



FCC 47 CFR PART 15 SUBPART E

UNII 802.11a/n/ac

CERTIFICATION TEST REPORT

FOR

GSM/WCDMA/LTE Phone + BT/BLE, DTS/UNII a/b/g/n/ac/ax, ANT+, NFC and WPT

MODEL NUMBER : SM-N970F/DS, SM-N970F, SM-N970X

FCC ID: A3LSMN970F

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ACCREDITED*

Testing
Laboratory

TL-637

Revision History

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SAMSUNG ELECTRONICS CO., LTD.

EUT DESCRIPTION: GSM/WCDMA/LTE Phone + BT/BLE, DTS/UNII a/b/g/n/ac/ax, ANT+, NFC and WPT

MODEL NUMBER: SM-N970F/DS, SM-N970F, SM-N970X

SERIAL NUMBER: R38M6037DNE, R38M60378FH (CONDUCTED)
R38M603796L, R38M6037CGW, R38M6037F5L (RADIATED);

DATE TESTED: MAY 30, 2019 – JUN 27, 2019;

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart E	Pass

UL Korea, Ltd. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Korea, Ltd. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Korea, Ltd. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Korea, Ltd. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by IAS, any agency of the Federal Government, or any agency of any government.

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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with following methods.

1. FCC CFR 47 Part 2.
2. FCC CFR 47 Part 15.
3. KDB 789033 D02 General UNII Test Procedures New Rules v02r01
4. KDB 905462 D02 UNII DFS Compliance Procedures New Rules v02
5. KDB 905462 D03 UNII Clients Without Radar Detection New Rules v01r02
6. KDB 662911 D01 v02r01
7. ANSI C63.10-2013.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea. Line conducted emissions are measured only at the 218 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

218 Maeyeong-ro
☒ Chamber 1
☒ Chamber 2
☒ Chamber 3

UL Korea, Ltd. is accredited by IAS, Laboratory Code TL-637. The full scope of accreditation can be viewed at <http://www.iasonline.org/PDF/TL/TL-637.pdf>.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

$$\begin{aligned}\text{Field Strength (dBuV/m)} &= \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \\ &\text{Cable Loss (dB)} - \text{Preamp Gain (dB)} \\ 36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} &= 28.9 \text{ dBuV/m}\end{aligned}$$

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	2.32 dB
Radiated Disturbance, 30 MHz to 1 GHz	3.86 dB
Radiated Disturbance, 1 GHz to 18 GHz	5.97 dB
Radiated Disturbance, 18 GHz to 40 GHz	5.57 dB

Uncertainty figures are valid to a confidence level of 95%.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a GSM/WCDMA/LTE Phone + BT/BLE, DTS/UNII a/b/g/n/ac/ax, ANT+, NFC and WPT. This test report addresses the NII (UNII 802.11a/n/ac) operational mode.

This report covers the Samsung models SM-N970F/DS, SM-N970F and SM-N970X. These models are identical in hardware except SM-N970F has single SIM tray and model SM-N970X has been disabled all cellular bands by software. With some pre-scan, model SM-N970F/DS was set for final test.

WiFi operating mode

Frequency Range	Mode	Antenna1	Antenna2
2.4GHz	802.11 b	TX/RX	TX/RX
	802.11 g	TX/RX	TX/RX
	802.11 g MIMO	TX/RX	TX/RX
	802.11 n	TX/RX	TX/RX
	802.11 n MIMO	TX/RX	TX/RX
	802.11 ax	TX/RX	TX/RX
	802.11 ax MIMO	TX/RX	TX/RX
5GHz	802.11 a	TX/RX	TX/RX
	802.11 a MIMO	TX/RX	TX/RX
	802.11 n	TX/RX	TX/RX
	802.11 n MIMO	TX/RX	TX/RX
	802.11 ac	TX/RX	TX/RX
	802.11 ac MIMO	TX/RX	TX/RX
	802.11 ax	TX/RX	TX/RX
	802.11 ax MIMO	TX/RX	TX/RX

Simultaneous TX Condition

Simultaneous Tx condition - **RSDB**

Mode	# of TX	5GHz		2.4GHz		Test Case
		Ant1	Ant2	Ant1	Ant2	
2.4GHz + 5GHz RSDB Only	2	A	-	-	B	V
	2	-	A	B	-	V
	2	A	-	B	-	-
	2	-	A	-	B	-
2.4GHz + 5GHz RSDB & MIMO	3	A	A	B	-	-
	3	A	A	-	B	-
	3	A	-	B	B	-
	3	-	A	B	B	-
2.4GHz + 5GHz RSDB MIMO	4	A	A	B	B	V

Simultaneous Tx condition - **Bluetooth with 5 GHz WLAN(not RSDB)**

Mode	# of TX	5GHz WLAN		2.4GHz Bluetooth	Test Case
		Ant1	Ant2	Ant1	
2.4GHz Bluetooth +5GHz WLAN (Not RSDB)	2	A	-	B	-
	2	-	A	B	-
	3	A		B	V

Spurious Emissions for Simultaneous Transmission were reported on the UNII 802.11ax test report(4789014604-E9) section 11.9.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum total conducted average output power as follows:

Frequency Range [MHz]	Mode	Output Power [dBm]		Output Power [mW]	
		Antenna1	Antenna2	Antenna1	Antenna2
5180 - 5240	802.11a MIMO	19.20		83.18	
	802.11n HT20 MIMO	19.17		82.60	
5190 - 5230	802.11n HT40 MIMO	18.38		68.87	
5210	802.11ac VHT80 MIMO	17.21		52.60	
5260 - 5320	802.11a MIMO	17.03		50.47	
	802.11n HT20 MIMO	16.99		50.00	
5270 - 5310	802.11n HT40 MIMO	18.18		65.77	
5290	802.11ac VHT80 MIMO	16.97		49.77	
5500 - 5720	802.11a MIMO	17.15		51.88	
	802.11n HT20 MIMO	17.15		51.88	
5510 - 5710	802.11n HT40 MIMO	18.50		70.79	
5530 - 5690	802.11ac VHT80 MIMO	17.18		52.24	
5745 - 5825	802.11a MIMO	19.29		84.92	
	802.11n HT20 MIMO	19.28		84.72	
5755 - 5795	802.11n HT40 MIMO	18.62		72.78	
5775	802.11ac VHT80 MIMO	17.27		53.33	

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a internal antenna, with a maximum gain of:

Frequency Range [MHz]	Antenna Gain [dBi]	
	Antenna 1	Antenna 2
UNII 1 5150 ~ 5250	-8.40	-4.10
UNII 2A 5250 ~ 5350	-6.60	-5.80
UNII 2C 5470 ~ 5725	-5.80	-6.50
UNII 3 5725 ~ 5850	-7.10	-6.80

WIFI1 and WIFI2 as indicated in antenna specification are written as ANT1 (Antenna 1) and ANT2 (Antenna 2) in this report.

5.4. List of test reduction and modes covering other modes:

The output power on covered modes is equal to or less than one referenced.

UNII 1

5150 - 5250 MHz Authorized Frequency Band (Radiated Testing)		
Frequency Range [MHz]	Mode	Covered by
5180 - 5240	802.11a legacy 1TX/CDD 2TX	802.11a 2TX CDD
5180 - 5240	802.11n HT20 1TX	802.11n HT20 2TX CDD
5180 - 5240	802.11n HT20 2TX SDM/CDD	802.11n HT20 2TX CDD
5180 - 5240	802.11ac VHT20 1TX	802.11n HT20 2TX CDD
5180 - 5240	802.11ac VHT20 2TX SDM/CDD	802.11n HT20 2TX CDD
5190 - 5230	802.11n HT40 1TX	802.11n HT40 2TX CDD
5190 - 5230	802.11n HT40 2TX SDM/CDD	802.11n HT40 2TX CDD
5190 - 5230	802.11ac VHT40 1TX	802.11n HT40 2TX CDD
5190 - 5230	802.11ac VHT40 2TX SDM/CDD	802.11n HT40 2TX CDD
5210	802.11ac VHT80 1TX	802.11ac VHT80 2TX CDD
5210	802.11ac VHT80 2TX SDM/CDD	802.11ac VHT80 2TX CDD

UNII 2A

5250 - 5350 MHz Authorized Frequency Band (Radiated Testing)		
Frequency Range [MHz]	Mode	Covered by
5260 - 5320	802.11a legacy 1TX/CDD 2TX	802.11a 2TX CDD
5260 - 5320	802.11n HT20 1TX	802.11n HT20 2TX CDD
5260 - 5320	802.11n HT20 2TX SDM/CDD	802.11n HT20 2TX CDD
5260 - 5320	802.11ac VHT20 1TX	802.11n HT20 2TX CDD
5260 - 5320	802.11ac VHT20 2TX SDM/CDD	802.11n HT20 2TX CDD
5270 - 5310	802.11n HT40 1TX	802.11n HT40 2TX CDD
5270 - 5310	802.11n HT40 2TX SDM/CDD	802.11n HT40 2TX CDD
5270 - 5310	802.11ac VHT40 1TX	802.11n HT40 2TX CDD
5270 - 5310	802.11ac VHT40 2TX SDM/CDD	802.11n HT40 2TX CDD
5290	802.11ac VHT80 1TX	802.11ac VHT80 2TX CDD
5290	802.11ac VHT80 2TX SDM/CDD	802.11ac VHT80 2TX CDD

UNII 2C

5470 - 5725 MHz Authorized Frequency Band (Radiated Testing)		
Frequency Range [MHz]	Mode	Covered by
5500 - 5720	802.11a legacy 1TX/CDD 2TX	802.11a 2TX CDD
5500 - 5720	802.11n HT20 1TX	802.11n HT20 2TX CDD
5500 - 5720	802.11n HT20 2TX SDM/CDD	802.11n HT20 2TX CDD
5500 - 5720	802.11ac VHT20 1TX	802.11n HT20 2TX CDD
5500 - 5720	802.11ac VHT20 2TX SDM/CDD	802.11n HT20 2TX CDD
5510 - 5710	802.11n HT40 1TX	802.11n HT40 2TX CDD
5510 - 5710	802.11n HT40 2TX SDM/CDD	802.11n HT40 2TX CDD
5510 - 5710	802.11ac VHT40 1TX	802.11n HT40 2TX CDD
5510 - 5710	802.11ac VHT40 2TX SDM/CDD	802.11n HT40 2TX CDD
5530 - 5690	802.11ac VHT80 1TX	802.11ac VHT80 2TX CDD
5530 - 5690	802.11ac VHT80 2TX SDM/CDD	802.11ac VHT80 2TX CDD

UNII 3

5725 - 5850 MHz Authorized Frequency Band (Radiated Testing)		
Frequency Range [MHz]	Mode	Covered by
5745 - 5825	802.11a legacy 1TX/CDD 2TX	802.11a 2TX CDD
5745 - 5825	802.11n HT20 1TX	802.11n HT20 2TX CDD
5745 - 5825	802.11n HT20 2TX SDM/CDD	802.11n HT20 2TX CDD
5745 - 5825	802.11ac VHT20 1TX	802.11n HT20 2TX CDD
5745 - 5825	802.11ac VHT20 2TX SDM/CDD	802.11n HT20 2TX CDD
5755 - 5795	802.11n HT40 1TX	802.11n HT40 2TX CDD
5755 - 5795	802.11n HT40 2TX SDM/CDD	802.11n HT40 2TX CDD
5755 - 5795	802.11ac VHT40 1TX	802.11n HT40 2TX CDD
5755 - 5795	802.11ac VHT40 2TX SDM/CDD	802.11n HT40 2TX CDD
5775	802.11ac VHT80 1TX	802.11ac VHT80 2TX CDD
5775	802.11ac VHT80 2TX SDM/CDD	802.11ac VHT80 2TX CDD

5.5. WORST-CASE CONFIGURATION AND MODE

Radiated emission below 1GHz and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

Radiated emission above 1GHz was performed with the EUT set to transmit low/mid/high channels.

The fundamental of the EUT was investigated in three orthogonal orientations X,Y,Z, it was determined that the Y orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in the Y orientation.

Based on the baseline scan, the worst-case data rates were:

802.11a mode: 6 Mbps (1Tx)
802.11a mode: 6 Mbps (2Tx CDD)
802.11n HT20mode: MCS0 (1Tx)
802.11n HT20mode: MCS0 (2Tx CDD)
802.11n HT40mode: MCS0 (1Tx)
802.11n HT40mode: MCS0 (2Tx CDD)
802.11ac VHT80mode: MCS0 (1Tx)
802.11ac VHT80mode: MCS0 (2Tx CDD)

The spot-check was performed for both SISO and MIMO mode, and it was determined that the MIMO mode is worst than SISO mode. Therefore, all testing was performed with MIMO mode.

Note : All radiated and power line conducted tests were performed connected with charger for evaluation of worst case mode.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Description	Manufacturer	Model	Serial Number	FCC ID
Charger	SAMSUNG	EP-TA800	R37M5DL3FL1SE3	N/A
Data Cable	SAMSUNG	EP-DG977	N/A	N/A

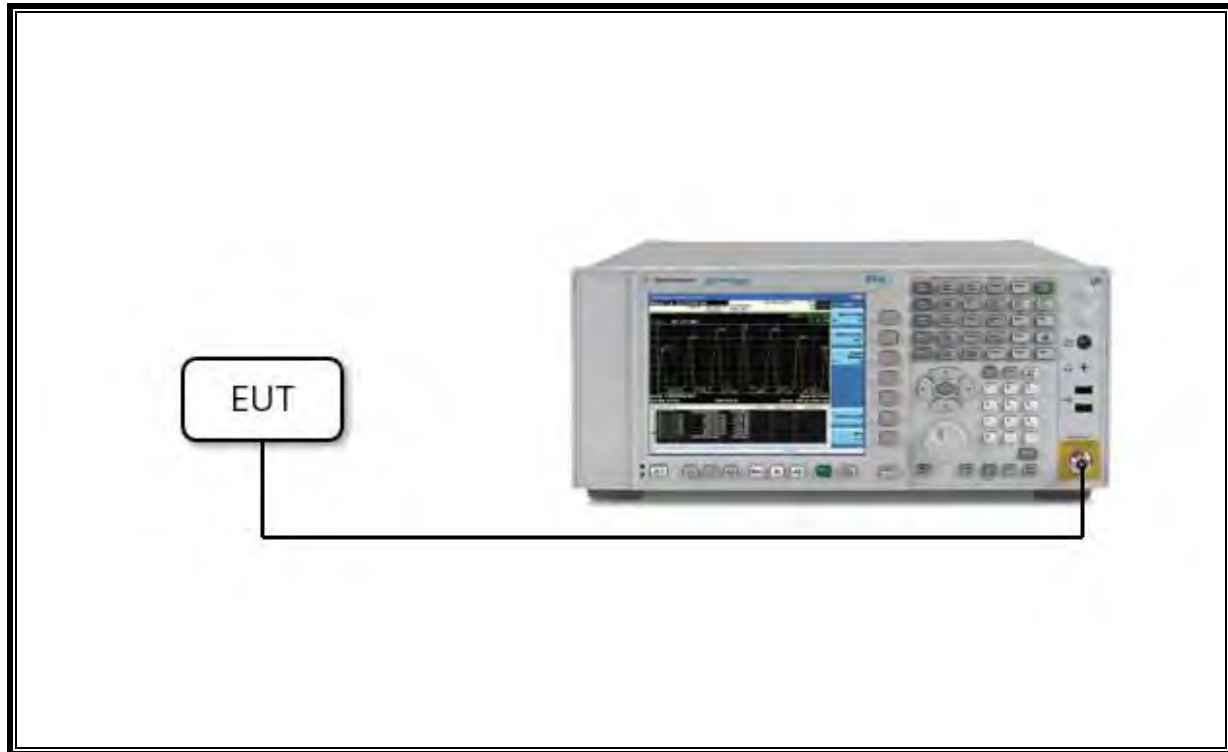
I/O CABLE

I/O Cable List						
Cable No.	Port	# of identical ports	Connector Type	Cable Type	Cable Length(m)	Remarks
1	DC Power	1	C Type	Shielded	1.0m	N/A

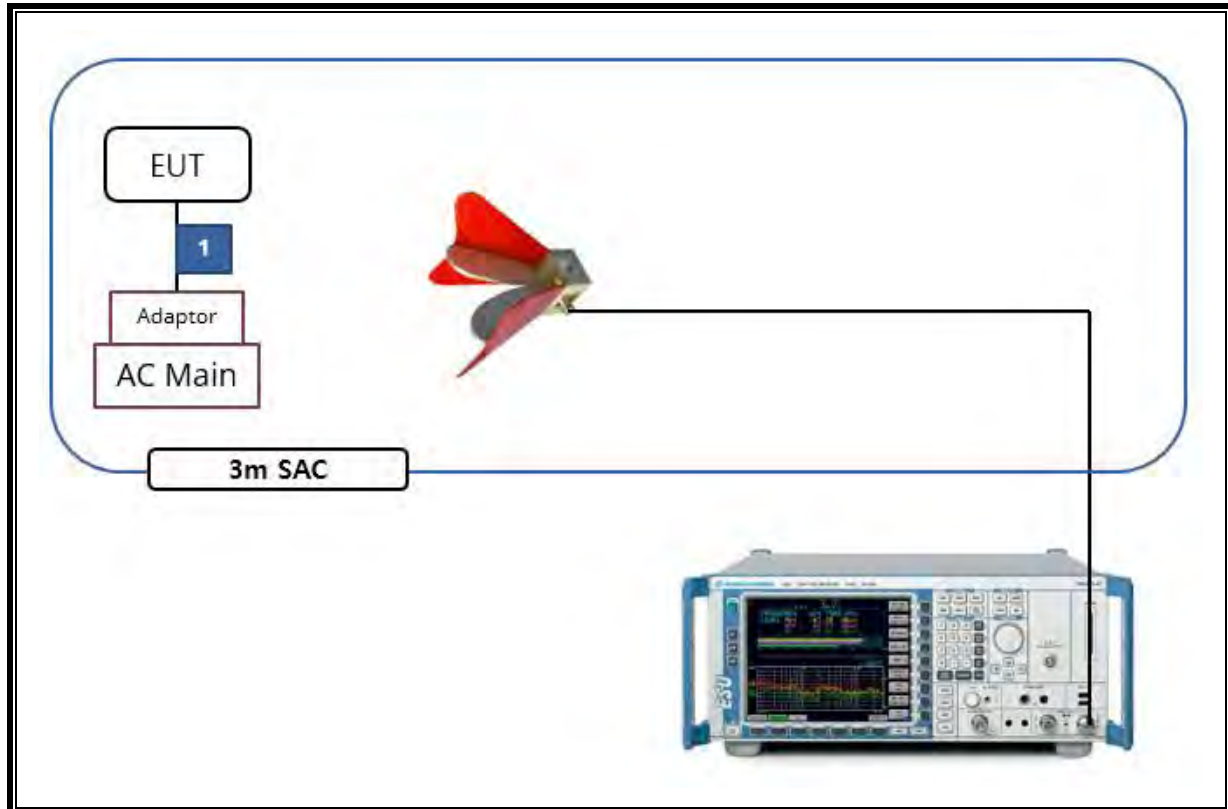
TEST SETUP

The EUT is a stand-alone unit during the tests.
Test software exercised the EUT to enable NII mode.

SETUP DIAGRAM FOR TESTS (CONDUCTED TEST SETUP)



SETUP DIAGRAM FOR TESTS (RADIATED TEST SETUP)



6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Test Equipment List				
Description	Manufacturer	Model	S/N	New Cal Due
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	750	08-04-20
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	749	08-04-20
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	845	08-04-20
Antenna, Horn, 18 GHz	ETS	3115	00167211	08-04-20
Antenna, Horn, 18 GHz	ETS	3115	00161451	08-04-20
Antenna, Horn, 18 GHz	ETS	3117	00168724	08-04-20
Antenna, Horn, 18 GHz	ETS	3117	00168717	08-04-20
Antenna, Horn, 18 GHz	ETS	3117	00205959	08-04-20
Antenna, Horn, 40 GHz	ETS	3116C	00166155	08-14-20
Antenna, Horn, 40 GHz	ETS	3116C	00168645	12-04-19
Antenna, Horn, 40 GHz	ETS	3116C-PA	00168841	08-09-19
Preamplifier, 1000 MHz	Sonoma	310N	341282	08-07-19
Preamplifier, 1000 MHz	Sonoma	310N	351741	08-07-19
Preamplifier, 1000 MHz	Sonoma	310N	370599	08-06-19
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1876511	08-07-19
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1896138	08-07-19
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	2029169	08-07-19
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54170614	08-07-19
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54490312	08-06-19
Spectrum Analyzer, 43.5 GHz	R&S	FSW43	104089	08-06-19
Average Power Sensor	Agilent / HP	U2000	MY54270007	08-07-19
Attenuator	PASTERNAK	PE7087-10	A001	08-08-19
Attenuator	PASTERNAK	PE7087-10	A008	08-08-19
Attenuator	PASTERNAK	PE7004-10	2	08-07-19
Attenuator	PASTERNAK	PE7087-10	A009	08-08-19
EMI Test Receive, 40 GHz	R&S	ESU40	100439	08-06-19
EMI Test Receive, 40 GHz	R&S	ESU40	100457	08-06-19
EMI Test Receive, 44 GHz	R&S	ESW44	101590	08-06-19
EMI Test Receive, 3 GHz	R&S	ESR3	101832	08-06-19
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	009	08-07-19
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	015	08-07-19
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	020	08-06-19
High Pass Filter 3GHz	Micro-Tronics	HPM17543	010	08-07-19
High Pass Filter 3GHz	Micro-Tronics	HPM17543	015	08-07-19
High Pass Filter 3GHz	Micro-Tronics	HPM17543	020	08-06-19
High Pass Filter 6GHz	Micro-Tronics	HPS17542	009	08-07-19
High Pass Filter 6GHz	Micro-Tronics	HPS17542	016	08-07-19
High Pass Filter 6GHz	Micro-Tronics	HPS17542	021	08-06-19
LISN	R&S	ENV-216	101837	08-09-19
UL Software				
Description	Manufacturer	Model	Version	
Radiated software	UL	UL EMC	Ver 9.5	
AC Line Conducted software	UL	UL EMC	Ver 9.5	

7. SUMMARY TABLE

FCC Part Section	Test Description	Test Limit	Test Condition	Test Result
15.407(e)	6dB Band width (5.8Ghz)	500KHz	Condcuted	PASS
15.407 (a)(2)	TX Cond. Power 5.15-2.25, 5.25-5.35 & 5.47-5.725	<24dBm or 11+10Log(26dB BW)		PASS
15.407 (a)(3)	TX Cond. Power 5.725-5.825	< 30dBm		PASS
15.407 (a)(5)	PSD (5.2,5.3,5.5GHz)	<11dBm		PASS
15.407 (a)(5)	PSD (5.8GHz)	30dBm per 500kHz		PASS
15.207 (a)	AC Power Line conducted emissions	Section 10	Radiated	PASS
15.407 (b) & 15.209	Radiated Spurious Emission	< 54dBuV/m		PASS
15.407 (h)(2)	Dynamic Frequency Selection	N/A	Condcuted	PASS

8. MEASUREMENT METHODS

On-Time and Duty Cycle : KDB 789033 D02 v02r01, Section II.B.

6dB Emission BW : KDB 789033 D02 v02r01, Section II.C.2.

26dB Emission BW : KDB 789033 D02 v02r01, Section II.C.1.

99% Occupied BW : KDB 789033 D02 v02r01, Section II.D.

Conducted Output Power : KDB 789033 D02 v02r01, Section II.E.3.b(Method PM-G)

Conducted Output Power for Straddle Channel (ch144/142/138 for 20/40/80MHz BW):

KDB 789033 D02 v02r01, Section II.E.2.b(Method SA-1)

Power Spectral Density : KDB 789033 D02 v02r01, Section II.F.

Unwanted emissions in restricted bands : KDB 789033 D02 v02r01, Section II.G.3 – II.G.6.

Unwanted emissions in non-restricted bands : KDB 789033 D02 v02r01, Section II.G.3 – II.G.6.

AC Power Line Conducted Emission : ANSI C63.10-2013, Section 6.2.

9. REFERENCE MEASUREMENTS RESULTS

9.1. ON TIME AND DUTY CYCLE RESULTS

Mode	ON Time B [msec]	Period [msec]	Duty Cycle x [linear]	Duty Cycle [%]	Duty Cycle Correction Factor [dB]	1/T Minimum VBW [kHz]
802.11a	5.483	5.582	0.982	98.2%	0.00	0.010
802.11n HT20	5.079	5.178	0.981	98.1%	0.00	0.010
802.11n HT40	5.479	5.579	0.982	98.2%	0.00	0.010
802.11ac VHT80	5.227	5.328	0.981	98.1%	0.00	0.010

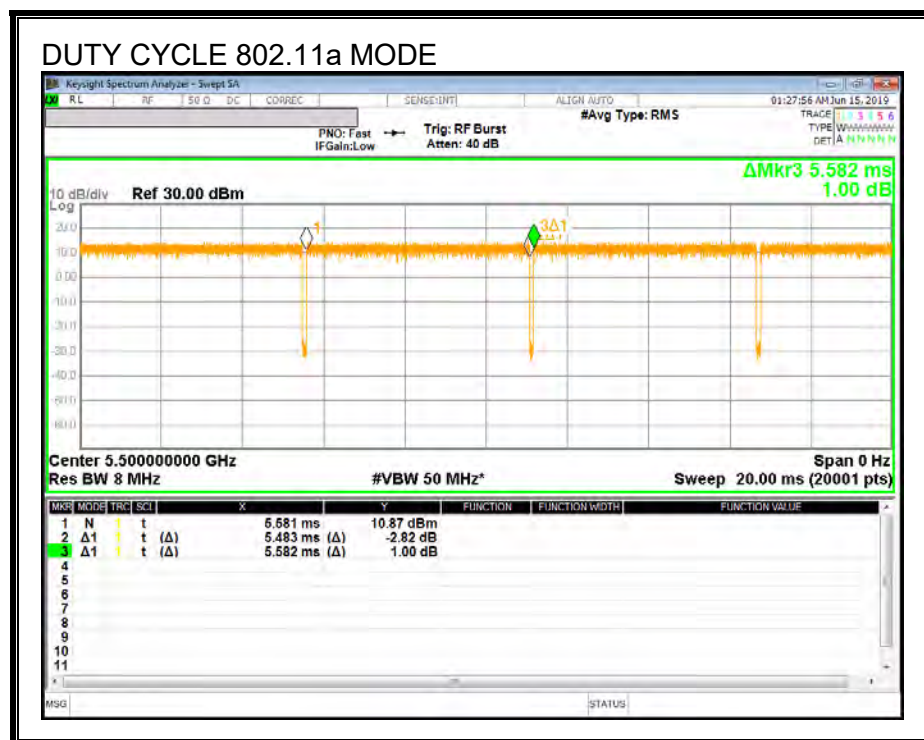
LIMITS

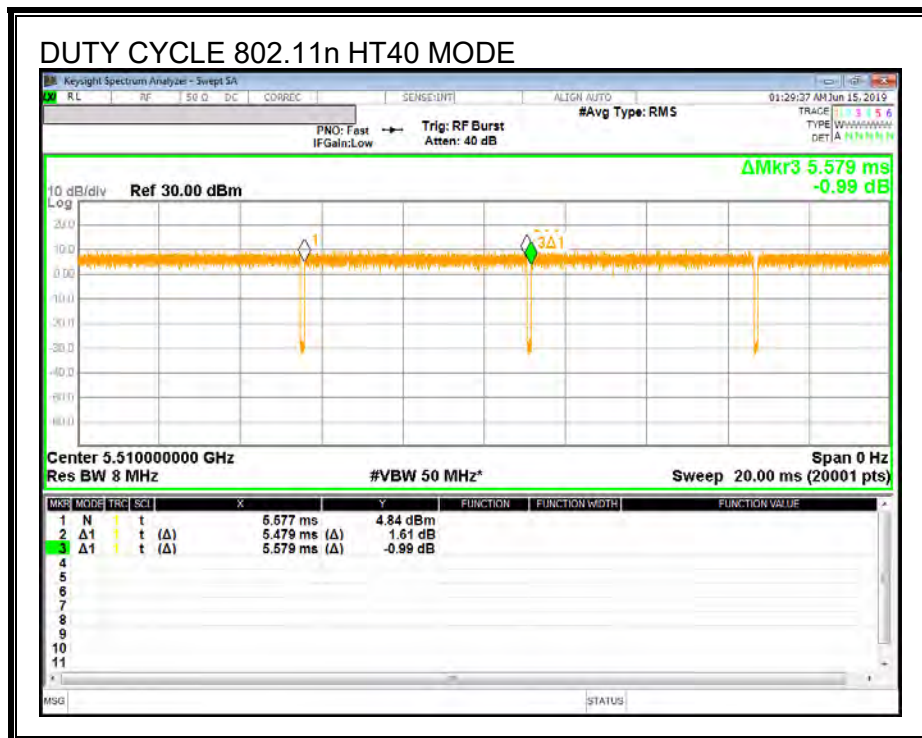
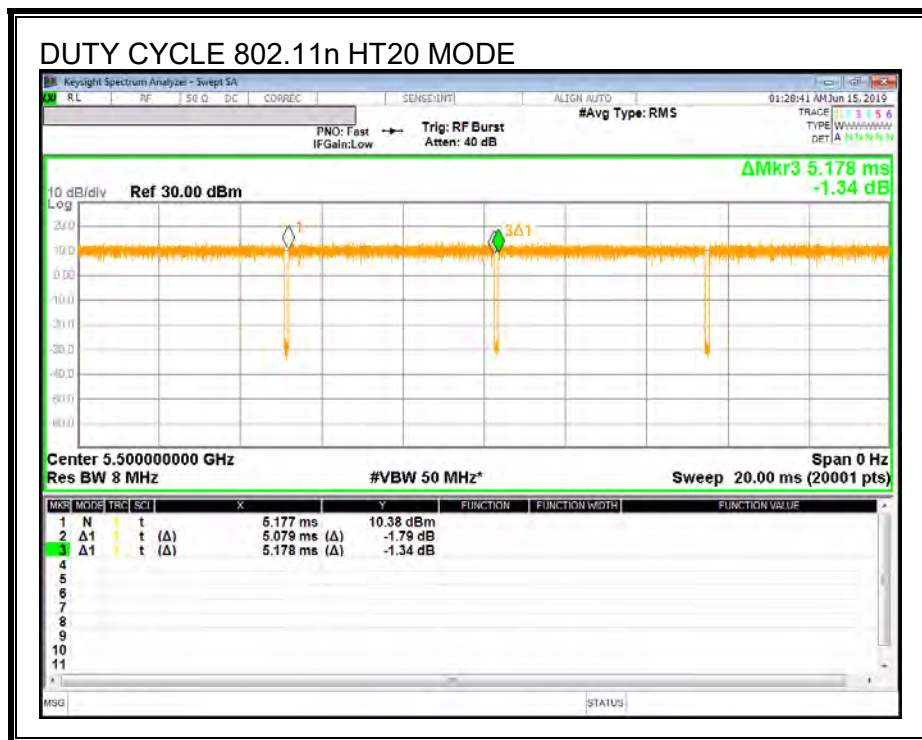
None; for reporting purposes only.

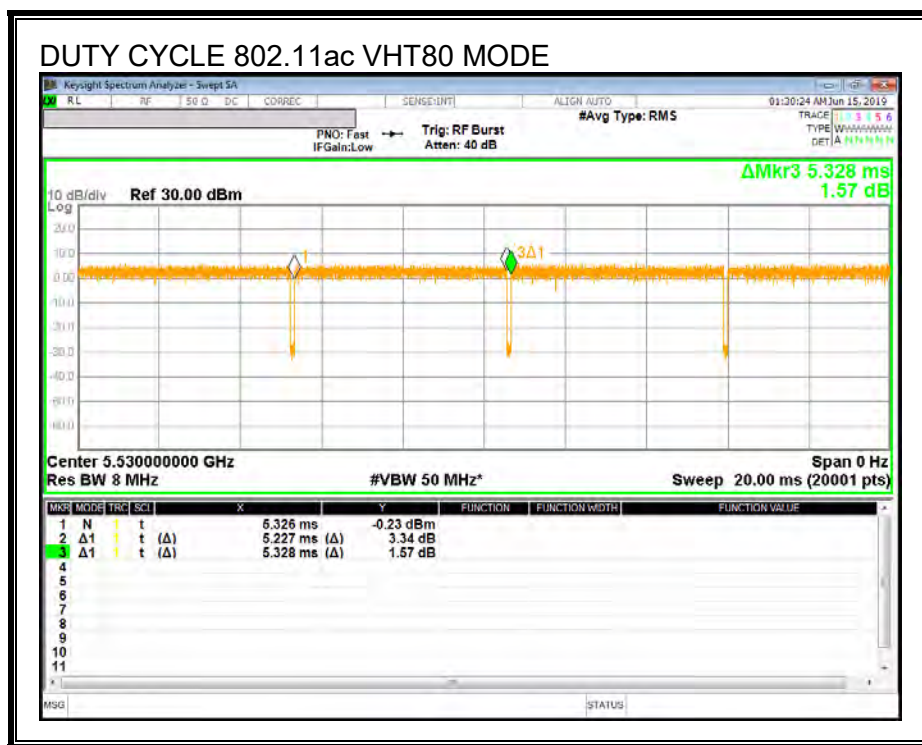
PROCEDURE

KDB 789033 D02 v02r01 Zero-Span Spectrum Analyzer Method.

