CERTIFICATION TEST REPORT

Report Number. : 11697707-E4V6

Applicant	:	APPLE, INC. 1 INFINITE LOOP CUPERTINO, CA 95014, U.S.A.
Model	:	A1897
FCC ID	:	BCG-E3174A
IC	:	579C-E3174A
EUT Description	:	SMARTPHONE
Test Standard(s)	:	FCC 47 CFR PART 15 SUBPART E

Date Of Issue:
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Prepared by:
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	6/28/2017	Initial Issue	Tri Pham
V2	7/10/2017	Address TCB's questions	Chin Pang
V3	7/12/2017	Re-measuring and Changing Power to align with original target power.	Francisco Guarnero
V4	7/18/2017	Address TCB's questions	Chin Pang
V5	7/20/2017	Address TCB's questions	Chin Pang
V6	7/24/2017	Address TCB's questions	Chin Pang

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TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS 11

2. TEST METHODOLOGY 12

3. FACILITIES AND ACCREDITATION 12

4. CALIBRATION AND UNCERTAINTY 13

4.1. MEASURING INSTRUMENT CALIBRATION 13

4.2. SAMPLE CALCULATION 13

4.3. MEASUREMENT UNCERTAINTY 13

5. EQUIPMENT UNDER TEST 14

5.1. DESCRIPTION OF EUT 14

5.2. MAXIMUM OUTPUT POWER 14

5.3. DESCRIPTION OF AVAILABLE ANTENNAS 17

5.4. SOFTWARE AND FIRMWARE 17

5.5. WORST-CASE CONFIGURATION AND MODE 18

5.6. DESCRIPTION OF TEST SETUP 19

6. TEST AND MEASUREMENT EQUIPMENT 25

7. ON TIME, DUTY CYCLE AND MEASUREMENT METHODS 26

7.1. ON TIME AND DUTY CYCLE 26

7.2. MEASUREMENT METHODS 30

8. ANTENNA PORT TEST RESULTS 31

8.1. 11n HT20 UAT 2 SISO MODE IN THE 5.2GHz BAND 31

8.1.1. 26 dB BANDWIDTH 31
8.1.2. 99% BANDWIDTH 34
8.1.3. AVERAGE POWER 37
8.1.4. OUTPUT POWER AND PPSD 38

8.2. 11n HT20 LAT 3 SISO MODE IN THE 5.2GHz BAND 42

8.2.1. 26 dB BANDWIDTH 42
8.2.2. 99% BANDWIDTH 45
8.2.3. AVERAGE POWER 48
8.2.4. OUTPUT POWER AND PPSD 49

8.3. 11n HT20 2TX CDD MIMO MODE IN THE 5.2GHz BAND 53

8.3.1. 26 dB BANDWIDTH 53
8.3.2. 99% BANDWIDTH 57
8.3.3. AVERAGE POWER 61
8.3.4. OUTPUT POWER AND PPSD 62

8.4. 11n HT40 UAT 2 SISO MODE IN THE 5.2GHz BAND 68

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8.4.1. 26 dB BANDWIDTH 68
8.4.2. 99% BANDWIDTH 70
8.4.3. AVERAGE POWER 72
8.4.4. OUTPUT POWER AND PPSD 73

8.5. 11n HT40 LAT 3 SISO MODE IN THE 5.2GHz BAND 76
8.5.1. 26 dB BANDWIDTH 76
8.5.2. 99% BANDWIDTH 78
8.5.3. AVERAGE POWER 80
8.5.4. OUTPUT POWER AND PPSD 81

8.6. 11n HT40 2TX CDD MIMO MODE IN THE 5.2GHz BAND 84
8.6.1. 26 dB BANDWIDTH 84
8.6.2. 99% BANDWIDTH 87
8.6.3. AVERAGE POWER 90
8.6.4. OUTPUT POWER AND PPSD 91

8.7. 11ac HT80 UAT 2 SISO MODE IN THE 5.2GHz BAND 96
8.7.1. 26 dB BANDWIDTH 96
8.7.2. 99% BANDWIDTH 97
8.7.3. AVERAGE POWER 99
8.7.4. OUTPUT POWER AND PPSD 100

8.8. 11ac HT80 LAT 3 SISO MODE IN THE 5.2GHz BAND 103
8.8.1. 26 dB BANDWIDTH 103
8.8.2. 99% BANDWIDTH 104
8.8.3. AVERAGE POWER 106
8.8.4. OUTPUT POWER AND PPSD 107

8.9. 11ac HT80 2TX CDD MIMO MODE IN THE 5.2GHz BAND 110
8.9.1. 26 dB BANDWIDTH 110
8.9.2. 99% BANDWIDTH 112
8.9.3. AVERAGE POWER 114
8.9.4. OUTPUT POWER AND PPSD 115

8.10. 11n HT20 UAT 2 SISO MODE IN THE 5.3GHz BAND 119
8.10.1. 26 dB BANDWIDTH 119
8.10.2. 99% BANDWIDTH 122
8.10.3. AVERAGE POWER 125
8.10.4. OUTPUT POWER AND PPSD 126

8.11. 11n HT20 LAT 3 SISO MODE IN THE 5.3GHz BAND 130
8.11.1. 26 dB BANDWIDTH 130
8.11.2. 99% BANDWIDTH 133
8.11.3. AVERAGE POWER 136
8.11.4. OUTPUT POWER AND PPSD 137

8.12. 11n HT20 2TX CDD MIMO MODE IN THE 5.3GHz BAND 141
8.12.1. 26 dB BANDWIDTH 141
8.12.2. 99% BANDWIDTH 145
8.12.3. AVERAGE POWER 149
8.12.4. OUTPUT POWER AND PPSD 150

8.13. 11n HT40 UAT 2 SISO MODE IN THE 5.3GHz BAND 155
8.13.1. 26 dB BANDWIDTH 155
8.13.2. 99% BANDWIDTH 157
8.13.3. AVERAGE POWER 159
8.13.4. OUTPUT POWER AND PPSD 160

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8.14. 11n HT40 LAT 3 SISO MODE IN THE 5.3GHz BAND 163
8.14.1. 26 dB BANDWIDTH 163
8.14.2. 99% BANDWIDTH 165
8.14.3. AVERAGE POWER 167
8.14.4. OUTPUT POWER AND PPSD 168

8.15. 11n HT40 2TX CDD MIMO MODE IN THE 5.3GHz BAND 171
8.15.1. 26 dB BANDWIDTH 171
8.15.2. 99% BANDWIDTH 174
8.15.3. AVERAGE POWER 177
8.15.4. OUTPUT POWER AND PPSD 178

8.16. 11ac HT80 UAT 2 SISO MODE IN THE 5.3GHz BAND 182
8.16.1. 26 dB BANDWIDTH 182
8.16.2. 99% BANDWIDTH 184
8.16.3. AVERAGE POWER 186
8.16.4. OUTPUT POWER AND PPSD 187

8.17. 11ac HT80 LAT 3 SISO MODE IN THE 5.3GHz BAND 190
8.17.1. 26 dB BANDWIDTH 190
8.17.2. 99% BANDWIDTH 192
8.17.3. AVERAGE POWER 194
8.17.4. OUTPUT POWER AND PPSD 195

8.18. 11ac HT80 2TX CDD MIMO MODE IN THE 5.3GHz BAND 198
8.18.1. 26 dB BANDWIDTH 198
8.18.2. 99% BANDWIDTH 200
8.18.3. AVERAGE POWER 202
8.18.4. OUTPUT POWER AND PPSD 203

8.19. 11n HT20 UAT 2 SISO MODE IN THE 5.6GHz BAND 206
8.19.1. 26 dB BANDWIDTH 206
8.19.2. 99% BANDWIDTH 210
8.19.3. AVERAGE POWER 214
8.19.4. OUTPUT POWER AND PPSD 215

8.20. 11ac HT20 UAT 2 SISO STRADDLE CHANNEL 144 220
8.20.1. OUTPUT POWER AND PPSD 220
8.20.2. 6 dB BANDWIDTH 224

8.21. 1n HT20 LAT 3 SISO MODE IN THE 5.6GHz BAND 225
8.21.1. 26 dB BANDWIDTH 225
8.21.2. 99% BANDWIDTH 229
8.21.3. AVERAGE POWER 233
8.21.4. OUTPUT POWER AND PPSD 234

8.22. 11ac HT20 LAT 3 SISO STRADDLE CHANNEL 144 239
8.22.1. OUTPUT POWER AND PPSD 239
8.22.2. 6 dB BANDWIDTH 243

8.23. 11n HT20 2TX CDD MIMO MODE IN THE 5.6GHz BAND 244
8.23.1. 26 dB BANDWIDTH 244
8.23.2. 99% BANDWIDTH 251
8.23.3. AVERAGE POWER 258
8.23.4. OUTPUT POWER AND PPSD 259

8.24. 11ac HT20 2TX CDD MIMO STRADDLE CHANNEL 144 266
8.24.1. OUTPUT POWER AND PPSD 266

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8.24.2. 6 dB BANDWIDTH 272

8.25. 11n HT40 UAT 2 SISO MODE IN THE 5.6GHz BAND 274
8.25.1. 26 dB BANDWIDTH 274
8.25.2. 99% BANDWIDTH 278
8.25.3. AVERAGE POWER 282
8.25.4. OUTPUT POWER AND PPSD 283

8.26. 11ac HT40 UAT 2 SISO STRADDLE CHANNEL 142 288
8.26.1. OUTPUT POWER AND PPSD 288
8.26.2. 6 dB BANDWIDTH 291

8.27. 11n HT40 LAT 3 SISO MODE IN THE 5.6GHz BAND 292
8.27.1. 26 dB BANDWIDTH 292
8.27.2. 99% BANDWIDTH 296
8.27.3. AVERAGE POWER 300
8.27.4. OUTPUT POWER AND PPSD 301

8.28. 11ac HT40 LAT 3 SISO STRADDLE CHANNEL 142 306
8.28.1. OUTPUT POWER AND PPSD 306
8.28.2. 6 dB BANDWIDTH 310

8.29. 11n HT40 2TX CDD MIMO MODE IN THE 5.6GHz BAND 311
8.29.1. 26 dB BANDWIDTH 311
8.29.2. 99% BANDWIDTH 318
8.29.3. AVERAGE POWER 325
8.29.4. OUTPUT POWER AND PPSD 326

8.30. 11ac HT40 2TX CDD MIMO STRADDLE CHANNEL 142 334
8.30.1. OUTPUT POWER AND PSD 334
8.30.2. 6 dB BBANDWIDTH 340

8.31. 11ac HT80 UAT 2 SISO MODE IN THE 5.6GHz BAND 342
8.31.1. 26 dB BANDWIDTH 342
8.31.2. 99% BANDWIDTH 345
8.31.3. AVERAGE POWER 348
8.31.4. OUTPUT POWER AND PPSD 349
8.31.5. STRADDLE CHANNEL 138 RESULTS 352
8.31.6. 6 dB BANDWIDTH 356

8.32. 11ac HT80 LAT 3 SISO MODE IN THE 5.6GHz BAND 357
8.32.1. 26 dB BANDWIDTH 357
8.32.2. 99% BANDWIDTH 360
8.32.3. AVERAGE POWER 363
8.32.4. OUTPUT POWER AND PPSD 364
8.32.5. STRADDLE CHANNEL 138 RESULTS 367
8.32.6. 6 dB BANDWIDTH 371

8.33. 11ac HT80 2TX CDD MIMO MODE IN THE 5.6GHz BAND 372
8.33.1. 26 dB BANDWIDTH 372
8.33.2. 99% BANDWIDTH 376
8.33.3. AVERAGE POWER 380
8.33.4. OUTPUT POWER AND PPSD 381
8.33.5. STRADDLE CHANNEL 138 RESULTS 386
8.33.6. 6 dB BANDWIDTH 392

8.34. 11n HT20 UAT 2 SISO MODE IN THE 5.8GHz BAND 394
8.34.1. 6 dB BANDWIDTH 394

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8.34.2. 26 dB BANDWIDTH ... 397
8.34.3. 99% BANDWIDTH ... 400
8.34.4. AVERAGE POWER ... 403
8.34.5. OUTPUT POWER ... 404
8.34.6. POWER SPECTRAL DENSITY ... 406

8.35. 11n HT20 LAT 3 SISO MODE IN THE 5.8GHz BAND ... 410
8.35.1. 6 dB BANDWIDTH ... 410
8.35.2. 26 dB BANDWIDTH ... 413
8.35.3. 99% BANDWIDTH ... 416
8.35.4. AVERAGE POWER ... 419
8.35.5. OUTPUT POWER ... 420
8.35.6. POWER SPECTRAL DENSITY ... 422

8.36. 11n HT20 2TX CDD MIMO MODE IN THE 5.8GHz BAND ... 426
8.36.1. 6 dB BANDWIDTH ... 426
8.36.2. 26 dB BANDWIDTH ... 430
8.36.3. 99% BANDWIDTH ... 434
8.36.4. AVERAGE POWER ... 438
8.36.5. OUTPUT POWER ... 439
8.36.6. POWER SPECTRAL DENSITY ... 441

8.37. 11n HT40 UAT 2 SISO MODE IN THE 5.8GHz BAND ... 446
8.37.1. 6 dB BANDWIDTH ... 446
8.37.2. 26 dB BANDWIDTH ... 448
8.37.3. 99% BANDWIDTH ... 450
8.37.4. AVERAGE POWER ... 452
8.37.5. OUTPUT POWER ... 453
8.37.6. POWER SPECTRAL DENSITY ... 455

8.38. 11n HT40 LAT 3 SISO MODE IN THE 5.8GHz BAND ... 458
8.38.1. 6 dB BANDWIDTH ... 458
8.38.2. 26 dB BANDWIDTH ... 460
8.38.3. 99% BANDWIDTH ... 462
8.38.4. AVERAGE POWER ... 464
8.38.5. OUTPUT POWER ... 465
8.38.6. POWER SPECTRAL DENSITY ... 467

8.39. 11n HT40 2TX CDD MIMO MODE IN THE 5.8GHz BAND ... 470
8.39.1. 6 dB BANDWIDTH ... 470
8.39.2. 26 dB BANDWIDTH ... 473
8.39.3. 99% BANDWIDTH ... 476
8.39.4. AVERAGE POWER ... 479
8.39.5. OUTPUT POWER ... 480
8.39.6. POWER SPECTRAL DENSITY ... 482

8.40. 11ac HT80 UAT 2 SISO MODE IN THE 5.8GHz BAND ... 486
8.40.1. 6 dB BANDWIDTH ... 486
8.40.2. 26 dB BANDWIDTH ... 488
8.40.3. 99% BANDWIDTH ... 490
8.40.4. AVERAGE POWER ... 492
8.40.5. OUTPUT POWER ... 493
8.40.6. POWER SPECTRAL DENSITY ... 495

8.41. 11ac HT80 LAT 3 SISO MODE IN THE 5.8GHz BAND ... 498
8.41.1. 6 dB BANDWIDTH ... 498
8.41.2. 26 dB BANDWIDTH ... 500

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8.41.3. 99% BANDWIDTH ... 502
8.41.4. AVERAGE POWER ... 504
8.41.5. OUTPUT POWER ... 505
8.41.6. POWER SPECTRAL DENSITY ... 507

8.42. 11ac HT80 2TX CDD MIMO MODE IN THE 5.8GHz BAND ... 510
8.42.1. 6 dB BANDWIDTH ... 510
8.42.2. 26 dB BANDWIDTH ... 512
8.42.3. 99% BANDWIDTH ... 514
8.42.4. AVERAGE POWER ... 516
8.42.5. OUTPUT POWER ... 517
8.42.6. POWER SPECTRAL DENSITY ... 519

9. RADIATED TEST RESULTS ... 522

9.1. LIMITS AND PROCEDURE ... 522
9.1.1. 11n HT20 UAT 2 SISO MODE IN THE 5.2GHz BAND ... 523
9.1.2. 11n HT20 LAT 3 SISO MODE IN THE 5.2GHz BAND ... 525
9.1.3. 11n HT20 2TX CDD MIMO MODE IN THE 5.2GHz BAND ... 527
9.1.4. 11n HT40 UAT 2 SISO MODE IN THE 5.2GHz BAND ... 535
9.1.5. 11n HT40 LAT 3 SISO MODE IN THE 5.2GHz BAND ... 537
9.1.6. 11n HT40 2TX CDD MIMO MODE IN THE 5.2GHz BAND ... 539
9.1.7. 11ac HT80 UAT 2 SISO MODE IN THE 5.2GHz BAND ... 545
9.1.8. 11ac HT80 LAT 3 SISO MODE IN THE 5.2GHz BAND ... 547
9.1.9. 11ac HT80 2TX CDD MIMO MODE IN THE 5.2GHz BAND ... 549
9.1.10. 11n HT20 UAT 2 SISO MODE IN THE 5.3GHz BAND ... 553
9.1.11. 11n HT20 LAT 3 SISO MODE IN THE 5.3GHz BAND ... 555
9.1.12. 11n HT20 2TX CDD MIMO MODE IN THE 5.3GHz BAND ... 557
9.1.13. 11n HT40 UAT 2 SISO MODE IN THE 5.3GHz BAND ... 565
9.1.14. 11n HT40 LAT 3 SISO MODE IN THE 5.3GHz BAND ... 567
9.1.15. 11n HT40 2TX CDD MIMO MODE IN THE 5.3GHz BAND ... 569
9.1.16. 11ac HT80 UAT 2 SISO MODE IN THE 5.3GHz BAND ... 575
9.1.17. 11ac HT80 LAT 3 SISO MODE IN THE 5.3GHz BAND ... 577
9.1.18. 11ac HT80 2TX CDD MIMO MODE IN THE 5.3GHz BAND ... 579
9.1.19. 11n HT20 UAT 2 SISO MODE IN THE 5.6GHz BAND ... 583
9.1.20. 11n HT20 LAT 3 SISO MODE IN THE 5.6GHz BAND ... 588
9.1.21. 11n HT20 2TX CDD MIMO MODE IN THE 5.6GHz BAND ... 592
9.1.22. 11n HT20 2TX CDD MIMO STRADDLE CHANNEL 144 ... 606
9.1.23. 11ac HT20 2TX CDD MIMO STRADDLE CHANNEL 144 ... 608
9.1.24. 11n HT40 UAT 2 SISO MODE IN THE 5.6GHz BAND ... 610
9.1.25. 11n HT40 LAT 3 SISO MODE IN THE 5.6GHz ... 614
9.1.26. 11ac HT40 LAT 3 SISO STRADDLE CHANNEL 142 ... 618
9.1.27. 11n HT40 2TX CDD MIMO MODE IN THE 5.6GHz BAND ... 620
9.1.28. 11ac HT40 2TX CDD MIMO STRADDLE CHANNEL 142 ... 630
9.1.29. 11ac HT80 UAT 2 SISO MODE IN THE 5.6GHz BAND ... 632
9.1.30. 11ac HT80 LAT 3 SISO MODE IN THE 5.6GHz BAND ... 634
9.1.31. 11ac HT80 2TX CDD MIMO MODE IN THE 5.6GHz BAND ... 636
9.1.32. 11ac HT80 2TX CDD MIMO STRADDLE CHANNEL 138 ... 642
9.1.33. 11n HT20 UAT 2 SISO MODE IN THE 5.8GHz BAND ... 644
9.1.34. 11n HT20 LAT 3 SISO MODE IN THE 5.8GHz BAND ... 648
9.1.35. 11n HT20 2TX CDD MIMO MODE IN THE 5.8GHz BAND ... 652
9.1.36. 11n HT40 UAT 2 SISO MODE IN THE 5.8GHz BAND ... 662
9.1.37. 11n HT40 LAT 3 SISO MODE IN THE 5.8GHz BAND ... 666
9.1.38. 11n HT40 2TX CDD MIMO MODE IN THE 5.8GHz BAND ... 670

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9.1.39. 11ac HT80 UAT 2 SISO MODE IN THE 5.8GHz BAND 678
9.1.40. 11ac HT80 LAT 3 SISO MODE IN THE 5.8GHz BAND 682
9.1.41. 5.6GHz band HT411ac HT80 2TX CDD MIMO MODE IN THE 5.8GHz BAND 686

9.2. WORST-CASE BELOW 1 GHz 692

9.3. WORST-CASE 18 to 26 GHz 694

9.4. WORST-CASE 26 to 40 GHz 696

10. AC POWER LINE CONDUCTED EMISSIONS 698

10.1. EUT POWERED BY AC/DC ADAPTER VIA USB CABLE 699

10.2. EUT POWERED BY HOST PC VIA USB CABLE 701

11. DYNAMIC FREQUENCY SELECTION 703

11.1. OVERVIEW 703
11.1.1. LIMITS 703
11.1.2. TEST AND MEASUREMENT SYSTEM 707
11.1.3. TEST ROOM ENVIRONMENT 709
11.1.4. TEST AND MEASUREMENT SOFTWARE 709
11.1.5. SETUP OF EUT (CLIENT MODE) 710
11.1.6. SETUP OF EUT (CLIENT-TO-CLIENT COMMUNICATIONS MODE) 711
11.1.7. SETUP OF EUT (PEER TO PEER MODE) 712
11.1.8. DESCRIPTION OF EUT 714

11.2. CLIENT MODE RESULTS FOR 20 MHz BANDWIDTH 716
11.2.1. TEST CHANNEL 716
11.2.2. RADAR WAVEFORM AND TRAFFIC 716
11.2.3. OVERLAPPING CHANNEL TESTS 719
11.2.4. MOVE AND CLOSING TIME 719

11.3. CLIENT MODE RESULTS FOR 40 MHz BANDWIDTH 723
11.3.1. TEST CHANNEL 723
11.3.2. RADAR WAVEFORM AND TRAFFIC 723
11.3.3. OVERLAPPING CHANNEL TESTS 726
11.3.4. MOVE AND CLOSING TIME 726

11.4. CLIENT MODE RESULTS FOR 80 MHz BANDWIDTH 730
11.4.1. TEST CHANNEL 730
11.4.2. RADAR WAVEFORM AND TRAFFIC 730
11.4.3. OVERLAPPING CHANNEL TESTS 733
11.4.4. MOVE AND CLOSING TIME 733
11.4.5. 30-MINUTE NON-OCCUPANCY PERIOD 737

11.5. CLIENT-TO-CLIENT COMMUNICATIONS MODE RESULTS FOR 20 MHz BANDWIDTH 738
11.5.1. TEST CHANNEL 738
11.5.2. RADAR WAVEFORM AND TRAFFIC 738
11.5.3. OVERLAPPING CHANNEL TESTS 741
11.5.4. MOVE AND CLOSING TIME 741

11.6. CLIENT-TO-CLIENT COMMUNICATIONS MODE RESULTS FOR 40 MHz BANDWIDTH 745
11.6.1. TEST CHANNEL 745
11.6.2. RADAR WAVEFORM AND TRAFFIC 745
11.6.3. OVERLAPPING CHANNEL TESTS 748

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11.6.4. MOVE AND CLOSING TIME 748

11.7. CLIENT-TO-CLIENT COMMUNICATIONS MODE RESULTS FOR 80 MHz BANDWIDTH *752*
11.7.1. TEST CHANNEL 752
11.7.2. RADAR WAVEFORM AND TRAFFIC 752
11.7.3. OVERLAPPING CHANNEL TESTS 755
11.7.4. MOVE AND CLOSING TIME 755
11.7.5. 30-MINUTE NON-OCCUPANCY PERIOD 759

11.8. PEER TO PEER MODE EUT RESULTS FOR 20 MHz BANDWIDTH *760*
11.8.1. TEST CHANNEL 760
11.8.2. RADAR WAVEFORM AND TRAFFIC 760
11.8.3. OVERLAPPING CHANNEL TESTS 763
11.8.4. MOVE AND CLOSING TIME 763

11.9. PEER TO PEER MODE EUT RESULTS FOR 40 MHz BANDWIDTH *767*
11.9.1. TEST CHANNEL 767
11.9.2. RADAR WAVEFORM AND TRAFFIC 767
11.9.3. OVERLAPPING CHANNEL TESTS 770
11.9.4. MOVE AND CLOSING TIME 770

11.10. PEER TO PEER MODE EUT RESULTS FOR 80 MHz BANDWIDTH *774*
11.10.1. TEST CHANNEL 774
11.10.2. RADAR WAVEFORM AND TRAFFIC 774
11.10.3. OVERLAPPING CHANNEL TESTS 777
11.10.4. MOVE AND CLOSING TIME 777
11.10.5. 30-MINUTE NON-OCCUPANCY PERIOD 781

11.11. PEER TO PEER MODE PEER DEVICE RESULTS FOR 20 MHz BANDWIDTH *782*
11.11.1. TEST CHANNEL 782
11.11.2. RADAR WAVEFORM AND TRAFFIC 782
11.11.3. OVERLAPPING CHANNEL TESTS 785
11.11.4. MOVE AND CLOSING TIME 785

11.12. PEER TO PEER MODE PEER DEVICE RESULTS FOR 40 MHz BANDWIDTH *789*
11.12.1. TEST CHANNEL 789
11.12.2. RADAR WAVEFORM AND TRAFFIC 789
11.12.3. OVERLAPPING CHANNEL TESTS 792
11.12.4. MOVE AND CLOSING TIME 792

11.13. PEER TO PEER MODE PEER DEVICE RESULTS FOR 80 MHz BANDWIDTH *796*
11.13.1. TEST CHANNEL 796
11.13.2. RADAR WAVEFORM AND TRAFFIC 796
11.13.3. OVERLAPPING CHANNEL TESTS 799
11.13.4. MOVE AND CLOSING TIME 799
11.13.5. 30-MINUTE NON-OCCUPANCY PERIOD 803

12. SETUP PHOTOS 804

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: APPLE, INC.
1 INFINITE LOOP
CUPERTINO, CA 95014, U.S.A.

