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
13501 MCCALLEN PASS ● AUSTIN, TX 78753 ● PHONE (512) 287-2500 ● FAX (512) 287-2513

August 9, 2016

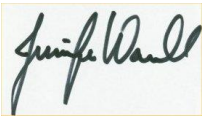
Amimon
2 Maskit St Building D, 2nd Floor
Herzelia, Israel 46733

Dear Gabi Nocham,

Enclosed is the EMC Wireless test report for compliance testing of the Amimon, AMNCVTX01 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.



Jennifer Warnell
Documentation Department

Reference: (\Amimon\EMC89646A-FCC407 UNII 2 Rev. 3)

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Electromagnetic Compatibility Criteria
Test Report

for the

Amimon
Model AMNCVTX01

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

MET Report: EMC89646A-FCC407 UNII 2 Rev. 3

August 9, 2016

Prepared For:

Amimon
2 Maskit St Building D, 2nd Floor
Herzelia, Israel 46733

Prepared By:
MET Laboratories, Inc.
914 W. Patapsco Ave.
Baltimore, MD 21230

Electromagnetic Compatibility Criteria
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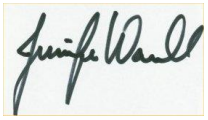
Title 47 of the CFR
15.407 Subpart E

Hadid Jones, Project Engineer
Electromagnetic Compatibility Lab



Jennifer Warnell
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.

Asad Bajwa,
Director, Electromagnetic Compatibility Lab

Report Status Sheet

Revision	Report Date	Reason for Revision
∅	June 7, 2016	Initial Issue.
1	June 27, 2016	Engineer Corrections.
2	July 5, 2016	Engineer corrections.
3	August 9, 2016	Added non-occupancy plot.

Table of Contents

List of Tables

List of Photographs

List of Plots

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 Amimon AMNCVTX01, 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 AMNCVTX01. Amimon should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the AMNCVTX01, 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 Amimon, purchase order number 16000358. 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(f)	RF Exposure	Compliant
15.407 (h)(2)	U-NII Detection Bandwidth	Not Applicable
15.407(h)(2)(ii)	Channel Availability Check Time	Not Applicable
15.407(h)(2)(ii-iii)	In-Service Monitoring	Compliant
15.407(h)(2)	Statistical Performance Check	Not Applicable

Table 1. Executive Summary of EMC Part 15.407 ComplianceTesting

II. Equipment Configuration

A. Overview

MET Laboratories, Inc. was contracted by Amimon to perform testing on the AMNCVTX01, under Amimon's purchase order number 16000358.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Amimon AMNCVTX01.

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

Model(s) Tested:	AMNCVTX01	
Model(s) Covered:	AMNCVTX01	
EUT Specifications:	Primary Power: 120 VAC, 60 Hz	
	FCC ID: VQSAMNCVTX01	
	Type of Modulations:	OFDM
	Equipment Code:	NII
	Peak RF Output Power:	U-NII 2A, 22.1 dBm U-NII 2C, 23.6 dBm
	EUT Frequency Ranges:	5255-2325 MHz and 5495-5705 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:	Hadid Jones	
Report Date(s):	July 5, 2016	

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 v01	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., 914 W. Patapsco Ave., 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.

D. Description of Test Sample

The Amimon AMNCVTX01, Equipment Under Test (EUT), is designed to modulate and transmit downstream video and audio content over the wireless medium and receive a control channel over the wireless upstream. The modulation uses a 40, 20 or 10 MHz bandwidth and is carried over the 5GHz unlicensed band.

E. Equipment Configuration

Ref. ID	Name / Description	Model Number	Part Number	Serial Number	Revision
--	Camera Vision TX device	AMNCVTX01	--	--	--

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
1	S-Bus + Telemetry terminated cable	Amimon	--
2	DC Power cable	Amimon	--
3	USB Cable	Wanshih	--
4	HDMI Type A-C cable	Wanshih	
5	HDMI Media streamer	WD	--
6	PC	Dell	--

Table 5. Support Equipment

G. Ports and Cabling Information

Ref. ID	Port Name on EUT	Cable Description	Qty.	Length (m)	Shielded (Y/N)	Termination Point
J2, J3 or J1, J4	Antenna ports	--	2 or 2	--	--	2 MMCX (J2 J3) or 2 UFL (J1, J4)
J5	B2b	--	1	--	--	--
J6	Power in	--	1	--	No	--
J7	uUSB Port		1		Yes	--
J8	Input of MIPI signal		1		Yes	--
J9	DC supply to peripheral camera	--	--	--	--	--
J11	UART	--	--	--	--	--

Table 6. Ports and Cabling Information

H. Mode of Operation

The AMNCVTX01 can be set into Test-Mode, simulating a continuous (100% duty-cycle) transmission mode of video test pattern. The frequency and power of operation may be programmed by the LAB using a PC tool and a serial communication connector.

I. Method of Monitoring EUT Operation

Slow blinking (on-off once during 1sec) blue LED indicates that board is functioning.

Fast blinking (on-off 3-4 times during 1sec) same LED, means that the board is out of calibration.

When this LED is not blinking this means that board has a certain problem.

Using the SW tool to configure the board, when configuration ended successfully a clear green indication appears, while a red bad indication appears when the desired configuration fails.

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 Amimon 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. The EUT has a unique reverse polarity antenna.

Test Engineer(s): Hadid Jones

Test Date(s): 01/12/16

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15. 403(i) 26dB Bandwidth

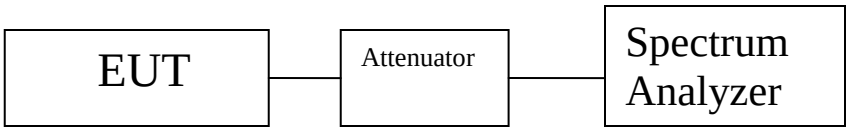
Test Requirements: **§ 15.403(i):** For purposes of this subpart the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of 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): Hadid Jones

Test Date(s): 02/17/16



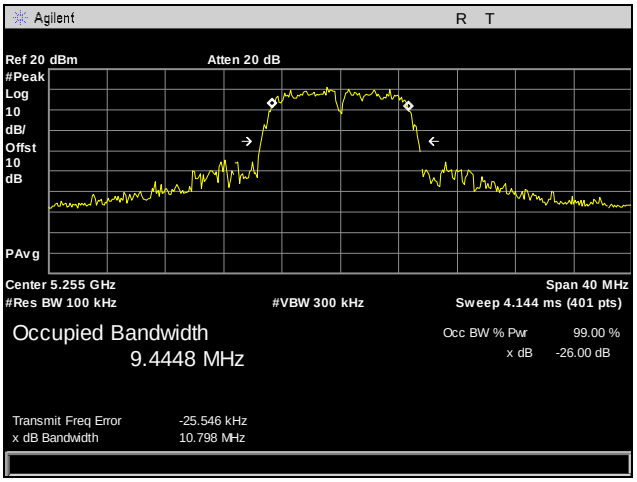
OBW 10MHz	
Frequency MHz	**-26db (MHz)**
5255	10.79
5305	11.00
5325	13.00
5495	15.61
5555	15.23
5705	21.12
OBW 20MHz	
Frequency MHz	**-26db (MHz)**
5260	27.70
5300	28.04
5320	24.60
5500	35.37
5540	38.82
5620	45.70
5700	44.19
OBW 40MHz	
Frequency MHz	**-26db (MHz)**
5270	78.91
5310	77.95
5510	87.87
5590	95.56
5670	96.97

Table 7. Occupied Bandwidth, Test Results, Channel 0

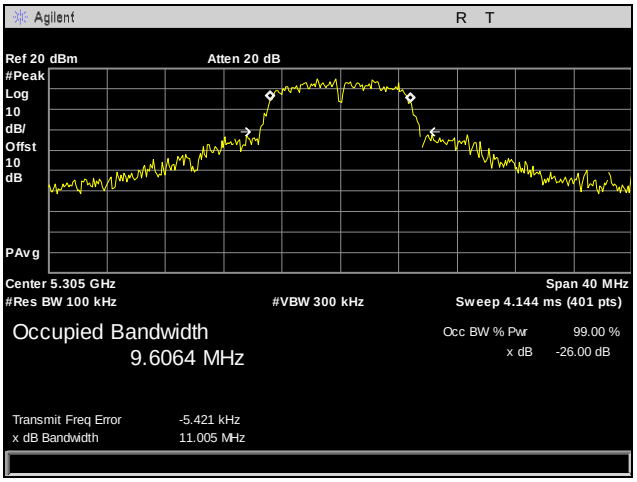
OBW 10MHz	
Frequency MHz	**-26db (MHz)**
5255	10.61
5305	10.64
5325	13.32
5495	15.68
5555	14.31
5705	10.60
OBW 20MHz	
Frequency MHz	**-26db (MHz)**
5260	30.13
5300	33.98
5320	33.98
5500	19.34
5540	31.12
5620	29.02
5700	20.61
OBW 40MHz	
Frequency MHz	**-26db (MHz)**
5270	93.55
5310	90.12
5510	91.67
5590	86.23
5670	82.73

Table 8. Occupied Bandwidth, Test Results, Channel 1

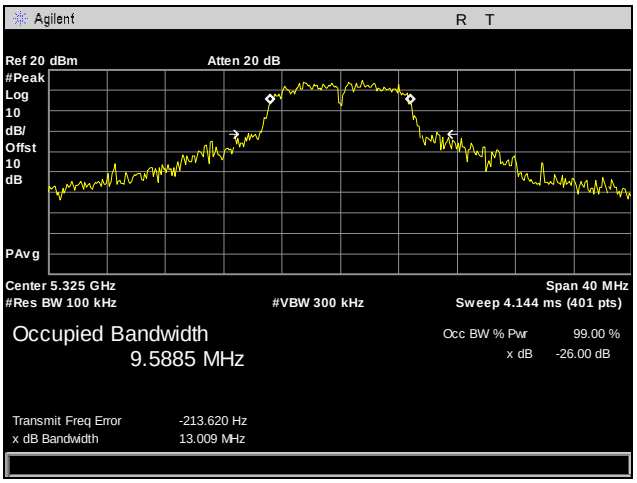
Occupied Bandwidth, 10 MHz, Channel 0



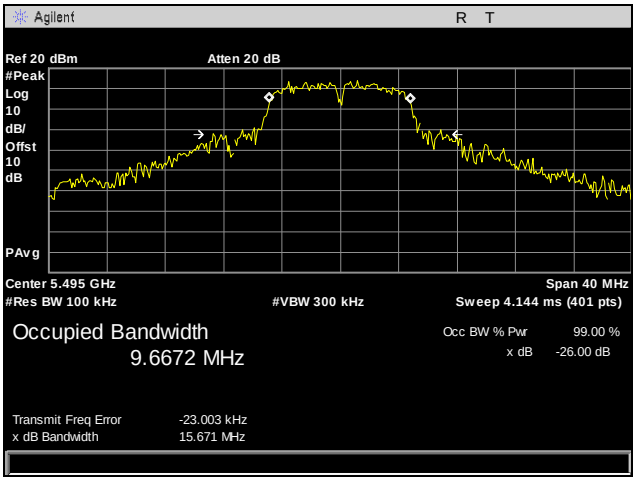
Plot 1. Occupied Bandwidth, 5255 MHz, 10 MHz, Channel 0



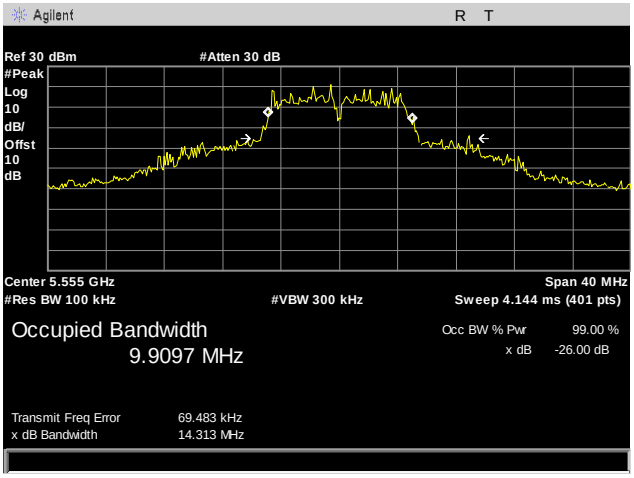
Plot 2. Occupied Bandwidth, 5305 MHz, 10 MHz, Channel 0



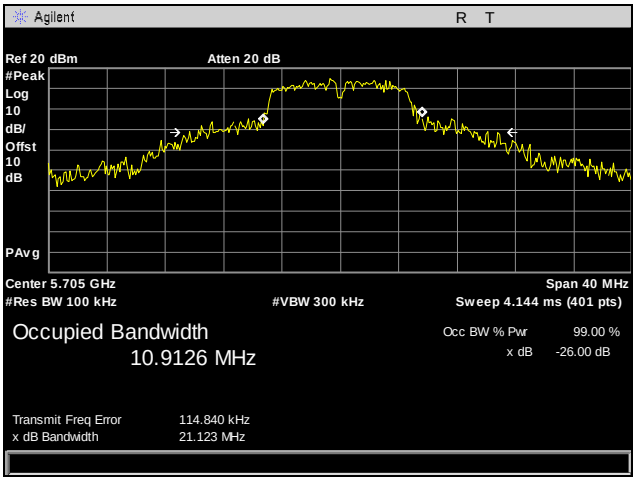
Plot 3. Occupied Bandwidth, 5325 MHz, 10 MHz, Channel 0



Plot 4. Occupied Bandwidth, 5495 MHz, 10 MHz, Channel 0

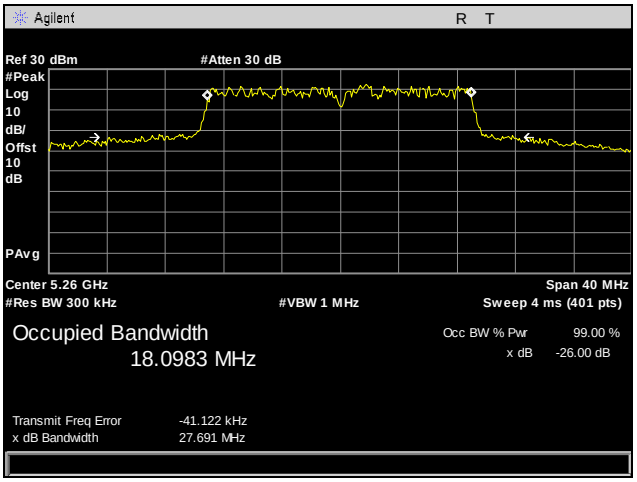


Plot 5. Occupied Bandwidth, 5555 MHz, 10 MHz, Channel 1

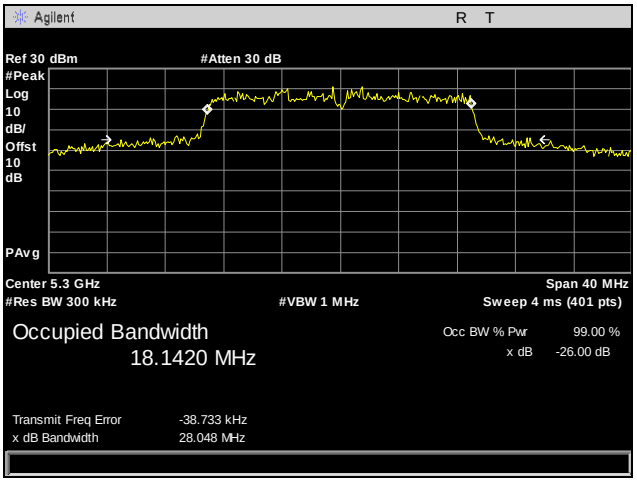


Plot 6. Occupied Bandwidth, 5705 MHz, 10 MHz, Channel 0

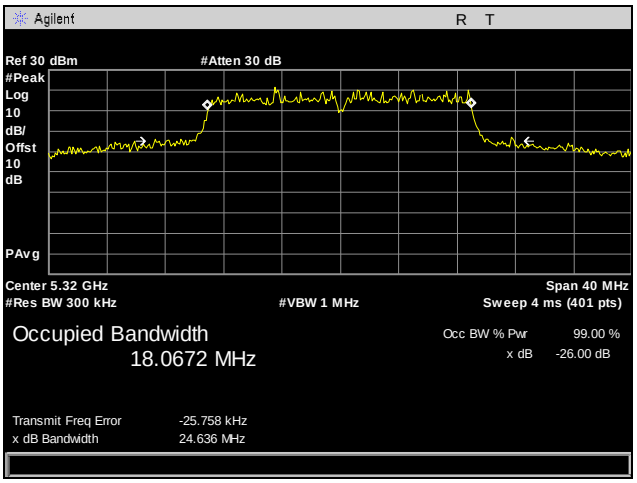
Occupied Bandwidth, 20 MHz, Channel 0



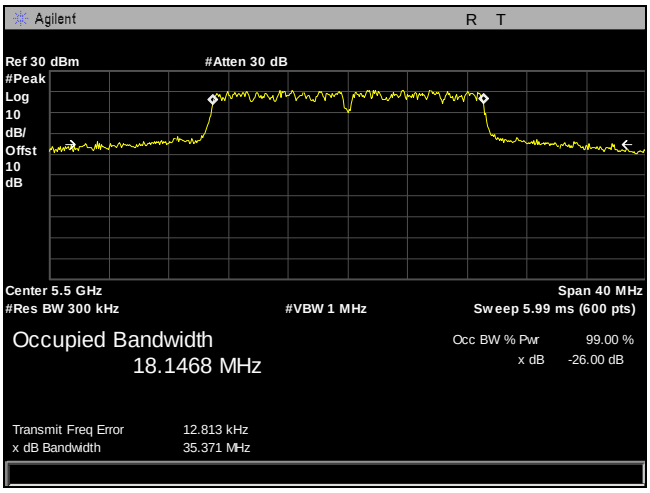
Plot 7. Occupied Bandwidth, 5260 MHz, 20 MHz, Channel 0



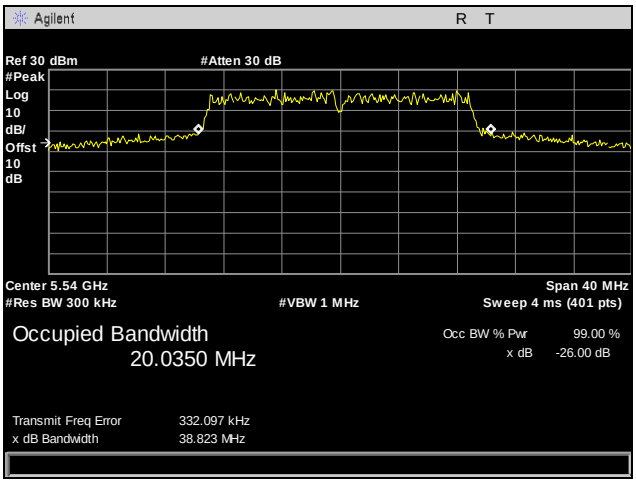
Plot 8. Occupied Bandwidth, 5300 MHz, 20 MHz, Channel 0



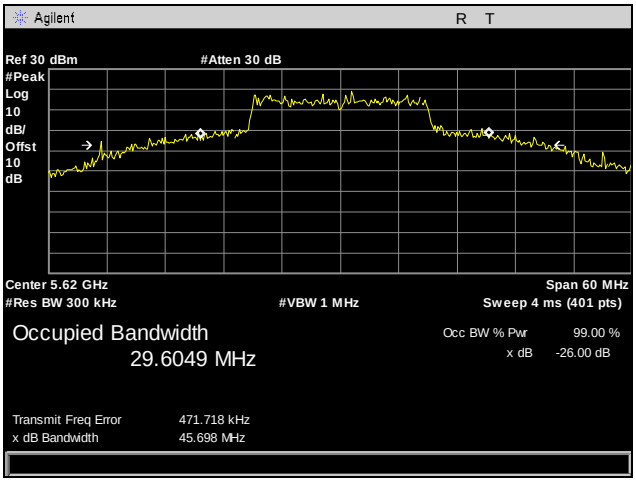
Plot 9. Occupied Bandwidth, 5320 MHz, 20 MHz, Channel 0



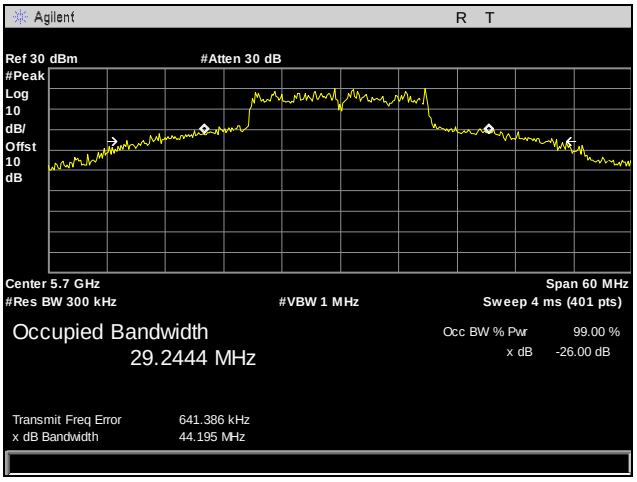
Plot 10. Occupied Bandwidth, 5500 MHz, 20 MHz, Channel 0



