FCC TEST REPORT

(15.407: U-NII-3)

REPORT NO.: RF140102C03A-2

MODEL NO.: AP102

FCC ID: U2M-AP102

RECEIVED: Jan. 13, 2014

TESTED: Jan. 14 ~ Jun. 18, 2014

ISSUED: Jun. 26, 2014

APPLICANT: Senao Networks, Inc.

ADDRESS: 3F, No. 529, Chung Cheng Rd., Hsintien, Taipei, Taiwan

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

LAB ADDRESS: No. 47, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan, R.O.C.

TEST LOCATION: No. 19, Hwa Ya 2nd Rd, Wen Hwa Tsuen, Kwei Shan Hsiang, Taoyuan Hsien 333, Taiwan, R.O.C.

This report should not be used by the client to claim product certification, approval, or endorsement by TAF or any government agencies.

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF140102C03A-2	Original release	Jun. 26, 2014

1. CERTIFICATION

PRODUCT:	Wireless 802.11abgn Access Point
MODEL NO.:	AP102
BRAND:	WatchGuard
APPLICANT:	Senao Networks, Inc.
TESTED:	Jan. 14 ~ Jun. 18, 2014
TEST SAMPLE:	ENGINEERING SAMPLE
STANDARDS:	**FCC Part 15, Subpart E (Section 15.407)**
	ANSI C63.10-2009

The above equipment (model: AP102) has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch,** and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

PREPARED BY : Celine Chou **, DATE :** Jun. 26, 2014

Celine Chou / Specialist

APPROVED BY : Ken Liu **, DATE :** Jun. 26, 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 -2.26dB at 0.36913MHz.
15.407(b/1/2/ 3/4/6)	Radiated Emissions	PASS	Meet the requirement of limit. Minimum passing margin is -1.0dB at 5861.00 and 11570.00 MHz.
15.407(b)(4)	Band Edge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -17.0dB at 5725.00MHz.
15.407(e)	6dB bandwidth	PASS	Meet the requirement of limit.
15.407(a)(3)	Conducted power	PASS	Meet the requirement of limit.
15.407(a)(5)	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	Antenna connector is I-PEX 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	3.34 dB
	200MHz ~1000MHz	3.35 dB
	1GHz ~ 18GHz	2.26 dB
	18GHz ~ 40GHz	1.94 dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k = 2.

3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

EUT	Wireless 802.11abgn Access Point
MODEL NO.	AP102
POWER SUPPLY	12Vdc from adapter 48Vdc from POE
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 300.0Mbps
OPERATING FREQUENCY	5745 ~ 5825MHz
NUMBER OF CHANNEL	5 for 802.11a, 802.11n (20MHz) 2 for 802.11n (40MHz)
OUTPUT POWER	135.538mW
ANTENNA TYPE	PIFA antenna with 6dBi gain
ANTENNA CONNECTOR	I-PEX
DATA CABLE	NA
I/O PORTS	Refer to user's manual
ACCESSORY DEVICES	Adapter

NOTE:

1. This report is prepared for FCC class II permissive change. This report is issued as a supplementary report of BV ADT report no.: RF140102C03. The difference compared with the original report is updating new rule for U-NII-3 Band. All tests had been re-tested.
2. The EUT incorporates a MIMO function. Physically, the EUT provides two completed transmitters and two receivers.

MODULATION MODE	TX FUNCTION
802.11a	2TX
802.11n (20MHz) MCS 0-15	2TX
802.11n (40MHz) MCS 0-15	2TX

3. The EUT consumes power from the following adapter.

ADAPTER	
BRAND:	Powertron Electronics Corp.
MODEL:	PA1015-2I
INPUT:	100-240Vac, 50-60Hz, 0.4A
OUTPUT:	12Vdc, 1.25A
POWER LINE:	1.5m cable without core attached on adapter

4. The following POE & POE's adapter are supports only.

POE	
BRAND	EnGenius
MODEL	EPE-48GR
INPUT POWER	48Vdc, 0.8A, 38.4W Max

ADAPTER For POE USED	
BRAND	Powertron Electronics Corp.
MODEL	PA1024-4HU
INPUT POWER	100-240Vac, 50-60Hz, 0.6A
OUTPUT POWER	48Vdc, 0.42A, 21W Max
POWER LINE	1.5m cable without core attached on adapter

5. 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 5745 ~ 5825MHz:

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

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

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

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
151	5755MHz	159	5795MHz

3.2.1 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE≥1G	RE<1G	PLC	APCM	
A	√	√	√	√	Powered by adapter
B	-	√	√	-	Powered by POE

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

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

RADIATED EMISSION TEST (ABOVE 1GHz):

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

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
A	802.11a	149 to 165	149, 157, 165	OFDM	BPSK	6.0
A	802.11n (20MHz)	149 to 165	149, 157, 165	OFDM	BPSK	7.2
A	802.11n (40MHz)	151 to 159	151, 159	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	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
A & B	802.11n (20MHz)	149 to 165	165	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	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
A & B	802.11n (20MHz)	149 to 165	165	OFDM	BPSK	7.2

BANDEDGE MEASUREMENT:

☒ 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	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
A	802.11a	149 to 165	149, 165	OFDM	BPSK	6.0
A	802.11n (20MHz)	149 to 165	149, 165	OFDM	BPSK	7.2
A	802.11n (40MHz)	151 to 159	151, 159	OFDM	BPSK	15.0

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	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
A	802.11a	149 to 165	149, 157, 165	OFDM	BPSK	6.0
A	802.11n (20MHz)	149 to 165	149, 157, 165	OFDM	BPSK	7.2
A	802.11n (40MHz)	151 to 159	151, 159	OFDM	BPSK	15.0

TEST CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE≥1G	25deg. C, 65%RH	120Vac, 60Hz	Chris Lin
RE<1G	25deg. C, 65%RH	120Vac, 60Hz 48Vdc	Chris Lin
PLC	25deg. C, 68%RH	120Vac, 60Hz 48Vdc	Sun Lin
APCM	25deg. C, 60%RH	120Vac, 60Hz	Martin Lee

3.3 DUTY CYCLE OF TEST SIGNAL

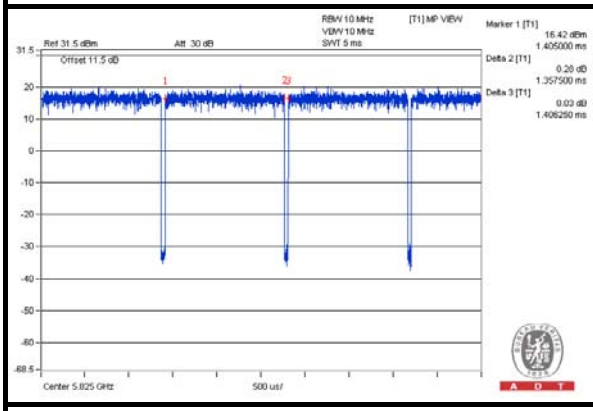
Duty cycle of test signal is < 98%, duty factor is required.

