
56	5280 MHz	64	5320 MHz

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

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
54	5270 MHz	62	5310 MHz

FOR 5500 ~ 5700MHz

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

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
100	5500 MHz	116	5580 MHz
104	5520 MHz	132	5660 MHz
108	5540 MHz	136	5680 MHz
112	5560 MHz	140	5700 MHz

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

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
102	5510 MHz	134	5670 MHz
110	5550 MHz		

3.2.1 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE $\geq$ 1G	RE<1G	PLC	APCM	
-	√	√	√	√	-

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: 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. BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
-	802.11a	5260-5320	52 to 64	52, 60, 64	OFDM	BPSK	6.0
-	802.11n (20MHz)		52 to 64	52, 60, 64	OFDM	BPSK	7.2
-	802.11n (40MHz)		54 to 62	54, 62	OFDM	BPSK	15.0
-	802.11a	5500-5700	100 to 140	100, 116, 140	OFDM	BPSK	6.0
-	802.11n (20MHz)		100 to 140	100, 116, 140	OFDM	BPSK	7.2
-	802.11n (40MHz)		102 to 134	102, 110, 134	OFDM	BPSK	15.0

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. BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
-	802.11n (20MHz)	5260-5320, 5500-5700	52 to 64, 100 to 140	60	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)
-	802.11n (20MHz)	5260-5320, 5500-5700	52 to 64, 100 to 140	60	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)
-	802.11a	5260-5320	52 to 64	52, 60, 64	OFDM	BPSK	6.0
-	802.11n (20MHz)		52 to 64	52, 60, 64	OFDM	BPSK	7.2
-	802.11n (40MHz)		54 to 62	54, 62	OFDM	BPSK	15.0
-	802.11a	5500-5700	100 to 140	100, 116, 140	OFDM	BPSK	6.0
-	802.11n (20MHz)		100 to 140	100, 116, 140	OFDM	BPSK	7.2
-	802.11n (40MHz)		102 to 134	102, 110, 134	OFDM	BPSK	15.0

TEST CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE $\geq$ 1G	22deg. C, 67%RH	120Vac, 60Hz	Jones Chang, Chris Lin
RE<1G	26deg. C, 71%RH	120Vac, 60Hz	Jones Chang
PLC	25deg. C, 68%RH	120Vac, 60Hz	Leo Tsai
APCM	25deg. C, 60%RH	120Vac, 60Hz	Leo Tsai

3.3 DUTY CYCLE OF TEST SIGNAL

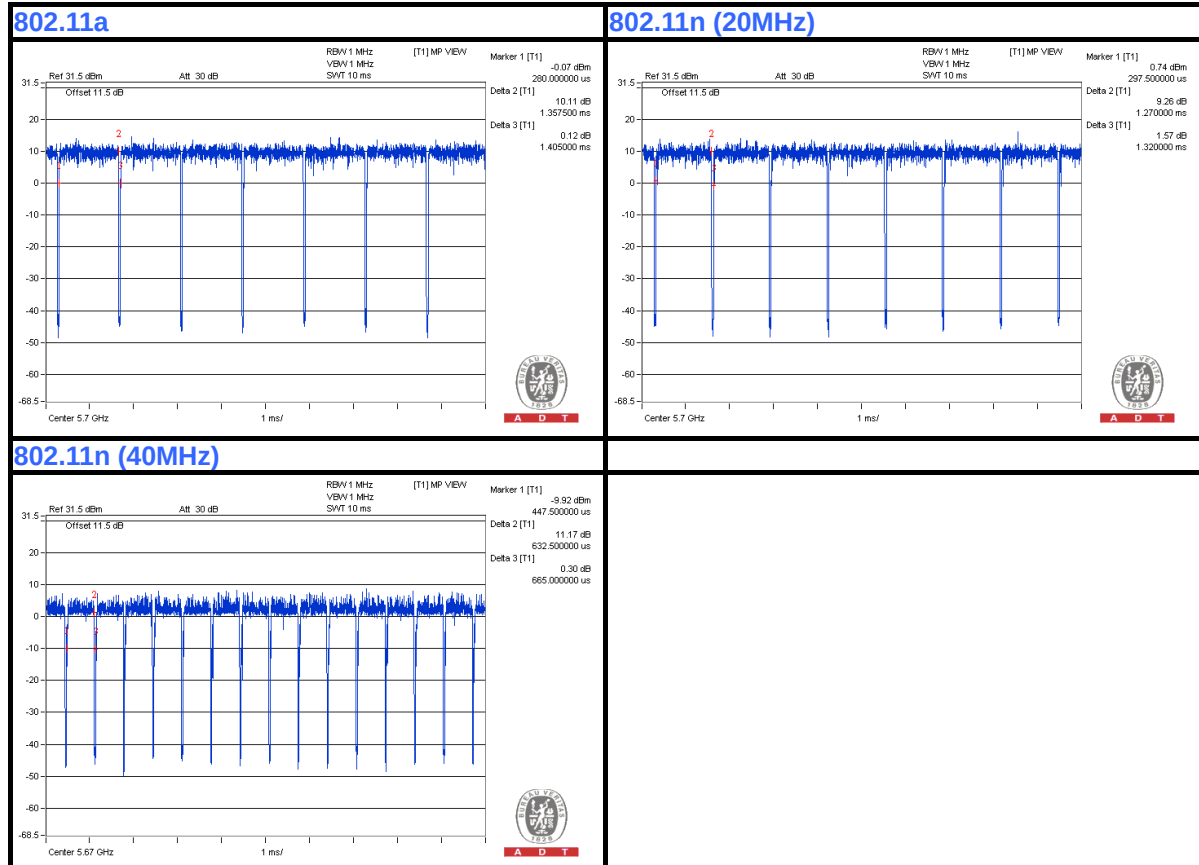
MODULATION TYPE: BPSK

Duty cycle of test signal is < 98 %, duty factor is required

802.11a: Duty cycle = $1.35750/1.4050 = 0.966$, Duty factor = $10 * \log(1/0.966) = 0.15$

802.11n (20MHz): Duty cycle = $1.27000/1.32000 = 0.962$, Duty factor = $10 * \log(1/0.962) = 0.17$

802.11n (40MHz): Duty cycle = $632.50000/665.00000 = 0.951$, Duty factor = $10 * \log(1/0.951) = 0.22$





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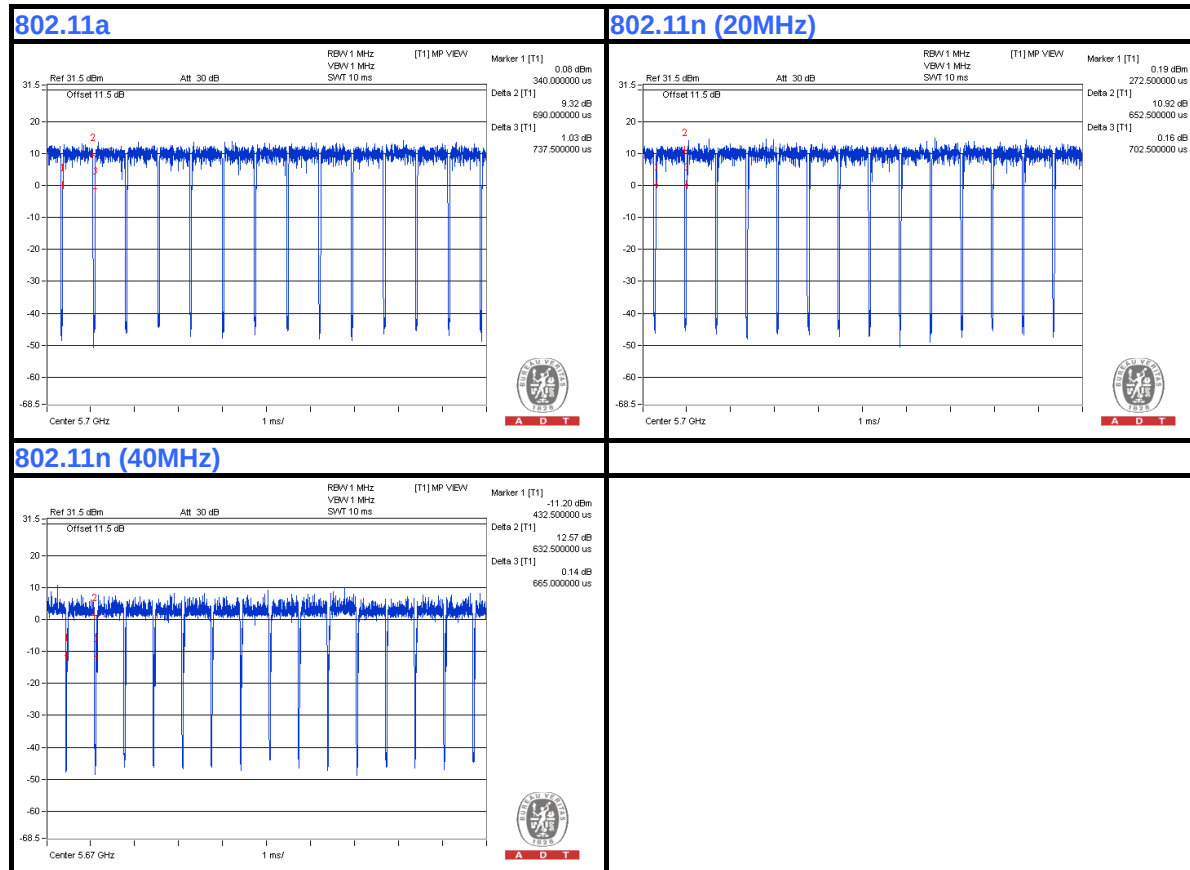
MODULATION TYPE: QPSK

