



Test Report

Report No.: MTi210713015-04E1

Date of issue: Aug. 17, 2021

Applicant: Guangdong WiiRobot Co., Ltd

Product name: Speedbird mini

Model(s): I20E, I20E Bundle A, I20E Bundle B, I20E Bundle C, I20E Bundle D, I20E Bundle E, I20E Bundle F, I20EA, I20EB, I20EC

FCC ID: 2AZ7PI20E

Shenzhen Microtest Co., Ltd.
<http://www.mtitest.com>



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TEST RESULT CERTIFICATION

Applicant's name	Guangdong WiiRobot Co., Ltd
Address.....	Room 401, Building 1, No.11 Yinghe 1st Street,Yaoshan, Xiegang Town, Dongguan City, Guangdong Province, China
Manufacturer's Name	Guangdong WiiRobot Co., Ltd
Address.....	Room 401, Building 1, No.11 Yinghe 1st Street,Yaoshan, Xiegang Town, Dongguan City, Guangdong Province, China

Product description

Product name	Speedbird mini
Trademark	ING
Model Name	I20E
Serial Model	I20E Bundle A, I20E Bundle B, I20E Bundle C, I20E Bundle D, I20E Bundle E, I20E Bundle F, I20EA, I20EB, I20EC
Standards.....	FCC Part 15.407
Test procedure	ANSI C63.10-2013 KDB 662911 D01 multiple transmitter v02r01 KDB 789033 D02 General UNII Test Procedures New Rules v02r01

Date of Test

Date (s) of performance of tests..... :	July 30, 2021 ~ Aug. 17, 2021
Test Result	Pass

This device described above has been tested by Shenzhen Microtest Co., Ltd. and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable

Testing Engineer

:

Cindy Qin

(Cindy Qin)

Technical Manager

:

Leon Chen

(Leon Chen)

Authorized Signatory

:

Tom Xue

(Tom Xue)



1 General information

1.1 Description of EUT

Equipment:	Speedbird mini
Model name:	I20E
Serial model:	I20E Bundle A, I20E Bundle B, I20E Bundle C, I20E Bundle D, I20E Bundle E, I20E Bundle F, I20EA, I20EB, I20EC
Model difference:	All the models are of the same circuit module, except the appearance color and model No..
Frequency range:	U-NII-1: 5150 MHz to 5250 MHz, U-NII-3: 5725 MHz to 5850 MHz
Modulation type:	OFDM with BPSK/QPSK/16QAM/64QAM/256QAM for 802.11a/n/;
Transfer rate:	802.11a: 6,9,12,18,24,36,48,54Mbps; 802.11n(HT20): MCS0-MCS15;
Channel bandwidth:	802.11a: 20 MHz 802.11n: 20 MHz
Antenna type:	Whip antenna
Antenna gain:	For 802.11a, working in SISO mode, then the antenna gain as below: 802.11a: Antenna A :2dBi 802.11a: Antenna B :2dBi
	For 802.11n20, working in MIMO mode, the antenna gains should be calculated by the formula: Directional Gain = GANT+10*log(NANT)dBi = 2 dBi + 10*Log(2) dBi = 5.01 dBi
Max. output power:	U-NII-1: 12.67dBm U-NII-3: 14.70dBm
Hardware version:	B19-RX V01
Software version:	B19-RX V01
Power supply:	DC 7.7V from battery
Adapter information:	N/A
Battery:	DC 7.7V 1820mAh
Serial number:	MTi210713015-04-S0001



1.2 Operation channel list

For U-NII-1:

20 MHz		40 MHz		80 MHz	
Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)
36	5180	--	--	--	--
40	5200	--	--	--	--
44	5220	--	--	--	--
48	5240	--	--	--	--

For U-NII-3:

20 MHz		40 MHz		80 MHz	
Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)
149	5745	--	--	--	--
153	5765	--	--	--	--
157	5785	--	--	--	--
161	5805	--	--	--	--
165	5825	--	--	--	--

1.3 Test channel list

U-NII-1 (5150 - 5250 MHz)			U-NII-3(5725 - 5850 MHz)		
Channel Number	Channel	Frequency (MHz)	Channel Number	Channel	Frequency (MHz)
36	Low	5180	149	Low	5745
40	Mid	5200	157	Mid	5785
48	High	5240	165	High	5825



1.4 Ancillary equipment list

Equipment	Model	S/N	Manufacturer	Certificate type
/	/	/	/	/

1.5 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.

Item	Equipment	Brand	Model/Type No.	Series No.	Note
/	/	/	/	/	/

Note:

(1)The support equipment was authorized by Declaration of Confirmation.

(2)For detachable type I/O cable should be specified the length in cm in 『Length』 column.



2 Summary of the Test Results

Test procedures according to the technical standards:

No.	Standard Section	Test Item	Result	Remark
1	15.203/15.407	Antenna Requirement	Pass	
2	15.407(a)	RF Output Power	Pass	
3	15.207	Power Line Conducted Emission	N/A	
4	15.407(a)	26dB Emission Bandwidth and Occupied bandwidth	Pass	
5	15.407(e)	6 dB bandwidth	Pass	
6	15.407(a)	Power Spectral Density	Pass	
7	15.407(b) 15.209	Radiation Spurious Emission	Pass	



3 Test Facilities and Accreditations

3.1 Test laboratory

Test Laboratory	Shenzhen Microtest Co., Ltd
Location	101, No. 7, Zone 2, Xinxing Industrial Park, Fuhai Avenue, Xinhe Community, Fuhai Street, Bao' an District, Shenzhen, Guangdong, China.
FCC Registration No.:	448573

3.2 Environmental conditions

Temperature:	15°C~35°C
Humidity	20%~75%
Atmospheric pressure	98kPa~101kPa



3.3 Measurement uncertainty

The reported uncertainty of measurement $y \pm U$ where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$ providing a level of confidence of approximately 95 %

No.	Item	Uncertainty
1	Conducted Emission Test	$\pm 1.38\text{dB}$
2	RF power, conducted	$\pm 0.16\text{dB}$
3	Spurious emissions, conducted	$\pm 0.21\text{dB}$
4	All emissions, radiated(<1G)	$\pm 4.68\text{dB}$
5	All emissions, radiated(>1G)	$\pm 4.89\text{dB}$
6	Temperature	$\pm 0.5^{\circ}\text{C}$
7	Humidity	$\pm 2\%$

3.4 Test software

Software Name	Manufacturer	Model	Version
Bluetooth and WiFi Test System	Shenzhen JS tonskend co., ltd	JS1120-3	2.5.77.0418



4 Equipment list

Equipment No.	Equipment Name	Manufacturer	Model	Serial No.	Calibration date	Due date
MTI-E043	EMI Test Receiver	Rohde&schwarz	ESCI7	101166	2021/06/02	2022/06/01
MTI-E044	TRILOG Broadband Antenna	schwarzbeck	VULB 9163	9163-1338	2021/05/30	2023/05/29
MTI-E047	Amplifier	Hewlett-Packard	8447F	3113A06150	2021/06/02	2022/06/01
MTI-E089	ESG Vector Signal Generator	Agilent	N5182A	MY49060455	2021/06/02	2022/06/01
MTI-E058	ESG Series Analog Signal Generator	Agilent	E4421B	GB40051240	2021/06/02	2022/06/01
MTI-E062	PXA Signal Analyzer	Agilent	N9030A	MY51350296	2021/06/02	2022/06/01
MTI-E066	MXA Signal Analyzer	Agilent	N9020A	MY50143483	2021/06/02	2022/06/01
MTi-E067	RF Control Unit	Tonscend	JS0806-1	19D8060152	2021/06/02	2022/06/01
MTI-E078	Synthesized Sweeper	Agilent	83752A	3610A01957	2021/06/02	2022/06/01
MTI-E079	DC Power Supply	Agilent	E3632A	MY40027695	2021/06/02	2022/06/01
MTI-E045	Double Ridged Broadband Horn Antenna	schwarzbeck	BBHA 9120D	9120D-2278	2021/05/30	2023/05/29
MTI-E021	EMI Test Receiver	Rohde&schwarz	ESCS30	100210	2021/06/02	2022/06/01
MTI-E022	Pulse Limiter	Schwarzbeck	VSTD 9561-F	00679	2021/06/02	2022/06/01
MTI-E023	Artificial mains network	Schwarzbeck	NSLK 8127	NSLK 8127 #841	2021/06/02	2022/06/01
MTI-E046	Active Loop Antenna	Schwarzbeck	FMZB 1519B	00044	2021/05/30	2023/05/29
MTI-E048	Amplifier	Agilent	8449B	3008A02400	2021/06/02	2022/06/01
MTI-E072	Thermometer Clock Humidity Monitor	-	HTC-1	/	2021/06/02	2022/06/01

Note: the calibration interval of the above test instruments is 12 or 24 months and the calibrations are traceable to international system unit (SI).



5 Test Results

5.1 Antenna requirement

5.1.1 Standard requirement

15.203 requirement: For intentional device, according to 15.203: an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

5.1.2 EUT Antenna

The antenna is Whip antenna, which was permanently affixed to the device and un-replaced, complies with 15.203. In addition, the maximum antenna gain is 2dBi.



5.2 RF output power

5.2.1 Limit

For the 5.15-5.25 GHz band

For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

For the 5.25-5.35 GHz and 5.47-5.725 GHz band

For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or $11 \text{ dBm} + 10 \log B$, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

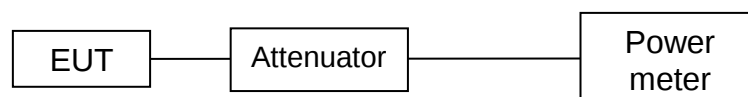
For the band 5.725-5.85 GHz

The maximum conducted output power over the frequency band of operation shall not exceed 1 W. If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

5.2.2 Test procedure

The maximum peak conducted output power may be measured using a broadband Average RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the emission bandwidth and utilize a fast-responding diode detector.

