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FCC TEST REPORT

REPORT NO.: RF130605C26
MODEL NO.: Z5SPM9382
FCC ID: I88Z5SPM9382
RECEIVED: May 23, 2013
TESTED: Jun. 19 ~ Jun. 28, 2013
ISSUED: Jul. 05, 2013

APPLICANT: ZyXEL Communications Corporation

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Park, Hsinchu, Taiwan

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
RF130605C26	Original release	Jul. 05, 2013



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1. CERTIFICATION

PRODUCT: 5G Wireless Card

MODEL NO.: Z5SPM9382

BRAND: ZyXEL

APPLICANT: ZyXEL Communications Corporation

TESTED: Jun. 19 ~ Jun. 28, 2013

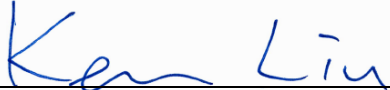
TEST SAMPLE: ENGINEERING SAMPLE

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

ANSI C63.10-2009

The above equipment (model: Z5SPM9382) 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 :  , **DATE** : Jul. 05, 2013
Pettie Chen / Senior Specialist

APPROVED BY :  , **DATE** : Jul. 05, 2013
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 C (SECTION 15.247)			
STANDARD SECTION	TEST TYPE	RESULT	REMARK
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is -18.61dB at 1.86328MHz.
15.247(d) 15.209	Radiated Emissions	PASS	Meet the requirement of limit. Minimum passing margin is -1.0dB at 5400.00MHz.
15.247(d)	Band Edge Measurement	PASS	Meet the requirement of limit.
15.247(a)(2)	6dB bandwidth	PASS	Meet the requirement of limit.
15.247(b)	Conducted power	PASS	Meet the requirement of limit.
15.247(e)	Power Spectral Density	PASS	Meet the requirement of limit.
15.203	Antenna Requirement	PASS	Antenna connector is Reverse SMA Plug 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	150kHz~30MHz	2.44 dB
Radiated emissions	30MHz ~ 200MHz	2.93 dB
	200MHz ~1000MHz	2.95 dB
	1GHz ~ 18GHz	2.26 dB
	18GHz ~ 40GHz	1.94 dB

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

3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

EUT	5G Wireless Card
MODEL NO.	Z5SPM9382
POWER SUPPLY	5Vdc (Power supply)
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	378.493mW
ANTENNA TYPE	Refer to Note
DATA CABLE	N/A
I/O PORTS	Refer to user's manual
ACCESSORY DEVICES	N/A

NOTE:

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

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

- The following antenna was provided to the EUT.

Type	Brand	Model	Connector	Gain(dBi)
Omini-directional dipole	LYNwave	AOA120-221030-000526	Reverse SMA Plug	3.0

- The above EUT information is declared by the manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.

3.2 DESCRIPTION OF TEST MODES

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

TEST CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER (SYSTEM)	TESTED BY
RE≥1G	25deg. C, 65%RH	120Vac, 60Hz	Chris Lin
RE<1G	25deg. C, 65%RH	120Vac, 60Hz	Chris Lin
PLC	25deg. C, 65%RH	120Vac, 60Hz	Chris Lin
APCM	25deg. C, 65%RH	120Vac, 60Hz	Cedric Wu

3.3 DESCRIPTION OF SUPPORT UNITS

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

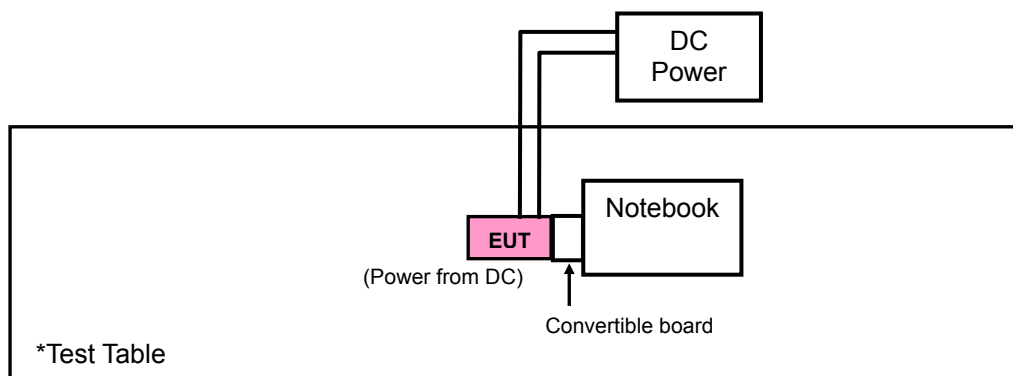
NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	Notebook	DELL	E5420	BPQ7MQ1	FCC DoC Approved
2	Convertible board	NA	NA	NA	NA
3	Power supply	Topward	6603D	NA	NA

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	NA
2	NA
3	NA

NOTE:

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

3.3.1 CONFIGURATION OF SYSTEM UNDER TEST





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3.4 GENERAL DESCRIPTION OF APPLIED STANDARDS

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

FCC Part 15, Subpart C (15.247)

662911 D01 Multiple Transmitter Output v01 r02

ANSI C63.10-2009

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

NOTE: The EUT is also considered as a kind of computer peripheral, because the connection to computer is necessary for typical use. It has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC). The test report has been issued separately.

4. TEST TYPES AND RESULTS

4.1 RADIATED EMISSION AND BANDEDGE MEASUREMENT

4.1.1 LIMITS OF RADIATED EMISSION AND BANDEDGE MEASUREMENT

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 30dB below the highest level of the desired power:

FREQUENCIES (MHz)	FIELD STRENGTH (microvolts/meter)	MEASUREMENT DISTANCE (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 30dB under any condition of modulation.



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4.1.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver ROHDE & SCHWARZ	ESCS30	100289	Nov. 16, 2012	Nov. 15, 2013
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100269	Jan. 28, 2013	Jan. 27, 2014
BILOG Antenna SCHWARZBECK	VULB9168	9168-156	Mar. 22, 2013	Mar. 21, 2014
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-209	Sep. 03, 2012	Sep. 02, 2013
HORN Antenna SCHWARZBECK	BBHA 9170	148	Jul. 11, 2012	Jul. 10, 2013
Preamplifier Agilent	8449B	3008A01911	Oct. 25, 2012	Oct. 24, 2013
Preamplifier Agilent	8447D	2944A10638	Oct. 25, 2012	Oct. 24, 2013
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	295013/4 283403/4	Aug. 28, 2012	Aug. 27, 2013
RF signal cable Worken	8D-FB	Cable-HYCH9-01	Aug. 11, 2012	Aug. 10, 2013
Software BV ADT	ADT_Radiated_ V7.6.15.9.3	NA	NA	NA
Antenna Tower EMCO	2070/2080	512.835.4684	NA	NA
Turn Table EMCO	2087-2.03	NA	NA	NA
Antenna Tower & Turn Table Controller EMCO	2090	NA	NA	NA
26GHz ~ 40GHz Amplifier	EM26400	815221	Oct. 25, 2012	Oct. 24, 2013
High Speed Peak Power Meter	ML2495A	0824012	Aug. 22, 2012	Aug. 21, 2013
Power Sensor	MA2411B	0738171	Jul. 30, 2012	Jul. 29, 2013

- NOTE:** 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HwaYa Chamber 4.
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 460141.
5. The IC Site Registration No. is IC7450F-4.

4.1.3 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. Height of receiving antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to 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.

