MET Laboratories, Inc. ***Safety Certification - EMI - Telecom Environmental Simulation***

914 WEST PATAPSCO AVENUE ● BALTIMORE, MARYLAND 21230-3432 ● PHONE (410) 354-3300 ● FAX (410) 354-3313
33439 WESTERN AVENUE ● UNION CITY, CALIFORNIA 94587 ● PHONE (510) 489-6300 ● FAX (510) 489-6372
3162 BELICK STREET ● SANTA CLARA, CALIFORNIA 95054 ● PHONE (408) 748-3585 ● FAX (510) 489-6372
13301 MCCALLEN PASS ● AUSTIN, TX 78753 ● PHONE (512) 287-2500 ● FAX (512) 287-2513

December 19, 2017

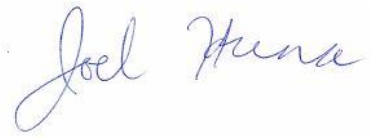
Weir Group Management Services
1 West Regent Street
Glasgow, Scotland G2 1RW

Dear Wayne Cooke,

Enclosed is the EMC Wireless test report for compliance testing of the Weir Group Management Services, Weir Industrial Gateway as tested to the requirements of Title 47 of the CFR, Ch. 1 (10-1-06 ed.), Title 47 of the CFR, Part 15.407, Subpart E (UNII 2).

Thank you for using the services of MET Laboratories, Inc. If you have any questions regarding these results or if MET can be of further service to you, please feel free to contact me.

Sincerely yours,
MET LABORATORIES, INC.



Joel Huna
Documentation Department

Reference: (\Weir Group Management Services\EMCA92659-FCC407 UNII 2 Rev. 1)

ACCREDITED TESTING CERT #0591.01 ACCREDITED TESTING CERT #0591.06

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Electromagnetic Compatibility Criteria
Test Report

for the

Weir Group Management Services
Model Weir Industrial Gateway

Tested under
The FCC Certification Rules
contained in
Title 47 of the CFR
15.407 Subpart E

MET Report: EMCA92659-FCC407 UNII 2 Rev. 1

December 19, 2017

Prepared For:

Weir Group Management Services
1 West Regent Street
Glasgow, Scotland G2 1RW

Prepared By:
MET Laboratories, Inc.
914 West Patapsco Avenue,
Baltimore, MD 21230

Electromagnetic Compatibility Criteria
Test Report

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Tested under
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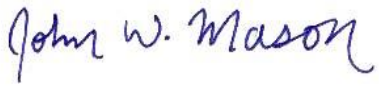
Title 47 of the CFR
15.407 Subpart E

Deepak Giri, Project Engineer
Electromagnetic Compatibility Lab

Joel Huna
Documentation Department

Engineering Statement: The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of 15.407 of the FCC Rules under normal use and maintenance.



John Mason,
Director, Electromagnetic Compatibility Lab

Report Status Sheet

Revision	Report Date	Reason for Revision
∅	November 29, 2017	Initial Issue.
1	December 19, 2017	Engineer Corrections and Customer Name/Address Update.

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List of Terms and Abbreviations

AC	**A**lternating **C**urrent
ACF	**A**ntenna **C**orrection **F**actor
Cal	**Cal**ibration
d	**M**easurement **D**istance
dB	**D**eci**b**els
dBµA	**D**eci**b**els above one **micro**amp
dBµV	**D**eci**b**els above one **micro**volt
dBµA/m	**D**eci**b**els above one **micro**amp **per m**eter
dBµV/m	**D**eci**b**els above one **micro**volt **per m**eter
DC	**D**irect **C**urrent
E	**E**lectric Field
DSL	**D**igital **S**ubscriber **L**ine
ESD	**E**lectro**s**tatic **D**ischarge
EUT	**E**quipment **U**nder **T**est
f	**F**requency
FCC	**F**ederal **C**ommunications **C**ommission
GRP	**G**round **R**eference **P**lane
H	Magnetic Field
HCP	**H**orizontal **C**oupling **P**lane
Hz	**H**ert**z**
IEC	**I**nternational **E**lectrotechnical **C**ommission
kHz	**k**ilo**h**ert**z**
kPa	**k**ilo**pa**scal
kV	**k**ilo**v**olt
LISN	**L**ine **I**mpedance **S**tabilization **N**etwork
MHz	**M**ega**h**ertz
µH	**microh**enry
µ	**microf**arad
µs	**micros**econds
PRF	**P**ulse **R**epetition **F**requency
RF	**R**adio **F**requency
RMS	**R**oot-**M**ean-**S**quare
TWT	**T**raveling **W**ave **T**ube
V/m	**V**olts **per m**eter
VCP	**V**ertical **C**oupling **P**lane

I. Executive Summary

A. Purpose of Test

An EMC evaluation was performed to determine compliance of the Weir Group Management Services Weir Industrial Gateway, with the requirements of Part 15, §15.407. All references are to the most current version of Title 47 of the Code of Federal Regulations in effect. In accordance with §2.1033, the following data is presented in support of the Certification of the Weir Industrial Gateway. Weir Group Management Services should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the Weir Industrial Gateway, has been **permanently** discontinued.

B. Executive Summary

The following tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15, §15.407, in accordance with Weir Group Management Services, purchase order number T10536863. All tests were conducted using measurement procedure ANSI C63.4-2014.

FCC Reference	Description	Results
§15.203	Antenna Requirement	Compliant
§15.403(i)	26 dB Occupied Bandwidth	Compliant
§15.407 (a)(2)	Maximum Conducted Output Power	Compliant
§15.407 (a)(2)	Maximum Power Spectral Density	Compliant
§15.407 (b)(2 – 3)& (6 - 7)	Undesirable Emissions	Compliant
§15.407(b)(6)	Conducted Emission	Compliant
§15.407(c)	Automatic Discontinue of Transmitter	Not Applicable
§15.407(f)	RF Exposure	Compliant
§15.407(g)	Frequency Stability	Compliant

Table 1. Executive Summary of EMC Part 15.407 ComplianceTesting

II. Equipment Configuration

A. Overview

MET Laboratories, Inc. was contracted by Weir Group Management Services to perform testing on the Weir Industrial Gateway, under Weir Group Management Services's purchase order number T10536863.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Weir Group Management Services Weir Industrial Gateway.

The results obtained relate only to the item(s) tested.

Model(s) Tested:	Weir Industrial Gateway	
Model(s) Covered:	Weir Industrial Gateway	
EUT Specifications:	Primary Power: 120/240 VAC 50/60 Hz	
	FCC ID: 2ANXR-STXMPM	
	Type of Modulations:	QAM
	Equipment Code:	NII
	Peak RF Output Power:	15.53 dBm
	EUT Frequency Ranges:	5250 – 5350 MHz and 5470 – 5725 MHz
Analysis:	The results obtained relate only to the item(s) tested.	
Environmental Test Conditions:	Temperature: 15-35º C	
	Relative Humidity: 30-60%	
	Barometric Pressure: 860-1060 mbar	
Type of Filing:	Original	
Evaluated by:	Deepak Giri	
Report Date(s):	December 19, 2017	

Table 2. EUT Summary

B. References

CFR 47, Part 15, Subpart E	Unlicensed National Information Infrastructure Devices (UNII)
ANSI C63.4:2014	Methods and Measurements of Radio-Noise Emissions from Low-Voltage Electrical And Electronic Equipment in the Range of 9 kHz to 40 GHz
ISO/IEC 17025:2005	General Requirements for the Competence of Testing and Calibration Laboratories
ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices
789033 D02 General UNII Test Procedures New Rules v01r04	Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices Part 15, Subpart E
905462 DO2 UNII DFS Compliance Procedures New Rules v01r02	Compliance Measurement Procedures for Unlicensed-National Information Infrastructure Devices Operating in the 5250-5350 MHz and 5470-5725 MHz Bands Incorporating Dynamic Frequency Selection

Table 3. References

C. Test Site

All testing was performed at MET Laboratories, Inc., 13501 McCallen Pass, Austin TX 78753 and MET Laboratories, Inc., 914 West Patapsco Avenue, Baltimore, MD 21230. All equipment used in making physical determinations is accurate and bears recent traceability to the National Institute of Standards and Technology.

Radiated Emissions measurements were performed in a 3 meter semi-anechoic chamber (equivalent to an Open Area Test Site). In accordance with §2.948(a)(3), a complete site description is contained at MET Laboratories.

MET Laboratories is a ISO/IEC 17025 accredited site by A2LA. Baltimore #0591.01 and Austin #0591.06.

D. Description of Test Sample

The Weir Group Management Services Weir Industrial Gateway, Equipment Under Test (EUT), is used to monitor the operation of the components of a drilling rig, in particular the sound and vibration from the bearings in the system. This is monitored through digital signal processing to determine if the bearing is nearing the end of its life and needs to be replaced.

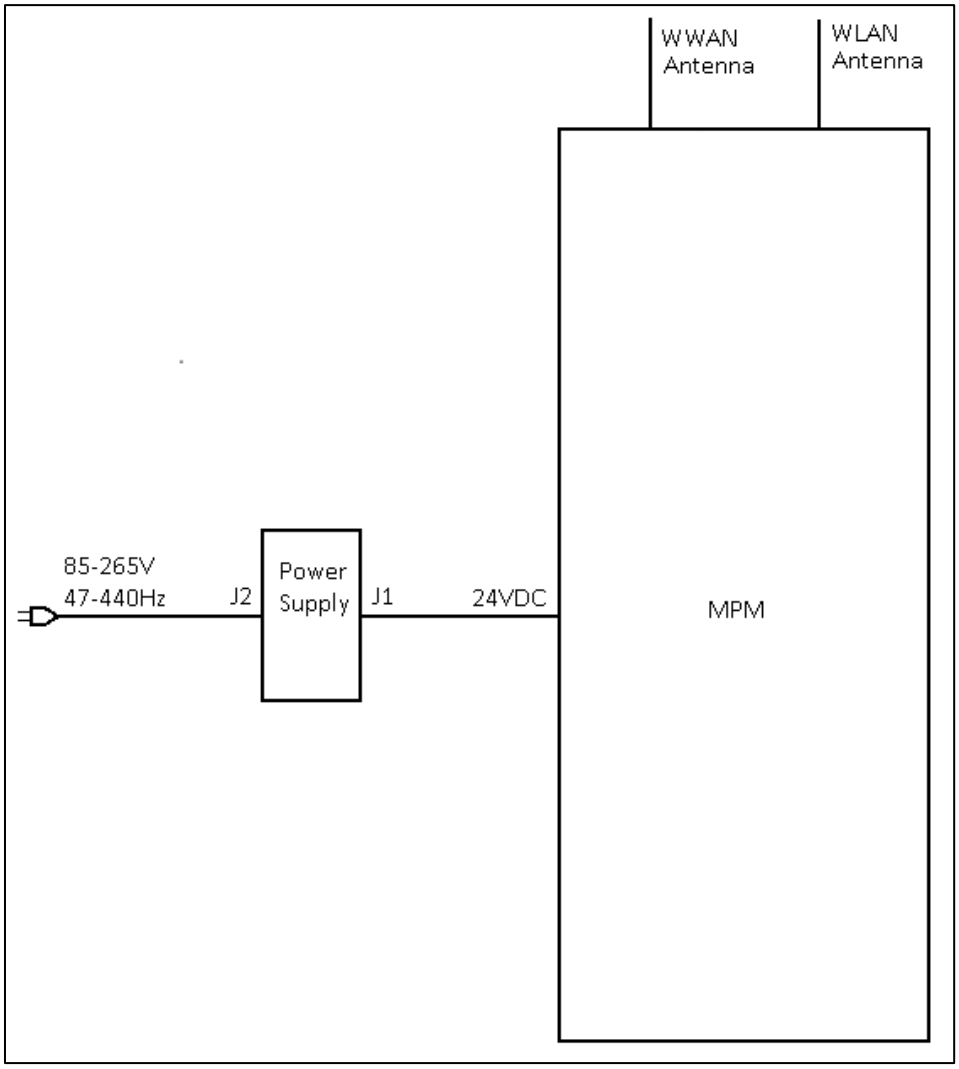


Figure 1. Block Diagram of Test Configuration

E. Equipment Configuration

The EUT was set up as outlined in Figure 1, Block Diagram of Test Setup. All cards, racks, etc., incorporated as part of the EUT is included in the following list.

Ref. ID	Name / Description	Model Number	Serial Number	Rev. #
A	Power Supply	CH-SAN500AC-24	161103	01
B	MPM	North America: STX-000004	006	01
P	Antenna	MY-0W4VW8-74431-5CM-0668-A00	N/A	N/A

Table 4. Equipment Configuration

F. Support Equipment

Support equipment necessary for the operation and testing of the EUT is included in the following list.

Ref. ID	Name / Description	Manufacturer	Model Number	*Customer Supplied Calibration Data
E	Ethernet Switch	Netgear	N300	N/A
F	External Laptop	Dell	Latitude E5570	N/A
The 'Customer Supplied Calibration Data' column will be marked as either not applicable, not available, or will contain the calibration date supplied by the customer.				

Table 5. Support Equipment

G. Ports and Cabling Information

Ref. ID	Port name on EUT	Cable Description or reason for no cable	Qty	Length as tested (m)	Max Length (m)	Shielded ? (Y/N)	Termination Box ID & Port Name
1	AC Input	3 conductor, bare wires at AC Mains end, 14 AWG	1	10	50	No	Power Box.J2
2	24VDC	4 conductor, 14 AWG	1	2	50	No	Power Box.J1
9	LAN	8 conductor, 20 AWG	1	5	50	Yes	Ethernet switch
33	MPM	Antenna cable, 1 conductor, coax, CA120/195-XC	1	10	10	Yes	Antenna

Table 6. Ports and Cabling Information

H. Mode of Operation

Custom software (WinEMI) will exercise all ports and send the system performance to a WiFi link to be monitored by an external laptop.

I. Method of Monitoring EUT Operation

An external laptop with a WiFi link will monitor the system and display the system performance.

J. Modifications

a) Modifications to EUT

No modifications were made to the EUT.

b) Modifications to Test Standard

No modifications were made to the test standard.

K. Disposition of EUT

The test sample including all support equipment submitted to the Electro-Magnetic Compatibility Lab for testing was returned to Weir Group Management Services upon completion of testing.

III. Electromagnetic Compatibility Criteria for Intentional Radiators

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.203 Antenna Requirement

Test Requirement: **§ 15.203:** An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

The structure and application of the EUT were analyzed to determine compliance with Section 15.203 of the Rules. Section 15.203 states that the subject device must meet at least one of the following criteria:

a.) Antenna must be permanently attached to the unit.

b.) Antenna must use a unique type of connector to attach to the EUT.

c.) Unit must be professionally installed. Installer shall be responsible for verifying that the correct antenna is employed with the unit.

Results: The EUT as tested is compliant the criteria of §15.203.

Antenna is professionally installed and uses special connectors.

Test Engineer(s): Deepak Giri

Test Date(s): May 5, 2017

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15. 403(i) 26dB Bandwidth

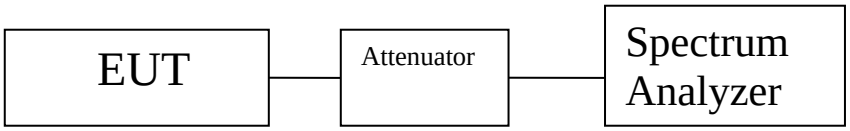
Test Requirements: **§ 15.403(i):** For purposes of this subpart the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier. Determination of the emissions bandwidth is based on the use of measurement instrumentation employing a peak detector function with an instrument resolution bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.

Test Procedure: The transmitter was set to low, mid, and high operating frequencies at the highest output power and connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using a RBW approximately equal to 1% of the total emission bandwidth, VBW > RBW. The 26 dB Bandwidth was measured and recorded.

Test Results The 26 dB Bandwidth was compliant with the requirements of this section.

Test Engineer(s): Deepak Giri

Test Date(s): May 12, 2017

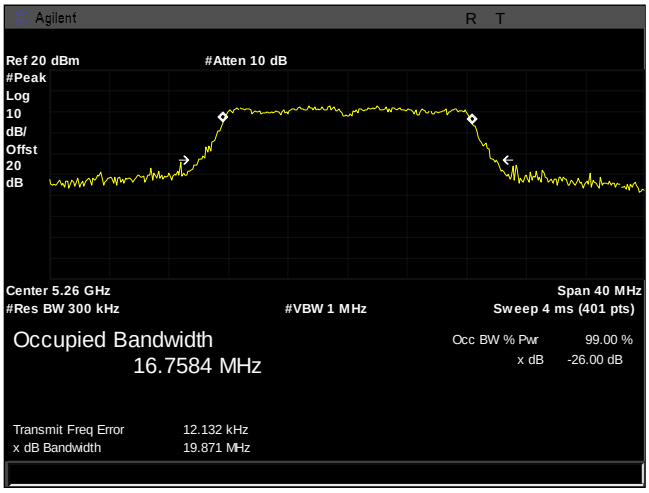


Bandwidth	Mode	Frequency MHz	99% Bw	26 dB
20 MHz	A	5260	16.75	19.87
		5280	16.73	19.56
		5320	16.59	19.43
		5500	16.7	19.75
		5560	16.72	19.54
		5700	16.67	19.19
	AC	5260	17.7	20.156
		5280	17.679	20.233
		5320	17.66	19.738
		5500	17.735	20.078
		5560	17.752	20.221
		5700	17.406	20.164
	N	5260	17.674	19.89
		5280	17.69	20.296
		5320	17.62	20.12
		5500	17.63	20.29
		5560	17.7	20.28
		5700	17.72	20.33
40 MHz	AC	5270	36.43	40.92
		5310	36.38	40.86
		5510	36.33	40.87
		5590	36.51	41.03
		5670	36.55	41.076
	N	5270	36.61	40.82
		5310	36.66	40.74
		5510	36.5	41.2
		5590	36.58	41.04
		5670	36.5	41.37
80 MHz	AC	5290	76.52	81.62
		5530	76.14	81.78
		5610	75.86	80.97

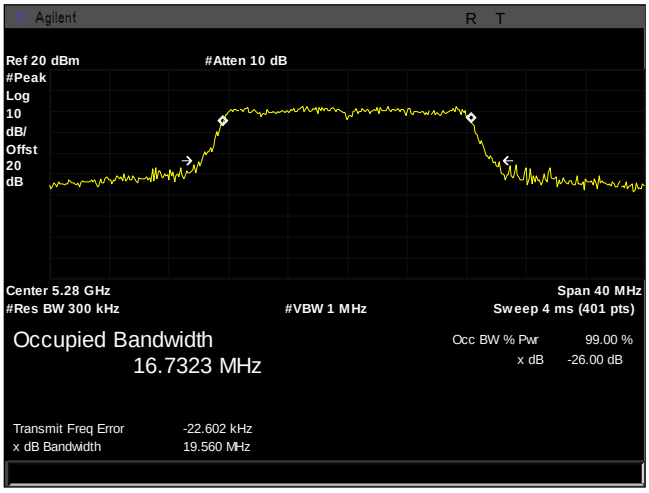
Table 7. Occupied Bandwidth, SISO, Test Results

Bandwidth	Mode	Frequency MHz	99% Bw		26 dB	
			Port A	Port B	Port A	Port B
20 MHz	A	5260	16.78	16.63	20.172	19.41
		5280	16.79	16.67	19.8	19.8
		5320	16.76	16.69	19.93	19.771
		5500	16.722	16.729	19.799	19.85
		5560	16.81	16.61	19.94	19.54
		5700	16.644	16.65	19.613	19.922
	AC	5260	16.74	16.69	20.06	19.88
		5280	16.811	16.65	19.88	19.78
		5320	16.72	16.707	19.78	19.863
		5500	16.77	16.69	20.105	19.826
		5560	16.77	16.68	19.79	19.56
		5700	16.7	16.64	19.77	19.9
	N	5260	16.66	16.7	20.07	20
		5280	16.81	16.65	19.94	19.69
		5320	16.73	16.71	19.68	19.86
		5500	16.77	16.65	20.1	19.87
		5560	16.74	16.68	19.76	19.63
		5700	16.77	16.62	19.91	19.92
40 MHz	AC	5270	36.33	36.28	41.23	40.9
		5310	36.44	36.42	41.45	40.94
		5510	36.24	36.28	41.63	40.95
		5590	36.39	36.32	41.76	41.03
		5670	36.27	36.33	41.59	41.34
	N	5270	36.29	36.24	41.01	40.97
		5310	36.51	36.36	41.59	40.78
		5510	36.2	36.37	41.29	40.99
		5590	36.44	36.29	41.8	41.01
		5670	36.31	36.37	40.97	41.29
80 MHz	AC	5290	76.52	75.83	81.62	81.39
		5530	75.84	75.44	81.78	81.33
		5610	76.22	75.99	81.97	81.72

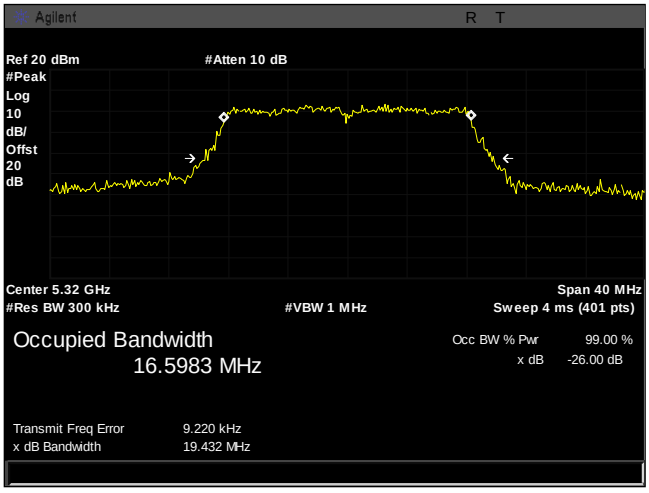
Table 8. Occupied Bandwidth, MIMO, Test Results



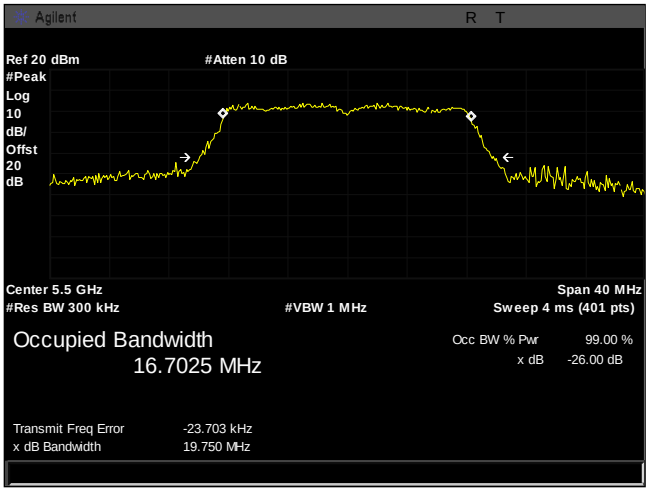
Plot 1. Occupied Bandwidth, 5260 MHz A mode 20 MHz



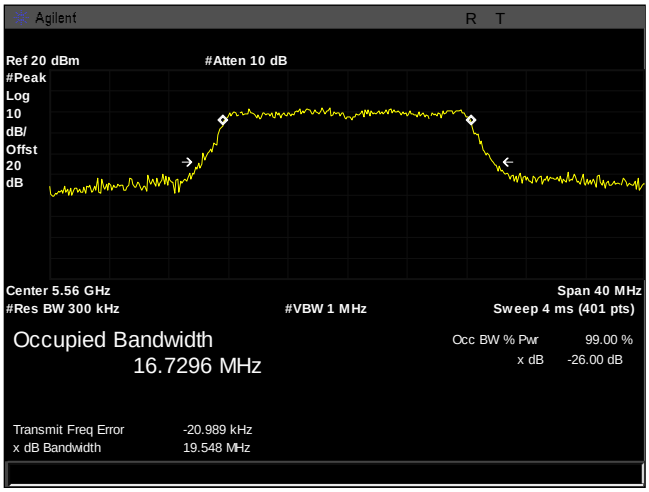
Plot 2. Occupied Bandwidth, 5280 MHz A mode 20 MHz



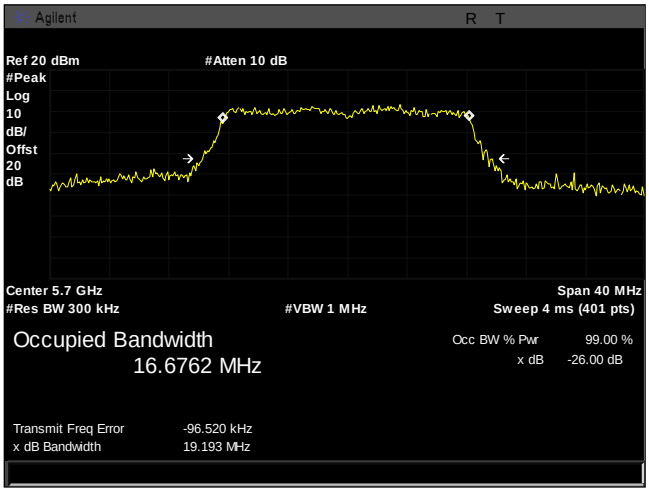
Plot 3. Occupied Bandwidth, 5320 MHz A mode 20 MHz



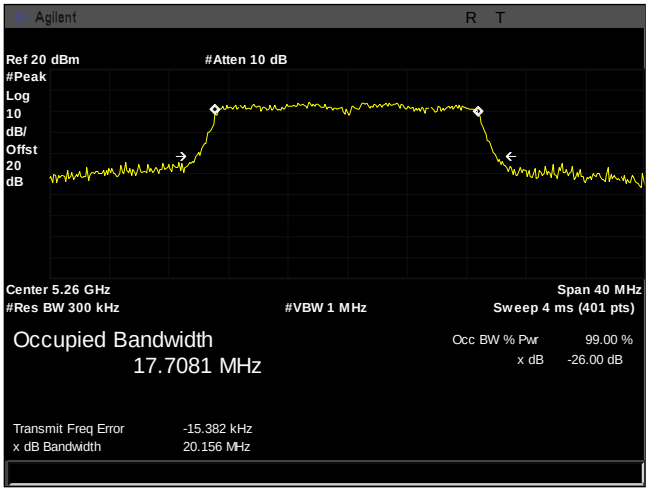
Plot 4. Occupied Bandwidth, 5500 Mhz A mode 20 Mhz



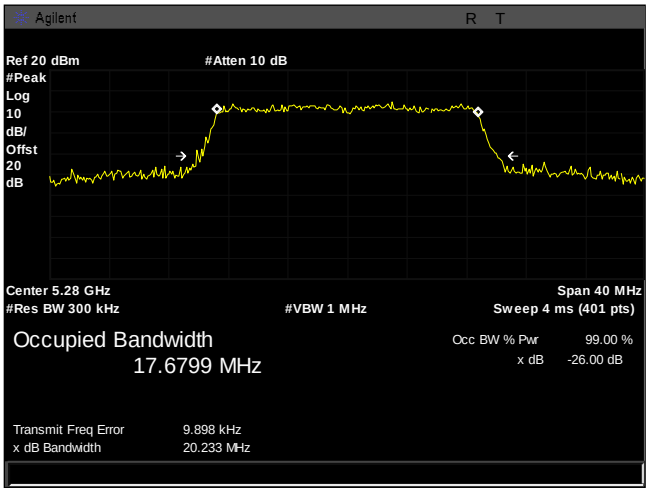
Plot 5. Occupied Bandwidth, 5560 MHz A mode 20 MHz



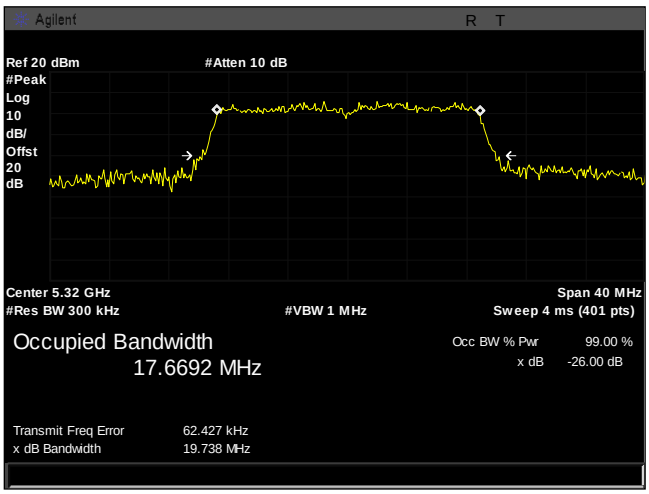
Plot 6. Occupied Bandwidth, 5700 MHz A mode 20 MHz



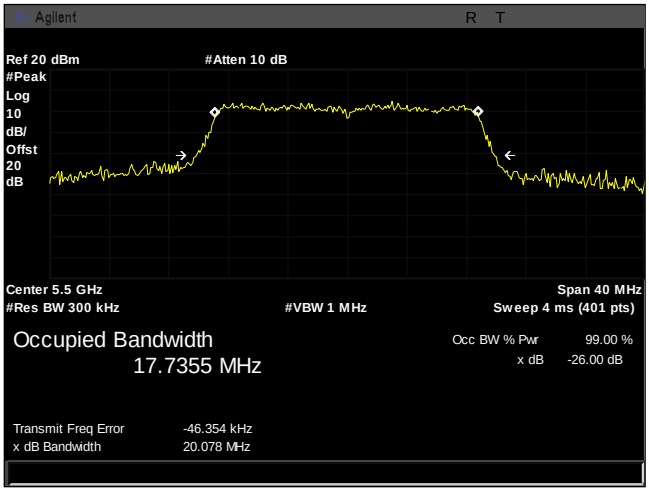
Plot 7. Occupied Bandwidth, 5260 MHz AC mode 20 MHz



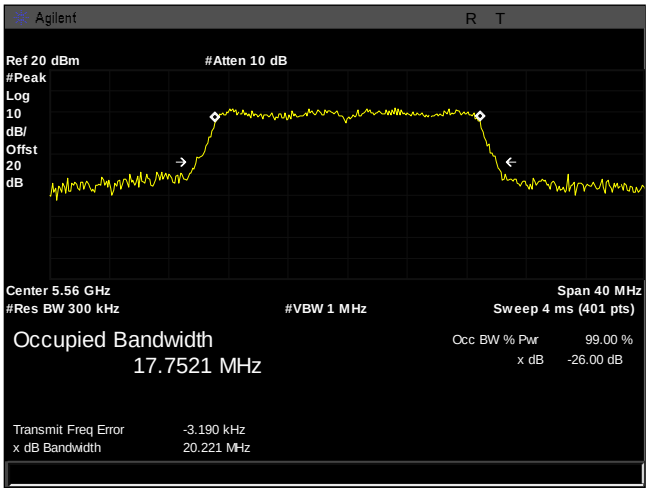
Plot 8. Occupied Bandwidth, 5280 MHz AC mode 20 MHz



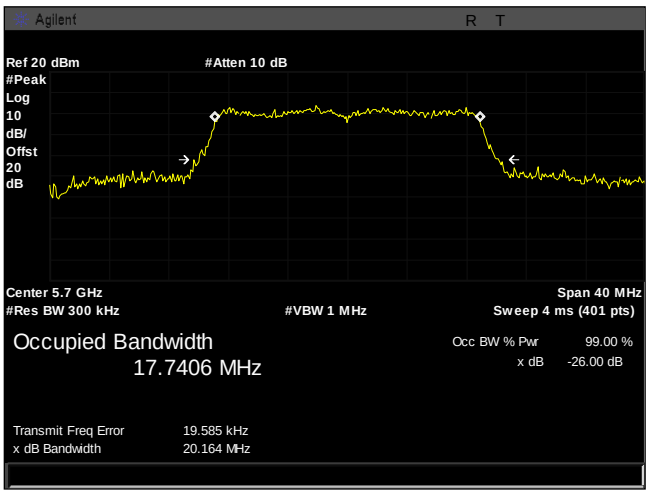
Plot 9. Occupied Bandwidth, 5320 MHz AC mode 20 MHz



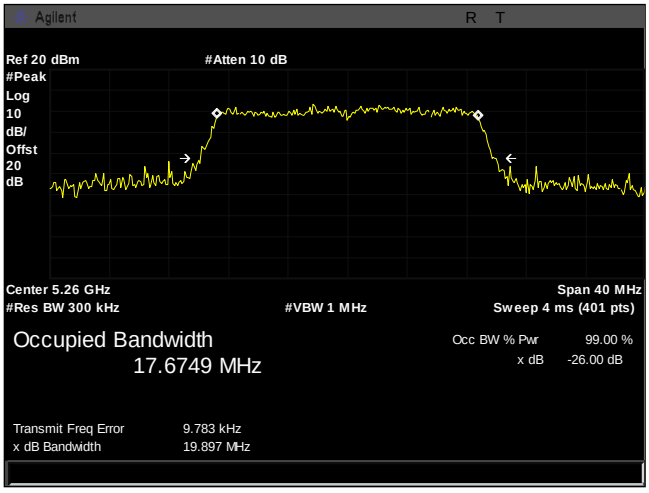
Plot 10. Occupied Bandwidth, 5500 MHz AC mode 20 MHz



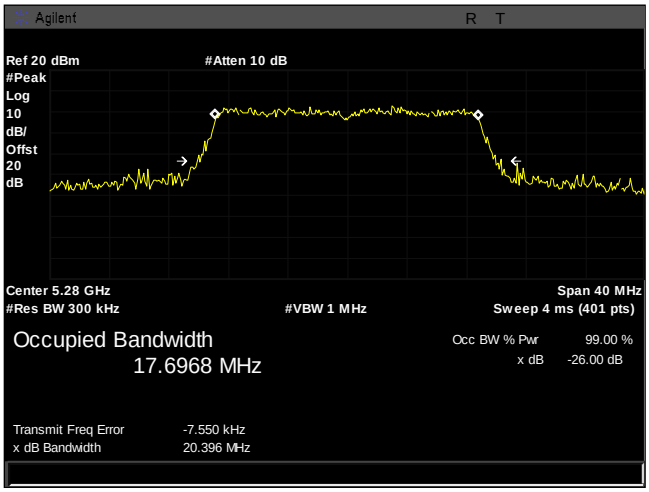
Plot 11. Occupied Bandwidth, 5560 MHz AC mode 20 MHz



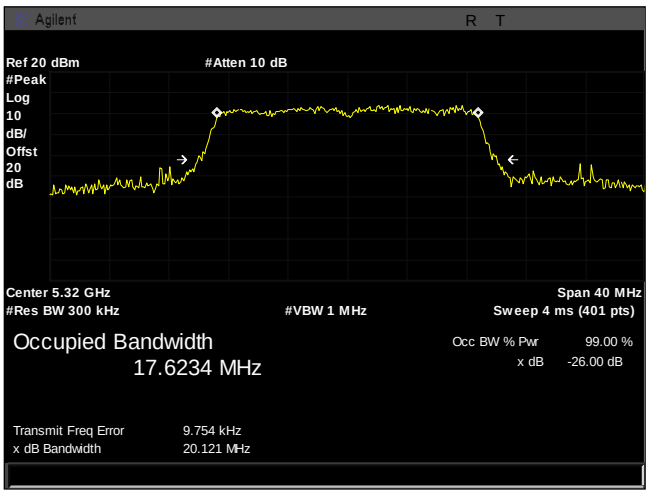
Plot 12. Occupied Bandwidth, 5700 MHz AC mode 20 MHz



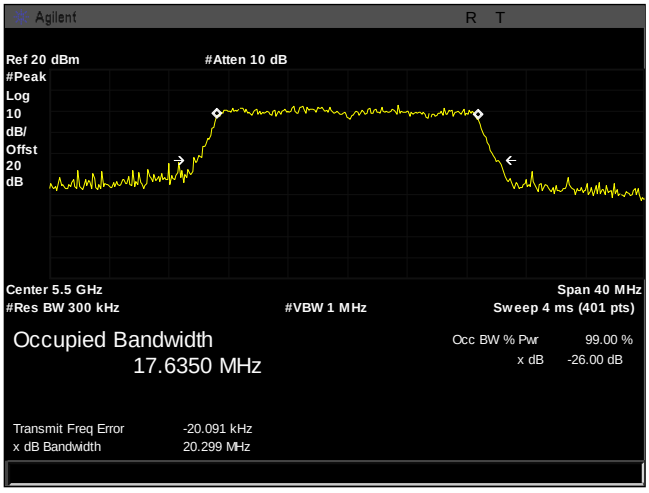
Plot 13. Occupied Bandwidth, 5260 MHz N mode 20 MHz



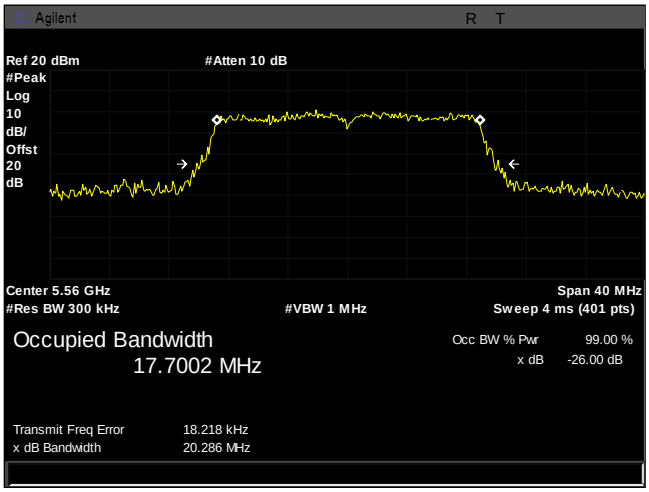
Plot 14. Occupied Bandwidth, 5280 MHz N mode 20 MHz



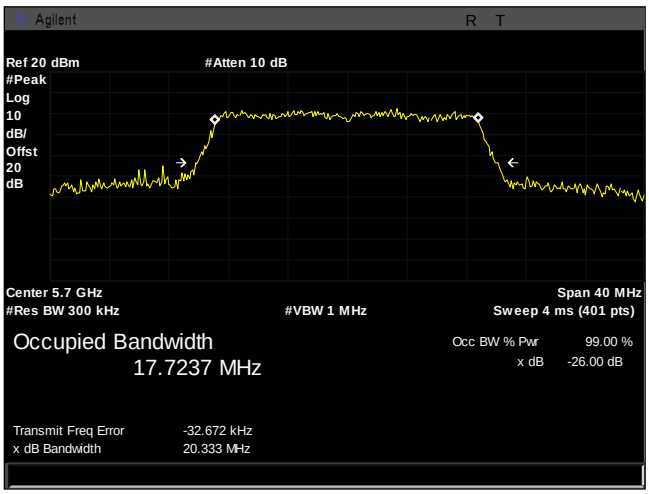
Plot 15. Occupied Bandwidth, 5320 MHz N mode 20 MHz



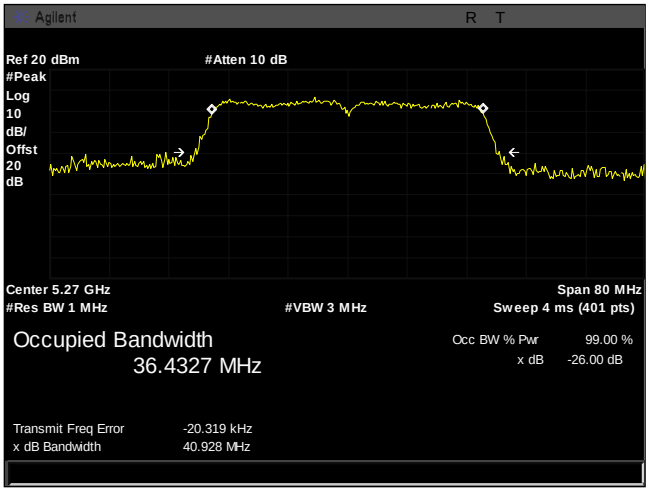
Plot 16. Occupied Bandwidth, 5500 MHz N mode 20 MHz



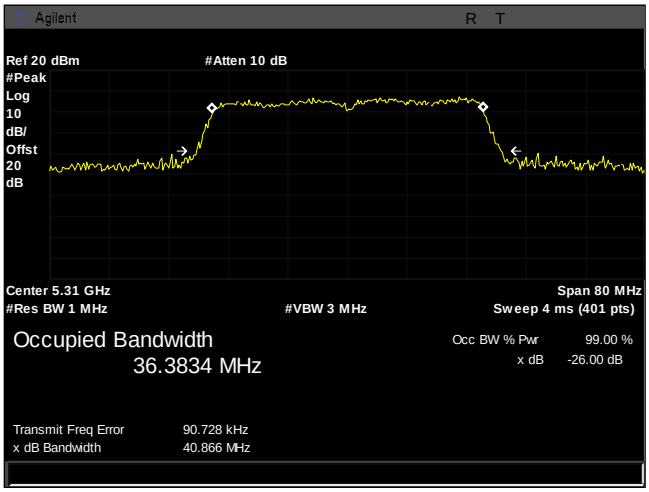
Plot 17. Occupied Bandwidth, 5560 MHz N mode 20 MHz



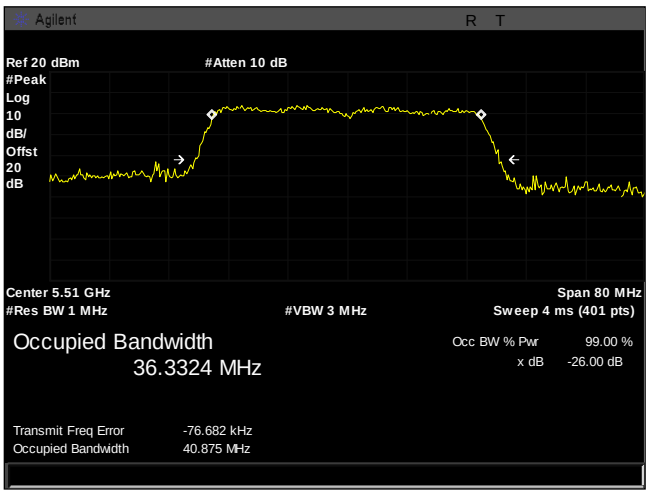
Plot 18. Occupied Bandwidth, 5700 MHz N mode 20 MHz



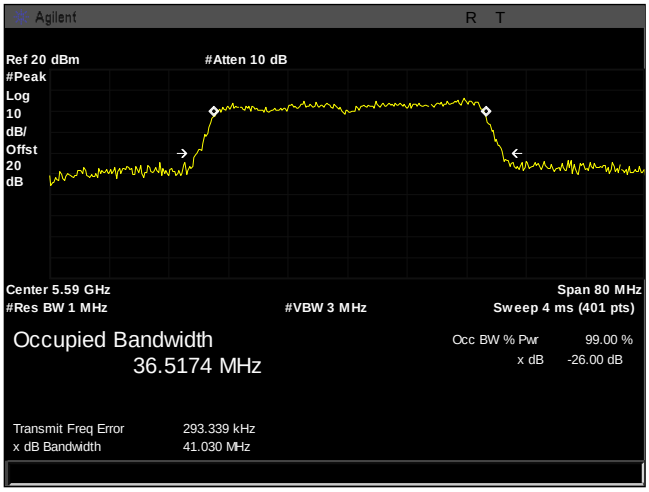
Plot 19. Occupied Bandwidth, 5270 MHz AC mode 40 MHz



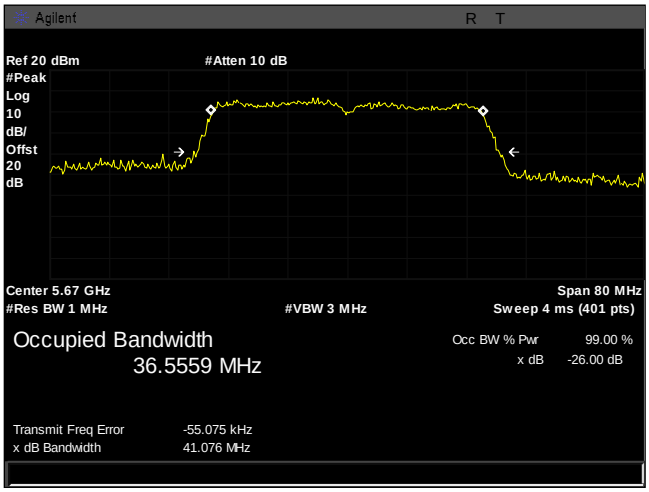
Plot 20. Occupied Bandwidth, 5310 MHz AC mode 40 MHz



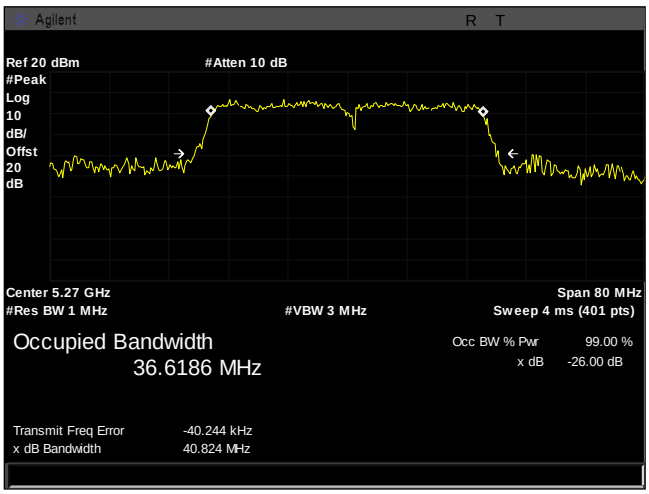
Plot 21. Occupied Bandwidth, 5510 MHz AC mode 40 MHz



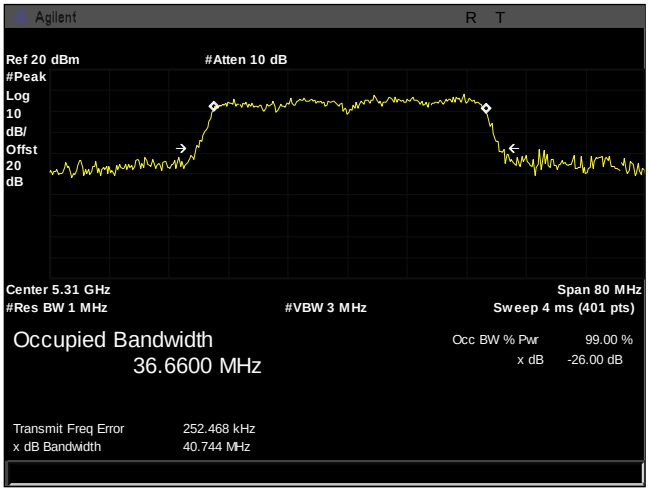
Plot 22. Occupied Bandwidth, 5590 MHz AC mode 40 MHz



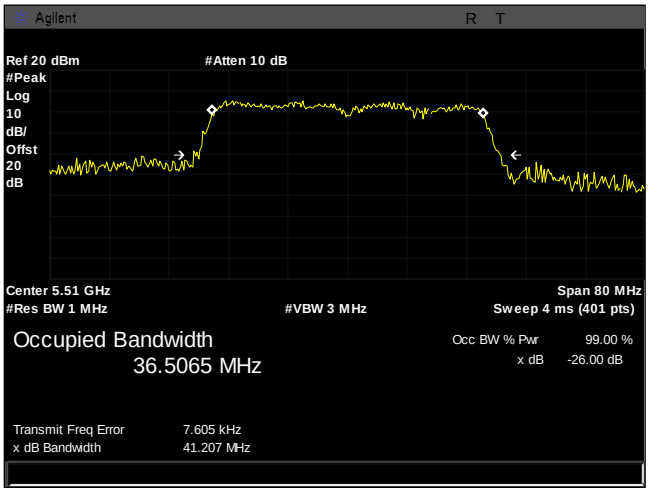
Plot 23. Occupied Bandwidth, 5670 MHz AC mode 40 MHz



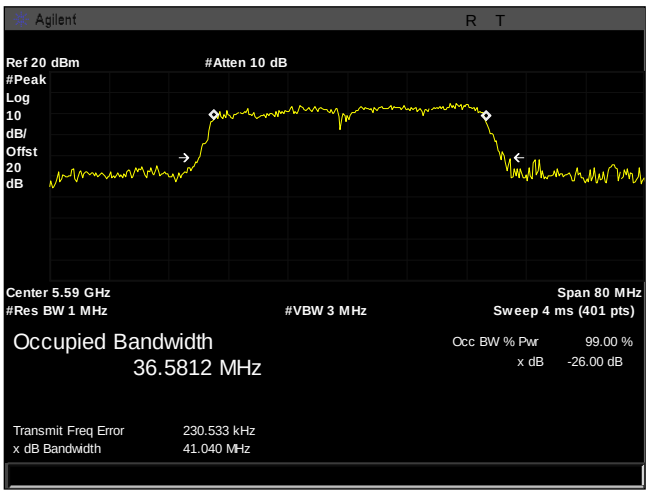
Plot 24. Occupied Bandwidth, 5270 MHz N mode 40 MHz



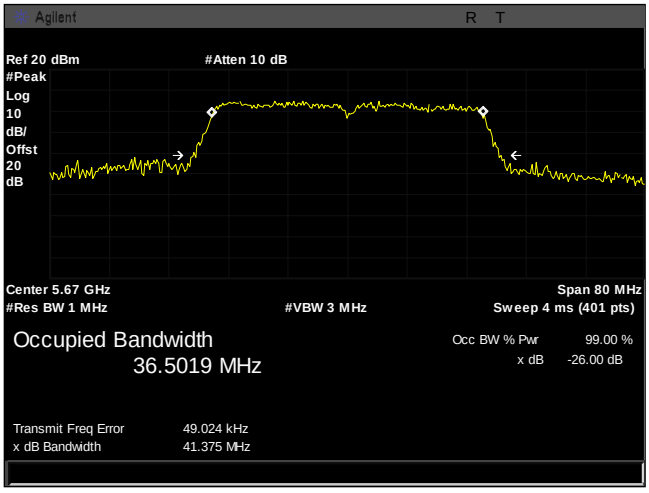
Plot 25. Occupied Bandwidth, 5310 MHz N mode 40 MHz



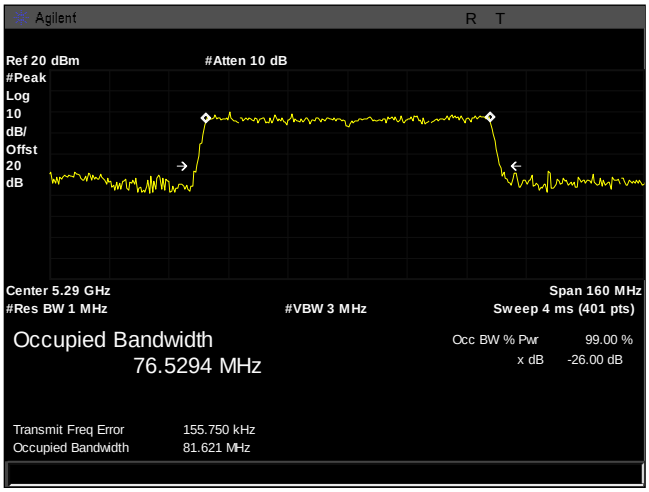
Plot 26. Occupied Bandwidth, 5510 MHz N mode 40 MHz



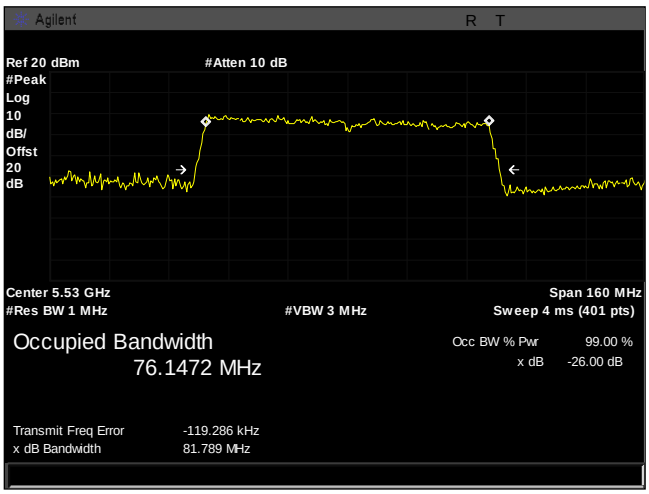
Plot 27. Occupied Bandwidth, 5590 MHz N mode 40 MHz



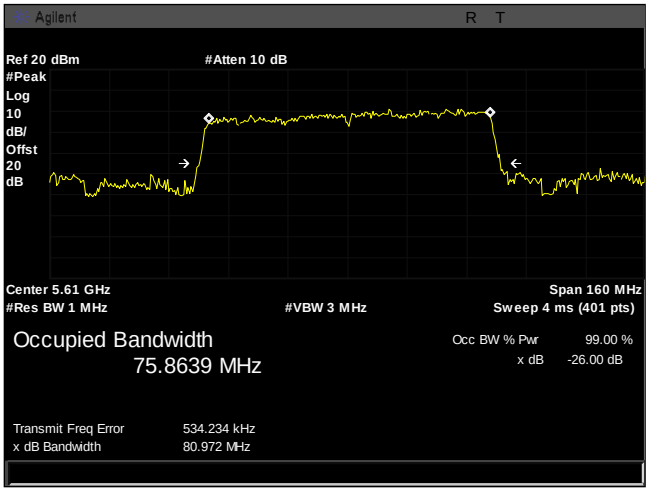
Plot 28. Occupied Bandwidth, 5670 MHz N mode 40 MHz



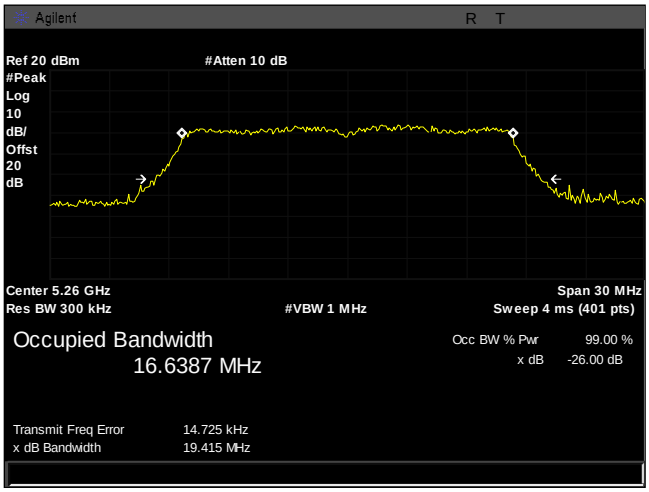
Plot 29. Occupied Bandwidth, 5290 Mhz AC mode 80 MHz



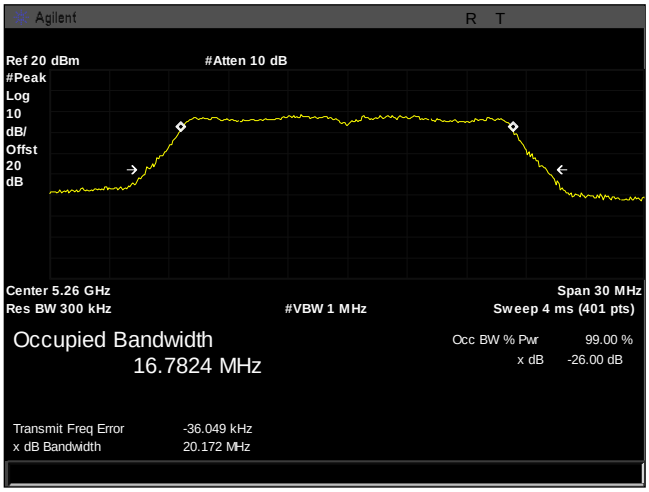
Plot 30. Occupied Bandwidth, 5530 MHz AC mode 80 MHz



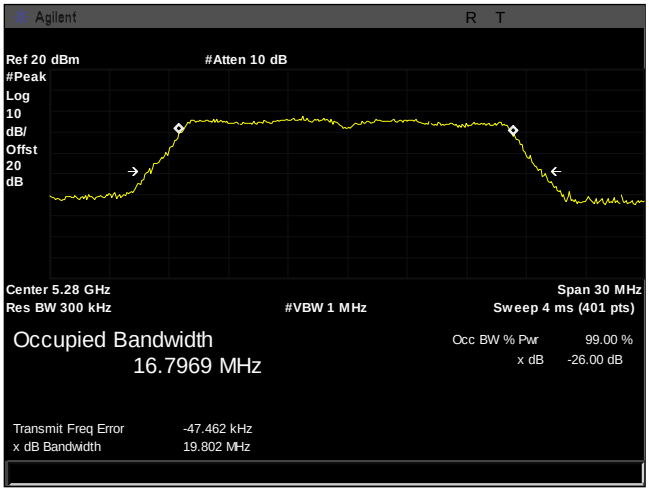
Plot 31. Occupied Bandwidth, 5610 MHz AC mode 80 MHz



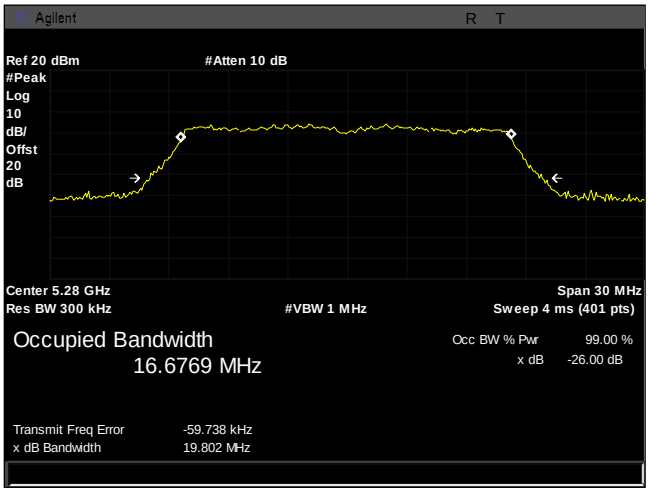
Plot 32. Occupied Bandwidth, 5260 MHz OBW A Mode 20 MHz Port B



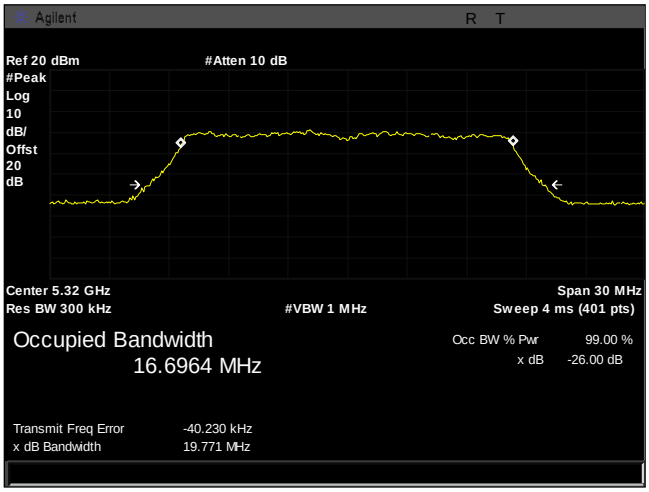
Plot 33. Occupied Bandwidth, 5260 MHz OBW A Mode 20 MHz Port A



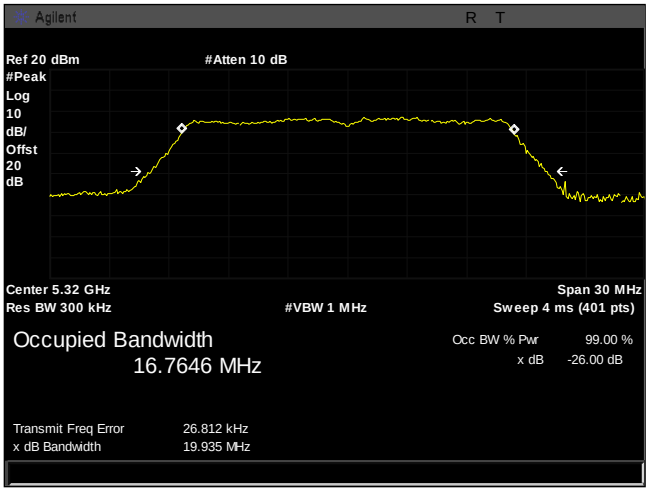
Plot 34. Occupied Bandwidth, 5280 MHz OBW A Mode 20 MHz Port A



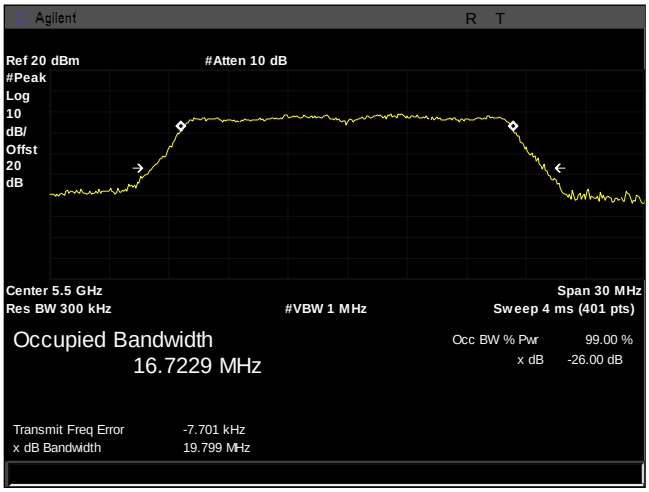
Plot 35. Occupied Bandwidth, 5280 MHz OBW A Mode 20 MHz Port B



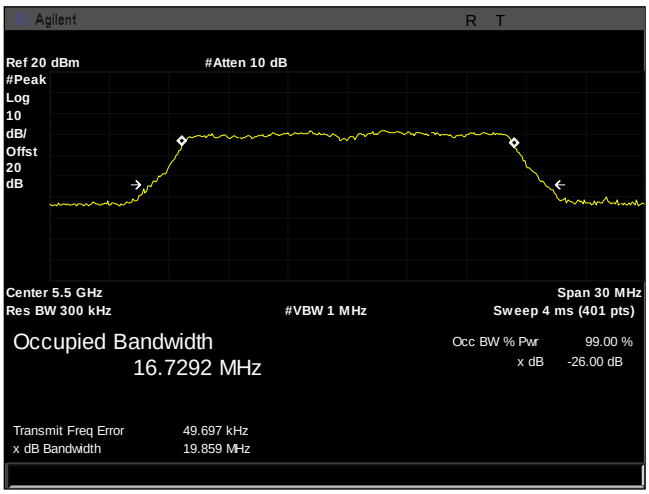
Plot 36. Occupied Bandwidth, 5320 MHz OBW A Mode 20 MHz Port B