5.2.3 Test setup





5.2.4 Test results

For U-NII-1

Test Channel	Frequency (MHz)	Output Power (ANT A)		Output Power (ANT B)		Output Power (ANT Total)		Limit (dBm)	
		dBm	mW	dBm	mW	dBm	mW	dBm	mW
802.11a mode									
CH36	5180	8.55	7.16	8.56	7.18	N/A	N/A	24	250
CH40	5200	9.22	8.36	9.20	8.32	N/A	N/A		
CH48	5240	10.17	10.40	9.89	9.75	N/A	N/A		
802.11n20 mode									
CH36	5180	8.60	7.24	8.57	7.19	11.60	14.44	24	250
CH40	5200	9.05	8.04	9.26	8.43	12.17	16.47		
CH48	5240	10.13	10.30	9.14	8.20	12.67	18.51		

For U-NII-3

Test Channel	Frequency (MHz)	Output Power (ANT A)		Output Power (ANT B)		Output Power (ANT Total)		Limit (dBm)	
		dBm	mW	dBm	mW	dBm	mW	dBm	mW
802.11a mode									
CH149	5745	11.60	14.45	11.55	14.29	N/A	N/A	30	1000
CH157	5785	11.43	13.90	11.24	13.30	N/A	N/A		
CH165	5825	12.04	16.00	11.68	14.72	N/A	N/A		
802.11n20 mode									
CH149	5745	10.90	12.30	11.61	14.49	14.28	26.79	30	1000
CH157	5785	11.44	13.93	11.32	13.55	14.39	27.48		
CH165	5825	11.66	14.66	11.72	14.86	14.70	29.51		



5.3 Power line conducted emission

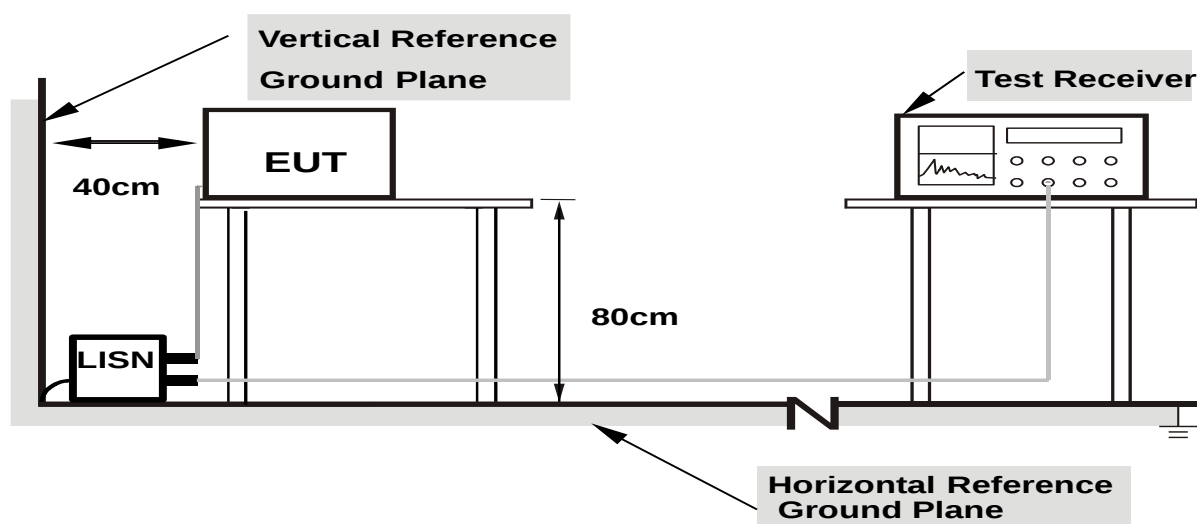
5.3.1 Limits

FREQUENCY (MHz)	Class B (dBuV)	
	Quasi-peak	Average
0.15 -0.5	66 - 56 *	56 - 46 *
0.50 -5.0	56.00	46.00
5.0 -30.0	60.00	50.00

Note

1. The tighter limit applies at the band edges.
2. The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

5.3.2 Test setup



Note: 1.Support units were connected to second LISN.

2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes



5.3.3 Test procedure

a. EUT Operating Conditions

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

b. The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

- c. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- d. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- e. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- f. LISN at least 80 cm from nearest part of EUT chassis.

For the actual test configuration, please refer to the related Item –EUT Test Photos.

5.3.4 Test results

Note: Not applicable. Because the product does not TX when it is charged, so this item not applicable.



5.4 26dB Emission Bandwidth and Occupied bandwidth

5.4.1 Limit

For purposes of this subpart the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier

5.4.2 Test procedure

26d Emission bandwidth

Set RBW = approximately 1% of the emission bandwidth.

Set VBW $\geq 3 \times \text{RBW}$

Detector = Peak.

Trace mode = Max hold.

Measure the maximum width of the emission that is 26 dB down from the peak of the emission.

Occupied Bandwidth

Set Span = 1.5 times to 5.0 times the OBW

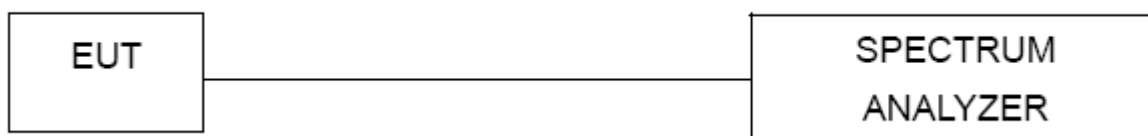
Set RBW = 1% to 5% of the OBW.

Set VBW $\geq 3 \times \text{RBW}$, Detector = Peak.

Trace mode = Max hold.

Use the 99% power bandwidth function of the instrument.

5.4.3 Test setup





5.4.4 Test results

Note1: The antenna A and antenna B have been tested. The report only shows the worst antenna. The worst case is ANT A.

ANT A test data:

For U-NII-1

Channel	Test Channel	Frequency (MHz)	26dB bandwidth (MHz)	99% bandwidth	Limit (kHz)	Result
11a	CH36	5180	31.44	17.093	/	Pass
11a	CH40	5200	20.67	16.596	/	Pass
11a	CH48	5240	20.42	16.607	/	Pass
11n (HT20)	CH36	5180	21.38	17.724	/	Pass
11n (HT20)	CH40	5200	21.29	17.715	/	Pass
11n (HT20)	CH48	5240	21.22	17.724	/	Pass

For U-NII-3

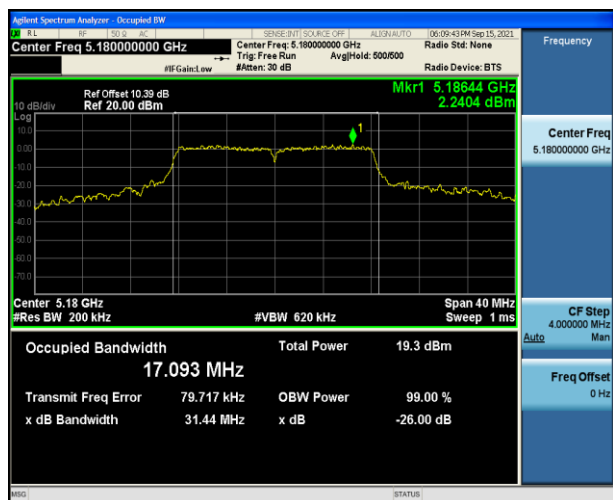
Channel	Test Channel	Frequency (MHz)	26dB bandwidth (MHz)	99% bandwidth	Limit (kHz)	Result
11a	CH149	5745	20.56	16.628	/	Pass
11a	CH157	5785	20.39	16.586	/	Pass
11a	CH165	5825	20.45	16.555	/	Pass
11n (HT20)	CH149	5745	21.54	17.740	/	Pass
11n (HT20)	CH157	5785	21.37	17.711	/	Pass
11n (HT20)	CH165	5825	20.95	17.680	/	Pass



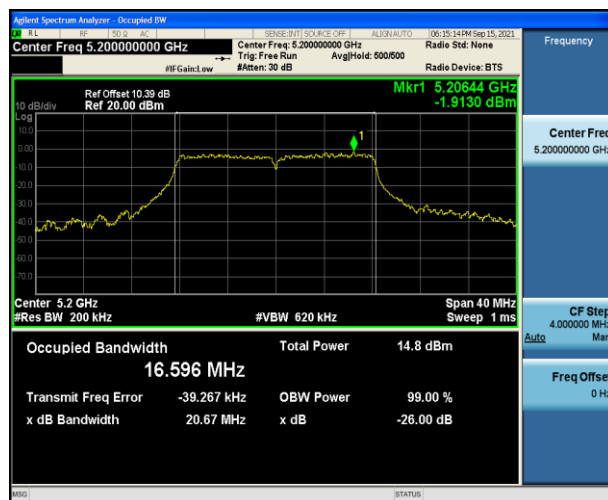
Test plots:

For U-NII-1

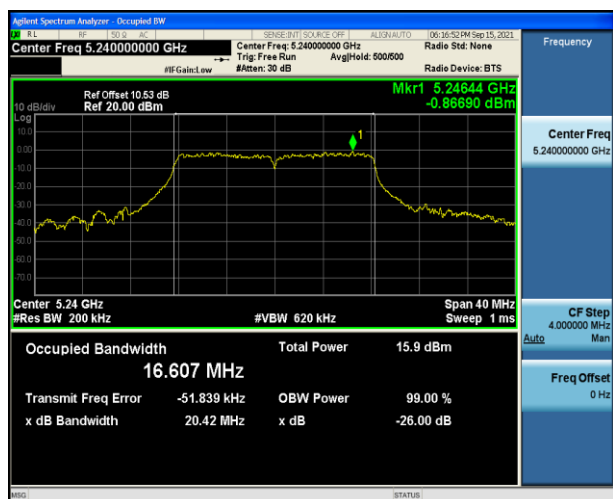
11a CH36



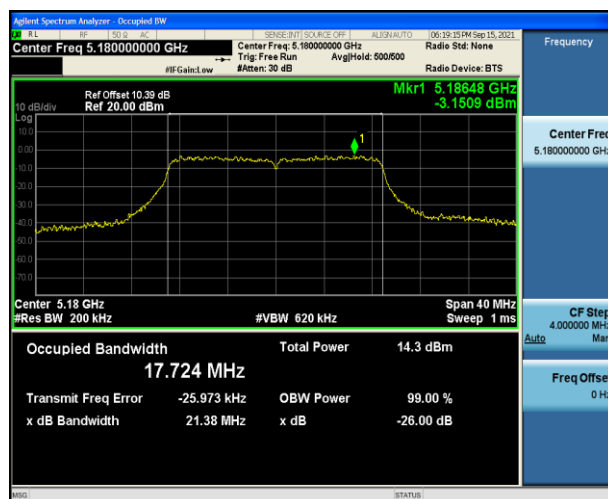
11a CH40



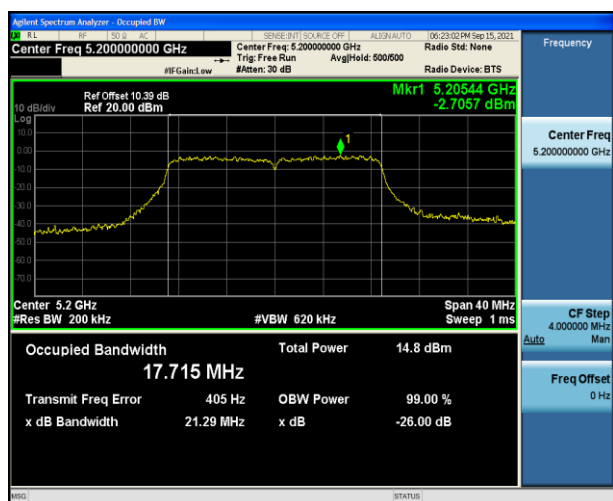
11a CH48



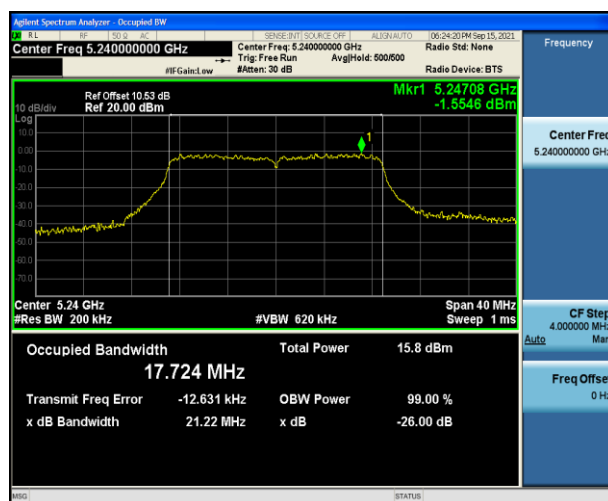
11n (HT20) CH36



11n (HT20) CH40



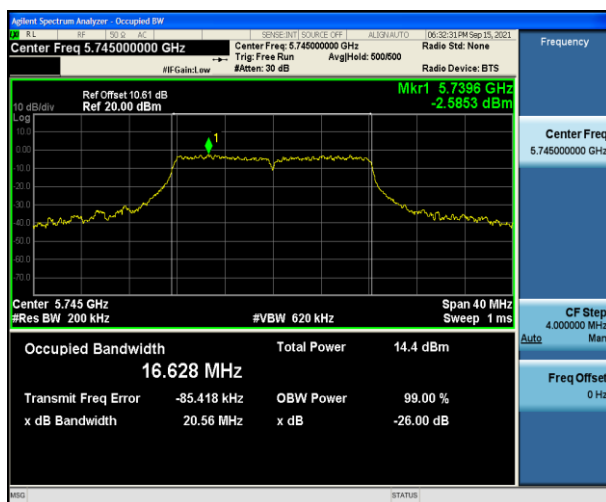
11n (HT20) CH48



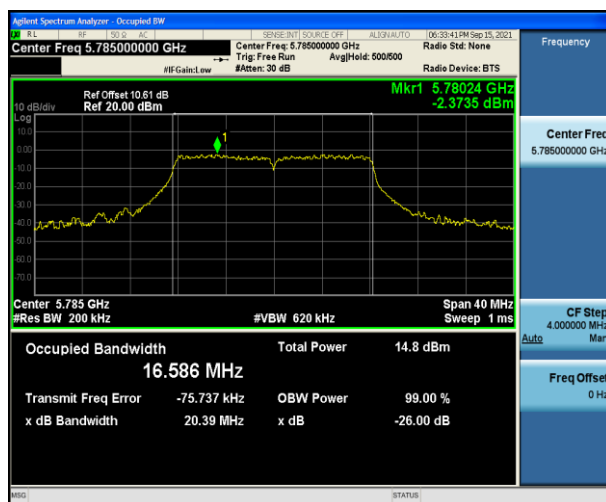


For U-NII-3

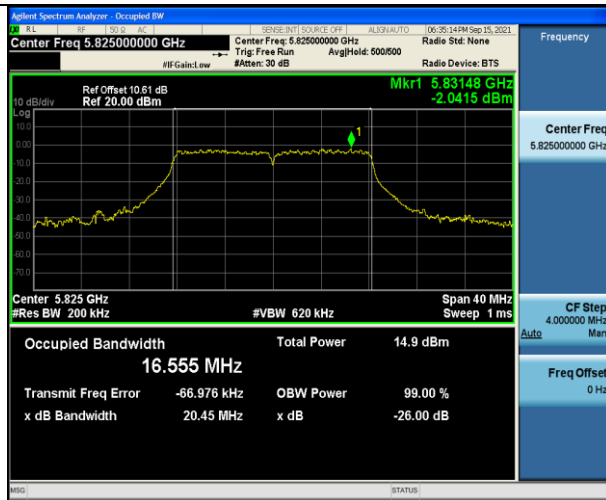
11a CH149



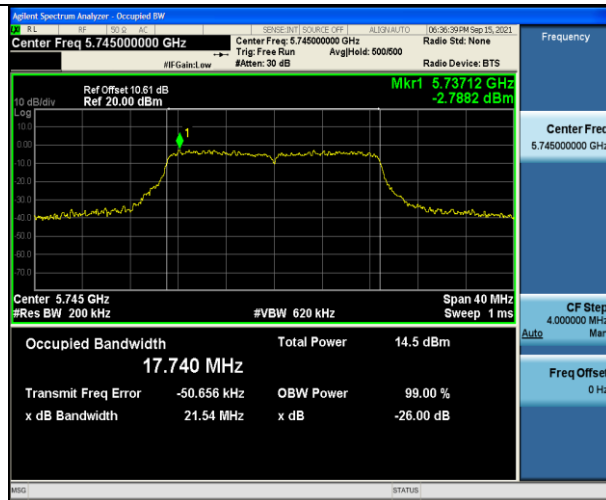
11a CH157



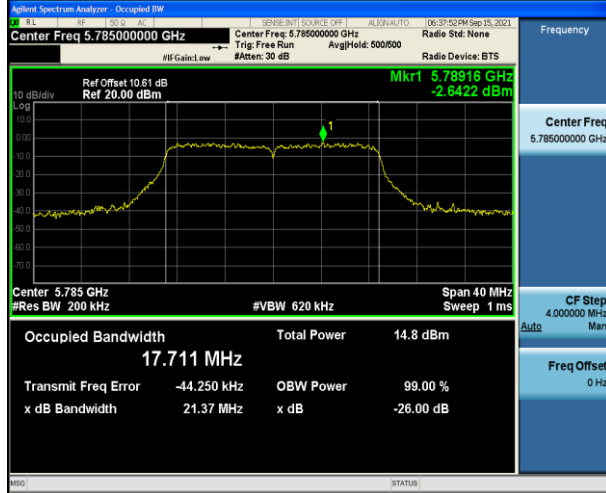
11a CH165



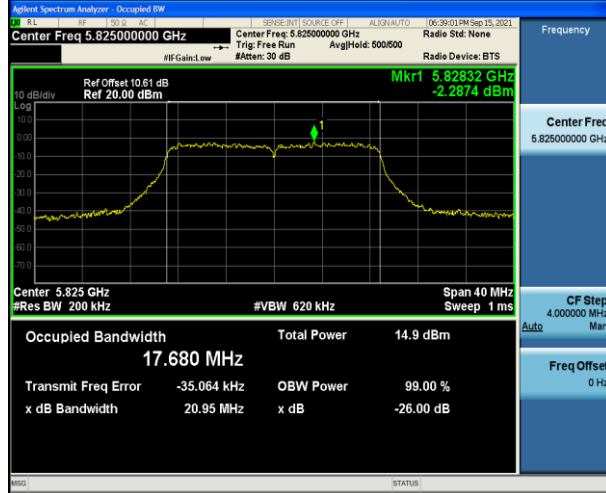
11n(HT20) CH149



11n(HT20) CH157



11n(HT20) CH165





5.5 6dB Bandwidth

5.5.1 Limit

For purposes of this subpart the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier

5.5.2 Test procedure

1. Set RBW= 100 kHz.
2. Set the video bandwidth (VBW) $\geq 3 \times$ 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) that are attenuated by 26 dB relative to the maximum level measured in the fundamental emission.

5.5.3 Test setup



5.5.4 Test results

For U-NII-3

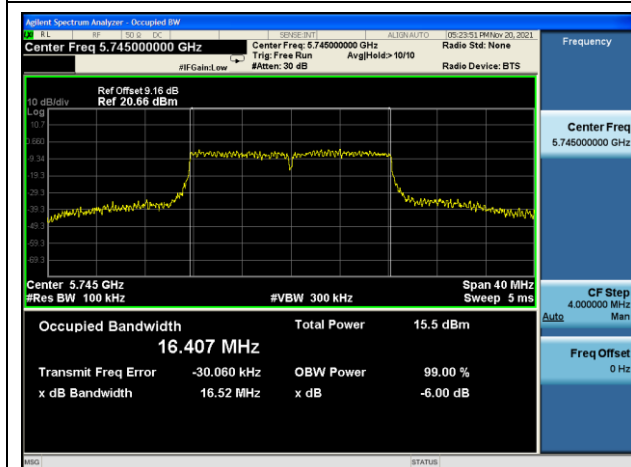
Channel	Test Channel	Frequency (MHz)	6dB bandwidth (MHz)	Limit (kHz)	Result
11a	CH149	5745	16.52	500	Pass
11a	CH157	5785	16.52	500	Pass
11a	CH165	5825	16.43	500	Pass
11n (HT20)	CH149	5745	17.76	500	Pass
11n (HT20)	CH157	5785	16.96	500	Pass
11n (HT20)	CH165	5825	17.66	500	Pass



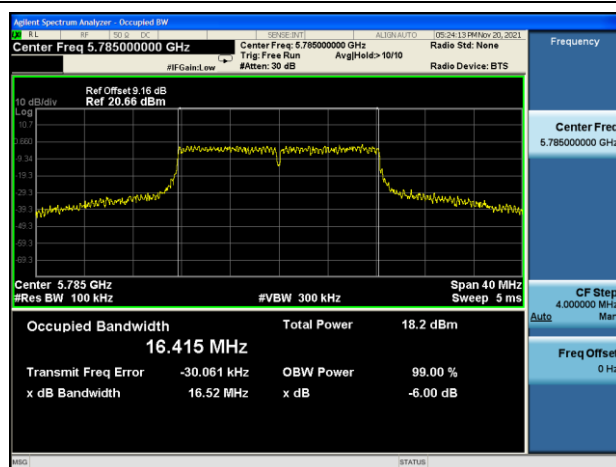
Test plots:

For U-NII-3

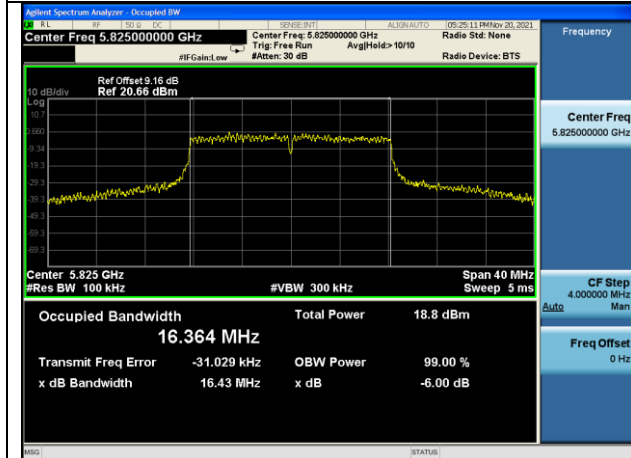
11a CH149



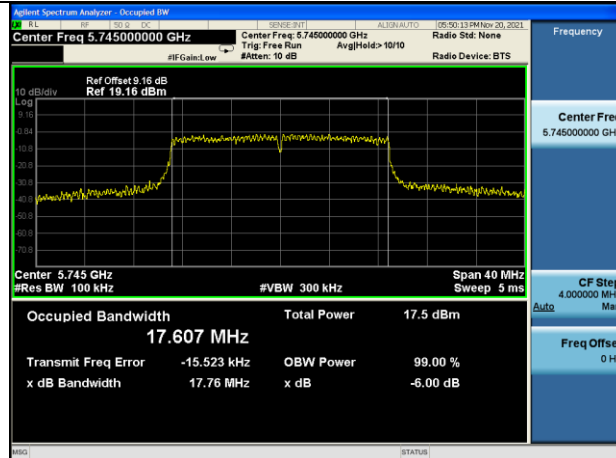
11a CH157



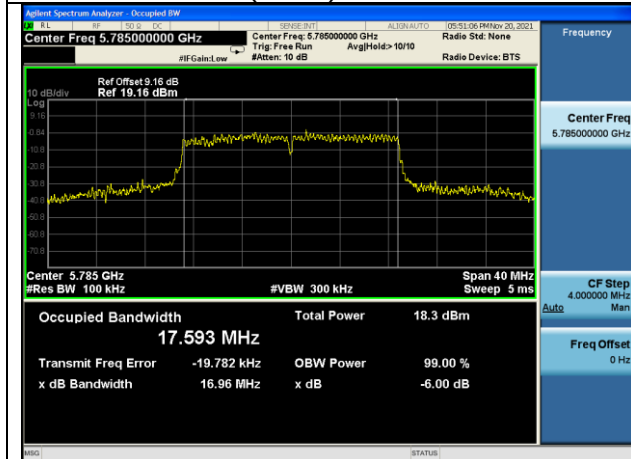
11a CH165



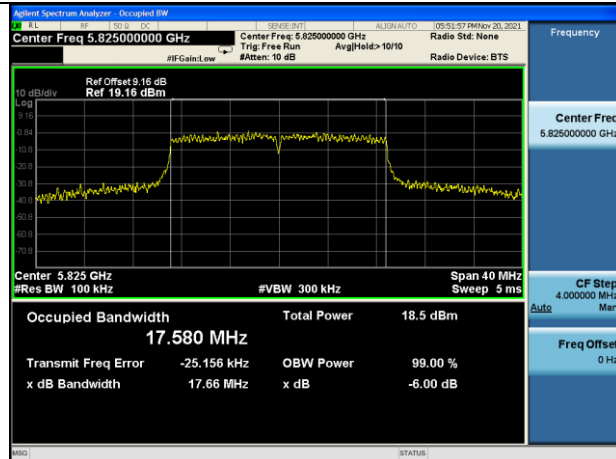
11n(HT20) CH149



11n(HT20) CH157



11n(HT20) CH165





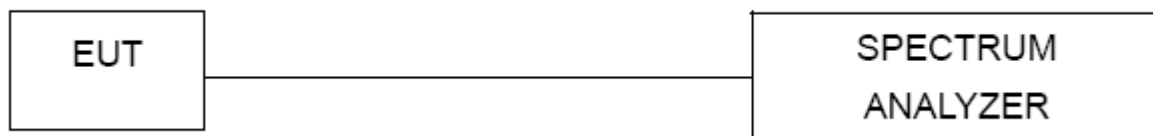
5.6 Conducted spurious emission

5.6.1 Limits

Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

Frequency Band (MHz)	Limit
5150 - 5250	Outside of the 5.15-5.35 GHz band: e.i.r.p. -27 dBm
5250 - 5350	Outside of the 5.15-5.35 GHz band: e.i.r.p. -27 dBm
5470 - 5725	Outside of the 5.47-5.725 GHz band: e.i.r.p. -27 dBm
5725 - 5850	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.