9.2. DUTY CYCLE PLOTS







9.3. 26 dB BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

Reference to 789033 D02 General UNII Test Procedures New Rules v02r01: The transmitter output is connected to a spectrum analyzer with the RBW set to approximately 1% of EBW, the VBW > RBW, peak detector and max hold.

NOTE

- Calculation for 26dB Bandwidth of UNII-2C and UNII-3 Straddle Channel

ex) Fundamental frequency : 5720MHz

- o 26dB BW : 20.58MHz
- o Turning Frequency : 5725MHz
- o 26dB Bandwidth of UNII-2C band Portion
 $= (5725 - (5720 - (20.58 / 2))) = 15.29 \text{ MHz}$
- o 26dB Bandwidth of UNII-3 band Portion
 $= (5720 + (20.58 / 2) - 5725) = 5.29 \text{ MHz}$

RESULTS

9.3.1. 802.11a MODE IN THE 5.2 GHz BAND

Channel	Frequency [MHz]	26 dB Bandwidth [MHz]	
		Antenna 1	Antenna 2
Low	5180	21.20	21.39
Mid	5200	21.25	21.39
High	5240	21.19	21.17
Worst		21.39	

9.3.2. 802.11n HT20 MODE IN THE 5.2 GHz BAND

Channel	Frequency [MHz]	26 dB Bandwidth [MHz]	
		Antenna 1	Antenna 2
Low	5180	21.51	21.41
Mid	5200	21.32	21.47
High	5240	21.30	21.27
Worst		21.51	

9.3.3. 802.11n HT40 MODE IN THE 5.2 GHz BAND

Channel	Frequency [MHz]	26 dB Bandwidth [MHz]	
		Antenna 1	Antenna 2
Low	5190	39.96	39.40
High	5230	39.66	39.85
Worst		39.96	

9.3.4. 802.11ac VHT80 MODE IN THE 5.2 GHz BAND

Channel	Frequency [MHz]	26 dB Bandwidth [MHz]	
		Antenna 1	Antenna 2
Mid	5210	81.38	81.90
Worst		81.90	

9.3.5. 802.11a MODE IN THE 5.3 GHz BAND

Channel	Frequency [MHz]	26 dB Bandwidth [MHz]	
		Antenna 1	Antenna 2
Low	5260	21.43	21.28
Mid	5300	21.37	21.52
High	5320	21.43	21.24
Worst		21.52	

9.3.6. 802.11n HT20 MODE IN THE 5.3 GHz BAND

Channel	Frequency [MHz]	26 dB Bandwidth [MHz]	
		Antenna 1	Antenna 2
Low	5260	21.31	21.84
Mid	5300	21.73	21.51
High	5320	21.51	21.49
Worst		21.84	

9.3.7. 802.11n HT40 MODE IN THE 5.3 GHz BAND

Channel	Frequency [MHz]	26 dB Bandwidth [MHz]	
		Antenna 1	Antenna 2
Low	5270	39.43	39.57
High	5310	39.62	39.68
Worst		39.68	

9.3.8. 802.11ac VHT80 MODE IN THE 5.3 GHz BAND

Channel	Frequency [MHz]	26 dB Bandwidth [MHz]	
		Antenna 1	Antenna 2
Mid	5290	81.45	81.27
Worst		81.45	

9.3.9. 802.11a MODE IN THE 5.5 GHz BAND

Channel	Frequency [MHz]	26 dB Bandwidth [MHz]	
		Antenna 1	Antenna 2
Low	5500	21.31	21.28
Mid	5580	21.14	21.42
High	5700	21.25	21.31
Straddle	5720	15.55	15.56
Worst		21.42	

9.3.10. 802.11n HT20 MODE IN THE 5.5 GHz BAND

Channel	Frequency [MHz]	26 dB Bandwidth [MHz]	
		Antenna 1	Antenna 2
Low	5500	21.49	21.47
Mid	5580	21.43	21.67
High	5700	21.33	21.48
Straddle	5720	15.78	15.70
Worst		21.67	

9.3.11. 802.11n HT40 MODE IN THE 5.5 GHz BAND

Channel	Frequency [MHz]	26 dB Bandwidth [MHz]	
		Antenna 1	Antenna 2
Low	5510	39.65	39.67
Mid	5590	39.51	40.02
High	5670	39.61	39.78
Straddle	5710	34.83	34.88
Worst		40.02	

9.3.12. 802.11ac VHT80 MODE IN THE 5.5 GHz BAND

Channel	Frequency [MHz]	26 dB Bandwidth [MHz]	
		Antenna 1	Antenna 2
Low	5530	81.00	81.88
High	5610	80.94	82.04
Straddle	5690	75.90	76.16
Worst		82.04	

9.3.13. 802.11a MODE IN THE 5.8 GHz BAND

Channel	Frequency [MHz]	26 dB Bandwidth [MHz]	
		Antenna 1	Antenna 2
Straddle	5720	5.55	5.56
Low	5745	21.08	21.21
Mid	5785	21.09	21.30
High	5825	21.00	21.40
Worst		21.40	

9.3.14. 802.11n HT20 MODE IN THE 5.8 GHz BAND

Channel	Frequency [MHz]	26 dB Bandwidth [MHz]	
		Antenna 1	Antenna 2
Straddle	5720	5.78	5.70
Low	5745	21.55	21.39
Mid	5785	21.52	21.56
High	5825	22.78	21.97
Worst		22.78	

9.3.15. 802.11n HT40 MODE IN THE 5.8 GHz BAND

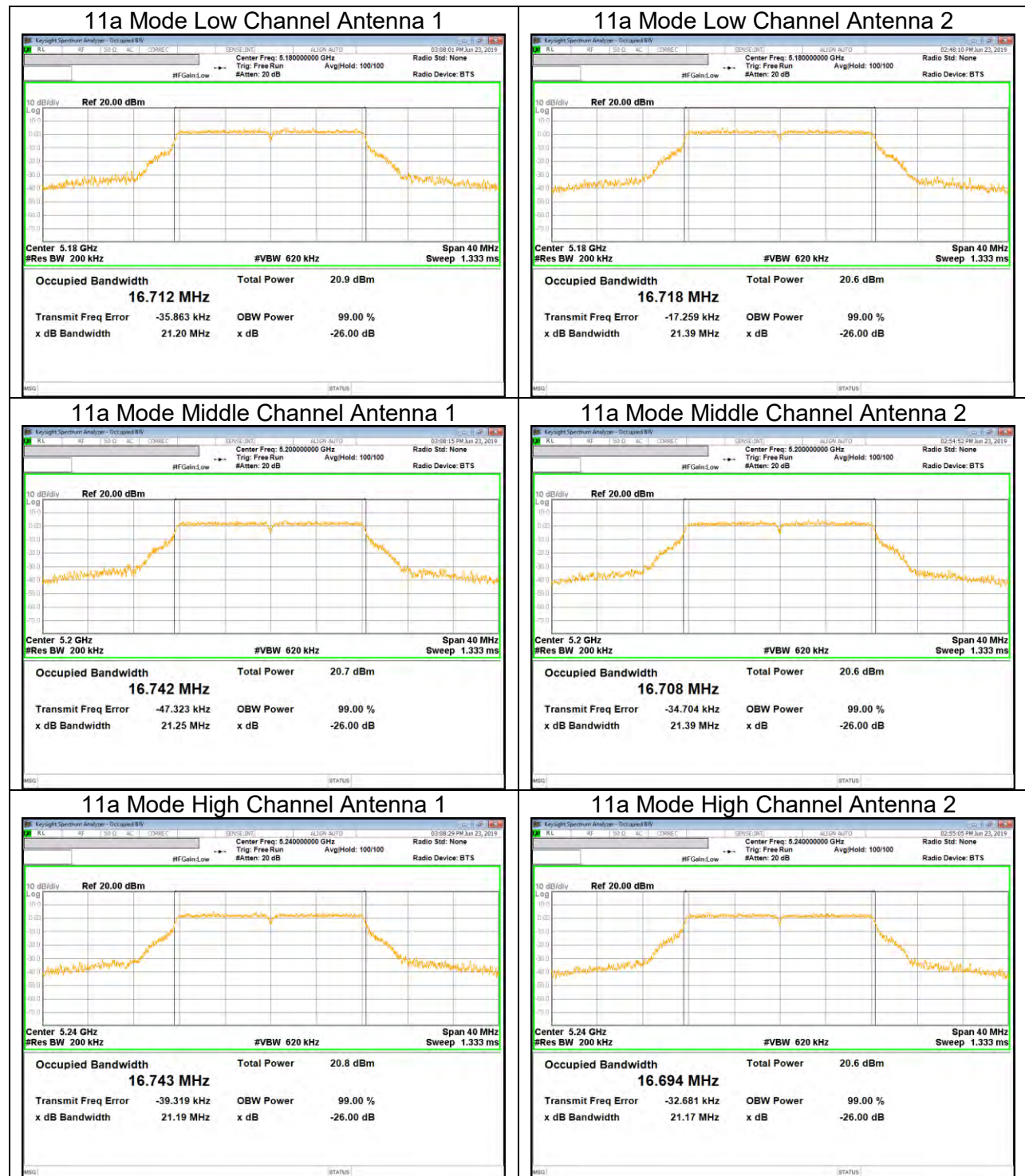
Channel	Frequency [MHz]	26 dB Bandwidth [MHz]	
		Antenna 1	Antenna 2
Straddle	5710	4.83	4.88
Low	5755	39.98	39.76
High	5795	39.63	39.93
Worst		39.98	

9.3.16. 802.11ac VHT80 MODE IN THE 5.8 GHz BAND

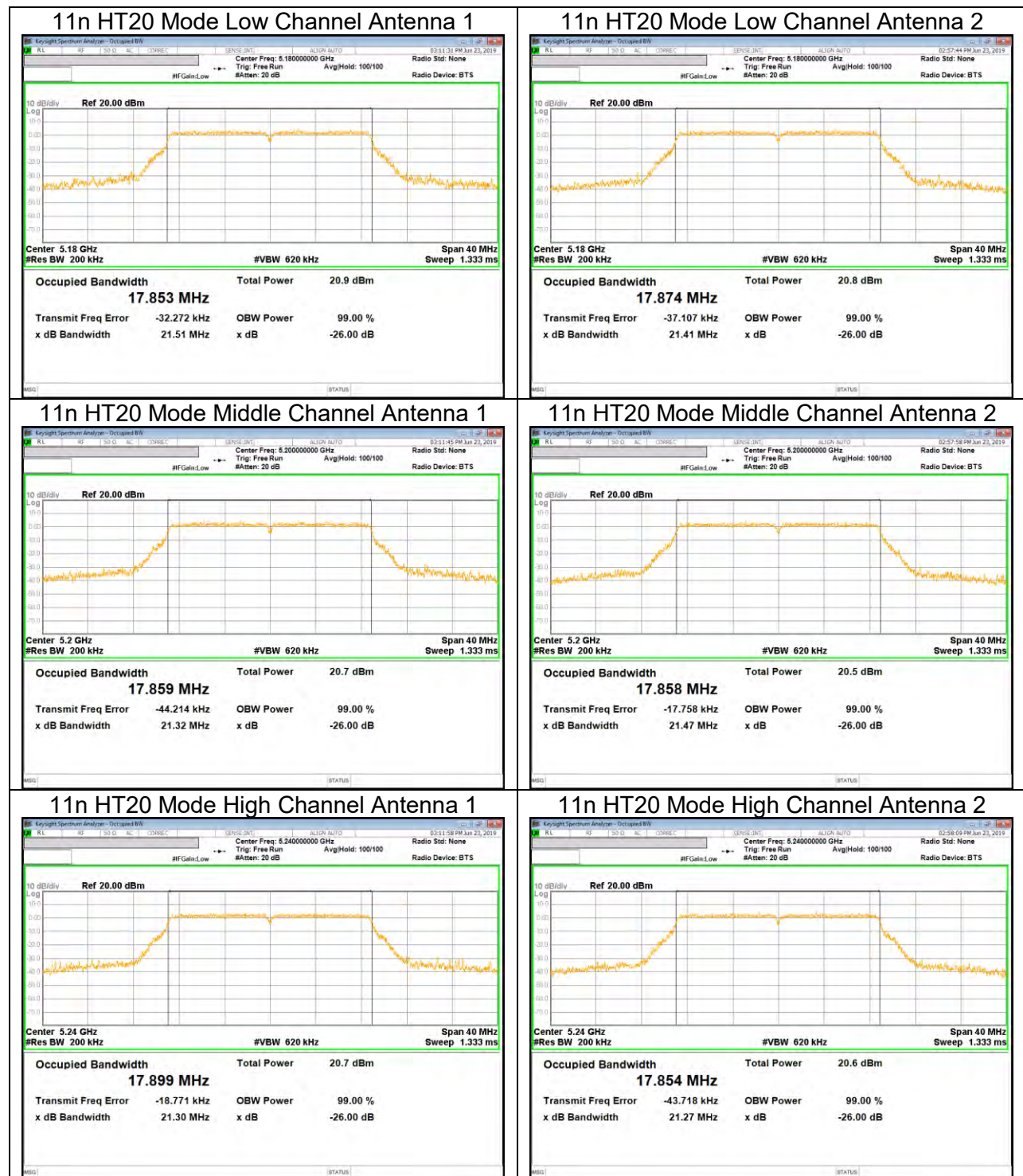
Channel	Frequency [MHz]	26 dB Bandwidth [MHz]	
		Antenna 1	Antenna 2
Straddle	5690	5.90	6.16
Middle	5775	81.65	81.78
Worst		81.78	

