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

April 10, 2014

Harris RF Communications
221 Jefferson Ridge Pkwy.
Lynchburg, VA 24501

Dear Tony Bond,

Enclosed is the EMC Wireless test report for compliance testing of the Harris RF Communications, MASTR V, Model: MASV-UTXMV as tested to the requirements of the FCC Certification rules under Title 47 of the CFR Part 22 Subpart C for Public Mobile Service, Part 80 for Stations in the Maritime Services, Part 90 for Private Land Mobile Radio Services, and Industry Canada RSS-119, Issue 11, June 2011 for Radio Transmitters and Receivers Operating in the Land Mobile and Fixed Services in the Frequency Range 27.41-960 MHz.

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 contact me.

Sincerely yours,
MET LABORATORIES, INC.

Jennifer Warnell
Documentation Department

Reference: (\Harris RF Communications\EMC40588-FCC22_80_90 Rev. 3)

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Electromagnetic Compatibility Criteria Test Report

for the

Harris RF Communications
MASTR V, Model: MASV-UTXMV

Verified under
FCC Certification Rules
Title 47 of the CFR, Part 22, 80, and 90
&
RSS-119, Issue 11, June 2011

MET Report: EMC40588-FCC22_80_90 Rev. 3

April 10, 2014

Prepared For:

Harris RF Communications
221 Jefferson Ridge Pkwy.
Lynchburg, VA 24501

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

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&
RSS-119, Issue 11, June 2011

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 22, Part 80, and Part 90 of the FCC Rules, and RSS-119, Issue 11, June 2011 of the Industry Canada Standards under normal use and maintenance.

Asad Bajwa, Director
Electromagnetic Compatibility Lab

Report Status Sheet

Revision	Report Date	Reason for Revision
∅	March 27, 2014	Initial Issue.
1	March 28, 2014	Editorial corrections
2	April 1, 2014	Revised to reflect engineer corrections.
3	April 10, 2014	Added transient frequency behavior

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List of Terms and Abbreviations

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

I. Executive Summary

A. Purpose of Test

An EMC evaluation was performed to determine compliance of the Harris RF Communications MASTR V, Model: MASV-UTXMV, with the requirements of Part 22 Subpart C and Part 80. 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 MASTR V, Model: MASV-UTXMV. Harris RF Communications should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the MASTR V, Model: MASV-UTXMV, 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 22, Part 80, and Part 90, in accordance with Harris RF Communications, purchase order number 1138488.

FCC Reference	Industry Canada Reference	Description	Compliance
§2.1046; §22.565; §80.215; §90. 205	RSS-119 Section 5.4	RF Power Output	Compliant
§2.1047	N/A	Modulation Characteristics	Not Applicable – Digital voice only.
§90. 214	RSS-119 Section 5.9	Transient Frequency Behavior	Compliant
§2.1049; §22.359(b); §80.205; §90.210(D)	RSS-119 Section 5.5	Occupied Bandwidth	Compliant
§2.1051; §22.359; §80.211; §90.210(D)	RSS-119 Section 5.8	Conducted Spurious Emissions & Emission Mask	Compliant
§2.1053; §22.359; §80.211; §90.210(D)	RSS-119 Section 5.8	Radiated Spurious Emissions	Compliant
§2.1055, §22.355; §80.209; §90	RSS-119 Section 5.3	Frequency Stability	Compliant

Table 1. Executive Summary of EMC ComplianceTesting

II. Equipment Configuration

A. Overview

MET Laboratories, Inc. was contracted by Harris RF Communications to perform testing on the MASTR V, Model: MASV-UTXMV, under Harris RF Communications' purchase order number 1138488.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Harris RF Communications, MASTR V, Model: MASV-UTXMV.

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

Model(s) Tested:	MASTR V, Model: MASV-UTXMV	
Model(s) Covered:	MASTR V, Model: MASV-UTXMV	
EUT Specifications:	Primary Power: 110 VAC	
	FCC ID: OWDTR-0130-E IC: 3636B-0130	
	Type of Modulations:	C4FM, WCQPSK, HDQPSK
	Equipment Code:	TNB
	Max Peak and Output Power:	50 dBm
	EUT Frequency Ranges:	450MHz-470MHz
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	
Date(s):	April 1, 2014	

B. References

CFR 47, Part 22, Subpart C	Operational and Technical Requirements
CFR 47, Part 80	Stations in the Maritime Services
CFR 47, Part 90	Private Land Mobile Radio Services
RSS-119 Issue 11 June 2011	Radio Transmitters and Receivers Operating in the Land Mobile and Fixed Services in the Frequency Range 27.41-960 MHz
RSS-182 Issue 5 January 2012	Maritime Radio Transmitters and Receivers in the Band 156-162.5 MHz
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
EIA/TIA-603-A-2001	Land Mobile FM or PM Communication Equipment Measurement and Performance Standards

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 MASTR V is a Radio Base Station/Repeater designed for communications in the Land Mobile Radio environment. The primary communication users are Public Safety, Utility and Military Commercial Off The Shelf.

E. Equipment Configuration

Ref. ID	Slot #	Name / Description	Model Number	Serial Number	Rev. #
Tx #1	1	Transmit Module #1	EA-555008-008	HR0808210023	4
Tx #2	3	Transmit Module #2	EA-555008-008	HR0808210027	4
Tx #3	8	Transmit Module #3	EA-555008-008	HR0808210028	4
Tx #4	10	Transmit Module #4	EA-555008-008	HR0808210029	4
PA #1	1	Linear Power Amplifier #1	PA: EA-555010-008 LIN: EA-555009-008	CR0008306248 HR0908110030	3 1
PA #2	2	Linear Power Amplifier #2	PA: EA-555010-008 LIN: EA-555009-008	CR0008306241 HR0908110042	3 1
PA #3	3	Linear Power Amplifier #3	PA: EA-555010-008 LIN: EA-555009-008	CR0008306242 HR0908110038	3 1
PA #4	4	Linear Power Amplifier #4	PA: EA-555010-008 LIN: EA-555009-008	CR0008306240 HR0908110036	3 1
Rx #1	2	Receive Module #1	EA-555007-008	HR0708210025	2
Rx #2	4	Receive Module #2	EA-555007-008	HR0708210032	2
Rx #3	9	Receive Module #3	EA-555007-008	HR0708210034	2
Rx #4	11	Receive Module #4	EA-555007-008	HR0708210040	3
BB #1	5	Baseband Module #1	EA-555005-001	EP5199D03334	D
BB #2	12	Baseband Module #2	EA-555005-001	EP5199D03378	D
TC #1	6	Traffic Controller #1	EA-555004-001	EP5197B00171	B
TC #2	7	Traffic Controller #2	EA-555004-001	EP5197B-0001	B
TC #3	13	Traffic Controller #3	EA-555004-001	EP5197001458	D
TC #4	14	Traffic Controller #4	EA-555004-001	EP5197001438	D
ES #1	S2	E-Switch (Primary)	EA-555012-001	EP5198000342	D
ES #2	S1	E-Switch (Redundant)	EA-555012-001	EP5198000343	D
PS #1	1	Power Supply #1	EA-555011-001	XH11236	C
PS #2	2	Power Supply #2	EA-555011-001	XH11296	C
PS #3	3	Power Supply #3	EA-555011-001	XE71719	C
PS #4	4	Power Supply #4	EA-555011-001	XE71463	C

Table 2. Equipment Configuration (Conducted Measurement)

F. Support Equipment

Harris RF Communications supplied support equipment necessary for the operation and testing of the MASTR V, Model: MASV-UTXMV. All support equipment supplied is listed in the following Support Equipment List.

Ref. ID	Name / Description	Manufacturer	Model Number	Serial Number
N/A	Handheld Barcode Scanner	HP	LS2208-SR20361RSBRE	None
N/A	100 Watt Dummy Load (qty 4)	N/A	N/A	None

Table 3. Support Equipment

G. Ports and Cabling Information

Ref. ID	Port name on EUT	Cable Description or reason for no cable	Qty	Length as tested (m)	Max Length (m)	Shielded? (Y/N)	Termination Box ID & Port Name
PA #1	RF Out	Coaxial Cable	1	1		Y	100W Dummy Load
PA #2	RF Out	Coaxial Cable	1	1		Y	100W Dummy Load
PA #3	RF Out	Coaxial Cable	1	1		Y	100W Dummy Load
PA #4	RF Out	Coaxial Cable	1	1		Y	100W Dummy Load
Rx #1	RF In	Cable to pre-selector	1	1.5		Y	50Ω Dummy Load
Rx #1	Audio	none, bench test only	0	-		-	-
Rx #2	RF In	Cable to pre-selector	1	-		Y	50Ω Dummy Load
Rx #2	Audio	none, bench test only	0	-		-	-
Rx #3	RF In	Cable to pre-selector	1	-		Y	50Ω Dummy Load
Rx #3	Audio	none, bench test only	0	-		-	-
Rx #4	RF In	Cable to pre-selector	1	-		Y	50Ω Dummy Load
Rx #4	Audio	none, bench test only	0	-		-	-
BB #1	M-LAN	Ethernet Cable, CAT5	0	-		-	-
BB #1	Simulcast	15-Conductor Cable	0	-		-	-
BB #1	COMM	none, test/local control	0	-		-	-
BB #1	Ref In	none, terminated	0	-		-	-
BB #2	M-LAN	Ethernet Cable, CAT5	0	-		-	-
BB #2	Simulcast	15-Conductor Cable	0	-		-	-
BB #2	COMM	none, test/local control	0	-		-	-
BB #2	Ref In	none, terminated	0	-		-	-
TC #1	M-LAN	Ethernet Cable, CAT5	0	-		-	-
TC #1	P-LAN	Ethernet Cable, CAT5	0	-		-	-
TC #1	COMM	none, test/local prog	0	-		-	-
TC #2	M-LAN	Ethernet Cable, CAT5	0	-		-	-
TC #2	P-LAN	Ethernet Cable, CAT5	0	-		-	-

Ref. ID	Port name on EUT	Cable Description or reason for no cable	Qty	Length as tested (m)	Max Length (m)	Shielded? (Y/N)	Termination Box ID & Port Name
TC #2	COMM	none, test/local prog	0	-		-	-
TC #3	M-LAN	Ethernet Cable, CAT5	0	-		-	-
TC #3	P-LAN	Ethernet Cable, CAT5	0	-		-	-
TC #3	COMM	none, test/local prog	0	-		-	-
TC #4	M-LAN	Ethernet Cable, CAT5	0	-		-	-
TC #4	P-LAN	Ethernet Cable, CAT5	0	-		-	-
TC #4	COMM	none, test/local prog	0	-		-	-
PS #1	A/C In	A/C Power Cord	1	1		N	110 VAC Power
PS #1	5V,12V VDC AUX	none, unused	0	-		-	-
PS #2	A/C In	A/C Power Cord	1	1		N	110 VAC Power
PS #2	5V,12V VDC AUX	none, unused	0	-		-	-
PS #3	A/C In	A/C Power Cord	1	1		N	110 VAC Power
PS #3	5V,12V VDC AUX	none, unused	0	-		-	-
PS #4	A/C In	A/C Power Cord	1	1		N	110 VAC Power
PS #4	5V,12V VDC AUX	none, unused	0	-		-	-
TP	Test Port	none, unused	0	-		-	on Backplane

Table 4. Ports and Cabling Information

H. Mode of Operation

The MASTR V can generate internal Test Patterns for each modulation mode, selecting the mode and enabling the transmitter is controller with a Bar Code Scanner connected via a standard Laptop PC to M-LAN port of the Baseband Module. No special software is required, all the commands can be sent using a Telnet session.
There are three modes of operation:

P25 Phase I – modulation C4FM
P25 Linear Simulcast – modulation WCQPSK
P25 Phase II – modulation HDQPSK

I. Method of Monitoring EUT Operation

A "STATUS" LED is part of each of the following modules: Tx Module, PA Module, Rx Module, Baseband Module, Traffic Controller and E-Switch. A Red indication on the "STATUS" LED of the Tx, PA, or Rx modules indicates that the module is not functioning properly and the associated channel is taken "Out Of Service".

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 Harris RF Communications upon completion of testing.

III. Electromagnetic Compatibility Criteria for Intentional Radiators

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 2.1046 RF Power Output

Test Requirements: **§2.1046 Measurements required: RF power output:**

§2.1046 (a) For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, power output shall be measured at the RF output terminals when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in § 2.1033(c)(8).The electrical characteristics of the radio frequency load attached to the output terminals when this test is made shall be stated.

§2.1046 (b) For single sideband, independent sideband, and single channel, controlled carrier radiotelephone transmitters, the procedure specified in paragraph (a) of this section shall be employed and, in addition, the transmitter shall be modulated during the test as specified and as applicable in § 2.1046 (b) (1-5). In all tests, the input level of the modulating signal shall be such as to develop rated peak envelope power or carrier power, as appropriate, for the transmitter.

§2.1046 (c) For measurements conducted pursuant to paragraphs (a) and (b) of this section, all calculations and methods used by the applicant for determining carrier power or peak envelope power, as appropriate, on the basis of measured power in the radio frequency load attached to the transmitter output terminals shall be shown. Under the test conditions specified, no components of the emission spectrum shall exceed the limits specified in the applicable rule parts as necessary for meeting occupied bandwidth or emission limitations.

§22.565(b): Basic power limit. Except as provided in paragraph (d) of this section, the ERP of base transmitters must not exceed 500 Watts.

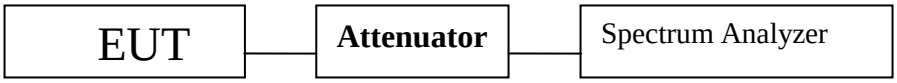
RSS-119 Section 5.4 The output power shall be within ±1.0 dB of the manufacturer's rated power.

Test Procedures: A laptop was connected to EUT to control the RF power output and frequency channel. The EUT was connected to a Spectrum Analyzer via an attenuator to measure the conducted output power. The EUT power was adjusted enough to produce maximum output power as specified in the owner's manual. The EUT has both a 10 Watt mode and a 100 Watt mode. The output power was then recorded as an average power. Measurements were made at the all four frequencies possible by the EUT sample.

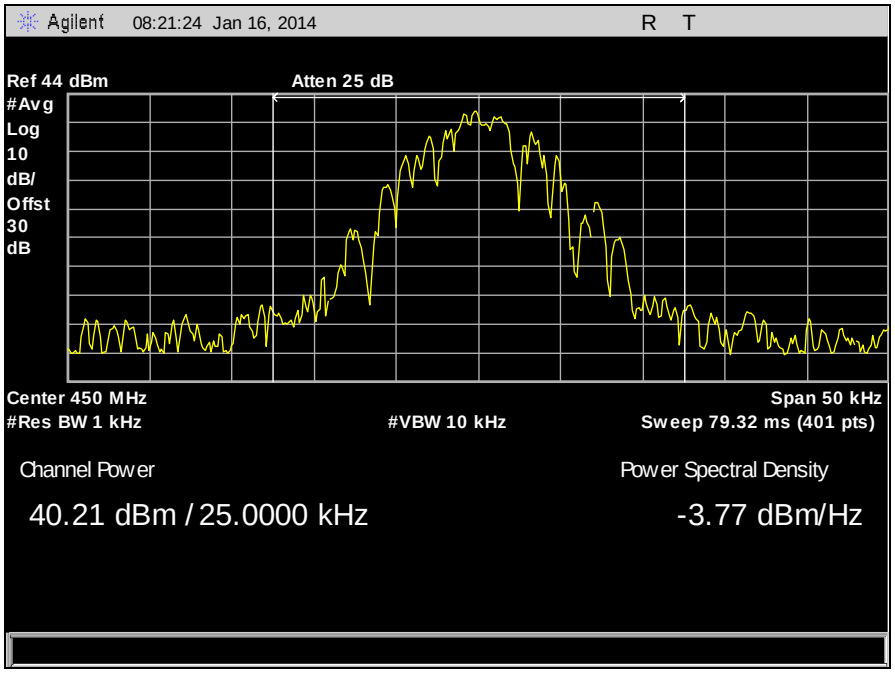
Test Results: The EUT was compliant with the requirements of this section. The EUT conducted power does not exceed limit at the carrier frequency.

Test Engineer(s): Surinder Singh

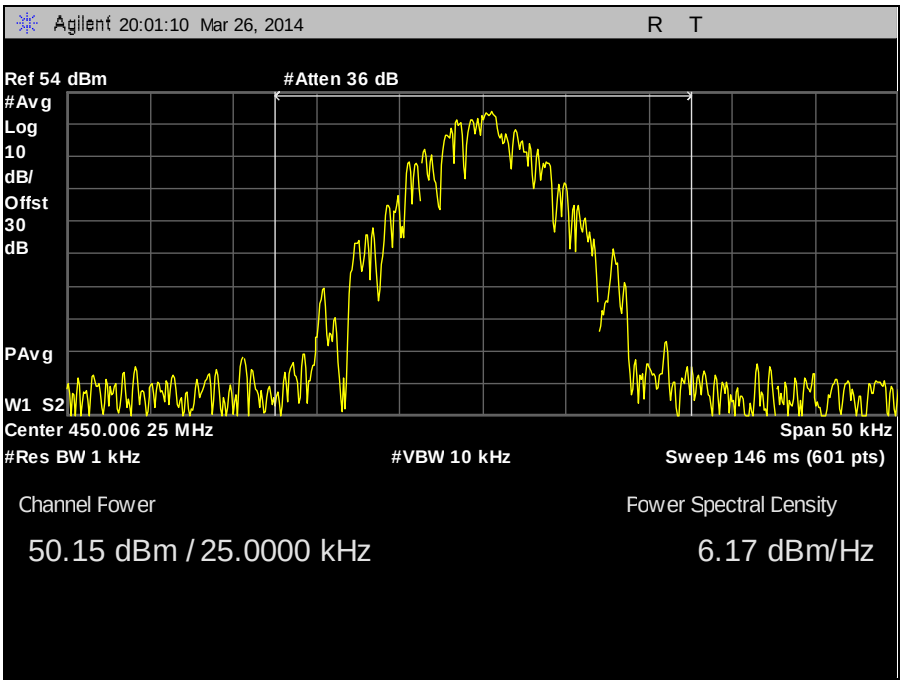
Test Date(s): 01/18/14



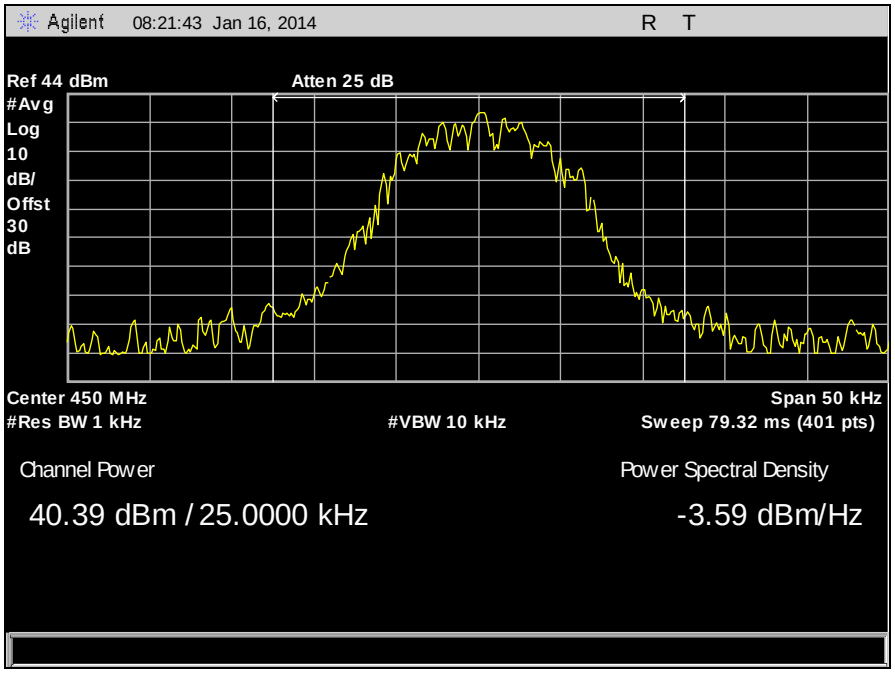
Block Diagram 1. RF Power Output Test Setup



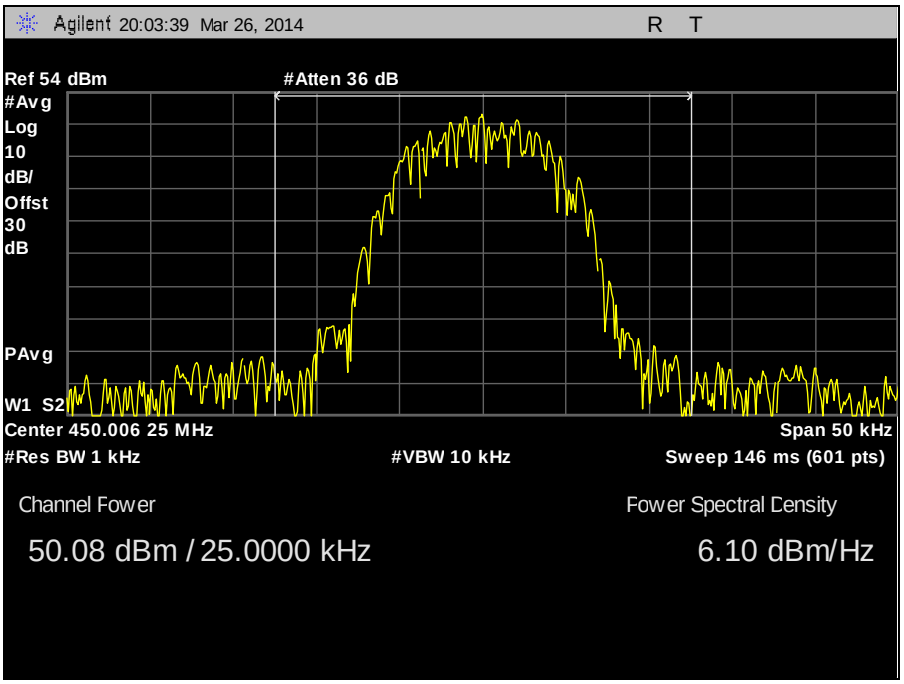
Plot 1. RF Power Output, 450 MHz, C4FM, 10W



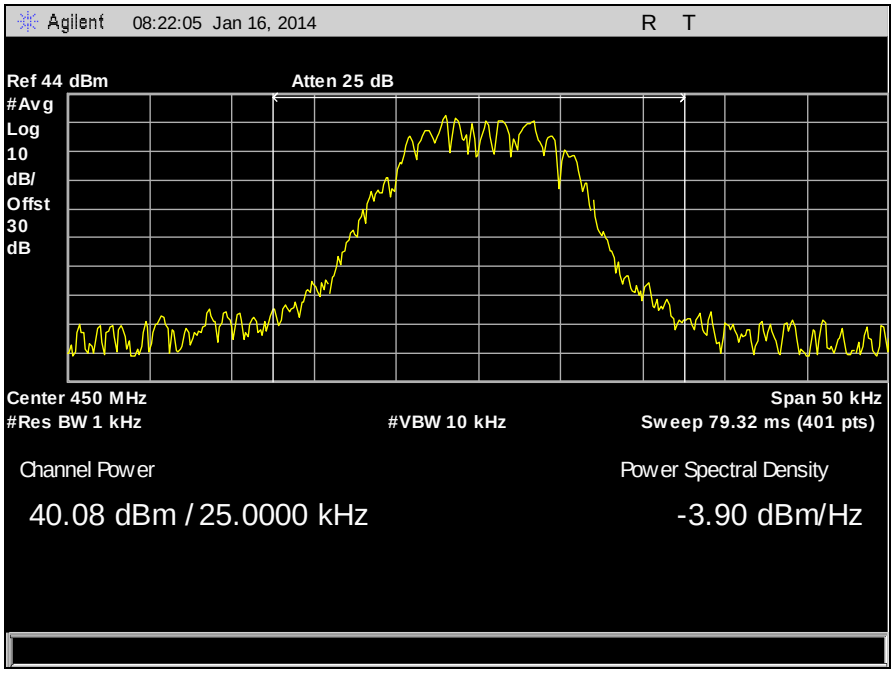
Plot 2. RF Power Output, 450 MHz, C4FM, 100W



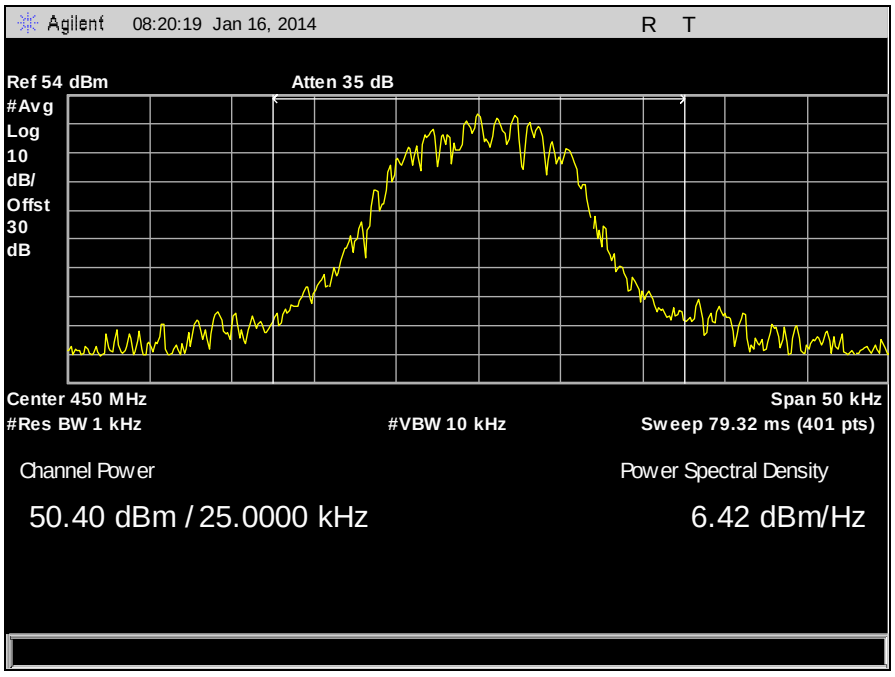
Plot 3. RF Power Output, 450 MHz, CQPSK, 10W



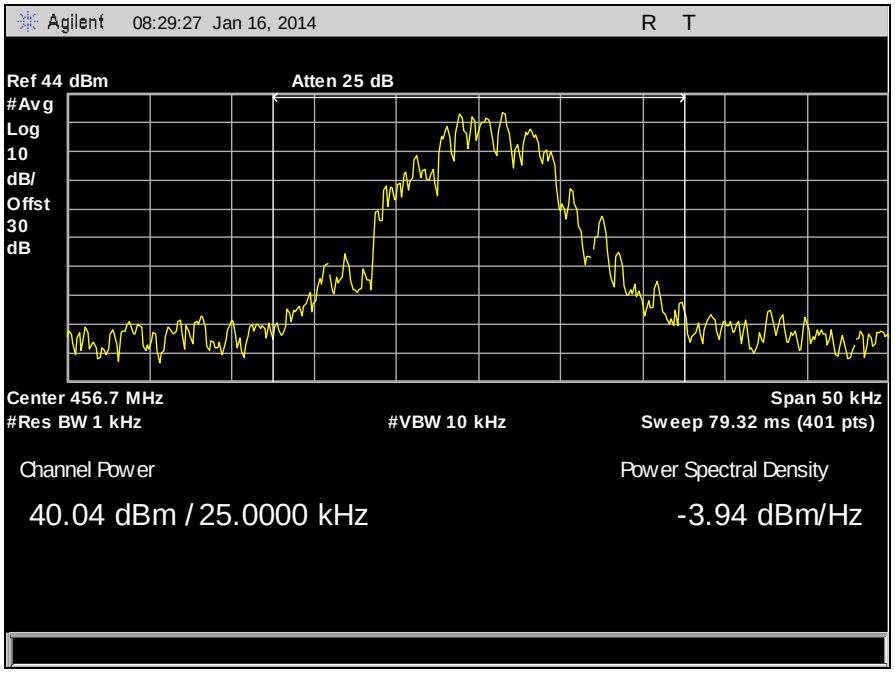
Plot 4. RF Power Output, 450 MHz, CQPSK, 100W



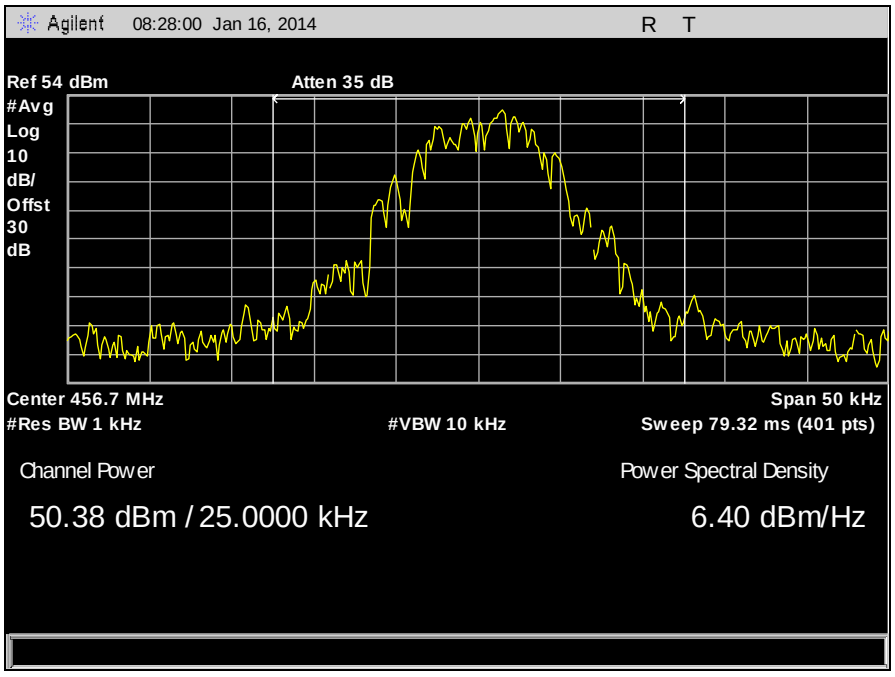
Plot 5. RF Power Output, 450 MHz, HDQPSK, 10W



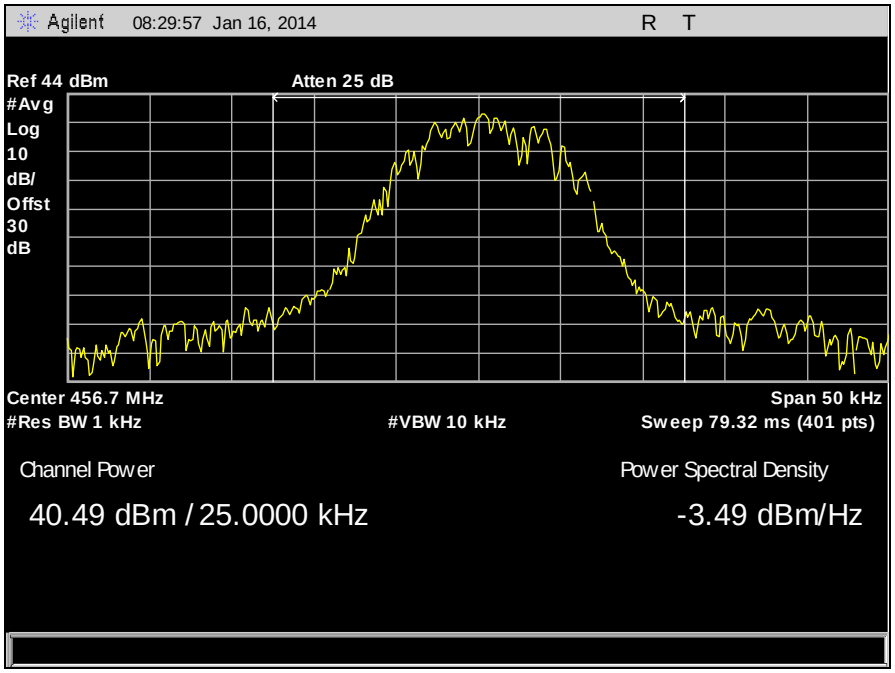
Plot 6. RF Power Output, 450 MHz, HDQPSK, 100W



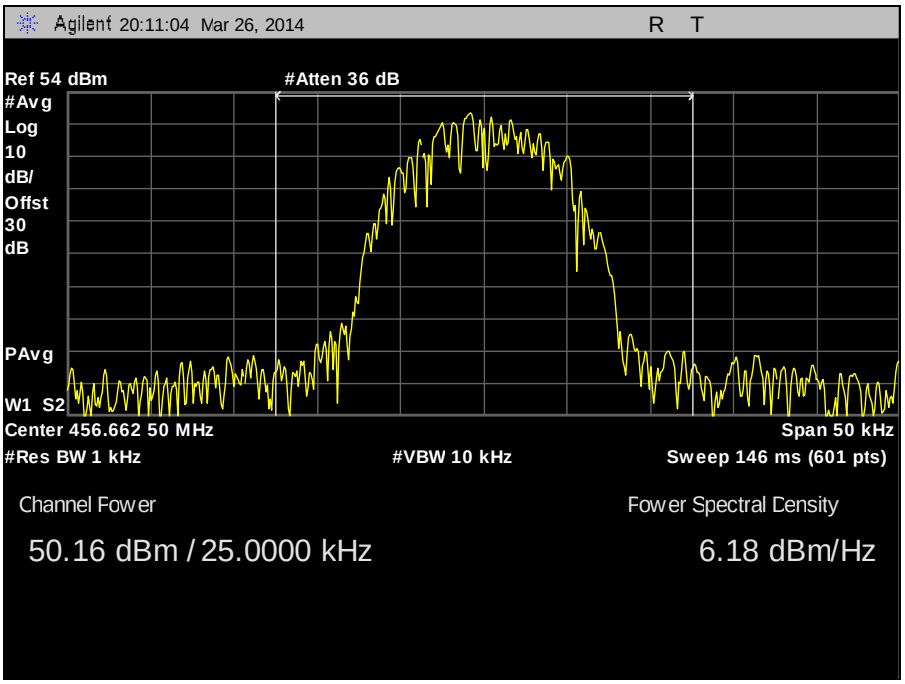
Plot 7. RF Power Output, 456 MHz, C4FM, 10W



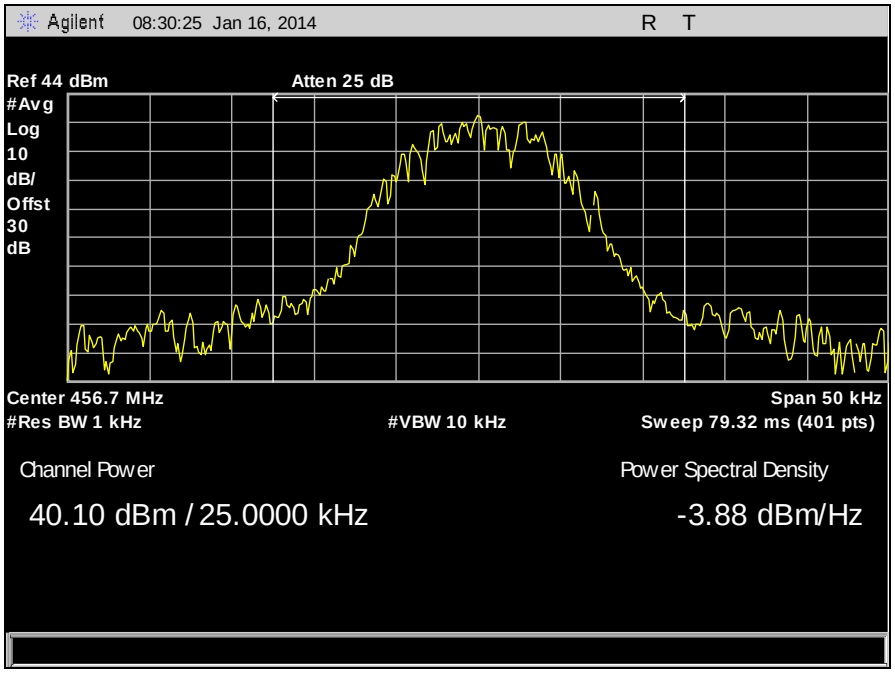
Plot 8. RF Power Output, 456 MHz, C4FM, 100W



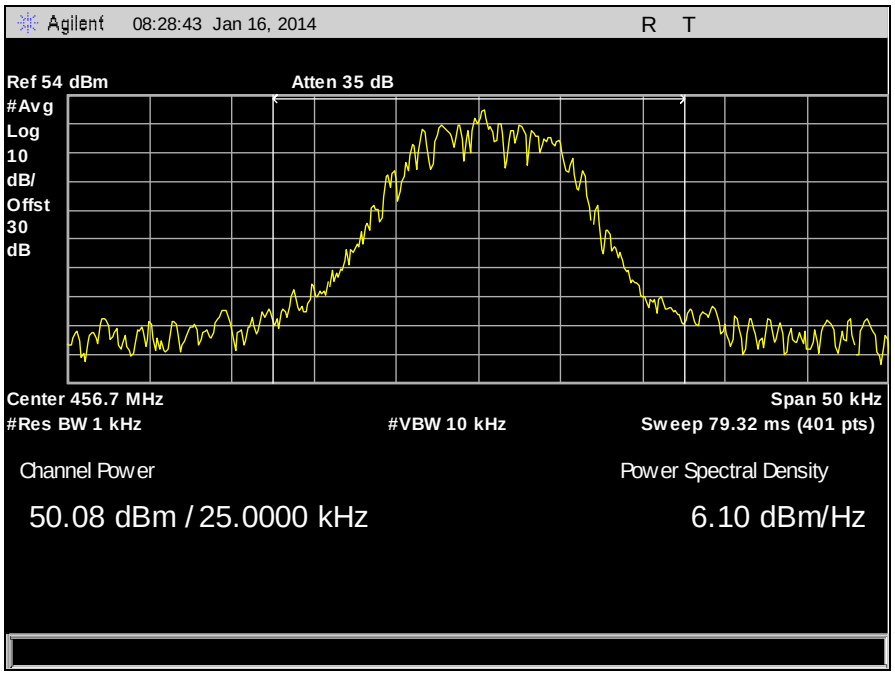
Plot 9. RF Power Output, 456 MHz, CQPSK, 10W



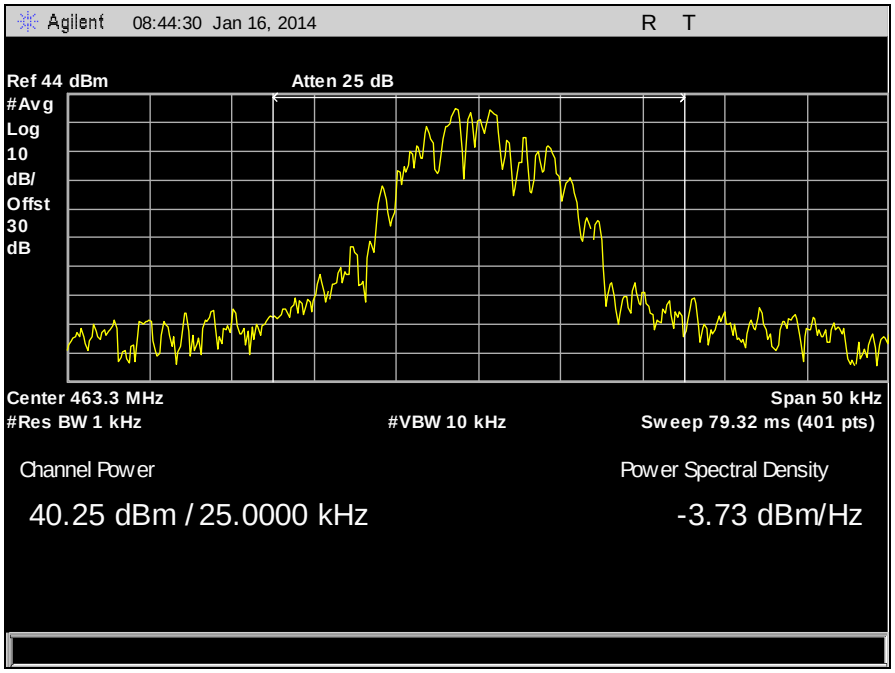
Plot 10. RF Power Output, 456 MHz, CQPSK, 100W



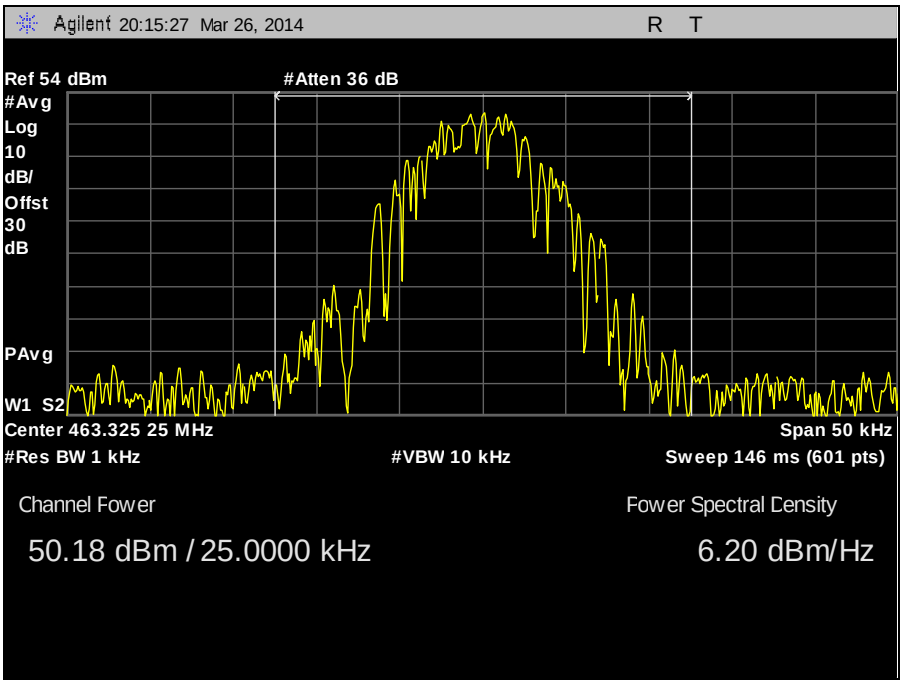
Plot 11. RF Power Output, 456 MHz, HDQPSK, 10W



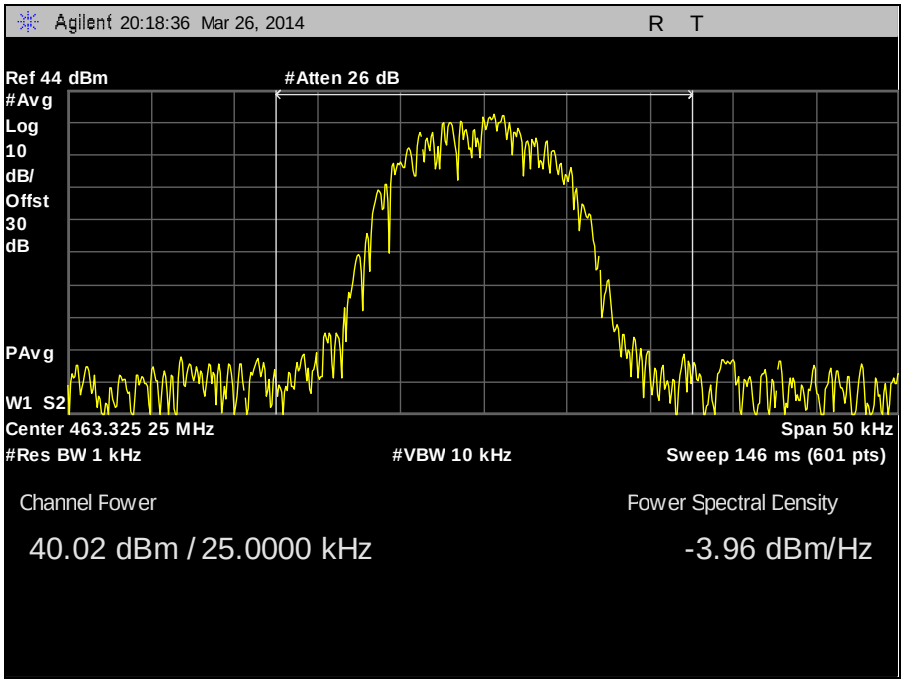
Plot 12. RF Power Output, 456 MHz, HDQPSK, 100W



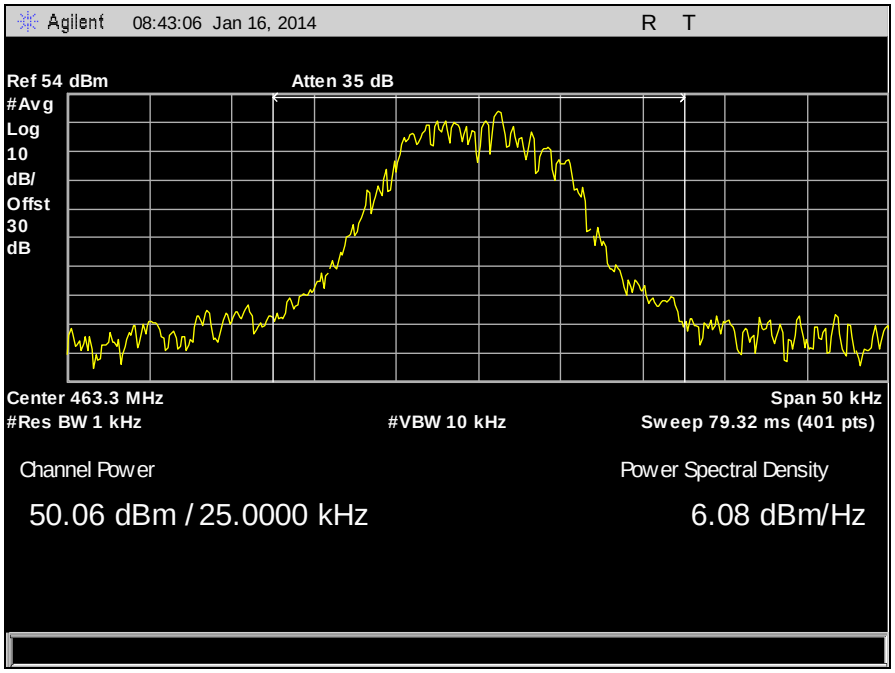
Plot 13. RF Power Output, 463 MHz, C4FM, 10W



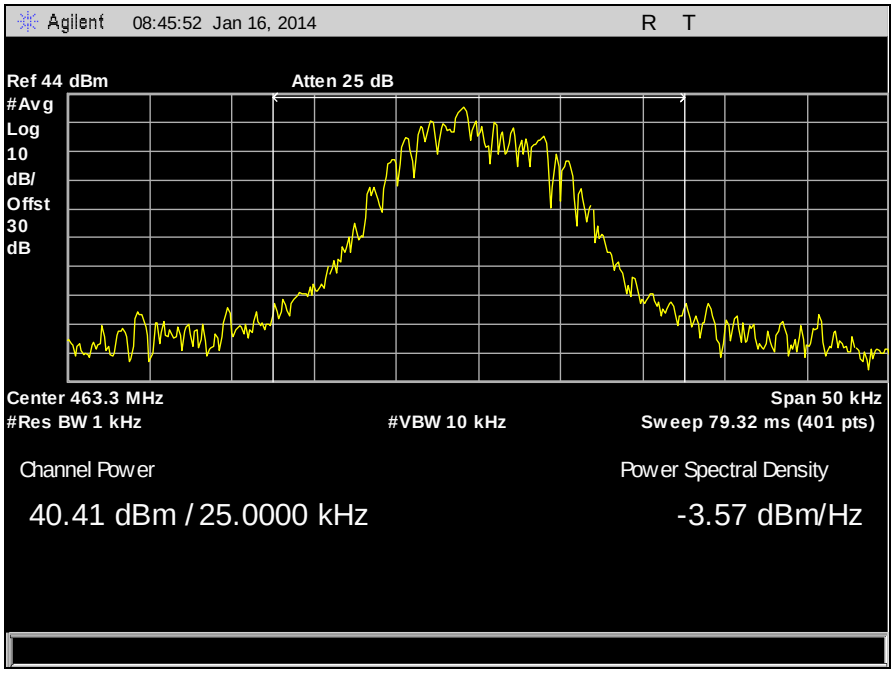
Plot 14. RF Power Output, 463 MHz, C4FM, 100W



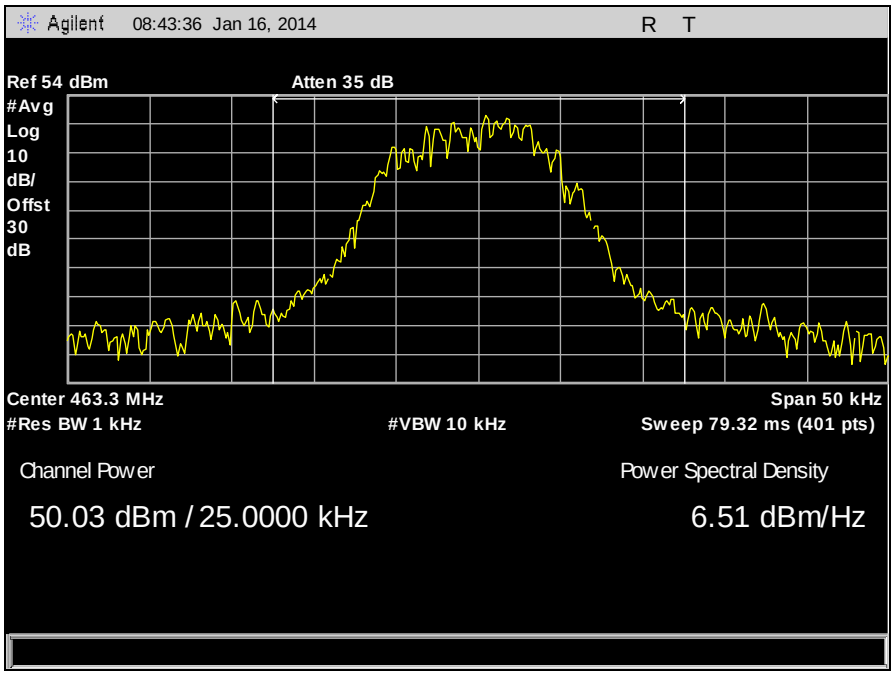
Plot 15. RF Power Output, 463 MHz, CQPSK, 10W



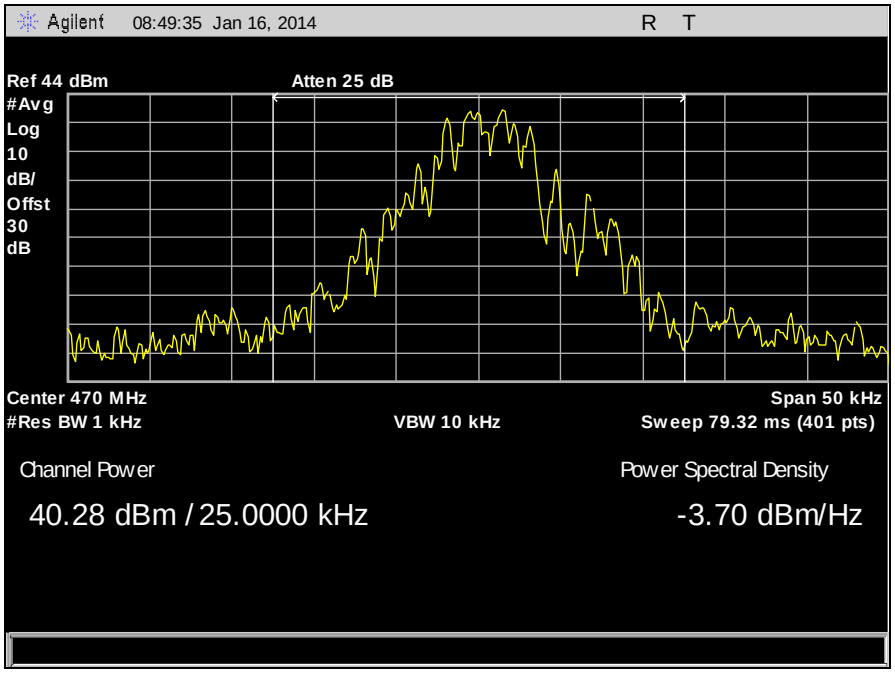
Plot 16. RF Power Output, 463 MHz, CQPSK, 100W



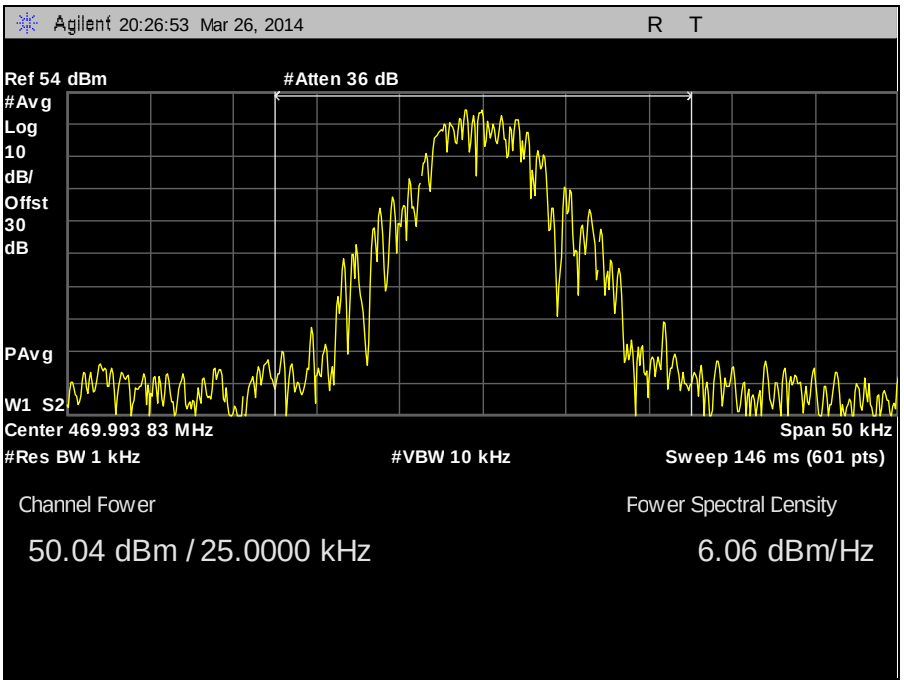
Plot 17. RF Power Output, 463 MHz, HDQPSK, 10W



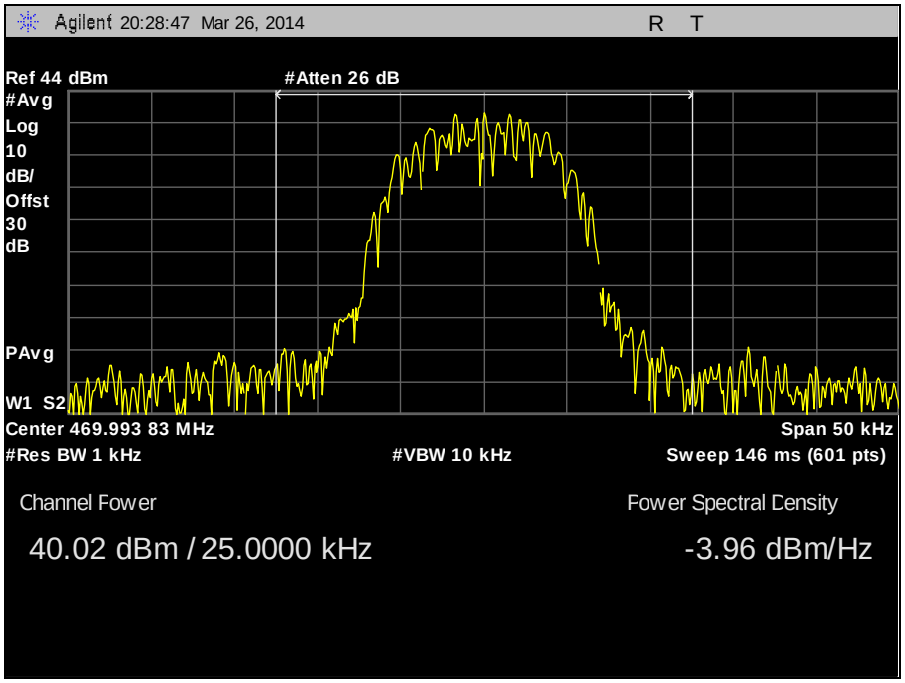
Plot 18. RF Power Output, 463 MHz, HDQPSK, 100W



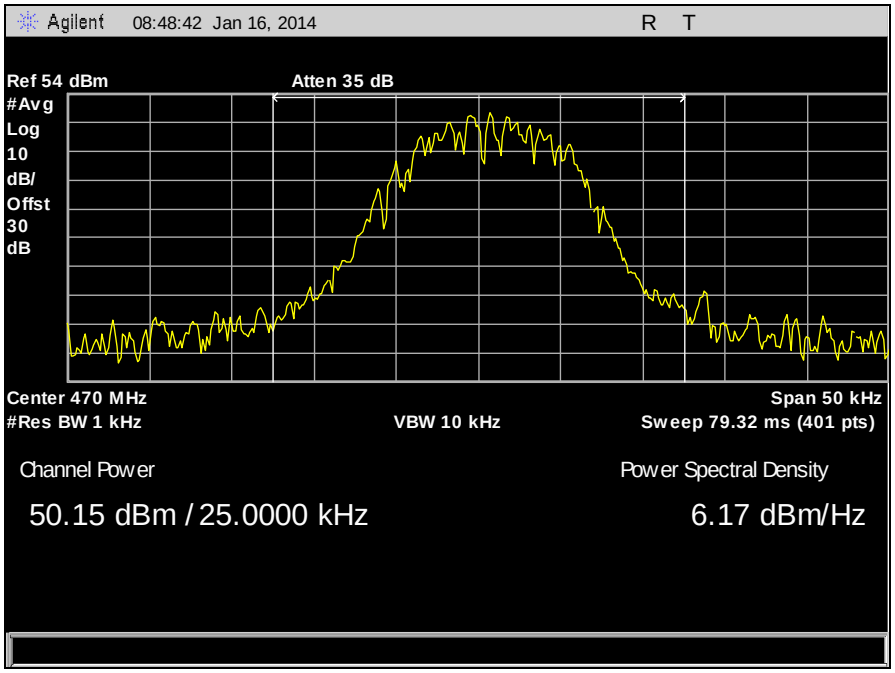
Plot 19. RF Power Output, 470 MHz, C4FM, 10W



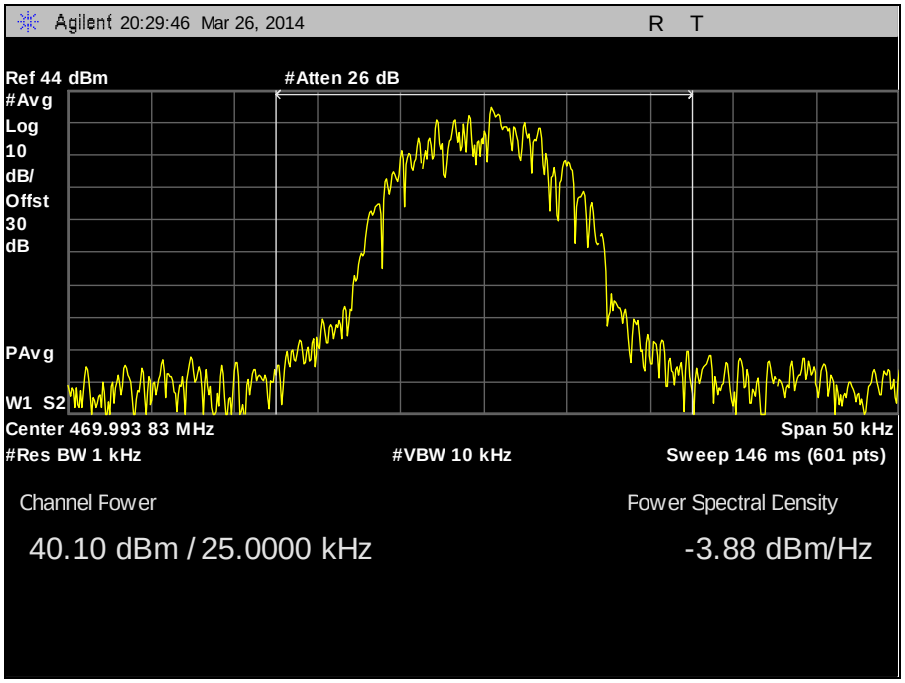
Plot 20. RF Power Output, 470 MHz, C4FM, 100W



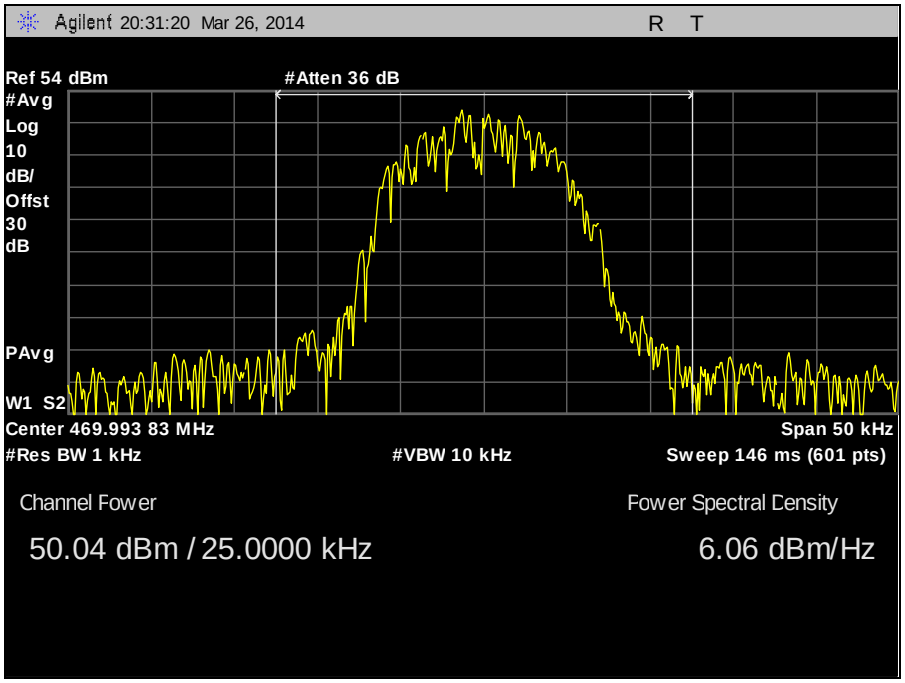
Plot 21. RF Power Output, 470 MHz, CQPSK, 10W



Plot 22. RF Power Output, 470 MHz, CQPSK, 100W



Plot 23. RF Power Output, 470 MHz, HDQPSK, 10W



Plot 24. RF Power Output, 470 MHz, HDQPSK, 100W

§ 2.1049 Occupied Bandwidth

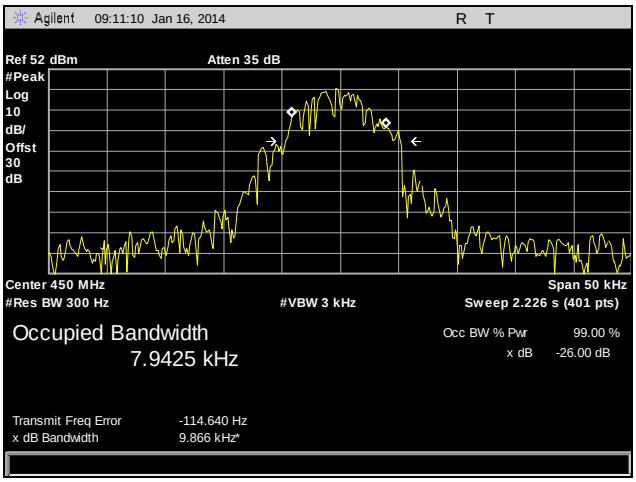
Test Requirement(s): **§ 2.1049Measurements required: Occupied bandwidth:** The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured under the specified conditions of § 2.1049 (a) through (i) as applicable.

Test Procedures: As required by 47 CFR 2.1049, *occupied bandwidth measurements* were made with a Spectrum Analyzer connected to the RF ports of the transmitter, with suitable attenuation.

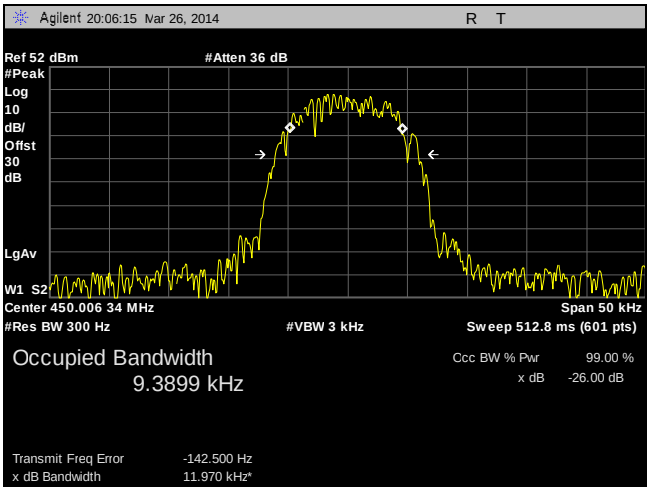
Test Results: The EUT was compliant with the requirements of this section. The variability in the Occupied Bandwidth plots was due to the duty cycles in use in the various modulation types.

Test Engineer(s): Surinder Singh

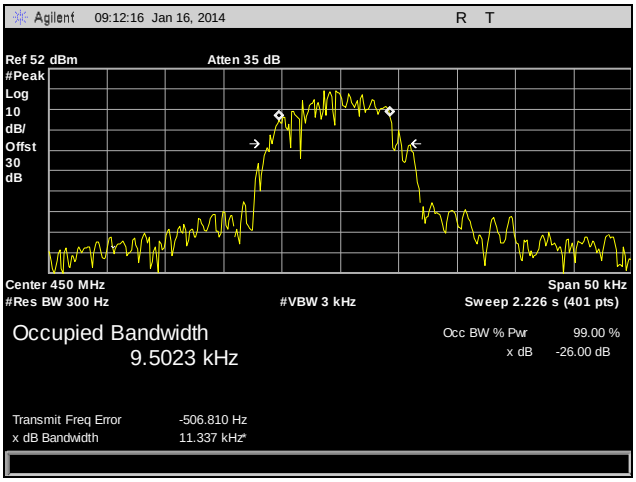
Test Date(s): 01/21/14



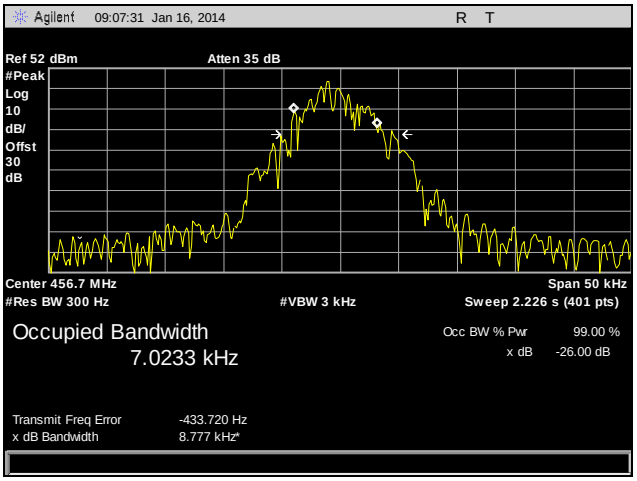
Plot 25. 26 dB Occupied Bandwidth, 450 MHz, C4FM



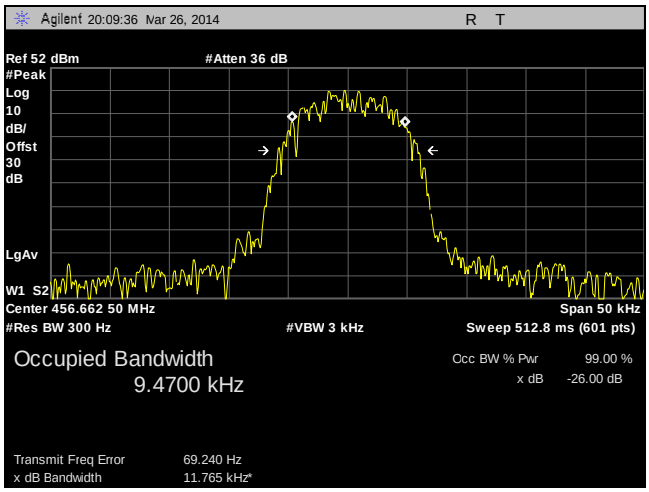
Plot 26. 26 dB Occupied Bandwidth, 450 MHz, CQPSK



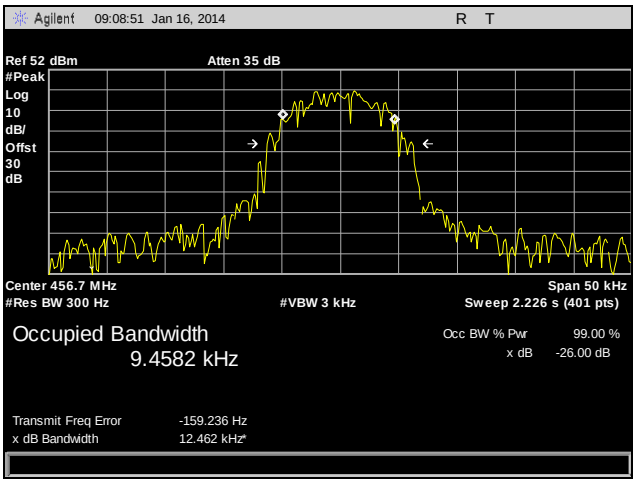
Plot 27. 26 dB Occupied Bandwidth, 450 MHz, HDQPSK



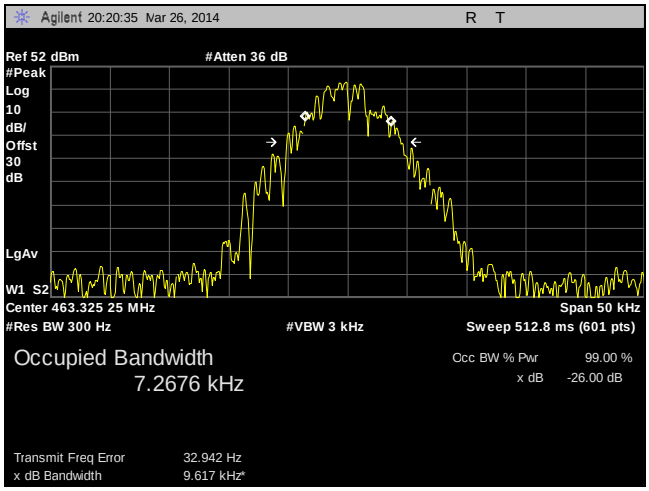
Plot 28. 26 dB Occupied Bandwidth, 456 MHz, C4FM



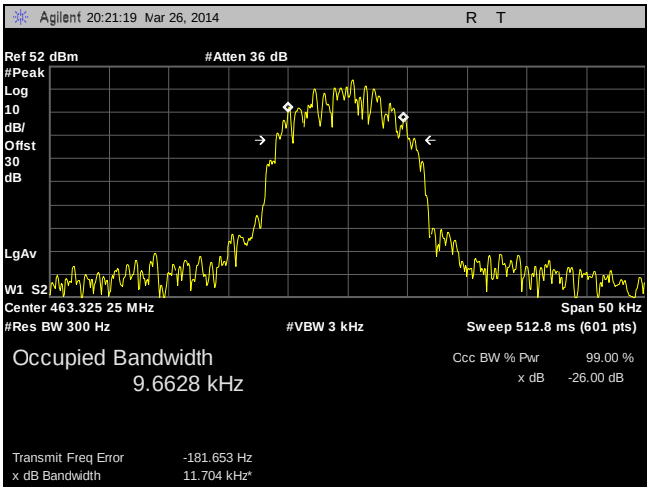
Plot 29. 26 dB Occupied Bandwidth, 456 MHz, CQPSK



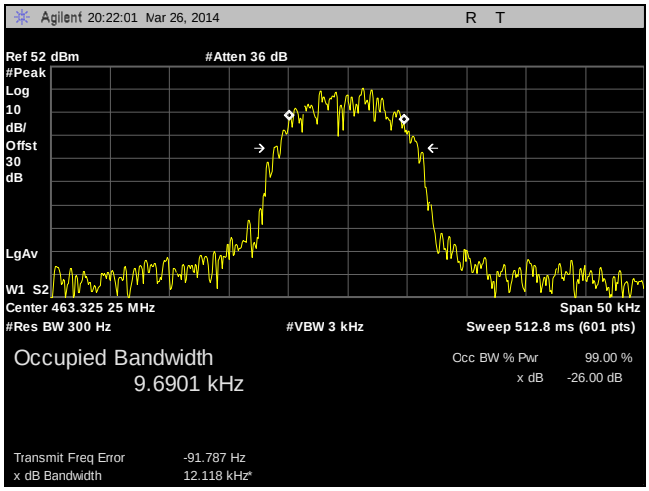
Plot 30. 26 dB Occupied Bandwidth, 456 MHz, HDQPSK



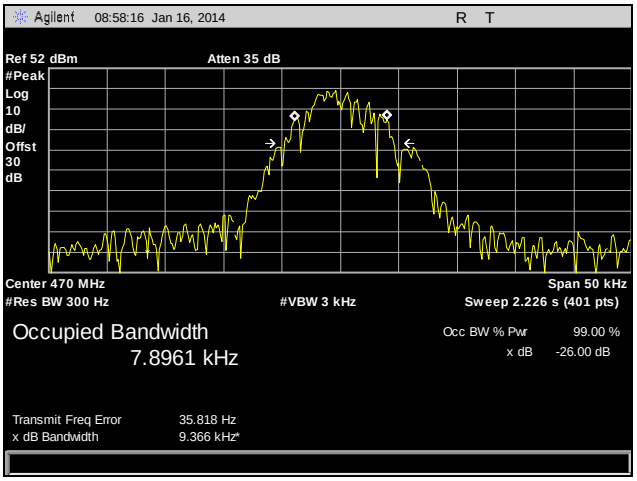
Plot 31. 26 dB Occupied Bandwidth, 463 MHz, C4FM



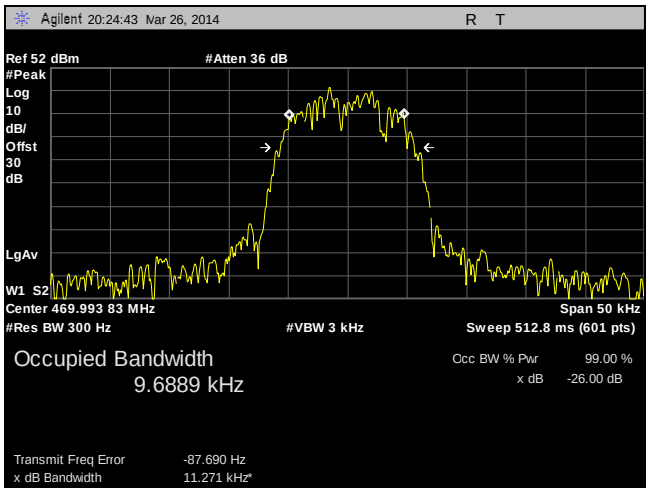
Plot 32. 26 dB Occupied Bandwidth, 463 MHz, CQPSK



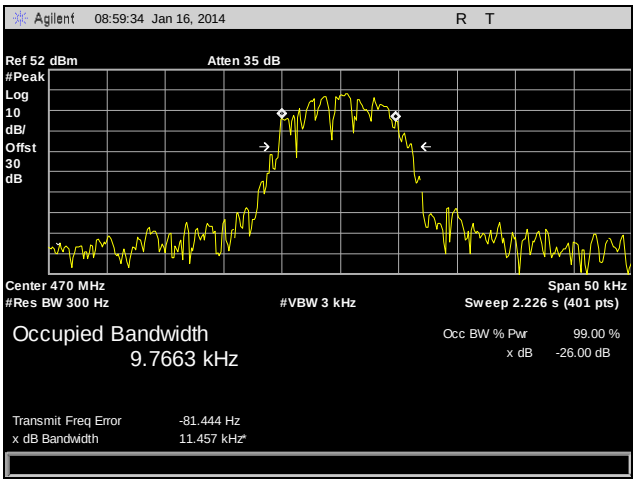
Plot 33. 26 dB Occupied Bandwidth, 463 MHz, HDQPSK



Plot 34. 26 dB Occupied Bandwidth, 470 MHz, C4FM



Plot 35. 26 dB Occupied Bandwidth, 470 MHz, CQPSK



Plot 36. 26 dB Occupied Bandwidth, 470 MHz, HDQPSK

§90.210 Conducted Spurious Emissions and Emissions Mask at Antenna Terminals

Test Requirement(s): **§2.1049 and §90.210 with FCC 04-265 (Emissions Mask D)**

Test Procedures: The EUT was connected to a spectrum analyzer through an RF attenuator. The EUT was set to transmit a CW signal on the low, mid, and high channels. The RBW of the spectrum analyzer was set to 100 kHz and the trace was set to max hold. The peak of the unmodulated carrier was then set as the reference level and another trace was turned on. The modulation was turned on and the RBW was reduced to 100 Hz, the trace was set to max hold, and the in-band emissions were compared to the emission mask. This was repeated for low, mid, and high channels for each modulation.