802.11a: Duty cycle = 1.358/1.406 = 0.965, Duty factor = 10 * log(1/0.965) = 0.15

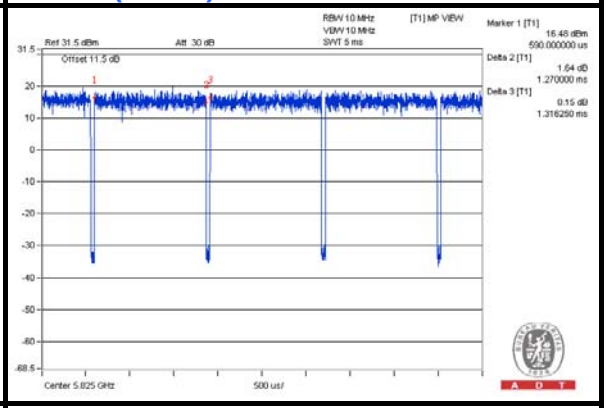
802.11n (20MHz): Duty cycle = 1.270/1.316 = 0.965, Duty factor = 10 * log(1/0.965) = 0.16

802.11n (40MHz): Duty cycle = 0.628/0.664 = 0.945, Duty factor = 10 * log(1/0.945) = 0.24

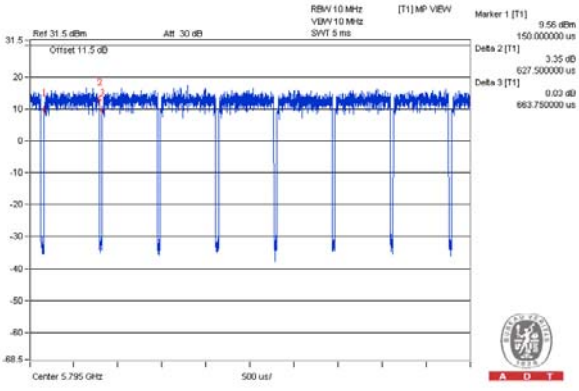
802.11a



802.11n (20MHz)



802.11n (40MHz)



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.

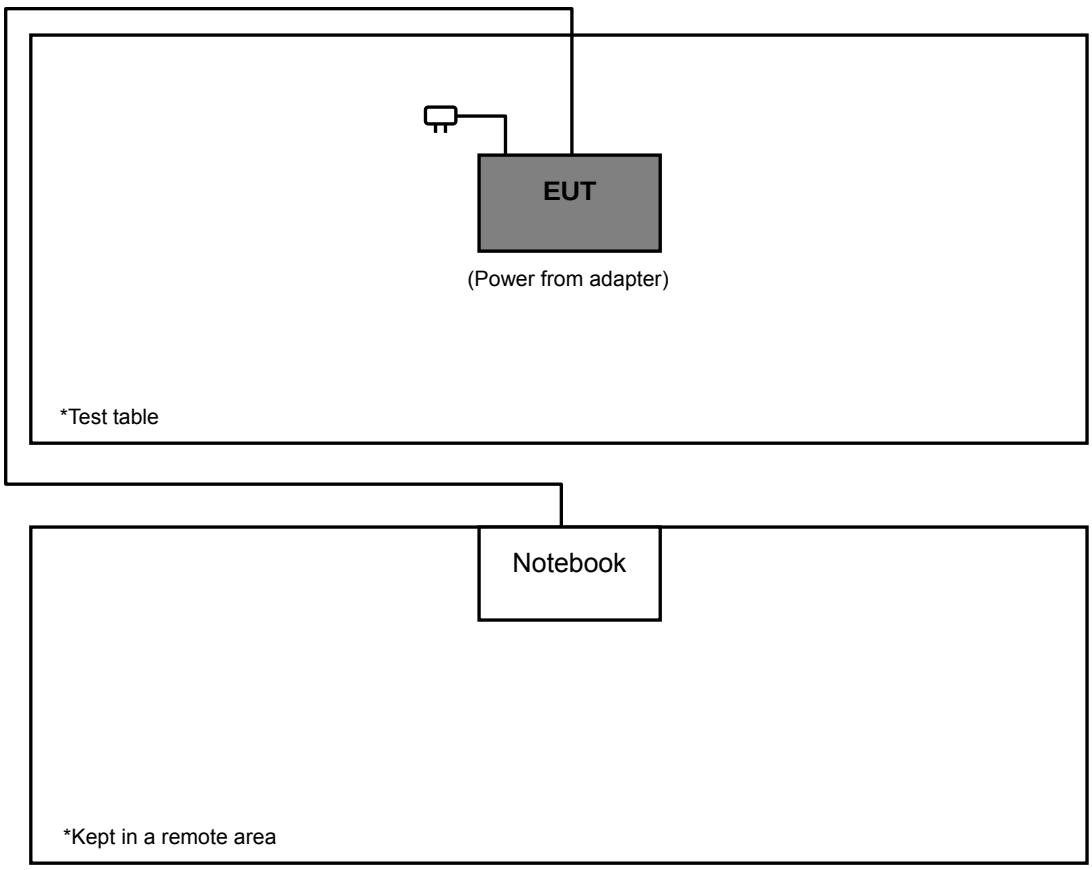
NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	NOTEBOOK	DELL	E5410	1HC2XM1	FCC Doc Approved
2	POE	EnGenius	EPE-48GR	NA	NA

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	3m LAN cable for mode A only, 1.8m LAN cable for mode B only
2	3m LAN cable for mode B only

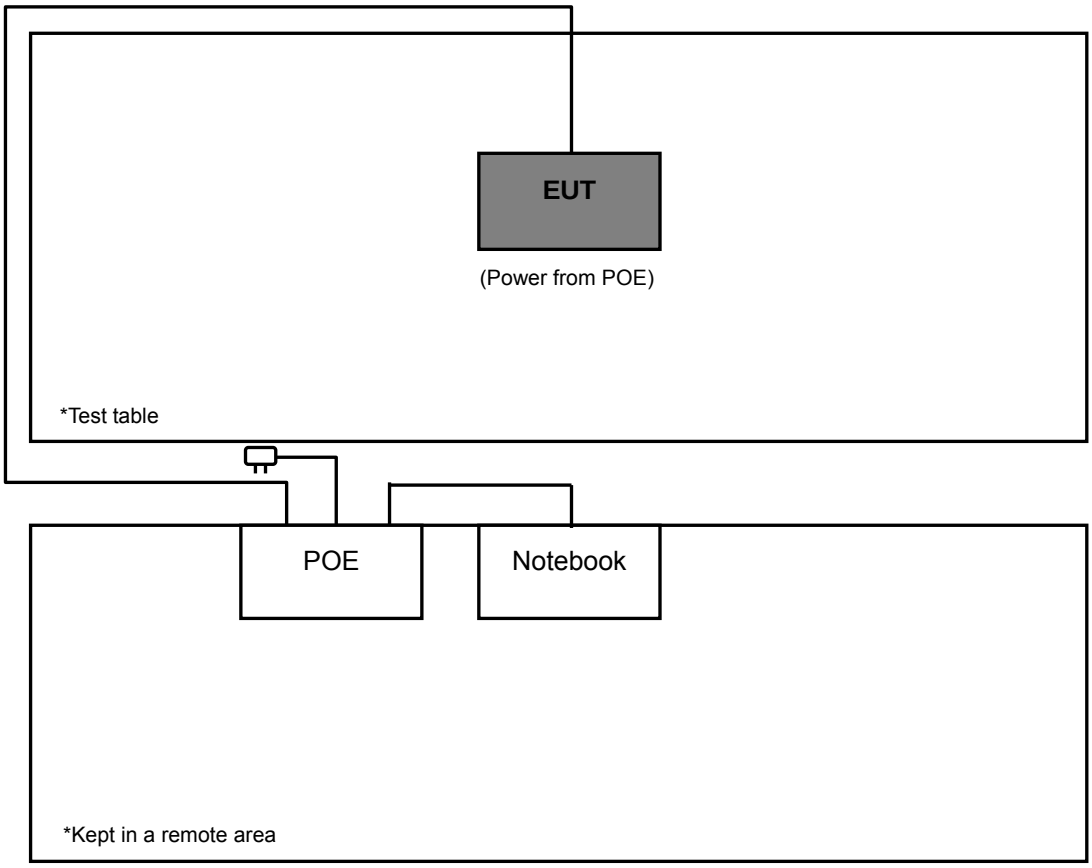
NOTE:
1. All power cords of the above support units are non-shielded (1.8m).
2. Item 1-2 acted as a communication partner to transfer data.
3. Item 2 was provided by client and for mode B tested only.