9.3.17. 26 dB BANDWIDTH PLOTS

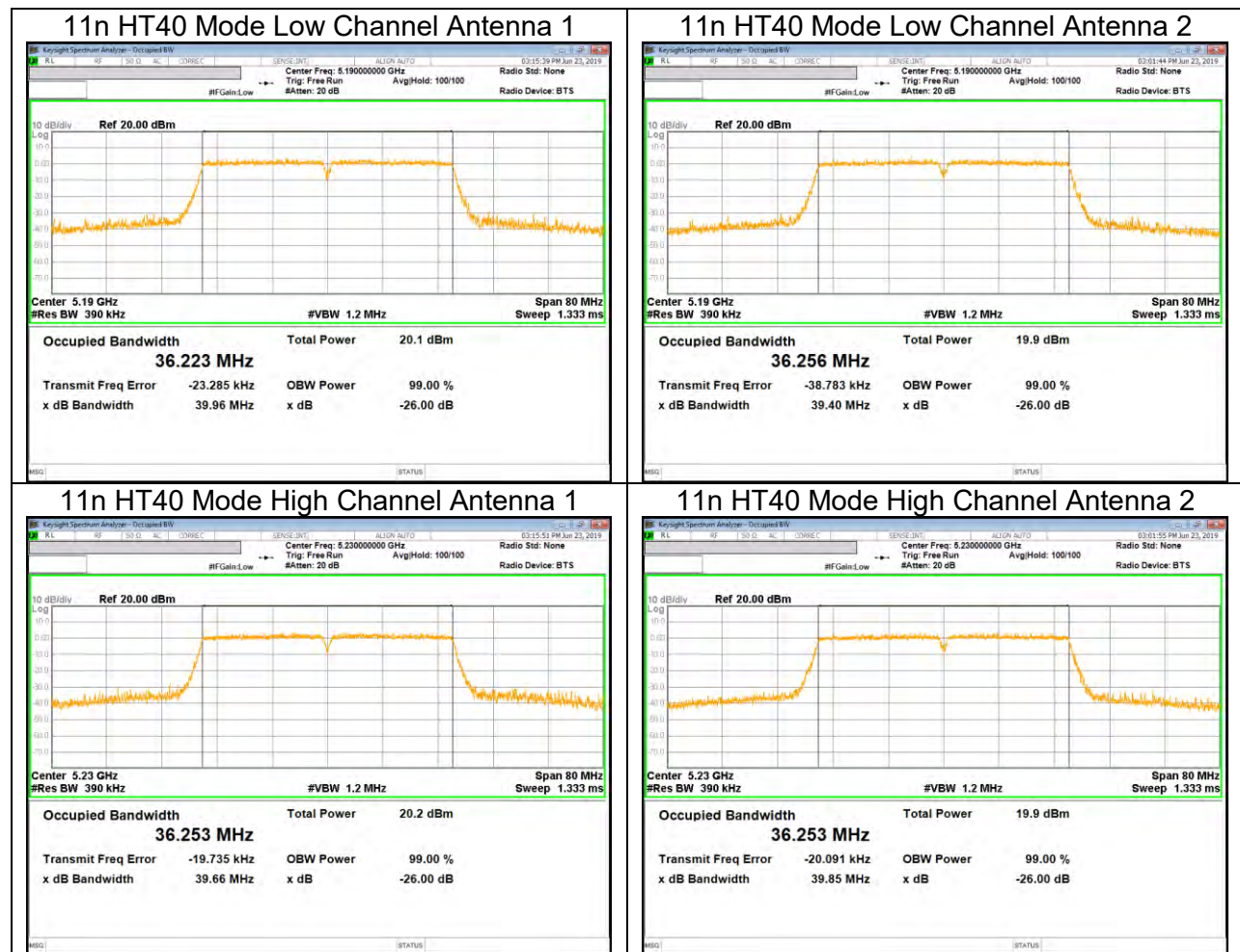
UNII 5.2 GHz IEEE 802.11a mode



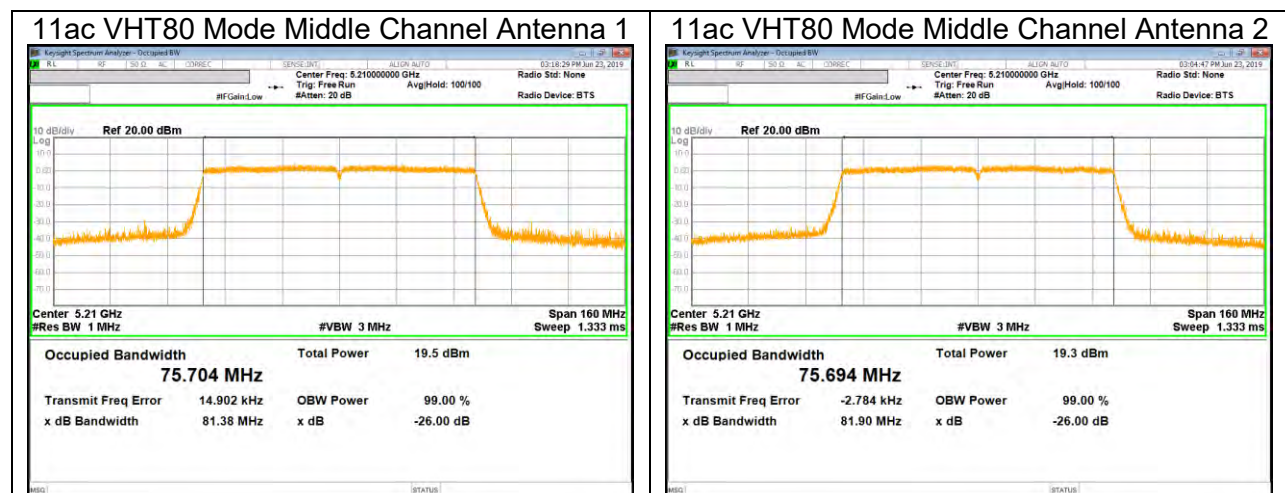
UNII 5.2 GHz IEEE 802.11n HT20 mode



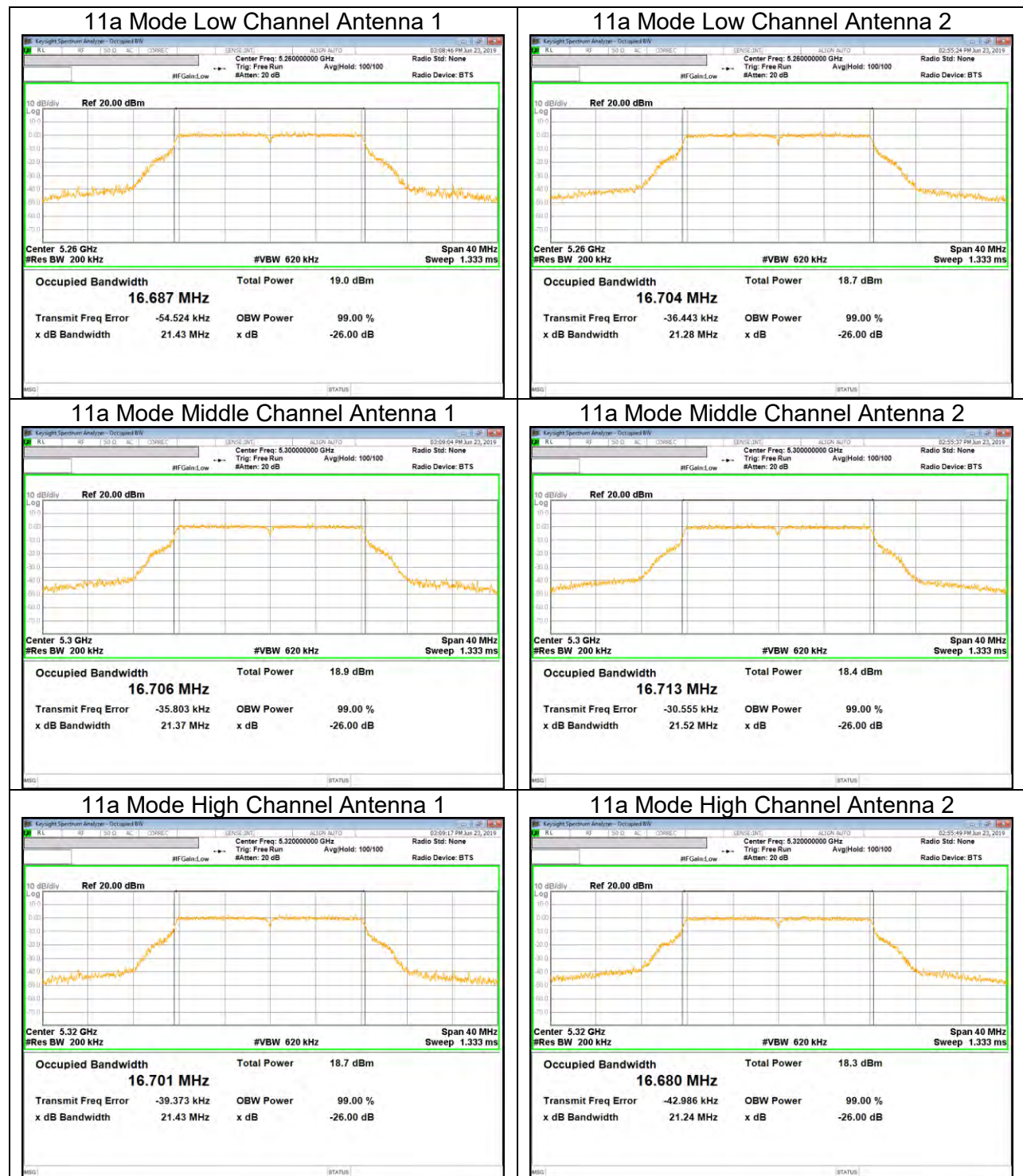
UNII 5.2 GHz IEEE 802.11n HT40 mode



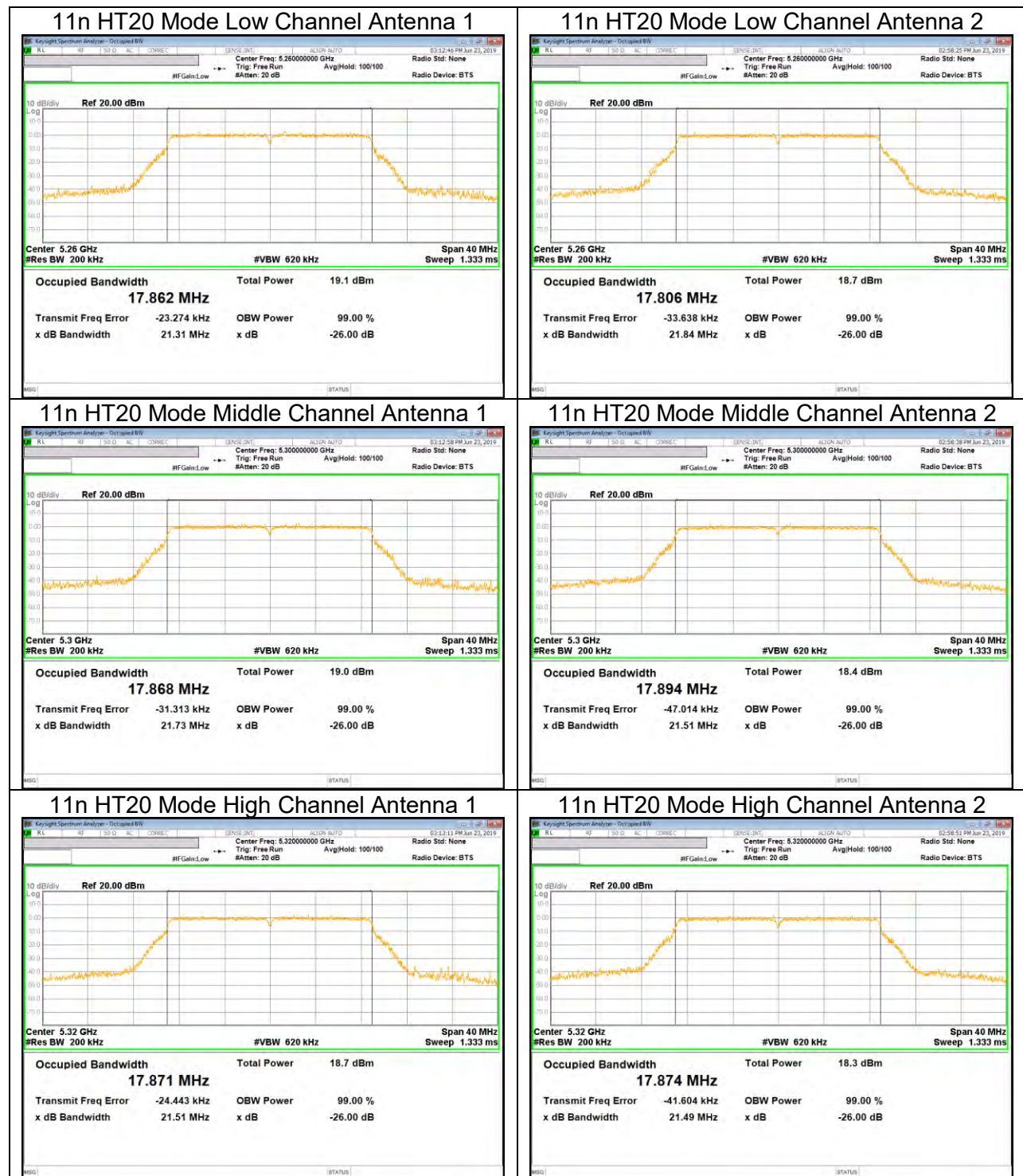
UNII 5.2 GHz IEEE 802.11ac VHT80 mode



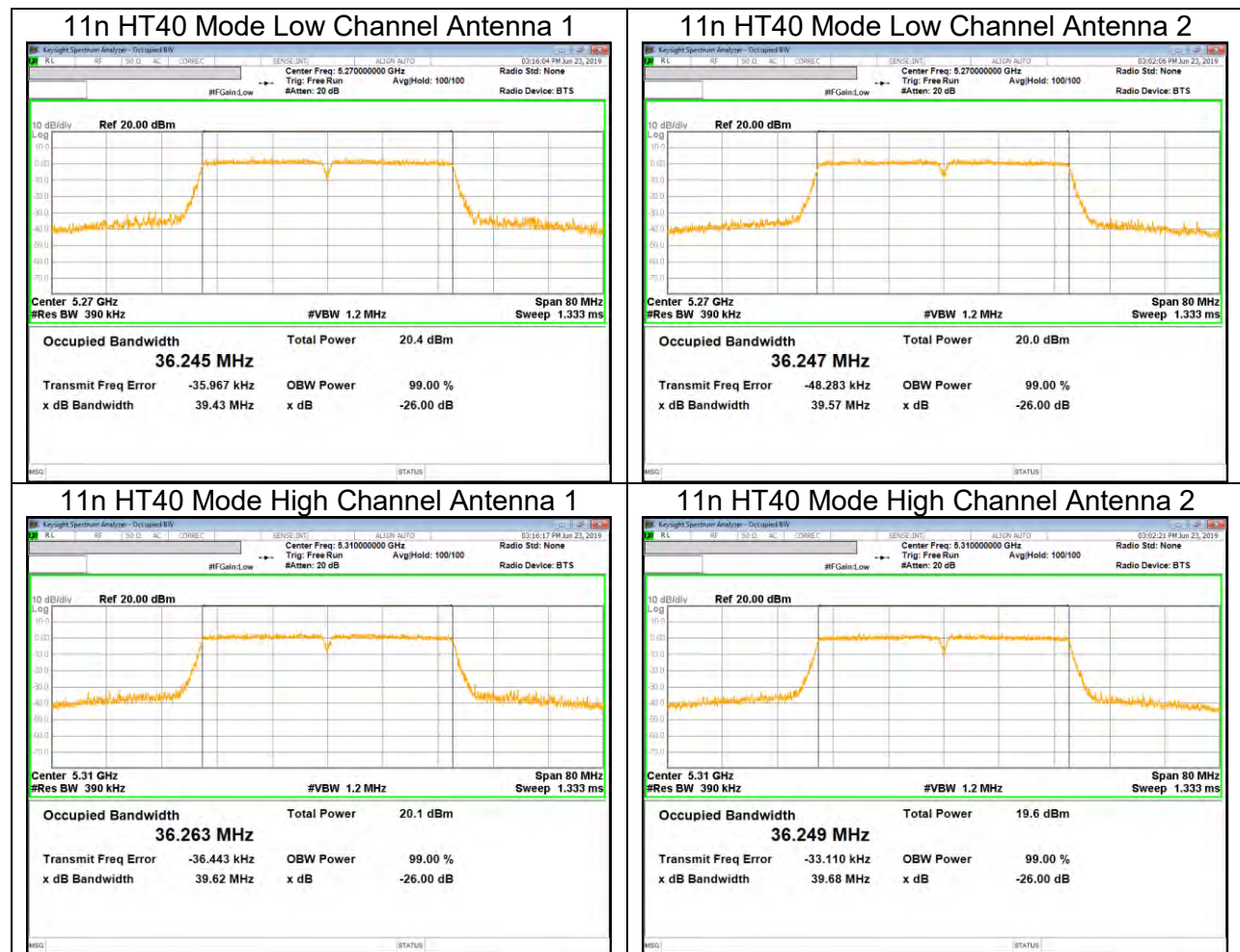
UNII 5.3 GHz IEEE 802.11a mode



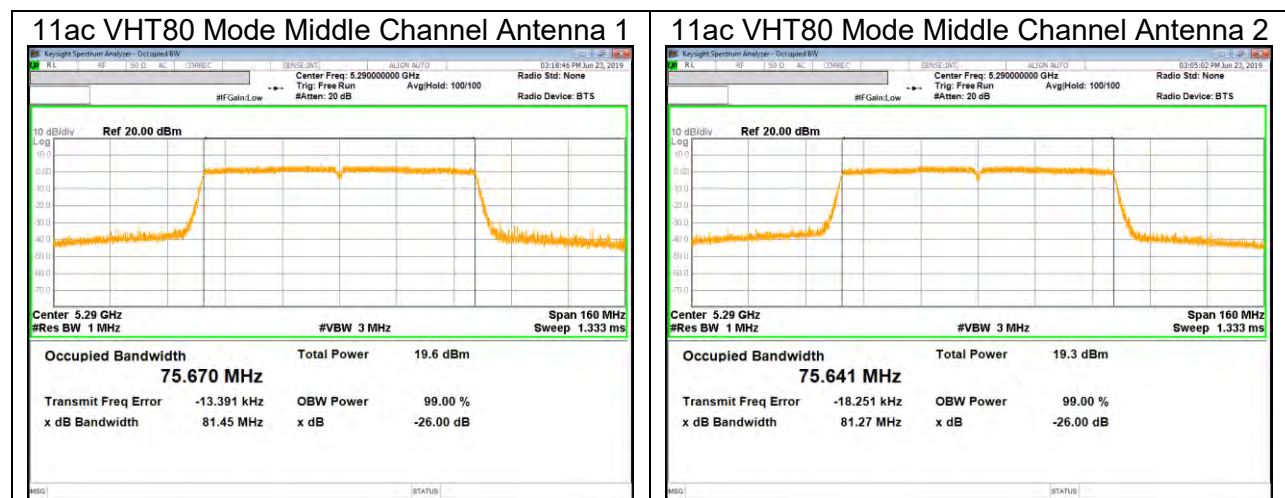
UNII 5.3 GHz IEEE 802.11n HT20 mode



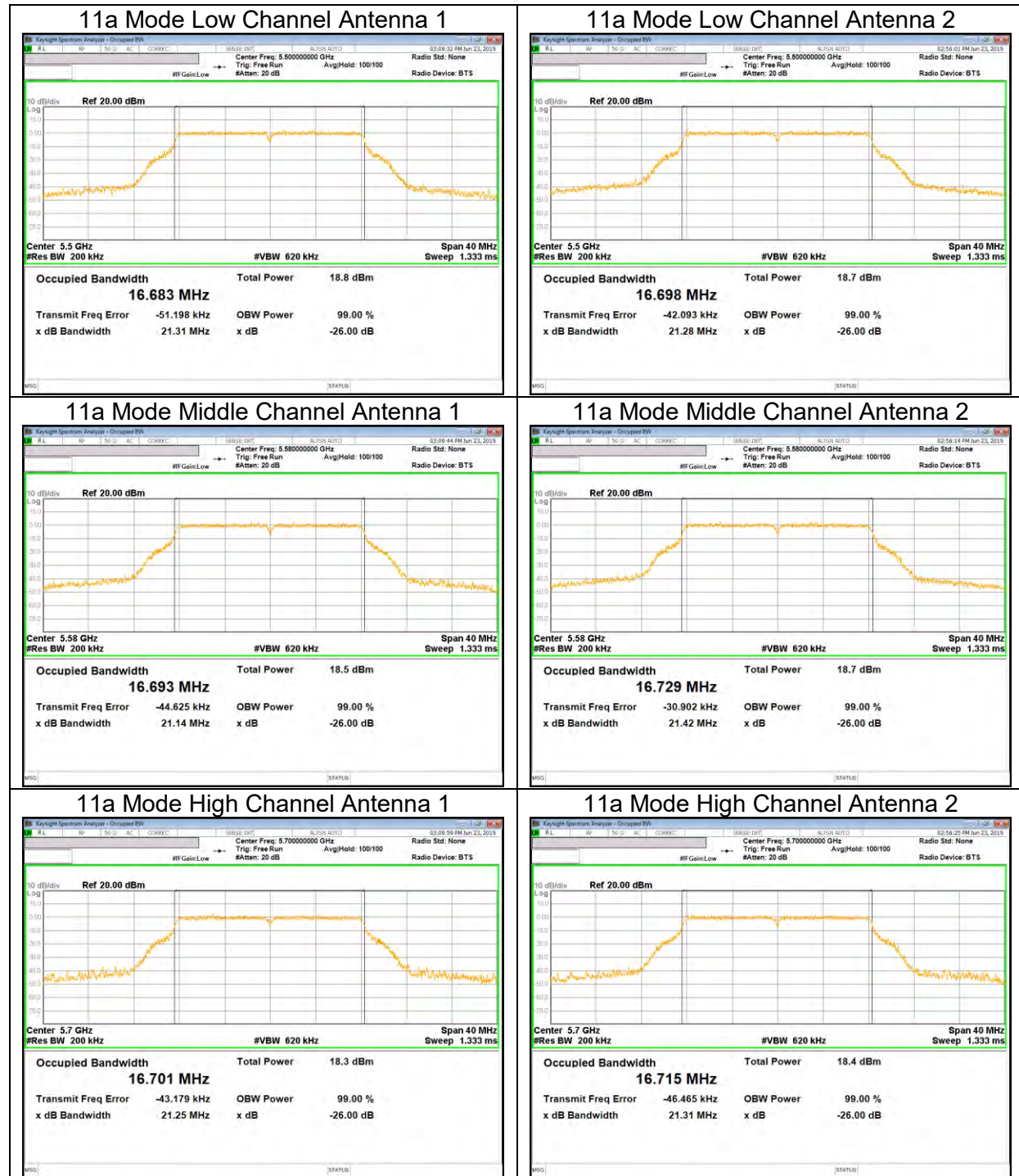
UNII 5.3 GHz IEEE 802.11n HT40 mode

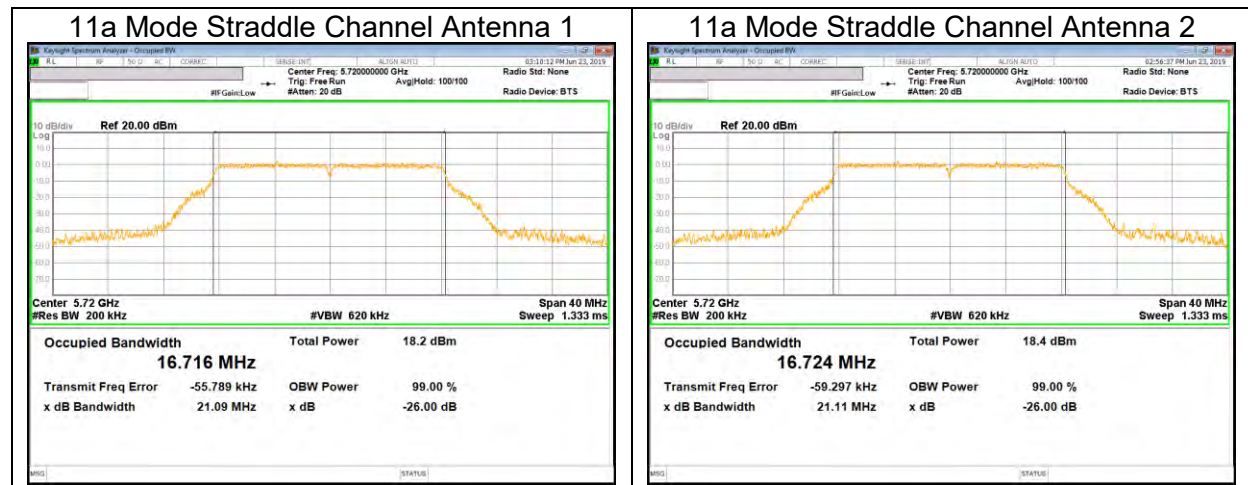


UNII 5.3 GHz IEEE 802.11ac VHT80 mode

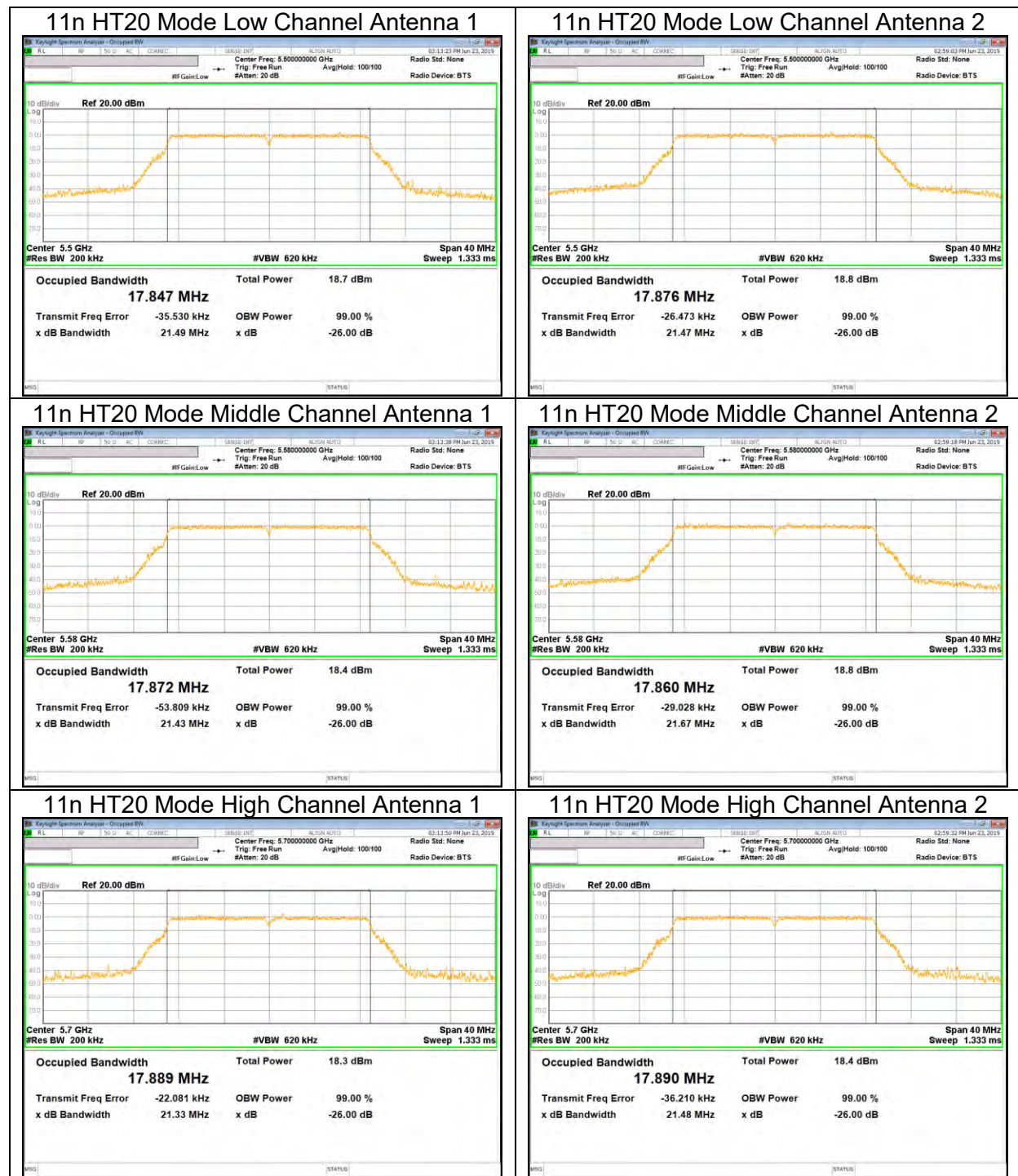


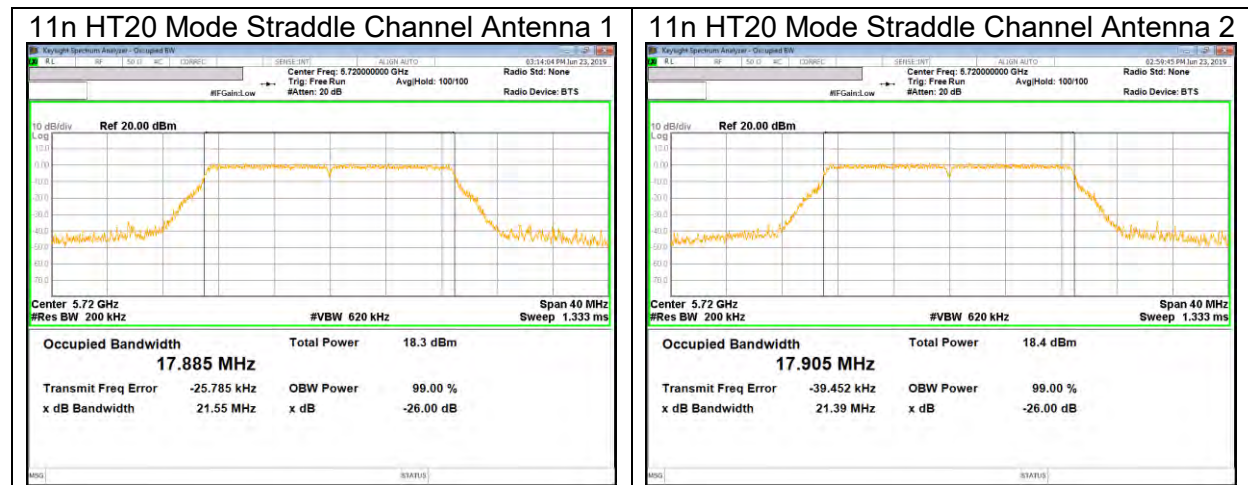
UNII 5.5 GHz IEEE 802.11a mode



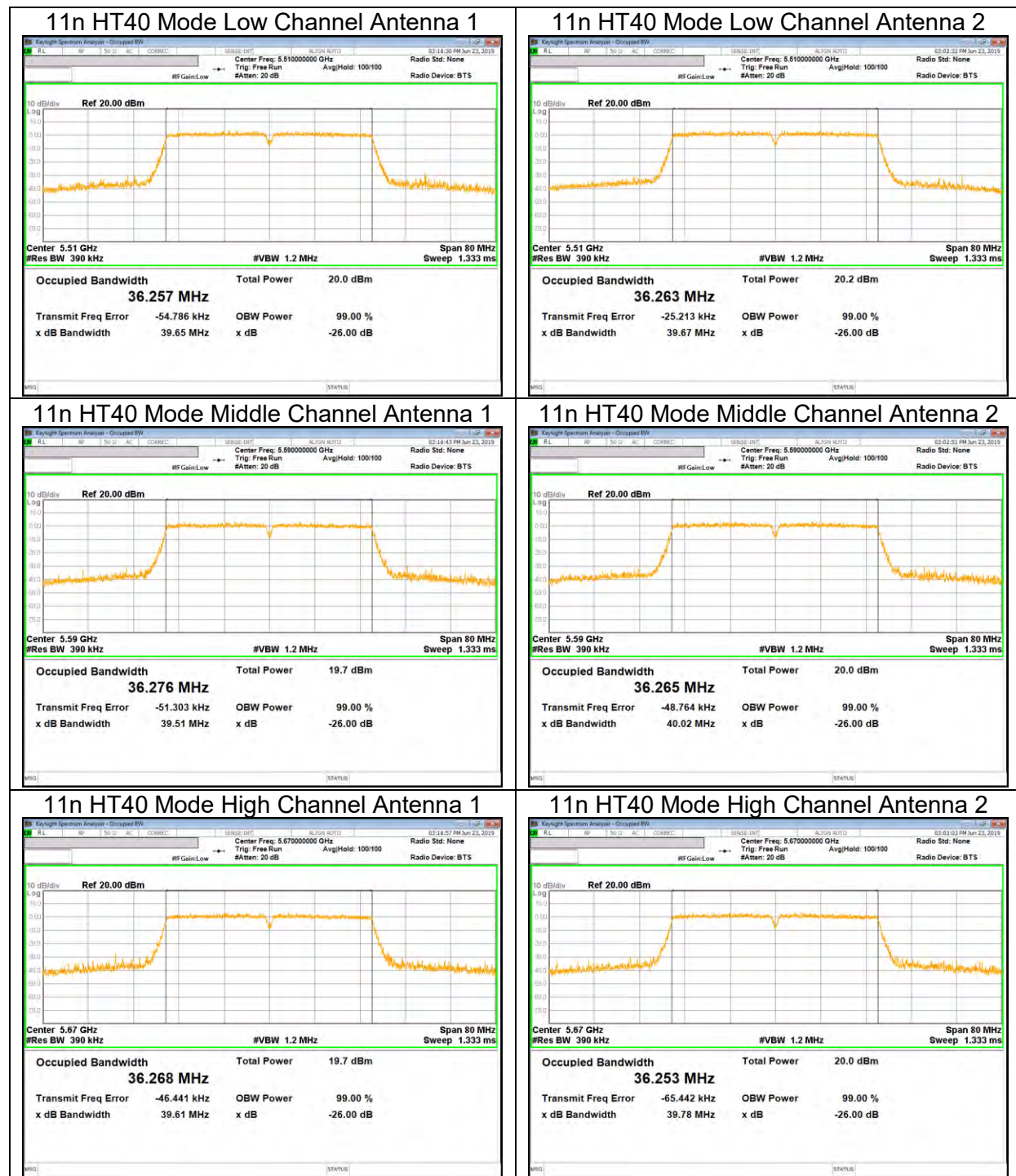


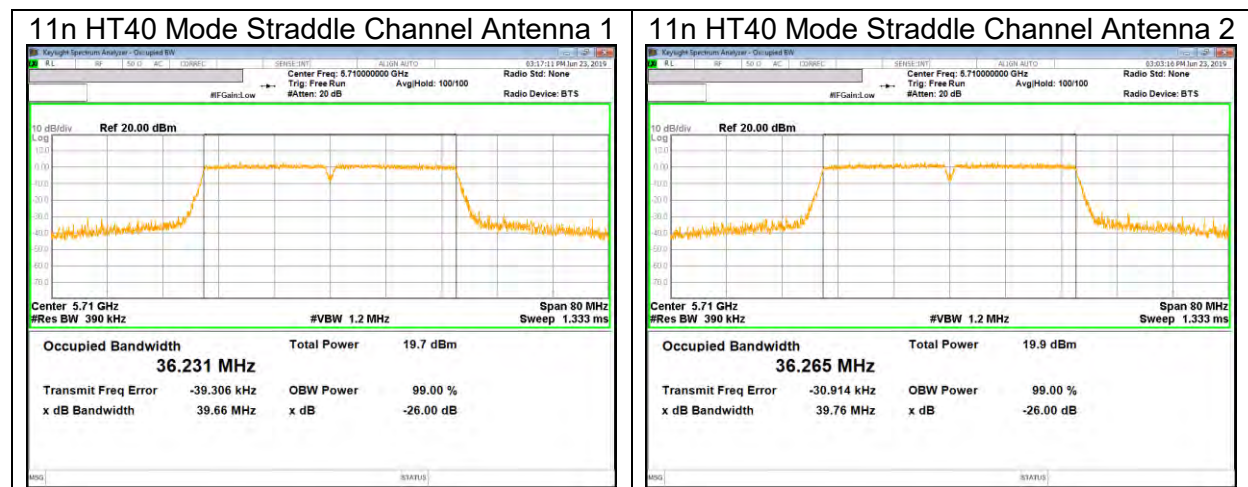
UNII 5.5 GHz IEEE 802.11n HT20 mode



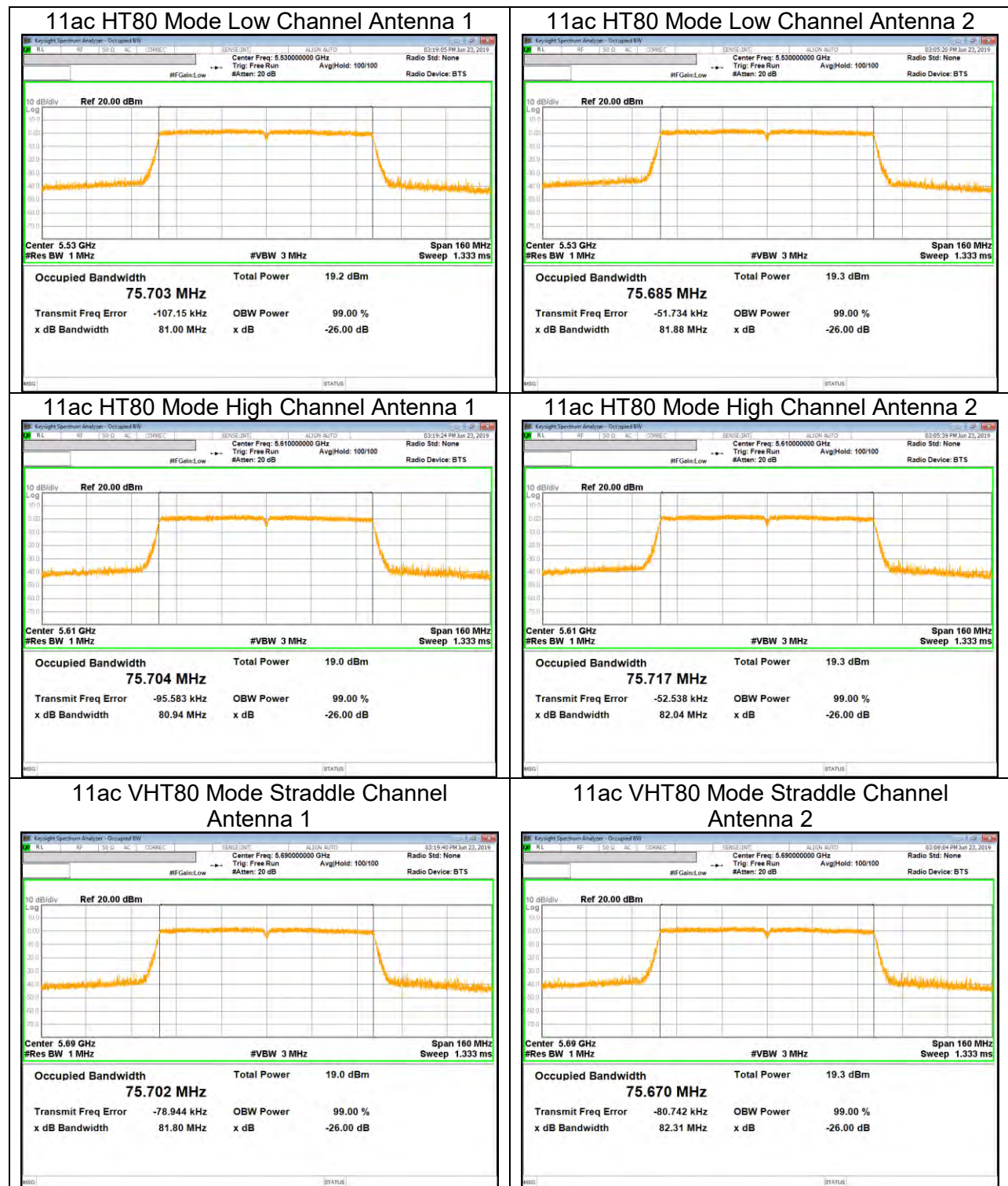


UNII 5.5 GHz IEEE 802.11n HT40 mode

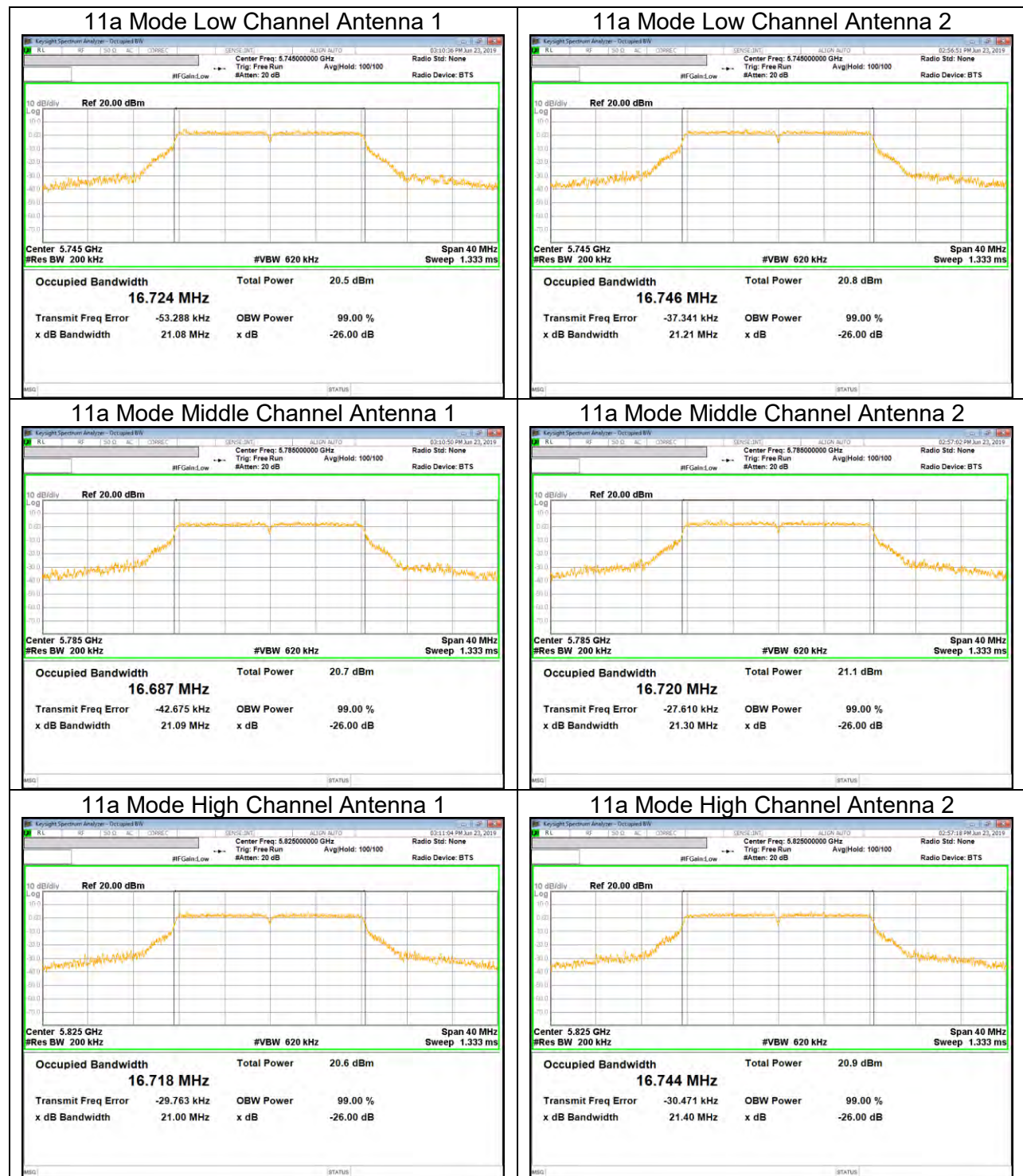




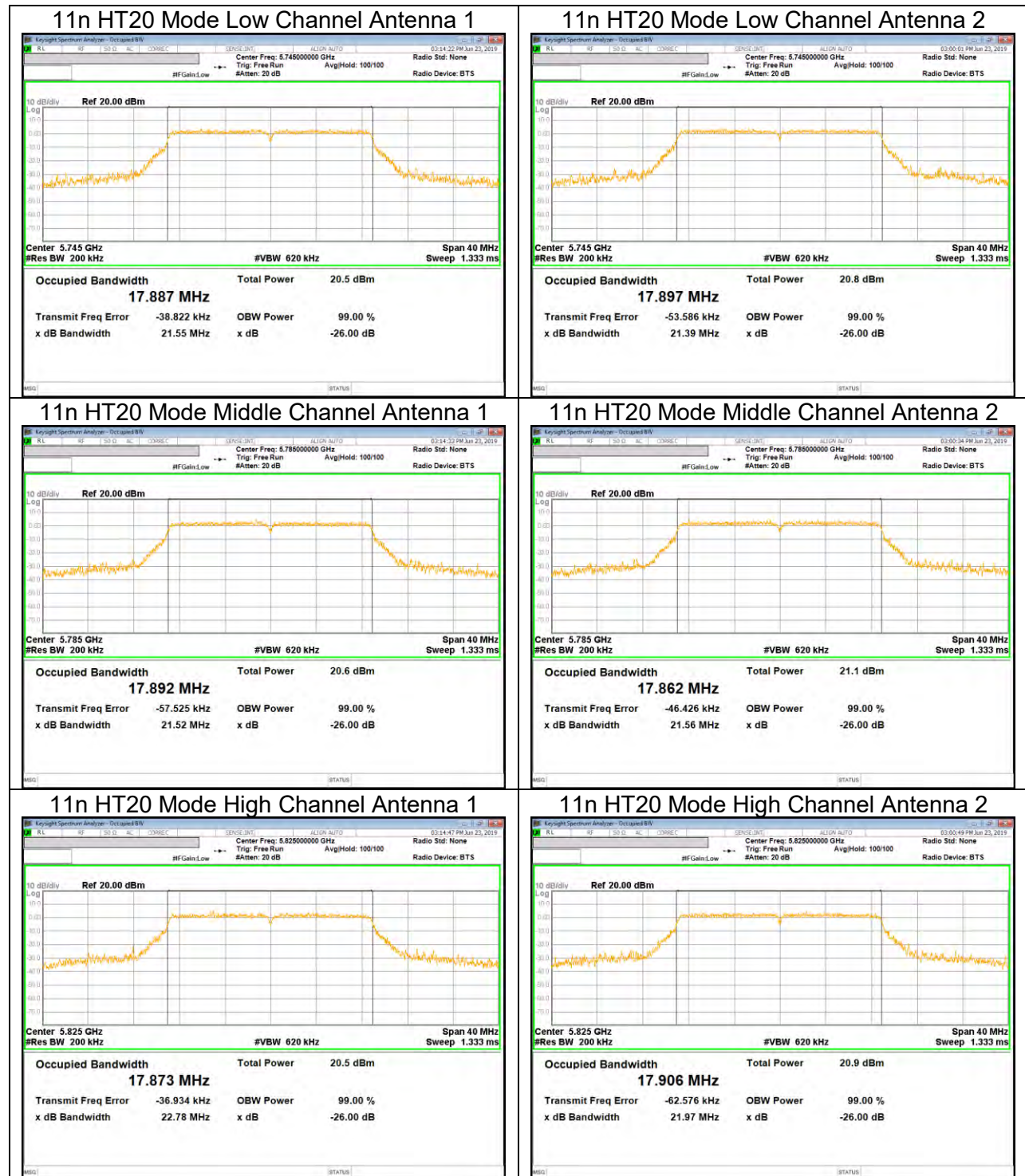
UNII 5.5 GHz IEEE 802.11ac VHT80 mode



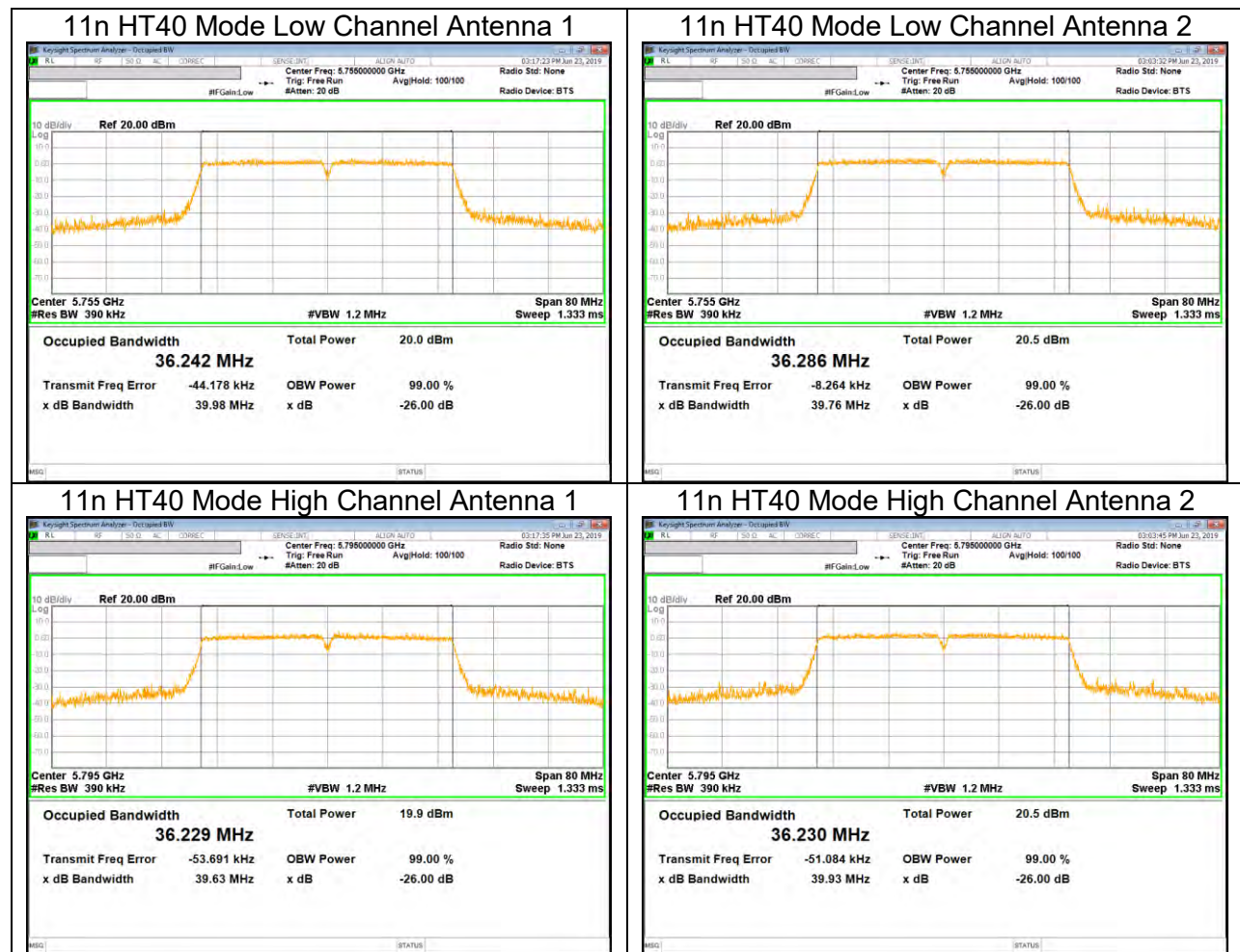
UNII 5.8 GHz IEEE 802.11a mode



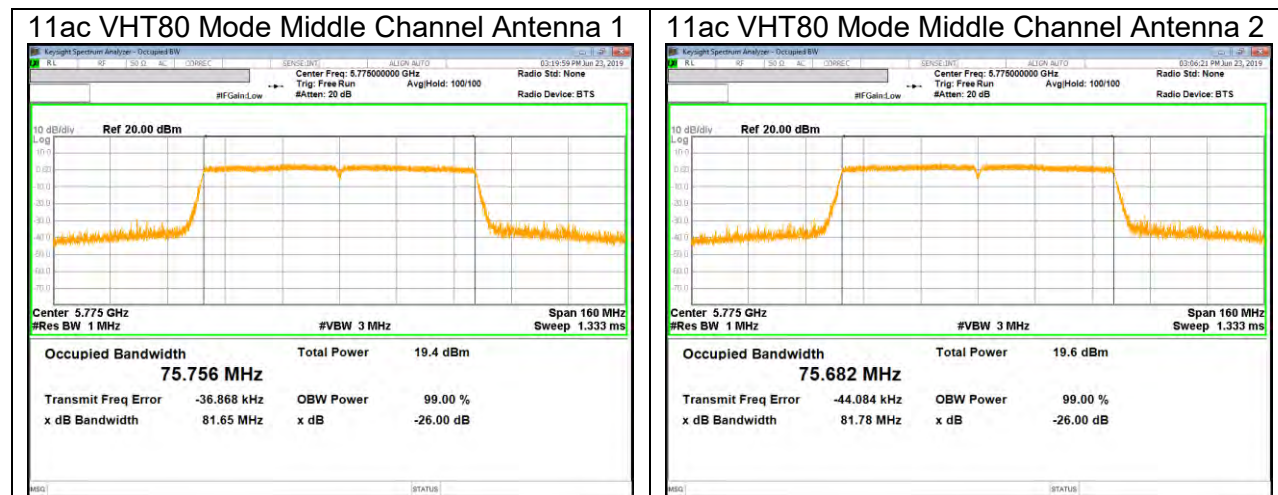
UNII 5.8 GHz IEEE 802.11n HT20 mode



UNII 5.8 GHz IEEE 802.11n HT40 mode



UNII 5.8 GHz IEEE 802.11ac VHT80 mode



10. ANTENNA PORT TEST RESULTS

10.1. 6 dB BANDWIDTH

LIMITS

FCC §15.407

The minimum 6 dB bandwidth shall be at least 500 kHz.

