RF TEST REPORT

Applicant	NOKIA Shanghai Bell CO. Ltd.
FCC ID	2ADZRHA030WB
Product	7368 Intelligent Services Access Manager CPE
Brand	NOKIA
Model	HA-030W-B
Report No.	R1901B0001-R4
Issue Date	February 19, 2019

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **FCC CFR47 Part 15E (2018)**. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Peng Tao

Performed by: Peng Tao

Kai Xu

Approved by: Kai Xu

TA Technology (Shanghai) Co., Ltd.

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Summary of measurement results

Number	Summary of measurements of results	Clause in FCC rules	Verdict
1	Average conducted output power	15.407(a)	PASS
2	Occupied bandwidth	15.407(e)	PASS
3	Frequency stability	15.407(g)	PASS
4	Maximum power spectral density	15.407(a)	PASS
5	Unwanted Emissions	15.407(b)	PASS
6	Conducted Emissions	15.207	PASS
7	Automatic Discontinue Transmission	15.407c	PASS (see Note 1)
Date of Testing: December 18, 2017 ~ March 7, 2018 and January 14, 2019 to February 1, 2019			
Note 1: Once the process halted for operational failure, corresponding data stream will colse. The device periodically scans surrounding pair diveices to update pair devices list when RF module is turned on and will not transmit useless packets.			

HA-030W-B (Report No:R1901B0001-R4) is a variant model of HA-030W-B (Report No: Y1804B0039-R1V3).Test values partial duplicated from Original for variant. There is only tested Radiated Emission and Conducted Emission for variant in this report. The detailed product change description please refers to the FCC class II permissive change application letter.

1. Test Laboratory

1.1. Notes of the test report

This report shall not be reproduced in full or partial, without the written approval of **TA technology (shanghai) co., Ltd.** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. Measurement Uncertainties were not taken into account and are published for informational purposes only. This report is written to support regulatory compliance of the applicable standards stated above.

1.2. Test facility

CNAS (accreditation number: L2264)

TA Technology (Shanghai) Co., Ltd. has obtained the accreditation of China National Accreditation Service for Conformity Assessment (CNAS).

FCC (Designation number: CN1179, Test Firm Registration Number: 446626)

TA Technology (Shanghai) Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

IC (recognition number is 8510A)

TA Technology (Shanghai) Co., Ltd. has been listed by industry Canada to perform electromagnetic emission measurement.

VCCI (recognition number is C-4595, T-2154, R-4113, G-10766)

TA Technology (Shanghai) Co., Ltd. has been listed by industry Japan to perform electromagnetic emission measurement.

A2LA (Certificate Number: 3857.01)

TA Technology (Shanghai) Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

1.3. Testing Location

Company:	TA Technology (Shanghai) Co., Ltd.
Address:	No.145, Jintang Rd, Tangzhen Industry Park, Pudong
City:	Shanghai
Post code:	201201
Country:	P. R. China
Contact:	Xu Kai
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Fax:	+86-021-50791141/2/3-8000
Website:	http://www.ta-shanghai.com
E-mail:	xukai@ta-shanghai.com

2. General Description of Equipment under Test

Client Information

Applicant	NOKIA Shanghai Bell Co. Ltd.
Applicant address	No. 388, Ningqiao Rd. Pilot Free Trade Zone, Shanghai, China
Manufacturer	TAICANG T&W ELECTRONICS CO.,LTD
Manufacturer address	89# Jiang Nan RD, Lu Du, Taicang, Jiangsu, China

General information

EUT Description	
Application Purpose:	Class II Permissive Change
Model	HA-030W-B
SN	/
Hardware Version	PEM2
Software Version	Null
Power Supply	AC adapter
Antenna Type	Internal Antenna
Antenna Gain	Antenna 1: 4.0 dBi Antenna 2: 4.0 dBi Antenna 3: 4.0 dBi Antenna 4: 4.0 dBi
Directional Gain	10.02 dBi
additional beamforming gain	6 dB
Test Mode(s)	U-NII-1(5150MHz-5250MHz) U-NII-2A(5250MHz-5350MHz) U-NII-2C(5470MHz-5725MHz) U-NII-3(5725MHz-5850MHz)
Modulation Type	802.11a/n (HT20/HT40) : OFDM 802.11ac (HT20/HT40/HT80): OFDM
Max. Conducted Power	29.50dBm
Operating Frequency Range(s)	U-NII-1: 5150-5250MHz U-NII-2A:5250-5350MHz U-NII-2C:5470-5725MHz U-NII-3: 5725-5850MHz
EUT Accessory	
Adapter	Manufacturer: Dongguan Shilong Fuhua Electronic Co., Ltd Model: UES24WU-120200SPA
Note: The information of the EUT is declared by the manufacturer.	

EUT Configuration

No.	Name	Model/Code No.	Edition	Serial No. or Quantity
1	EMA-HA-030W-B	3FE47429AA	PEM2	PEM 1
2	Power adapter	UES24WU-120200SPA	A/0	UE181219GWAD2RI

ONT Mnemonic	Kit Code	EMA Code	Part Description	Power Adapter
HA-030W-B	3FE47357AA	3FE47429AA	Wi-Fi Access Point and range extender, 3xGE UNI, 3x3 11n+4x4 11ac, US plug	UES24WU-120200SPA
HA-030W-B	3FE47671AA	3FE47429AA	Wi-Fi Access Point and range extender, 3xGE UNI, 3x3 11n+4x4 11ac, US plug,2 pack	UES24WU-120200SPA
HA-030W-B	3FE47672AA	3FE47429AA	Wi-Fi Access Point and range extender, 3xGE UNI, 3x3 11n+4x4 11ac, US plug,3 pack	UES24WU-120200SPA

Auxiliary Equipment

No.	Name	Brand name	Model	ASB code	Valid Until
1	SmartBits 600B	Sprient	DE7853	-	No Cal. Required
2	PC	HP	N.A	-	No Cal. Required
3	PC	DELL	N.A	-	No Cal. Required
4	PC	Thinkpad	N.A	-	No Cal. Required

Ports

No.	Port name	Number	Shielded or unshielded	Cable type (optic, twisted pair, etc.)	Max. Cable length
1	AC port	1	Unshielded	--	--
2	GE	4	Unshielded	--	--

3. Applied Standards

According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC CFR47 Part 15E (2018) Unlicensed National Information Infrastructure Devices

ANSI C63.10 (2013)

KDB 789033 D02 General UNII Test Procedures New Rules v02

KDB 662911 D01 Multiple Transmitter Output v02r01

4. Test Configuration

Test Mode

The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application.

The radiated emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in stand-up position (Z axis) and the worst case was recorded.

In order to find the worst case condition, Pre-tests are needed at the presence of different data rate. Preliminary tests have been done on all the configuration for confirming worst case. Data rate below means worst-case rate of each test item.

Worst-case data rates are shown as following table.

Band	Data Rate			
	Antenna 1	Antenna 2	Antenna 3	Antenna 4
802.11a	6	6	6	6
802.11n HT20	MCS0	MCS0	MCS0	MCS0
802.11n HT40	MCS0	MCS0	MCS0	MCS0
802.11ac HT20	MCS0	MCS0	MCS0	MCS0
802.11ac HT40	MCS0	MCS0	MCS0	MCS0
802.11ac HT80	MCS0	MCS0	MCS0	MCS0

The worst case Antenna mode for each of the following tests for Wi-Fi:

Test Cases	MIMO Antenna 1	MIMO Antenna 2	MIMO Antenna 3	MIMO Antenna 4
Average conducted output power	O	O	O	O
Occupied bandwidth	O	O	O	O
Frequency stability	O	O	O	O
Power Spectral Density	O	O	O	O
Unwanted Emissions	O	O	O	O
Conducted Emissions	O	O	O	O
Note：“O”: test all bands				

Wireless Technology and Frequency Range

Wireless Technology		Bandwidth	Channel	Frequency
Wi-Fi	U-NII-1	20 MHz	36	5180MHz
			40	5200MHz
			44	5220MHz
			48	5240MHz
		40 MHz	38	5190MHz
			46	5230MHz
		80 MHz	42	5210MHz
	U-NII-2A	20 MHz	52	5260MHz
			56	5280MHz
			60	5300MHz
			64	5320MHz
		40 MHz	54	5270MHz
			62	5310MHz
		80 MHz	58	5290MHz
	U-NII-2C	20 MHz	100	5500MHz
			104	5520MHz
			108	5540MHz
			112	5560MHz
			116	5580MHz
			120	5600MHz
			124	5620MHz
			128	5640MHz
			132	5660MHz
			136	5680MHz
			140	5700MHz
			144	5720MHz
		40 MHz	102	5510MHz
			110	5550MHz
			118	5590MHz
			126	5630MHz
			134	5670MHz
			142	5710MHz
		80 MHz	106	5530MHz
			122	5610MHz
			138	5690MHz
	U-NII-3	20 MHz	149	5745MHz
			157	5785MHz
			165	5825MHz

		40 MHz	151	5755MHz
			159	5795MHz
		80 MHz	155	5775MHz
Does this device support TPC Function? ☐Yes ☒No				
Does this device support TDWR Band? ☒Yes ☐No				

5. Test Case Results

5.1. Occupied Bandwidth

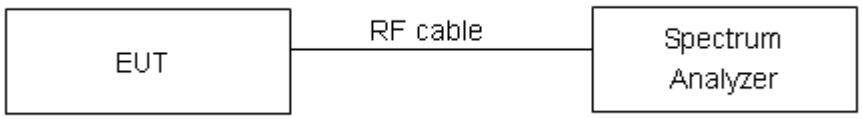
Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

The EUT was connected to the spectrum analyzer through an external attenuator (20dB) and a known loss cable.
For U-NII-1, set RBW ≈1% OCB kHz, VBW ≥ 3 × RBW, 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 26 dB relative to the maximum level measured in the fundamental emission.
For U-NII-3, Set RBW = 100 kHz, VBW ≥ 3 × RBW, 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.
Note: The automatic bandwidth measurement capability of a spectrum analyzer or EMI receiver may be employed if it implements the functionality described above.
Use the 99 % power bandwidth function of the instrument

Test Setup



Limits

Rule FCC Part §15.407(e)
Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 2, U= 936 Hz.

Test Results:

U-NII-1

Network Standards	Carrier frequency (MHz)	99% bandwidth (MHz)	Minimum 26 dB bandwidth (MHz)	Conclusion
802.11a	5180	16.779	21.38	PASS
	5200	16.768	21.25	PASS
	5240	16.728	21.22	PASS
802.11n HT20	5180	18.067	28.90	PASS
	5200	19.959	30.00	PASS
	5240	21.182	30.00	PASS
802.11n HT40	5190	36.326	40.03	PASS
	5230	40.026	60.00	PASS
802.11ac HT20	5180	18.093	29.77	PASS
	5200	20.733	30.00	PASS
	5240	20.472	30.00	PASS
802.11ac HT40	5190	36.306	39.95	PASS
	5230	39.271	60.00	PASS
802.11ac HT80	5210	74.997	81.27	PASS

U-NII-2A

Network Standards	Carrier frequency (MHz)	99% bandwidth (MHz)	Minimum 26 dB bandwidth (MHz)	Conclusion
802.11a	5260	16.743	21.25	PASS
	5300	16.680	21.26	PASS
	5320	16.800	21.25	PASS
802.11n HT20	5260	17.892	21.48	PASS
	5300	17.894	24.18	PASS
	5320	17.849	21.55	PASS
802.11n HT40	5270	36.314	39.85	PASS
	5310	36.285	39.85	PASS
802.11ac HT20	5260	17.917	21.59	PASS
	5300	17.913	21.48	PASS
	5320	17.880	21.61	PASS
802.11ac HT40	5270	36.291	39.85	PASS
	5310	36.321	40.16	PASS
802.11ac HT80	5290	75.799	79.67	PASS

U-NII-2C

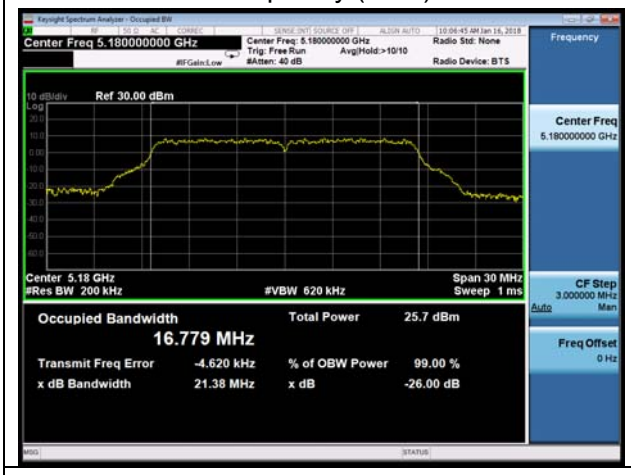
Network Standards	Carrier frequency (MHz)	99% bandwidth (MHz)	Minimum 26 dB bandwidth (MHz)	Conclusion
802.11a	5500	16.736	21.25	PASS
	5580	16.698	21.00	PASS
	5700	16.756	21.20	PASS
802.11n HT20	5500	17.864	21.40	PASS
	5580	17.859	21.50	PASS
	5700	17.893	21.54	PASS
802.11n HT40	5510	36.339	39.93	PASS
	5550	36.273	39.79	PASS
	5670	36.296	39.78	PASS
802.11ac HT20	5500	17.836	21.39	PASS
	5580	17.799	21.37	PASS
	5700	17.872	21.54	PASS
802.11ac HT40	5510	36.250	39.85	PASS
	5550	36.340	39.90	PASS
	5670	36.312	40.08	PASS
802.11ac HT80	5530	75.833	80.11	PASS

U-NII-3

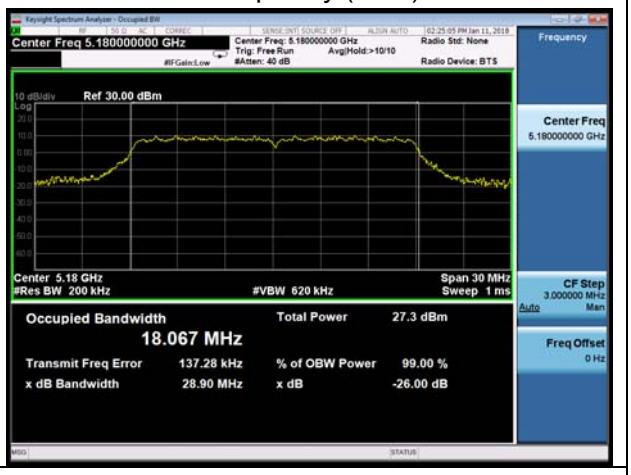
Network Standards	Carrier frequency (MHz)	99% bandwidth (MHz)	Minimum 6 dB bandwidth (MHz)	Limit (kHz)	Conclusion
802.11a	5745	18.135	16.39	500	PASS
	5785	19.371	16.36	500	PASS
	5825	21.662	16.32	500	PASS
802.11n HT20	5745	18.291	17.62	500	PASS
	5785	18.197	17.60	500	PASS
	5825	19.334	17.63	500	PASS
802.11n HT40	5755	36.732	36.35	500	PASS
	5795	37.221	36.42	500	PASS
802.11ac HT20	5745	18.356	17.64	500	PASS
	5785	18.643	17.59	500	PASS
	5825	20.040	17.59	500	PASS
802.11ac HT40	5755	36.811	36.38	500	PASS
	5795	37.378	36.41	500	PASS
802.11ac HT80	5775	76.054	75.83	500	PASS

U-NII-1

U-NII-1, 802.11a
Carrier frequency (MHz): 5180



U-NII-1, 802.11n HT20
Carrier frequency (MHz): 5180



U-NII-1, 802.11a
Carrier frequency (MHz): 5200

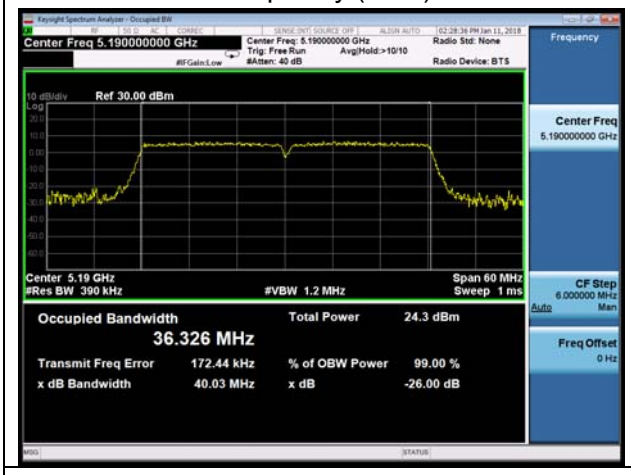
U-NII-1, 802.11n HT20
Carrier frequency (MHz): 5200

