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, CA 95054 • PHONE (408) 748-3585 • FAX (510) 489-6372
13301 MCCALLEN PASS • AUSTIN, TEXAS 78753 • PHONE (512) 287-2500 • FAX (512) 287-2513

August 4, 2014

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

Dear Tal Keren-Zvi,

Enclosed is the EMC Wireless test report for compliance testing of the Amimon, MAGLAN 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 and RSS-210 Issue 8 December 2010 for Intentional Radiators.

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\EMC41655D-FCC407 Rev. 1 (UNII 2))

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, CA 95054 • PHONE (408) 748-3585 • FAX (510) 489-6372
13301 MCCALLEN PASS • AUSTIN, TEXAS 78753 • PHONE (512) 287-2500 • FAX (512) 287-2513

Electromagnetic Compatibility Criteria
Test Report

for the

Amimon
Model MAGLAN

Tested under
the Certification Rules
contained in
Title 47 of the CFR, Part 15.407 & RSS-210
for Intentional Radiators

MET Report: EMC41655D-FCC407 Rev. 1 (UNII 2)

August 4, 2014

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
Test Report

for the

Amimon
Model MAGLAN

Tested under
the Certification Rules
contained in
Title 47 of the CFR, Part 15.407 & RSS-210
for Intentional Radiators

Surinder Singh, 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 Part 15.407 of the FCC Rules and Industry Canada standard RSS-210 Issue 8 December 2010 under normal use and maintenance.

Asad Bajwa,
Director, Electromagnetic Compatibility Lab

Report Status Sheet

Revision	Report Date	Reason for Revision
∅	June 24, 2014	Initial Issue.
1	August 4, 2014	Revised to reflect engineer corrections.

Table of Contents

List of Tables

List of Figures

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

IV. Executive Summary

A. Purpose of Test

An EMC evaluation was performed to determine compliance of the Amimon MAGLAN, 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 MAGLAN. Amimon should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the MAGLAN, 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 35. All tests were conducted using measurement procedure ANSI C63.4-2003.

FCC Reference	IC Reference	Description	Results
47 CFR Part 15.107 (a)	ICES-003 Issue 5 August 2012	Conducted Emission Limits for a Class B Digital Device	Compliant
47 CFR Part 15.109 (a)	ICES-003 Issue 5 August 2012	Radiated Emission Limits for a Class B Digital Device	Compliant
§15.203	RSS-GEN 7.1.4	Antenna Requirements	Compliant
§15.207	RSS-GEN 7.2.2; RSS-210 2.2	AC Conducted Emissions 150KHz – 30MHz	Compliant
§15.407 (i)	A8.2	26dB Occupied Bandwidth	Compliant
§15.407 (a)(2)	A9.2(3)	Conducted Transmitter Output Power	Compliant
§15.407 (a)(2)	A9.2(3)	Power Spectral Density	Compliant
§15.407 (a)(6)	N/A	Peak Excursion	Compliant
§15.407 (b)(2), (3), (5), (6)	A9.3(4)	Undesirable Emissions (15.205/15.209 - General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Compliant
§15.407(f)	RSS-GEN	RF Exposure	Compliant
§15.407(g)	2.1	Frequency Stability	Compliant
15.407 (h)(2)(ii)	A9.3	Transmit Power Control (TPC)	Compliant
15.407 (h)(2)(ii)	A9.3	Initial Channel Availability Check Time	Compliant
15.407 (h)	A9.3	DFS Bandwidth	Compliant
15.407 (h)(2)(ii)	A9.3	Radar Burst at the Beginning of Channel Availability Check Time	Compliant
15.407 (h)(2)(ii)	A9.3	Radar Burst at the End of Channel Availability Check Time	Compliant
15.407 (h)(2)(iii)	A9.3	Channel Move Time and Channel Closing Time	Compliant
15.407 (h)(2)(iv)	A9.3	Non-Occupancy Period	Compliant
15.407 (h)(2)	A9.3	Statistical Performance Check	Compliant

Table 1. Executive Summary of EMC Part 15.407 ComplianceTesting

V. Equipment Configuration

A. Overview

MET Laboratories, Inc. was contracted by Amimon to perform testing on the MAGLAN, under Amimon's purchase order number 35.

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

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

Model(s) Tested:	MAGLAN	
Model(s) Covered:	MAGLAN	
EUT Specifications:	Primary Power: 5VDC	
	FCC ID: VQSAMNMGIN01	
	Type of Modulations:	BPSK; OFDM
	Equipment Code:	NII
	Peak RF Output Power:	5250-5350 MHz: 23.81 dBm 5470-5725 MHz: 23.93 dBm
	EUT Frequency Ranges:	5260 – 5320 MHz; 5500 – 5580 MHz; 5660 - 5700 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	
Evaluated by:	Surinder Singh	
Report Date(s):	August 4, 2014	

Table 2. EUT Summary

B. References

CFR 47, Part 15, Subpart E	Unlicensed National Information Infrastructure Devices (UNII)
RSS-210 Issue 8 Dec. 2010	Low-power Licence-exempt Radiocommunications Devices (All Frequency Bands): Category I Equipment
RSS-GEN, Issue 3, Dec. 2010	General Requirements and Information for the Certification of Radio Apparatus
CFR 47, Part 15, Subpart B	Electromagnetic Compatibility: Criteria for Radio Frequency Devices
ICES-003, Issue 5 August 2012	Information Technology Equipment (ITE) — Limits and methods of measurement
ANSI C63.4:2003	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 C63.10-2009	American National Standard for Testing Unlicensed Wireless Devices

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 MAGLAN video Sink module is designed to be at the receiver end of the WHDI downstream. The MAGLAN receives wireless downstream transmission, demodulates it and regenerates the video, audio and control content transmitted by the WHDI source.

The receiver works at the 5GHz unlicensed band.

The channel bandwidth can be operated at 40MHz and 20 MHz modes.

The MAGLAN board has 5 receiving channels (Multiple-In), and single transmitting channel (Single-Out).

The MAGLAN is a DFS Master device. It is equipped with all features and characteristics required to fully provide CAC and ISM requirements for Radar-Detection.

The MAGLAN board is designed to be integrated with any custom-designed video interface board (e.g. HDMI or DH-SDI video interfaces), to form a complete product with standard video output and wireless capabilities.

The MAGLAN board is independent module, fully performing the wireless functionality of the WHDI video link.

E. Equipment Configuration

Ref. ID	Slot #	Name / Description
A	N/A	MAGLAN

Table 4. Equipment Configuration

F. Support Equipment

Amimon supplied support equipment necessary for the operation and testing of the MAGLAN. All support equipment supplied is listed in the following Support Equipment List.

Ref. ID	Name / Description	Manufacturer	Model Number	Customer Supplied Calibration Data
1	PC Laptop	N/A	N/A	N/A
2	Debug Board (APP; MAGLAN)	Amimon	AMN043PCB	N/A
3	Debug Flat Cable	N/A	N/A	N/A
4	USB-to-Serial Converter (APP; MAGLAN)	ATEN	UC-232A	N/A
5	USB cable (optional)	N/A	N/A	N/A
6	MAGLAN supply cord	Amimon	-	N/A

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
J15	RF TX Port	External Antenna	1	N/A	N/A	UL
J1	5V DC Supply	MAGLAN 5V Power Supply Cord	1	0.1	No	5VDC
J2	APP UART	Debug Flat Cable	1	0.1	No	APP
J3	MAC UART	Debug Flat Cable	1	0.1	No	MAC

Table 6. Ports and Cabling Information

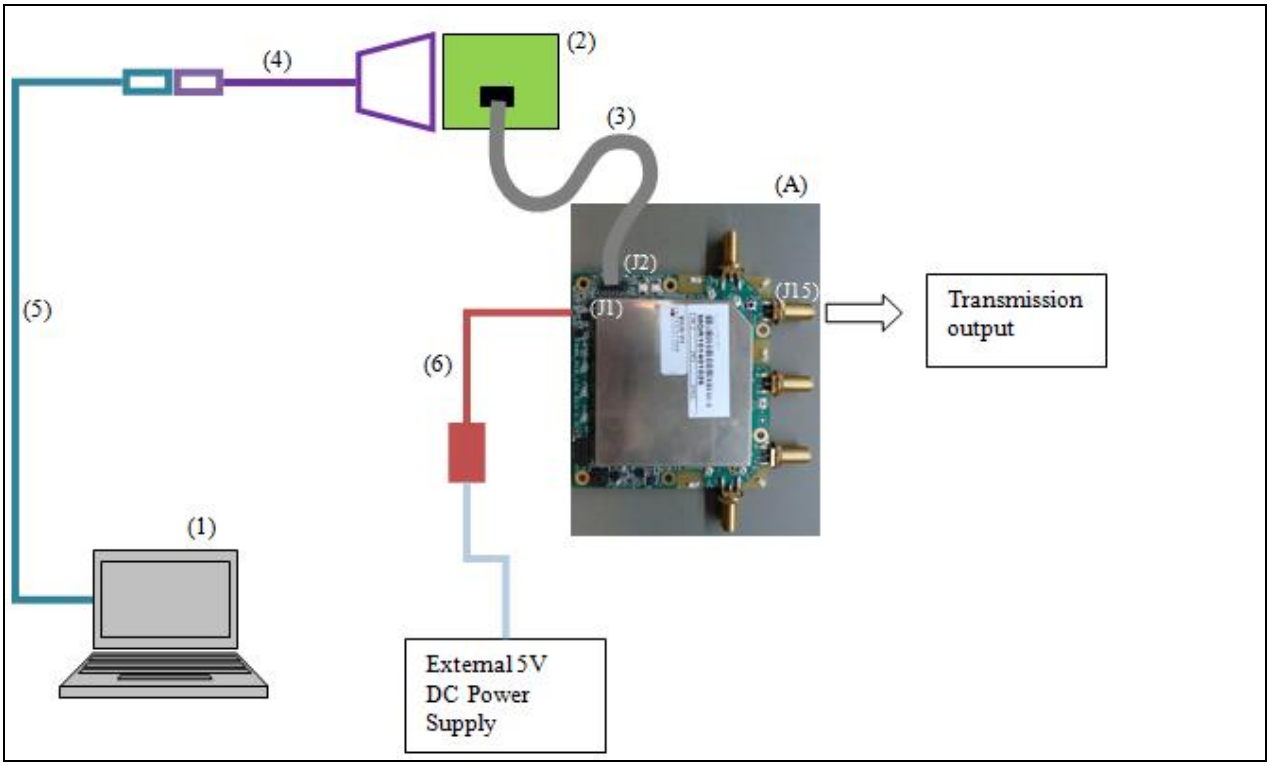


Figure 1. Block Diagram of Test Configuration

H. Mode of Operation

The MAGLAN board can be set into Test mode, simulating continues normal operating mode.

This mode is enabled by simple GUI provided by AMIMON's 'AppCom' Tool.

The tool enables setting the EUT to Transmit or Receive modes. It controls the center channel frequency, the operating channel bandwidth, and the TX channel power.

A complete description of operation is detailed in 'How to use AppCom Regulation control.doc' file.

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 Unintentional Radiators

Electromagnetic Compatibility Criteria

§ 15.107 Conducted Emissions Limits

Test Requirement(s):

15.107 (a) Except for Class A digital devices, for equipment 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 30 MHz shall not exceed the limits in Table 7. Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminals.

15.107 (b) For a Class A digital device 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 30 MHz shall not exceed the limits in Table 7. Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminals. The lower limit applies at the band edges.

Frequency range (MHz)	Class A Conducted Limits (dBµV)		*Class B Conducted Limits (dBµV)	
	Quasi-Peak	Average	Quasi-Peak	Average
* 0.15- 0.45	79	66	66 - 56	56 - 46
0.45 - 0.5	79	66	56	46
0.5 - 30	73	60	60	50
Note 1 — The lower limit shall apply at the transition frequencies. Note 2 — The limit decreases linearly with the logarithm if the frequency in the range 0.15 MHz to 0.5 MHz.				

Table 7. Conducted Limits for Radio Frequency Devices calculated from FCC Part 15 Subsections 15.107(a) (b)

Test Procedures:

The EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber. The method of testing, test conditions, and test procedures of ANSI C63.4 were used. The EUT was powered through a 50Ω/50µH LISN. An EMI receiver, connected to the measurement port of the LISN, scanned the frequency range from 150 kHz to 30 MHz in order to find the peak conducted emissions. All peak emissions within 6 dB of the limit were re-measured using a quasi-peak and/or average detector as appropriate.

Test Results:

The EUT was compliant with the Class B requirement(s) of this section. Measured emissions were below applicable limits.

Test Engineer(s):

Surinder Singh

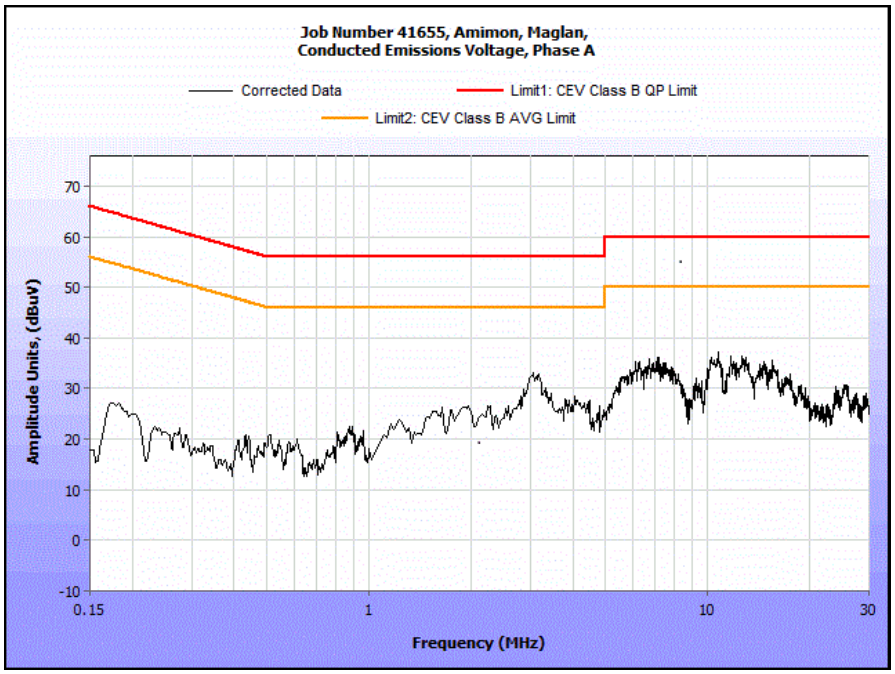
Test Date(s):

05/05/14

Conducted Emissions - Voltage, AC Power, Phase Line

Frequency (MHz)	Uncorrected Meter Reading (dBuV) QP	Cable Loss (dB)	Corrected Measurement (dBuV) QP	Limit (dBuV) QP	Margin (dB) QP	Uncorrected Meter Reading (dBuV) Avg.	Cable Loss (dB)	Corrected Measurement (dBuV) Avg.	Limit (dBuV) Avg.	Margin (dB) Avg.
0.1725	27.03	0	27.03	79	-51.97	9.903	0	9.903	66	-56.097
0.8864	16.72	0	16.72	73	-56.28	5.569	0	5.569	60	-54.431
3.067	29.27	0	29.27	73	-43.73	18.1	0	18.1	60	-41.9
7.041	29.92	0.17	30.09	73	-42.91	19.15	0.17	19.32	60	-40.68
10.21	27.48	0.17	27.65	73	-45.35	17.95	0.17	18.12	60	-41.88
27.2	22.84	0.17	23.01	73	-49.99	15.35	0.17	15.52	60	-44.48

Table 8. Conducted Emissions - Voltage, AC Power, Phase Line

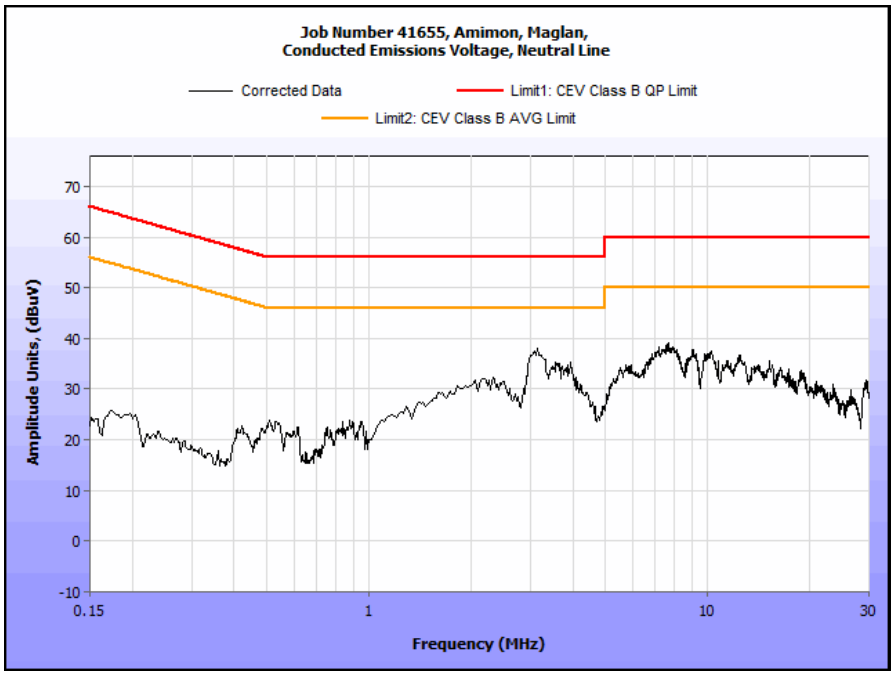


Plot 1. Conducted Emissions, Phase Line Plot

Conducted Emissions - Voltage, AC Power, Neutral Line

Frequency (MHz)	Uncorrected Meter Reading (dBuV) QP	Cable Loss (dB)	Corrected Measurement (dBuV) QP	Limit (dBuV) QP	Margin (dB) QP	Uncorrected Meter Reading (dBuV) Avg.	Cable Loss (dB)	Corrected Measurement (dBuV) Avg.	Limit (dBuV) Avg.	Margin (dB) Avg.
0.1733	21.25	0	21.25	79	-57.75	11.03	0	11.03	66	-54.97
0.531	18.03	0	18.03	73	-54.97	6.903	0	6.903	60	-53.097
0.8852	20.02	0	20.02	73	-52.98	9.722	0	9.722	60	-50.278
3.05	32.27	0	32.27	73	-40.73	21.57	0	21.57	60	-38.43
7.812	33.48	0.17	33.65	73	-39.35	25.33	0.17	25.5	60	-34.5
29.34	26.78	0.28	27.06	73	-45.94	20.9	0.28	21.18	60	-38.82

Table 9. Conducted Emissions - Voltage, AC Power, Neutral Line



Plot 2. Conducted Emissions, Neutral Line Plot

Radiated Emission Limits

§ 15.109 Radiated Emissions Limits

Test Requirement(s): **15.109 (a)** Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the Class B limits expressed in Table 10.

15.109 (b) The field strength of radiated emissions from a Class A digital device, as determined at a distance of 10 meters, shall not exceed the Class A limits expressed in Table 10.

Frequency (MHz)	Field Strength (dBµV/m)	
	§15.109 (b), Class A Limit (dBµV) @ 10m	§15.109 (a),Class B Limit (dBµV) @ 3m
30 - 88	39.00	40.00
88 - 216	43.50	43.50
216 - 960	46.40	46.00
Above 960	49.50	54.00

Table 10. Radiated Emissions Limits calculated from FCC Part 15, §15.109 (a) (b)

Test Procedures: The EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber. The method of testing and test conditions of ANSI C63.4 were used. An antenna was located 3 m from the EUT on an adjustable mast. A pre-scan was first performed in order to find prominent radiated emissions. For final emissions measurements at each frequency of interest, the EUT was rotated and the antenna height was varied between 1 m and 4 m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. Unless otherwise specified, measurements were made using a quasi-peak detector with a 120 kHz bandwidth.

Test Results: The EUT was compliant with the Class B requirement(s) of this section. Measured emissions were below applicable limits.

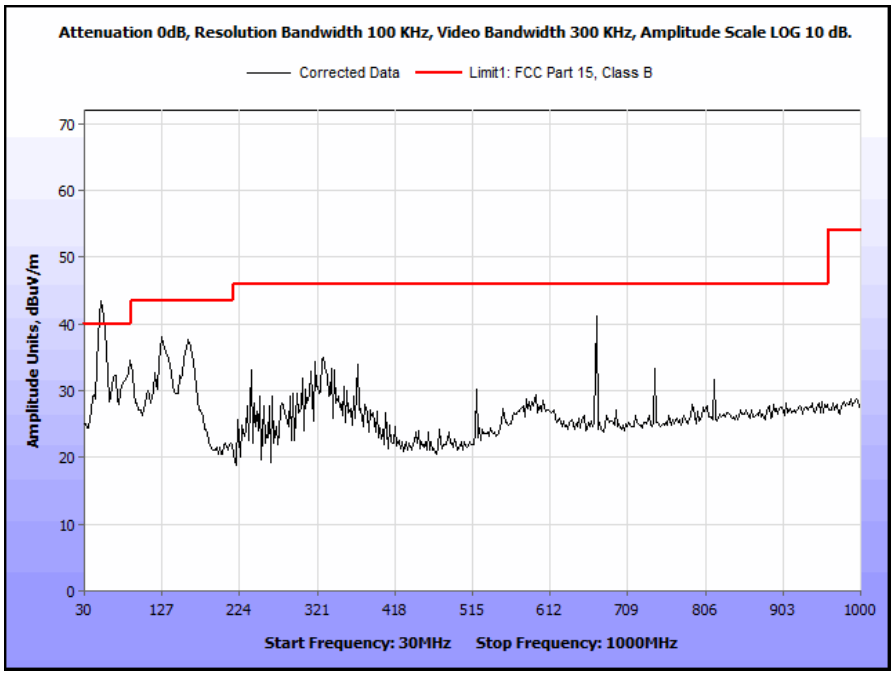
Test Engineer(s): Surinder Singh

Test Date(s): 04/23/14 – 05/05/14

Radiated Emissions Limits Test Results, Class B

Frequency (MHz)	EUT Azimuth (Degrees)	Antenna Polarity (H/V)	Antenna HEIGHT (m)	Uncorrected Amplitude (dBuV)	Antenna Correction Factor (dB) (+)	Cable Loss (dB) (+)	Distance Correction Factor (dB) (-)	Corrected Amplitude (dBuV/m)	Limit (dBuV/m)	Margin (dB)
49.779559	2	H	1.59	9.20	8.77	0.48	0.00	18.45	40.00	-21.55
49.779559	11	V	1.61	28.84	8.77	0.48	0.00	38.09	40.00	-1.91
156.01202	22	H	1.57	9.73	12.90	0.95	0.00	23.58	43.50	-19.92
156.01202	12	V	1.55	15.29	12.90	0.95	0.00	29.14	43.50	-14.36
328.33292	24	H	1.57	4.94	14.77	1.29	0.00	21.00	46.00	-25.00
328.33292	35	V	1.60	7.78	14.77	1.29	0.00	23.84	46.00	-22.16
668.25777	35	H	1.53	11.00	20.57	2.14	0.00	33.71	46.00	-12.29
668.25777	36	V	1.60	8.30	20.57	2.14	0.00	31.01	46.00	-14.99
742.50251	23	H	1.49	7.84	21.20	2.38	0.00	31.42	46.00	-14.58
742.50251	20	V	1.43	6.58	21.20	2.38	0.00	30.16	46.00	-15.84

Table 11. Radiated Emissions Limits, Test Results, 30 MHz – 1 GHz



Plot 3. Radiated Emissions, 30 MHz - 1 GHz

Frequency (MHz)	EUT Azimuth (Degrees)	Antenna Polarity (H/V)	Antenna HEIGHT (m)	Uncorrected Amplitude (dBuV)	Antenna Correction Factor (dB) (+)	Cable Loss (dB) (+)	Distance Correction Factor (dB) (-)	Corrected Amplitude (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1.046	34	H	1.08	8.478	24.31	5.86	0	38.64	54	-15.36
1.046	45	V	1.03	7.567	24.34	5.87	0	37.78	54	-16.22
1.256	122	H	1.12	7.673	25.57	6.08	0	33.24	54	-20.76
1.256	155	V	1.15	7.225	25.71	6.09	0	39.03	54	-14.97
1.483	132	H	1.02	8.382	25.62	7.48	0	41.48	54	-12.52
1.483	167	V	1.09	8.382	25.77	7.50	0	41.65	54	-12.35
1.645	278	H	1.05	6.378	26.09	8.05	0	40.52	54	-13.48
1.645	219	V	1.05	7.249	26.19	8.18	0	41.62	54	-12.38
1.825	356	H	1.08	7.836	27.46	7.83	0	43.13	54	-10.87
1.825	14	V	1.05	8.375	27.50	7.85	0	43.73	54	-10.27
1.948	94	H	1.12	7.372	28.13	8.24	0	43.74	54	-10.26
1.948	325	V	1.12	7.148	28.02	8.26	0	43.43	54	-10.58

Table 12. Radiated Emissions Limits, Test Results, 1 GHz – 2 GHz

IV. 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 to the criteria of §15.203. Depending on configuration, the EUT either has an integrated antenna or an antenna with a unique connector (reverse polarity SMA).

Test Engineer(s): Surinder Singh

Test Date(s): 05/13/14

Electromagnetic Compatibility Criteria for Intentional Radiators

§15.207 Conducted Emissions Limits

Test Requirement(s): **§ 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 13. Conducted Limits for Intentional Radiators from FCC Part 15 § 15.207(a)

Test Procedure: The EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber. 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 C63.4-1992 "Methods and Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40 GHz"*. The measurements were performed over the frequency range of 0.15 MHz to 30 MHz using a 50 Ω/50 μH LISN as the input transducer to an EMC/field intensity meter.

Test Results: The EUT was compliant with the Class B requirement(s) of this section. Measured emissions were below the applicable limit.

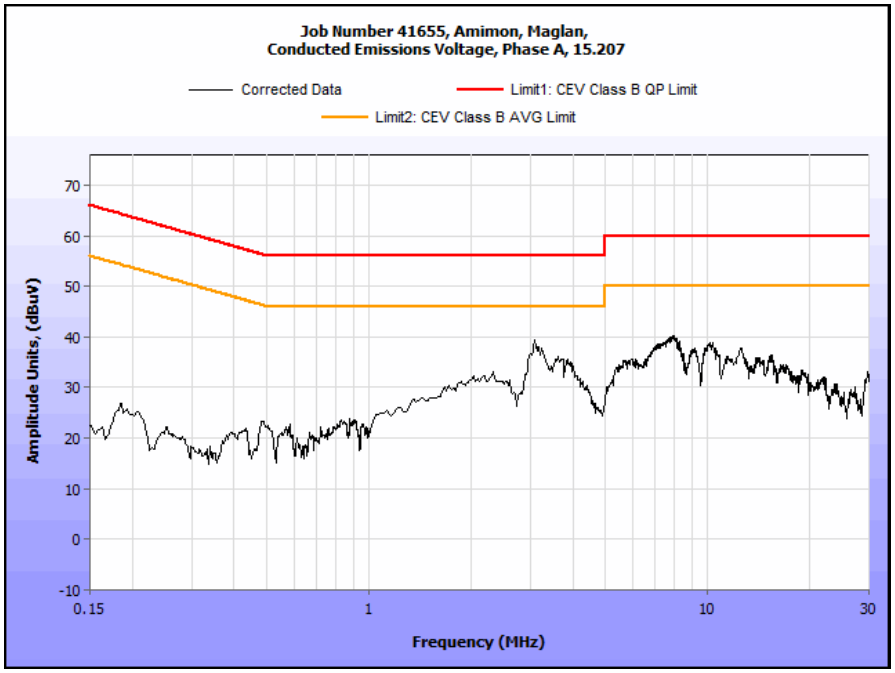
Test Engineer(s): Surinder Singh

Test Date(s): 05/13/14

Conducted Emissions - Voltage, AC Power

Frequency (MHz)	Uncorrected Meter Reading (dBuV) QP	Cable Loss (dB)	Corrected Measurement (dBuV) QP	Limit (dBuV) QP	Margin (dB) QP	Uncorrected Meter Reading (dBuV) Avg.	Cable Loss (dB)	Corrected Measurement (dBuV) AVG	Limit (dBuV) AVG	Margin (dB) AVG
0.1829	21.81	0	21.81	79	-57.19	11.4	0	11.4	66	-54.6
0.4862	19.18	0	19.18	79	-59.82	9.912	0	9.912	66	-56.088
2.189	12.36	0	12.36	73	-60.64	8.251	0	8.251	60	-51.749
3.098	34.92	0	34.92	73	-38.08	23.63	0	23.63	60	-36.37
7.412	34.84	0.17	35.01	73	-37.99	26.04	0.17	26.21	60	-33.79
15.24	30.36	0	30.36	73	-42.64	22.37	0	22.37	60	-37.63

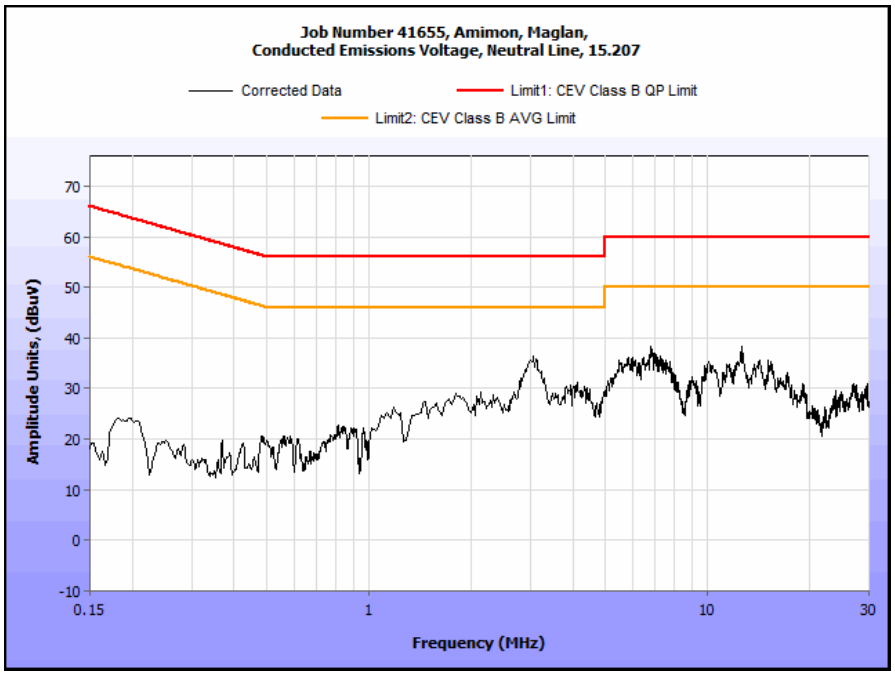
Table 14. Conducted Emissions - Voltage, AC Power, Phase Line



Plot 4. §15.207 Conducted Emissions, Phase Line

Frequency (MHz)	Uncorrected Meter Reading (dBuV) QP	Cable Loss (dB)	Corrected Measurement (dBuV) QP	Limit (dBuV) QP	Margin (dB) QP	Uncorrected Meter Reading (dBuV) Avg.	Cable Loss (dB)	Corrected Measurement (dBuV) AVG	Limit (dBuV) AVG	Margin (dB) AVG
0.1824	20.74	0	20.74	79	-58.26	9.252	0	9.252	66	-56.748
0.503	13.71	0	13.71	73	-59.29	4.176	0	4.176	60	-55.824
3.085	29.53	0	29.53	73	-43.47	17.88	0	17.88	60	-42.12
7.085	30.26	0.17	30.43	73	-42.57	19.8	0.17	19.97	60	-40.03
12.53	30.11	0.12	30.23	73	-42.77	21.44	0.12	21.56	60	-38.44
29.31	23.52	0.27	23.79	73	-49.21	15.48	0.27	15.75	60	-44.25

Table 15. Conducted Emissions - Voltage, AC Power, Neutral Line



Plot 5. §15.207 Conducted Emissions, Neutral Line

Electromagnetic Compatibility Criteria for Intentional Radiators

§15. 403(c) 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 both 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 and was determined from the plots on the following pages.

Test Engineer(s): Surinder Singh

Test Date(s): 05/13/14

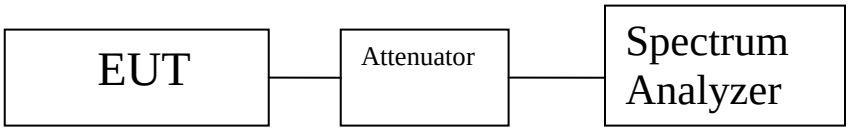


Figure 2. Occupied Bandwidth, Test Setup

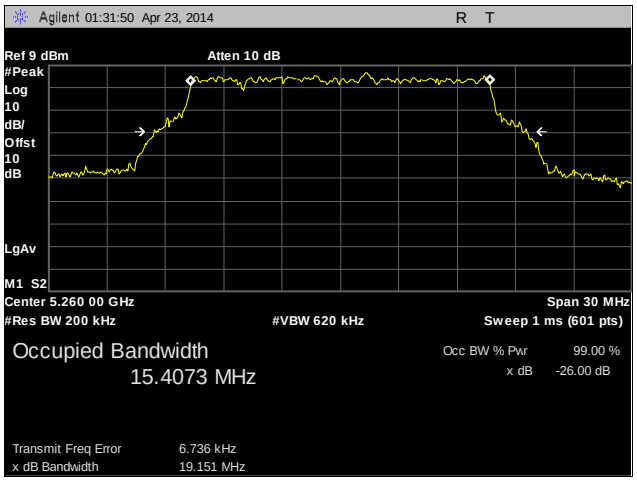
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
20 MHz	5260	19.151
	5300	18.807
	5320	19.092
	5500	19.130
	5580	18.826
	5700	18.858
40 MHz	5270	38.128
	5310	38.050
	5510	37.999
	5670	38.190

Table 16. 26 dB Occupied Bandwidth, Test Results

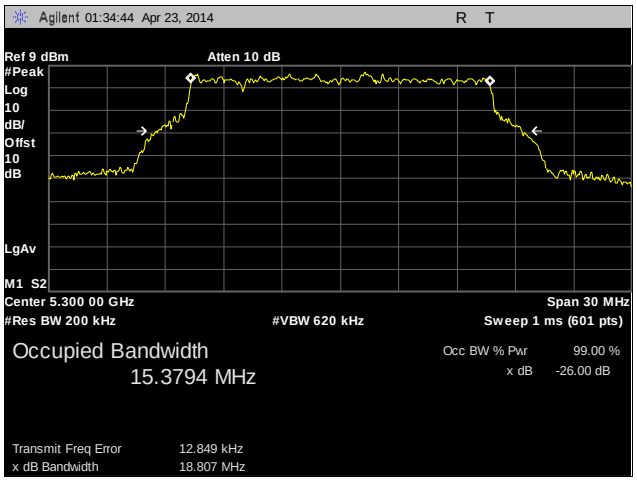
Channel	Frequency (MHz)	99% Bandwidth (MHz)
20 MHz	5260	15.4812
	5300	15.4470
	5320	15.4852
	5500	15.4530
	5580	15.4469
	5700	15.5373
40 MHz	5270	31.2171
	5310	31.0199
	5510	31.1281
	5670	31.1107

Table 17. 99% Occupied Bandwidth, Test Results

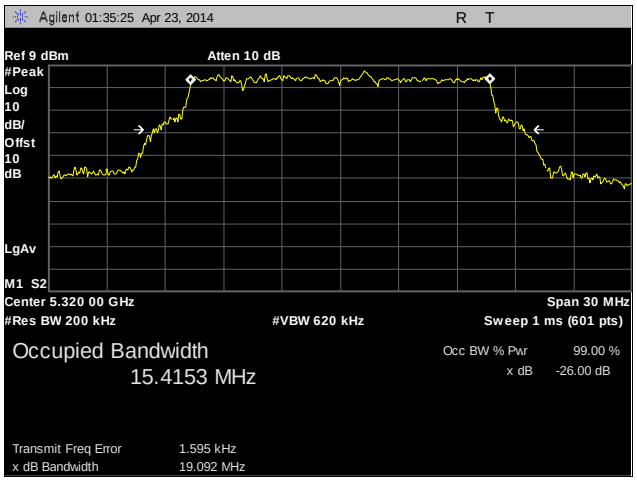
26 dB Occupied Bandwidth, 20 MHz



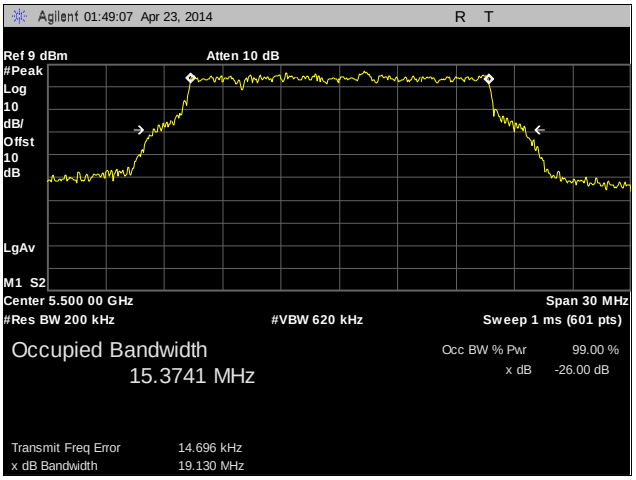
Plot 6. 26 dB Occupied Bandwidth, 20 MHz, 5260 MHz



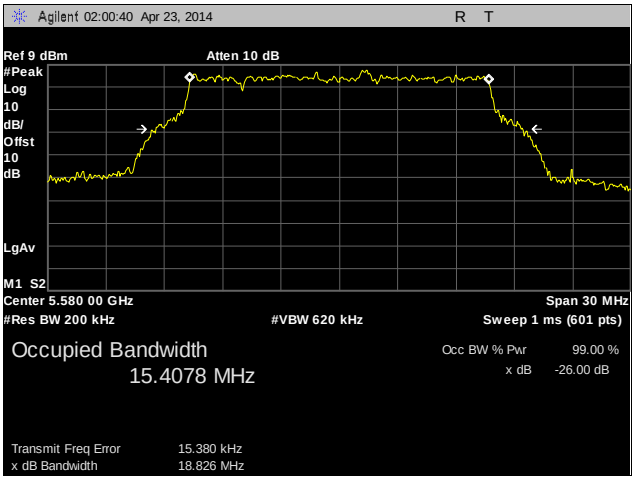
Plot 7. 26 dB Occupied Bandwidth, 20 MHz, 5300 MHz



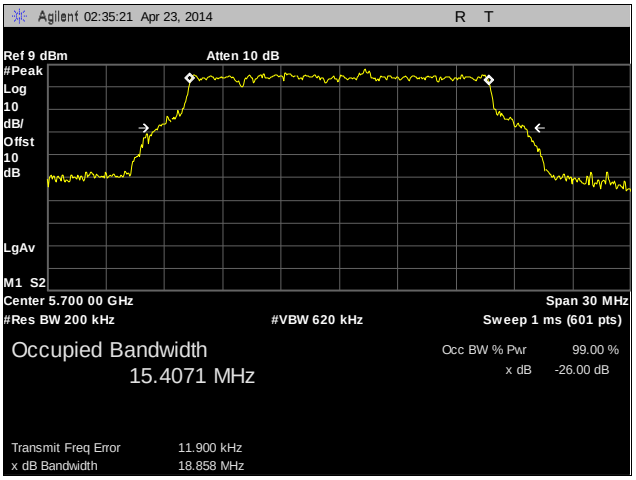
Plot 8. 26 dB Occupied Bandwidth, 20 MHz, 5320 MHz



Plot 9. 26 dB Occupied Bandwidth, 20 MHz, 5500 MHz

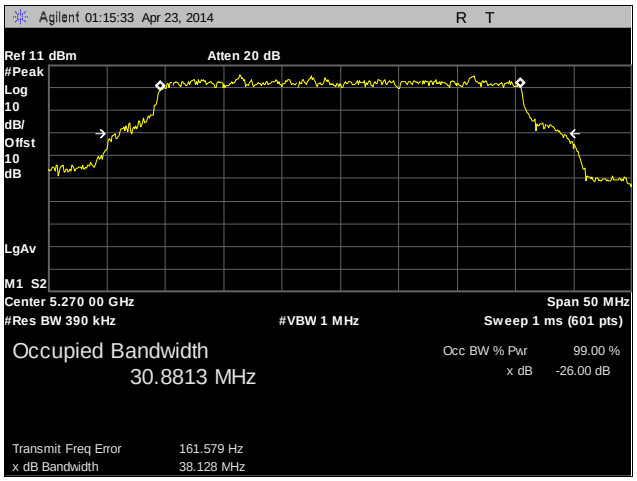


Plot 10. 26 dB Occupied Bandwidth, 20 MHz, 5580 MHz

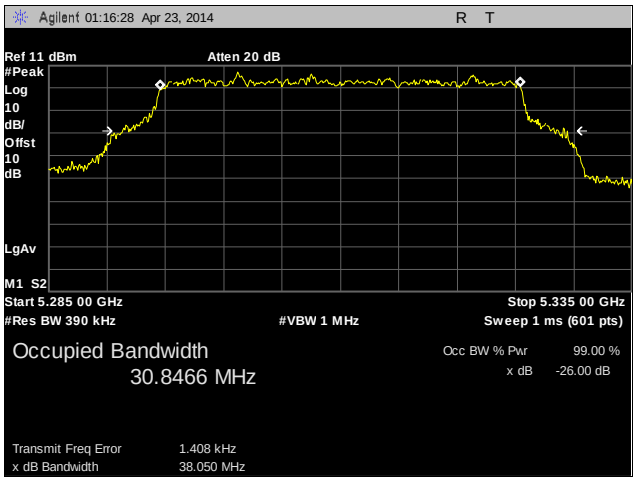


Plot 11. 26 dB Occupied Bandwidth, 20 MHz, 5700 MHz

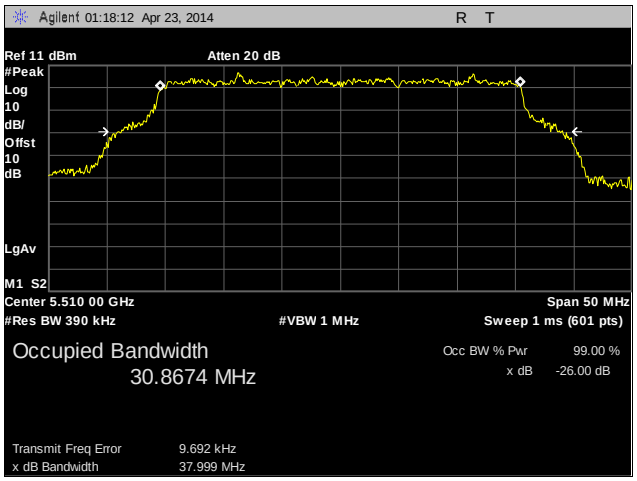
26 dB Occupied Bandwidth, 40 MHz



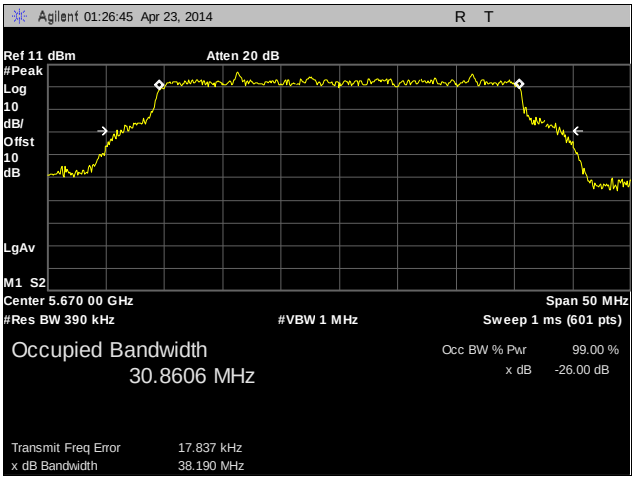
Plot 12. 26 dB Occupied Bandwidth, 40 MHz, 5270 MHz