Test Results: Equipment complies with Section 2.1049 and 90.210(D) with FCC 04-265 (*Equipment designed to operate with a 12.5 kHz channel bandwidth must meet the requirements of Emission Mask D.*). The EUT does not exceed the Emission Masks limit.

The following pages show measurements of Emission Mask plots:

Test Engineer(s): Surinder Singh

Test Date(s): 01/23/14

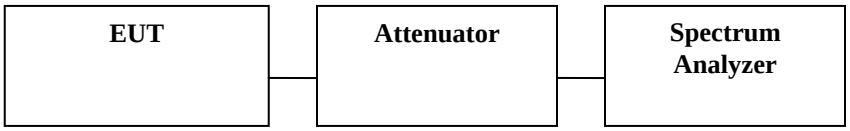
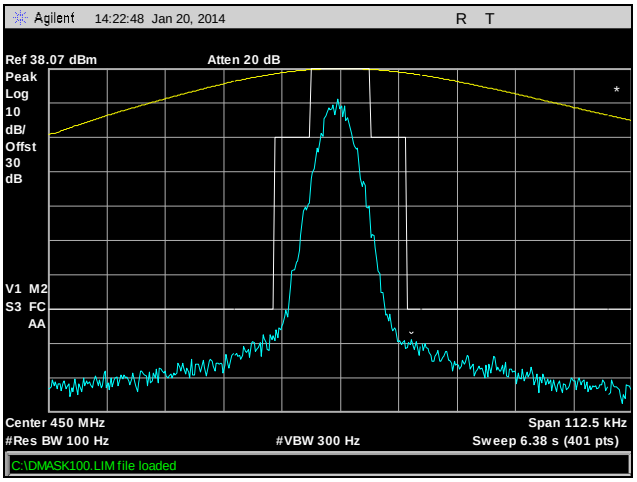
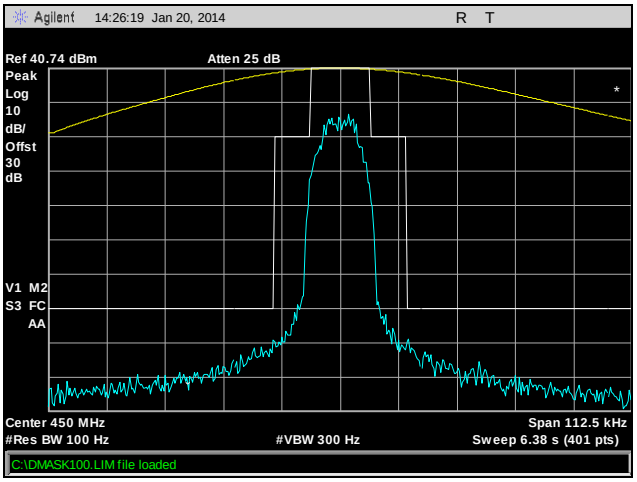


Figure 1. Emission Mask Test Setup

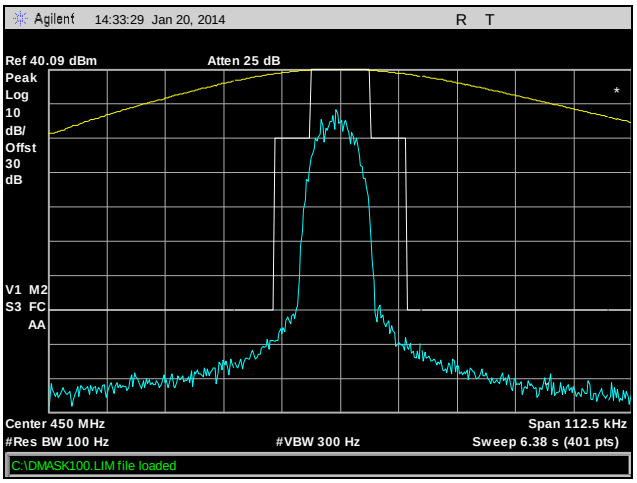
Emission Mask



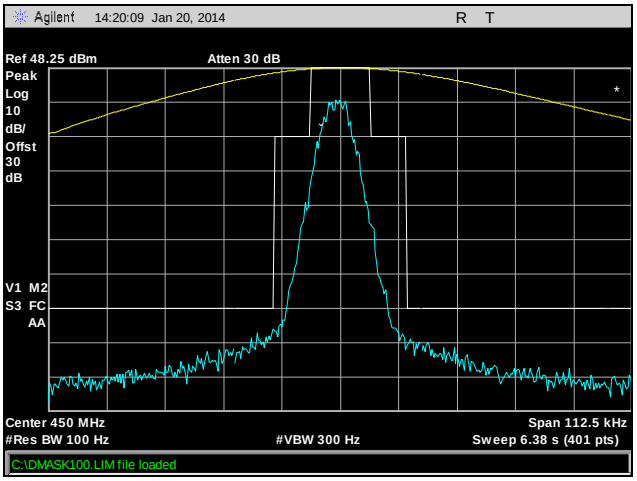
Plot 37. Part 90, Emission Mask, 450 MHz, C4FM, 10 W



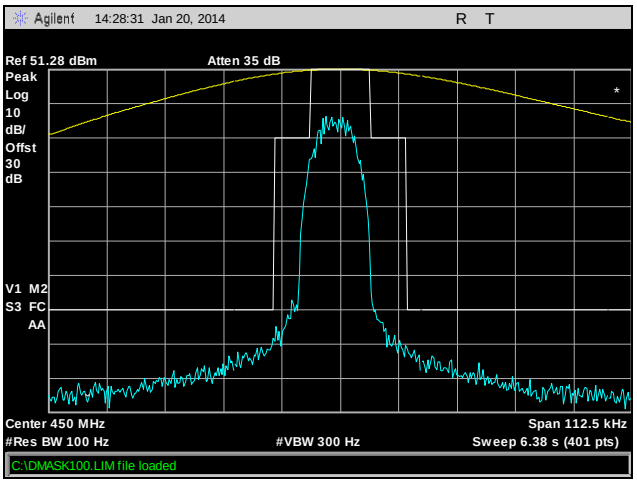
Plot 38. Part 90, Emission Mask, 450 MHz, CQPSK, 10 W



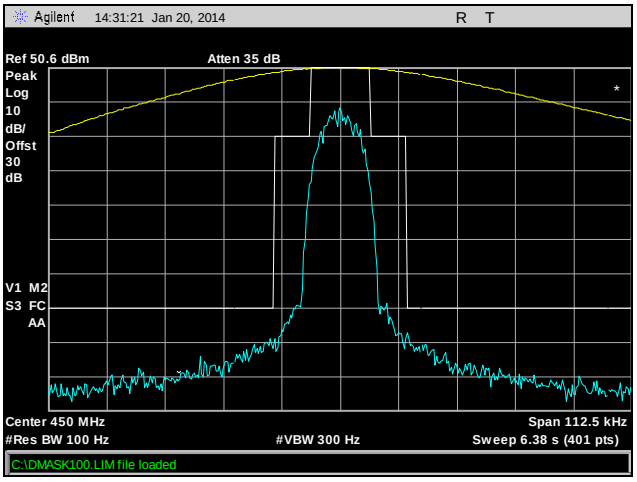
Plot 39. Part 90, Emission Mask, 450 MHz, HDQPSK, 10 W



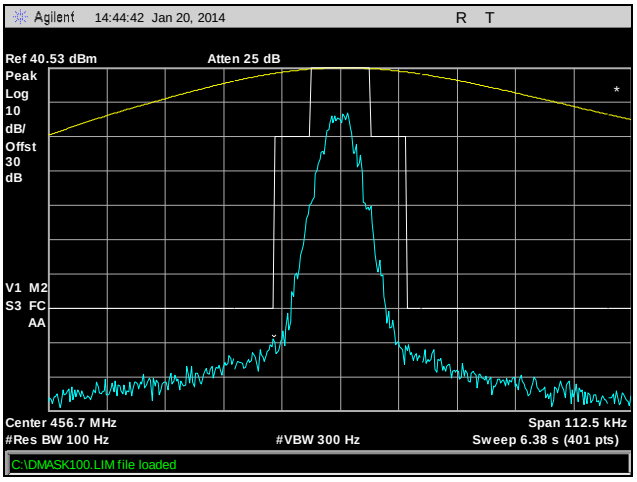
Plot 40. Part 90, Emission Mask, 450 MHz, C4FM, 100 W



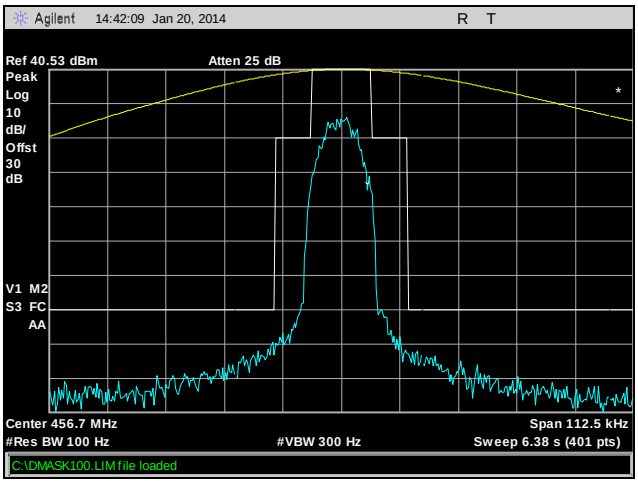
Plot 41. Part 90, Emission Mask, 450 MHz, CQPSK, 100 W



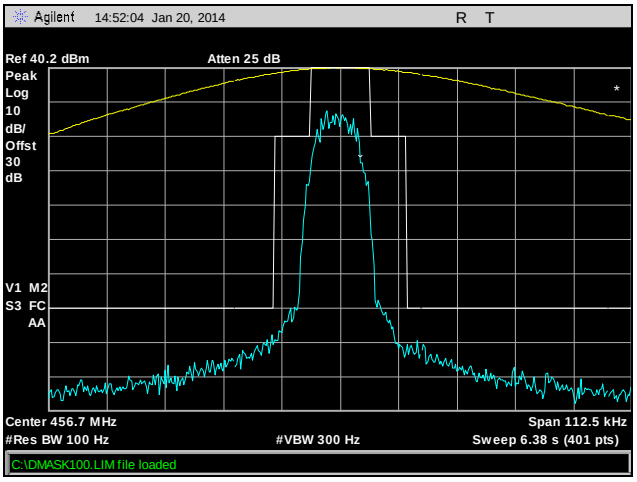
Plot 42. Part 90, Emission Mask, 450 MHz, HDQPSK, 100 W



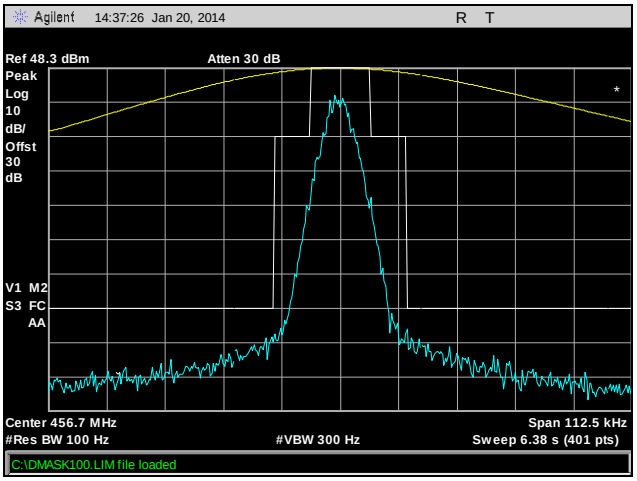
Plot 43. Part 90, Emission Mask, 456 MHz, C4FM, 10 W



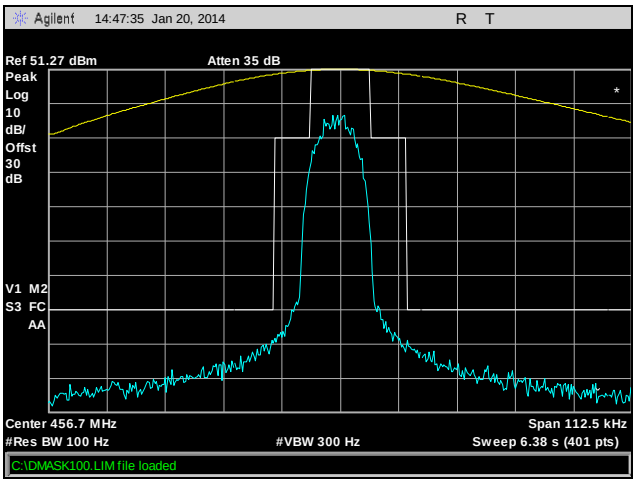
Plot 44. Part 90, Emission Mask, 456 MHz, CQPSK, 10 W



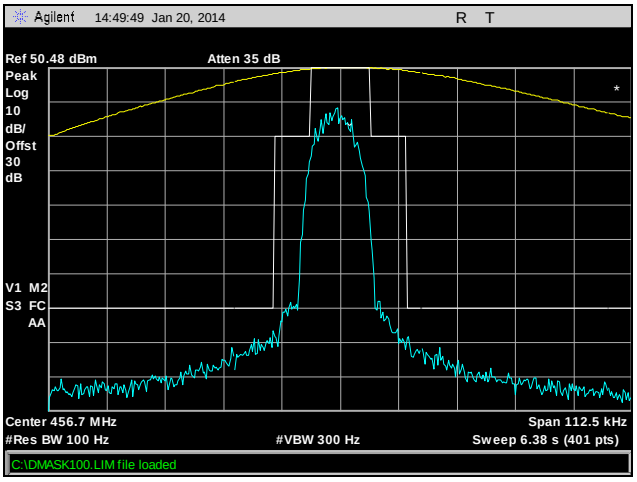
Plot 45. Part 90, Emission Mask, 456 MHz, HDQPSK, 10 W



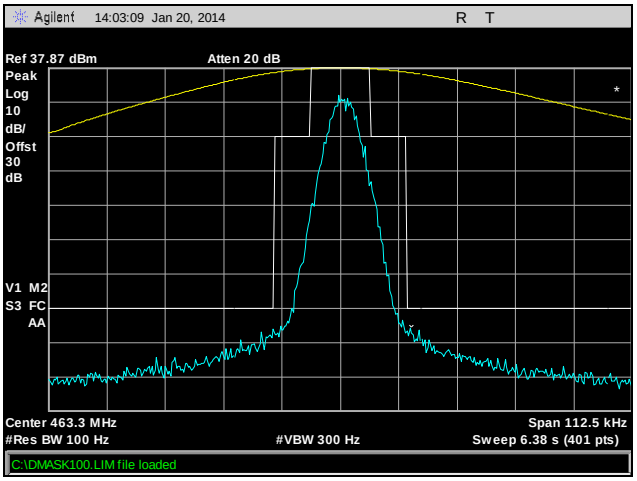
Plot 46. Part 90, Emission Mask, 456 MHz, C4FM, 100 W



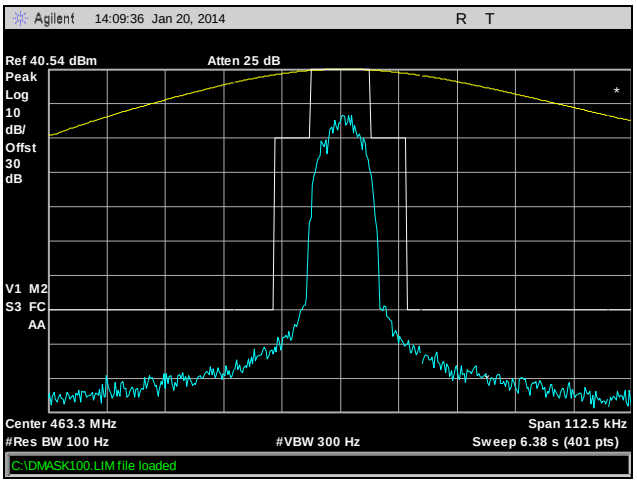
Plot 47. Part 90, Emission Mask, 456 MHz, CQPSK, 100 W



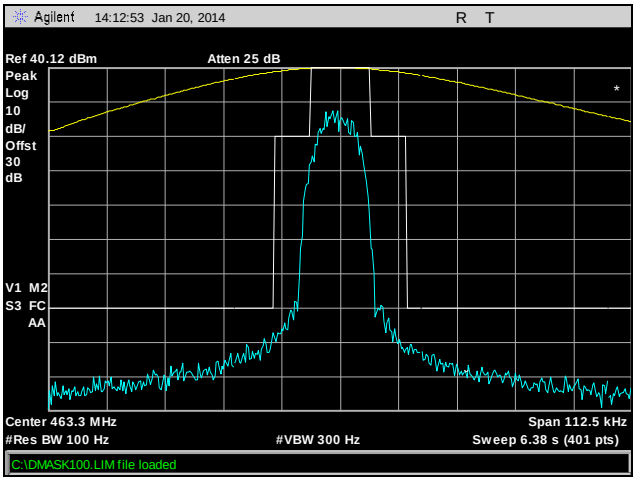
Plot 48. Part 90, Emission Mask, 456 MHz, HDQPSK, 100 W



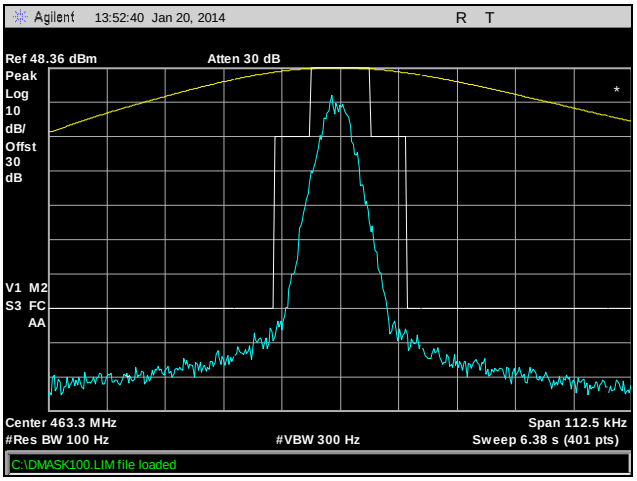
Plot 49. Part 90, Emission Mask, 463 MHz, C4FM, 10 W



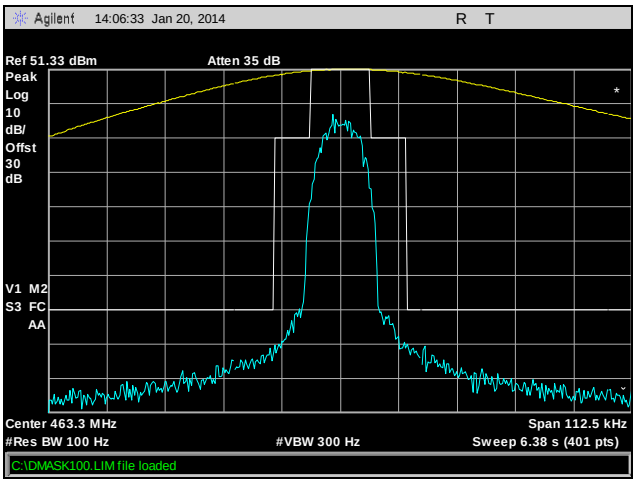
Plot 50. Part 90, Emission Mask, 463 MHz, CQPSK, 10 W



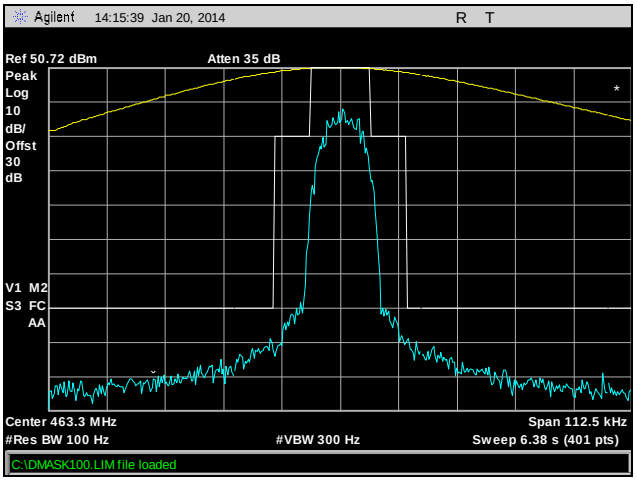
Plot 51. Part 90, Emission Mask, 463 MHz, HDQPSK, 10 W



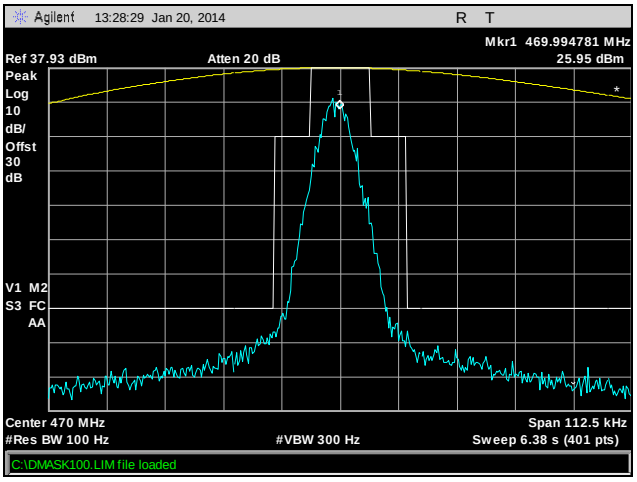
Plot 52. Part 90, Emission Mask, 463 MHz, C4FM, 100 W



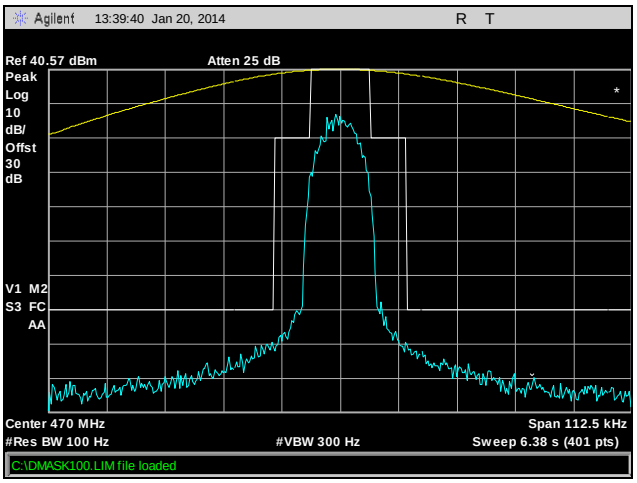
Plot 53. Part 90, Emission Mask, 463 MHz, CQPSK, 100 W



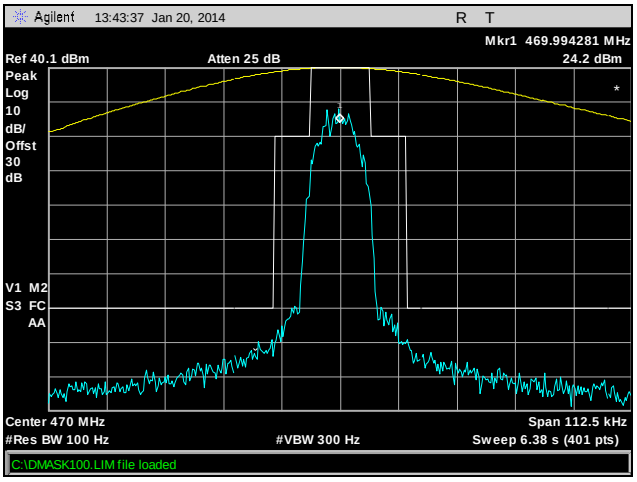
Plot 54. Part 90, Emission Mask, 463 MHz, HDQPSK, 100 W



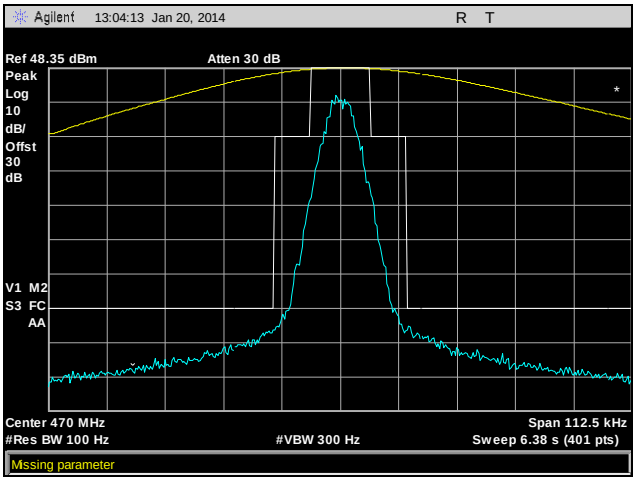
Plot 55. Part 90, Emission Mask, 470 MHz, C4FM, 10 W



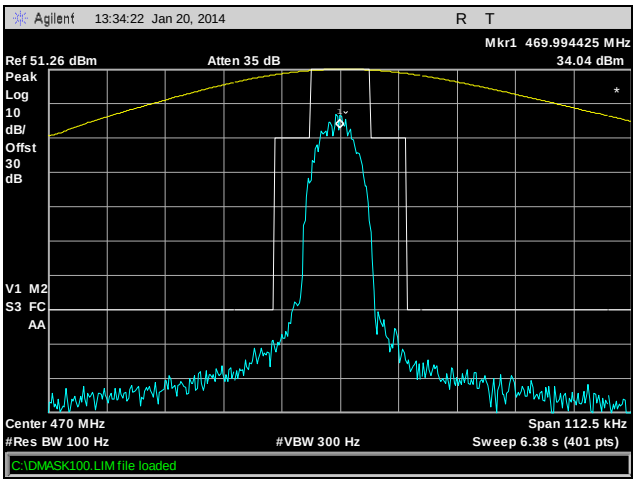
Plot 56. Part 90, Emission Mask, 470 MHz, CQPSK, 10 W



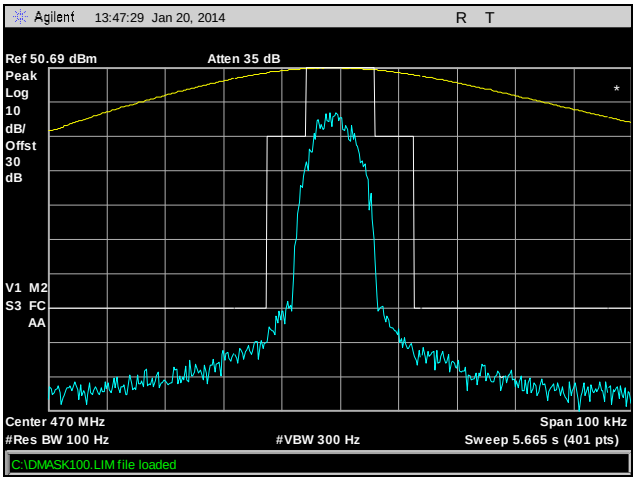
Plot 57. Part 90, Emission Mask, 470 MHz, HDQPSK, 10 W



Plot 58. Part 90, Emission Mask, 470 MHz, C4FM, 100 W

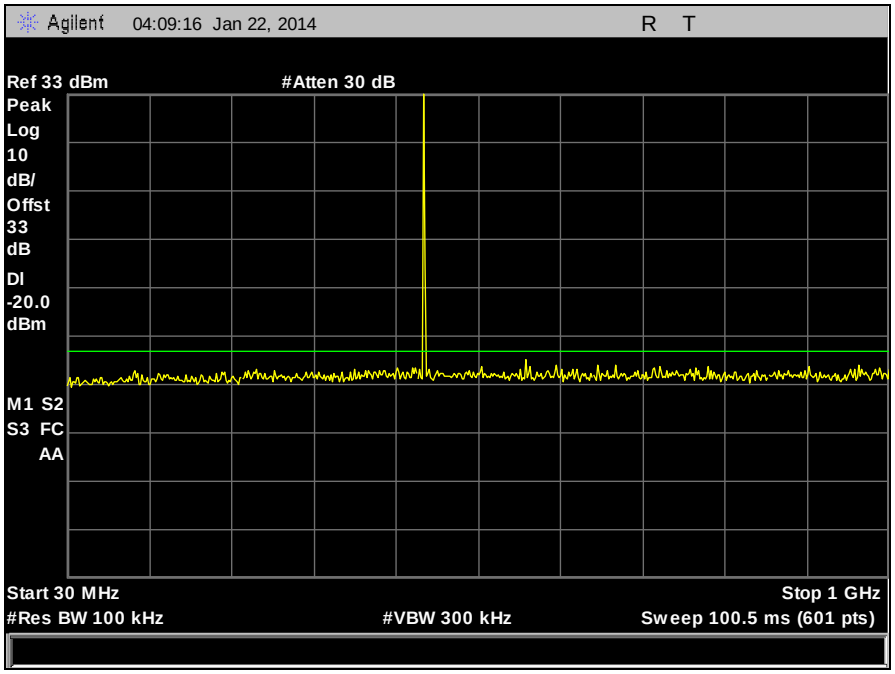


Plot 59. Part 90, Emission Mask, 470 MHz, CQPSK, 100 W

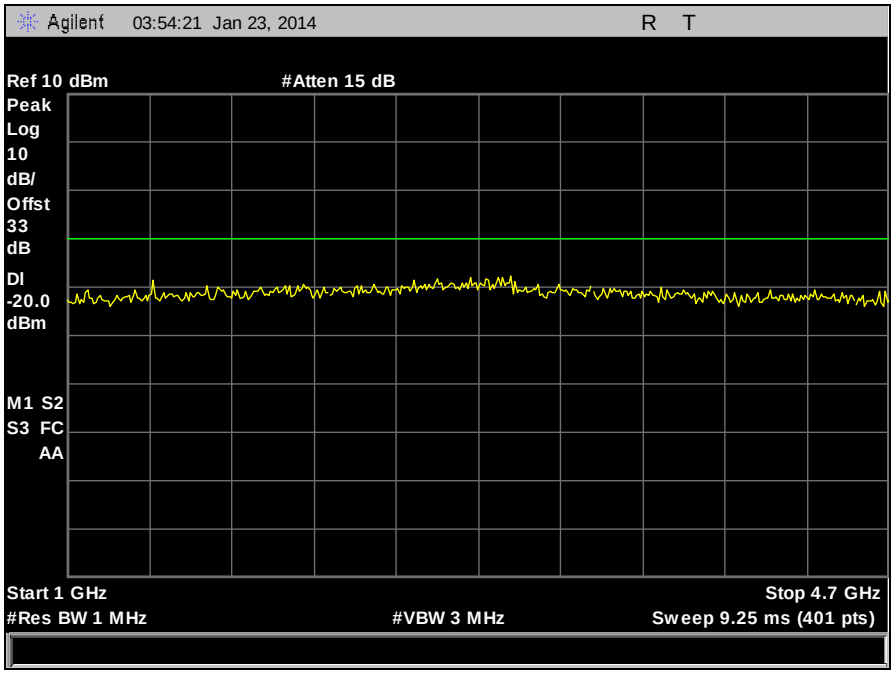


Plot 60. Part 90, Emission Mask, 470 MHz, HDQPSK, 100 W

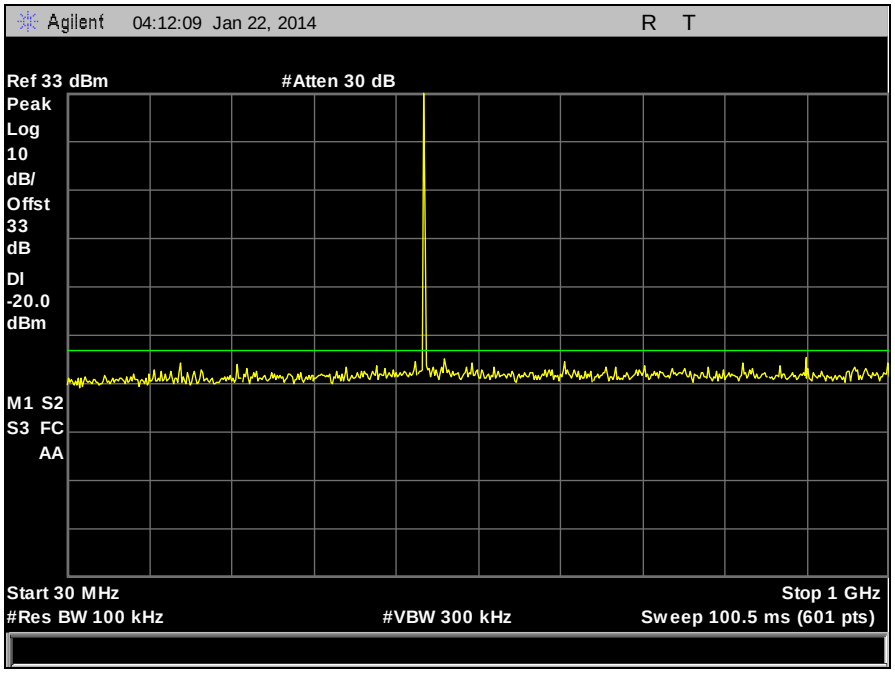
Conducted Spurious Emissions



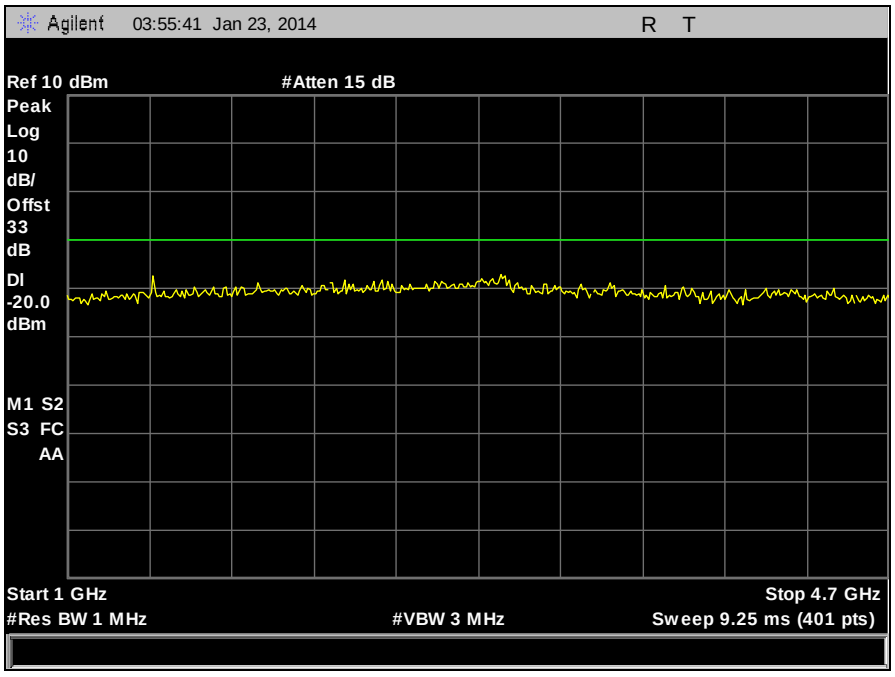
Plot 61. Part 90, Conducted Spurious Emissions, 450 MHz, C4FM, 10 W, 30 MHz – 1 GHz



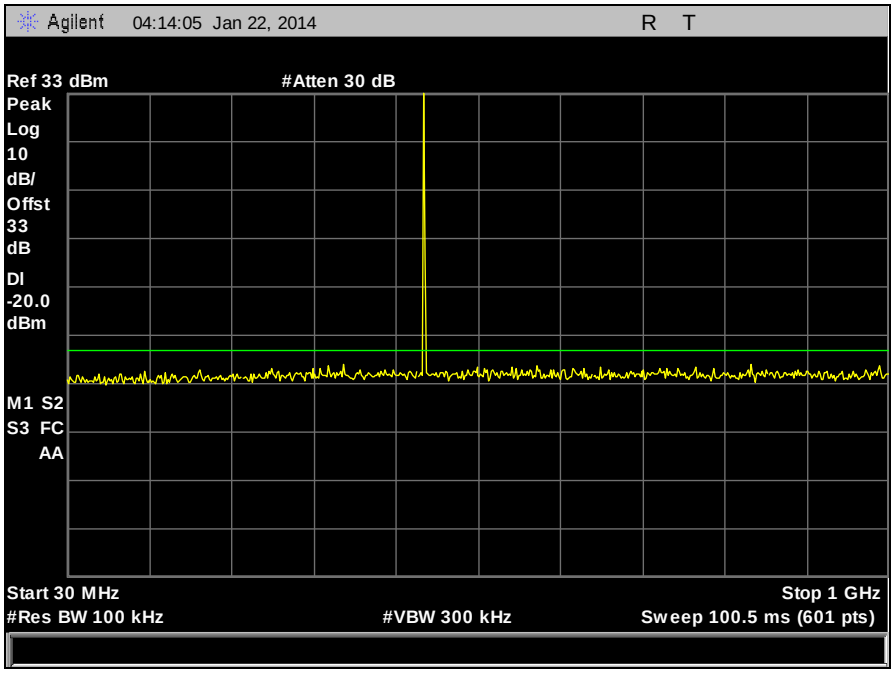
Plot 62. Part 90, Conducted Spurious Emissions, 450 MHz, C4FM, 10 W, 1 GHz – 4.7 GHz



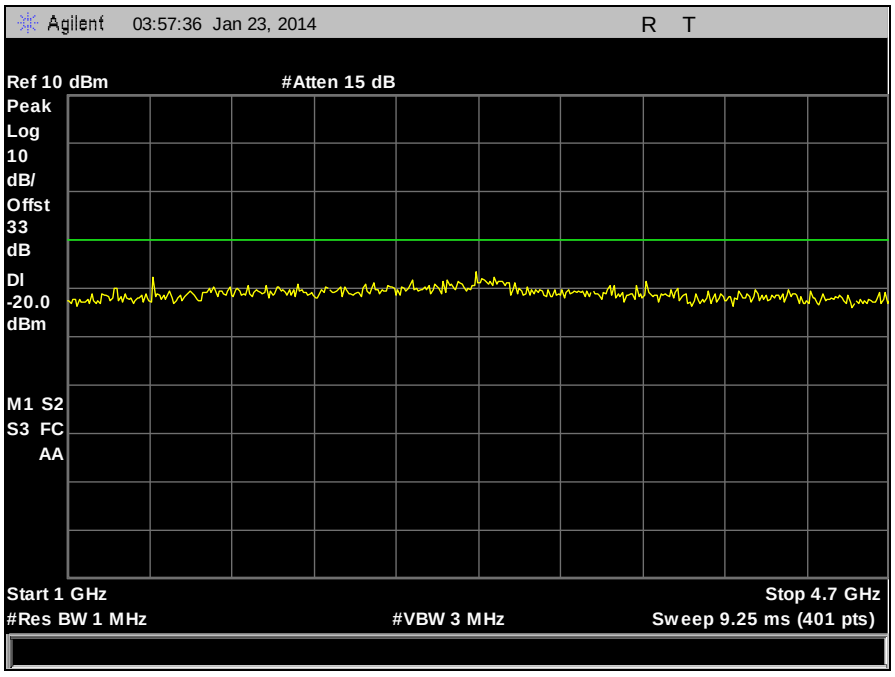
Plot 63. Part 90, Conducted Spurious Emissions, 450 MHz, CQPSK, 10 W, 30 MHz – 1 GHz



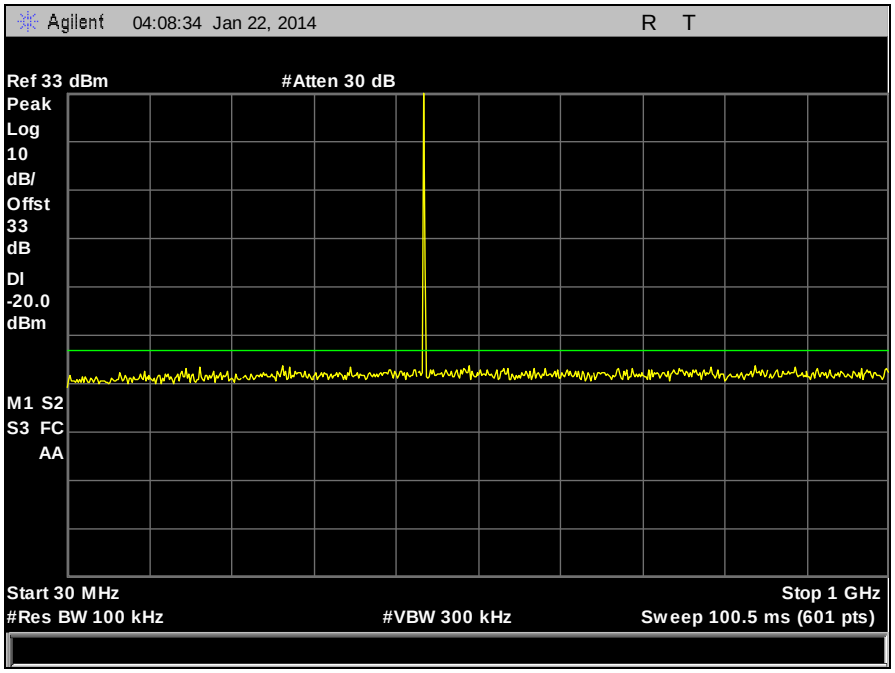
Plot 64. Part 90, Conducted Spurious Emissions, 450 MHz, CQPSK, 10 W, 1 GHz – 4.7 GHz



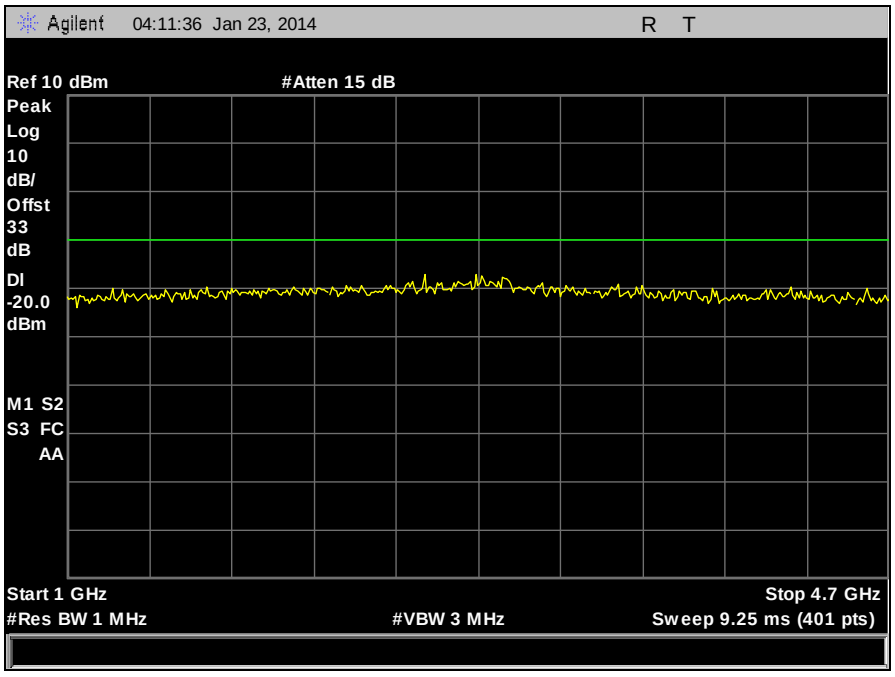
Plot 65. Part 90, Conducted Spurious Emissions, 450 MHz, HDQPSK, 10 W, 30 MHz – 1 GHz



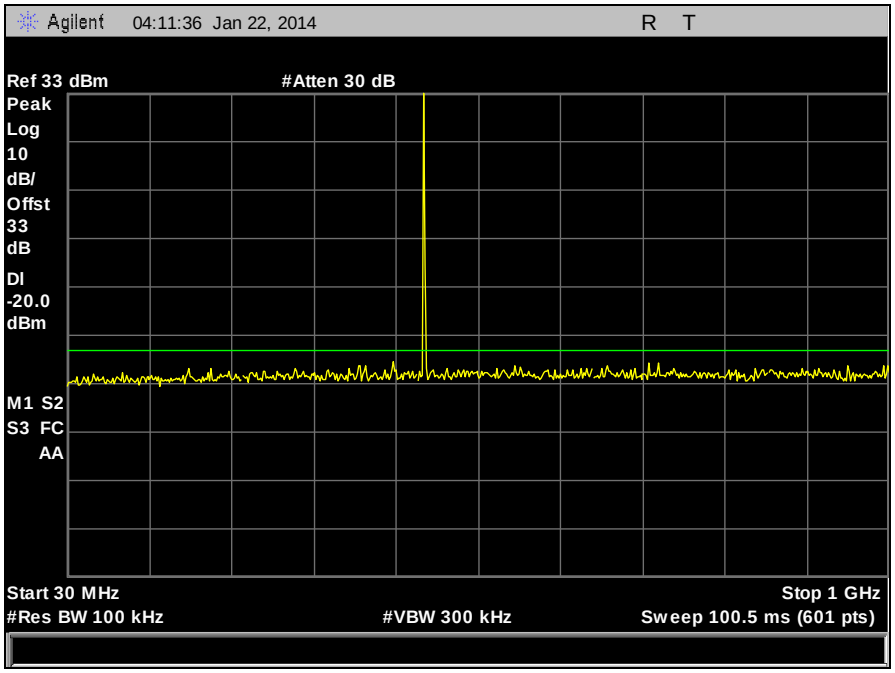
Plot 66. Part 90, Conducted Spurious Emissions, 450 MHz, HDQPSK, 10 W, 1 GHz – 4.7 GHz



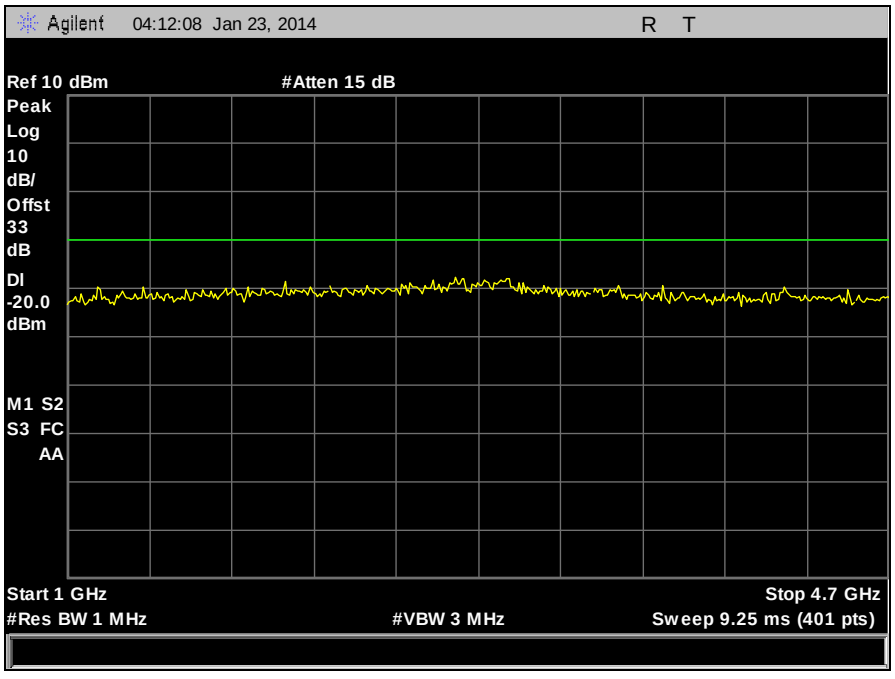
Plot 67. Part 90, Conducted Spurious Emissions, 450 MHz, C4FM, 100 W, 30 MHz – 1 GHz



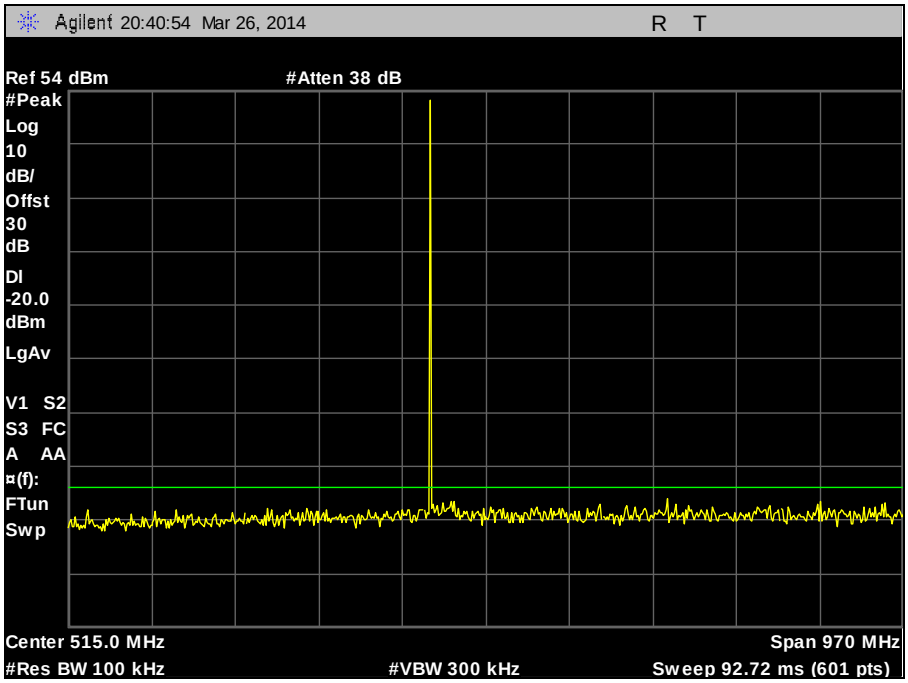
Plot 68. Part 90, Conducted Spurious Emissions, 450 MHz, C4FM, 100 W, 1 GHz – 4.7 GHz



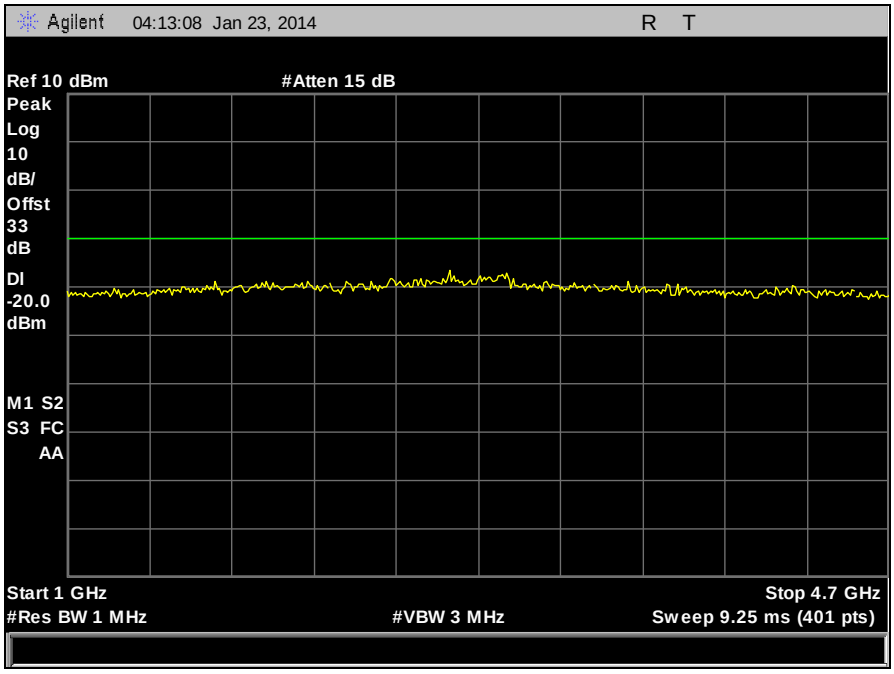
Plot 69. Part 90, Conducted Spurious Emissions, 450 MHz, CQPSK, 100 W, 30 MHz – 1 GHz



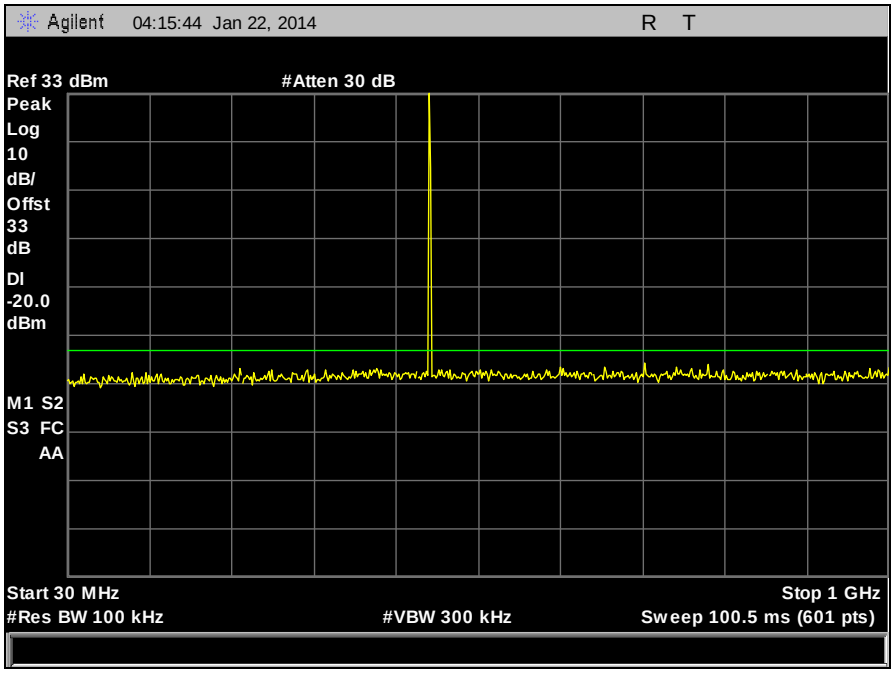
Plot 70. Part 90, Conducted Spurious Emissions, 450 MHz, CQPSK, 100 W, 1 GHz – 4.7 GHz



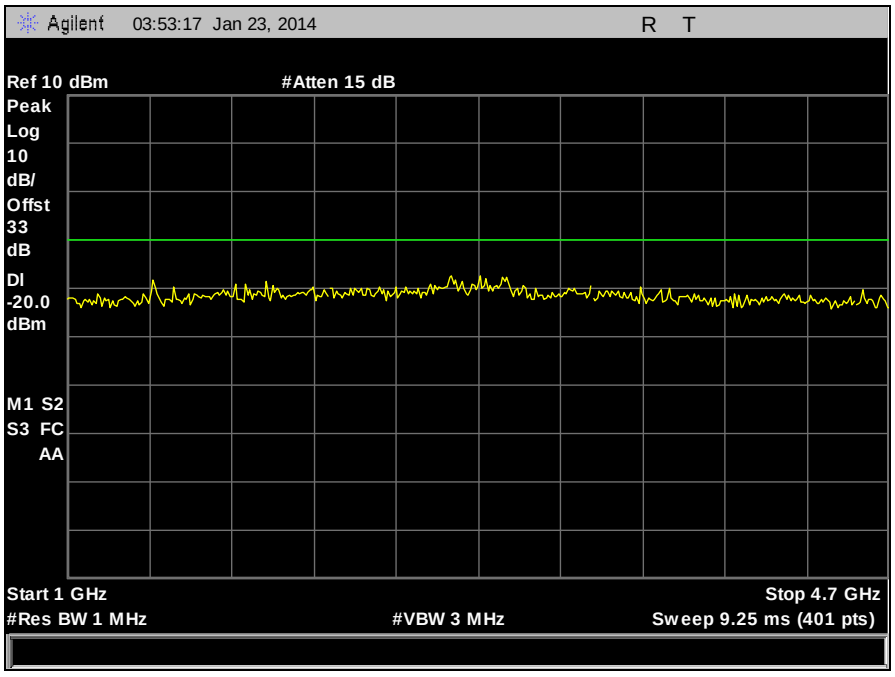
Plot 71. Part 90, Conducted Spurious Emissions, 450 MHz, HDQPSK, 100 W, 30 MHz – 1 GHz



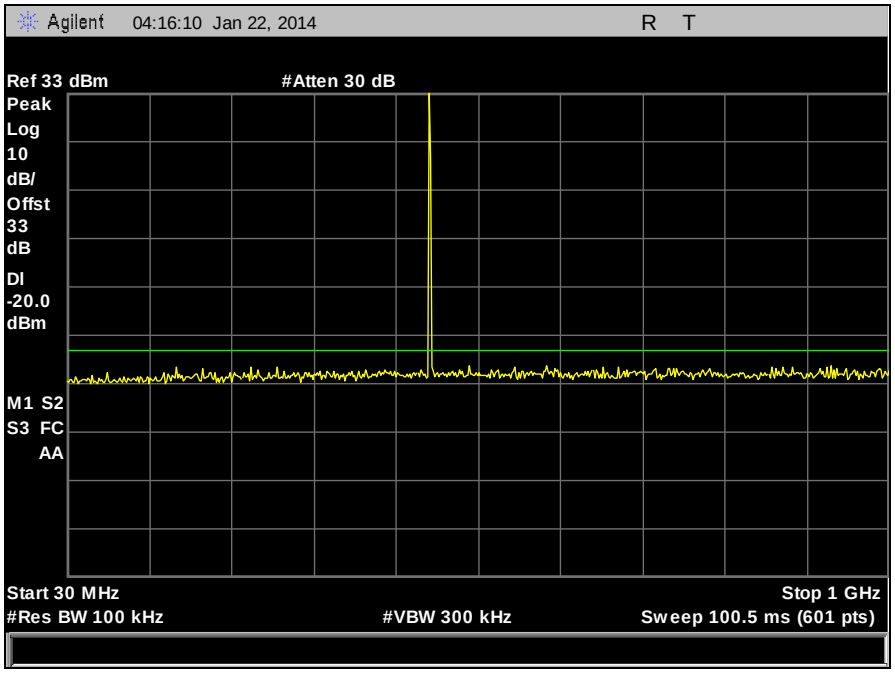
Plot 72. Part 90, Conducted Spurious Emissions, 450 MHz, HDQPSK, 100 W, 1 GHz – 4.7 GHz



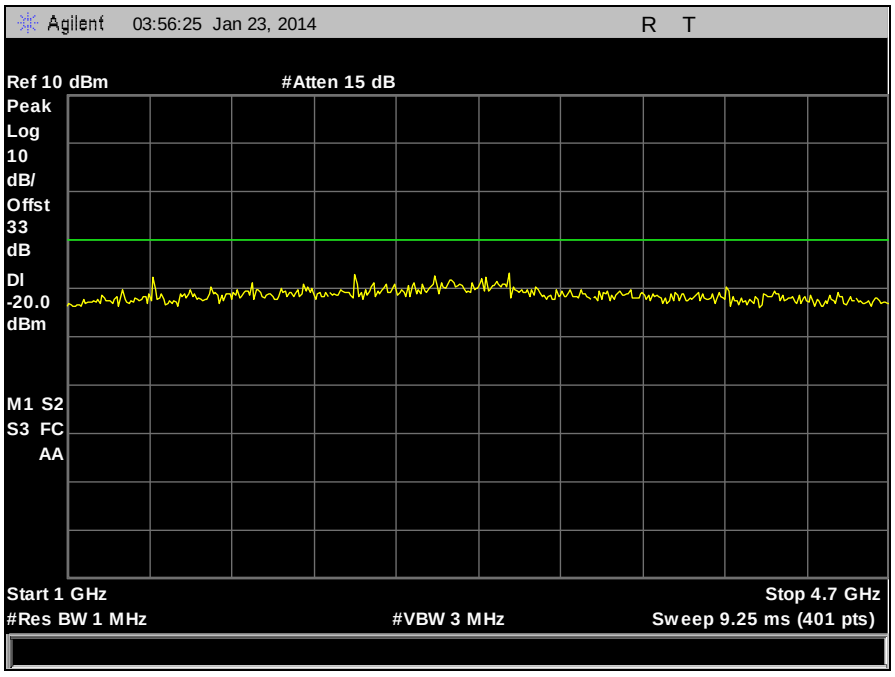
Plot 73. Part 90, Conducted Spurious Emissions, 456 MHz, C4FM, 10 W, 30 MHz – 1 GHz



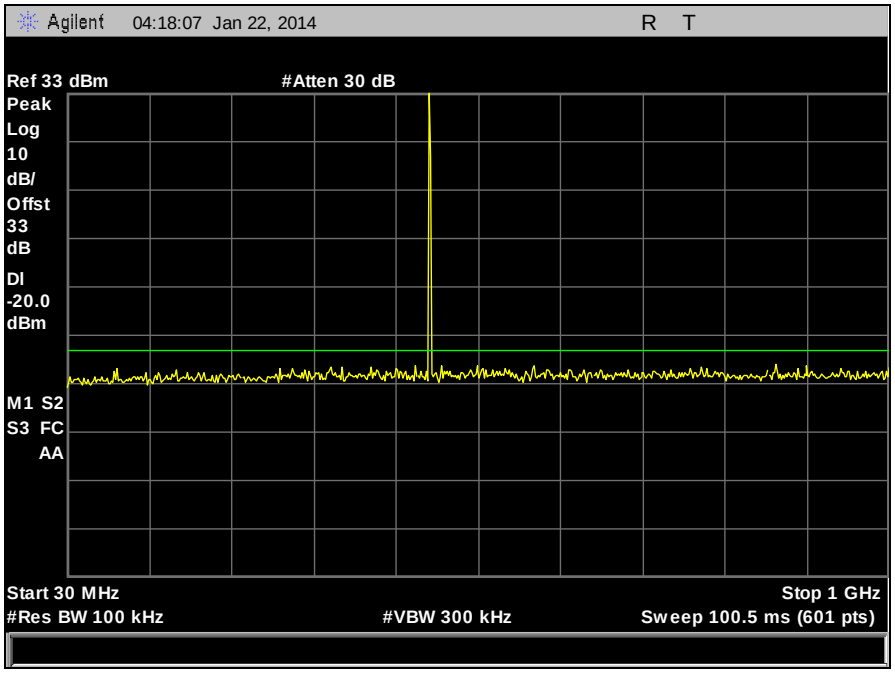
Plot 74. Part 90, Conducted Spurious Emissions, 456 MHz, C4FM, 10 W, 1 GHz – 4.7 GHz



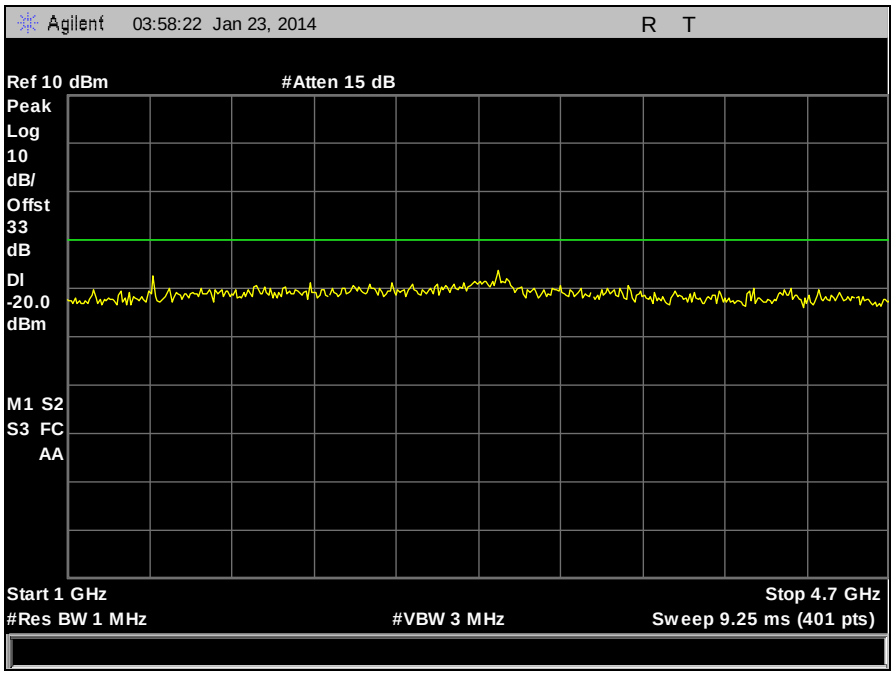
Plot 75. Part 90, Conducted Spurious Emissions, 456 MHz, CQPSK, 10 W, 30 MHz – 1 GHz



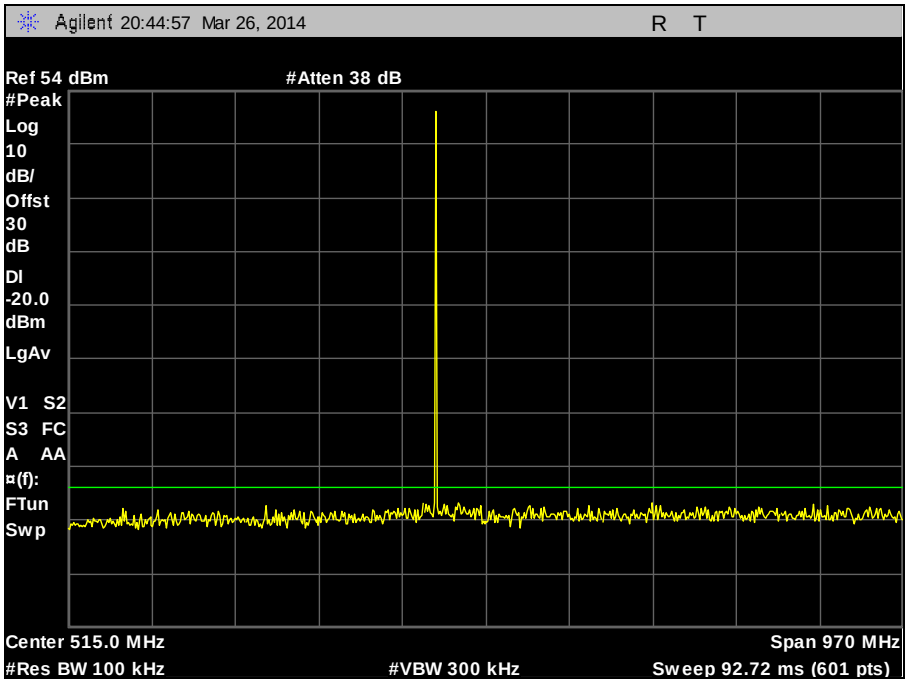
Plot 76. Part 90, Conducted Spurious Emissions, 456 MHz, CQPSK, 10 W, 1 GHz – 4.7 GHz



