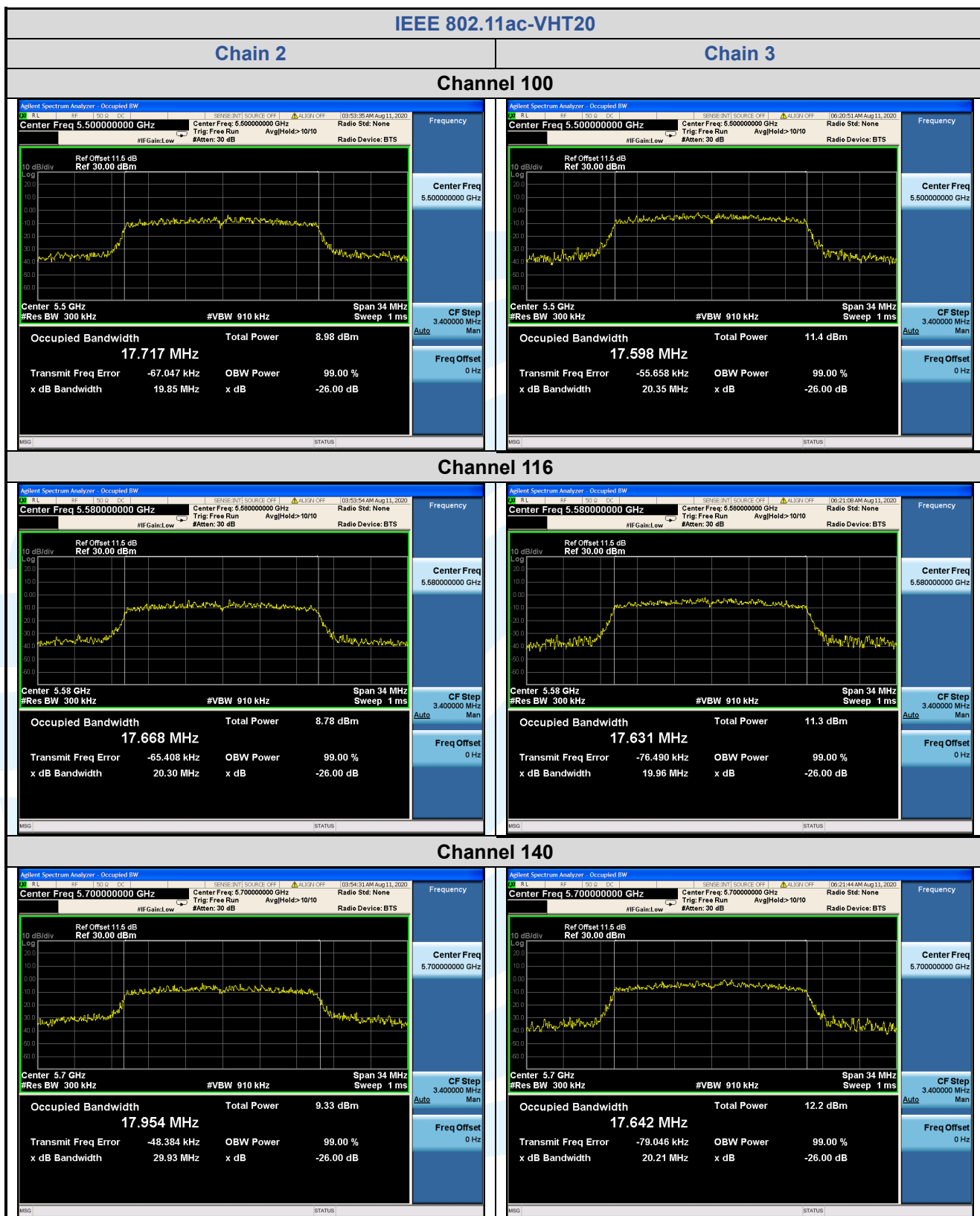
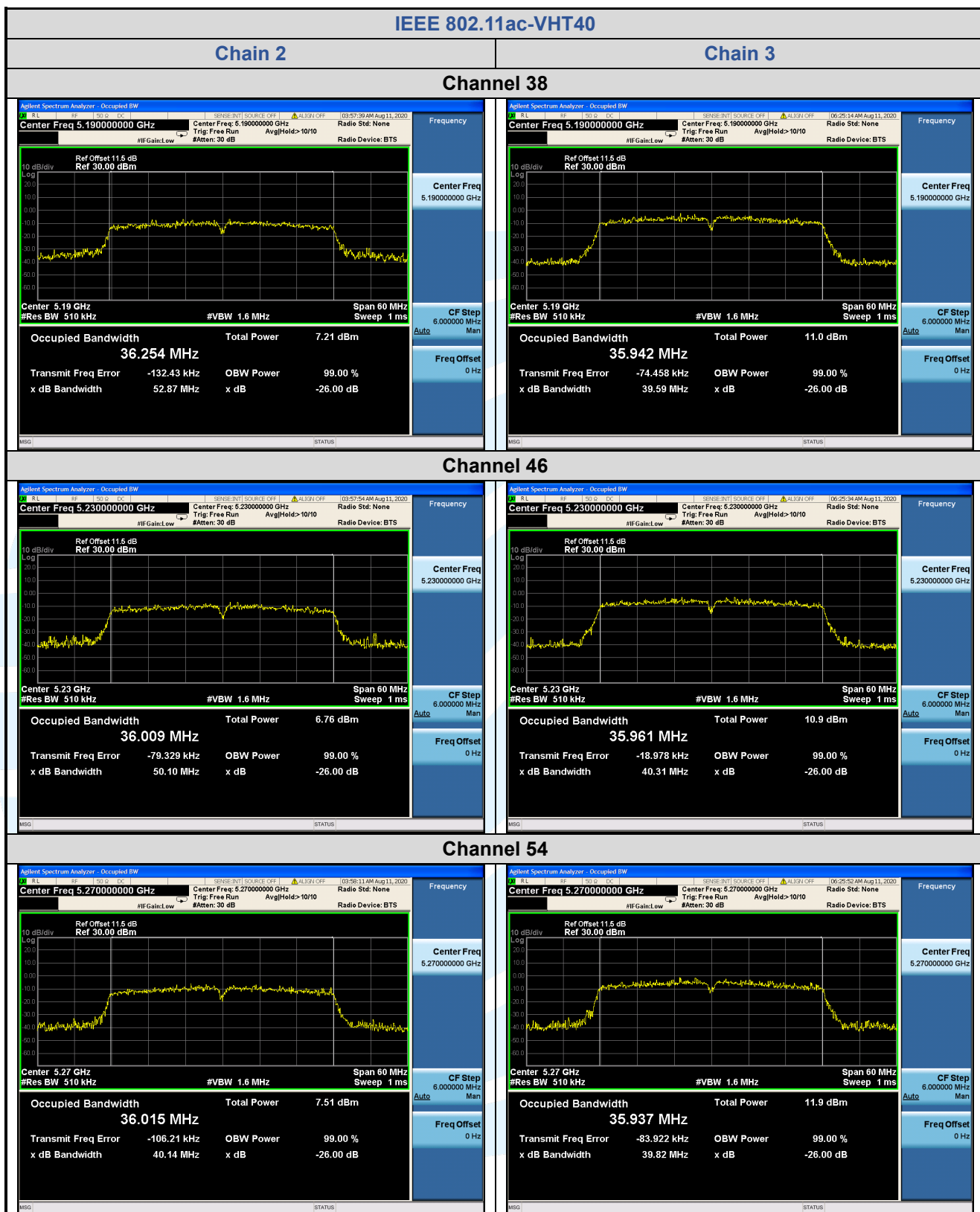
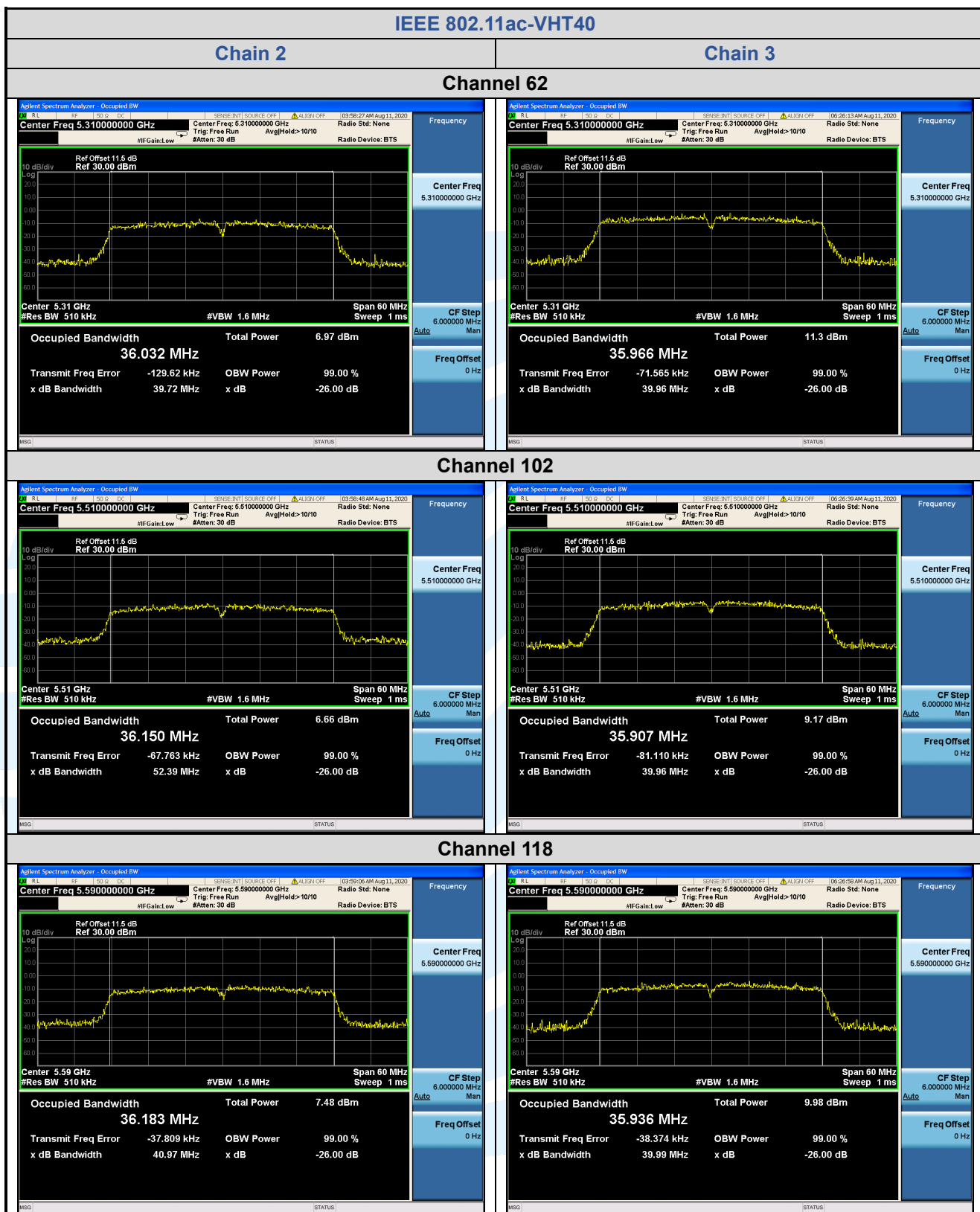
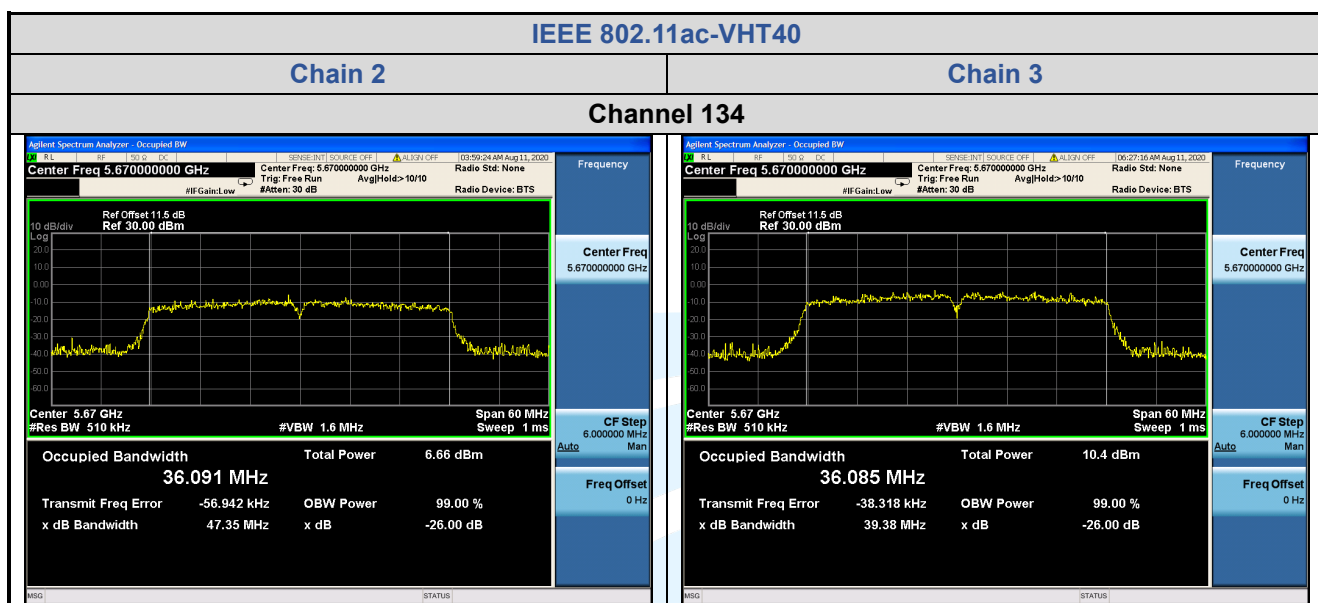