Plot 13. 26 dB Occupied Bandwidth, 40 MHz, 5310 MHz

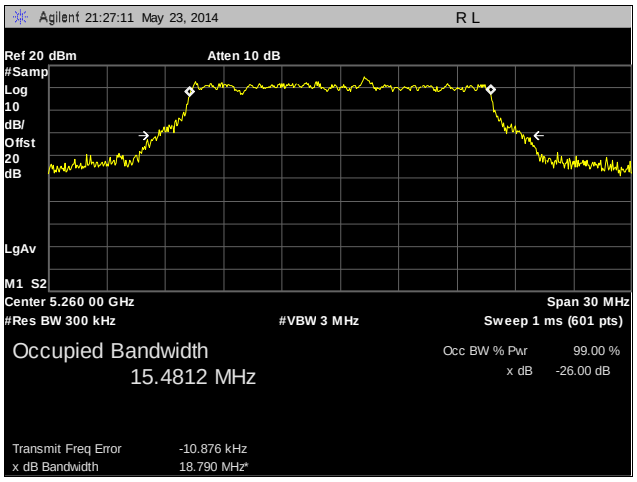


Plot 14. 26 dB Occupied Bandwidth, 40 MHz, 5510 MHz

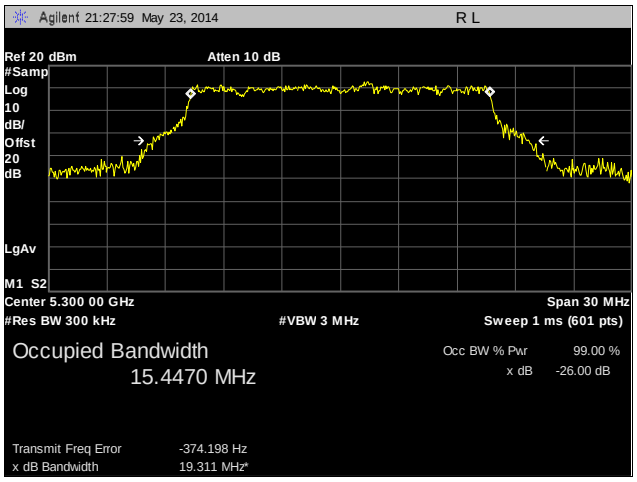


Plot 15. 26 dB Occupied Bandwidth, 40 MHz, 5670 MHz

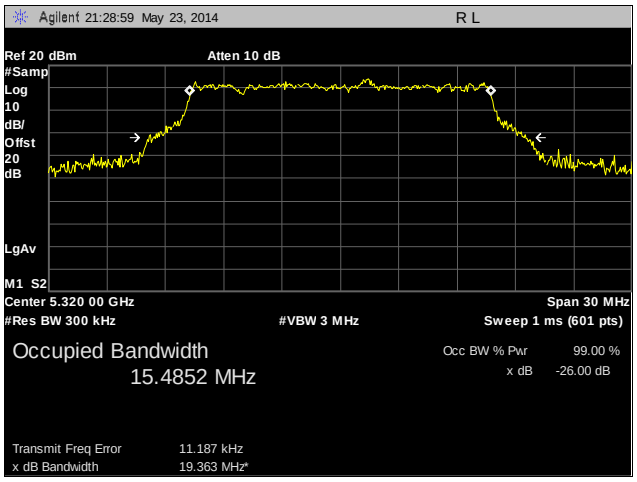
99% Occupied Bandwidth, 20 MHz



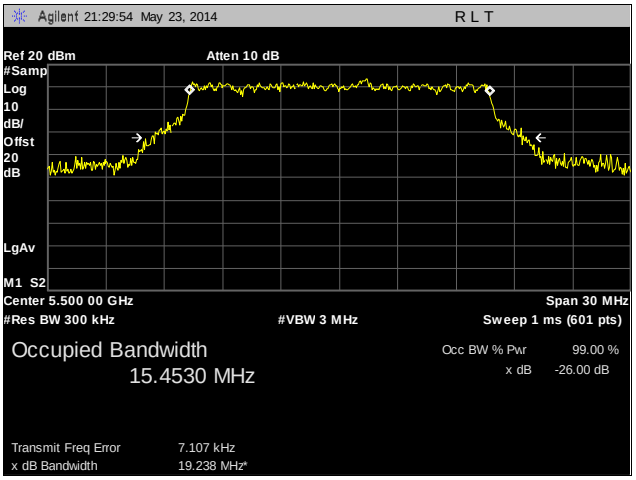
Plot 16. 99% Occupied Bandwidth, 20 MHz, 5260 MHz



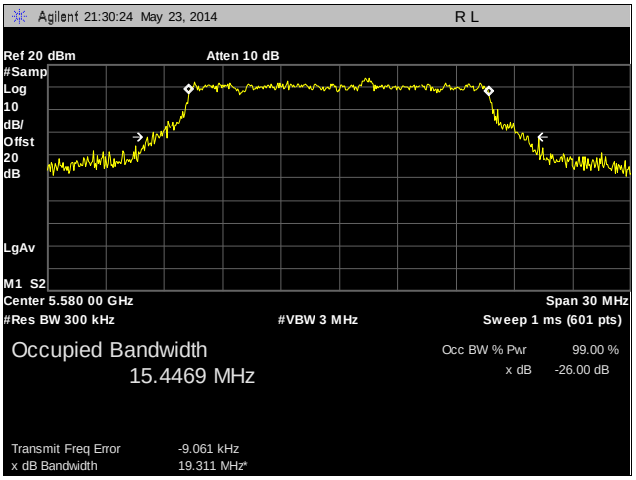
Plot 17. 99% Occupied Bandwidth, 20 MHz, 5300 MHz



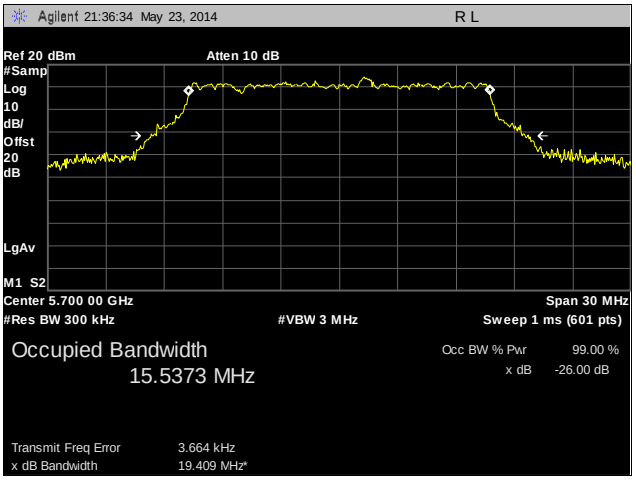
Plot 18. 99% Occupied Bandwidth, 20 MHz, 5320 MHz



Plot 19. 99% Occupied Bandwidth, 20 MHz, 5500 MHz

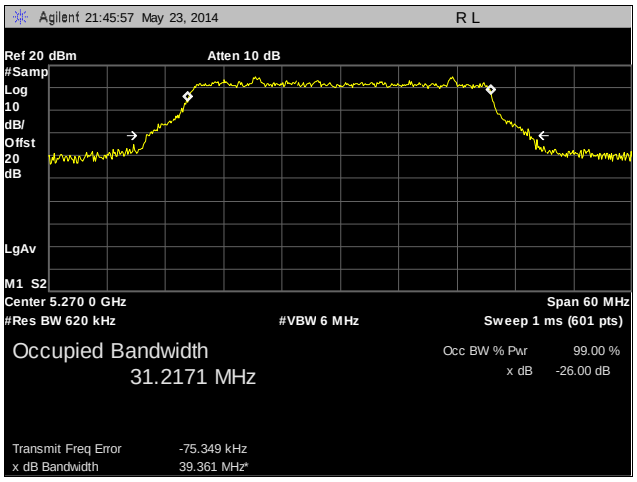


Plot 20. 99% Occupied Bandwidth, 20 MHz, 5580 MHz

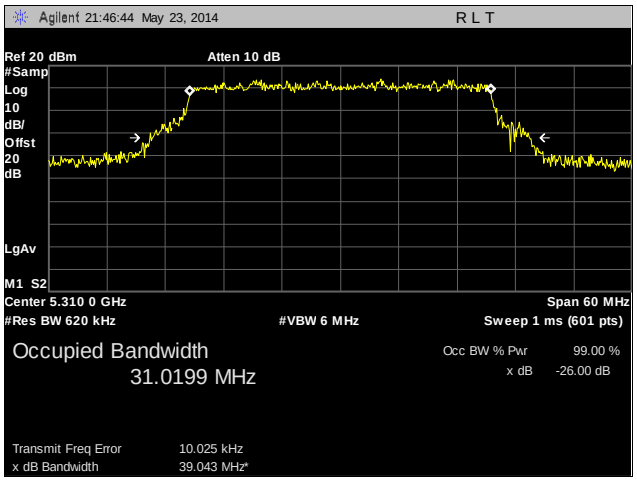


Plot 21. 99% Occupied Bandwidth, 20 MHz, 5700 MHz

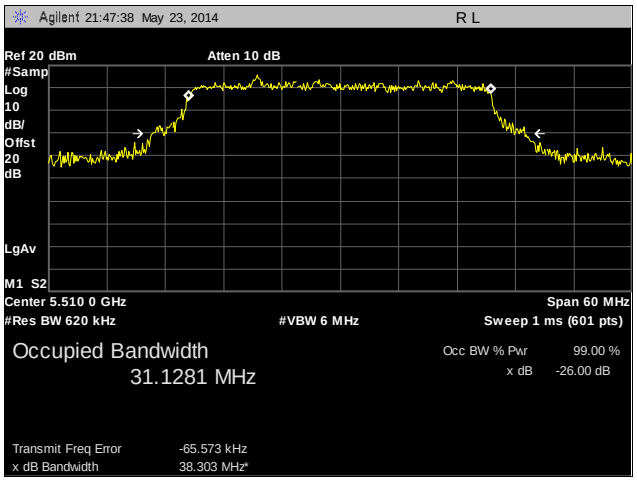
99% Occupied Bandwidth, 40 MHz



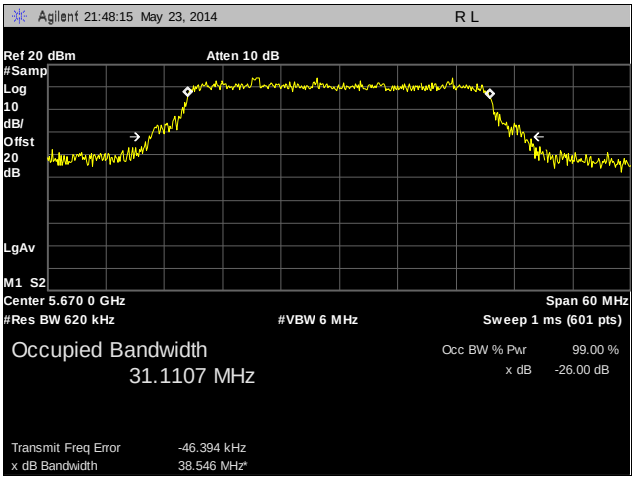
Plot 22. 99% Occupied Bandwidth, 40 MHz, 5270 MHz



Plot 23. 99% Occupied Bandwidth, 40 MHz, 5310 MHz



Plot 24. 99% Occupied Bandwidth, 40 MHz, 5510 MHz



Plot 25. 99% Occupied Bandwidth, 40 MHz, 5670 MHz

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15. 407(a)(2) RF Power Output

Test Requirements: **§15.407(a)(2):** The maximum output power of the intentional radiator shall not exceed the following:

§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 + 10log B, where B is the 26 dB emission bandwidth in megahertz.

Test Procedure: The EUT was connected to a Spectrum Analyzer.

Test Results: Equipment was compliant with the Peak Power Output limits of **§ 15.401(a)(2)**.

Test Engineer(s): Surinder Singh

Test Date(s): 05/13/14

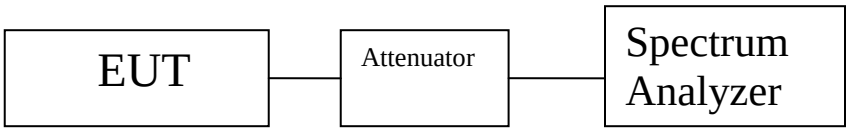


Figure 3. Power Output Test Setup

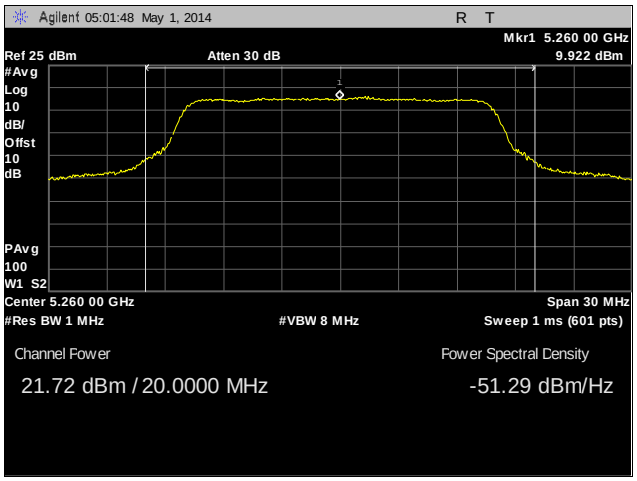
	Frequency (MHz)	Power (dBm)	Antenna Gain (dBi)	Limit (dBm)	Limit With gain Correction (dBm)	Margin dB
20 MHz	5260	21.72	5	24	24	-2.28
	5280	23.81	5	24	24	-0.19
	5300	21.47	5	24	24	-2.53
	5320	21.33	5	24	24	-2.67
	5500	23.69	5	24	24	-0.31
	5520	23.72	5	24	24	-0.28
	5540	23.93	5	24	24	-0.07
	5560	23.59	5	24	24	-0.41
	5580	23.91	5	24	24	-0.09
	5660	23.90	5	24	24	-0.1
	5680	23.70	5	24	24	-0.3
	5700	23.39	5	24	24	-0.61
40 MHz	5270	23.57	5	24	24	-0.43
	5310	23.80	5	24	24	-0.2
	5510	23.72	5	24	24	-0.28
	5550	23.74	5	24	24	-0.26
	5670	23.66	5	24	24	-0.34

Table 18. RF Power Output, Test Results, 5 dBi Antenna

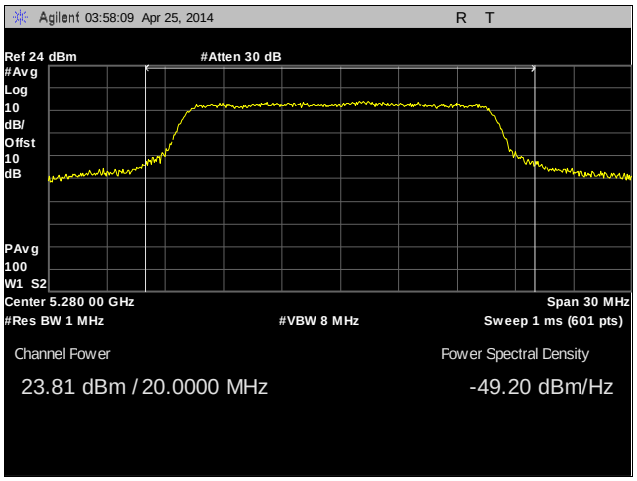
	Frequency (MHz)	Power (dBm)	Antenna Gain (dBi)	Limit (dBm)	Limit With gain Correction (dBm)	Margin dB
20 MHz	5260	14.46	13.5	24	16.5	-2.04
	5280	15.8	13.5	24	16.5	-0.7
	5300	13.86	13.5	24	16.5	-2.64
	5320	14.66	13.5	24	16.5	-1.84
	5500	16.11	13.5	24	16.5	-0.39
	5520	15.94	13.5	24	16.5	-0.56
	5540	15.84	13.5	24	16.5	-0.66
	5560	16.19	13.5	24	16.5	-0.31
	5580	16.33	13.5	24	16.5	-0.17
	5660	15.82	13.5	24	16.5	-0.68
	5680	15.95	13.5	24	16.5	-0.55
	5700	16.29	13.5	24	16.5	-0.21
40 MHz	5270	16.22	13.5	24	16.5	-0.28
	5310	16.31	13.5	24	16.5	-0.19
	5510	16.44	13.5	24	16.5	-0.06
	5550	16.43	13.5	24	16.5	-0.07
	5670	16.23	13.5	24	16.5	-0.27

Table 19. RF Power Output, Test Results, 13.5 dBi Antenna

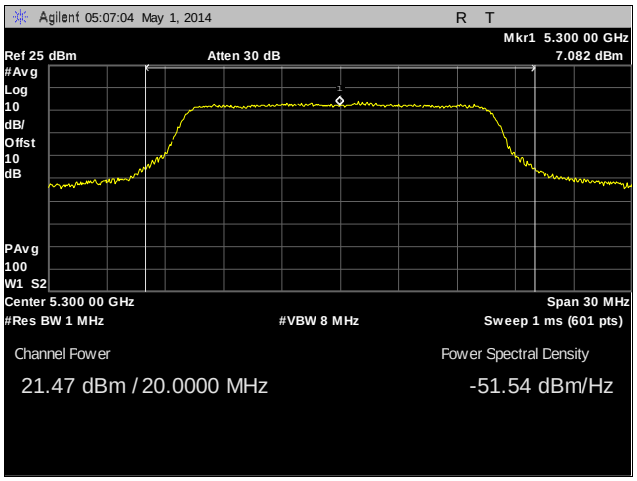
Output Power, 20 MHz, 5 dBi Antenna



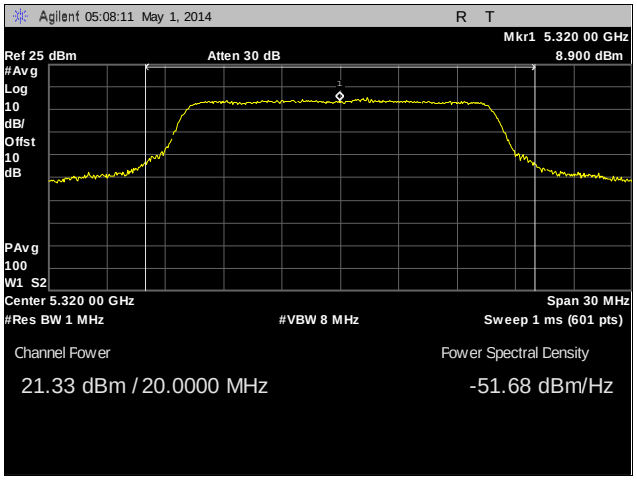
Plot 26. Output Power, 20 MHz, 5260 MHz



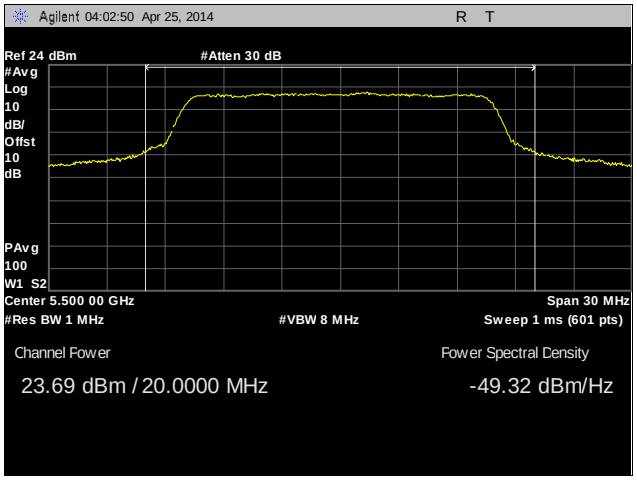
Plot 27. Output Power, 20 MHz, 5280 MHz



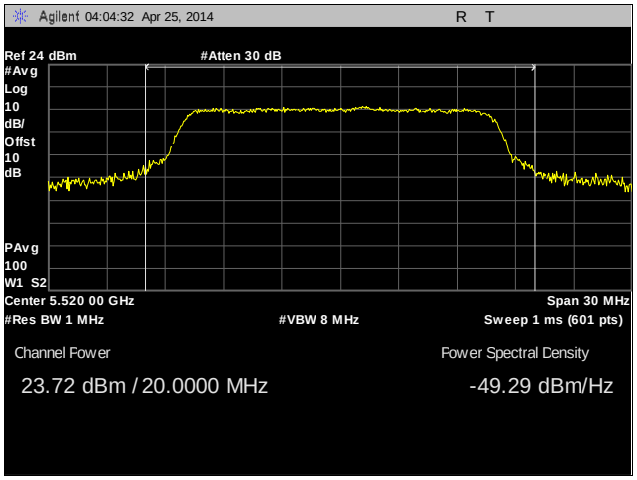
Plot 28. Output Power, 20 MHz, 5300 MHz



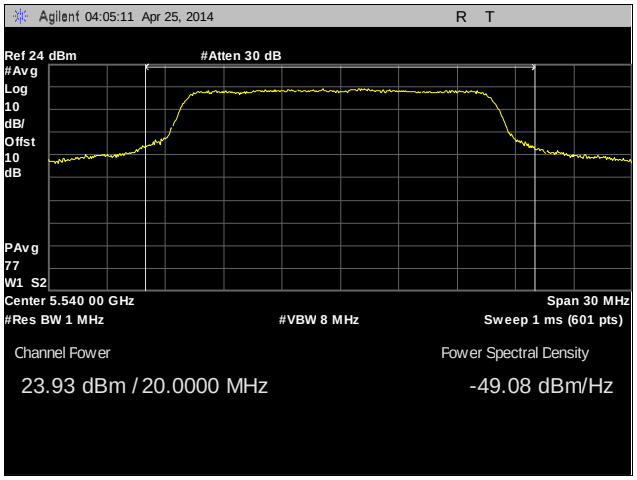
Plot 29. Output Power, 20 MHz, 5320 MHz



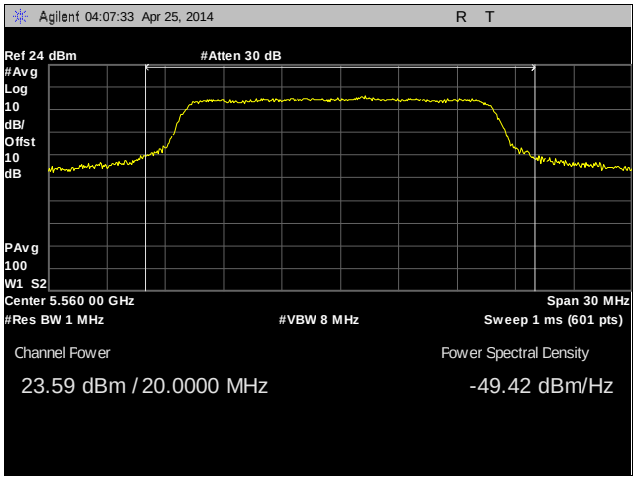
Plot 30. Output Power, 20 MHz, 5500 MHz



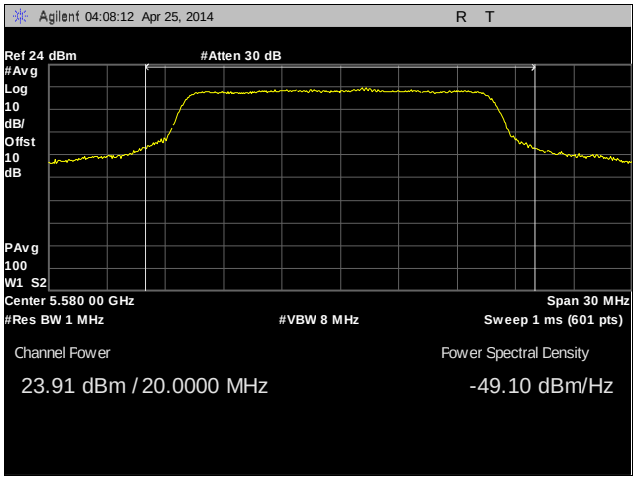
Plot 31. Output Power, 20 MHz, 5520 MHz



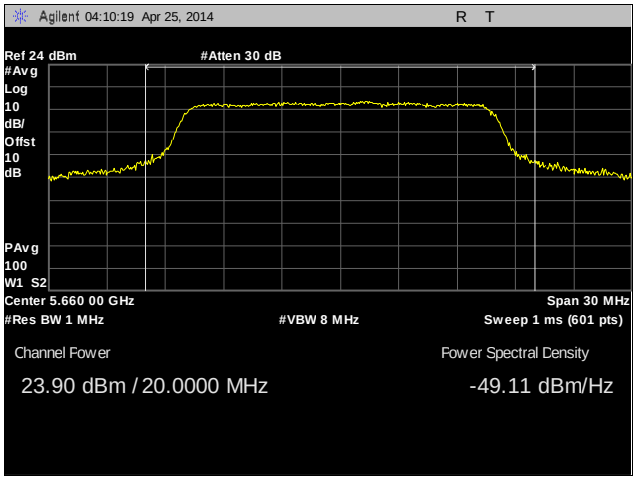
Plot 32. Output Power, 20 MHz, 5540 MHz



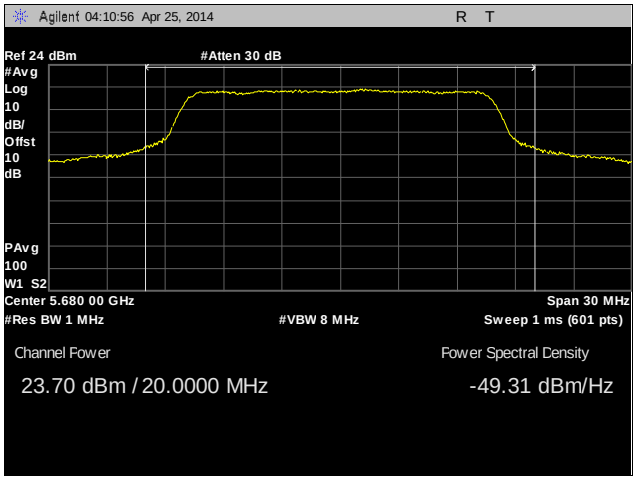
Plot 33. Output Power, 20 MHz, 5560 MHz



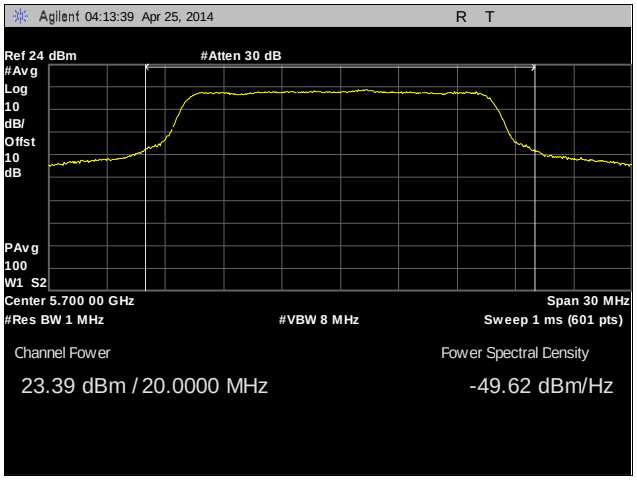
Plot 34. Output Power, 20 MHz, 5580 MHz



Plot 35. Output Power, 20 MHz, 5660 MHz

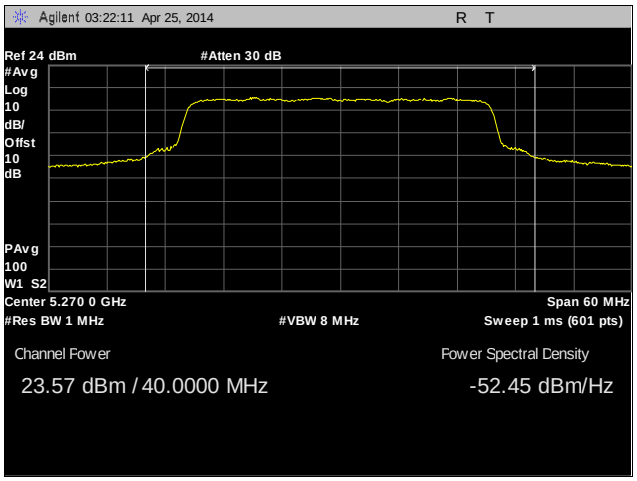


Plot 36. Output Power, 20 MHz, 5680 MHz

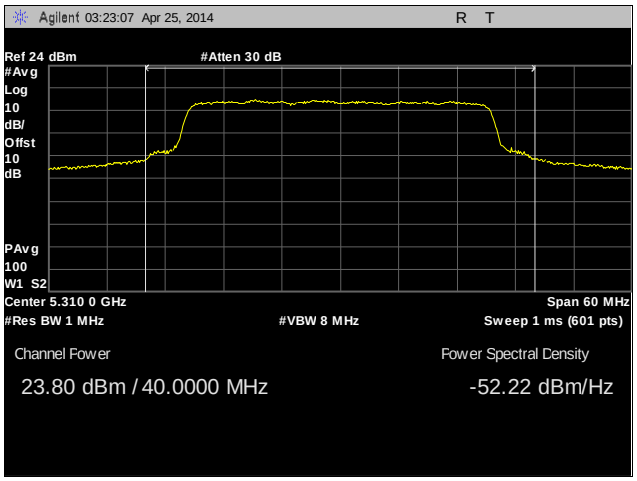


Plot 37. Output Power, 20 MHz, 5700 MHz

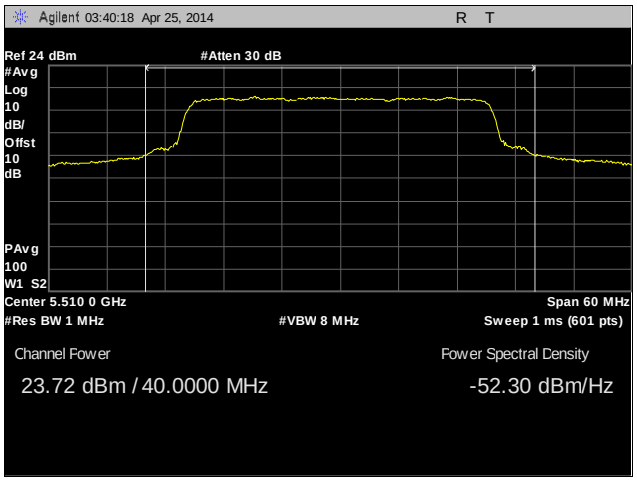
Output Power, 40 MHz, 5 dBi Antenna



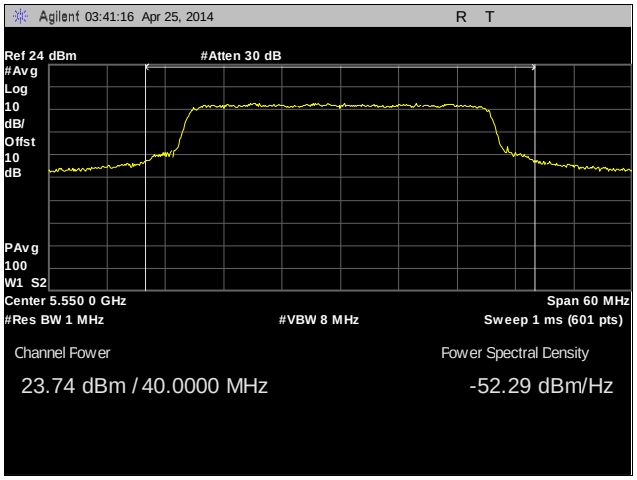
Plot 38. Output Power, 40 MHz, 5270 MHz



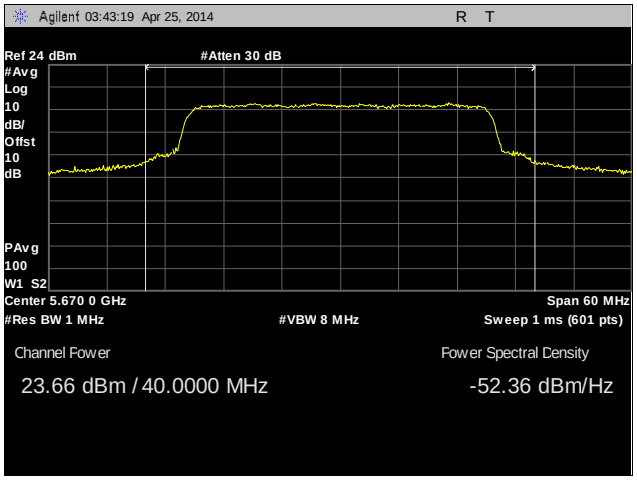
Plot 39. Output Power, 40 MHz, 5310 MHz



Plot 40. Output Power, 40 MHz, 5510 MHz

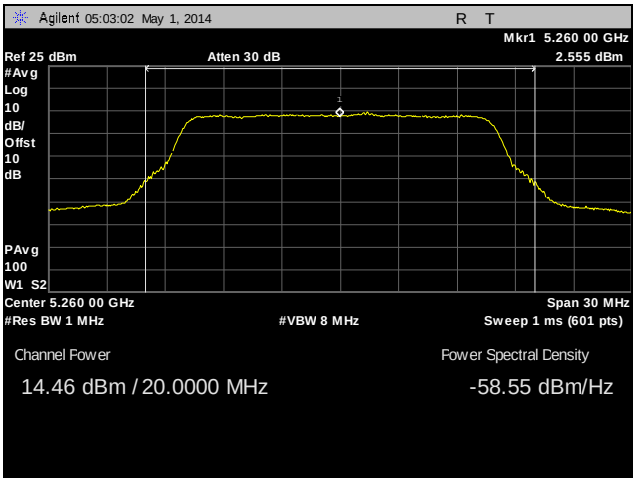


Plot 41. Output Power, 40 MHz, 5550 MHz

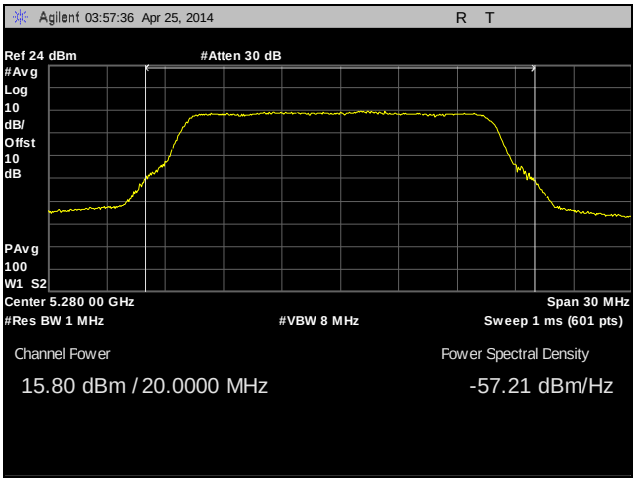


Plot 42. Output Power, 40 MHz, 5670 MHz

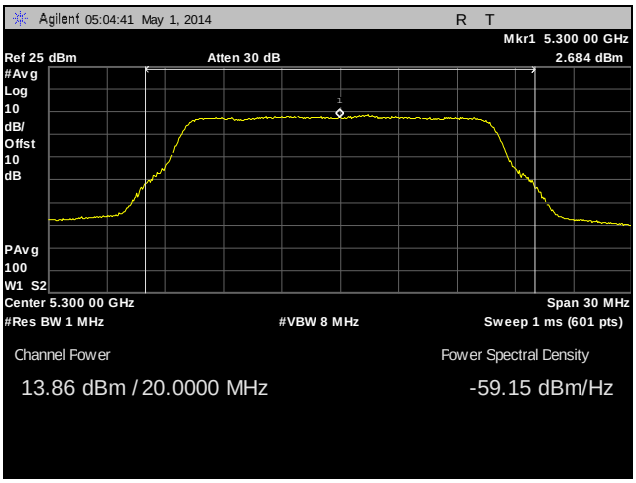
Output Power, 20 MHz, 13.5 dBi Antenna



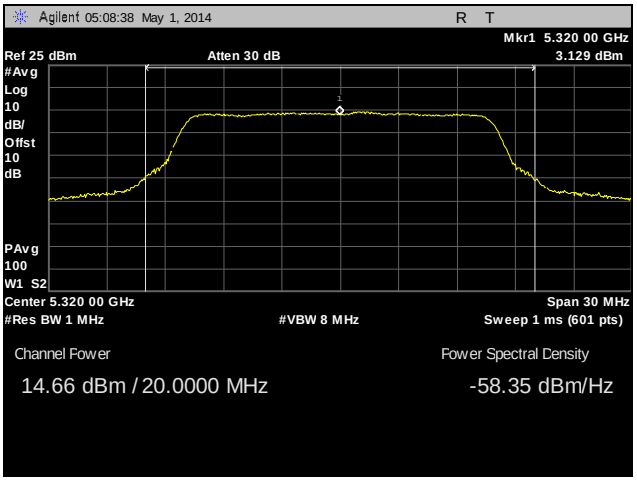
Plot 43. Output Power, 20 MHz, 5260 MHz, 13.5 dBi Antenna



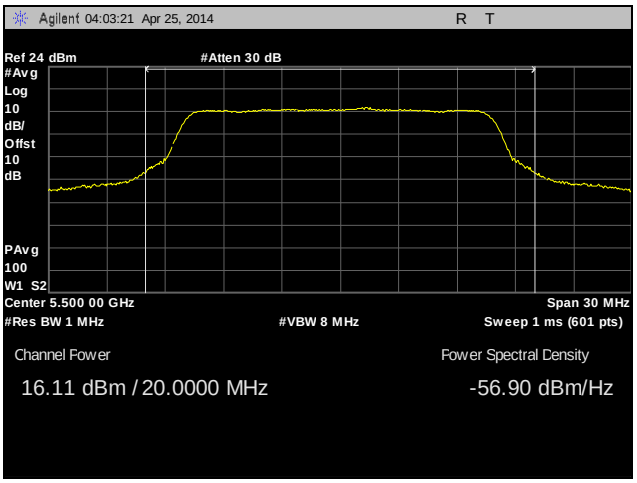
Plot 44. Output Power, 20 MHz, 5280 MHz, 13.5 dBi Antenna



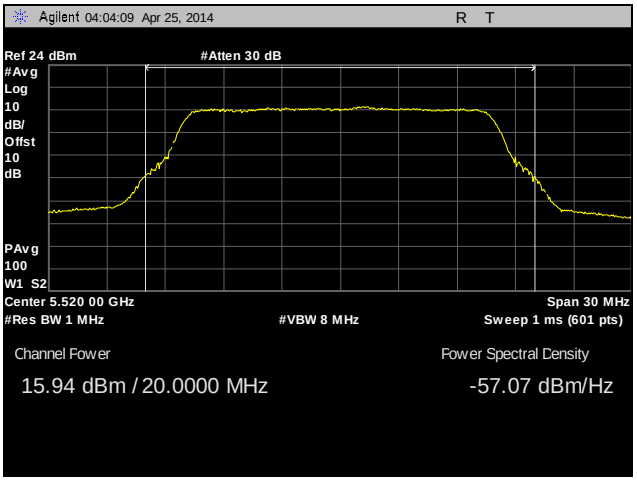
Plot 45. Output Power, 20 MHz, 5300 MHz, 13.5 dBi Antenna



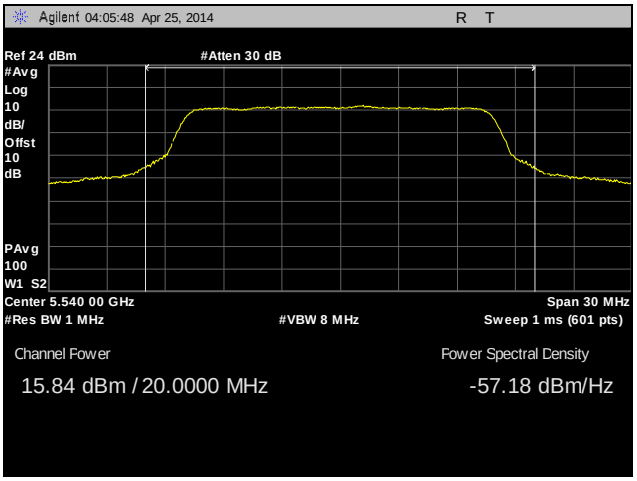
Plot 46. Output Power, 20 MHz, 5320 MHz, 13.5 dBi Antenna



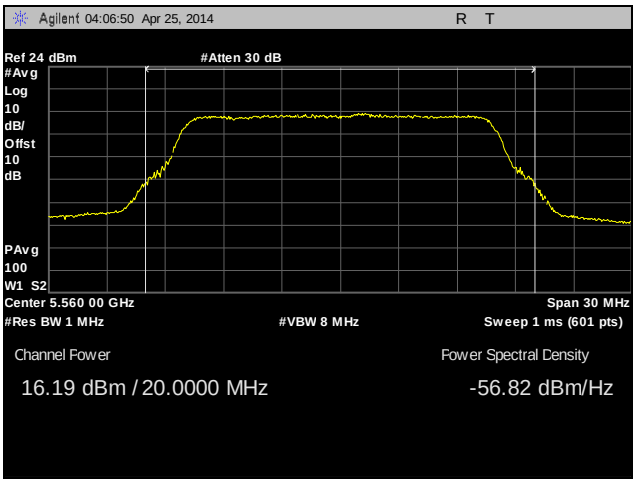
Plot 47. Output Power, 20 MHz, 5500 MHz, 13.5 dBi Antenna



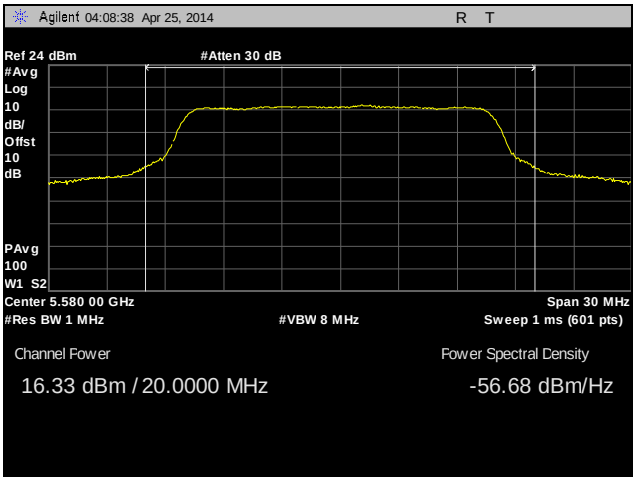
Plot 48. Output Power, 20 MHz, 5520 MHz, 13.5 dBi Antenna



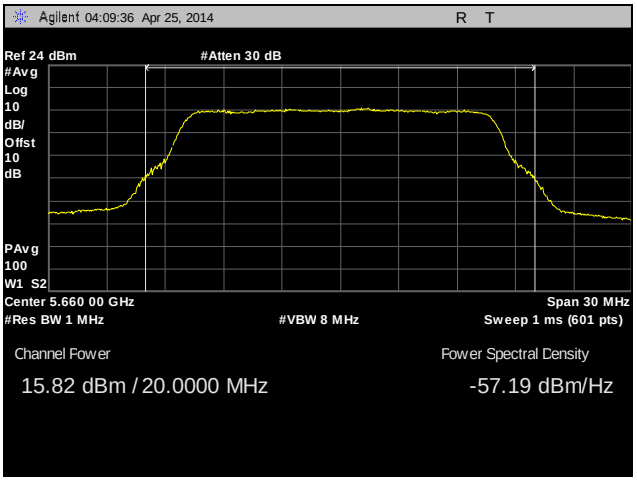
Plot 49. Output Power, 20 MHz, 5540 MHz, 13.5 dBi Antenna



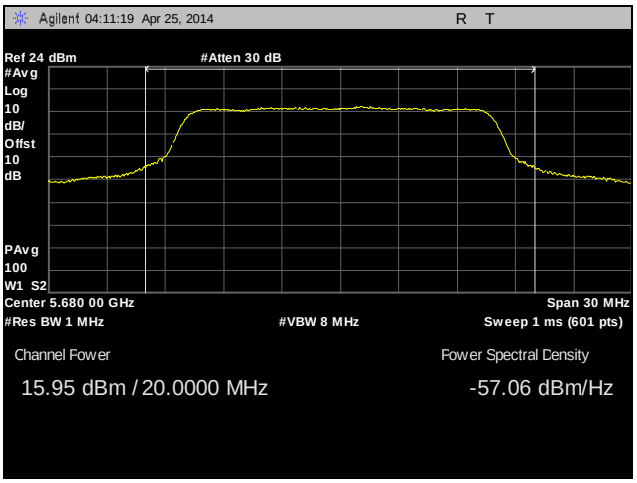
Plot 50. Output Power, 20 MHz, 5560 MHz, 13.5 dBi Antenna



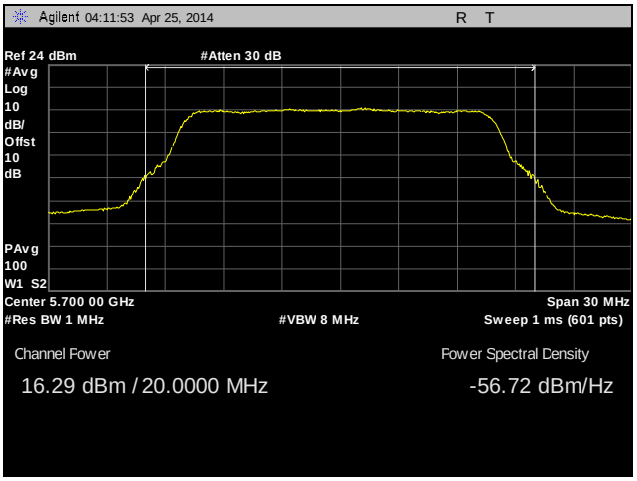
Plot 51. Output Power, 20 MHz, 5580 MHz, 13.5 dBi Antenna



Plot 52. Output Power, 20 MHz, 5660 MHz, 13.5 dBi Antenna

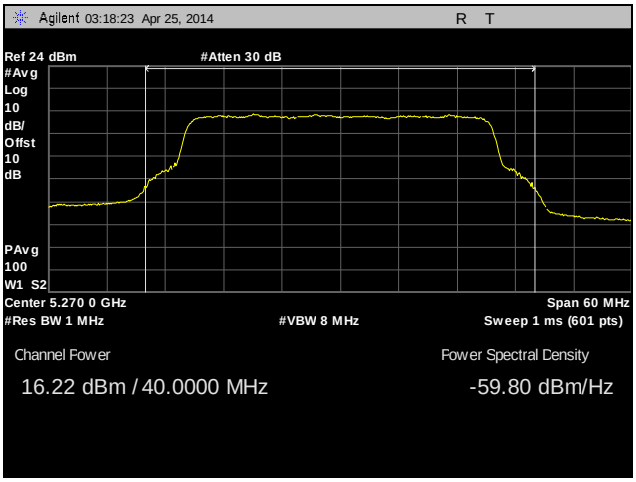


Plot 53. Output Power, 20 MHz, 5680 MHz, 13.5 dBi Antenna

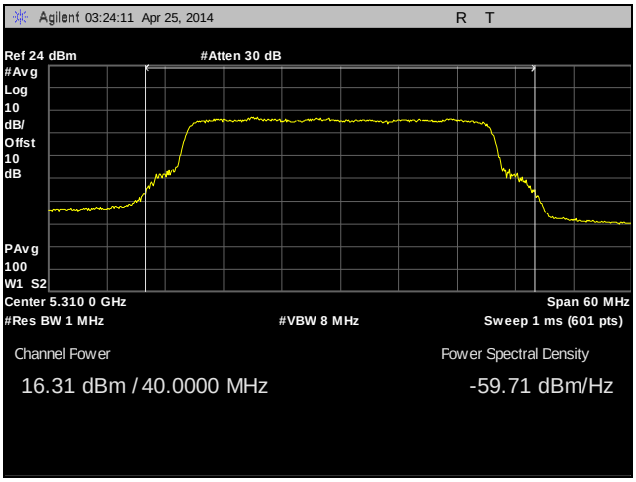


Plot 54. Output Power, 20 MHz, 5700 MHz, 13.5 dBi Antenna

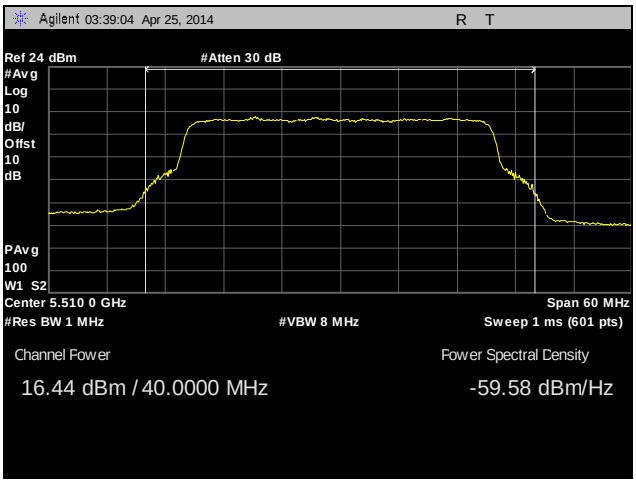
Output Power, 40 MHz



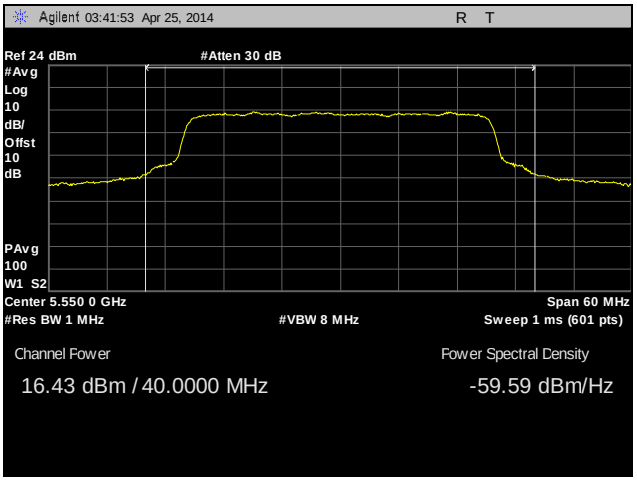
Plot 55. Output Power, 40 MHz, 5270 MHz



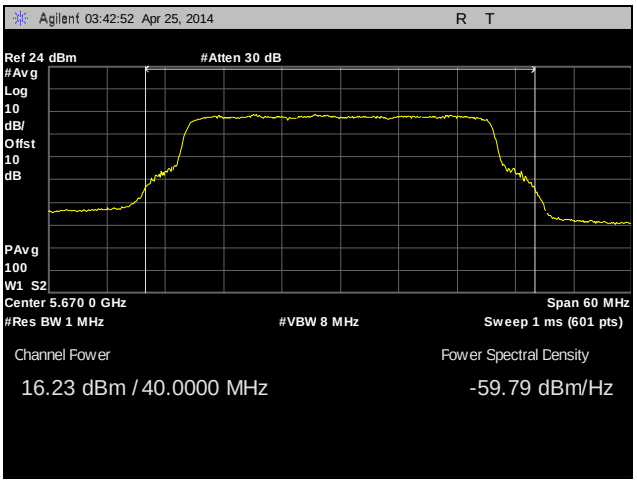
Plot 56. Output Power, 40 MHz, 5310 MHz



Plot 57. Output Power, 40 MHz, 5510 MHz



Plot 58. Output Power, 40 MHz, 5550 MHz



Plot 59. Output Power, 40 MHz, 5670 MHz

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15. 407(h)(1) Transmit Power Control

Test Requirements: **§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. EUT power level was dropped until it comes below at least 6dB below the mean e.i.r.p. value of 30dBm.

