



CERTIFICATION TEST REPORT

Report Number : 13018973-E5V3

Applicant : APPLE, INC.
1 APPLE PARK WAY
CUPERTINO, CA 95014, U.S.A.

Model : A2275, A2297, A2298

IC : 579C-E3500A

EUT Description : SMARTPHONE

Test Standard(s) : ISED RSS-247 ISSUE 2
ISED RSS-GEN ISSUE 5

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REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	2/10/2020	Initial Issue	Tony Li
V2	3/21/2020	Address TCB Questions	Chin Pang
V3	3/25/2020	Remove DFS KDB in Section 2	Chin Pang

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: APPLE, INC.
1 APPLE PARK WAY
CUPERTINO, CA 95014, U.S.A.

EUT DESCRIPTION: SMARTPHONE

MODEL: A2275, A2297, A2298

SERIAL NUMBER: FFMZV04ZPM63, FFMZW0B3PM63

DATE TESTED: AUGUST 28, 2019 – JANUARY 31, 2020

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
ISED RSS-247 Issue 2	Complies
ISED RSS-GEN Issue 5	Complies

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. All samples tested were in good operating condition throughout the entire test program. Measurement Uncertainties are published for informational purposes only and were not taken into account unless noted otherwise.

This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. 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 NVLAP, NIST, any agency of the Federal Government, or any agency of the U.S. government.

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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, FCC KDB 662911 D01 v02r01, FCC KDB 789033 D02 v02r01, ANSI C63.10-2013, RSS-GEN Issue 5, and RSS-247 Issue 2.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 and 47266 Benicia Street, and 47658 Kato Road, Fremont, California, USA. Line conducted emissions are measured only at the 47173 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.

47173 Benicia Street	47266 Benicia Street	47658 Kato Rd
☒ Chamber A (ISED:2324B-1)	☒ Chamber D (ISED:22541-1)	☒ Chamber I (ISED:2324A-5)
☒ Chamber B (ISED:2324B-2)	☒ Chamber E (ISED:22541-2)	☐ Chamber J (ISED:2324A-6)
☐ Chamber C (ISED:2324B-3)	☒ Chamber F (ISED:22541-3)	☐ Chamber K (ISED:2324A-1)
	☒ Chamber G (ISED:22541-4)	☐ Chamber L (ISED:2324A-3)
	☒ Chamber H (ISED:22541-5)	

The above test sites and facilities are covered under FCC Test Firm Registration # 208313. Chambers above are covered under Industry Canada company address and respective code

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0

4. DECISION RULES AND MEASUREMENT UNCERTAINTY

4.1. METROLOGICAL TRACEABILITY

All test and measuring equipment utilized to perform the tests documented in this report are calibrated on a regular basis, with a maximum time between calibrations of one year or the manufacturers' recommendation, whichever is less, and where applicable is traceable to recognized national standards.

4.2. DECISION RULES

The Decision Rule is based on Simple Acceptance in accordance with ISO Guide 98-4:2012 Clause 8.2. (Measurement uncertainty is not taken into account when stating conformity with a specified requirement.)

4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	U _{LAB}
Worst Case Conducted Disturbance, 9KHz to 0.15 MHz	3.39 dB
Worst Case Conducted Disturbance, 0.15 to 30 MHz	3.07 dB
Worst Case Radiated Disturbance, 9KHz to 30 MHz	2.52 dB
Worst Case Radiated Disturbance, 30 to 1000 MHz	4.88 dB
Worst Case Radiated Disturbance, 1000 to 18000 MHz	4.24 dB
Worst Case Radiated Disturbance, 18000 to 26000 MHz	4.37 dB
Worst Case Radiated Disturbance, 26000 to 40000 MHz	5.17 dB

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

5. EQUIPMENT UNDER TEST

5.1. EUT DESCRIPTION

The Apple iPhone is a smartphone with multimedia functions (music, application support, and video), cellular GSM, GPRS, EGPRS, UMTS, LTE, TD-SCDMA, CDMA, IEEE 802.11a/b/g/n/ac/ax, Bluetooth, GPS and NFC. All models support at least one UICC based SIM. The second SIM, if present, is either UICC based pSIM (physical SIM) or e-SIM (electronic SIM). The device has a built-in inductive charging receiver. The rechargeable battery is also not user accessible.

5.2. DIFFERENCE IN MODEL NUMBER

Model A2275, A2297 and A2298 is electrically identical to Model A2275. Three model numbers are allocated for marketing and logistic purposes only. A2275 was used to perform all final tests.

5.3. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power as follows:

5.2 GHz BAND (IC)

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5.2 GHz band, 1TX			
5180-5240	802.11a	Covered by 802.11n HT20 1TX	
5180-5240	802.11n HT20	18.44	69.82
5190-5230	802.11n HT40	20.91	123.31
5180-5240	802.11ac VHT20	Covered by 802.11n HT20 1TX	
5190-5230	802.11ac VHT40	Covered by 802.11n HT40 1TX	
5210	802.11ac VHT80	14.36	27.29
5180-5240	802.11ax HE20	18.41	69.34
5190-5230	802.11ax HE40	20.88	122.46
5210	802.11ax HE80	12.89	19.45
5.2 GHz band, 2TX			
5180-5240	802.11n HT20 CDD	16.45	44.16
5180-5240	802.11n HT20 SDM/STBC	Covered by 802.11n HT20 2TX CDD	
5190-5230	802.11n HT40 CDD	18.94	78.34
5190-5230	802.11n HT40 SDM/STBC	Covered by 802.11n HT40 2TX CDD	
5180-5240	802.11ac VHT20 SDM/STBC/CDD	Covered by 802.11n HT20 2TX CDD	
5190-5230	802.11ac VHT40 SDM/STBC/CDD	Covered by 802.11n HT40 2TX CDD	
5210	802.11ac VHT80 CDD	16.86	48.53
5210	802.11ac VHT80 SDM/STBC	Covered by 802.11ac VHT80 2TX CDD	
5180-5240	802.11ax HE20 OFDMA	16.43	43.95
5190-5230	802.11ax HE40 OFDMA	18.77	75.34
5210	802.11ax HE80 OFDMA	15.40	34.67

5.3 GHz BAND (IC)

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5.3 GHz band, 1TX			
5260 - 5320	802.11a	Covered by 802.11n HT20 1TX	
5260 - 5320	802.11n HT20	20.93	123.88
5270 - 5310	802.11n HT40	20.88	122.46
5260 - 5320	802.11ac VHT20	Covered by 802.11n HT20 1TX	
5270 - 5310	802.11ac VHT40	Covered by 802.11n HT40 1TX	
5290	802.11ac VHT80	14.76	29.92
5260 - 5320	802.11ax HE20	20.82	120.78
5270 - 5310	802.11ax HE40	20.87	122.18
5290	802.11ax HE80	13.48	22.28
5.3 GHz band, 2TX			
5260 - 5320	802.11n HT20 CDD	20.18	104.23
5260 - 5320	802.11n HT20 SDM/STBC	Covered by 802.11n HT20 2TX CDD	
5270 - 5310	802.11n HT40 CDD	21.46	139.96
5270 - 5310	802.11n HT40 SDM/STBC	Covered by 802.11n HT40 2TX CDD	
5260 - 5320	802.11ac VHT20 SDM/STBC/CDD	Covered by 802.11n HT20 2TX CDD	
5270 - 5310	802.11ac VHT40 SDM/STBC/CDD	Covered by 802.11n HT40 2TX CDD	
5290	802.11ac VHT80 CDD	16.75	47.32
5290	802.11ac VHT80 SDM/STBC	Covered by 802.11ac VHT80 2TX CDD	
5260 - 5320	802.11ax HE20 OFDMA	20.18	104.23
5270 - 5310	802.11ax HE40 OFDMA	21.49	140.93
5290	802.11ax HE80 OFDMA	15.88	38.73

5.6 GHz BAND (IC)

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5.6 GHz band, 1TX			
5500-5720	802.11a	Covered by 802.11n HT20 1TX	
5500-5720	802.11n HT20	20.94	124.17
5510-5710	802.11n HT40	20.89	122.74
5500-5720	802.11ac VHT20	Covered by 802.11n HT20 1TX	
5510-5710	802.11ac VHT40	Covered by 802.11n HT40 1TX	
5530-5690	802.11ac VHT80	20.90	123.03
5500-5720	802.11ax HE20	20.94	124.17
5510-5710	802.11ax HE40	20.74	118.58
5530-5690	802.11ax HE80	20.74	118.58
5.6 GHz band, 2TX			
5500-5720	802.11n HT20 CDD	20.45	110.92
5500-5720	802.11n HT20 SDM/STBC	Covered by 802.11n HT20 2TX CDD	
5510-5710	802.11n HT40 CDD	21.63	145.55
5510-5710	802.11n HT40 SDM/STBC	Covered by 802.11n HT40 2TX CDD	
5500-5720	802.11ac VHT20 SDM/STBC/CDD	Covered by 802.11n HT20 2TX CDD	
5510-5710	802.11ac VHT40 SDM/STBC/CDD	Covered by 802.11n HT40 2TX CDD	
5530-5690	802.11ac VHT80 CDD	21.76	149.97
5530-5690	802.11ac VHT80 SDM/STBC	Covered by 802.11ac VHT80 2TX CDD	
5500-5720	802.11ax HE20 OFDMA	20.47	111.43
5510-5710	802.11ax HE40 OFDMA	21.60	144.54
5530-5690	802.11ax HE80 OFDMA	21.66	146.55

5.8 GHz BAND (IC)

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5.8 GHz band, 1TX			
5745-5825	802.11a	Covered by 802.11n HT20 1TX	
5745-5825	802.11n HT20	20.71	117.76
5755-5795	802.11n HT40	20.72	118.03
5745-5825	802.11ac VHT20	Covered by 802.11n HT20 1TX	
5755-5795	802.11ac VHT40	Covered by 802.11n HT40 1TX	
5775	802.11ac VHT80	20.72	118.03
5745-5825	802.11ax HE20	20.75	118.85
5755-5795	802.11ax HE40	20.74	118.58
5775	802.11ax HE80	20.72	118.03
5.8 GHz band, 2TX			
5745-5825	802.11n HT20 CDD	22.36	172.19
5745-5825	802.11n HT20 SDM/STBC	Covered by 802.11n HT20 2TX CDD	
5755-5795	802.11n HT40 CDD	22.33	171.00
5755-5795	802.11n HT40 SDM/STBC	Covered by 802.11n HT40 2TX CDD	
5745-5825	802.11ac VHT20 STM/STBC/CDD	Covered by 802.11n HT20 2TX CDD	
5755-5795	802.11ac VHT40 STM/STBC/CDD	Covered by 802.11n HT40 2TX CDD	
5775	802.11ac VHT80 CDD	22.30	169.82
5775	802.11ac VHT80 SDM/STBC	Covered by 802.11ac VHT80 2TX CDD	
5745-5825	802.11ax HE20 OFDMA	22.41	174.18
5755-5795	802.11ax HE40 OFDMA	22.38	172.98
5775	802.11ax HE80 OFDMA	22.39	173.38

5.4. DESCRIPTION OF AVAILABLE ANTENNAS

Frequency Range	UAT 2	LAT 3
5180 - 5240	-3.40	-1.30
5260 - 5320	-1.90	-0.50
5500 - 5720	-2.30	-0.30
5745 - 5825	-1.60	-0.20

5.5. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was WiFi FW Version: 18_20_71_1.

5.6. WORST-CASE CONFIGURATION AND MODE

The fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z on UAT 2 and LAT 3, it was determined that X (Flatbed) orientation was the worst-case orientation for UAT 2; and Y (Landscape) orientation was the worst case for LAT 3 and 2TX.

For radiated harmonics spurious below 1GHz, 1-18GHz L/M/H channels, 18-40GHz, and power line conducted emissions were performed with the EUT set at the 2TX CDD mode among the CDD/SDM modes and 2TX HE mode with power setting equal or higher than SISO modes as worst-case scenario.

Radiated band edge, harmonic, and spurious emissions from 1GHz to 18GHz were performed with the EUT was set to transmit at highest power on Low/Middle/High channels.

Below 1GHz tests were performed with EUT connected to AC power adapter as the worst case; and for above 1GHz, the worst-case configuration reported was tested with EUT only. For AC line conducted emission, test was investigated with AC power adapter and with laptop. There were no emissions found below 30MHz within 20dB of the limit.

The output power and psd for the 802.11 ax mode were investigated between all different tones, and we found that the highest tone had the highest output power and lowest tone had the highest PSD readings. Therefore, full testing was performed on both the highest and lowest tones.

For simultaneous transmission with the Bluetooth was investigated, no noticeable emission was found.

Investigated worst-case data rates as listed below were:

802.11n HT20mode: MCS0
802.11n HT40mode: MCS0
802.11ac VHT80 mode: MCS0
802.11ax HE20/HE40/HE80 FULL RU & RU26

There are two vendors of the WiFi/Bluetooth radio modules: variant 1 and variant 2. The Wi-Fi/Bluetooth radio modules have the same mechanical outline (e.g., the same package dimension and pin-out layout), use the same on-board antenna matching circuit, have an identical antenna structure, and are built and tested to conform to the same specifications and to operate within the same tolerances.

Baseline testing was performed on the two variants to determine the worst case on all conducted power and radiated emissions.

5.7. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	Apple	MacBook Pro	HRP003436	QDS-BRCM1080
AC Adapter	Apple	A1385	D29325SM03XDHLHC9	N/A
Dongle	N/A	N/A	N/A	NA

I/O CABLES (CONDUCTED TEST)

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	Antenna	1	SMA	Un-Shielded	0.2	To spectrum Analyzer
2	USB	1	USB	Shielded	1	N/A
3	AC	1	AC	Un-shielded	2	N/A

I/O CABLES (RADIATED ABOVE 1 GHZ)

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
None Used						

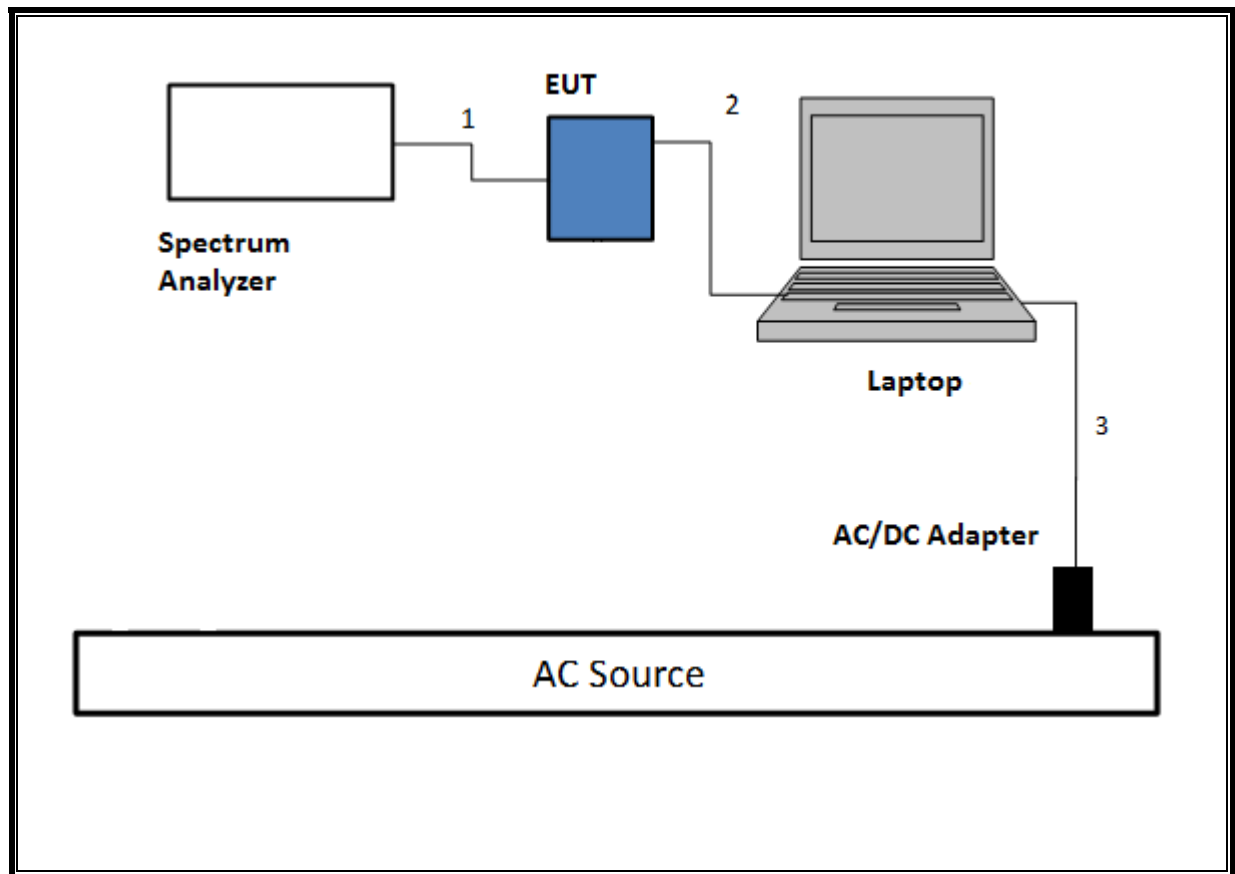
I/O CABLES (AC POWER CONDUCTED TEST AND BELOW 1 GHZ)

I/O Cable List						
Cable No	Port	# of identical	Connector Type	Cable Type	Cable Length (m)	Remarks
1	AC	1	AC	Un-shielded	2	N/A
2	USB	1	USB	Un-shielded	1	N/A

TEST SETUP CONDUCTED PORT

The EUT is connected to a test laptop during the tests. Test software exercised the EUT

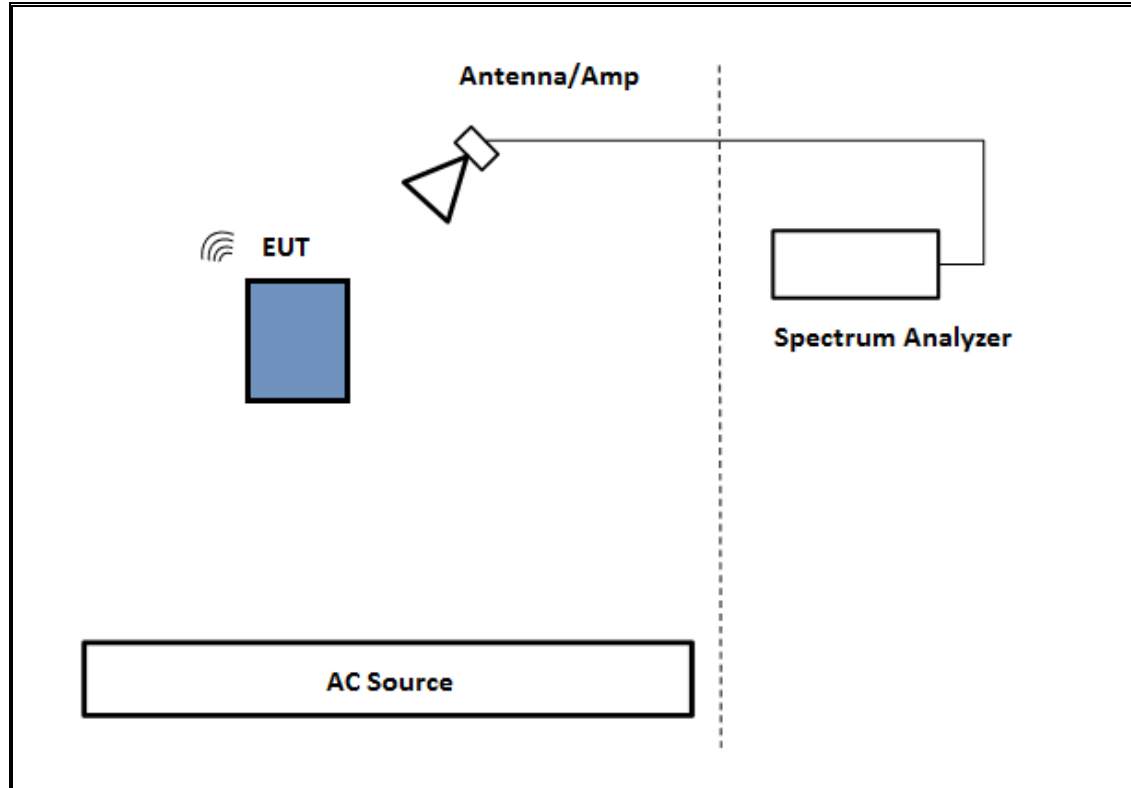
SETUP DIAGRAM FOR CONDUCTED TESTS



TEST SETUP- RADIATED-ABOVE 1 GHZ

The EUT was powered by Battery. Test software exercised the EUT.

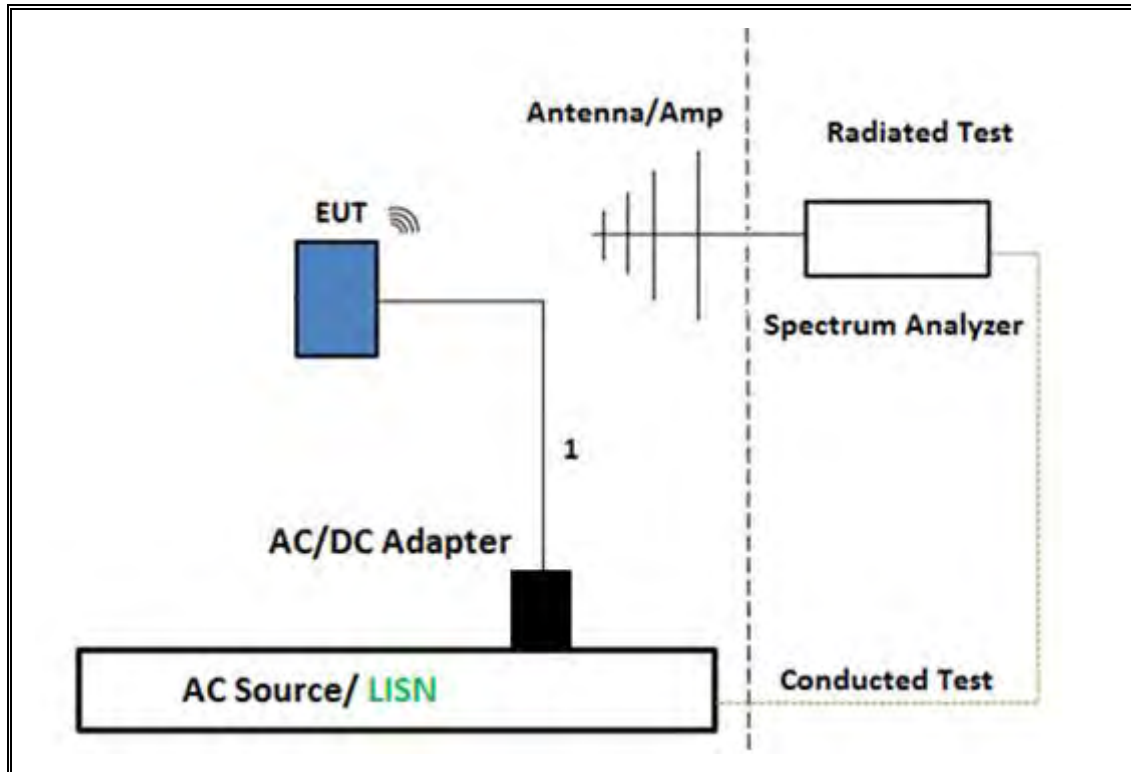
SETUP DIAGRAM



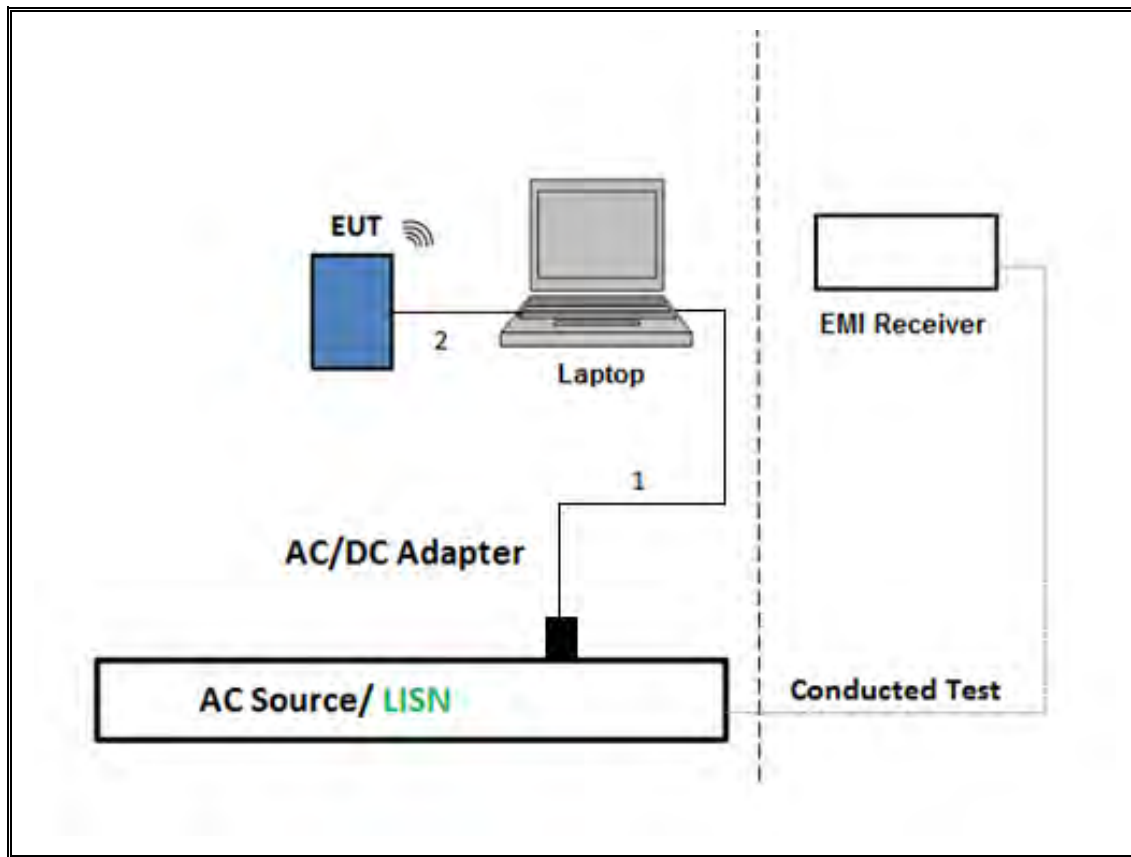
TEST SETUP- BELOW 1GHZ & AC LINE CONDUCTED TESTS

The EUT was powered by AC cord. Test software exercised the EUT.

SETUP DIAGRAM



TEST SETUP- AC LINE CONDUCTED: LAPTOP CONFIGURATION



6. MEASUREMENT METHOD

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

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

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

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

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

Power Spectral Density: KDB 789033 D02 v02r01, Section F

Unwanted emissions in restricted bands: KDB 789033 D02 v02r01, Sections G.3, G.4, G.5, and G.6.