Shenzhen UnionTrust Quality and Technology Co., Ltd.

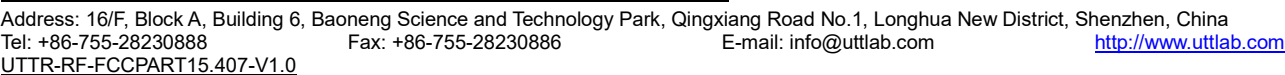
Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China

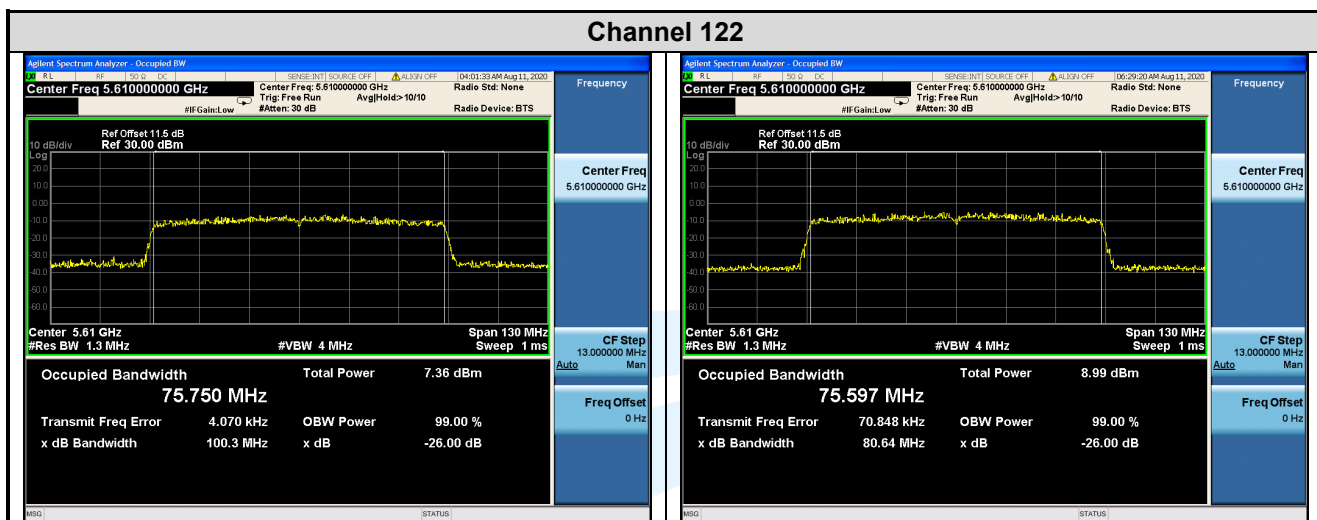
Tel: +86-755-28230888

Fax: +86-755-28230886

E-mail: info@uttlab.com
<http://www.uttlab.com>

UTTR-RF-FCCPART15.407-V1.0





Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China

Tel: +86-755-28230888

Fax: +86-755-28230886

E-mail: info@uttlab.com

<http://www.uttlab.com>

UTTR-RF-FCCPART15.407-V1.0

5.46 DB BANDWIDTH

Test Requirement: FCC 47 CFR Part 15 Subpart C Section 15.407 (e)

Test Method: KDB 789033 D02 v02r01Section C.2

Limit: Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

Test Procedure:

The output from the transmitter was connected to an attenuator and then to the input of the RF Spectrum Analyzer.

Spectrum analyzer according to the following Settings:

- Set RBW = 100 kHz.
- Set the video bandwidth (VBW) $\geq 3 * \text{RBW}$.
- Detector = Peak.
- Trace mode = max hold.
- Sweep = auto couple.
- Allow the trace to stabilize.
- 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 cable loss and attenuator loss were offset into measure device as an amplitude offset.

Test Setup: Refer to section 4.5.3 for details.

Instruments Used: Refer to section 3 for details

Test Mode: Transmitter mode

Test Results: Pass

Test Data:

Mode	Channel/ Frequency (MHz)	6 dB Bandwidth (MHz)		99% Bandwidth (MHz)		6 dB Bandwidth Limit	Pass / Fail
		Chain 0	Chain 1	Chain 0	Chain 1		
IEEE 802.11a	149 (5745)	15.05	14.20	16.900	17.067	> 500 kHz	Pass
	157 (5785)	15.76	13.19	17.006	17.173	> 500 kHz	Pass
	165 (5825)	14.44	15.17	16.601	17.459	> 500 kHz	Pass
IEEE 802.11n-HT20	149 (5745)	16.04	12.92	17.595	17.694	> 500 kHz	Pass
	157 (5785)	15.15	13.79	17.552	17.565	> 500 kHz	Pass
	165 (5825)	9.461	15.51	17.555	17.657	> 500 kHz	Pass
IEEE 802.11n-HT40	151 (5755)	33.93	33.96	35.091	36.117	> 500 kHz	Pass
	159 (5795)	33.83	35.11	35.928	36.037	> 500 kHz	Pass
IEEE 802.11ac-VHT20	149 (5745)	13.18	15.49	17.573	17.618	> 500 kHz	Pass
	157 (5785)	13.51	13.84	17.619	17.594	> 500 kHz	Pass
	165 (5825)	12.86	13.88	17.554	17.638	> 500 kHz	Pass
IEEE 802.11ac-VHT40	151 (5755)	31.43	33.94	35.932	36.095	> 500 kHz	Pass
	159 (5795)	35.12	32.60	35.969	36.129	> 500 kHz	Pass
IEEE 802.11ac-VHT80	155 (5775)	71.49	75.29	75.396	75.789	> 500 kHz	Pass

Mode	Channel/ Frequency (MHz)	6 dB Bandwidth (MHz)		99% Bandwidth (MHz)		6 dB Bandwidth Limit	Pass / Fail
		Chain 2	Chain 3	Chain 2	Chain 3		
IEEE 802.11a	149 (5745)	16.02	14.15	17.050	16.437	> 500 kHz	Pass
	157 (5785)	14.11	15.84	17.020	16.412	> 500 kHz	Pass
	165 (5825)	15.40	13.55	17.567	16.450	> 500 kHz	Pass
IEEE 802.11n-HT20	149 (5745)	15.89	15.12	17.856	17.521	> 500 kHz	Pass
	157 (5785)	15.10	15.14	17.862	17.537	> 500 kHz	Pass
	165 (5825)	15.44	15.94	17.828	17.592	> 500 kHz	Pass
IEEE 802.11n-HT40	151 (5755)	31.42	35.15	36.810	35.948	> 500 kHz	Pass
	159 (5795)	35.10	35.16	36.453	35.806	> 500 kHz	Pass
IEEE 802.11ac-VHT20	149 (5745)	13.81	12.44	17.881	17.532	> 500 kHz	Pass
	157 (5785)	15.80	15.13	17.997	17.549	> 500 kHz	Pass
	165 (5825)	15.09	15.15	17.791	17.604	> 500 kHz	Pass
IEEE 802.11ac-VHT40	151 (5755)	31.40	35.14	36.580	35.895	> 500 kHz	Pass
	159 (5795)	35.10	30.15	36.784	35.893	> 500 kHz	Pass
IEEE 802.11ac-VHT80	155 (5775)	72.67	73.93	78.750	75.457	> 500 kHz	Pass

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China

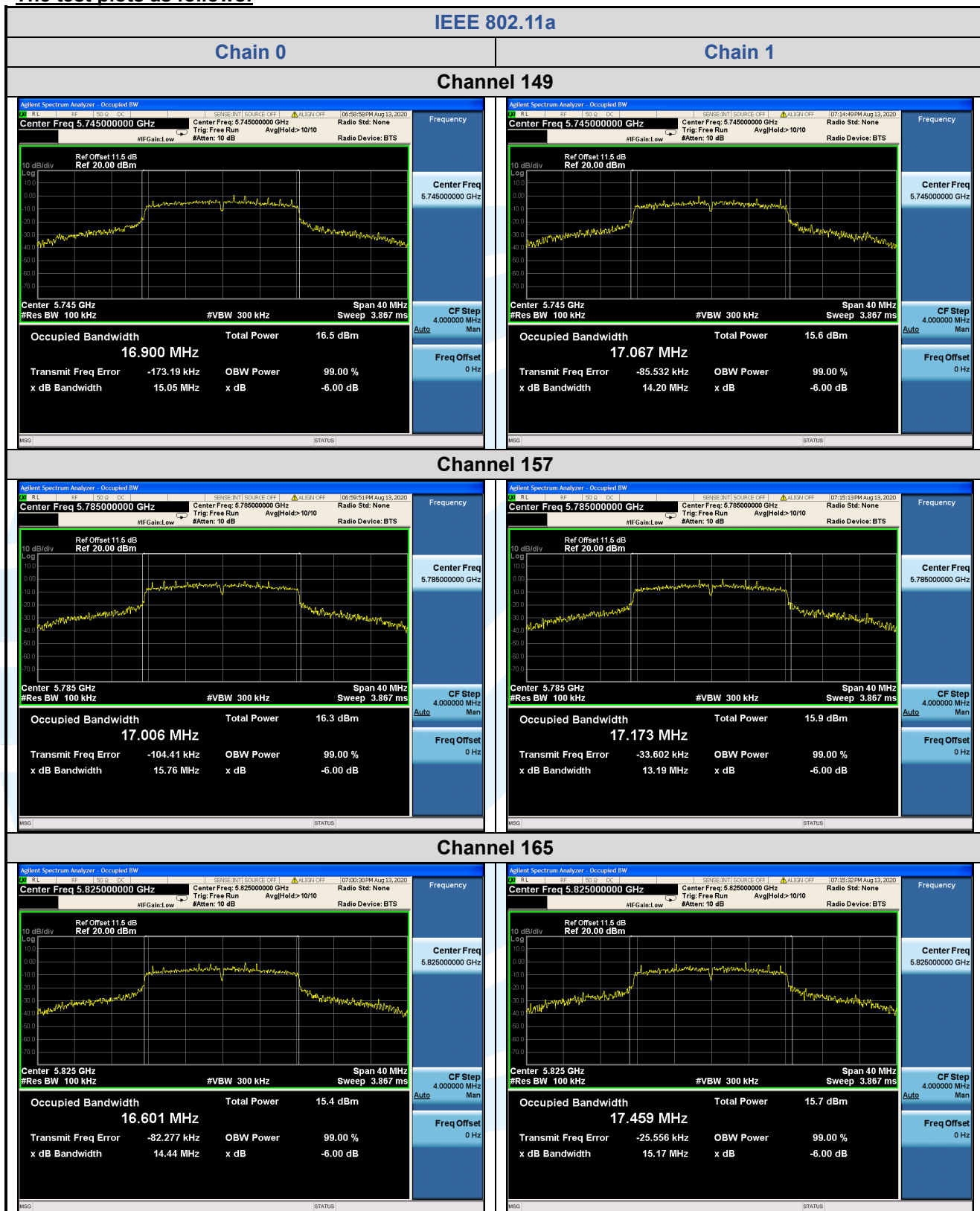
Tel: +86-755-28230888

Fax: +86-755-28230886

E-mail: info@uttlab.com
<http://www.uttlab.com>

UTTR-RF-FCCPART15.407-V1.0

The test plots as follows:



Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China

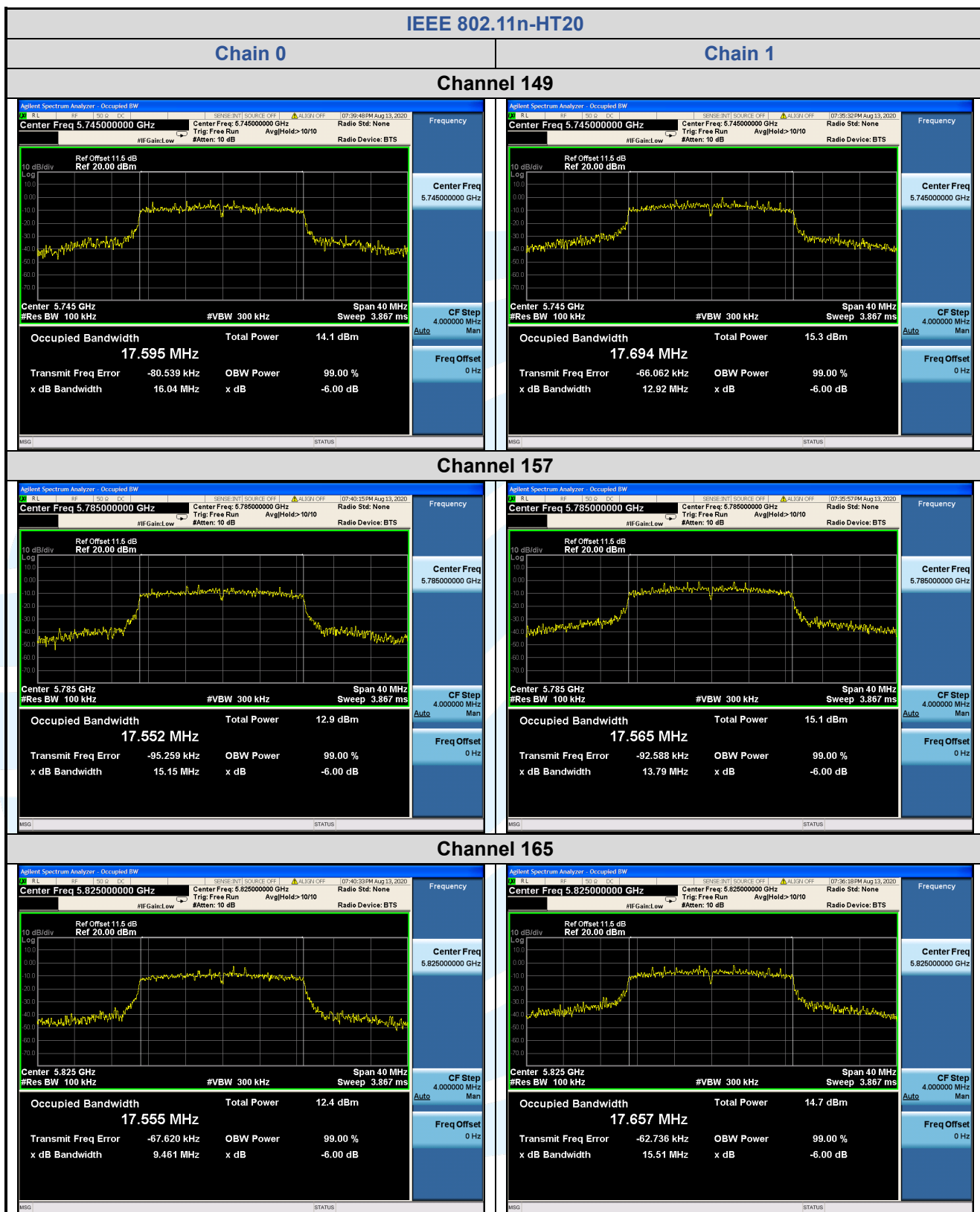
Tel: +86-755-28230888

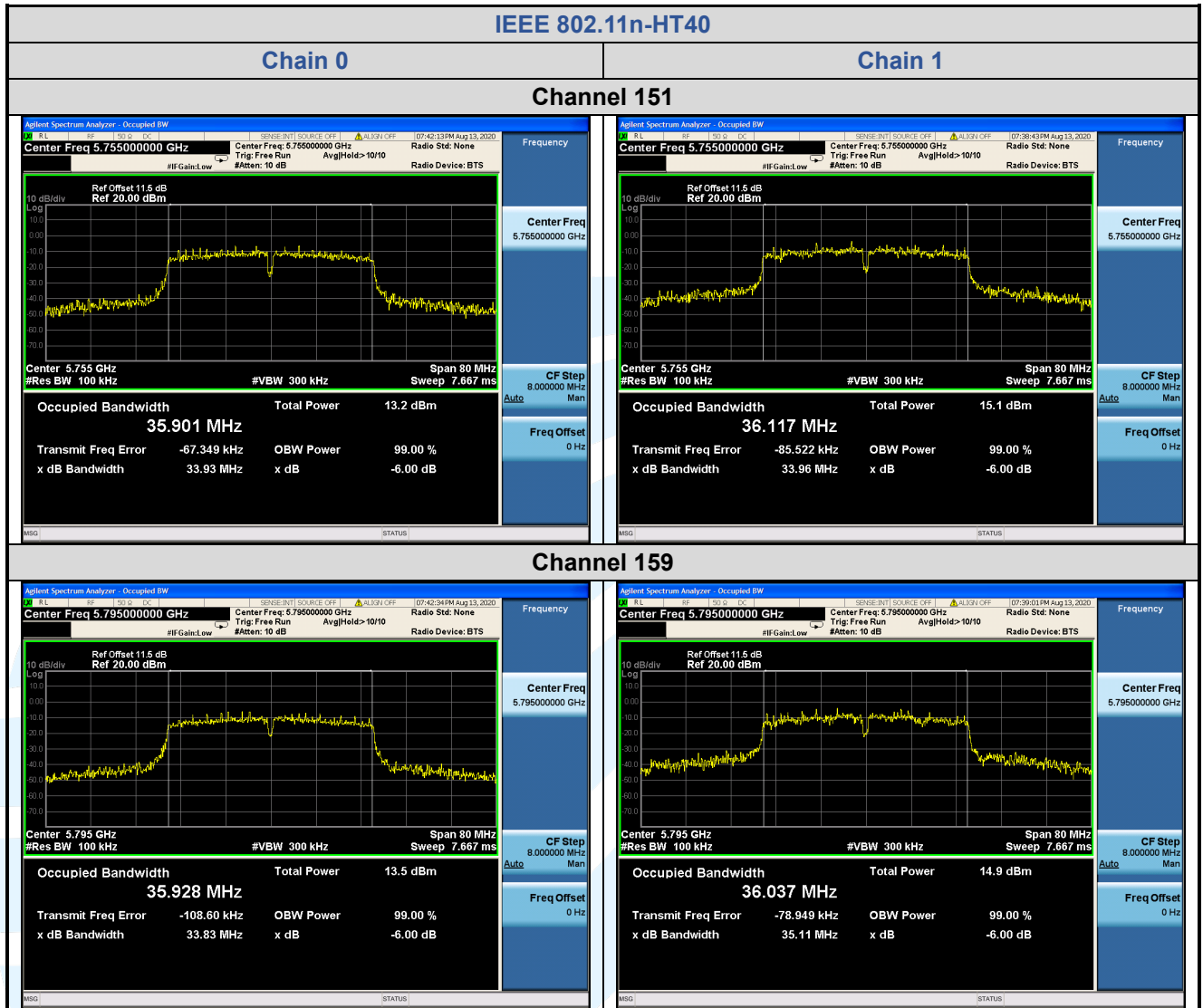
Fax: +86-755-28230886

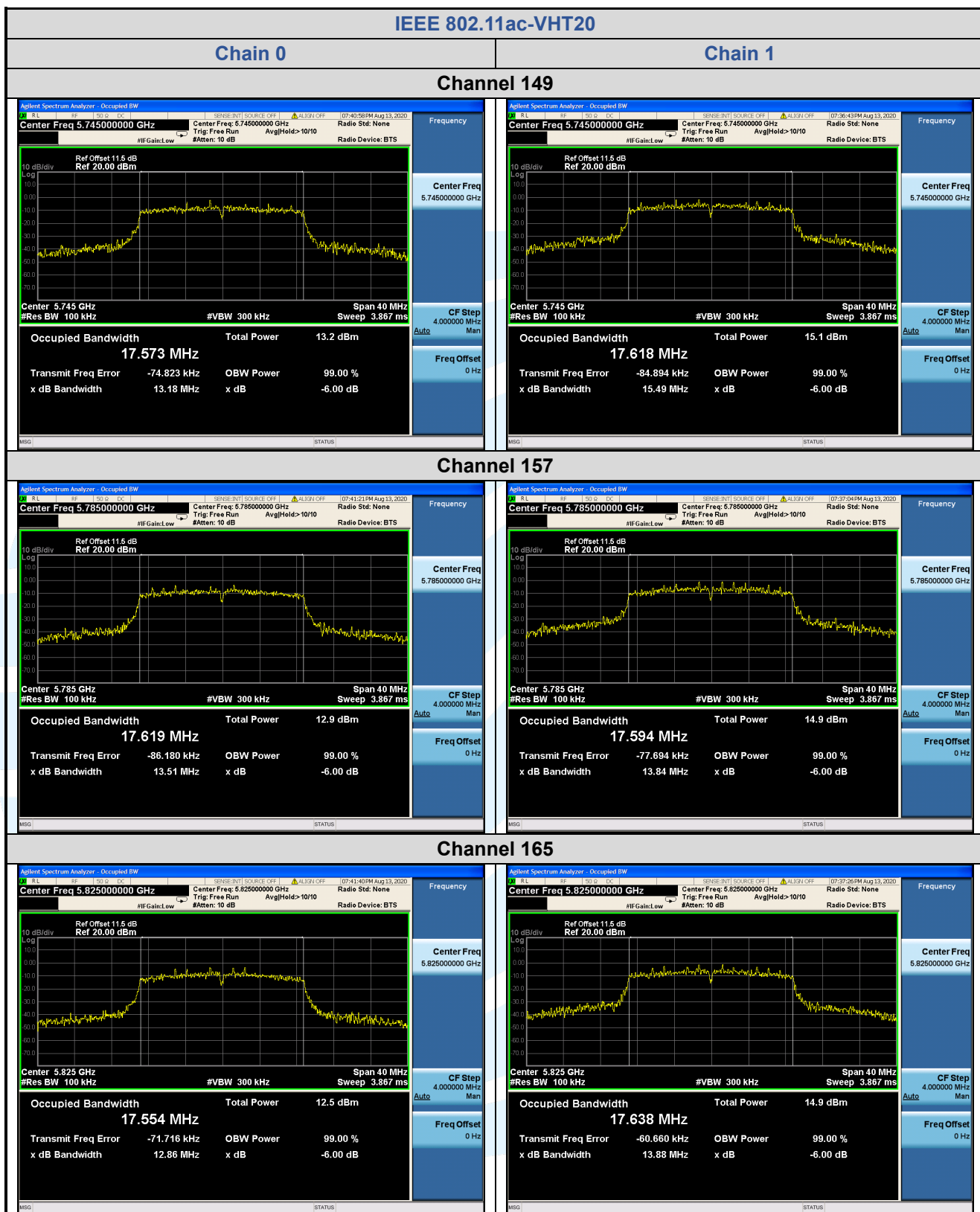
E-mail: info@uttlab.com

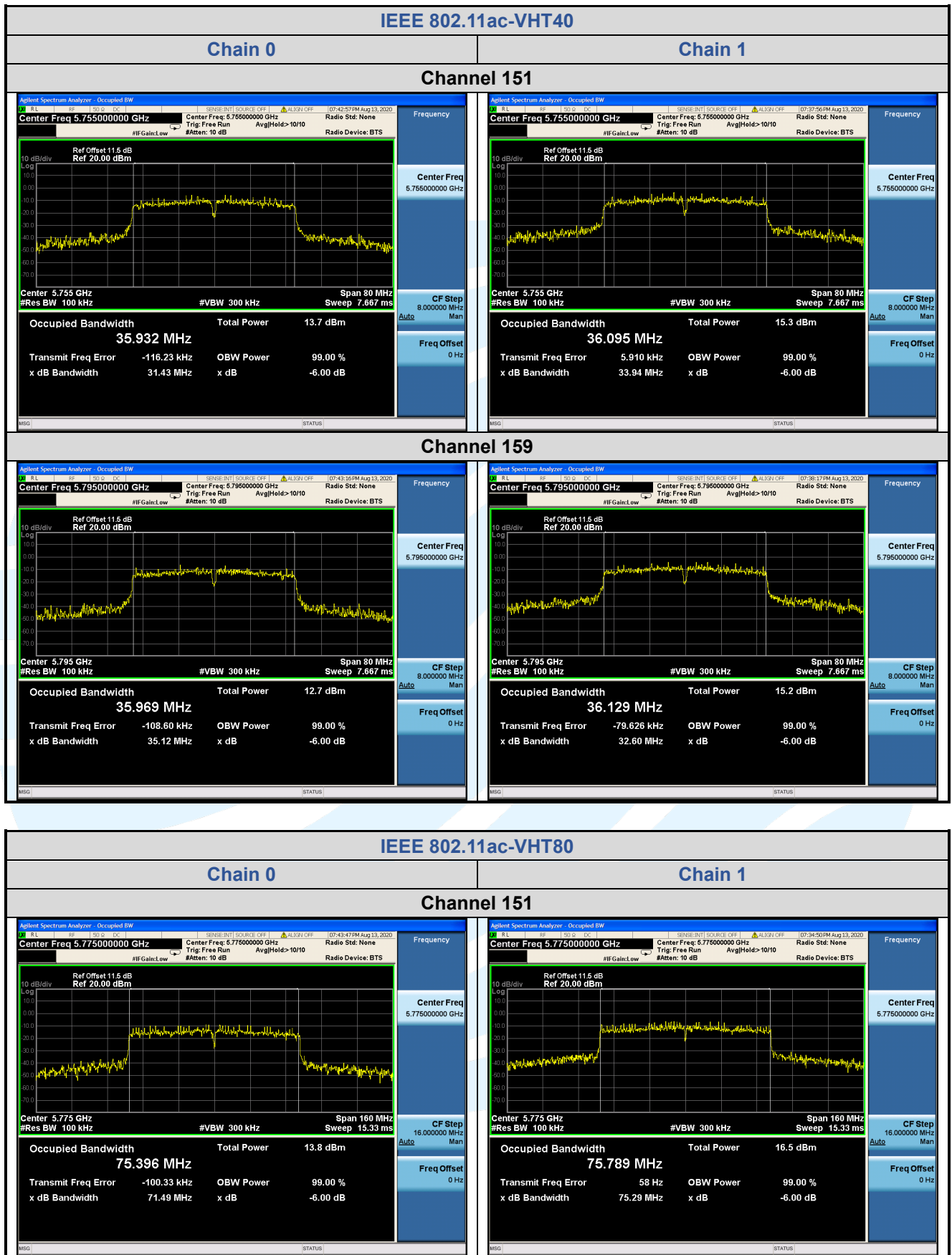
<http://www.uttlab.com>

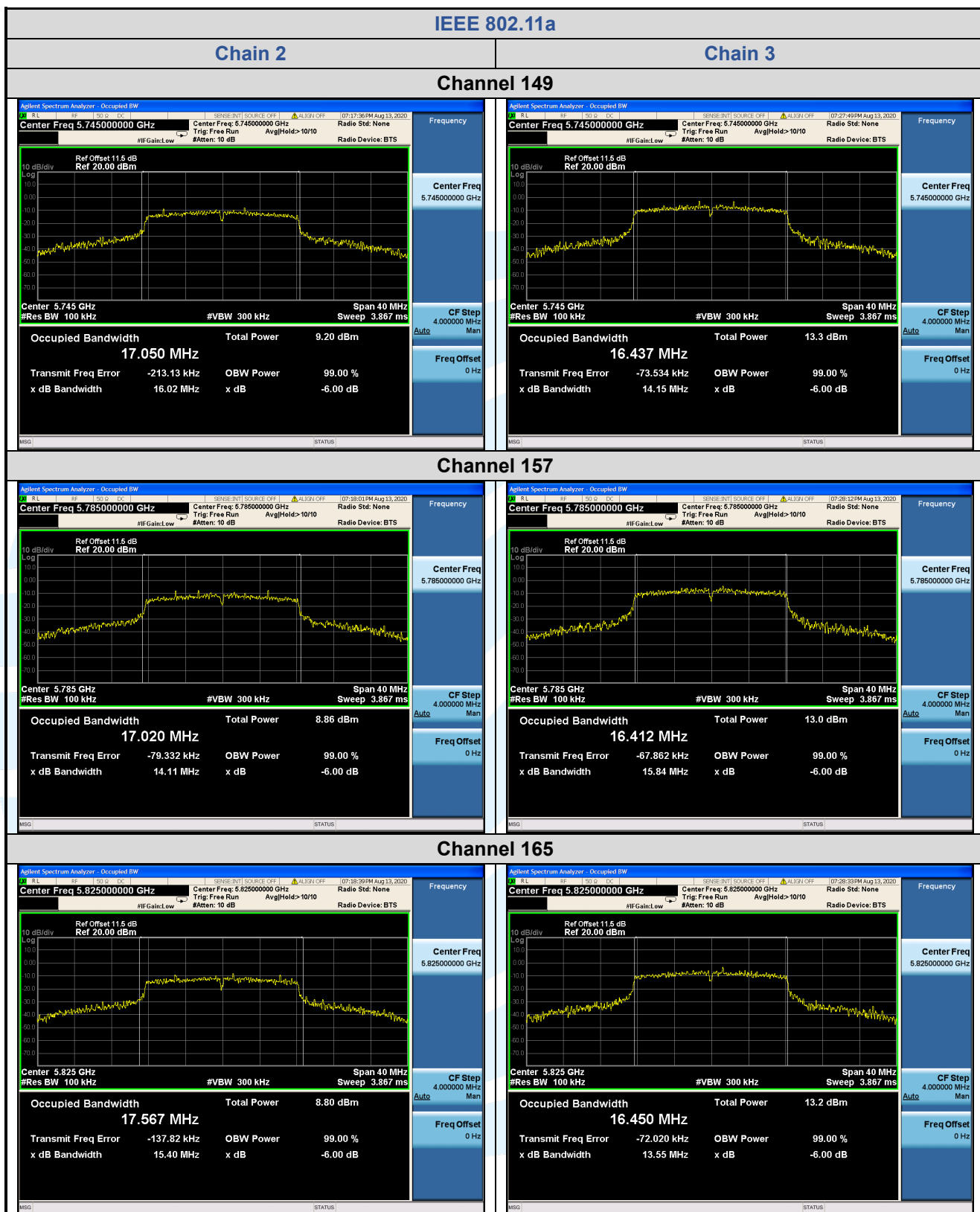