Test Results: Equipment was compliant with the transmit power control requirements of **§ 15.401(h)(1)**.

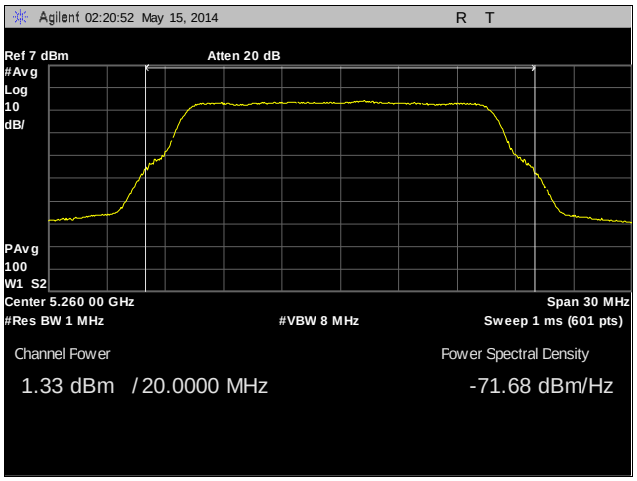
Test Engineer(s): Surinder Singh

Test Date(s): 05/13/14

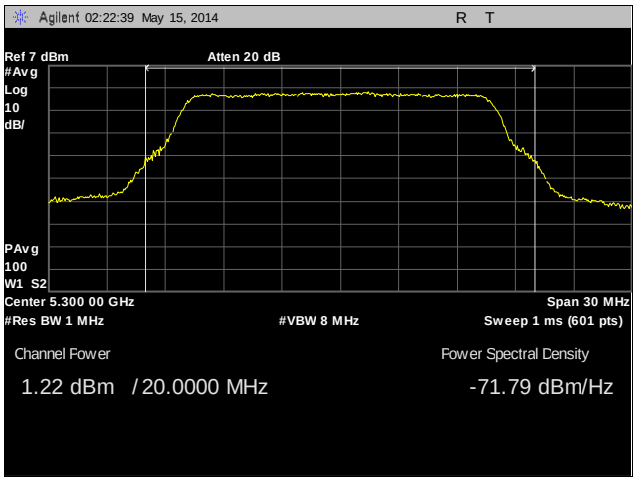
Carrier	Frequency (MHz)	Power (dBm)	Maximum Antenna Gain (dBi)	Resultant EIRP	EIRP Limit dBm	Margin (dB)
20 MHz	5260	1.33	13.5	14.83	24	-9.17
	5300	1.22	13.5	14.72	24	-9.28
	5320	1.80	13.5	15.3	24	-8.7
	5500	1.51	13.5	15.01	24	-8.99
	5580	1.32	13.5	14.82	24	-9.18
	5700	1.11	13.5	14.61	24	-9.39
40 MHz	5270	2.00	13.5	15.5	24	-8.5
	5310	2.31	13.5	15.81	24	-8.19
	5510	0.85	13.5	14.35	24	-9.65
	5550	0.57	13.5	14.07	24	-9.93
	5670	0.17	13.5	13.67	24	-10.33

Table 20. Transmit Power Control, Test Results

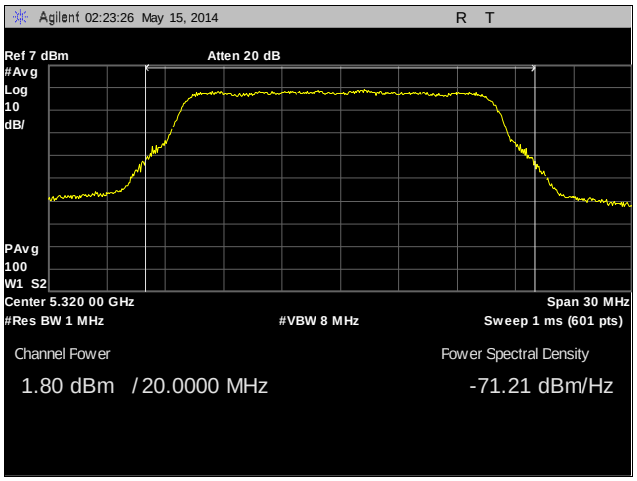
Transmit Power Control, 20 MHz



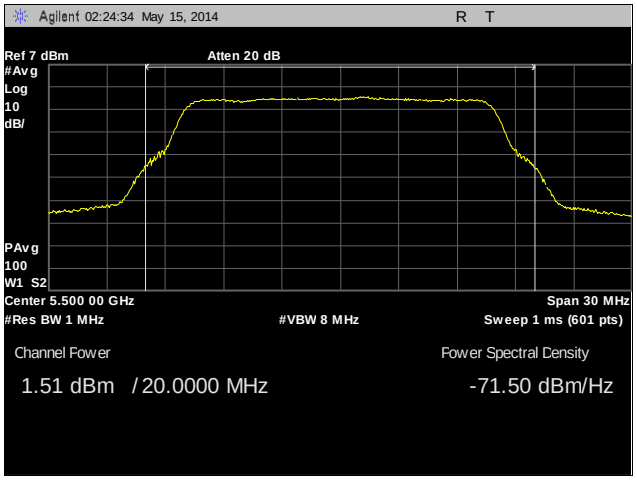
Plot 60. Transmit Power Control, 20 MHz, 5260 MHz



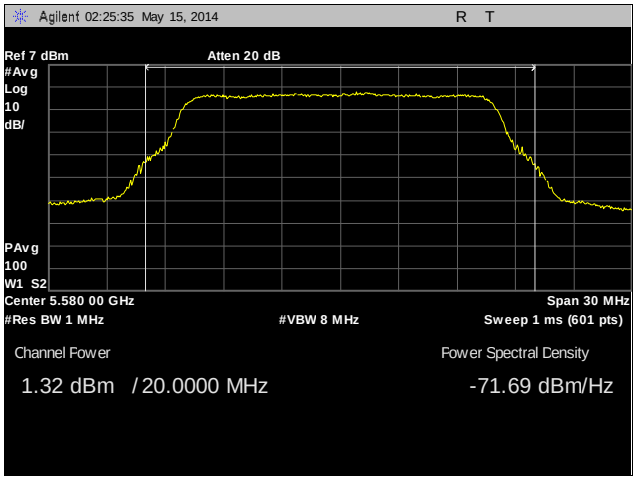
Plot 61. Transmit Power Control, 20 MHz, 5300 MHz



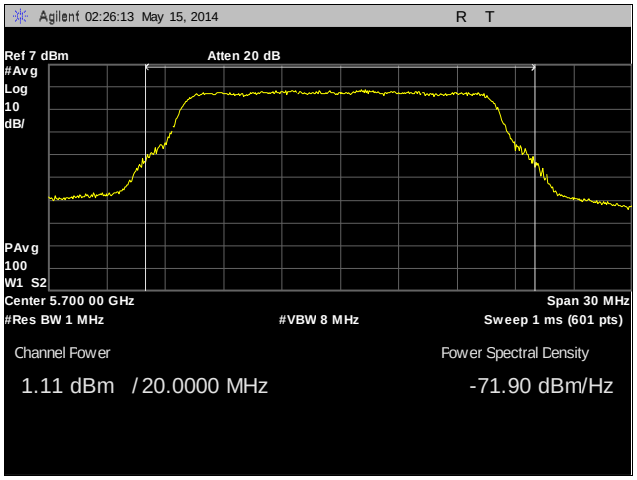
Plot 62. Transmit Power Control, 20 MHz, 5320 MHz



Plot 63. Transmit Power Control, 20 MHz, 5500 MHz

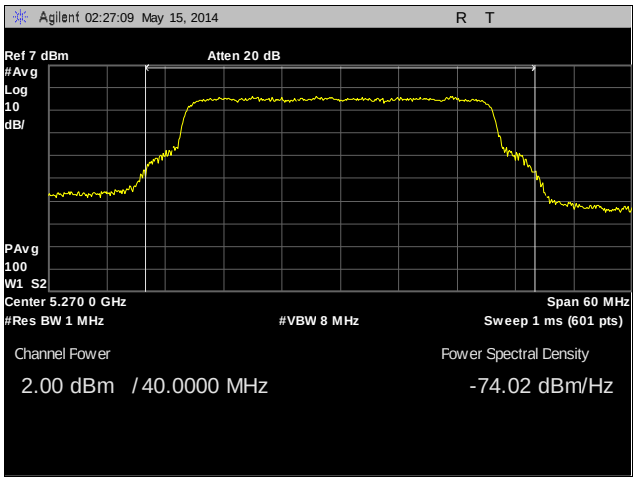


Plot 64. Transmit Power Control, 20 MHz, 5580 MHz

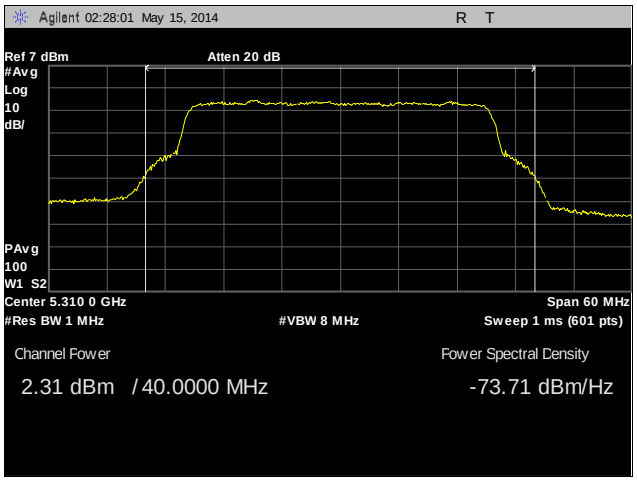


Plot 65. Transmit Power Control, 20 MHz, 5700 MHz

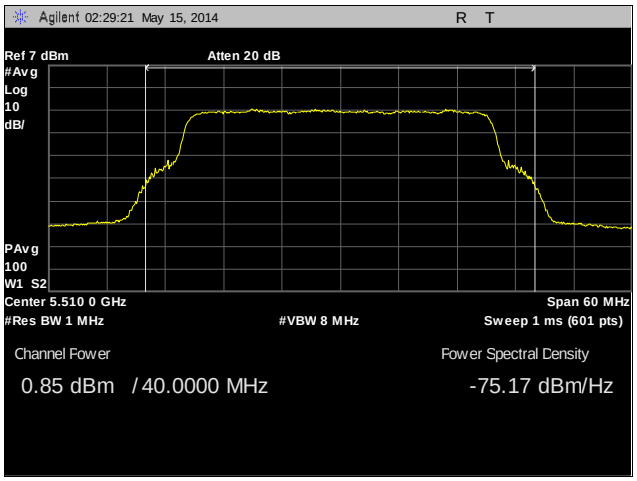
Transmit Power Control, 40 MHz



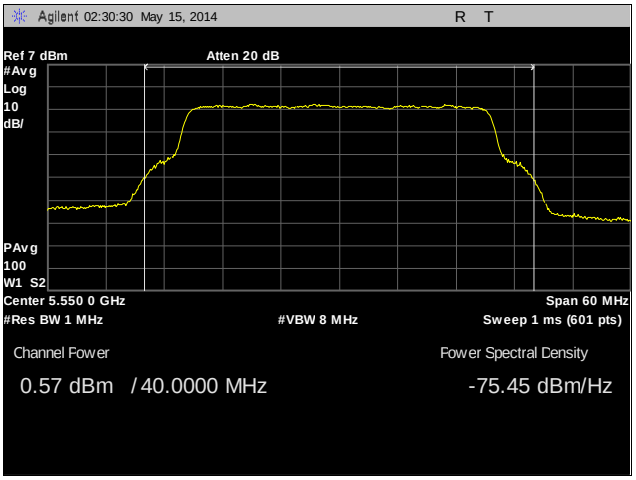
Plot 66. Transmit Power Control, 40 MHz, 5270 MHz



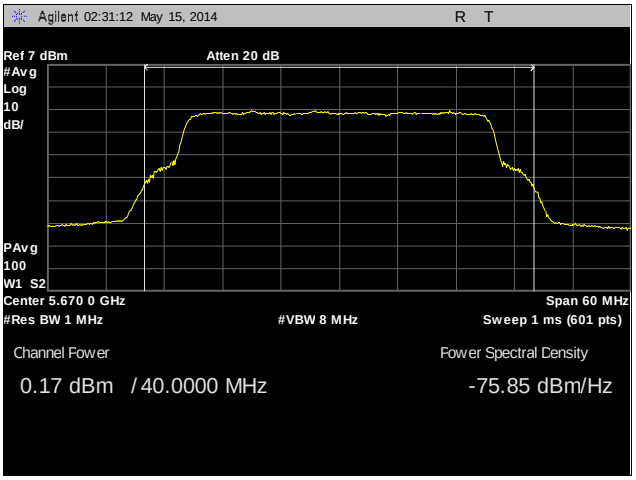
Plot 67. Transmit Power Control, 40 MHz, 5310 MHz



Plot 68. Transmit Power Control, 40 MHz, 5510 MHz



Plot 69. Transmit Power Control, 40 MHz, 5550 MHz



Plot 70. Transmit Power Control, 40 MHz, 5670 MHz

Electromagnetic Compatibility Criteria for Intentional Radiators

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

Test Requirements: **§ 15.407(a)(2):** In addition, the peak power spectral density shall not exceed 11 dBm in any 1 megahertz band.

Test Procedure: The transmitter was connected directly to a Spectrum Analyzer through an attenuator. The power level was set to the maximum level on the EUT. The RBW was set to 1MHz and the VBW was set to 3MHz. The method of measurement SA-1 from the FCC KDB 789033 was used.

Test Results: Equipment was compliant with the peak power spectral density limits of **§ 15.407 (a)(2).** The peak power spectral density was determined from plots on the following page(s).

Test Engineer(s): Surinder Singh

Test Date(s): 03/13/14

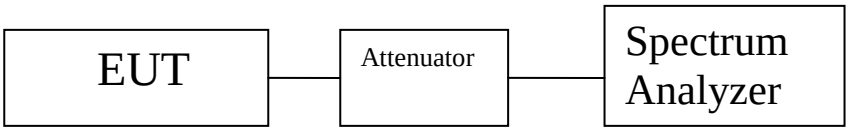


Figure 4. Power Spectral Density Test Setup

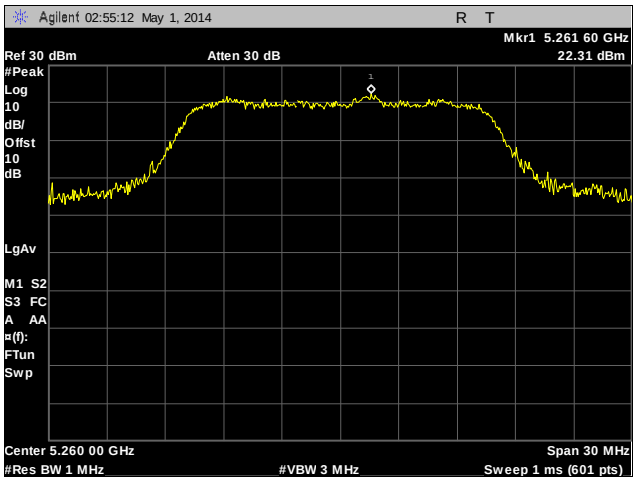
	Frequency (MHz)	PSD (dBm)	Antenna Gain (dBi)	Limit (dBm)	Limit With gain Correction (dBm)	Margin (dB)
20 MHz	5260	10.81	5	11	11	-0.19
	5300	10.43	5	11	11	-0.57
	5320	10.58	5	11	11	-0.42
	5500	10.76	5	11	11	-0.24
	5580	10.89	5	11	11	-0.11
	5700	10.61	5	11	11	-0.39
40 MHz	5270	9.16	5	11	11	-1.84
	5310	7.45	5	11	11	-3.55
	5510	7.07	5	11	11	-3.93
	5550	7.87	5	11	11	-3.13
	5670	7.37	5	11	11	-3.63

Table 21. Power Spectral Density, Test Results, 5 dBi Antenna

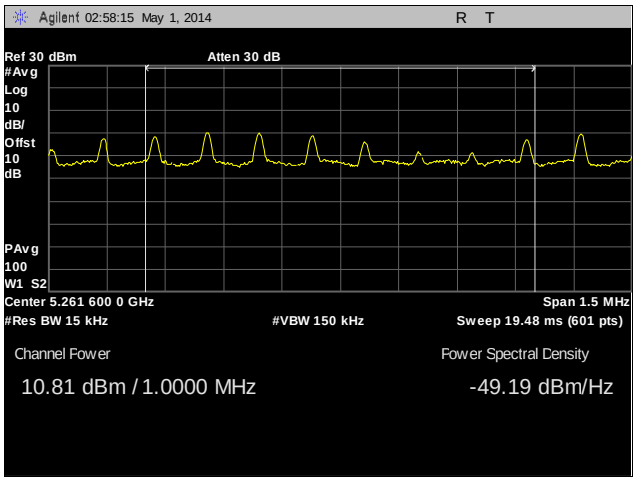
	Frequency (MHz)	PSD (dBm)	Antenna Gain (dBi)	Limit (dBm)	Limit With gain Correction (dBm)	Margin (dB)
20 MHz	5260	3.16	13.5	11	3.5	-0.34
	5300	3.39	13.5	11	3.5	-0.11
	5320	3.32	13.5	11	3.5	-0.18
	5500	2.6	13.5	11	3.5	-0.9
	5580	2.41	13.5	11	3.5	-1.09
	5700	1.11	13.5	11	3.5	-2.39
40 MHz	5270	1.76	13.5	11	3.5	-1.74
	5310	1.26	13.5	11	3.5	-2.24
	5510	0.42	13.5	11	3.5	-3.08
	5550	2.34	13.5	11	3.5	-1.16
	5670	1.35	13.5	11	3.5	-2.15

Table 22. Power Spectral Density, Test Results, 13.5 dBi Antenna

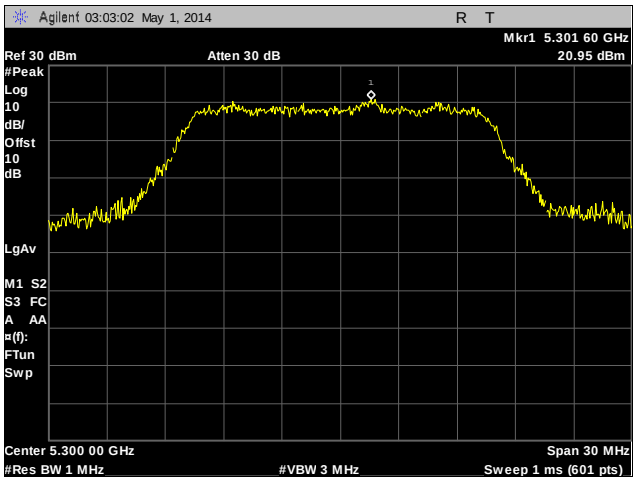
Peak Power Spectral Density, 20 MHz, 5 dBi



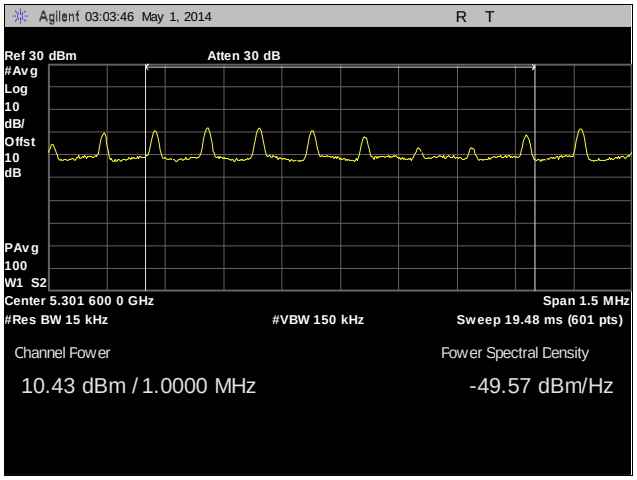
Plot 71. Peak Power Spectral Density, 20 MHz, 5260 MHz, Determination, 5 dBi Antenna



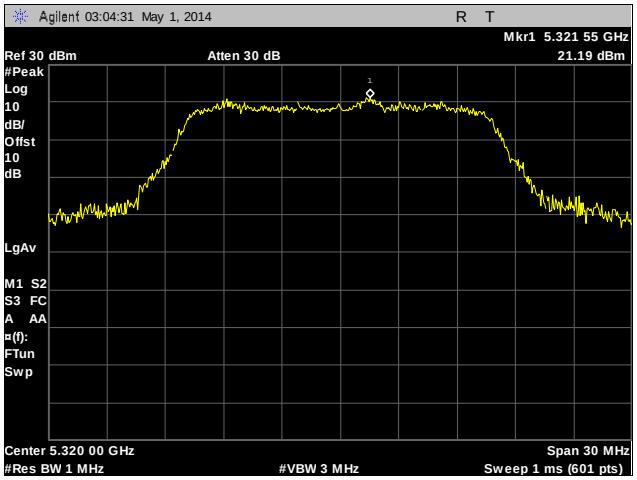
Plot 72. Peak Power Spectral Density, 20 MHz, 5260 MHz, 5 dBi Antenna



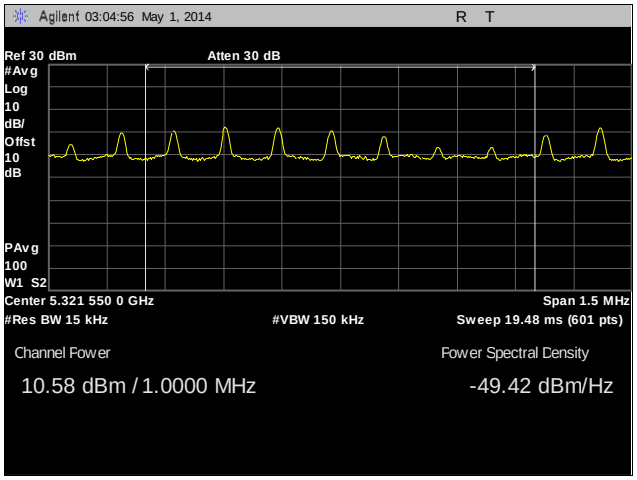
Plot 73. Peak Power Spectral Density, 20 MHz, 5300 MHz, Determination, 5 dBi Antenna



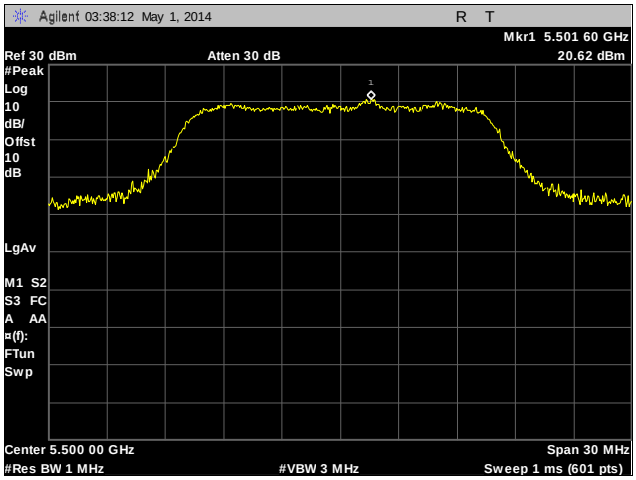
Plot 74. Peak Power Spectral Density, 20 MHz, 5300 MHz, 5 dBi Antenna



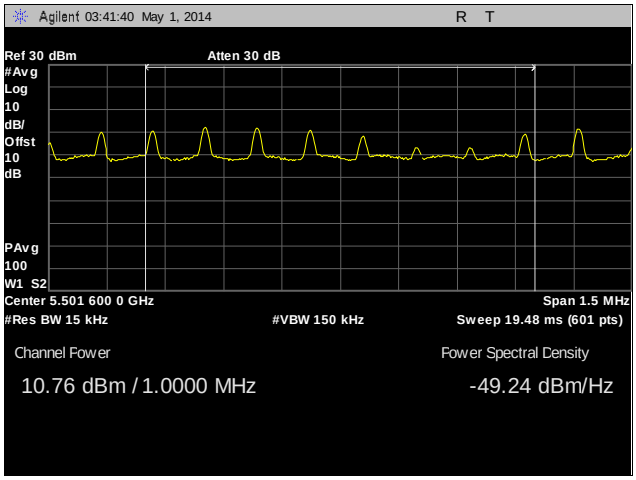
Plot 75. Peak Power Spectral Density, 20 MHz, 5320 MHz, Determination, 5 dBi Antenna



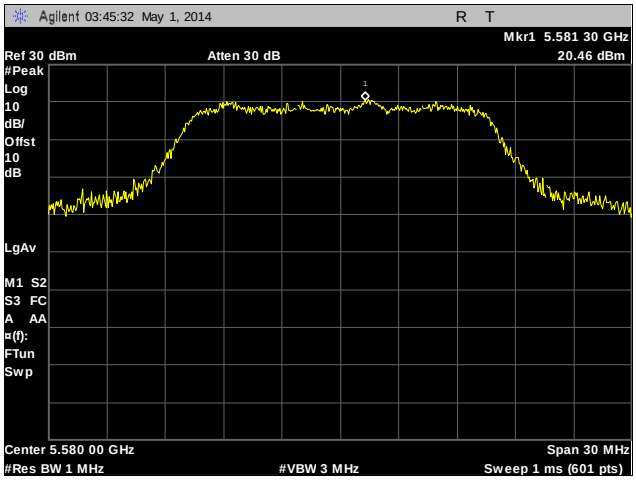
Plot 76. Peak Power Spectral Density, 20 MHz, 5320 MHz, 5 dBi Antenna



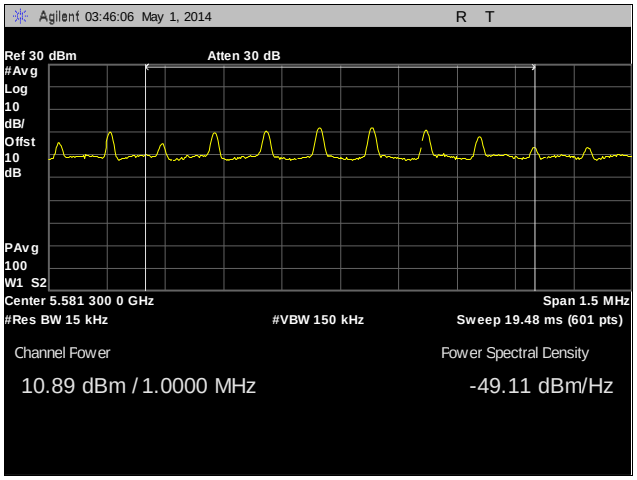
Plot 77. Peak Power Spectral Density, 20 MHz, 5500 MHz, Determination, 5 dBi Antenna



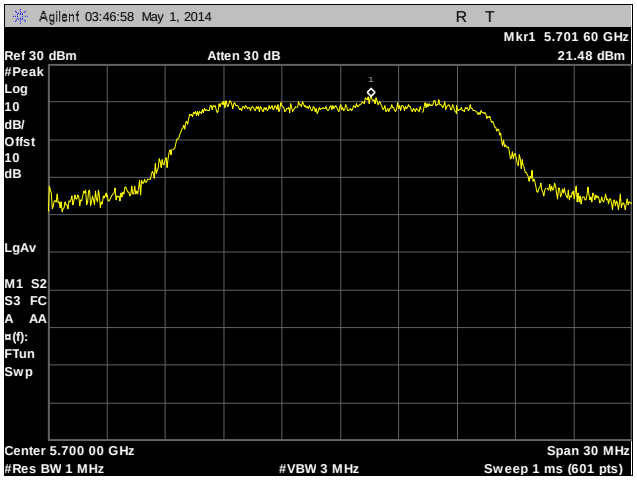
Plot 78. Peak Power Spectral Density, 20 MHz, 5500 MHz, 5 dBi Antenna



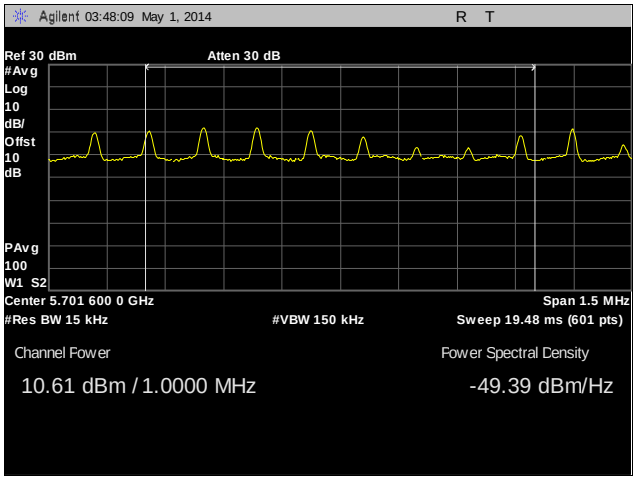
Plot 79. Peak Power Spectral Density, 20 MHz, 5580 MHz, Determination, 5 dBi Antenna



Plot 80. Peak Power Spectral Density, 20 MHz, 5580 MHz, 5 dBi Antenna

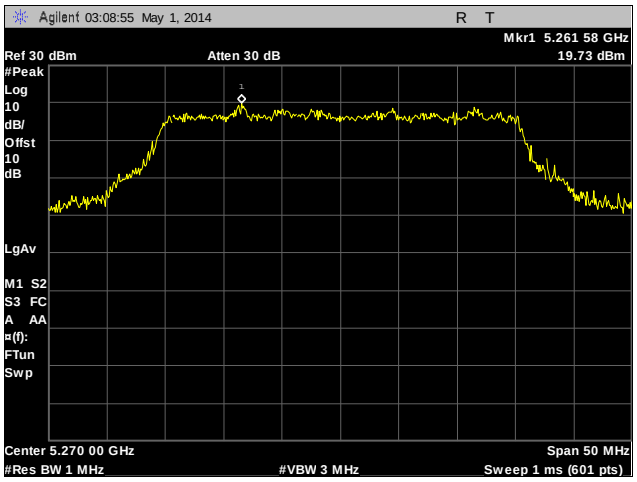


Plot 81. Peak Power Spectral Density, 20 MHz, 5700 MHz, Determination, 5 dBi Antenna

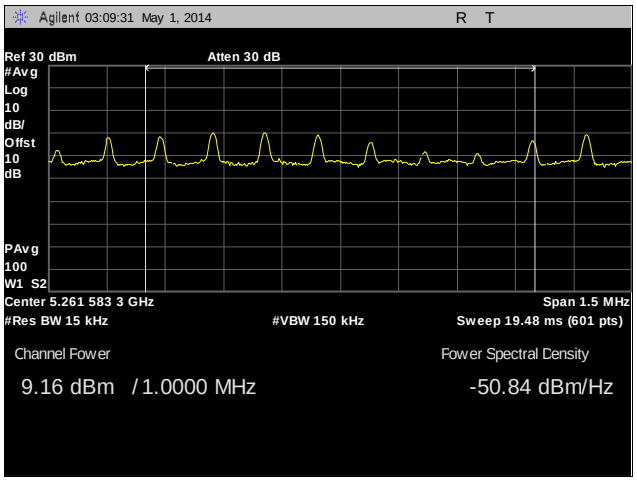


Plot 82. Peak Power Spectral Density, 20 MHz, 5700 MHz, 5 dBi Antenna

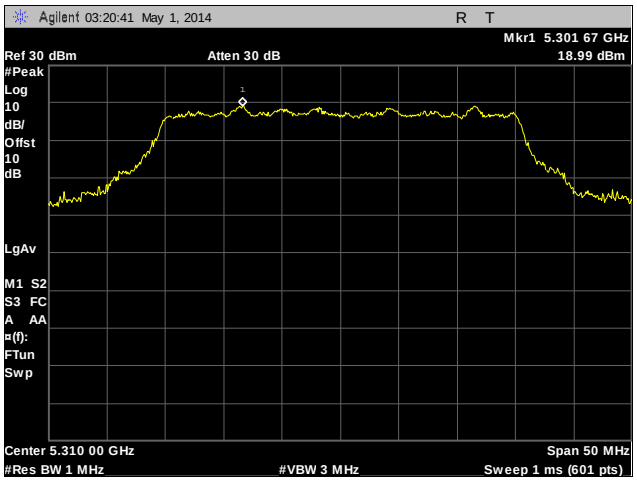
Peak Power Spectral Density, 40 MHz, 5 dBi



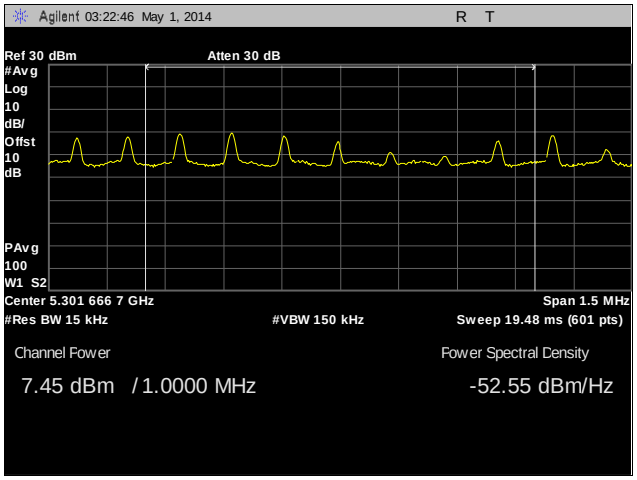
Plot 83. Peak Power Spectral Density, 40 MHz, 5270 MHz, Determination, 5 dBi Antenna



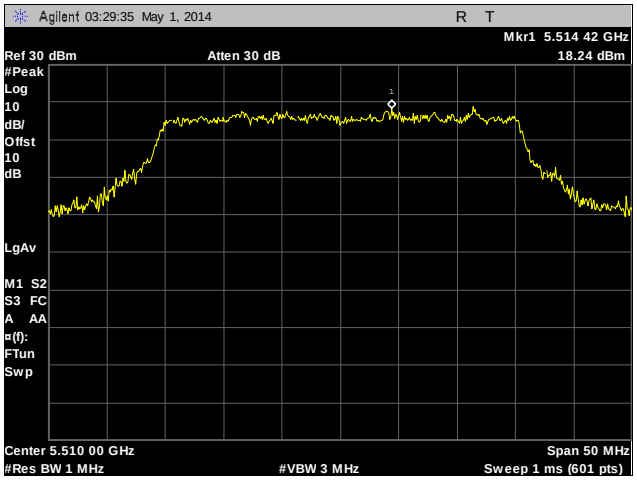
Plot 84. Peak Power Spectral Density, 40 MHz, 5270 MHz, 5 dBi Antenna



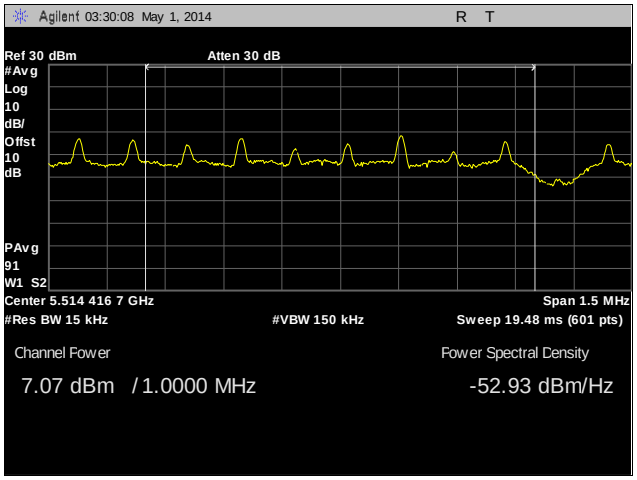
Plot 85. Peak Power Spectral Density, 40 MHz, 5310 MHz, Determination, 5 dBi Antenna



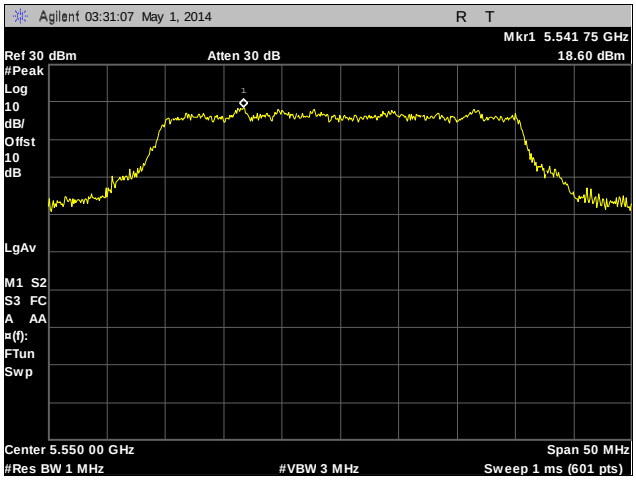
Plot 86. Peak Power Spectral Density, 40 MHz, 5310 MHz, 5 dBi Antenna



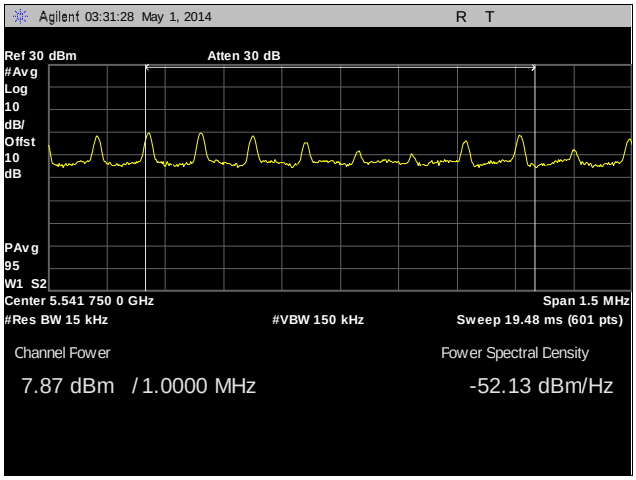
Plot 87. Peak Power Spectral Density, 40 MHz, 5510 MHz, Determination, 5 dBi Antenna



