



Test Report No.: RF181225N030



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	N/A
Model	W1
Additional Model & Model Difference	X26, S107G, S109G, S111G, S5, S8, S39-1, X4, etc., see items 3.1
Date of tests	Dec. 25, 2018 ~ Apr. 15, 2019

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 Breeze Jiang Project Engineer/ EMC Department	Approved by Glyn He Supervisor / EMC Department
	 Date: Apr. 19, 2019

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF181225N030	Original release.	Apr. 19, 2019



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	Power 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	3.83dB
	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.



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2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

PRODUCT NAME	DRONE
MODEL NO.	W1
ADDITIONAL MODELS	S107G, S107H, S109G, S111G, S5H, S8, S39-1, X4, X5, X5C, X5S, X5SC, X5SW, X5HC, X5HW, X5U, X5UC, X5UW, X5UW(720P), X5UW-D, X8C, X8W, X8G, X8HC, X8HG, X8HW(720P), X8SC, X8SW(720P), X8SW(720P)-D, X8PRO, X9, X9S, X11, X11C, X12S, X13, X14W(720P), X14, X15, X15C, X15-S, X15W, X15A, X18, X20, X20-S, X20W, X21, X21-S, X21W, X21W-1, X22, X22-S, X22S, X22SW, X22W, X22W-1, X23, X23W, X25W, X25PRO, X26, X26A, X27, X27W, X28, W1, Z1, Z2, Z3, X54HW, X56W, X56W-P, X57, X28W, X29, X29W, X30, X30W
FCC ID	QV7-GC88752-31
POWER SUPPLY	DC 7.6V from Plane Battery
MODULATION TYPE	256QAM, 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 86.7Mbps
OPERATING FREQUENCY	5180MHz, 5745MHz
NUMBER OF CHANNEL	Refer to 2.2 section
CONDUCTED OUTPUT POWER	12.86dBm (Maximum AVG Power)
ANTENNA TYPE	5180MHz: Wire antenna with 2dBi gain 5745MHz: Wire antenna with 2dBi gain
I/O PORTS	Refer to user's manual
CABLE SUPPLIED	N/A



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NOTE:

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

MODULATION MODE	TX FUNCTION
802.11a	1TX
802.11n 20MHz	1TX

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.: 181225N030) for detailed product photo.
5. Additional models (see about table) are identical with the test model W1 except the model name for trading purpose.
6. When the EUT charging that wireless function can't working, the charging mode was tested in the FCC Part 15B(sDOC) report.(report no.: FS 181225N030)



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2.2 DESCRIPTION OF TEST MODES

1 channel is provided for 802.11a, 802.11n (20MHz):

CHANNEL	FREQUENCY
36	5180 MHz

1 channel is 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 \geq 1G	RE<1G	PLC	APCM	
-	√	√	-	√	Powered by fully Battery with wifi(5G) link

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

NOTE: "-" means no effect.

RADIATED EMISSION TEST (ABOVE 1GHz):

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

EUT CONFIGURE MODE	MODE	FREQ. BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
-	802.11a	5180	36	36	OFDM	BPSK	6.0
-	802.11n (20MHz)		36	36	OFDM	BPSK	6.5
-	802.11a	5745	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	5180 5745	36 149	36	OFDM	BPSK	6.0



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POWER LINE CONDUCTED EMISSION TEST:

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

EUT CONFIGURE MODE	MODE	FREQ. BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
-	802.11a	5180 5745	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	5180	36	36	OFDM	BPSK	6.0
-	802.11n (20MHz)		36	36	OFDM	BPSK	6.5
-	802.11a	5745	149	149	OFDM	BPSK	6.0
-	802.11n (20MHz)		149	149	OFDM	BPSK	6.5

TEST CONDITION:

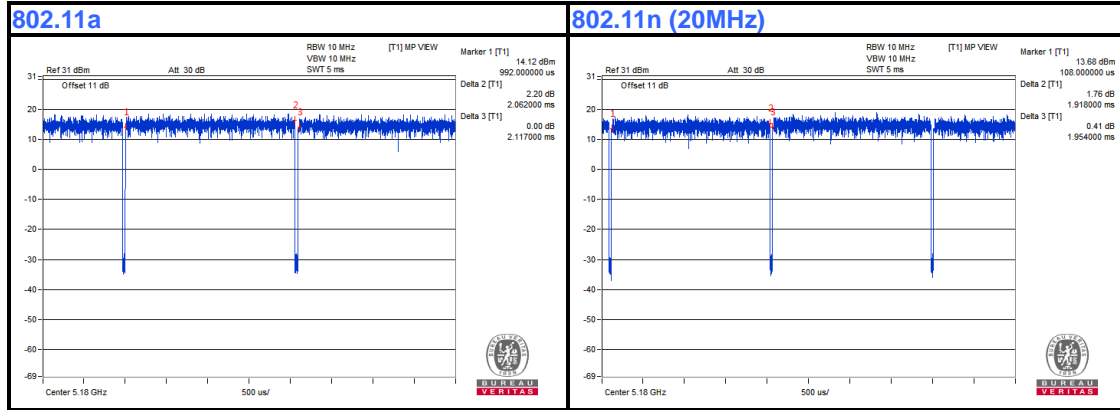
APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE<1G	25deg. C, 51%RH	DC 7.6V from fully Battery	Daniel
RE≥1G	25deg. C, 51%RH	DC 7.6V from fully Battery	Daniel
PLC	N/A	N/A	N/A
APCM	20deg. C, 55%RH	DC 7.6V from fully Battery	Robert Cheng