3.4.1 CONFIGURATION OF SYSTEM UNDER TEST

TEST MODE A



TEST MODE B


EUT
(Power from POE)
*Test table
POE
Notebook
*Kept in a remote area

3.5 GENERAL DESCRIPTION OF APPLIED STANDARDS

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

FCC Part 15, Subpart E (15.407)
789033 D02 General UNII Test Procedures New Rules v01
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 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	
789033 D02 General UNII Test Procedures New Rules v01	FIELD STRENGTH AT 3m	
	PK: 74 (dBμV/m)	AV: 54 (dBμV/m)
APPLICABLE TO	**EIRP LIMIT**	**EQUIVALENT FIELD STRENGTH AT 3m**
15.407(b)(1)	PK: -27 (dBm/MHz)	PK: 68.3 (dBμV/m)
15.407(b)(2)		
15.407(b)(3)		
15.407(b)(4)	PK: -27 (dBm/MHz) *1 PK: -17 (dBm/MHz) *2	PK: 68.3 (dBμV/m) *1 PK: 78.3 (dBμV/m) *2

NOTE: *1 beyond 10MHz of the band edge *2 within 10 MHz of band edge

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

$$E = \frac{1000000\sqrt{30P}}{3}$$ μV/m, where P is the eirp

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	Jan. 31, 2013	Jan. 30, 2014
			Jan. 31, 2014	Jan. 30, 2015
BILOG Antenna SCHWARZBECK	VULB9168	9168-160	Mar. 20, 2013	Mar. 19, 2014
			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. 13, 2013	Jun. 12, 2014
			Jun. 10, 2014	Jun. 09, 2015

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 meters semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

NOTE:

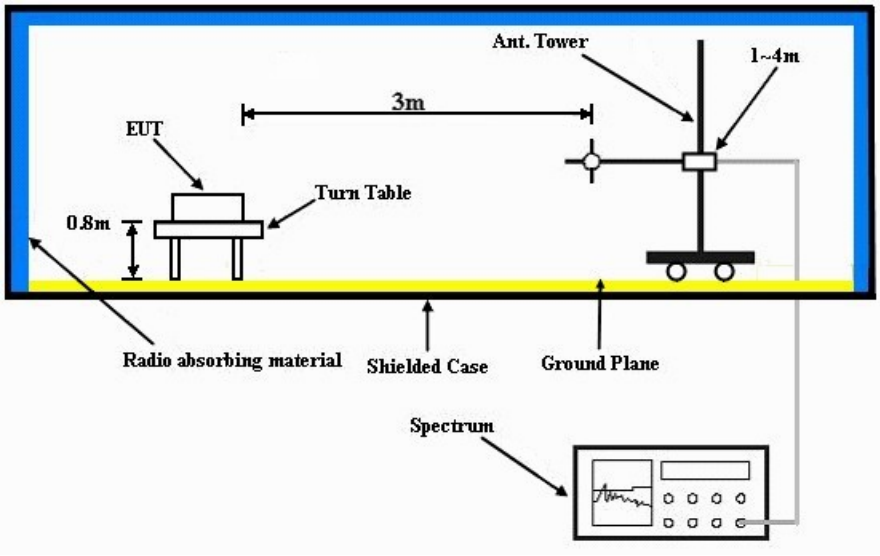
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
3. The resolution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

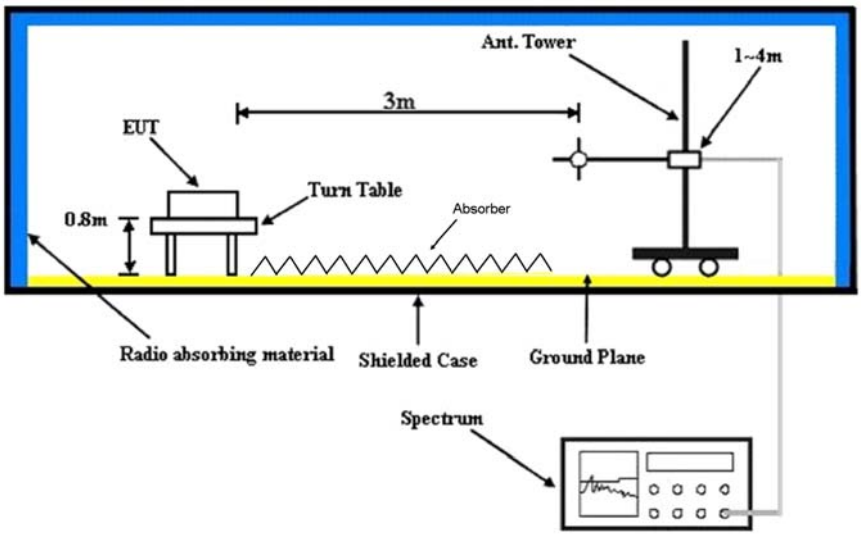
No deviation.

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 CONDITIONS

a. Placed the EUT on the testing table.
b. Prepared notebook to act as communication partner and placed it outside of testing area.
c. The communication partner connected with EUT via a LAN 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

CHANNEL	TX Channel 149	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 40GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5714.00	66.5 PK	68.3	-1.8	1.27 H	31	60.50	6.00
2	#5722.00	71.9 PK	78.3	-6.4	1.00 H	304	65.90	6.00
3	#5725.00	59.3 PK	78.3	-19.0	1.18 H	31	53.30	6.00
4	*5745.00	109.5 PK			1.09 H	304	71.00	38.50
5	*5745.00	99.7 AV			1.09 H	304	61.20	38.50
6	11490.00	62.9 PK	74.0	-11.1	1.30 H	56	42.50	20.40
7	11490.00	49.1 AV	54.0	-4.9	1.30 H	56	28.70	20.40
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	#5714.00	66.3 PK	68.3	-2.0	1.06 V	304	60.30	6.00
2	#5722.00	74.4 PK	78.3	-3.9	1.00 V	308	68.40	6.00
3	#5725.00	61.3 PK	78.3	-17.0	1.05 V	319	55.30	6.00
4	*5745.00	107.7 PK			1.15 V	309	69.20	38.50
5	*5745.00	98.6 AV			1.15 V	309	60.10	38.50
6	11490.00	62.0 PK	74.0	-12.0	1.10 V	290	41.60	20.40
7	11490.00	49.0 AV	54.0	-5.0	1.10 V	290	28.60	20.40

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.

CHANNEL	TX Channel 157	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 40GHz		Average (AV)

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	*5785.00	114.5 PK			1.00 H	39	75.90	38.60
2	*5785.00	104.9 AV			1.00 H	39	66.30	38.60
3	11570.00	67.9 PK	74.0	-6.1	1.37 H	315	47.50	20.40
4	11570.00	52.8 AV	54.0	-1.2	1.37 H	315	32.40	20.40
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	*5785.00	115.6 PK			1.02 V	16	77.00	38.60
2	*5785.00	105.7 AV			1.02 V	16	67.10	38.60
3	11570.00	62.8 PK	74.0	-11.2	1.10 V	296	42.40	20.40
4	11570.00	50.8 AV	54.0	-3.2	1.10 V	296	30.40	20.40

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.