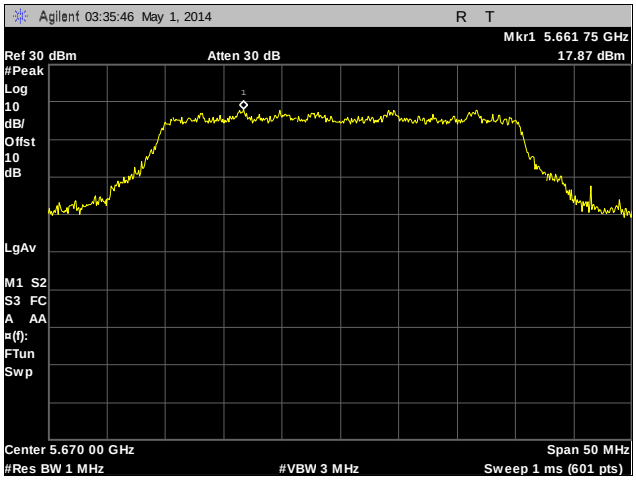
Plot 88. Peak Power Spectral Density, 40 MHz, 5510 MHz, 5 dBi Antenna



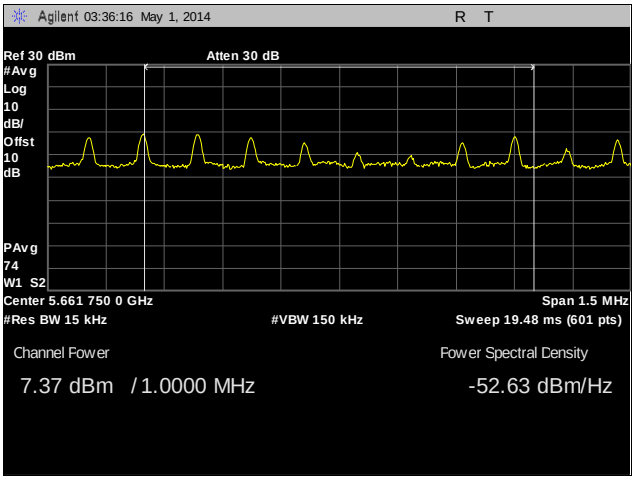
Plot 89. Peak Power Spectral Density, 40 MHz, 5550 MHz, Determination, 5 dBi Antenna



Plot 90. Peak Power Spectral Density, 40 MHz, 5550 MHz, 5 dBi Antenna

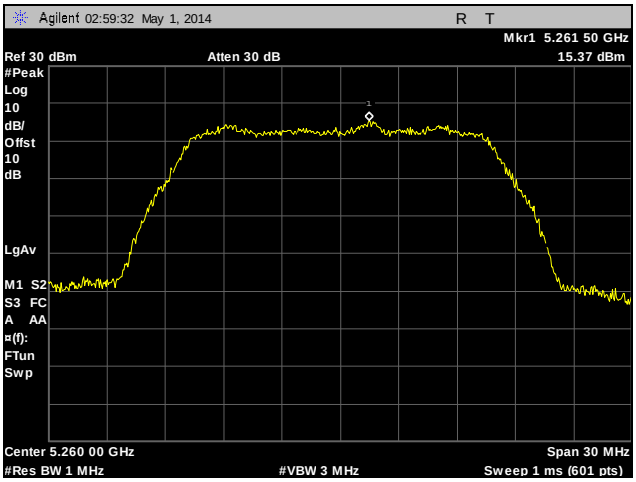


Plot 91. Peak Power Spectral Density, 40 MHz, 5670 MHz, Determination, 5 dBi Antenna

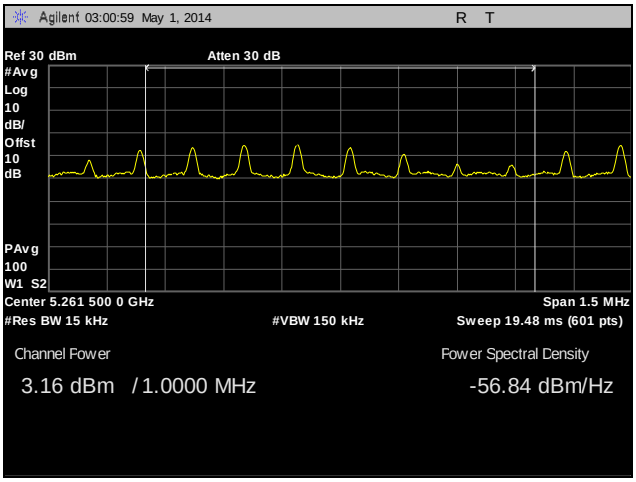


Plot 92. Peak Power Spectral Density, 40 MHz, 5670 MHz, 5 dBi Antenna

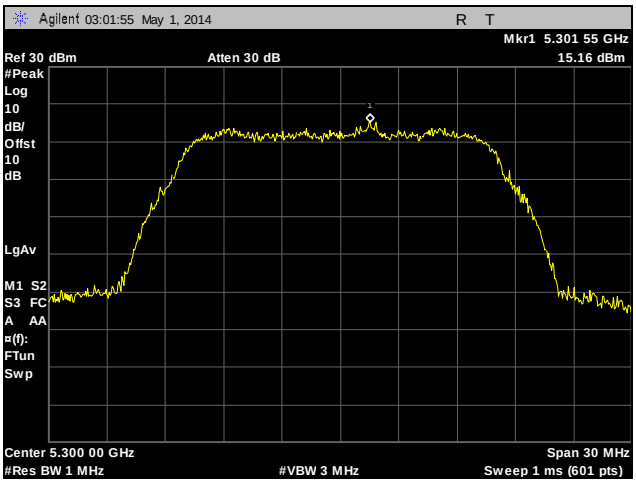
Peak Power Spectral Density, 20 MHz, 13.5 dBi



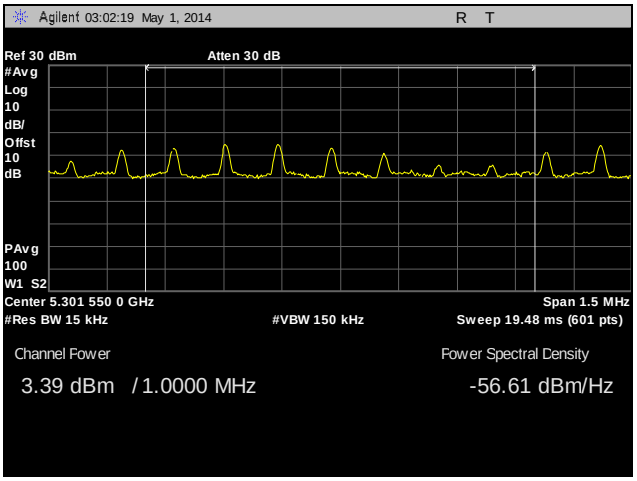
Plot 93. Peak Power Spectral Density, 20 MHz, 5260 MHz, Determination, 13.5 dBi Antenna



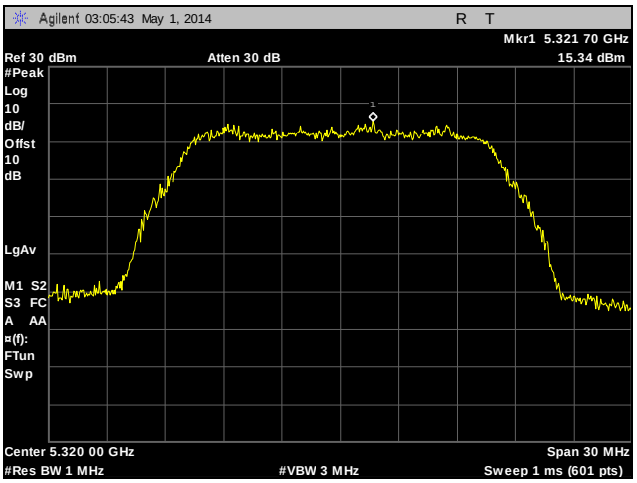
Plot 94. Peak Power Spectral Density, 20 MHz, 5260 MHz, 13.5 dBi Antenna



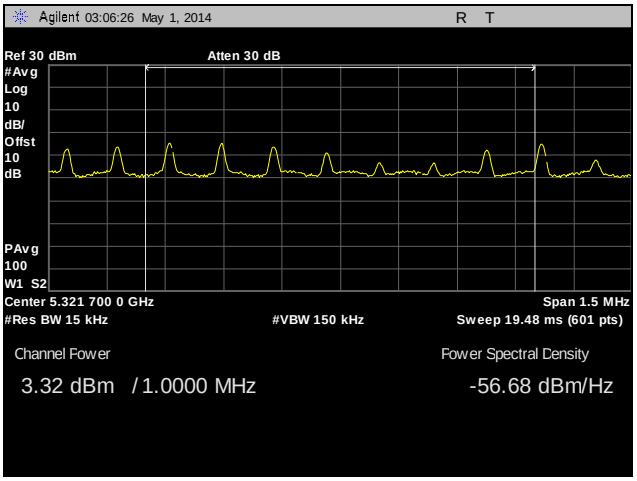
Plot 95. Peak Power Spectral Density, 20 MHz, 5300 MHz, Determination, 13.5 dBi Antenna



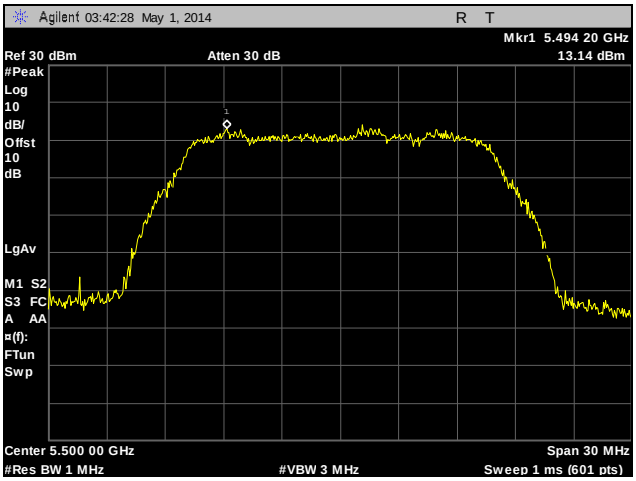
Plot 96. Peak Power Spectral Density, 20 MHz, 5300 MHz, 13.5 dBi Antenna



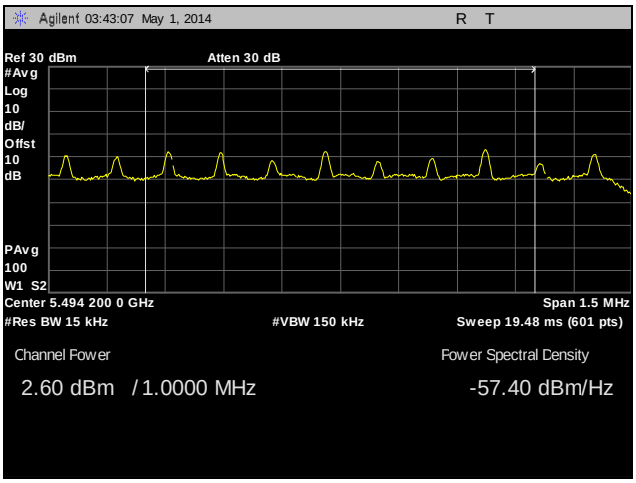
Plot 97. Peak Power Spectral Density, 20 MHz, 5320 MHz, Determination, 13.5 dBi Antenna



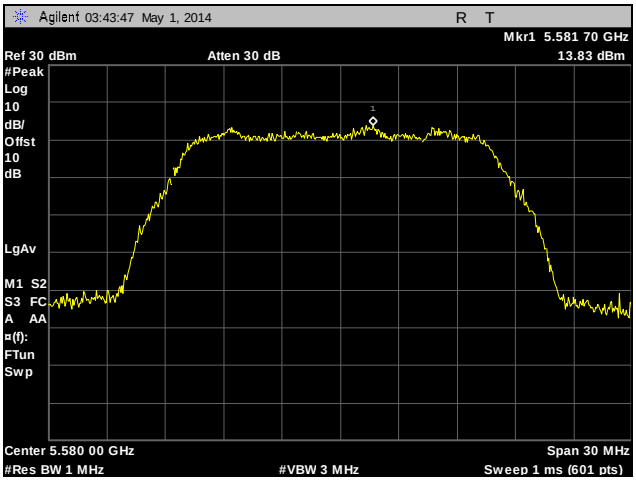
Plot 98. Peak Power Spectral Density, 20 MHz, 5320 MHz, 13.5 dBi Antenna



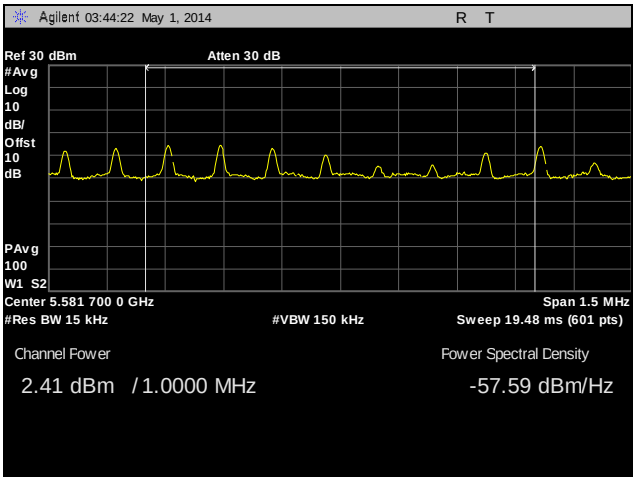
Plot 99. Peak Power Spectral Density, 20 MHz, 5500 MHz, Determination, 13.5 dBi Antenna



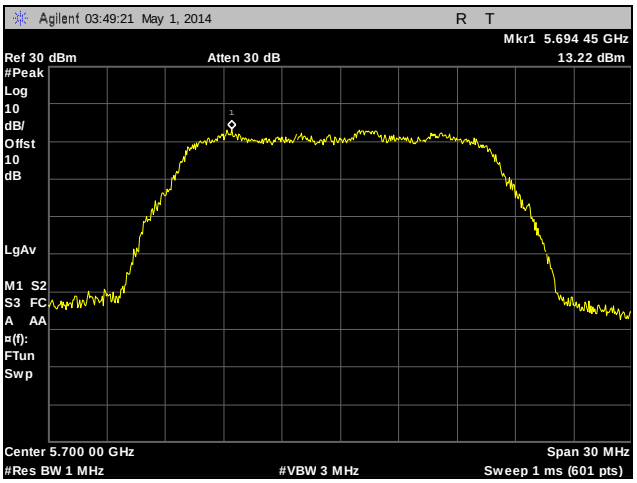
Plot 100. Peak Power Spectral Density, 20 MHz, 5500 MHz, 13.5 dBi Antenna



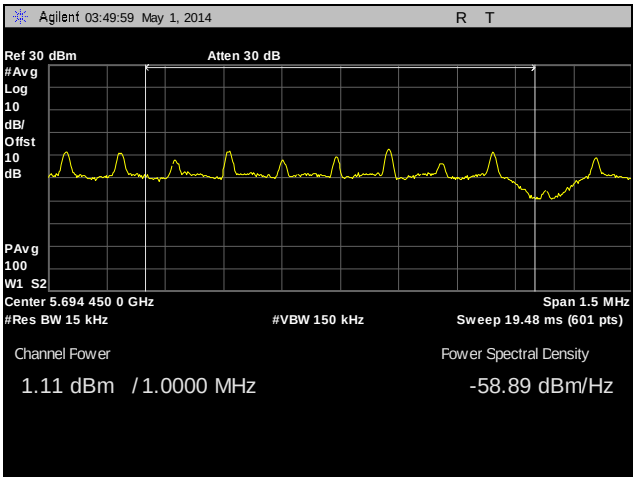
Plot 101. Peak Power Spectral Density, 20 MHz, 5580 MHz, Determination, 13.5 dBi Antenna



Plot 102. Peak Power Spectral Density, 20 MHz, 5580 MHz, 13.5 dBi Antenna

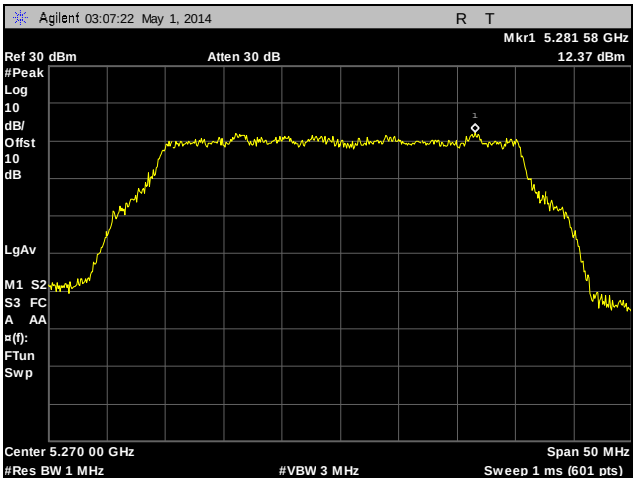


Plot 103. Peak Power Spectral Density, 20 MHz, 5700 MHz, Determination, 13.5 dBi Antenna

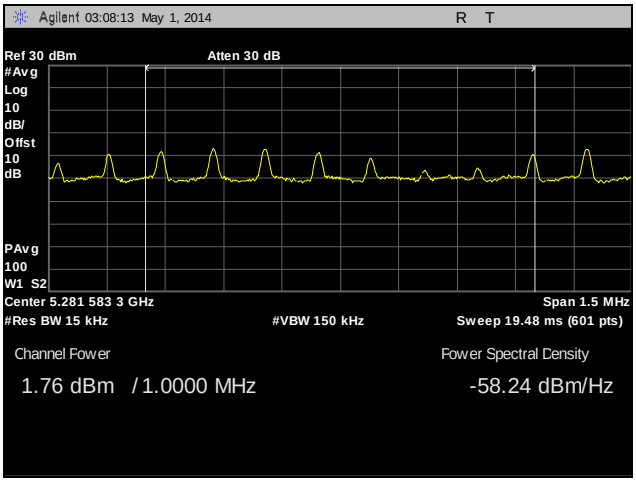


Plot 104. Peak Power Spectral Density, 20 MHz, 5700 MHz, 13.5 dBi Antenna

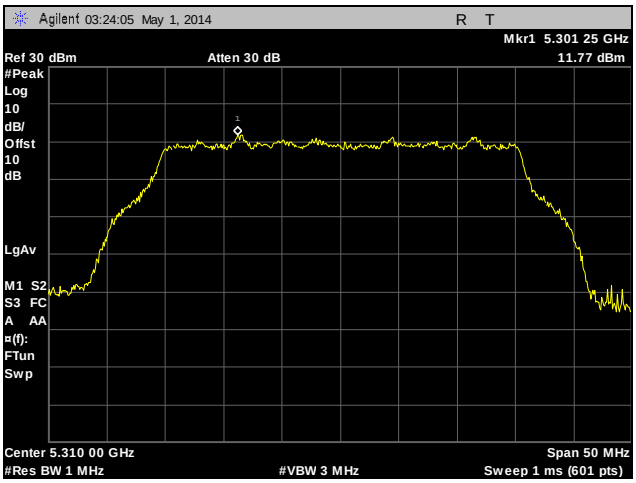
Peak Power Spectral Density, 40 MHz, 13.5 dBi



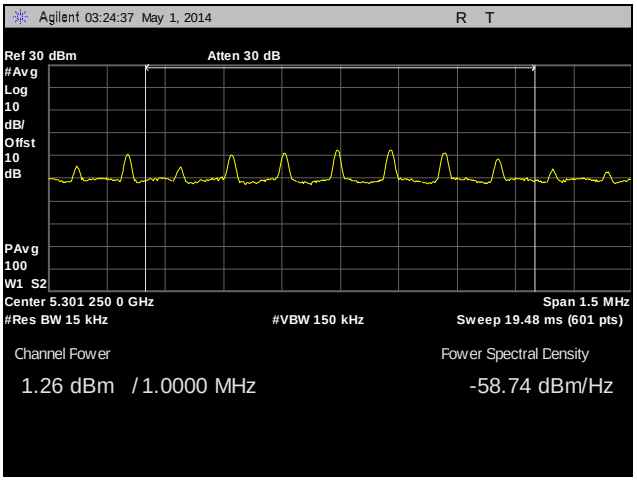
Plot 105. Peak Power Spectral Density, 40 MHz, 5270 MHz, Determination, 13.5 dBi Antenna



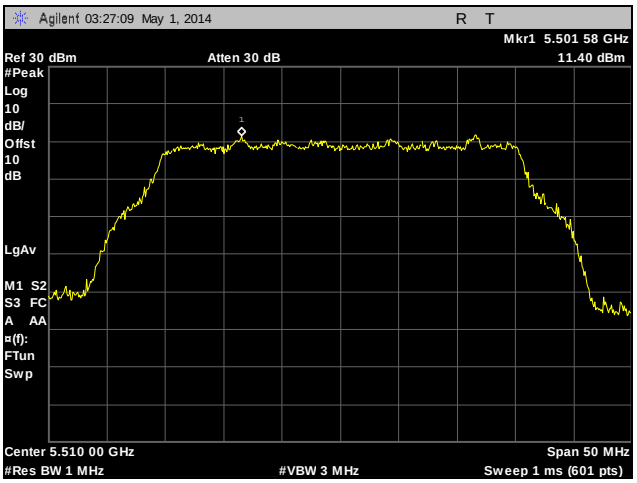
Plot 106. Peak Power Spectral Density, 40 MHz, 5270 MHz, 13.5 dBi Antenna



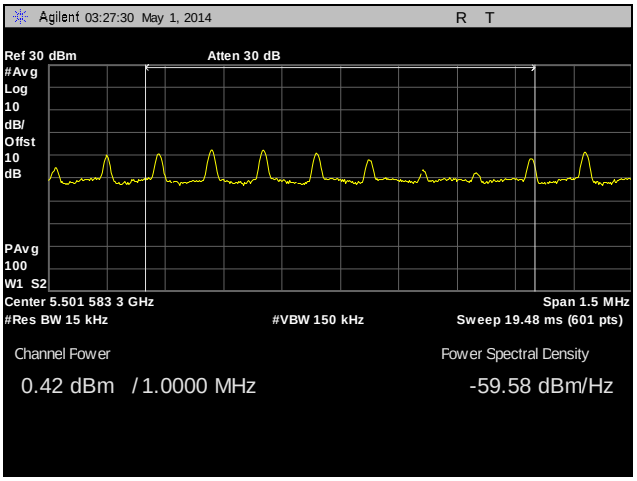
Plot 107. Peak Power Spectral Density, 40 MHz, 5310 MHz, Determination, 13.5 dBi Antenna



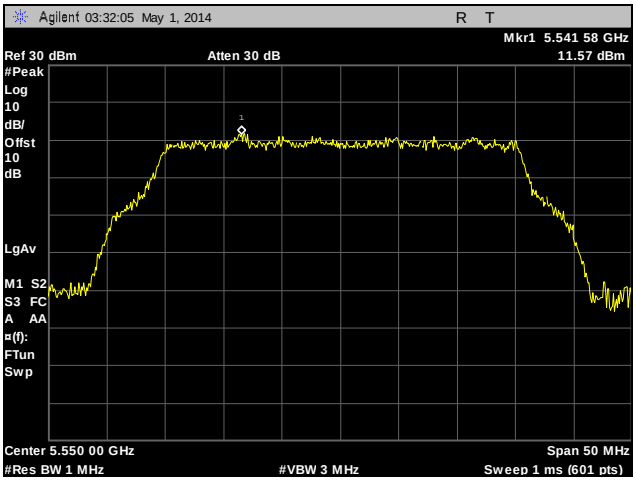
Plot 108. Peak Power Spectral Density, 40 MHz, 5310 MHz, 13.5 dBi Antenna



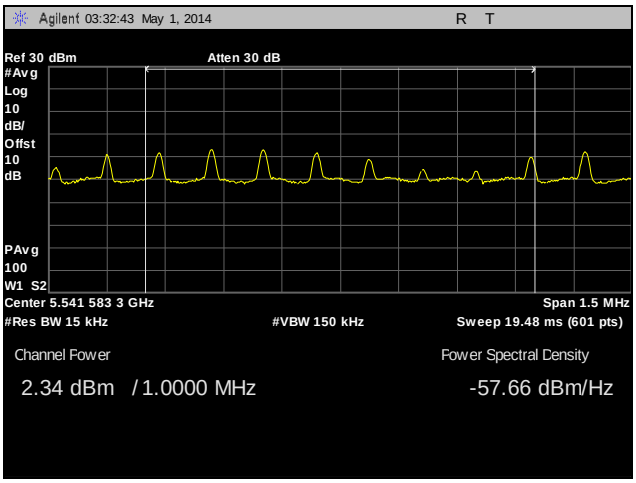
Plot 109. Peak Power Spectral Density, 40 MHz, 5510 MHz, Determination, 13.5 dBi Antenna



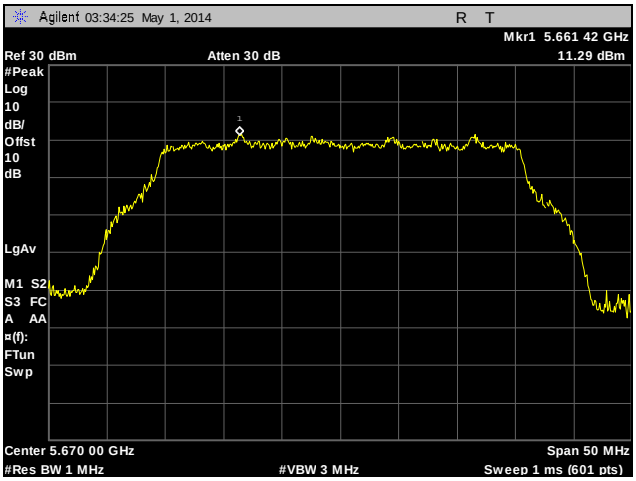
Plot 110. Peak Power Spectral Density, 40 MHz, 5510 MHz, 13.5 dBi Antenna



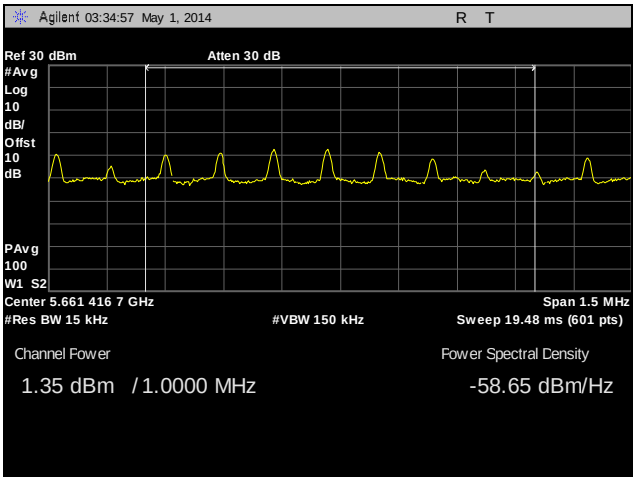
Plot 111. Peak Power Spectral Density, 40 MHz, 5550 MHz, Determination, 13.5 dBi Antenna



Plot 112. Peak Power Spectral Density, 40 MHz, 5550 MHz, 13.5 dBi Antenna



Plot 113. Peak Power Spectral Density, 40 MHz, 5670 MHz, Determination, 13.5 dBi Antenna



Plot 114. Peak Power Spectral Density, 40 MHz, 5670 MHz, 13.5 dBi Antenna

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.407(b)(2), (3), (6), (7) Undesirable Emissions

Test Requirements: **§ 15.407(b)(2), (3), (6), (7)**; **§15.205:** Emissions outside the frequency band.

§ 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 EIRP of -27 dBm/MHz. Devices operating in the 5.25-5.35 GHz band that generate emissions in the 5.15-5.25 GHz band must meet all applicable technical requirements for operation in the 5.15-5.25 GHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of -27 dBm/MHz in the 5.15-5.25 GHz band.

§ 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 EIRP 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 0.8m high stand on a turntable in a semi-anechoic chamber. The EUT was set to transmit on low, mid, and high channels, while the turntable was rotated 360 degrees through three orthogonal axes and the receiving antenna height was varied to maximize emissions.

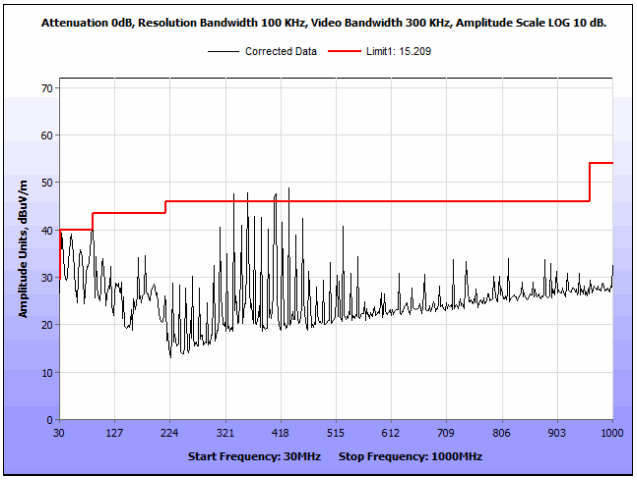
For frequencies from 30 MHz to 1 GHz, measurements were first made using a peak detector with a 100kHz resolution bandwidth. Emissions which exceeded the limits were re-measured using a quasi-peak detector with a 120 kHz resolution bandwidth.

For measurements above 1 GHz, measurements were made with a Peak detector with 1 MHz resolution bandwidth. Where the spurious emissions fell into a restricted band, measurements were also made with an average detector to make sure they complied with 15.209 limits. Emissions were explored up to 40 GHz.
The equation, **EIRP= E + 20 log D – 104.8** was used to convert an EIRP limit to a field strength limit.
E = field strength (dBuV/m)
D = Reference measurement distance

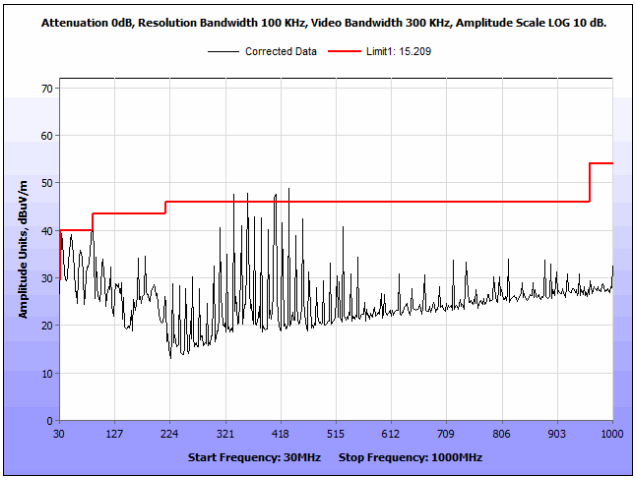
Test Results: The EUT was compliant with the Radiated Emission limits for Intentional Radiators. See following pages for detailed test results. Only noise floor was observed above 18GHz. There were some emissions over the FCC 15.209 requirement between 30MHz-1GHz. However, these emissions were still there while radio was turned off. Since the EUT was compliant with FCC 15B digital emission as class B device which has same limit as FCC 15.209 requirement, therefore it is compliant by similarity to FCC 15.209 requirement.

Test Engineer(s): Surinder Singh

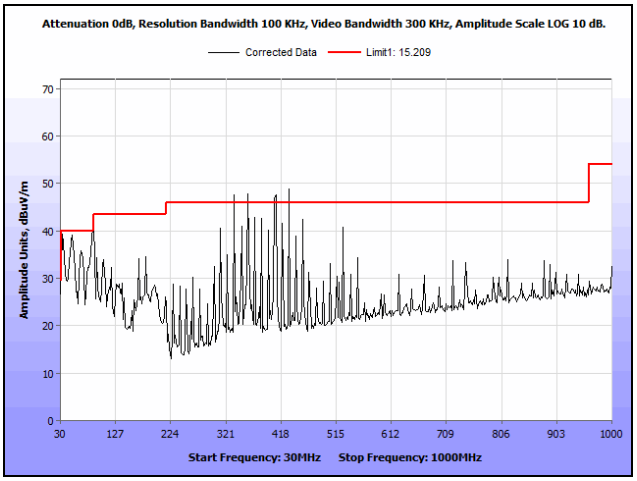
Test Date(s): 05/13/14



Plot 115. Radiated Spurious Emissions, Radio Off, 2 dBi

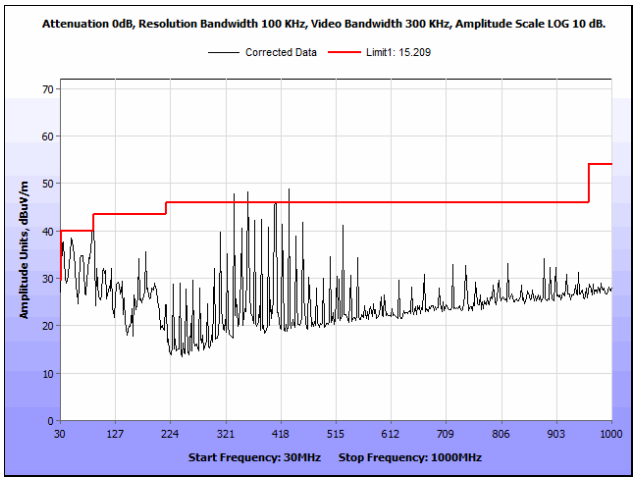


Plot 116. Radiated Spurious Emissions, Radio Off, 5 dBi

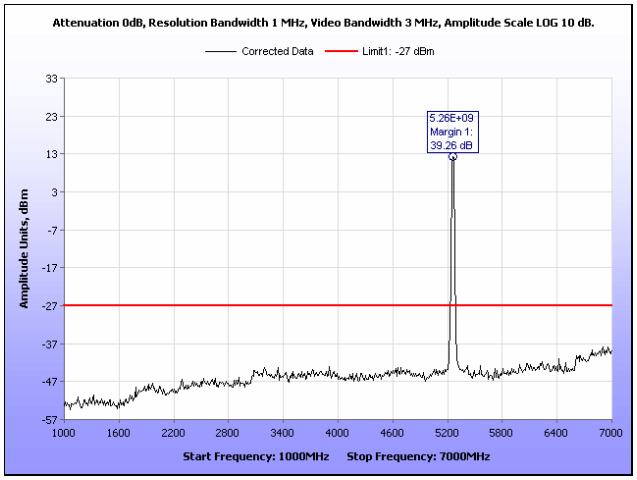


Plot 117. Radiated Spurious Emissions, Radio Off, 13.5 dBi

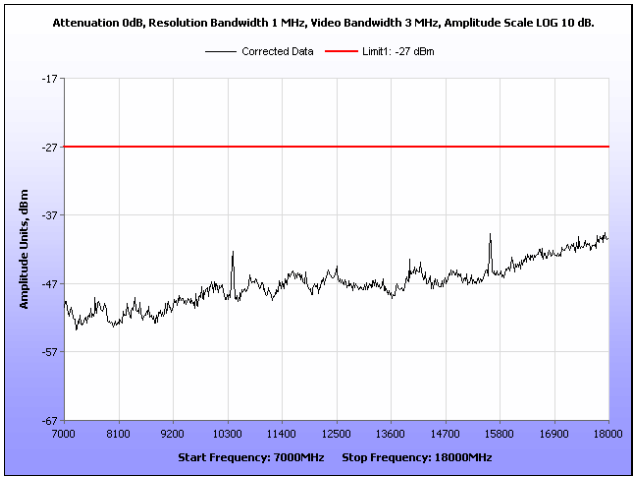
Radiated Spurious Emissions, 20 MHz, 2 dBi



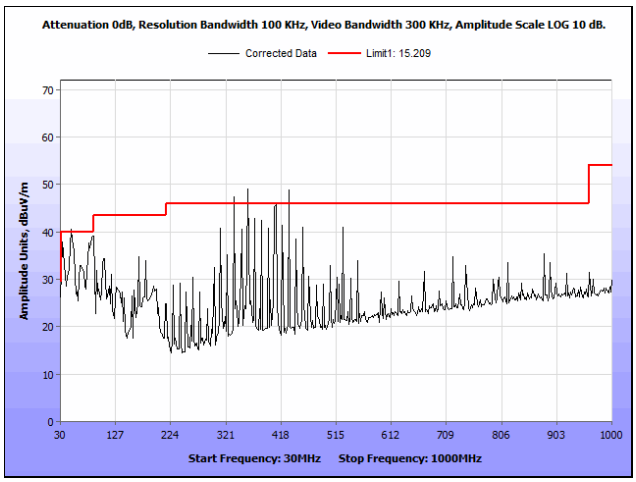
Plot 118. Radiated Spurious Emissions, 20 MHz, 5260 MHz, 30 MHz – 1 GHz, 2 dBi



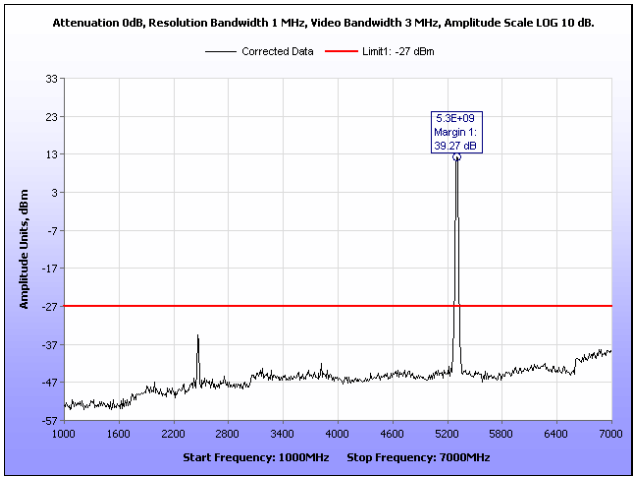
Plot 119. Radiated Spurious Emissions, 20 MHz, 5260 MHz, 1 GHz – 7 GHz, 2 dBi



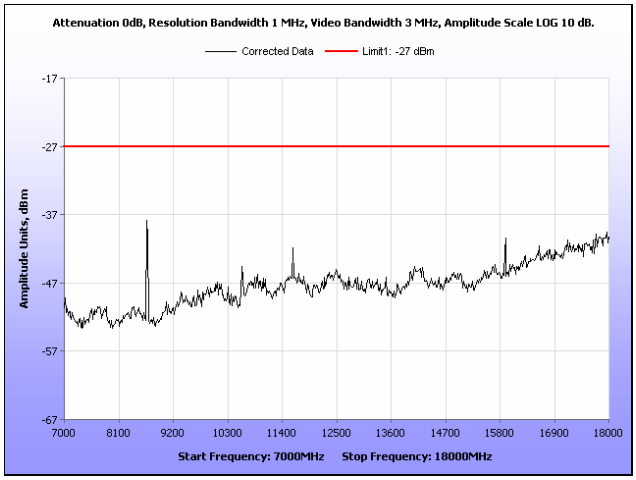
Plot 120. Radiated Spurious Emissions, 20 MHz, 5260 MHz, 7 GHz – 18 GHz, 2 dBi



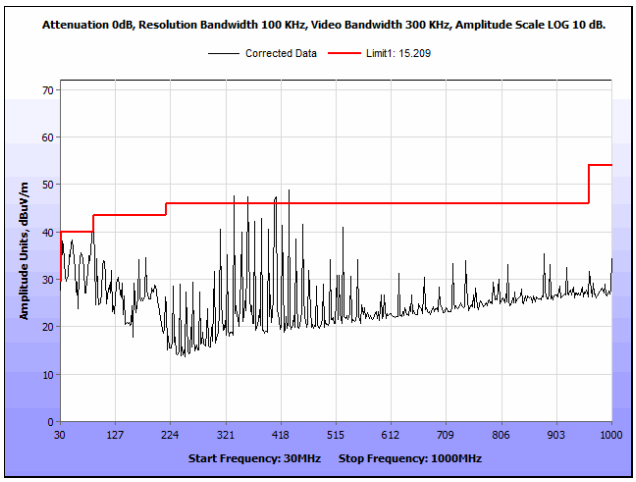
Plot 121. Radiated Spurious Emissions, 20 MHz, 5300 MHz, 30 MHz – 1 GHz, 2 dBi



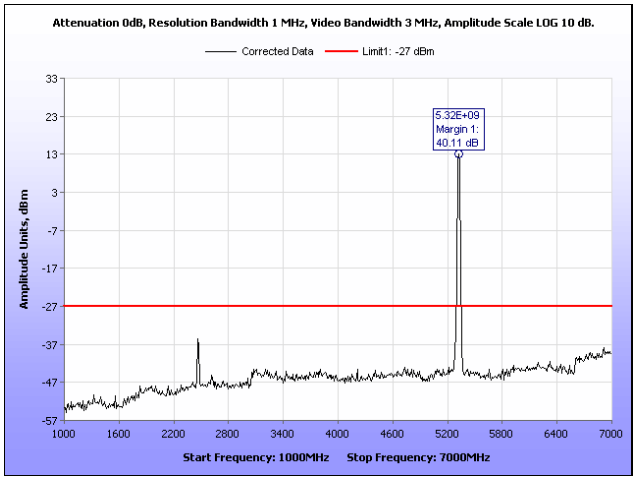
Plot 122. Radiated Spurious Emissions, 20 MHz, 5300 MHz, 1 GHz – 7 GHz, 2 dBi



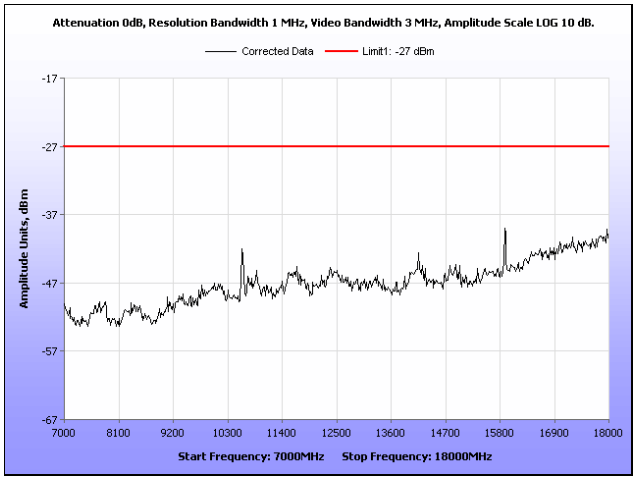
Plot 123. Radiated Spurious Emissions, 20 MHz, 5300 MHz, 7 GHz – 18 GHz, 2 dBi



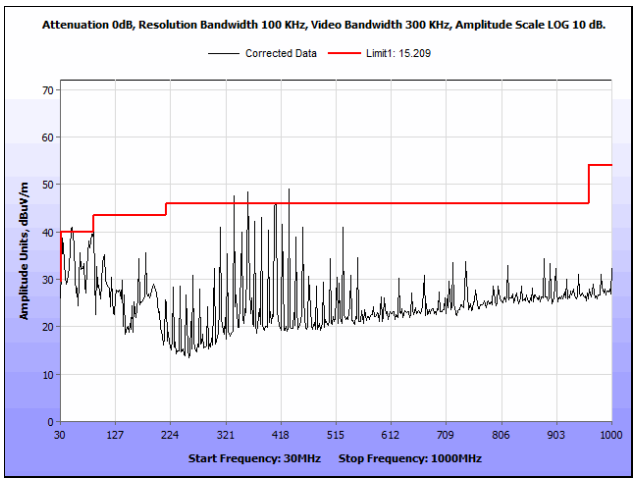
Plot 124. Radiated Spurious Emissions, 20 MHz, 5320 MHz, 30 MHz – 1 GHz, 2 dBi



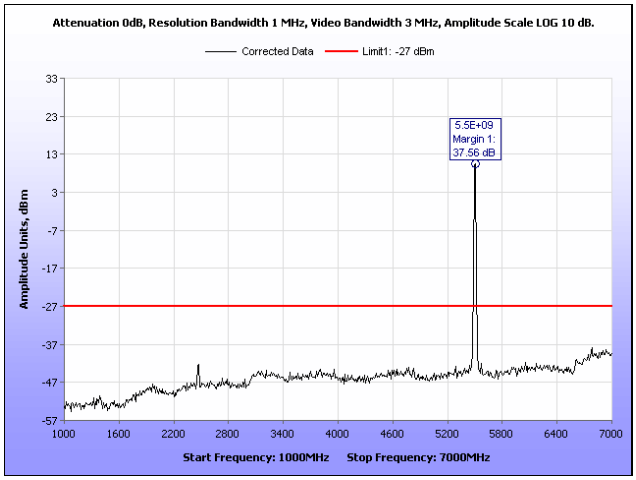
Plot 125. Radiated Spurious Emissions, 20 MHz, 5320 MHz, 1 GHz – 7 GHz, 2 dBi