Unwanted emissions in non-restricted bands: KDB 789033 D02 v02r01, Sections G.3, G.4, and G.5.

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

Radiated Spurious Emissions Below 30MHz: ANSI C63.10-2013 Section 6.4

7. 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	ID Num	Cal Due	Last Cal
Antenna, Horn 1-18GHz	ETS Lindgren	3117	T119	03/22/2020	03/22/2019
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	T863	05/30/2020	05/30/2019
Antenna, Horn 1-18GHz	ETS Lindgren	3117	T136	07/02/2020	07/02/2019
Antenna, Horn 1-18GHz	ETS Lindgren	3117	T712	02/26/2020	02/26/2019
Antenna, Horn 1-18GHz	ETS Lindgren	3117	T345	04/20/2020	04/20/2019
Antenna Horn, 18 to 26GHz	ARA	MWH-1826	T447	08/13/2020	08/13/2019
Antenna, Horn 26.5GHz to 40GHz	ARA	MWH-2640/B	T446	08/13/2020	08/13/2019
Antenna, Double Ridge Guide Horn Antenna 700MHz to 18GHz	A.H. SYSTEMS, INC.	SAS-571	PRE0194893	05/16/2021	05/16/2019
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences	JB1	T407	05/11/2020	05/11/2019
Amplifier, 10KHz to 1GHz, 32dB	Sonoma	310N	T173	06/06/2020	06/06/2019
Antenna, Horn 1-18GHz	ETS Lindgren	3117	T862	06/05/2020	06/05/2019
RF Amplifier, 1-18GHz	MITEQ	AFS42-00101800- 25-S-42	171460	08/24/2020	08/24/2019
*Amplifier, 1 to 18GHz, 35dB	Ampical	AFS42-00101800- 25-S-42	T1567	01/26/2020	01/26/2019
Amplifier, 1 to 18GHz	Miteq	AFS42-00101800- 25-S-42	T931	05/11/2020	05/11/2019
Amplifier, 1 to 18GHz	Miteq	AFS42-00101800- 25-S-42	T491	05/30/2020	05/30/2019
Amplifier, 1 to 18GHz	Miteq	AFS42-00101800- 25-S-42	138301	08/03/2020	08/03/2019
Amplifier, 1 to 18GHz	Miteq	AFS42-00101800- 25-S-42	T740	07/31/2020	07/31/2019
Pre-Amp 18-26GHz	Agilent Technology	8449B	T404	03/23/2020	03/23/2019
*Amplifier, 1 to 18GHz	Miteq	AFS42-00101800- 25-S-42	T742	12/15/2019	12/15/2018
Amplifier, 26GHz to 40GHz	Miteq	TTA2640-35-HG	T1864	03/23/2020	03/23/2019
*Spectrum Analyzer, PXA 3Hz to 44GHz	Keysight	N9030A	T1466	01/23/2020	01/23/2019
*Spectrum Analyzer, PXA 3Hz to 44GHz	Keysight	N9030A	T905	01/24/2020	01/24/2019
*Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent (Keysight) Technologies	N9030A	T342	01/23/2020	01/23/2019
*Spectrum Analyzer, PXA 3Hz to 44GHz	Keysight	N9030A	T1454	01/23/2020	01/23/2019
*Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent (Keysight) Technologies	N9030A	T340	01/22/2020	01/22/2019
*Spectrum Analyzer, PXA 3Hz to 44GHz	Agilent (Keysight) Technologies	N9030A	T908	01/23/2020	01/23/2019
*Spectrum Analyzer, PXA 3Hz to 44GHz	Agilent (Keysight) Technologies	N9030A-544	T1113	01/22/2020	01/22/2019
3GHz HPF	Micro-Tronic	HPM17543	T1014	04/28/2020	04/28/2019
*Spectrum Analyzer, PXA 3Hz to 44GHz	Keysight	N9030A	T339	01/23/2020	01/23/2019
EMI Test Receiver	Rohde & Schwarz	ESW44	Pre0179376	02/14/2020	02/14/2019
Power Sensor	Keysight	N1921A	T1224	02/22/2020	02/22/2019
*Power Meter, P-series single channel	Keysight	N1912A	T1272	01/29/2020	01/29/2019
Antenna, Active Loop 9KHz to 30MHz	EMCO	6502	T35	06/06/2020	06/06/2019

AC Line Conducted					
Description	Manufacturer	Model	ID Num	Cal Due	Last Cal
*EMI Test Receiver 9Khz-7GHz	Rohde & Schwarz	ESCI7	T1436	02/14/2020	02/14/2019
*Power Cable, Line Conducted Emissions	UL	PG1	T861	10/19/2019	10/19/2018
*LISN for Conducted Emissions CISPR-16	Fischer	50/250-25-2-01	T1310	01/24/2020	01/24/2019
UL AUTOMATION SOFTWARE					
Radiated Software	UL	UL EMC	Ver 9.5, April 26, 2016		
Conducted Software	UL	UL EMC	Ver 9.9, June 4, 2019		
AC Line Conducted Software	UL	UL EMC	Ver 9.5, May 26, 2015		

*Testing is completed before equipment expiration date.

8. ANTENNA PORT TEST RESULTS

8.1. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method.

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/B Minimum VBW (kHz)
802.11n HT20 1TX	1.920	1.941	0.989	98.92%	0.00	0.010
802.11n HT20 CDD	1.920	1.941	0.989	98.92%	0.00	0.010
802.11n HT40 1TX	0.944	0.964	0.979	97.93%	0.09	1.059
802.11n HT40 CDD	0.944	0.964	0.979	97.93%	0.09	1.059
802.11ac VHT80 1TX	0.459	0.480	0.956	95.63%	0.19	2.179
802.11ac VHT80 CDD	0.460	0.481	0.956	95.63%	0.19	2.174
802.11ax HE20 1Tx, 242-Tones	1.572	1.596	0.985	98.50%	0.00	0.010
802.11ax HE20 1Tx, 26-Tones	4.095	4.155	0.986	98.56%	0.00	0.010
802.11ax HE20 OFDMA, 242-Tones	1.572	1.593	0.987	98.68%	0.00	0.010
802.11ax HE20 OFDMA, 26-Tones	4.095	4.150	0.987	98.67%	0.00	0.010
802.11ax HE40 1TX, 484-Tones	1.560	1.581	0.987	98.67%	0.00	0.010
802.11ax HE40 1TX, 26-Tones	4.095	4.155	0.986	98.56%	0.00	0.010
802.11ax HE40 OFDMA, 484-Tones	1.557	1.581	0.985	98.48%	0.00	0.010
802.11ax HE40 OFDMA, 26-Tones	4.100	4.155	0.987	98.68%	0.00	0.010
802.11ax HE80 1TX, 996-Tones	1.458	1.485	0.982	98.18%	0.00	0.010
802.11ax HE80 1TX, 26-Tones	4.105	4.160	0.987	98.68%	0.00	0.010
802.11ax HE80 OFDMA, 996-Tones	1.464	1.491	0.982	98.19%	0.00	0.010
802.11ax HE80 OFDMA, 26-Tones	4.105	4.155	0.988	98.80%	0.00	0.010



DUTY CYCLE 802.11n HT20 1TX MODE



DUTY CYCLE 802.11n 2TX CDD MODE



DUTY CYCLE 802.11n HT40 1Tx MODE



DUTY CYCLE 802.11n HT40 2TX CDD MODE



DUTY CYCLE 802.11ac VHT80 1Tx MODE



DUTY CYCLE 802.11ac VHT80 2TX CDD MODE



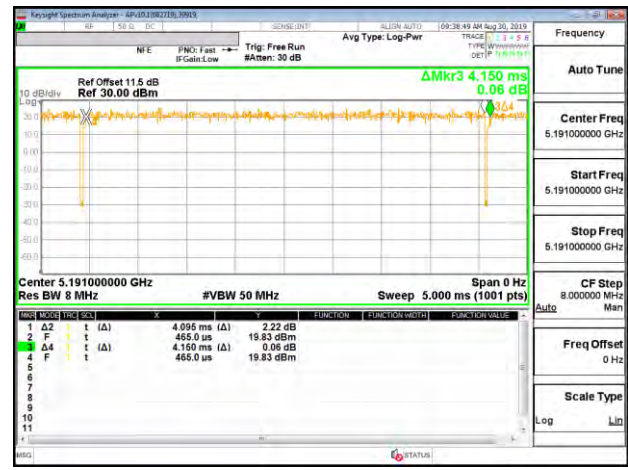
DUTY CYCLE 802.11ax HE20 1TX 242 TONES



DUTY CYCLE 802.11ax HE20 1TX 26 TONES



DUTY CYCLE 802.11ax HE20 2TX 242 TONES



DUTY CYCLE 802.11ax HE20 2TX 26 TONES



DUTY CYCLE 802.11ax HE40 1TX 484 TONES



DUTY CYCLE 802.11ax HE40 1TX 26 TONES



8.2. 26 dB BANDWIDTH

LIMITS

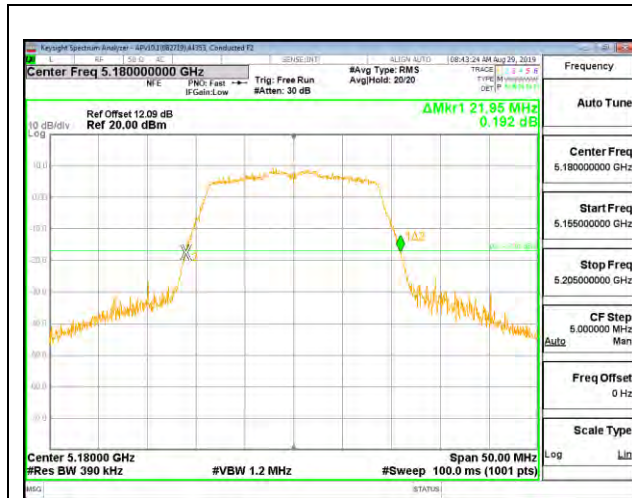
None; for reporting purposes only.

RESULTS

8.2.1. 802.11n HT20 MODE IN THE 5.2 GHz BAND

1TX UAT 2 MODE

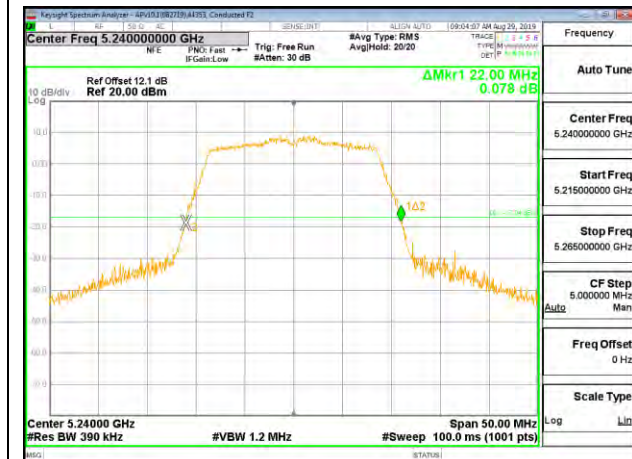
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
Low	5180	21.95
Mid	5200	22.05
High	5240	22.00



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

Channel	Frequency	26 dB Bandwidth
	(MHz)	(MHz)
Low	5180	22.10
Mid	5200	21.95
High	5240	22.10



LOW CHANNEL

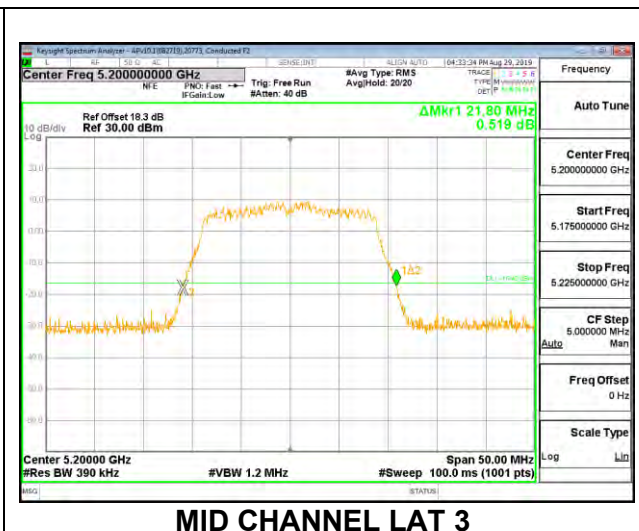
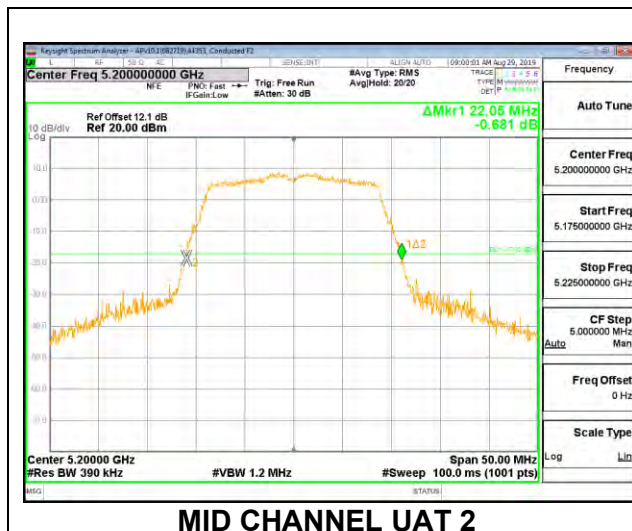
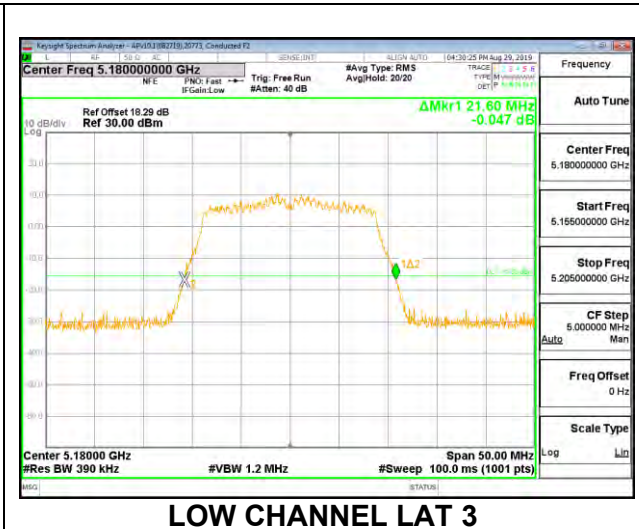
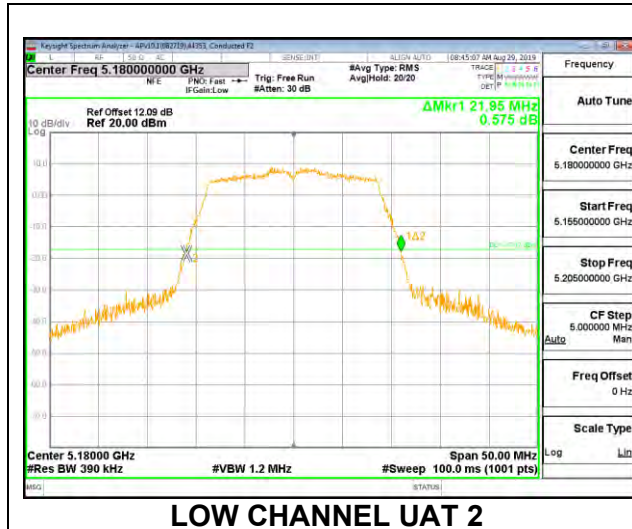


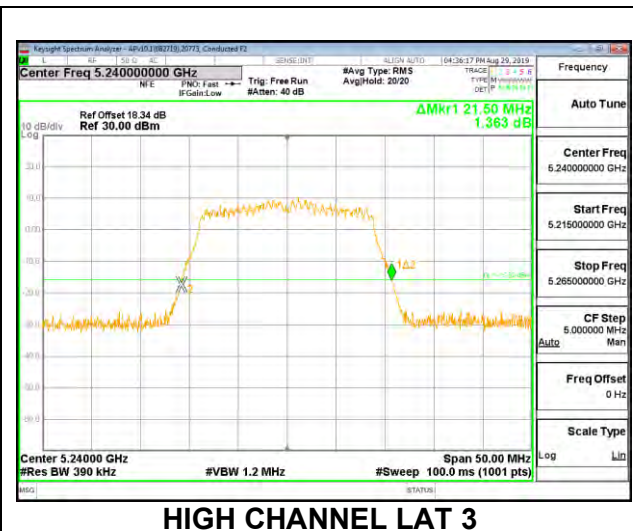
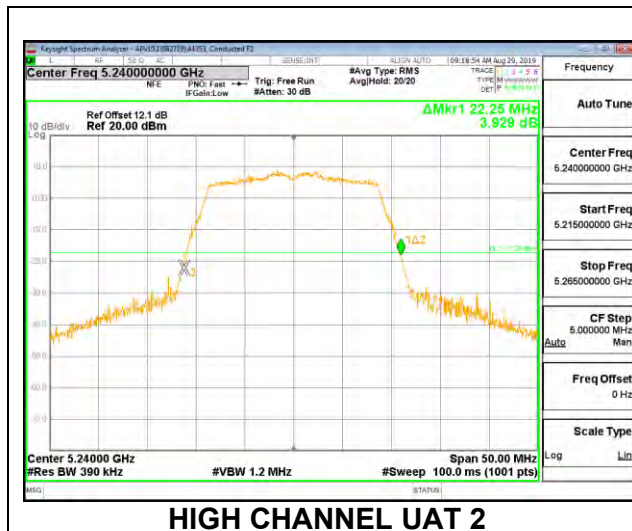
MID CHANNEL



HIGH CHANNEL

Channel	Frequency (MHz)	26 dB Bandwidth UAT 2 (MHz)	26 dB Bandwidth LAT 3 (MHz)
Low	5180	21.95	21.60
Mid	5200	22.05	21.80
High	5240	22.25	21.50

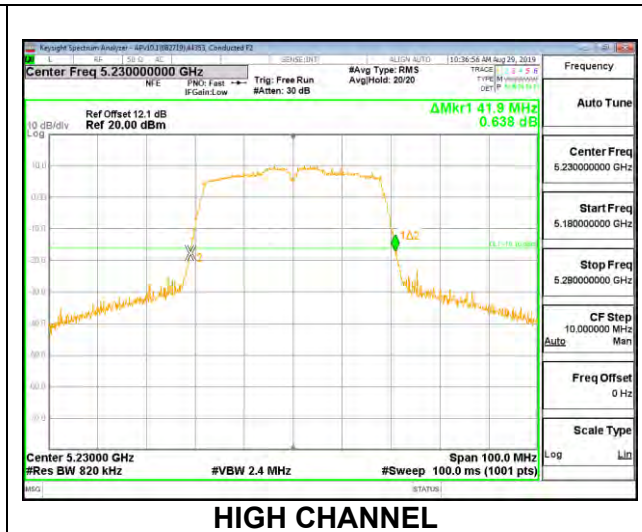
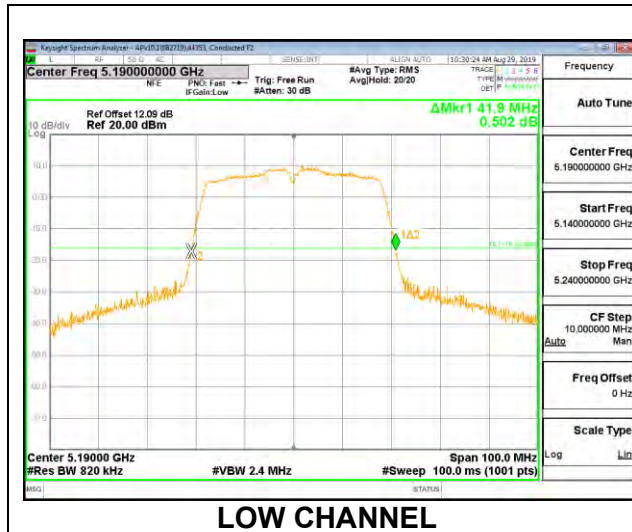




8.2.2. 802.11n HT40 MODE IN THE 5.2 GHz BAND

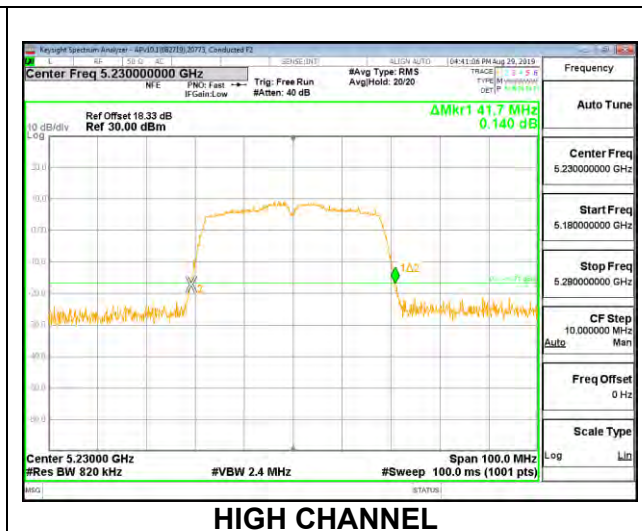
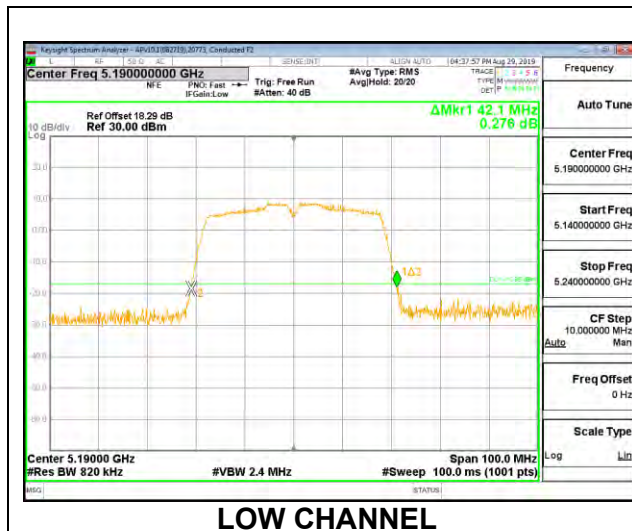
1TX UAT 2 MODE

Channel	Frequency (MHz)	26dB Bandwidth (MHz)
Low	5190	41.90
High	5230	41.90

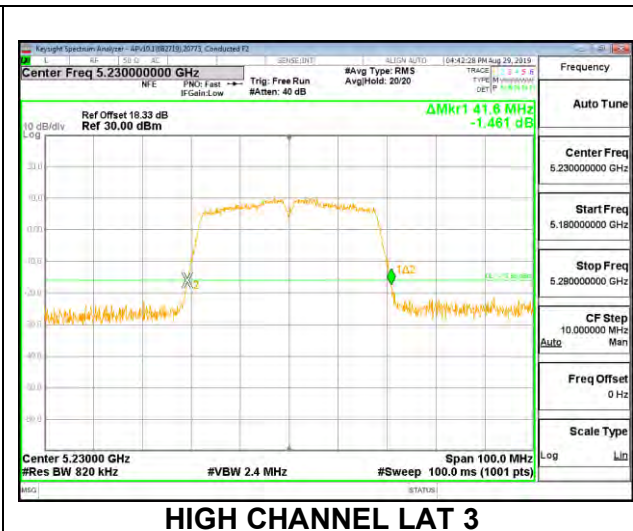
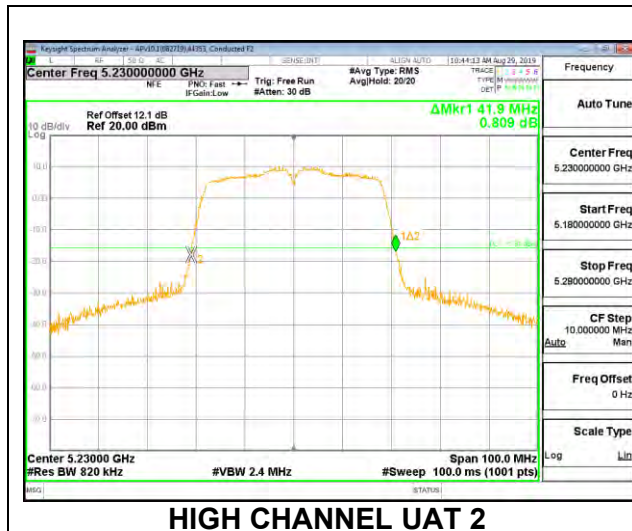
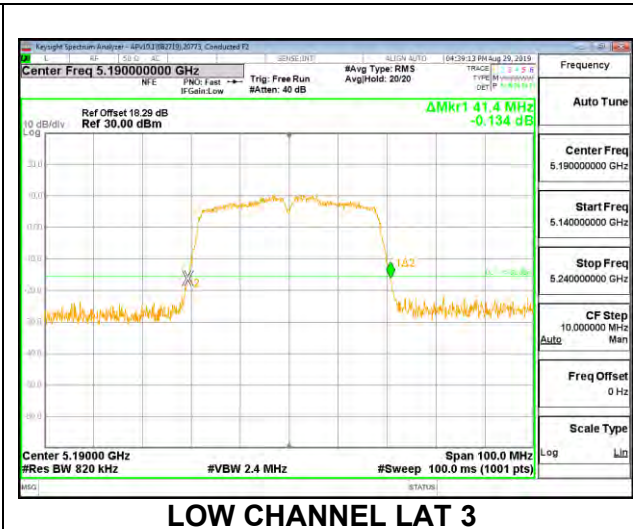
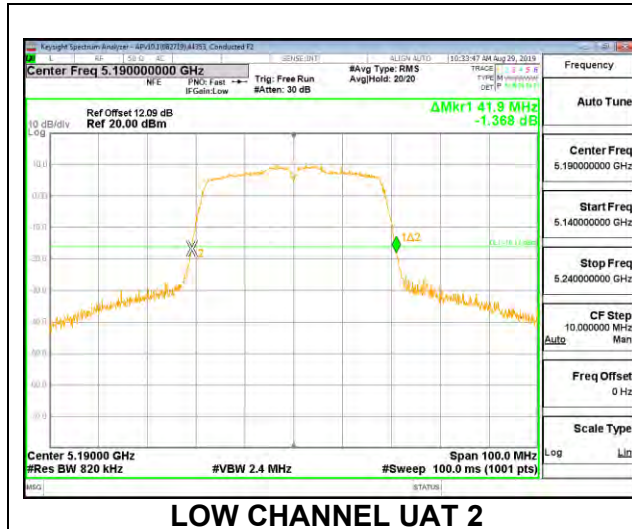