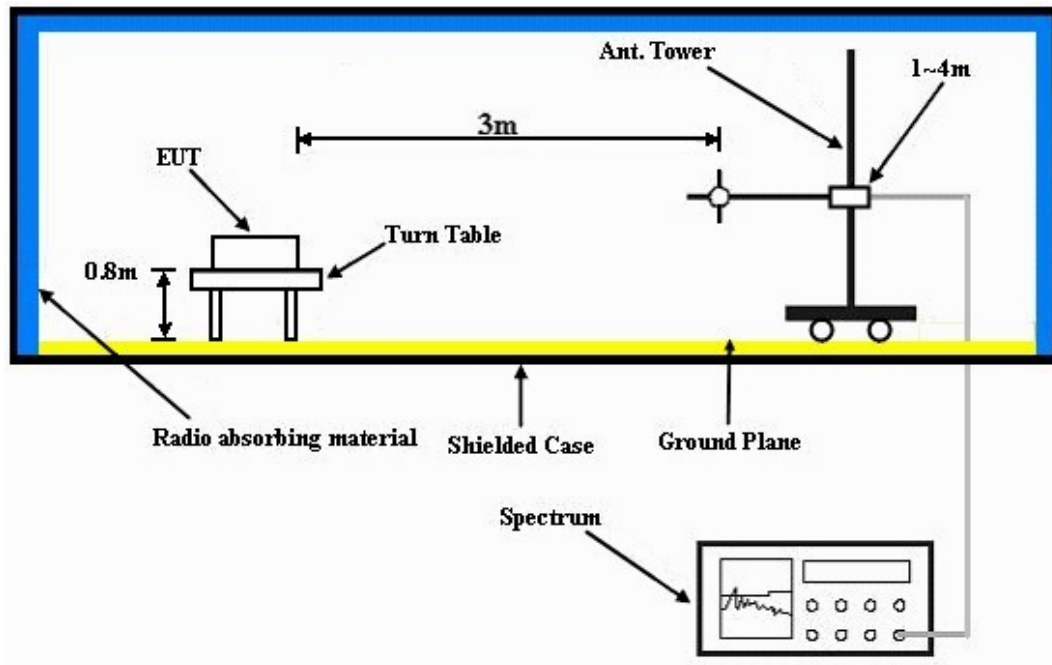
NOTE:

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 1kHz(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.

4.1.4 DEVIATION FROM TEST STANDARD

No deviation.

4.1.5 TEST SETUP



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

4.1.6 EUT OPERATING CONDITIONS

- Plugged the EUT into the notebook via convertible board and placed them on the testing table.
- The notebook run a test program (provided by manufacturer) to enable EUT under transmission condition continuously at specific channel frequency.
- The necessary accessories enable the system in full functions.

4.1.7 TEST RESULTS

ABOVE 1GHz DATA :

802.11a

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 149	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Chris Lin

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	#5725.00	71.1 PK	77.9	-6.8	1.00 H	203	26.50	44.60
2	#5725.00	61.1 AV	67.7	-6.6	1.00 H	203	16.50	44.60
3	*5745.00	107.9 PK			1.00 H	183	63.30	44.60
4	*5745.00	97.7 AV			1.00 H	183	53.10	44.60
5	11490.00	56.0 PK	74.0	-18.0	1.02 H	307	3.40	52.60
6	11490.00	45.7 AV	54.0	-8.3	1.02 H	307	-6.90	52.60
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	#5725.00	80.9 PK	88.7	-7.8	1.00 V	203	36.30	44.60
2	#5725.00	71.8 AV	78.6	-6.8	1.00 V	203	27.20	44.60
3	*5745.00	118.7 PK			1.61 V	19	74.10	44.60
4	*5745.00	108.6 AV			1.61 V	19	64.00	44.60
5	11490.00	60.4 PK	74.0	-13.6	1.32 V	84	7.80	52.60
6	11490.00	49.1 AV	54.0	-4.9	1.32 V	84	-3.50	52.60

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. “ * ”: Fundamental frequency.
6. The limit value is defined as per 15.247.
7. "#":The radiated frequency is out the restricted band.



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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 157	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Chris Lin

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	108.9 PK			1.00 H	0	64.20	44.70
2	*5785.00	98.8 AV			1.00 H	0	54.10	44.70
3	11570.00	56.9 PK	74.0	-17.1	1.32 H	108	4.10	52.80
4	11570.00	46.0 AV	54.0	-8.0	1.32 H	108	-6.80	52.80
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	5440.00	62.2 PK	74.0	-11.8	1.00 V	244	18.00	44.20
2	5440.00	52.2 AV	54.0	-1.8	1.00 V	244	8.00	44.20
3	*5785.00	119.2 PK			1.62 V	19	74.50	44.70
4	*5785.00	109.8 AV			1.62 V	19	65.10	44.70
5	11570.00	60.3 PK	74.0	-13.7	1.23 V	87	7.50	52.80
6	11570.00	49.4 AV	54.0	-4.6	1.23 V	87	-3.40	52.80

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 limit value is defined as per 15.247.



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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 165	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Chris Lin

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	108.5 PK			1.10 H	20	63.70	44.80
2	*5825.00	98.5 AV			1.10 H	20	53.70	44.80
3	#5850.00	60.4 PK	78.5	-18.1	1.20 H	212	15.50	44.90
4	#5850.00	50.4 AV	68.5	-18.1	1.20 H	212	5.50	44.90
5	11650.00	57.4 PK	74.0	-16.6	1.32 H	74	4.40	53.00
6	11650.00	46.1 AV	54.0	-7.9	1.32 H	74	-6.90	53.00
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	5400.00	61.5 PK	74.0	-12.5	1.00 V	56	17.30	44.20
2	5400.00	52.5 AV	54.0	-1.5	1.00 V	56	8.30	44.20
3	*5825.00	119.8 PK			1.00 V	188	75.00	44.80
4	*5825.00	109.9 AV			1.00 V	188	65.10	44.80
5	#5850.00	71.7 PK	89.8	-18.1	1.20 V	212	26.80	44.90
6	#5850.00	61.8 AV	79.9	-18.1	1.20 V	212	16.90	44.90
7	11650.00	61.4 PK	74.0	-12.6	1.30 V	214	8.40	53.00
8	11650.00	49.1 AV	54.0	-4.9	1.30 V	214	-3.90	53.00

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 limit value is defined as per 15.247.
7. “#”:The radiated frequency is out the restricted band.

802.11n (20MHz)

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 149	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Chris Lin

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	#5725.00	72.6 PK	78.1	-5.5	1.01 H	222	28.00	44.60
2	#5725.00	62.6 AV	68.1	-5.5	1.01 H	222	18.00	44.60
3	*5745.00	108.1 PK			1.10 H	290	63.50	44.60
4	*5745.00	98.1 AV			1.10 H	290	53.50	44.60
5	11490.00	57.3 PK	74.0	-16.7	1.23 H	84	4.70	52.60
6	11490.00	46.4 AV	54.0	-7.6	1.23 H	84	-6.20	52.60
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	#5725.00	82.9 PK	88.4	-5.5	1.10 V	210	38.30	44.60
2	#5725.00	72.9 AV	78.4	-5.5	1.10 V	210	28.30	44.60
3	*5745.00	118.4 PK			1.00 V	17	73.80	44.60
4	*5745.00	108.4 AV			1.00 V	17	63.80	44.60
5	11490.00	60.3 PK	74.0	-13.7	1.09 V	74	7.70	52.60
6	11490.00	48.0 AV	54.0	-6.0	1.09 V	74	-4.60	52.60

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. “ * “: Fundamental frequency.
6. The limit value is defined as per 15.247.
7. “#”:The radiated frequency is out the restricted band.



A D T

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 157	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Chris Lin

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	109.5 PK			1.10 H	30	64.80	44.70
2	*5785.00	99.5 AV			1.10 H	30	54.80	44.70
3	11570.00	56.0 PK	74.0	-18.0	1.23 H	65	3.20	52.80
4	11570.00	45.9 AV	54.0	-8.1	1.23 H	65	-6.90	52.80
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	5400.00	63.1 PK	74.0	-10.9	1.20 V	114	18.90	44.20
2	5400.00	53.0 AV	54.0	-1.0	1.20 V	114	8.80	44.20
3	*5785.00	119.7 PK			1.70 V	30	75.00	44.70
4	*5785.00	109.7 AV			1.70 V	30	65.00	44.70
5	11570.00	61.3 PK	74.0	-12.7	1.30 V	47	8.50	52.80
6	11570.00	48.1 AV	54.0	-5.9	1.30 V	47	-4.70	52.80

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 limit value is defined as per 15.247.