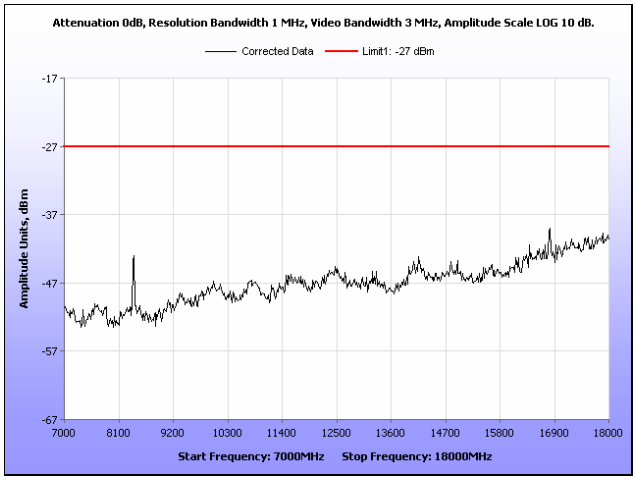
Plot 126. Radiated Spurious Emissions, 20 MHz, 5320 MHz, 7 GHz – 18 GHz, 2 dBi



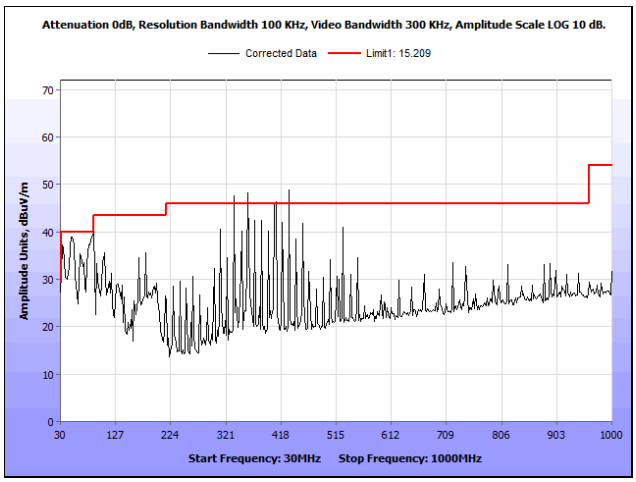
Plot 127. Radiated Spurious Emissions, 20 MHz, 5500 MHz, 30 MHz – 1 GHz, 2 dBi



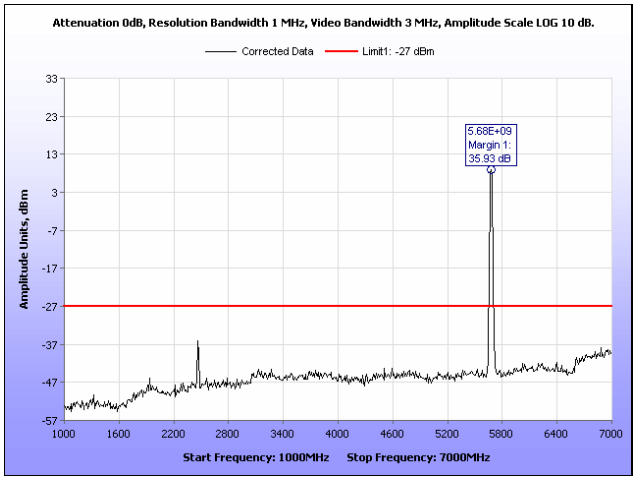
Plot 128. Radiated Spurious Emissions, 20 MHz, 5500 MHz, 1 GHz – 7 GHz, 2 dBi



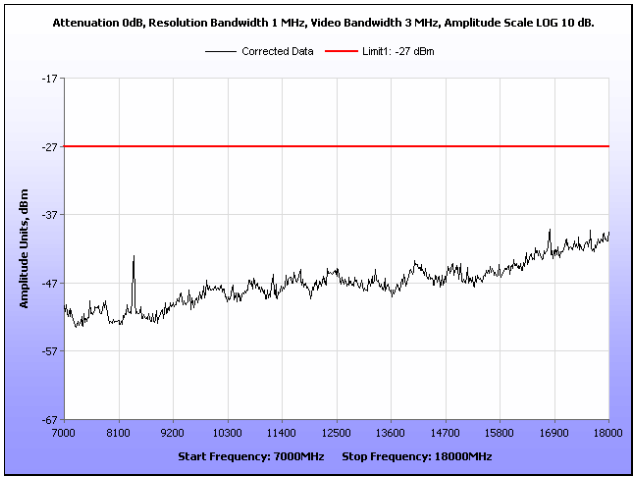
Plot 129. Radiated Spurious Emissions, 20 MHz, 5500 MHz, 7 GHz – 18 GHz, 2 dBi



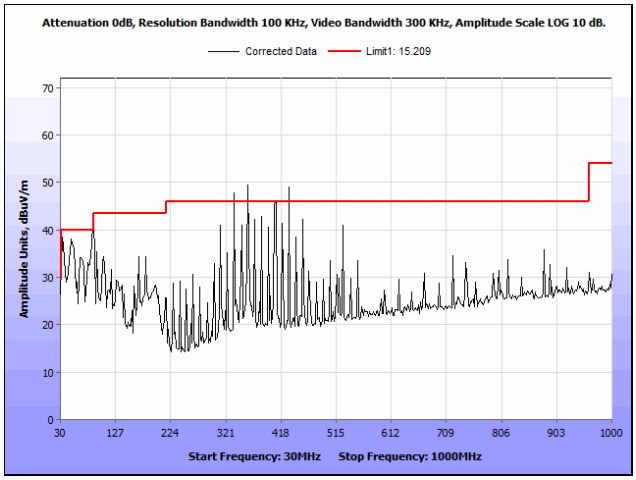
Plot 130. Radiated Spurious Emissions, 20 MHz, 5580 MHz, 30 MHz – 1 GHz, 2 dBi



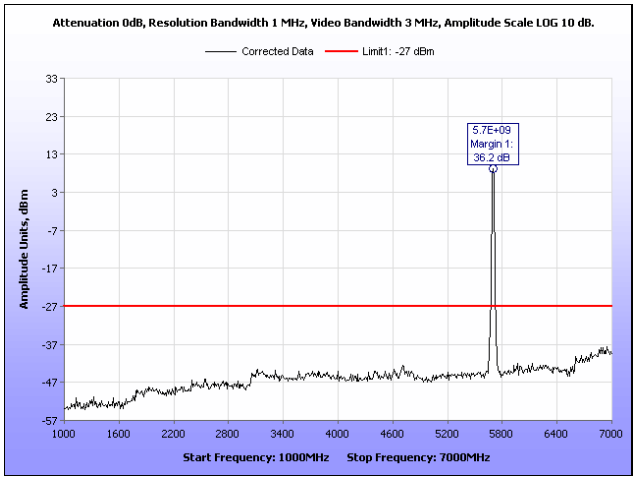
Plot 131. Radiated Spurious Emissions, 20 MHz, 5580 MHz, 1 GHz – 7 GHz, 2 dBi



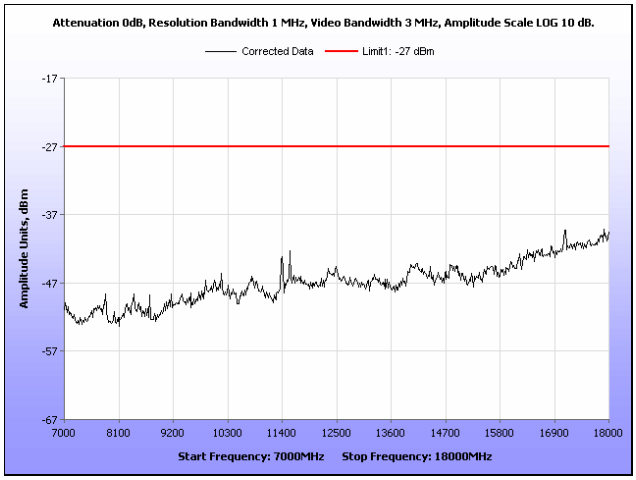
Plot 132. Radiated Spurious Emissions, 20 MHz, 5580 MHz, 7 GHz – 18 GHz, 2 dBi



Plot 133. Radiated Spurious Emissions, 20 MHz, 5700 MHz, 30 MHz – 1 GHz, 2 dBi

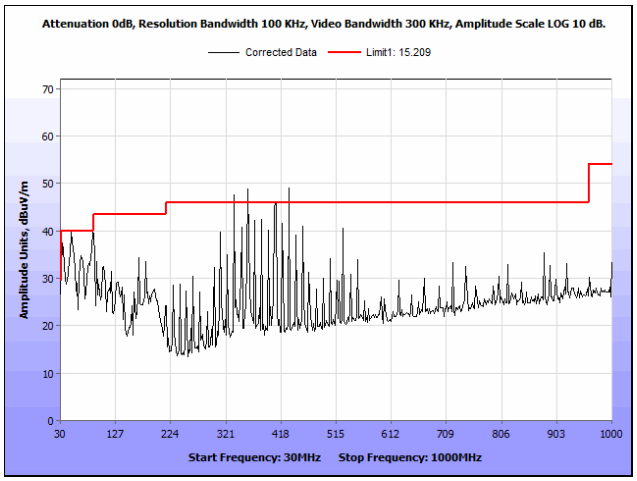


Plot 134. Radiated Spurious Emissions, 20 MHz, 5700 MHz, 1 GHz – 7 GHz, 2 dBi

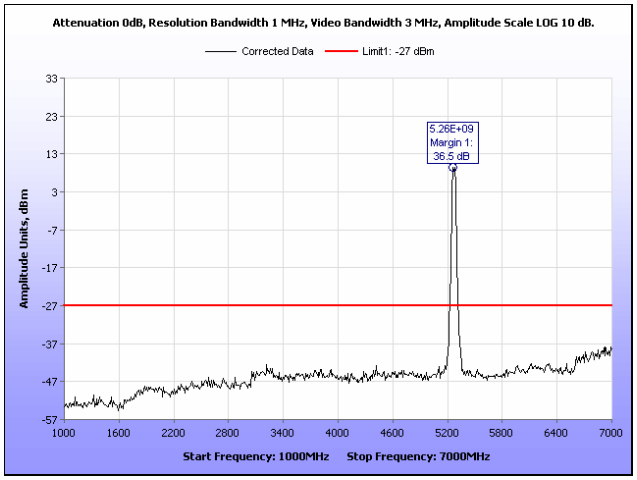


Plot 135. Radiated Spurious Emissions, 20 MHz, 5700 MHz, 7 GHz – 18 GHz, 2 dBi

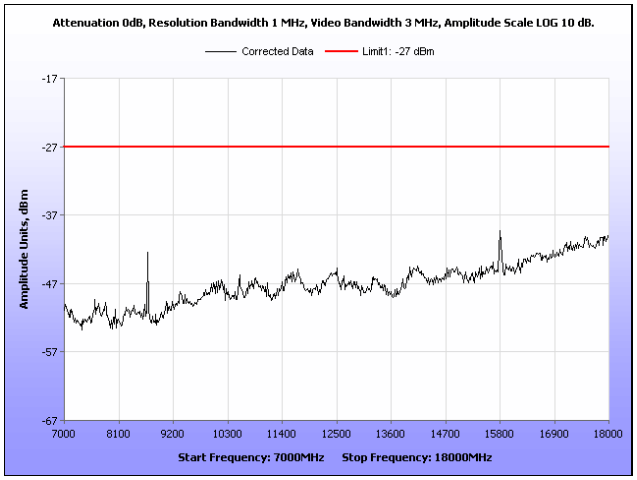
Radiated Spurious Emissions, 40 MHz, 2 dBi



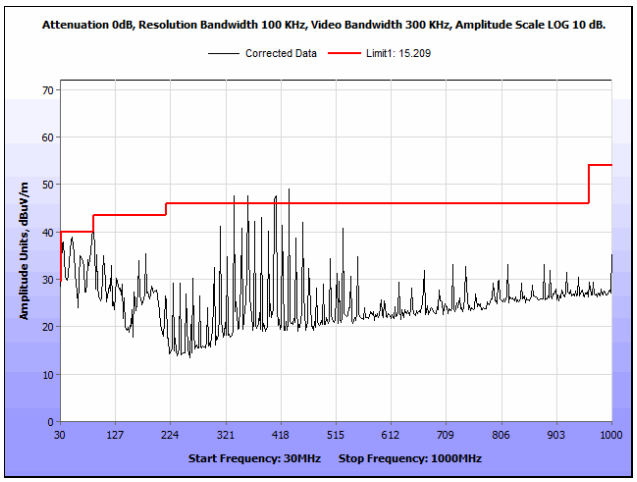
Plot 136. Radiated Spurious Emissions, 40 MHz, 5270 MHz, 30 MHz – 1 GHz, 2 dBi



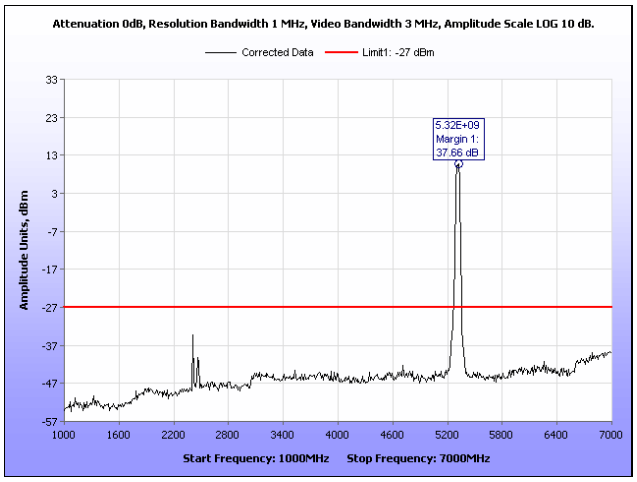
Plot 137. Radiated Spurious Emissions, 40 MHz, 5270 MHz, 1 GHz – 7 GHz, 2 dBi



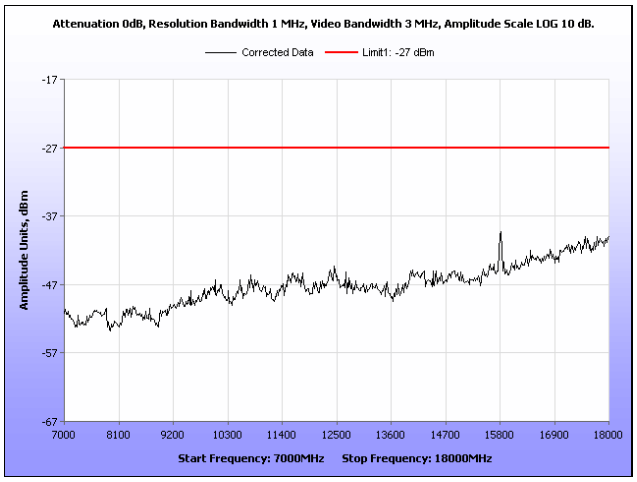
Plot 138. Radiated Spurious Emissions, 40 MHz, 5270 MHz, 7 GHz – 18 GHz, 2 dBi



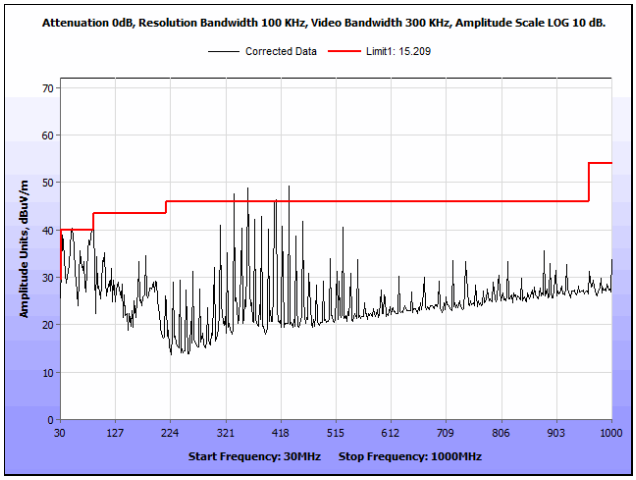
Plot 139. Radiated Spurious Emissions, 40 MHz, 5310 MHz, 30 MHz – 1 GHz, 2 dBi



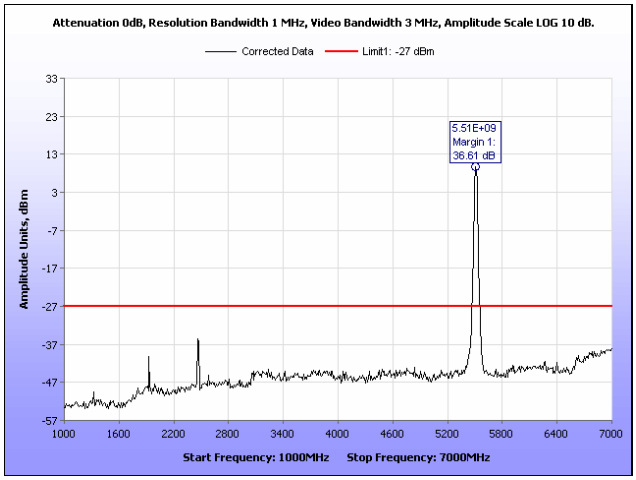
Plot 140. Radiated Spurious Emissions, 40 MHz, 5310 MHz, 1 GHz – 7 GHz, 2 dBi



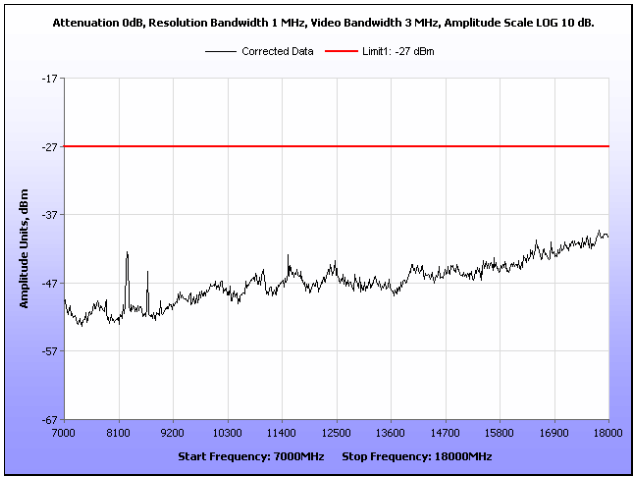
Plot 141. Radiated Spurious Emissions, 40 MHz, 5310 MHz, 7 GHz – 18 GHz, 2 dBi



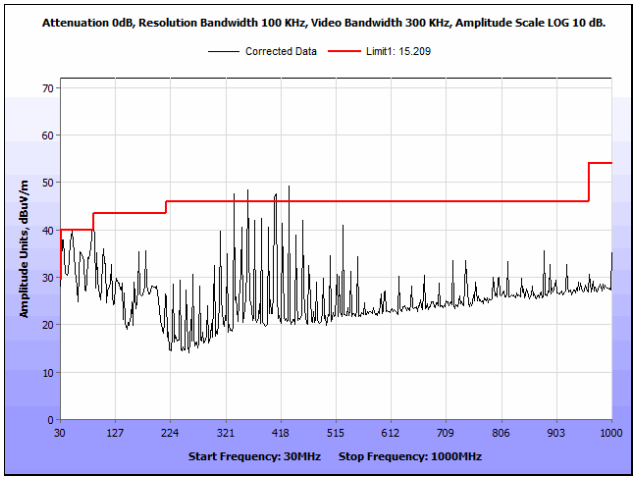
Plot 142. Radiated Spurious Emissions, 40 MHz, 5510 MHz, 30 MHz – 1 GHz, 2 dBi



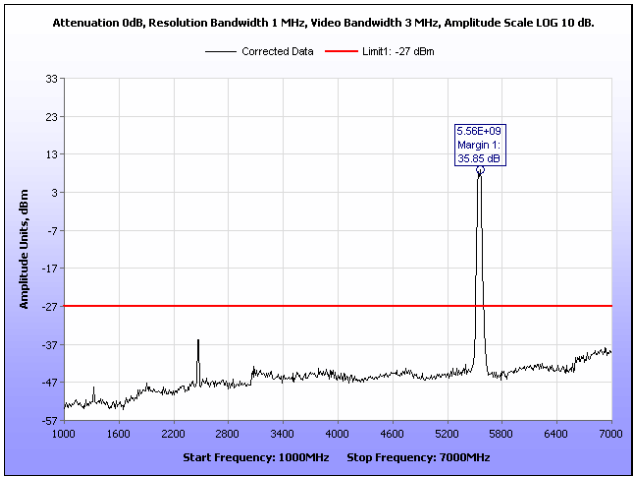
Plot 143. Radiated Spurious Emissions, 40 MHz, 5510 MHz, 1 GHz – 7 GHz, 2 dBi



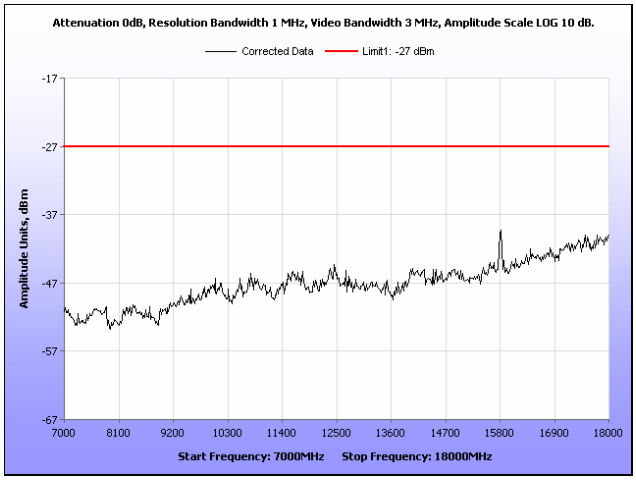
Plot 144. Radiated Spurious Emissions, 40 MHz, 5510 MHz, 7 GHz – 18 GHz, 2 dBi



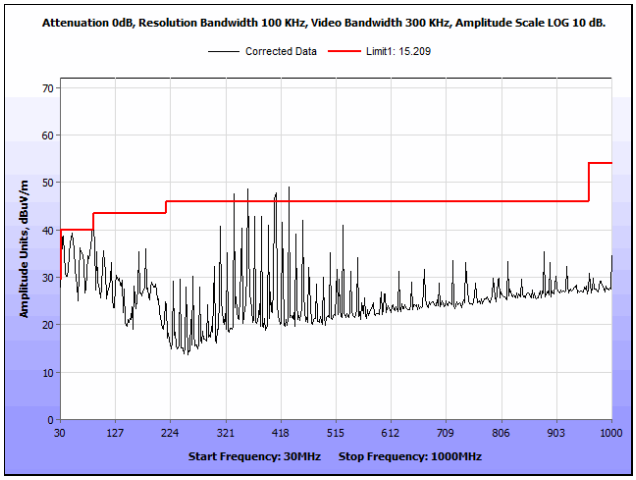
Plot 145. Radiated Spurious Emissions, 40 MHz, 5550 MHz, 30 MHz – 1 GHz, 2 dBi



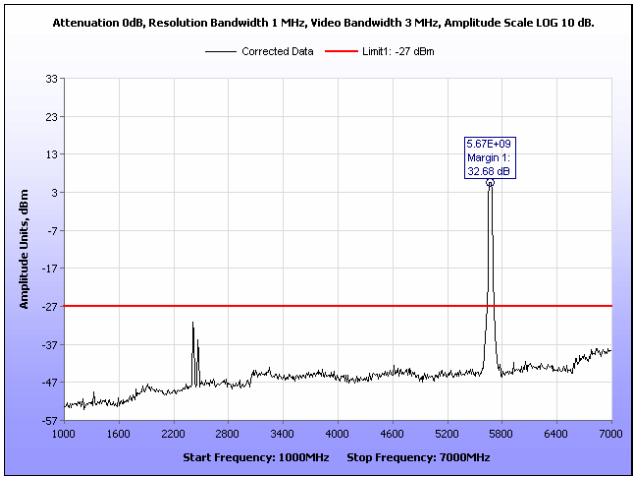
Plot 146. Radiated Spurious Emissions, 40 MHz, 5550 MHz, 1 GHz – 7 GHz, 2 dBi



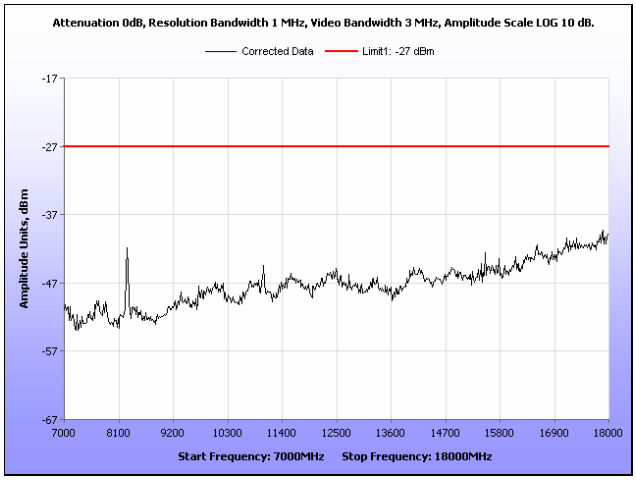
Plot 147. Radiated Spurious Emissions, 40 MHz, 5550 MHz, 7 GHz – 18 GHz, 2 dBi



Plot 148. Radiated Spurious Emissions, 40 MHz, 5670 MHz, 30 MHz – 1 GHz, 2 dBi

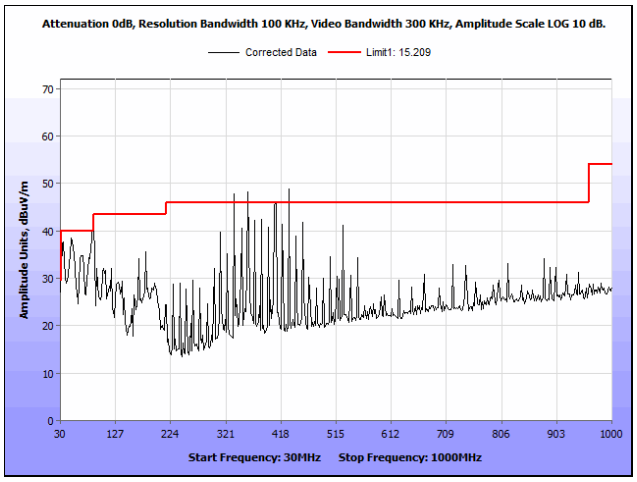


Plot 149. Radiated Spurious Emissions, 40 MHz, 5670 MHz, 1 GHz – 7 GHz, 2 dBi

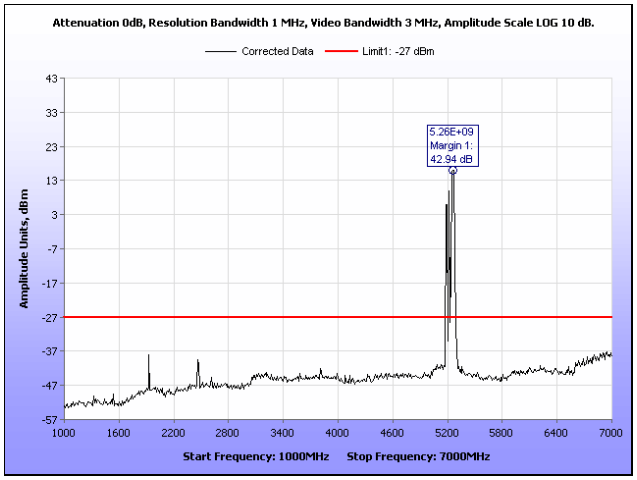


Plot 150. Radiated Spurious Emissions, 40 MHz, 5670 MHz, 7 GHz – 18 GHz, 2 dBi

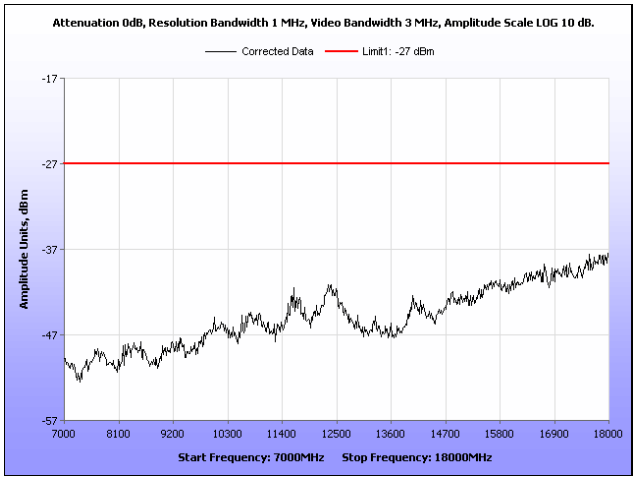
Radiated Spurious Emissions, 20 MHz, 5 dBi



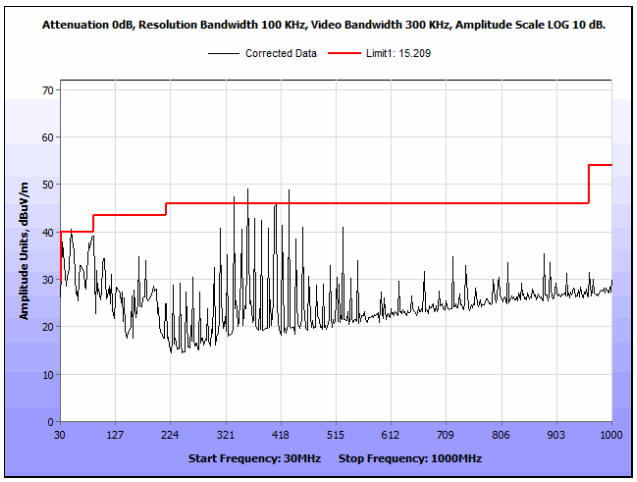
Plot 151. Radiated Spurious Emissions, 20 MHz, 5260 MHz, 30 MHz – 1 GHz, 5 dBi



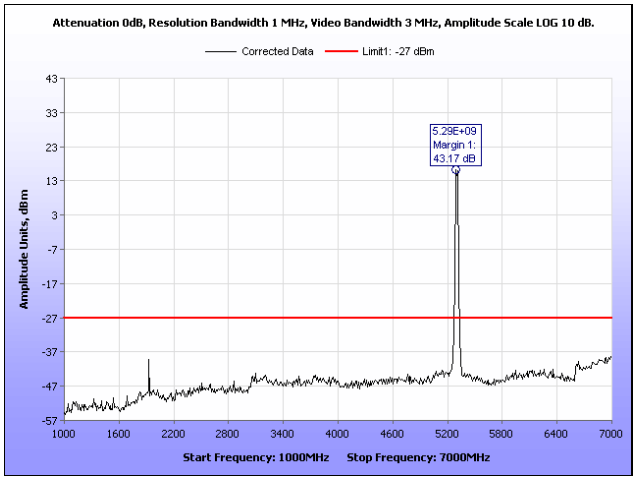
Plot 152. Radiated Spurious Emissions, 20 MHz, 5260 MHz, 1 GHz – 7 GHz, 5 dBi



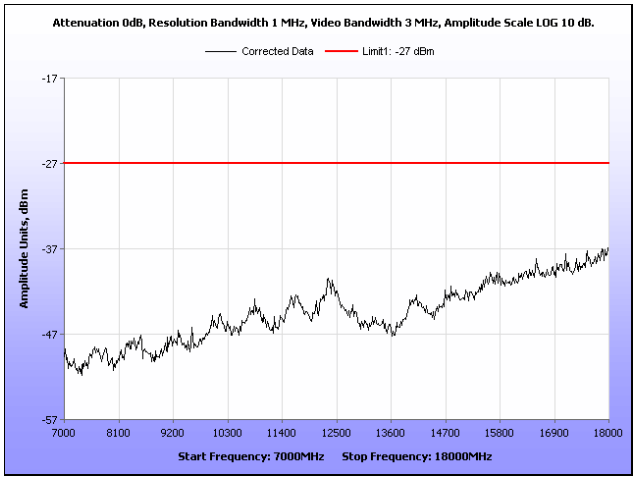
Plot 153. Radiated Spurious Emissions, 20 MHz, 5260 MHz, 7 GHz – 18 GHz, 5 dBi



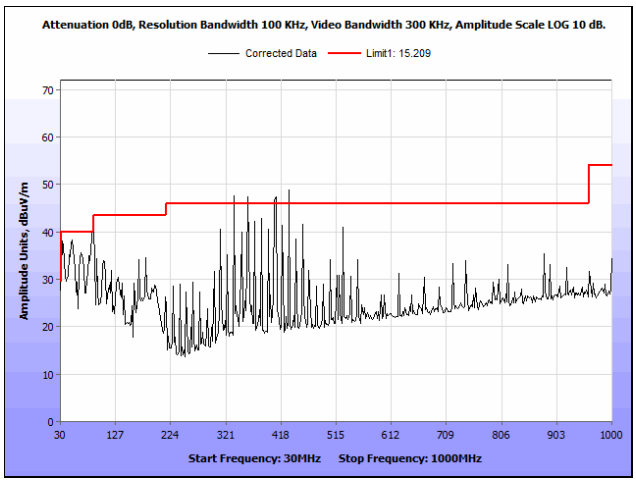
Plot 154. Radiated Spurious Emissions, 20 MHz, 5300 MHz, 30 MHz – 1 GHz, 5 dBi



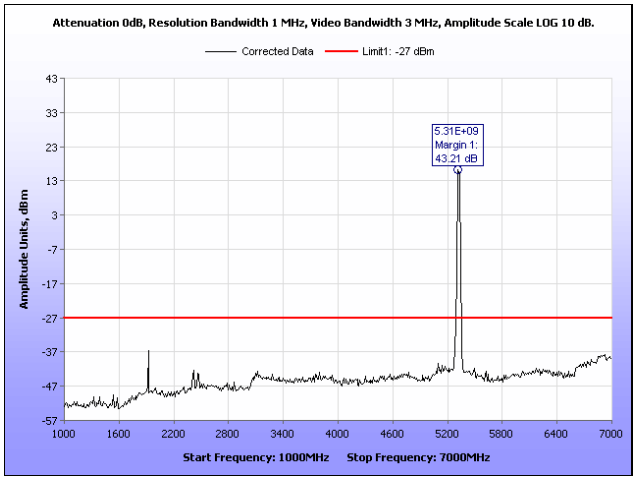
Plot 155. Radiated Spurious Emissions, 20 MHz, 5300 MHz, 1 GHz – 7 GHz, 5 dBi



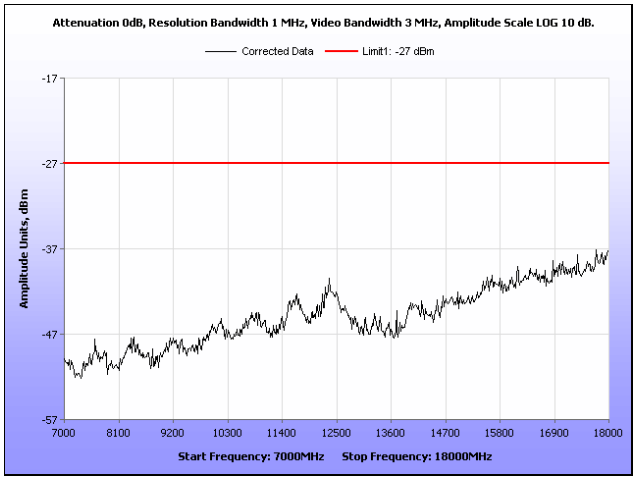
Plot 156. Radiated Spurious Emissions, 20 MHz, 5300 MHz, 7 GHz – 18 GHz, 5 dBi



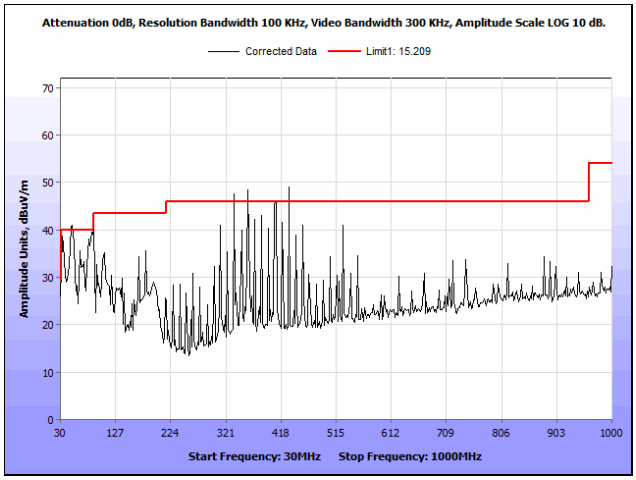
Plot 157. Radiated Spurious Emissions, 20 MHz, 5320 MHz, 30 MHz – 1 GHz, 5 dBi



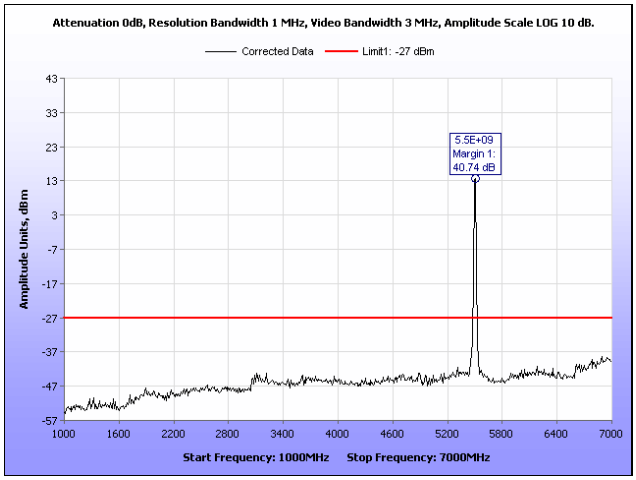
Plot 158. Radiated Spurious Emissions, 20 MHz, 5320 MHz, 1 GHz – 7 GHz, 5 dBi



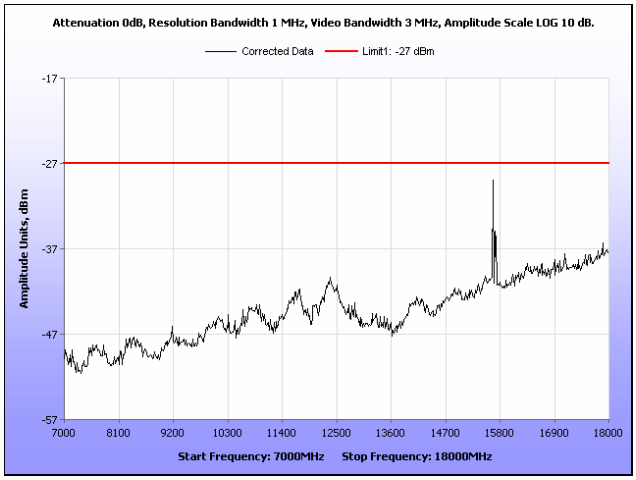
Plot 159. Radiated Spurious Emissions, 20 MHz, 5320 MHz, 7 GHz – 18 GHz, 5 dBi



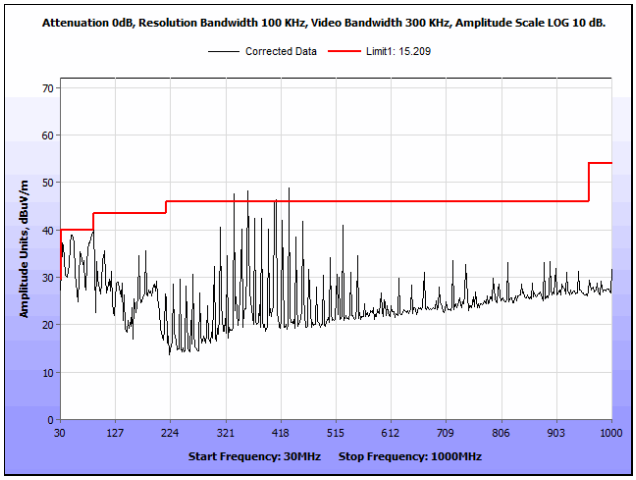
Plot 160. Radiated Spurious Emissions, 20 MHz, 5500 MHz, 30 MHz – 1 GHz, 5 dBi



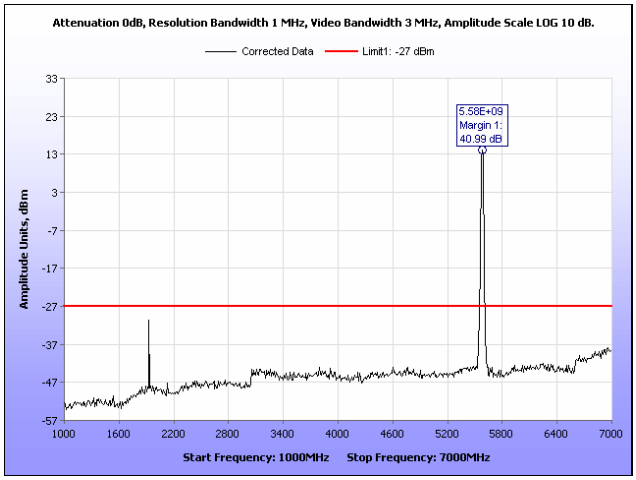
Plot 161. Radiated Spurious Emissions, 20 MHz, 5500 MHz, 1 GHz – 7 GHz, 5 dBi



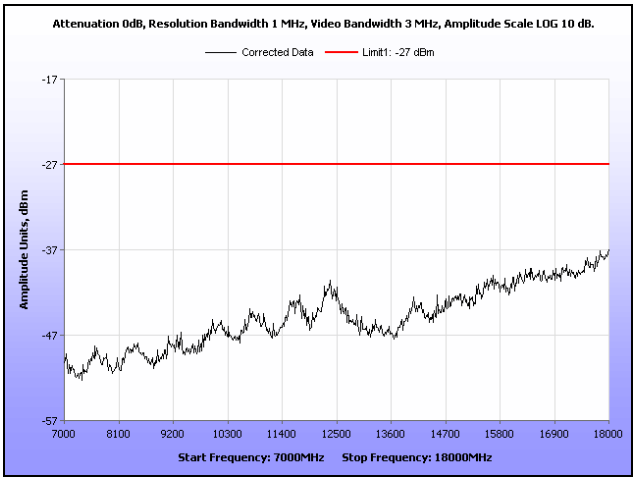
Plot 162. Radiated Spurious Emissions, 20 MHz, 5500 MHz, 7 GHz – 18 GHz, 5 dBi



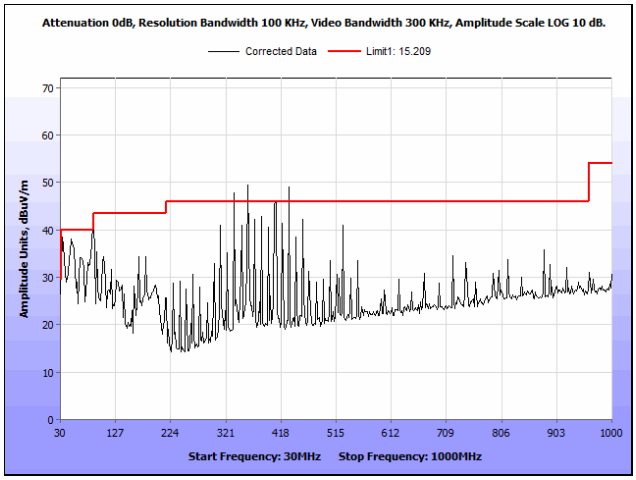
Plot 163. Radiated Spurious Emissions, 20 MHz, 5580 MHz, 30 MHz – 1 GHz, 5 dBi



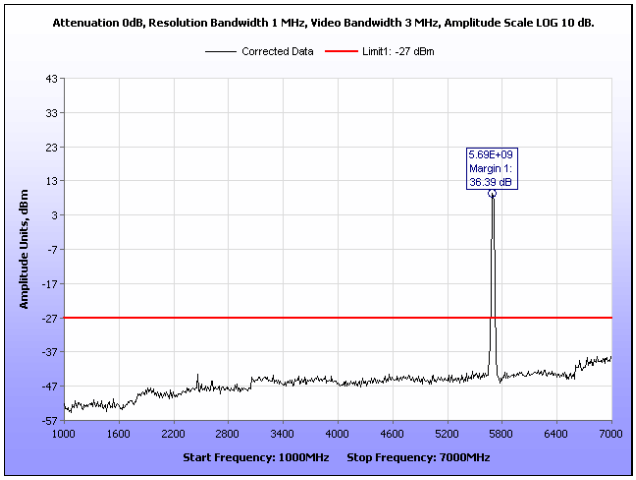
Plot 164. Radiated Spurious Emissions, 20 MHz, 5580 MHz, 1 GHz – 7 GHz, 5 dBi