TEST PROCEDURE

Reference to 789033 D02 General UNII Test Procedures New Rules v02r01: The transmitter output is connected to a spectrum analyzer with the RBW set to 100kHz, the VBW $\geq 3 \times$ RBW, peak detector and max hold.

NOTE

- Calculation for 6dB Bandwidth of UNII-3 Straddle Channel

ex) Fundamental frequency : 5720MHz

- o 6dB BW : 16.350MHz
- o Starting Frequency of UNII-3 band : 5725MHz
- o 6dB Bandwidth of UNII-3 band Portion
 $= (5720 + (16.350 / 2) - 5725) = 3.175 \text{ MHz}$

RESULTS

10.1.1. 802.11a MODE IN THE 5.8 GHz BAND

Channel	Frequency [MHz]	6 dB Bandwidth [MHz]		Minimum Limit [MHz]
		Antenna 1	Antenna 2	
Straddle	5720	3.22	3.23	0.5
Low	5745	16.36	16.48	
Mid	5785	16.36	16.37	
High	5825	16.38	16.40	
Worst		3.22		

10.1.2. 802.11n HT20 MODE IN THE 5.8 GHz BAND

Channel	Frequency [MHz]	6 dB Bandwidth [MHz]		Minimum Limit [MHz]
		Antenna 1	Antenna 2	
Straddle	5720	3.80	3.81	0.5
Low	5745	17.58	17.58	
Mid	5785	17.61	17.59	
High	5825	17.61	17.60	
Worst		3.80		

10.1.3. 802.11n HT40 MODE IN THE 5.8 GHz BAND

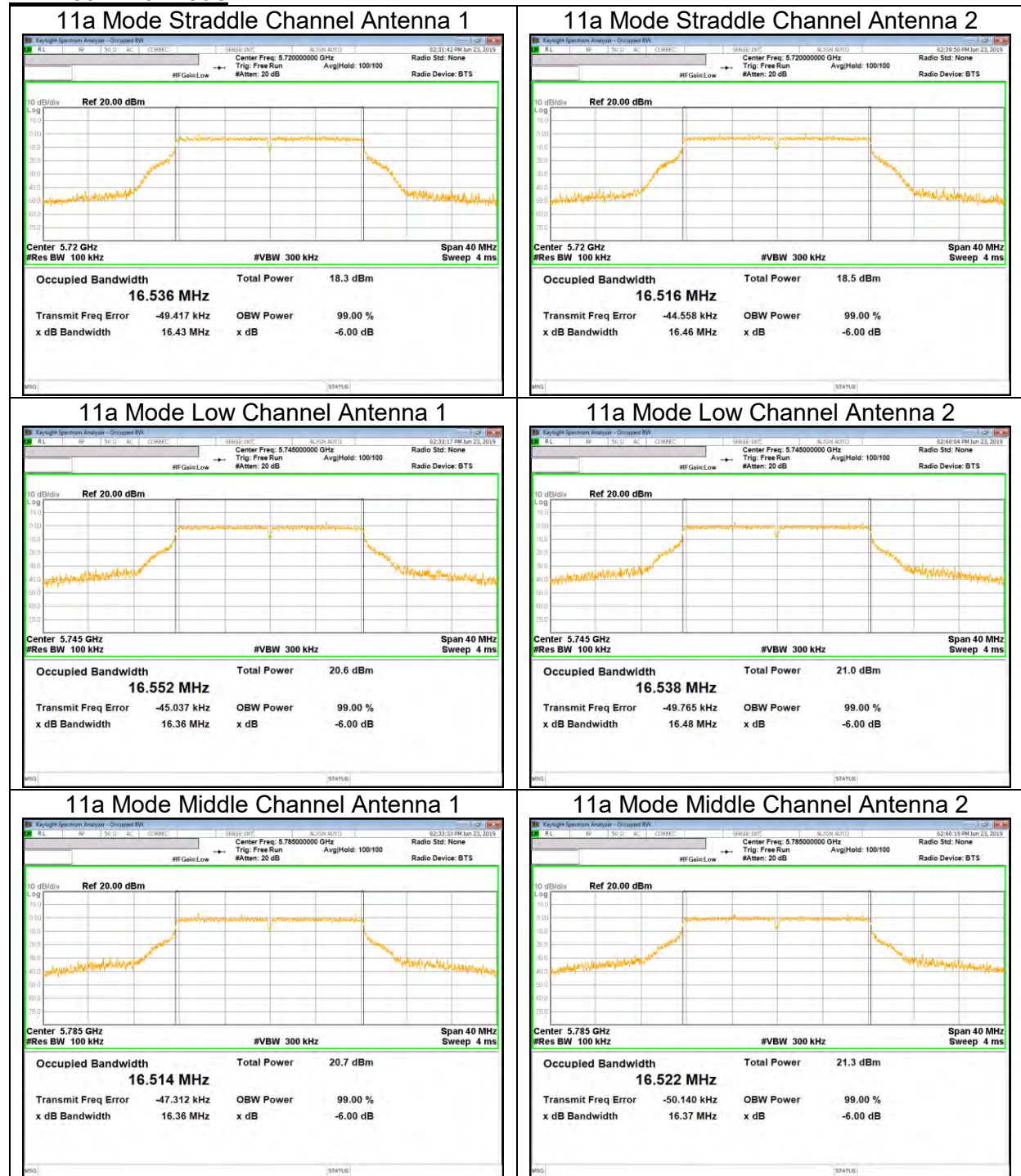
Channel	Frequency [MHz]	6 dB Bandwidth [MHz]		Minimum Limit [MHz]
		Antenna 1	Antenna 2	
Straddle	5710	3.18	3.17	0.5
Low	5755	36.32	36.34	
High	5795	36.34	36.34	
Worst		3.17		

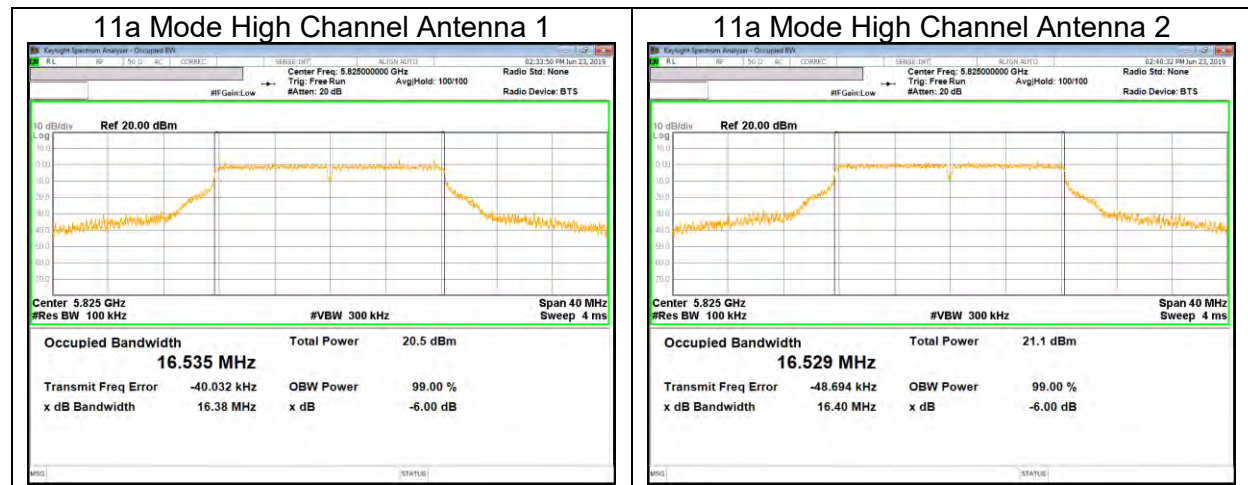
10.1.4. 802.11ac VHT80 MODE IN THE 5.8 GHz BAND

Channel	Frequency [MHz]	6 dB Bandwidth [MHz]		Minimum Limit [MHz]
		Antenna 1	Antenna 2	
Straddle	5690	3.06	2.72	0.5
Middle	5775	75.92	76.30	
Worst		2.72		

10.1.5. 6 dB BANDWIDTH PLOTS

IEEE 802.11a mode



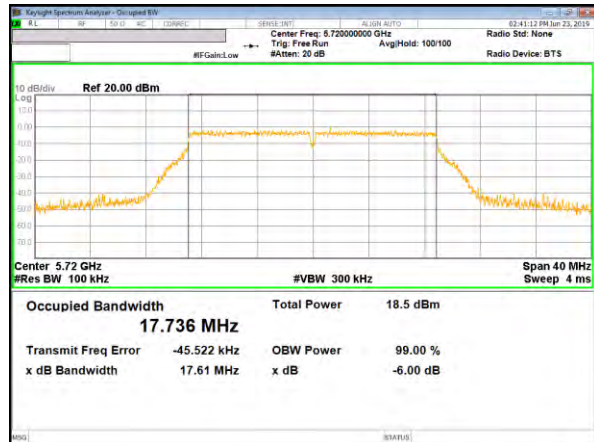


IEEE 802.11n HT20 mode

11n HT20 Mode Straddle Channel Antenna 1



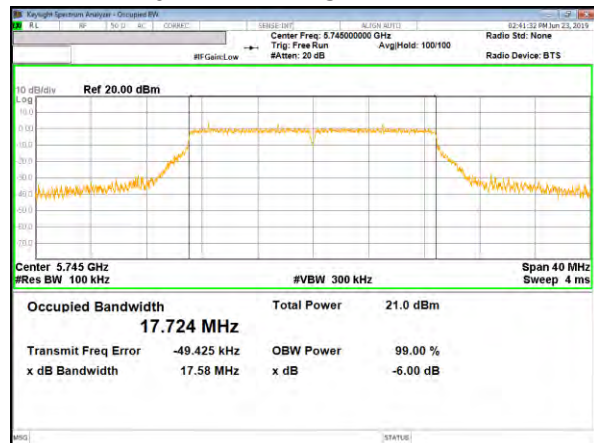
11n HT20 Mode Straddle Channel Antenna 2



11n HT20 Mode Low Channel Antenna 1



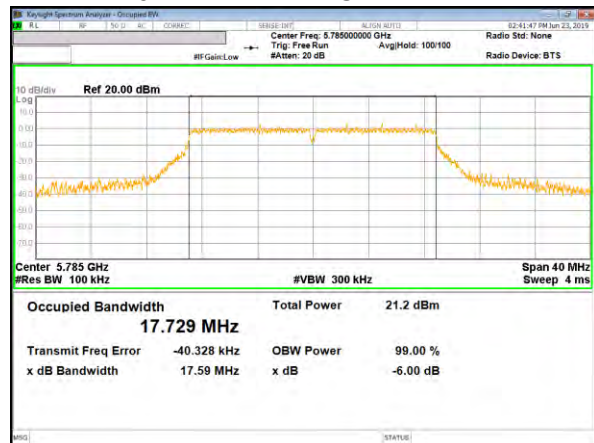
11n HT20 Mode Low Channel Antenna 2

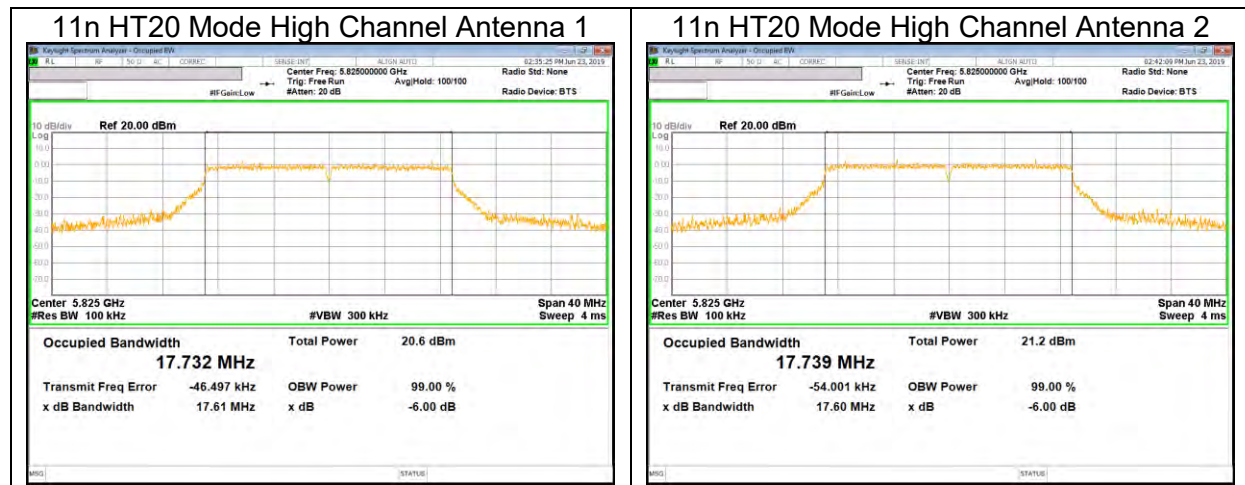


11n HT20 Mode Middle Channel Antenna 1

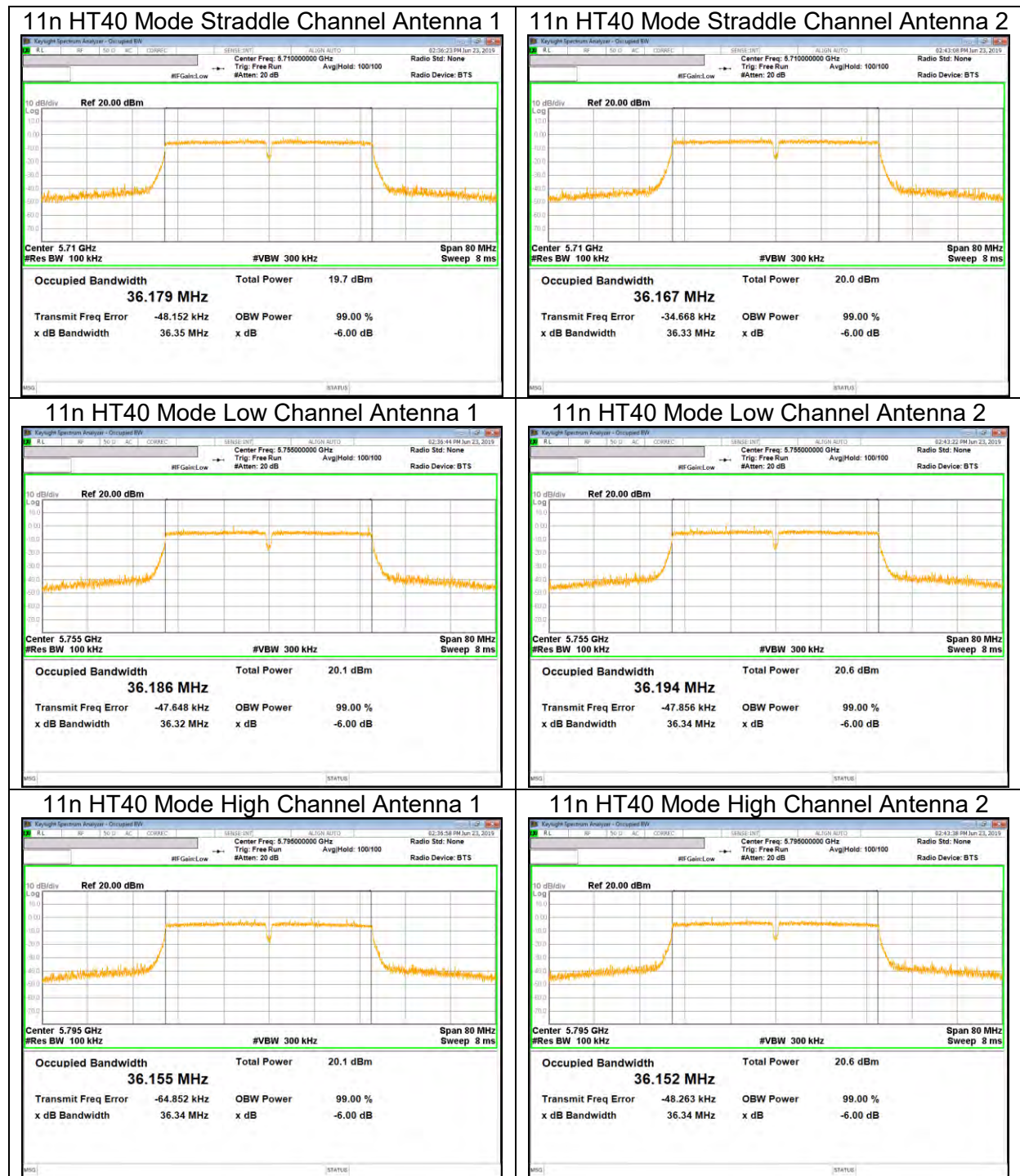


11n HT20 Mode Middle Channel Antenna 2

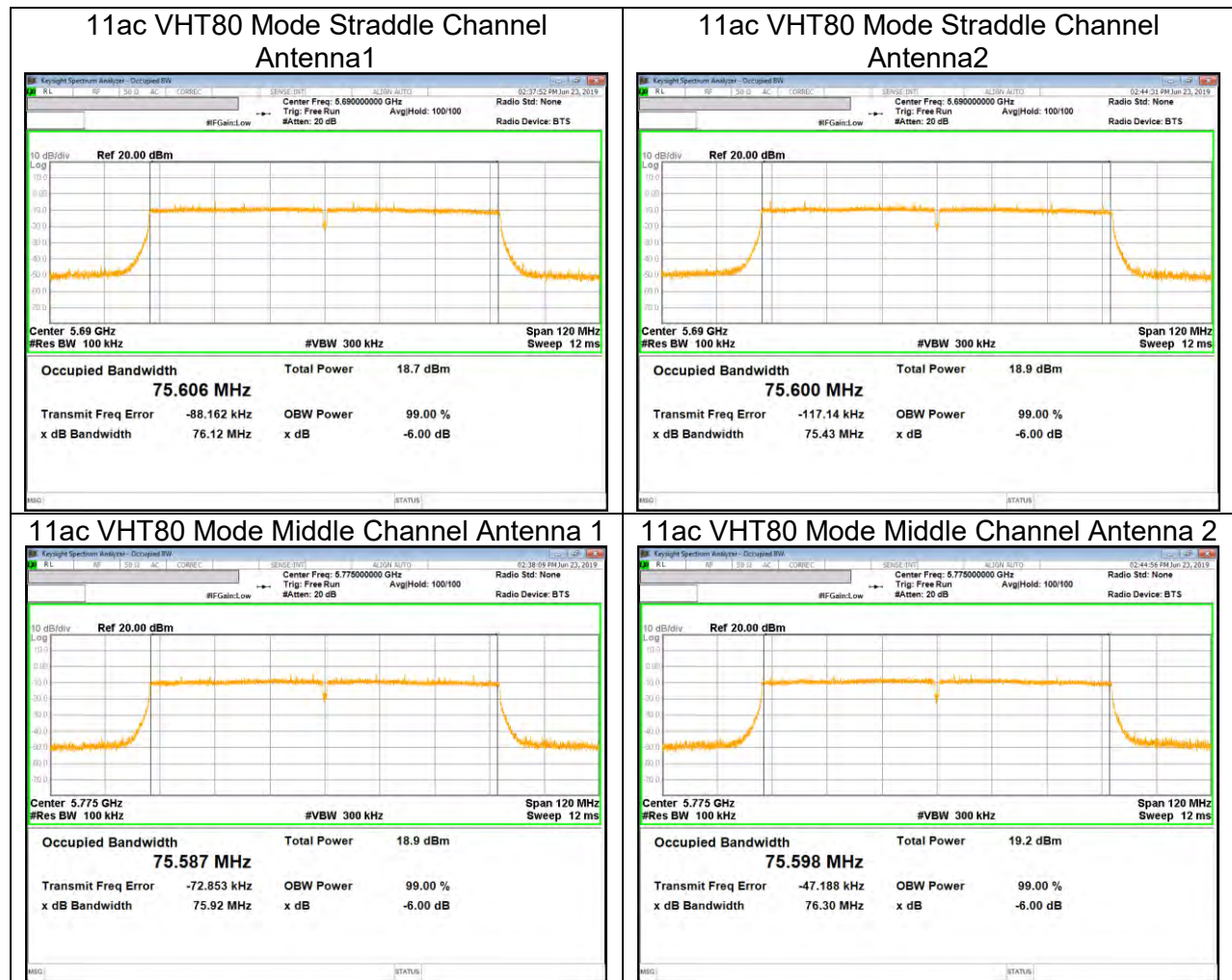




IEEE 802.11n HT40 mode



IEEE 802.11ac VHT80 mode



10.2. OUTPUT POWER AND PPSD

LIMITS

FCC §15.407 (a) (1) (2) (3)

FCC

For the band 5.15–5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250 mW or $11 \text{ dBm} + 10 \log B$, where B is the 26dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 11 dBm in any 1–MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak 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 $11 \text{ dBm} + 10 \log B$, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band.

TEST PROCEDURE

KDB 789033 Method PM is used for output power.

KDB 789033 Method SA-2 is used for only power of straddle Ch. and PPSD. RBW set to 1MHz(500kHz for the band 5.725-5.85 GHz, the VBW $\geq 3 \times \text{RBW}$, RMS detector and trace averaging). Band power function used for power and peak marker value of the spectrum is used for PSD.

DIRECTIONAL ANTENNA GAIN

For OUTPUT POWER and PSD: The TX chains are correlated and the antenna gains are unequal among the chains. The directional gain is:

Frequency Range [MHz]	Antenna 1 Gain[dBi]	Antenna 2 Gain[dBi]	Correlated Chains Directional Gain [dBi]
UNII 1	-8.40	-4.10	-2.98
UNII 2A	-6.60	-5.80	-3.18
UNII 2C	-5.80	-6.50	-3.13
UNII 3	-7.10	-6.80	-3.94

RESULTS

10.2.1. 802.11a MODE IN THE 5.2 GHz BAND

Bandwidth and Antenna Gain

Portion	Frequency [MHz]	Min 26 dB BW [MHz]	Directional Gain for Power [dBi]	Directional Gain for PPSD [dBi]
Low	5180	21.20	-2.98	-2.98
Mid	5200	21.25	-2.98	-2.98
High	5240	21.17	-2.98	-2.98

Limits

Portion	Frequency [MHz]	FCC Power Limit [dBm]	Power Limit [dBm]	FCC PPSD Limit [dBm/MHz]	PPSD Limit [dBm/MHz]
Low	5180	24.00	24.00	11.00	11.00
Mid	5200	24.00	24.00	11.00	11.00
High	5240	24.00	24.00	11.00	11.00

Duty Cycle CF [dB]	0.00	Included in Calculations of Corr'd Power & PPSD
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Output Power Results

Portion	Frequency [MHz]	Antenna 1 Meas Power [dBm]	Antenna 2 Meas Power [dBm]	Total Corr'd Power [dBm]	Power Limit [dBm]	Power Margin [dB]
Low	5180	16.31	16.07	19.20	24.00	-4.80
Mid	5200	16.21	15.96	19.10	24.00	-4.90
High	5240	16.15	15.88	19.03	24.00	-4.97

PPSD Results

Channel	Frequency [MHz]	Antenna 1 Meas PPSD [dBm/MHz]	Antenna 2 Meas PPSD [dBm/MHz]	Total Corr'd PPSD [dBm/MHz]	PPSD Limit [dBm/MHz]	PPSD Margin [dB]
Low	5180	4.67	4.32	7.51	11.00	-3.49
Mid	5200	4.28	4.09	7.20	11.00	-3.80
High	5240	4.56	4.40	7.49	11.00	-3.51

10.2.2. 802.11n HT20 MODE IN THE 5.2 GHz BAND

Bandwidth and Antenna Gain

Portion	Frequency [MHz]	Min 26 dB BW [MHz]	Directional Gain for Power [dBi]	Directional Gain for PPSP [dBi]
Low	5180	21.41	-2.98	-2.98
Mid	5200	21.32	-2.98	-2.98
High	5240	21.27	-2.98	-2.98

Limits

Portion	Frequency [MHz]	FCC Power Limit [dBm]	Power Limit [dBm]	FCC PPSP Limit [dBm/MHz]	PPSP Limit [dBm/MHz]
Low	5180	24.00	24.00	11.00	11.00
Mid	5200	24.00	24.00	11.00	11.00
High	5240	24.00	24.00	11.00	11.00

Duty Cycle CF [dB]	0.00	Included in Calculations of Corr'd Power & PPSP
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Output Power Results

Portion	Frequency [MHz]	Antenna 1 Meas Power [dBm]	Antenna 2 Meas Power [dBm]	Total Corr'd Power [dBm]	Power Limit [dBm]	Power Margin [dB]
Low	5180	16.25	16.06	19.17	24.00	-4.83
Mid	5200	16.18	15.98	19.09	24.00	-4.91
High	5240	16.17	15.84	19.02	24.00	-4.98

PPSP Results

Channel	Frequency [MHz]	Antenna 1 Meas PPSP [dBm/MHz]	Antenna 2 Meas PPSP [dBm/MHz]	Total Corr'd PPSP [dBm/MHz]	PPSP Limit [dBm/MHz]	PPSP Margin [dB]
Low	5180	4.42	4.17	7.31	11.00	-3.69
Mid	5200	4.02	4.03	7.04	11.00	-3.96
High	5240	4.08	4.02	7.06	11.00	-3.94

10.2.3. 802.11n HT40 MODE IN THE 5.2 GHz BAND

Bandwidth and Antenna Gain

Portion	Frequency [MHz]	Min 26 dB BW [MHz]	Directional Gain for Power [dBi]	Directional Gain for PPSD [dBi]
Low	5190	39.40	-2.98	-2.98
High	5230	39.66	-2.98	-2.98

Limits

Portion	Frequency [MHz]	FCC Power Limit [dBm]	Power Limit [dBm]	FCC PPSD Limit [dBm/MHz]	PPSD Limit [dBm/MHz]
Low	5190	24.00	24.00	11.00	11.00
High	5230	24.00	24.00	11.00	11.00

Duty Cycle CF [dB]	0.00	Included in Calculations of Corr'd Power & PPSD
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Output Power Results

Portion	Frequency [MHz]	Antenna 1 Meas Power [dBm]	Antenna 2 Meas Power [dBm]	Total Corr'd Power [dBm]	Power Limit [dBm]	Power Margin [dB]
Low	5190	15.49	15.25	18.38	24.00	-5.62
High	5230	15.41	15.15	18.29	24.00	-5.71

PPSD Results

Channel	Frequency [MHz]	Antenna 1 Meas PPSD [dBm/MHz]	Antenna 2 Meas PPSD [dBm/MHz]	Total Corr'd PPSD [dBm/MHz]	PPSD Limit [dBm/MHz]	PPSD Margin [dB]
Low	5190	0.24	0.53	3.40	11.00	-7.60
High	5230	0.63	0.38	3.52	11.00	-7.48

10.2.4. 802.11ac VHT80 MODE IN THE 5.2 GHz BAND

Bandwidth and Antenna Gain

Portion	Frequency [MHz]	Min 26 dB BW [MHz]	Directional Gain for Power [dBi]	Directional Gain for PPSP [dBi]
Mid	5210	81.38	-2.98	-2.98

Limits

Portion	Frequency [MHz]	FCC Power Limit [dBm]	Power Limit [dBm]	FCC PPSP Limit [dBm/MHz]	PPSP Limit [dBm/MHz]
Mid	5210	24.00	24.00	11.00	11.00

Duty Cycle CF [dB]	0.00	Included in Calculations of Corr'd Power & PPSP
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Output Power Results

Portion	Frequency [MHz]	Antenna 1 Meas Power [dBm]	Antenna 2 Meas Power [dBm]	Total Corr'd Power [dBm]	Power Limit [dBm]	Power Margin [dB]
Mid	5210	14.39	14.00	17.21	24.00	-6.79

PPSP Results

Channel	Frequency [MHz]	Antenna 1 Meas PPSP [dBm/MHz]	Antenna 2 Meas PPSP [dBm/MHz]	Total Corr'd PPSP [dBm/MHz]	PPSP Limit [dBm/MHz]	PPSP Margin [dB]
Mid	5210	-3.54	-4.02	-0.76	11.00	-11.76

10.2.5. 802.11a MODE IN THE 5.3 GHz BAND

Bandwidth and Antenna Gain

Portion	Frequency [MHz]	Min 26 dB BW [MHz]	Directional Gain for Power [dBi]	Directional Gain for PPSP [dBi]
Low	5260	21.28	-3.18	-3.18
Mid	5300	21.37	-3.18	-3.18
High	5320	21.24	-3.18	-3.18

Limits

Portion	Frequency [MHz]	FCC Power Limit [dBm]	Power Limit [dBm]	FCC PPSP Limit [dBm/MHz]	PPSP Limit [dBm/MHz]
Low	5260	24.00	24.00	11.00	11.00
Mid	5300	24.00	24.00	11.00	11.00
High	5320	24.00	24.00	11.00	11.00

Duty Cycle CF [dB]	0.00	Included in Calculations of Corr'd Power & PPSP
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Output Power Results

Portion	Frequency [MHz]	Antenna 1 Meas Power [dBm]	Antenna 2 Meas Power [dBm]	Total Corr'd Power [dBm]	Power Limit [dBm]	Power Margin [dB]
Low	5260	14.26	13.76	17.03	24.00	-6.97
Mid	5300	14.14	13.70	16.94	24.00	-7.06
High	5320	14.11	13.66	16.90	24.00	-7.10

PPSP Results

Channel	Frequency [MHz]	Antenna 1 Meas PPSP [dBm/MHz]	Antenna 2 Meas PPSP [dBm/MHz]	Total Corr'd PPSP [dBm/MHz]	PPSP Limit [dBm/MHz]	PPSP Margin [dB]
Low	5260	2.64	2.41	5.54	11.00	-5.46
Mid	5300	2.57	2.43	5.51	11.00	-5.49
High	5320	2.64	1.82	5.26	11.00	-5.74

10.2.6. 802.11n HT20 MODE IN THE 5.3 GHz BAND

Bandwidth and Antenna Gain

Portion	Frequency [MHz]	Min 26 dB BW [MHz]	Directional Gain for Power [dBi]	Directional Gain for PPSP [dBi]
Low	5260	21.31	-3.18	-3.18
Mid	5300	21.51	-3.18	-3.18
High	5320	21.49	-3.18	-3.18