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 165	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Chris Lin

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	109.6 PK			1.20 H	40	64.80	44.80
2	*5825.00	99.6 AV			1.20 H	40	54.80	44.80
3	#5850.00	63.3 PK	79.6	-16.3	1.30 H	222	18.40	44.90
4	#5850.00	53.3 AV	69.6	-16.3	1.30 H	222	8.40	44.90
5	11650.00	57.4 PK	74.0	-16.6	1.06 H	74	4.40	53.00
6	11650.00	46.4 AV	54.0	-7.6	1.06 H	74	-6.60	53.00
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	5360.00	62.3 PK	74.0	-11.7	1.25 V	240	18.20	44.10
2	5360.00	52.0 AV	54.0	-2.0	1.25 V	240	7.90	44.10
3	*5825.00	120.4 PK			1.10 V	200	75.60	44.80
4	*5825.00	110.4 AV			1.10 V	200	65.60	44.80
5	#5850.00	74.1 PK	90.4	-16.3	1.10 V	209	29.20	44.90
6	#5850.00	64.1 AV	80.4	-16.3	1.10 V	209	19.20	44.90
7	11650.00	61.4 PK	74.0	-12.6	1.09 V	221	8.40	53.00
8	11650.00	49.4 AV	54.0	-4.6	1.09 V	221	-3.60	53.00

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 limit value is defined as per 15.247.
7. “#”:The radiated frequency is out the restricted band.

802.11n (40MHz)

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 151	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Chris Lin

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	#5725.00	73.7 PK	74.7	-1.0	1.10 H	210	29.10	44.60
2	#5725.00	63.9 AV	64.9	-1.0	1.10 H	210	19.30	44.60
3	*5755.00	104.7 PK			1.00 H	184	60.00	44.70
4	*5755.00	94.9 AV			1.00 H	184	50.20	44.70
5	11510.00	56.0 PK	74.0	-18.0	1.06 H	47	3.30	52.70
6	11510.00	45.5 AV	54.0	-8.5	1.06 H	47	-7.20	52.70
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5725.00	83.2 PK	84.2	-1.0	1.00 V	203	38.60	44.60
2	#5725.00	73.9 AV	74.9	-1.0	1.00 V	203	29.30	44.60
3	*5755.00	114.2 PK			1.00 V	210	69.50	44.70
4	*5755.00	104.9 AV			1.00 V	210	60.20	44.70
5	11510.00	61.0 PK	74.0	-13.0	1.03 V	67	8.30	52.70
6	11510.00	49.1 AV	54.0	-4.9	1.03 V	67	-3.60	52.70

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. “ * “: Fundamental frequency.
6. The limit value is defined as per 15.247.
7. “#”:The radiated frequency is out the restricted band.



A D T

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 159	FREQUENCY RANGE	1 ~ 40GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Chris Lin

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	105.2 PK			1.00 H	0	60.50	44.70
2	*5795.00	95.2 AV			1.00 H	0	50.50	44.70
3	#5850.00	59.0 PK	75.2	-16.2	1.66 H	232	14.10	44.90
4	#5850.00	48.7 AV	65.2	-16.5	1.66 H	232	3.80	44.90
5	11590.00	57.0 PK	74.0	-17.0	1.03 H	49	4.20	52.80
6	11590.00	46.0 AV	54.0	-8.0	1.03 H	49	-6.80	52.80
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	5400.00	60.5 PK	74.0	-13.5	1.00 V	240	16.30	44.20
2	5400.00	50.1 AV	54.0	-3.9	1.00 V	240	5.90	44.20
3	*5795.00	115.1 PK			1.00 V	189	70.40	44.70
4	*5795.00	105.6 AV			1.00 V	189	60.90	44.70
5	#5850.00	68.9 PK	85.1	-16.2	1.66 V	232	24.00	44.90
6	#5850.00	59.4 AV	75.6	-16.2	1.66 V	232	14.50	44.90
7	11590.00	62.4 PK	74.0	-11.6	1.30 V	226	9.60	52.80
8	11590.00	50.2 AV	54.0	-3.8	1.30 V	226	-2.60	52.80

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 limit value is defined as per 15.247.
7. “#”:The radiated frequency is out the restricted band.

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

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 149	FREQUENCY RANGE	Below 1000MHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Quasi-Peak
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Chris Lin

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	99.84	37.0 QP	43.5	-6.5	1.24 H	152	27.20	9.80
2	142.52	39.4 QP	43.5	-4.1	1.00 H	139	26.20	13.20
3	165.80	37.3 QP	43.5	-6.2	1.50 H	58	24.00	13.30
4	231.76	36.2 QP	46.0	-9.8	1.24 H	96	24.20	12.00
5	299.66	34.1 QP	46.0	-11.9	1.50 H	185	19.60	14.50
6	598.42	34.2 QP	46.0	-11.8	1.00 H	87	11.80	22.40
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	31.94	36.1 QP	40.0	-3.9	1.24 V	184	23.40	12.70
2	99.84	42.4 QP	43.5	-1.1	1.50 V	258	32.60	9.80
3	142.52	37.5 QP	43.5	-6.0	1.00 V	28	24.30	13.20
4	165.80	37.5 QP	43.5	-6.0	1.24 V	248	24.20	13.30
5	208.48	34.5 QP	43.5	-9.0	1.00 V	195	23.60	10.90
6	837.04	35.7 QP	46.0	-10.3	1.50 V	137	9.80	25.90

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

4.2 CONDUCTED EMISSION MEASUREMENT

4.2.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dB μ V)	
	Quasi-peak	Average
0.15 ~ 0.5	66 to 56	56 to 46
0.5 ~ 5	56	46
5 ~ 30	60	50

- NOTE:** 1. The lower limit shall apply at the transition frequencies.
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.
3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

4.2.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver ROHDE & SCHWARZ	ESCS30	100288	Nov. 09, 2012	Nov. 08, 2013
RF signal cable Woken	5D-FB	Cable-HYCO2-01	Dec. 28, 2012	Dec. 27, 2013
LISN ROHDE & SCHWARZ (EUT)	ESH2-Z5	100100	Dec. 21, 2012	Dec. 20, 2013
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Jul. 06, 2012	Jul. 05, 2013
Software ADT	BV ADT_Cond_ V7.3.7.3	NA	NA	NA

- NOTE:** 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HwaYa Shielded Room 2.
3. The VCCI Site Registration No. is C-2047.