U-NII-1, 802.11a
Carrier frequency (MHz):5240

U-NII-1, 802.11n HT20
Carrier frequency (MHz):5240

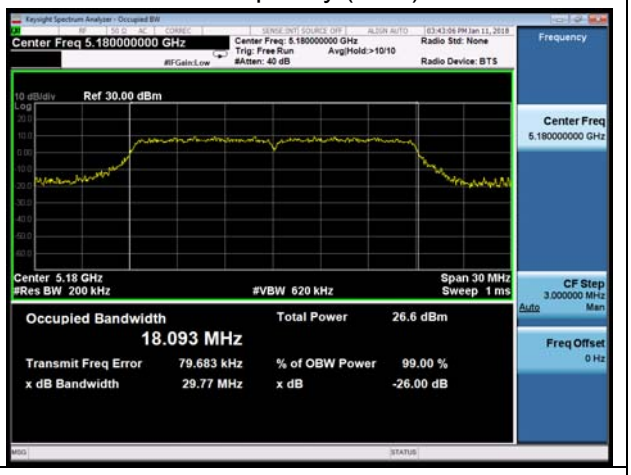
U-NII-1, 802.11n HT40

Carrier frequency (MHz): 5190



U-NII-1, 802.11ac HT20

Carrier frequency (MHz): 5180

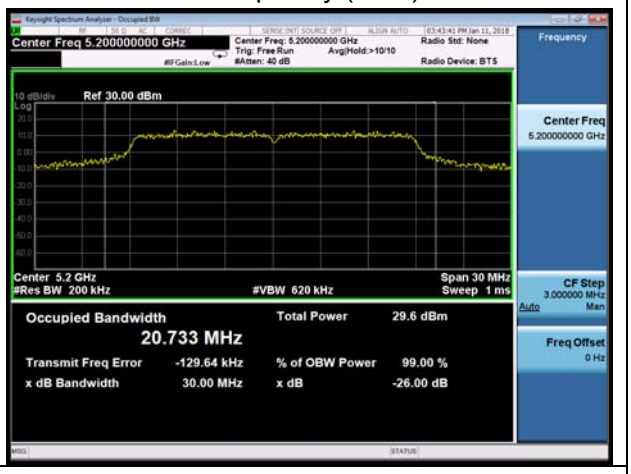


U-NII-1, 802.11n HT40

Carrier frequency (MHz): 5230

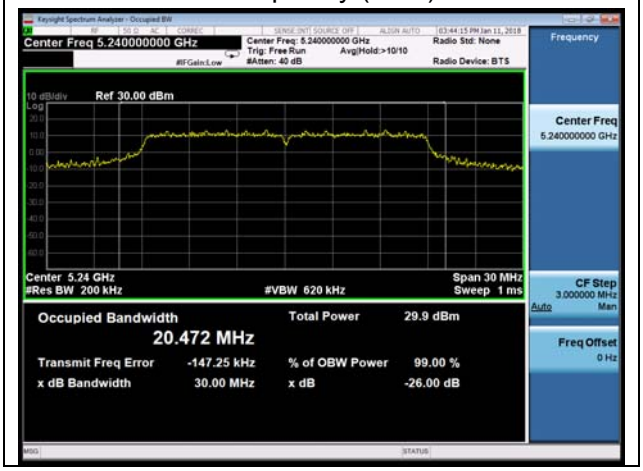
U-NII-1, 802.11ac HT20

Carrier frequency (MHz): 5200



U-NII-1, 802.11ac HT20

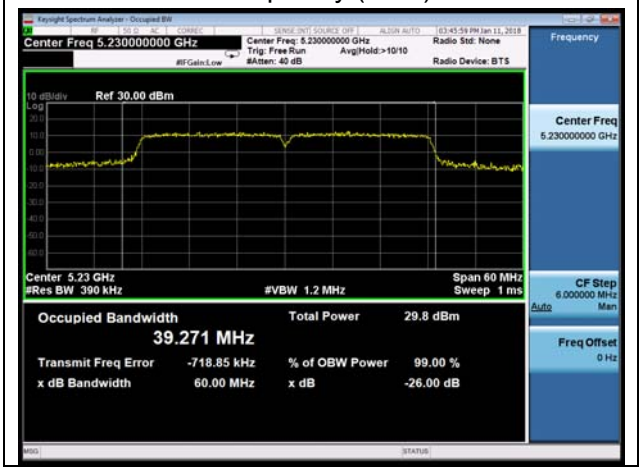
Carrier frequency (MHz):5240



U-NII-1, 802.11ac HT40
Carrier frequency (MHz): 5190

U-NII-1, 802.11ac HT80
Carrier frequency (MHz): 5210

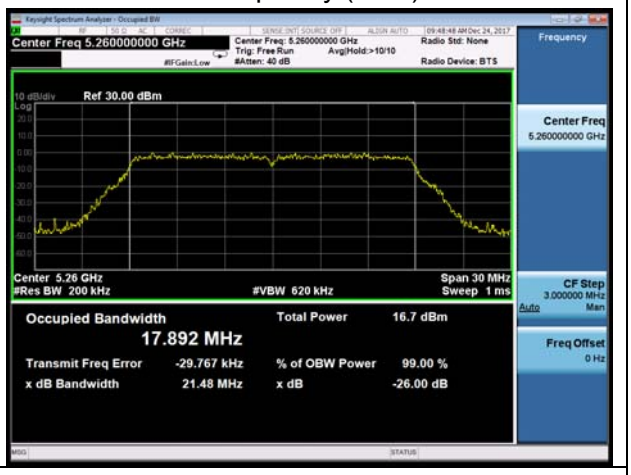
U-NII-1, 802.11ac HT40
Carrier frequency (MHz): 5230



U-NII-2A

U-NII-2A, 802.11a
Carrier frequency (MHz): 5260

U-NII-2A, 802.11n HT20
Carrier frequency (MHz): 5260



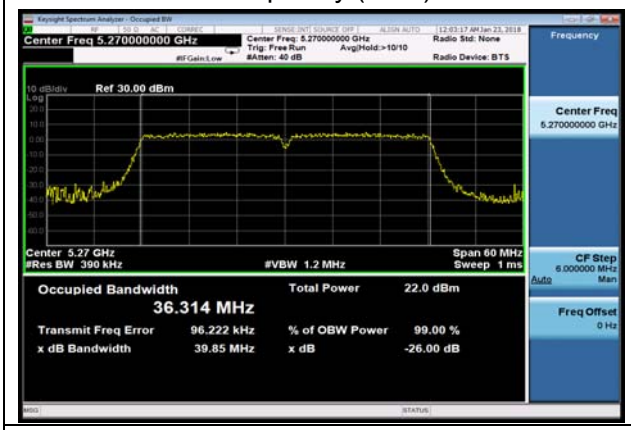
U-NII-2A, 802.11a
Carrier frequency (MHz): 5300

U-NII-2A, 802.11n HT20
Carrier frequency (MHz): 5300

U-NII-2A, 802.11a
Carrier frequency (MHz):5320

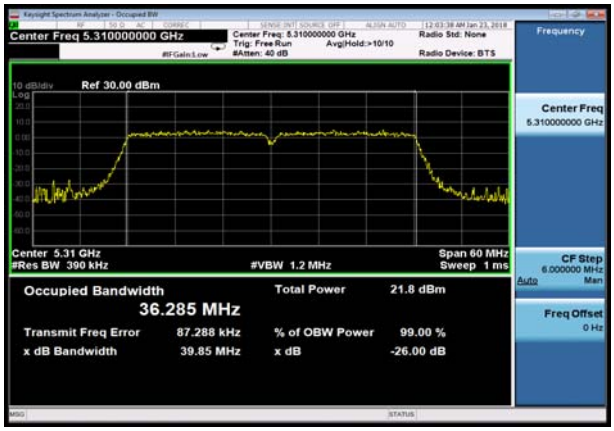
U-NII-2A, 802.11n HT20
Carrier frequency (MHz):5320

U-NII-2A, 802.11n HT40
Carrier frequency (MHz): 5270

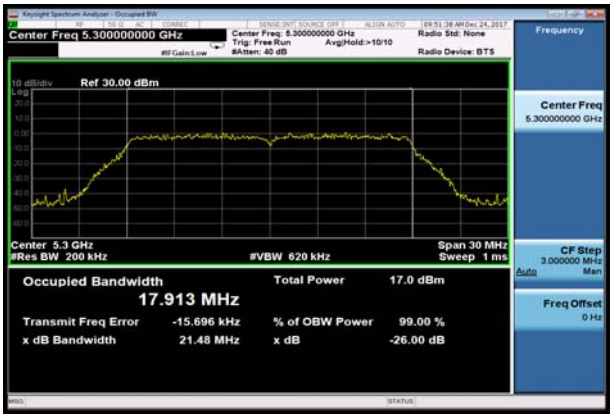


U-NII-2A, 802.11ac HT20
Carrier frequency (MHz):5260

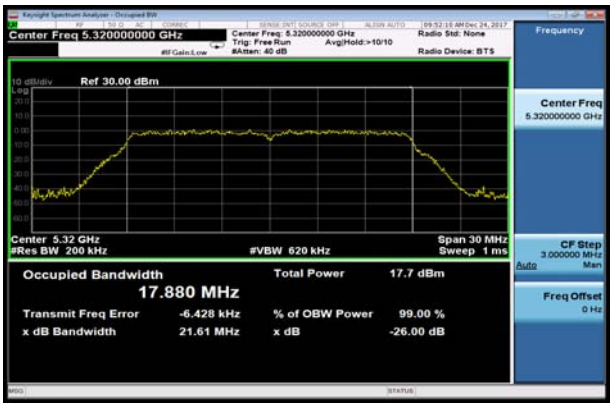
U-NII-2A, 802.11n HT40
Carrier frequency (MHz): 5310



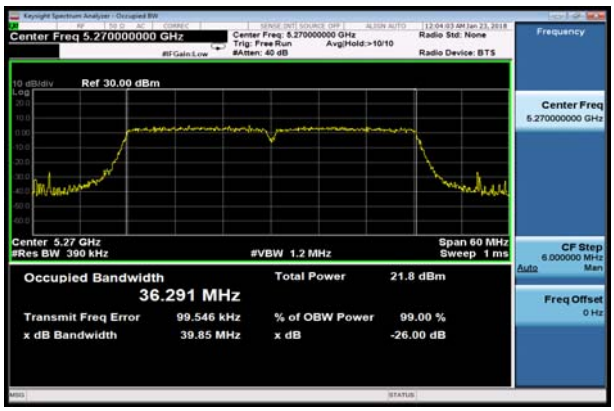
U-NII-2A, 802.11ac HT20
Carrier frequency (MHz): 5300



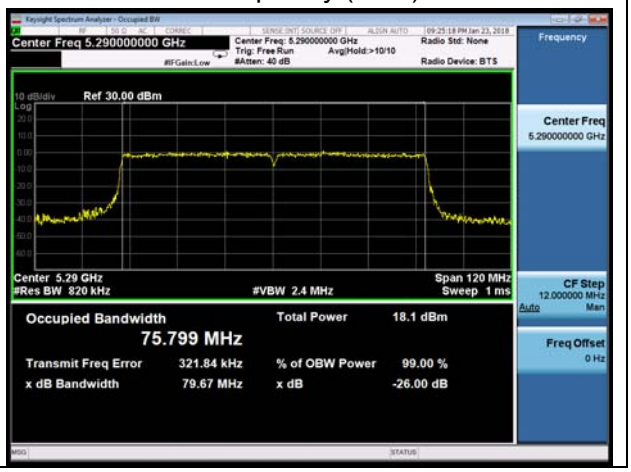
U-NII-2A, 802.11ac HT20
Carrier frequency (MHz):5320



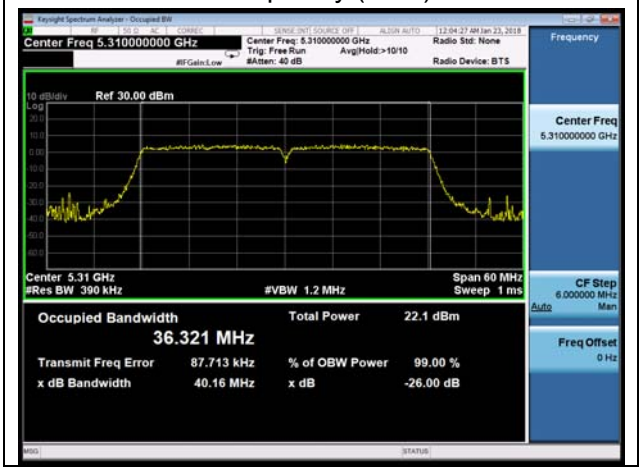
U-NII-2A, 802.11ac HT40
Carrier frequency (MHz): 5270



U-NII-2A, 802.11ac HT80
Carrier frequency (MHz): 5290



U-NII-2A, 802.11ac HT40
Carrier frequency (MHz): 5310



U-NII-2C, 802.11a

Carrier frequency (MHz): 5500

U-NII-2C, 802.11n HT20

Carrier frequency (MHz): 5500

U-NII-2C, 802.11a

Carrier frequency (MHz): 5580

U-NII-2C, 802.11n HT20

Carrier frequency (MHz): 5580

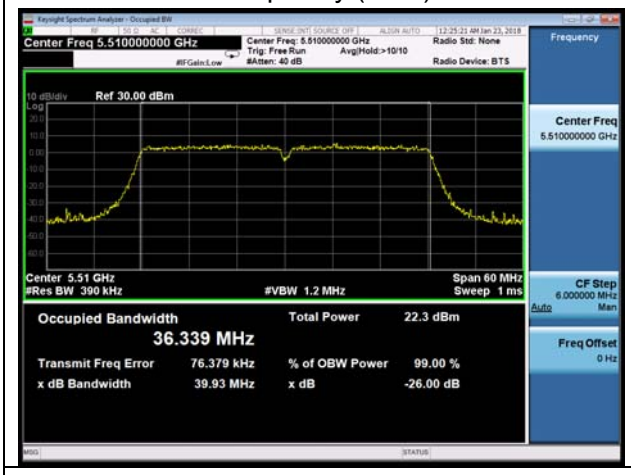
U-NII-2C, 802.11a

Carrier frequency (MHz):5700

U-NII-2C, 802.11n HT20

Carrier frequency (MHz):5700

U-NII-2C, 802.11n HT40
Carrier frequency (MHz): 5510



U-NII-2C, 802.11ac HT20
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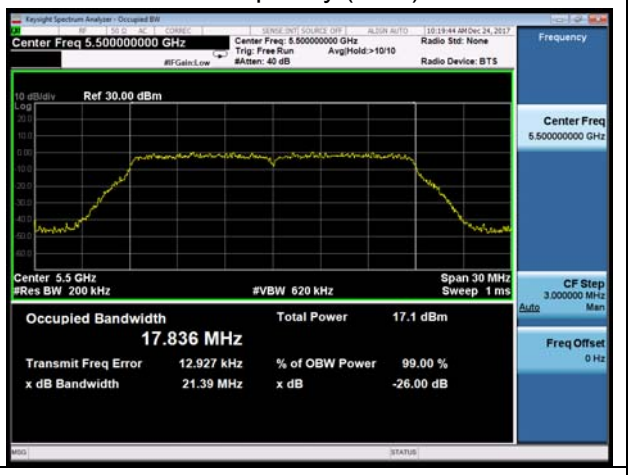

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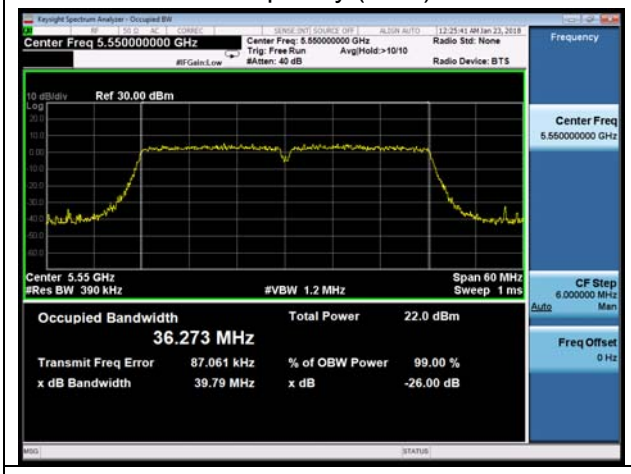
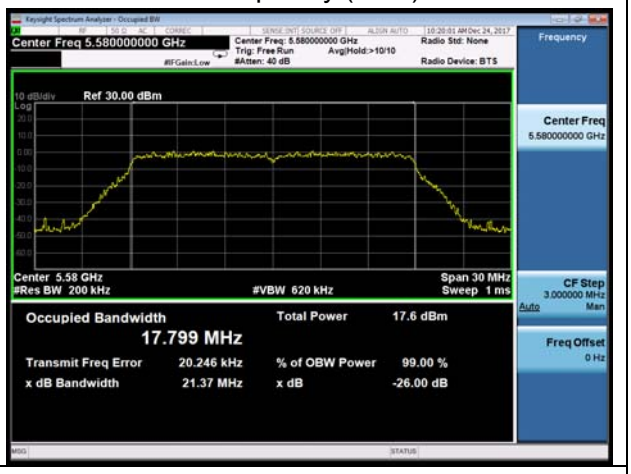
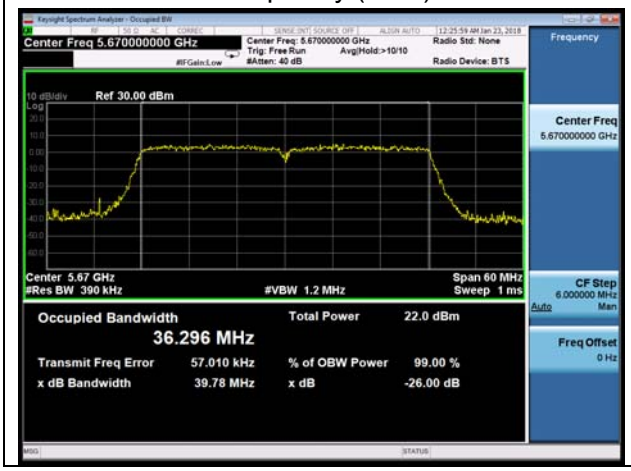
Carrier frequency (MHz): 5550



U-NII-2C, 802.11ac HT20
Carrier frequency (MHz): 5580



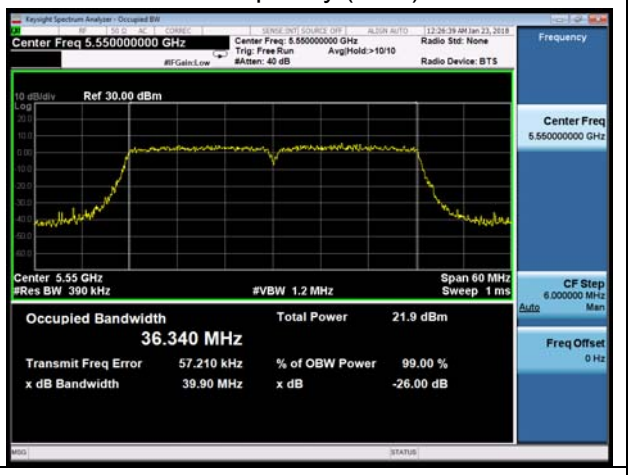
U-NII-2C, 802.11n HT40
Carrier frequency (MHz): 5670



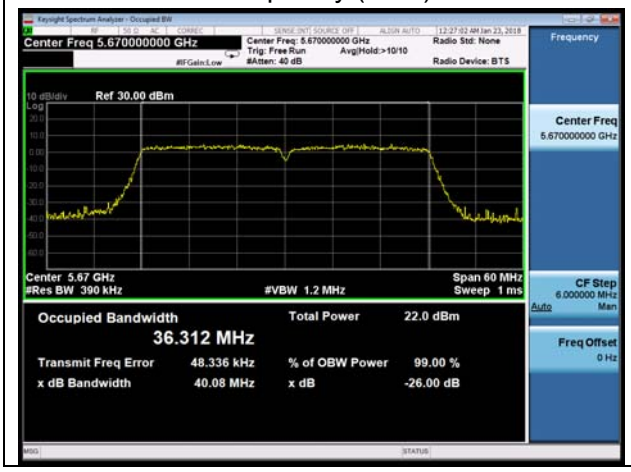
U-NII-2C, 802.11ac HT20
Carrier frequency (MHz):5700

U-NII-2C, 802.11ac HT40
Carrier frequency (MHz): 5510

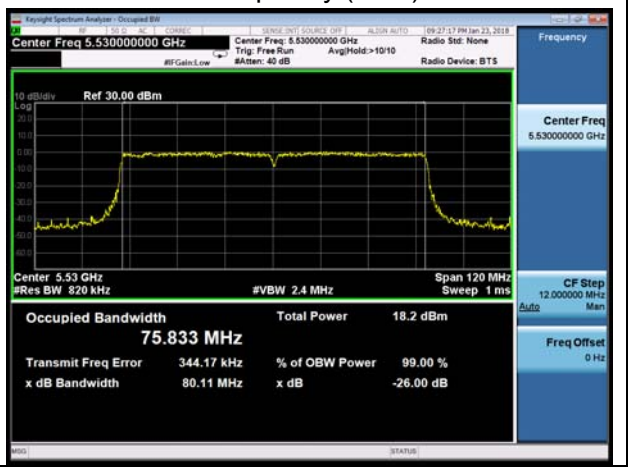
U-NII-2C, 802.11ac HT40
Carrier frequency (MHz): 5550



U-NII-2C, 802.11ac HT40
Carrier frequency (MHz): 5670



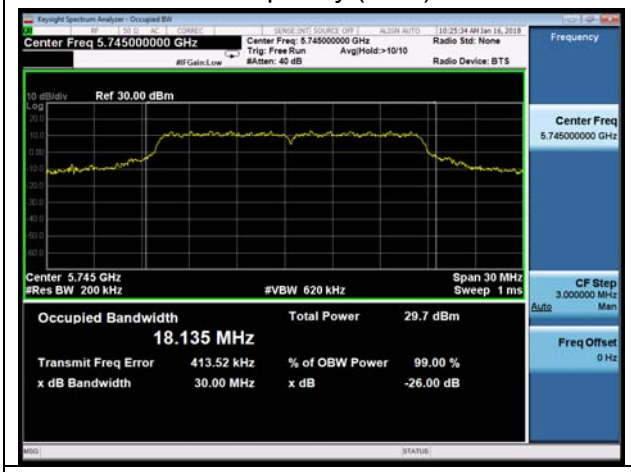
U-NII-2C, 802.11ac HT80
Carrier frequency (MHz): 5530



U-NII-3 99% bandwidth

U-NII-3, 802.11a

Carrier frequency (MHz): 5745



U-NII-3, 802.11n HT20

Carrier frequency (MHz): 5745

U-NII-3, 802.11a

Carrier frequency (MHz): 5785

U-NII-3, 802.11n HT20

Carrier frequency (MHz): 5785

U-NII-3, 802.11a

Carrier frequency (MHz): 5825

U-NII-3, 802.11n HT20

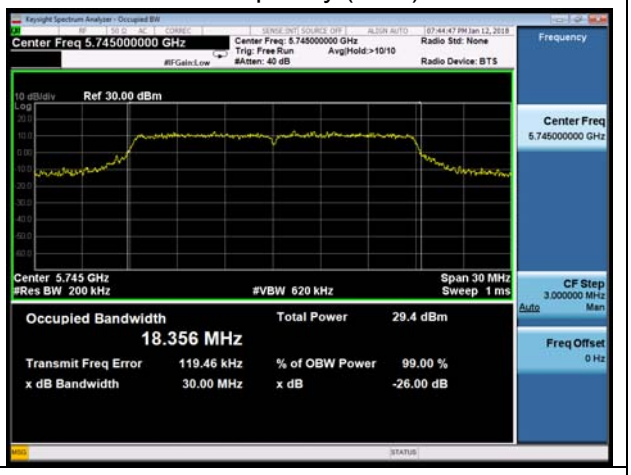
Carrier frequency (MHz): 5825

U-NII-3, 802.11n HT40

Carrier frequency (MHz): 5755

U-NII-3, 802.11ac HT20

Carrier frequency (MHz): 5745



U-NII-3, 802.11n HT40

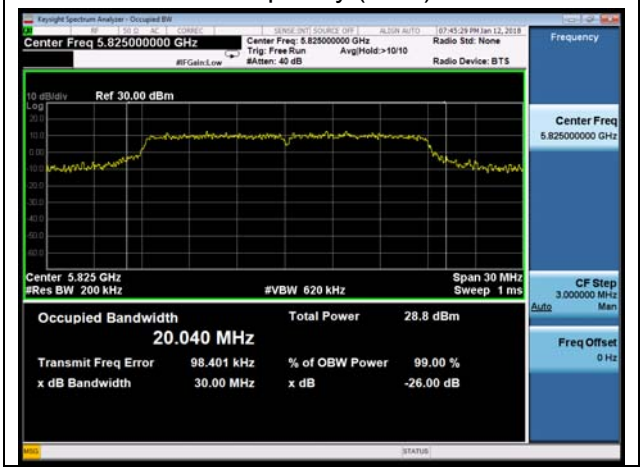
Carrier frequency (MHz): 5795

U-NII-3, 802.11ac HT20

Carrier frequency (MHz): 5785

U-NII-3, 802.11ac HT20

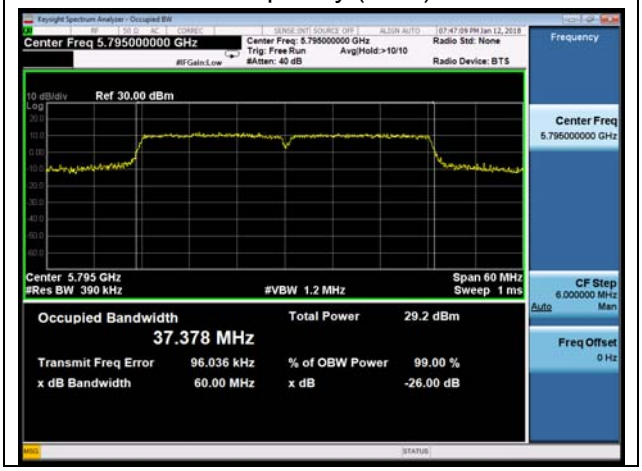
Carrier frequency (MHz): 5825



U-NII-3, 802.11ac HT40
Carrier frequency (MHz): 5755

U-NII-3, 802.11ac HT80
Carrier frequency (MHz): 5775

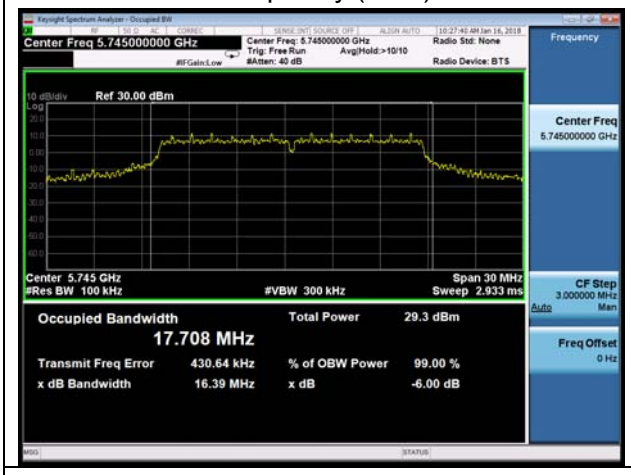
U-NII-3, 802.11ac HT40
Carrier frequency (MHz): 5795



U-NII-3 Minimum 6 dB bandwidth

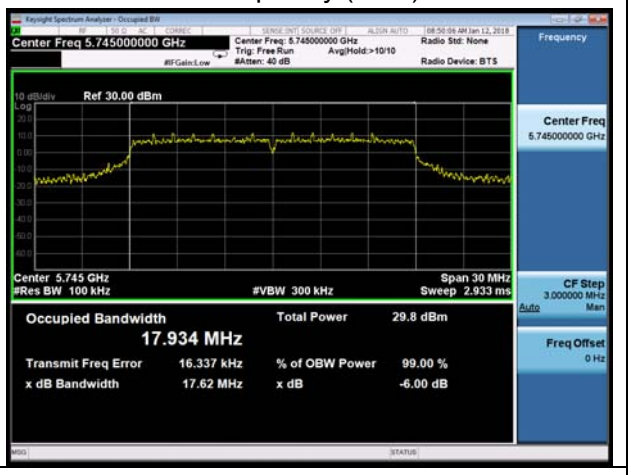
U-NII-3, 802.11a

Carrier frequency (MHz): 5745



U-NII-3, 802.11n HT20

Carrier frequency (MHz): 5745

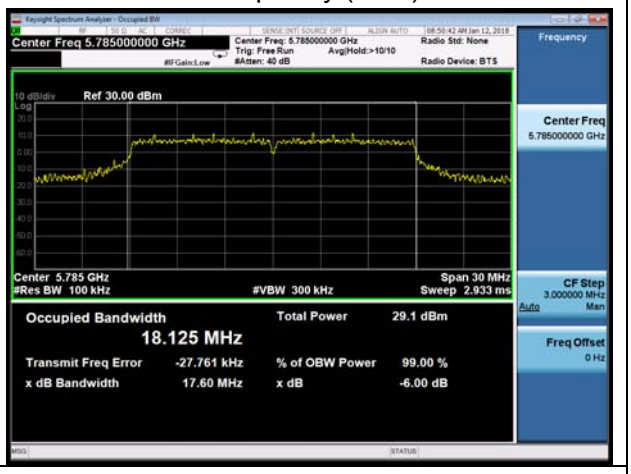


U-NII-3, 802.11a

Carrier frequency (MHz): 5785

U-NII-3, 802.11n HT20

Carrier frequency (MHz): 5785



U-NII-3, 802.11a

Carrier frequency (MHz): 5825

U-NII-3, 802.11n HT20

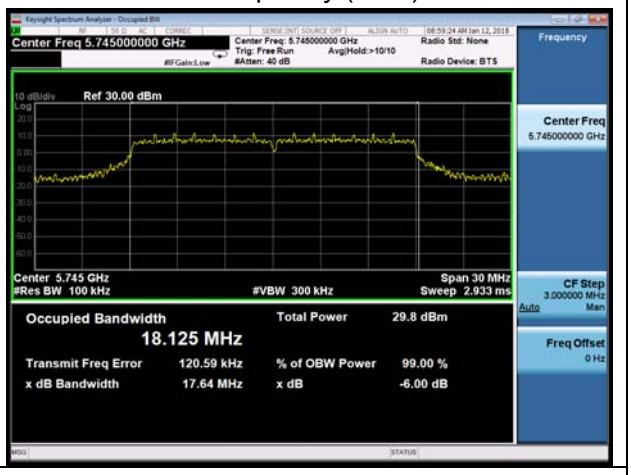
Carrier frequency (MHz): 5825

U-NII-3, 802.11n HT40

Carrier frequency (MHz): 5755

U-NII-3, 802.11ac HT20

Carrier frequency (MHz): 5745



U-NII-3, 802.11n HT40

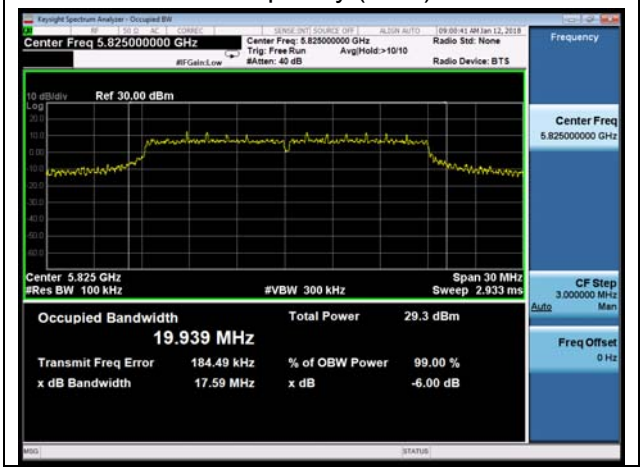
Carrier frequency (MHz): 5795

U-NII-3, 802.11ac HT20

Carrier frequency (MHz): 5785

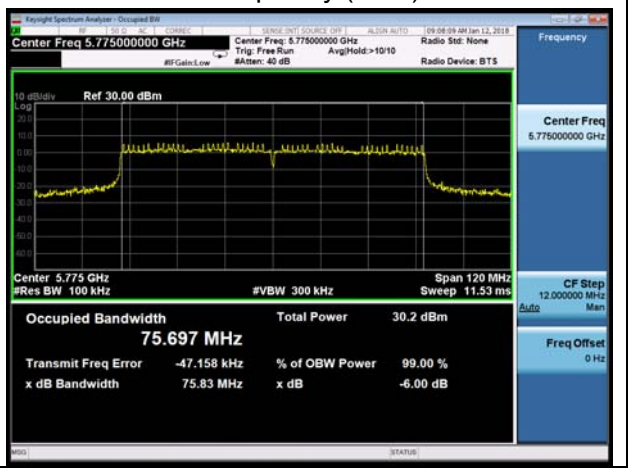
U-NII-3, 802.11ac HT20

Carrier frequency (MHz): 5825

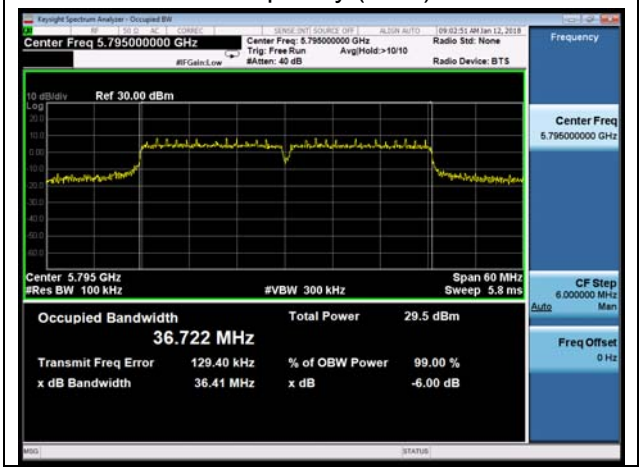


U-NII-3, 802.11ac HT40
Carrier frequency (MHz): 5755

U-NII-3, 802.11ac HT80
Carrier frequency (MHz): 5775



U-NII-3, 802.11ac HT40
Carrier frequency (MHz): 5795



5.2. Average Power Output –Conducted

Ambient condition

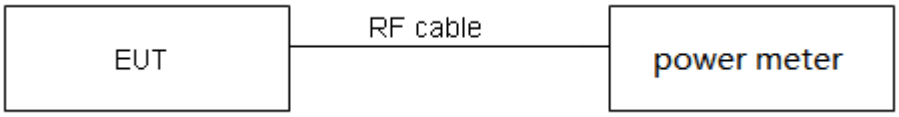
Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Methods of Measurement

During the process of the testing, The EUT was connected to power meter through an external attenuator and a known loss cable. The EUT is max power transmission with proper modulation. We use Maximum average Conducted Output Power Level Method in KDB789033 for this test

The conducted Power is measured at each antenna port. The measured results at the various antenna ports are then summed mathematically.

Test Setup



Limits

Rule FCC Part 15.407(a)(1)(2)(3)

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 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. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz 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.

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 2, U= 0.44 dB.

Test Results

Network Standards		Channel/Frequency (MHz)	B=26 dB bandwidth (MHz)	Limit 11 dBm + 10 log B (dBm)	Final Limit (dBm)
U-NII-2A	802.11a	52/5260	21.25	24.27 >24	24
		60/5300	21.26	24.28 >24	24
		64/5320	21.25	24.27 >24	24
	802.11n HT20	52/5260	21.48	24.32 >24	24
		60/5300	21.48	24.32 >24	24
		64/5320	21.55	24.33 >24	24
	802.11n HT40	54/5270	39.85	27.00 >24	24
		62/5310	39.85	27.00 >24	24
	802.11ac HT20	52/5260	21.59	24.34 >24	24
		60/5300	21.48	24.32 >24	24
		64/5320	21.61	24.35 >24	24
	802.11ac HT40	54/5270	39.85	27.00 >24	24
		62/5310	40.16	27.04 >24	24
	802.11ac HT80	58/5290	79.67	30.01 >24	24
U-NII-2C	802.11a	100/5500	21.25	24.27 >24	24
		116/5580	21.00	24.22 >24	24
		140/5700	21.20	24.26 >24	24
	802.11n HT20	100/5500	21.40	24.30 >24	24
		116/5580	21.50	24.32 >24	24
		140/5700	21.54	24.33 >24	24
	802.11n HT40	102/5510	39.93	27.01 >24	24
		110/5550	39.79	27.00 >24	24
		134/5670	39.78	27.00 >24	24
	802.11ac HT20	100/5500	21.39	24.30 >24	24
		116/5580	21.37	24.30 >24	24
		140/5700	21.54	24.33 >24	24
	802.11ac HT40	102/5510	39.85	27.00 >24	24
		110/5550	39.90	27.01 >24	24
		134/5670	40.08	27.03 >24	24
	802.11ac HT80	106/5530	80.11	30.04 >24	24
Note: 250mW=24dBm					

Band	T_{on} (ms)	$T_{(on+off)}$ (ms)	Duty cycle	Duty cycle correction Factor(dB)
802.11a	2.06	2.17	0.95	0.21
802.11n HT20	1.92	2.02	0.95	0.23
802.11n HT40	0.94	1.04	0.90	0.44
802.11ac HT20	1.93	1.97	0.98	NA
802.11ac HT40	0.95	0.98	0.97	0.13
802.11ac HT80	0.95	0.98	0.97	0.14
Note: when Duty cycle>0.98, Duty cycle correction Factor not required.				

Test results

U-NII-1

MIMO without Beamforming

Network Standards	Channel/ Frequency (MHz)	Output Power									Limit (dBm)	Conclusion
		Antenna 1		Antenna 2		Antenna 3		Antenna 4		Total Power (dBm)		
		Read Value (dBm)	Output Power (dBm)	Read Value (dBm)	Output Power (dBm)	Read Value (dBm)	Output Power (dBm)	Read Value (dBm)	Output Power (dBm)			
802.11a	36/5180	18.61	18.82	17.95	18.16	18.28	18.49	17.65	17.86	24.37	30.00	PASS
	40/5200	18.53	18.74	17.63	17.84	18.10	18.31	17.42	17.63	24.18	30.00	PASS
	48/5240	18.17	18.38	17.84	18.05	18.28	18.49	17.71	17.92	24.24	30.00	PASS
802.11n HT20	36/5180	18.82	19.05	18.01	18.24	18.53	18.76	17.45	17.68	24.48	30.00	PASS
	40/5200	16.30	16.53	16.20	16.43	16.37	16.60	15.32	15.55	22.32	30.00	PASS
	48/5240	18.08	18.31	17.75	17.98	18.20	18.43	17.34	17.57	24.11	30.00	PASS
802.11n HT40	38/5190	15.03	15.48	14.81	15.26	14.55	15.00	13.83	14.28	21.05	30.00	PASS
	46/5230	21.19	21.64	20.75	21.20	21.21	21.66	20.64	21.09	27.43	30.00	PASS
802.11ac HT20	36/5180	18.65	18.65	17.91	17.91	18.26	18.26	17.29	17.29	24.08	30.00	PASS
	40/5200	18.67	18.67	17.72	17.72	18.32	18.32	17.30	17.30	24.06	30.00	PASS
	48/5240	18.26	18.26	17.86	17.86	18.21	18.21	17.67	17.67	24.03	30.00	PASS
802.11ac HT40	38/5190	17.88	18.02	16.55	16.69	17.64	17.78	16.61	16.75	23.38	30.00	PASS
	46/5230	21.59	21.73	21.11	21.25	21.49	21.63	20.94	21.08	27.45	30.00	PASS
802.11ac HT80	42/5210	17.48	17.62	16.93	17.07	17.07	17.21	16.24	16.38	23.12	30.00	PASS

Note: 1. For Total Power, according to KDB 662911 D01 Multiple Transmitter Output v02r01 1),

The Total Power $=10\log(10^{(\text{Power antenna1 in dBm}/10)}+10^{(\text{Power antenna2 in dBm}/10)}+10^{(\text{Power antenna3 in dBm}/10)}) +10^{(\text{PSD antenna4 in dBm}/10)})$.

2. The manufacturer declared the transmitter output signals is CDD mode And N_{ss}=1. According to KDB 662911 D01 Multiple Transmitter Output v02r01 2)f)(i): If all antennas have the same gain, Directional gain = G_{ANT} + Array Gain,

For power measurements on IEEE 802.11 devices,

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

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

Array Gain = 5 log(N_{ANT}/N_{SS}) dB or 3 dB, whichever is less, for 20-MHz channel widths with $N_{ANT} \geq 5$.

So directional gain = G_{ANT} + Array Gain =4+0=4 dBi<6dBi. So the power limt is 30dBm.

U-NII-2A

MIMO without Beamforming

Network Standards	Channel/ Frequency (MHz)	Output Power									Limit (dBm)	Conclusion
		Antenna 1		Antenna 2		Antenna 3		Antenna 4		Total Power (dBm)		
		Read Value (dBm)	Output Power (dBm)	Read Value (dBm)	Output Power (dBm)	Read Value (dBm)	Output Power (dBm)	Read Value (dBm)	Output Power (dBm)			
802.11a	52/5260	10.94	11.15	11.97	12.18	11.93	12.14	11.23	11.44	17.77	24.00	PASS
	60/5300	11.19	11.40	12.16	12.37	12.22	12.43	11.62	11.83	18.05	24.00	PASS
	64/5320	11.42	11.63	12.59	12.80	12.64	12.85	11.69	11.90	18.35	24.00	PASS
802.11n HT20	52/5260	11.59	11.82	12.34	12.57	12.31	12.54	11.61	11.84	18.23	24.00	PASS
	60/5300	11.33	11.56	12.59	12.82	12.57	12.80	11.87	12.10	18.37	24.00	PASS
	64/5320	11.80	12.03	12.60	12.83	12.86	13.09	12.38	12.61	18.68	24.00	PASS
802.11n HT40	54/5270	14.43	14.88	14.81	15.26	15.13	15.58	14.62	15.07	21.23	24.00	PASS
	62/5310	14.84	15.29	15.22	15.67	15.60	16.05	14.85	15.30	21.61	24.00	PASS
802.11ac HT20	52/5260	11.75	11.75	12.28	12.28	12.52	12.52	11.85	11.85	18.13	24.00	PASS
	60/5300	11.61	11.61	12.72	12.72	12.93	12.93	12.24	12.24	18.42	24.00	PASS
	64/5320	11.92	11.92	12.87	12.87	13.14	13.14	12.42	12.42	18.63	24.00	PASS
802.11ac HT40	54/5270	14.71	14.85	15.12	15.26	15.26	15.40	14.81	14.95	21.14	24.00	PASS
	62/5310	14.94	15.08	15.44	15.58	15.62	15.76	15.22	15.36	21.48	24.00	PASS
802.11ac HT80	58/5290	16.45	16.59	16.72	16.86	16.83	16.97	16.55	16.69	22.80	24.00	PASS

Note: 1. For Total Power, according to KDB 662911 D01 Multiple Transmitter Output v02r01 1),

The Total Power $=10\log(10^{(\text{Power antenna1 in dBm/10})}+10^{(\text{Power antenna2 in dBm/10})}+10^{(\text{Power antenna3 in dBm/10})}) +10^{(\text{PSD antenna4 in dBm/10})})$.

2. The manufacturer declared the transmitter output signals is CDD mode And $N_{ss}=1$. According to KDB 662911 D01 Multiple Transmitter Output v02r01 2)f)(i): If all antennas have the same gain, Directional gain = G_{ANT} + Array Gain,

For power measurements on IEEE 802.11 devices,

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

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

Array Gain = 5 log(N_{ANT}/N_{SS}) dB or 3 dB, whichever is less, for 20-MHz channel widths with $N_{ANT} \geq 5$.

So directional gain = G_{ANT} + Array Gain =4+0=4 dBi<6dBi. So the power limt is 30dBm.

U-NII-2C

MIMO without Beamforming

Network Standards	Channel/ Frequency (MHz)	Output Power									Limit (dBm)	Conclusion
		Antenna 1		Antenna 2		Antenna 3		Antenna 4		Total Power (dBm)		
		Read Value (dBm)	Output Power (dBm)	Read Value (dBm)	Output Power (dBm)	Read Value (dBm)	Output Power (dBm)	Read Value (dBm)	Output Power (dBm)			
802.11a	100/5500	11.86	12.07	11.50	11.71	11.45	11.66	11.21	11.42	17.75	24.00	PASS
	116/5580	11.53	11.74	11.27	11.48	11.58	11.79	11.58	11.79	17.73	24.00	PASS
	140/5700	11.12	11.33	11.13	11.34	11.76	11.97	11.06	11.27	17.51	24.00	PASS
802.11n HT20	100/5500	11.76	11.99	11.55	11.78	11.60	11.83	11.28	11.51	17.80	24.00	PASS
	116/5580	11.73	11.96	11.59	11.82	11.83	12.06	11.87	12.10	18.01	24.00	PASS
	140/5700	11.83	12.06	11.69	11.92	12.31	12.54	11.65	11.88	18.13	24.00	PASS
802.11n HT40	102/5510	13.50	13.95	12.70	13.15	13.26	13.71	12.31	12.76	19.44	24.00	PASS
	110/5550	14.08	14.53	13.39	13.84	13.99	14.44	12.61	13.06	20.03	24.00	PASS
	134/5670	13.17	13.62	12.76	13.21	13.02	13.47	12.58	13.03	19.36	24.00	PASS
802.11ac HT20	100/5500	12.04	12.04	11.50	11.50	11.85	11.85	11.42	11.42	17.73	24.00	PASS
	116/5580	11.86	11.86	11.56	11.56	11.84	11.84	11.94	11.94	17.82	24.00	PASS
	140/5700	11.89	11.89	11.61	11.61	12.45	12.45	11.77	11.77	17.96	24.00	PASS
802.11ac HT40	102/5510	13.20	13.34	12.78	12.92	12.85	12.99	12.29	12.43	18.96	24.00	PASS
	110/5550	13.91	14.05	13.64	13.78	13.89	14.03	13.51	13.65	19.90	24.00	PASS
	134/5670	13.20	13.34	12.92	13.06	13.16	13.30	12.97	13.11	19.23	24.00	PASS
802.11ac HT80	106/5530	14.49	14.63	13.96	14.10	13.86	14.00	13.81	13.95	20.20	24.00	PASS

Note: 1. For Total Power, according to KDB 662911 D01 Multiple Transmitter Output v02r01 1),

The Total Power $=10\log(10^{(\text{Power antenna1 in dBm}/10)}+10^{(\text{Power antenna2 in dBm}/10)}+10^{(\text{Power antenna3 in dBm}/10)}) +10^{(\text{PSD antenna4 in dBm}/10)})$.

2. The manufacturer declared the transmitter output signals is CDD mode And $N_{ss}=1$. According to KDB 662911 D01 Multiple Transmitter Output v02r01 2)f)(i): If all antennas have the same gain, Directional gain = G_{ANT} + Array Gain,

For power measurements on IEEE 802.11 devices,

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

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

Array Gain = 5 log(N_{ANT}/N_{SS}) dB or 3 dB, whichever is less, for 20-MHz channel widths with $N_{ANT} \geq 5$.

So directional gain = G_{ANT} + Array Gain =4+0=4 dBi<6dBi. So the power limt is 30dBm.

U-NII-3

MIMO without Beamforming

Network Standards	Channel/ Frequency (MHz)	Output Power									Limit (dBm)	Conclusion
		Antenna 1		Antenna 2		Antenna 3		Antenna 4		Total Power (dBm)		
		Read Value (dBm)	Output Power (dBm)	Read Value (dBm)	Output Power (dBm)	Read Value (dBm)	Output Power (dBm)	Read Value (dBm)	Output Power (dBm)			
802.11a	149/5745	23.67	23.88	23.42	23.63	22.90	23.11	22.17	22.38	29.31	30.00	PASS
	157/5785	23.49	23.70	23.32	23.53	22.68	22.89	22.27	22.48	29.20	30.00	PASS
	165/5825	23.38	23.59	23.09	23.30	22.77	22.98	22.58	22.79	29.20	30.00	PASS
802.11n HT20	149/5745	23.52	23.75	22.44	22.67	22.02	22.25	21.28	21.51	28.64	30.00	PASS
	157/5785	23.43	23.66	23.33	23.56	22.66	22.89	22.22	22.45	29.19	30.00	PASS
	165/5825	23.55	23.78	23.79	24.02	22.84	23.07	22.74	22.97	29.50	30.00	PASS
802.11n HT40	151/5755	22.29	22.74	22.12	22.57	22.45	22.90	21.47	21.92	28.57	30.00	PASS
	159/5795	22.67	23.12	22.39	22.84	22.75	23.20	21.86	22.31	28.91	30.00	PASS
802.11ac HT20	149/5745	23.51	23.51	22.65	22.65	22.01	22.01	21.63	21.63	28.53	30.00	PASS
	157/5785	23.53	23.53	23.40	23.40	22.59	22.59	22.28	22.28	29.00	30.00	PASS
	165/5825	23.57	23.57	23.46	23.46	22.69	22.69	22.66	22.66	29.14	30.00	PASS
802.11ac HT40	151/5755	22.97	23.11	22.40	22.54	22.69	22.83	21.87	22.01	28.67	30.00	PASS
	159/5795	22.77	22.91	22.58	22.72	22.72	22.86	22.11	22.25	28.72	30.00	PASS
802.11ac HT80	155/5775	22.04	22.18	21.94	22.08	21.95	22.09	21.75	21.89	28.09	30.00	PASS

Note: 1. For Total Power, according to KDB 662911 D01 Multiple Transmitter Output v02r01 1),

The Total Power $=10\log(10^{(\text{Power antenna1 in dBm/10})}+10^{(\text{Power antenna2 in dBm/10})}+10^{(\text{Power antenna3 in dBm/10})}) +10^{(\text{PSD antenna4 in dBm/10})})$.

2. The manufacturer declared the transmitter output signals is CDD mode And $N_{ss}=1$. According to KDB 662911 D01 Multiple Transmitter Output v02r01 2)f)(i): If all antennas have the same gain, Directional gain = G_{ANT} + Array Gain,

For power measurements on IEEE 802.11 devices,

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

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

Array Gain = 5 log(N_{ANT}/N_{SS}) dB or 3 dB, whichever is less, for 20-MHz channel widths with $N_{ANT} \geq 5$.

So directional gain = G_{ANT} + Array Gain =4+0=4 dBi<6dBi. So the power limt is 30dBm.

U-NII-1

MIMO with Beamforming

Network Standards	Channel/ Frequency (MHz)	Output Power									Limit (dBm)	Conclusion
		Antenna 1		Antenna 2		Antenna 3		Antenna 4		Total Power (dBm)		
		Read Value (dBm)	Output Power (dBm)	Read Value (dBm)	Output Power (dBm)	Read Value (dBm)	Output Power (dBm)	Read Value (dBm)	Output Power (dBm)			
802.11n HT20	36/5180	18.46	18.69	17.31	17.54	18.53	18.76	17.24	17.47	24.18	25.98	PASS
	40/5200	18.11	18.34	17.19	17.42	18.17	18.40	17.02	17.25	23.90	25.98	PASS
	48/5240	17.94	18.17	17.45	17.68	18.31	18.54	17.19	17.42	23.99	25.98	PASS
802.11n HT40	38/5190	20.31	20.76	19.11	19.56	19.50	19.95	18.72	19.17	25.93	25.98	PASS
	46/5230	19.63	20.08	19.19	19.64	19.73	20.18	19.09	19.54	25.89	25.98	PASS
802.11ac HT20	36/5180	17.61	17.61	17.42	17.42	18.08	18.08	16.87	16.87	23.54	25.98	PASS
	40/5200	18.28	18.28	17.34	17.34	18.04	18.04	17.11	17.11	23.74	25.98	PASS
	48/5240	17.93	17.93	17.51	17.51	18.05	18.05	17.36	17.36	23.74	25.98	PASS
802.11ac HT40	38/5190	20.33	20.47	19.28	19.42	19.98	20.12	19.06	19.20	25.86	25.98	PASS
	46/5230	19.80	19.94	19.45	19.59	19.87	20.01	19.31	19.45	25.78	25.98	PASS
802.11ac HT80	42/5210	19.94	20.08	19.33	19.47	19.41	19.55	18.72	18.86	25.54	25.98	PASS

Note: 1. For Total Power, according to KDB 662911 D01 Multiple Transmitter Output v02r01 1),

The Total Power =$10\log(10^{(\text{Power antenna1 in dBm/10})}+10^{(\text{Power antenna2 in dBm/10})}+10^{(\text{Power antenna3 in dBm/10})}) +10^{(\text{PSD antenna4 in dBm/10})}$).

2. Direction gain calculation according to KDB662911 D01 Multiple Transmitter Output v02r01 F) 2) e） (i),If all antennas have the same gain, directional gain = GANT + 10 log(NANT/NSS)=4+10log(4/1)=10.02>6 dBi. So the power limt=30-(directional gain-6 dBi)=30-(10.02-6)=25.98 dBm.

U-NII-2A

MIMO with Beamforming

Network Standards	Channel/ Frequency (MHz)	Output Power								Total Power (dBm)	Limit (dBm)	Conclusion
		Antenna 1		Antenna 2		Antenna 3		Antenna 4				
		Read Value (dBm)	Output Power (dBm)	Read Value (dBm)	Output Power (dBm)	Read Value (dBm)	Output Power (dBm)	Read Value (dBm)	Output Power (dBm)			
802.11n HT20	52/5260	11.54	11.77	11.96	12.19	12.19	12.42	11.61	11.84	18.08	19.98	PASS
	60/5300	11.50	11.73	12.37	12.60	12.54	12.77	11.99	12.22	18.37	19.98	PASS
	64/5320	11.61	11.84	12.65	12.88	12.88	13.11	12.34	12.57	18.65	19.98	PASS
802.11n HT40	54/5270	12.73	13.18	13.27	13.72	13.42	13.87	12.75	13.20	19.53	19.98	PASS
	62/5310	12.94	13.39	13.53	13.98	13.59	14.04	13.07	13.52	19.77	19.98	PASS
802.11ac HT20	52/5260	11.60	11.60	12.10	12.10	12.39	12.39	11.82	11.82	18.01	19.98	PASS
	60/5300	11.62	11.62	12.60	12.60	12.62	12.62	12.29	12.29	18.32	19.98	PASS
	64/5320	11.81	11.81	12.77	12.77	13.05	13.05	12.50	12.50	18.58	19.98	PASS
802.11ac HT40	54/5270	13.10	13.24	13.45	13.59	13.35	13.49	13.15	13.29	19.43	19.98	PASS
	62/5310	13.31	13.45	13.75	13.89	13.40	13.54	13.09	13.23	19.56	19.98	PASS
802.11ac HT80	58/5290	12.79	12.93	13.52	13.66	13.61	13.75	12.68	12.82	19.33	19.98	PASS

Note: 1. For Total Power, according to KDB 662911 D01 Multiple Transmitter Output v02r01 1),

The Total Power $=10\log(10^{(\text{Power antenna1 in dBm/10})}+10^{(\text{Power antenna2 in dBm/10})}+10^{(\text{Power antenna3 in dBm/10})}) +10^{(\text{PSD antenna4 in dBm/10})})$.

2. Direction gain calculation according to KDB662911 D01 Multiple Transmitter Output v02r01 F) 2) e） (i),If all antennas have the same gain, directional gain = GANT + 10 log(NANT/NSS)=4+10log(4/1)=10.02>6 dBi. So the power limt=30-(directional gain-6 dBi)=24-(10.02-6)=19.98 dBm.

U-NII-2C

MIMO with Beamforming

Network Standards	Channel/ Frequency (MHz)	Output Power								Total Power (dBm)	Limit (dBm)	Conclusion
		Antenna 1		Antenna 2		Antenna 3		Antenna 4				
		Read Value (dBm)	Output Power (dBm)	Read Value (dBm)	Output Power (dBm)	Read Value (dBm)	Output Power (dBm)	Read Value (dBm)	Output Power (dBm)			
802.11n HT20	100/5500	11.90	12.13	11.34	11.57	12.00	12.23	11.89	12.12	18.04	19.98	PASS
	116/5580	11.57	11.80	11.69	11.92	11.94	12.17	11.85	12.08	18.02	19.98	PASS
	140/5700	12.17	12.40	11.54	11.77	12.76	12.99	12.31	12.54	18.47	19.98	PASS
802.11n HT40	102/5510	13.09	13.54	12.20	12.65	12.96	13.41	12.89	13.34	19.27	19.98	PASS
	110/5550	13.19	13.64	12.75	13.20	13.51	13.96	12.84	13.29	19.56	19.98	PASS
	134/5670	13.44	13.89	12.66	13.11	13.78	14.23	13.22	13.67	19.77	19.98	PASS
802.11ac HT20	100/5500	12.04	12.04	11.45	11.45	12.16	12.16	12.09	12.09	17.96	19.98	PASS
	116/5580	11.67	11.67	11.78	11.78	11.93	11.93	12.05	12.05	17.88	19.98	PASS
	140/5700	12.06	12.06	11.77	11.77	12.71	12.71	12.37	12.37	18.26	19.98	PASS
802.11ac HT40	102/5510	13.52	13.66	12.69	12.83	13.22	13.36	12.99	13.13	19.28	19.98	PASS
	110/5550	13.47	13.61	13.10	13.24	13.38	13.52	13.17	13.31	19.45	19.98	PASS
	134/5670	13.82	13.96	12.90	13.04	13.46	13.60	13.56	13.70	19.61	19.98	PASS
802.11ac HT80	106/5530	13.25	13.39	13.18	13.32	13.30	13.44	12.86	13.00	19.32	19.98	PASS

Note: 1. For Total Power, according to KDB 662911 D01 Multiple Transmitter Output v02r01 1),
The Total Power =$10\log(10^{(\text{Power antenna1 in dBm}/10)}+10^{(\text{Power antenna2 in dBm}/10)}+10^{(\text{Power antenna3 in dBm}/10)}) +10^{(\text{PSD antenna4 in dBm}/10)})$.
2. Direction gain calculation according to KDB662911 D01 Multiple Transmitter Output v02r01 F) 2) e） (i),If all antennas have the same gain, directional gain = GANT + 10 log(NANT/NSS)=4+10log(4/1)=10.02>6 dBi. So the power limt=30-(directional gain-6 dBi)=24-(10.02-6)=19.98 dBm.

U-NII-3

MIMO with Beamforming

Network Standards	Channel/ Frequency (MHz)	Output Power									Limit (dBm)	Conclusion
		Antenna 1		Antenna 2		Antenna 3		Antenna 4		Total Power (dBm)		
		Read Value (dBm)	Output Power (dBm)	Read Value (dBm)	Output Power (dBm)	Read Value (dBm)	Output Power (dBm)	Read Value (dBm)	Output Power (dBm)			
802.11n HT20	149/5745	19.63	19.86	19.62	19.85	19.51	19.74	18.64	18.87	25.62	25.98	PASS
	157/5785	19.76	19.99	19.78	20.01	19.76	19.99	18.81	19.04	25.80	25.98	PASS
	165/5825	19.70	19.93	19.61	19.84	19.39	19.62	18.90	19.13	25.66	25.98	PASS
802.11n HT40	151/5755	19.26	19.71	19.22	19.67	19.71	20.16	18.81	19.26	25.74	25.98	PASS
	159/5795	19.40	19.85	19.15	19.60	19.64	20.09	18.78	19.23	25.73	25.98	PASS
802.11ac HT20	149/5745	19.65	19.65	19.66	19.66	19.79	19.79	18.77	18.77	25.51	25.98	PASS
	157/5785	19.66	19.66	19.65	19.65	19.77	19.77	18.87	18.87	25.52	25.98	PASS
	165/5825	19.81	19.81	19.64	19.64	19.61	19.61	18.82	18.82	25.51	25.98	PASS
802.11ac HT40	151/5755	19.58	19.72	19.58	19.72	19.47	19.61	18.84	18.98	25.54	25.98	PASS
	159/5795	19.60	19.74	19.54	19.68	19.54	19.68	18.90	19.04	25.57	25.98	PASS
802.11ac HT80	155/5775	19.28	19.42	19.26	19.40	19.13	19.27	18.46	18.60	25.21	25.98	PASS

Note: 1. For Total Power, according to KDB 662911 D01 Multiple Transmitter Output v02r01 1),

The Total Power $=10\log(10^{(\text{Power antenna1 in dBm}/10)}+10^{(\text{Power antenna2 in dBm}/10)}+10^{(\text{Power antenna3 in dBm}/10)}) +10^{(\text{Power antenna4 in dBm}/10)})$.

2. Direction gain calculation according to KDB662911 D01 Multiple Transmitter Output v02r01 F) 2) e） (i),If all antennas have the same gain, directional gain = GANT + 10 log(NANT/NSS)=4+10log(4/1)=10.02>6 dBi. So the power limt=30-(directional gain-6 dBi)=30-(10.02-6)=25.98 dBm.

5.3. Frequency Stability

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

1. Frequency stability with respect to ambient temperature

a) Supply the EUT with a nominal ac voltage or install a new or fully charged battery in the EUT. If possible, a dummy load shall be connected to the EUT because an antenna near the metallic walls of an environmental test chamber could affect the output frequency of the EUT. If the EUT is equipped with a permanently attached, adjustable-length antenna, then the EUT shall be placed in the center of the chamber with the antenna adjusted to the shortest length possible. Turn ON the EUT and tune it to one of the number of frequencies shown in 5.6.

b) Couple the unlicensed wireless device output to the measuring instrument by connecting an antenna to the measuring instrument with a suitable length of coaxial cable and placing the measuring antenna near the EUT (e.g., 15 cm away), or by connecting a dummy load to the measuring instrument, through an attenuator if necessary.

c) Adjust the location of the measurement antenna and the controls on the measurement instrument to obtain a suitable signal level (i.e., a level that will not overload the measurement instrument but is strong enough to allow measurement of the operating or fundamental frequency of the EUT).

d) Turn the EUT OFF and place it inside the environmental temperature chamber. For devices that have oscillator heaters, energize only the heater circuit.

e) Set the temperature control on the chamber to the highest specified in the regulatory requirements for the type of device and allow the oscillator heater and the chamber temperature to stabilize.

f) While maintaining a constant temperature inside the environmental chamber, turn the EUT ON and record the operating frequency at startup, and at 2 minutes, 5 minutes, and 10 minutes after the EUT is energized. Four measurements in total are made.

g) Measure the frequency at each of frequencies specified in 5.6.

h) Switch OFF the EUT but do not switch OFF the oscillator heater.

i) Lower the chamber temperature by not more that 10 C, and allow the temperature inside the chamber to stabilize.

j) Repeat step f) through step i) down to the lowest specified temperature.

2. Frequency stability when varying supply voltage

Unless otherwise specified, these tests shall be made at ambient room temperature (+15 C to +25 C). An antenna shall be connected to the antenna output terminals of the EUT if possible. If the EUT is equipped with or uses an adjustable-length antenna, then it shall be fully extended.

a) Supply the EUT with nominal voltage or install a new or fully charged battery in the EUT. Turn ON the EUT and couple its output to a frequency counter or other frequency-measuring instrument.

b) Tune the EUT to one of the number of frequencies required in 5.6. Adjust the location of the measurement antenna and the controls on the measurement instrument to obtain a suitable signal level (i.e., a level that will not overload the measurement instrument but is strong enough to allow measurement of the operating or fundamental frequency of the EUT).
c) Measure the frequency at each of the frequencies specified in 5.6.
d) Repeat the above procedure at 85% and 115% of the nominal supply voltage.

Limit

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the users manual.

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 2, U= 936Hz

Test Results

Voltage (V)	Temperature (°C)	U-NII-1 Test Results			
		5200MHz			
		1min	2min	5min	10min
12	-20	5199.997502	5199.993261	5199.985059	5199.982938
12	-10	5200.001106	5199.987446	5199.980274	5199.976304
12	0	5200.000095	5199.985562	5199.970942	5199.968559
12	10	5199.996109	5199.983594	5199.965812	5199.959597
12	20	5199.990647	5199.97896	5199.956915	5199.950832
12	30	5199.989139	5199.973689	5199.952134	5199.949671
12	40	5199.984635	5199.966926	5199.947932	5199.948853
12	50	5199.975293	5199.962228	5199.941996	5199.947692
10.2	20	5199.969414	5199.956608	5199.940632	5199.943189
13.8	20	5199.968863	5199.95567	5199.939728	5199.938771
MHz		-0.031137219	-0.044329818	-0.060271583	-0.061228703
PPM		-5.987926693	-8.52496506	-11.59068908	-11.77475052

Voltage (V)	Temperature (°C)	U-NII-2A Test Results			
		5300MHz			
		1min	2min	5min	10min
12	-20	5299.99364	5299.993038	5299.987792	5299.978857
12	-10	5299.987036	5299.986147	5299.984537	5299.971844
12	0	5299.9854	5299.979774	5299.978191	5299.962679
12	10	5299.978986	5299.976471	5299.975796	5299.959271
12	20	5299.976145	5299.97319	5299.967679	5299.95009
12	30	5299.973349	5299.969184	5299.967639	5299.943572
12	40	5299.965714	5299.960552	5299.958224	5299.940816
12	50	5299.962673	5299.952631	5299.95315	5299.934768
10.2	20	5299.955169	5299.944559	5299.948647	5299.926172
13.8	20	5299.951747	5299.940491	5299.939704	5299.925445
MHz		-0.048253111	-0.05950865	-0.060296183	-0.07455465
PPM		-9.104360595	-11.22804725	-11.37663837	-14.06691506

Voltage (V)	Temperature (°C)	U-NII-2C Test Results			
		5580MHz			
		1min	2min	5min	10min
12	-20	5580.000077	5579.991358	5579.985759	5579.976649
12	-10	5579.998522	5579.988829	5579.983676	5579.967627
12	0	5579.995396	5579.98797	5579.98118	5579.95945
12	10	5579.991985	5579.979581	5579.971393	5579.955821
12	20	5579.983442	5579.970089	5579.969547	5579.948283
12	30	5579.982844	5579.966962	5579.963645	5579.938471
12	40	5579.974215	5579.95845	5579.959447	5579.937769
12	50	5579.970111	5579.955417	5579.956374	5579.931187
10.2	20	5579.963287	5579.947107	5579.9472	5579.921729
13.8	20	5579.957968	5579.940647	5579.941837	5579.916796
MHz		-0.042032016	-0.059353395	-0.058162568	-0.083203553
PPM		-7.53261944	-10.6368092	-10.42339932	-14.91103096

Voltage (V)	Temperature (°C)	U-NII-3 Test Results			
		5785MHz			
		1min	2min	5min	10min
12	-20	5784.99667	5784.990456	5784.981587	5784.976913
12	-10	5784.990582	5784.986245	5784.979691	5784.976098
12	0	5784.985479	5784.984671	5784.976149	5784.972778
12	10	5784.975511	5784.977206	5784.970385	5784.971088
12	20	5784.966127	5784.97056	5784.969733	5784.961242
12	30	5784.959831	5784.960746	5784.963615	5784.95718
12	40	5784.956327	5784.951477	5784.962077	5784.949226
12	50	5784.949497	5784.95064	5784.95585	5784.943344
10.2	20	5784.942953	5784.94589	5784.948871	5784.933513
13.8	20	5784.93789	5784.945689	5784.946467	5784.933238
MHz		-0.062110064	-0.054310829	-0.053533372	-0.066762293
PPM		-10.73639823	-9.388215892	-9.253823981	-11.54058654

5.4. Power Spectral Density

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

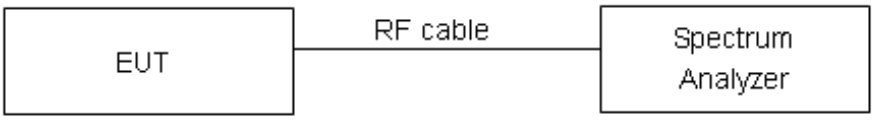
The EUT was connected to the spectrum analyzer through an external attenuator (20dB) and a known loss cable.

Set RBW = 510 kHz, VBW =1.5MHz for the band 5.725-5.85 GHz

Set RBW = 1 MHz, VBW =3MHz for the band 5.150-5.250 GHz

The conducted PSD is measured at each antenna port. The measured results at the various antenna ports are then summed mathematically.

Test setup



Limits

Rule FCC Part 15.407(a)(1)/ Part 15.407(a)(2) / Part 15.407(a)(3)
For an indoor access point operating in the band 5.15-5.25 GHz, the maximum power spectral density shall not exceed 17 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 bands, 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 power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmittingantennas 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.

Frequency Bands/MHz	Limits
5150-5250	17MHz
5.25-5.35 GHz and 5.47-5.725 GHz	11dBm/MHz
5725-5850	30dBm/500kHz

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 2, U= 0.75dB.

Test Results:

U-NII-1

MIMO without Beamforming

Network Standards	Channel/ Frequency (MHz)	Power Spectral Density									Limit (dBm/ MHz)	Conclusion
		Antenna 1		Antenna 2		Antenna 3		Antenna 4		Total Power (dBm /MHz)		
		Read Value (dBm/ MHz)	PSD (dBm/ MHz)	Read Value (dBm/ MHz)	PSD (dBm/ MHz)	Read Value (dBm/ MHz)	PSD (dBm/ MHz)	Read Value (dBm/ MHz)	PSD (dBm/ MHz)			
802.11a	36/5180	6.71	6.92	6.72	6.94	7.42	7.63	5.38	5.59	12.85	12.98	PASS
	40/5200	6.76	6.97	6.53	6.75	7.26	7.47	5.47	5.68	12.79	12.98	PASS
	48/5240	6.43	6.65	6.66	6.88	7.11	7.32	5.45	5.66	12.69	12.98	PASS
802.11n HT20	36/5180	6.63	6.86	6.81	7.04	7.40	7.63	5.47	5.70	12.88	12.98	PASS
	40/5200	4.40	4.63	3.41	3.64	3.07	3.30	3.68	3.91	9.92	12.98	PASS
	48/5240	6.32	6.55	6.49	6.72	7.21	7.44	5.48	5.71	12.67	12.98	PASS
802.11n HT40	38/5190	0.47	0.92	0.17	0.62	0.36	0.81	-0.84	-0.39	6.54	12.98	PASS
	46/5230	6.83	7.29	5.90	6.36	6.06	6.52	4.84	5.30	12.44	12.98	PASS
802.11ac HT20	36/5180	6.74	6.74	6.83	6.83	7.30	7.30	5.50	5.50	12.66	12.98	PASS
	40/5200	6.53	6.53	6.53	6.53	7.07	7.07	5.48	5.48	12.46	12.98	PASS
	48/5240	6.20	6.20	6.62	6.62	7.27	7.27	5.59	5.59	12.49	12.98	PASS
802.11ac HT40	38/5190	3.25	3.39	2.44	2.58	2.73	2.87	2.21	2.35	8.84	12.98	PASS
	46/5230	7.13	7.27	6.35	6.49	6.34	6.48	5.04	5.18	12.44	12.98	PASS
802.11ac HT80	42/5210	0.703	0.85	-0.26	-0.11	0.43	0.58	-0.32	-0.17	6.33	12.98	PASS

Note: 1. Power Spectral Density =Read Value+Duty cycle correction factor

2. For Total PSD, according to KDB 662911 D01 Multiple Transmitter Output v02r01 2)a),the power spectral density=10log($10^{(PSD\ antenna1\ in\ dBm/10)}$+$10^{(PSD\ antenna2\ in\ dBm/10)}$+$10^{(PSD\ antenna3\ in\ dBm/10)}$) +$10^{(PSD\ antenna4\ in\ dBm/10)}$)

3. The manufacturer declared the transmitter output signals is CDD mode And Nss=1. According to KDB 662911 D01 Multiple Transmitter Output v02r01 2)f)(i): If all antennas have the same gain, Directional gain = GANT + Array Gain, For PSD measurements on all devices,Array Gain=10log(Nant/Nss)dB,so directional gain=GANT+Array Gain=4+10log（4/1)=10.02>6 dBi. So the PSD limt is 17-(directional gain-6 dBi) =17-(10.02-6) =12.98 dBm.

U-NII-2A

MIMO without Beamforming

Network Standards	Channel/ Frequency (MHz)	Power Spectral Density									Limit (dBm/ MHz)	Conclusion
		Antenna 1		Antenna 2		Antenna 3		Antenna 4		Total Power (dBm /MHz)		
		Read Value (dBm/ MHz)	PSD (dBm/ MHz)	Read Value (dBm/ MHz)	PSD (dBm/ MHz)	Read Value (dBm/ MHz)	PSD (dBm/ MHz)	Read Value (dBm/ MHz)	PSD (dBm/ MHz)			
802.11a	52/5260	-0.15	0.07	0.30	0.52	0.84	1.05	0.11	0.32	6.53	6.98	PASS
	60/5300	-0.26	-0.05	0.60	0.81	1.05	1.26	0.08	0.29	6.63	6.98	PASS
	64/5320	-0.37	-0.16	0.88	1.10	0.89	1.10	0.02	0.23	6.62	6.98	PASS
802.11n HT20	52/5260	-0.29	-0.06	0.61	0.84	0.73	0.96	0.05	0.28	6.54	6.98	PASS
	60/5300	-0.25	-0.02	0.67	0.90	1.02	1.25	-0.01	0.22	6.64	6.98	PASS
	64/5320	-0.14	0.10	0.90	1.13	1.13	1.36	0.13	0.36	6.79	6.98	PASS
802.11n HT40	54/5270	-0.16	0.30	0.01	0.46	-0.03	0.42	-0.20	0.25	6.38	6.98	PASS
	62/5310	-0.23	0.22	0.70	1.16	0.66	1.12	-0.29	0.16	6.71	6.98	PASS
802.11ac HT20	52/5260	-0.30	-0.30	0.83	0.83	0.89	0.89	0.07	0.07	6.42	6.98	PASS
	60/5300	-0.16	-0.16	0.90	0.90	0.96	0.96	0.09	0.09	6.49	6.98	PASS
	64/5320	-0.32	-0.32	0.67	0.67	1.00	1.00	0.18	0.18	6.43	6.98	PASS
802.11ac HT40	54/5270	-0.07	0.07	0.41	0.55	0.53	0.67	-0.18	-0.03	6.35	6.98	PASS
	62/5310	0.12	0.26	0.55	0.70	0.60	0.74	0.12	0.27	6.52	6.98	PASS
802.11ac HT80	58/5290	-2.11	-1.97	-2.52	-2.38	-2.72	-2.57	-1.79	-1.65	3.89	6.98	PASS

Note: 1. Power Spectral Density =Read Value+Duty cycle correction factor

2. For Total PSD, according to KDB 662911 D01 Multiple Transmitter Output v02r01 2)a),the power spectral density=$10\log(10^{(\text{PSD antenna1 in dBm/10})}+10^{(\text{PSD antenna2 in dBm/10})}+10^{(\text{PSD antenna3 in dBm/10})}) +10^{(\text{PSD antenna4 in dBm/10})})$

3. The manufacturer declared the transmitter output signals is CDD mode And Nss=1. According to KDB 662911 D01 Multiple Transmitter Output v02r01 2)f)(i): If all antennas have the same gain, Directional gain = GANT + Array Gain, For PSD measurements on all devices,Array Gain=10log(Nant/Nss)dB,so directional gain=GANT+Array Gain=4+10log（4/1)=10.02>6 dBi. So the PSD limt is 11-(directional gain-6 dBi) =11-(10.02-6)=6.98 dBm.

U-NII-2C

MIMO without Beamforming

Network Standards	Channel/ Frequency (MHz)	Power Spectral Density									Limit (dBm/ MHz)	Conclusion
		Antenna 1		Antenna 2		Antenna 3		Antenna 4		Total Power (dBm /MHz)		
		Read Value (dBm/ MHz)	PSD (dBm/ MHz)	Read Value (dBm/ MHz)	PSD (dBm/ MHz)	Read Value (dBm/ MHz)	PSD (dBm/ MHz)	Read Value (dBm/ MHz)	PSD (dBm/ MHz)			
802.11a	100/5500	0.51	0.73	0.54	0.75	0.46	0.67	0.56	0.78	6.75	6.98	PASS
	116/5580	0.48	0.69	0.51	0.72	0.49	0.70	0.81	1.02	6.81	6.98	PASS
	140/5700	0.27	0.49	0.51	0.73	0.72	0.93	0.67	0.89	6.78	6.98	PASS
802.11n HT20	100/5500	0.58	0.81	0.45	0.68	0.61	0.84	0.28	0.51	6.73	6.98	PASS
	116/5580	0.46	0.69	0.52	0.75	0.62	0.85	0.76	0.99	6.84	6.98	PASS
	140/5700	0.67	0.90	0.55	0.78	0.89	1.12	0.52	0.75	6.91	6.98	PASS
802.11n HT40	102/5510	-1.90	-1.44	-1.53	-1.07	-2.23	-1.77	-1.68	-1.23	4.65	6.98	PASS
	110/5550	-0.89	-0.44	-1.00	-0.54	-1.16	-0.71	-0.57	-0.12	5.57	6.98	PASS
	134/5670	-1.53	-1.08	-1.55	-1.10	-1.29	-0.83	-1.50	-1.05	5.01	6.98	PASS
802.11ac HT20	100/5500	0.57	0.57	0.50	0.50	0.61	0.61	0.54	0.54	6.57	6.98	PASS
	116/5580	0.62	0.62	0.54	0.54	0.90	0.90	1.01	1.01	6.79	6.98	PASS
	140/5700	0.72	0.72	0.61	0.61	1.22	1.22	1.05	1.05	6.93	6.98	PASS
802.11ac HT40	102/5510	-1.80	-1.66	-1.62	-1.47	-2.40	-2.26	-1.62	-1.48	4.32	6.98	PASS
	110/5550	-1.00	-0.85	-0.83	-0.69	-1.43	-1.28	-0.79	-0.65	5.16	6.98	PASS
	134/5670	-1.42	-1.27	-1.22	-1.08	-1.28	-1.14	-1.16	-1.02	4.89	6.98	PASS
802.11ac HT80	106/5530	-3.20	-3.06	-3.71	-3.56	-3.76	-3.61	-3.12	-2.97	2.73	6.98	PASS

Note: 1. Power Spectral Density =Read Value+Duty cycle correction factor

2. For Total PSD, according to KDB 662911 D01 Multiple Transmitter Output v02r01 2)a),the power spectral density=10log($10^{(\text{PSD antenna1 in dBm/10})}$+$10^{(\text{PSD antenna2 in dBm/10})}$+$10^{(\text{PSD antenna3 in dBm/10})}$) +$10^{(\text{PSD antenna4 in dBm/10})}$)

3. The manufacturer declared the transmitter output signals is CDD mode And Nss=1. According to KDB 662911 D01 Multiple Transmitter Output v02r01 2)f)(i): If all antennas have the same gain, Directional gain = GANT + Array Gain, For PSD measurements on all devices,Array Gain=10log(Nant/Nss)dB,so directional gain=GANT+Array Gain=4+10log（4/1)=10.02>6 dBi. So the PSD limt is 11-(directional gain-6 dBi) =11-(10.02-6)=6.98 dBm.

U-NII-3

MIMO without Beamforming

Network Standards	Channel/ Frequency (MHz)	Power Spectral Density									Limit (dBm/ MHz)	Conclusion
		Antenna 1		Antenna 2		Antenna 3		Antenna 4		Total Power (dBm /MHz)		
		Read Value (dBm/ MHz)	PSD (dBm/ MHz)	Read Value (dBm/ MHz)	PSD (dBm/ MHz)	Read Value (dBm/ MHz)	PSD (dBm/ MHz)	Read Value (dBm/ MHz)	PSD (dBm/ MHz)			
802.11a	149/5745	9.66	9.88	9.80	10.02	8.83	9.05	8.80	9.01	15.53	25.98	PASS
	157/5785	9.48	9.70	9.88	10.09	8.84	9.06	8.79	9.00	15.51	25.98	PASS
	165/5825	9.41	9.63	9.50	9.71	8.76	8.97	9.17	9.38	15.45	25.98	PASS
802.11n HT20	149/5745	9.51	9.74	9.42	9.65	9.19	9.42	8.04	8.27	15.33	25.98	PASS
	157/5785	9.39	9.62	9.45	9.68	8.70	8.93	8.65	8.88	15.31	25.98	PASS
	165/5825	9.62	9.85	9.79	10.02	9.09	9.32	9.15	9.38	15.67	25.98	PASS
802.11n HT40	151/5755	5.02	5.47	4.76	5.21	5.34	5.79	4.74	5.19	11.45	25.98	PASS
	159/5795	5.49	5.95	4.99	5.45	5.65	6.10	5.53	5.99	11.90	25.98	PASS
802.11ac HT20	149/5745	9.06	9.06	9.34	9.34	8.95	8.95	8.18	8.18	14.92	25.98	PASS
	157/5785	9.35	9.35	9.50	9.50	8.64	8.64	8.47	8.47	15.03	25.98	PASS
	165/5825	9.30	9.30	9.61	9.61	8.67	8.67	8.78	8.78	15.13	25.98	PASS
802.11ac HT40	151/5755	5.46	5.60	4.92	5.06	5.48	5.62	4.90	5.04	11.36	25.98	PASS
	159/5795	5.44	5.58	5.60	5.74	5.73	5.88	5.97	6.11	11.85	25.98	PASS
802.11ac HT80	155/5775	1.71	1.85	1.53	1.68	1.30	1.44	0.62	0.77	7.47	25.98	PASS

Note: 1. Power Spectral Density =Read Value+Duty cycle correction factor

2. For Total PSD, according to KDB 662911 D01 Multiple Transmitter Output v02r01 2)a),the power spectral density=$10\log(10^{(\text{PSD antenna1 in dBm/10})}+10^{(\text{PSD antenna2 in dBm/10})}+10^{(\text{PSD antenna3 in dBm/10})}) +10^{(\text{PSD antenna4 in dBm/10})})$

3. The manufacturer declared the transmitter output signals is CDD mode And Nss=1. According to KDB 662911 D01 Multiple Transmitter Output v02r01 2)f)(i): If all antennas have the same gain, Directional gain = GANT + Array Gain, For PSD measurements on all devices,Array Gain=10log(Nant/Nss)dB,so directional gain=GANT+Array Gain=4+10log（4/1)=10.02>6 dBi. So the PSD limt is 30-(directional gain-6 dBi) =30-(10.02-6)=25.98 dBm.

U-NII-1

MIMO with Beamforming

Network Standards	Channel/ Frequency (MHz)	Power Spectral Density									Limit (dBm /MHz)	Conclusion
		ANT1		ANT2		ANT3		ANT 4		Total Power (dBm /MHz)		
		Read Value (dBm /MHz)	PSD (dBm /MHz)	Read Value (dBm /MHz)	PSD (dBm /MHz)	Read Value (dBm /MHz)	PSD (dBm /MHz)	Read Value (dBm /MHz)	PSD (dBm /MHz)			
802.11n HT20	36/5180	6.87	7.10	6.21	6.44	6.91	7.14	5.82	6.05	12.73	12.98	PASS
	40/5200	6.88	7.11	6.07	6.30	6.78	7.01	5.80	6.03	12.66	12.98	PASS
	48/5240	6.60	6.83	6.37	6.60	6.96	7.19	6.10	6.33	12.77	12.98	PASS
802.11n HT40	38/5190	5.82	6.27	4.89	5.35	5.17	5.62	4.39	4.84	11.57	12.98	PASS
	46/5230	5.38	5.83	5.27	5.72	3.75	4.21	4.86	5.32	11.33	12.98	PASS
802.11ac HT20	36/5180	6.91	6.91	6.14	6.14	6.70	6.70	5.58	5.58	12.38	12.98	PASS
	40/5200	6.73	6.73	6.41	6.41	6.65	6.65	5.76	5.76	12.42	12.98	PASS
	48/5240	6.90	6.90	6.69	6.69	6.95	6.95	6.07	6.07	12.69	12.98	PASS
802.11ac HT40	38/5190	6.03	6.17	5.08	5.23	5.58	5.72	4.78	4.93	11.56	12.98	PASS
	46/5230	5.58	5.72	5.46	5.61	5.37	5.51	4.98	5.12	11.52	12.98	PASS
802.11ac HT80	42/5210	3.71	3.85	3.11	3.25	3.05	3.19	2.46	2.60	9.27	12.98	PASS

Note: 1. Power Spectral Density =Read Value+Duty cycle correction factor

2. For Total PSD, according to KDB 662911 D01 Multiple Transmitter Output v02r01 2)a),the power spectral density=$10\log(10^{(\text{PSD antenna1 in dBm/10})}+10^{(\text{PSD antenna2 in dBm/10})}+10^{(\text{PSD antenna3 in dBm/10})}) +10^{(\text{PSD antenna4 in dBm/10})}$)

3. Direction gain calculation according to KDB662911 D01 Multiple Transmitter Output v02r01 F) 2) e）(i),If all antennas have the same gain, directional gain = GANT + 10 log(NANT/NSS)=4+10log(4/1)=10.02>6 dBi.

So the PSD limt is 17-(directional gain-6 dBi) =17-(10.02-6) =12.98 dBm.

U-NII-2A

MIMO with Beamforming

Network Standards	Channel/ Frequency (MHz)	Power Spectral Density								Total Power (dBm /MHz)	Limit (dBm/ MHz)	Conclusion
		Antenna 1		Antenna 2		Antenna 3		Antenna 4				
		Read Value (dBm/ MHz)	PSD (dBm/ MHz)	Read Value (dBm/ MHz)	PSD (dBm/ MHz)	Read Value (dBm/ MHz)	PSD (dBm/ MHz)	Read Value (dBm/ MHz)	PSD (dBm/ MHz)			
802.11n HT20	52/5260	-0.25	-0.02	0.66	0.89	0.70	0.93	0.06	0.29	6.56	6.98	PASS
	60/5300	-0.22	0.01	0.51	0.74	0.71	0.94	0.07	0.30	6.53	6.98	PASS
	64/5320	-0.28	-0.05	0.80	1.03	0.88	1.11	0.70	0.93	6.80	6.98	PASS
802.11n HT40	54/5270	-1.87	-1.41	-1.49	-1.04	-1.12	-0.67	-1.51	-1.06	4.98	6.98	PASS
	62/5310	-1.26	-0.81	-0.98	-0.52	-0.57	-0.12	-1.14	-0.69	5.49	6.98	PASS
802.11ac HT20	52/5260	-0.28	-0.28	0.69	0.69	0.94	0.94	0.11	0.11	6.41	6.98	PASS
	60/5300	-0.08	-0.08	0.56	0.56	1.06	1.06	0.41	0.41	6.53	6.98	PASS
	64/5320	-0.02	-0.02	0.70	0.70	1.01	1.01	0.47	0.47	6.58	6.98	PASS
802.11ac HT40	54/5270	-1.40	-1.25	-1.10	-0.95	-0.96	-0.81	-1.56	-1.41	4.92	6.98	PASS
	62/5310	-1.27	-1.13	-0.23	-0.08	-0.33	-0.19	-0.79	-0.64	5.53	6.98	PASS
802.11ac HT80	58/5290	-5.07	-4.93	-3.71	-3.56	-3.51	-3.37	-4.11	-3.97	2.11	6.98	PASS

Note: 1. Power Spectral Density =Read Value+Duty cycle correction factor

2. For Total PSD, according to KDB 662911 D01 Multiple Transmitter Output v02r01 2)a),the power spectral density=$10\log(10^{(\text{PSD antenna1 in dBm/10})}+10^{(\text{PSD antenna2 in dBm/10})}+10^{(\text{PSD antenna3 in dBm/10})}) +10^{(\text{PSD antenna4 in dBm/10})})$

3. Direction gain calculation according to KDB662911 D01 Multiple Transmitter Output v02r01 F) 2) e） (i),If all antennas have the same gain, directional gain = GANT + 10 log(NANT/NSS)=4+10log(4/1)=10.02>6 dBi. So the PSD limt is 11-(directional gain-6 dBi) =11-(10.02-6) =6.98 dBm.

U-NII-2C

MIMO with Beamforming

Network Standards	Channel/ Frequency (MHz)	Power Spectral Density									Limit (dBm/ MHz)	Conclusion
		Antenna 1		Antenna 2		Antenna 3		Antenna 4		Total Power (dBm /MHz)		
		Read Value (dBm/ MHz)	PSD (dBm/ MHz)	Read Value (dBm/ MHz)	PSD (dBm/ MHz)	Read Value (dBm/ MHz)	PSD (dBm/ MHz)	Read Value (dBm/ MHz)	PSD (dBm/ MHz)			
802.11n HT20	100/5500	0.41	0.64	0.45	0.68	0.59	0.82	0.05	0.28	6.63	6.98	PASS
	116/5580	-0.08	0.15	0.23	0.46	0.54	0.77	0.37	0.60	6.52	6.98	PASS
	140/5700	0.38	0.61	0.35	0.58	0.89	1.12	0.49	0.72	6.78	6.98	PASS
802.11n HT40	102/5510	-1.21	-0.76	-1.96	-1.51	-1.22	-0.77	-1.96	-1.51	4.90	6.98	PASS
	110/5550	-1.23	-0.78	-1.65	-1.20	-1.04	-0.58	-1.40	-0.94	5.15	6.98	PASS
	134/5670	-1.07	-0.62	-1.38	-0.93	-1.11	-0.66	-1.40	-0.94	5.24	6.98	PASS
802.11ac HT20	100/5500	0.79	0.79	0.58	0.58	0.48	0.48	0.52	0.52	6.61	6.98	PASS
	116/5580	0.32	0.32	0.35	0.35	0.52	0.52	0.55	0.55	6.46	6.98	PASS
	140/5700	0.61	0.61	0.95	0.95	0.93	0.93	0.35	0.35	6.74	6.98	PASS
802.11ac HT40	102/5510	-1.58	-1.43	-1.37	-1.22	-1.46	-1.32	-1.75	-1.60	4.63	6.98	PASS
	110/5550	-1.49	-1.35	-1.21	-1.06	-0.92	-0.78	-0.82	-0.68	5.06	6.98	PASS
	134/5670	-1.46	-1.32	-1.13	-0.98	-0.45	-0.31	-1.07	-0.92	5.15	6.98	PASS
802.11ac HT80	106/5530	-4.29	-4.15	-4.08	-3.93	-3.89	-3.75	-4.79	-4.64	1.92	6.98	PASS

Note: 1. Power Spectral Density =Read Value+Duty cycle correction factor

2. For Total PSD, according to KDB 662911 D01 Multiple Transmitter Output v02r01 2)a),the power spectral density=$10\log(10^{(\text{PSD antenna1 in dBm/10})}+10^{(\text{PSD antenna2 in dBm/10})}+10^{(\text{PSD antenna3 in dBm/10})}) +10^{(\text{PSD antenna4 in dBm/10})})$

3. Direction gain calculation according to KDB662911 D01 Multiple Transmitter Output v02r01 F) 2) e） (i),If all antennas have the same gain, directional gain = GANT + 10 log(NANT/NSS)=4+10log(4/1)=10.02>6 dBi. So the PSD limt is 11-(directional gain-6 dBi) =11-(10.02-6) =6.98 dBm.

U-NII-3

MIMO with Beamforming

Network Standards	Channel/ Frequency (MHz)	Power Spectral Density									Limit (dBm/ 500kHz)	Conclusion
		Antenna 1		Antenna 2		Antenna 3		Antenna 4		Total Power (dBm/ 500kHz)		
		Read Value (dBm/ 500kHz)	PSD (dBm/ 500kHz)	Read Value (dBm/ 500kHz)	PSD (dBm/ 500kHz)	Read Value (dBm/ 500kHz)	PSD (dBm/ 500kHz)	Read Value (dBm/ 500kHz)	PSD (dBm/ 500kHz)			
802.11n HT20	149/5745	5.27	5.50	5.43	5.66	5.24	5.47	4.81	5.04	11.44	25.98	PASS
	157/5785	5.42	5.65	5.47	5.70	5.46	5.69	4.98	5.21	11.59	25.98	PASS
	165/5825	5.42	5.65	5.46	5.69	4.90	5.13	5.32	5.55	11.53	25.98	PASS
802.11n HT40	151/5755	2.19	2.65	2.04	2.49	2.80	3.25	2.27	2.73	8.81	25.98	PASS
	159/5795	2.74	3.20	2.19	2.64	2.47	2.92	2.57	3.02	8.97	25.98	PASS
802.11ac HT20	149/5745	5.34	5.34	5.52	5.52	5.55	5.55	4.82	4.82	11.34	25.98	PASS
	157/5785	5.26	5.26	5.41	5.41	5.27	5.27	5.38	5.38	11.35	25.98	PASS
	165/5825	5.51	5.51	5.46	5.46	5.25	5.25	5.63	5.63	11.48	25.98	PASS
802.11ac HT40	151/5755	2.32	2.47	2.12	2.26	2.75	2.89	1.46	1.61	8.35	25.98	PASS
	159/5795	2.49	2.63	2.34	2.49	2.60	2.74	2.70	2.84	8.70	25.98	PASS
802.11ac HT80	155/5775	-0.98	-0.83	-1.11	-0.96	-1.12	-0.98	-1.42	-1.28	5.01	25.98	PASS

Note: 1. Power Spectral Density =Read Value+Duty cycle correction factor

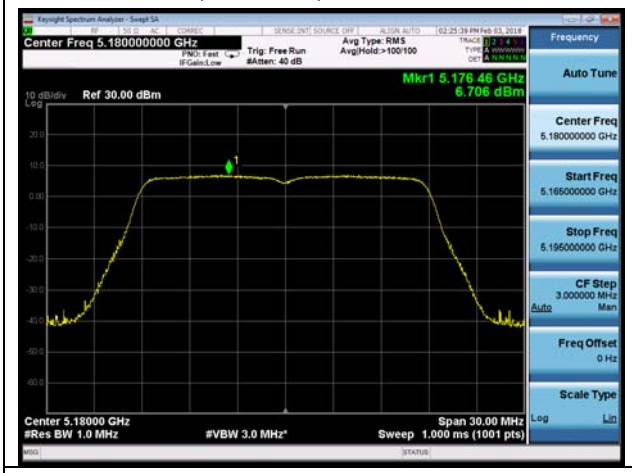
2. For Total PSD, according to KDB 662911 D01 Multiple Transmitter Output v02r01 2)a),the power spectral density=$10\log(10^{(\text{PSD antenna1 in dBm/10})}+10^{(\text{PSD antenna2 in dBm/10})}+10^{(\text{PSD antenna3 in dBm/10})}) +10^{(\text{PSD antenna4 in dBm/10})})$

3. Direction gain calculation according to KDB662911 D01 Multiple Transmitter Output v02r01 F) 2) e） (i),If all antennas have the same gain, directional gain = GANT + 10 log(NANT/NSS)=4+10log(4/1)=10.02>6 dBi. So the PSD limt is 30-(directional gain-6 dBi) =30-(10.02-6) =25.98 dBm.

MIMO without Beamforming

Antenna 1

U-NII-1, 802.11a, Channel No.: 36

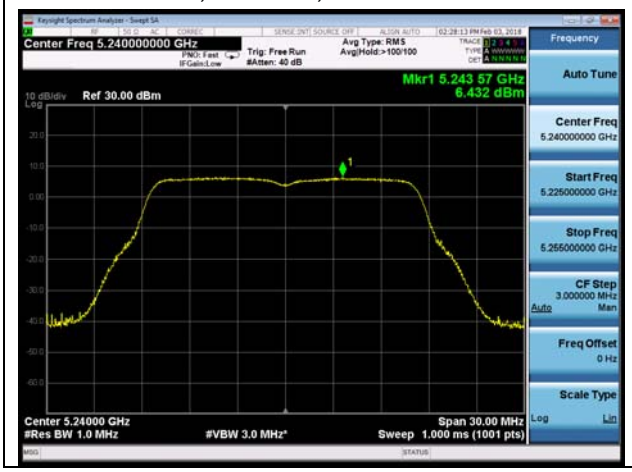


U-NII-1, 802.11n HT20, Channel No.: 36

U-NII-1, 802.11a, Channel No.: 40

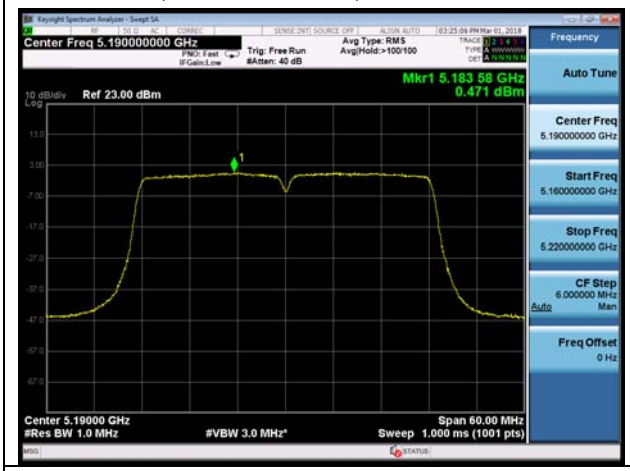
U-NII-1, 802.11n HT20, Channel No.: 40

U-NII-1, 802.11a, Channel No.: 48



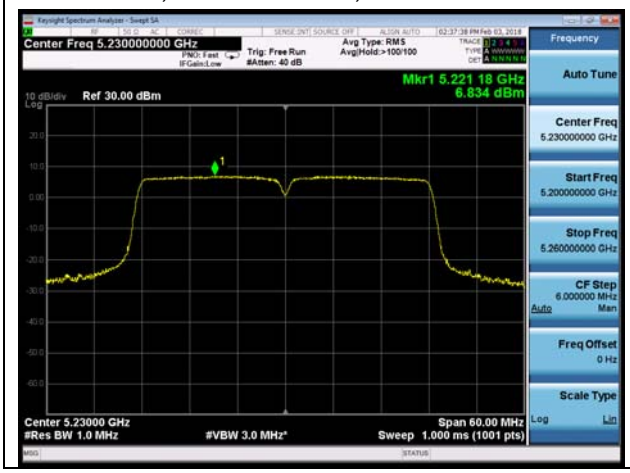
U-NII-1, 802.11n HT20, Channel No.: 48

U-NII-1, 802.11n HT40, Channel No.: 38



U-NII-1, 802.11ac HT20, Channel No.: 36

U-NII-1, 802.11n HT40, Channel No.: 46



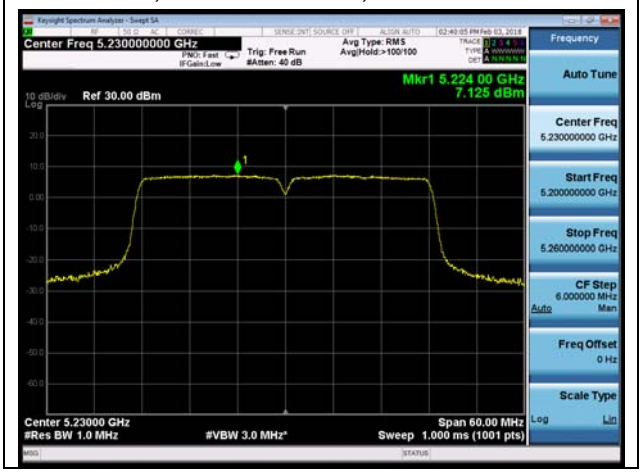
U-NII-1, 802.11ac HT20, Channel No.: 40

U-NII-1, 802.11ac HT20, Channel No.: 48

U-NII-1, 802.11ac HT40, Channel No.: 38

U-NII-1, 802.11ac HT80, Channel No.: 42

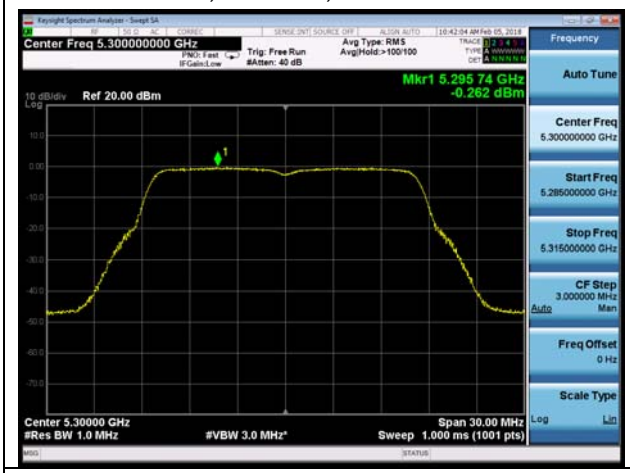
U-NII-1, 802.11ac HT40, Channel No.: 46



U-NII-2A, 802.11a, Channel No.: 52

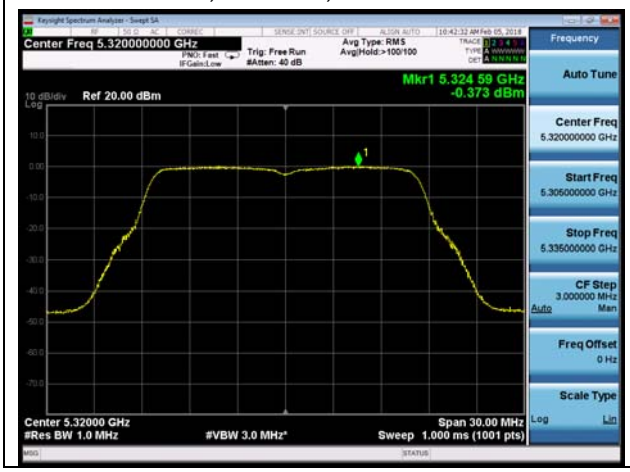
U-NII-2A, 802.11n HT20, Channel No.: 52

U-NII-2A, 802.11a, Channel No.: 60



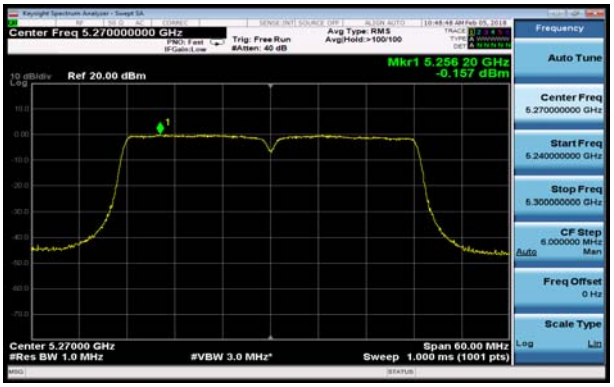
U-NII-2A, 802.11n HT20, Channel No.: 60

U-NII-2A, 802.11a, Channel No.: 64

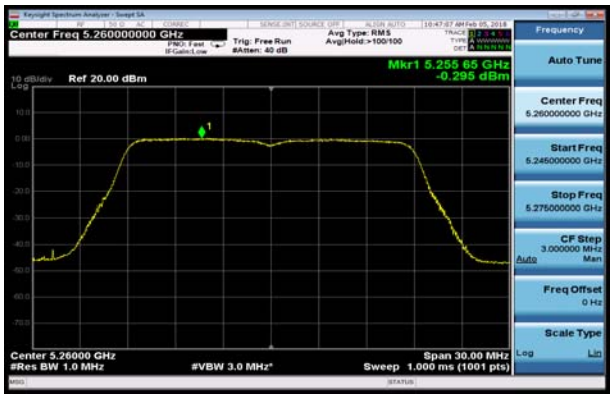


U-NII-2A, 802.11n HT20, Channel No.: 64

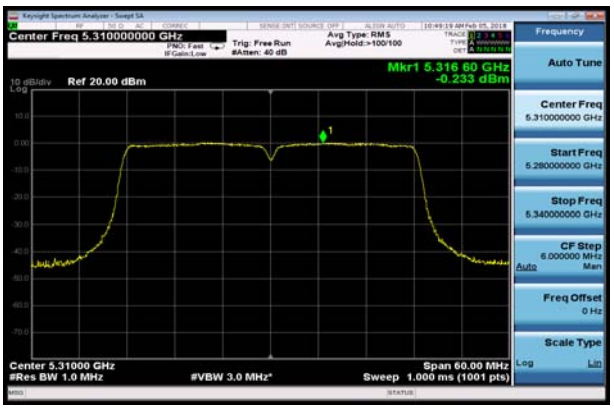
U-NII-2A, 802.11n HT40, Channel No.: 54



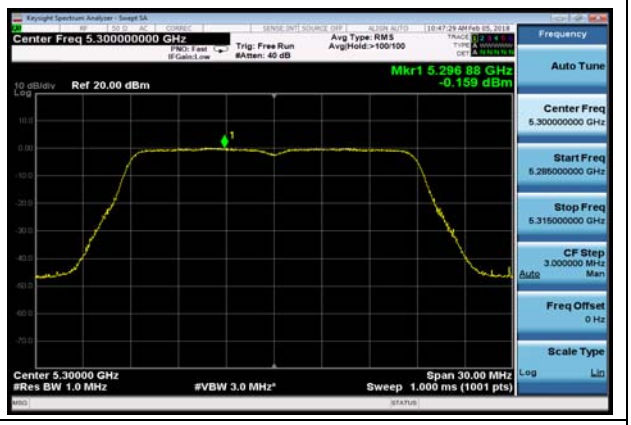
U-NII-2A, 802.11ac HT20, Channel No.:52



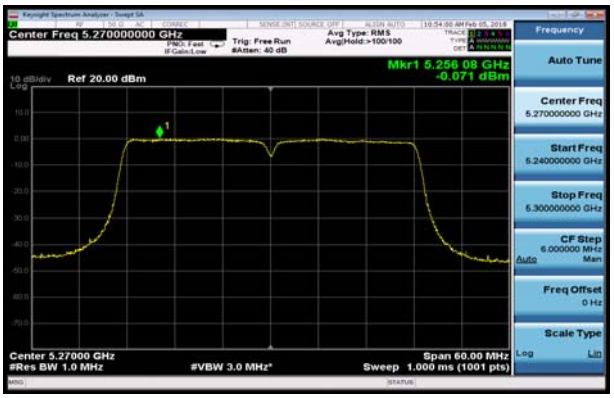
U-NII-2A, 802.11n HT40, Channel No.: 62



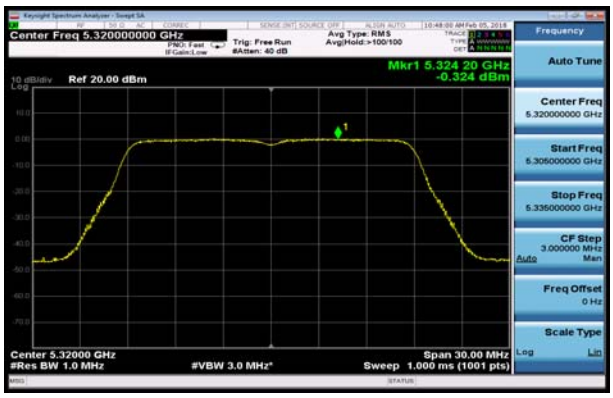
U-NII-2A, 802.11ac HT20, Channel No.: 60



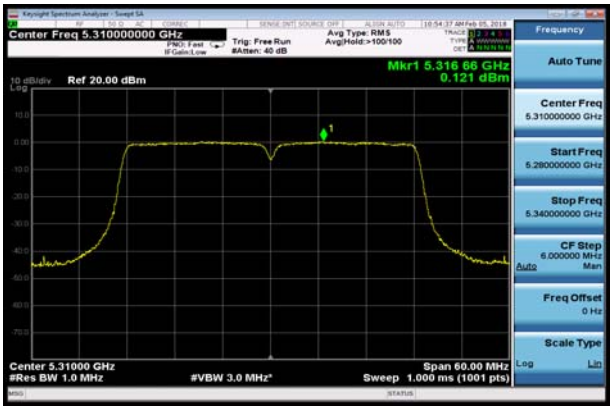
U-NII-2A, 802.11ac HT40, Channel No.: 54



U-NII-2A, 802.11ac HT20, Channel No.: 64



U-NII-2A, 802.11ac HT40, Channel No.: 62



U-NII-2A, 802.11ac HT80, Channel No.: 58

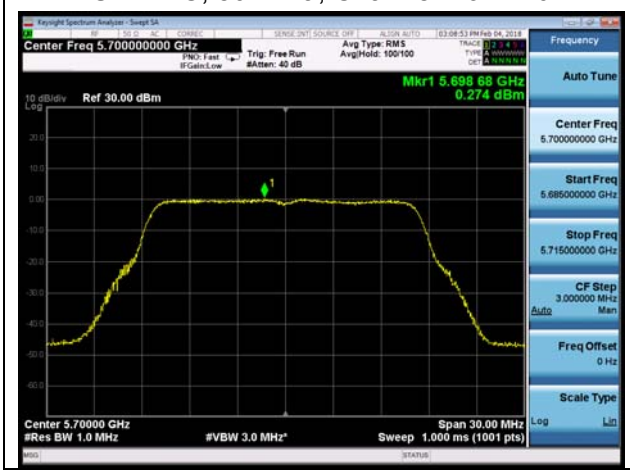
U-NII-2C, 802.11a, Channel No.: 100

U-NII-2C, 802.11n HT20, Channel No.: 100

U-NII-2C, 802.11a, Channel No.: 116

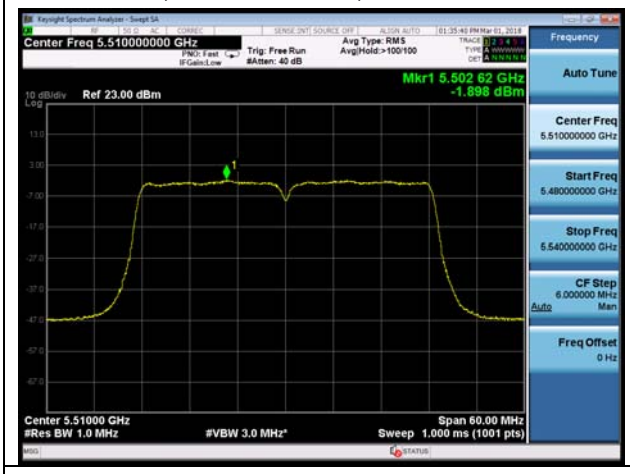
U-NII-2C, 802.11n HT20, Channel No.: 116

U-NII-2C, 802.11a, Channel No.: 140



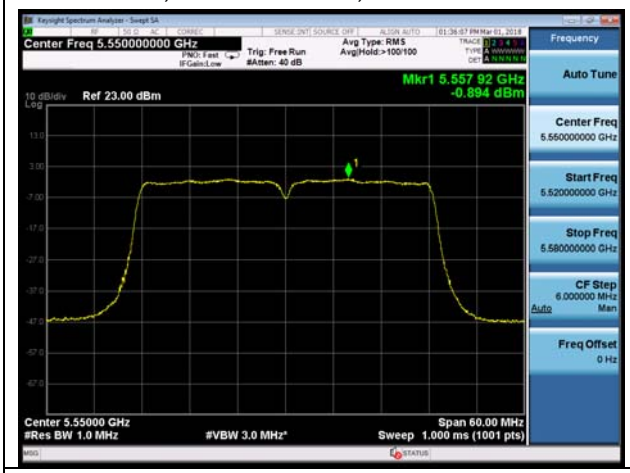
U-NII-2C, 802.11n HT20, Channel No.: 140

U-NII-2C, 802.11n HT40, Channel No.: 102



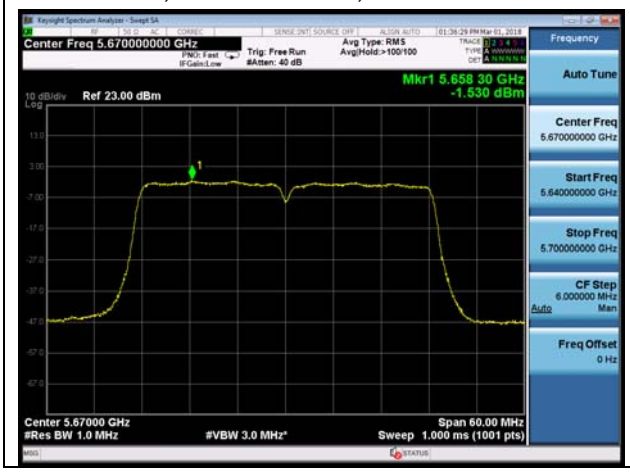
U-NII-2C, 802.11ac HT20, Channel No.: 100

U-NII-2C, 802.11n HT40, Channel No.: 110



U-NII-2C, 802.11ac HT20, Channel No.: 116

U-NII-2C, 802.11n HT40, Channel No.: 134

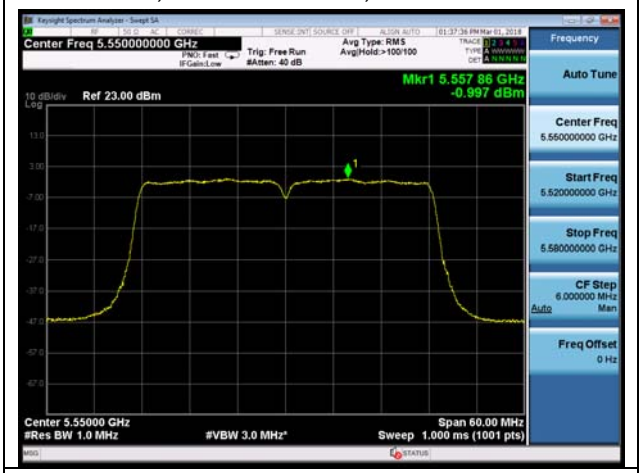


U-NII-2C, 802.11ac HT20, Channel No.: 140

U-NII-2C, 802.11ac HT40, Channel No.: 102

U-NII-2C, 802.11ac HT80, Channel No.: 106

U-NII-2C, 802.11ac HT40, Channel No.: 110



U-NII-2C, 802.11ac HT40, Channel No.: 134