2.3 DUTY CYCLE OF TEST SIGNAL

802.11a: 98.2%

802.11n (20MHz): 98.4%



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 v01r03

ANSI C63.10-2013

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



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3. TEST TYPES AND RESULTS

3.1 RADIATED EMISSION AND BANDEDGE MEASUREMENT

3.1.1 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

NOTES:

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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3.1.2 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:

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



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3.1.3 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESU40	100449	Mar. 12,19	Mar. 11,20
Signal and Spectrum Analyzer	Rohde&Schwarz	FSV7	102331	Aug. 02,18	Aug. 01,19
Active Loop Antenna (9KHz -30MHz)	SCHWARZBECK	FMZB 1519B	1519B-045	May 04,18	May 03,19
Amplifier (9KHz -1GHz)	Burgeon	BPA-530	100210	Apr. 18,18	Apr. 18,19
Bilog Antenna (20MHz -2GHz)	Teseq	CBL 6111D	30643	Aug. 11, 18	Aug. 10, 19
Horn Antenna (1GHz -18GHz)	ETS -Lindgren	3117	00062558	Jul. 21, 18	Jul. 20, 19
Horn Antenna (18GHz -40GHz)	SCHWARZBECK	BBHA 9170	BBHA9170242	May 05,18	May 04,19
3m Semi-anechoic Chamber	ETS-LINDGREN	9m*6m*6m	NSEMC003	Feb. 10,19	Feb. 09,20
Test Software	ADT	ADT_Radiated_V7.6.15.9.2	N/A	N/A	N/A
Broadband Preamplifier (1GHz~18GHz)	SCHWARZBECK	BBV9718	305	Apr. 18,18	Apr. 18,19
Pre-Amplifier (18GHz-40GHz)	EMCI	EMC 184045	980102	Nov. 09,18	Nov. 08,19
Test Software	ADT	ADT_Radiated_V7.6.15.9.2	N/A	N/A	N/A

NOTES:

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.



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3.1.4 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:

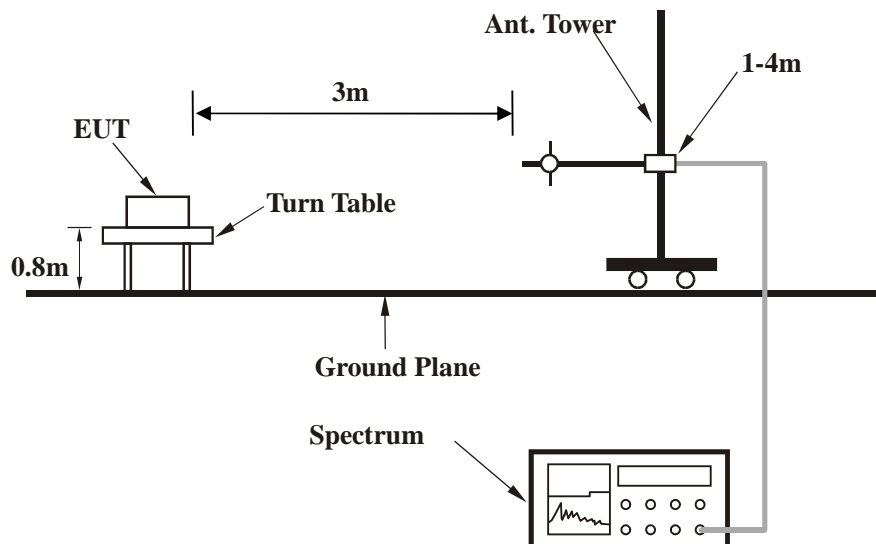
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
3. The resolution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

3.1.5 DEVIATION FROM TEST STANDARD

No deviation.