4.2.3 TEST PROCEDURES

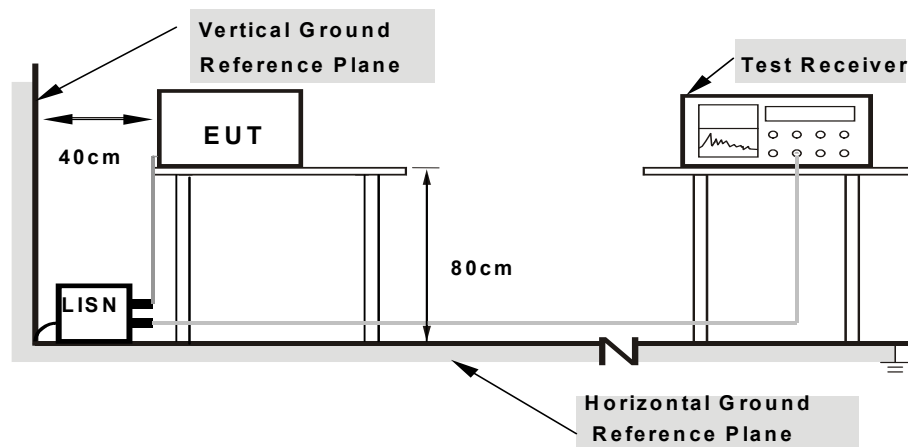
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance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

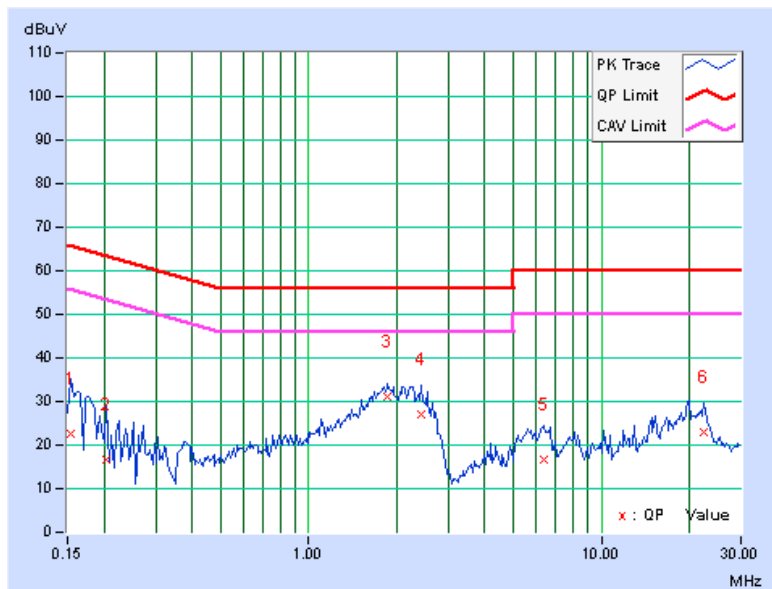
4.2.7 TEST RESULTS

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

PHASE	Line 1	6dB BANDWIDTH	9kHz
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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	0.15391	0.17	22.59	12.47	22.76	12.64	65.79	55.79	-43.02	-43.14
2	0.20469	0.17	16.66	2.80	16.83	2.97	63.42	53.42	-46.59	-50.45
3	1.86328	0.28	30.80	27.11	31.08	27.39	56.00	46.00	-24.92	-18.61
4	2.42578	0.30	26.67	24.28	26.97	24.58	56.00	46.00	-29.03	-21.42
5	6.33984	0.39	16.38	10.71	16.77	11.10	60.00	50.00	-43.23	-38.90
6	22.49609	0.62	22.32	18.15	22.94	18.77	60.00	50.00	-37.06	-31.23

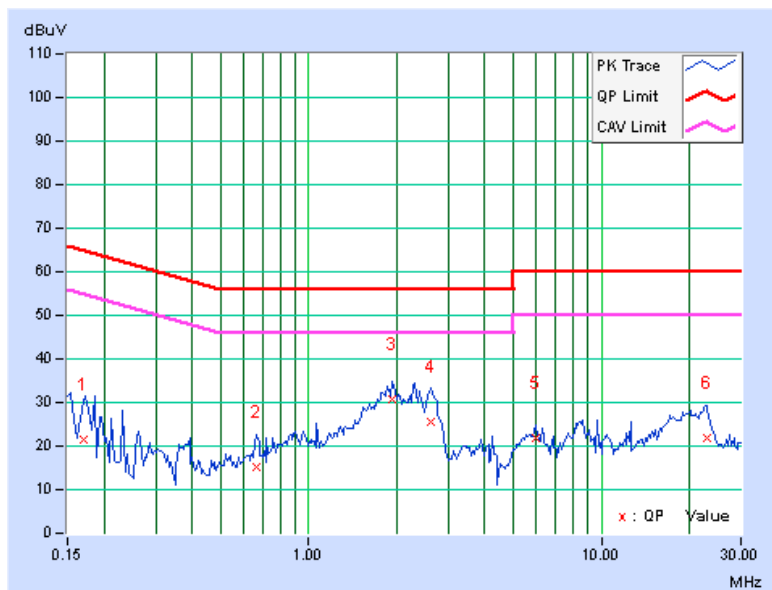
- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
 2. The emission levels of other frequencies were very low against the limit.
 3. Margin value = Emission level - Limit value
 4. Correction factor = Insertion loss + Cable loss
 5. Emission Level = Correction Factor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



PHASE	Line 2	6dB BANDWIDTH	9kHz
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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	0.16953	0.18	21.46	10.03	21.64	10.21	64.98	54.98	-43.34	-44.77
2	0.66172	0.24	14.88	9.75	15.12	9.99	56.00	46.00	-40.88	-36.01
3	1.93750	0.28	30.40	26.50	30.68	26.78	56.00	46.00	-25.32	-19.22
4	2.62500	0.31	25.15	21.68	25.46	21.99	56.00	46.00	-30.54	-24.01
5	5.95703	0.42	21.29	14.09	21.71	14.51	60.00	50.00	-38.29	-35.49
6	22.96875	0.71	21.23	17.07	21.94	17.78	60.00	50.00	-38.06	-32.22

- 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.

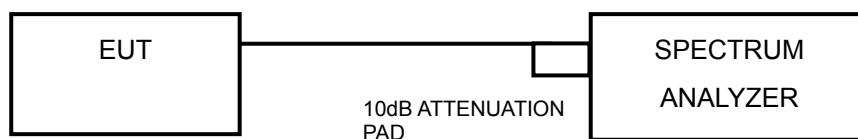


4.3 6dB BANDWIDTH MEASUREMENT

4.3.1 LIMITS OF 6dB BANDWIDTH MEASUREMENT

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

4.3.2 TEST SETUP



4.3.3 TEST INSTRUMENTS

Refer to section 4.1.2 to get information of above instrument.

4.3.4 TEST PROCEDURE

- Set resolution bandwidth (RBW) = 100kHz
- Set the video bandwidth (VBW) $\geq 3 \times$ RBW, Detector = Peak.
- Trace mode = max hold.
- Sweep = auto couple.
- 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

4.3.5 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 lowest, middle and highest channel frequencies individually.

4.3.7 TEST RESULTS

802.11a

CHANNEL	FREQUENCY (MHz)	6dB BANDWIDTH (MHz)		MINIMUM LIMIT (MHz)	PASS / FAIL
		CHAIN 0	CHAIN 1		
149	5745	16.41	16.44	0.5	PASS
157	5785	16.45	16.44	0.5	PASS
165	5825	16.52	16.41	0.5	PASS

802.11n (20MHz)

CHANNEL	FREQUENCY (MHz)	6dB BANDWIDTH (MHz)		MINIMUM LIMIT (MHz)	PASS / FAIL
		CHAIN 0	CHAIN 1		
149	5745	16.71	17.61	0.5	PASS
157	5785	16.96	17.61	0.5	PASS
165	5825	17.65	17.63	0.5	PASS

802.11n (40MHz)

CHANNEL	FREQUENCY (MHz)	6dB BANDWIDTH (MHz)		MINIMUM LIMIT (MHz)	PASS / FAIL
		CHAIN 0	CHAIN 1		
151	5755	35.91	36.41	0.5	PASS
159	5795	36.17	36.48	0.5	PASS

4.4 CONDUCTED OUTPUT POWER

4.4.1 LIMITS OF CONDUCTED OUTPUT POWER MEASUREMENT

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

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

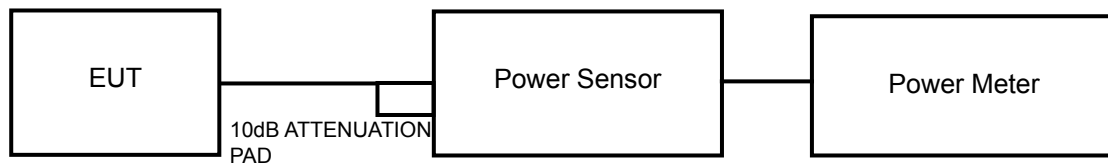
Array Gain = 0 dB (i.e., no array gain) for $NANT \leq 4$;

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

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

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

4.4.2 TEST SETUP



4.4.3 TEST INSTRUMENTS

Refer to section 4.1.2 to get information of above instrument.