Limits

Portion	Frequency [MHz]	FCC Power Limit [dBm]	Power Limit [dBm]	FCC PPSP Limit [dBm/MHz]	PPSP Limit [dBm/MHz]
Low	5260	24.00	24.00	11.00	11.00
Mid	5300	24.00	24.00	11.00	11.00
High	5320	24.00	24.00	11.00	11.00

Duty Cycle CF [dB]	0.00	Included in Calculations of Corr'd Power & PPSP
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Output Power Results

Portion	Frequency [MHz]	Antenna 1 Meas Power [dBm]	Antenna 2 Meas Power [dBm]	Total Corr'd Power [dBm]	Power Limit [dBm]	Power Margin [dB]
Low	5260	14.20	13.74	16.99	24.00	-7.01
Mid	5300	14.18	13.65	16.93	24.00	-7.07
High	5320	14.08	13.65	16.88	24.00	-7.12

PPSP Results

Channel	Frequency [MHz]	Antenna 1 Meas PPSP [dBm/MHz]	Antenna 2 Meas PPSP [dBm/MHz]	Total Corr'd PPSP [dBm/MHz]	PPSP Limit [dBm/MHz]	PPSP Margin [dB]
Low	5260	2.23	2.13	5.19	11.00	-5.81
Mid	5300	2.32	1.98	5.16	11.00	-5.84
High	5320	2.31	1.64	4.99	11.00	-6.01

10.2.7. 802.11n HT40 MODE IN THE 5.3 GHz BAND

Bandwidth and Antenna Gain

Portion	Frequency [MHz]	Min 26 dB BW [MHz]	Directional Gain for Power [dBi]	Directional Gain for PPSD [dBi]
Low	5270	39.43	-3.18	-3.18
High	5310	39.62	-3.18	-3.18

Limits

Portion	Frequency [MHz]	FCC Power Limit [dBm]	Power Limit [dBm]	FCC PPSD Limit [dBm/MHz]	PPSD Limit [dBm/MHz]
Low	5270	24.00	24.00	11.00	11.00
High	5310	24.00	24.00	11.00	11.00

Duty Cycle CF [dB]	0.00	Included in Calculations of Corr'd Power & PPSD
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Output Power Results

Portion	Frequency [MHz]	Antenna 1 Meas Power [dBm]	Antenna 2 Meas Power [dBm]	Total Corr'd Power [dBm]	Power Limit [dBm]	Power Margin [dB]
Low	5270	15.36	14.98	18.18	24.00	-5.82
High	5310	15.28	14.90	18.10	24.00	-5.90

PPSD Results

Channel	Frequency [MHz]	Antenna 1 Meas PPSD [dBm/MHz]	Antenna 2 Meas PPSD [dBm/MHz]	Total Corr'd PPSD [dBm/MHz]	PPSD Limit [dBm/MHz]	PPSD Margin [dB]
Low	5270	0.75	0.30	3.54	11.00	-7.46
High	5310	0.75	0.04	3.42	11.00	-7.58

10.2.8. 802.11ac VHT80 MODE IN THE 5.3 GHz BAND

Bandwidth and Antenna Gain

Portion	Frequency [MHz]	Min 26 dB BW [MHz]	Directional Gain for Power [dBi]	Directional Gain for PPSP [dBi]
Mid	5290	81.27	-3.18	-3.18

Limits

Portion	Frequency [MHz]	FCC Power Limit [dBm]	Power Limit [dBm]	FCC PPSP Limit [dBm/MHz]	PPSP Limit [dBm/MHz]
Mid	5290	24.00	24.00	11.00	11.00

Duty Cycle CF [dB]	0.00	Included in Calculations of Corr'd Power & PPSP
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Output Power Results

Portion	Frequency [MHz]	Antenna 1 Meas Power [dBm]	Antenna 2 Meas Power [dBm]	Total Corr'd Power [dBm]	Power Limit [dBm]	Power Margin [dB]
Mid	5290	14.06	13.86	16.97	24.00	-7.03

PPSP Results

Channel	Frequency [MHz]	Antenna 1 Meas PPSP [dBm/MHz]	Antenna 2 Meas PPSP [dBm/MHz]	Total Corr'd PPSP [dBm/MHz]	PPSP Limit [dBm/MHz]	PPSP Margin [dB]
Mid	5290	-3.28	-4.01	-0.62	11.00	-11.62

10.2.9. 802.11a MODE IN THE 5.5 GHz BAND

Bandwidth and Antenna Gain

Portion	Frequency [MHz]	Min 26 dB BW [MHz]	Directional Gain for Power [dBi]	Directional Gain for PPSP [dBi]
Low	5500	21.28	-3.13	-3.13
Mid	5580	21.14	-3.13	-3.13
High	5700	21.25	-3.13	-3.13

Limits

Portion	Frequency [MHz]	FCC Power Limit [dBm]	Power Limit [dBm]	FCC PPSP Limit [dBm/MHz]	PPSP Limit [dBm/MHz]
Low	5500	24.00	24.00	11.00	11.00
Mid	5580	24.00	24.00	11.00	11.00
High	5700	24.00	24.00	11.00	11.00

Duty Cycle CF [dB]	0.00	Included in Calculations of Corr'd Power & PPSP
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Output Power Results

Portion	Frequency [MHz]	Antenna 1 Meas Power [dBm]	Antenna 2 Meas Power [dBm]	Total Corr'd Power [dBm]	Power Limit [dBm]	Power Margin [dB]
Low	5500	14.01	14.27	17.15	24.00	-6.85
Mid	5580	13.90	14.09	17.01	24.00	-6.99
High	5700	13.80	14.16	16.99	24.00	-7.01

PPSP Results

Channel	Frequency [MHz]	Antenna 1 Meas PPSP [dBm/MHz]	Antenna 2 Meas PPSP [dBm/MHz]	Total Corr'd PPSP [dBm/MHz]	PPSP Limit [dBm/MHz]	PPSP Margin [dB]
Low	5500	2.33	2.53	5.44	11.00	-5.56
Mid	5580	2.29	2.40	5.35	11.00	-5.65
High	5700	2.11	2.14	5.14	11.00	-5.86

10.2.10. 802.11n HT20 MODE IN THE 5.5 GHz BAND

Bandwidth and Antenna Gain

Portion	Frequency [MHz]	Min 26 dB BW [MHz]	Directional Gain for Power [dBi]	Directional Gain for PPSP [dBi]
Low	5500	21.47	-3.13	-3.13
Mid	5580	21.43	-3.13	-3.13
High	5700	21.33	-3.13	-3.13

Limits

Portion	Frequency [MHz]	FCC Power Limit [dBm]	Power Limit [dBm]	FCC PPSP Limit [dBm/MHz]	PPSP Limit [dBm/MHz]
Low	5500	24.00	24.00	11.00	11.00
Mid	5580	24.00	24.00	11.00	11.00
High	5700	24.00	24.00	11.00	11.00

Duty Cycle CF [dB]	0.00	Included in Calculations of Corr'd Power & PPSP
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Output Power Results

Portion	Frequency [MHz]	Antenna 1 Meas Power [dBm]	Antenna 2 Meas Power [dBm]	Total Corr'd Power [dBm]	Power Limit [dBm]	Power Margin [dB]
Low	5500	14.03	14.24	17.15	24.00	-6.85
Mid	5580	13.88	14.04	16.97	24.00	-7.03
High	5700	13.84	14.04	16.95	24.00	-7.05

PPSP Results

Channel	Frequency [MHz]	Antenna 1 Meas PPSP [dBm/MHz]	Antenna 2 Meas PPSP [dBm/MHz]	Total Corr'd PPSP [dBm/MHz]	PPSP Limit [dBm/MHz]	PPSP Margin [dB]
Low	5500	2.33	2.22	5.29	11.00	-5.71
Mid	5580	1.93	2.26	5.11	11.00	-5.89
High	5700	1.78	1.75	4.77	11.00	-6.23

10.2.11. 802.11n HT40 MODE IN THE 5.5 GHz BAND

Bandwidth and Antenna Gain

Portion	Frequency [MHz]	Min 26 dB BW [MHz]	Directional Gain for Power [dBi]	Directional Gain for PPSP [dBi]
Low	5510	39.65	-3.13	-3.13
Mid	5590	39.51	-3.13	-3.13
High	5670	39.61	-3.13	-3.13

Limits

Portion	Frequency [MHz]	FCC Power Limit [dBm]	Power Limit [dBm]	FCC PPSP Limit [dBm/MHz]	PPSP Limit [dBm/MHz]
Low	5510	24.00	24.00	11.00	11.00
Mid	5590	24.00	24.00	11.00	11.00
High	5670	24.00	24.00	11.00	11.00

Duty Cycle CF [dB]	0.00	Included in Calculations of Corr'd Power & PPSP
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Output Power Results

Portion	Frequency [MHz]	Antenna 1 Meas Power [dBm]	Antenna 2 Meas Power [dBm]	Total Corr'd Power [dBm]	Power Limit [dBm]	Power Margin [dB]
Low	5510	15.32	15.65	18.50	24.00	-5.50
Mid	5590	15.09	15.38	18.25	24.00	-5.75
High	5670	14.98	15.40	18.21	24.00	-5.79

PPSP Results

Channel	Frequency [MHz]	Antenna 1 Meas PPSP [dBm/MHz]	Antenna 2 Meas PPSP [dBm/MHz]	Total Corr'd PPSP [dBm/MHz]	PPSP Limit [dBm/MHz]	PPSP Margin [dB]
Low	5510	0.55	1.00	3.79	11.00	-7.21
Mid	5590	0.12	0.42	3.28	11.00	-7.72
High	5670	0.16	0.47	3.33	11.00	-7.67

10.2.12. 802.11ac VHT80 MODE IN THE 5.5 GHz BAND

Bandwidth and Antenna Gain

Portion	Frequency [MHz]	Min 26 dB BW [MHz]	Directional Gain for Power [dBi]	Directional Gain for PPSP [dBi]
Low	5530	81.00	-3.13	-3.13
High	5610	80.94	-3.13	-3.13

Limits

Portion	Frequency [MHz]	FCC Power Limit [dBm]	Power Limit [dBm]	FCC PPSP Limit [dBm/MHz]	PPSP Limit [dBm/MHz]
Low	5530	24.00	24.00	11.00	11.00
High	5610	24.00	24.00	11.00	11.00

Duty Cycle CF [dB]	0.00	Included in Calculations of Corr'd Power & PPSP
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Output Power Results

Portion	Frequency [MHz]	Antenna 1 Meas Power [dBm]	Antenna 2 Meas Power [dBm]	Total Corr'd Power [dBm]	Power Limit [dBm]	Power Margin [dB]
Low	5530	14.05	14.29	17.18	24.00	-6.82
High	5610	13.83	14.11	16.98	24.00	-7.02

PPSP Results

Channel	Frequency [MHz]	Antenna 1 Meas PPSP [dBm/MHz]	Antenna 2 Meas PPSP [dBm/MHz]	Total Corr'd PPSP [dBm/MHz]	PPSP Limit [dBm/MHz]	PPSP Margin [dB]
Low	5530	-3.90	-3.79	-0.83	11.00	-11.83
High	5610	-4.32	-4.06	-1.18	11.00	-12.18

10.2.13. 802.11a MODE IN THE 5.8 GHz BAND

Bandwidth and Antenna Gain

Portion	Frequency [MHz]	Min 26 dB BW [MHz]	Directional Gain for Power [dBi]	Directional Gain for PPSP [dBi]
Low	5745	21.08	-3.94	-3.94
Mid	5785	21.09	-3.94	-3.94
High	5825	21.00	-3.94	-3.94

Limits

Portion	Frequency [MHz]	FCC Power Limit [dBm]	Power Limit [dBm]	FCC PPSP Limit [dBm/500 kHz]	PPSP Limit [dBm/500 kHz]
Low	5745	30.00	30.00	30.00	30.00
Mid	5785	30.00	30.00	30.00	30.00
High	5825	30.00	30.00	30.00	30.00

Duty Cycle CF [dB]	0.00	Included in Calculations of Corr'd Power & PPSP
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Output Power Results

Portion	Frequency [MHz]	Antenna 1 Meas Power [dBm]	Antenna 2 Meas Power [dBm]	Total Corr'd Power [dBm]	Power Limit [dBm]	Power Margin [dB]
Low	5745	16.08	16.48	19.29	30.00	-10.71
Mid	5785	16.01	16.46	19.25	30.00	-10.75
High	5825	16.00	16.33	19.18	30.00	-10.82

PPSP Results

Channel	Frequency [MHz]	Antenna 1 Meas PPSP [dBm/500kHz]	Antenna 2 Meas PPSP [dBm/500kHz]	Total Corr'd PPSP [dBm/500kHz]	PPSP Limit [dBm/500kHz]	PPSP Margin [dB]
Low	5745	1.45	1.51	4.49	30.00	-25.51
Mid	5785	1.09	1.49	4.31	30.00	-25.69
High	5825	1.21	1.38	4.31	30.00	-25.69

10.2.14. 802.11n HT20 MODE IN THE 5.8 GHz BAND

Bandwidth and Antenna Gain

Portion	Frequency [MHz]	Min 26 dB BW [MHz]	Directional Gain for Power [dBi]	Directional Gain for PPSP [dBi]
Low	5745	21.39	-3.94	-3.94
Mid	5785	21.52	-3.94	-3.94
High	5825	21.97	-3.94	-3.94

Limits

Portion	Frequency [MHz]	FCC Power Limit [dBm]	Power Limit [dBm]	FCC PPSP Limit [dBm/500 kHz]	PPSP Limit [dBm/500 kHz]
Low	5745	30.00	30.00	30.00	30.00
Mid	5785	30.00	30.00	30.00	30.00
High	5825	30.00	30.00	30.00	30.00

Duty Cycle CF [dB]	0.00	Included in Calculations of Corr'd Power & PPSP
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Output Power Results

Portion	Frequency [MHz]	Antenna 1 Meas Power [dBm]	Antenna 2 Meas Power [dBm]	Total Corr'd Power [dBm]	Power Limit [dBm]	Power Margin [dB]
Low	5745	16.04	16.48	19.28	30.00	-10.72
Mid	5785	15.97	16.44	19.22	30.00	-10.78
High	5825	15.99	16.33	19.17	30.00	-10.83

PPSP Results

Channel	Frequency [MHz]	Antenna 1 Meas PPSP [dBm/500kHz]	Antenna 2 Meas PPSP [dBm/500kHz]	Total Corr'd PPSP [dBm/500kHz]	PPSP Limit [dBm/500kHz]	PPSP Margin [dB]
Low	5745	0.70	1.07	3.90	30.00	-26.10
Mid	5785	1.12	1.27	4.21	30.00	-25.79
High	5825	0.78	1.23	4.02	30.00	-25.98

10.2.15. 802.11n HT40 MODE IN THE 5.8 GHz BAND

Bandwidth and Antenna Gain

Portion	Frequency [MHz]	Min 26 dB BW [MHz]	Directional Gain for Power [dBi]	Directional Gain for PPSD [dBi]
Low	5755	39.76	-3.94	-3.94
High	5795	39.63	-3.94	-3.94

Limits

Portion	Frequency [MHz]	FCC Power Limit [dBm]	Power Limit [dBm]	FCC PPSD Limit [dBm/500 kHz]	PPSD Limit [dBm/500 kHz]
Low	5755	30.00	30.00	30.00	30.00
High	5795	30.00	30.00	30.00	30.00

Duty Cycle CF [dB]	0.00	Included in Calculations of Corr'd Power & PPSP
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Output Power Results

Portion	Frequency [MHz]	Antenna 1 Meas Power [dBm]	Antenna 2 Meas Power [dBm]	Total Corr'd Power [dBm]	Power Limit [dBm]	Power Margin [dB]
Low	5755	15.34	15.87	18.62	30.00	-11.38
High	5795	15.25	15.76	18.52	30.00	-11.48

PPSD Results

Channel	Frequency [MHz]	Antenna 1 Meas PPSD [dBm/500kHz]	Antenna 2 Meas PPSD [dBm/500kHz]	Total Corr'd PPSD [dBm/500kHz]	PPSD Limit [dBm/500kHz]	PPSD Margin [dB]
Low	5755	-2.53	-2.14	0.68	30.00	-29.32
High	5795	-2.38	-2.11	0.77	30.00	-29.23

10.2.16. 802.11ac VHT80 MODE IN THE 5.8 GHz BAND

Bandwidth and Antenna Gain

Portion	Frequency [MHz]	Min 26 dB BW [MHz]	Directional Gain for Power [dBi]	Directional Gain for PPSP [dBi]
Mid	5775	81.65	-3.94	-3.94

Limits

Portion	Frequency [MHz]	FCC Power Limit [dBm]	Power Limit [dBm]	FCC PPSP Limit [dBm/500 kHz]	PPSP Limit [dBm/500 kHz]
Mid	5775	30.00	30.00	30.00	30.00

Duty Cycle CF [dB]	0.00	Included in Calculations of Corr'd Power & PPSP
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Output Power Results

Portion	Frequency [MHz]	Antenna 1 Meas Power [dBm]	Antenna 2 Meas Power [dBm]	Total Corr'd Power [dBm]	Power Limit [dBm]	Power Margin [dB]
Mid	5775	14.13	14.39	17.27	30.00	-12.73

PPSP Results

Channel	Frequency [MHz]	Antenna 1 Meas PPSP [dBm/500kHz]	Antenna 2 Meas PPSP [dBm/500kHz]	Total Corr'd PPSP [dBm/500kHz]	PPSP Limit [dBm/500kHz]	PPSP Margin [dB]
Mid	5775	-6.60	-6.53	-3.55	30.00	-33.55

10.2.17. 802.11a MODE IN THE STRADDLE CHANNEL

Bandwidth and Antenna Gain

Portion	Frequency [MHz]	Min 26 dB BW [MHz]	Directional Gain for Power [dBi]	Directional Gain for PPSD [dBi]
UNII-2C	5720	15.55	-3.13	-3.13
UNII-3	5720	5.55	-3.94	-3.94

Limits

Portion	Frequency [MHz]	FCC Power Limit [dBm]	Power Limit [dBm]	FCC PPSD Limit [dBm/MHz]	PPSD Limit [dBm/MHz]
UNII-2C	5720	22.92	22.92	11.00	11.00
UNII-3	5720	30.00	30.00	30.00	30.00

Duty Cycle CF [dB]	0.00	Included in Calculations of Corr'd Power & PPSD
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Output Power Results

Portion	Frequency [MHz]	Antenna 1 Meas Power [dBm]	Antenna 2 Meas Power [dBm]	Total Corr'd Power [dBm]	Power Limit [dBm]	Power Margin [dB]
UNII-2C	5720	12.68	12.85	15.77	22.92	-7.15
UNII-3	5720	6.48	6.61	9.56	30.00	-20.44

PPSD Results

Channel	Frequency [MHz]	Antenna 1 Meas PPSD [dBm/MHz]	Antenna 2 Meas PPSD [dBm/MHz]	Total Corr'd PPSD [dBm/MHz]	PPSD Limit [dBm/MHz]	PPSD Margin [dB]
UNII-2C	5720	2.05	2.10	5.09	11.00	-5.91
UNII-3*	5720	-1.28	-1.26	1.74	30.00	-28.26

* For UNII-3, the unit of PPSP is [dBm/500kHz].

10.2.18. 802.11n HT20 MODE IN THE STRADDLE CHANNEL

Bandwidth and Antenna Gain

Portion	Frequency [MHz]	Min 26 dB BW [MHz]	Directional Gain for Power [dBi]	Directional Gain for PPSP [dBi]
UNII-2C	5720	15.70	-3.13	-3.13
UNII-3	5720	5.70	-3.94	-3.94

Limits

Portion	Frequency [MHz]	FCC Power Limit [dBm]	Power Limit [dBm]	FCC PPSP Limit [dBm/MHz]	PPSP Limit [dBm/MHz]
UNII-2C	5720	22.96	22.96	11.00	11.00
UNII-3	5720	30.00	30.00	30.00	30.00

Duty Cycle CF [dB]	0.00	Included in Calculations of Corr'd Power & PPSP
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Output Power Results

Portion	Frequency [MHz]	Antenna 1 Meas Power [dBm]	Antenna 2 Meas Power [dBm]	Total Corr'd Power [dBm]	Power Limit [dBm]	Power Margin [dB]
UNII-2C	5720	12.53	12.78	15.67	22.96	-7.29
UNII-3	5720	6.93	7.18	10.06	30.00	-19.94

PPSP Results

Channel	Frequency [MHz]	Antenna 1 Meas PPSP [dBm/MHz]	Antenna 2 Meas PPSP [dBm/MHz]	Total Corr'd PPSP [dBm/MHz]	PPSP Limit [dBm/MHz]	PPSP Margin [dB]
UNII-2C	5720	1.83	1.92	4.89	11.00	-6.11
UNII-3*	5720	-1.64	-1.52	1.43	30.00	-28.57

* For UNII-3, the unit of PPSP is [dBm/500kHz].

10.2.19. 802.11n HT40 MODE IN THE STRADDLE CHANNEL

Bandwidth and Antenna Gain

Portion	Frequency [MHz]	Min 26 dB BW [MHz]	Directional Gain for Power [dBi]	Directional Gain for PPSP [dBi]
UNII-2C	5710	34.83	-3.13	-3.13
UNII-3	5710	4.83	-3.94	-3.94

Limits

Portion	Frequency [MHz]	FCC Power Limit [dBm]	Power Limit [dBm]	FCC PPSP Limit [dBm/MHz]	PPSP Limit [dBm/MHz]
UNII-2C	5710	24.00	24.00	11.00	11.00
UNII-3	5710	30.00	30.00	30.00	30.00

Duty Cycle CF [dB]	0.00	Included in Calculations of Corr'd Power & PPSP
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Output Power Results

Portion	Frequency [MHz]	Antenna 1 Meas Power [dBm]	Antenna 2 Meas Power [dBm]	Total Corr'd Power [dBm]	Power Limit [dBm]	Power Margin [dB]
UNII-2C	5710	14.66	14.75	17.71	24.00	-6.29
UNII-3	5710	4.02	4.26	7.15	30.00	-22.85

PPSP Results

Channel	Frequency [MHz]	Antenna 1 Meas PPSP [dBm/MHz]	Antenna 2 Meas PPSP [dBm/MHz]	Total Corr'd PPSP [dBm/MHz]	PPSP Limit [dBm/MHz]	PPSP Margin [dB]
UNII-2C	5710	0.20	0.34	3.28	11.00	-7.72
UNII-3*	5710	-3.65	-3.47	-0.55	30.00	-30.55

* For UNII-3, the unit of PPSP is [dBm/500kHz].

10.2.20. 802.11ac VHT80 MODE IN THE STRADDLE CHANNEL

Bandwidth and Antenna Gain

Portion	Frequency [MHz]	Min 26 dB BW [MHz]	Directional Gain for Power [dBi]	Directional Gain for PPSD [dBi]
UNII-2C	5690	75.90	-3.13	-3.13
UNII-3	5690	5.90	-3.94	-3.94

Limits

Portion	Frequency [MHz]	FCC Power Limit [dBm]	Power Limit [dBm]	FCC PPSD Limit [dBm/MHz]	PPSD Limit [dBm/MHz]
UNII-2C	5690	24.00	24.00	11.00	11.00
UNII-3	5690	30.00	30.00	30.00	30.00

Duty Cycle CF [dB]	0.00	Included in Calculations of Corr'd Power & PPSD
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Output Power Results

Portion	Frequency [MHz]	Antenna 1 Meas Power [dBm]	Antenna 2 Meas Power [dBm]	Total Corr'd Power [dBm]	Power Limit [dBm]	Power Margin [dB]
UNII-2C	5690	13.45	13.88	16.68	24.00	-7.32
UNII-3	5690	-1.29	-0.84	1.95	30.00	-28.05

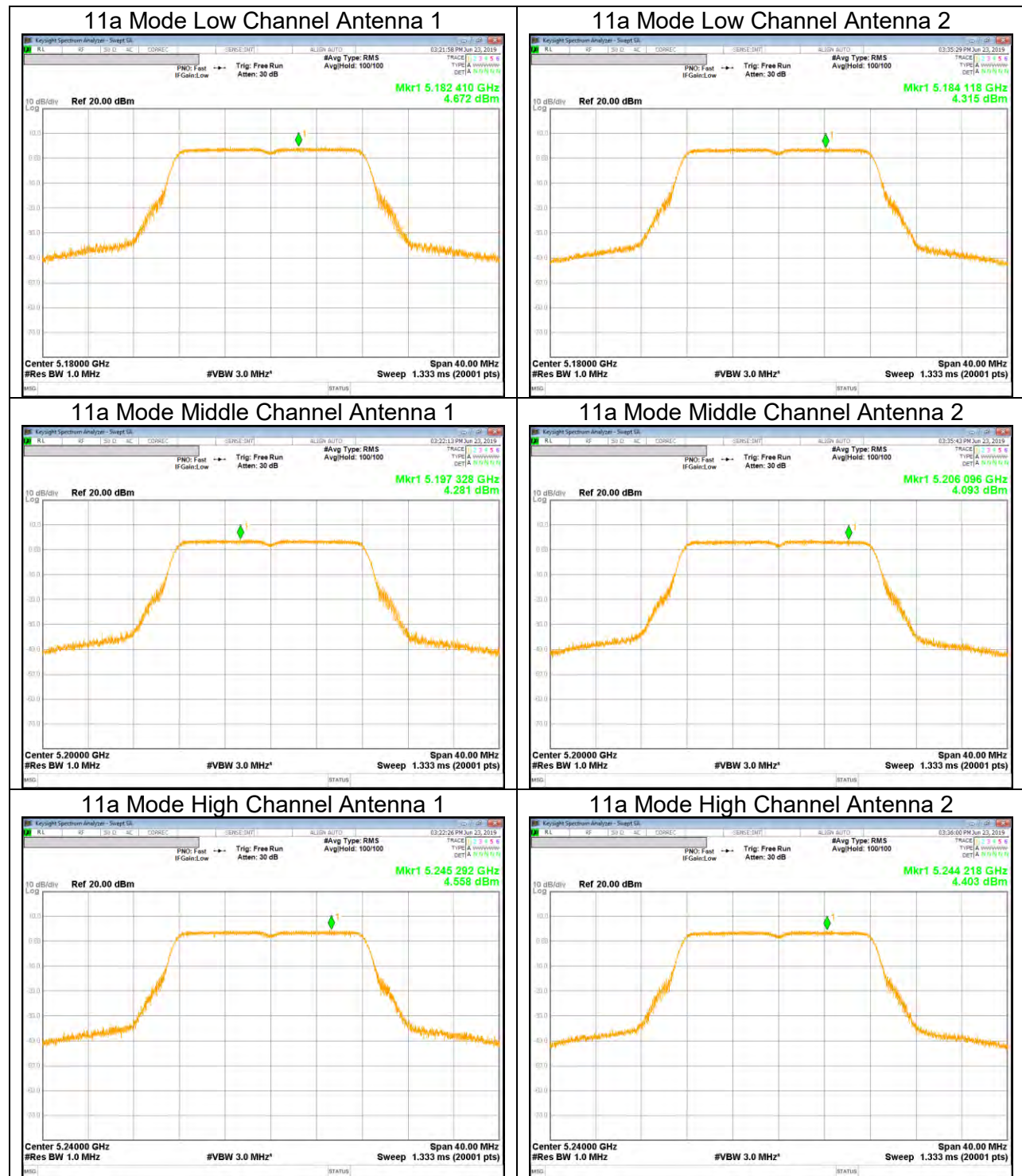
PPSD Results

Channel	Frequency [MHz]	Antenna 1 Meas PPSD [dBm/MHz]	Antenna 2 Meas PPSD [dBm/MHz]	Total Corr'd PPSD [dBm/MHz]	PPSD Limit [dBm/MHz]	PPSD Margin [dB]
UNII-2C	5690	-4.13	-3.87	-0.99	11.00	-11.99
UNII-3*	5690	-8.77	-8.81	-5.78	30.00	-35.78

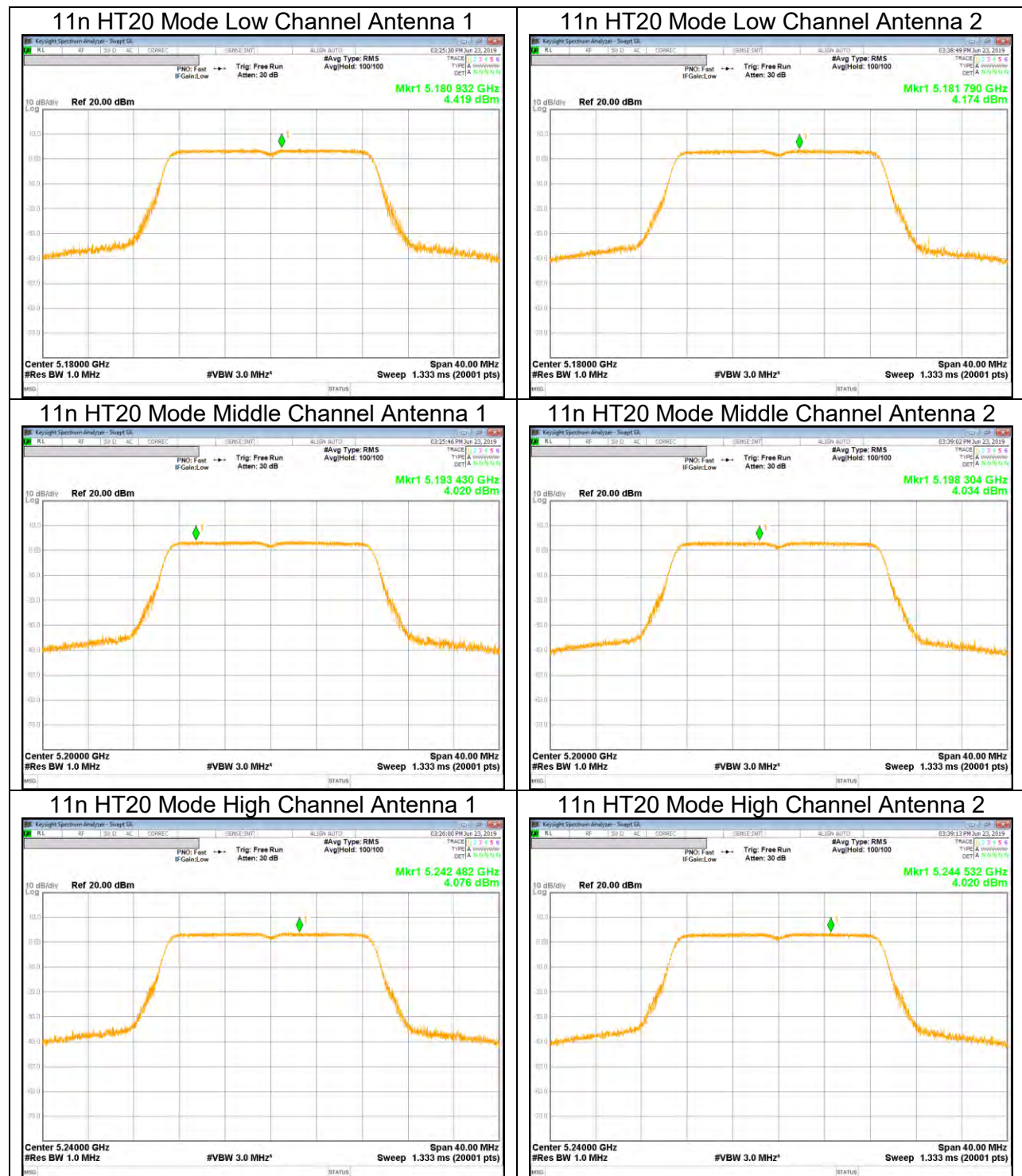
* For UNII-3, the unit of PPSP is [dBm/500kHz].