Plot 11. Occupied Bandwidth, 5540 MHz, 20 MHz, Channel 0

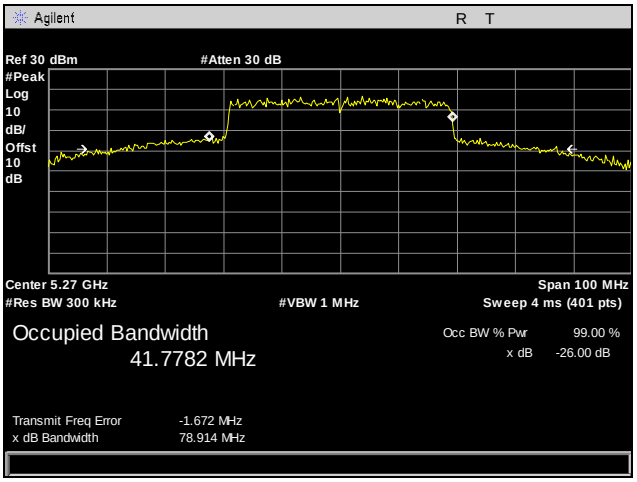


Plot 12. Occupied Bandwidth, 5620 MHz, 20 MHz, Channel 0

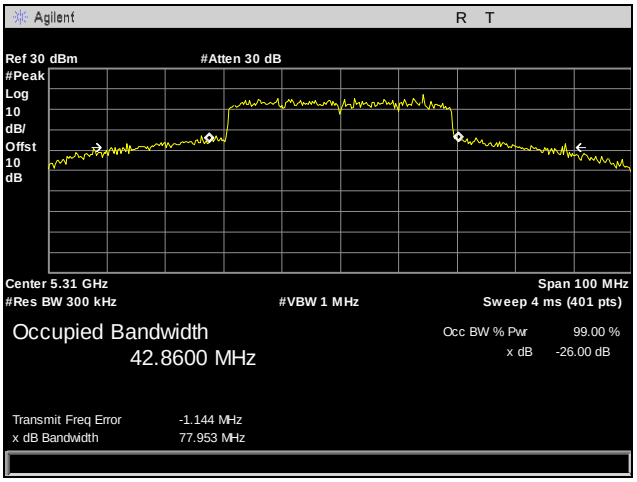


Plot 13. Occupied Bandwidth, 5700 MHz, 20 MHz, Channel 0

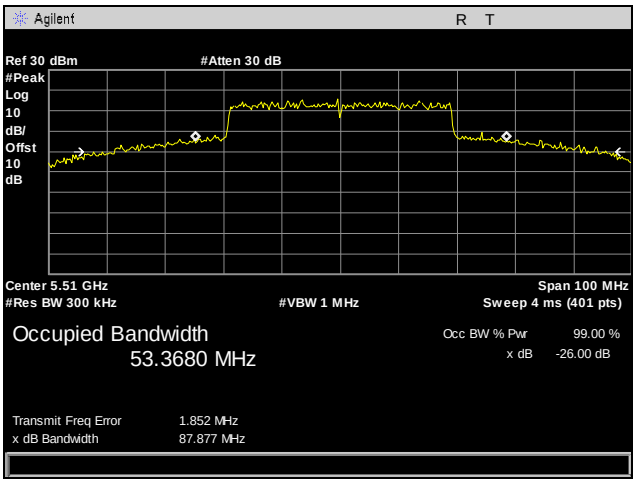
Occupied Bandwidth, 40 MHz, Channel 0



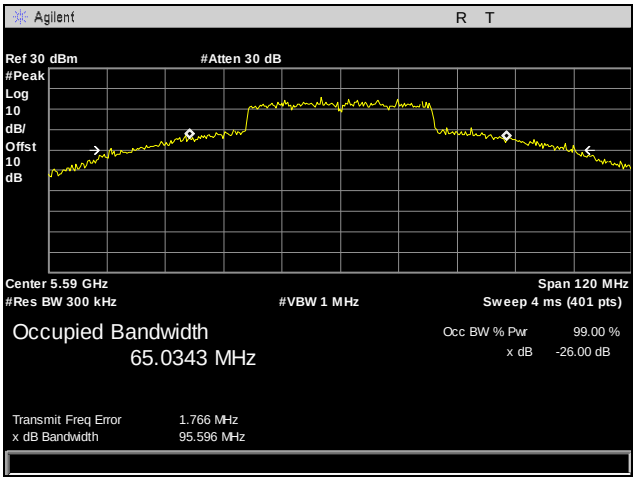
Plot 14. Occupied Bandwidth, 5270 MHz, 40 MHz, Channel 0



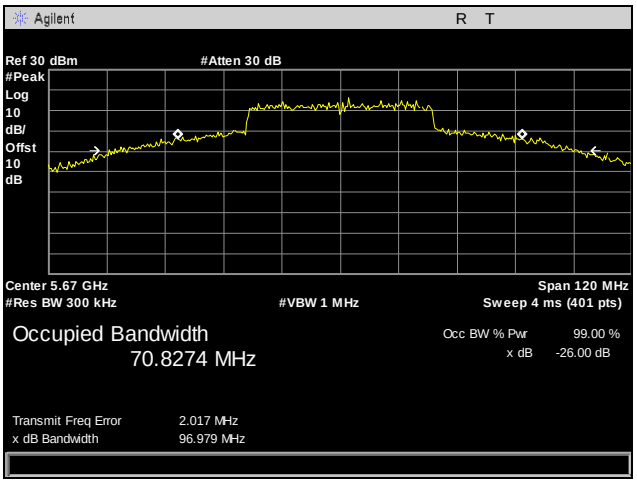
Plot 15. Occupied Bandwidth, 5310 MHz, 40 MHz, Channel 0



Plot 16. Occupied Bandwidth, 5510 MHz, 40 MHz, Channel 0



Plot 17. Occupied Bandwidth, 5590 MHz, 40 MHz, Channel 0



Plot 18. Occupied Bandwidth, 5760 MHz, 40 MHz, Channel 0

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.

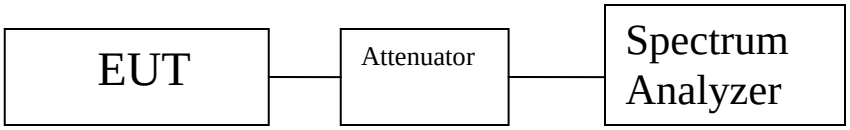
Test Procedure: The EUT was connected to a spectrum analyzer through a cable and attenuator. Measurements were taken with the EUT set to transmit continuously on its low, mid, and high channels. Its power was measured according to measurement method SA-1, as described in 789033 D02 General UNII Test Procedures v01.

To verify the TPC requirement of the rule part, observations using the same measurement method were made with the EUT set to a lower power setting.

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

Test Engineer(s): Hadid Jones

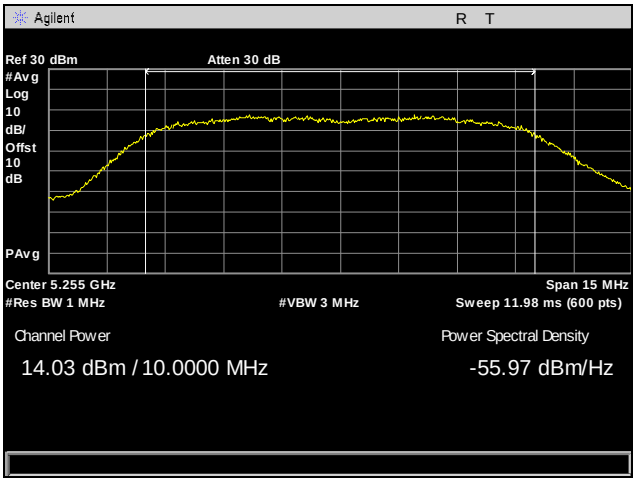
Test Date(s): 02/17/16



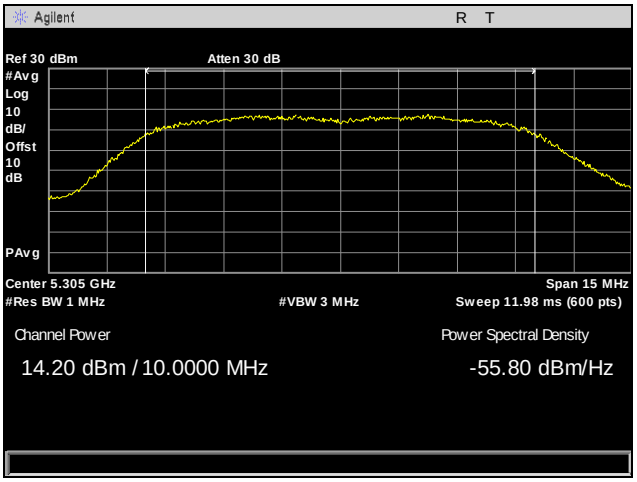
Maximum Output Power 10MHz Band (FCC)							
Frequency (MHz)	**Conducted Power CH0 (dBm)**	**Conducted Power CH1 (dBm)**	**Conducted Power Total (dBm)**	**-26db BW worse case (MHz)**	**Conducted Power Limit (dBm)**	**Conducted Power Margin (dB)**	**Total Antenna Gain (dBi)**
5255	**14.03**	**13.57**	16.8	10.80	21.3	**-4.5**	2
5305	**14.2**	**13.92**	17.1	10.80	21.3	**-4.3**	2
5325	**13.44**	**13.76**	16.6	10.80	21.3	**-4.7**	2
5495	**13.48**	**13.03**	16.3	10.80	21.3	**-5.1**	2
5555	**13.27**	**13.32**	16.3	10.80	21.3	**-5.0**	2
5705	**13.08**	**12.67**	15.9	10.80	21.3	**-5.4**	2
Maximum Output Power 20MHz Band (FCC)							
Frequency (MHz)	**Conducted Power CH0 (dBm)**	**Conducted Power CH1 (dBm)**	**Conducted Power Total (dBm)**	**-26db BW worse case (MHz)**	**Conducted Power Limit (dBm)**	**Conducted Power Margin (dB)**	**Total Antenna Gain (dBi)**
5260	17.6	17.5	20.6	20.6	24.0	**-3.4**	2
5300	18.6	19.4	22.1	20.6	24.0	**-1.9**	2
5320	18.7	19.5	22.1	20.6	24.0	**-1.9**	2
5500	19.65	19.92	22.8	20.6	24.0	**-1.2**	2
5540	20.1	20.0	23.0	20.6	24.0	**-1.0**	2
5620	19.8	18.9	22.4	20.6	24.0	**-1.6**	2
5700	20.5	18.5	22.6	20.6	24.0	**-1.4**	2
Maximum Output Power 40MHz Band (FCC)							
Frequency (MHz)	**Conducted Power CH0 (dBm)**	**Conducted Power CH1 (dBm)**	**Conducted Power Total (dBm)**	**-26db BW worse case (MHz)**	**Conducted Power Limit (dBm)**	**Conducted Power Margin (dB)**	**Total Antenna Gain (dBi)**
5270	18.6	18.2	21.4	79	24	**-2.6**	2
5310	16.0	14.2	18.2	79	24	**-5.8**	2
5510	15.5	15.2	18.4	79	24	**-5.6**	2
5550	18.6	17.9	21.3	79	24	**-2.7**	2
5590	20.4	20.0	23.2	79	24	**-0.8**	2
5670	21.1	20.1	23.6	79	24	**-0.4**	2

Table 9. Maximum Conducted Output Power, Test Results

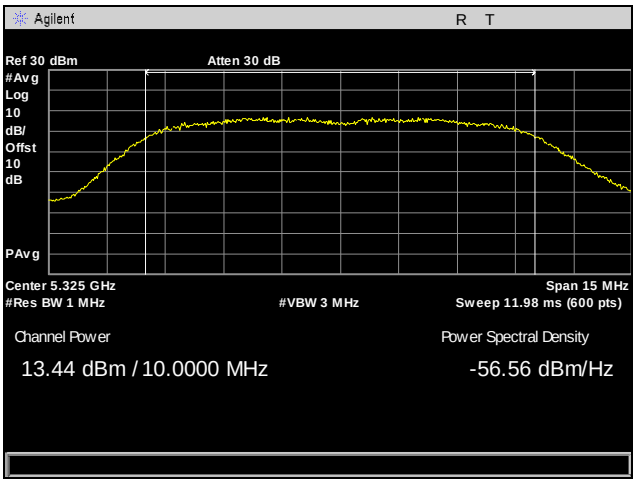
Maximum Conducted Output Power, 10 MHz, Channel 0



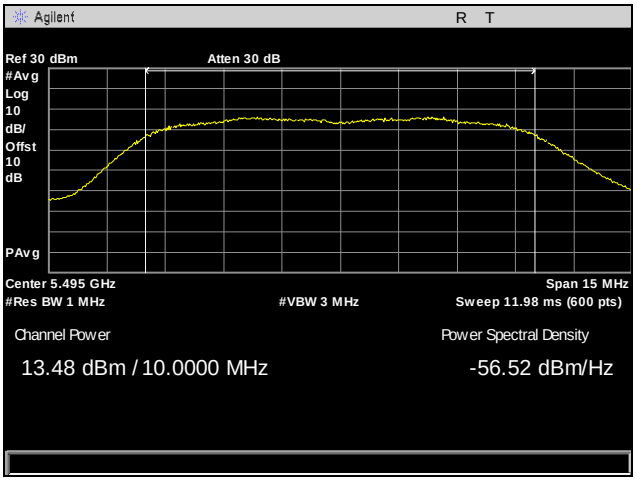
Plot 19. Maximum Conducted Output Power, 5255 MHz, 10 MHz, Channel 0



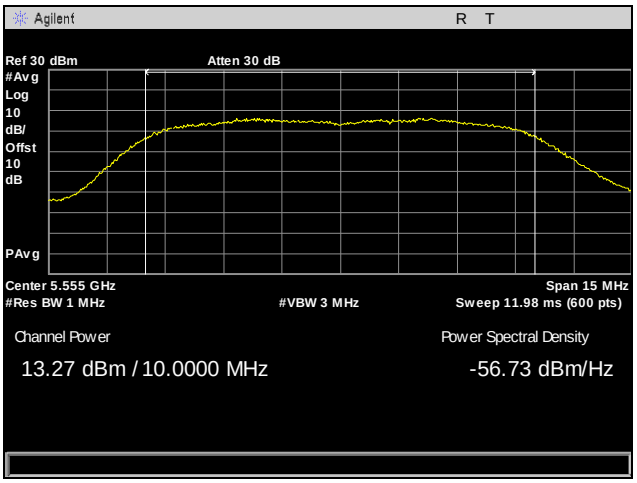
Plot 20. Maximum Conducted Output Power, 5305 MHz, 10 MHz, Channel 0



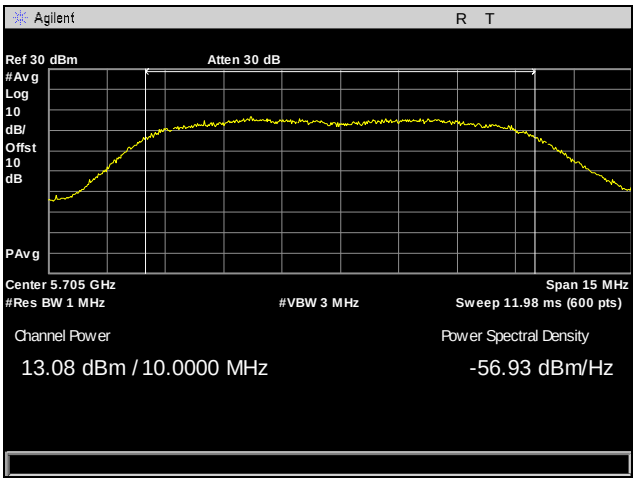
Plot 21. Maximum Conducted Output Power, 5325 MHz, 10 MHz, Channel 0



Plot 22. Maximum Conducted Output Power, 5495 MHz, 10 MHz, Channel 0

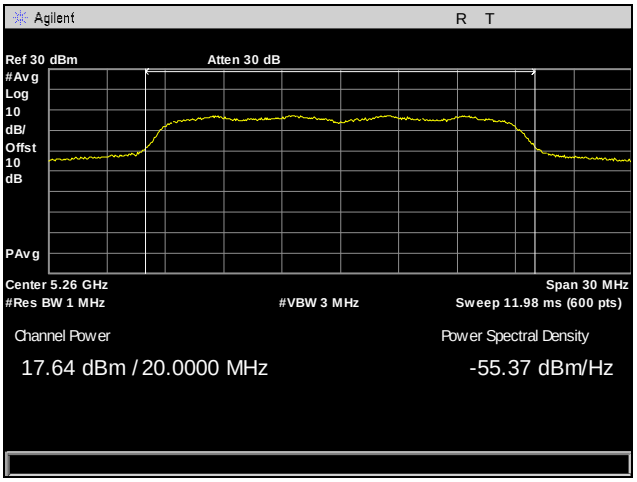


Plot 23. Maximum Conducted Output Power, 5555 MHz, 10 MHz, Channel 0

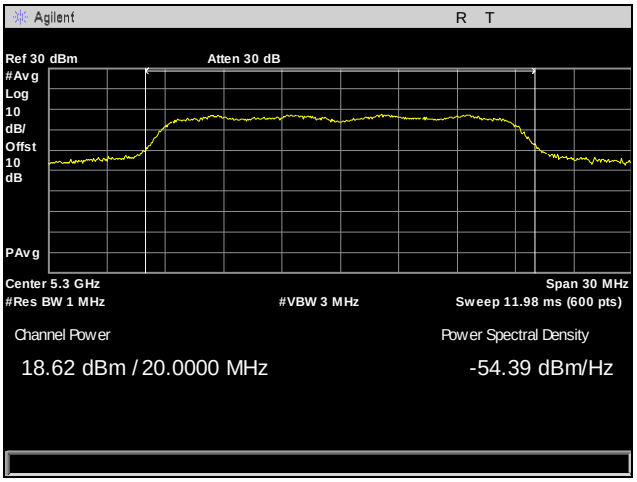


Plot 24. Maximum Conducted Output Power, 5705 MHz, 10 MHz, Channel 0

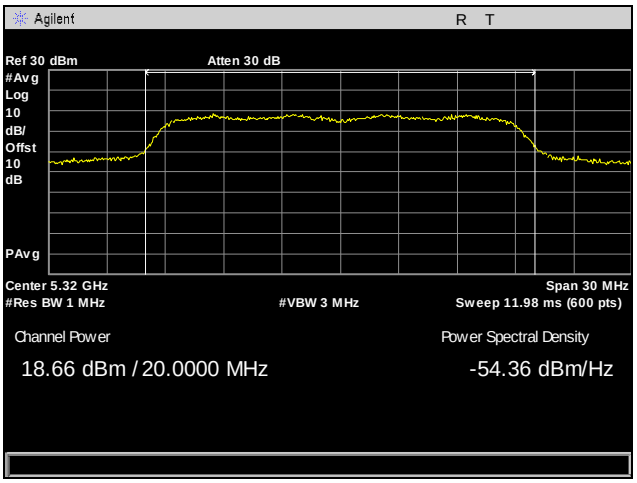
Maximum Conducted Output Power, 20 MHz, Channel 0



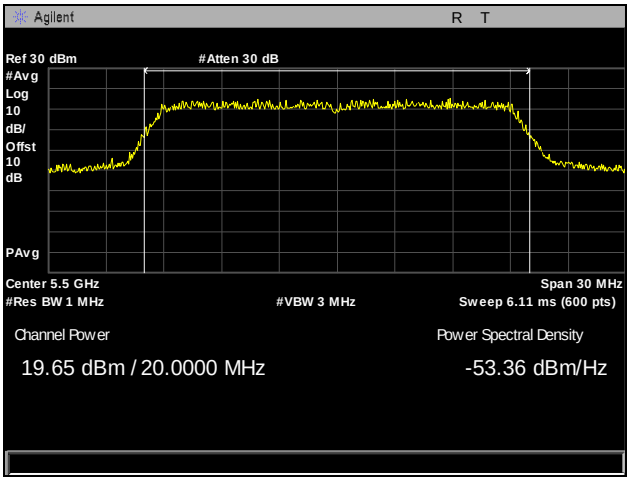
Plot 25. Maximum Conducted Output Power, 5260 MHz, 20 MHz, Channel 0



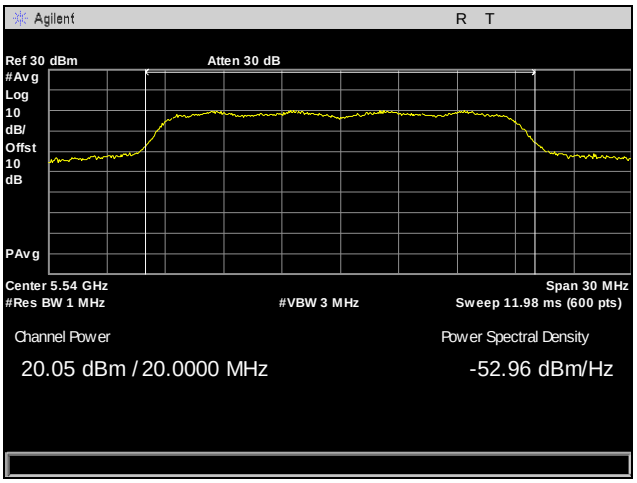
Plot 26. Maximum Conducted Output Power, 5300 MHz, 20 MHz, Channel 0