4.4.4 TEST PROCEDURES

An average power sensor was used on the output port of the EUT. A power meter was used to read the response of the average power sensor. Record the average power level.

4.4.5 DEVIATION FROM TEST STANDARD

No deviation.

4.4.6 EUT OPERATING CONDITIONS

Same as Item 4.3.6.

4.4.7 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	20.06	18.62	174.169	22.41	30	PASS
157	5785	23.17	22.33	378.493	25.78	30	PASS
165	5825	22.12	21.56	306.149	24.86	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	19.04	19.09	161.264	22.08	30	PASS
157	5785	22.23	21.92	322.706	25.09	30	PASS
165	5825	22.28	21.52	310.950	24.93	30	PASS

802.11n (40MHz)

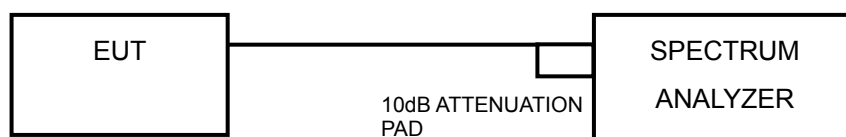
CHAN.	FREQ. (MHz)	AVG. POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)	LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1				
151	5755	18.28	18.76	142.460	21.54	30	PASS
159	5795	21.91	21.91	310.478	24.92	30	PASS

4.5 POWER SPECTRAL DENSITY MEASUREMENT

4.5.1 LIMITS OF POWER SPECTRAL DENSITY MEASUREMENT

The Maximum of Power Spectral Density Measurement is 8dBm.

4.5.2 TEST SETUP



4.5.3 TEST INSTRUMENTS

Refer to section 4.1.2 to get information of above instrument.

4.5.4 TEST PROCEDURE

- Set the RBW = 3 kHz, VBW = 10 kHz, Detector = peak.
- Sweep time = auto couple, Trace mode = max hold, allow trace to fully stabilize.
- Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

4.5.5 DEVIATION FROM TEST STANDARD

No deviation.

4.5.6 EUT OPERATING CONDITION

Same as Item 4.3.6

4.5.7 TEST RESULTS

802.11a

TX chain	Channel	Freq. (MHz)	PSD (dBm/3kHz)	10 log (N=2) dB	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	PASS /FAIL
0	149	5745	-4.91	3.01	-1.90	7.99	PASS
	157	5785	-4.38	3.01	-1.37	7.99	PASS
	165	5825	-4.09	3.01	-1.08	7.99	PASS
1	149	5745	-4.39	3.01	-1.38	7.99	PASS
	157	5785	-5.37	3.01	-2.36	7.99	PASS
	165	5825	-3.01	3.01	0.00	7.99	PASS

NOTE: Directional gain = $3\text{dBi} + 10\log(2) = 6.01\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $8-(6.01-6) = 7.99\text{dBm}$.

802.11n (20MHz)

TX chain	Channel	Freq. (MHz)	PSD (dBm/3kHz)	10 log (N=2) dB	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	PASS /FAIL
0	149	5745	-4.89	3.01	-1.88	7.99	PASS
	157	5785	-3.95	3.01	-0.94	7.99	PASS
	165	5825	-4.09	3.01	-1.08	7.99	PASS
1	149	5745	-5.54	3.01	-2.53	7.99	PASS
	157	5785	-5.24	3.01	-2.23	7.99	PASS
	165	5825	-4.40	3.01	-1.39	7.99	PASS

NOTE: Directional gain = $3\text{dBi} + 10\log(2) = 6.01\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $8-(6.01-6) = 7.99\text{dBm}$.

802.11n (40MHz)

TX chain	Channel	Freq. (MHz)	PSD (dBm/3kHz)	10 log (N=2) dB	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	PASS /FAIL
0	151	5755	-7.67	3.01	-4.66	7.99	PASS
	159	5795	-7.78	3.01	-4.77	7.99	PASS
1	151	5755	-7.32	3.01	-4.31	7.99	PASS
	159	5795	-7.71	3.01	-4.70	7.99	PASS

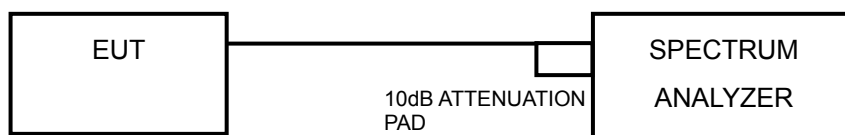
NOTE: Directional gain = $3\text{dBi} + 10\log(2) = 6.01\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $8-(6.01-6) = 7.99\text{dBm}$.

4.6 CONDUCTED OUT OF BAND EMISSION MEASUREMENT

4.6.1 LIMITS OF CONDUCTED OUT OF BAND EMISSION MEASUREMENT

Below -30dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).

4.6.2 TEST SETUP



4.6.3 TEST INSTRUMENTS

Refer to section 4.1.2 to get information of above instrument.

4.6.4 TEST PROCEDURE

MEASUREMENT PROCEDURE REF

1. Set the RBW = 100 kHz.
2. Set the VBW $\geq$ 300 kHz.
3. Detector = average.
4. Sweep time = auto couple.
5. Trace mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

MEASUREMENT PROCEDURE OOB

1. Set RBW = 100 kHz.
2. Set VBW $\geq$ 300 kHz.
3. Set span to encompass the spectrum to be examined.
4. Detector = average.
5. Trace Mode = max hold.
6. Sweep = auto couple.

4.6.5 DEVIATION FROM TEST STANDARD

No deviation.

4.6.6 EUT OPERATING CONDITION

Same as Item 4.3.6

4.6.7 TEST RESULTS

The conducted emission test is performed on each TX port of operating mode without summing or adding $10\log(N)$ since the limit is relative emission limit. Only worst data of each operating mode is presented.

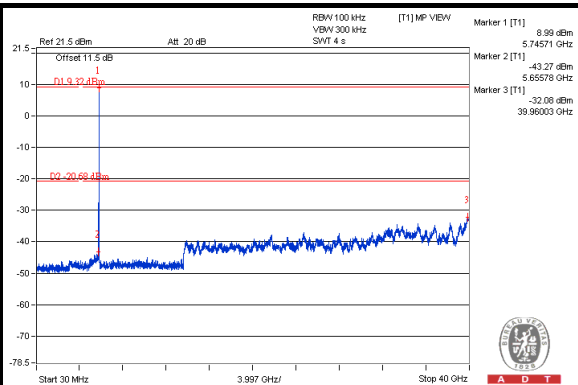
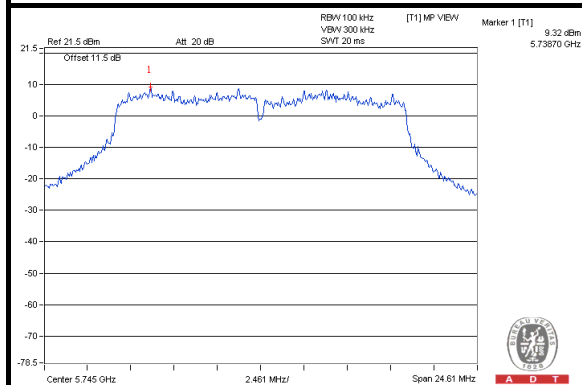
The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 30dB offset below D1. It shows compliance with the requirement.