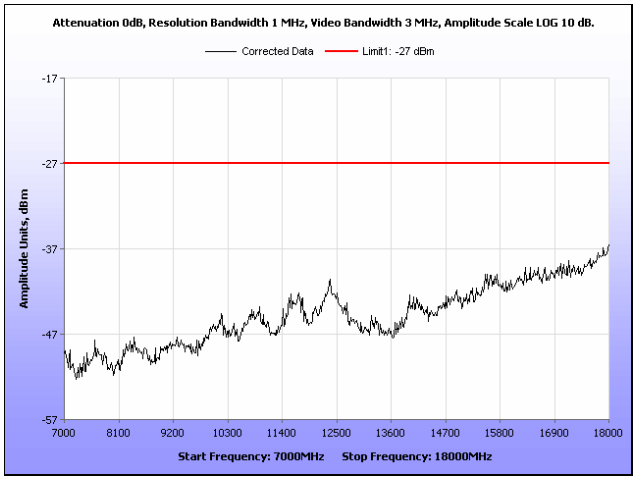
Plot 165. Radiated Spurious Emissions, 20 MHz, 5580 MHz, 7 GHz – 18 GHz, 5 dBi



Plot 166. Radiated Spurious Emissions, 20 MHz, 5700 MHz, 30 MHz – 1 GHz, 5 dBi

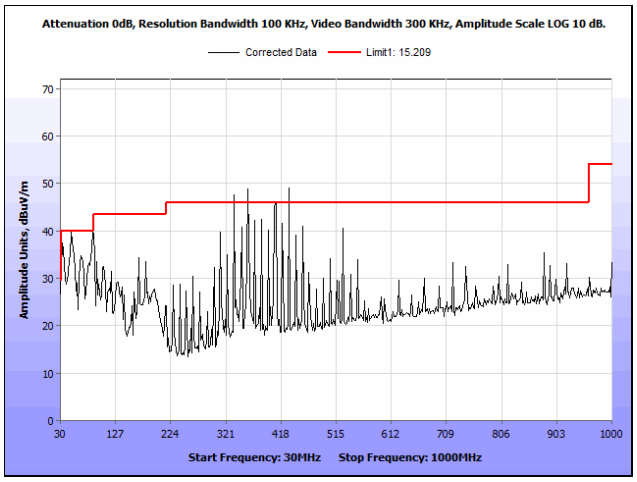


Plot 167. Radiated Spurious Emissions, 20 MHz, 5700 MHz, 1 GHz – 7 GHz, 5 dBi

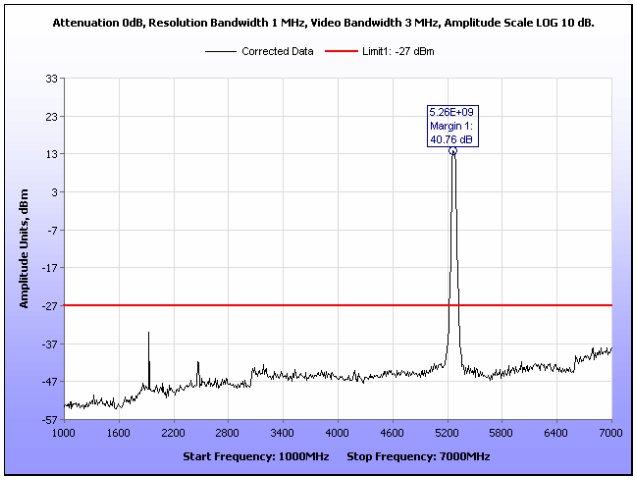


Plot 168. Radiated Spurious Emissions, 20 MHz, 5700 MHz, 7 GHz – 18 GHz, 5 dBi

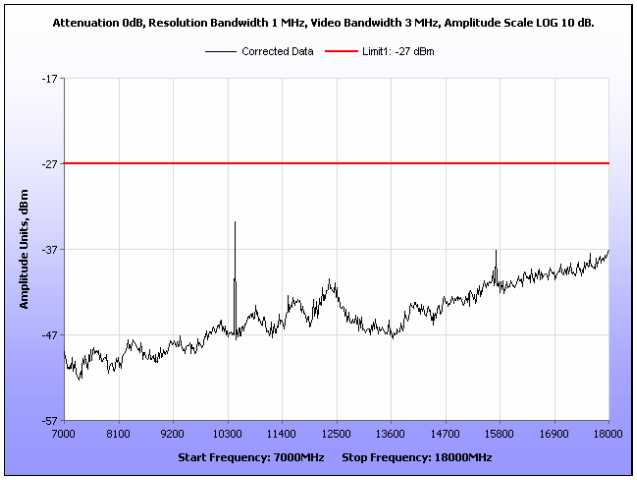
Radiated Spurious Emissions, 40 MHz, 5 dBi



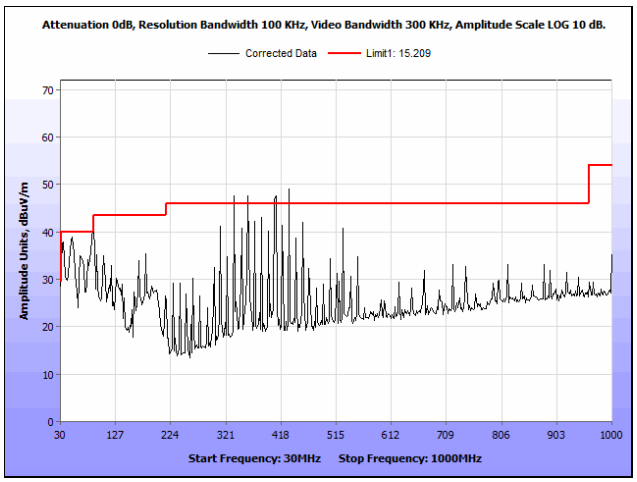
Plot 169. Radiated Spurious Emissions, 40 MHz, 5270 MHz, 30 MHz – 1 GHz, 5 dBi



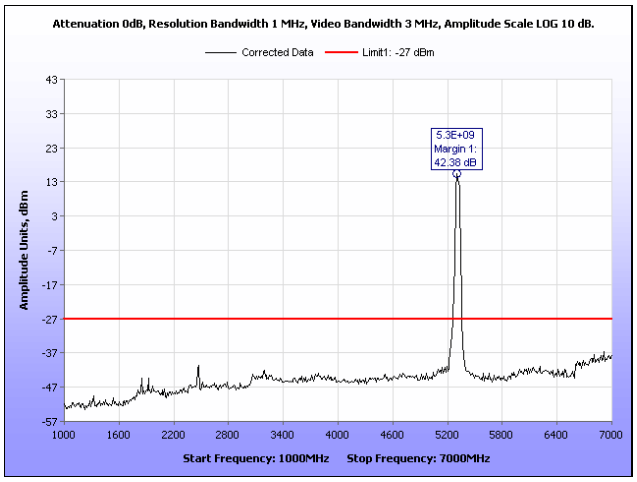
Plot 170. Radiated Spurious Emissions, 40 MHz, 5270 MHz, 1 GHz – 7 GHz, 5 dBi



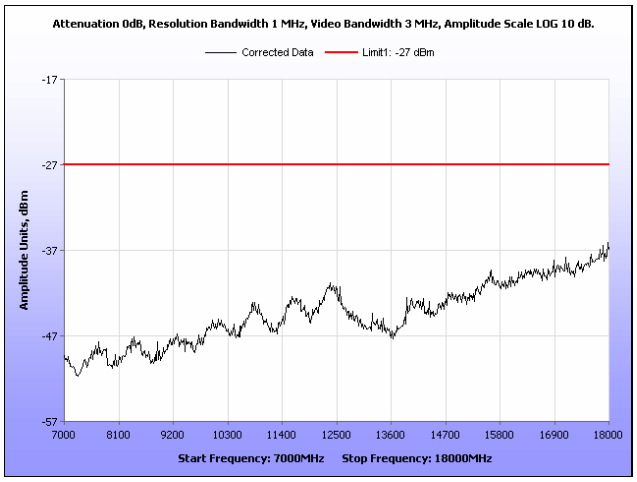
Plot 171. Radiated Spurious Emissions, 40 MHz, 5270 MHz, 7 GHz – 18 GHz, 5 dBi



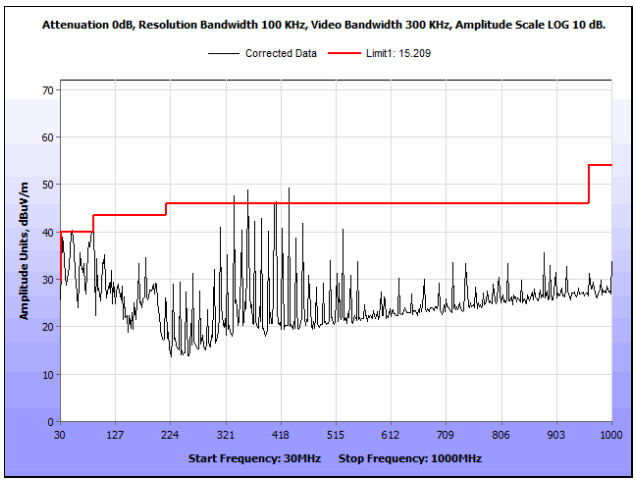
Plot 172. Radiated Spurious Emissions, 40 MHz, 5310 MHz, 30 MHz – 1 GHz, 5 dBi



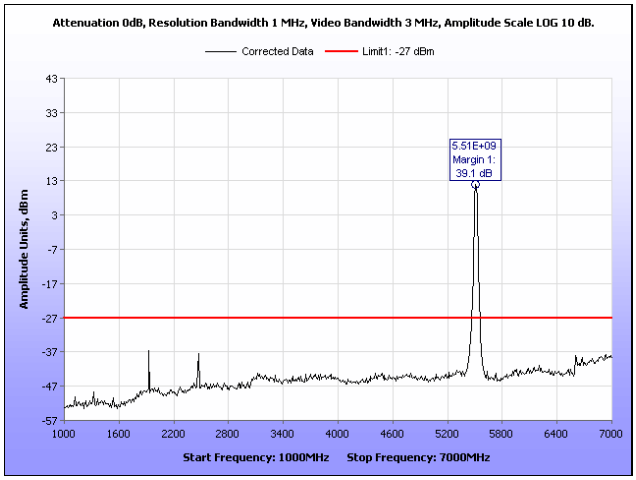
Plot 173. Radiated Spurious Emissions, 40 MHz, 5310 MHz, 1 GHz – 7 GHz, 5 dBi



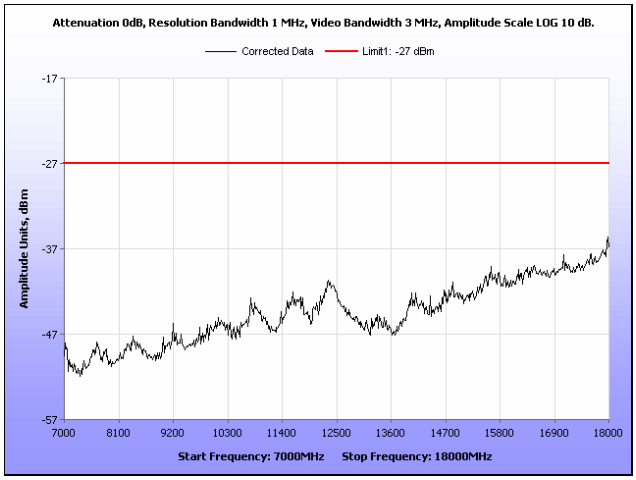
Plot 174. Radiated Spurious Emissions, 40 MHz, 5310 MHz, 7 GHz – 18 GHz, 5 dBi



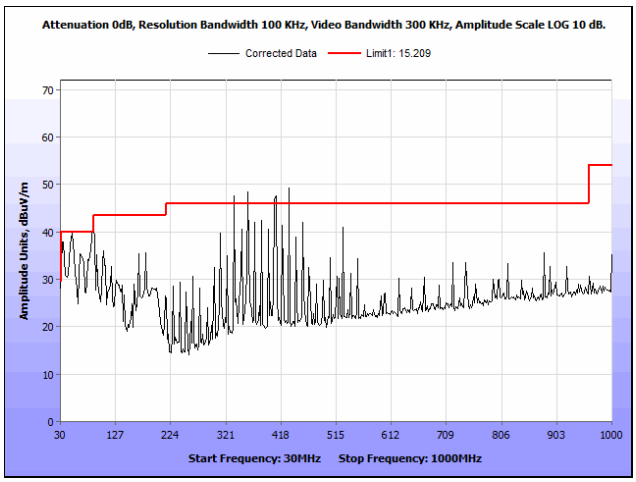
Plot 175. Radiated Spurious Emissions, 40 MHz, 5510 MHz, 30 MHz – 1 GHz, 5 dBi



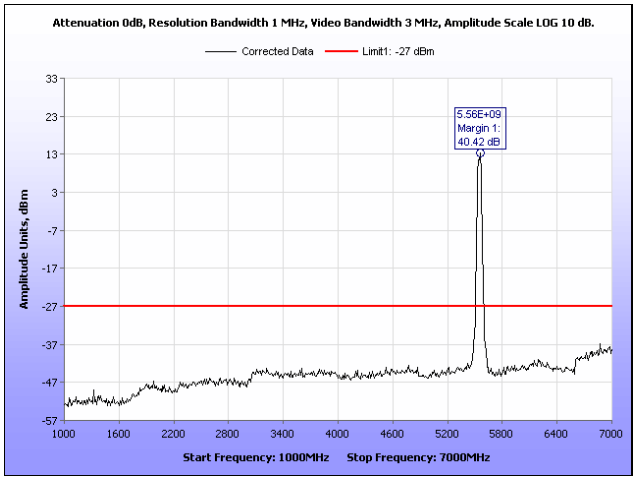
Plot 176. Radiated Spurious Emissions, 40 MHz, 5510 MHz, 1 GHz – 7 GHz, 5 dBi



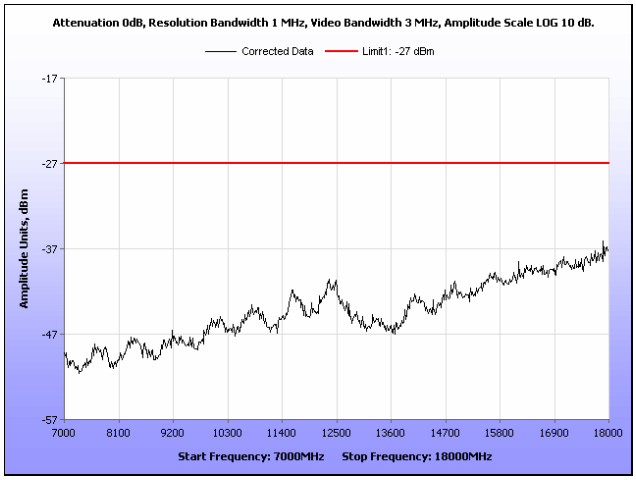
Plot 177. Radiated Spurious Emissions, 40 MHz, 5510 MHz, 7 GHz – 18 GHz, 5 dBi



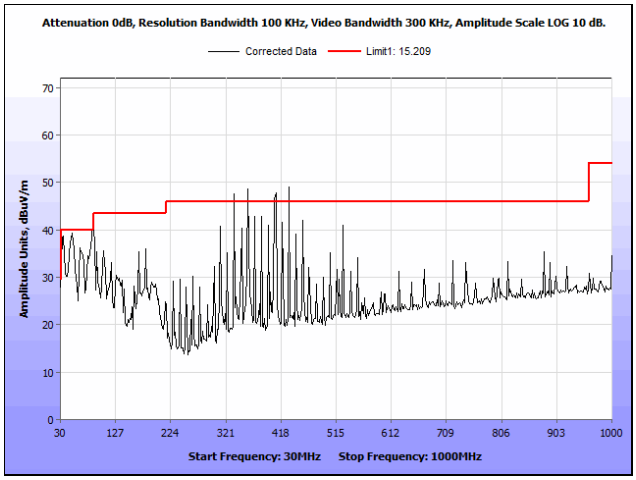
Plot 178. Radiated Spurious Emissions, 40 MHz, 5550 MHz, 30 MHz – 1 GHz, 5 dBi



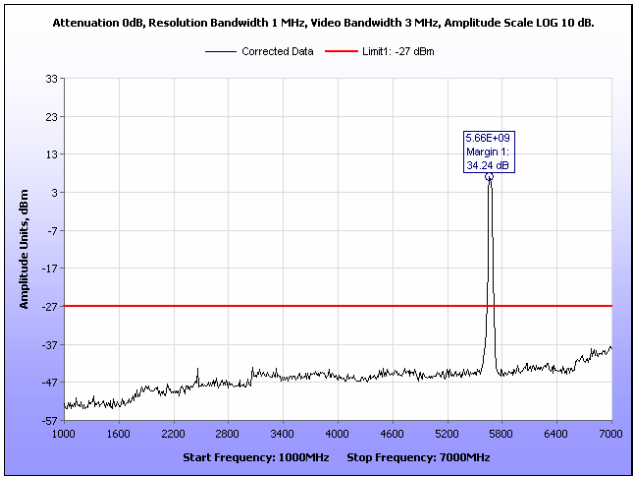
Plot 179. Radiated Spurious Emissions, 40 MHz, 5550 MHz, 1 GHz – 7 GHz, 5 dBi



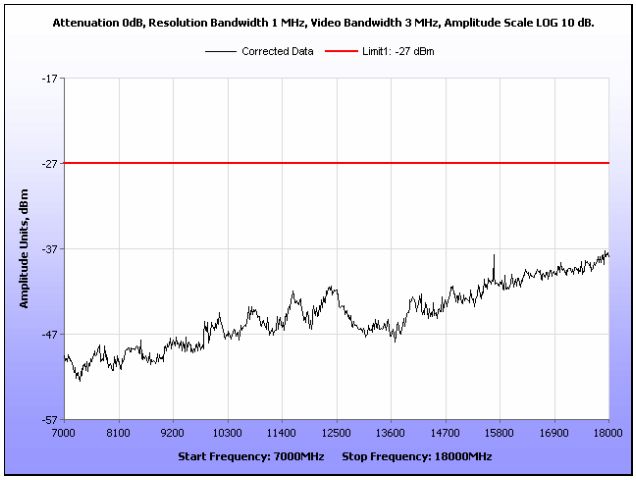
Plot 180. Radiated Spurious Emissions, 40 MHz, 5550 MHz, 7 GHz – 18 GHz, 5 dBi



Plot 181. Radiated Spurious Emissions, 40 MHz, 5670 MHz, 30 MHz – 1 GHz, 5 dBi

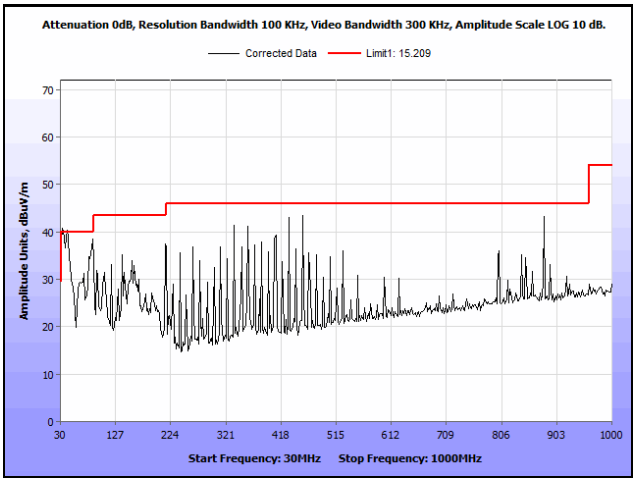


Plot 182. Radiated Spurious Emissions, 40 MHz, 5670 MHz, 1 GHz – 7 GHz, 5 dBi

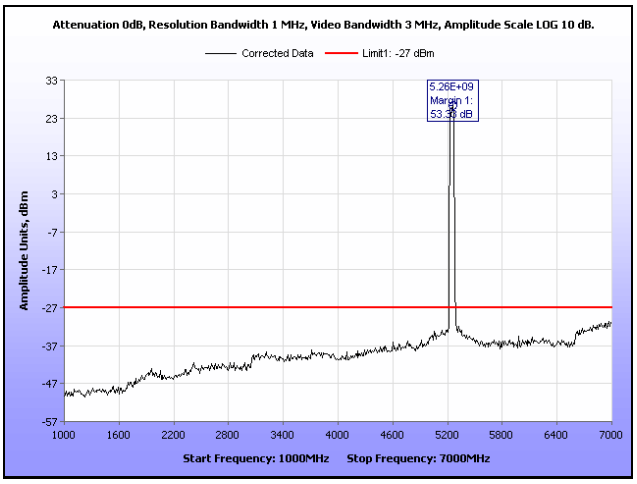


Plot 183. Radiated Spurious Emissions, 40 MHz, 5670 MHz, 7 GHz – 18 GHz, 5 dBi

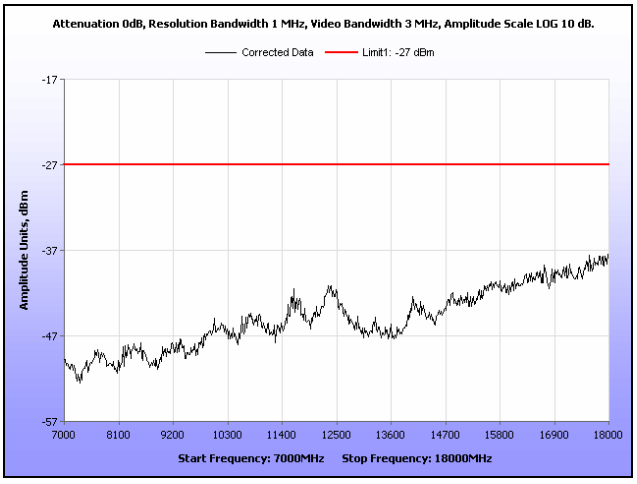
Radiated Spurious Emissions, 20 MHz, 13.5 dBi



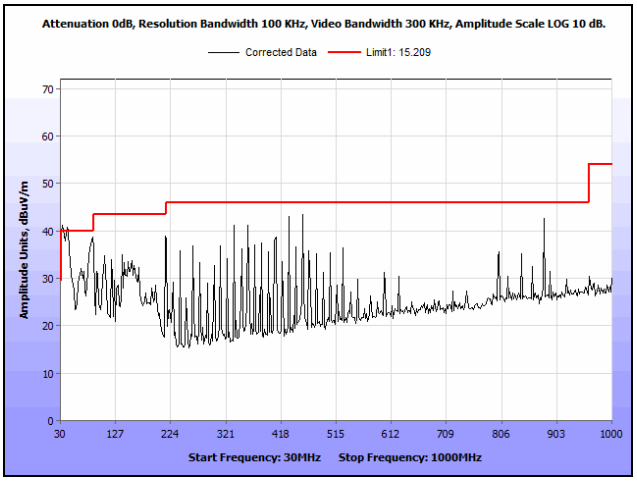
Plot 184. Radiated Spurious Emissions, 20 MHz, 5260 MHz, 30 MHz – 1 GHz, 13.5 dBi



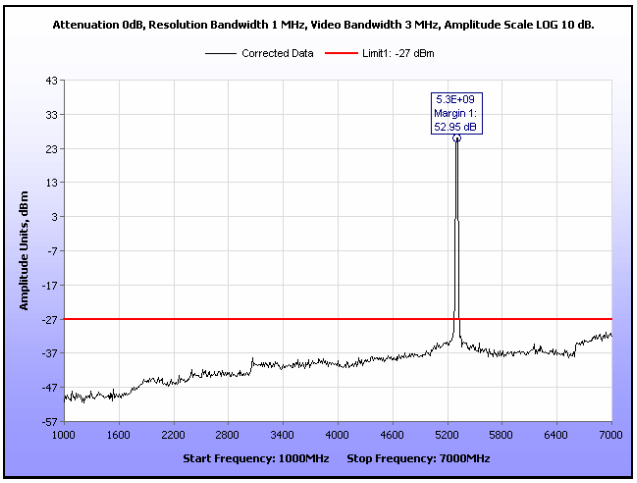
Plot 185. Radiated Spurious Emissions, 20 MHz, 5260 MHz, 1 GHz – 7 GHz, 13.5 dBi



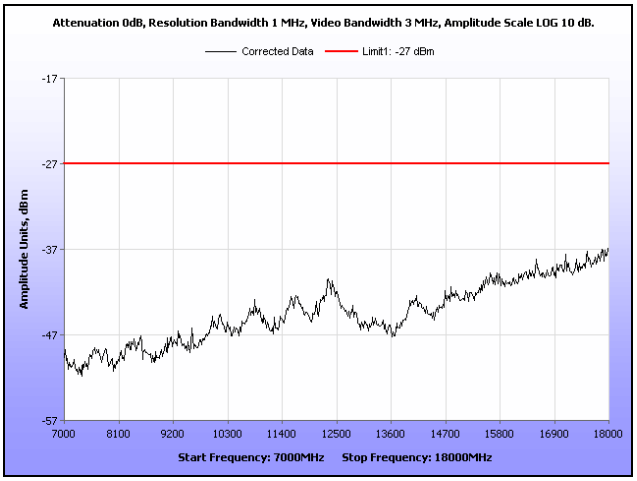
Plot 186. Radiated Spurious Emissions, 20 MHz, 5260 MHz, 7 GHz – 18 GHz, 13.5 dBi



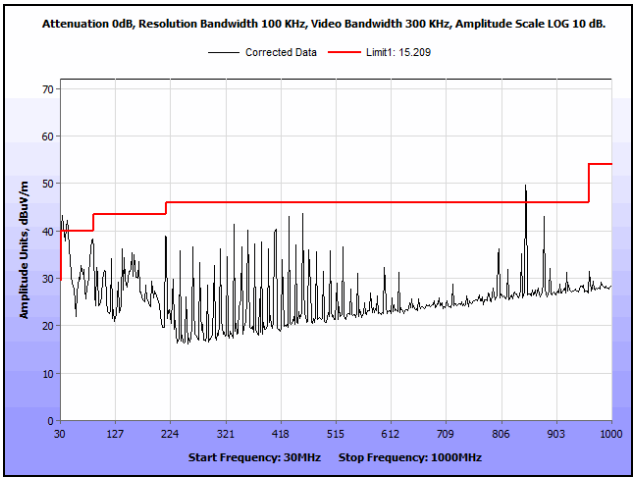
Plot 187. Radiated Spurious Emissions, 20 MHz, 5300 MHz, 30 MHz – 1 GHz, 13.5 dBi



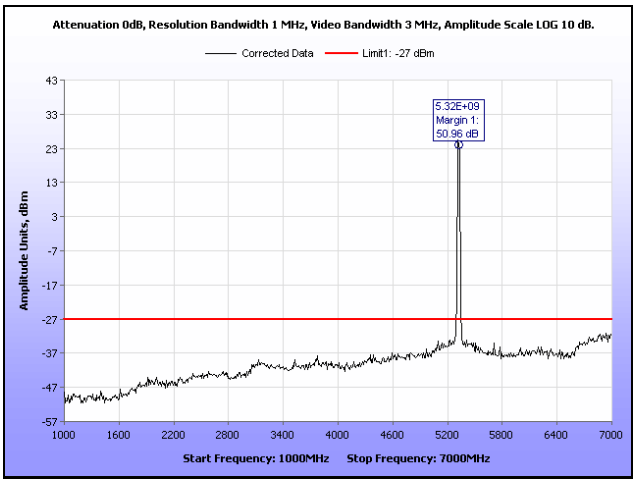
Plot 188. Radiated Spurious Emissions, 20 MHz, 5300 MHz, 1 GHz – 7 GHz, 13.5 dBi



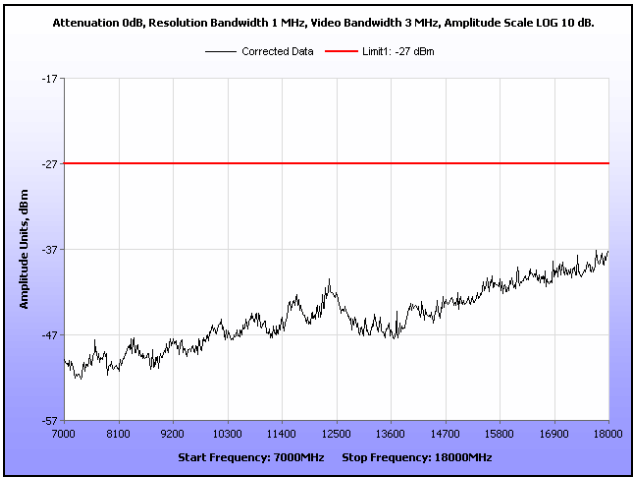
Plot 189. Radiated Spurious Emissions, 20 MHz, 5300 MHz, 7 GHz – 18 GHz, 13.5 dBi



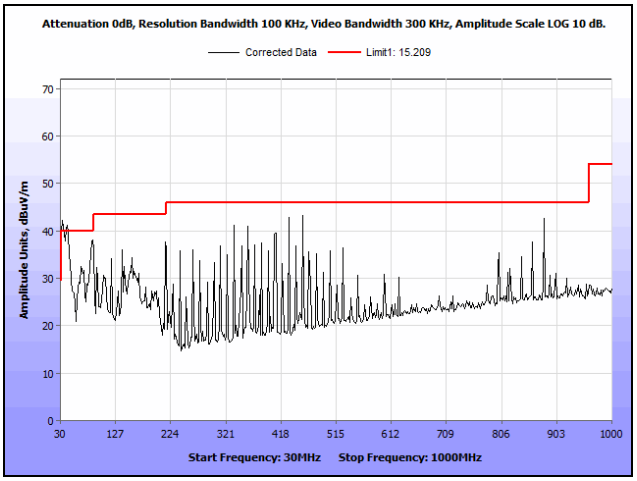
Plot 190. Radiated Spurious Emissions, 20 MHz, 5320 MHz, 30 MHz – 1 GHz, 13.5 dBi



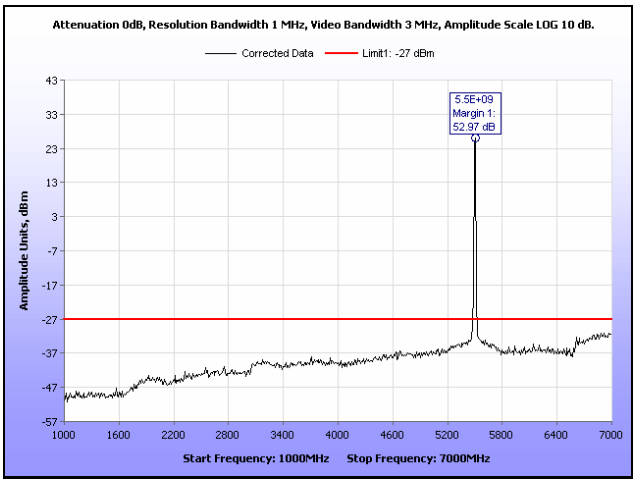
Plot 191. Radiated Spurious Emissions, 20 MHz, 5320 MHz, 1 GHz – 7 GHz, 13.5 dBi



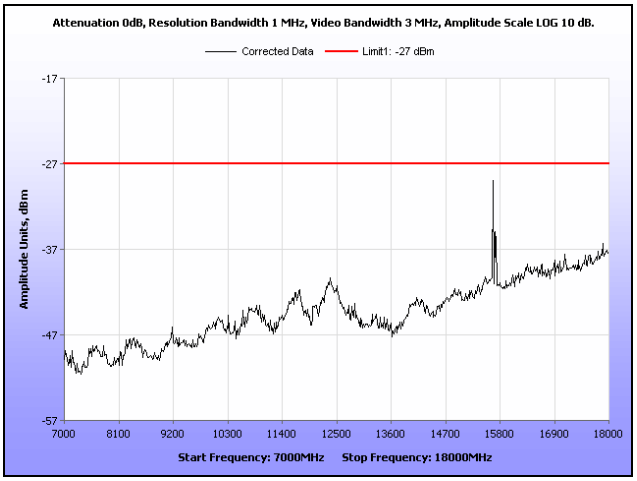
Plot 192. Radiated Spurious Emissions, 20 MHz, 5320 MHz, 7 GHz – 18 GHz, 13.5 dBi



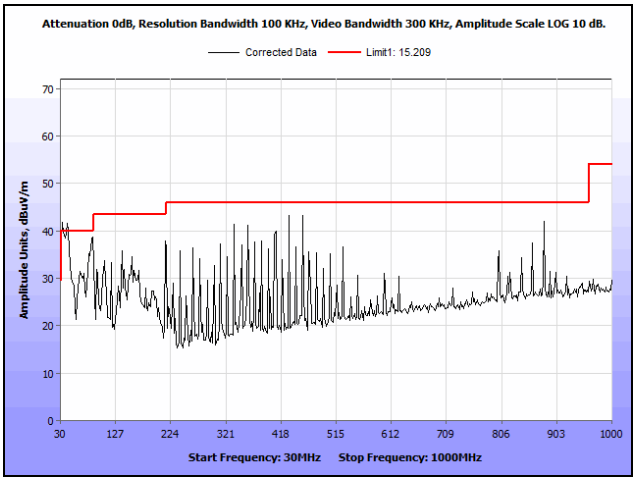
Plot 193. Radiated Spurious Emissions, 20 MHz, 5500 MHz, 30 MHz – 1 GHz, 13.5 dBi



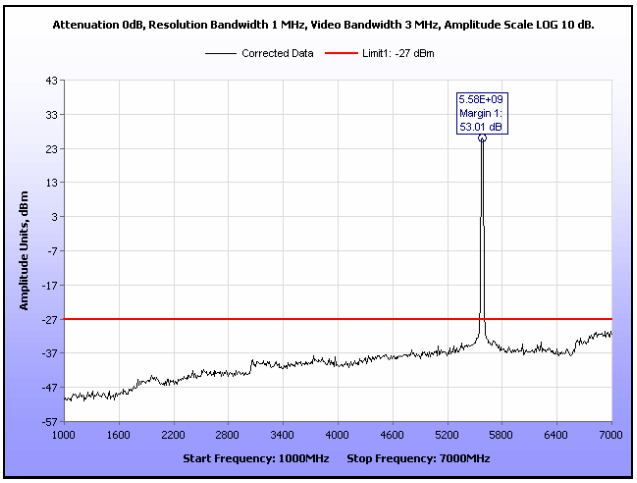
Plot 194. Radiated Spurious Emissions, 20 MHz, 5500 MHz, 1 GHz – 7 GHz, 13.5 dBi



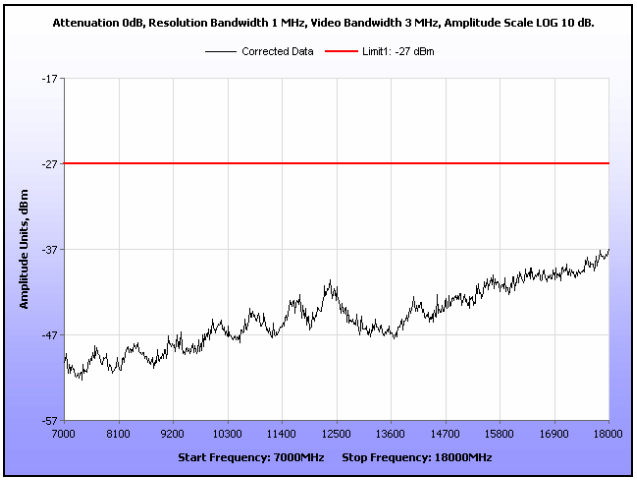
Plot 195. Radiated Spurious Emissions, 20 MHz, 5500 MHz, 7 GHz – 18 GHz, 13.5 dBi



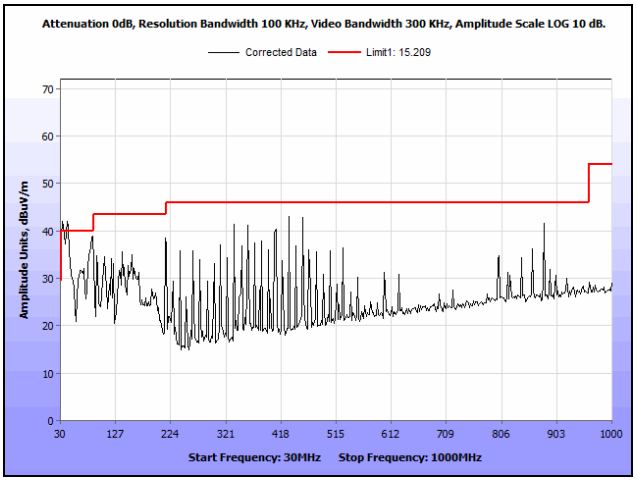
Plot 196. Radiated Spurious Emissions, 20 MHz, 5580 MHz, 30 MHz – 1 GHz, 13.5 dBi



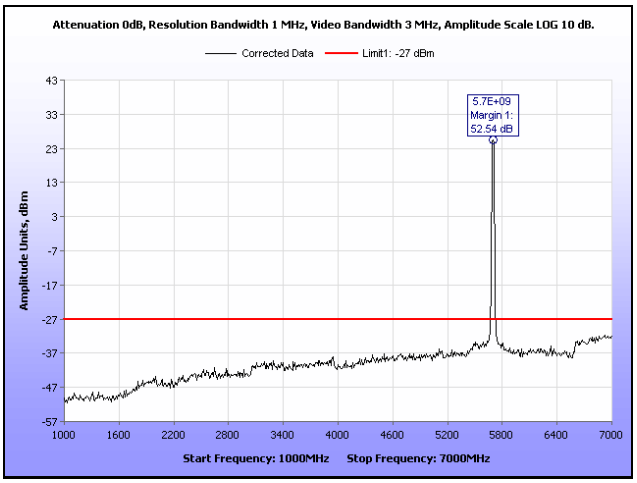
Plot 197. Radiated Spurious Emissions, 20 MHz, 5580 MHz, 1 GHz – 7 GHz, 13.5 dBi



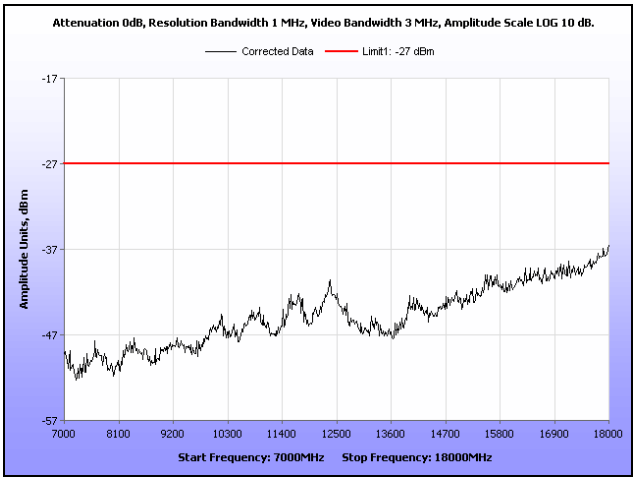
Plot 198. Radiated Spurious Emissions, 20 MHz, 5580 MHz, 7 GHz – 18 GHz, 13.5 dBi



Plot 199. Radiated Spurious Emissions, 20 MHz, 5700 MHz, 30 MHz – 1 GHz, 13.5 dBi

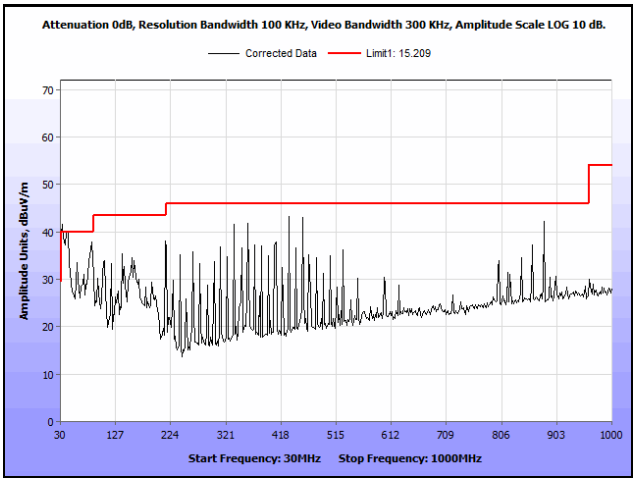


Plot 200. Radiated Spurious Emissions, 20 MHz, 5700 MHz, 1 GHz – 7 GHz, 13.5 dBi

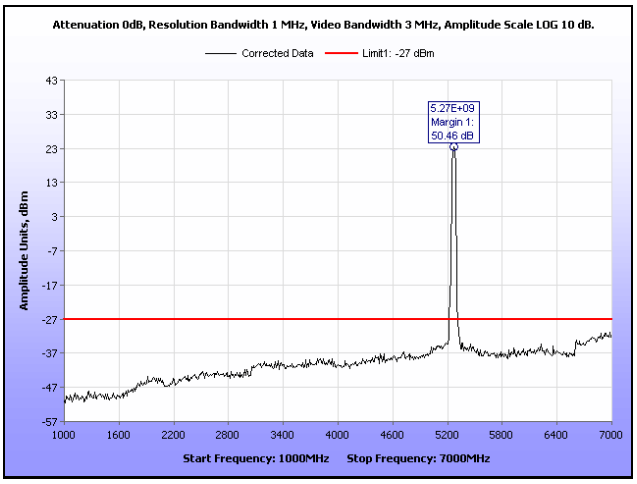


Plot 201. Radiated Spurious Emissions, 20 MHz, 5700 MHz, 7 GHz – 18 GHz, 13.5 dBi

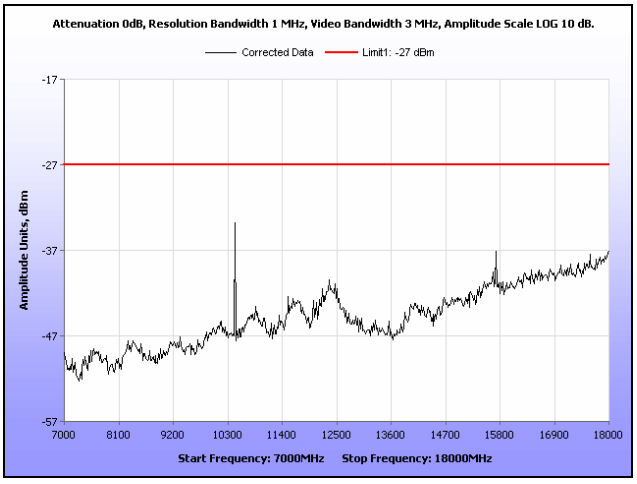
Radiated Spurious Emissions, 40 MHz, 13.5 dBi



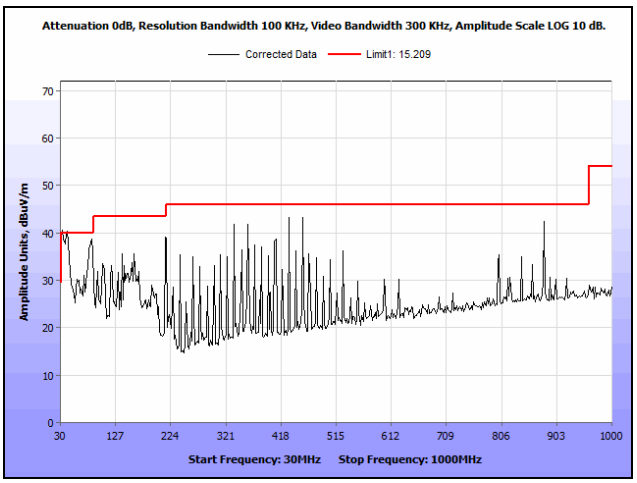
Plot 202. Radiated Spurious Emissions, 40 MHz, 5270 MHz, 30 MHz – 1 GHz, 13.5 dBi



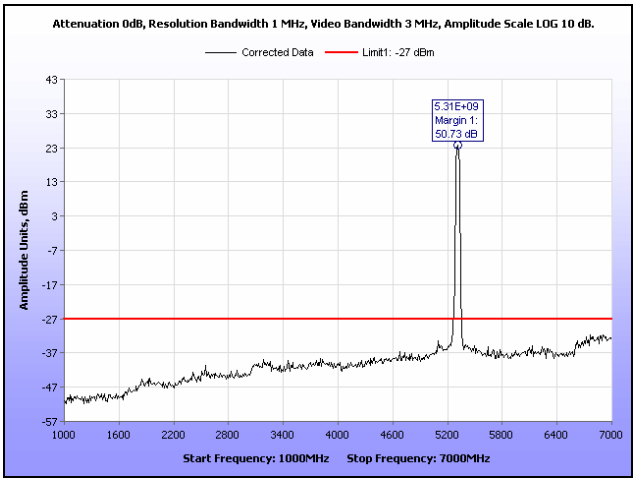
Plot 203. Radiated Spurious Emissions, 40 MHz, 5270 MHz, 1 GHz – 7 GHz, 13.5 dBi



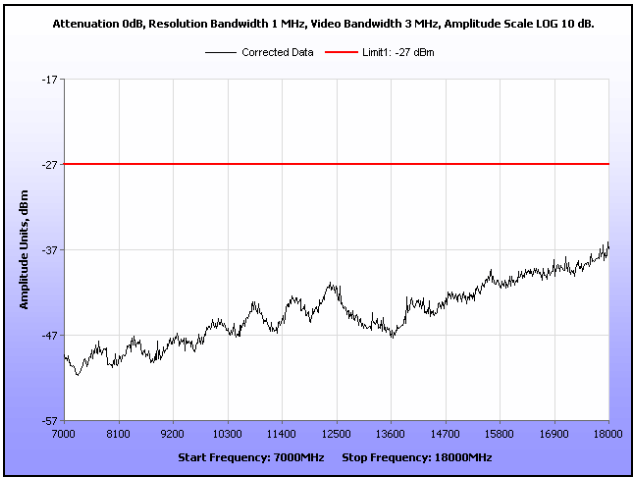
Plot 204. Radiated Spurious Emissions, 40 MHz, 5270 MHz, 7 GHz – 18 GHz, 13.5 dBi



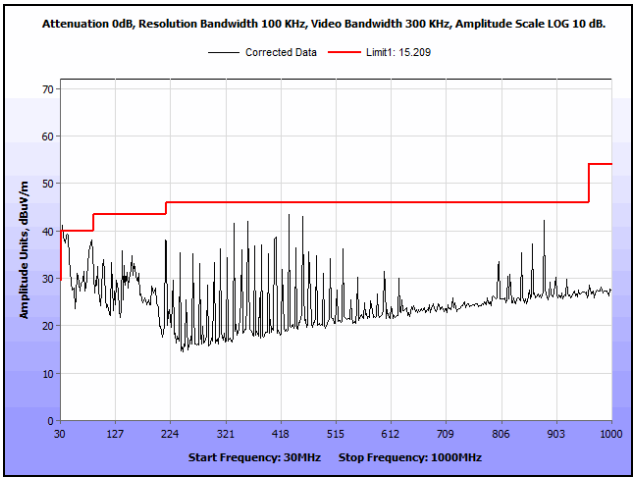
Plot 205. Radiated Spurious Emissions, 40 MHz, 5310 MHz, 30 MHz – 1 GHz, 13.5 dBi



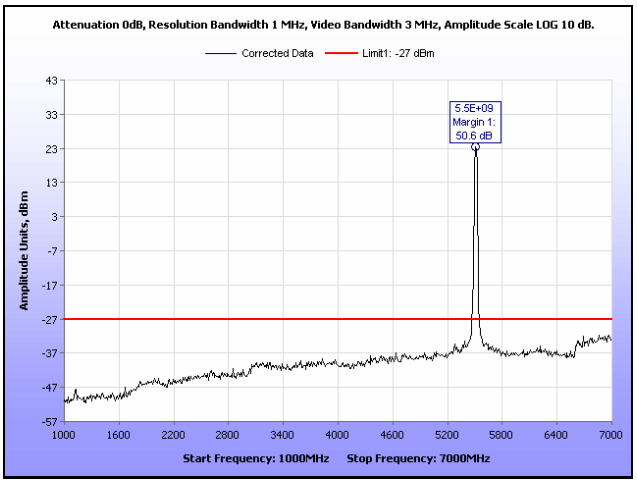
Plot 206. Radiated Spurious Emissions, 40 MHz, 5310 MHz, 1 GHz – 7 GHz, 13.5 dBi



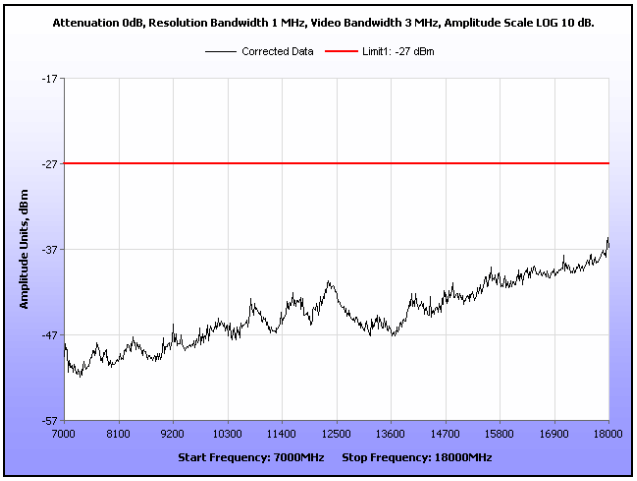
Plot 207. Radiated Spurious Emissions, 40 MHz, 5310 MHz, 7 GHz – 18 GHz, 13.5 dBi



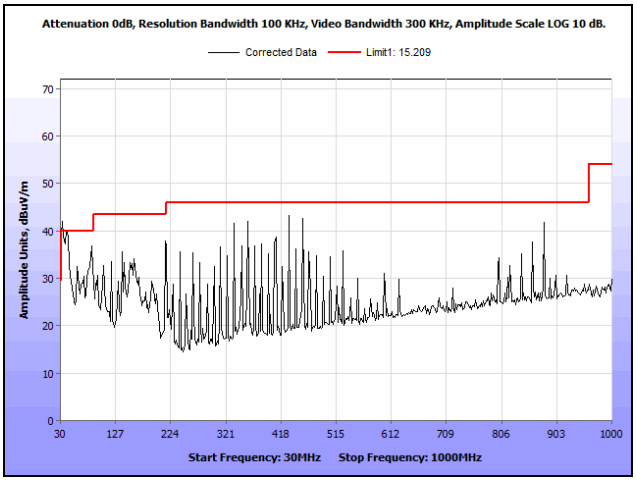
Plot 208. Radiated Spurious Emissions, 40 MHz, 5510 MHz, 30 MHz – 1 GHz, 13.5 dBi



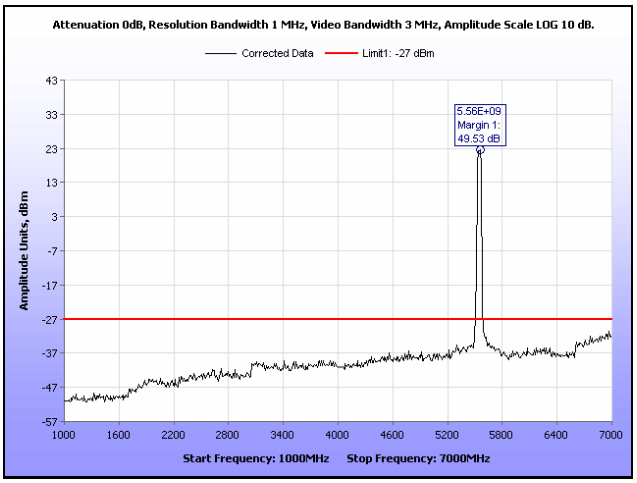
Plot 209. Radiated Spurious Emissions, 40 MHz, 5510 MHz, 1 GHz – 7 GHz, 13.5 dBi



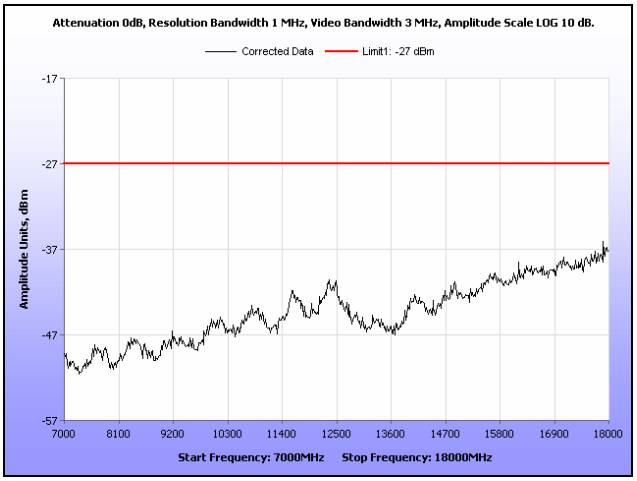
Plot 210. Radiated Spurious Emissions, 40 MHz, 5510 MHz, 7 GHz – 18 GHz, 13.5 dBi



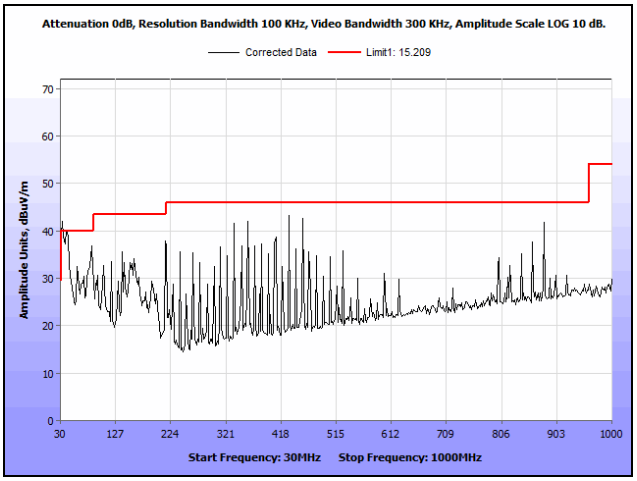
Plot 211. Radiated Spurious Emissions, 40 MHz, 5550 MHz, 30 MHz – 1 GHz, 13.5 dBi



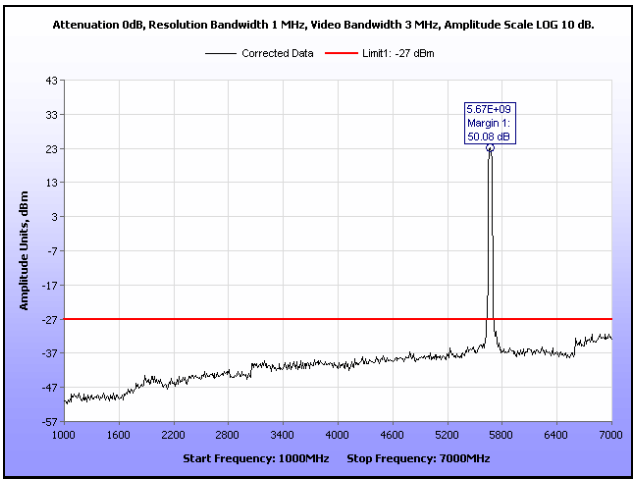
Plot 212. Radiated Spurious Emissions, 40 MHz, 5550 MHz, 1 GHz – 7 GHz, 13.5 dBi



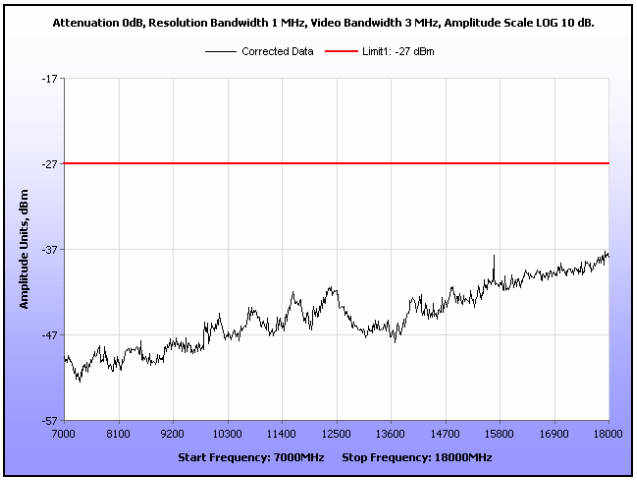
Plot 213. Radiated Spurious Emissions, 40 MHz, 5550 MHz, 7 GHz – 18 GHz, 13.5 dBi



Plot 214. Radiated Spurious Emissions, 40 MHz, 5670 MHz, 30 MHz – 1 GHz, 13.5 dBi

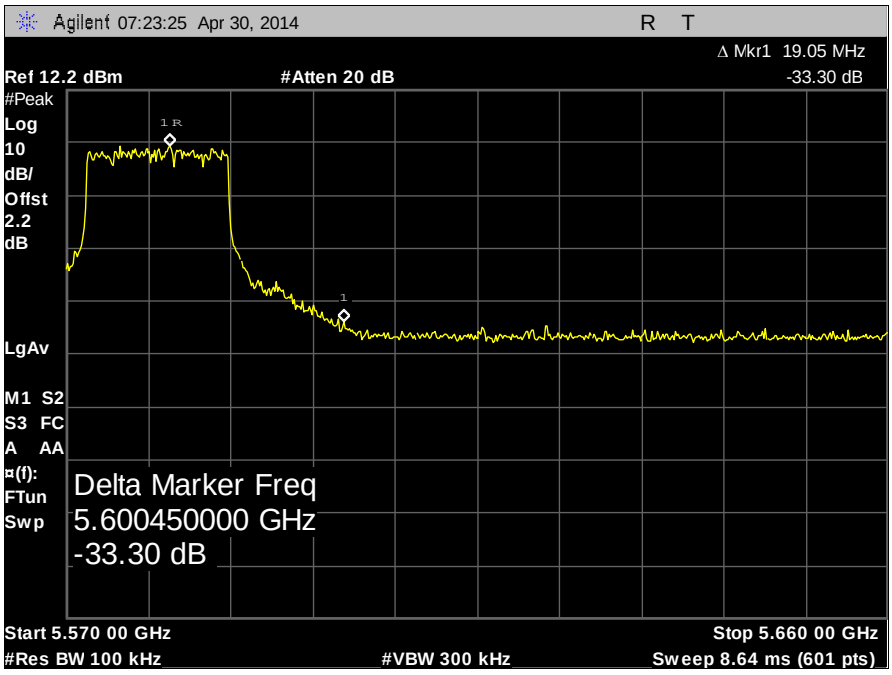


Plot 215. Radiated Spurious Emissions, 40 MHz, 5670 MHz, 1 GHz – 7 GHz, 13.5 dBi

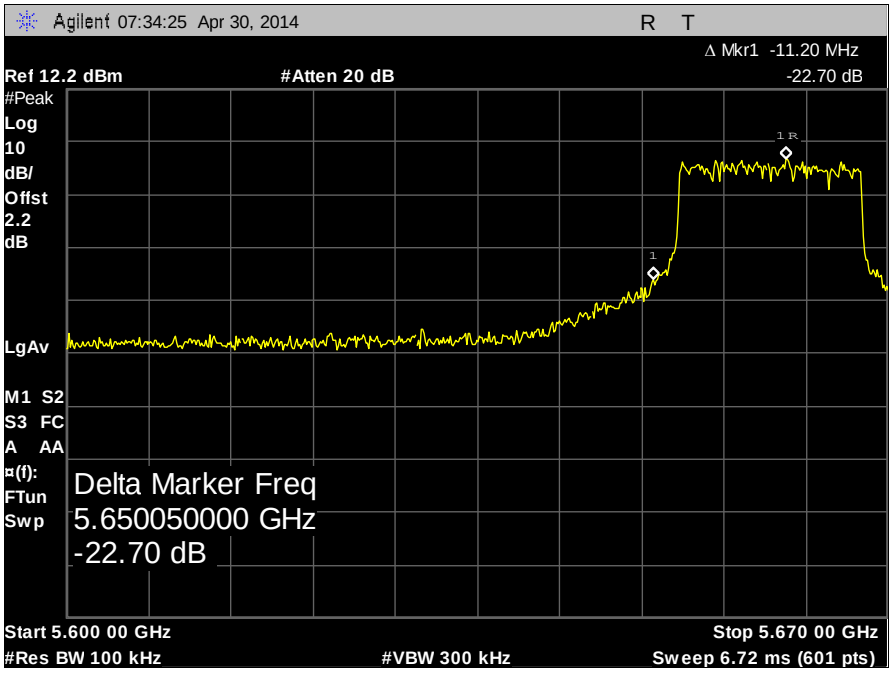


Plot 216. Radiated Spurious Emissions, 40 MHz, 5670 MHz, 7 GHz – 18 GHz, 13.5 dBi

20 dBc Band Edge, 20 MHz, 2 dBi

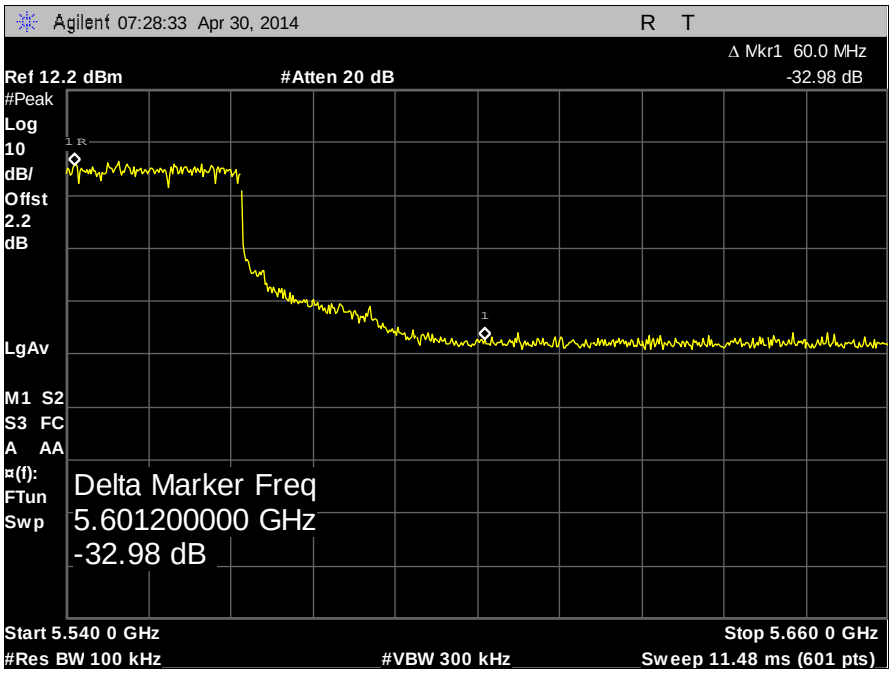


Plot 217. 20 dBc Band Edge, 20 MHz, 5580 MHz, 2 dBi

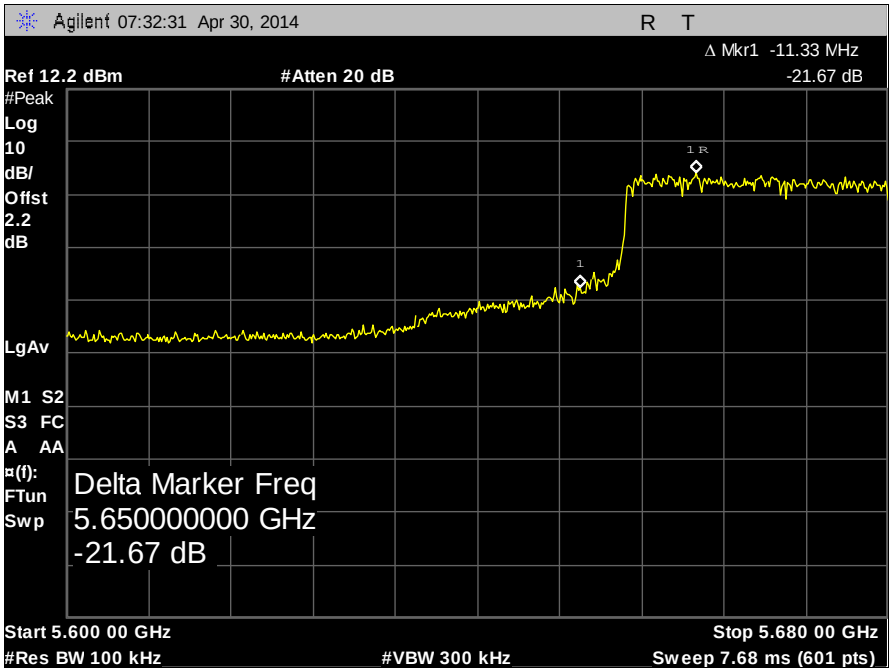


Plot 218. 20 dBc Band Edge, 20 MHz, 5660 MHz, 2 dBi

20 dBc Band Edge, 40 MHz, 2 dBi

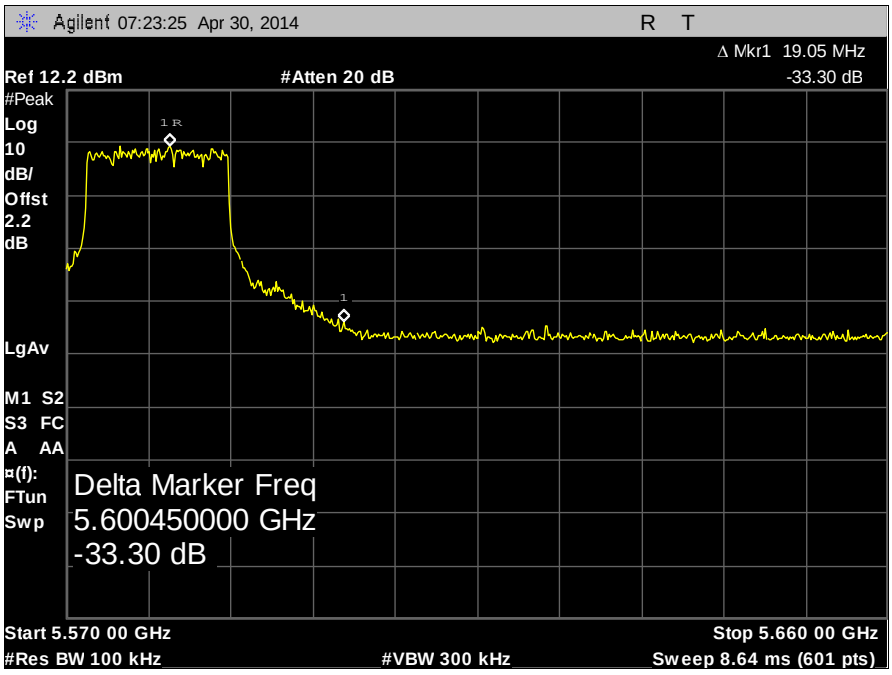


Plot 219. 20 dBc Band Edge, 40 MHz, 5550 MHz, 2 dBi

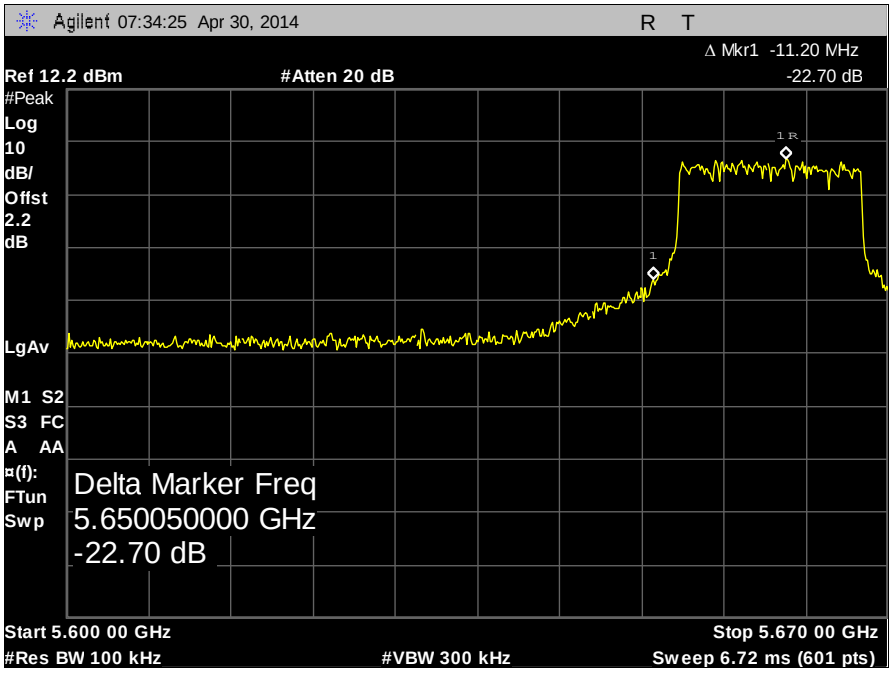


Plot 220. 20 dBc Band Edge, 40 MHz, 5670 MHz, 2 dBi

20 dBc Band Edge, 20 MHz, 5 dBi

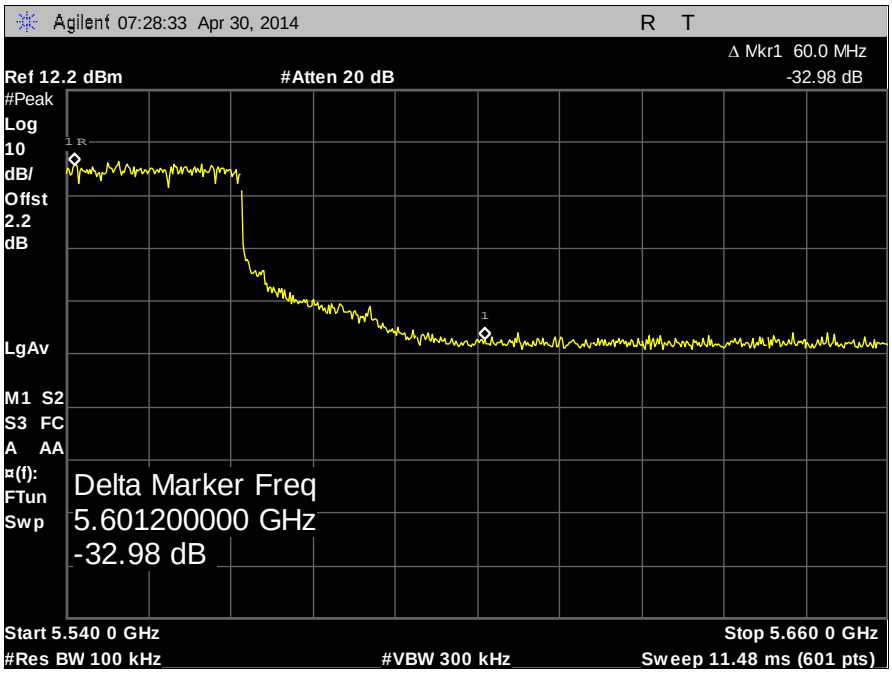


Plot 221. 20 dBc Band Edge, 20 MHz, 5580 MHz, 5 dBi

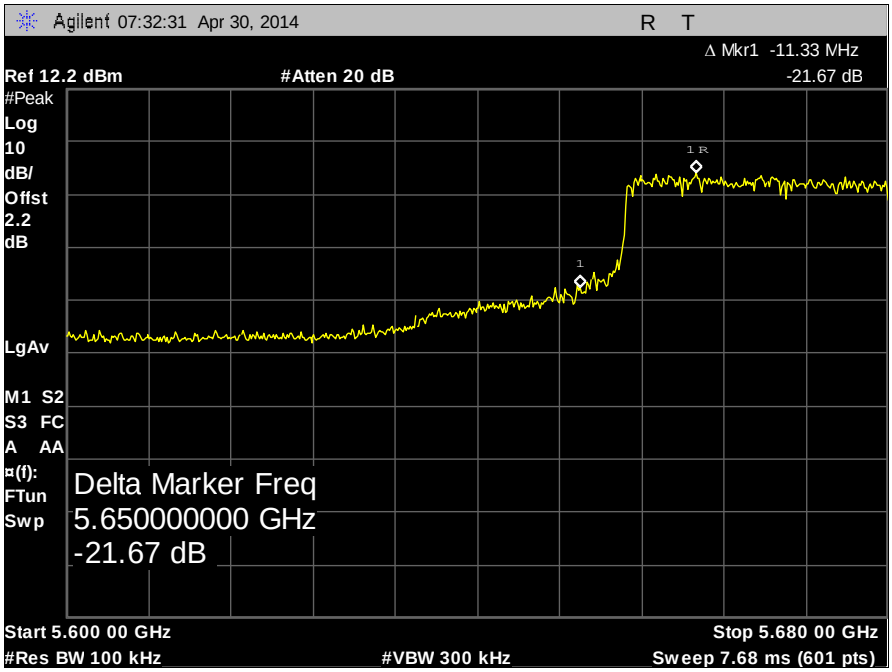


Plot 222. 20 dBc Band Edge, 20 MHz, 5660 MHz, 5 dBi

20 dBc Band Edge, 40 MHz, 5 dBi

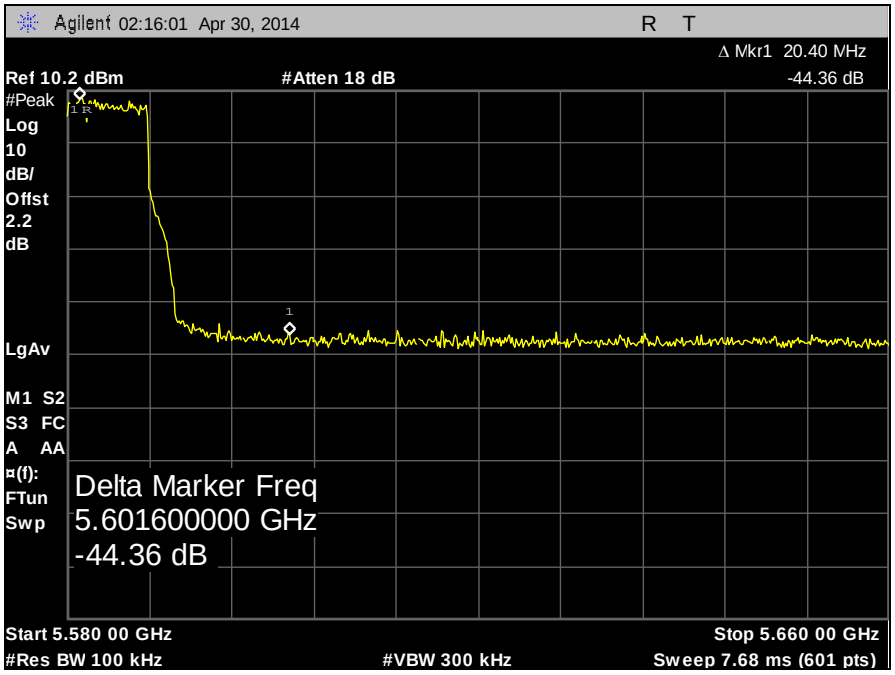


Plot 223. 20 dBc Band Edge, 40 MHz, 5550 MHz, 5 dBi

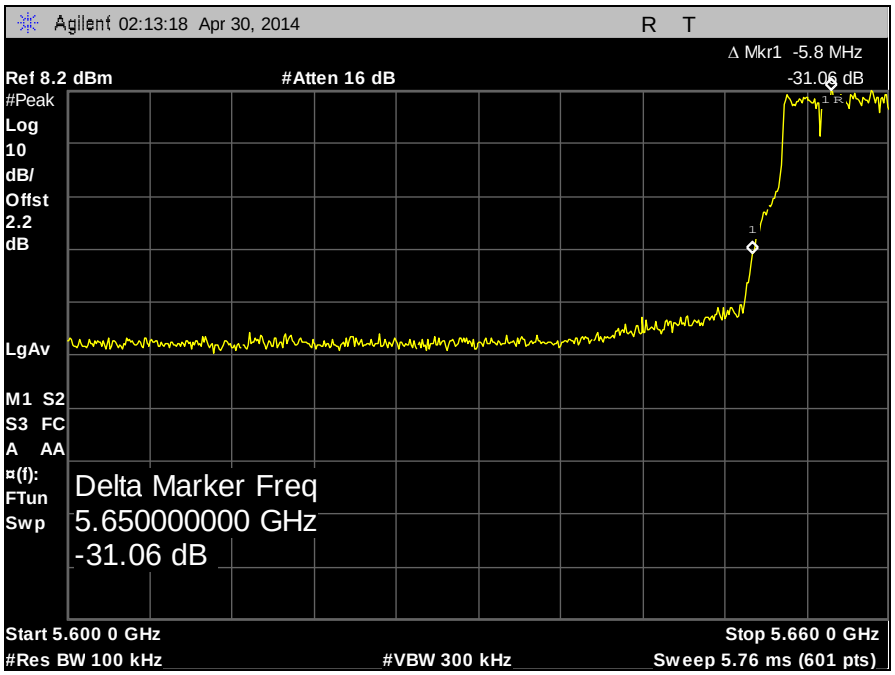


Plot 224. 20 dBc Band Edge, 40 MHz, 5670 MHz, 5 dBi

20 dBc Band Edge, 20 MHz, 13.5 dBi

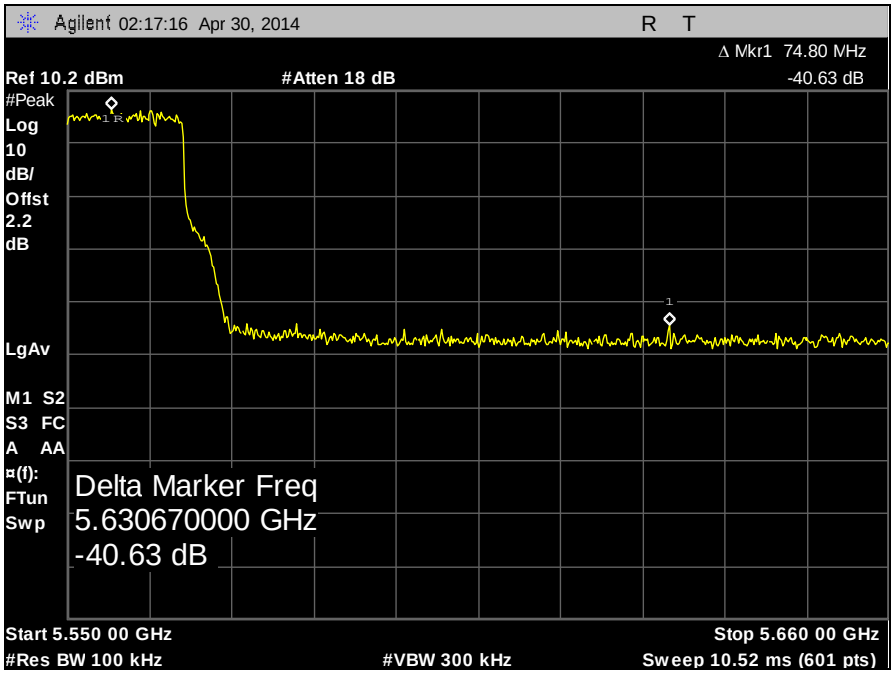


Plot 225. 20 dBc Band Edge, 20 MHz, 5580 MHz, 13.5 dBi

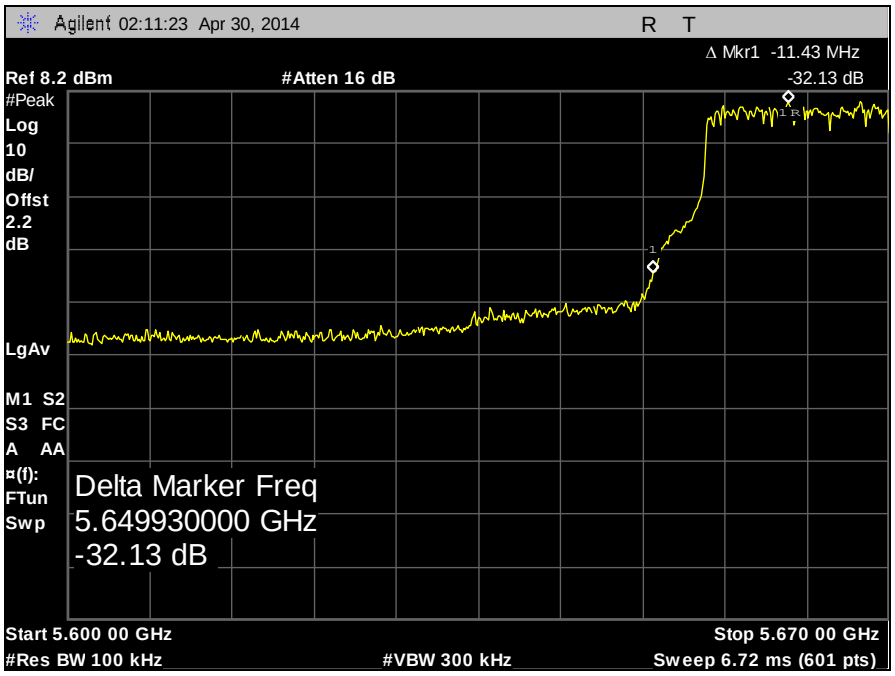


Plot 226. 20 dBc Band Edge, 20 MHz, 5660 MHz, 13.5 dBi

20 dBc Band Edge, 40 MHz, 13.5 dBi

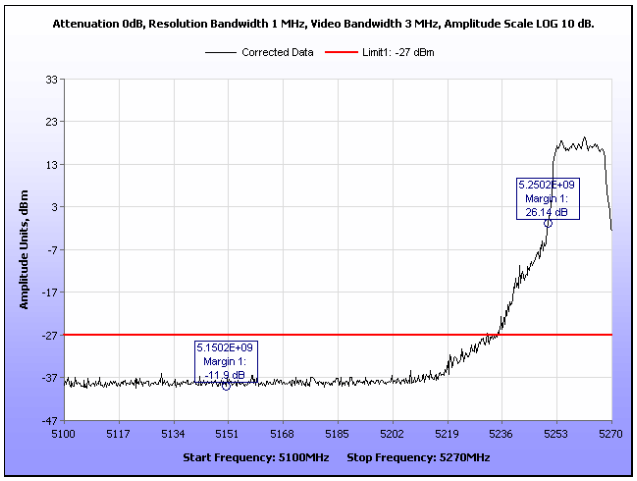


Plot 227. 20 dBc Band Edge, 40 MHz, 5550 MHz, 13.5 dBi

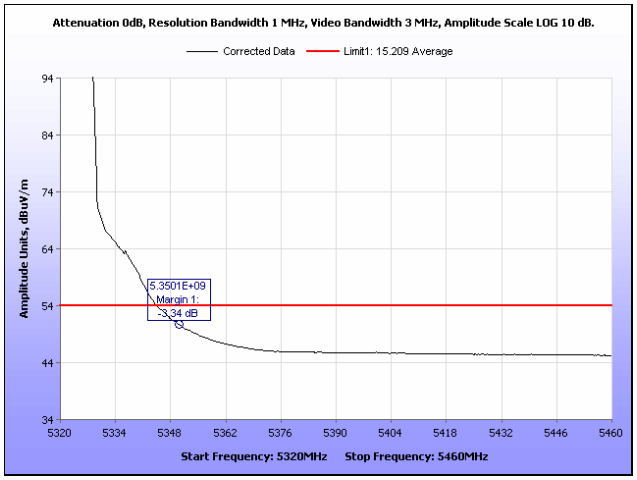


Plot 228. 20 dBc Band Edge, 40 MHz, 5670 MHz, 13.5 dBi

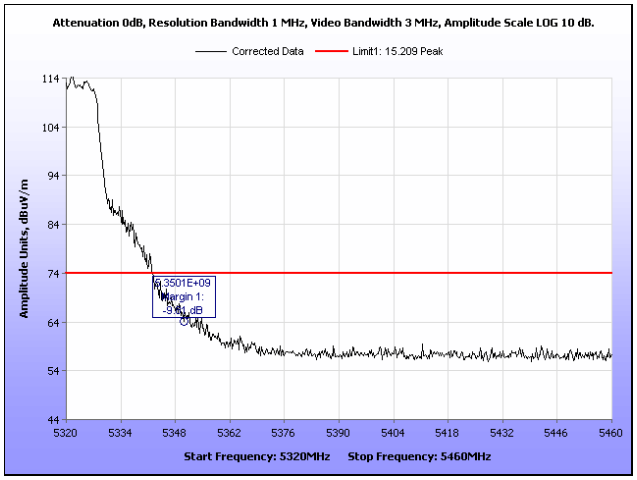
Band Edge, 20 MHz, 2 dBi



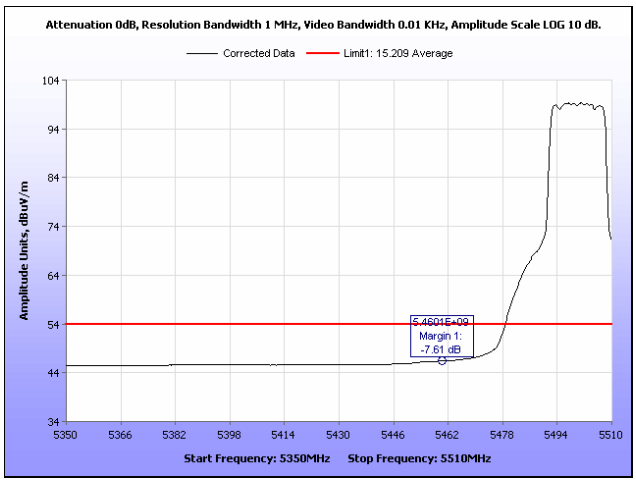
Plot 229. Radiated Band Edge, 20 MHz, 5260 MHz



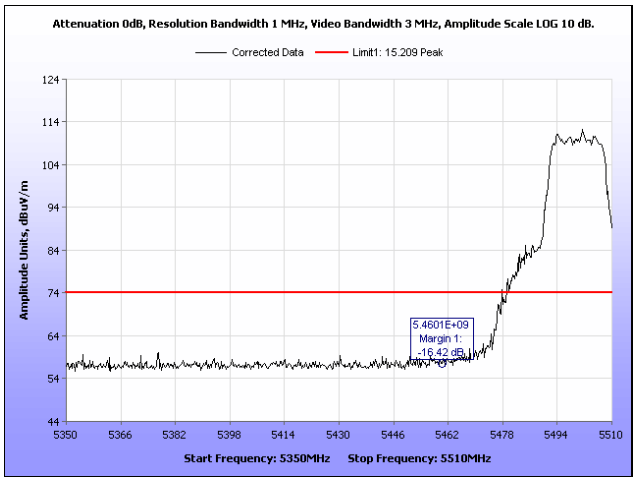
Plot 230. Radiated Band Edge, 20 MHz, 5320 MHz, Average, 2 dBi



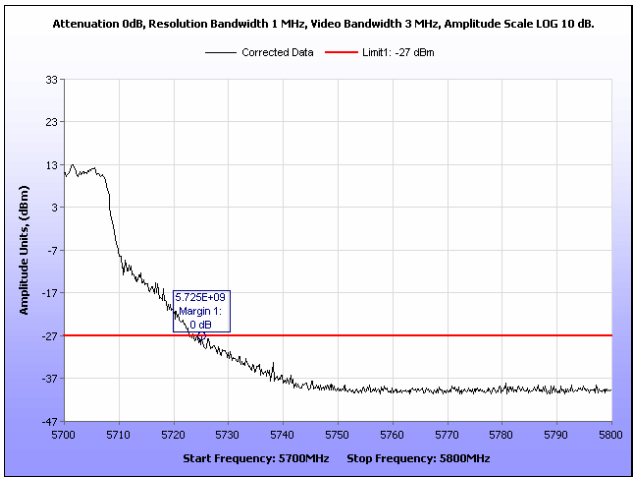
Plot 231. Radiated Band Edge, 20 MHz, 5320 MHz, Peak, 2 dBi