EUT DESCRIPTION: SMARTPHONE

MODEL: A1897

SERIAL NUMBER: C39TQ009J6L8; DFS(C39TJ00YJ30J)

DATE TESTED: MARCH 05, 2017 – JULY 17, 2017

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

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

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL 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 any government.

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2. TEST METHODOLOGY

FCC: 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/ D07 v02, FCC KDB 789033 D02 v01r04, FCC KDB 644545 D03 v01, ANSI C63.10-2013.
The tests documented in this report were performed in accordance with the DFS portion of FCC CFR 47 Part 2, FCC CFR 47 Part 15, FCC 06-96, FCC KDB 789033, KDB 905462 D02 and D03 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, 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
☐ Chamber A (IC:2324B-1)	☐ Chamber D (IC: 22541-1)
☐ Chamber B (IC:2324B-2)	☐ Chamber E (IC: 22541-2)
☐ Chamber C (IC:2324B-3)	☒ Chamber F (IC: 22541-3)
	☐ Chamber G (IC: 22541-4)
	☒ Chamber H (IC: 22541-5)

The above test sites and facilities are covered under FCC Test Firm Registration # 208313.

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://ts.nist.gov/standards/scopes/2000650.htm.

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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

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

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:
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
Occupied Channel Bandwidth	±0.39 %
Time	±0.02 %

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

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5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The Equipment Under Test is a mobile phone with GSM, GPRS, EGPRS, UMTS, LTE and TD-SCDMA technologies. It also supports IEEE 802.11a/b/g/n/ac, Bluetooth®, GPS and NFC. The device has a built-in inductive charging receiver which is not user accessible. The rechargeable battery is not user accessible.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power as follows:

NOTE: Covered modes are test reduction modes. The output powers on the “covered modes are equal to or less than the mode referenced and use the same modulation.

5.2GHz Band

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5180 - 5240	802.11a	Covered by 802.11n HT20 SISO	
	802.11n HT20 SISO	20.88	122.46
	80.11n HT20 STBC/SDM 1TX, 802.11ac VHT20 STBC/SDM 1TX	Covered by 802.11n HT20 SISO	
	802.11n HT20 CDD 2TX	20.88	122.46
	80.11n HT20 STBC/SDM 2TX, 802.11ac VHT20 STBC/SDM 2TX	Covered by 802.11n HT20 2TX CDD	
5190 - 5230	802.11n HT40 SISO	18.42	69.50
	80.11n HT40 STBC/SDM 1TX, 802.11ac VHT40 STBC/SDM 1TX	Covered by 802.11n HT20 SISO	
	802.11n HT40 CDD 2TX	21.42	138.68
	80.11n HT40 STBC/SDM 2TX, 802.11ac VHT40 STBC/SDM 2TX	Covered by 802.11n HT40 2TX CDD	
5210	802.11ac VHT80 SISO	14.88	30.76
	802.11ac VHT80 STBC/SDM 1TX	Covered by 802.11ac VHT80 SISO	
	802.11ac VHT80 CDD 2TX	16.43	43.95
	802.11ac VHT80 STBC/SDM 2TX	Covered by 802.11ac VHT80 2TX CDD	

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5.3GHz Band

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5260 - 5320	802.11a	Covered by 802.11n HT20 SISO	
	802.11n HT20 SISO	20.95	124.45
	80.11n HT20 STBC/SDM 1TX, 802.11ac VHT20 STBC/SDM 1TX	Covered by 802.11n HT20 SISO	
	802.11n HT20 CDD 2TX	20.72	118.03
	80.11n HT20 STBC/SDM 2TX, 802.11ac VHT20 STBC/SDM 2TX	Covered by 802.11n HT20 2TX CDD	
5270 - 5310	802.11n HT40 SISO	18.47	70.31
	80.11n HT40 STBC/SDM 1TX, 802.11ac VHT40 STBC/SDM 1TX	Covered by 802.11n HT40 SISO	
	802.11n HT40 CDD 2TX	21.42	138.68
	80.11n HT40 STBC/SDM 2TX, 802.11ac VHT40 STBC/SDM 2TX	Covered by 802.11n HT40 2TX CDD	
5290	802.11ac VHT80 SISO	14.93	31.12
	80.11ac VHT80 STBC/SDM 1TX	Covered by 802.11ac VHT80 SISO	
	802.11ac VHT80 CDD 2TX	17.41	55.08
	80.11ac VHT80 STBC/SDM 2TX	Covered by 802.11ac HT80 2TX CDD	

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5.6GHz Band

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5500 - 5700	802.11a	Covered by 802.11n HT20 SISO	
5500 - 5700	802.11n HT20 SISO	20.93	123.88
	802.11n HT20 STBC/SDM 1TX	Covered by 802.11n HT20 SISO	
5720	802.11ac VHT20 SISO (based on UNII-2C band output power)	19.75	94.41
	802.11ac VHT20 STBC/SDM 1TX	Covered by 802.11ac VHT20 SISO	
5500 - 5700	802.11n HT20 CDD 2TX	20.91	123.31
	802.11n HT20 STBC/SDM 2TX, 802.11ac VHT20 STBC/SDM 2TX	Covered by 802.11n HT20 CDD 2TX	
5720	802.11ac VHT20 CDD 2TX (based on UNII-2C band output power)	19.77	94.84
	802.11ac VHT20 STBC SISO/2TX (based on UNII-2C band output power)	Covered by 802.11n HT20 2TX CDD	
5510 - 5670	802.11n HT40 SISO	19.44	87.90
	802.11n HT40 STBC/SDM 1TX	Covered by 802.11n HT40 SISO	
5710	802.11ac VHT40 SISO (based on UNII-2C band output power)	18.94	78.34
	802.11ac VHT40 STBC/SDM 1TX	Covered by 802.11ac VHT40 SISO	
5510 - 5670	802.11n HT40 CDD 2TX	22.42	174.58
	802.11n HT40 STBC/SDM 2TX, 802.11ac VHT40 STBC/SDM 2TX	Covered by 802.11n HT40 CDD 2TX	
5710	802.11ac VHT40 CDD 2TX (based on UNII-2C band output power)	21.82	152.05
	802.11ac VHT40 STBC/SDM 2TX	Covered by 802.11ac VHT40 CDD 2TX	
5530-5610	802.11ac VHT80 SISO	18.88	77.27
	802.11ac VHT80 STBC/SDM 1TX	Covered by 802.11ac VHT80 SISO	
5690	802.11ac VHT80 SISO (based on UNII-2C band output power)	18.82	76.21
	802.11ac VHT80 STBC/SDM 1TX	Covered by 802.11ac VHT80 SISO	
5530-5610	802.11ac VHT80 CDD 2TX	21.90	154.88
	802.11ac VHT80 STBC/SDM 2TX	Covered by 802.11ac VHT80 CDD 2TX	
5690	802.11ac VHT80 CDD 2TX (based on UNII-2C band output power)	21.72	148.59
	802.11ac VHT80 STBC/SDM 2TX	Covered by 802.11ac VHT80 CDD 2TX	

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5.8GHz Band

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5745 - 5825	802.11a	Covered by 802.11n HT20 SISO	
	802.11n HT20 SISO	20.93	123.88
	802.11n HT20 STBC/SDM 1TX, 802.11ac VHT20 STBC/SDM 1TX	Covered by 802.11n HT20 SISO	
	802.11n HT20 CDD 2TX	23.86	243.22
	802.11n HT20 STBC/SDM 2TX, 802.11ac VHT20 STBC/SDM 2TX	Covered by 802.11n HT20 CDD 2TX	
5755 - 5795	802.11n HT40 SISO	19.48	88.72
	802.11n HT40 STBC/SDM 1TX, 802.11ac VHT40 STBC/SDM 1TX	Covered by 802.11n HT40 SISO	
	802.11n HT40 CDD 2TX	22.43	174.98
	802.11n HT40 STBC/SDM 2TX, 802.11ac VHT40 STBC/SDM 2TX	Covered by 802.11n HT40 CDD 2TX	
5775	802.11ac VHT80 SISO	18.94	78.34
	802.11ac VHT80 STBC/SDM 1TX	Covered by 802.11n HT80 SISO	
	802.11ac VHT80 CDD 2TX	20.42	110.15
	802.11ac VHT80 STBC/SDM 2TX	Covered by 802.11ac VHT80 CDD 2TX	

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

Frequency Band (GHz)	Antenna Gain (dBi)	
	UAT 2	LAT 3
5.2	-4.61	-0.98
5.3	-3.74	-1.09
5.5	-0.75	-0.96
5.8	0.68	-0.93

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was version 13.10.452.12

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5.5. WORST-CASE CONFIGURATION AND MODE

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 CDD mode among the CDD/STBC/SDM modes with power setting equal or higher than SISO modes as worst-case scenario.

For SISO modes, there are two transmission antennas. The antenna used in any given time can be either UAT 2 or LAT 3. Both antenna ports have the same power; output power and PSD measurement for SISO modes on both antennas are reported. For MIMO modes, both UAT 2 and LAT 3 used at the same time.

The fundamental of the EUT was investigated in three orthogonal orientations X (Flatbed), Y (Landscape), Z (Portrait), on both UAT 2 and LAT 3 antennas, In addition, the EUT was also investigated with and without AC/DC charger, headphones & laptop. It was determined that (see table below) was worst-case orientation for both antennas without AC/DC charger, headphones, or laptop; therefore, all final radiated testing was performed with EUT only in (see table below) orientation For 1 - 18GHz and 18 – 40GHz. EUT was tested without AC/DC charger and for 30MHz – 1000MHz was tested with AC/DC charger.

All radiated harmonic 1-18GHz emissions on SISO mode, straddle channels are covered by 2TX MIMO mode with power setting equal or higher than SISO among the CDD/STBC/SDM modes.

Frequency Band (GHz)	Mode	Antenna Port	Worst-case Orientation
5.2-5.8	1TX SISO	UAT 2	Y-Landscape
		LAT 3	Y-Landscape
	2TX MIMO	UAT 2 + LAT 3	Y-Landscape

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 VHT20 mode: MCS0
802.11ac VHT40 mode: MCS0
802.11ac VHT80 mode: MCS0

802.11ac VHT20 and VHT40 mode are different from 802.11nHT20 and HT40 only in control messages and have the same power settings.

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.

For simultaneous transmission of multiple channels from the same antenna in the 2.4GHz and 5GHz bands, tests were conducted for various configurations having the highest power. No noticeable new emission was found

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5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop AC/DC adapter	Liteon Technology	PA-1450-BA1	B123	NA
Laptop	Apple	MackBook Air 4	NA	NA
Dongle	N/A	N/A	HDG1409226823	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 (RADAITED BELOW 1 GHZ)

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

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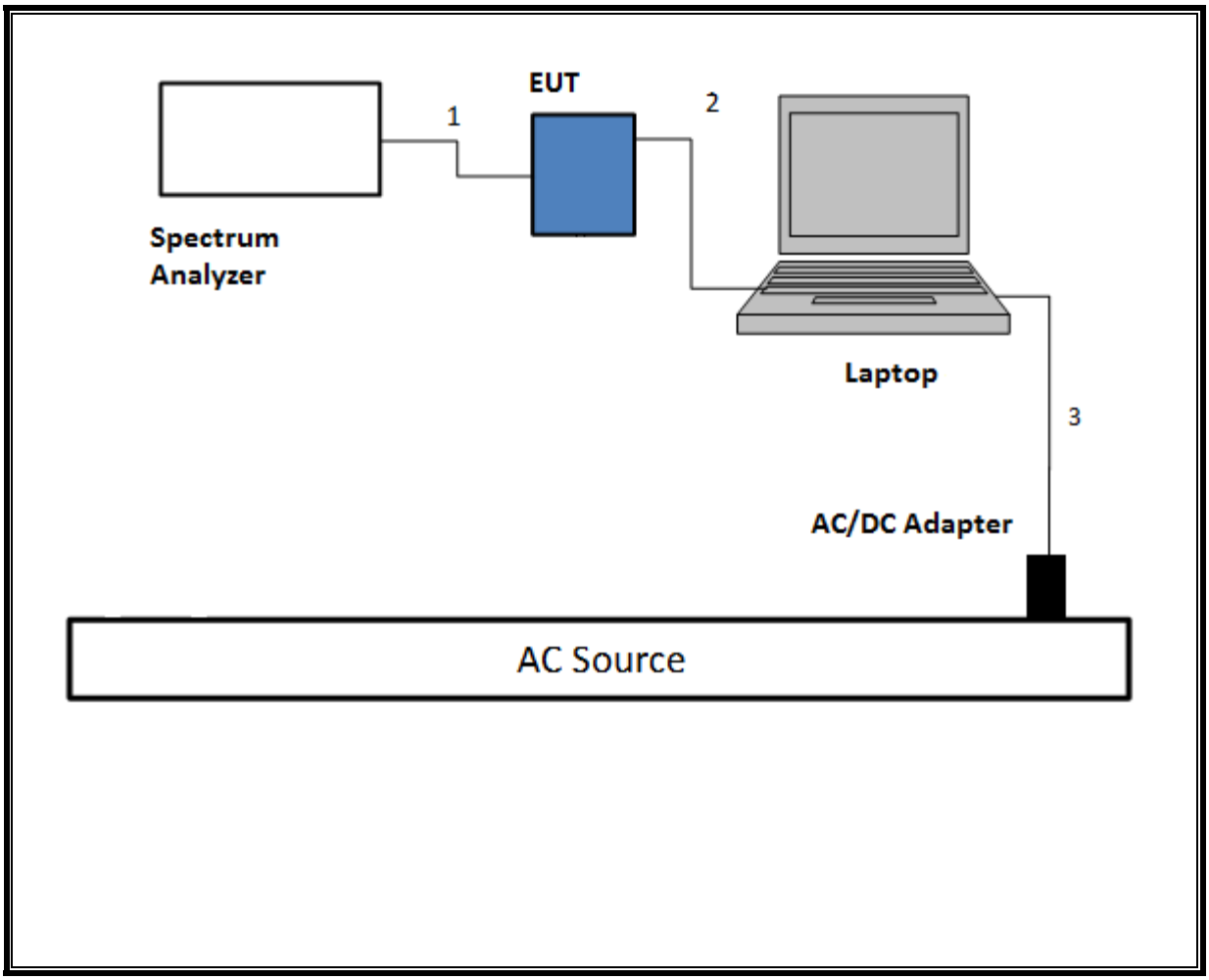
TEST SETUP - CONDUCTED TESTS

The EUT was tested connected to a host Laptop via USB cable adapter and spectrum analyzer to antenna port. Test software exercised the EUT.

SETUP DIAGRAM



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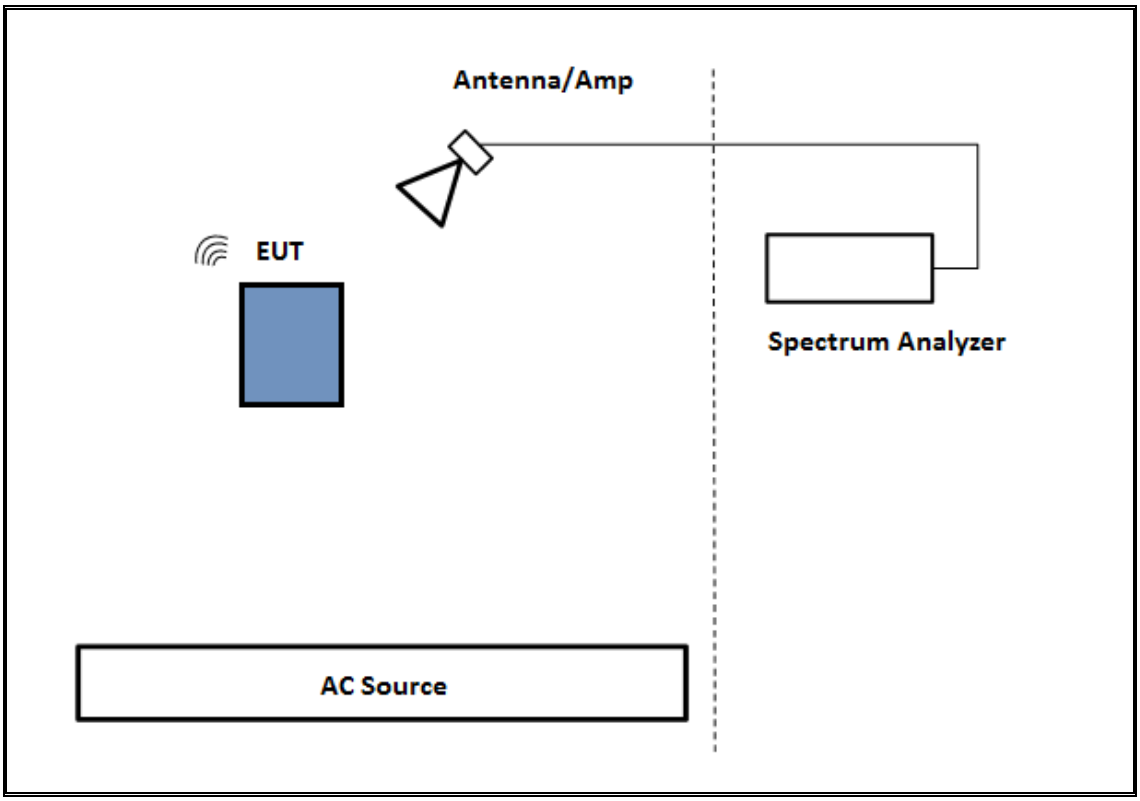
TEST SETUP- RADIATED-ABOVE 1 GHZ

The EUT was tested battery powered. Test software exercised the EUT.

SETUP DIAGRAM



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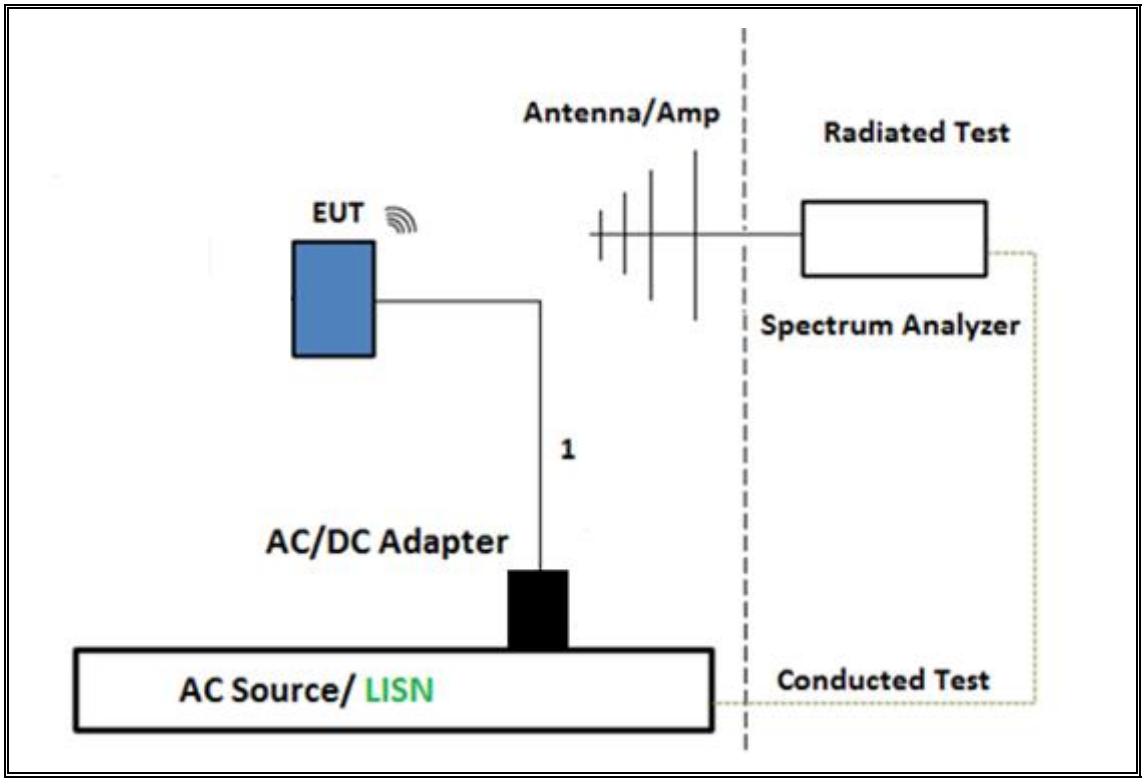
TEST SETUP- BELOW 1GHz

The EUT was tested with earphone connected and powered by AC adapter. Test software exercised the EUT.

SETUP DIAGRAM



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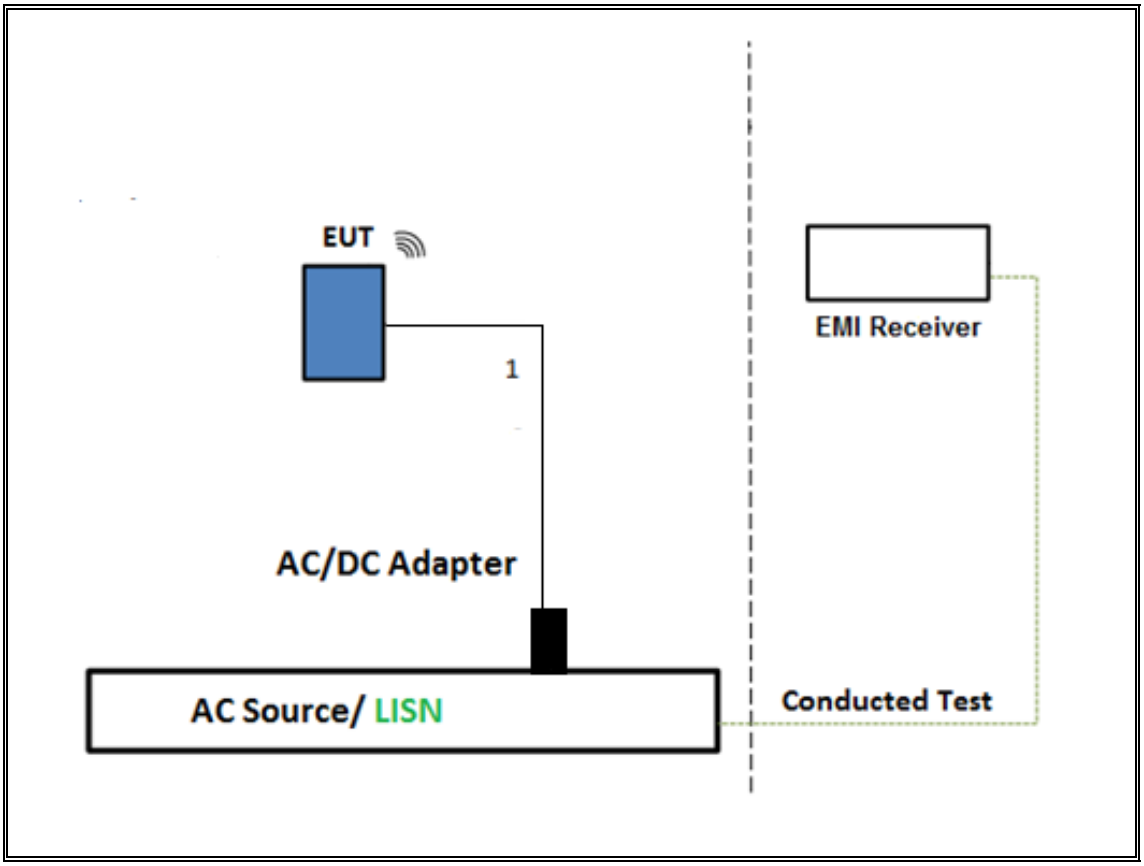
TEST SETUP- AC LINE CONDUCTED: AC/DC ADAPTER

The EUT was connected to AC Charger via USB cable. Test software exercised the EUT.