UTTR-RF-FCCPART15.407-V1.0

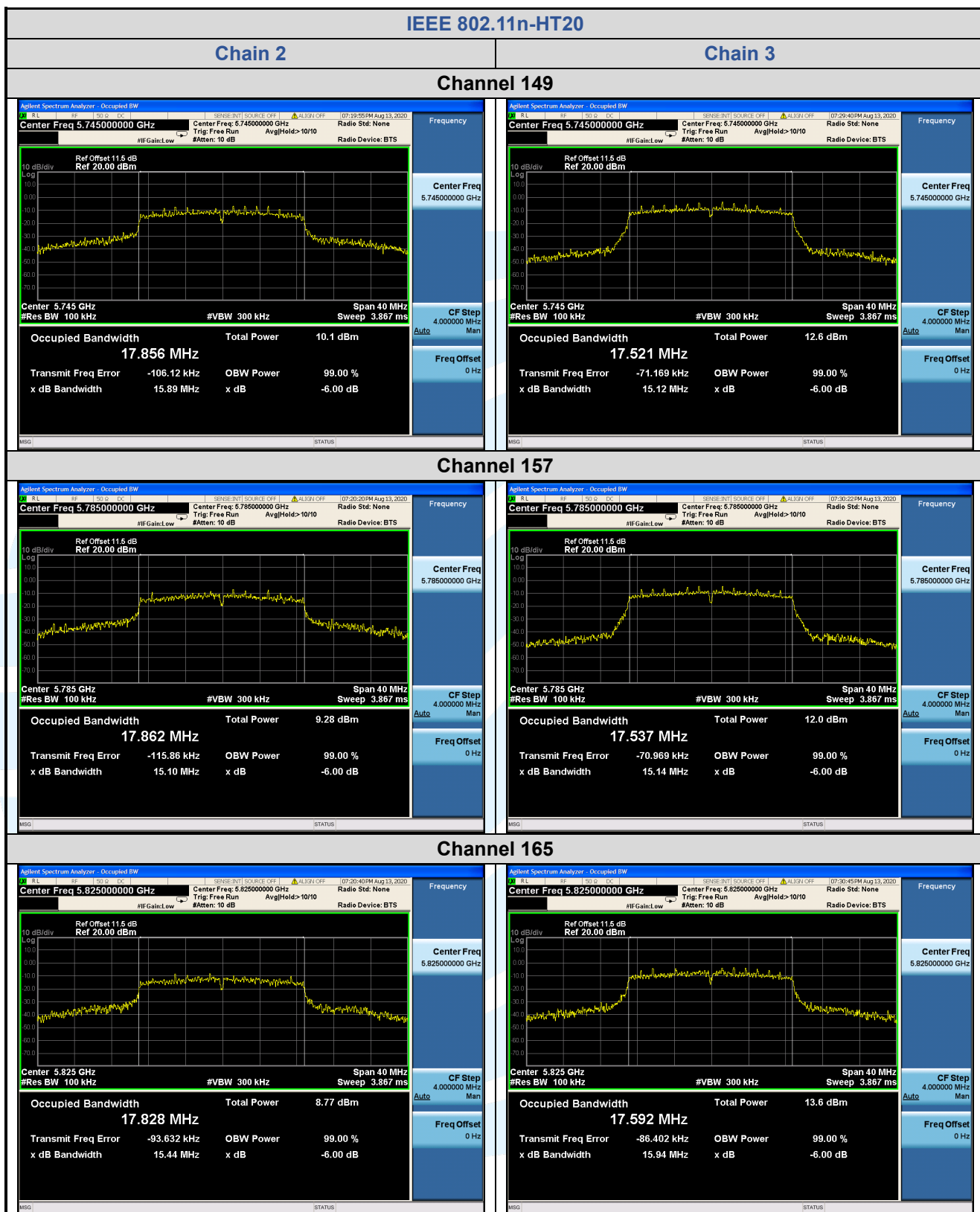


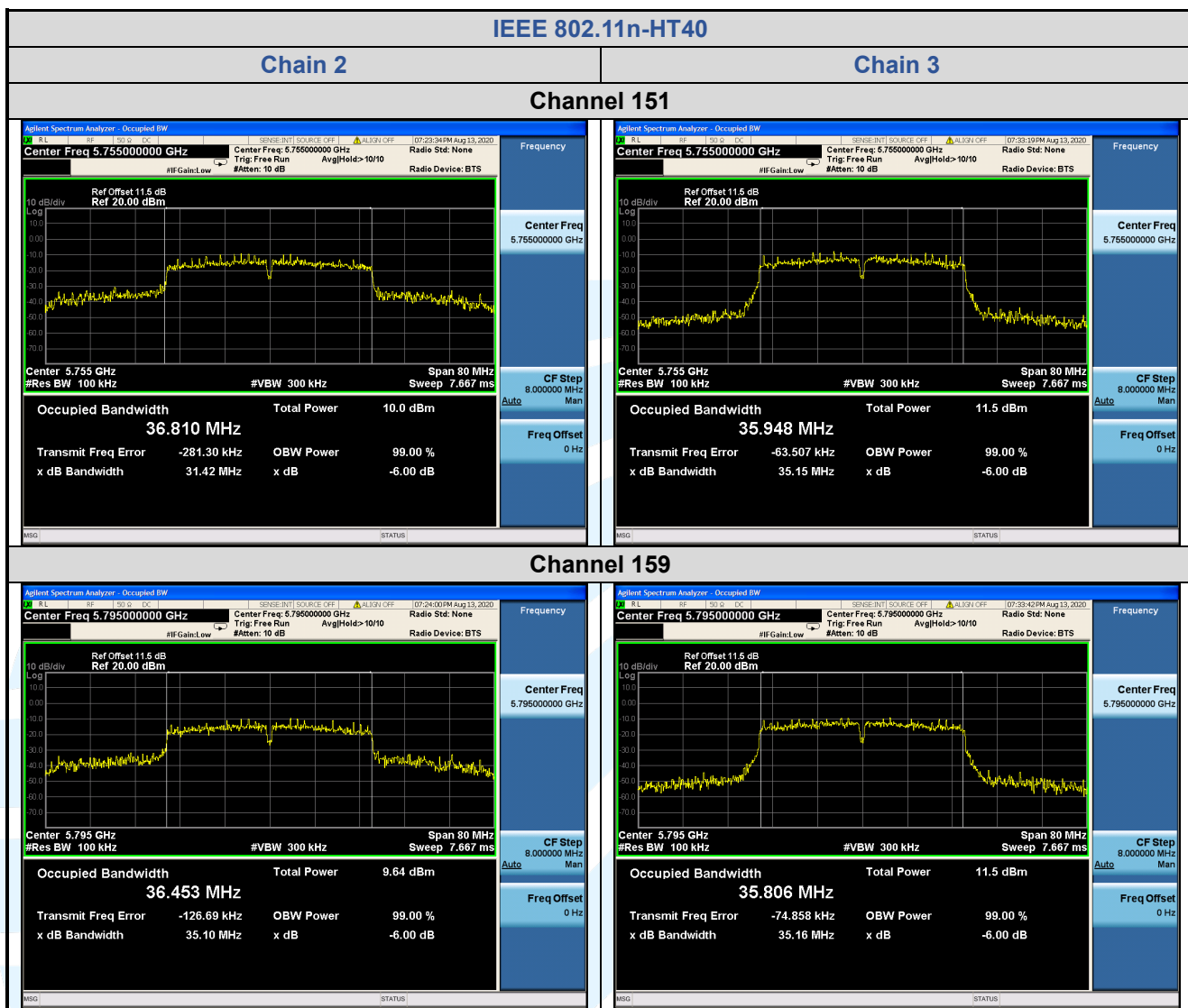


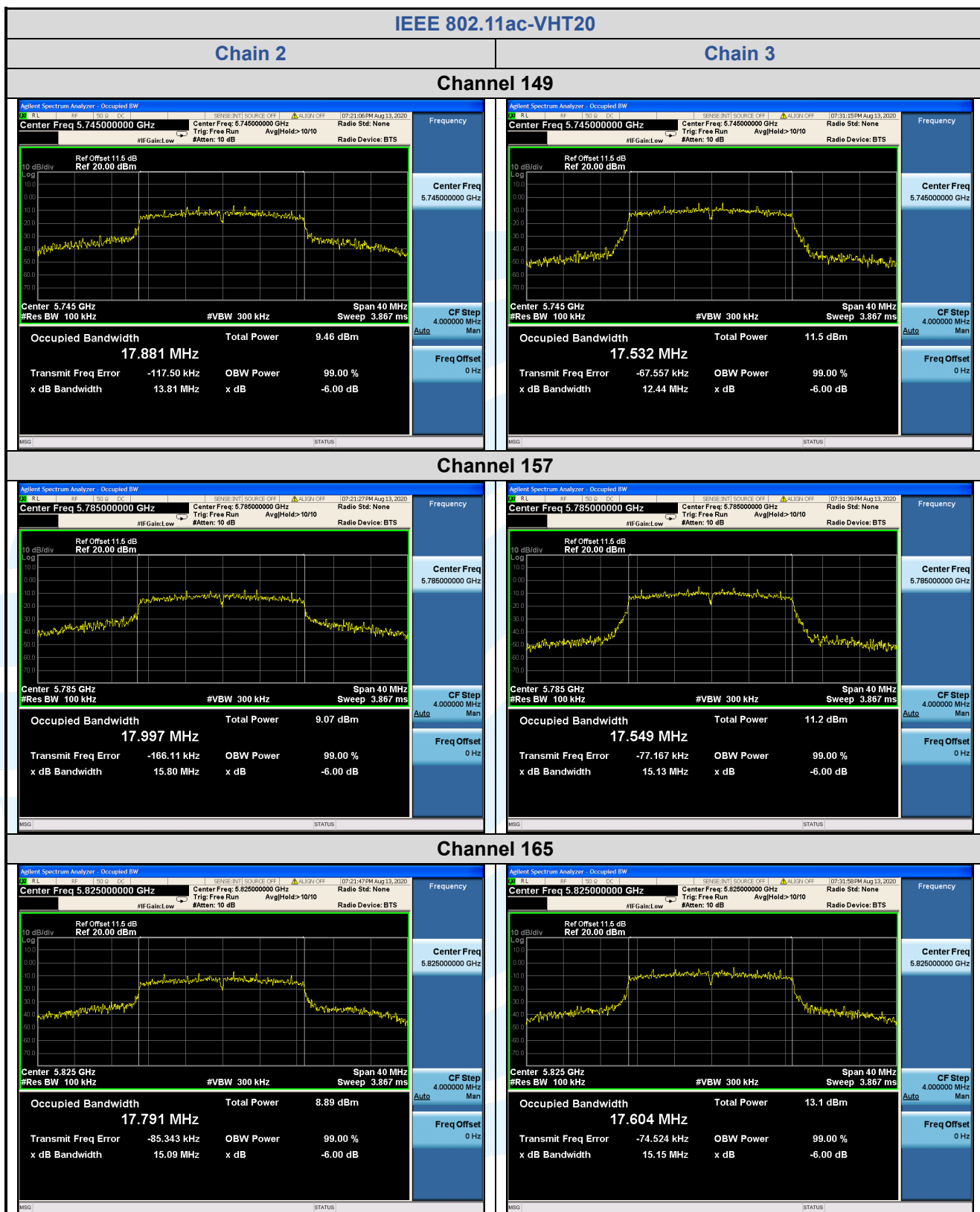


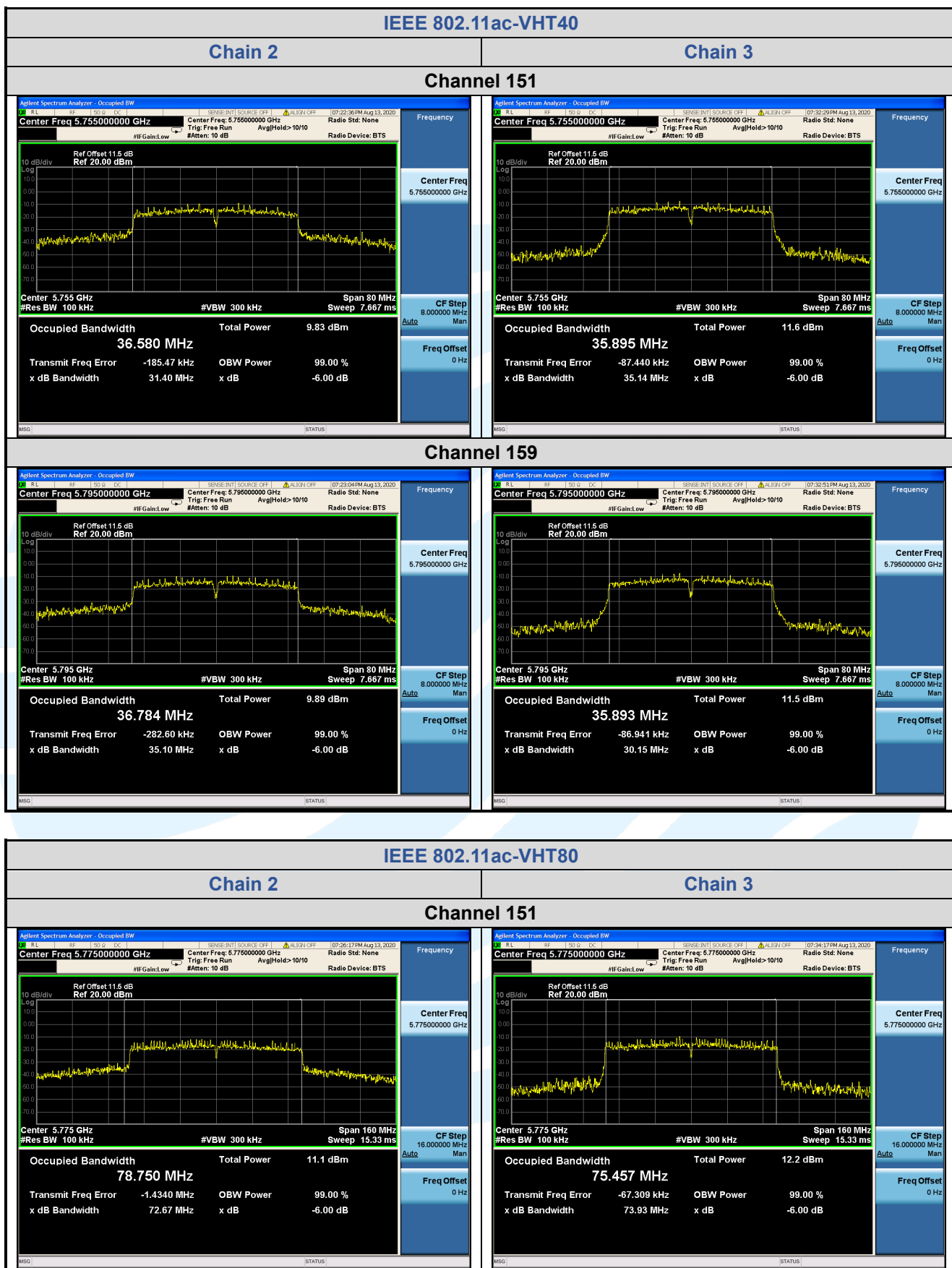












5.5 MAXIMUM CONDUCTED OUTPUT POWER

Test Requirement: FCC 47 CFR Part 15 Subpart E Section 15.407 (a)(1)(2)(3)

