Test Report

FCC ID: 2AYC2-CPC200

Date of issue: Nov. 20, 2020

Report Number:	MTi20091717-2E2
Sample Description:	Car OEM Wired CarPlay to Wireless CarPlay
Model(s):	CPC200-AutoKit, CPC200-CCPW, CPC200-C2W, CPC200-U2W, CPC200-U2W Plus, CPC200-CCPA, CPC200-CP2A
Applicant:	Huizhou Veelink Technology Co., Ltd.
Address:	1504-1506, Finance Building, 23 Xiapu Road, Huicheng District, Huizhou City, Guangdong Province China.
Date of Test:	Oct. 19, 2020 to Nov. 11, 2020

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

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Test Result Certification

Applicant's name:	Huizhou Veelink Technology Co., Ltd.
Address:	1504-1506, Finance Building, 23 Xiapu Road, Huicheng District, Huizhou City, Guangdong Province China.
Manufacture's Name:	Huizhou Veelink Technology Co., Ltd.
Address:	1504-1506, Finance Building, 23 Xiapu Road, Huicheng District, Huizhou City, Guangdong Province China.
Product name:	Car OEM Wired CarPlay to Wireless CarPlay
Trademark:	CalinKit
Model name:	CPC200-AutoKit, CPC200-CCPW, CPC200-C2W, CPC200-U2W, CPC200-U2W Plus, CPC200-CCPA, CPC200-CP2A
Standards:	FCC Part 15.407
Test Procedure:	ANSI C63.10-2013 KDB 789033 D02 General UNII Test Procedures New Rules v02r01

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

Tested by:	Demi Mu	Nov. 11, 2020
Reviewed by:	Leo Su	Nov. 20, 2020
Approved by:	Tom Xue	Nov. 20, 2020

1 General information

1.1 Description of EUT

Equipment:	Car OEM Wired CarPlay to Wireless CarPlay
Model name:	CPC200-AutoKit
Serial Model:	CPC200-CCPW, CPC200-C2W, CPC200-U2W, CPC200-U2W Plus, CPC200-CCPA, CPC200-CP2A
Model difference:	All the models are of the same circuit and RF module, except the run the software 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/ac;
Transfer rate:	802.11a: 6,9,12,18,24,36,48,54Mbps; 802.11n(HT20/HT40): MCS0-MCS15; 802.11ac(VHT20): NSS1, MCS0-MCS8 802.11ac(VHT40):NSS1, MCS0-MCS9 802.11ac(VHT80) :NSS2,MCS0-MCS9;
Channel bandwidth:	802.11a: 20 MHz 802.11n: 20 MHz, 40 MHz 802.11ac: 20 MHz, 40 MHz, 80MHz
Antenna type:	FPC antenna
Antenna Gain (dBi)	For 802.11a, working in SISO mode, then the antenna gain as below: 802.11a: Antenna A :3dBi 802.11a: Antenna B :3dBi
	For 802.11n/ac, working in MIMO mode, the antenna gains should be calculated by the formula: Directional Gain = G_{ANT}+10*log(N_{ANT})dBi = 3 dBi + 10*Log(2) dBi = 6.01 dBi
Max. output power:	U-NII-1: 10.76dBm U-NII-3: 11.57dBm
Hardware version:	A15
Software version:	AutoKit, C2W, U2W
Power supply:	DC 5V from PC
Adapter information:	N/A
Battery:	N/A

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	38	5190	42	5210
40	5200	46	5230	--	--
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	151	5755	155	5775
153	5765	159	5795	--	--
157	5785	--	--	--	--
161	5805	--	--	--	--
165	5825	--	--	--	--

1.3 Test channel list

For 802.11a/n/ac (HT20)

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
44	Mid	5220	157	Mid	5785
48	High	5240	165	High	5825

80 MHz	
Channel Number	Frequency (MHz)
42	5210

For 802.11n/ac (HT40)

U-NII-1 (5150 - 5250 MHz)			U-NII-3(5725 - 5850 MHz)		
Channel Number	Channel	Frequency (MHz)	Channel Number	Channel	Frequency (MHz)
38	Low	5190	151	Low	5755
46	High	5230	159	High	5795

80 MHz	
Channel Number	Frequency (MHz)
155	5775

1.4 Ancillary equipment list

Equipment	Model	S/N	Manufacturer	Certificate type
Mobile phone	S9+	/	SAMSUNG	/
Laptop	E485	/	Lenovo	/

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	Pass	
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	
8	15.407(b) 15.209	Conducted Spurious Emission	Pass	
9	15.407(g)	Frequency stability	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:	15ºC~35ºC
Humidity	20%~75%
Atmospheric pressure	98kPa~101kPa

3.3 Measurement uncertainty

The reported uncertainty of measurement y ± U，where expended 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	±1.38dB
2	RF power, conducted	±0.16dB
3	Spurious emissions, conducted	±0.21dB
4	All emissions, radiated(<1G)	±4.68dB
5	All emissions, radiated(>1G)	±4.89dB
6	Temperature	±0.5°C
7	Humidity	±2%

3.4 Test software

Software Name	Manufacturer	Model	Version
Bluetooth and WiFi Test System	Shenzhen JS tonscend 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	2020/06/04	2021/06/03
MTI-E044	TRILOG Broadband Antenna	schwarabeck	VULB 9163	9163-1338	2020/06/05	2021/06/04
MTI-E047	Amplifier	Hewlett-Packard	8447F	3113A06150	2020/06/04	2021/06/03
MTI-E089	ESG Vector Signal Generator	Agilent	N5182A	MY49060455	2020/06/03	2021/06/02
MTI-E058	ESG Series Analog Ssignal Generator	Agilent	E4421B	GB40051240	2020/07/03	2021/07/04
MTI-E062	PXA Signal Analyzer	Agilent	N9030A	MY51350296	2020/06/04	2021/06/03
MTI-E066	MXA Signal Analyzer	Agilent	N9020A	MY50143483	2020/06/04	2021/06/03
MTI-E078	Synthesized Sweeper	Agilent	83752A	3610A01957	2020/06/04	2021/06/03
MTI-E079	DC Power Supply	Agilent	E3632A	MY40027695	2020/06/04	2021/06/03
MTI-E045	Double Ridged Broadband Horn Antenna	schwarabeck	BBHA 9120 D	9120D-2278	2020/06/05	2021/06/04
MTI-E021	EMI Test Receiver	Rohde&schwarz	ESCS30	100210	2020/06/04	2021/06/03
MTI-E022	Pulse Limiter	Schwarzbeck	VSTD 9561-F	00679	2020/06/03	2021/06/02
MTI-E023	Artificial mains network	Schwarzbeck	NSLK 8127	NSLK 8127 #841	2020/06/04	2021/06/03
MTI-E046	Active Loop Antenna	Schwarzbeck	FMZB 1519 B	00044	2020/06/05	2021/06/04
MTI-E048	Amplifier	Agilent	8449B	3008A02400	2020/07/03	2021/07/04
MTI-E072	Thermometer Clock Humidity Monitor	-	HTC-1	/	2020/06/07	2021/06/06
Note: the calibration interval of the above test instruments is 12 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 FPC antenna, which was permanently affixed to the device and un-replaced, complies with 15.203. In addition, the maximum antenna gain is 3dBi.

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 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.

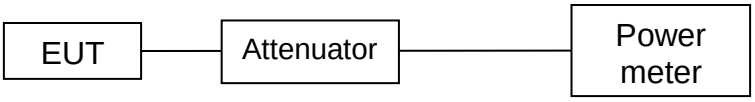
For the band 5.725-5.85 GHz

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

Note 1: For FCC standard, if transmitting antennas of directional gain greater than 6 dBi are used, all band maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

For U-NII-1

Modulation mode	Test Channel	Frequency (MHz)	Maximum Peak Conducted Power						Limit (dBm)	Limit (mW)
			ANT A		ANT B		Total power of antennas			
			(dBm)	(mW)	(dBm)	(mW)	(dBm)	(mW)		
11a	CH36	5180	10.76	11.91	10.00	10.00	/	/	24	250
11a	CH40	5200	9.64	9.20	9.53	8.97	/	/	24	250
11a	CH48	5240	10.06	10.14	9.29	8.49	/	/	24	250
11n (HT20)	CH36	5180	7.86	6.11	8.12	6.49	11.00	12.59	23.99	250
11n (HT20)	CH40	5200	8.71	7.43	8.03	6.35	11.39	13.78	23.99	250
11n (HT20)	CH48	5240	8.52	7.11	7.87	6.12	11.22	13.24	23.99	250
11n (HT40)	CH38	5190	6.81	4.80	6.85	4.84	9.84	9.64	23.99	250
11n (HT40)	CH46	5230	6.64	4.61	6.64	4.61	9.65	9.23	23.99	250

Modulation mode	Test Channel	Frequency (MHz)	Maximum Peak Conducted Power						Limit (dBm)	Limit (mW)
			ANT A		ANT B		Total power of antennas			
			(dBm)	(mW)	(dBm)	(mW)	(dBm)	(mW)		
11ac (HT20)	CH36	5180	8.50	7.08	7.57	5.71	11.07	12.79	23.99	250
11ac (HT20)	CH40	5200	8.21	6.62	7.45	5.56	10.86	12.18	23.99	250
11ac (HT20)	CH48	5240	8.74	7.48	7.17	5.21	11.04	12.69	23.99	250
11ac (HT40)	CH38	5190	6.89	4.89	6.53	4.50	9.72	9.38	23.99	250
11ac (HT40)	CH46	5230	6.81	4.80	6.99	5.00	9.91	9.80	23.99	250
11ac (HT80)	CH46	5210	6.78	4.76	7.10	5.13	9.95	9.89	23.99	250

Note: if transmitting antennas of directional gain greater than 6 dBi are used, then the limit should be reduced.
Because the directional gain = 6.01dB > 6.0 dBi, the limit should be calculated as below:
Limit = 24 dBm - (ANT Gain + 10*Log(N=2))
= 24 dBm - (3 + 3.01-6) dBi = 23.99dBm

For U-NII-3

Modulation mode	Test Channel	Frequency (MHz)	Maximum Peak Conducted Power						Limit (dBm)	Limit (mW)
			ANT A		ANT B		Total power of antennas			
			(dBm)	(mW)	(dBm)	(mW)	(dBm)	(mW)		
11a	CH36	5745	10.08	10.19	11.57	14.35	/	/	24	1000
11a	CH40	5785	10.07	10.16	11.20	13.18	/	/	24	1000
11a	CH48	5825	9.43	8.77	10.70	11.75	/	/	24	1000
11n (HT20)	CH36	5745	4.82	3.03	4.58	2.87	7.71	5.90	23.99	1000
11n (HT20)	CH40	5785	4.50	2.82	4.12	2.58	7.32	5.40	23.99	1000
11n (HT20)	CH48	5825	3.98	2.50	4.48	2.81	7.25	5.31	23.99	1000
11n (HT40)	CH38	5755	4.79	3.01	4.71	2.96	7.76	5.97	23.99	1000
11n (HT40)	CH46	5795	4.65	2.92	4.21	2.64	7.45	5.55	23.99	1000

Modulation mode	Test Channel	Frequency (MHz)	Maximum Peak Conducted Power						Limit (dBm)	Limit (mW)
			ANT A		ANT B		Total power of antennas			
			(dBm)	(mW)	(dBm)	(mW)	(dBm)	(mW)		
11ac (HT20)	CH36	5745	4.68	2.94	4.78	3.01	7.74	5.94	23.99	1000
11ac (HT20)	CH40	5785	4.55	2.85	4.61	2.89	7.59	5.74	23.99	1000
11ac (HT20)	CH48	5825	4.18	2.62	4.03	2.53	7.12	5.15	23.99	1000
11ac (HT40)	CH38	5755	4.68	2.94	4.41	2.76	7.56	5.70	23.99	1000
11ac (HT40)	CH46	5795	3.93	2.47	4.05	2.54	7.00	5.01	23.99	1000
11ac (HT80)	CH46	5775	3.76	2.38	4.98	3.15	7.42	5.52	23.99	1000

