

TEST REPORT

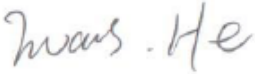
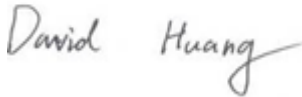
Applicant	GUANGDONG SYMA MODEL AIRCRAFT INDUSTRIAL CO., LTD
Address	NO.2 West Xingye Road Laimei Industrial Area Chenghai Shantou Guangdong China

Manufacturer or Supplier	GUANGDONG SYMA MODEL AIRCRAFT INDUSTRIAL CO., LTD
Address	NO.2 West Xingye Road Laimei Industrial Area Chenghai Shantou Guangdong China
Product Name	DRONE
Brand Name	Syma
Model	X30
Additional Model & Model Difference	X500, P0220, X300, X400, S100, S200, W1PRO, T0521
Date of tests	Sep. 28, 2020~ Dec. 02, 2020

The tests have been carried out according to the requirements of the following standard:

☒ **FCC Part 15, Subpart E, Section 15.407**

CONCLUSION: The submitted sample was found to COMPLY with the test requirement

Tested by Evans He Project Engineer / EMC Department	Approved by David Huang Supervisor / EMC Department
	 Date: Dec. 04, 2020

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF200612N047-3	Original release.	Dec. 04, 2020

1. SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC PART 15, SUBPART E (SECTION 15.407 UNDER NEW RULE)			
STANDARD SECTION	TEST TYPE	RESULT	REMARK
15.407(b)(6)	AC Power Conducted Emissions	N/A	Powered by Battery
15.407(b)(1/2/3/4/6)	Radiated Emissions & Band Edge Measurement	PASS	Meet the requirement of limit.
15.407(a)(1/2/3)	Max Average Transmit Power	PASS	Meet the requirement of limit.
15.407(a)(1/2/3)	Peak Power Spectral Density	PASS	Meet the requirement of limit.
15.407(g)	Frequency Stability	PASS	Meet the requirement of limit.
15.203	Antenna Requirement	PASS	No antenna connector is used

1.1 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
Radiated emissions	9KHz ~ 30MHz	2.16dB
	30MHz ~ 1GMHz	3.74dB
	1GHz ~ 18GHz	4.66dB
	18GHz ~ 40GHz	4.67dB

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

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

PRODUCT NAME	DRONE
MODEL NO.	X30
ADDITIONAL NO.	X500, P0220, X300, X400, S100, S200, W1PRO, T0521
FCC ID	QV7-GC88752-48
POWER SUPPLY	DC 8.4V from plane Battery Battery Charger: DC 7.6V from USB
MODULATION TYPE	64QAM, 16QAM, QPSK, BPSK for OFDM
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 144.4Mbps
OPERATING FREQUENCY	5180MHz, 5745MHz
NUMBER OF CHANNEL	Refer to 2.2 section
CONDUCTED OUTPUT POWER	12.7dBm for 5180MHz (Maximum AVG Power) 11.7dBm for 5745MHz (Maximum AVG Power)
ANTENNA TYPE	ANT0 5180MHz: External Antenna, 2dBi Gain 5745MHz: External Antenna, 2dBi Gain ANT1 5180MHz: External Antenna, 2dBi Gain 5745MHz: External Antenna, 2dBi Gain
I/O PORTS	Refer to user's manual
CABLE SUPPLIED	USB cable: Unshielded, Detachable 80cm

NOTE:

1. The EUT incorporates a MIMO function. Physically, the EUT provides 2 completed transmitter and 2 receiver.

MODULATION MODE	TX FUNCTION
802.11a	2TX/2RX
802.11n 20MHz	2TX/2RX

2. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
3. For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.
4. Please refer to the EUT photo document (Reference No.: 200612N047) for detailed product photo.
5. When the EUT charging that wireless function can't working, the charging mode was tested in



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the FCC Part 15B(sDOC) report.(report no.: FS200612N047)

6. Additional models (see about table) are identical with the test model X30 except the color of the appearance、trade name and model name for trading purpose.

2.2 DESCRIPTION OF TEST MODES

FOR 5180MHz

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

CHANNEL	FREQUENCY
36	5180 MHz

FOR 5745MHz

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

CHANNEL	FREQUENCY
149	5745MHz

2.2.1 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE≥1G	RE<1G	PLC	APCM	
-	√	√	-	√	Powered by Battery with wifi(5G) link

Where **RE≥1G**: Radiated Emission above 1GHz

RE<1G: Radiated Emission below 1GHz

PLC: Power Line Conducted Emission

APCM: Antenna Port Conducted Measurement

NOTE: “-” means no effect.

RADIATED EMISSION TEST (ABOVE 1GHz):

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

- ☒ Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	MODE	FREQ. BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
-	802.11a	5150-5250	36	36	OFDM	BPSK	6.0
-	802.11n (20MHz)		36	36	OFDM	BPSK	6.5
-	802.11a	5725-5850	149	149	OFDM	BPSK	6.0
-	802.11n (20MHz)		149	149	OFDM	BPSK	6.5

RADIATED EMISSION TEST (BELOW 1GHz):

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

- ☒ Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	MODE	FREQ. BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
-	802.11a	5150-5250 5725-5850	36 149	36	OFDM	BPSK	6.0

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	FREQ. BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
-	802.11a	5150-5250	36	36	OFDM	BPSK	6.0
-	802.11n (20MHz)		36	36	OFDM	BPSK	6.5
-	802.11a	5725-5850	149	149	OFDM	BPSK	6.0
-	802.11n (20MHz)		149	149	OFDM	BPSK	6.5

TEST CONDITION:

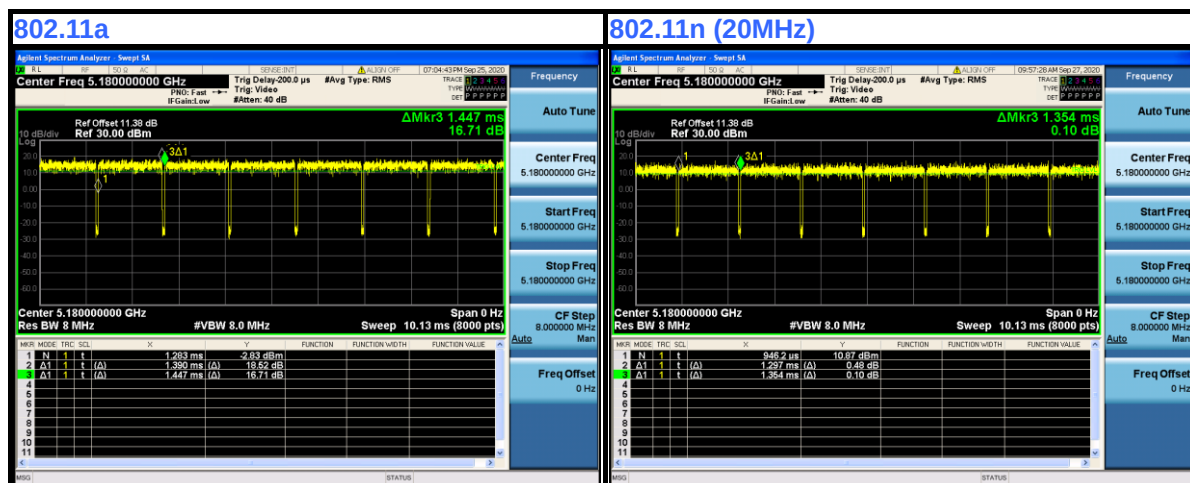
APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE<1G	25deg. C, 51%RH	DC 8.4V from Fully Battery	Aaron Liang
RE≥1G	25deg. C, 51%RH	DC 8.4V from Fully Battery	Aaron Liang
PLC	-	-	-
APCM	20deg. C, 55%RH	DC 8.4V from Fully Battery	Aaron Liang

2.3 DUTY CYCLE OF TEST SIGNAL

Mode	ON Time(ms)	Period(ms)	Duty Cycle (%)	1/T Minimum VBW (kHz)
802.11a	1.390	1.447	96.06	0.719
802.11n(20MHz)	1.297	1.354	95.79	0.771

802.11a: Duty cycle of test signal is < 98 %, Duty factor = $10 * \log(1/0.9606) = 0.17$

802.11n (20MHz): Duty cycle of test signal is < 98%, Duty factor = $10 * \log(1/0.9579) = 0.19$



2.4 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	N/A	N/A	N/A	N/A	N/A

NO.	DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	N/A

2.5 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 v02r01

ANSI C63.10-2013

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

3. TEST TYPES AND RESULTS

3.1 RADIATED EMISSION AND BANDEDGE MEASUREMENT

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 30dB under any condition of modulation.

3.1.1 LIMITS OF UNWANTED EMISSION OUT OF THE RESTRICTED BANDS

APPLICABLE TO	LIMIT	
789033 D02 General UNII Test Procedures New Rules v01r03	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: 68.2 (dBμV/m)
15.407(b)(2)		
15.407(b)(3)		
15.407(b)(4)	Note	Note

NOTE: For transmitters operating in the 5.725-5.85 GHz band:

Section 15.407(b)(4) specifies the unwanted emissions limit for the U-NII-3 band. A band emissions mask is specified in Section 15.407(b)(4)(i). An alternative to the band emissions mask is specified in Section 15.407(b)(4)(ii). The alternative limits are based on the highest antenna gain specified in the filing. There are also marketing and importation restrictions for the alternative limit.