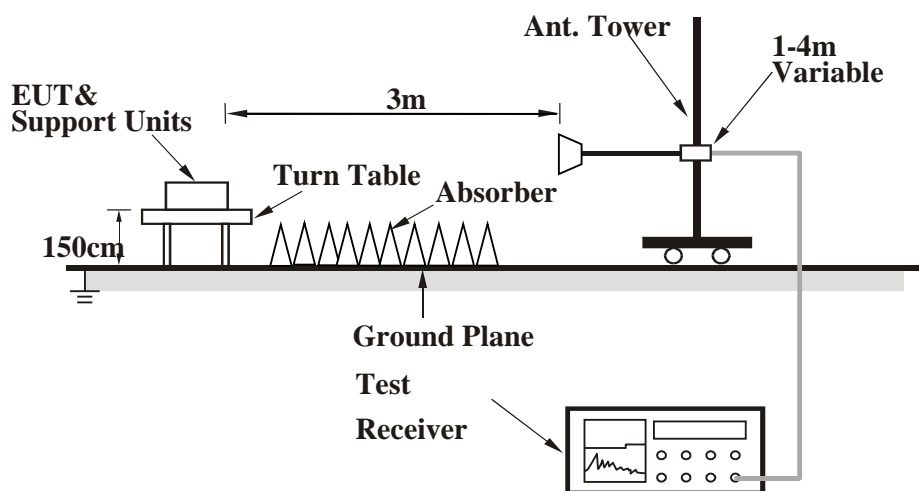
3.1.6 TEST SETUP

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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3.1.7 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.



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3.1.8 TEST RESULTS

BELOW 1GHz WORST-CASE DATA

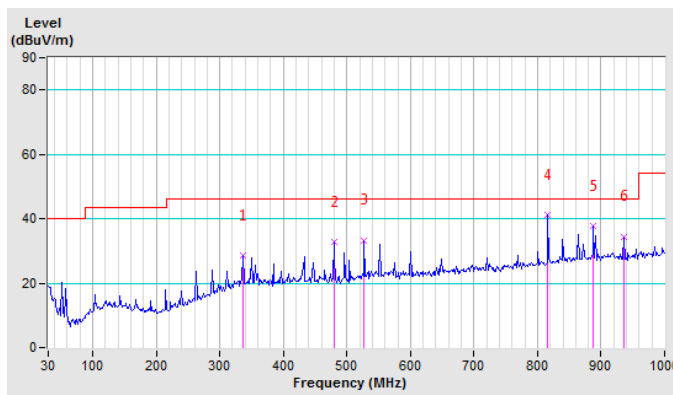
802.11a

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	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	336.23	28.64 QP	46.00	-17.36	1.00 H	12	39.83	-11.19
2	479.25	32.87 QP	46.00	-13.13	1.00 H	0	40.93	-8.06
3	527.44	33.34 QP	46.00	-12.66	1.00 H	211	40.04	-6.70
4	816.57	41.06 QP	46.00	-4.94	1.00 H	23	42.81	-1.75
5	888.08	37.84 QP	46.00	-8.16	1.00 H	134	38.54	-0.70
6	936.27	34.48 QP	46.00	-11.52	1.00 H	48	34.92	-0.44

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 emission levels of other frequencies were less than 20dB margin against the limit.
4. Margin value = Emission level – Limit value.





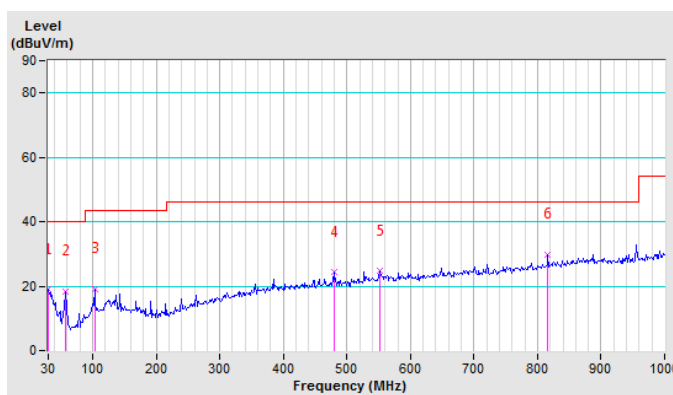
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CHANNEL	TX Channel 36	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	30.00	19.12 QP	40.00	-20.88	1.00 V	117	29.25	-10.13
2	57.98	18.48 QP	40.00	-21.52	1.00 V	242	41.86	-23.38
3	103.06	19.22 QP	43.50	-24.28	1.00 V	183	37.00	-17.78
4	479.25	24.33 QP	46.00	-21.67	1.00 V	159	32.39	-8.06
5	552.31	24.71 QP	46.00	-21.29	1.00 V	194	30.73	-6.02
6	816.57	29.91 QP	46.00	-16.09	1.00 V	302	31.66	-1.75

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 emission levels of other frequencies were less than 20dB margin against the limit.
4. Margin value = Emission level – Limit value.