Note: if transmitting antennas of directional gain greater than 6 dBi are used, then the limit should be reduced.
Because the directional gain = 6.01dB > 6.0 dBi, the limit should be calculated as below:
Limit = 24 dBm - (ANT Gain + 10*Log(N=2))
= 24 dBm - (3 + 3.01-6) dBi = 23.99dBm

5.3 Power line conducted emission

5.3.1 Limits

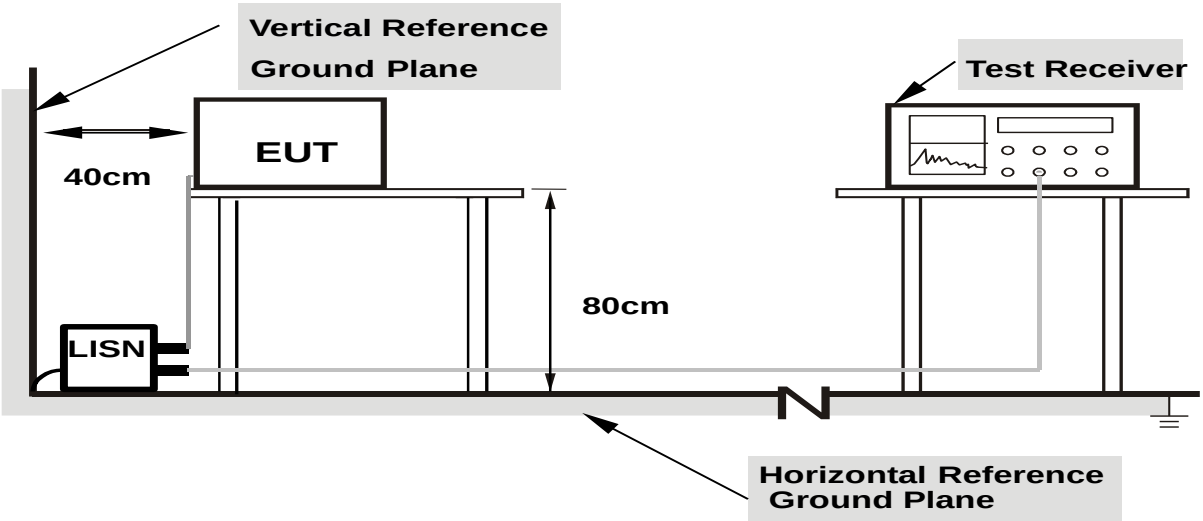
FREQUENCY (MHz)	Class B (dBuV)	
	Quasi-peak	Average
0.15 -0.5	66 - 56 *	56 - 46 *
0.50 -5.0	56.00	46.00
5.0 -30.0	60.00	50.00

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 equipment's 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.

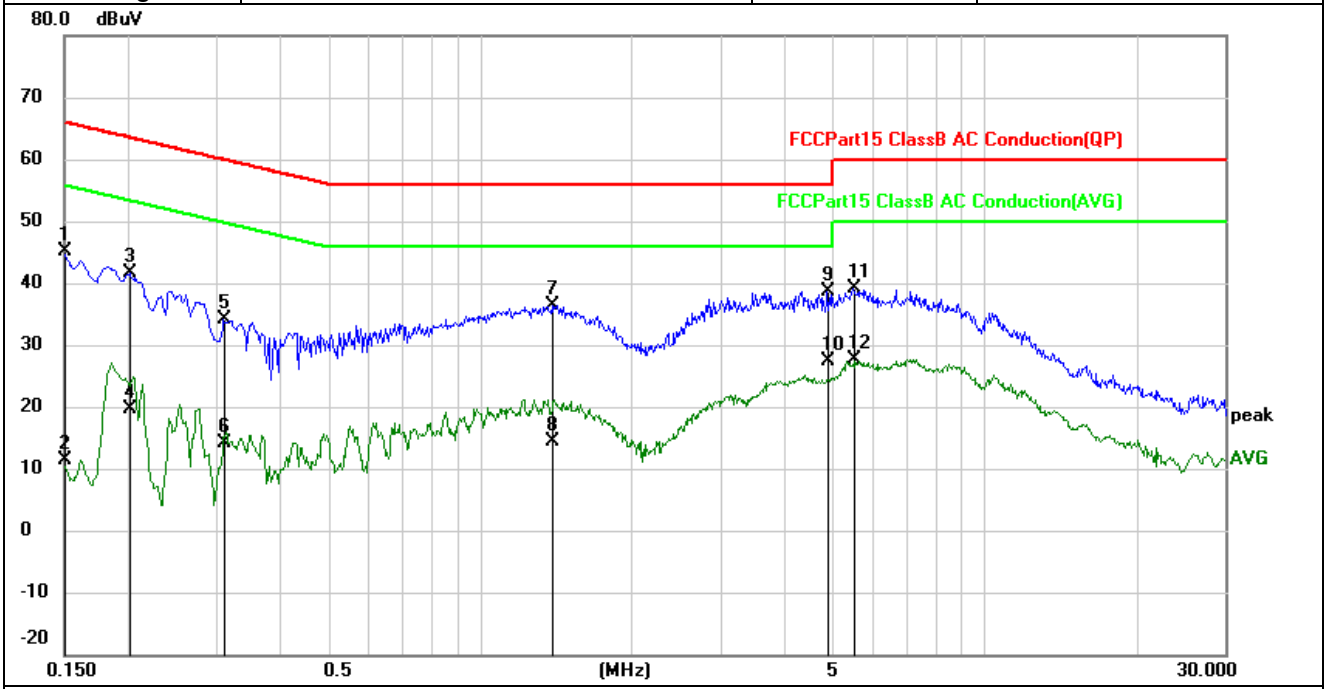
e. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.

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.

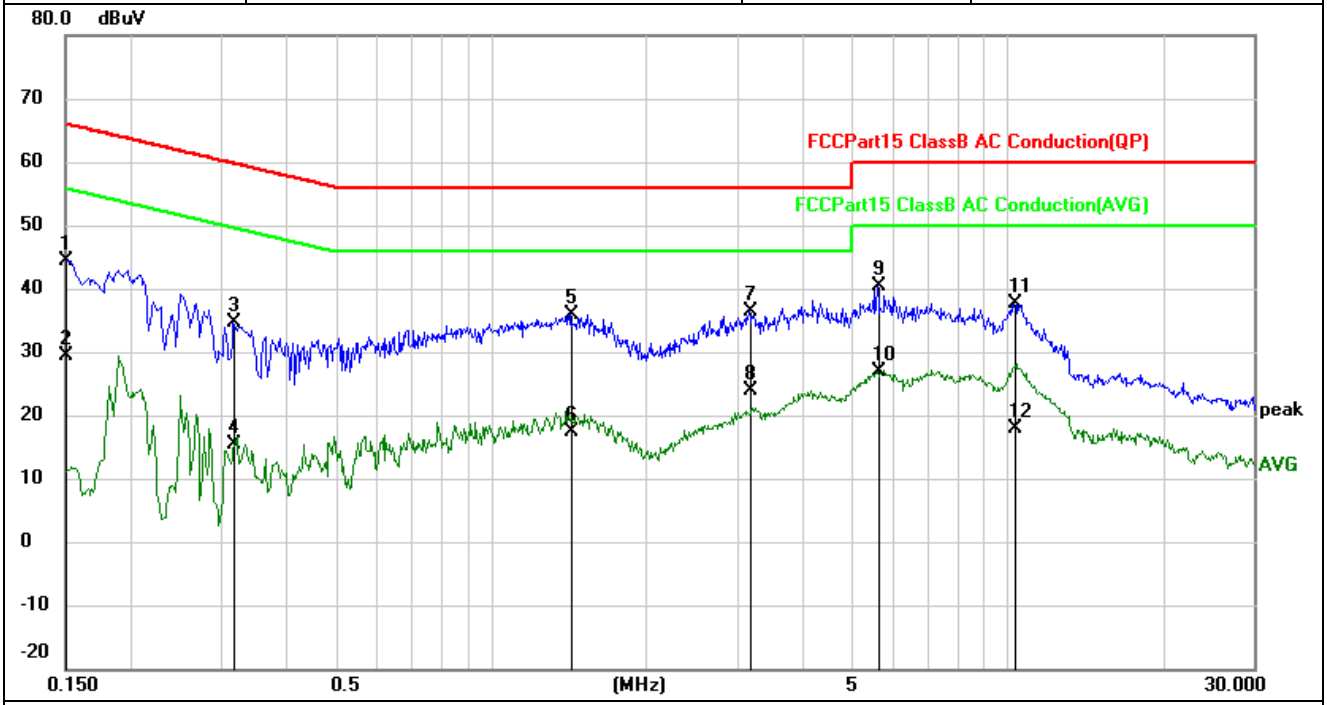
5.3.4 Test results

EUT:	Car OEM Wired CarPlay to Wireless CarPlay	Model Name. :	CPC200-AutoKit
Pressure:	1010hPa	Phase:	L
Test Voltage:	DC 5V from PC	Test Mode:	TX



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.1500	44.91	0.11	45.02	66.00	-20.98	QP
2		0.1500	11.32	0.11	11.43	56.00	-44.57	AVG
3		0.2020	41.57	0.11	41.68	63.53	-21.85	QP
4		0.2020	19.49	0.11	19.60	53.53	-33.93	AVG
5		0.3100	33.91	0.11	34.02	59.97	-25.95	QP
6		0.3100	14.10	0.11	14.21	49.97	-35.76	AVG
7		1.3937	36.32	0.12	36.44	56.00	-19.56	QP
8		1.3937	14.31	0.12	14.43	46.00	-31.57	AVG
9	*	4.8778	38.48	0.21	38.69	56.00	-17.31	QP
10		4.8778	27.16	0.21	27.37	46.00	-18.63	AVG
11		5.5019	38.79	0.22	39.01	60.00	-20.99	QP
12		5.5019	27.48	0.22	27.70	50.00	-22.30	AVG

EUT:	Car OEM Wired CarPlay to Wireless CarPlay	Model Name. :	CPC200-AutoKit
Pressure:	1010hPa	Phase:	N
Test Voltage:	DC 5V from PC	Test Mode:	TX



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.1500	44.35	0.11	44.46	66.00	-21.54	QP
2		0.1500	29.34	0.11	29.45	56.00	-26.55	AVG
3		0.3180	34.59	0.11	34.70	59.76	-25.06	QP
4		0.3180	15.27	0.11	15.38	49.76	-34.38	AVG
5		1.4299	35.73	0.12	35.85	56.00	-20.15	QP
6		1.4299	17.37	0.12	17.49	46.00	-28.51	AVG
7	*	3.1579	36.24	0.16	36.40	56.00	-19.60	QP
8		3.1579	23.80	0.16	23.96	46.00	-22.04	AVG
9		5.6177	40.09	0.22	40.31	60.00	-19.69	QP
10		5.6177	26.72	0.22	26.94	50.00	-23.06	AVG
11		10.3300	37.23	0.31	37.54	60.00	-22.46	QP
12		10.3300	17.53	0.31	17.84	50.00	-32.16	AVG

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 ≥ 3*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

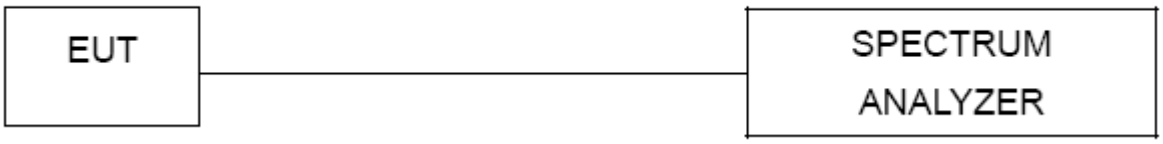
Set RBW = 1% to 5% of the OBW.

