CERTIFICATION TEST REPORT

Report Number. : 12563734-E5V3

Applicant : Samsung Electronics Co., Ltd.
129 Samsung-Ro, Yeongtong-Gu,
Suwon-Si, Gyeonggi-Do, 16677, Korea

Model : SM-G970F/DS and SM-G970F

FCC ID : A3LSMG970F

EUT Description : GSM/WCDMA/LTE phone with BT, DTS/UNII a/b/g/n/ac/11ax HE 20/40/80, ANT+ and NFC

Test Standard(s) : FCC 47 CFR PART 15 SUBPART E (Excluding DFS)

Date Of Issue:
January 16, 2019

Prepared by:
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NVLAP TESTING
ilac-MRA
NVLAP Lab code: 200065-0

REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	12/28/2018	Initial Issue	
V2	1/14/2019	Updated Section 2, 5.2, 5.3, 5.5, 6, 7, 8.2, 8.3, 8.5, 8.5.21, 9.1.9, and 9.1.21. Removed Previous Duplicant Section 7	Steven Tran
V3	1/16/2019	Updated Antenna Gain for 5.6 Chain 1, and 5.8 Chain 1 and 2	Steven Tran

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TABLE OF CONTENTS

REPORT REVISION HISTORY 2

TABLE OF CONTENTS 3

1. ATTESTATION OF TEST RESULTS 7

2. TEST METHODOLOGY 8

3. FACILITIES AND ACCREDITATION 8

4. CALIBRATION AND UNCERTAINTY 9

4.1. MEASURING INSTRUMENT CALIBRATION 9

4.2. SAMPLE CALCULATION 9

4.3. MEASUREMENT UNCERTAINTY 9

5. EQUIPMENT UNDER TEST 10

5.1. EUT DESCRIPTION 10

5.2. MAXIMUM OUTPUT POWER 10

5.3. DESCRIPTION OF AVAILABLE ANTENNAS 13

5.4. SOFTWARE AND FIRMWARE 13

5.5. WORST-CASE CONFIGURATION AND MODE 13

5.6. DESCRIPTION OF TEST SETUP 14

6. MEASUREMENT METHOD 17

7. TEST AND MEASUREMENT EQUIPMENT 18

8. ANTENNA PORT TEST RESULTS 19

8.1. ON TIME AND DUTY CYCLE 19

8.2. 26 dB BANDWIDTH 25

8.2.1. 802.11a MODE IN THE 5.2 GHz BAND 26
8.2.2. 802.11n HT20 MODE IN THE 5.2 GHz BAND 28
8.2.3. 802.11n HT40 MODE IN THE 5.2 GHz BAND 30
8.2.4. 802.11ac VHT80 MODE IN THE 5.2 GHz BAND 31
8.2.5. 802.11ax HE20 MODE IN THE 5.2 GHz BAND 32
8.2.6. 802.11ax HE40 MODE IN THE 5.2 GHz BAND 50
8.2.7. 802.11ax HE80 MODE IN THE 5.2 GHz BAND 62
8.2.8. 802.11a MODE IN THE 5.3 GHz BAND 77
8.2.9. 802.11n HT20 MODE IN THE 5.3 GHz BAND 79
8.2.10. 802.11n HT40 MODE IN THE 5.3 GHz BAND 81
8.2.11. 802.11ac VHT80 MODE IN THE 5.3 GHz BAND 82
8.2.12. 802.11ax HE20 MODE IN THE 5.3 GHz BAND 83
8.2.13. 802.11ax HE40 MODE IN THE 5.3 GHz BAND 101
8.2.14. 802.11ax HE80 MODE IN THE 5.3 GHz BAND 113

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8.2.15. 802.11a MODE IN THE 5.6 GHz BAND 128
8.2.16. 802.11n HT20 MODE IN THE 5.6 GHz BAND 130
8.2.17. 802.11n HT40 MODE IN THE 5.6 GHz BAND 132
8.2.18. 802.11ac VHT80 MODE IN THE 5.6 GHz BAND 134
8.2.19. 802.11ax HE20 MODE IN THE 5.6 GHz BAND 136
8.2.20. 802.11ax HE40 MODE IN THE 5.6 GHz BAND 154
8.2.21. 802.11ax HE80 MODE IN THE 5.6 GHz BAND 178
8.2.22. 802.11a MODE IN THE 5.8 GHz BAND 208
8.2.23. 802.11n HT20 MODE IN THE 5.8 GHz BAND 210
8.2.24. 802.11n HT40 MODE IN THE 5.8 GHz BAND 212
8.2.25. 802.11ac VHT80 MODE IN THE 5.8 GHz BAND 213
8.2.26. 802.11ax HE20 MODE IN THE 5.8 GHz BAND 214
8.2.27. 802.11ax HE40 MODE IN THE 5.8 GHz BAND 232
8.2.28. 802.11ax HE80 MODE IN THE 5.8 GHz BAND 244

8.3. 99% BANDWIDTH 259
8.3.1. 802.11a MODE IN THE 5.2 GHz BAND 260
8.3.2. 802.11n HT20 MODE IN THE 5.2 GHz BAND 262
8.3.3. 802.11n HT40 MODE IN THE 5.2 GHz BAND 264
8.3.4. 802.11ac VHT80 MODE IN THE 5.2 GHz BAND 265
8.3.5. 802.11ax HE20 MODE IN THE 5.2 GHz BAND 266
8.3.6. 802.11ax HE40 MODE IN THE 5.2 GHz BAND 268
8.3.7. 802.11ax HE80 MODE IN THE 5.2 GHz BAND 269
8.3.8. 802.11a MODE IN THE 5.3 GHz BAND 270
8.3.9. 802.11n HT20 MODE IN THE 5.3 GHz BAND 272
8.3.10. 802.11n HT40 MODE IN THE 5.3 GHz BAND 274
8.3.11. 802.11ac VHT80 MODE IN THE 5.3 GHz BAND 275
8.3.12. 802.11ax HE20 MODE IN THE 5.3 GHz BAND 276
8.3.13. 802.11ax HE40 MODE IN THE 5.3 GHz BAND 278
8.3.14. 802.11ax HE80 MODE IN THE 5.3 GHz BAND 279
8.3.15. 802.11a MODE IN THE 5.6 GHz BAND 280
8.3.16. 802.11n HT20 MODE IN THE 5.6 GHz BAND 282
8.3.17. 802.11n HT40 MODE IN THE 5.6 GHz BAND 284
8.3.18. 802.11ac VHT80 MODE IN THE 5.6 GHz BAND 286
8.3.19. 802.11ax HE20 MODE IN THE 5.6 GHz BAND 288
8.3.20. 802.11ax HE40 MODE IN THE 5.6 GHz BAND 290
8.3.21. 802.11ax HE80 MODE IN THE 5.6 GHz BAND 292
8.3.22. 802.11a MODE IN THE 5.8 GHz BAND 294
8.3.23. 802.11n HT20 MODE IN THE 5.8 GHz BAND 296
8.3.24. 802.11n HT40 MODE IN THE 5.8 GHz BAND 298
8.3.25. 802.11ac VHT80 MODE IN THE 5.8 GHz BAND 299
8.3.26. 802.11ax HE20 MODE IN THE 5.8 GHz BAND 300
8.3.27. 802.11ax HE40 MODE IN THE 5.8 GHz BAND 302
8.3.28. 802.11ax HE80 MODE IN THE 5.8 GHz BAND 303

8.4. 6 dB BANDWIDTH 304
8.4.1. 802.11a MODE IN THE 5.8 GHz BAND 305
8.4.2. 802.11n HT20 MODE IN THE 5.8 GHz BAND 307
8.4.3. 802.11n HT40 MODE IN THE 5.8 GHz BAND 309
8.4.4. 802.11ac VHT80 MODE IN THE 5.8 GHz BAND 311
8.4.5. 802.11ax HE20 MODE IN THE 5.8 GHz BAND 312
8.4.6. 802.11ax HE40 MODE IN THE 5.8 GHz BAND 314
8.4.7. 802.11ax HE80 MODE IN THE 5.8 GHz BAND 315

8.5. OUTPUT POWER AND PSD 316

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8.5.1. 802.11a MODE IN THE 5.2 GHz BAND 318
8.5.2. 802.11n HT20 MODE IN THE 5.2 GHz BAND 320
8.5.3. 802.11n HT40 MODE IN THE 5.2 GHz BAND 322
8.5.4. 802.11ac VHT80 MODE IN THE 5.2 GHz BAND 324
8.5.5. 802.11ax HE20 MODE IN THE 5.2 GHz BAND 326
8.5.6. 802.11ax HE40 MODE IN THE 5.2 GHz BAND 344
8.5.7. 802.11ax HE80 MODE IN THE 5.2 GHz BAND 368
8.5.8. 802.11a MODE IN THE 5.3 GHz BAND 398
8.5.9. 802.11n HT20 MODE IN THE 5.3 GHz BAND 400
8.5.10. 802.11n HT40 MODE IN THE 5.3 GHz BAND 402
8.5.11. 802.11ac VHT80 MODE IN THE 5.3 GHz BAND 404
8.5.12. 802.11ax HE20 MODE IN THE 5.3 GHz BAND 406
8.5.13. 802.11ax HE40 MODE IN THE 5.3 GHz BAND 424
8.5.14. 802.11ax HE80 MODE IN THE 5.3 GHz BAND 448
8.5.15. 802.11a MODE IN THE 5.6 GHz BAND 478
8.5.16. 802.11n HT20 MODE IN THE 5.6 GHz BAND 481
8.5.17. 802.11n HT40 MODE IN THE 5.6 GHz BAND 484
8.5.18. 802.11ac VHT80 MODE IN THE 5.6 GHz BAND 487
8.5.19. 802.11ax HE20 MODE IN THE 5.6 GHz BAND 489
8.5.20. 802.11ax HE40 MODE IN THE 5.6 GHz BAND 516
8.5.21. 802.11ax HE80 MODE IN THE 5.6 GHz BAND 552
8.5.22. 802.11a MODE IN THE 5.8 GHz BAND 582
8.5.23. 802.11n HT20 MODE IN THE 5.8 GHz BAND 584
8.5.24. 802.11n HT40 MODE IN THE 5.8 GHz BAND 586
8.5.25. 802.11ac VHT80 MODE IN THE 5.8 GHz BAND 588
8.5.26. 802.11ax HE20 MODE IN THE 5.8 GHz BAND 590
8.5.27. 802.11ax HE40 MODE IN THE 5.8 GHz BAND 608
8.5.28. 802.11ax HE80 MODE IN THE 5.8 GHz BAND 632

9. RADIATED TEST RESULTS 662

9.1. TRANSMITTER ABOVE 1 GHz 663
9.1.1. TX ABOVE 1 GHz 802.11a MODE IN THE 5.2 GHz BAND 663
9.1.2. TX ABOVE 1 GHz 802.11n HT20 MODE IN THE 5.2 GHz BAND 671
9.1.3. TX ABOVE 1 GHz 802.11n HT40 MODE IN THE 5.2 GHz BAND 679
9.1.4. TX ABOVE 1 GHz 802.11ac VHT80 MODE IN THE 5.2 GHz BAND 685
9.1.5. TX ABOVE 1 GHz 802.11ax HE20 MODE IN THE 5.2 GHz BAND 689
9.1.6. TX ABOVE 1 GHz 802.11ax HE40 MODE IN THE 5.2 GHz BAND 710
9.1.7. TX ABOVE 1 GHz 802.11ax HE80 MODE IN THE 5.2 GHz BAND 728
9.1.8. TX ABOVE 1 GHz 802.11a MODE IN THE 5.3 GHz BAND 744
9.1.9. TX ABOVE 1 GHz 802.11n HT20 MODE IN THE 5.3 GHz BAND 752
9.1.10. TX ABOVE 1 GHz 802.11n HT40 MODE IN THE 5.3 GHz BAND 760
9.1.11. TX ABOVE 1 GHz 802.11ac VHT80 MODE IN THE 5.3 GHz BAND 766
9.1.12. TX ABOVE 1 GHz 802.11ax HE20 MODE IN THE 5.3 GHz BAND 770
9.1.13. TX ABOVE 1 GHz 802.11ax HE40 MODE IN THE 5.3 GHz BAND 790
9.1.14. TX ABOVE 1 GHz 802.11ax HE80 MODE IN THE 5.3 GHz BAND 808
9.1.15. TX ABOVE 1 GHz 802.11a MODE IN THE 5.6 GHz BAND 824
9.1.16. TX ABOVE 1 GHz 802.11n HT20 MODE IN THE 5.6 GHz BAND 836
9.1.17. TX ABOVE 1 GHz 802.11n HT40 MODE IN THE 5.6 GHz BAND 848
9.1.18. TX ABOVE 1 GHz 802.11ac VHT80 MODE IN THE 5.6 GHz BAND 860
9.1.19. TX ABOVE 1 GHz 802.11ax HE20 MODE IN THE 5.6 GHz BAND 870
9.1.20. TX ABOVE 1 GHz 802.11ax HE40 MODE IN THE 5.6 GHz BAND 903
9.1.21. TX ABOVE 1 GHz 802.11ax HE80 MODE IN THE 5.6 GHz BAND 940
9.1.22. TX ABOVE 1 GHz 802.11a MODE IN THE 5.8 GHz BAND 977

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9.1.23. TX ABOVE 1 GHz 802.11n HT20 MODE IN THE 5.8 GHz BAND.....987
9.1.24. TX ABOVE 1 GHz 802.11n HT40 MODE IN THE 5.8 GHz BAND.....997
9.1.25. TX ABOVE 1 GHz 802.11ac VHT80 MODE IN THE 5.8 GHz BAND 1005
9.1.26. TX ABOVE 1 GHz 802.11ax HE20 MODE IN THE 5.8 GHz BAND.....1011
9.1.27. TX ABOVE 1 GHz 802.11ax HE40 MODE IN THE 5.8 GHz BAND.....1039
9.1.28. TX ABOVE 1 GHz 802.11ax HE80 MODE IN THE 5.8 GHz BAND.....1067

9.2. SPURIOUS EMISSIONS FOR SIMULTANEOUS TRANSMITION.....1096
9.2.1. TEST CASE 1.....1098
9.2.2. TEST CASE 2.....1100
9.2.3. TEST CASE 3.....1102
9.2.4. TEST CASE 4.....1104
9.2.5. TEST CASE 5.....1106

9.3. WORST-CASE BELOW 30 MHz.....1108

9.4. WORST-CASE BELOW 1 GHz.....1110

9.5. WORST-CASE 18-26 GHz 1112

9.6. WORST-CASE 26-40 GHz 1114

10. AC POWER LINE CONDUCTED EMISSIONS.....1116

11. SETUP PHOTOS.....1119

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Samsung Electronics Co., Ltd.
129 Samsung-Ro, Yeongtong-Gu,
Suwon-Si, Gyeonggi-Do, 16677, Korea

EUT DESCRIPTION: GSM/WCDMA/LTE phone with BT, DTS/UNII a/b/g/n/ac/11ax HE 20/40/80, ANT+ and NFC

MODEL: SM-G970F/DS and SM-G970F

SERIAL NUMBER: Conducted: R38KA0H49TL
Radiated: R38KB05BJQB

DATE TESTED: NOVEMBER 2, 2018 – DECEMBER 27, 2018

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart E (Excluding DFS)	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 14-30, FCC KDB 662911 D01 v02r01, FCC KDB 905462 D02 v02/D03 v01r02/D06 v02, FCC KDB 789033 D02 v02r01, FCC KDB 644545 D03 v01, ANSI C63.10-2013, FCC 06-96.

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

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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

RADIATED EMISSIONS
Where relevant, the following sample calculation is provided:
Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)
36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

MAINS CONDUCTED EMISSIONS
Where relevant, the following sample calculation is provided:
Final Voltage (dBuV) = Measured Voltage (dBuV) + Cable Loss (dB) + Limiter Factor (dB) + LISN Insertion Loss.
36.5 dBuV + 0 dB +10.1 dB+ 0 dB = 46.6 dBuV

4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Worst Case Conducted Disturbance, 9KHz to 0.15 MHz	3.84 dB
Worst Case Conducted Disturbance, 0.15 to 30 MHz	3.65 dB
Worst Case Radiated Disturbance, 9KHz to 30 MHz	3.15 dB
Worst Case Radiated Disturbance, 30 to 1000 MHz	5.36 dB
Worst Case Radiated Disturbance, 1000 to 18000 MHz	4.32 dB
Worst Case Radiated Disturbance, 18000 to 26000 MHz	4.45 dB
Worst Case Radiated Disturbance, 26000 to 40000 MHz	5.24 dB

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

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5. EQUIPMENT UNDER TEST

5.1. EUT DESCRIPTION

The EUT is a GSM/WCDMA/LTE phone with BT, DTS/UNII a/b/g/n/ac/11ax HE 20/40/80, ANT+ and NFC

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power as follows:

5.2 GHz BAND

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5.2 GHz band, 2TX			
5180-5240	802.11a CDD	19.70	93.33
5180-5240	802.11n HT20 CDD	19.70	93.33
5190-5230	802.11n HT40 CDD	18.59	72.28
5210	802.11ac VHT80 CDD	17.69	58.75
5180-5240	802.11ax HE20 OFDMA, 242-Tones	19.56	90.36
5180-5240	802.11ax HE20 OFDMA, 106-Tones	18.57	71.94
5180-5240	802.11ax HE20 OFDMA, 52-Tones	14.62	28.97
5180-5240	802.11ax HE20 OFDMA, 26-Tones	13.06	20.23
5190-5230	802.11ax HE40 OFDMA, 484-Tones	18.66	73.45
5190-5230	802.11ax HE40 OFDMA, 242-Tones	19.56	90.36
5190-5230	802.11ax HE40 OFDMA, 106-Tones	18.69	73.96
5190-5230	802.11ax HE40 OFDMA, 52-Tones	15.25	33.50
5190-5230	802.11ax HE40 OFDMA, 26-Tones	12.74	18.79
5210	802.11ax HE80 OFDMA, 996-Tones	17.55	56.89
5210	802.11ax HE80 OFDMA, 484-Tones	18.72	74.47
5210	802.11ax HE80 OFDMA, 242-Tones	19.72	93.76
5210	802.11ax HE80 OFDMA, 106-Tones	18.72	74.47
5210	802.11ax HE80 OFDMA, 52-Tones	15.23	33.34
5210	802.11ax HE80 OFDMA, 26-Tones	13.66	23.23

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5.3 GHz BAND

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5.3 GHz band, 2TX			
5260-5320	802.11a CDD	19.58	90.78
5260-5320	802.11n HT20 CDD	19.60	91.20
5270-5310	802.11n HT40 CDD	18.62	72.78
5290	802.11ac VHT80 CDD	17.41	55.08
5260-5320	802.11ax HE20 OFDMA, 242-Tones	19.29	84.92
5260-5320	802.11ax HE20 OFDMA, 106-Tones	18.33	68.08
5260-5320	802.11ax HE20 OFDMA, 52-Tones	14.90	30.90
5260-5320	802.11ax HE20 OFDMA, 26-Tones	13.41	21.93
5270-5310	802.11ax HE40 OFDMA, 484-Tones	18.64	73.11
5270-5310	802.11ax HE40 OFDMA, 242-Tones	19.52	89.54
5270-5310	802.11ax HE40 OFDMA, 106-Tones	18.04	63.68
5270-5310	802.11ax HE40 OFDMA, 52-Tones	14.53	28.38
5270-5310	802.11ax HE40 OFDMA, 26-Tones	12.10	16.22
5290	802.11ax HE80 OFDMA, 996-Tones	17.49	56.10
5290	802.11ax HE80 OFDMA, 484-Tones	18.48	70.47
5290	802.11ax HE80 OFDMA, 242-Tones	19.45	88.10
5290	802.11ax HE80 OFDMA, 106-Tones	18.41	69.34
5290	802.11ax HE80 OFDMA, 52-Tones	14.99	31.55
5290	802.11ax HE80 OFDMA, 26-Tones	13.32	21.48

5.6 GHz BAND

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5.6 GHz band, 2TX			
5500-5720	802.11a CDD	19.27	84.53
5500-5720	802.11n HT20 CDD	19.26	84.33
5510-5710	802.11n HT40 CDD	18.44	69.82
5530-5690	802.11ac VHT80 CDD	17.44	55.46
5500-5720	802.11ax HE20 OFDMA, 242-Tones	19.50	89.13
5500-5720	802.11ax HE20 OFDMA, 106-Tones	18.03	63.53
5500-5720	802.11ax HE20 OFDMA, 52-Tones	14.52	28.31
5500-5720	802.11ax HE20 OFDMA, 26-Tones	13.51	22.44
5510-5710	802.11ax HE40 OFDMA, 484-Tones	19.56	90.36
5510-5710	802.11ax HE40 OFDMA, 242-Tones	19.50	89.13
5510-5710	802.11ax HE40 OFDMA, 106-Tones	18.47	70.31
5510-5710	802.11ax HE40 OFDMA, 52-Tones	15.02	31.77
5510-5710	802.11ax HE40 OFDMA, 26-Tones	13.48	22.28
5530-5690	802.11ax HE80 OFDMA, 996-Tones	17.42	55.21
5530-5690	802.11ax HE80 OFDMA, 484-Tones	18.49	70.63
5530-5690	802.11ax HE80 OFDMA, 242-Tones	19.41	87.30
5530-5690	802.11ax HE80 OFDMA, 106-Tones	18.47	70.31
5530-5690	802.11ax HE80 OFDMA, 52-Tones	15.40	34.67
5530-5690	802.11ax HE80 OFDMA, 26-Tones	14.49	28.12

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5.8 GHz BAND

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5.8 GHz band, 2TX			
5745-5825	802.11a CDD	19.74	94.19
5745-5825	802.11n HT20 CDD	19.72	93.76
5755-5795	802.11n HT40 CDD	18.22	66.37
5775	802.11ac VHT80 CDD	17.35	54.33
5745-5825	802.11ax HE20 OFDMA, 242-Tones	19.28	84.72
5745-5825	802.11ax HE20 OFDMA, 106-Tones	18.41	69.34
5745-5825	802.11ax HE20 OFDMA, 52-Tones	15.46	35.16
5745-5825	802.11ax HE20 OFDMA, 26-Tones	14.33	27.10
5755-5795	802.11ax HE40 OFDMA, 484-Tones	18.38	68.87
5755-5795	802.11ax HE40 OFDMA, 242-Tones	19.38	86.70
5755-5795	802.11ax HE40 OFDMA, 106-Tones	18.19	65.92
5755-5795	802.11ax HE40 OFDMA, 52-Tones	15.41	34.75
5755-5795	802.11ax HE40 OFDMA, 26-Tones	14.26	26.67
5775	802.11ax HE80 OFDMA, 996-Tones	17.16	52.00
5775	802.11ax HE80 OFDMA, 484-Tones	18.43	69.66
5775	802.11ax HE80 OFDMA, 242-Tones	19.38	86.70
5775	802.11ax HE80 OFDMA, 106-Tones	18.40	69.18
5775	802.11ax HE80 OFDMA, 52-Tones	15.45	35.08
5775	802.11ax HE80 OFDMA, 26-Tones	14.33	27.10

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5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an FPCB antenna, with a maximum gain as below table:

Frequency Band (GHz)	Chain 0	Chain 1
	Antenna Gain (dBi)	Antenna Gain (dBi)
5.2	-2.27	-1.75
5.3	-2.10	-0.16
5.6	-2.10	-2.50
5.8	-7.19	-6.65

Note:
Antenna #1 = Chain 0
Antenna #2-2 = Chain 1

5.4. SOFTWARE AND FIRMWARE

The test utility software used during testing was G970F.001.

5.5. WORST-CASE CONFIGURATION AND MODE

Radiated emissions below 1GHz, above 18GHz, and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

Band edge and radiated emissions between 1GHz and 18GHz were performed with the EUT set to transmit at the highest power on low, middle and high channels.

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

Worst-case data rates as provided by the client were:

802.11a mode: 6 Mbps
802.11n HT20 mode: MCS0
802.11n HT40 mode: MCS0
802.11ac VHT80 mode: MCS0
802.11ax HE20 mode: MCS0
802.11ax HE40 mode: MCS0
802.11ax HE80 mode: MCS0

All radios that can be transmitted simultaneously have been evaluated for radiated for all possible combinations of transmission and found to be in compliance.

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5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
AC Adapter	Samsung	EP-TA300	R3KB5B01S1SE3	N/A
USB Data Cabe	Samsung	N/A	N/A	N/A
Earphone	Samsung	N/A	N/A	N/A

I/O CABLES

I/O Cable List						
Cable No	**Port**	**# of identical ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	Antenna	1	RF	Shielded	0.2	To Spectrum Analyzer
2	USB	1	USB	Un-shielded	1	EUT to AC Mains

I/O CABLES (RADIATED AND CONDUCTED EMISSIONS)

I/O Cable List						
Cable No	**Port**	**# of identical ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	USB	1	Type C	Shielded	1	N/A
2	Earphone	1	3.5mm	Un-shielded	1	N/A

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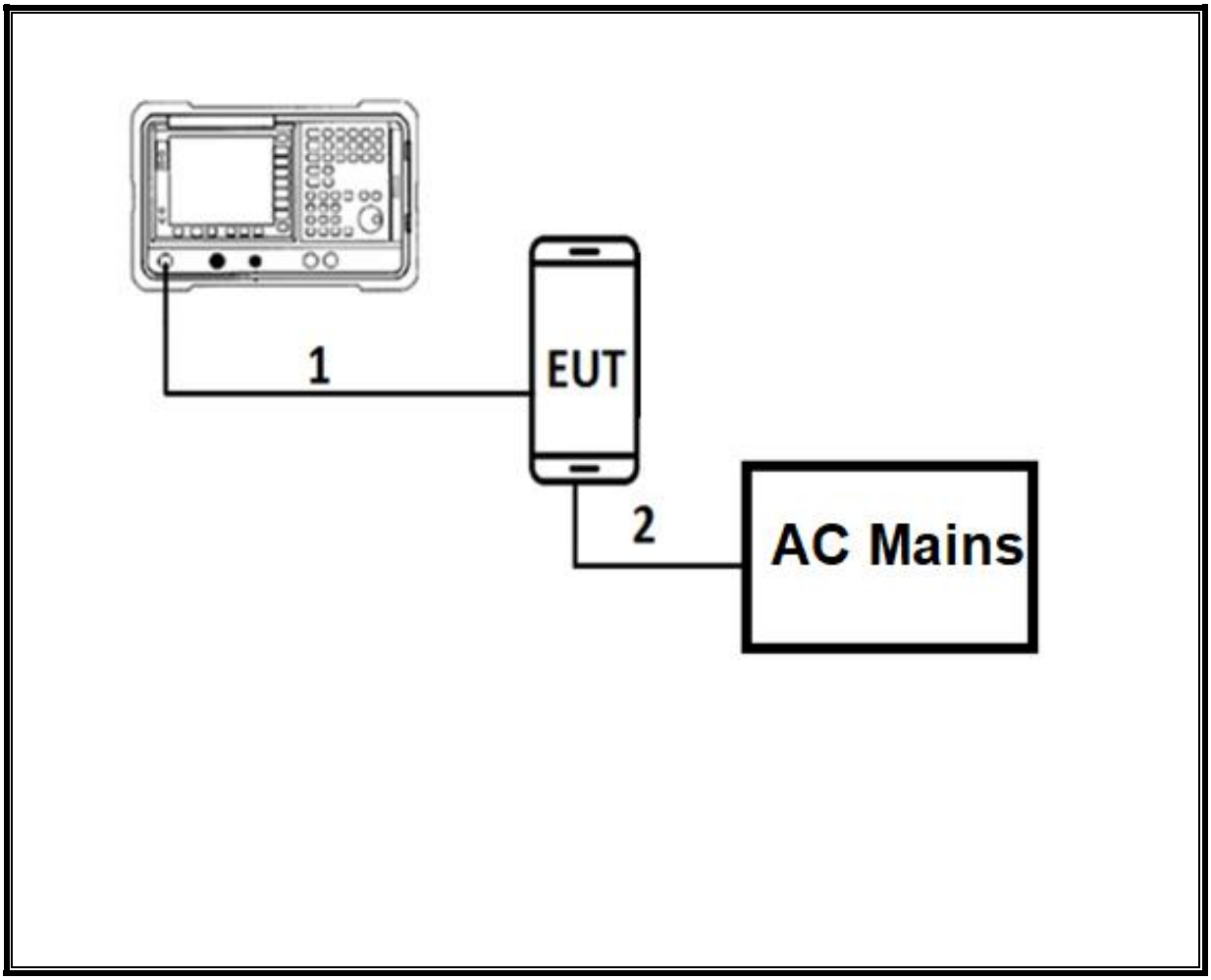
TEST SETUP

The EUT is a stand alone. Test software exercised the radio card.

CONDUCTED TEST SETUP DIAGRAM



TEST SETUP

For conducted tests: the EUT was stand alone. The test software exercises the radio.

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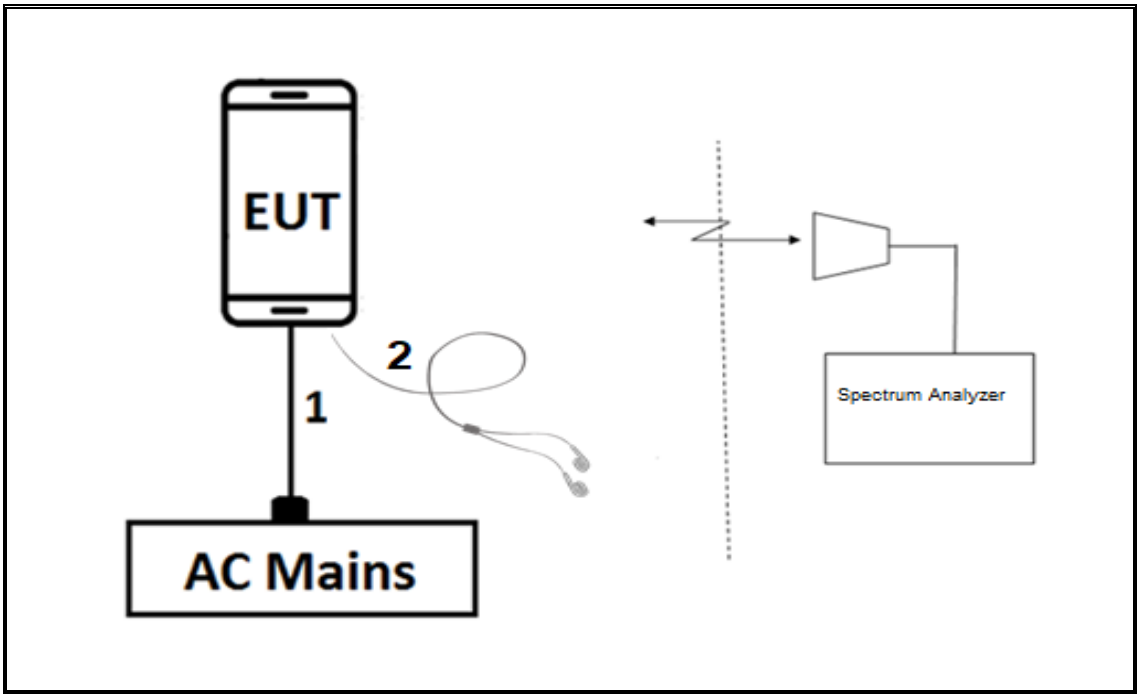
RADIATED AND AC LINE CONDUCTED EMISSIONS SETUP DIAGRAM



TEST SETUP

For radiated tests: EUT has support equipment. The test software exercises the radio.

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6. MEASUREMENT METHOD

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

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

26 dB 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, Sections II.E.3.b & II.E.2.b.

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

Unwanted emissions: KDB 789033 D02 v02r01, Sections II.G.3 – II.G.6.

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

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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**
Amplifier, 100KHz to 1GHz,32dB	Agilent (Keysight) Technologies	8447D	T15	10/20/2019	10/20/2018
RF Amplifier	MITEQ	AFS42-00101800-25-S-42	T493	10/13/2019	10/13/2018
RF Amplifier, 1-18GHz	MITEQ	AFS42-00101800-25-S-42	T1165	10/20/2019	10/20/2018
Pre-Amp 1-26.5 GHz	Agilent	8449B	T404	03/09/2019	023/09/2018
Antenna, Broadband Hybrid, 30MHz to 3000MHz	Sunol Sciences Corp.	JB3	PRE0181574	08/01/2019	08/01/2018
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	T345	04/25/2019	04/25/2018
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	T863	06/21/2019	06/21/2018
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	T862	05/24/2019	05/24/2018
Antenna, Active Loop 9kHz-30MHz	Com-Power Corp.	AL-130R	PRE0165308	12/13/2018	12/13/2017
18 - 26.5 GHz Horn Antenna	ARA	MWH-1826/B	T477	06/16/2019	06/16/2018
26.5 - 40 GHz Horn Antenna	ARA	MWH-2640/B	T446	8/9/2019	8/9/2018
Power Meter, P-series single channel	Agilent (Keysight) Technologies	N1911A	T1271	07/26/2019	07/26/2018
Power Sensor, P-series, 50MHz to 18GHz, Wideband	Agilent (Keysight) Technologies	N1921A	T1224	10/09/2019	10/09/2018
EMI Reciever	Rohde & Schwarz	ESR	T1436	02/21/2019	02/21/2018
L.I.S.N.	FCC INC.	FCC LISN 50/250	T1310	06/15/2019	06/15/2018
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent (Keysight) Technologies	N9030A	T1113	12/21/2018	12/21/2017
Spectrum Analyzer	Agilent (Keysight) Technologies	E4446A	T146	08/13/2019	08/13/2018
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent (Keysight) Technologies	N9030A	T1466	04/16/2019	04/16/2018
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent (Keysight) Technologies	N9030A	T1454	01/08/2019	01/08/2018

Test Software List			
Description	**Manufacturer**	**Model**	**Version**
Radiated Software	UL	UL EMC	Ver 9.5, Dec 01, 2016
Antenna Port Software	UL	UL RF	Ver 9.0, Oct 31, 2018

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8. ANTENNA PORT TEST RESULTS

8.1. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

PROCEDURE

KDB 789033 Zero-Span Spectrum Analyzer Method.

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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)
802.11a CDD	1.428	1.528	0.935	93.46%	0.29	0.700
802.11n HT20 CDD	1.336	1.436	0.930	93.04%	0.31	0.749
802.11n HT40 CDD	0.664	0.762	0.871	87.14%	0.60	1.506
802.11ac VHT80 CDD	0.192	0.301	0.638	63.79%	1.95	5.208
802.11ax HE20 OFDMA, RU size 242T	0.602	0.702	0.858	85.75%	0.67	1.661
802.11ax HE20 OFDMA, RU size 106T	1.282	1.386	0.925	92.50%	0.34	0.780
802.11ax HE20 OFDMA, RU size 52T	2.642	2.746	0.962	96.21%	0.17	0.379
802.11ax HE20 OFDMA, RU size 26T	5.218	5.338	0.978	97.75%	0.10	0.192
802.11ax HE40 OFDMA, RU size 484T	0.337	0.437	0.771	77.13%	1.13	2.966
802.11ax HE40 OFDMA, RU size 242T	0.600	0.700	0.857	85.71%	0.67	1.667
802.11ax HE40 OFDMA, RU size 106T	1.282	1.394	0.920	91.97%	0.36	0.780
802.11ax HE40 OFDMA, RU size 52T	2.654	2.760	0.962	96.16%	0.17	0.377
802.11ax HE40 OFDMA, RU size 26T	5.194	5.330	0.974	97.45%	0.11	0.193
802.11ax HE80 OFDMA, RU size 996T	0.202	0.312	0.648	64.77%	1.89	4.946
802.11ax HE80 OFDMA, RU size 484T	0.337	0.446	0.756	75.57%	1.22	2.966
802.11ax HE80 OFDMA, RU size 242T	0.601	0.709	0.848	84.77%	0.72	1.663
802.11ax HE80 OFDMA, RU size 106T	1.281	1.393	0.920	91.96%	0.36	0.781
802.11ax HE80 OFDMA, RU size 52T	2.653	2.753	0.964	96.37%	0.16	0.377
802.11ax HE80 OFDMA, RU size 26T	5.185	5.333	0.972	97.22%	0.12	0.193

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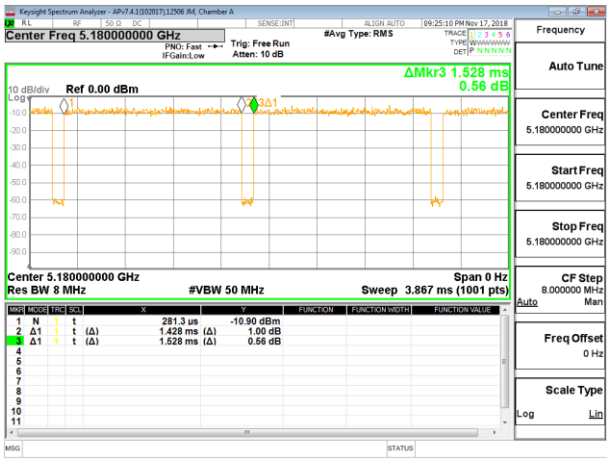
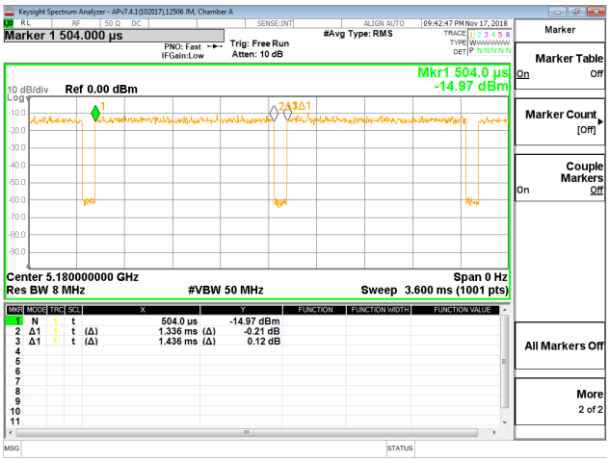
DUTY CYCLE PLOTS



802.11a CDD MODE



802.11n HT20 CDD MODE

802.11n HT40 CDD MODE

802.11ac VHT80 CDD MODE

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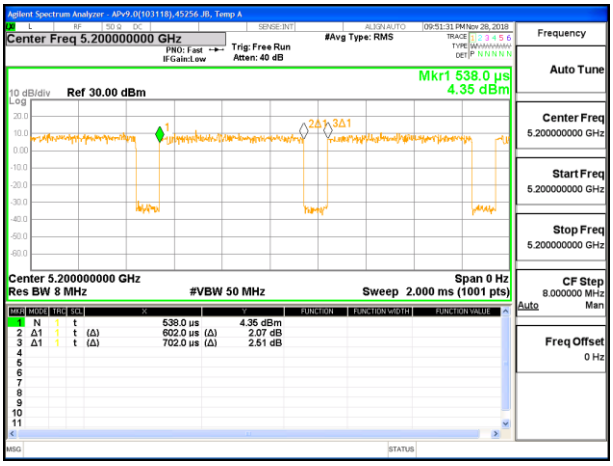
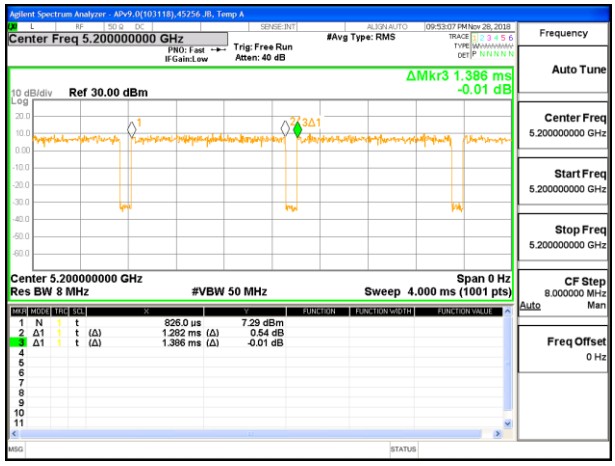


802.11ax HE20 OFDMA, RU SIZE 242T MODE



802.11ax HE20 OFDMA, RU SIZE 106T MODE

802.11ax HE20 OFDMA, RU SIZE 52T MODE

802.11ax HE20 OFDMA, RU SIZE 26T MODE

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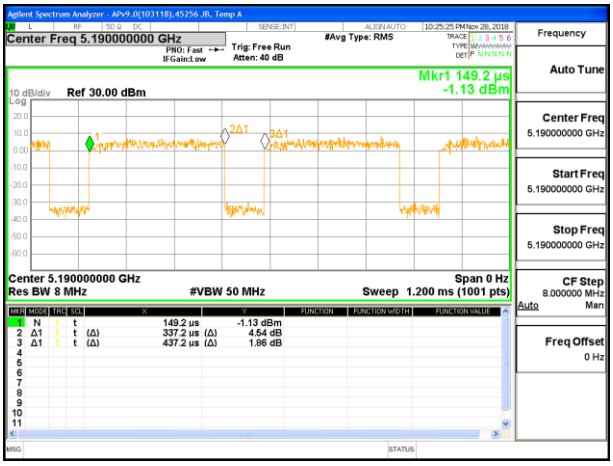
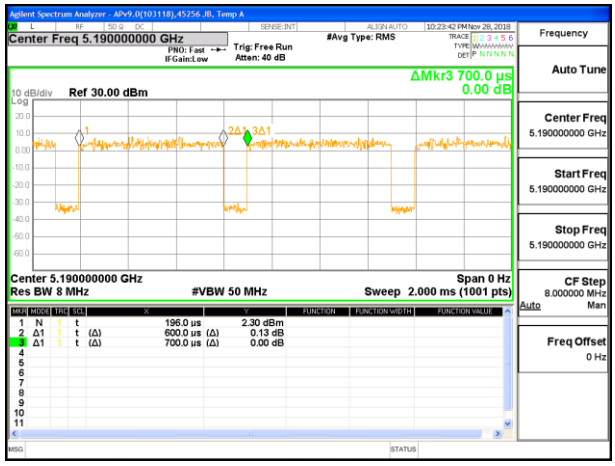


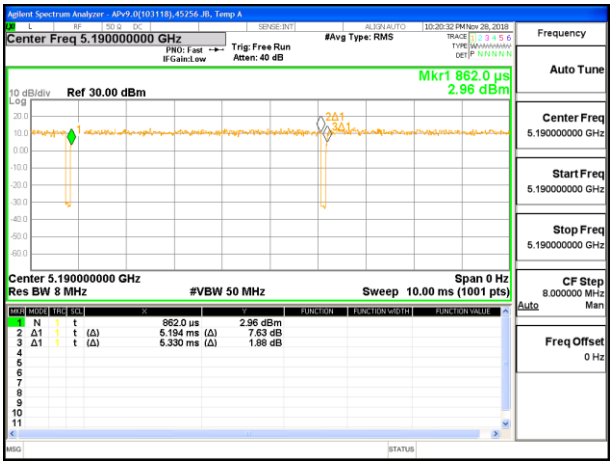
802.11ax HE40 OFDMA, RU SIZE 484T MODE



802.11ax HE40 OFDMA, RU SIZE 242T MODE

802.11ax HE40 OFDMA, RU SIZE 106T MODE

802.11ax HE40 OFDMA, RU SIZE 52T MODE



802.11ax HE40 OFDMA, RU SIZE 26T MODE

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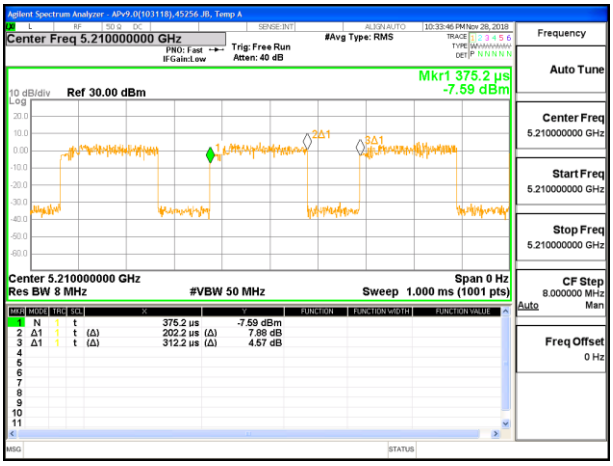
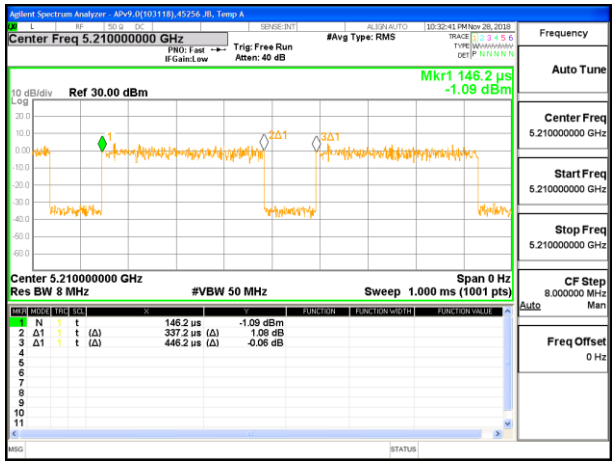


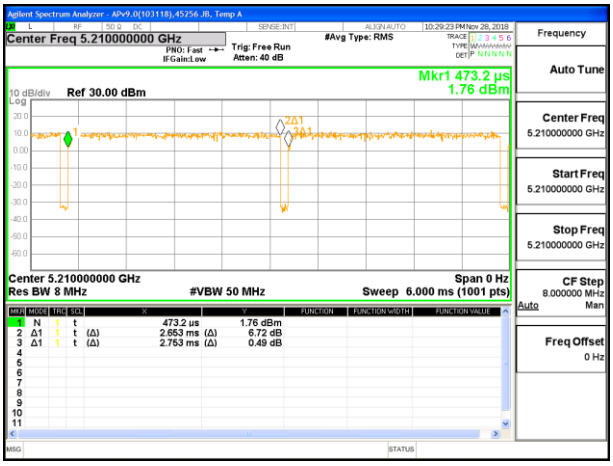
802.11ax HE80 OFDMA, RU SIZE 996T MODE



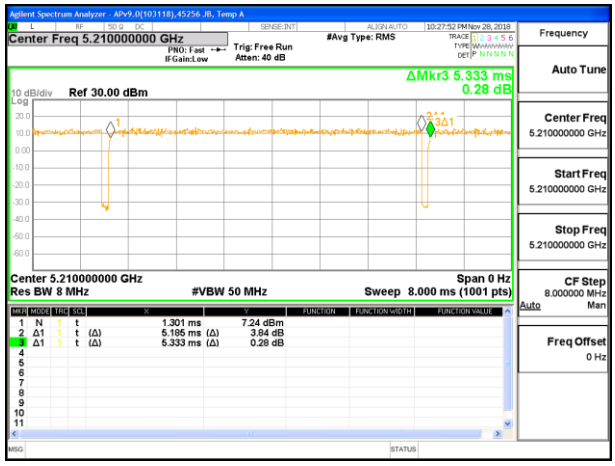
802.11ax HE80 OFDMA, RU SIZE 484T MODE

802.11ax HE80 OFDMA, RU SIZE 242T MODE

802.11ax HE80 OFDMA, RU SIZE 106T MODE



802.11ax HE80 OFDMA, RU SIZE 52T MODE



802.11ax HE80 OFDMA, RU SIZE 26T MODE

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8.2. 26 dB BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

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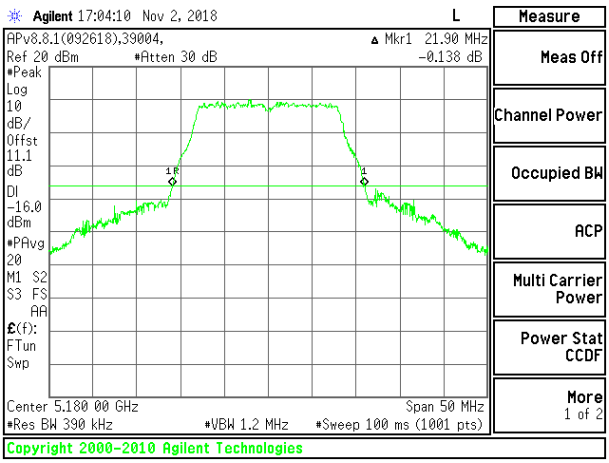
8.2.1. 802.11a MODE IN THE 5.2 GHz BAND

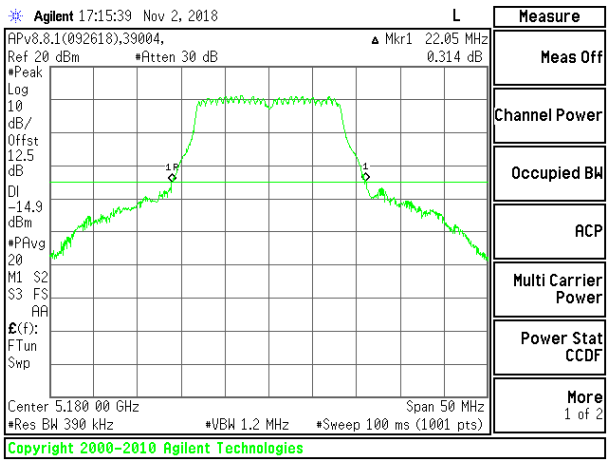
2TX Antenna 1 + Antenna 2 CDD MODE

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)
Low	5180	21.90	22.05
Mid	5200	24.35	22.00
High	5240	21.85	22.05

LOW CHANNEL

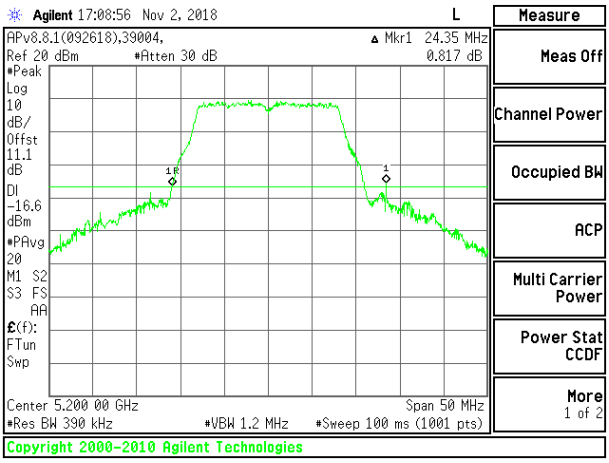


LOW CHANNEL CHAIN 0

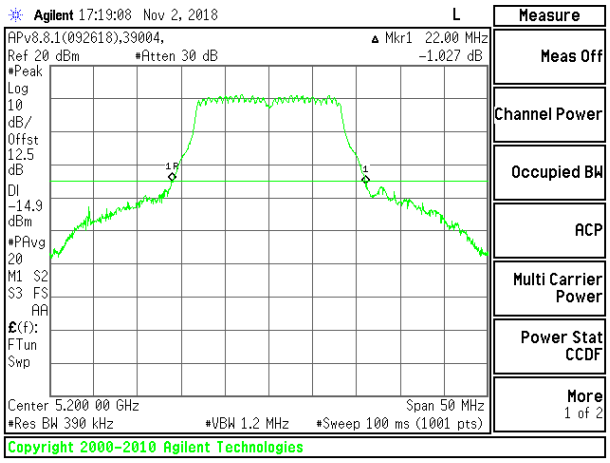


LOW CHANNEL CHAIN 1

MID CHANNEL



MID CHANNEL CHAIN 0



MID CHANNEL CHAIN 1

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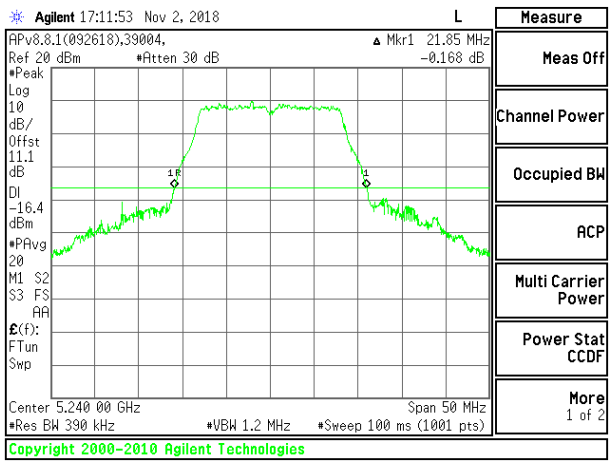
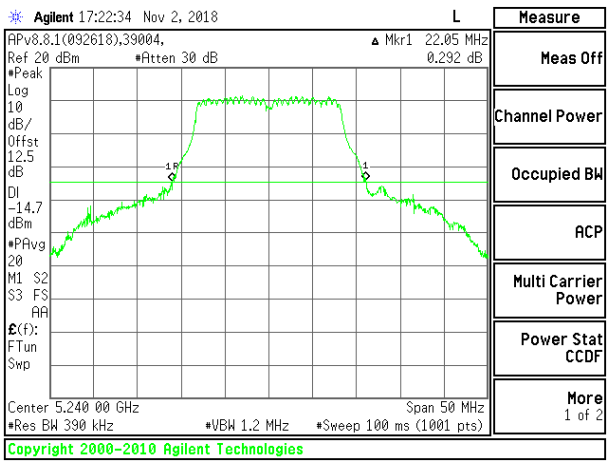
HIGH CHANNEL



HIGH CHANNEL CHAIN 0



HIGH CHANNEL CHAIN 1

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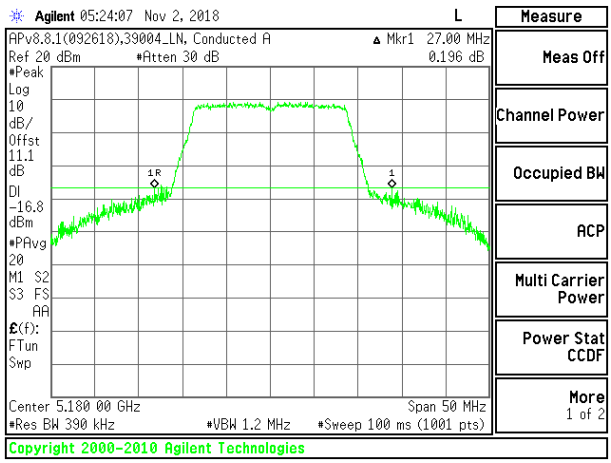
8.2.2. 802.11n HT20 MODE IN THE 5.2 GHz BAND

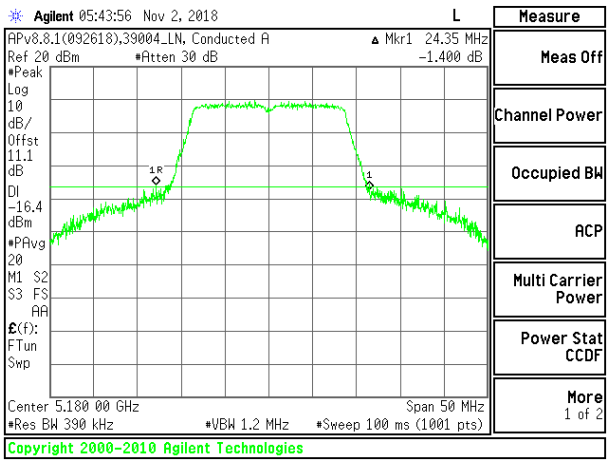
2TX Antenna 1 + Antenna 2 CDD MODE

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)
Low	5180	27.00	24.35
Mid	5200	22.40	24.75
High	5240	22.60	26.30

LOW CHANNEL

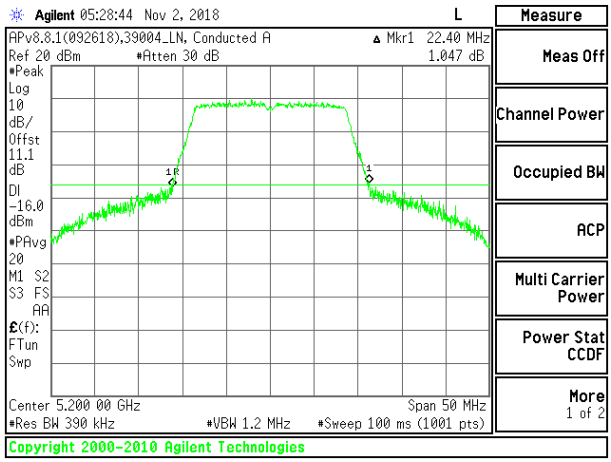


LOW CHANNEL CHAIN 0

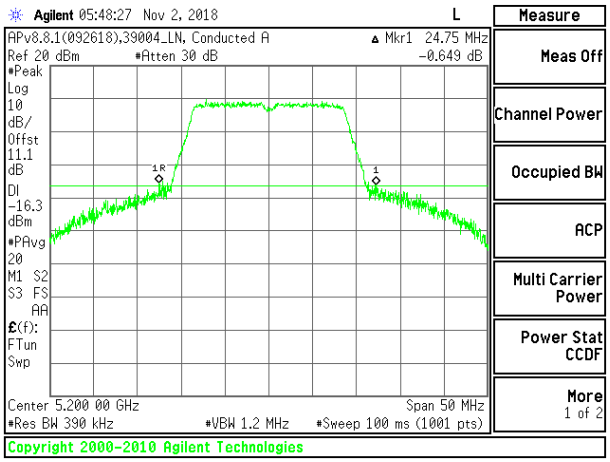


LOW CHANNEL CHAIN 1

MID CHANNEL



MID CHANNEL CHAIN 0



MID CHANNEL CHAIN 1

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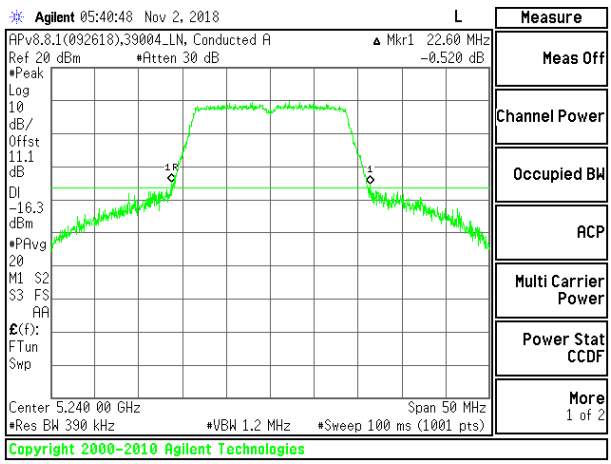
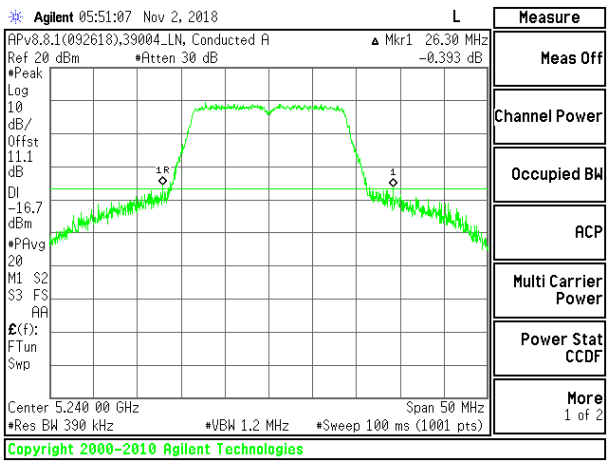
HIGH CHANNEL



HIGH CHANNEL CHAIN 0



HIGH CHANNEL CHAIN 1

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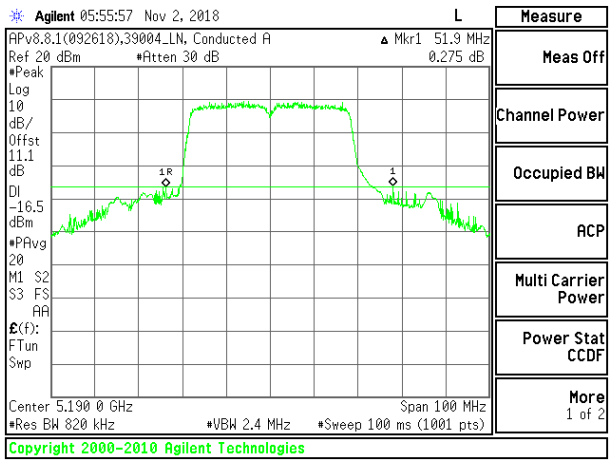
8.2.3. 802.11n HT40 MODE IN THE 5.2 GHz BAND

2TX Antenna 1 + Antenna 2 CDD MODE

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)
Low	5190	51.90	50.30
High	5230	50.40	49.20

LOW CHANNEL



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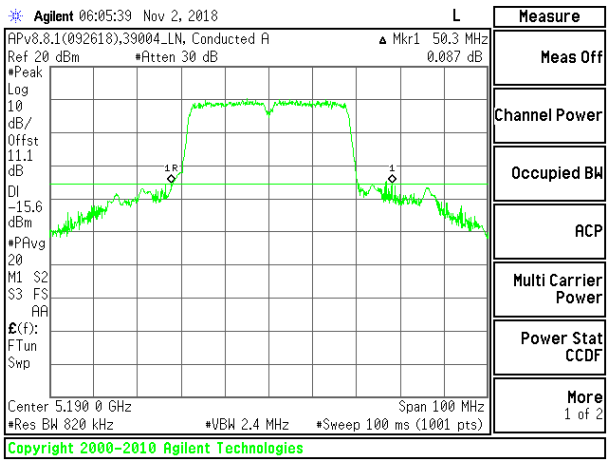
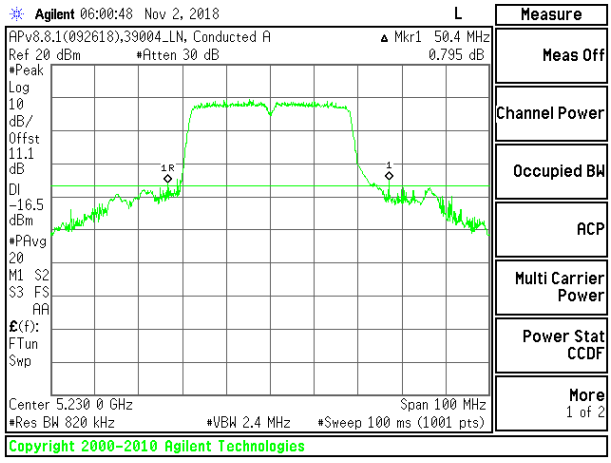
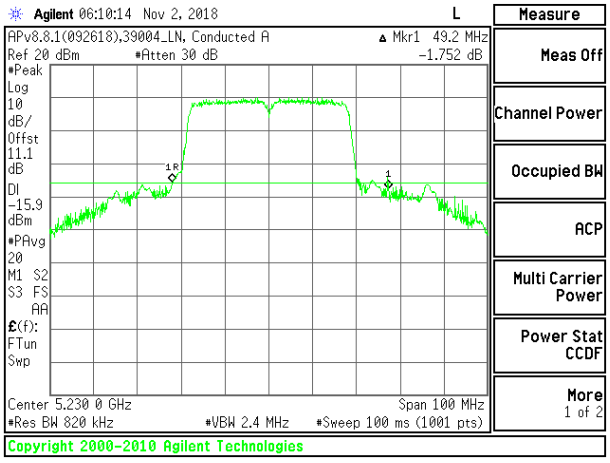


LOW CHANNEL CHAIN 1

HIGH CHANNEL



HIGH CHANNEL CHAIN 0



HIGH CHANNEL CHAIN 1

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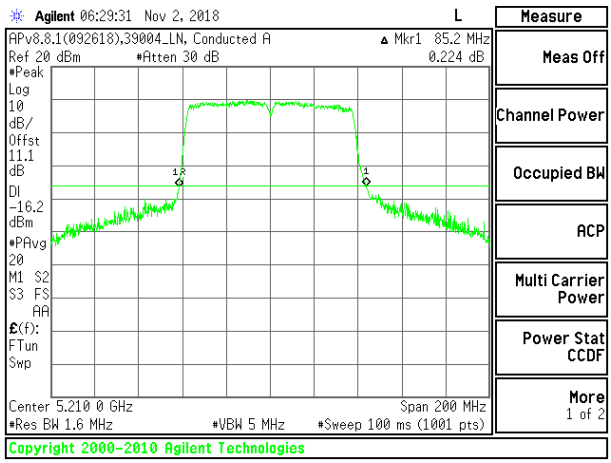
8.2.4. 802.11ac VHT80 MODE IN THE 5.2 GHz BAND

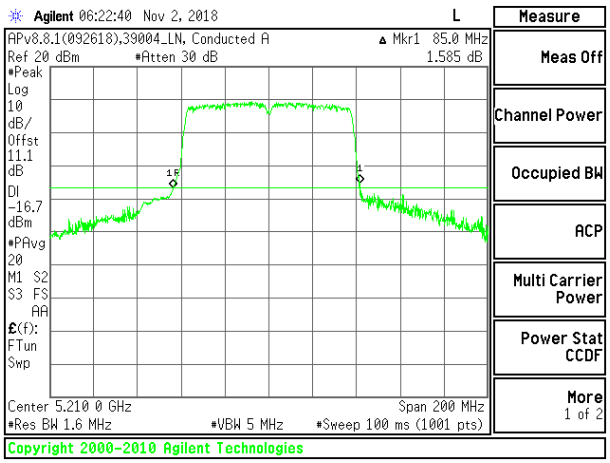
2TX Antenna 1 + Antenna 2 CDD MODE

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)
Mid	5210	85.20	85.00

MID CHANNEL



MID CHANNEL CHAIN 0



MID CHANNEL CHAIN 1

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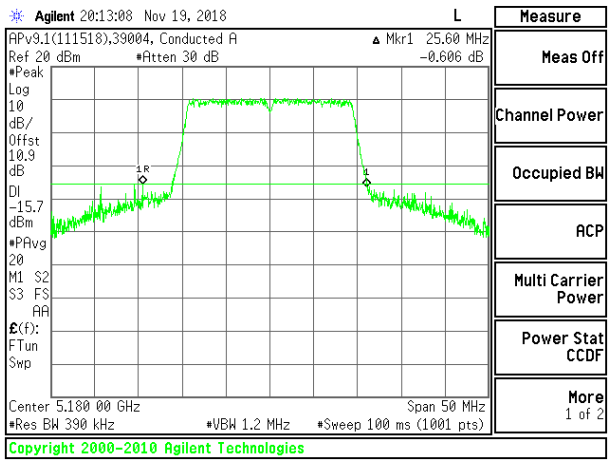
8.2.5. 802.11ax HE20 MODE IN THE 5.2 GHz BAND

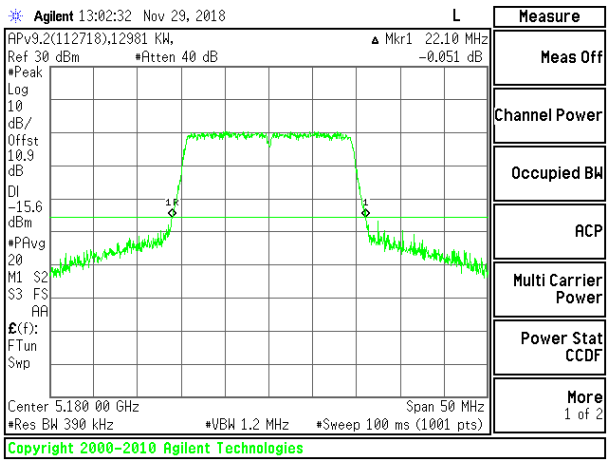
2TX Antenna 1 + Antenna 2 OFDMA MODE – 242-Tones, RU Index 61

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)
Low	5180	25.60	22.10
Mid	5200	22.15	21.95
High	5240	22.20	21.95

LOW CHANNEL

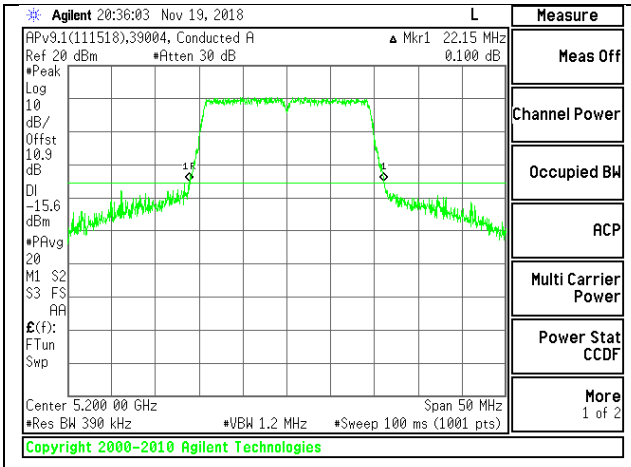


LOW CHANNEL CHAIN 0

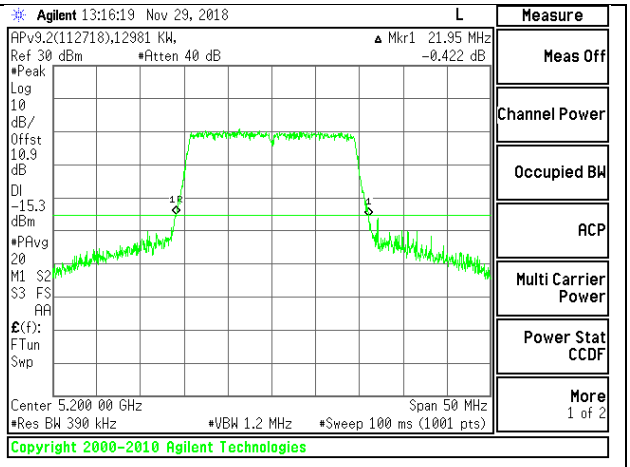


LOW CHANNEL CHAIN 1

MID CHANNEL



MID CHANNEL CHAIN 0



MID CHANNEL CHAIN 1

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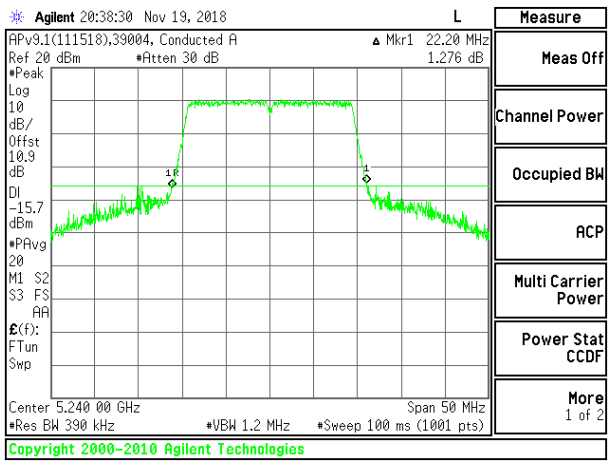
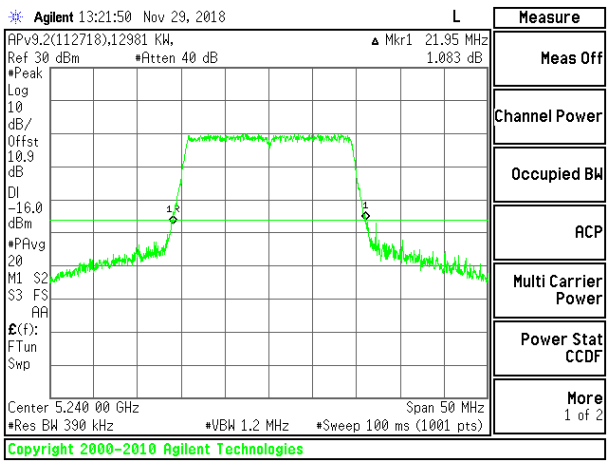
HIGH CHANNEL



HIGH CHANNEL CHAIN 0



HIGH CHANNEL CHAIN 1

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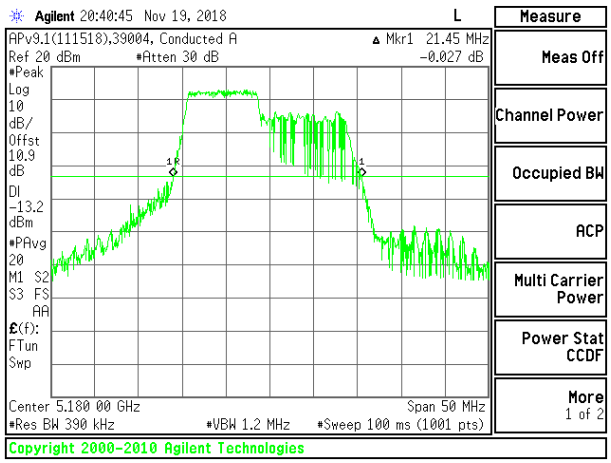
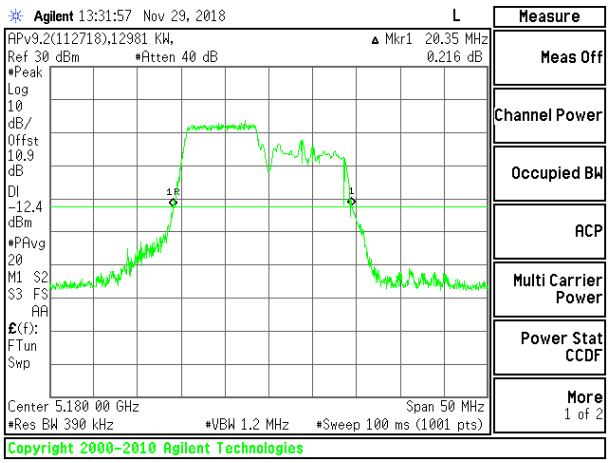
2TX Antenna 1 + Antenna 2 OFDMA MODE – 106-Tones, RU Index 53

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)
Low	5180	21.45	20.35
Mid	5200	21.50	20.55
High	5240	21.60	20.60

LOW CHANNEL

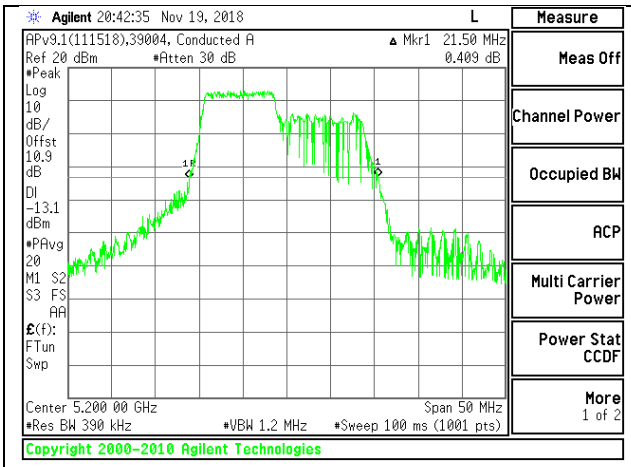


LOW CHANNEL CHAIN 0

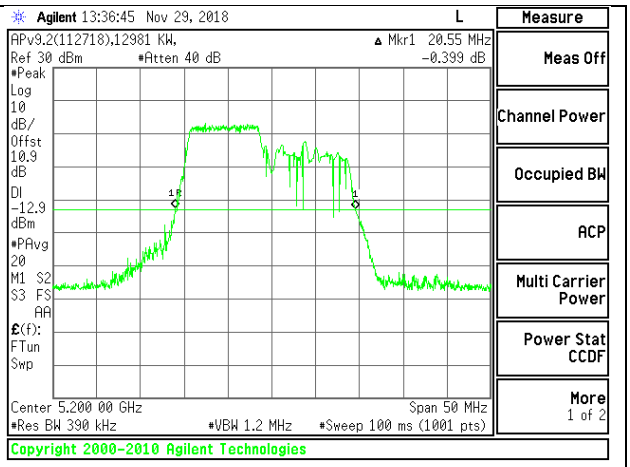


LOW CHANNEL CHAIN 1

MID CHANNEL



MID CHANNEL CHAIN 0



MID CHANNEL CHAIN 1

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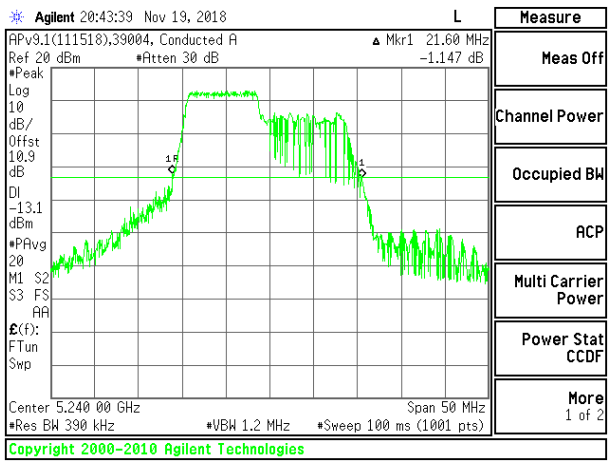
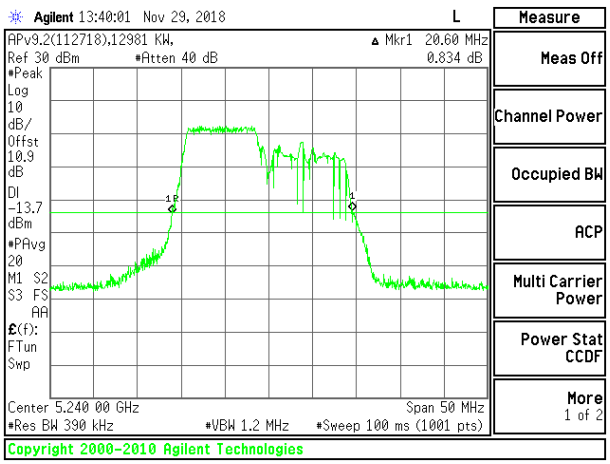
HIGH CHANNEL



HIGH CHANNEL CHAIN 0



HIGH CHANNEL CHAIN 1

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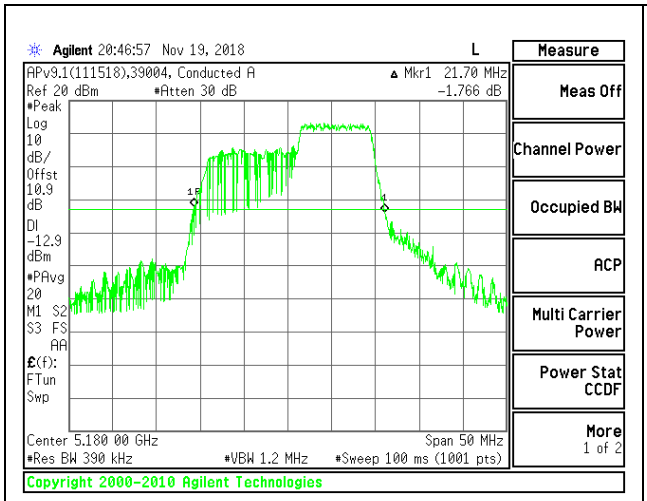
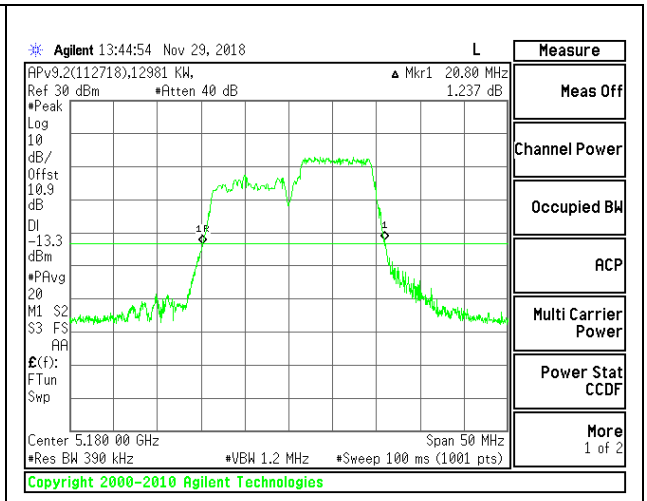
2TX Antenna 1 + Antenna 2 OFDMA MODE – 106-Tones, RU Index 54

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)
Low	5180	21.70	20.80
Mid	5200	21.80	20.75
High	5240	21.80	20.65

LOW CHANNEL

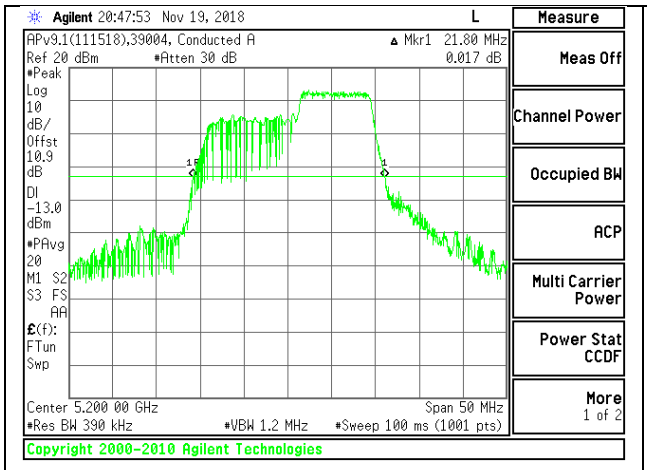


LOW CHANNEL CHAIN 0

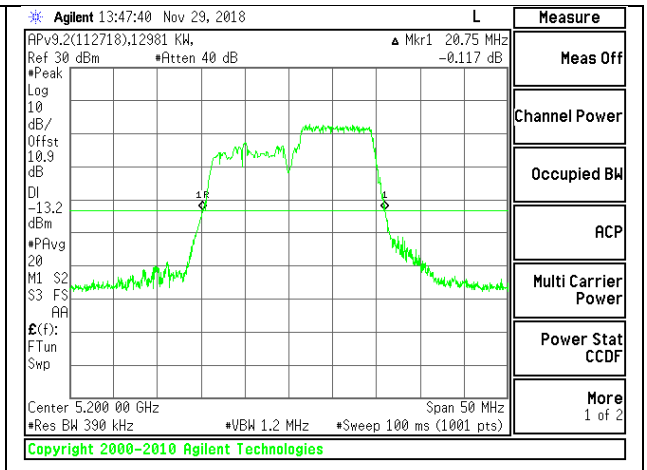


LOW CHANNEL CHAIN 1

MID CHANNEL



MID CHANNEL CHAIN 0



MID CHANNEL CHAIN 1

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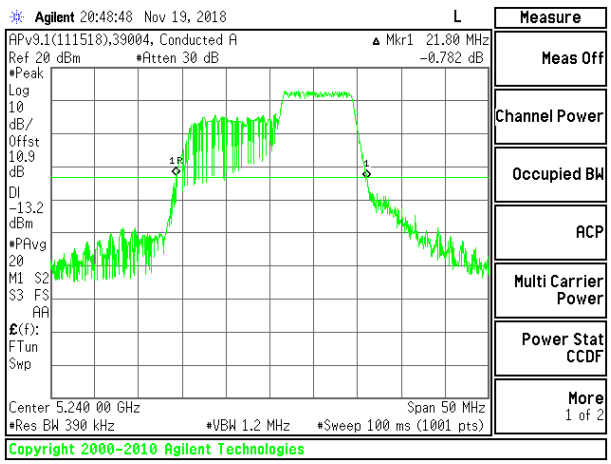
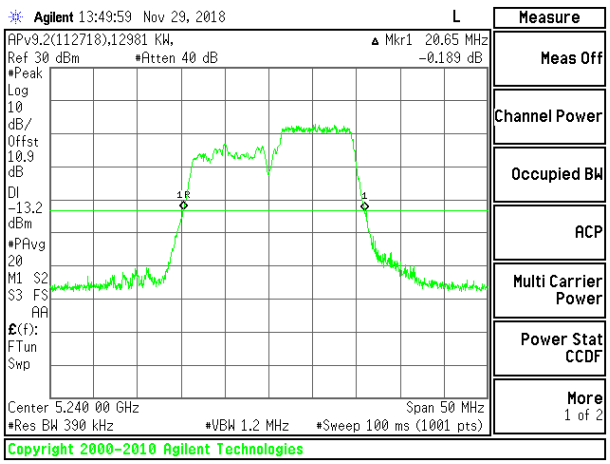
HIGH CHANNEL



HIGH CHANNEL CHAIN 0



HIGH CHANNEL CHAIN 1

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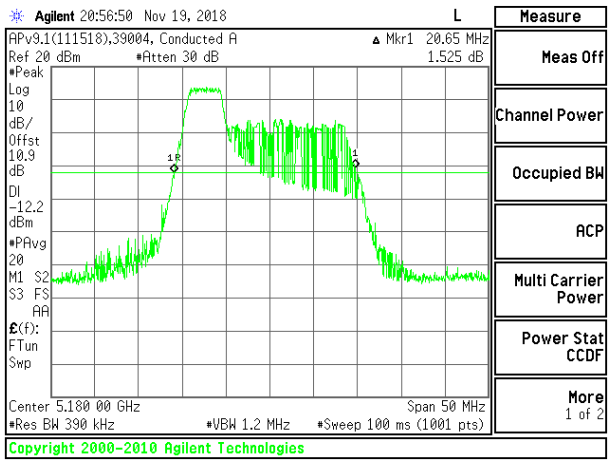
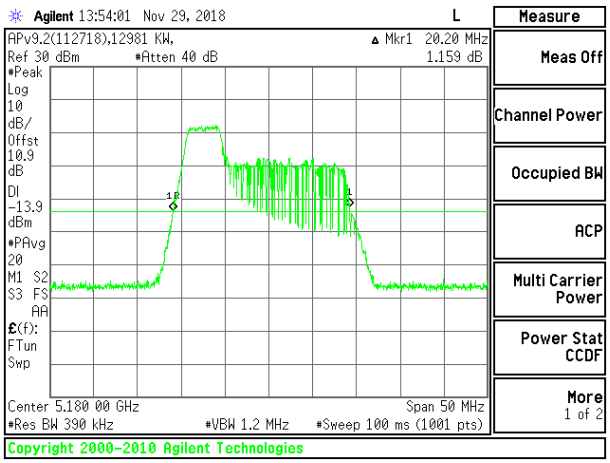
2TX Antenna 1 + Antenna 2 OFDMA MODE – 52-Tones, RU Index 37

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)
Low	5180	20.65	20.20
Mid	5200	20.85	20.15
High	5240	20.95	20.25

LOW CHANNEL

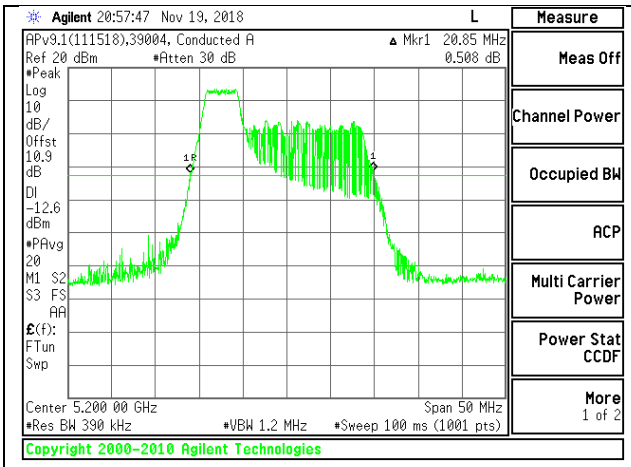


LOW CHANNEL CHAIN 0

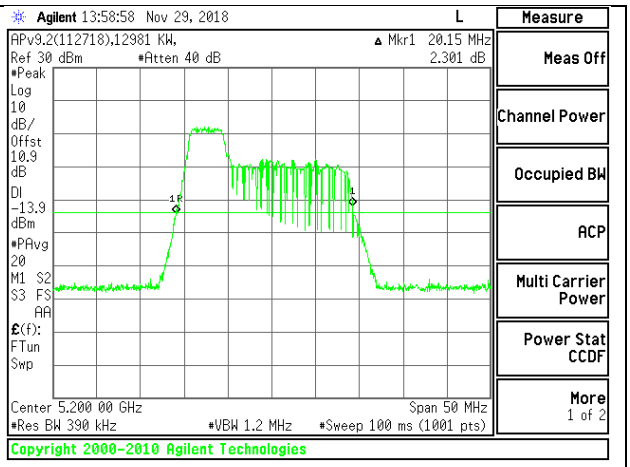


LOW CHANNEL CHAIN 1

MID CHANNEL



MID CHANNEL CHAIN 0



MID CHANNEL CHAIN 1

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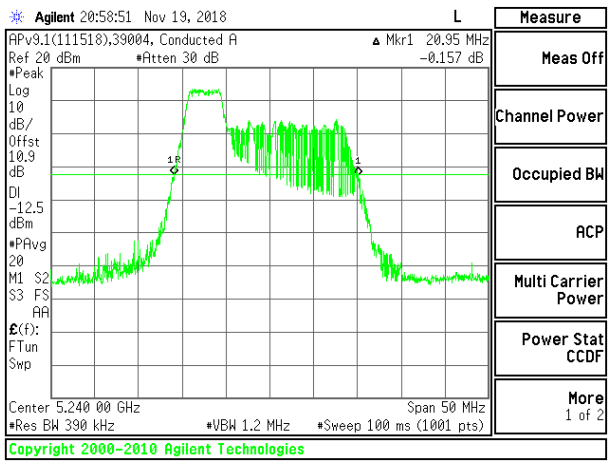
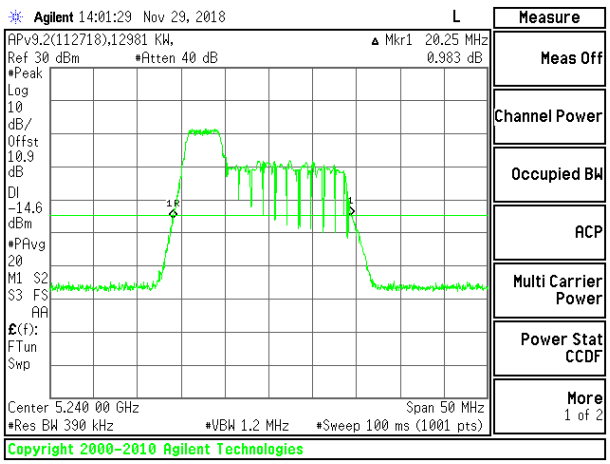
HIGH CHANNEL



HIGH CHANNEL CHAIN 0



HIGH CHANNEL CHAIN 1

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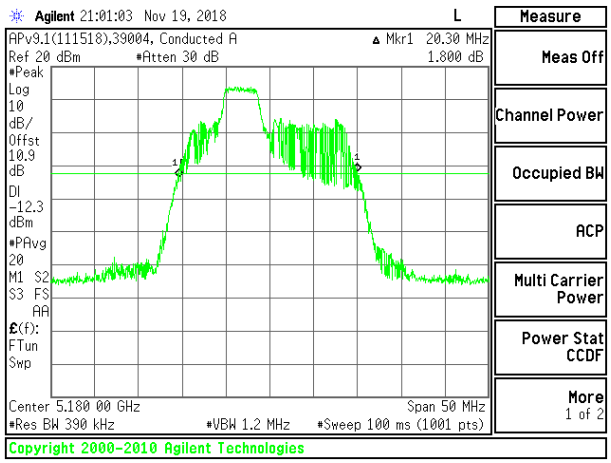
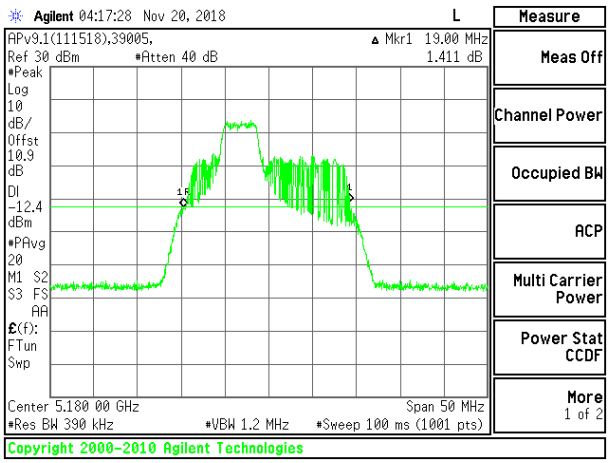
2TX Antenna 1 + Antenna 2 OFDMA MODE – 52-Tones, RU Index 38

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)
Low	5180	20.30	19.00
Mid	5200	20.30	19.05
High	5240	20.40	19.10

LOW CHANNEL

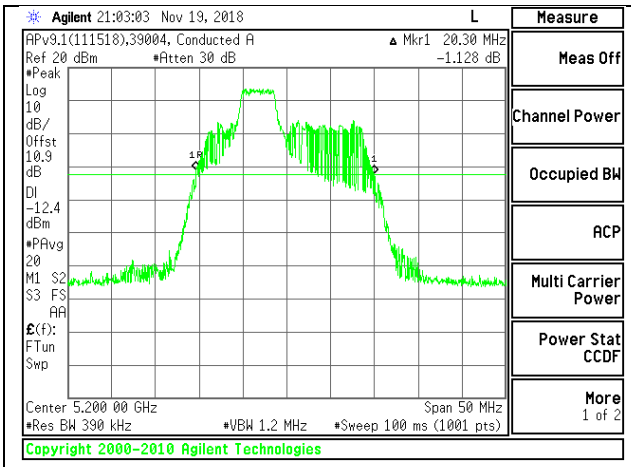


LOW CHANNEL CHAIN 0

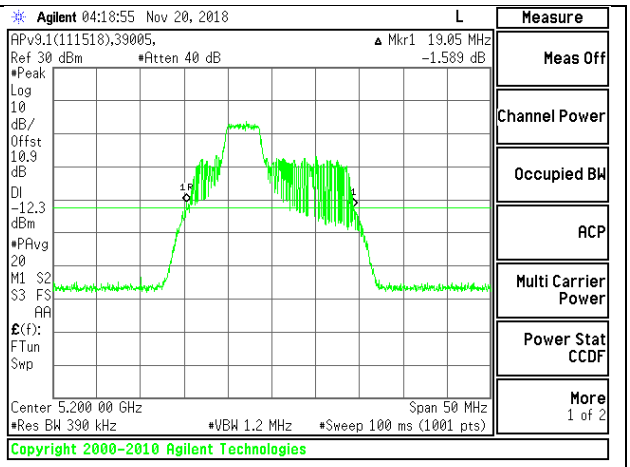


LOW CHANNEL CHAIN 1

MID CHANNEL



MID CHANNEL CHAIN 0



MID CHANNEL CHAIN 1

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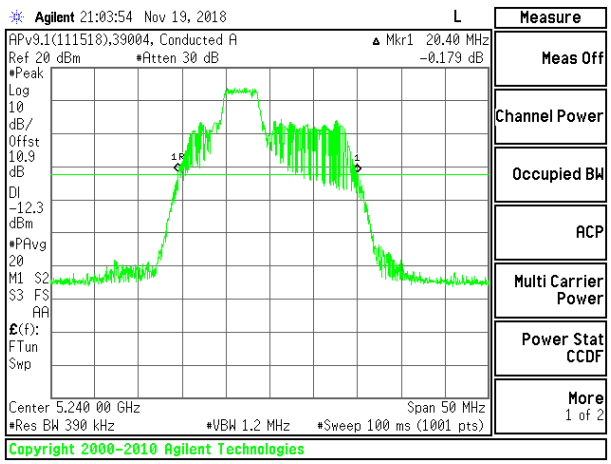
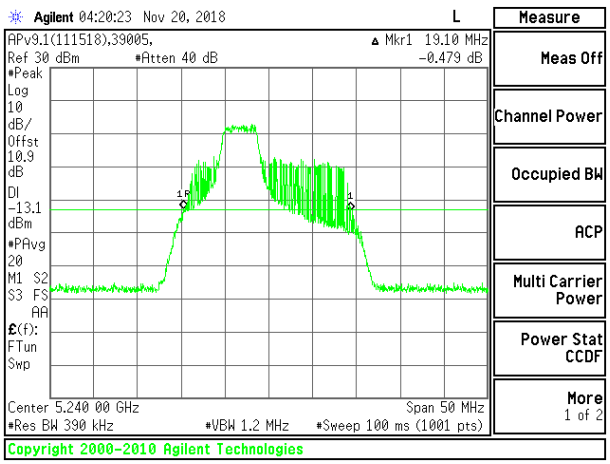
HIGH CHANNEL



HIGH CHANNEL CHAIN 0



HIGH CHANNEL CHAIN 1

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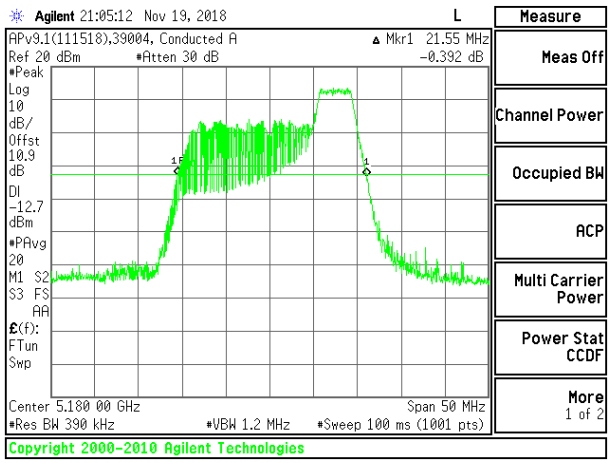
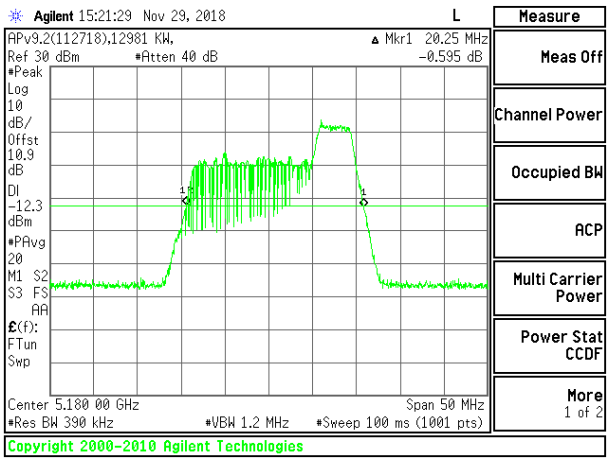
2TX Antenna 1 + Antenna 2 OFDMA MODE – 52-Tones, RU Index 40

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)
Low	5180	21.55	20.25
Mid	5200	21.55	20.35
High	5240	21.50	20.45

LOW CHANNEL

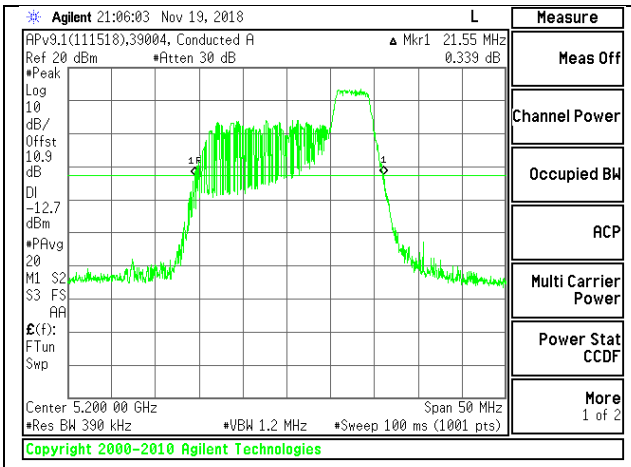


LOW CHANNEL CHAIN 0

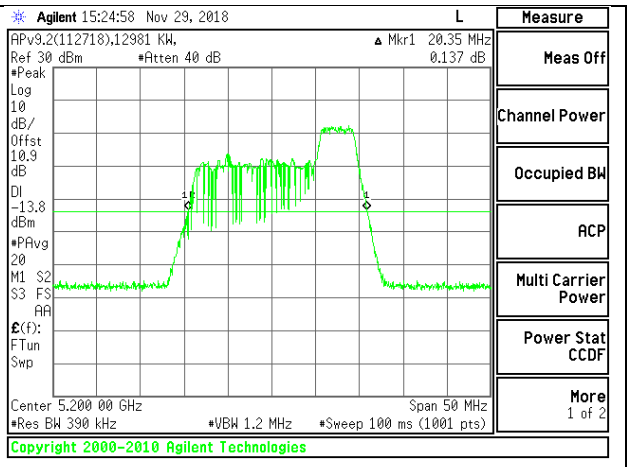


LOW CHANNEL CHAIN 1

MID CHANNEL



MID CHANNEL CHAIN 0



MID CHANNEL CHAIN 1

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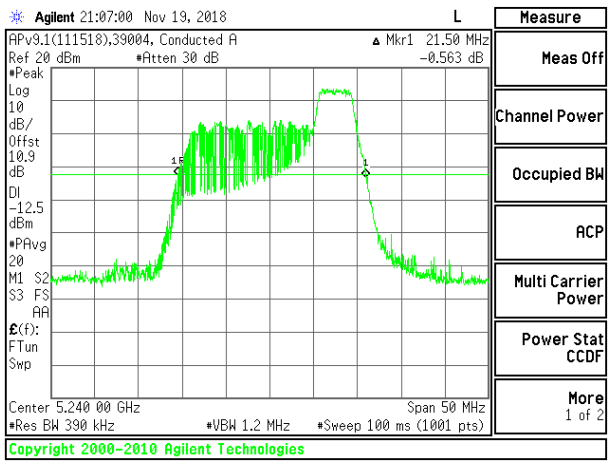
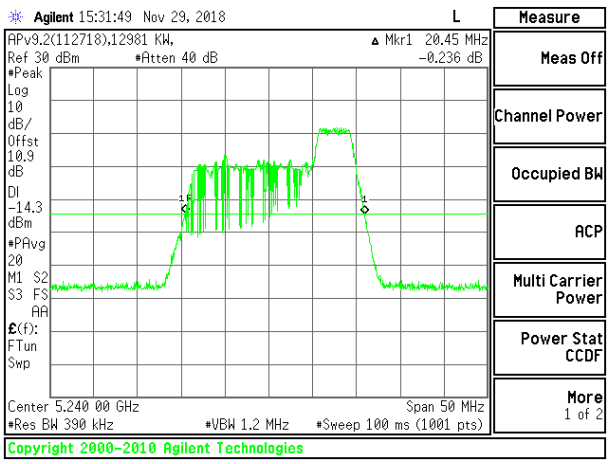
HIGH CHANNEL



HIGH CHANNEL CHAIN 0



HIGH CHANNEL CHAIN 1

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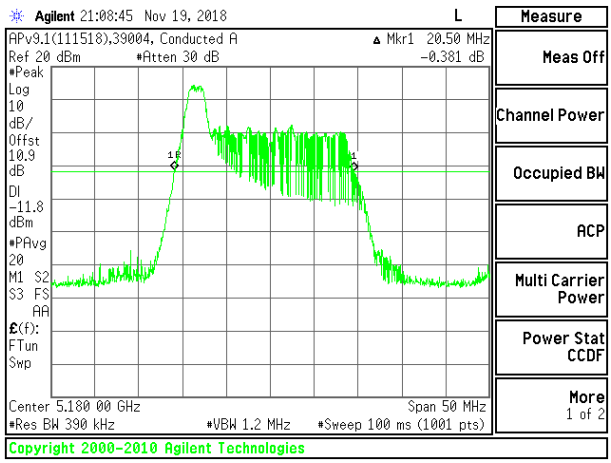
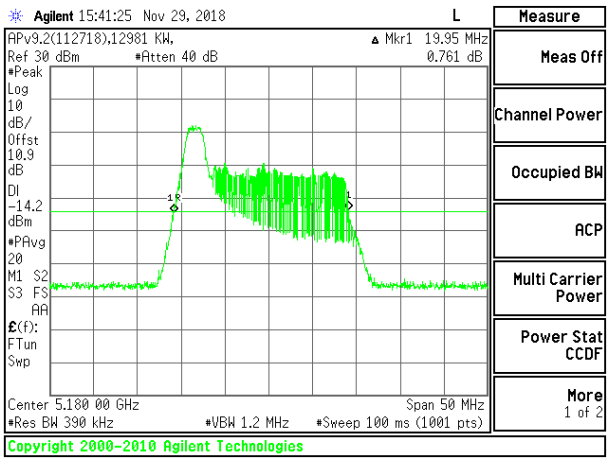
2TX Antenna 1 + Antenna 2 OFDMA MODE – 26-Tones, RU Index 0

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)
Low	5180	20.50	19.95
Mid	5200	20.35	19.95
High	5240	20.50	19.95

LOW CHANNEL

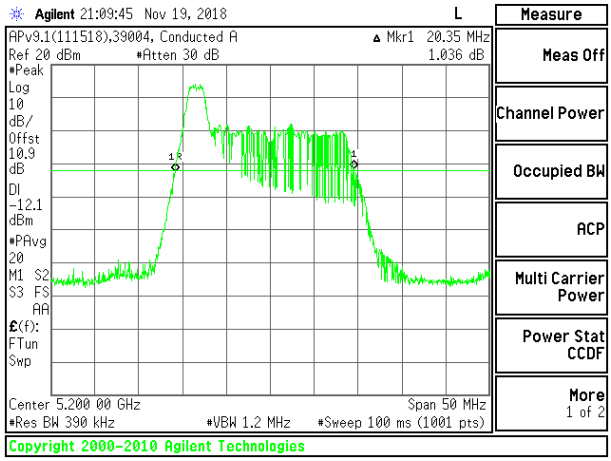


LOW CHANNEL CHAIN 0

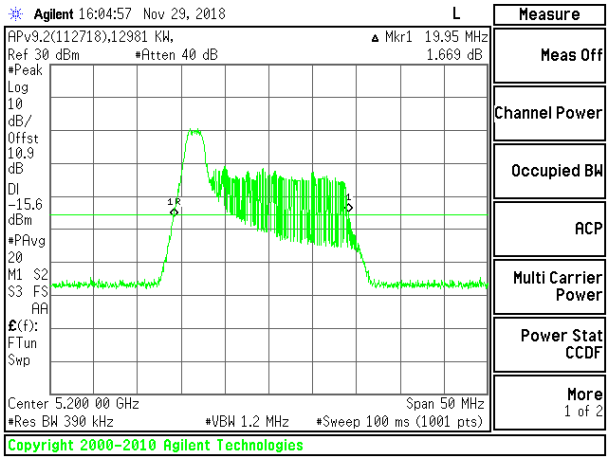


LOW CHANNEL CHAIN 1

MID CHANNEL



MID CHANNEL CHAIN 0



MID CHANNEL CHAIN 1

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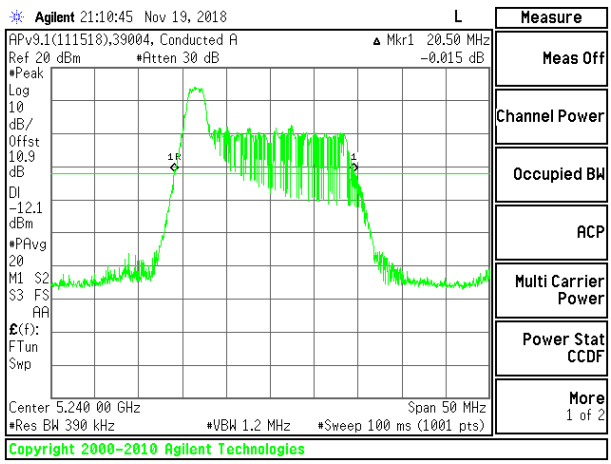
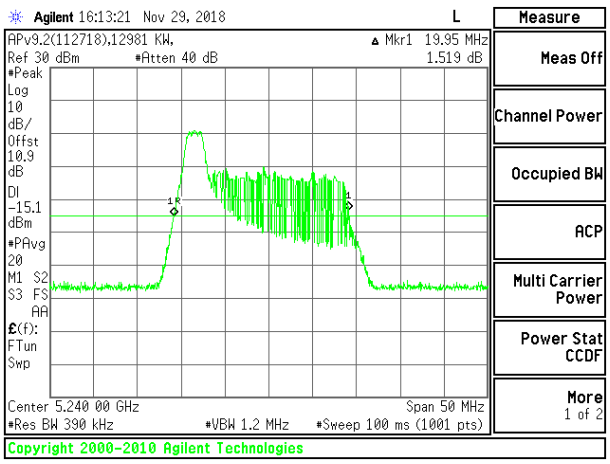
HIGH CHANNEL



HIGH CHANNEL CHAIN 0



HIGH CHANNEL CHAIN 1

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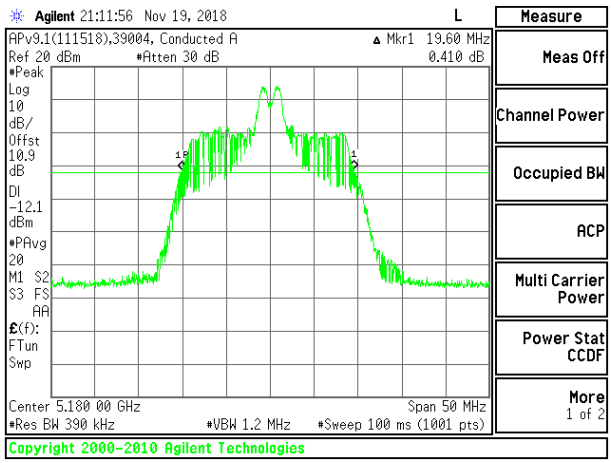
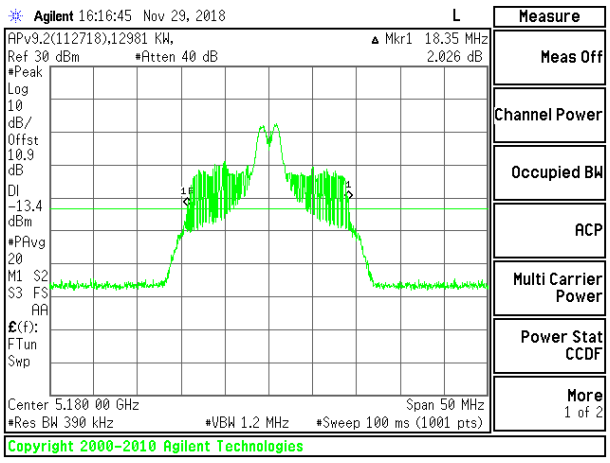
2TX Antenna 1 + Antenna 2 OFDMA MODE – 26-Tones, RU Index 4

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)
Low	5180	19.60	18.35
Mid	5200	19.80	18.35
High	5240	19.70	18.50

LOW CHANNEL

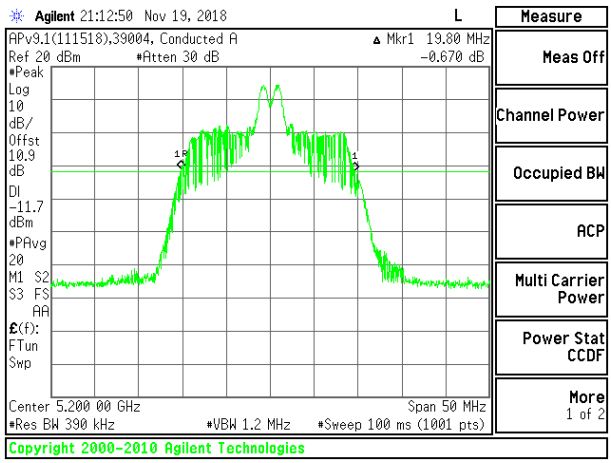


LOW CHANNEL CHAIN 0

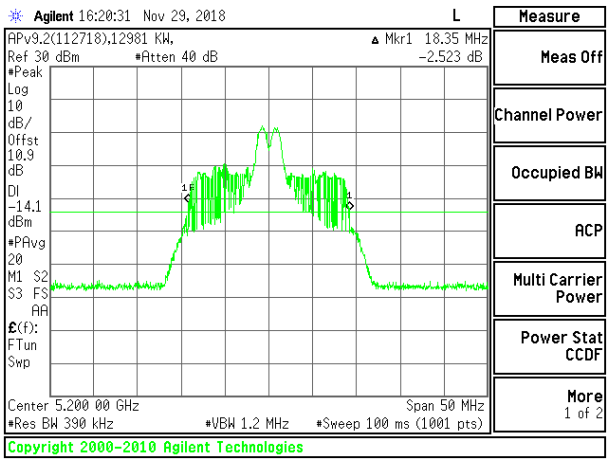


LOW CHANNEL CHAIN 1

MID CHANNEL



MID CHANNEL CHAIN 0



MID CHANNEL CHAIN 1

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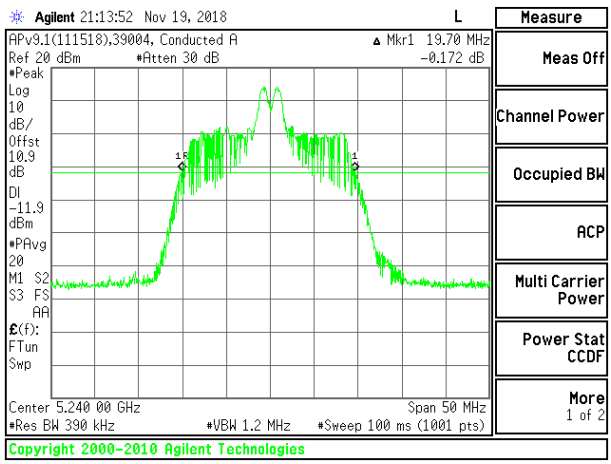
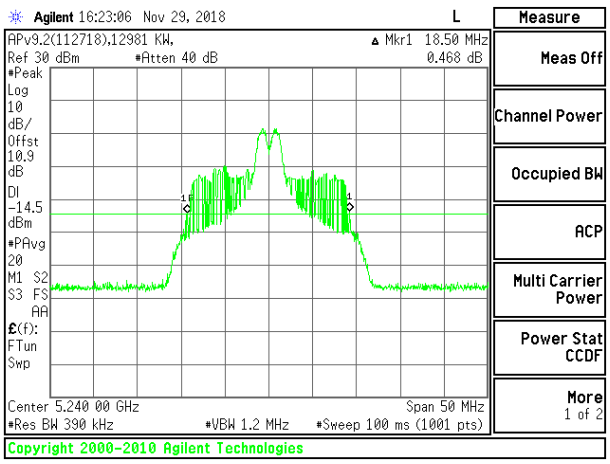
HIGH CHANNEL



HIGH CHANNEL CHAIN 0



HIGH CHANNEL CHAIN 1

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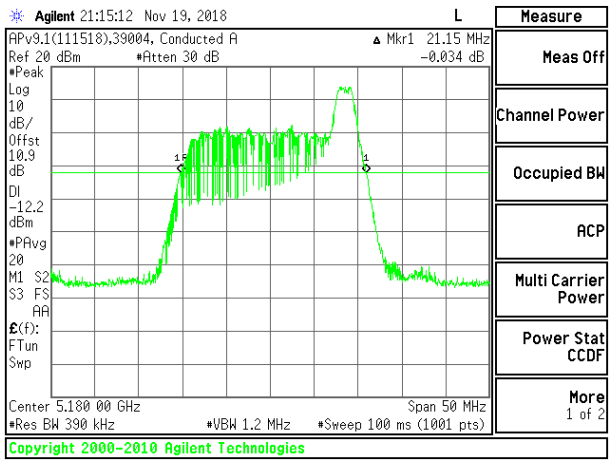
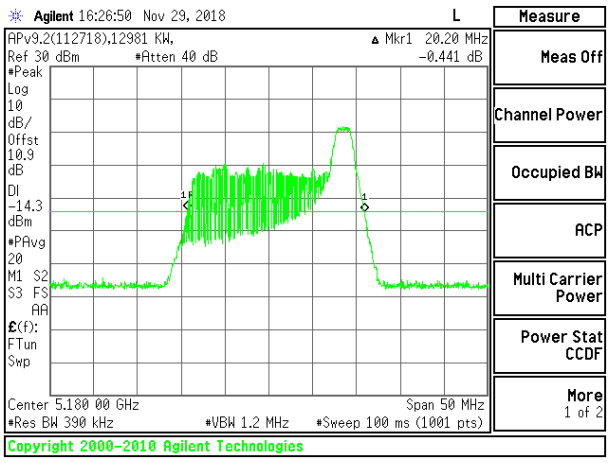
2TX Antenna 1 + Antenna 2 OFDMA MODE – 26-Tones, RU Index 8

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)
Low	5180	21.15	20.20
Mid	5200	21.10	20.15
High	5240	21.05	20.20

LOW CHANNEL

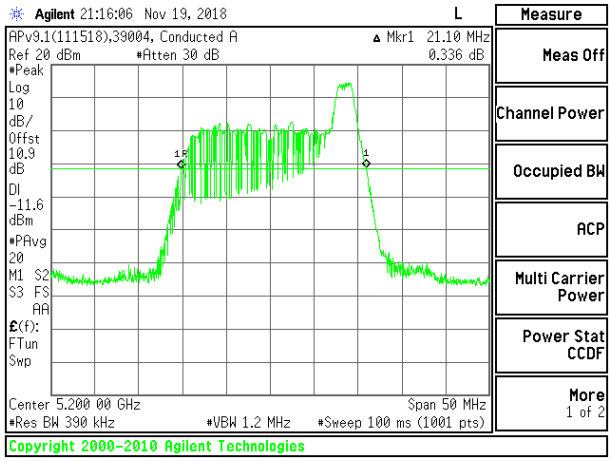


LOW CHANNEL CHAIN 0

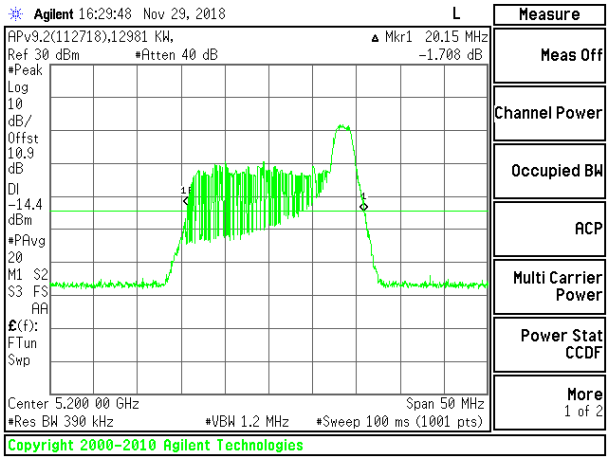


LOW CHANNEL CHAIN 1

MID CHANNEL



MID CHANNEL CHAIN 0



MID CHANNEL CHAIN 1

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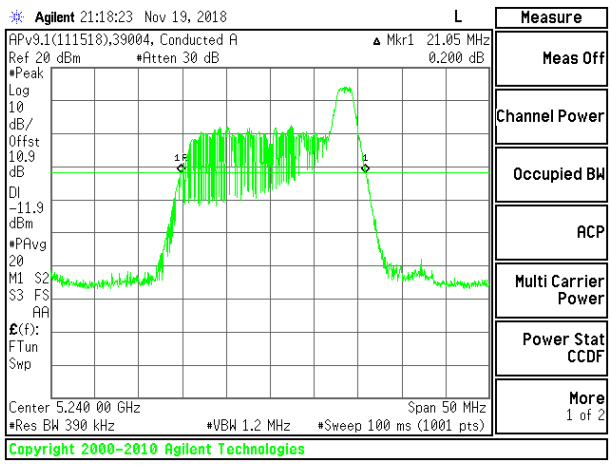
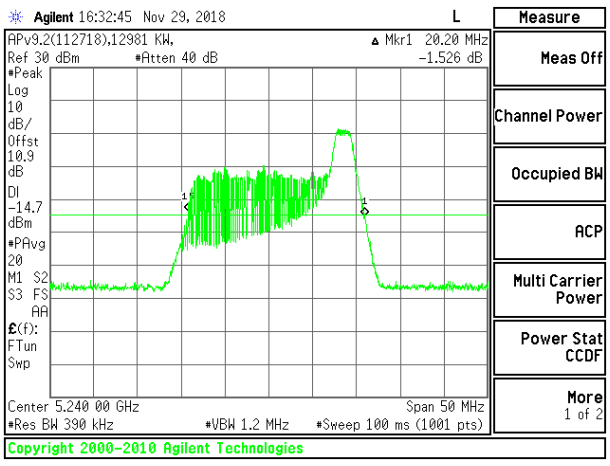
HIGH CHANNEL



HIGH CHANNEL CHAIN 0



HIGH CHANNEL CHAIN 1

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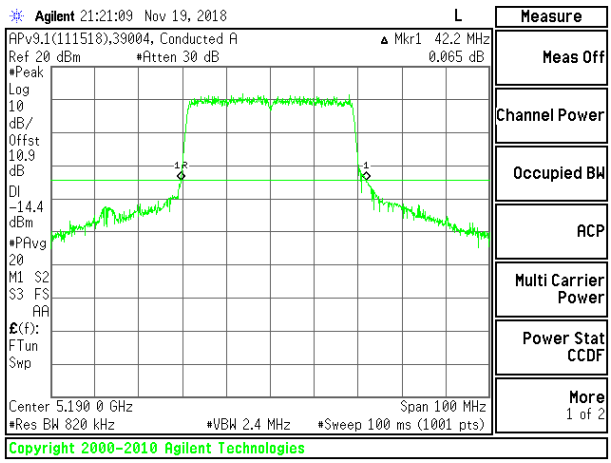
8.2.6. 802.11ax HE40 MODE IN THE 5.2 GHz BAND

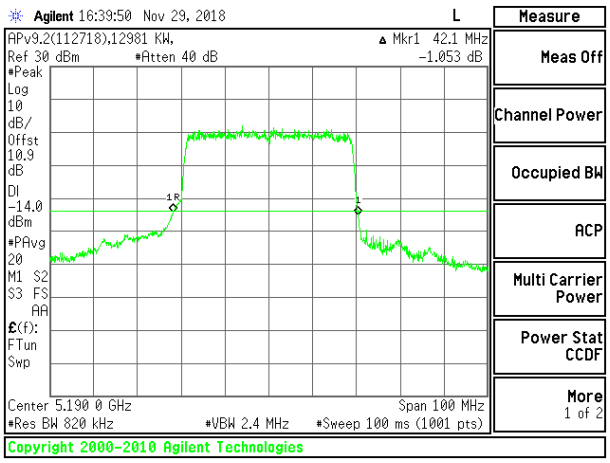
2TX Antenna 1 + Antenna 2 OFDMA MODE – 484-Tones, RU Index 65

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)
Low	5190	42.20	42.10
High	5230	42.20	42.00

LOW CHANNEL

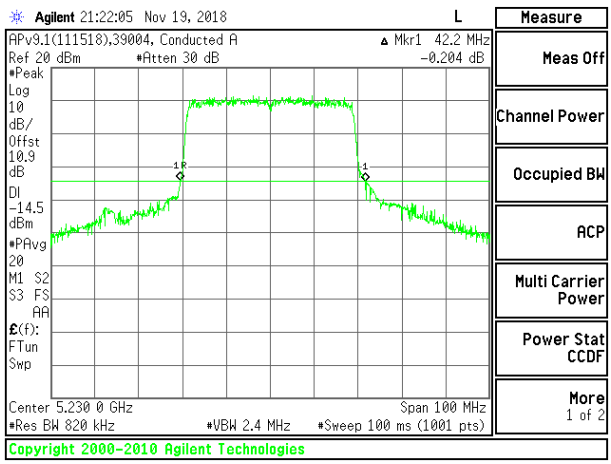


LOW CHANNEL CHAIN 0

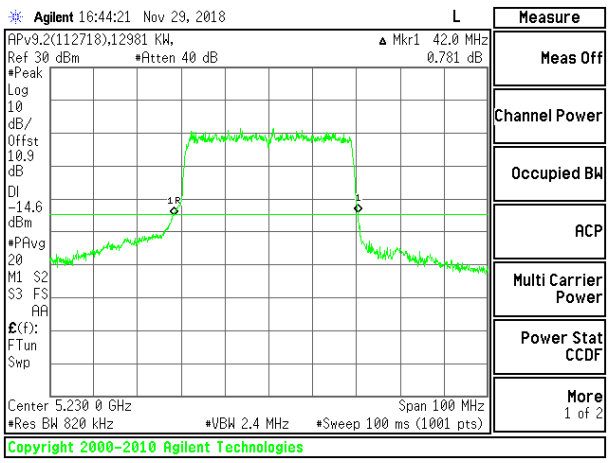


LOW CHANNEL CHAIN 1

HIGH CHANNEL



HIGH CHANNEL CHAIN 0



HIGH CHANNEL CHAIN 1

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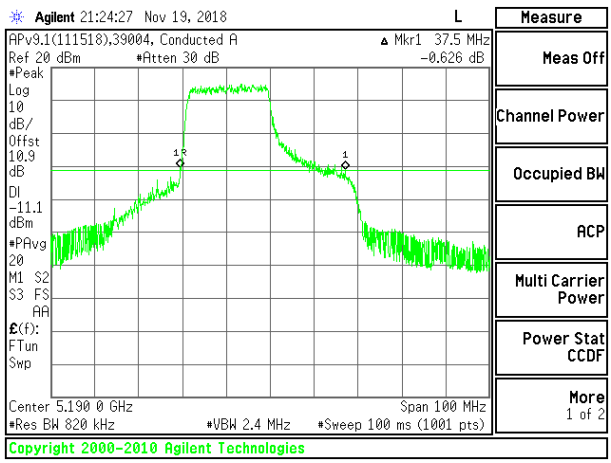
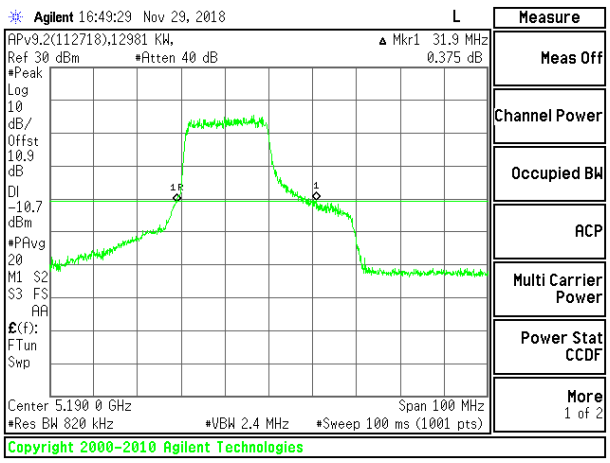
2TX Antenna 1 + Antenna 2 OFDMA MODE – 242-Tones, RU Index 61

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)
Low	5190	37.50	31.90
High	5230	38.40	33.80

LOW CHANNEL

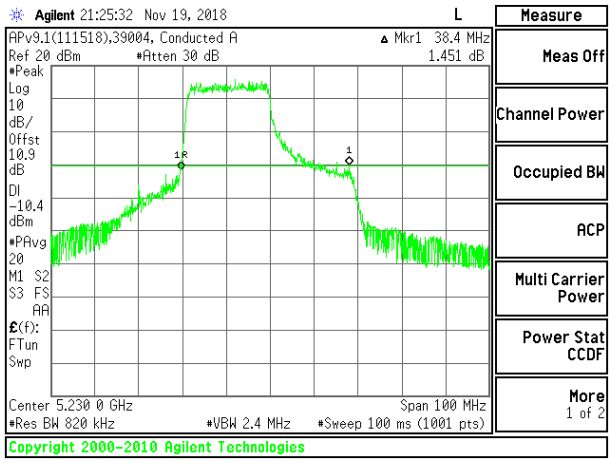


LOW CHANNEL CHAIN 0

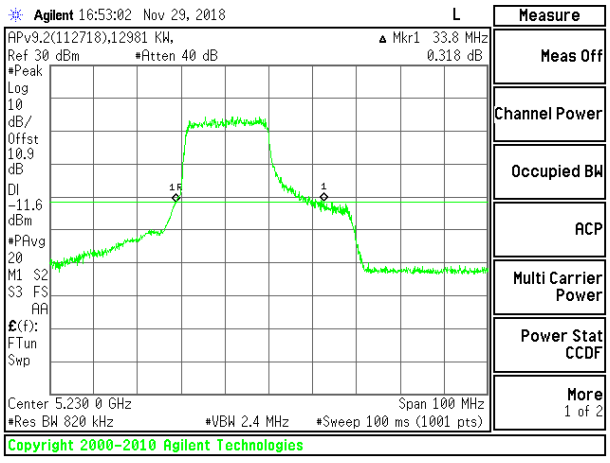


LOW CHANNEL CHAIN 1

HIGH CHANNEL



HIGH CHANNEL CHAIN 0



HIGH CHANNEL CHAIN 1

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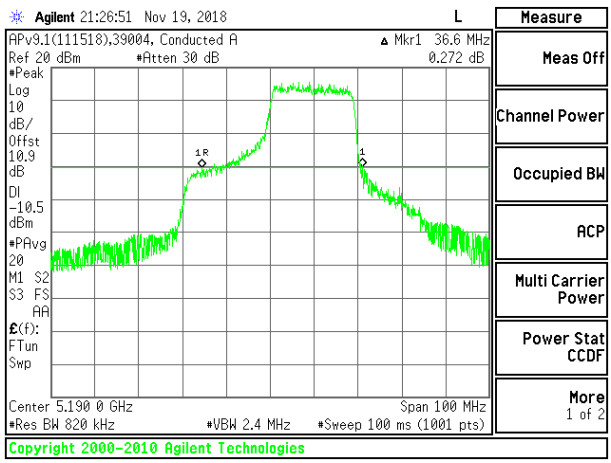
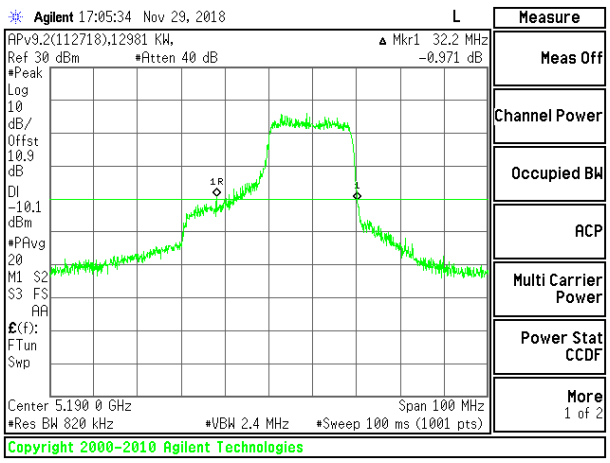
2TX Antenna 1 + Antenna 2 OFDMA MODE – 242-Tones, RU Index 62

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)
Low	5190	36.60	32.20
High	5230	38.10	33.20

LOW CHANNEL

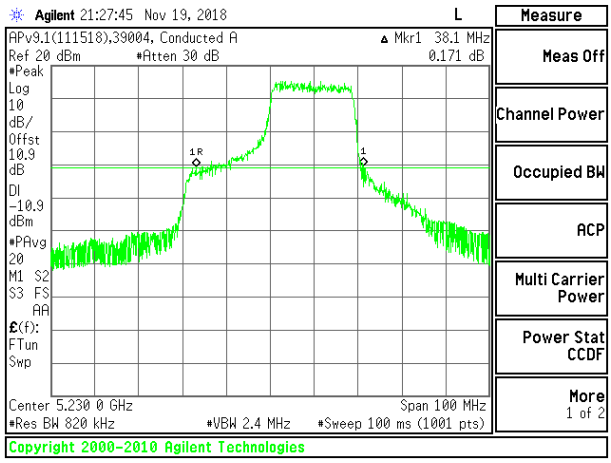


LOW CHANNEL CHAIN 0

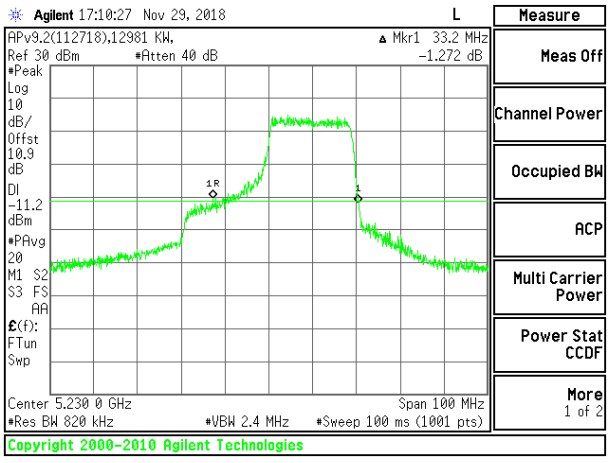


LOW CHANNEL CHAIN 1

HIGH CHANNEL



HIGH CHANNEL CHAIN 0



HIGH CHANNEL CHAIN 1

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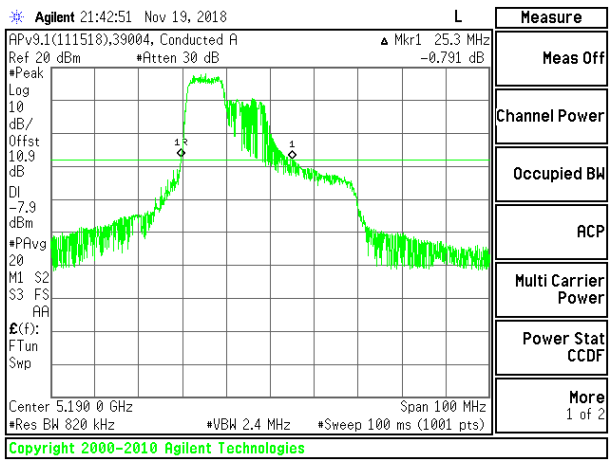
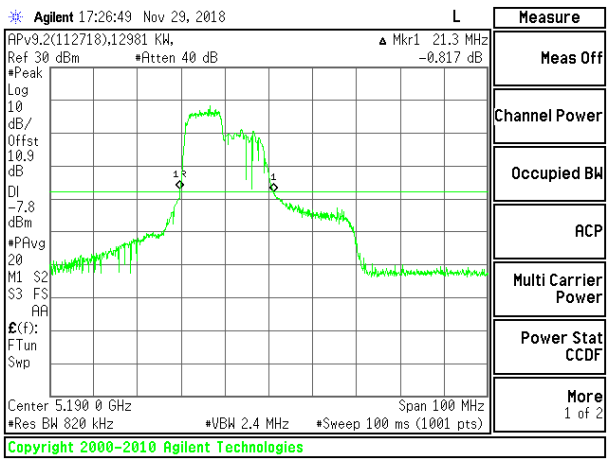
2TX Antenna 1 + Antenna 2 OFDMA MODE – 106-Tones, RU Index 53

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)
Low	5190	25.30	21.30
High	5230	25.80	21.50

LOW CHANNEL

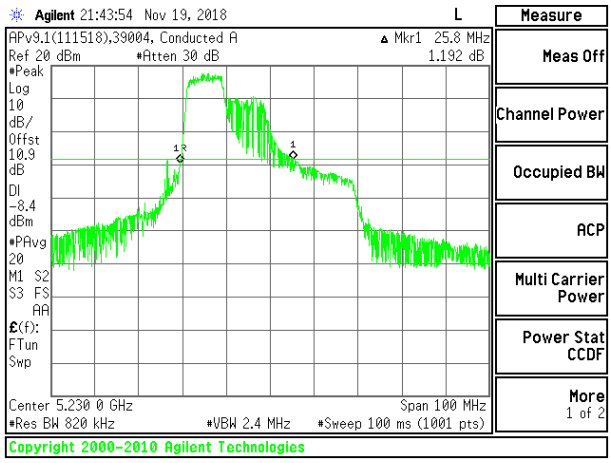


LOW CHANNEL CHAIN 0

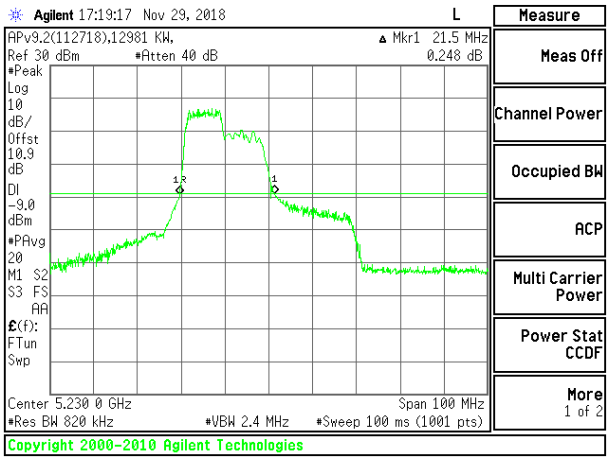


LOW CHANNEL CHAIN 1

HIGH CHANNEL



HIGH CHANNEL CHAIN 0



HIGH CHANNEL CHAIN 1

UL VERIFICATION SERVICES INC.
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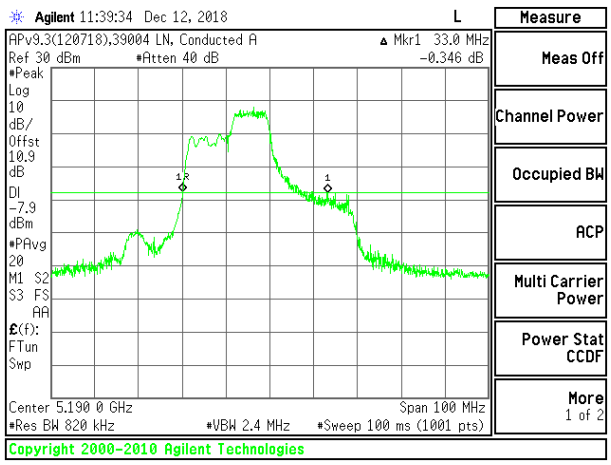
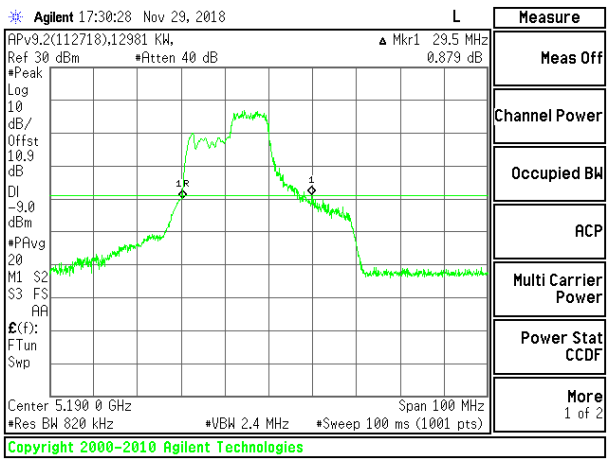
2TX Antenna 1 + Antenna 2 OFDMA MODE – 106-Tones, RU Index 54

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)
Low	5190	33.00	29.50
High	5230	35.90	28.70

LOW CHANNEL

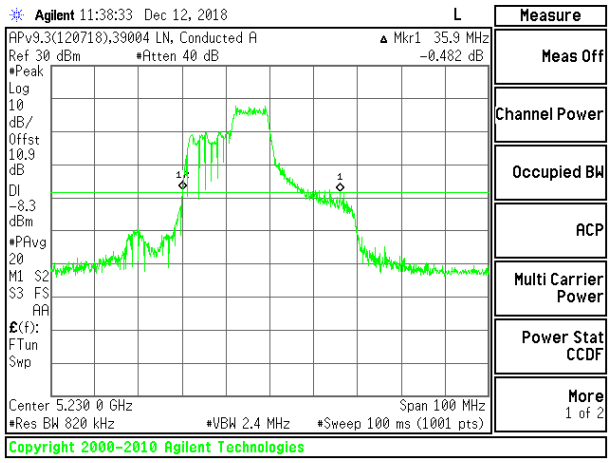


LOW CHANNEL CHAIN 0

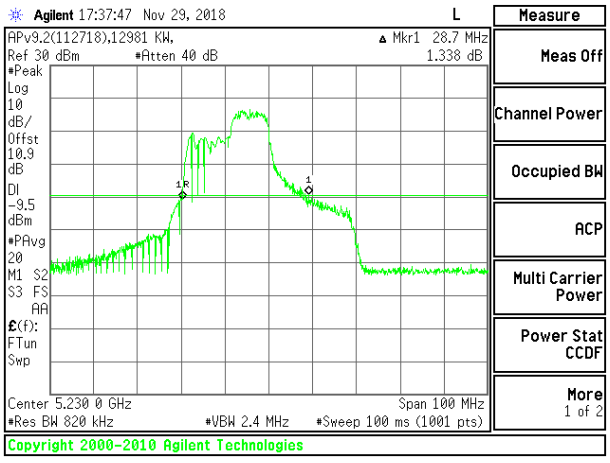


LOW CHANNEL CHAIN 1

HIGH CHANNEL



HIGH CHANNEL CHAIN 0



HIGH CHANNEL CHAIN 1

UL VERIFICATION SERVICES INC.
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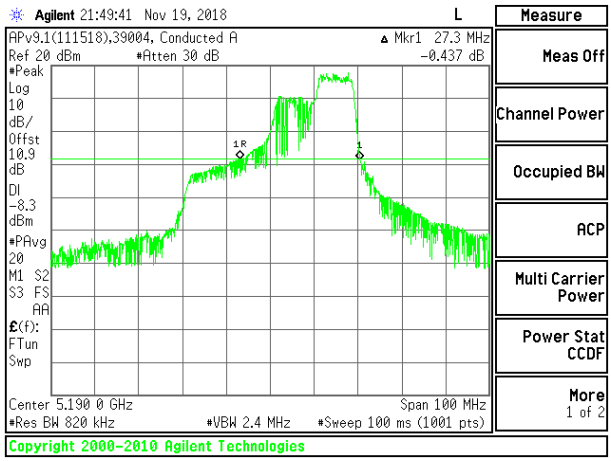
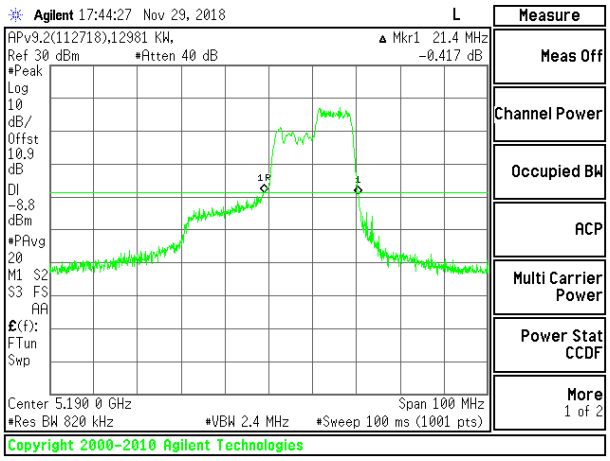
2TX Antenna 1 + Antenna 2 OFDMA MODE – 106-Tones, RU Index 56

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)
Low	5190	21.50	21.50
High	5230	21.60	21.40

LOW CHANNEL

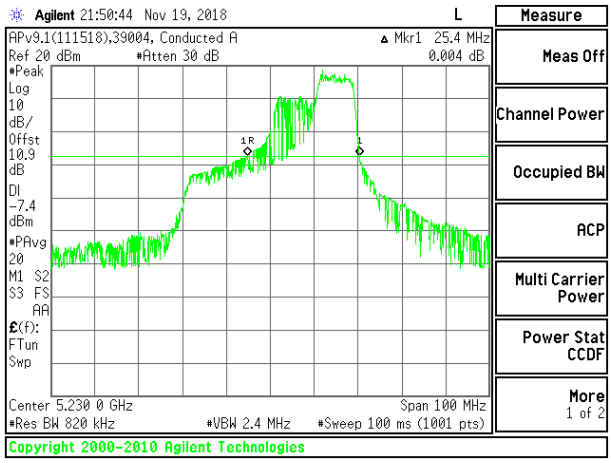


LOW CHANNEL CHAIN 0

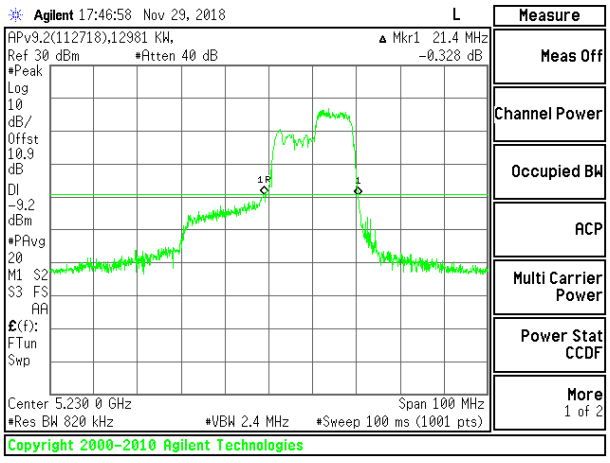


LOW CHANNEL CHAIN 1

HIGH CHANNEL



HIGH CHANNEL CHAIN 0



HIGH CHANNEL CHAIN 1

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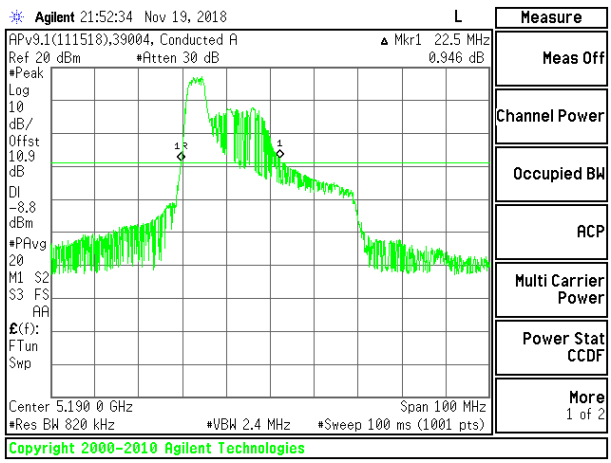
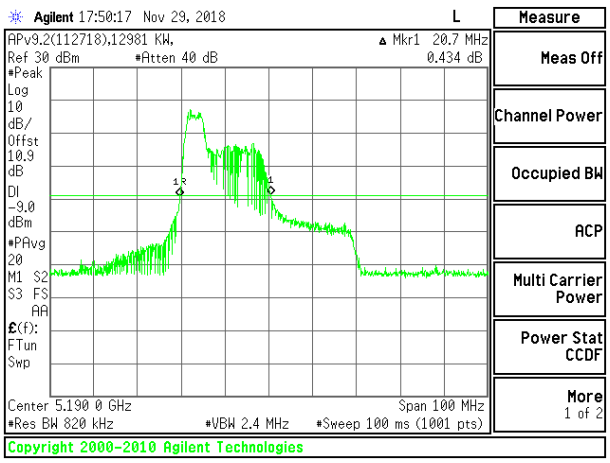
2TX Antenna 1 + Antenna 2 OFDMA MODE – 52-Tones, RU Index 37

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)
Low	5190	22.50	20.70
High	5230	22.70	20.70

LOW CHANNEL

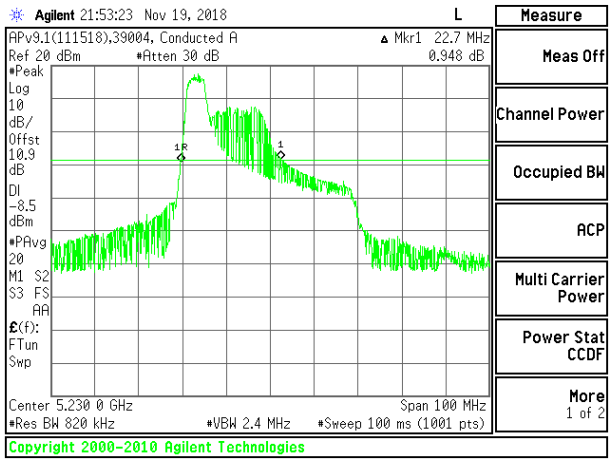


LOW CHANNEL CHAIN 0

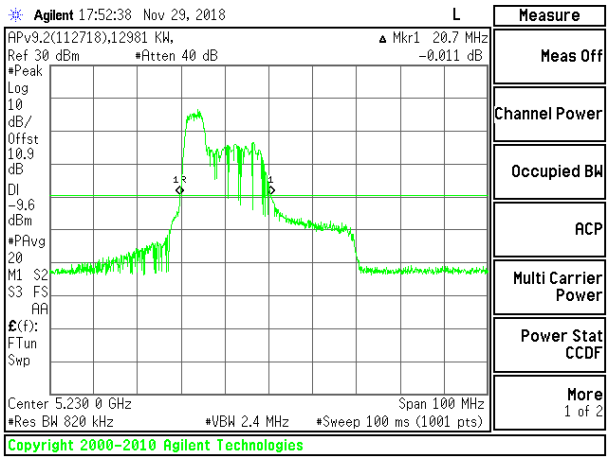


LOW CHANNEL CHAIN 1

HIGH CHANNEL



HIGH CHANNEL CHAIN 0



HIGH CHANNEL CHAIN 1

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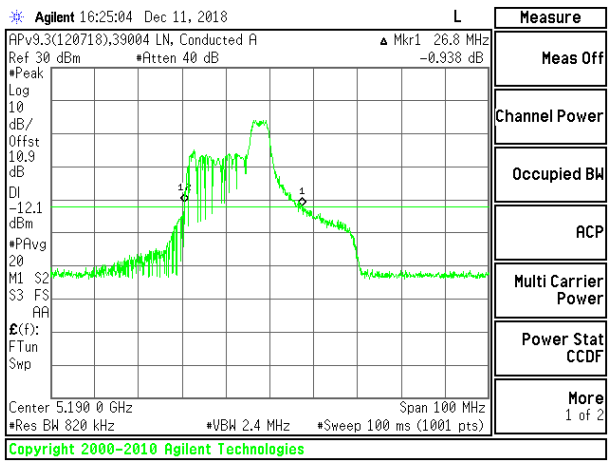
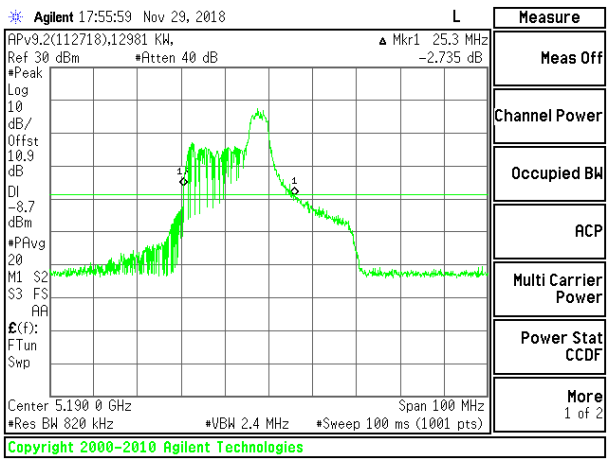
2TX Antenna 1 + Antenna 2 OFDMA MODE – 52-Tones, RU Index 40

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)
Low	5190	26.80	25.30
High	5230	25.20	26.90

LOW CHANNEL

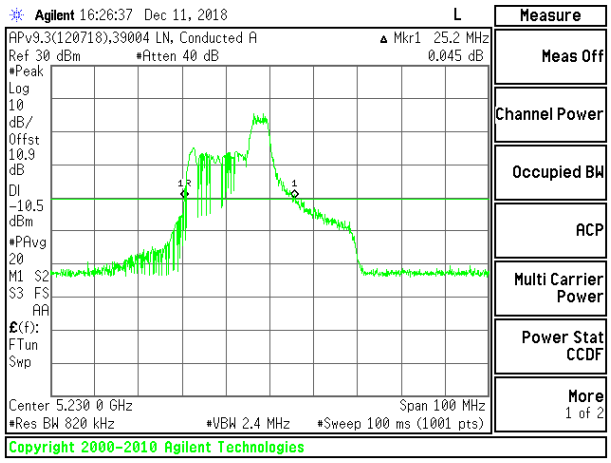


LOW CHANNEL CHAIN 0

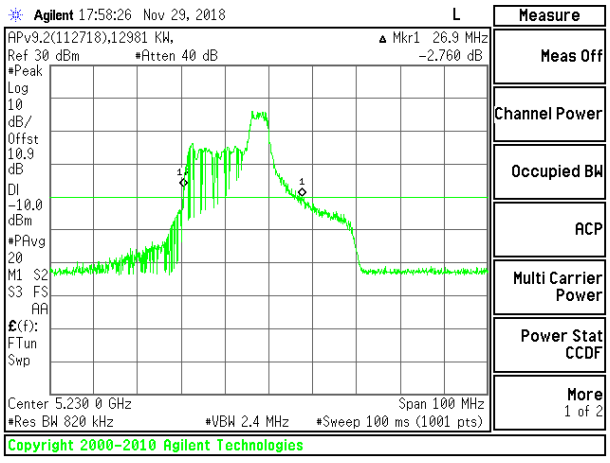


LOW CHANNEL CHAIN 1

HIGH CHANNEL



HIGH CHANNEL CHAIN 0



HIGH CHANNEL CHAIN 1

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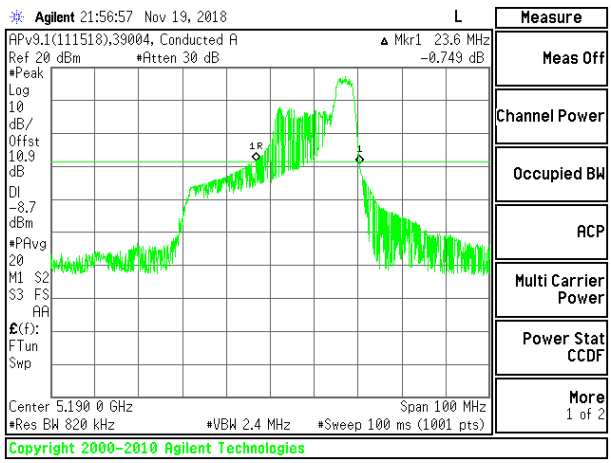
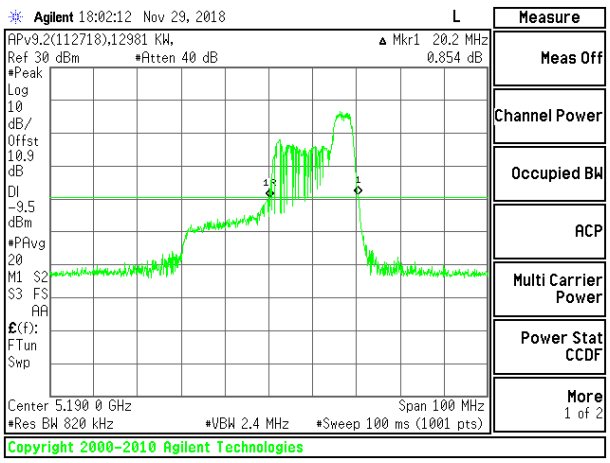
2TX Antenna 1 + Antenna 2 OFDMA MODE – 52-Tones, RU Index 44

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)
Low	5190	23.60	20.20
High	5230	23.50	20.40

LOW CHANNEL

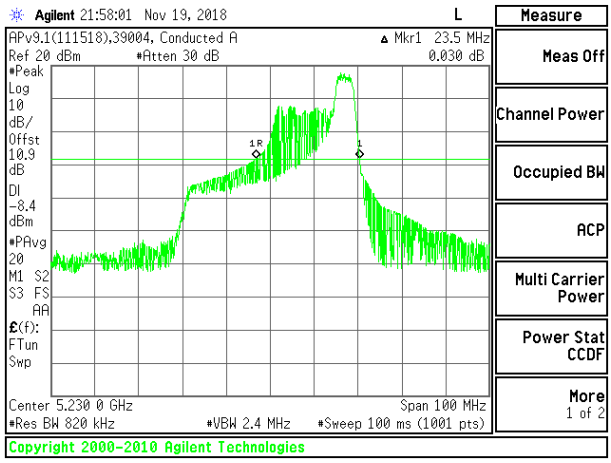


LOW CHANNEL CHAIN 0

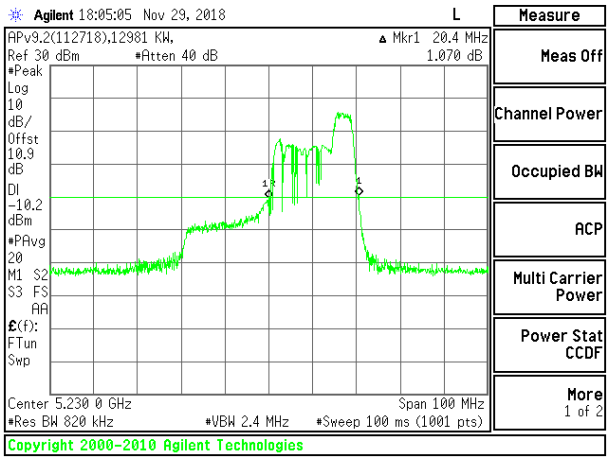


LOW CHANNEL CHAIN 1

HIGH CHANNEL



HIGH CHANNEL CHAIN 0



HIGH CHANNEL CHAIN 1

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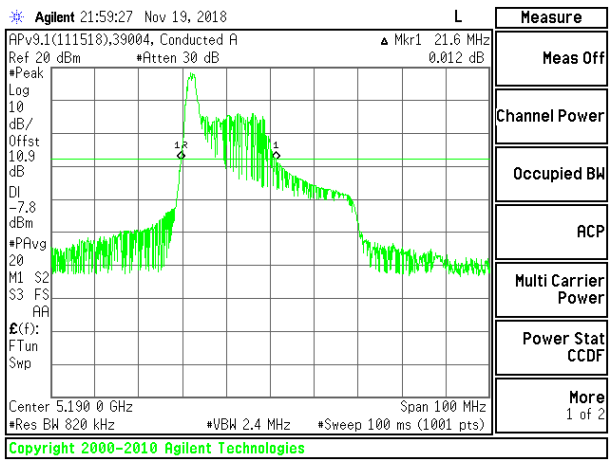
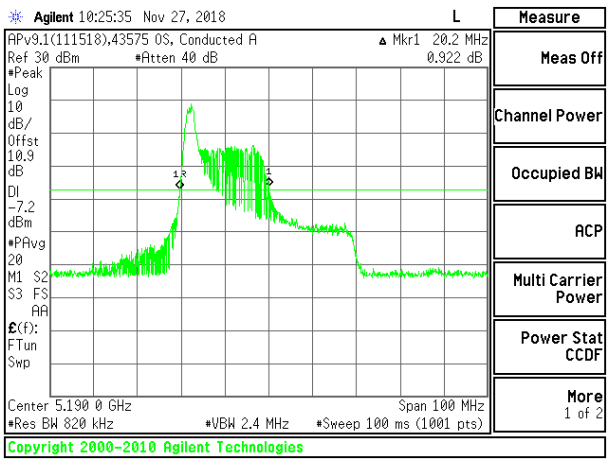
2TX Antenna 1 + Antenna 2 OFDMA MODE – 26-Tones, RU Index 0

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)
Low	5190	21.60	20.20
High	5230	21.40	20.30

LOW CHANNEL

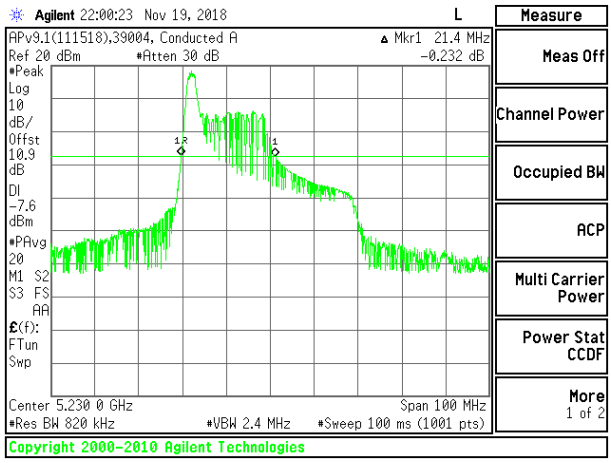


LOW CHANNEL CHAIN 0

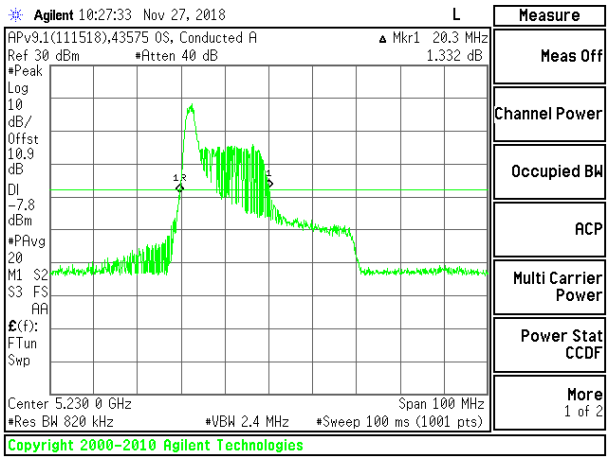


LOW CHANNEL CHAIN 1

HIGH CHANNEL



HIGH CHANNEL CHAIN 0



HIGH CHANNEL CHAIN 1

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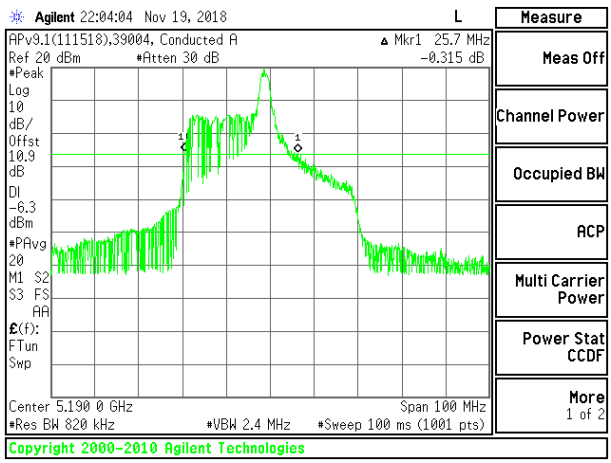
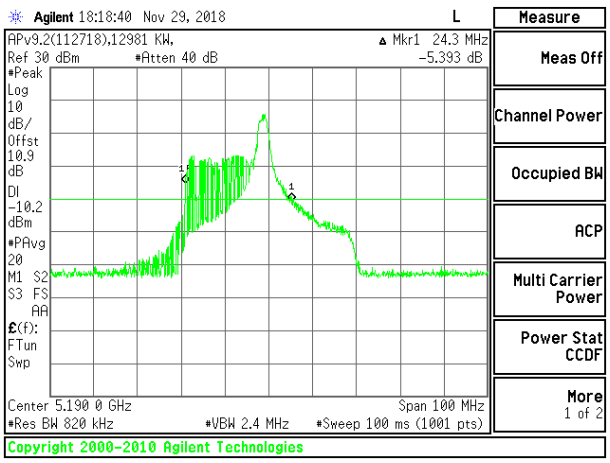
2TX Antenna 1 + Antenna 2 OFDMA MODE – 26-Tones, RU Index 8

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)
Low	5190	25.70	24.30
High	5230	26.70	24.20

LOW CHANNEL

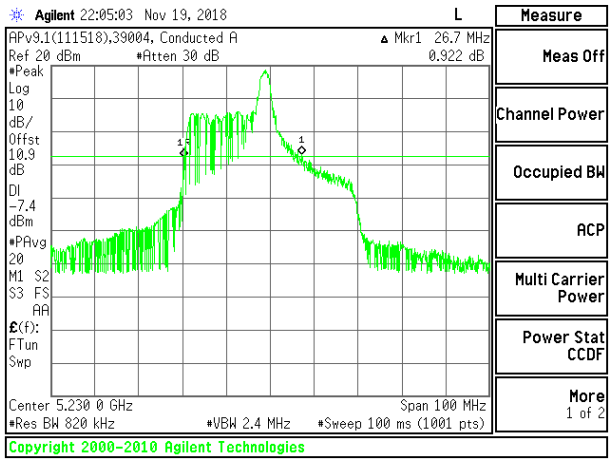


LOW CHANNEL CHAIN 0

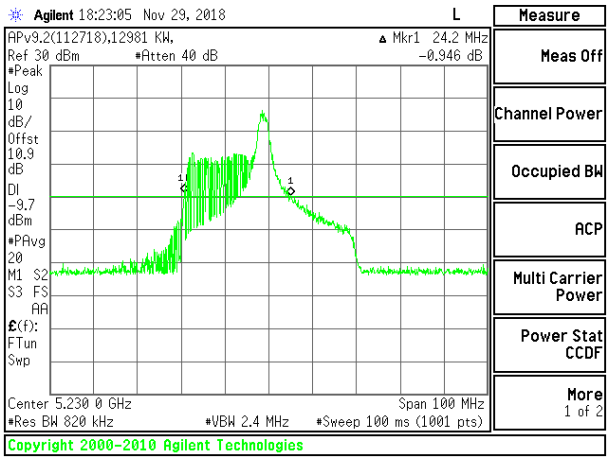


LOW CHANNEL CHAIN 1

HIGH CHANNEL



HIGH CHANNEL CHAIN 0



HIGH CHANNEL CHAIN 1

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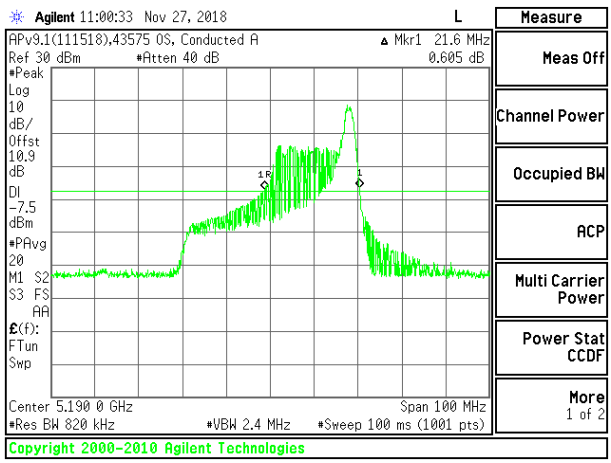
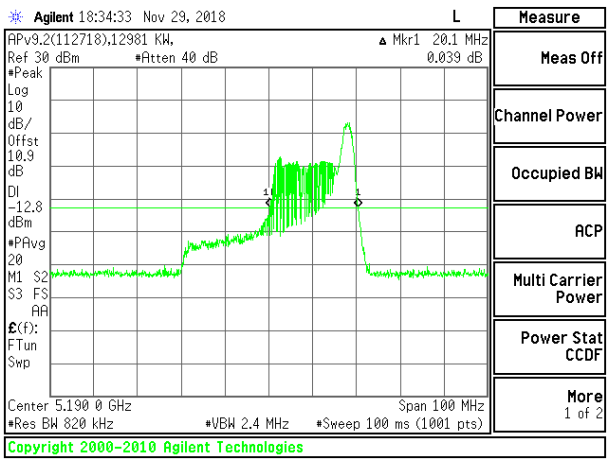
2TX Antenna 1 + Antenna 2 OFDMA MODE – 26-Tones, RU Index 17

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)
Low	5190	21.60	20.10
High	5230	22.20	19.80

LOW CHANNEL

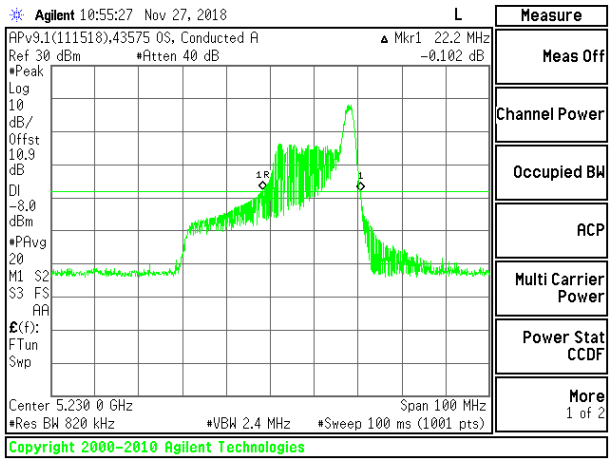


LOW CHANNEL CHAIN 0

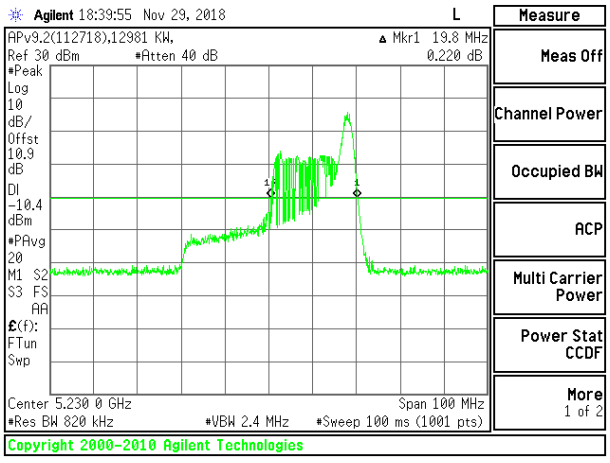


LOW CHANNEL CHAIN 1

HIGH CHANNEL



HIGH CHANNEL CHAIN 0



HIGH CHANNEL CHAIN 1

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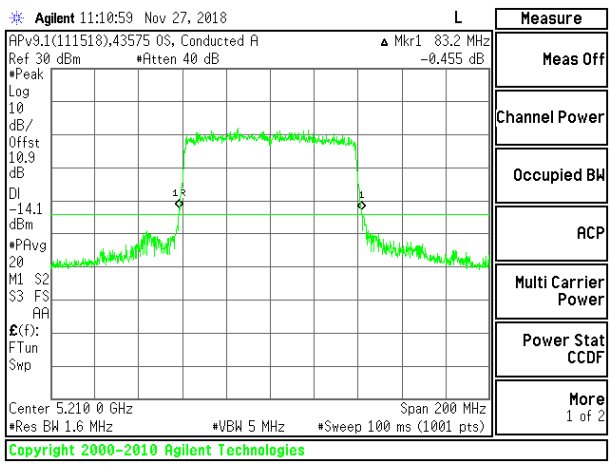
8.2.7. 802.11ax HE80 MODE IN THE 5.2 GHz BAND

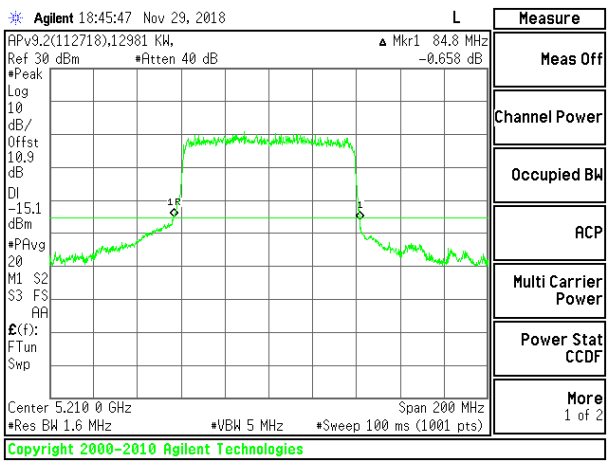
2TX Antenna 1 + Antenna 2 OFDMA MODE – 996-Tones, RU Index 67

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)
Mid	5210	83.20	84.80

MID CHANNEL



MID CHANNEL CHAIN 0



MID CHANNEL CHAIN 1

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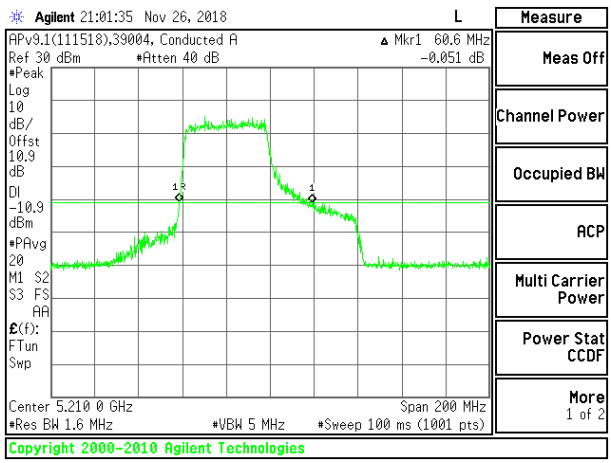
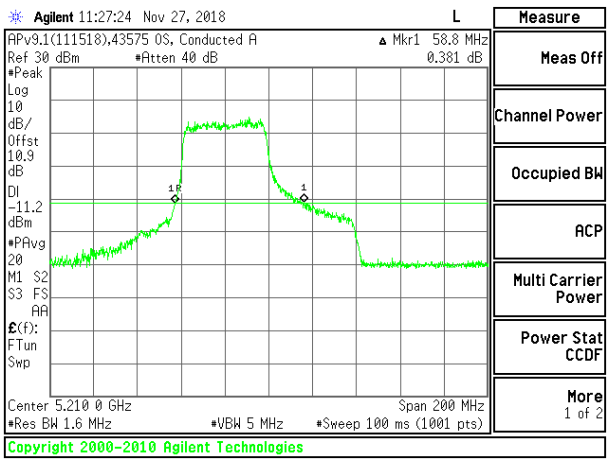
2TX Antenna 1 + Antenna 2 OFDMA MODE – 484-Tones, RU Index 65

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)
Mid	5210	60.60	58.80

MID CHANNEL



MID CHANNEL CHAIN 0



MID CHANNEL CHAIN 1

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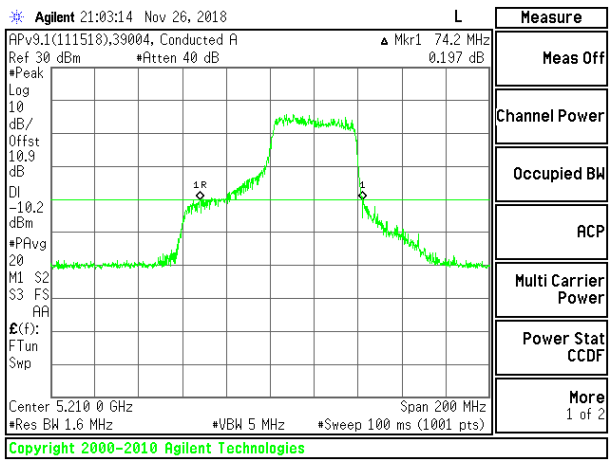
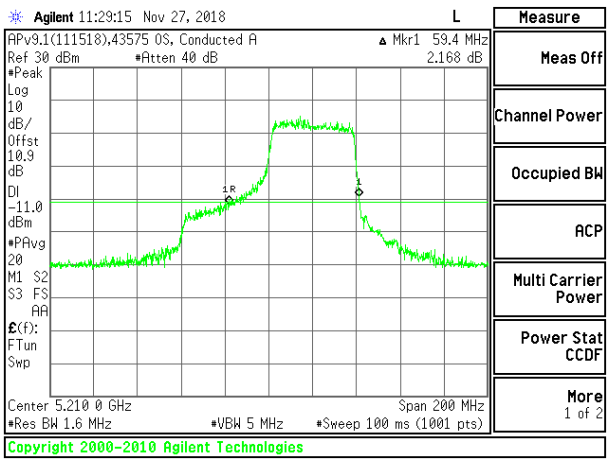
2TX Antenna 1 + Antenna 2 OFDMA MODE – 484-Tones, RU Index 66

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)
Mid	5210	74.20	59.40

MID CHANNEL



MID CHANNEL CHAIN 0



MID CHANNEL CHAIN 1

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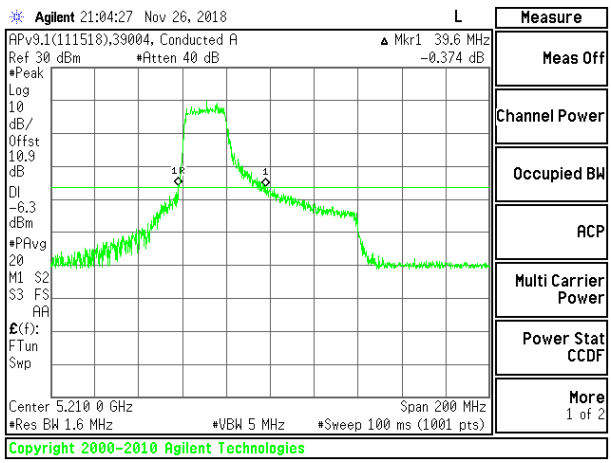
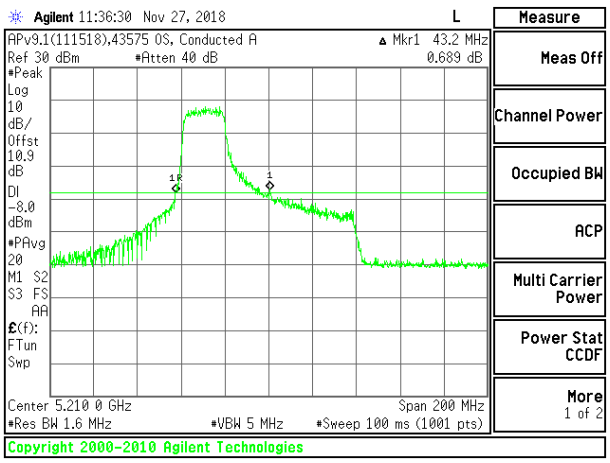
2TX Antenna 1 + Antenna 2 OFDMA MODE – 242-Tones, RU Index 61

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)
Mid	5210	39.60	43.20

MID CHANNEL



MID CHANNEL CHAIN 0



MID CHANNEL CHAIN 1

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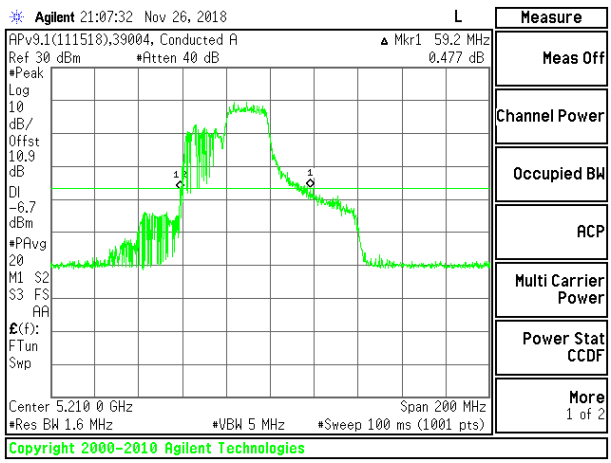
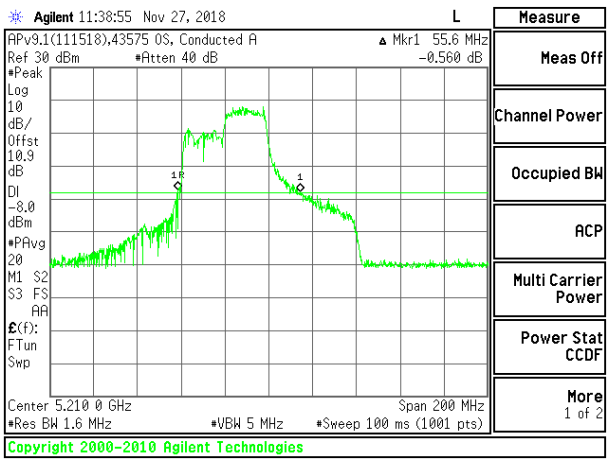
2TX Antenna 1 + Antenna 2 OFDMA MODE – 242-Tones, RU Index 62

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)
Mid	5210	59.20	55.60

MID CHANNEL



MID CHANNEL CHAIN 0



MID CHANNEL CHAIN 1

UL VERIFICATION SERVICES INC.
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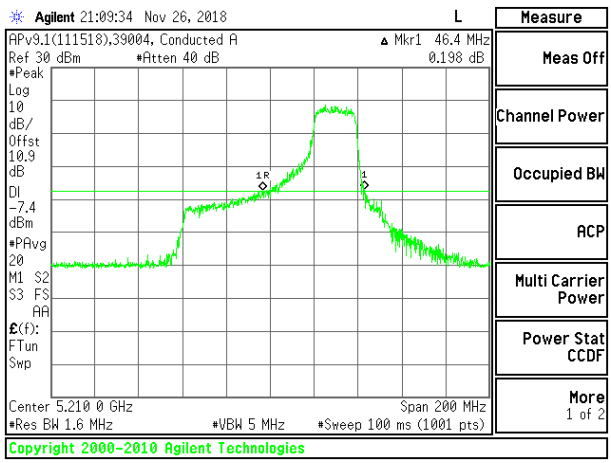
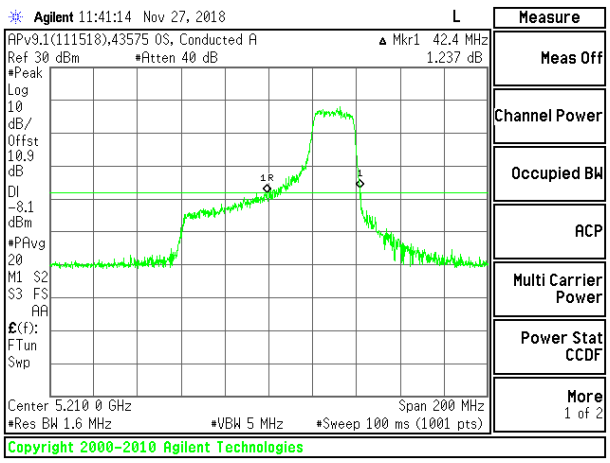
2TX Antenna 1 + Antenna 2 OFDMA MODE – 242-Tones, RU Index 64

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)
Mid	5210	46.40	42.40

MID CHANNEL



MID CHANNEL CHAIN 0



MID CHANNEL CHAIN 1

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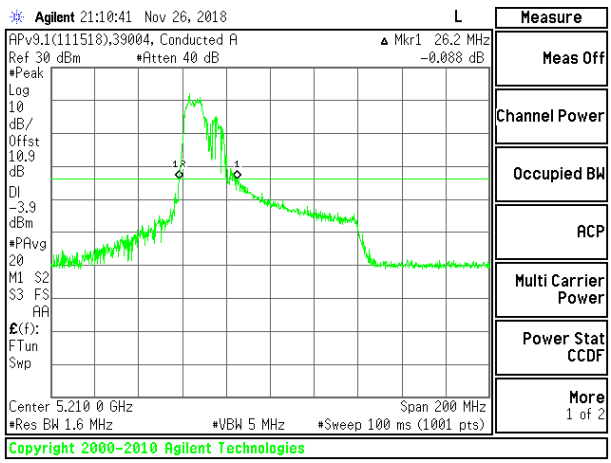
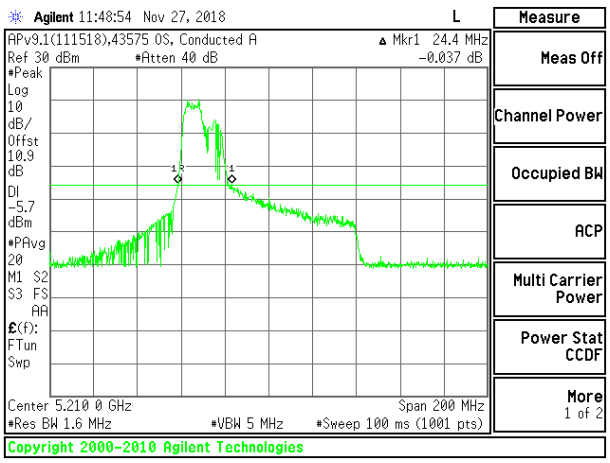
2TX Antenna 1 + Antenna 2 OFDMA MODE – 106-Tones, RU Index 53

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)
Mid	5210	26.20	24.40

MID CHANNEL



MID CHANNEL CHAIN 0



MID CHANNEL CHAIN 1

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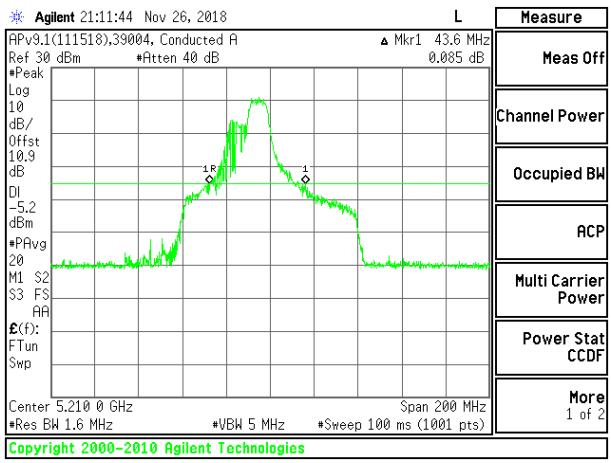
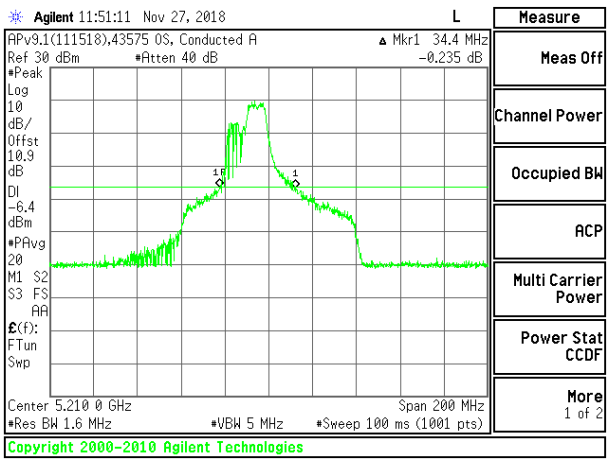
2TX Antenna 1 + Antenna 2 OFDMA MODE – 106-Tones, RU Index 56

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)
Mid	5210	43.60	34.40

MID CHANNEL



MID CHANNEL CHAIN 0



MID CHANNEL CHAIN 1

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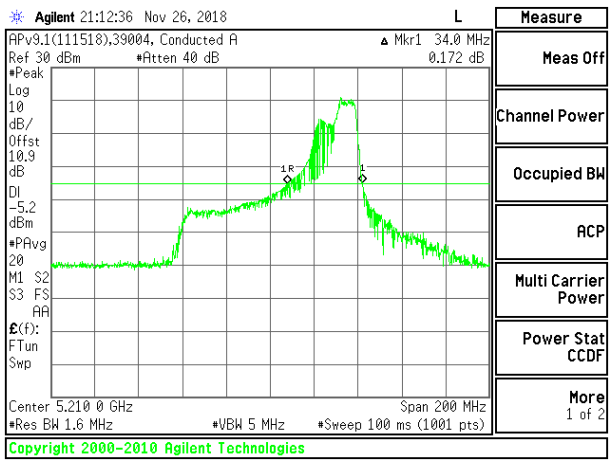
2TX Antenna 1 + Antenna 2 OFDMA MODE – 106-Tones, RU Index 60

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)
Mid	5210	34.00	26.40

MID CHANNEL



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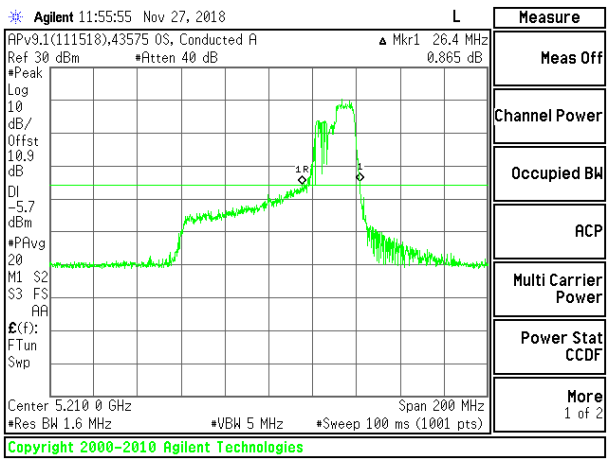

MID CHANNEL CHAIN 1

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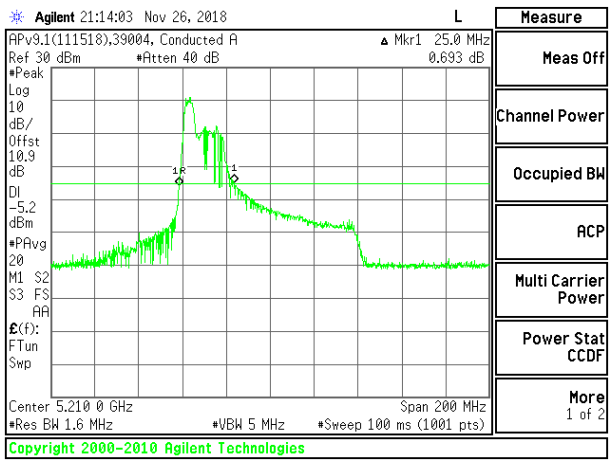
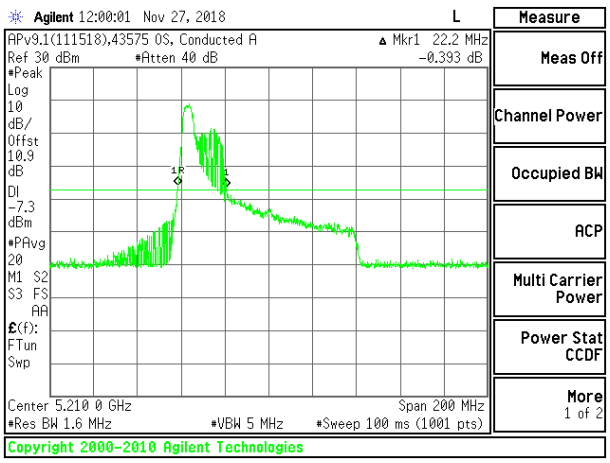
2TX Antenna 1 + Antenna 2 OFDMA MODE – 52-Tones, RU Index 37

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)
Mid	5210	25.00	22.20

MID CHANNEL



MID CHANNEL CHAIN 0



MID CHANNEL CHAIN 1

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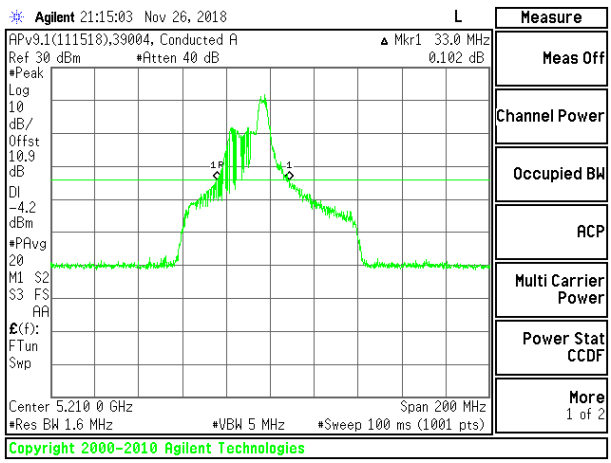
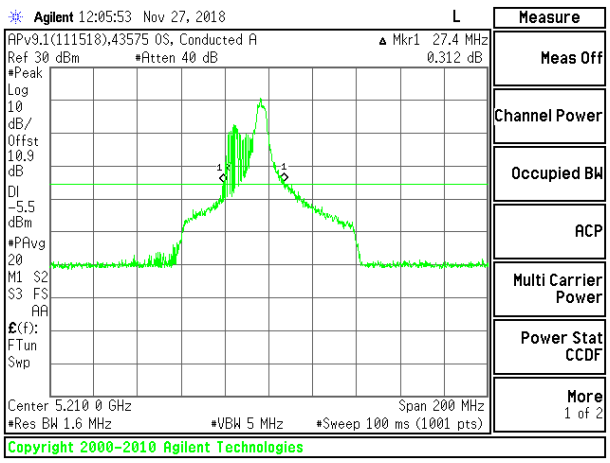
2TX Antenna 1 + Antenna 2 OFDMA MODE – 52-Tones, RU Index 44

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)
Mid	5210	33.00	27.40

MID CHANNEL



MID CHANNEL CHAIN 0



MID CHANNEL CHAIN 1

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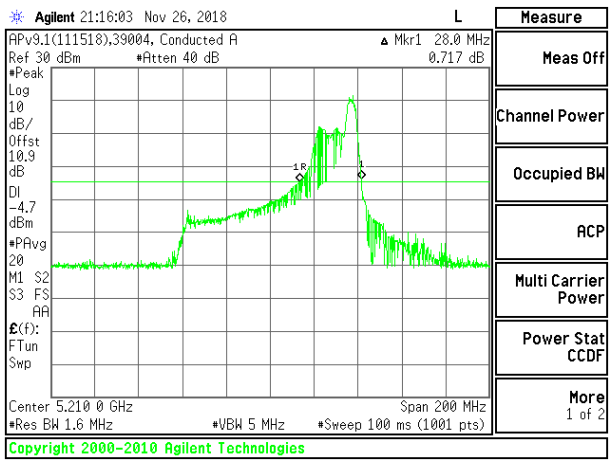
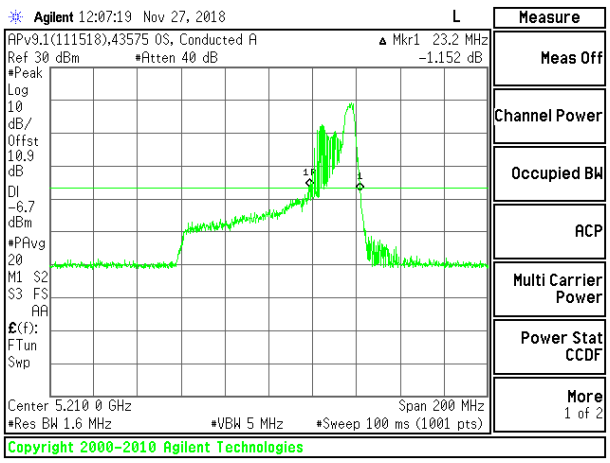
2TX Antenna 1 + Antenna 2 OFDMA MODE – 52-Tones, RU Index 52

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)
Mid	5210	28.00	23.20

MID CHANNEL



MID CHANNEL CHAIN 0



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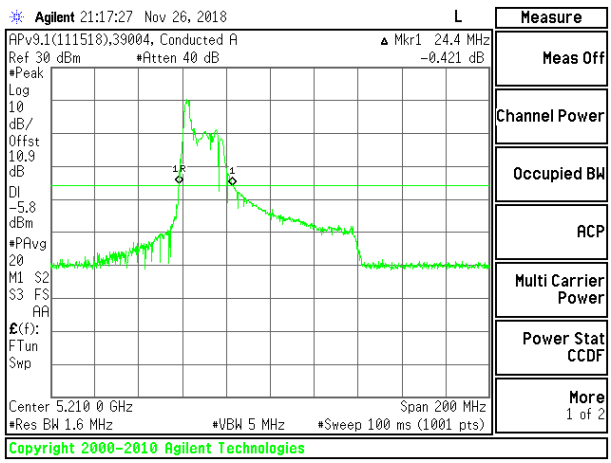
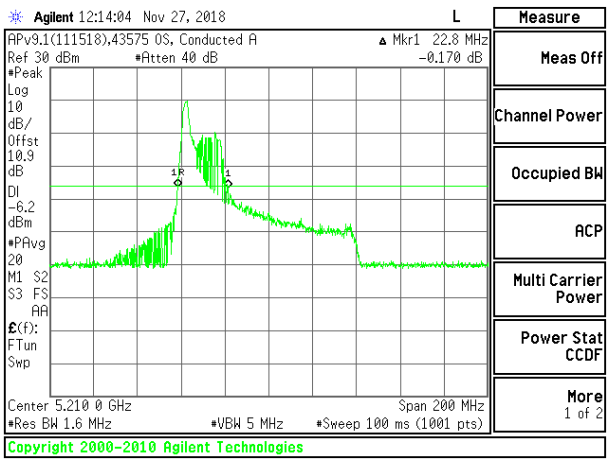
2TX Antenna 1 + Antenna 2 OFDMA MODE – 26-Tones, RU Index 0

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)
Mid	5210	24.40	22.80

MID CHANNEL



MID CHANNEL CHAIN 0



MID CHANNEL CHAIN 1

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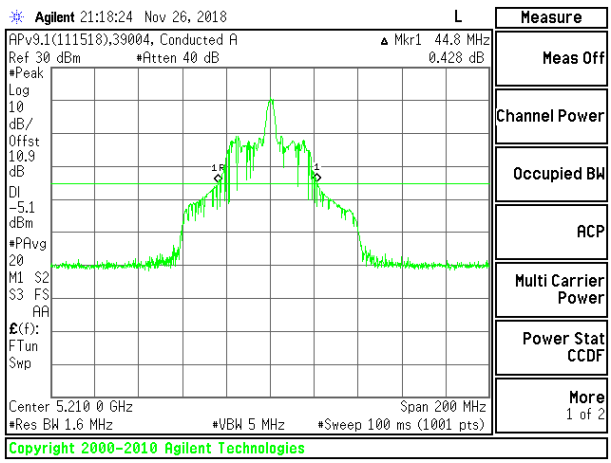
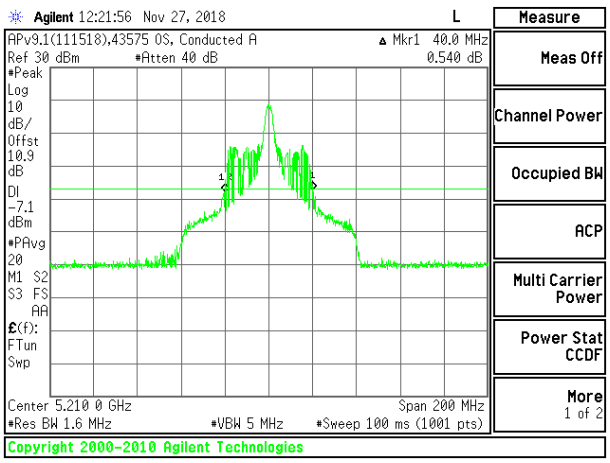
2TX Antenna 1 + Antenna 2 OFDMA MODE – 26-Tones, RU Index 18

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)
Mid	5210	44.80	40.00

MID CHANNEL



MID CHANNEL CHAIN 0



MID CHANNEL CHAIN 1

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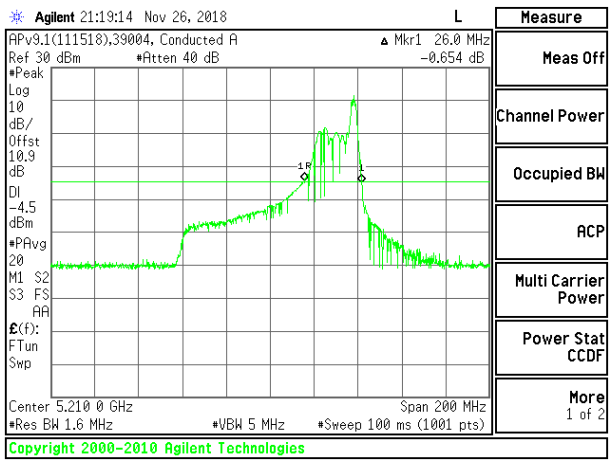
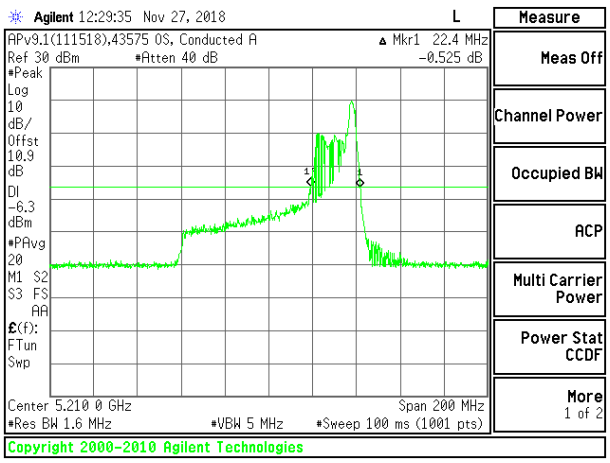
2TX Antenna 1 + Antenna 2 OFDMA MODE – 26-Tones, RU Index 36

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)
Mid	5210	26.00	22.40

MID CHANNEL



MID CHANNEL CHAIN 0



MID CHANNEL CHAIN 1

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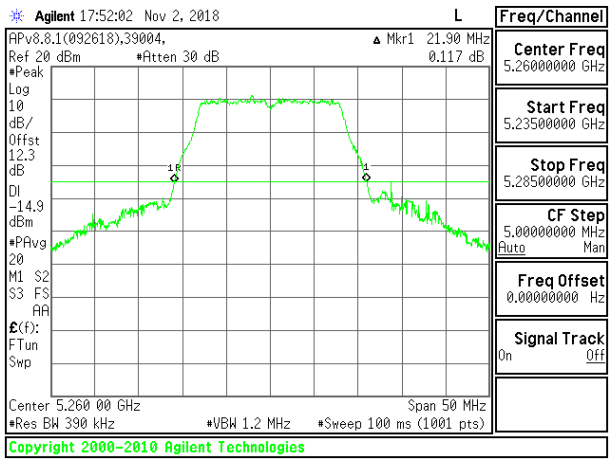
8.2.8. 802.11a MODE IN THE 5.3 GHz BAND

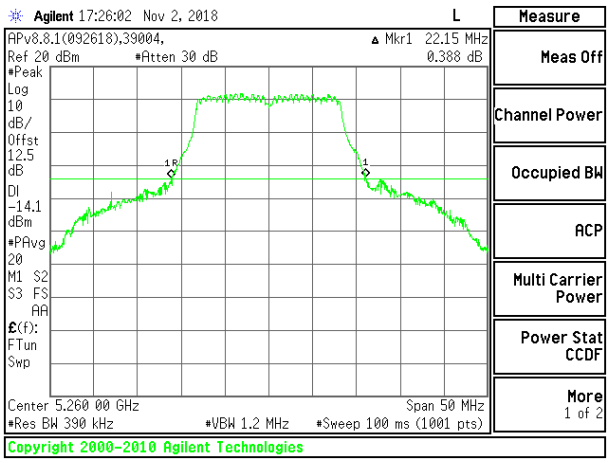
2TX Antenna 1 + Antenna 2 CDD MODE

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)
Low	5260	21.90	22.15
Mid	5300	21.80	22.10
High	5320	21.85	22.65

LOW CHANNEL

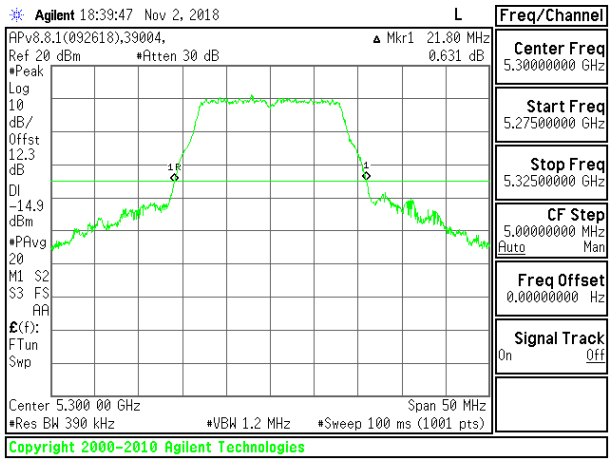


LOW CHANNEL CHAIN 0

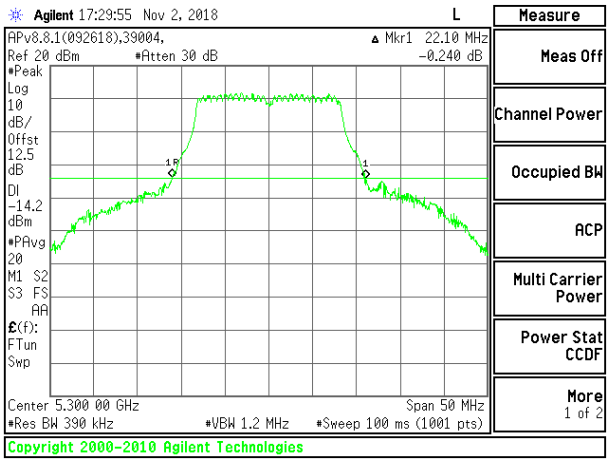


LOW CHANNEL CHAIN 1

MID CHANNEL



MID CHANNEL CHAIN 0



MID CHANNEL CHAIN 1

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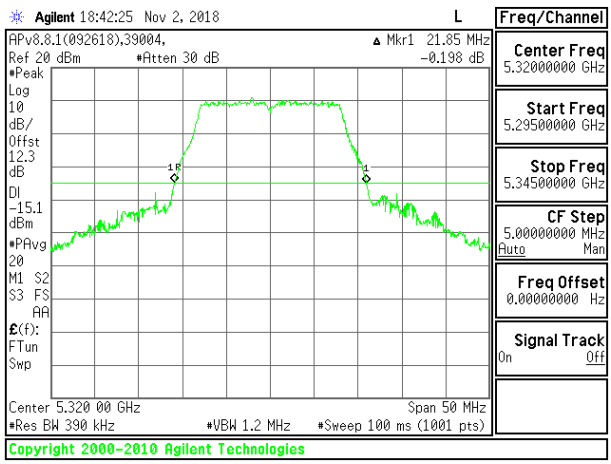
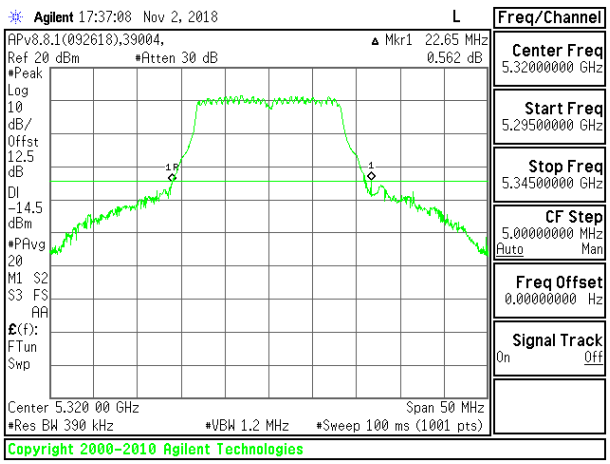
HIGH CHANNEL



HIGH CHANNEL CHAIN 0



HIGH CHANNEL CHAIN 1

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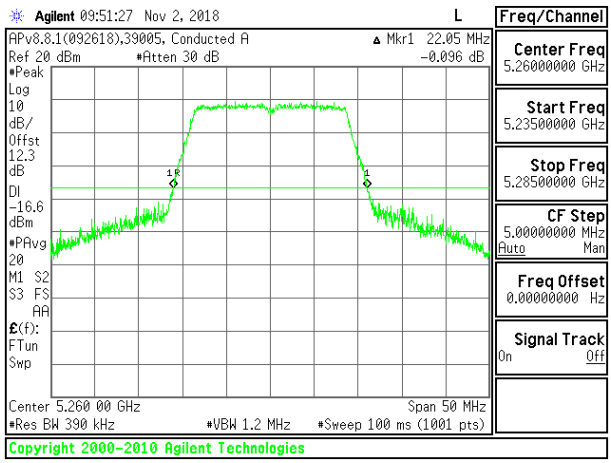
8.2.9. 802.11n HT20 MODE IN THE 5.3 GHz BAND

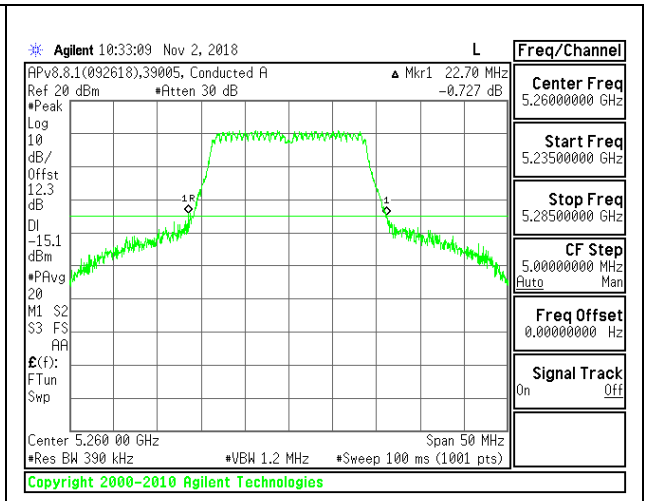
2TX Antenna 1 + Antenna 2 CDD MODE

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)
Low	5260	22.05	22.70
Mid	5300	22.20	22.25
High	5320	22.05	22.30

LOW CHANNEL

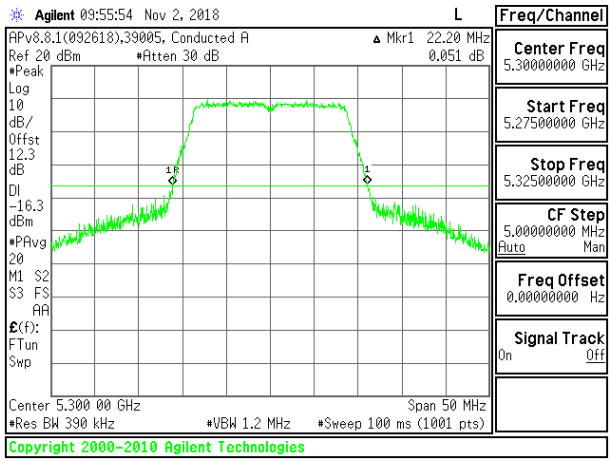


LOW CHANNEL CHAIN 0

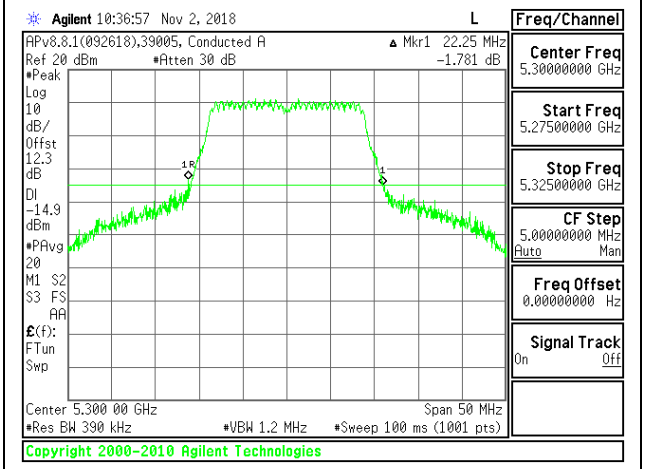


LOW CHANNEL CHAIN 1

MID CHANNEL



MID CHANNEL CHAIN 0



MID CHANNEL CHAIN 1

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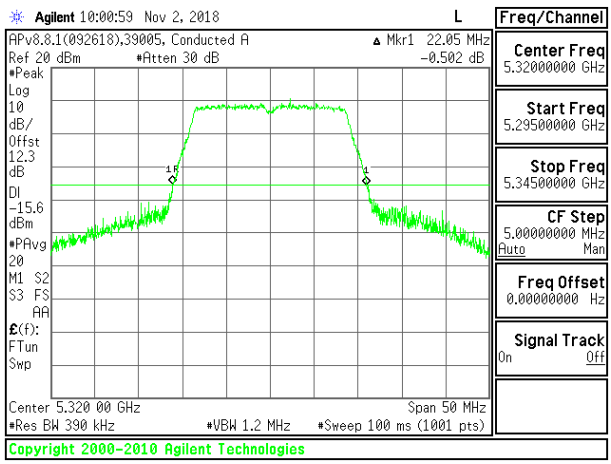
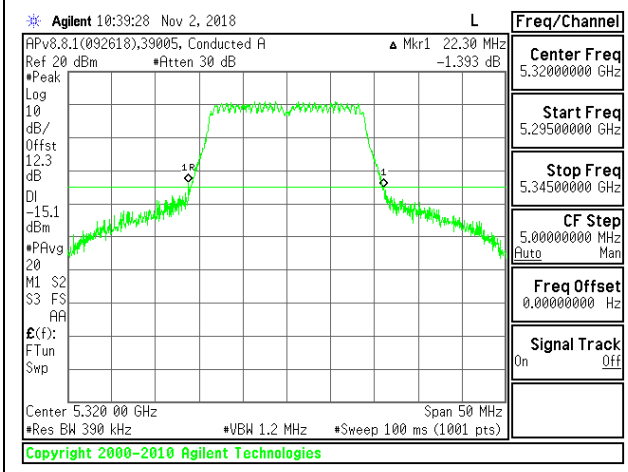
HIGH CHANNEL



HIGH CHANNEL CHAIN 0



HIGH CHANNEL CHAIN 1

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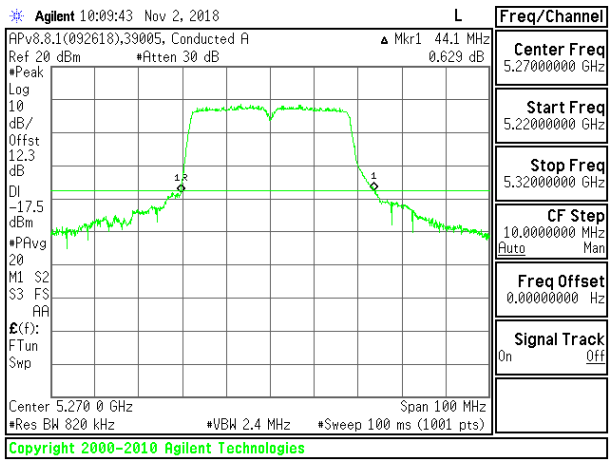
8.2.10. 802.11n HT40 MODE IN THE 5.3 GHz BAND

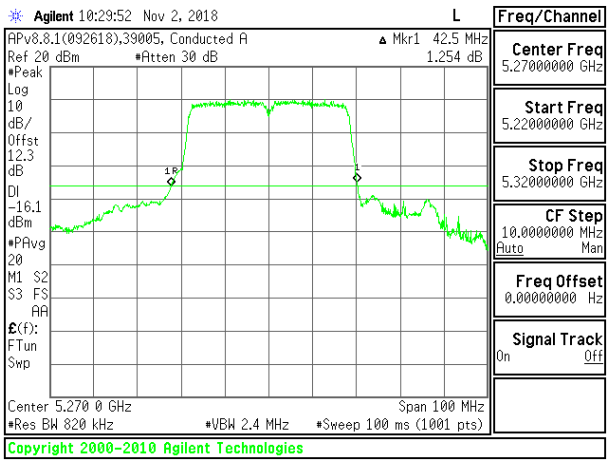
2TX Antenna 1 + Antenna 2 CDD MODE

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)
Low	5270	44.10	42.50
High	5310	44.10	42.60

LOW CHANNEL

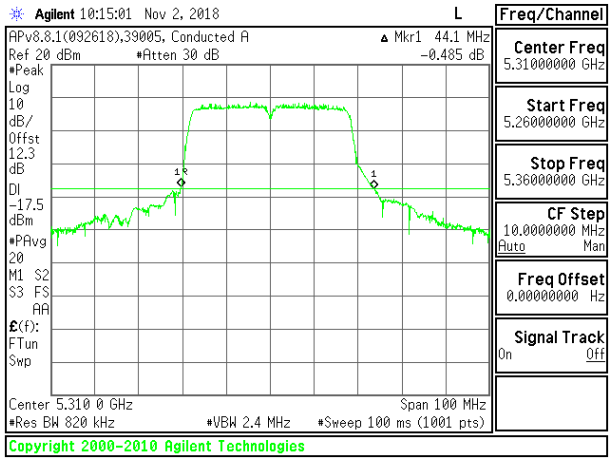


LOW CHANNEL CHAIN 0

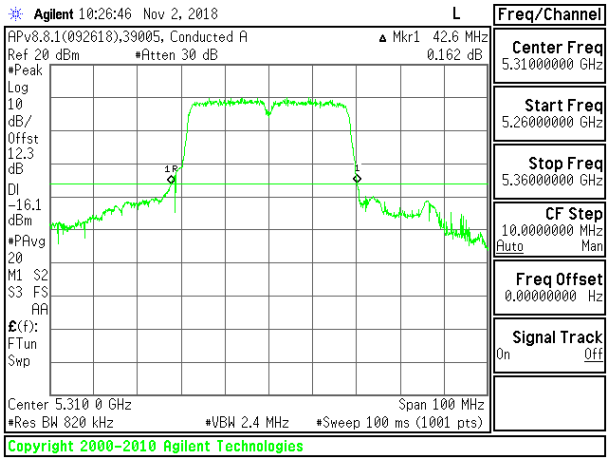


LOW CHANNEL CHAIN 1

HIGH CHANNEL



HIGH CHANNEL CHAIN 0



HIGH CHANNEL CHAIN 1

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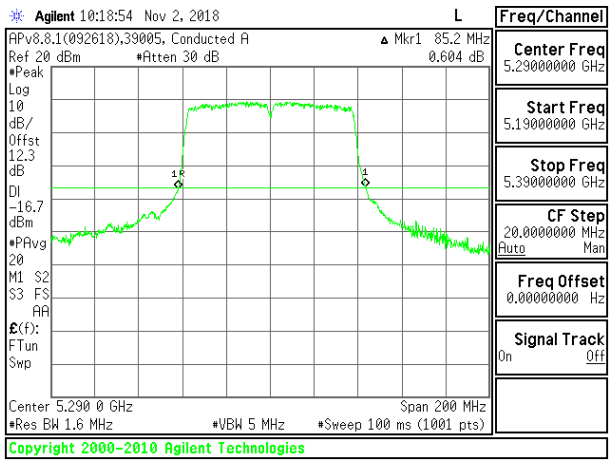
8.2.11. 802.11ac VHT80 MODE IN THE 5.3 GHz BAND

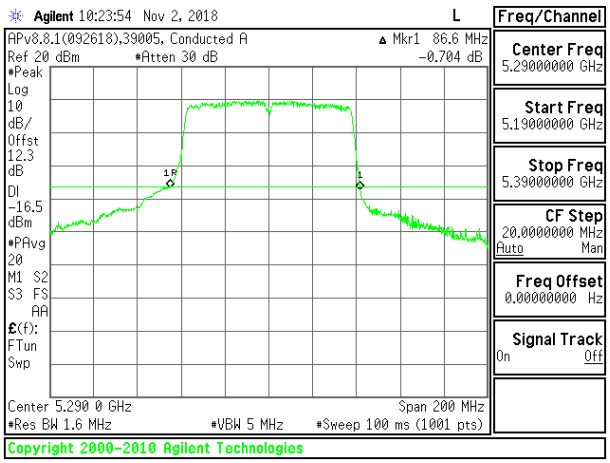
2TX Antenna 1 + Antenna 2 CDD MODE

Channel	Frequency (MHz)	26 dB Bandwidth Chain 0 (MHz)	26 dB Bandwidth Chain 1 (MHz)
Mid	5290	85.20	86.60

MID CHANNEL



MID CHANNEL CHAIN 0



MID CHANNEL CHAIN 1

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