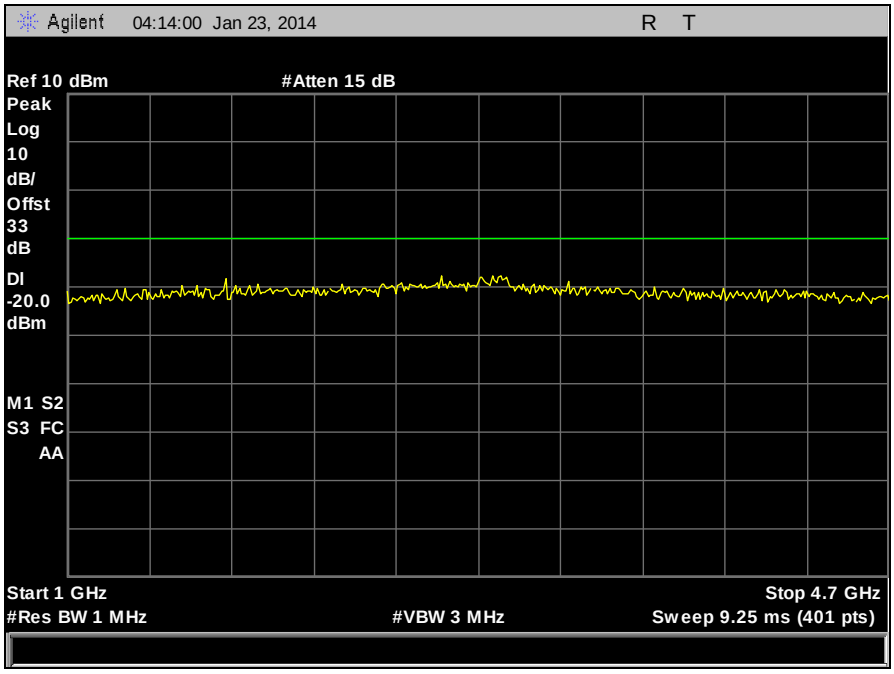
Plot 77. Part 90, Conducted Spurious Emissions, 456 MHz, HDQPSK, 10 W, 30 MHz – 1 GHz



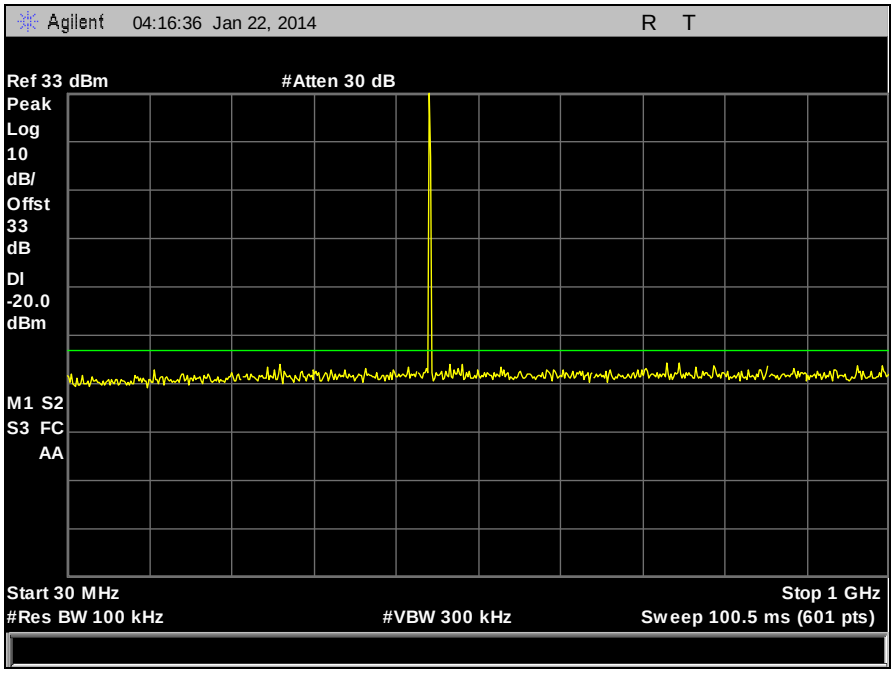
Plot 78. Part 90, Conducted Spurious Emissions, 456 MHz, HDQPSK, 10 W, 1 GHz – 4.7 GHz



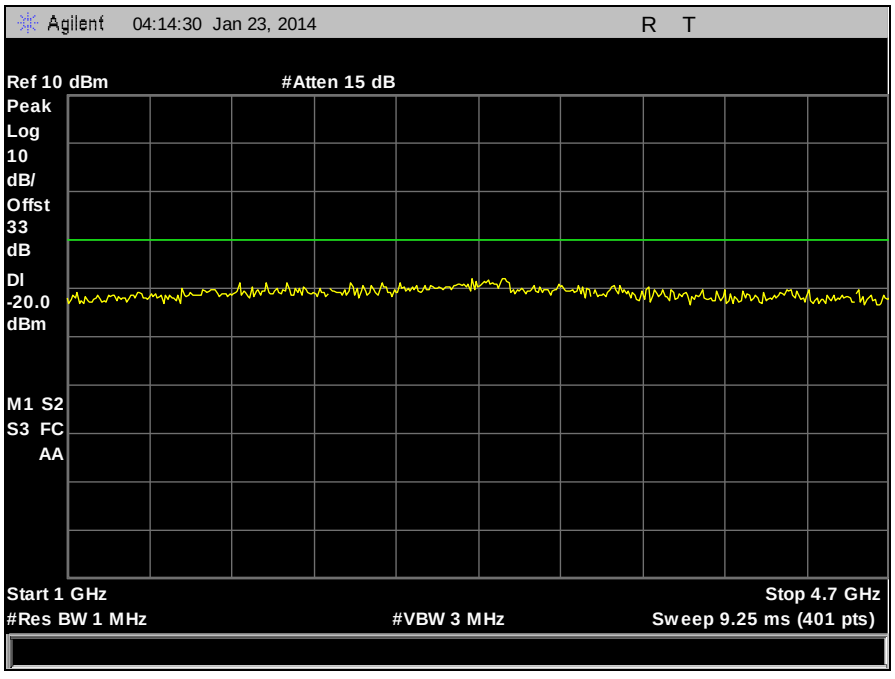
Plot 79. Part 90, Conducted Spurious Emissions, 456 MHz, C4FM, 100 W, 30 MHz – 1 GHz



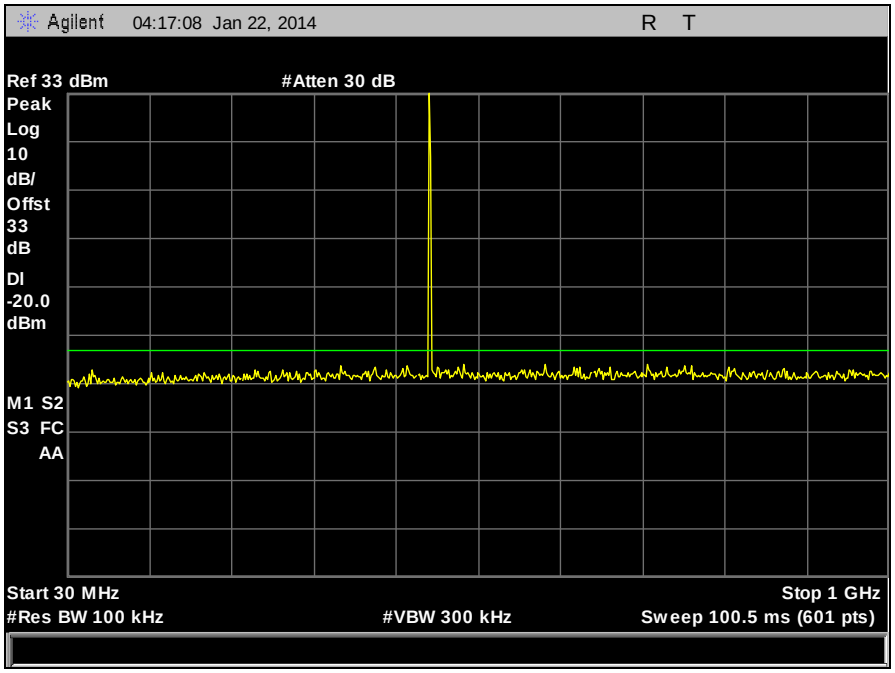
Plot 80. Part 90, Conducted Spurious Emissions, 456 MHz, C4FM, 100 W, 1 GHz – 4.7 GHz



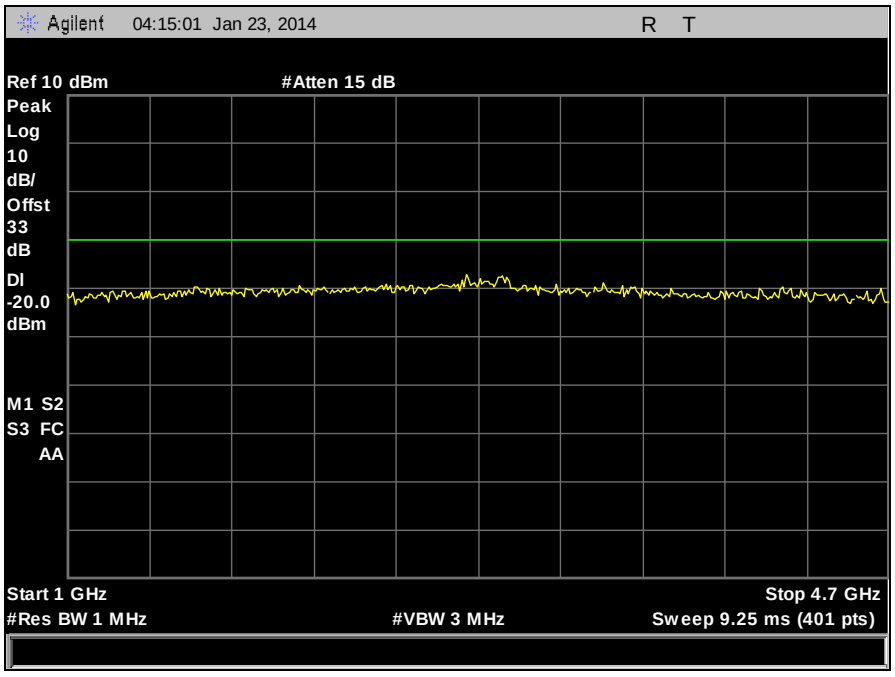
Plot 81. Part 90, Conducted Spurious Emissions, 456 MHz, CQPSK, 100 W, 30 MHz – 1 GHz



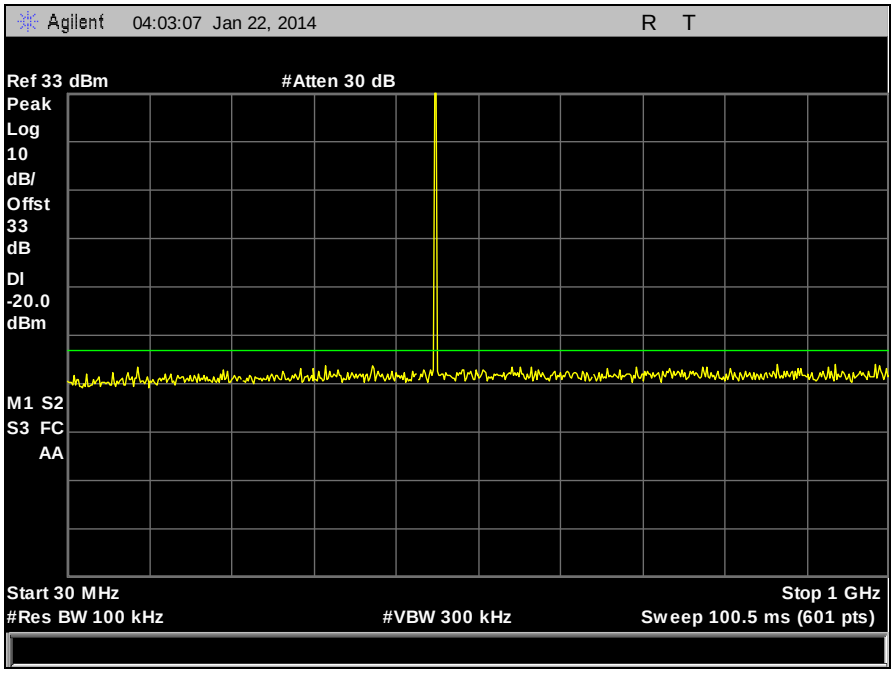
Plot 82. Part 90, Conducted Spurious Emissions, 456 MHz, CQPSK, 100 W, 1 GHz – 4.7 GHz



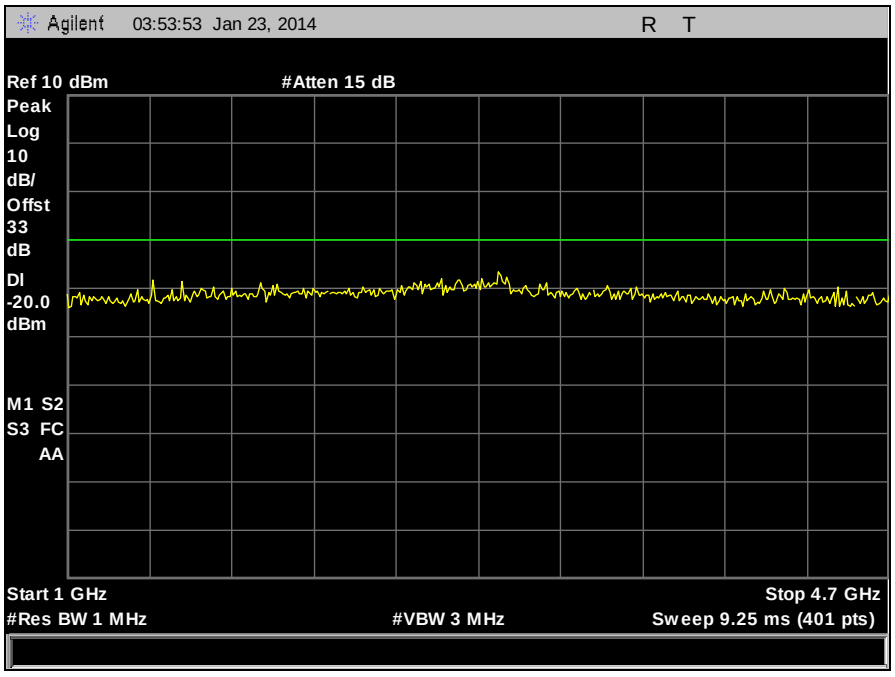
Plot 83. Part 90, Conducted Spurious Emissions, 456 MHz, HDQPSK, 100 W, 30 MHz – 1 GHz



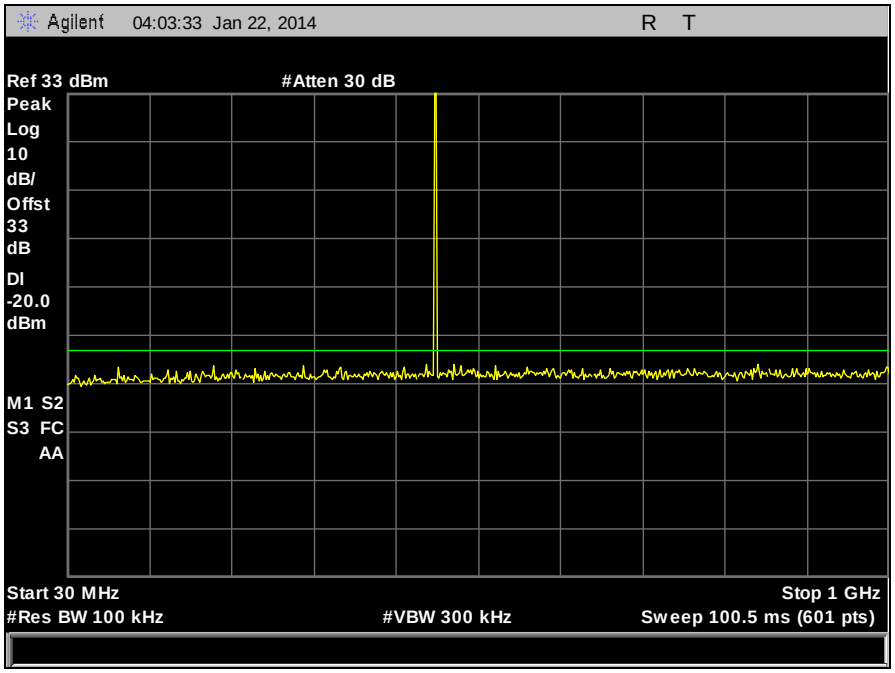
Plot 84. Part 90, Conducted Spurious Emissions, 456 MHz, HDQPSK, 100 W, 1 GHz – 4.7 GHz



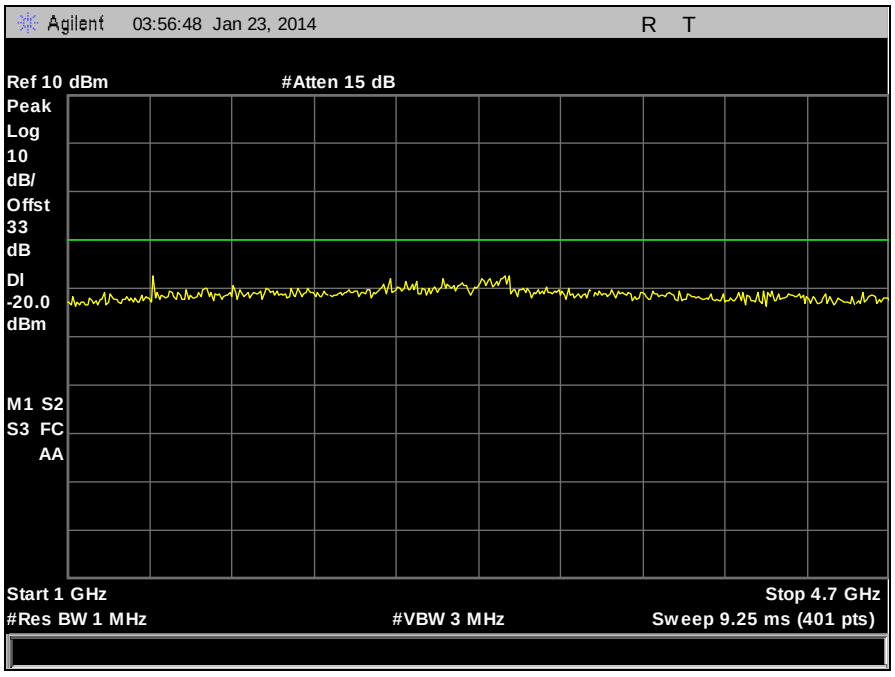
Plot 85. Part 90, Conducted Spurious Emissions, 463 MHz, C4FM, 10 W, 30 MHz – 1 GHz



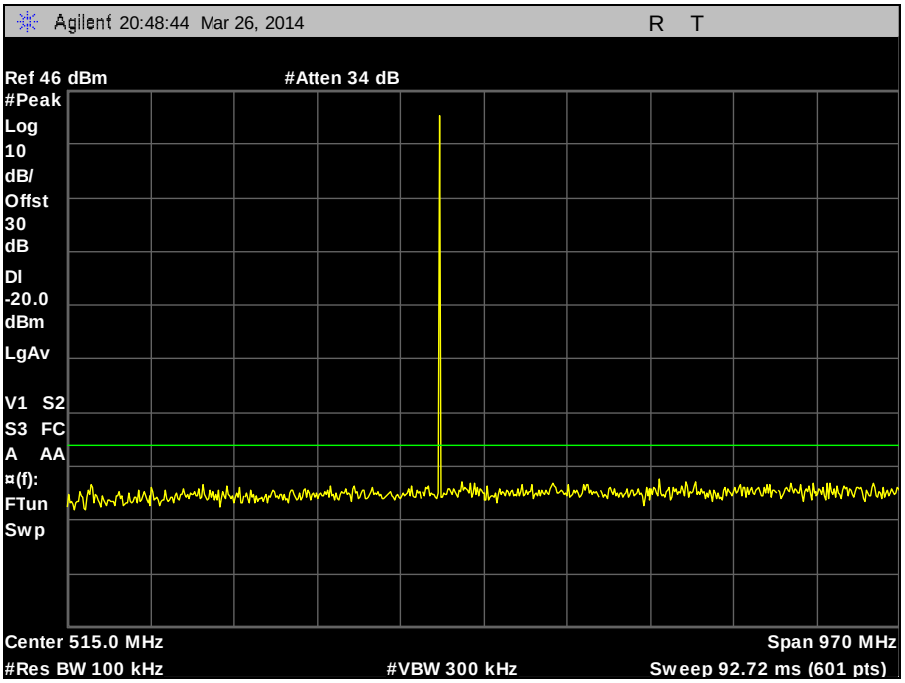
Plot 86. Part 90, Conducted Spurious Emissions, 463 MHz, C4FM, 10 W, 1 GHz – 4.7 GHz



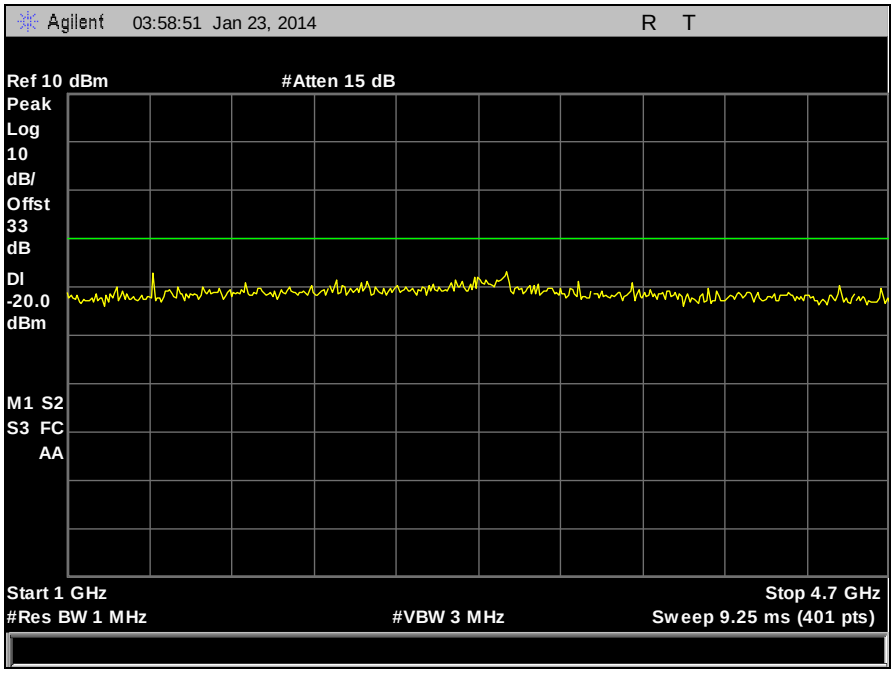
Plot 87. Part 90, Conducted Spurious Emissions, 463 MHz, CQPSK, 10 W, 30 MHz – 1 GHz



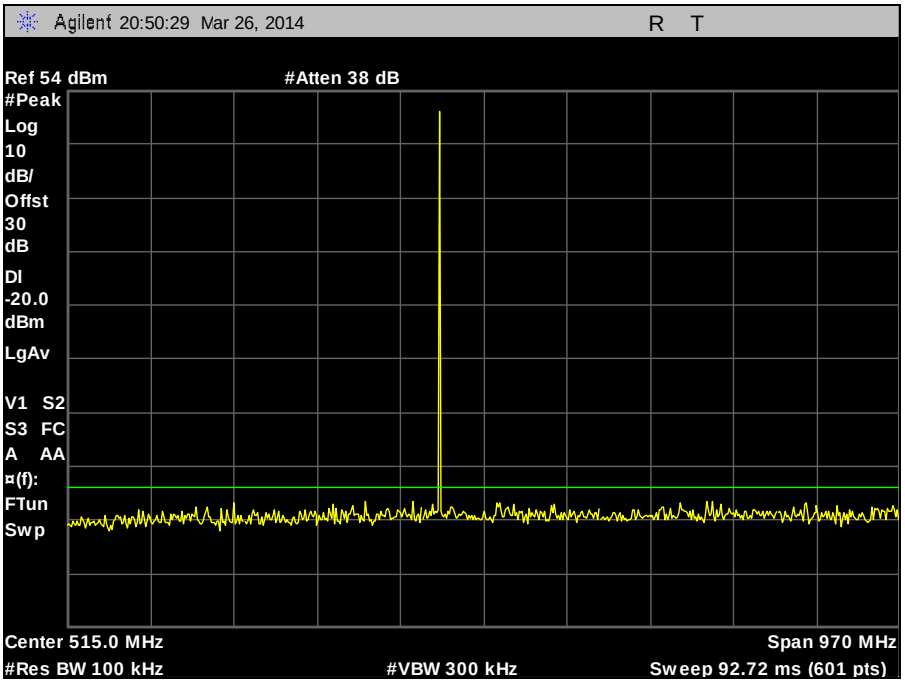
Plot 88. Part 90, Conducted Spurious Emissions, 463 MHz, CQPSK, 10 W, 1 GHz – 4.7 GHz



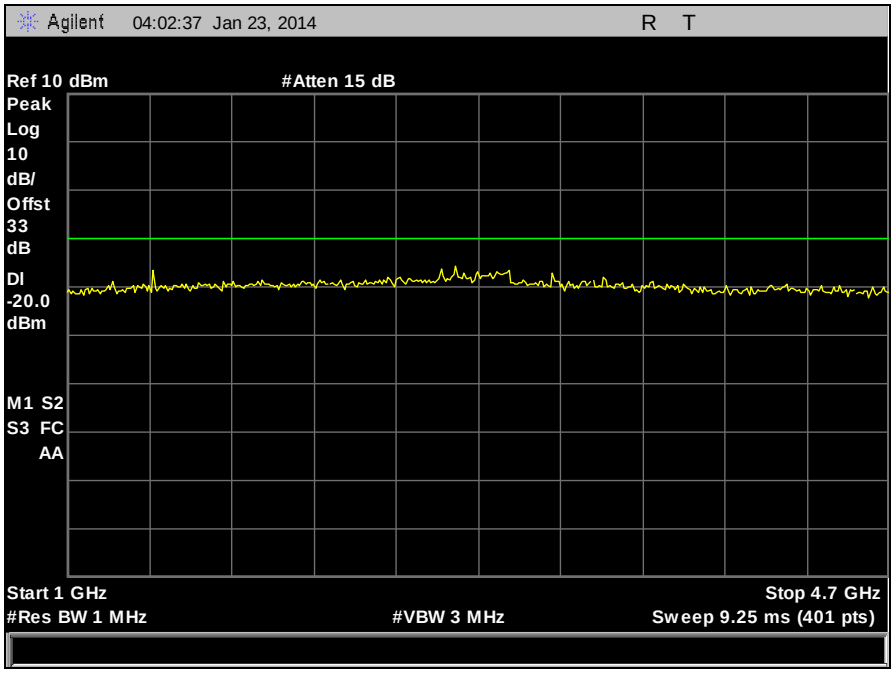
Plot 89. Part 90, Conducted Spurious Emissions, 463 MHz, HDQPSK, 10 W, 30 MHz – 1 GHz



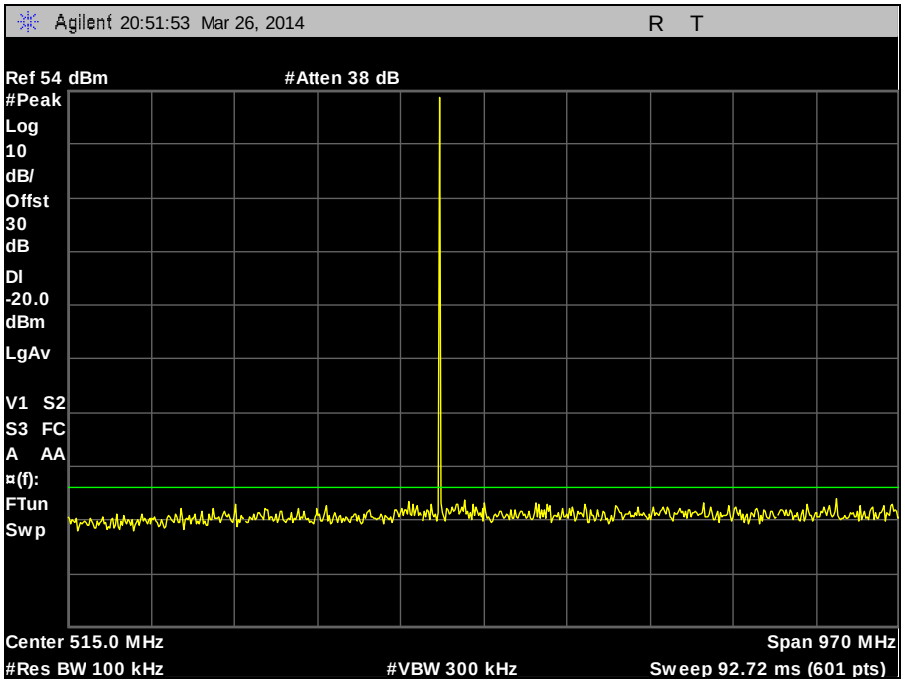
Plot 90. Part 90, Conducted Spurious Emissions, 463 MHz, HDQPSK, 10 W, 1 GHz – 4.7 GHz



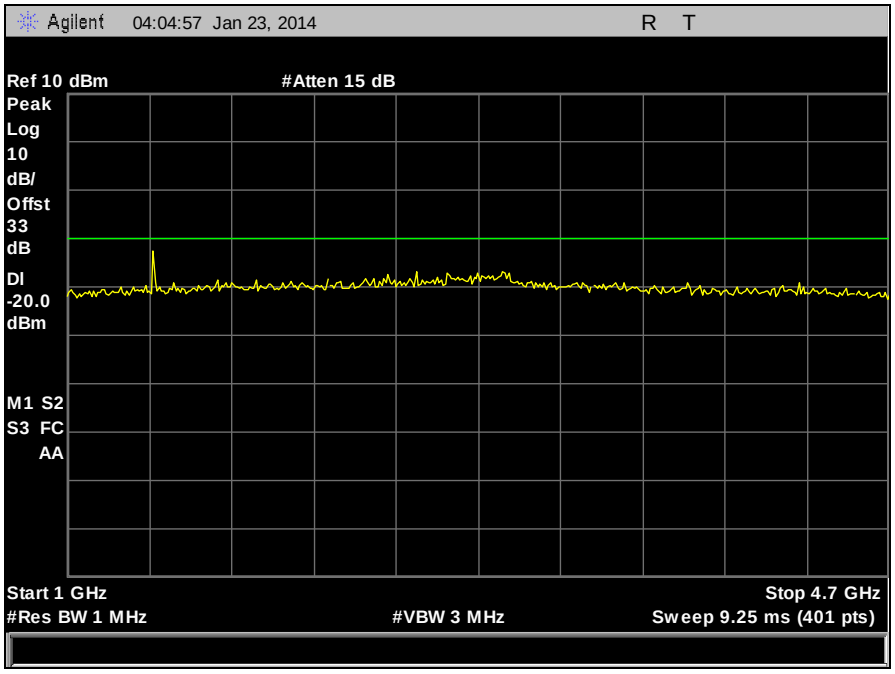
Plot 91. Part 90, Conducted Spurious Emissions, 463 MHz, C4FM, 100 W, 30 MHz – 1 GHz



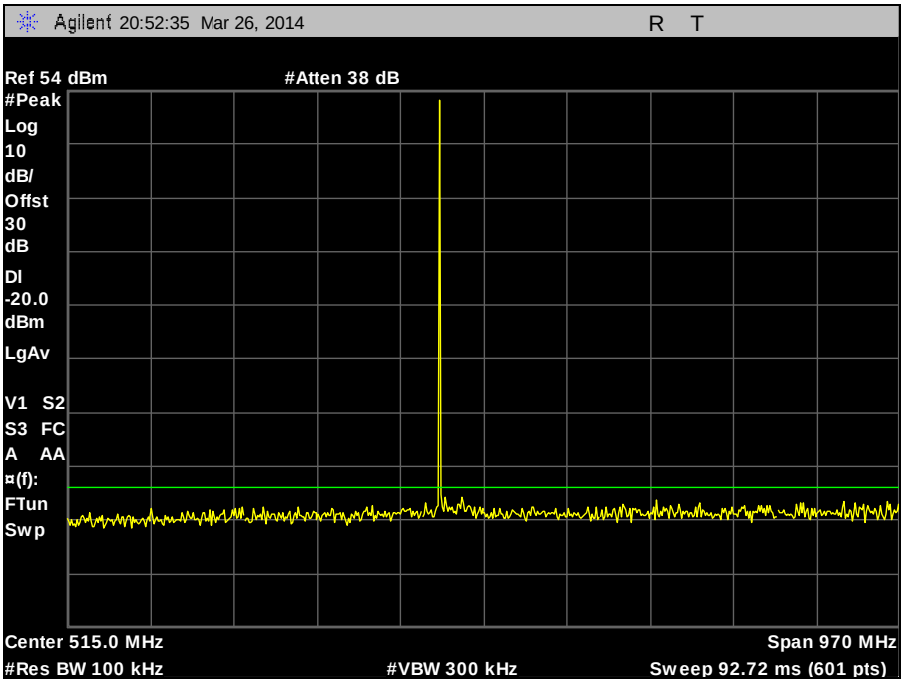
Plot 92. Part 90, Conducted Spurious Emissions, 463 MHz, C4FM, 100 W, 1 GHz – 4.7 GHz



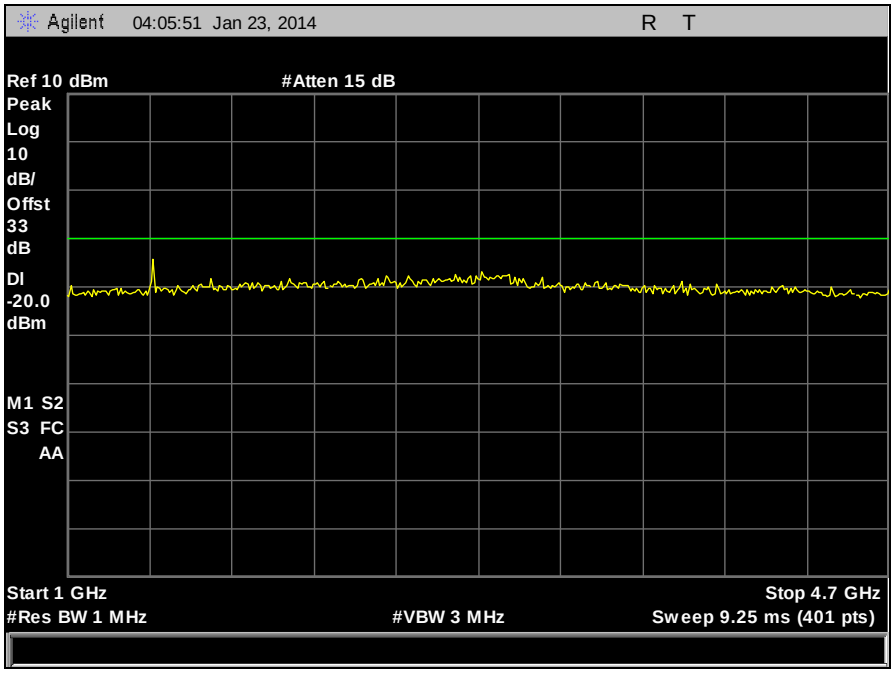
Plot 93. Part 90, Conducted Spurious Emissions, 463 MHz, CQPSK, 100 W, 30 MHz – 1GHz



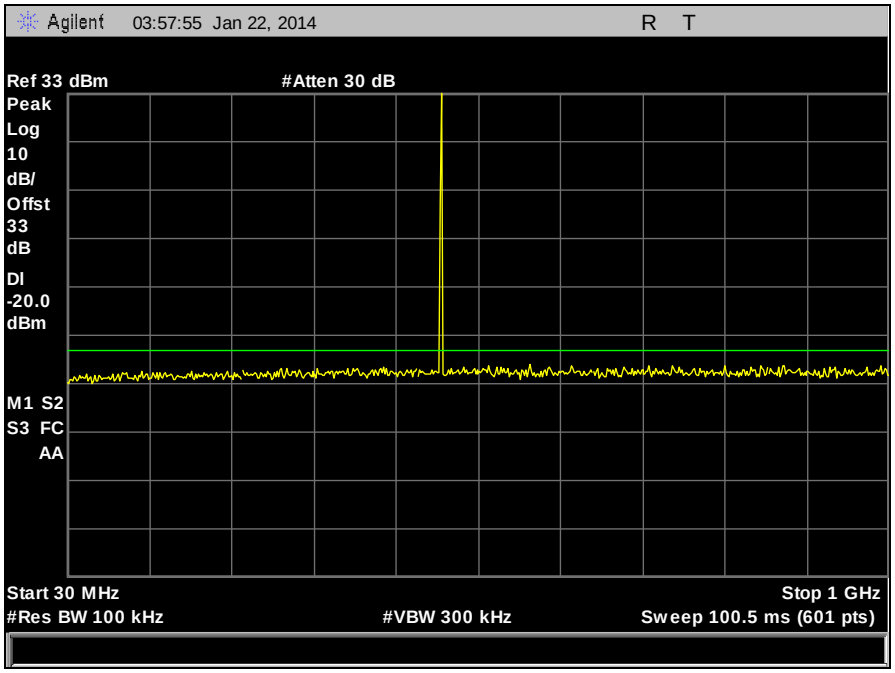
Plot 94. Part 90, Conducted Spurious Emissions, 463 MHz, CQPSK, 100 W, 1GHz – 4.7 GHz



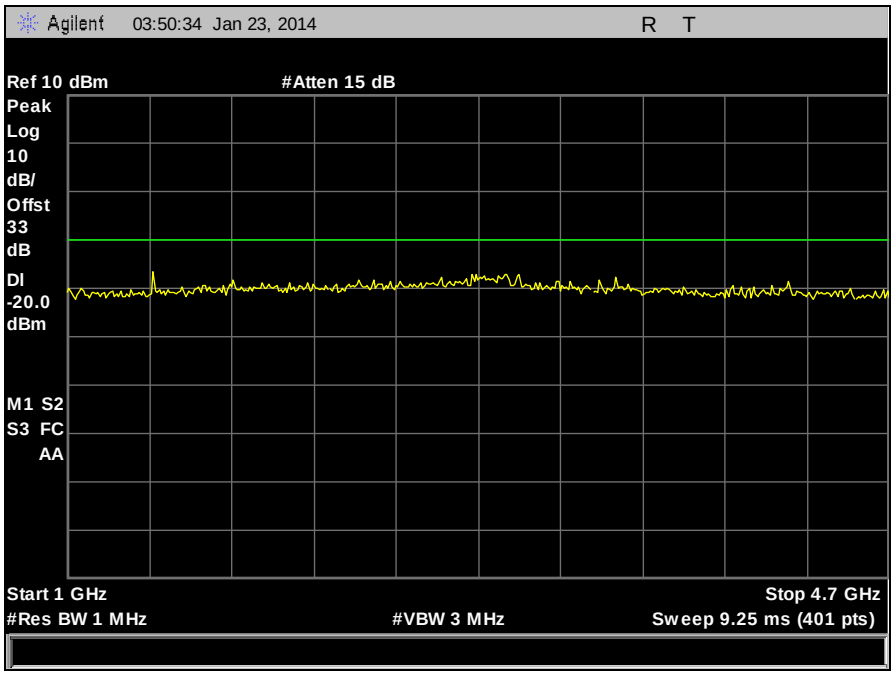
Plot 95. Part 90, Conducted Spurious Emissions, 463 MHz, HDQPSK, 100 W, 30 MHz – 1 GHz



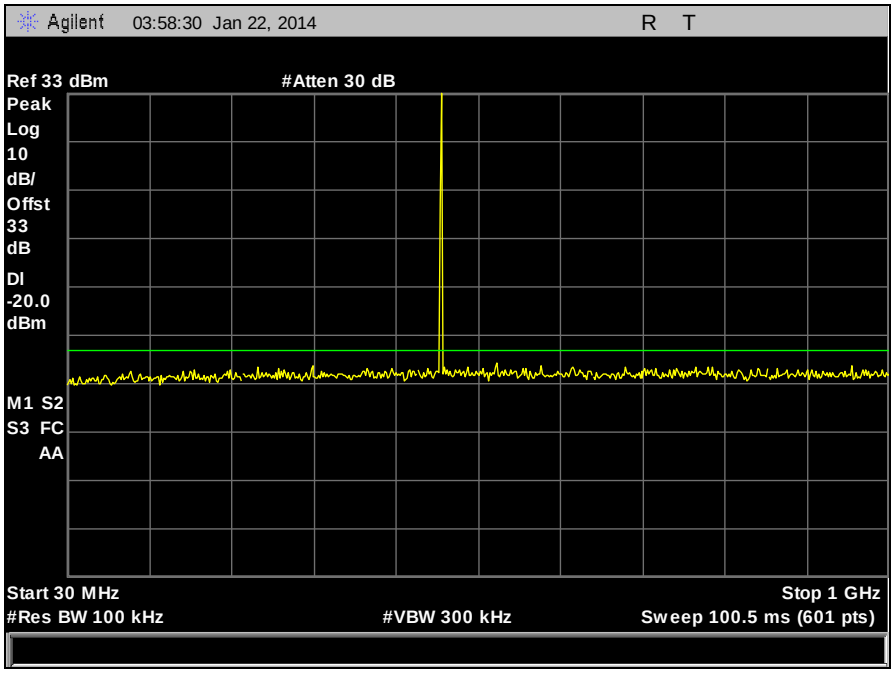
Plot 96. Part 90, Conducted Spurious Emissions, 463 MHz, HDQPSK, 100 W, 1 GHz – 4.7 GHz



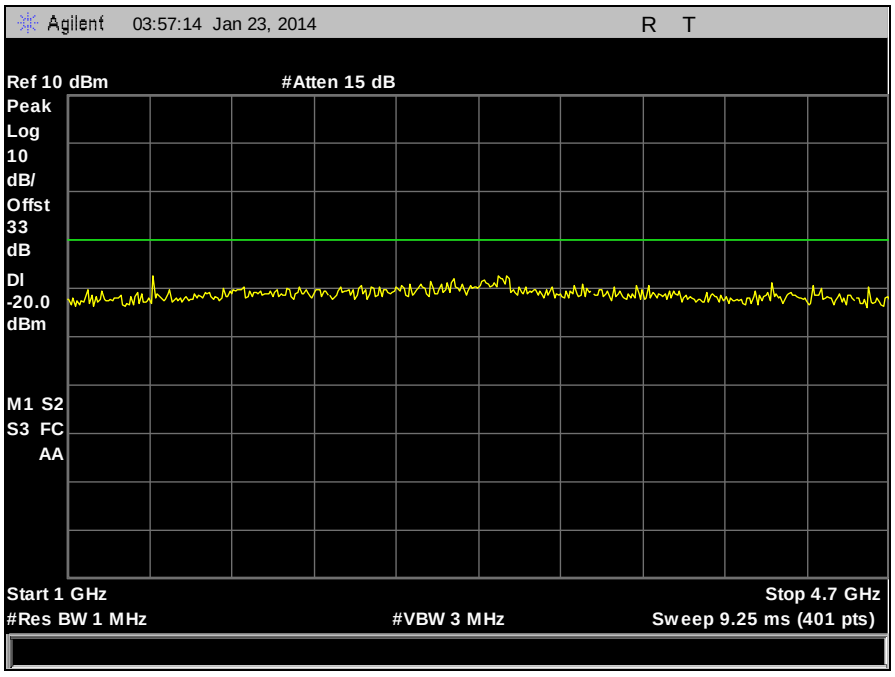
Plot 97. Part 90, Conducted Spurious Emissions, 470 MHz, C4FM, 10 W, 30 MHz – 1 GHz



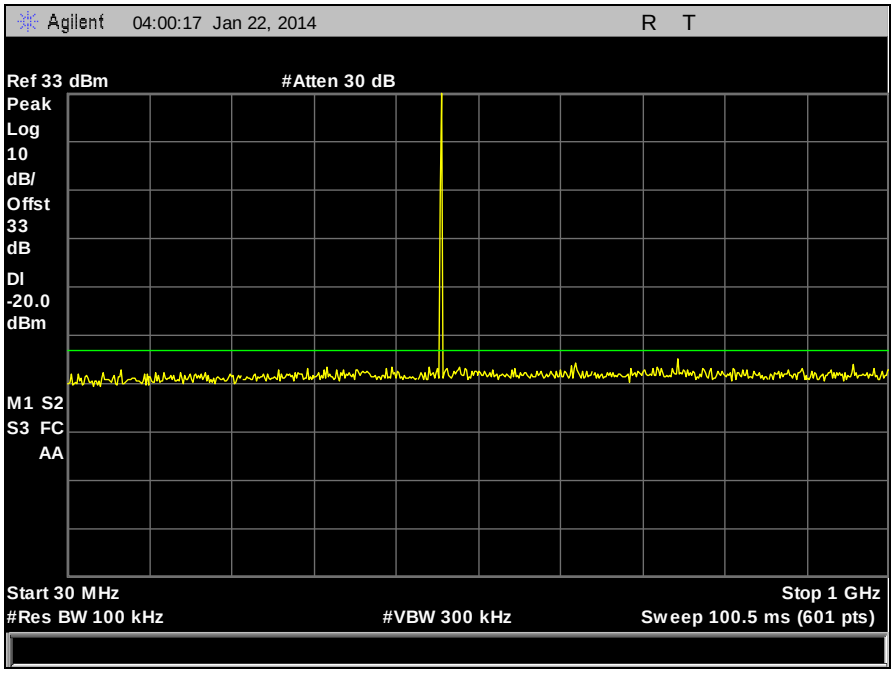
Plot 98. Part 90, Conducted Spurious Emissions, 470 MHz, C4FM, 10 W, 1 GHz – 4.7 GHz



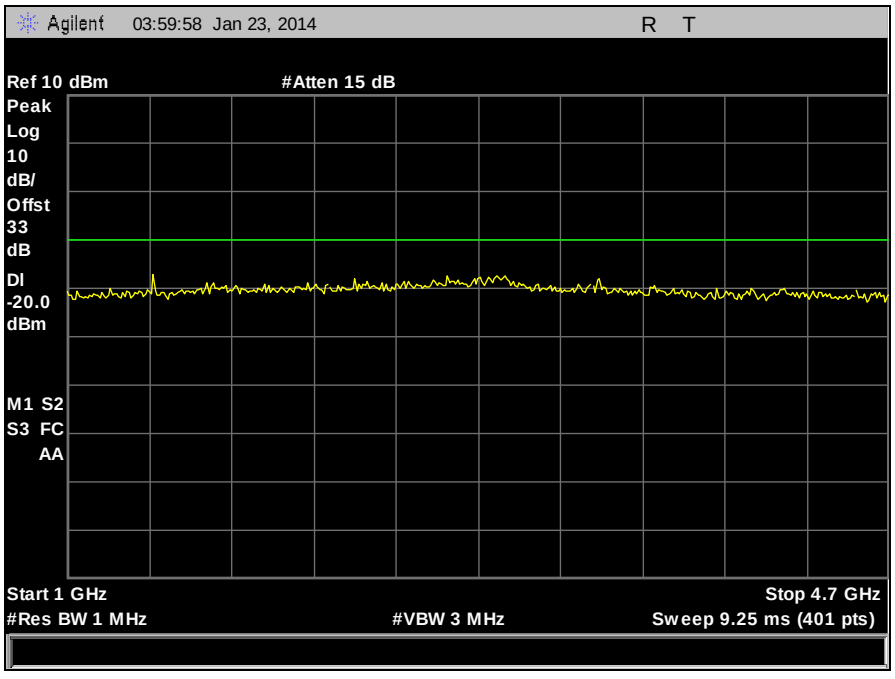
Plot 99. Part 90, Conducted Spurious Emissions, 470 MHz, CQPSK, 10 W, 30 MHz – 1 GHz



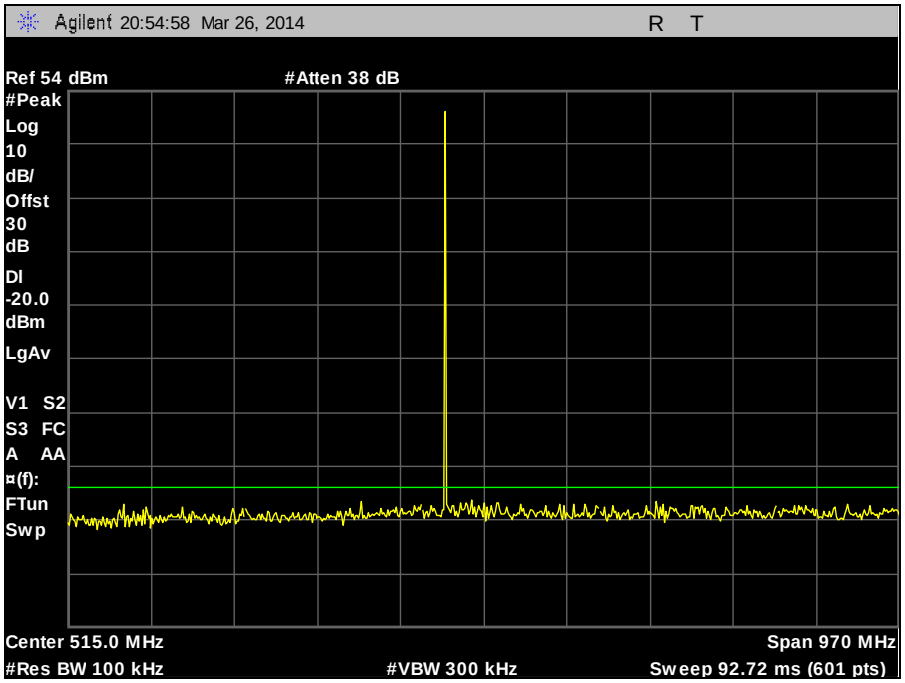
Plot 100. Part 90, Conducted Spurious Emissions, 470 MHz, CQPSK, 10 W, 1 GHz – 4.7 GHz



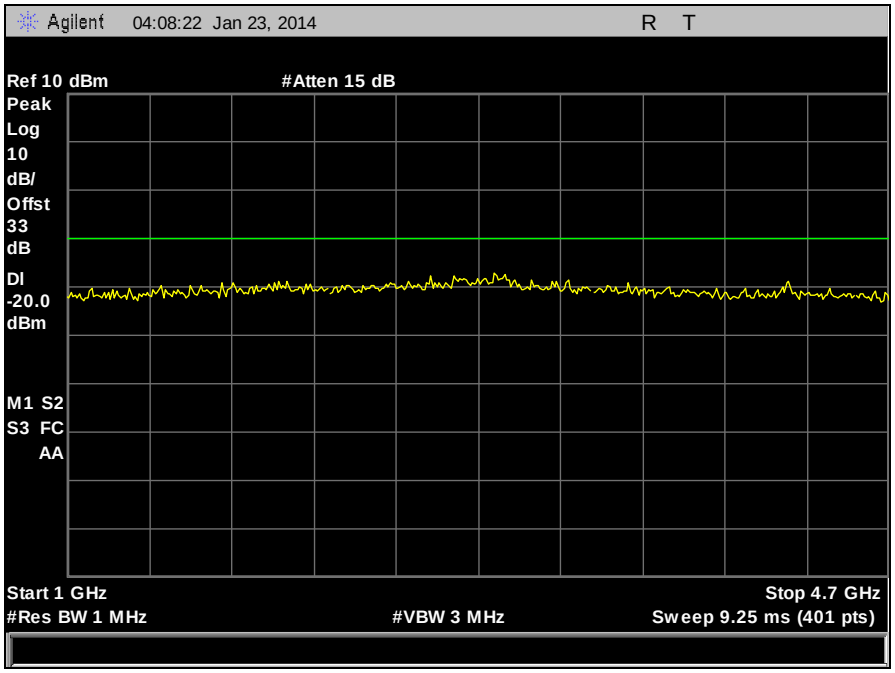
Plot 101. Part 90, Conducted Spurious Emissions, 470 MHz, HDQPSK, 10 W, 30 MHz – 1 GHz



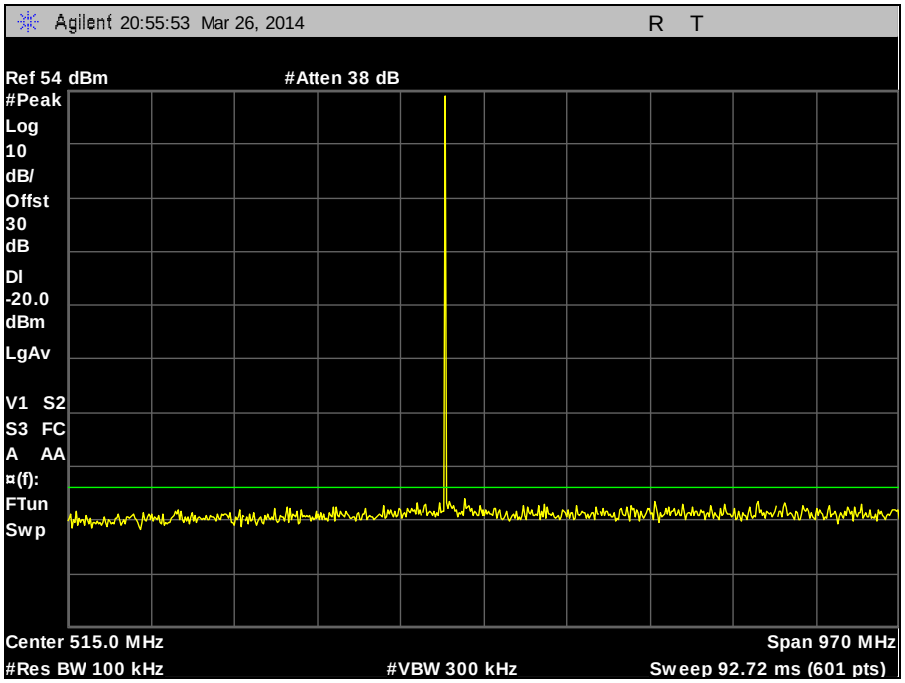
Plot 102. Part 90, Conducted Spurious Emissions, 470 MHz, HDQPSK, 10 W, 1 GHz – 4.7 GHz



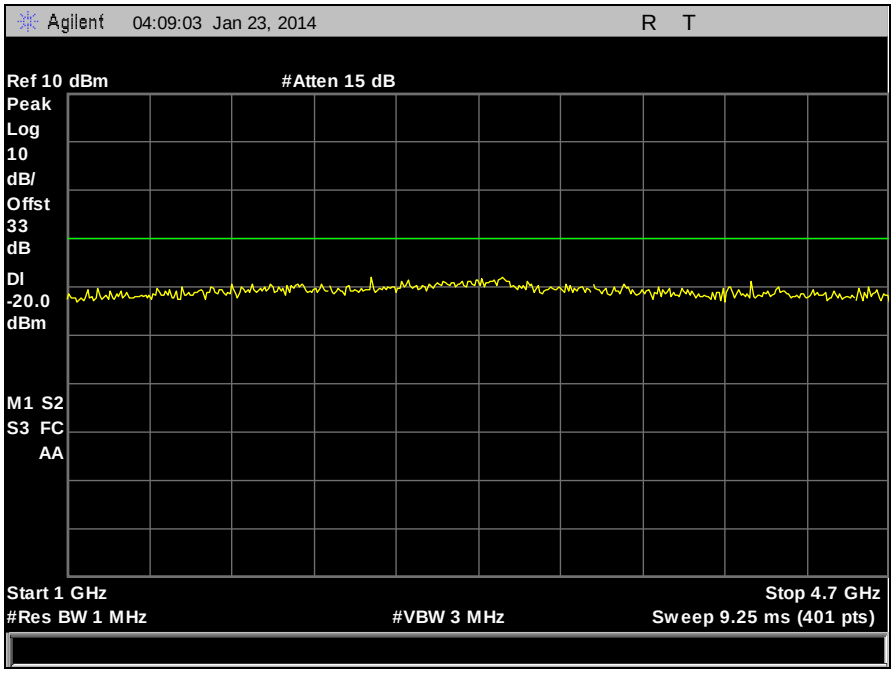
Plot 103. Part 90, Conducted Spurious Emissions, 470 MHz, C4FM, 100 W, 30 MHz – 1 GHz



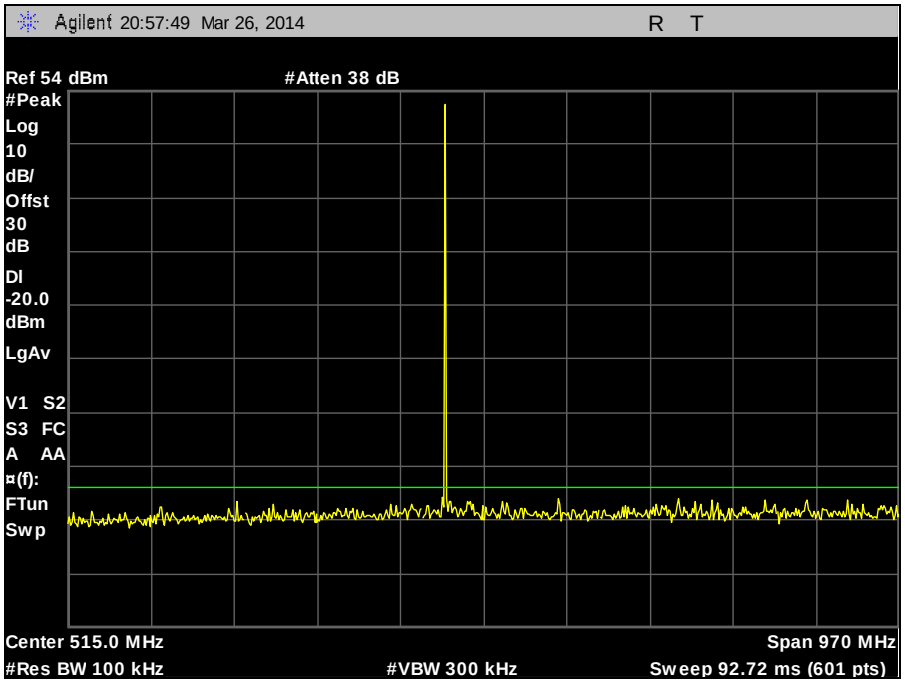
Plot 104. Part 90, Conducted Spurious Emissions, 470 MHz, C4FM, 100 W, 1 GHz – 4.7 GHz



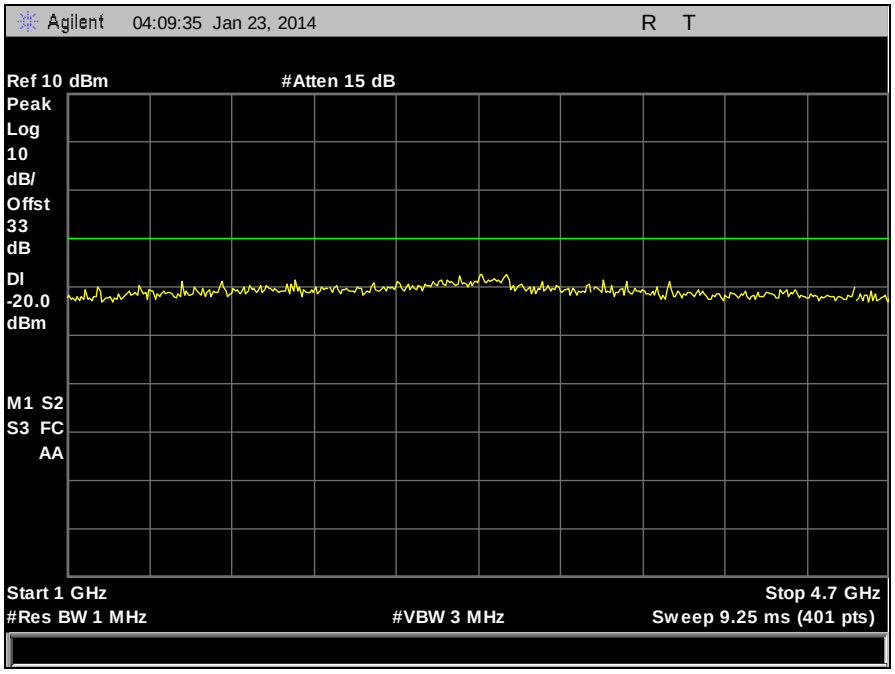
Plot 105. Part 90, Conducted Spurious Emissions, 470 MHz, CQPSK, 100 W, 30 MHz – 1 GHz



Plot 106. Part 90, Conducted Spurious Emissions, 470 MHz, CQPSK, 100 W, 1 GHz – 4.7 GHz



Plot 107. Part 90, Conducted Spurious Emissions, 470 MHz, HDQPSK, 100 W, 30 MHz – 1 GHz



Plot 108. Part 90, Conducted Spurious Emissions, 470 MHz, HDQPSK, 100 W, 1 GHz – 4.7 GHz

§22.359 Conducted Spurious Emissions

Test Requirement(s): The rules in this section govern the spectral characteristics of emissions in the Public Mobile Services, except for the Air-Ground Radiotelephone Service (see §22.861, instead) and the Cellular Radiotelephone Service (see §22.917, instead).

(a) *Out of band emissions.* The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log (P) dB.

(b) *Measurement procedure.* Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 30 kHz or more. In the 60 kHz bands immediately outside and adjacent to the authorized frequency range or channel, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e., 30 kHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.
.

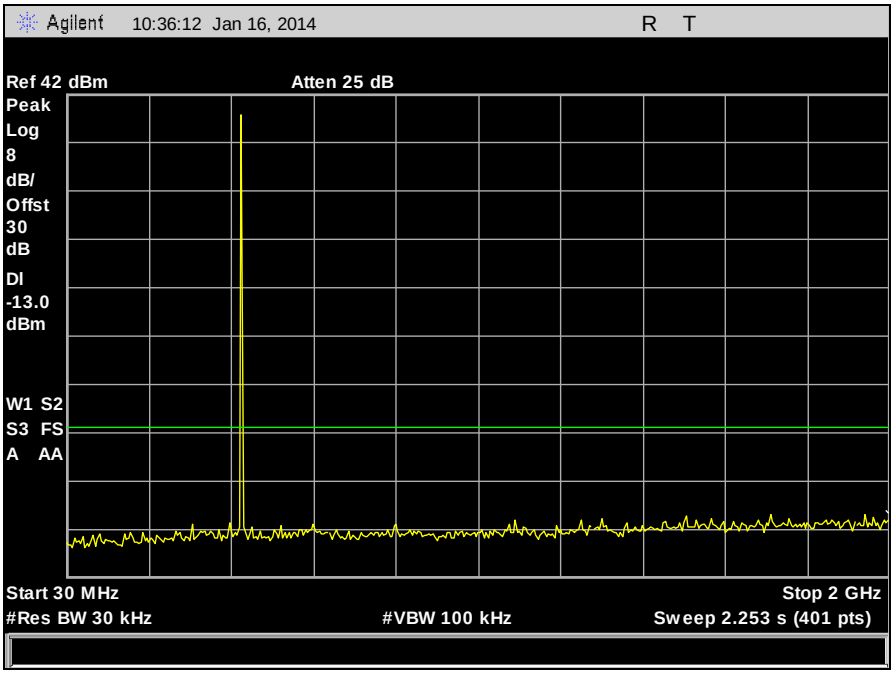
Test Procedures: Measurements were made with a Spectrum Analyzer connected to the RF ports of the transmitter, with suitable attenuation.