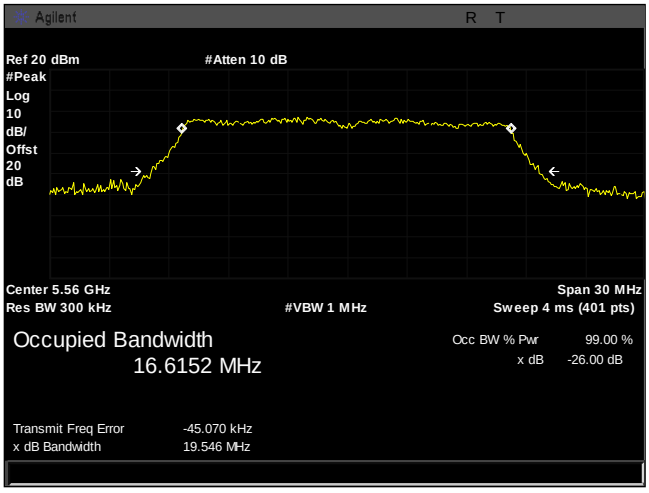
Plot 37. Occupied Bandwidth, 5320 MHz OBW A Mode 20 MHz Port A



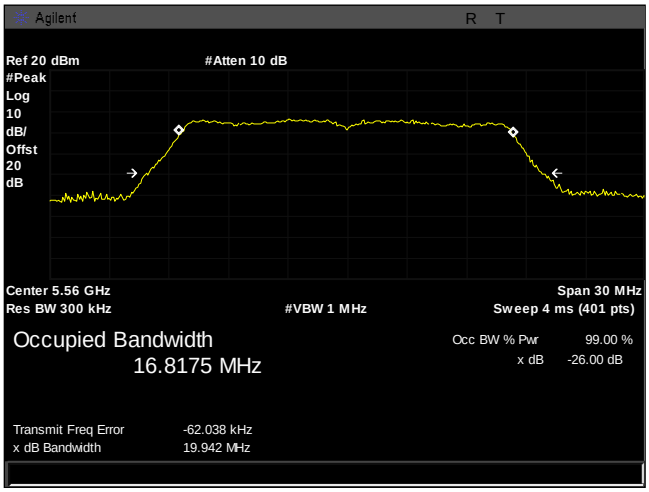
Plot 38. Occupied Bandwidth, 5500 MHz OBW A Mode 20 MHz Port A



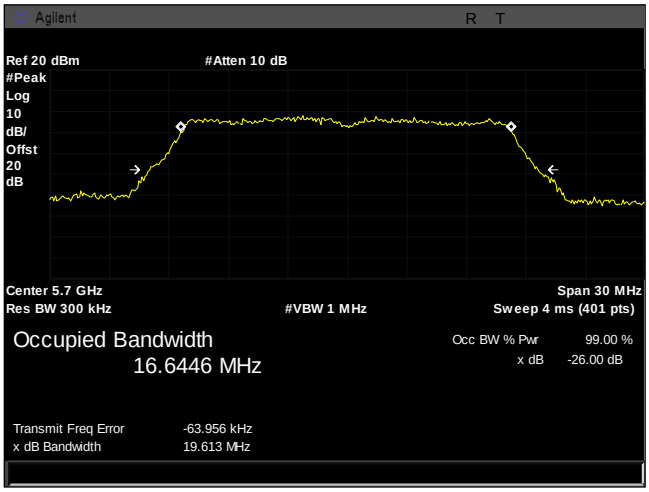
Plot 39. Occupied Bandwidth, 5500 MHz OBW A Mode 20 MHz Port B



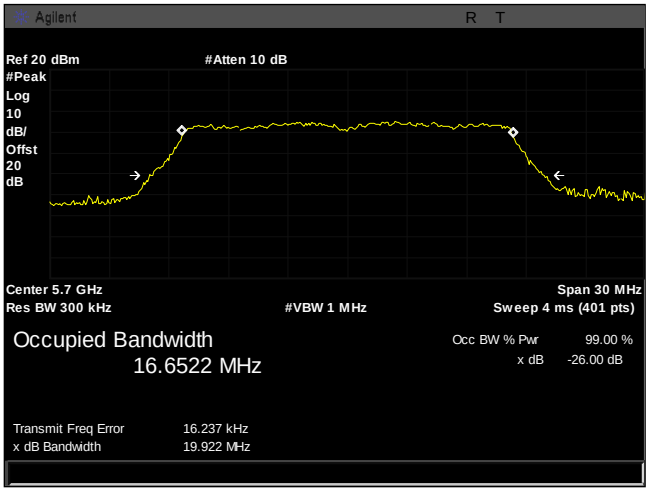
Plot 40. Occupied Bandwidth, 5560 MHz OBW A Mode 20 MHz Port B



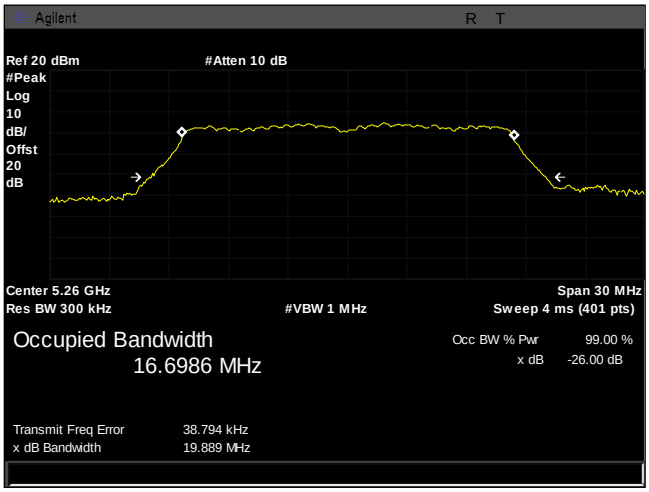
Plot 41. Occupied Bandwidth, 5560 MHz OBW A Mode 20 MHz Port A



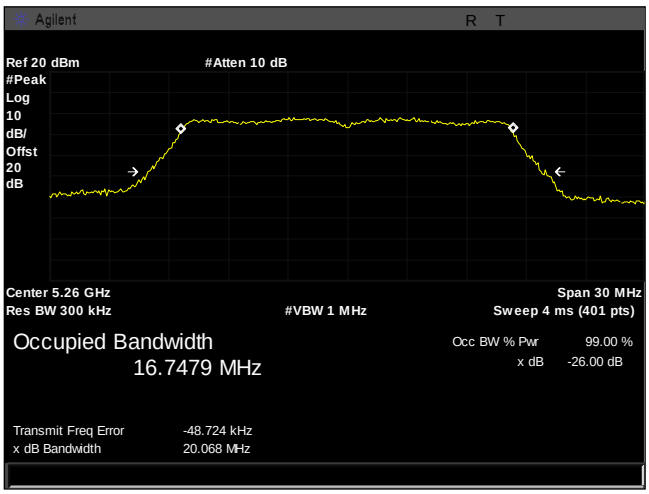
Plot 42. Occupied Bandwidth, 5700 MHz OBW A Mode 20 MHz Port A



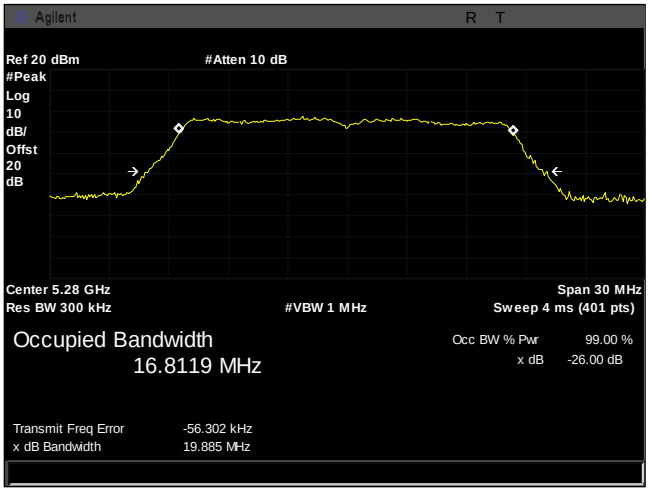
Plot 43. Occupied Bandwidth, 5700 MHz OBW A Mode 20 MHz Port B



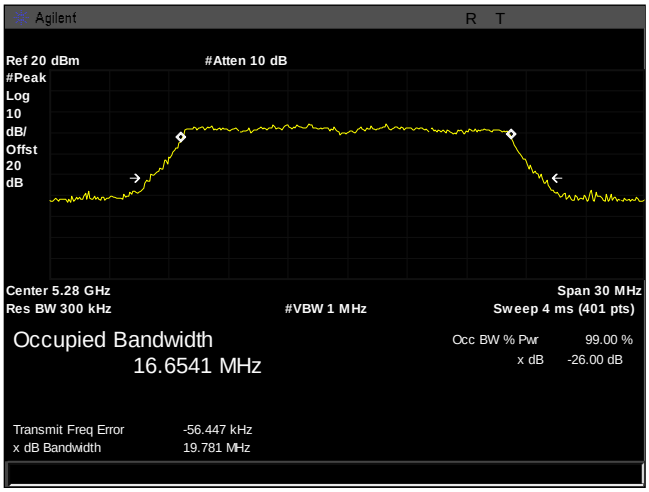
Plot 44. Occupied Bandwidth, 5260 MHz OBW AC Mode 20 MHz Port B



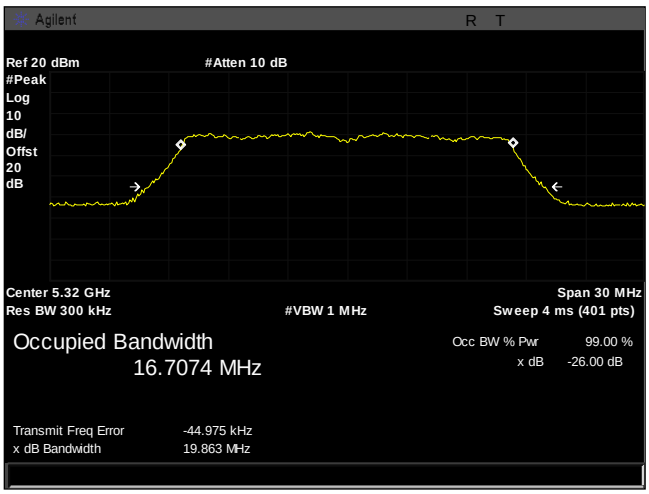
Plot 45. Occupied Bandwidth, 5260 MHz OBW AC Mode 20 MHz Port A



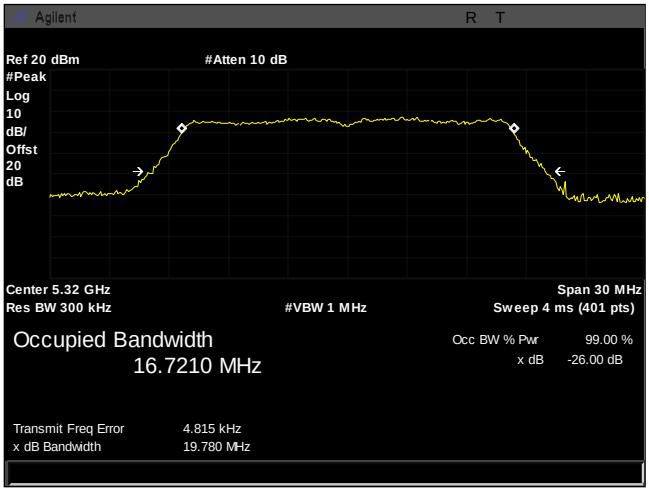
Plot 46. Occupied Bandwidth, 5280 MHz OBW AC Mode 20 MHz Port A



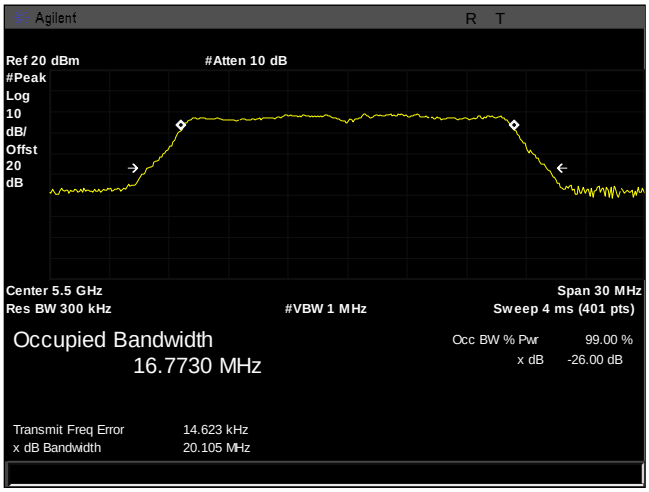
Plot 47. Occupied Bandwidth, 5280 MHz OBW AC Mode 20 MHz Port B



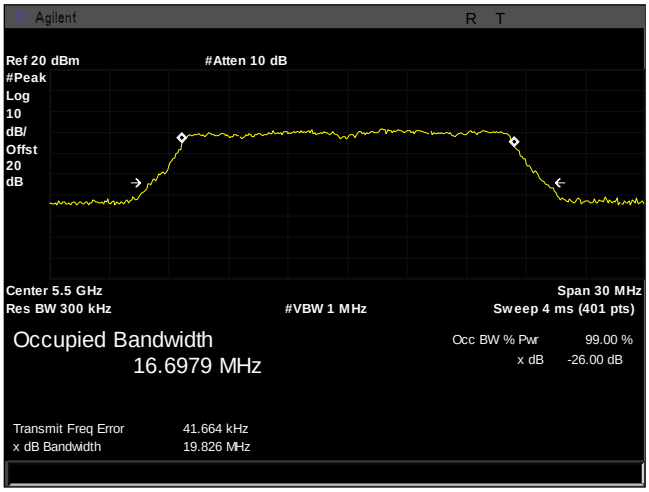
Plot 48. Occupied Bandwidth, 5320 MHz OBW AC Mode 20 MHz Port B



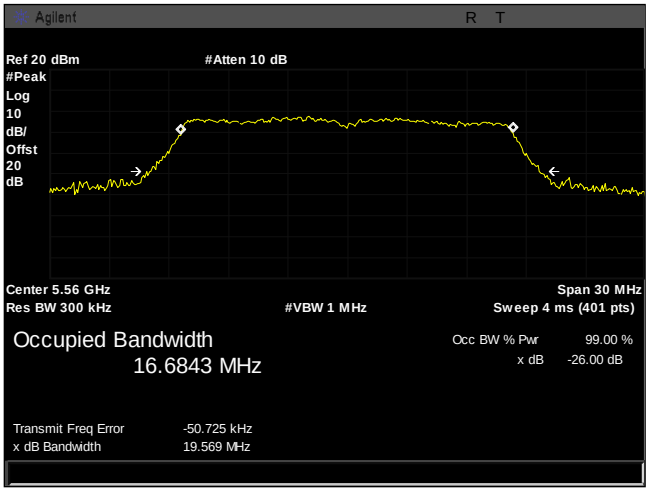
Plot 49. Occupied Bandwidth, 5320 MHz OBW AC Mode 20 MHz Port A



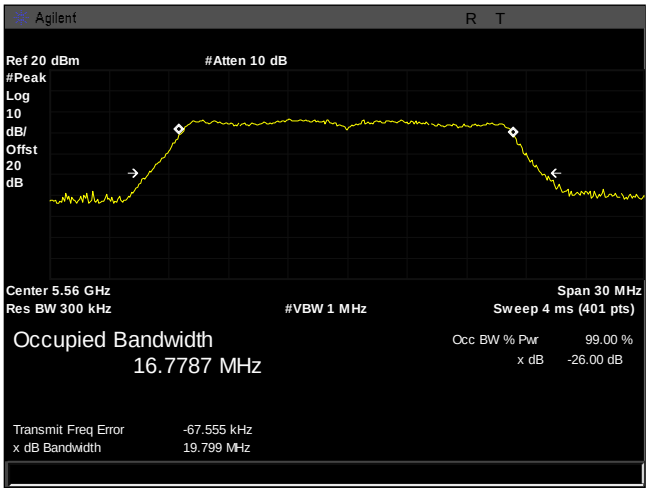
Plot 50. Occupied Bandwidth, 5500 MHz OBW AC Mode 20 MHz Port A



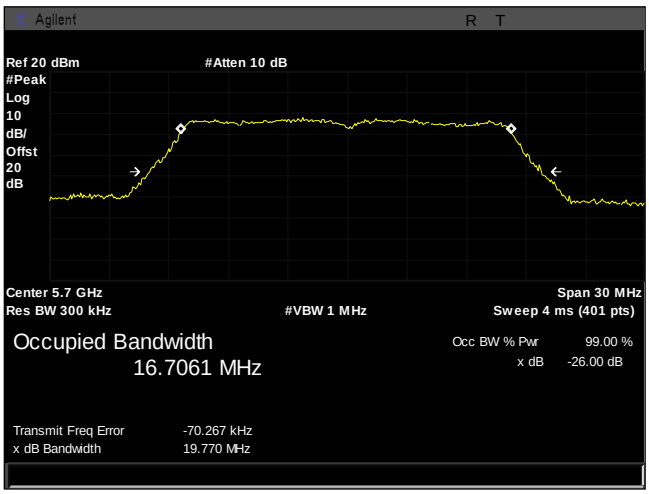
Plot 51. Occupied Bandwidth, 5500 MHz OBW AC Mode 20 MHz Port B



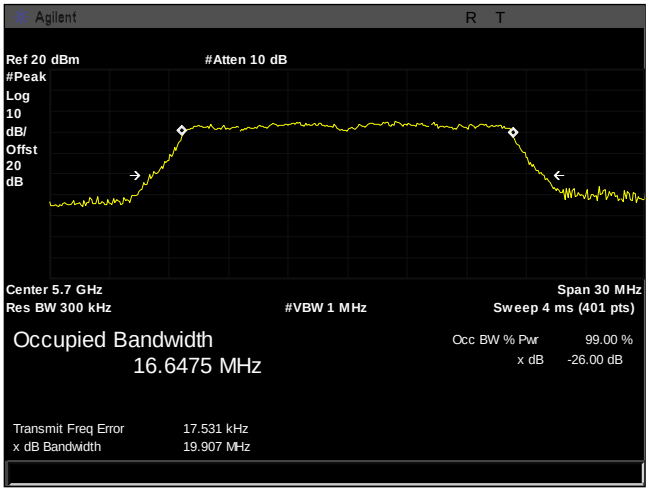
Plot 52. Occupied Bandwidth, 5560 MHz OBW AC Mode 20 MHz Port B



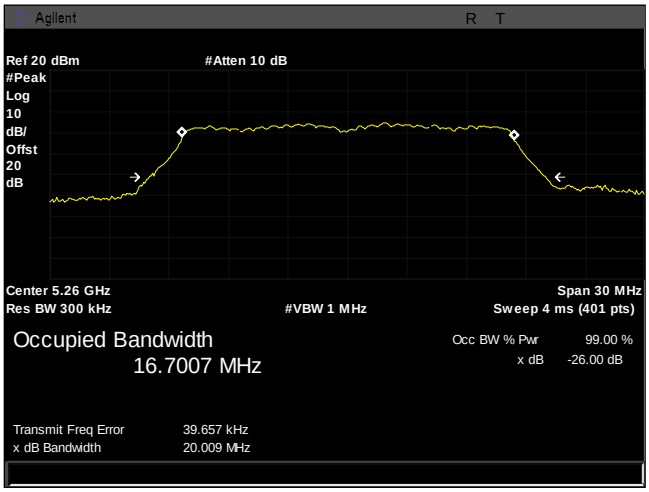
Plot 53. Occupied Bandwidth, 5560 MHz OBW AC Mode 20 MHz Port A



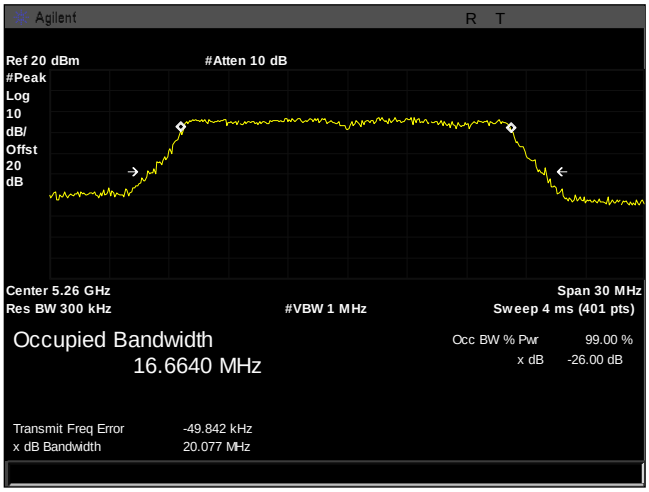
Plot 54. Occupied Bandwidth, 5700 MHz OBW AC Mode 20 MHz Port A



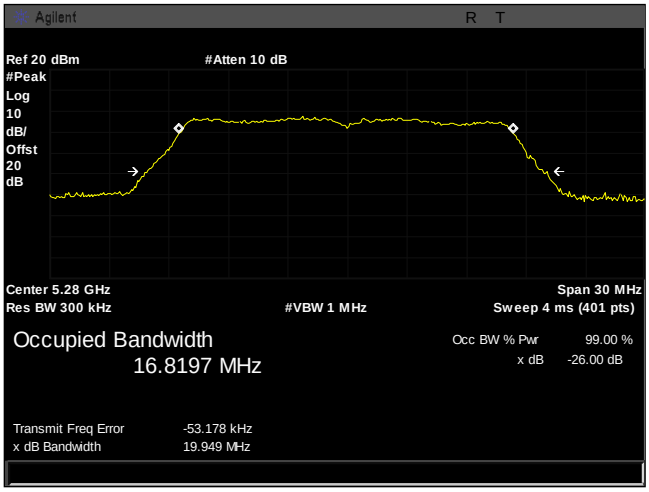
Plot 55. Occupied Bandwidth, 5700 MHz OBW AC Mode 20 MHz Port B



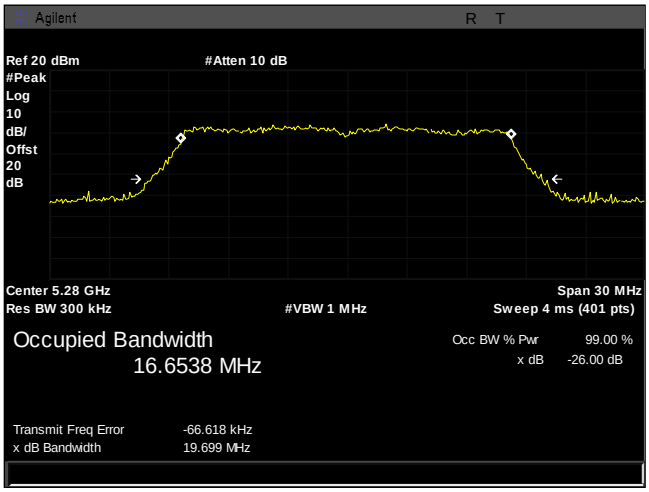
Plot 56. Occupied Bandwidth, 5260 MHz OBW N Mode 20 MHz Port B



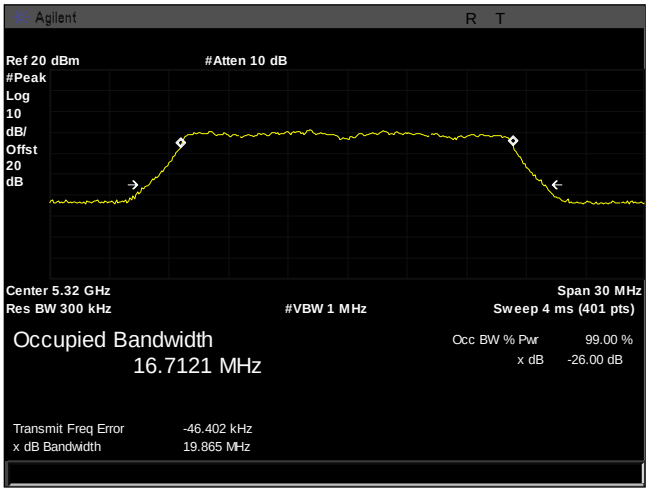
Plot 57. Occupied Bandwidth, 5260 MHz OBW N Mode 20 MHz Port A



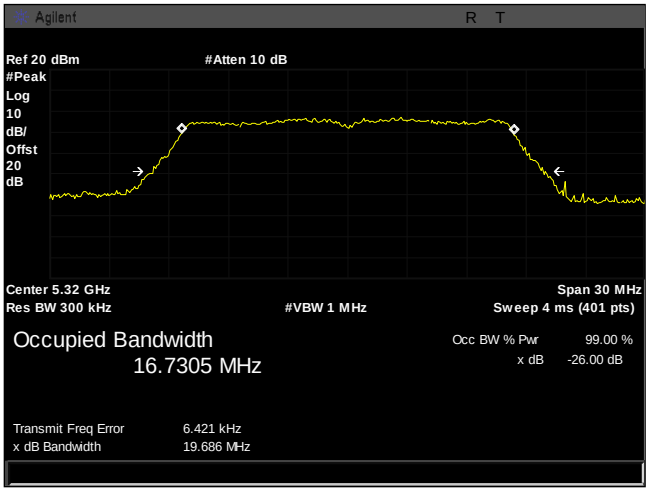
Plot 58. Occupied Bandwidth, 5280 MHz OBW N Mode 20 MHz Port A



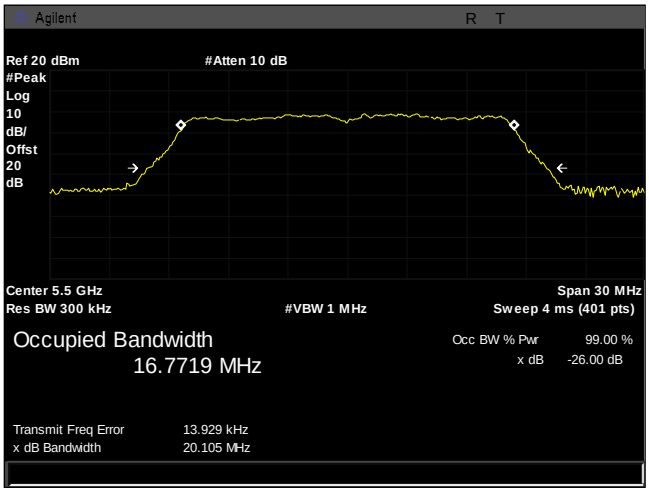
Plot 59. Occupied Bandwidth, 5280 MHz OBW N Mode 20 MHz Port B



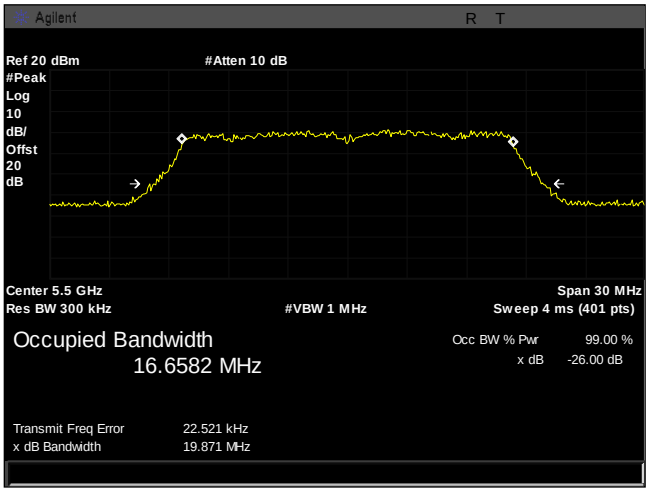
Plot 60. Occupied Bandwidth, 5320 MHz OBW N Mode 20 MHz Port B



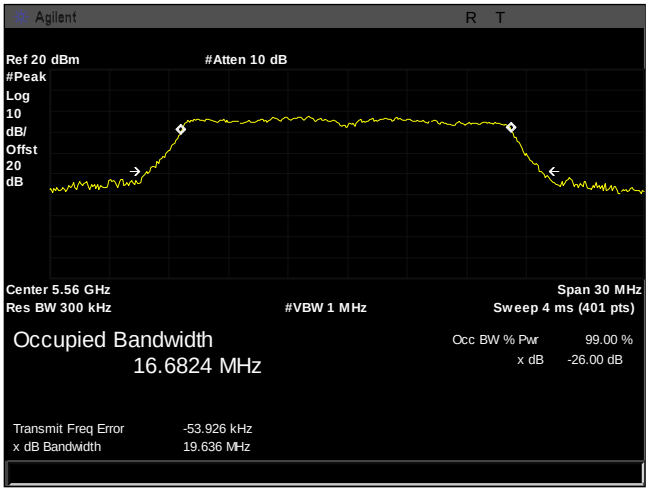
Plot 61. Occupied Bandwidth, 5320 MHz OBW N Mode 20 MHz Port A



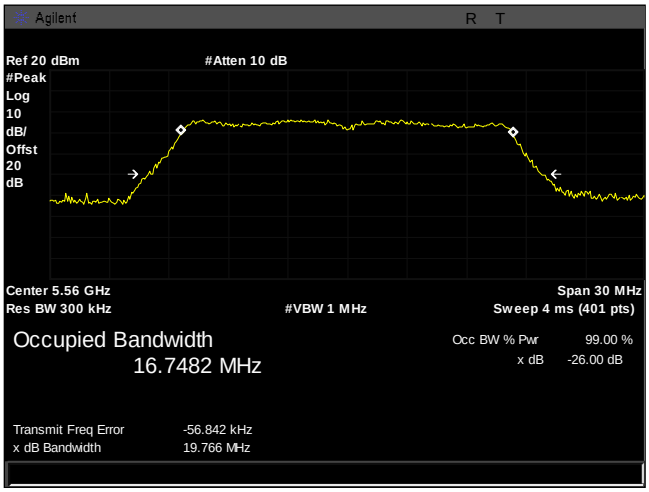
Plot 62. Occupied Bandwidth, 5500 MHz OBW N Mode 20 MHz Port A



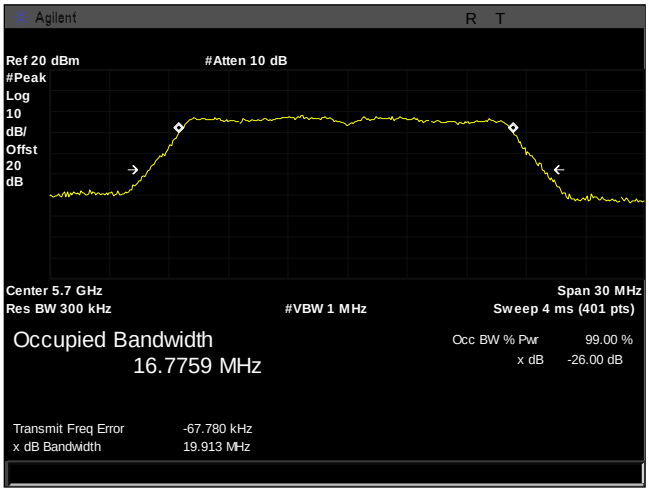
Plot 63. Occupied Bandwidth, 5500 MHz OBW N Mode 20 MHz Port B



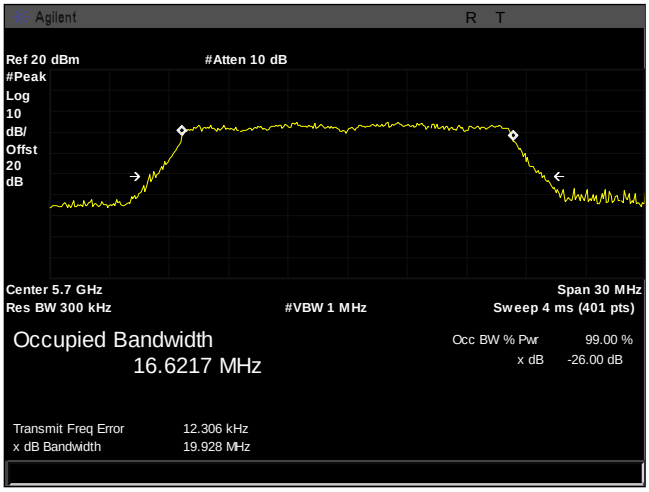
Plot 64. Occupied Bandwidth, 5560 MHz OBW N Mode 20 MHz Port B



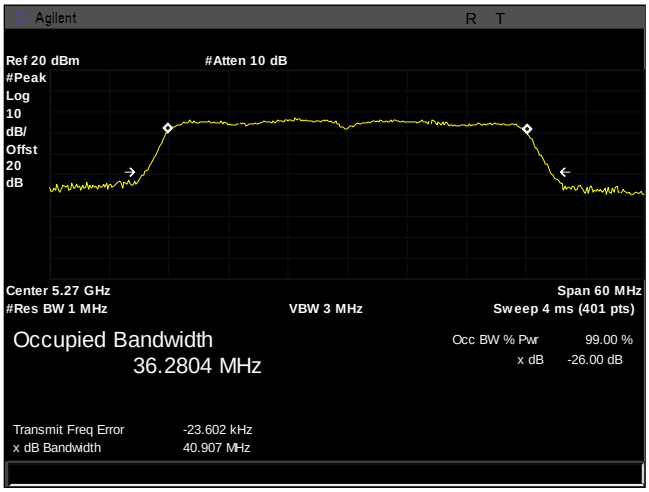
Plot 65. Occupied Bandwidth, 5560 MHz OBW N Mode 20 MHz Port A



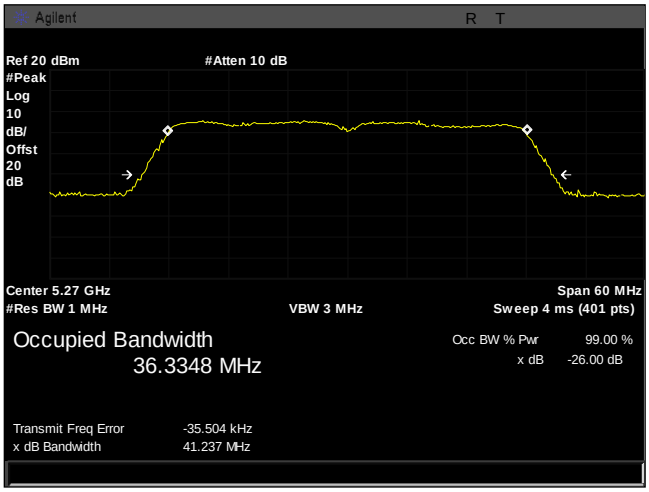
Plot 66. Occupied Bandwidth, 5700 MHz OBW N Mode 20 MHz Port A



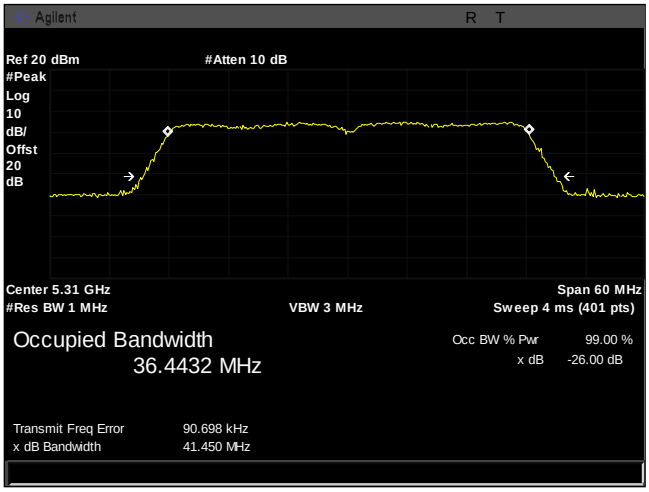
Plot 67. Occupied Bandwidth, 5700 MHz OBW N Mode 20 MHz Port B



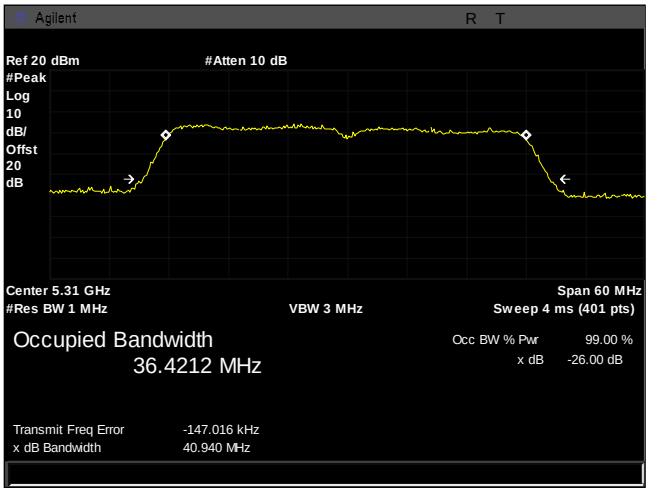
Plot 68. Occupied Bandwidth, 5270 MHz OBW AC Mode 40 MHz Port B



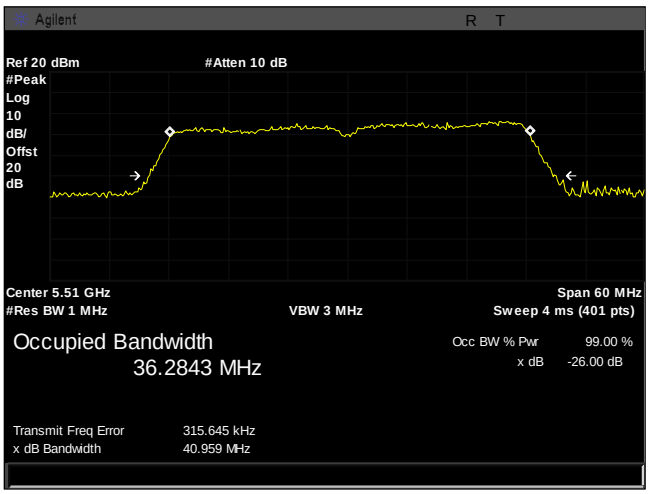
Plot 69. Occupied Bandwidth, 5270 MHz OBW AC Mode 40 MHz Port A



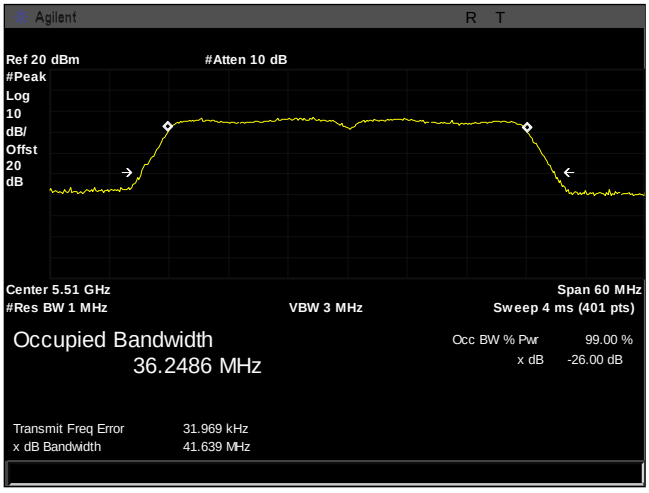
Plot 70. Occupied Bandwidth, 5310 MHz OBW AC Mode 40 MHz Port A



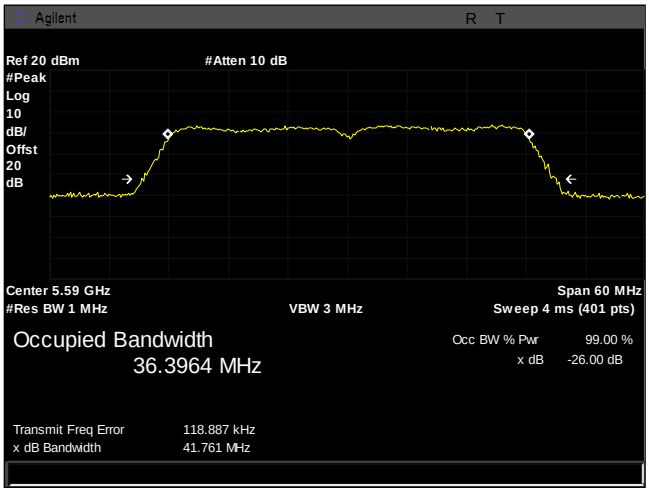
Plot 71. Occupied Bandwidth, 5310 MHz OBW AC Mode 40 MHz Port B



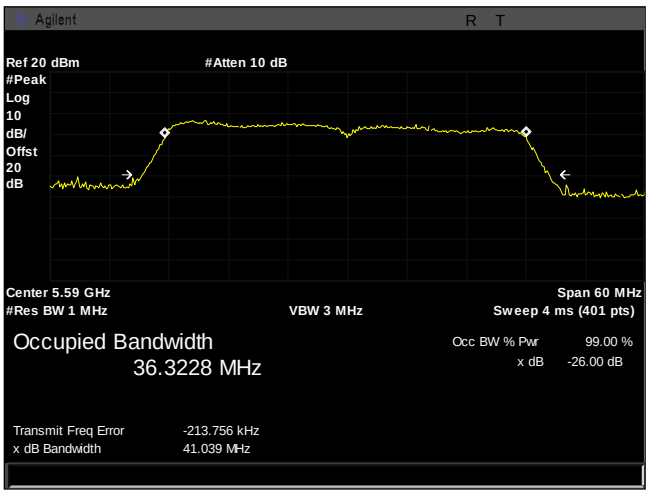
Plot 72. Occupied Bandwidth, 5510 MHz OBW AC Mode 40 MHz Port B



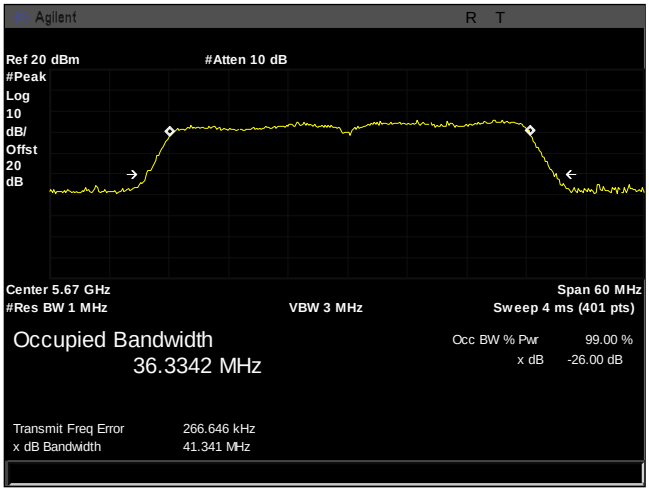
Plot 73. Occupied Bandwidth, 5510 MHz OBW AC Mode 40 MHz Port A



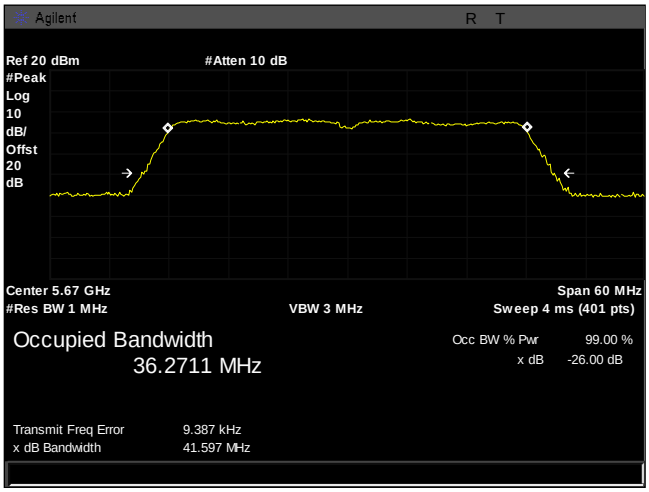
Plot 74. Occupied Bandwidth, 5590 MHz OBW AC Mode 40 MHz Port A



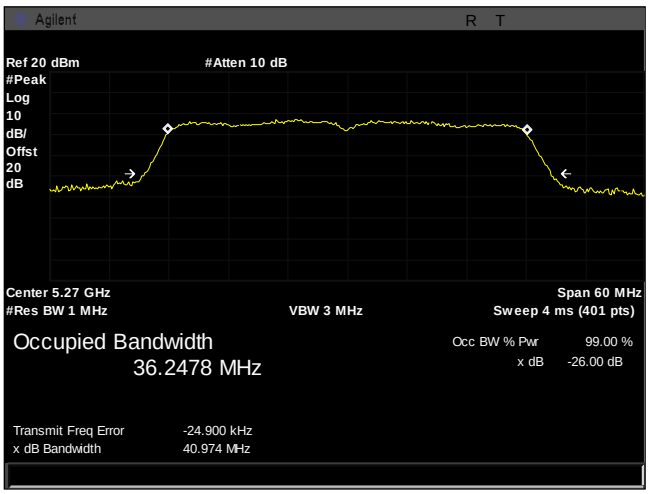
Plot 75. Occupied Bandwidth, 5590 MHz OBW AC Mode 40 MHz Port B



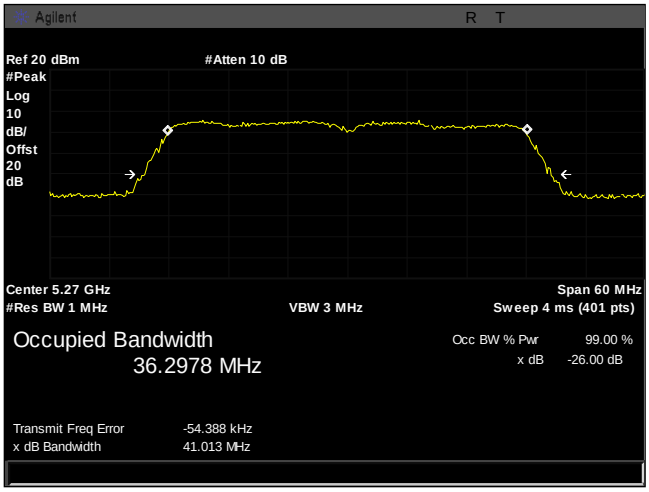
Plot 76. Occupied Bandwidth, 5670 MHz OBW AC Mode 40 MHz Port B



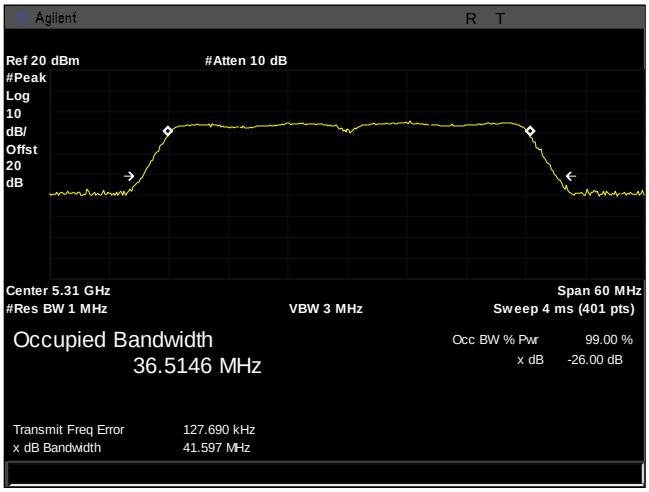
Plot 77. Occupied Bandwidth, 5670 MHz OBW AC Mode 40 MHz Port A



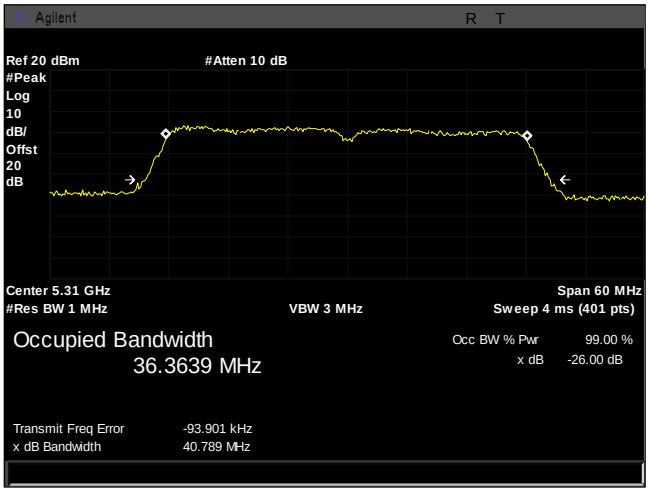
Plot 78. Occupied Bandwidth, 5270 MHz OBW N Mode 40 MHz Port B



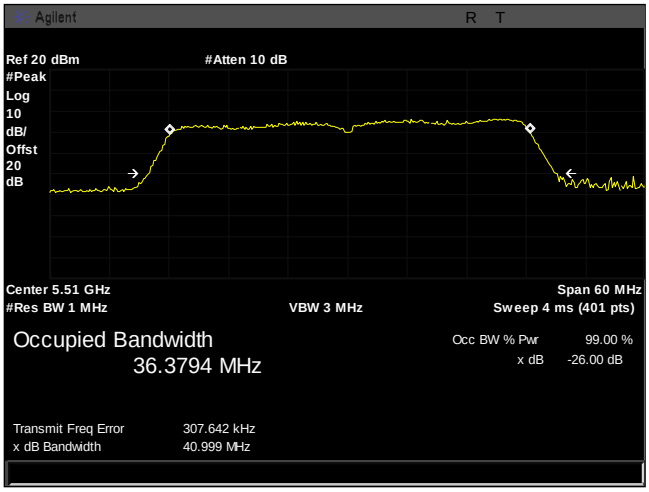
Plot 79. Occupied Bandwidth, 5270 MHz OBW N Mode 40 MHz Port A



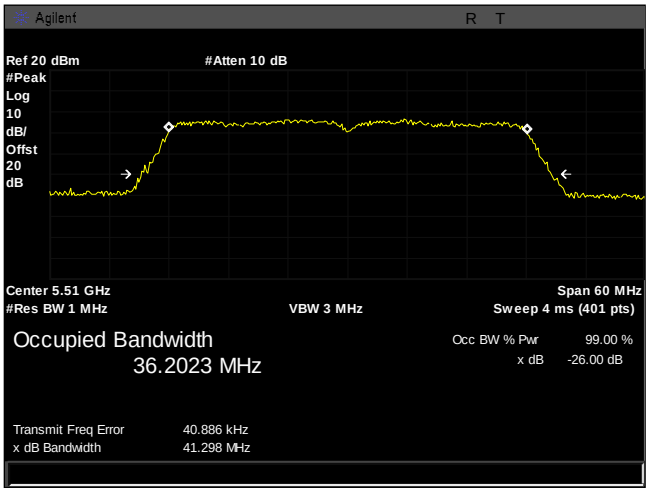
Plot 80. Occupied Bandwidth, 5310 MHz OBW N Mode 40 MHz Port A



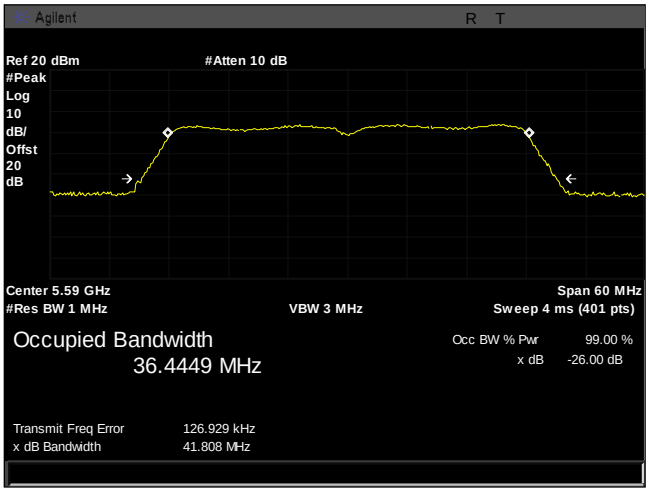
Plot 81. Occupied Bandwidth, 5310 MHz OBW N Mode 40 MHz Port B



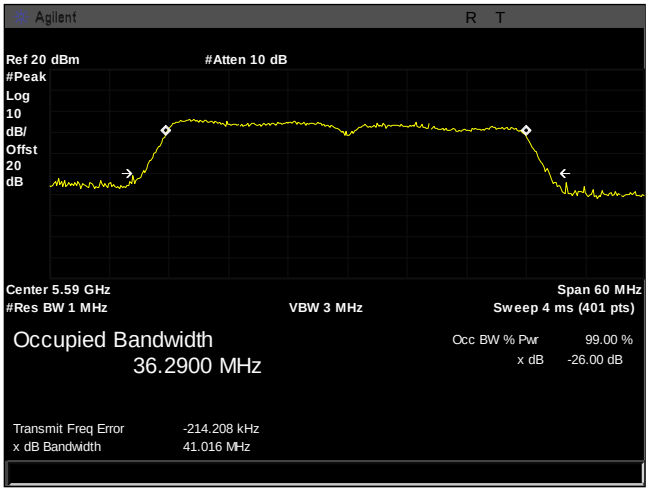
Plot 82. Occupied Bandwidth, 5510 MHz OBW N Mode 40 MHz Port B



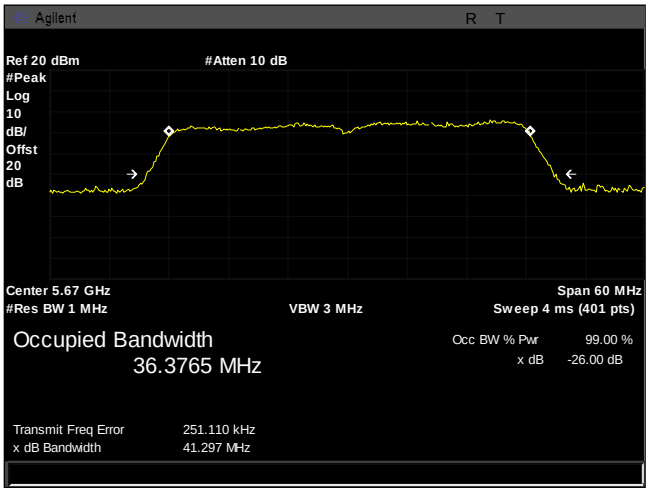
Plot 83. Occupied Bandwidth, 5510 MHz OBW N Mode 40 MHz Port A



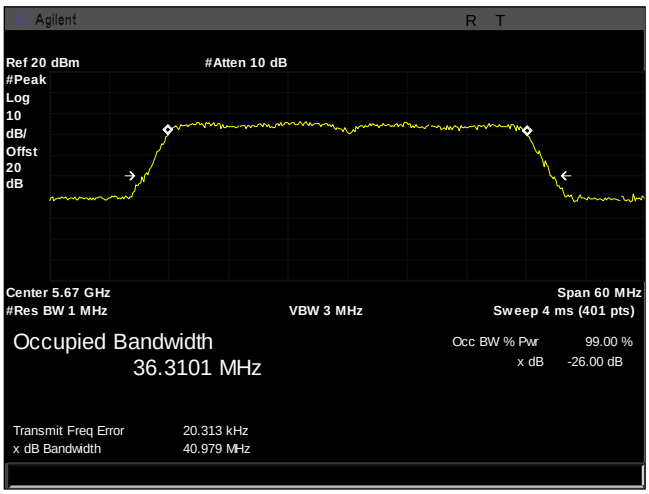
Plot 84. Occupied Bandwidth, 5590 MHz OBW N Mode 40 MHz Port A



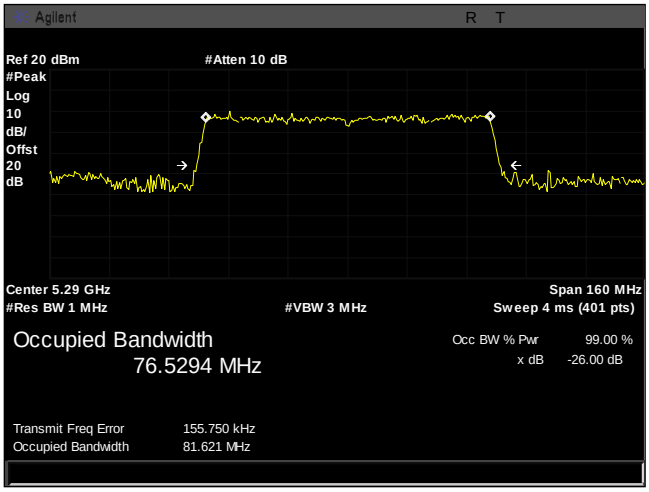
Plot 85. Occupied Bandwidth, 5590 MHz OBW N Mode 40 MHz Port B



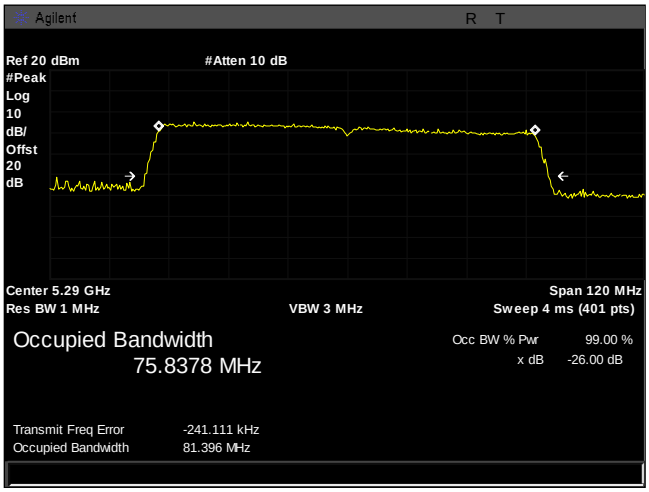
Plot 86. Occupied Bandwidth, 5670 MHz OBW N Mode 40 MHz Port B



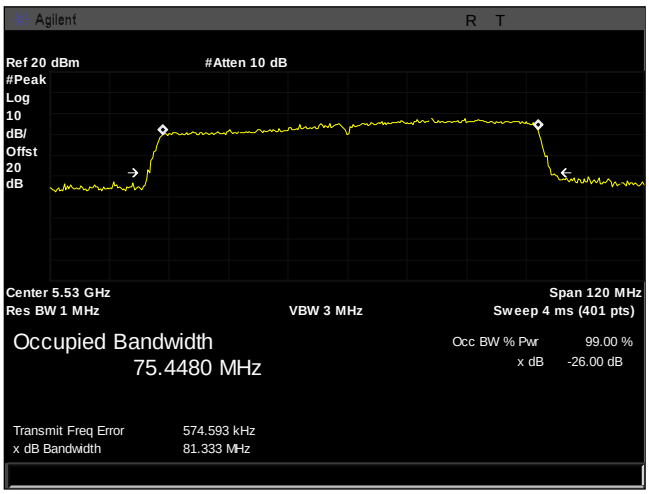
Plot 87. Occupied Bandwidth, 5670 MHz OBW N Mode 40 MHz Port A



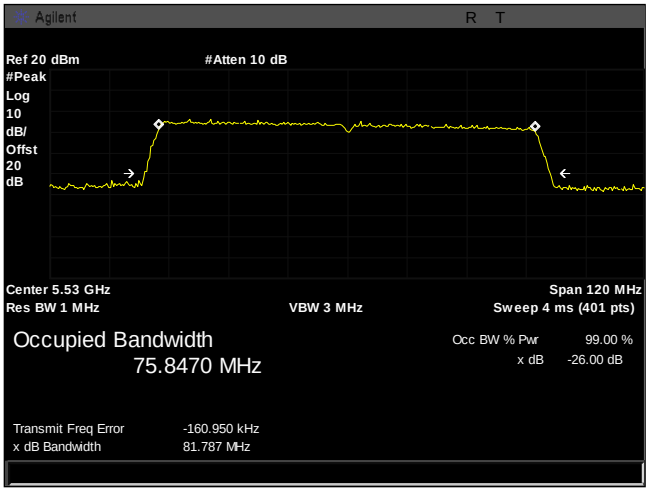
Plot 88. Occupied Bandwidth, 5290 Mhz OBW AC mode 80 MHz Port A



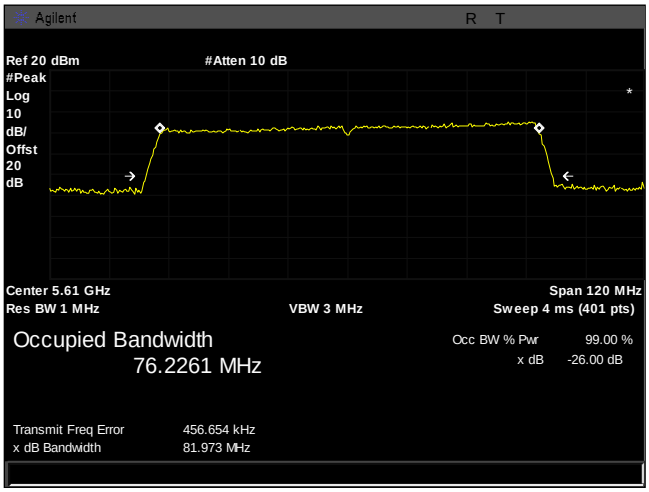
Plot 89. Occupied Bandwidth, 5290 MHz OBW AC Mode 80 MHz Port B



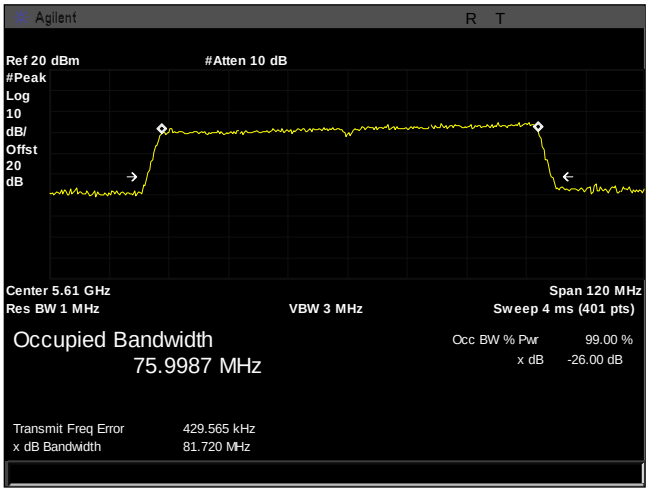
Plot 90. Occupied Bandwidth, 5530 MHz OBW AC Mode 80 MHz Port B



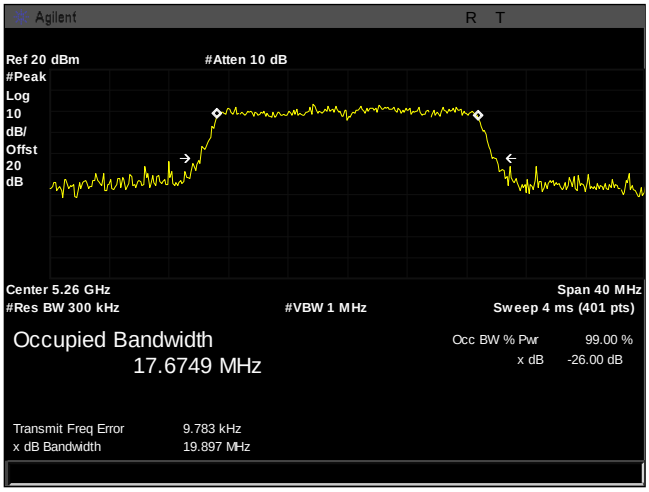
Plot 91. Occupied Bandwidth, 5530 MHz OBW AC Mode 80 MHz Port A



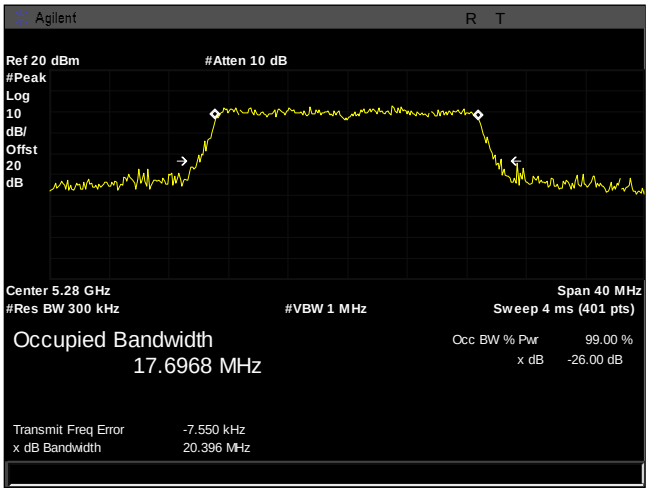
Plot 92. Occupied Bandwidth, 5610 MHz OBW AC Mode 80 MHz Port A



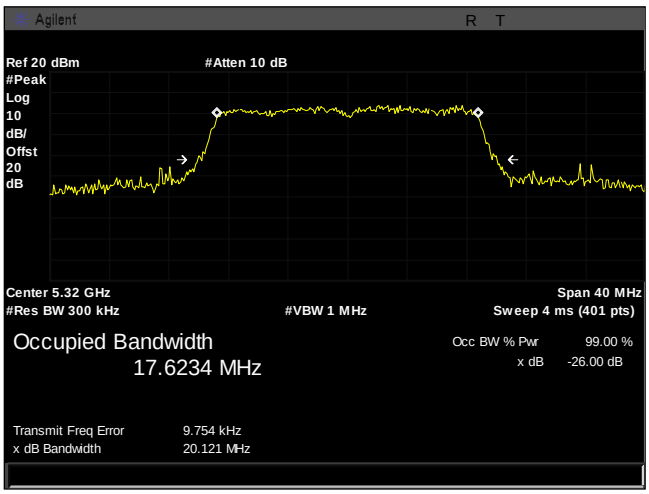
Plot 93. Occupied Bandwidth, 5610 MHz OBW AC Mode 80 MHz Port B



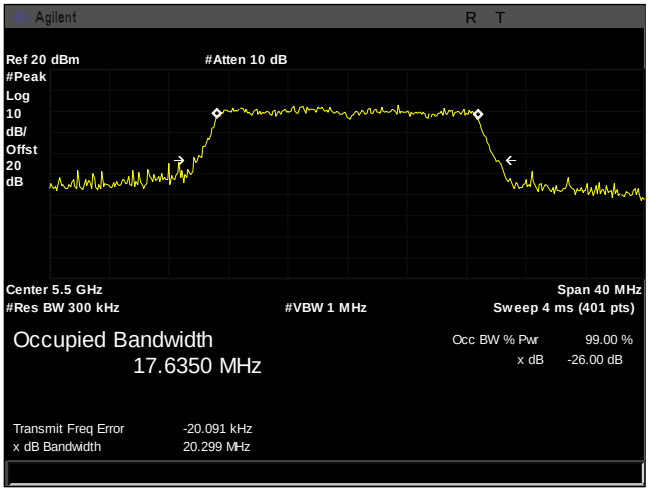
Plot 94. Occupied Bandwidth, 5260 MHz N mode 20 MHz



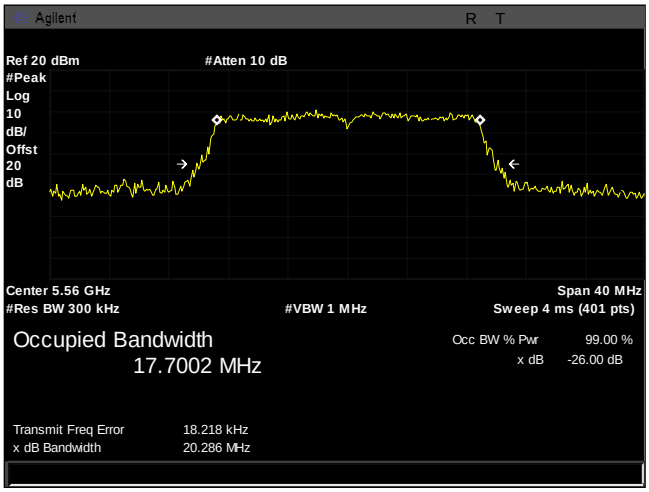
Plot 95. Occupied Bandwidth, 5280 MHz N mode 20 MHz



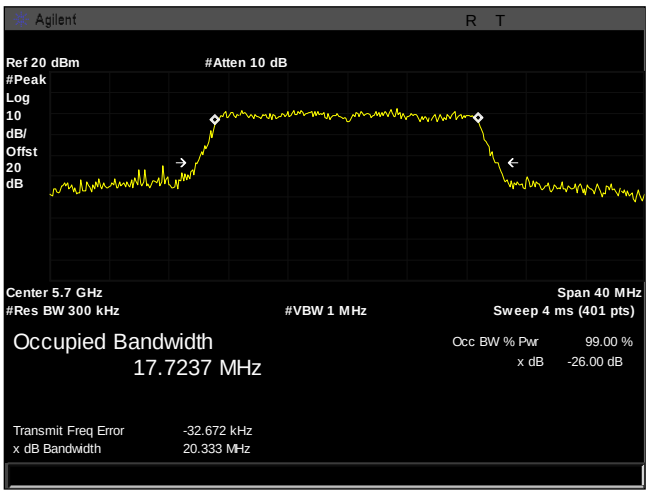
Plot 96. Occupied Bandwidth, 5320 MHz N mode 20 MHz



Plot 97. Occupied Bandwidth, 5500 MHz N mode 20 MHz



Plot 98. Occupied Bandwidth, 5560 MHz N mode 20 MHz



Plot 99. Occupied Bandwidth, 5700 MHz N mode 20 MHz

Electromagnetic Compatibility Criteria for Intentional Radiators

§15. 407(a)(2) Maximum Conducted Output Power

Test Requirements: **§15.407(a)(2):** For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz.
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.