Duty cycle of test signal is < 98 %, duty factor is required

802.11a: Duty cycle = $690.00000 / 737.50000 = 0.936$, Duty factor = $10 * \log(1/0.936) = 0.29$

802.11n (20MHz): Duty cycle = $652.50000 / 702.50000 = 0.929$, Duty factor = $10 * \log(1/0.929) = 0.32$

802.11n (40MHz): Duty cycle = $632.50000 / 665.00000 = 0.951$, Duty factor = $10 * \log(1/0.951) = 0.22$



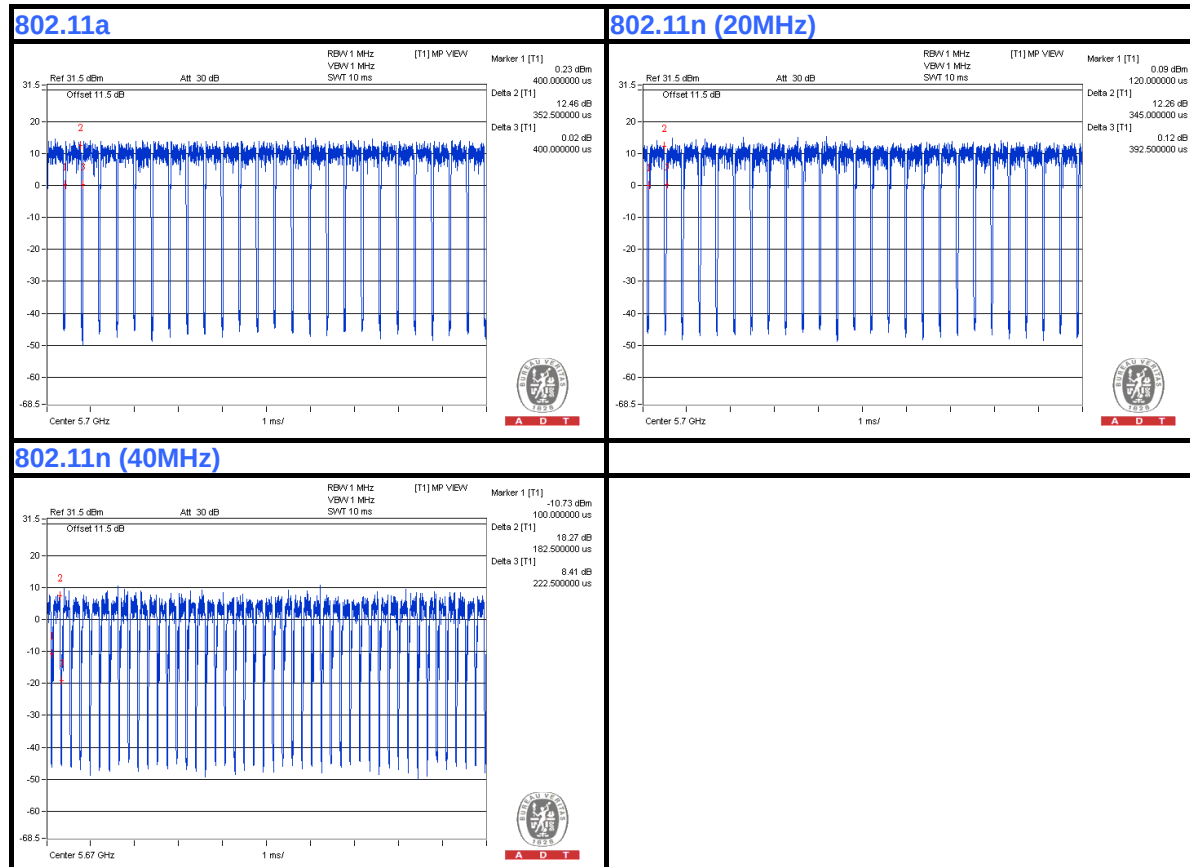
MODULATION TYPE: 16QAM

Duty cycle of test signal is < 98 %, duty factor is required

802.11a: Duty cycle = $352.50000/400.00000 = 0.881$, Duty factor = $10 * \log(1/0.881) = 0.55$

802.11n (20MHz): Duty cycle = $345.000000/392.50000 = 0.879$, Duty factor = $10 * \log(1/0.879) = 0.56$

802.11n (40MHz): Duty cycle = $182.50000/222.50000 = 0.820$, Duty factor = $10 * \log(1/0.820) = 0.86$



MODULATION TYPE: 64QAM

Duty cycle of test signal is < 98 %, duty factor is required

802.11a: Duty cycle = $185.00000/232.50000 = 0.796$, Duty factor = $10 * \log(1/0.796) = 0.99$

802.11n (20MHz): Duty cycle = $187.50000/237.50000 = 0.789$, Duty factor = $10 * \log(1/0.789) = 1.03$

802.11n (40MHz): Duty cycle = $107.50000/145.00000 = 0.741$, Duty factor = $10 * \log(1/0.741) = 1.30$



3.4 DESCRIPTION OF SUPPORT UNITS

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

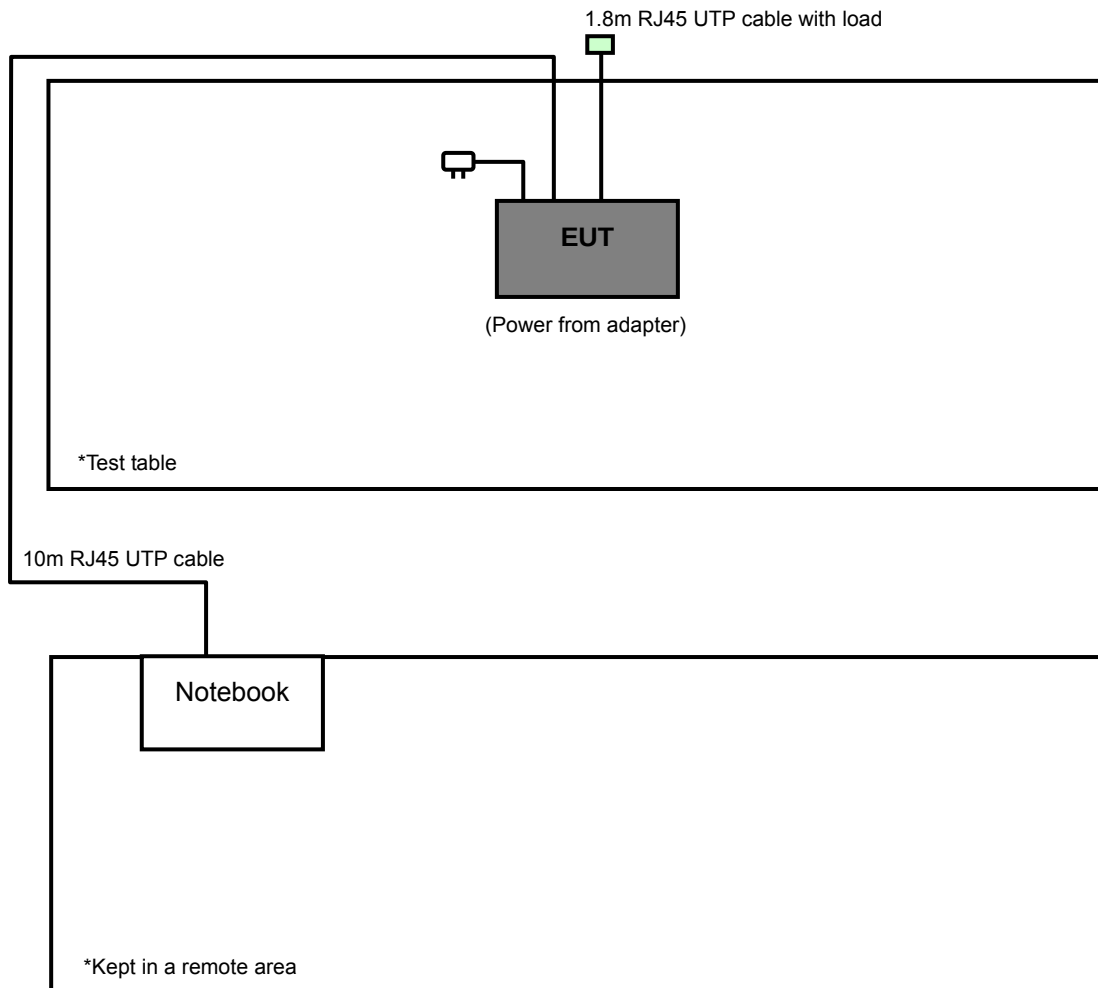
NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	Notebook	DELL	D531	CN-0XM006-48643-8 1U-2973	QDS-BRCM1020

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

NOTE:

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

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 v01r03

662911 D01 Multiple Transmitter Output v02r01

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	ESIB7	100187	Jan. 02, 2014	Jan. 01, 2015
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100039	Mar. 03, 2014	Mar. 02, 2015
BILOG Antenna SCHWARZBECK	VULB9168	9168-160	Feb. 26, 2014	Feb. 25, 2015
HORN Antenna SCHWARZBECK	9120D	209	Sep. 12, 2013	Sep. 11, 2014
HORN Antenna SCHWARZBECK	BBHA 9170	148	Jul. 15, 2013	Jul. 14, 2014
Preamplifier Agilent	8447D	2944A10633	Oct. 07, 2013	Oct. 06, 2014
Preamplifier Agilent	8449B	3008A01964	Aug. 26, 2013	Aug. 25, 2014
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	214378/4	Aug. 26, 2013	Aug. 25, 2014
RF signal cable HUBER+SUHNNER	SUCOFLEX 106	12738/6 +309224/4	Aug. 26, 2013	Aug. 25, 2014
Software BV ADT	ADT_Radiated_ V7.6.15.9.4	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. 18, 2013	Oct. 17, 2014
WIT Standard Temperature And Humidity Chamber	TH-4S-C	W981030	Jun. 10, 2013	Jun. 09, 2014

- NOTE:** 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HwaYa Chamber 3.
3. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
4. The FCC Site Registration No. is 988962.
5. The IC Site Registration No. is IC 7450F-3.