CHANNEL	TX Channel 165	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 40GHz		Average (AV)

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	*5825.00	112.5 PK			1.00 H	38	73.80	38.70
2	*5825.00	103.0 AV			1.00 H	38	64.30	38.70
3	#5850.00	55.6 PK	78.3	-22.7	1.19 H	304	49.40	6.20
4	#5853.00	72.1 PK	78.3	-6.2	1.08 H	324	65.70	6.40
5	#5861.00	67.2 PK	68.3	-1.1	1.22 H	42	60.80	6.40
6	11650.00	63.2 PK	74.0	-10.8	1.34 H	319	42.90	20.30
7	11650.00	50.5 AV	54.0	-3.5	1.34 H	319	30.20	20.30
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	*5825.00	113.5 PK			1.12 V	7	74.80	38.70
2	*5825.00	103.3 AV			1.12 V	7	64.60	38.70
3	#5850.00	55.6 PK	78.3	-22.7	1.00 V	19	49.40	6.20
4	#5853.00	70.8 PK	78.3	-7.5	1.12 V	2	64.40	6.40
5	#5861.00	67.0 PK	68.3	-1.3	1.22 V	6	60.60	6.40
6	11650.00	60.6 PK	74.0	-13.4	1.12 V	132	40.30	20.30
7	11650.00	48.2 AV	54.0	-5.8	1.12 V	132	27.90	20.30

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)

CHANNEL	TX Channel 149	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 40GHz		Average (AV)

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	#5714.00	66.6 PK	68.3	-1.7	1.08 H	307	60.60	6.00
2	#5722.00	73.8 PK	78.3	-4.5	1.21 H	35	67.80	6.00
3	#5725.00	55.9 PK	78.3	-22.4	1.00 H	33	49.90	6.00
4	*5745.00	109.4 PK			1.00 H	36	70.90	38.50
5	*5745.00	99.7 AV			1.00 H	36	61.20	38.50
6	11490.00	63.0 PK	74.0	-11.0	1.13 H	69	42.60	20.40
7	11490.00	49.1 AV	54.0	-4.9	1.13 H	69	28.70	20.40
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	#5714.00	66.5 PK	68.3	-1.8	1.26 V	308	60.50	6.00
2	#5722.00	65.9 PK	78.3	-12.4	1.07 V	70	59.90	6.00
3	#5725.00	55.9 PK	78.3	-22.4	1.14 V	19	49.90	6.00
4	*5745.00	107.0 PK			1.04 V	314	68.50	38.50
5	*5745.00	97.4 AV			1.04 V	314	58.90	38.50
6	11490.00	62.4 PK	74.0	-11.6	1.15 V	69	42.00	20.40
7	11490.00	48.4 AV	54.0	-5.6	1.15 V	69	28.00	20.40

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.

CHANNEL	TX Channel 157	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 40GHz		Average (AV)

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	*5785.00	115.1 PK			1.20 H	37	76.50	38.60
2	*5785.00	105.5 AV			1.20 H	37	66.90	38.60
3	11570.00	68.3 PK	74.0	-5.7	1.27 H	300	47.90	20.40
4	**11570.00**	**53.0 AV**	**54.0**	**-1.0**	**1.27 H**	**300**	**32.60**	**20.40**
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	*5785.00	116.1 PK			1.03 V	18	77.50	38.60
2	*5785.00	106.0 AV			1.03 V	18	67.40	38.60
3	11570.00	64.0 PK	74.0	-10.0	1.28 V	318	43.60	20.40
4	11570.00	51.6 AV	54.0	-2.4	1.28 V	318	31.20	20.40

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.

CHANNEL	TX Channel 165	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 40GHz		Average (AV)

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	*5825.00	112.8 PK			1.00 H	38	74.10	38.70
2	*5825.00	103.2 AV			1.00 H	38	64.50	38.70
3	#5850.00	60.0 PK	78.3	-18.3	1.29 H	304	53.80	6.20
4	#5853.00	69.7 PK	78.3	-8.6	1.23 H	299	63.30	6.40
5	#5861.00	67.0 PK	68.3	-1.3	1.17 H	37	60.60	6.40
6	11650.00	63.3 PK	74.0	-10.7	1.29 H	52	43.00	20.30
7	11650.00	50.7 AV	54.0	-3.3	1.29 H	52	30.40	20.30
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	*5825.00	112.4 PK			1.01 V	18	73.70	38.70
2	*5825.00	102.2 AV			1.01 V	18	63.50	38.70
3	#5850.00	50.0 PK	78.3	-28.3	1.01 V	12	43.80	6.20
4	#5853.00	62.6 PK	78.3	-15.7	1.01 V	8	56.20	6.40
5	**#5861.00**	**67.3 PK**	**68.3**	**-1.0**	**1.01 V**	**358**	**60.90**	**6.40**
6	11650.00	61.8 PK	74.0	-12.2	1.34 V	20	41.50	20.30
7	11650.00	48.2 AV	54.0	-5.8	1.34 V	20	27.90	20.30

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)

CHANNEL	TX Channel 151	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 40GHz		Average (AV)

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	#5714.00	66.8 PK	68.3	-1.5	1.22 H	35	60.80	6.00
2	#5722.00	69.7 PK	78.3	-8.6	1.00 H	304	63.70	6.00
3	#5725.00	53.3 PK	78.3	-25.0	1.00 H	303	47.30	6.00
4	*5755.00	101.8 PK			1.16 H	305	63.20	38.60
5	*5755.00	92.9 AV			1.16 H	305	54.30	38.60
6	11510.00	62.0 PK	74.0	-12.0	1.05 H	66	41.60	20.40
7	11510.00	48.2 AV	54.0	-5.8	1.05 H	66	27.80	20.40
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	#5714.00	66.8 PK	68.3	-1.5	1.04 V	19	60.80	6.00
2	#5722.00	63.9 PK	78.3	-14.4	1.34 V	302	57.90	6.00
3	#5725.00	49.7 PK	78.3	-28.6	1.25 V	305	43.70	6.00
4	*5755.00	99.2 PK			1.12 V	293	60.60	38.60
5	*5755.00	89.6 AV			1.12 V	293	51.00	38.60
6	11510.00	62.4 PK	74.0	-11.6	1.33 V	220	42.00	20.40
7	11510.00	48.0 AV	54.0	-6.0	1.33 V	220	27.60	20.40

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.

CHANNEL	TX Channel 159	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 40GHz		Average (AV)

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	*5795.00	108.4 PK			1.22 H	38	69.80	38.60
2	*5795.00	99.5 AV			1.22 H	38	60.90	38.60
3	#5850.00	53.0 PK	78.3	-25.3	1.27 H	38	46.80	6.20
4	#5853.00	69.9 PK	78.3	-8.4	1.16 H	323	63.50	6.40
5	#5861.00	66.9 PK	68.3	-1.4	1.18 H	321	60.50	6.40
6	11590.00	62.9 PK	74.0	-11.1	1.16 H	30	42.50	20.40
7	11590.00	49.3 AV	54.0	-4.7	1.16 H	30	28.90	20.40
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	*5795.00	110.3 PK			1.03 V	11	71.70	38.60
2	*5795.00	100.9 AV			1.03 V	11	62.30	38.60
3	#5850.00	55.2 PK	78.3	-23.1	1.17 V	41	49.00	6.20
4	#5853.00	70.9 PK	78.3	-7.4	1.13 V	205	64.50	6.40
5	#5861.00	66.8 PK	68.3	-1.5	1.01 V	2	60.40	6.40
6	11590.00	61.7 PK	74.0	-12.3	1.14 V	78	41.30	20.40
7	11590.00	47.9 AV	54.0	-6.1	1.14 V	78	27.50	20.40

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.