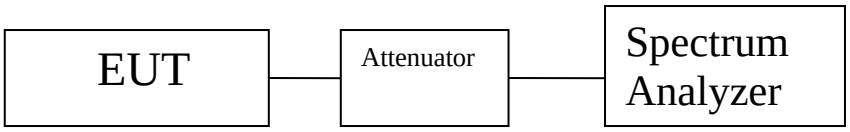
§15.407(h)(1): Transmit power control (TPC). U-NII devices operating in the 5.25-5.35 GHz band and the 5.47-5.725 GHz band shall employ a TPC mechanism. The U-NII device is required to have the capability to operate at least 6 dB below the mean EIRP value of 30 dBm. A TPC mechanism is not required for systems with an e.i.r.p. of less than 500 mW.

Test Procedure: The EUT was connected to a spectrum analyzer through a cable and attenuator. Measurements were taken with the EUT set to transmit continuously on its low, mid, and high channels. Its power was measured according to measurement method SA-1, as described in 789033 D02 General UNII Test Procedures v01r04.

Test Results: The EUT as tested is compliant with the requirements of this section. TPC is not required because EIRP is less than 500mW.

Test Engineer(s): Deepak Giri

Test Date(s): May 12, 2017



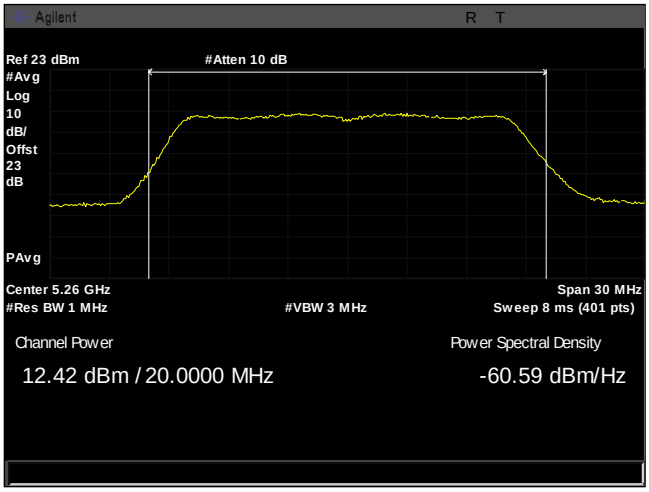
Conducted Power for SISO									
Bandwidth	Mode	Frequency MHz	Conducted Power dBm	Antenna Gain dBi	EIRP dBm	Conducted Limit dBm	EIRP Limit dBm	Conducted Margin dBm	EIRP Margin dBm
20 MHz	A	5260	12.42	9	21.42	23.979	26.979	-11.559	-5.559
		5280	11.85	9	20.85	23.979	26.979	-12.129	-6.129
		5320	11.24	9	20.24	23.979	26.979	-12.739	-6.739
		5500	12.04	9	21.04	23.979	26.979	-11.939	-5.939
		5560	13.57	9	22.57	23.979	26.979	-10.409	-4.409
		5700	11.75	9	20.75	23.979	26.979	-12.229	-6.229
	AC	5260	12.38	9	21.38	23.979	26.979	-11.599	-5.599
		5280	9.33	9	18.33	23.979	26.979	-14.649	-8.649
		5320	10.96	9	19.96	23.979	26.979	-13.019	-7.019
		5500	12.29	9	21.29	23.979	26.979	-11.689	-5.689
		5560	13.38	9	22.38	23.979	26.979	-10.599	-4.599
		5700	11.84	9	20.84	23.979	26.979	-12.139	-6.139
	N	5260	12.37	9	21.37	23.979	26.979	-11.609	-5.609
		5280	12.2	9	21.2	23.979	26.979	-11.779	-5.779
		5320	11.3	9	20.3	23.979	26.979	-12.679	-6.679
		5500	12.5	9	21.5	23.979	26.979	-11.479	-5.479
		5560	13.09	9	22.09	23.979	26.979	-10.889	-4.889
		5700	12.09	9	21.09	23.979	26.979	-11.889	-5.889
40 MHz	AC	5270	11.78	9	20.78	23.979	26.979	-12.199	-6.199
		5310	11.11	9	20.11	23.979	26.979	-12.869	-6.869
		5510	11.77	9	20.77	23.979	26.979	-12.209	-6.209
		5590	11.55	9	20.55	23.979	26.979	-12.429	-6.429
		5670	11.11	9	20.11	23.979	26.979	-12.869	-6.869
	N	5270	11.46	9	20.46	23.979	26.979	-12.519	-6.519
		5310	11.07	9	20.07	23.979	26.979	-12.909	-6.909
		5510	11.87	9	20.87	23.979	26.979	-12.109	-6.109
		5590	11.73	9	20.73	23.979	26.979	-12.249	-6.249
		5670	11.65	9	20.65	23.979	26.979	-12.329	-6.329
80 MHz	AC	5290	15.06	9	24.06	23.979	26.979	-8.919	-2.919
		5530	15.53	9	24.53	23.979	26.979	-8.449	-2.449
		5610	15.18	9	24.18	23.979	26.979	-8.799	-2.799

Table 9. Power Table SISO

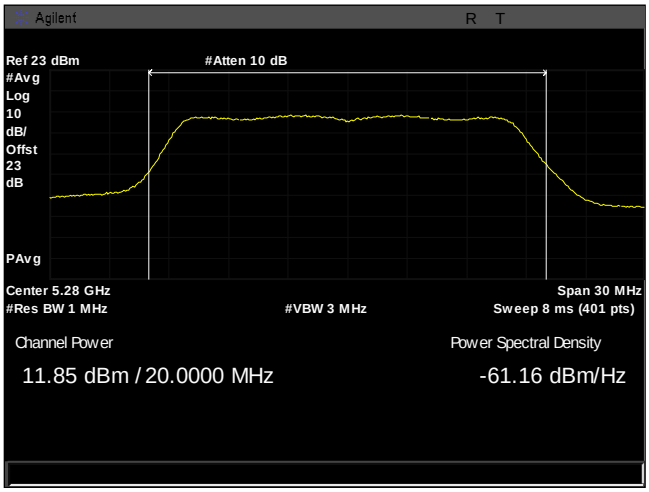
Conducted Power for MIMO

Bandwidth	Mode	Frequency MHz	Conducted Power dBm		Antenna Gain dBi	EIRP dBm		Total Conducted Power dBm	Total EIRP dBm	Conducted Limit dBm	EIRP Limit dBm	Conducted Margin dBm	EIRP Margin dBm
			Port A	Port B		Port A	Port B						
20 MHz	A	5260	9.6	11.24	9	18.6	20.24	13.50725723	22.50725723	23.979	29.979	-10.4717428	-7.471742768
		5280	8.13	11.82	9	17.13	20.82	13.36595249	22.36595249	23.979	29.979	-10.6130475	-7.613047514
		5320	8.4	10.04	9	17.4	19.04	12.30725723	21.30725723	23.979	29.979	-11.6717428	-8.671742768
		5500	10.25	11.23	9	19.25	20.23	13.77788404	22.77788404	23.979	29.979	-10.201116	-7.201115959
		5560	7.41	12.68	9	16.41	21.68	13.80995759	22.80995759	23.979	29.979	-10.1690424	-7.169042412
		5700	8.13	11.01	9	17.13	20.01	12.81478172	21.81478172	23.979	29.979	-11.1642183	-8.164218282
	AC	5260	8.93	11.17	9	17.93	20.17	13.20314512	22.20314512	23.979	29.979	-10.7758549	-7.77585488
		5280	8.36	11.66	9	17.36	20.66	13.32647692	22.32647692	23.979	29.979	-10.6525231	-7.652523075
		5320	8.21	9.7	9	17.21	18.7	12.02888861	21.02888861	23.979	29.979	-11.9501114	-8.950111385
		5500	10.37	11.38	9	19.37	20.38	13.91459487	22.91459487	23.979	29.979	-10.0644051	-7.064405133
		5560	7.56	12.02	9	16.56	21.02	13.3493061	22.3493061	23.979	29.979	-10.6296939	-7.629693901
		5700	8.76	10.9	9	17.76	19.9	12.97079911	21.97079911	23.979	29.979	-11.0082009	-8.008200888
	N	5260	9.06	11.05	9	18.06	20.05	13.17829739	22.17829739	23.979	29.979	-10.8007026	-7.800702609
		5280	8.61	11.61	9	17.61	20.61	13.37434862	22.37434862	23.979	29.979	-10.6046514	-7.604651376
		5320	8.45	9.89	9	17.45	18.89	12.23971155	21.23971155	23.979	29.979	-11.7392884	-8.739288449
		5500	10.35	11.25	9	19.35	20.25	13.83357203	22.83357203	23.979	29.979	-10.145428	-7.145427968
		5560	7.64	12.97	9	16.64	21.97	14.08628526	23.08628526	23.979	29.979	-9.89271474	-6.892714737
		5700	8.88	11.14	9	17.88	20.14	13.1656791	22.1656791	23.979	29.979	-10.8133209	-7.813320899
40 MHz	AC	5270	3.78	5	9	12.78	14	7.44299943	16.44299943	23.979	29.979	-16.5360006	-13.53600057
		5310	3.83	5.23	9	12.83	14.23	7.596470707	16.59647071	23.979	29.979	-16.3825293	-13.38252929
		5510	5.22	5.02	9	14.22	14.02	8.131451147	17.13145115	23.979	29.979	-15.8475489	-12.84754885
		5590	3.29	4.65	9	12.29	13.65	7.033319614	16.03331961	23.979	29.979	-16.9456804	-13.94568039
		5670	4.46	4.44	9	13.46	13.44	7.46031147	16.46031147	23.979	29.979	-16.5186885	-13.51868853
	N	5270	3.88	5.31	9	12.88	14.31	7.663892933	16.66389293	23.979	29.979	-16.3151071	-13.31510707
		5310	3.5	5.18	9	12.5	14.18	7.431033651	16.43103365	23.979	29.979	-16.5479663	-13.54796635
		5510	5.66	4.63	9	14.66	13.63	8.185763816	17.18576382	23.979	29.979	-15.7932362	-12.79323618
		5590	2.73	4.84	9	11.73	13.84	6.922200874	15.92220087	23.979	29.979	-17.0567991	-14.05679913
		5670	5.07	4.7	9	14.07	13.7	7.899239064	16.89923906	23.979	29.979	-16.0797609	-13.07976094
80 MHz	AC	5290	6.66	6.29	9	15.66	15.29	9.489239064	18.48923906	23.979	29.979	-14.4897609	-11.48976094
		5530	7.49	6.51	9	16.49	15.51	10.03788404	19.03788404	23.979	29.979	-13.941116	-10.94111596
		5610	6.09	5.09	9	15.09	14.09	8.62901891	17.62901891	23.979	29.979	-15.3499811	-12.34998109

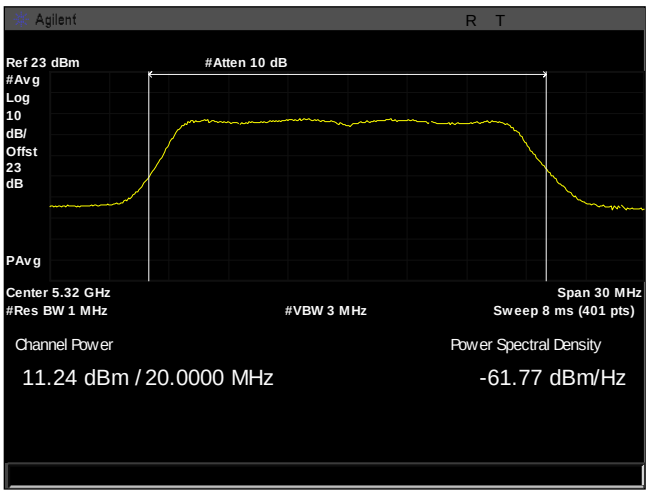
Table 10. Power Table, MIMO



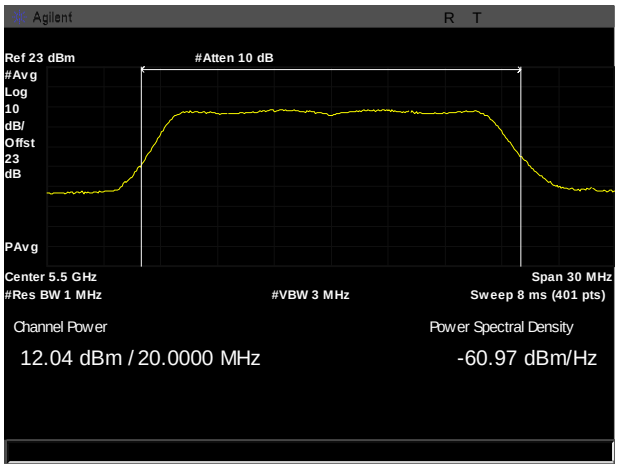
Plot 100. Conducted Transmitter Output Power, 5260 MHz, A mode 20 MHz



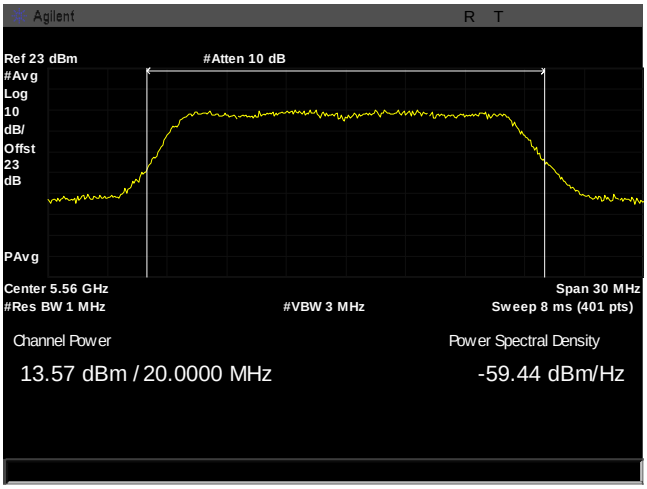
Plot 101. Conducted Transmitter Output Power, 5280 MHz, A mode 20 MHz



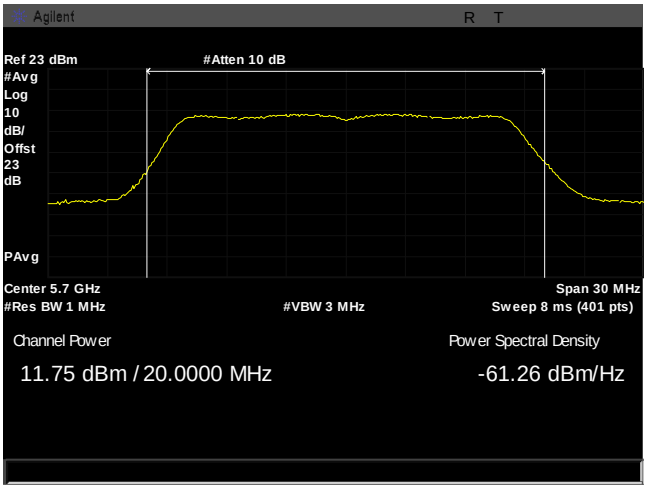
Plot 102. Conducted Transmitter Output Power, 5320 MHz, A mode 20 MHz



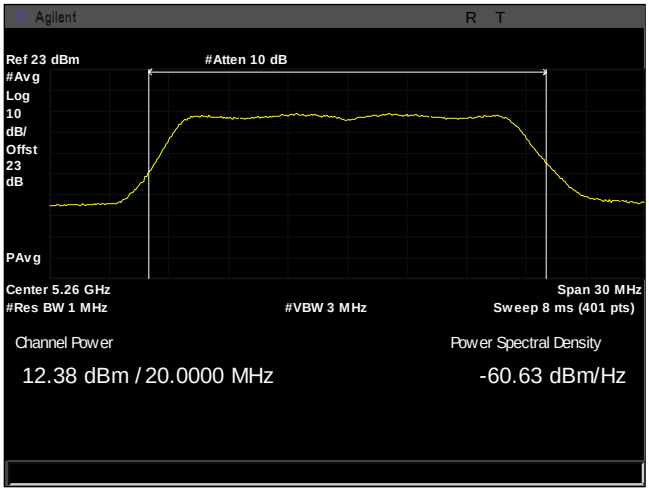
Plot 103. Conducted Transmitter Output Power, 5500 MHz, A mode 20 MHz



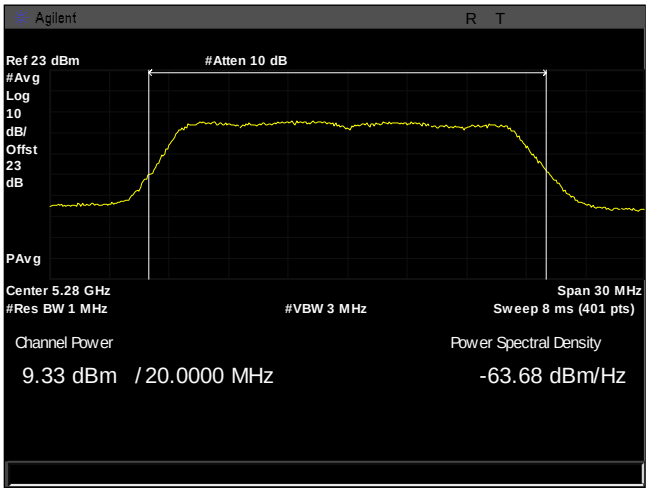
Plot 104. Conducted Transmitter Output Power, 5560 MHz, A mode 20 MHz



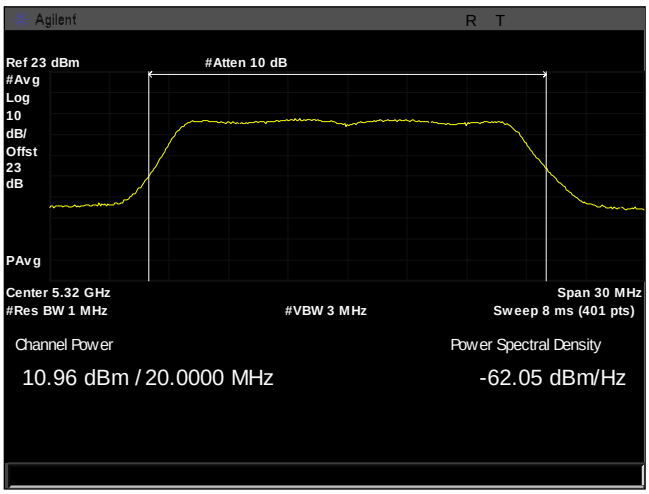
Plot 105. Conducted Transmitter Output Power, 5700 MHz, A mode 20 MHz



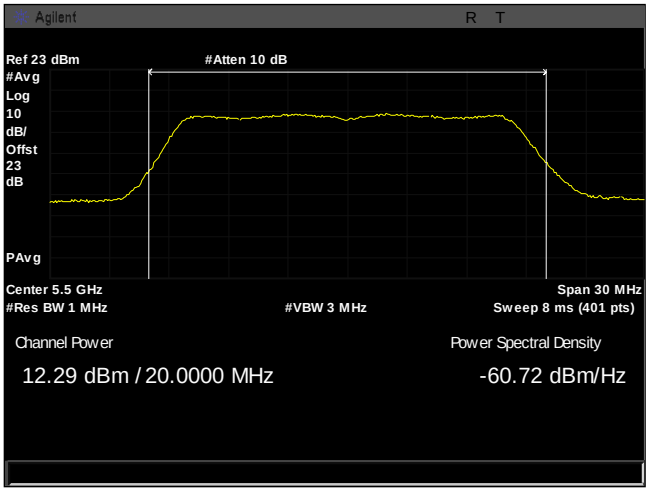
Plot 106. Conducted Transmitter Output Power, 5260 MHz, AC mode 20 MHz



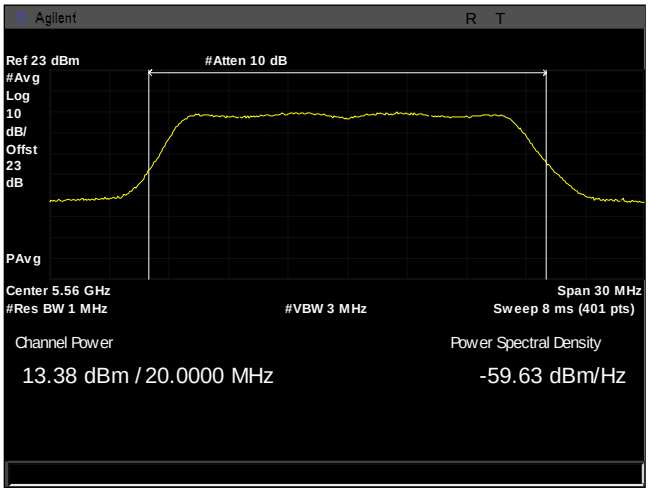
Plot 107. Conducted Transmitter Output Power, 5280 MHz, AC mode 20 MHz



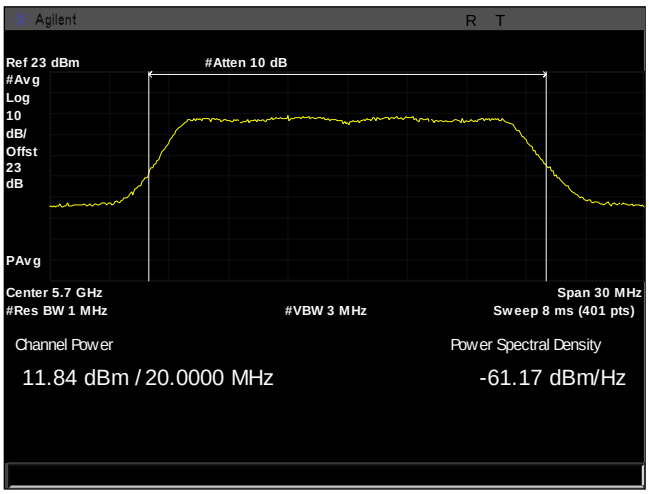
Plot 108. Conducted Transmitter Output Power, 5320 MHz, AC mode 20 MHz



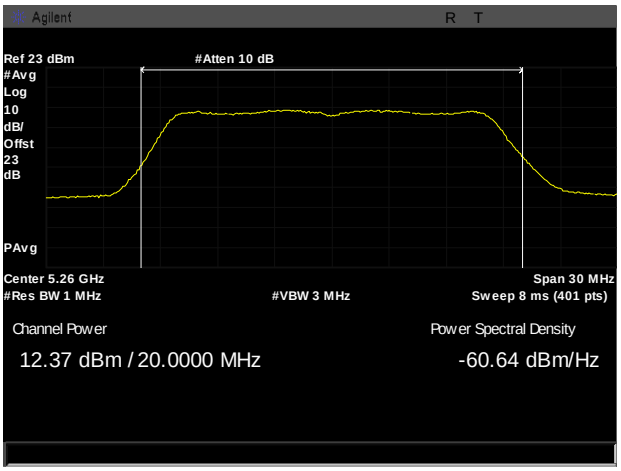
Plot 109. Conducted Transmitter Output Power, 5500 MHz, AC mode 20 MHz



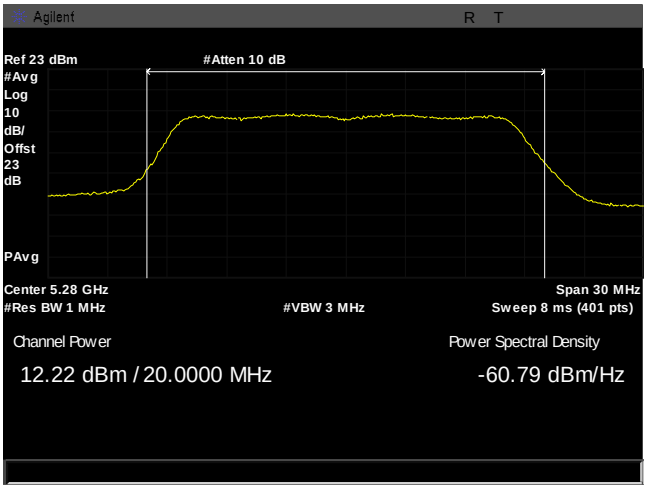
Plot 110. Conducted Transmitter Output Power, 5560 MHz, AC mode 20 MHz



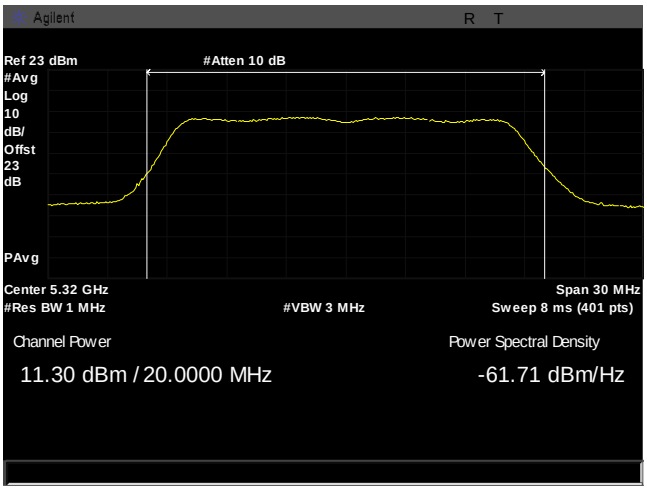
Plot 111. Conducted Transmitter Output Power, 5700 MHz, AC mode 20 MHz



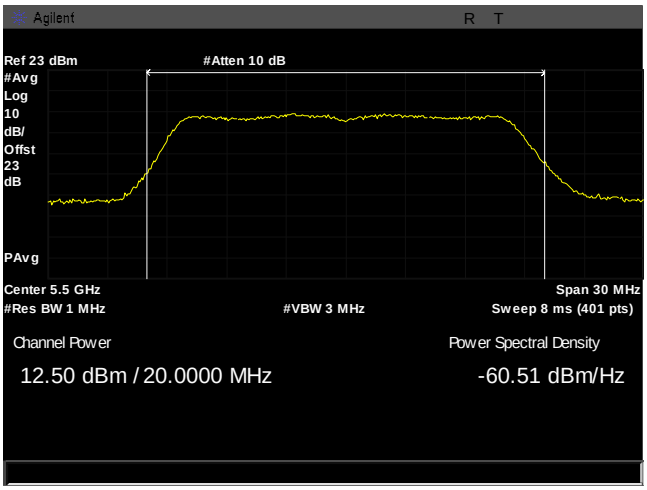
Plot 112. Conducted Transmitter Output Power, 5260 MHz, N Mode 20 MHz



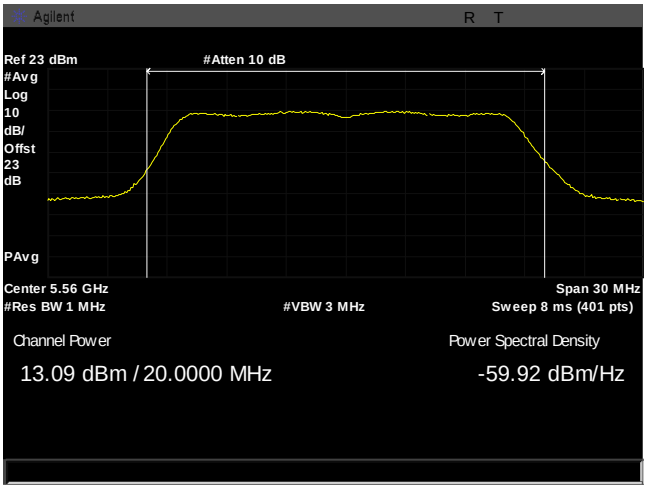
Plot 113. Conducted Transmitter Output Power, 5280 MHz, N Mode 20 MHz



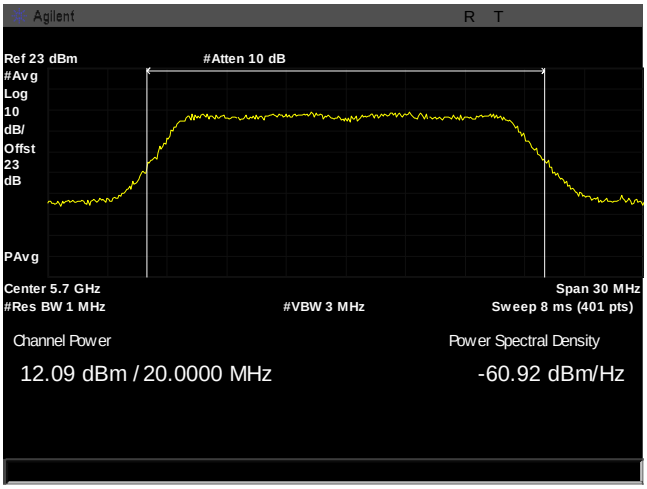
Plot 114. Conducted Transmitter Output Power, 5320 MHz, N Mode 20 MHz



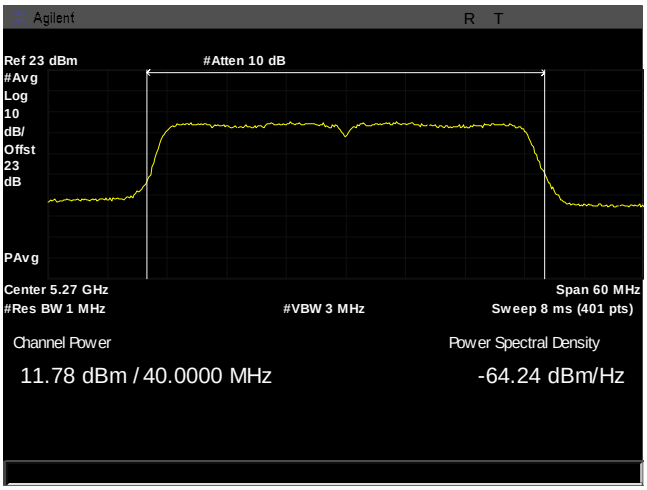
Plot 115. Conducted Transmitter Output Power, 5500 MHz, N Mode 20 MHz



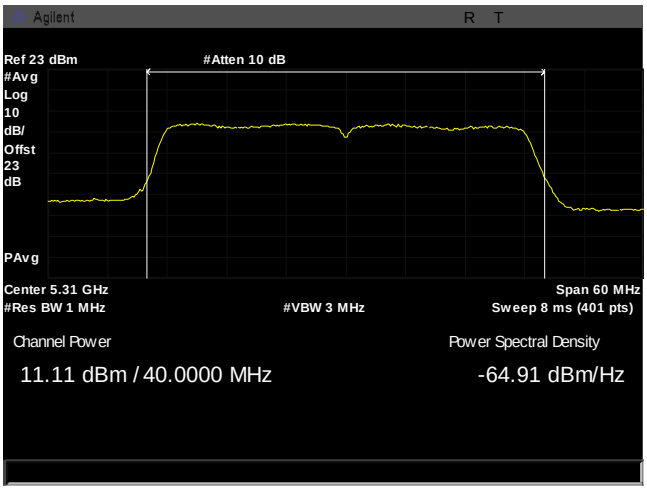
Plot 116. Conducted Transmitter Output Power, 5560 MHz, N Mode 20 MHz



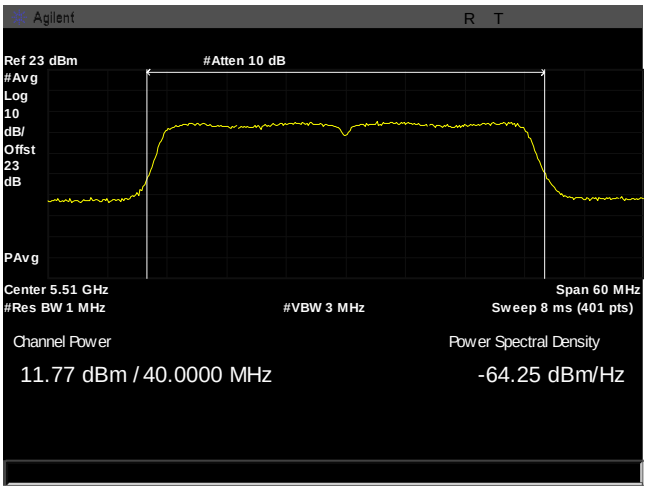
Plot 117. Conducted Transmitter Output Power, 5700 MHz, N Mode 20 MHz



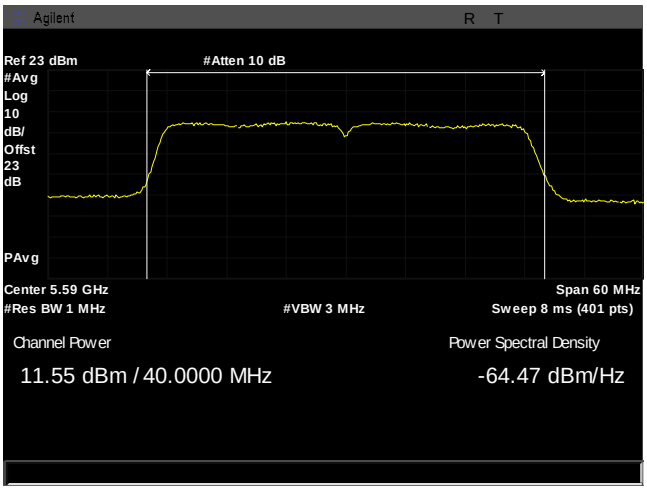
Plot 118. Conducted Transmitter Output Power, 5270 MHz, AC mode 40 MHz



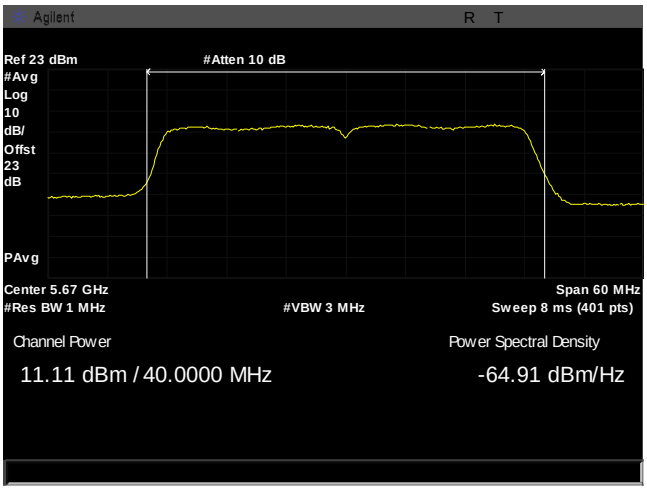
Plot 119. Conducted Transmitter Output Power, 5310 MHz, AC mode 40 MHz



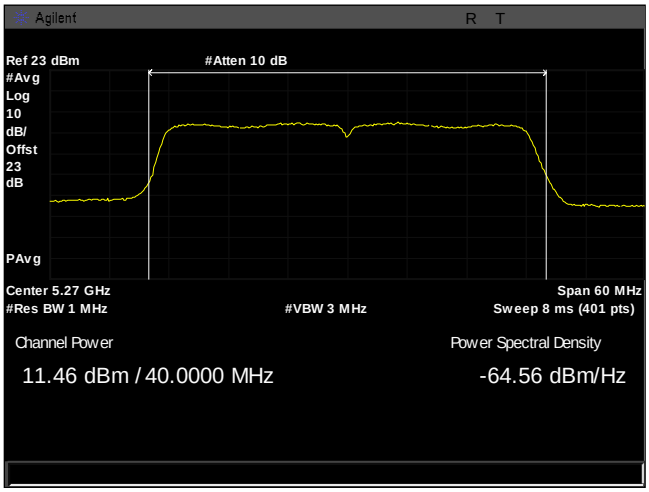
Plot 120. Conducted Transmitter Output Power, 5510 MHz, AC mode 40 MHz



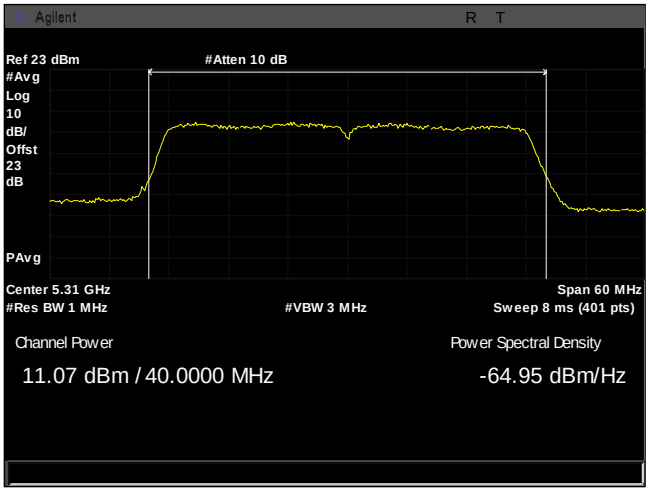
Plot 121. Conducted Transmitter Output Power, 5590 Mhz AC mode 40 MHz



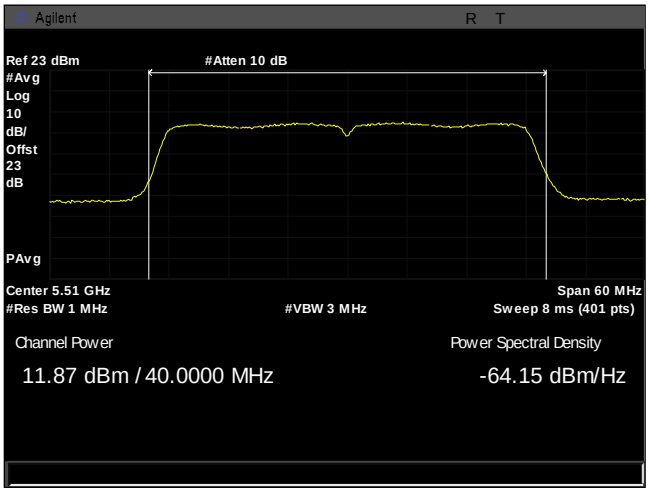
Plot 122. Conducted Transmitter Output Power, 5670 Mhz AC mode 40 MHz



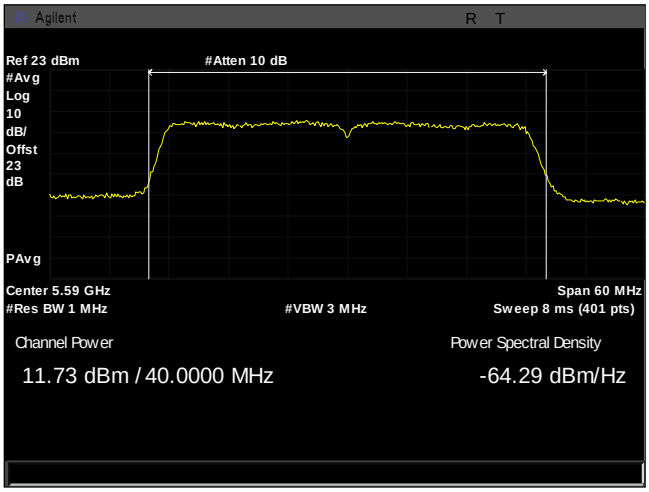
Plot 123. Conducted Transmitter Output Power, 5270 MHz, N Mode 40 MHz



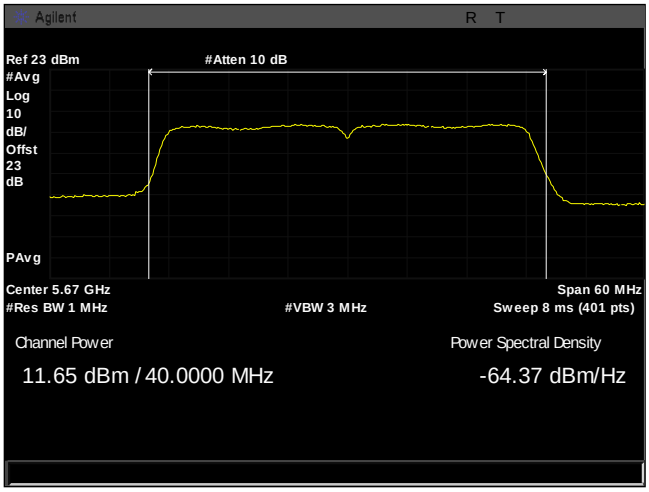
Plot 124. Conducted Transmitter Output Power, 5310 Mhz N Mode 40 MHz



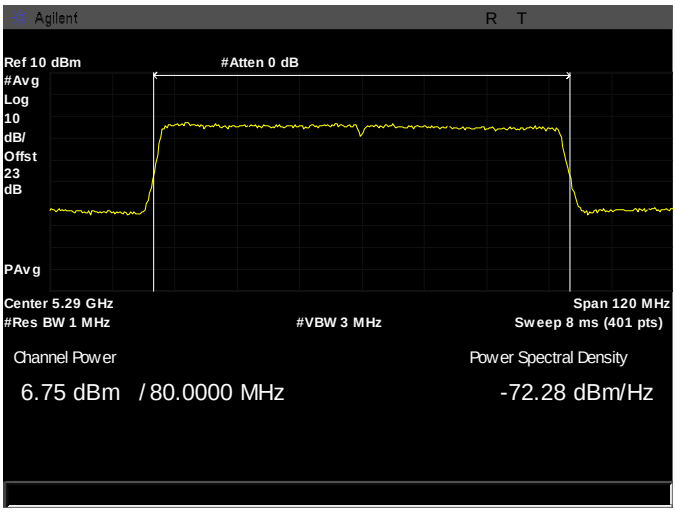
Plot 125. Conducted Transmitter Output Power, 5510 MHz, N Mode 40 MHz



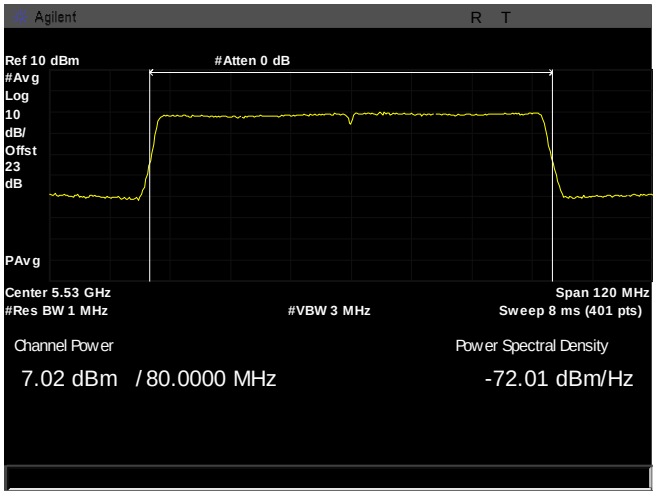
Plot 126. Conducted Transmitter Output Power, 5590 MHz, N Mode 40 MHz



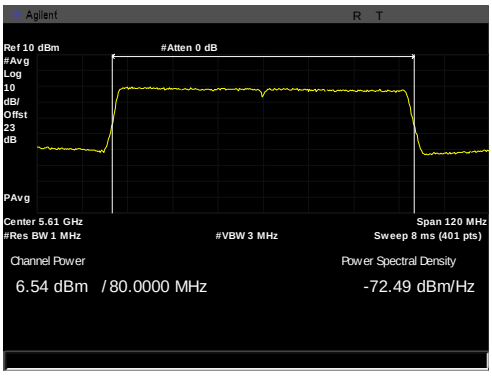
Plot 127. Conducted Transmitter Output Power, 5670 MHz, N Mode 40 MHz



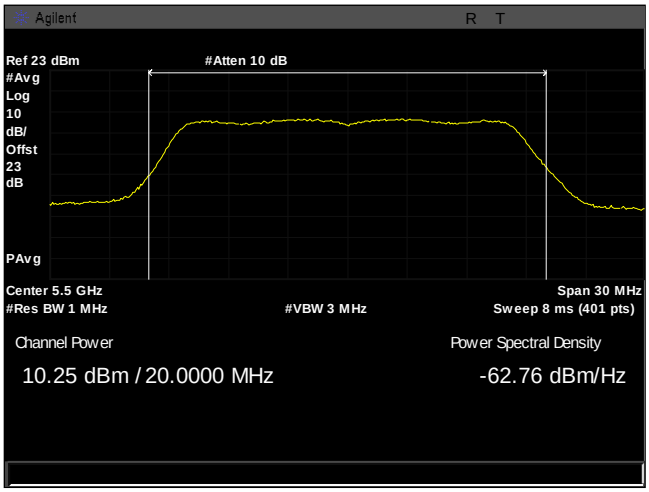
Plot 128. Conducted Transmitter Output Power, 5290 MHz, AC mode 80 MHz



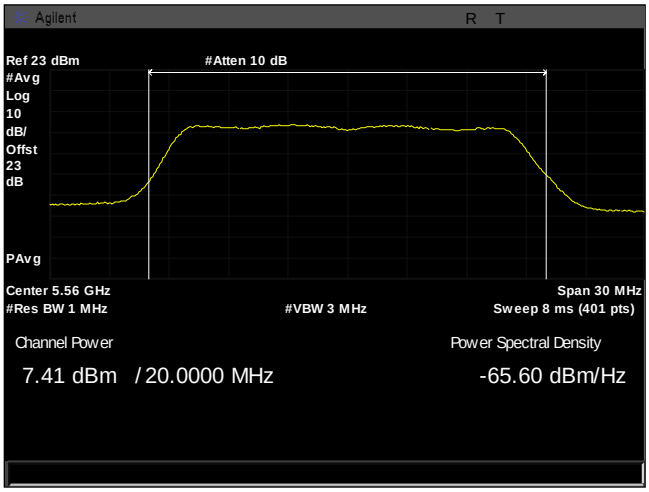
Plot 129. Conducted Transmitter Output Power, 5530 Mhz AC mode 80 MHz



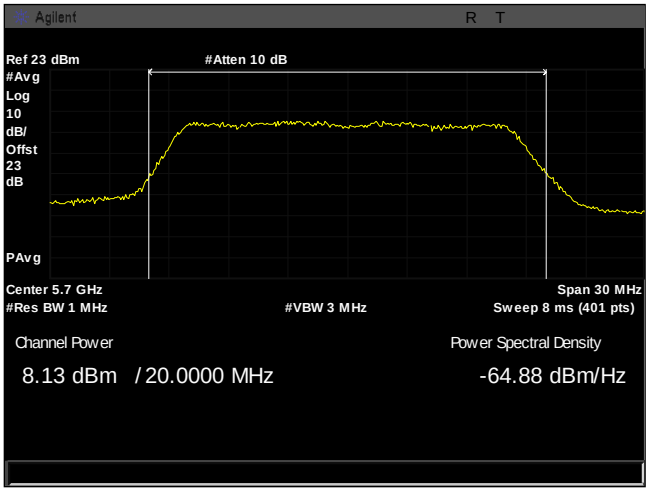
Plot 130. Conducted Transmitter Output Power, 5610 MHz, AC mode 80 MHz



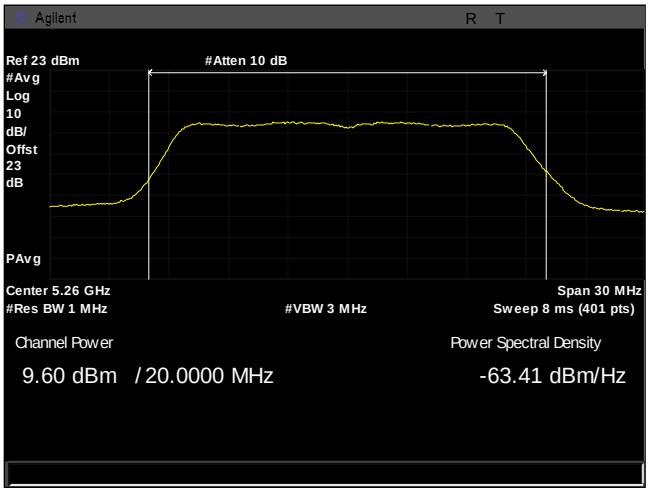
Plot 131. Conducted Transmitter Output Power, 5500 MHz, Power A Mode 20 MHz, Port A



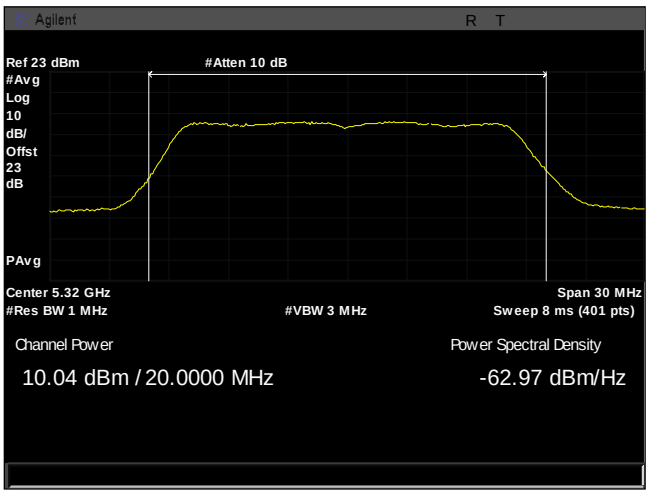
Plot 132. Conducted Transmitter Output Power, 5560 MHz, Power A Mode 20 MHz, Port A



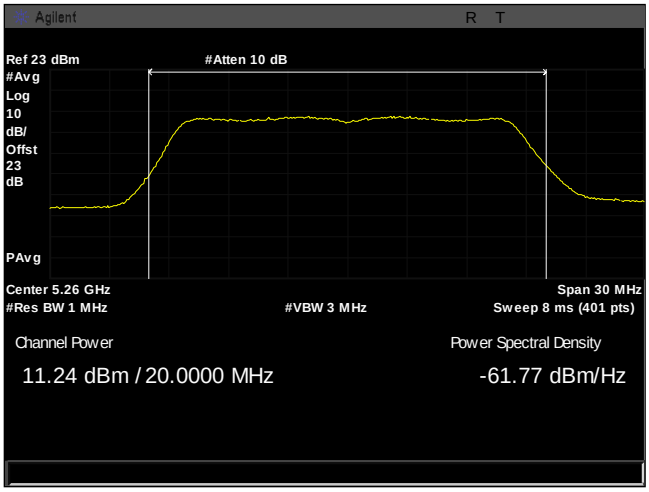
Plot 133. Conducted Transmitter Output Power, 5700 MHz, Power A Mode 20 MHz, Port A



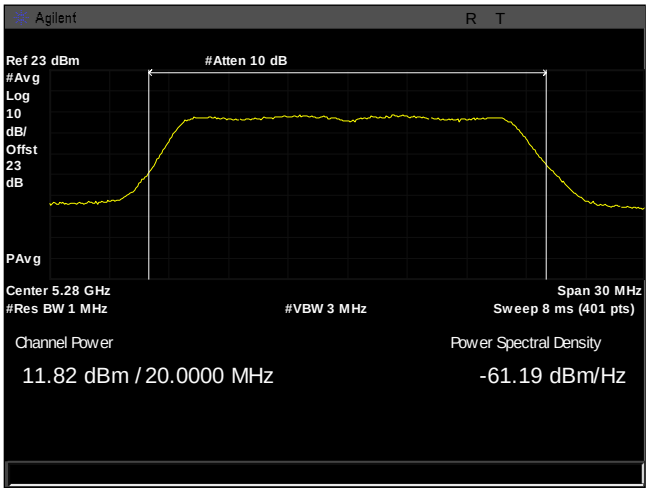
Plot 134. Conducted Transmitter Output Power, 5260 MHz, Power A Mode 20 MHz, Port A



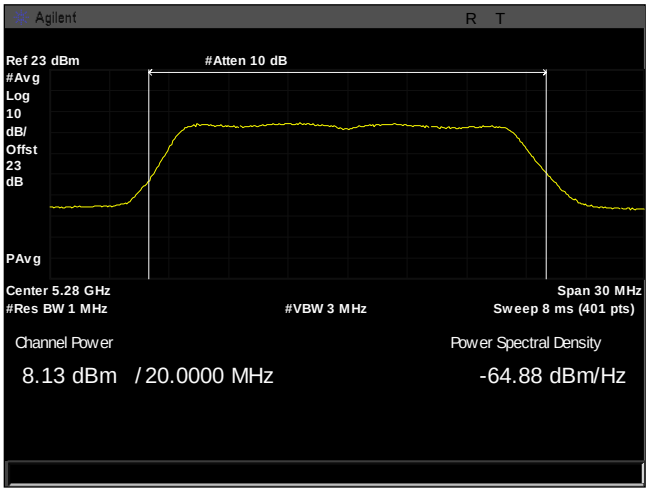
Plot 135. Conducted Transmitter Output Power, 5320 MHz, Power A Mode 20 MHz, Port B



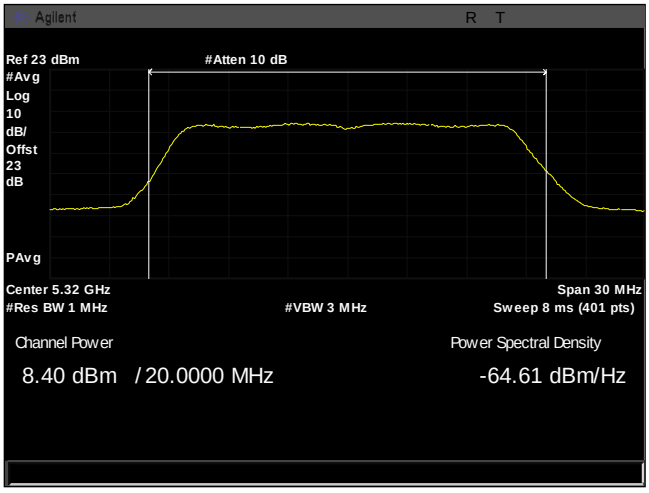
Plot 136. Conducted Transmitter Output Power, 5260 MHz, Power A Mode 20 MHz, Port B



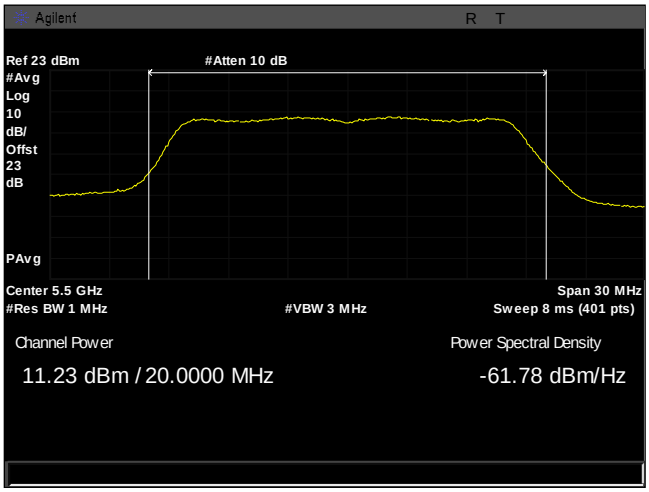
Plot 137. Conducted Transmitter Output Power, 5280 MHz, Power A Mode 20 MHz, Port B