5.6.2 Test setup



5.6.3 Test procedure

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.

RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz

VBW $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize

NOTE: Two transmit chains had been tested, the ANT A was the worst case and record in the test report.

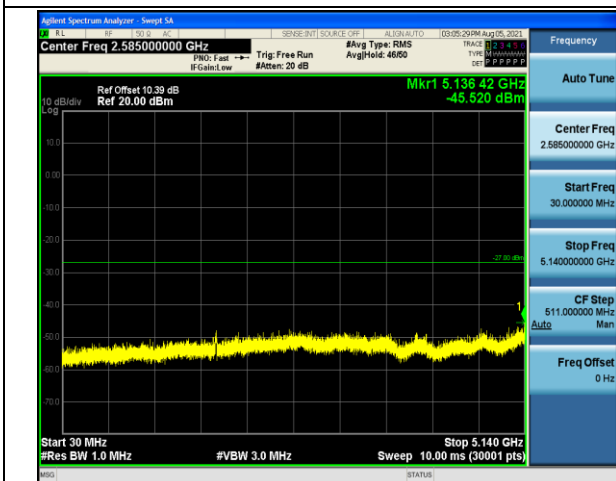


5.6.4 Test results

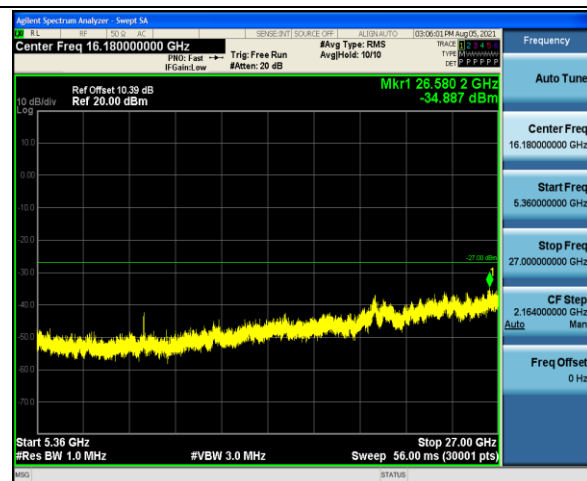
For U-NII-1

11a

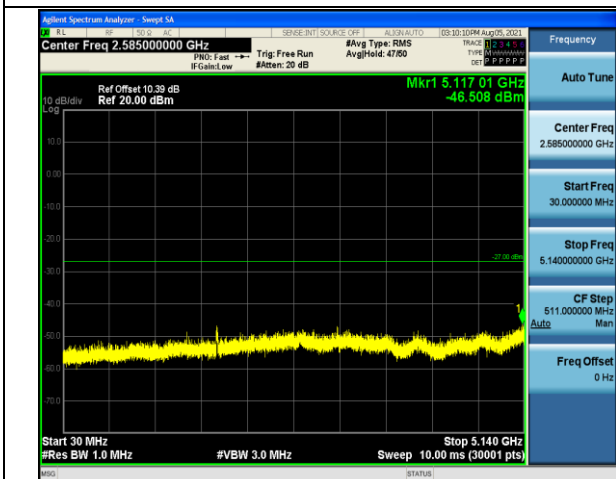
Low channel



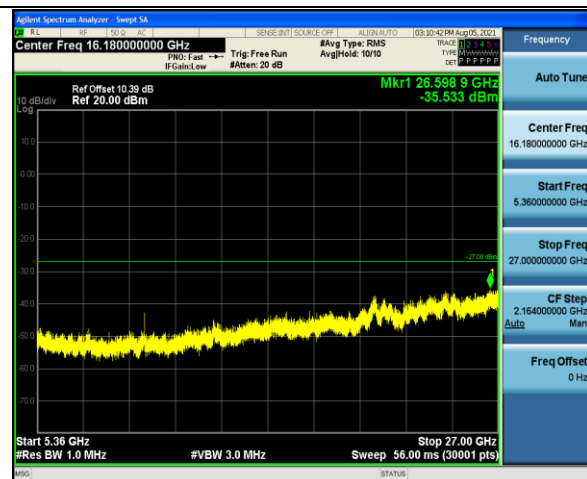
Low channel



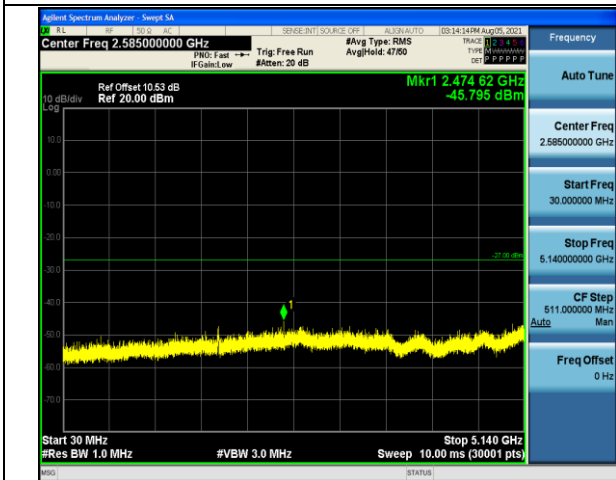
Middle channel



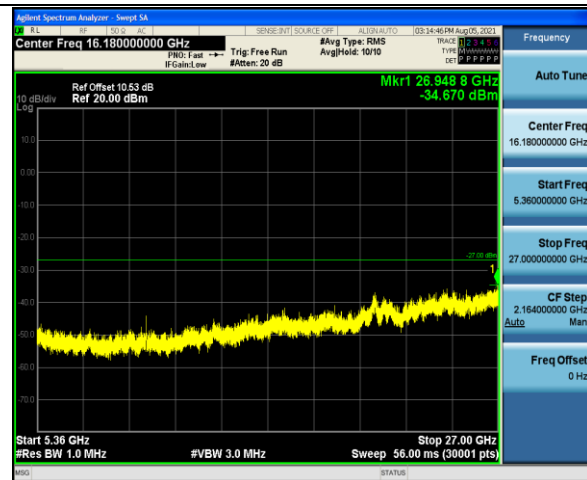
Middle channel



High channel



High channel



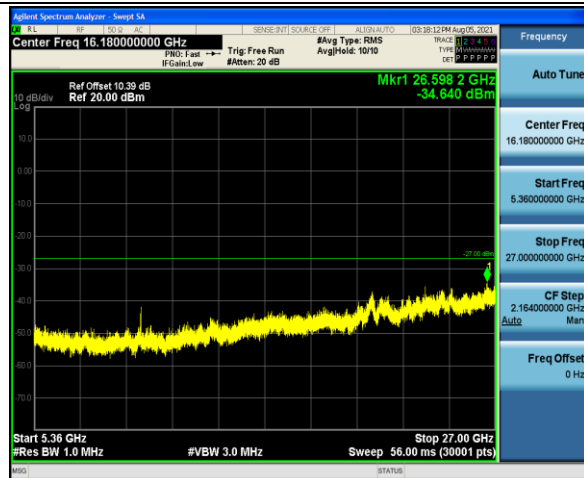


11n20

Low channel



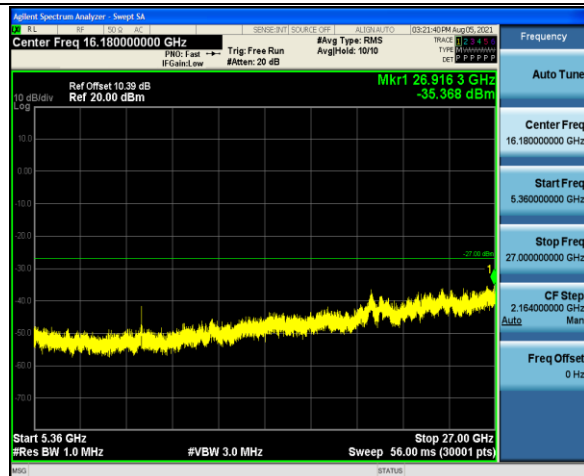
Low channel



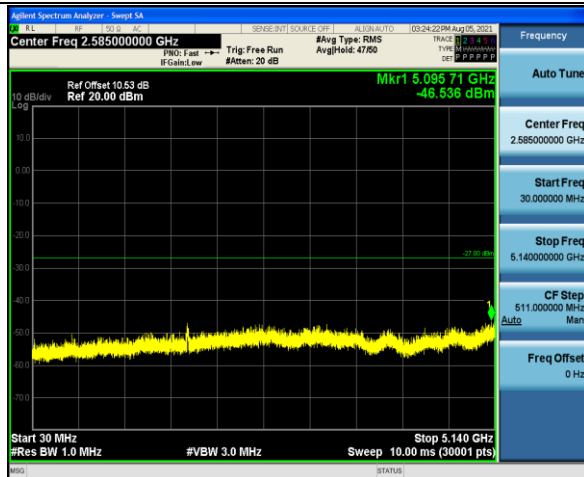
Middle channel



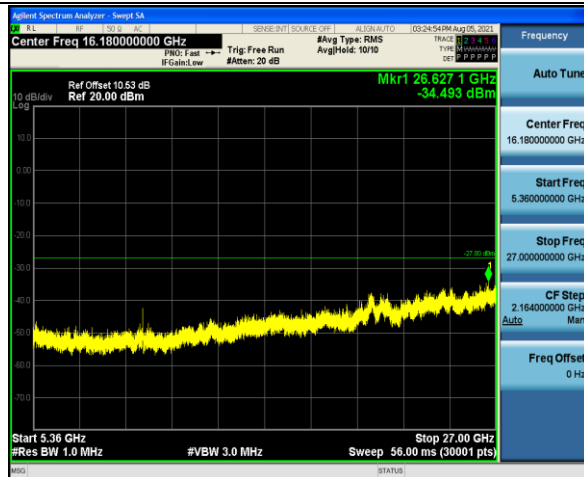
Middle channel