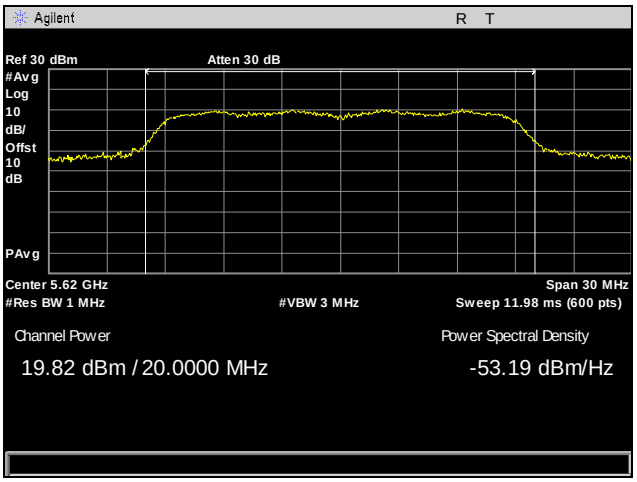
Plot 27. Maximum Conducted Output Power, 5320 MHz, 20 MHz, Channel 0



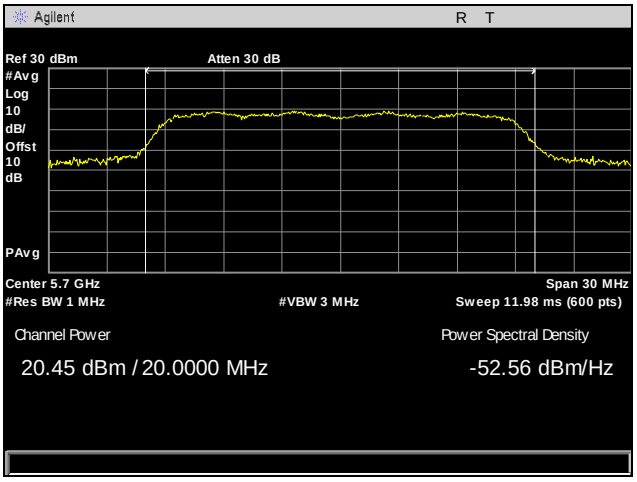
Plot 28. Maximum Conducted Output Power, 5500 MHz, 20 MHz, Channel 0



Plot 29. Maximum Conducted Output Power, 5540 MHz, 20 MHz, Channel 0

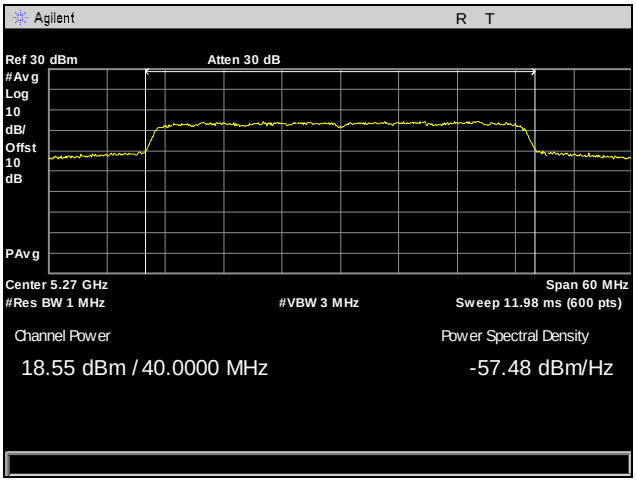


Plot 30. Maximum Conducted Output Power, 5620 MHz, 20 MHz, Channel 0

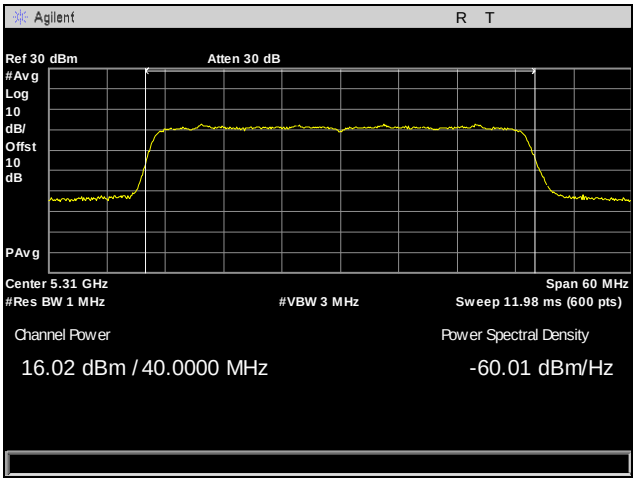


Plot 31. Maximum Conducted Output Power, 5700 MHz, 20 MHz, Channel 0

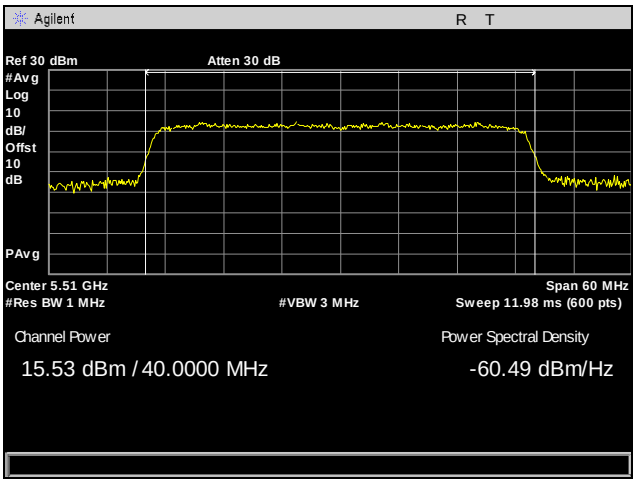
Maximum Conducted Output Power, 40 MHz, Channel 0



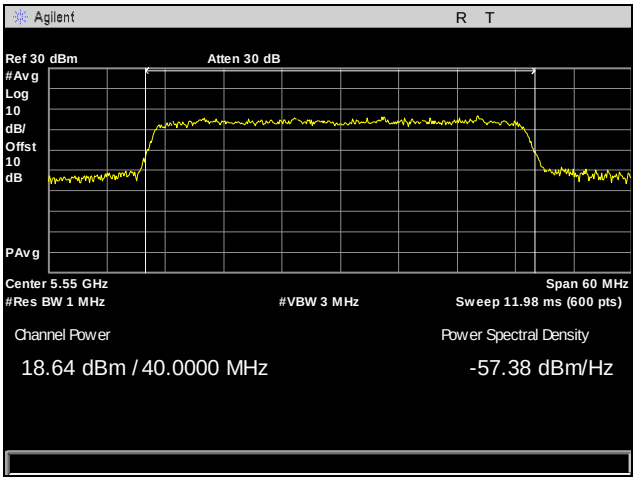
Plot 32. Maximum Conducted Output Power, 5270 MHz, 40 MHz, Channel 0



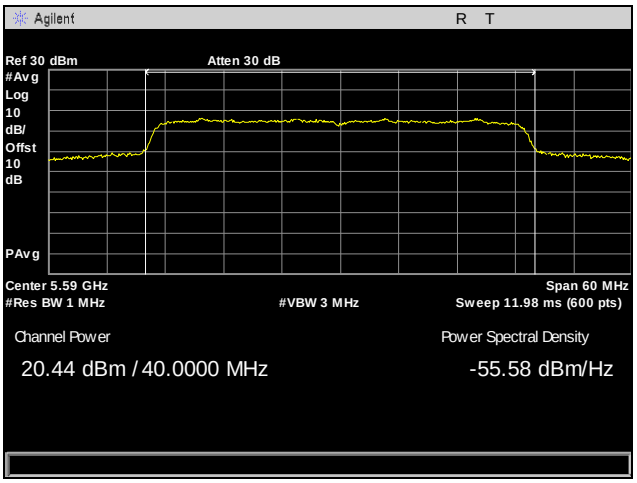
Plot 33. Maximum Conducted Output Power, 5310 MHz, 40 MHz, Channel 0



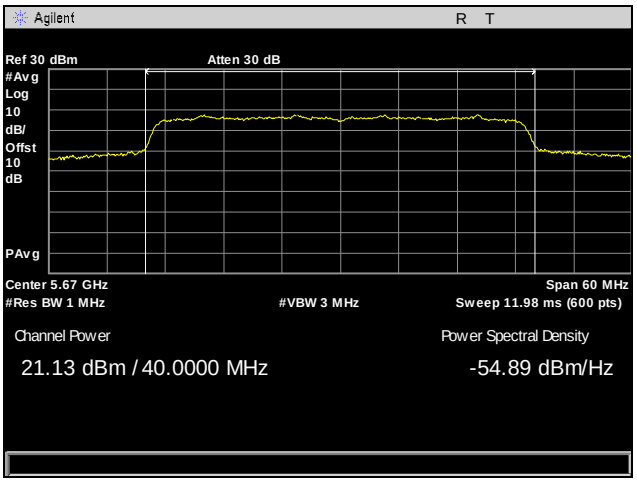
Plot 34. Maximum Conducted Output Power, 5510 MHz, 40 MHz, Channel 0



Plot 35. Maximum Conducted Output Power, 5550 MHz, 40 MHz, Channel 0



Plot 36. Maximum Conducted Output Power, 5590 MHz, 40 MHz, Channel 0



Plot 37. Maximum Conducted Output Power, 5760 MHz, 40 MHz, Channel 0

Electromagnetic Compatibility Criteria for Intentional Radiators

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

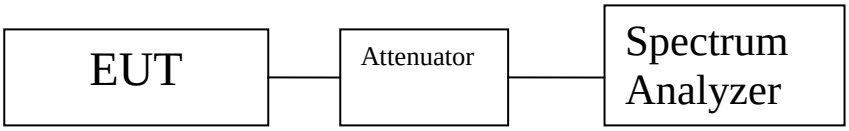
Test Requirements: **§15.407(a)(2):** In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced 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 with the EUT set to transmit continuously on its low, mid, and high channels. Its power was measured according KDB 789033 D02 General UNII Test Procedures v01.

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

Test Engineer(s): Hadid Jones

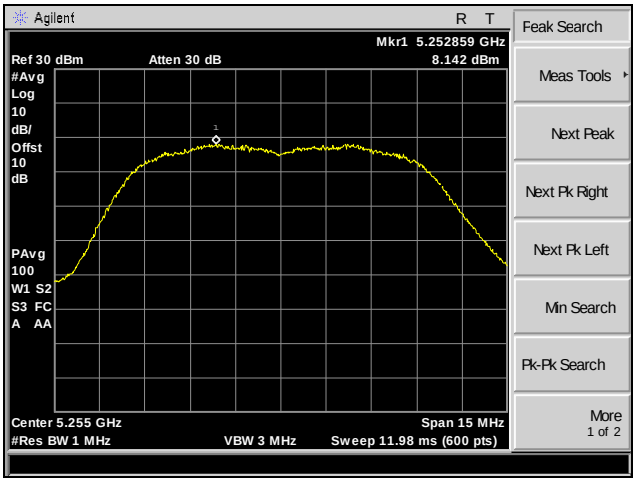
Test Date(s): 02/17/16



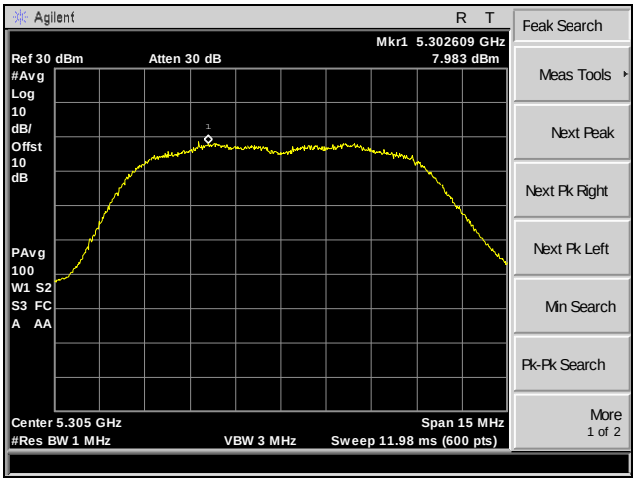
PSD 10MHz Band (FCC)						
Frequency (MHz)	**Conducted PSD ch0 (dBm)**	**Conducted PSD ch1 (dBm)**	**Conducted PSD Total (dBm)**	**Conducted PSD Limit (dBm)**	**Conducted PSD Margin (dB)**	**Antenna Gain(dBi)**
5255	8.14	5.94	10.2	11	**-0.8**	2
5305	7.98	5.92	10.1	11	**-0.9**	2
5325	8.09	6.40	10.3	11	**-0.7**	2
5495	7.44	5.74	9.7	11	**-1.3**	2
5555	7.75	6.12	10.0	11	**-1.0**	2
5705	7.42	6.10	9.8	11	**-1.2**	2
PSD 20MHz Band (FCC)						
Frequency (MHz)	**Conducted PSD ch0 (dBm)**	**Conducted PSD ch1 (dBm)**	**Conducted PSD Total (dBm)**	**Conducted PSD Limit (dBm)**	**Conducted PSD Margin (dB)**	**Antenna Gain(dBi)**
5260	7.43	6.21	9.9	11.0	**-1.1**	2
5300	7.51	6.24	9.9	11.0	**-1.1**	2
5320	7.56	6.67	10.1	11.0	**-0.9**	2
5500	7.46	6.43	10.0	11	**-1.0**	2
5540	7.46	6.16	9.9	11.0	**-1.1**	2
5620	7.53	6.80	10.2	11.0	**-0.8**	2
5700	7.52	7.50	10.5	11.0	**-0.5**	2
PSD 40MHz Band (FCC)						
Frequency (MHz)	**Conducted PSD ch0 (dBm)**	**Conducted PSD ch1 (dBm)**	**Conducted PSD Total (dBm)**	**Conducted PSD Limit (dBm)**	**Conducted PSD Margin (dB)**	**Antenna Gain(dBi)**
5270	7.47	5.18	9.5	11	**-1.5**	2
5310	1.74	0.24	4.1	11	**-6.9**	2
5510	1.39	0.72	4.1	11	**-6.9**	2
5550	4.78	2.05	6.6	11	**-4.4**	2
5590	6.84	4.30	8.8	11	**-2.2**	2
5670	7.51	6.87	10.2	11	**-0.8**	2

Table 10. Maximum Power Spectral Density, Test Results

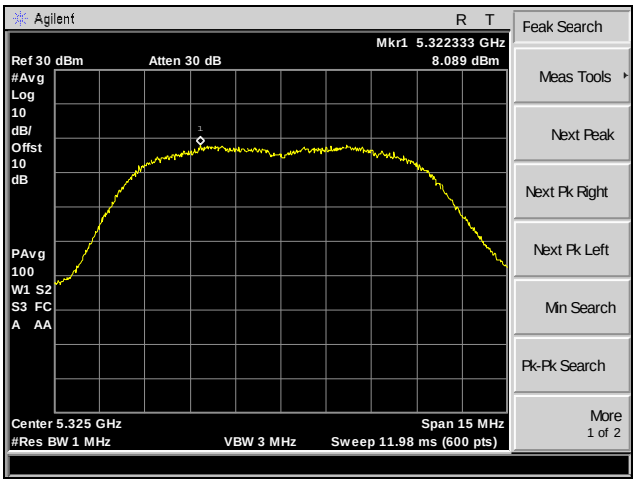
Maximum Power Spectral Density, 10 MHz, Channel 0



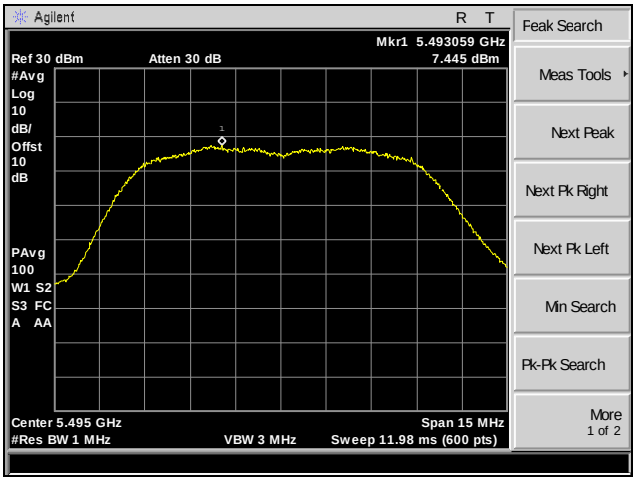
Plot 38. Maximum Power Spectral Density, 5255 MHz, 10 MHz, Channel 0



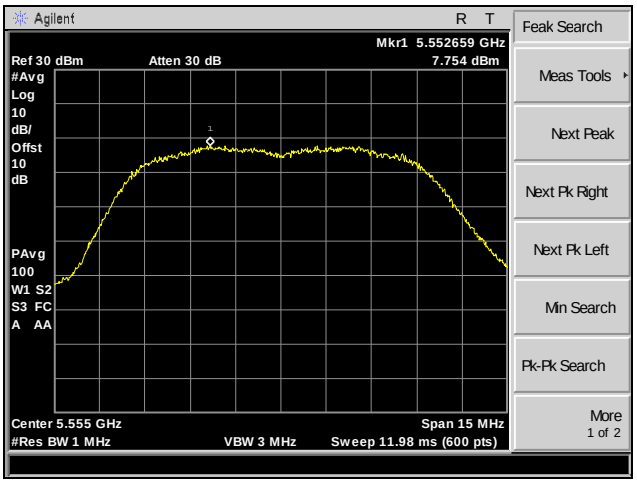
Plot 39. Maximum Power Spectral Density, 5305 MHz, 10 MHz, Channel 0



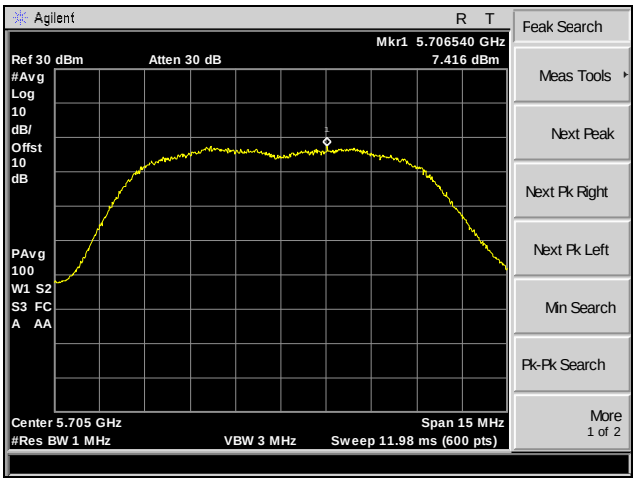
Plot 40. Maximum Power Spectral Density, 5325 MHz, 10 MHz, Channel 0



Plot 41. Maximum Power Spectral Density, 5495 MHz, 10 MHz, Channel 0

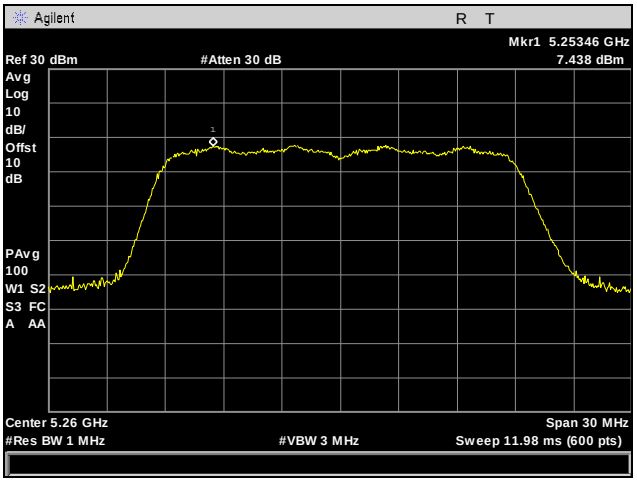


Plot 42. Maximum Power Spectral Density, 5555 MHz, 10 MHz, Channel 0

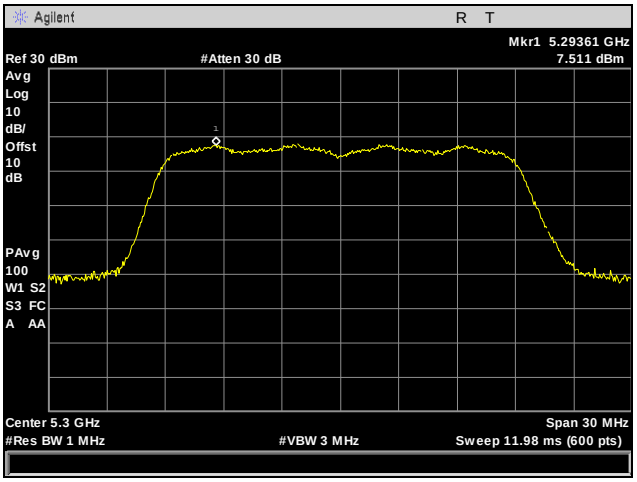


Plot 43. Maximum Power Spectral Density, 5705 MHz, 10 MHz, Channel 0

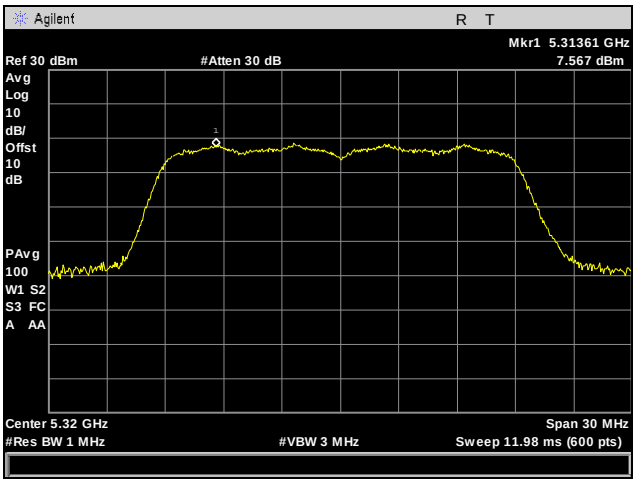
Maximum Power Spectral Density, 20 MHz, Channel 0