SETUP DIAGRAM



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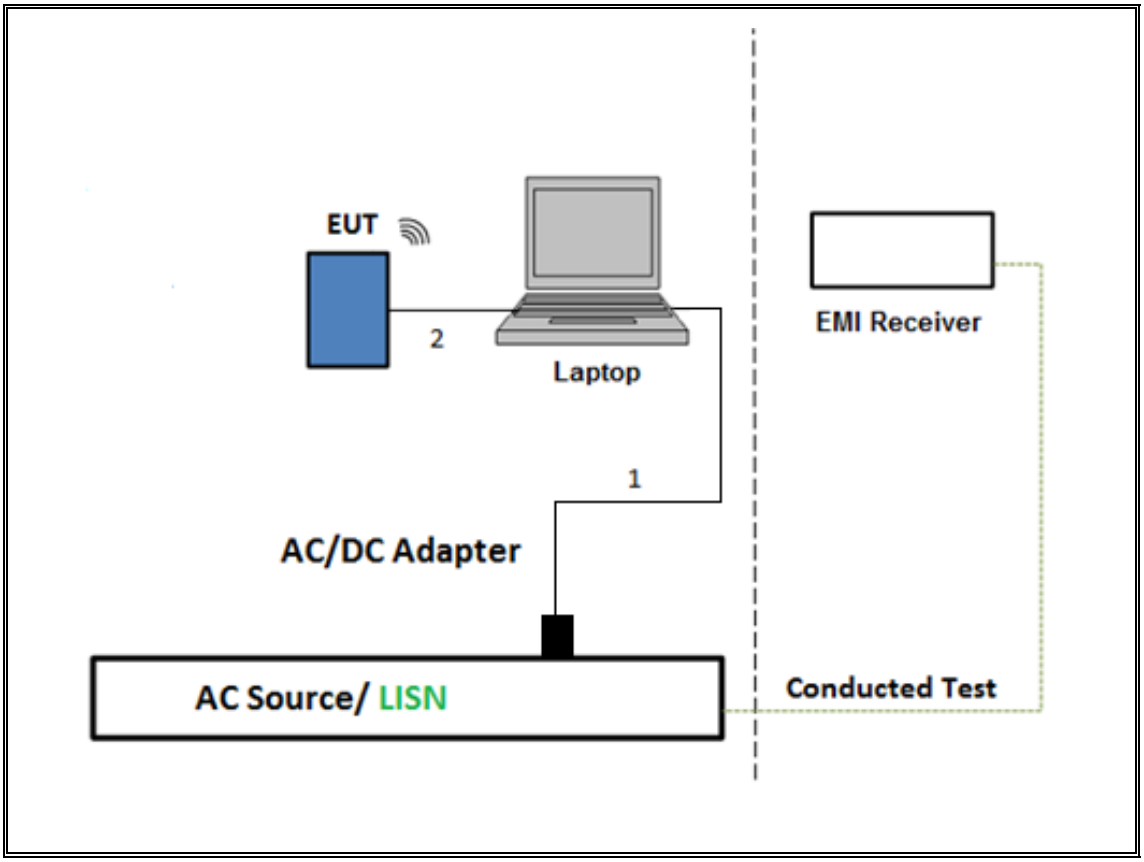
TEST SETUP- AC LINE CONDUCTED: LAPTOP CONFIGURATION

The EUT was tested with earphone connected and powered by host PC via USB cable. Test software exercised the EUT.

SETUP DIAGRAM



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6. TEST AND MEASUREMENT EQUIPMENT

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

TEST EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Asset**	**Cal Due**
Antenna, Horn 1-18GHz	ETS Lindgren	3117	T120	5/4/2018
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences	JB3	T122	1/31/2018
Amplifier, 1 to 18GHz	Miteq	AFS42-00101800-25-S-42	T742	11/29/2017
*Amplifier, 10KHz to 1GHz, 32dB	Sonoma	310N	T173	6/17/2017
Spectrum Analyzer, PXA 3Hz to 44GHz	Keysight	N9030A	T1113	12/20/2017
*Antenna, Horn 1-18GHz	ETS Lindgren	3117	T863	4/26/2017
*Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences	JB3	T900	5/3/2017
Amplifier, 1 to 18GHz, 35dB	Amplical	AMP1G18-35	T1569	9/15/2017
*Amplifier, 10KHz to 1GHz, 32dB	Sonoma	310N	T835	6/18/2017
Antenna, Horn 1-18GHz	ETS Lindgren	3117	T119	3/28/2018
Spectrum Analyzer, PXA 3Hz to 44GHz	Keysight	N9030A	T1613	12/2/2017
Spectrum Analyzer, 40GHz	Agilent	8564E	T106	9/7/2017
*Antenna, Horn 26.5GHz to 40GHz	ARA	MWH-2640/B	T446	05/26/2017
*Amplifier 26-40Ghz	Miteq	NSP 4000 SP2	T88	4/7/2017
*Antenna Horn, 18 to 26GHz	ARA	MWH-1826	T447	6/16/2017
Horn Antenna, 40GHz	ARA	MWH-2640/B	1029	8/19/2017
Power Sensor	Keysight	N1921A	T750	10/1/2017
Power Meter, P-series single channel	Keysight	N1912A	T1245	1/05/2018
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent (Keysight) Technologies	N9030A	T339	09/22/2017
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent (Keysight) Technologies	N9030A	T340	12/14/2017
AC Line Conducted				
EMI Test Receiver 9Khz-7GHz	Rohde & Schwarz	ESCI7	T1436	01/06/2018
*LISN for Conducted Emissions CISPR-16	Fischer	50/250-25-2-01	T1310	06/08/2017
Power Cable, Line Conducted Emissions	UL	PG1	T861	9/1/2017
UL AUTOMATION SOFTWARE				
Radiated Software	UL	UL EMC	Ver 9.5, April 26, 2016	
Conducted Software	UL	UL EMC	Ver 5.4, October 13, 2016	
AC Line Conducted Software	UL	UL EMC	Ver 9.5, May 26, 2015	

NOTE: *testing is completed before equipment calibration expiration date.

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7. ON TIME, DUTY CYCLE AND MEASUREMENT METHODS

7.1. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

PROCEDURE

KDB 789033 Zero-Span Spectrum Analyzer Method.

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 2TX	1.920	1.941	0.989	98.92%	0.00	0.010
802.11n HT40 1TX	0.944	0.966	0.977	97.72%	0.10	1.059
802.11n HT40 CDD 2TX	0.943	0.965	0.978	97.77%	0.10	1.060
802.11ac VHT80 1TX	0.460	0.481	0.956	95.57%	0.20	2.174
802.11ac VHT80 CDD 2TX	0.460	0.481	0.956	95.57%	0.20	2.174

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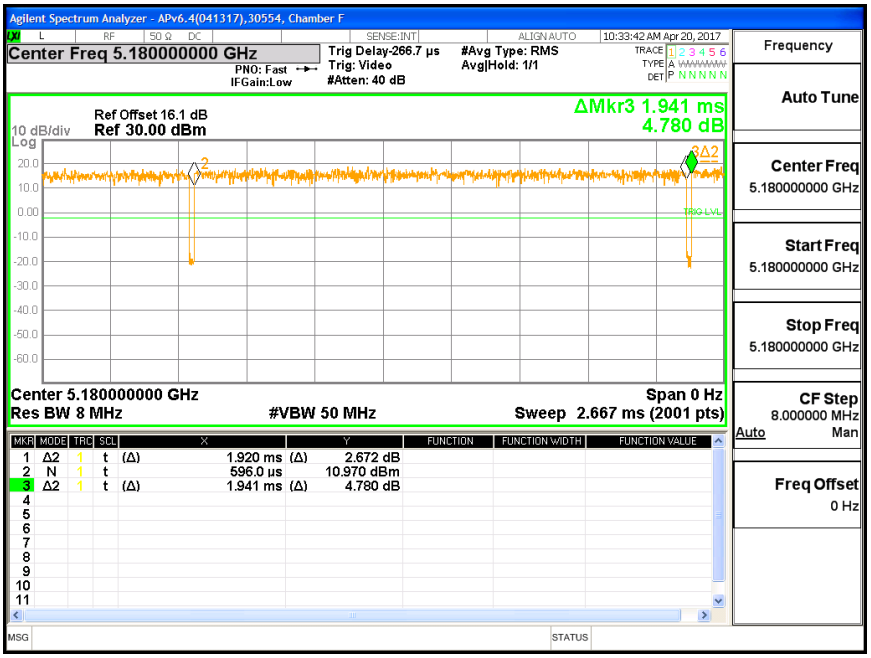
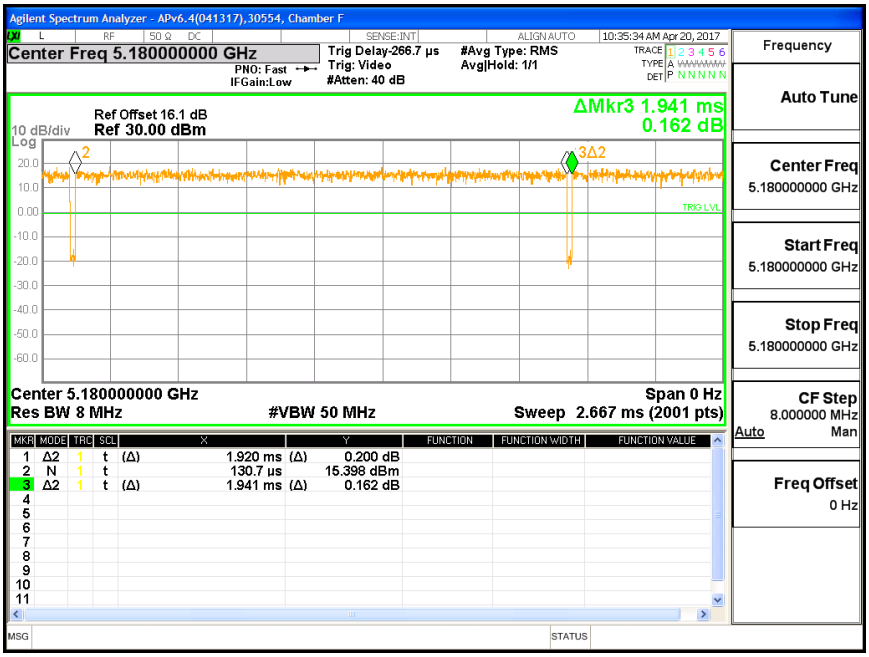
DUTY CYCLE PLOTS

DUTY CYCLE 802.11n HT20 1TX MODE



DUTY CYCLE 802.11n HT20 CDD MODE



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47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
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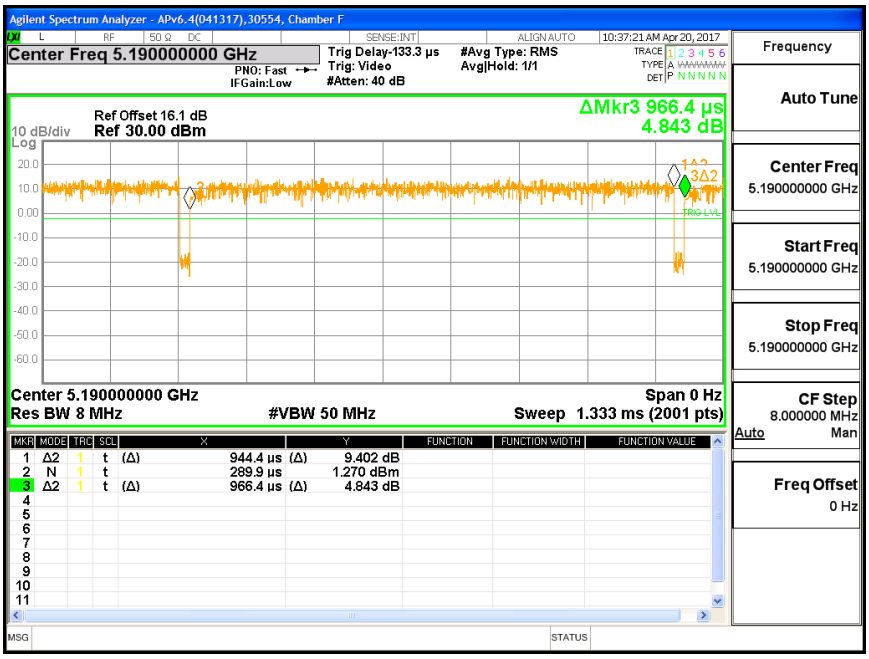
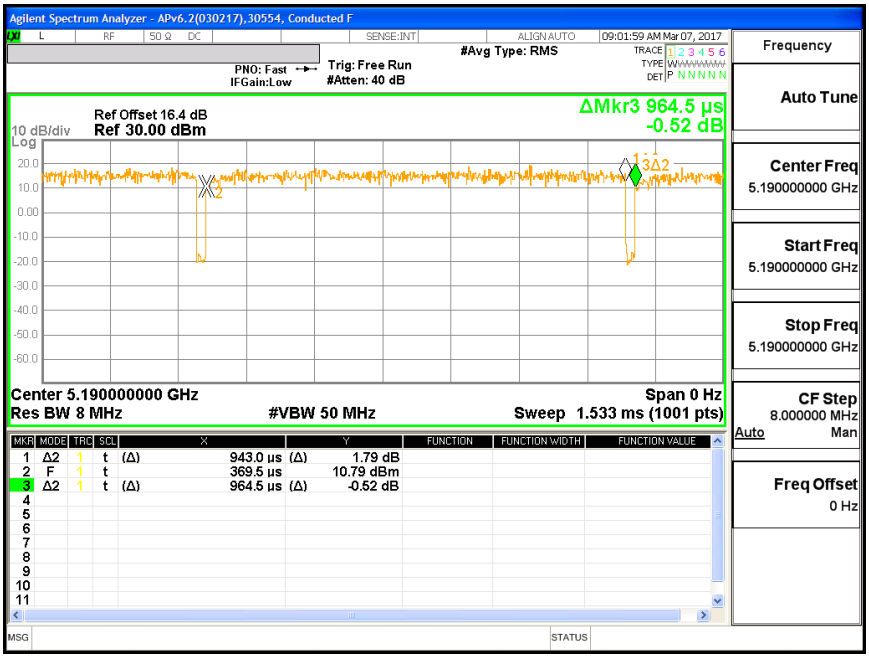
DUTY CYCLE 802.11n HT40 1TX MODE



DUTY CYCLE 802.11n HT40 CDD MODE



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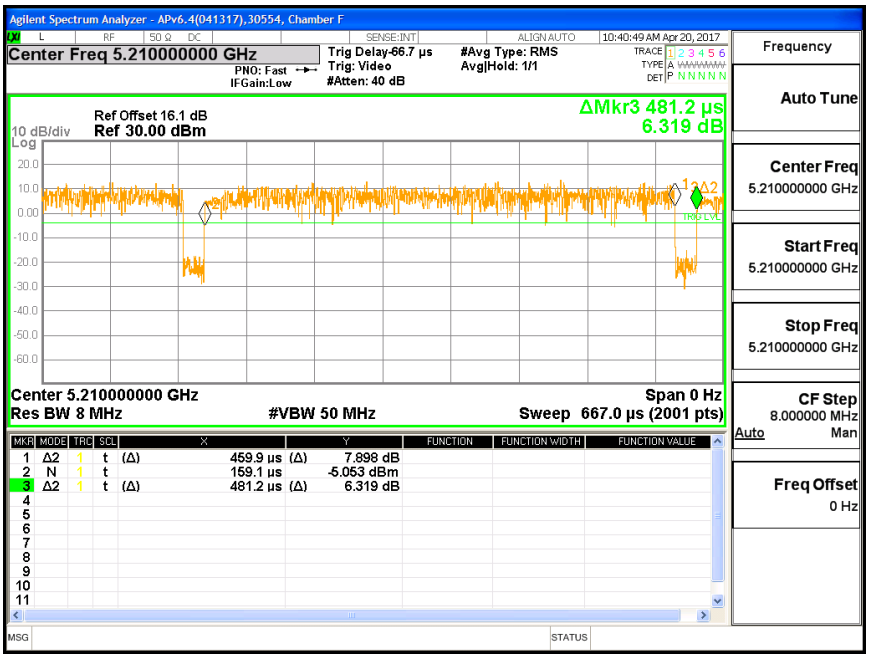
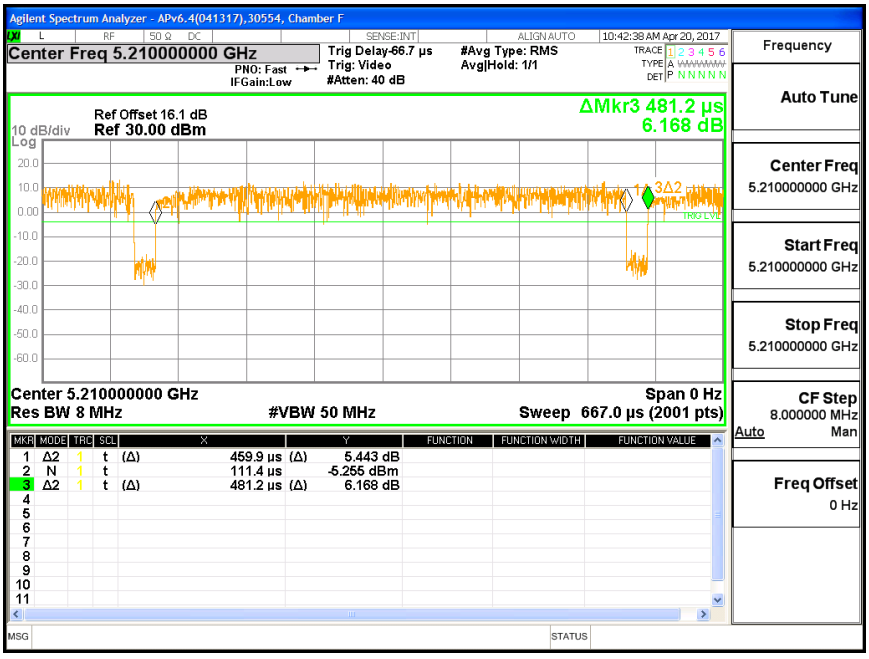
DUTY CYCLE 802.11n HT80 1TX MODE



DUTY CYCLE 802.11n HT80 CDD MODE



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7.2. MEASUREMENT METHODS

6 dB Emission BW: KDB 789033 D02 v01r04, Section C.

26 dB Emission BW: KDB 789033 D02 v01r04, Section C.

99% Occupied BW: KDB 789033 D02 v01r04, Section D.

Conducted Output Power: KDB 789033 D02 v01r04, Section E.3.b (Method PM-G).

Power Spectral Density: KDB 789033 D02 v01r04, Section F (Method SA-2).

Unwanted emissions in restricted bands: KDB 789033 D02 v01r04, Sections G.3, G.4, G.5, and G.6.

Unwanted emissions in non-restricted bands: KDB 789033 D02 v01r04, Sections G.3, G.4, and G.5.

AC Power-line conducted emissions: ANSI C63.10-2013, Section 6.2.

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8. ANTENNA PORT TEST RESULTS

8.1. 11n HT20 UAT 2 SISO MODE IN THE 5.2GHz BAND

8.1.1. 26 dB BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

Channel	Frequency	26 dB BW UAT 2 (MHz)
Low	5180	22.05
Mid	5200	22.00
High	5240	21.95

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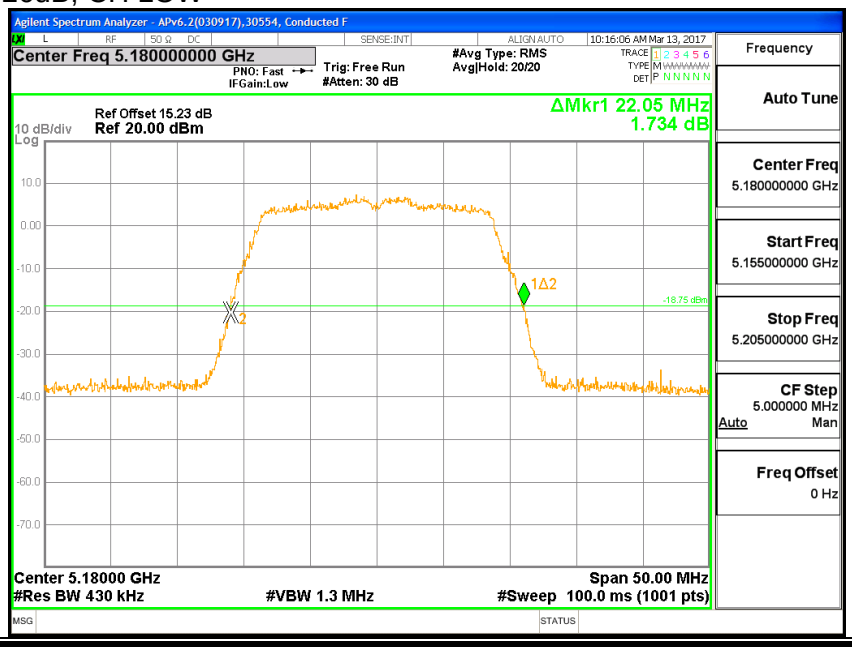
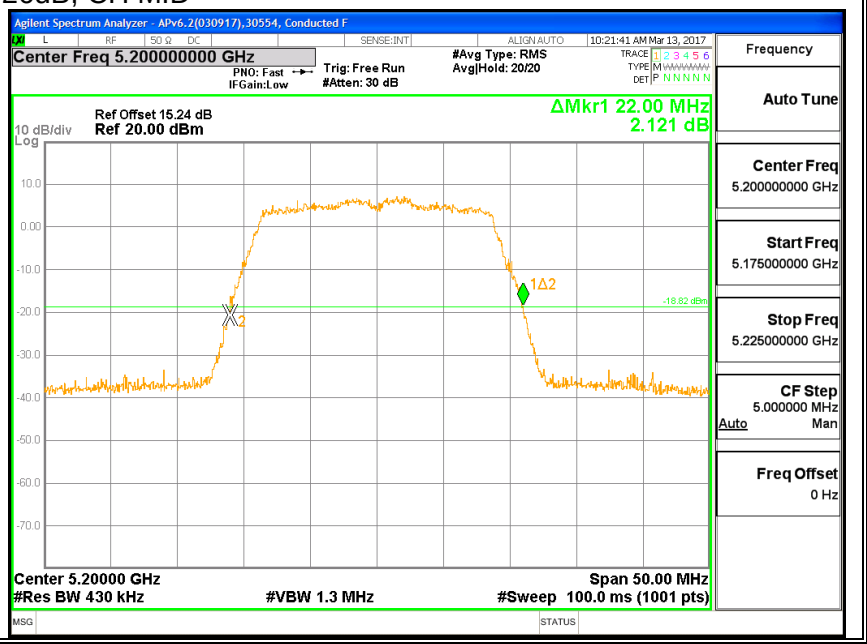
26dB, CH LOW