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:

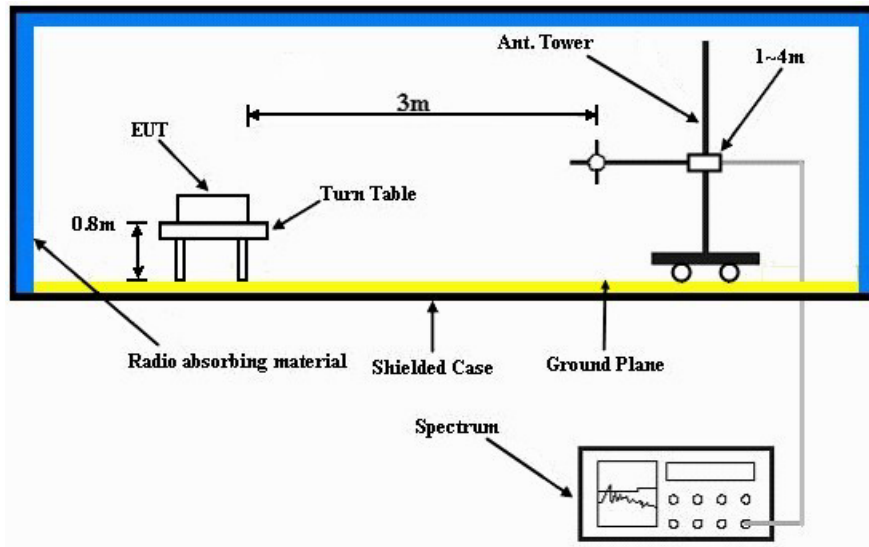
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is $\geq 1/T$ (Duty cycle < 98%) or 10Hz (Duty cycle > 98%) for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.

4.1.5 DEVIATION FROM TEST STANDARD

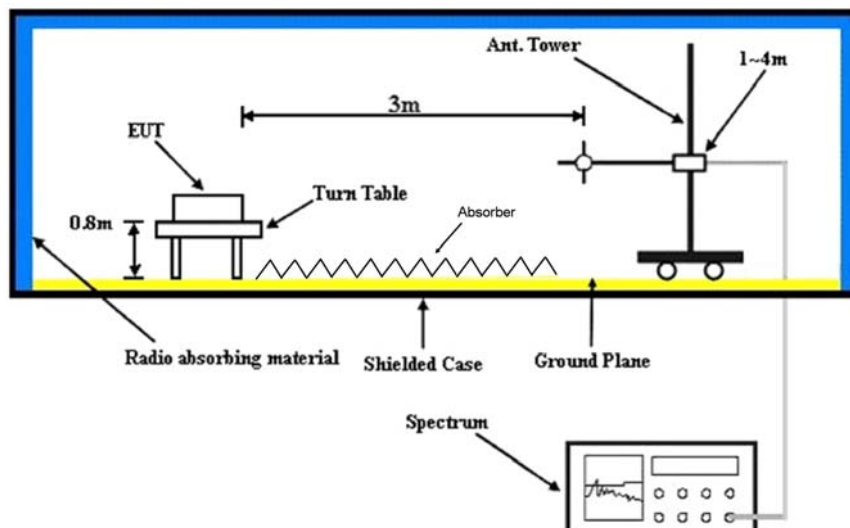
No deviation.

4.1.6 TEST SETUP

Frequency range 30MHz~1GHz



Frequency range above 1GHz



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 notebook to act as a communication partner and placed it outside of testing area.
- c. The communication partner connected with EUT via a RJ45 cable and ran a test program (provided by manufacturer) to enable EUT under transmission condition continuously at specific channel frequency.
- d. The communication partner sent data to EUT by command "PING".

4.1.8 TEST RESULTS

ABOVE 1GHz DATA :

802.11a

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 52	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	22deg. C, 67%RH	TESTED BY	Jones Chang

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	58.0 PK	74.0	-16.0	1.30 H	288	52.90	5.10
2	5150.00	45.2 AV	54.0	-8.8	1.30 H	288	40.10	5.10
3	*5260.00	117.4 PK			1.25 H	47	79.50	37.90
4	*5260.00	107.9 AV			1.25 H	47	70.00	37.90
5	#10520.00	64.0 PK	74.0	-10.0	1.12 H	284	44.60	19.40
6	#10520.00	50.6 AV	54.0	-3.4	1.12 H	284	31.20	19.40
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	5150.00	56.5 PK	74.0	-17.5	1.16 V	85	51.40	5.10
2	5150.00	43.7 AV	54.0	-10.3	1.16 V	85	38.60	5.10
3	*5260.00	115.0 PK			1.10 V	348	77.10	37.90
4	*5260.00	104.8 AV			1.10 V	348	66.90	37.90
5	#10520.00	67.5 PK	74.0	-6.5	1.76 V	112	48.10	19.40
6	#10520.00	52.5 AV	54.0	-1.5	1.76 V	112	33.10	19.40

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 of the restricted band.

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 60	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	22deg. C, 67%RH	TESTED BY	Jones Chang

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	*5300.00	116.3 PK			1.32 H	55	78.40	37.90
2	*5300.00	106.5 AV			1.32 H	55	68.60	37.90
3	10600.00	62.8 PK	74.0	-11.2	1.08 H	253	43.80	19.00
4	10600.00	49.5 AV	54.0	-4.5	1.08 H	253	30.50	19.00
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	*5300.00	114.3 PK			1.20 V	343	76.40	37.90
2	*5300.00	104.2 AV			1.20 V	343	66.30	37.90
3	10600.00	67.3 PK	74.0	-6.7	1.76 V	104	48.30	19.00
4	10600.00	52.5 AV	54.0	-1.5	1.76 V	104	33.50	19.00

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.

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 64	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	22deg. C, 67%RH	TESTED BY	Jones Chang

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	*5320.00	115.9 PK			1.23 H	53	77.90	38.00
2	*5320.00	106.7 AV			1.23 H	53	68.70	38.00
3	5350.00	72.7 PK	74.0	-1.3	1.20 H	36	67.30	5.40
4	5350.00	51.9 AV	54.0	-2.1	1.20 H	36	46.50	5.40
5	10640.00	62.3 PK	74.0	-11.7	1.22 H	296	43.50	18.80
6	10640.00	49.3 AV	54.0	-4.7	1.22 H	296	30.50	18.80
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	*5320.00	114.3 PK			1.08 V	343	76.30	38.00
2	*5320.00	103.6 AV			1.08 V	343	65.60	38.00
3	5350.00	70.7 PK	74.0	-3.3	1.09 V	348	65.30	5.40
4	5350.00	50.8 AV	54.0	-3.2	1.09 V	348	45.40	5.40
5	10640.00	65.0 PK	74.0	-9.0	1.72 V	113	46.20	18.80
6	10640.00	51.5 AV	54.0	-2.5	1.72 V	113	32.70	18.80

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.

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 100	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	22deg. C, 67%RH	TESTED BY	Jones Chang

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	5460.00	67.4 PK	74.0	-6.6	1.35 H	60	61.80	5.60
2	5460.00	47.9 AV	54.0	-6.1	1.35 H	60	42.30	5.60
3	#5470.00	72.5 PK	74.0	-1.5	1.29 H	50	66.80	5.70
4	#5470.00	51.1 AV	54.0	-2.9	1.29 H	50	45.40	5.70
5	*5500.00	115.7 PK			1.28 H	64	77.40	38.30
6	*5500.00	105.3 AV			1.28 H	64	67.00	38.30
7	#5581.00	62.2 PK	74.0	-11.8	1.12 H	304	56.40	5.80
8	#5581.00	51.1 AV	54.0	-2.9	1.12 H	304	45.30	5.80
9	11000.00	61.0 PK	74.0	-13.0	1.26 H	115	41.20	19.80
10	11000.00	49.8 AV	54.0	-4.2	1.26 H	115	30.00	19.80
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	5460.00	58.2 PK	74.0	-15.8	1.41 V	330	52.60	5.60
2	5460.00	46.2 AV	54.0	-7.8	1.41 V	330	40.60	5.60
3	#5470.00	66.6 PK	74.0	-7.4	1.39 V	325	60.90	5.70
4	#5470.00	48.3 AV	54.0	-5.7	1.39 V	325	42.60	5.70
5	*5500.00	114.0 PK			1.11 V	340	75.70	38.30
6	*5500.00	104.6 AV			1.11 V	340	66.30	38.30
7	#5581.00	61.6 PK	74.0	-12.4	1.34 V	45	55.80	5.80
8	#5581.00	50.4 AV	54.0	-3.6	1.34 V	45	44.60	5.80
9	11000.00	60.9 PK	74.0	-13.1	1.47 V	98	41.10	19.80
10	11000.00	50.2 AV	54.0	-3.8	1.47 V	98	30.40	19.80

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.

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 116	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	22deg. C, 67%RH	TESTED BY	Jones Chang

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	*5580.00	118.4 PK			1.16 H	46	80.10	38.30
2	*5580.00	109.2 AV			1.16 H	46	70.90	38.30
3	11160.00	63.1 PK	74.0	-10.9	1.19 H	169	43.20	19.90
4	11160.00	49.8 AV	54.0	-4.2	1.19 H	169	29.90	19.90
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	*5580.00	117.5 PK			1.14 V	36	79.20	38.30
2	*5580.00	107.9 AV			1.14 V	36	69.60	38.30
3	11160.00	64.7 PK	74.0	-9.3	1.65 V	126	44.80	19.90
4	11160.00	51.4 AV	54.0	-2.6	1.65 V	126	31.50	19.90

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.