High channel



High channel

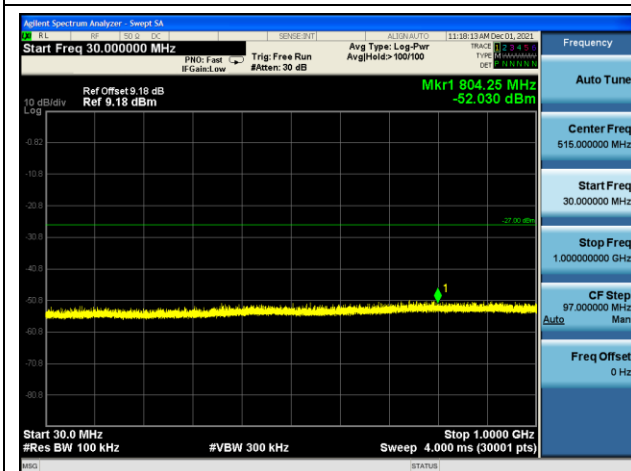




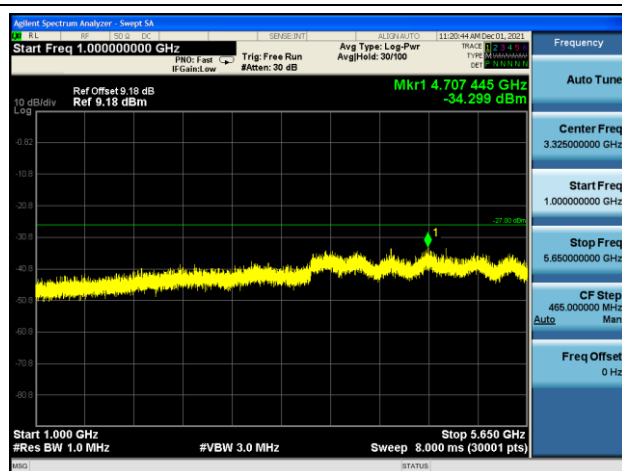
For U-NII-3

11a

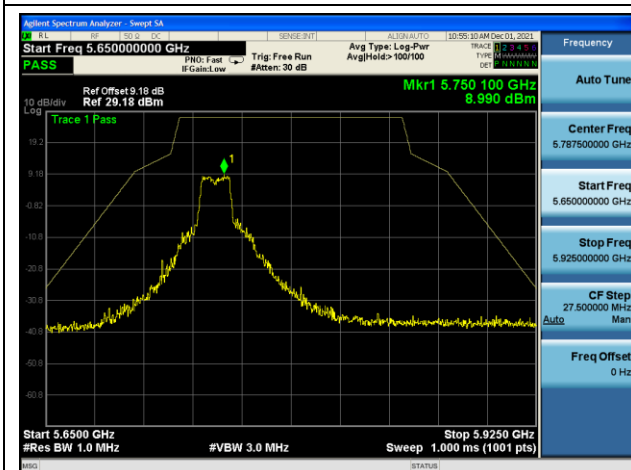
Low channel



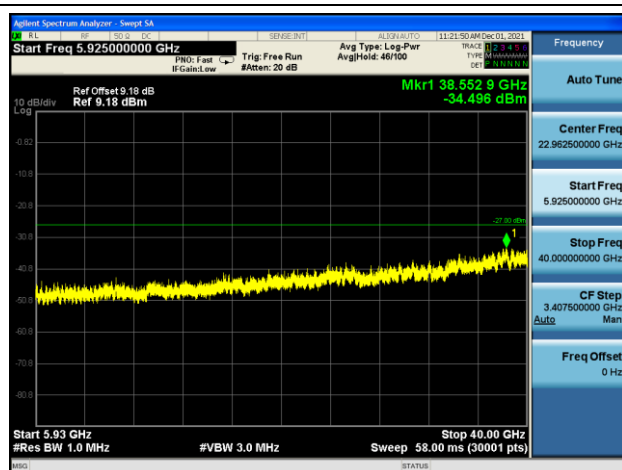
Low channel



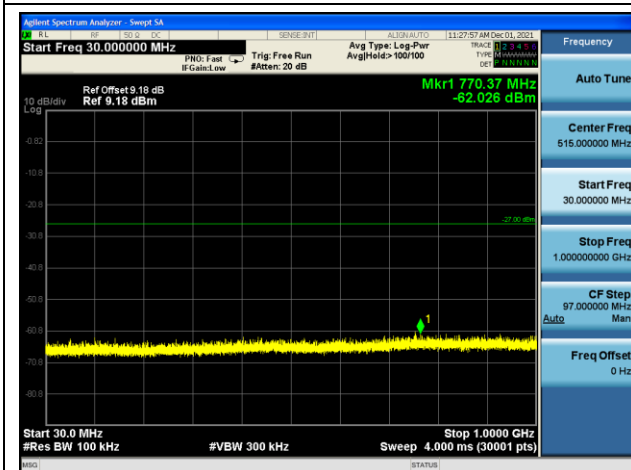
Low channel



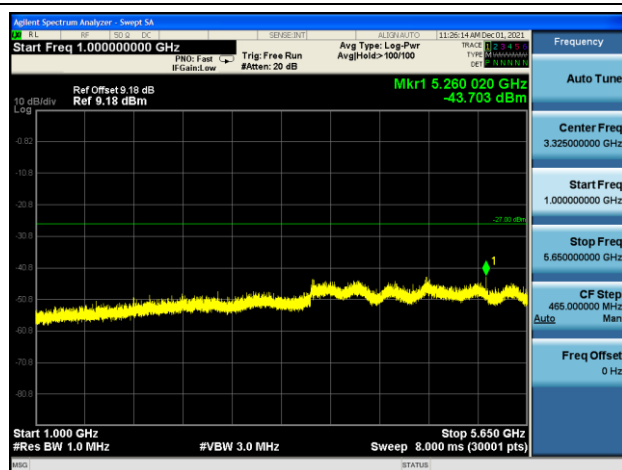
Low channel



Middle channel

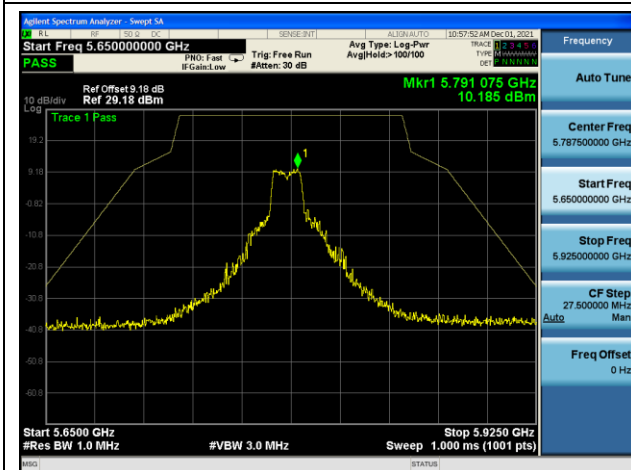


Middle channel

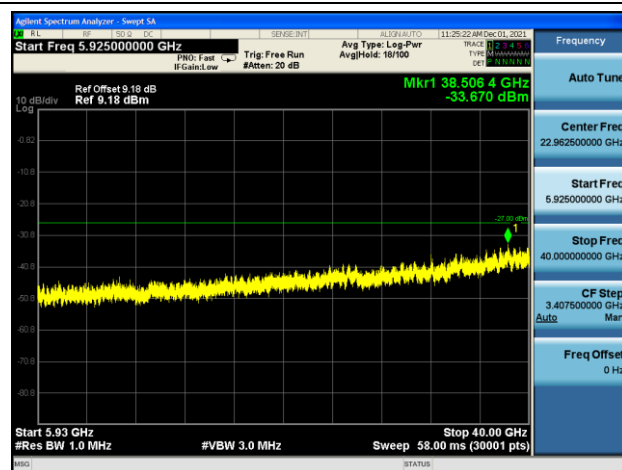




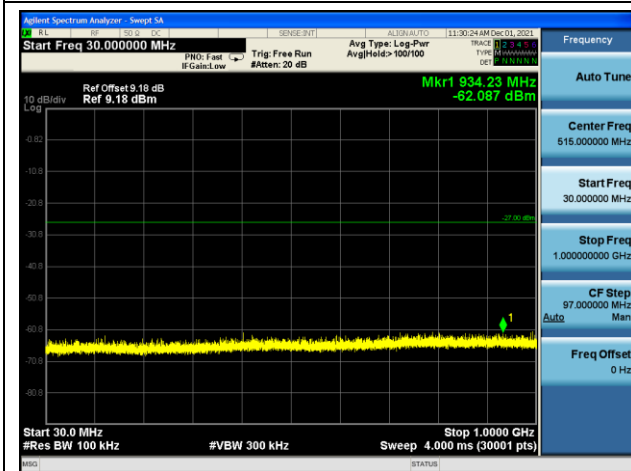
Middle channel



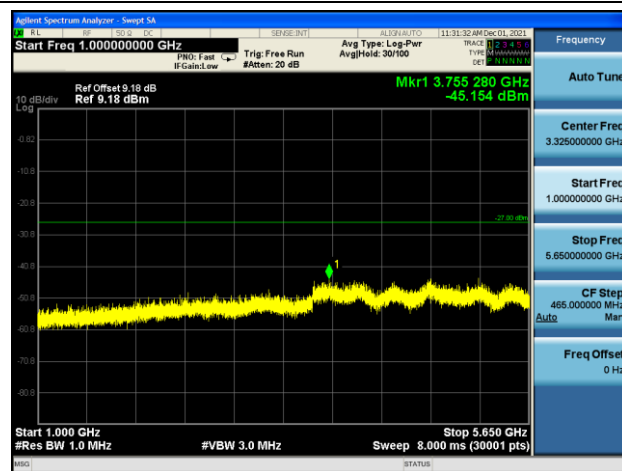
Middle channel



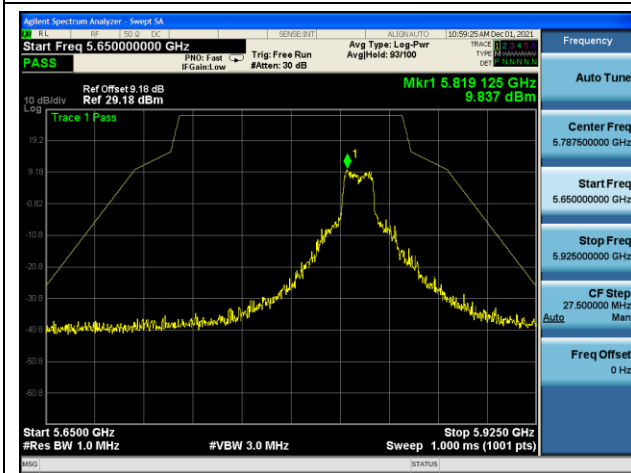
High channel



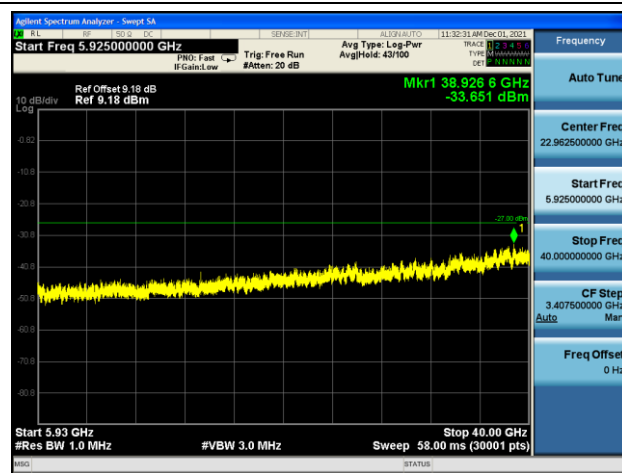
High channel



High channel



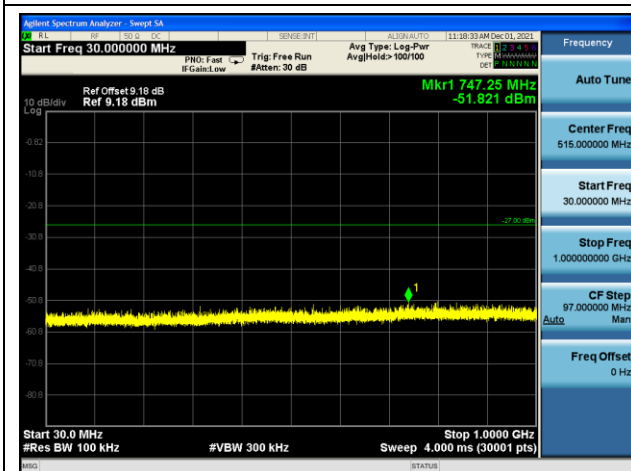
High channel



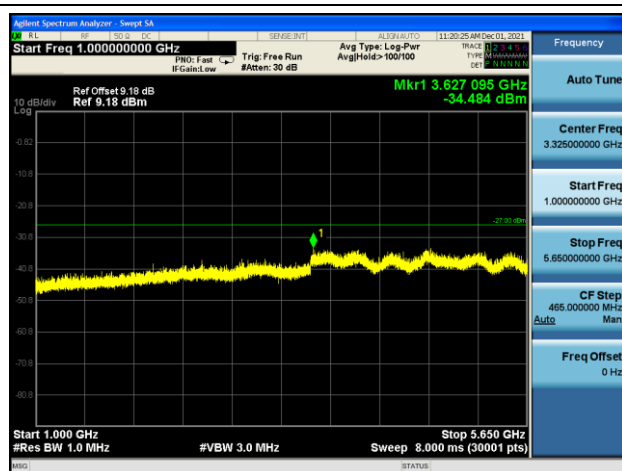


11n20

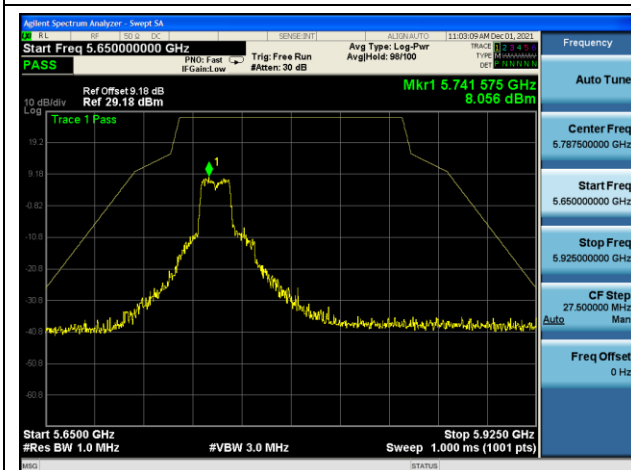
Low channel



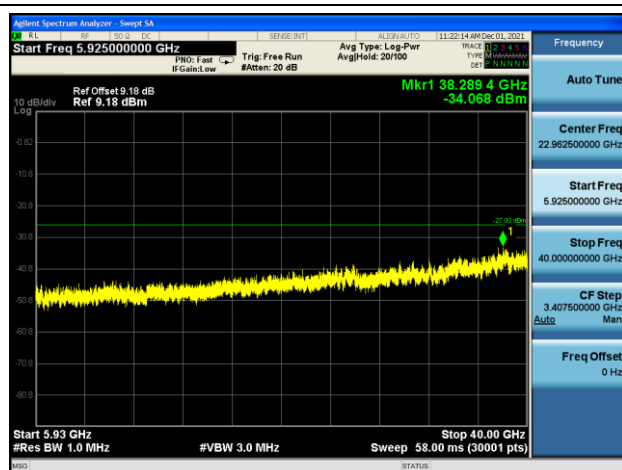