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Band 1:

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)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5145.00	54.23 PK	74.00	-19.77	1.00 H	128	48.44	5.79
2	5145.00	38.38 AV	54.00	-15.62	1.00 H	128	32.59	5.79
3	5150.00	62.01 PK	74.00	-11.99	1.00 H	128	56.21	5.80
4	5150.00	40.92 AV	54.00	-13.08	1.00 H	128	35.12	5.80
5	*5180.00	104.95 PK			1.00 H	128	99.04	5.91
6	*5180.00	94.97 AV			1.00 H	128	89.06	5.91
7	#10360.00	62.27 PK	68.20	-5.93	1.00 H	125	48.22	14.05
8	15540.00	64.36 PK	74.00	-9.64	1.00 H	174	43.47	20.89
9	15540.00	50.68 AV	54.00	-3.32	1.00 H	174	29.79	20.89
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	5145.00	50.27 PK	74.00	-23.73	1.00 V	250	44.48	5.79
2	5145.00	37.12 AV	54.00	-16.88	1.00 V	250	31.33	5.79
3	5150.00	58.13 PK	74.00	-15.87	1.00 V	250	52.33	5.80
4	5150.00	39.45 AV	54.00	-14.55	1.00 V	250	33.65	5.80
5	*5180.00	103.01 PK			1.00 V	250	97.10	5.91
6	*5180.00	93.56 AV			1.00 V	250	87.65	5.91
7	#10360.00	64.39 PK	68.20	-3.81	1.00 V	46	50.34	14.05
8	15540.00	62.01 PK	74.00	-11.99	1.00 V	271	41.12	20.89
9	15540.00	50.59 AV	54.00	-3.41	1.00 V	271	29.70	20.89

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 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.

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Test Report No.: RF181225N030

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)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	5145.00	54.54 PK	74.00	-19.46	1.00 H	299	48.75	5.79
2	5145.00	37.41 AV	54.00	-16.59	1.00 H	299	31.62	5.79
3	5150.00	57.23 PK	74.00	-16.77	1.00 H	299	51.43	5.80
4	5150.00	39.66 AV	54.00	-14.34	1.00 H	299	33.86	5.80
5	*5180.00	104.66 PK			1.00 H	299	98.75	5.91
6	*5180.00	95.19 AV			1.00 H	299	89.28	5.91
7	#10360.00	62.36 PK	68.20	-5.84	1.00 H	121	48.31	14.05
8	15540.00	63.30 PK	74.00	-10.70	1.00 H	127	42.41	20.89
9	15540.00	50.15 AV	54.00	-3.85	1.00 H	127	29.26	20.89

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	5145.00	54.62 PK	74.00	-19.38	1.00 V	250	48.83	5.79
2	5145.00	38.29 AV	54.00	-15.71	1.00 V	250	32.50	5.79
3	5150.00	56.26 PK	74.00	-17.74	1.00 V	250	50.46	5.80
4	5150.00	38.26 AV	54.00	-15.74	1.00 V	250	32.46	5.80
5	*5180.00	101.75 PK			1.00 V	250	95.84	5.91
6	*5180.00	91.96 AV			1.00 V	250	86.05	5.91
7	#10360.00	64.14 PK	68.20	-4.06	1.00 V	64	50.09	14.05
8	15540.00	63.85 PK	74.00	-10.15	1.00 V	102	42.96	20.89
9	15540.00	50.77 AV	54.00	-3.23	1.00 V	102	29.88	20.89

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 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.



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Band 4:

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)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	#5717.91	63.76 PK	110.22	-46.46	1.00 H	0	56.76	7.00
2	#5725.00	73.96 PK	122.20	-48.24	1.00 H	0	66.97	6.99
3	*5745.00	104.60 PK			1.00 H	136	97.61	6.99
4	*5745.00	94.45 AV			1.00 H	136	87.46	6.99
5	#5855.89	46.99 PK	110.55	-63.56	1.00 H	0	40.05	6.94
6	11490.00	59.99 PK	74.00	-14.01	1.00 H	77	43.79	16.20
7	11490.00	46.60 AV	54.00	-7.40	1.00 H	77	30.40	16.20
8	#17235.00	65.12 PK	68.20	-3.08	1.00 H	0	42.06	23.06
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	#5717.07	58.89 PK	109.98	-51.09	1.00 V	0	51.89	7.00
2	#5725.00	69.96 PK	122.20	-52.24	1.00 V	0	62.97	6.99
3	*5745.00	97.06 PK			1.00 V	0	90.07	6.99
4	*5745.00	85.87 AV			1.00 V	0	78.88	6.99
5	#5851.00	45.95 PK	119.92	-73.97	1.00 V	0	39.01	6.94
6	11490.00	61.29 PK	74.00	-12.71	1.00 V	291	45.09	16.20
7	11490.00	47.82 AV	54.00	-6.18	1.00 V	291	31.62	16.20
8	#17235.00	65.30 PK	68.20	-2.90	1.00 V	20	42.24	23.06

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 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.