26dB, CH MID



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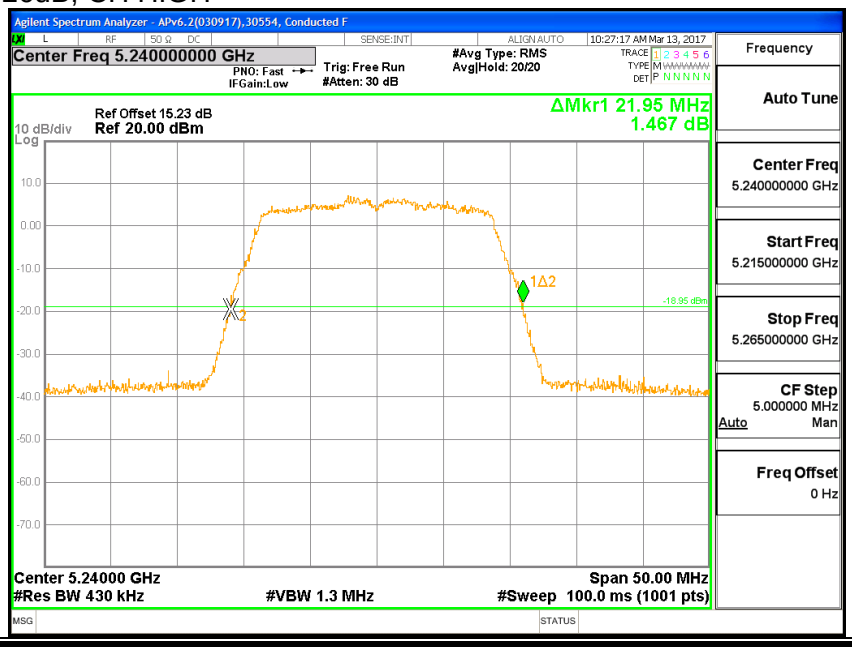
26dB, CH HIGH



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8.1.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

Channel	Frequency	99% BW UAT 2 (MHz)
Low	5180	17.683
Mid	5200	17.665
High	5240	17.768

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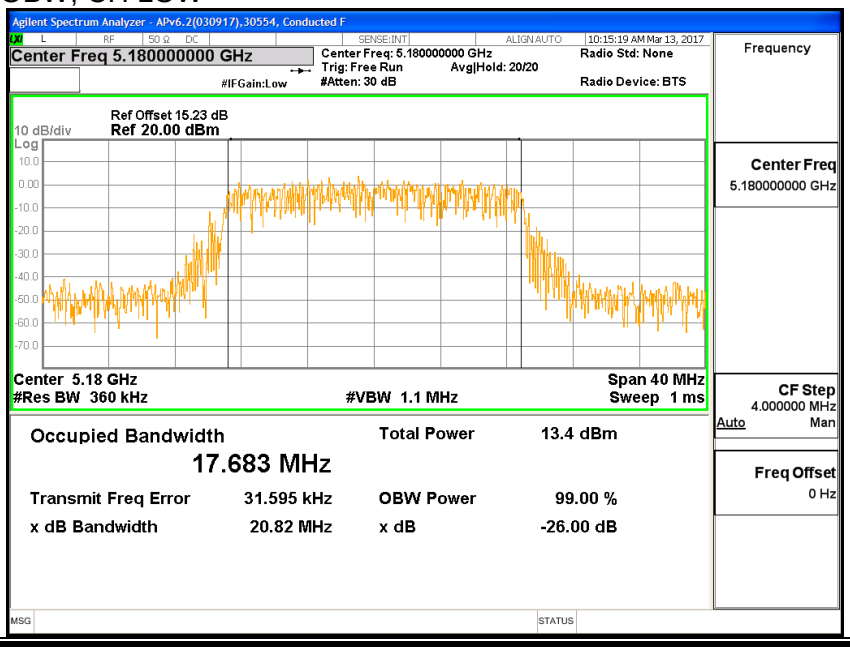
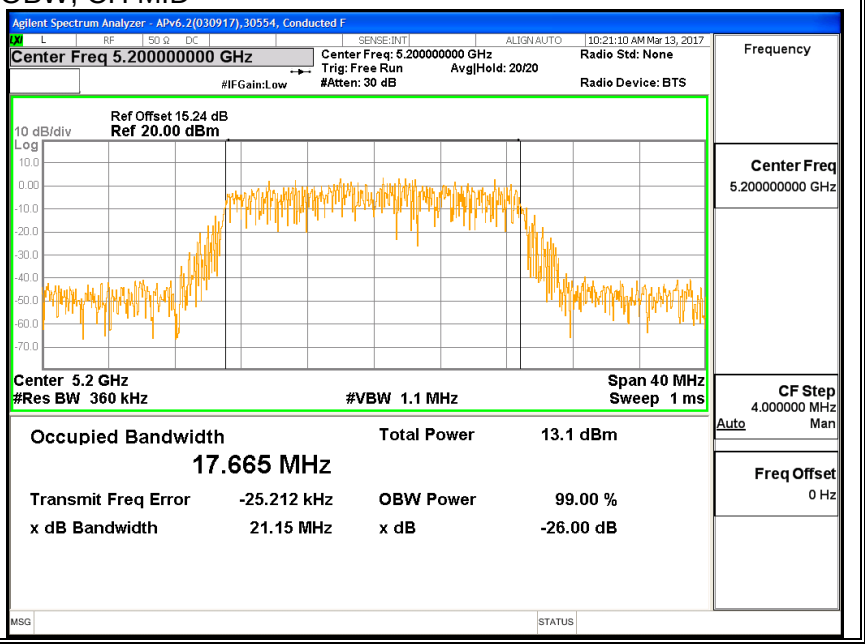
OBW, CH LOW



OBW, CH MID



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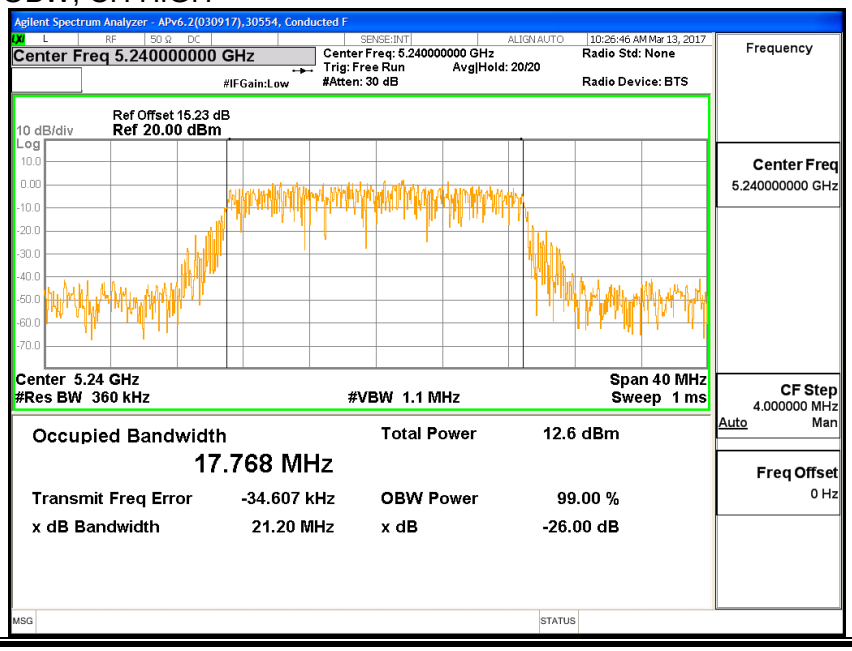
OBW, CH HIGH



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8.1.3. AVERAGE POWER

ID:	30554	Date:	6/12/2017

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter.

RESULTS

Channel	Frequency	Power UAT 2 (dBm)
Low	5180	17.40
Mid	5200	19.40
High	5240	20.80

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8.1.4. OUTPUT POWER AND PPSD

LIMITS

FCC §15.407 (a) (1)

(i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

(ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

DIRECTIONAL ANTENNA GAIN

There is only one transmitter output therefore the directional gain is equal to the antenna gain.

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RESULTS

Antenna Gain and Limits

Channel	Frequency (MHz)	Directional Gain for Power (dBi)	Directional Gain for PSD (dBi)	Power Limit (dBm)	PSD Limit (dBm)
Low	5180	-4.61	-4.61	24.00	11.00
Mid	5200	-4.61	-4.61	24.00	11.00
High	5240	-4.61	-4.61	24.00	11.00

Duty Cycle CF (dB)	0.00	**Included in Calculations of Corr'd PSD**

Output Power Results

Channel	Frequency (MHz)	UAT 2 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5180	17.4	17.40	24.00	-6.60
Mid	5200	19.4	19.40	24.00	-4.60
High	5240	20.8	20.80	24.00	-3.20

PSD Results

Channel	Frequency (MHz)	UAT 2 Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Low	5180	6.953	6.95	11.00	-4.05
Mid	5200	8.690	8.69	11.00	-2.31
High	5240	10.517	10.52	11.00	-0.48

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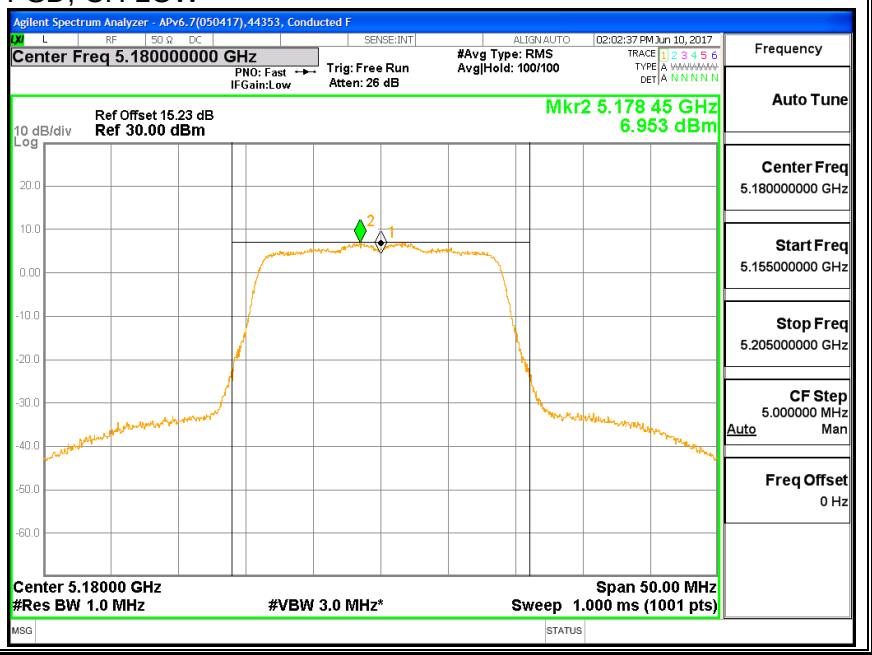
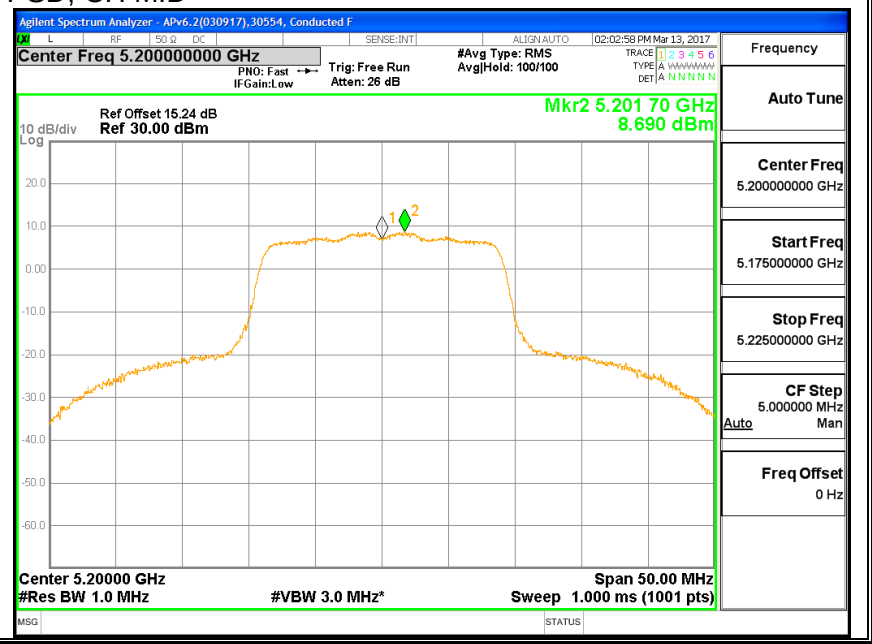
PSD, CH LOW



PSD, CH MID



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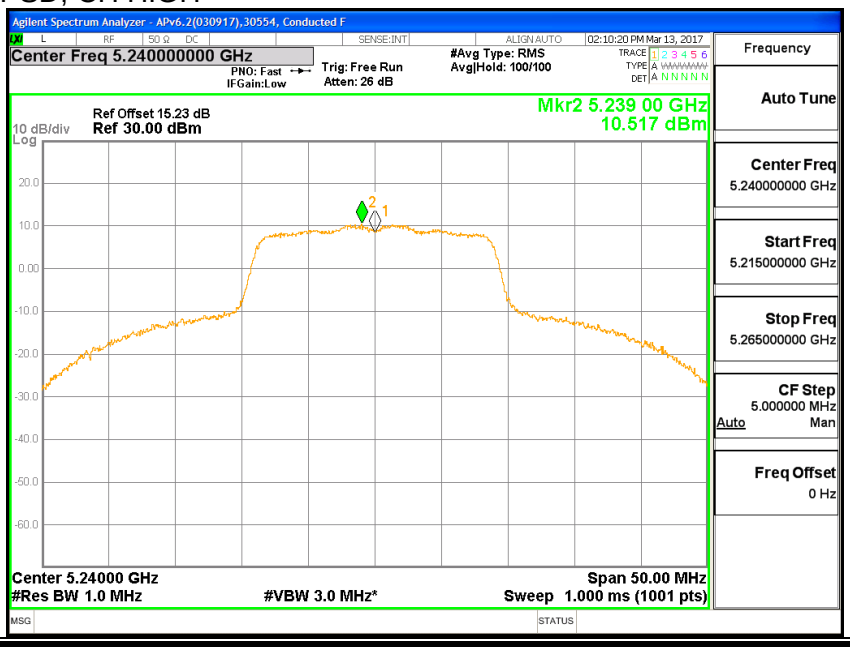
PSD, CH HIGH



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8.2. 11n HT20 LAT 3 SISO MODE IN THE 5.2GHz BAND

8.2.1. 26 dB BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

Channel	Frequency	26 dB BW LAT 3 (MHz)
Low	5180	22.00
Mid	5200	22.10
High	5240	22.05

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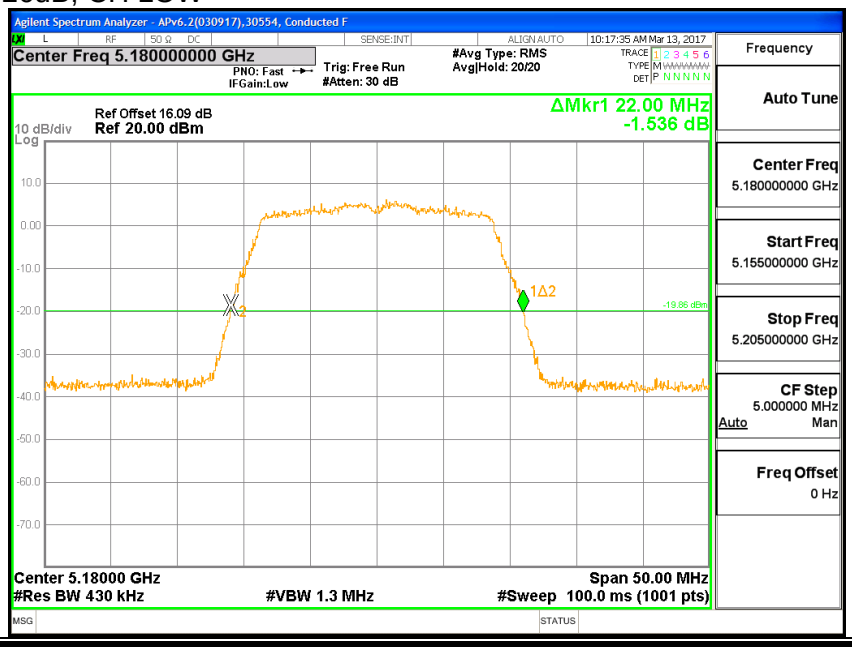
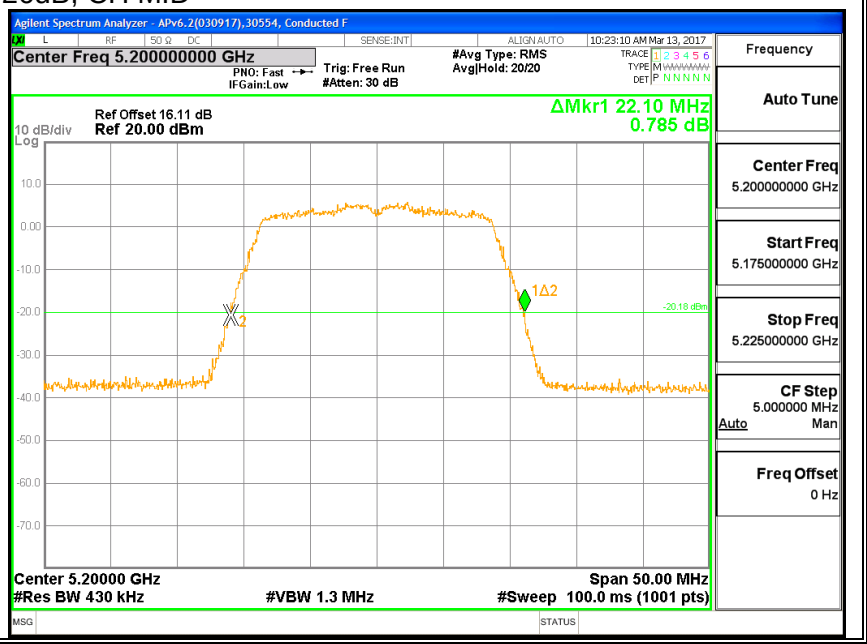
26dB, CH LOW



26dB, CH MID



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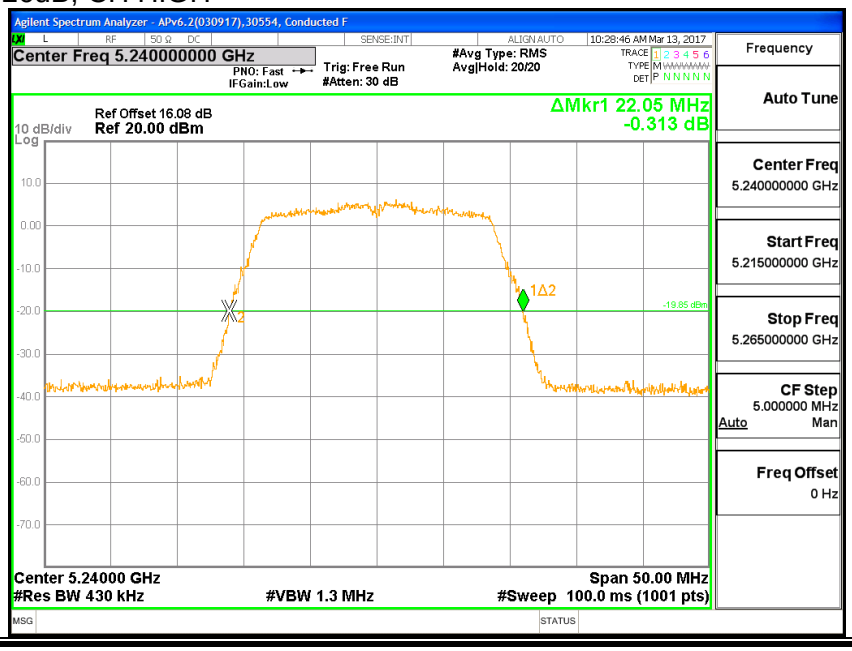
26dB, CH HIGH



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8.2.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

Channel	Frequency	99% BW LAT 3 (MHz)
Low	5180	17.828
Mid	5200	17.729
High	5240	17.686

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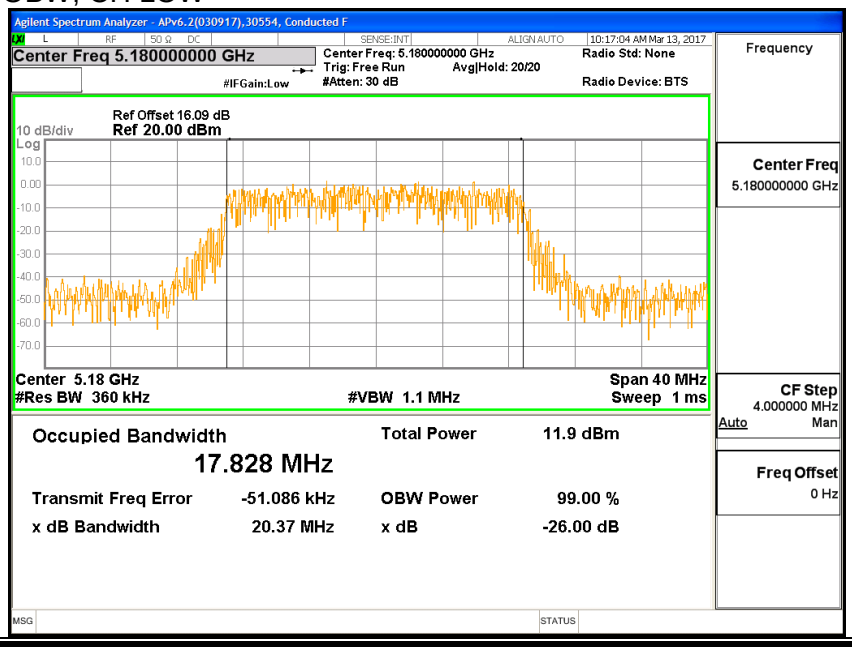
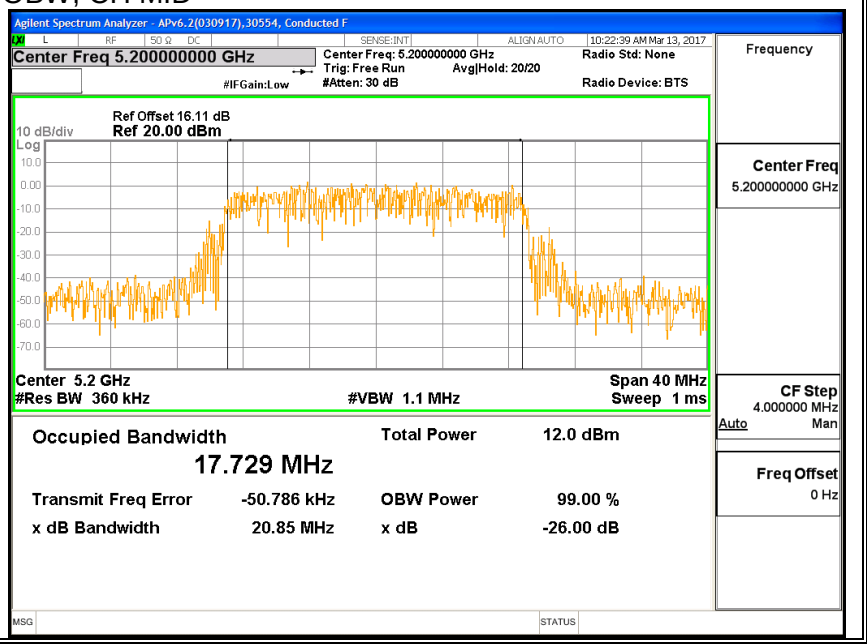
OBW, CH LOW



OBW, CH MID



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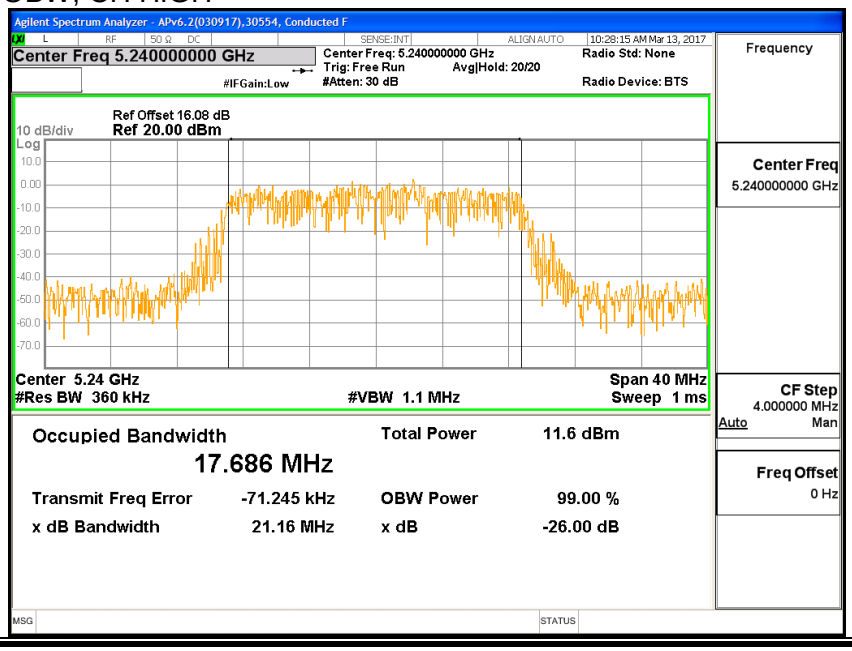
OBW, CH HIGH



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8.2.3. AVERAGE POWER

ID:	39472	Date:	7/10/17

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter.