Set VBW ≥ 3*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

For U-NII-1

Channel	Test Channel	Frequency(MHz)	26dB bandwidth(MHz)	99% bandwidth (MHz)	Limit(kHz)	Result
11a	CH36	5180	18.86	16.353	/	Pass
11a	CH40	5200	18.77	16.364	/	Pass
11a	CH48	5240	18.79	16.356	/	Pass
11n (HT20)	CH36	5180	19.68	17.517	/	Pass
11n (HT20)	CH40	5200	19.53	17.523	/	Pass
11n (HT20)	CH48	5240	19.63	17.516	/	Pass
11n (HT40)	CH38	5190	38.45	35.816	/	Pass
11n (HT40)	CH46	5230	38.51	35.821	/	Pass

Channel	Test Channel	Frequency (MHz)	26dB bandwidth(MHz)	99% bandwidth(MHz)	Limit(kHz)	Result
11ac (HT20)	CH36	5180	19.49	17.511	/	Pass
11ac (HT20)	CH40	5200	19.56	17.510	/	Pass
11ac (HT20)	CH48	5240	19.47	17.520	/	Pass
11ac (HT40)	CH38	5190	38.58	35.835	/	Pass
11ac (HT40)	CH46	5230	38.24	35.817	/	Pass
11ac (HT80)	CH46	5210	78.20	75.249	/	Pass

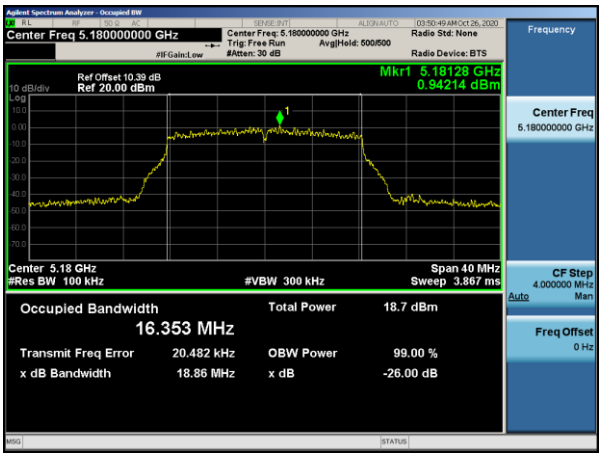
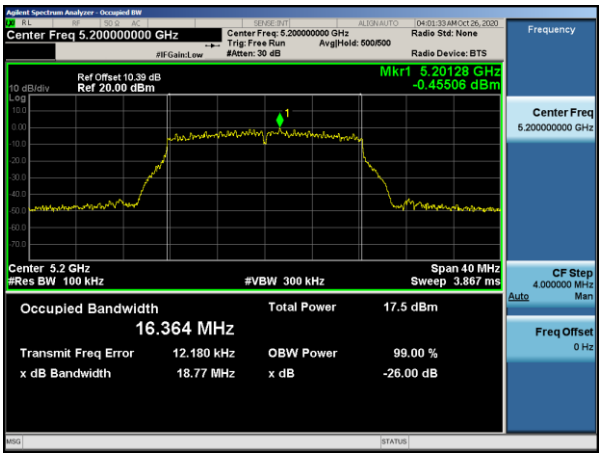
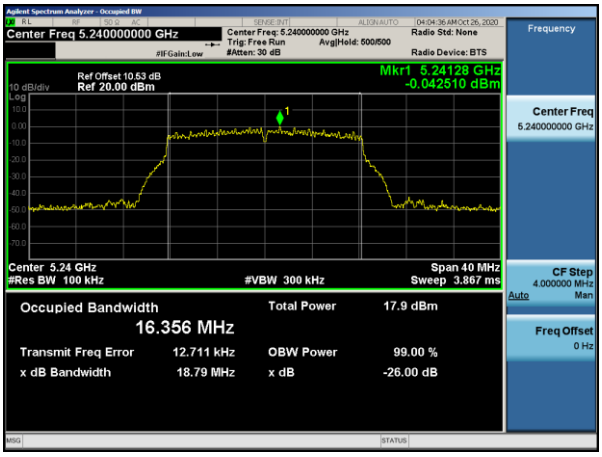
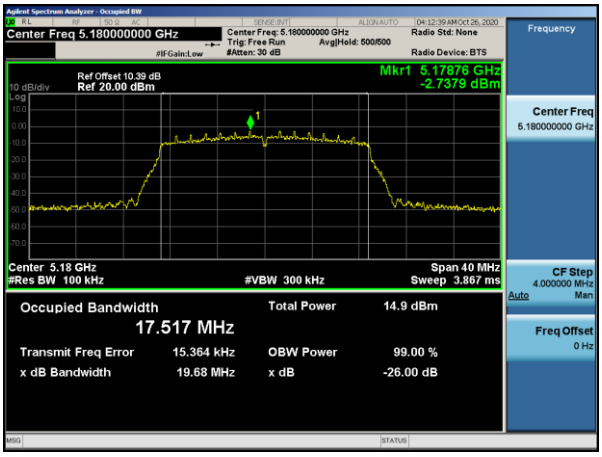
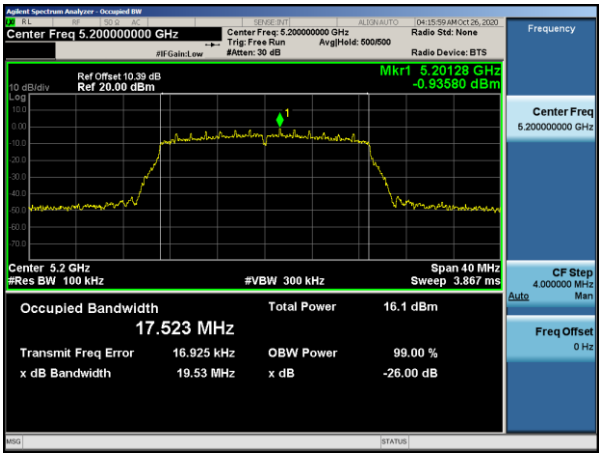
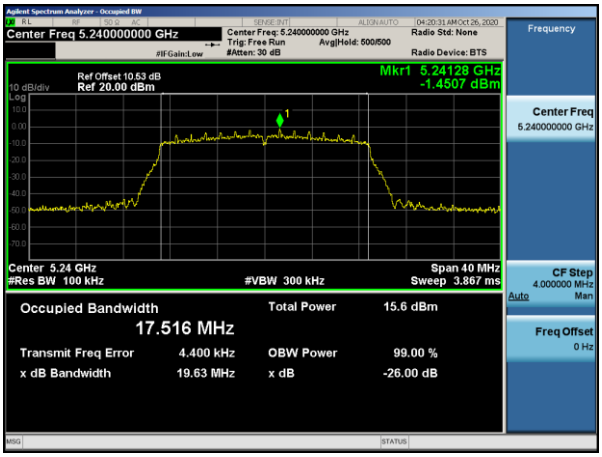
For U-NII-3

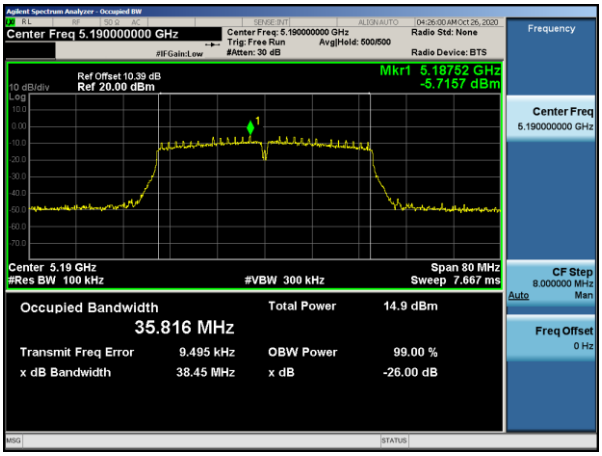
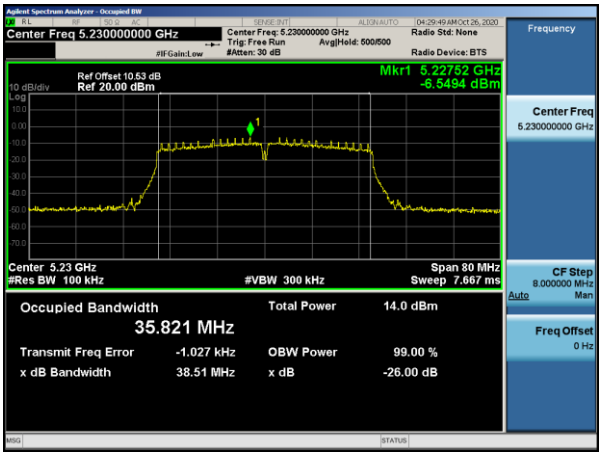
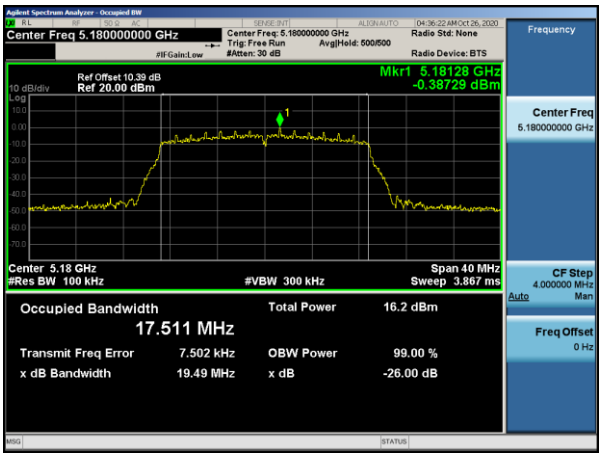
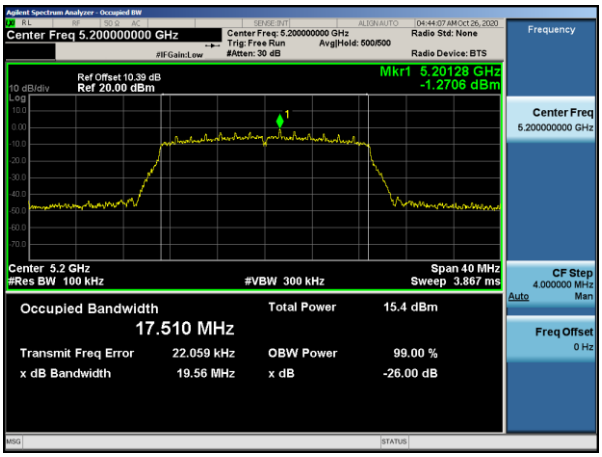
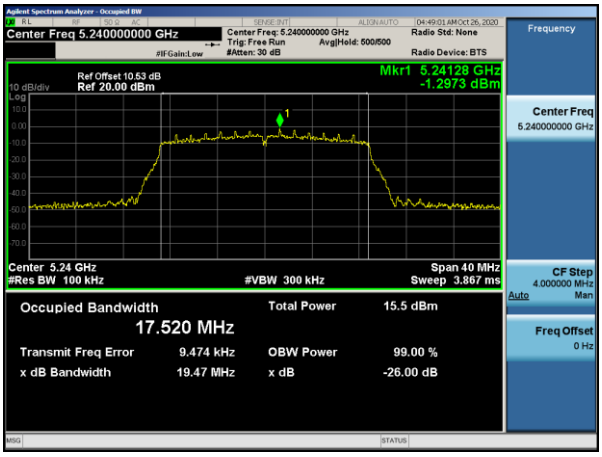
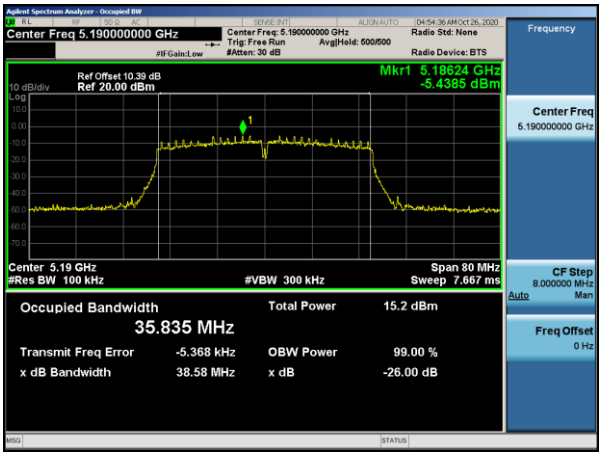
Channel	Test Channel	Frequency(MHz)	99% bandwidth(MHz)	Limit(kHz)	Result
11a	CH149	5745	16.337	/	Pass
11a	CH157	5785	16.335	/	Pass
11a	CH165	5825	16.354	/	Pass
11n (HT20)	CH149	5745	17.518	/	Pass
11n (HT20)	CH157	5785	17.525	/	Pass
11n (HT20)	CH165	5825	17.531	/	Pass
11n (HT40)	CH151	5755	35.895	/	Pass
11n (HT40)	CH159	5795	35.828	/	Pass