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 140	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	22deg. C, 67%RH	TESTED BY	Jones Chang

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	*5700.00	116.1 PK			1.12 H	51	77.60	38.50
2	*5700.00	106.2 AV			1.12 H	51	67.70	38.50
3	#5725.00	72.8 PK	74.0	-1.2	1.16 H	63	66.80	6.00
4	#5725.00	51.3 AV	54.0	-2.7	1.16 H	63	45.30	6.00
5	11400.00	62.1 PK	74.0	-11.9	1.25 H	212	42.10	20.00
6	11400.00	49.2 AV	54.0	-4.8	1.25 H	212	29.20	20.00
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	*5700.00	114.3 PK			1.18 V	47	75.80	38.50
2	*5700.00	104.2 AV			1.18 V	47	65.70	38.50
3	#5725.00	71.2 PK	74.0	-2.8	1.31 V	36	65.20	6.00
4	#5725.00	51.4 AV	54.0	-2.6	1.31 V	36	45.40	6.00
5	11400.00	63.4 PK	74.0	-10.6	1.63 V	135	43.40	20.00
6	11400.00	50.6 AV	54.0	-3.4	1.63 V	135	30.60	20.00

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 52	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	22deg. C, 67%RH	TESTED BY	Jones Chang

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	57.3 PK	74.0	-16.7	1.25 H	66	52.20	5.10
2	5150.00	44.9 AV	54.0	-9.1	1.25 H	66	39.80	5.10
3	*5260.00	118.0 PK			1.25 H	46	80.10	37.90
4	*5260.00	107.5 AV			1.25 H	46	69.60	37.90
5	#10520.00	63.7 PK	74.0	-10.3	1.24 H	255	44.30	19.40
6	#10520.00	50.6 AV	54.0	-3.4	1.24 H	255	31.20	19.40
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	5150.00	56.7 PK	74.0	-17.3	1.21 V	289	51.60	5.10
2	5150.00	44.6 AV	54.0	-9.4	1.21 V	289	39.50	5.10
3	*5260.00	113.1 PK			1.29 V	299	75.20	37.90
4	*5260.00	103.2 AV			1.29 V	299	65.30	37.90
5	#10520.00	68.3 PK	74.0	-5.7	1.74 V	114	48.90	19.40
6	#10520.00	52.8 AV	54.0	-1.2	1.74 V	114	33.40	19.40

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 of the restricted band.

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 60	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	22deg. C, 67%RH	TESTED BY	Jones Chang

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	*5300.00	116.3 PK			1.09 H	53	78.40	37.90
2	*5300.00	106.4 AV			1.09 H	53	68.50	37.90
3	10600.00	64.3 PK	74.0	-9.7	1.24 H	350	45.30	19.00
4	10600.00	50.9 AV	54.0	-3.1	1.24 H	250	31.90	19.00
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	*5300.00	114.4 PK			1.29 V	298	76.50	37.90
2	*5300.00	103.8 AV			1.29 V	298	65.90	37.90
3	10600.00	66.8 PK	74.0	-7.2	1.71 V	113	47.80	19.00
4	10600.00	52.2 AV	54.0	-1.8	1.71 V	113	33.20	19.00

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.

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 64	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	22deg. C, 67%RH	TESTED BY	Jones Chang

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	*5320.00	117.0 PK			1.20 H	54	79.00	38.00
2	*5320.00	106.4 AV			1.20 H	54	68.40	38.00
3	5350.00	71.9 PK	74.0	-2.1	1.18 H	37	66.50	5.40
4	5350.00	51.6 AV	54.0	-2.4	1.18 H	37	46.20	5.40
5	10640.00	61.7 PK	74.0	-12.3	1.22 H	258	42.90	18.80
6	10640.00	49.5 AV	54.0	-4.5	1.22 H	258	30.70	18.80
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	*5320.00	113.1 PK			1.07 V	342	75.10	38.00
2	*5320.00	103.7 AV			1.07 V	342	65.70	38.00
3	5350.00	73.0 PK	74.0	-1.0	1.19 V	336	67.60	5.40
4	5350.00	52.1 AV	54.0	-1.9	1.19 V	336	46.70	5.40
5	10640.00	66.8 PK	74.0	-7.2	1.77 V	123	48.00	18.80
6	10640.00	51.3 AV	54.0	-2.7	1.77 V	123	32.50	18.80

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.

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 100	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	22deg. C, 67%RH	TESTED BY	Jones Chang

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	5460.00	70.5 PK	74.0	-3.5	1.31 H	55	64.90	5.60
2	5460.00	51.6 AV	54.0	-2.4	1.31 H	55	46.00	5.60
3	#5470.00	72.2 PK	74.0	-1.8	1.29 H	53	66.50	5.70
4	#5470.00	52.4 AV	54.0	-1.6	1.29 H	53	46.70	5.70
5	*5500.00	116.7 PK			1.18 H	55	78.40	38.30
6	*5500.00	106.6 AV			1.18 H	55	68.30	38.30
7	11000.00	63.2 PK	74.0	-10.8	1.10 H	183	43.40	19.80
8	11000.00	49.6 AV	54.0	-4.4	1.10 H	183	29.80	19.80
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	5460.00	64.5 PK	74.0	-9.5	1.25 V	43	58.90	5.60
2	5460.00	47.7 AV	54.0	-6.3	1.25 V	43	42.10	5.60
3	#5470.00	73.0 PK	74.0	-1.0	1.27 V	40	67.30	5.70
4	#5470.00	51.7 AV	54.0	-2.3	1.27 V	40	46.00	5.70
5	*5500.00	114.8 PK			1.26 V	42	76.50	38.30
6	*5500.00	104.8 AV			1.26 V	42	66.50	38.30
7	11000.00	64.6 PK	74.0	-9.4	1.61 V	120	44.80	19.80
8	11000.00	50.9 AV	54.0	-3.1	1.61 V	120	31.10	19.80

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.

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 116	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	22deg. C, 67%RH	TESTED BY	Jones Chang

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	*5580.00	119.5 PK			1.27 H	53	81.20	38.30
2	*5580.00	109.2 AV			1.27 H	53	70.90	38.30
3	11160.00	63.8 PK	74.0	-10.2	1.20 H	170	43.90	19.90
4	11160.00	50.6 AV	54.0	-3.4	1.20 H	170	30.70	19.90
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	*5580.00	117.2 PK			1.25 V	38	78.90	38.30
2	*5580.00	107.0 AV			1.25 V	38	68.70	38.30
3	11160.00	65.7 PK	74.0	-8.3	1.64 V	124	45.80	19.90
4	11160.00	51.2 AV	54.0	-2.8	1.64 V	124	31.30	19.90

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.

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 140	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	22deg. C, 67%RH	TESTED BY	Jones Chang

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	*5700.00	116.6 PK			1.23 H	50	78.10	38.50
2	*5700.00	106.6 AV			1.23 H	50	68.10	38.50
3	#5725.00	72.5 PK	74.0	-1.5	1.27 H	64	66.50	6.00
4	#5725.00	51.6 AV	54.0	-2.4	1.27 H	64	45.60	6.00
5	11400.00	62.5 PK	74.0	-11.5	1.29 H	188	42.50	20.00
6	11400.00	49.7 AV	54.0	-4.3	1.29 H	188	29.70	20.00
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	*5700.00	114.0 PK			1.18 V	48	75.50	38.50
2	*5700.00	103.9 AV			1.18 V	48	65.40	38.50
3	#5725.00	72.9 PK	74.0	-1.1	1.18 V	45	66.90	6.00
4	#5725.00	52.0 AV	54.0	-2.0	1.18 V	45	46.00	6.00
5	11400.00	64.2 PK	74.0	-9.8	1.66 V	131	44.20	20.00
6	11400.00	50.4 AV	54.0	-3.6	1.66 V	131	30.40	20.00

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		MEASUREMENT DETAIL	
CHANNEL	Channel 54	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	22deg. C, 67%RH	TESTED BY	Jones Chang

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	56.8 PK	74.0	-17.2	1.20 H	42	51.70	5.10
2	5150.00	45.9 AV	54.0	-8.1	1.20 H	42	40.80	5.10
3	*5270.00	113.9 PK			1.20 H	51	76.00	37.90
4	*5270.00	104.3 AV			1.20 H	51	66.40	37.90
5	5350.00	70.0 PK	74.0	-4.0	1.20 H	278	64.60	5.40
6	5350.00	51.1 AV	54.0	-2.9	1.20 H	278	45.70	5.40
7	#10540.00	62.9 PK	74.0	-11.1	1.21 H	252	43.60	19.30
8	#10540.00	49.3 AV	54.0	-4.7	1.21 H	252	30.00	19.30
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	5150.00	57.4 PK	74.0	-16.6	1.10 V	346	52.30	5.10
2	5150.00	44.6 AV	54.0	-9.4	1.10 V	346	39.50	5.10
3	*5270.00	111.9 PK			1.10 V	346	74.00	37.90
4	*5270.00	101.8 AV			1.10 V	346	63.90	37.90
5	5350.00	71.0 PK	74.0	-3.0	1.07 V	340	65.60	5.40
6	5350.00	51.2 AV	54.0	-2.8	1.07 V	340	45.80	5.40
7	#10520.00	67.6 PK	74.0	-6.4	1.64 V	119	48.20	19.40
8	#10520.00	53.0 AV	54.0	-1.0	1.64 V	119	33.60	19.40

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 of the restricted band.