RESULTS

Channel	Frequency	Power LAT 3 (dBm)
Low	5180	17.37
Mid	5200	19.40
High	5240	20.88

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8.2.4. OUTPUT POWER AND PPSD

LIMITS

FCC §15.407 (a) (1)

(i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

(ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

DIRECTIONAL ANTENNA GAIN

There is only one transmitter output therefore the directional gain is equal to the antenna gain.

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RESULTS

Antenna Gain and Limits

Channel	Frequency (MHz)	Directional Gain for Power (dBi)	Directional Gain for PSD (dBi)	Power Limit (dBm)	PSD Limit (dBm)
Low	5180	-0.98	-0.98	24.00	11.00
Mid	5200	-0.98	-0.98	24.00	11.00
High	5240	-0.98	-0.98	24.00	11.00

Duty Cycle CF (dB)	0.00	**Included in Calculations of Corr'd PSD**

Output Power Results

Channel	Frequency (MHz)	LAT 3 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5180	17.37	17.37	24.00	-6.63
Mid	5200	19.40	19.40	24.00	-4.60
High	5240	20.88	20.88	24.00	-3.12

PSD Results

Channel	Frequency (MHz)	LAT 3 Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Low	5180	6.165	6.165	11.00	-4.84
Mid	5200	8.275	8.275	11.00	-2.73
High	5240	10.225	10.225	11.00	-0.78

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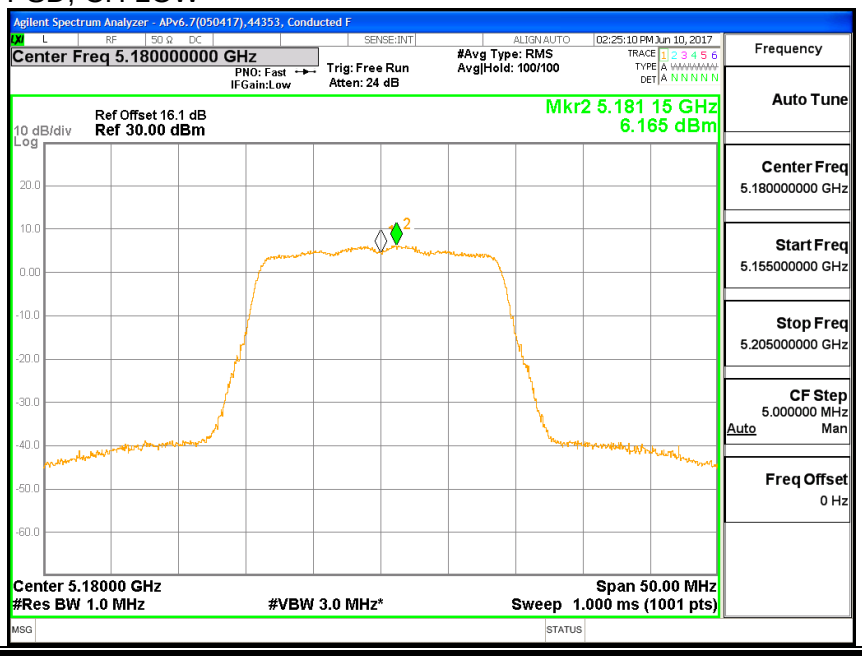
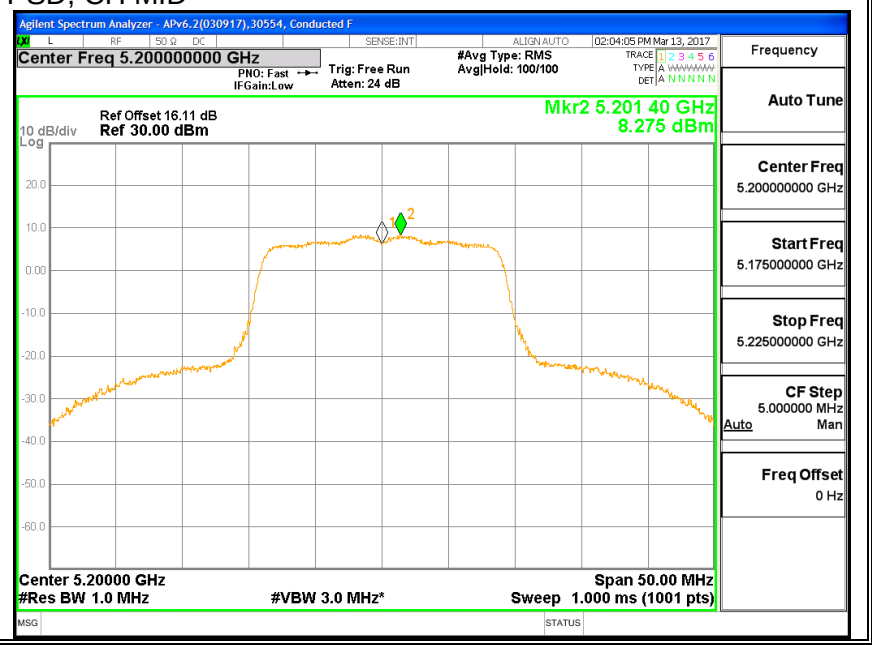
PSD, CH LOW



PSD, CH MID



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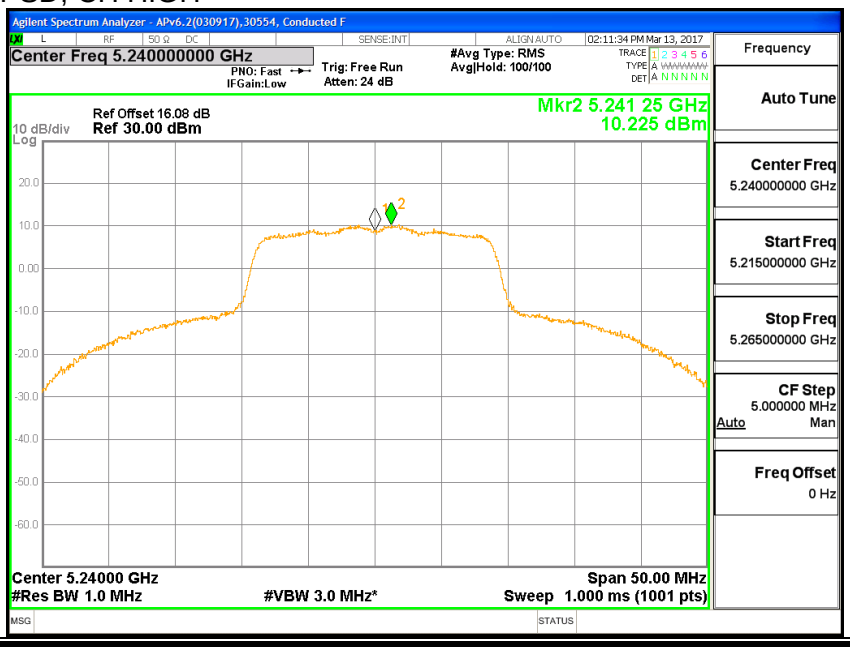
PSD, CH HIGH



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8.3. 11n HT20 2TX CDD MIMO MODE IN THE 5.2GHz BAND

8.3.1. 26 dB BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

Channel	Frequency	26 dB BW UAT 2 (MHz)	26 dB BW LAT 3 (MHz)
Low	5180	21.85	21.60
Mid	5200	22.05	21.65
High	5240	22.25	21.55

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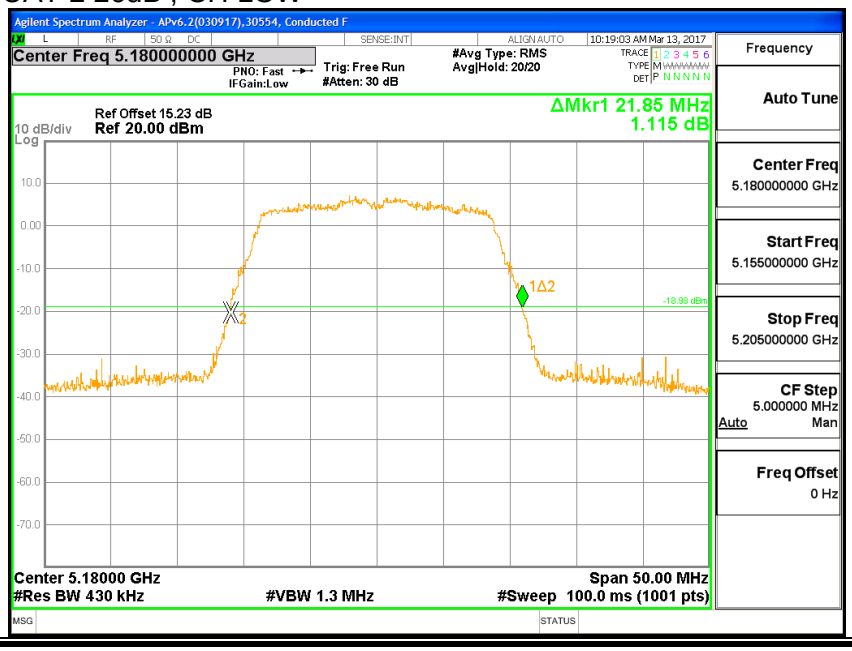
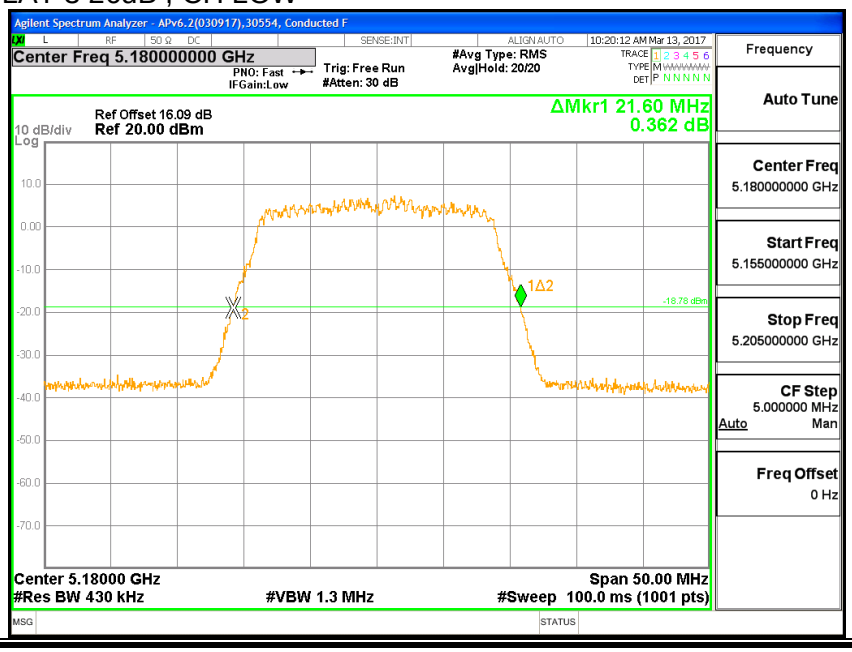
UAT 2 26dB , CH LOW



LAT 3 26dB , CH LOW



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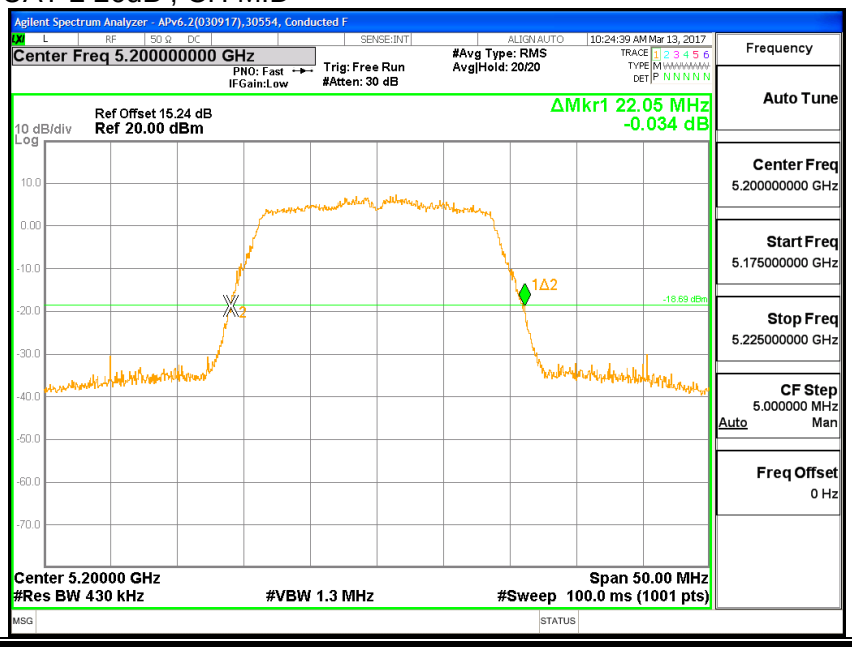
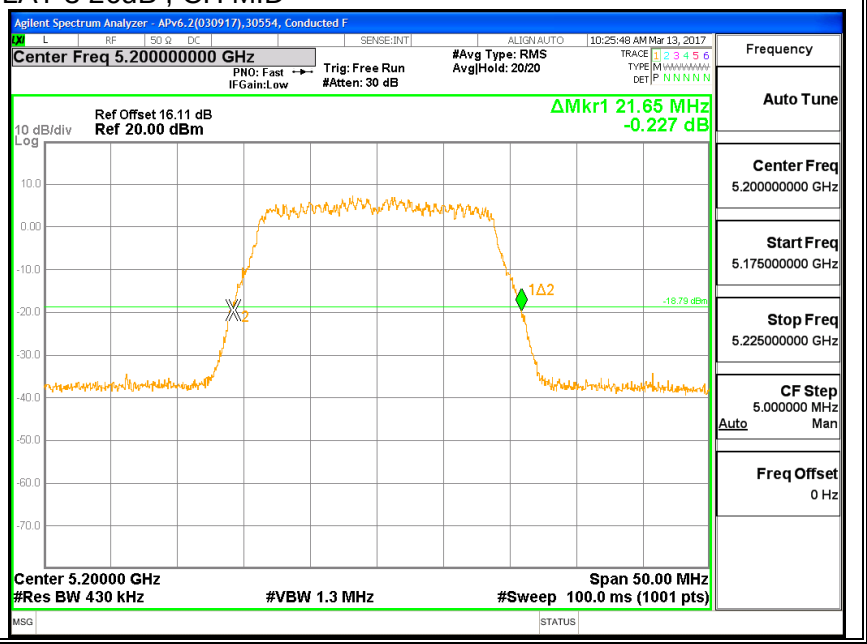
UAT 2 26dB , CH MID



LAT 3 26dB , CH MID



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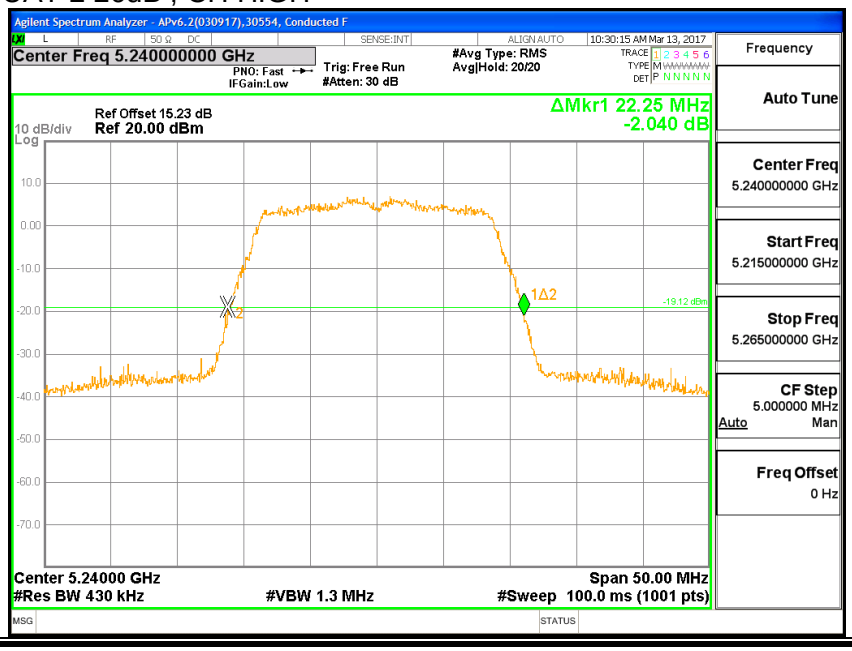
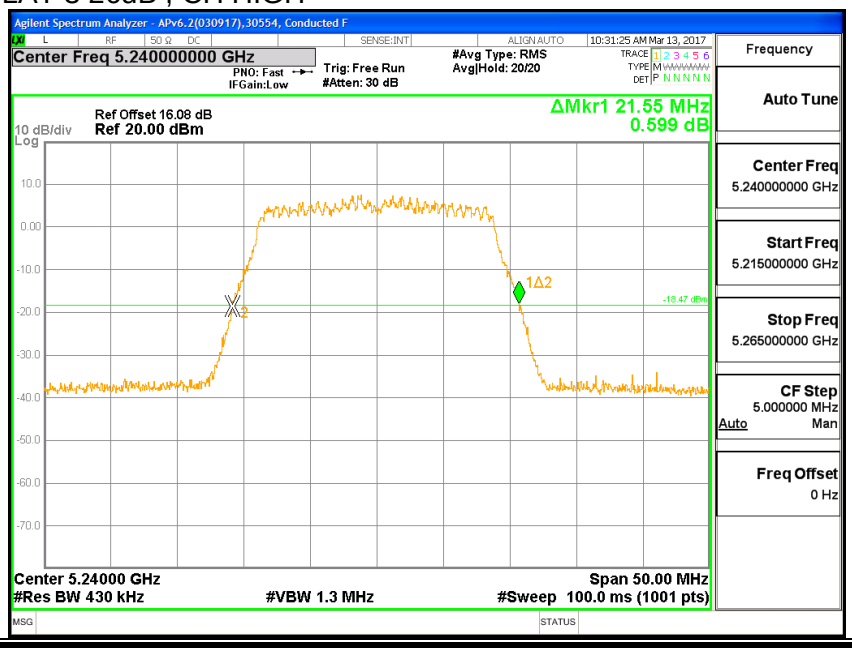
UAT 2 26dB , CH HIGH



LAT 3 26dB , CH HIGH



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8.3.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

Channel	Frequency	99% BW UAT 2 (MHz)	99% BW LAT 3 (MHz)
Low	5180	17.775	17.907
Mid	5200	17.776	17.803
High	5240	17.743	17.713

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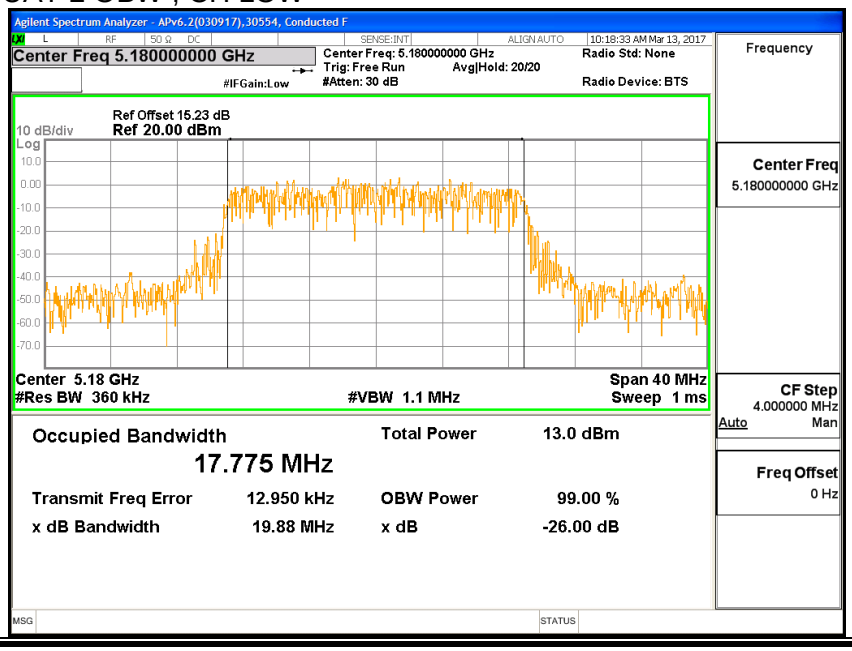
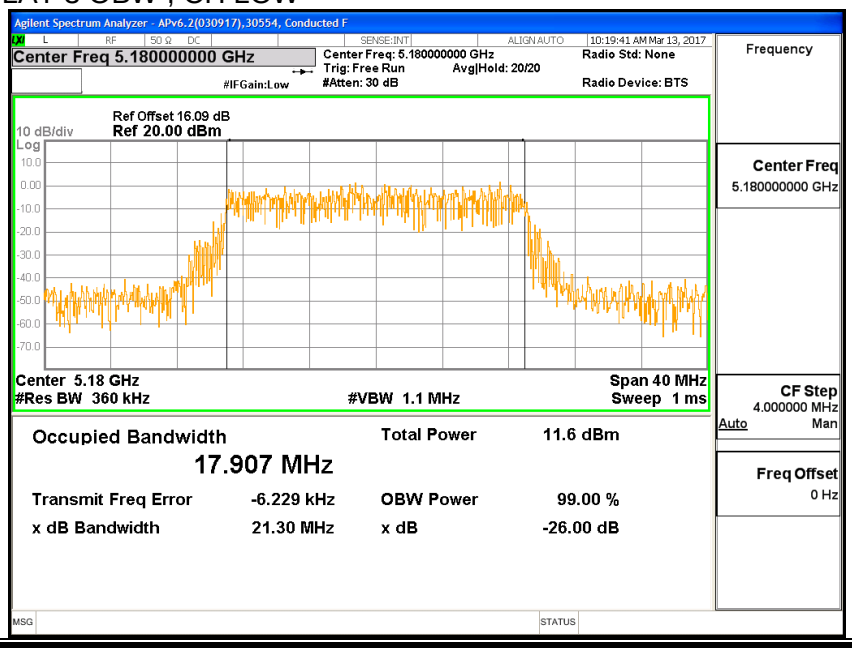
UAT 2 OBW , CH LOW