10.2.21. OUTPUT POWER AND PPSD PLOTS

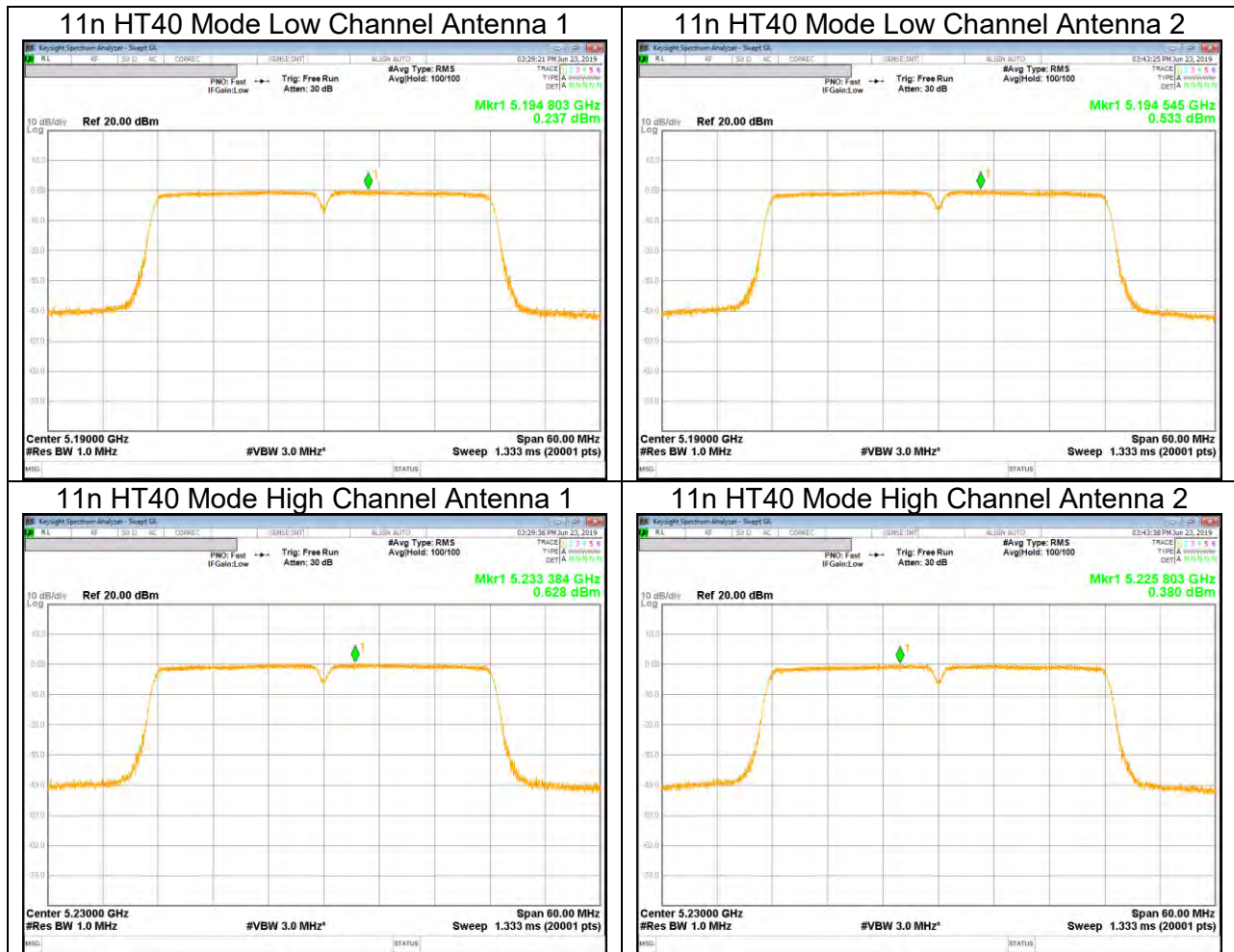
UNII 5.2 GHz IEEE 802.11a mode PSD



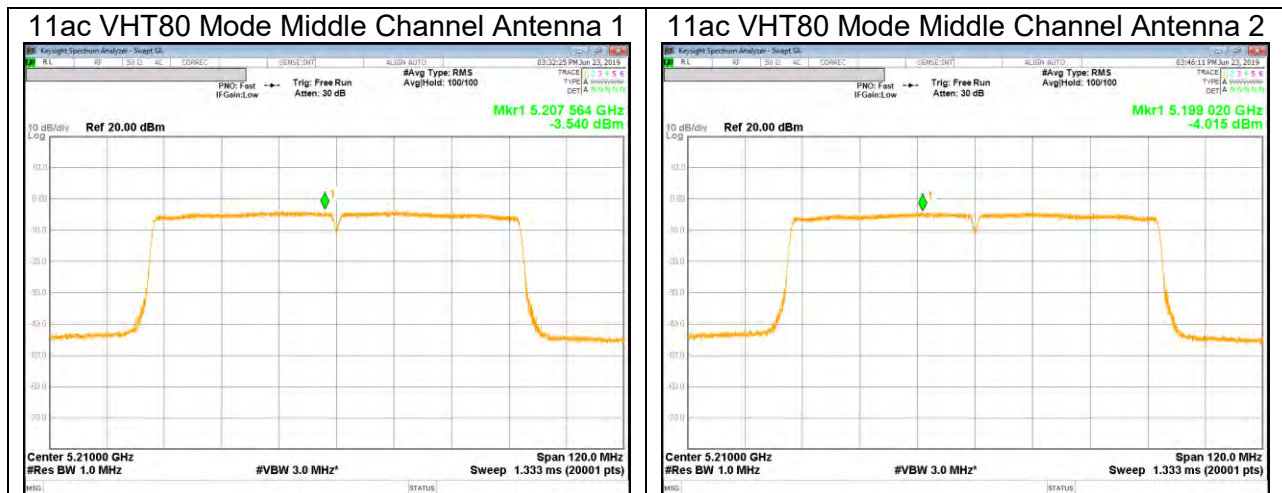
UNII 5.2 GHz IEEE 802.11n HT20 mode PSD



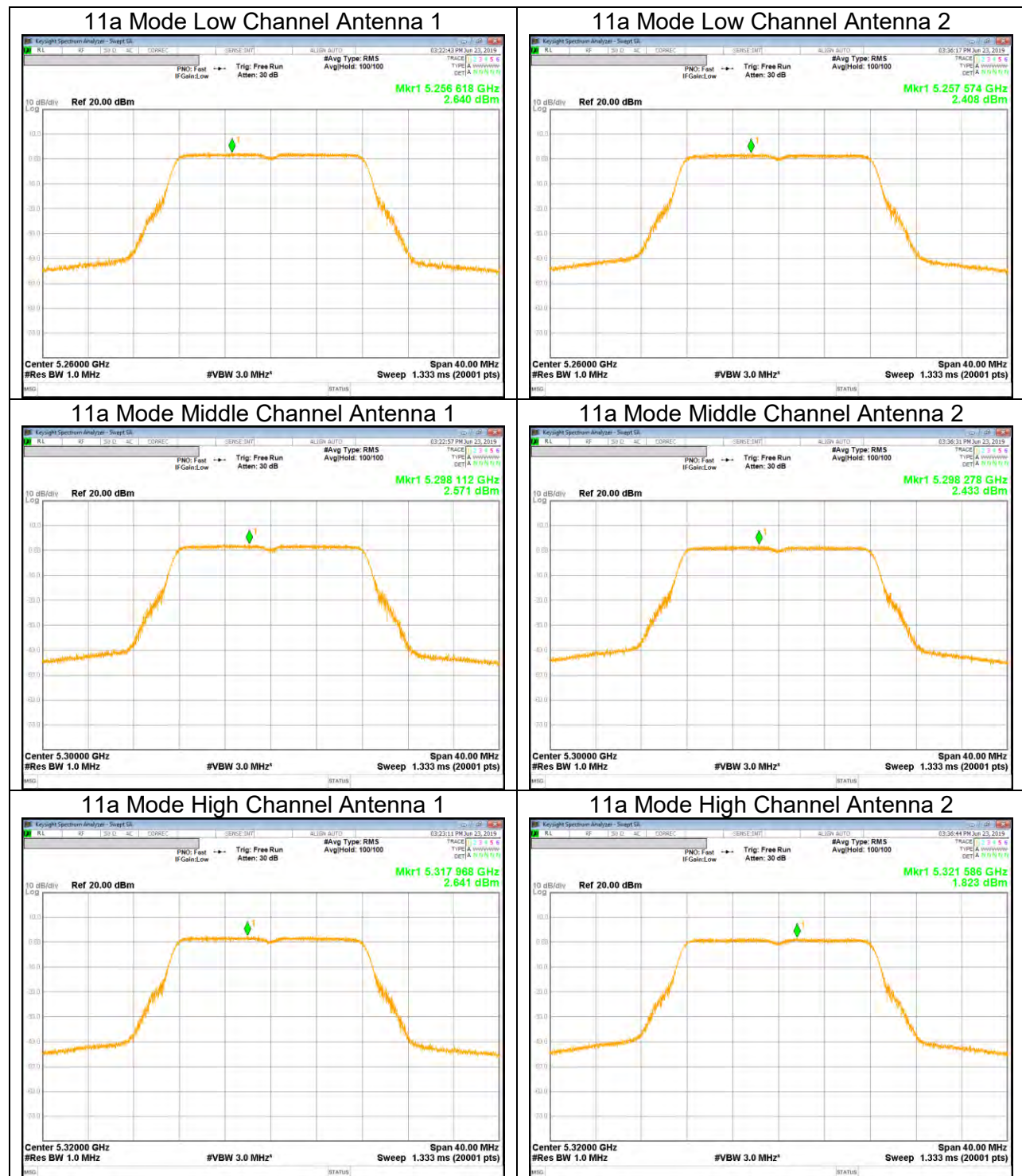
UNII 5.2 GHz IEEE 802.11n HT40 mode PSD



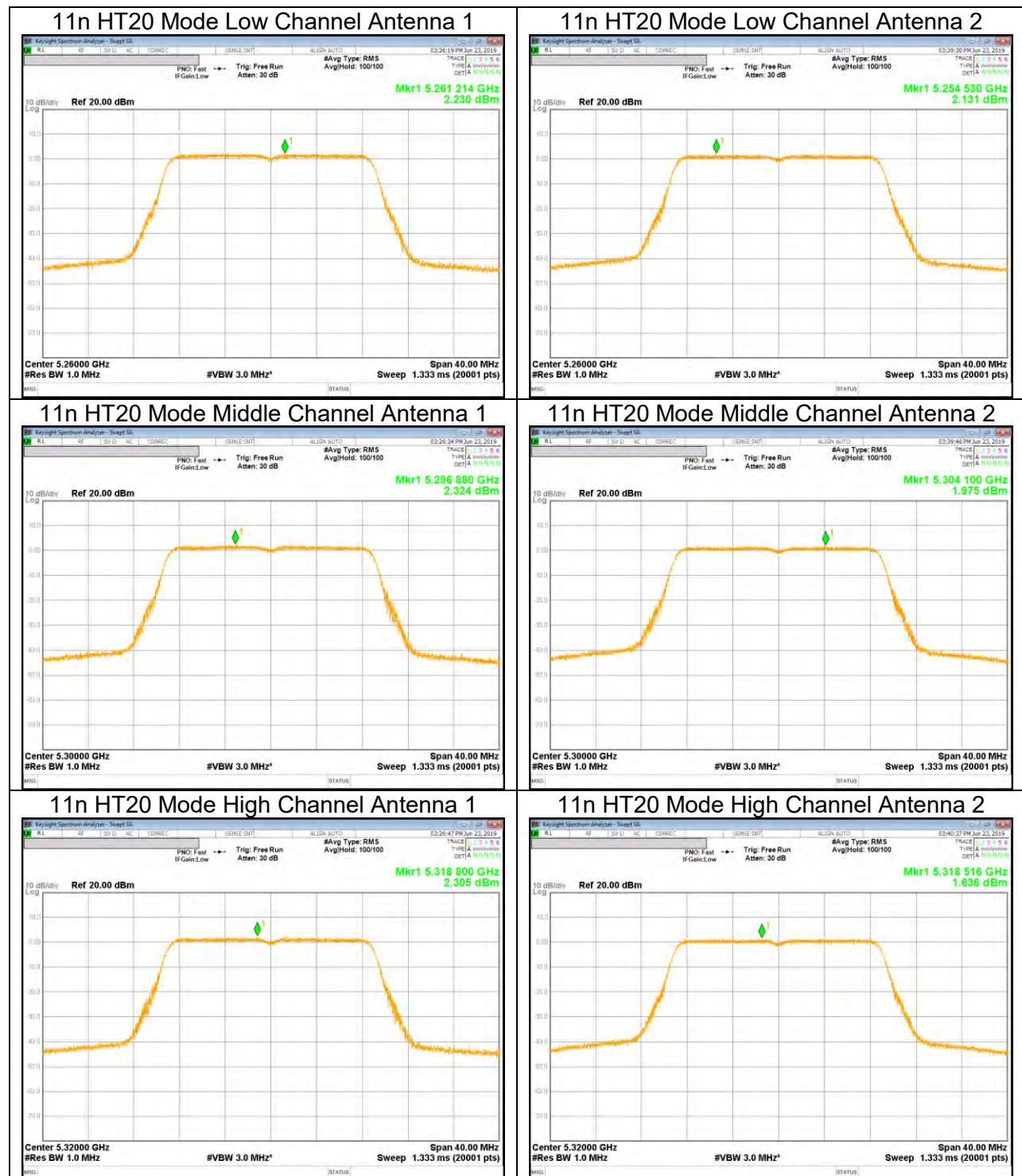
UNII 5.2 GHz IEEE 802.11ac VHT80 mode PSD



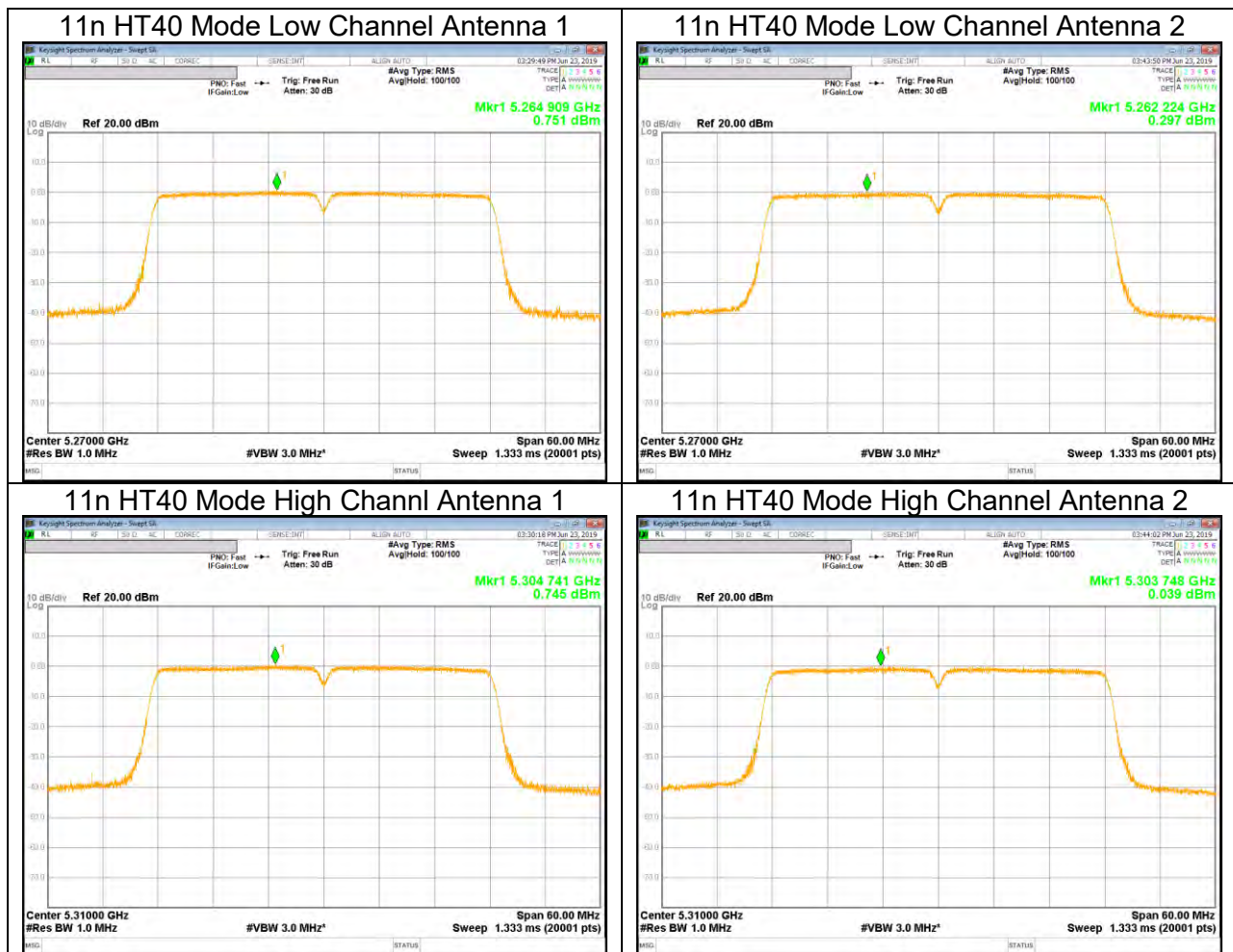
UNII 5.3 GHz IEEE 802.11a mode PSD



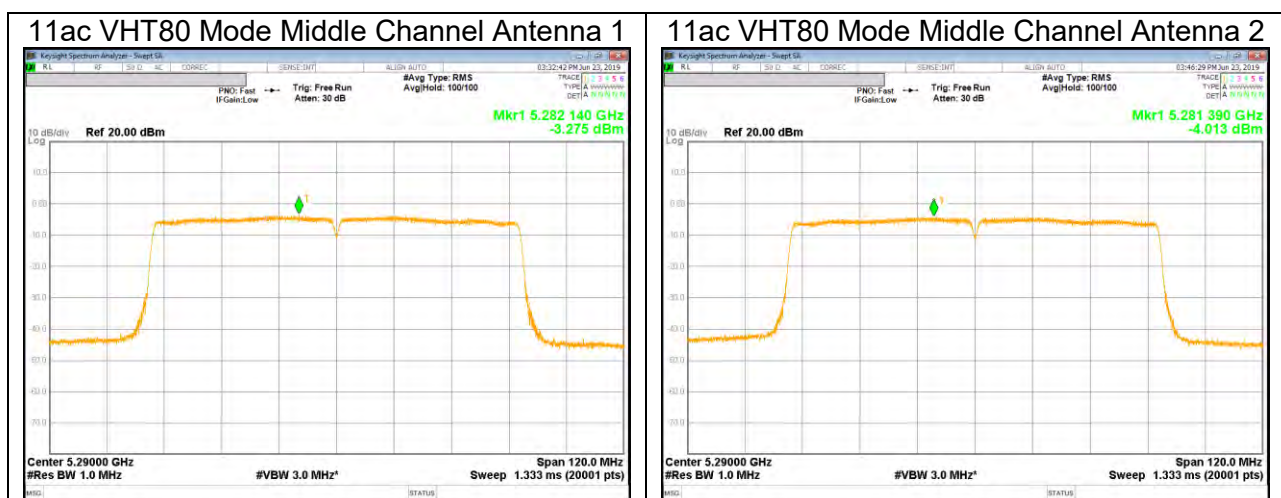
UNII 5.3 GHz IEEE 802.11n HT20 mode PSD



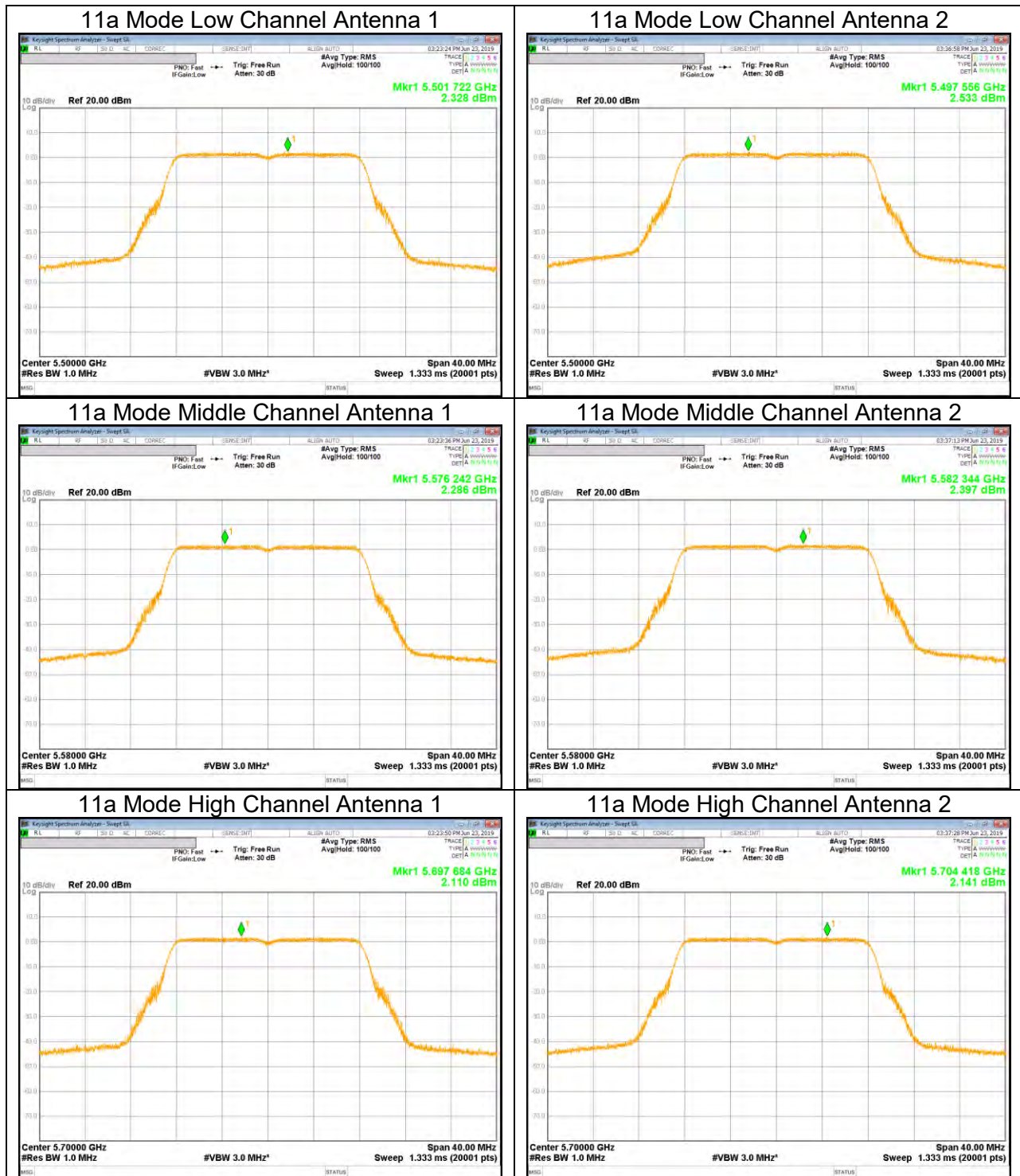
UNII 5.3 GHz IEEE 802.11n HT40 mode PSD



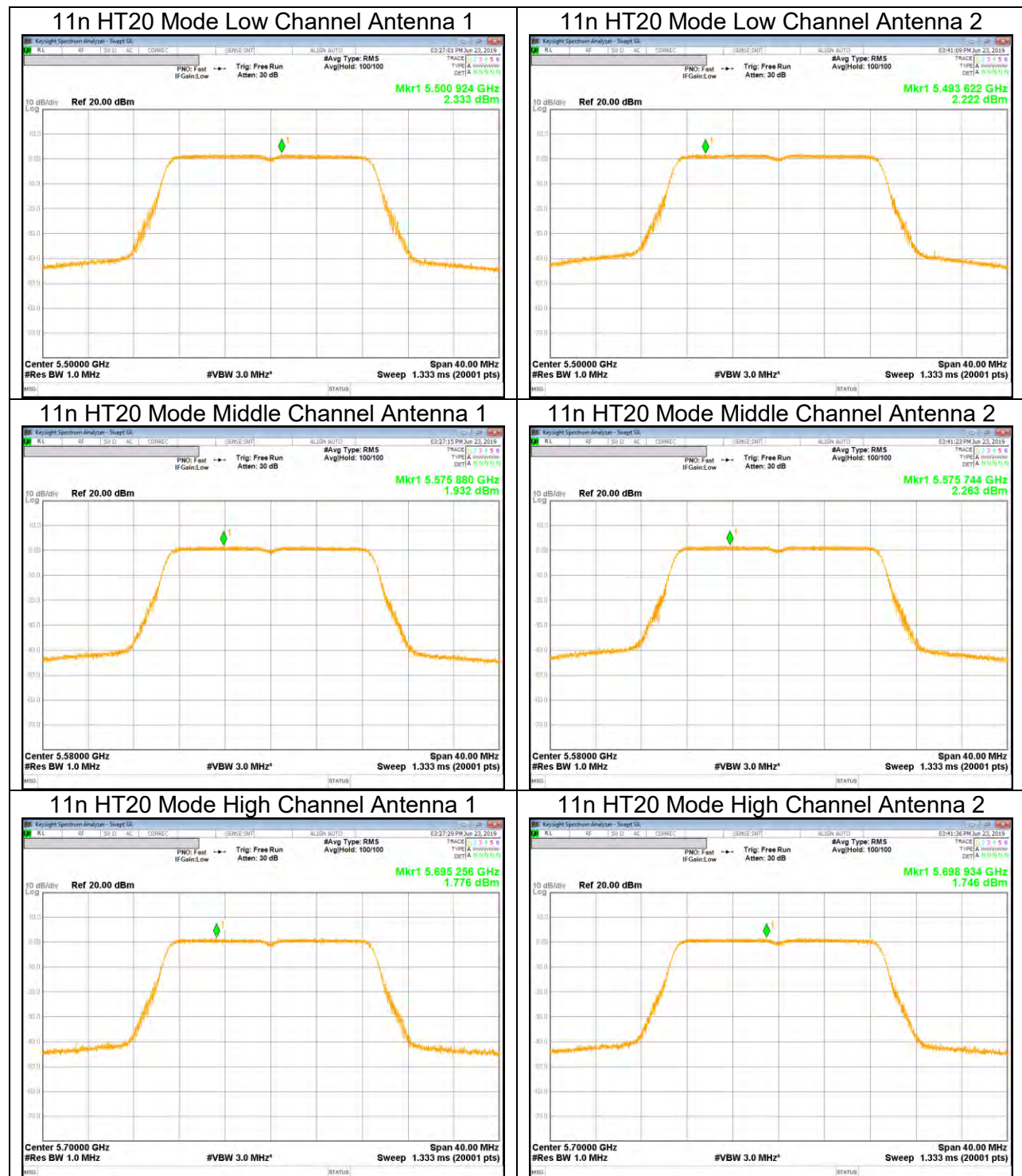
UNII 5.3 GHz IEEE 802.11ac VHT80 mode PSD