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 62	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	22deg. C, 67%RH	TESTED BY	Jones Chang

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	*5310.00	106.2 PK			1.35 H	43	68.30	37.90
2	*5310.00	95.5 AV			1.35 H	43	57.60	37.90
3	5350.00	72.4 PK	74.0	-1.6	1.33 H	49	67.00	5.40
4	5350.00	50.9 AV	54.0	-3.1	1.33 H	49	45.50	5.40
5	10640.00	65.4 PK	74.0	-8.6	1.68 H	121	46.60	18.80
6	10640.00	51.2 AV	54.0	-2.8	1.68 H	121	32.40	18.80
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	*5310.00	103.9 PK			1.10 V	341	66.00	37.90
2	*5310.00	94.1 AV			1.10 V	341	56.20	37.90
3	5350.00	69.6 PK	74.0	-4.4	1.10 V	323	64.20	5.40
4	5350.00	49.0 AV	54.0	-5.0	1.10 V	323	43.60	5.40
5	10620.00	63.1 PK	74.0	-10.9	1.74 V	111	44.20	18.90
6	10620.00	49.4 AV	54.0	-4.6	1.74 V	111	30.50	18.90

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.

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 102	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	22deg. C, 67%RH	TESTED BY	Jones Chang

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	5460.00	62.8 PK	74.0	-11.2	1.30 H	50	57.20	5.60
2	5460.00	46.1 AV	54.0	-7.9	1.30 H	50	40.50	5.60
3	#5470.00	72.6 PK	74.0	-1.4	1.28 H	52	66.90	5.70
4	#5470.00	52.5 AV	54.0	-1.5	1.28 H	52	46.80	5.70
5	*5510.00	107.8 PK			1.16 H	55	69.50	38.30
6	*5510.00	97.5 AV			1.16 H	55	59.20	38.30
7	11020.00	62.4 PK	74.0	-11.6	1.21 H	167	42.50	19.90
8	11020.00	49.5 AV	54.0	-4.5	1.21 H	167	29.60	19.90
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	5460.00	59.3 PK	74.0	-14.7	1.26 V	39	53.70	5.60
2	5460.00	46.5 AV	54.0	-7.5	1.26 V	39	40.90	5.60
3	#5470.00	69.7 PK	74.0	-4.3	1.28 V	40	64.00	5.70
4	#5470.00	50.8 AV	54.0	-3.2	1.28 V	40	45.10	5.70
5	*5510.00	107.1 PK			1.27 V	40	68.80	38.30
6	*5510.00	96.9 AV			1.27 V	40	58.60	38.30
7	11020.00	61.8 PK	74.0	-12.2	1.68 V	140	41.90	19.90
8	11020.00	48.7 AV	54.0	-5.3	1.68 V	140	28.80	19.90

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.

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 110	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	22deg. C, 67%RH	TESTED BY	Jones Chang

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	#5470.00	67.0 PK	74.0	-7.0	1.28 H	55	61.30	5.70
2	#5470.00	49.2 AV	54.0	-4.8	1.28 H	55	43.50	5.70
3	*5550.00	114.2 PK			1.26 H	57	75.90	38.30
4	*5550.00	104.6 AV			1.26 H	57	66.30	38.30
5	11100.00	62.3 PK	74.0	-11.7	1.18 H	190	42.50	19.80
6	11100.00	49.2 AV	54.0	-4.8	1.18 H	190	29.40	19.80
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	#5470.00	65.7 PK	74.0	-8.3	1.26 V	45	60.00	5.70
2	#5470.00	47.4 AV	54.0	-6.6	1.26 V	45	41.70	5.70
3	*5550.00	114.2 PK			1.26 V	39	75.90	38.30
4	*5550.00	103.6 AV			1.26 V	39	65.30	38.30
5	11100.00	62.4 PK	74.0	-11.6	1.49 V	162	42.60	19.80
6	11100.00	49.3 AV	54.0	-4.7	1.49 V	162	29.50	19.80

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.

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 134	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	22deg. C, 67%RH	TESTED BY	Jones Chang

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	*5670.00	113.8 PK			1.25 H	55	75.40	38.40
2	*5670.00	103.6 AV			1.25 H	55	65.20	38.40
3	#5725.00	72.7 PK	74.0	-1.3	1.27 H	53	66.70	6.00
4	#5725.00	49.5 AV	54.0	-4.5	1.27 H	53	43.50	6.00
5	11340.00	62.2 PK	74.0	-11.8	1.19 H	197	42.30	19.90
6	11340.00	49.1 AV	54.0	-4.9	1.19 H	197	29.20	19.90
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	*5670.00	111.3 PK			1.21 V	43	72.90	38.40
2	*5670.00	101.2 AV			1.21 V	43	62.80	38.40
3	#5725.00	72.0 PK	74.0	-2.0	1.22 V	37	66.00	6.00
4	#5725.00	50.6 AV	54.0	-3.4	1.22 V	37	44.60	6.00
5	11340.00	62.4 PK	74.0	-11.6	1.61 V	158	42.50	19.90
6	11340.00	48.6 AV	54.0	-5.4	1.61 V	158	28.70	19.90

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 60	FREQUENCY RANGE	Below 1000MHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	DETECTOR FUNCTION	Quasi-Peak
ENVIRONMENTAL CONDITIONS	22deg. C, 67%RH	TESTED BY	Jones Chang

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	57.12	31.4 QP	40.0	-8.6	2.00 H	58	46.00	-14.60
2	97.95	32.9 QP	43.5	-10.6	2.00 H	274	51.90	-19.00
3	249.60	28.1 QP	46.0	-17.9	1.01 H	95	42.30	-14.20
4	375.98	30.7 QP	46.0	-15.3	1.01 H	87	41.40	-10.70
5	751.23	34.4 QP	46.0	-11.6	1.01 H	16	37.40	-3.00
6	1000.00	33.1 QP	54.0	-20.9	1.01 H	16	32.00	1.10
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	49.34	35.6 QP	40.0	-4.4	1.00 V	5	50.10	-14.50
2	59.06	37.8 QP	40.0	-2.2	1.00 V	13	52.50	-14.70
3	97.95	31.9 QP	43.5	-11.6	1.00 V	60	50.90	-19.00
4	375.98	28.4 QP	46.0	-17.6	1.49 V	319	39.10	-10.70
5	624.85	31.6 QP	46.0	-14.4	1.49 V	149	37.10	-5.50
6	751.23	32.3 QP	46.0	-13.7	1.49 V	347	35.30	-3.00

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

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.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESCS30	100288	Nov. 17, 2013	Nov. 16, 2014
RF signal cable Woken	5D-FB	Cable-HYCO2-01	Dec. 27, 2013	Dec. 26, 2014
LISN ROHDE & SCHWARZ (EUT)	ESH2-Z5	100100	Dec. 23, 2013	Dec. 22, 2014
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100312	Jul. 08, 2013	Jul. 07, 2014
Software ADT	BV ADT_Cond_ V7.3.7.3	NA	NA	NA

- Notes: 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

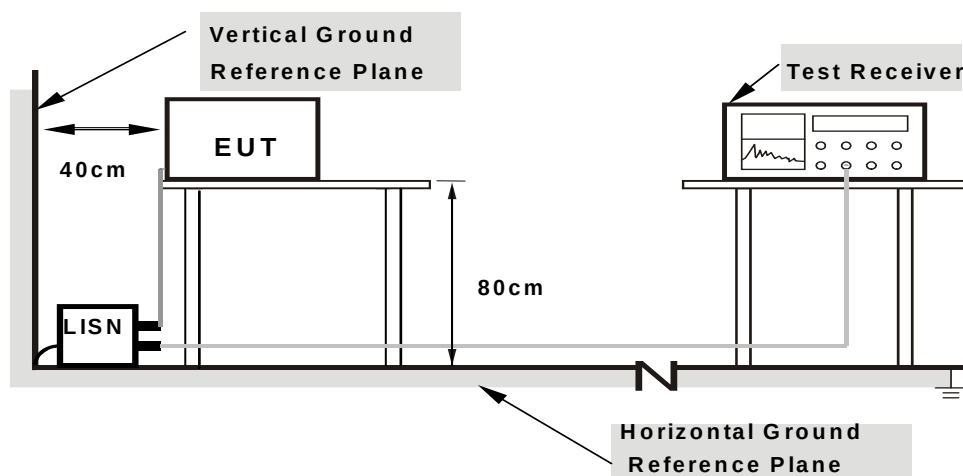
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance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

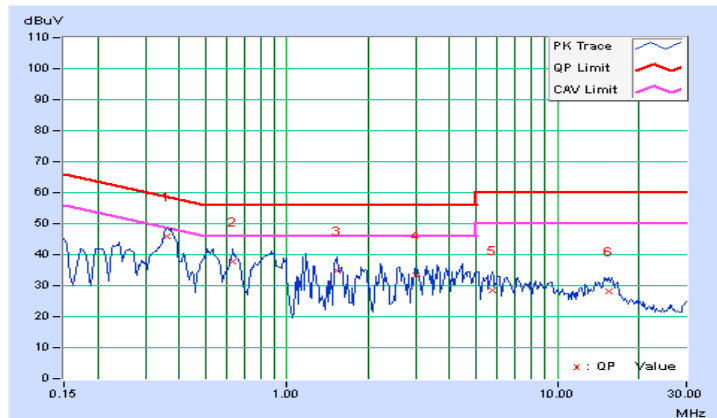
4.2.7 TEST RESULTS

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

PHASE	Line 1	6dB BANDWIDTH	9kHz
CHANNEL	Channel 60		

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	0.36094	0.22	45.61	33.64	45.83	33.86	58.71	48.71	-12.87	-14.84
2	0.62656	0.25	37.51	25.54	37.76	25.79	56.00	46.00	-18.24	-20.21
3	1.52734	0.34	34.39	21.05	34.73	21.39	56.00	46.00	-21.27	-24.61
4	3.00000	0.41	33.07	19.92	33.48	20.33	56.00	46.00	-22.52	-25.67
5	5.72266	0.46	28.15	16.91	28.61	17.37	60.00	50.00	-31.39	-32.63
6	15.56641	0.60	27.62	15.16	28.22	15.76	60.00	50.00	-31.78	-34.24