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

CHANNEL	TX Channel 165	**DETECTOR FUNCTION**	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		
TEST MODE	A		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	**FREQ. (MHz)**	**EMISSION LEVEL (dBuV/m)**	**LIMIT (dBuV/m)**	**MARGIN (dB)**	**ANTENNA HEIGHT (m)**	**TABLE ANGLE (Degree)**	**RAW VALUE (dBuV)**	**CORRECTION FACTOR (dB/m)**
1	115.28	28.1 QP	43.5	-15.4	1.25 H	263	44.90	-16.80
2	243.34	35.1 QP	46.0	-10.9	1.00 H	240	49.60	-14.50
3	280.21	33.0 QP	46.0	-13.0	1.50 H	154	45.70	-12.70
4	375.29	29.0 QP	46.0	-17.0	1.00 H	92	39.90	-10.90
5	499.48	30.9 QP	46.0	-15.1	1.25 H	214	39.20	-8.30
6	625.60	30.2 QP	46.0	-15.8	1.50 H	167	35.70	-5.50
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	55.13	34.3 QP	40.0	-5.7	1.25 V	21	48.60	-14.30
2	115.28	32.6 QP	43.5	-10.9	1.25 V	155	49.40	-16.80
3	243.34	34.5 QP	46.0	-11.5	1.00 V	170	49.00	-14.50
4	499.48	33.9 QP	46.0	-12.1	1.50 V	207	42.20	-8.30
5	600.38	30.7 QP	46.0	-15.3	1.00 V	158	36.80	-6.10
6	802.18	29.9 QP	46.0	-16.1	1.50 V	163	32.10	-2.20

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

CHANNEL	TX Channel 165	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		
TEST MODE	B		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	57.12	24.2 QP	40.0	-15.8	1.25 H	343	39.10	-14.90
2	212.66	28.7 QP	43.5	-14.8	1.00 H	181	45.00	-16.30
3	374.04	33.1 QP	46.0	-12.9	1.50 H	183	44.00	-10.90
4	624.85	37.1 QP	46.0	-8.9	1.00 H	175	42.60	-5.50
5	751.23	32.5 QP	46.0	-13.5	1.25 H	95	35.50	-3.00
6	875.67	37.6 QP	46.0	-8.4	1.50 H	52	38.60	-1.00
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	249.60	24.8 QP	46.0	-21.2	1.25 V	210	39.00	-14.20
2	374.04	27.7 QP	46.0	-18.3	1.00 V	188	38.60	-10.90
3	500.42	27.4 QP	46.0	-18.6	1.50 V	82	35.70	-8.30
4	624.85	34.7 QP	46.0	-11.3	1.00 V	186	40.20	-5.50
5	751.23	28.2 QP	46.0	-17.8	1.50 V	142	31.20	-3.00
6	875.67	33.5 QP	46.0	-12.5	1.25 V	94	34.50	-1.00

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

4.2 CONDUCTED EMISSION MEASUREMENT

4.2.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dBμV)	
	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. 29, 2013	Nov. 28, 2014
RF signal cable Woken	5D-FB	Cable-HYC01-01	Dec. 27, 2013	Dec. 26, 2014
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Jul. 17, 2013	Jul. 16, 2014
LISN ROHDE & SCHWARZ (EUT)	ESH3-Z5	835239/001	Feb. 04, 2013	Feb. 03, 2014
			Feb. 04, 2014	Feb. 03, 2015
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

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

b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

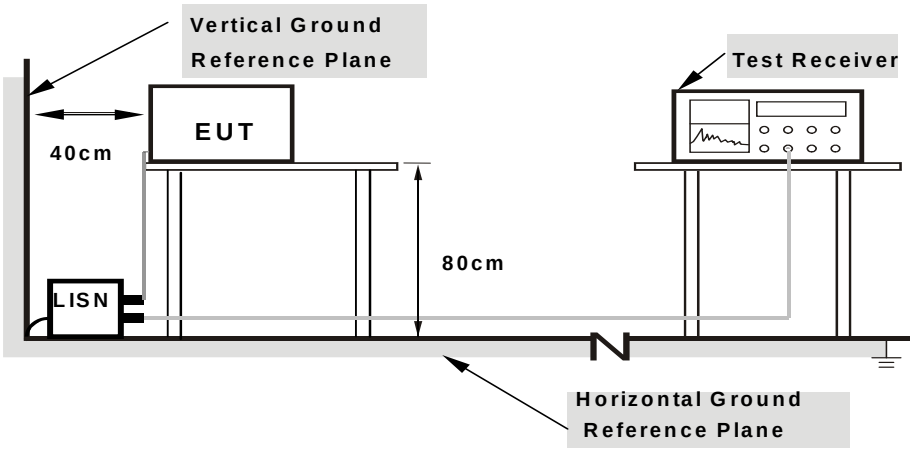
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) were not recorded.

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 item 4.1.6.

4.2.7 TEST RESULTS

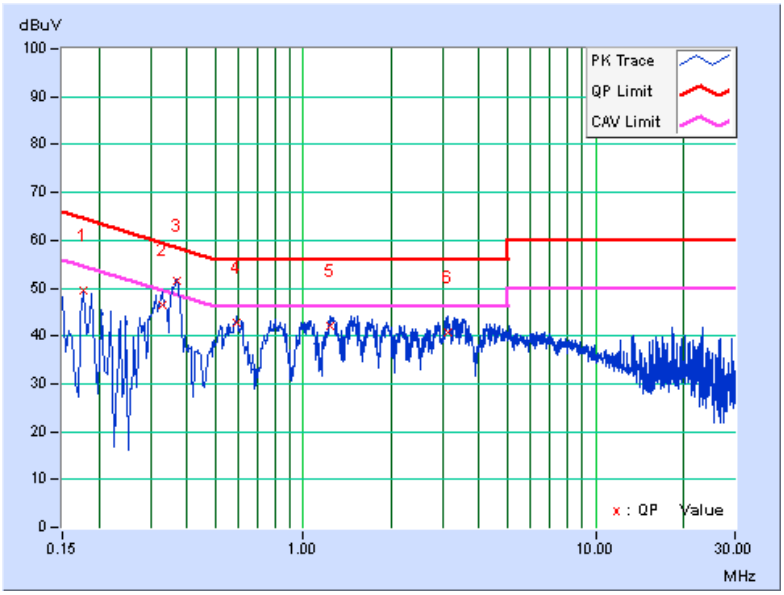
CONDUCTED WORST-CASE DATA：802.11n (20MHz)

PHASE	Line 1	6dB BANDWIDTH	9kHz
TEST MODE	A		

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.17744	0.10	49.42	35.74	49.52	35.84	64.60	54.60	-15.08	-18.76
2	0.32959	0.11	46.45	34.88	46.56	34.99	59.46	49.46	-12.90	-14.47
3	0.36816	0.12	51.26	46.11	51.38	46.23	58.54	48.54	-7.17	-2.32
4	0.58792	0.13	42.69	36.50	42.82	36.63	56.00	46.00	-13.18	-9.37
5	1.23307	0.15	41.82	33.86	41.97	34.01	56.00	46.00	-14.03	-11.99
6	3.12942	0.20	40.69	33.80	40.89	34.00	56.00	46.00	-15.11	-12.00

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

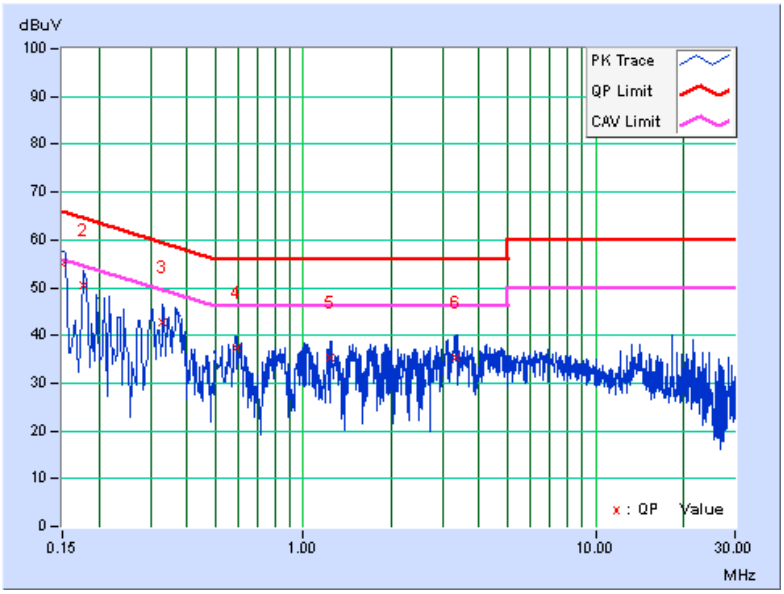


PHASE	Line 2	**6dB BANDWIDTH**	9kHz
TEST MODE	A		

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	0.11	54.88	40.23	54.99	40.34	66.00	56.00	-11.01	-15.66
2	0.17744	0.11	50.35	33.77	50.46	33.88	64.60	54.60	-14.14	-20.72
3	0.32986	0.12	42.61	27.12	42.73	27.24	59.45	49.45	-16.72	-22.21
4	0.58792	0.13	37.40	24.43	37.53	24.56	56.00	46.00	-18.47	-21.44
5	1.23065	0.14	35.16	22.51	35.30	22.65	56.00	46.00	-20.70	-23.35
6	3.33274	0.19	35.18	24.21	35.37	24.40	56.00	46.00	-20.63	-21.60