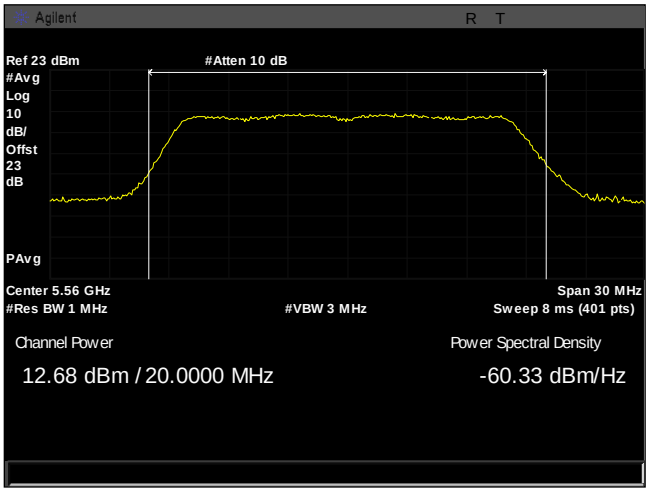
Plot 138. Conducted Transmitter Output Power, 5280 MHz, Power A Mode 20 MHz, Port A



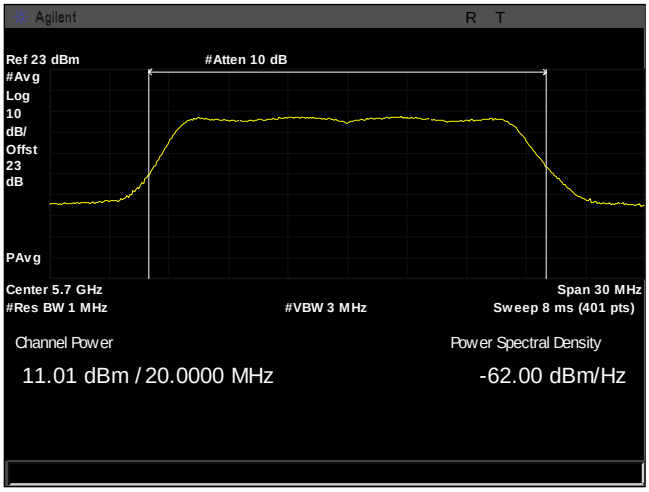
Plot 139. Conducted Transmitter Output Power, 5320 MHz, Power A Mode 20 MHz, Port A



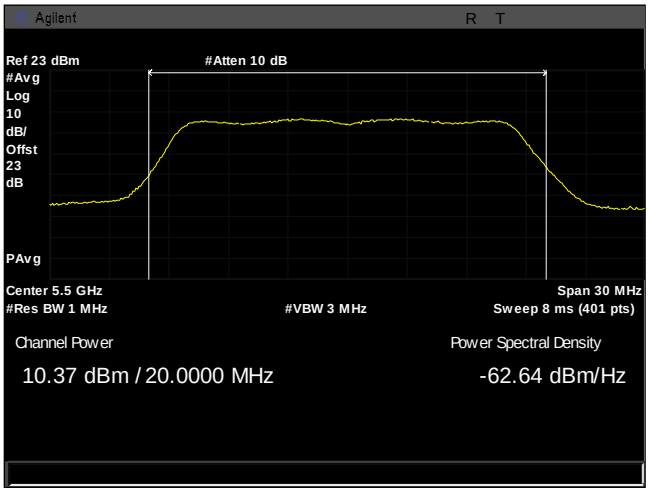
Plot 140. Conducted Transmitter Output Power, 5500 MHz, Power A Mode 20 MHz, Port B



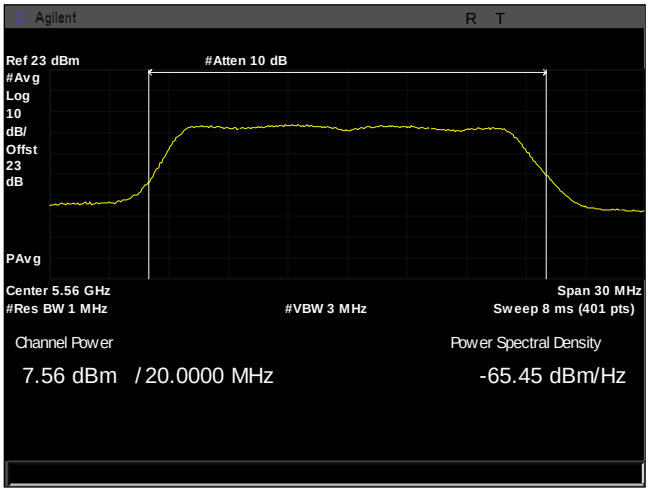
Plot 141. Conducted Transmitter Output Power, 5560 MHz, Power A Mode 20 MHz, Port B



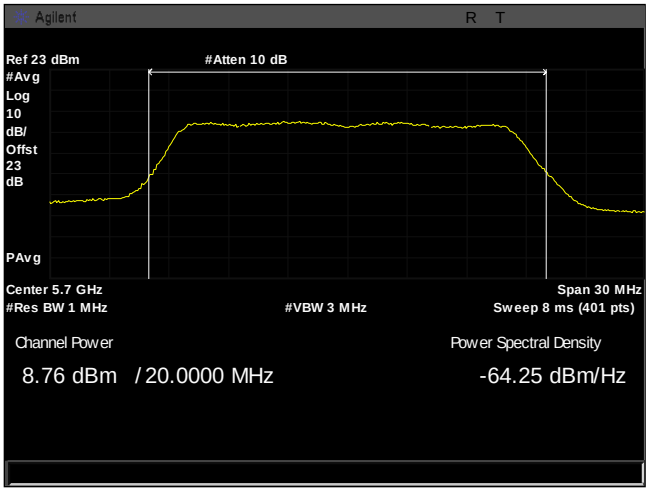
Plot 142. Conducted Transmitter Output Power, 5700 MHz, Power A Mode 20 MHz, Port B



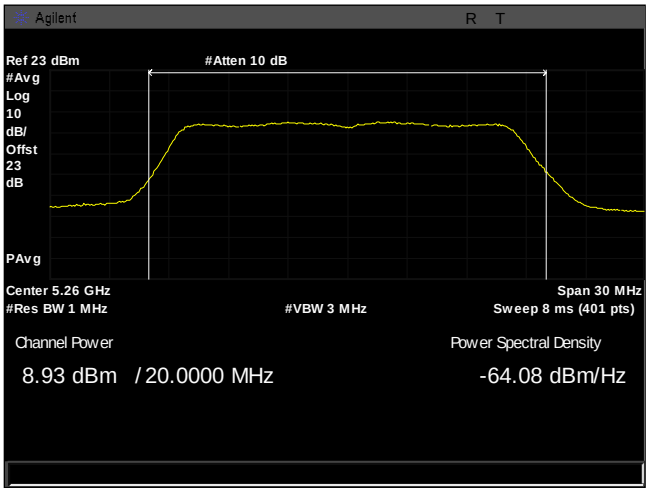
Plot 143. Conducted Transmitter Output Power, 5500 MHz, Power AC Mode 20 MHz, Port A



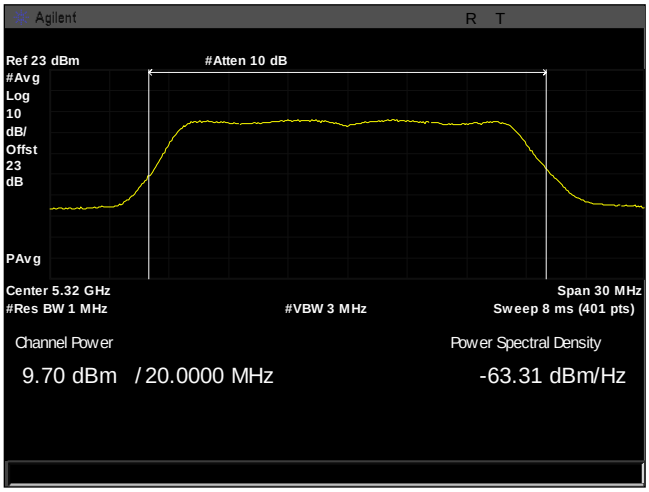
Plot 144. Conducted Transmitter Output Power, 5560 MHz, Power AC Mode 20 MHz, Port A



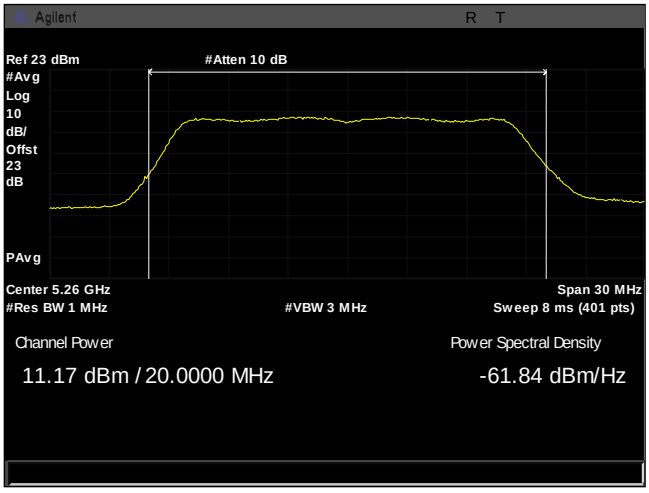
Plot 145. Conducted Transmitter Output Power, 5700 MHz, Power AC Mode 20 MHz, Port A



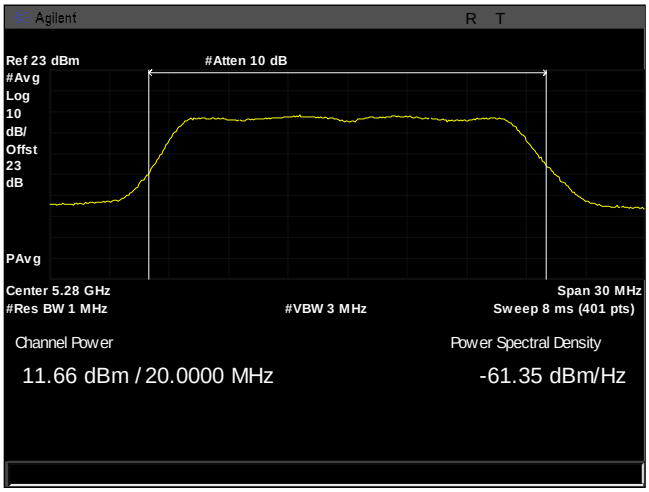
Plot 146. Conducted Transmitter Output Power, 5260 MHz, Power AC Mode 20 MHz, Port A



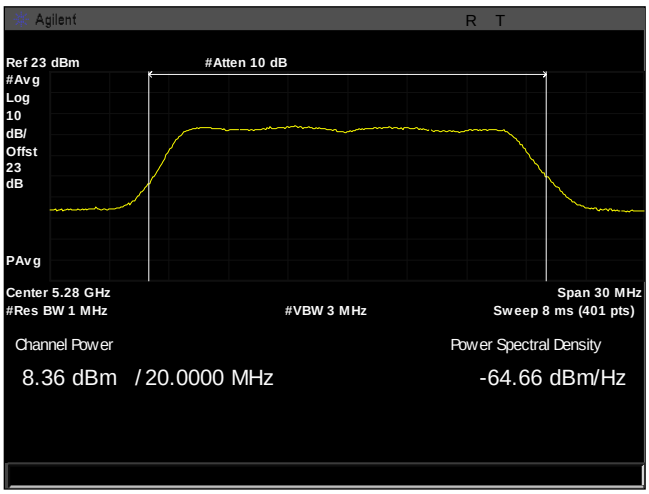
Plot 147. Conducted Transmitter Output Power, 5320 MHz, Power AC Mode 20 MHz, Port B



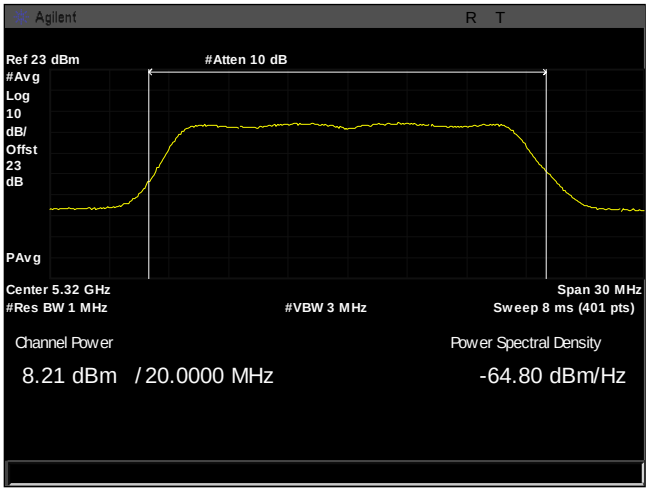
Plot 148. Conducted Transmitter Output Power, 5260 MHz, Power AC Mode 20 MHz, Port B



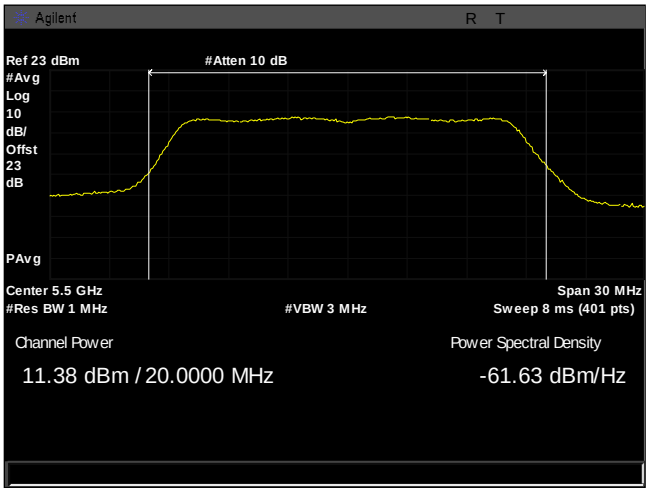
Plot 149. Conducted Transmitter Output Power, 5280 MHz, Power AC Mode 20 MHz, Port B



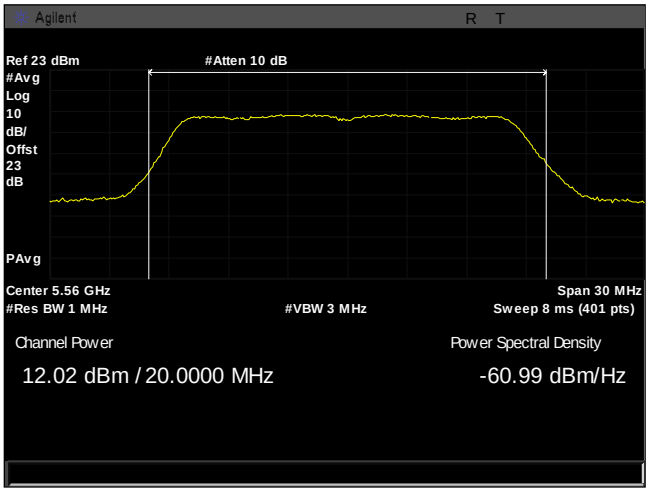
Plot 150. Conducted Transmitter Output Power, 5280 MHz, Power AC Mode 20 MHz, Port A



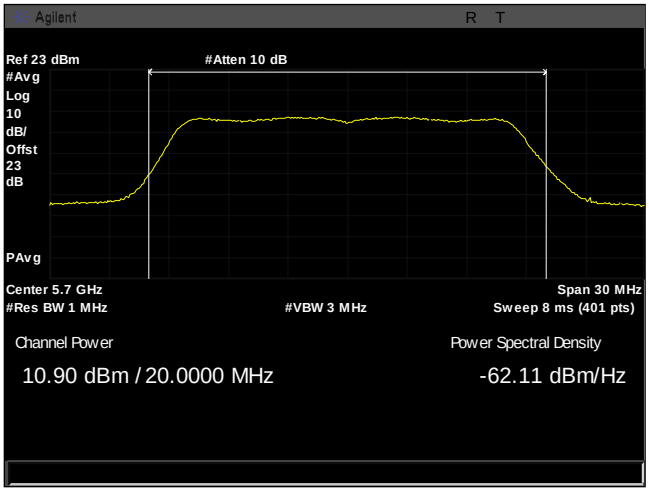
Plot 151. Conducted Transmitter Output Power, 5320 MHz, Power AC Mode 20 MHz, Port A



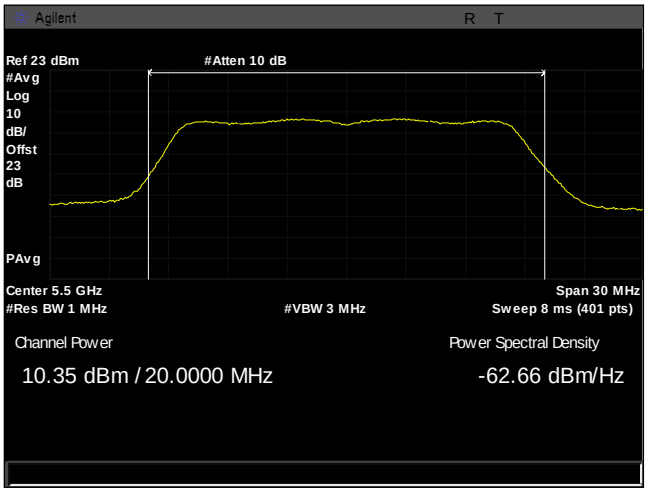
Plot 152. Conducted Transmitter Output Power, 5500 MHz, Power AC Mode 20 MHz, Port B



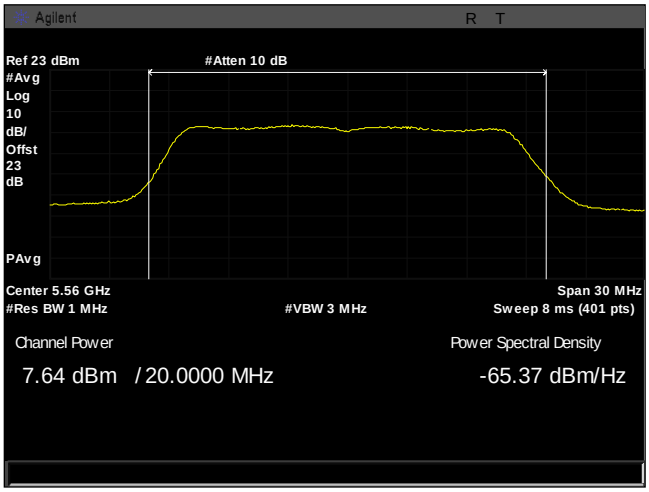
Plot 153. Conducted Transmitter Output Power, 5560 MHz, Power AC Mode 20 MHz, Port B



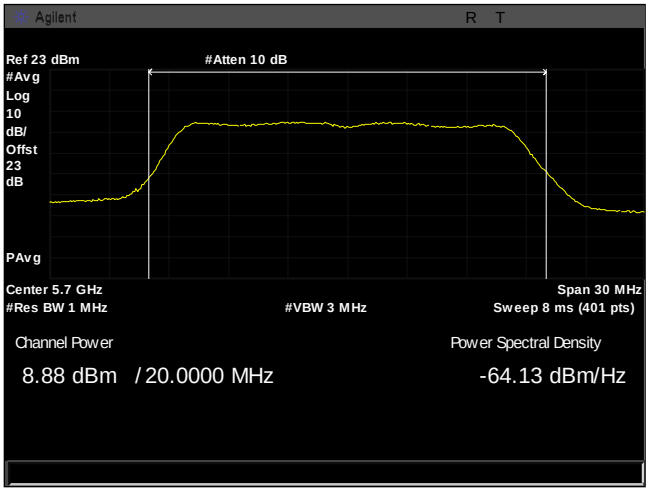
Plot 154. Conducted Transmitter Output Power, 5700 MHz, Power AC Mode 20 MHz, Port B



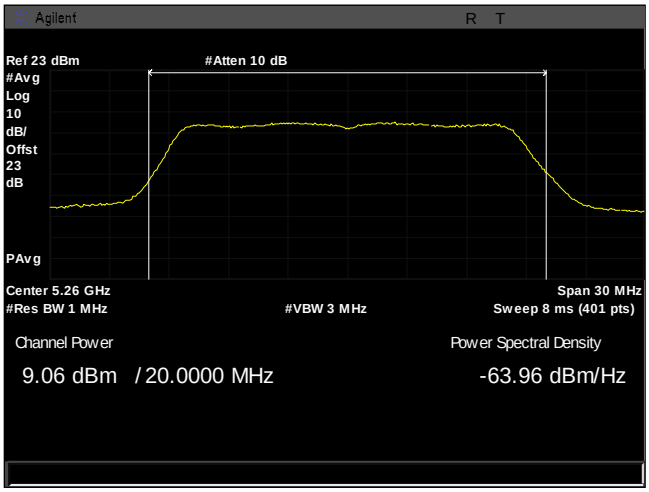
Plot 155. Conducted Transmitter Output Power, 5500 MHz, Power N Mode 20 MHz, Port A



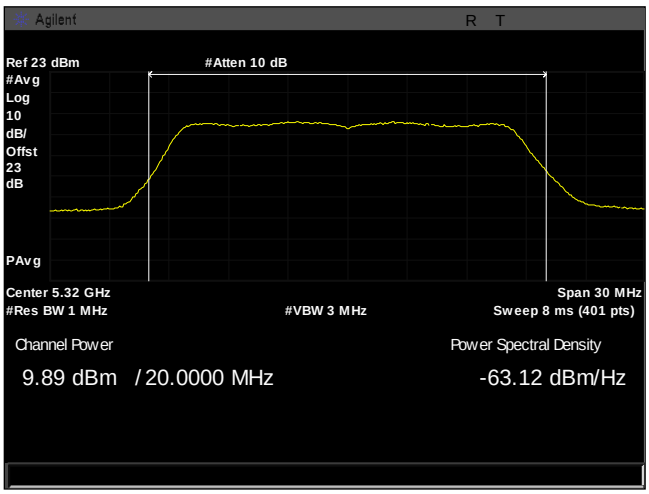
Plot 156. Conducted Transmitter Output Power, 5560 MHz, Power N Mode 20 MHz, Port A



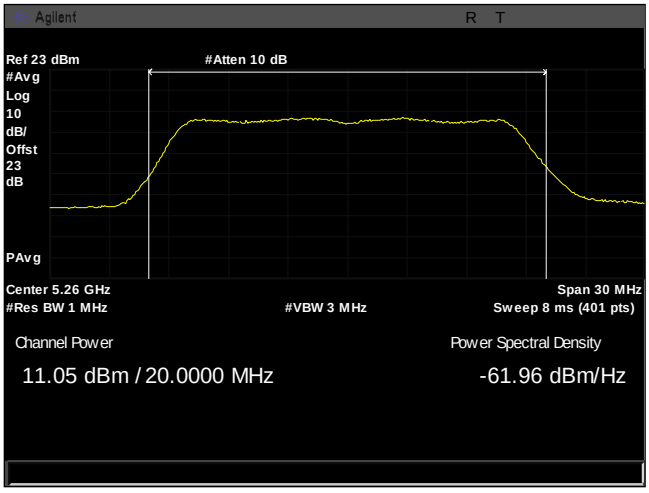
Plot 157. Conducted Transmitter Output Power, 5700 MHz, Power N Mode 20 MHz, Port A



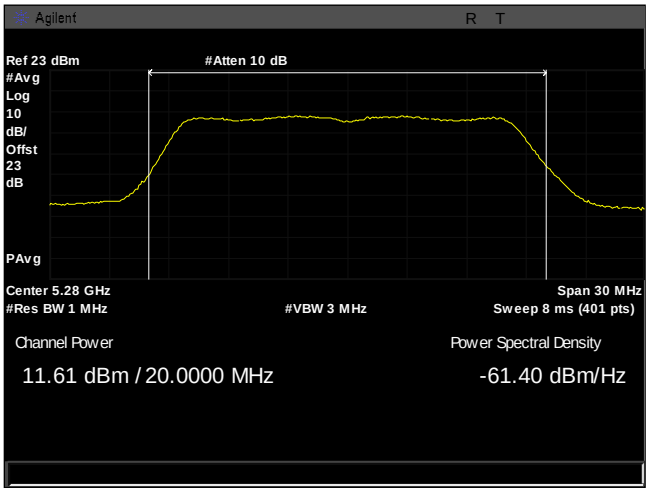
Plot 158. Conducted Transmitter Output Power, 5260 MHz, Power N Mode 20 MHz, Port A



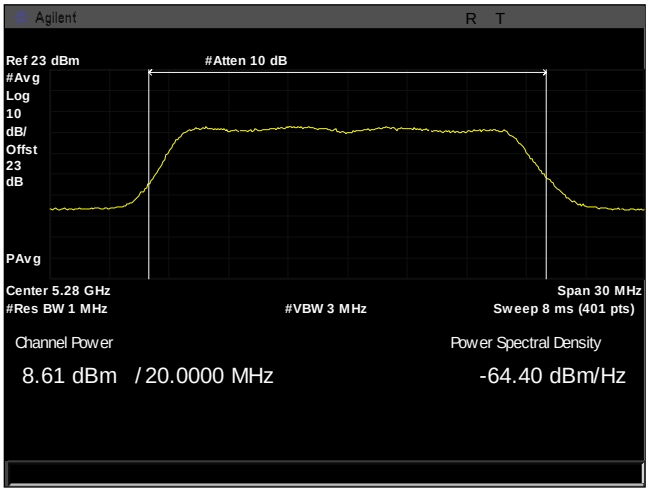
Plot 159. Conducted Transmitter Output Power, 5320 MHz, Power N Mode 20 MHz, Port B



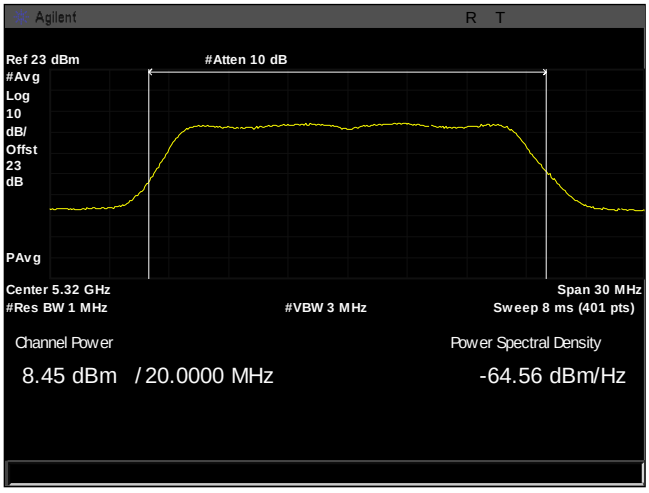
Plot 160. Conducted Transmitter Output Power, 5260 MHz, Power N Mode 20 MHz, Port B



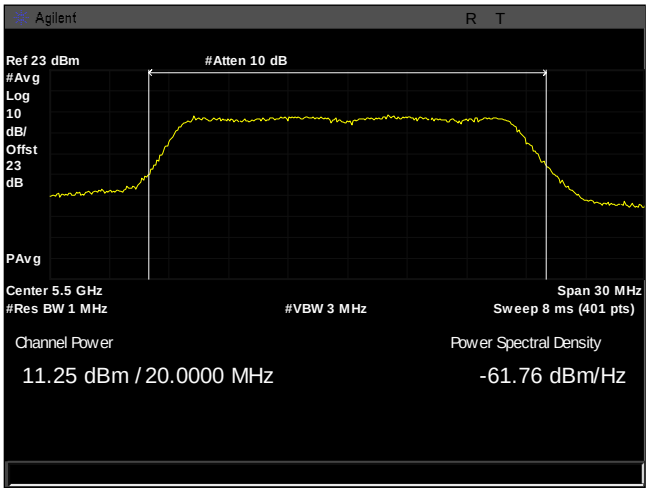
Plot 161. Conducted Transmitter Output Power, 5280 MHz, Power N Mode 20 MHz, Port B



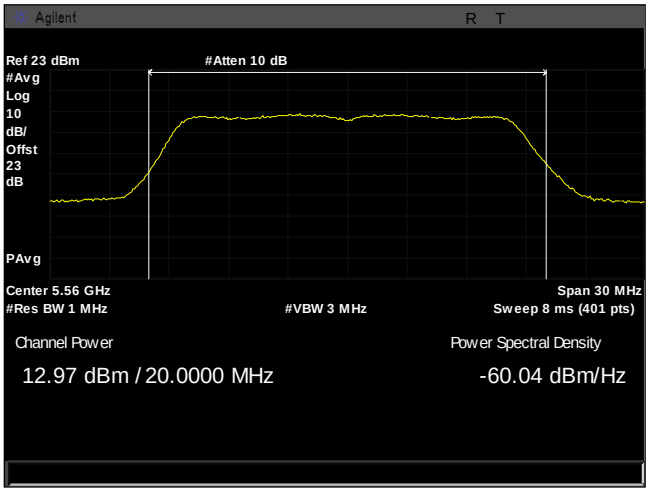
Plot 162. Conducted Transmitter Output Power, 5280 MHz, Power N Mode 20 MHz, Port A



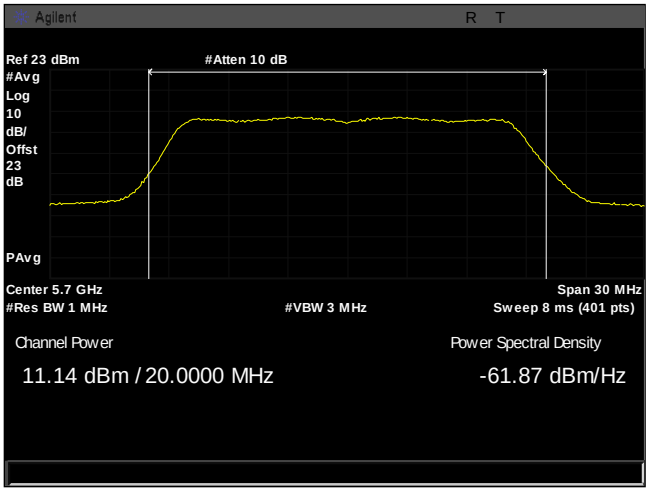
Plot 163. Conducted Transmitter Output Power, 5320 MHz, Power N Mode 20 MHz, Port A



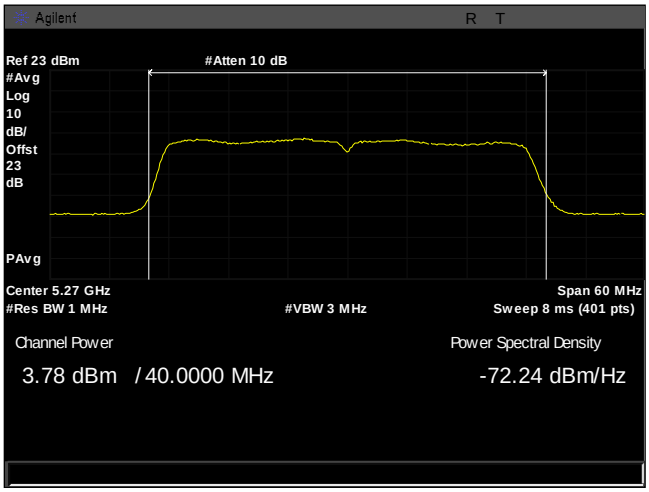
Plot 164. Conducted Transmitter Output Power, 5500 MHz, Power N Mode 20 MHz, Port B



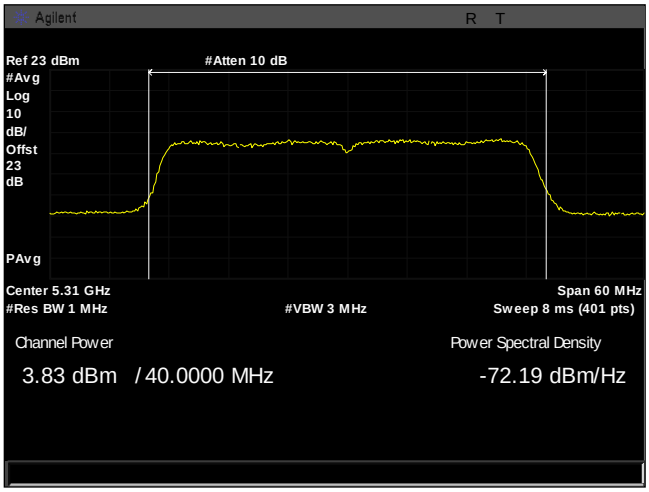
Plot 165. Conducted Transmitter Output Power, 5560 MHz, Power N Mode 20 MHz, Port B



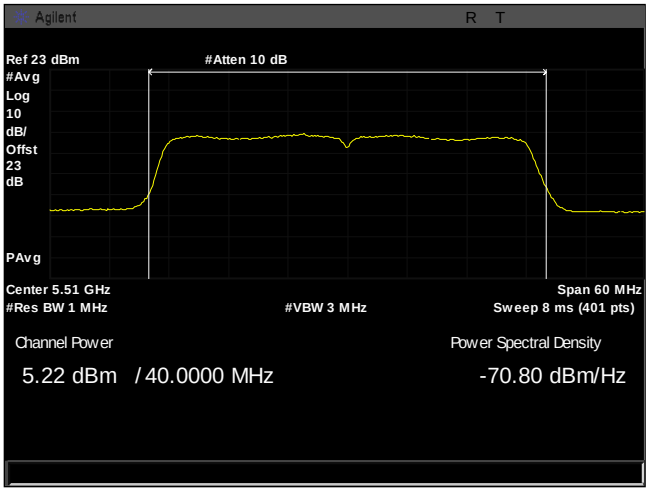
Plot 166. Conducted Transmitter Output Power, 5700 MHz, Power N Mode 20 MHz, Port B



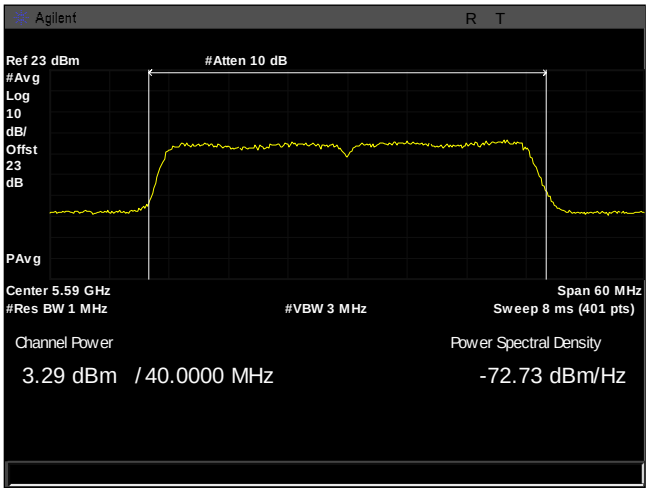
Plot 167. Conducted Transmitter Output Power, 5270 MHz, Power AC Mode 40 MHz, Port A



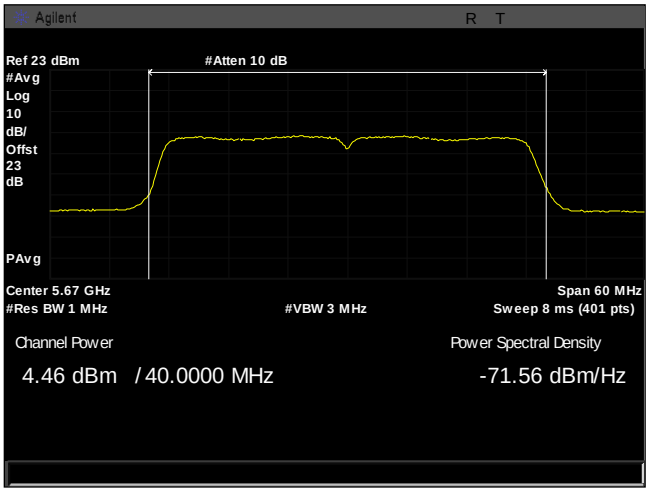
Plot 168. Conducted Transmitter Output Power, 5310 MHz, Power AC Mode 40 MHz, Port A



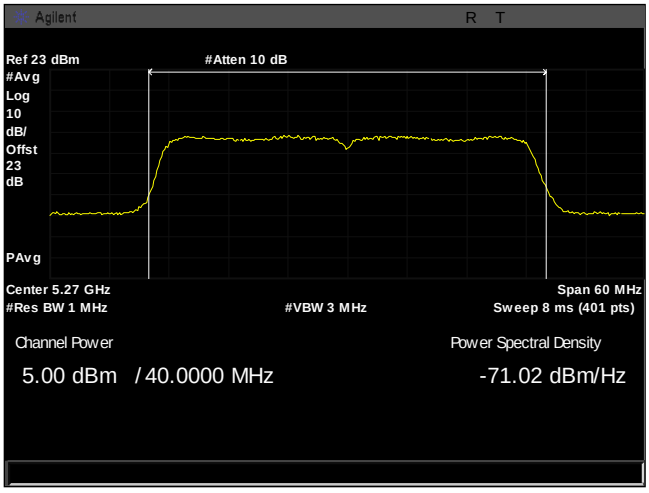
Plot 169. Conducted Transmitter Output Power, 5510 MHz, Power AC Mode 40 MHz, Port A



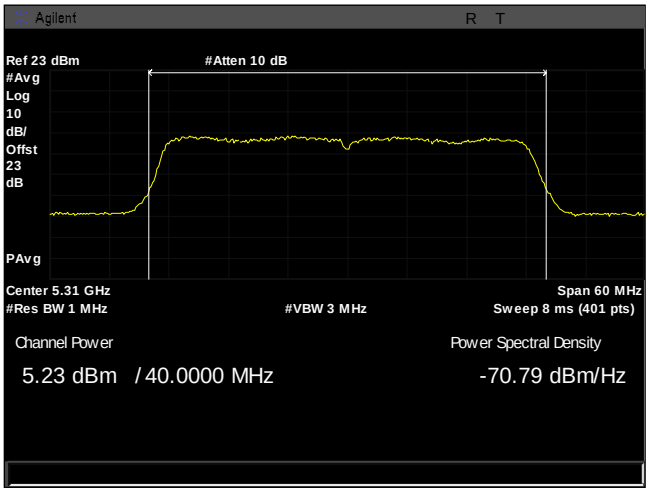
Plot 170. Conducted Transmitter Output Power, 5590 MHz, Power AC Mode 40 MHz, Port A



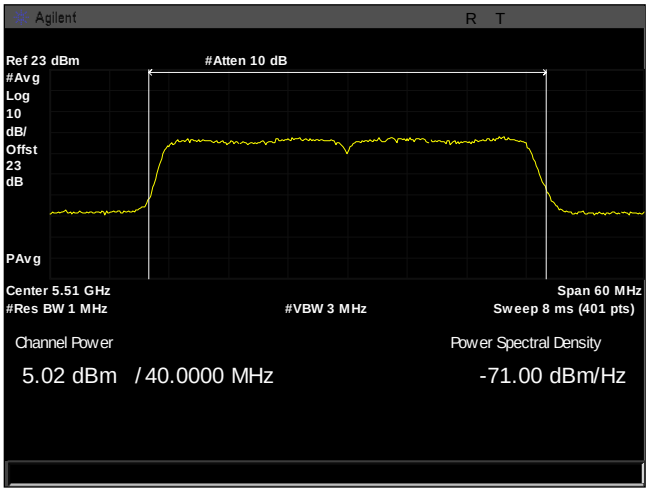
Plot 171. Conducted Transmitter Output Power, 5670 MHz, Power AC Mode 40 MHz, Port A



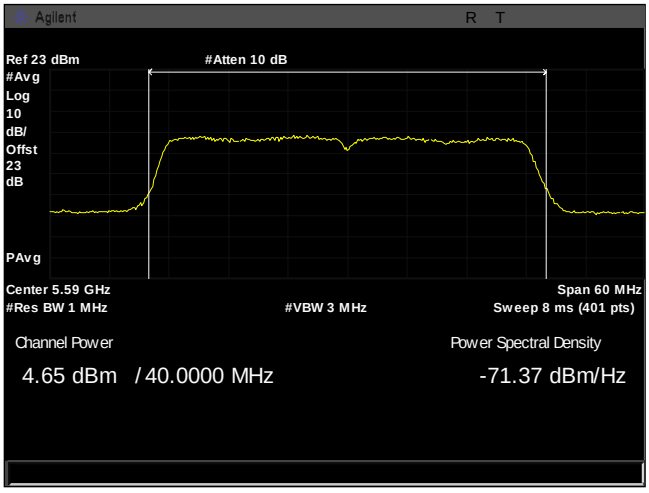
Plot 172. Conducted Transmitter Output Power, 5270 MHz, Power AC Mode 40 MHz, Port B



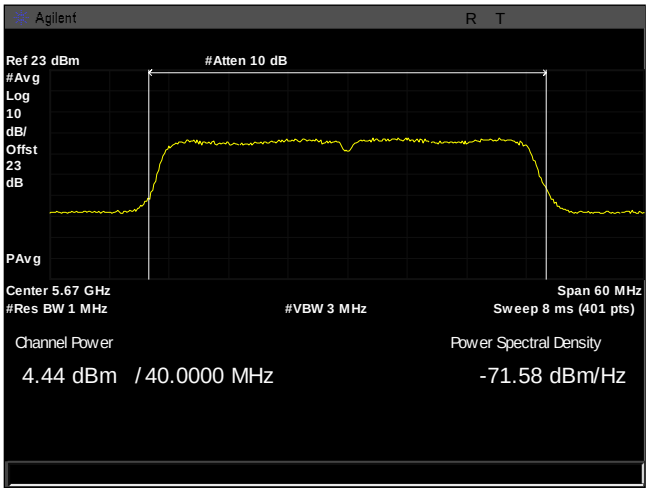
Plot 173. Conducted Transmitter Output Power, 5310 MHz, Power AC Mode 40 MHz, Port B



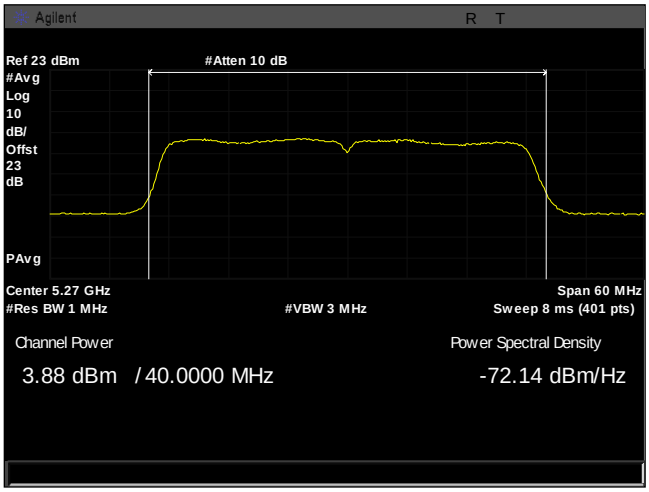
Plot 174. Conducted Transmitter Output Power, 5510 MHz, Power AC Mode 40 MHz, Port B



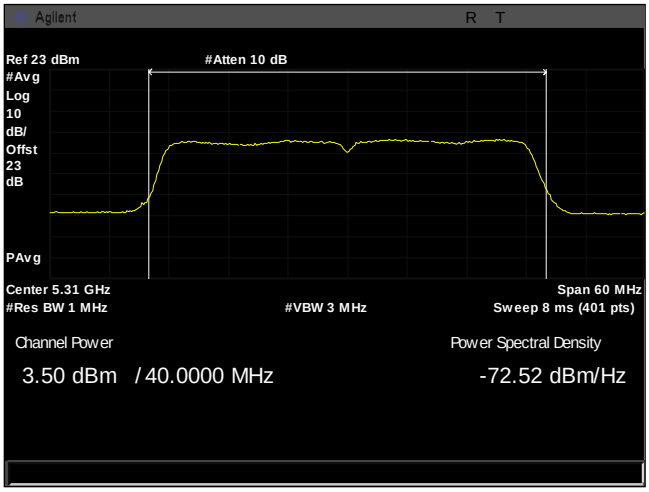
Plot 175. Conducted Transmitter Output Power, 5590 MHz, Power AC Mode 40 MHz, Port B



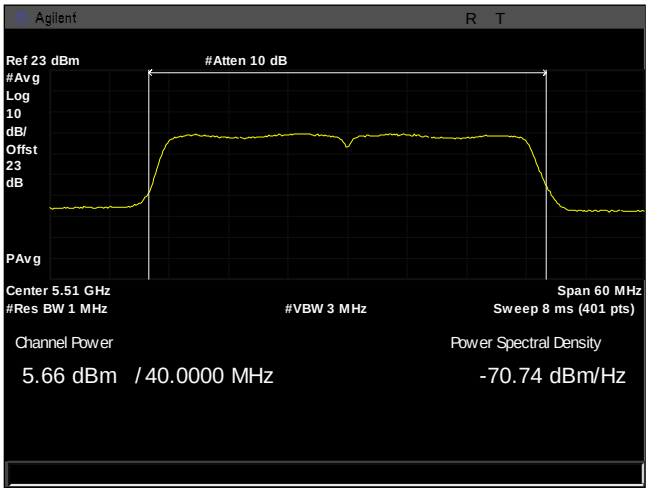
Plot 176. Conducted Transmitter Output Power, 5670 MHz, Power AC Mode 40 MHz, Port B



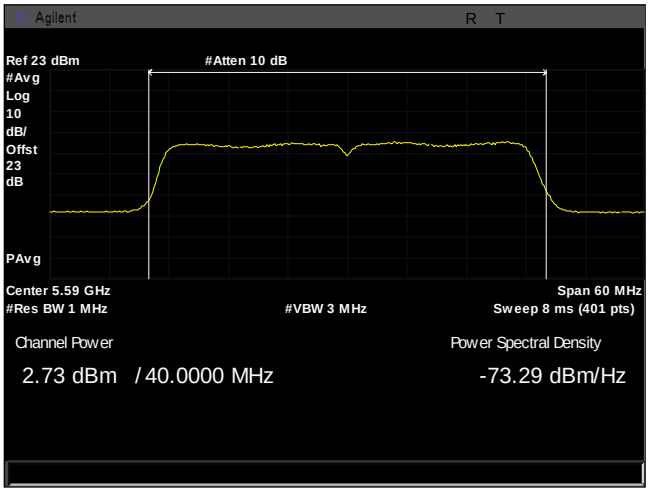
Plot 177. Conducted Transmitter Output Power, 5270 MHz, Power N Mode 40 MHz, Port A



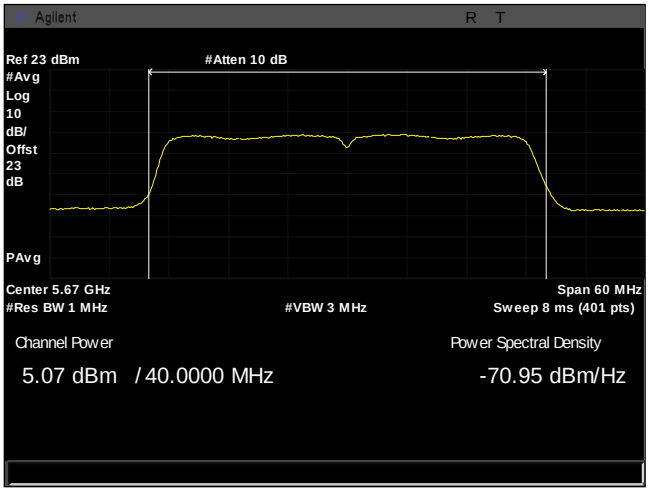
Plot 178. Conducted Transmitter Output Power, 5310 MHz, Power N Mode 40 MHz, Port A



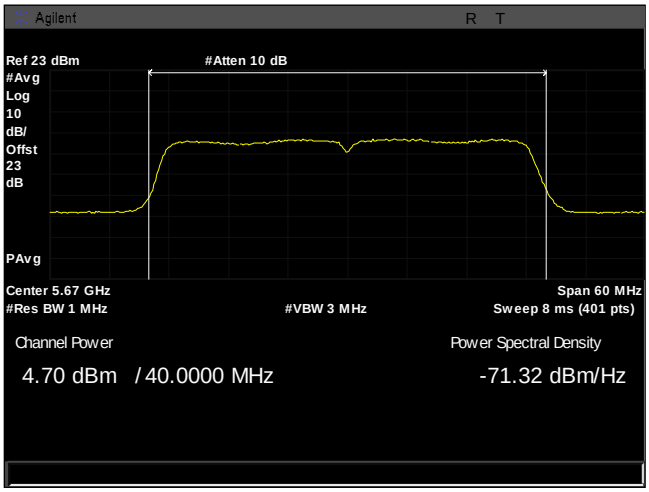
Plot 179. Conducted Transmitter Output Power, 5510 MHz, Power N Mode 40 MHz, Port A



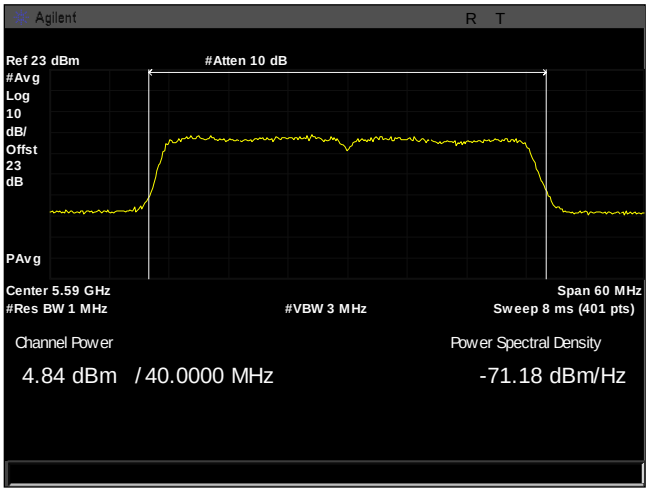
Plot 180. Conducted Transmitter Output Power, 5590 MHz, Power N Mode 40 MHz, Port A



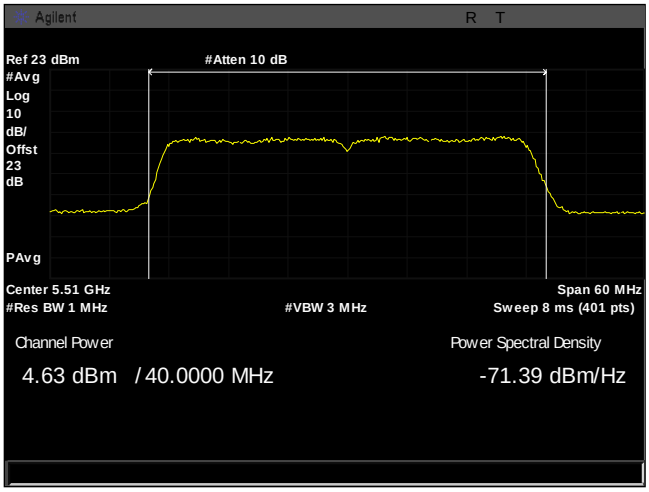
Plot 181. Conducted Transmitter Output Power, 5670 MHz, Power N Mode 40 MHz, Port A



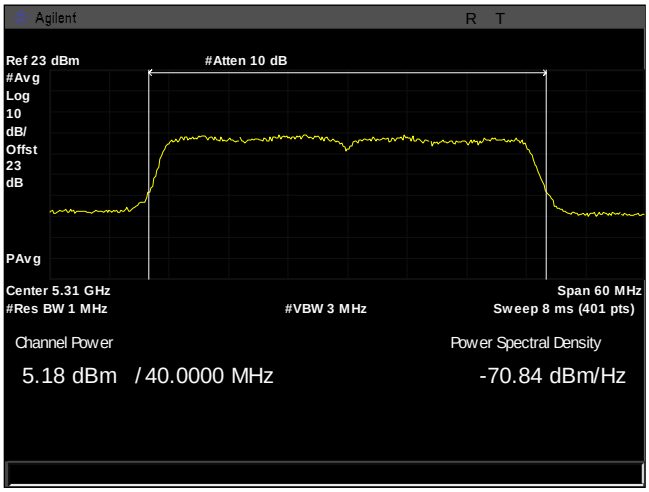
Plot 182. Conducted Transmitter Output Power, 5670 MHz, Power N Mode 40 MHz, Port B



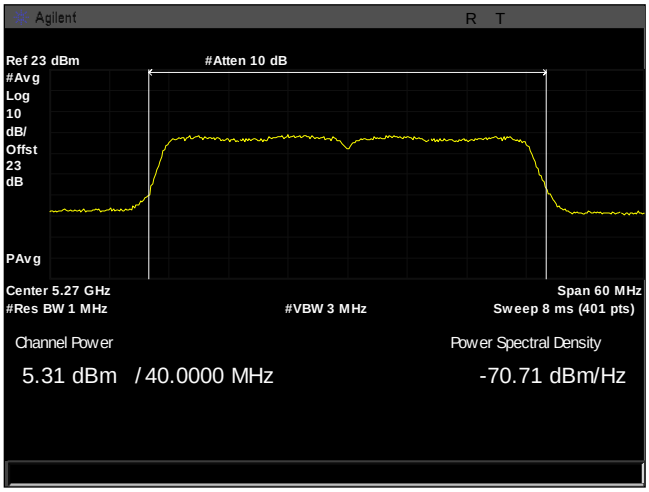
Plot 183. Conducted Transmitter Output Power, 5590 MHz, Power N Mode 40 MHz, Port B



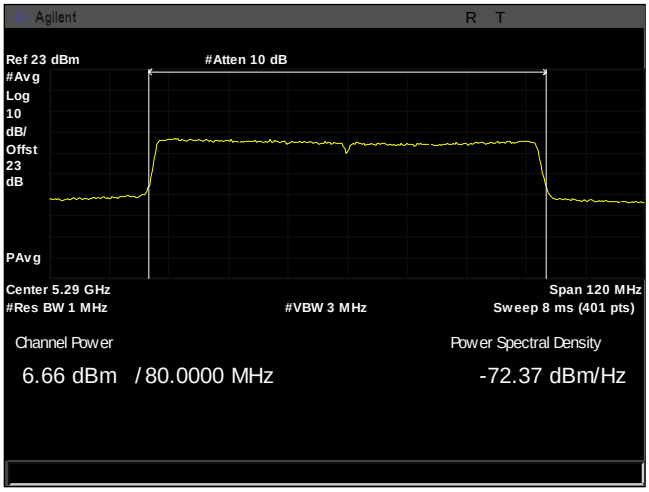
Plot 184. Conducted Transmitter Output Power, 5510 MHz, Power N Mode 40 MHz, Port B



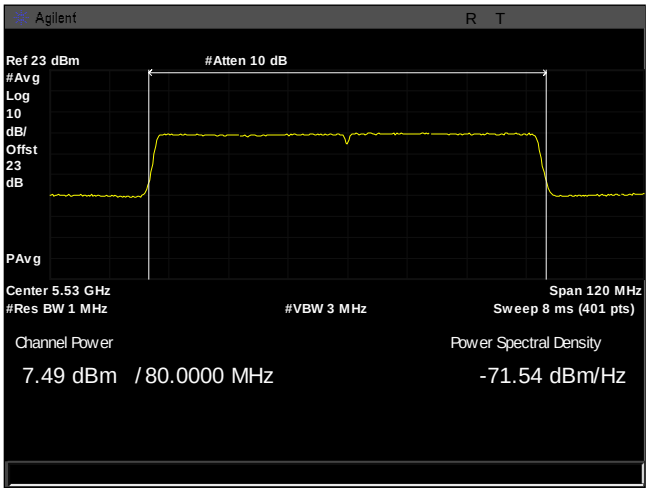
Plot 185. Conducted Transmitter Output Power, 5310 MHz, Power N Mode 40 MHz, Port B



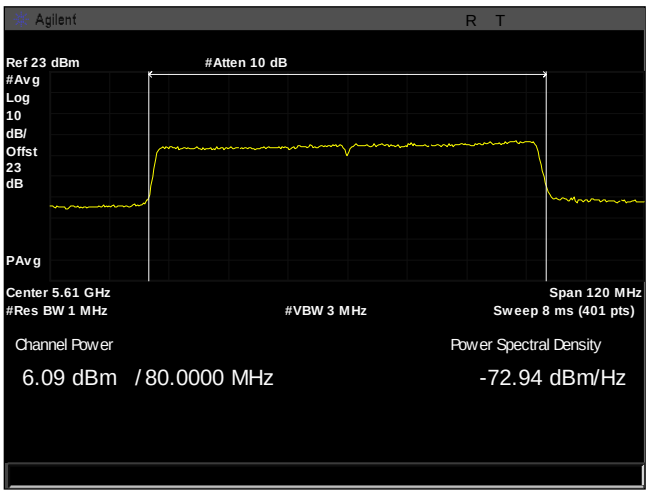
Plot 186. Conducted Transmitter Output Power, 5270 MHz, Power N Mode 40 MHz, Port B



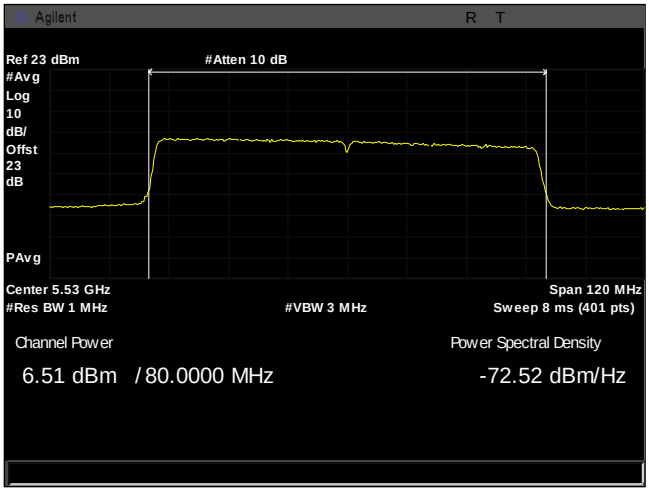
Plot 187. Conducted Transmitter Output Power, 5290 MHz, Power AC Mode 80 MHz, Port A



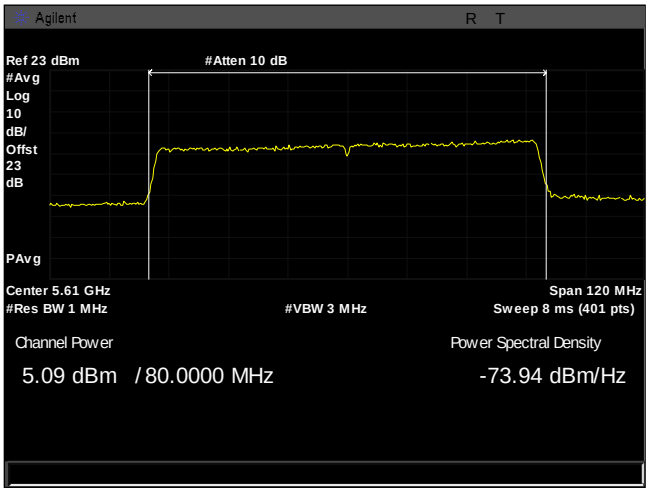
Plot 188. Conducted Transmitter Output Power, 5530 MHz, Power AC Mode 80 MHz, Port A



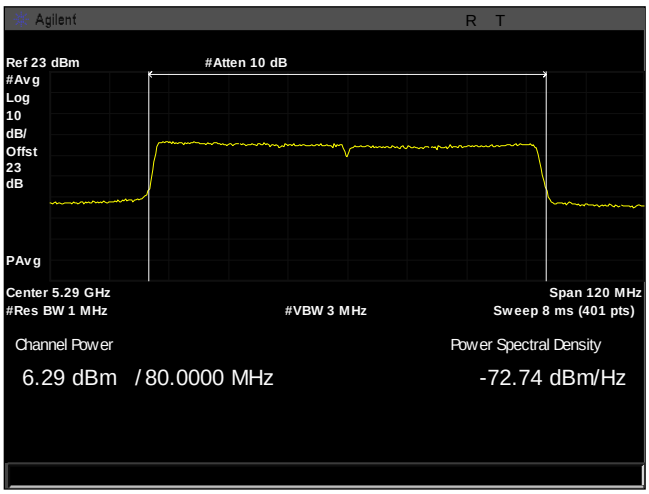
Plot 189. Conducted Transmitter Output Power, 5610 MHz, Power AC Mode 80 MHz, Port A



Plot 190. Conducted Transmitter Output Power, 5530 MHz, Power AC Mode 80 MHz, Port B



Plot 191. Conducted Transmitter Output Power, 5610 MHz, Power AC Mode 80 MHz, Port B



Plot 192. Conducted Transmitter Output Power, 5290 MHz, Power AC Mode 80 MHz, Port B

Electromagnetic Compatibility Criteria for Intentional Radiators

§15.407(a)(2) Maximum Power Spectral Density

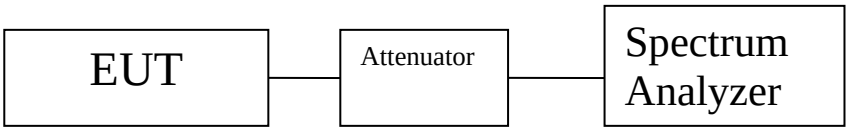
Test Requirements: **§15.407(a)(2):** In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Test Procedure: The EUT was connected to a spectrum analyzer through a cable and attenuator. Measurements were taken on low, mid, and high channels. Its power was measured according KDB 789033 D02 General UNII Test Procedures v01r04.

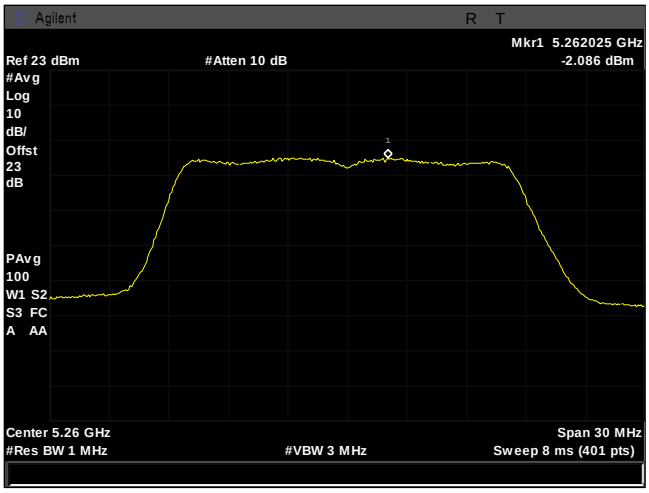
Test Results: The EUT as tested is compliant with the requirements of this section.