Plot 232. Radiated Band Edge, 20 MHz, 5500 MHz, Average, 2 dBi

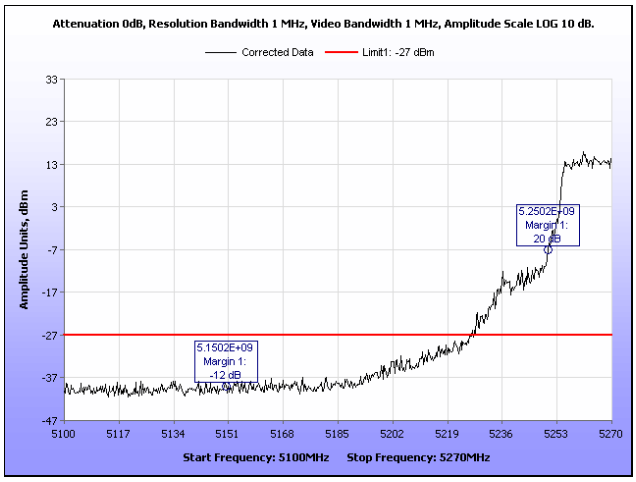


Plot 233. Radiated Band Edge, 20 MHz, 5500 MHz, Peak, 2 dBi

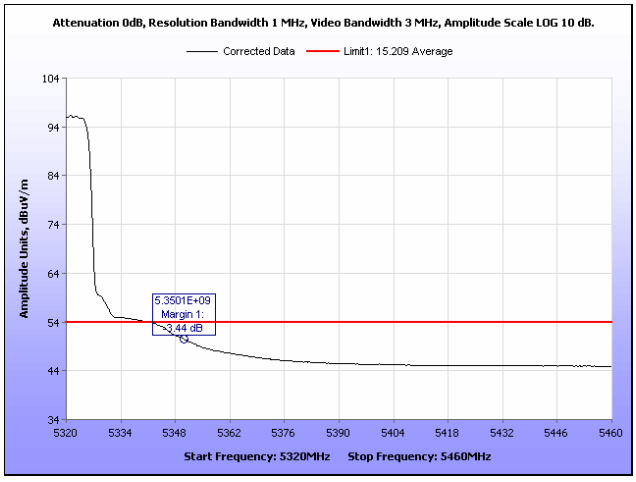


Plot 234. Radiated Band Edge, 20 MHz, 5700 MHz, 2 dBi

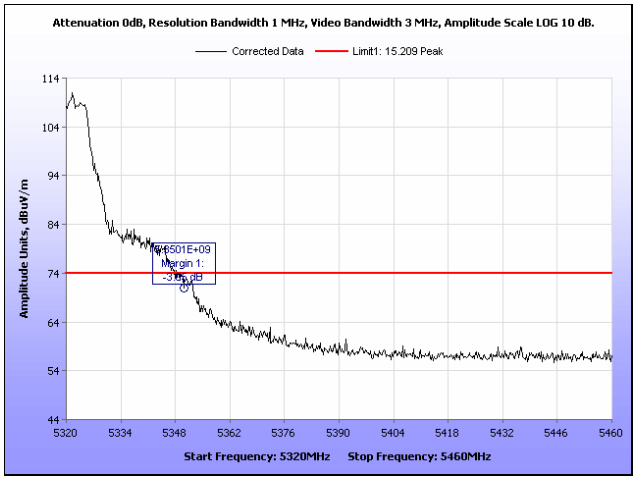
Band Edge, 40 MHz, 2 dBi



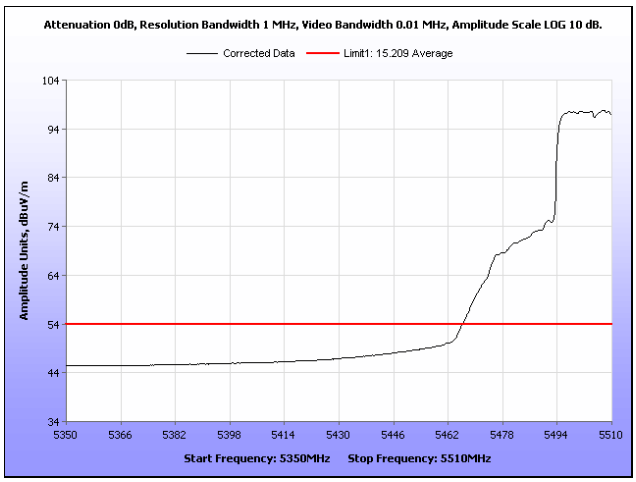
Plot 235. Radiated Band Edge, 40 MHz, 5270 MHz, 2 dBi



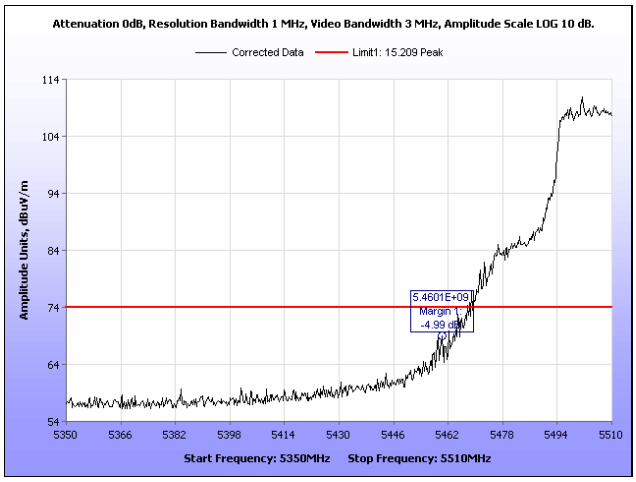
Plot 236. Radiated Band Edge, 40 MHz, 5310 MHz, Average, 2 dBi



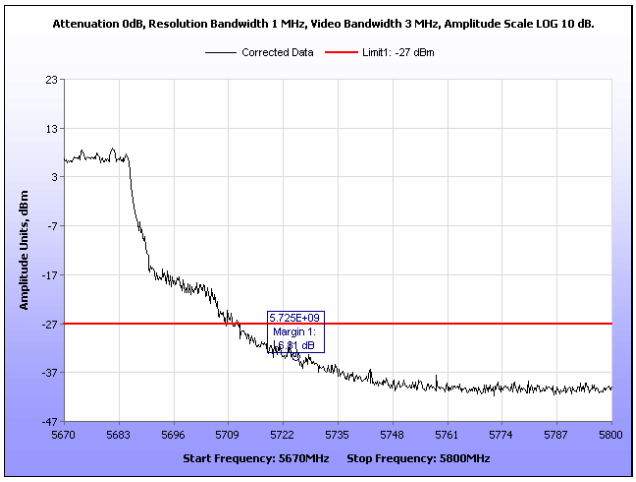
Plot 237. Radiated Band Edge, 40 MHz, 5310 MHz, Peak, 2 dBi



Plot 238. Radiated Band Edge, 40 MHz, 5510 MHz, Average, 2 dBi

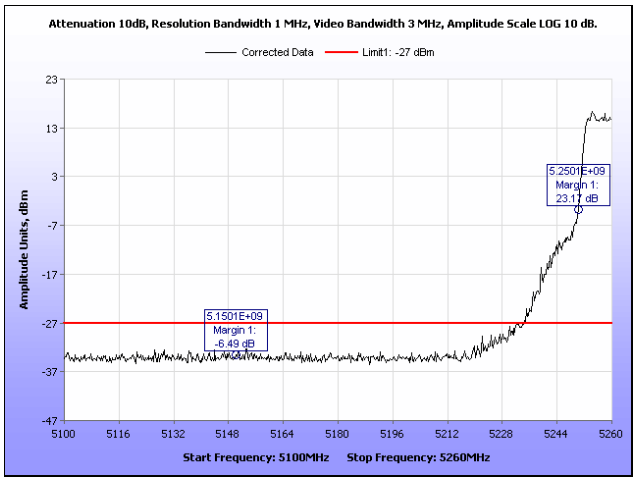


Plot 239. Radiated Band Edge, 40 MHz, 5510 MHz, Peak, 2 dBi

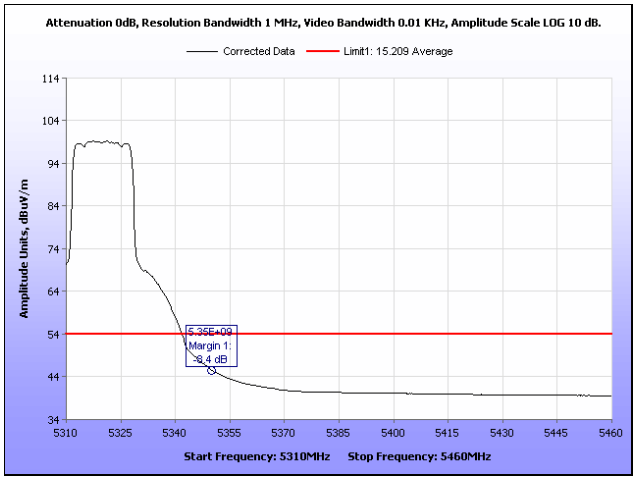


Plot 240. Radiated Band Edge, 40 MHz, 5670 MHz, 2 dBi

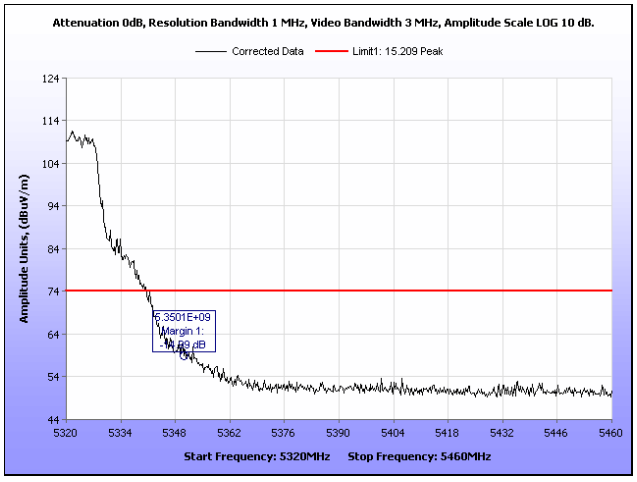
Band Edge, 20 MHz, 5 dBi



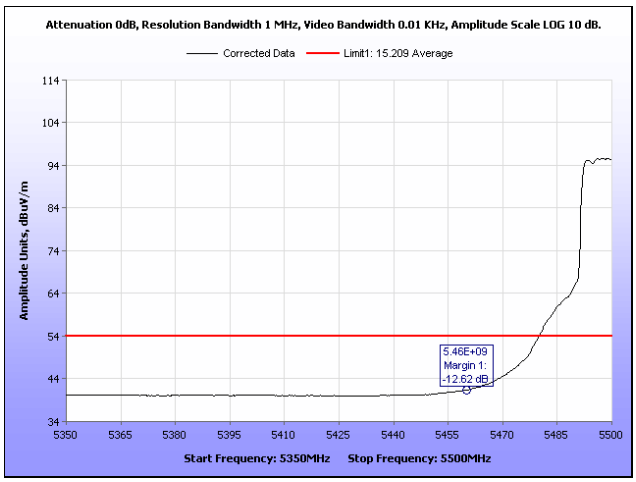
Plot 241. Radiated Band Edge, 20 MHz, 5260 MHz



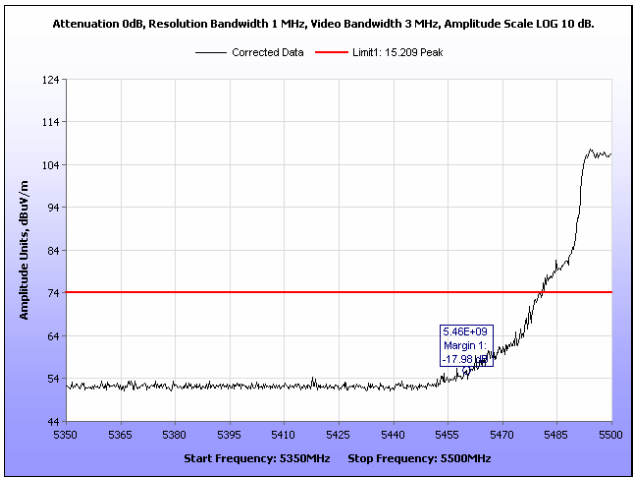
Plot 242. Radiated Band Edge, 20 MHz, 5320 MHz, Average, 5 dBi



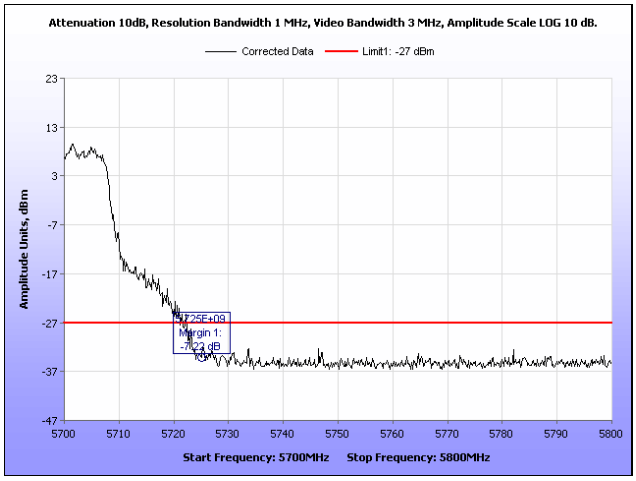
Plot 243. Radiated Band Edge, 20 MHz, 5320 MHz, Peak, 5 dBi



Plot 244. Radiated Band Edge, 20 MHz, 5500 MHz, Average, 5 dBi

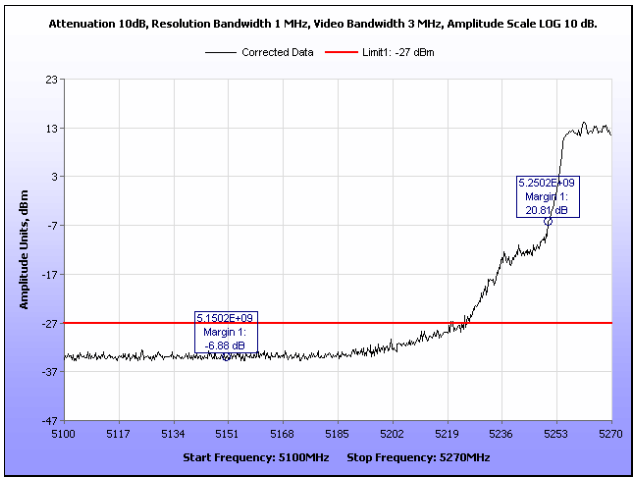


Plot 245. Radiated Band Edge, 20 MHz, 5500 MHz, Peak, 5 dBi

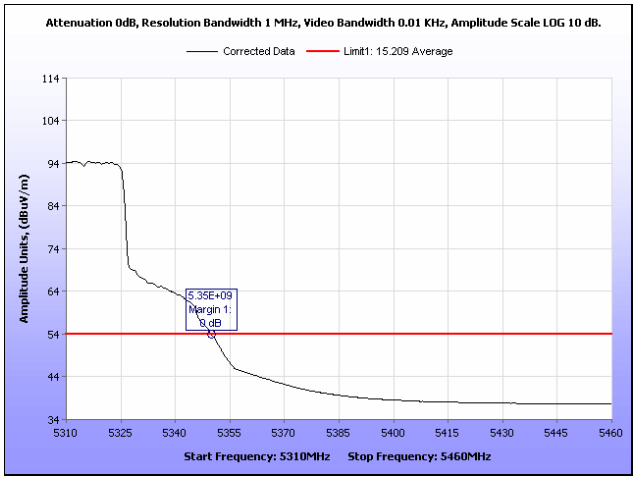


Plot 246. Radiated Band Edge, 20 MHz, 5700 MHz, 5 dBi

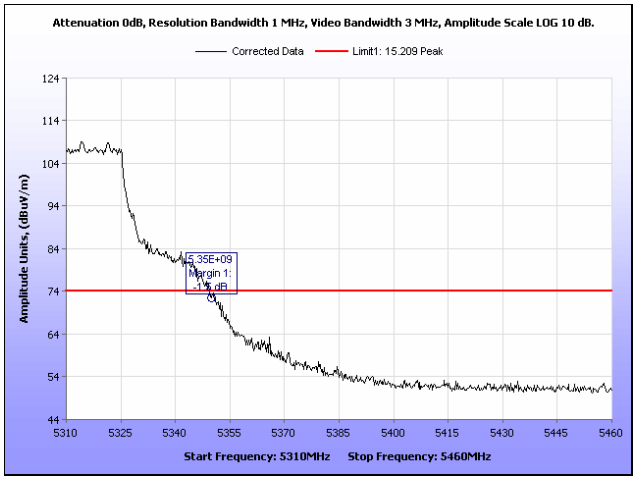
Band Edge, 40 MHz, 5 dBi



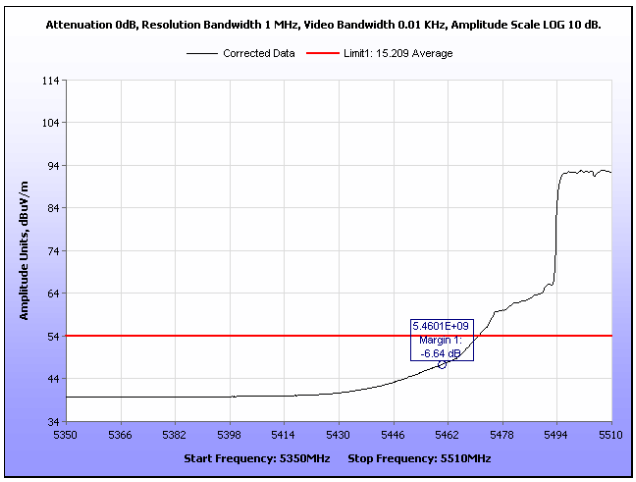
Plot 247. Radiated Band Edge, 40 MHz, 5270 MHz, 5 dBi



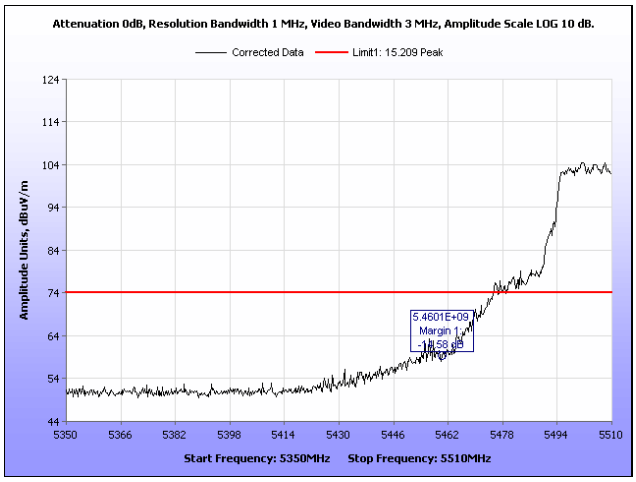
Plot 248. Radiated Band Edge, 40 MHz, 5310 MHz, Average, 5 dBi



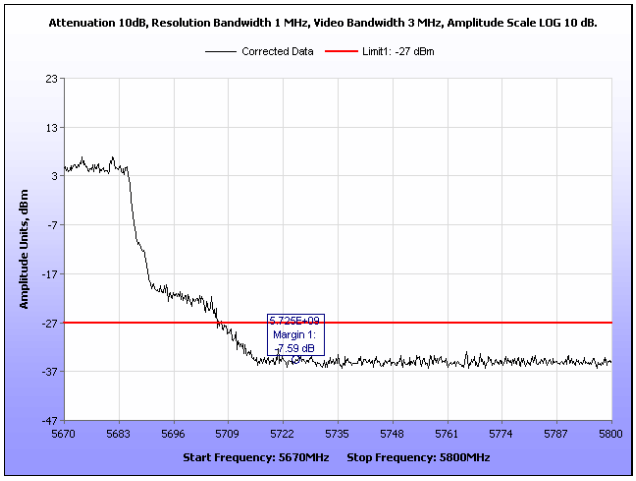
Plot 249. Radiated Band Edge, 40 MHz, 5310 MHz, Peak, 5 dBi



Plot 250. Radiated Band Edge, 40 MHz, 5510 MHz, Average, 5 dBi

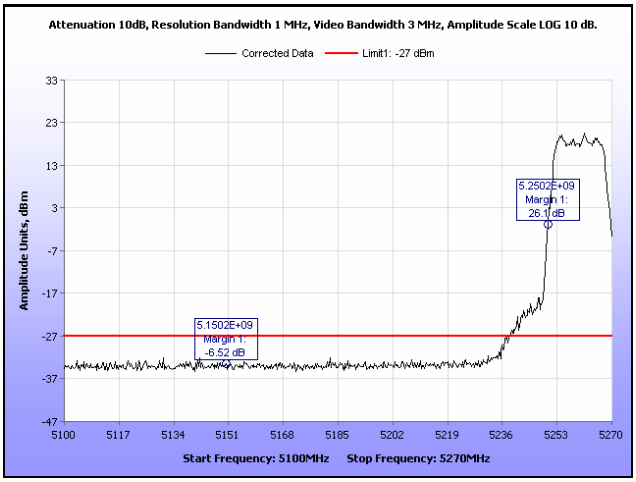


Plot 251. Radiated Band Edge, 40 MHz, 5510 MHz, Peak, 5 dBi

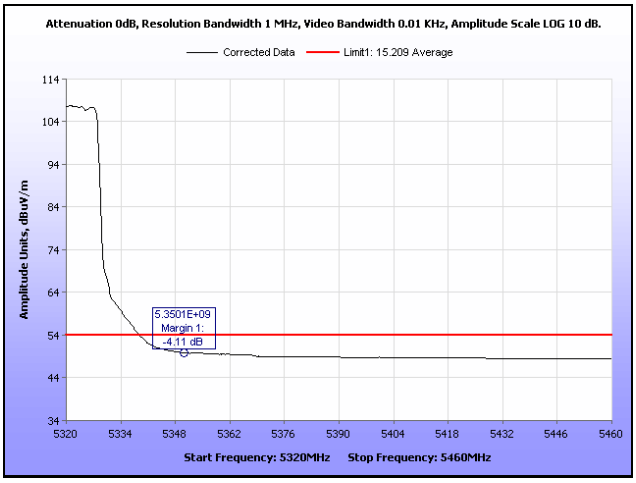


Plot 252. Radiated Band Edge, 40 MHz, 5670 MHz, 5 dBi

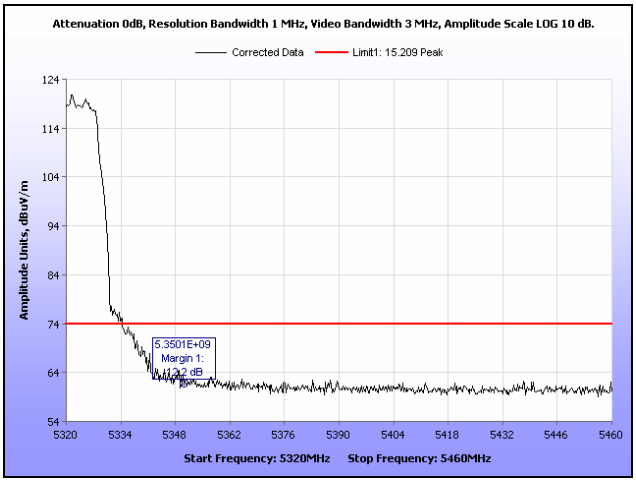
Band Edge, 20 MHz, 13.5 dBi



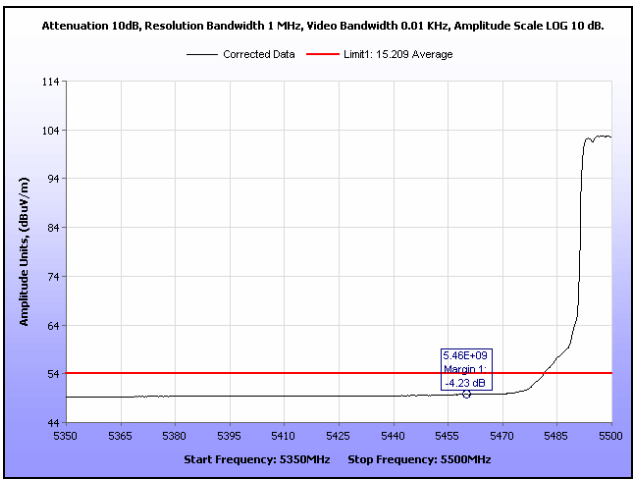
Plot 253. Radiated Band Edge, 20 MHz, 5260 MHz



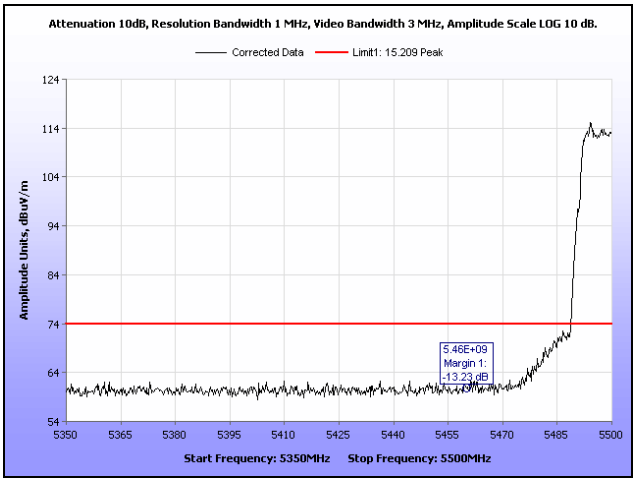
Plot 254. Radiated Band Edge, 20 MHz, 5320 MHz, Average, 13.5 dBi



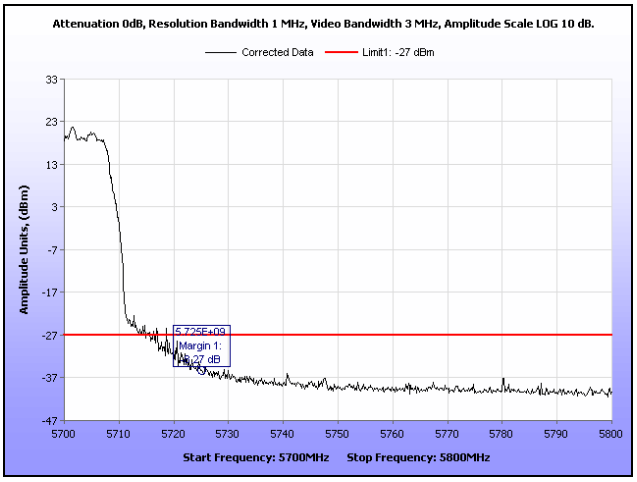
Plot 255. Radiated Band Edge, 20 MHz, 5320 MHz, Peak, 13.5 dBi



Plot 256. Radiated Band Edge, 20 MHz, 5500 MHz, Average, 13.5 dBi

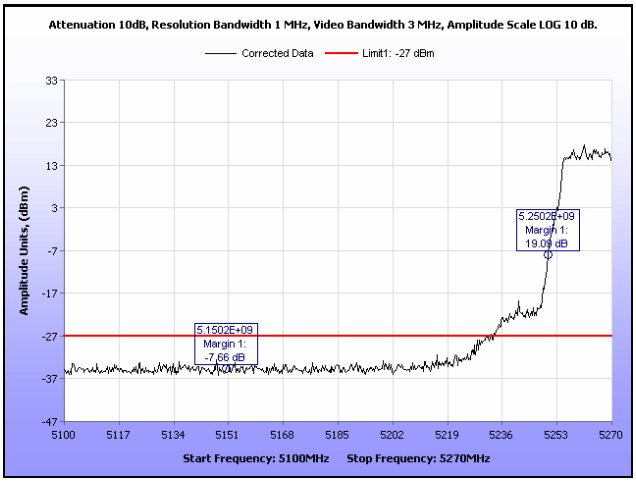


Plot 257. Radiated Band Edge, 20 MHz, 5500 MHz, Peak, 13.5 dBi

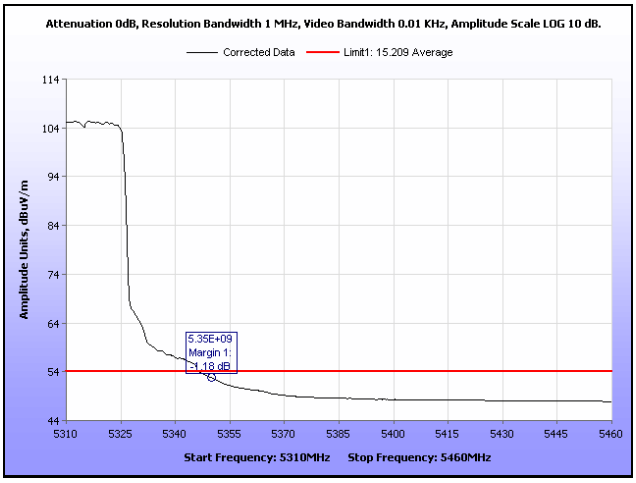


Plot 258. Radiated Band Edge, 20 MHz, 5700 MHz, 13.5 dBi

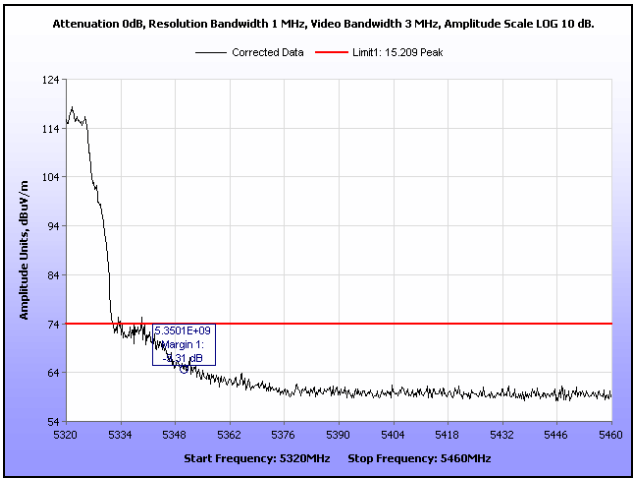
Band Edge, 40 MHz, 13.5 dBi



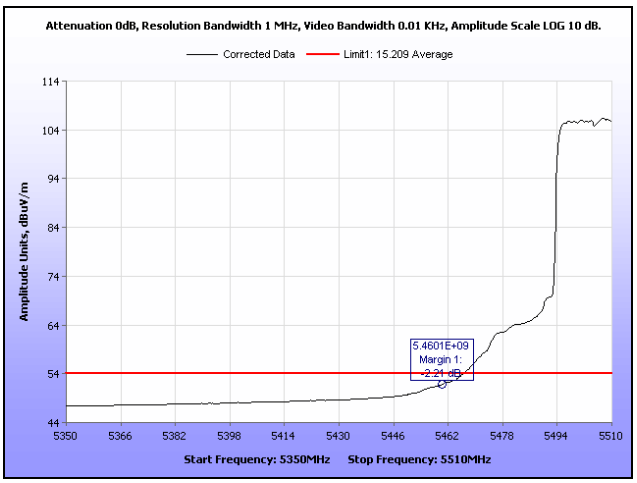
Plot 259. Radiated Band Edge, 40 MHz, 5270 MHz, 13.5 dBi



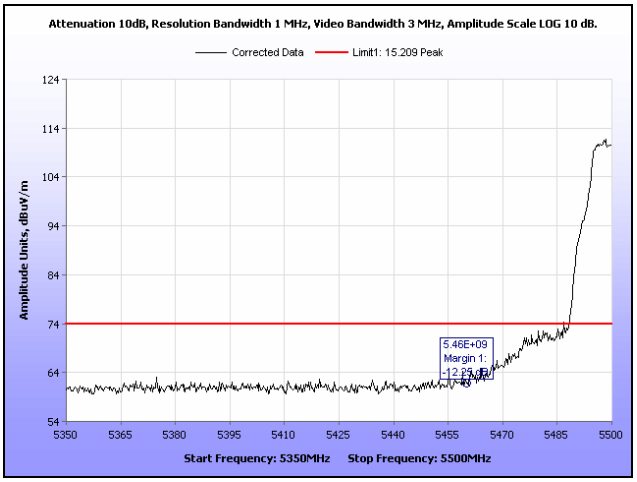
Plot 260. Radiated Band Edge, 40 MHz, 5310 MHz, Average, 13.5 dBi



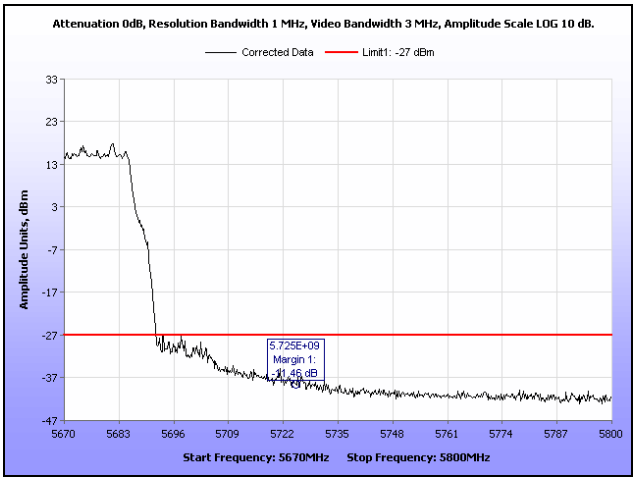
Plot 261. Radiated Band Edge, 40 MHz, 5310 MHz, Peak, 13.5 dBi



Plot 262. Radiated Band Edge, 40 MHz, 5510 MHz, Average, 13.5 dBi



Plot 263. Radiated Band Edge, 40 MHz, 5510 MHz, Peak, 13.5 dBi



Plot 264. Radiated Band Edge, 40 MHz, 5670 MHz, 13.5 dBi

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.407(f) RF Exposure

Test 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 Calculation: EUT's operating frequency is 5260 MHz and 5700 MHz; **Limit for Uncontrolled exposure: 1 mW/cm^2.**

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

$$S = P G / 4\pi R^2$$

where,

S = Power Density mW/m^2
P = Power (mW)
R = Distance to the center of radiation of the antenna
G = Maximum antenna gain

1. When Maximum antenna gain for EUT = 13.5 dBi = 22.387

   P = 44.055 mW
   R = 20 cm
   G = 22.387

   $S = 44.055*22.387 / 4(3.1416)(20)^2$

   $S = 0.1962 mW/cm^2$

2. When Maximum antenna gain for EUT = 5 dBi = 3.16

   P = 247.17 mW
   R = 20 cm
   G = 3.16

   $S = 247.17*3.16 / 4(3.1416)(20)^2$

   $S = 0.1553 mW/cm^2$

Therefore, EUT meets the Uncontrolled Exposure limit at 20cm.

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.407(g) Frequency Stability

Test Requirements: **§ 15.407(g):** 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.

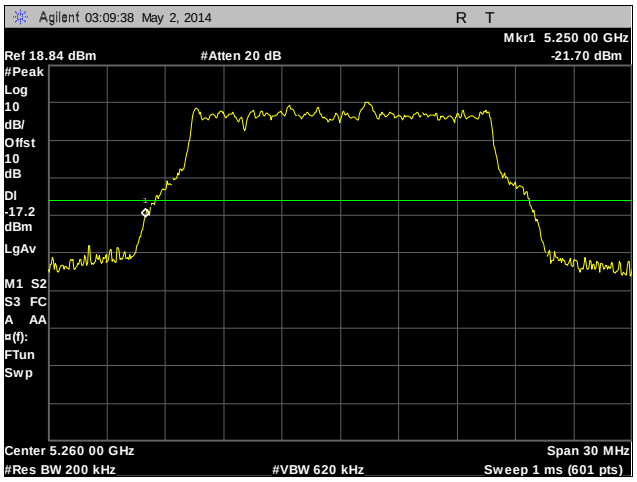
Test Procedure: The EUT was connected directly to a spectrum analyzer through an attenuator. The resolution band width of the spectrum analyzer was set to 200 KHz and 20dBc point was determined which must be outside the UNII-1 Band as per plot provided below in order to satisfy FCC 15.407(g) requirement. Only Lower channel of UNII-2 Band was investigated for frequency stability because the upper channel on which device operate was 5320MHz which does not require frequency stability investigation based on the fact that it was too away from the Upper Band edge of UNII-2 band. In upper UNII-2 band same rationale has been applied to make it exempt from frequency stability requirement.

Test Results: The EUT was compliant with the requirements of **§15.407(g)**.

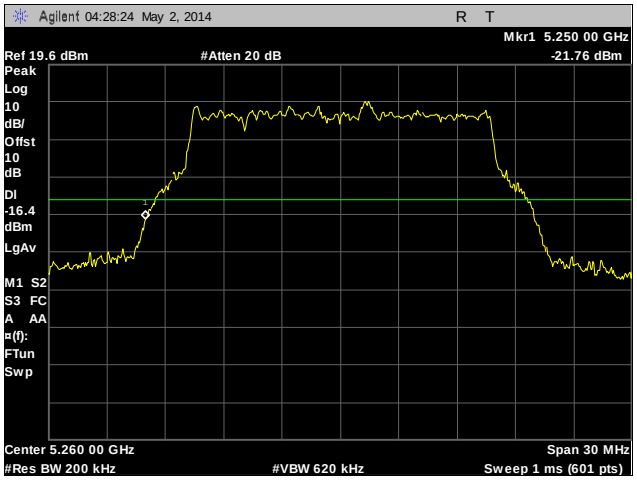
Test Engineer(s): Surinder Singh

Test Date(s): 05/13/14

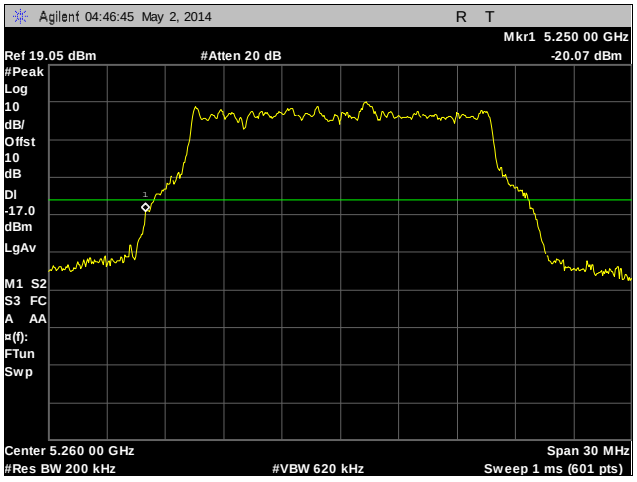
Frequency Stability



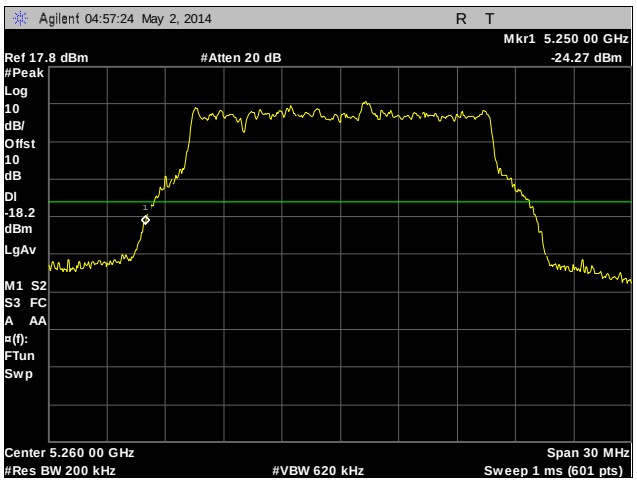
Plot 265. Frequency Stability, 5260 MHz, -20°C, 120 VAC



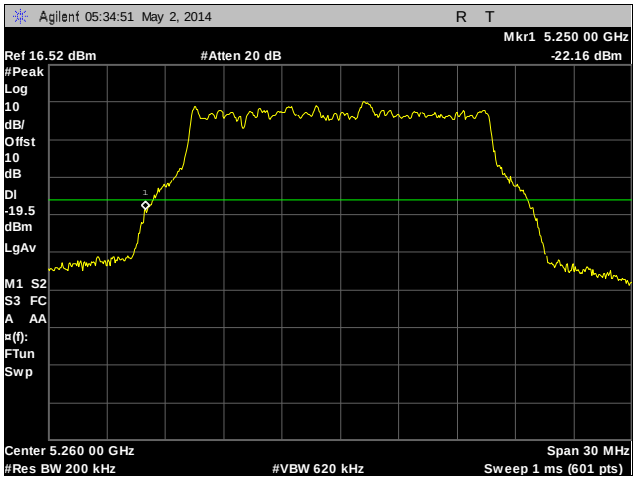
Plot 266. Frequency Stability, 5260 MHz, -10°C, 120 VAC



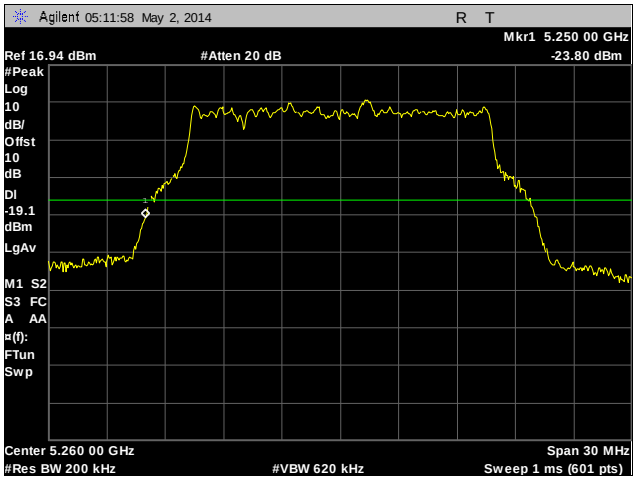
Plot 267. Frequency Stability, 5260 MHz, 0°C, 120 VAC



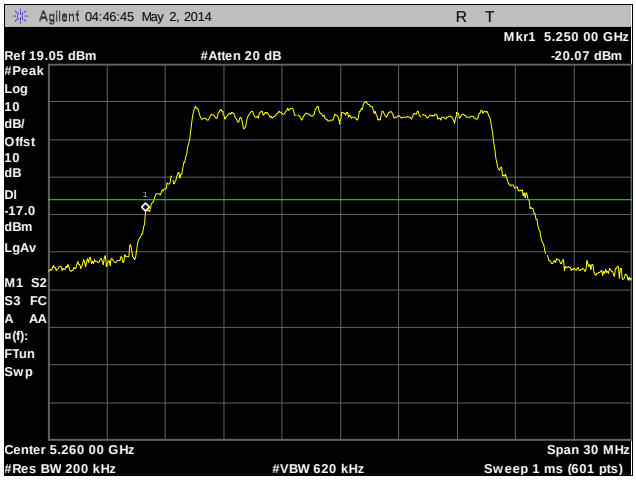
Plot 268. Frequency Stability, 5260 MHz, 10°C, 120 VAC



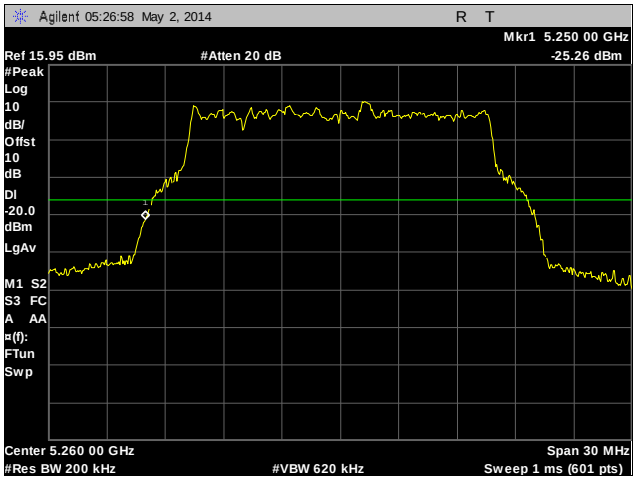
Plot 269. Frequency Stability, 5260 MHz, 20°C, 107 VAC



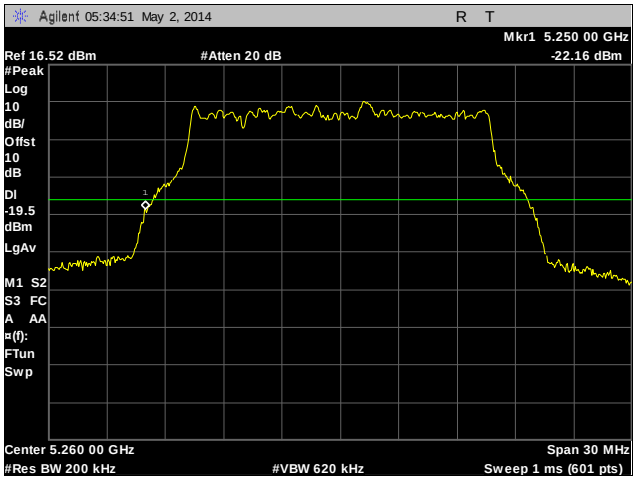
Plot 270. Frequency Stability, 5260 MHz, 20°C, 120 VAC



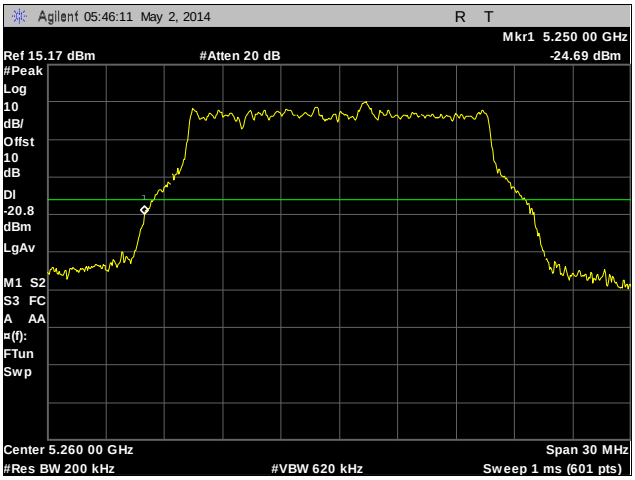
Plot 271. Frequency Stability, 5260 MHz, 20°C, 132 VAC



Plot 272. Frequency Stability, 5260 MHz, 30°C, 120 VAC



Plot 273. Frequency Stability, 5260 MHz, 40°C, 120 VAC



Plot 274. Frequency Stability, 5260 MHz, 55°C, 120 VAC