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

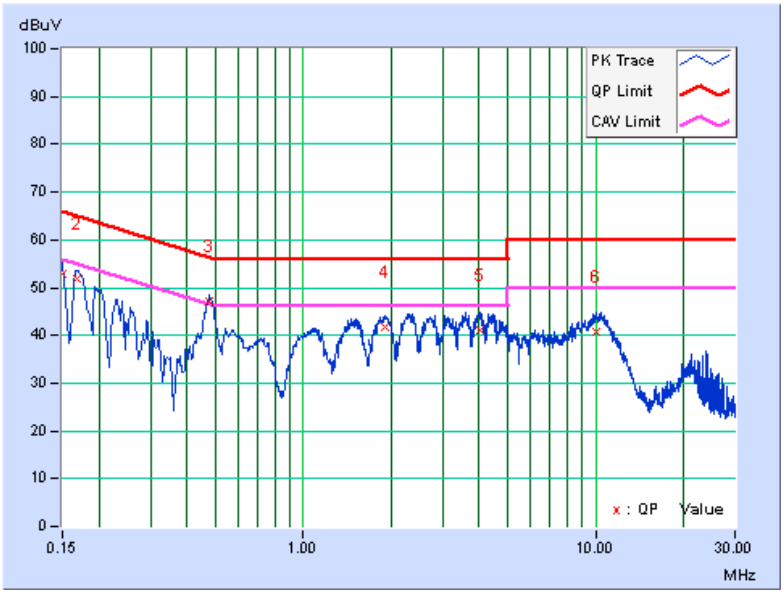


PHASE	Line 1	6dB BANDWIDTH	9kHz
TEST MODE	B		

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	0.10	52.68	35.79	52.78	35.89	66.00	56.00	-13.22	-20.11
2	0.16745	0.10	51.90	36.79	52.00	36.89	65.09	55.09	-13.09	-18.20
3	0.47844	0.12	47.05	39.17	47.17	39.29	56.37	46.37	-9.19	-7.07
4	1.89386	0.17	41.53	35.66	41.70	35.83	56.00	46.00	-14.30	-10.17
5	4.03263	0.23	40.68	35.47	40.91	35.70	56.00	46.00	-15.09	-10.30
6	10.02275	0.49	40.09	34.17	40.58	34.66	60.00	50.00	-19.42	-15.34

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

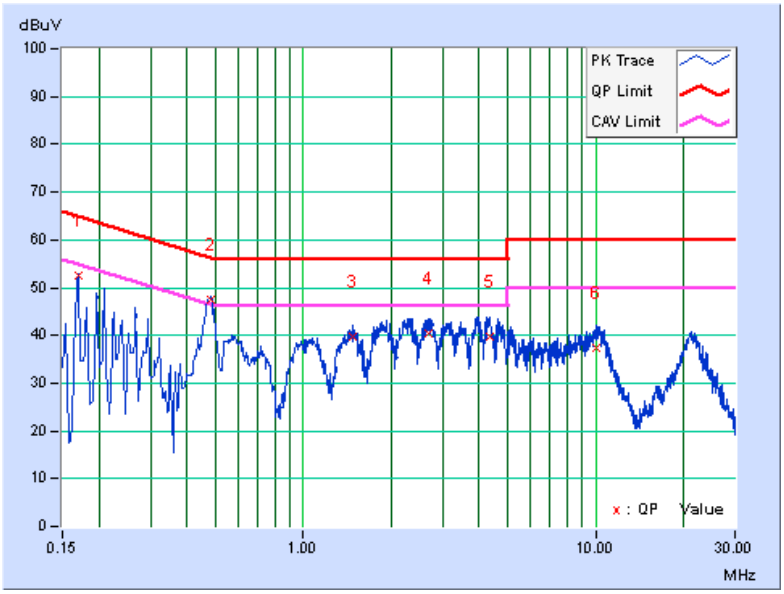


PHASE	Line 2	6dB BANDWIDTH	9kHz
TEST MODE	B		

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16955	0.11	52.57	39.83	52.68	39.94	64.98	54.98	-12.30	-15.04
2	0.48041	0.13	47.33	39.32	47.46	39.45	56.33	46.33	-8.87	-6.88
3	1.47549	0.15	39.62	33.24	39.77	33.39	56.00	46.00	-16.23	-12.61
4	2.67195	0.18	40.28	34.75	40.46	34.93	56.00	46.00	-15.54	-11.07
5	4.33370	0.22	39.60	33.51	39.82	33.73	56.00	46.00	-16.18	-12.27
6	10.06185	0.37	37.12	31.47	37.49	31.84	60.00	50.00	-22.51	-18.16

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

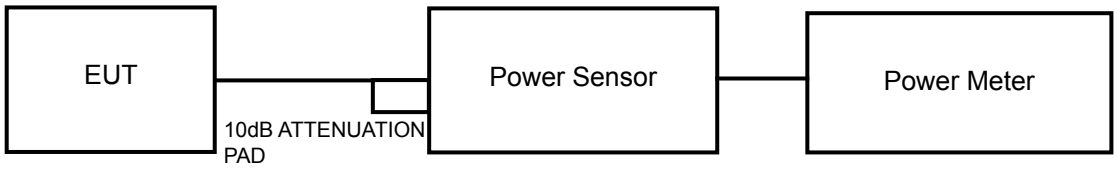
4.3.1 LIMITS OF TRANSMIT POWER MEASUREMENT

For systems using digital modulation in the 5725 –5850 MHz bands: 1 Watt (30dBm)
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



4.3.3 INSTRUMENTS

Refer to section 4.1.3 to get information of above instrument.

4.3.4 TEST PROCEDURES

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.

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

802.11a

CHAN.	FREQ. (MHz)	AVG. POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)	LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1				
149	5745	12.76	12.82	38.023	15.80	30	PASS
157	5785	16.43	17.16	95.954	19.82	30	PASS
165	5825	14.19	15.60	62.550	17.96	30	PASS

802.11n (20MHz)

CHAN.	FREQ. (MHz)	AVG. POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)	LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1				
149	5745	12.44	12.96	37.309	15.72	30	PASS
157	5785	17.93	18.66	**135.538**	21.32	30	PASS
165	5825	14.60	15.26	62.414	17.95	30	PASS

802.11n (40MHz)

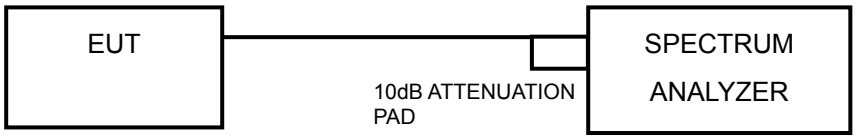
CHAN.	FREQ. (MHz)	AVG. POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)	LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1				
151	5755	10.29	11.03	23.368	13.69	30	PASS
159	5795	13.93	14.84	55.196	17.42	30	PASS

4.4 POWER SPECTRAL DENSITY MEASUREMENT

4.4.1 LIMITS OF POWER SPECTRAL DENSITY MEASUREMENT

The Maximum of Power Spectral Density Measurement is 30dBm.