Low channel



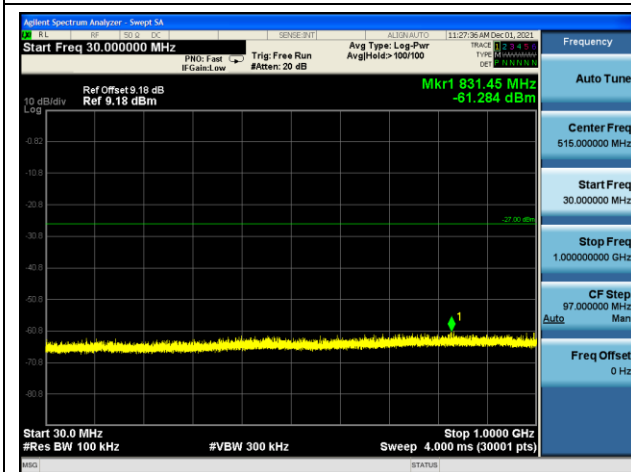
Low channel



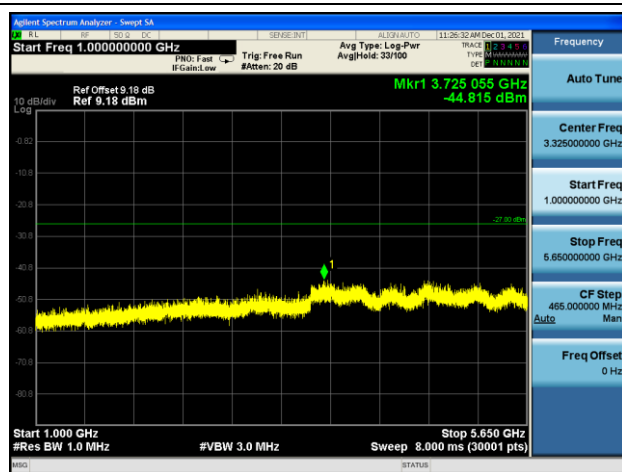
Low channel



Middle channel

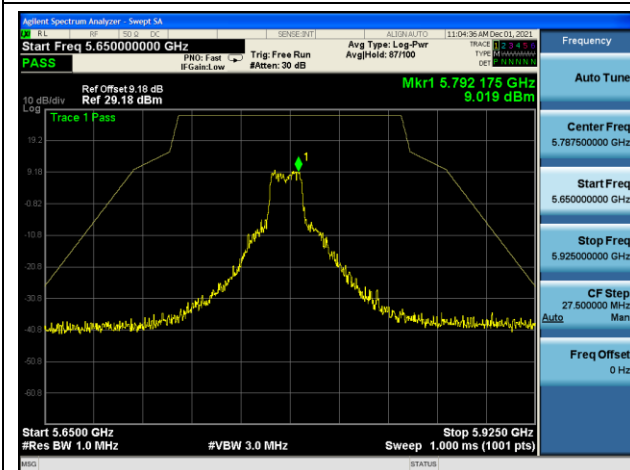


Middle channel

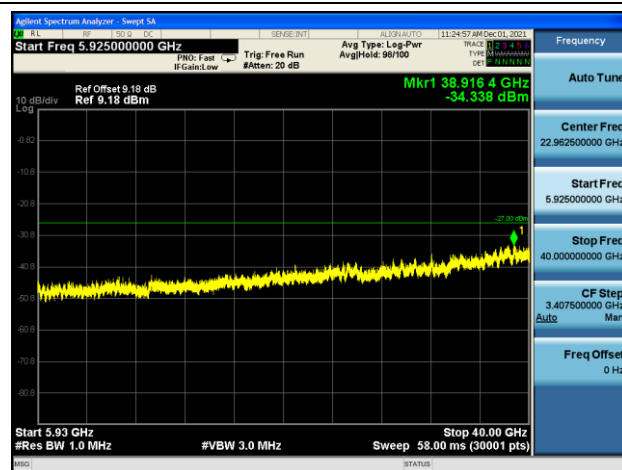




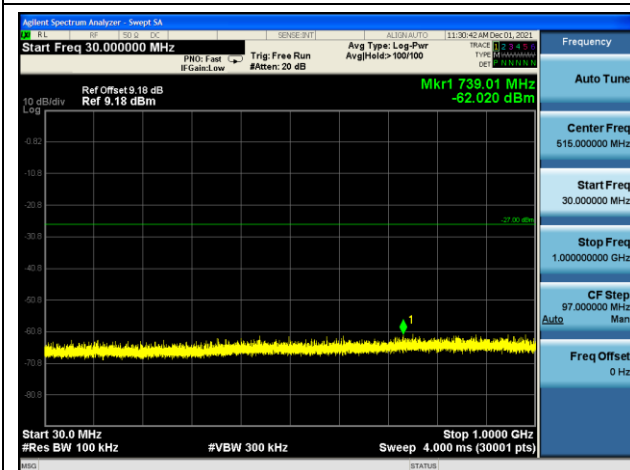
Middle channel



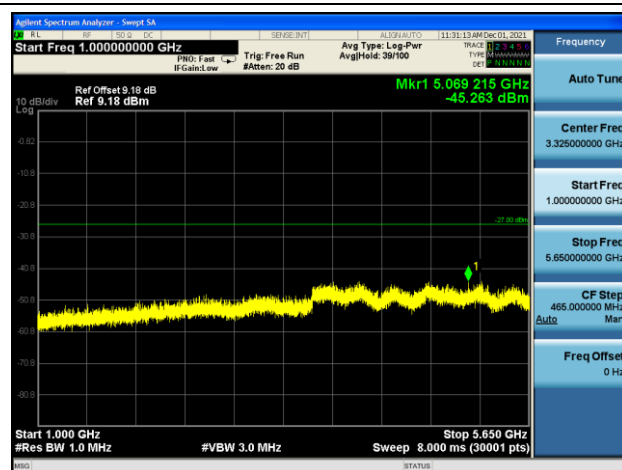
Middle channel



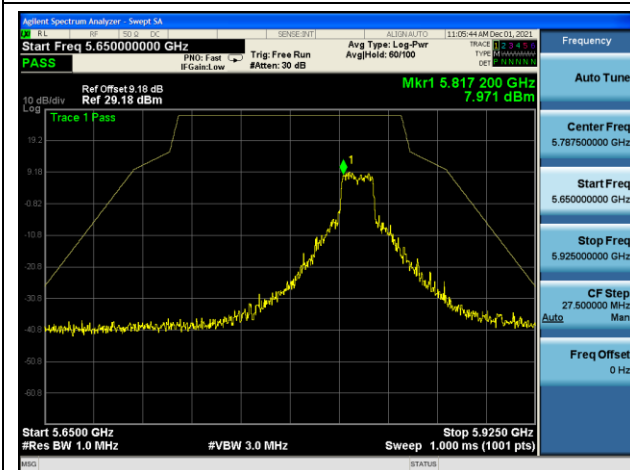
High channel



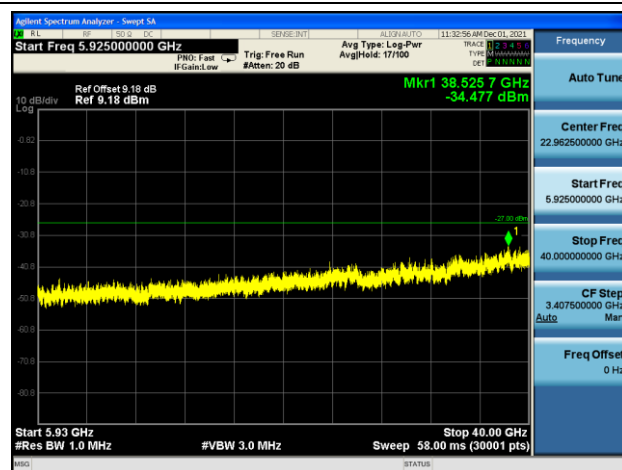
High channel



High channel



High channel





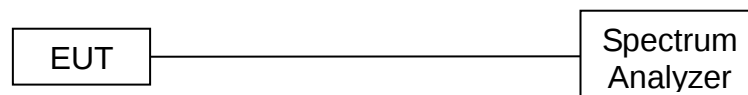
5.7 Conducted band edge

5.7.1 Limits

Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

Frequency Band (MHz)	Limit
5150 - 5250	Outside of the 5.15-5.35 GHz band: e.i.r.p. -27 dBm
5250 - 5350	Outside of the 5.15-5.35 GHz band: e.i.r.p. -27 dBm
5470 - 5725	Outside of the 5.47-5.725 GHz band: e.i.r.p. -27 dBm
5725 - 5850	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.