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Test Report No.: RF181225N030

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	#5720.79	69.60 PK	112.61	-43.01	1.00 H	0	62.61	6.99
2	#5725.00	77.08 PK	122.20	-45.12	1.00 H	0	70.09	6.99
3	*5745.00	104.60 PK			1.00 H	136	97.61	6.99
4	*5745.00	95.02 AV			1.00 H	136	88.03	6.99
5	#5860.00	47.47 PK	109.40	-61.93	1.00 H	0	40.53	6.94
6	11490.00	61.29 PK	74.00	-12.71	1.00 H	175	45.09	16.20
7	11490.00	48.32 AV	54.00	-5.68	1.00 H	175	32.12	16.20
8	#17235.00	64.92 PK	68.20	-3.28	1.00 H	0	41.86	23.06

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	#5722.48	67.01 PK	116.45	-49.44	1.00 V	0	60.02	6.99
2	#5725.00	72.65 PK	122.20	-49.55	1.00 V	0	65.66	6.99
3	*5745.00	97.32 PK			1.00 V	249	90.33	6.99
4	*5745.00	87.24 AV			1.00 V	249	80.25	6.99
5	#5871.87	47.60 PK	106.07	-58.47	1.00 V	0	40.67	6.93
6	11490.00	60.34 PK	74.00	-13.66	1.00 V	114	44.14	16.20
7	11490.00	47.51 AV	54.00	-6.49	1.00 V	114	31.31	16.20
8	#17235.00	65.00 PK	68.20	-3.20	1.00 V	172	41.94	23.06

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 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.

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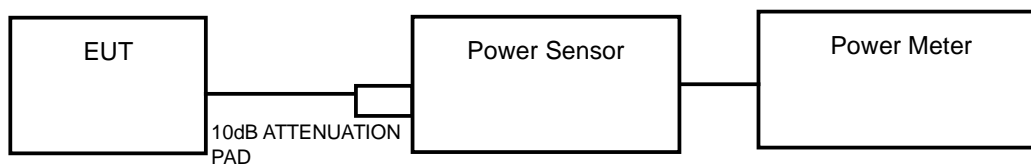
3.2 TRANSMIT POWER MEASUREMENT

3.2.1 LIMITS OF TRANSMIT POWER MEASUREMENT

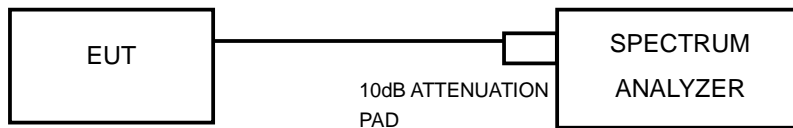
Operation Band	EUT Category		LIMIT
U-NII-1		Outdoor Access Point	1 Watt (30 dBm) (Max. e.i.r.p \leq 125mW(21 dBm) at any elevation angle above 30 degrees as measured from the horizon)
		Fixed point-to-point Access Point	1 Watt (30 dBm)
		Indoor Access Point	1 Watt (30 dBm)
	√	Mobile and Portable client 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.

3.2.2 TEST SETUP



FOR 6/26dB BANDWIDTH





3.2.3 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Power Sensor	Keysight	U2021XA	MY55060016	Jun. 13,18	Jun. 12,19
Power Sensor	Keysight	U2021XA	MY55060018	Jun. 13,18	Jun. 12,19
Power Meter	Anritsu	ML2495A	1139001	Mar. 12,19	Mar. 11,20
Power Sensor	Anritsu	MA2411B	1531155	Mar. 12,19	Mar. 11,20
Digital Multimeter	FLUKE	15B	A1220010DG	Oct. 17, 18	Oct.16, 19
Humid & Temp Programmable Tester	Haida	HD-2257	110807201	Nov.15,18	Nov. 14,19
Oscilloscope	Agilent	DSO9254A	MY51260160	Nov. 09,18	Nov. 08,19
Signal Analyzer	Rohde & Schwarz	FSV7	102331	Aug. 02,18	Aug. 01,19
Signal Generator	Agilent	N5183A	MY50140980	Dec. 07,18	Dec. 06,19
Agile Signal Generator	Agilent	8645A	Agilent	Oct.27, 18	Oct.26, 19
Spectrum Analyzer	Keysight	N9020A	MY55400499	Mar. 12,19	Mar. 11,20
MXG-B RF Vector Signal Generator	Keysight	N5182B	MY56200288	Dec. 07, 18	Dec. 06, 19
Attenuator	MINI	BW-S10W2+	S130129FGE2	N/A	N/A
DC Source	Keysight	E3642A	MY56146098	N/A	N/A

NOTES:

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, GRGT/CHINA and NIM/CHINA.