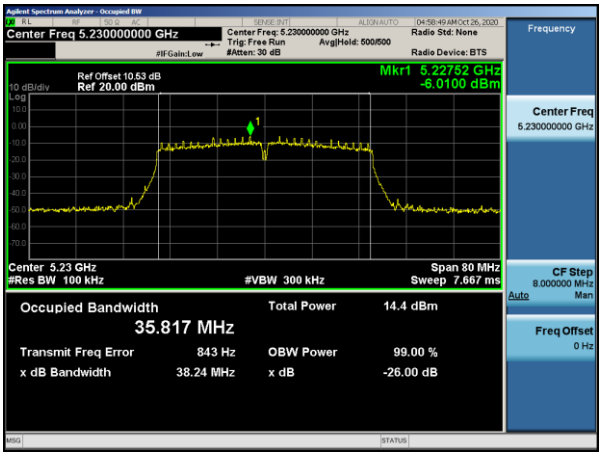
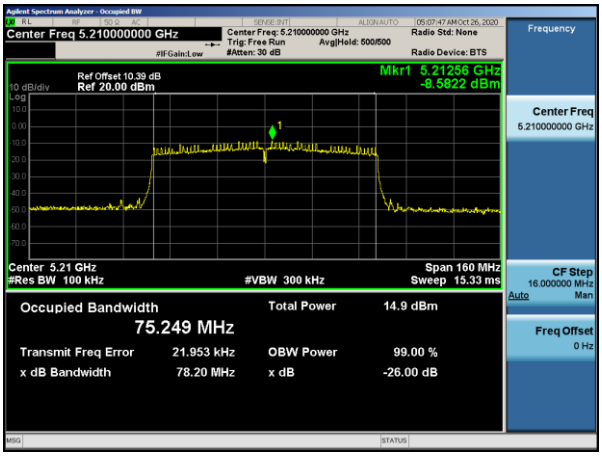
Channel	Test Channel	Frequency(MHz)	99% bandwidth(MHz)	Limit(kHz)	Result
11ac (HT20)	CH149	5745	17.525	/	Pass
11ac (HT20)	CH157	5785	17.519	/	Pass
11ac (HT20)	CH165	5825	17.524	/	Pass
11ac (HT40)	CH151	5755	35.865	/	Pass
11ac (HT40)	CH159	5795	35.834	/	Pass
11ac (HT80)	CH159	5775	75.249	/	Pass

Test plots:

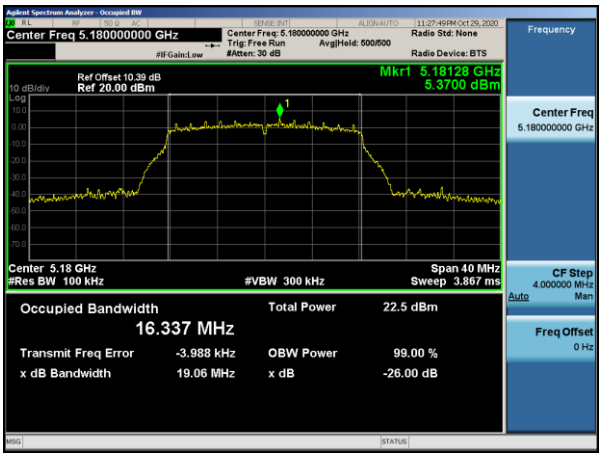
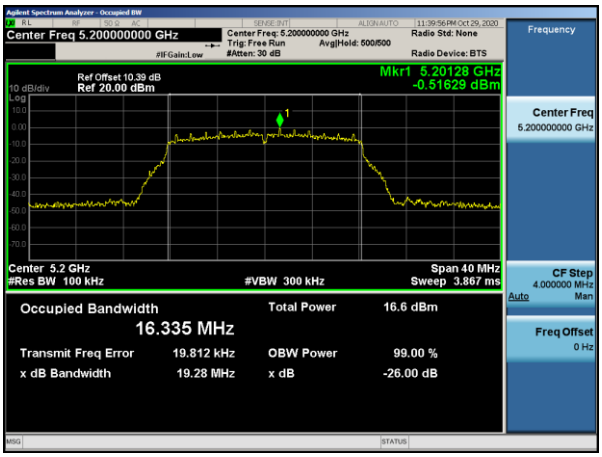
For U-NII-1

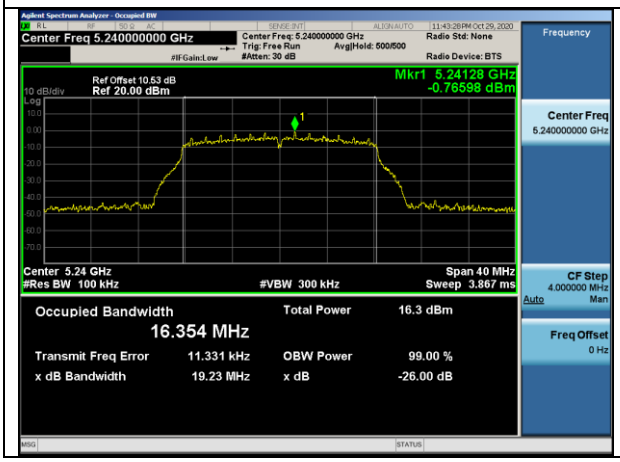
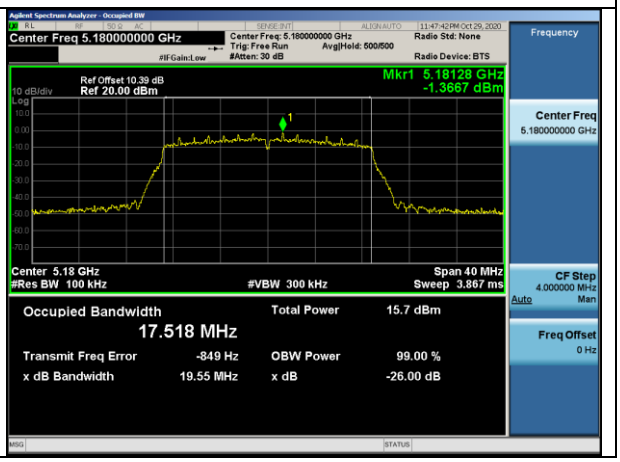
11a CH36	11a CH40
	
11a CH48	**11n (HT20) CH36**
	
11n (HT20) CH40	**11n (HT20) CH48**
	

11n (HT40) CH38	11n (HT40) CH46
	
11ac (HT20) CH36	**11ac (HT20) CH40**
	
11ac (HT20) CH48	**11ac (HT40) CH38**
	

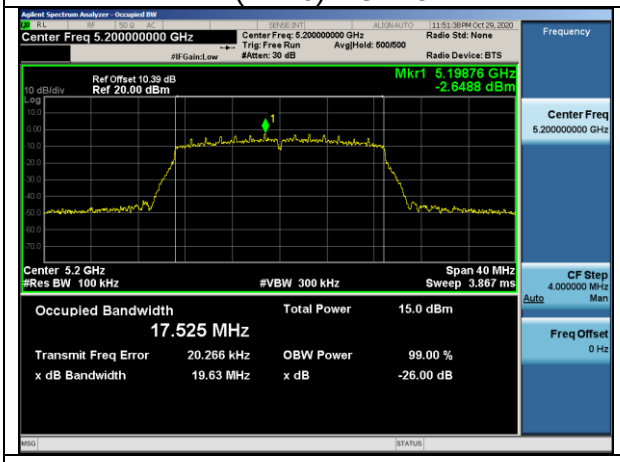
11ac (HT40) CH46	11ac (HT80) CH46
	

For U-NII-3

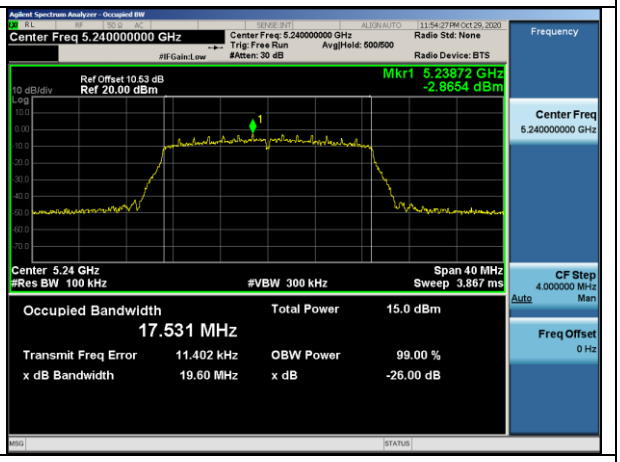
11a CH149	11a CH157
	

11a CH165	11n(HT20) CH149
	

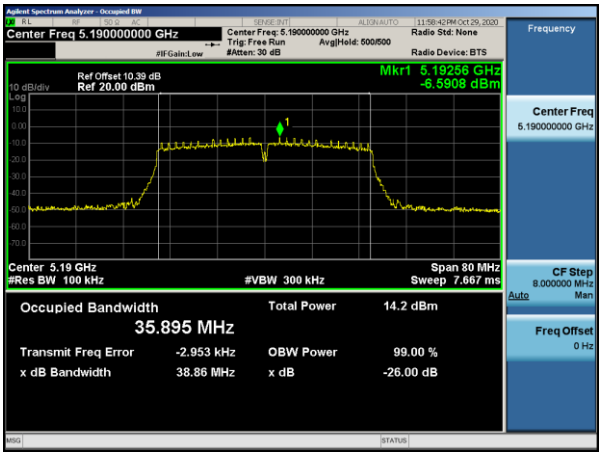
11n(HT20) CH157



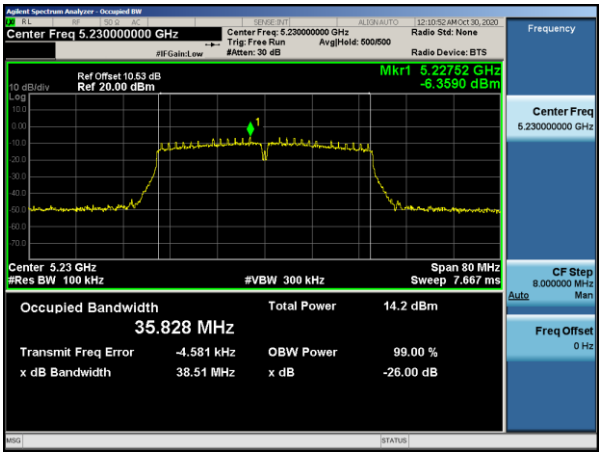
11n(HT20) CH165



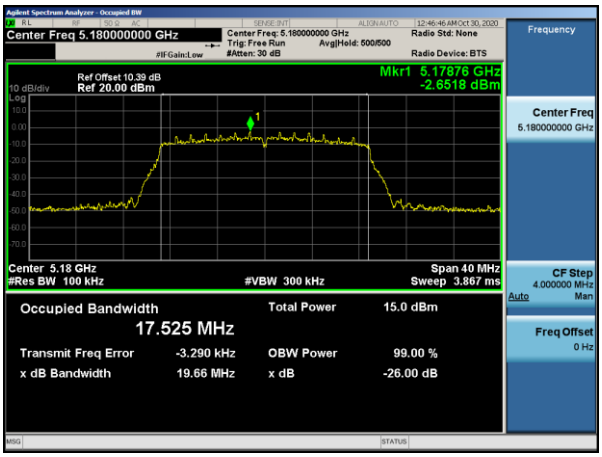
11n (HT40) CH151



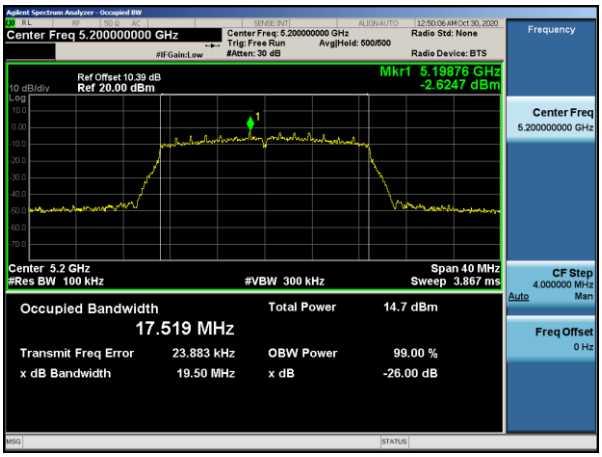
11n (HT40) CH159

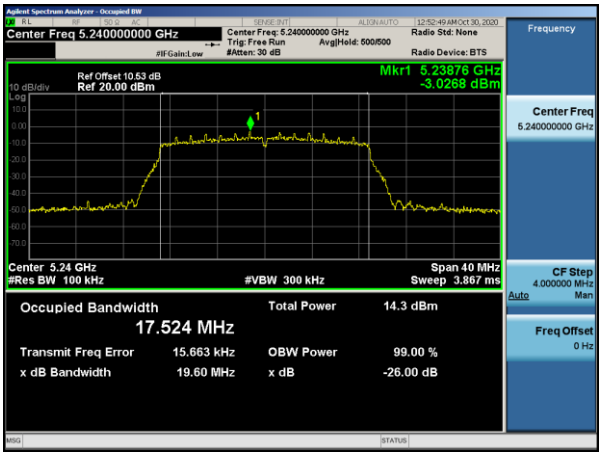
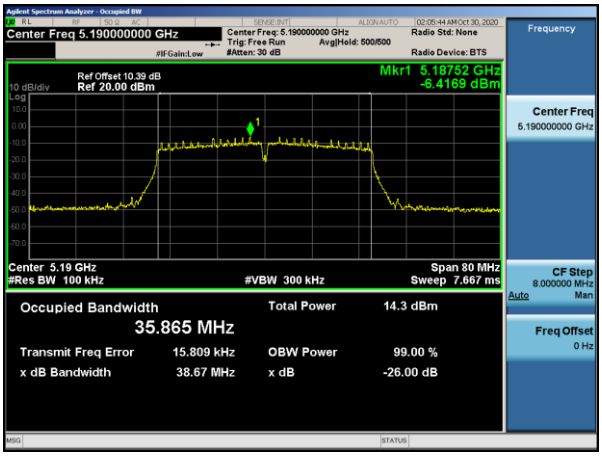
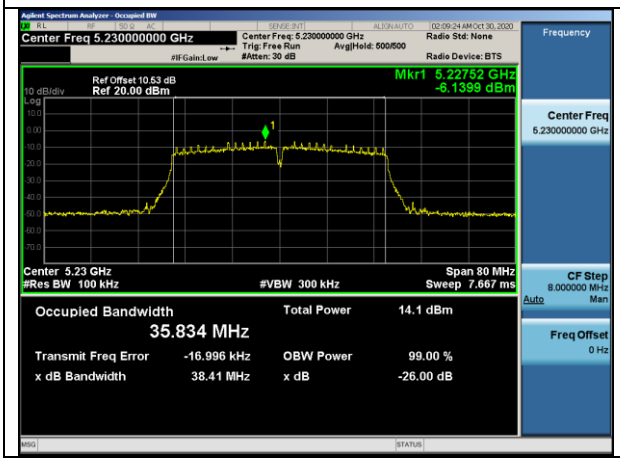
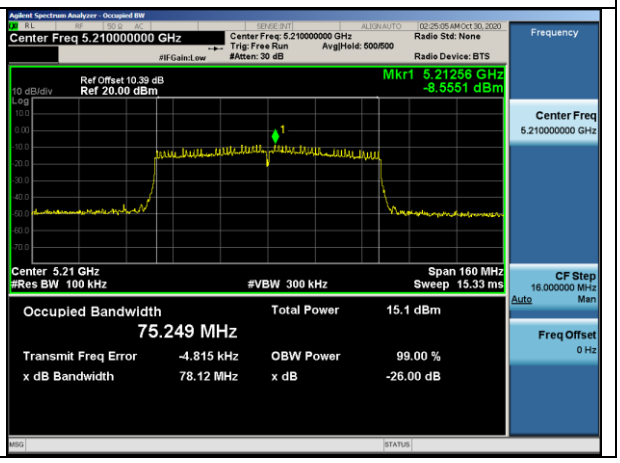


11ac (HT20) CH149



11ac (HT20) CH157



11ac(HT20) CH165	11ac(HT40) CH151
	
11ac(HT40) CH159	**11ac(HT80) CH159**
	

5.5 6dB Bandwidth

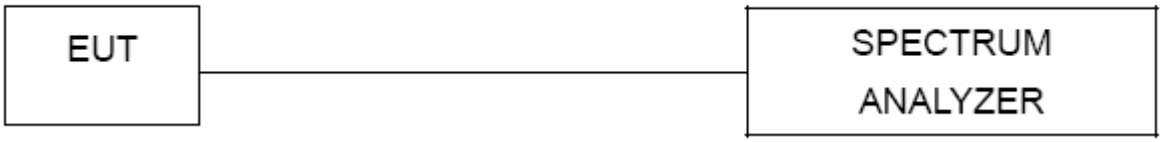
5.5.1 Limit

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) ≥ 3 x 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

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
For U-NII-3

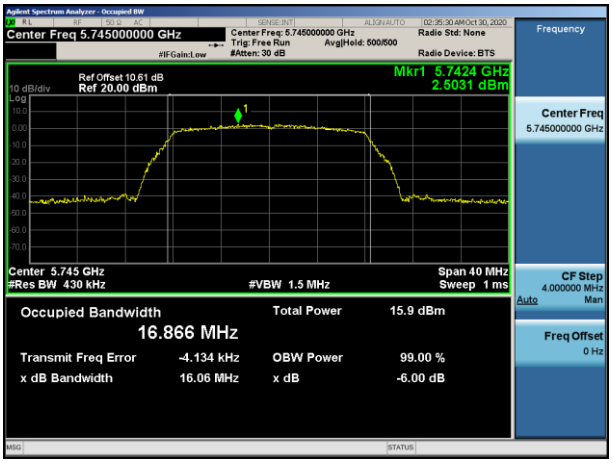
Channel	Test Channel	Frequency(MHz)	6dB bandwidth(MHz)	Limit(kHz)	Result
11a	CH149	5745	16.06	500	Pass
11a	CH157	5785	16.14	500	Pass
11a	CH165	5825	15.91	500	Pass
11n (HT20)	CH149	5745	17.41	500	Pass
11n (HT20)	CH157	5785	17.40	500	Pass
11n (HT20)	CH165	5825	17.31	500	Pass
11n (HT40)	CH151	5755	35.87	500	Pass
11n (HT40)	CH159	5795	36.06	500	Pass

Channel	Test Channel	Frequency(MHz)	6dB bandwidth(MHz)	Limit(kHz)	Result
11ac (HT20)	CH149	5745	17.15	500	Pass
11ac (HT20)	CH157	5785	17.45	500	Pass
11ac (HT20)	CH165	5825	17.16	500	Pass
11ac (HT40)	CH151	5755	35.70	500	Pass
11ac (HT40)	CH159	5795	35.80	500	Pass
11ac (HT80)	CH159	5775	74.80	500	Pass

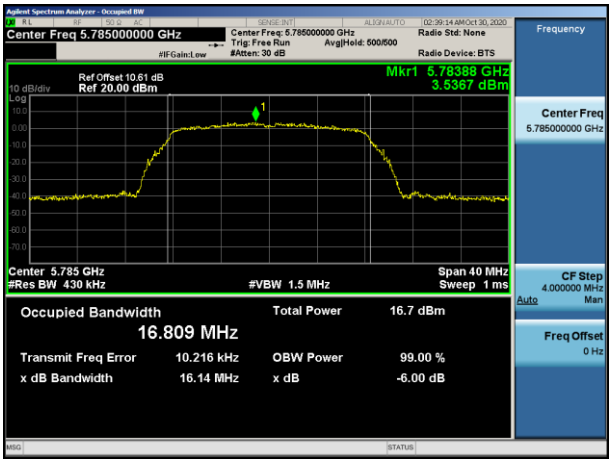
Test plots:

For U-NII-3

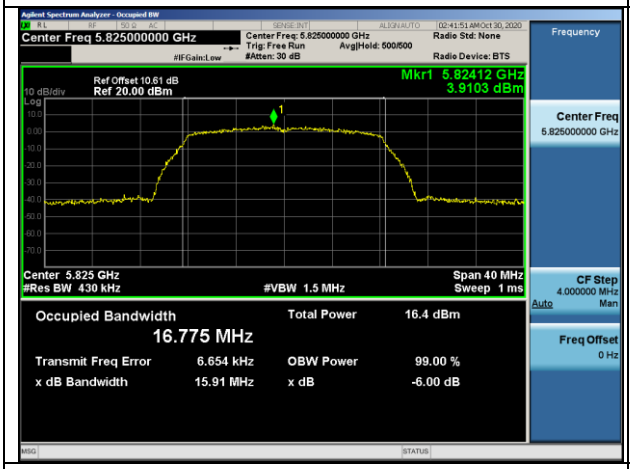
11a CH149



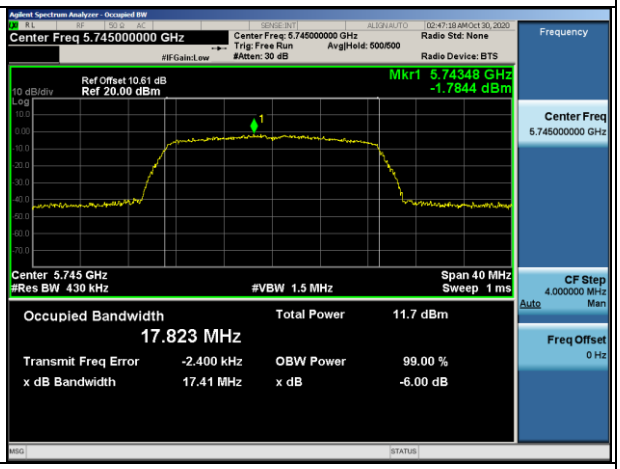
11a CH157



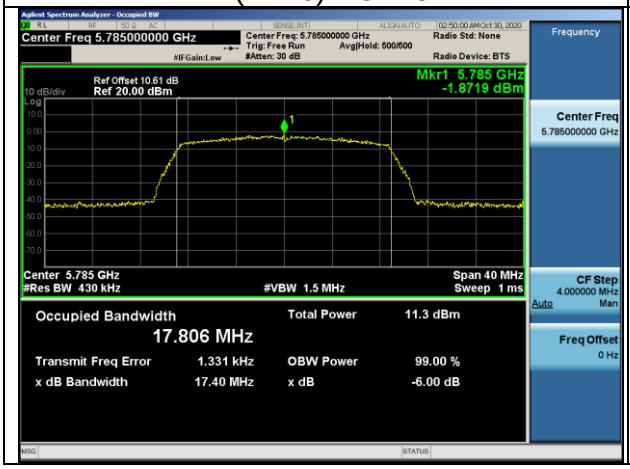
11a CH165



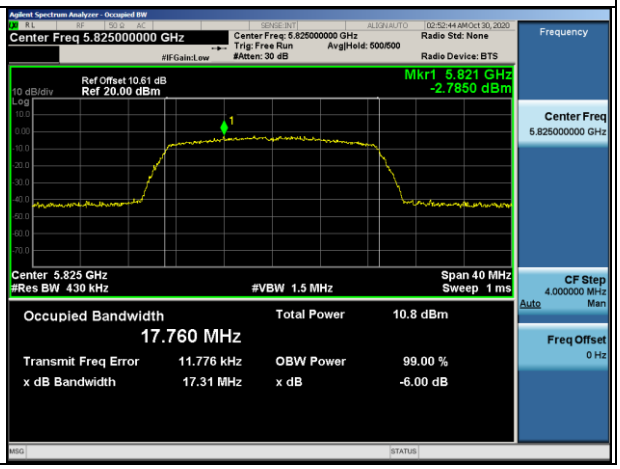
11n(HT20) CH149



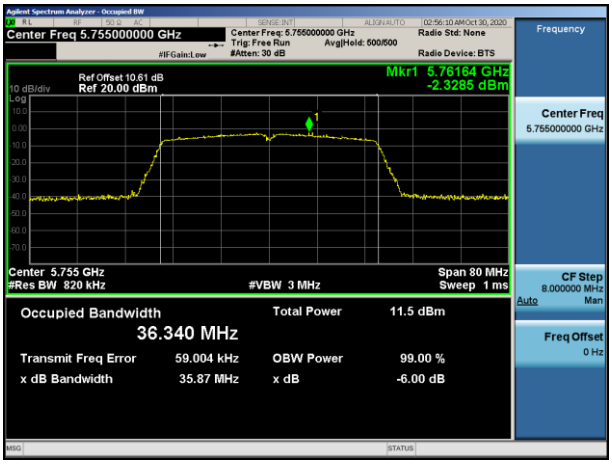
11n(HT20) CH157



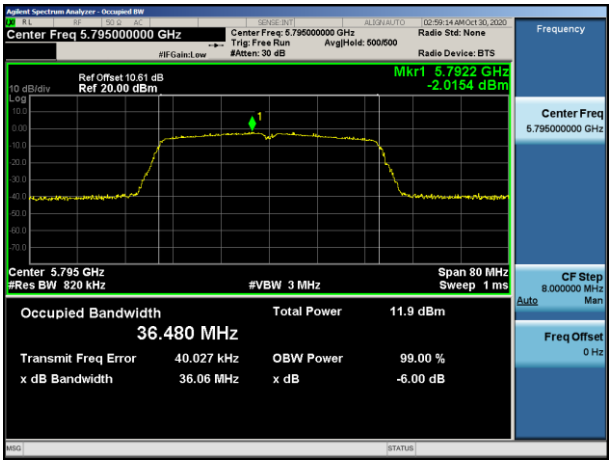
11n(HT20) CH165



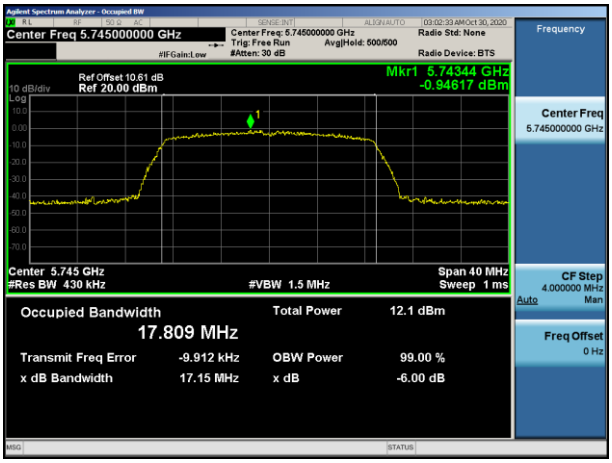
11n (HT40) CH151



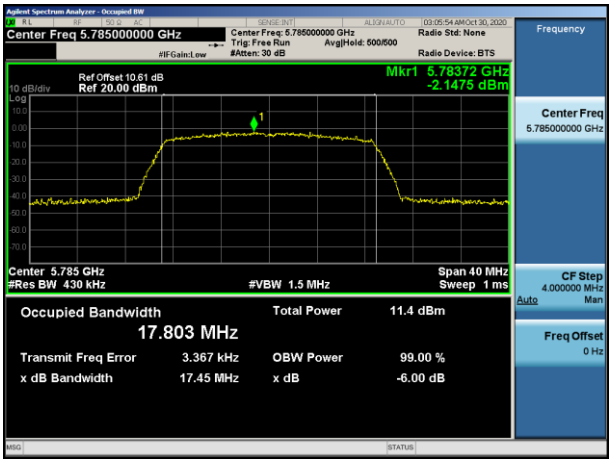
11n (HT40) CH159



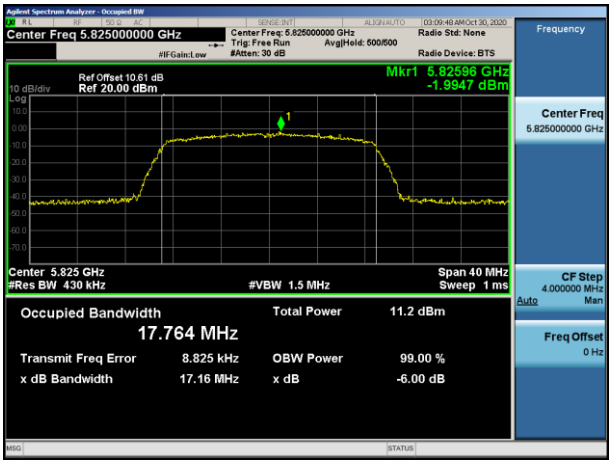
11ac (HT20) CH149



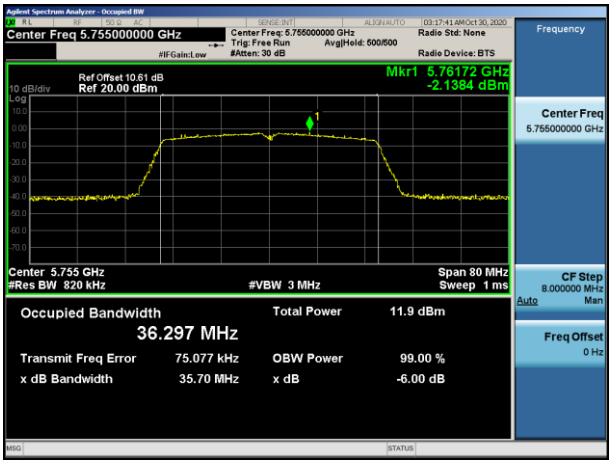
11ac (HT20) CH157

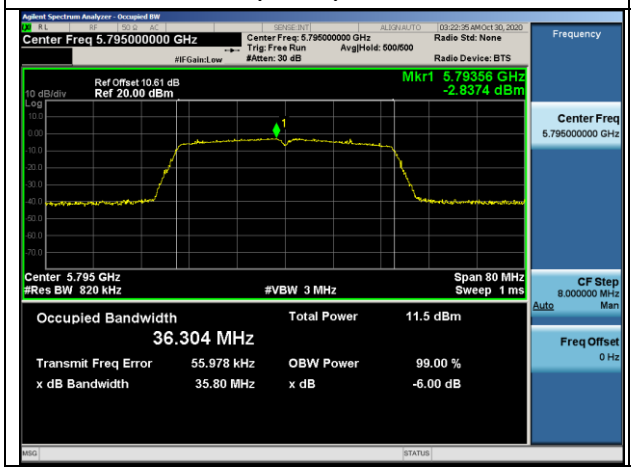


11ac(HT20) CH165



11ac(HT40) CH151



11ac(HT40) CH159	11ac(HT80) CH159
	

5.6 Radiated spurious emission

Radiated Emission Limits

20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

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

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RBW / VBW (emission in restricted band)	1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average

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

5.6.1 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.

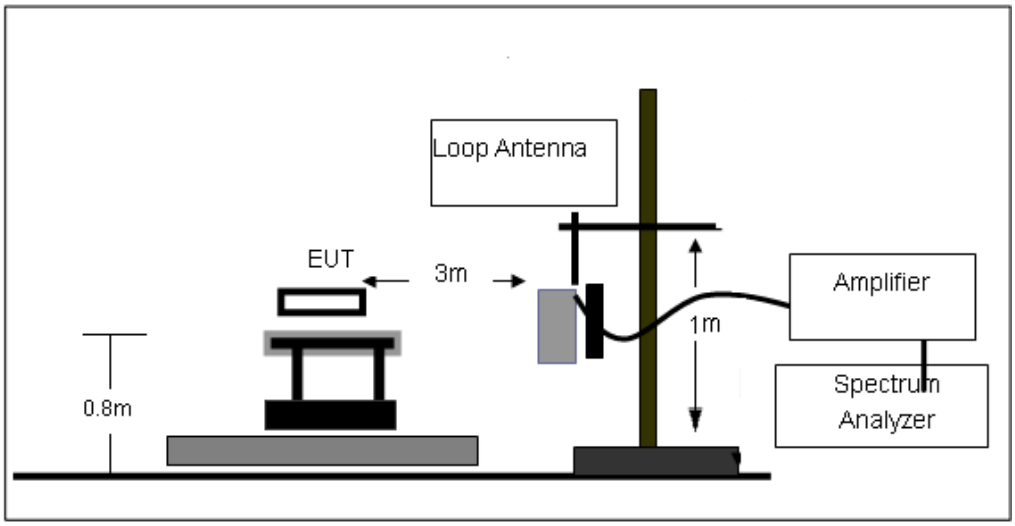
The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.

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.

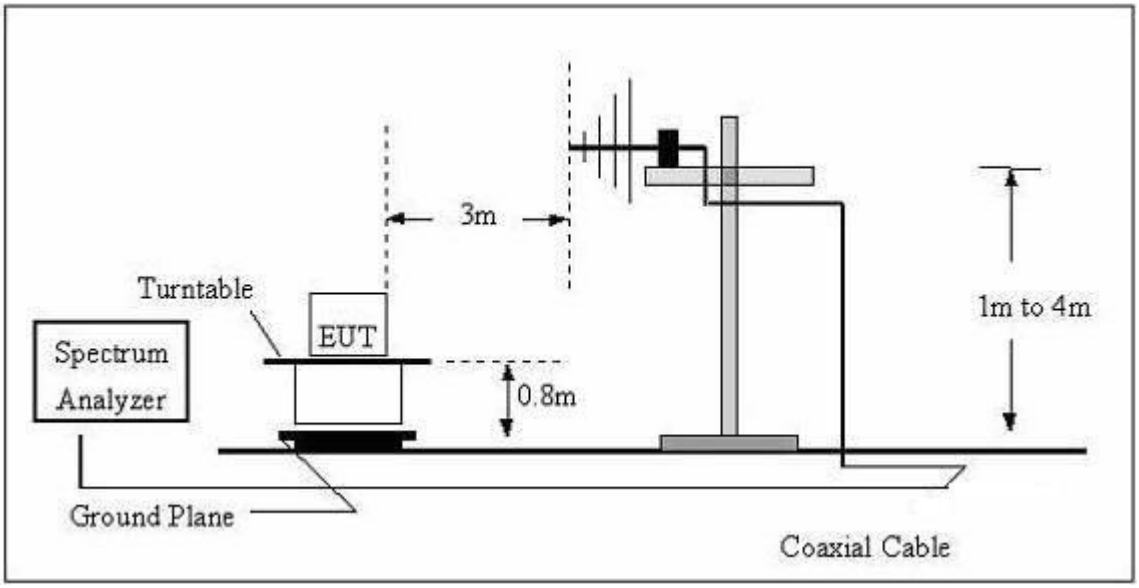
Note: Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported

5.6.2 Test setup

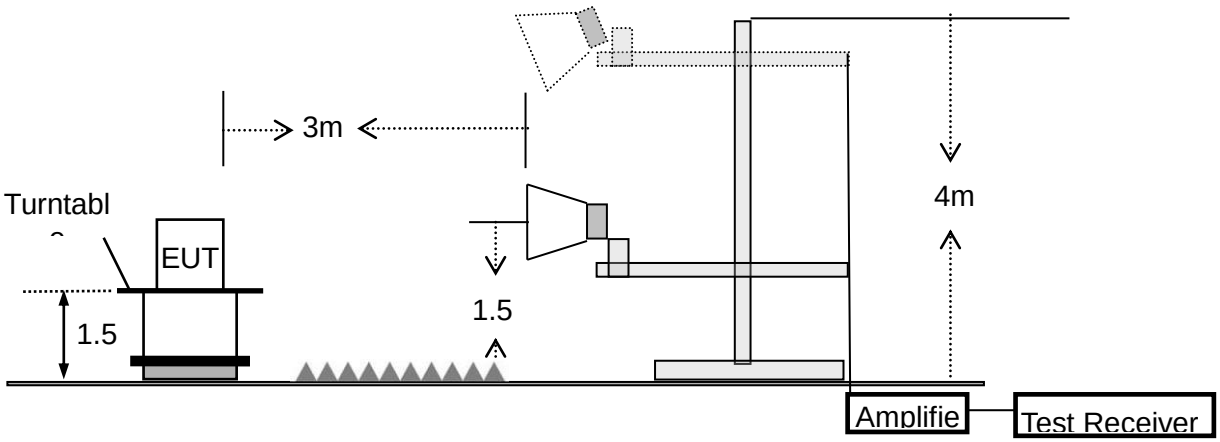
（A）Radiated Emission test-up Frequency Below 30MHz



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



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



5.6.3 Test results

EUT：	Car OEM Wired CarPlay to Wireless CarPlay	Model Name. ：	CPC200-AutoKit
Pressure：	1010 hPa	Test Voltage：	DC 5V from PC
Test Mode：	TX	Polarization :	--

Below 30MHz

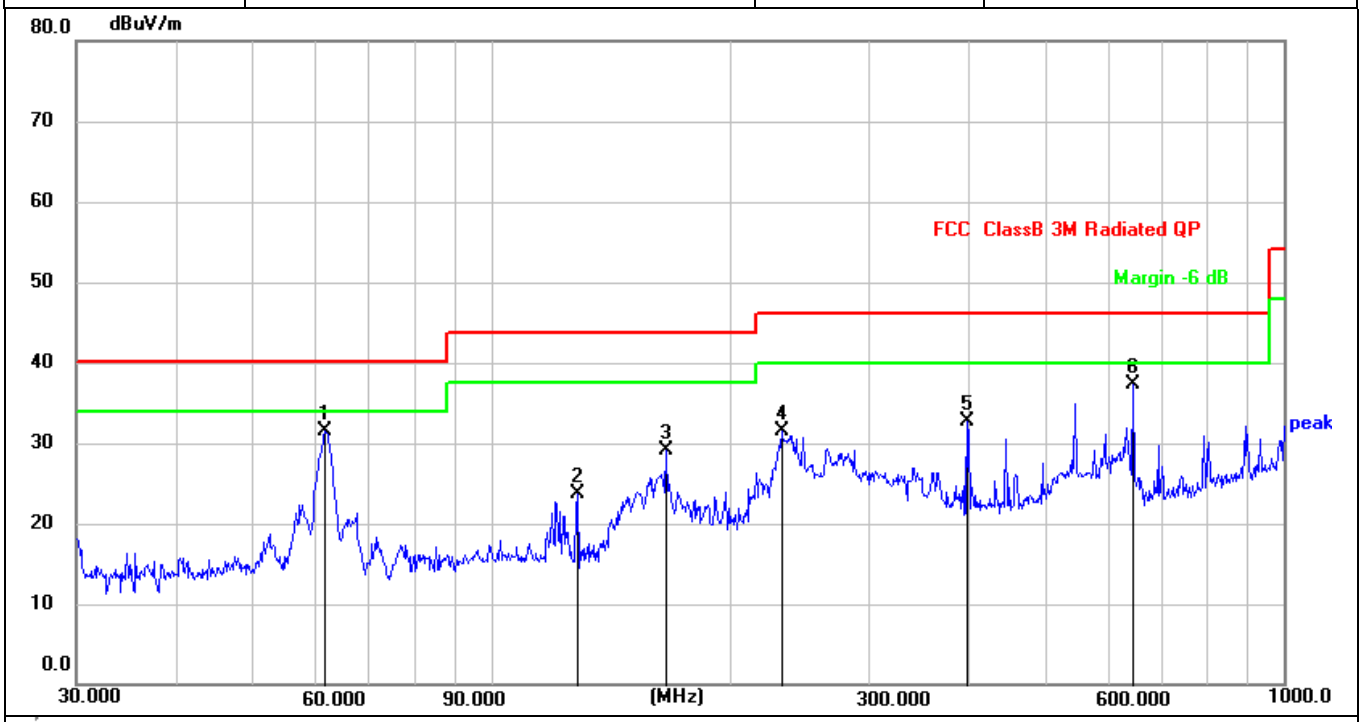
Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F
--	--	--	--	Pass
--	--	--	--	Pass

Note1:The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
Note2:Distance extrapolation factor =40 log (specific distance/test distance)(dB);Limit line = specific limits(dBuV) + distance extrapolation factor.

Between 30MHz – 1GHz

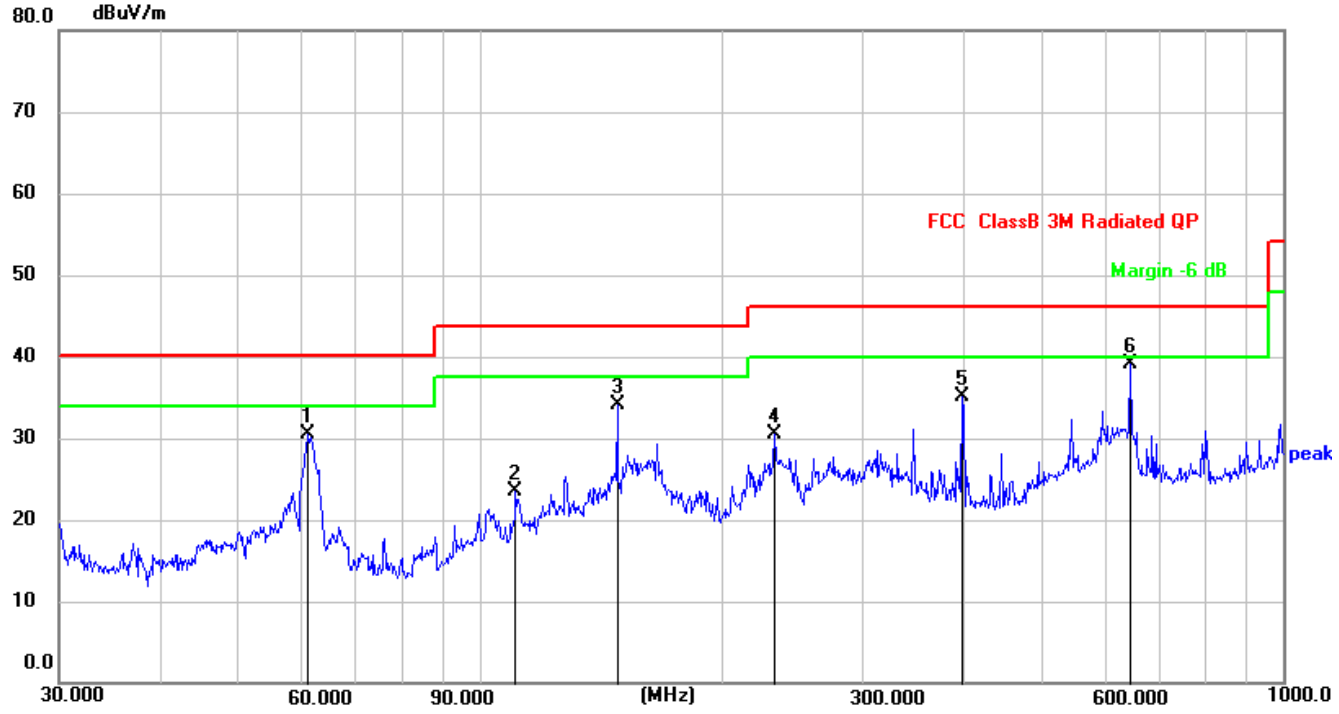
Note1 : Emission Level = Meter Reading + Factor, Margin= Emission Level- Limit, Factor = Antenna Factor + Cable Loss – Pre-amplifier.
Note2 :The peak value is less than the AV value, AV value is not required Factor added by measurement software automatically.

EUT:	Car OEM Wired CarPlay to Wireless CarPlay	Model Name. :	CPC200-AutoKit
Pressure:	1010 hPa	Phase:	H
Test Voltage:	DC 5V from PC	Mode:	TX



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1 *	61.7779	46.62	-15.17	31.45	40.00	-8.55	QP
2	128.5629	40.53	-16.87	23.66	43.50	-19.84	QP
3	166.0680	45.39	-16.28	29.11	43.50	-14.39	QP
4	232.5318	44.15	-12.67	31.48	46.00	-14.52	QP
5	399.0300	41.81	-9.02	32.79	46.00	-13.21	QP
6	645.1194	41.48	-4.22	37.26	46.00	-8.74	QP

EUT:	Car OEM Wired CarPlay to Wireless CarPlay	Model Name. :	CPC200-AutoKit
Pressure:	1010 hPa	Phase :	V
Test Voltage:	DC 5V from PC	Mode:	TX



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	61.1315	45.52	-14.98	30.54	40.00	-9.46	QP
2	110.9569	38.28	-14.85	23.43	43.50	-20.07	QP
3	148.4410	51.60	-17.48	34.12	43.50	-9.38	QP
4	232.5318	43.24	-12.67	30.57	46.00	-15.43	QP
5	399.0300	44.05	-9.02	35.03	46.00	-10.97	QP
6 *	645.1194	43.24	-4.22	39.02	46.00	-6.98	QP

1G-40GHz

Note1 : Emission Level = Meter Reading + Factor, Margin= Emission Level- Limit, Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Note2 :The peak value is less than the AV value, AV value is not required Factor added by measurement software automatically.

Note3 :The spurious emission of 25GHz – 40GHz band which the margin is lower more than 20dB,So that it is not reported in this test report.

Note4: The antenna A and antenna B have been tested. The report only shows the worst antenna. The worst case is ANT A.