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

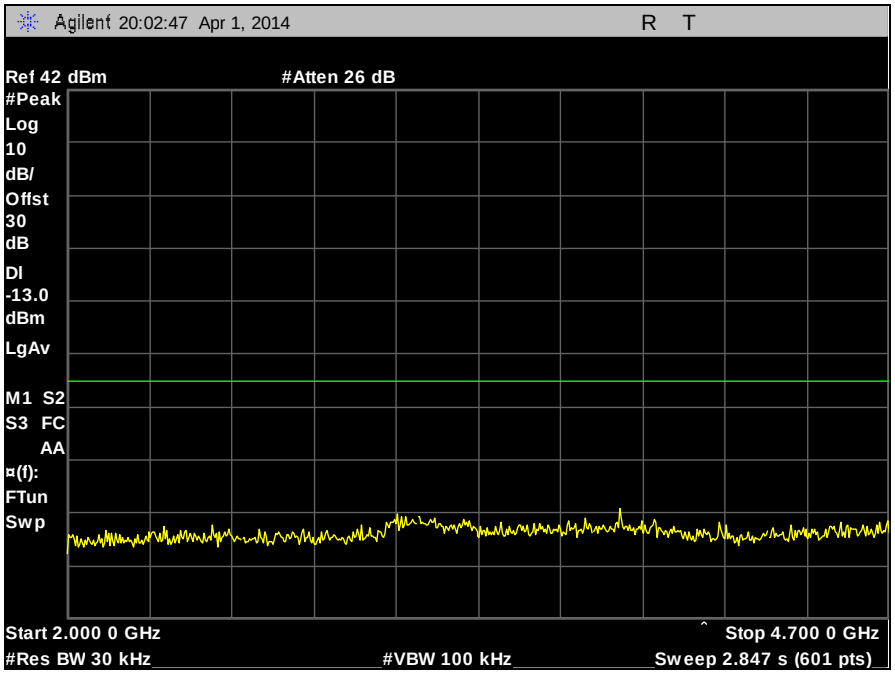
Test Engineer(s): Surinder Singh

Test Date(s): 01/21/14

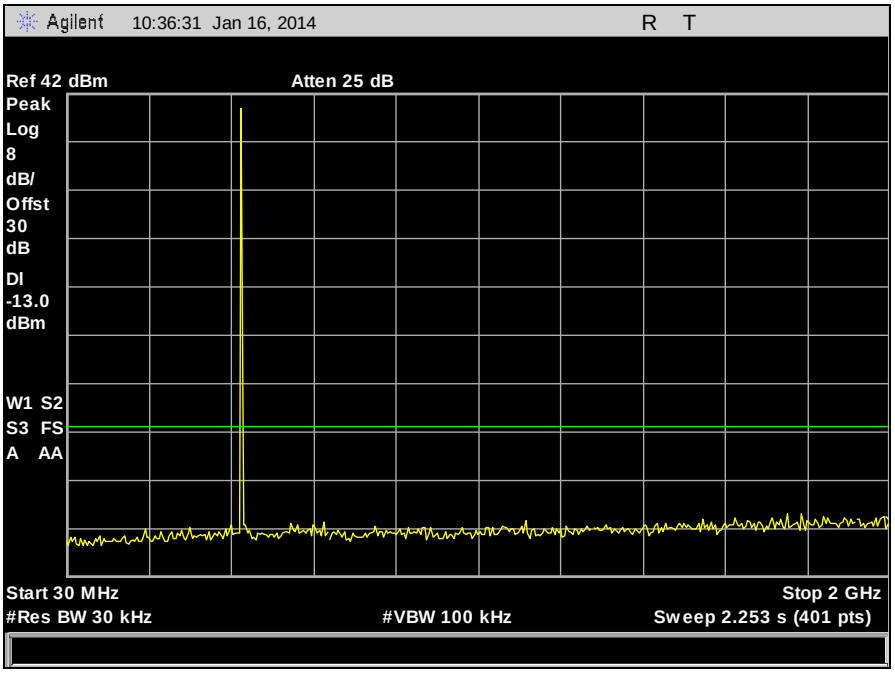
Conducted Spurious Emissions



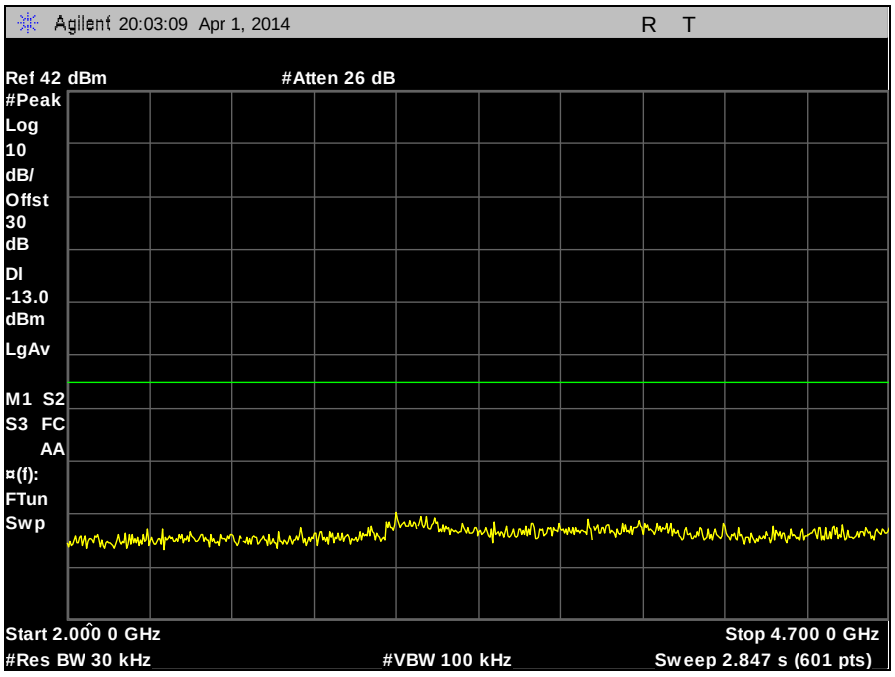
Plot 109. Part 22, Conducted Spurious Emissions, 450 MHz, C4FM, 10 W, 30 MHz – 2 GHz



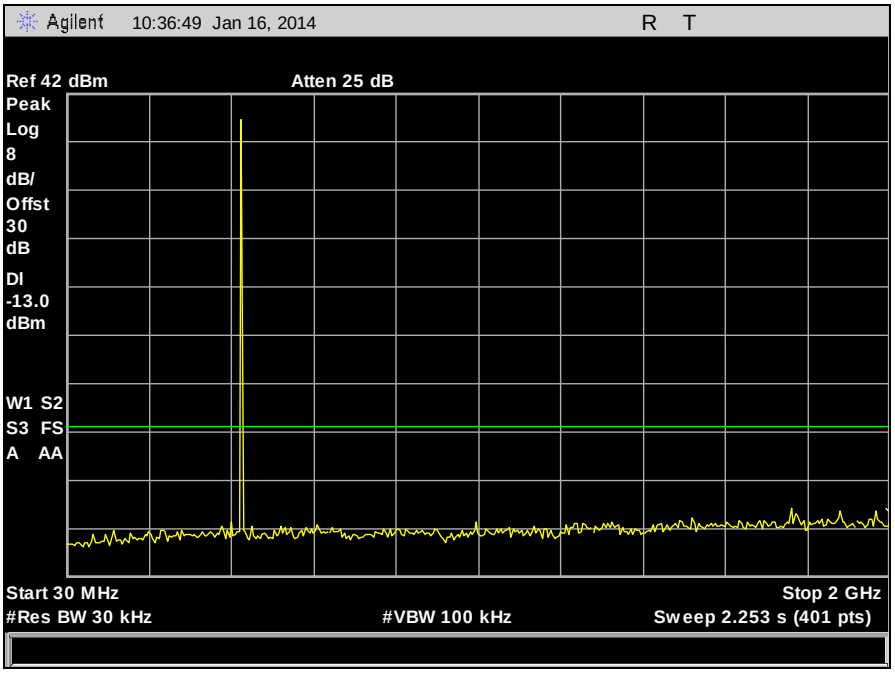
Plot 110. Part 22, Conducted Spurious Emissions, 450 MHz, C4FM, 10 W, 2 GHz – 4.7GHz



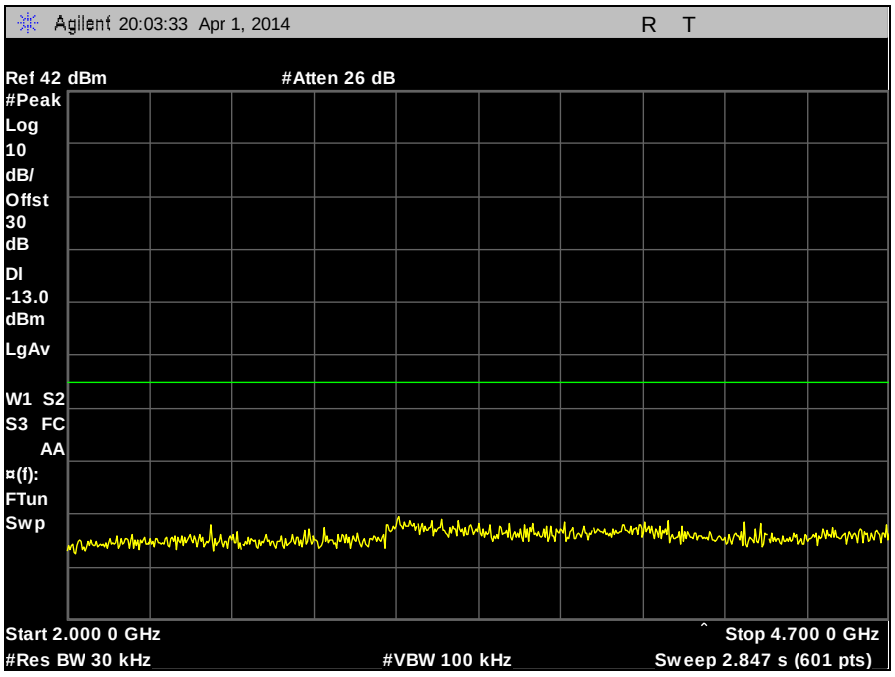
Plot 111. Part 22, Conducted Spurious Emissions, 450 MHz, CQPSK, 10 W, 30 MHz – 2 GHz



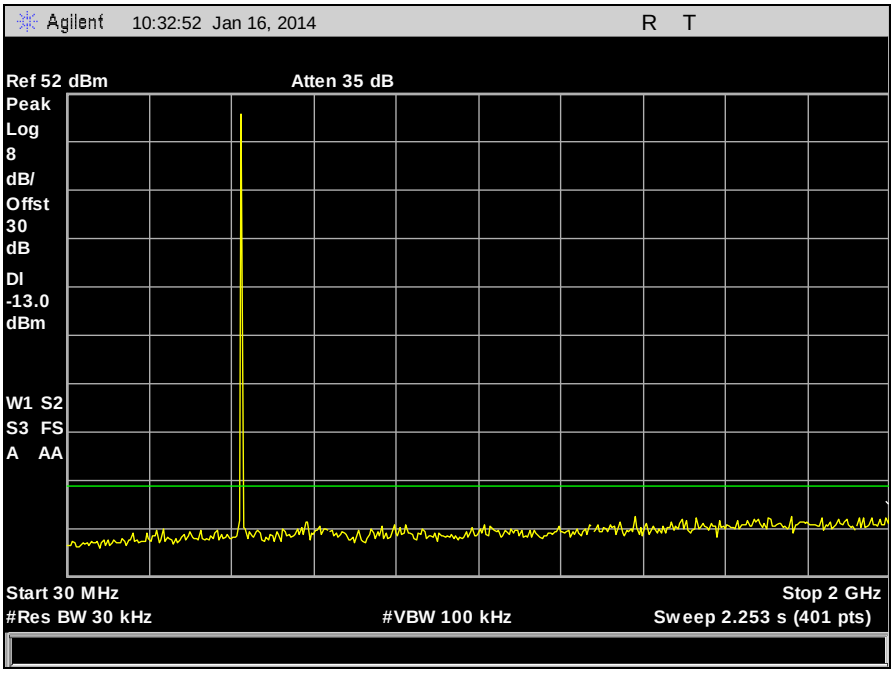
Plot 112. Part 22, Conducted Spurious Emissions, 450 MHz, CQPSK, 10 W, 2 GHz – 4.7 GHz



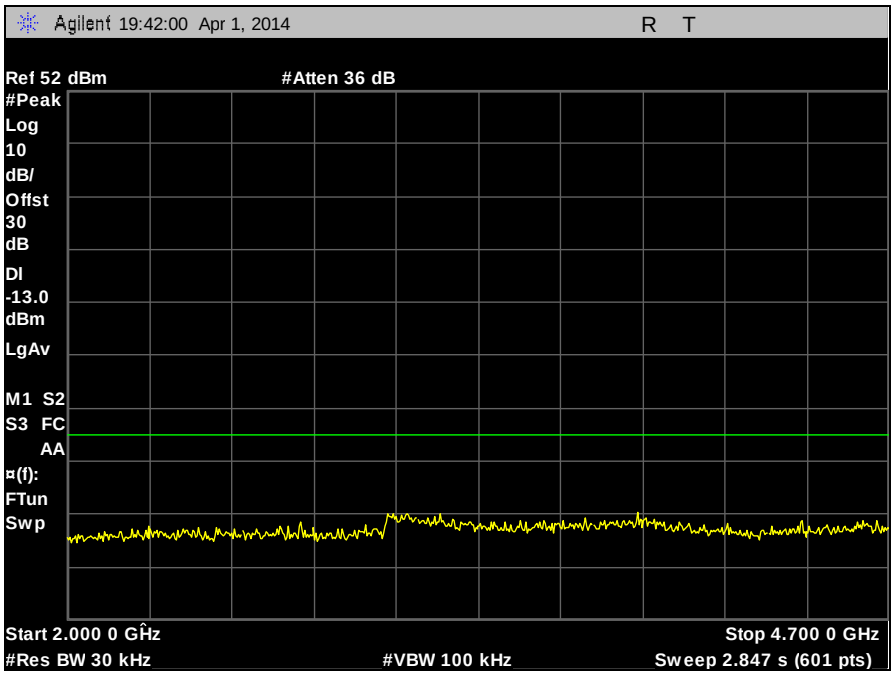
Plot 113. Part 22, Conducted Spurious Emissions, 450 MHz, HDQPSK, 10 W, 30 MHz – 2 GHz



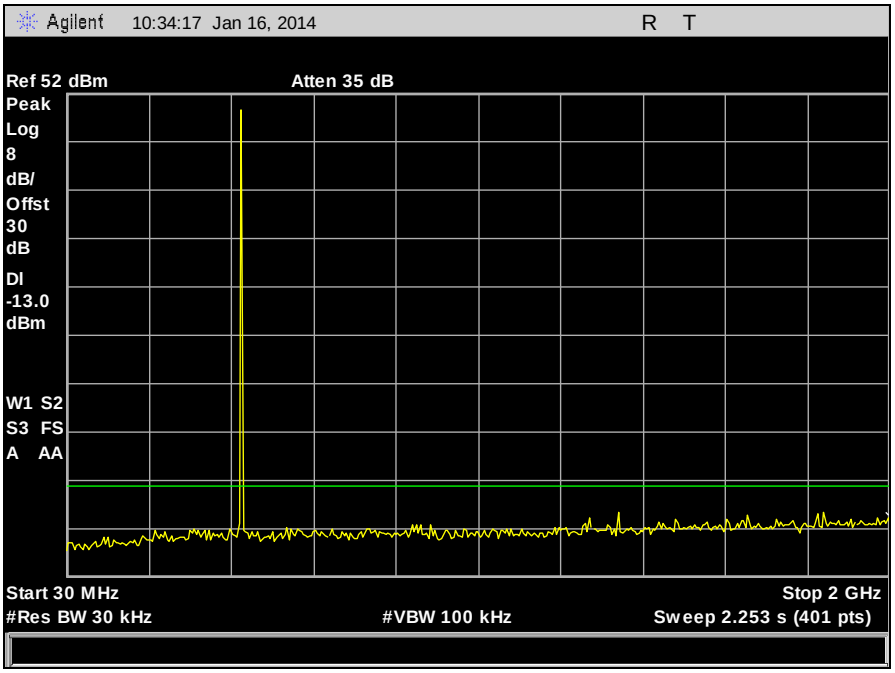
Plot 114. Part 22, Conducted Spurious Emissions, 450 MHz, HDQPSK, 10 W, 2 GHz – 4.7 GHz



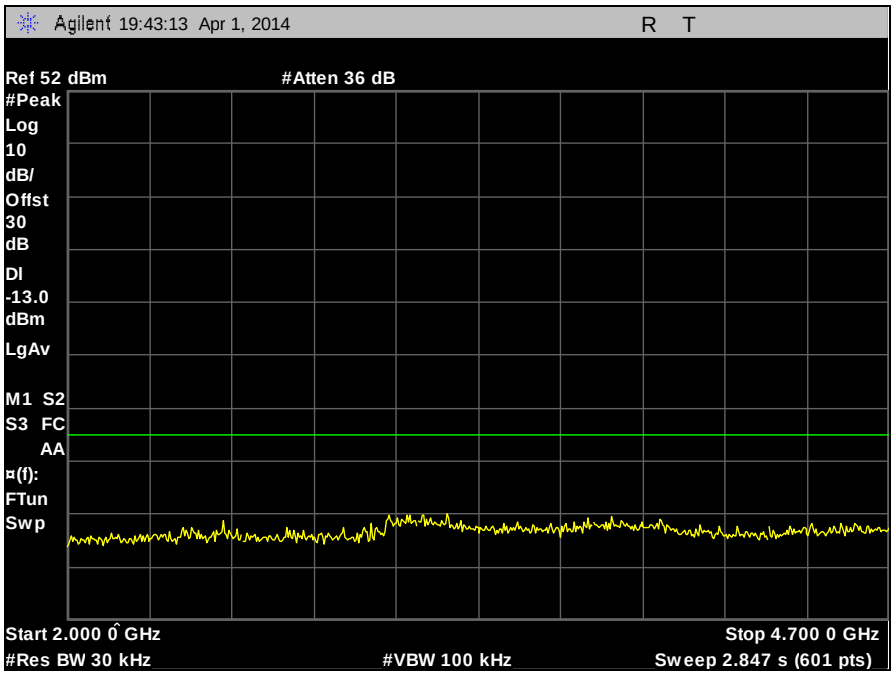
Plot 115. Part 22, Conducted Spurious Emissions, 450 MHz, C4FM, 100 W, 30 MHz – 2 GHz



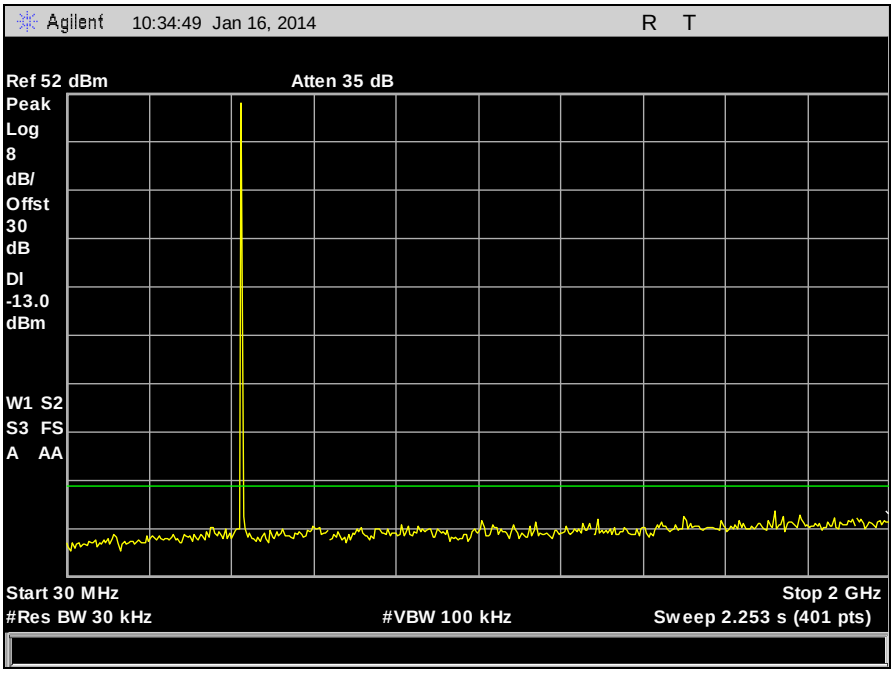
Plot 116. Part 22, Conducted Spurious Emissions, 450 MHz, C4FM, 100 W, 2 GHz – 4.7 GHz



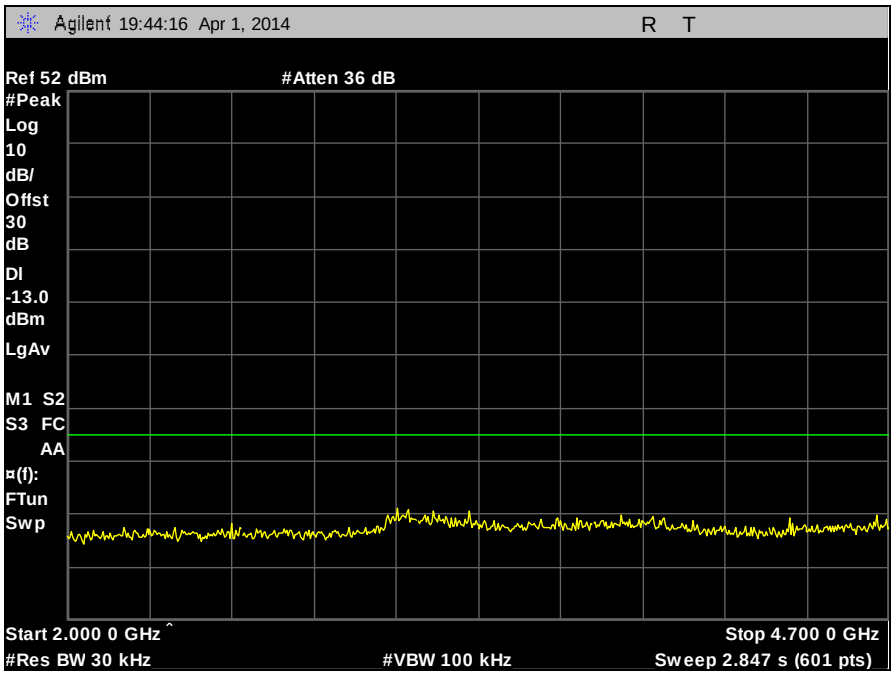
Plot 117. Part 22, Conducted Spurious Emissions, 450 MHz, CQPSK, 100 W, 30 MHz – 2 GHz



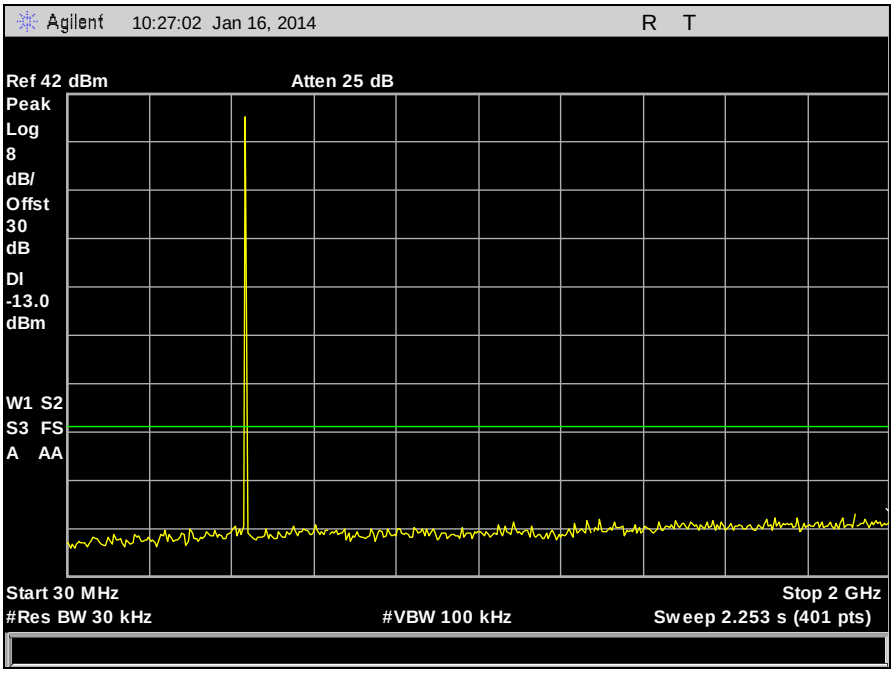
Plot 118. Part 22, Conducted Spurious Emissions, 450 MHz, CQPSK, 100 W, 2 GHz – 4.7 GHz



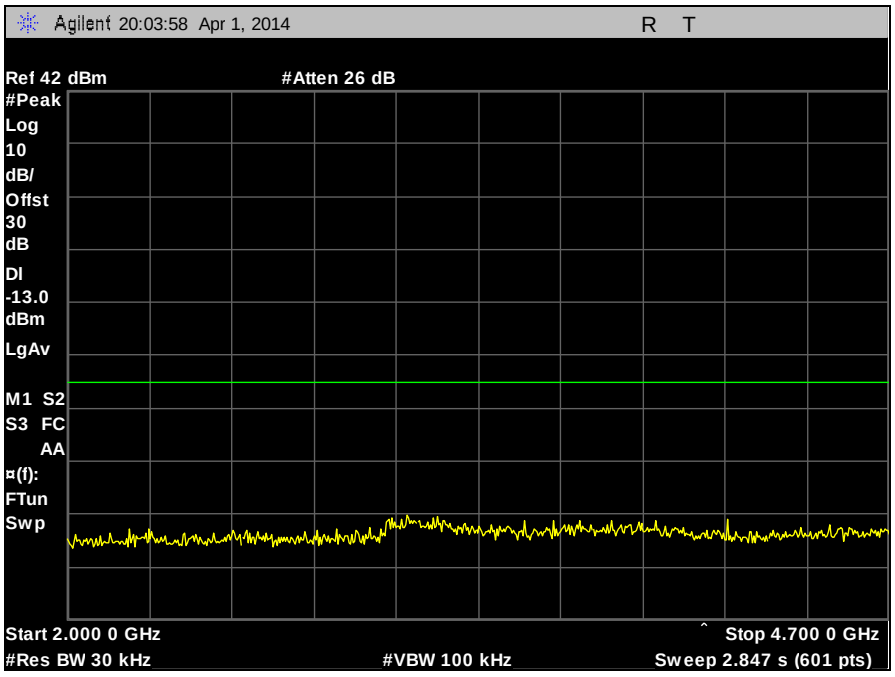
Plot 119. Part 22, Conducted Spurious Emissions, 450 MHz, HDQPSK, 100 W, 30 MHz – 2 GHz



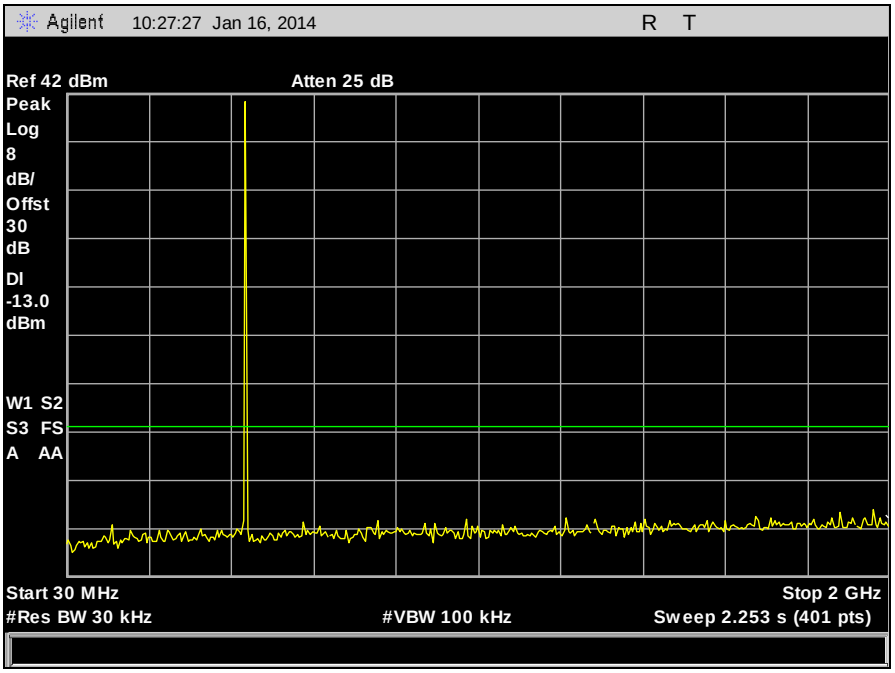
Plot 120. Part 22, Conducted Spurious Emissions, 450 MHz, HDQPSK, 100 W, 2 GHz – 4.7 GHz



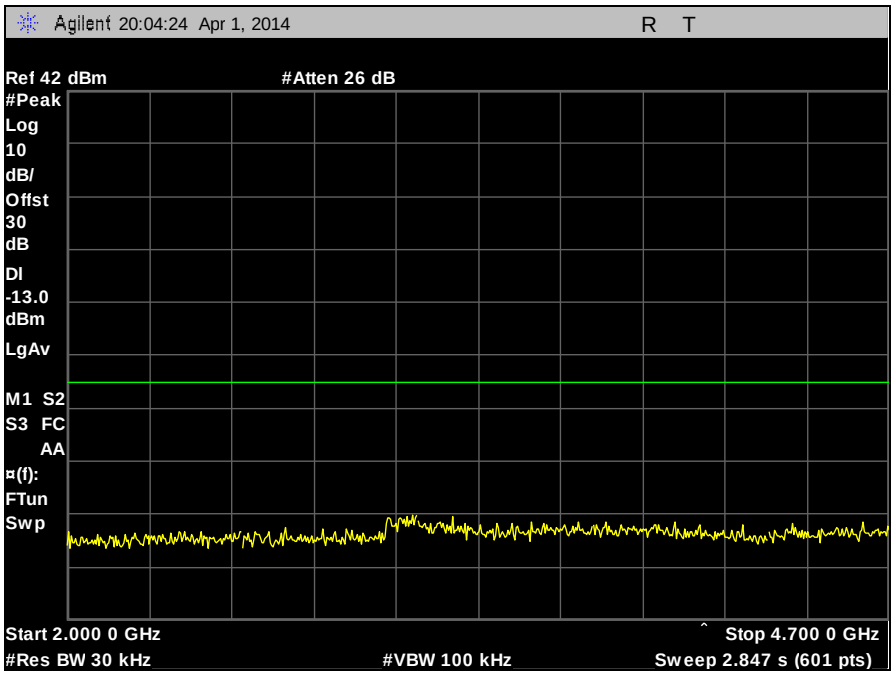
Plot 121. Part 22, Conducted Spurious Emissions, 456 MHz, C4FM, 10 W, 30 MHz – 2 GHz



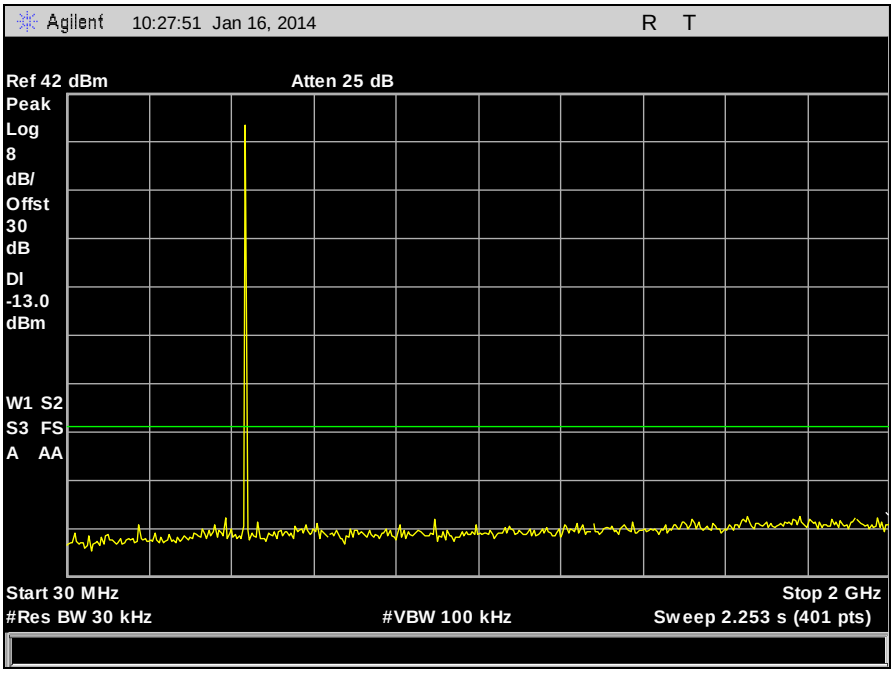
Plot 122. Part 22, Conducted Spurious Emissions, 456 MHz, C4FM, 10 W, 2 GHz – 4.7 GHz



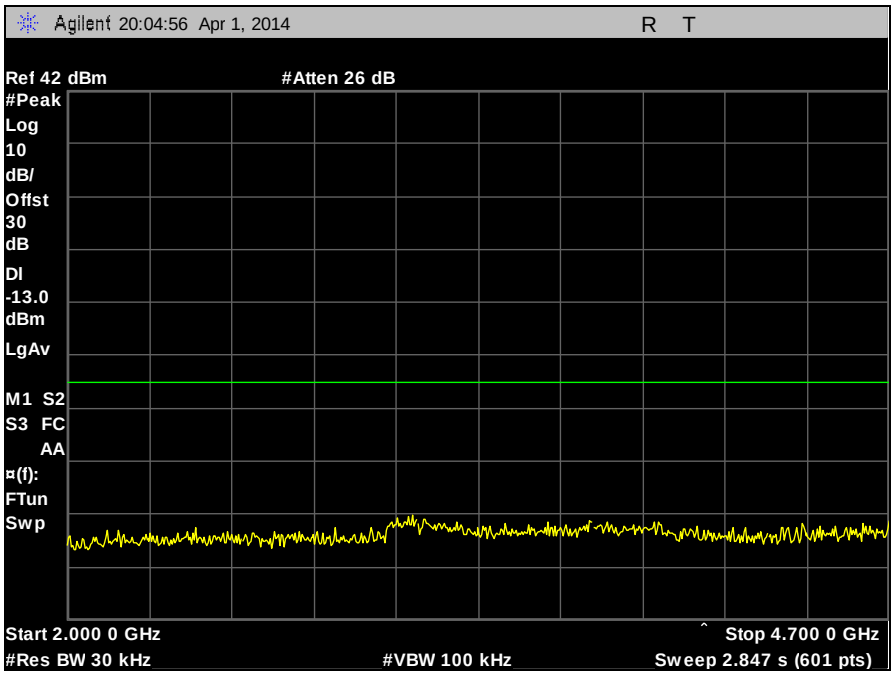
Plot 123. Part 22, Conducted Spurious Emissions, 456 MHz, CQPSK, 10 W, 30 MHz – 2 GHz



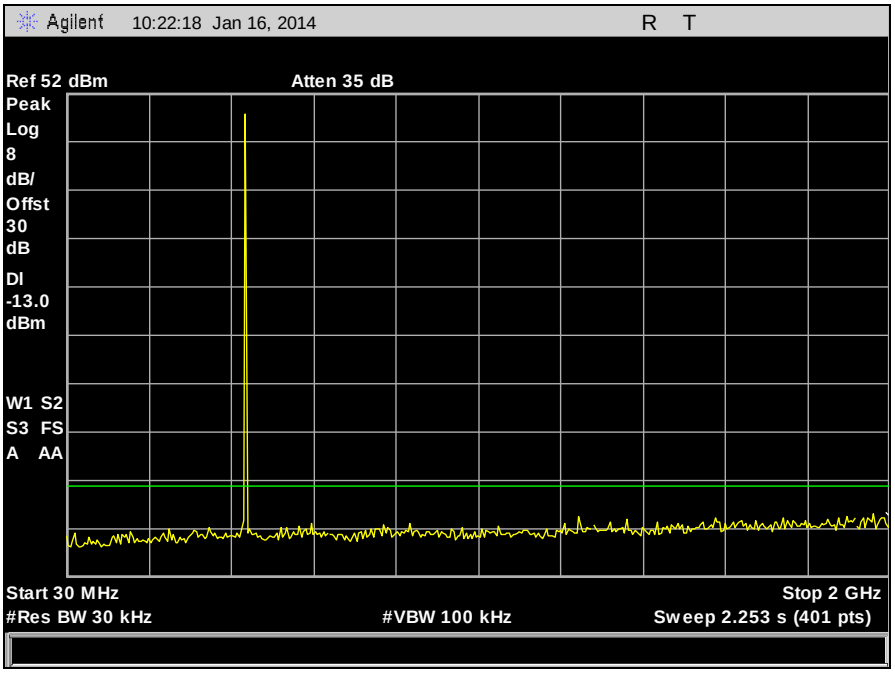
Plot 124. Part 22, Conducted Spurious Emissions, 456 MHz, CQPSK, 10 W, 2 GHz – 4.7 GHz



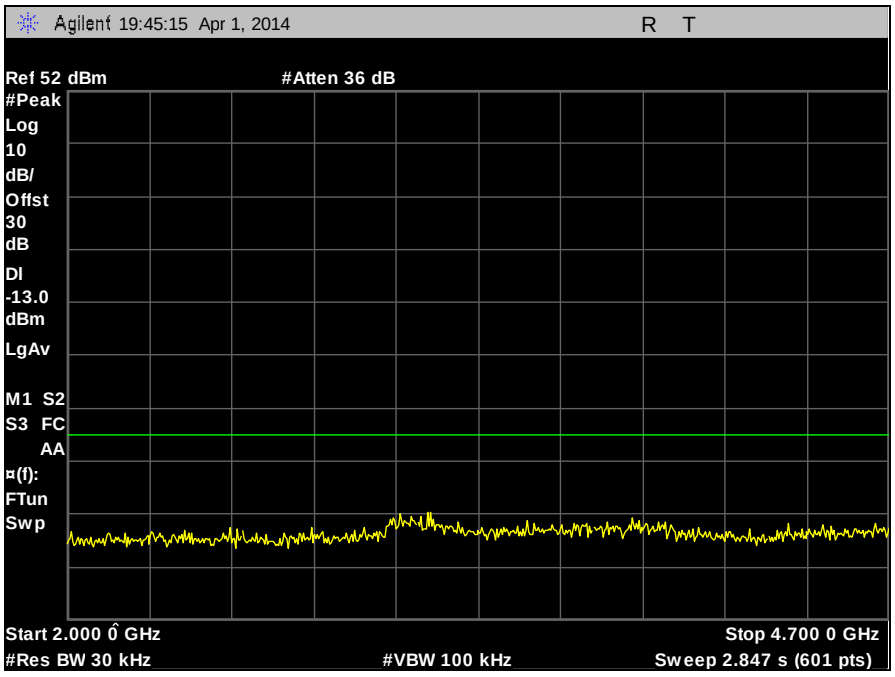
Plot 125. Part 22, Conducted Spurious Emissions, 456 MHz, HDQPSK, 10 W, 30 MHz – 2 GHz



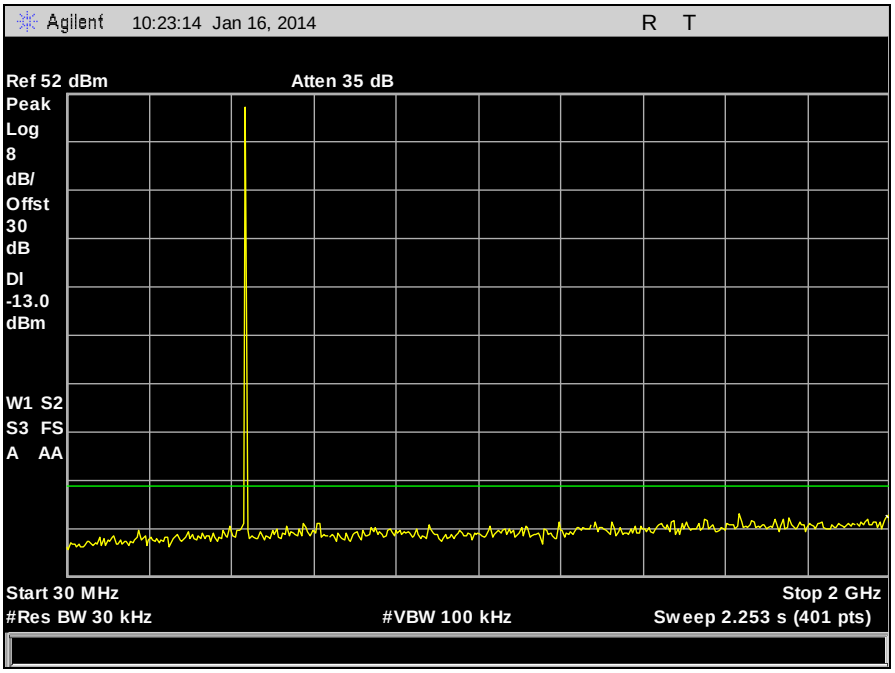
Plot 126. Part 22, Conducted Spurious Emissions, 456 MHz, HDQPSK, 10 W, 2 GHz – 4.7 GHz



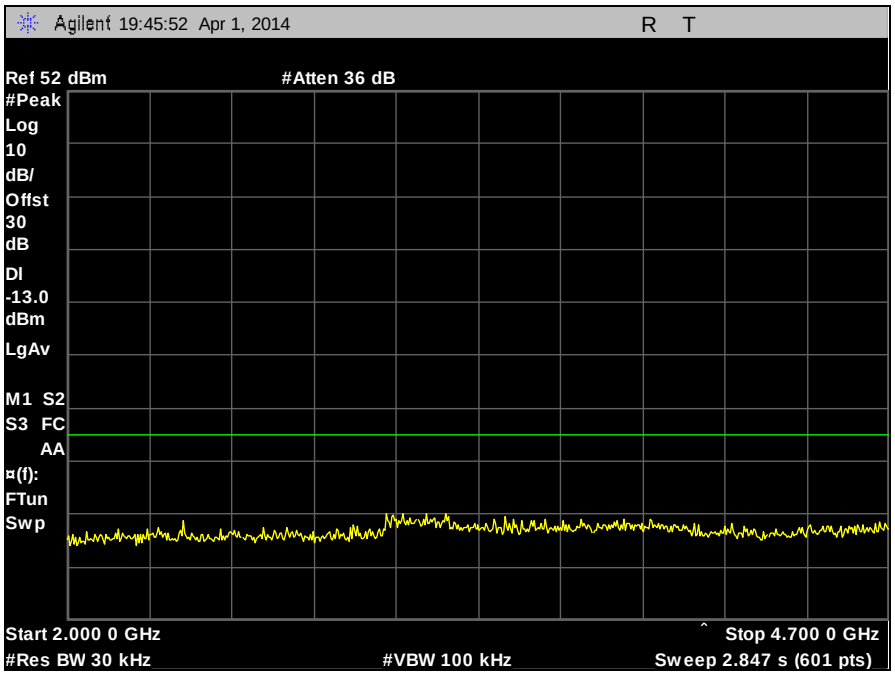
Plot 127. Part 22, Conducted Spurious Emissions, 456 MHz, C4FM, 100 W, 30 MHz – 2 GHz



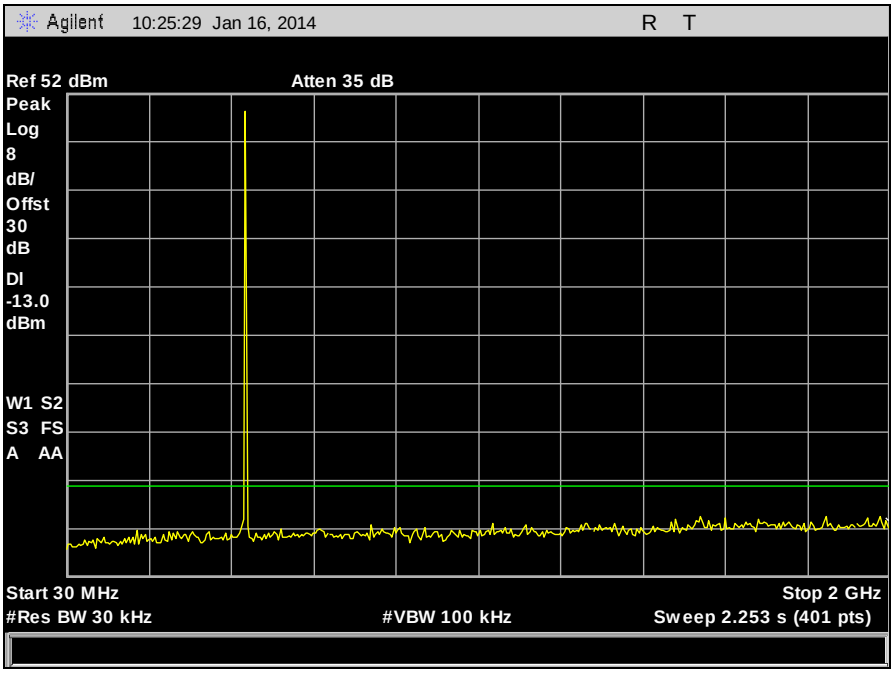
Plot 128. Part 22, Conducted Spurious Emissions, 456 MHz, C4FM, 100 W, 2 GHz – 4.7 GHz



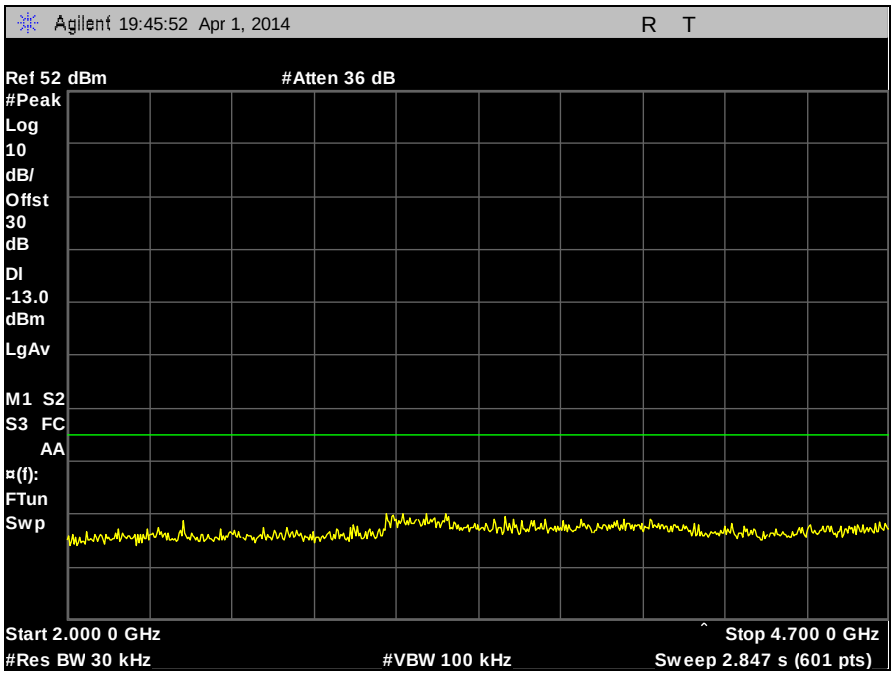
Plot 129. Part 22, Conducted Spurious Emissions, 456 MHz, CQPSK, 100 W, 30 MHz – 2 GHz



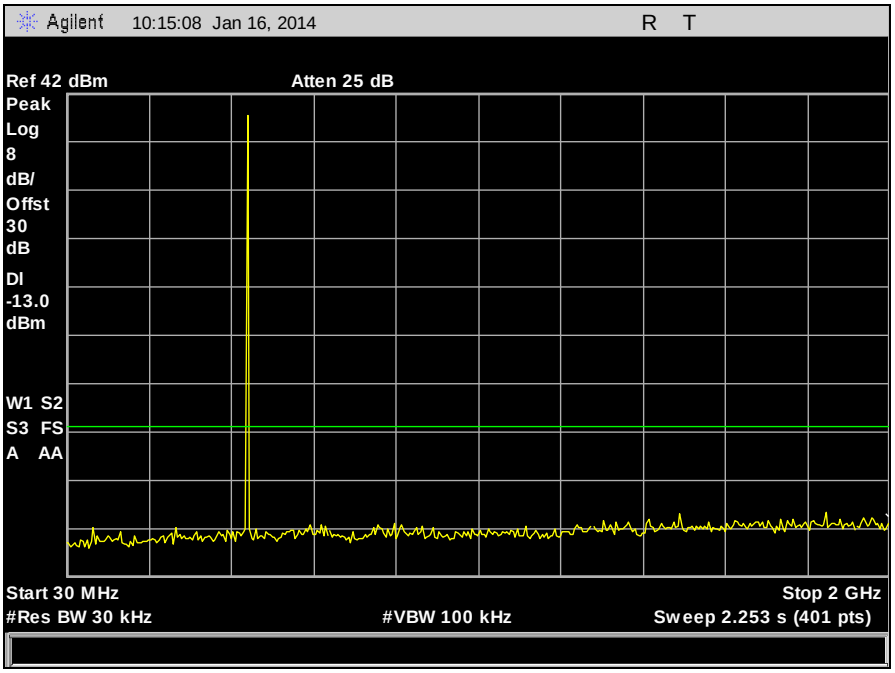
Plot 130. Part 22, Conducted Spurious Emissions, 456 MHz, CQPSK, 100 W, 2 GHz – 4.7 GHz



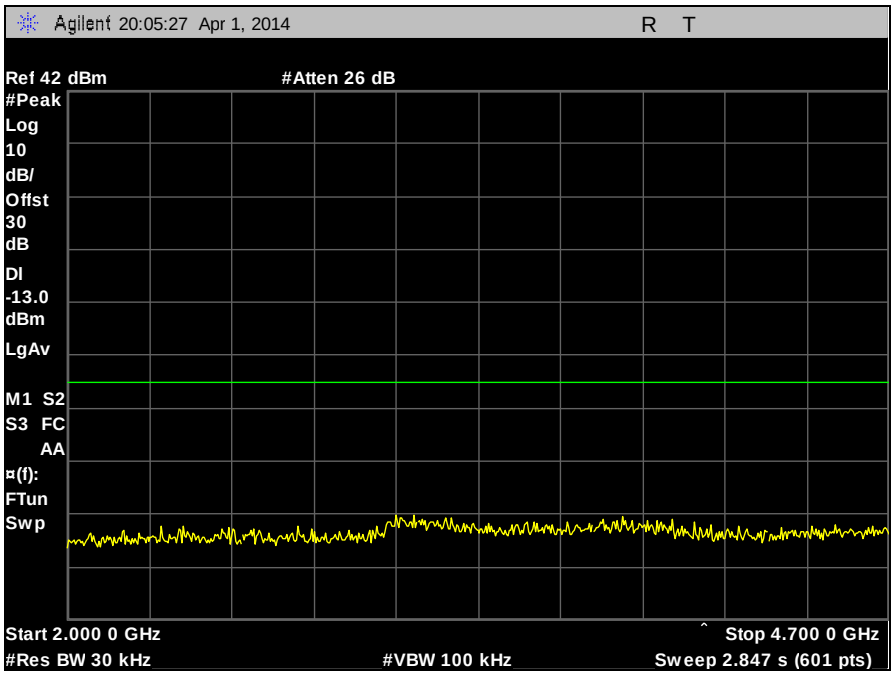
Plot 131. Part 22, Conducted Spurious Emissions, 456 MHz, HDQPSK, 100 W, 30 MHz – 2 GHz



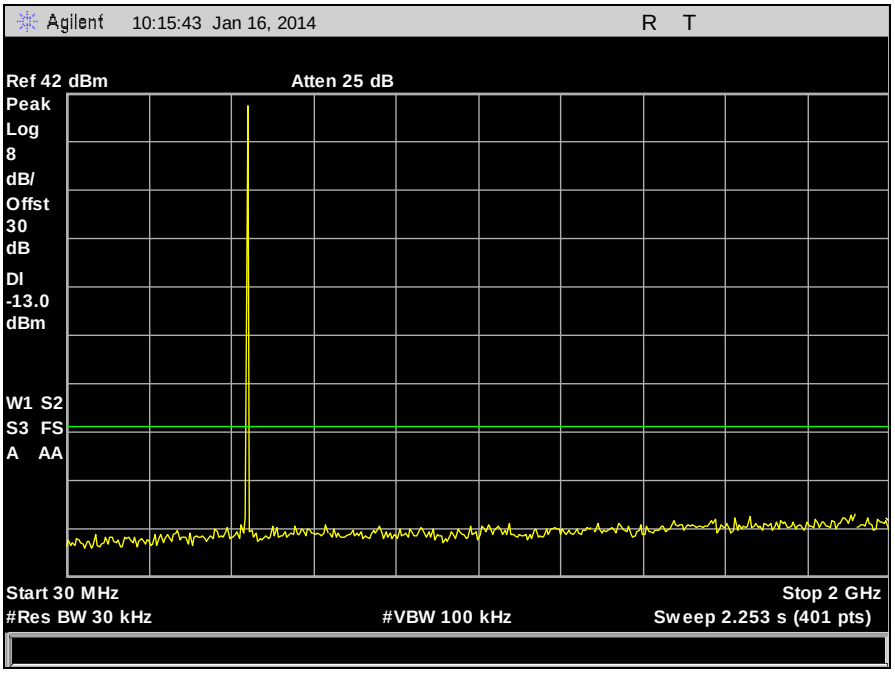
Plot 132. Part 22, Conducted Spurious Emissions, 456 MHz, HDQPSK, 100 W, 2 GHz – 4.7 GHz



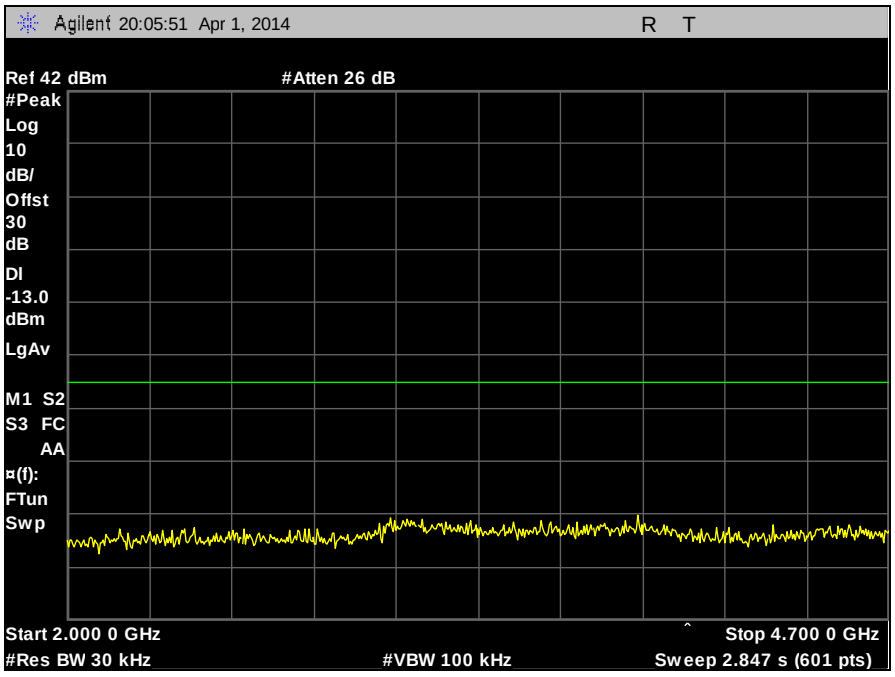
Plot 133. Part 22, Conducted Spurious Emissions, 463 MHz, C4FM, 10 W, 30 MHz – 2 GHz



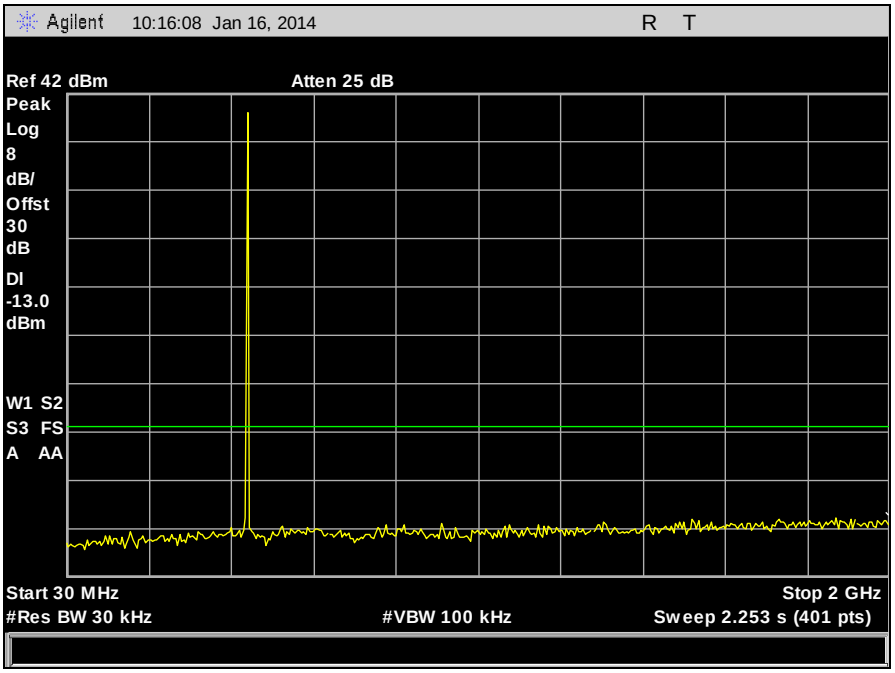
Plot 134. Part 22, Conducted Spurious Emissions, 463 MHz, C4FM, 10 W, 2 GHz – 4.7 GHz



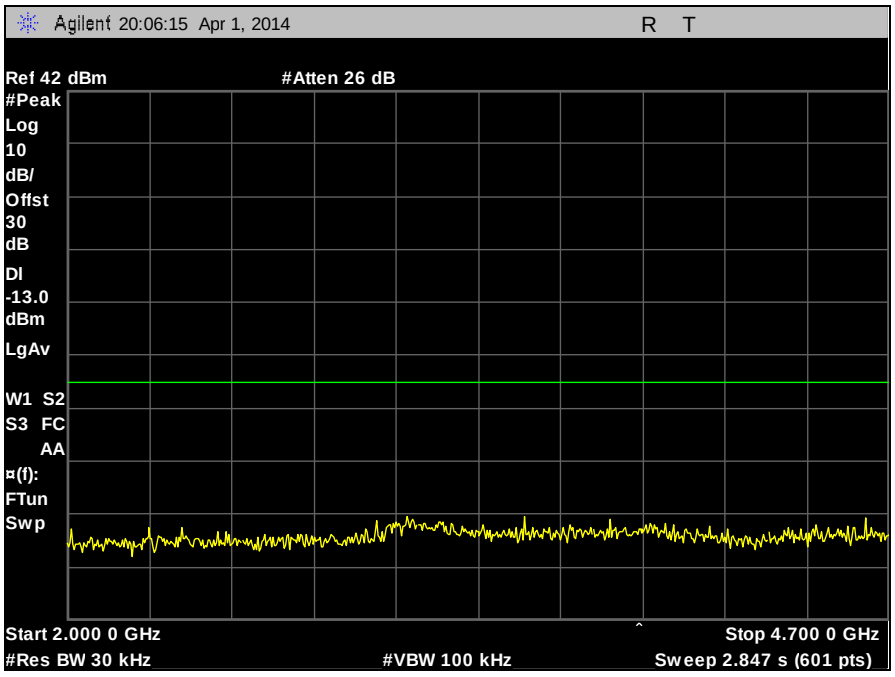
Plot 135. Part 22, Conducted Spurious Emissions, 463 MHz, CQPSK, 10 W, 30 MHz – 2 GHz



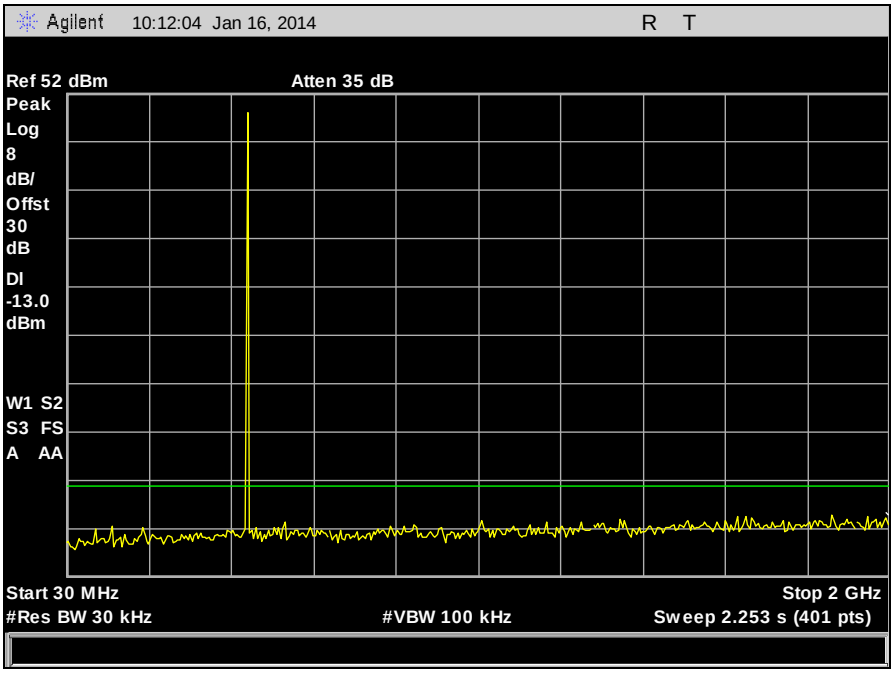
Plot 136. Part 22, Conducted Spurious Emissions, 463 MHz, CQPSK, 10 W, 2 GHz – 4.7 GHz



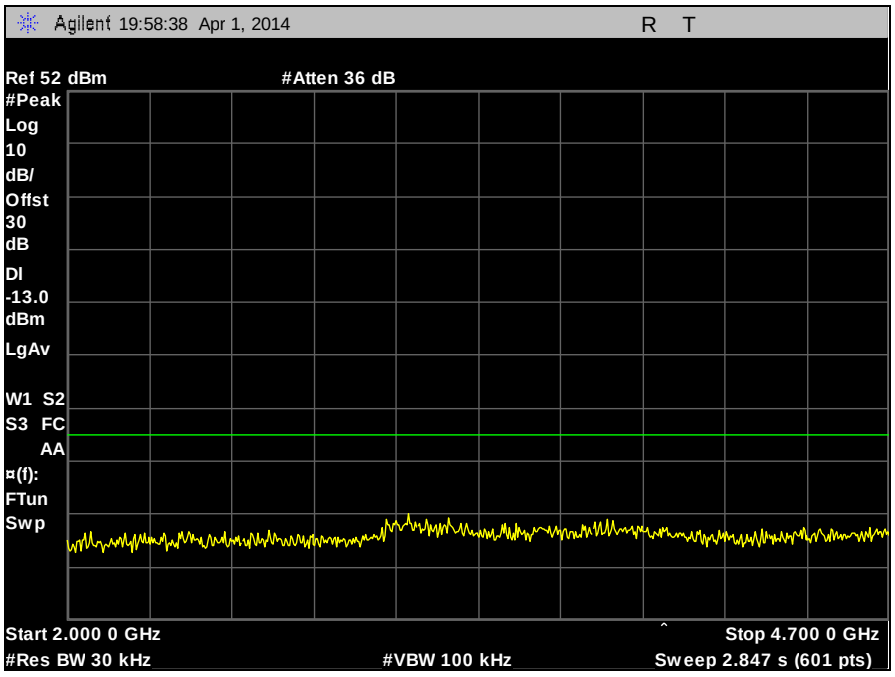
Plot 137. Part 22, Conducted Spurious Emissions, 463 MHz, HDQPSK, 10 W, 30 MHz – 2 GHz



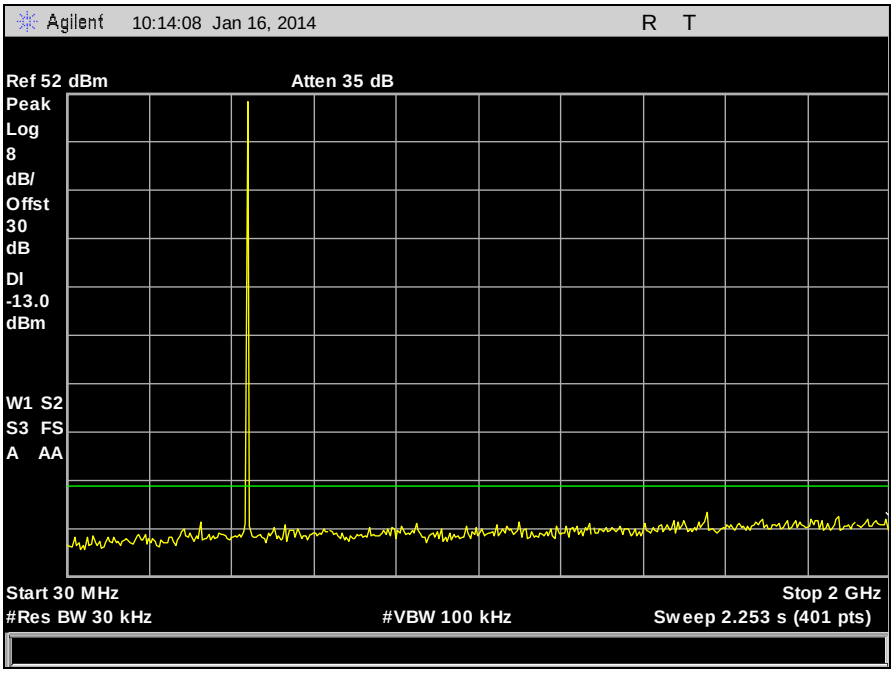
Plot 138. Part 22, Conducted Spurious Emissions, 463 MHz, HDQPSK, 10 W, 2 GHz – 4.7 GHz



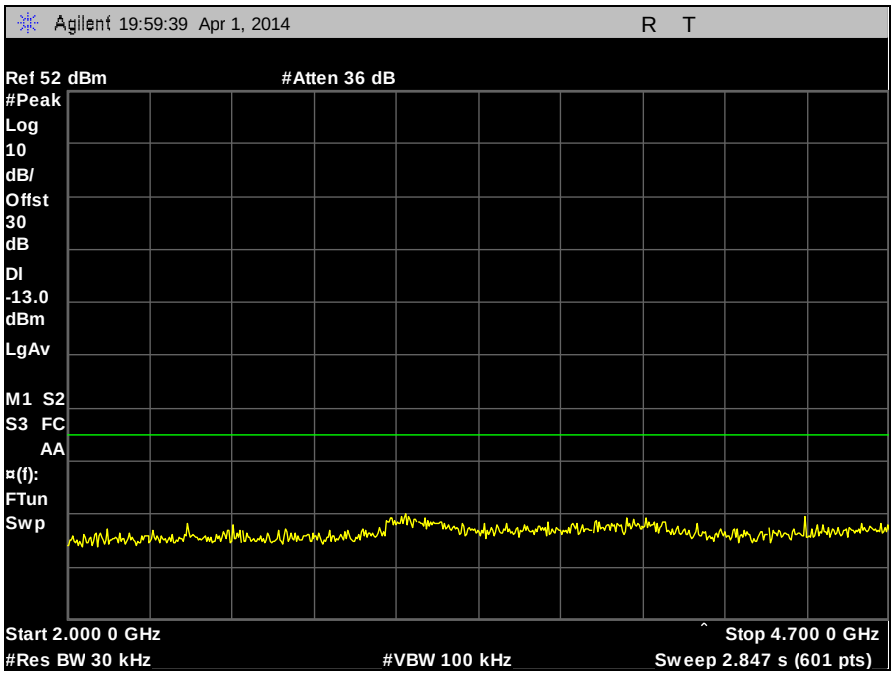
Plot 139. Part 22, Conducted Spurious Emissions, 463 MHz, C4FM, 100 W, 30 MHz – 2 GHz



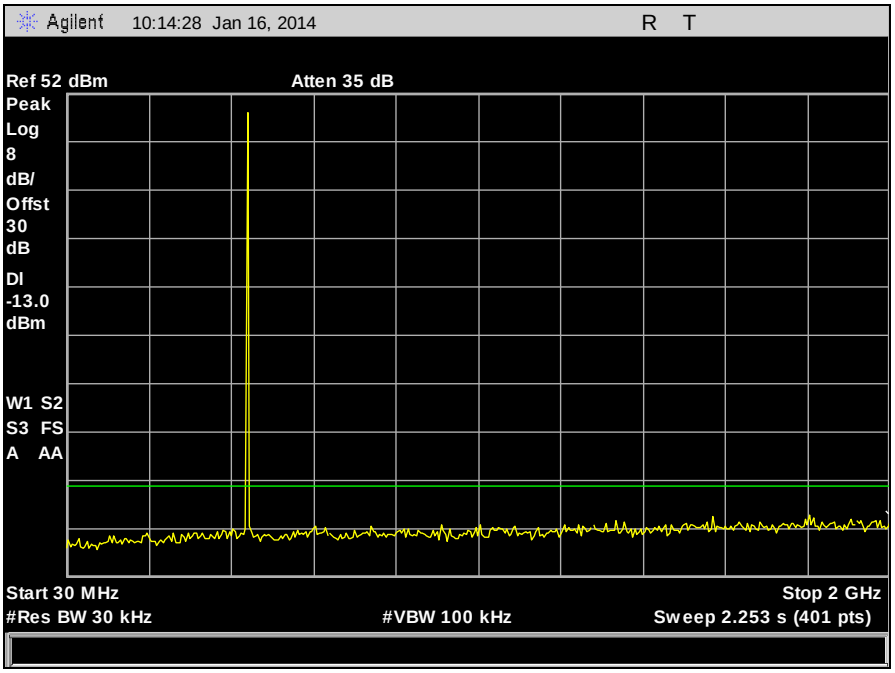
Plot 140. Part 22, Conducted Spurious Emissions, 463 MHz, C4FM, 100 W, 2 GHz – 4.7 GHz



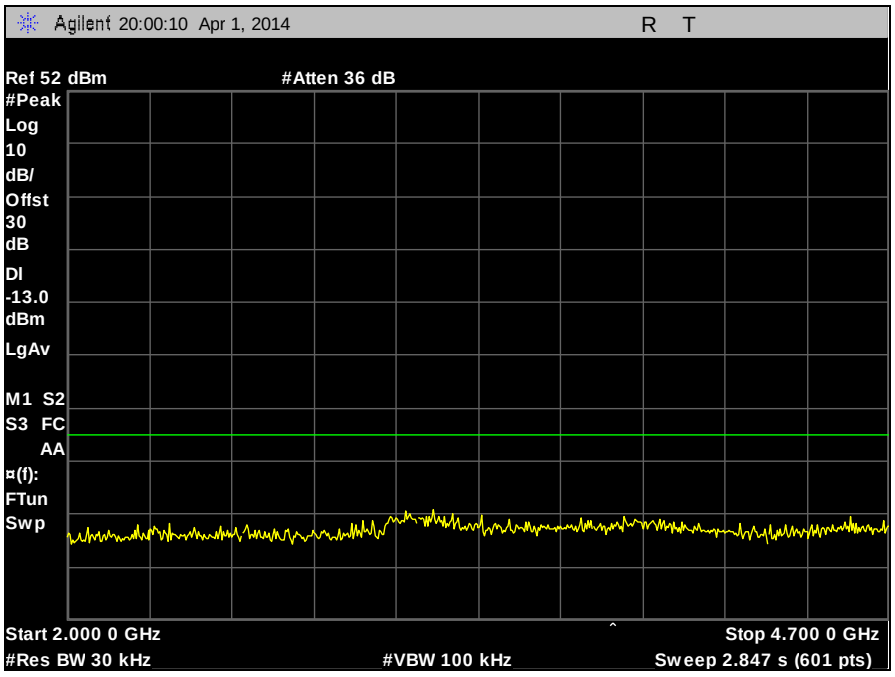
Plot 141. Part 22, Conducted Spurious Emissions, 463 MHz, CQPSK, 100 W, 30 MHz – 2 GHz



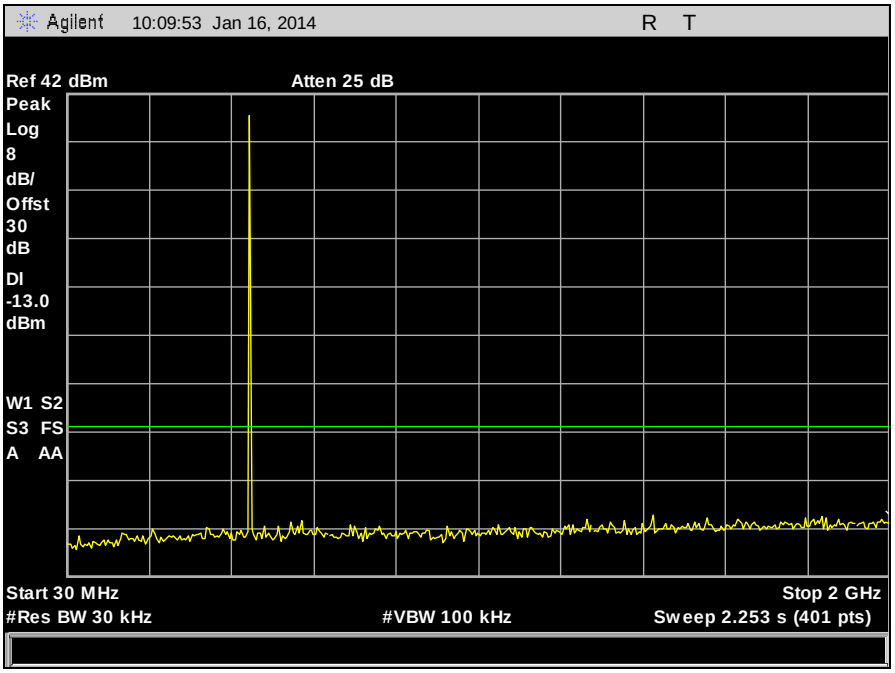
Plot 142. Part 22, Conducted Spurious Emissions, 463 MHz, CQPSK, 100 W, 2 GHz – 4.7 GHz



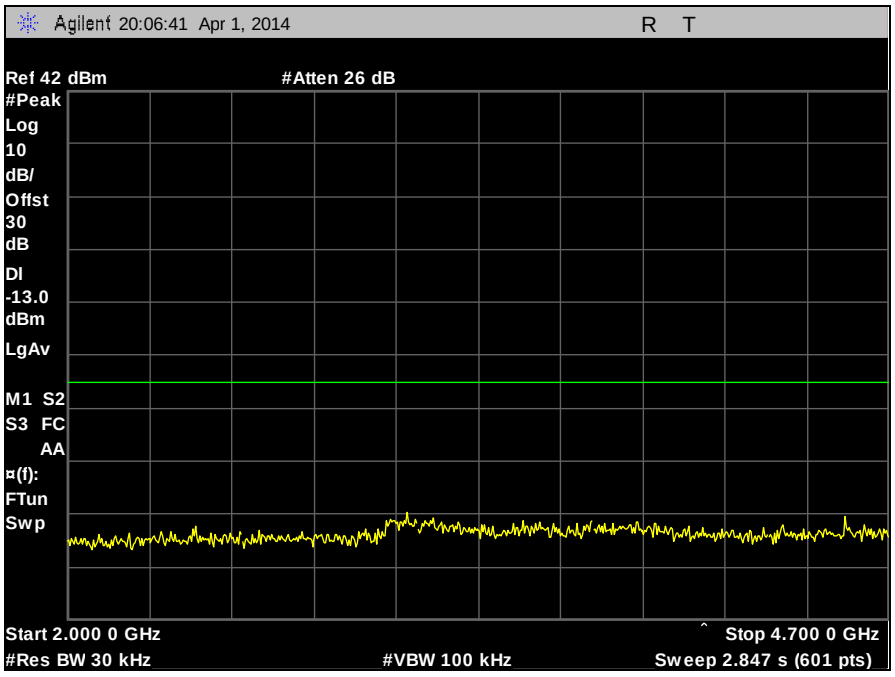
Plot 143. Part 22, Conducted Spurious Emissions, 463 MHz, HDQPSK, 100 W, 30 MHz – 2 GHz



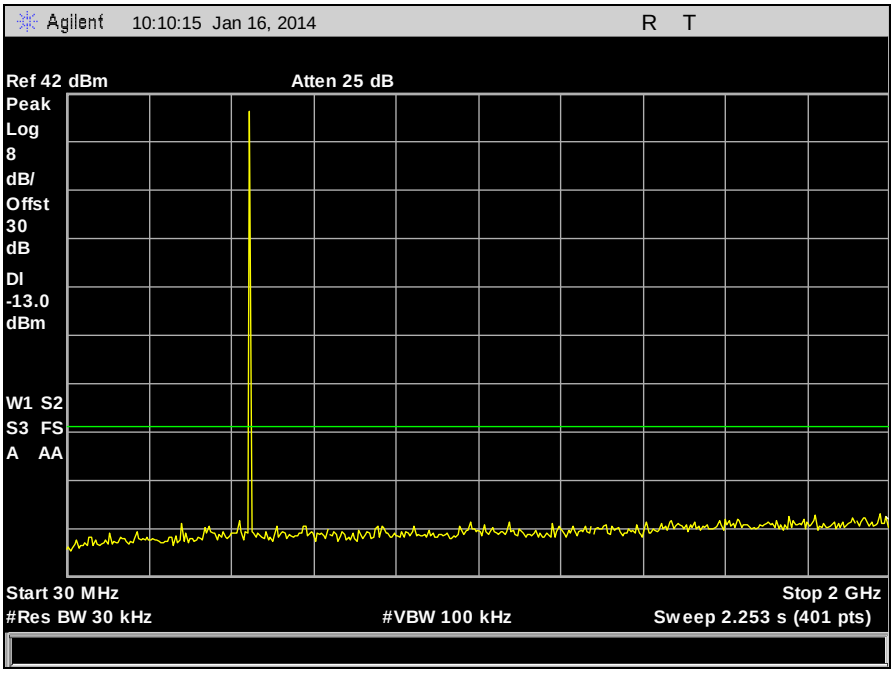
Plot 144. Part 22, Conducted Spurious Emissions, 463 MHz, HDQPSK, 100 W, 2 GHz – 4.7 GHz