Test Engineer(s): Deepak Giri

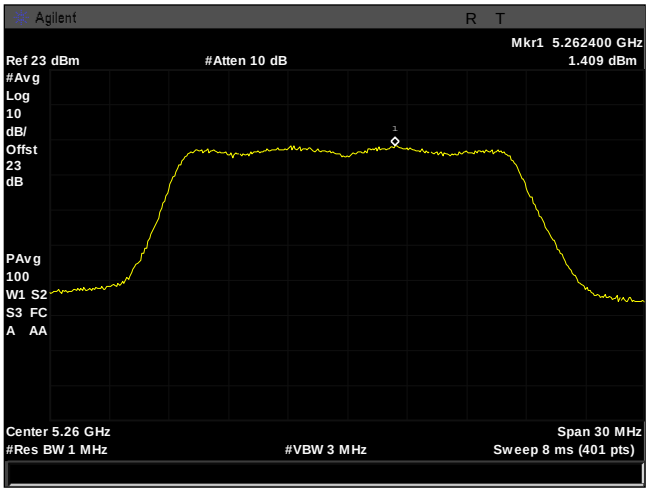
Test Date(s): May 13, 2017



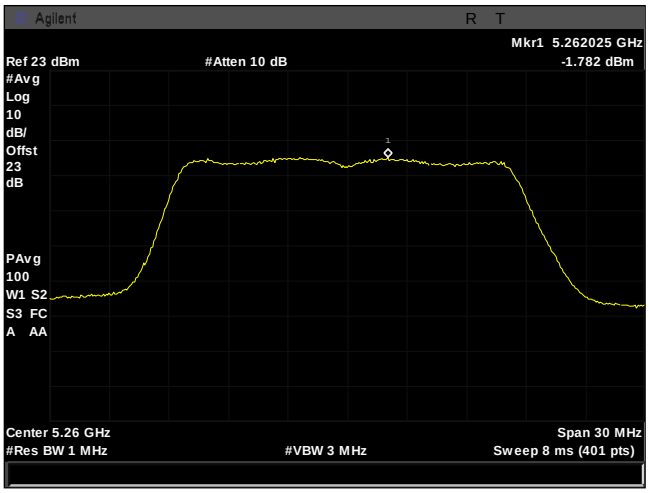
MIMO



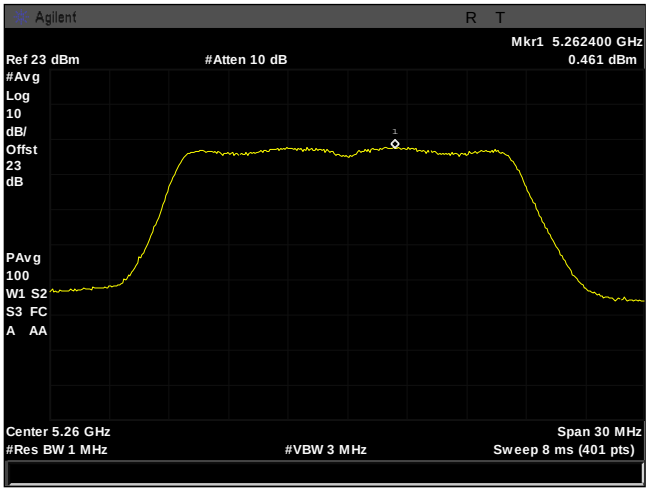
Plot 193. Power Spectral Density, 5260 MHz, A mode, 20 MHz, Port A, MIMO



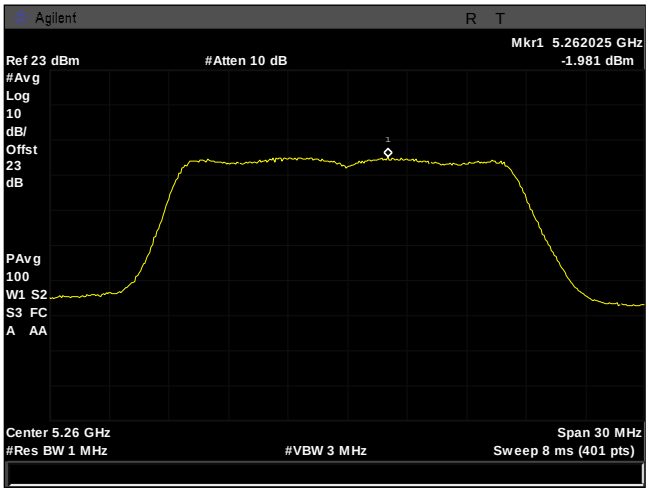
Plot 194. Power Spectral Density, 5260 MHz, A mode, 20 MHz, Port B, MIMO



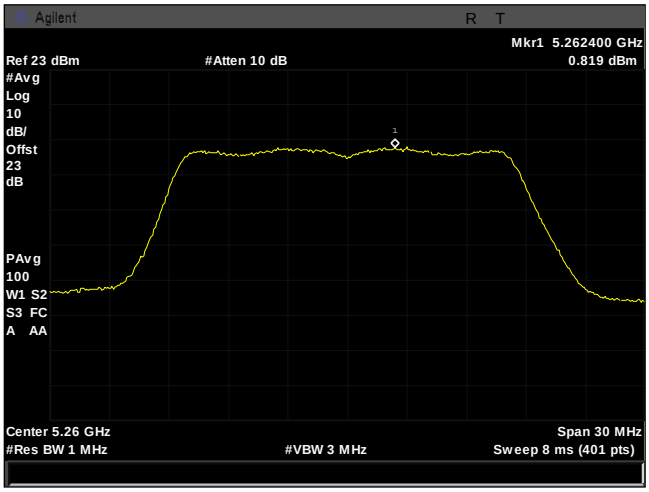
Plot 195. Power Spectral Density, 5260 MHz, AC mode, 20 MHz, Port A, MIMO



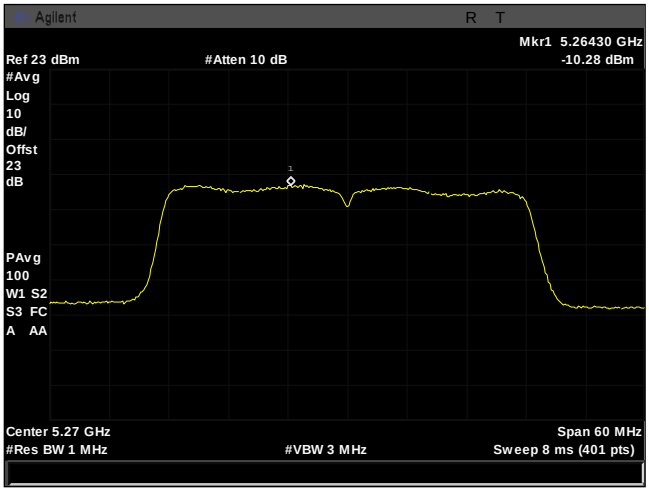
Plot 196. Power Spectral Density, 5260 MHz, AC mode, 20 MHz, Port B, MIMO



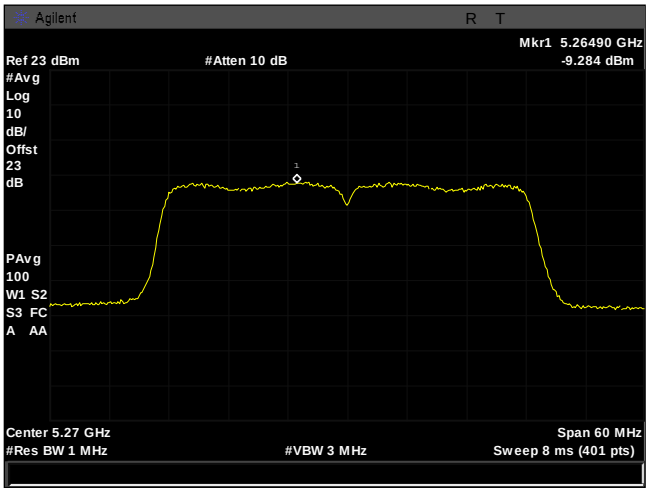
Plot 197. Power Spectral Density, 5260 MHz, N mode, 20 MHz, Port A, MIMO



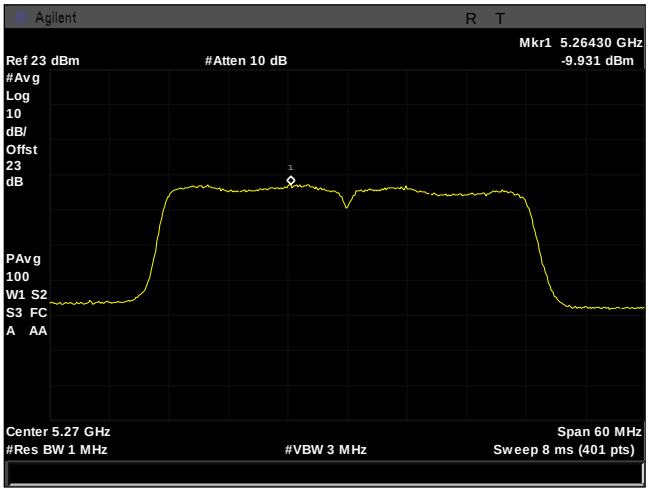
Plot 198. Power Spectral Density, 5260 MHz, N mode, 20 MHz, Port B, MIMO



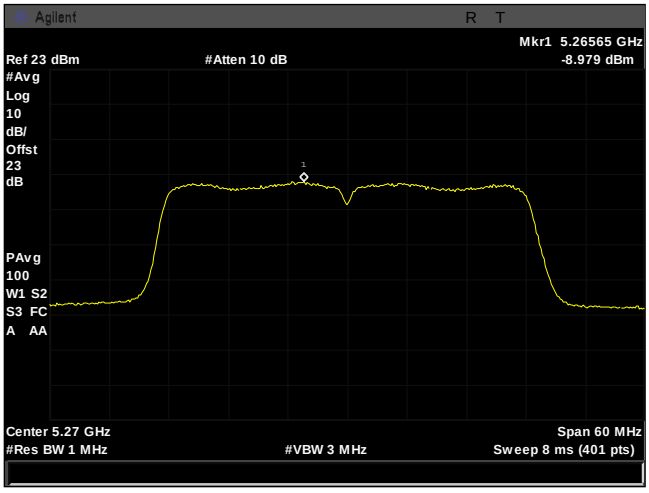
Plot 199. Power Spectral Density, 5270 MHz, AC mode, 40 MHz, Port A, MIMO



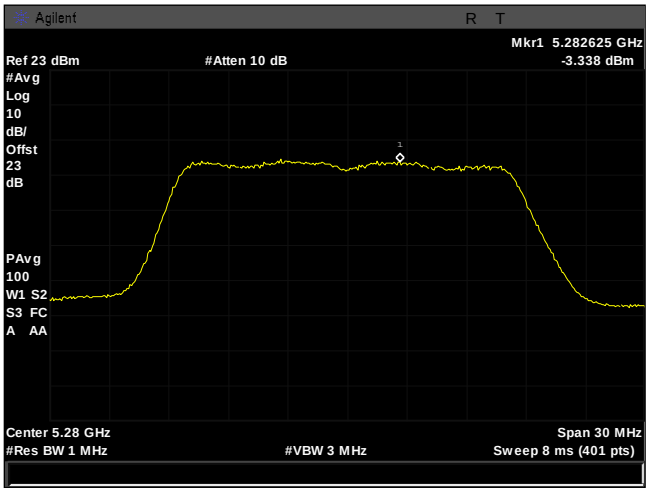
Plot 200. Power Spectral Density, 5270 MHz, AC mode, 40 MHz, Port B, MIMO



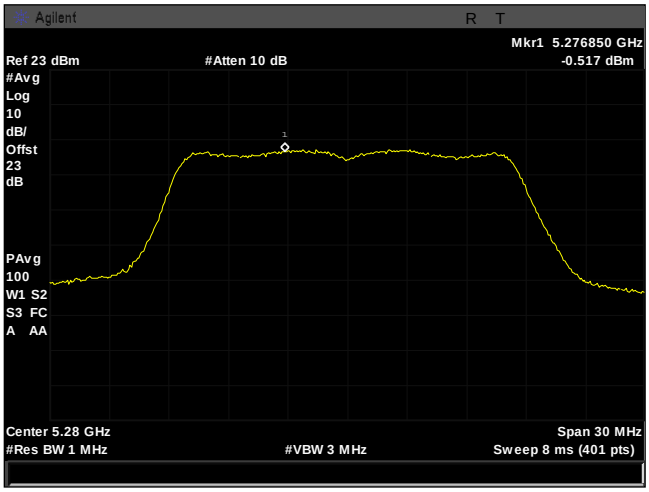
Plot 201. Power Spectral Density, 5270 MHz, N mode, 40 MHz, Port A, MIMO



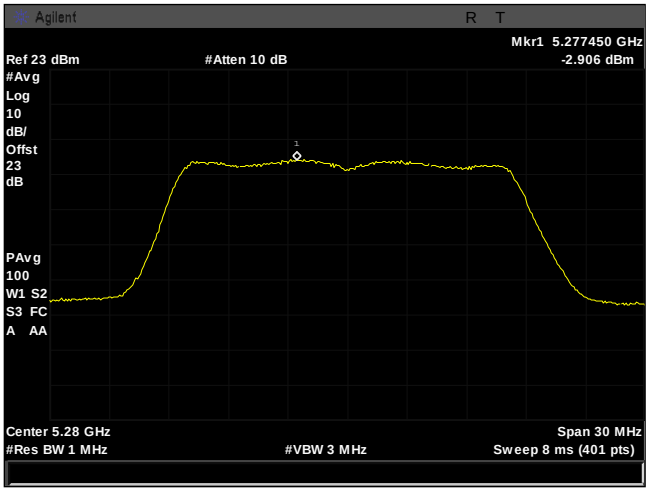
Plot 202. Power Spectral Density, 5270 MHz, N mode, 40 MHz, Port B, MIMO



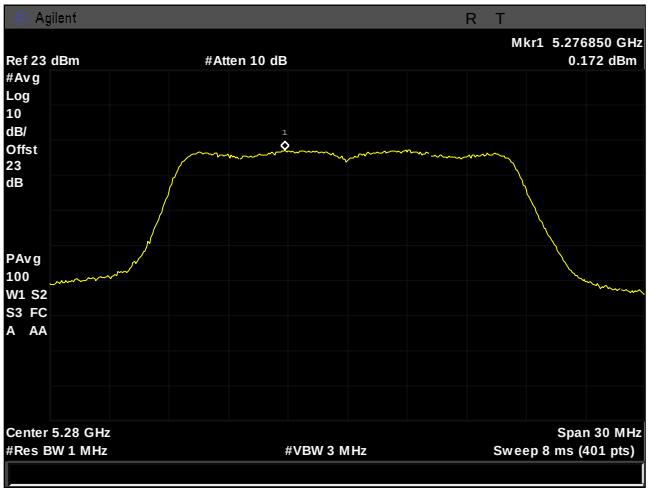
Plot 203. Power Spectral Density, 5280 MHz, A mode, 20 MHz, Port A, MIMO



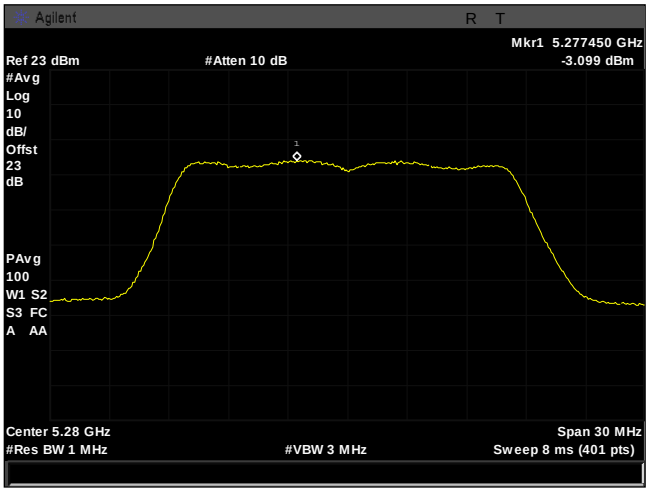
Plot 204. Power Spectral Density, 5280 MHz, A mode, 20 MHz, Port B, MIMO



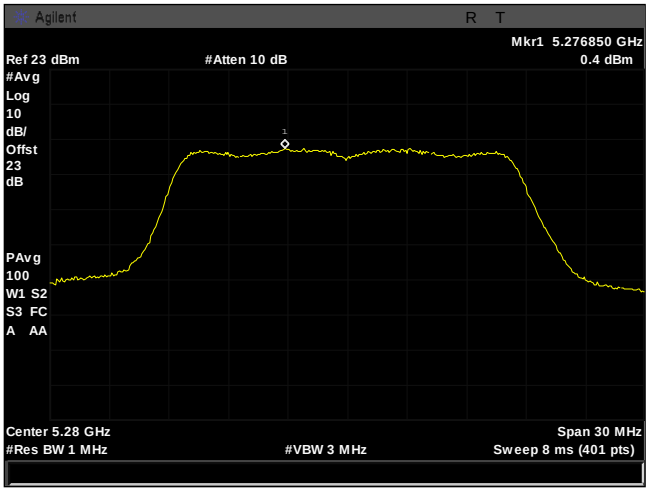
Plot 205. Power Spectral Density, 5280 MHz, AC mode, 20 MHz, Port A, MIMO



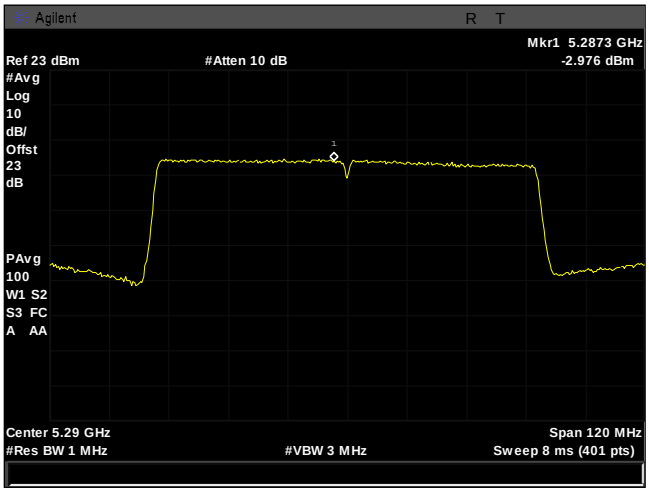
Plot 206. Power Spectral Density, 5280 MHz, AC mode, 20 MHz, Port B, MIMO



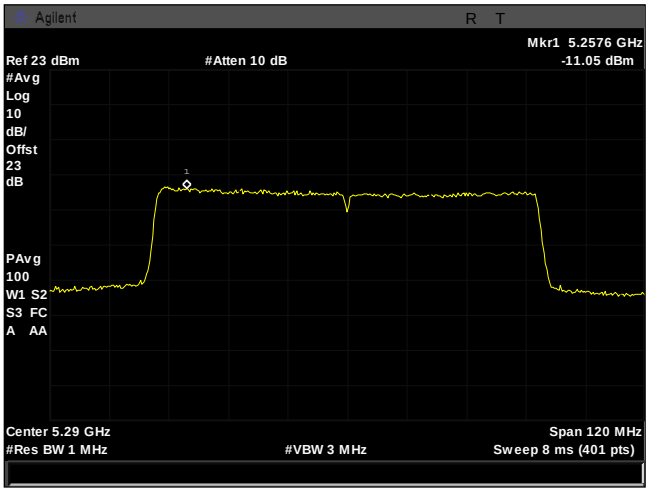
Plot 207. Power Spectral Density, 5280 MHz, N mode, 20 MHz, Port A, MIMO



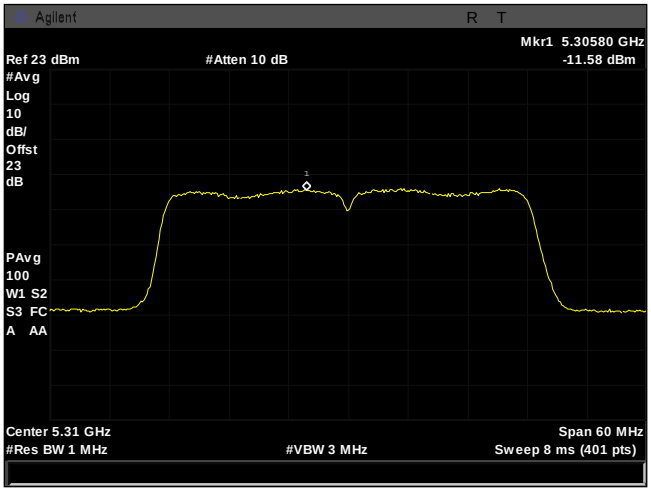
Plot 208. Power Spectral Density, 5280 MHz, N mode, 20 MHz, Port B, MIMO



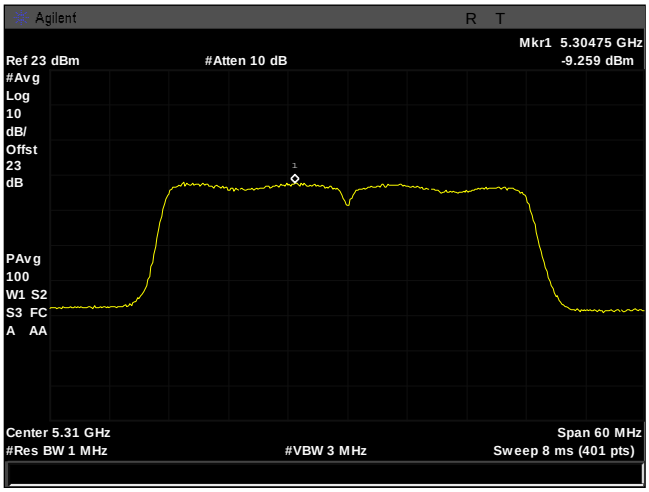
Plot 209. Power Spectral Density, 5290 MHz, AC mode, 80 MHz, Port B, MIMO



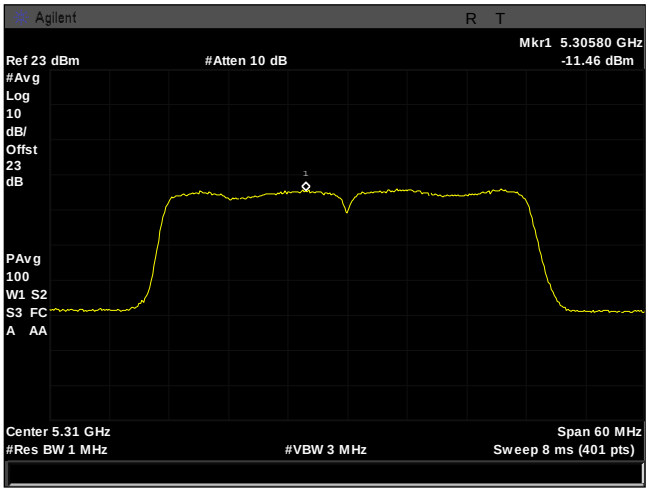
Plot 210. Power Spectral Density, 5290 MHz, AC mode, 80 MHz, Port A, MIMO



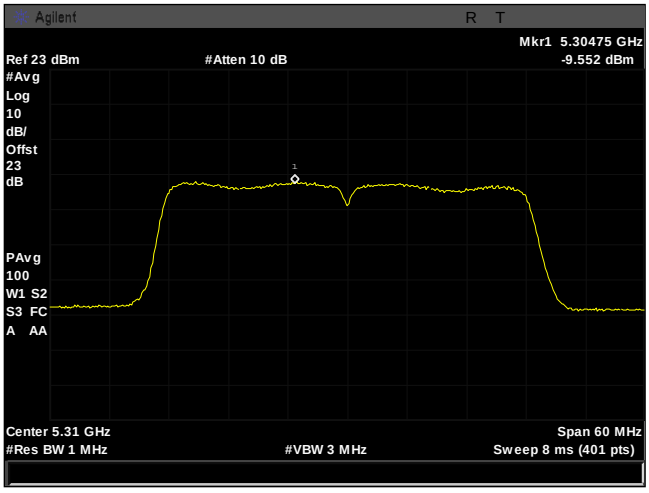
Plot 211. Power Spectral Density, 5310 MHz, AC mode, 40 MHz, Port A, MIMO



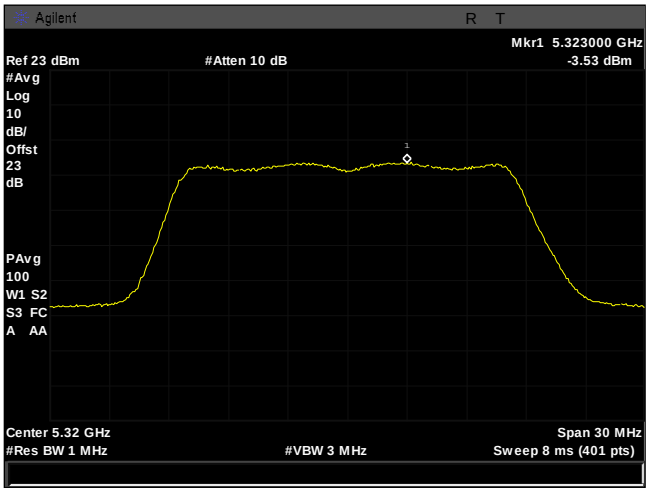
Plot 212. Power Spectral Density, 5310 MHz, AC mode, 40 MHz, Port B, MIMO



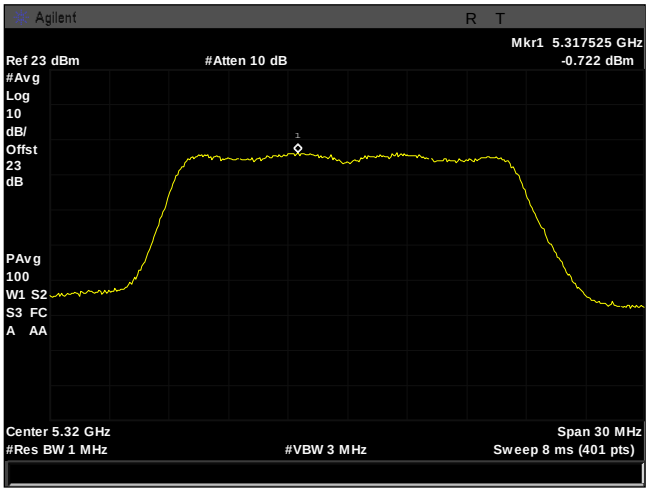
Plot 213. Power Spectral Density, 5310 MHz, N mode, 40 MHz, Port A, MIMO



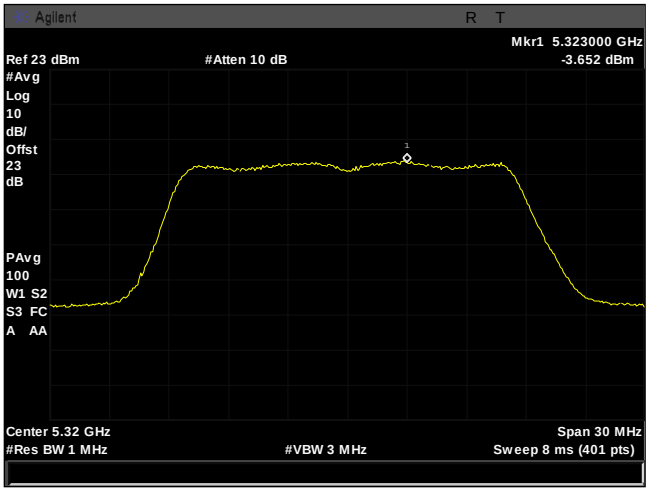
Plot 214. Power Spectral Density, 5310 MHz, N mode, 40 MHz, Port B, MIMO



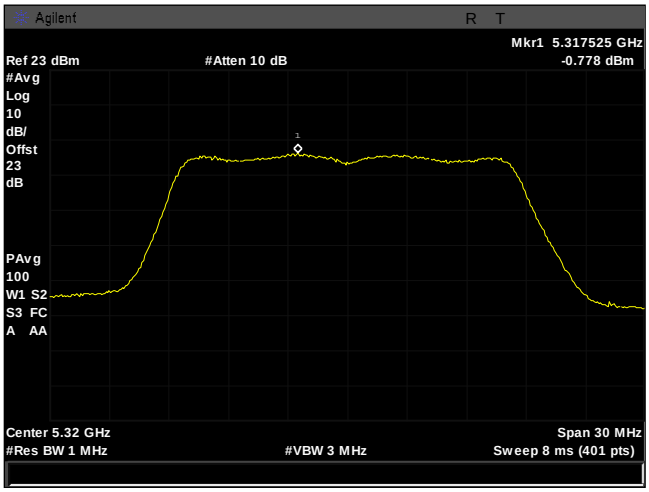
Plot 215. Power Spectral Density, 5320 MHz, A mode, 20 MHz, Port A, MIMO



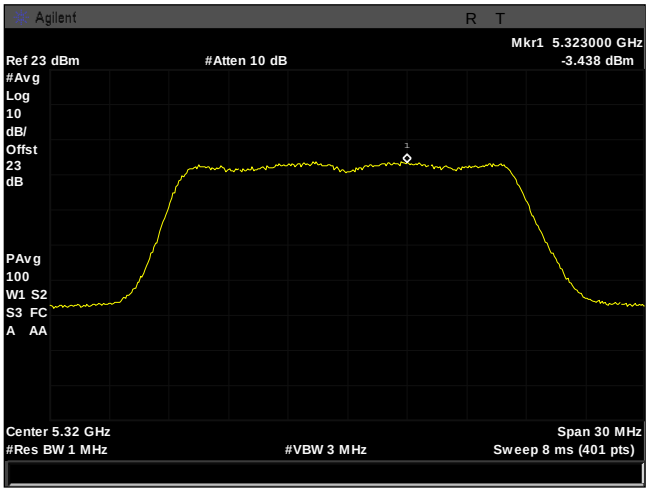
Plot 216. Power Spectral Density, 5320 MHz, A mode, 20 MHz, Port B, MIMO



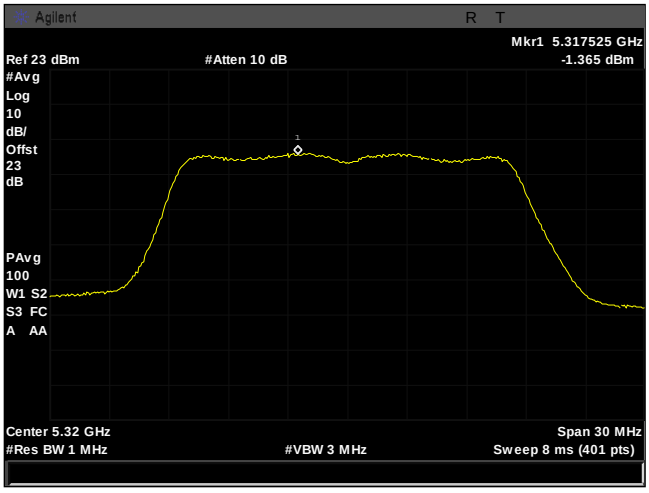
Plot 217. Power Spectral Density, 5320 MHz, AC mode, 20 MHz, Port A, MIMO



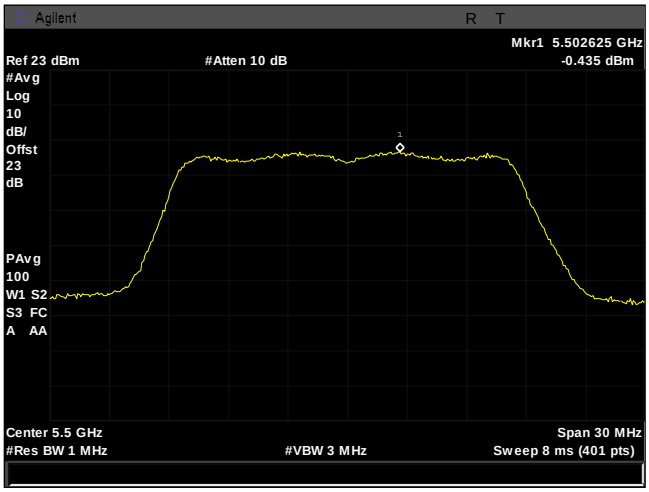
Plot 218. Power Spectral Density, 5320 MHz, AC mode, 20 MHz, Port B, MIMO



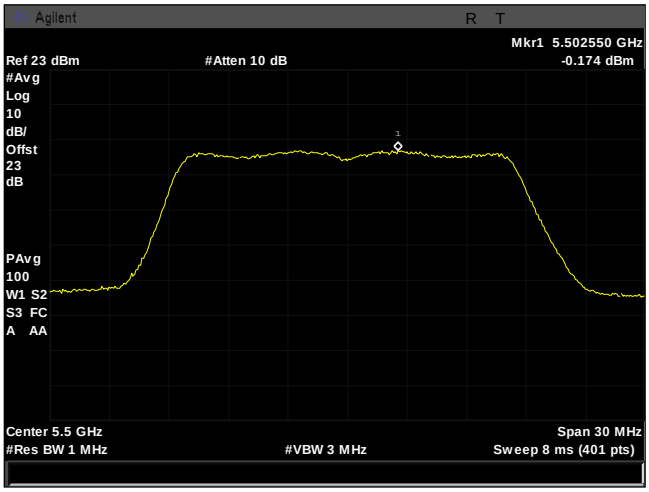
Plot 219. Power Spectral Density, 5320 MHz, N mode, 20 MHz, Port A, MIMO



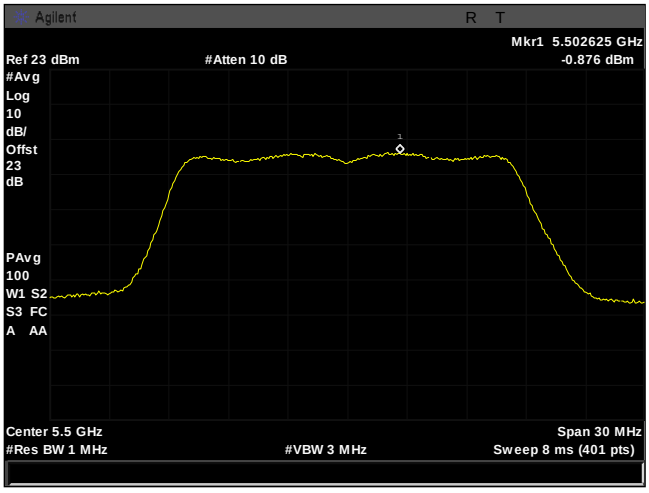
Plot 220. Power Spectral Density, 5320 MHz, N mode, 20 MHz, Port B, MIMO



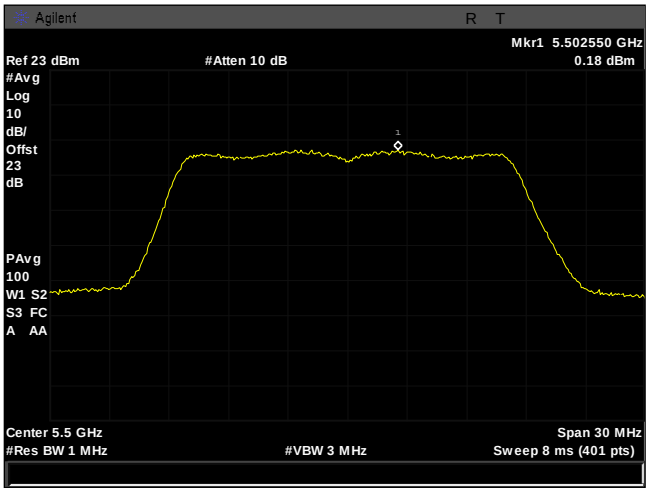
Plot 221. Power Spectral Density, 5500 MHz, A mode, 20 MHz, Port A, MIMO



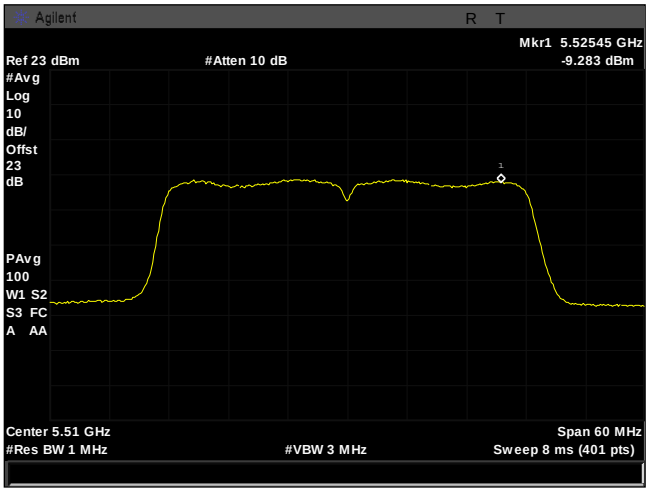
Plot 222. Power Spectral Density, 5500 MHz, A mode, 20 MHz, Port B, MIMO



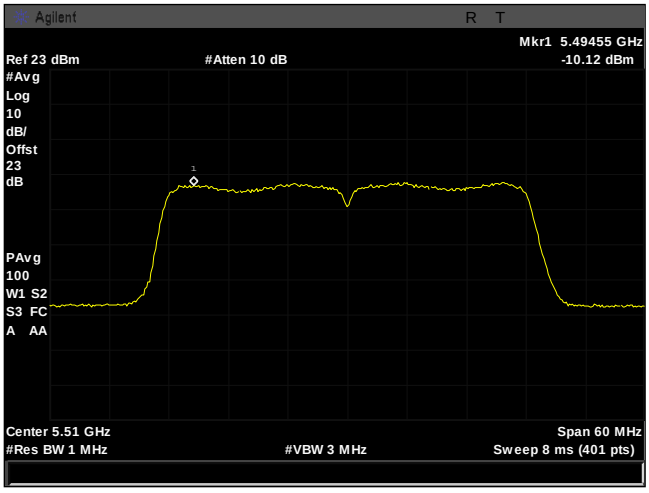
Plot 223. Power Spectral Density, 5500 MHz, N mode, 20 MHz, Port A, MIMO



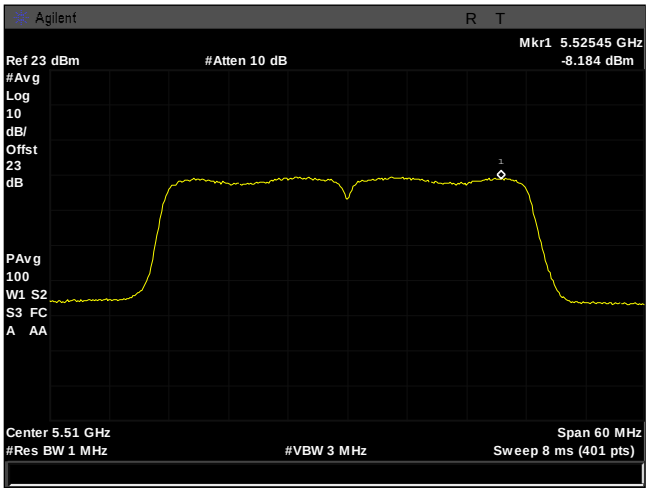
Plot 224. Power Spectral Density, 5500 MHz, N mode, 20 MHz, Port B, MIMO



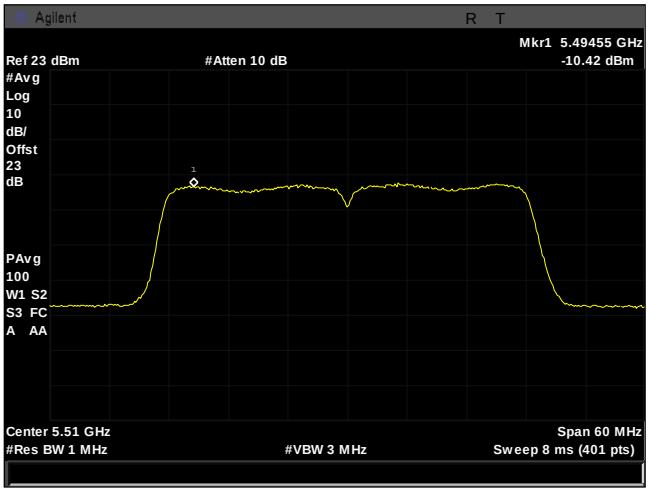
Plot 225. Power Spectral Density, 5510 MHz, AC mode, 40 MHz, Port A, MIMO



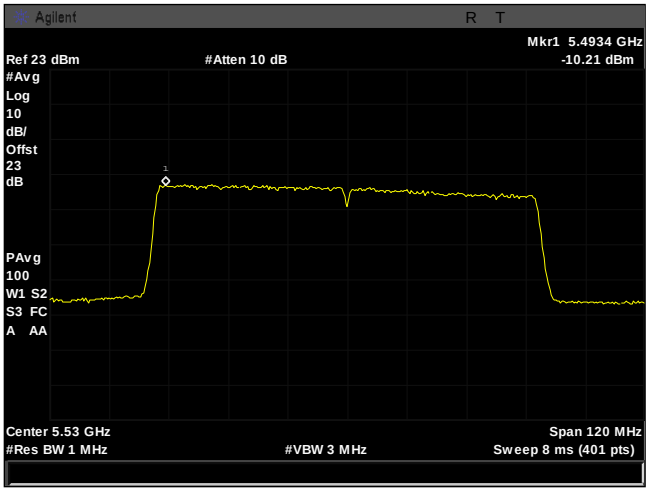
Plot 226. Power Spectral Density, 5510 MHz, AC mode, 40 MHz, Port B, MIMO



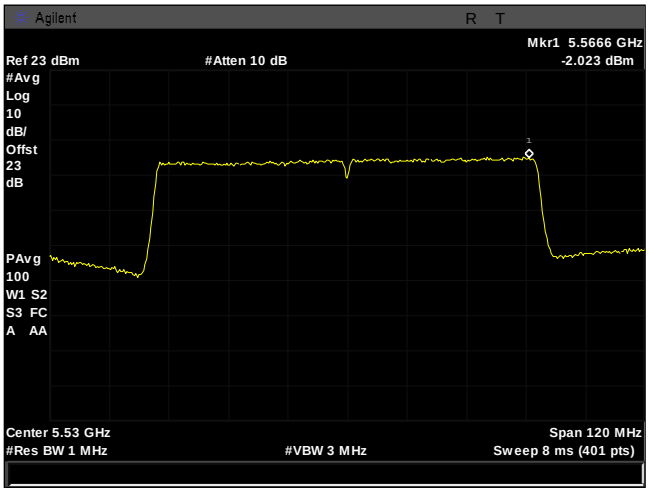
Plot 227. Power Spectral Density, 5510 MHz, N mode, 40 MHz, Port A, MIMO



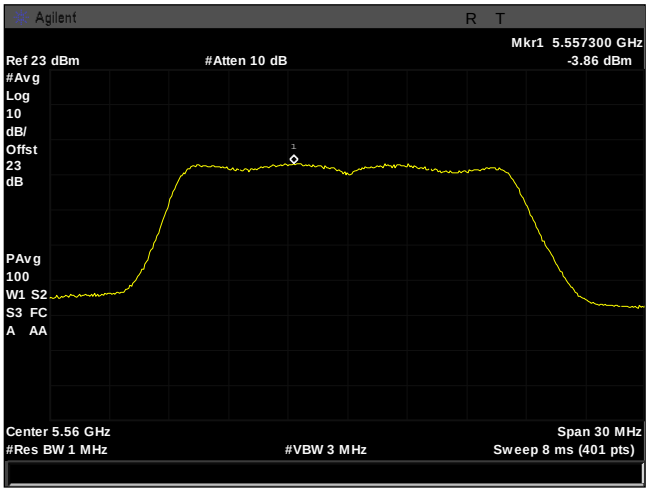
Plot 228. Power Spectral Density, 5510 MHz, N mode, 40 MHz, Port B, MIMO



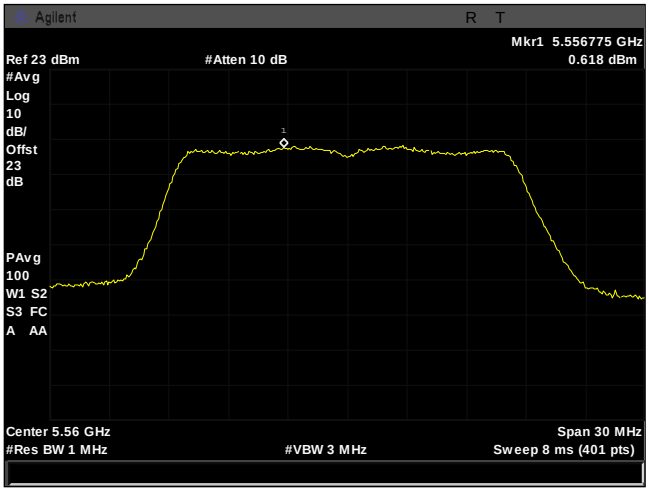
Plot 229. Power Spectral Density, 5530 MHz, AC mode, 80 MHz, Port A, MIMO



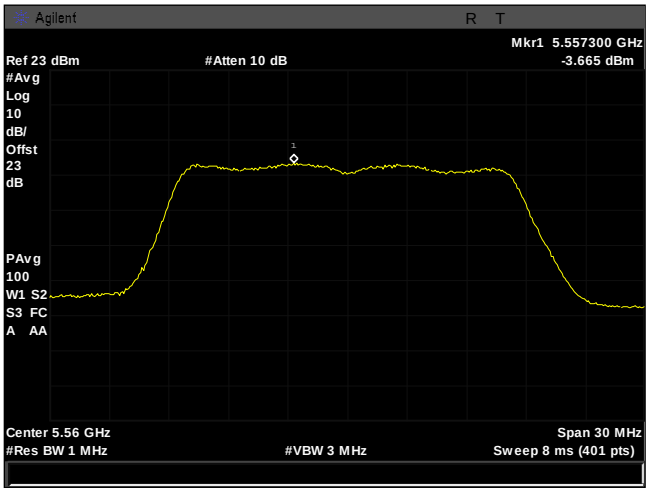
Plot 230. Power Spectral Density, 5530 MHz, AC mode, 80 MHz, Port B, MIMO



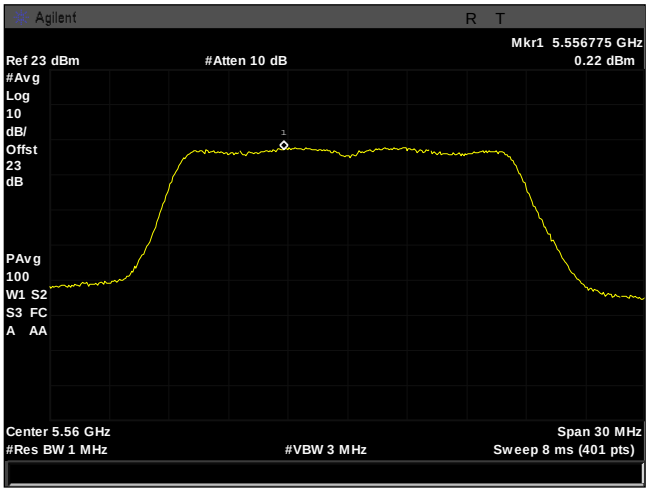
Plot 231. Power Spectral Density, 5560 MHz, A mode, 20 MHz, Port A, MIMO



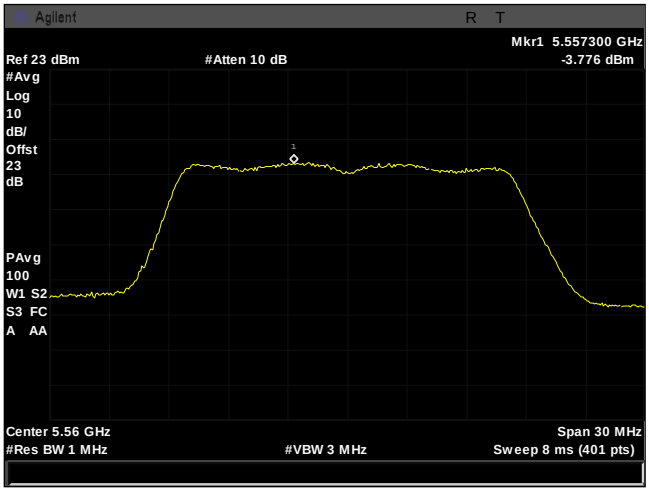
Plot 232. Power Spectral Density, 5560 MHz, A mode, 20 MHz, Port B, MIMO



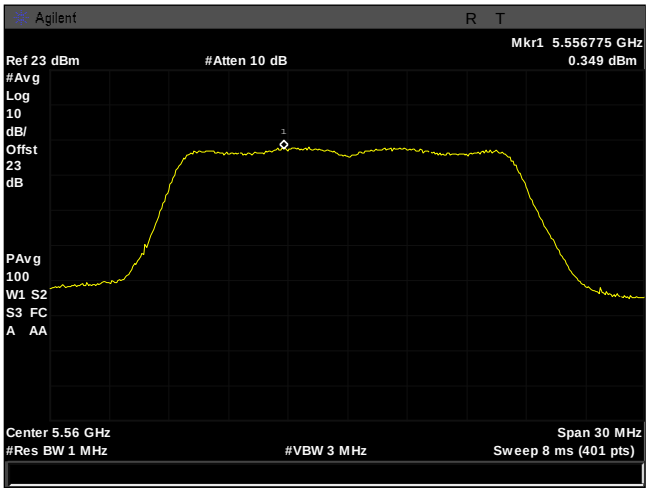
Plot 233. Power Spectral Density, 5560 MHz, AC mode, 20 MHz, Port A, MIMO



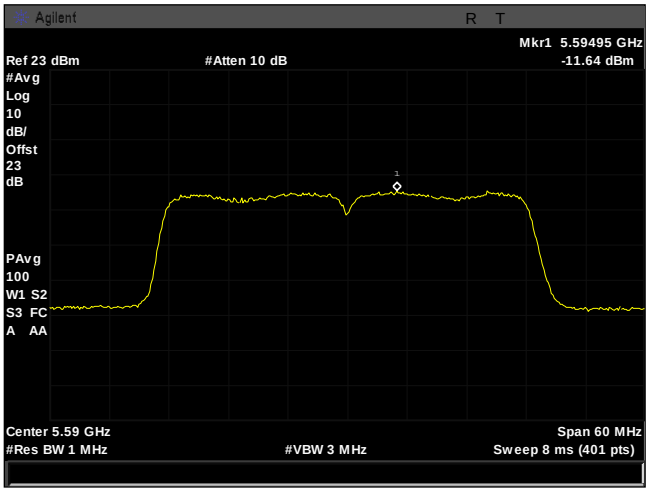
Plot 234. Power Spectral Density, 5560 MHz, AC mode, 20 MHz, Port B, MIMO



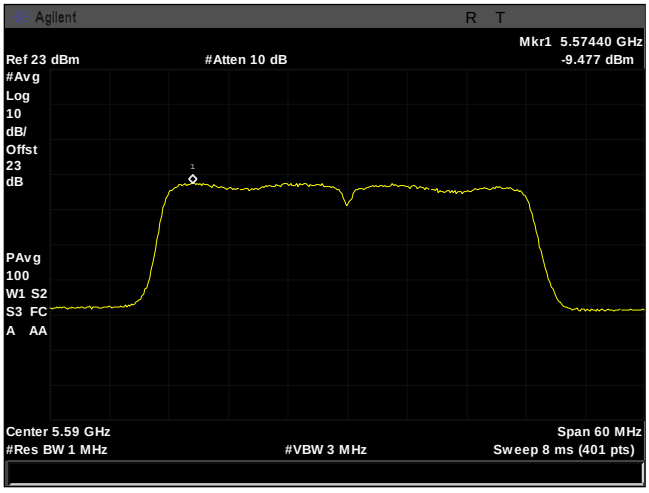
Plot 235. Power Spectral Density, 5560 MHz, N mode, 20 MHz, Port A, MIMO



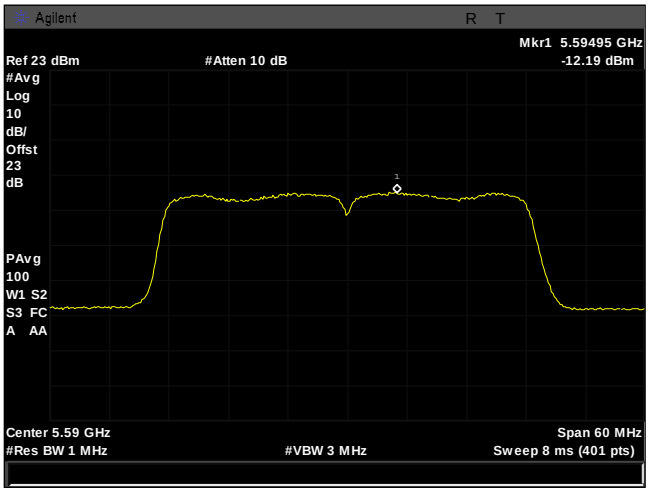
Plot 236. Power Spectral Density, 5560 MHz, N mode, 20 MHz, Port B, MIMO



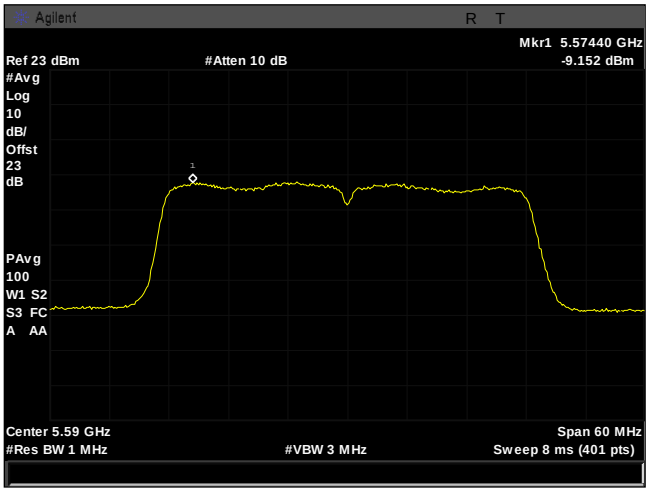
Plot 237. Power Spectral Density, 5590 MHz, AC mode, 40 MHz, Port A, MIMO



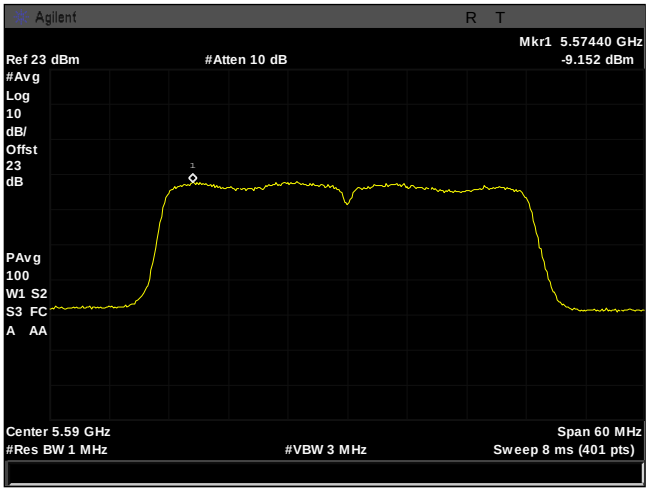
Plot 238. Power Spectral Density, 5590 MHz, AC mode, 40 MHz, Port B, MIMO



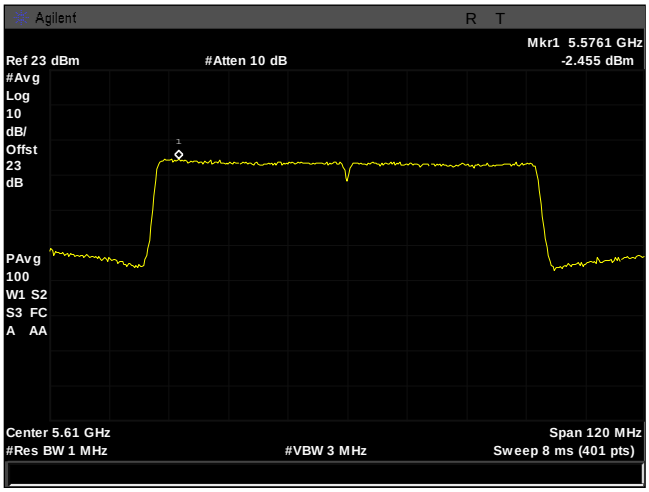
Plot 239. Power Spectral Density, 5590 MHz, N mode, 40 MHz, Port A, MIMO



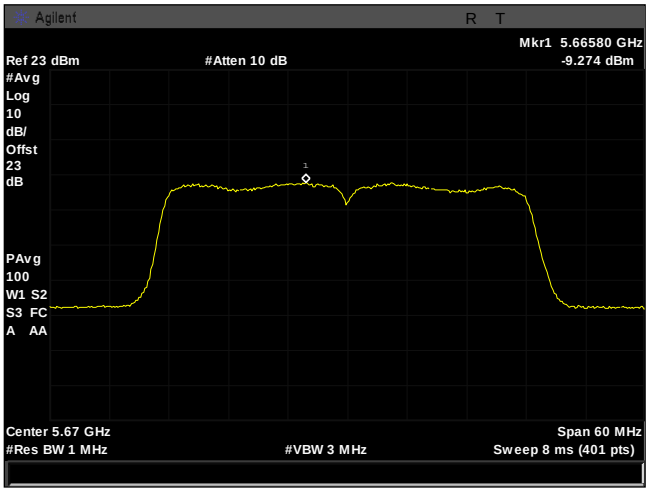
Plot 240. Power Spectral Density, 5590 MHz, N mode, 40 MHz, Port B, MIMO



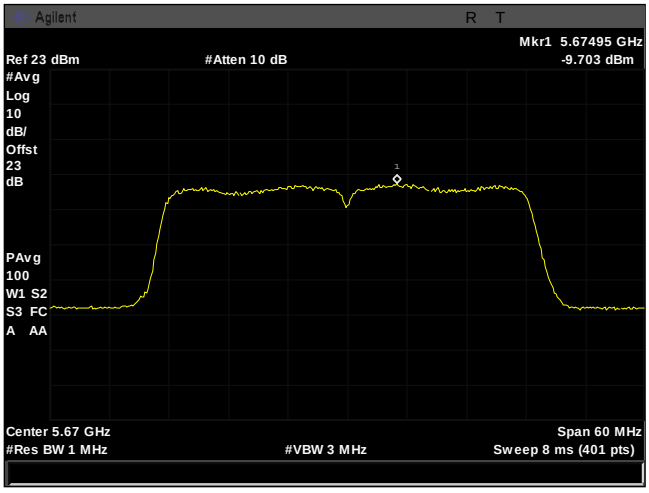
Plot 241. Power Spectral Density, 5610 MHz, AC mode, 80 MHz, Port A, MIMO



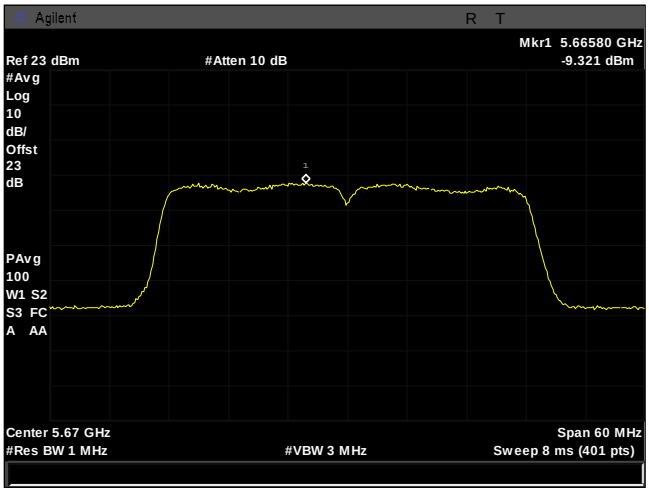
Plot 242. Power Spectral Density, 5610 MHz, AC mode, 80 MHz, Port B, MIMO



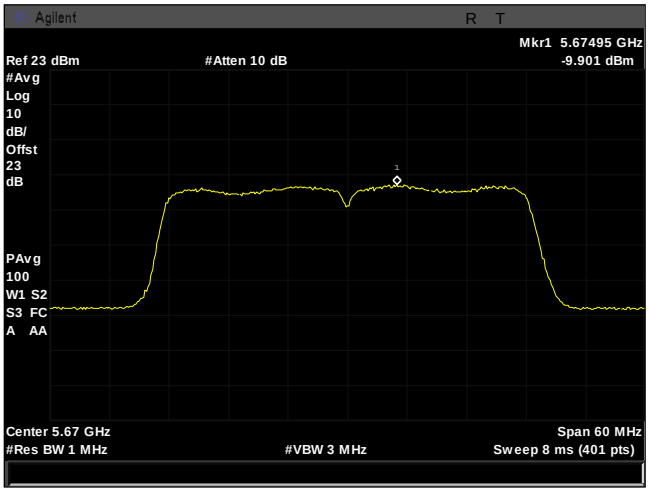
Plot 243. Power Spectral Density, 5670 MHz, AC mode, 40 MHz, Port A, MIMO



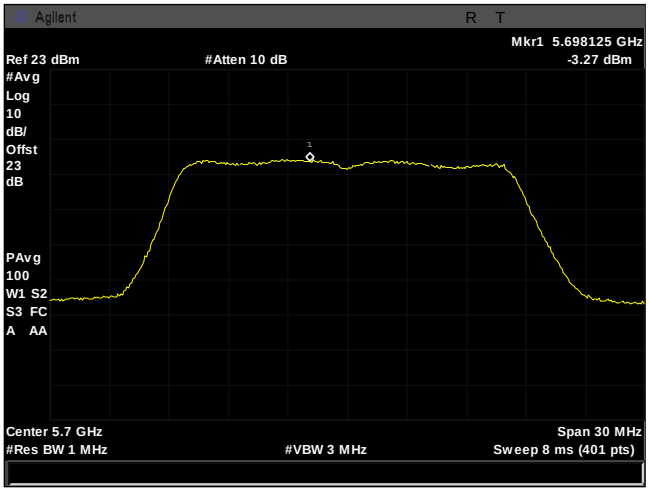
Plot 244. Power Spectral Density, 5670 MHz, AC mode, 40 MHz, Port B, MIMO