1TX LAT 3 MODE

Channel	Frequency (MHz)	26dB Bandwidth (MHz)
Low	5190	42.10
High	5230	41.70



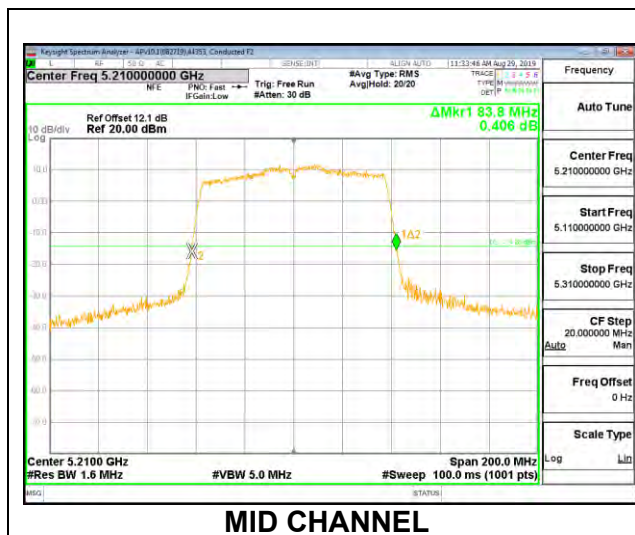
Channel	Frequency (MHz)	26 dB Bandwidth UAT 2 (MHz)	26 dB Bandwidth LAT 3 (MHz)
Low	5190	41.90	41.40
High	5230	41.90	41.60



8.2.3. 802.11ac VHT80 MODE IN THE 5.2 GHz BAND

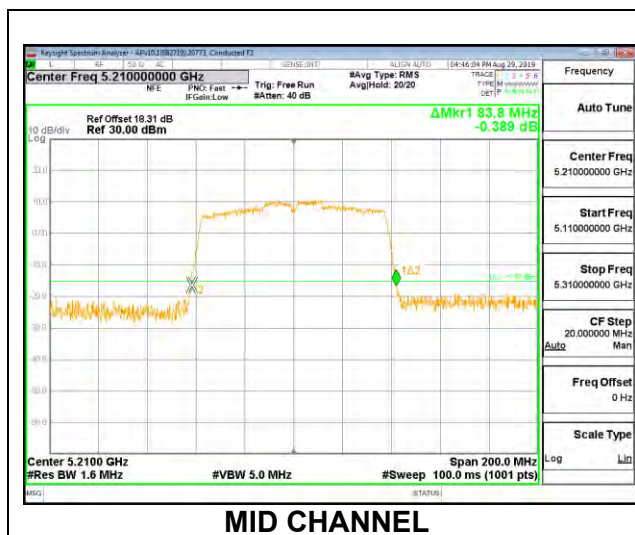
1TX UAT 2 MODE

Channel	Frequency	26 dB Bandwidth
	(MHz)	(MHz)
Mid	5210	83.80

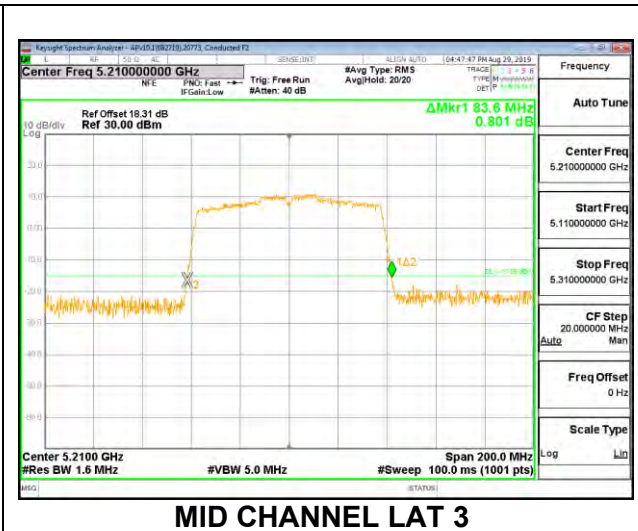
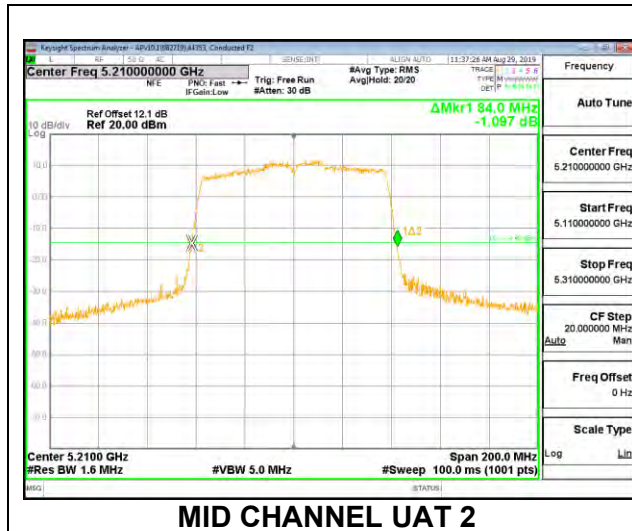


1TX LAT 3 MODE

Channel	Frequency	26 dB Bandwidth
	(MHz)	(MHz)
Mid	5210	83.80



Channel	Frequency	26 dB Bandwidth	26 dB Bandwidth
	(MHz)	UAT 2	LAT 3
		(MHz)	(MHz)
Mid	5210	84.00	83.60



8.2.4. 802.11ax HE20 MODE IN THE 5.2 GHz BAND

1TX UAT 2 MODE – 242-Tones, RU Index 61

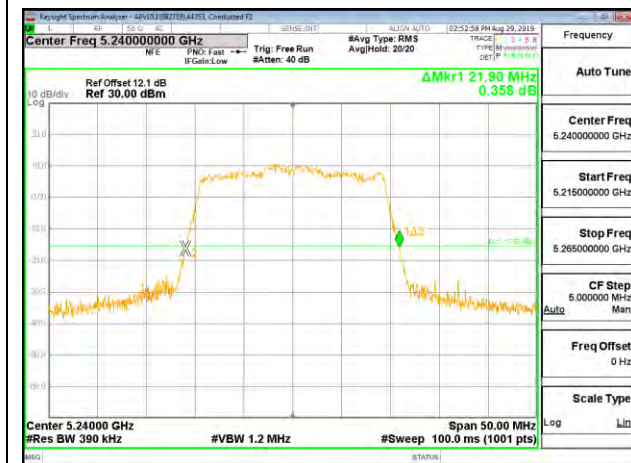
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
Low	5180	21.70
Mid	5200	21.90
High	5240	21.90



LOW CHANNEL



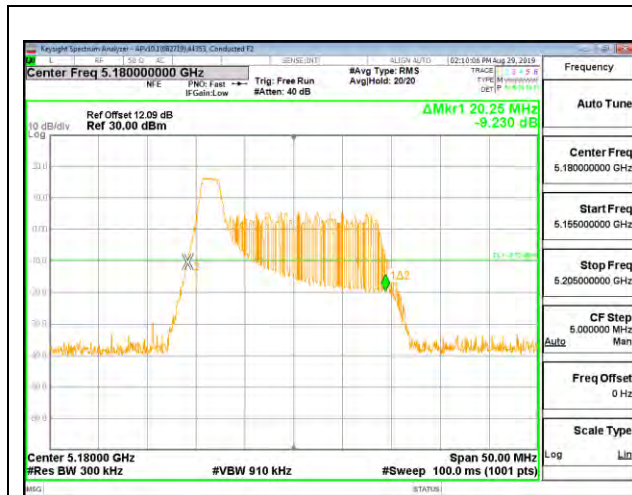
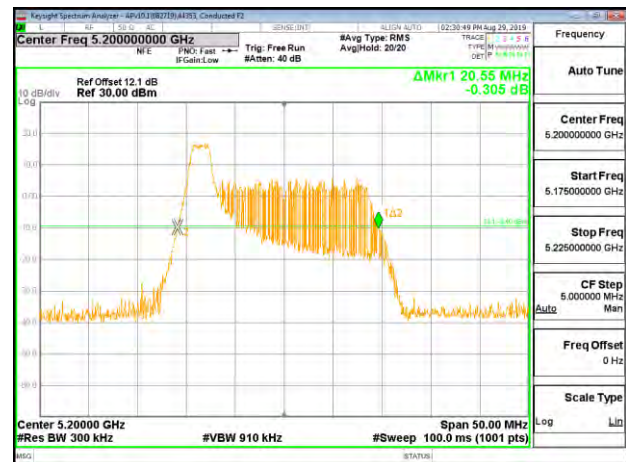
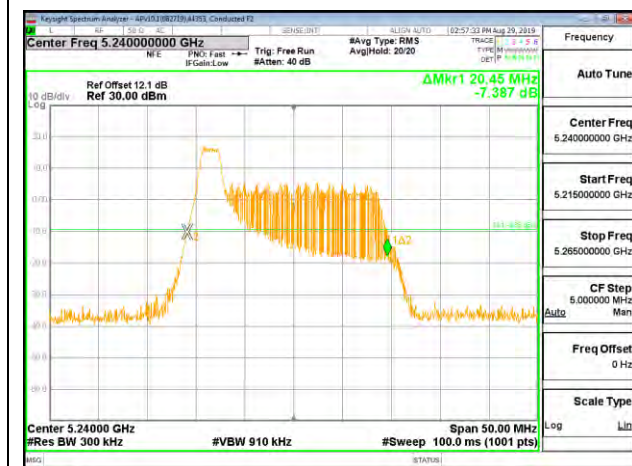
MID CHANNEL



HIGH CHANNEL

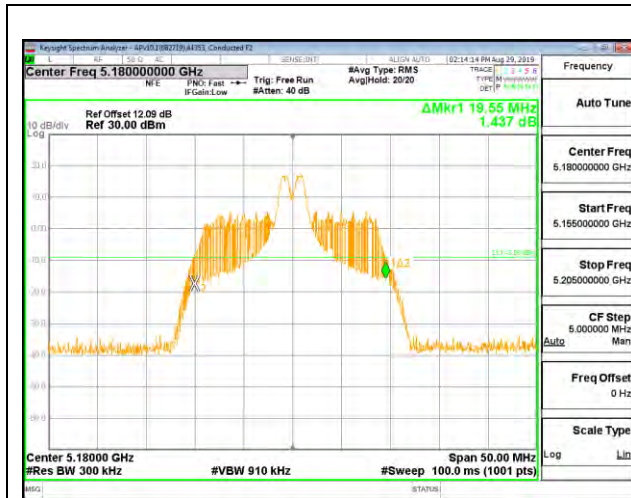
1TX UAT 2 MODE – 26-Tones, RU Index 0

Channel	Frequency	26 dB Bandwidth
	(MHz)	(MHz)
Low	5180	20.25
Mid	5200	20.55
High	5240	20.45

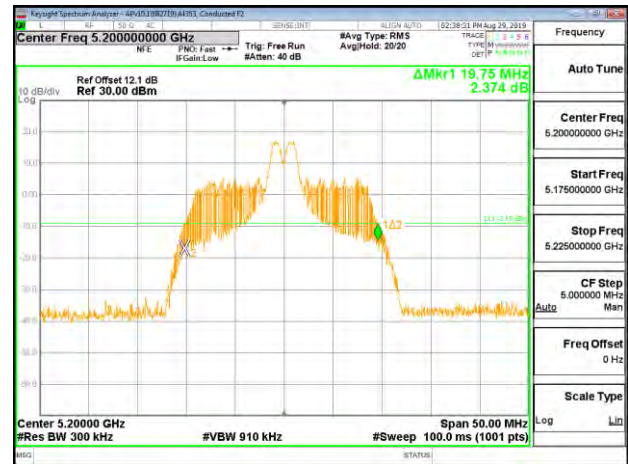
**LOW CHANNEL****MID CHANNEL****HIGH CHANNEL**

1TX UAT 2 MODE – 26-Tones, RU Index 4

Channel	Frequency	26 dB Bandwidth
	(MHz)	(MHz)
Low	5180	19.55
Mid	5200	19.75
High	5240	19.75



LOW CHANNEL



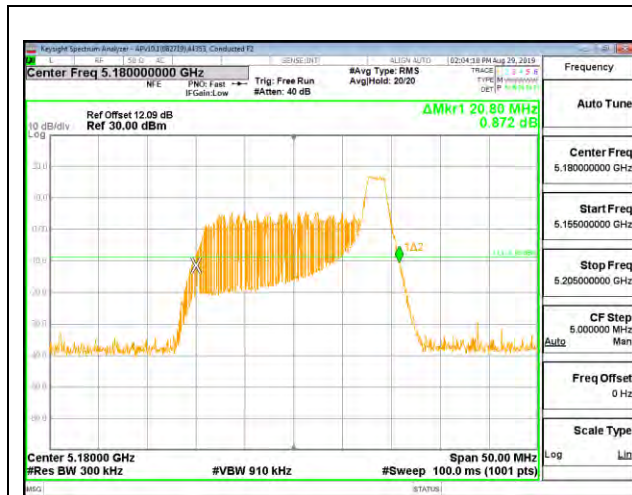
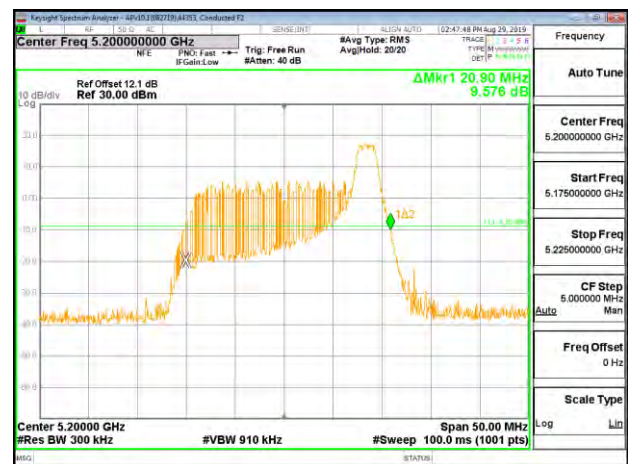
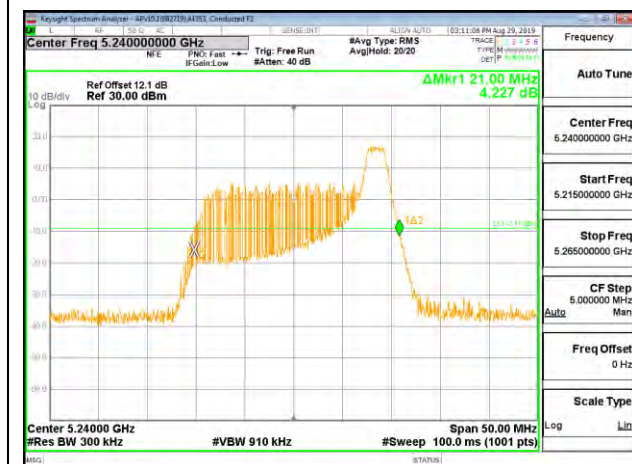
MID CHANNEL



HIGH CHANNEL

1TX UAT 2 MODE – 26-Tones, RU Index 8

Channel	Frequency	26 dB Bandwidth
	(MHz)	(MHz)
Low	5180	20.80
Mid	5200	20.90
High	5240	21.00

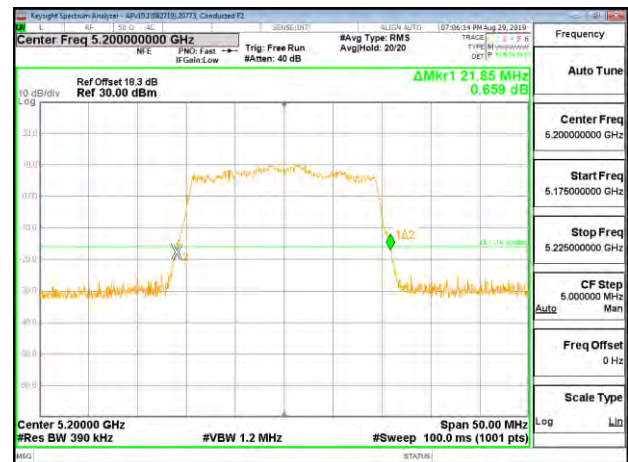
**LOW CHANNEL****MID CHANNEL****HIGH CHANNEL**

1TX LAT 3 MODE – 242-Tones, RU Index 61

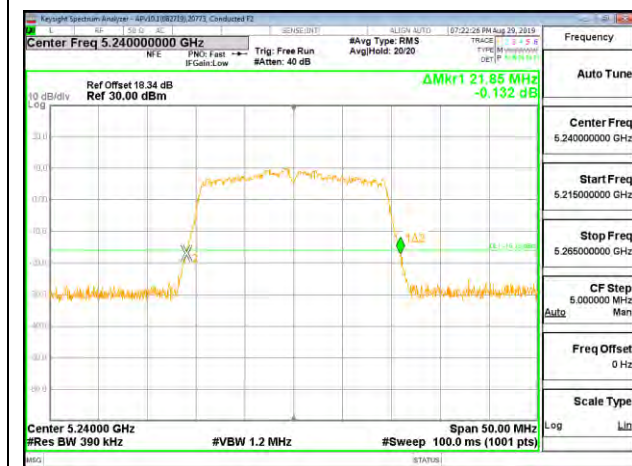
Channel	Frequency	26 dB Bandwidth
	(MHz)	(MHz)
Low	5180	21.85
Mid	5200	21.85
High	5240	21.85



LOW CHANNEL



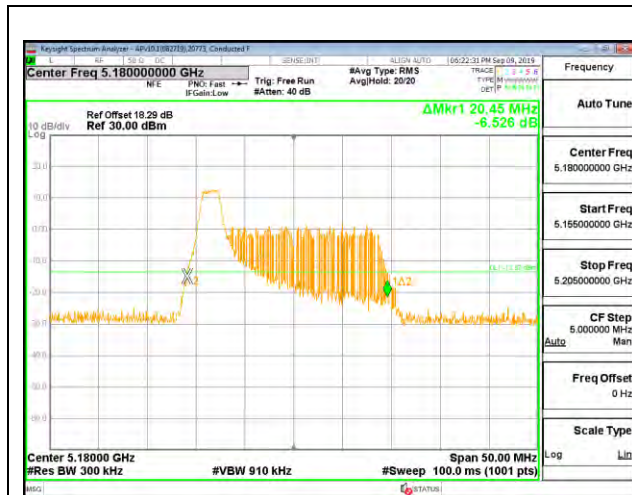
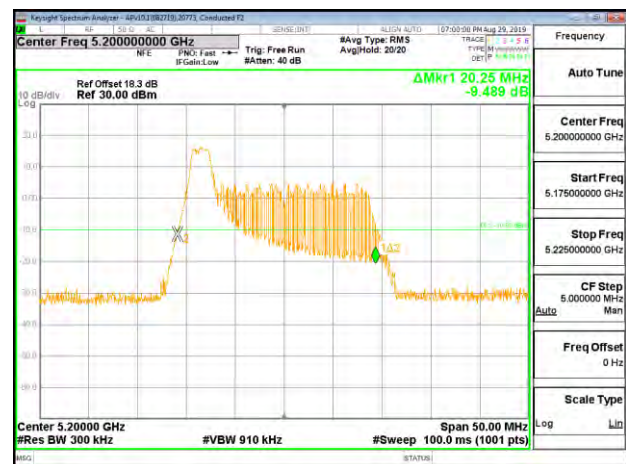
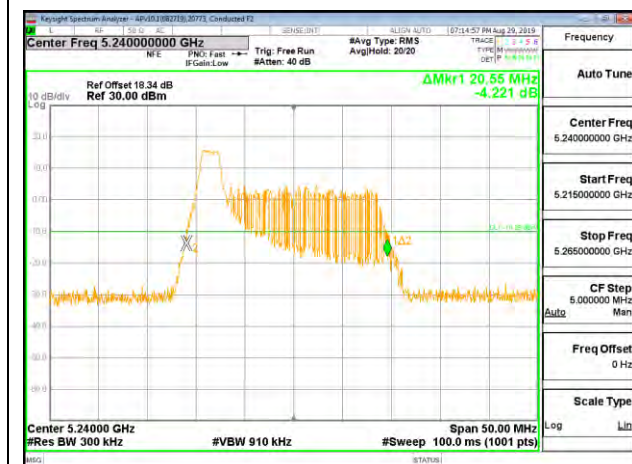
MID CHANNEL



HIGH CHANNEL

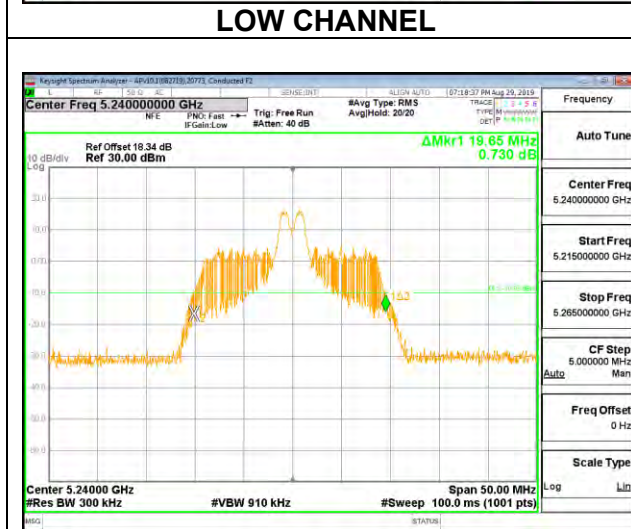
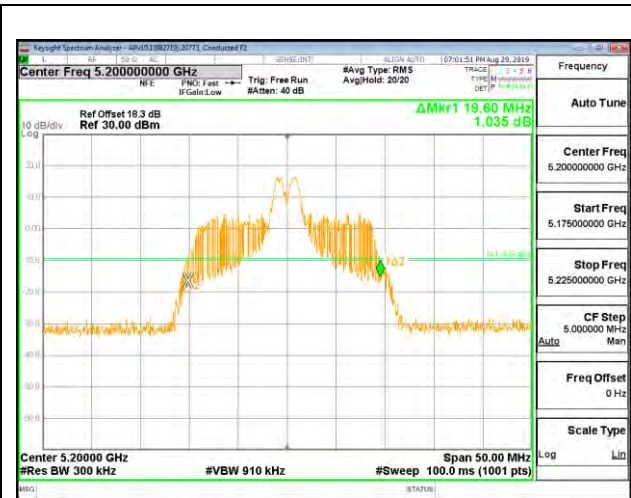
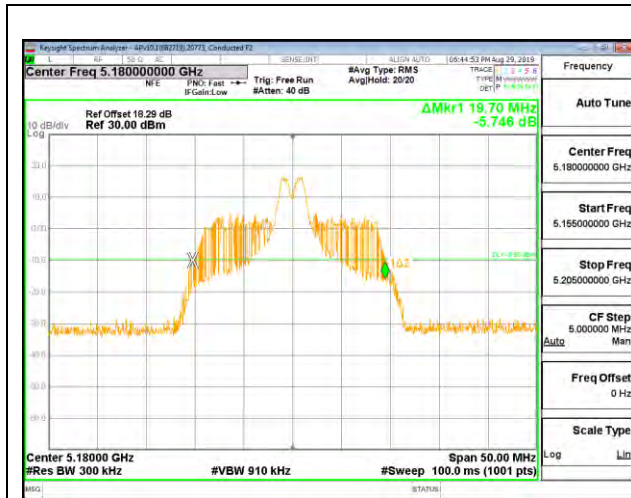
1TX LAT 3 MODE – 26-Tones, RU Index 0

Channel	Frequency	26 dB Bandwidth
	(MHz)	(MHz)
Low	5180	20.45
Mid	5200	20.25
High	5240	20.55

**LOW CHANNEL****MID CHANNEL****HIGH CHANNEL**

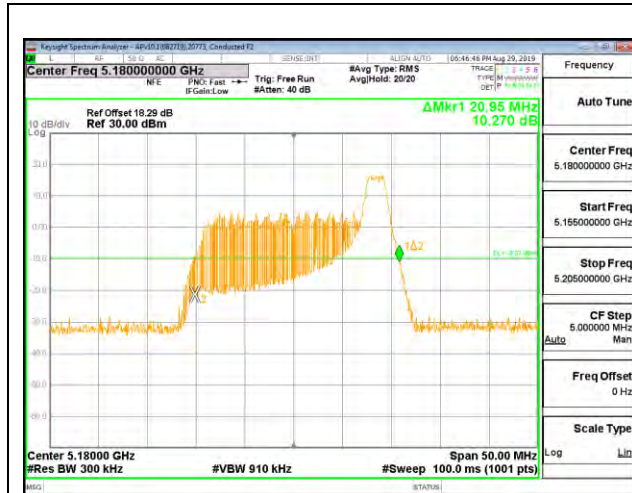
1TX LAT 3 MODE – 26-Tones, RU Index 4

Channel	Frequency	26 dB Bandwidth
	(MHz)	(MHz)
Low	5180	19.70
Mid	5200	19.60
High	5240	19.65

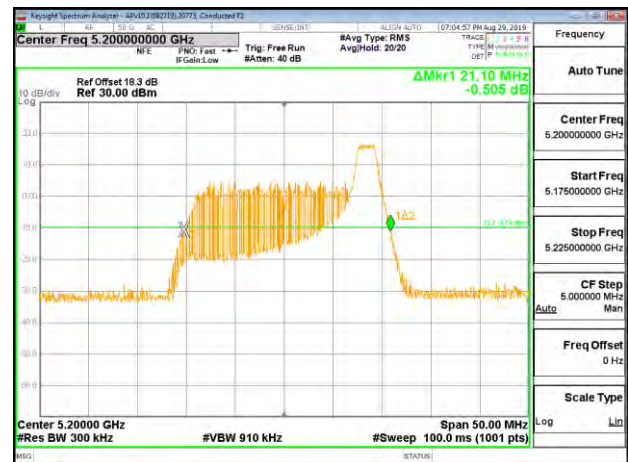


1TX LAT 3 MODE – 26-Tones, RU Index 8

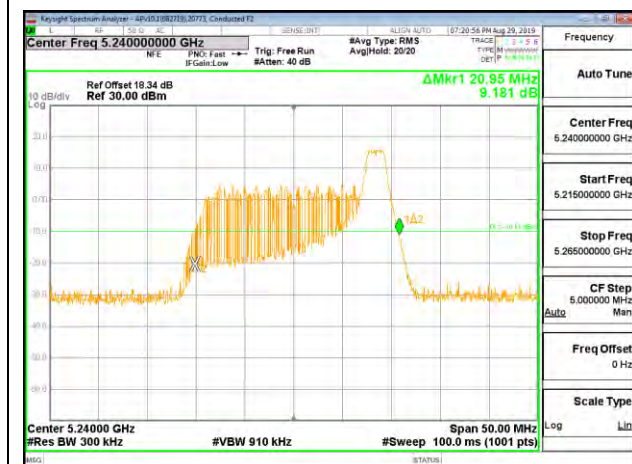
Channel	Frequency	26 dB Bandwidth
	(MHz)	(MHz)
Low	5180	20.95
Mid	5200	21.10
High	5240	20.95