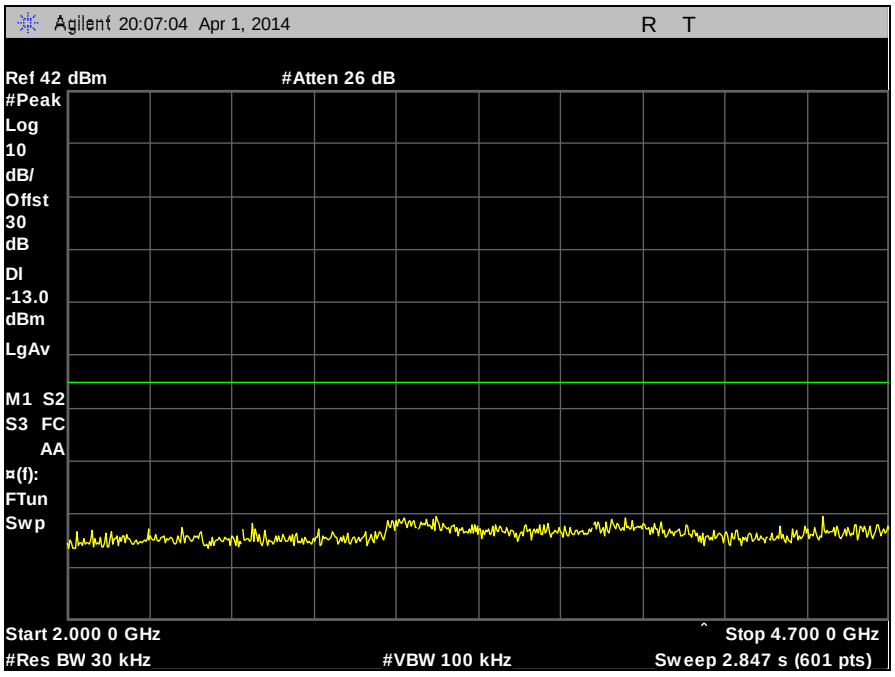
Plot 145. Part 22, Conducted Spurious Emissions, 470 MHz, C4FM, 10 W, 30 MHz – 2 GHz



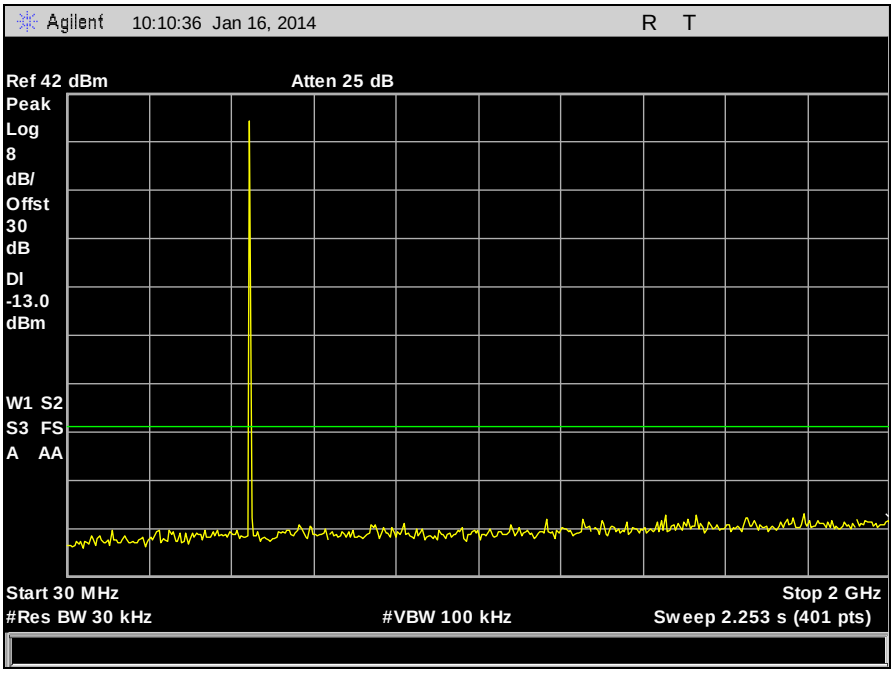
Plot 146. Part 22, Conducted Spurious Emissions, 470 MHz, C4FM, 10 W, 2 GHz – 4.7 GHz



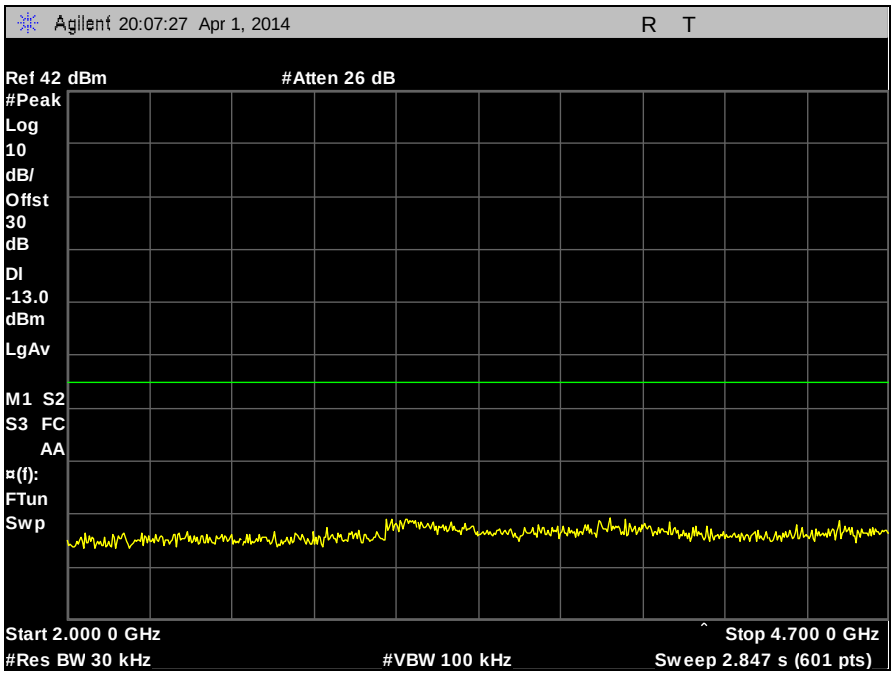
Plot 147. Part 22, Conducted Spurious Emissions, 470 MHz, CQPSK, 10 W, 30 MHz – 2 GHz



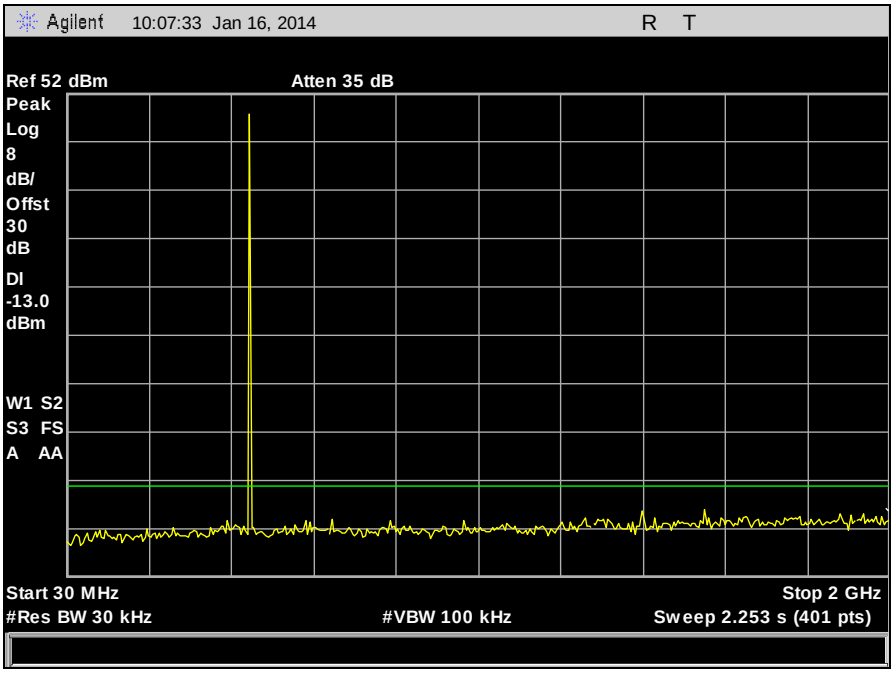
Plot 148. Part 22, Conducted Spurious Emissions, 470 MHz, CQPSK, 10 W, 2 GHz – 4.7 GHz



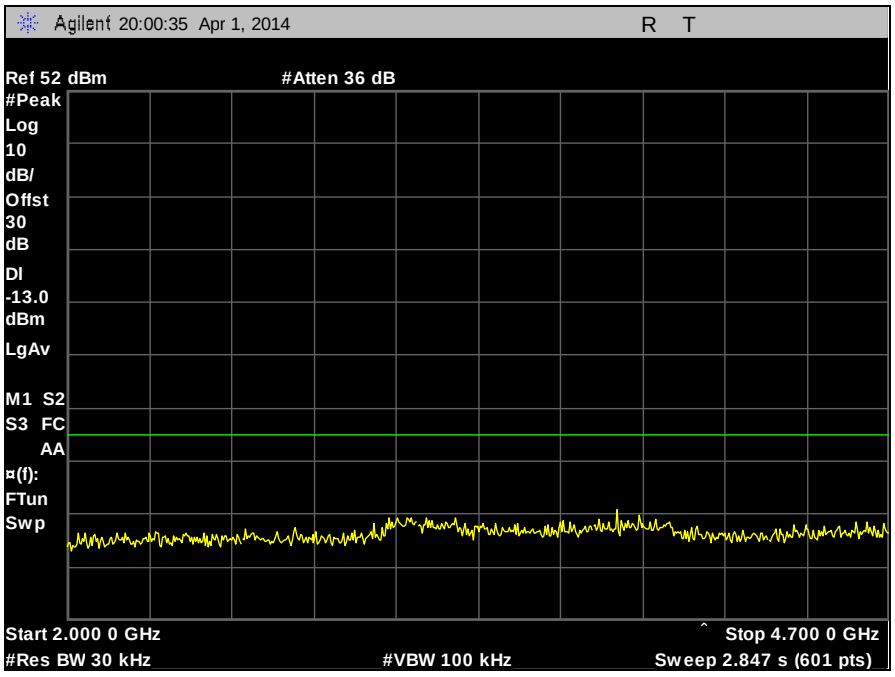
Plot 149. Part 22, Conducted Spurious Emissions, 470 MHz, HDQPSK, 10 W, 30 MHz – 2 GHz



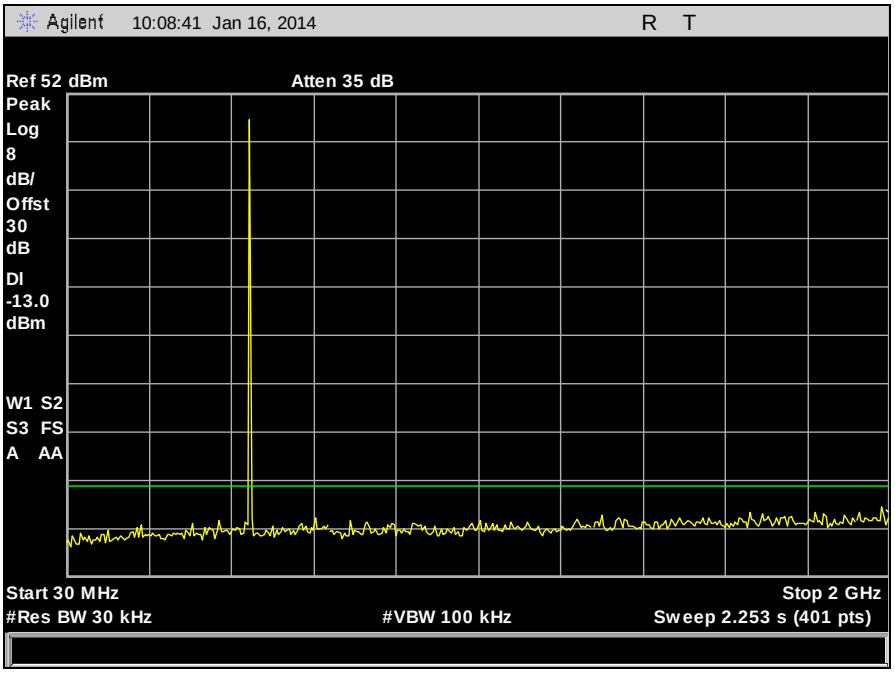
Plot 150. Part 22, Conducted Spurious Emissions, 470 MHz, HDQPSK, 10 W, 2 GHz – 4.7 GHz



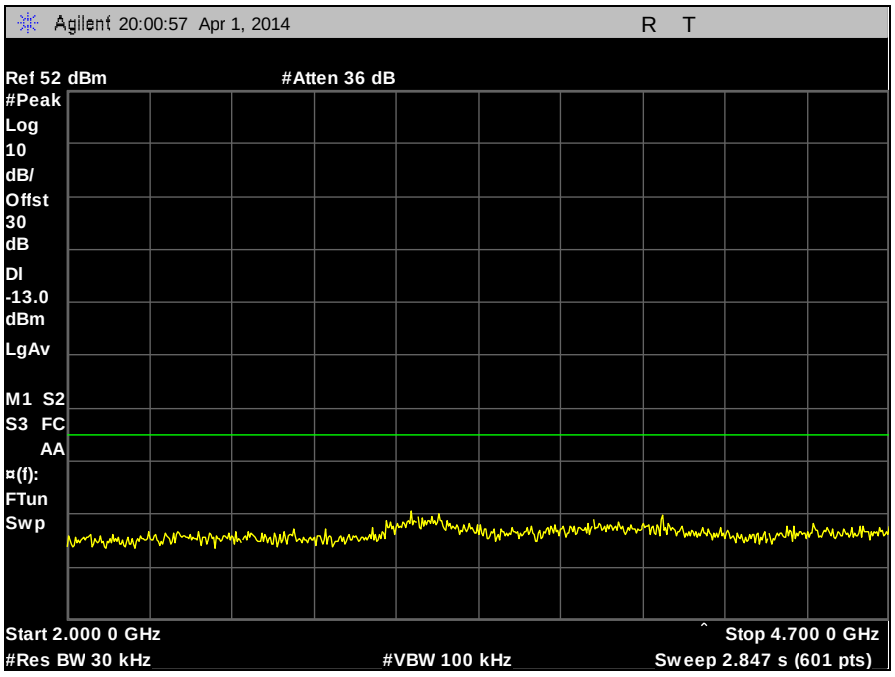
Plot 151. Part 22, Conducted Spurious Emissions, 470 MHz, C4FM, 100 W, 30 MHz – 2 GHz



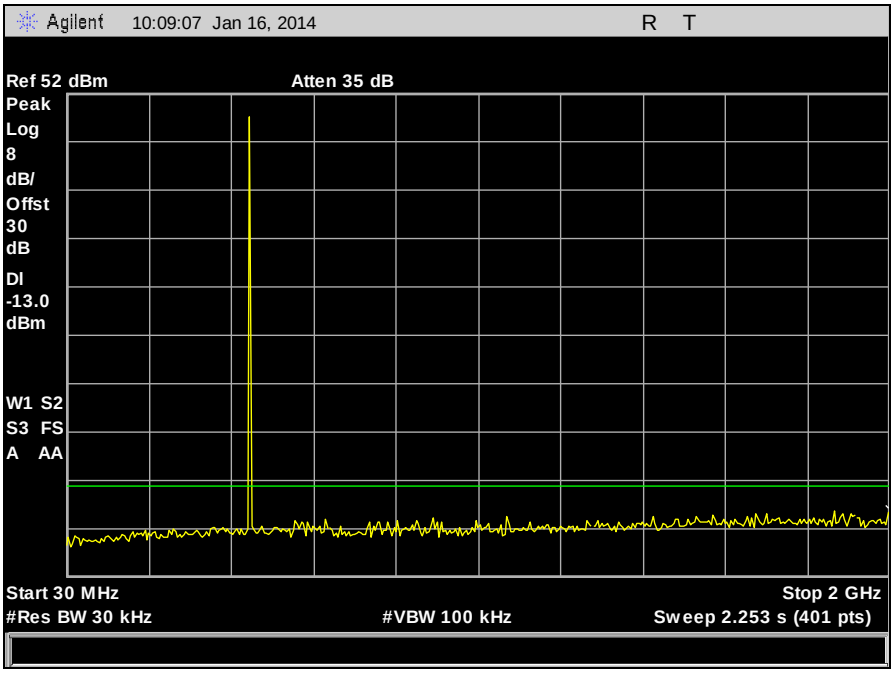
Plot 152. Part 22, Conducted Spurious Emissions, 470 MHz, C4FM, 100 W, 2 GHz – 4.7 GHz



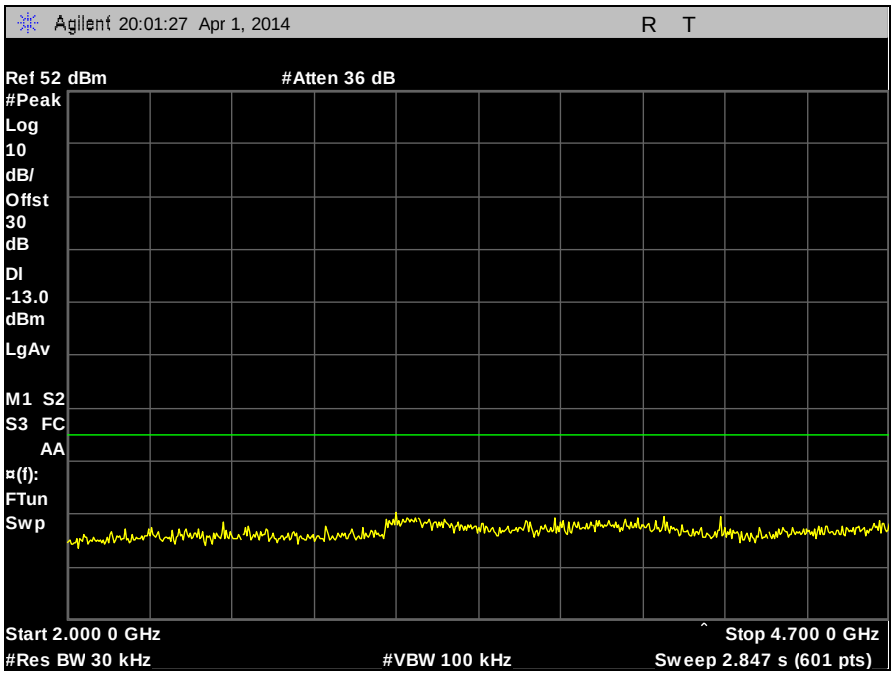
Plot 153. Part 22, Conducted Spurious Emissions, 470 MHz, CQPSK, 100 W, 30 MHz – 2 GHz



Plot 154. Part 22, Conducted Spurious Emissions, 470 MHz, CQPSK, 100 W, 2 GHz – 4.7 GHz



Plot 155. Part 22, Conducted Spurious Emissions, 470 MHz, HDQPSK, 100 W, 30 MHz – 2 GHz



Plot 156. Part 22, Conducted Spurious Emissions, 470 MHz, HDQPSK, 100 W, 2 GHz – 4.7 GHz

§ 80.211 Conducted Spurious Emissions and Emission Mask

Test Requirement(s): The mean power when using emissions other than those in paragraphs (a), (b), (c) and (d) of this section:

(1) On any frequency removed from the assigned frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: At least 20 dB

(2) On any frequency removed from the assigned frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: At least 35 dB; and

(3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43 plus $10\log_{10}$ (mean power in watts) dB.

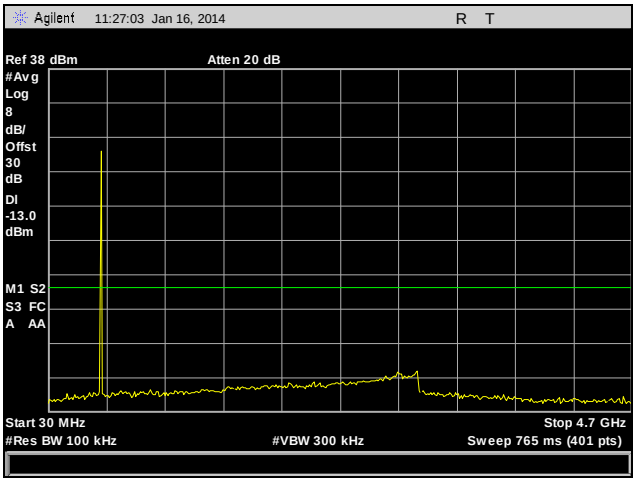
Test Procedures: As required by 47 CFR §2.1051, *Spurious Emissions at Antenna Terminals*, specifically the *Emissions Limitations* as defined in *Part 80.211 (f)(1).* Measurements were made with a Spectrum Analyzer connected to the RF ports of the transmitter, with suitable attenuation.

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

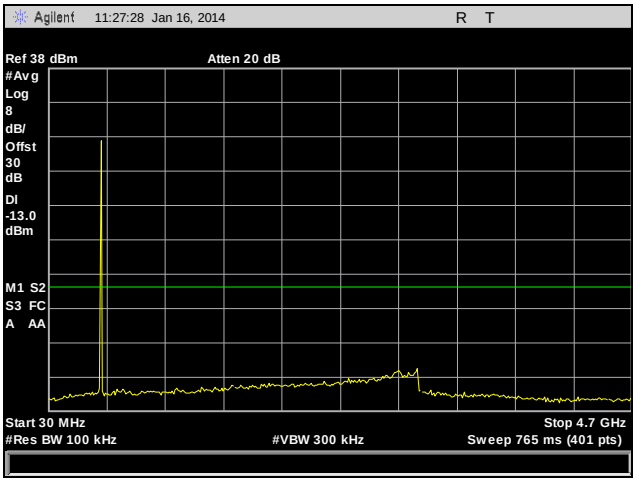
Test Engineer(s): Surinder Singh

Test Date(s): 01/23/14

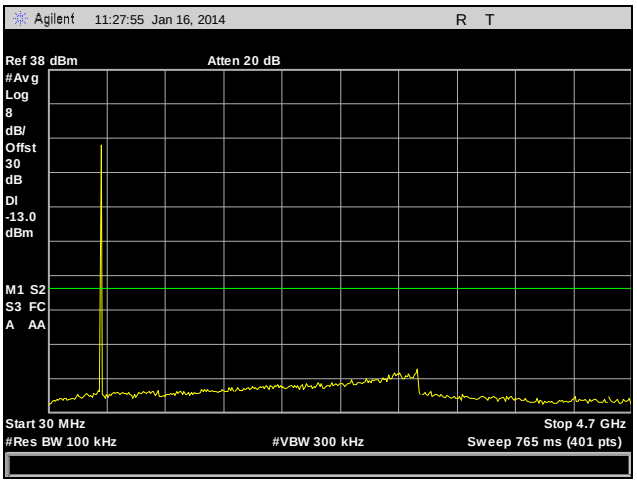
Conducted Spurious Emissions



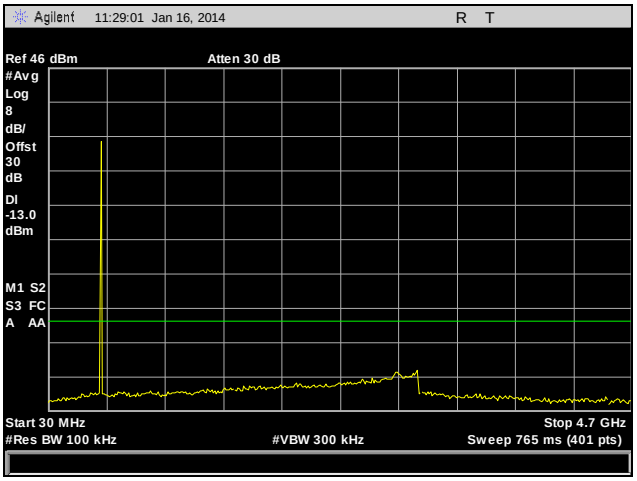
Plot 157. Part 80, Conducted Spurious Emissions, 450 MHz, C4FM, 10 W, 30 MHz – 4.7 GHz



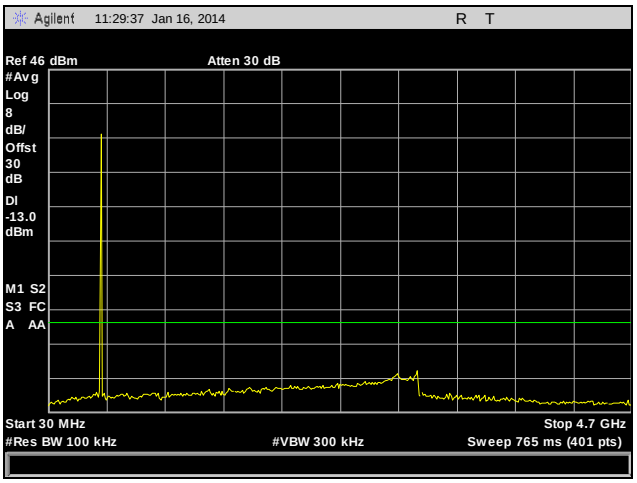
Plot 158. Part 80, Conducted Spurious Emissions, 450 MHz, CQPSK, 10 W, 30 MHz – 4.7 GHz



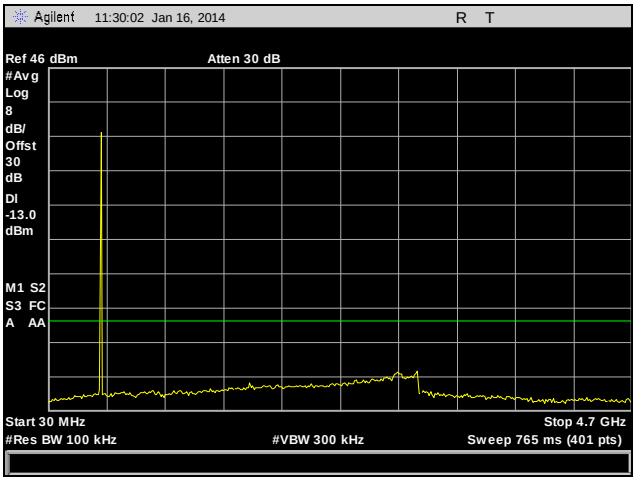
Plot 159. Part 80, Conducted Spurious Emissions, 450 MHz, HDQPSK, 10 W, 30 MHz – 4.7 GHz



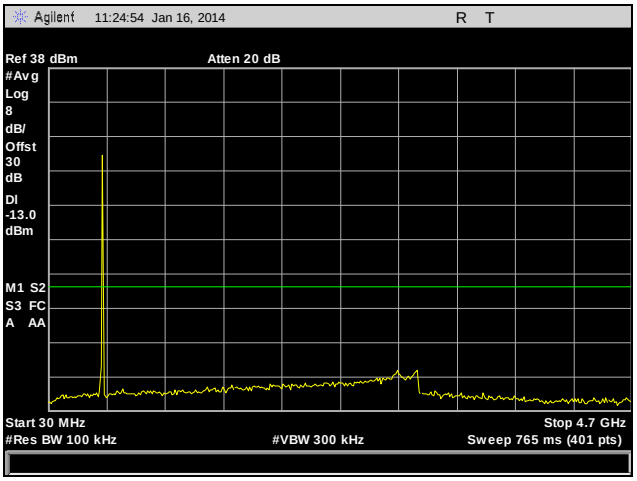
Plot 160. Part 80, Conducted Spurious Emissions, 450 MHz, C4FM, 100 W, 30 MHz – 4.7 GHz



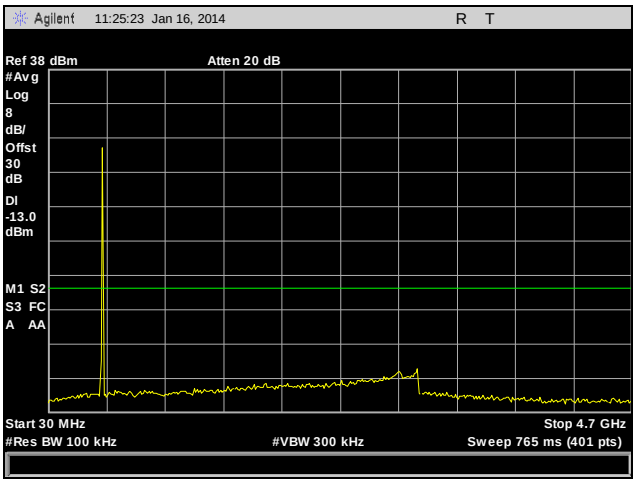
Plot 161. Part 80, Conducted Spurious Emissions, 450 MHz, CQPSK, 100 W, 30 MHz – 4.7 GHz



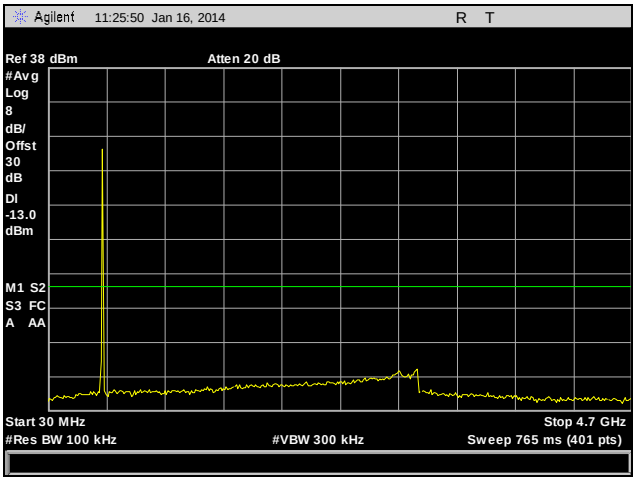
Plot 162. Part 80, Conducted Spurious Emissions, 450 MHz, HDQPSK, 100 W, 30 MHz – 4.7 GHz



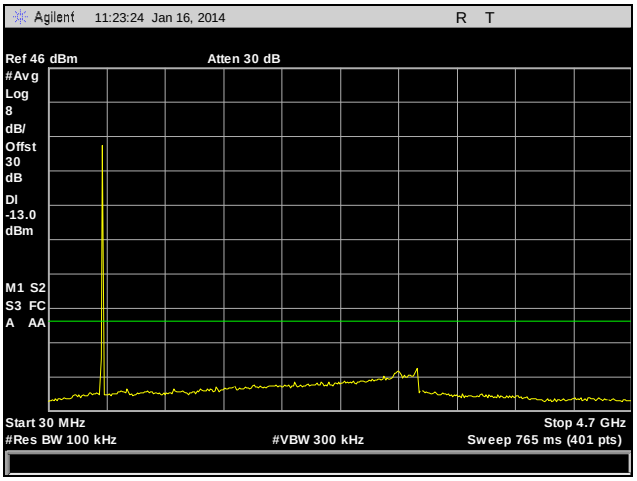
Plot 163. Part 80, Conducted Spurious Emissions, 456 MHz, C4FM, 10 W, 30 MHz – 4.7 GHz



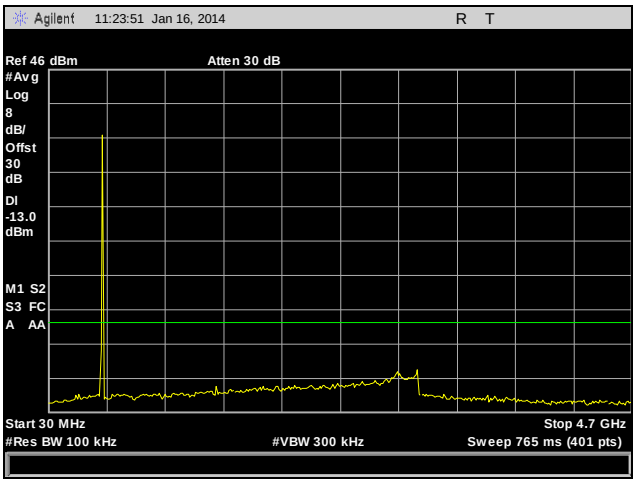
Plot 164. Part 80, Conducted Spurious Emissions, 456 MHz, CQPSK, 10 W, 30 MHz – 4.7 GHz



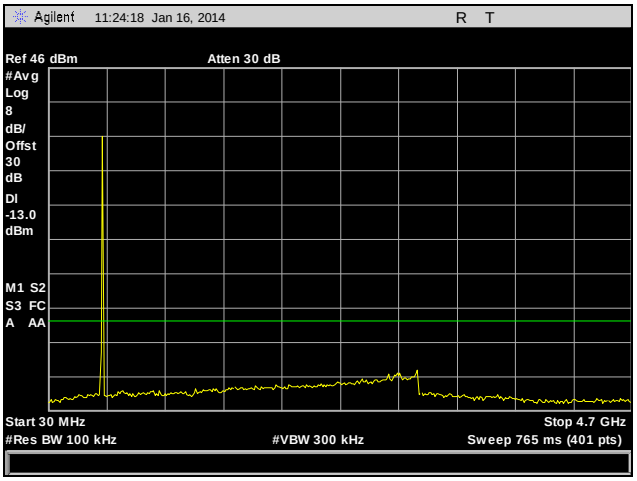
Plot 165. Part 80, Conducted Spurious Emissions, 456 MHz, HDQPSK, 10 W, 30 MHz – 4.7 GHz



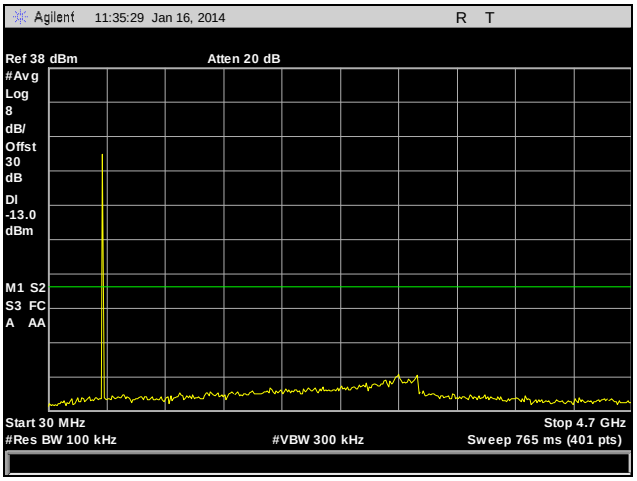
Plot 166. Part 80, Conducted Spurious Emissions, 456 MHz, C4FM, 100 W, 30 MHz – 4.7 GHz



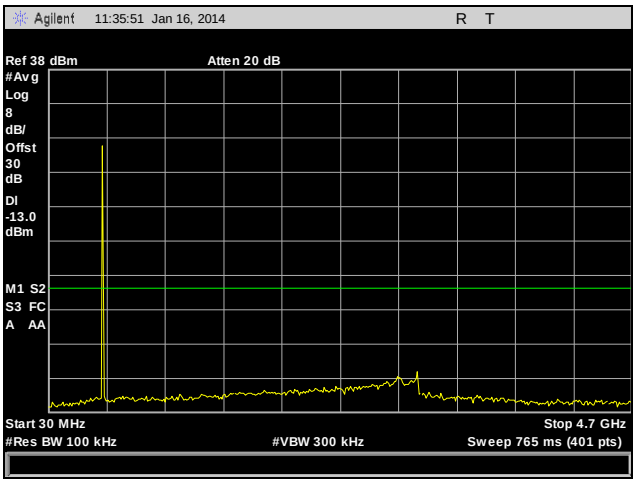
Plot 167. Part 80, Conducted Spurious Emissions, 456 MHz, CQPSK, 100 W, 30 MHz – 4.7 GHz



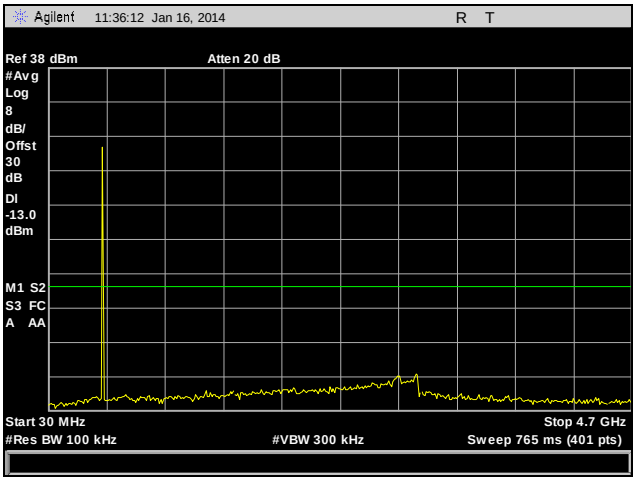
Plot 168. Part 80, Conducted Spurious Emissions, 456 MHz, HDQPSK, 100 W, 30 MHz – 4.7 GHz



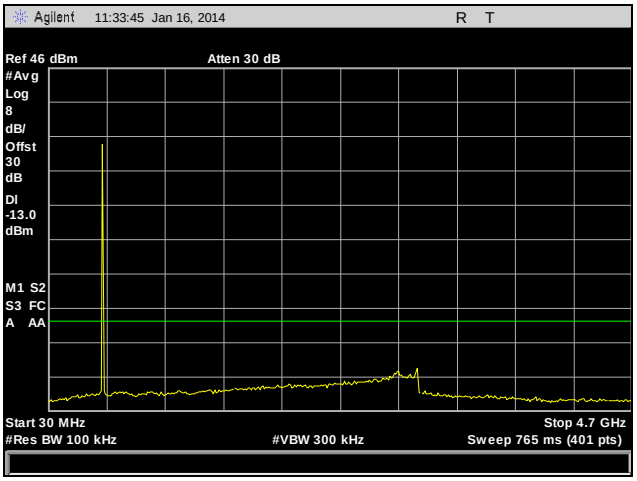
Plot 169. Part 80, Conducted Spurious Emissions, 463 MHz, C4FM, 10 W, 30 MHz – 4.7 GHz



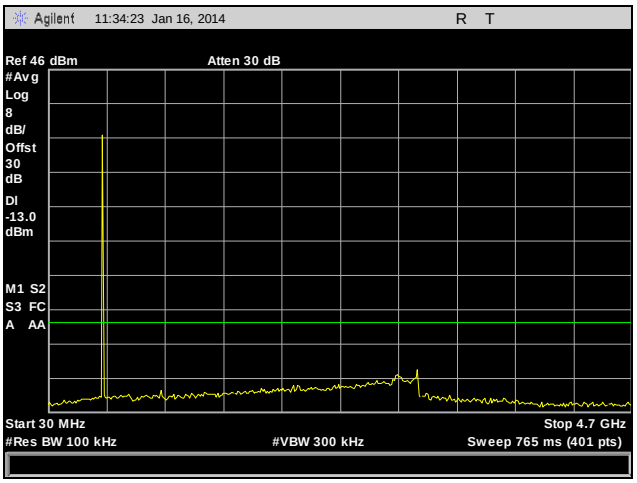
Plot 170. Part 80, Conducted Spurious Emissions, 463 MHz, CQPSK, 10 W, 30 MHz – 4.7 GHz



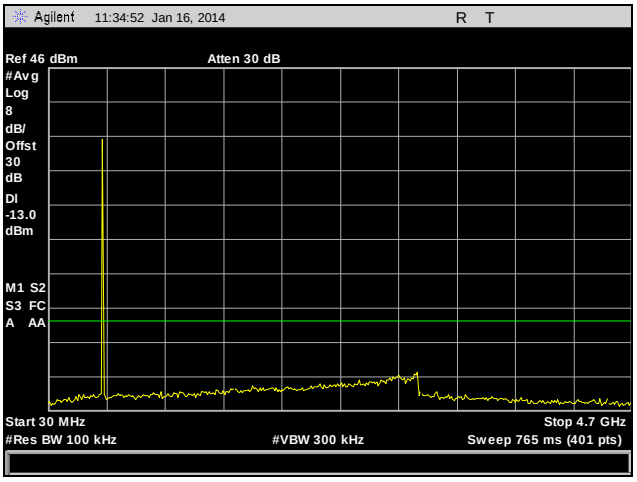
Plot 171. Part 80, Conducted Spurious Emissions, 463 MHz, HDQPSK, 10 W, 30 MHz – 4.7 GHz



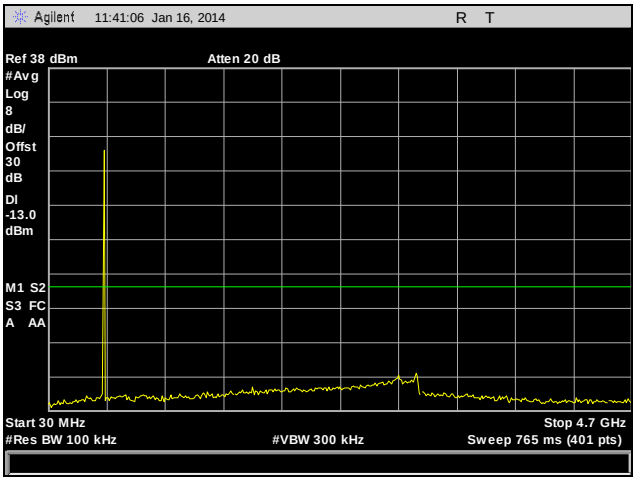
Plot 172. Part 80, Conducted Spurious Emissions, 463 MHz, C4FM, 100 W, 30 MHz – 4.7 GHz



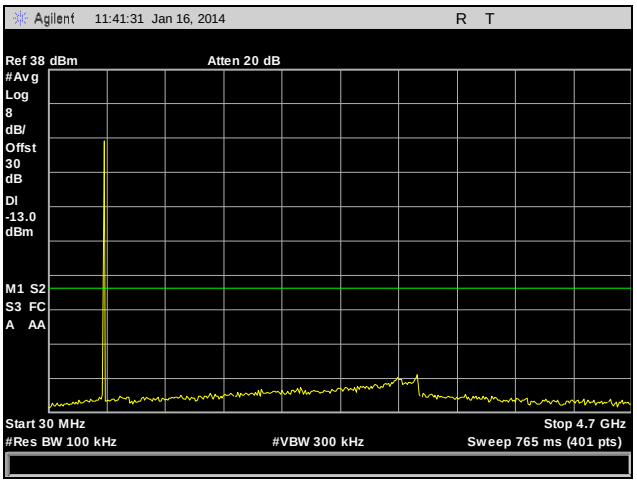
Plot 173. Part 80, Conducted Spurious Emissions, 463 MHz, CQPSK, 100 W, 30 MHz – 4.7 GHz



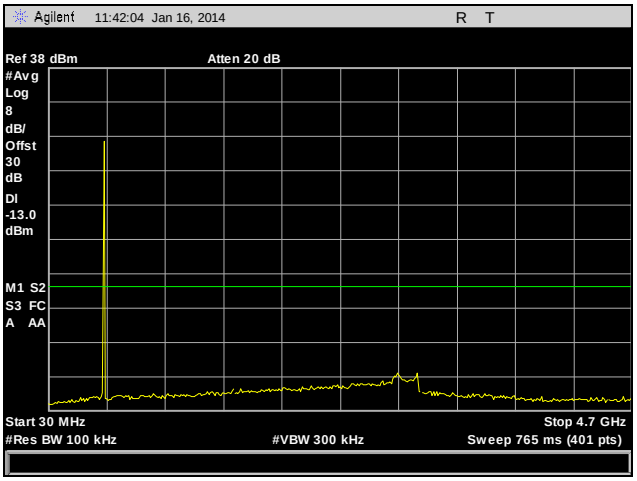
Plot 174. Part 80, Conducted Spurious Emissions, 463 MHz, HDQPSK, 100 W, 30 MHz – 4.7 GHz



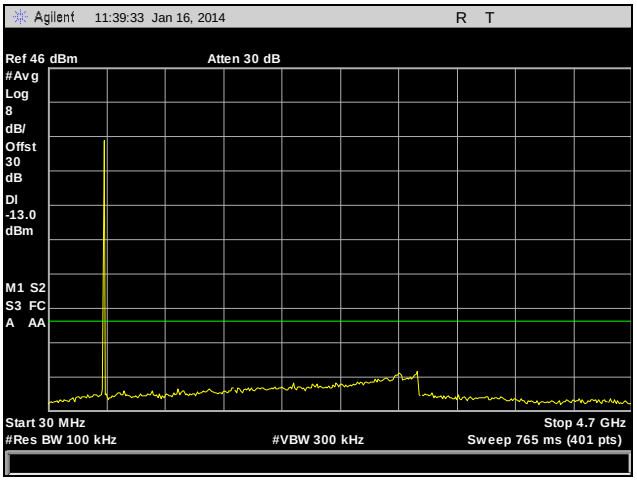
Plot 175. Part 80, Conducted Spurious Emissions, 470 MHz, C4FM, 10 W, 30 MHz – 4.7 GHz



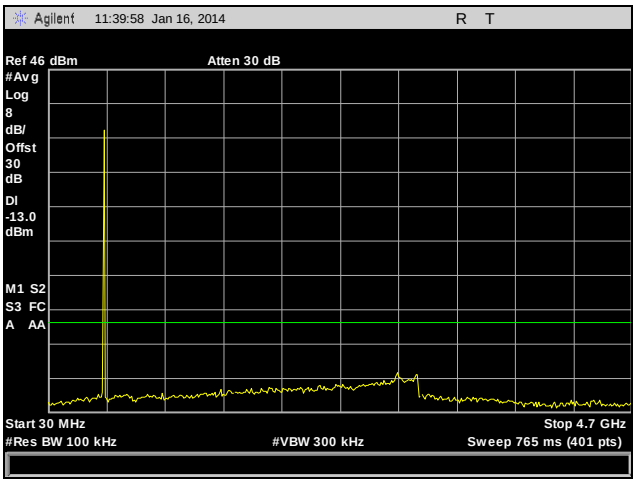
Plot 176. Part 80, Conducted Spurious Emissions, 470 MHz, CQPSK, 10 W, 30 MHz – 4.7 GHz



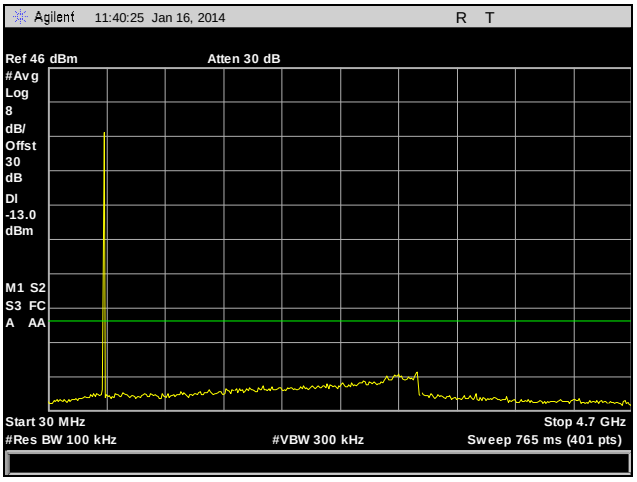
Plot 177. Part 80, Conducted Spurious Emissions, 470 MHz, HDQPSK, 10 W, 30 MHz – 4.7 GHz



Plot 178. Part 80, Conducted Spurious Emissions, 470 MHz, C4FM, 100 W, 30 MHz – 4.7 GHz

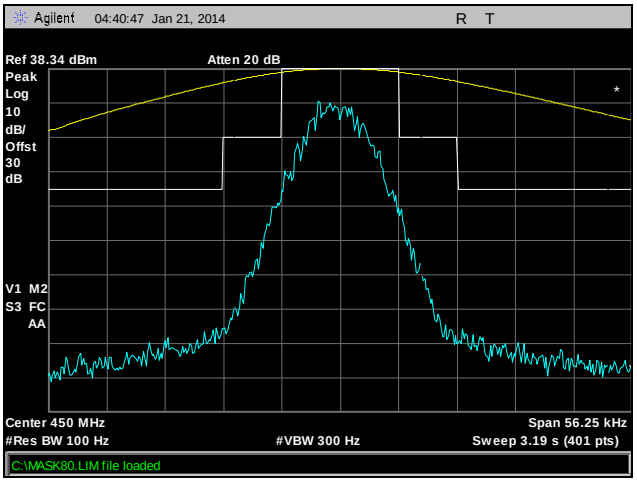


Plot 179. Part 80, Conducted Spurious Emissions, 470 MHz, CQPSK, 100 W, 30 MHz – 4.7 GHz

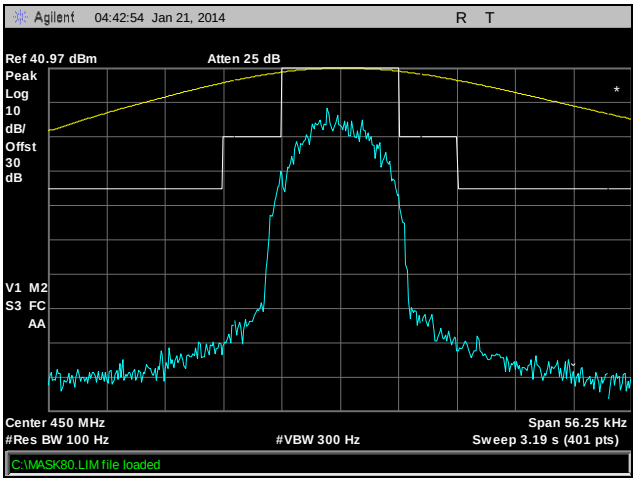


Plot 180. Part 80, Conducted Spurious Emissions, 470 MHz, HDQPSK, 100 W, 30 MHz – 4.7 GHz

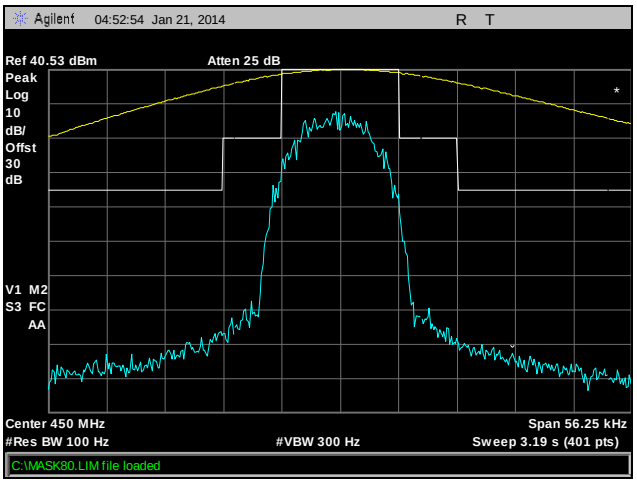
Emission Mask



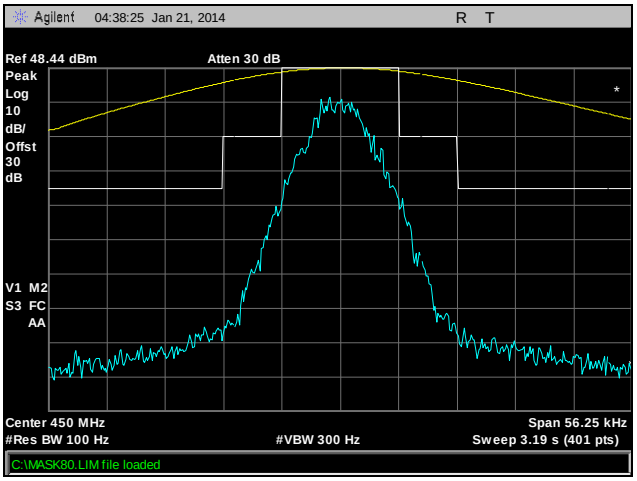
Plot 181. Part 80, Emission Mask, 450 MHz, C4FM, 10 W



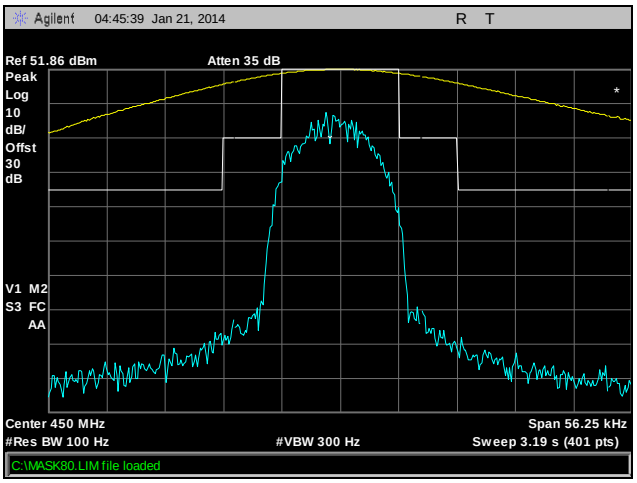
Plot 182. Part 80, Emission Mask, 450 MHz, CQPSK, 10 W



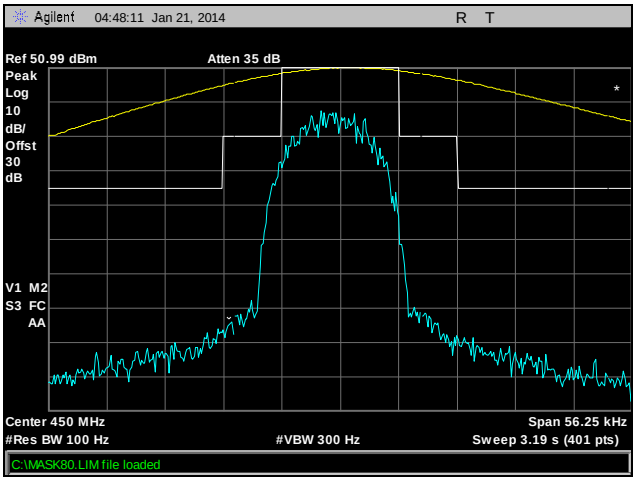
Plot 183. Part 80, Emission Mask, 450 MHz, HDQPSK, 10 W



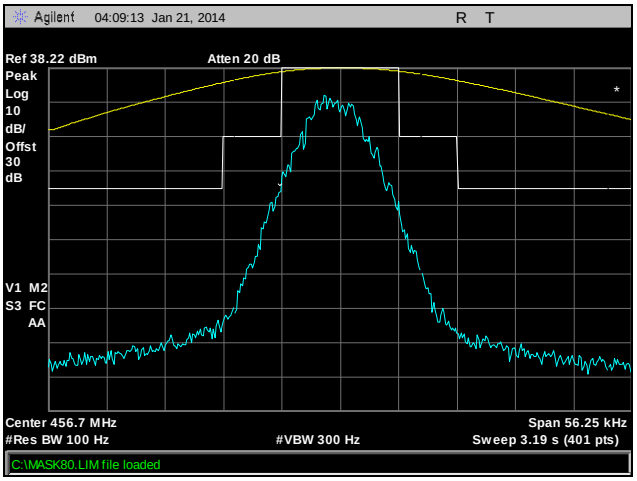
Plot 184. Part 80, Emission Mask, 450 MHz, C4FM, 100 W



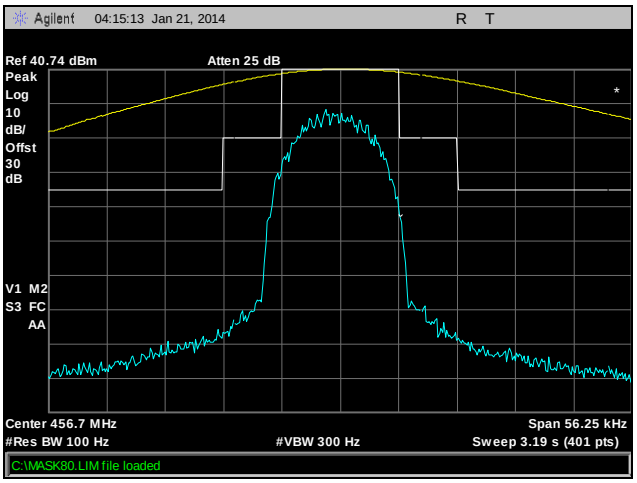
Plot 185. Part 80, Emission Mask, 450 MHz, CQPSK, 100 W



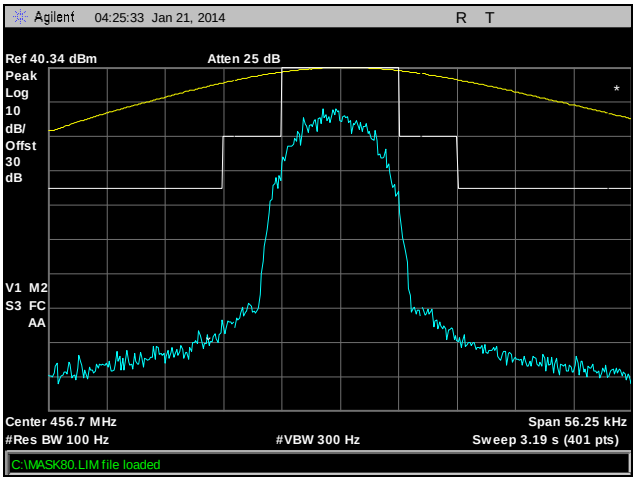
Plot 186. Part 80, Emission Mask, 450 MHz, HDQPSK, 100 W



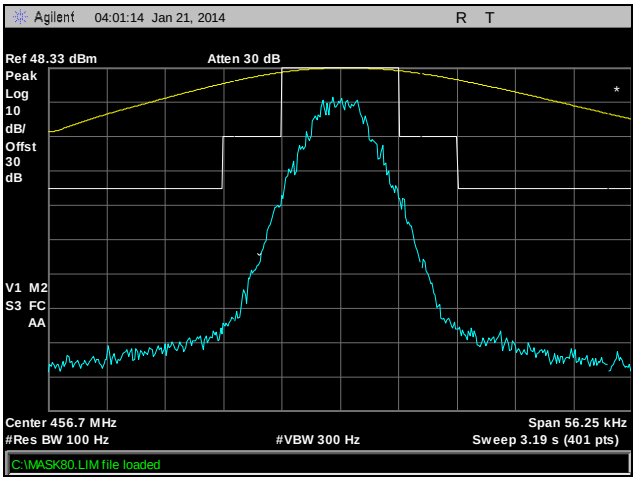
Plot 187. Part 80, Emission Mask, 456 MHz, C4FM, 10 W



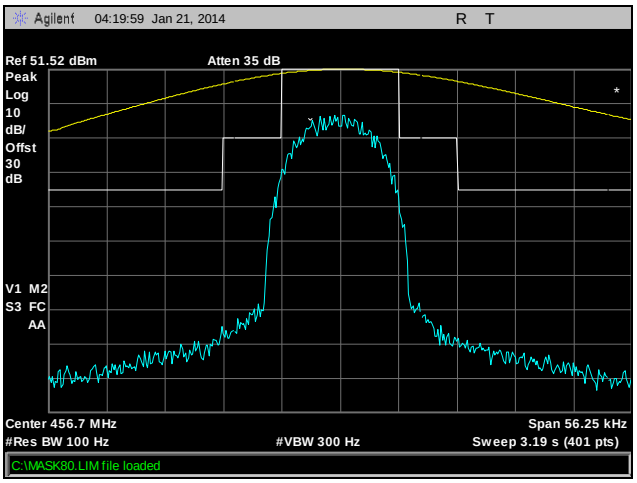
Plot 188. Part 80, Emission Mask, 456 MHz, CQPSK, 10 W



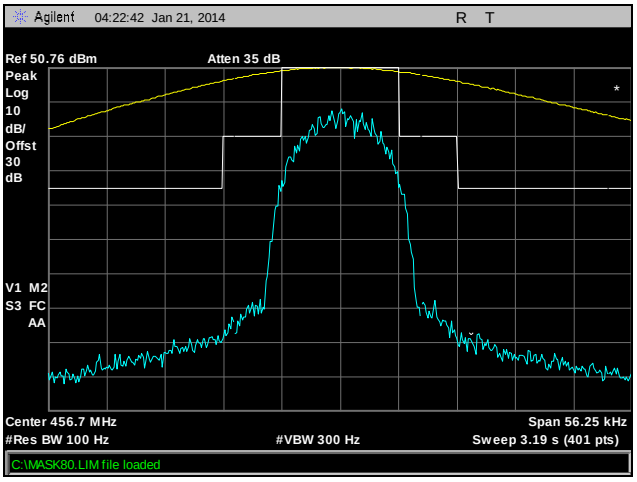
Plot 189. Part 80, Emission Mask, 456 MHz, HDQPSK, 10 W



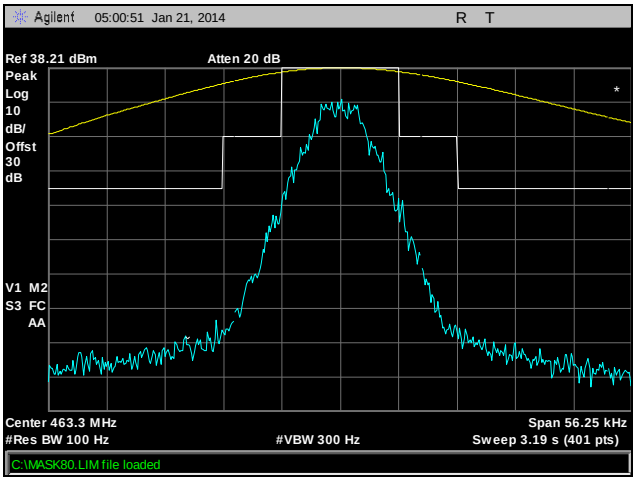
Plot 190. Part 80, Emission Mask, 456 MHz, C4FM, 100 W



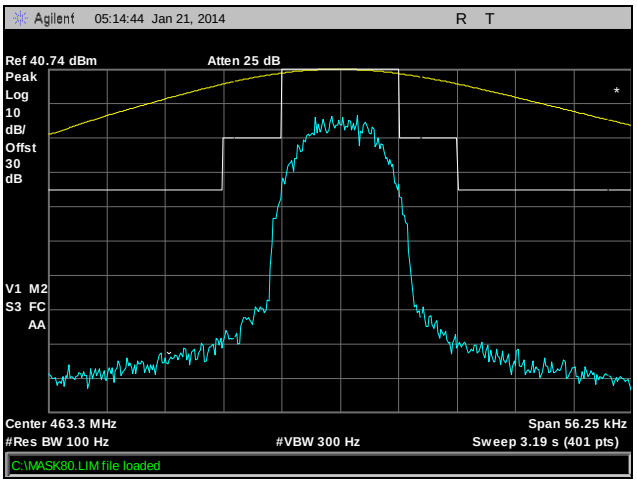
Plot 191. Part 80, Emission Mask, 456 MHz, CQPSK, 100 W



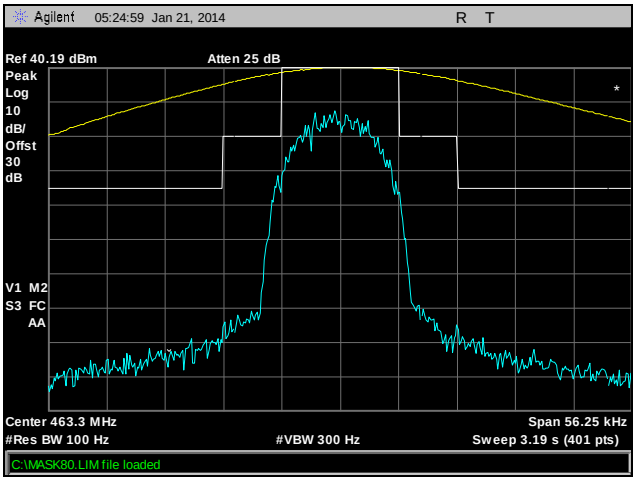
Plot 192. Part 80, Emission Mask, 456 MHz, HDQPSK, 100 W



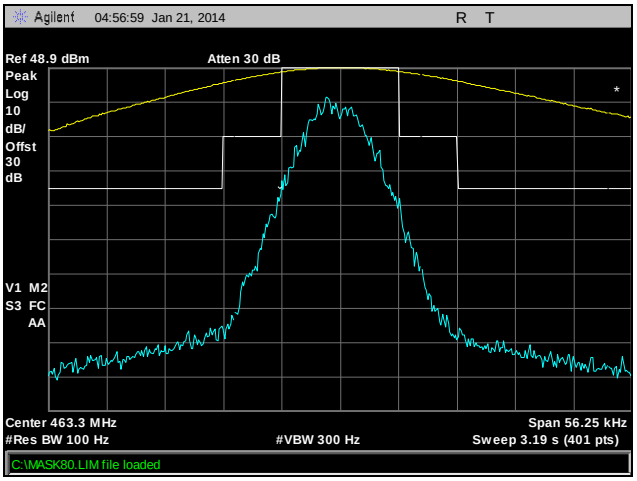
Plot 193. Part 80, Emission Mask, 463 MHz, C4FM, 10 W



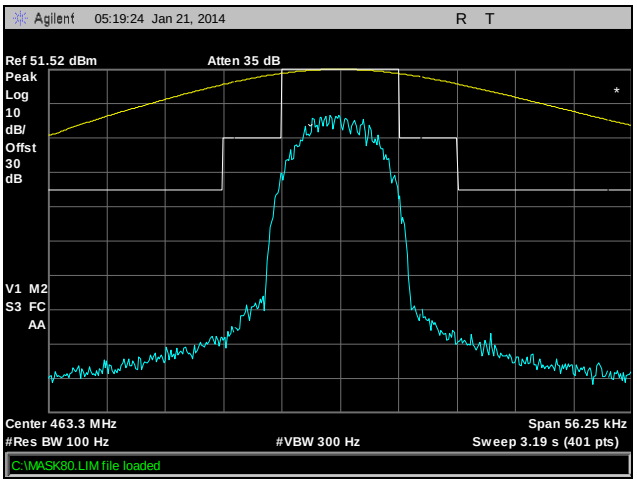
Plot 194. Part 80, Emission Mask, 463 MHz, CQPSK, 10 W



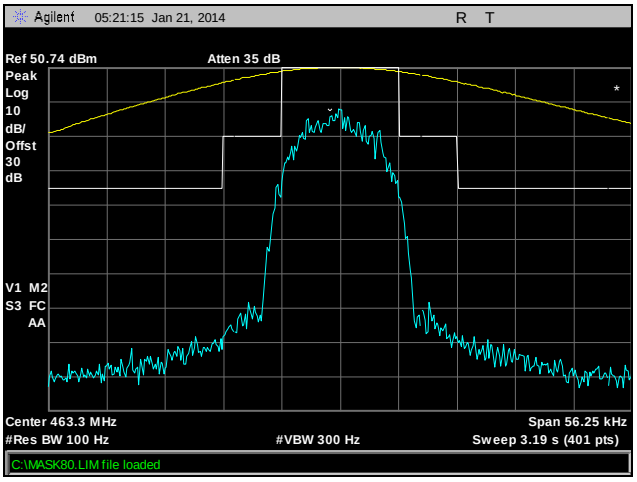
Plot 195. Part 80, Emission Mask, 463 MHz, HDQPSK, 10 W



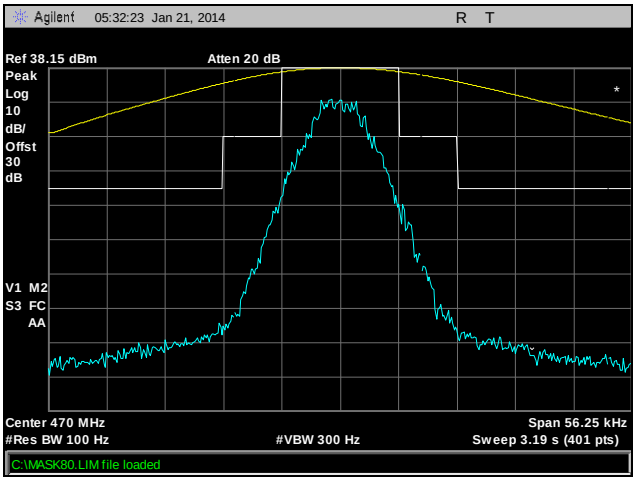
Plot 196. Part 80, Emission Mask, 463 MHz, C4FM, 100 W



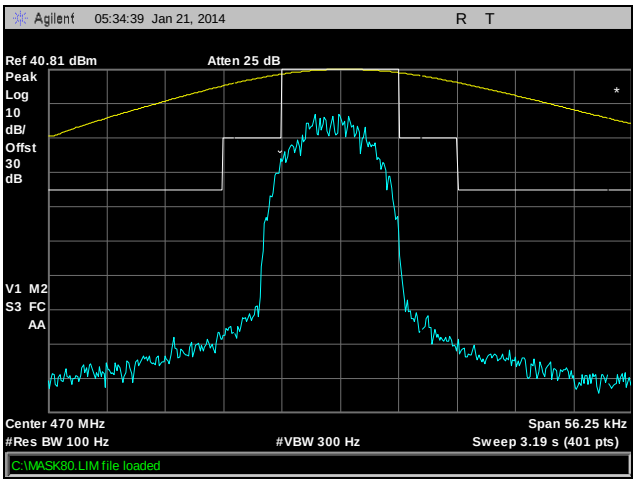
Plot 197. Part 80, Emission Mask, 463 MHz, CQPSK, 100 W



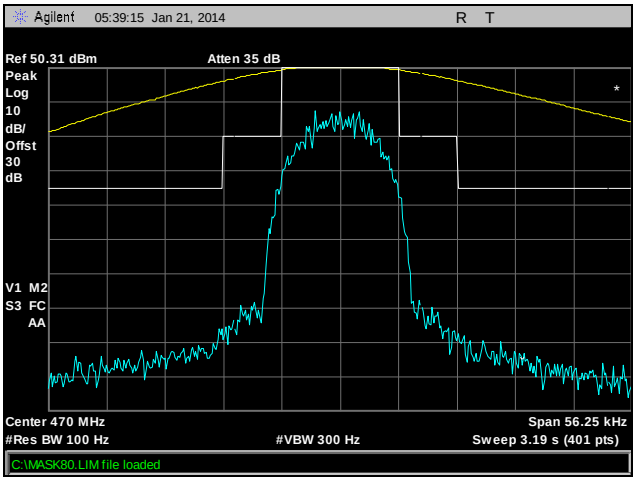
Plot 198. Part 80, Emission Mask, 463 MHz, HDQPSK, 100 W



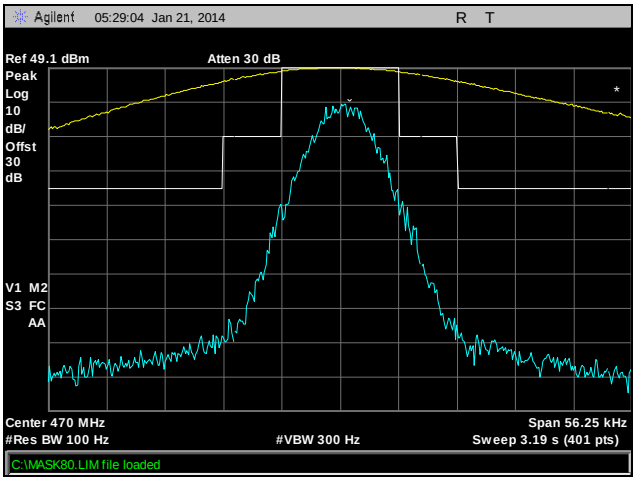
Plot 199. Part 80, Emission Mask, 470 MHz, C4FM, 10 W



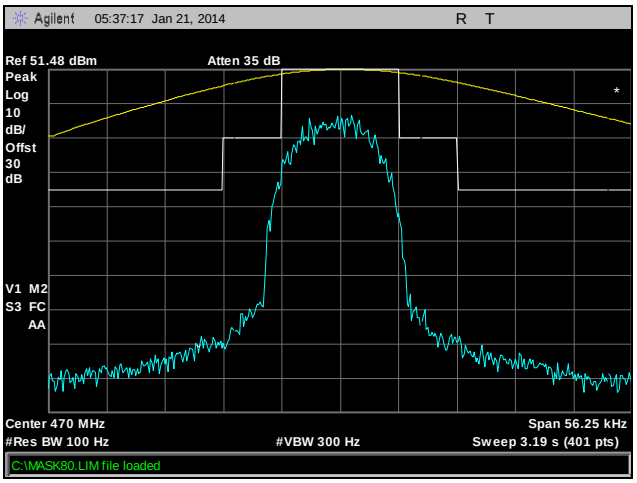
Plot 200. Part 80, Emission Mask, 470 MHz, CQPSK, 10 W



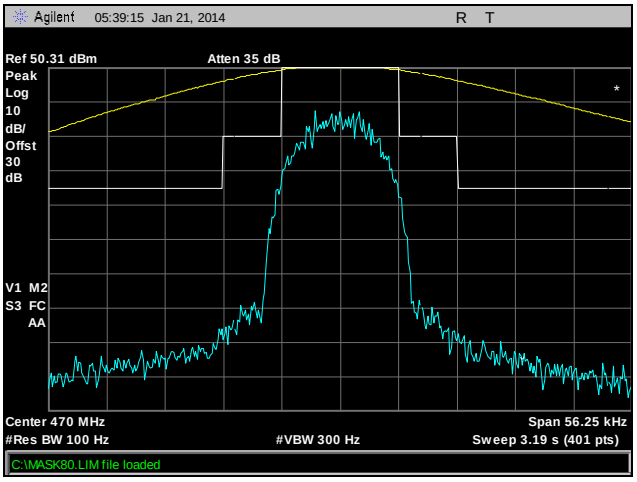
Plot 201. Part 80, Emission Mask, 470 MHz, HDQPSK, 10 W



Plot 202. Part 80, Emission Mask, 470 MHz, C4FM, 100 W



Plot 203. Part 80, Emission Mask, 470 MHz, CQPSK, 100 W



Plot 204. Part 80, Emission Mask, 470 MHz, HDQPSK, 100 W

§2.1053 Radiated Spurious Emissions

Test Requirement(s): **§2.1053 Measurements required: Field strength of spurious radiation.**

§2.1053 (a) Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data shall be supplied showing the magnitude of each harmonic and other spurious emission. For this test, single sideband, independent sideband, and controlled carrier transmitters shall be modulated under the conditions specified in paragraph (c) of § 2.1049, as appropriate

§2.1053 (b): The measurements specified in paragraph (a) of this section shall be made for the following equipment:

(1) Those in which the spurious emissions are required to be 60 dB or more below the mean power of the transmitter.