5.7.2 Test setup



5.7.3 Test procedure

- Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
- Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
- Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
- Repeat above procedures until all measured frequencies were complete.



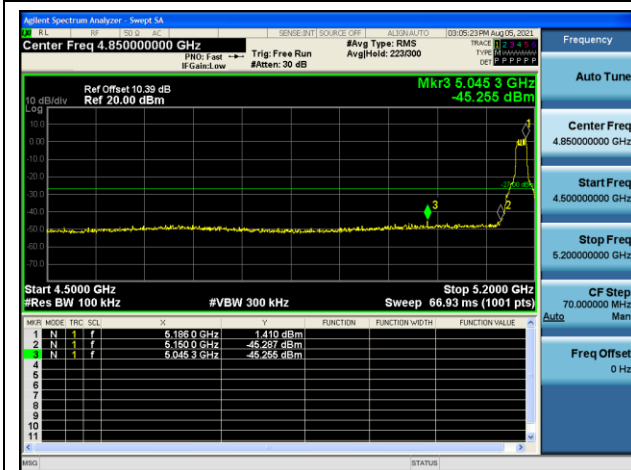
5.7.4 Test results

NOTE: Two transmit chains had been tested, the ANT A was the worst case and record in the test report.

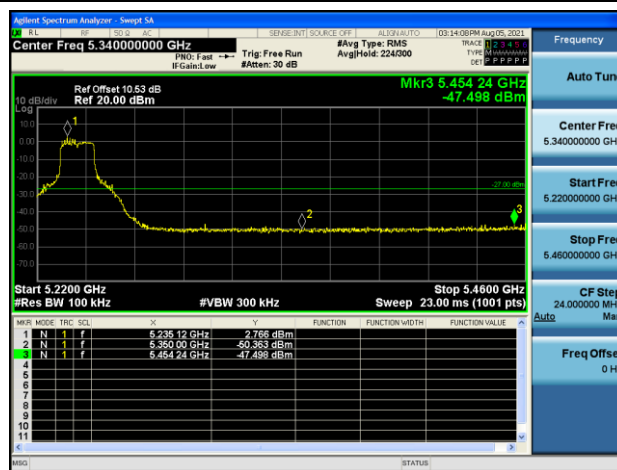
For U-NII-1

11a

Band Edge-Left Side

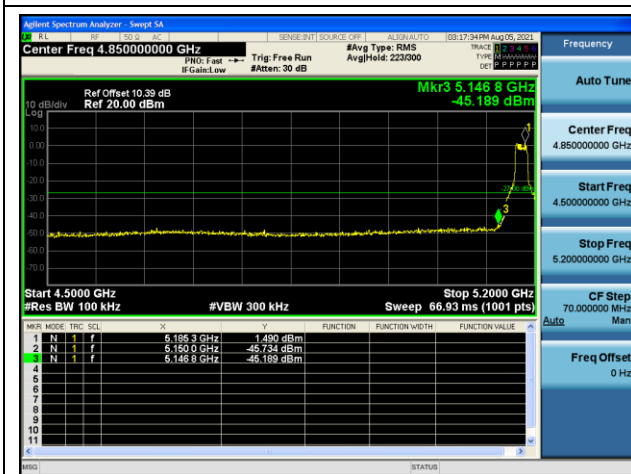


Band Edge-Left Side

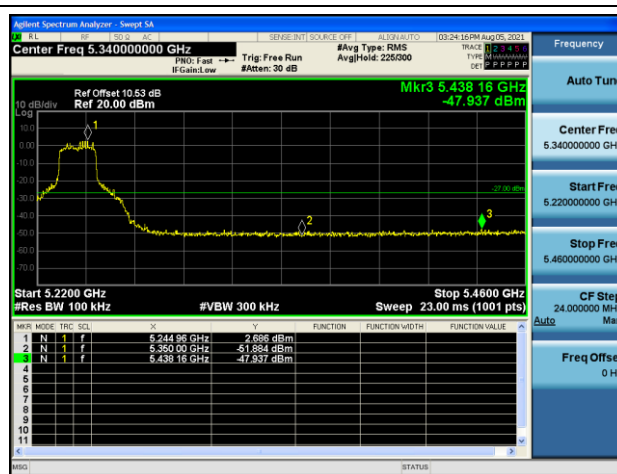


11n20

Band Edge-Left Side



Band Edge-Left Side

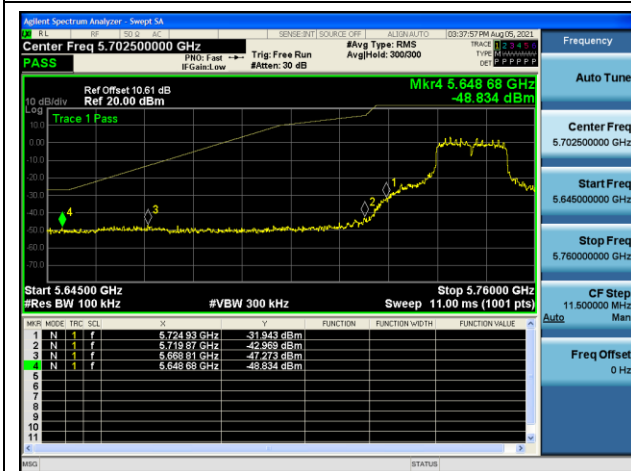




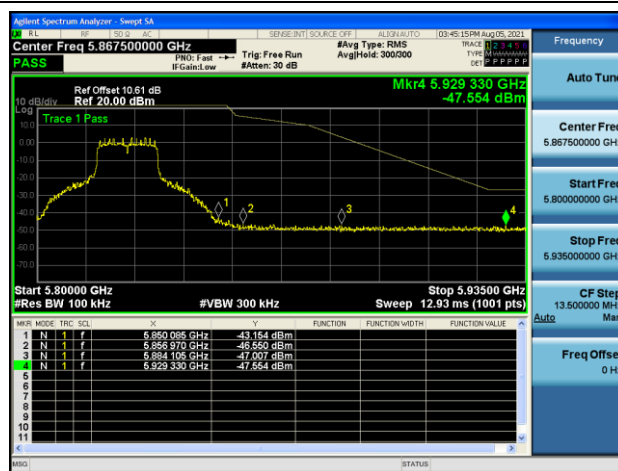
For U-NII-3

11a

Band Edge-Left Side

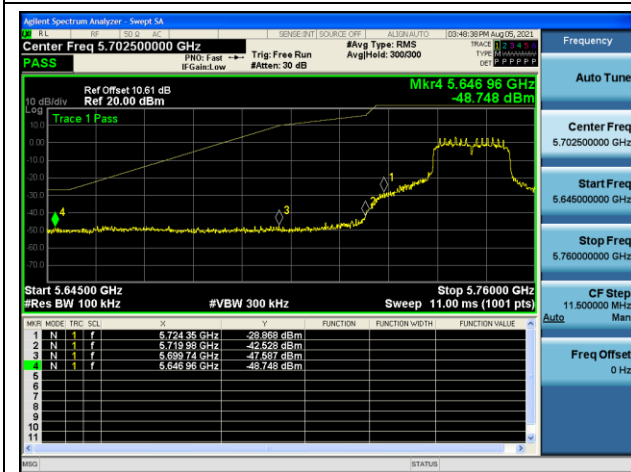


Band Edge-Left Side



11n20

Band Edge-Left Side



Band Edge-Left Side





5.8 Radiated spurious emission

5.8.1 Radiated Emission Limits

1. For transmitters operating in the 5.15-5.25 GHz band:
All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
2. For transmitters operating in the 5.25-5.35 GHz band:
All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
3. For transmitters operating in the 5.47-5.725 GHz band:
All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
4. For transmitters operating in the 5.725-5.85 GHz band:

(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.

(ii) Devices certified before March 2, 2017 with antenna gain greater than 10 dBi may demonstrate compliance with the emission limits in §15.247(d), but manufacturing, marketing and importing of devices certified under this alternative must cease by March 2, 2018. Devices certified before March 2, 2018 with antenna gain of 10 dBi or less may demonstrate compliance with the emission limits in §15.247(d), but manufacturing, marketing and importing of devices certified under this alternative must cease before March 2, 2020.



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

Frequency Range	RBW	VBW	Measurement
30MHz-1GHz	1MHz	3MHz	Peak
Above 1GHz	1MHz	10Hz ^{Note1}	Average
	1MHz	>1/T ^{Note2}	Average
Note1	When duty cycle is no less than 98%		
Note2	When duty cycle is less than 98%		

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP



5.8.2 Test procedure

The measuring distance of at 3 m shall be used for measurements at frequency up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.

The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.

The height of the equipment or of the substitution antenna shall be 0.8 m; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

For emission measurements above 1 GHz, the EUT shall be placed at a height of 1.5 m above the floor on a support that is RF transparent for the frequencies of interest. Final measurements for the EUT require a measurement antenna height scan of 1 m to 4 m.

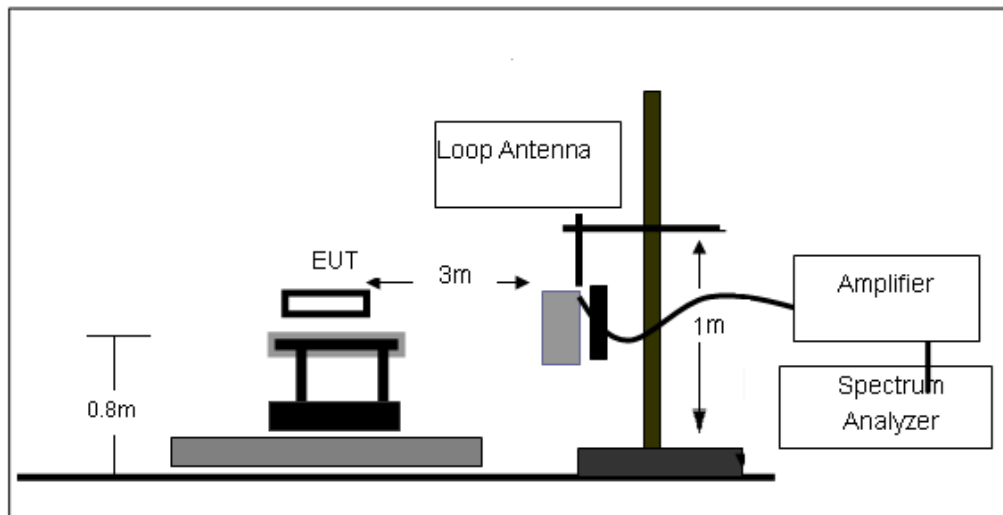
The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.

If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed. For the actual test configuration, please refer to the related Item –EUT Test Photos.