LOW CHANNEL



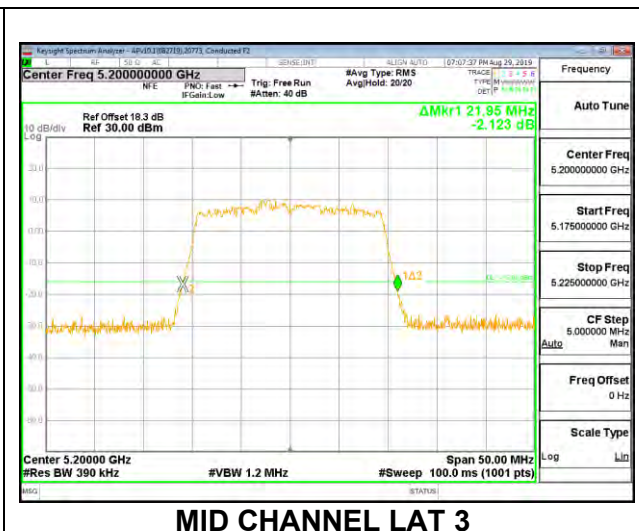
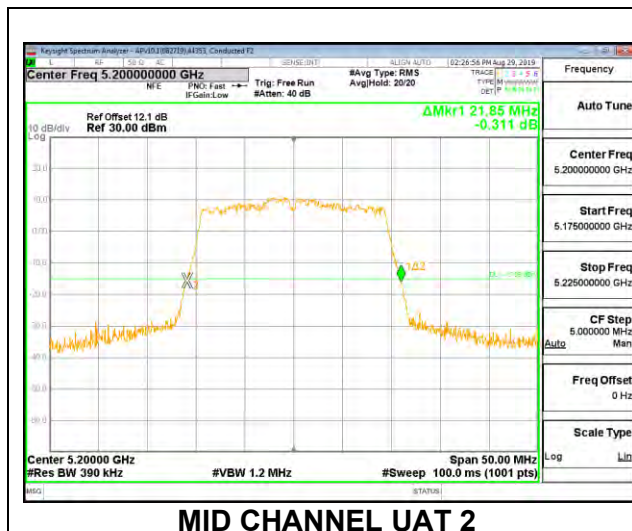
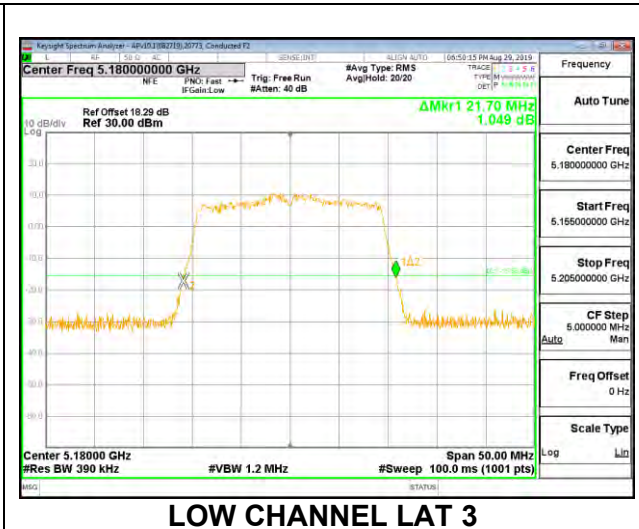
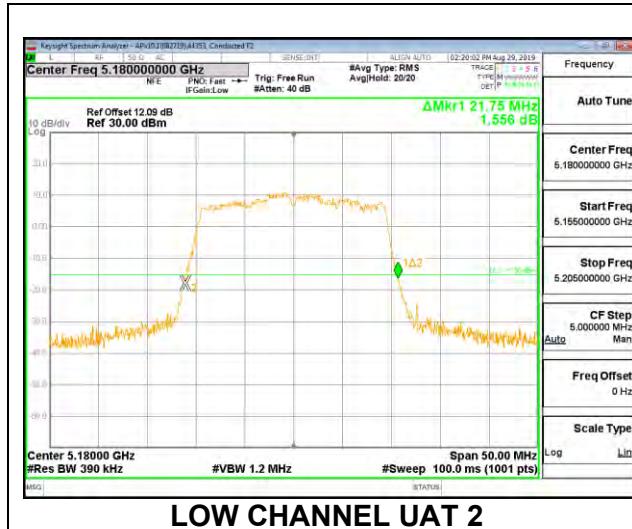
MID CHANNEL

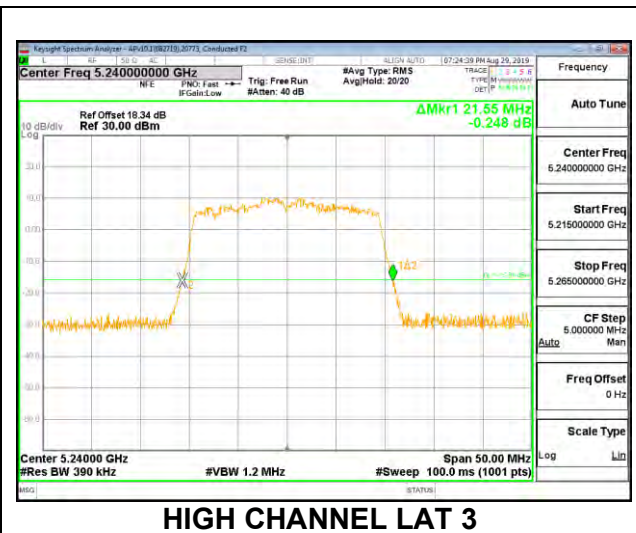
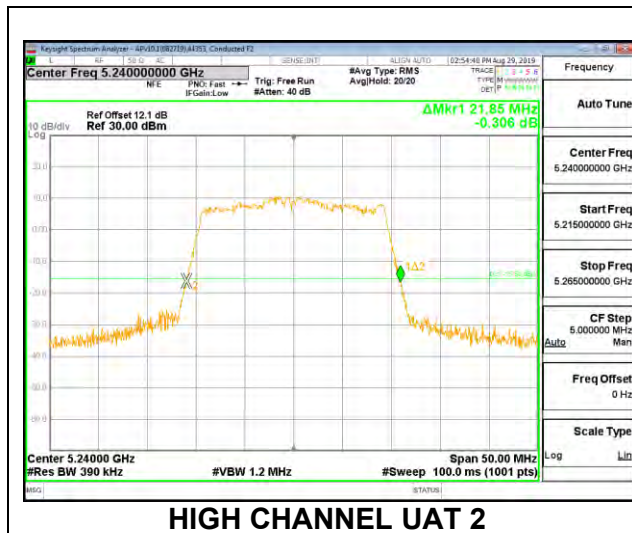


HIGH CHANNEL

2TX UAT 2 + LAT 3 OFDMA MODE – 242 Tones, RU Index 61

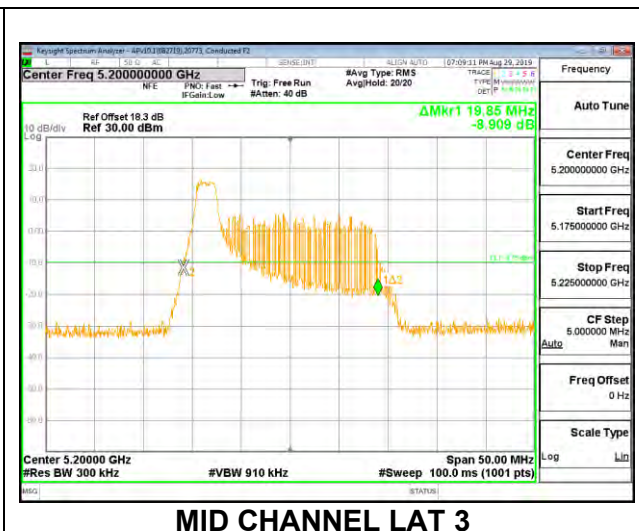
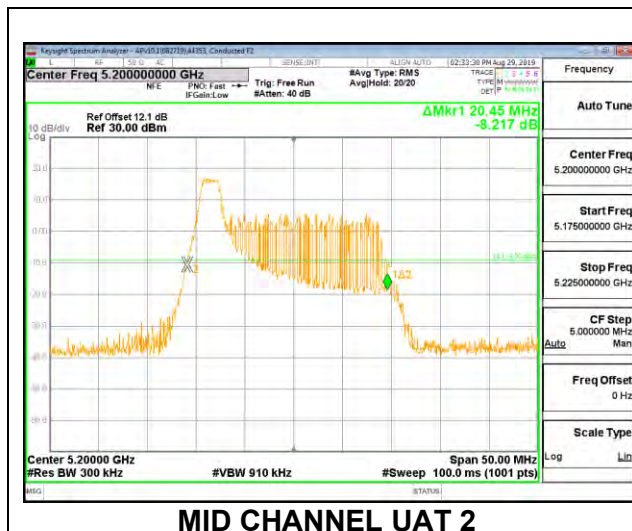
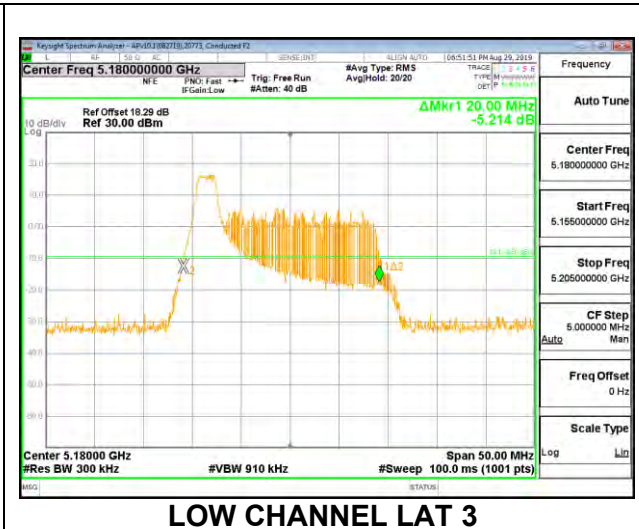
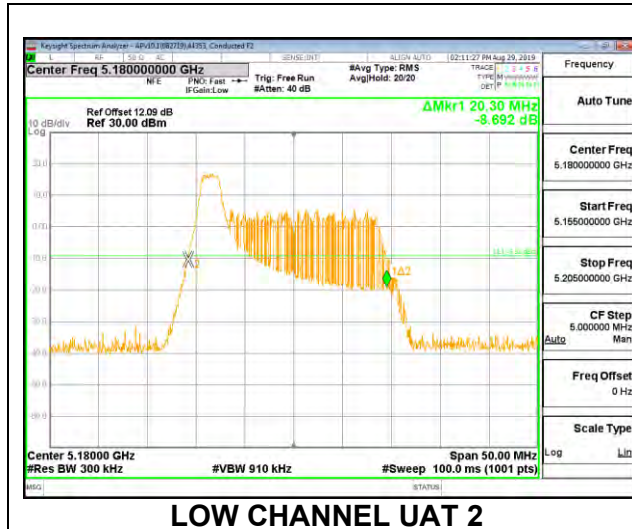
Channel	Frequency	26 dB Bandwidth	26 dB Bandwidth
	(MHz)	UAT 2 (MHz)	LAT 3 (MHz)
Low	5180	21.75	21.70
Mid	5200	21.85	21.95
High	5240	21.85	21.55

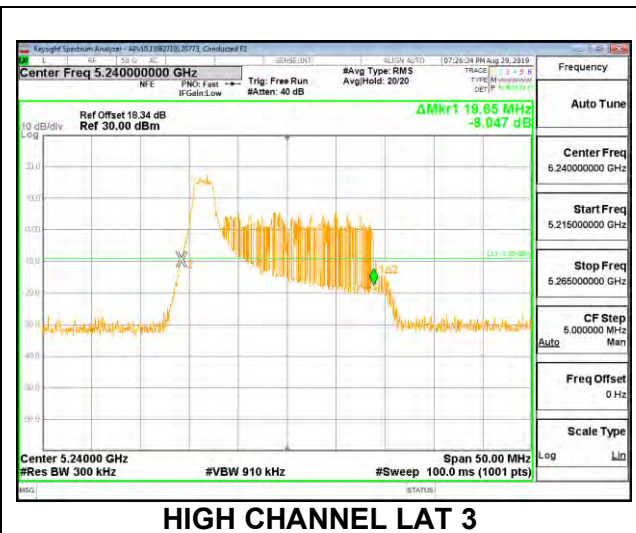
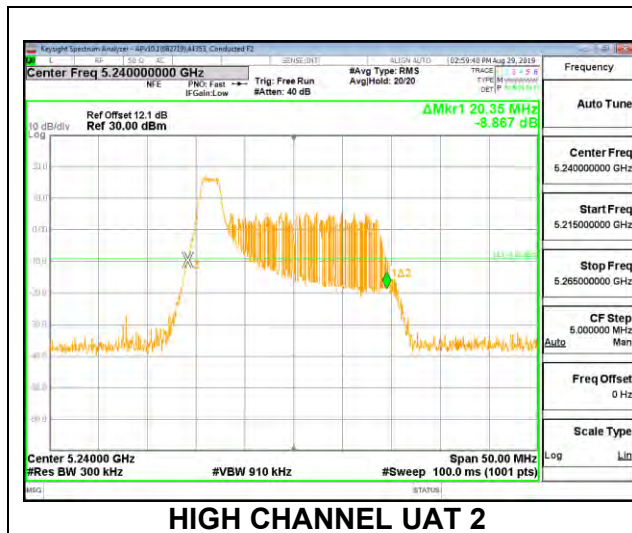




2TX UAT 2 + LAT 3 OFDMA MODE – 26 Tones, RU Index 0

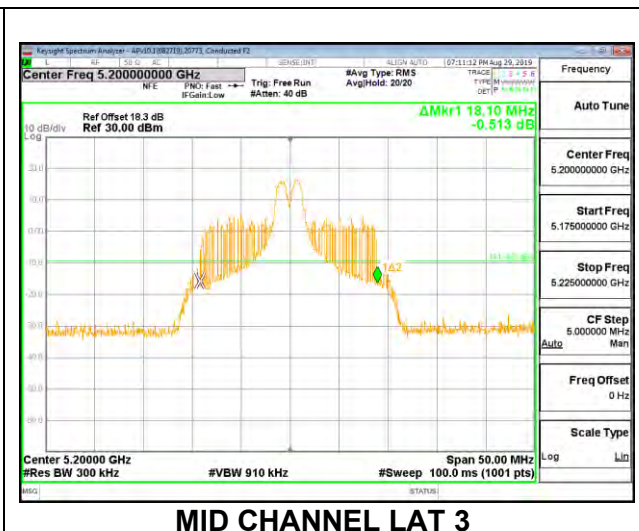
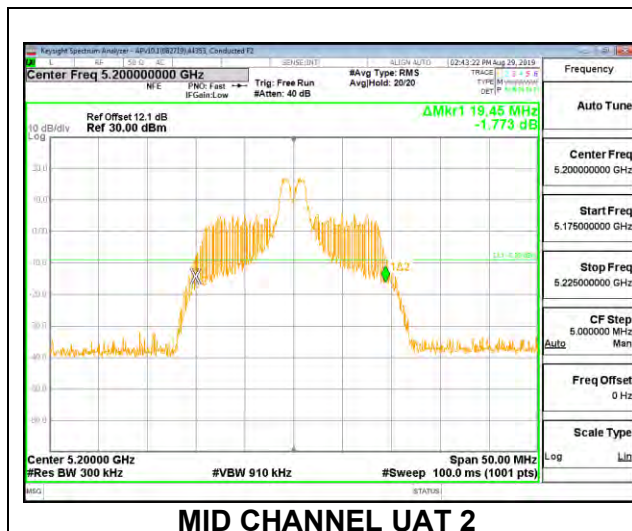
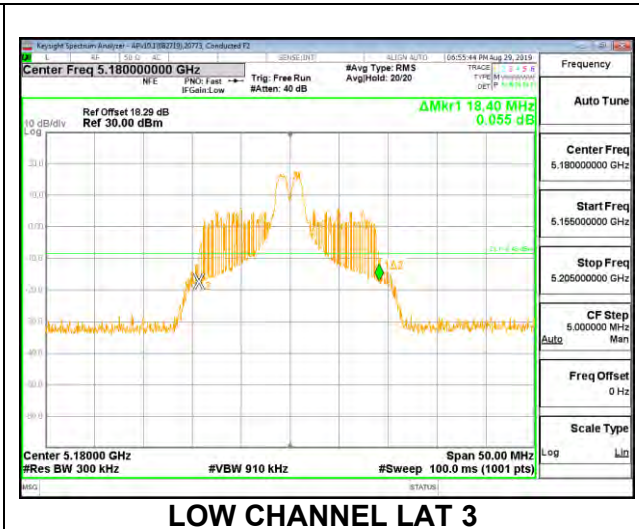
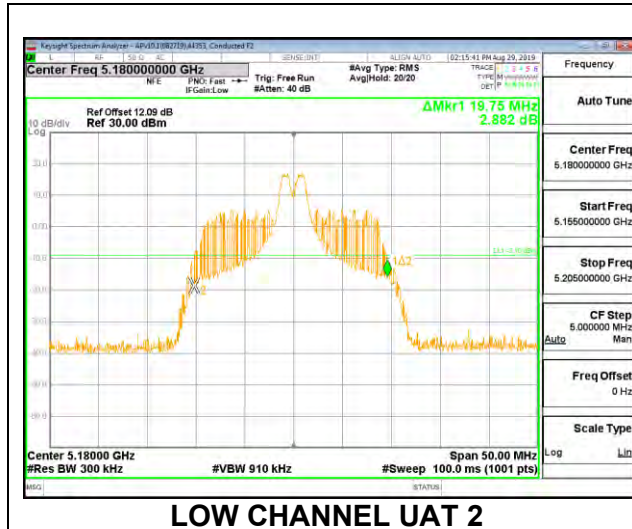
Channel	Frequency	26 dB Bandwidth	26 dB Bandwidth
	(MHz)	UAT 2	LAT 3
		(MHz)	(MHz)
Low	5180	20.30	20.00
Mid	5200	20.45	19.85
High	5240	20.35	19.65

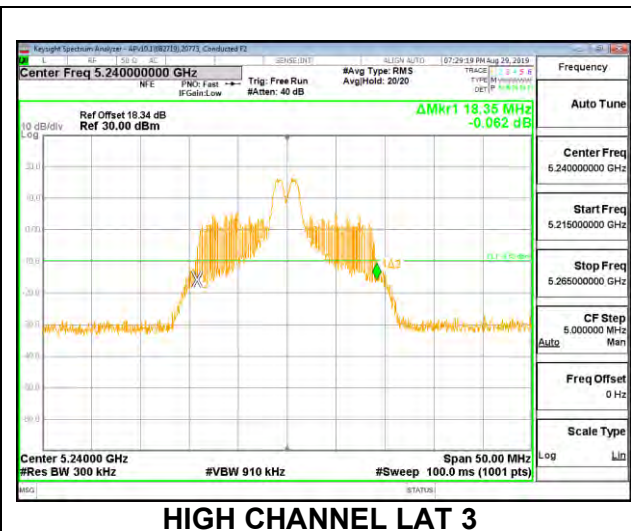
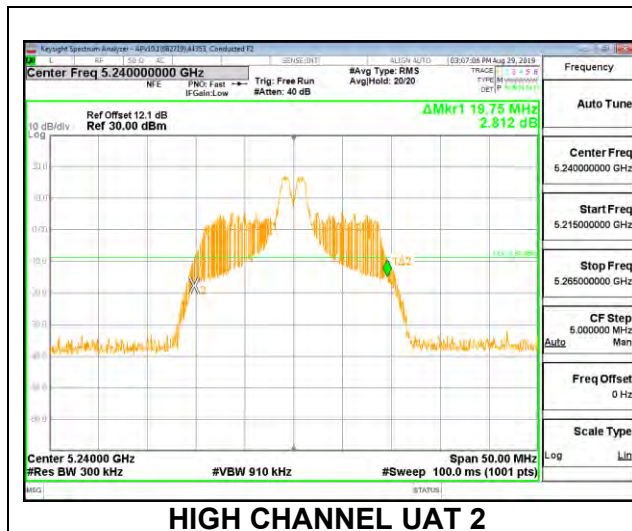




2TX UAT 2 + LAT 3 OFDMA MODE – 26 Tones, RU Index 4

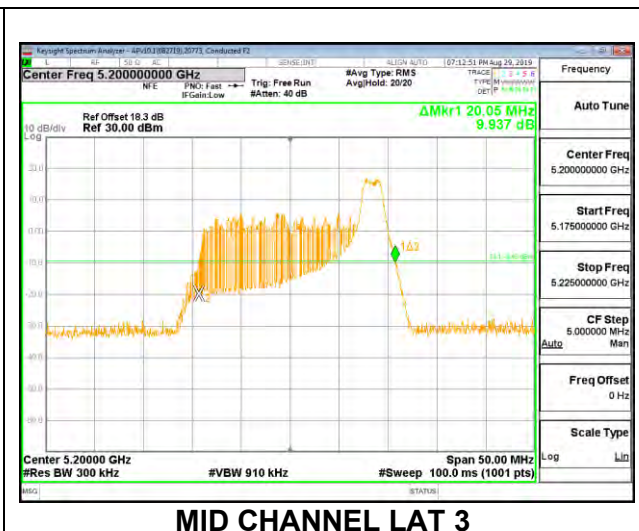
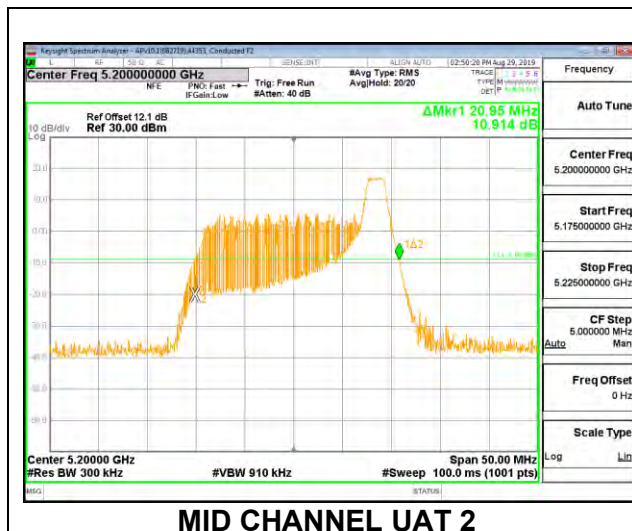
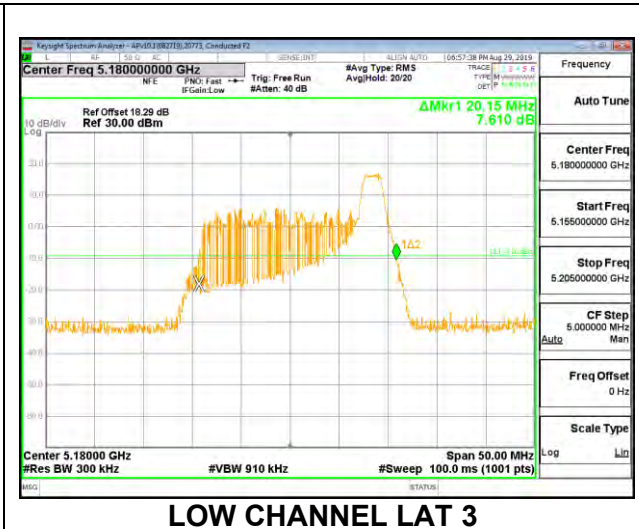
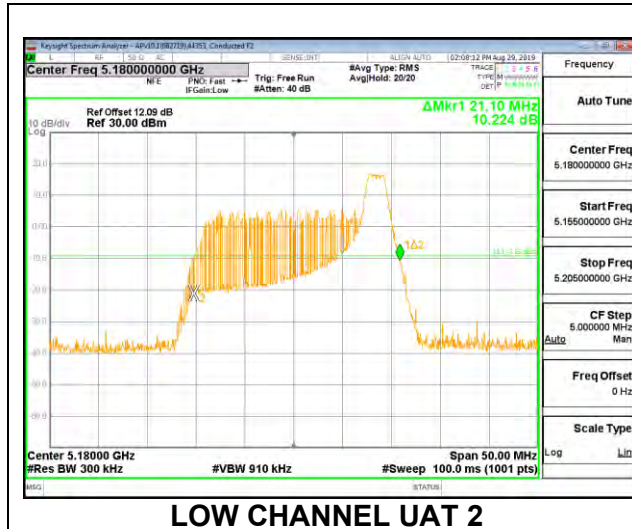
Channel	Frequency	26 dB Bandwidth	26 dB Bandwidth
	(MHz)	UAT 2 (MHz)	LAT 3 (MHz)
Low	5180	19.75	18.40
Mid	5200	19.45	18.10
High	5240	19.75	18.35

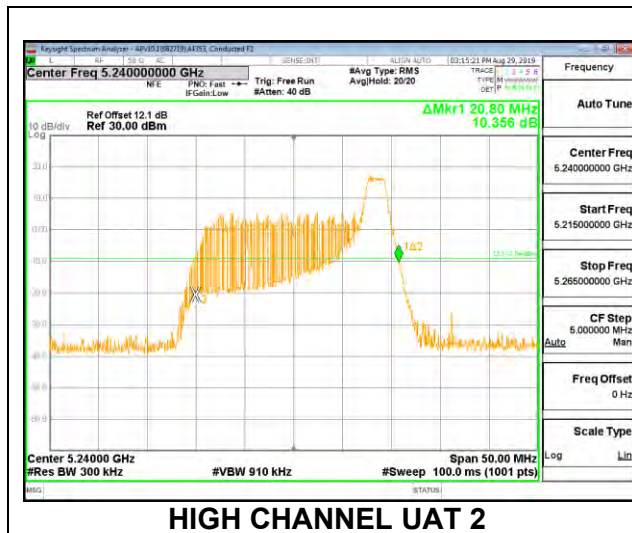




2TX UAT 2 + LAT 3 OFDMA MODE – 26 Tones, RU Index 8

Channel	Frequency (MHz)	26 dB Bandwidth UAT 2 (MHz)	26 dB Bandwidth LAT 3 (MHz)
Low	5180	21.10	20.15
Mid	5200	20.95	20.05
High	5240	20.80	20.05

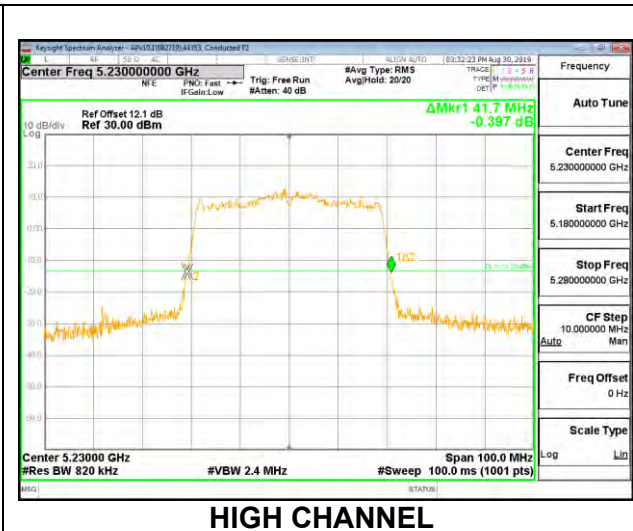
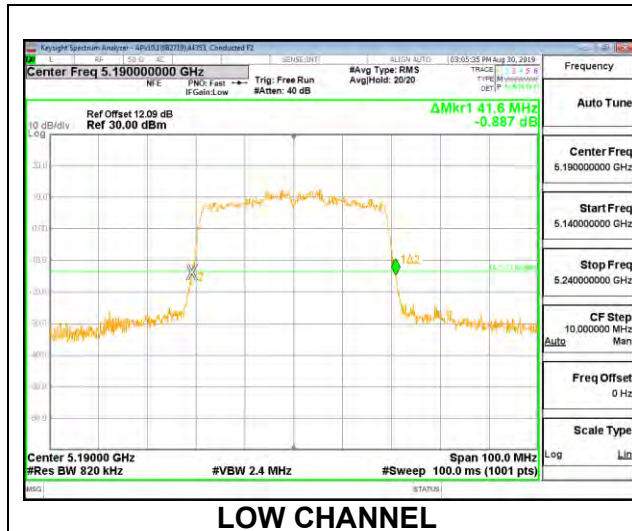




8.2.5. 802.11ax HE40 MODE IN THE 5.2 GHz BAND

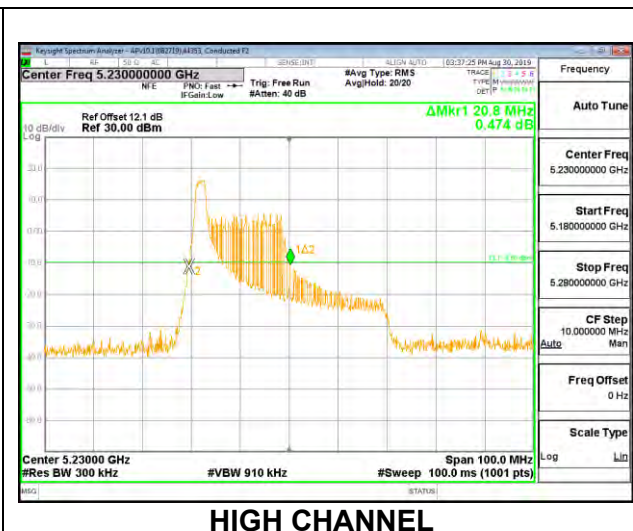
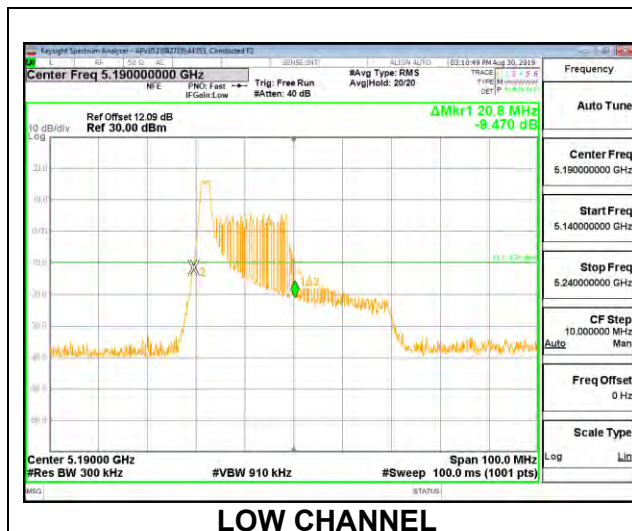
1TX UAT 2 MODE – 484 Tones, RU Index 65

Channel	Frequency (MHz)	26dB Bandwidth (MHz)
Low	5190	41.60
High	5230	41.70



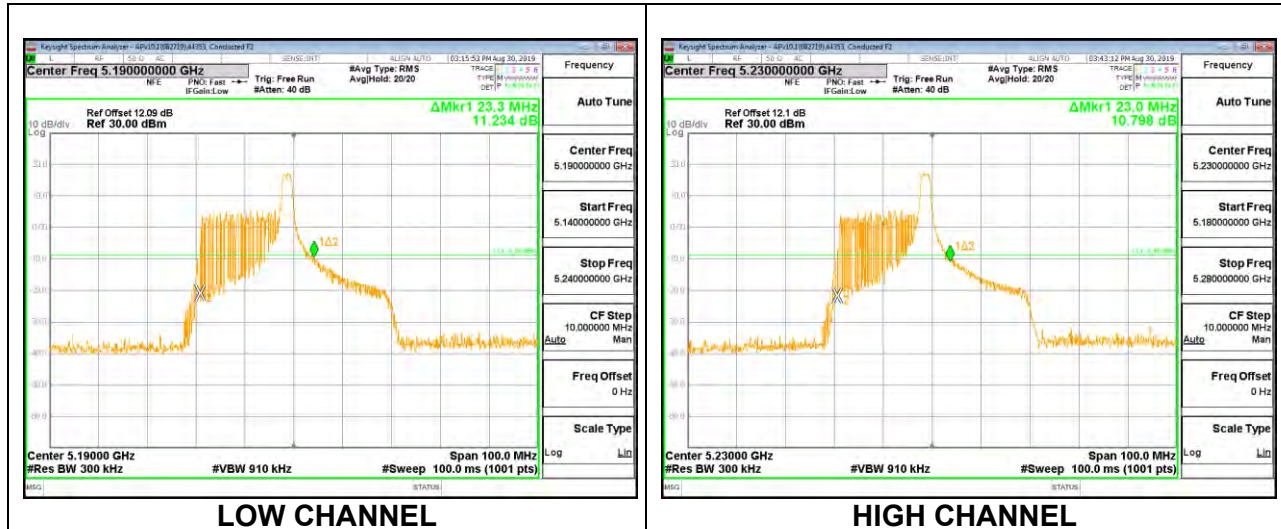
1TX UAT 2 MODE – 26 Tones, RU Index 0

Channel	Frequency (MHz)	26dB Bandwidth (MHz)
Low	5190	20.80
High	5230	20.80



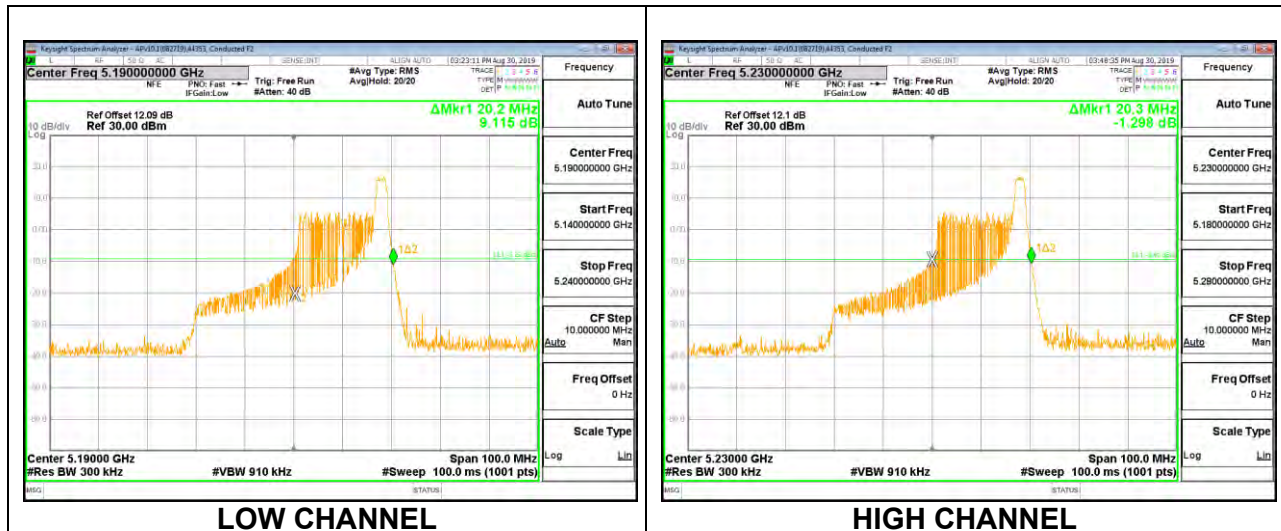
1TX UAT 2 MODE – 26 Tones, RU Index 8

Channel	Frequency (MHz)	26dB Bandwidth (MHz)
Low	5190	23.30
High	5230	23.00



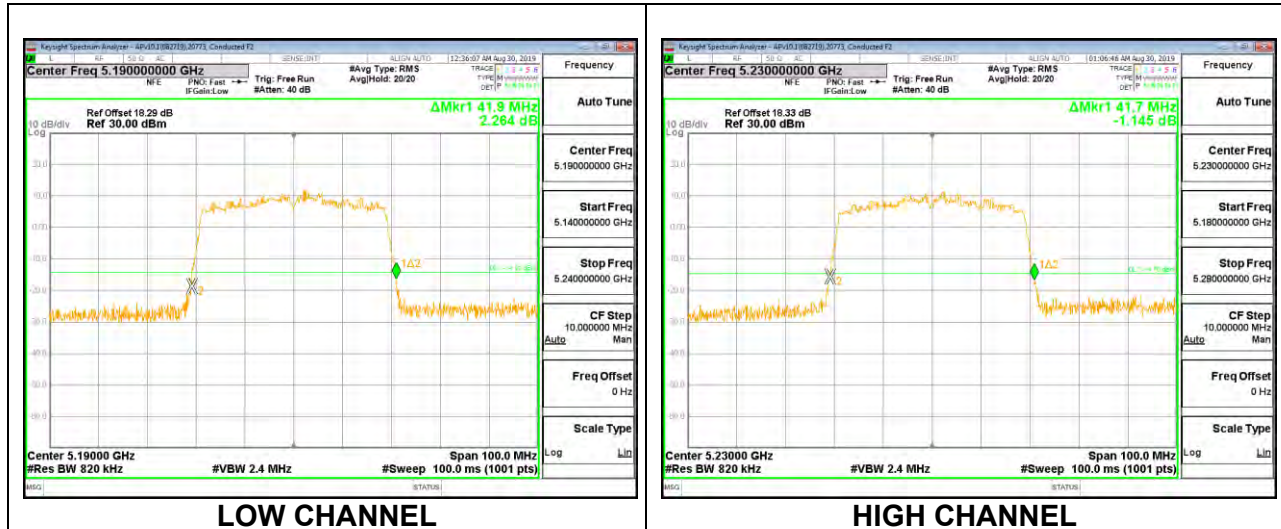
1TX UAT 2 MODE – 26 Tones, RU Index 17

Channel	Frequency (MHz)	26dB Bandwidth (MHz)
Low	5190	20.20
High	5230	20.30



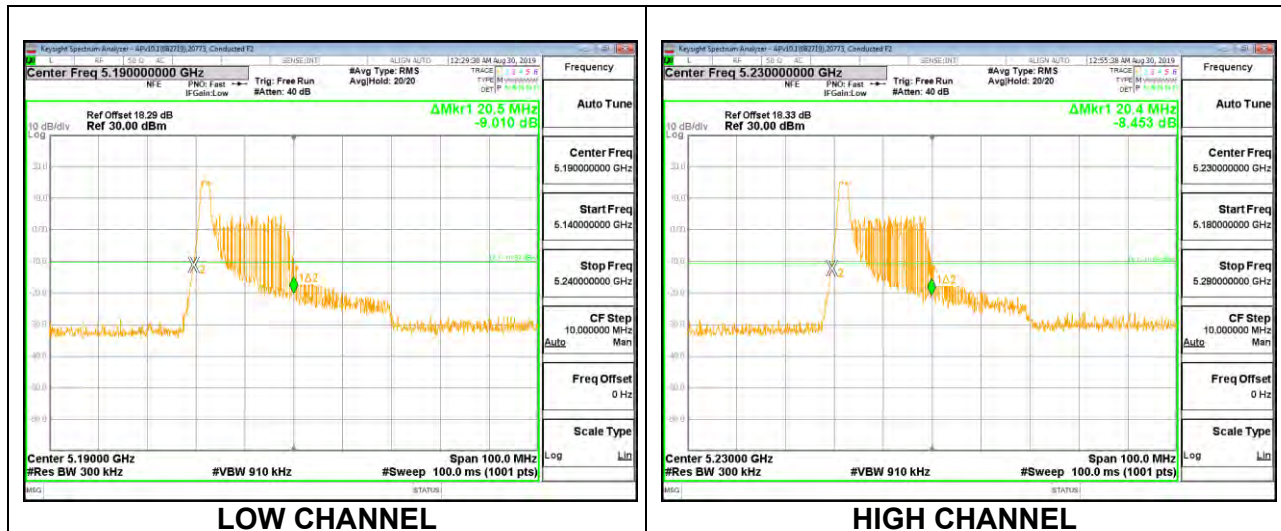
1TX LAT 3 MODE – 484 Tones, RU Index 65

Channel	Frequency (MHz)	26dB Bandwidth (MHz)
Low	5190	41.90
High	5230	41.70



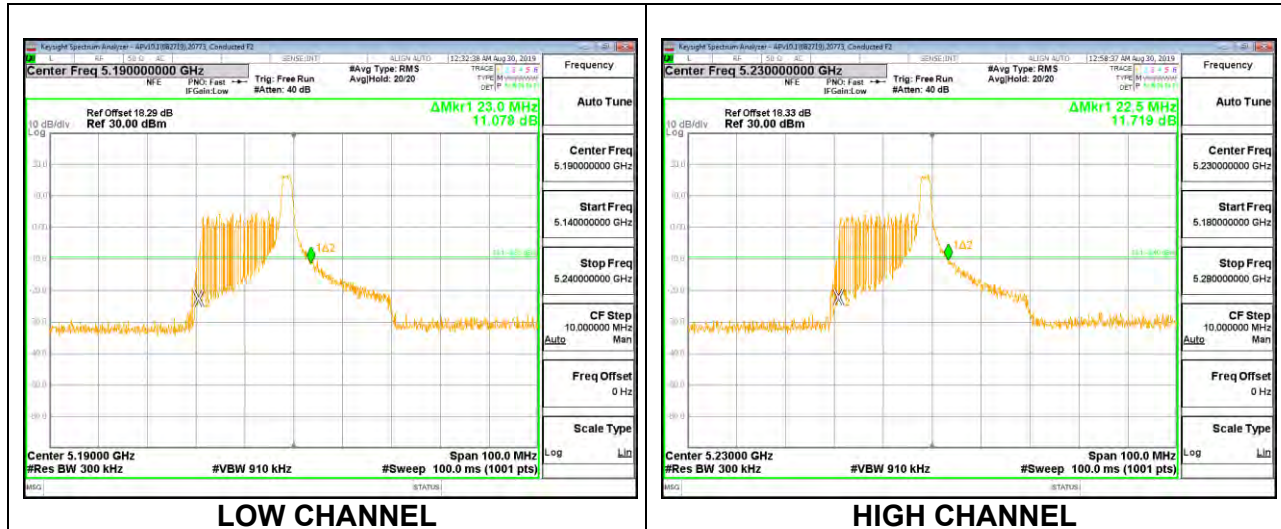
1TX LAT 3 MODE – 26 Tones, RU Index 0

Channel	Frequency (MHz)	26dB Bandwidth (MHz)
Low	5190	20.50
High	5230	20.40



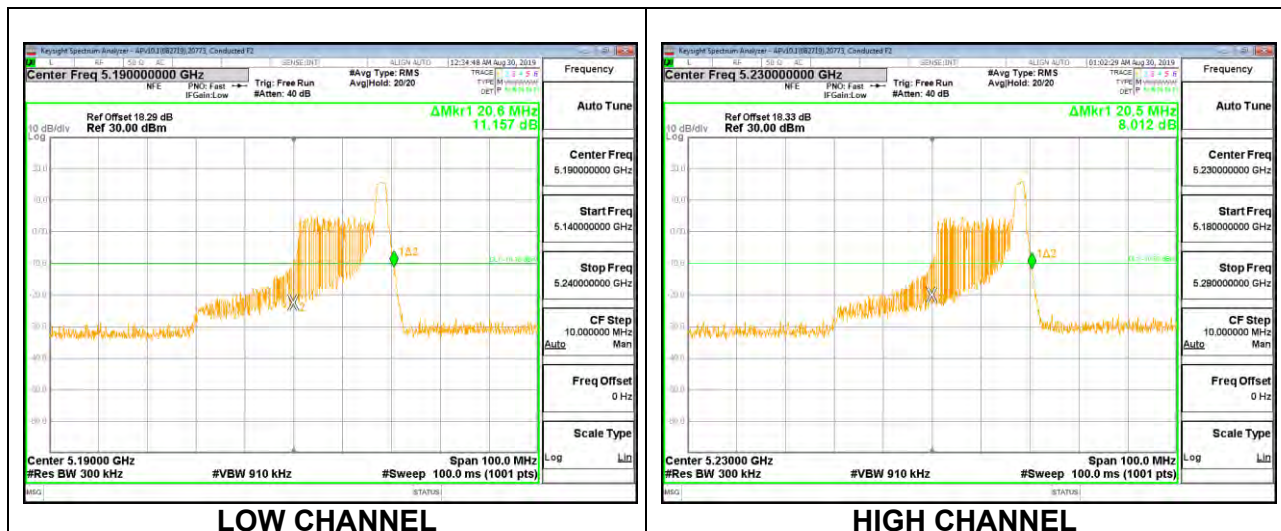
1TX LAT 3 MODE – 26 Tones, RU Index 8

Channel	Frequency (MHz)	26dB Bandwidth (MHz)
Low	5190	23.00
High	5230	22.50



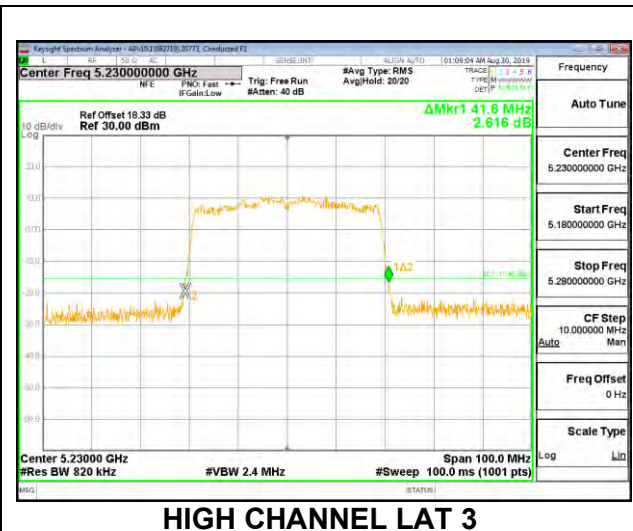
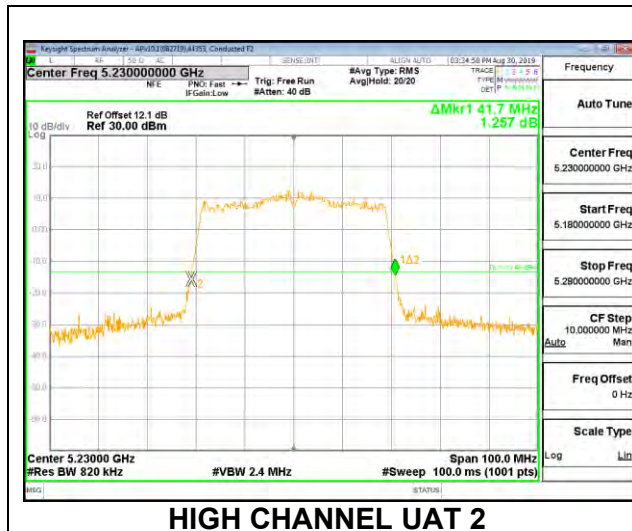
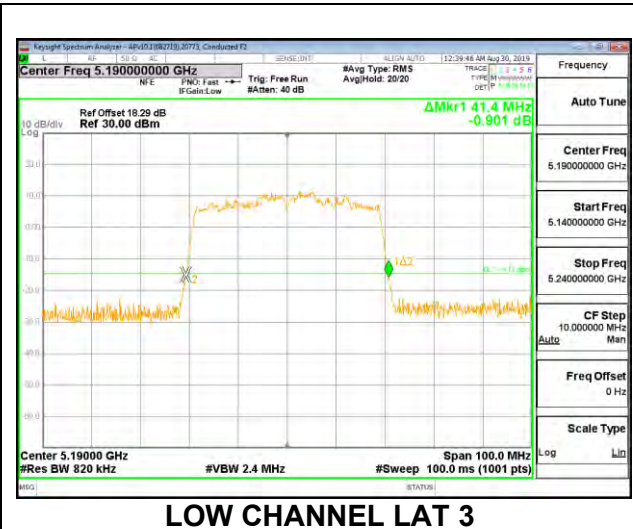
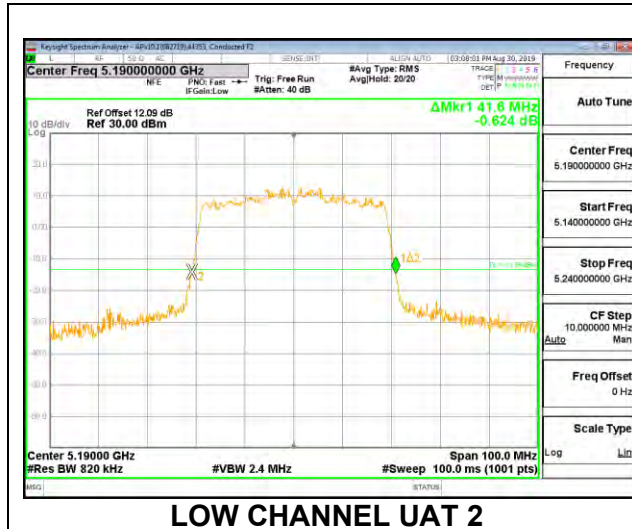
1TX LAT 3 MODE – 26 Tones, RU Index 17

Channel	Frequency (MHz)	26dB Bandwidth (MHz)
Low	5190	20.60
High	5230	20.50



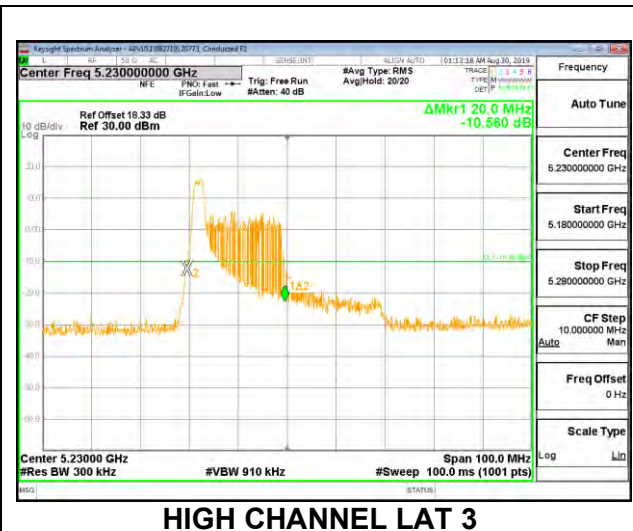
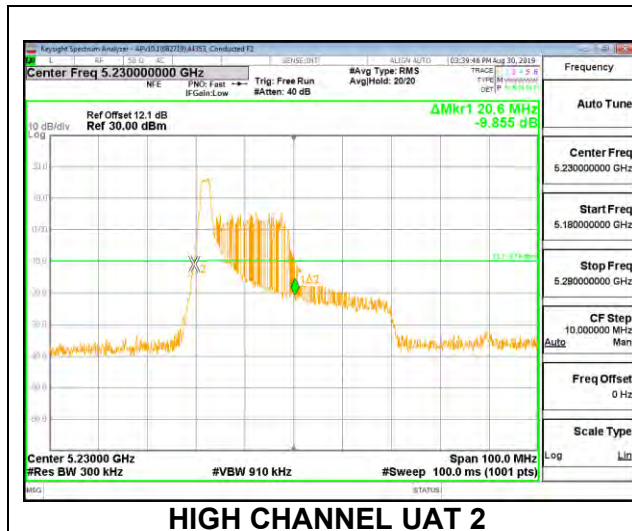
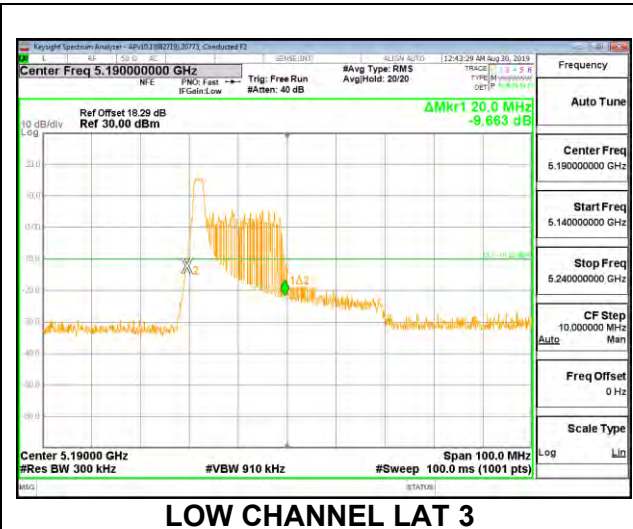
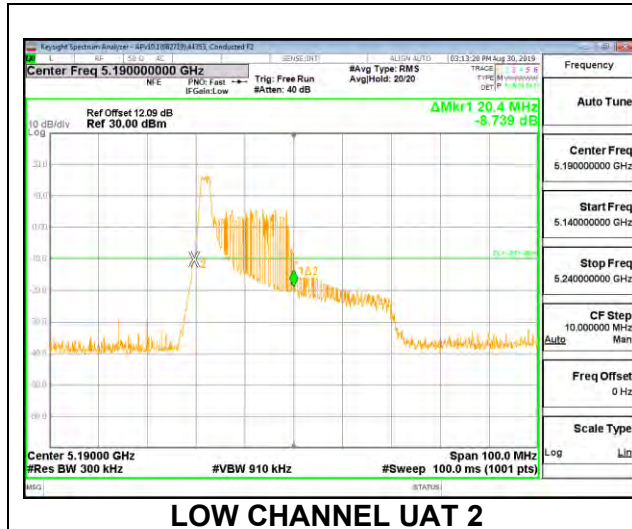
2TX UAT 2 + LAT 3 OFDMA MODE – 484 Tones, RU Index 65

Channel	Frequency (MHz)	26 dB Bandwidth UAT 2 (MHz)	26 dB Bandwidth LAT 3 (MHz)
Low	5190	41.60	41.40
High	5230	41.70	41.60



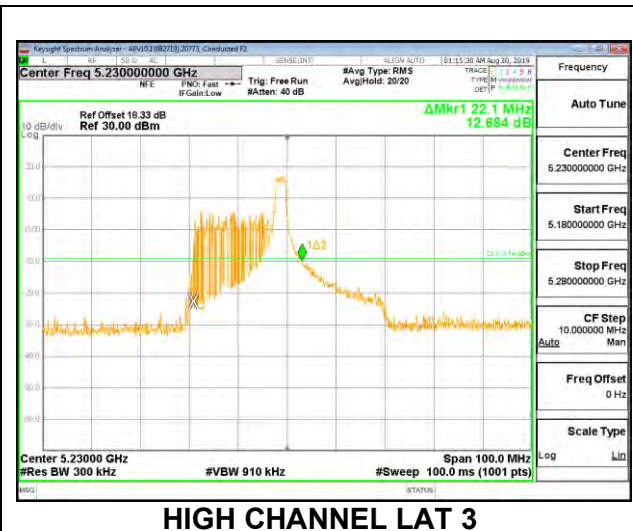
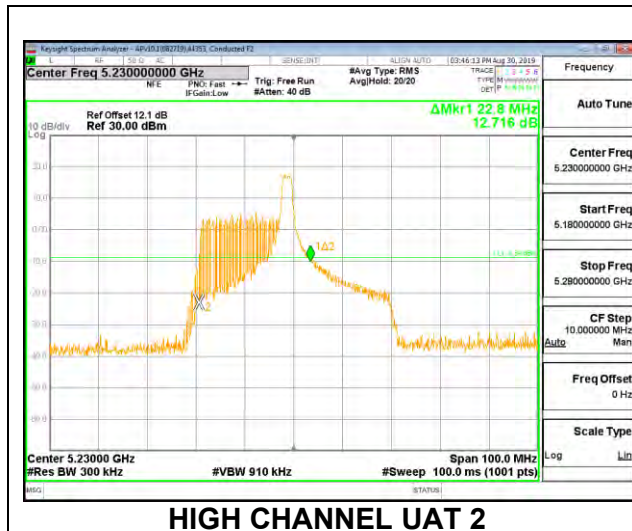
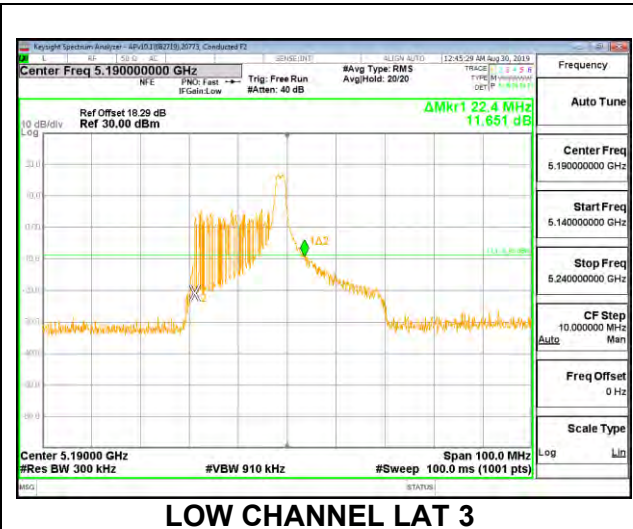
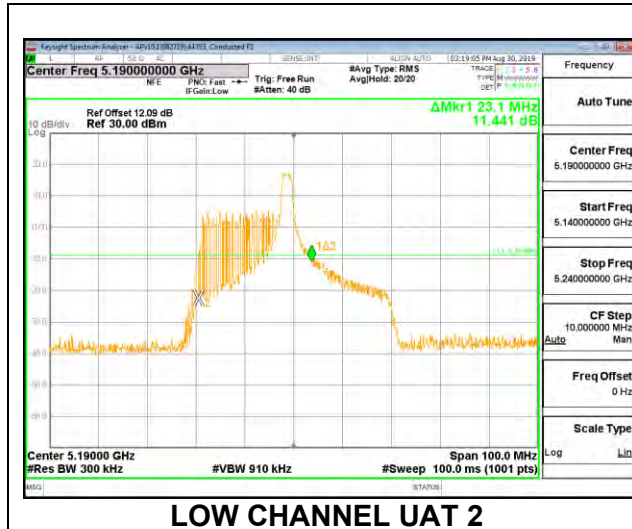
2TX UAT 2 + LAT 3 OFDMA MODE – 26 Tones, RU Index 0

Channel	Frequency (MHz)	26 dB Bandwidth	26 dB Bandwidth
		UAT 2 (MHz)	LAT 3 (MHz)
Low	5190	20.40	20.00
High	5230	20.60	20.00



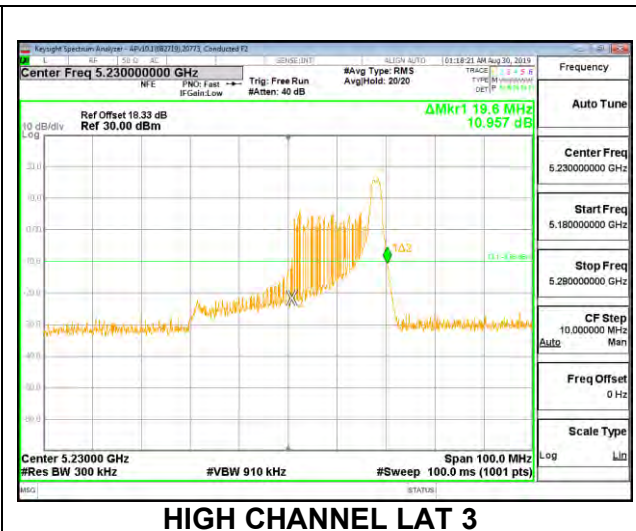
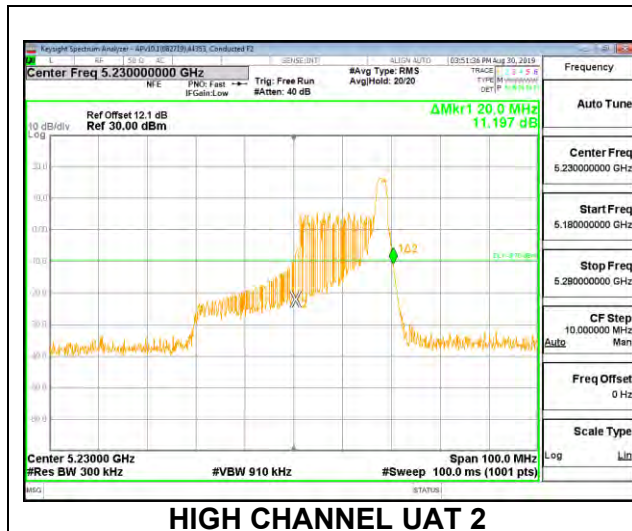
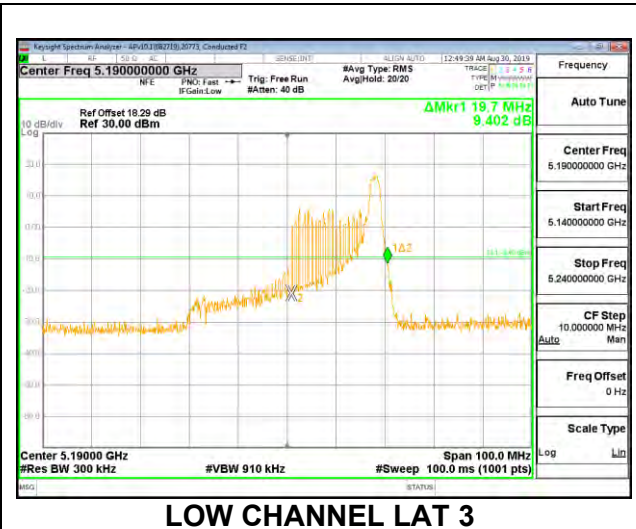
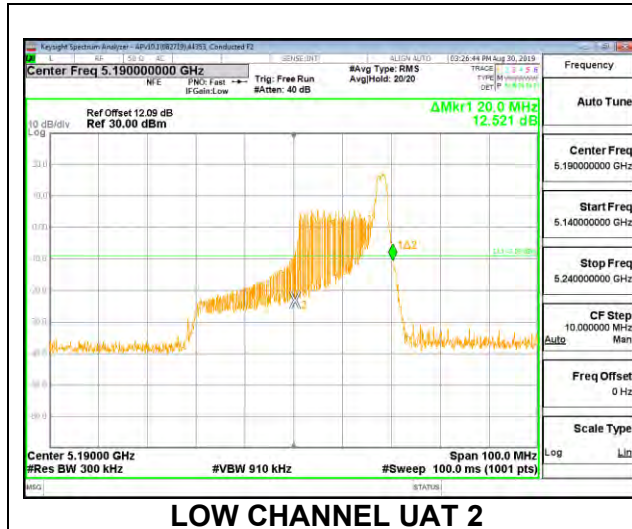
2TX UAT 2 + LAT 3 OFDMA MODE – 26 Tones, RU Index 8

Channel	Frequency (MHz)	26 dB Bandwidth	26 dB Bandwidth
		UAT 2 (MHz)	LAT 3 (MHz)
Low	5190	23.10	22.40
High	5230	22.80	22.10



2TX UAT 2 + LAT 3 OFDMA MODE – 26 Tones, RU Index 17

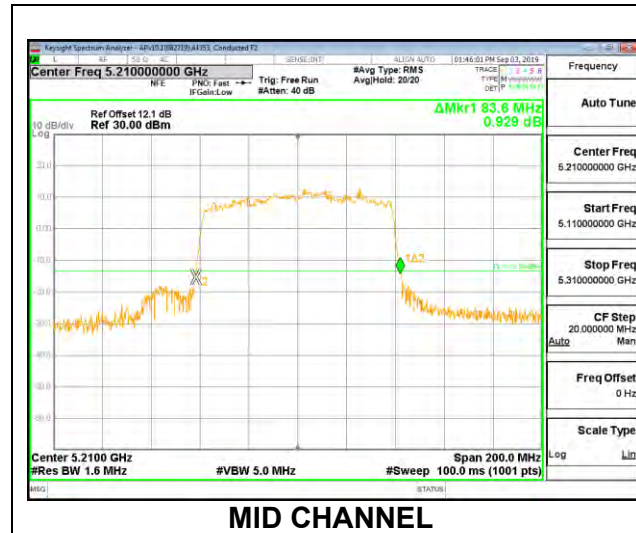
Channel	Frequency (MHz)	26 dB Bandwidth	26 dB Bandwidth
		UAT 2 (MHz)	LAT 3 (MHz)
Low	5190	20.00	19.70
High	5230	20.00	19.60



8.2.6. 802.11ax HE80 MODE IN THE 5.2 GHz BAND

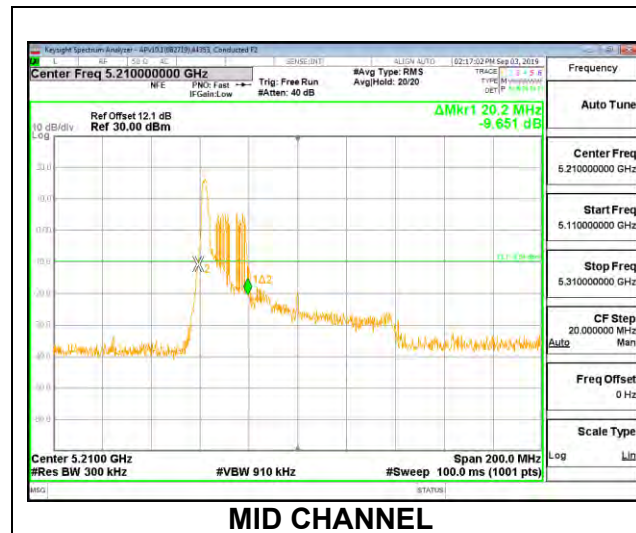
1TX UAT 2 MODE – 996 Tones, RU Index 67

Channel	Frequency	26 dB Bandwidth
	(MHz)	(MHz)
Mid	5210	83.60



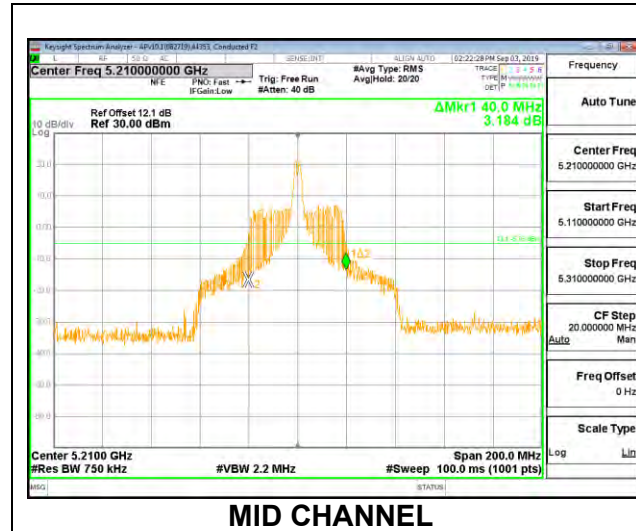
1TX UAT 2 MODE – 26 Tones, RU Index 0

Channel	Frequency	26 dB Bandwidth
	(MHz)	(MHz)
Mid	5210	20.20



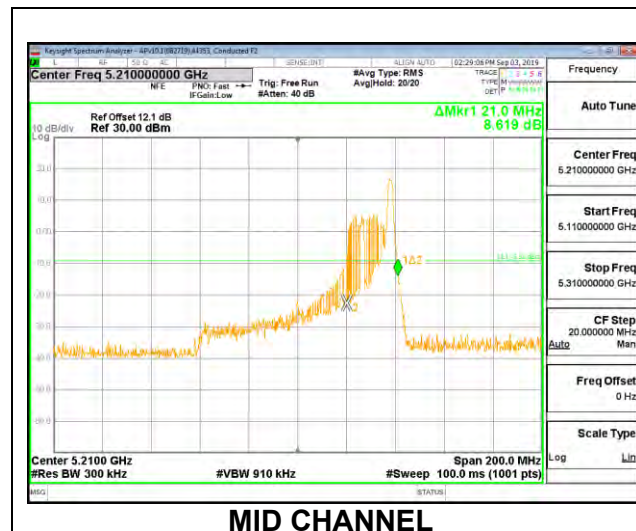
1TX UAT 2 MODE – 26 Tones, RU Index 18

Channel	Frequency	26 dB Bandwidth
	(MHz)	(MHz)
Mid	5210	40.00



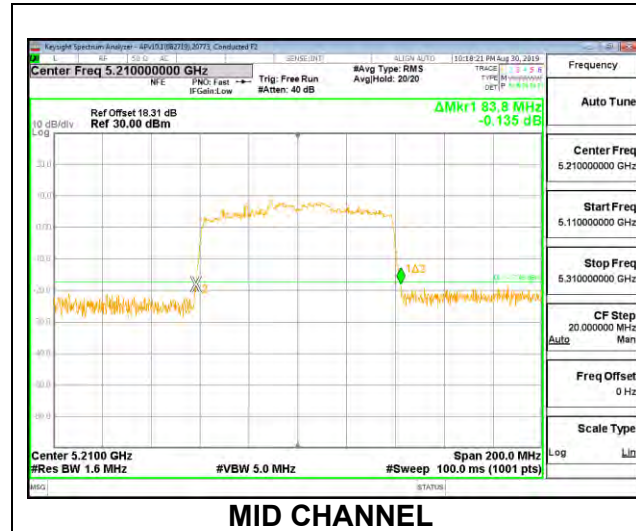
1TX UAT 2 MODE – 26 Tones, RU Index 36

Channel	Frequency	26 dB Bandwidth
	(MHz)	(MHz)
Mid	5210	21.00



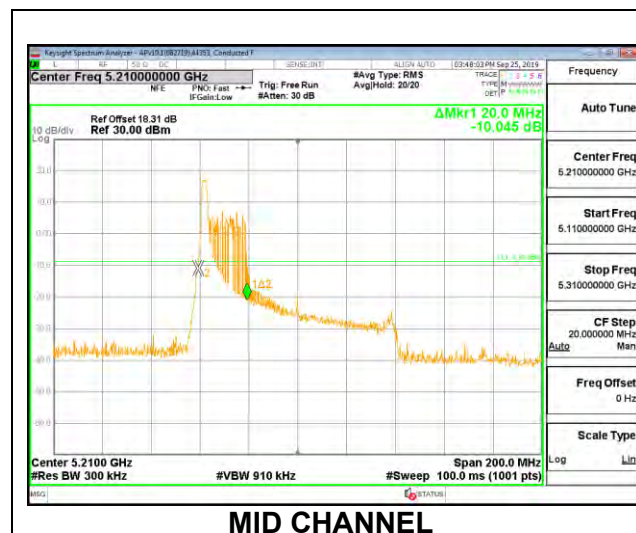
1TX LAT 3 MODE – 996 Tones, RU Index 67

Channel	Frequency	26 dB Bandwidth
	(MHz)	(MHz)
Mid	5210	83.80



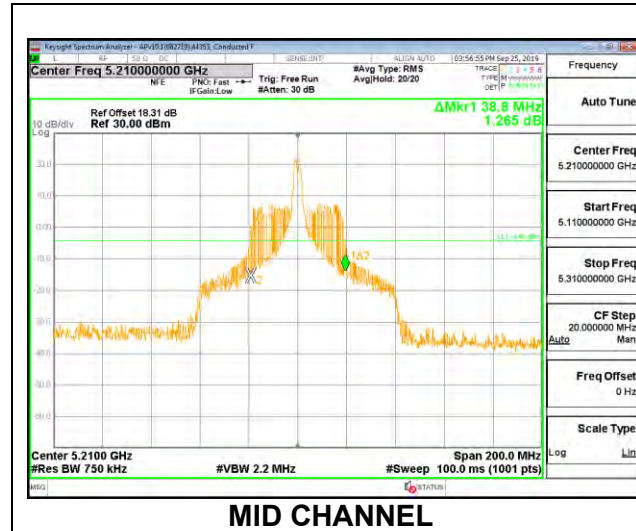
1TX LAT 3 MODE – 26 Tones, RU Index 0

Channel	Frequency	26 dB Bandwidth
	(MHz)	(MHz)
Mid	5210	20.00



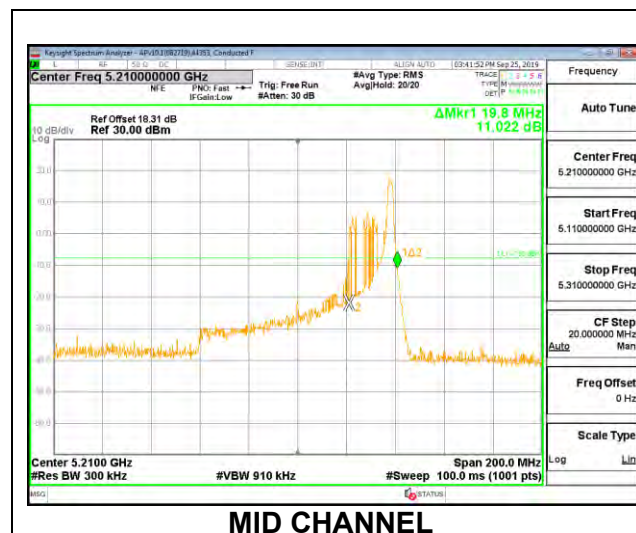
1TX LAT 3 MODE – 26 Tones, RU Index 18

Channel	Frequency	26 dB Bandwidth
	(MHz)	(MHz)
Mid	5210	38.80



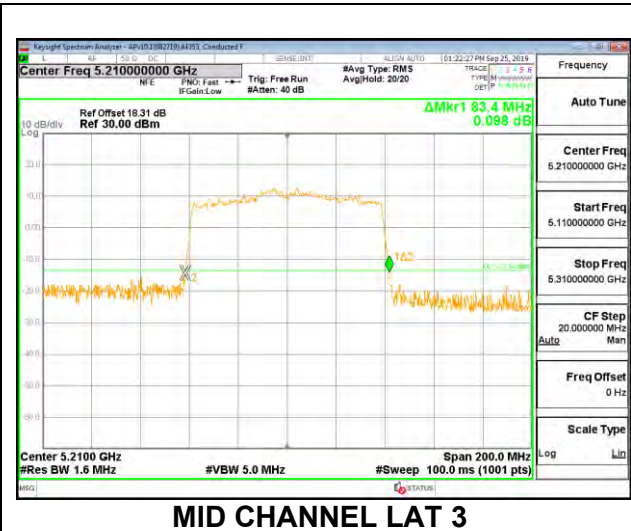
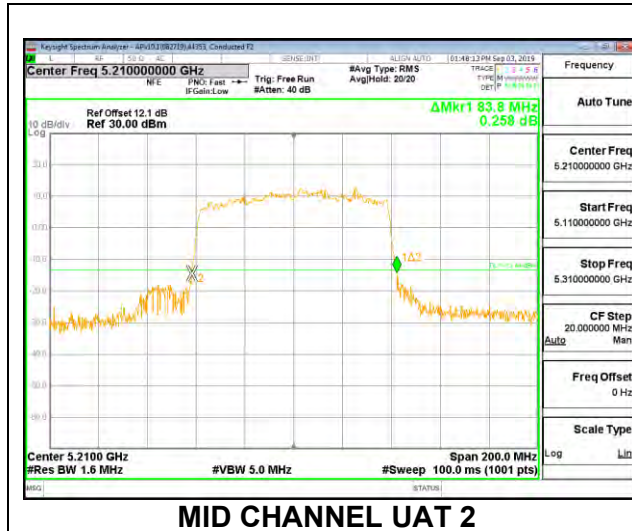
1TX LAT 3 MODE – 26 Tones, RU Index 36

Channel	Frequency	26 dB Bandwidth
	(MHz)	(MHz)
Mid	5210	19.80



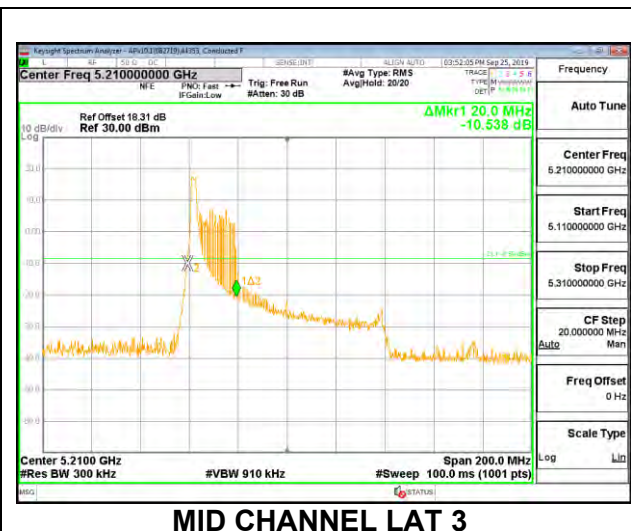
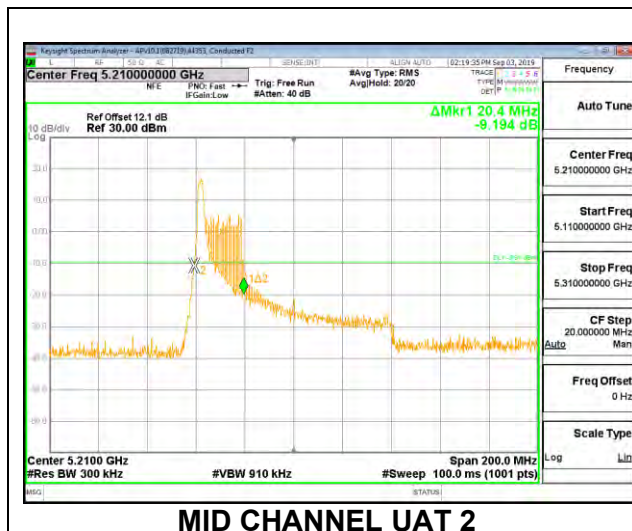
2TX UAT 2 + LAT 3 CDD MODE – 996 Tones, RU 67

Channel	Frequency (MHz)	26 dB Bandwidth UAT 2 (MHz)	26 dB Bandwidth LAT 3 (MHz)
Mid	5210	83.80	83.40



2TX UAT 2 + LAT 3 CDD MODE – 26 Tones, RU 0

Channel	Frequency (MHz)	26 dB Bandwidth UAT 2 (MHz)	26 dB Bandwidth LAT 3 (MHz)
Mid	5210	20.40	20.00



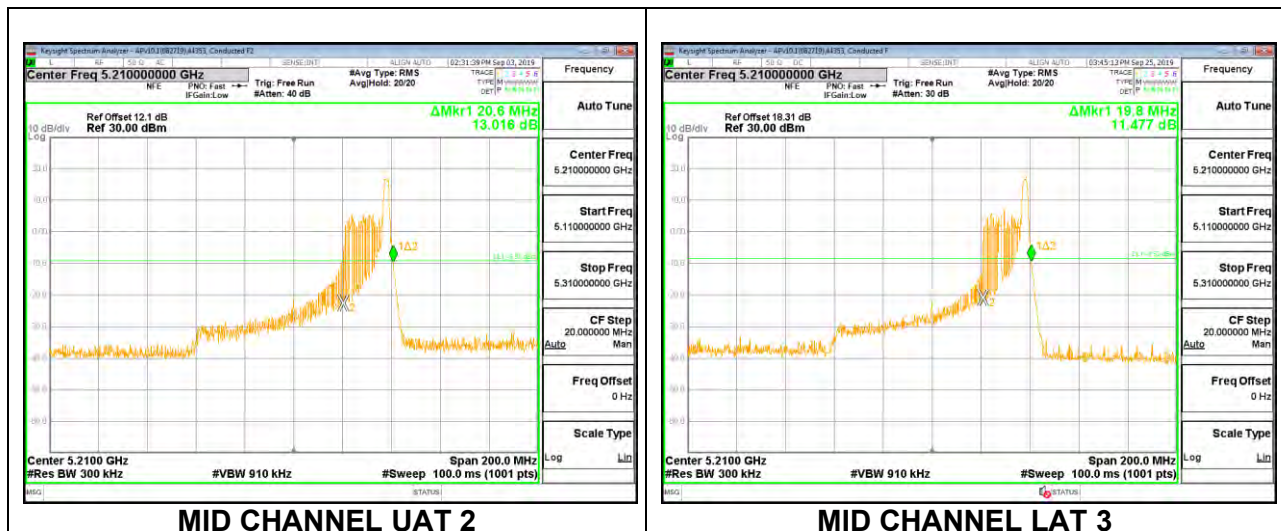
2TX UAT 2 + LAT 3 CDD MODE – 26 Tones, RU 18

Channel	Frequency (MHz)	26 dB Bandwidth UAT 2 (MHz)	26 dB Bandwidth LAT 3 (MHz)
Mid	5210	39.60	38.80



2TX UAT 2 + LAT 3 CDD MODE – 26 Tones, RU 36

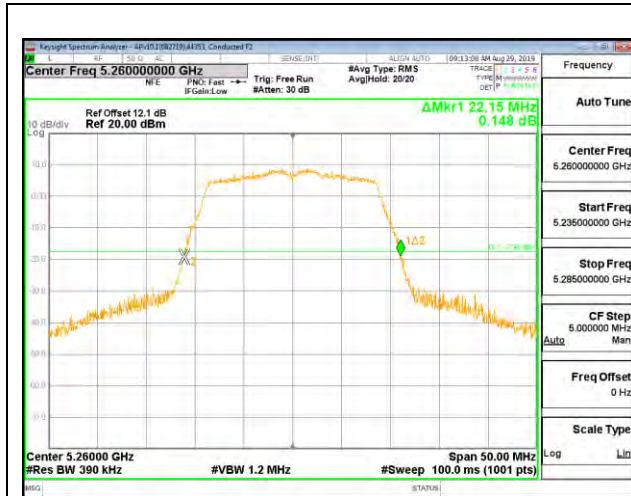
Channel	Frequency (MHz)	26 dB Bandwidth UAT 2 (MHz)	26 dB Bandwidth LAT 3 (MHz)
Mid	5210	20.60	19.80