(2) All equipment operating on frequencies higher than 25 MHz.

(3) All equipment where the antenna is an integral part of, and attached directly to the transmitter.

(4) Other types of equipment as required, when deemed necessary by the Commission.

Test Procedures: As required by 47 CFR 2.1053, *field strength of radiated spurious measurements* were made in accordance with the procedures of TIA/EIA-603-C-2004 "Land Mobile FM or PM Communications Equipment Measurement and Performance Standards".

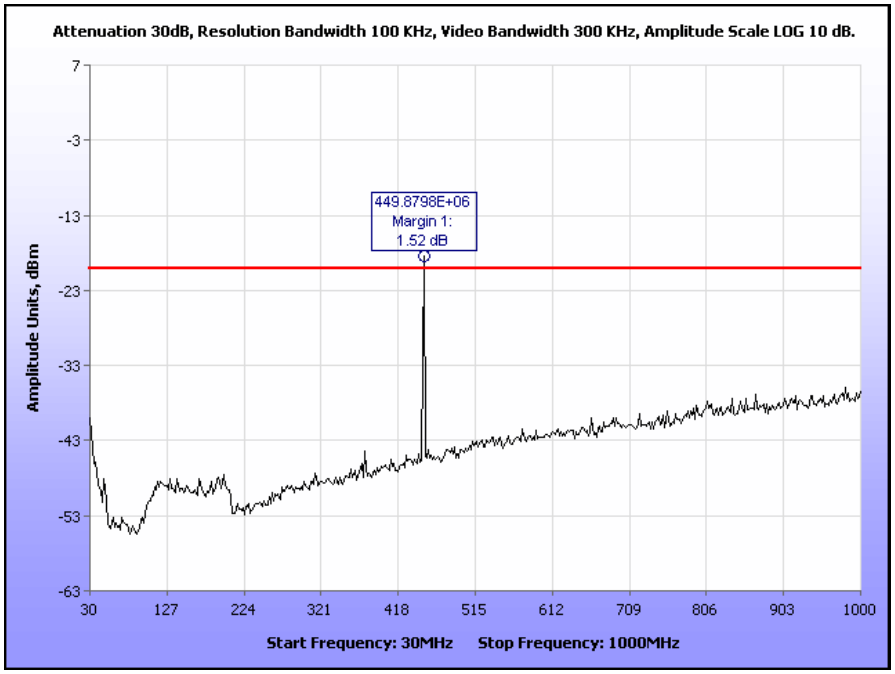
Radiated emission measurements were performed inside a 3 meter semi-anechoic chamber. The EUT was set at a distance of 3m from the receiving antenna. The EUT's RF ports were terminated to 50ohm load. The EUT was set to transmit at all four channels of the transmitter frequency range at its maximum power level. The EUT was rotated about 360^0 and the receiving antenna scanned from 1-4m in order to capture the maximum emission. These steps were carried out with the receiving antenna in both vertical and horizontal polarization. Harmonic emissions up to the 10^{th} or 40GHz, which ever was the lesser, were investigated.

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

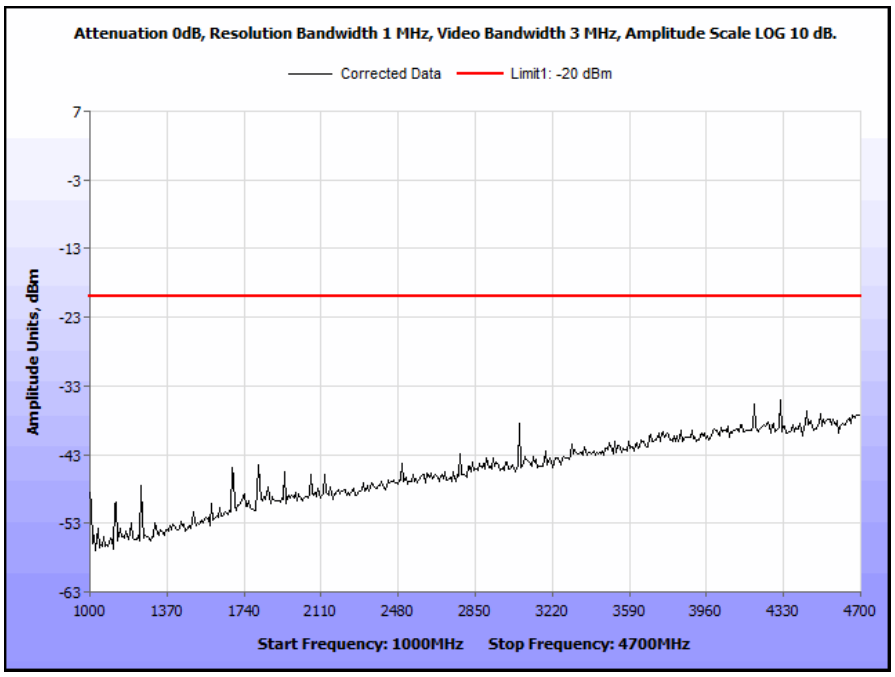
Test Engineer: Surinder Singh

Test Date(s): 01/23/14

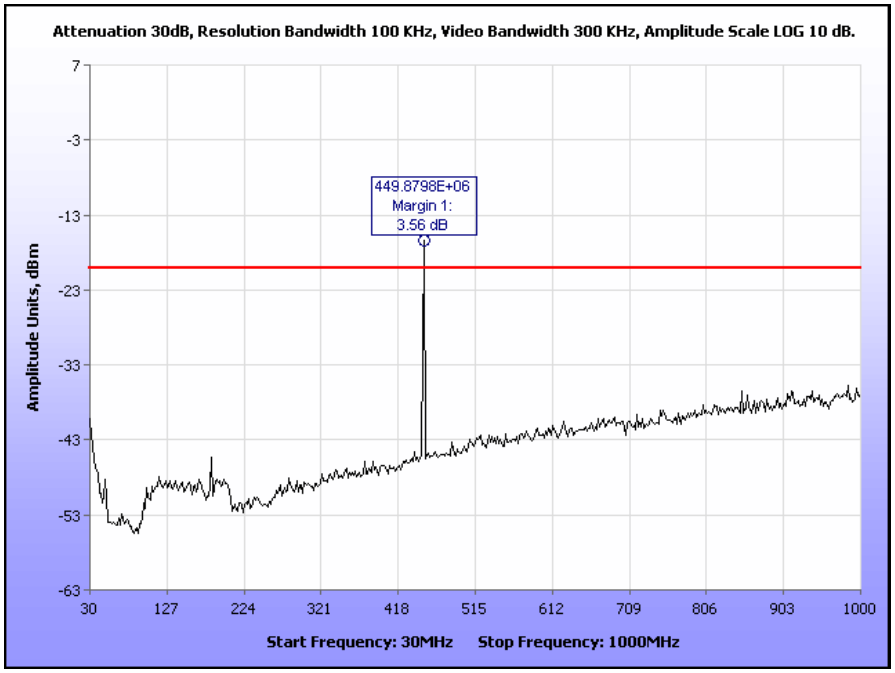
Radiated Spurious Emissions



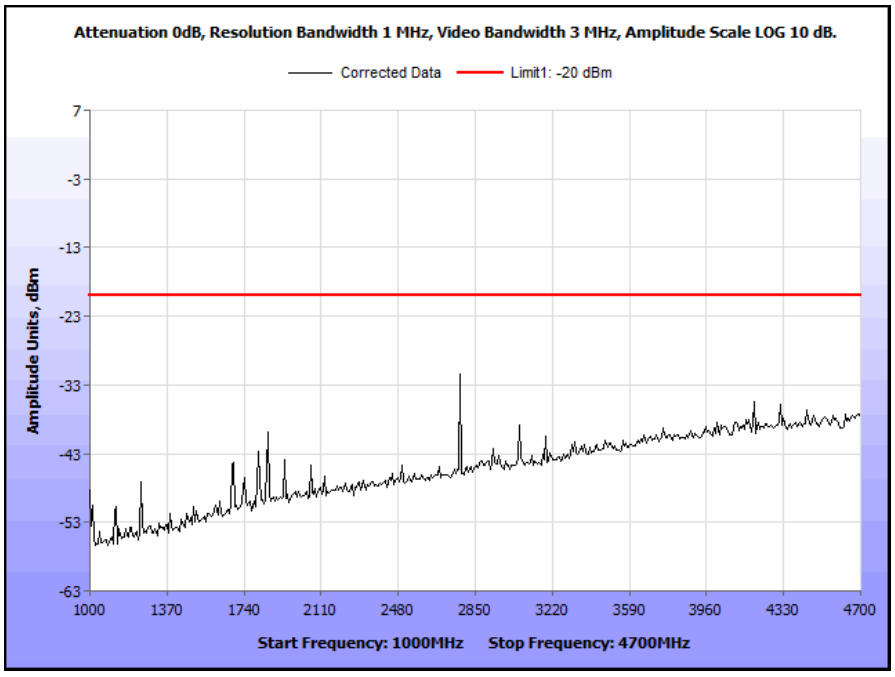
Plot 205. Part 90, Radiated Spurious Emissions, 450 MHz, C4FM, 30 MHz – 1 GHz, 10 W



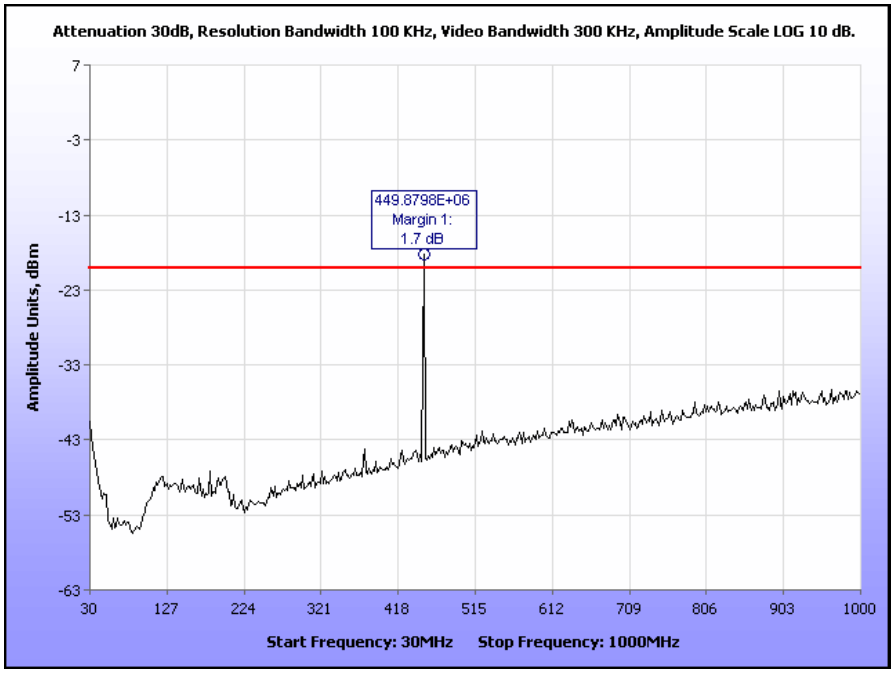
Plot 206. Part 90, Radiated Spurious Emissions, 450 MHz, C4FM, 1 GHz – 4.7 GHz, 10 W



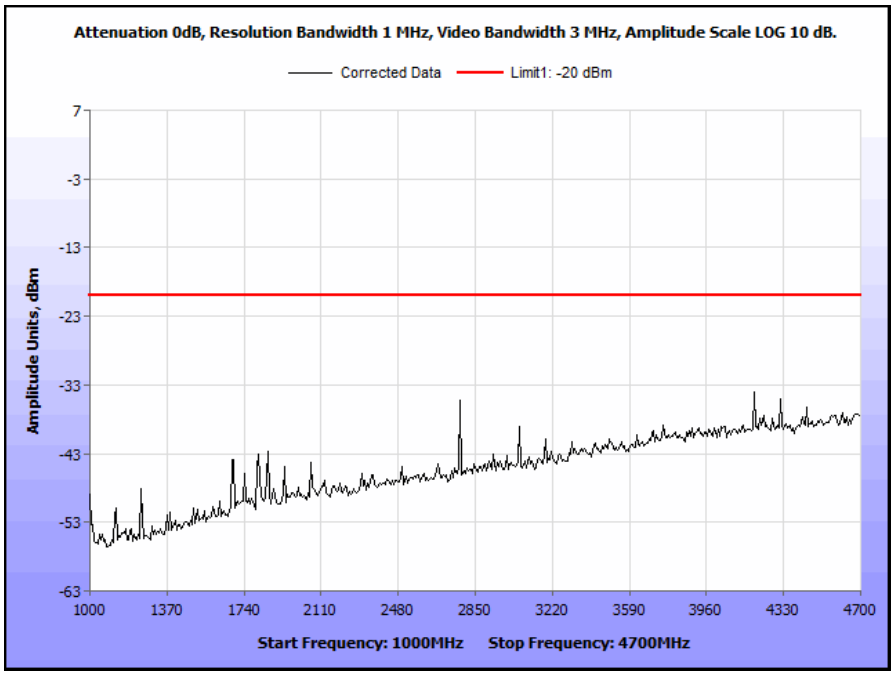
Plot 207. Part 90, Radiated Spurious Emissions, 450 MHz, CQPSK, 30 MHz – 1 GHz, 10 W



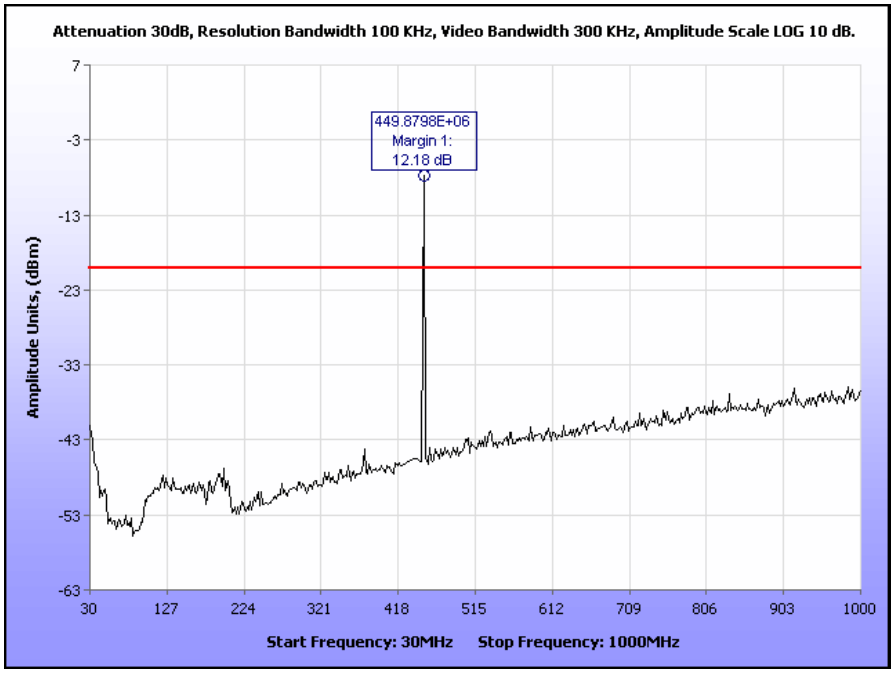
Plot 208. Part 90, Radiated Spurious Emissions, 450 MHz, CQPSK, 1 GHz – 4.7 GHz, 10 W



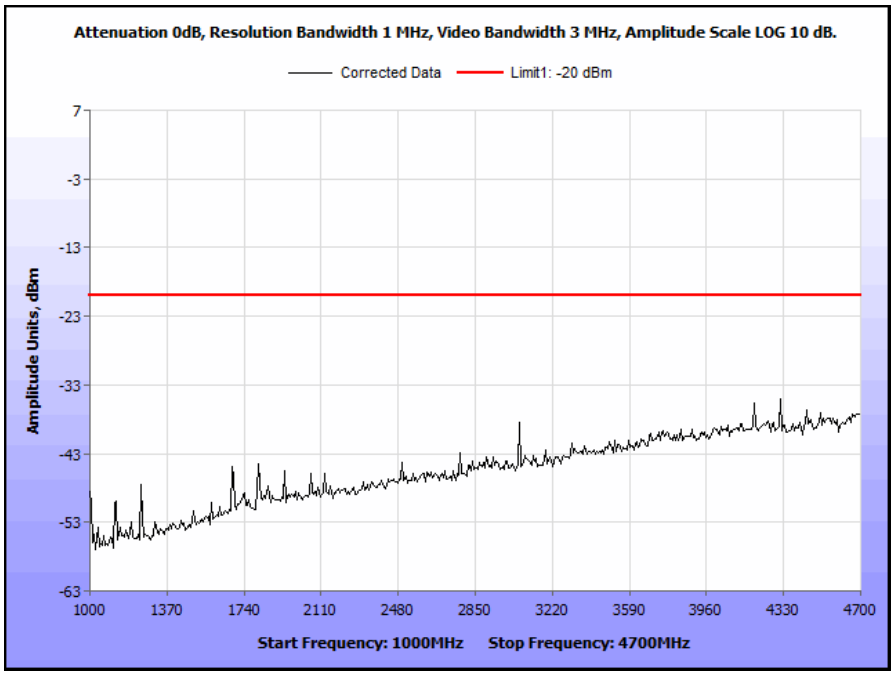
Plot 209. Part 90, Radiated Spurious Emissions, 450 MHz, HDQPSK, 30 MHz – 1 GHz, 10 W



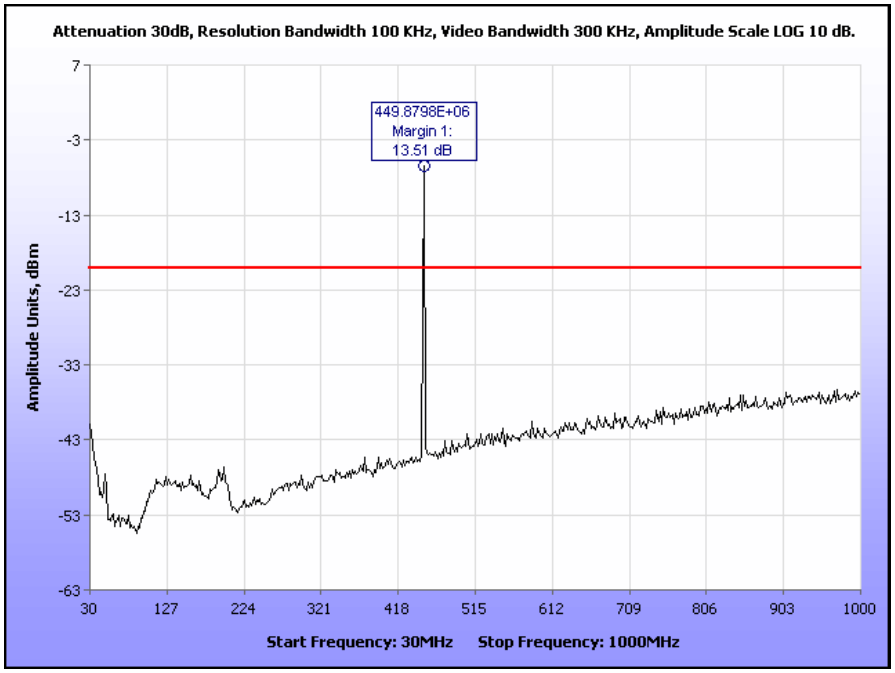
Plot 210. Part 90, Radiated Spurious Emissions, 450 MHz, HDQPSK, 1 GHz – 4.7 GHz, 10 W



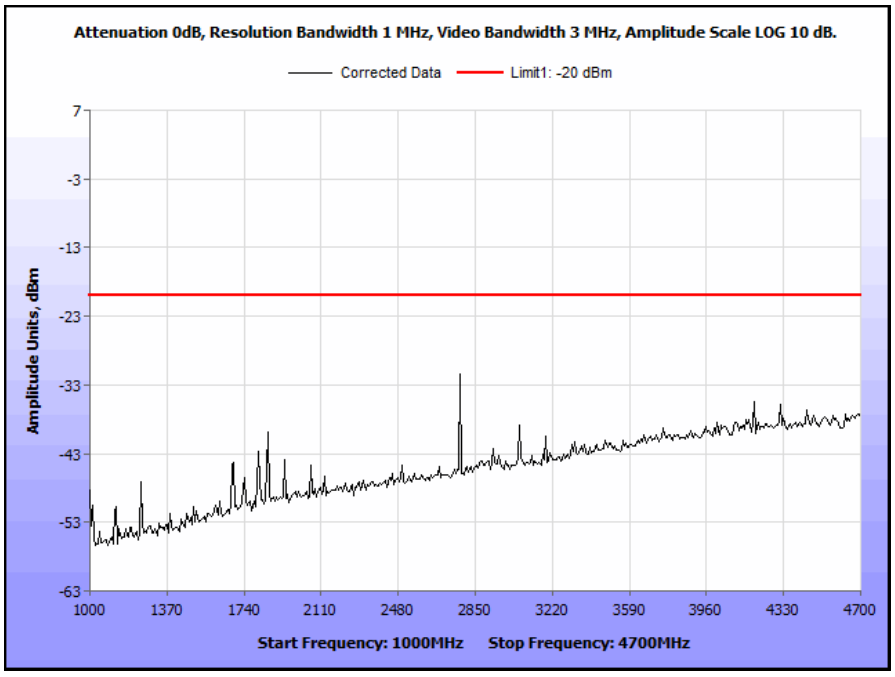
Plot 211. Part 90, Radiated Spurious Emissions, 450 MHz, C4FM, 30 MHz – 1 GHz, 100 W



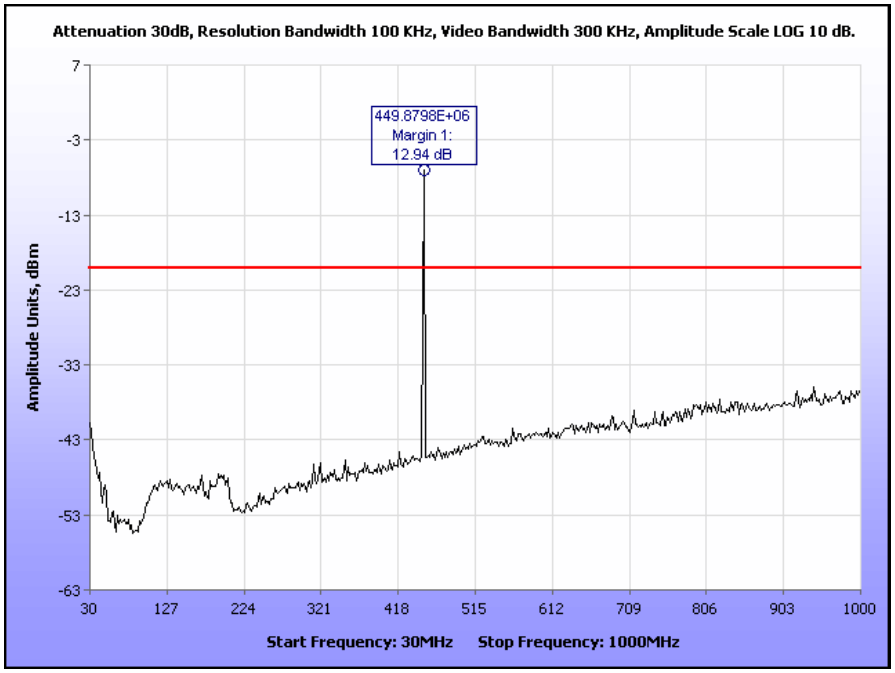
Plot 212. Part 90, Radiated Spurious Emissions, 450 MHz, C4FM, 1 GHz – 4.7 GHz, 100 W



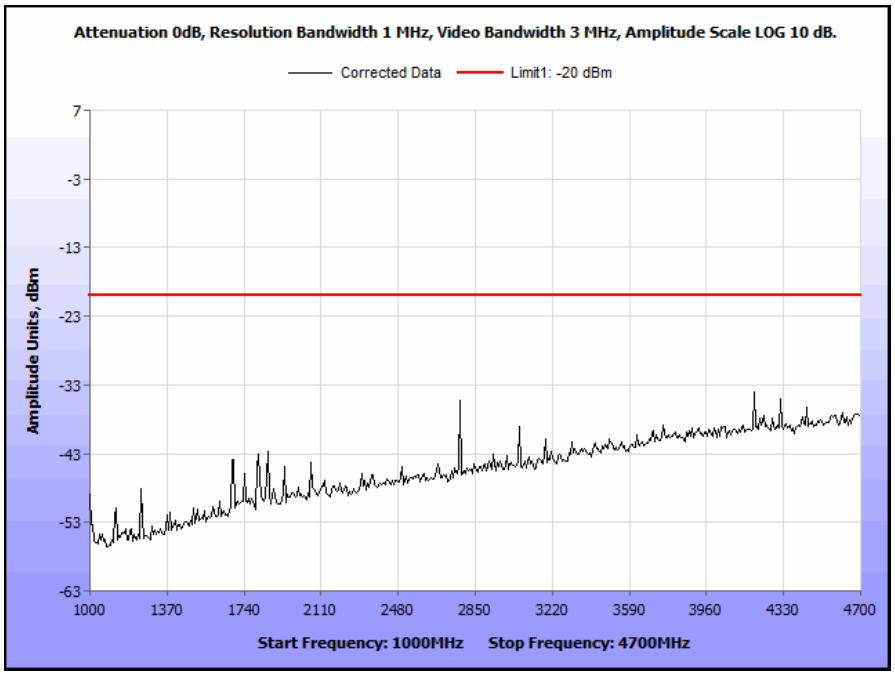
Plot 213. Part 90, Radiated Spurious Emissions, 450 MHz, CQPSK, 30 MHz – 1 GHz, 100 W



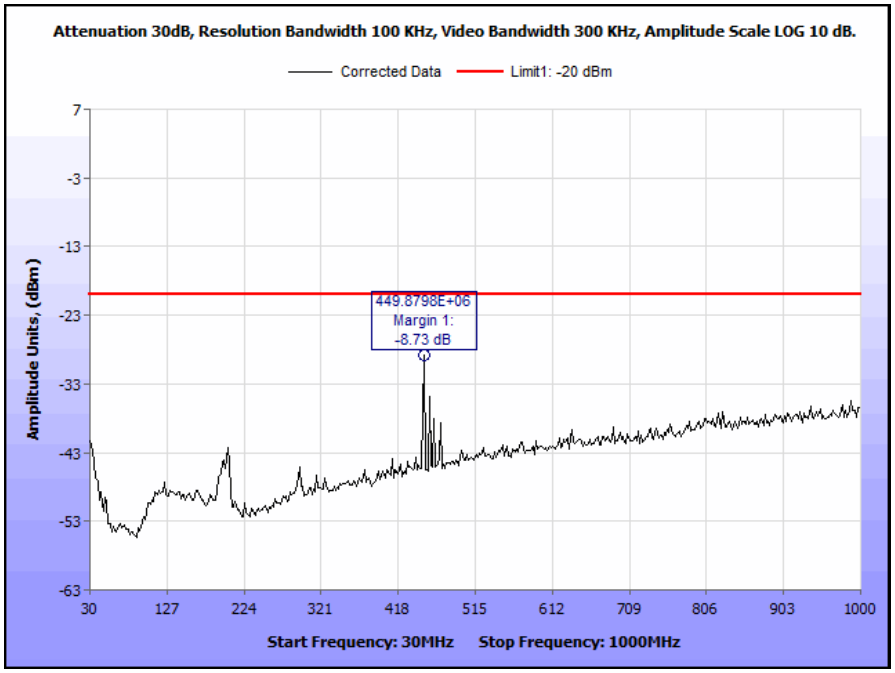
Plot 214. Part 90, Radiated Spurious Emissions, 450 MHz, CQPSK, 1 GHz – 4.7 GHz, 100 W



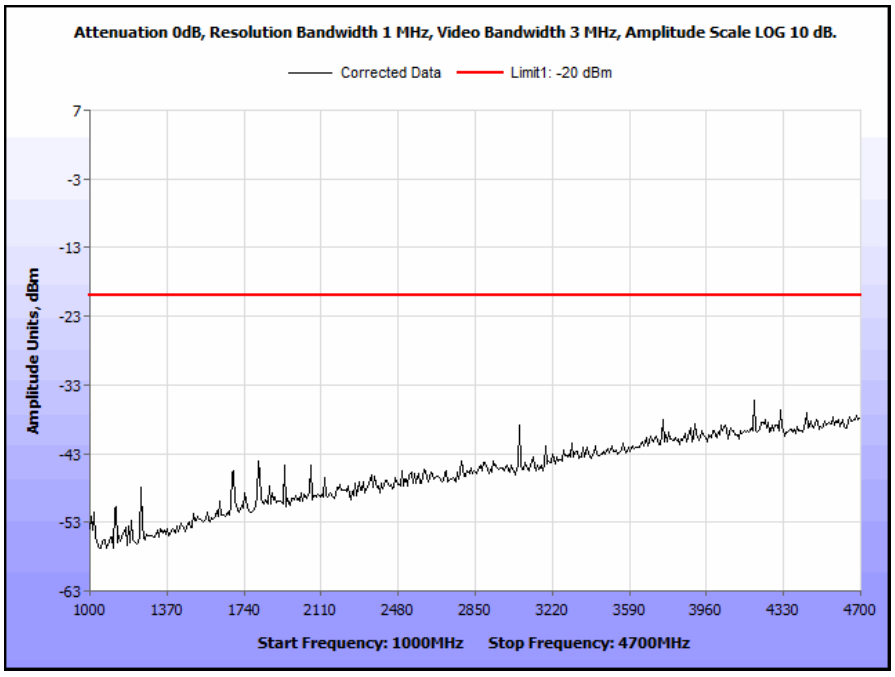
Plot 215. Part 90, Radiated Spurious Emissions, 450 MHz, HDQPSK, 30 MHz – 1 GHz, 100 W



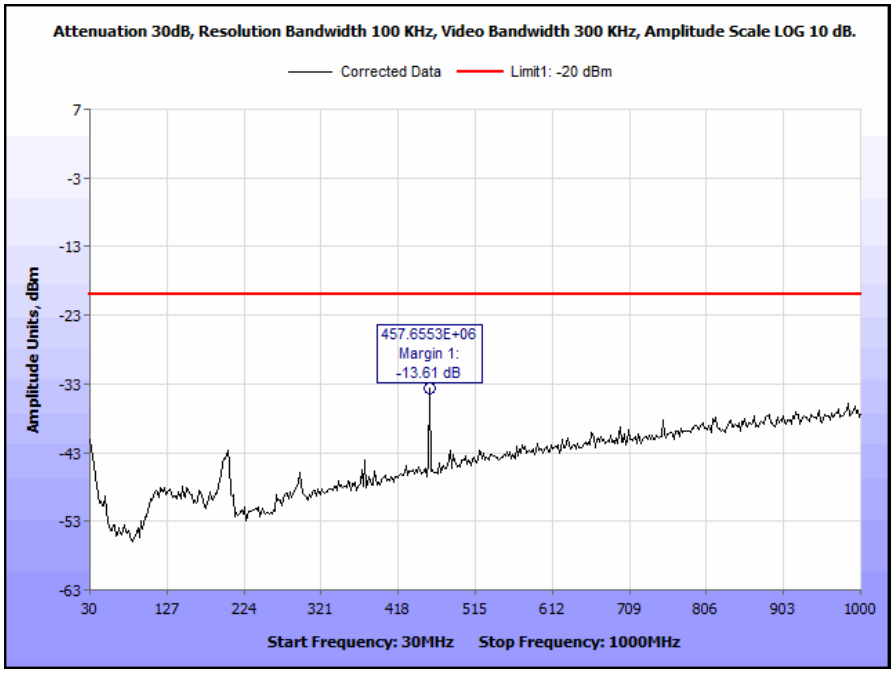
Plot 216. Part 90, Radiated Spurious Emissions, 450 MHz, HDQPSK, 1 GHz – 4.7 GHz, 100 W



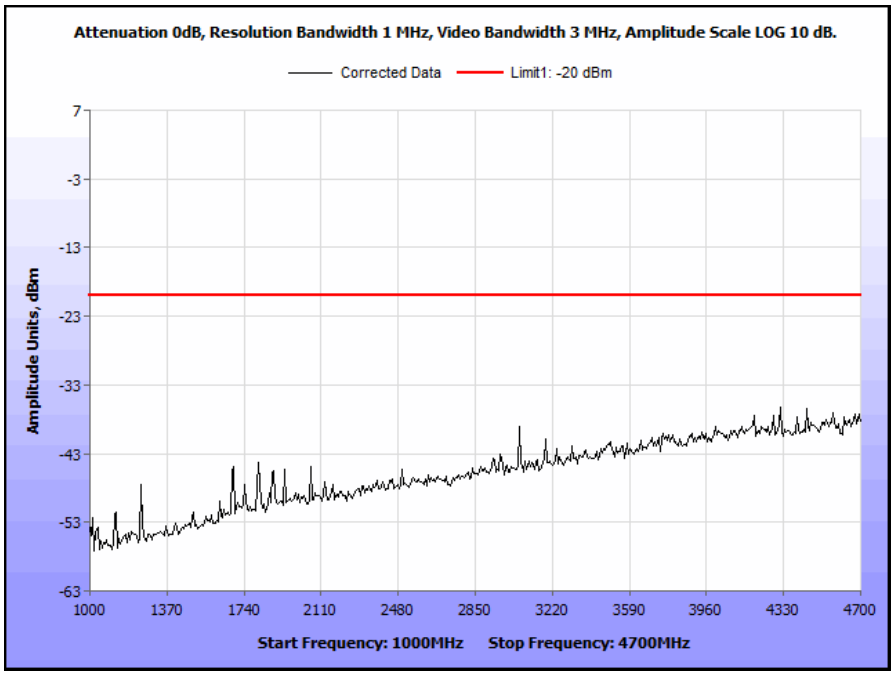
Plot 217. Part 90, Radiated Spurious Emissions, 456 MHz, C4FM, 30 MHz – 1 GHz, 10 W



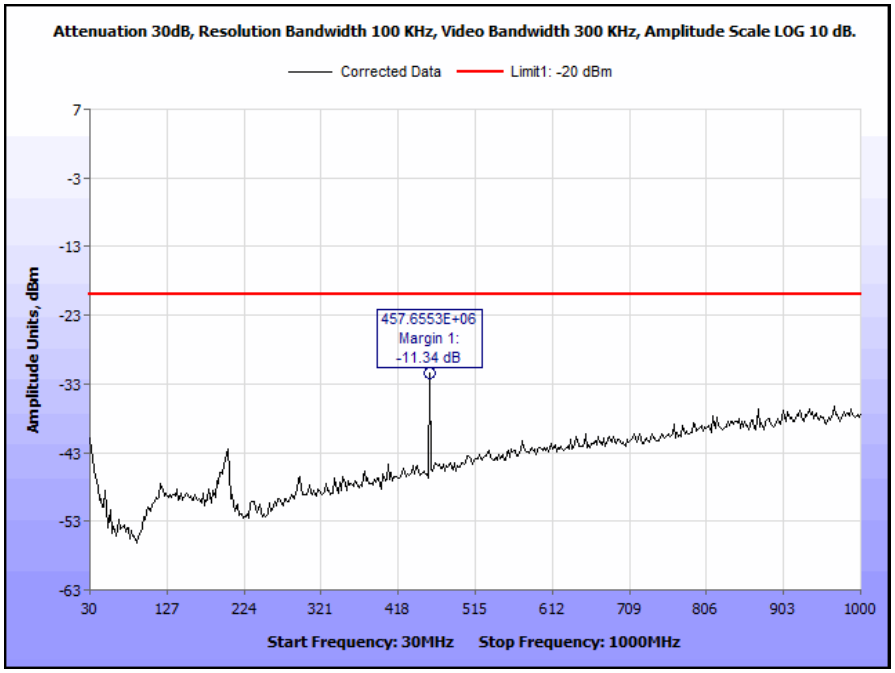
Plot 218. Part 90, Radiated Spurious Emissions, 456 MHz, C4FM, 1 GHz – 4.7 GHz, 10 W



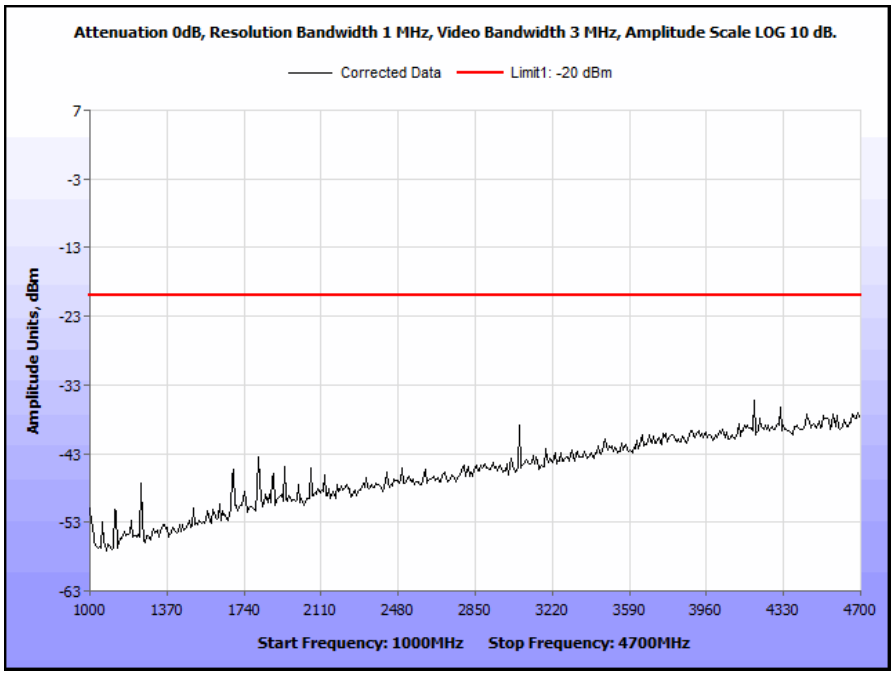
Plot 219. Part 90, Radiated Spurious Emissions, 456 MHz, CQPSK, 30 MHz – 1 GHz, 10 W



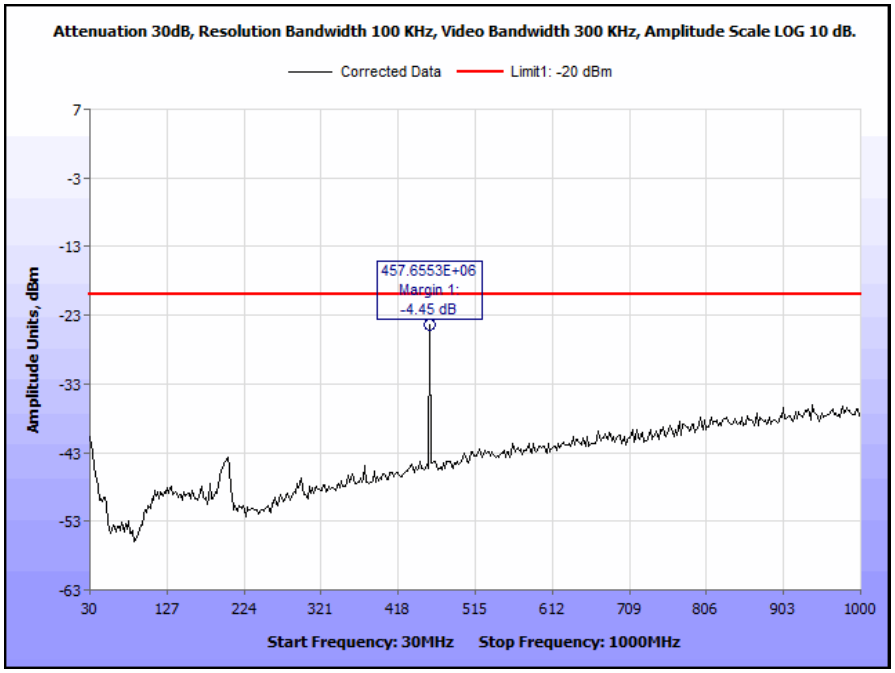
Plot 220. Part 90, Radiated Spurious Emissions, 456 MHz, CQPSK, 1 GHz – 4.7 GHz, 10 W



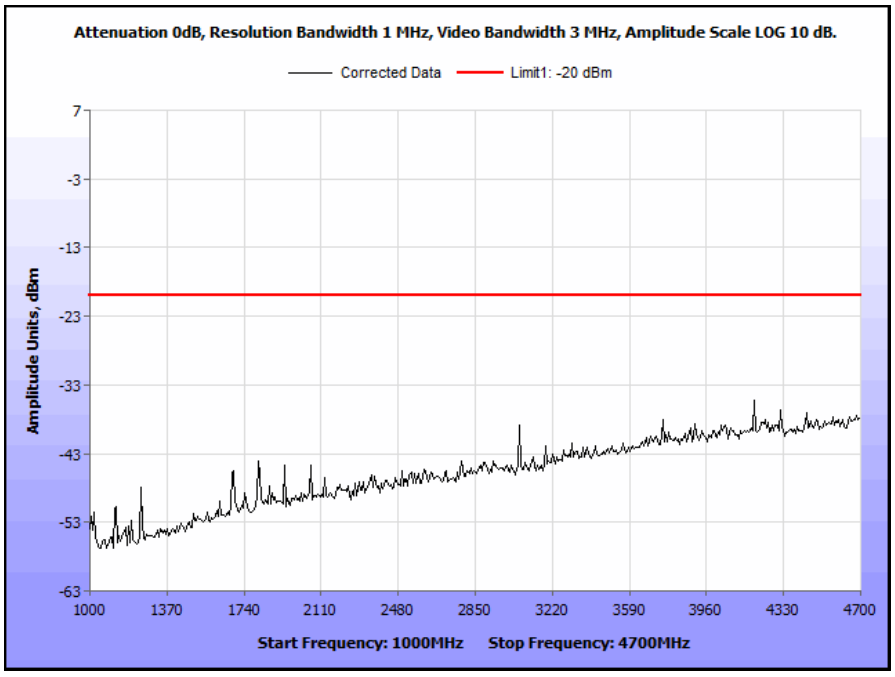
Plot 221. Part 90, Radiated Spurious Emissions, 456 MHz, HDQPSK, 30 MHz – 1 GHz, 10 W



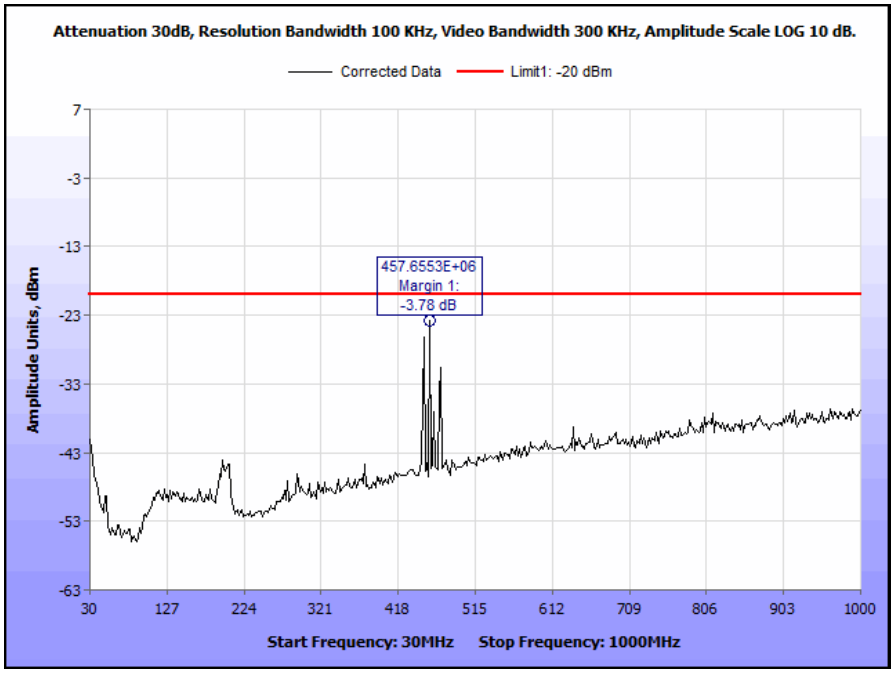
Plot 222. Part 90, Radiated Spurious Emissions, 456 MHz, HDQPSK, 1 GHz – 4.7 GHz, 10 W



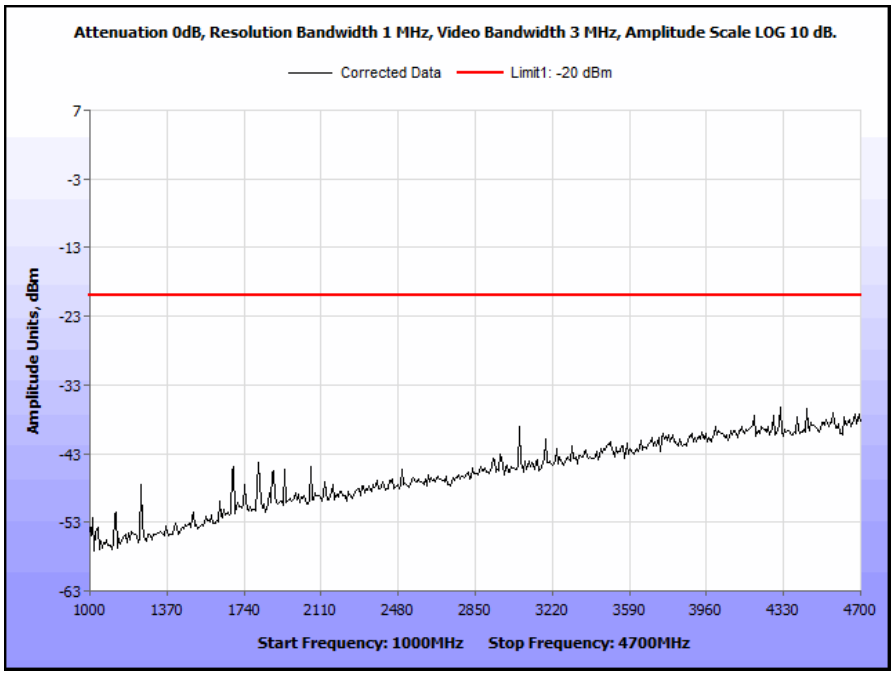
Plot 223. Part 90, Radiated Spurious Emissions, 456 MHz, C4FM, 30 MHz – 1 GHz, 100 W



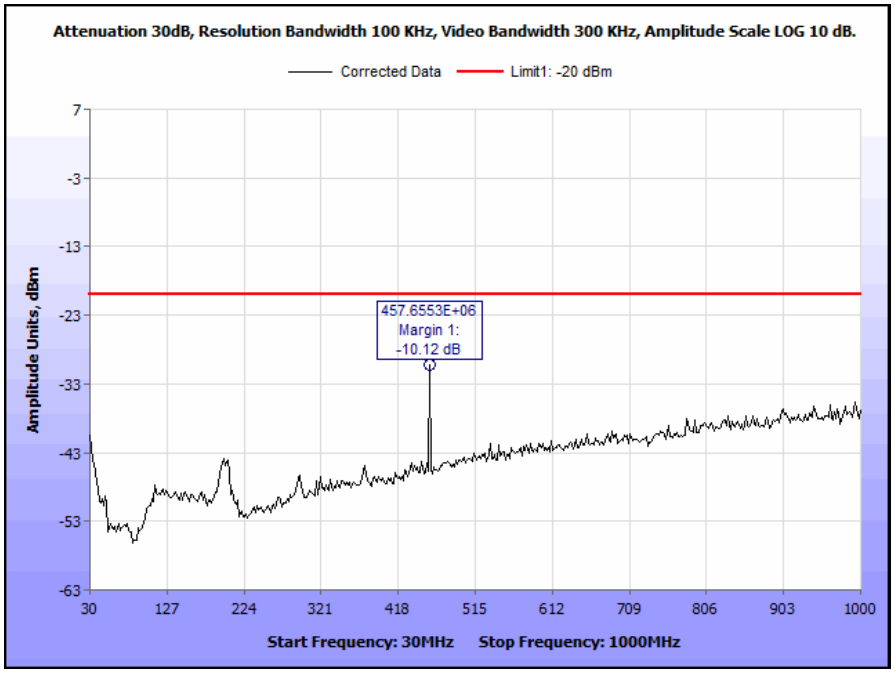
Plot 224. Part 90, Radiated Spurious Emissions, 456 MHz, C4FM, 1 GHz – 4.7 GHz, 100 W



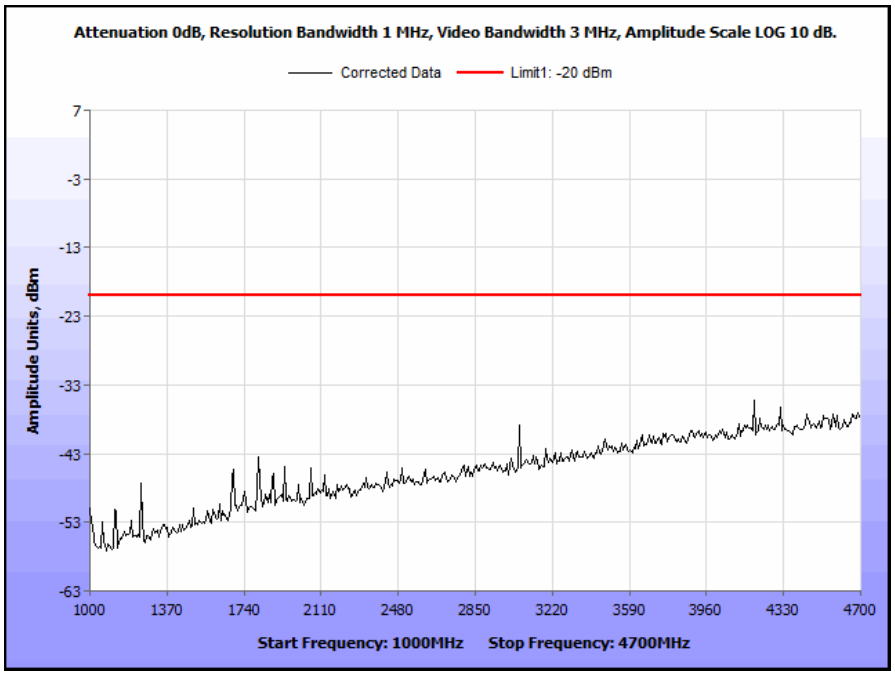
Plot 225. Part 90, Radiated Spurious Emissions, 456 MHz, CQPSK, 30 MHz – 1 GHz, 100 W



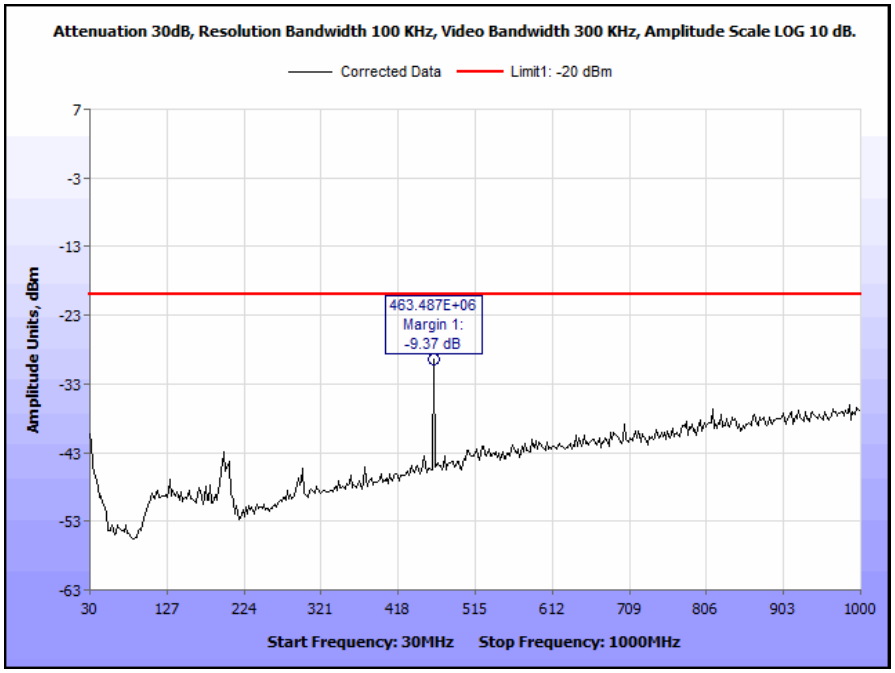
Plot 226. Part 90, Radiated Spurious Emissions, 456 MHz, CQPSK, 1 GHz – 4.7 GHz, 100 W



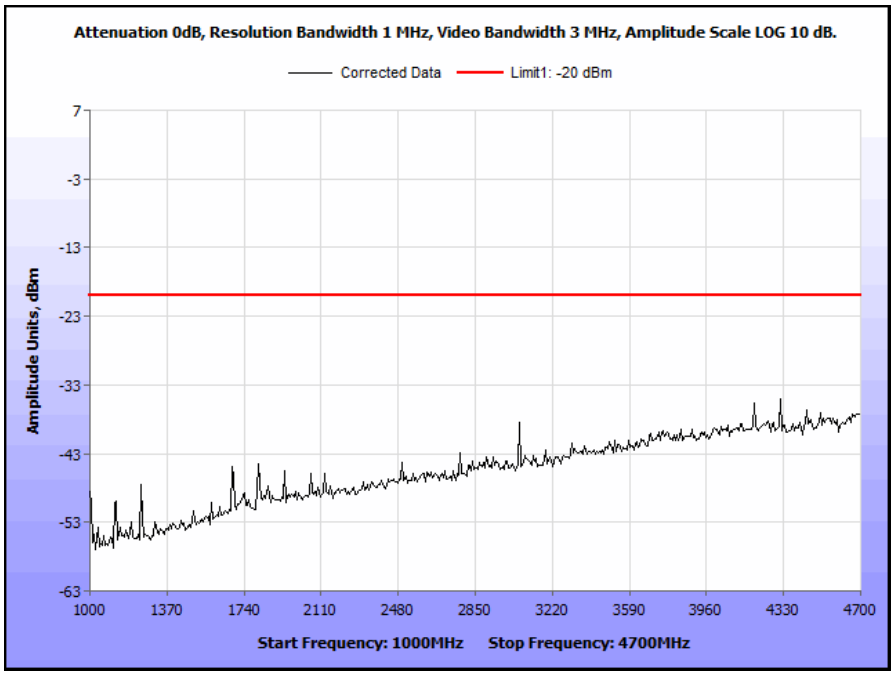
Plot 227. Part 90, Radiated Spurious Emissions, 456 MHz, HDQPSK, 30 MHz – 1 GHz, 100 W



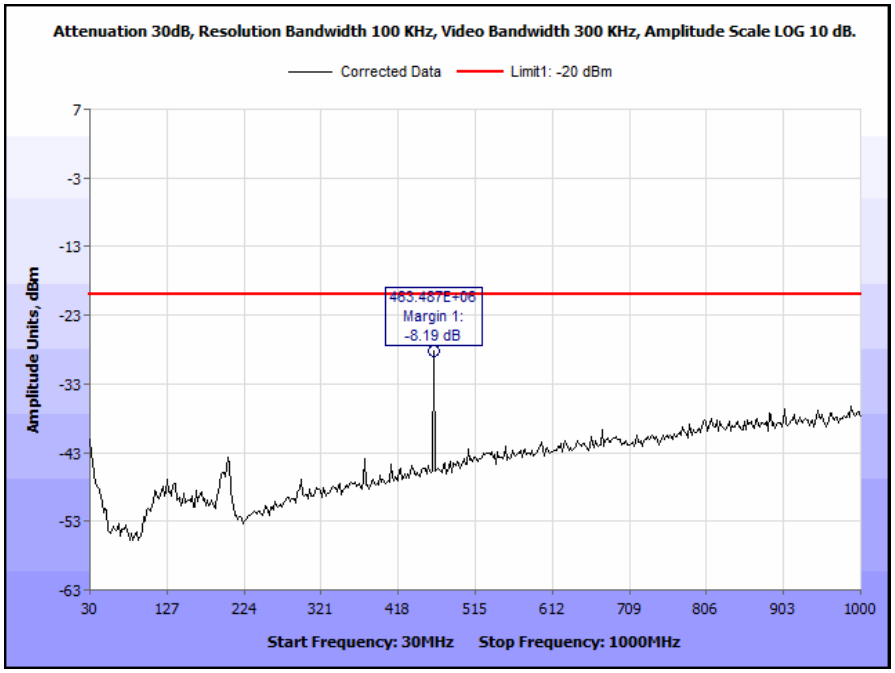
Plot 228. Part 90, Radiated Spurious Emissions, 456 MHz, HDQPSK, 1 GHz – 4.7 GHz, 100 W



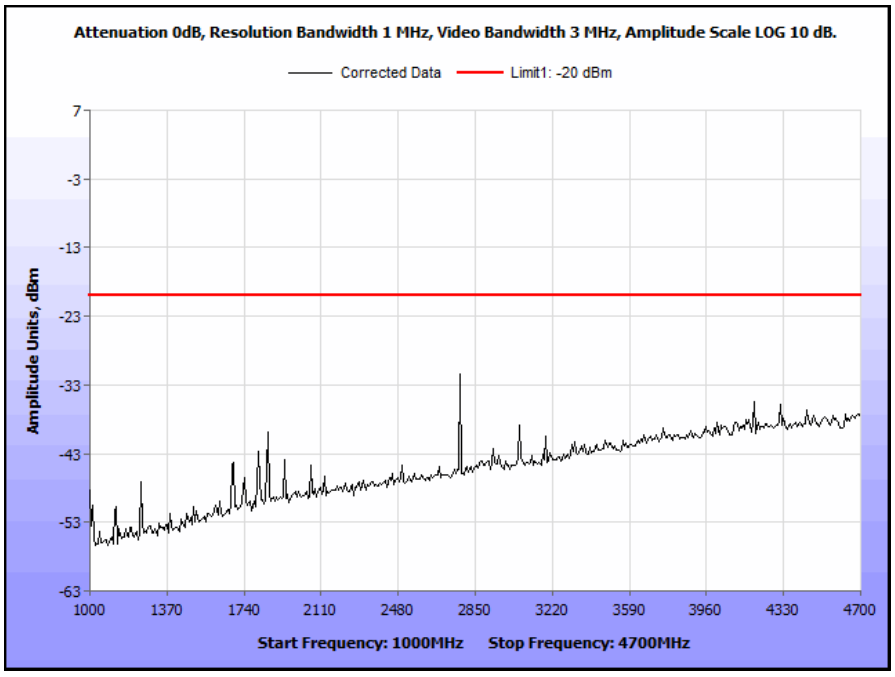
Plot 229. Part 90, Radiated Spurious Emissions, 463 MHz, C4FM, 30 MHz – 1 GHz, 10 W



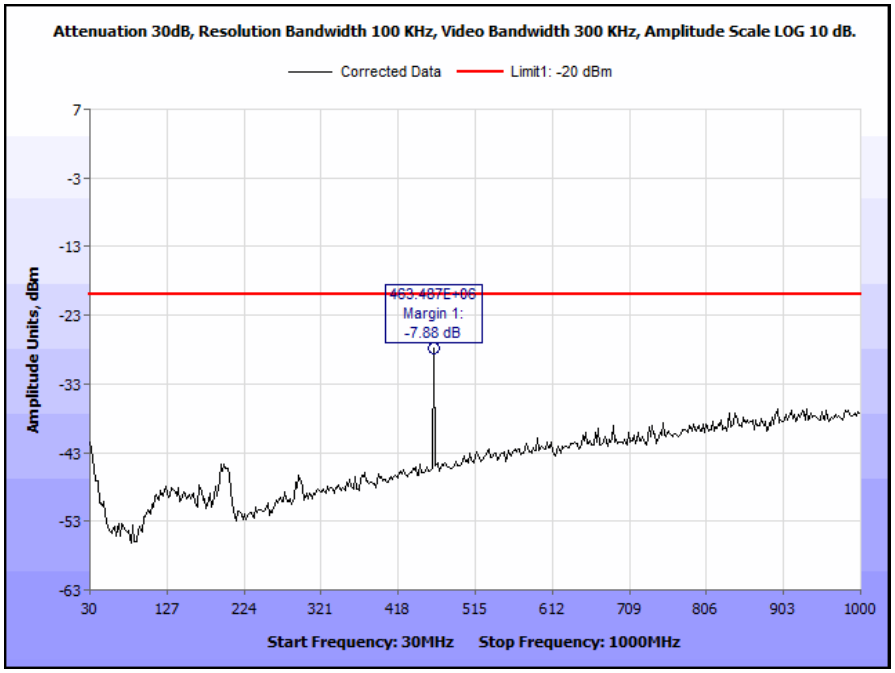
Plot 230. Part 90, Radiated Spurious Emissions, 463 MHz, C4FM, 1 GHz – 4.7 GHz, 10 W



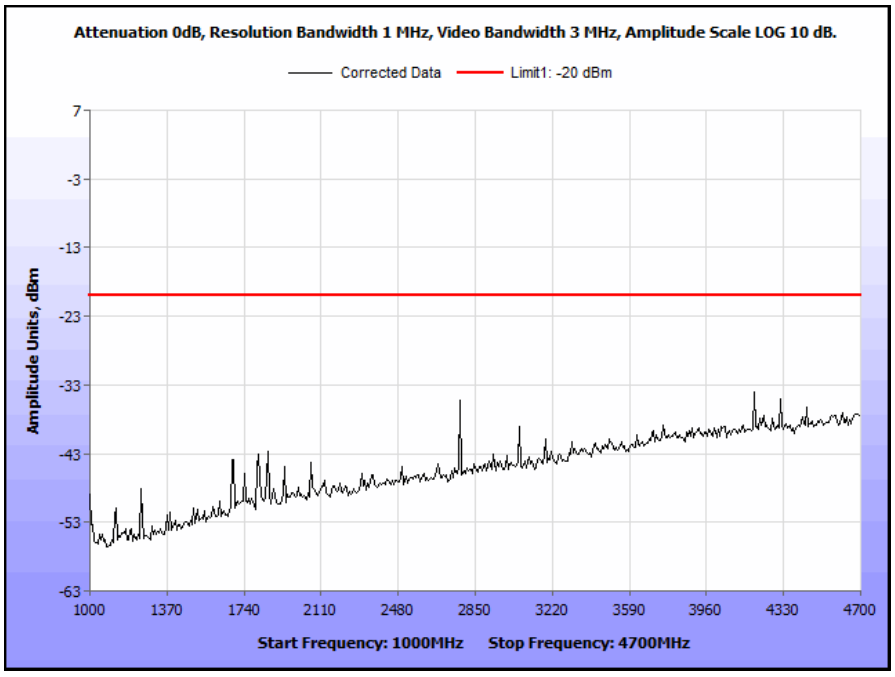
Plot 231. Part 90, Radiated Spurious Emissions, 463 MHz, CQPSK, 30 MHz – 1 GHz, 10 W



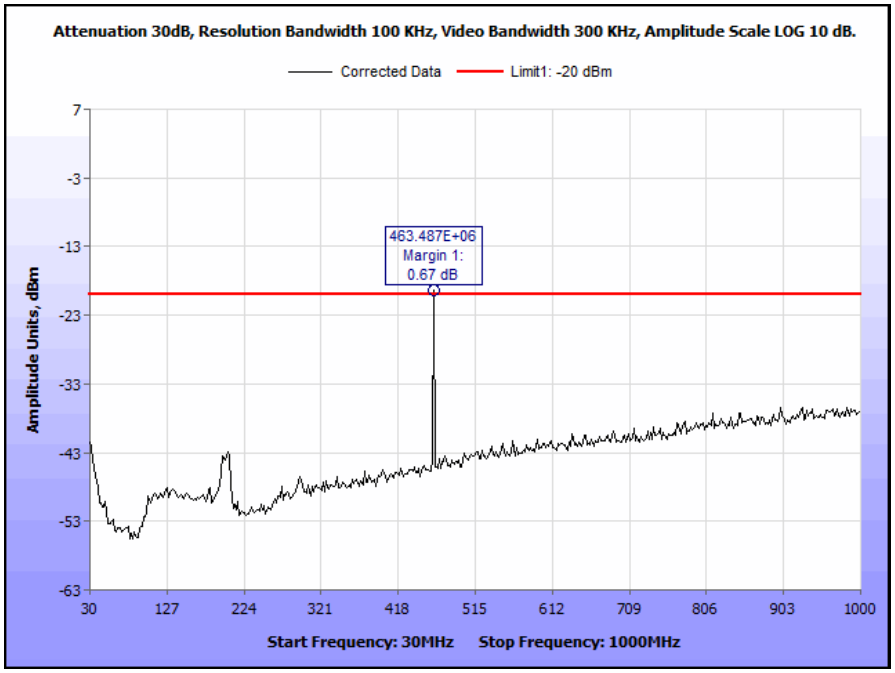
Plot 232. Part 90, Radiated Spurious Emissions, 463 MHz, CQPSK, 1 GHz – 4.7 GHz, 10 W



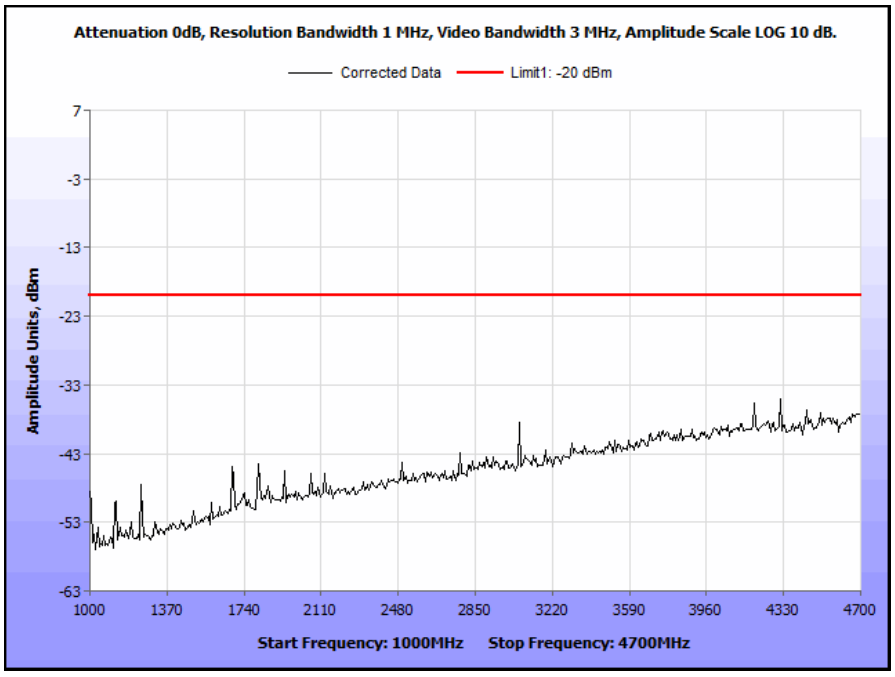
Plot 233. Part 90, Radiated Spurious Emissions, 463 MHz, HDQPSK, 30 MHz – 1 GHz, 10 W



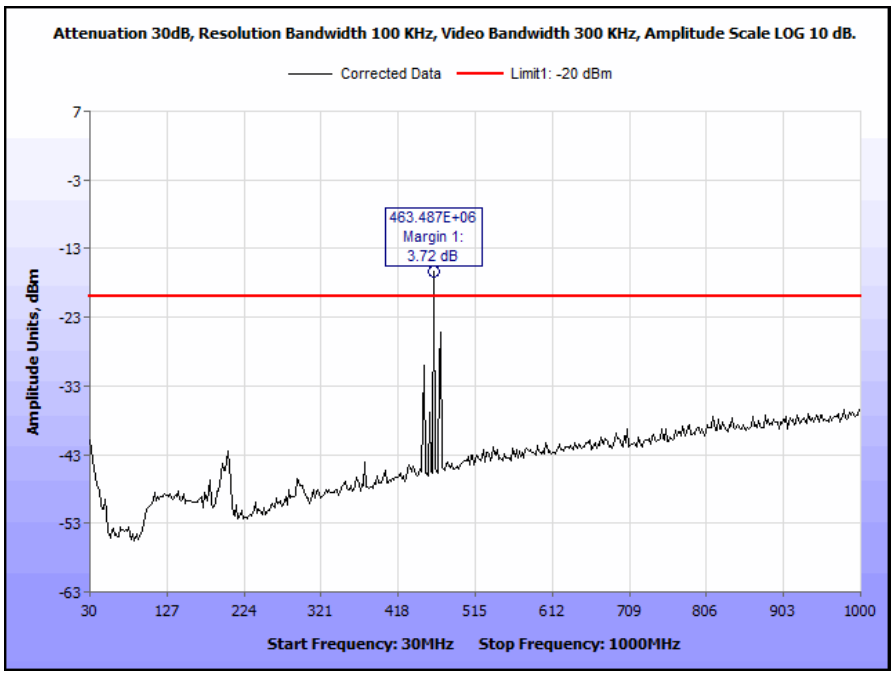
Plot 234. Part 90, Radiated Spurious Emissions, 463 MHz, HDQPSK, 1 GHz – 4.7 GHz, 10 W