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 PROCEDURE.

1) Set span to encompass the entire emission bandwidth (EBW) of the signal.
2) Set RBW = 500 kHz, Set VBW ≥ 3 RBW, Detector = RMS
3) Sweep time = auto, trigger set to “free run”.
4) Trace average at least 100 traces in power averaging mode.
5) 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 CONDITION

Same as item 4.3.6.

4.4.7 TEST RESULTS

802.11a

TX chain	Chan	Freq. (MHz)	PSD (dBm/500kHz)	10 log (N=2) dB	Total PSD without Duty Factor (dBm/500kHz)	Duty Factor	Total PSD with Duty Factor (dBm/500kHz)	Limit (dBm/500kHz)	PASS /FAIL
0	149	5745	5.67	3.01	8.68	0.15	8.83	26.99	PASS
	157	5785	9.24	3.01	12.25	0.15	12.40	26.99	PASS
	165	5825	7.50	3.01	10.51	0.15	10.66	26.99	PASS
1	149	5745	6.13	3.01	9.14	0.15	9.29	26.99	PASS
	157	5785	10.34	3.01	13.35	0.15	13.50	26.99	PASS
	165	5825	8.78	3.01	11.79	0.15	11.94	26.99	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 = 6dBi + 10log(2) = 9.01dBi > 6dBi , so the power density limit shall be reduced to 30-(9.01-6) = 26.99dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11n (20MHz)

TX chain	Chan	Freq. (MHz)	PSD (dBm/500kHz)	10 log (N=2) dB	Total PSD without Duty Factor (dBm/500kHz)	Duty Factor	Total PSD with Duty Factor (dBm/500kHz)	Limit (dBm/500kHz)	PASS /FAIL
0	149	5745	5.76	3.01	8.77	0.16	8.93	26.99	PASS
	157	5785	10.55	3.01	13.56	0.16	13.72	26.99	PASS
	165	5825	6.77	3.01	9.78	0.16	9.94	26.99	PASS
1	149	5745	5.67	3.01	8.68	0.16	8.84	26.99	PASS
	157	5785	10.74	3.01	13.75	0.16	13.91	26.99	PASS
	165	5825	7.56	3.01	10.57	0.16	10.73	26.99	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 = 6dBi + 10log(2) = 9.01dBi > 6dBi , so the power density limit shall be reduced to 30-(9.01-6) = 26.99dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11n (40MHz)

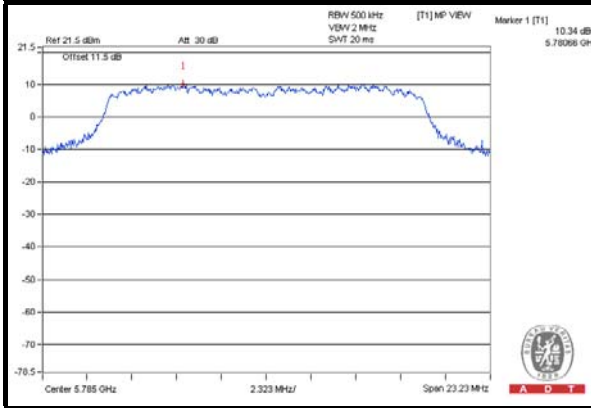
TX chain	Chan	Freq. (MHz)	PSD (dBm/500kHz)	10 log (N=2) dB	Total PSD without Duty Factor (dBm/500kHz)	Duty Factor	Total PSD with Duty Factor (dBm/500kHz)	Limit (dBm/500kHz)	PASS /FAIL
0	151	5755	1.00	3.01	4.01	0.24	4.25	26.96	PASS
	159	5795	3.07	3.01	6.08	0.24	6.32	26.96	PASS
1	151	5755	0.14	3.01	3.15	0.24	3.39	26.96	PASS
	159	5795	3.96	3.01	6.97	0.24	7.21	26.96	PASS

NOTE:

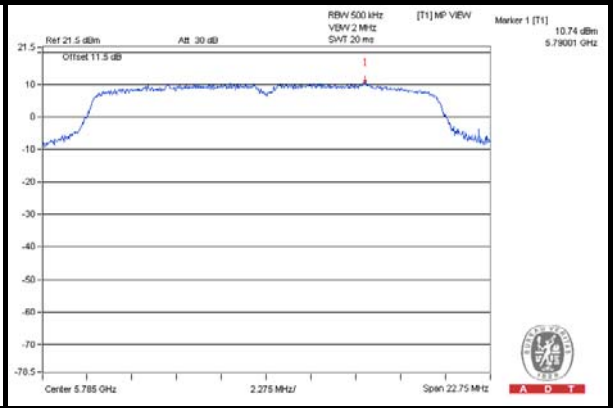
1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = 6dBi + 10log(2) = 9.01dBi > 6dBi , so the power density limit shall be reduced to 30-(9.01-6) = 26.99dBm.
3. Refer to section 3.3 for duty cycle spectrum plot.

SPECTRUM PLOT OF WORST VALUE

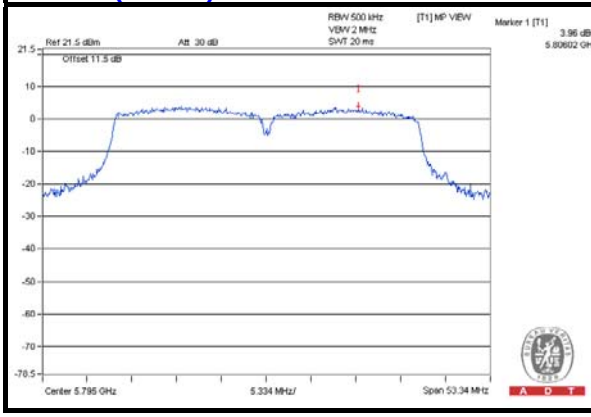
802.11a



802.11n (20MHz)



802.11n (40MHz)

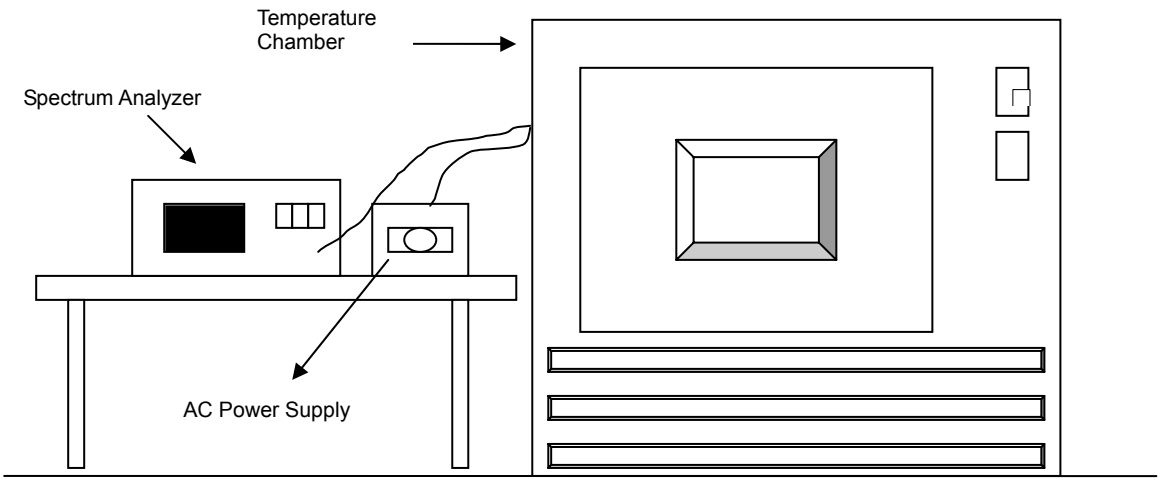


4.5 FREQUENCY STABILITY

4.5.1 LIMITS OF FREQUENCY STABILITY MEASUREMENT

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

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

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.