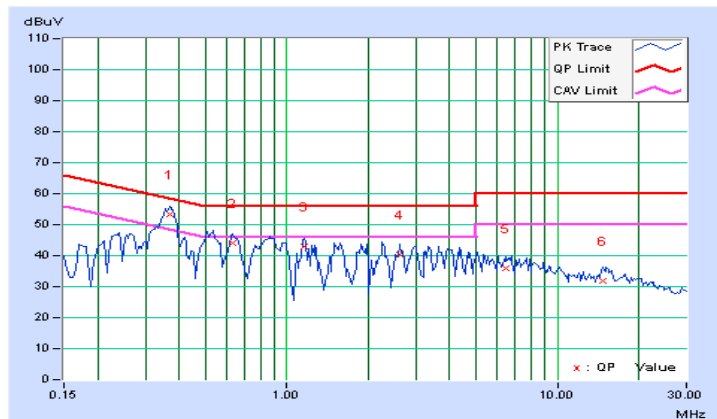
- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
 2. The emission levels of other frequencies were very low against the limit.
 3. Margin value = Emission level - Limit value
 4. Correction factor = Insertion loss + Cable loss
 5. Emission Level = Correction Factor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



PHASE	Line 2	6dB BANDWIDTH	9kHz
CHANNEL	Channel 60		

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	0.36875	0.29	53.01	43.63	53.30	43.92	58.53	48.53	-5.23	-4.61
2	0.63047	0.30	43.95	36.14	44.25	36.44	56.00	46.00	-11.75	-9.56
3	1.15625	0.31	42.67	33.57	42.98	33.88	56.00	46.00	-13.02	-12.12
4	2.60547	0.42	39.79	31.02	40.21	31.44	56.00	46.00	-15.79	-14.56
5	6.44922	0.53	35.22	27.92	35.75	28.45	60.00	50.00	-24.25	-21.55
6	14.79688	0.67	31.07	24.30	31.74	24.97	60.00	50.00	-28.26	-25.03

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 TRANSMIT POWER MEASUREMENT

4.3.1 LIMITS OF TRANSMIT POWER MEASUREMENT

FREQUENCY BAND	LIMIT
5.150 ~ 5.250GHz	The lesser of 50mW (17dBm) or 4dBm + 10logB
5.250 ~ 5.350GHz	The lesser of 250mW (24dBm) or 11dBm + 10logB
5.470 ~ 5.725GHz	The lesser of 250mW (24dBm) or 11dBm + 10logB

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

Per KDB 662911 D01 Multiple Transmitter Output v02r01 Method of conducted output power measurement on IEEE 802.11 devices,

Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;

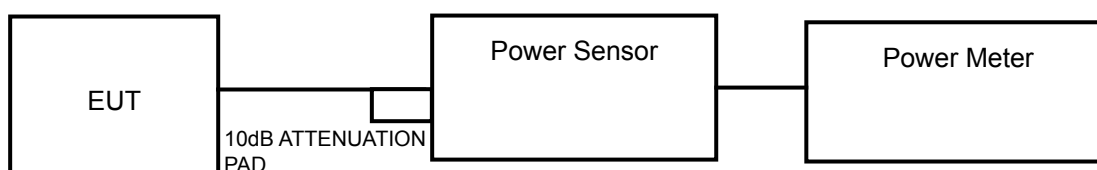
Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any N_{ANT} ;

Array Gain = $5 \log(N_{ANT}/N_{SS})$ dB or 3 dB, whichever is less for 20-MHz channel widths with $N_{ANT} \geq 5$.

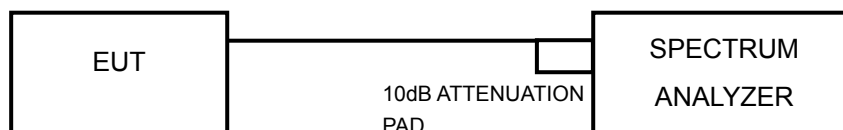
For power measurements on all other devices: Array Gain = $10 \log(N_{ANT}/N_{SS})$ dB.

4.3.2 TEST SETUP

FOR POWER OUTPUT MEASUREMENT



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

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 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

CHAN.	CHAN. FREQ. (MHz)	AVERAGE POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)	POWER LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1				
52	5260	17.51	17.86	117.458	20.70	23.79	PASS
60	5300	18.03	18.64	136.647	21.36	23.73	PASS
64	5320	18.76	18.28	142.460	21.54	23.79	PASS
100	5500	18.02	17.59	120.799	20.82	23.73	PASS
116	5580	18.74	17.23	127.662	21.06	23.71	PASS
140	5700	18.21	16.93	115.539	20.63	23.71	PASS

NOTE:

CHAIN 0

1. $11\text{dBm} + 10\log(19.75) = 23.96\text{ dBm} < 24\text{dBm}$.
2. $11\text{dBm} + 10\log(19.68) = 23.94\text{ dBm} < 24\text{dBm}$.
3. $11\text{dBm} + 10\log(19.47) = 23.89\text{ dBm} < 24\text{dBm}$.
4. $11\text{dBm} + 10\log(19.77) = 23.96\text{ dBm} < 24\text{dBm}$.
5. $11\text{dBm} + 10\log(19.73) = 23.95\text{ dBm} < 24\text{dBm}$.
6. $11\text{dBm} + 10\log(18.66) = 23.71\text{ dBm} < 24\text{dBm}$.

CHAIN 1

1. $11\text{dBm} + 10\log(19.00) = 23.79\text{ dBm} < 24\text{dBm}$.
2. $11\text{dBm} + 10\log(18.76) = 23.73\text{ dBm} < 24\text{dBm}$.
3. $11\text{dBm} + 10\log(19.03) = 23.79\text{ dBm} < 24\text{dBm}$.
4. $11\text{dBm} + 10\log(18.73) = 23.73\text{ dBm} < 24\text{dBm}$.
5. $11\text{dBm} + 10\log(18.66) = 23.71\text{ dBm} < 24\text{dBm}$.
6. $11\text{dBm} + 10\log(18.89) = 23.76\text{ dBm} < 24\text{dBm}$.

802.11n (20MHz)

CHAN.	CHAN. FREQ. (MHz)	AVERAGE POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)	POWER LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1				
52	5260	17.98	18.36	131.355	21.18	24.00	PASS
60	5300	18.21	18.86	143.135	21.56	23.98	PASS
64	5320	18.70	18.31	141.895	21.52	23.96	PASS
100	5500	18.21	18.49	136.854	21.36	23.93	PASS
116	5580	18.65	17.08	124.332	20.95	23.98	PASS
140	5700	18.23	16.86	115.056	20.61	23.97	PASS

NOTE:

CHAIN 0

1. $11\text{dBm} + 10\log(20.37) = 24.09\text{ dBm} > 24\text{dBm}$.
2. $11\text{dBm} + 10\log(20.27) = 24.07\text{ dBm} > 24\text{dBm}$.
3. $11\text{dBm} + 10\log(20.42) = 24.10\text{ dBm} > 24\text{dBm}$.
4. $11\text{dBm} + 10\log(19.65) = 23.93\text{ dBm} < 24\text{dBm}$.
5. $11\text{dBm} + 10\log(20.45) = 24.11\text{ dBm} > 24\text{dBm}$.
6. $11\text{dBm} + 10\log(20.51) = 24.12\text{ dBm} > 24\text{dBm}$.

CHAIN 1

1. $11\text{dBm} + 10\log(20.04) = 24.02\text{ dBm} > 24\text{dBm}$.
2. $11\text{dBm} + 10\log(19.87) = 23.98\text{ dBm} < 24\text{dBm}$.
3. $11\text{dBm} + 10\log(19.78) = 23.96\text{ dBm} < 24\text{dBm}$.
4. $11\text{dBm} + 10\log(19.93) = 24.00\text{ dBm} = 24\text{dBm}$.
5. $11\text{dBm} + 10\log(19.87) = 23.98\text{ dBm} < 24\text{dBm}$.
6. $11\text{dBm} + 10\log(19.81) = 23.97\text{ dBm} < 24\text{dBm}$.

802.11n (40MHz)

CHAN.	CHAN. FREQ. (MHz)	AVERAGE POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)	POWER LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1				
54	5270	19.88	21.11	226.397	23.55	24	PASS
62	5310	11.97	11.85	31.051	14.92	24	PASS
102	5510	14.23	13.80	50.473	17.03	24	PASS
110	5550	21.66	19.76	241.179	23.82	24	PASS
134	5670	18.67	17.45	129.211	21.11	24	PASS

NOTE:

CHAIN 0

1. $11\text{dBm} + 10\log(82.97) = 30.19\text{ dBm} > 24\text{dBm}$.
2. $11\text{dBm} + 10\log(48.24) = 27.83\text{ dBm} > 24\text{dBm}$.
3. $11\text{dBm} + 10\log(47.37) = 27.76\text{ dBm} > 24\text{dBm}$.
4. $11\text{dBm} + 10\log(77.54) = 29.90\text{ dBm} > 24\text{dBm}$.
5. $11\text{dBm} + 10\log(73.98) = 29.69\text{ dBm} > 24\text{dBm}$.