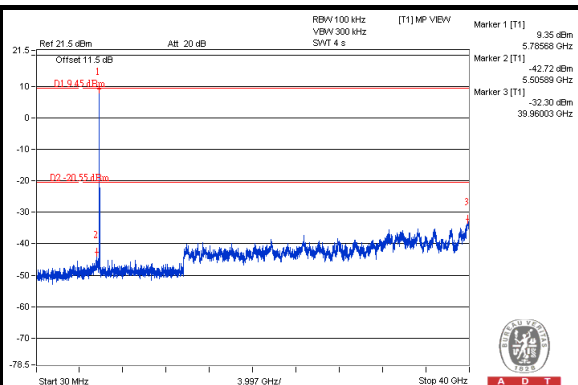
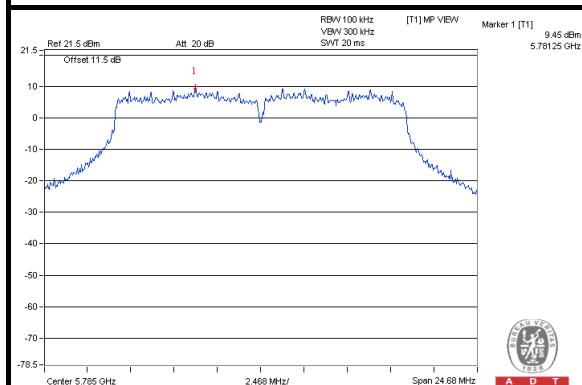
A D T

802.11a
CHAIN 0

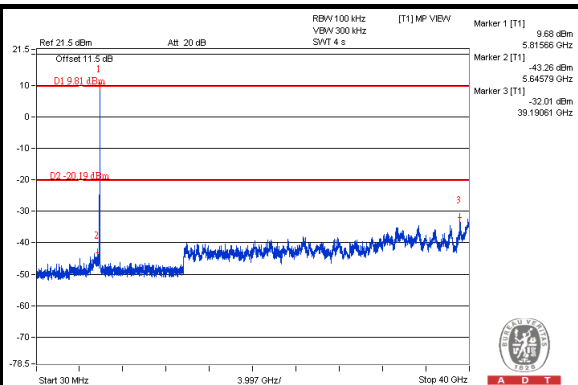
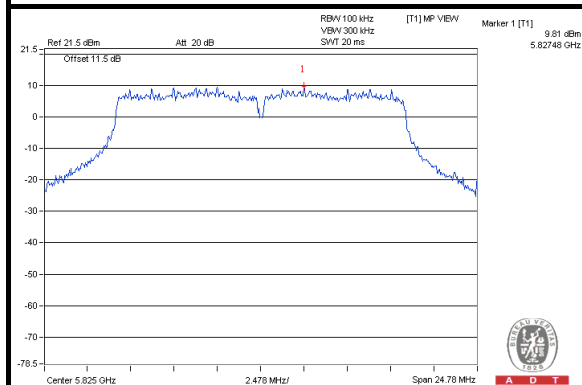
CH 149