4.5.5 DEVIATION FROM TEST STANDARD

No deviation.

4.5.6 EUT OPERATING CONDITION

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

4.5.7 TEST RESULTS

FREQUEMCY STABILITY VERSUS TEMP.									
OPERATING FREQUENCY: 5785MHz									
TEMP. (℃)	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 (%)
55	120	5785.0077	0.00013	5785.0073	0.00013	5785.0137	0.00024	5785.0157	0.00027
50	120	5785.0073	0.00013	5785.0152	0.00026	5785.0057	0.00010	5785.0102	0.00018
40	120	5784.9808	-0.00033	5784.9784	-0.00037	5784.9759	-0.00042	5784.9754	-0.00043
30	120	5784.9896	-0.00018	5784.9928	-0.00012	5784.9904	-0.00017	5784.9977	-0.00004
20	120	5785.0092	0.00016	5785.012	0.00021	5785.007	0.00012	5785.0133	0.00023
10	120	5784.9818	-0.00031	5784.9825	-0.00030	5784.981	-0.00033	5784.9804	-0.00034
0	120	5784.9977	-0.00004	5784.9936	-0.00011	5785.0004	0.00001	5784.9996	-0.00001
-10	120	5784.985	-0.00026	5784.9823	-0.00031	5784.985	-0.00026	5784.9767	-0.00040
-20	120	5785.0076	0.00013	5784.9982	-0.00003	5784.9963	-0.00006	5785.0059	0.00010

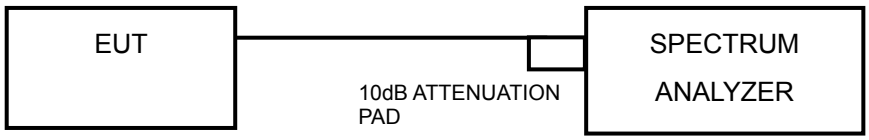
FREQUEMCY STABILITY VERSUS TEMP.									
OPERATING FREQUENCY: 5785MHz									
TEMP. (℃)	POWER SUPPLY (Vac)	0 MINUTE		2 MINUTE		5 MINUTE		10 MINUTE	
		Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)	Measured Frequency (MHz)	Frequency Drift (%)
20	138	5785.009	0.00016	5785.0128	0.00022	5785.0067	0.00012	5785.0137	0.00024
	120	5785.0092	0.00016	5785.012	0.00021	5785.007	0.00012	5785.0133	0.00023
	102	5785.0091	0.00016	5785.012	0.00021	5785.0075	0.00013	5785.0123	0.00021

4.6 6dB BANDWIDTH MEASUREMENT

4.6.1 LIMITS OF 6dB BANDWIDTH MEASUREMENT

The minimum of 6dB Bandwidth Measurement is 0.5MHz.

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. Set resolution bandwidth (RBW) = 100kHz
b. Set the video bandwidth (VBW) ≥ 3 x RBW, Detector = Peak.
c. Trace mode = max hold.
d. Sweep = auto couple.
e. Measure the maximum width of the emission that is constrained by the frequencies associated with the two amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission

4.6.5 DEVIATION FROM TEST STANDARD

No deviation.

4.6.6 EUT OPERATING CONDITIONS

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.6.7 TEST RESULTS

802.11a

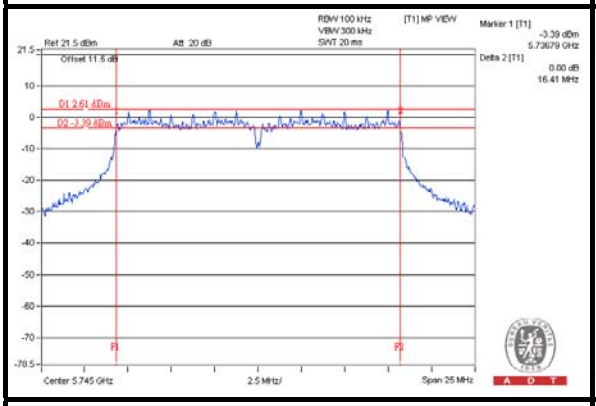
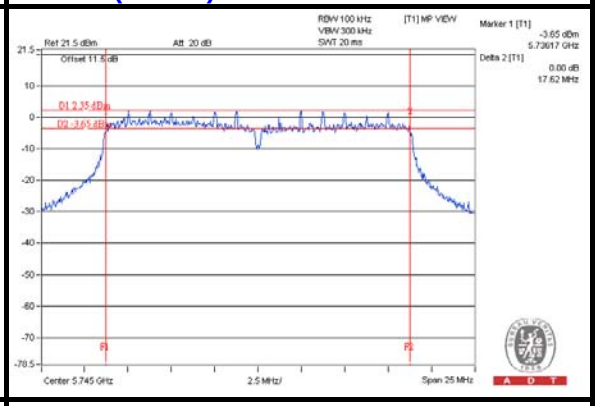
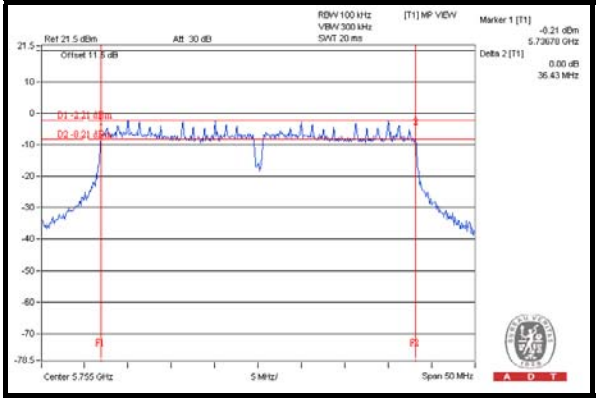
CHANNEL	FREQUENCY (MHz)	6dB BANDWIDTH (MHz)		MINIMUM LIMIT (MHz)	PASS / FAIL
		CHAIN 0	CHAIN 1		
149	5745	15.55	16.41	0.5	PASS
157	5785	16.37	15.49	0.5	PASS
165	5825	15.31	16.39	0.5	PASS

802.11n (20MHz)

CHANNEL	FREQUENCY (MHz)	6dB BANDWIDTH (MHz)		MINIMUM LIMIT (MHz)	PASS / FAIL
		CHAIN 0	CHAIN 1		
149	5745	17.61	17.62	0.5	PASS
157	5785	15.14	15.17	0.5	PASS
165	5825	17.60	17.60	0.5	PASS

802.11n (40MHz)

CHANNEL	FREQUENCY (MHz)	6dB BANDWIDTH (MHz)		MINIMUM LIMIT (MHz)	PASS / FAIL
		CHAIN 0	CHAIN 1		
151	5755	35.65	36.43	0.5	PASS
159	5795	36.13	35.56	0.5	PASS

SPECTRUM PLOT OF WORST VALUE	
802.11a	**802.11n (20MHz)**
	
802.11n (40MHz)	
	

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:

Linko EMC/RF Lab
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Fax: 886-2-26051924

Hsin Chu EMC/RF Lab
Tel: 886-3-5935343
Fax: 886-3-5935342

Hwa Ya EMC/RF/Safety/Telecom Lab
Tel: 886-3-3183232
Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com
Web Site: www.bureauveritas-adt.com

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

7. APPENDIX A – MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No modifications were made to the EUT by the lab during the test.

---END---