15.407(b)(4)(i) All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

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

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

3.1.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESL6	1300.5001K06-100262-eQ	Mar. 24, 20	Mar. 24, 21
Bilog Antenna	Sunol Sciences	JB6	A110712	Jul. 21, 20	Jul. 21, 21
Active Antenna	CMO-POWER	AL-130	121031	Jun. 30, 20	Jun. 30, 21
Signal Amplifier	HP	8447E	443008	Mar. 24, 20	Mar. 24, 21
Signal and Spectrum Analyzer	R&S	FSV40	101094	Mar. 19, 20	Mar. 19, 21
MXA signal analyzer	Agilent	N9020A	MY49100060	Mar. 24, 20	Mar. 24, 21
Horn Antenna	COM-POWER	AH-118	71259	Apr. 17, 20	Apr. 17, 21
Horn Antenna	COM-POWER	AH-118	71283	Jul. 21, 20	Jul. 21, 21
SHF-EHF Horn	Schwarzbeck	BBHA9170	BBHA9170147	May 10, 20	May 10, 21
SHF-EHF Horn	Schwarzbeck	BBHA9170	BBHA9170242	May 10, 20	May 10, 21
AMPLIFIER	EM Electornic Corporation	EM01G26G	60613	Mar. 24, 20	Mar. 24, 21
Pre-amplifier	Rohde&Schwarz	SCU40	100437	Oct. 17, 20	Oct. 16, 21
3m Semi-anechoic Chamber	SAEMC	9m*6m*6m	N/A	Oct. 18, 18	Oct. 17, 21
Test Software	EZ-EMC	ICP-03A1	N/A	N/A	N/A

NOTE:

1. The test was performed in 966 Chamber.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.
3. The horn antenna is used only for the measurement of emission frequency above 1GHz if tested.
4. The FCC Site Registration No. is 749762.

TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 1.5 meters(above 1GHz) and 0.8 meters(below 1GHz) 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 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

NOTE:

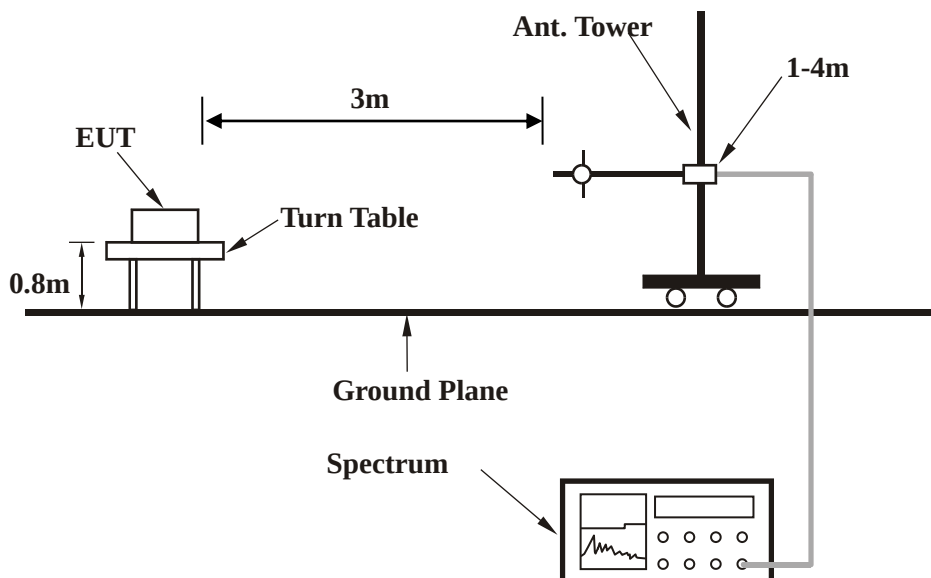
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
3. The resolution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

DEVIATION FROM TEST STANDARD

No deviation.

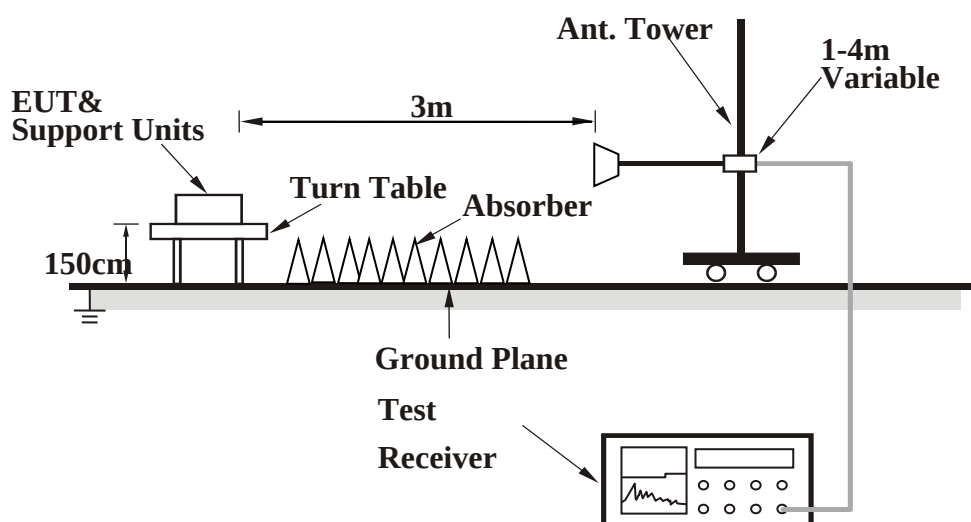
TEST SETUP

Below 1GHz test setup



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

Above 1GHz test setup



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



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EUT OPERATING CONDITION

- a. Set the EUT under full load condition and placed them on a testing table.
- b. Set the transmitter part of EUT under transmission condition continuously at specific channel frequency.
- c. The necessary accessories enable the EUT in full functions.

TEST RESULTS

BELOW 1GHz WORST-CASE DATA

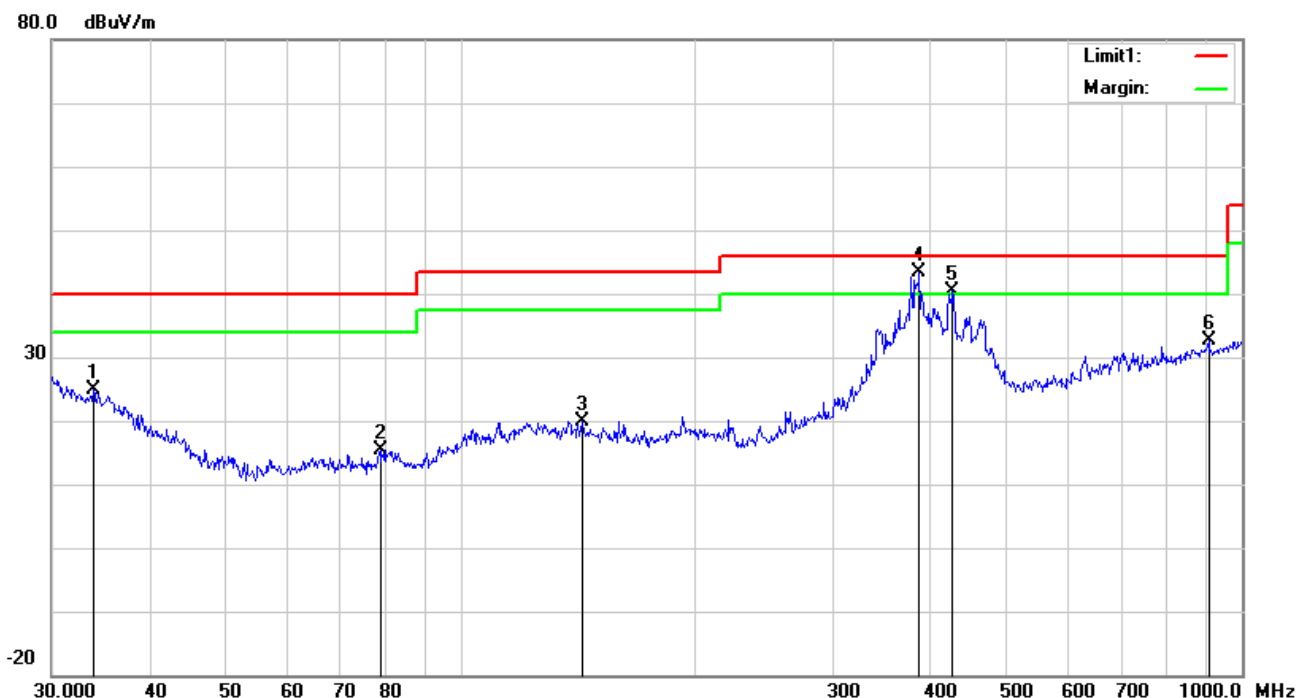
802.11a

CHANNEL	TX Channel 36	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 m										
No.	Frequency (MHz)	Reading (dBuV/m)	Ant_F (dB/m)	PA_G (dB)	Cab_L (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)
1	33.9174	27.49	18.46	21.62	0.64	24.97	40.00	-15.03	100	72
2	78.9652	28.68	7.46	21.61	0.91	15.44	40.00	-24.56	200	4
3	143.3261	27.46	12.84	21.69	1.19	19.80	43.50	-23.70	100	101
4	386.6338	48.31	15.23	22.00	1.90	43.44	46.00	-2.56	100	97
5	426.5210	44.14	16.24	22.01	1.98	40.35	46.00	-5.65	100	28
6	906.4824	28.84	22.44	21.52	2.89	32.65	46.00	-13.35	200	14

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 Gain (dB).
3. The emission levels of other frequencies were greater than 20dB margin.
4. 9KHz~30MHz have been test and test data more than 20dB margin.
5. Margin value = Emission level – Limit value.