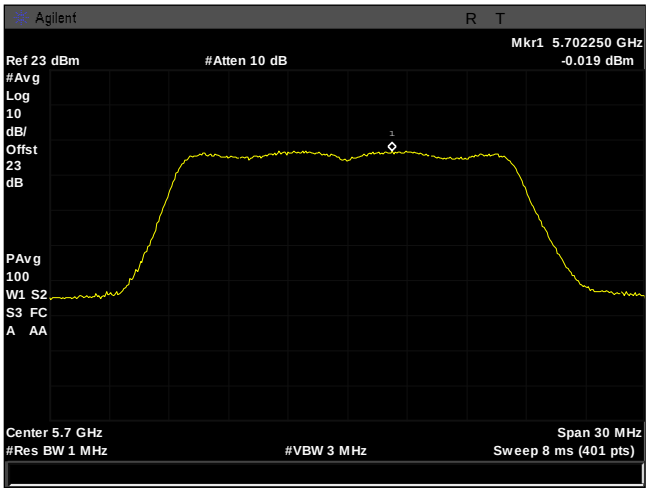
Plot 245. Power Spectral Density, 5670 MHz, N mode, 40 MHz, Port A, MIMO



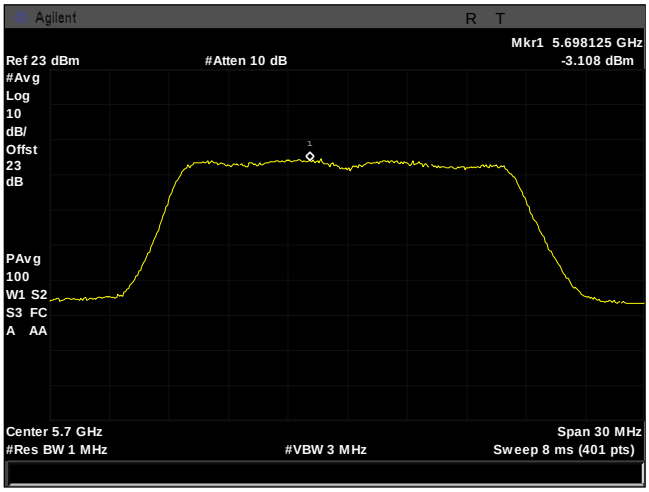
Plot 246. Power Spectral Density, 5670 MHz, N mode, 40 MHz, Port B, MIMO



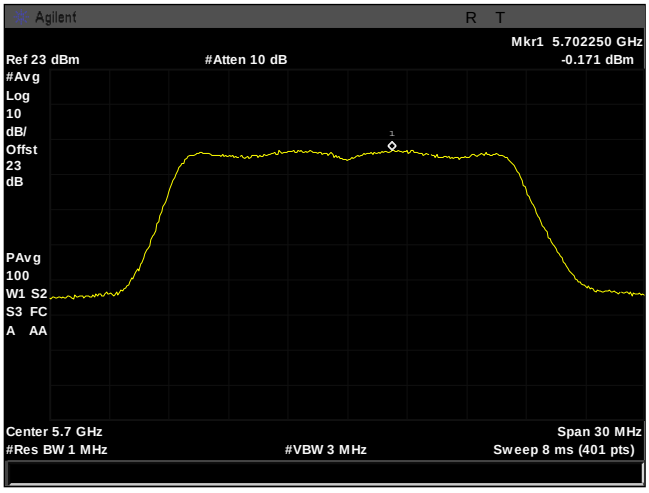
Plot 247. Power Spectral Density, 5700 MHz, AC mode, 20 MHz, Port A, MIMO



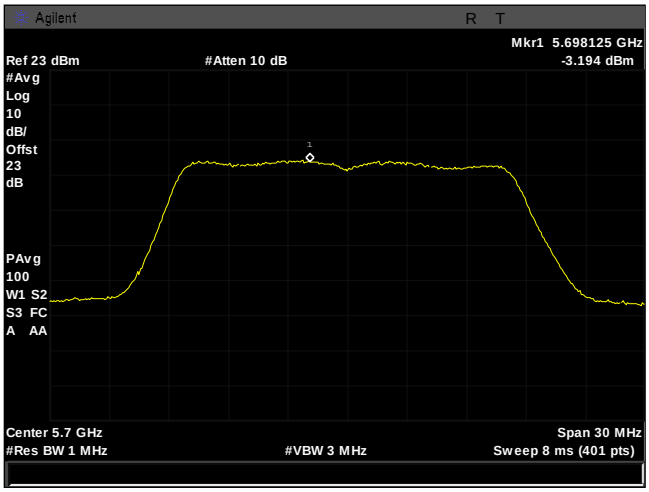
Plot 248. Power Spectral Density, 5700 MHz, AC mode, 20 MHz, Port B, MIMO



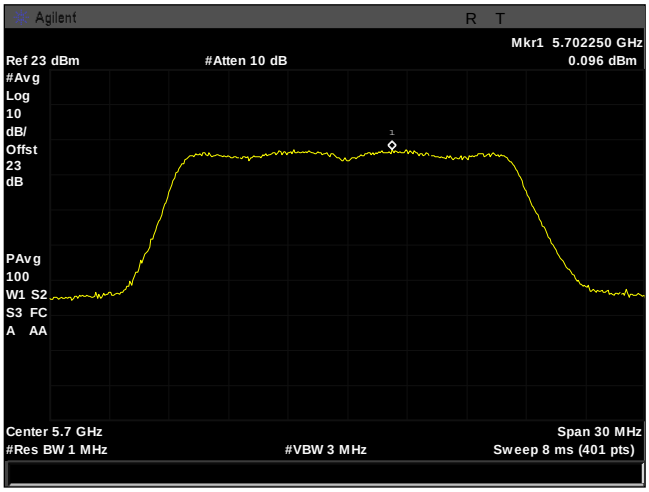
Plot 249. Power Spectral Density, 5700 MHz, A mode, 20 MHz, Port A, MIMO



Plot 250. Power Spectral Density, 5700 MHz, A mode, 20 MHz, Port B, MIMO

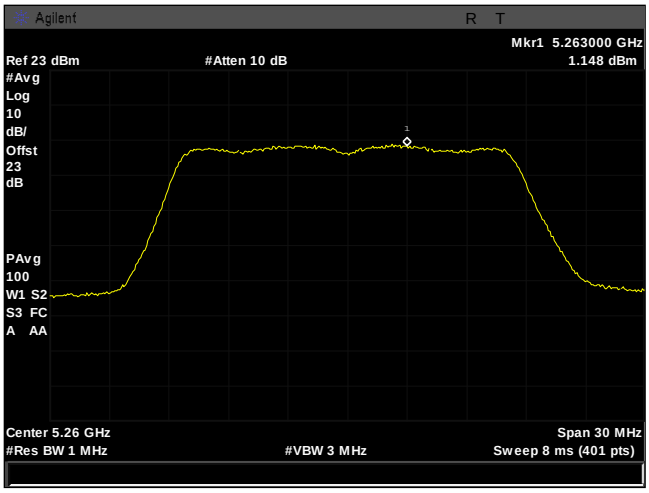


Plot 251. Power Spectral Density, 5700 MHz, N mode, 20 MHz, Port A, MIMO

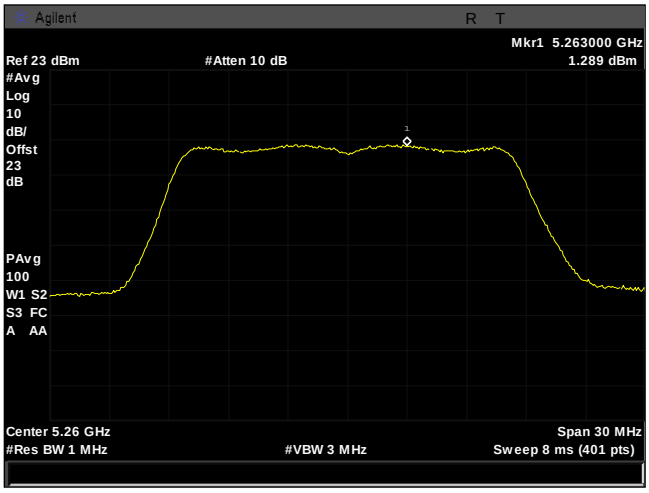


Plot 252. Power Spectral Density, 5700 MHz, N mode, 20 MHz, Port B, MIMO

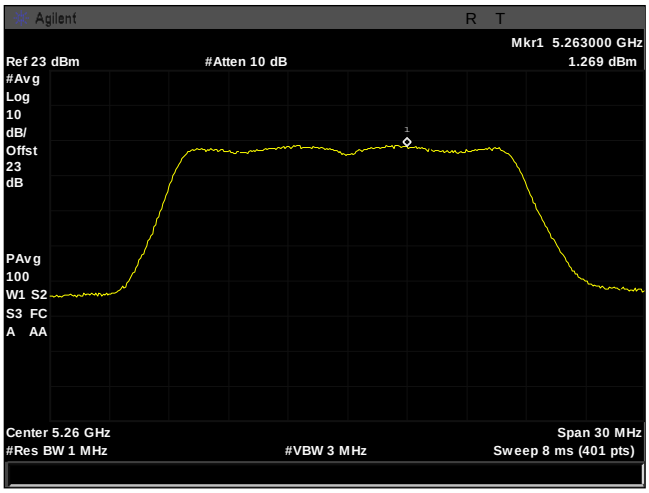
SISO



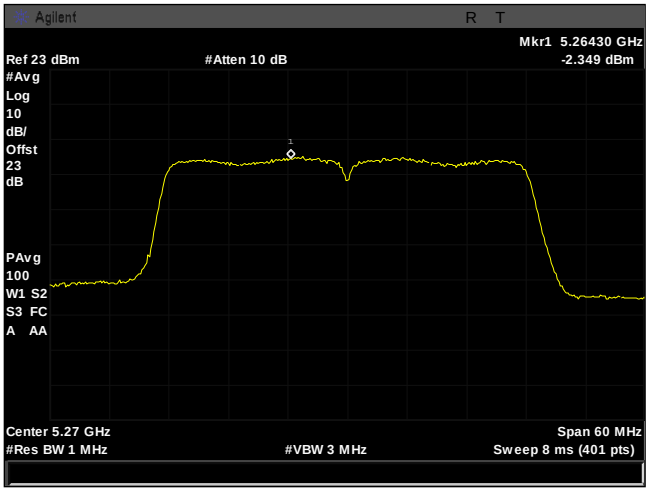
Plot 253. Power Spectral Density, 5260 MHz, AC mode, 20 MHz, SISO



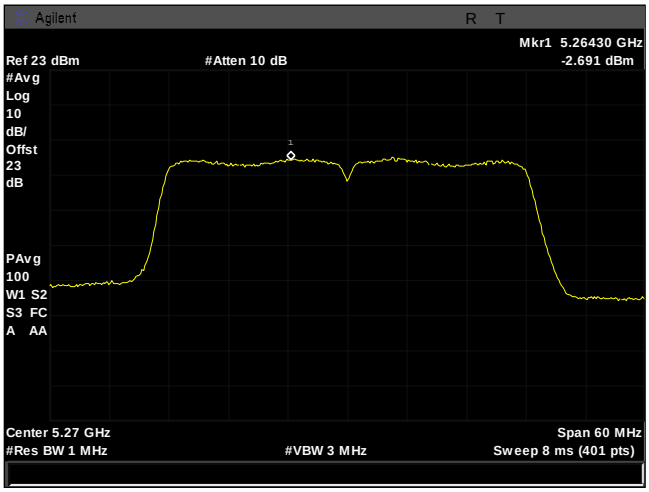
Plot 254. Power Spectral Density, 5260 MHz, A mode, 20 MHz, SISO



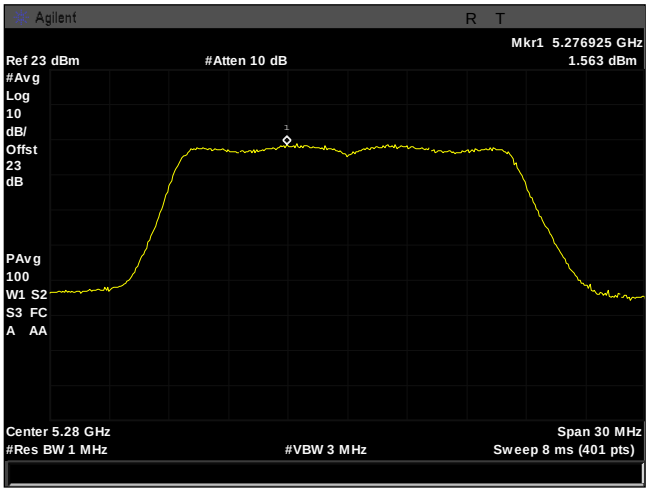
Plot 255. Power Spectral Density, 5260 MHz, N mode, 20 MHz, SISO



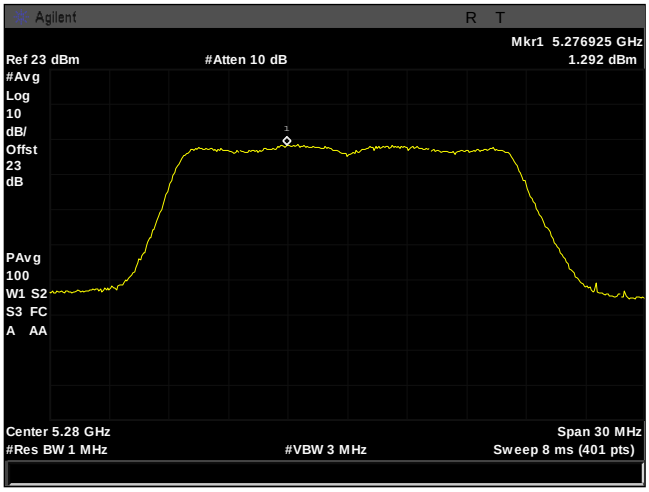
Plot 256. Power Spectral Density, 5270 MHz, AC mode, 40 MHz, SISO



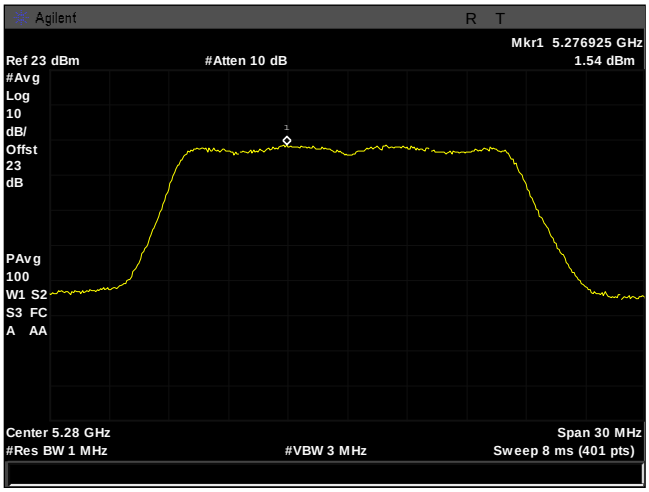
Plot 257. Power Spectral Density, 5270 MHz, N mode, 40 MHz, SISO



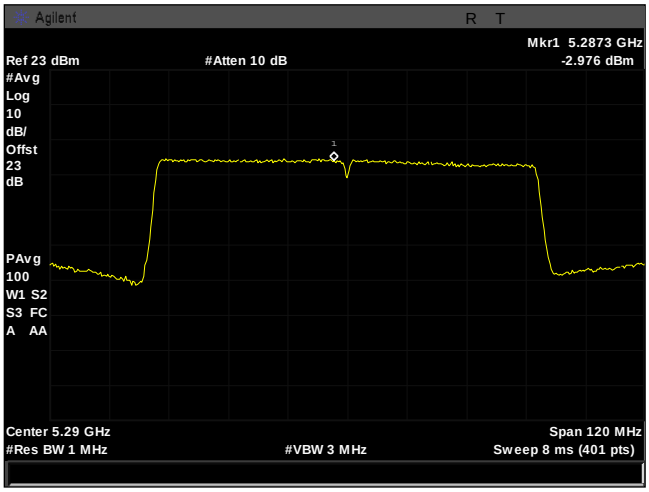
Plot 258. Power Spectral Density, 5280 MHz, AC mode, 20 MHz, SISO



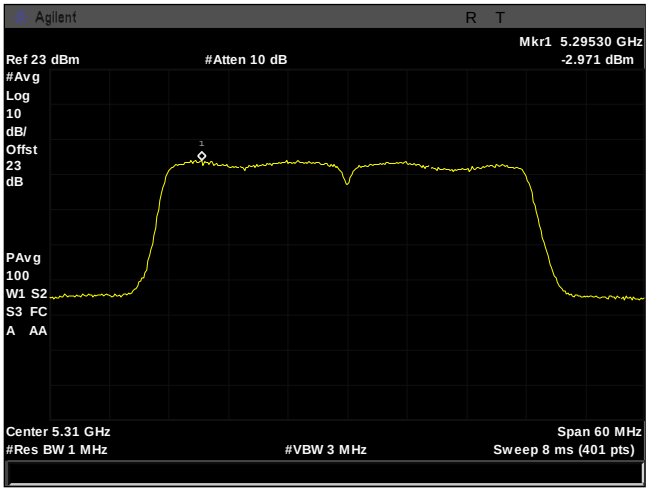
Plot 259. Power Spectral Density, 5280 MHz, A mode, 20 MHz, SISO



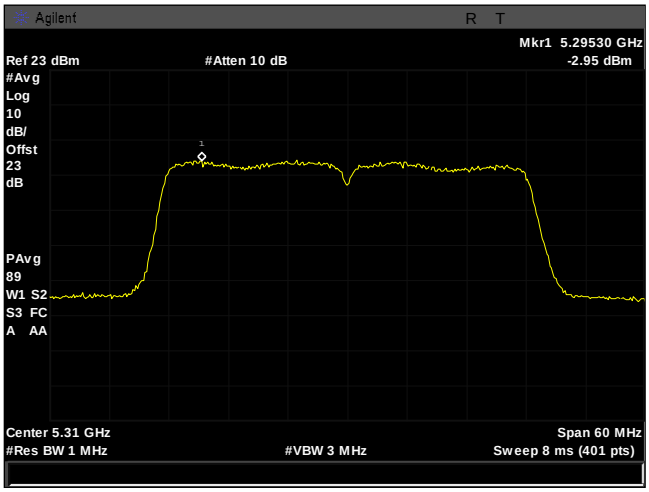
Plot 260. Power Spectral Density, 5280 MHz, N mode, 20 MHz, SISO



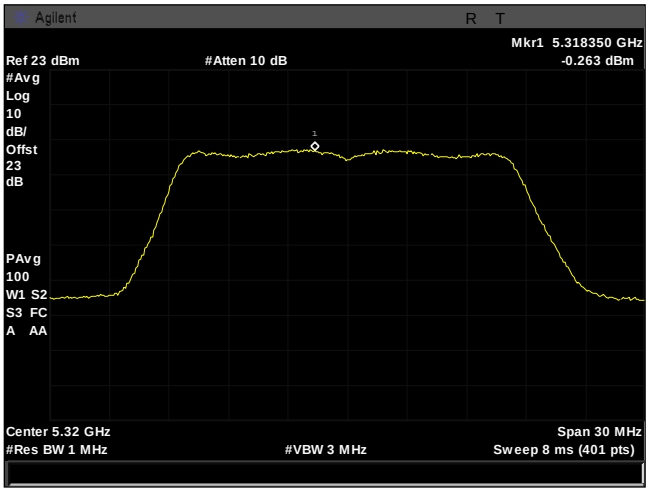
Plot 261. Power Spectral Density, 5290 MHz, AC mode, 80 MHz, SISO



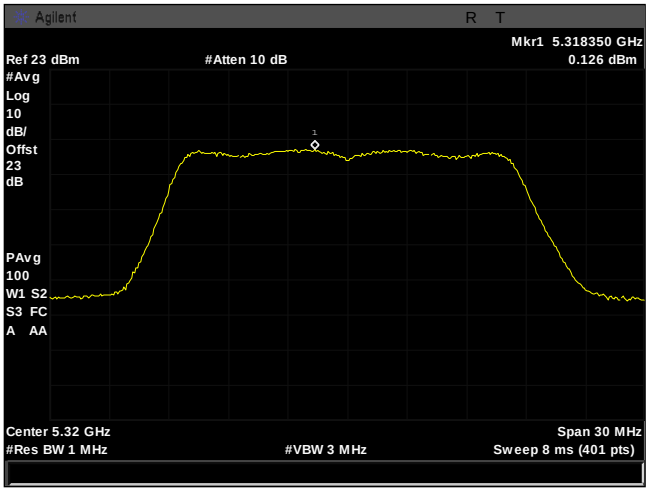
Plot 262. Power Spectral Density, 5310 MHz, AC mode, 40 MHz, SISO



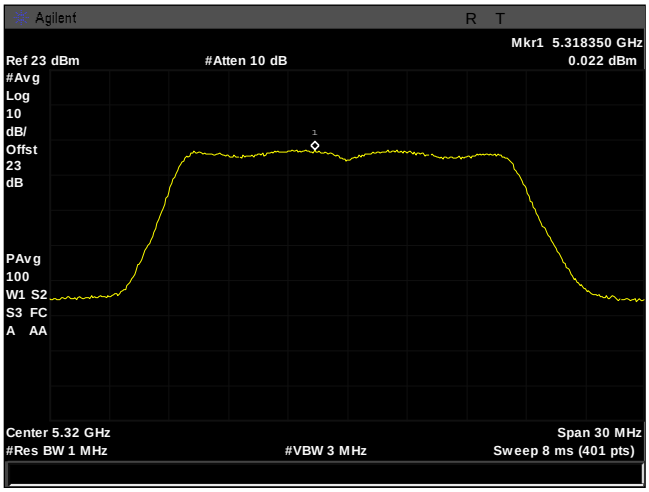
Plot 263. Power Spectral Density, 5310 MHz, N mode, 40 MHz, SISO



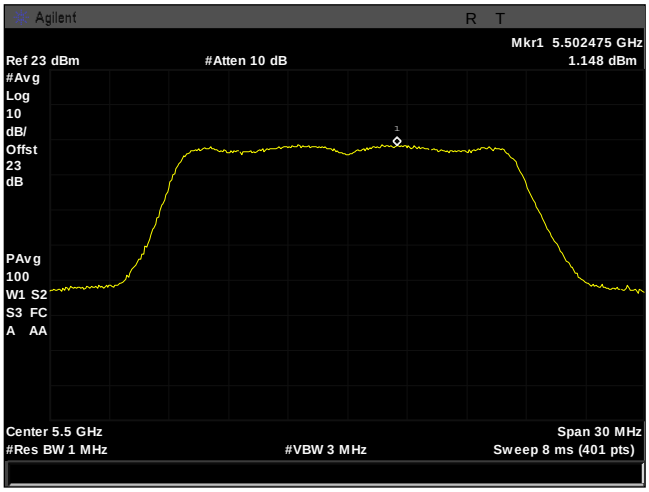
Plot 264. Power Spectral Density, 5320 MHz, AC mode, 20MHz, SISO



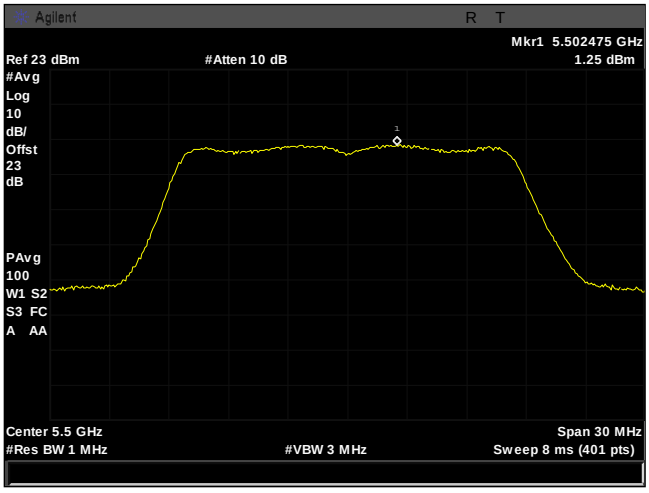
Plot 265. Power Spectral Density, 5320 MHz, A mode, 20 MHz, SISO



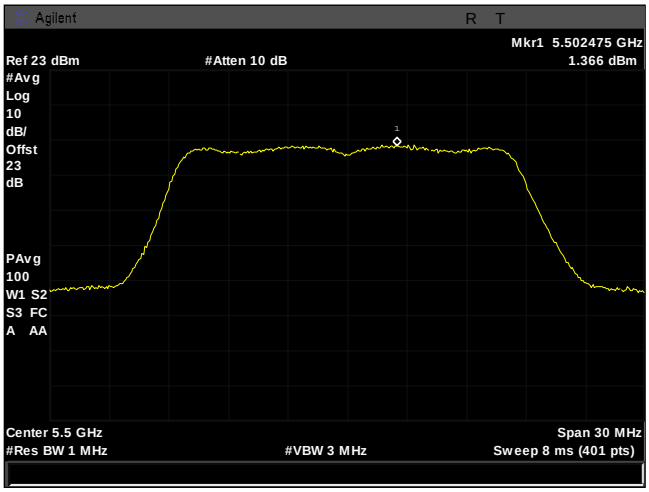
Plot 266. Power Spectral Density, 5320 MHz, N mode, 20 MHz, SISO



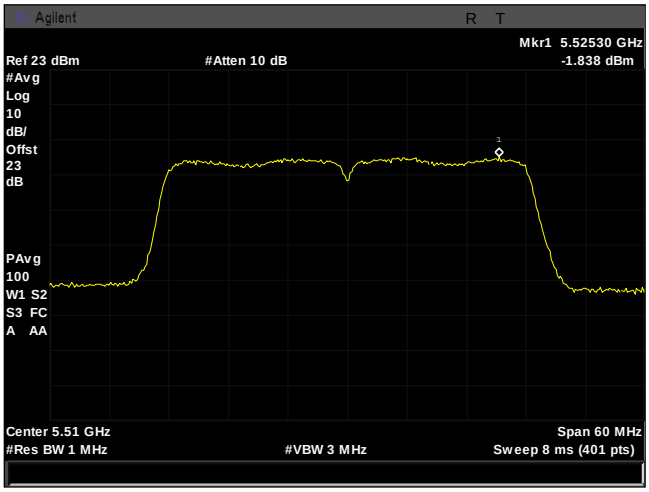
Plot 267. Power Spectral Density, 5500 MHz, AC mode, 20 MHz, SISO



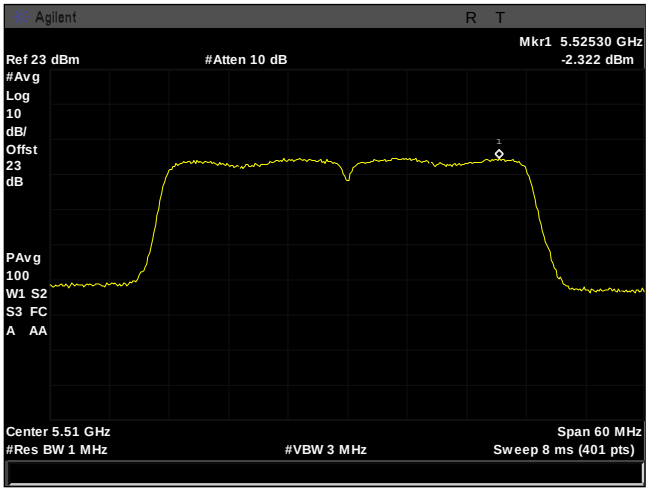
Plot 268. Power Spectral Density, 5500 MHz, A mode, 20 MHz, SISO



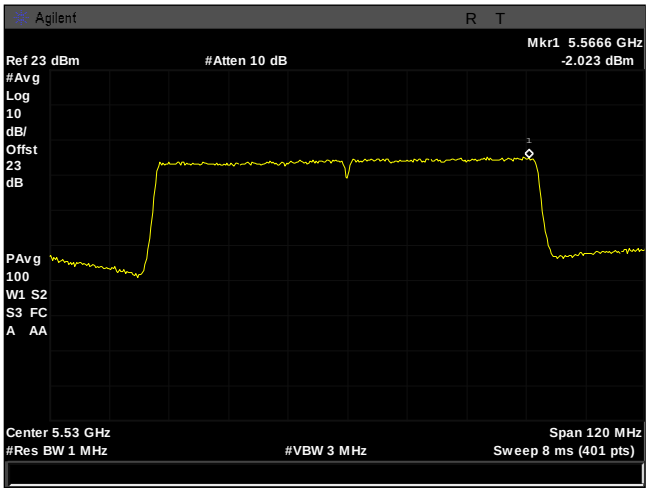
Plot 269. Power Spectral Density, 5500 MHz, N mode, 20 MHz, SISO



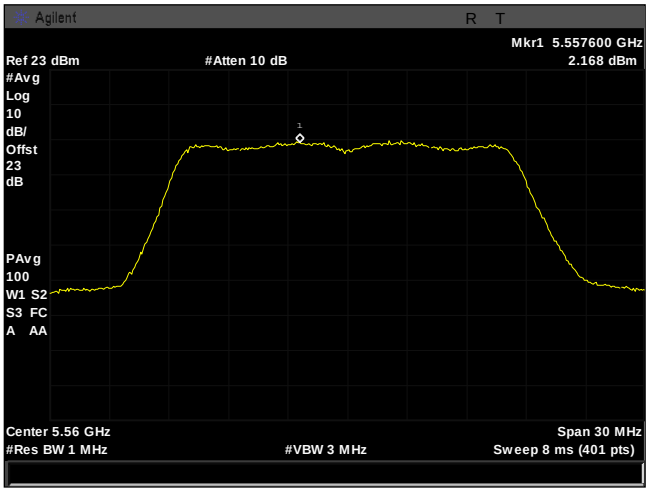
Plot 270. Power Spectral Density, 5510 MHz, AC mode, 40 MHz, SISO



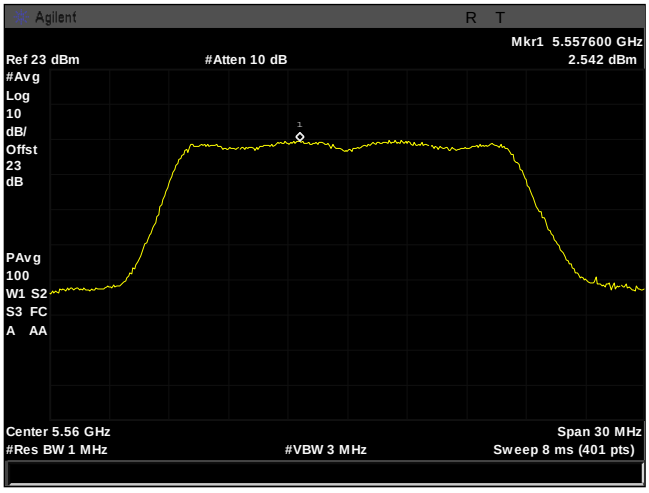
Plot 271. Power Spectral Density, 5510 MHz, N mode, 40 MHz, SISO



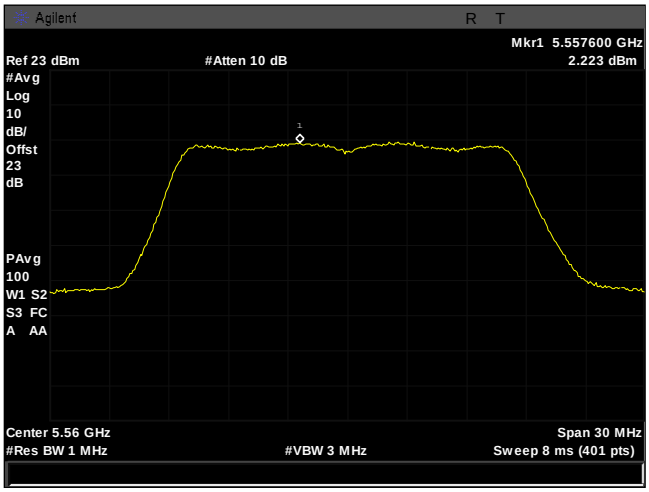
Plot 272. Power Spectral Density, 5530 MHz, AC mode, 80 MHz, SISO



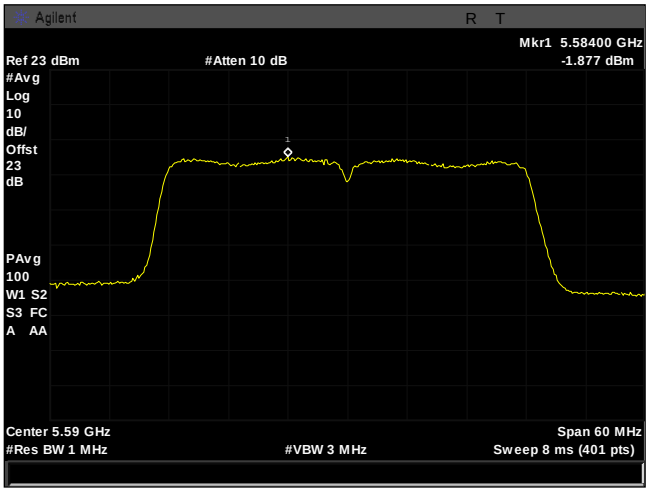
Plot 273. Power Spectral Density, 5560 MHz, AC mode, 20 MHz, SISO



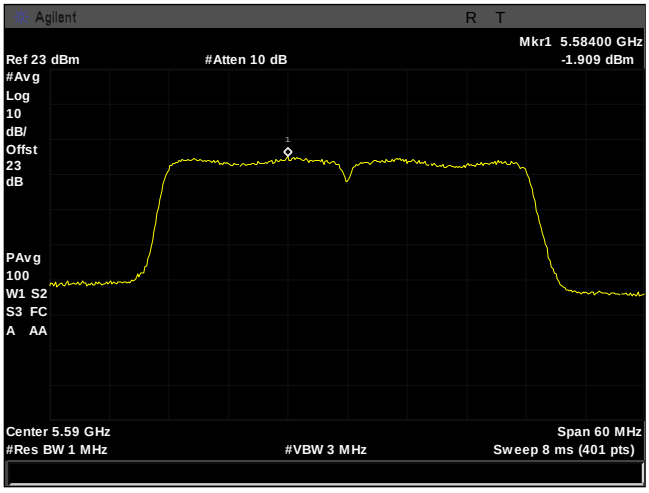
Plot 274. Power Spectral Density, 5560 MHz, A mode, 20 MHz, SISO



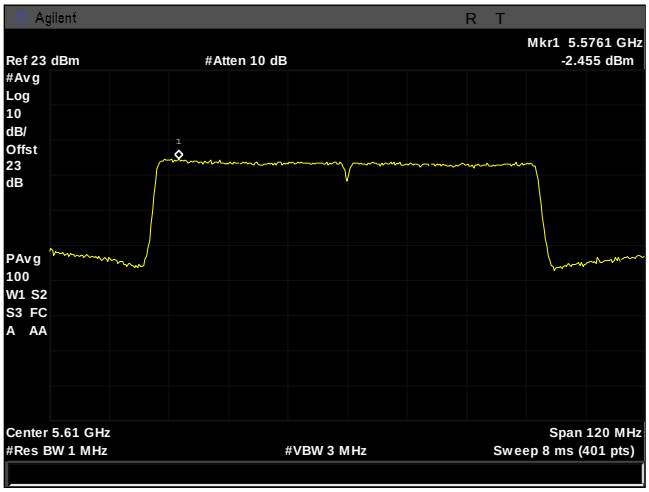
Plot 275. Power Spectral Density, 5560 MHz, N mode, 20 MHz, SISO



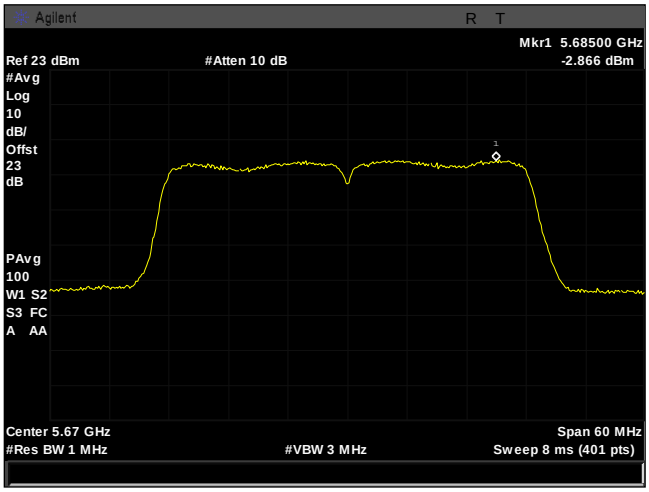
Plot 276. Power Spectral Density, 5590 MHz, AC mode, 40 MHz, SISO



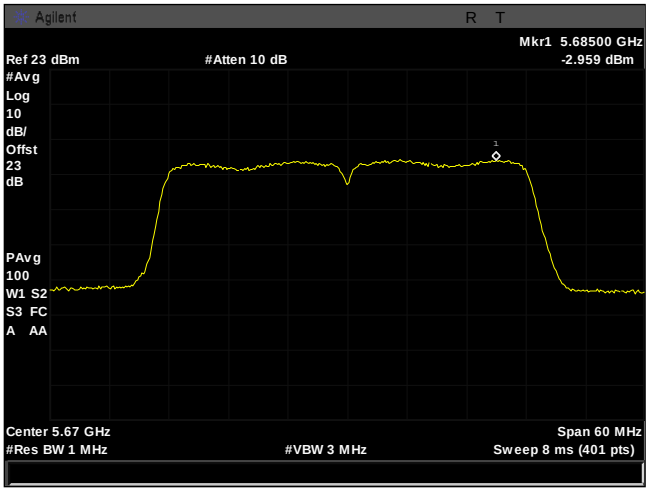
Plot 277. Power Spectral Density, 5590 MHz, N mode, 40 MHz, SISO



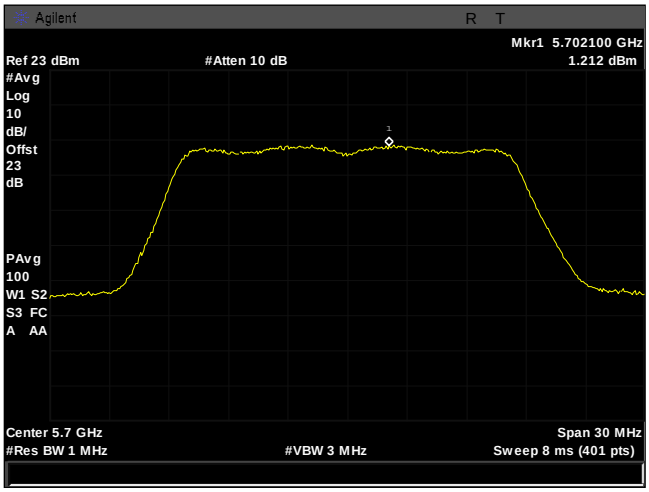
Plot 278. Power Spectral Density, 5610 MHz, AC mode, 80 MHz, SISO



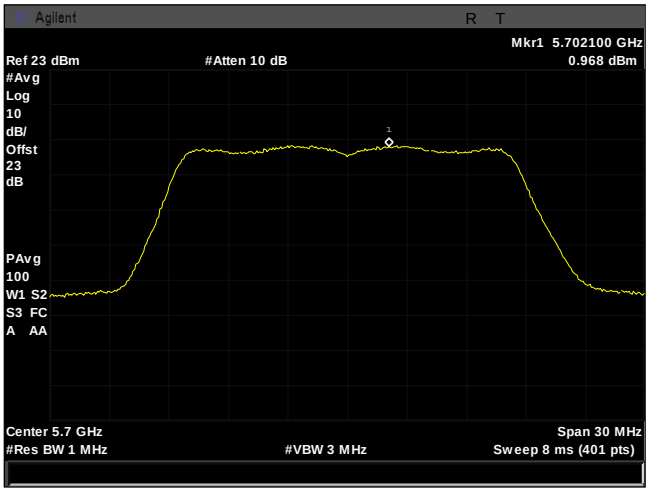
Plot 279. Power Spectral Density, 5670 MHz, AC mode, 40 MHz, SISO



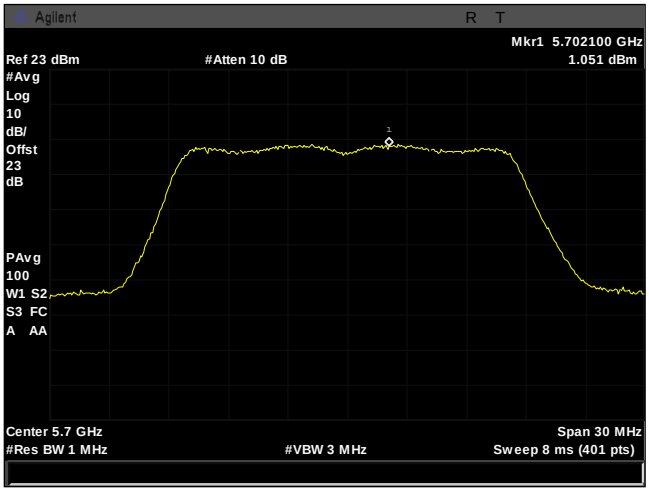
Plot 280. Power Spectral Density, 5670 MHz, N mode, 40 MHz, SISO



Plot 281. Power Spectral Density, 5700 MHz, AC mode, 20 MHz, SISO



Plot 282. Power Spectral Density, 5700 MHz, A mode, 20 MHz, SISO



Plot 283. Power Spectral Density, 5700 MHz, N mode, 20 MHz, SISO

Electromagnetic Compatibility Criteria for Intentional Radiators

§15.407(b)(2 – 3) & (6 – 7) Undesirable Emissions

Test Requirements:

§ 15.407(b)(2): For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

§ 15.407(b)(3): For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

§ 15.407(b)(6): Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in Section 15.209. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in Section 15.207.

§ 15.407(b)(7): The provisions of Section 15.205 of this part apply to intentional radiators operating under this section.

Test Procedure:

The EUT was placed on a non-conducting stand on a turntable in a chamber. To find the maximum emission the EUT was set to transmit on low, mid, and high channels. Additionally, the turntable was rotated 360 degrees, the EUT was oriented through its three orthogonal axes, and the receive antenna height was varied in order to maximize emissions.

For frequencies from 30 MHz to 1 GHz, measurements were first made using a peak detector with a 100 kHz resolution bandwidth. Emissions which exceeded the limits were re-measured using a quasi-peak detector with a 120 kHz resolution bandwidth.

For emissions above 1 GHz and in restricted bands, measurements of the field strength were made with a peak detector and an average detector and compared with the limits of 15.209.

As an alternative, according to FCC KDB 789033 D02 General UNII Test Procedure New Rules v01, all emissions above 1 GHz that comply with the peak and average limits of 15.209 satisfy the requirements of unwanted emissions in 15.407.

Test Results:

For below 1 GHz, the EUT compliant with the requirements of this section.

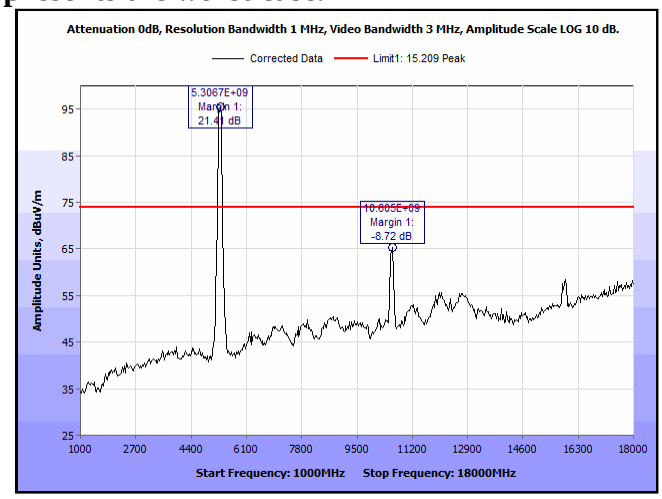
For above 1 GHz, the EUT was compliant with the requirements of this section.

Measured emissions were within applicable limits. Any spurs 20dB close to limit line were investigated. Data presented below represents worst case. Only noise was observed above 18 GHz.

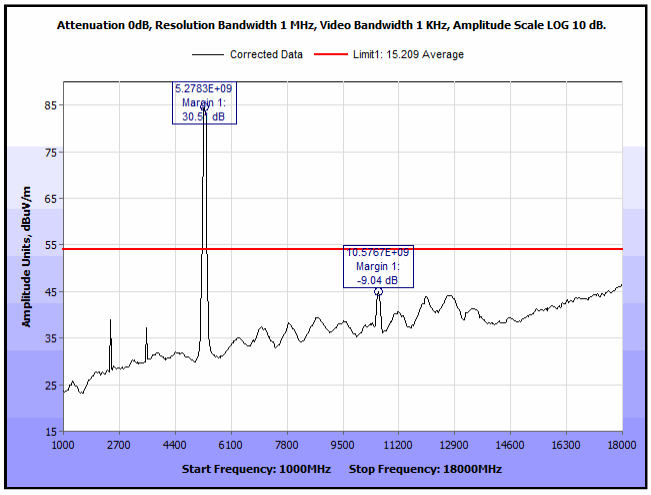
Test Engineer(s): Deepak Giri

Test Date(s): May 24, 2017

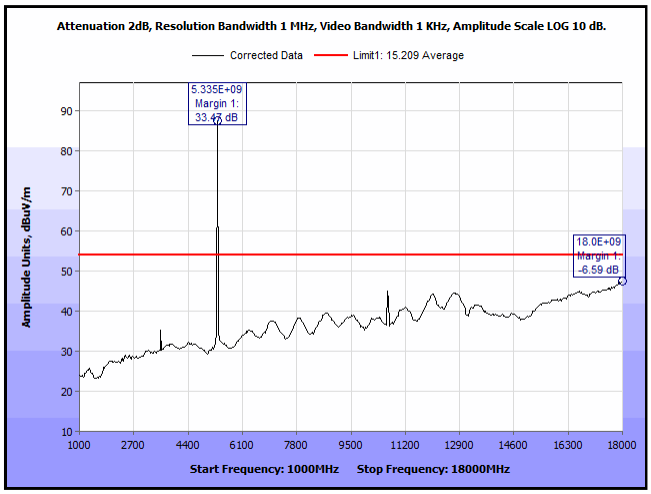
Undesirable Emission Plots for MIMO:
Note: Data presented represents the worst case.



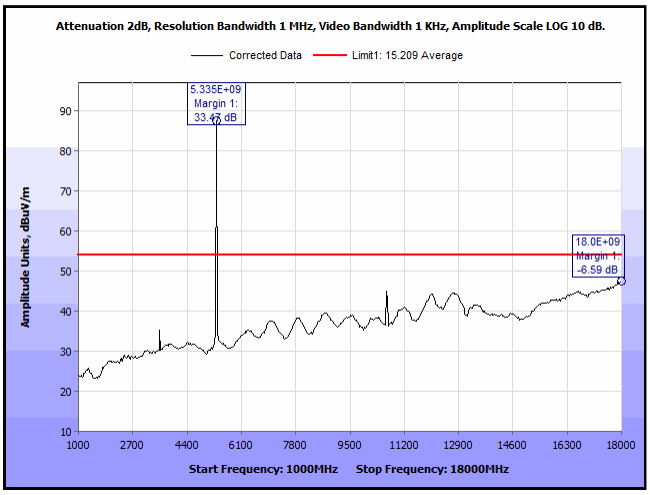
Plot 284. Undesirable Emissions, 1 – 18 GHz, 5290 MHz, AC mode, 80 MHz, Peak, MIMO



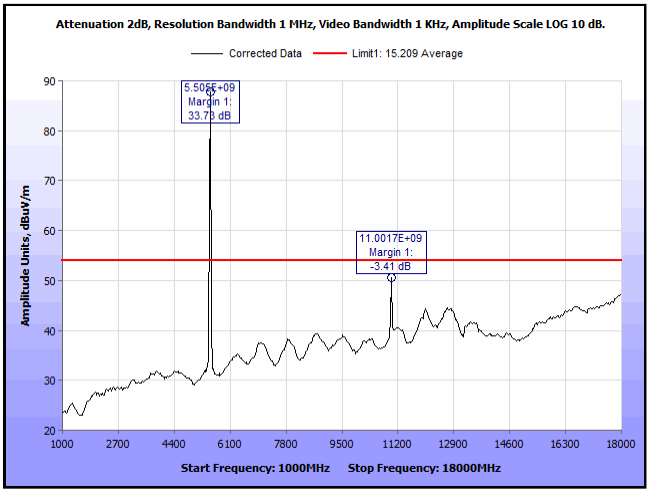
Plot 285. Undesirable Emissions, 1 – 18 GHz, 5290 MHz, AC mode, 80 MHz, Average, MIMO



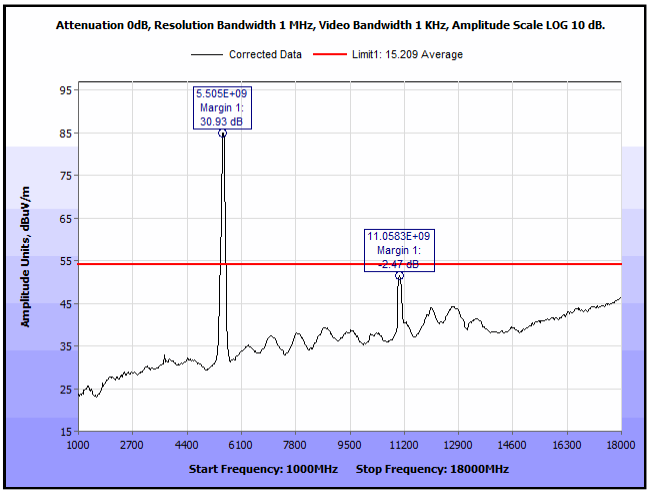
Plot 286. **Undesirable Emissions, 1 – 18 GHz, 5320 MHz, A mode, 20 MHz, Average, MIMO**



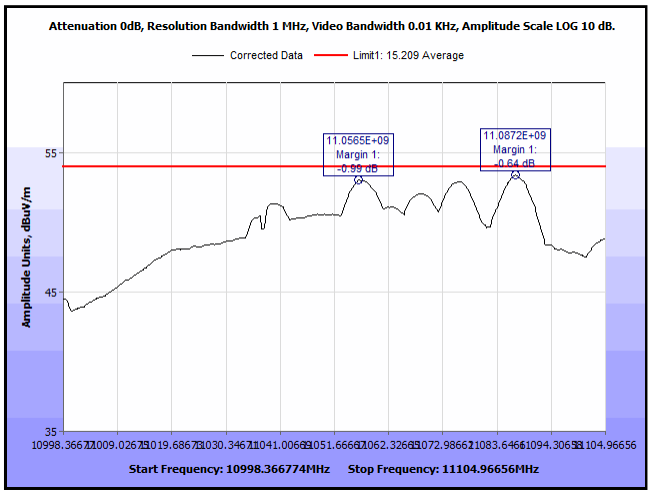
Plot 287. Undesirable Emissions, 1 – 18 GHz, 5320 MHz, AC mode, 20 MHz, Average, MIMO



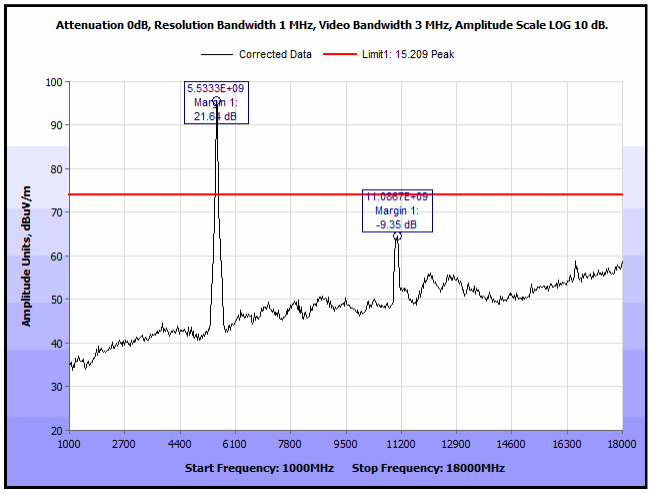
Plot 288. Undesirable Emissions, 1 – 18 GHz, 5500 MHz, A mode, 20 MHz, Average, MIMO



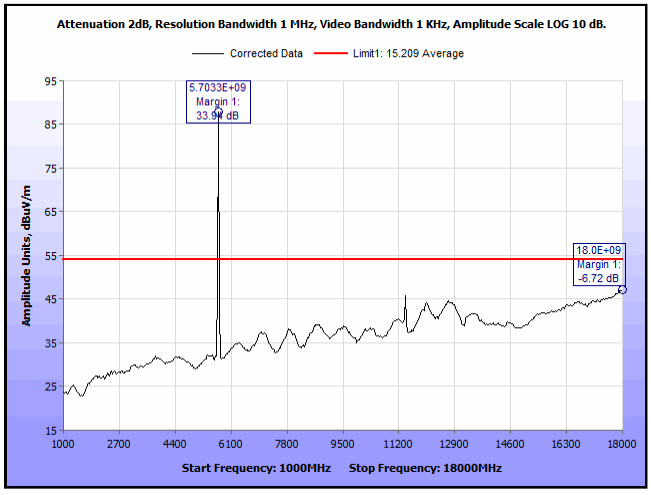
Plot 289. Undesirable Emissions, 1 – 18 GHz, 5530 MHz, AC mode, 80 MHz, Average, MIMO



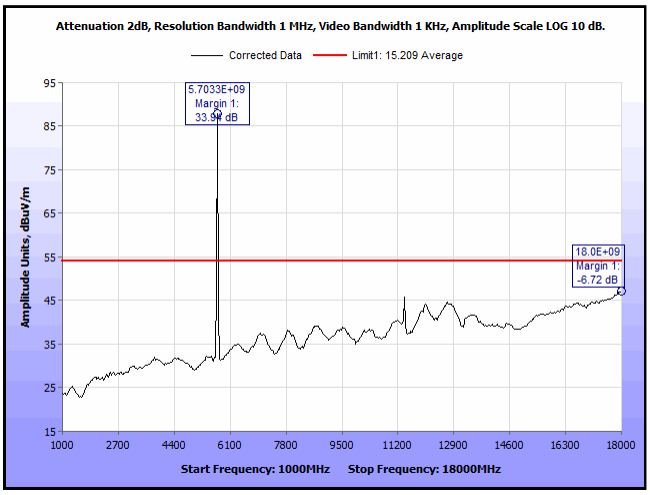
Plot 290. Undesirable Emissions, 1 – 18 GHz, 5530 MHz, 11.11 GHz, AC mode, 80 MHz, Average, MIMO



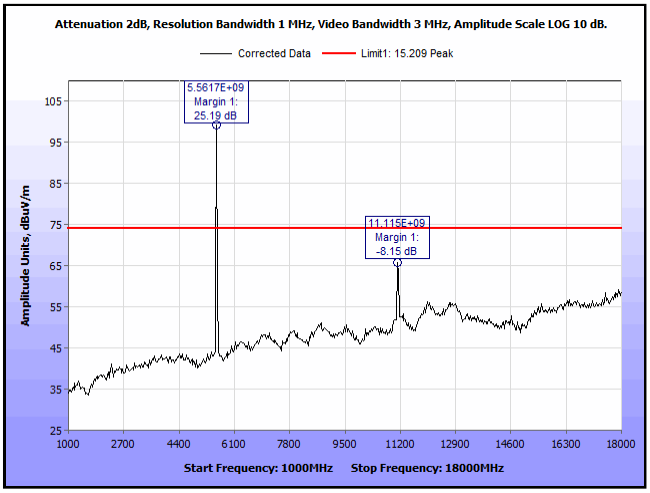
Plot 291. Undesirable Emissions, 1 – 18 GHz, 5530 MHz, AC mode, 80 MHz, Peak, MIMO



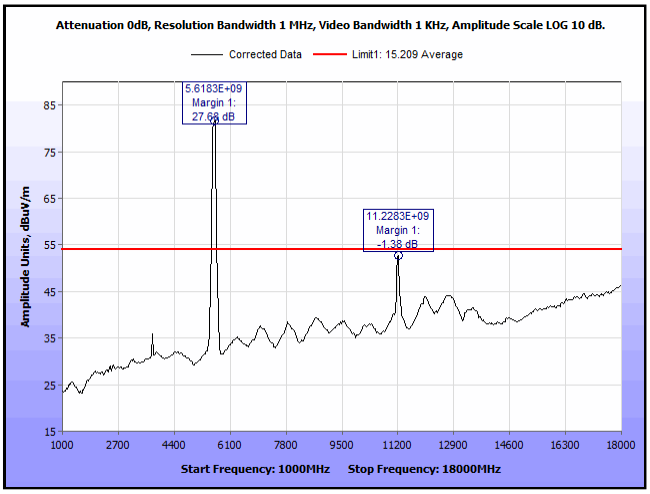
Plot 292. Undesirable Emissions, 1 – 18 GHz, 5560 MHz, AC mode, 20 MHz, Average, MIMO



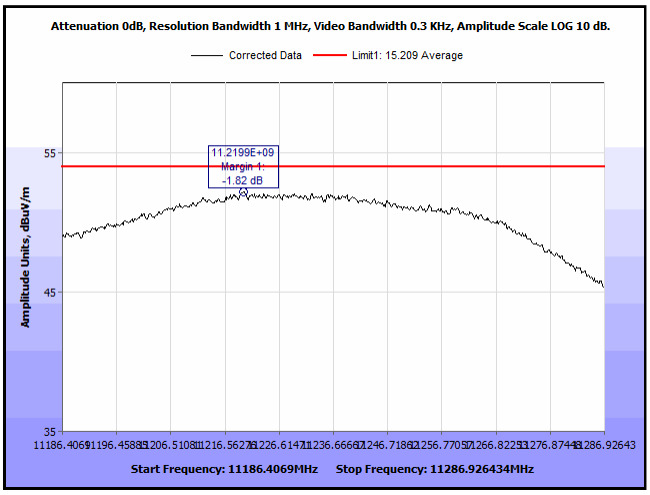
Plot 293. Undesirable Emissions, 1 – 18 GHz, 5560 MHz, A mode, 20 MHz, Average, MIMO



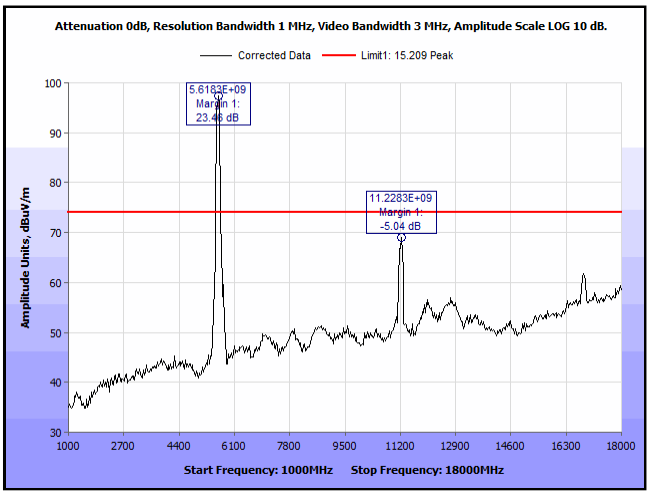
Plot 294. Undesirable Emissions, 1 -18 GHz, 5560 MHz, A mode, 20 MHz, Peak, MIMO



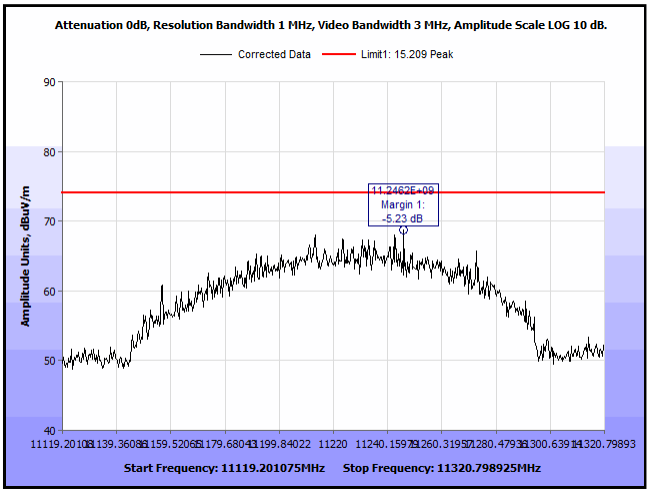
Plot 295. Undesirable Emissions, 1 – 18 GHz, 5610 MHz, AC mode, 80 MHz, Average, MIMO



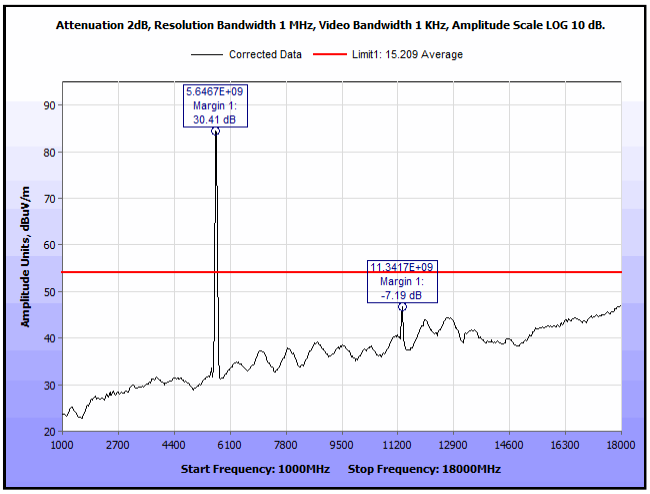
Plot 296. Undesirable Emissions, 1 – 18 GHz, 5610 MHz, 11.2 GHz, AC mode, 80 MHz, Average, MIMO



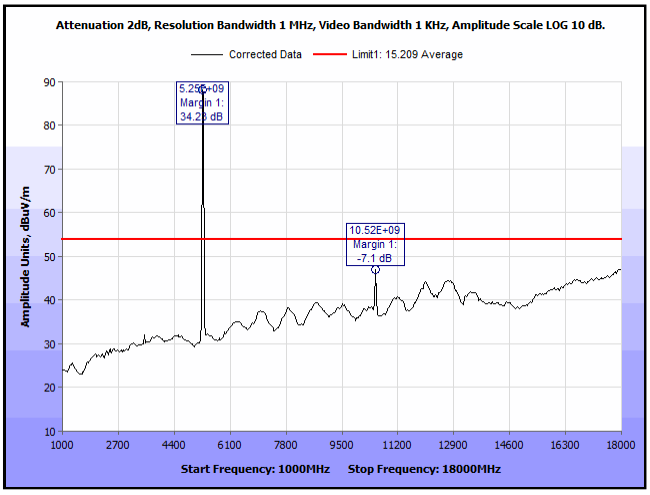
Plot 297. Undesirable Emissions, 1 – 18 GHz, 5610 MHz, AC mode, 80 MHz, Peak, MIMO