CH 157



CH 165

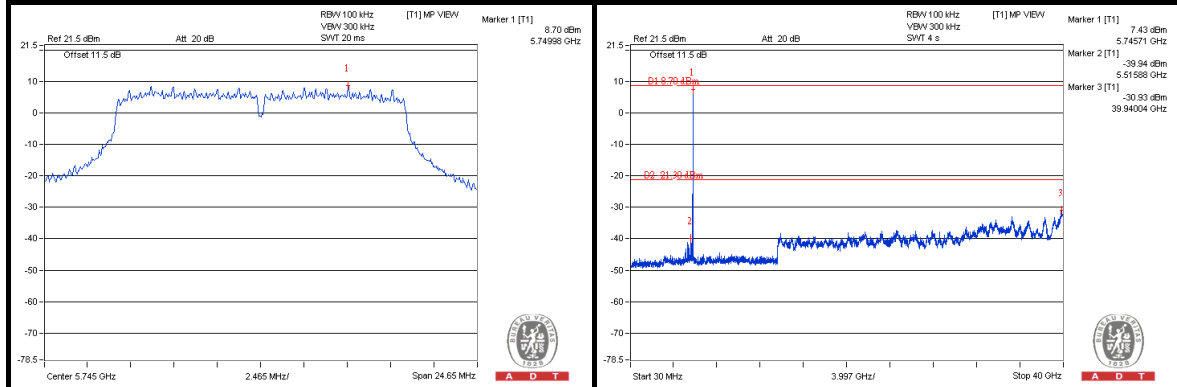




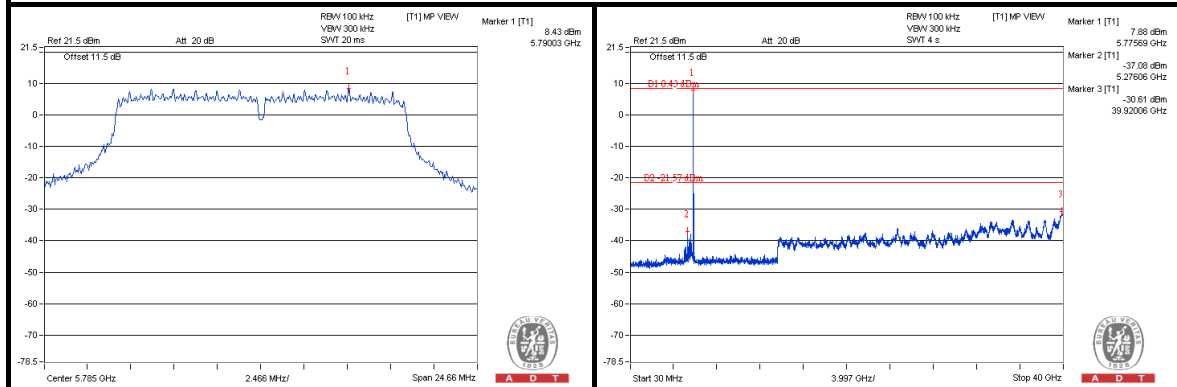
A D T

CHAIN 1

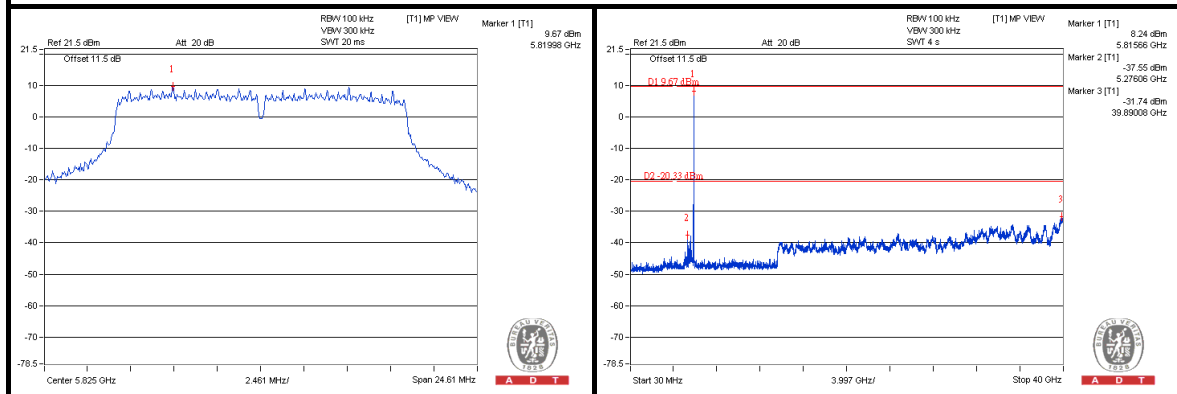
CH 149



CH 157



CH 165



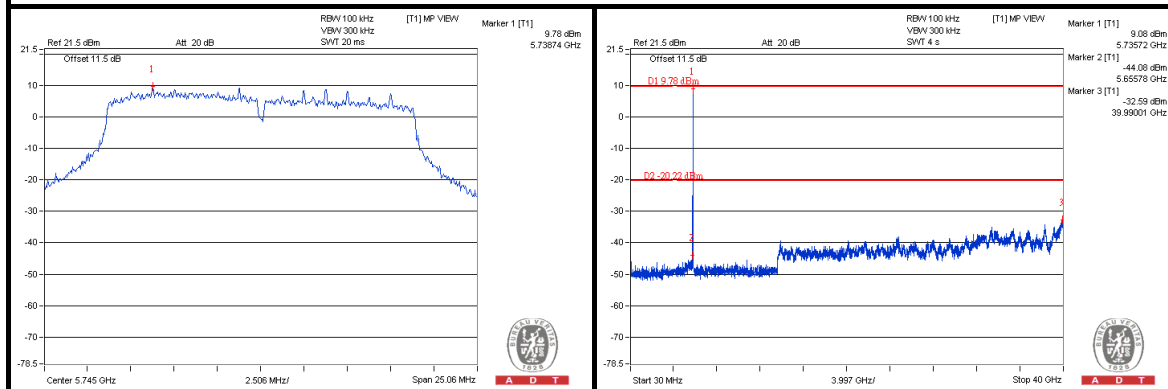


A D T

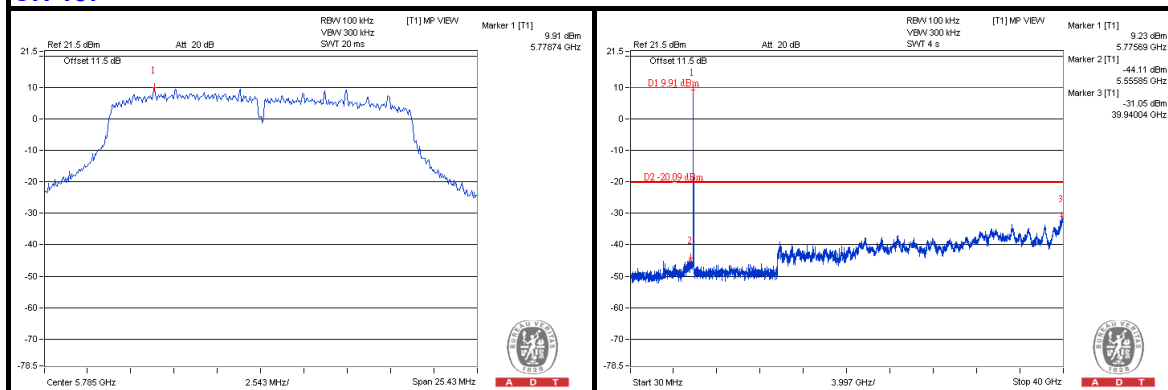
802.11n (20MHz)