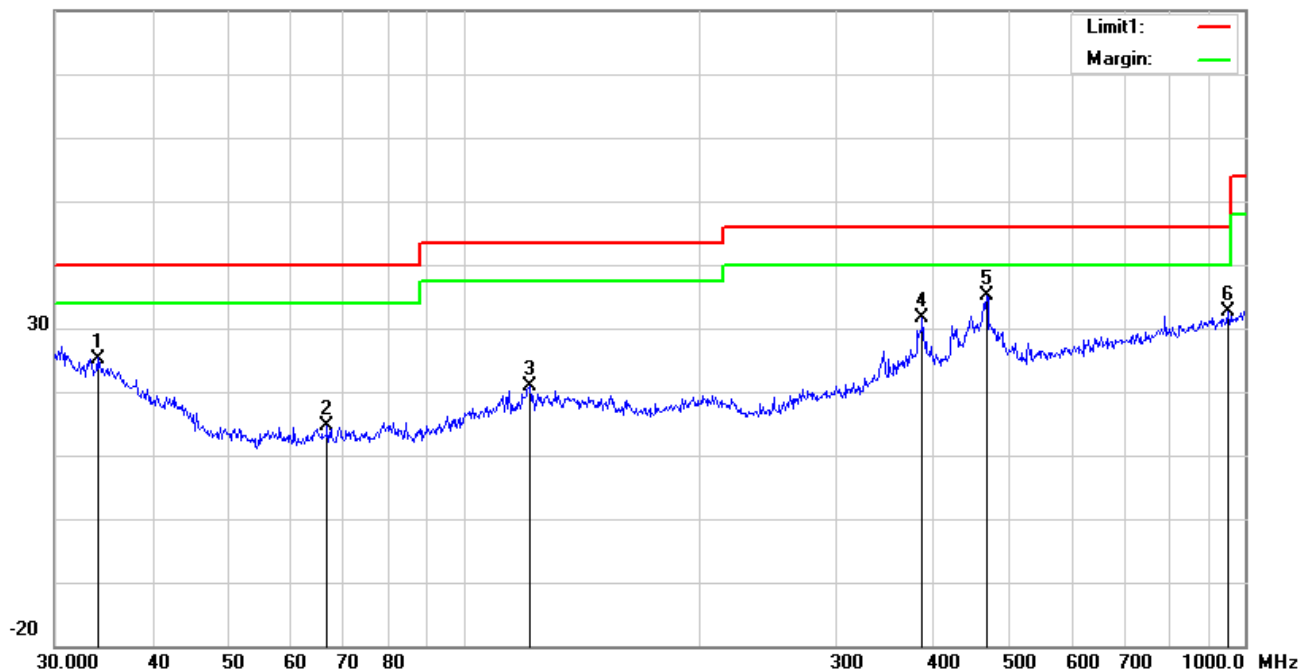
CHANNEL	TX Channel 36	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 m										
No.	Frequency (MHz)	Reading (dBuV/m)	Ant_F (dB/m)	PA_G (dB)	Cab_L (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)
1	34.0365	27.86	18.37	21.62	0.64	25.25	40.00	-14.75	100	58
2	66.9669	27.48	7.84	21.62	0.84	14.54	40.00	-25.46	200	342
3	121.5486	28.29	13.04	21.65	1.12	20.80	43.50	-22.70	200	184
4	386.6338	36.52	15.23	22.00	1.90	31.65	46.00	-14.35	100	330
5	467.2349	37.91	17.24	22.02	2.06	35.19	46.00	-10.81	100	124
6	952.0937	28.46	22.71	21.45	2.98	32.70	46.00	-13.30	100	339

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 Gain (dB).
3. The emission levels of other frequencies were greater than 20dB margin.
4. 9KHz~30MHz have been test and test data more than 20dB margin.
5. Margin value = Emission level – Limit value.

80.0 dBuV/m



Band 1 (5180MHz):

ABOVE 1GHz DATA

802.11a

CHANNEL	TX Channel 36	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 40GHz		Average (AV)

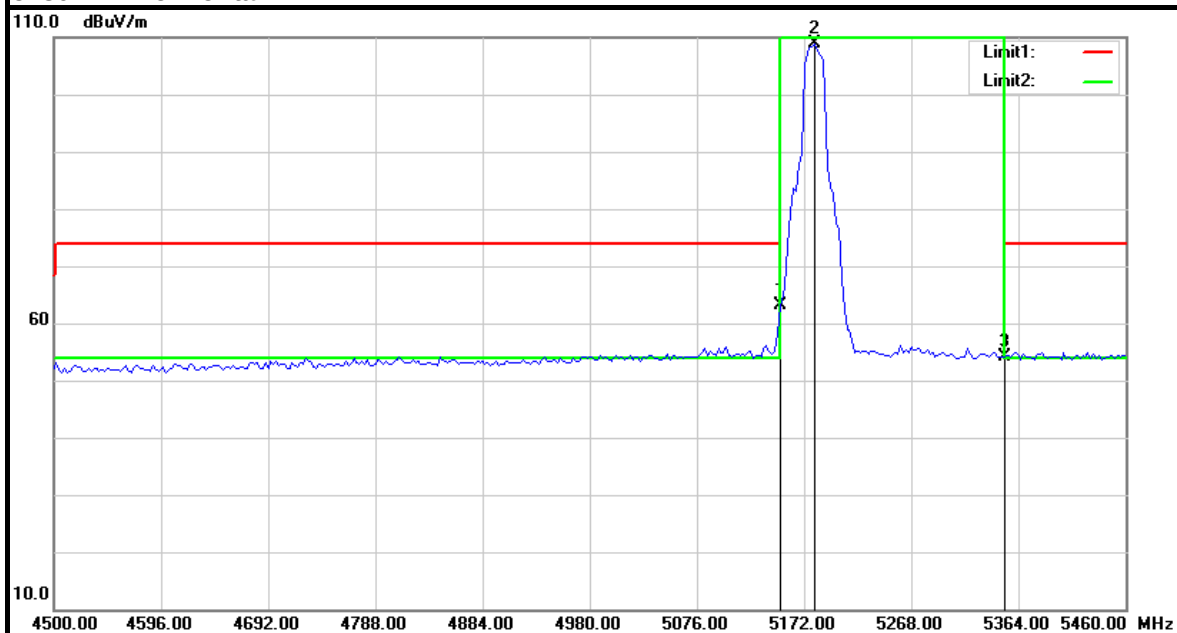
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M						
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)
1	5150	63.08 PK	74	-10.92	137	94
2	5150	46.1 AV	54	-7.9	137	94
3	*5180.00	108.97 PK			130	84
4	*5180.00	100.22 AV			130	84
5	5350	54.16 PK	74	-19.84	220	274
6	5350	43.89 AV	54	-10.11	220	274
7	#10360.00	64.41 PK	68.3	-3.89	188	31
8	15540	62.2 PK	74	-11.8	122	31
9	15540	50.96 AV	54	-3.04	122	31
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)
1	5150	54.29 PK	74	-19.71	110	64
2	5150	43.74 AV	54	-10.26	110	64
3	*5180.00	99.46 PK			130	49
4	*5180.00	88.94 AV			130	49
5	5350	53.96 PK	74	-20.04	246	347
6	5350	43.84 AV	54	-10.16	246	347
7	#10360.00	63.66 PK	74	-10.34	142	16
8	15540	62.98 PK	74	-11.02	234	227
9	15540	51.52 AV	54	-2.48	234	227

REMARKS:

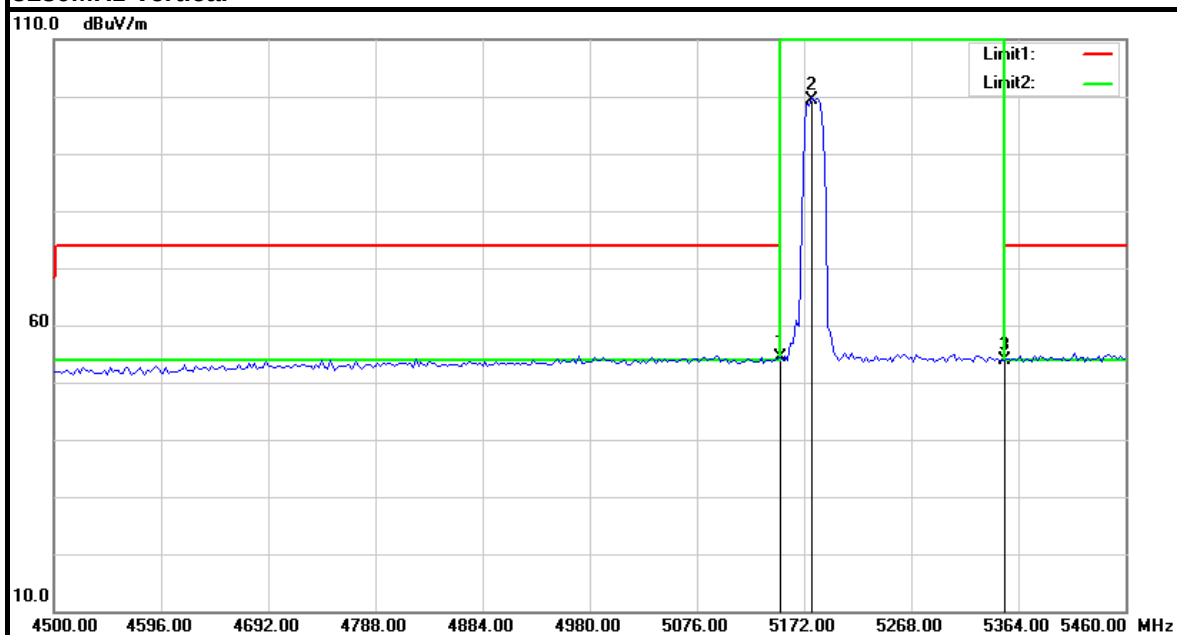
1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) - Pre-amplifier Gain (dB).
3. The emission levels of other frequencies were less than 20dB margin against the limit.
4. Margin value = Emission level – Limit value.
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

Band edge Plot

5180MHz Horizontal



5180MHz Vertical



802.11n (20MHz)

CHANNEL	TX Channel 36	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 40GHz		Average (AV)