ANT A

For U-NII-1

Polar	Frequency	Meter Reading	Cable loss	Antenna Factor	Preamp Factor	Emission Level	Limits	Margin	Detector Type
(H/V)	(MHz)	(dBuV)	(dB)	dB/m	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
Low Channel (5185 MHz)-Above 1G									
Vertical	4434.212	56.37	5.94	35.40	44.00	53.71	74.00	-20.29	Pk
Vertical	4434.212	45.21	5.94	35.40	44.00	42.55	54.00	-11.45	AV
Vertical	10370.154	62.70	8.46	39.75	44.50	66.41	74.00	-7.59	Pk
Vertical	10370.154	44.24	8.46	39.75	44.50	47.95	54.00	-6.05	AV
Vertical	15540.126	57.04	10.12	38.80	44.10	61.86	74.00	-12.14	Pk
Vertical	15540.126	43.17	10.12	38.80	42.70	49.39	54.00	-4.61	AV
Horizontal	4434.242	59.22	5.94	35.18	44.00	56.34	74.00	-17.66	Pk
Horizontal	4434.242	42.28	5.94	35.18	44.00	39.40	54.00	-14.60	AV
Horizontal	10370.121	61.31	8.46	38.71	44.50	63.98	74.00	-10.02	Pk
Horizontal	10730.121	44.54	8.46	38.71	44.50	47.21	54.00	-6.79	AV
Horizontal	15540.115	57.51	10.12	38.38	44.10	61.91	74.00	-12.09	Pk
Horizontal	15540.115	43.79	10.12	38.38	44.10	48.19	54.00	-5.81	AV
middle Channel (5200 MHz)-Above 1G									
Vertical	4592.142	57.89	6.48	36.35	44.05	56.67	74.00	-17.33	Pk
Vertical	4592.142	41.92	6.48	36.35	44.05	40.70	54.00	-13.30	AV
Vertical	10401.205	62.31	8.47	37.88	44.51	64.15	74.00	-9.85	Pk
Vertical	10401.205	46.44	8.47	37.88	44.51	48.28	54.00	-5.72	AV
Vertical	15600.176	56.61	10.12	38.8	44.10	61.43	74.00	-12.57	Pk
Vertical	15600.176	41.55	10.12	38.8	42.70	47.77	54.00	-6.23	AV
Horizontal	4592.313	60.74	6.48	36.37	44.05	59.54	74.00	-14.46	Pk
Horizontal	4592.313	43.04	6.48	36.37	44.05	41.84	54.00	-12.16	AV
Horizontal	10400.215	62.02	8.47	38.64	44.50	64.63	74.00	-9.37	Pk
Horizontal	10400.215	48.14	8.47	38.64	44.50	50.75	54.00	-3.25	AV
Horizontal	15600.175	58.10	10.12	38.38	44.10	62.50	74.00	-11.50	Pk
Horizontal	15600.175	42.79	10.12	38.38	44.10	47.19	54.00	-6.81	AV

High Channel (5240 MHz)-Above 1G									
Vertical	4739.216	59.09	7.10	37.24	43.50	59.93	74.00	-14.07	Pk
Vertical	4739.216	46.47	7.10	37.24	43.50	47.31	54.00	-6.69	AV
Vertical	10480.274	62.13	8.46	37.68	44.50	63.77	74.00	-10.23	Pk
Vertical	10480.274	46.41	8.46	37.68	44.50	48.05	54.00	-5.95	AV
Vertical	15720.189	57.56	10.12	38.8	44.10	62.38	74.00	-11.62	Pk
Vertical	15720.189	42.75	10.12	38.8	42.70	48.97	54.00	-5.03	AV
Horizontal	4739.116	58.84	7.10	37.24	43.50	59.68	74.00	-14.32	Pk
Horizontal	4739.116	43.86	7.10	37.24	43.50	44.70	54.00	-9.30	AV
Horizontal	10481.402	59.37	8.46	38.57	44.50	61.90	74.00	-12.10	Pk
Horizontal	10481.402	42.65	8.46	38.57	44.50	45.18	54.00	-8.82	AV
Horizontal	15720.263	57.36	10.12	38.38	44.10	61.76	74.00	-12.24	Pk
Horizontal	15720.263	41.80	10.12	38.38	44.10	46.20	54.00	-7.80	AV

Note: Both horizontal and vertical antenna polarities were tested and only the worst case(horizontal) emissions were reported.

For U-NII-3

Polar	Frequency	Meter Reading	Cable loss	Antenna Factor	Preamp Factor	Emission Level	Limits	Margin	Detector Type
(H/V)	(MHz)	(dBuV)	(dB)	dB/m	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
Low Channel (5745 MHz)-Above 1G									
Vertical	4679.136	59.45	5.94	35.40	44.00	56.79	74.00	-17.21	Pk
Vertical	4679.136	45.57	5.94	35.40	44.00	42.91	54.00	-11.09	AV
Vertical	11490.052	59.20	8.46	39.75	44.50	62.91	74.00	-11.09	Pk
Vertical	11490.052	45.68	8.46	39.75	44.50	49.39	54.00	-4.61	AV
Vertical	17235.261	56.42	10.12	38.80	44.10	61.24	74.00	-12.76	Pk
Vertical	17235.261	41.04	10.12	38.80	42.70	47.26	54.00	-6.74	AV
Horizontal	4679.135	58.41	5.94	35.18	44.00	55.53	74.00	-18.47	Pk
Horizontal	4679.135	45.03	5.94	35.18	44.00	42.15	54.00	-11.85	AV
Horizontal	11490.302	60.24	8.46	38.71	44.50	62.91	74.00	-11.09	Pk
Horizontal	11490.302	46.28	8.46	38.71	44.50	48.95	54.00	-5.05	AV
Horizontal	17235.246	59.63	10.12	38.38	44.10	64.03	74.00	-9.97	Pk
Horizontal	17235.246	42.85	10.12	38.38	44.10	47.25	54.00	-6.75	AV
middle Channel (5785 MHz)-Above 1G									
Vertical	4592.208	59.68	6.48	36.35	44.05	58.46	74.00	-15.54	Pk
Vertical	4592.208	44.56	6.48	36.35	44.05	43.34	54.00	-10.66	AV
Vertical	11570.136	60.24	8.47	37.88	44.51	62.08	74.00	-11.92	Pk
Vertical	11570.136	45.36	8.47	37.88	44.51	47.20	54.00	-6.80	AV
Vertical	17355.249	57.86	10.12	38.8	44.10	62.68	74.00	-11.32	Pk
Vertical	17355.249	42.04	10.12	38.8	42.70	48.26	54.00	-5.74	AV
Horizontal	4592.138	59.81	6.48	36.37	44.05	58.61	74.00	-15.39	Pk
Horizontal	4592.138	45.47	6.48	36.37	44.05	44.27	54.00	-9.73	AV
Horizontal	11570.256	62.00	8.47	38.64	44.50	64.61	74.00	-9.39	Pk
Horizontal	11570.256	47.02	8.47	38.64	44.50	49.63	54.00	-4.37	AV
Horizontal	17355.127	61.09	10.12	38.38	44.10	65.49	74.00	-8.51	Pk
Horizontal	17355.127	44.36	10.12	38.38	44.10	48.76	54.00	-5.24	AV

High Channel (5825 MHz)-Above 1G									
Vertical	5039.156	60.32	7.10	37.24	43.50	61.16	74.00	-12.84	Pk
Vertical	5039.156	47.14	7.10	37.24	43.50	47.98	54.00	-6.02	AV
Vertical	11650.131	56.89	8.46	37.68	44.50	58.53	74.00	-15.47	Pk
Vertical	11650.131	44.16	8.46	37.68	44.50	45.80	54.00	-8.20	AV
Vertical	17475.289	60.89	10.12	38.8	44.10	65.71	74.00	-8.29	Pk
Vertical	17475.289	40.99	10.12	38.8	42.70	47.21	54.00	-6.79	AV
Horizontal	5039.316	66.70	7.10	37.24	43.50	67.54	74.00	-6.46	Pk
Horizontal	5039.316	42.96	7.10	37.24	43.50	43.80	54.00	-10.20	AV
Horizontal	11650.203	58.58	8.46	38.57	44.50	61.11	74.00	-12.89	Pk
Horizontal	11650.203	44.64	8.46	38.57	44.50	47.17	54.00	-6.83	AV
Horizontal	17475.152	60.50	10.12	38.38	44.10	64.90	74.00	-9.10	Pk
Horizontal	17475.152	44.93	10.12	38.38	44.10	49.33	54.00	-4.67	AV

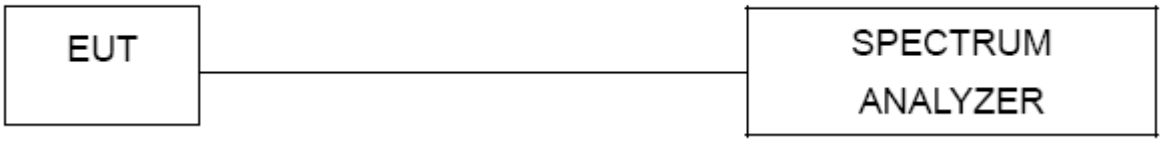
5.7 Conduction spurious emission

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

Use the following spectrum analyzer settings:

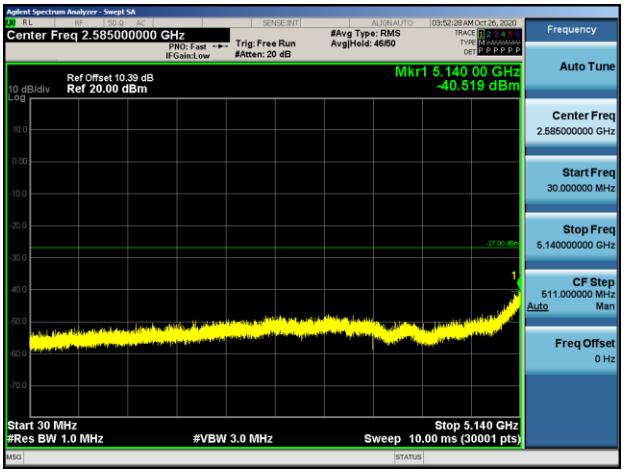
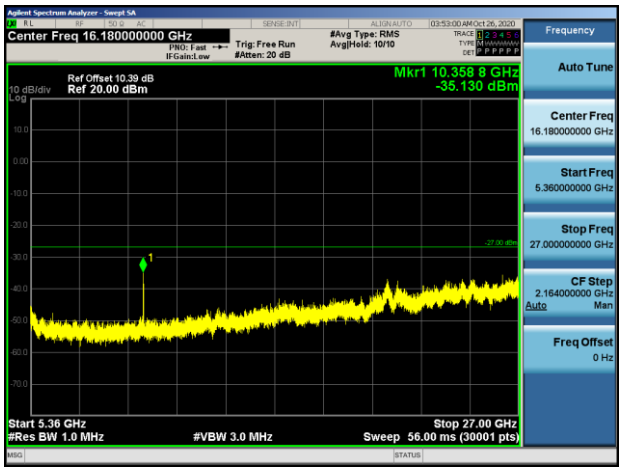
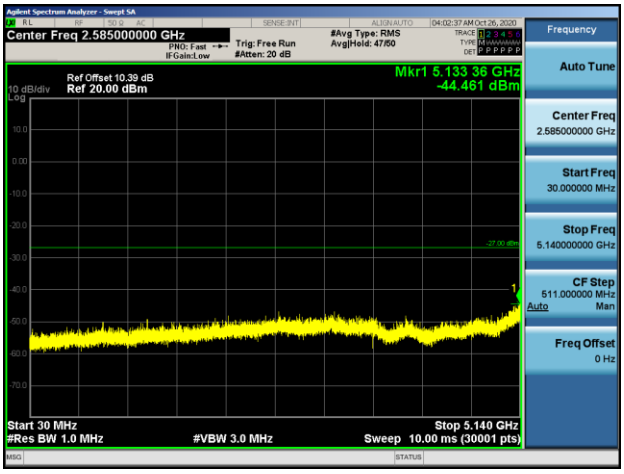
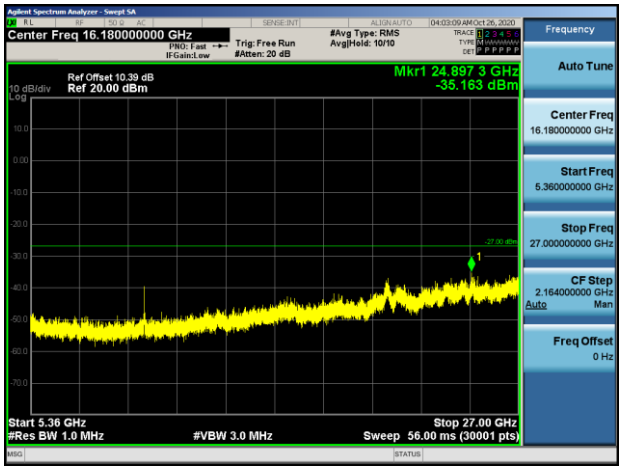
Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.
RBW = 1 MHz for f ≥ 1 GHz, 100 kHz for f < 1 GHz
VBW ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold
Allow the trace to stabilize

5.7.4 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

For U-NII-1

11a	
Low channel	Low channel
	
Middle channel	Middle channel