8.2.7. 802.11n HT20 MODE IN THE 5.3 GHz BAND

1TX UAT 2 MODE

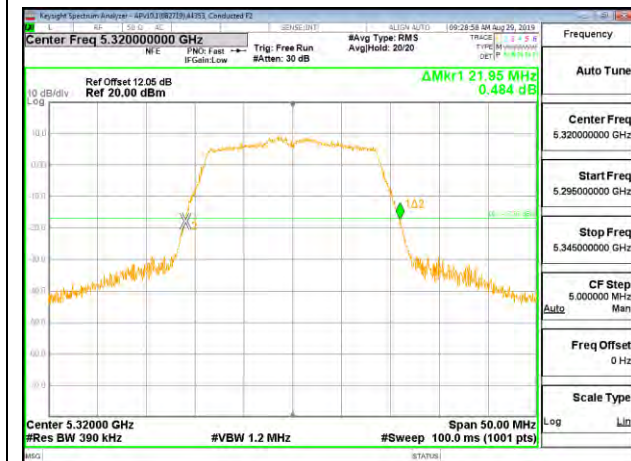
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
Low	5260	22.15
Mid	5300	21.90
High	5320	21.95



LOW CHANNEL

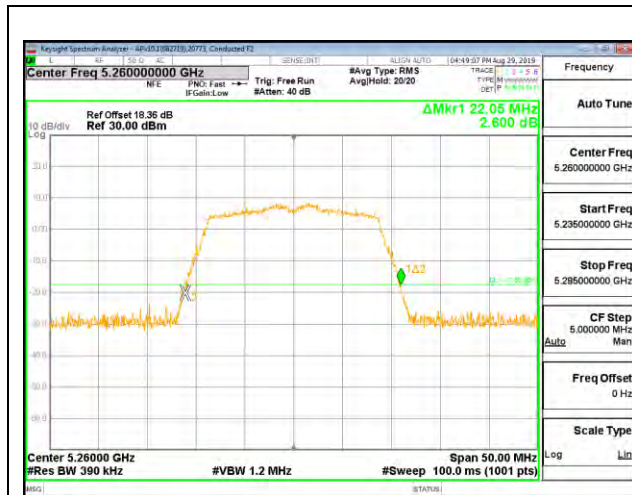


MID CHANNEL



HIGH CHANNEL

Channel	Frequency	26 dB Bandwidth
	(MHz)	(MHz)
Low	5260	22.05
Mid	5300	22.15
High	5320	22.00



LOW CHANNEL

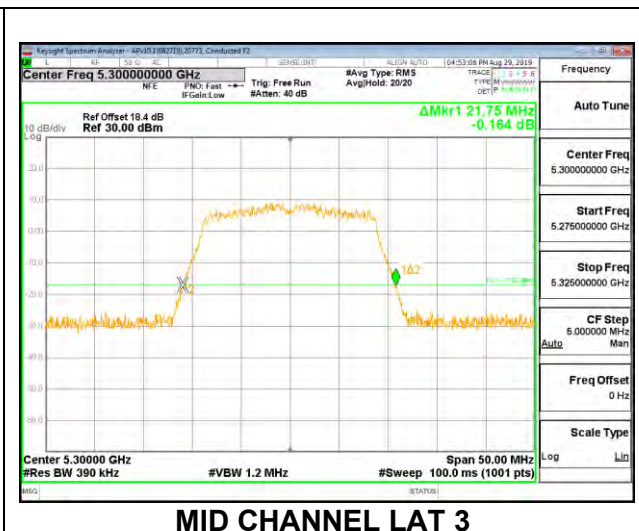
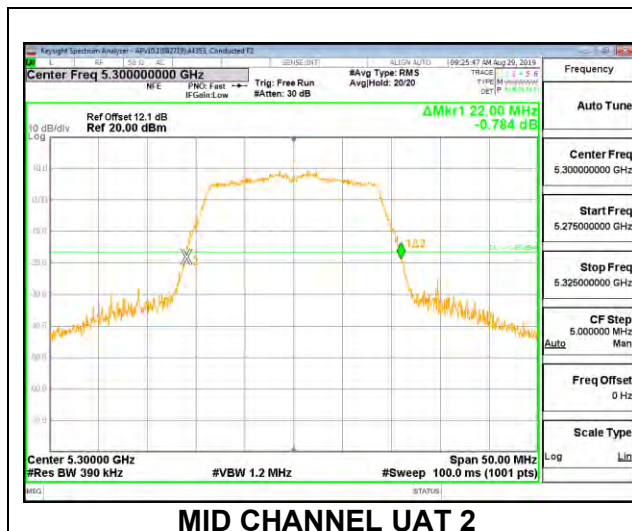
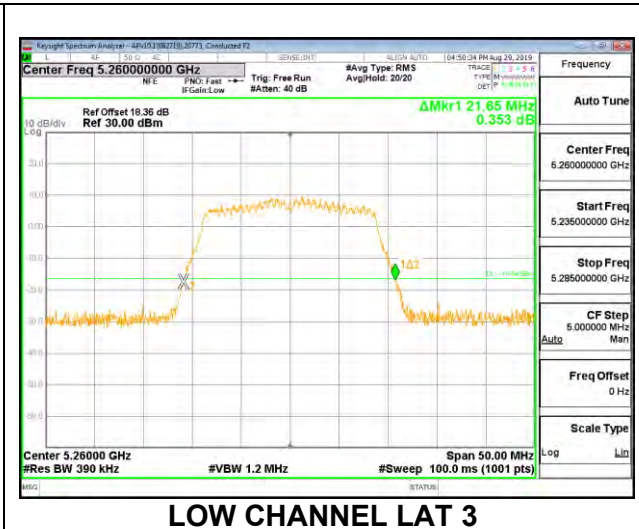
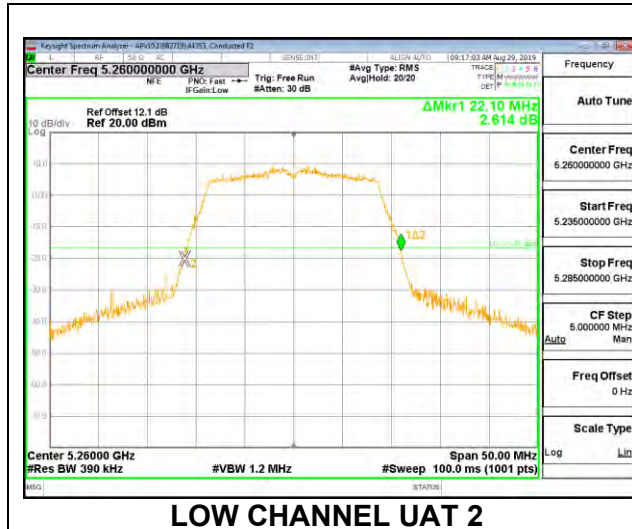


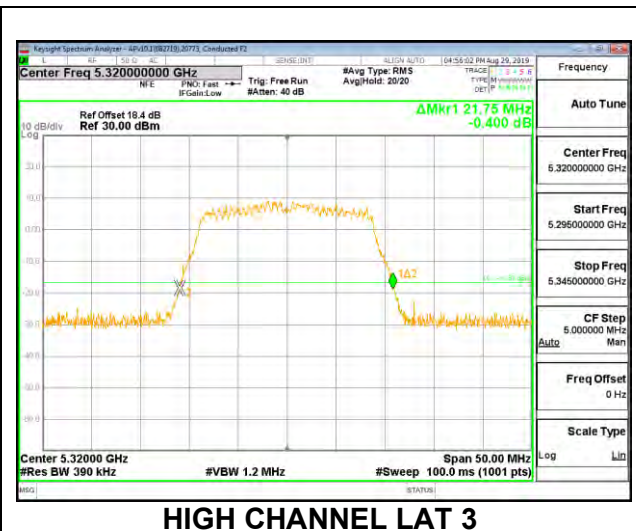
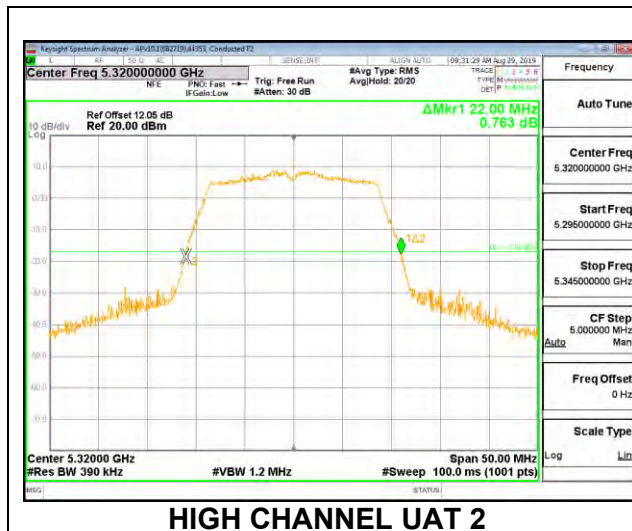
MID CHANNEL



HIGH CHANNEL

Channel	Frequency	26 dB Bandwidth	26 dB Bandwidth
	(MHz)	UAT 2 (MHz)	LAT 3 (MHz)
Low	5260	22.10	21.65
Mid	5300	22.00	21.75
High	5320	22.00	21.75

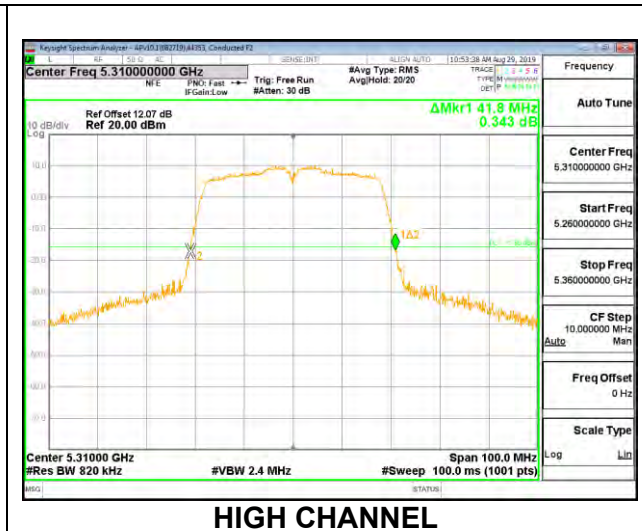
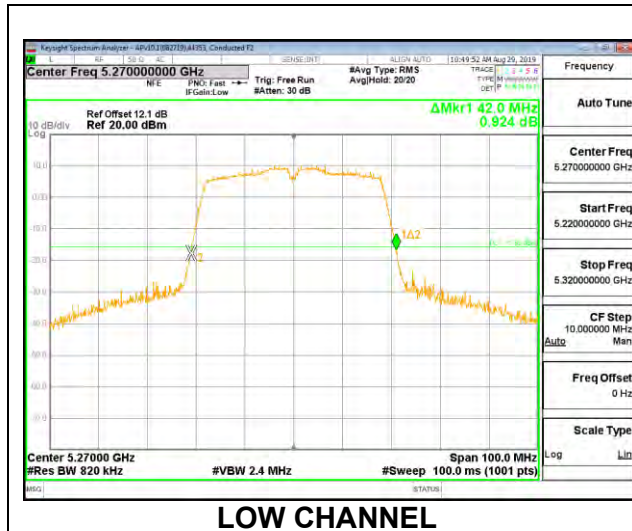




8.2.8. 802.11n HT40 MODE IN THE 5.3 GHz BAND

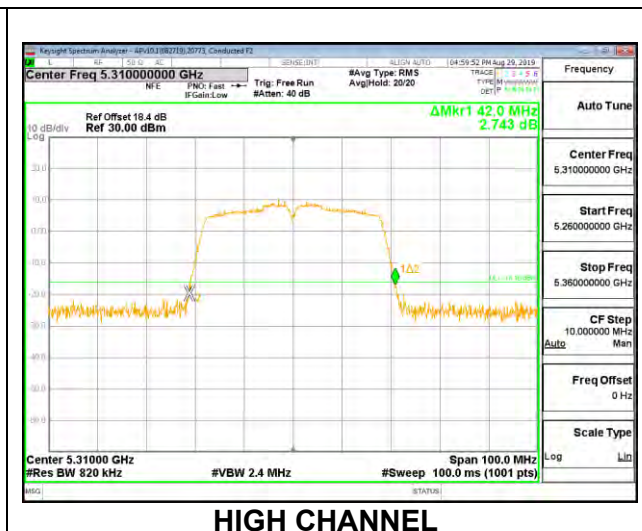
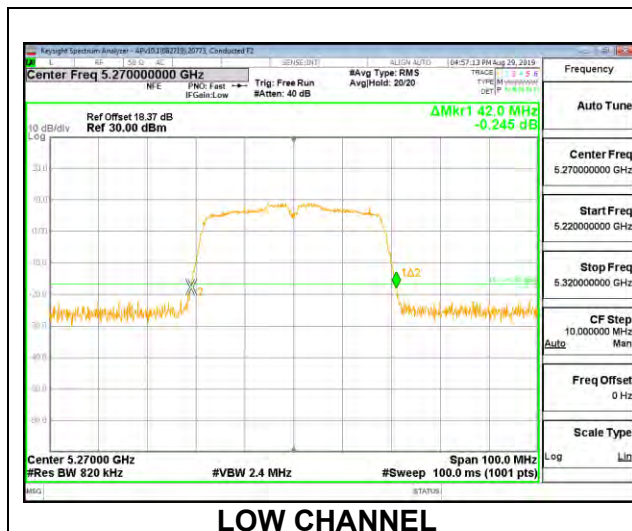
1TX UAT 2 MODE

Channel	Frequency (MHz)	26dB Bandwidth (MHz)
Low	5270	42.00
High	5310	41.80

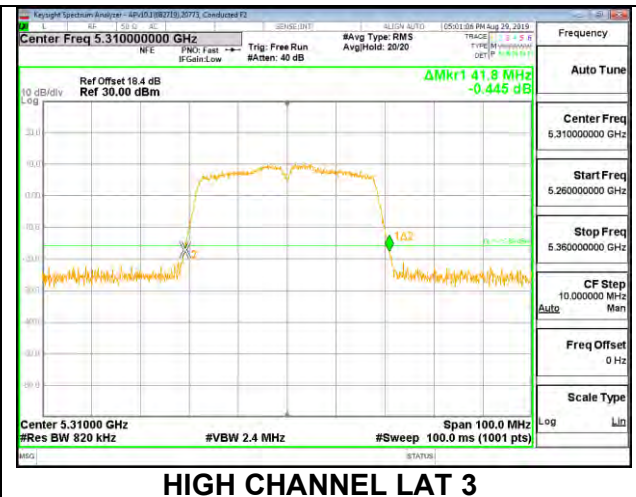
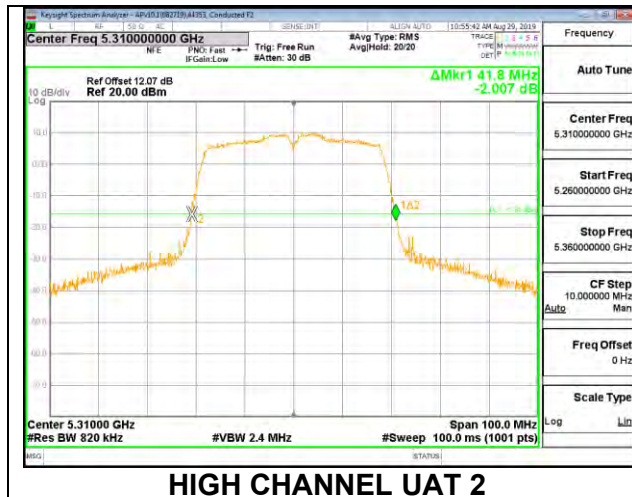
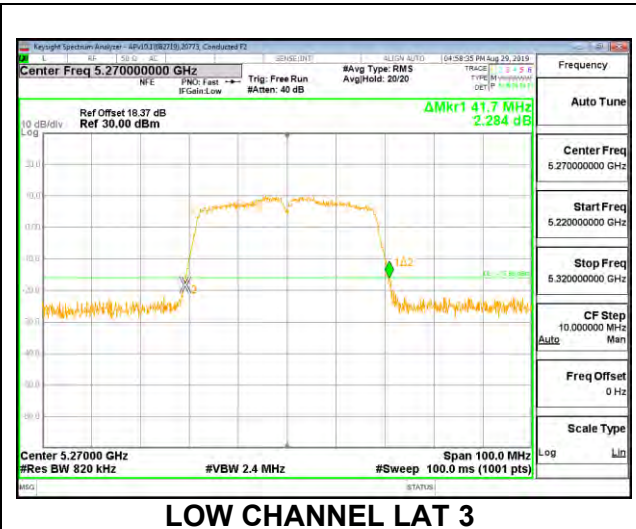
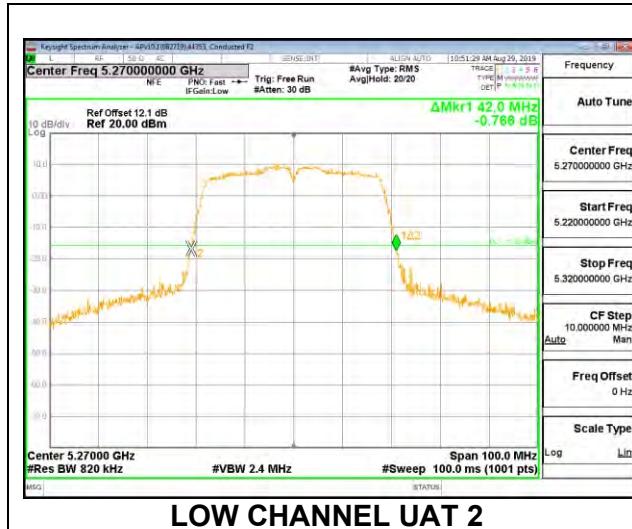


1TX LAT 3 MODE

Channel	Frequency (MHz)	26dB Bandwidth (MHz)
Low	5270	42.00
High	5310	42.00



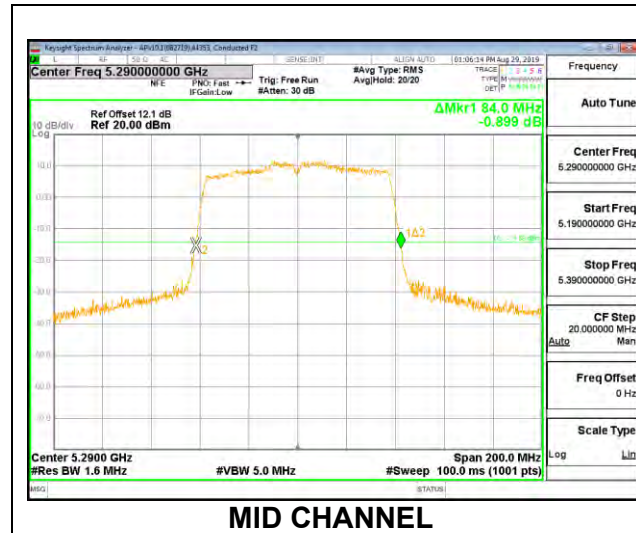
Channel	Frequency	26 dB Bandwidth	26 dB Bandwidth
	(MHz)	UAT 2	LAT 3
		(MHz)	(MHz)
Low	5270	42.00	41.70
High	5310	41.80	41.80



8.2.9. 802.11ac VHT80 MODE IN THE 5.3 GHz BAND

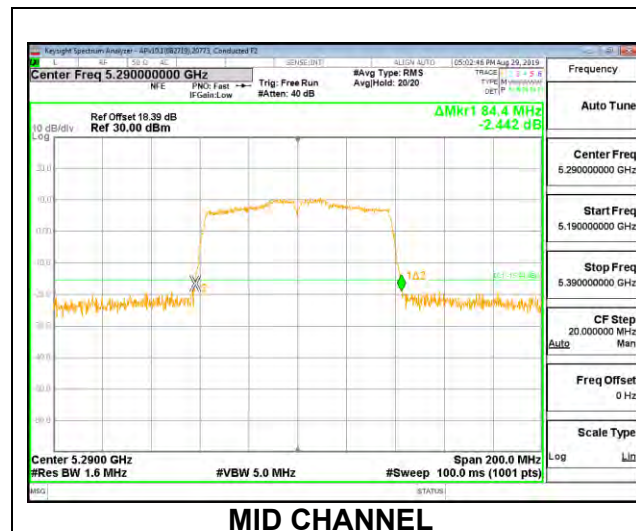
1TX UAT 2 MODE

Channel	Frequency	26 dB Bandwidth
	(MHz)	(MHz)
Mid	5290	84.00

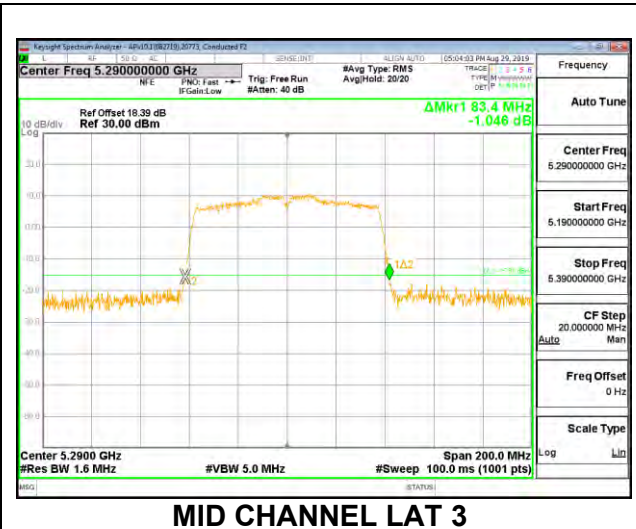
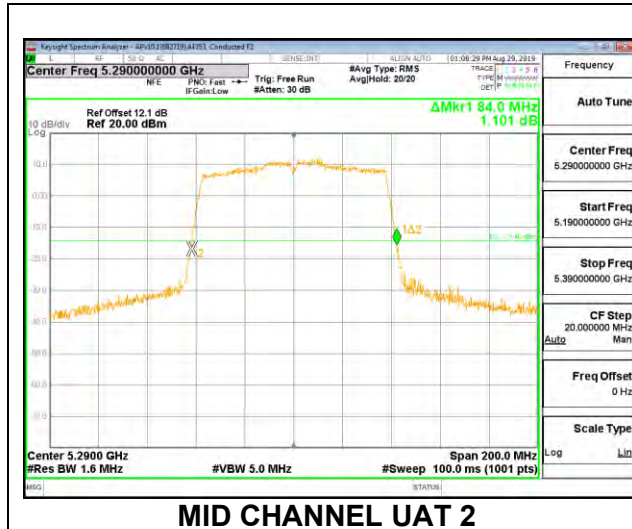


1TX LAT 3 MODE

Channel	Frequency	26 dB Bandwidth
	(MHz)	(MHz)
Mid	5290	84.40



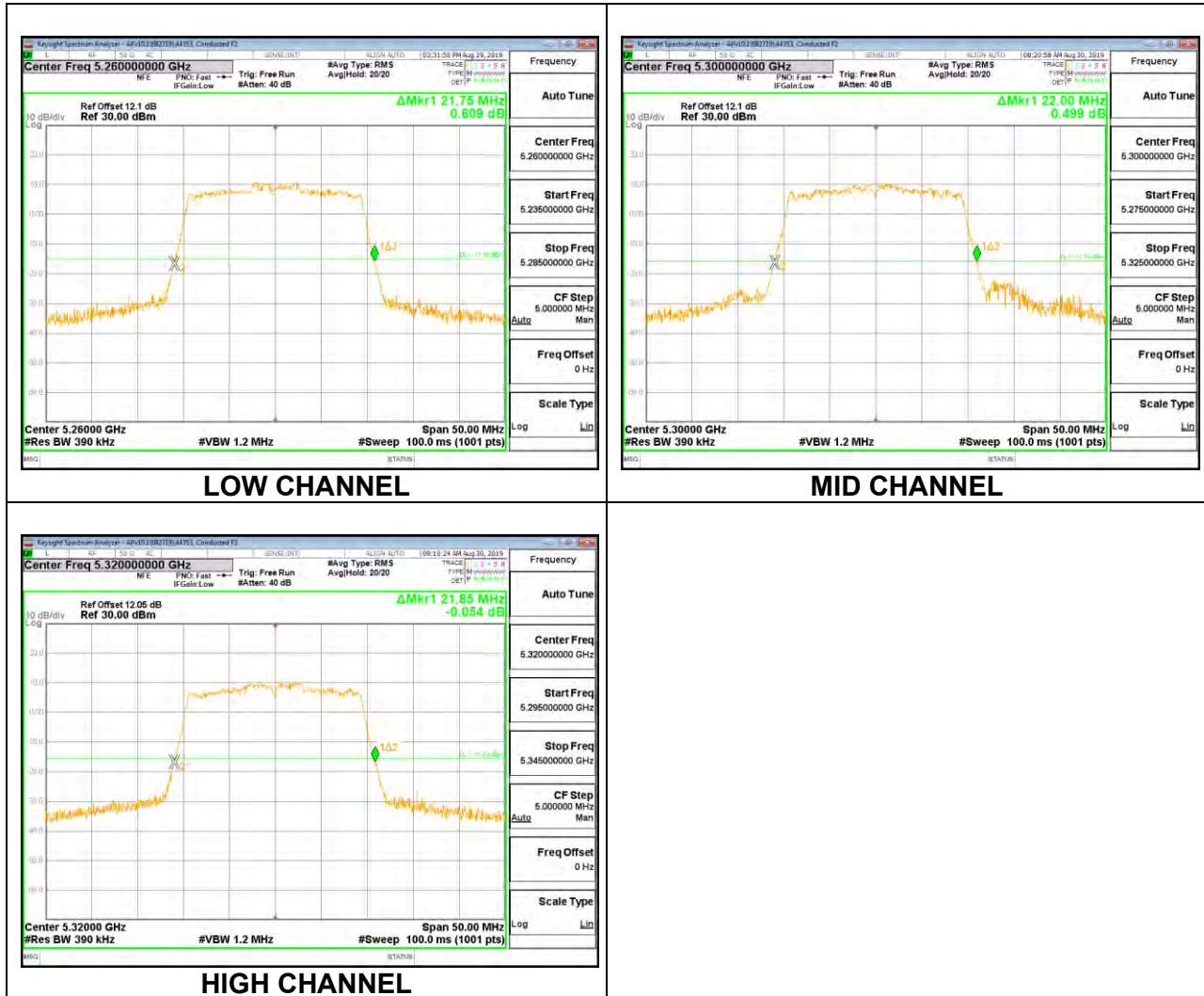
Channel	Frequency	26 dB Bandwidth	26 dB Bandwidth
	(MHz)	UAT 2 (MHz)	LAT 3 (MHz)
Mid	5290	84.00	83.40