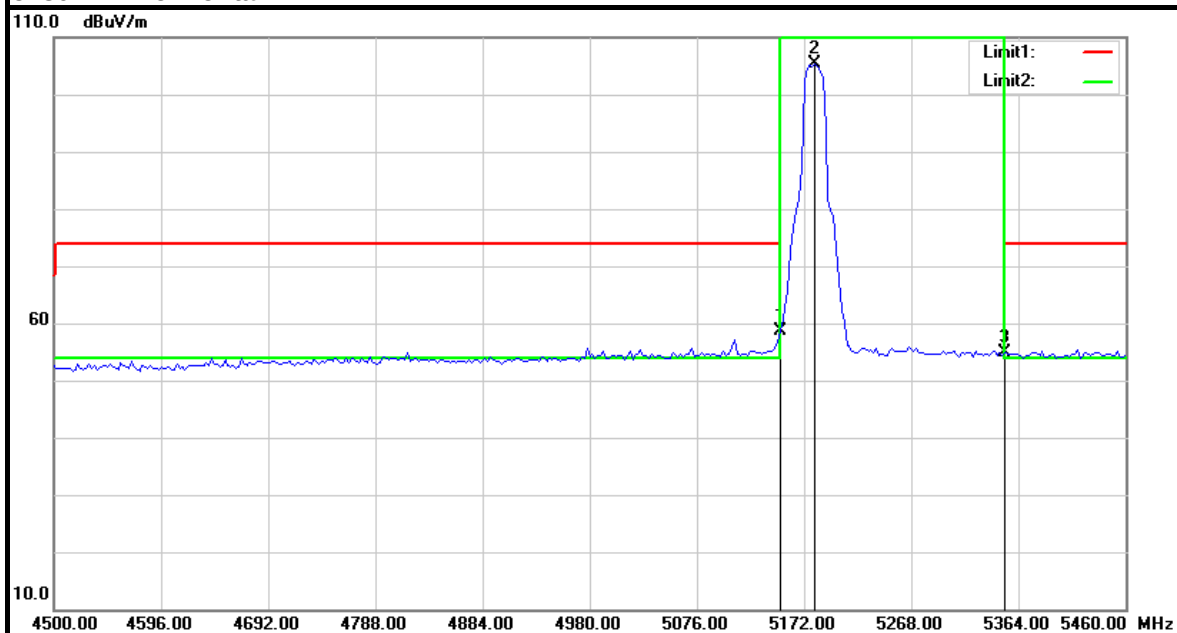
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M						
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)
1	5150	58.57 PK	74	-15.43	202	75
2	5150	44.86 AV	54	-9.14	202	75
3	*5180.00	105.44 PK			186	340
4	*5180.00	96.11 AV			186	340
5	5350	54.99 PK	74	-19.01	225	166
6	5350	43.67 AV	54	-10.33	225	166
7	#10360.00	61.06 PK	68.3	-7.24	187	271
8	15540	61.4 PK	74	-12.6	163	197
9	15540	50.02 AV	54	-3.98	163	197
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)
1	5149.9	55.01 PK	74	-18.99	160	44
2	5149.9	43.7 AV	54	-10.3	160	44
3	*5180.00	96.02 PK			123	135
4	*5180.00	86.75 AV			123	135
5	5350	55.12 PK	74	-18.88	151	48
6	5350	43.72 AV	54	-10.28	151	48
7	#10360.00	61.33 PK	68.3	-6.97	153	151
8	15540	61.91 PK	74	-12.09	222	302
9	15540	50.25 AV	54	-3.75	222	302

REMARKS:

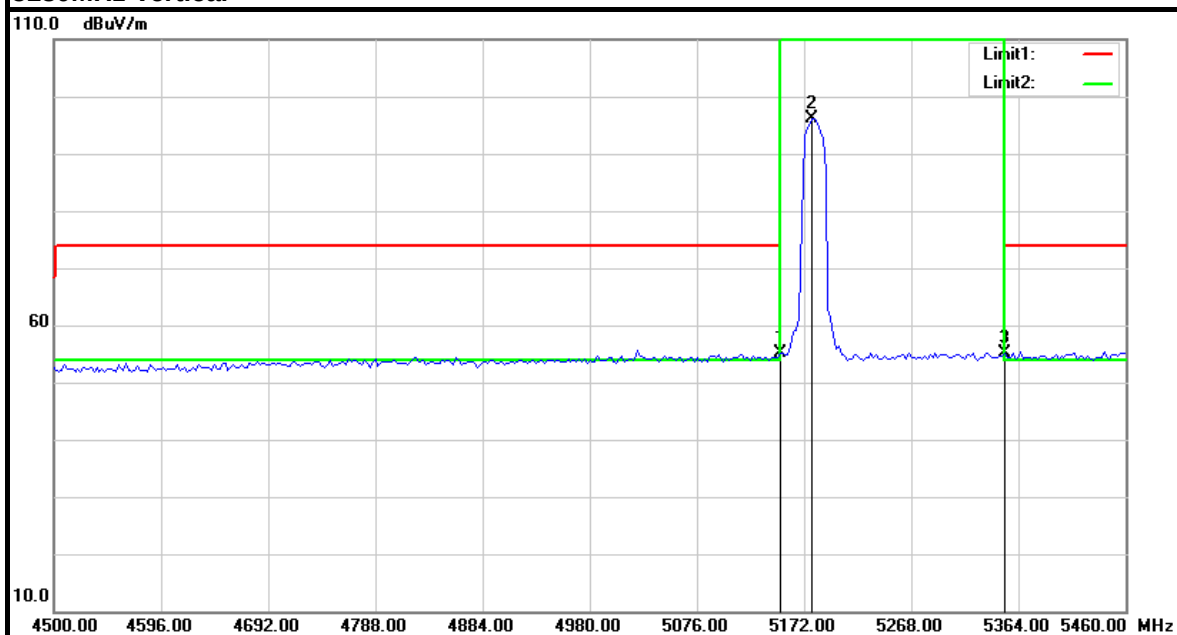
1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) - Pre-amplifier Gain (dB).
3. The emission levels of other frequencies were less than 20dB margin against the limit.
4. Margin value = Emission level – Limit value.
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

Band edge Plot

5180MHz Horizontal



5180MHz Vertical



Band 4 (5745MHz):

ABOVE 1GHz DATA

802.11a

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

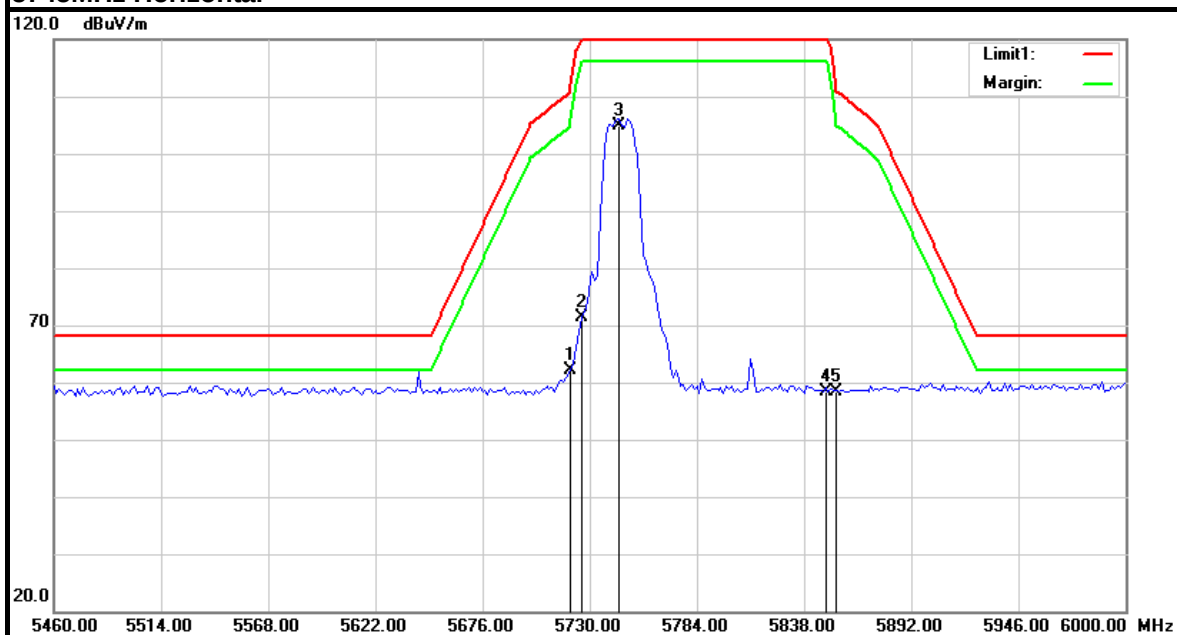
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M						
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)
1	#5720.00	62.11 PK	110.8	-48.69	143	319
2	#5725.00	71.28 AV	122.2	-50.92	141	196
3	*5745.00	104.86 PK			246	322
4	*5745.00	97.01 AV			246	322
5	#5850.00	58.42 PK	122.2	-63.78	242	142
6	#5855.00	58.38 AV	110.8	-52.42	242	142
7	11490	59.84 PK	74	-14.16	218	29
8	11490	49.38 PK	54	-4.62	218	29
9	#17235.00	65.31 AV	74	-8.69	193	143
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)
1	#5720.00	58.39 PK	110.8	-52.41	143	9
2	#5725.00	61.12 AV	122.2	-61.08	143	62
3	*5745.00	95.85 PK			127	113
4	*5745.00	87.05 AV			127	113
5	#5850.00	58.06 PK	122.2	-64.14	192	182
6	#5855.00	58.6 AV	110.8	-52.2	192	182
7	11490	62.03 PK	74	-11.97	150	145
8	11490	49.47 PK	54	-4.53	150	145
9	#17235.00	64.36 AV	74	-9.64	129	167

REMARKS:

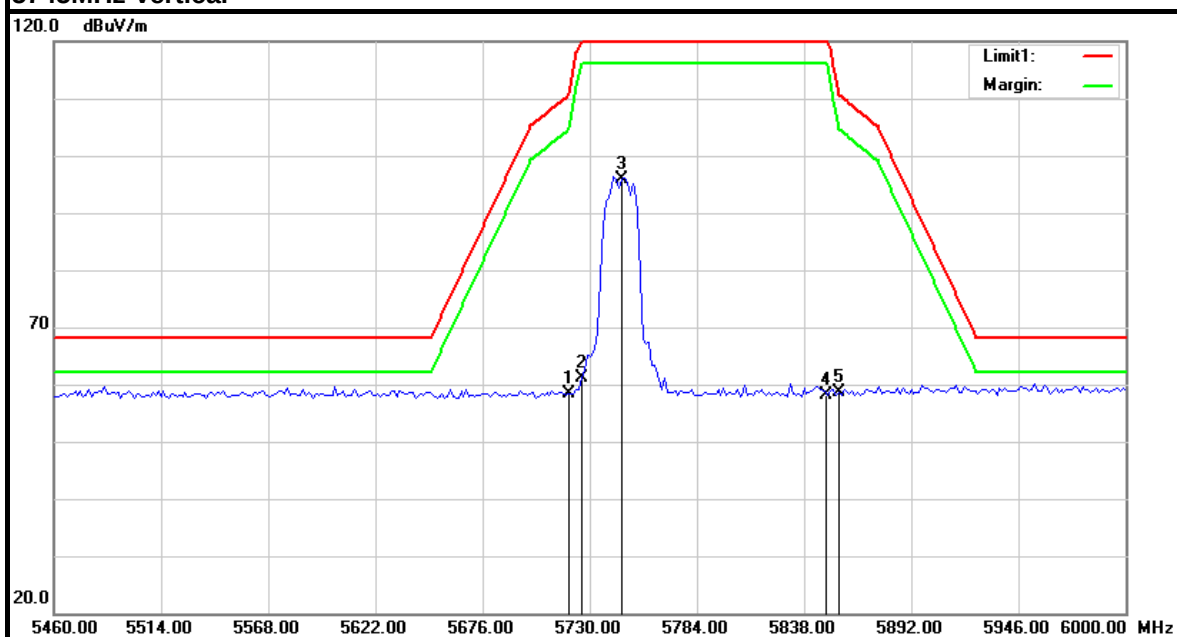
1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) - Pre-amplifier Gain (dB).
3. The emission levels of other frequencies were less than 20dB margin against the limit.
4. Margin value = Emission level – Limit value.
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

Band edge Plot

5745MHz Horizontal



5745MHz Vertical



802.11n (20MHz)

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

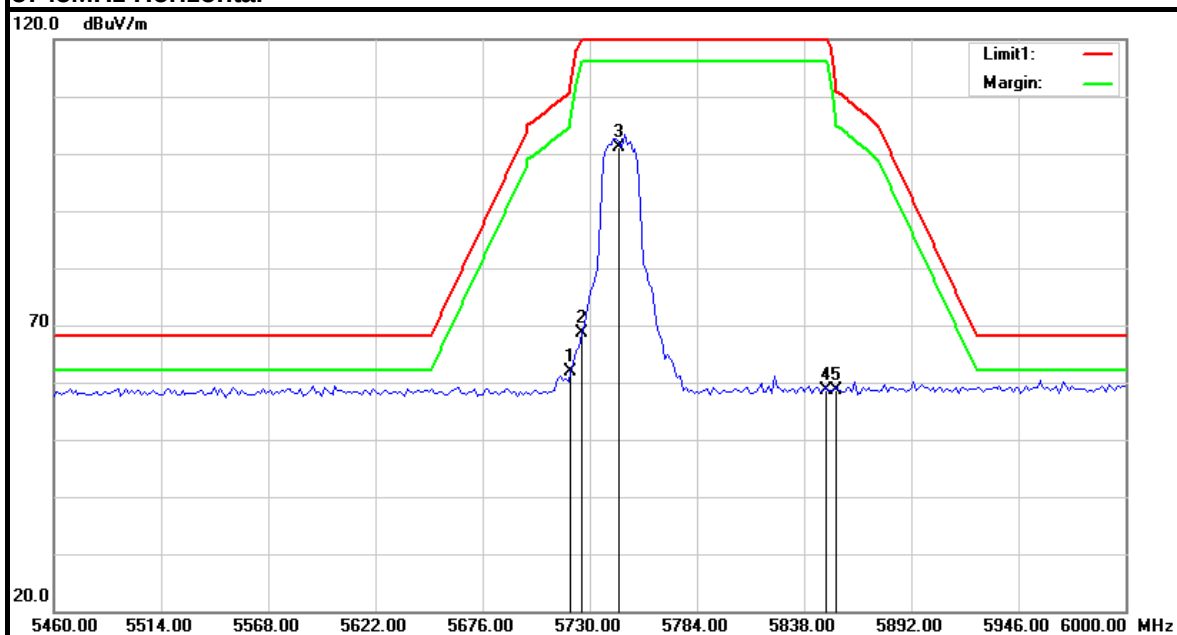
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M						
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)
1	#5720.00	61.83 PK	110.8	-48.97	190	190
2	#5725.00	68.7 AV	122.2	-53.5	131	133
3	*5745.00	101.19 PK			158	47
4	*5745.00	92.36 AV			158	47
5	#5850.00	58.57 PK	122.2	-63.63	147	58
6	#5855.00	58.74 AV	110.8	-52.06	147	58
7	11490	59.08 PK	74	-14.92	233	266
8	11490	48.06 PK	54	-5.94	233	266
9	#17235.00	64.26 AV	74	-9.74	138	14
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)
1	#5720.00	58.47 PK	110.8	-52.33	135	112
2	#5725.00	59.34 AV	122.2	-62.86	183	299
3	*5745.00	91.67 PK			135	41
4	*5745.00	82.06 AV			135	41
5	#5850.00	58.37 PK	122.2	-63.83	167	132
6	#5855.00	59.09 AV	110.8	-51.71	167	132
7	11490	59.74 PK	74	-14.26	250	308
8	11490	48.05 PK	54	-5.95	250	308
9	#17235.00	64.51 AV	74	-9.49	249	78

REMARKS:

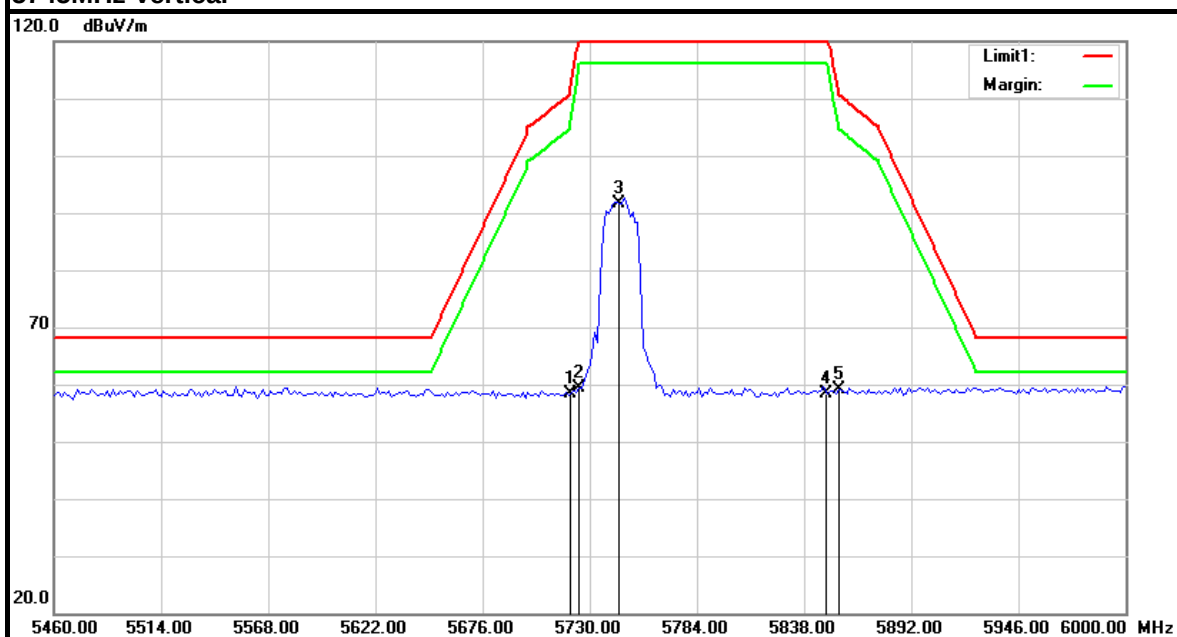
1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) - Pre-amplifier Gain (dB).
3. The emission levels of other frequencies were less than 20dB margin against the limit.
4. Margin value = Emission level – Limit value.
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

Band edge Plot

5745MHz Horizontal



5745MHz Vertical



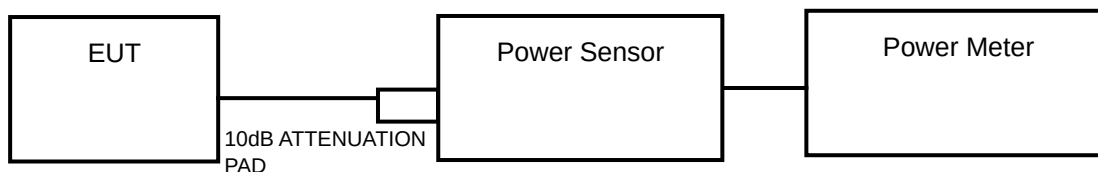
3.2 TRANSMIT POWER MEASUREMENT

LIMITS OF TRANSMIT POWER MEASUREMENT

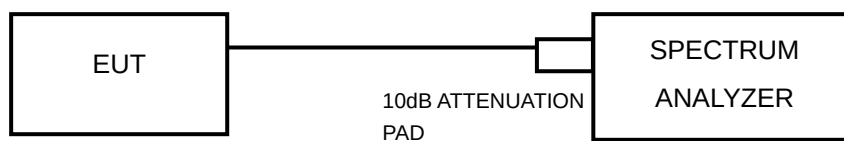
Operation Band	EUT Category		LIMIT
U-NII-1	√	Outdoor Access Point	1 Watt (30 dBm) (Max. e.i.r.p $\leq$ 125mW(21 dBm) at any elevation angle above 30 degrees as measured from the horizon)
		Fixed point-to-point Access Point	1 Watt (30 dBm)
		Indoor Access Point	1 Watt (30 dBm)
		Mobile and Portable client device	250mW (24 dBm)
U-NII-2A	-		250mW(24dBm) or 11 dBm+10LogB*
U-NII-2C	-		250mW(24dBm) or 11 dBm+10LogB*
U-NII-3	√		1 Watt (30 dBm)

NOTE: 1. Where B is the 26dB emission bandwidth in MHz.

3.2.1 TEST SETUP



FOR 6/26dB BANDWIDTH



3.2.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Wireless Connectivity Tester	R&S	CMW270	1201.0002K75	Dec. 28, 19	Dec. 27, 20
MXA VEXTOR SIGNAL	Agilent	n5182a	MY50140530	Mar. 24, 20	Mar. 24, 21
MXA signal analyzer	Agilent	n9020a	MY49100060	Mar. 24, 20	Mar. 24, 21
RF Control Unit	Tonscend	JS0806-2	188060112	Mar. 24, 20	Mar. 24, 21
Signal Generation	Agilent	E4421B	US40051152	Dec. 18, 19	Dec. 17, 20
DC Power Supply	Agilent	E3640A	MY40004013	Mar. 30, 20	Mar. 30, 21
Programmable Temperature & Humidity Chamber	Hongjin	HYC-TH-225 DH	DG-180746	Mar. 24, 20	Mar. 24, 21
Test System	Tonscend	JS 1120-3	N/A	N/A	N/A
Power Splitter	Weinschel	1580-1	TL177	Mar. 27, 20	Mar. 27, 21

NOTE:

1. The test was performed in RF Oven room.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA, GREGT/CHINA and NIM/CHINA.

3.2.3 TEST PROCEDURE

FOR AVERAGE POWER MEASUREMENT

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

FOR 26dB BANDWIDTH

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

FOR 6dB BANDWIDTH

- 1) Set RBW = 100 kHz.
- 2) Set the video bandwidth (VBW) ≥ 3 RBW.
- 3) Detector = Peak.
- 4) Trace mode = max hold.
- 5) Sweep = auto couple.
- 6) Allow the trace to stabilize.
- 7) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

3.2.4 DEVIATION FROM TEST STANDARD

No deviation.

3.2.5 EUT OPERATING CONDITIONS

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

TEST RESULTS

OUTPUT POWER:

802.11a

CHAN.	FREQ. (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass/Fail
		CHAIN 0	CHAIN 1				
36	5180	10.57	8.58	18.621	12.7	21	Pass
149	5745	8.95	8.42	14.791	11.7	30	Pass

802.11n (20MHz)

CHAN.	FREQ. (MHz)	Maximum Conducted Power (dBm)		Total Power (mW)	Total Power (dBm)	Power Limit (dBm)	Pass/Fail
		CHAIN 0	CHAIN 1				
36	5180	9.43	5.84	12.618	11.01	21	Pass
149	5745	7.98	5.72	10.023	10.01	30	Pass

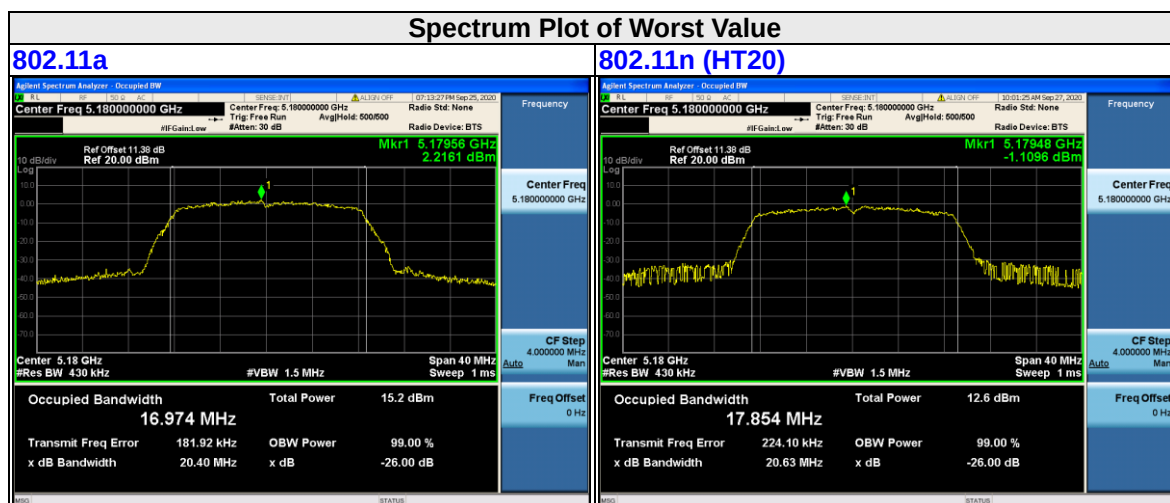
26dB BANDWIDTH for 5150-5250MHz:

802.11a

Channel	Channel Frequency (MHz)	26dB Bandwidth (MHz)	
		Chain 0	Chain 1
36	5180	20.31	20.40

802.11n (20MHz)

Channel	Channel Frequency (MHz)	26dB Bandwidth (MHz)	
		Chain 0	Chain 1
36	5180	20.20	20.63



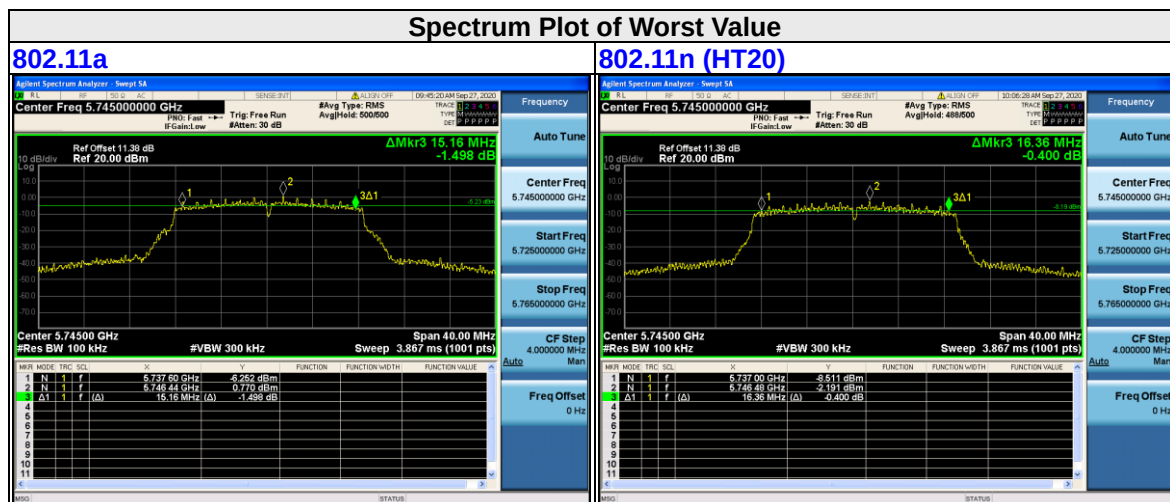
6dB BANDWIDTH for 5725-5850MHz

802.11a

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
149	5745	15.16	15.12	0.5	Pass

802.11n (20M)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
149	5745	16.36	15.16	0.5	Pass

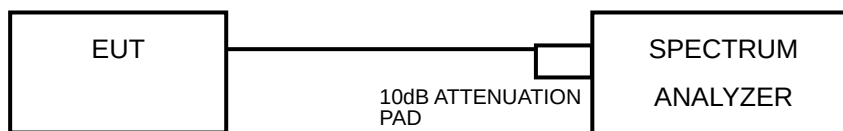


3.3 PEAK POWER SPECTRAL DENSITY MEASUREMENT

LIMITS OF PEAK POWER SPECTRAL DENSITY MEASUREMENT

Operation Band	EUT Category		LIMIT
U-NII-1	√	Outdoor Access Point	17dBm/ MHz
		Fixed point-to-point Access Point	
		Indoor Access Point	
		Mobile and Portable client device	11dBm/ MHz
U-NII-2A	-		11dBm/ MHz
U-NII-2C	-		11dBm/ MHz
U-NII-3	√		30dBm/ 500kHz

3.3.1 TEST SETUP



3.3.2 TEST INSTRUMENTS

Refer to section 3.3.3 to get information of above instrument.

3.3.3 TEST PROCEDURES

For U-NII-1, U-NII-2A, U-NII-2C band:

Using method SA-2

- 1) Set span to encompass the entire emission bandwidth (EBW) of the signal.
- 2) Set RBW = 1MHz, Set VBW =3 MHz, Detector = RMS
- 3) Set Channel power measure = 1MHz
- 4) Sweep time = auto, trigger set to “free run”.
- 5) Trace average at least 100 traces in power averaging mode.
- 6) Record the max value and add 10 log (1/duty cycle)

For U-NII-3 band:

Using method SA-2

- 1) Set span to encompass the entire emission bandwidth (EBW) of the signal.
- 2) Set RBW = 300 kHz, Set VBW = 1 MHz, Detector = RMS
- 3) Set Channel power measure = 1MHz
- 4) Sweep time = auto, trigger set to "free run".
- 5) Trace average at least 100 traces in power averaging mode.
- 6) Record the max value and add 10 log (1/duty cycle)

3.3.4 DEVIATION FROM TEST STANDARD

No deviation.

3.3.5 EUT OPERATING CONDITIONS

Same as 3.3.6

TEST RESULTS

For 5.180~5.240GHz
802.11a

Channel Number	Frequency(MHz)	RF Power Level in 1MHz BW (dBm)		Total power density(mW)	MAX.Limit (dBm)	PASS /FAIL
		Chain 0	Chain 1			
36	5180	7.695	3.869	9.201	17	PASS

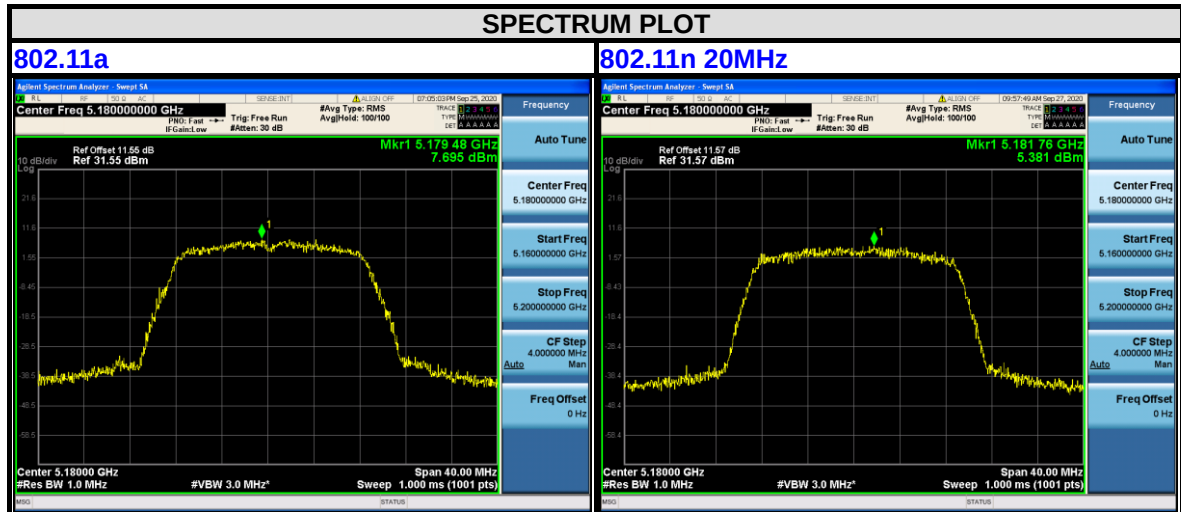
Note: 1. Directional gain = 2dBi + 10log(2) = 5.01dBi < 6dBi , so the power density limit is 17dBm.
2. Refer to section 2.3 for duty cycle spectrum plot.

802.11n (20MHz)

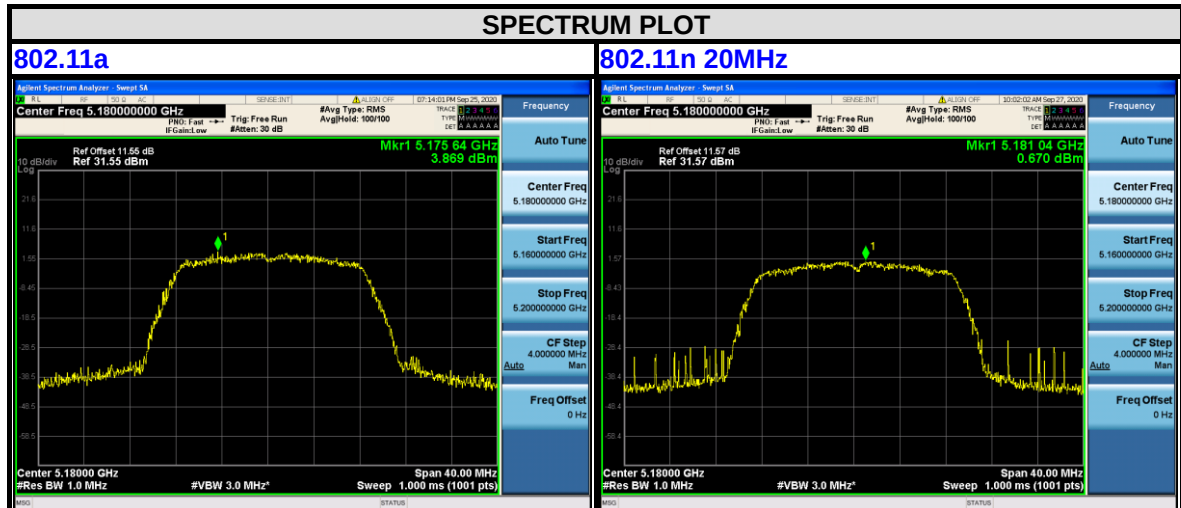
Channel Number	Frequency(MHz)	RF Power Level in 1MHz BW (dBm)		Total power density(mW)	MAX.Limit (dBm)	PASS /FAIL
		Chain 0	Chain 1			
36	5180	5.381	0.67	6.646	17	PASS

Note: 1. Directional gain = 2dBi + 10log(2) = 5.01dBi < 6dBi , so the power density limit is 17dBm.
2. Refer to section 2.3 for duty cycle spectrum plot.

CHAIN 0



CHAIN 1



For 5.745~5.825GHz

802.11a

RF Power Level in 300kHz BW

Channel Number	Frequency(MHz)	RF Power Level in 300kHz BW (dBm)		Total power density(mW)	MAX.Limit (dBm)	PASS /FAIL
		Chain 0	Chain 1			
149	5745	3.587	-1.673	4.719	30	PASS

- Note:**
1. Directional gain = $2dBi + 10\log(2) = 5.01dBi < 6dBi$, so the power density limit is 30dBm.
 2. Refer to section 2.3 for duty cycle spectrum plot.

RF Power Level in 500kHz BW

Channel Number	Frequency(MHz)	RF Power Level in 500kHz BW (dBm)		Total power density(mW)	MAX.Limit (dBm)	PASS /FAIL
		Chain 0	Chain 1			
149	5745	5.876	3.533	7.871	30	PASS

- Note:**
1. Directional gain = $2dBi + 10\log(2) = 5.01dBi < 6dBi$, so the power density limit is 30dBm.
 2. Refer to section 2.3 for duty cycle spectrum plot.

802.11n (20MHz)

RF Power Level in 300kHz BW

Channel Number	Frequency(MHz)	RF Power Level in 300kHz BW (dBm)		Total power density(mW)	MAX.Limit (dBm)	PASS /FAIL
		Chain 0	Chain 1			
149	5745	1.093	-1.93	2.85	30	PASS

- Note:**
1. Directional gain = $2dBi + 10\log(2) = 5.01dBi < 6dBi$, so the power density limit is 30dBm.
 2. Refer to section 2.3 for duty cycle spectrum plot.

RF Power Level in 500kHz BW

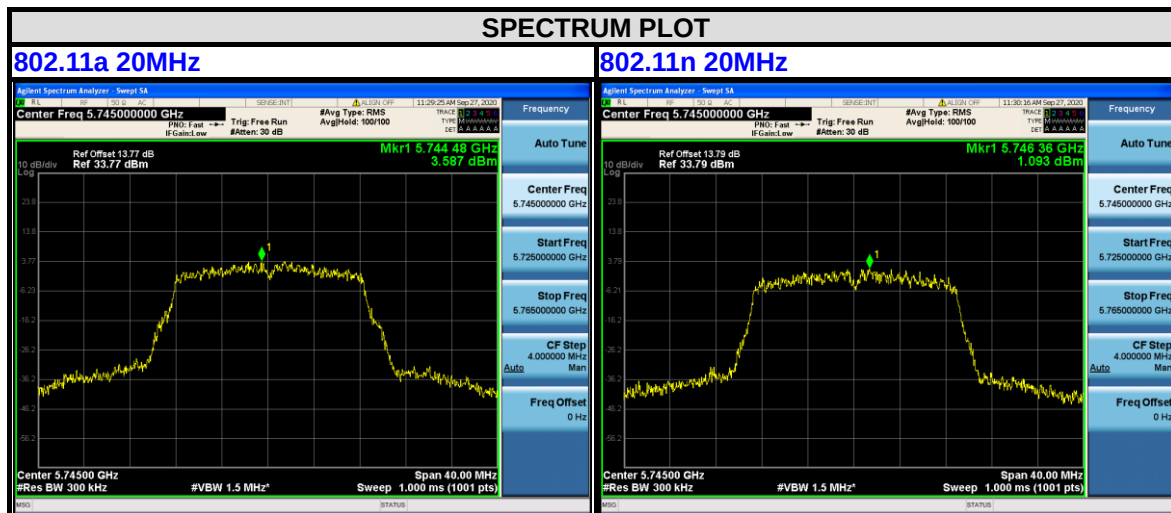
Channel Number	Frequency(MHz)	RF Power Level in 500kHz BW (dBm)		Total power density(mW)	MAX.Limit (dBm)	PASS /FAIL
		Chain 0	Chain 1			
149	5745	4.345	0.539	5.857	30	PASS

- Note:**
1. Directional gain = $2dBi + 10\log(2) = 5.01dBi < 6dBi$, so the power density limit is 30dBm.
 2. Refer to section 2.3 for duty cycle spectrum plot.