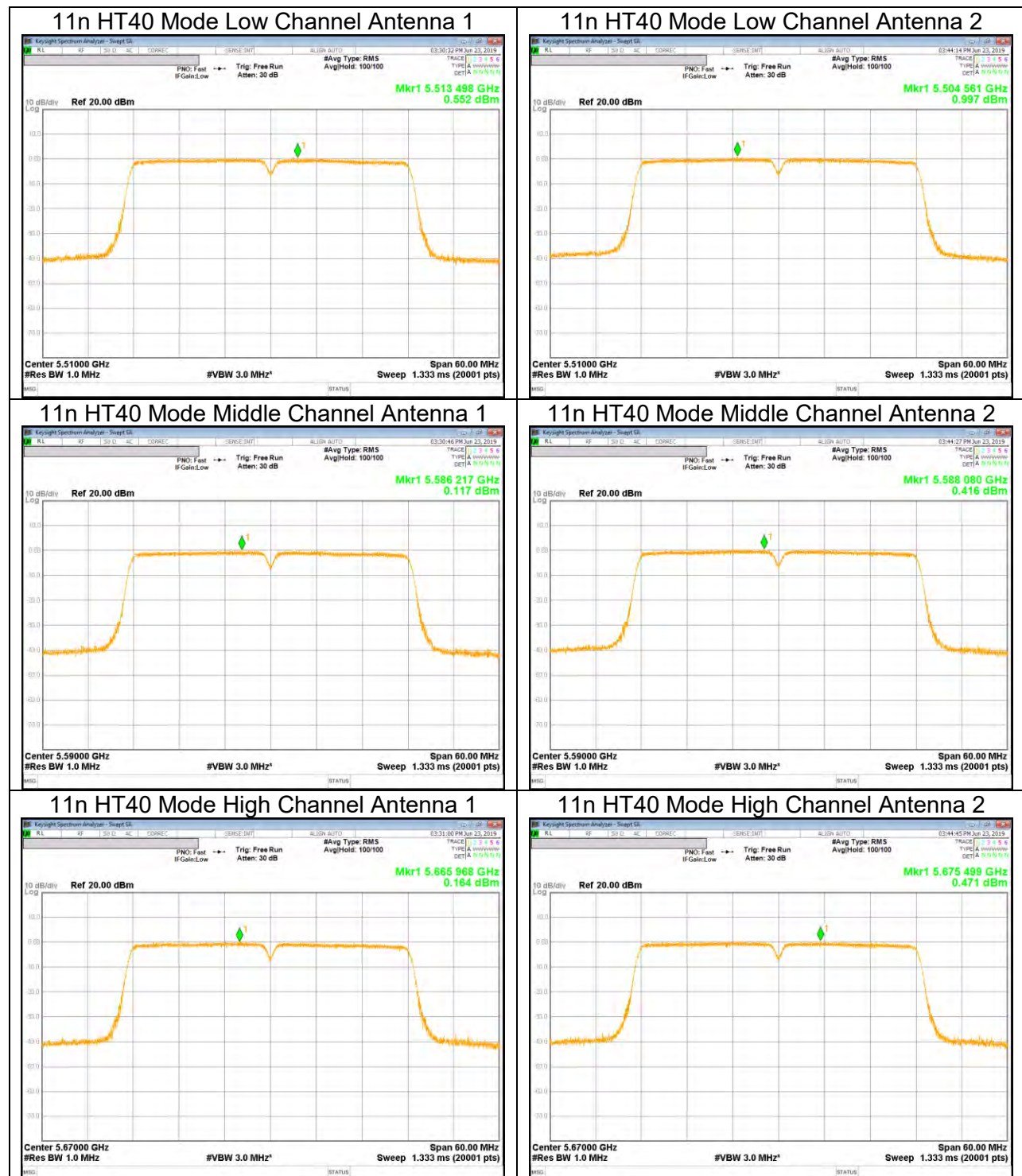
UNII 5.5 GHz IEEE 802.11a mode PSD



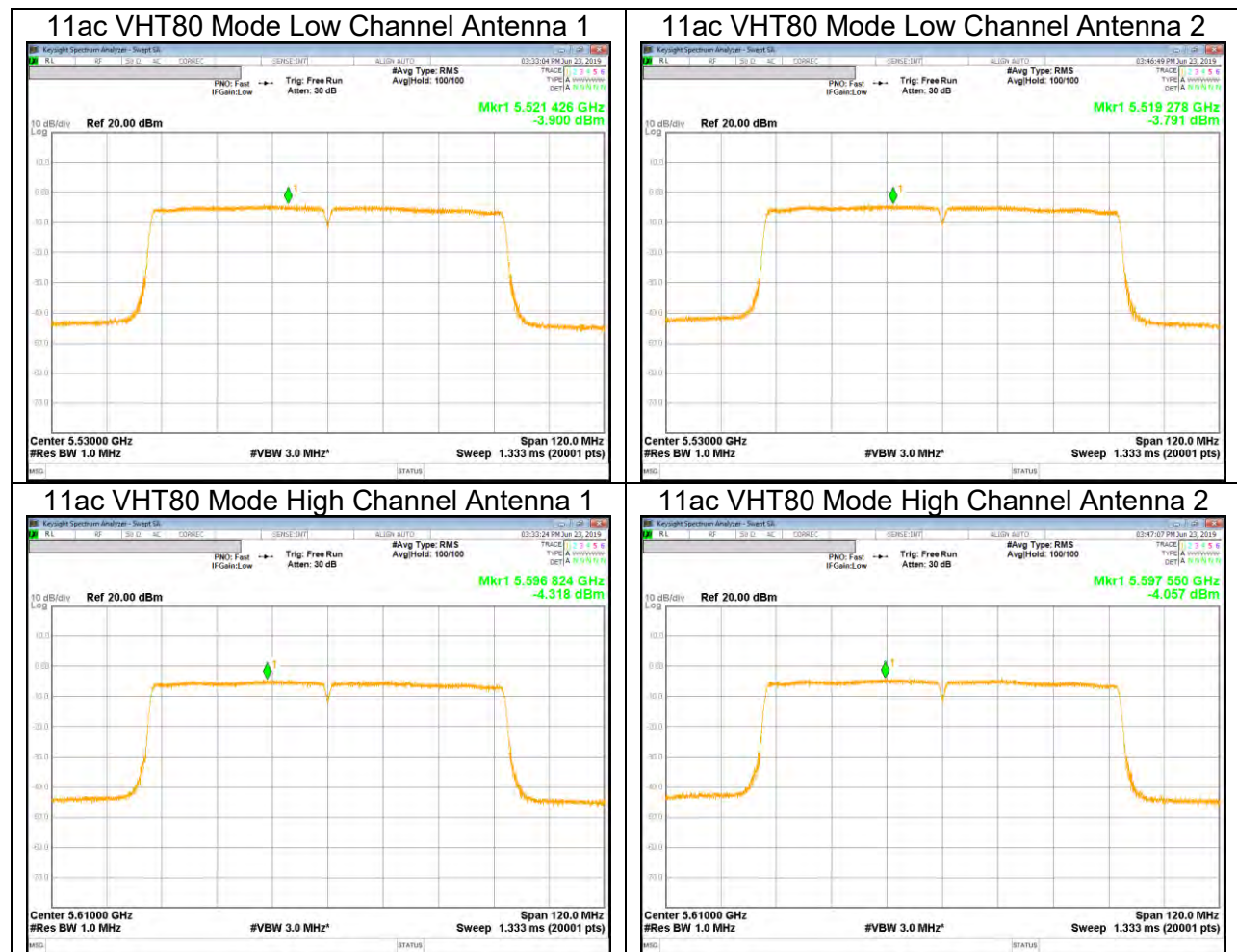
UNII 5.5 GHz IEEE 802.11n HT20 mode PSD



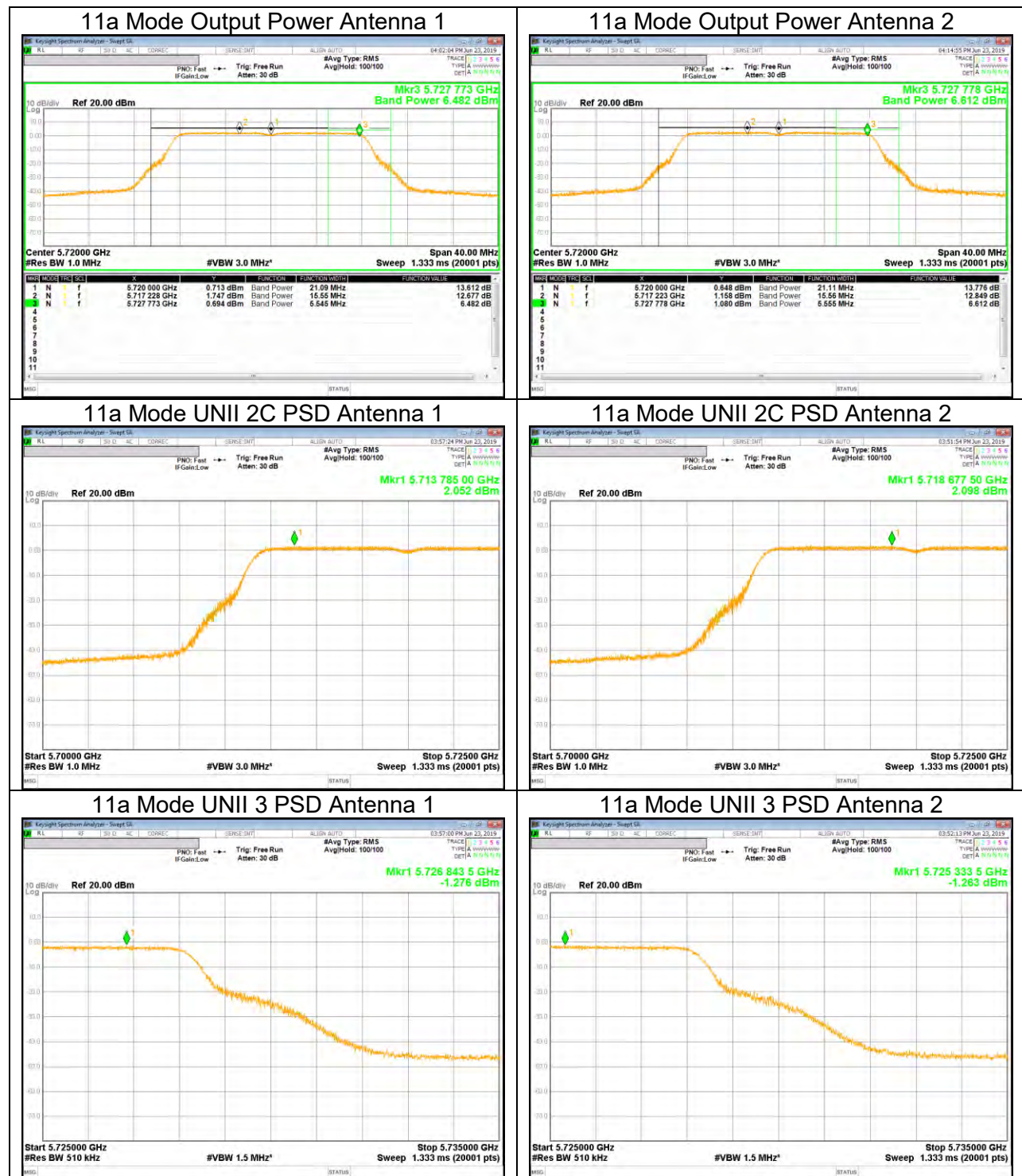
UNII 5.5 GHz IEEE 802.11n HT40 mode PSD



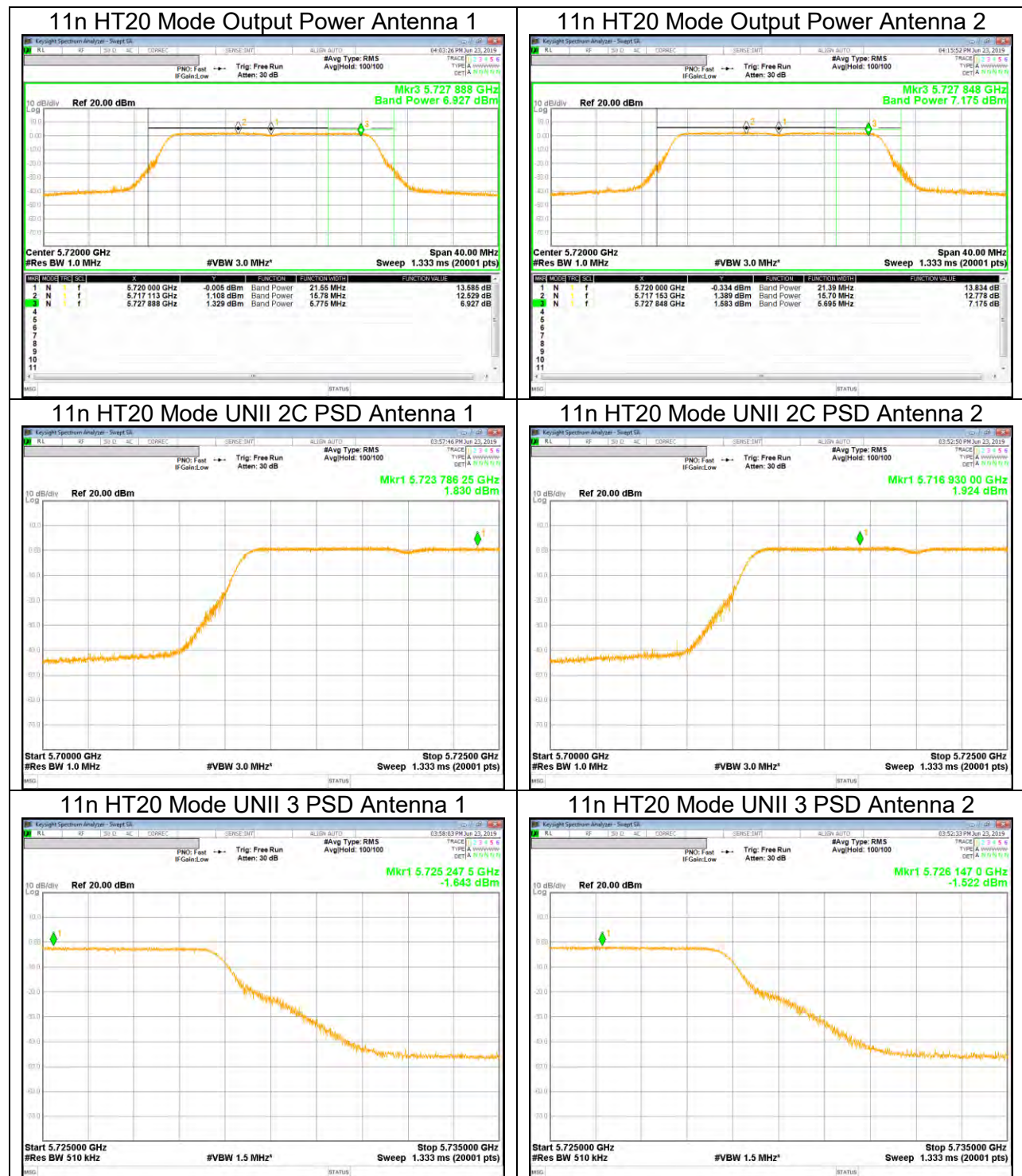
UNII 5.5 GHz IEEE 802.11ac VHT80 mode PSD



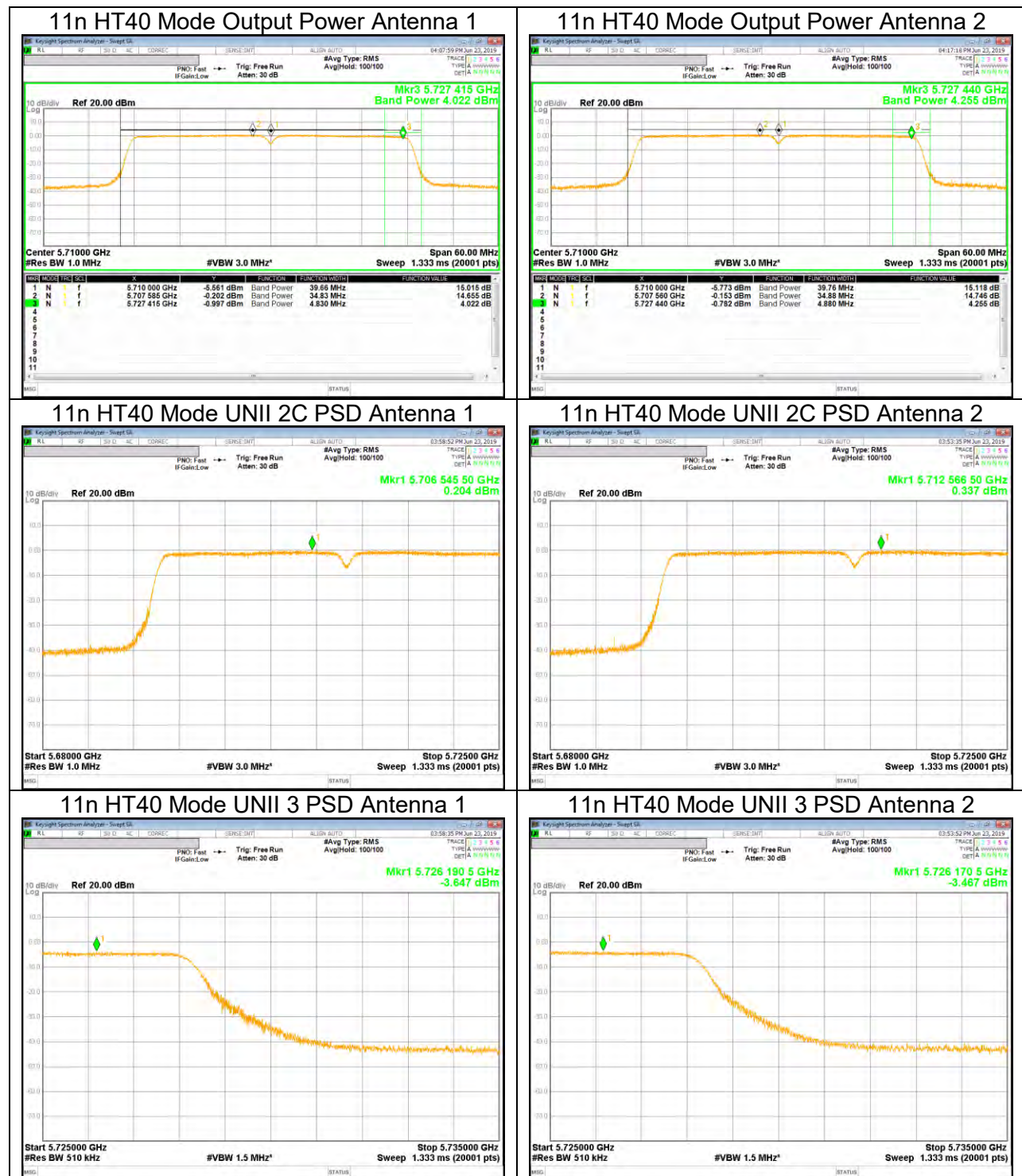
UNII Straddle Ch. IEEE 802.11a mode Ourput Power and PSD



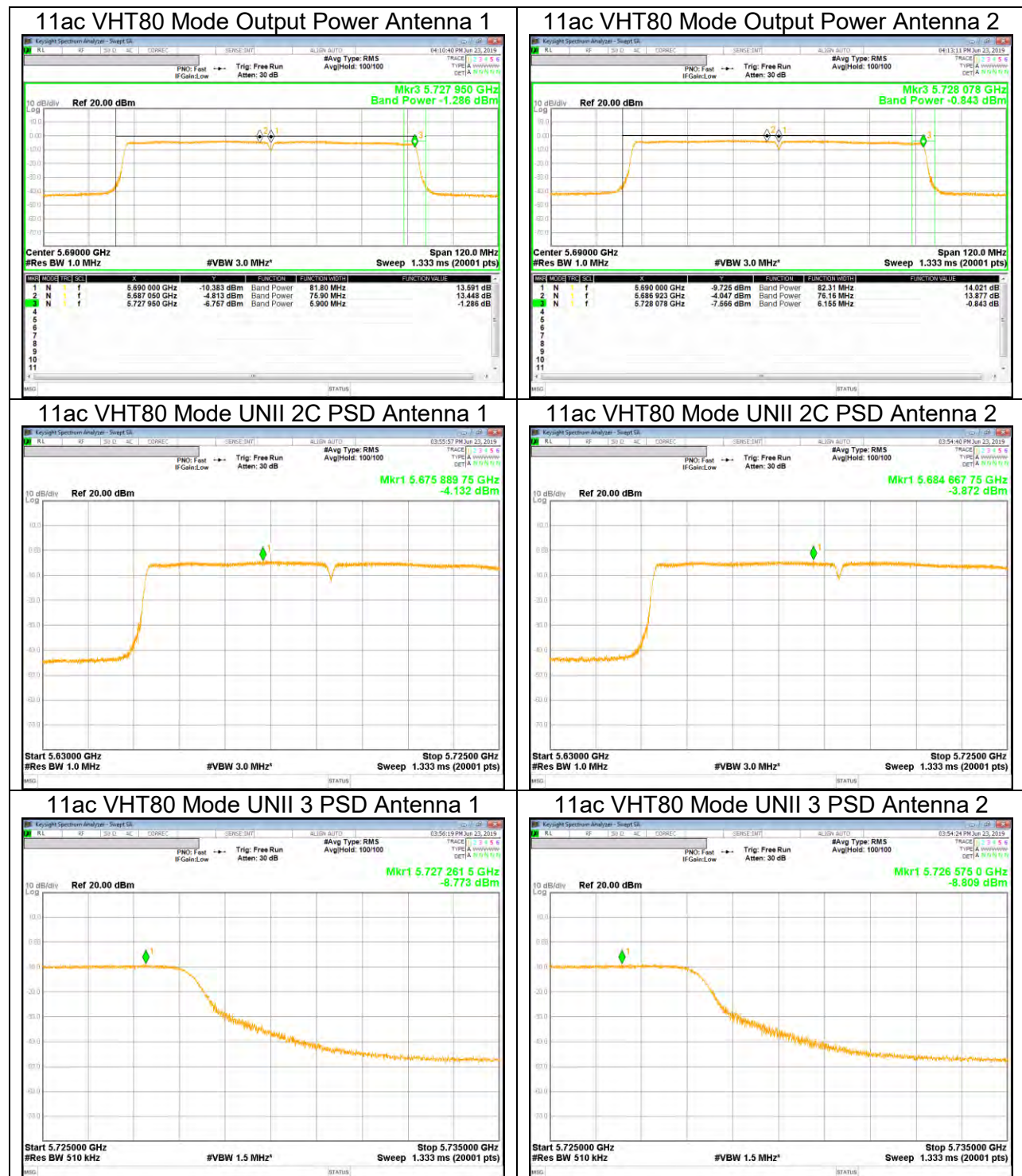
UNII Straddle Ch. IEEE 802.11n HT20 mode Ourput Power and PSD



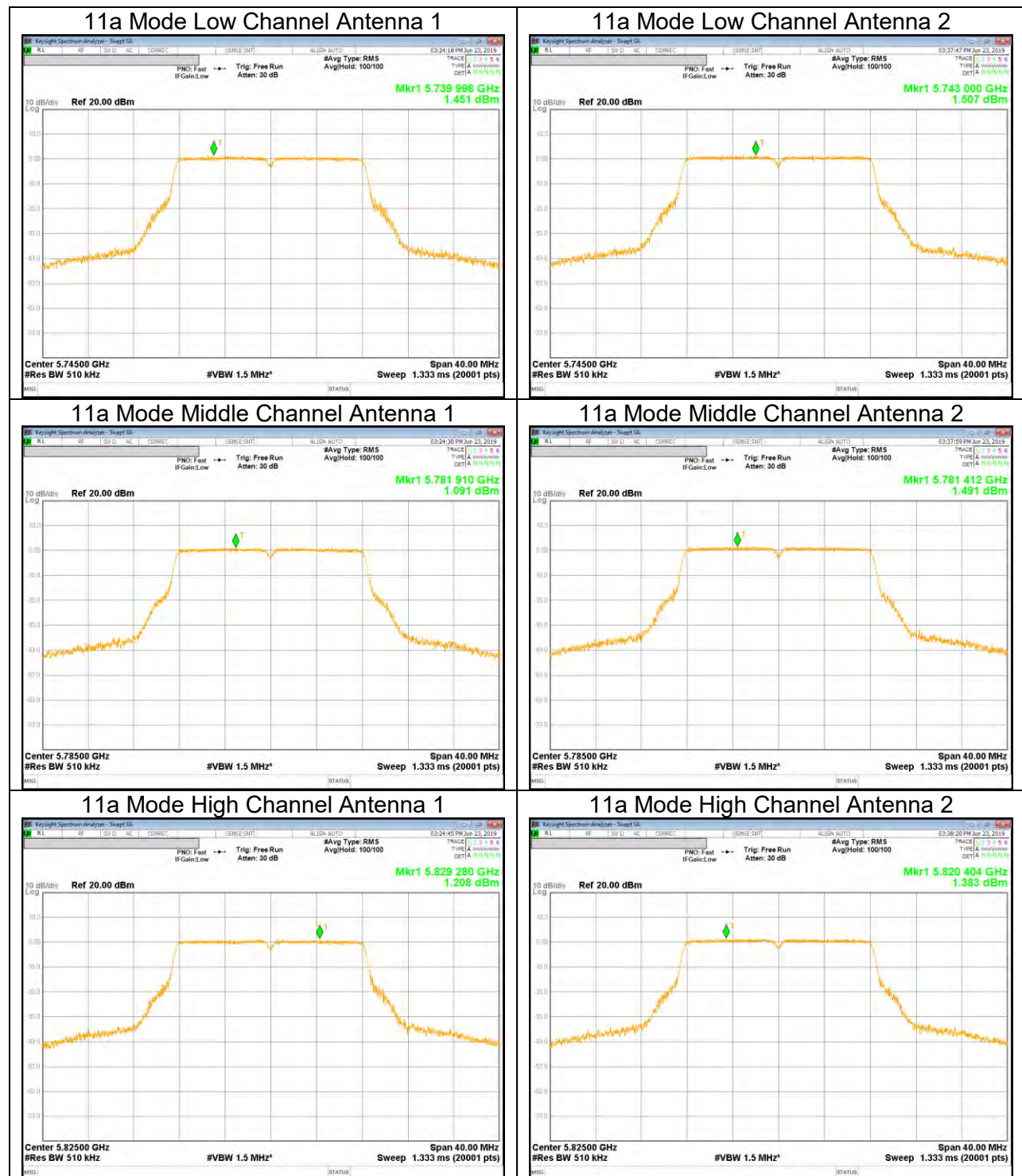
UNII Straddle Ch. IEEE 802.11n HT40 mode Ourput Power and PSD



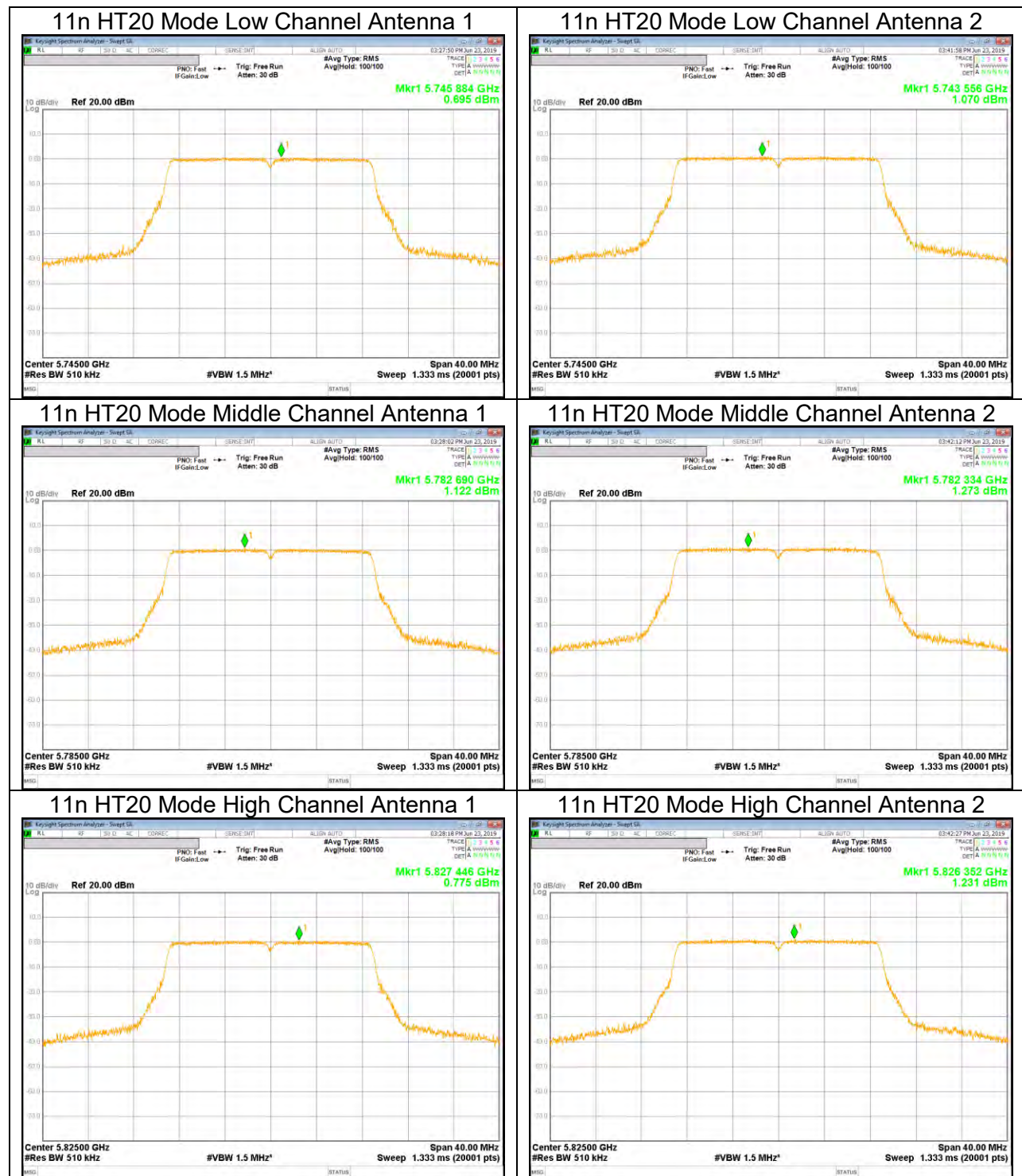
UNII Straddle Ch. IEEE 802.11ac VHT80 mode Ourput Power and PSD



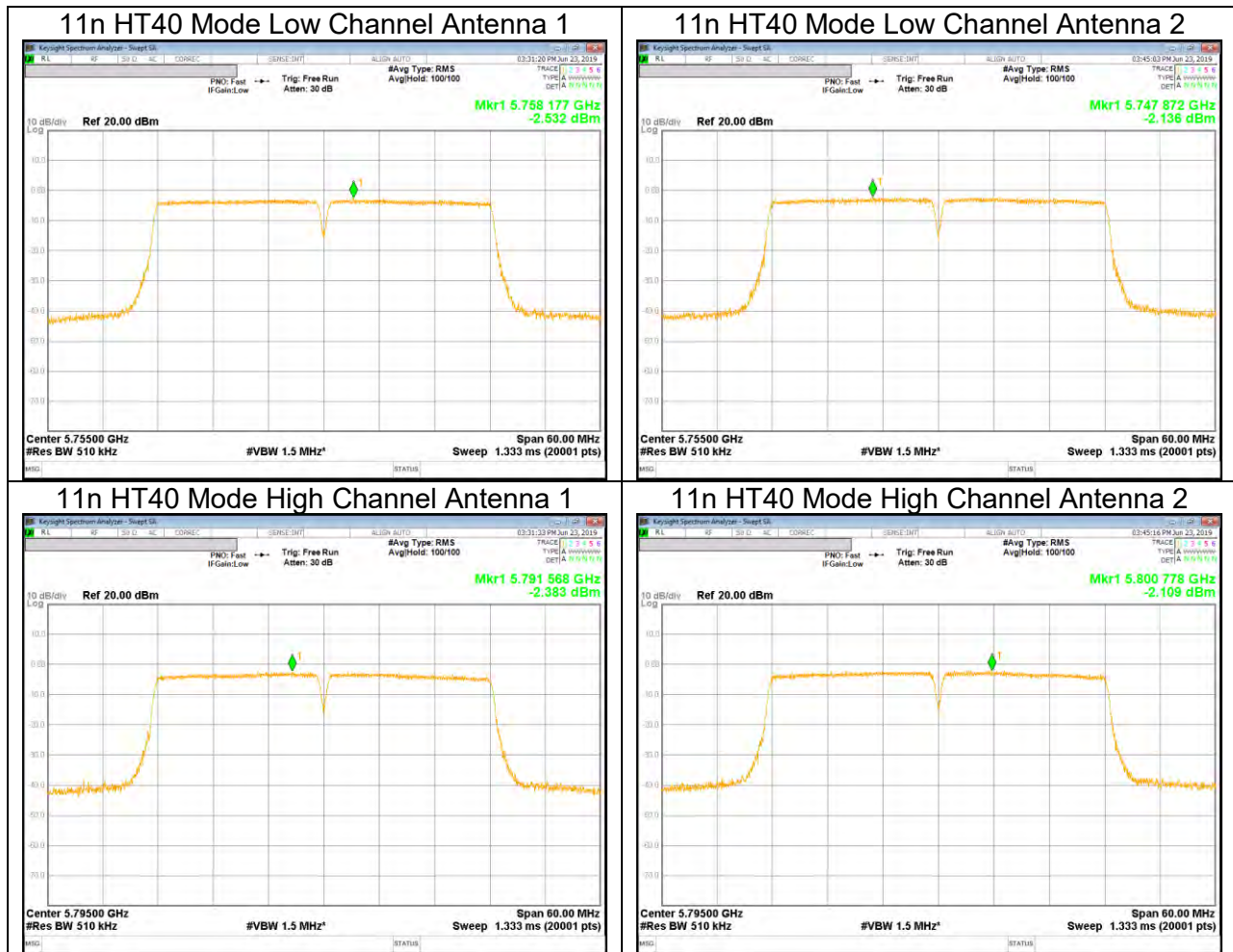
UNII 5.8 GHz IEEE 802.11a mode PSD



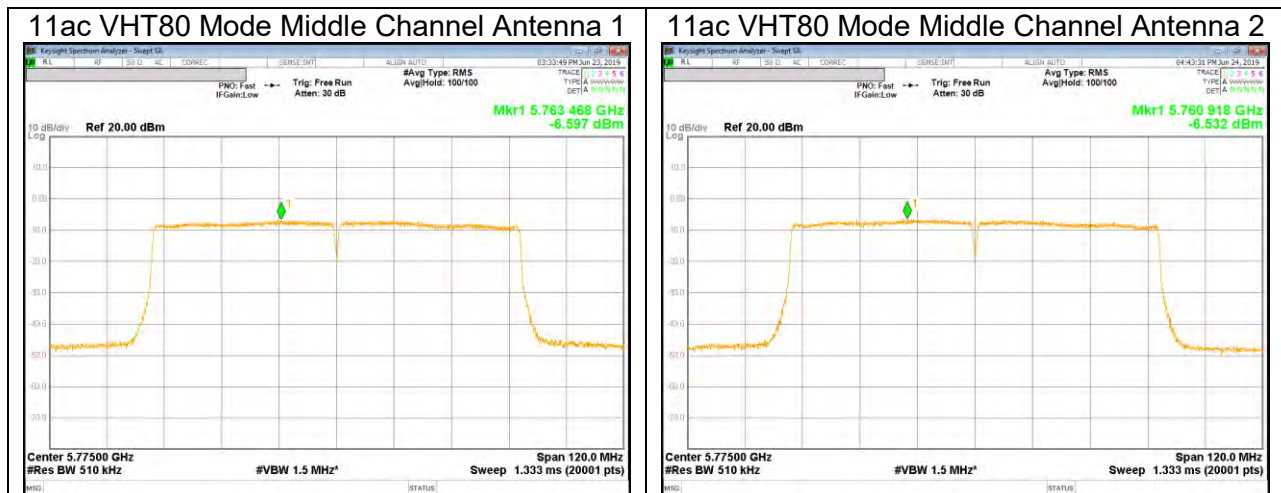
UNII 5.8 GHz IEEE 802.11n HT20 mode mode PSD



UNII 5.8 GHz IEEE 802.11n HT40 mode mode PSD



UNII 5.8 GHz IEEE 802.11ac VHT80 mode mode PSD



11. TRANSMITTER ABOVE 1 GHz

LIMITS

FCC §15.205 and §15.209

Limits for radiated disturbance of an intentional radiator		
Frequency range (MHz)	Limits (µV/m)	Measurement Distance (m)
0.009 – 0.490	2400 / F (kHz)	300
0.490 – 1.705	24000 / F (kHz)	30
1.705 – 30.0	30	30
30 – 88	100**	3
88 - 216	150**	3
216 – 960	200**	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g. §§ 15.231 and 15.241.

FCC §15.407 (b)

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

- (1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
- (2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
- (3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
- (4) For transmitters operating in the 5.725-5.85 GHz band:
 - (i) All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.
- (5) The emission measurements shall be performed using a minimum resolution bandwidth of

- 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary,
provided the measured energy is integrated to show the total power over 1 MHz.
- (6) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in §15.207.
- (7) The provisions of §15.205 apply to intentional radiators operating under this section.
- (8) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the upper and lower frequency band edges as the design of the equipment permits.

Note

- Limit translation to field strength level (FCC §15.407)

$$E[\text{dBuV/m}] = \text{EIRP}[\text{dBm}] + 95.2 = -27\text{dBm} + 95.2 = 68.2\text{dBuV/m}$$

$$E[\text{dBuV/m}] = \text{EIRP}[\text{dBm}] + 95.2 = -17\text{dBm} + 95.2 = 78.2\text{dBuV/m}$$

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane for below 1GHz and 150 cm for above 1GHz. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.10. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

Reference to KDB 789033 D02 v02r01 UNII part G) 6) c) Method AD:

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 3 MHz for peak measurements and add duty cycle factor to the reading offset for average measurements.

Pre-scans to detect harmonic and spurious emissions, the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 30 KHz for peak measurements.