LAT 3 OBW , CH LOW



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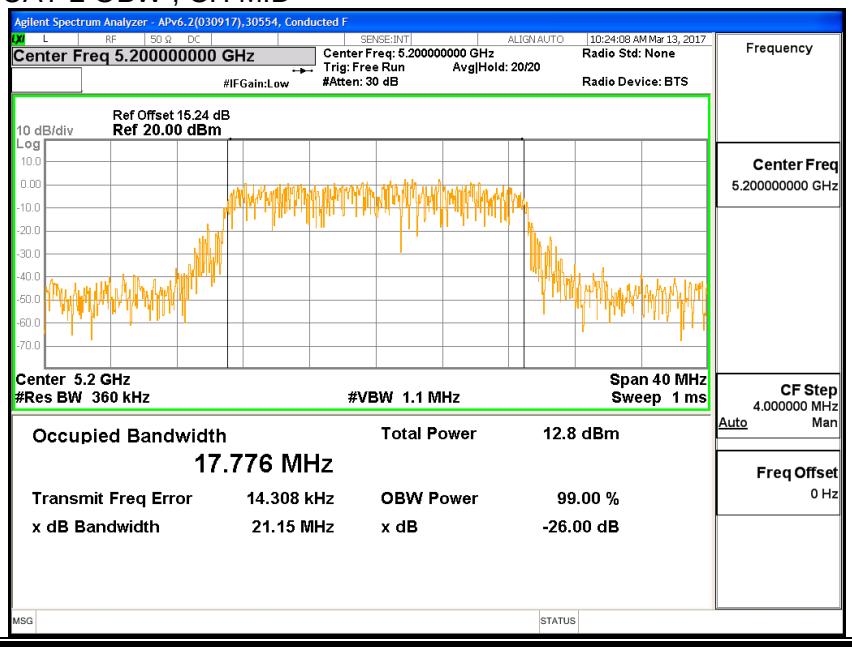
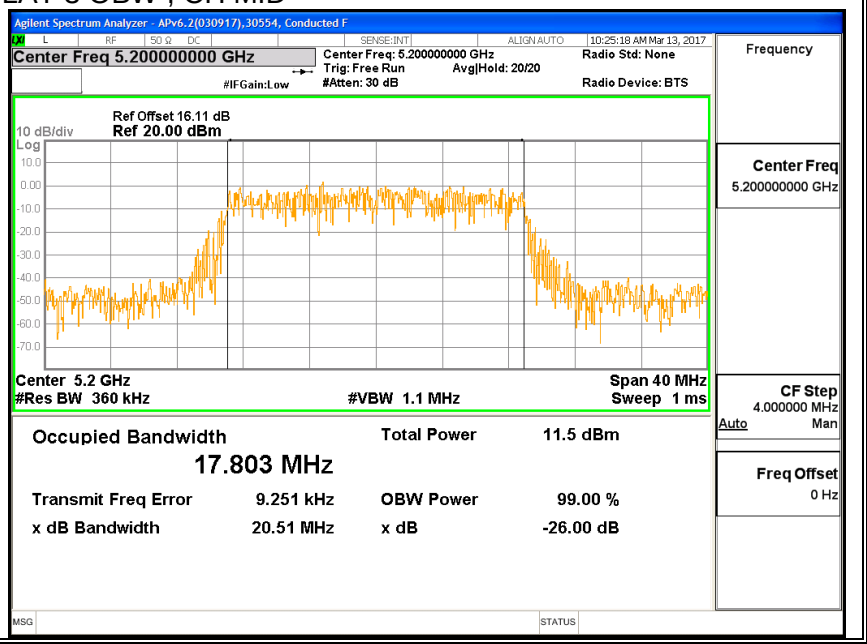
UAT 2 OBW , CH MID



LAT 3 OBW , CH MID



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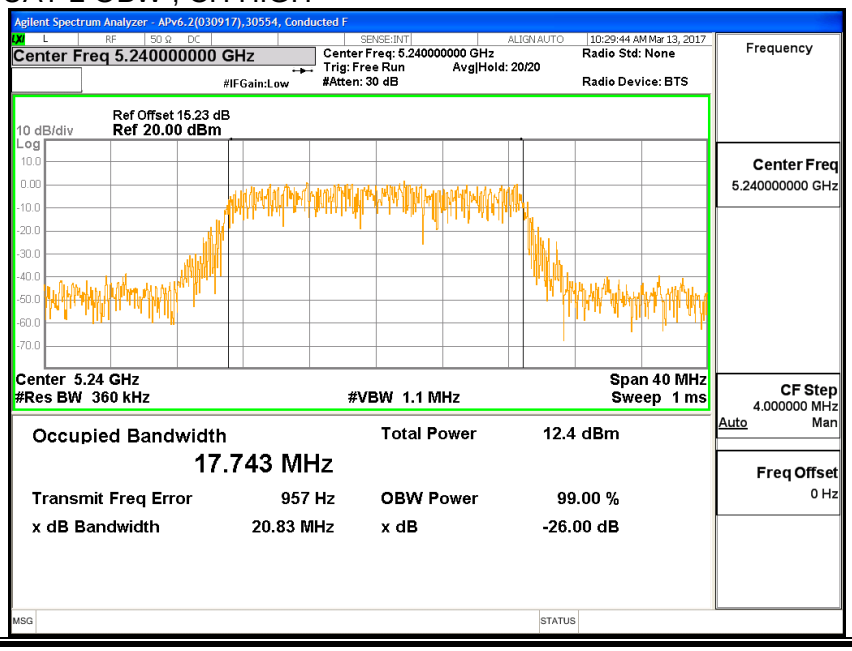
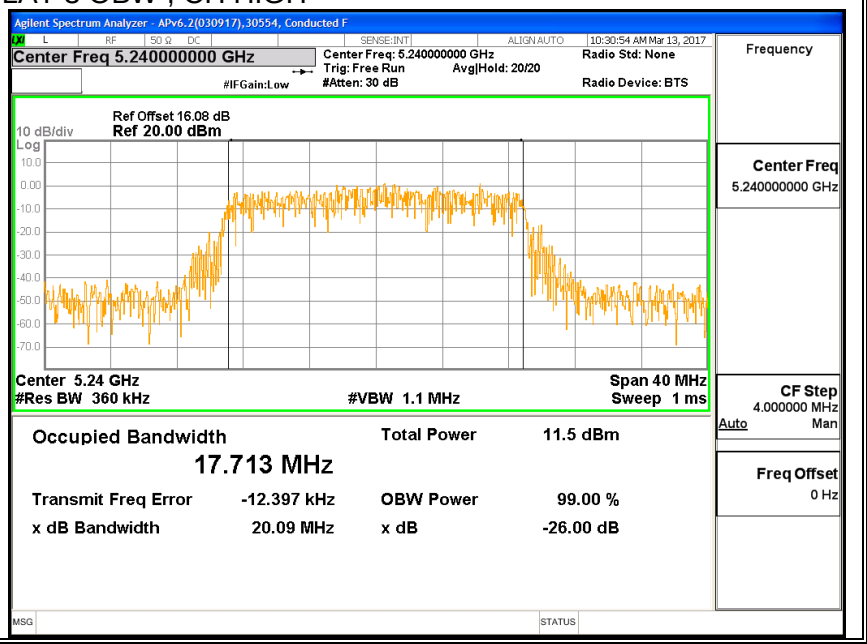
UAT 2 OBW , CH HIGH



LAT 3 OBW , CH HIGH



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8.3.3. AVERAGE POWER

ID:	30554	Date:	6/12/2017

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter.

RESULTS

Average Power Results

Channel	Frequency (MHz)	UAT 2 Power (dBm)	LAT 3 Power (dBm)	Total Power (dBm)
Low	5180	16.85	16.91	19.89
Mid	5200	17.79	17.95	20.88
High	5240	17.76	17.92	20.85

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8.3.4. OUTPUT POWER AND PPSD

LIMITS

FCC §15.407 (a) (1)

(i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

(ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

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DIRECTIONAL ANTENNA GAIN

For Power used uncorrelated gain: The TX chains are uncorrelated and the antenna gain is unequal among the chains. The directional gain is:

UAT 2 Antenna Gain (dBi)	LAT 3 Antenna Gain (dBi)	Uncorrelated Chains Directional Gain (dBi)
-4.61	-0.98	-2.43

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

UAT 2 Antenna Gain (dBi)	LAT 3 Antenna Gain (dBi)	Correlated Chains Directional Gain (dBi)
-4.61	-0.98	0.40

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RESULTS

Antenna Gain and Limits

Channel	Frequency (MHz)	Directional Gain for Power (dBi)	Directional Gain for PSD (dBi)	Power Limit (dBm)	PSD Limit (dBm)
Low	5180	-2.43	0.40	24.00	11.00
Mid	5200	-2.43	0.40	24.00	11.00
High	5240	-2.43	0.40	24.00	11.00

Duty Cycle CF (dB)	0.00	**Included in Calculations of Corr'd PSD**

Output Power Results

Channel	Frequency (MHz)	UAT 2 Meas Power (dBm)	LAT 3 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5180	16.850	16.910	19.89	24.00	-4.11
Mid	5200	17.790	17.950	20.88	24.00	-3.12
High	5240	17.760	17.920	20.85	24.00	-3.15

PSD Results

Channel	Frequency (MHz)	UAT 2 Meas PSD (dBm)	LAT 3 Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Low	5180	6.635	6.959	9.81	11.00	-1.19
Mid	5200	7.397	8.086	10.77	11.00	-0.23
High	5240	7.132	7.865	10.52	11.00	-0.48

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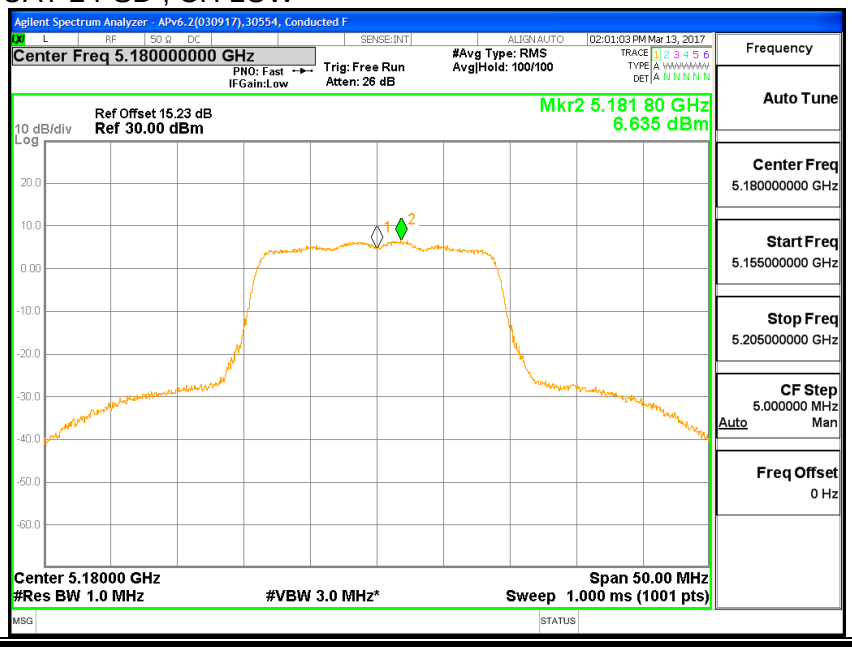
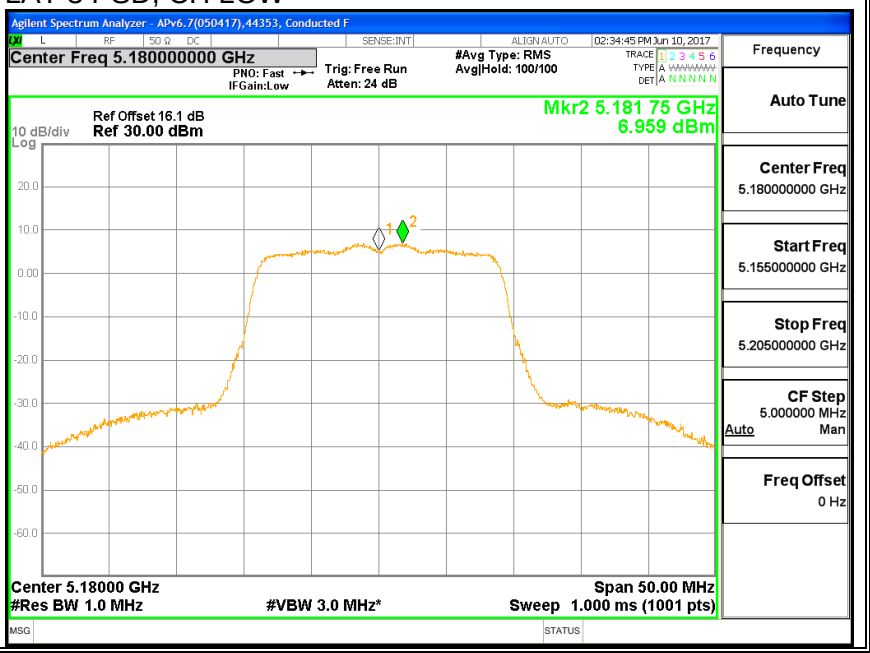
UAT 2 PSD , CH LOW



LAT 3 PSD, CH LOW



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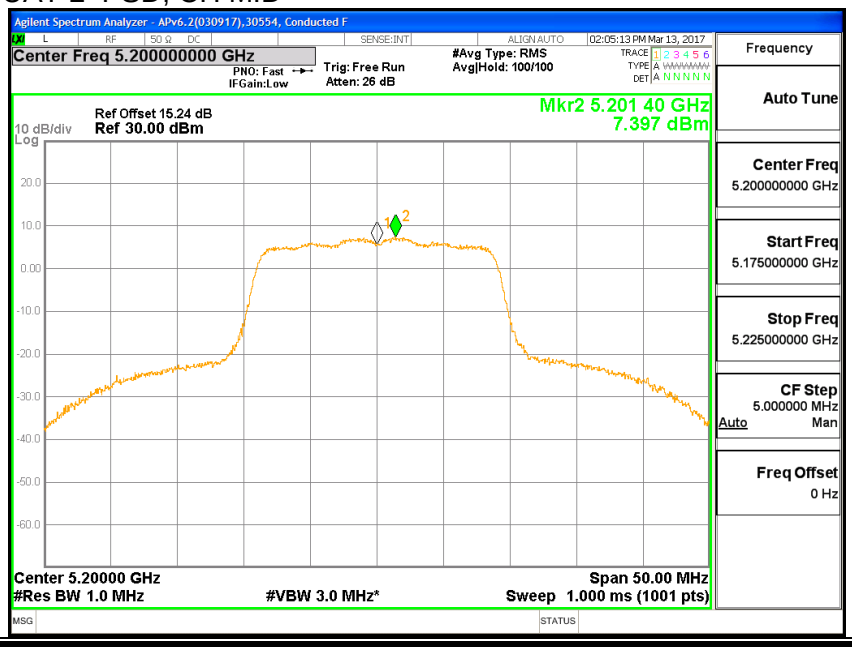
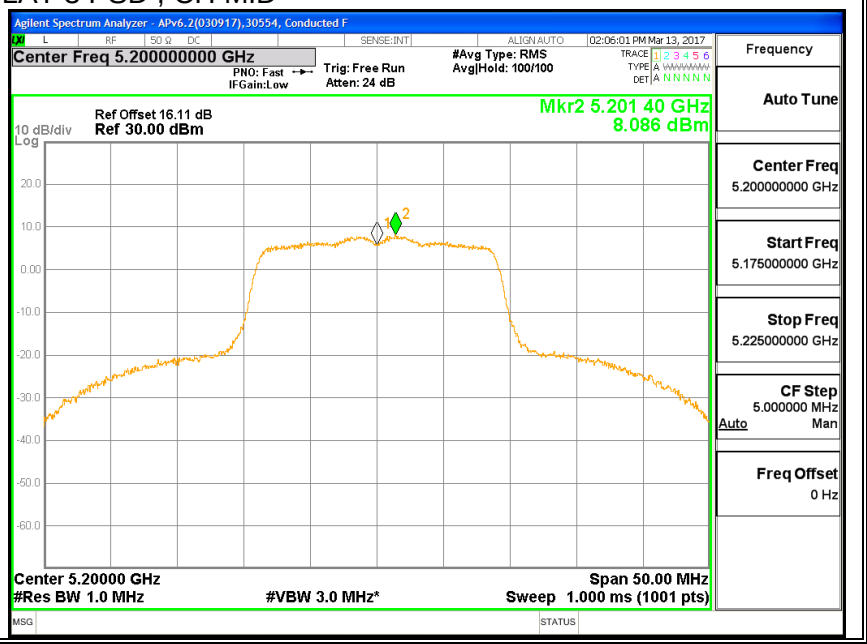
UAT 2 PSD, CH MID



LAT 3 PSD , CH MID



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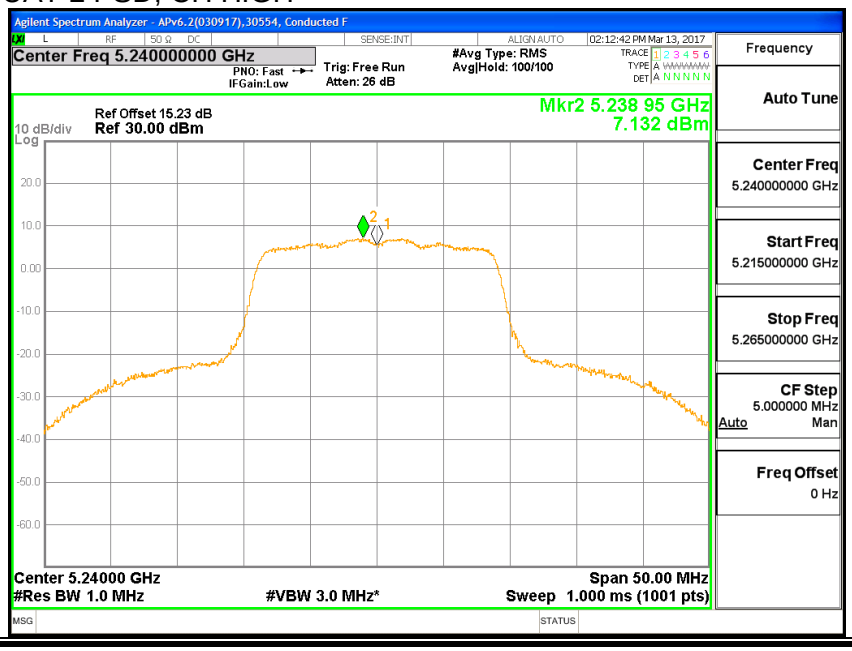
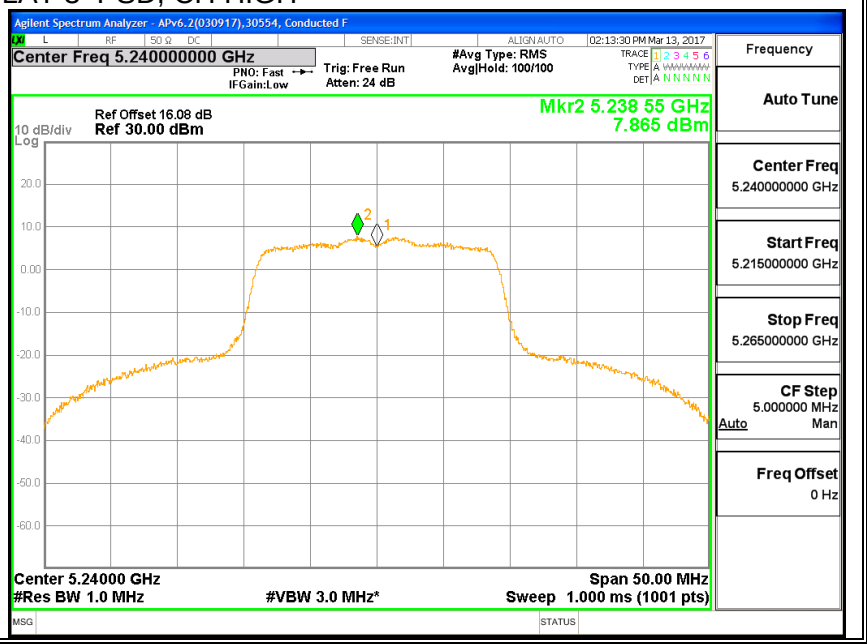
UAT 2 PSD, CH HIGH



LAT 3 PSD, CH HIGH



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8.4. 11n HT40 UAT 2 SISO MODE IN THE 5.2GHz BAND

8.4.1. 26 dB BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

Channel	Frequency	26 dB BW UAT 2 (MHz)
Low	5190	40.6
High	5230	40.4

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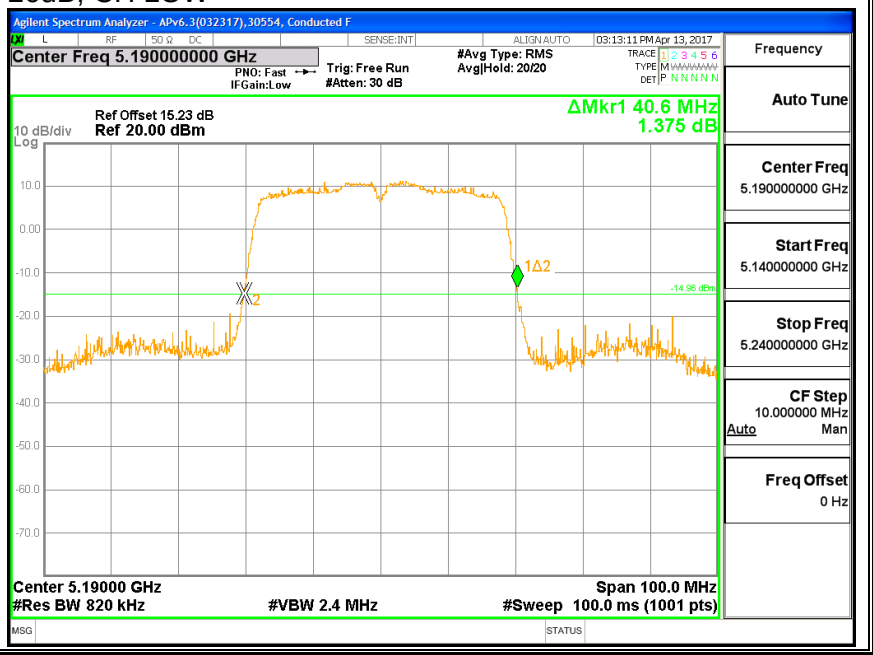
26dB, CH LOW



26dB, CH HIGH

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8.4.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

Channel	Frequency	99% BW UAT 2 (MHz)
Low	5190	36.270
High	5230	36.334

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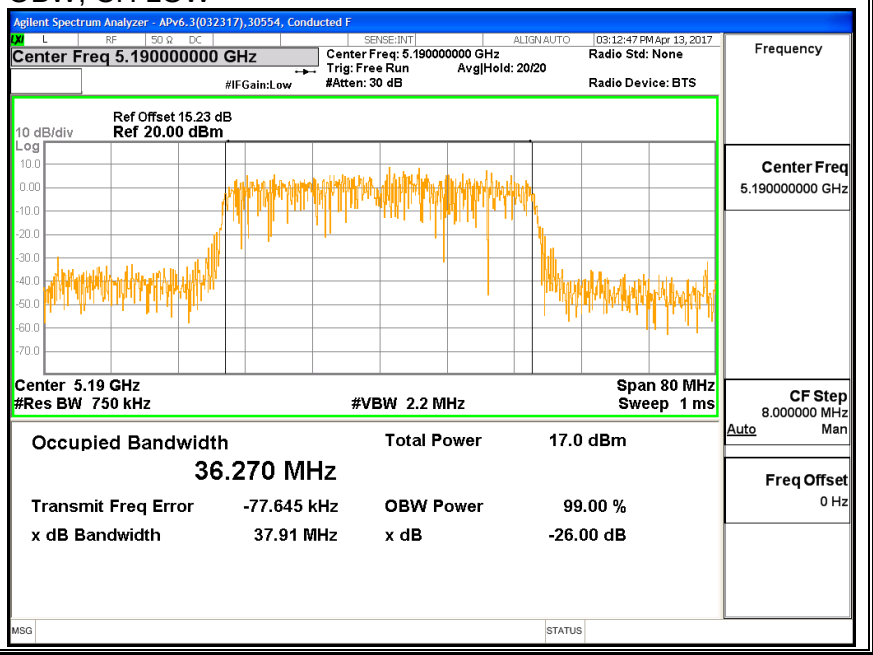
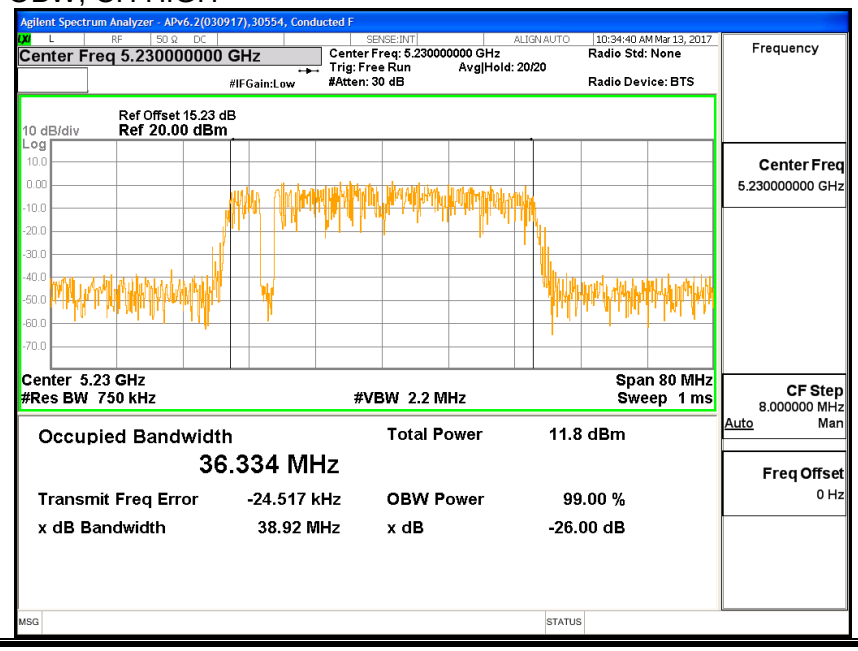
OBW, CH LOW



OBW, CH HIGH



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8.4.3. AVERAGE POWER

ID:	30554	Date:	6/12/2017

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter.