3.2.4 TEST PROCEDURE

FOR AVERAGE POWER MEASUREMENT

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

FOR 26dB BANDWIDTH

- 1) Set RBW = approximately 1% of the emission bandwidth.
- 2) Set the VBW > RBW.
- 3) Detector = 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%.



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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.

3.2.5 DEVIATION FROM TEST STANDARD

No deviation.

3.2.6 EUT OPERATING CONDITIONS

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



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Test Report No.: RF181225N030

3.2.7 TEST RESULTS

OUTPUT POWER:

802.11a

Channel Number	FREQ. (MHz)	AVG. CONDUCTED POWER (dBm)	LIMIT (dBm)	PASS /FAIL
36	5180	12.69	24.00	PASS
149	5745	10.36	30.00	PASS

802.11n (20MHz)

Channel Number	FREQ. (MHz)	AVG. CONDUCTED POWER (dBm)	LIMIT (dBm)	PASS /FAIL
36	5180	12.86	24.00	PASS
149	5745	10.39	30.00	PASS



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26dB BANDWIDTH:

802.11a

Channel Number	Freq. (MHz)	26dB DOWN BANDWIDTH (MHz)	PASS /FAIL
36	5180	28.77	PASS

802.11n (20MHz)

Channel Number	Freq. (MHz)	26dB DOWN BANDWIDTH (MHz)	PASS /FAIL
36	5180	31.08	PASS

6dB BANDWIDTH

802.11a

Channel Number	Freq. (MHz)	6dB DOWN BANDWIDTH (MHz)	PASS /FAIL
149	5745	16.05	PASS

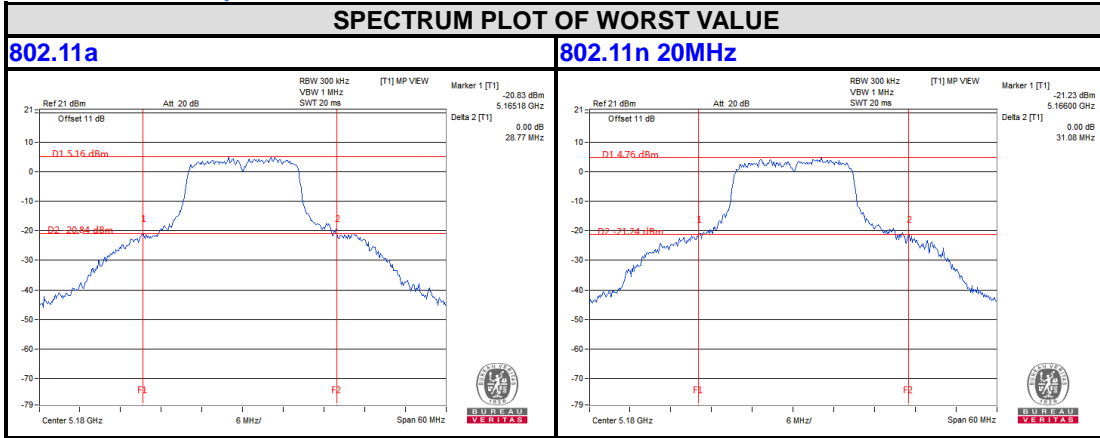
802.11n (20M)

Channel Number	Freq. (MHz)	6dB DOWN BANDWIDTH (MHz)	PASS /FAIL
149	5745	16.85	PASS

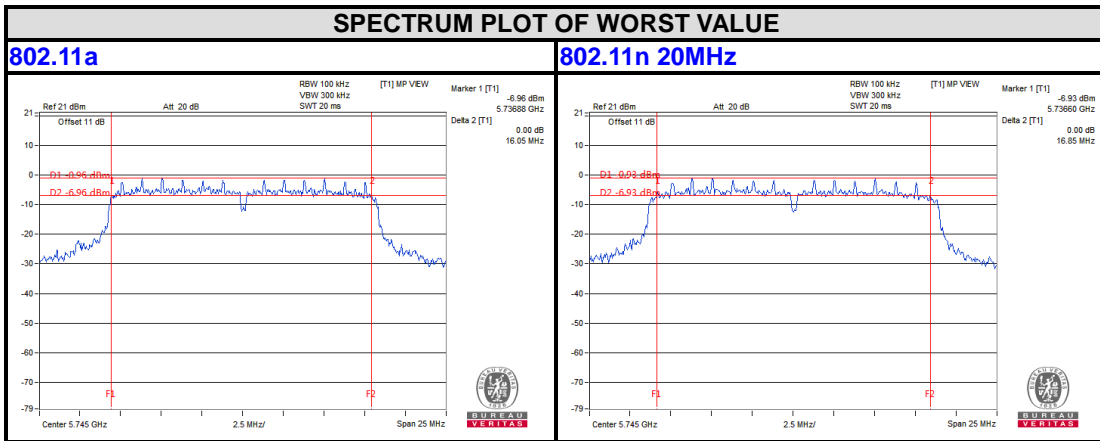


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26dB bandwidth Test Plot For 5180MHz worst plot



6dB BANDWIDTH For 5745MHz



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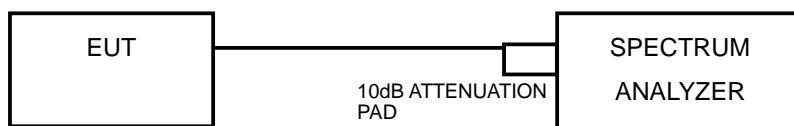
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3.3 PEAK POWER SPECTRAL DENSITY MEASUREMENT

3.3.1 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

3.3.2 TEST SETUP



3.3.3 TEST INSTRUMENTS

Refer to section 3.3.3 to get information of above instrument.

3.3.4 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)



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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)

3.3.5 DEVIATION FROM TEST STANDARD

No deviation.

3.3.6 EUT OPERATING CONDITIONS

Same as 3.3.6



Test Report No.: RF181225N030

3.3.7 TEST RESULTS

802.11a

Channel Number	Frequency (MHz)	RF Power Level in 1MHz BW (dBm)		MAX. Limit (dBm)	PASS / FAIL
36	5180	0.31		11.00	PASS
Channel Number	Frequency (MHz)	RF Power Level in 300kHz BW (dBm)	RF Power Level in 500kHz BW (dBm)	MAX. Limit (dBm/500k)	PASS / FAIL
149	5745	-11.39	-9.17	30.00	PASS

802.11n (20MHz)

Channel Number	Frequency (MHz)	RF Power Level in 1MHz BW (dBm)		MAX. Limit (dBm)	PASS / FAIL
36	5180	0.17		11.00	PASS
Channel Number	Frequency (MHz)	RF Power Level in 300kHz BW (dBm)	RF Power Level in 500kHz BW (dBm)	MAX. Limit (dBm/500k)	PASS / FAIL
149	5745	-11.58	-9.36	30.00	PASS

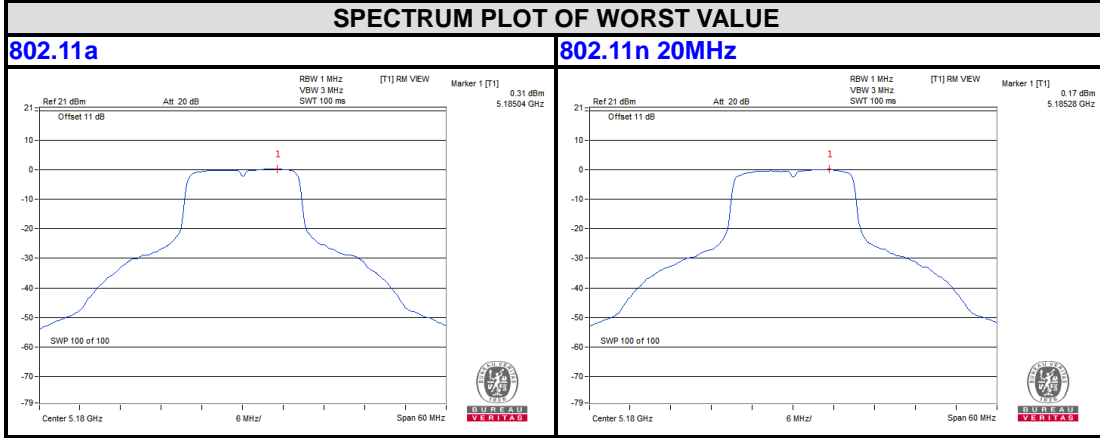


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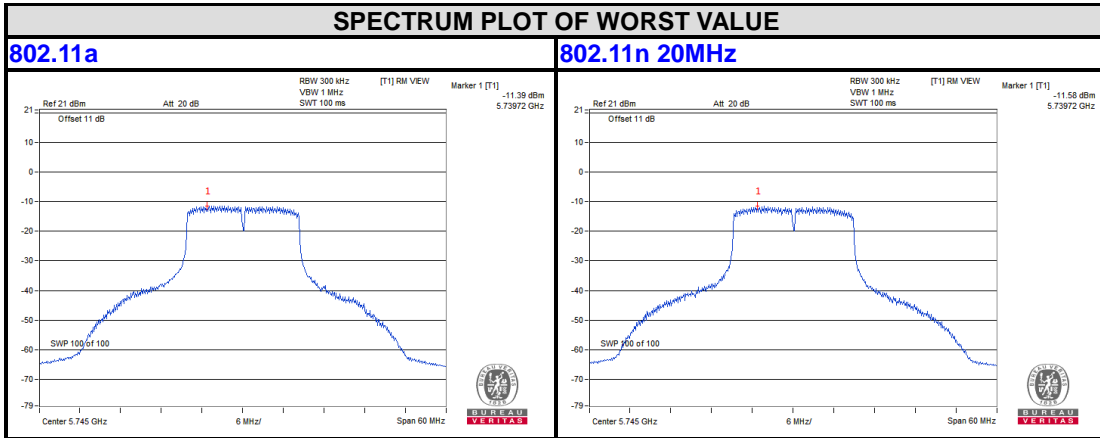
Test Report No.: RF181225N030

PSD Test Plot

BAND 1



BAND4



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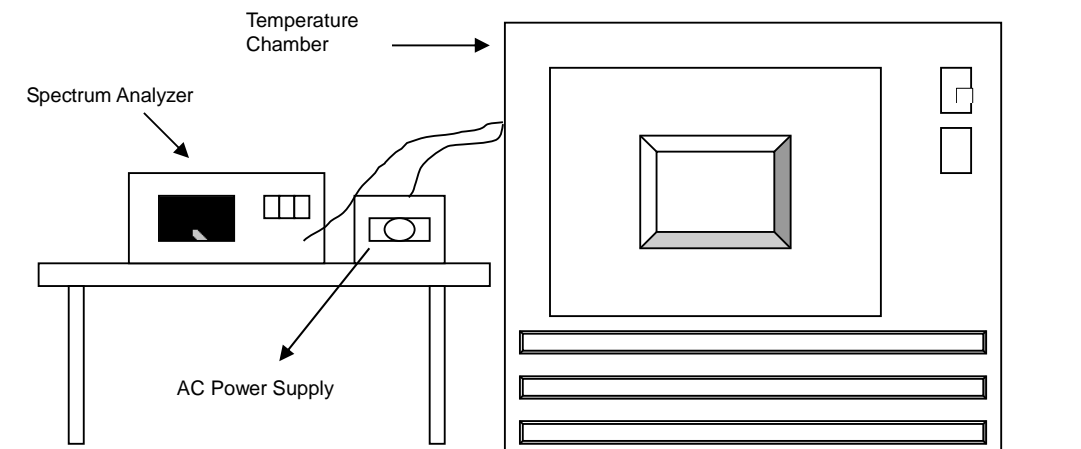
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3.4 FREQUENCY STABILITY

3.4.1 LIMITS OF FREQUENCY STABILITY MEASUREMENT

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

3.4.2 TEST SETUP



3.4.3 TEST INSTRUMENTS

Refer to section 3.3.3 to get information of above instrument.



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3.4.4 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.

3.4.5 DEVIATION FROM TEST STANDARD

No deviation.

3.4.6 EUT OPERATING CONDITION

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



Test Report No.: RF181225N030

3.4.7 TEST RESULTS

FREQUENCY STABILITY VERSUS TEMP.									
OPERATING FREQUENCY: 5180MHz									
TEMP. (°C)	POWER SUPPLY (Vdc)	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	7.6	5744.9905	-0.00017	5744.9898	-0.00018	5744.9928	-0.00013	5744.9925	-0.00013
40	7.6	5744.9939	-0.00011	5744.9946	-0.00009	5744.9941	-0.00010	5744.9917	-0.00014
30	7.6	5745.0186	0.00032	5745.0176	0.00031	5745.019	0.00033	5745.0168	0.00029
20	7.6	5744.9827	-0.00030	5744.9837	-0.00028	5744.979	-0.00037	5744.9792	-0.00036
10	7.6	5744.977	-0.00040	5744.9744	-0.00045	5744.9741	-0.00045	5744.9757	-0.00042
0	7.6	5744.9963	-0.00006	5744.9959	-0.00007	5744.9945	-0.00010	5744.9965	-0.00006
-10	7.6	5744.981	-0.00033	5744.9809	-0.00033	5744.9807	-0.00034	5744.9791	-0.00036
-20	7.6	5745.02	0.00035	5745.0176	0.00031	5745.019	0.00033	5745.019	0.00033
-30	7.6	5744.9749	-0.00044	5744.9731	-0.00047	5744.9703	-0.00052	5744.9745	-0.00044

FREQUENCY STABILITY VERSUS TEMP.									
OPERATING FREQUENCY: 5180MHz									
TEMP. (°C)	POWER SUPPLY (Vdc)	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	7.6	5744.9837	-0.00028	5744.9832	-0.00029	5744.9787	-0.00037	5744.9788	-0.00037
	6.46	5744.9827	-0.00030	5744.9837	-0.00028	5744.979	-0.00037	5744.9792	-0.00036
	8.74	5744.9821	-0.00031	5744.9831	-0.00029	5744.9785	-0.00037	5744.9801	-0.00035



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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.

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