CHAIN 0

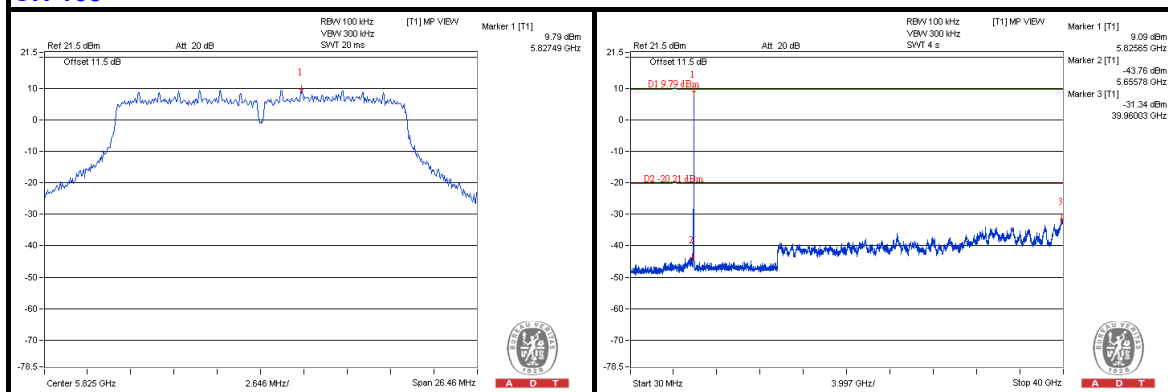
CH 149



CH 157



CH 165

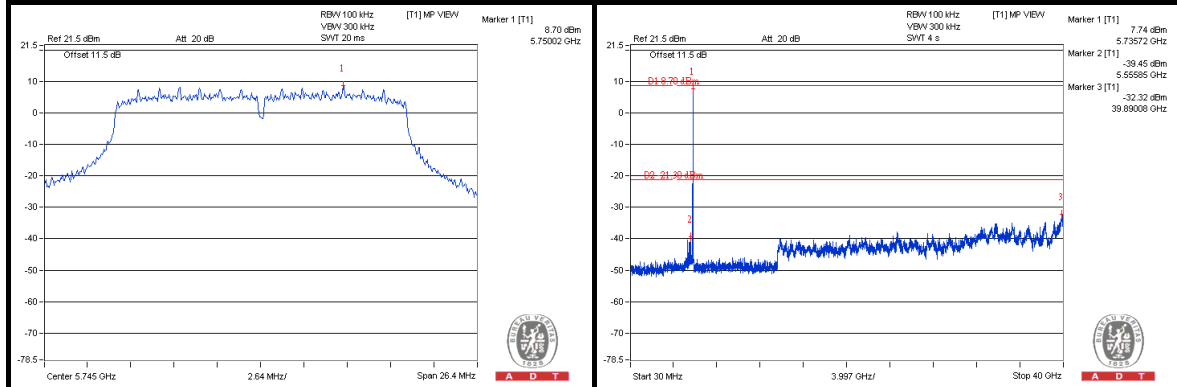




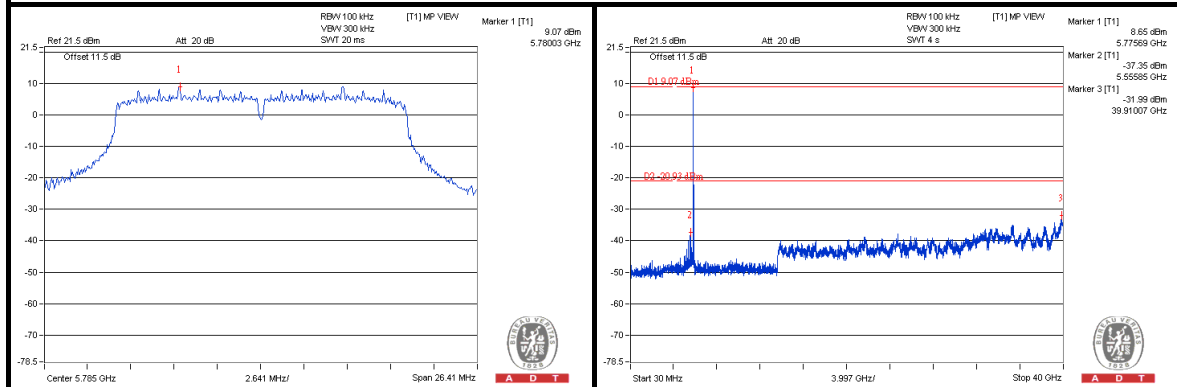
A D T

CHAIN 1

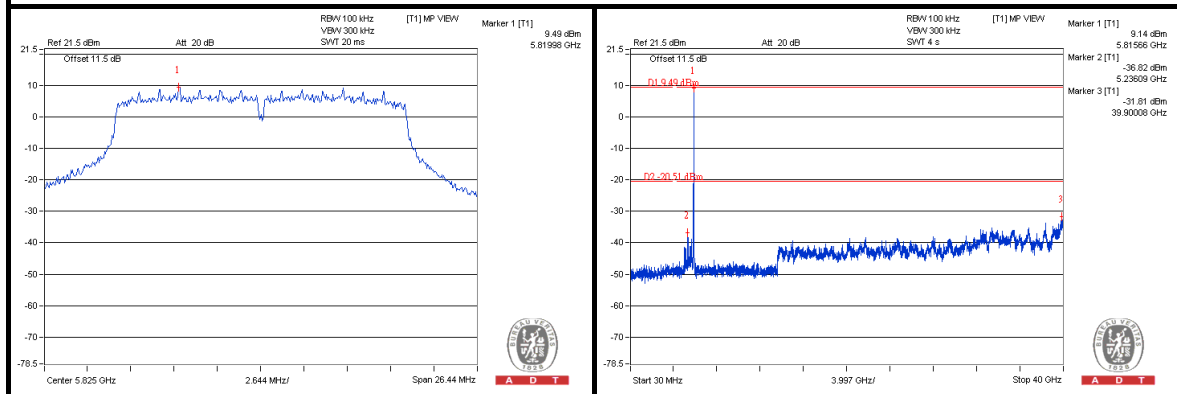
CH 149



CH 157



CH 165

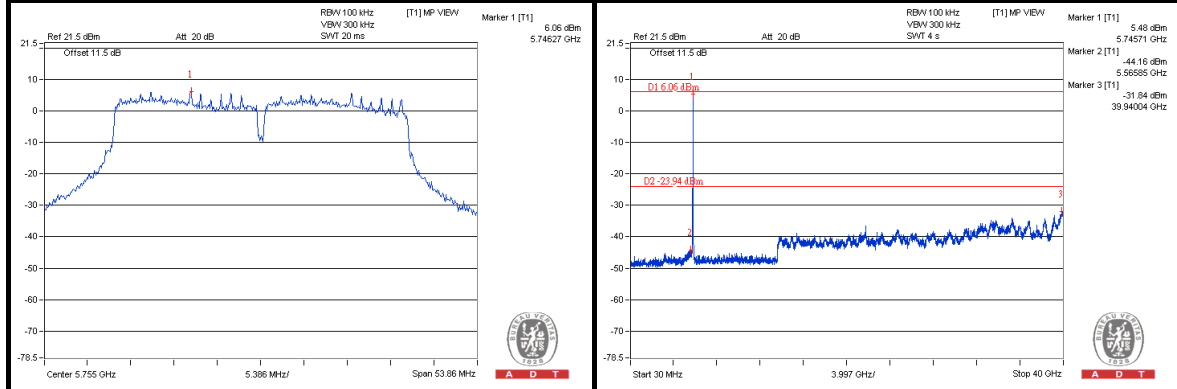




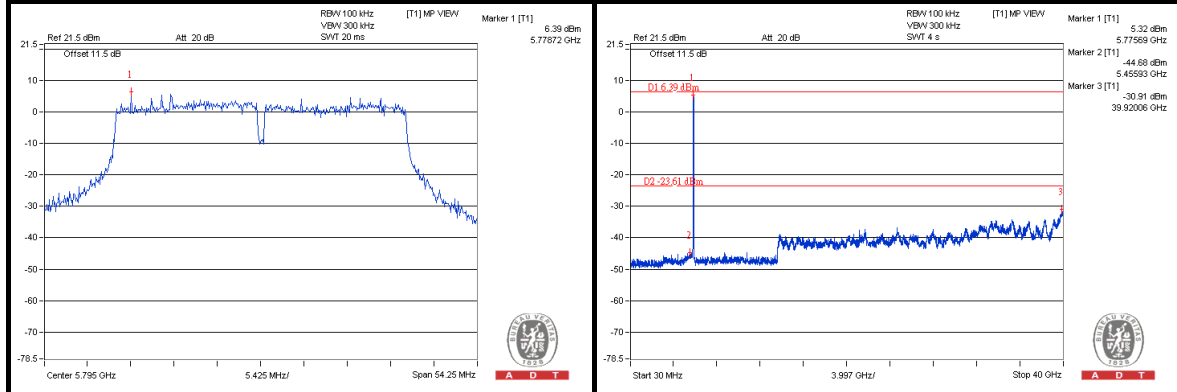
A D T

802.11n (40MHz) CHAIN 0

CH 151



CH 159

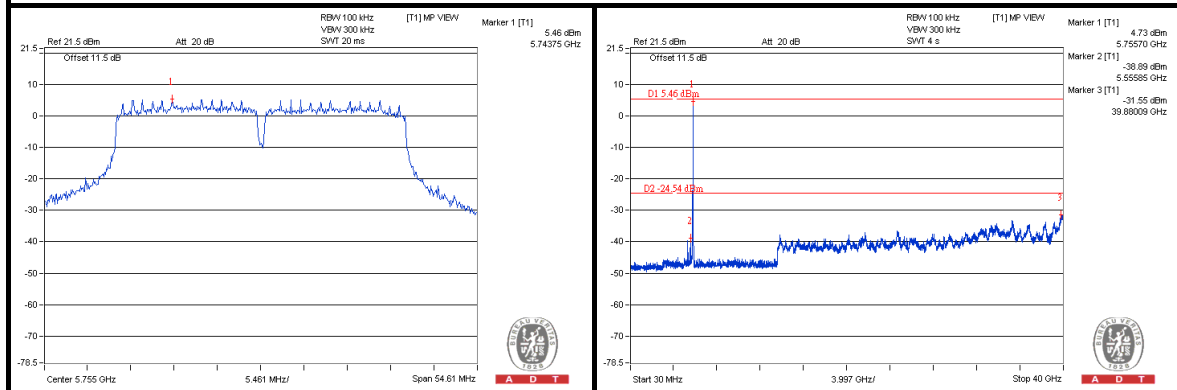




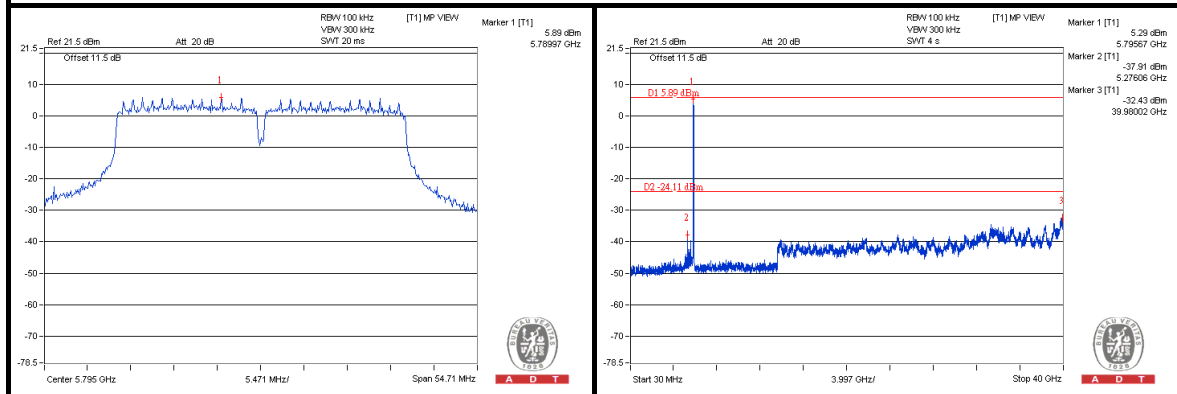
A D T

CHAIN 1

CH 151



CH 159





A D T

5. PHOTOGRAPHS OF THE TEST CONFIGURATION

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



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6. INFORMATION ON THE TESTING LABORATORIES

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

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

Linko EMC/RF Lab:

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Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com

Web Site: www.bureauveritas-adt.com

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



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

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

---END---