RESULTS

Channel	Frequency	Power UAT 2 (dBm)
Low	5190	15.38
High	5230	18.42

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8.4.4. OUTPUT POWER AND PPSD

LIMITS

FCC §15.407 (a) (1)

(i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

(ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required on power table. However, PSD measurement was measured by Spectrum Analyzer and duty cycle factor is required.

DIRECTIONAL ANTENNA GAIN

There is only one transmitter output therefore the directional gain is equal to the antenna gain.

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RESULTS

Antenna Gain and Limits

Channel	Frequency (MHz)	Directional Gain for Power (dBi)	Directional Gain for PSD (dBi)	Power Limit (dBm)	PSD Limit (dBm)
Low	5190	-4.61	-4.61	24.00	11.00
High	5230	-4.61	-4.61	24.00	11.00

Duty Cycle CF (dB)	0.10	**Included in Calculations of Corr'PSD**

Output Power Results

Channel	Frequency (MHz)	UAT 2 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5190	15.38	15.38	24.00	-8.62
High	5230	18.42	18.42	24.00	-5.58

PSD Results

Channel	Frequency (MHz)	UAT 2 Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Low	5190	3.919	4.019	11.00	-6.98
High	5230	6.585	6.685	11.00	-4.32

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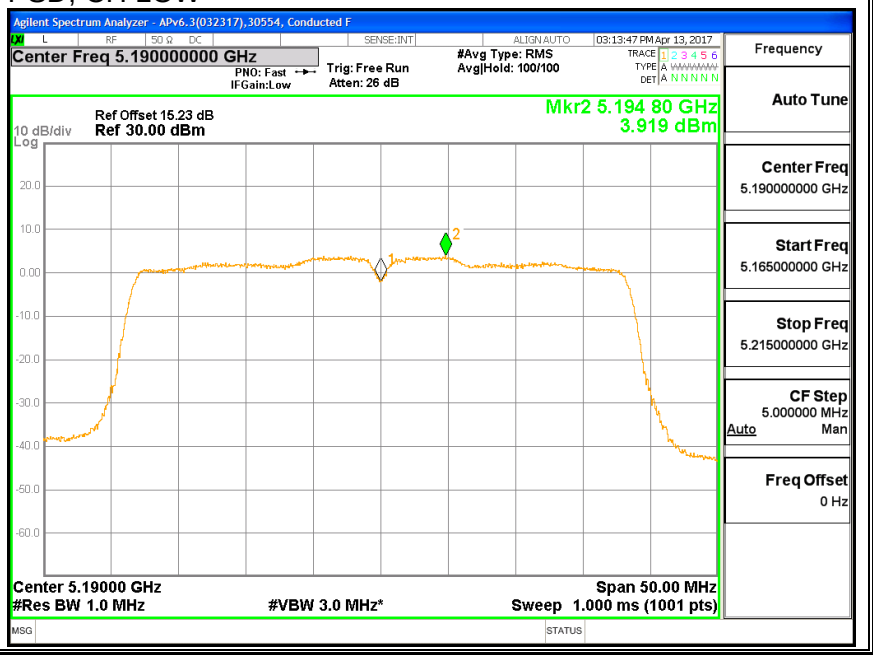
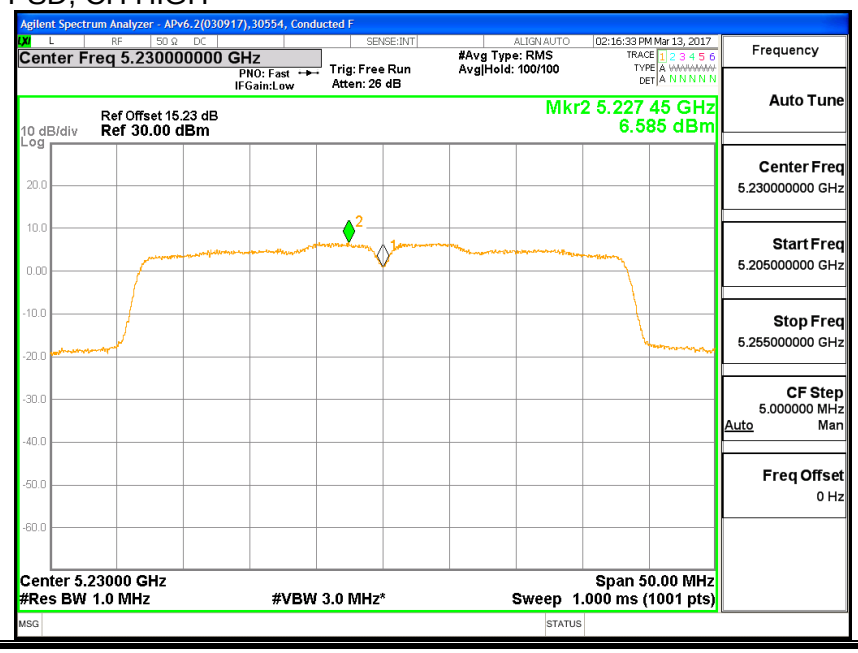
PSD, CH LOW



PSD, CH HIGH



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8.5. 11n HT40 LAT 3 SISO MODE IN THE 5.2GHz BAND

8.5.1. 26 dB BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

Channel	Frequency	26 dB BW LAT 3 (MHz)
Low	5190	40.6
High	5230	40.4

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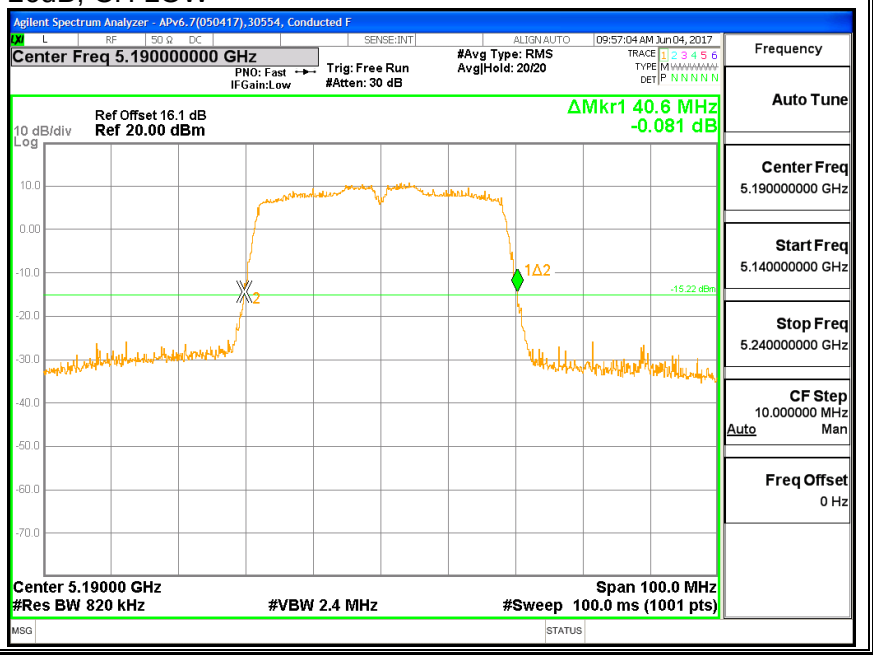
26dB, CH LOW



26dB, CH HIGH

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8.5.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

Channel	Frequency	99% BW LAT 3 (MHz)
Low	5190	36.417
High	5230	36.267

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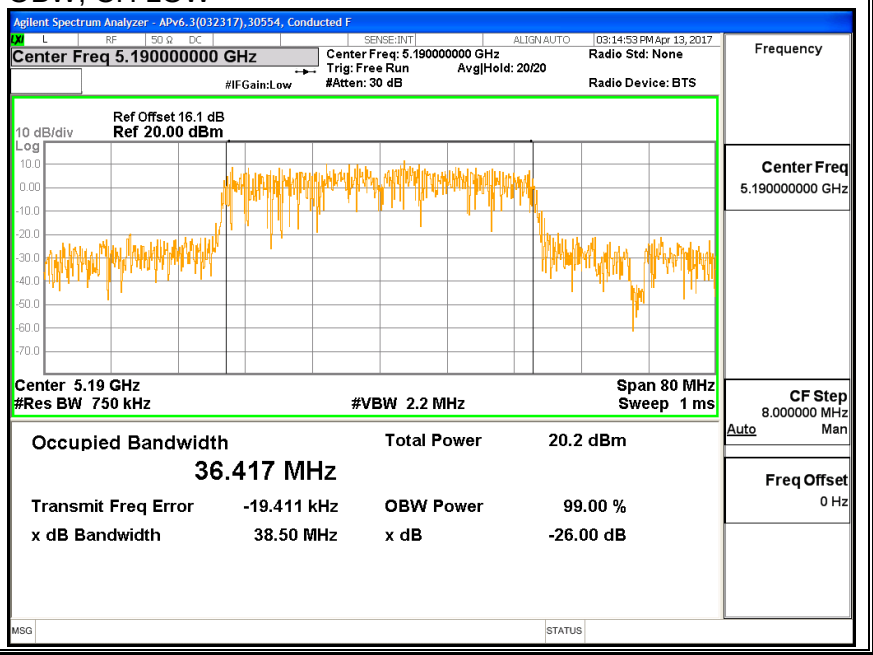
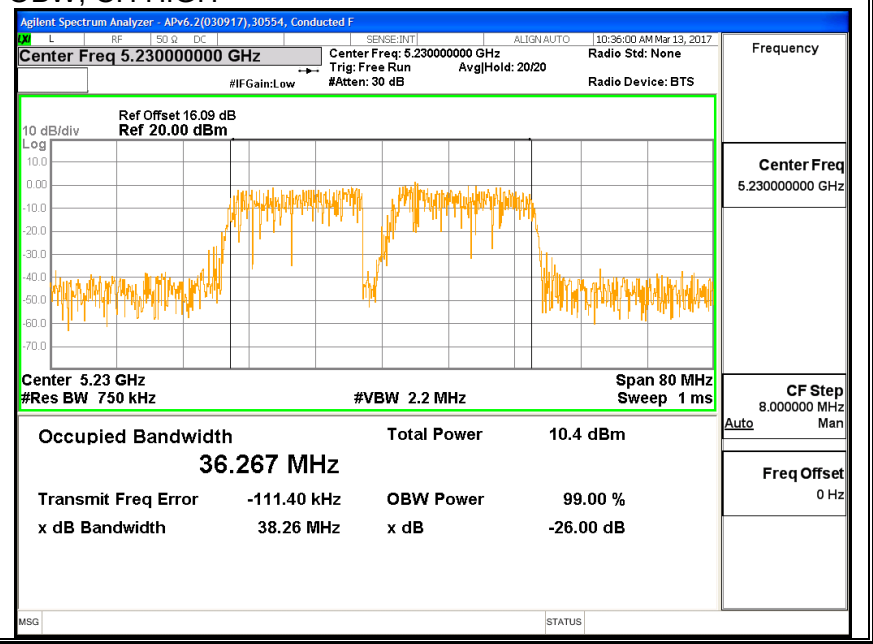
OBW, CH LOW



OBW, CH HIGH



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8.5.3. AVERAGE POWER

ID:	30554	Date:	6/12/2017

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter.

RESULTS

Channel	Frequency	Power LAT 3 (dBm)
Low	5190	15.28
High	5230	18.33

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8.5.4. OUTPUT POWER AND PPSD

LIMITS

FCC §15.407 (a) (1)

(i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

(ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required. However, PSD measurement was measured by Spectrum Analyzer and duty cycle factor is required.

DIRECTIONAL ANTENNA GAIN

There is only one transmitter output therefore the directional gain is equal to the antenna gain.

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RESULTS

Antenna Gain and Limits

Channel	Frequency (MHz)	Directional Gain for Power (dBi)	Directional Gain for PSD (dBi)	Power Limit (dBm)	PSD Limit (dBm)
Low	5190	-0.98	-0.98	24.00	11.00
High	5230	-0.98	-0.98	24.00	11.00

Duty Cycle CF (dB)	0.10	**Included in Calculations of Corr'PSD**

Output Power Results

Channel	Frequency (MHz)	LAT 3 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5190	15.28	15.28	24.00	-8.72
High	5230	18.33	18.33	24.00	-5.67

PSD Results

Channel	Frequency (MHz)	LAT 3 Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Low	5190	3.194	3.29	11.00	-7.71
High	5230	6.143	6.24	11.00	-4.76

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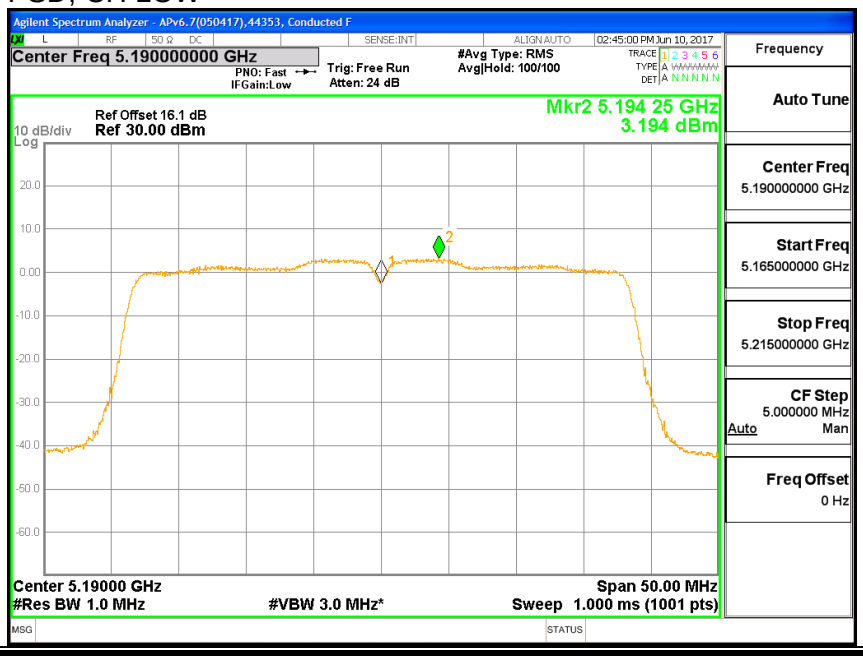
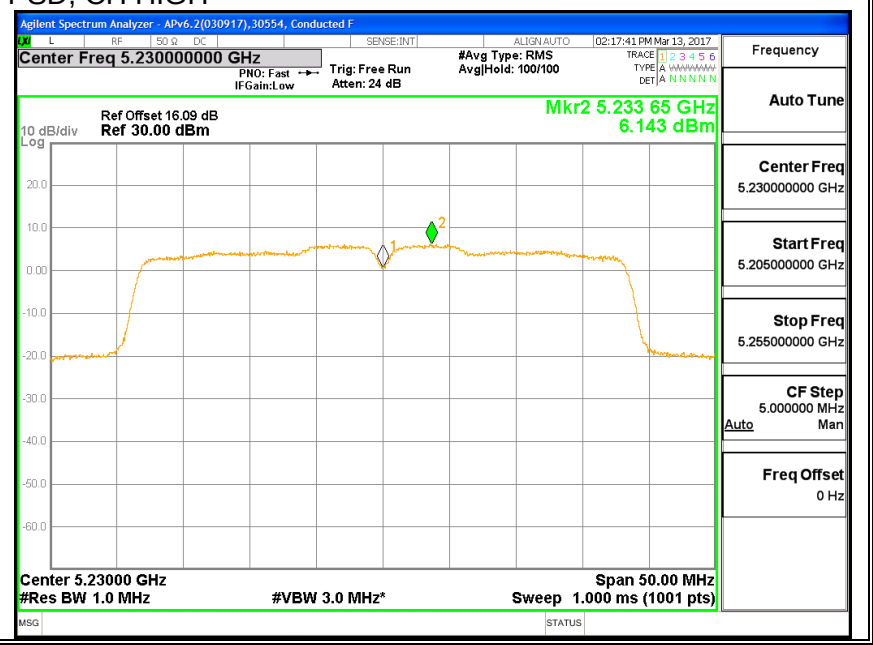
PSD, CH LOW



PSD, CH HIGH



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8.6. 11n HT40 2TX CDD MIMO MODE IN THE 5.2GHz BAND

8.6.1. 26 dB BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

Channel	Frequency	26 dB BW UAT 2 (MHz)	26 dB BW LAT 3 (MHz)
Low	5190	40.6	40.1
High	5230	40.4	40.0

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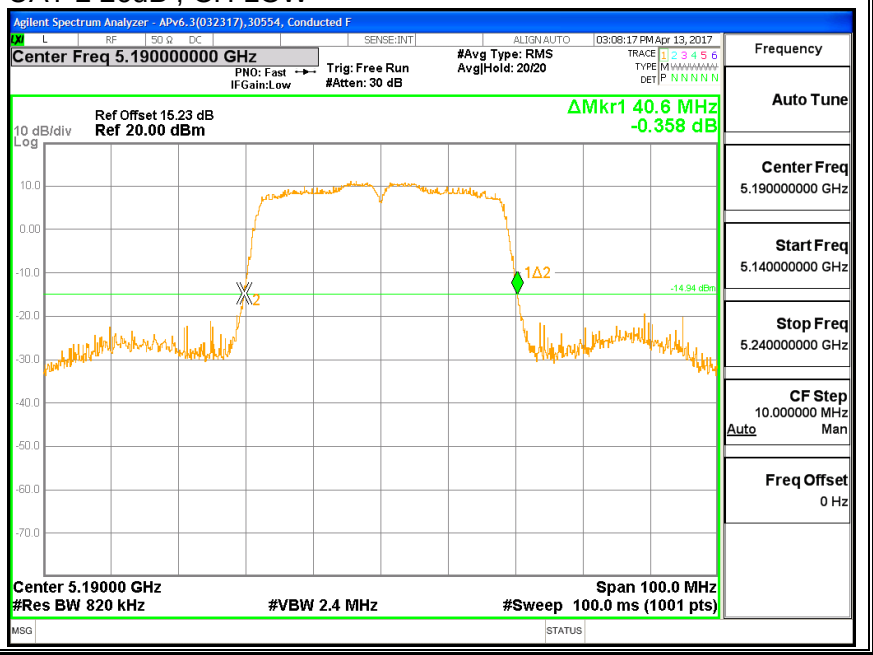
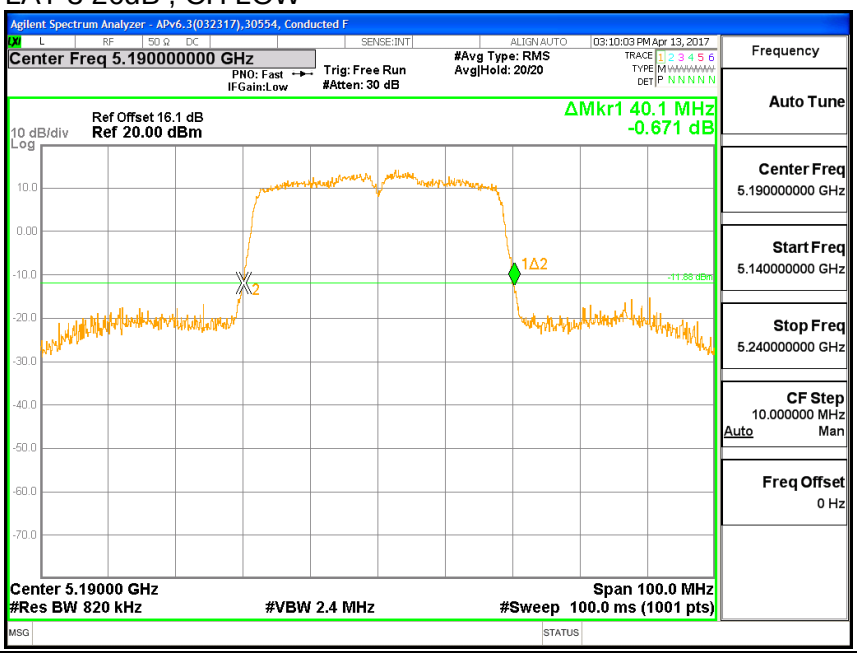
UAT 2 26dB , CH LOW