Test Method: KDB 789033 D02 v02r01 Section E.3.a (Method PM)

Limits:

1. For the band 5.15-5.25 GHz.
 - (i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, 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. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).
 - (ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, 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.
 - (iii) For fixed point-to-point access points operating in the band 5.15-5.25 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 17 dBm in any 1 megahertz band. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple colocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.
 - (iv) 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.
2. For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or $11 \text{ dBm} + 10 \log B$, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
3. 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. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple colocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

Test Procedure:

1. Connected the EUT's antenna port to measure device by 10dB attenuator.
2. Method PM is used to perform output power measurement, trigger and gating function of wide band power meter is enabled to measure max output power of Tx on burst.

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

Test Setup: Refer to section 4.5.3 for details.

Instruments Used: Refer to section 3 for details

Test Mode: Transmitter mode

Test Results: Pass

Test Data:

For U-NII-2A, U-NII-2C Band:

For IEEE 802.11 a/n/ac, the minimum 26 dB emission bandwidth is 19.85 MHz

$$11 \text{ dBm} + 10\log_{10}(19.85) = 23.98\text{dBm} > 18.98 \text{ dBm (200mW)}$$

So the 18.98dB limit applicable

Directional gain and the maximum output power limit.

Frequency Band	Chain 0 Antenna Gain (dBi)	Chain 1 Antenna Gain (dBi)	Chain2 Antenna Gain (dBi)	Chain 3 Antenna Gain	Correlated chains directional gain (dBi)	Peak Power Limits (dBm)
U-NII-1	5.00	5.00	5.00	5.00	11.02	24.98
U-NII-2A	5.00	5.00	5.00	5.00	11.02	18.98
U-NII-2C	5.00	5.00	5.00	5.00	11.02	18.98
U-NII-3	5.00	5.00	5.00	5.00	11.02	24.98

Basic methodology with N_{ANT} transmit antennas, each with the same directional gain G_{ANT} dBi, being driven by N_{ANT} transmitter outputs of equal power. Directional gain is to be computed as follows:

If any transmit signals are *correlated* with each other,

$$\text{Directional gain} = G_{ANT} + 10 \log(N_{ANT}) \text{ dBi}$$

Mode	Channel/ Frequency (MHz)	Maximum Conducted Output Power (dBm)								Total Power MIMO_ Chain 0+1+2+3	Limits (dBm)	Pass / Fail
		SISO										
		Chain 0		Chain 1		Chain 2		Chain 3				
		Meas Power	Corr'd Power	Meas Power	Corr'd Power	Meas Power	Corr'd Power	Meas Power	Corr'd Power			
IEEE 802.11a	36 (5180)	10.93	11.86	10.46	11.39	4.15	5.08	10.18	11.11	N/A	30.00	Pass
	44 (5220)	10.42	11.35	10.15	11.08	4.91	5.84	10.25	11.18	N/A	30.00	Pass
	48 (5240)	10.83	11.76	10.06	10.99	5.29	6.22	10.17	11.10	N/A	30.00	Pass
	52 (5260)	10.59	11.52	11.06	11.99	5.84	6.77	10.85	11.78	N/A	24.00	Pass
	60 (5300)	10.45	11.38	10.75	11.68	6.20	7.13	10.68	11.61	N/A	24.00	Pass
	64 (5320)	10.26	11.19	10.60	11.53	6.56	7.49	10.52	11.45	N/A	24.00	Pass
	100 (5500)	8.52	9.45	8.42	9.35	5.89	6.82	9.70	10.63	N/A	24.00	Pass
	116 (5580)	8.85	9.78	7.93	8.86	5.33	6.26	9.43	10.36	N/A	24.00	Pass
	140 (5700)	8.89	9.82	9.07	10.00	4.65	5.58	9.37	10.30	N/A	24.00	Pass
	149 (5745)	12.59	13.52	12.72	13.65	6.19	7.12	11.87	12.80	N/A	30.00	Pass
	157 (5785)	12.41	13.34	12.19	13.12	5.81	6.74	11.61	12.54	N/A	30.00	Pass
	165 (5825)	12.13	13.06	11.86	12.79	5.18	6.11	11.50	12.43	N/A	30.00	Pass

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China

Tel: +86-755-28230888

Fax: +86-755-28230886

E-mail: info@uttlab.com

<http://www.uttlab.com>

UTTR-RF-FCCPART15.407-V1.0

Mode	Channel/ Frequency (MHz)	Maximum Conducted Output Power (dBm)								Total Power MIMO_ Chain 0+1+2+3	Limits (dBm)	Pass / Fail
		MIMO										
		Chain 0		Chain 1		Chain 2		Chain 3				
		Meas Power	Corr'd Power	Meas Power	Corr'd Power	Meas Power	Corr'd Power	Meas Power	Corr'd Power			
IEEE 802.11n- HT20	36 (5180)	6.53	9.40	7.82	10.69	1.27	4.14	5.89	8.76	14.85	24.98	Pass
	44 (5220)	6.93	9.80	7.32	10.19	1.37	4.24	5.82	8.69	14.78	24.98	Pass
	48 (5240)	6.69	9.56	6.90	9.77	1.55	4.42	5.34	8.21	14.46	24.98	Pass
	52 (5260)	7.06	9.93	7.79	10.66	2.21	5.08	6.88	9.75	15.33	18.98	Pass
	60 (5300)	6.91	9.78	7.01	9.88	2.35	5.22	6.62	9.49	14.98	18.98	Pass
	64 (5320)	6.73	9.60	7.06	9.93	2.32	5.19	6.18	9.05	14.81	18.98	Pass
	100 (5500)	5.45	8.32	5.62	8.49	2.55	5.42	5.10	7.97	13.73	18.98	Pass
	116 (5580)	4.75	7.62	4.97	7.84	1.62	4.49	4.59	7.46	13.06	18.98	Pass
	140 (5700)	5.72	8.59	6.52	9.39	1.20	4.07	4.30	7.17	13.74	18.98	Pass
	149 (5745)	10.56	13.43	10.63	13.50	4.46	7.33	10.19	13.06	18.45	24.98	Pass
	157 (5785)	10.41	13.28	10.37	13.24	3.97	6.84	9.97	12.84	18.22	24.98	Pass
	165 (5825)	10.05	12.92	10.08	12.95	3.78	6.65	9.88	12.75	17.98	24.98	Pass

Mode	Channel/ Frequency (MHz)	Maximum Conducted Output Power (dBm)								Total Power MIMO_ Chain 0+1+2+3	Limits (dBm)	Pass / Fail
		MIMO										
		Chain 0		Chain 1		Chain 2		Chain 3				
		Meas Power	Corr'd Power	Meas Power	Corr'd Power	Meas Power	Corr'd Power	Meas Power	Corr'd Power			
IEEE 802.11n- HT40	38 (5190)	2.81	6.81	5.18	9.18	-1.98	2.02	1.47	5.47	12.60	24.98	Pass
	46 (5230)	2.59	6.59	4.38	8.38	-2.03	1.97	1.71	5.71	12.24	24.98	Pass
	54 (5270)	2.93	6.93	5.18	9.18	-1.51	2.49	2.78	6.78	12.96	18.98	Pass
	62 (5310)	2.48	6.48	4.71	8.71	-1.63	2.37	2.29	6.29	12.52	18.98	Pass
	102 (5510)	1.96	5.96	3.56	7.56	-0.52	3.48	1.63	5.63	11.91	18.98	Pass
	110 (5550)	2.37	6.37	3.88	7.88	-0.21	3.79	1.93	5.93	12.25	18.98	Pass
	134 (5670)	2.39	6.39	3.85	7.85	-1.32	2.68	2.18	6.18	12.16	18.98	Pass
	151 (5755)	8.67	12.67	10.22	14.22	2.43	6.43	7.57	11.57	18.04	24.98	Pass
	159 (5795)	8.38	12.38	9.91	13.91	2.01	6.01	7.27	11.27	17.73	24.98	Pass

Mode	Channel/ Frequency (MHz)	Maximum Conducted Output Power (dBm)								Total Power MIMO_ Chain 0+1+2+3	Limits (dBm)	Pass / Fail
		MIMO										
		Chain 0		Chain 1		Chain 2		Chain 3				
		Meas Power	Corr'd Power	Meas Power	Corr'd Power	Meas Power	Corr'd Power	Meas Power	Corr'd Power			
IEEE 802.11ac -VHT20	36 (5180)	6.81	9.62	7.61	10.42	0.90	3.71	5.76	8.57	14.73	24.98	Pass
	44 (5220)	6.65	9.46	7.28	10.09	1.21	4.02	5.75	8.56	14.59	24.98	Pass
	48 (5240)	6.60	9.41	7.04	9.85	1.42	4.23	5.29	8.10	14.39	24.98	Pass
	52 (5260)	6.77	9.58	7.84	10.65	2.13	4.94	6.73	9.54	15.16	18.98	Pass
	60 (5300)	6.72	9.53	7.18	9.99	2.29	5.10	6.52	9.33	14.88	18.98	Pass
	64 (5320)	6.60	9.41	6.85	9.66	2.26	5.07	6.27	9.08	14.67	18.98	Pass
	100 (5500)	5.23	8.04	5.88	8.69	2.38	5.19	4.91	7.72	13.61	18.98	Pass
	116 (5580)	4.53	7.34	5.08	7.89	1.70	4.51	4.45	7.26	12.95	18.98	Pass
	140 (5700)	5.46	8.27	6.39	9.20	1.12	3.93	4.17	6.98	13.52	18.98	Pass
	149 (5745)	10.61	13.42	10.83	13.64	4.33	7.14	10.12	12.93	18.45	24.98	Pass
	157 (5785)	10.40	13.21	10.64	13.45	3.69	6.50	9.89	12.70	18.21	24.98	Pass
	165 (5825)	10.08	12.89	10.32	13.13	3.61	6.42	9.68	12.49	17.93	24.98	Pass

Mode	Channel/ Frequency (MHz)	Maximum Conducted Output Power (dBm)								Total Power MIMO_ Chain 0+1+2+3	Limits (dBm)	Pass / Fail
		MIMO										
		Chain 0		Chain 1		Chain 2		Chain 3				
		Meas Power	Corr'd Power	Meas Power	Corr'd Power	Meas Power	Corr'd Power	Meas Power	Corr'd Power			
IEEE 802.11ac -VHT40	38 (5190)	2.93	7.25	4.44	8.76	-2.12	2.20	1.35	5.67	12.59	24.98	Pass
	46 (5230)	2.45	6.77	3.81	8.13	-2.29	2.03	1.58	5.90	12.24	24.98	Pass
	54 (5270)	2.92	7.24	4.52	8.84	-1.63	2.69	2.63	6.95	12.96	18.98	Pass
	62 (5310)	2.35	6.67	3.67	7.99	-1.77	2.55	2.18	6.50	12.36	18.98	Pass
	102 (5510)	1.89	6.21	2.81	7.13	-0.63	3.69	1.45	5.77	11.89	18.98	Pass
	110 (5550)	2.21	6.53	3.16	7.48	-0.29	4.03	1.75	6.07	12.22	18.98	Pass
	134 (5670)	2.05	6.37	3.33	7.65	-1.50	2.82	2.10	6.42	12.16	18.98	Pass
	151 (5755)	8.61	12.93	9.14	13.46	2.33	6.65	7.44	11.76	17.88	24.98	Pass
	159 (5795)	8.31	12.63	8.92	13.24	1.94	6.26	7.19	11.51	17.62	24.98	Pass

Mode	Channel/ Frequency (MHz)	Maximum Conducted Output Power (dBm)								Total Power MIMO_Chain 0+1+2+3	Limits (dBm)	Pass / Fail
		MIMO										
		Chain 0		Chain 1		Chain 2		Chain 3				
		Meas Power	Corr'd Power	Meas Power	Corr'd Power	Meas Power	Corr'd Power	Meas Power	Corr'd Power			
IEEE 802.11ac -VHT80	42 (5230)	0.86	6.63	2.71	8.48	-3.58	2.19	0.59	6.36	12.46	24.98	Pass
	58 (5290)	0.15	5.92	1.48	7.25	-3.93	1.84	0.36	6.13	11.72	18.98	Pass
	106 (5530)	-1.45	4.32	-0.65	5.12	-3.96	1.81	-1.77	4.00	9.99	18.98	Pass
	122 (5610)	-1.48	4.29	-0.04	5.73	-3.58	2.19	-1.42	4.35	10.34	18.98	Pass
	155 (5775)	4.69	10.46	6.01	11.78	-0.57	5.20	2.82	8.59	15.65	24.98	Pass

Remark:

1. Corr'd Power = Meas Power + Duty Cycle Factor
2. Total (Chain 0+1+2+3) = $10 \cdot \log[(10^{\text{Chain 0}/10}) + (10^{\text{Chain 1}/10})]$

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China

Tel: +86-755-28230888

Fax: +86-755-28230886

E-mail: info@uttlab.com

<http://www.uttlab.com>

UTTR-RF-FCCPART15.407-V1.0

5.6 PEAK POWER SPECTRAL DENSITY

Test Requirement: FCC 47 CFR Part 15 Subpart E Section 15.407 (a)(1)(2)(3)

Test Method: KDB 789033 D02 v02r01 Section F

Limits:

1. For the band 5.15-5.25 GHz.
 - (i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, 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. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).
 - (ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, 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.
 - (iii) For fixed point-to-point access points operating in the band 5.15-5.25 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 17 dBm in any 1 megahertz band. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.
 - (iv) 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.
2. For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or $11 \text{ dBm} + 10 \log B$, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
3. 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. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

Test Procedure:

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China

Tel: +86-755-28230888

Fax: +86-755-28230886

E-mail: info@uttlab.com

<http://www.uttlab.com>

UTTR-RF-FCCPART15.407-V1.0

The output from the transmitter was connected to an attenuator and then to the input of the RF Spectrum Analyzer.

Spectrum analyzer according to the following Settings:

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

Using method SA-2

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

2. For U-NII-3 band:

- Set span to encompass the entire emission bandwidth (EBW) of the signal.
- Set RBW = 500 kHz, Set VBW $\geq$ 3 RBW, Detector = RMS
- Use the peak marker function to determine the maximum power level in any 500 kHz band segment within the fundamental EBW.
- Sweep time = auto, trigger set to "free run".
- Trace average at least 100 traces in power averaging mode.
- Record the max value and add 10 log (1/duty cycle)

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

Test Setup: Refer to section 4.5.3 for details.

Instruments Used: Refer to section 3 for details

Test Mode: Transmitter mode

Test Results: Pass

Test Data:

Directional gain and the maximum output power limit.

Frequency Band	Chain 0 Antenna Gain	Chain 1 Antenna Gain	Chain 2 Antenna Gain	Chain 3 Antenna Gain	Correlated chains directional gain (dBi)	PSD Limits (dBm/MHz or dBm/500kHz)
U-NII-1	5.00	5.00	5.00	5.00	11.02	11.98
U-NII-2A	5.00	5.00	5.00	5.00	11.02	5.98
U-NII-2C	5.00	5.00	5.00	5.00	11.02	5.98
U-NII-3	5.00	5.00	5.00	5.00	11.02	24.98

Basic methodology with N_{ANT} transmit antennas, each with the same directional gain G_{ANT} dBi, being driven by N_{ANT} transmitter outputs of equal power. Directional gain is to be computed as follows:

If any transmit signals are *correlated* with each other,

$$\text{Directional gain} = G_{ANT} + 10 \log(N_{ANT}) \text{ dBi}$$

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

Mode	Channel/ Frequency (MHz)	Maximum Power Spectral Density (dBm/MHz)								Total PSD MIMO_ Chain 0+1+2+3	Limit s	Pass / Fail
		SISO										
		Chain 0		Chain 1		Chain 2		Chain 3				
		Meas PSD	Corr'd PSD	Meas PSD	Corr'd PSD	Meas PSD	Corr'd PSD	Meas PSD	Corr'd PSD			
IEEE 802.11 a	36 (5180)	1.404	2.335	1.298	2.229	-5.899	-4.968	-0.195	0.736	---	17	Pass
	44 (5220)	1.316	2.247	1.093	2.024	-5.691	-4.760	-0.208	0.723	---	17	Pass
	48 (5240)	1.086	2.017	0.712	1.643	-5.337	-4.406	-0.267	0.664	---	17	Pass
	52 (5260)	1.477	2.408	1.582	2.513	-4.386	-3.455	-0.382	0.549	---	11	Pass
	60 (5300)	1.128	2.059	1.015	1.946	-4.031	-3.100	-0.200	0.731	---	11	Pass
	64 (5320)	0.686	1.617	0.817	1.748	-4.328	-3.397	-0.032	0.899	---	11	Pass
	100 (5500)	-1.188	-0.257	-2.216	-1.285	-5.501	-4.570	-1.089	-0.158	---	11	Pass
	116 (5580)	-1.420	-0.489	-2.096	-1.165	-5.898	-4.967	-1.607	-0.676	---	11	Pass
	140 (5700)	-0.461	0.470	-0.561	0.370	-5.914	-4.983	-0.811	0.120	---	11	Pass

Mode	Channel/ Frequency (MHz)	Maximum Power Spectral Density (dBm/MHz)								Total PSD MIMO_ Chain 0+1+2+3	Limits	Pass / Fail
		MIMO										
		Chain 0		Chain 1		Chain 2		Chain 3				
		Meas PSD	Corr'd PSD	Meas PSD	Corr'd PSD	Meas PSD	Corr'd PSD	Meas PSD	Corr'd PSD			
IEEE 802.11n- HT20	36 (5180)	-2.817	0.049	-1.841	1.025	-9.328	-6.462	-4.595	-1.729	5.017	11.98	Pass
	44 (5220)	-2.984	-0.118	-2.135	0.731	-8.980	-6.114	-4.538	-1.672	4.887	11.98	Pass
	48 (5240)	-3.255	-0.389	-2.565	0.301	-9.263	-6.397	-5.146	-2.280	4.482	11.98	Pass
	52 (5260)	-2.904	-0.038	-1.979	0.887	-8.290	-5.424	-3.652	-0.786	5.236	5.98	Pass
	60 (5300)	-3.561	-0.695	-2.680	0.186	-7.242	-4.376	-3.130	-0.264	5.054	5.98	Pass
	64 (5320)	-3.875	-1.009	-2.955	-0.089	-7.511	-4.645	-4.216	-1.350	4.546	5.98	Pass
	100 (5500)	-5.531	-2.665	-4.499	-1.633	-8.467	-5.601	-5.680	-2.814	3.067	5.98	Pass
	116 (5580)	-5.406	-2.540	-5.016	-2.150	-8.763	-5.897	-6.094	-3.228	2.786	5.98	Pass
	140 (5700)	-4.265	-1.399	-3.779	-0.913	-9.115	-6.249	-6.026	-3.160	3.531	5.98	Pass

Mode	Channel/ Frequency (MHz)	Maximum Power Spectral Density (dBm/MHz)								Total PSD MIMO_ Chain 0+1+2+3	Limits	Pass / Fail
		MIMO										
		Chain 0		Chain 1		Chain 2		Chain 3				
		Meas PSD	Corr'd PSD	Meas PSD	Corr'd PSD	Meas PSD	Corr'd PSD	Meas PSD	Corr'd PSD			
IEEE 802.11n- HT40	38 (5190)	-9.752	-5.747	-8.259	-4.254	-15.756	-11.751	-12.055	-8.050	-0.629	11.98	Pass
	46 (5230)	-10.441	-6.436	-9.544	-5.539	-15.908	-11.903	-11.639	-7.634	-1.288	11.98	Pass
	54 (5270)	-9.190	-5.185	-8.448	-4.443	-14.417	-10.412	-10.034	-6.029	0.013	5.98	Pass
	62 (5310)	-10.258	-6.253	-9.745	-5.740	-15.588	-11.583	-10.682	-6.677	-1.035	5.98	Pass
	102 (5510)	-12.218	-8.213	-11.309	-7.304	-15.999	-11.994	-13.693	-9.688	-2.945	5.98	Pass
	118 (5590)	-10.232	-6.227	-10.862	-6.857	-13.516	-9.511	-12.403	-8.398	-1.542	5.98	Pass
	134 (5670)	-10.017	-6.012	-10.988	-6.983	-14.106	-10.101	-11.685	-7.680	-1.432	5.98	Pass

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China

Tel: +86-755-28230888

Fax: +86-755-28230886

E-mail: info@uttlab.com

<http://www.uttlab.com>

UTTR-RF-FCCPART15.407-V1.0

Mode	Channel/ Frequency (MHz)	Maximum Power Spectral Density (dBm/MHz)								Total PSD MIMO_ Chain 0+1+2+3	Limits	Pass / Fail
		MIMO										
		Chain 0		Chain 1		Chain 2		Chain 3				
		Meas PSD	Corr'd PSD	Meas PSD	Corr'd PSD	Meas PSD	Corr'd PSD	Meas PSD	Corr'd PSD			
IEEE 802.11ac- VHT20	36 (5180)	-2.548	0.262	-2.167	0.643	-9.354	-6.544	-4.780	-1.970	4.884	11.98	Pass
	44 (5220)	-3.312	-0.502	-2.172	0.638	-9.063	-6.253	-4.700	-1.890	4.673	11.98	Pass
	48 (5240)	-3.572	-0.762	-3.050	-0.240	-9.171	-6.361	-4.759	-1.949	4.240	11.98	Pass
	52 (5260)	-3.003	-0.193	-2.003	0.807	-8.710	-5.900	-3.676	-0.866	5.101	5.98	Pass
	60 (5300)	-3.098	-0.288	-2.319	0.491	-8.655	-5.845	-4.450	-1.640	4.773	5.98	Pass
	64 (5320)	-2.781	0.029	-2.992	-0.182	-7.918	-5.108	-5.079	-2.269	4.575	5.98	Pass
	100 (5500)	-5.553	-2.743	-5.569	-2.759	-8.905	-6.095	-6.260	-3.450	2.453	5.98	Pass
	116 (5580)	-6.118	-3.308	-5.860	-3.050	-8.843	-6.033	-5.541	-2.731	2.417	5.98	Pass
	140 (5700)	-4.291	-1.481	-3.206	-0.396	-8.895	-6.085	-6.040	-3.230	3.702	5.98	Pass

Mode	Channel/ Frequency (MHz)	Maximum Power Spectral Density (dBm/MHz)								Total PSD MIMO_ Chain 0+1+2+3	Limits	Pass / Fail
		MIMO										
		Chain 0		Chain 1		Chain 2		Chain 3				
		Meas PSD	Corr'd PSD	Meas PSD	Corr'd PSD	Meas PSD	Corr'd PSD	Meas PSD	Corr'd PSD			
IEEE 802.11ac- VHT40	38 (5190)	-10.153	-5.837	-8.642	-4.326	-14.878	-10.562	-12.577	-8.261	-0.619	11.98	Pass
	46 (5230)	-10.370	-6.054	-9.725	-5.409	-16.272	-11.956	-12.234	-7.918	-1.185	11.98	Pass
	54 (5270)	-10.872	-6.556	-8.473	-4.157	-14.866	-10.550	-11.420	-7.104	-0.516	5.98	Pass
	62 (5310)	-10.693	-6.377	-9.854	-5.538	-15.583	-11.267	-12.170	-7.854	-1.259	5.98	Pass
	102 (5510)	-12.356	-8.040	-12.381	-8.065	-15.614	-11.298	-13.472	-9.156	-2.935	5.98	Pass
	118 (5590)	-9.068	-4.752	-10.825	-6.509	-12.954	-8.638	-12.764	-8.448	-0.767	5.98	Pass
	134 (5670)	-9.325	-5.009	-10.276	-5.960	-14.300	-9.984	-12.345	-8.029	-0.825	5.98	Pass

Mode	Channel/ Frequency (MHz)	Maximum Power Spectral Density (dBm/MHz)								Total PSD MIMO_ Chain 0+1+2+3	Limits	Pass / Fail
		MIMO										
		Chain 0		Chain 1		Chain 2		Chain 3				
		Meas PSD	Corr'd PSD	Meas PSD	Corr'd PSD	Meas PSD	Corr'd PSD	Meas PSD	Corr'd PSD			
IEEE 802.11ac- VHT80	42 (5230)	-14.194	-8.425	-12.437	-6.668	-19.975	-14.206	-15.801	-10.032	-3.042	11.98	Pass
	58 (5290)	-15.425	-9.656	-14.777	-9.008	-20.690	-14.921	-16.057	-10.288	-4.441	5.98	Pass
	106 (5530)	-18.392	-12.623	-18.127	-12.358	-21.541	-15.772	-20.454	-14.685	-7.613	5.98	Pass
	122 (5610)	-16.851	-11.082	-16.545	-10.776	-20.828	-15.059	-18.758	-12.989	-6.143	5.98	Pass

For U-NII-3 band

Mode	Channel/ Frequency (MHz)	Maximum Power Spectral Density (dBm/500kHz)										
		SISO								Total PSD MIMO_ Chain 0+1+2+3	Limits	Pass / Fail
		Chain 0		Chain 1		Chain 2		Chain 3				
		Meas PSD	Corr'd PSD	Meas PSD	Corr'd PSD	Meas PSD	Corr'd PSD	Meas PSD	Corr'd PSD			
IEEE 802.11a	149 (5745)	-0.004	0.9272	0.057	0.9882	-7.191	-6.26	-1.337	-0.406	---	30	Pass
	157 (5785)	0.62	1.5512	0.172	1.1032	-6.794	-5.863	-1.178	-0.247	---	30	Pass
	165 (5825)	0.317	1.2482	-0.835	0.0962	-7.395	-6.464	-1.382	-0.451	---	30	Pass

Mode	Channel/ Frequency (MHz)	Maximum Power Spectral Density (dBm/500kHz)										Limits	Pass / Fail
		MIMO								Total PSD MIMO_ Chain 0+1+2+3			
		Chain 0		Chain 1		Chain 2		Chain 3					
		Meas PSD	Corr'd PSD	Meas PSD	Corr'd PSD	Meas PSD	Corr'd PSD	Meas PSD	Corr'd PSD				
IEEE 802.11n- HT20	149 (5745)	-2.501	0.365	-2.702	0.164	-9.051	-6.185	-2.951	-0.085	5.247	24.98	Pass	
	157 (5785)	-1.711	1.155	-2.601	0.265	-8.410	-5.544	-2.653	0.213	5.678	24.98	Pass	
	165 (5825)	-2.573	0.293	-2.624	0.242	-9.391	-6.525	-3.178	-0.312	5.159	24.98	Pass	
IEEE 802.11n- HT40	151 (5755)	-7.563	-3.558	-6.654	-2.649	-14.140	-10.135	-7.761	-3.756	1.767	24.98	Pass	
	159 (5795)	-7.272	-3.267	-6.397	-2.392	-13.028	-9.023	-7.990	-3.985	1.966	24.98	Pass	

Mode	Channel/ Frequency (MHz)	Maximum Power Spectral Density (dBm/500kHz)										Limits	Pass / Fail
		MIMO								Total PSD MIMO_ Chain 0+1+2+3			
		Chain 0		Chain 1		Chain 2		Chain 3					
		Meas PSD	Corr'd PSD	Meas PSD	Corr'd PSD	Meas PSD	Corr'd PSD	Meas PSD	Corr'd PSD				
IEEE 802.11ac- VHT20	149 (5745)	-1.772	1.038	-1.776	1.034	-9.078	-6.268	-2.703	0.107	5.798	24.98	Pass	
	157 (5785)	-2.317	0.493	-1.427	1.383	-8.936	-6.126	-3.195	-0.385	5.628	24.98	Pass	
	165 (5825)	-2.204	0.606	-2.544	0.266	-9.569	-6.759	-3.381	-0.571	5.186	24.98	Pass	
IEEE 802.11ac- VHT40	151 (5755)	-7.225	-2.909	-7.756	-3.440	-13.578	-9.262	-8.434	-4.118	1.675	24.98	Pass	
	159 (5795)	-7.373	-3.057	-7.013	-2.697	-13.179	-8.863	-8.331	-4.015	1.928	24.98	Pass	

Mode	Channel/ Frequency (MHz)	Maximum Power Spectral Density (dBm/500kHz)										Limits	Pass / Fail
		MIMO								Total PSD MIMO_ Chain 0+1+2+3			
		Chain 0		Chain 1		Chain 2		Chain 3					
		Meas PSD	Corr'd PSD	Meas PSD	Corr'd PSD	Meas PSD	Corr'd PSD	Meas PSD	Corr'd PSD				
IEEE 802.11ac- VHT80	155 (5775)	-14.292	-8.523	-12.541	-8.523	-19.403	-13.634	-16.780	-11.011	-3.941	24.98	Pass	

Remark:

1. Corr'd PSD = Meas PSD + Duty Cycle Factor
2. Total (Chain 0+1) = $10 \cdot \log[(10^{\text{Chain 0}/10}) + (10^{\text{Chain 1}/10})]$

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China

Tel: +86-755-28230888

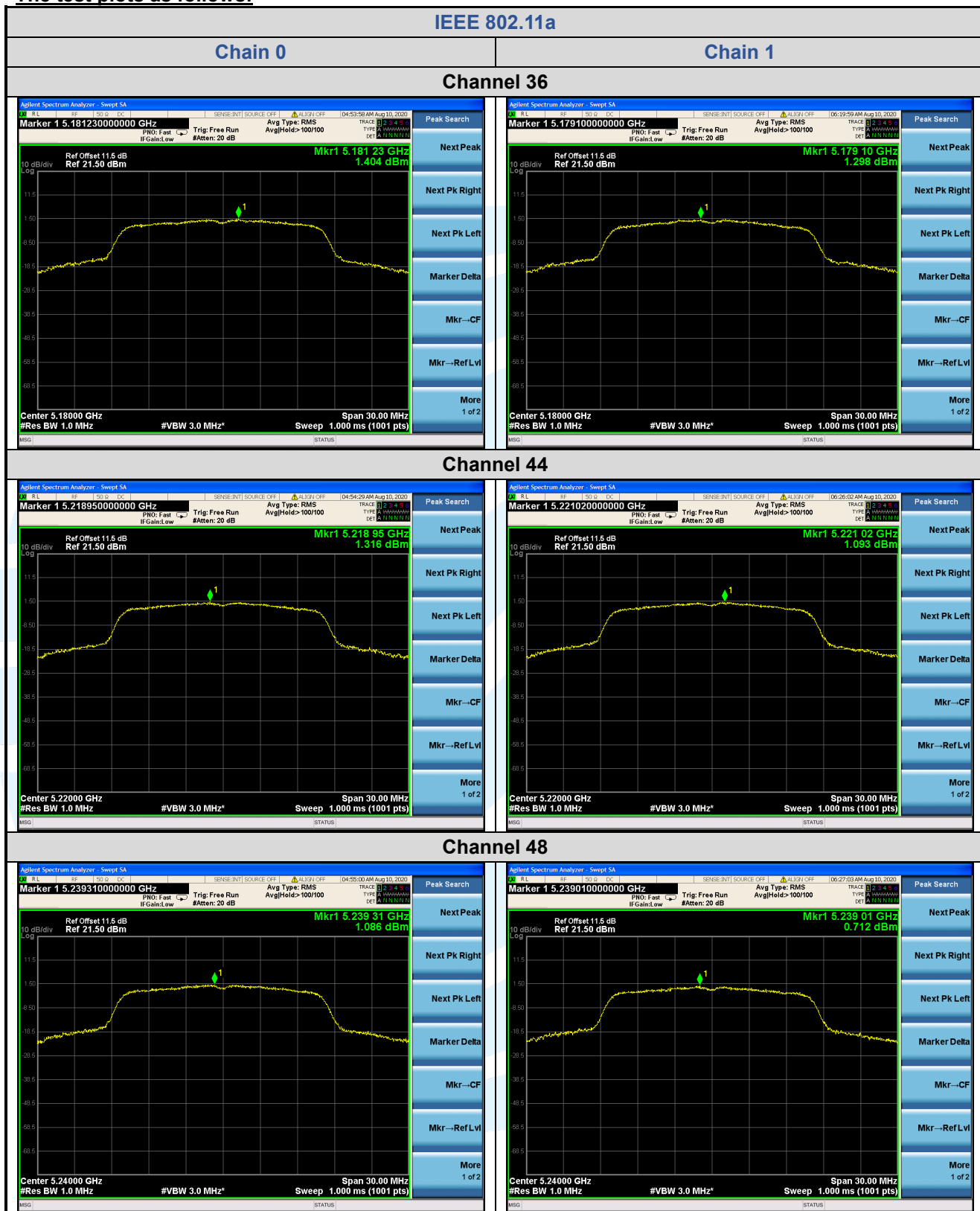
Fax: +86-755-28230886

E-mail: info@uttlab.com

<http://www.uttlab.com>

UTTR-RF-FCCPART15.407-V1.0

The test plots as follows:



Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China

Tel: +86-755-28230888

Fax: +86-755-28230886

E-mail: info@uttlab.com

<http://www.uttlab.com>

UTTR-RF-FCCPART15.407-V1.0