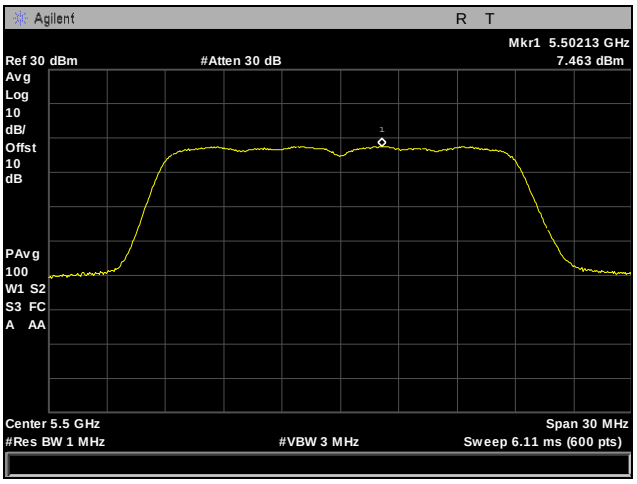
Plot 44. Maximum Power Spectral Density, 5260 MHz, 20 MHz, Channel 0



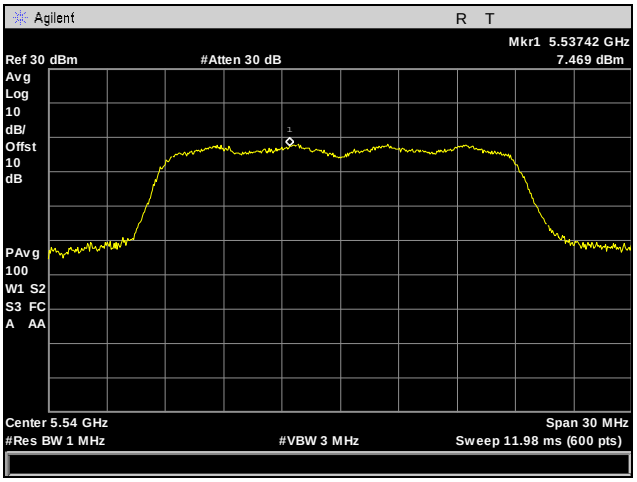
Plot 45. Maximum Power Spectral Density, 5300 MHz, 20 MHz, Channel 0



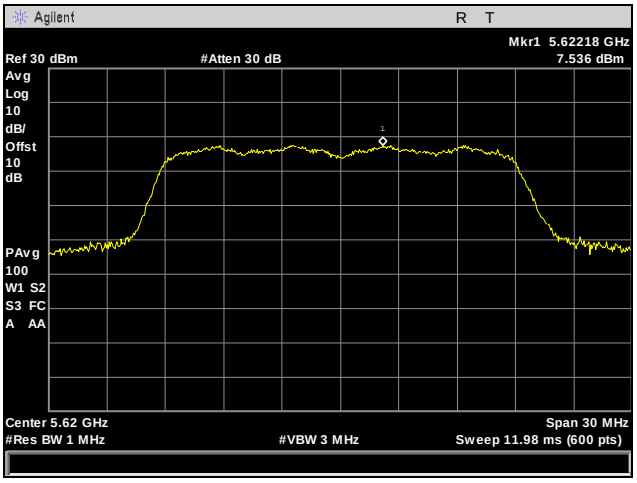
Plot 46. Maximum Power Spectral Density, 5320 MHz, 20 MHz, Channel 0



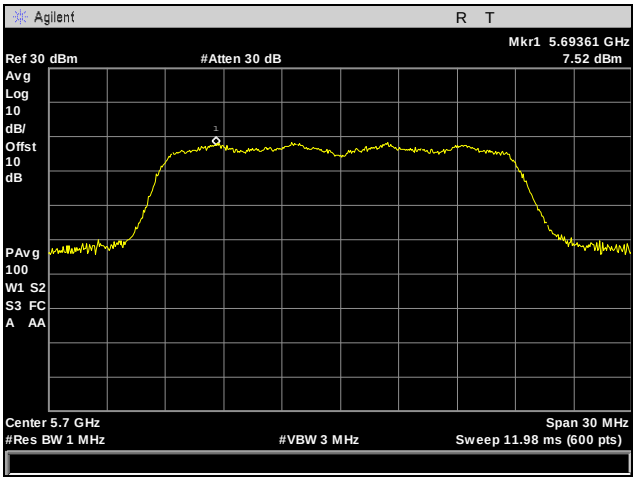
Plot 47. Maximum Power Spectral Density, 5500 MHz, 20 MHz, Channel 0



Plot 48. Maximum Power Spectral Density, 5540 MHz, 20 MHz, Channel 0

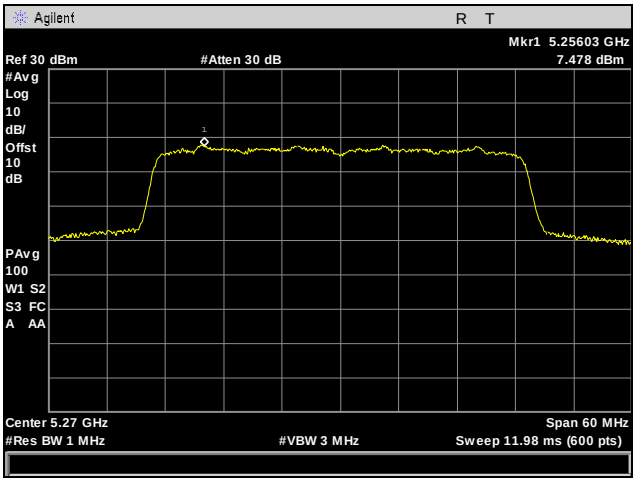


Plot 49. Maximum Power Spectral Density, 5620 MHz, 20 MHz, Channel 0

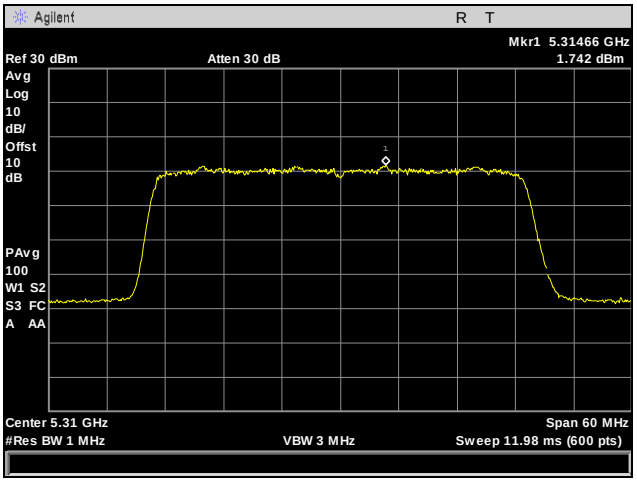


Plot 50. Maximum Power Spectral Density, 5700 MHz, 20 MHz, Channel 0

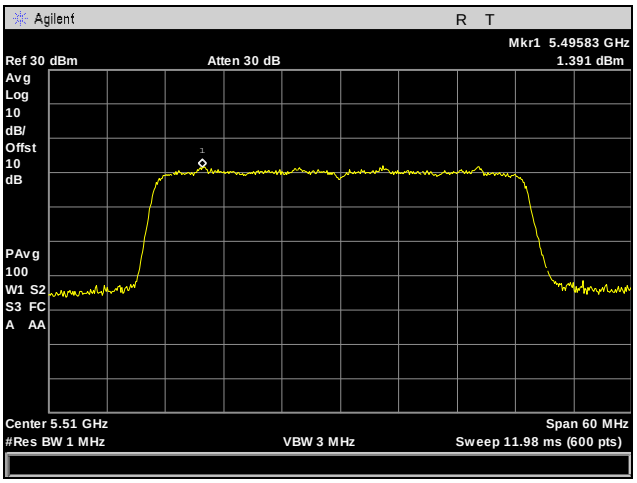
Maximum Power Spectral Density, 40 MHz, Channel 0



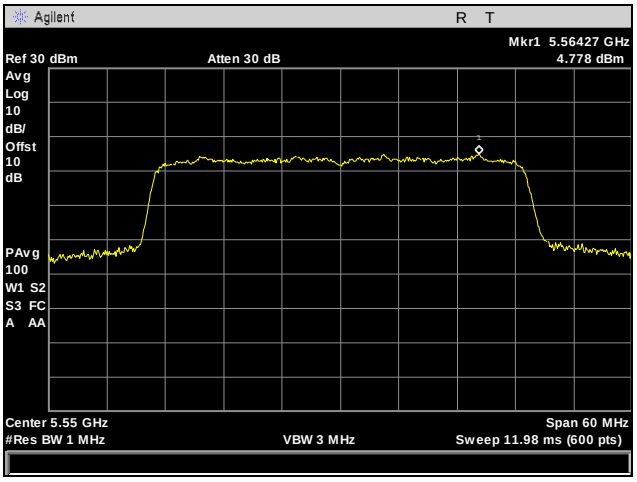
Plot 51. Maximum Power Spectral Density, 5270 MHz, 40 MHz, Channel 0



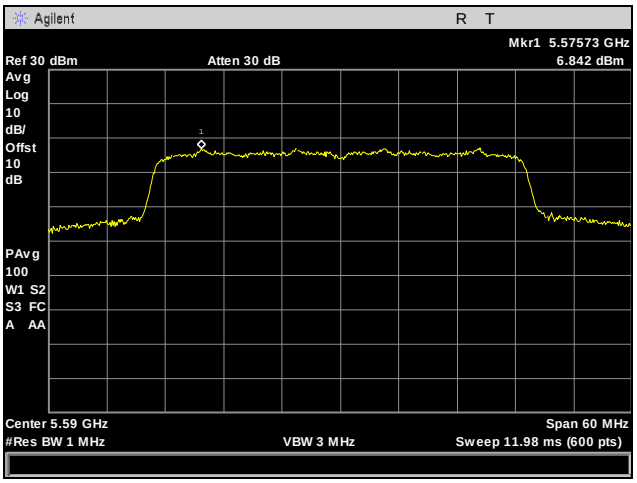
Plot 52. Maximum Power Spectral Density, 5310 MHz, 40 MHz, Channel 0



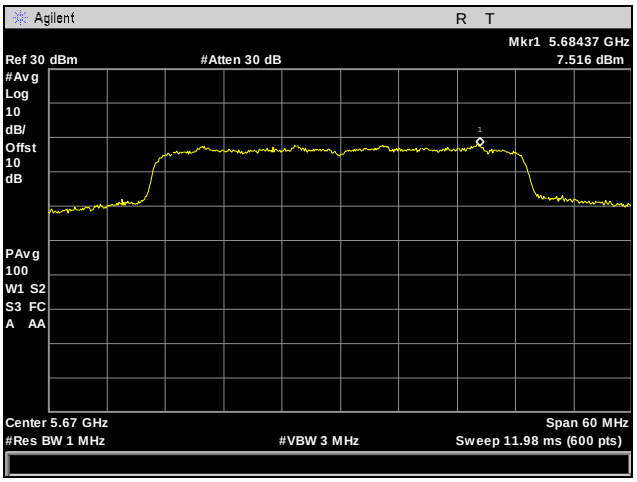
Plot 53. Maximum Power Spectral Density, 5510 MHz, 40 MHz, Channel 0



Plot 54. Maximum Power Spectral Density, 5550 MHz, 40 MHz, Channel 0



Plot 55. Maximum Power Spectral Density, 5590 MHz, 40 MHz, Channel 0



Plot 56. Maximum Power Spectral Density, 5760 MHz, 40 MHz, Channel 0

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.

Above 1 GHz, measurements were made pursuant the method described in FCC KDB 789033 D02 General UNII Test Procedure New Rules v01. The equation, **EIRP= E + 20 log D – 104.8** was used to convert field strength to EIRP (**E** = field strength (dBµV/m) and **D** = Reference measurement distance**).**

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 was compliant with the requirements of this section.

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

Note 1: For the 30-1000MHz and 7-18GHz ranges the worse case configuration (40MHz bw) was reported.

Note 2: For the 15.209 average limit, the highest spurious emissions were found at the restricted band edge closest to the U-NII 1 band edge.

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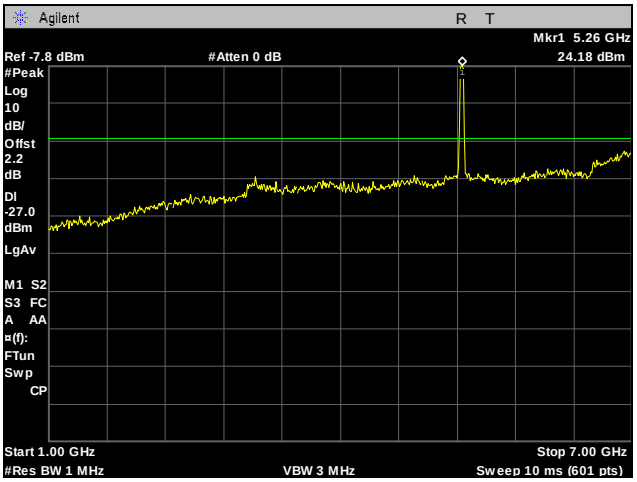
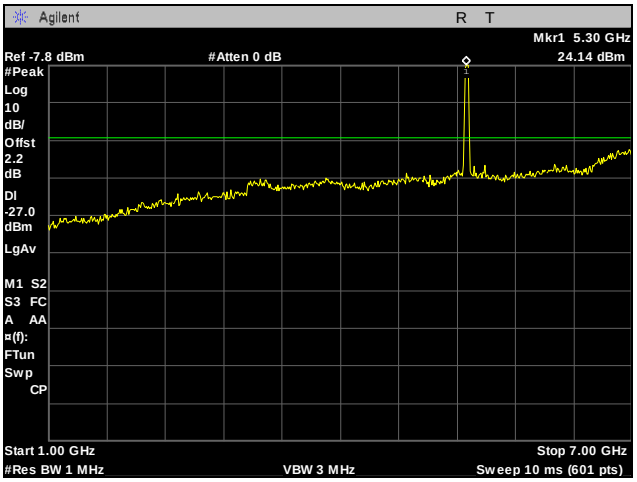
Test Engineer(s): Hadid Jones

Test Date(s): 01/26/16

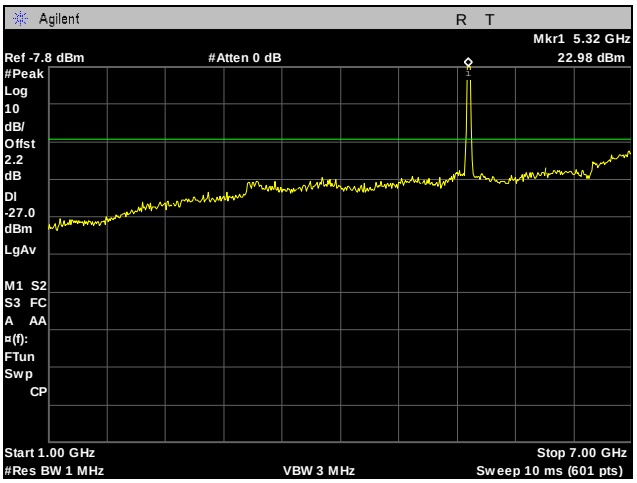
Radiated Spurious Emissions, 10 MHz



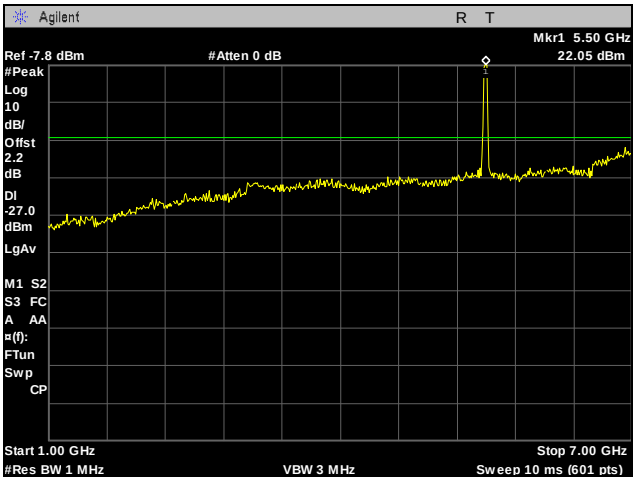
Plot 57. Radiated Spurious Emissions, 5255 MHz, 10 MHz, 1 GHz – 7 GHz



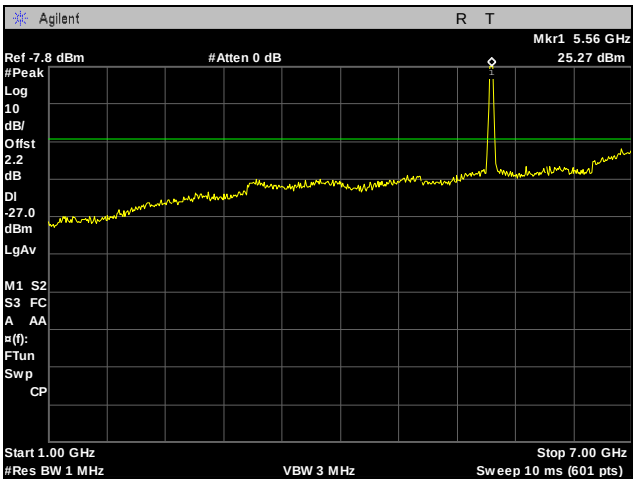
Plot 58. Radiated Spurious Emissions, 5305 MHz, 10 MHz, 1 GHz – 7 GHz



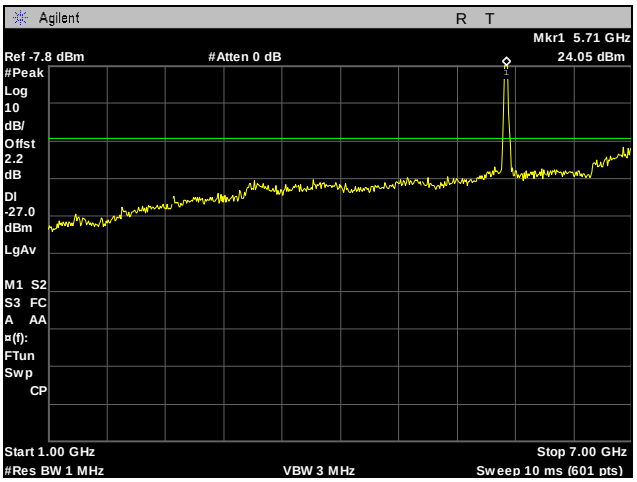
Plot 59. Radiated Spurious Emissions, 5325 MHz, 10 MHz, 1 GHz – 7 GHz



Plot 60. Radiated Spurious Emissions, 5495 MHz, 10 MHz, 1 GHz – 7 GHz

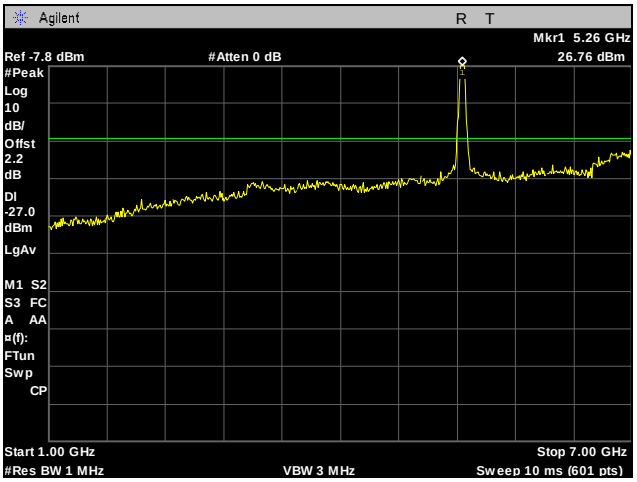


Plot 61. Radiated Spurious Emissions, 5555 MHz, 10 MHz, 1 GHz – 7 GHz

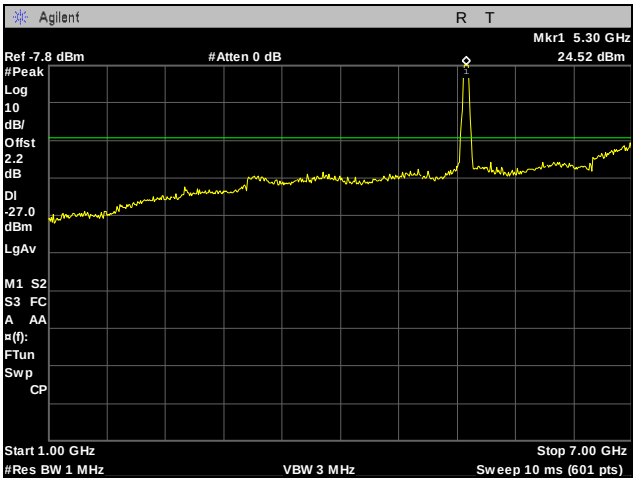


Plot 62. Radiated Spurious Emissions, 5705 MHz, 10 MHz, 1 GHz – 7 GHz

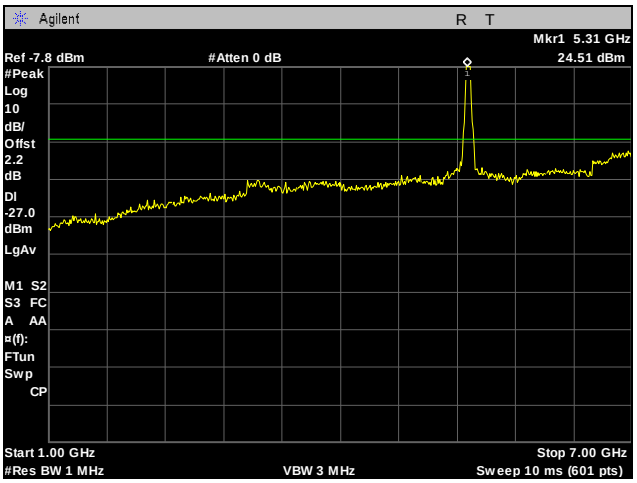
Radiated Spurious Emissions, 20 MHz



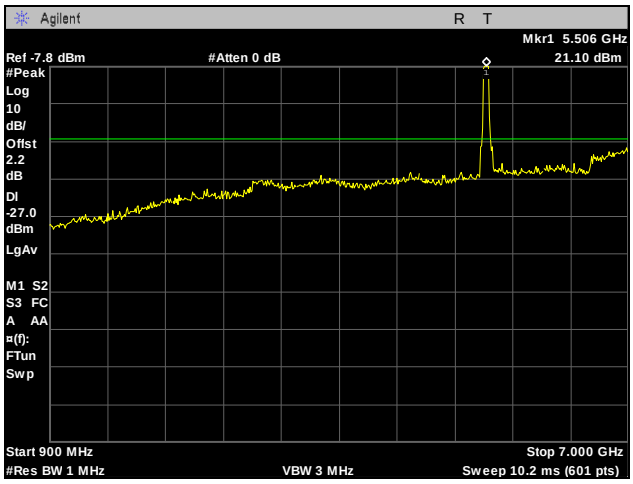
Plot 63. Radiated Spurious Emissions, 5260 MHz, 20 MHz, 1 GHz – 7 GHz



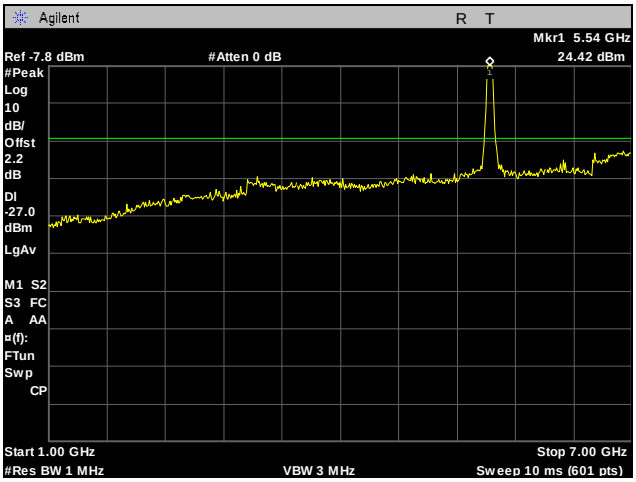
Plot 64. Radiated Spurious Emissions, 5300 MHz, 20 MHz, 1 GHz – 7 GHz



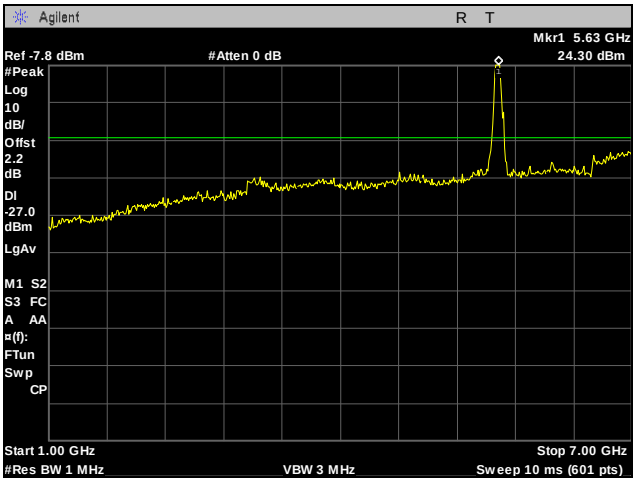
Plot 65. Radiated Spurious Emissions, 5320 MHz, 20 MHz, 1 GHz – 7 GHz



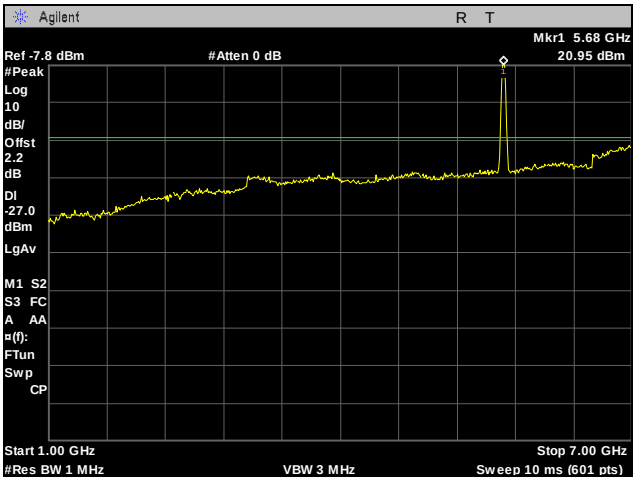
Plot 66. Radiated Spurious Emissions, 5500 MHz, 20 MHz, 1 GHz – 7 GHz



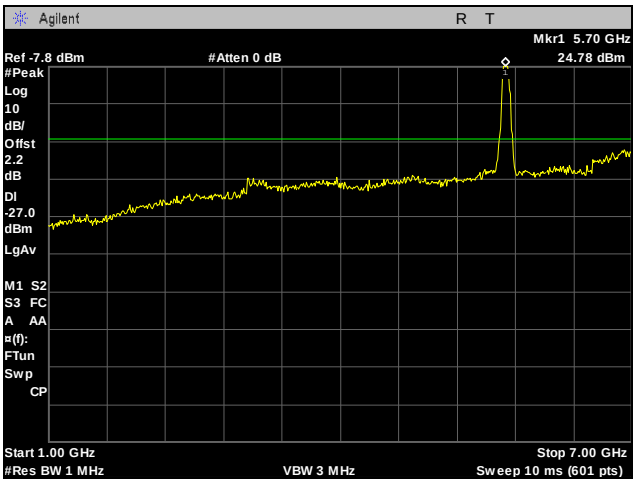
Plot 67. Radiated Spurious Emissions, 5540 MHz, 20 MHz, 1 GHz – 7 GHz



Plot 68. Radiated Spurious Emissions, 5620 MHz, 20 MHz, 1 GHz – 7 GHz

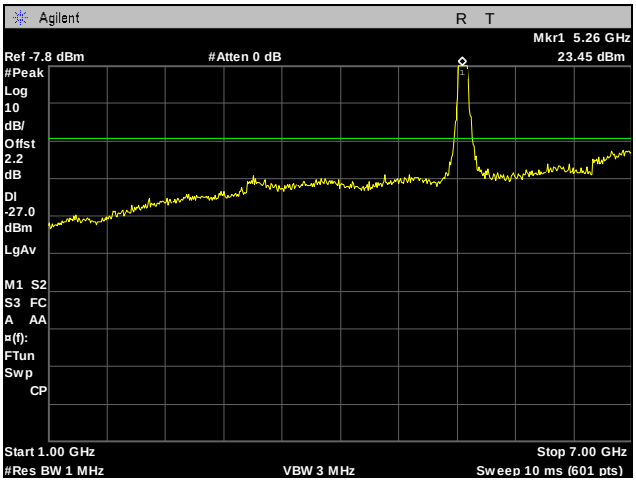


Plot 69. Radiated Spurious Emissions, 5680 MHz, 20 MHz, 1 GHz – 7 GHz

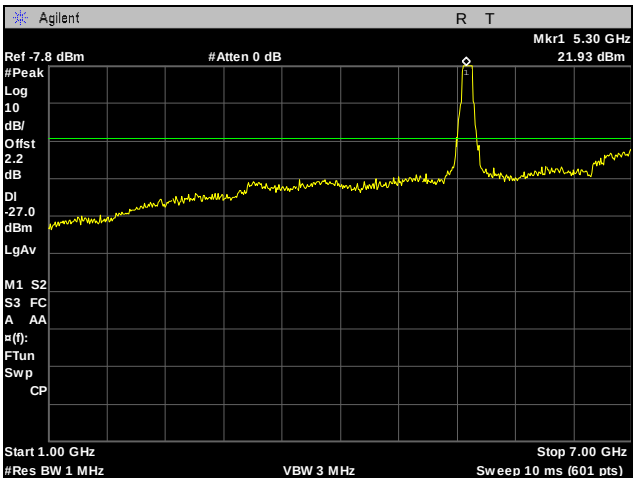


Plot 70. Radiated Spurious Emissions, 5700 MHz, 20 MHz, 1 GHz – 7 GHz

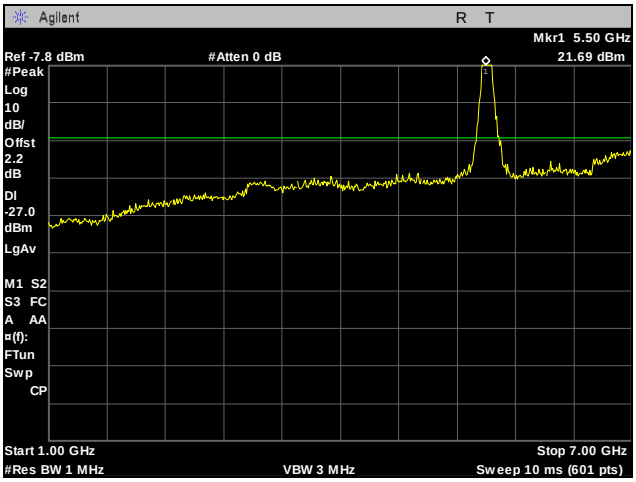
Radiated Spurious Emissions, 40 MHz



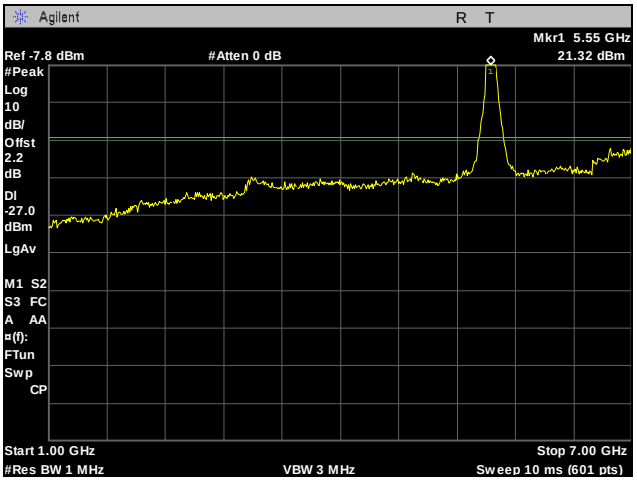
Plot 71. Radiated Spurious Emissions, 5270 MHz, 40 MHz, 1 GHz – 7 GHz



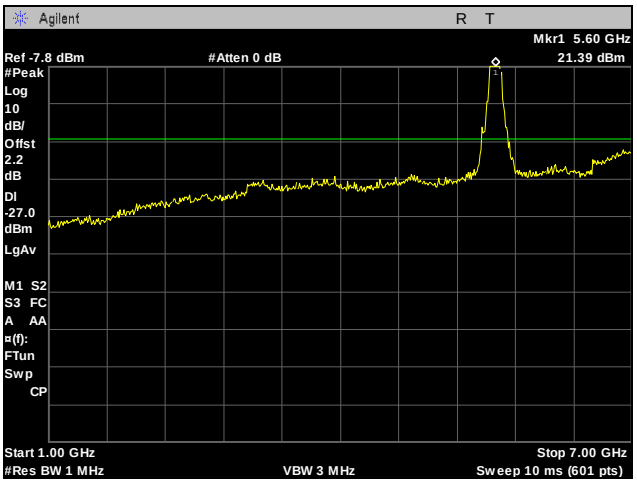
Plot 72. Radiated Spurious Emissions, 5310 MHz, 40 MHz, 1 GHz – 7 GHz



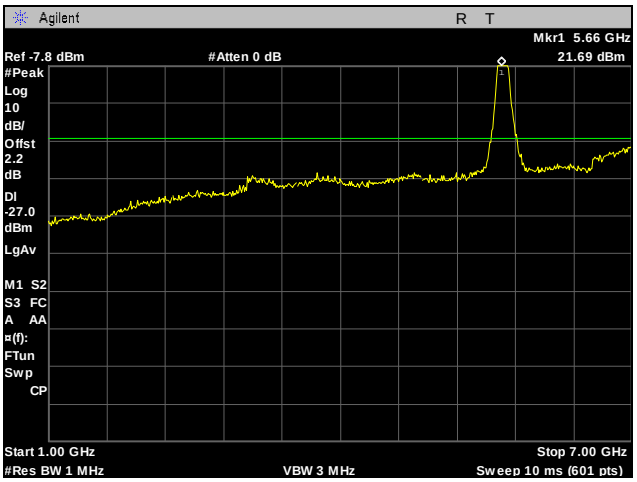
Plot 73. Radiated Spurious Emissions, 5510 MHz, 40 MHz, 1 GHz – 7 GHz



Plot 74. Radiated Spurious Emissions, 5550 MHz, 40 MHz, 1 GHz – 7 GHz

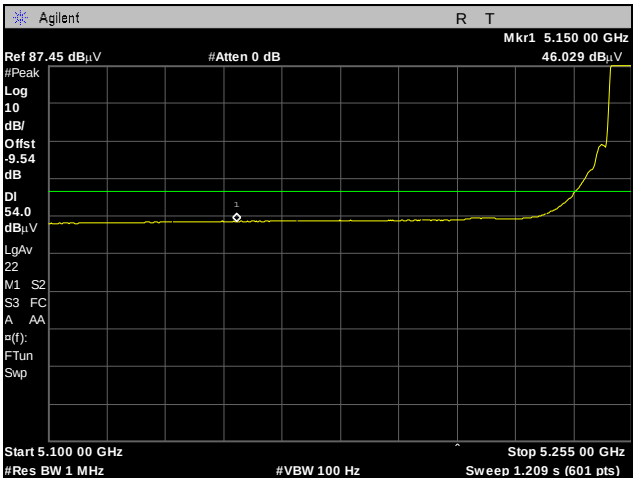


Plot 75. Radiated Spurious Emissions, 5590 MHz, 40 MHz, 1 GHz – 7 GHz

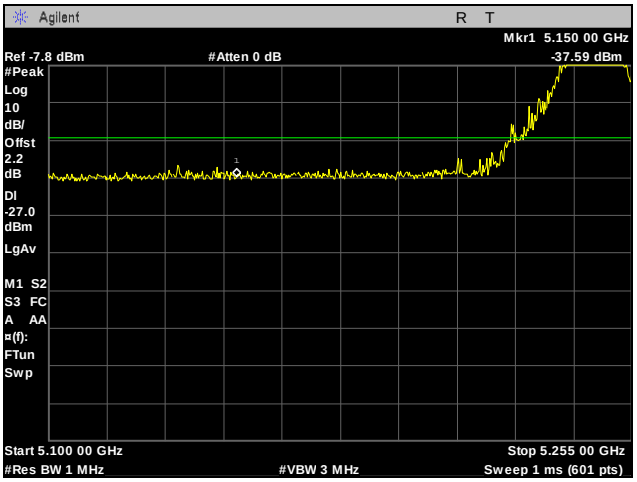


Plot 76. Radiated Spurious Emissions, 5760 MHz, 40 MHz, 1 GHz – 7 GHz

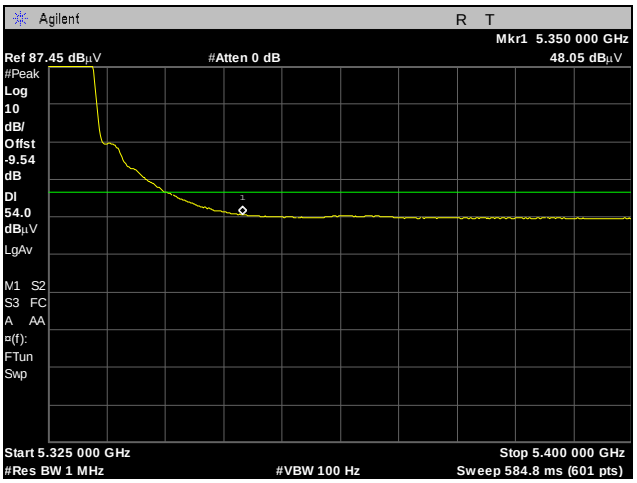
Radiated Band Edge, 10 MHz



Plot 77. Radiated Band Edge, 5255 MHz, 10 MHz, Average

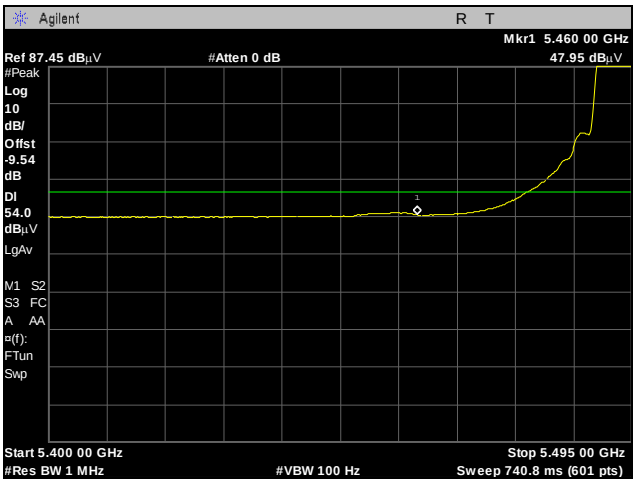


Plot 78. Radiated Band Edge, 5255 MHz, 10 MHz, Peak

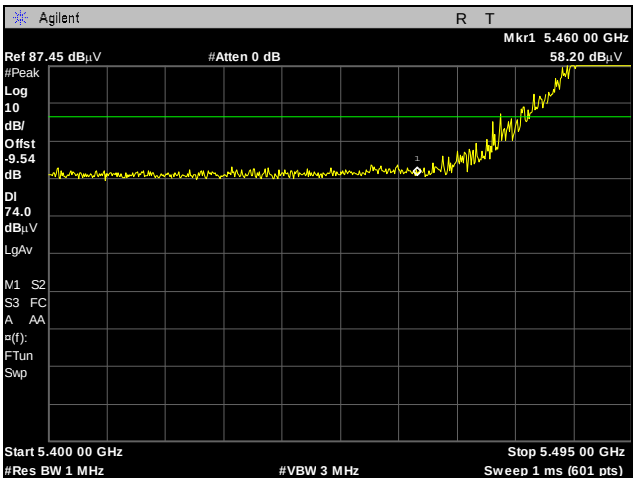


Plot 79. Radiated Band Edge, 5325 MHz, 10 MHz, Average

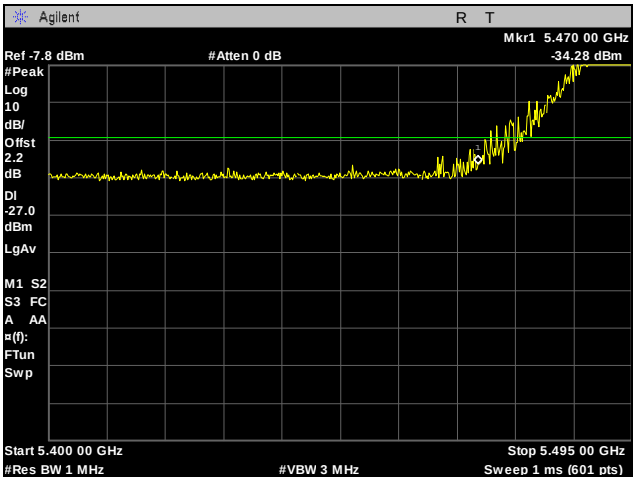
Plot 80. Radiated Band Edge, 5325 MHz, 10 MHz, Peak



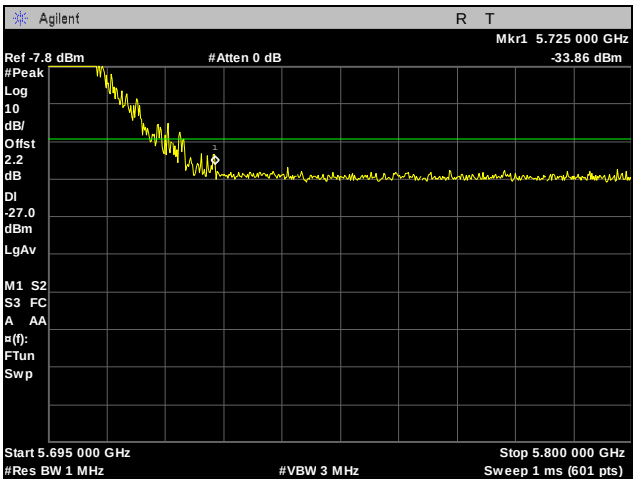
Plot 81. Radiated Band Edge, 5495 MHz, 10 MHz, Average



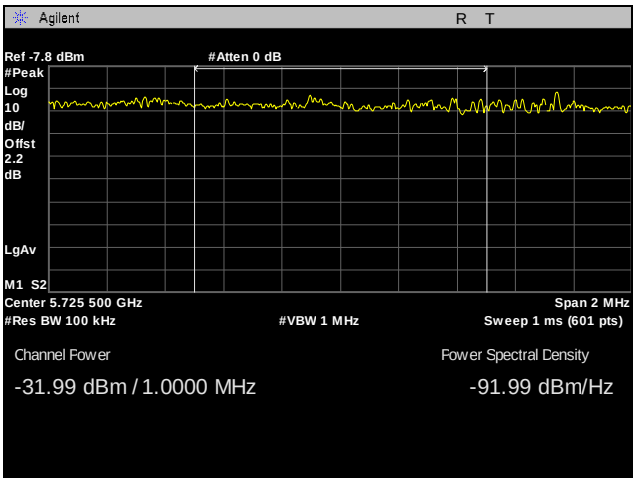
Plot 82. Radiated Band Edge, 5495 MHz, 10 MHz, Peak



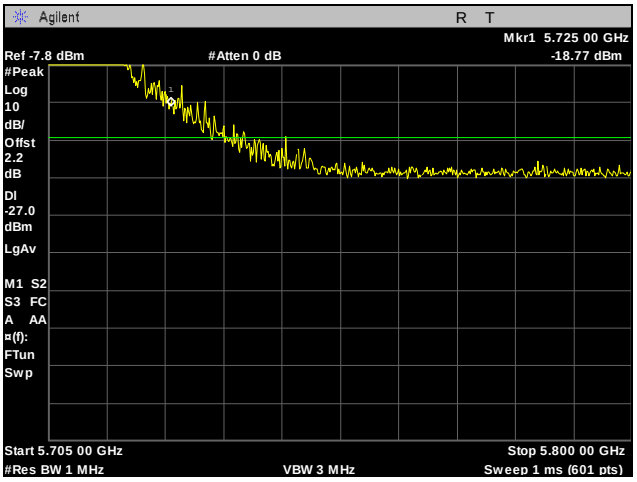
Plot 83. Radiated Band Edge, 5495 MHz, 10 MHz, -27 Peak



Plot 84. Radiated Band Edge, 5695 MHz, 10 MHz, Peak

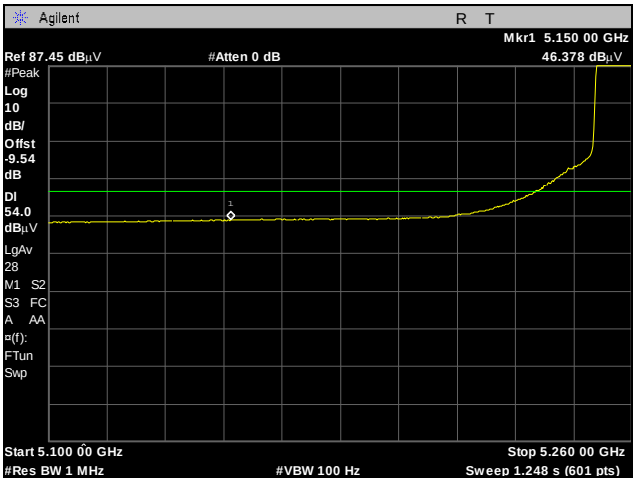


Plot 85. Radiated Band Edge, 5705 MHz, 10 MHz, Peak Integration

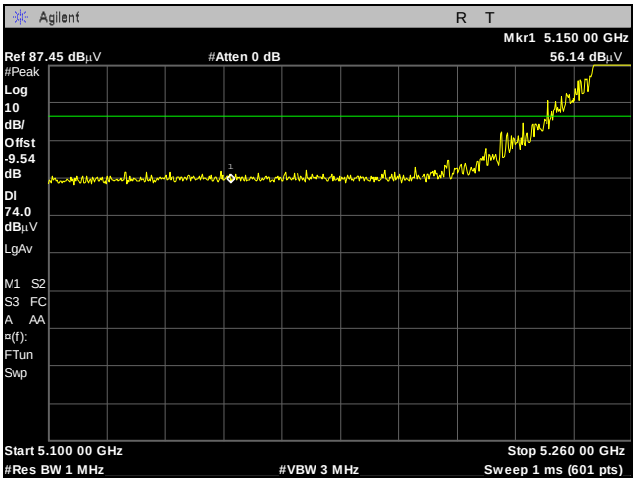


Plot 86. Radiated Band Edge, 5705 MHz, 10 MHz, Peak

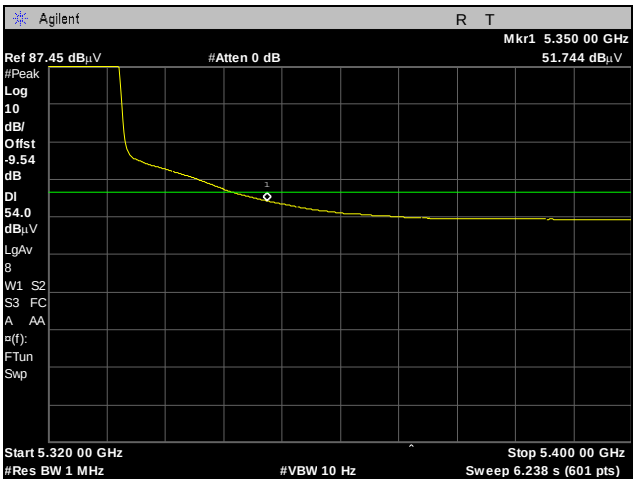
Radiated Band Edge, 20 MHz



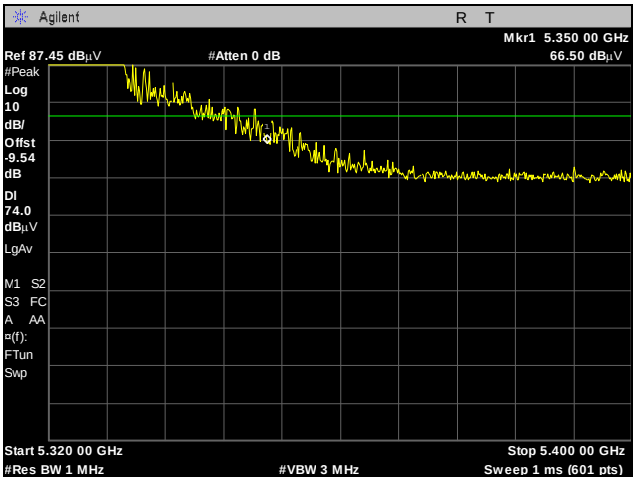
Plot 87. Radiated Band Edge, 5260 MHz, 20 MHz, Average



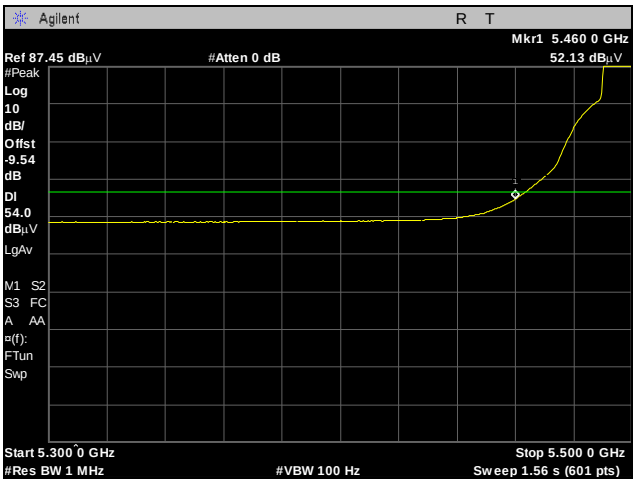
Plot 88. Radiated Band Edge, 5260 MHz, 20 MHz, Peak



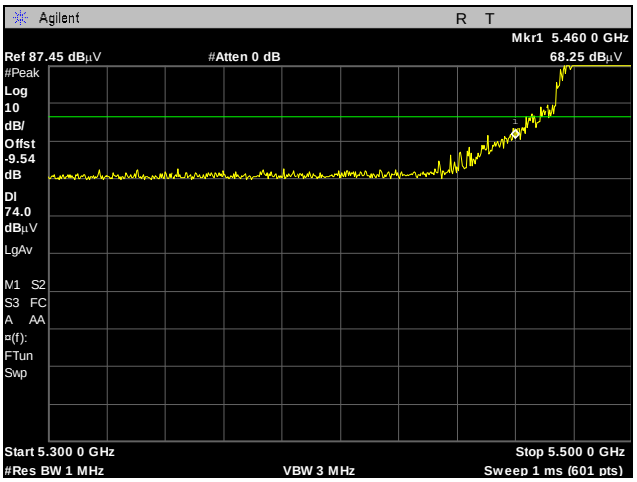
Plot 89. Radiated Band Edge, 5320 MHz, 20 MHz, Average



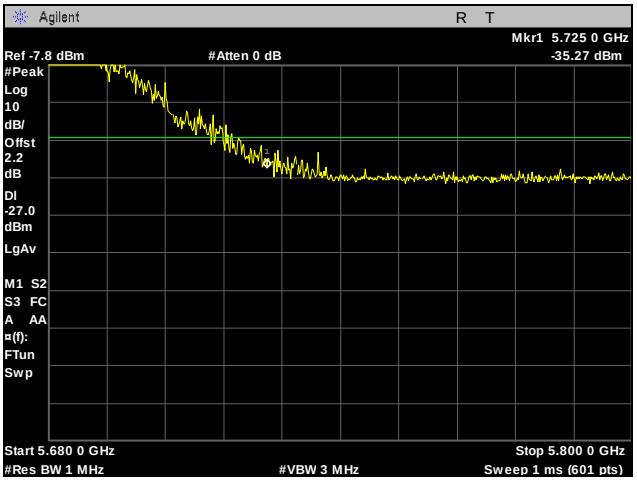
Plot 90. Radiated Band Edge, 5320 MHz, 20 MHz, Peak



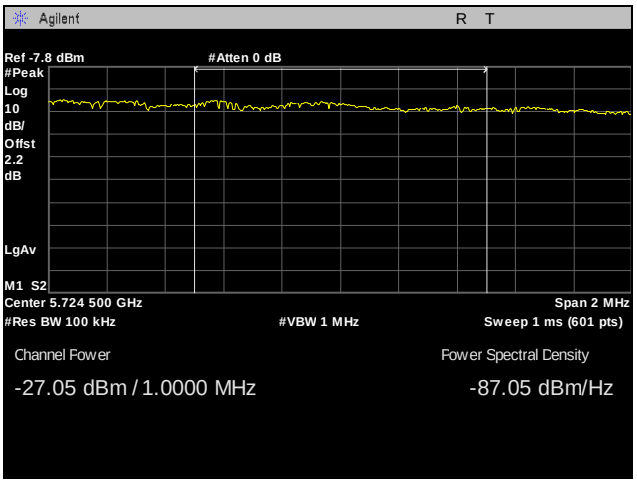
Plot 91. Radiated Band Edge, 5500 MHz, 20 MHz, Average



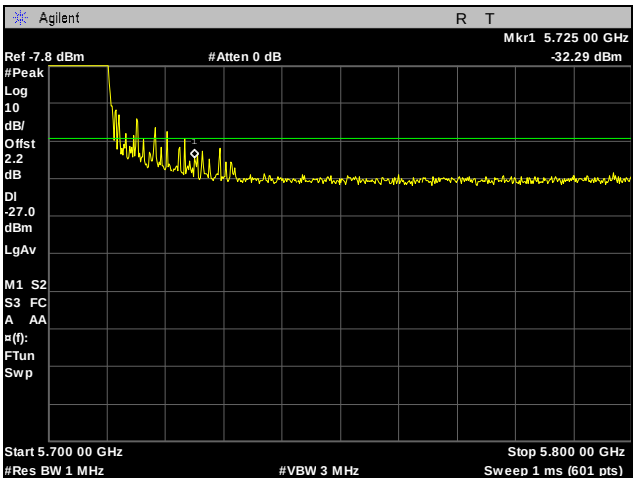
Plot 92. Radiated Band Edge, 5500 MHz, 20 MHz, Peak



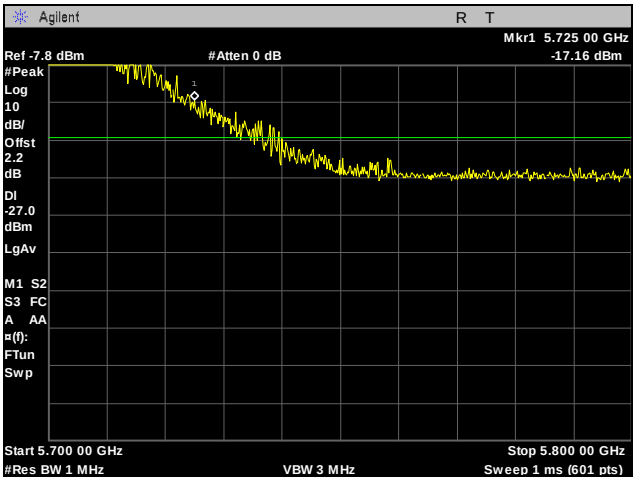
Plot 93. Radiated Band Edge, 5680 MHz, 20 MHz, Peak



Plot 94. Radiated Band Edge, 5700 MHz, 20 MHz, Peak Integration

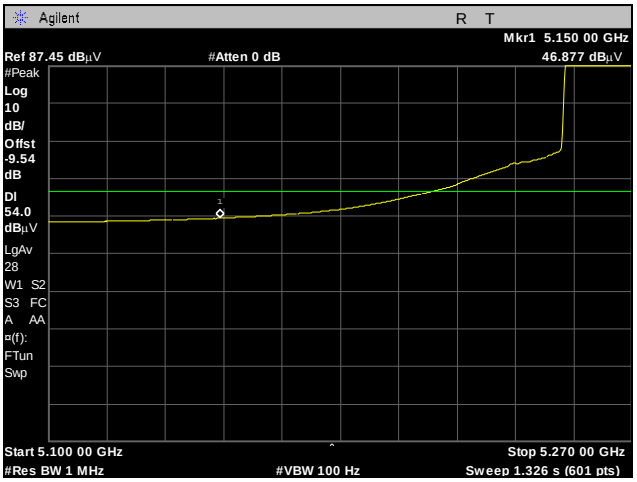


Plot 95. Radiated Band Edge, 5700 MHz, 20 MHz, Peak

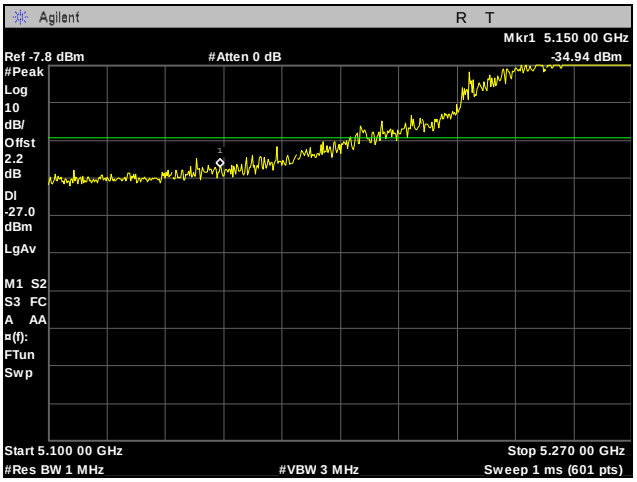


Plot 96. Radiated Band Edge, 5700 MHz, 20 MHz, -27 Peak

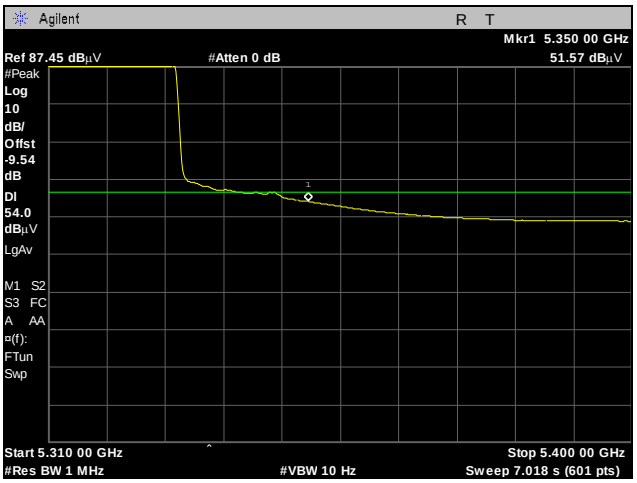
Radiated Band Edge, 40 MHz



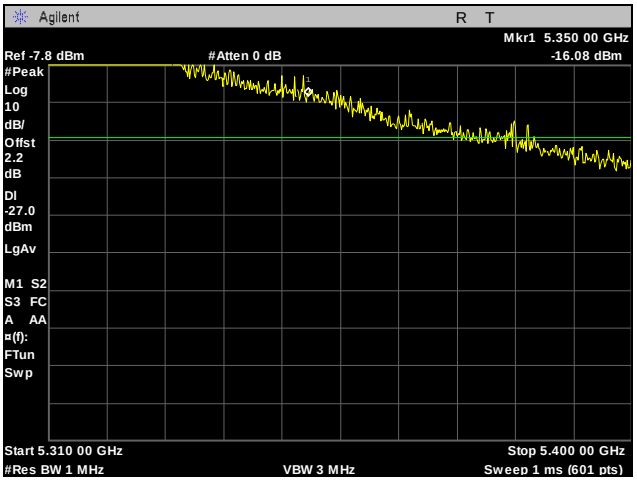
Plot 97. Radiated Band Edge, 5270 MHz, 40 MHz, Average



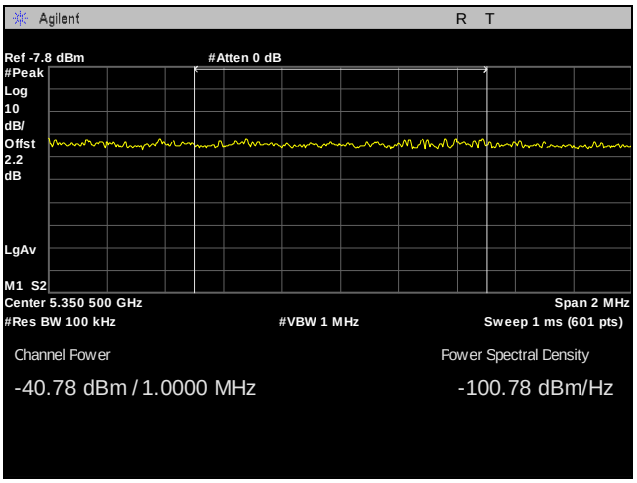
Plot 98. Radiated Band Edge, 5270 MHz, 40 MHz, Peak



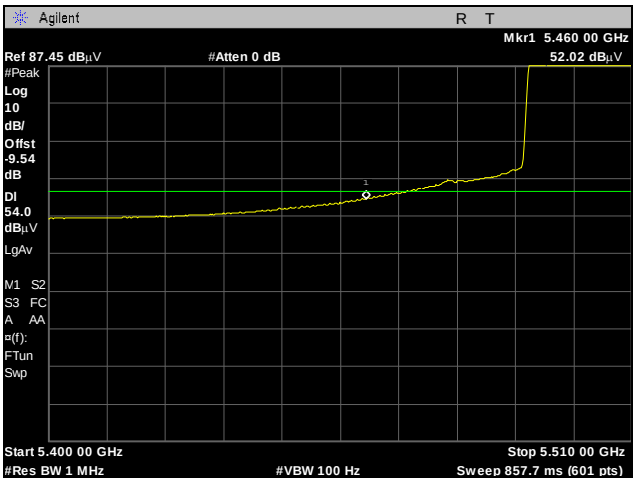
Plot 99. Radiated Band Edge, 5310 MHz, 40 MHz, Average



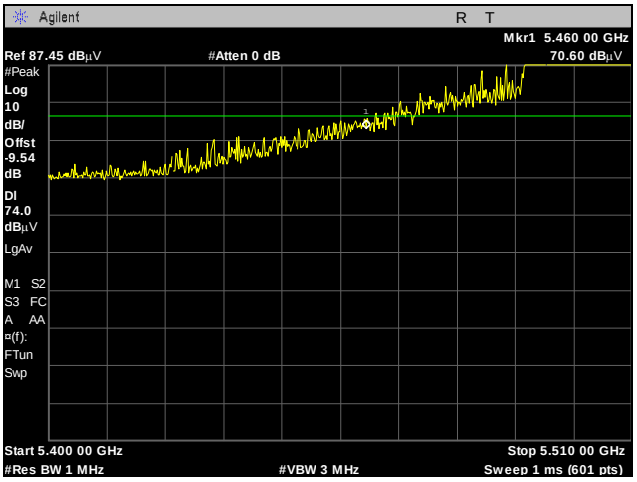
Plot 100. Radiated Band Edge, 5310 MHz, 40 MHz, Peak



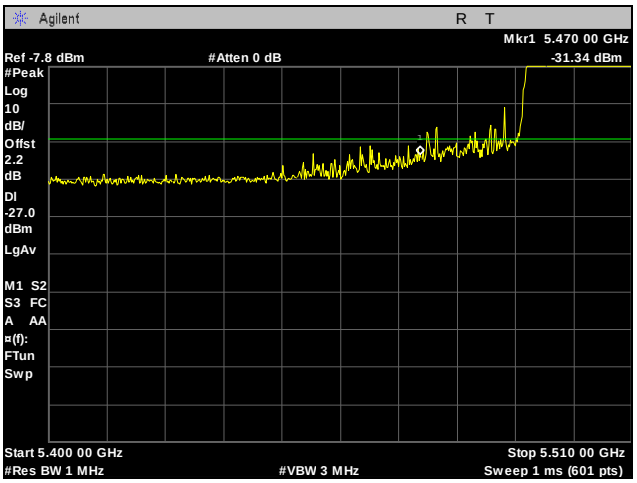
Plot 101. Radiated Band Edge, 5310 MHz, 40 MHz, Peak Integration



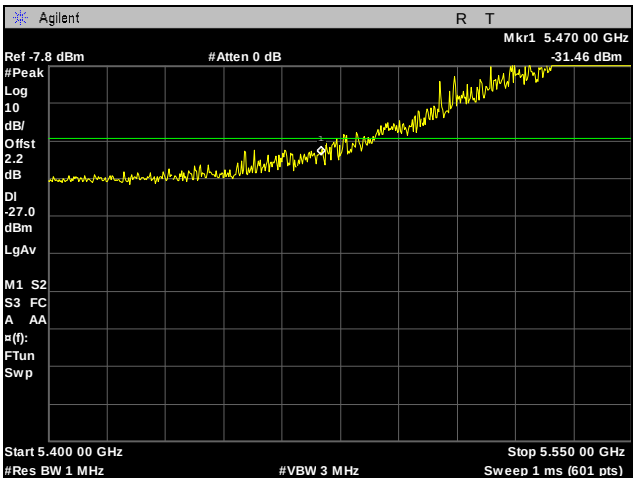
Plot 102. Radiated Band Edge, 5510 MHz, 40 MHz, Average



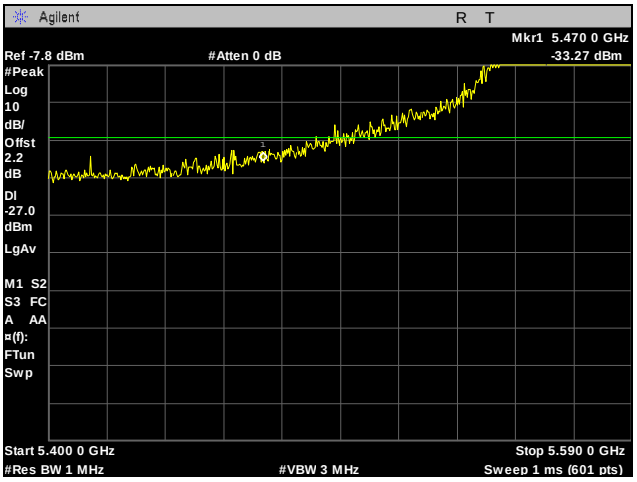
Plot 103. Radiated Band Edge, 5510 MHz, 40 MHz, Peak



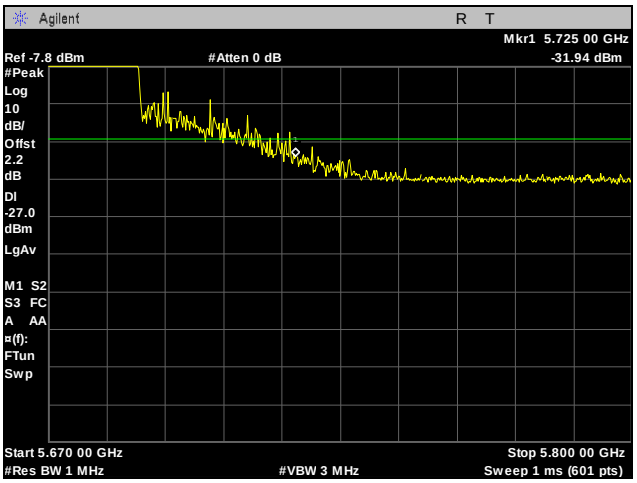
Plot 104. Radiated Band Edge, 5510 MHz, 40 MHz, -27 Peak



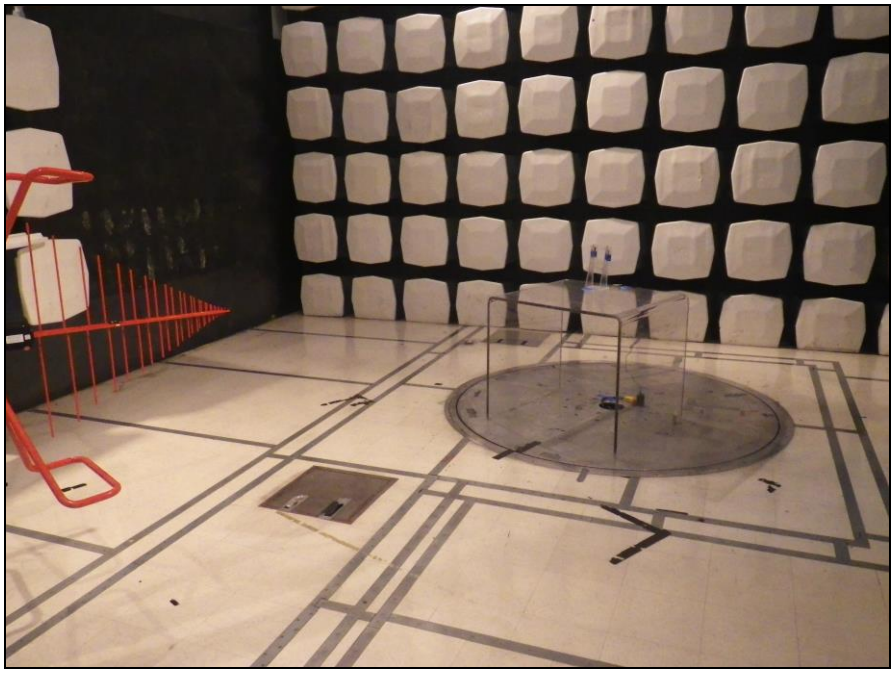
Plot 105. Radiated Band Edge, 5550 MHz, 40 MHz, Peak



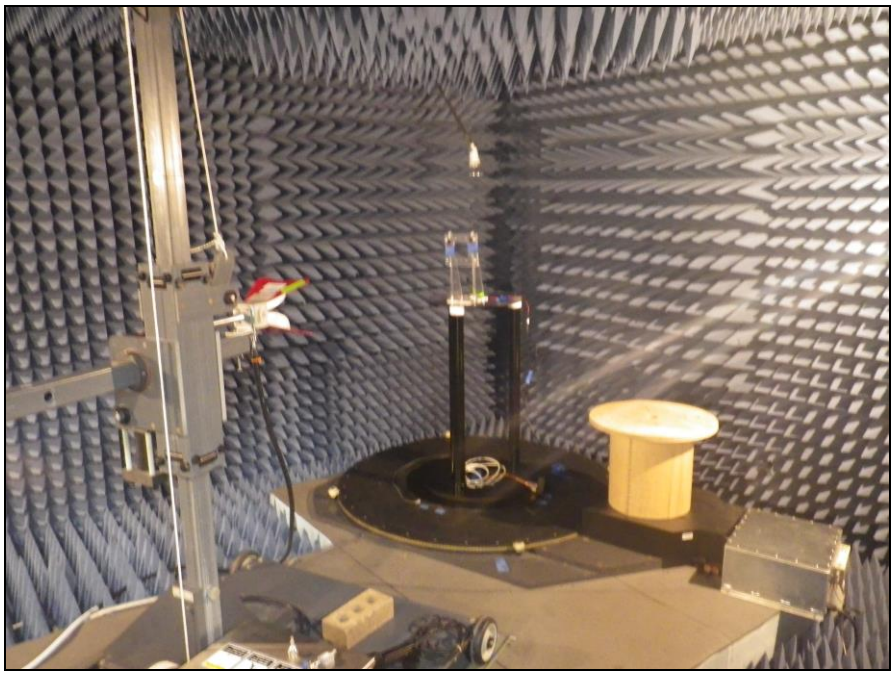
Plot 106. Radiated Band Edge, 5590 MHz, 40 MHz, Peak



Plot 107. Radiated Band Edge, 5670MHz, 40 MHz, Peak



Photograph 1. Radiated Test Setup, Below 1 GHz



Photograph 2. Radiated Test Setup, Above 1 GHz

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.

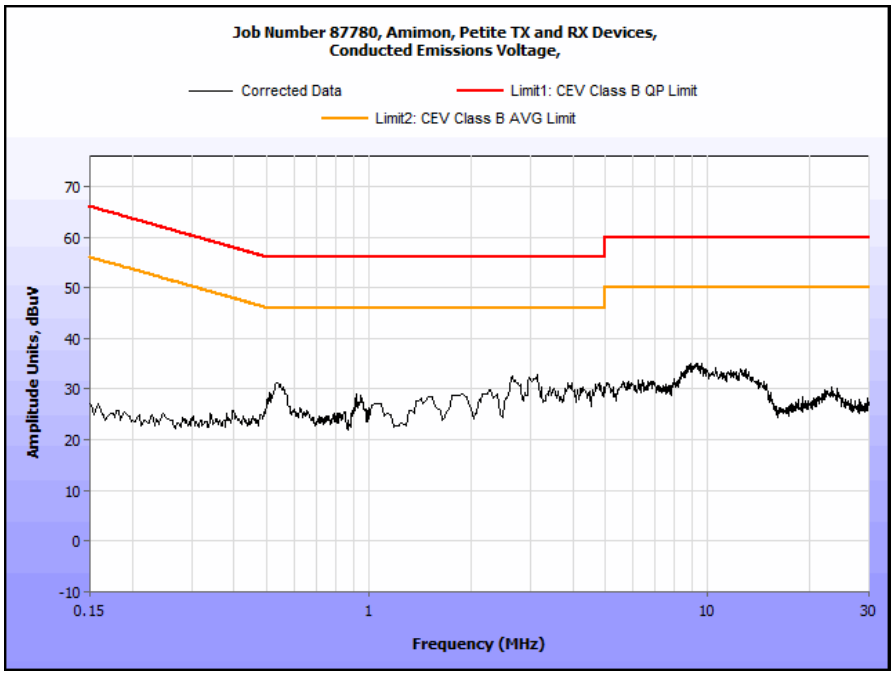
Test Engineer(s): Hadid Jones

Test Date(s): 12/19/15

Conducted Emissions - Voltage, AC Power, Phase Line (120 VAC, 60 Hz)

Frequency (MHz)	Uncorrected Meter Reading (dBµV) QP	Cable Loss (dB)	Corrected Measurement (dBµV) QP	Limit (dBµV) QP	Margin (dB) QP	Uncorrected Meter Reading (dBµV) Avg.	Cable Loss (dB)	Corrected Measurement (dBµV) AVG	Limit (dBµV) AVG	Margin (dB) AVG
0.536	18.3	0	18.3	56	-37.7	13.07	0	13.07	46	-32.93
0.949	12.58	0	12.58	56	-43.42	6.53	0	6.53	46	-39.47
2.721	17.44	0	17.44	56	-38.56	11.14	0	11.14	46	-34.86
3.04	18.18	0	18.18	56	-37.82	11.88	0	11.88	46	-34.12
9.1	19.7	0	19.7	60	-40.3	13.01	0	13.01	50	-36.99
12.95	18.73	0	18.73	60	-41.27	12.66	0	12.66	50	-37.34

Table 12. Conducted Emissions - Voltage, AC Power, Phase Line (120 VAC, 60 Hz)

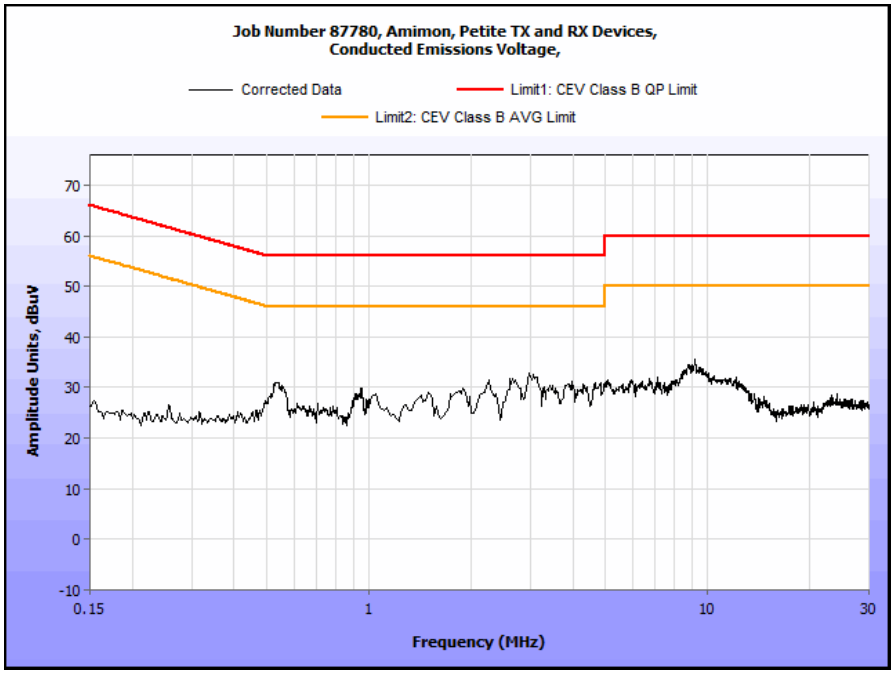


Plot 108. Conducted Emission, Phase Line Plot

Conducted Emissions - Voltage, AC Power, Neutral Line (120 VAC, 60 Hz)

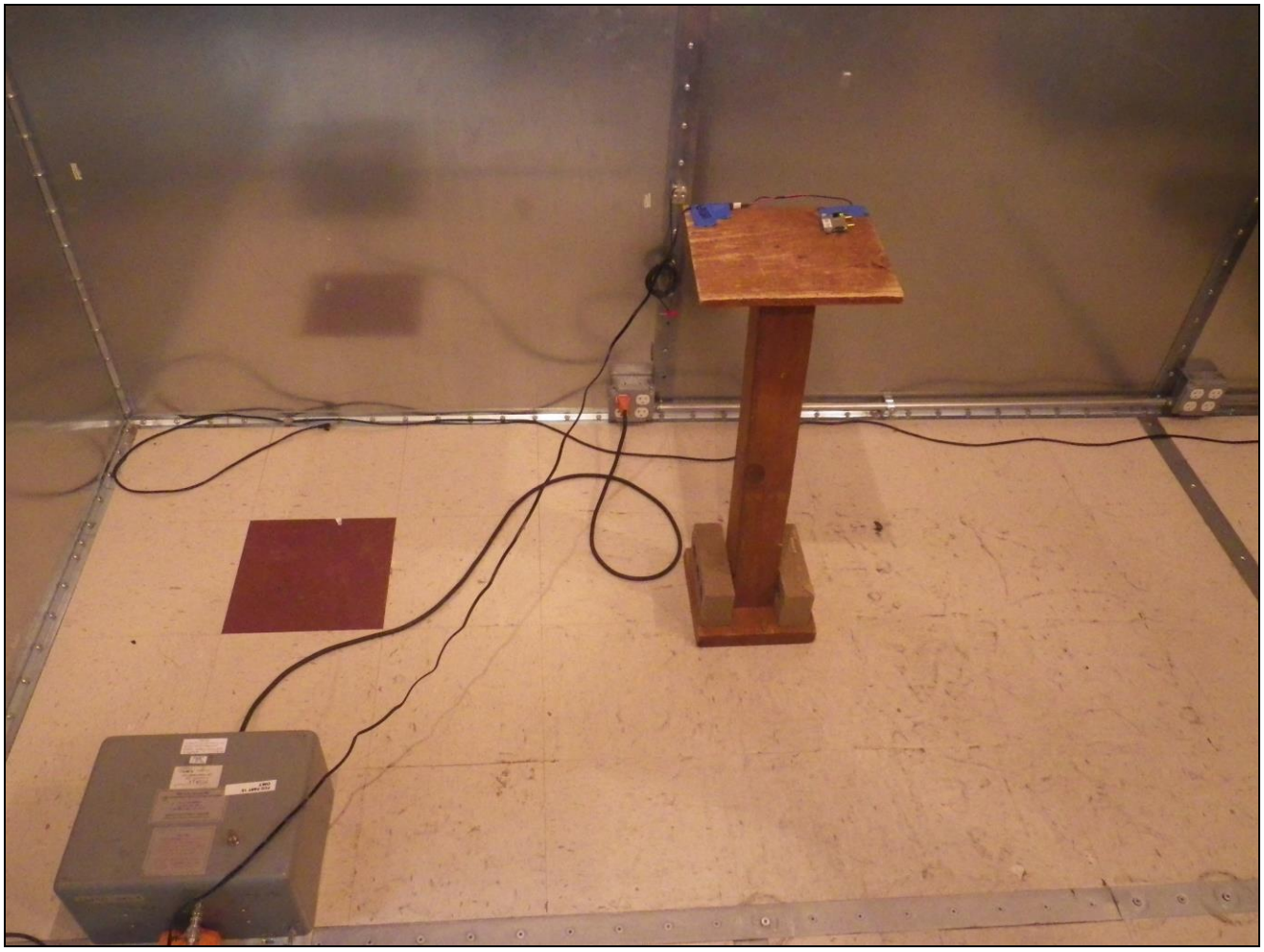
Frequency (MHz)	Uncorrected Meter Reading (dBµV) QP	Cable Loss (dB)	Corrected Measurement (dBµV) QP	Limit (dBµV) QP	Margin (dB) QP	Uncorrected Meter Reading (dBµV) Avg.	Cable Loss (dB)	Corrected Measurement (dBµV) AVG	Limit (dBµV) AVG	Margin (dB) AVG
0.534	18.08	0	18.08	56	-37.92	12.6	0	12.6	46	-33.4
0.913	13.5	0	13.5	56	-42.5	7.8	0	7.8	46	-38.2
1.032	14.95	0	14.95	56	-41.05	9.39	0	9.39	46	-36.61
2.78	17.56	0	17.56	56	-38.44	10.65	0	10.65	46	-35.35
3.094	18.32	0	18.32	56	-37.68	11.67	0	11.67	46	-34.33
8.91	19.51	0	19.51	60	-40.49	13.09	0	13.09	50	-36.91

Table 13. Conducted Emissions - Voltage, AC Power, Neutral Line (120 VAC, 60 Hz)



Plot 109. Conducted Emission, Neutral Line Plot

Conducted Emission Limits Test Setup



Photograph 3. Conducted Emissions, Test Setup

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**
5670	24	251.189	2	1.585	0.0792	1	0.9208	20	Pass

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

IV. DFS Requirements and Radar Waveform Description & Calibration

A. DFS Requirements

Requirement	Operational Mode		
	Master	Client Without Radar Detection	Client With Radar Detection
Non-Occupancy Period	Yes	Not required	Yes
DFS Detection Threshold	Yes	Not required	Yes
Channel Availability Check Time	Yes	Not required	Not required
U-NII Detection Bandwidth	Yes	Not required	Yes

Table 14. Applicability of DFS Requirements Prior to Use of a Channel

Requirement	Operational Mode	
	Master Device or Client with Radar Detection	Client Without Radar Detection
DFS Detection Threshold	Yes	Not required
Channel Closing Transmission Time	Yes	Yes
Channel Move Time	Yes	Yes
U-NII Detection Bandwidth	Yes	Not required

Additional requirements for devices with multiple bandwidth modes	Master Device or Client with Radar Detection	Client Without Radar Detection
U-NII Detection Bandwidth and Statistical Performance Check	All BW modes must be tested	Not required
Channel Move Time and Channel Closing Transmission Time	Test using widest BW mode available	Test using the widest BW mode available for the link
All other tests	Any single BW mode	Not required
Note: Frequencies selected for statistical performance check (Section 7.8.4) should include several frequencies within the radar detection bandwidth and frequencies near the edge of the radar detection bandwidth. For 802.11 devices it is suggested to select frequencies in each of the bonded 20 MHz channels and the channel center frequency.		

Table 15. Applicability of DFS Requirements During Normal Operation

Maximum Transmit Power	Value (See Notes 1, 2, and 3)
EIRP ≥ 200 milliwatt	-64 dBm
EIRP < 200 milliwatt and power spectral density < 10 dBm/MHz	-62 dBm
EIRP < 200 milliwatt that do not meet the power spectral density requirement	-64 dBm
Note 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna. **Note 2:** Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response. **Note3:** EIRP is based on the highest antenna gain. For MIMO devices refer to KDB Publication 662911 D01.	

Table 16. DFS Detection Thresholds for Master or Client Devices Incorporating DFS

Parameter	Value
Non-occupancy period	Minimum 30 minutes
Channel Availability Check Time	60 seconds
Channel Move Time	10 seconds See Note 1.
Channel Closing Transmission Time	200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period. See Notes 1 and 2.
U-NII Detection Bandwidth	Minimum 100% of the U-NII 99% transmission power bandwidth. See Note 3.
Note 1: *Channel Move Time* and the *Channel Closing Transmission Time* should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst. **Note 2:** The *Channel Closing Transmission Time* is comprised of 200 milliseconds starting at the beginning of the *Channel Move Time* plus any additional intermittent control signals required to facilitate a *Channel* move (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions. **Note 3:** During the *U-NII Detection Bandwidth* detection test, radar type 0 should be used. For each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic.	

Table 17. DFS Response Requirement Values

B. Radar Test Waveforms

This section provides the parameters for required test waveforms, minimum percentage of successful detections, and the minimum number of trials that must be used for determining DFS conformance. Step intervals of 0.1 microsecond for Pulse Width, 1 microsecond for PRI, 1 MHz for chirp width and 1 for the number of pulses will be utilized for the random determination of specific test waveforms.

Short Pulse Radar Test Waveforms

Radar Type	Pulse Width (µsec)	PRI (µsec)	Number of Pulses	Minimum Percentage of Successful Detection	Minimum Number of Trials
0	1	1428	18	See Note 1	See Note 1
1	1	Test A: 15 unique PRI values randomly selected from the list of 23 PRI values in Table 5a	Roundup $\left\{\left(\frac{1}{360}\right)\cdot\left(\frac{19\cdot 10^6}{PRI_{\mu sec}}\right)\right\}$	60%	30
		Test B: 15 unique PRI values randomly selected within the range of 518-3066 µsec, with a minimum increment of 1 µsec, excluding PRI values selected in Test A			
2	1-5	150-230	23-29	60%	30
3	6-10	200-500	16-18	60%	30
4	11-20	200-500	12-16	60%	30
Aggregate (Radar Types 1-4)				80%	120
Note 1: Short Pulse Radar Type 0 should be used for the detection bandwidth test, channel move time, and channel closing time tests.					

A minimum of 30 unique waveforms are required for each of the short pulse radar types 2 through 4. If more than 30 waveforms are used for short pulse radar types 2 through 4, then each additional waveform must also be unique and not repeated from the previous waveforms. If more than 30 waveforms are used for Short Pulse Radar Type1, then each additional waveform is generated with Test B and must also be unique and not repeated from the previous waveforms in Tests A or B.

Pulse Repetition Frequency Number	Pulse Repetition Frequency (Pulses Per Second)	Pulse Repetition Interval (Microseconds)
1	1930.5	518
2	1858.7	538
3	1792.1	558
4	1730.1	578
5	1672.2	598
6	1618.1	618
7	1567.4	638
8	1519.8	658
9	1474.9	678
10	1432.7	698
11	1392.8	718
12	1355	738
13	1319.3	758
14	1285.3	778
15	1253.1	798
16	1222.5	818
17	1193.3	838
18	1165.6	858
19	1139	878
20	1113.6	898
21	1089.3	918
22	1066.1	938
23	326.2	3066

Table 18. Pulse Repetition Intervals Values for Test A

C. Radar Waveform Calibration

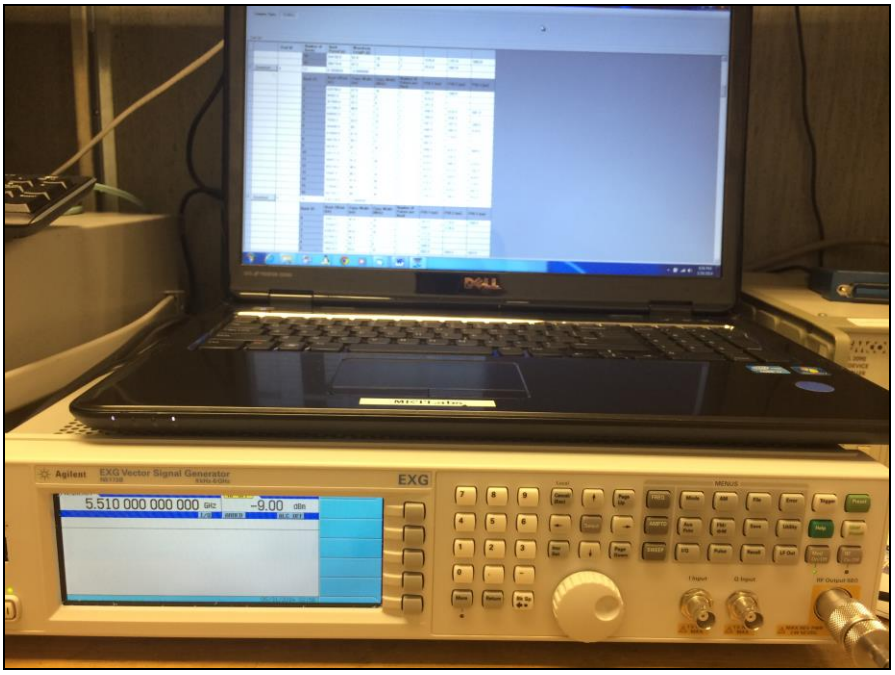
Calibration of the DFS test was done using a radiated method. A signal generator capable of producing all radar pulse types (0-6) was connected to a transmitting antenna. A receive antenna, through an external pre-amp was connected to a spectrum analyzer. The spectrum analyzer was set to a zero span with a peak detector and an RBW and VBW of 3 MHz. The transmit and receive antennas were vertically polarized during this calibration.

With the signal generator and spectrum analyzer tuned to the test frequency, each radar pulse was triggered and observed on the spectrum analyzer. The DFS Detection Threshold was verified for each radar pulse type (0-6).

During this process there were no transmissions by either the Master or Client Device.

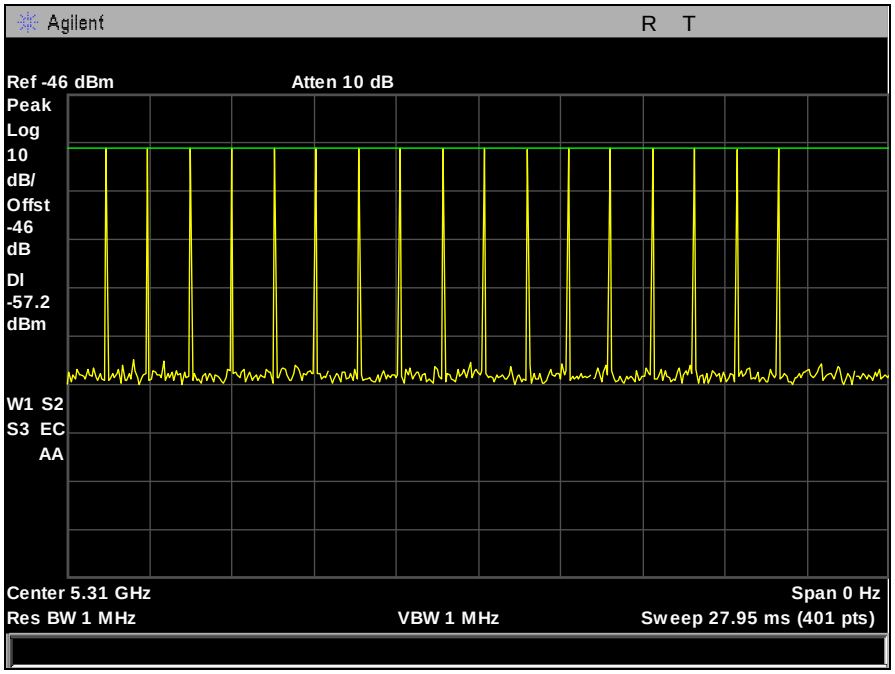
Note: Testing with pulse types 0-4 and 6 was done in the conducted configuration. The detection threshold was computed based on the total gain of the 3 antennas in the normal setup of the master device where G(total) = g = 10Log(N) or 6.77dbi. The calibration level was therefore -64 + 6.77, or -57.2dBm.

Test pulse 5 was done in the radiated configuration with a the threshold level of -64dBm

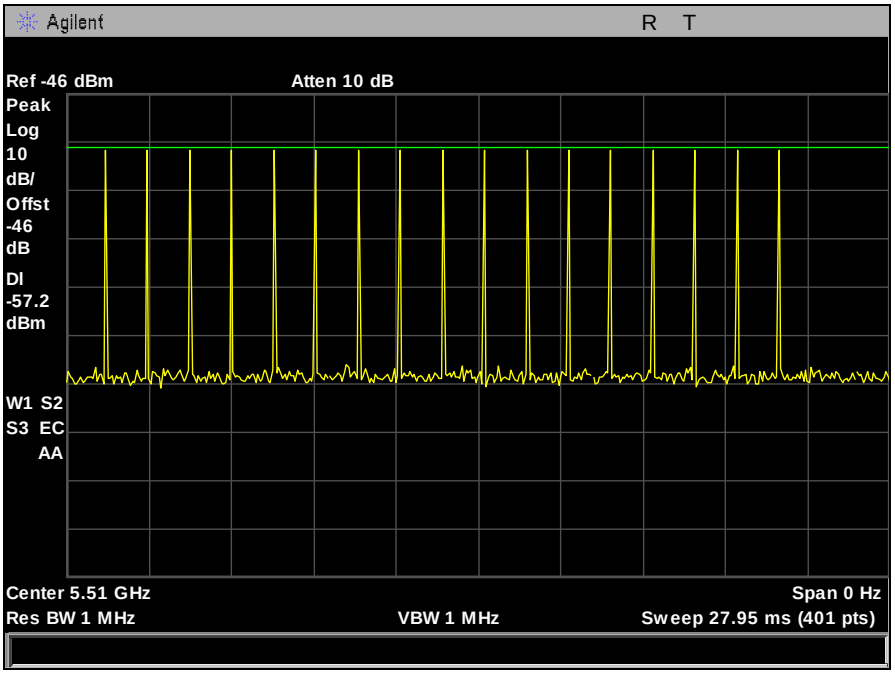


Photograph 4. DFS Radar Test Signal Generator

Radar Waveform Calibration



Plot 110. Radar Waveform Calibration, Type 0, 5310 MHz, 10 dBm

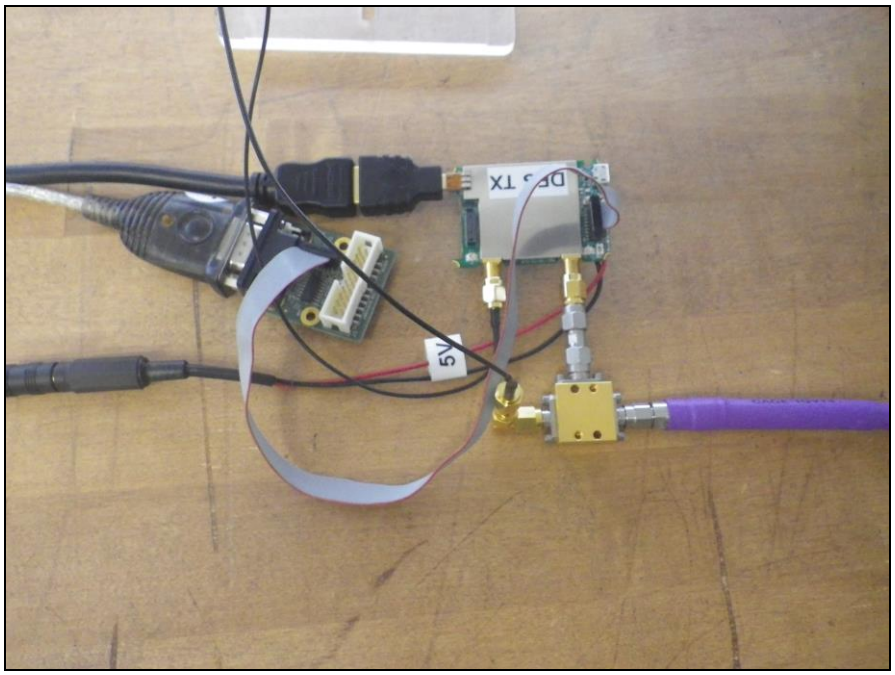


Plot 111. Radar Waveform Calibration, Type 0, 5510 MHz, 10 dBm

V. DFS Test Procedure and Test Results

A. DFS Test Setup

1. A spectrum analyzer is used as a monitor to verify that the Unit Under Test (EUT) has vacated the Channel within the Channel Closing Transmission Time and Channel Move Time, and does not transmit on a Channel during the Non-Occupancy Period after the detection and subsequent Channel move. It is also used to monitor EUT transmissions during the Channel Availability Check Time.
2. The test setup, which consists of test equipment and equipment under test (EUT), is diagrammed in Photograph 5.



Photograph 5. DFS, Test Setup Conducted

B. UNII Detection Bandwidth

Test Requirement(s): **KDB 905462 §5.1** All BW modes must be tested.

§5.3 A minimum 100% detection rate is required across a EUT's 99% bandwidth.

Test Results: The EUT was not applicable with the requirements of this section. The EUT is a client device without radar detection.

C. Channel Availability Check Time

Test Requirements: **§15.407(h)(2)(ii)** A U-NII device shall check if there is a radar system already operating on the channel before it can initiate a transmission on a channel and when it has to move to a new channel. The U-NII device may start using the channel if no radar signal with a power level greater than the interference threshold values listed in paragraph (h)(2) of this section, is detected within 60 seconds.

Test Results: The EUT was not applicable with the requirements of this section. The EUT is a client device without radar detection.

D. In-Service Monitoring for Channel Move Time, Channel Closing Transmission Time, and Non-Occupancy Period

Test Requirements: **§15.407(h)(2)(iii)** Channel Move Time. After a radar's presence is detected, all transmissions shall cease on the operating channel within 10 seconds. Transmissions during this period shall consist of normal traffic for a maximum of 200 ms after detection of the radar signal. In addition, intermittent management and control signals can be sent during the remaining time to facilitate vacating the operating channel.

§15.407(h)(2)(iv) Non-occupancy Period. A channel that has been flagged as containing a radar system, either by a channel availability check or in-service monitoring, is subject to a non-occupancy period of at least 30 minutes. The non-occupancy period starts at the time when the radar system is detected.

KDB 905462 §5.1 Test using widest BW mode available.

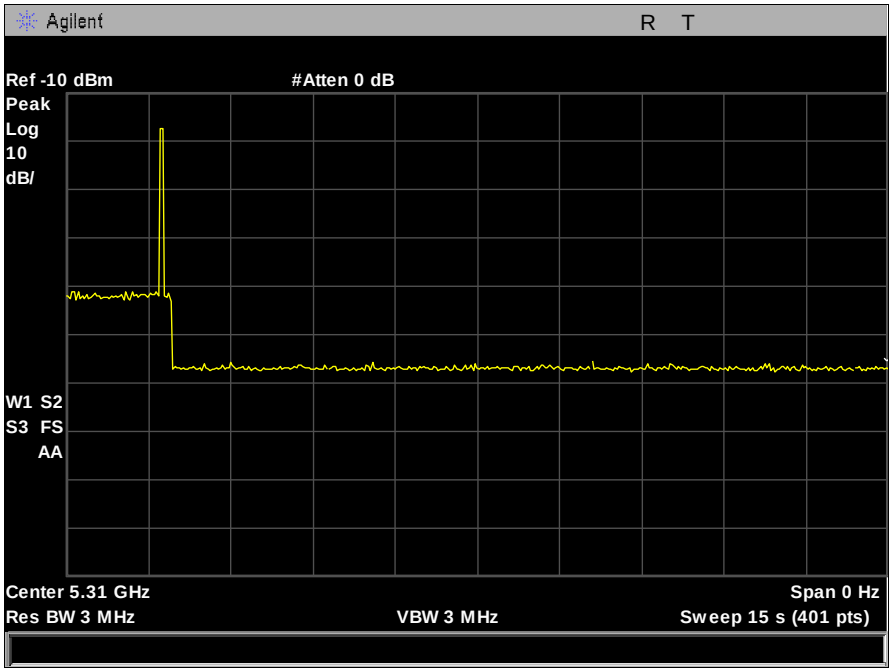
Test Procedure: The EUT was setup as a Master device and associated with a Client device. A test file was streamed from the Master device to the Client device for the entire period of the test. A Radar Burst of type 0 with a level equal to the DFS Detection Threshold + 1 dB was used.

A radar pulse was generated while the EUT was transmitting. A spectrum analyzer set to a zero span was used to observe the transmission of the EUT at the end of the burst.

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

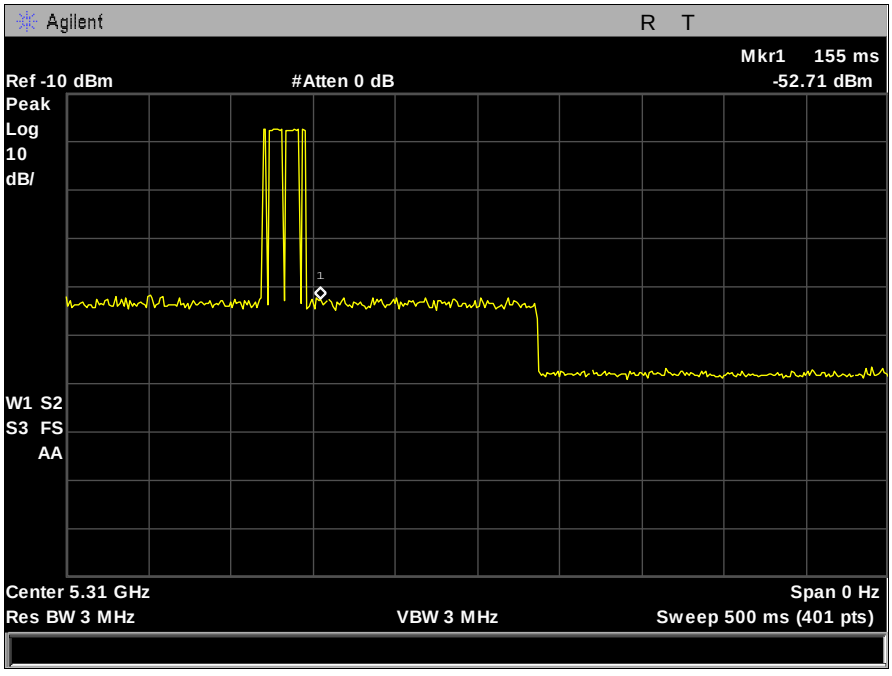
Test Engineer(s): Hadid Jones

Test Date(s): 12/16/15



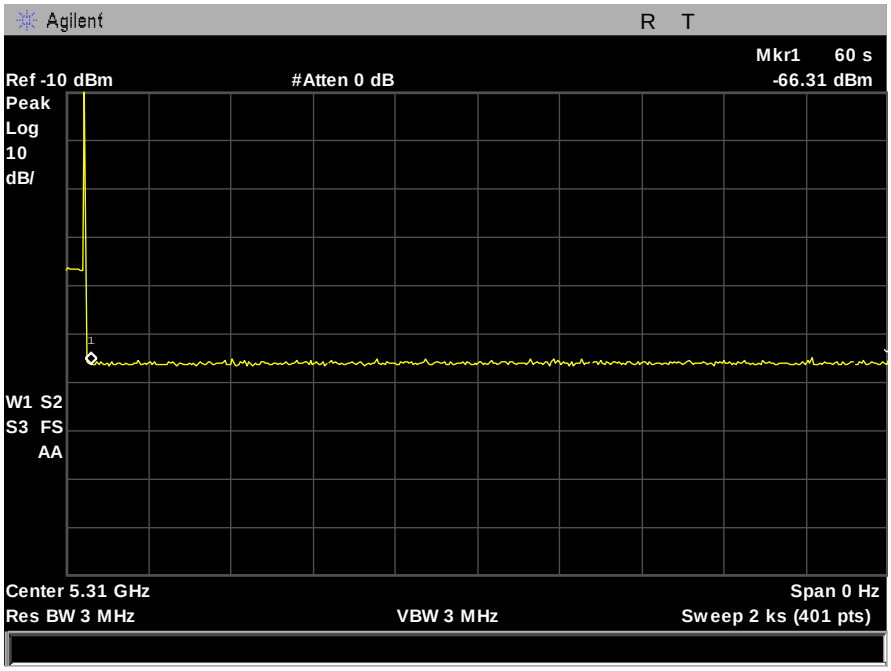
Plot 112. Channel Move Time, 40 MHz

Note: In the above graph the pulse was injected after ~1.5 seconds and the transmission moved in less than 1 second.



Plot 113. Channel Close Time, 40 MHz

Note: In the graph above the pulse was injected at ~130ms and the transmission stopped ~180ms thereafter.



Plot 114. Non-Occupancy Period

E. Statistical Performance Check

Test Requirements: **KDB 905462 §5.1** All BW modes must be tested.

KDB 905462: Each of the Radar Pulse types requires a minimum percentage of detections while the EUT is transmitting and listening for potential radar systems operating within the DFS Detection Bandwidth.
For Short Pulse Radar types the aggregate minimum percentage of detections is 80 percent.
Fort the Long Pulse Radar types the minimum percentage of detections is 80 percent.
For the Frequency Hopping Radar type the minimum percentage of detections is 70 percent.

Test Results: The EUT was not applicable with the requirements of this section. The EUT is a client device without radar detection.

VI. 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.

MET ASSET #	EQUIPMENT	MANUFACTURER	MODEL	LAST CAL DATE	CAL DUE DATE
1T4612	SPECTRUM ANALYZER	AGILENT TECHNOLOGIES	E4407B	09/01/2015	03/01/2017
1T4871	VECTOR SIGNAL GENERATOR	AGILENT TECHNOLOGIES	N5172B	02/03/2016	08/03/2017
1T8818	SPECTRUM ANALYZER	AGILENT TECHNOLOGIES	E4407B	12/16/2015	12/16/2016
1T4300B	SEMI-ANECHOIC 3M CHAMBER # 1 D (2043A-1) (IC)	EMC TEST SYSTEMS	NONE	01/11/2015	01/11/2018
1T4409	EMI RECEIVER	ROHDE & SCHWARZ	ESIB7	10/29/2014	10/29/2016
1T4753	ANTENNA - BILOG	SUNOL SCIENCES	JB6	03/09/2015	09/09/2016
1T4483	ANTENNA; HORN	ETS-LINDGREN	3117	10/08/2015	04/08/2017
1T4771	PSA SPECTRUM ANALYZER	AGILENT TECHNOLOGIES	E4446A	11/25/2014	05/25/2016

Table 19. Test Equipment List

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

VII. 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.

VIII. Appendix