LAT 3 26dB , CH LOW



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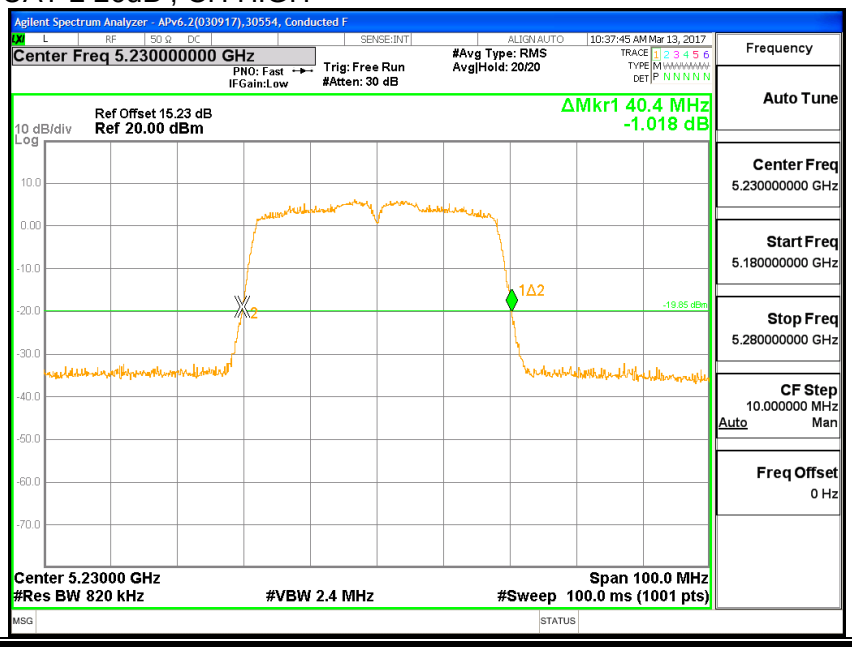
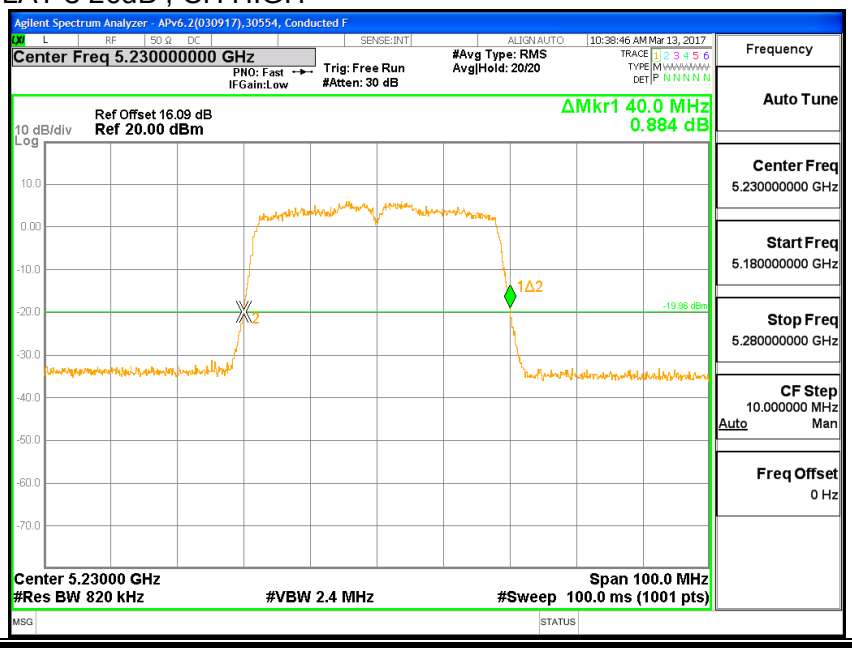
UAT 2 26dB , CH HIGH



LAT 3 26dB , CH HIGH



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8.6.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

Channel	Frequency	99% BW UAT 2 (MHz)	99% BW LAT 3 (MHz)
Low	5190	36.169	36.160
High	5230	36.370	36.257

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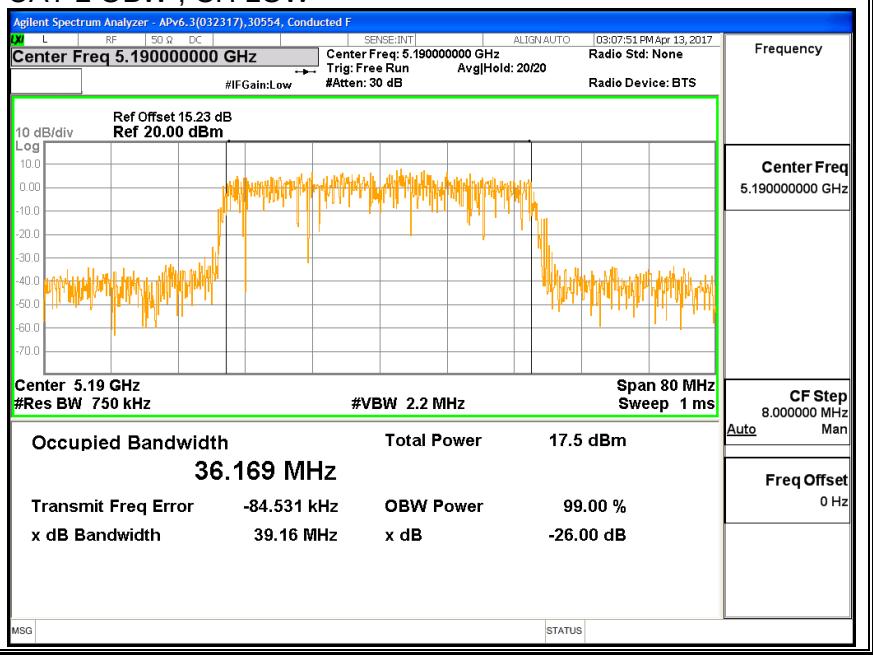
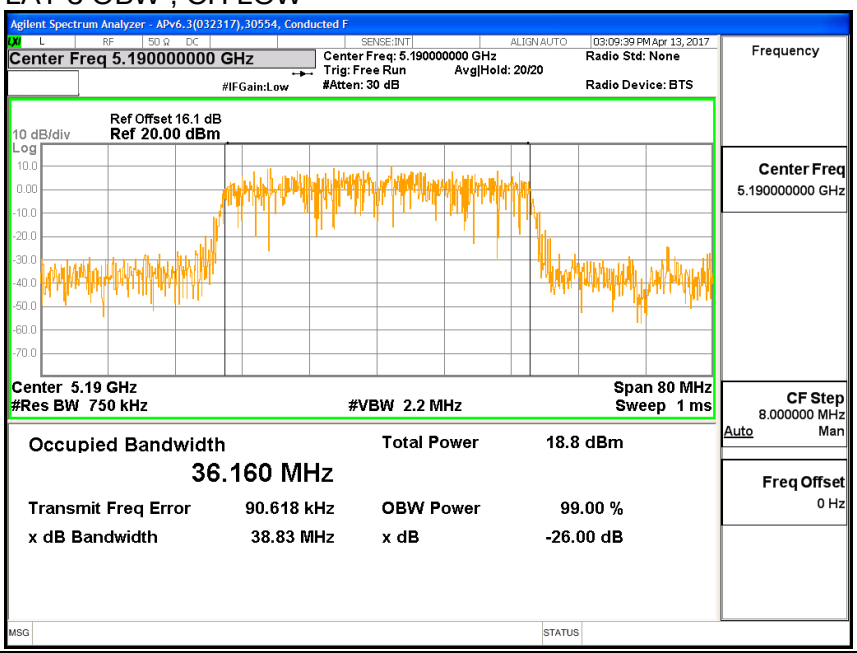
UAT 2 OBW , CH LOW



LAT 3 OBW , CH LOW



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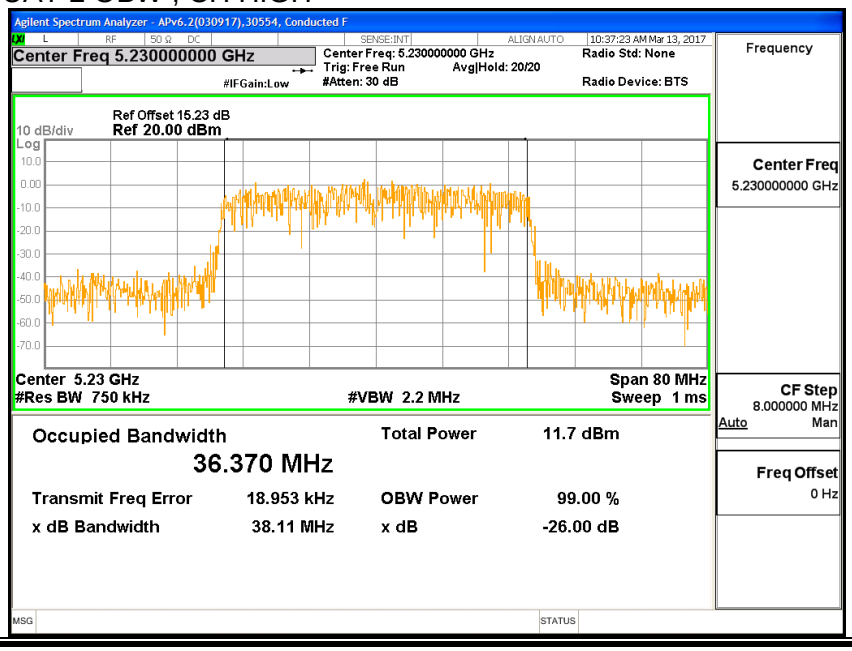
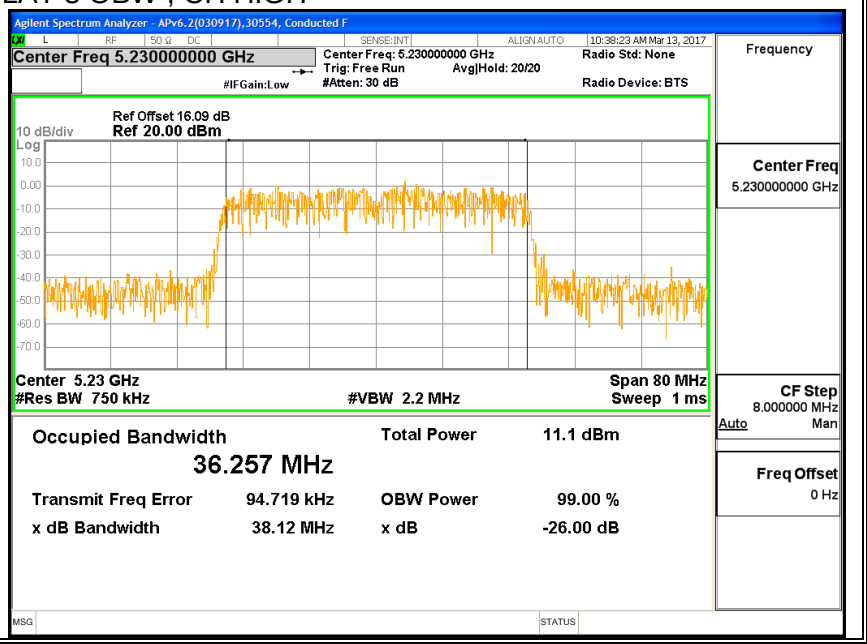
UAT 2 OBW , CH HIGH



LAT 3 OBW , CH HIGH



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8.6.3. AVERAGE POWER

ID:	30554	Date:	6/12/2017

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter.

RESULTS

Average Power Results

Channel	Frequency (MHz)	UAT 2 Power (dBm)	LAT 3 Power (dBm)	Total Power (dBm)
Low	5190	13.93	13.84	16.90
High	5230	18.42	18.39	21.42

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8.6.4. OUTPUT POWER AND PPSD

LIMITS

FCC §15.407 (a) (1)

(i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

(ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required. However, PSD measurement was measured by Spectrum Analyzer and duty cycle factor is required.

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DIRECTIONAL ANTENNA GAIN

For Power used uncorrelated gain: The TX chains are uncorrelated and the antenna gain is unequal among the chains. The directional gain is:

UAT 2 Antenna Gain (dBi)	LAT 3 Antenna Gain (dBi)	Uncorrelated Chains Directional Gain (dBi)
-4.61	-0.98	-2.43

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

UAT 2 Antenna Gain (dBi)	LAT 3 Antenna Gain (dBi)	Correlated Chains Directional Gain (dBi)
-4.61	-0.98	0.40

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RESULTS

Antenna Gain and Limits

Channel	Frequency (MHz)	Directional Gain for Power (dBi)	Directional Gain for PSD (dBi)	Power Limit (dBm)	PSD Limit (dBm)
Low	5190	-2.43	0.40	24.00	11.00
High	5230	-2.43	0.40	24.00	11.00

Duty Cycle CF (dB)	0.10	**Included in Calculations of Corr'd PSD**

Output Power Results

Channel	Frequency (MHz)	UAT 2 Meas Power (dBm)	LAT 3 Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Power Margin (dB)
Low	5190	13.93	13.84	16.90	24.00	-7.10
High	5230	18.42	18.39	21.42	24.00	-2.58

PSD Results

Channel	Frequency (MHz)	UAT 2 Meas PSD (dBm)	LAT 3 Meas PSD (dBm)	Total Corr'd PSD (dBm)	PSD Limit (dBm)	PSD Margin (dB)
Low	5190	2.399	2.048	5.337	11.00	-5.66
High	5230	5.518	5.230	8.49	11.00	-2.51

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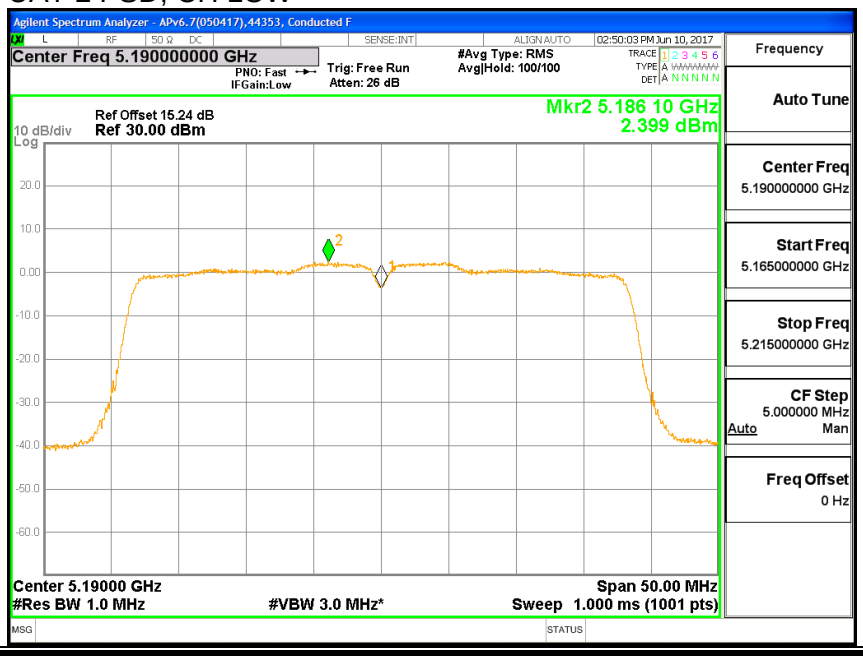
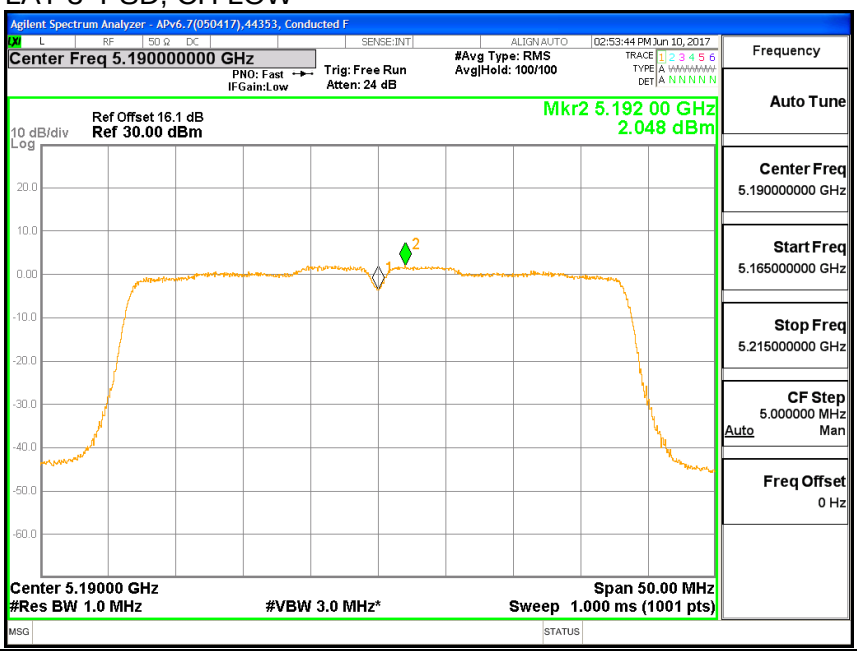
UAT 2 PSD, CH LOW



LAT 3 PSD, CH LOW



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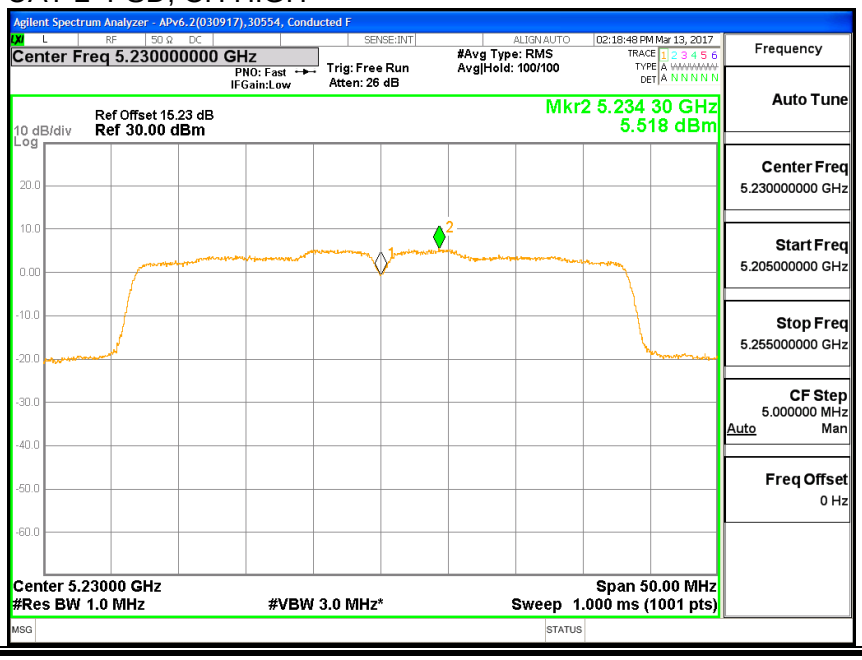
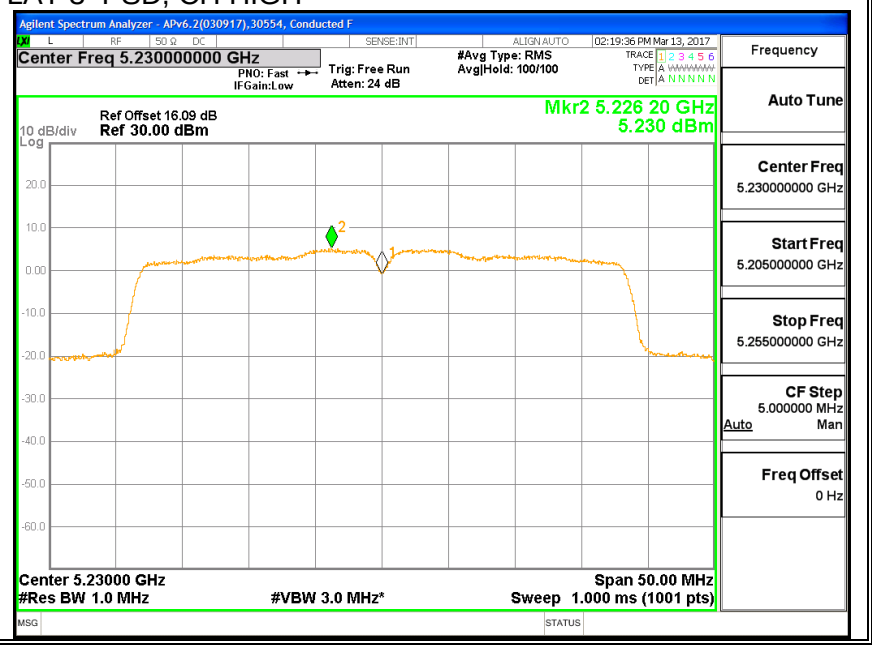
UAT 2 PSD, CH HIGH



LAT 3 PSD, CH HIGH



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8.7. 11ac HT80 UAT 2 SISO MODE IN THE 5.2GHz BAND

8.7.1. 26 dB BANDWIDTH

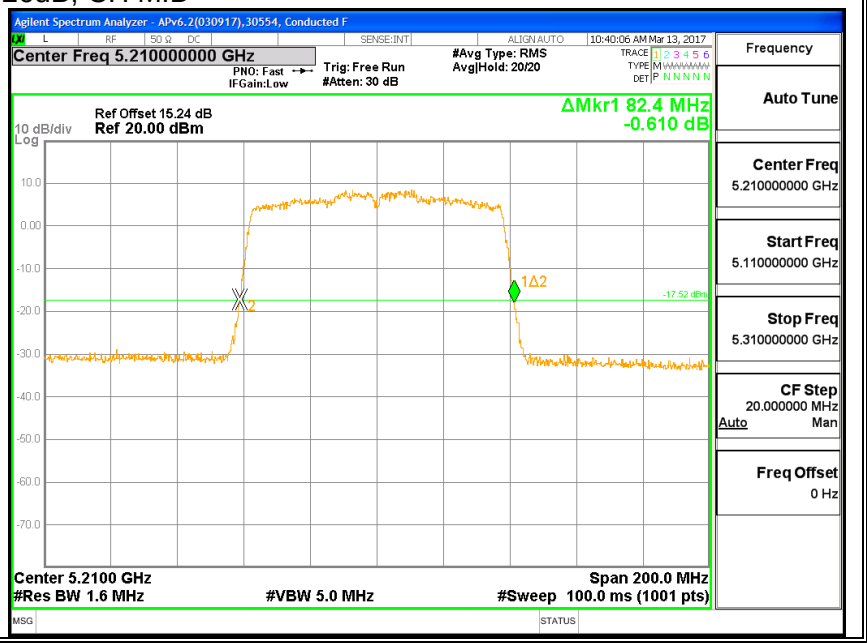
LIMITS

None; for reporting purposes only.

RESULTS

Channel	Frequency	26 dB BW UAT 2 (MHz)
Mid	5210	82.4

26dB, CH MID



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8.7.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

Channel	Frequency	99% BW UAT 2 (MHz)
Mid	5210	76.061

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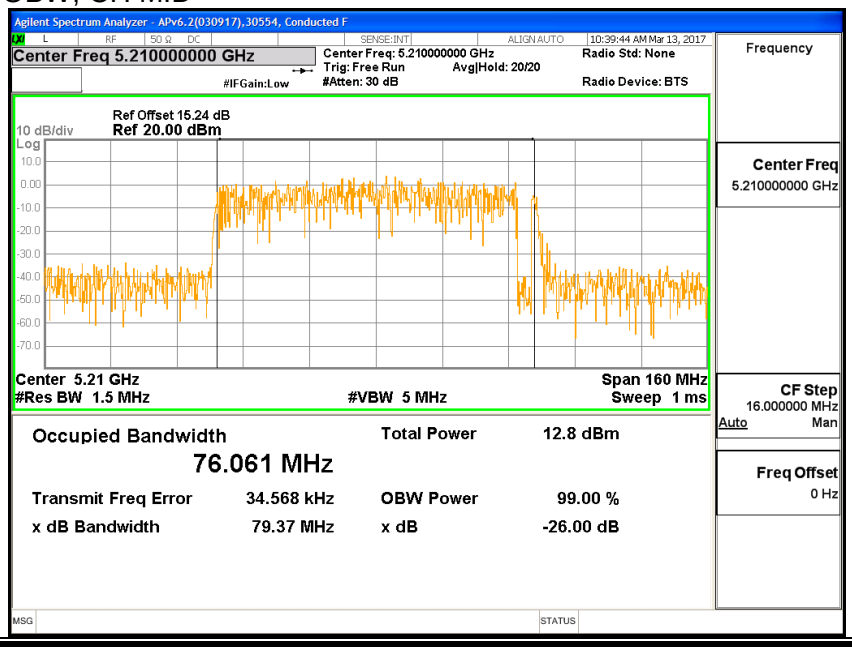
OBW, CH MID



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8.7.3. AVERAGE POWER

ID:	30554	Date:	6/12/2017

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter.

RESULTS

Channel	Frequency	Power UAT 2 (dBm)
Mid	5210	14.88

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8.7.4. OUTPUT POWER AND PPSD

LIMITS

FCC §15.407 (a) (1)

(i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

(ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required. However, PSD measurement was measured by Spectrum Analyzer and duty cycle factor is required

DIRECTIONAL ANTENNA GAIN

There is only one transmitter output therefore the directional gain is equal to the antenna gain.

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