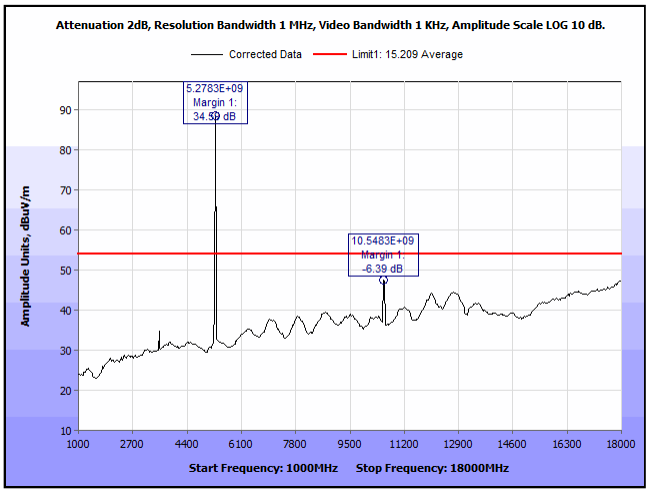
Plot 298. Undesirable Emissions, 1 – 18 GHz, 5610 MHz, 11.2 GHz, AC mode, 80 MHz, Peak, MIMO



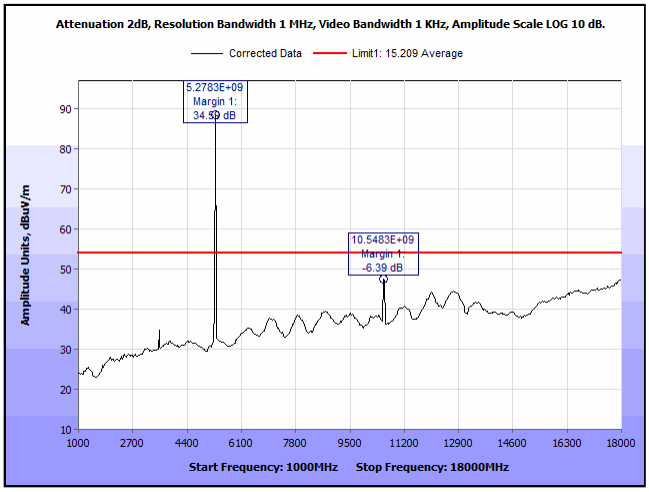
Plot 299. Undesirable Emissions, 1 – 18 GHz, 5670 MHz, AC mode, 40 MHz, Average, MIMO



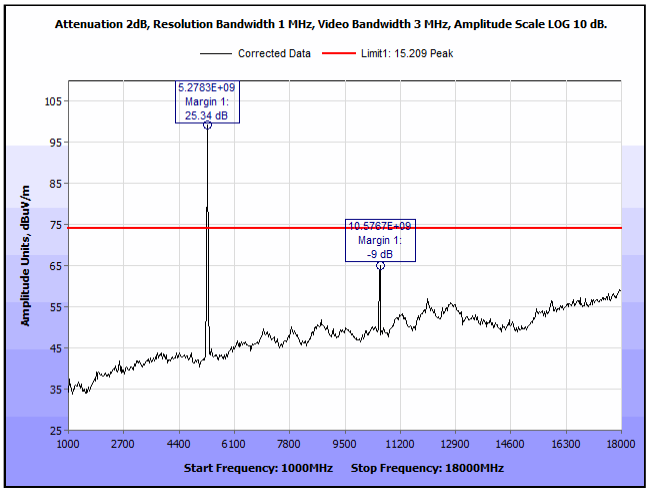
Plot 300. Undesirable Emissions, 1 – 18 GHz, 5260 MHz, AC mode, 20 MHz, Average, MIMO



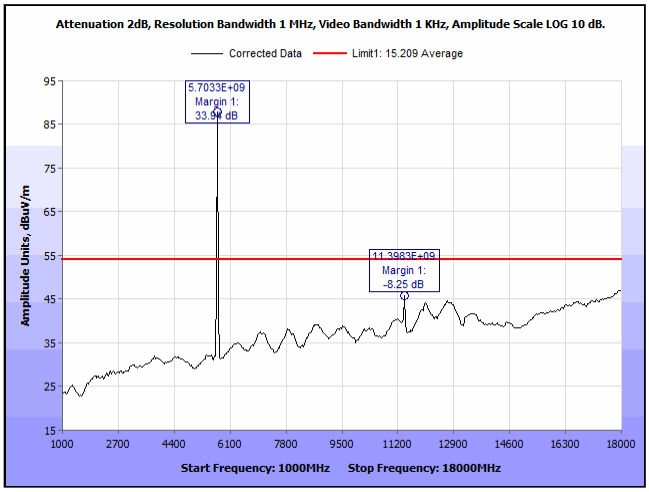
Plot 301. Undesirable Emissions, 1 – 18 GHz, 5280 MHz, AC mode, 20 MHz, Average, MIMO



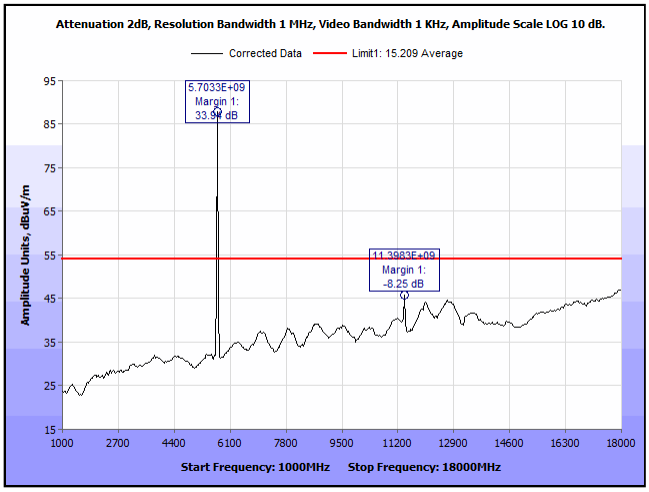
Plot 302. Undesirable Emissions, 1 – 18 GHz, 5280 MHz, N mode, 20 MHz, Average, MIMO



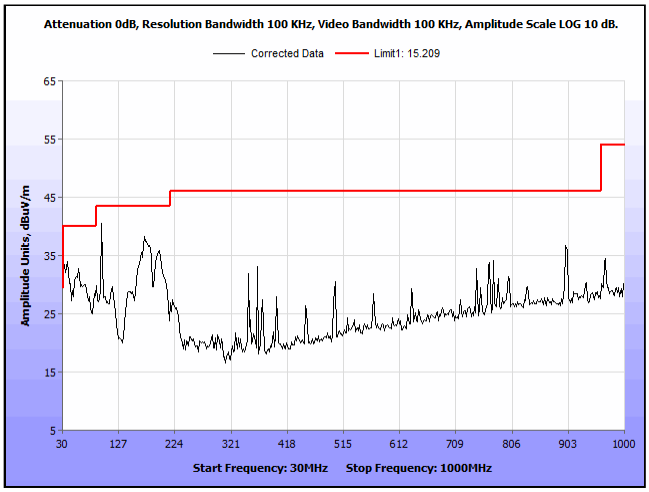
Plot 303. Undesirable Emissions, 1 – 18 GHz, 5280 MHz, N mode, 20 MHz, Peak, MIMO



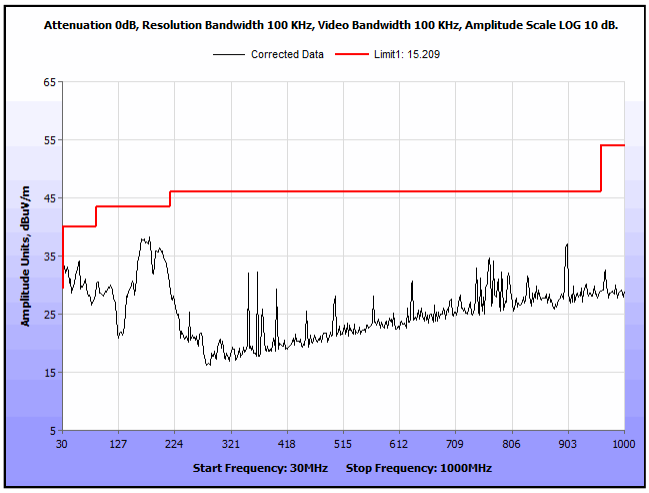
Plot 304. Undesirable Emissions, 1 – 18 GHz, 5700 MHz, AC mode, 20 MHz, Average, MIMO



Plot 305. Undesirable Emissions, 1 – 18 GHz, 5700 MHz, N mode, 20 MHz, Average, MIMO

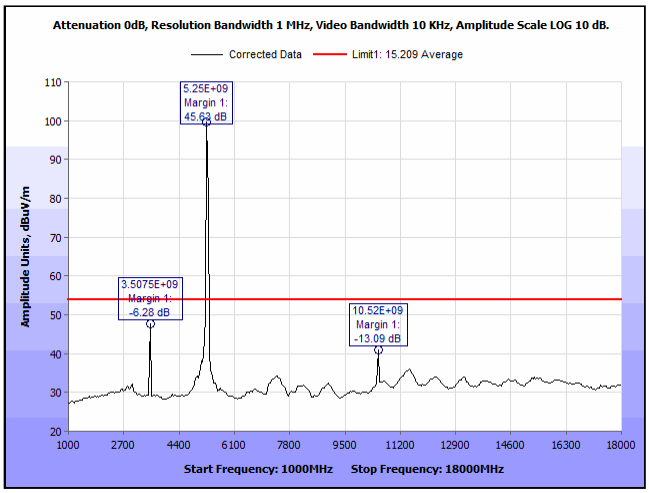


Plot 306. Undesirable Emissions, 30 MHz – 1 GHz, 5320 MHz, AC mode, 20 MHz, MIMO

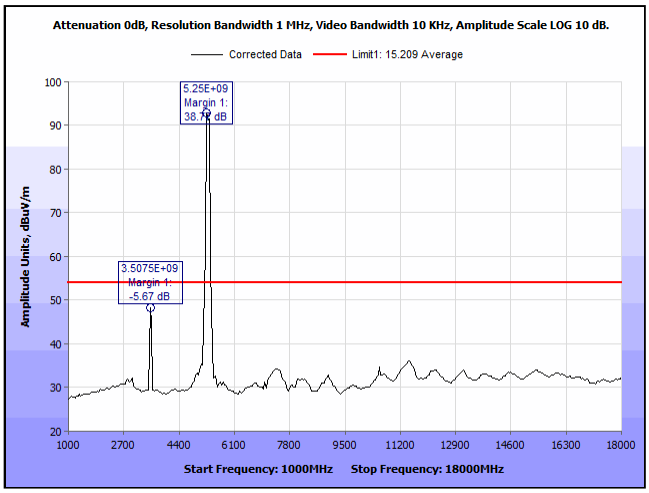


Plot 307. Undesirable Emissions, 30 MHz – 1 GHz, 5560 MHz, N mode, 20 MHz, MIMO

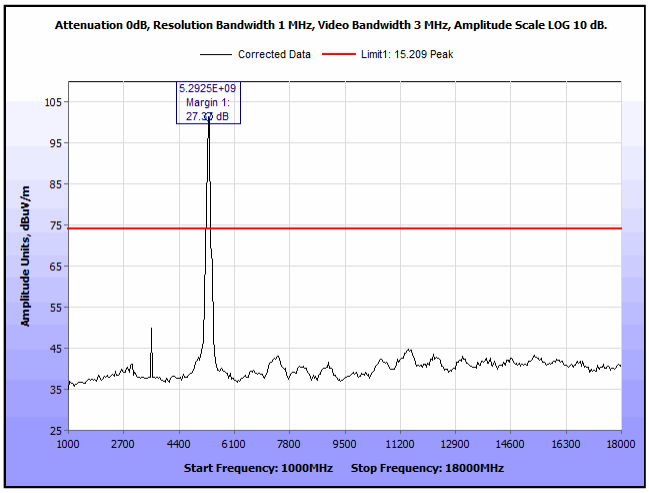
Undesirable Emission plots for SISO:
Plots presented represents the worst case.



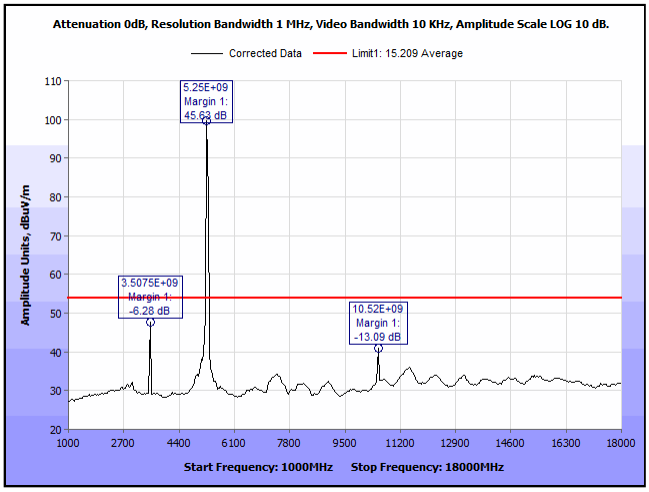
Plot 308. Undesirable Emissions, 1 – 18 GHz, 5260 MHz, N mode, 20 MHz, Average, SISO



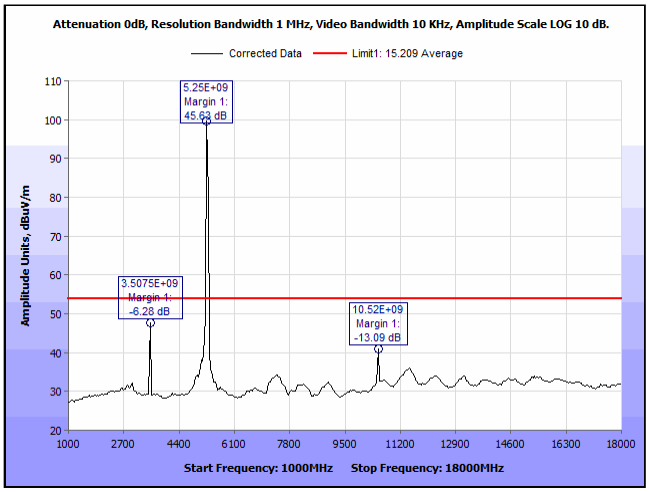
Plot 309. Undesirable Emissions, 1 – 18 GHz, 5290 MHz, AC mode, 80 MHz, Average, SISO



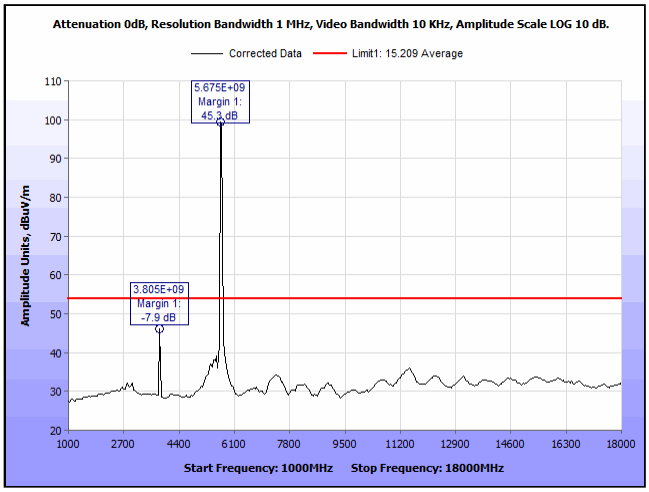
Plot 310. Undesirable Emissions, 1 – 18 GHz, 5290 MHz, AC mode, 80 MHz, Peak, SISO



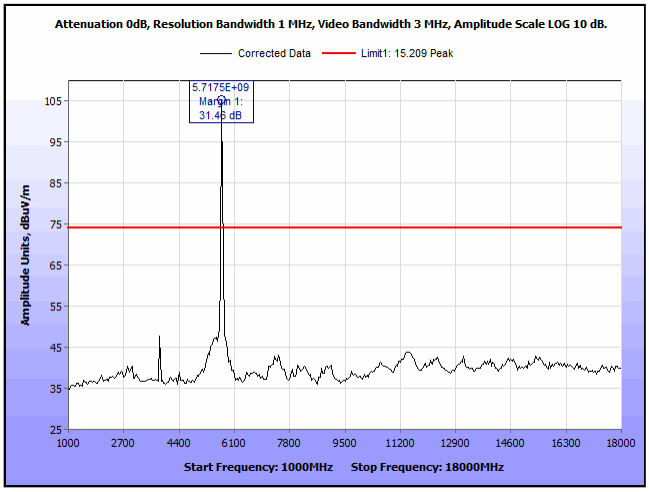
Plot 311. Undesirable Emissions, 1 – 18 GHz, 5260 MHz, AC mode, 20 MHz, Average, SISO



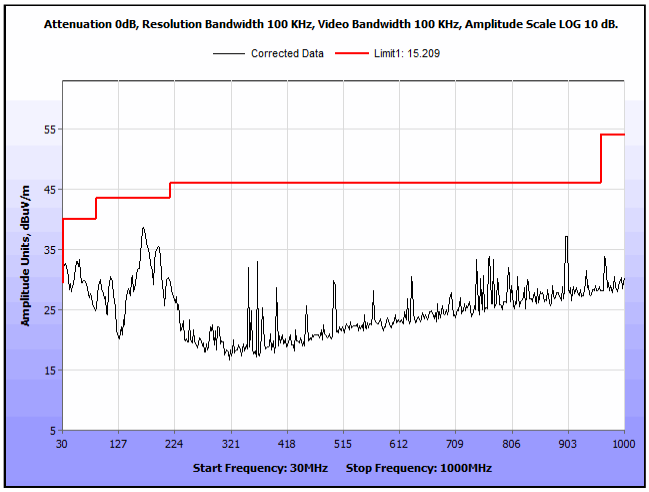
Plot 312. Undesirable Emissions, 1 – 18 GHz, 5260 MHz, A mode, 20 MHz, Average, SISO



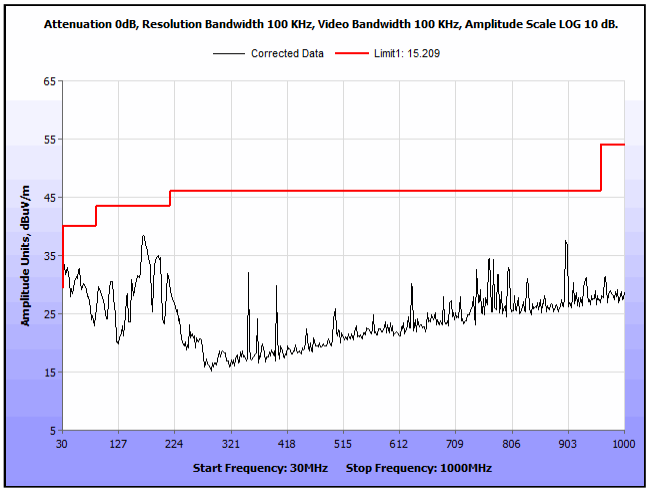
Plot 313. Undesirable Emissions, 1 – 18 GHz, 5700 MHz, N mode, 20 MHz, Average, SISO



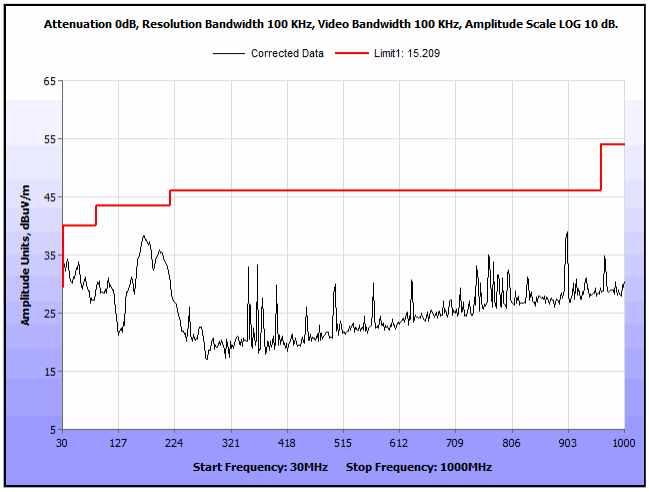
Plot 314. Undesirable Emissions, 1 – 18 GHz, 5700 MHz, N mode, 20 MHz, Peak, SISO



Plot 315. Undesirable Emissions, 30 MHz – 1 GHz, 5560 MHz, A mode, 20 MHz, SISO

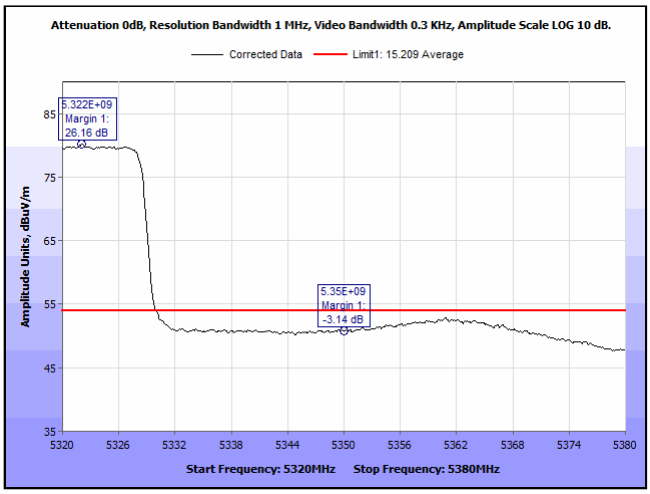


Plot 316. Undesirable Emissions, 30 MHz – 1 GHz, 5530 MHz, AC mode, 80 MHz, SISO

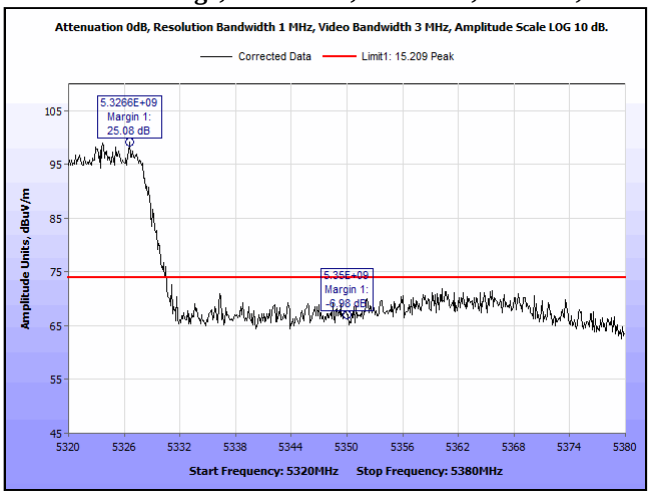


Plot 317. Undesirable Emissions, 30 MHz – 1 GHz, 5610 MHz, AC mode, 80 MHz, SISO

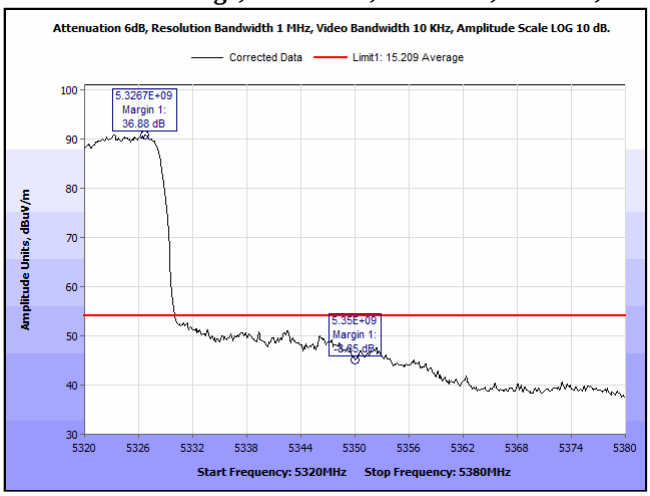
Radiated Band Edge, Test Results



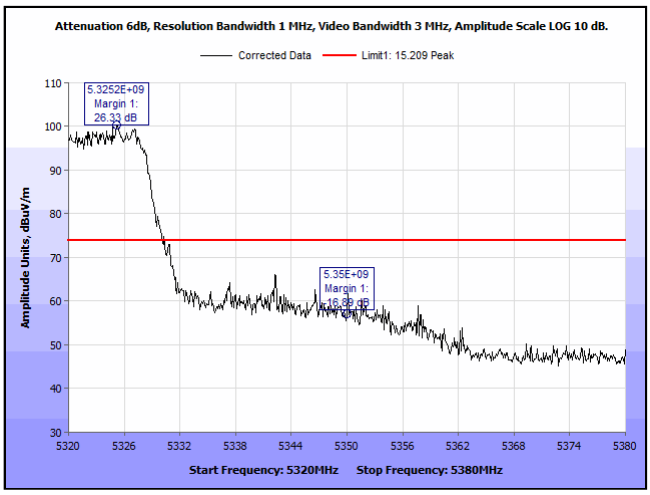
Plot 318. Radiated Band Edge, 5280 MHz, AC mode, 80 MHz, Average, MIMO



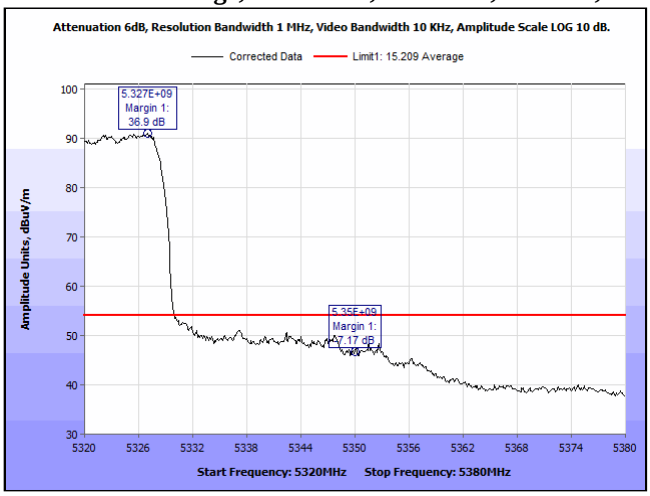
Plot 319. Radiated Band Edge, 5290 MHz, AC mode, 80 MHz, Peak, MIMO



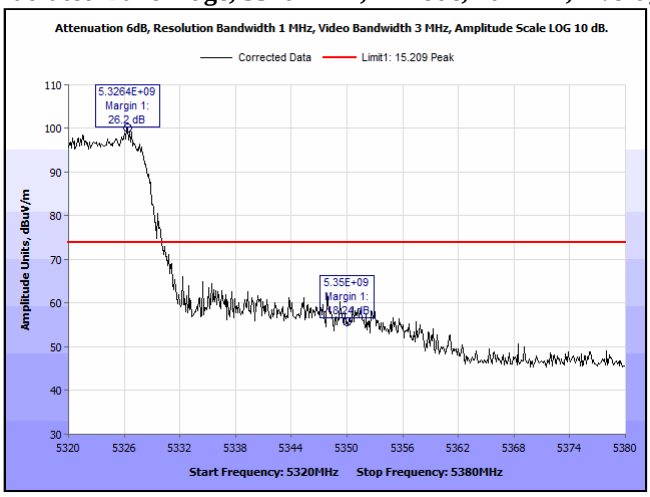
Plot 320. Radiated Band Edge, 5310 MHz, AC mode, 40 MHz, Average, MIMO



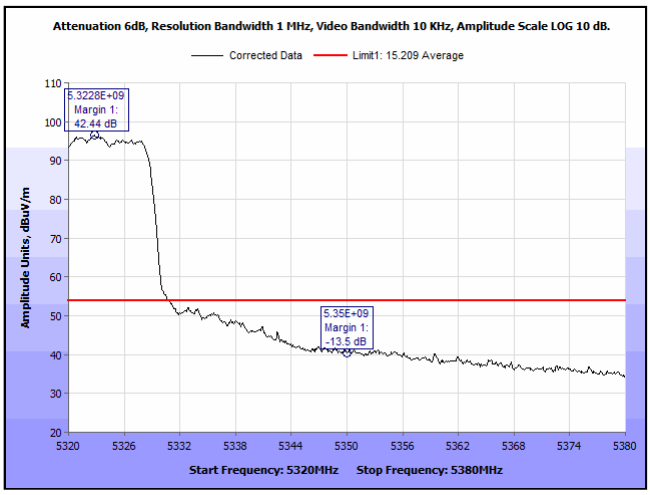
Plot 321. Radiated Band Edge, 5310 MHz, AC mode, 40 MHz, Peak, MIMO



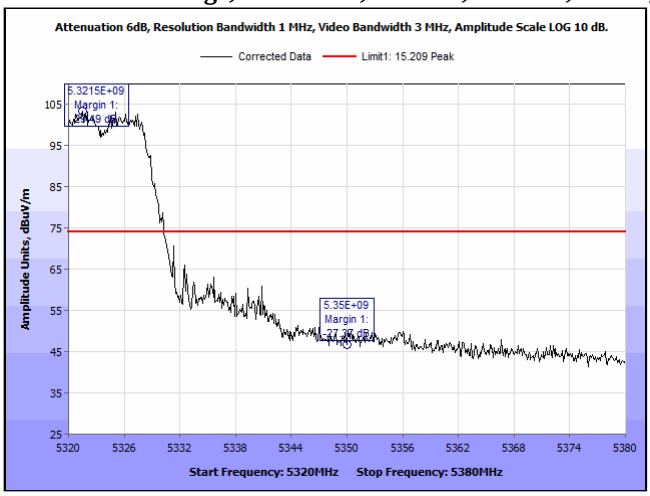
Plot 322. Radiated Band Edge, 5310 MHz, N mode, 40 MHz, Average, MIMO



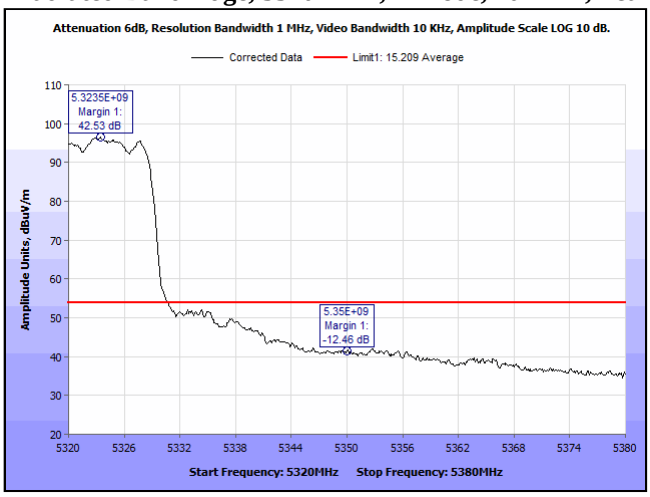
Plot 323. Radiated Band Edge, 5310 MHz, N mode, 40 MHz, Peak, MIMO



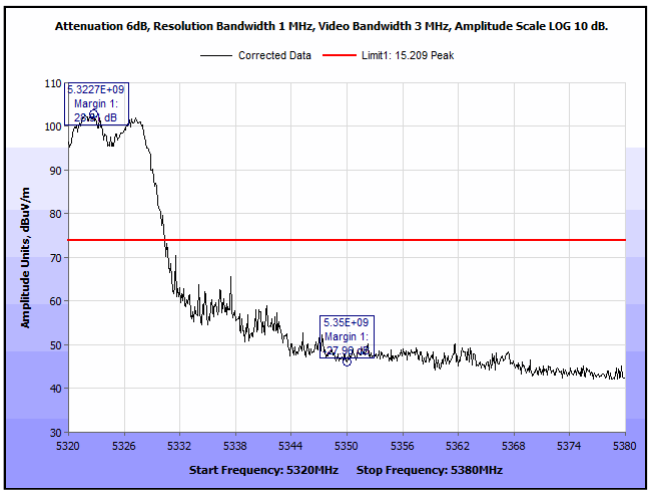
Plot 324. Radiated Band Edge, 5320 MHz, A mode, 20 MHz, Average, MIMO



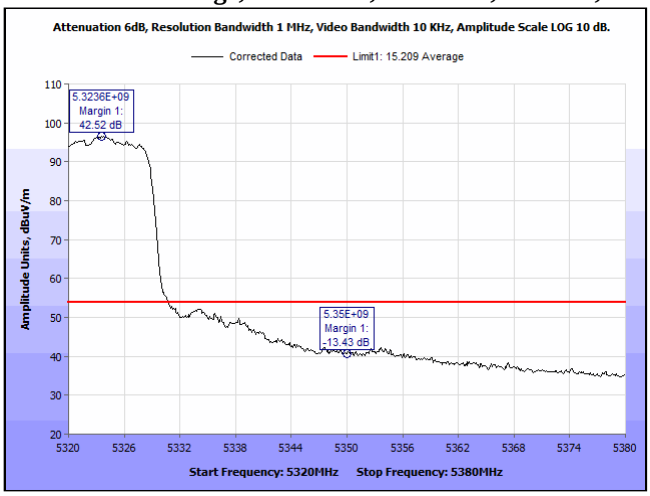
Plot 325. Radiated Band Edge, 5320 MHz, A mode, 20 MHz, Peak, MIMO



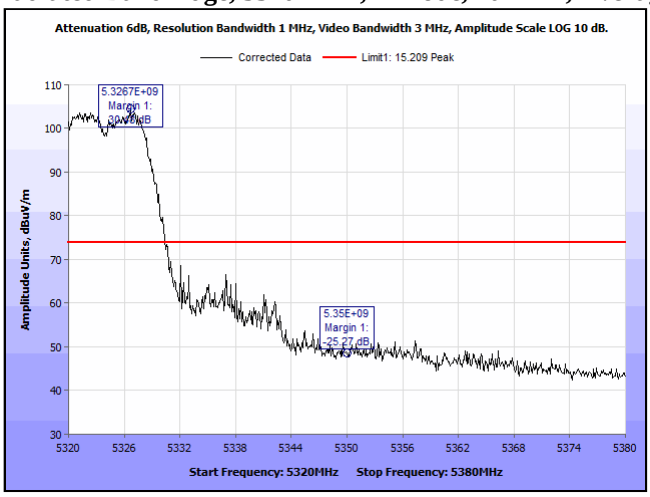
Plot 326. Radiated Band Edge, 5320 MHz, AC mode, 20 MHz, Average, MIMO



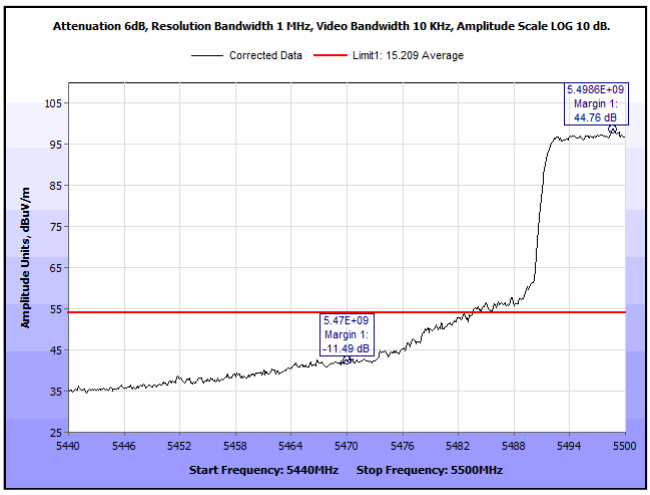
Plot 327. Radiated Band Edge, 5320 MHz, AC mode, 20 MHz, Peak, MIMO



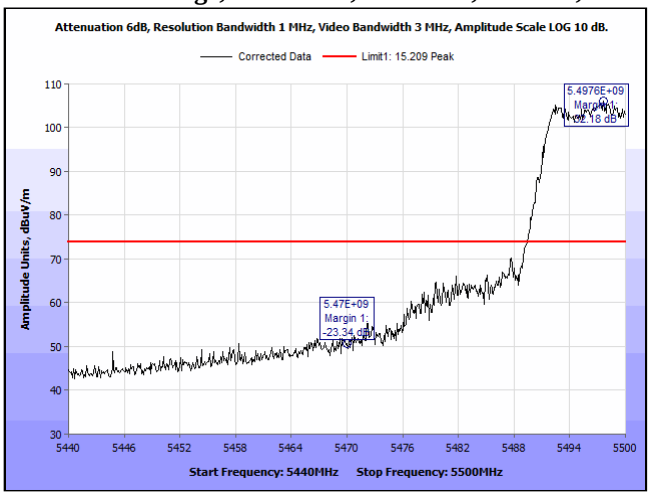
Plot 328. Radiated Band Edge, 5320 MHz, N mode, 20 MHz, Average, MIMO



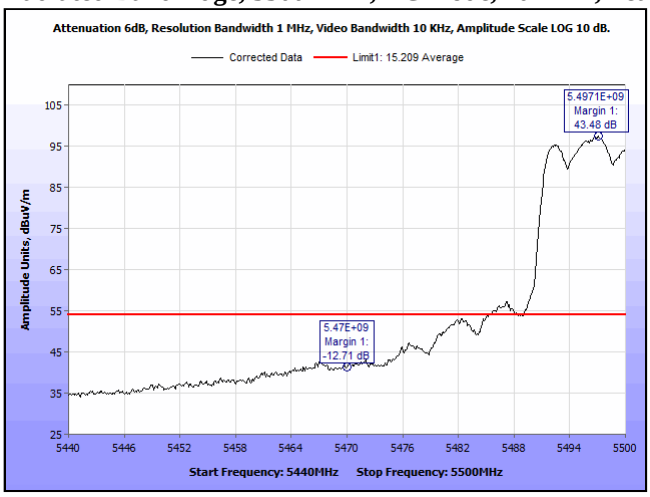
Plot 329. Radiated Band Edge, 5320 MHz, N mode, 20 MHz, Peak, MIMO



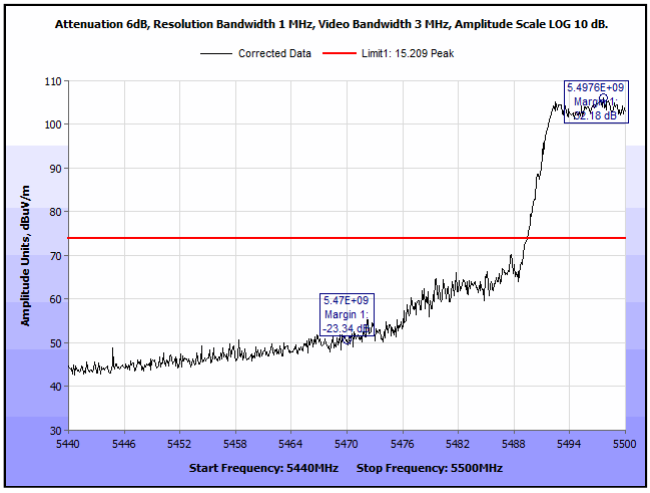
Plot 330. Radiated Band Edge, 5500 MHz, AC mode, 20 MHz, Average, MIMO



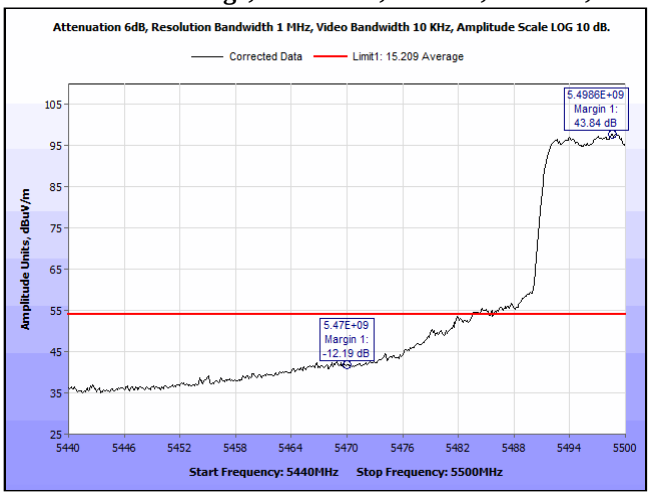
Plot 331. Radiated Band Edge, 5500 MHz, AC mode, 20 MHz, Peak, MIMO



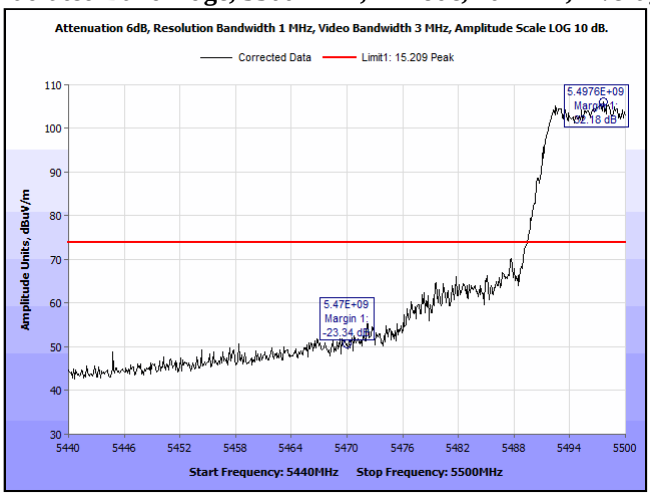
Plot 332. Radiated Band Edge, 5500 MHz, N mode, 20 MHz, Average, MIMO



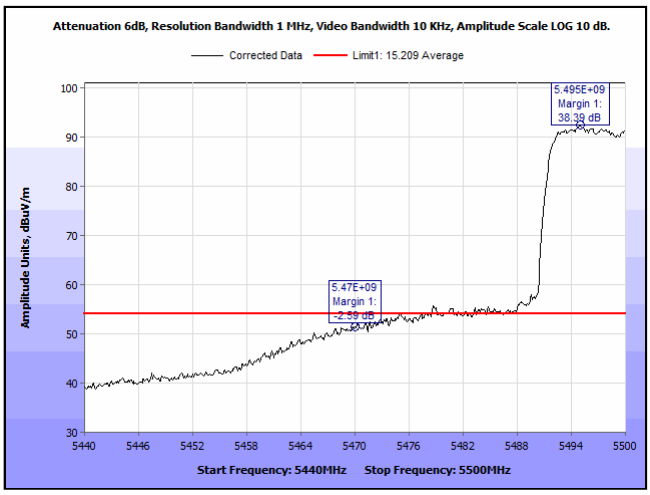
Plot 333. Radiated Band Edge, 5500 MHz, N mode, 20 MHz, Peak, MIMO



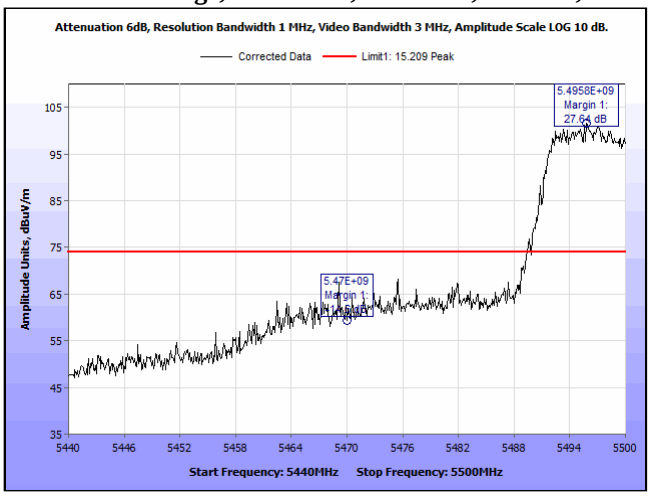
Plot 334. Radiated Band Edge, 5500 MHz, A mode, 20 MHz, Average, MIMO



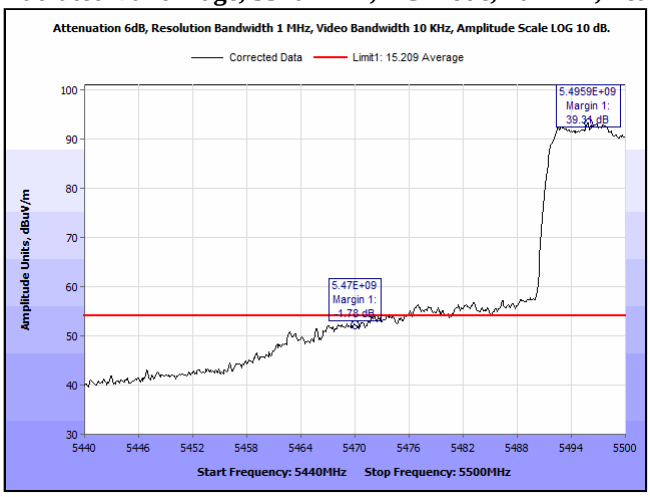
Plot 335. Radiated Band Edge, 5500 MHz, A mode, 20 MHz, Peak, MIMO



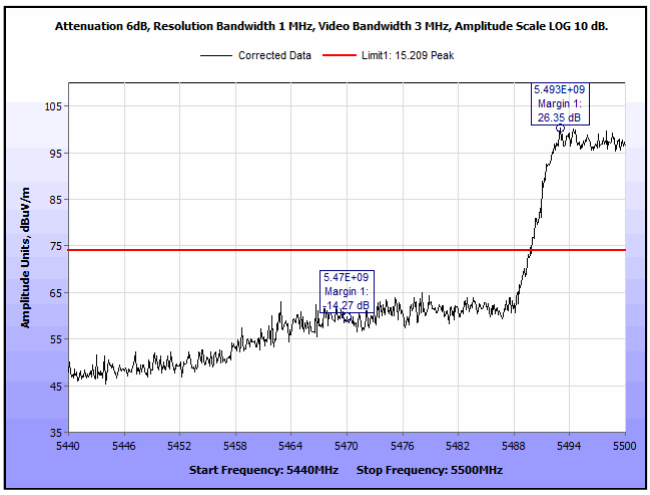
Plot 336. Radiated Band Edge, 5510 MHz, AC mode, 40 MHz, Average, MIMO



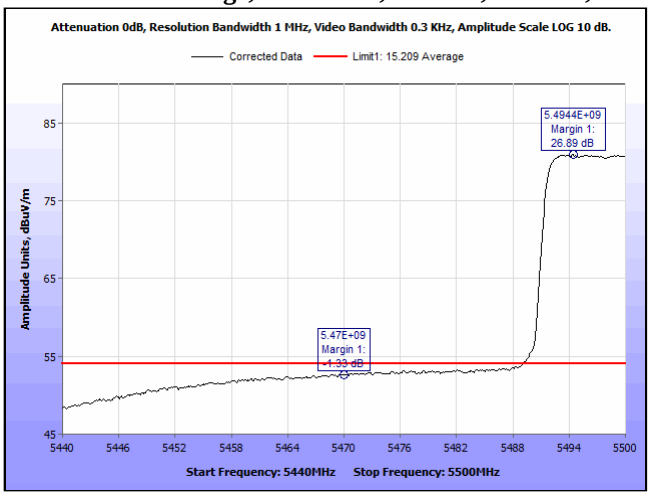
Plot 337. Radiated Band Edge, 5510 MHz, AC mode, 40 MHz, Peak, MIMO



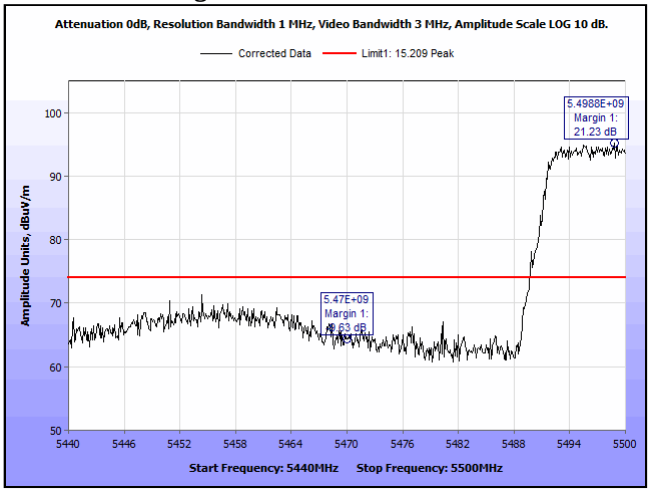
Plot 338. Radiated Band Edge, 5510 MHz, N mode, 40 MHz, Average, MIMO



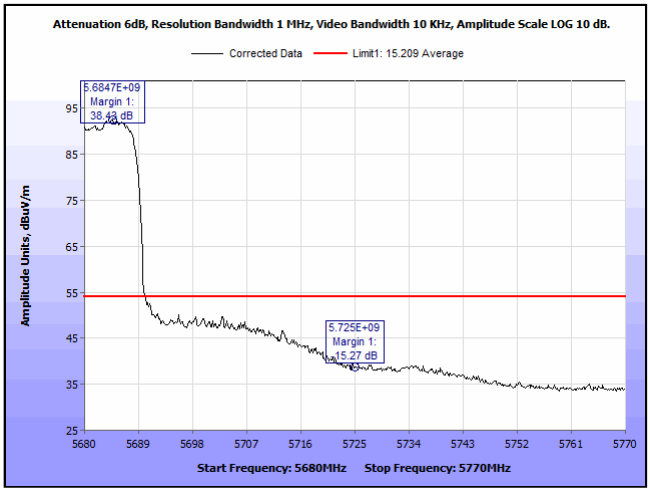
Plot 339. Radiated Band Edge, 5510 MHz, N mode, 40 MHz, Peak, MIMO



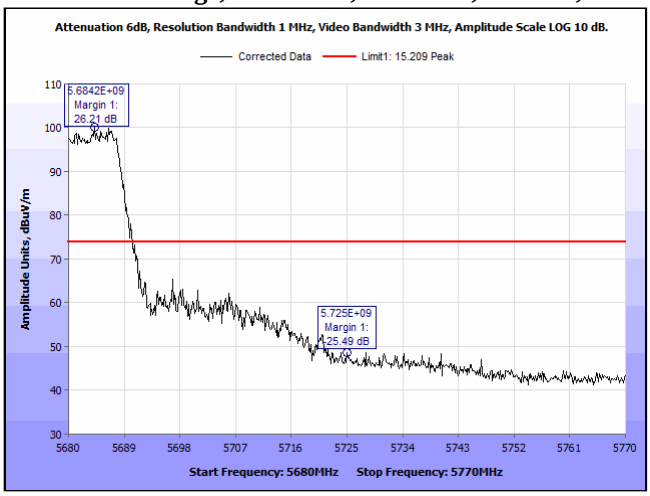
Plot 340. Radiated Band Edge, 5530 MHz, AC mode, 80 MHz, Average, MIMO



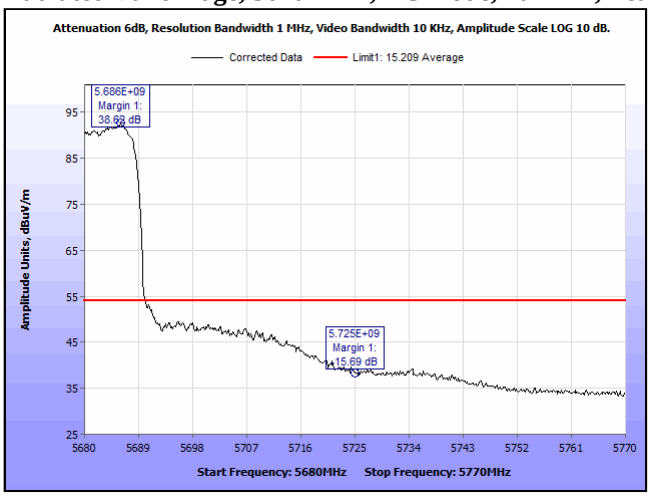
Plot 341. Radiated Band Edge, 5530 MHz, AC mode, 80 MHZ, Peak, MIMO



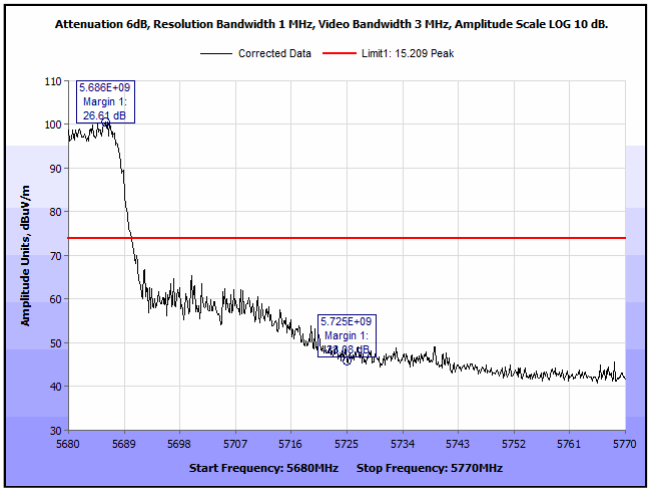
Plot 342. Radiated Band Edge, 5670 MHz, AC mode, 40 MHz, Average, MIMO



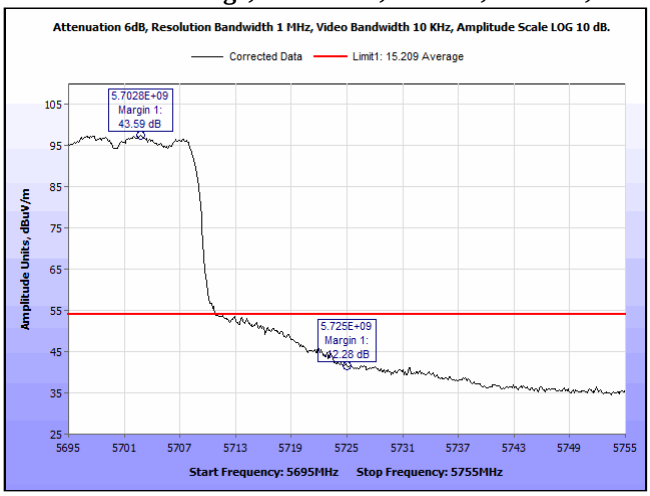
Plot 343. Radiated Band Edge, 5670 MHz, AC mode, 40 MHz, Peak, MIMO



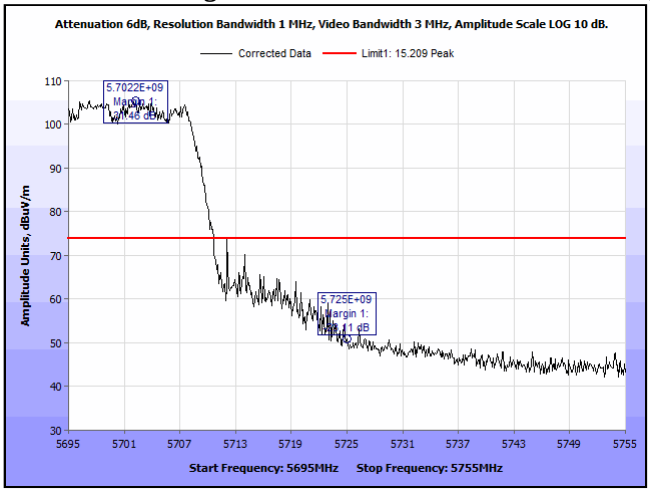
Plot 344. Radiated Band Edge, 5670 MHz, N mode, 40 MHz, Average, MIMO



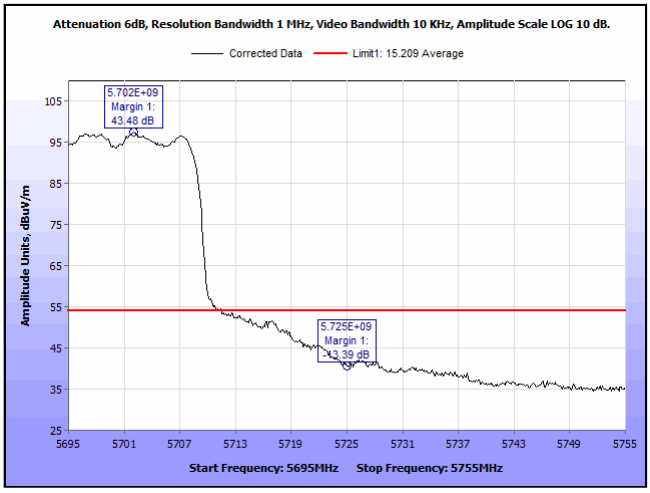
Plot 345. Radiated Band Edge, 5670 MHz, N mode, 40 MHz, Peak, MIMO



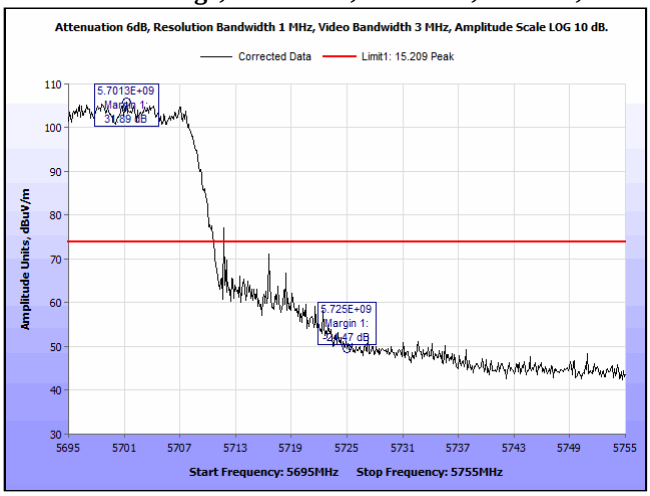
Plot 346. Radiated Band Edge, 5700 MHz, A mode, 20 MHz, Average, MIMO



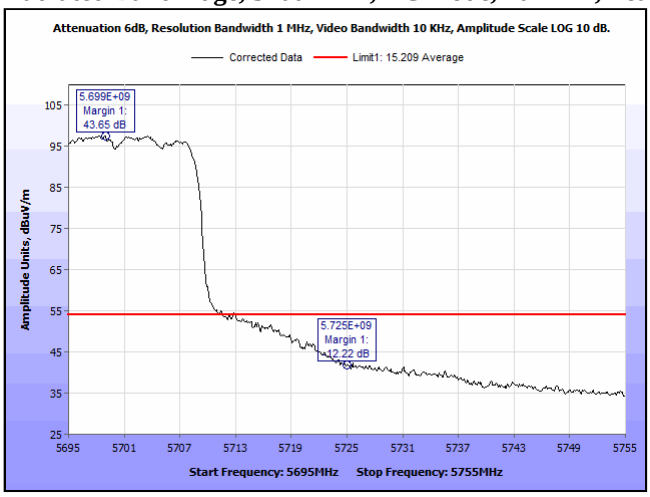
Plot 347. Radiated Band Edge, 5700 MHz, A mode, 20 MHz, Peak, MIMO



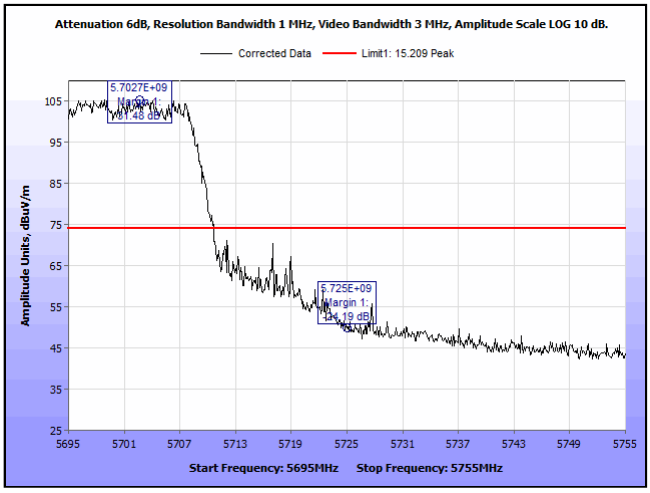
Plot 348. Radiated Band Edge, 5700 MHz, AC mode, 20 MHz, Average, MIMO



Plot 349. Radiated Band Edge, 5700 MHz, AC mode, 20 MHz, Peak, MIMO

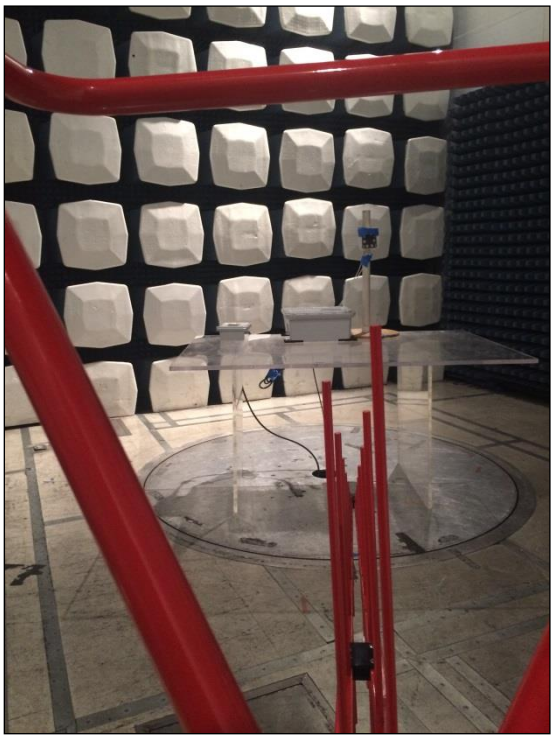


Plot 350. Radiated Band Edge, 5700 MHz, N mode, 20 MHz, Average, MIMO



Plot 351. Radiated Band Edge, 5700 MHz, N mode, 20 MHz, Peak, MIMO

Radiated Emissions Test Setup



Photograph 1. Radiated Emissions, Below 1 GHz, Test Setup

Photograph 2. Radiated Emissions, Above 1 GHz, Test Setup

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.407(b)(6) Conducted Emissions

Test Requirement(s): **§ 15.407 (b)(6):** Any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in §15.207.

§ 15.207 (a): For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30MHz, shall not exceed the limits in the following table, as measured using a 50 μH/50 Σ line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency range (MHz)	§ 15.207(a), Conducted Limit (dBμV)	
	Quasi-Peak	Average
* 0.15- 0.45	66 – 56	56 - 46
0.45 - 0.5	56	46
0.5 - 30	60	50

Table 11. Conducted Limits for Intentional Radiators from FCC Part 15 § 15.207(a)

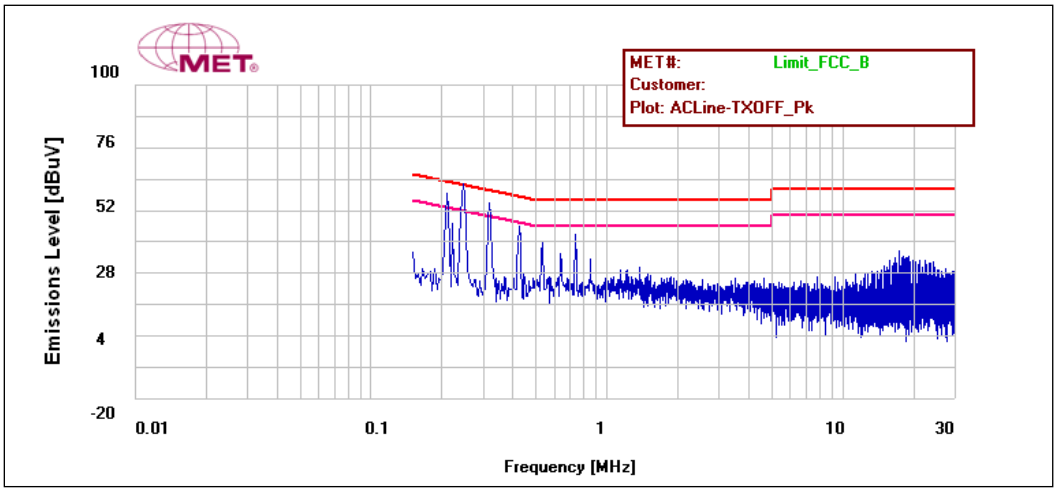
Test Procedure: The EUT was placed on a non-metallic table inside a screen room. The EUT was situated such that the back of the EUT was 0.4 m from one wall of the vertical ground plane, and the remaining sides of the EUT were no closer than 0.8 m from any other conductive surface. The EUT was powered from a 50 Ω/50 μH Line Impedance Stabilization Network (LISN). The EMC receiver scanned the frequency range from 150 kHz to 30 MHz. Conducted Emissions measurements were made in accordance with *ANSI C63.4-2014 "Methods and Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40 GHz"*. Scans were performed with the transmitter on.

Test Results: The EUT was compliant with requirements of this section. Emissions above the limit were present with the transmitter off and are likely to not be caused by the transmitter.

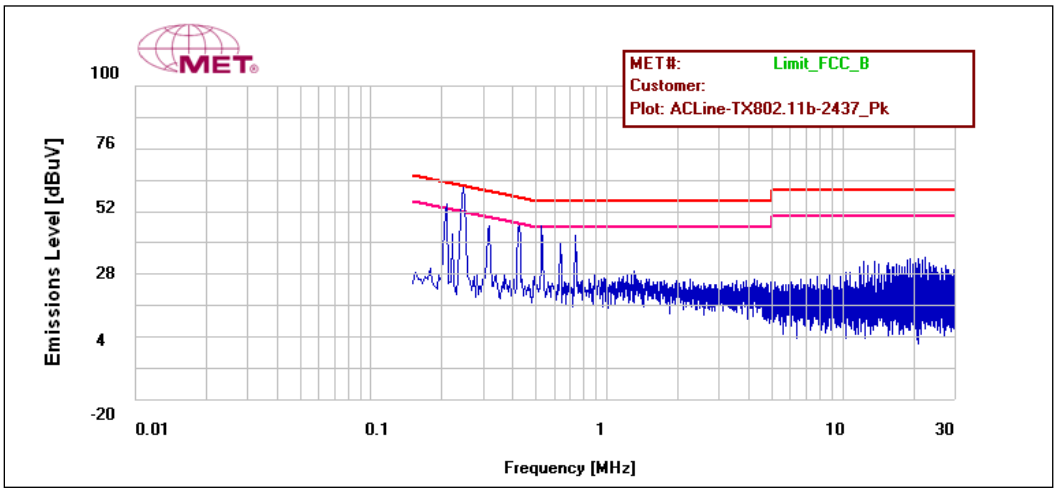
Test Engineer(s): Giuliano Messina

Test Date(s): May 9, 2017

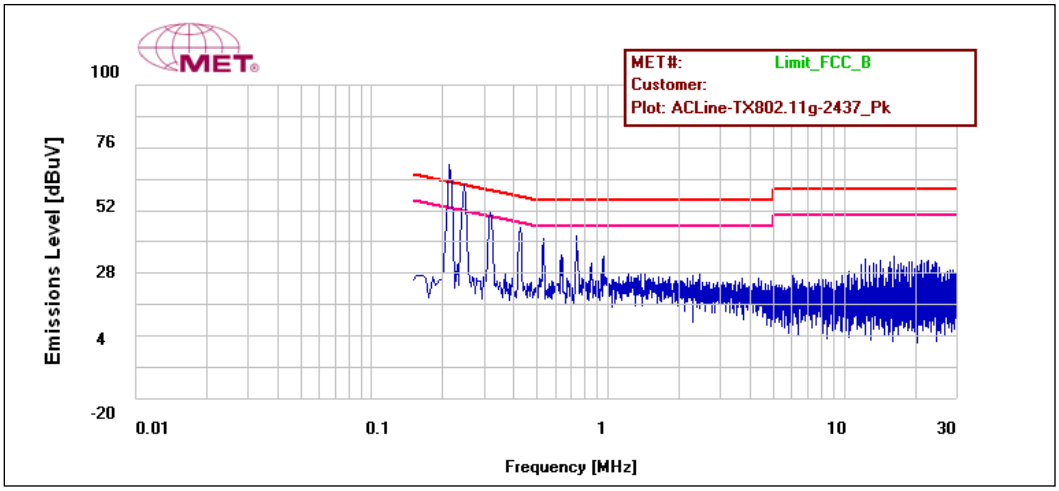
15.207(a) Conducted Emissions Test Results



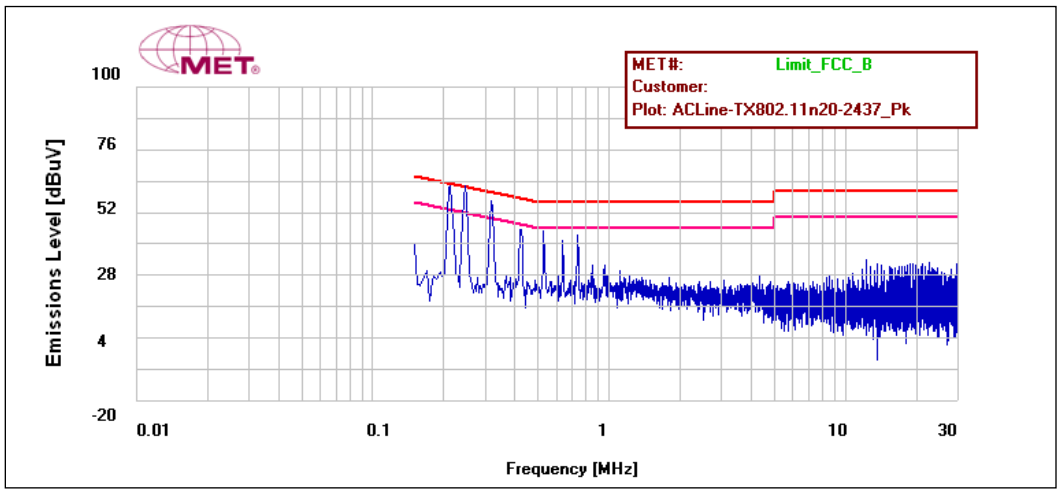
Plot 352. Conducted Emissions, 15.207(a), Transmit Off, Phase Line



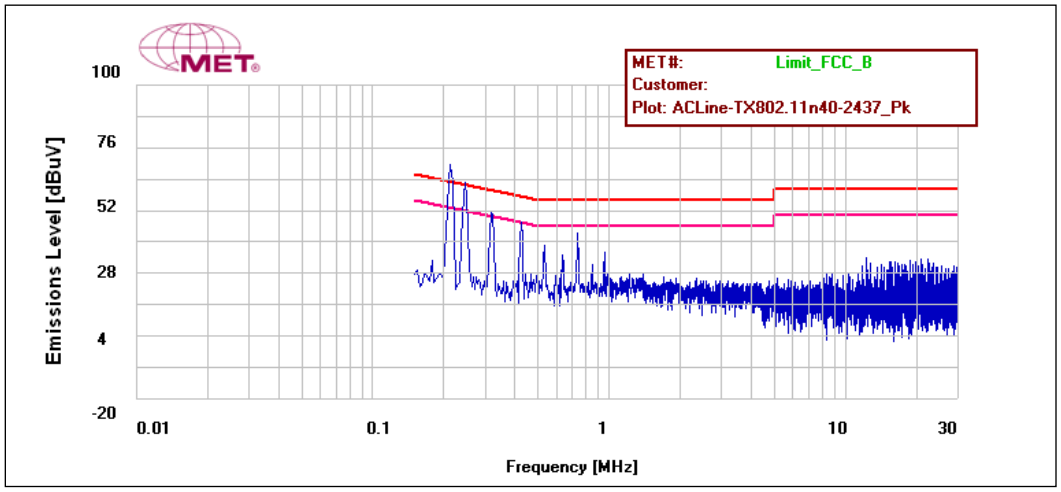
Plot 353. Conducted Emissions, 15.207(a), 2.4 GHz WiFi, 802.11b, Phase Line



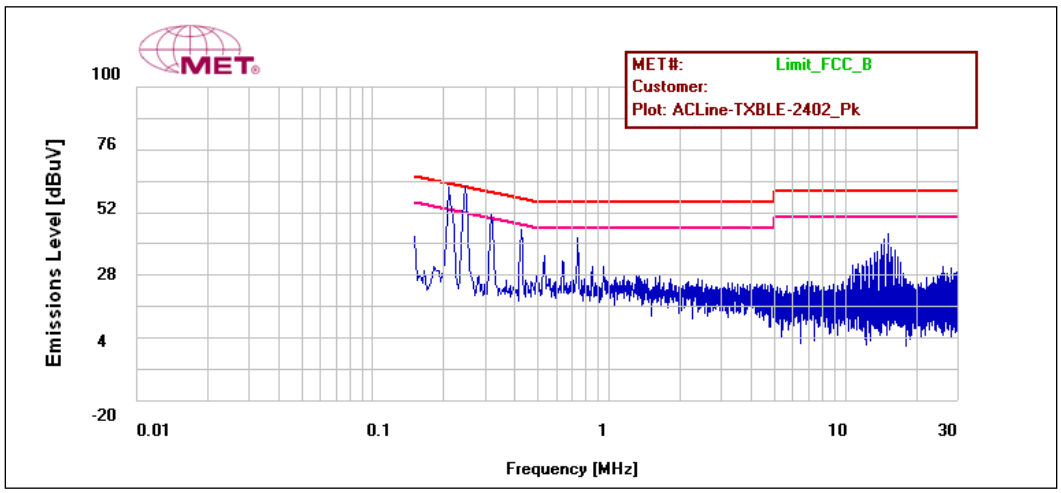
Plot 354. Conducted Emissions, 15.207(a), 2.4 GHz WiFi, 802.11g, Phase Line



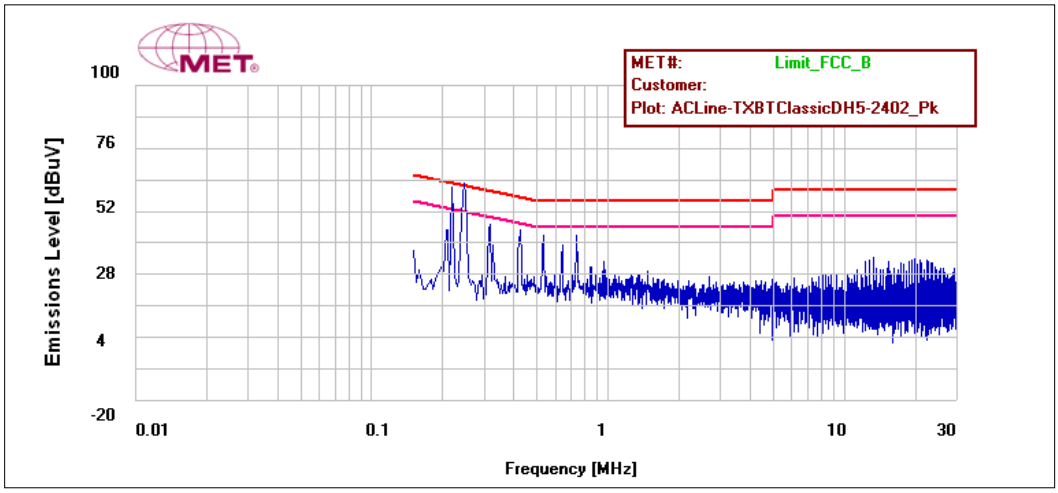
Plot 355. Conducted Emissions, 15.207(a), 2.4 GHz WiFi, 802.11n, 20 MHz, Phase Line



Plot 356. Conducted Emissions, 15.207(a), 2.4 GHz WiFi, 802.11n, 40 MHz, Phase Line

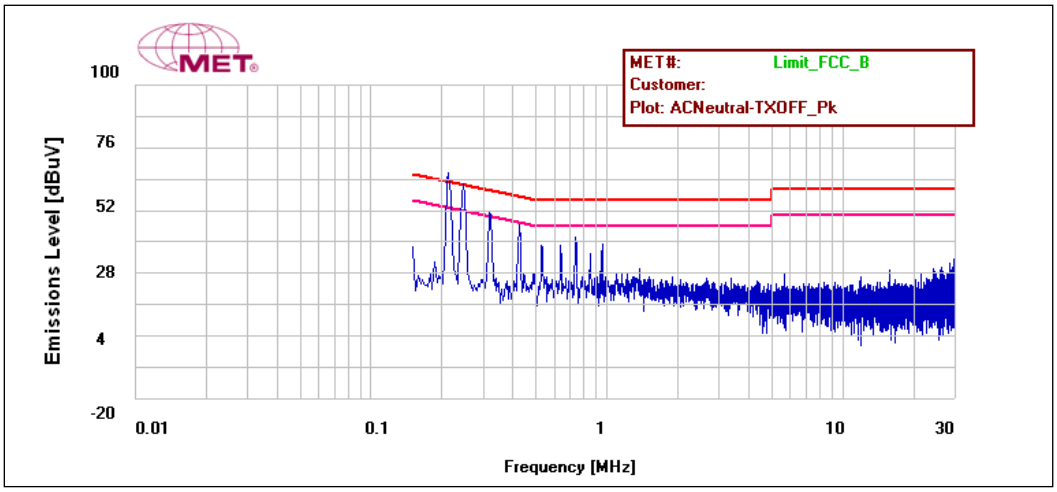


Plot 357. Conducted Emissions, 15.207(a), TX BLE, Phase Line

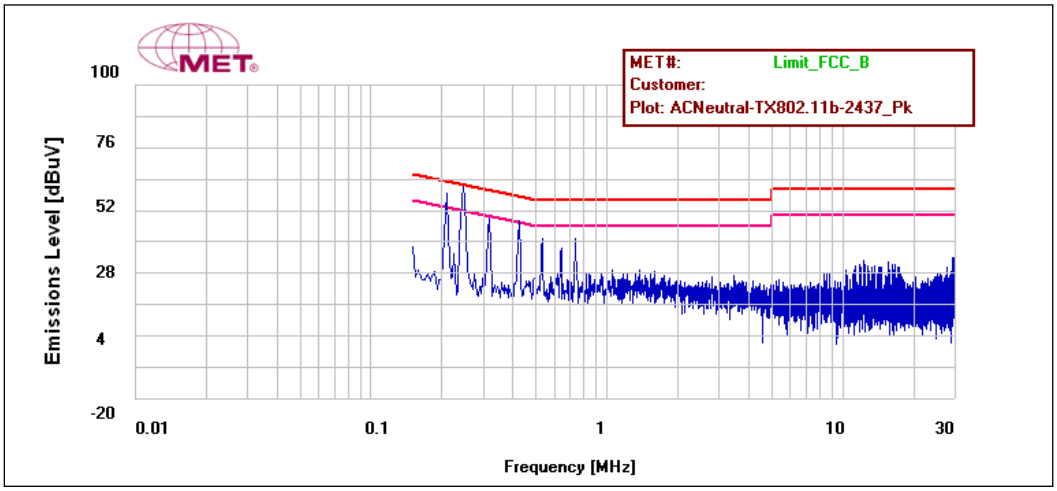


Plot 358. Conducted Emissions, 15.207(a), Transmit On, Phase Line

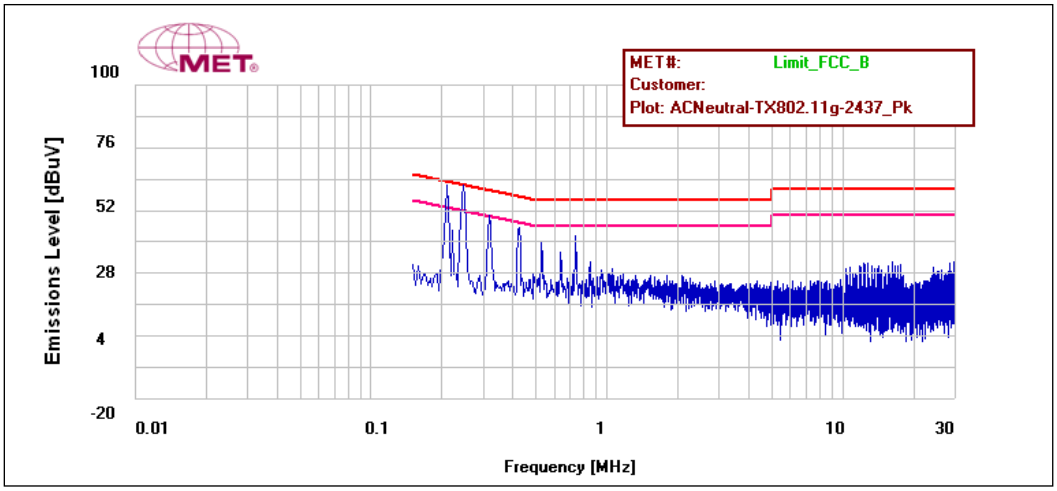
15.207(a) Conducted Emissions Test Results



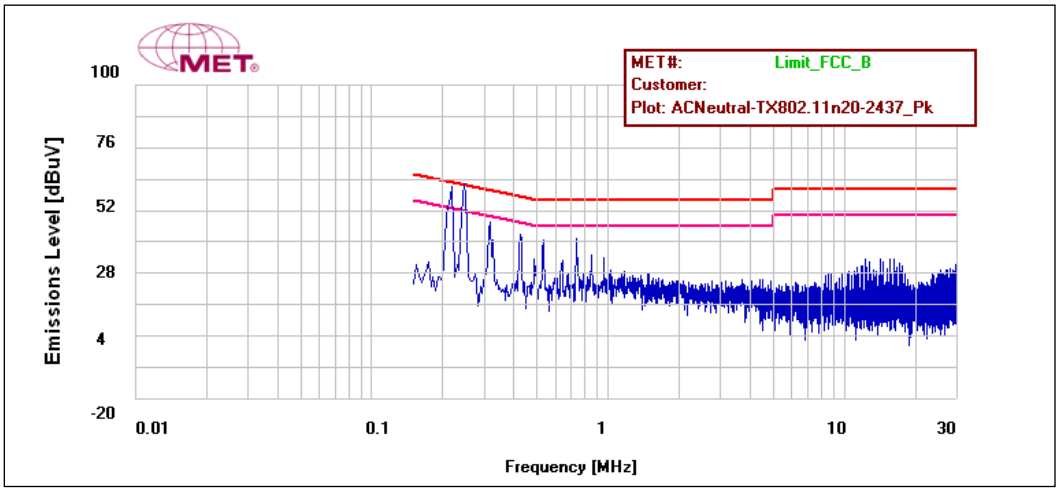
Plot 359. Conducted Emissions, 15.207(a), Transmit Off, Neutral Line



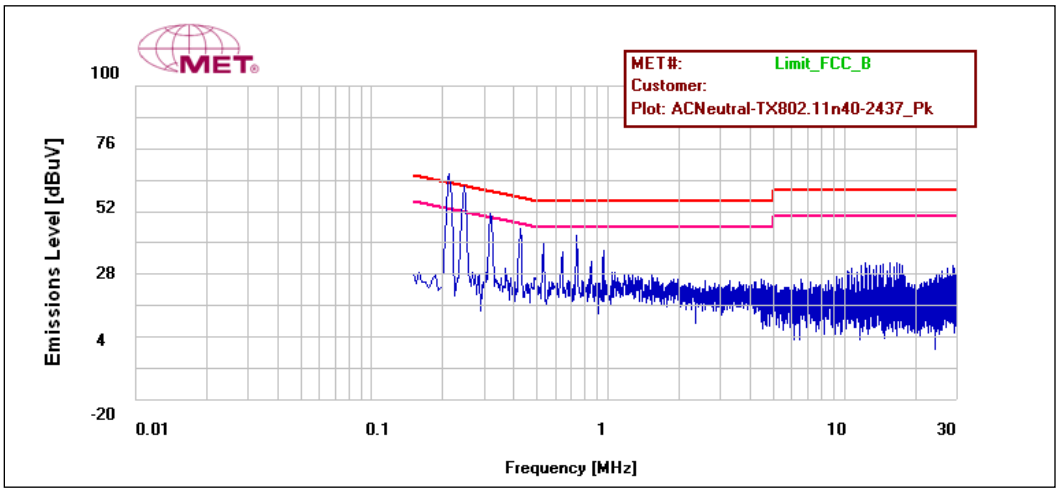
Plot 360. Conducted Emissions, 15.207(a), 2.4 GHz WiFi, 802.11b, Neutral Line



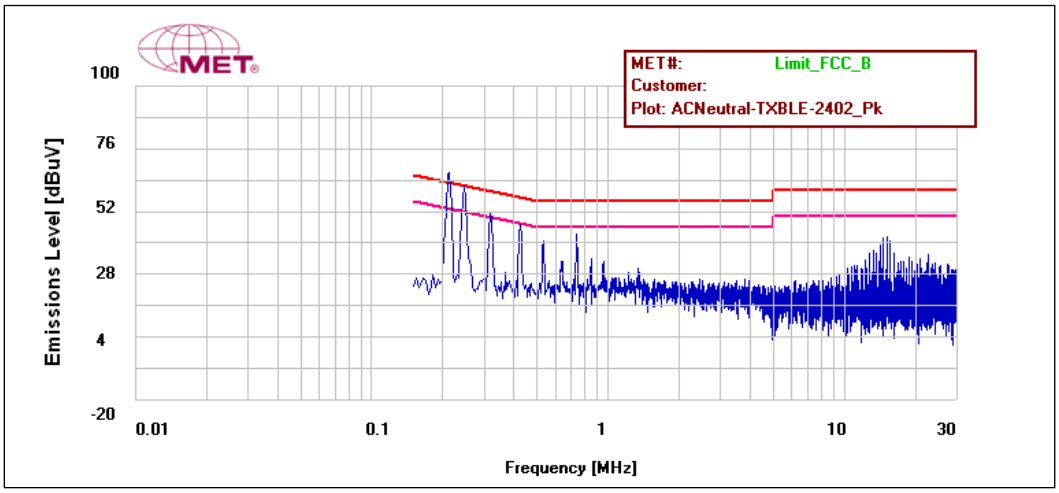
Plot 361. Conducted Emissions, 15.207(a), 2.4 GHz WiFi, 802.11g, Neutral Line



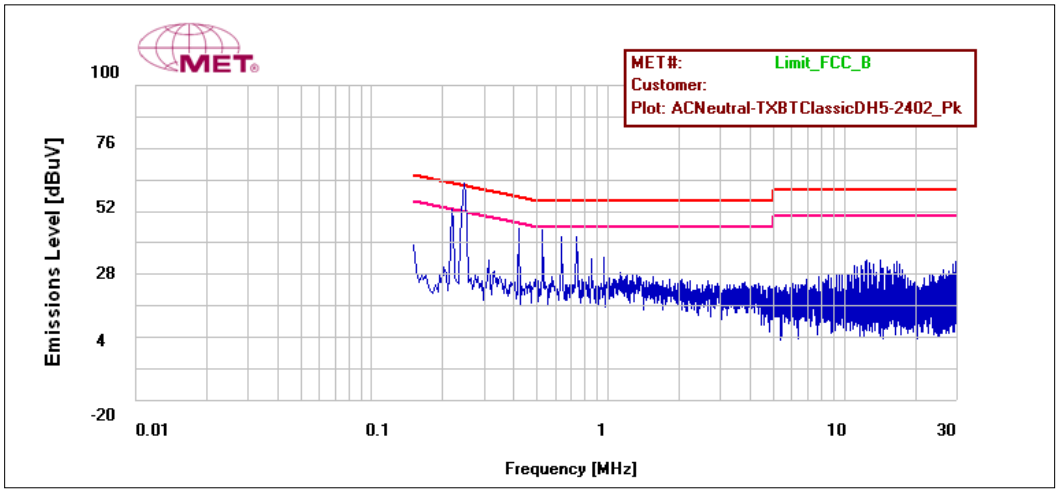
Plot 362. Conducted Emissions, 15.207(a), 2.4 GHz WiFi, 802.11n, 20 MHz, Neutral Line



Plot 363. Conducted Emissions, 15.207(a), 2.4 GHz WiFi, 802.11n, 40 MHz, Neutral Line

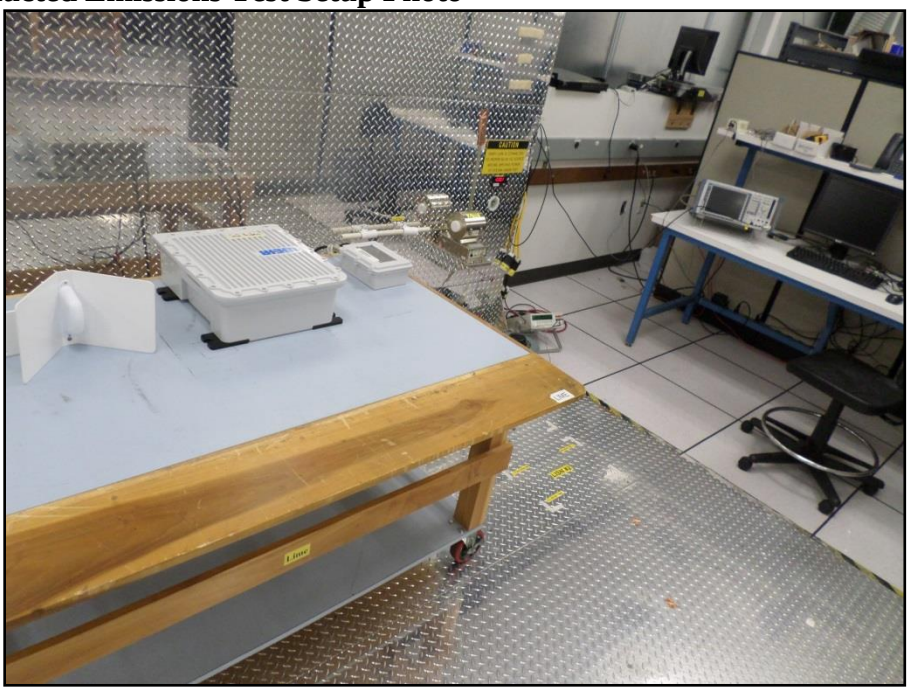


Plot 364. Conducted Emissions, 15.207(a), TX BLE, Neutral Line

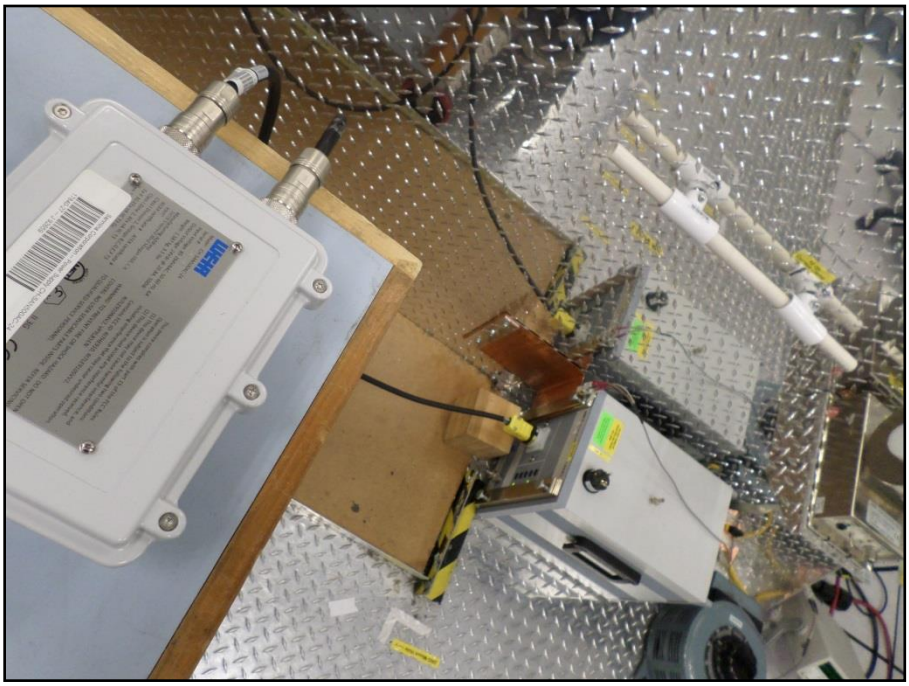


Plot 365. Conducted Emissions, 15.207(a), Transmit On, Neutral Line

15.207(a) Conducted Emissions Test Setup Photo



Photograph 3. Conducted Emissions, 15.207(a), CEV Station Setup



Photograph 4. Conducted Emissions, 15.207(a), LISN Connection

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.407(c) Automatic Discontinue of Transmission

Test Requirement(s): **§ 15.407 (c):** The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude the transmission of control or signaling information or the use of repetitive codes used by certain digital technologies to complete frame or burst intervals.

Test Results: The EUT was not applicable with the requirement of this section.

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.407(f) Maximum Permissible Exposure

Test Requirement(s): **§15.407(f):** U-NII devices are subject to the radio frequency radiation exposure requirements specified in §1.1307(b), §2.1091 and §2.1093 of this chapter, as appropriate. All equipment shall be considered to operate in a "general population/uncontrolled" environment.

RF Exposure Requirements: **§1.1307(b)(1) and §1.1307(b)(2):** Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines.

RF Radiation Exposure Limit: **§1.1310:** As specified in this section, the Maximum Permissible Exposure (MPE) Limit shall be used to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation as specified in Sec. 1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of Sec. 2.1093 of this chapter.

MPE Limit: EUT's operating frequencies @ 5250-5350 MHz and 5470 – 5725 MHz; **Limit for Uncontrolled exposure: 1 mW/cm^2 or 10 W/m^2**

Equation from page 18 of OET 65, Edition 97-01

$$S = PG / 4\pi R^2 \quad \text{or} \quad R = \sqrt{(PG / 4\pi S)}$$

where, S = Power Density (mW/cm^2)
P = Power Input to antenna (mW)
G = Antenna Gain (numeric value)
R = Distance (cm)

Test Results:

FCC									
Frequency (MHz)	**Con. Pwr. (dBm)**	**Con. Pwr. (mW)**	**Ant. Gain (dBi)**	**Ant. Gain numeric**	**Pwr. Density (mW/cm^2)**	**Limit (mW/cm^2)**	**Margin**	**Distance (cm)**	**Result**
5560	14.086	25.621	9	7.943	0.04049	1	0.95951	20	Pass

Photograph 5. Maximum Permissible Exposure

The safe distance where Power Density is less than the MPE Limit listed above was found to be 20 cm.

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.407(g) Frequency Stability

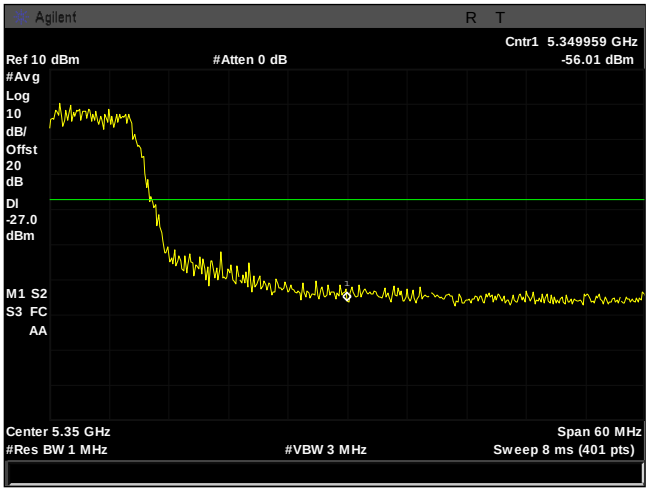
Test Requirements: Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

Test Procedure: The EUT was connected directly to a spectrum analyzer through an attenuator. The 1st trace of the Spectrum Analyzer was taken at ambient conditions and used as a reference. A 2nd trace was used to show the drift of the carrier at extreme conditions. A delta marker was used to find the drift at a given extreme condition.

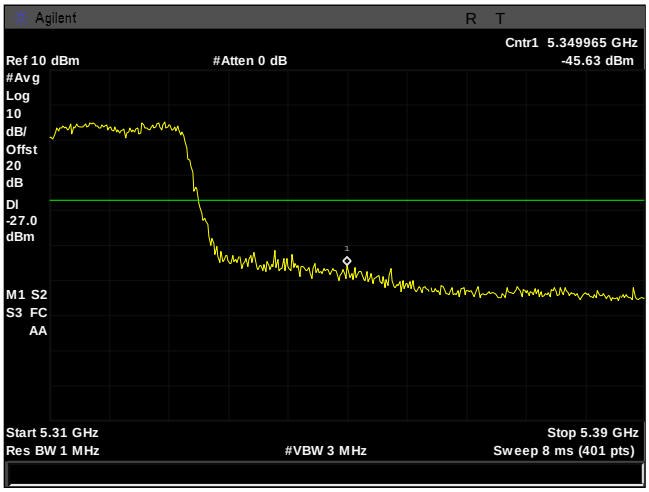
Test Results: The EUT was compliant with the requirements of this section.

Test Engineer(s): Deepak Giri

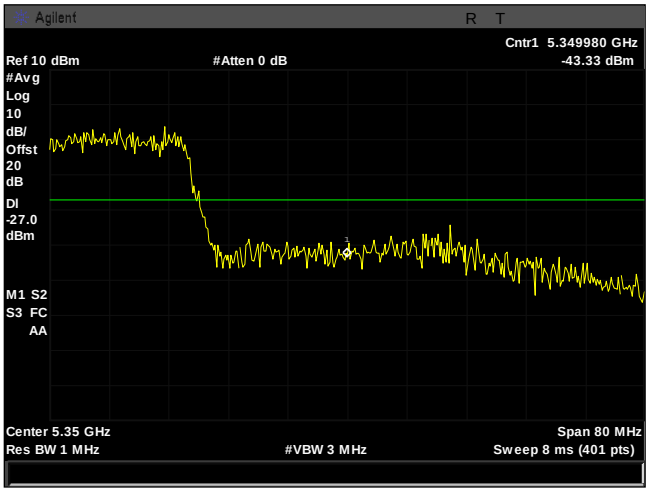
Test Date(s): May 24, 2017



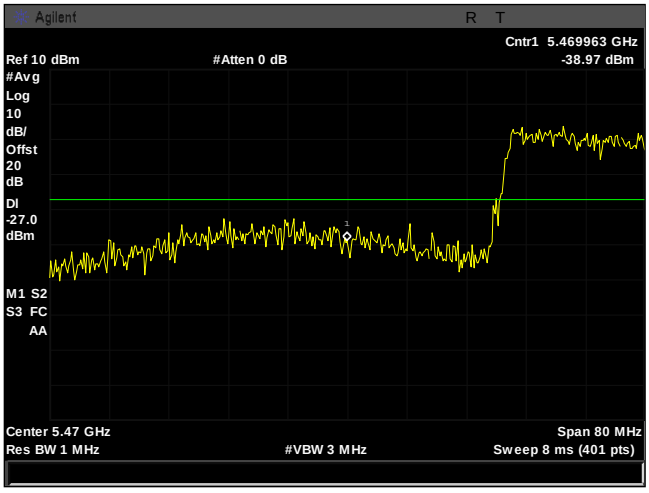
Plot 366. Frequency Stability, 5350 MHz, Band Edge, 20 MHz Channel Average, 80.C



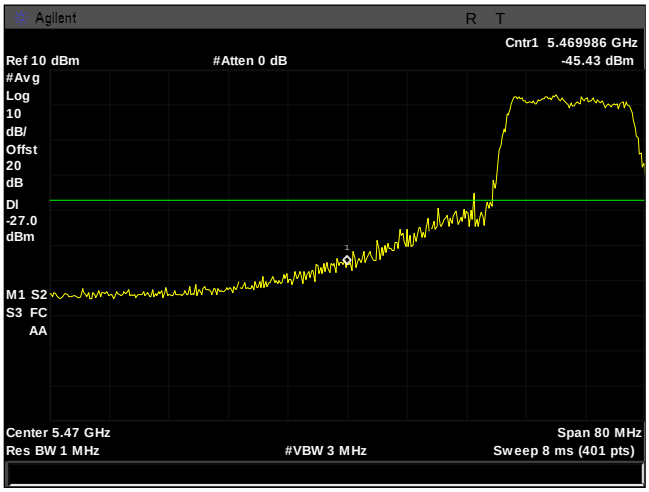
Plot 367. Frequency Stability, 5350 MHz, Band Edge, 40 MHz, Channel Average 80.C



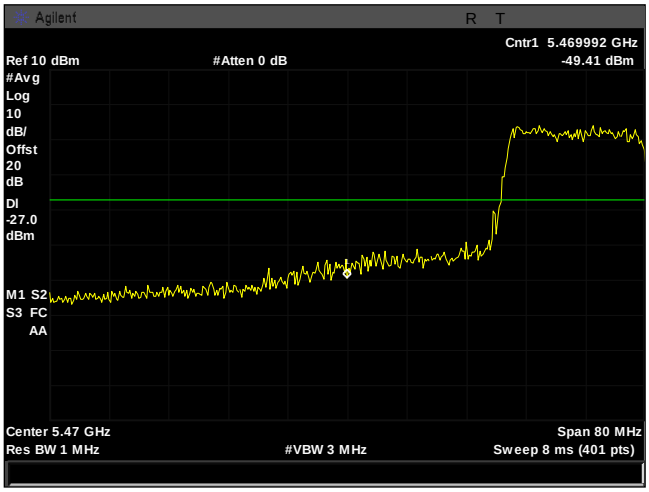
Plot 368. Frequency Stability, 5350 MHz, Band Edge, 80 MHz, Channel Average 80.C



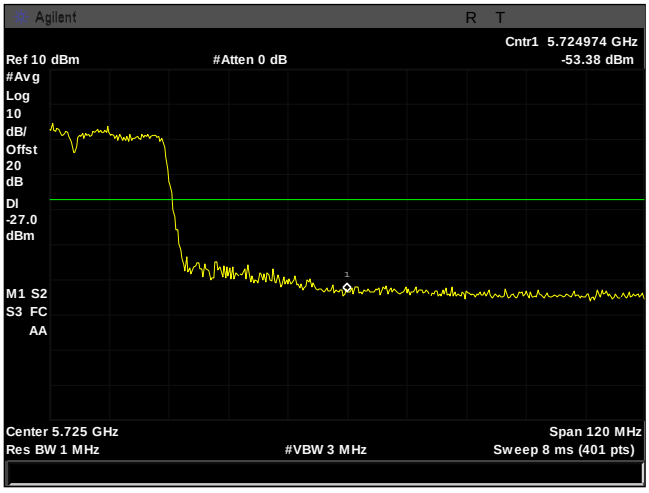
Plot 369. Frequency Stability, 5470 MHz, Band Edge, 80 MHz, Channel Average 80.C



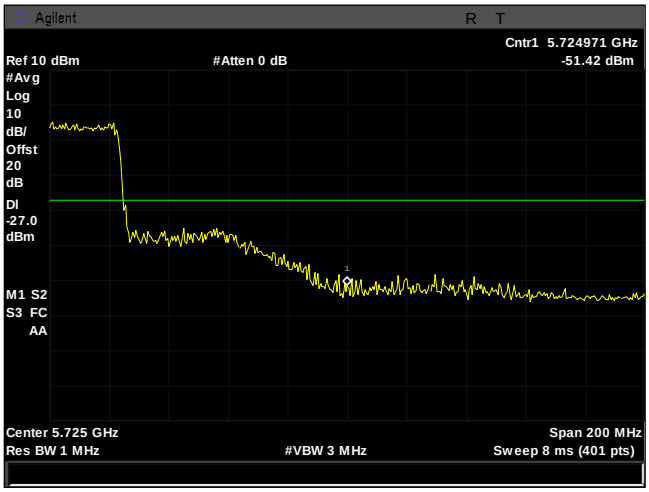
Plot 370. Frequency Stability, 5470 MHz, Band Edge, 20 MHz, Channel Average 80.C



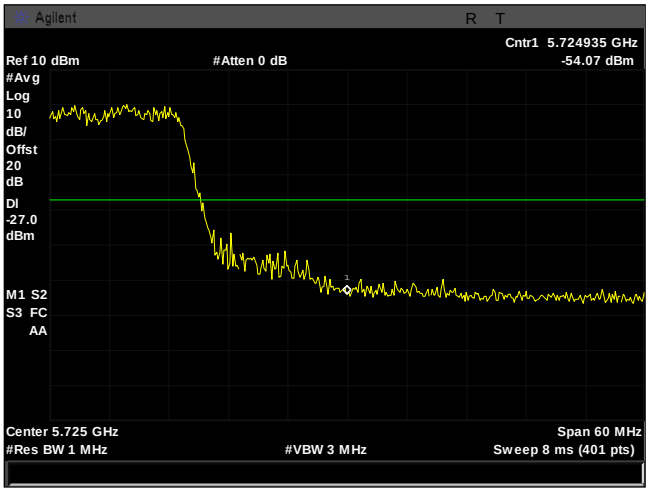
Plot 371. Frequency Stability, 5470 MHz, Band Edge, 40 MHz, Channel Average 80.C



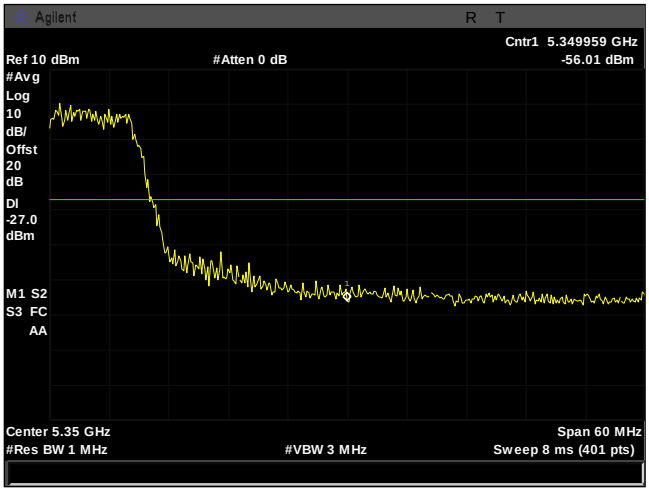
Plot 372. Frequency Stability, 5725 MHz, Band Edge, 40 MHz, Channel Average 80.C



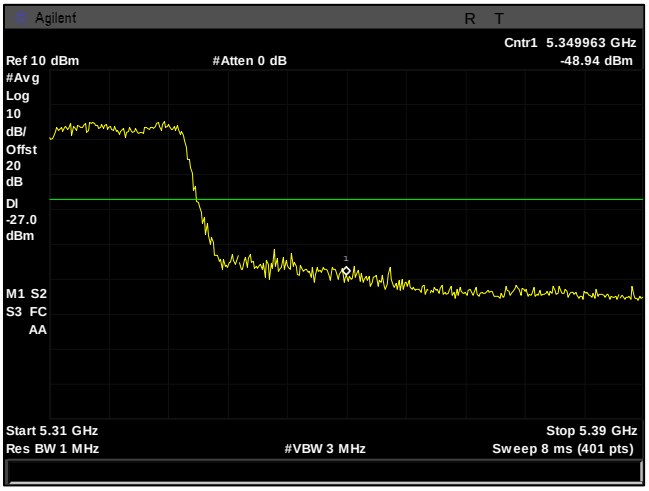
Plot 373. Frequency Stability, 5725 MHz, Band Edge, 80 MHz, Channel Average 80.C



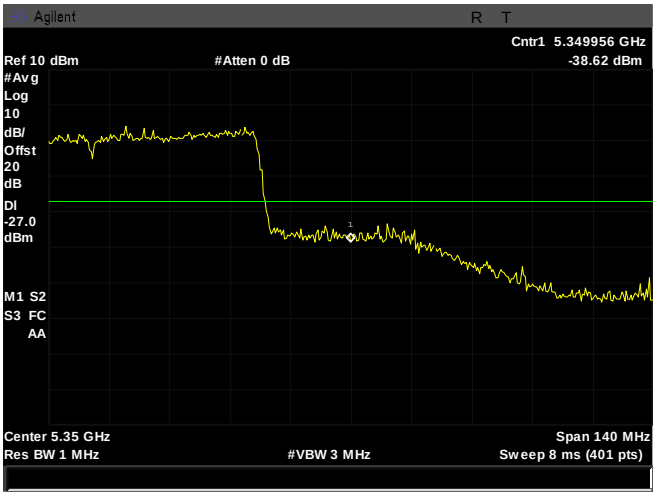
Plot 374. Frequency Stability, 5725 MHz, Band Edge, 20 MHz, Channel Average 80.C



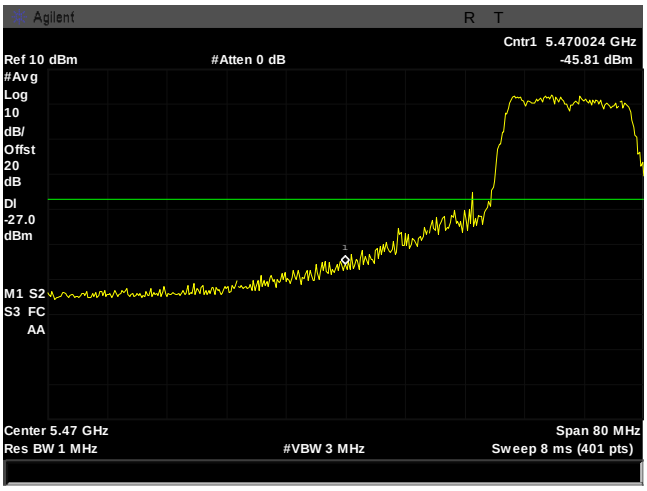
Plot 375. Frequency Stability, 5350 MHz, Band Edge, 20 MHz, Channel Average -40.C



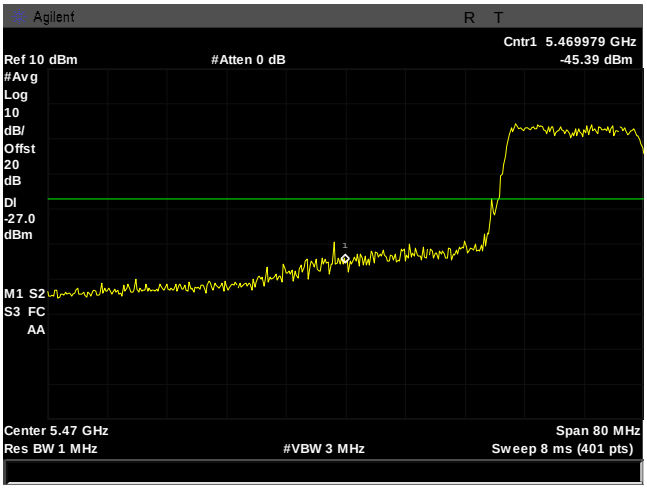
Plot 376. Frequency Stability, 5350 MHz, Band Edge, 40 MHz, Channel Average -40.C



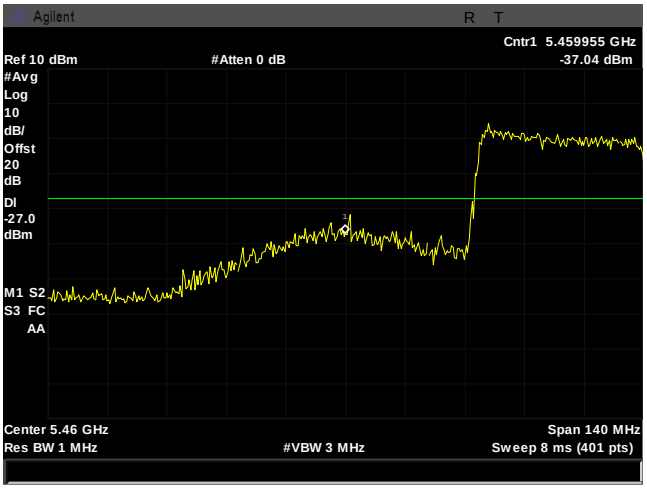
Plot 377. Frequency Stability, 5350 MHz, Band Edge, 80 MHz, Channel Average -40.C



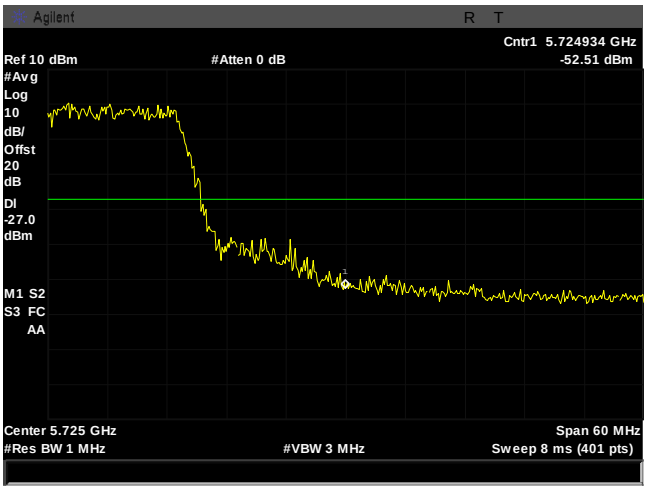
Plot 378. Frequency Stability, 5470 MHz, Band Edge, 20 MHz, Channel Average -40.C



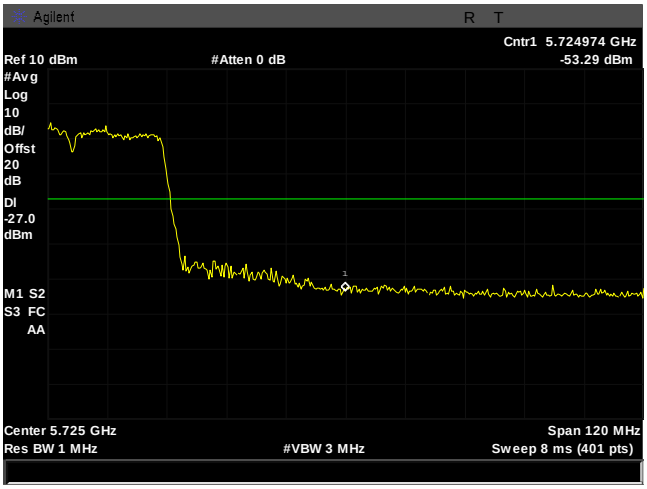
Plot 379. Frequency Stability, 5470 MHz, Band Edge, 40 MHz, Channel Average -40.C



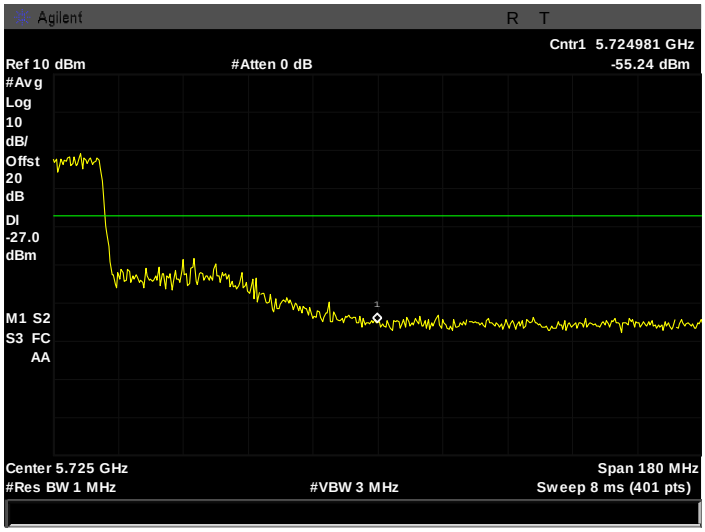
Plot 380. Frequency Stability, 5470 MHz, Band Edge, 80 MHz, Channel Average -40.C



Plot 381. Frequency Stability, 5725 MHz, Band Edge, 20 MHz, Channel Average -40.C



Plot 382. Frequency Stability, 5725 MHz, Band Edge, 40 MHz, Channel Average -40.C



Plot 383. Frequency Stability, 5725 MHz, Band Edge, 80 MHz, Channel Average -40.C

IV. Test Equipment

Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2005.

Asset	Equipment	Manufacturer	Model	Calibration Date	Calibration Due Date
1T4300	SEMI-ANECHOIC CHAMBER # 1 (NSA)	EMC TEST SYSTEMS	NONE	2/6/2015	2/6/2018
1T4404	EMC Test Room 1	MET Laboratories	N/A	Not Required	
1T4149	High-Frequency Anechoic Chamber	Ray Proof	81	Not Required	
1T4771	PSA Spectrum Analyzer	Agilent Technologies	E4446A	8/10/2016	2/10/2018
1T4751	Antenna - Bilog	Sunol Sciences	JB6	2/28/2017	8/28/2018
1T4409	EMI Receiver	Rohde & Schwarz	ESIB7	12/7/2016	12/7/2018
1T4483	Antenna; Horn	ETS-Lindgren	3117	4/19/2017	10/19/2018
1T4829	Spectrum Analyzer	Agilent Technologies	E4407B	2/20/2017	2/20/2018
2T5819	Format Environmental Chamber / Temp Controller / RH Controller	Thermo Electron Corp / Watlow / Watlow	3851/3940M / 982 / 982	4/8/2017	4/8/2018
1T4676	LISN	Solar Electronics Company	9233-50-TS-50-N	4/19/2017	10/19/2018

Table 12. Test Equipment List

Note: Functionally tested equipment is verified using calibrated instrumentation at the time of testing.

V. Certification & User's Manual Information

Certification & User's Manual Information

L. Certification Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 2, Subpart I — Marketing of Radio frequency devices:

§ 2.801 Radio-frequency device defined.

As used in this part, a radio-frequency device is any device which in its operation is capable of Emitting radio-frequency energy by radiation, conduction, or other means. Radio- frequency devices include, but are not limited to:

(a) The various types of radio communication transmitting devices described throughout this chapter.

(b) The incidental, unintentional and intentional radiators defined in Part 15 of this chapter.

(c) The industrial, scientific, and medical equipment described in Part 18 of this chapter.

(d) Any part or component thereof which in use emits radio-frequency energy by radiation, conduction, or other means.

§ 2.803 Marketing of radio frequency devices prior to equipment authorization.

(a) Except as provided elsewhere in this chapter, no person shall sell or lease, or offer for sale or lease (including advertising for sale or lease), or import, ship or distribute for the purpose of selling or leasing or offering for sale or lease, any radio frequency device unless:

(1) In the case of a device subject to certification, such device has been authorized by the Commission in accordance with the rules in this chapter and is properly identified and labeled as required by §2.925 and other relevant sections in this chapter; or

(2) In the case of a device that is not required to have a grant of equipment authorization issued by the Commission, but which must comply with the specified technical standards prior to use, such device also complies with all applicable administrative (including verification of the equipment or authorization under a Declaration of Conformity, where required), technical, labeling and identification requirements specified in this chapter.

(d) Notwithstanding the provisions of paragraph (a) of this section, the offer for sale solely to business, commercial, industrial, scientific or medical users (but not an offer for sale to other parties or to end users located in a residential environment) of a radio frequency device that is in the conceptual, developmental, design or pre-production stage is permitted prior to equipment authorization or, for devices not subject to the equipment authorization requirements, prior to a determination of compliance with the applicable technical requirements *provided* that the prospective buyer is advised in writing at the time of the offer for sale that the equipment is subject to the FCC rules and that the equipment will comply with the appropriate rules before delivery to the buyer or to centers of distribution.

(e)(1) Notwithstanding the provisions of paragraph (a) of this section, prior to equipment authorization or determination of compliance with the applicable technical requirements any radio frequency device may be operated, but not marketed, for the following purposes and under the following conditions:

(i) Compliance testing;

(ii) Demonstrations at a trade show provided the notice contained in paragraph (c) of this section is displayed in a conspicuous location on, or immediately adjacent to, the device;

(iii) Demonstrations at an exhibition conducted at a business, commercial, industrial, scientific or medical location, but excluding locations in a residential environment, provided the notice contained in paragraphs (c) or (d) of this section, as appropriate, is displayed in a conspicuous location on, or immediately adjacent to, the device;

(iv) Evaluation of product performance and determination of customer acceptability, provided such operation takes place at the manufacturer's facilities during developmental, design or pre-production states; or

(v) Evaluation of product performance and determination of customer acceptability where customer acceptability of a radio frequency device cannot be determined at the manufacturer's facilities because of size or unique capability of the device, provided the device is operated at a business, commercial, industrial, scientific or medical user's site, but not at a residential site, during the development, design or pre-production stages.

(e)(2) For the purpose of paragraphs (e)(1)(iv) and (e)(1)(v) of this section, the term *manufacturer's facilities* includes the facilities of the party responsible for compliance with the regulations and the manufacturer's premises, as well as the facilities of other entities working under the authorization of the responsible party in connection with the development and manufacture, but not the marketing, of the equipment.

(f) For radio frequency devices subject to verification and sold solely to business, commercial, industrial, scientific and medical users (excluding products sold to other parties or for operation in a residential environment), parties responsible for verification of the devices shall have the option of ensuring compliance with the applicable technical specifications of this chapter at each end user's location after installation, provided that the purchase or lease agreement includes a proviso that such a determination of compliance be made and is the responsibility of the party responsible for verification of the equipment.

Certification & User's Manual Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 2, Subpart J — Equipment Authorization Procedures:

§ 2.901 Basis and Purpose

(a) In order to carry out its responsibilities under the Communications Act and the various treaties and international regulations, and in order to promote efficient use of the radio spectrum, the Commission has developed technical standards for radio frequency equipment and parts or components thereof. The technical standards applicable to individual types of equipment are found in that part of the rules governing the service wherein the equipment is to be operated.[1] *In addition to the technical standards provided, the rules governing the service may require that such equipment be verified by the manufacturer or importer*, be authorized under a Declaration of Conformity, or receive an equipment authorization from the Commission by one of the following procedures: certification or registration.

(b) The following sections describe the verification procedure, the procedure for a Declaration of Conformity, and the procedures to be followed in obtaining certification from the Commission and the conditions attendant to such a grant.

§ 2.907 Certification.

(a) Certification is an equipment authorization issued by the Commission, based on representation and test data submitted by the applicant.

(b) Certification attaches to all units subsequently marketed by the grantee which are identical (see Section 2.908) to the sample tested except for permissive changes or other variations authorized by the Commission pursuant to Section 2.1043.

[1] In this case, the equipment is subject to the rules of Part 15. More specifically, the equipment falls under Subpart B (of Part 15), which deals with unintentional radiators.

Certification & User's Manual Information

§ 2.948 Description of measurement facilities.

(a) Each party making measurements of equipment that is subject to an equipment authorization under Part 15 or Part 18 of this chapter, regardless of whether the measurements are filed with the Commission or kept on file by the party responsible for compliance of equipment marketed within the U.S. or its possessions, shall compile a description of the measurement facilities employed.

(1) If the measured equipment is subject to the verification procedure, the description of the measurement facilities shall be retained by the party responsible for verification of the equipment.

(i) If the equipment is verified through measurements performed by an independent laboratory, it is acceptable for the party responsible for verification of the equipment to rely upon the description of the measurement facilities retained by or placed on file with the Commission by that laboratory. In this situation, the party responsible for the verification of the equipment is not required to retain a duplicate copy of the description of the measurement facilities.

(ii) If the equipment is verified based on measurements performed at the installation site of the equipment, no specific site calibration data is required. It is acceptable to retain the description of the measurement facilities at the site at which the measurements were performed.

(2) If the equipment is to be authorized by the Commission under the certification procedure, the description of the measurement facilities shall be filed with the Commission's Laboratory in Columbia, Maryland. The data describing the measurement facilities need only be filed once but must be updated as changes are made to the measurement facilities or as otherwise described in this section. At least every three years, the organization responsible for filing the data with the Commission shall certify that the data on file is current.

Certification & User's Manual Information

Label and User's Manual Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 15, Subpart A — General:

§ 15.19 Labeling requirements.

(a) In addition to the requirements in Part 2 of this chapter, a device subject to certification or verification shall be labeled as follows:

(1) Receivers associated with the operation of a licensed radio service, e.g., FM broadcast under Part 73 of this chapter, land mobile operation under Part 90, etc., shall bear the following statement in a conspicuous location on the device:

This device complies with Part 15 of the FCC Rules. Operation is subject to the condition that this device does not cause harmful interference.

(2) A stand-alone cable input selector switch, shall bear the following statement in a conspicuous location on the device:

This device is verified to comply with Part 15 of the FCC Rules for use with cable television service.

(3) All other devices shall bear the following statement in a conspicuous location on the device:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

(4) Where a device is constructed in two or more sections connected by wires and marketed together, the statement specified under paragraph (a) of this section is required to be affixed only to the main control unit.

(5) When the device is so small or for such use that it is not practicable to place the statement specified under paragraph (a) of this section on it, the information required by this paragraph shall be placed in a prominent location in the instruction manual or pamphlet supplied to the user or, alternatively, shall be placed on the container in which the device is marketed. However, the FCC identifier or the unique identifier, as appropriate, must be displayed on the device.

§ 15.21 Information to user.

The users manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Verification & User's Manual Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 15, Subpart B — Unintentional Radiators:

§ 15.105 Information to the user.

(a) For a Class A digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at own expense.

(b) For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

– Reorient or relocate the receiving antenna.

– Increase the separation between the equipment and receiver.

– Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

– Consult the dealer or an experienced radio/TV technician for help.