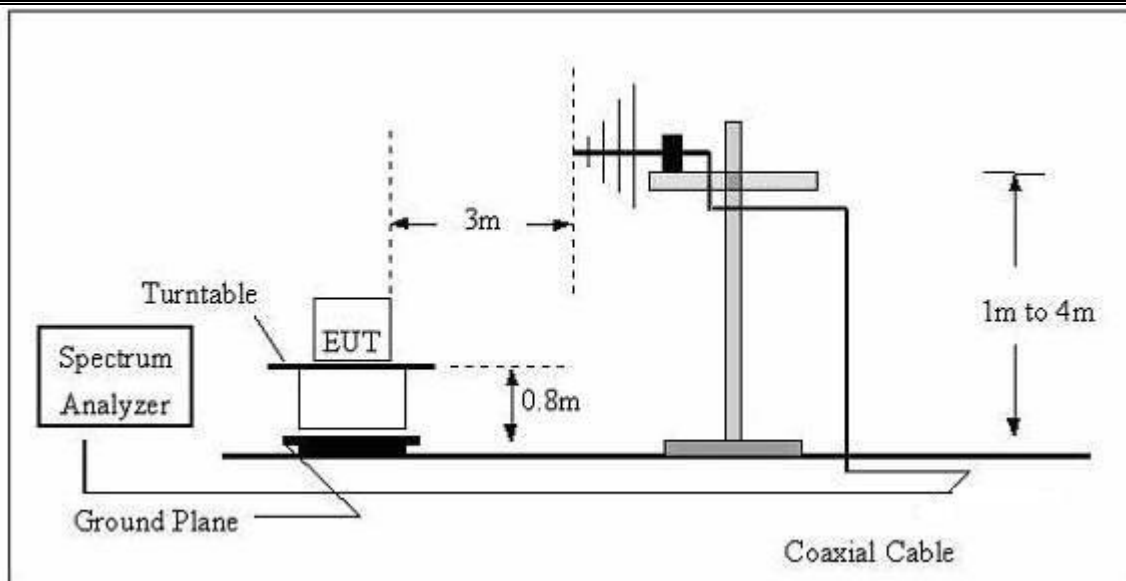
Note: Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported

5.8.3 Test setup

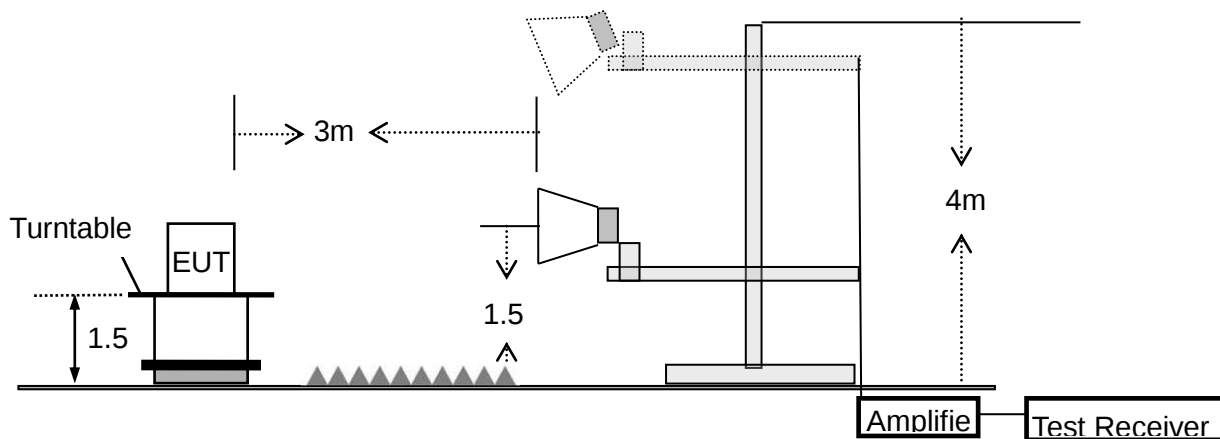
(A) Radiated Emission test-up Frequency Below 30MHz



(B) Radiated Emission Test-Up Frequency 30MHz~1GHz



(C) Radiated Emission Test-Up Frequency Above 1GHz





5.8.4 Test results

EUT:	Speedbird mini	Model Name:	I20E
Pressure:	1010 hPa	Test Voltage:	DC 7.7V from battery
Test Mode:	TX	Polarization:	--

Below 30MHz

Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F
--	--	--	--	Pass
--	--	--	--	Pass

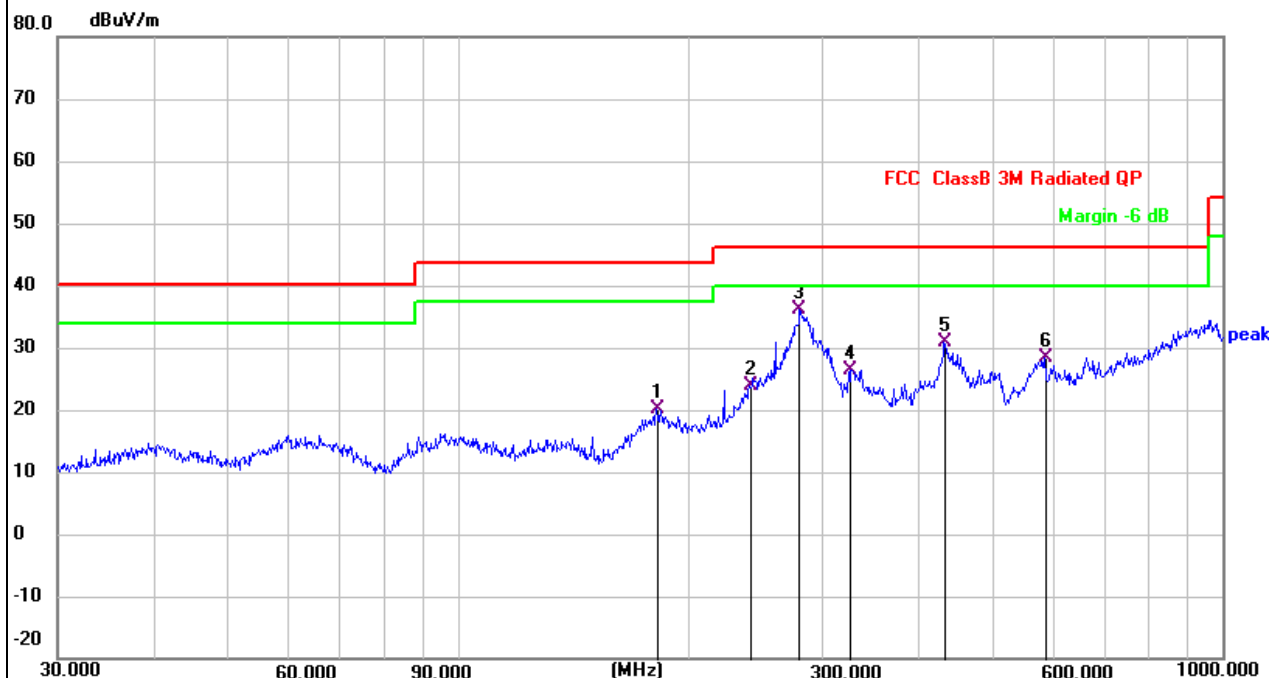
Note:

1. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
2. Distance extrapolation factor = $40 \log (\text{specific distance}/\text{test distance})$ (dB); Limit line = specific limits (dBuV) + distance extrapolation factor.



Between 30MHz – 1GHz

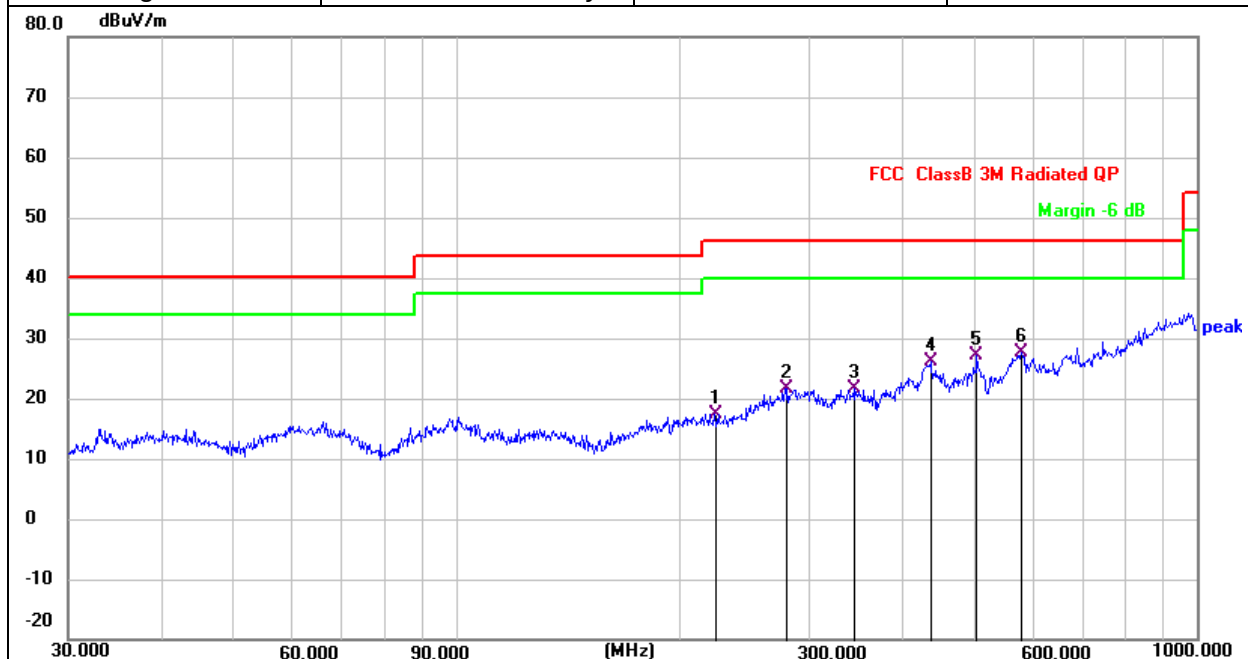
EUT:	Speedbird mini	Model Name:	I20E
Pressure:	1010 hPa	Phase:	H
Test Voltage:	DC 7.7V from battery	Mode:	TX



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		181.9202	34.60	-14.55	20.05	43.50	-23.45	QP
2		240.8304	36.14	-12.27	23.87	46.00	-22.13	QP
3	*	280.0237	46.30	-10.29	36.01	46.00	-9.99	QP
4		326.7395	35.41	-8.98	26.43	46.00	-19.57	QP
5		432.5457	36.05	-5.29	30.76	46.00	-15.24	QP
6		584.7895	31.69	-3.42	28.27	46.00	-17.73	QP



EUT:	Speedbird mini	Model Name:	I20E
Pressure:	1010 hPa	Phase:	V
Test Voltage:	DC 7.7V from battery	Mode:	TX



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over
		MHz	dBuV	dB	dBuV/m	dB/m	dB
1		223.7334	31.12	-13.64	17.48	46.00	-28.52
2		280.0237	31.61	-10.09	21.52	46.00	-24.48
3		344.3855	30.03	-8.41	21.62	46.00	-24.38
4		437.1199	32.84	-6.82	26.02	46.00	-19.98
5		504.7062	32.89	-5.72	27.17	46.00	-18.83
6	*	578.6699	29.48	-1.82	27.66	46.00	-18.34

Note:

1. The MIMO mode 11N20 CH165 is the worst mode. Just report the worst data.
2. Emission Level = Meter Reading + Factor, Margin= Emission Level- Limit, Factor = Antenna Factor + Cable Loss – Pre-amplifier.
3. The peak value is less than the AV value, AV value is not required Factor added by measurement software automatically.