CHAIN 1

1. $11\text{dBm} + 10\log(74.68) = 29.73\text{ dBm} > 24\text{dBm}$.
2. $11\text{dBm} + 10\log(45.81) = 27.61\text{ dBm} > 24\text{dBm}$.
3. $11\text{dBm} + 10\log(46.13) = 27.64\text{ dBm} > 24\text{dBm}$.
4. $11\text{dBm} + 10\log(73.46) = 29.66\text{ dBm} > 24\text{dBm}$.
5. $11\text{dBm} + 10\log(60.07) = 28.79\text{ dBm} > 24\text{dBm}$.

26dB BANDWIDTH:

802.11a

CHANNEL	CHANNEL FREQUENCY (MHz)	26dBc BANDWIDTH (MHz)		PASS / FAIL
		CHAIN 0	CHAIN 1	
52	5260	19.75	19.00	PASS
60	5300	19.68	18.76	PASS
64	5320	19.47	19.03	PASS
100	5500	19.77	18.73	PASS
116	5580	19.73	18.66	PASS
140	5700	18.66	18.89	PASS

802.11n (20MHz)

CHANNEL	CHANNEL FREQUENCY (MHz)	26dBc BANDWIDTH (MHz)		PASS / FAIL
		CHAIN 0	CHAIN 1	
52	5260	20.37	20.04	PASS
60	5300	20.27	19.87	PASS
64	5320	20.42	19.78	PASS
100	5500	19.65	19.93	PASS
116	5580	20.45	19.87	PASS
140	5700	20.51	19.81	PASS

802.11n (40MHz)

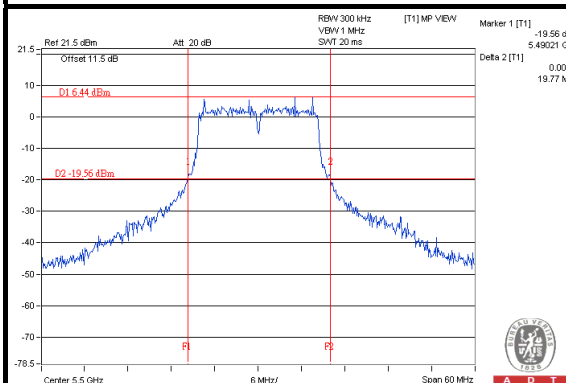
CHANNEL	CHANNEL FREQUENCY (MHz)	26dBc BANDWIDTH (MHz)		PASS / FAIL
		CHAIN 0	CHAIN 1	
54	5270	82.97	74.68	PASS
62	5310	48.24	45.81	PASS
102	5510	47.37	46.13	PASS
110	5550	77.54	73.46	PASS
134	5670	73.98	60.07	PASS



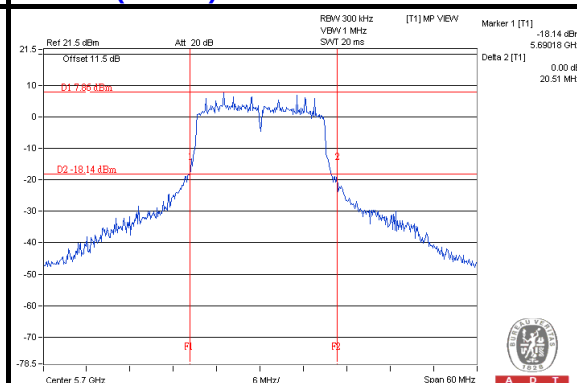
A D T

SPECTRUM PLOT OF WORST VALUE

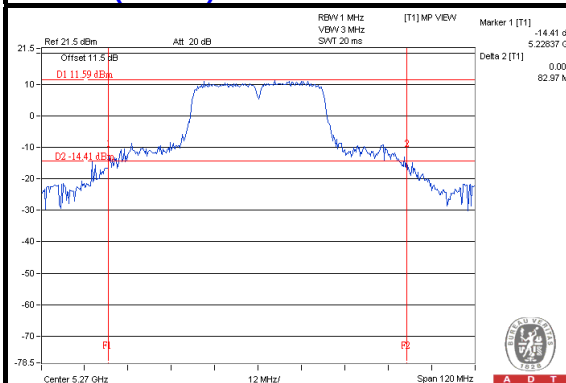
802.11a



802.11n (20MHz)



802.11n (40MHz)



EUT MAXIMUM CONDUCTED POWER

802.11a

FREQUENCY BAND (MHz)	MAX. POWER	
	OUTPUT POWER (mW)	OUTPUT POWER (dBm)
5250~5350	142.460	21.54
5470~5725	127.662	21.06

NOTE: Manufacturer provides Transmit Power Control description to meet this requirement.

802.11n (20MHz)

FREQUENCY BAND (MHz)	MAX. POWER	
	OUTPUT POWER (mW)	OUTPUT POWER (dBm)
5250~5350	143.135	21.56
5470~5725	136.854	21.36

NOTE: Manufacturer provides Transmit Power Control description to meet this requirement.

802.11n (40MHz)

FREQUENCY BAND (MHz)	MAX. POWER	
	OUTPUT POWER (mW)	OUTPUT POWER (dBm)
5250~5350	226.397	23.55
5470~5725	241.179	23.82

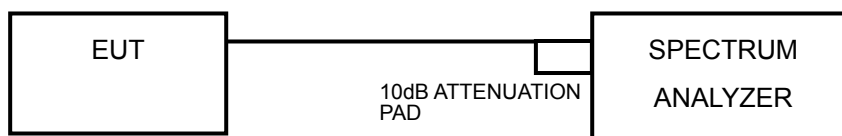
NOTE: Manufacturer provides Transmit Power Control description to meet this requirement.

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
5.250 ~ 5.350GHz	11dBm
5.470 ~ 5.725GHz	11dBm

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-2 alternative

- 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 = 30ms
- 5) Perform a single sweep.
- 6) Record the max value and add 10 log (1/duty cycle)

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

CHAN.	CHAN. FREQ. (MHz)	PSD (dBm)		TOTAL PSD W/O DUTY FACTOR (dBm)	DUTY FACTOR	TOTAL PSD WITH DUTY FACTOR (dBm)	MAX. LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1					
52	5260	4.98	5.47	8.23	0.15	8.38	8.49	PASS
60	5300	5.03	5.36	8.20	0.15	8.35	8.49	PASS
64	5320	4.99	5.35	8.17	0.15	8.32	8.49	PASS
100	5500	5.10	4.75	7.93	0.15	8.08	8.49	PASS
116	5580	6.21	4.21	8.32	0.15	8.47	8.49	PASS
140	5700	6.41	3.87	8.32	0.15	8.47	8.49	PASS

NOTE:

1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = $5.5\text{dBi} + 10\log(2) = 8.51\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $11-(8.51-6) = 8.49\text{dBm}$.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11n (20MHz)

CHAN.	CHAN. FREQ. (MHz)	PSD (dBm)		TOTAL PSD W/O DUTY FACTOR (dBm)	DUTY FACTOR	TOTAL PSD WITH DUTY FACTOR (dBm)	MAX. LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1					
52	5260	4.87	5.47	8.16	0.17	8.33	8.49	PASS
60	5300	4.62	5.94	8.31	0.17	8.48	8.49	PASS
64	5320	5.00	5.59	8.29	0.17	8.46	8.49	PASS
100	5500	5.29	5.01	8.13	0.17	8.30	8.49	PASS
116	5580	6.17	3.94	8.18	0.17	8.35	8.49	PASS
140	5700	6.19	3.20	7.93	0.17	8.10	8.49	PASS

NOTE:

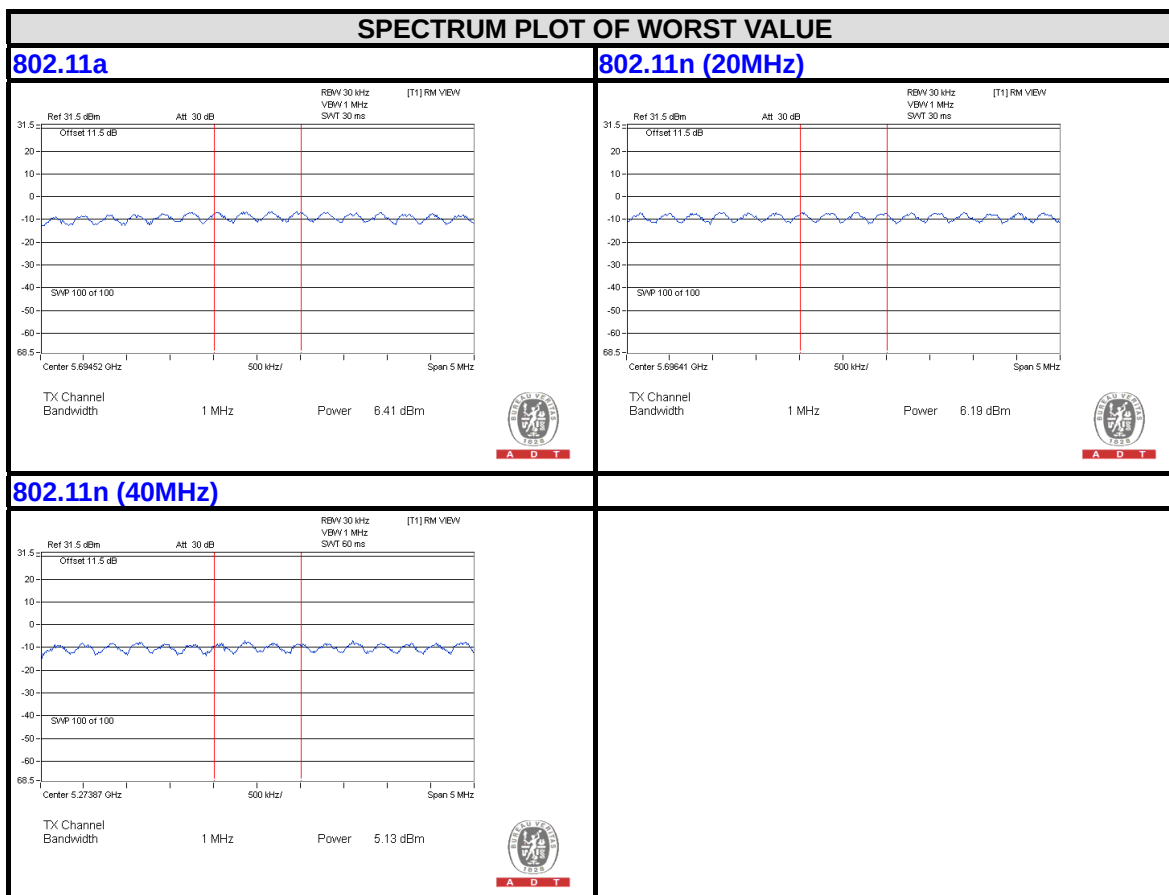
1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = $5.5\text{dBi} + 10\log(2) = 8.51\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $11-(8.51-6) = 8.49\text{dBm}$.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11n (40MHz)

CHAN.	CHAN. FREQ. (MHz)	PSD (dBm)		TOTAL PSD W/O DUTY FACTOR (dBm)	DUTY FACTOR	TOTAL PSD WITH DUTY FACTOR (dBm)	MAX. LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1					
54	5270	3.35	5.13	7.26	0.22	7.48	8.49	PASS
62	5310	-4.23	-3.92	-1.14	0.22	-0.92	8.49	PASS
102	5510	-1.66	-2.06	1.07	0.22	1.29	8.49	PASS
110	5550	4.95	3.83	7.36	0.22	7.58	8.49	PASS
134	5670	3.48	0.43	5.15	0.22	5.37	8.49	PASS

NOTE:

- Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
- Directional gain = $5.5\text{dBi} + 10\log(2) = 8.51\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $11-(8.51-6) = 8.49\text{dBm}$.
- Refer to section 3.3 for duty cycle spectrum plot.

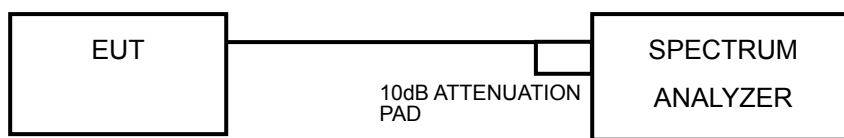


4.5 PEAK POWER EXCURSION MEASUREMENT

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.
Find the worst channel and modulation mode as above test procedure, and follow KDB 789033 D01 General UNII Test Procedures v01r03 and repeat step 1 to 5 for final testing of each modulation mode on a single channel (all modulation types) in a single operating band to compliance with the peak excursion requirement.

4.5.5 DEVIATION FROM TEST STANDARD

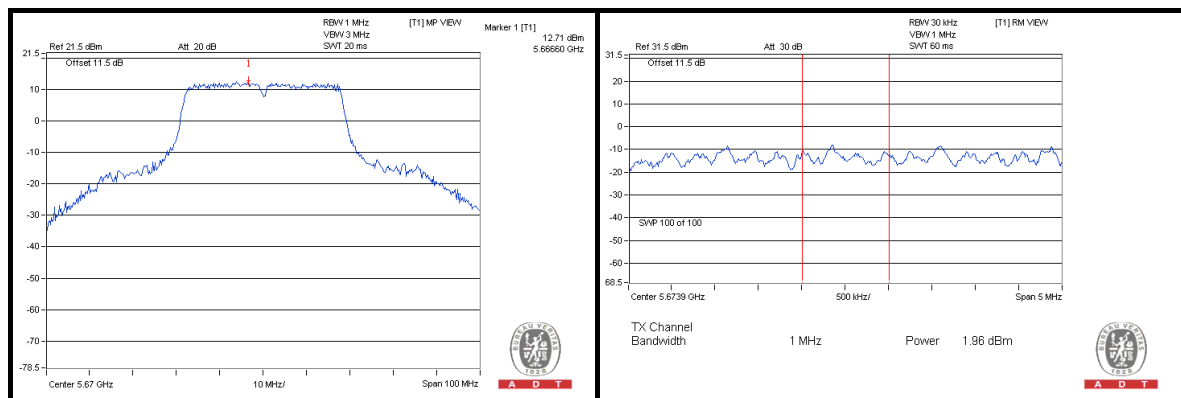
No deviation.

4.5.6 EUT OPERATING CONDITIONS

Same as 4.2.6

4.5.7 TEST RESULTS

MODULATION MODE	MODULATION TYPE	CHAN. FREQ. (MHz)	PEAK VALUE (dBm)	PPSD WITHOUT DUTY FACTOR (dBm)	PPSD WITH DUTY FACTOR (dBm)	PEAK EXCURSION (dB)	LIMIT (dB)	PASS /FAIL
802.11a	BPSK	5700	14.58	6.41	6.56	8.02	13	PASS
	QPSK		16.11	6.70	6.99	9.12	13	PASS
	16QAM		15.80	5.90	6.45	9.35	13	PASS
	64QAM		15.83	5.62	6.61	9.22	13	PASS
802.11n (20MHz)	BPSK	5700	14.71	6.19	6.36	8.35	13	PASS
	QPSK		15.42	6.13	6.45	8.97	13	PASS
	16QAM		15.66	5.86	6.42	9.24	13	PASS
	64QAM		15.72	5.71	6.74	8.98	13	PASS
802.11n (40MHz)	BPSK	5670	12.11	3.48	3.70	8.41	13	PASS
	QPSK		12.61	3.17	3.39	9.22	13	PASS
	16QAM		12.76	2.84	3.70	9.06	13	PASS
	64QAM		12.71	1.96	3.26	9.45	13	PASS

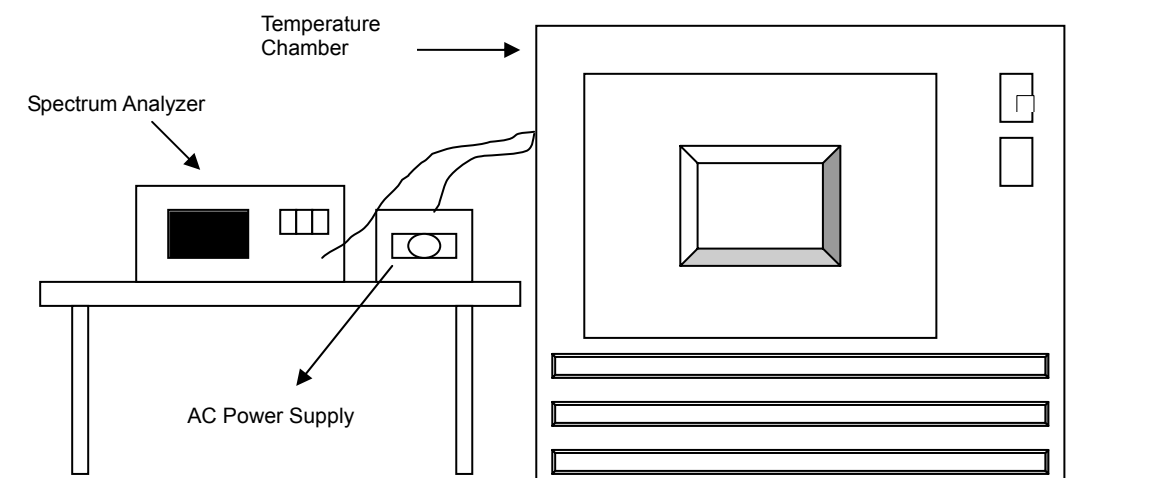


4.6 FREQUENCY STABILITY

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: 5320MHz									
TEMP. (°C)	POWER SUPPLY (Vac)	0 MINUTE		2 MINUTE		5 MINUTE		10 MINUTE	
		Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)
50	120	5320.0045	0.00008	5320.0065	0.00012	5320.0101	0.00019	5320.0069	0.00013
40	120	5319.9748	-0.00047	5319.9749	-0.00047	5319.9779	-0.00042	5319.9777	-0.00042
30	120	5320.0069	0.00013	5320.0022	0.00004	5320.008	0.00015	5320.0061	0.00011
20	120	5320.0162	0.00030	5320.0196	0.00037	5320.0159	0.00030	5320.0177	0.00033
10	120	5319.9899	-0.00019	5319.9991	-0.00002	5319.9911	-0.00017	5319.9975	-0.00005
0	120	5319.9792	-0.00039	5319.978	-0.00041	5319.9813	-0.00035	5319.9777	-0.00042
-10	120	5320.0173	0.00033	5320.0252	0.00047	5320.0167	0.00031	5320.0208	0.00039
-20	120	5320.0222	0.00042	5320.0175	0.00033	5320.0196	0.00037	5320.0248	0.00047
-30	120	5319.9965	-0.00007	5319.9981	-0.00004	5319.9905	-0.00018	5319.9954	-0.00009

FREQUENCY STABILITY VERSUS VOLTAGE									
OPERATING FREQUENCY: 5320MHz									
TEMP. (°C)	POWER SUPPLY (Vac)	0 MINUTE		2 MINUTE		5 MINUTE		10 MINUTE	
		Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)
20	138	5320.0152	0.00029	5320.019	0.00036	5320.0153	0.00029	5320.0177	0.00033
	120	5320.0162	0.00030	5320.0196	0.00037	5320.0159	0.00030	5320.0177	0.00033
	102	5320.0166	0.00031	5320.0187	0.00035	5320.015	0.00028	5320.0171	0.00032

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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Tel: 886-2-26052180

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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.

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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