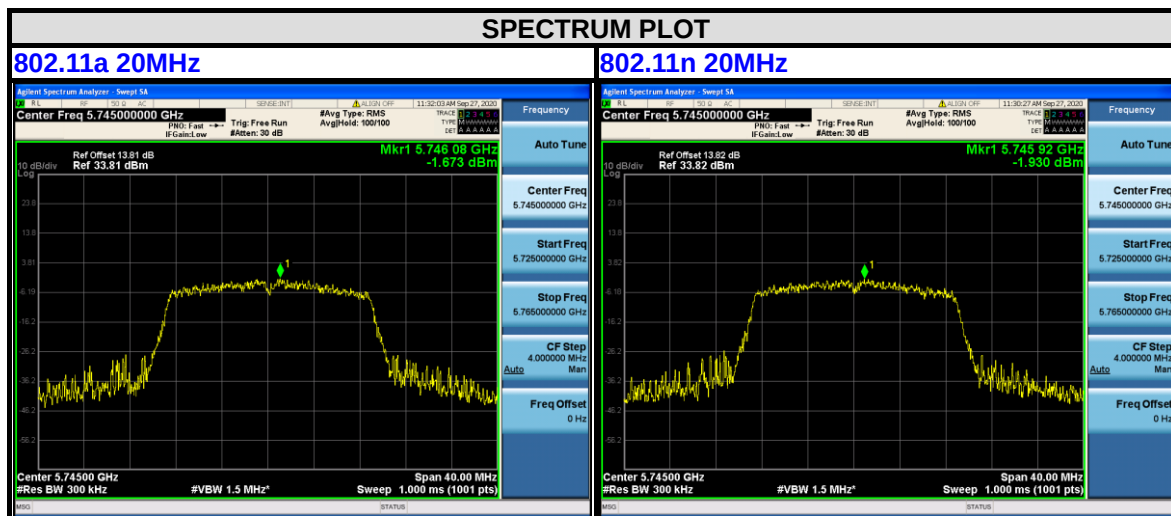
PSD Test Plot

RF Power Level in 300kHz BW

CHAIN 0



CHAIN 1



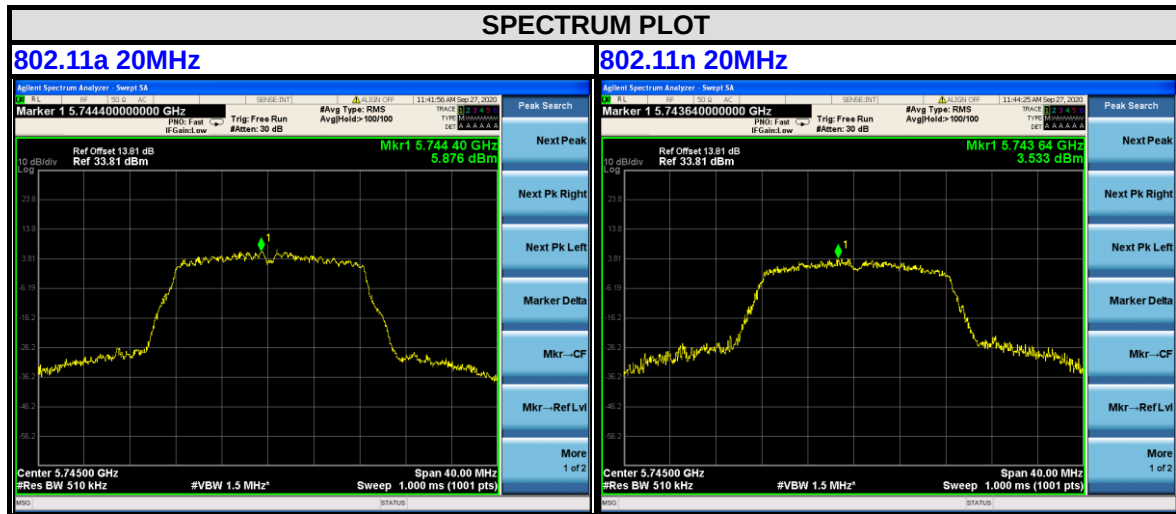


BUREAU
VERITAS

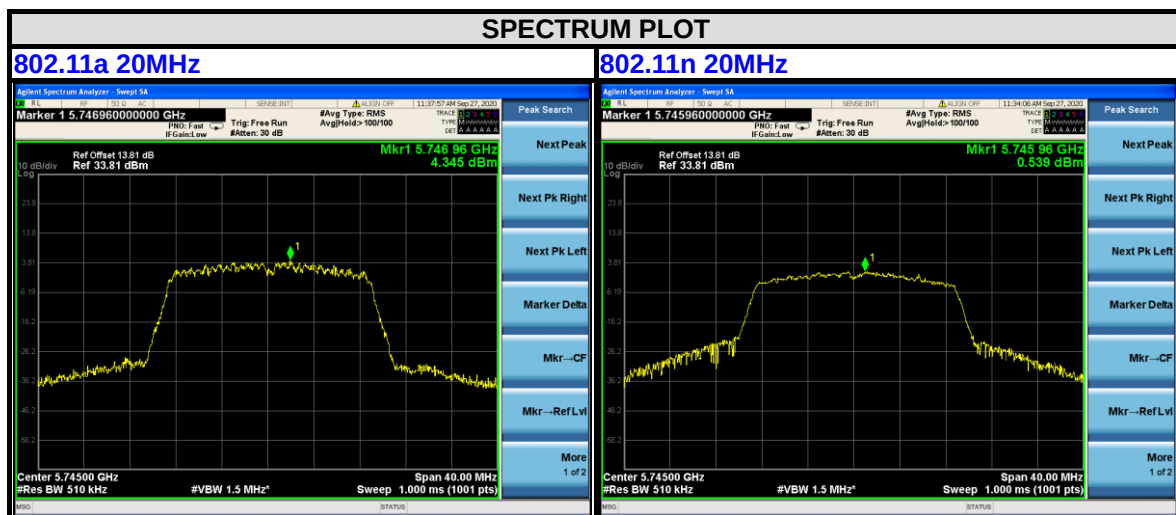
Test Report No.: RF200612N047-3

RF Power Level in 500kHz BW

CHAIN 0



CHAIN 1



Bureau Veritas Shenzhen Co., Ltd.
Dongguan Branch

No. 96, Guantai Road (Houjie Section), Houjie
Town, Dongguan City, Guangdong Province.
523942. People's Republic of China.

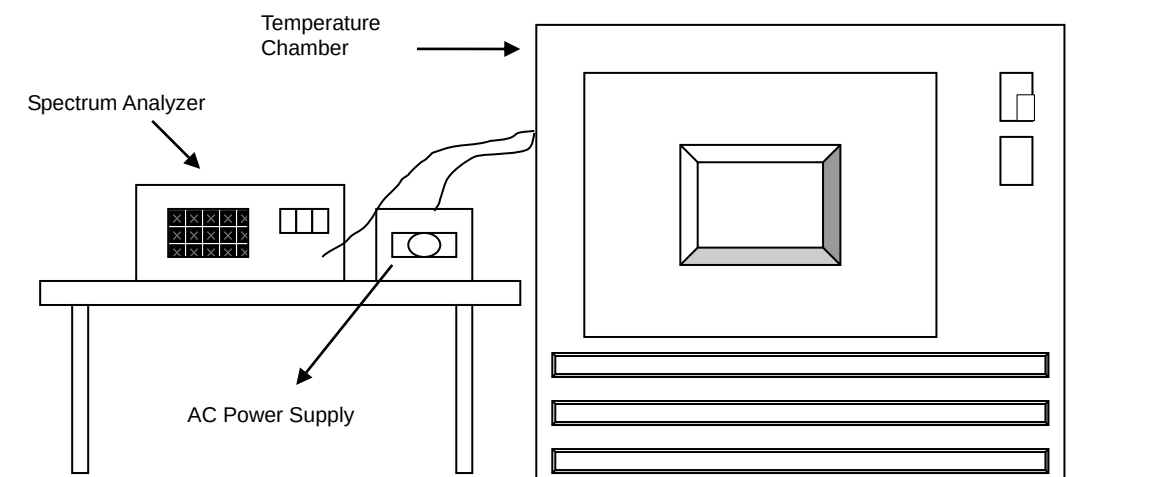
Tel: +86 769 8998 2098
Fax: +86 769 8593 1080
Email: customerservice.dg@cn.bureauveritas.com

3.4 FREQUENCY STABILITY

LIMITS OF FREQUENCY STABILITY MEASUREMENT

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

3.4.1 TEST SETUP



3.4.2 TEST INSTRUMENTS

Refer to section 3.3.3 to get information of above instrument.

3.4.3 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.

3.4.4 DEVIATION FROM TEST STANDARD

No deviation.

3.4.5 EUT OPERATING CONDITION

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

TEST RESULTS

FREQUENCY STABILITY VERSUS TEMP.									
OPERATING FREQUENCY: 5180MHz									
TEMP. (°C)	POWER SUPPLY (Vac)	0 MINUTE		2 MINUTE		5 MINUTE		10 MINUTE	
		Measured Frequency (MHz)	Frequency Drift	Measured Frequency (MHz)	Frequency Drift	Measured Frequency (MHz)	Frequency Drift	Measured Frequency (MHz)	Frequency Drift
50	8.4	5180.0676	0.00131	5180.08	0.00148	5180.0759	0.00147	5180.0804	0.00155
40	8.4	5180.0687	0.00133	5180.07	0.00141	5180.0762	0.00147	5180.0784	0.00151
30	8.4	5180.07	0.00135	5180.08	0.00147	5180.0696	0.00134	5180.0801	0.00155
20	8.4	5180.0558	0.00108	5180.07	0.00133	5180.08	0.00154	5180.0846	0.00163
10	8.4	5180.0692	0.00134	5180.08	0.00148	5180.0699	0.00135	5180.0759	0.00147
0	8.4	5180.0672	0.0013	5180.07	0.00135	5180.0807	0.00156	5180.0685	0.00132
-10	8.4	5180.0694	0.00134	5180.07	0.00132	5180.0787	0.00152	5180.0727	0.0014
-20	8.4	5180.0755	0.00146	5180.08	0.00153	5180.0661	0.00128	5180.0855	0.00165
-30	8.4	5180.0689	0.00133	5180.07	0.00129	5180.0782	0.00151	5180.0856	0.00165

FREQUENCY STABILITY VERSUS TEMP.									
OPERATING FREQUENCY: 5180MHz									
TEMP. (°C)	POWER SUPPLY (Vac)	0 MINUTE		2 MINUTE		5 MINUTE		10 MINUTE	
		Measured Frequency (MHz)	Frequency Drift	Measured Frequency (MHz)	Frequency Drift	Measured Frequency (MHz)	Frequency Drift	Measured Frequency (MHz)	Frequency Drift
20	9.66	5180.0114	0.00022	5180.08	0.00155	5180.0708	0.00137	5180.0839	0.00162
	8.4	5180.0558	0.00108	5180.07	0.00133	5180.08	0.00154	5180.0846	0.00163
	7.14	5180.0119	0.00023	5180.08	0.00148	5180.0761	0.00147	5180.0764	0.00147



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4. PHOTOGRAPHS OF THE TEST CONFIGURATION

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



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5. 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---