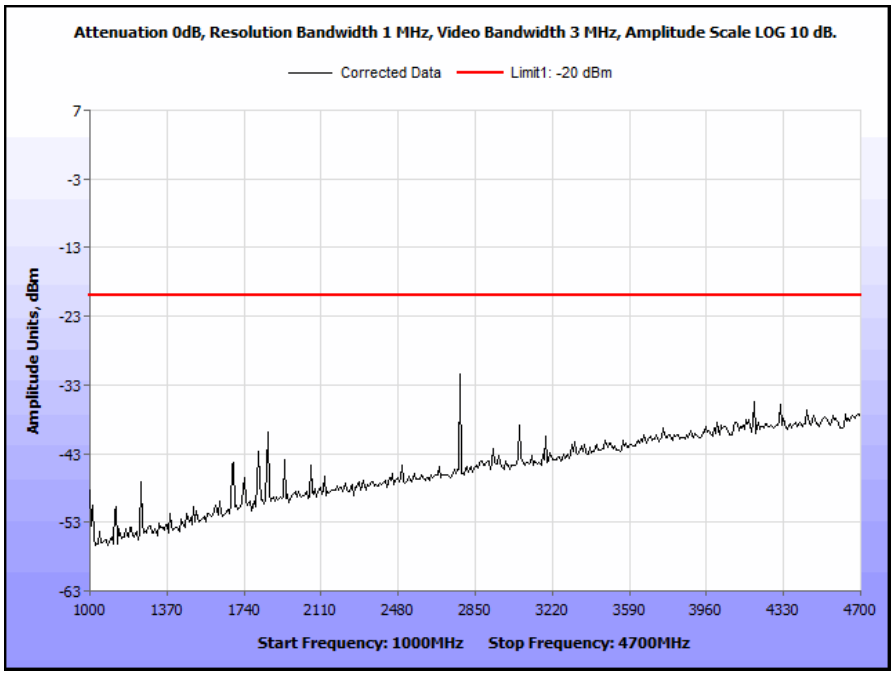
Plot 235. Part 90, Radiated Spurious Emissions, 463 MHz, C4FM, 30 MHz – 1 GHz, 100 W



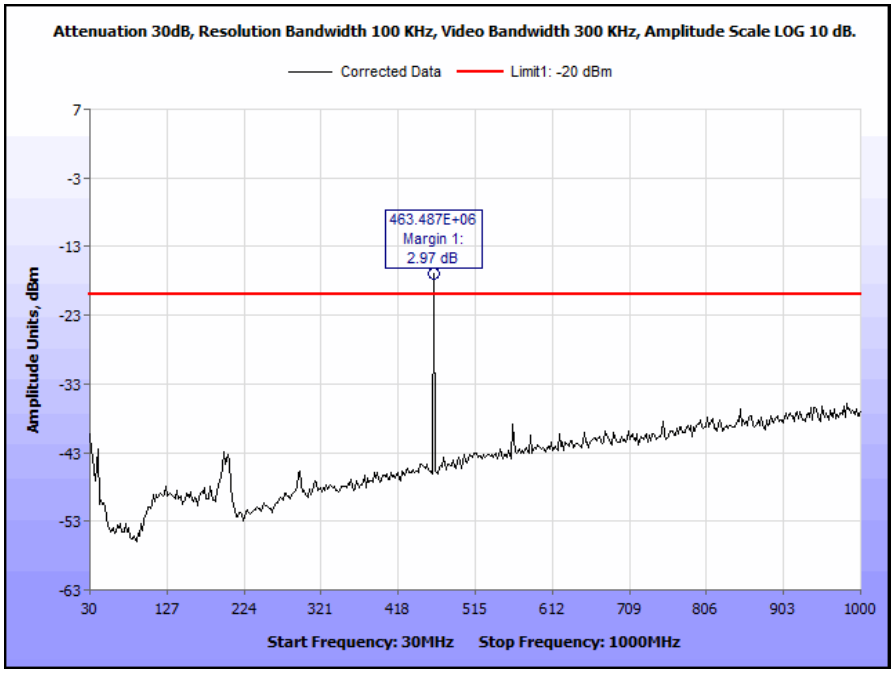
Plot 236. Part 90, Radiated Spurious Emissions, 463 MHz, C4FM, 1 GHz – 4.7 GHz, 100 W



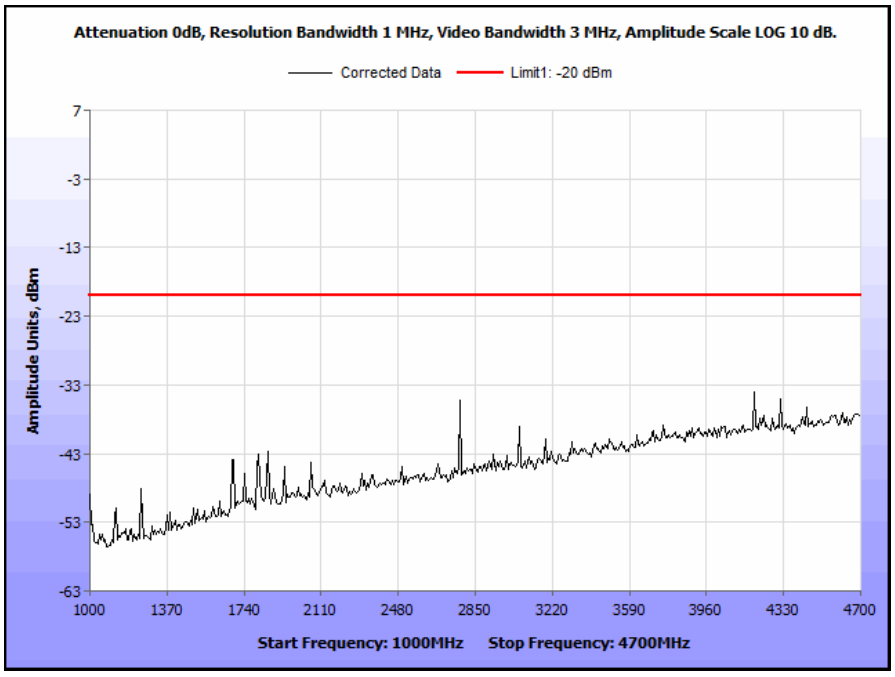
Plot 237. Part 90, Radiated Spurious Emissions, 463 MHz, CQPSK, 30 MHz – 1 GHz, 100 W



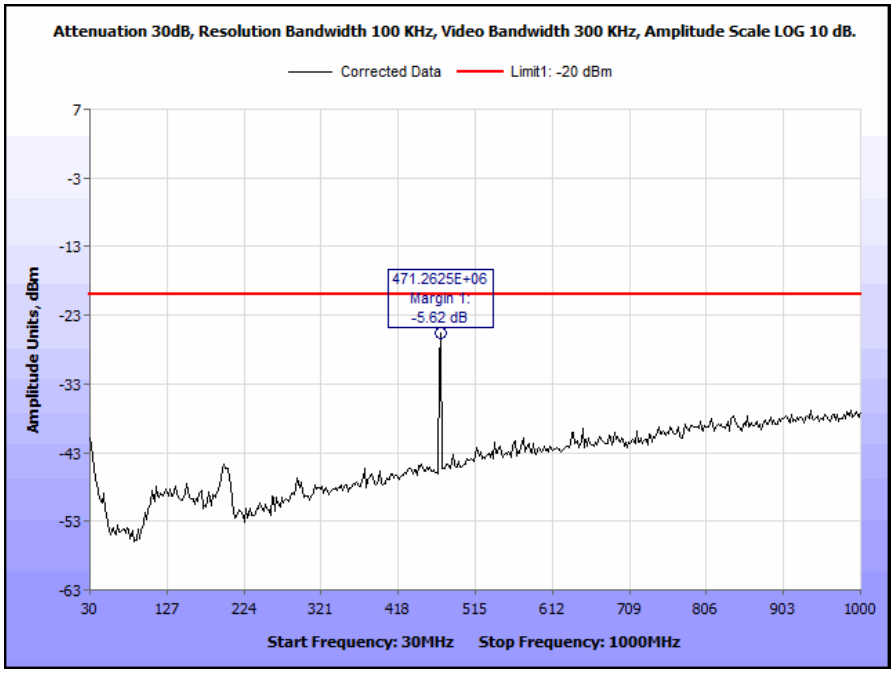
Plot 238. Part 90, Radiated Spurious Emissions, 463 MHz, CQPSK, 1 GHz – 4.7 GHz, 100 W



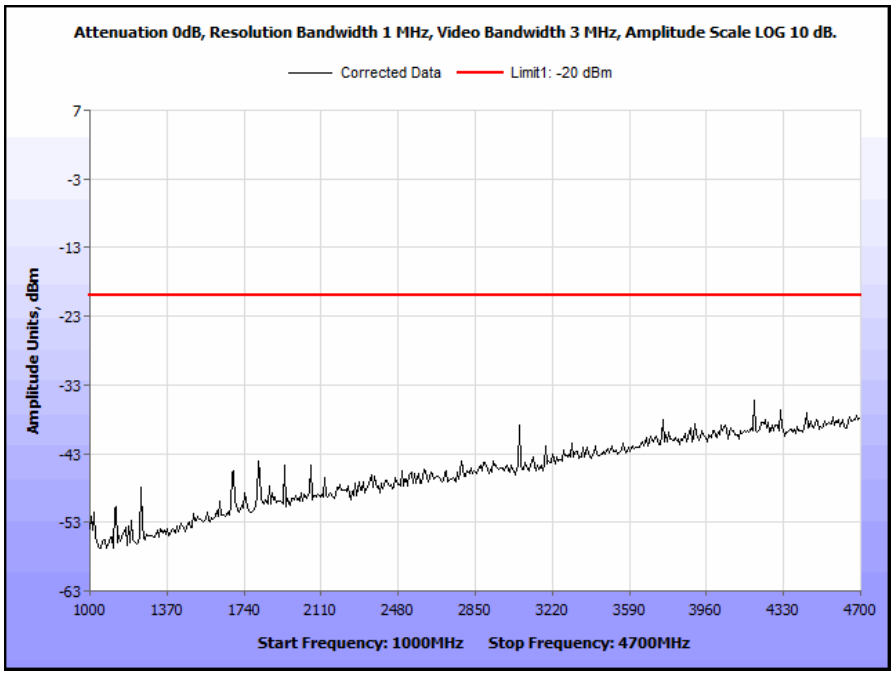
Plot 239. Part 90, Radiated Spurious Emissions, 463 MHz, HDQPSK, 30 MHz – 1 GHz, 100 W



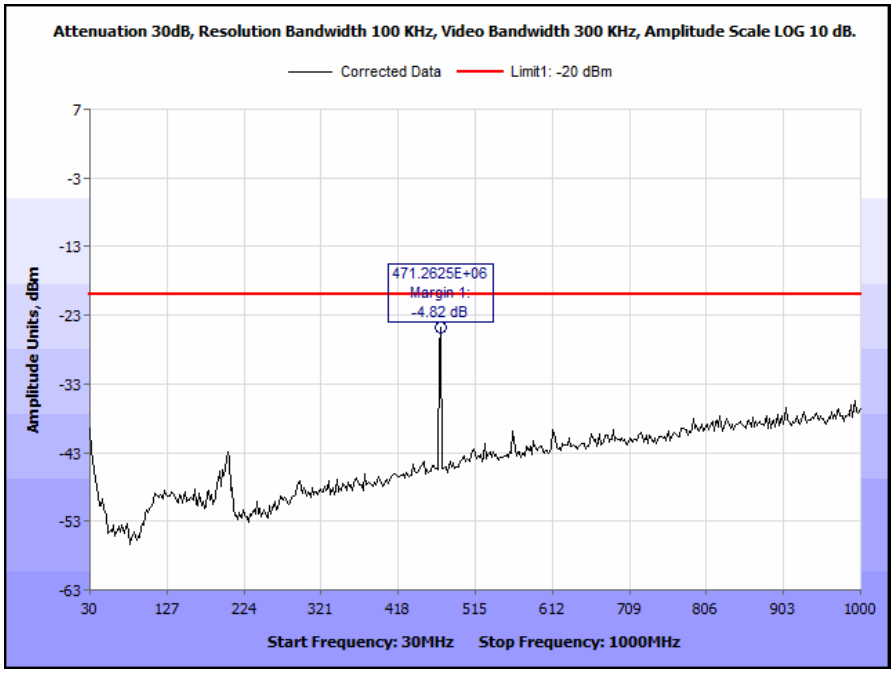
Plot 240. Part 90, Radiated Spurious Emissions, 463 MHz, HDQPSK, 1 GHz – 4.7 GHz, 100 W



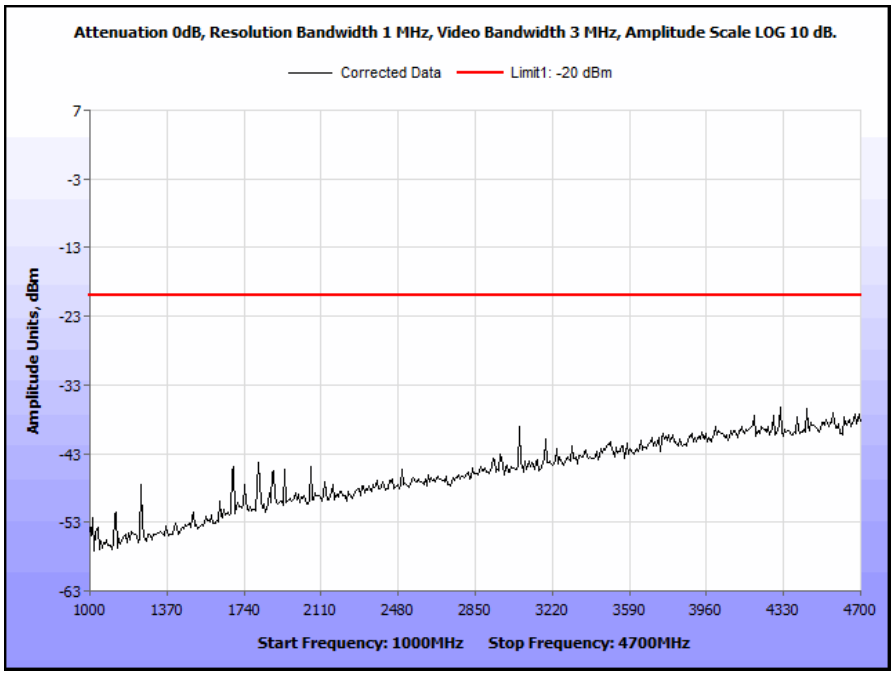
Plot 241. Part 90, Radiated Spurious Emissions, 470 MHz, C4FM, 30 MHz – 1 GHz, 10 W



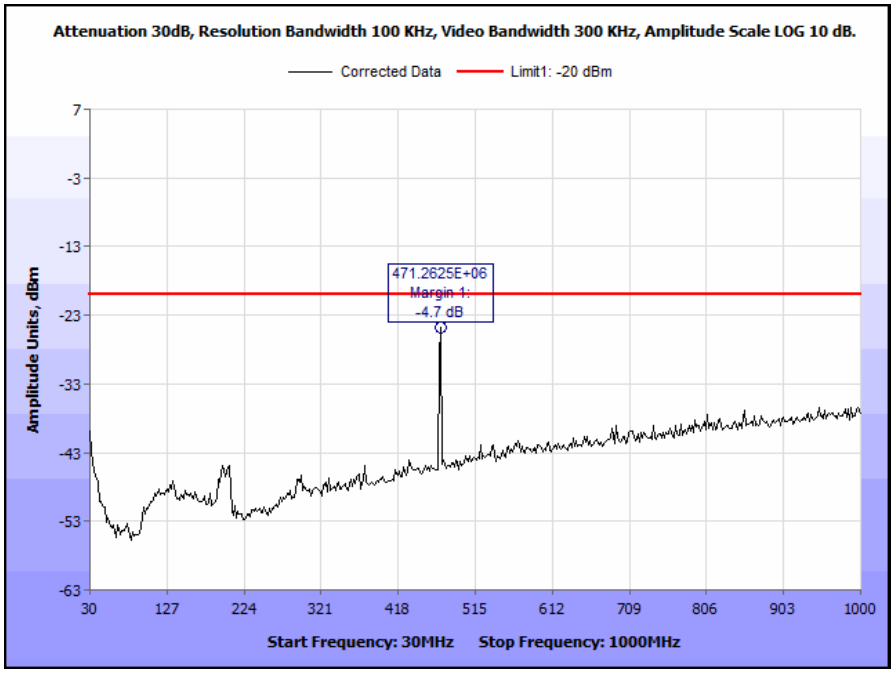
Plot 242. Part 90, Radiated Spurious Emissions, 470 MHz, C4FM, 1 GHz – 4.7 GHz, 10 W



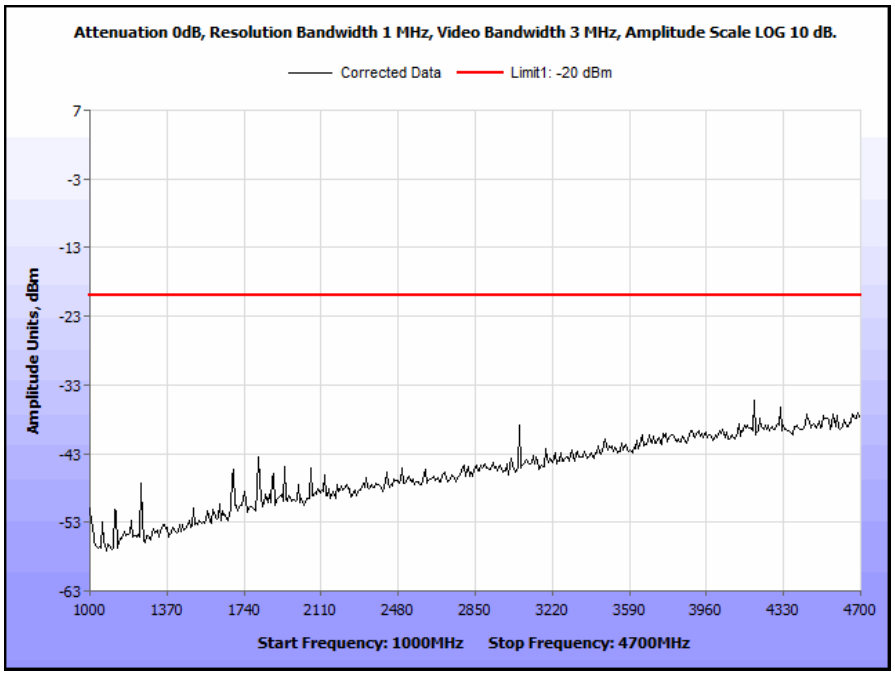
Plot 243. Part 90, Radiated Spurious Emissions, 470 MHz, CQPSK, 30 MHz – 1 GHz, 10 W



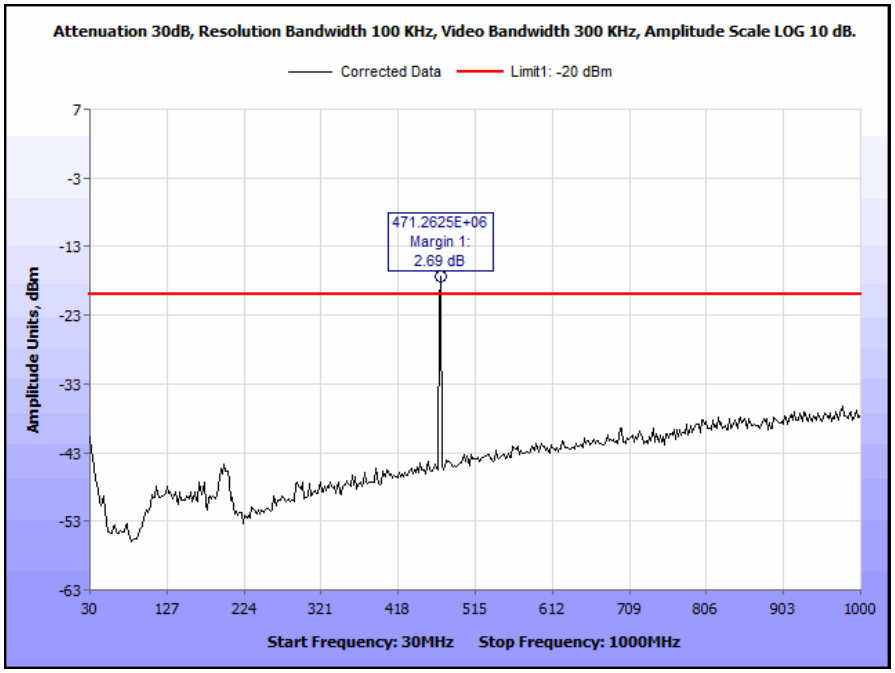
Plot 244. Part 90, Radiated Spurious Emissions, 470 MHz, CQPSK, 1 GHz – 4.7 GHz, 10 W



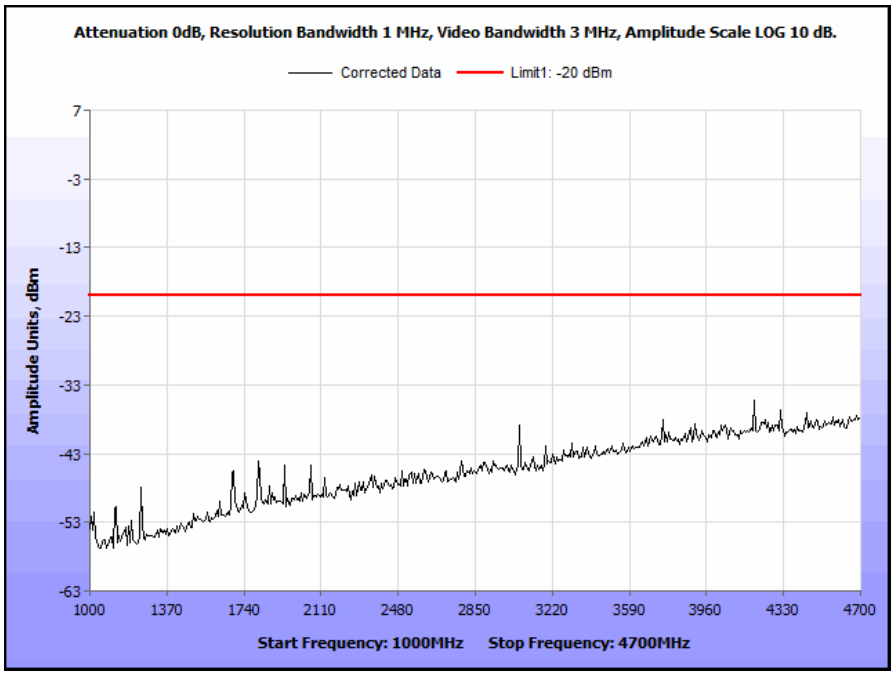
Plot 245. Part 90, Radiated Spurious Emissions, 470 MHz, HDQPSK, 30 MHz – 1 GHz, 10 W



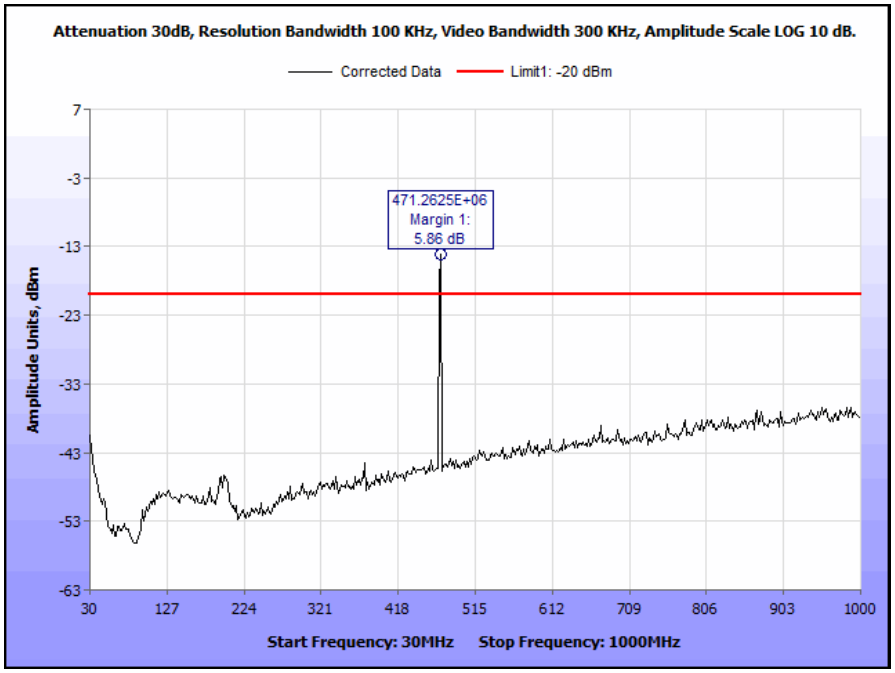
Plot 246. Part 90, Radiated Spurious Emissions, 470 MHz, HDQPSK, 1 GHz – 4.7 GHz, 10 W



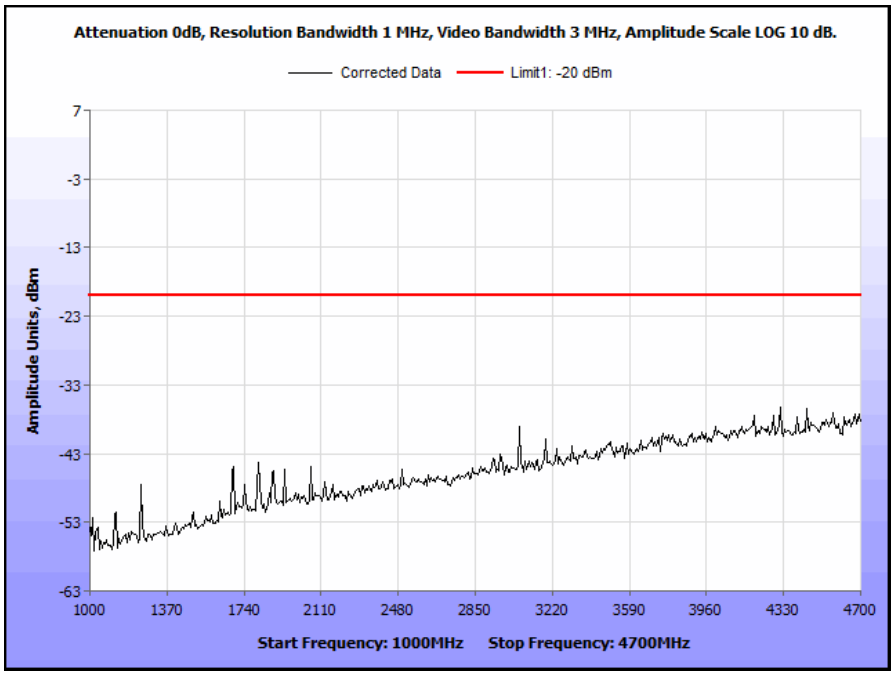
Plot 247. Part 90, Radiated Spurious Emissions, 470 MHz, C4FM, 30 MHz – 1 GHz, 100 W



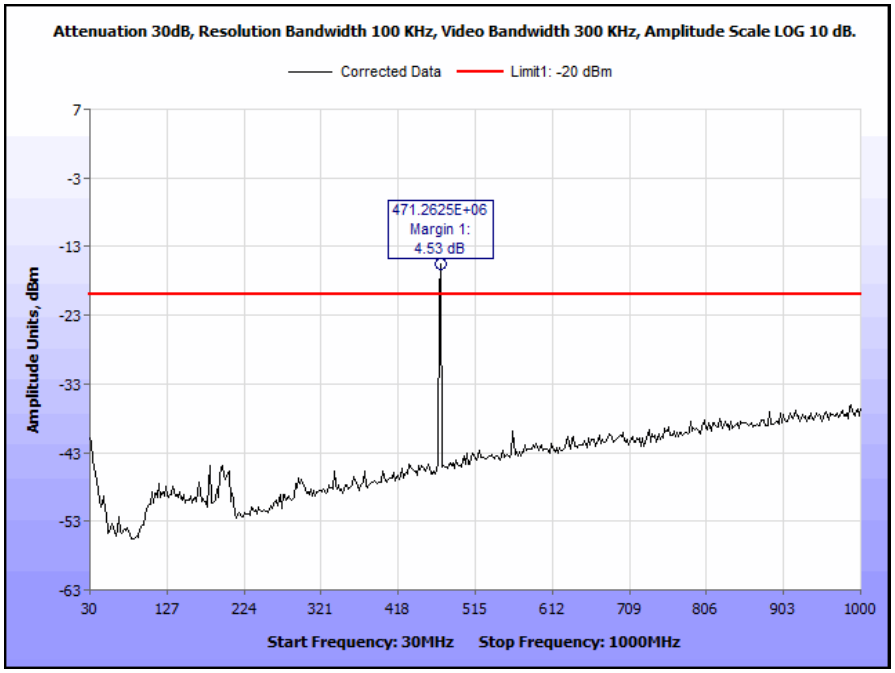
Plot 248. Part 90, Radiated Spurious Emissions, 470 MHz, C4FM, 1 GHz – 4.7 GHz, 100 W



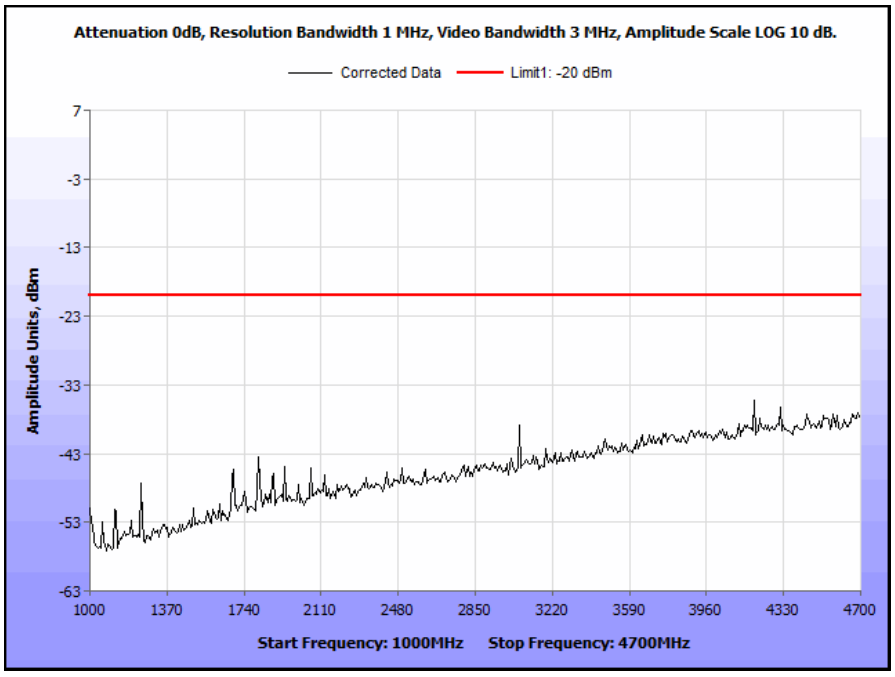
Plot 249. Part 90, Radiated Spurious Emissions, 470 MHz, CQPSK, 30 MHz – 1 GHz, 100 W



Plot 250. Part 90, Radiated Spurious Emissions, 470 MHz, CQPSK, 1 GHz – 4.7 GHz, 100 W



Plot 251. Part 90, Radiated Spurious Emissions, 470 MHz, HDQPSK, 30 MHz – 1 GHz, 100 W



Plot 252. Part 90, Radiated Spurious Emissions, 470 MHz, HDQPSK, 1 GHz – 4.7 GHz, 100 W

§22 and §80 Radiated Spurious Emissions

Test Requirement(s): **§2.1053 Measurements required: Field strength of spurious radiation.**

§2.1053 (a) Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data shall be supplied showing the magnitude of each harmonic and other spurious emission. For this test, single sideband, independent sideband, and controlled carrier transmitters shall be modulated under the conditions specified in paragraph (c) of § 2.1049, as appropriate. For equipment operating on frequencies below 890 MHz, an open field test is normally required with the measuring instrument antenna located in the far-field at all test frequencies. In the event it is either impractical or impossible to make open field measurements (e.g. a broadcast transmitter installed in a building) measurements will be accepted of the equipment as installed. Such measurements must be accompanied by a description of the site where the measurements were made showing the location of any possible source of reflections which might distort the field strength measurements. Information submitted shall include the relative radiated power of each spurious emission with reference to the rated power output of the transmitter, assuming all emissions are radiated from half-wave dipole antennas.

§22.359 (a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log (P) dB.

§80.211 On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43 plus 10log10 (mean power in watts) dB.

Test Procedures: As required by 47 CFR 2.1053, *field strength of radiated spurious measurements* were made in accordance with the procedures of TIA/EIA-603-A-2001 "Land Mobile FM or PM Communications Equipment Measurement and Performance Standards".

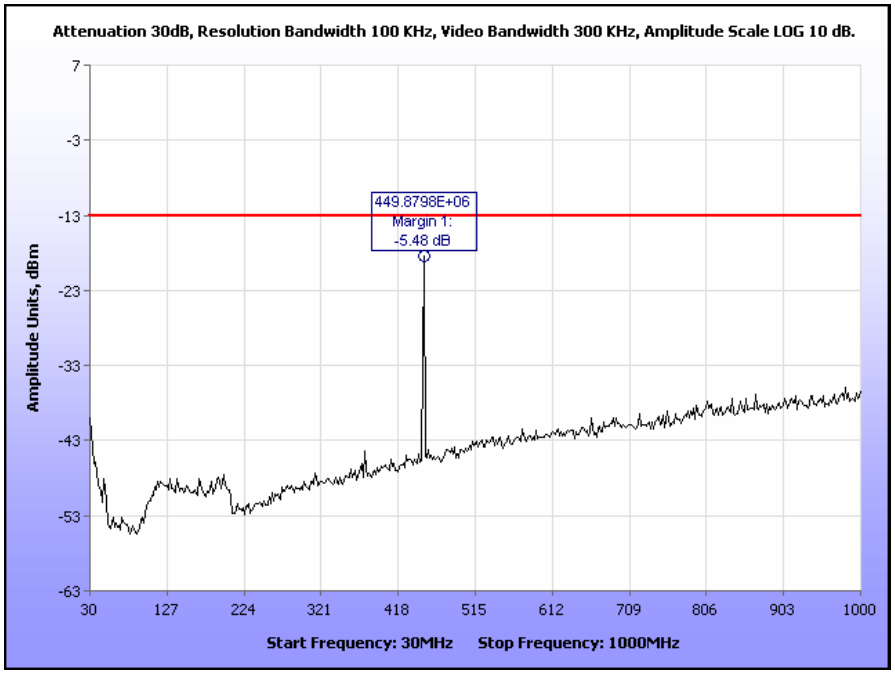
Radiated emission measurements were performed inside a 3 meter semi-anechoic chamber. The EUT was set at a distance of 3m from the receiving antenna. The EUT's RF ports were terminated to 50ohm load. The EUT was set to transmit at the low, mid and high channels of the transmitter frequency range at its maximum power level. The EUT was rotated about 360^0 and the receiving antenna scanned from 1-4m in order to capture the maximum emission. Emissions up to the 10^{th} or 40GHz, which ever was the lesser, were investigated.

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

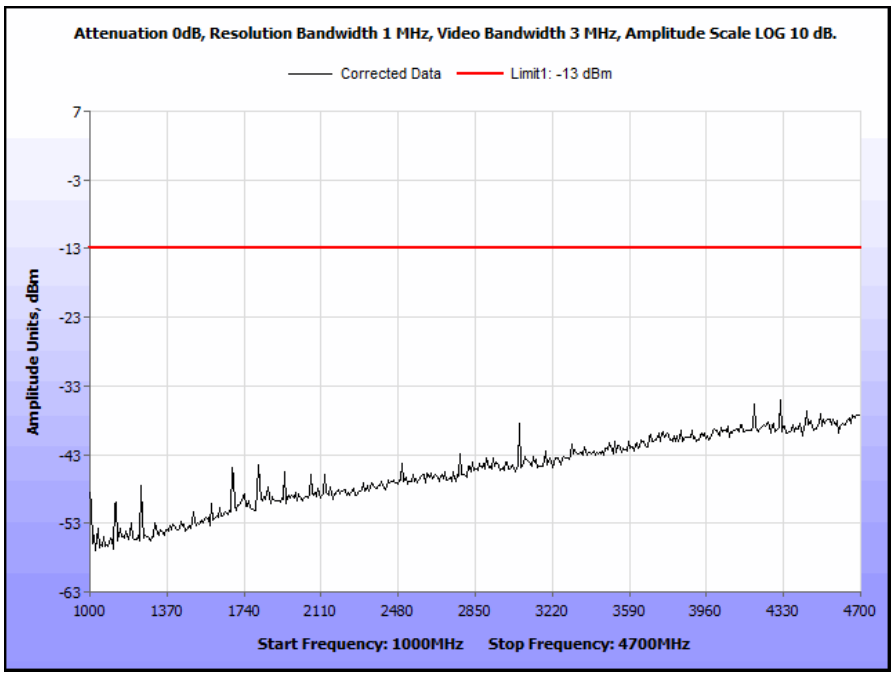
Test Engineer: Surinder Singh

Test Date(s): 01/23/14

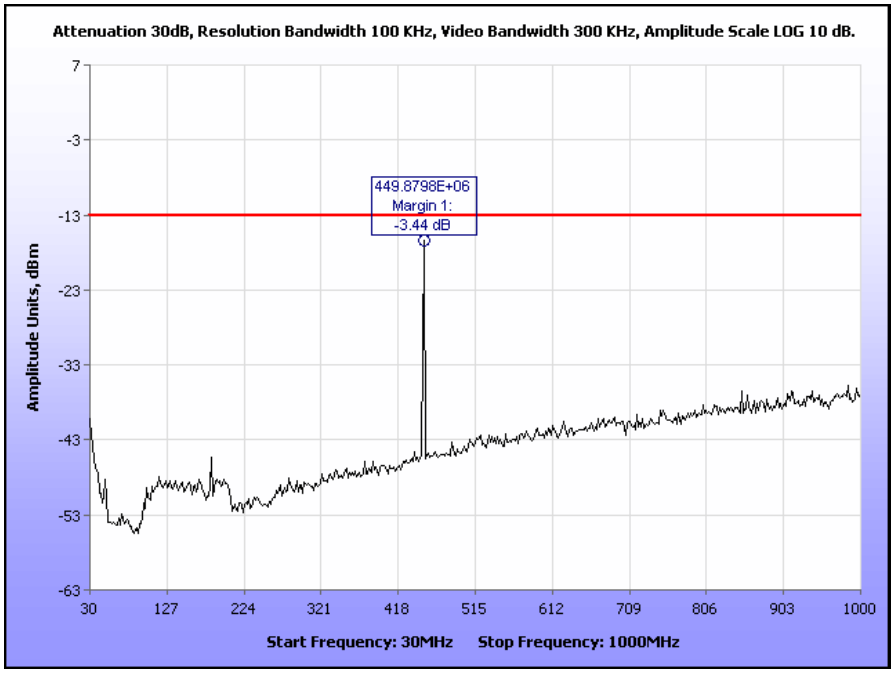
Radiated Spurious Emissions



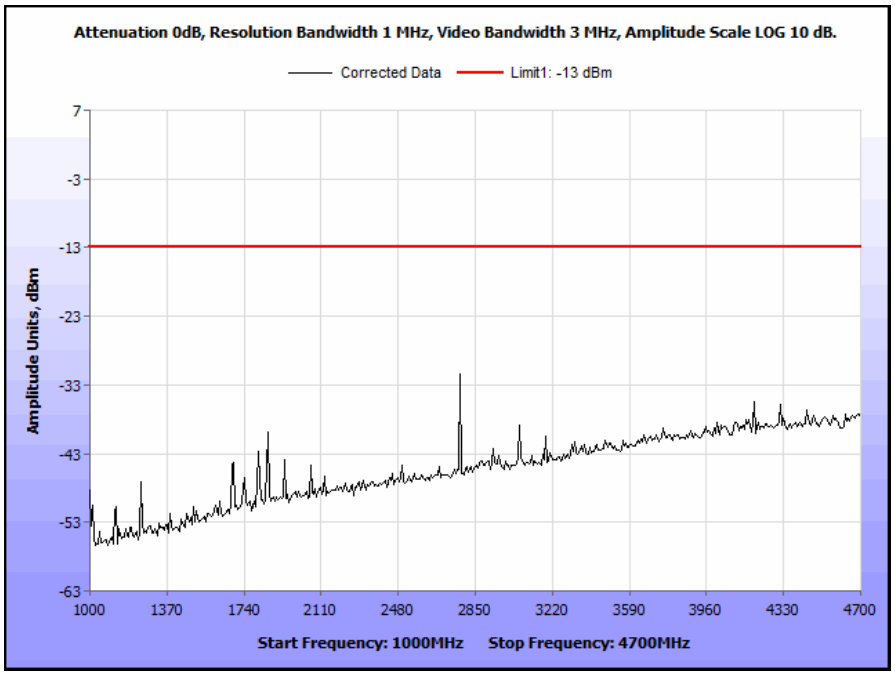
Plot 253. Part 80, Radiated Spurious Emissions, 450 MHz, C4FM, 30 MHz – 1 GHz, 10 W



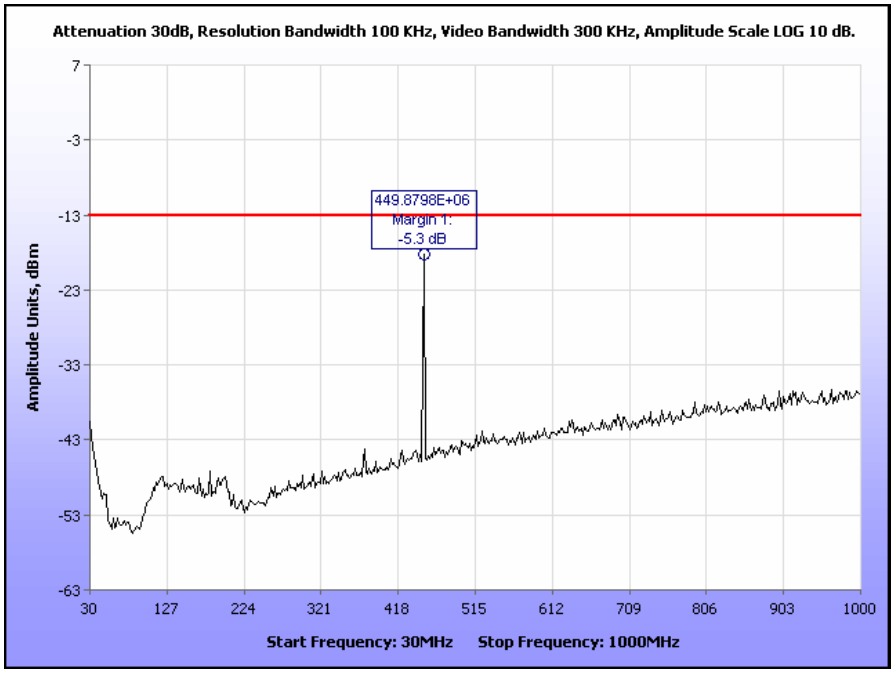
Plot 254. Part 80, Radiated Spurious Emissions, 450 MHz, C4FM, 1 GHz – 4.7 GHz, 10 W



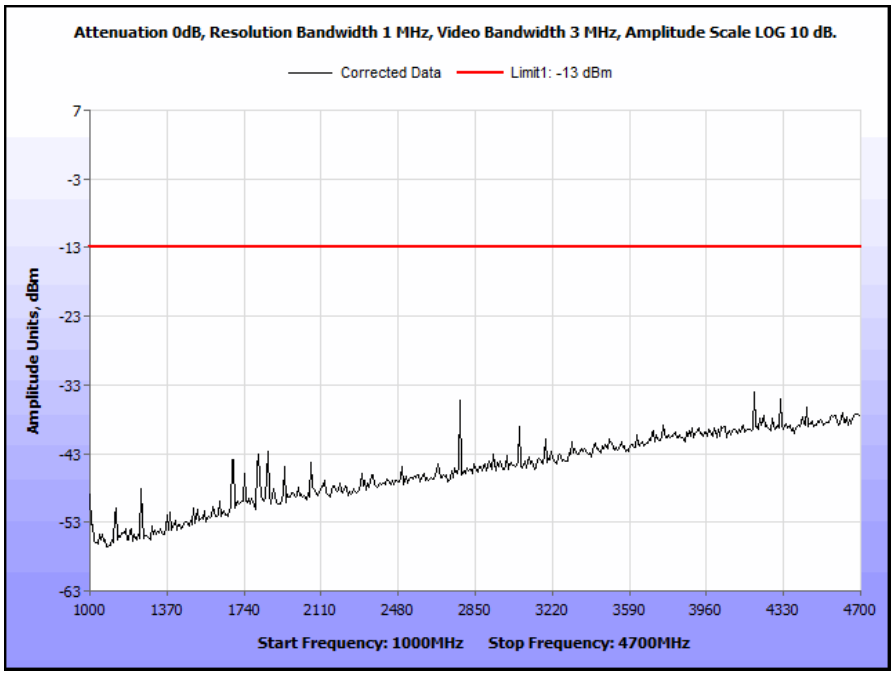
Plot 255. Part 80, Radiated Spurious Emissions, 450 MHz, CQPSK, 30 MHz – 1 GHz, 10 W



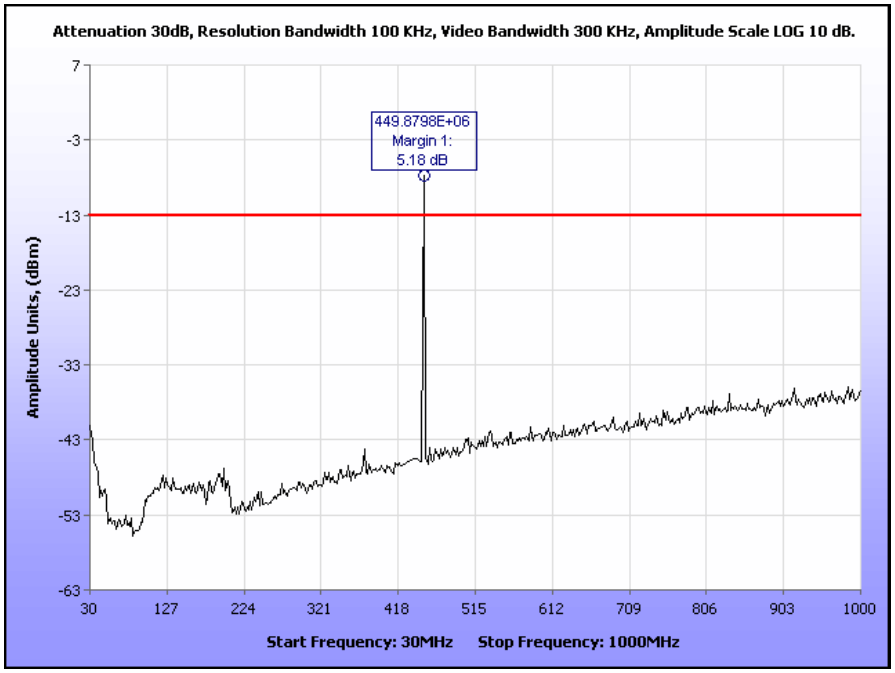
Plot 256. Part 80, Radiated Spurious Emissions, 450 MHz, CQPSK, 1 GHz – 4.7 GHz, 10 W



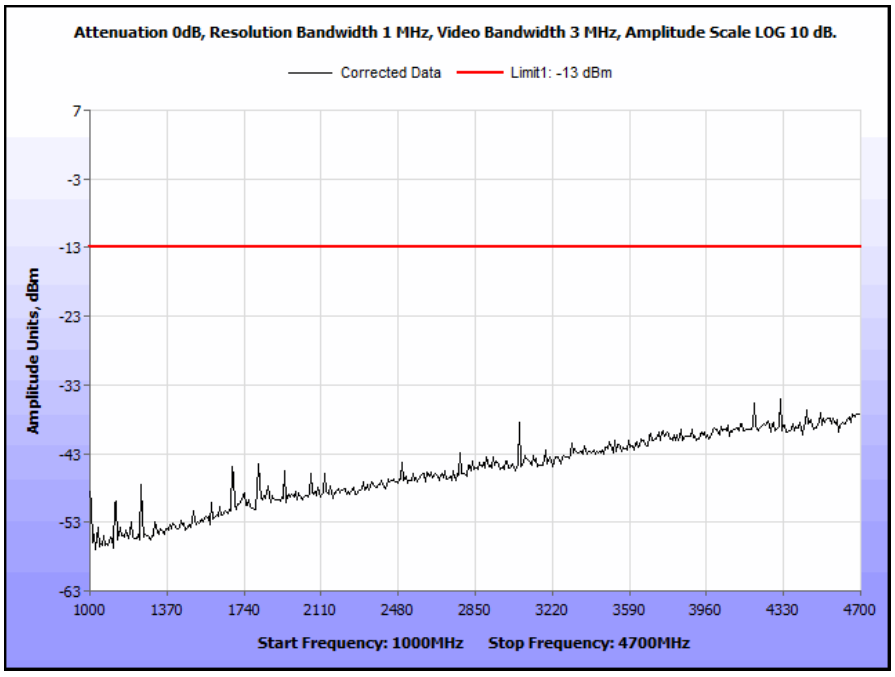
Plot 257. Part 80, Radiated Spurious Emissions, 450 MHz, HDQPSK, 30 MHz – 1 GHz, 10 W



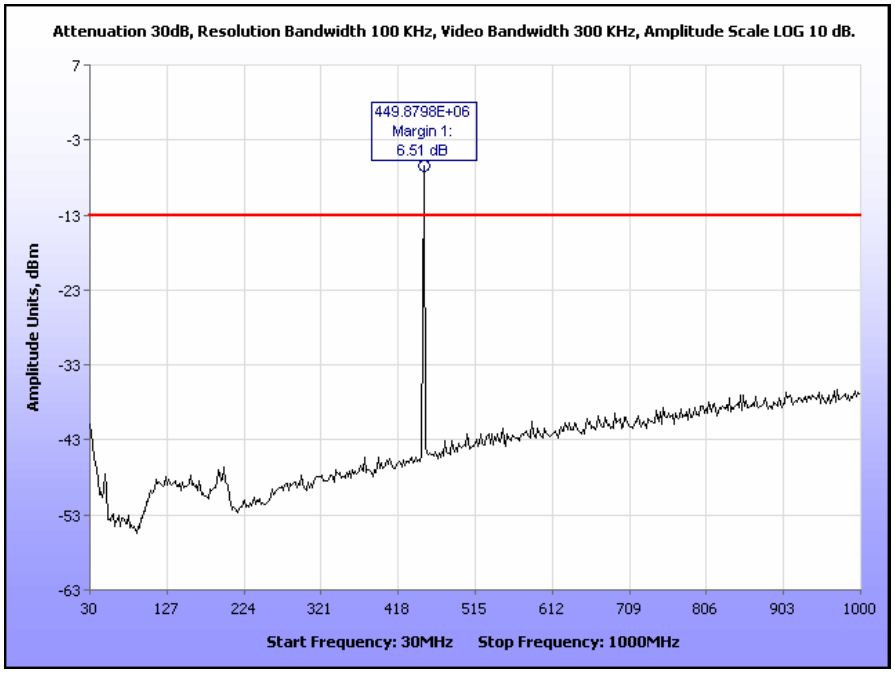
Plot 258. Part 80, Radiated Spurious Emissions, 450 MHz, HDQPSK, 1 GHz – 4.7 GHz, 10 W



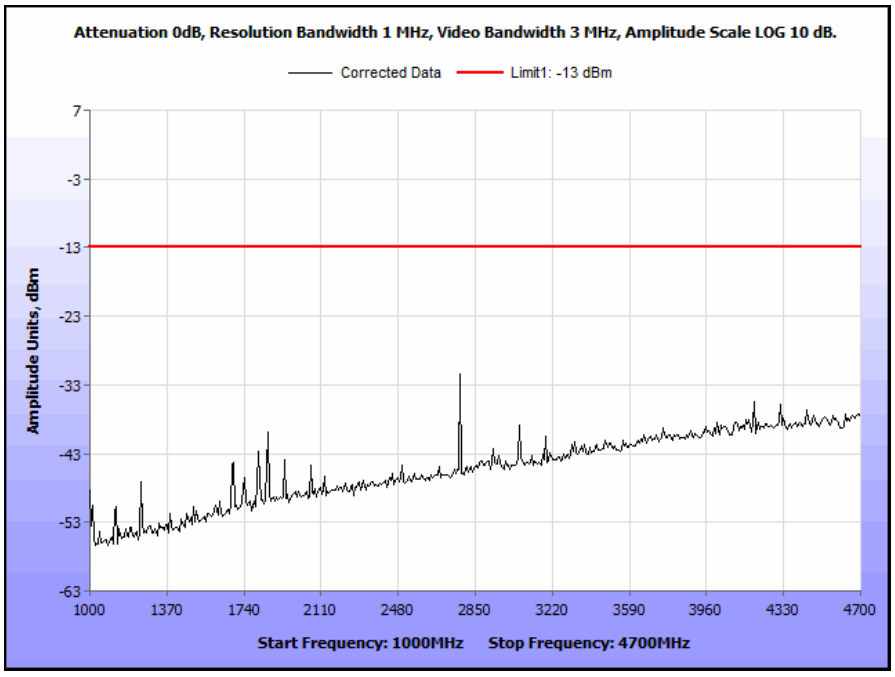
Plot 259. Part 80, Radiated Spurious Emissions, 450 MHz, C4FM, 30 MHz – 1 GHz, 100 W



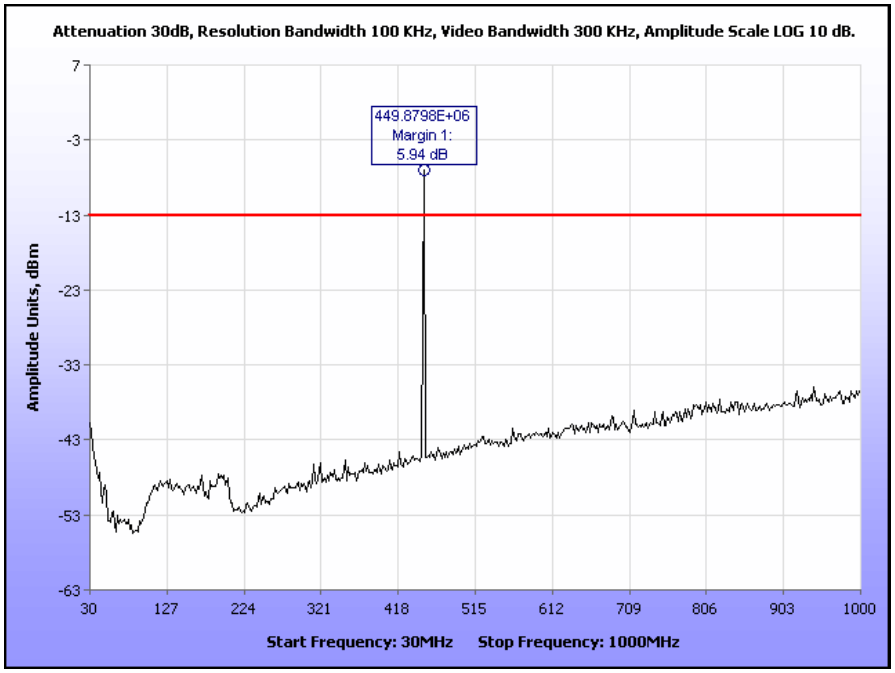
Plot 260. Part 80, Radiated Spurious Emissions, 450 MHz, C4FM, 1 GHz – 4.7 GHz, 100 W



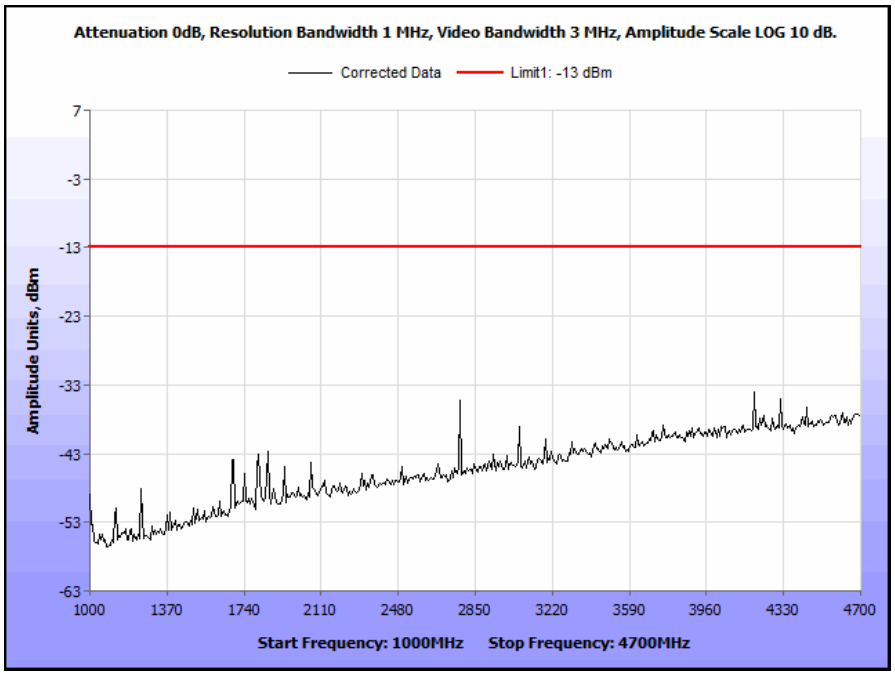
Plot 261. Part 80, Radiated Spurious Emissions, 450 MHz, CQPSK, 30 MHz – 1 GHz, 100 W



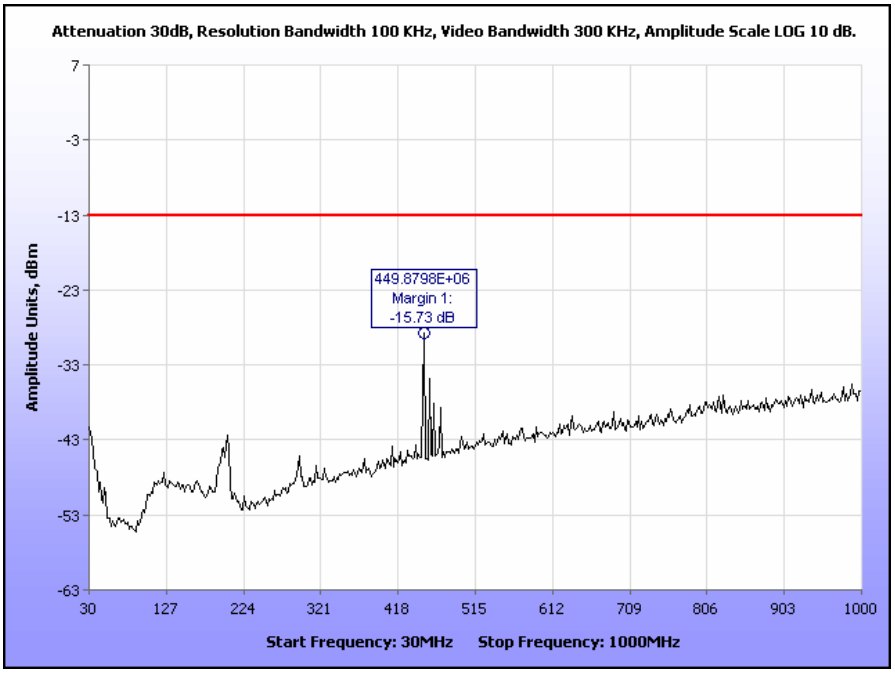
Plot 262. Part 80, Radiated Spurious Emissions, 450 MHz, CQPSK, 1 GHz – 4.7 GHz, 100 W



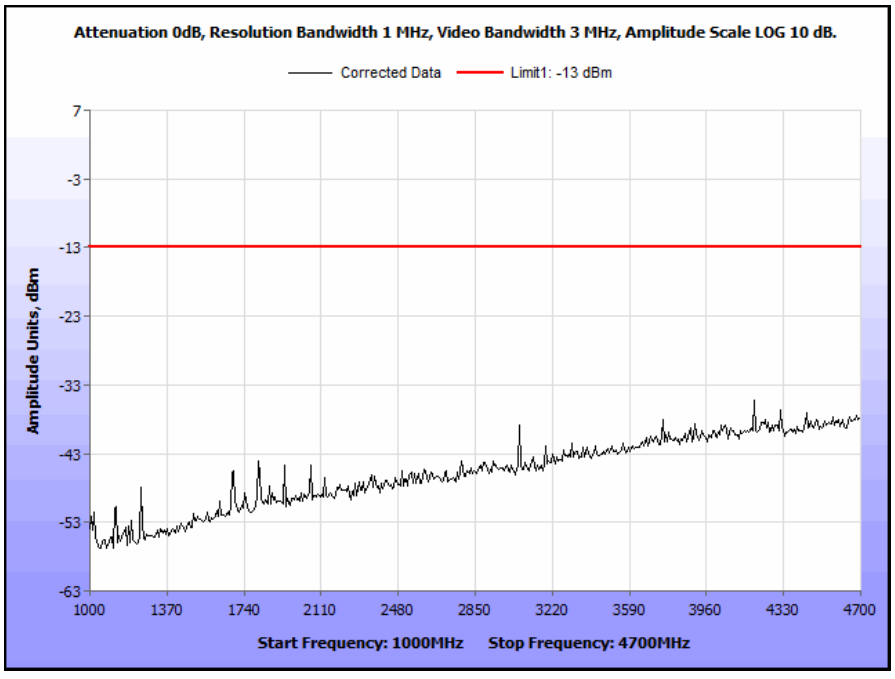
Plot 263. Part 80, Radiated Spurious Emissions, 450 MHz, HDQPSK, 30 MHz – 1 GHz, 100 W



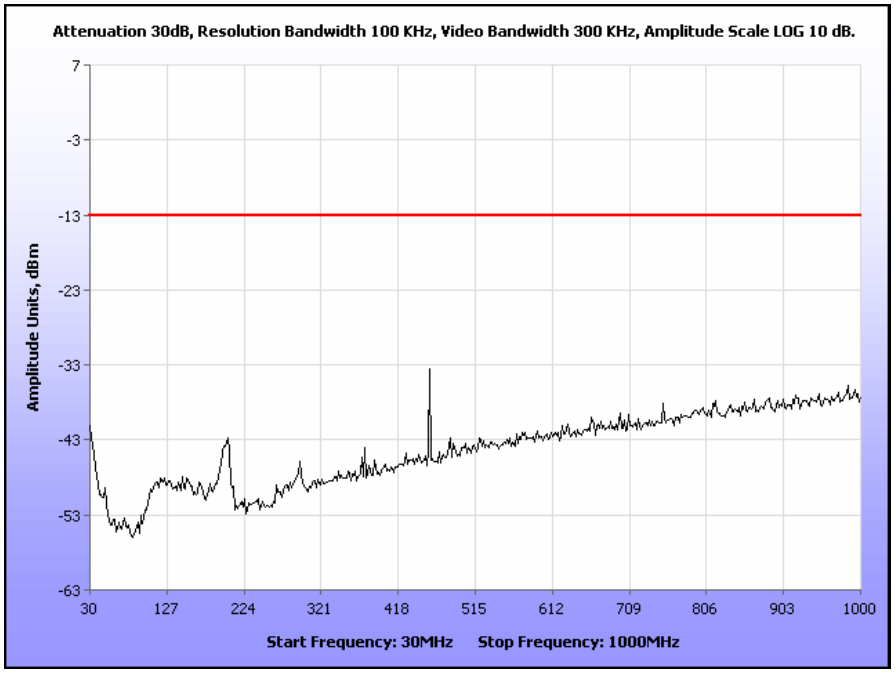
Plot 264. Part 80, Radiated Spurious Emissions, 450 MHz, HDQPSK, 1 GHz – 4.7 GHz, 100 W



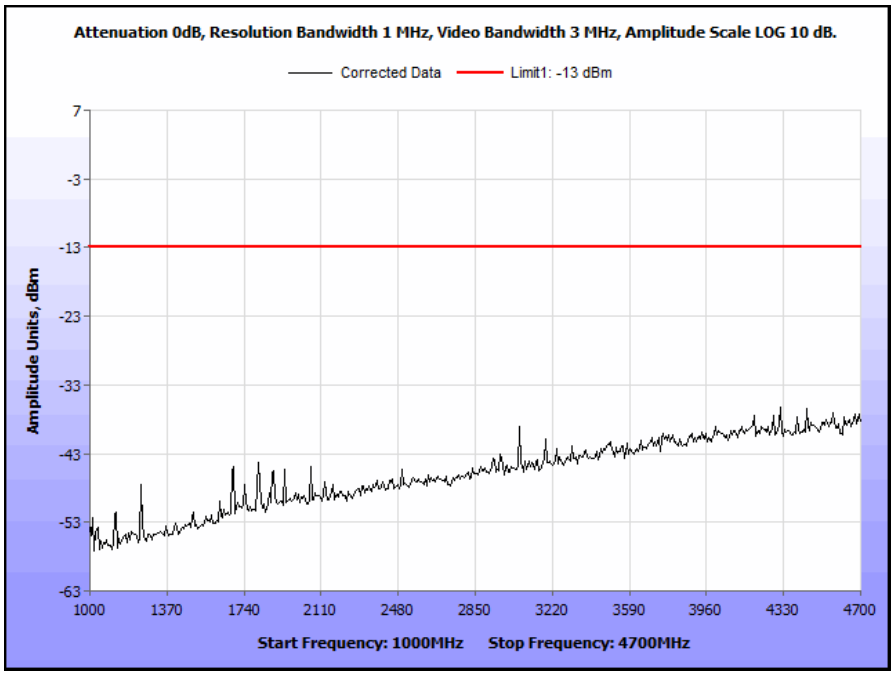
Plot 265. Part 80, Radiated Spurious Emissions, 456 MHz, C4FM, 30 MHz – 1 GHz, 10 W



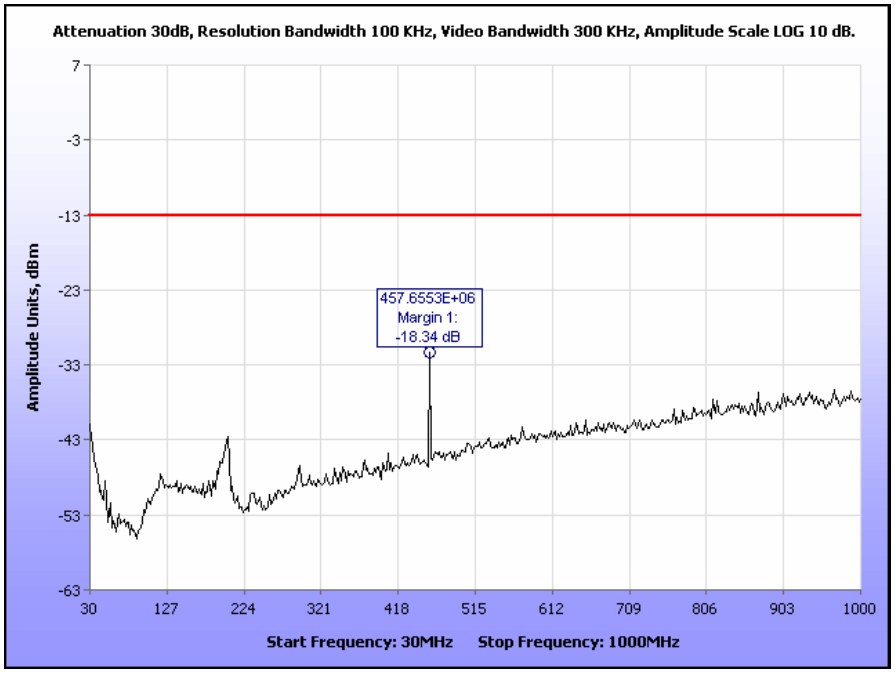
Plot 266. Part 80, Radiated Spurious Emissions, 456 MHz, C4FM, 1 GHz – 4.7 GHz, 10 W



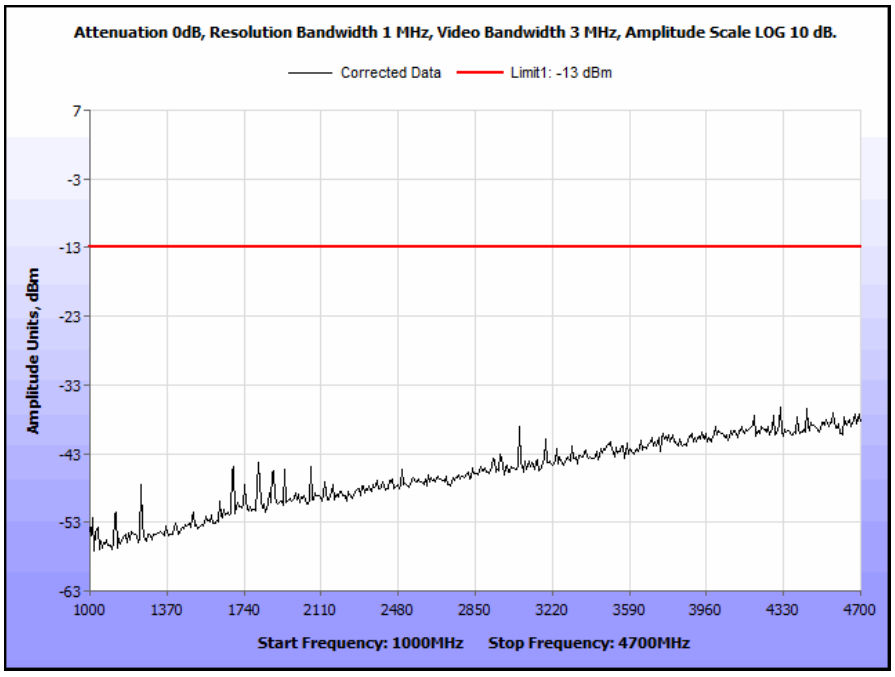
Plot 267. Part 80, Radiated Spurious Emissions, 456 MHz, CQPSK, 30 MHz – 1 GHz, 10 W



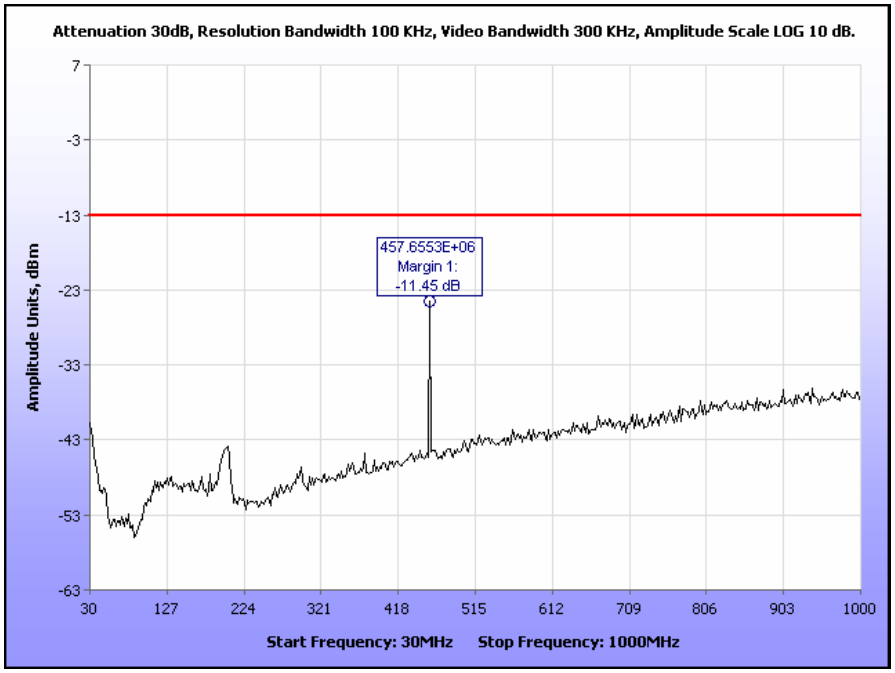
Plot 268. Part 80, Radiated Spurious Emissions, 456 MHz, CQPSK, 1 GHz – 4.7 GHz, 10 W



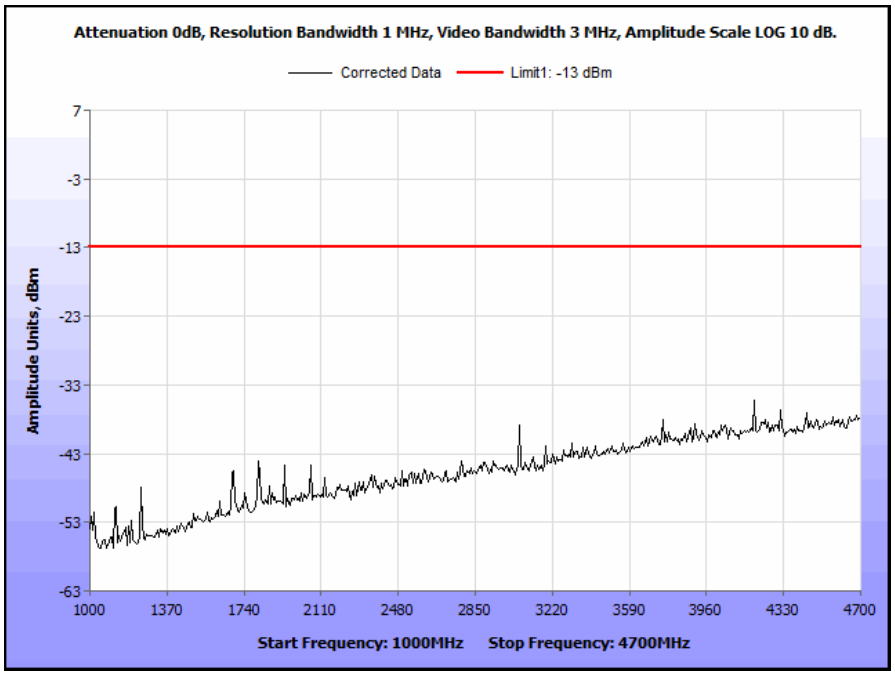
Plot 269. Part 80, Radiated Spurious Emissions, 456 MHz, HDQPSK, 30 MHz – 1 GHz, 10 W



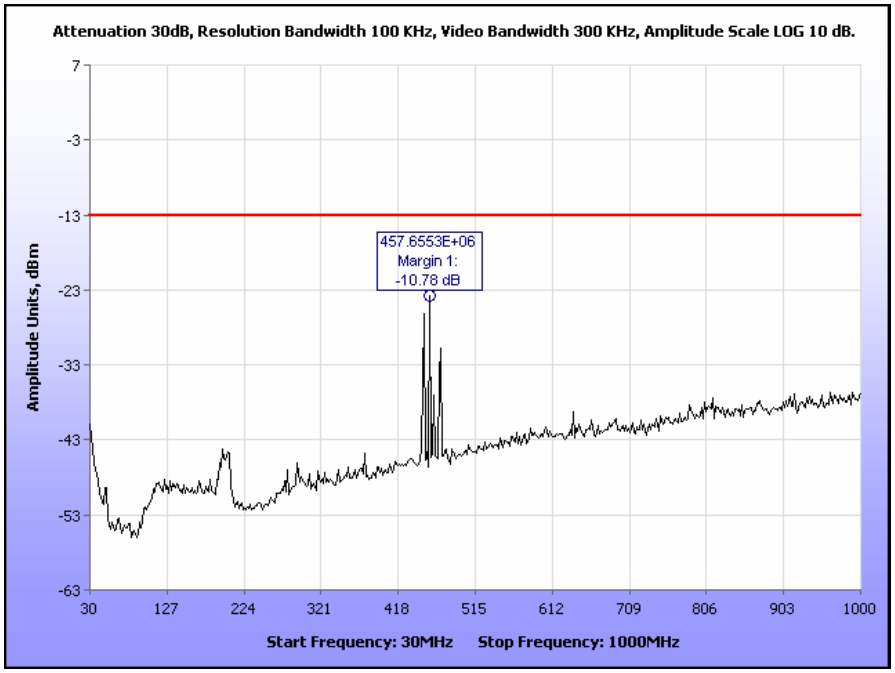
Plot 270. Part 80, Radiated Spurious Emissions, 456 MHz, HDQPSK, 1 GHz – 4.7 GHz, 10 W



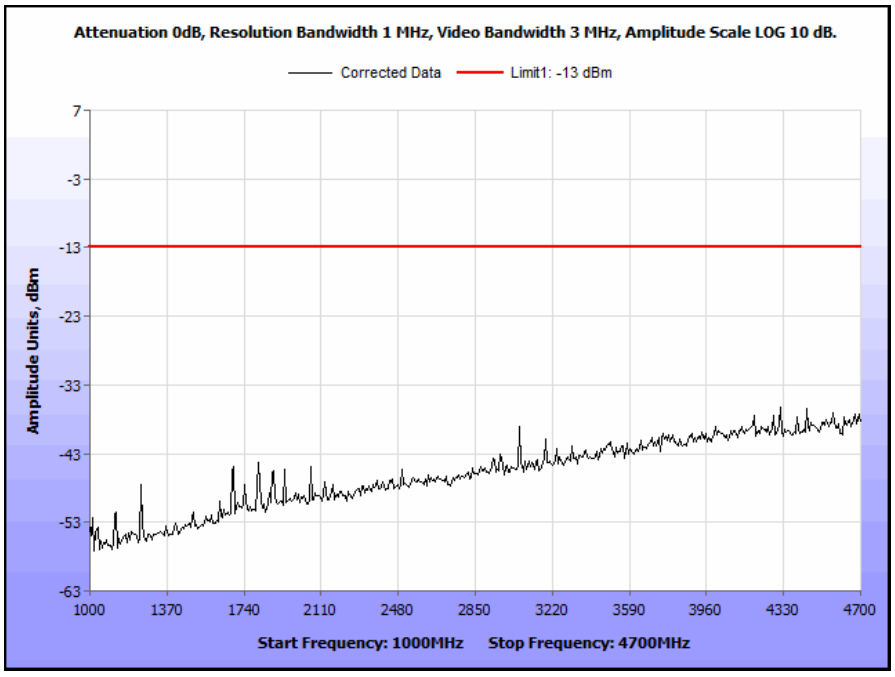
Plot 271. Part 80, Radiated Spurious Emissions, 456 MHz, C4FM, 30 MHz – 1 GHz, 100 W



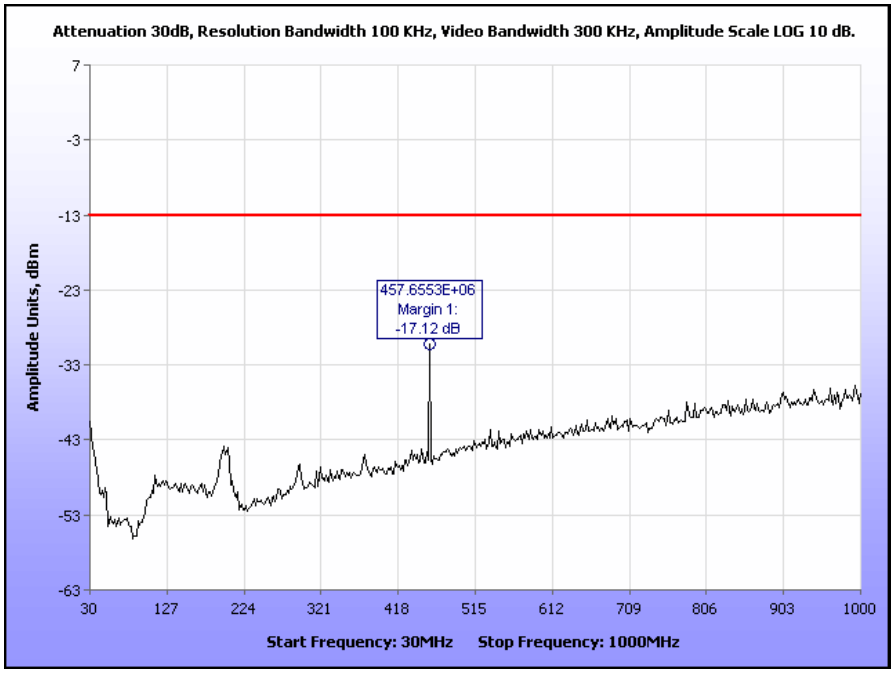
Plot 272. Part 80, Radiated Spurious Emissions, 456 MHz, C4FM, 1 GHz – 4.7 GHz, 100 W



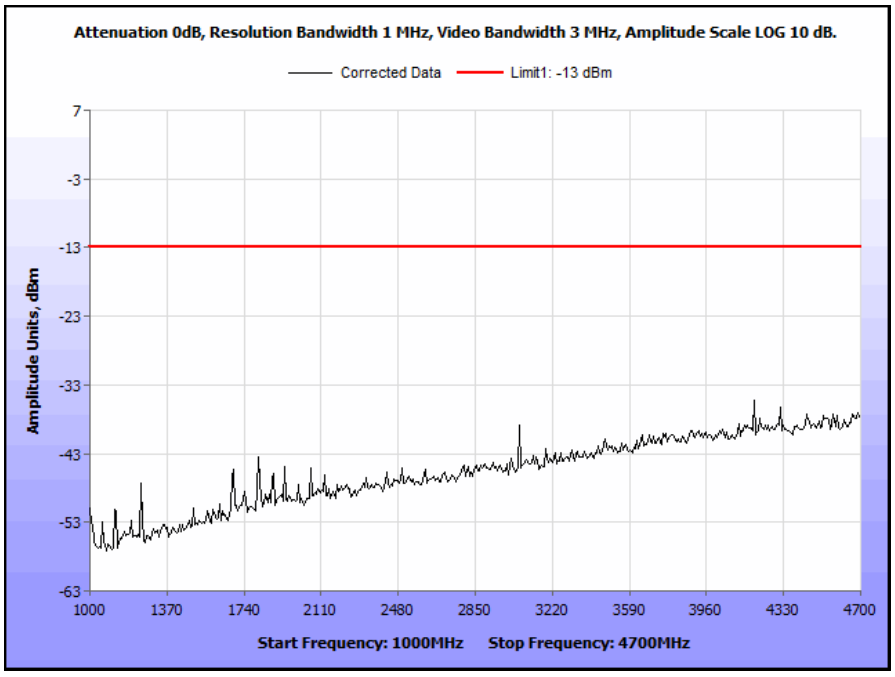
Plot 273. Part 80, Radiated Spurious Emissions, 456 MHz, CQPSK, 30 MHz – 1 GHz, 100 W



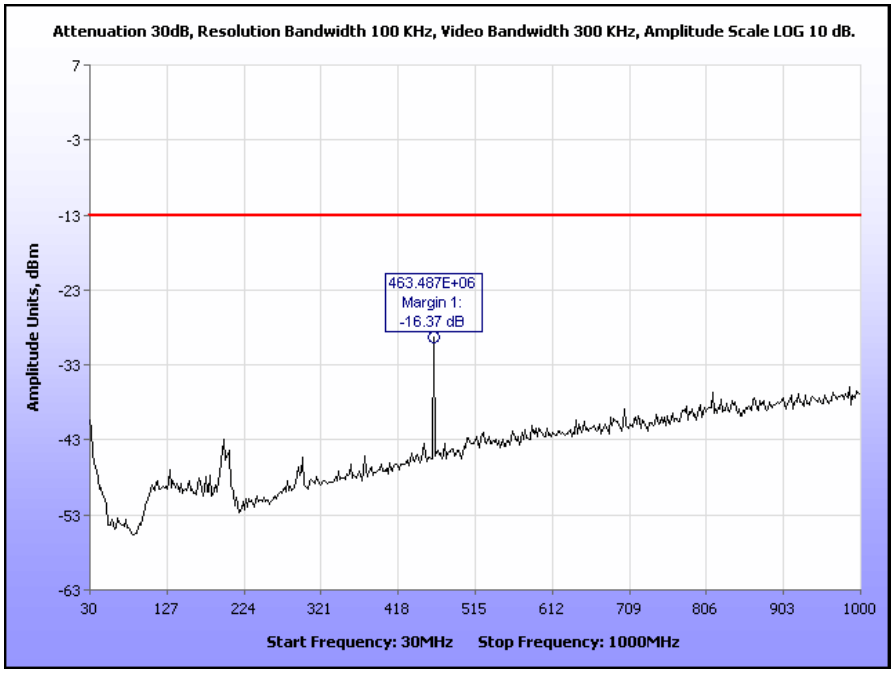
Plot 274. Part 80, Radiated Spurious Emissions, 456 MHz, CQPSK, 1 GHz – 4.7 GHz, 100 W



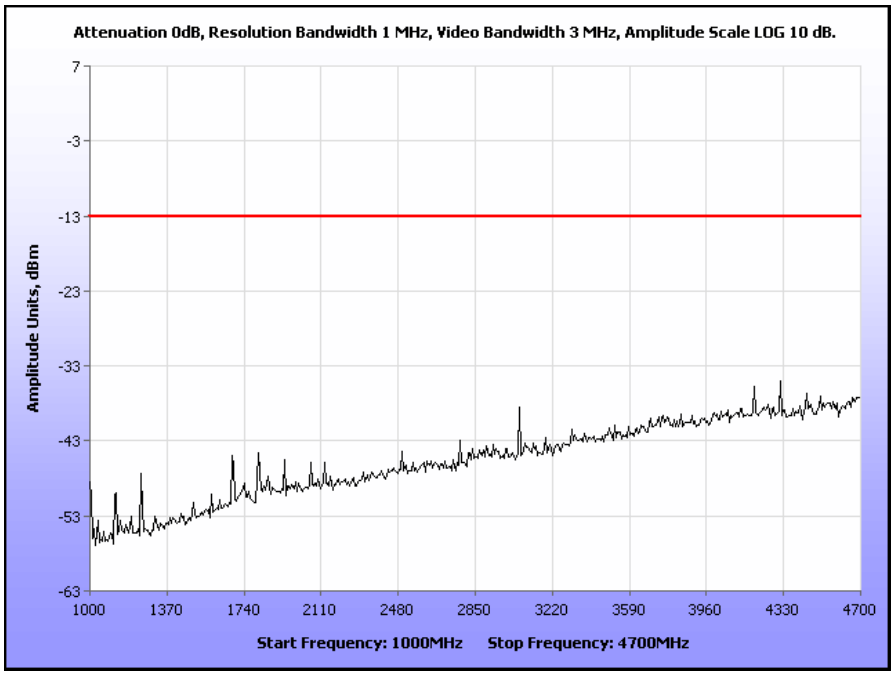
Plot 275. Part 80, Radiated Spurious Emissions, 456 MHz, HDQPSK, 30 MHz – 1 GHz, 100 W



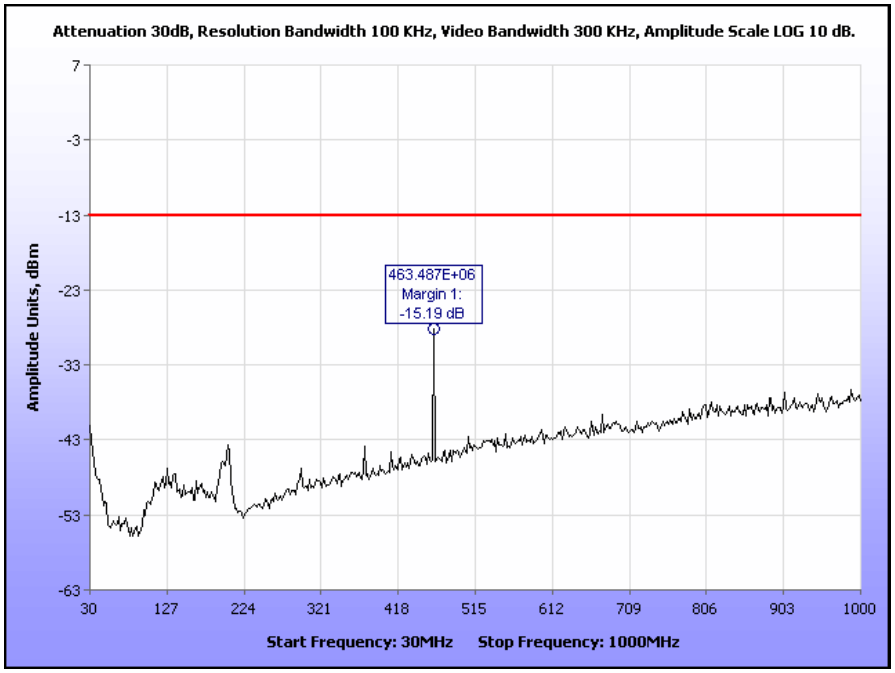
Plot 276. Part 80, Radiated Spurious Emissions, 456 MHz, HDQPSK, 1 GHz – 4.7 GHz, 100 W



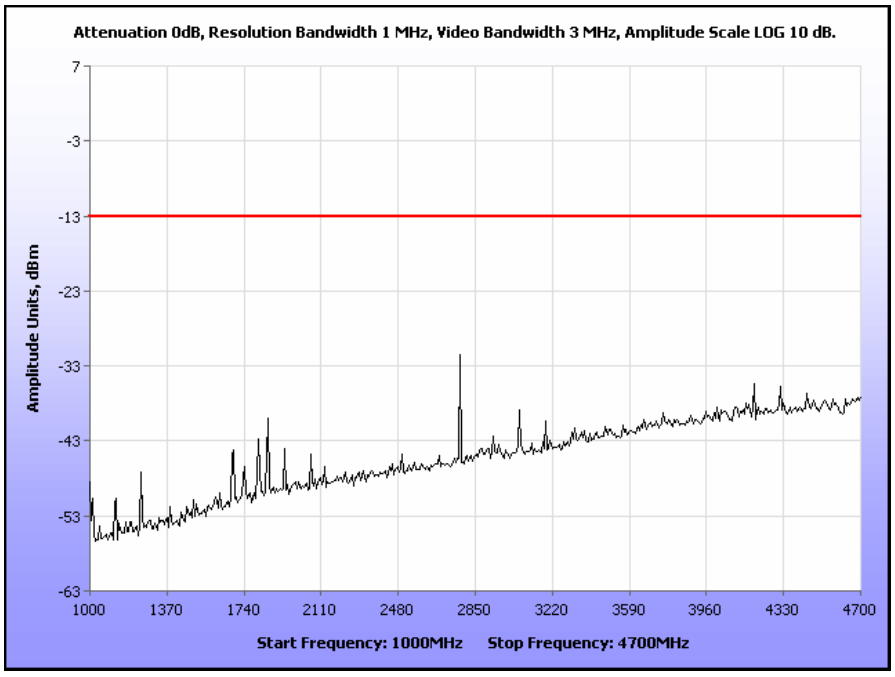
Plot 277. Part 80, Radiated Spurious Emissions, 463 MHz, C4FM, 30 MHz – 1 GHz, 10 W



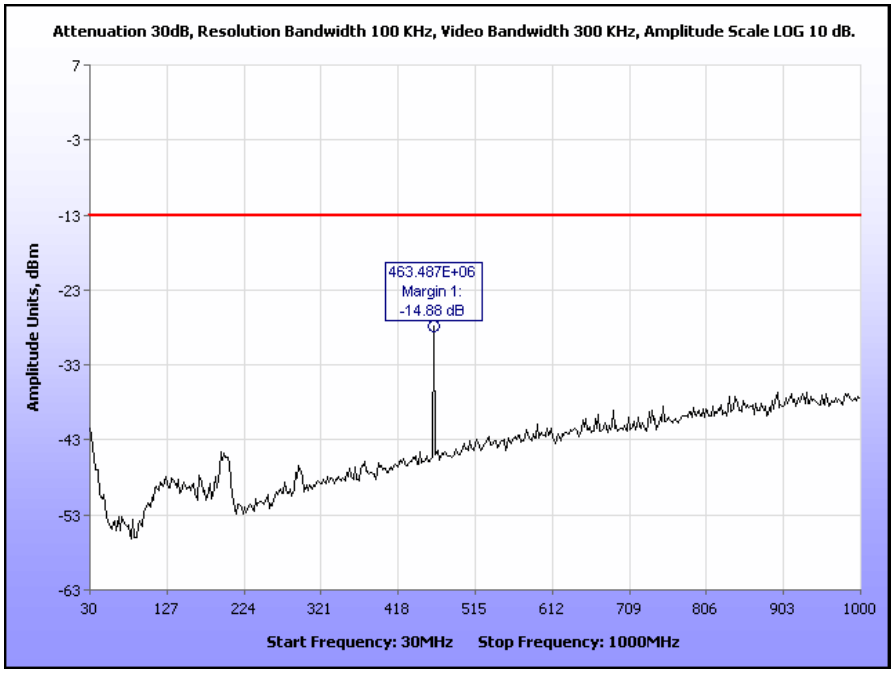
Plot 278. Part 80, Radiated Spurious Emissions, 463 MHz, C4FM, 1 GHz – 4.7 GHz, 10 W



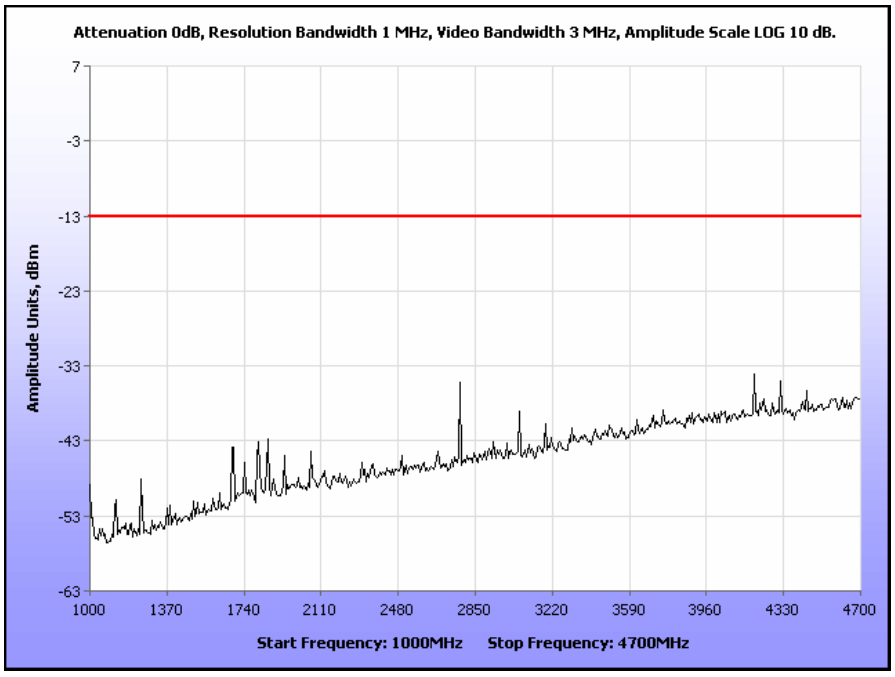
Plot 279. Part 80, Radiated Spurious Emissions, 463 MHz, CQPSK, 30 MHz – 1 GHz, 10 W



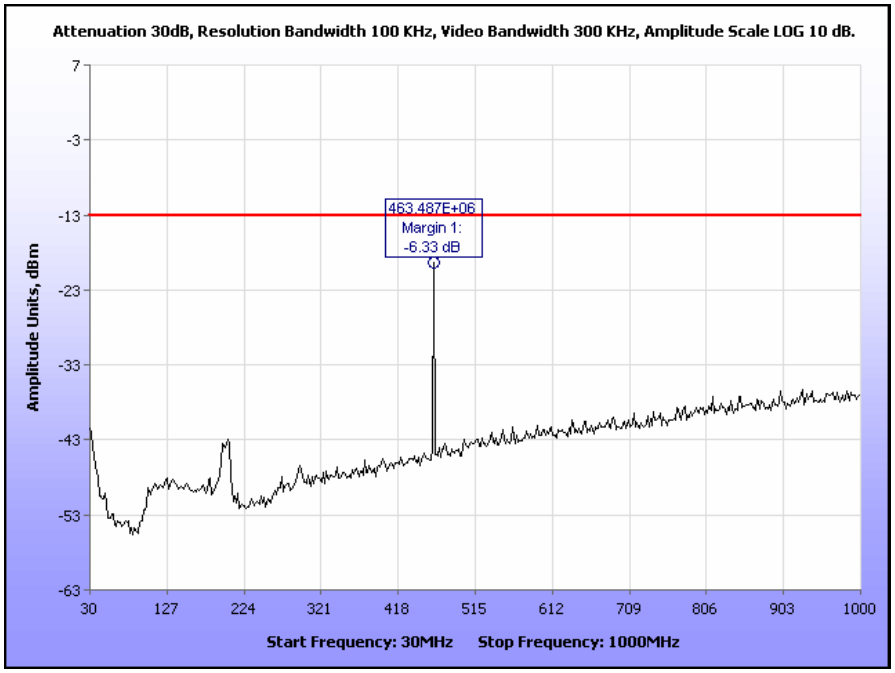
Plot 280. Part 80, Radiated Spurious Emissions, 463 MHz, CQPSK, 1 GHz – 4.7 GHz, 10 W



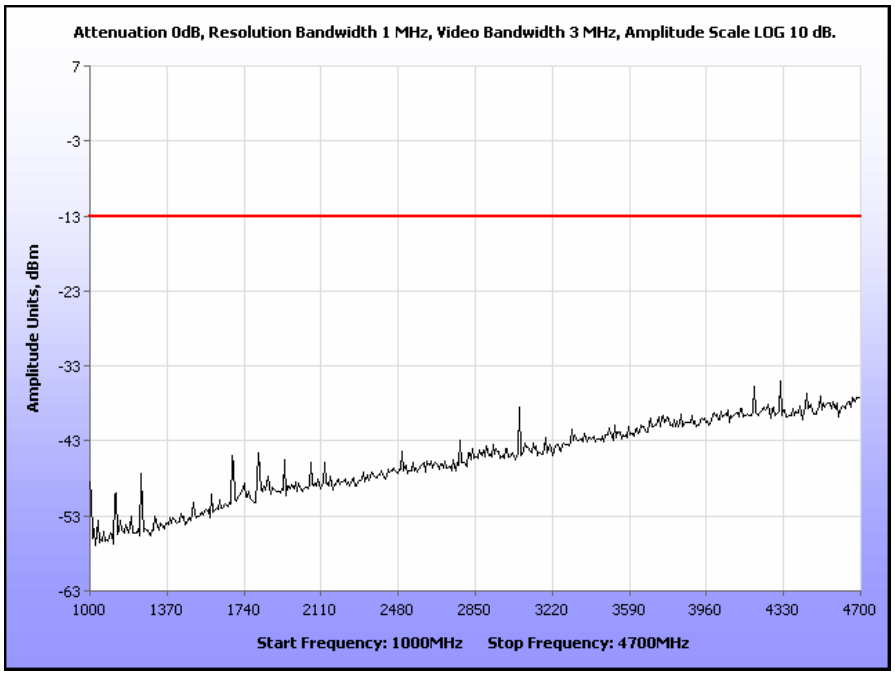
Plot 281. Part 80, Radiated Spurious Emissions, 463 MHz, HDQPSK, 30 MHz – 1 GHz, 10 W



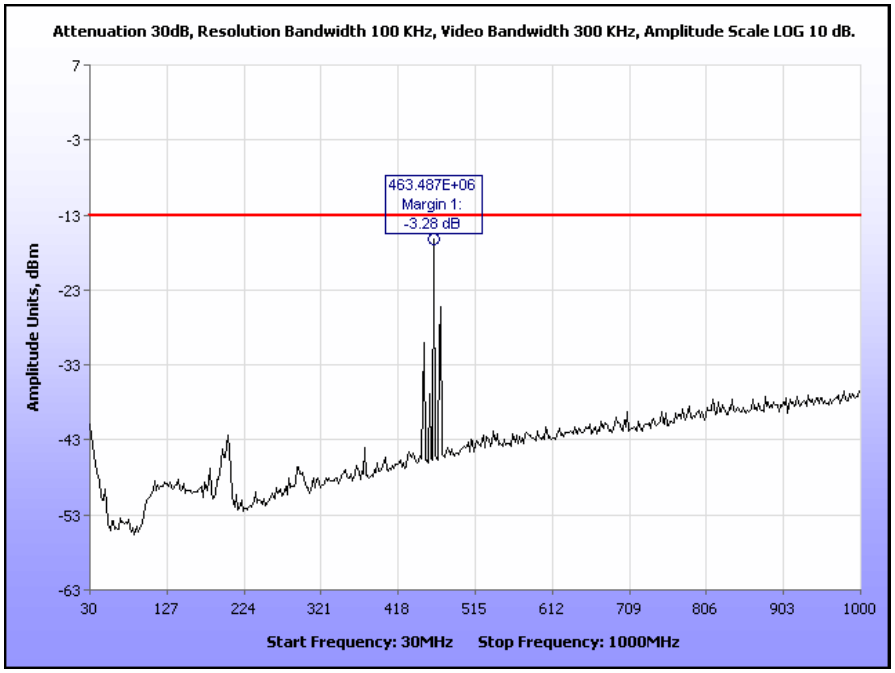
Plot 282. Part 80, Radiated Spurious Emissions, 463 MHz, HDQPSK, 1 GHz – 4.7 GHz, 10 W



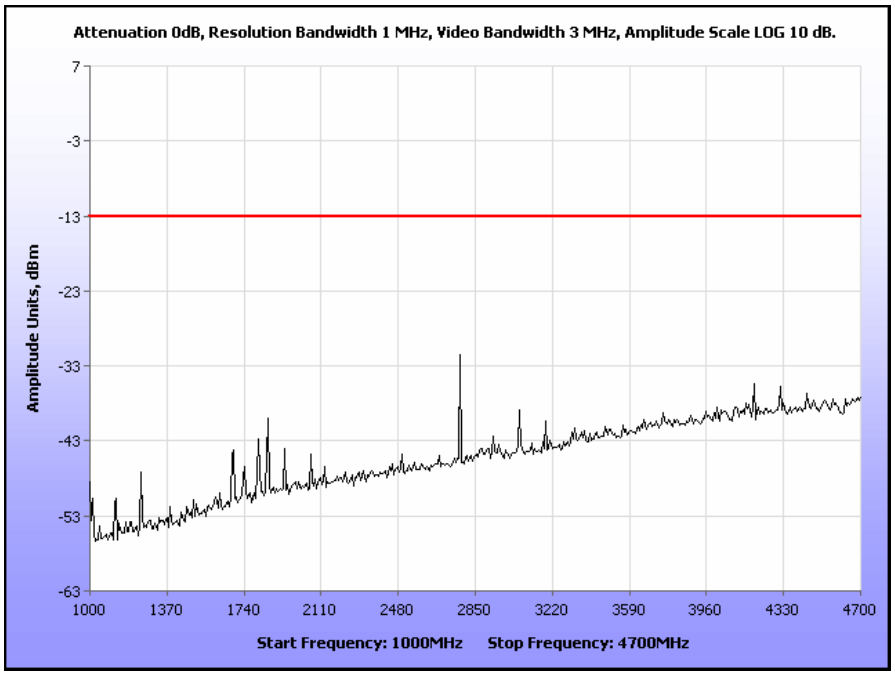
Plot 283. Part 80, Radiated Spurious Emissions, 463 MHz, C4FM, 30 MHz – 1 GHz, 100 W



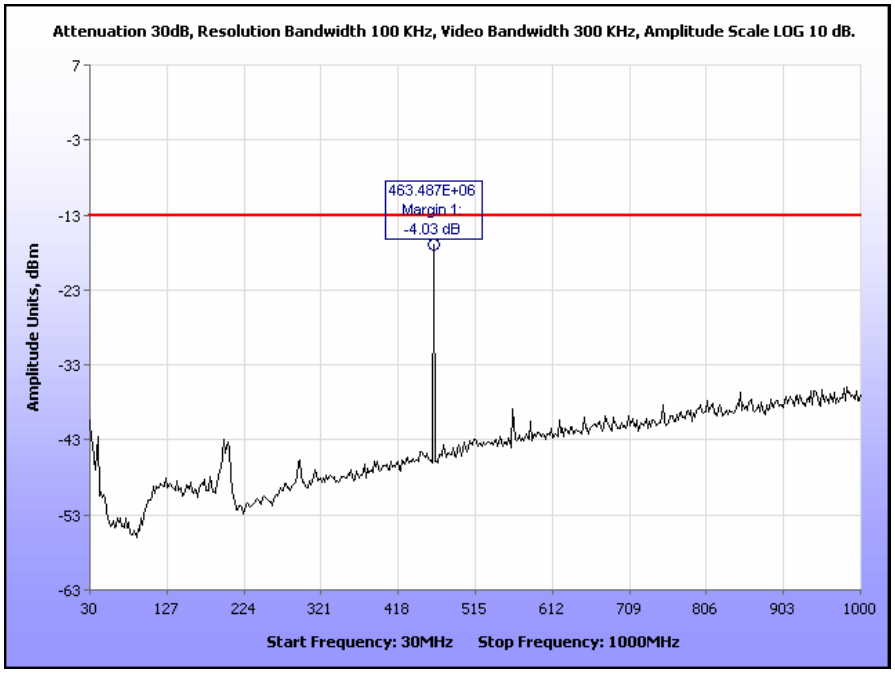
Plot 284. Part 80, Radiated Spurious Emissions, 463 MHz, C4FM, 1 GHz – 4.7 GHz, 100 W



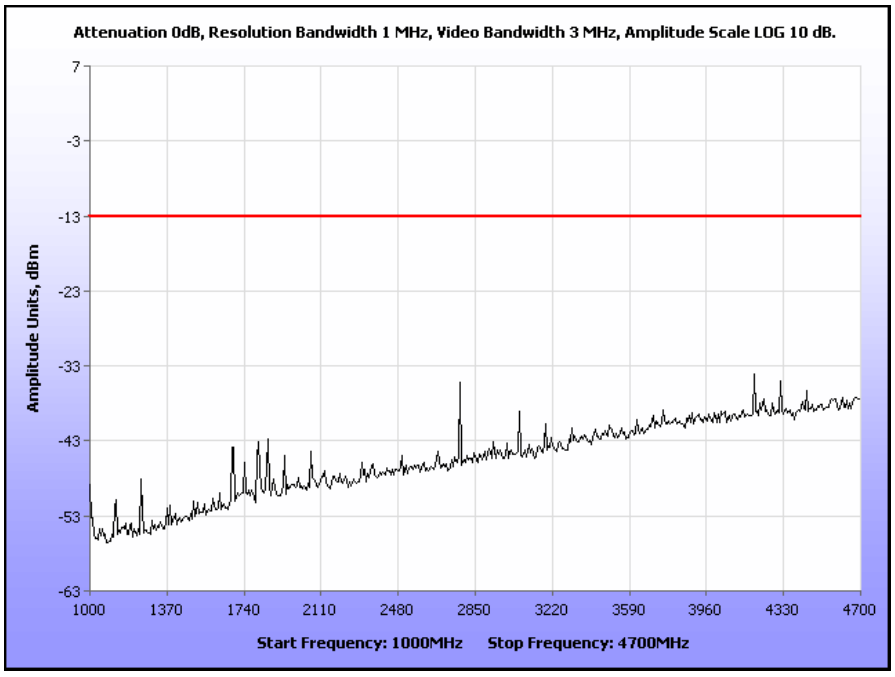
Plot 285. Part 80, Radiated Spurious Emissions, 463 MHz, CQPSK, 30 MHz – 1 GHz, 100 W



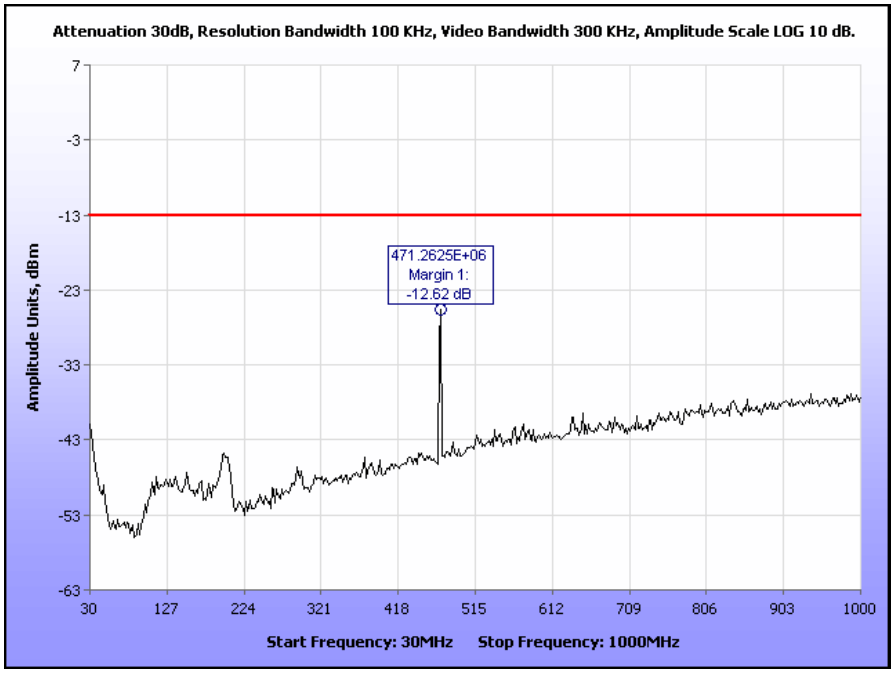
Plot 286. Part 80, Radiated Spurious Emissions, 463 MHz, CQPSK, 1 GHz – 4.7 GHz, 100 W



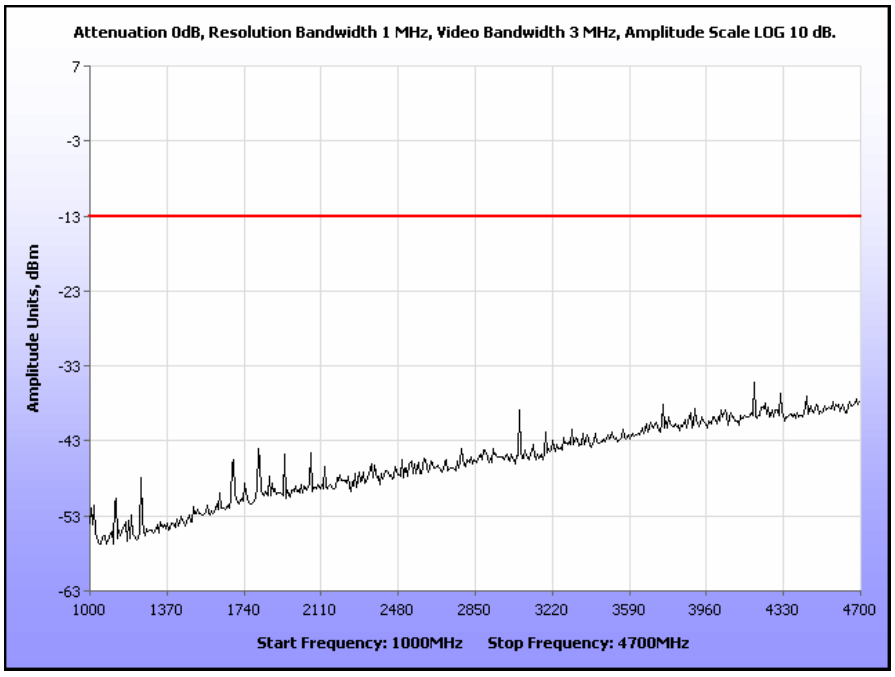
Plot 287. Part 80, Radiated Spurious Emissions, 463 MHz, HDQPSK, 30 MHz – 1 GHz, 100 W



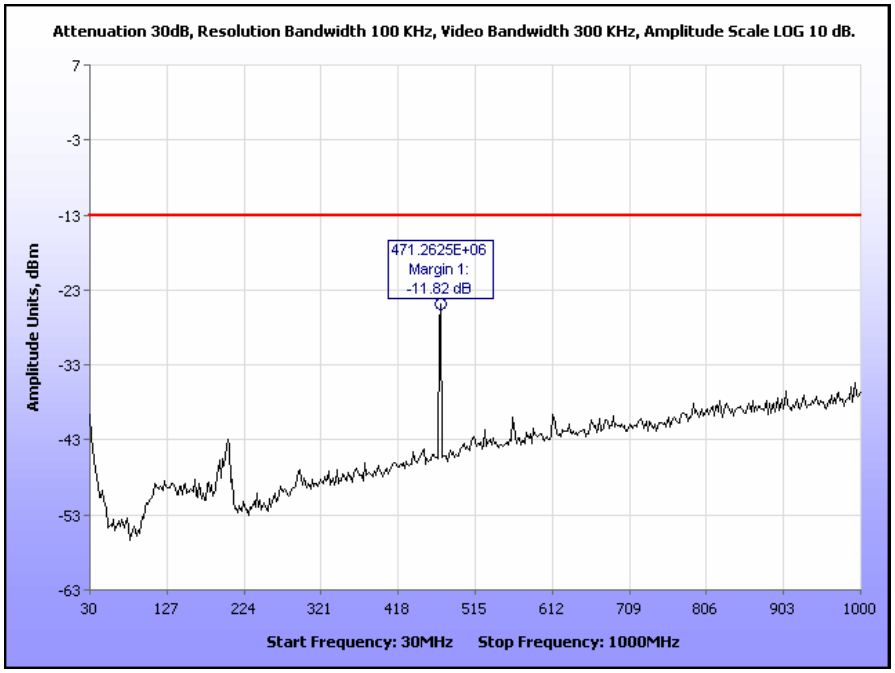
Plot 288. Part 80, Radiated Spurious Emissions, 463 MHz, HDQPSK, 1 GHz – 4.7 GHz, 100 W



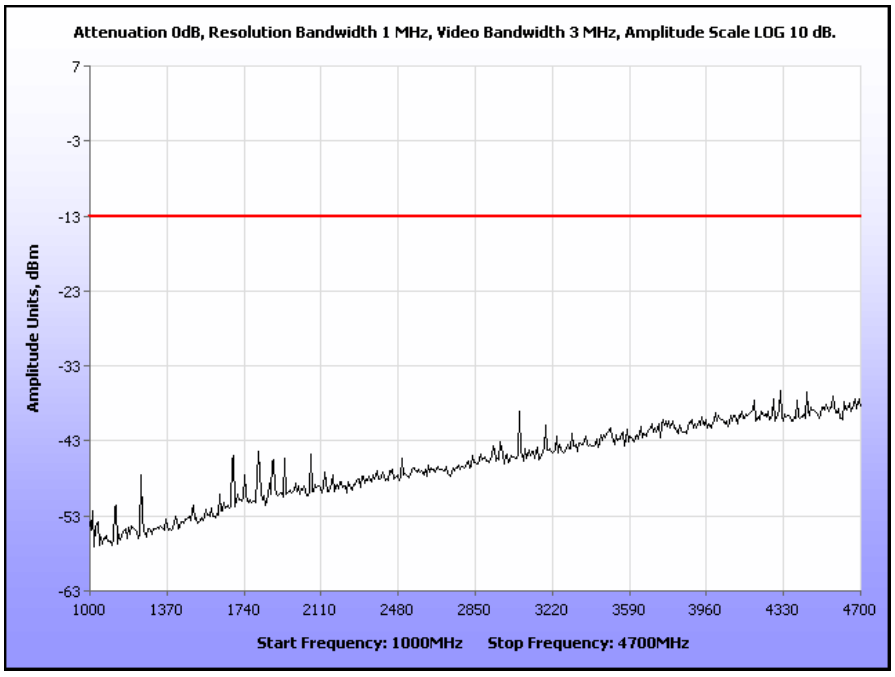
Plot 289. Part 80, Radiated Spurious Emissions, 470 MHz, C4FM, 30 MHz – 1 GHz, 10 W



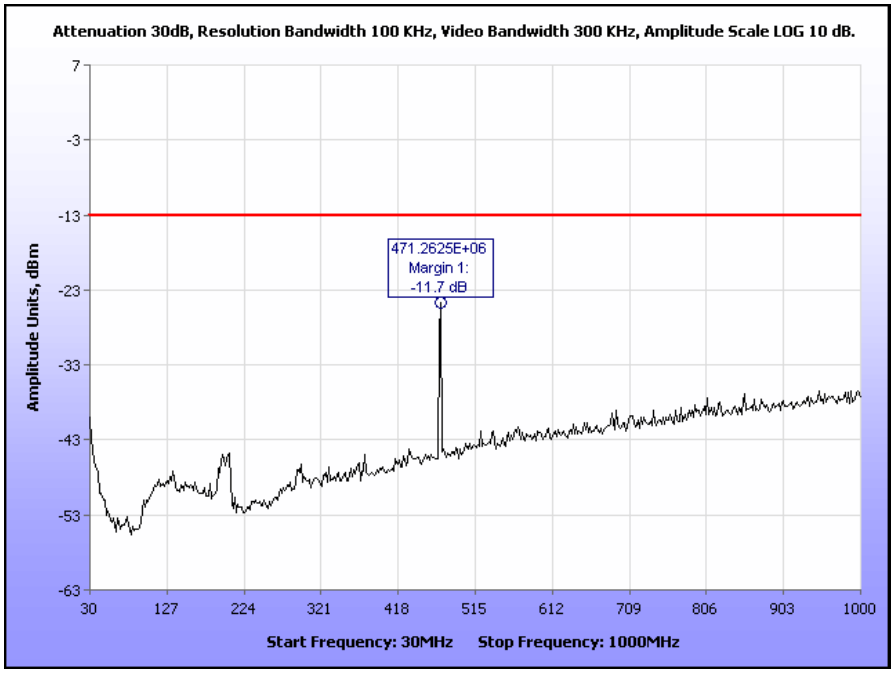
Plot 290. Part 80, Radiated Spurious Emissions, 470 MHz, C4FM, 1 GHz – 4.7 GHz, 10 W



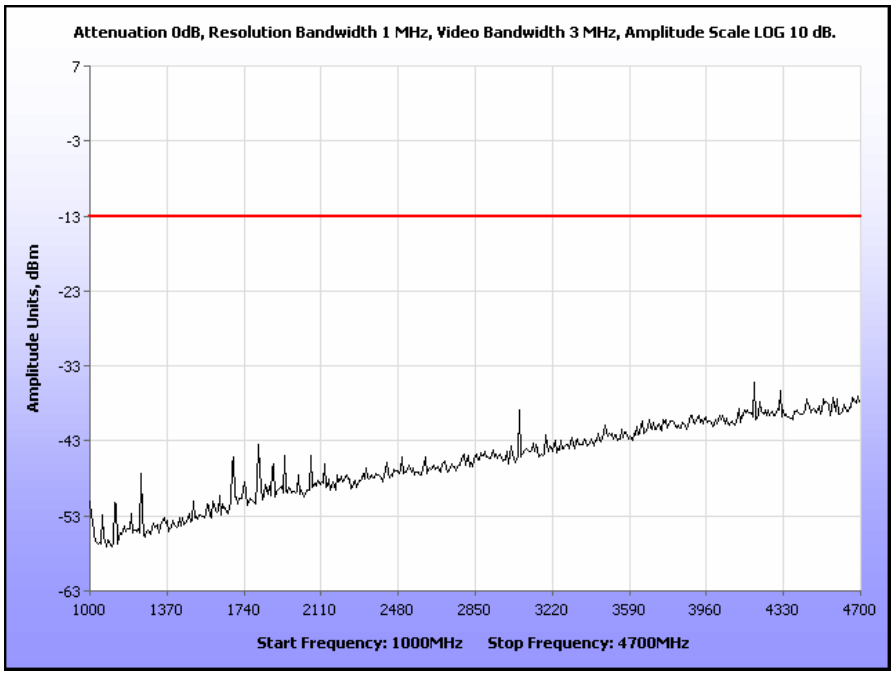
Plot 291. Part 80, Radiated Spurious Emissions, 470 MHz, CQPSK, 30 MHz – 1 GHz, 10 W



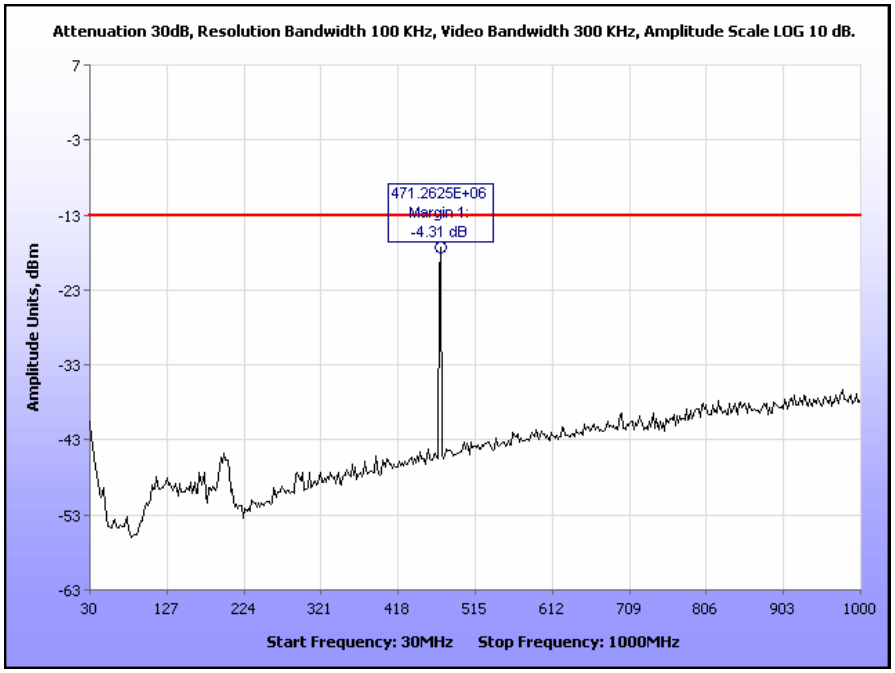
Plot 292. Part 80, Radiated Spurious Emissions, 470 MHz, CQPSK, 1 GHz – 4.7 GHz, 10 W



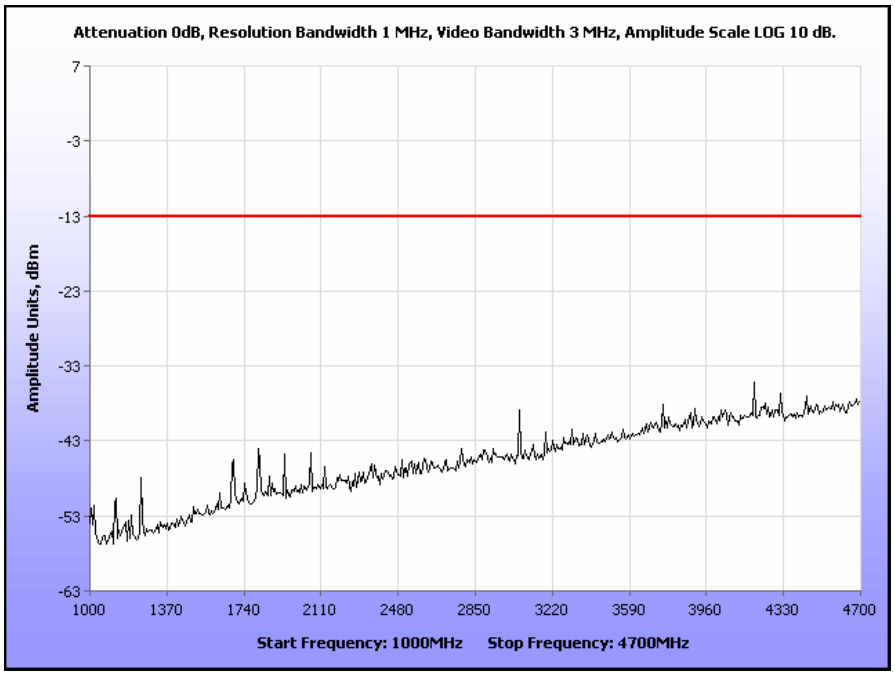
Plot 293. Part 80, Radiated Spurious Emissions, 470 MHz, HDQPSK, 30 MHz – 1 GHz, 10 W



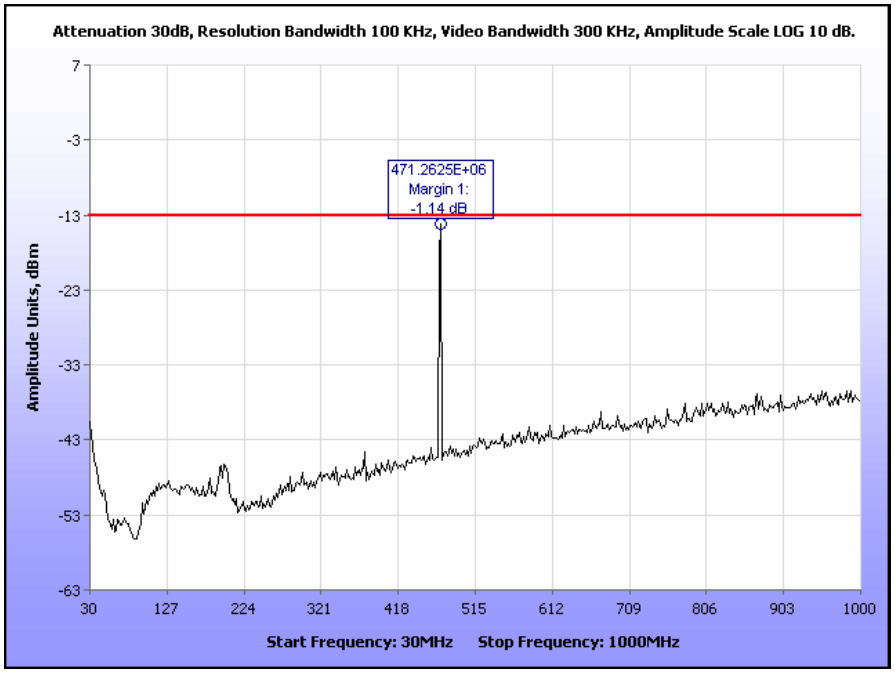
Plot 294. Part 80, Radiated Spurious Emissions, 470 MHz, HDQPSK, 1 GHz – 4.7 GHz, 10 W



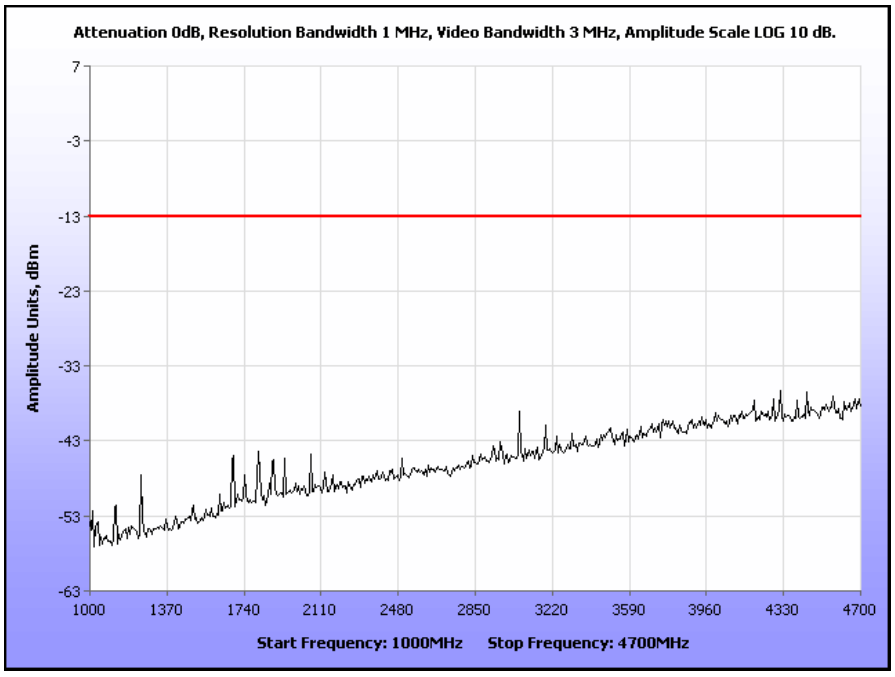
Plot 295. Part 80, Radiated Spurious Emissions, 470 MHz, C4FM, 30 MHz – 1 GHz, 100 W



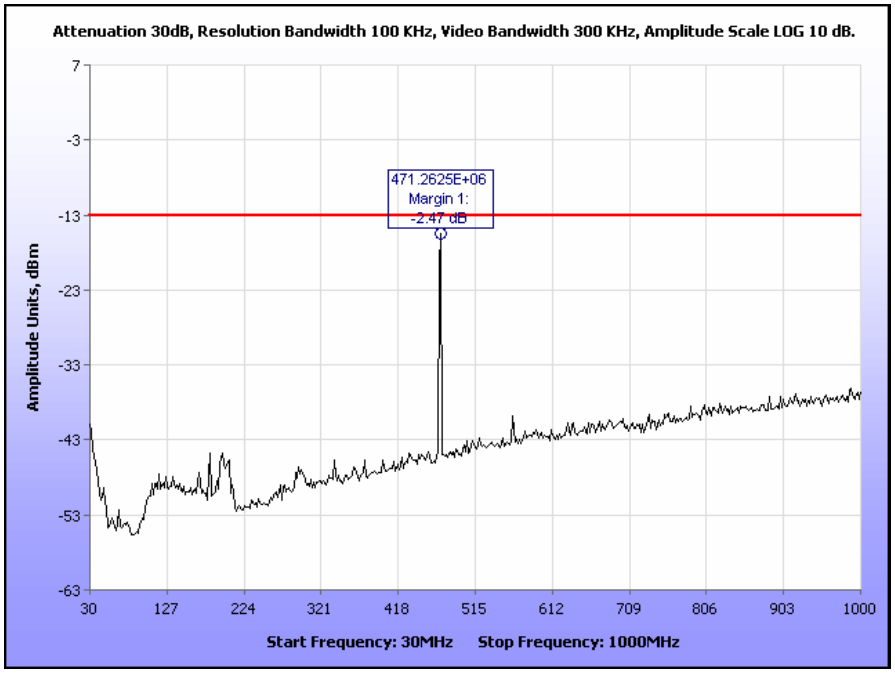
Plot 296. Part 80, Radiated Spurious Emissions, 470 MHz, C4FM, 1 GHz – 4.7 GHz, 100 W



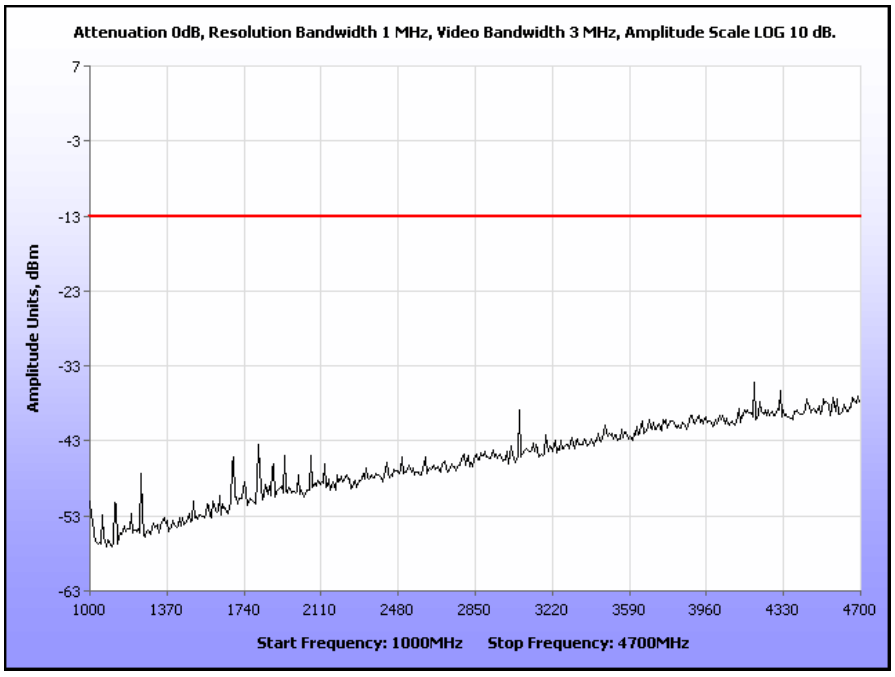
Plot 297. Part 80, Radiated Spurious Emissions, 470 MHz, CQPSK, 30 MHz – 1 GHz, 100 W



Plot 298. Part 80, Radiated Spurious Emissions, 470 MHz, CQPSK, 1 GHz – 4.7 GHz, 100 W



Plot 299. Part 80, Radiated Spurious Emissions, 470 MHz, HDQPSK, 30 MHz – 1 GHz, 100 W



Plot 300. Part 80, Radiated Spurious Emissions, 470 MHz, HDQPSK, 1 GHz – 4.7 GHz, 100 W

Electromagnetic Compatibility Criteria for Intentional Radiators

§2.1055 Frequency Stability over Temperature and Voltage Variations

Test Requirement(s): §2.1055(a)(1); §22.355; §80.209

Test Procedures: As required by 47 CFR 2.1055, *Frequency Stability measurements* were made at the RF output terminals using a Directional Coupler through a Spectrum Analyzer and Power Meter.

The EUT was placed in the Environmental Chamber and support equipment were outside the chamber on a table. A CW signal was injected into the EUT at the appropriate RF level. The frequency counter option on the Spectrum Analyzer was used to measure frequency deviations. The frequency drift was investigated for every 10^{C} increment until the unit is stabilized then recorded the reading in tabular format with the temperature range of -30 to 50^{C}.

Voltage supplied to EUT is 120 VAC reference temperature was done at 20^{C}. The voltage was varied by ± 15 % of nominal

Test Results: Equipment was compliant with Section 2.1055 and 22.355

Test Engineer(s): Surinder Singh

Test Date(s): 01/29/14

Temperature (degree Celcius)	AC Voltage	Frequency Drift (ppm)	Frequency Drift (Hz)
50	120	450.006243	4.999999987
40	120	450.006241	2.999999992
30	120	450.006239	0.999999997
20	102	450.0062517	13.70000001
20	120	450.006238	0
20	138	450.0062521	14.09999999
10	120	450.006239	0.999999997
0	120	450.00624	1.999999995
-10	120	450.006243	4.999999987
-20	120	450.006244	5.999999985
-30	120	450.006244	5.999999985

Table 5. Frequency Stability, Test Results

Photograph 1. Frequency Stability, Test Setup

3.1. Transient Frequency Behavior

FCC §90.214
Test Requirement(s): **§90.214 Transient frequency behavior**

Transmitters designed to operate in the 150-174 MHz and 421-512 MHz frequency bands must maintain transient frequencies within the maximum frequency difference limits during the time intervals indicated:

Time intervals [1] [2]	Maximum frequency difference [3]	All equipment	
		150 to 174 MHz	421 to 512 MHz
Transient Frequency Behavior for Equipment Designed to Operate on 25 kHz Channels			
t_1 [4]	±25.0 kHz	5.0 ms	10.0 ms
t_2	±12.5 kHz	20.0 ms	25.0 ms
t_3 [4]	±25.0 kHz	5.0 ms	10.0 ms
Transient Frequency Behavior for Equipment Designed to Operate on 12.5 kHz Channels			
t_1 [4]	±12.5 kHz	5.0 ms	10.0 ms
t_2	±6.25 kHz	20.0 ms	25.0 ms
t_3 [4]	±12.5 kHz	5.0 ms	10.0 ms
Transient Frequency Behavior for Equipment Designed to Operate on 6.25 kHz Channels			
t_1 [4]	±6.25 kHz	5.0 ms	10.0 ms
t_2	±3.125 kHz	20.0 ms	25.0 ms
t_3 [4]	±6.25 kHz	5.0 ms	10.0 ms

[1] t_{on} is the instant when a 1 kHz test signal is completely suppressed, including any capture time due to phasing.

t_1 is the time period immediately following t_{on}.

t_2 is the time period immediately following t_1.

t_3 is the time period from the instant when the transmitter is turned off until t_{off}.

t_{off} is the instant when the 1 kHz test signal starts to rise.

[2] During the time from the end of $t_2$to the beginning of t_3, the frequency difference must not exceed the limits specified in § 90.213.

[3] Difference between the actual transmitter frequency and the assigned transmitter frequency.

[4] If the transmitter carrier output power rating is 6 watts or less, the frequency difference during this time period may exceed the maximum frequency difference for this time period.

Test Procedures: The alternate method of testing used was from TIA-603-C, section 2.2.19.2 using a Modulation Domain Analyzer.

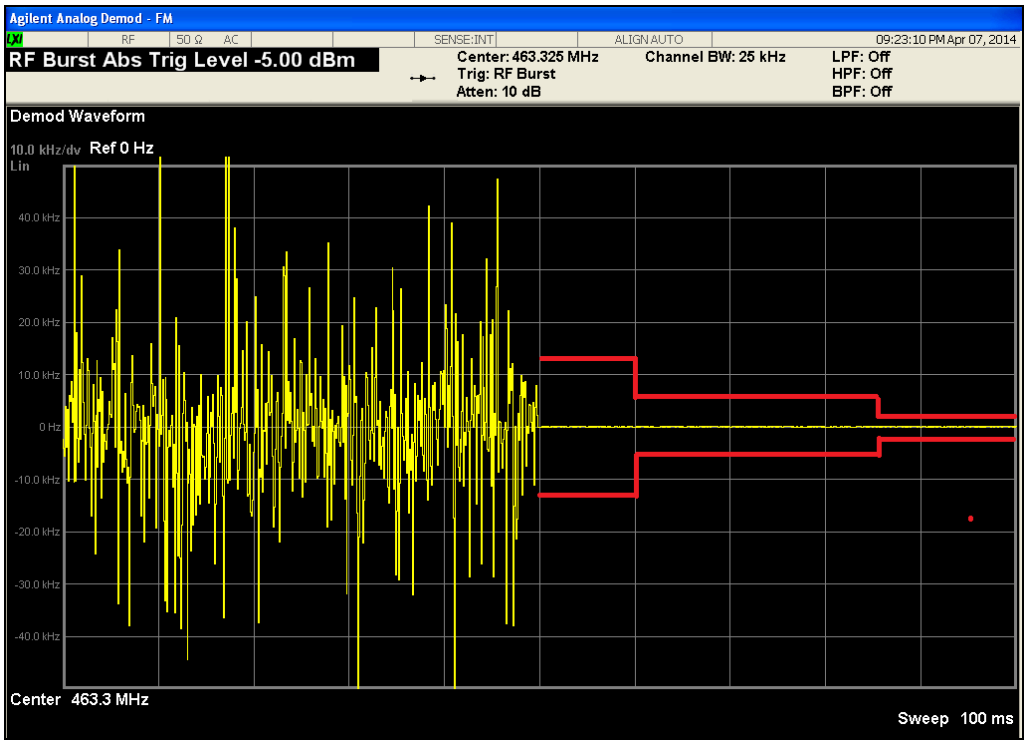
The EUT was connected to the Modulation Domain Analyzer. In order to capture a single-shot turn-on of the transmitter signal, the modulation domain analyzer was set to trigger on the rising edge of the waveform with a 50 ms delay. Plots were taken.

The modulation domain analyzer was then adjusted to trigger on the falling edge of the transmitter waveform with a 50ms delay in order to capture a single-shot turn-off transient of the transmitter signal. Plots were taken.

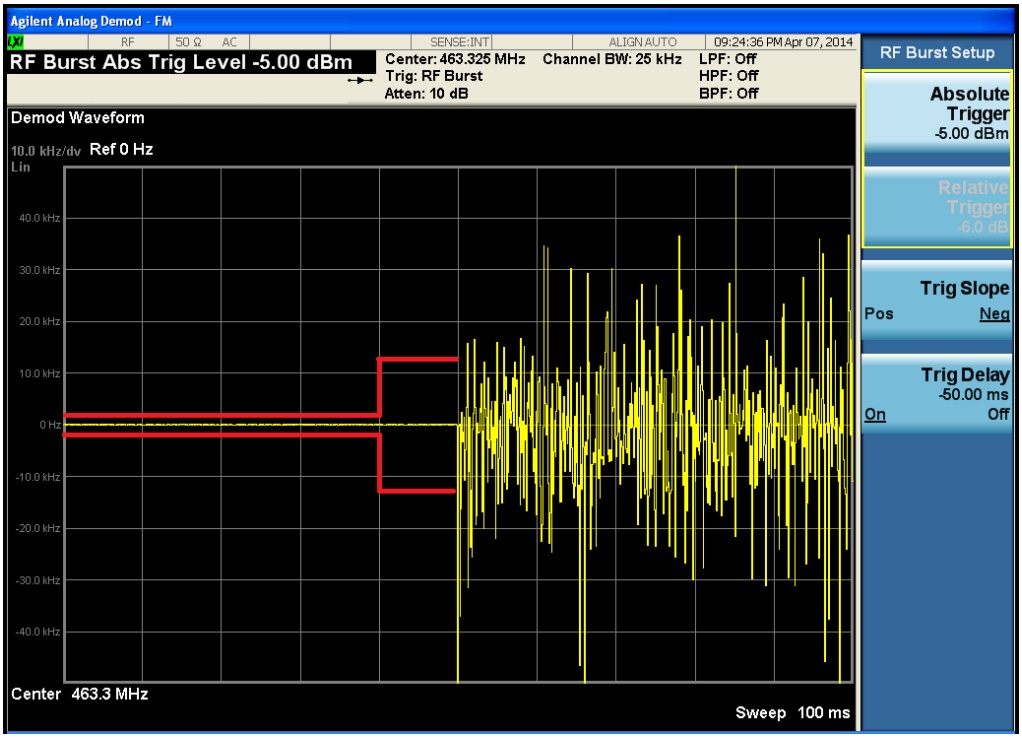
Test Results: Equipment complies with Section §90.214 and RSS-119.

Test Engineer(s): Ben Taylor

Test Date(s): 04/1/14



Plot 301. Transient Frequency Behavior, power up



Plot 302. Transient Frequency Behavior, power down

IV. Test Equipment

Test Equipment

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

MET Asset #	Equipment	Manufacturer	Model	Last Cal Date	Cal Due Date
1T4409	EMI RECEIVER	ROHDE & SCHWARZ	ESIB7	7/16/2012	7/16/2014
1T4787	HYGROMETER / THERMOMETER / BAROMETER / DEW POINT PEN	CONTROL COMPANY	15-078-198, FB70423, 245CD	2/15/2012	2/15/2014
1T4483	ANTENNA; HORN	EMCO	3115	9/5/2012	3/5/2014
1T4300C	SEMI-ANECHOIC 3M CHAMBER # 1 (VCCI)	EMC TEST SYSTEMS	NONE	1/31/2012	1/31/2015
1T4612	SPECTRUM ANALYZER	AGILENT TECHNOLOGIES	E4407B	7/30/2013	7/30/2014
1S2229	TEMPERATURE CHAMBER	TENNY ENGINEERING	T63C	9/18/2013	3/18/2015
SN:MY49060084	SIGNAL ANALYZER	AGILENT	EXA	11/01/2013	11/01/2015
1T4818	COMB GENERATOR	COM-POWER	CGO-520	SEE NOTE	

Table 6. Test Equipment

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

V. Certification & User's Manual Information

Certification & User's Manual Information

A. Certification Information

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

§ 2.801 Radio-frequency device defined.

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

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

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

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

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

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

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

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

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

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

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

(i) Compliance testing;

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

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

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

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

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

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

Certification & User's Manual Information

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

§ 2.901 Basis and Purpose

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

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

§ 2.907 Certification.

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

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

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

Certification & User's Manual Information

§ 2.948 Description of measurement facilities.

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

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

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

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

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

Certification & User's Manual Information

Label and User's Manual Information

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

§ 15.19 Labeling requirements.

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

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

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

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

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

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

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

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

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

§ 15.21 Information to user.

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

Verification & User's Manual Information

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

§ 15.105 Information to the user.

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

> Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
>
> – Reorient or relocate the receiving antenna.
>
> – Increase the separation between the equipment and receiver.
>
> – Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
>
> – Consult the dealer or an experienced radio/TV technician for help.

End of Report