8.2.10. 802.11ax HE20 MODE IN THE 5.3 GHz BAND

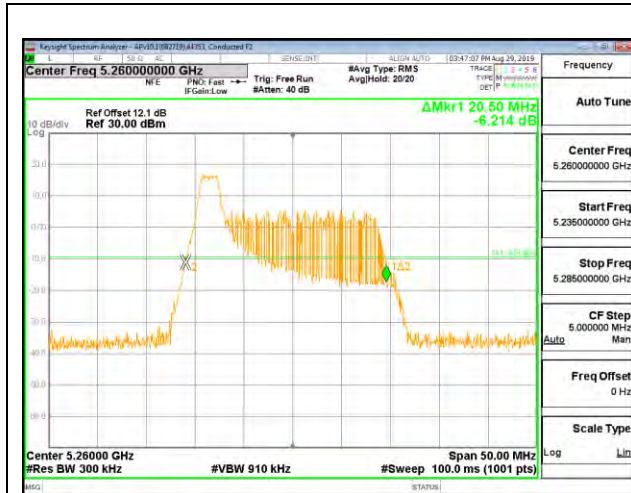
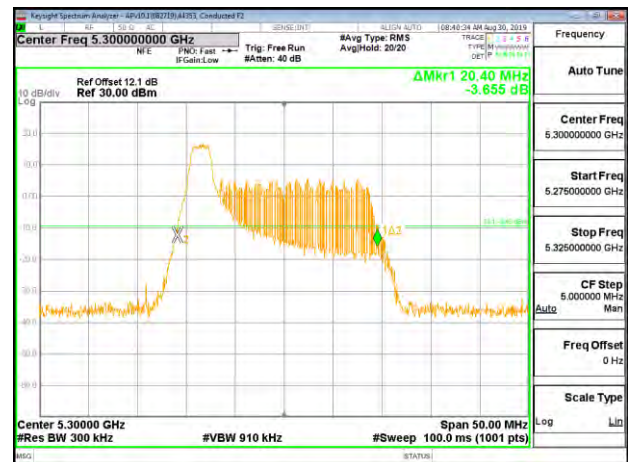
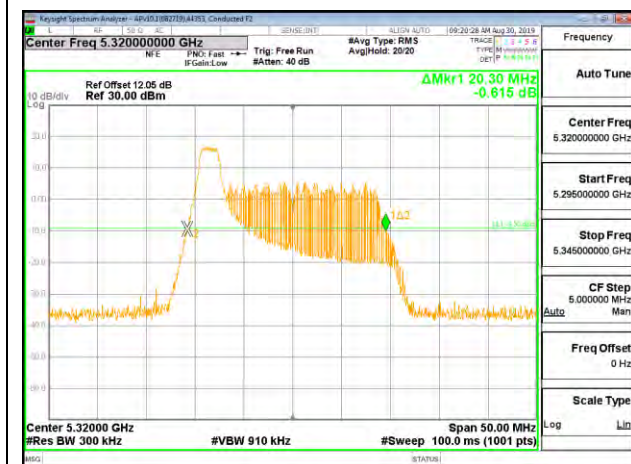
1TX UAT 2 MODE – 242 Tones, RU Index 61

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
Low	5260	21.75
Mid	5300	22.00
High	5320	21.85



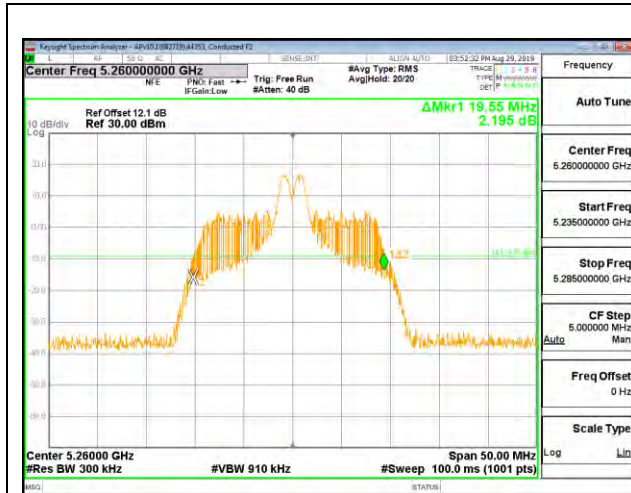
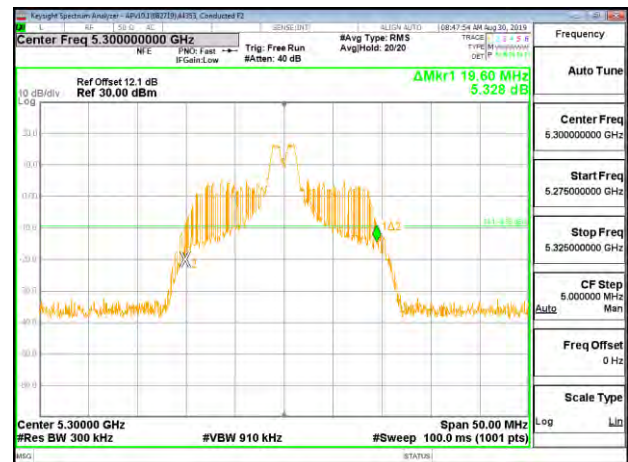
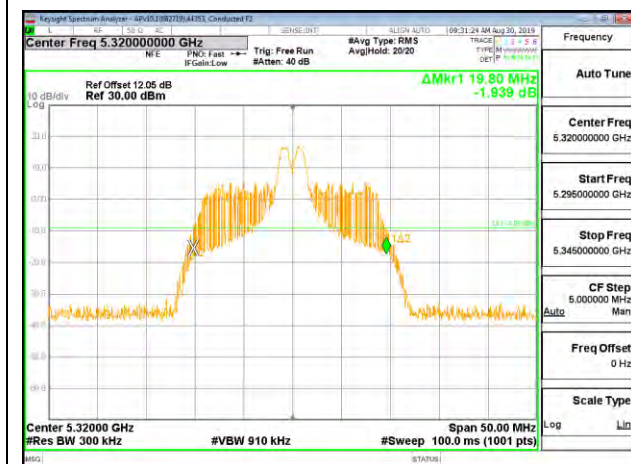
1TX UAT 2 MODE – 26 Tones, RU Index 0

Channel	Frequency	26 dB Bandwidth
	(MHz)	(MHz)
Low	5260	20.50
Mid	5300	20.40
High	5320	20.30

**LOW CHANNEL****MID CHANNEL****HIGH CHANNEL**

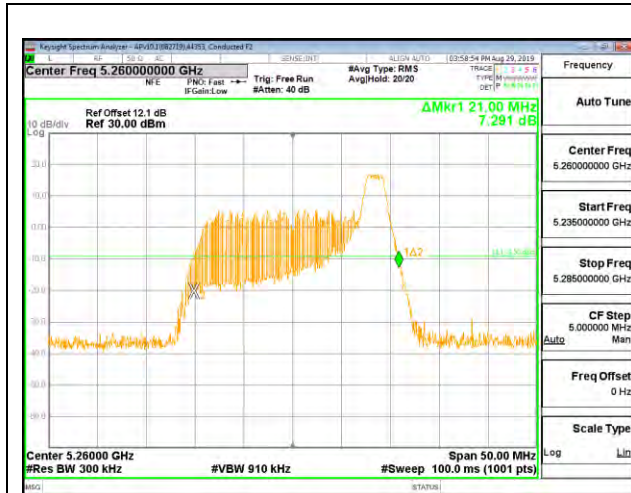
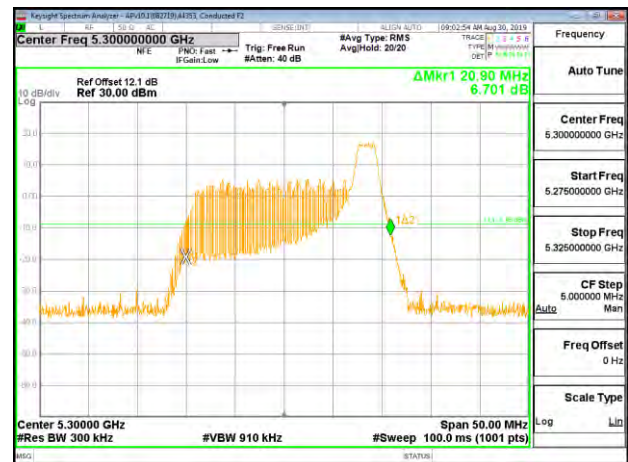
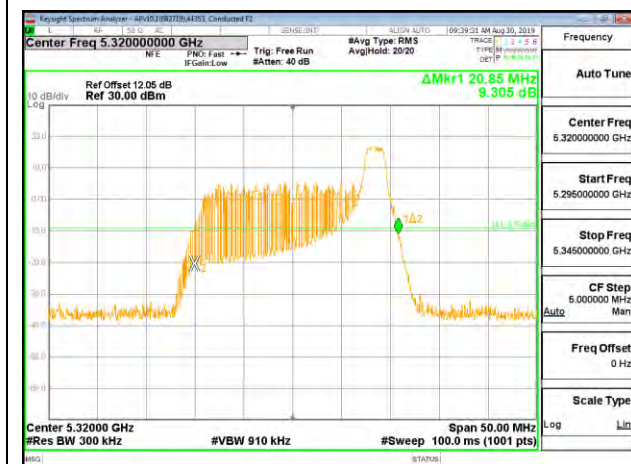
1TX UAT 2 MODE – 26 Tones, RU Index 4

Channel	Frequency	26 dB Bandwidth
	(MHz)	(MHz)
Low	5260	19.55
Mid	5300	19.60
High	5320	19.80

**LOW CHANNEL****MID CHANNEL****HIGH CHANNEL**

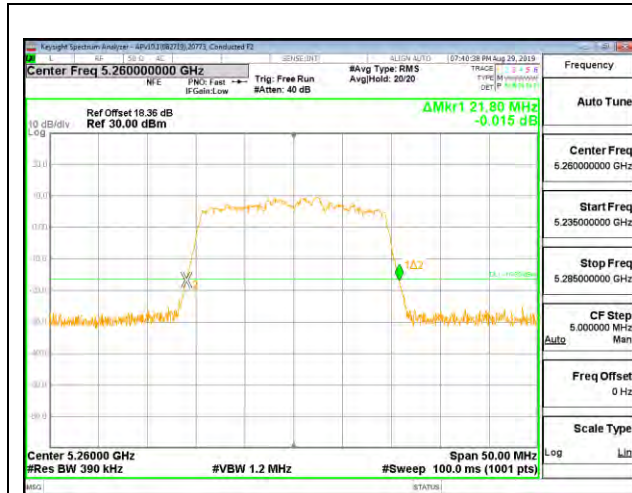
1TX UAT 2 MODE – 26 Tones, RU Index 8

Channel	Frequency	26 dB Bandwidth
	(MHz)	(MHz)
Low	5260	21.00
Mid	5300	20.90
High	5320	20.85

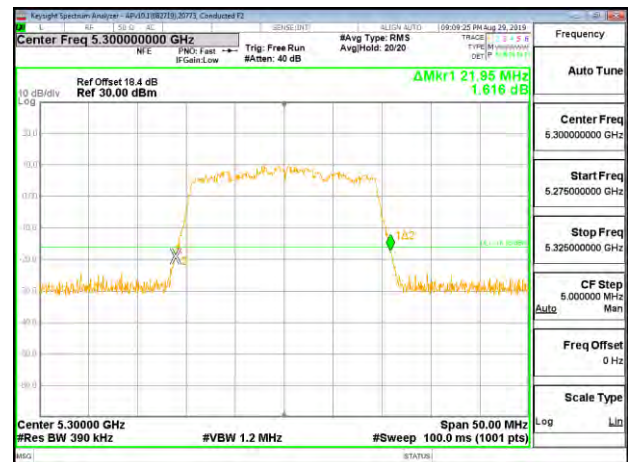
**LOW CHANNEL****MID CHANNEL****HIGH CHANNEL**

1TX LAT 3 MODE – 242 Tones, RU Index 61

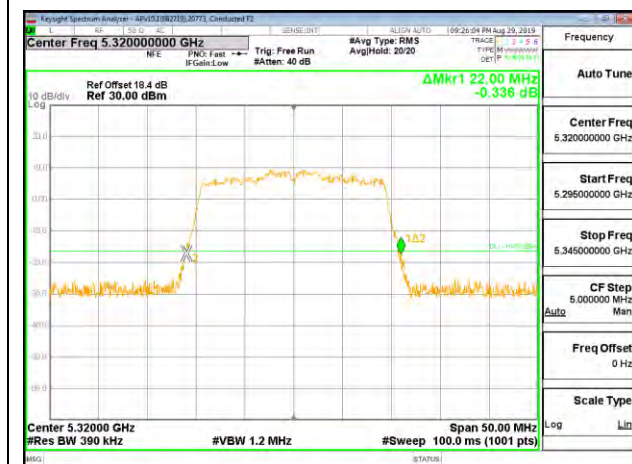
Channel	Frequency	26 dB Bandwidth
	(MHz)	(MHz)
Low	5260	21.80
Mid	5300	21.95
High	5320	22.00



LOW CHANNEL



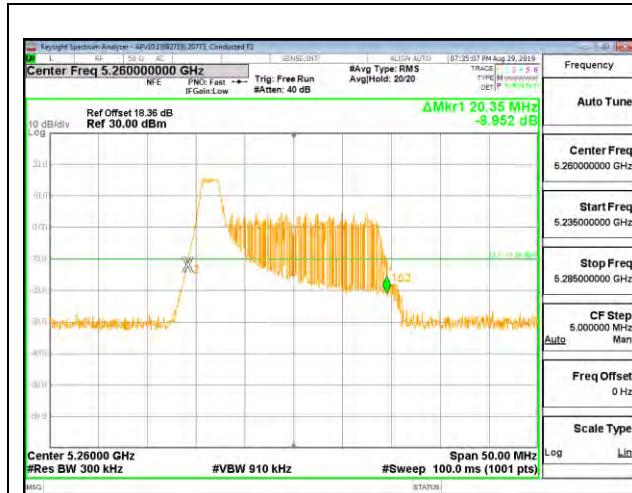
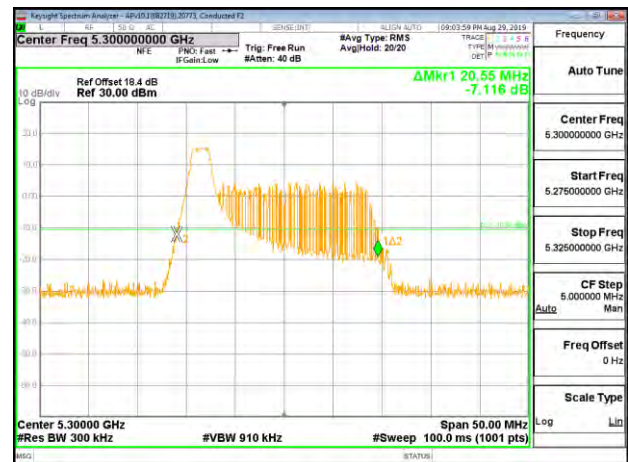
MID CHANNEL



HIGH CHANNEL

1TX LAT 3 MODE – 26 Tones, RU Index 0

Channel	Frequency	26 dB Bandwidth
	(MHz)	(MHz)
Low	5260	20.35
Mid	5300	20.55
High	5320	20.40

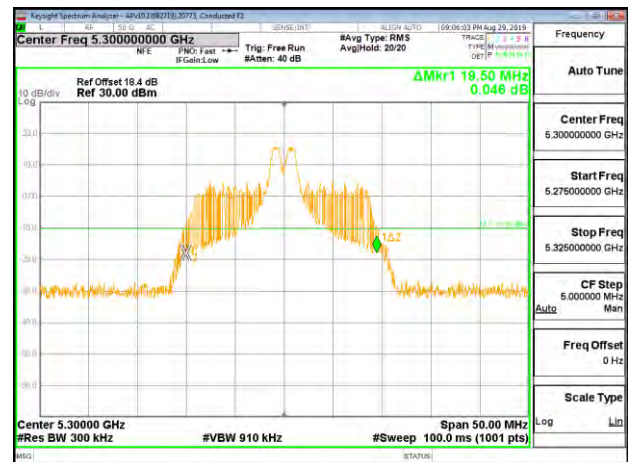
**LOW CHANNEL****MID CHANNEL****HIGH CHANNEL**

1TX LAT 3 MODE – 26 Tones, RU Index 4

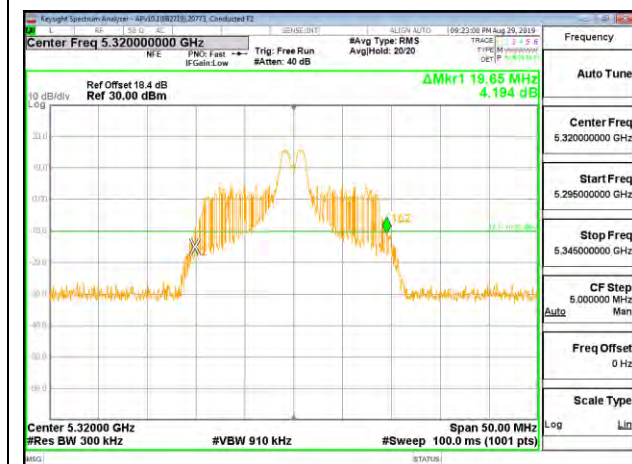
Channel	Frequency	26 dB Bandwidth
	(MHz)	(MHz)
Low	5260	19.85
Mid	5300	19.50
High	5320	19.65



LOW CHANNEL



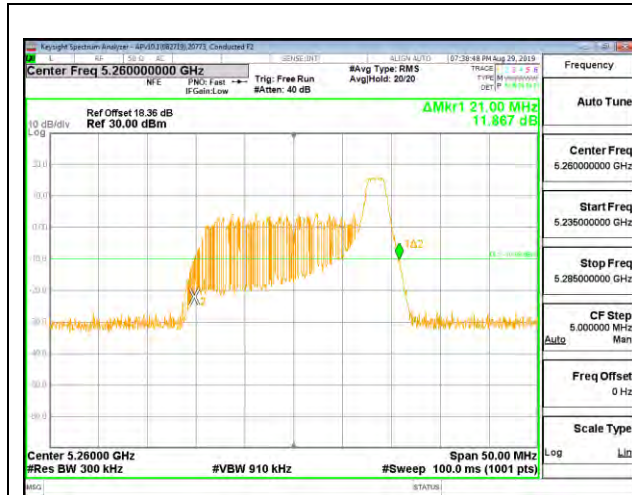
MID CHANNEL



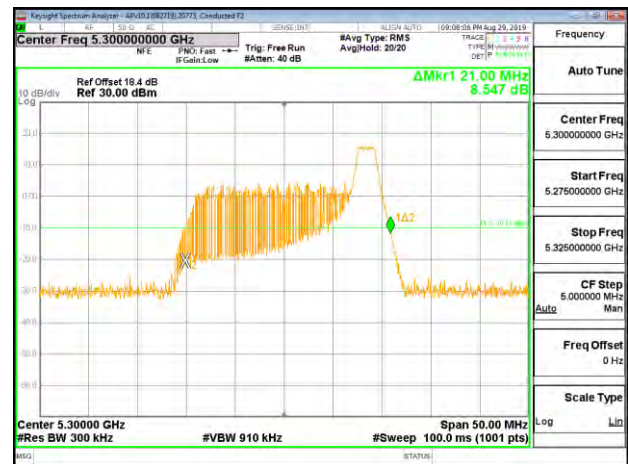
HIGH CHANNEL

1TX LAT 3 MODE – 26 Tones, RU Index 8

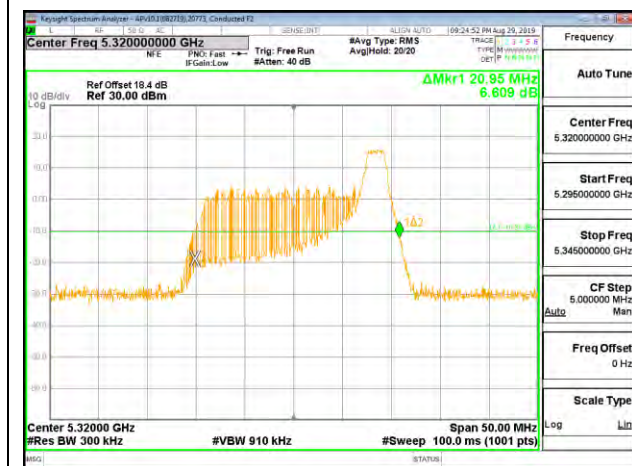
Channel	Frequency	26 dB Bandwidth
	(MHz)	(MHz)
Low	5260	21.00
Mid	5300	21.00
High	5320	20.95



LOW CHANNEL



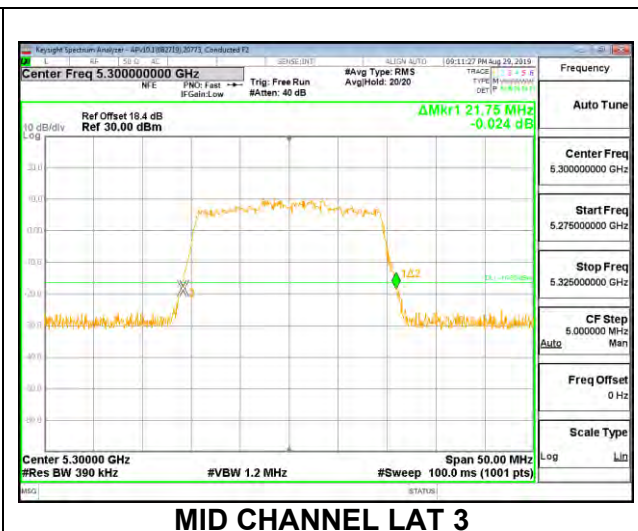
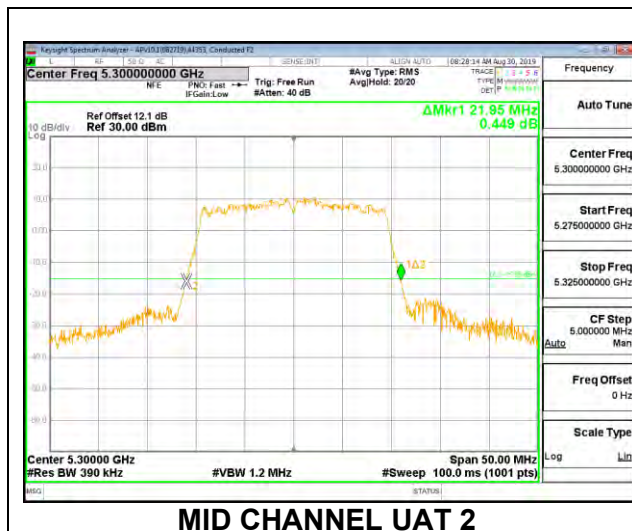
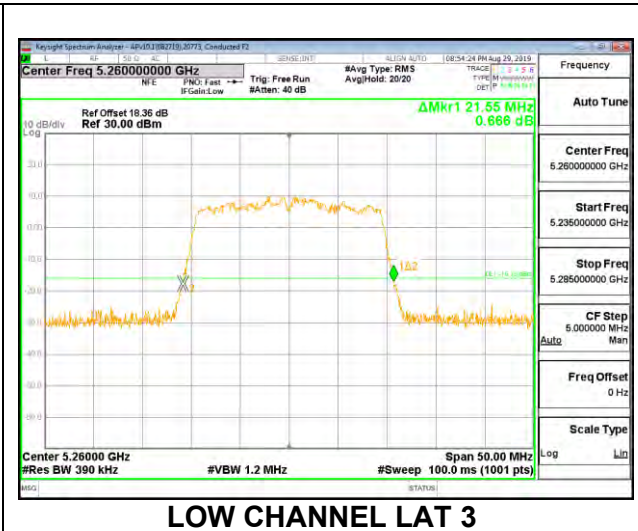
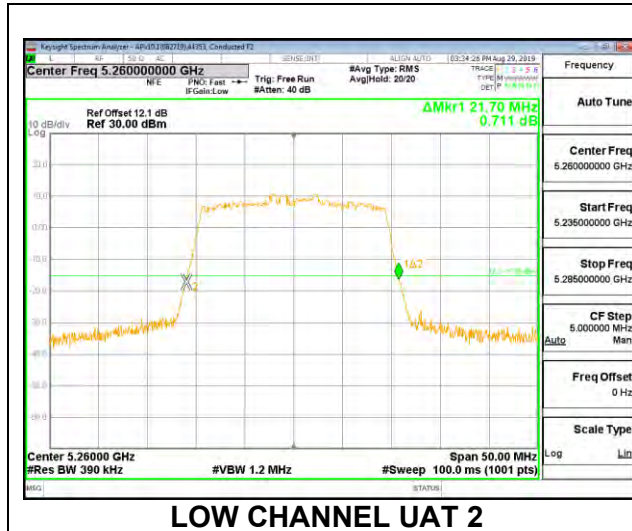
MID CHANNEL

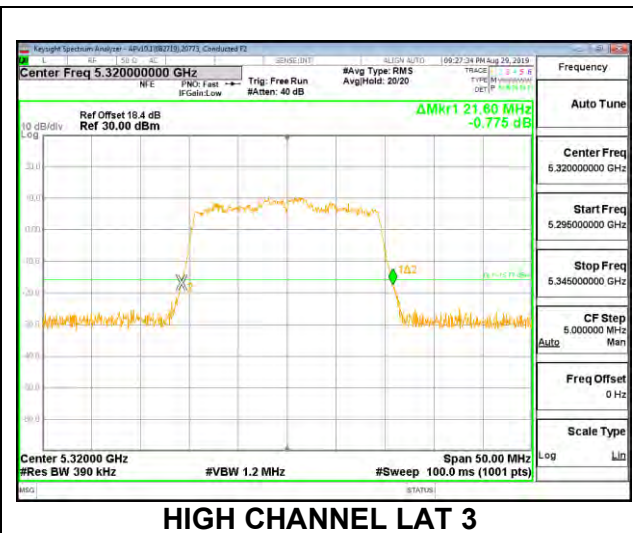
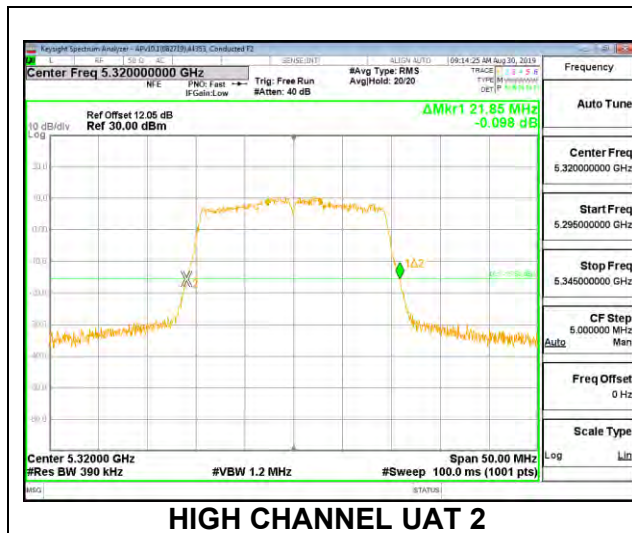


HIGH CHANNEL

2TX UAT 2 + LAT 3 OFDMA MODE – 242 Tones, RU Index 61

Channel	Frequency (MHz)	26 dB Bandwidth UAT 2 (MHz)	26 dB Bandwidth LAT 3 (MHz)
Low	5260	21.70	21.55
Mid	5300	21.95	21.75
High	5320	21.85	21.60





2TX UAT 2 + LAT 3 OFDMA MODE – 26 Tones, RU Index 0

Channel	Frequency (MHz)	26 dB Bandwidth UAT 2 (MHz)	26 dB Bandwidth LAT 3 (MHz)
Low	5260	20.35	20.05
Mid	5300	20.50	19.85
High	5320	20.10	19.95