The spectrum from 1GHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band.
(From 30MHz to 1GHz, test was performed with the EUT set to transmit at the channel with highest output power)

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

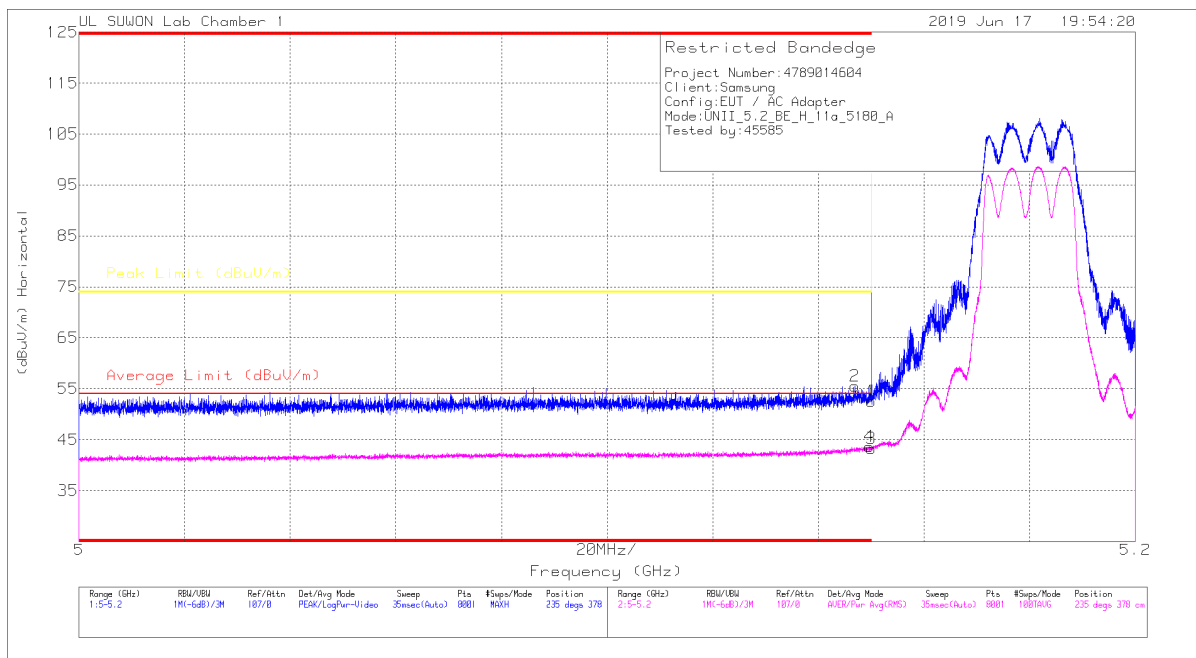
Note : Emission was pre-scanned from 9KHz to 30MHz; No emissions were detected which was at least 20dB below the specification limit (consider distance correction factor).
Per FCC part 15.31(o), test results were not reported.

Although these tests were performed other than open field test site, adequate comparison measurements were confirmed against 30 m open field test site.
Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the one of tests made in an open field based on KDB 414788.

11.1. 5.2 GHz

11.1.1. TX Above 1GHz 802.11a 2Tx CDD MODE IN THE 5.2GHz BAND RESTRICTED BANDEDGE (LOW CHANNEL)

HORIZONTAL PEAK AND AVERAGE DATA



Trace Markers

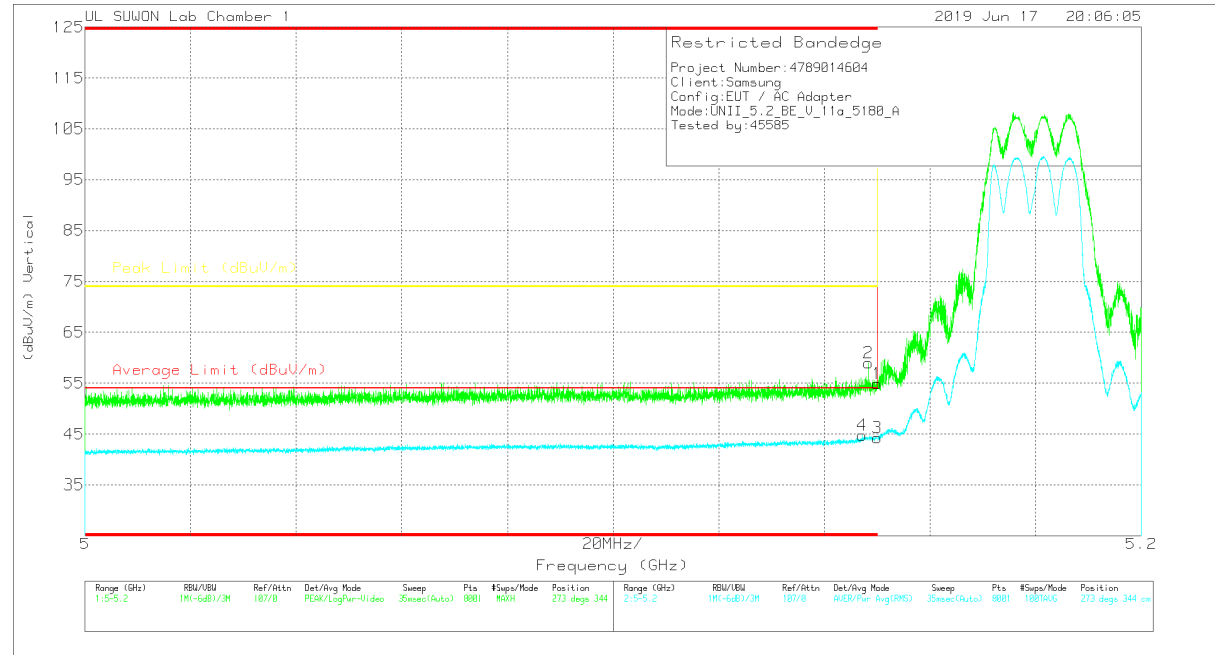
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168717	10dB[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	5.15	39.81	Pk	34.5	-21.8	0	52.51	-	-	74	-21.49	235	378	H
2	* 5.14698	42.93	Pk	34.4	-21.8	0	55.53	-	-	74	-18.47	235	378	H
3	5.15	30.82	RMS	34.5	-22	0	43.32	54	-10.68	-	-	235	378	H
4	* 5.14963	31.27	RMS	34.4	-22	0	43.67	54	-10.33	-	-	235	378	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

VERTICAL PEAK AND AVERAGE DATA



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168717	10dB[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	5.15	42.15	Pk	34.5	-21.8	0	54.85	-	-	74	-19.15	273	344	V
2	* 5.14838	46.37	Pk	34.4	-21.8	0	58.97	-	-	74	-15.03	273	344	V
3	5.15	31.75	RMS	34.5	-22	0	44.25	54	-9.75	-	-	273	344	V
4	* 5.14718	32.34	RMS	34.4	-22	0	44.74	54	-9.26	-	-	273	344	V

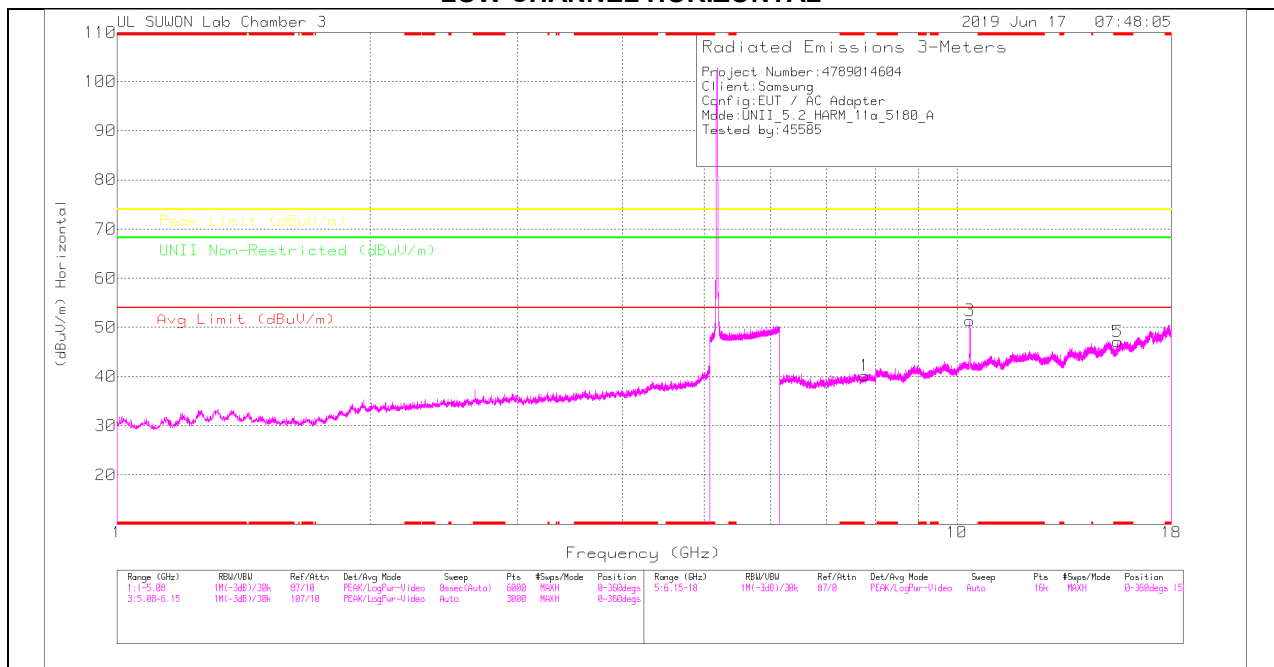
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

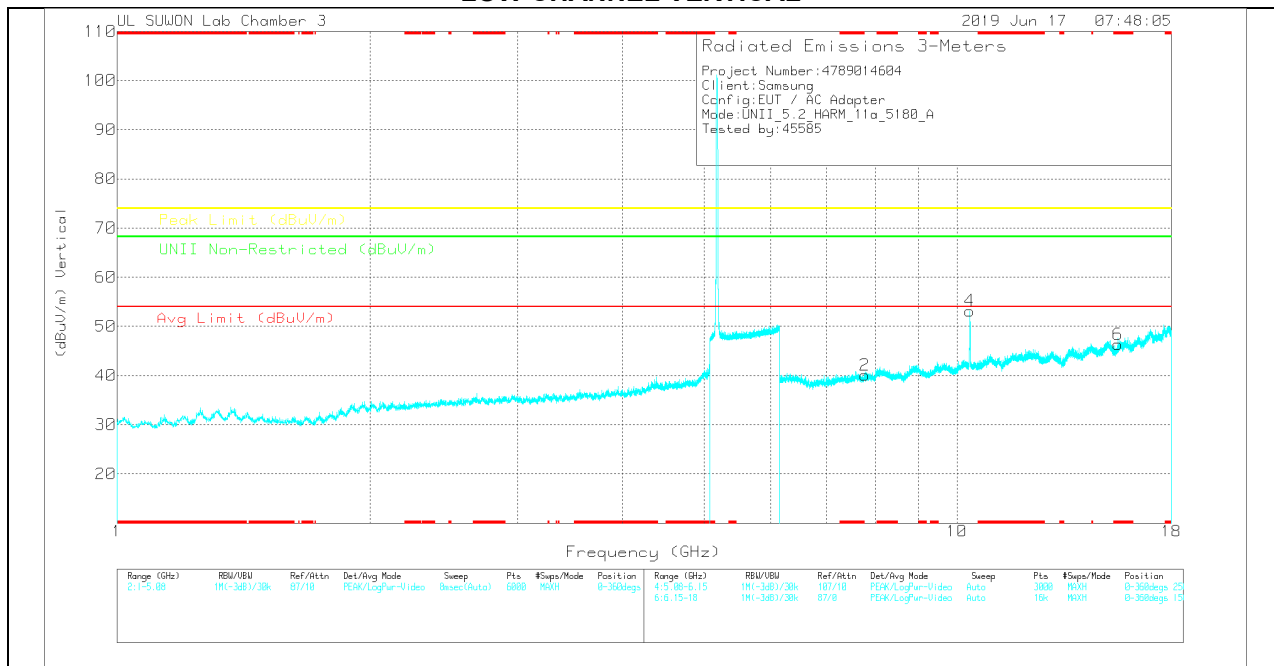
RMS - RMS detection

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL HORIZONTAL



LOW CHANNEL VERTICAL



Note: Emission was scanned up to 40GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

LOW CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_0020959	6GHz_HP[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	UNII Non-Restricted (dBuV/m)	Margin (dB)	Altitude (Degs)	Height (cm)	Polarity
1	7.771	27.42	PK	35.9	-23.1	0	40.22	-	-	-	-	68.2	-27.98	0-360	250	H
3	10.36	32.97	PK	37.6	-19.2	0	51.37	-	-	-	-	68.2	-16.83	0-360	150	H
5	* 15.534	28.69	PK	40.2	-19.8	0	47.09	-	-	74	-26.91	-	-	0-360	150	H
2	7.769	27.18	PK	35.9	-23	0	40.08	-	-	-	-	68.2	-28.12	0-360	150	V
4	10.359	34.74	PK	37.6	-19.2	0	53.14	-	-	-	-	68.2	-15.06	0-360	250	V
6	* 15.539	25.73	PK	40.2	-19.6	0	46.33	-	-	74	-27.67	-	-	0-360	250	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK – Peak Detector

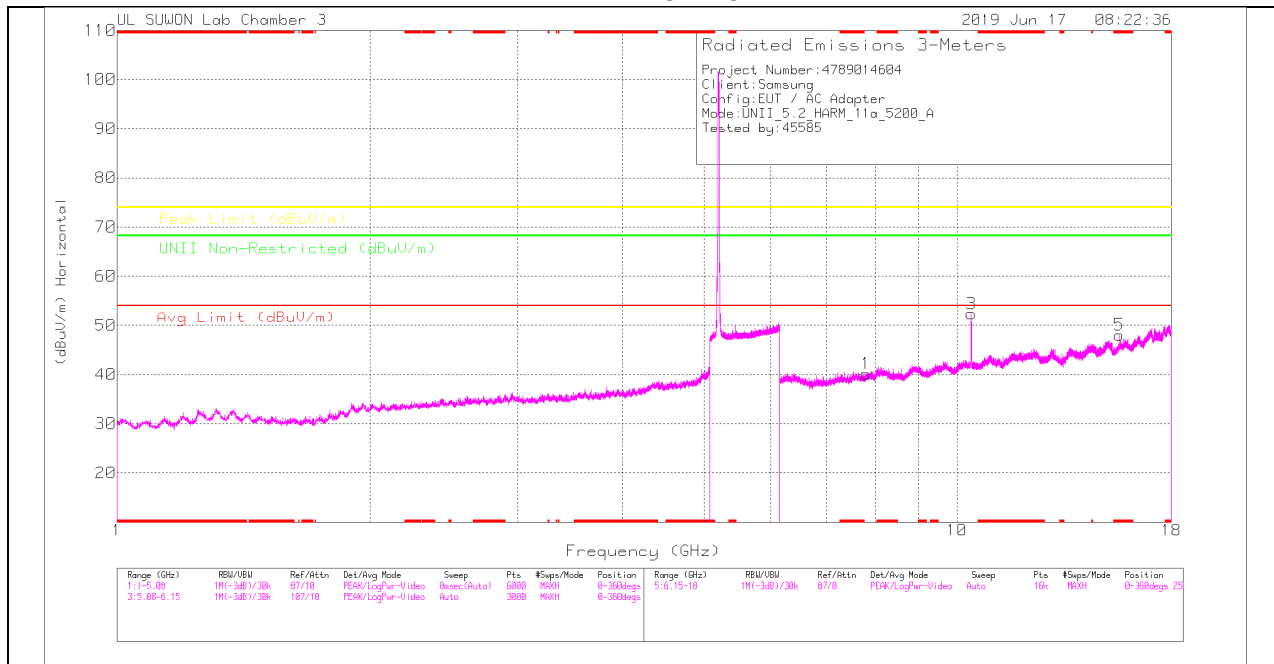
Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	3117_0020959	6GHz_HP[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	UNII Non-Restricted (dBuV/m)	Margin (dB)	Altitude (Degs)	Height (cm)	Polarity
10.366	45.17	PK-U	37.6	-19.2	0	63.57	-	-	-	-	68.2	-4.63	250	121	H
10.365	45.31	PK-U	37.6	-19.3	0	63.61	-	-	-	-	68.2	-4.59	155	190	V

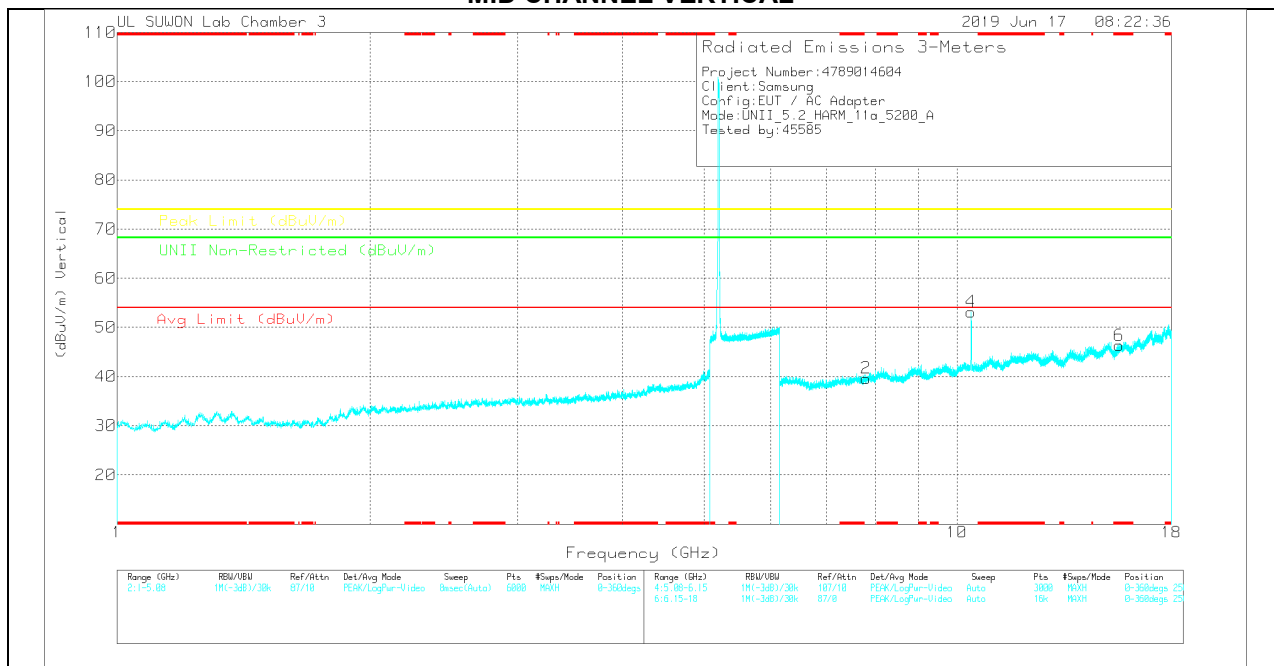
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK-U - U-NII: Maximum Peak

MID CHANNEL HORIZONTAL



MID CHANNEL VERTICAL



Note: Emission was scanned up to 40GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

MID CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00205959	6GHz_HP[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Unit Non-Restricted (dBuV/m)	Margin (dB)	Altitude (Degs)	Height (cm)	Polarity
1	7.798	27.15	PK	35.9	-22.9	0	40.15	-	-	-	-	68.2	-28.05	0-360	150	H
3	10.401	34.05	PK	37.6	-19.3	0	52.35	-	-	-	-	68.2	-15.85	0-360	150	H
5	* 15.599	27.35	PK	40.2	-19.5	0	48.05	-	-	74	-25.95	-	-	0-360	250	H
2	7.797	26.64	PK	35.9	-22.9	0	39.64	-	-	-	-	68.2	-28.56	0-360	250	V
4	10.399	34.86	PK	37.6	-19.3	0	53.16	-	-	-	-	68.2	-15.04	0-360	150	V
6	* 15.603	25.53	PK	40.2	-19.4	0	46.33	-	-	74	-27.67	-	-	0-360	150	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK – Peak Detector

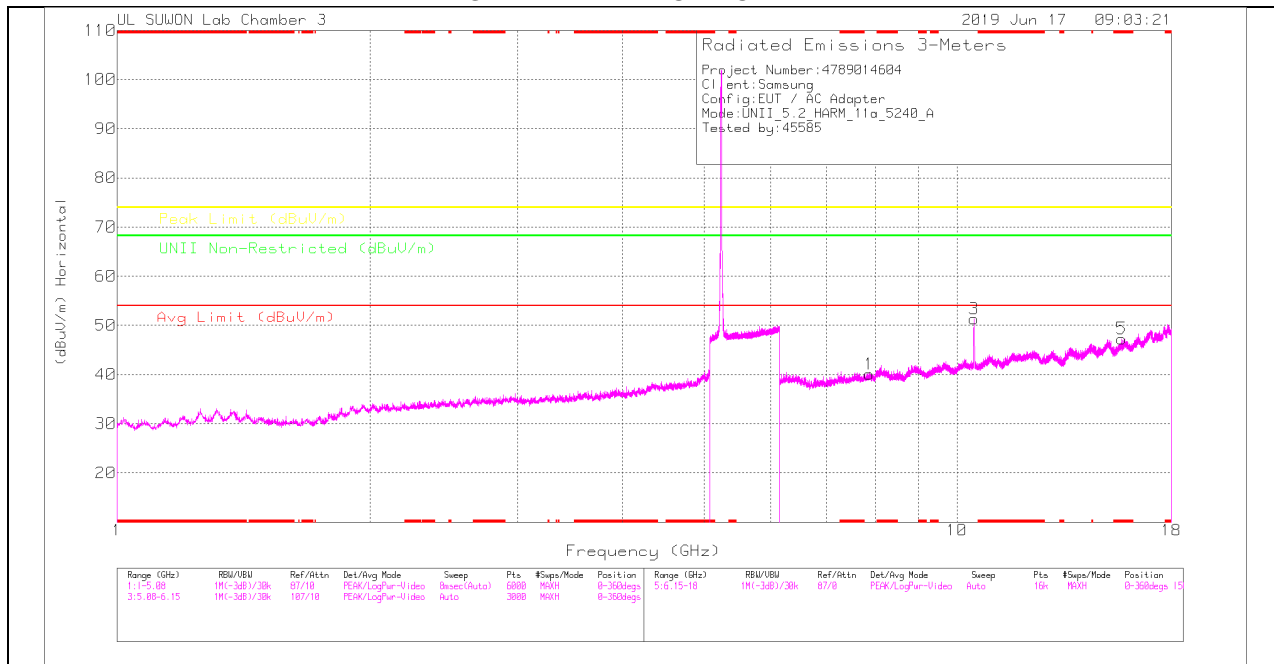
Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00205959	6GHz_HP[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Unit Non-Restricted (dBuV/m)	Margin (dB)	Altitude (Degs)	Height (cm)	Polarity
10.4	45.14	PK-U	37.6	-19.3	0	63.44	-	-	-	-	68.2	-4.76	250	117	H
10.4	45.5	PK-U	37.6	-19.3	0	63.8	-	-	-	-	68.2	-4.4	151	196	V

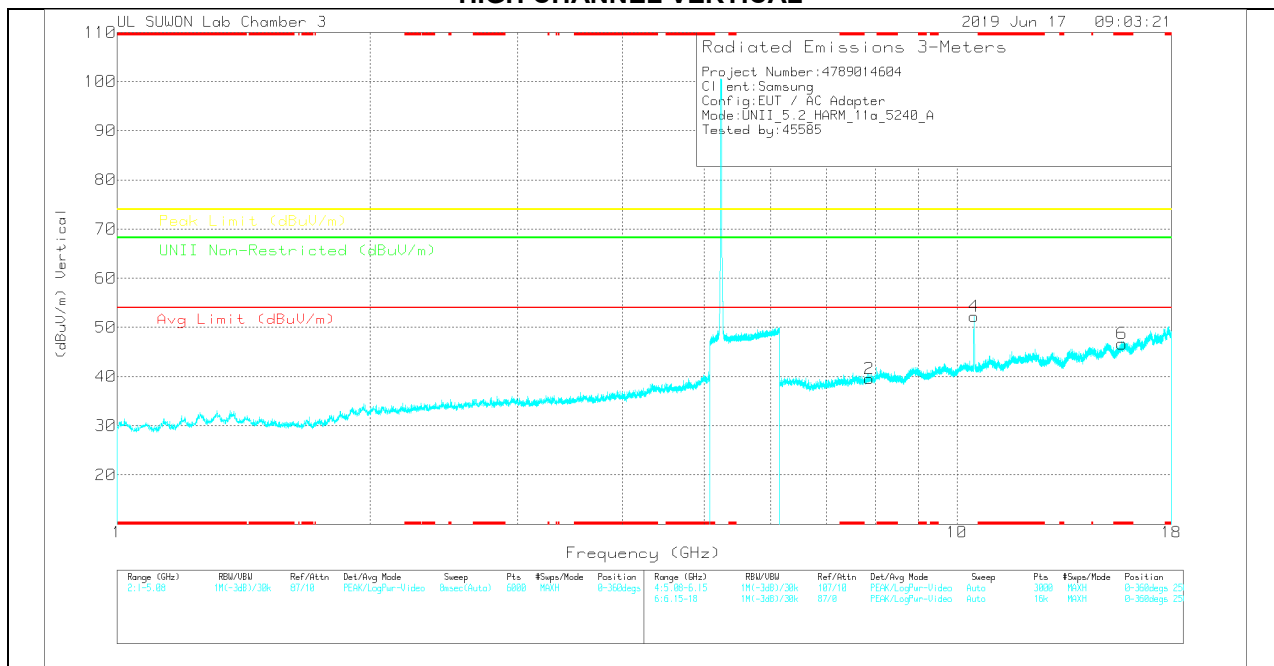
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK-U - U-NII: Maximum Peak

HIGH CHANNEL HORIZONTAL



HIGH CHANNEL VERTICAL



Note: Emission was scanned up to 40GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

HIGH CHANNEL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00205959	6GHz_HP[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	UNII Non-Restricted (dBuV/m)	Margin (dB)	Altitude (Degs)	Height (cm)	Polarity
1	7.859	26.66	PK	35.9	-22.5	0	40.06	-	-	-	-	68.2	-28.14	0-360	150	H
3	10.48	32.94	PK	37.7	-19.3	0	51.34	-	-	-	-	68.2	-16.86	0-360	150	H
5	* 15.715	26.19	PK	40.4	-19.3	0	47.29	-	-	74	-26.71	-	-	0-360	250	H
2	7.862	26.08	PK	35.9	-22.4	0	39.58	-	-	-	-	68.2	-28.62	0-360	250	V
4	10.479	33.8	PK	37.7	-19.3	0	52.2	-	-	-	-	68.2	-16	0-360	150	V
6	* 15.722	25.39	PK	40.4	-19.1	0	46.69	-	-	74	-27.31	-	-	0-360	150	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK – Peak Detector

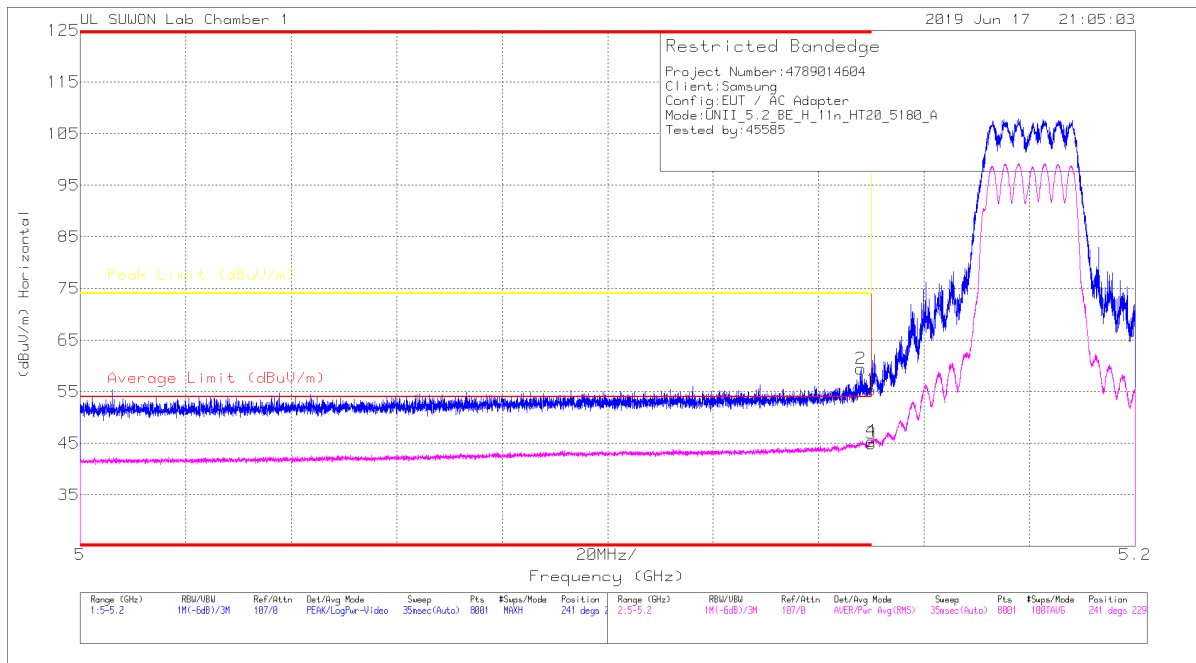
Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00205959	6GHz_HP[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	UNII Non-Restricted (dBuV/m)	Margin (dB)	Altitude (Degs)	Height (cm)	Polarity
10.485	45.7	PK-U	37.7	-19.3	0	64.1	-	-	-	-	68.2	-4.1	248	116	H
10.48	45.85	PK-U	37.7	-19.3	0	64.25	-	-	-	-	68.2	-3.95	152	193	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK-U - U-NII: Maximum Peak

11.1.2.TX Above 1GHz 802.11n HT20 2Tx CDD MODE IN THE 5.2GHz BAND RESTRICTED BANDEDGE (LOW CHANNEL)

HORIZONTAL PEAK AND AVERAGE DATA



Trace Markers

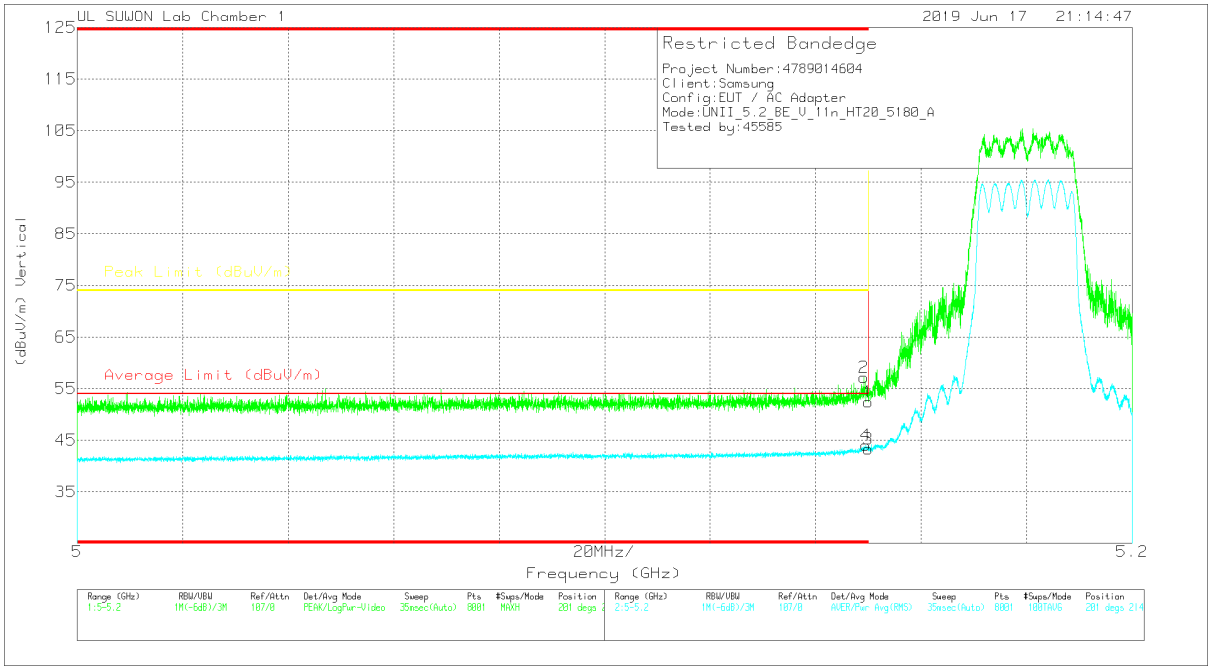
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168717	10dB[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	5.15	42.67	PK	34.5	-21.8	0	55.37	-	-	74	-18.63	241	229	H
2	* 5.148	46.85	PK	34.4	-21.8	0	59.45	-	-	74	-14.55	241	229	H
3	5.15	32.44	RMS	34.5	-22	0	44.94	54	-9.06	-	-	241	229	H
4	* 5.14995	33.01	RMS	34.4	-22	0	45.41	54	-8.59	-	-	241	229	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK - Peak detector

RMS - RMS detection

VERTICAL PEAK AND AVERAGE DATA



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168717	10dB[dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	5.15	39.71	Pk	34.5	-21.8	0	52.41	-	-	74	-21.59	201	214	V
2	*5.14913	44.57	Pk	34.4	-21.8	0	57.17	-	-	74	-16.83	201	214	V
3	5.15	30.8	RMS	34.5	-22	0	43.3	54	-10.7	-	-	201	214	V
4	*5.14953	31.63	RMS	34.4	-22	0	44.03	54	-9.97	-	-	201	214	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection