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

October 25, 2013

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

Dear Brian Justin,

Enclosed is the EMC Wireless Class II Permissive Change test report for compliance testing of the Harris RF Communications, MASTR V, MASV-XTXMV as tested to the requirements of the FCC Certification rules under Title 47 of the CFR Part 22 Subpart C for Public Mobile Service, and Part 80 for Stations in the Maritime Services.

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\EMC38832-FCC22_80 Rev. 2)

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Electromagnetic Compatibility Criteria
Class II Permissive Change Test Report

for the

Harris RF Communications
Model MASTR V, MASV-XTXMV

Verified under
FCC Certification Rules
Title 47 of the CFR, Part 22 Subpart C
for Public Mobile Service
and
Title 47 of the CFR, Part 80
for Stations in the Maritime Services

MET Report: EMC38832-FCC22_80 Rev. 2

October 25, 2013

Prepared For:

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

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

Electromagnetic Compatibility Criteria
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and
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for Stations in the Maritime Services

Benjamin Taylor, 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 Subpart C and Part 80of the FCC Rules under normal use and maintenance.

Asad Bajwa, Director
Electromagnetic Compatibility Lab

Report Status Sheet

Revision	Report Date	Reason for Revision
∅	September 10, 2013	Initial Issue.
1	October 1, 2013	Revised to reflect customer and engineer corrections.
2	October 25, 2013	Editorial corrections.

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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 Class II Permissive Change evaluation was performed to determine compliance of the Harris RF Communications MASTR V, MASV-XTXMV, 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, MASV-XTXMV. 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, MASV-XTXMV, 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 Subpart C and Part 80, in accordance with Harris RF Communications, purchase order number 1131250.

Reference	Description	Compliance
§2.1046; §22.565; §80.215	RF Power Output	Compliant
§2.1055, §22.355; §80.209	Frequency Stability	Compliant
§2.1051; §22.359; §80.211	Spurious Emissions at Antenna Terminals	Compliant
§2.1053; §22.359; §80.211	Field Strength of Spurious Radiated Emissions	Compliant
§2.1049; §22.359(b); §80.205	Occupied Bandwidth	Compliant
--	RF Exposure	Not Applicable

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, MASV-XTXMV, under Harris RF Communications' purchase order number 1131250.

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, MASV-XTXMV.

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

Model(s) Tested:	MASTR V, MASV-XTXMV	
Model(s) Covered:	MASTR V, MASV-XTXMV	
EUT Specifications:	Primary Power: 110 VAC	
	FCC ID: OWDTR-0065-E	
	Type of Modulations:	C4FM, WCQPSK, HDQPSK
	Equipment Code:	TNB
	Max Peak and Output Power:	50.98 dBm
	EUT Frequency Ranges:	150.0125 – 173.9875 MHz
Analysis:	The results obtained relate only to the item(s) tested.	
Environmental Test Conditions:	Temperature: 15-35º C	
	Relative Humidity: 30-60%	
	Barometric Pressure: 860-1060 mbar	
Evaluated by:	Benjamin Taylor	
Date(s):	October 25, 2013	

B. References

CFR 47, Part 22, Subpart C	Operational and Technical Requirements
CFR 47, Part 15, Subpart B	Electromagnetic Compatibility: Criteria for Radio Frequency Devices
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 10 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 Harris RF Communications MASTR V, MASV-XTXMV, Equipment Under Test (EUT), 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 Of The Shelf.

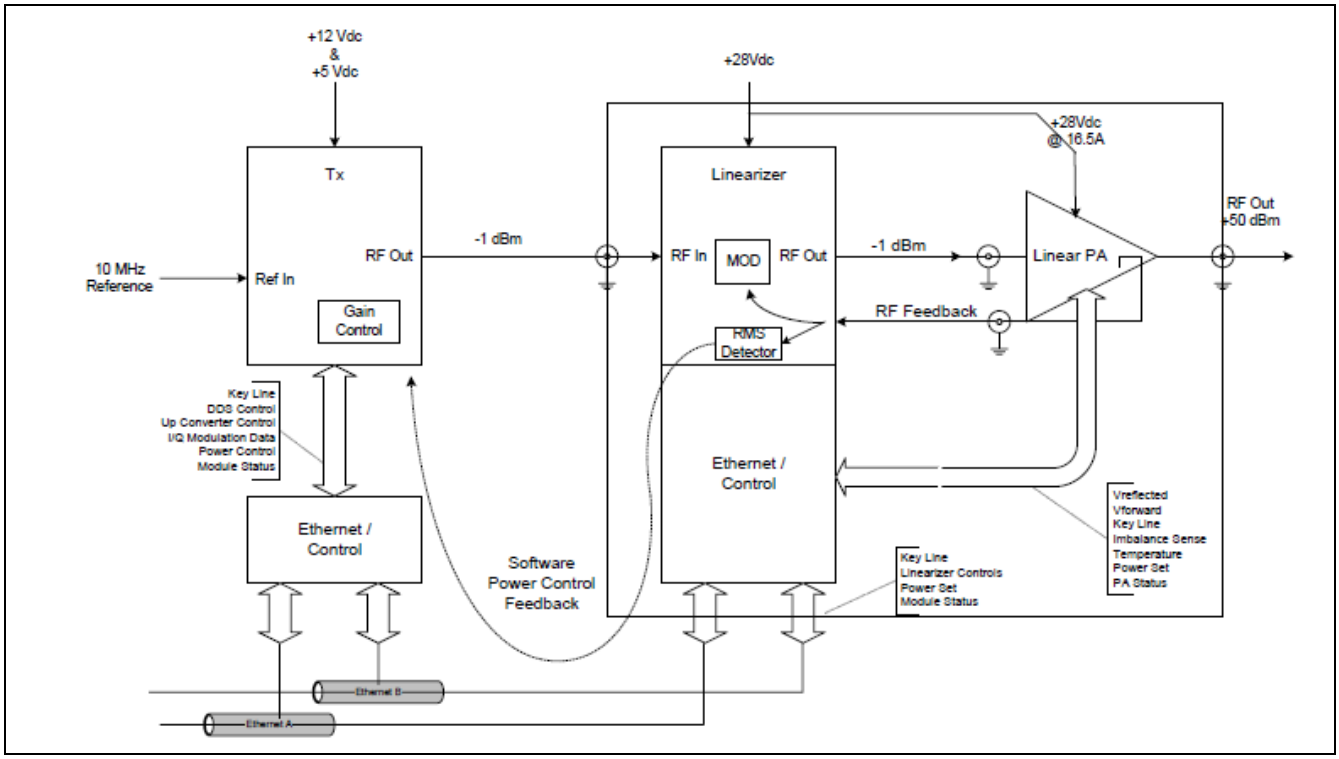


Figure 1. Block Diagram, Transmitter Lineup

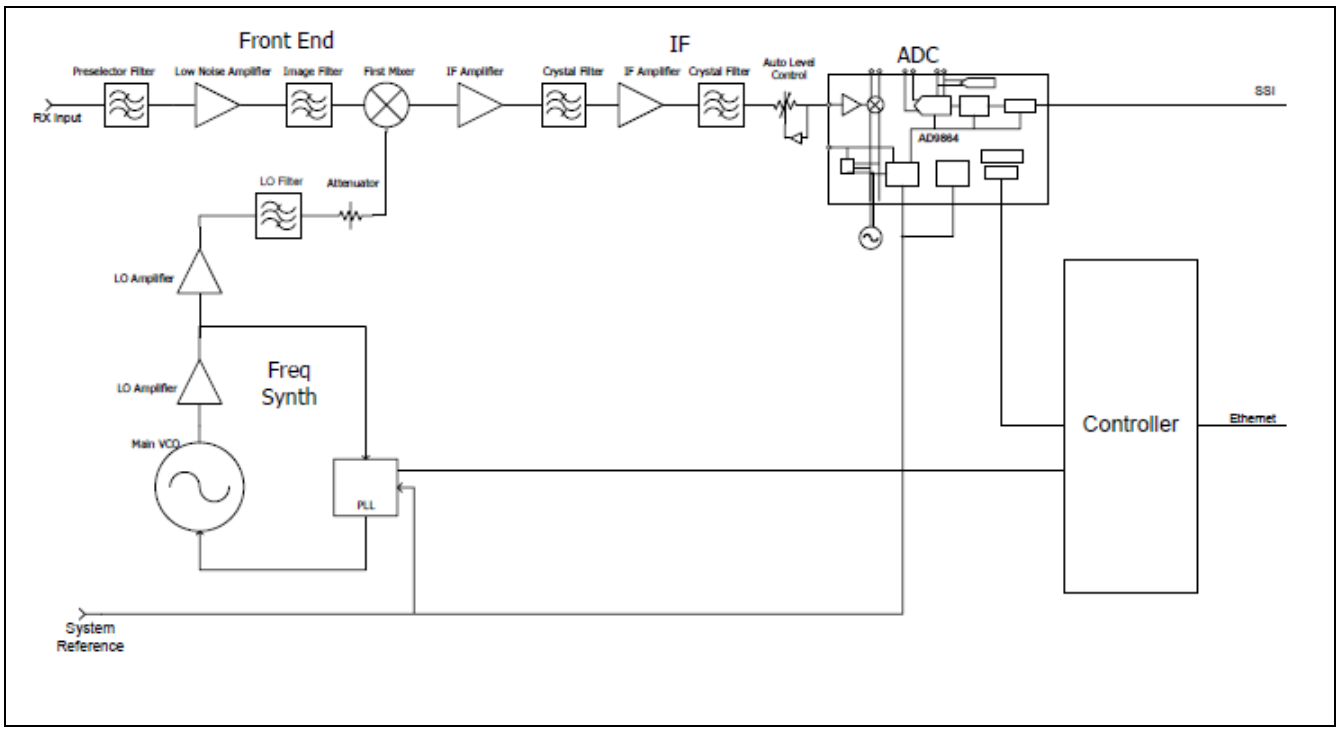


Figure 2. Block Diagram, Receiver

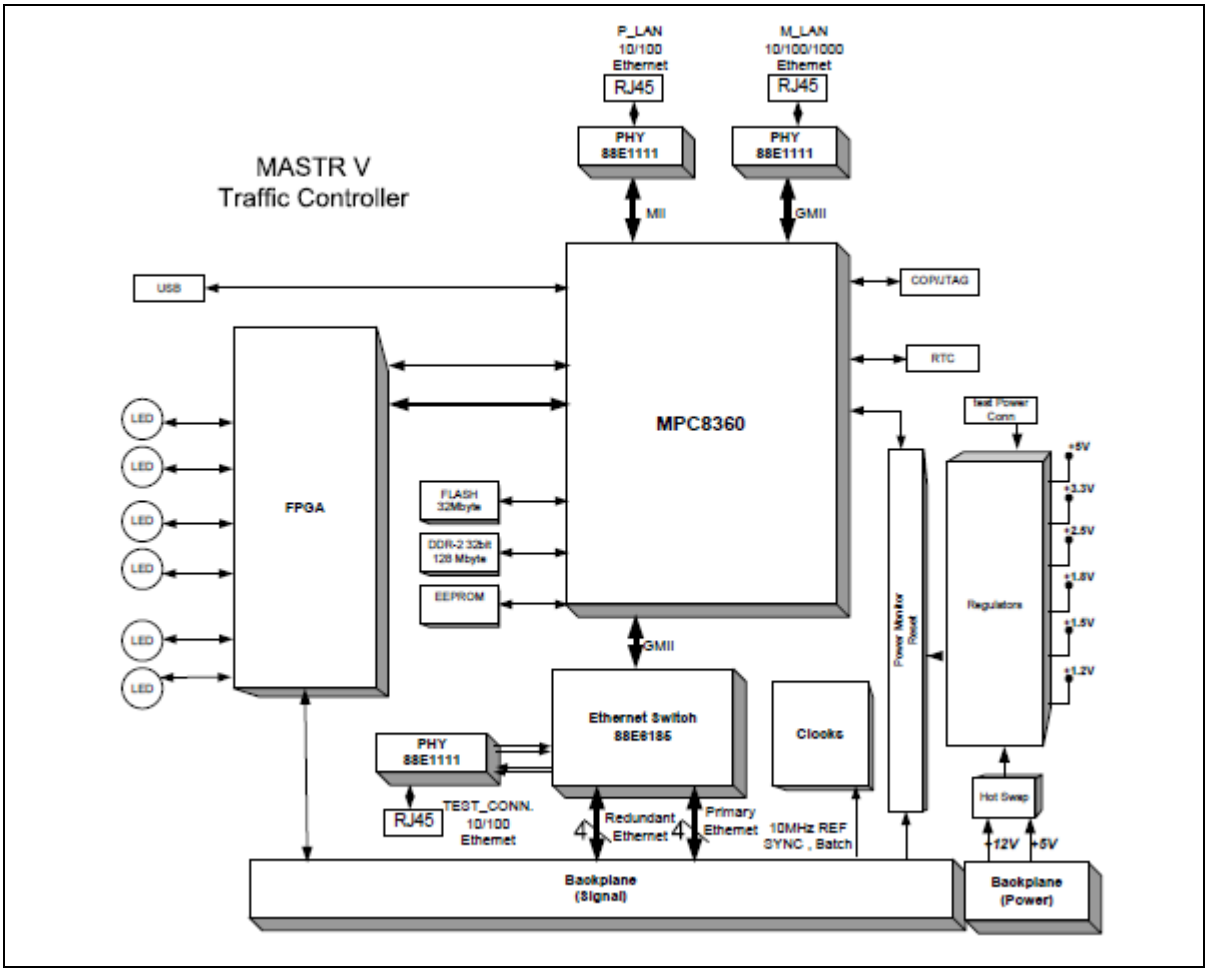


Figure 3. Block Diagram, Traffic Controller

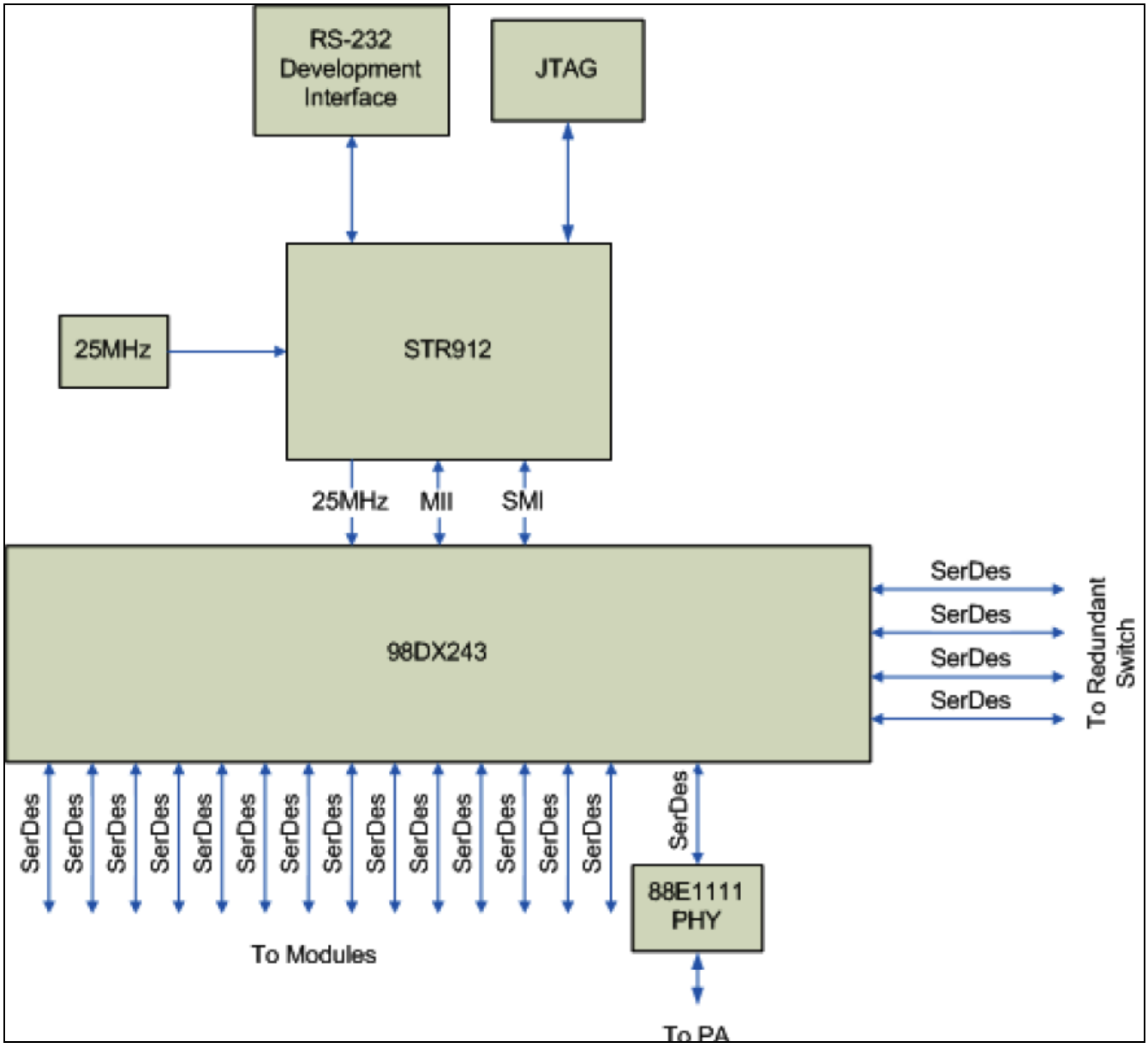


Figure 4. Block Diagram, Ethernet Switch

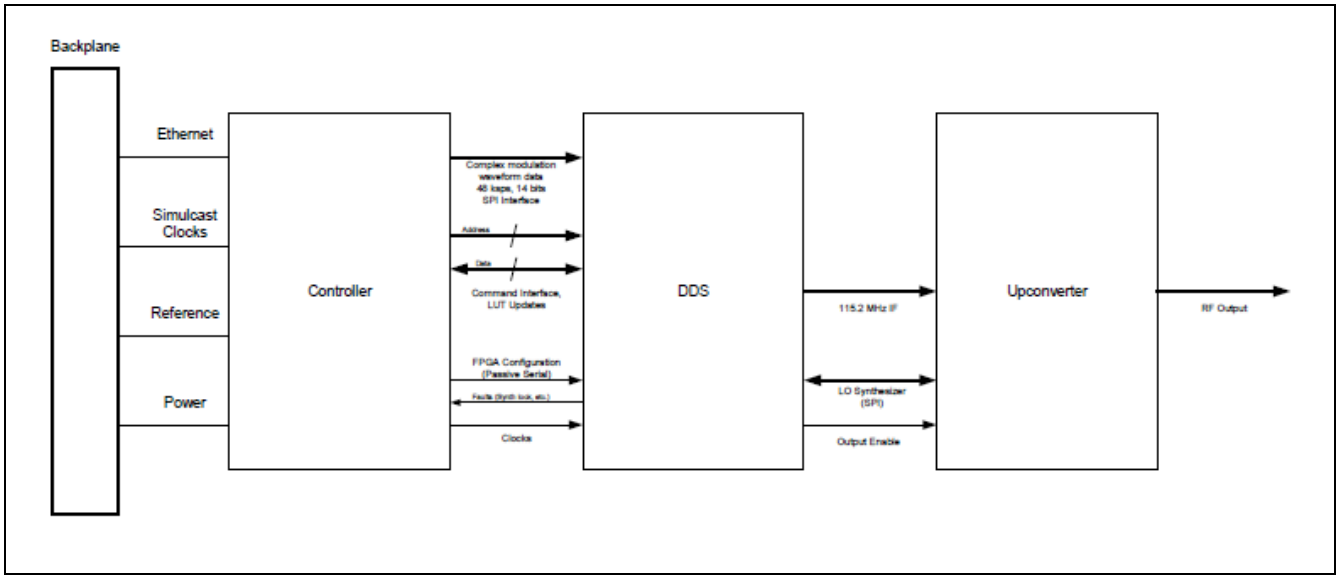


Figure 5. Block Diagram, Transmit Module

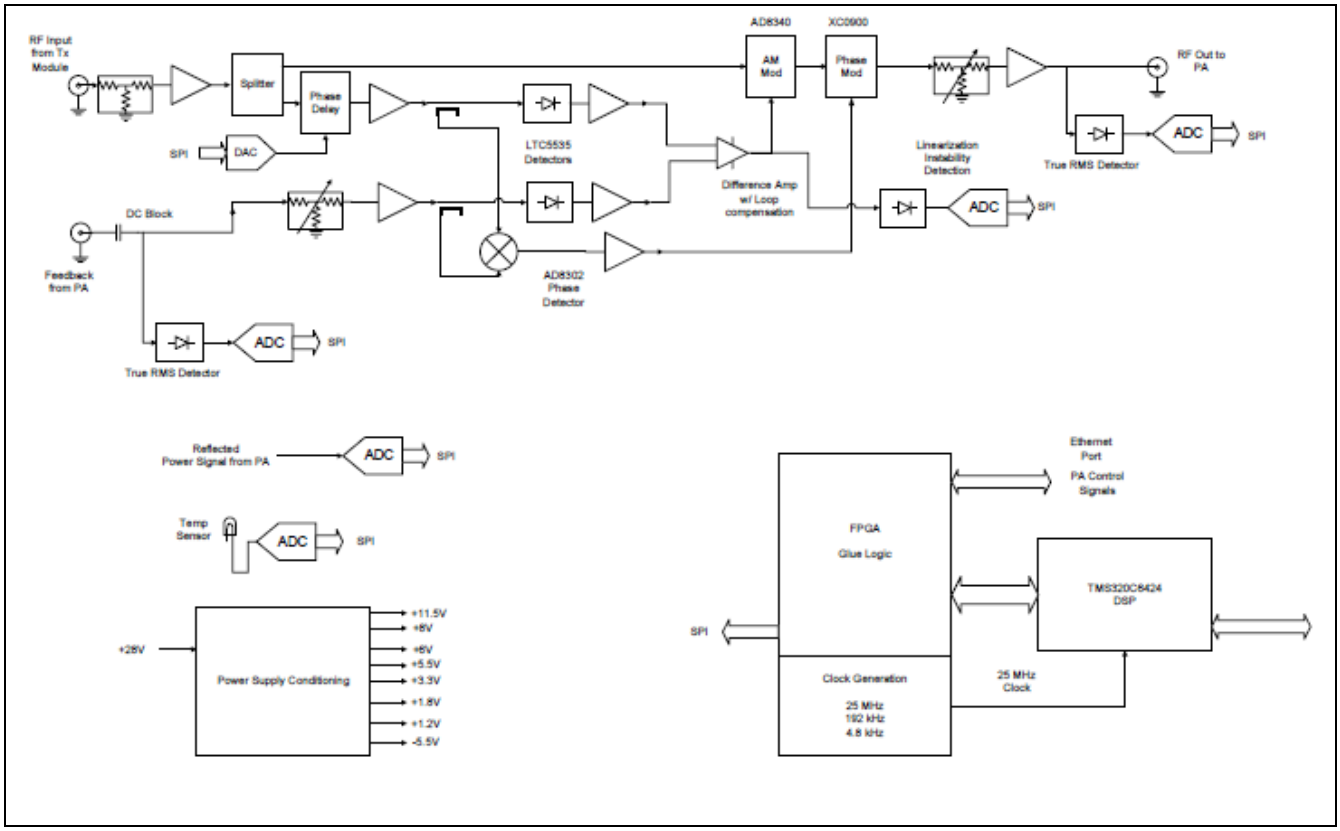


Figure 6. Block Diagram, Power Amplifier Logic (including Linearizer section)

E. Equipment Configuration

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

Ref. ID	Name / Description	Model Number	Serial Number
Tx #1	Transmit Module #1	EA-555008-002	EP5466000067
Tx #2	Transmit Module #2	EA-555008-002	EP5466000044
Tx #3	Transmit Module #3	EA-555008-002	EP5466000084
Tx #4	Transmit Module #4	EA-555008-002	EP5466000057
PA #1	Linear Power Amplifier #1	EA-555010-102 & 009-002	CR0102279950
PA #2	Linear Power Amplifier #2	EA-555010-102 & 009-002	CR0102279968
PA #3	Linear Power Amplifier #3	EA-555010-102 & 009-002	CR0102279952
PA #4	Linear Power Amplifier #4	EA-555010-102 & 009-002	CR0102279970
Rx #1	Receive Module #1	EA-555007-002	EP5466000087
Rx #2	Receive Module #2	EA-555007-002	EP5466000057
Rx #3	Receive Module #3	EA-555007-002	EP5466000067
Rx #4	Receive Module #4	EA-555007-002	EP5466000044
BB #1	Baseband Module #1	EA-555005	EP5199001553
BB #2	Baseband Module #2	EA-555005	EP5199001575
TC #1	Traffic Controller #1	EA-555004-001	EP5197001446
TC #2	Traffic Controller #2	EA-555004-001	EP5197001448
TC #3	Traffic Controller #3	EA-555004-001	EP5197001463
TC #4	Traffic Controller #4	EA-555004-001	EP5197001460
ES #1	E-Switch (Primary)	EA-555012	MACM000A7E
ES #2	E-Switch (Redundant)	EA-555012	MACM000A7G
PS #1	Power Supply #1	EA-555011-001	UG33152
PS #2	Power Supply #2	EA-555011-001	UG33199
PS #3	Power Supply #3	EA-555011-001	UG33223
PS #4	Power Supply #4	EA-555011-001	UG33182

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, MASV-XTXMV. 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 (m)	Shielded? (Y/N)	Termination Box ID & Port ID
Tx #1	RF Out	Coaxial Cable	1	1	Y	PA #1 RF In
Tx #2	RF Out	Coaxial Cable	1	1	Y	PA #2 RF In
Tx #3	RF Out	Coaxial Cable	1	1	Y	PA #3 RF In
Tx #4	RF Out	Coaxial Cable	1	1	Y	PA #4 RF In
PA #1	RF In	Coaxial Cable	1	1	Y	Tx #1 RF Out
PA #1	Control	15 Conductor	1	1	Y	Backplane, J21
PA #2	RF In	Coaxial Cable	1	1	Y	Tx #2 RF Out
PA #2	Control	15 Conductor	1	1	Y	Backplane, J22
PA #3	RF In	Coaxial Cable	1	1	Y	Tx #3 RF Out
PA #3	Control	15 Conductor	1	1	Y	Backplane, J23
PA #4	RF In	Coaxial Cable	1	1	Y	Tx #4 RF Out
PA #4	Control	15 Conductor	1	1	Y	Backplane, J24
PS #1	HPA	28 VDC Power	1	0.5	N	PA #1, POWER
PS #1	Shelf	5V/12V DC Power	1	1	N	Backplane, J30
PS #2	HPA	28 VDC Power	1	0.5	N	PA #2, POWER
PS #2	Shelf	5V/12V DC Power	1	1	N	Backplane, J31
PS #3	HPA	28 VDC Power	1	0.5	N	PA #3, POWER
PS #4	HPA	28 VDC Power	1	0.5	N	PA #4, POWER

Table 4. Ports and Cabling Information

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

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 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.

§ 22.913 Power and antenna height limits.

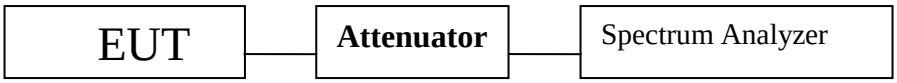
§ 22.913(a): The Effective radiated power (ERP) of base transmitters and cellular repeaters must not exceed 500 watts.

Test Procedures: As required by 47 CFR 2.1046, RF power output measurements were made at the RF output terminals using an attenuator and spectrum analyzer or power meter. This test was performed in all applicable modulations and power output configurations.

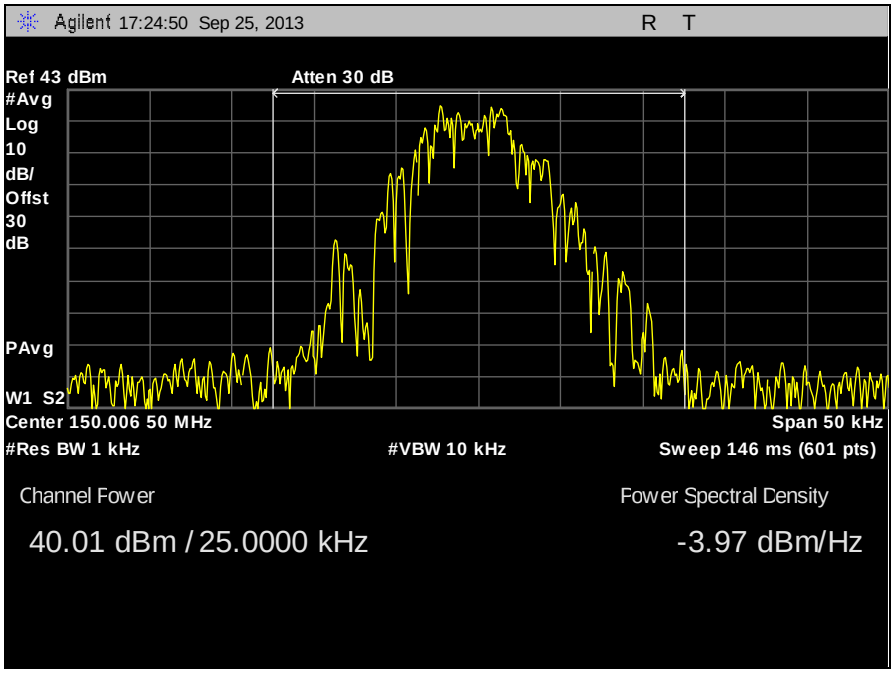
Test Results: The EUT was compliant with the requirements of this section. The EUT conducted power does not exceed limit at the carrier frequency.

Test Engineer(s): Benjamin Taylor

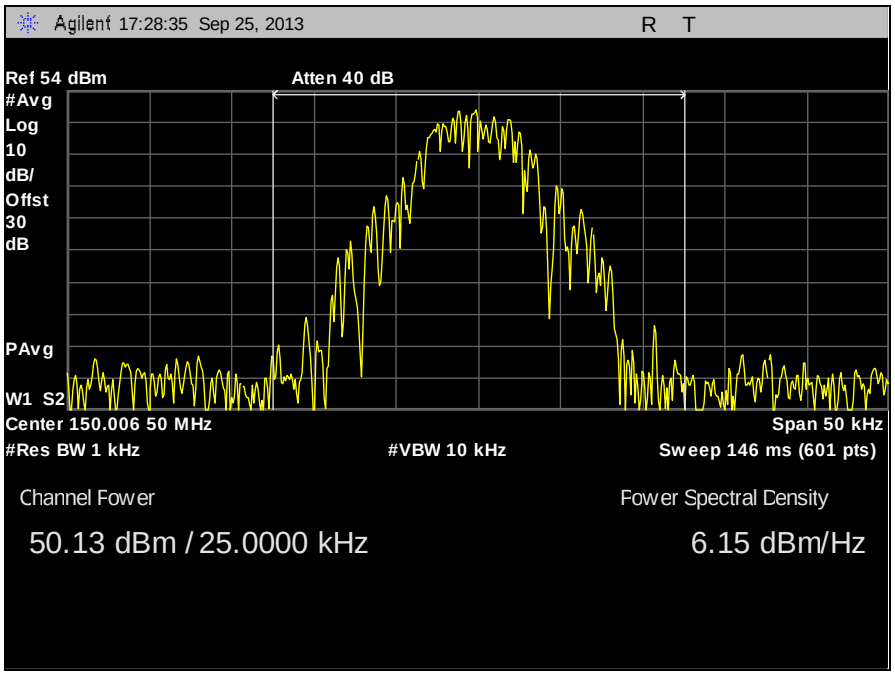
Test Date(s): 08/13/13 – 08/14/13



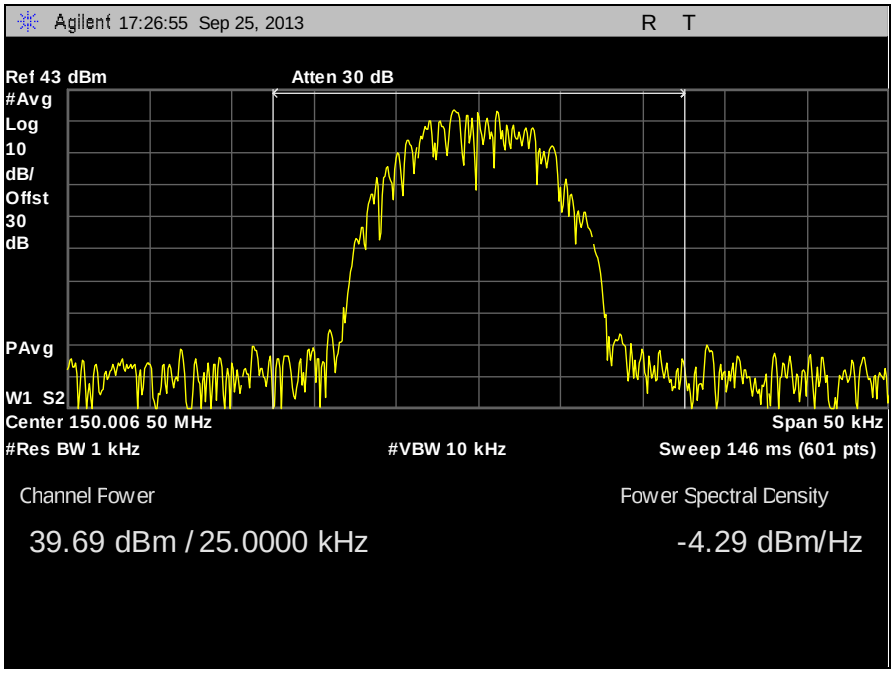
Block Diagram 1. RF Power Output Test Setup



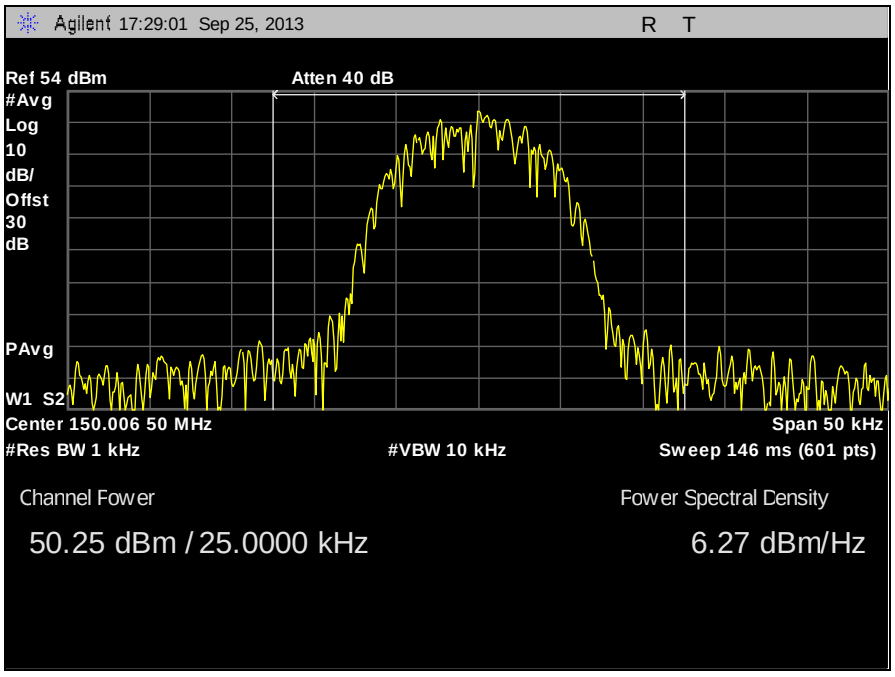
Plot 1. RF Power Output, 150 MHz, C4FM, 10W



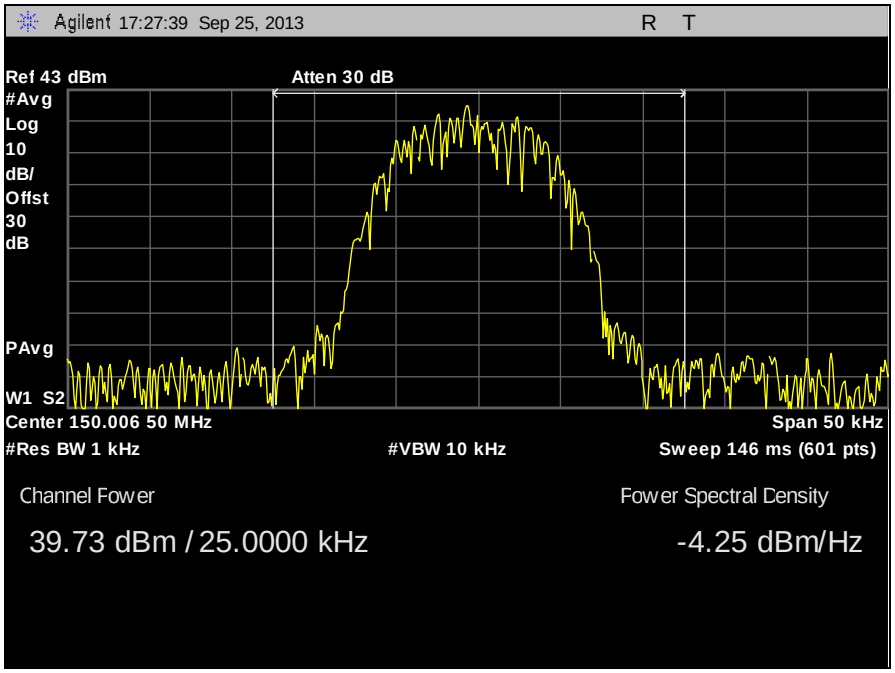
Plot 2. RF Power Output, 150 MHz, C4FM, 100W



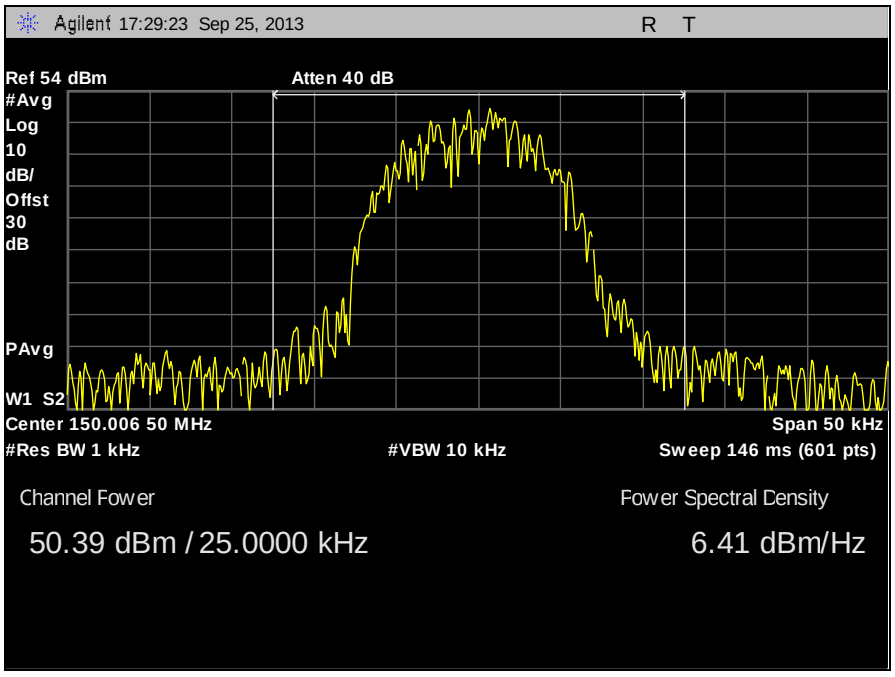
Plot 3. RF Power Output, 150 MHz, CQPSK, 10W



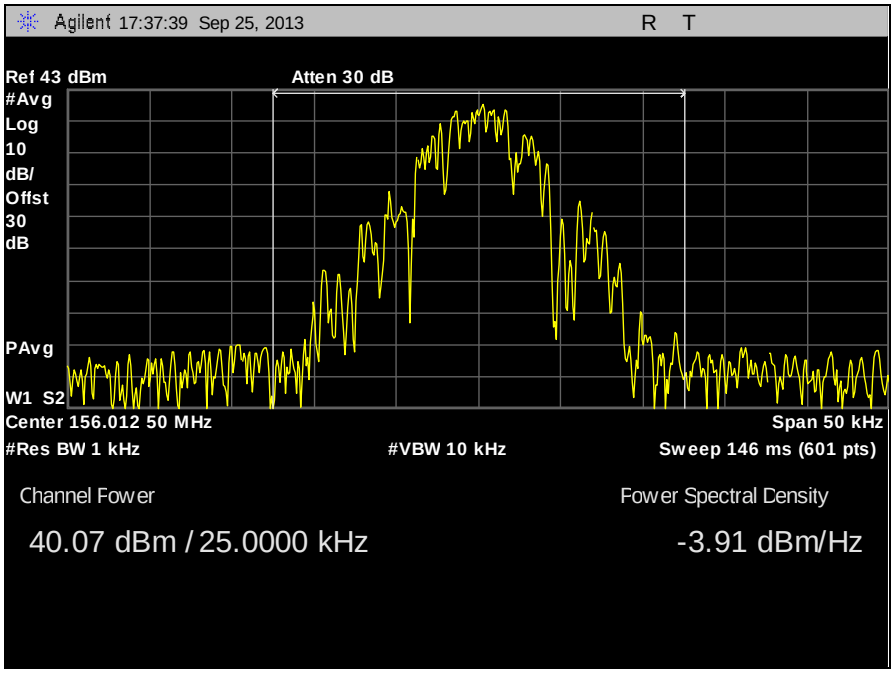
Plot 4. RF Power Output, 150 MHz, CQPSK, 100W



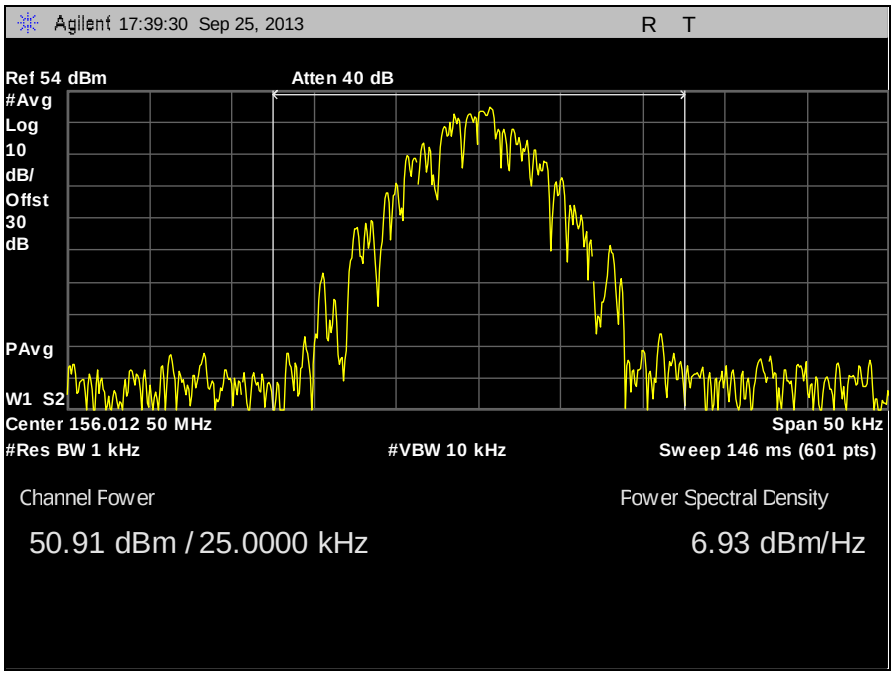
Plot 5. RF Power Output, 150 MHz, HDQPSK, 10W



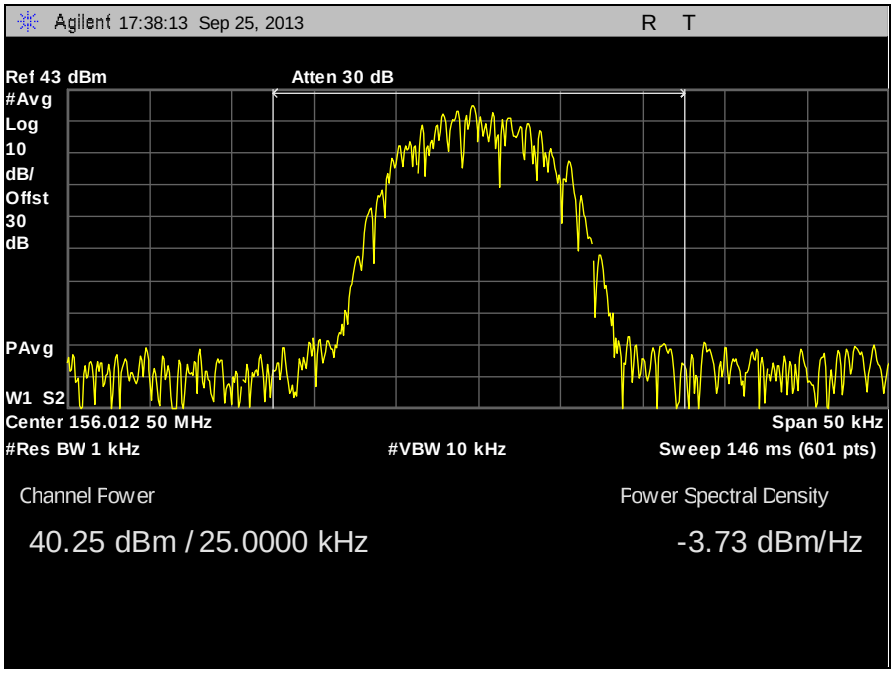
Plot 6. RF Power Output, 150 MHz, HDQPSK, 100W



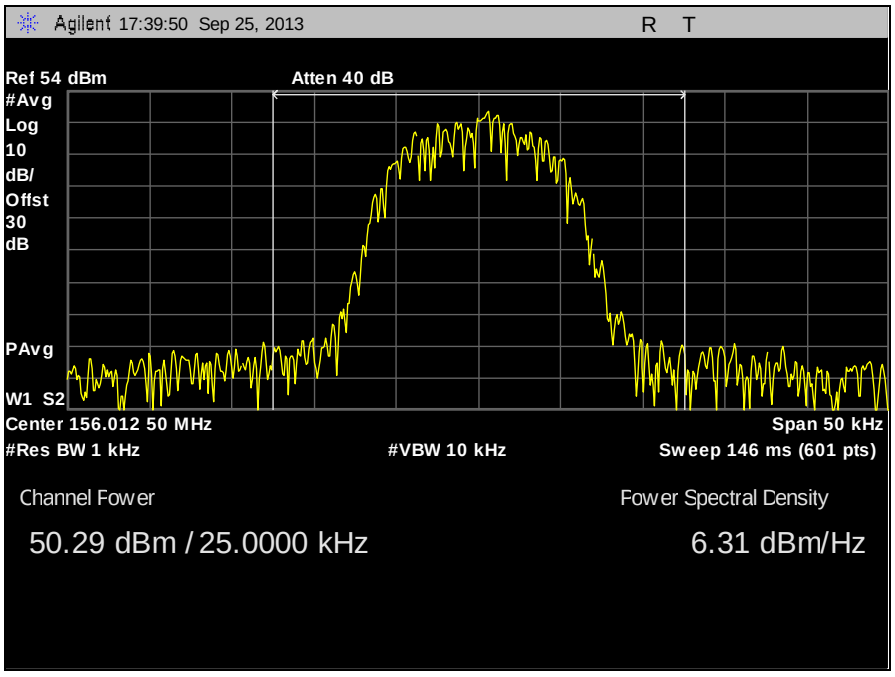
Plot 7. RF Power Output, 156 MHz, C4FM, 10W



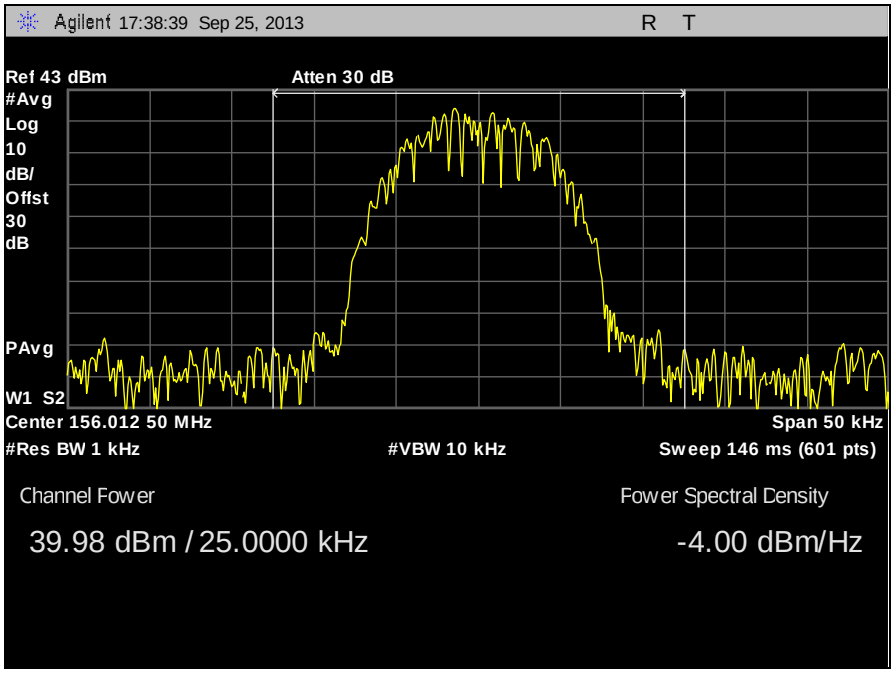
Plot 8. RF Power Output, 156 MHz, C4FM, 100W



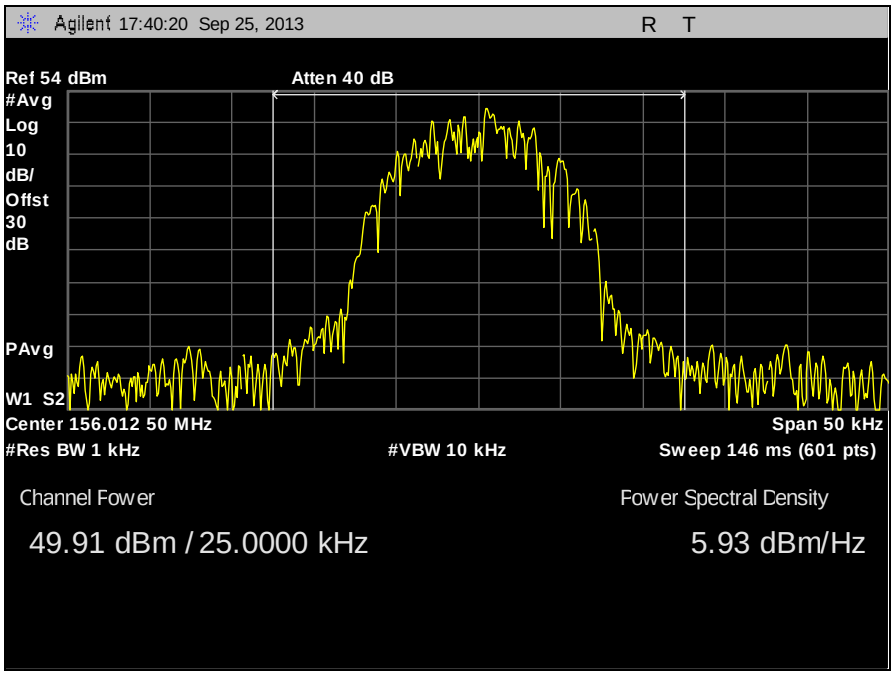
Plot 9. RF Power Output, 156 MHz, CQPSK, 10W



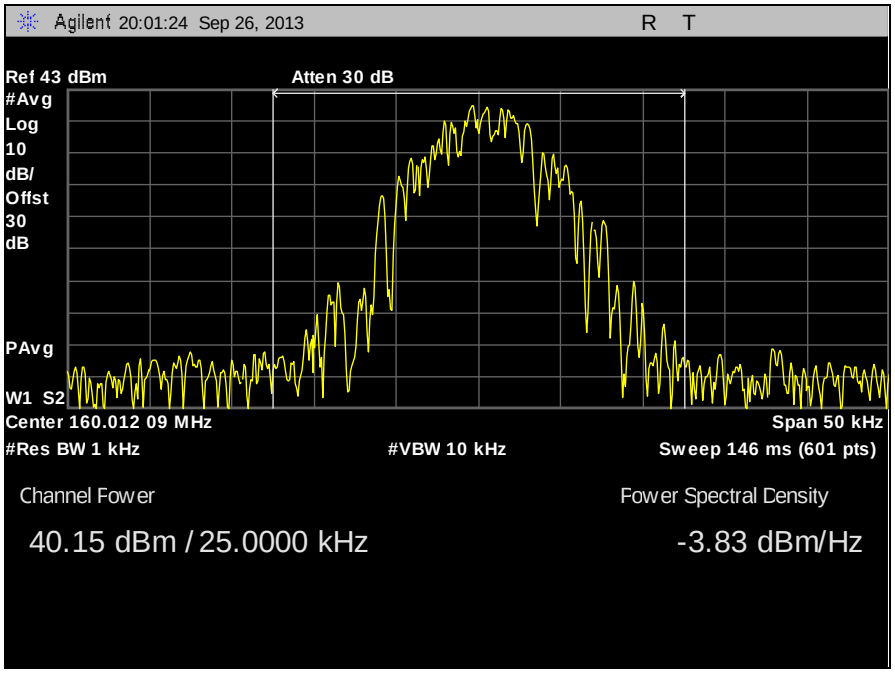
Plot 10. RF Power Output, 156 MHz, CQPSK, 100W



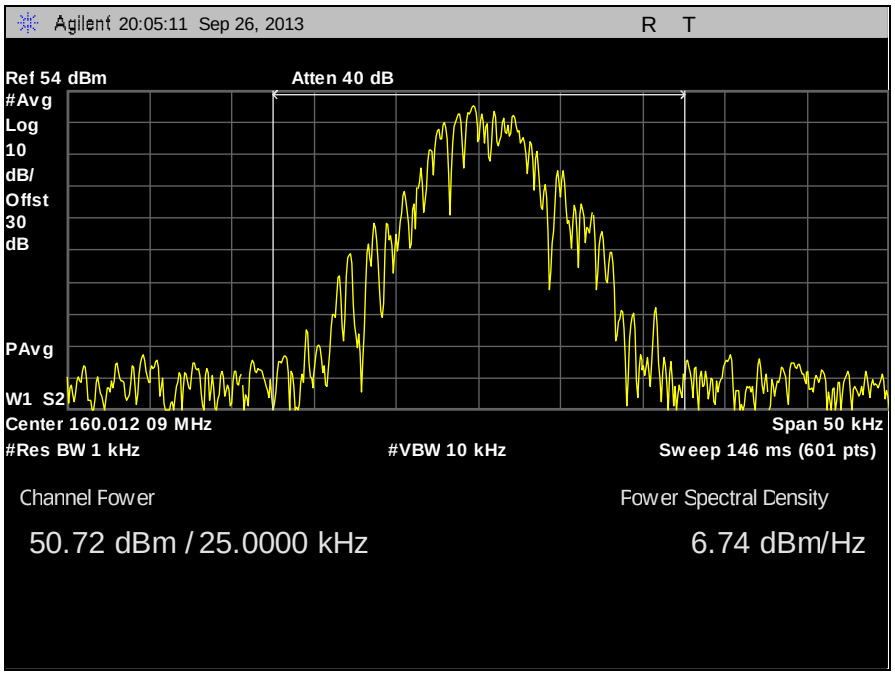
Plot 11. RF Power Output, 156 MHz, HDQPSK, 10W



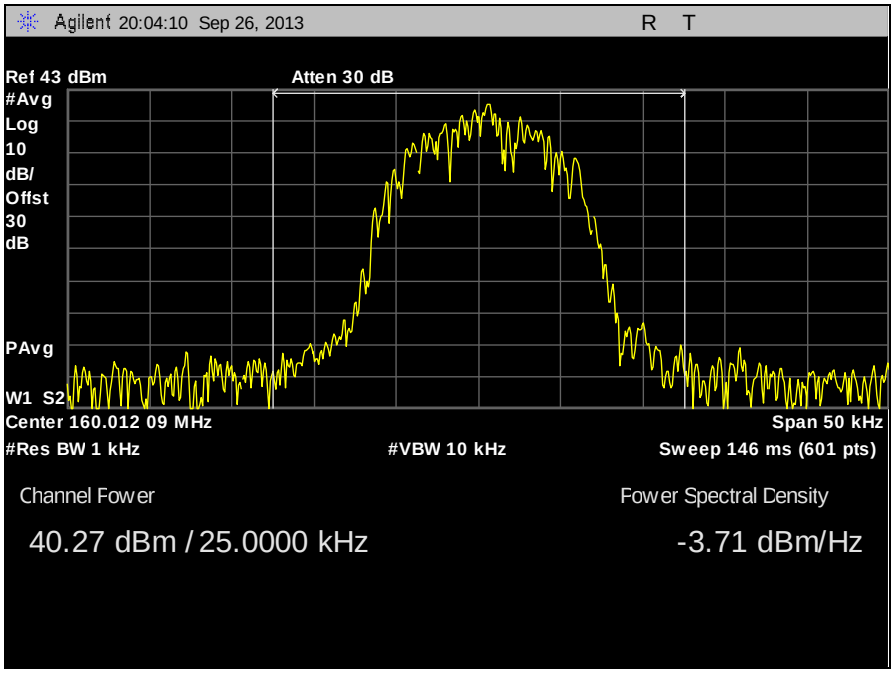
Plot 12. RF Power Output, 156 MHz, HDQPSK, 100W



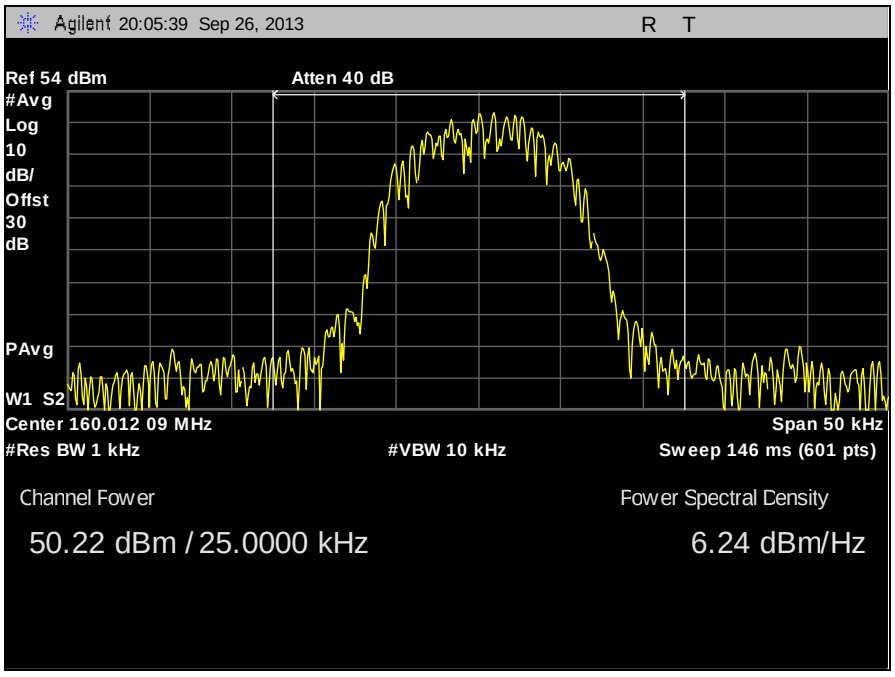
Plot 13. RF Power Output, 160 MHz, C4FM, 10W



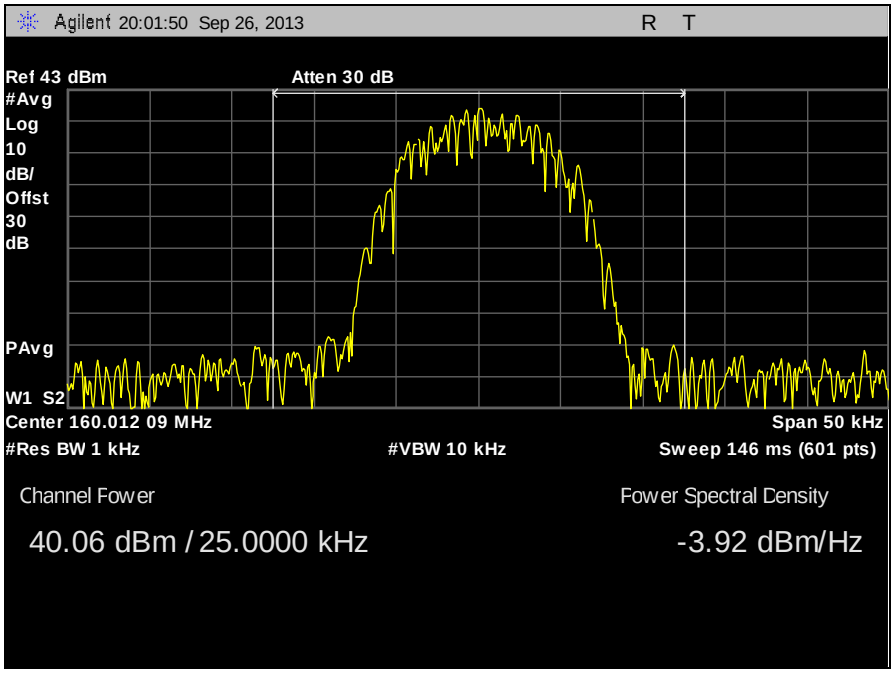
Plot 14. RF Power Output, 160 MHz, C4FM, 100W



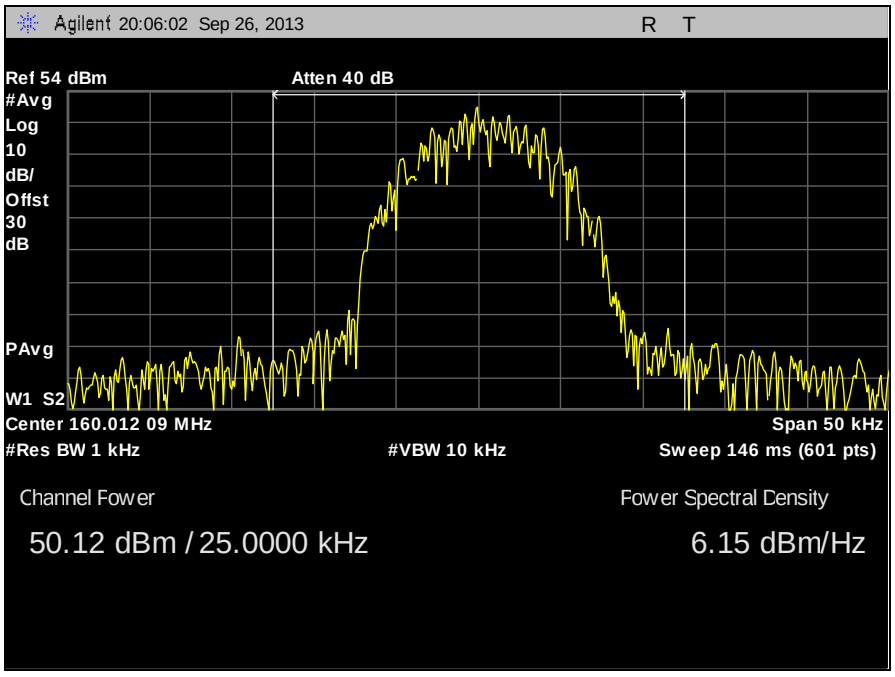
Plot 15. RF Power Output, 160 MHz, CQPSK, 10W



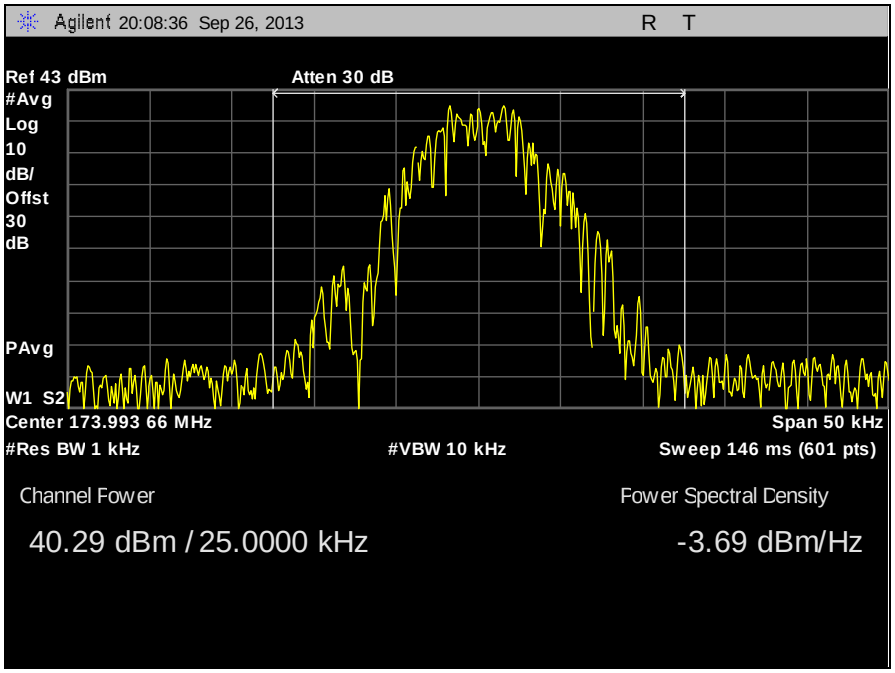
Plot 16. RF Power Output, 160 MHz, CQPSK, 100W



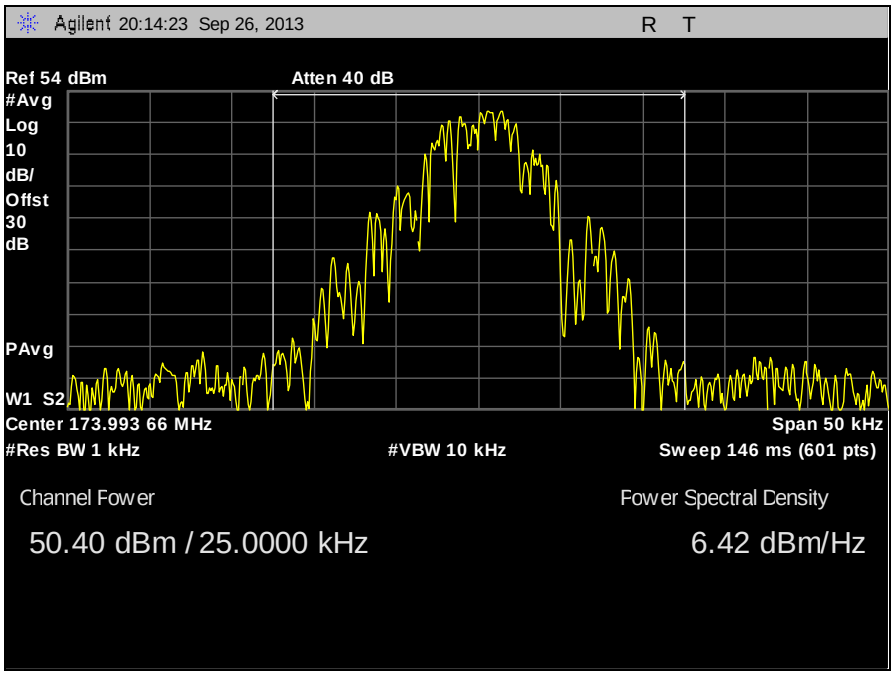
Plot 17. RF Power Output, 160 MHz, HDQPSK, 10W



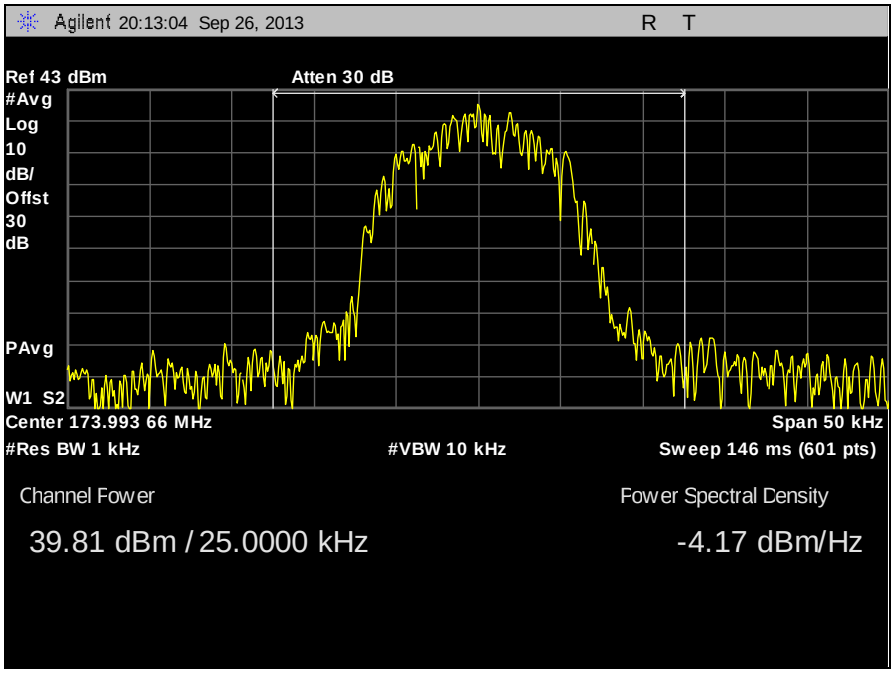
Plot 18. RF Power Output, 160 MHz, HDQPSK, 100W



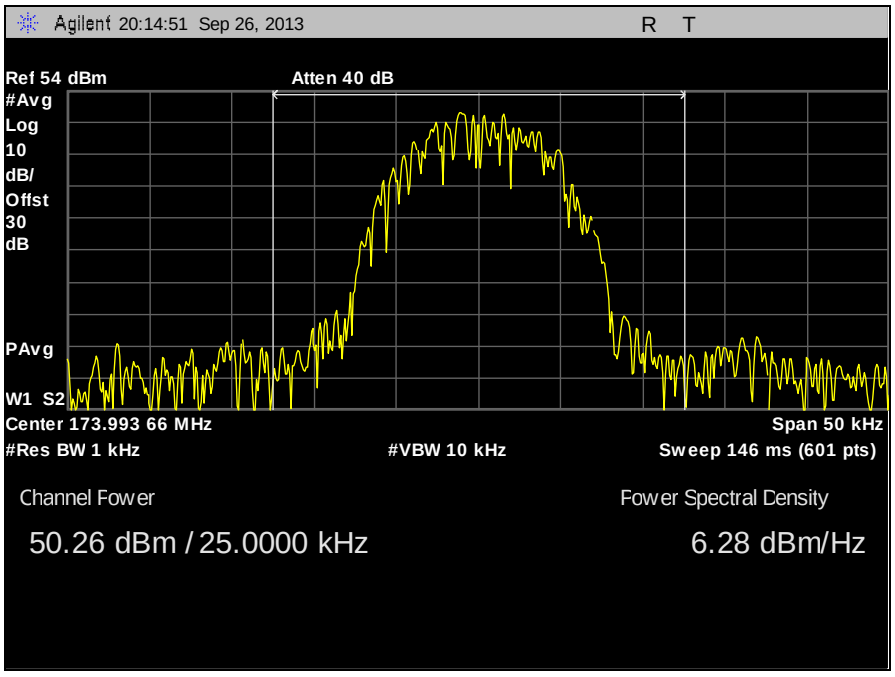
Plot 19. RF Power Output, 174 MHz, C4FM, 10W



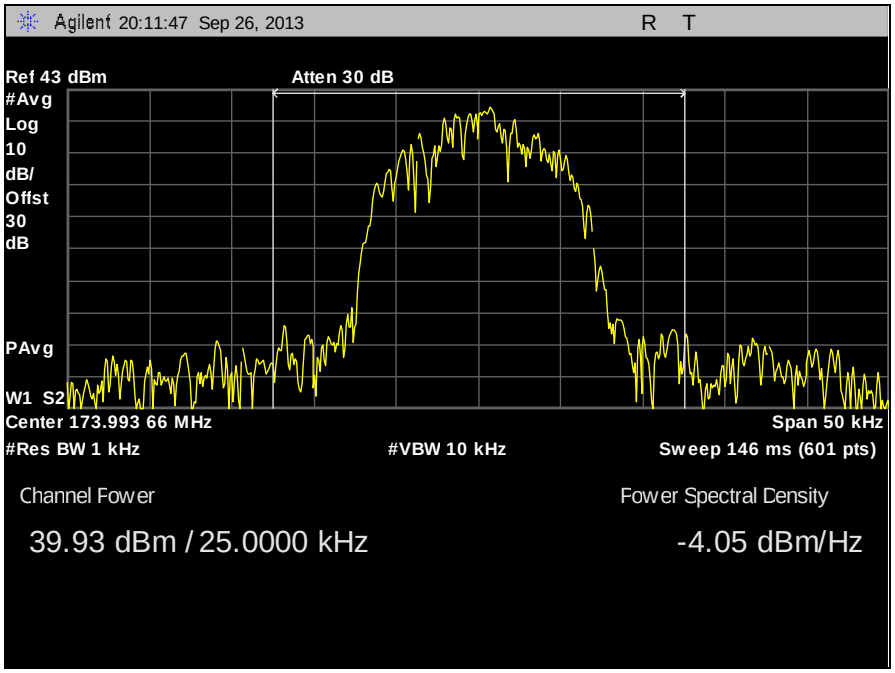
Plot 20. RF Power Output, 174 MHz, C4FM, 100W



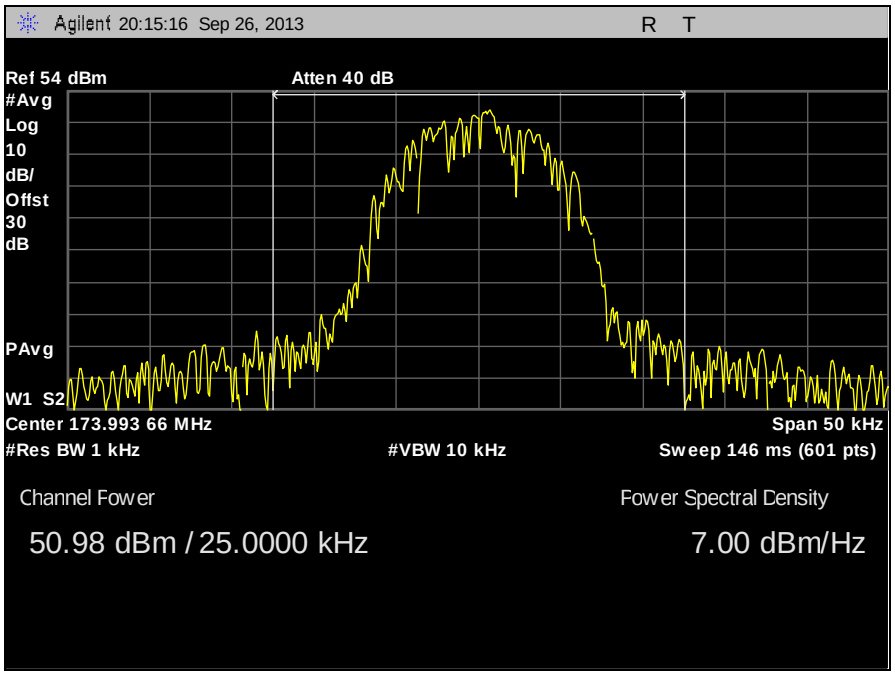
Plot 21. RF Power Output, 174 MHz, CQPSK, 10W



Plot 22. RF Power Output, 174 MHz, CQPSK, 100W



Plot 23. RF Power Output, 174 MHz, HDQPSK, 10W



Plot 24. RF Power Output, 174 MHz, HDQPSK, 100W

§ 2.1049 Occupied Bandwidth

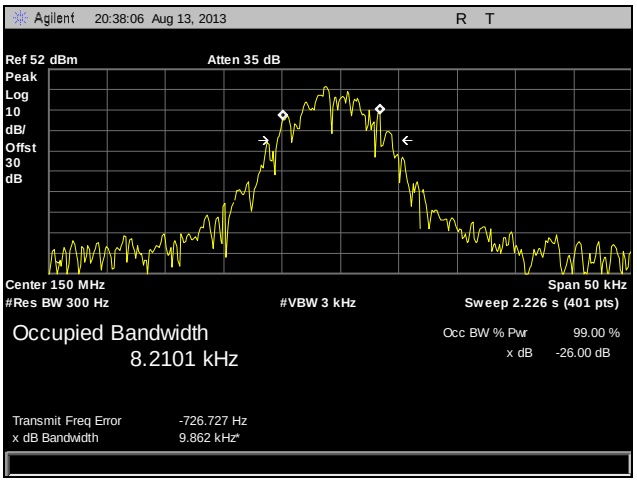
Test Requirement(s): **§ 2.1049 Measurements required: Occupied bandwidth:** The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission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

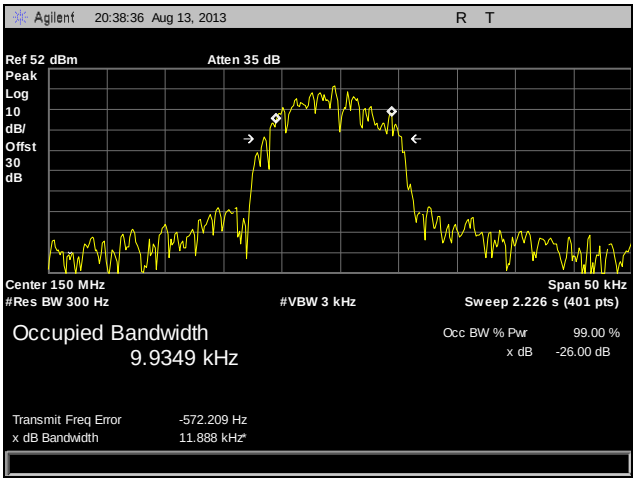
Test Results: The EUT was compliant with the requirements of this section. The variability in the Occupied Bandwidth plots was due to the duty cycles in use in the various modulation types.

Test Engineer(s): Benjamin Taylor

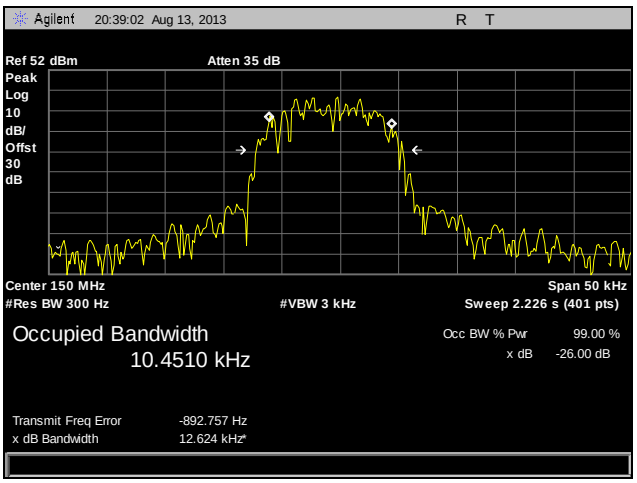
Test Date(s): 08/14/13



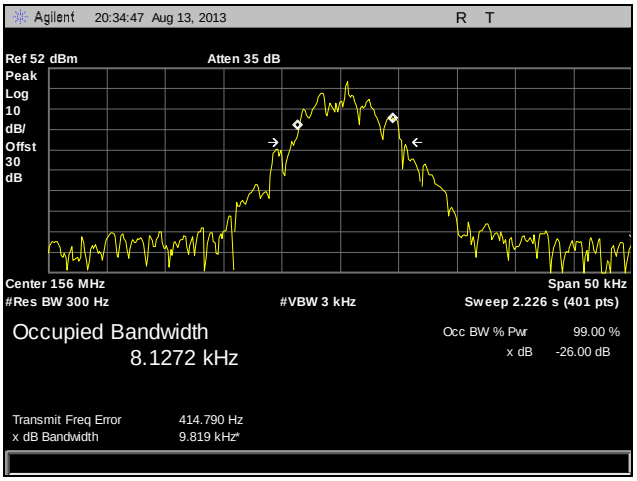
Plot 25. Occupied Bandwidth, 150 MHz, C4FM



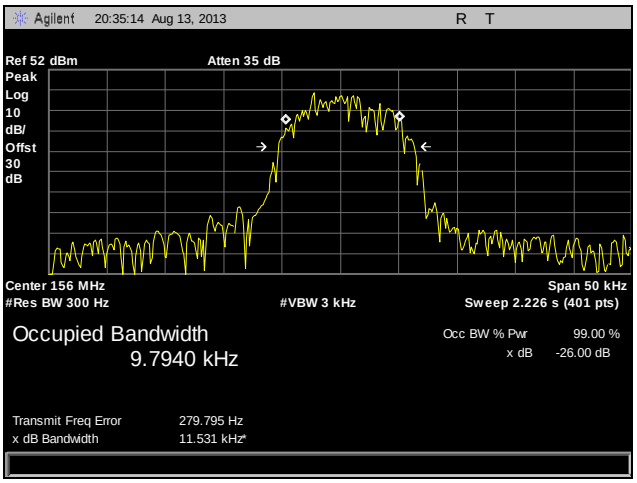
Plot 26. Occupied Bandwidth, 150 MHz, CQPSK



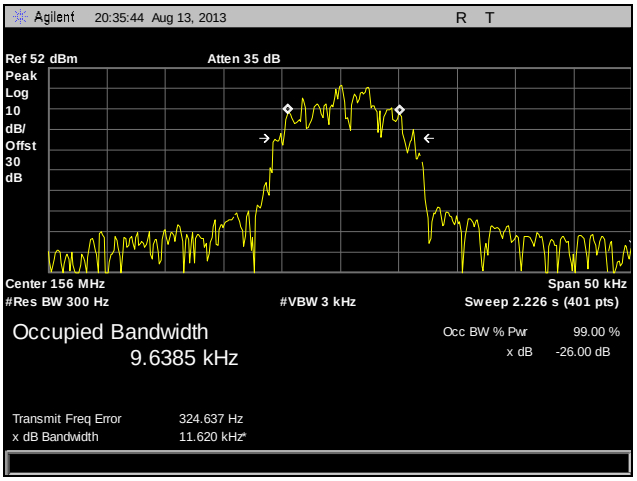
Plot 27. Occupied Bandwidth, 150 MHz, HDQPSK



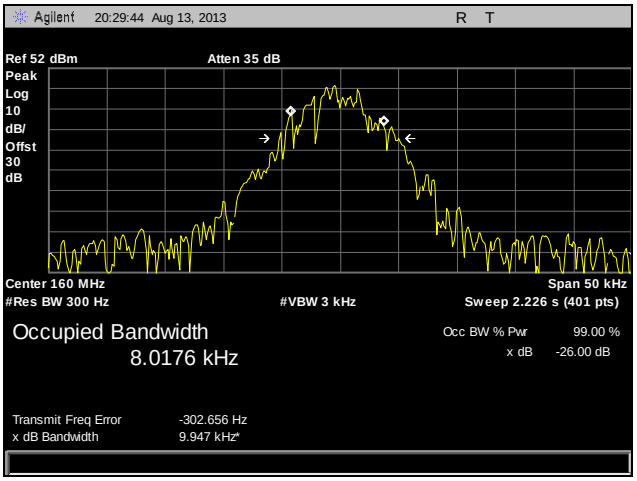
Plot 28. Occupied Bandwidth, 156 MHz, C4FM



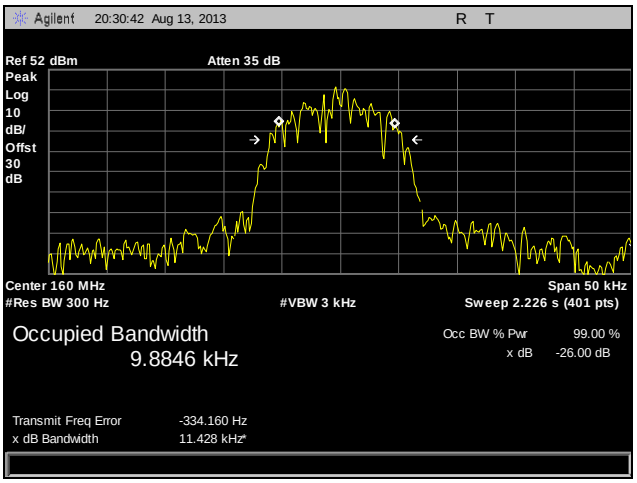
Plot 29. Occupied Bandwidth, 156 MHz, CQPSK



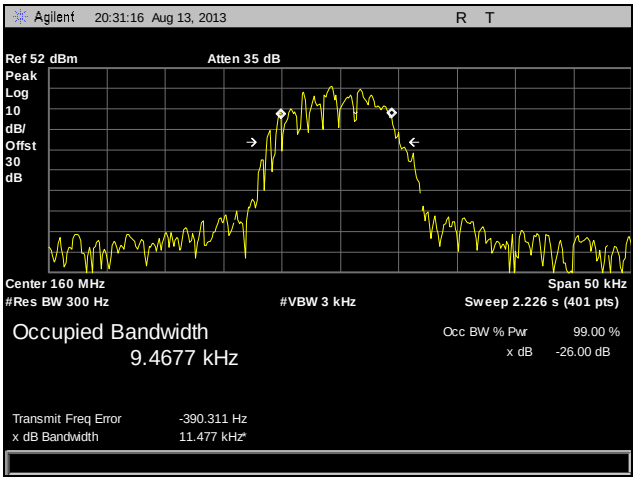
Plot 30. Occupied Bandwidth, 156 MHz, HDQPSK



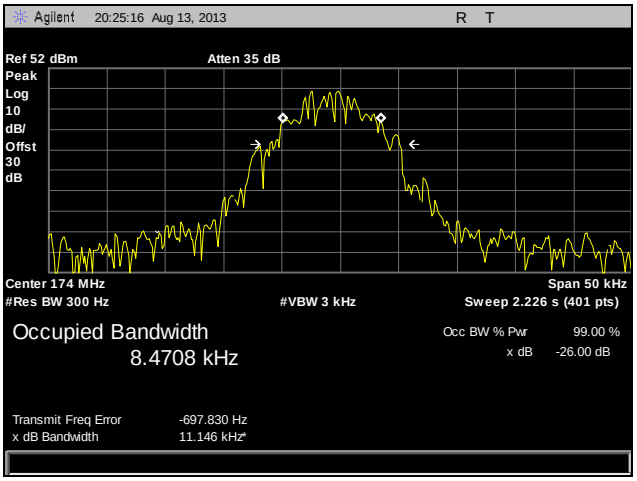
Plot 31. Occupied Bandwidth, 160 MHz, C4FM



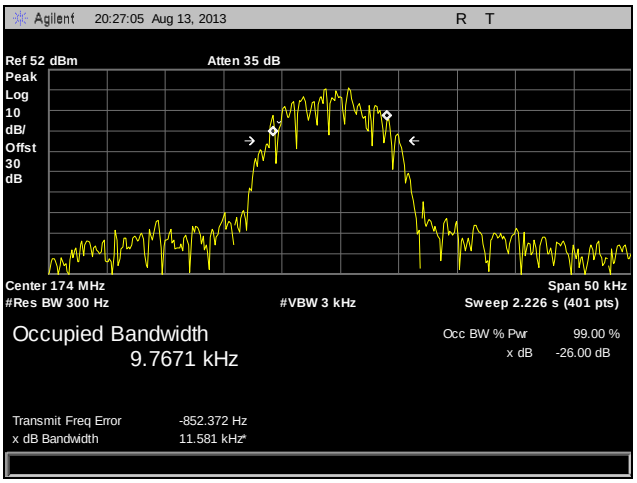
Plot 32. Occupied Bandwidth, 160 MHz, CQPSK



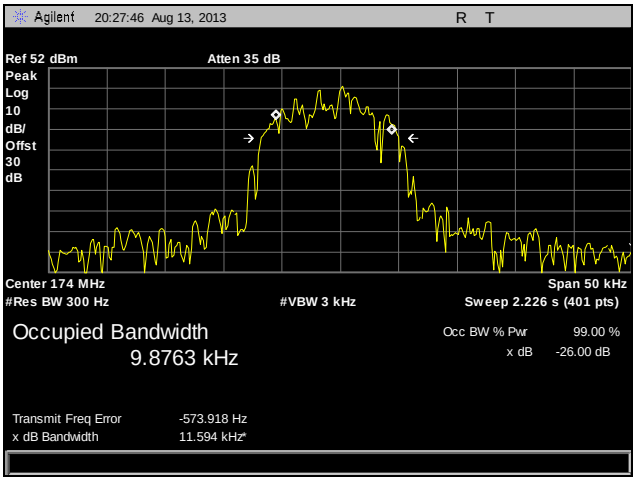
Plot 33. Occupied Bandwidth, 160 MHz, HDQPSK



Plot 34. Occupied Bandwidth, 174 MHz, C4FM



Plot 35. Occupied Bandwidth, 174 MHz, CQPSK



Plot 36. Occupied Bandwidth, 174 MHz, HDQPSK

§ 80.211 Emission Mask

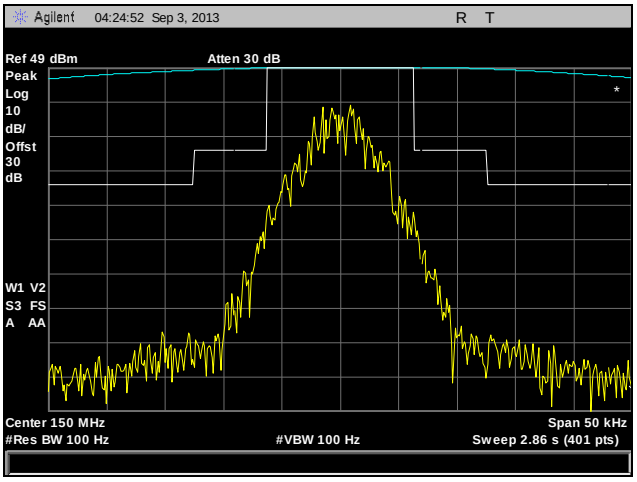
Test Requirement(s):

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.

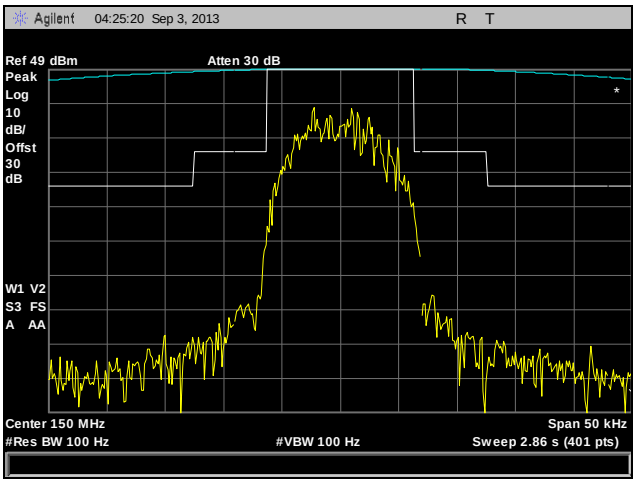
Test Results: The EUT was compliant with the requirements of this section.

Test Engineer(s): Benjamin Taylor

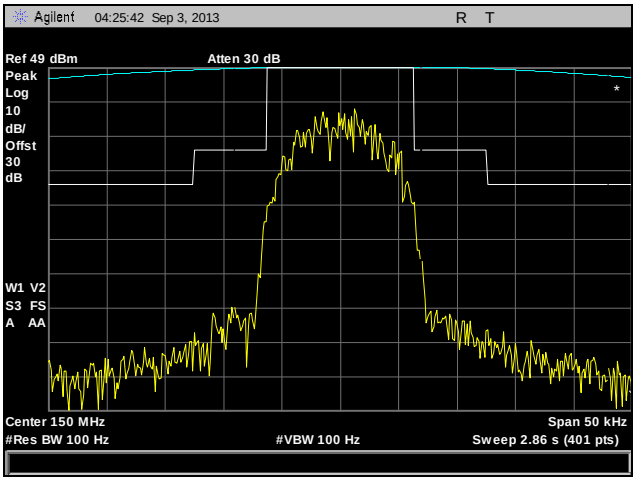
Test Date(s): 09/04/13



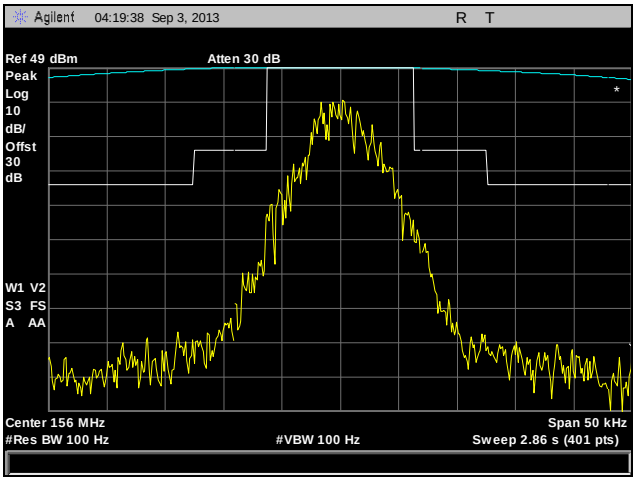
Plot 37. Emission Mask, 150 MHz, C4FM



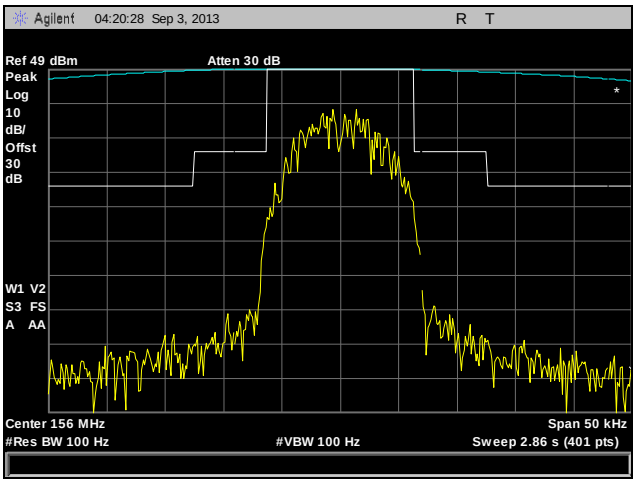
Plot 38. Emission Mask, 150 MHz, CQPSK



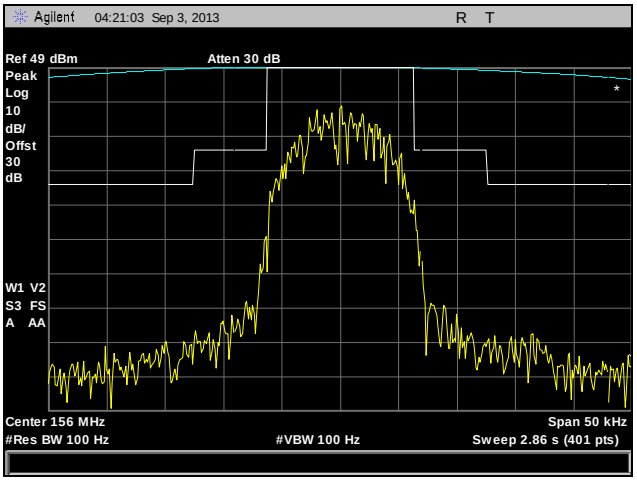
Plot 39. Emission Mask, 150 MHz, HDQPSK



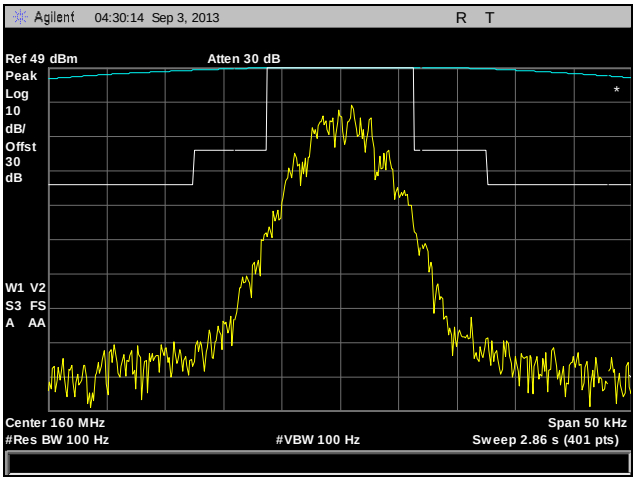
Plot 40. Emission Mask, 156 MHz, C4FM



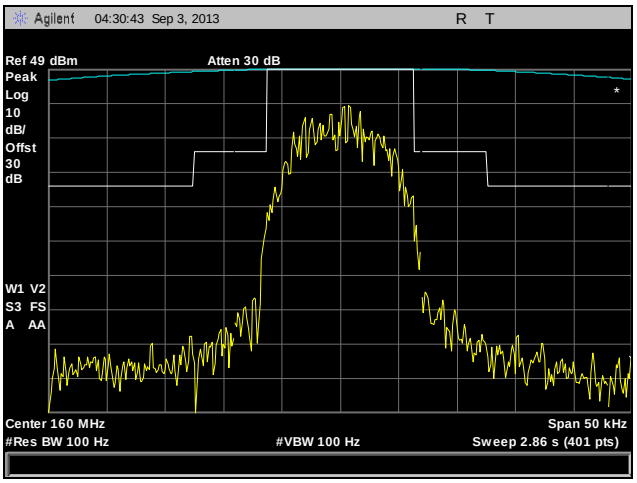
Plot 41. Emission Mask, 156 MHz, CQPSK



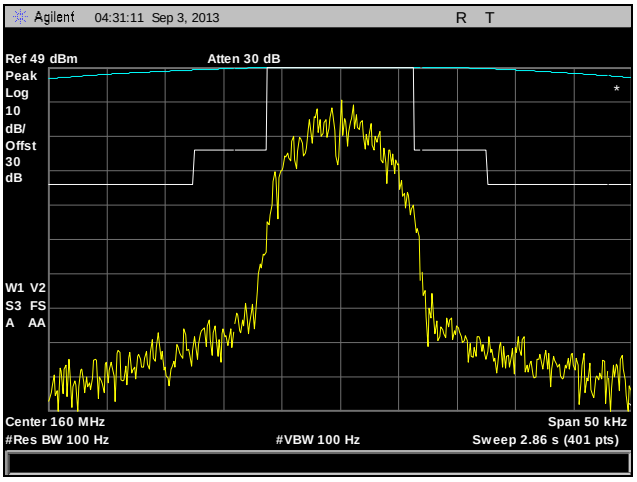
Plot 42. Emission Mask, 156 MHz, HDQPSK



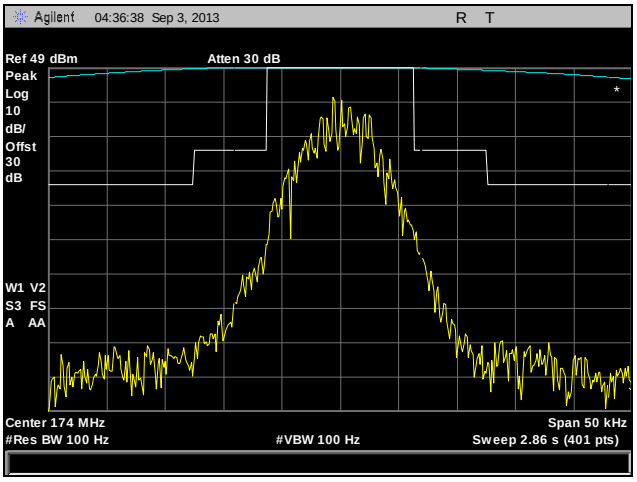
Plot 43. Emission Mask, 160 MHz, C4FM



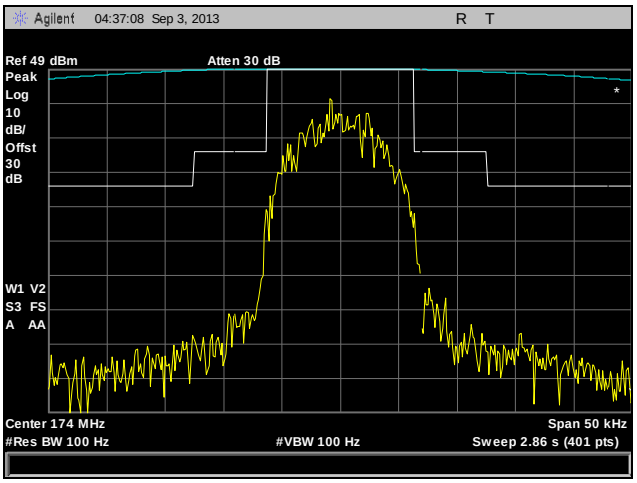
Plot 44. Emission Mask, 160 MHz, CQPSK



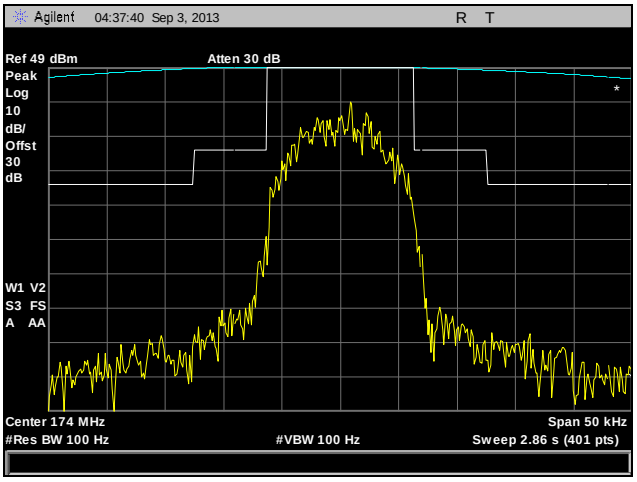
Plot 45. Emission Mask, 160 MHz, HDQPSK



Plot 46. Emission Mask, 174 MHz, C4FM



Plot 47. Emission Mask, 174 MHz, CQPSK



Plot 48. Emission Mask, 174 MHz, HDQPSK

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 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. 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.

§ 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.

§ 22.359 Emission masks: Unless otherwise indicated in the rules governing a specific radio service, all transmitters intended for use in the Public Mobile Services must be designed to comply with the emission masks outlined in this section. If an emission outside of the authorized bandwidth causes harmful interference, the FCC may, at its discretion, require greater attenuation than specified in this section.

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".

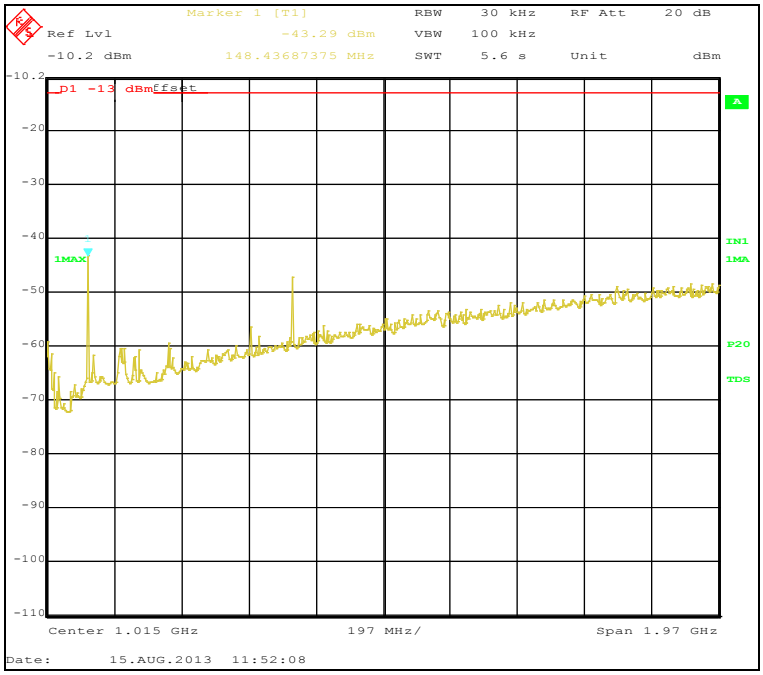
Radiated emission measurements were performed inside a 10 meter semi-anechoic chamber. The EUT was set at a distance of 3m from the receiving antenna. The EUT's RF ports were terminated to 50ohm load. The EUT was set to transmit at the low, mid and high channels of the transmitter frequency range at 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. A calibrated antenna source was positioned in place of the EUT and the previously recorded signal was duplicated. The maximum EIRP of the emission was calculated by adding the forward power to the calibrated source plus its appropriate gain value. 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.

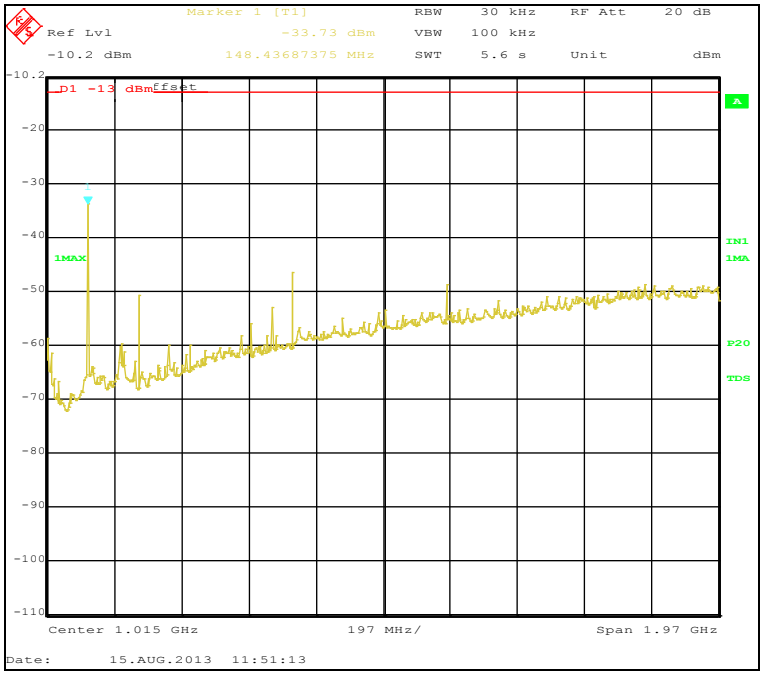
Test Engineer: Shawn McMillen and Benjamin Taylor

Test Date(s): 08/15/13 – 08/16/13

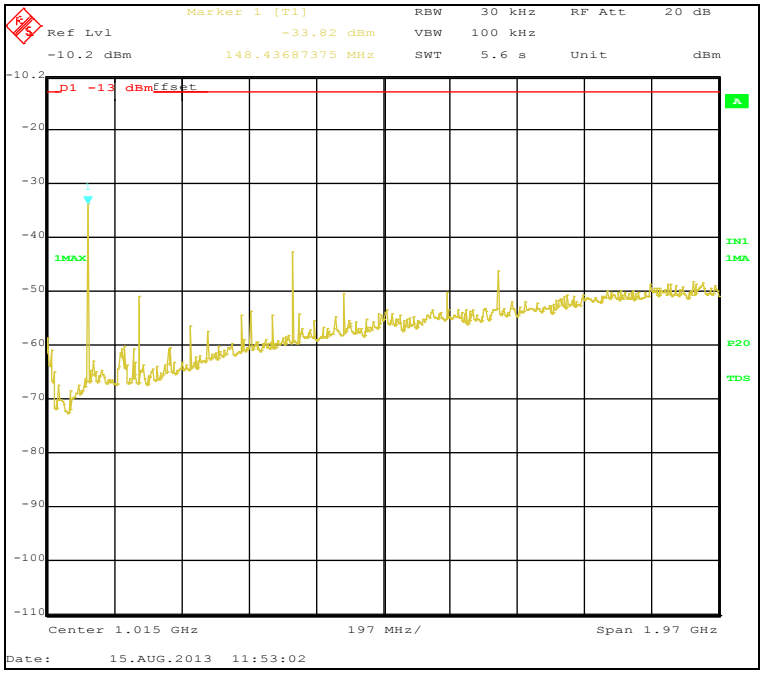
Part 22



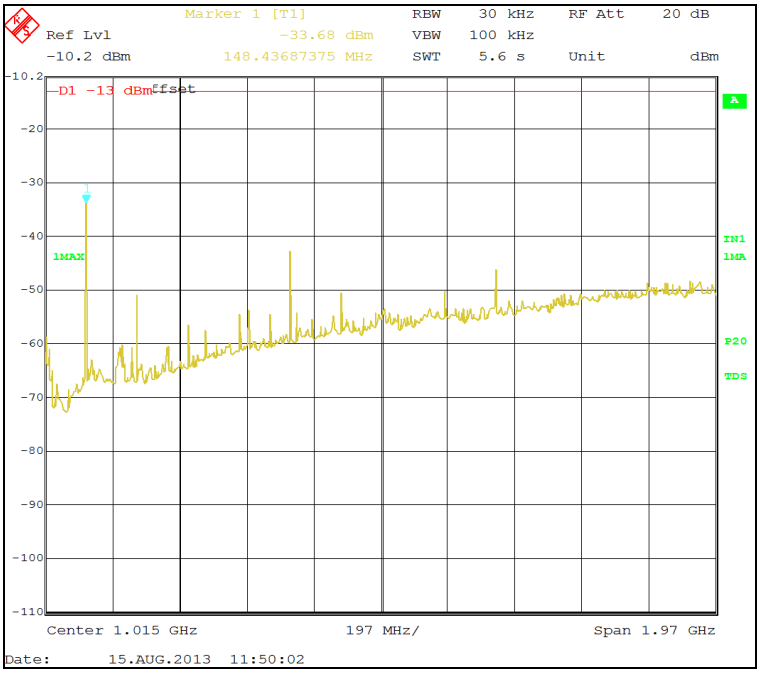
Plot 49. Radiated Spurious Emissions, Channel 1, Power Level 10, C4FM



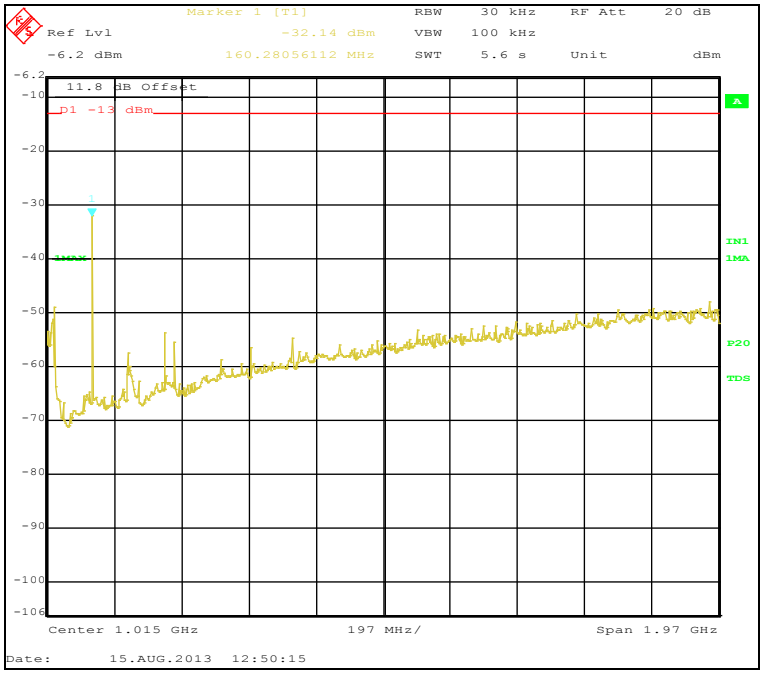
Plot 50. Radiated Spurious Emissions, Channel 1, Power Level 100, C4FM



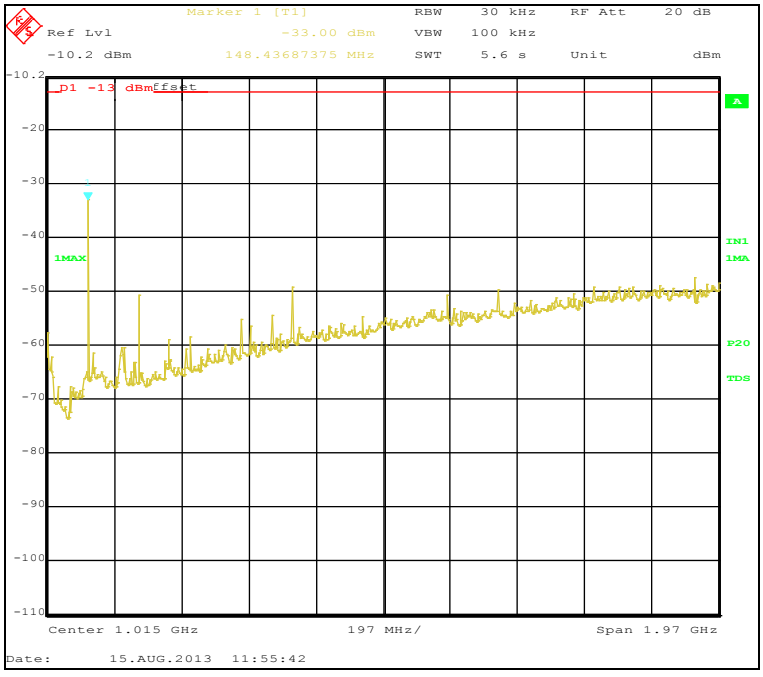
Plot 51. Radiated Spurious Emissions, Channel 1, Power Level 10, CQPSK



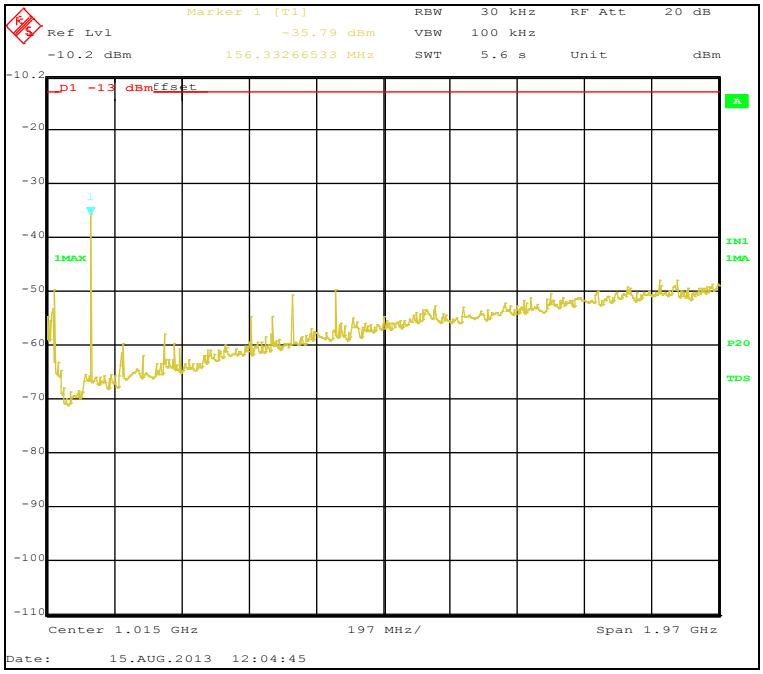
Plot 52. Radiated Spurious Emissions, Channel 1, Power Level 100, CQPSK



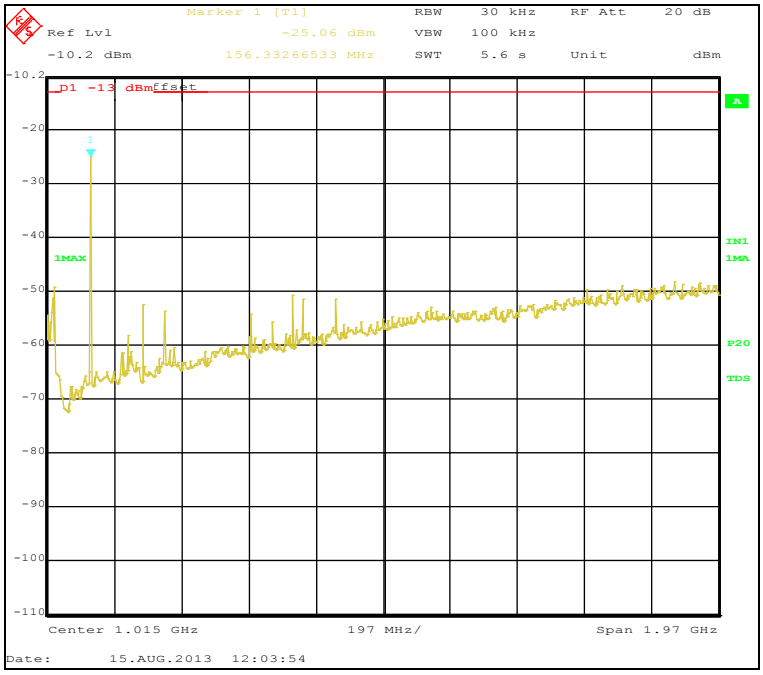
Plot 53. Radiated Spurious Emissions, Channel 1, Power Level 10, HDQPSK



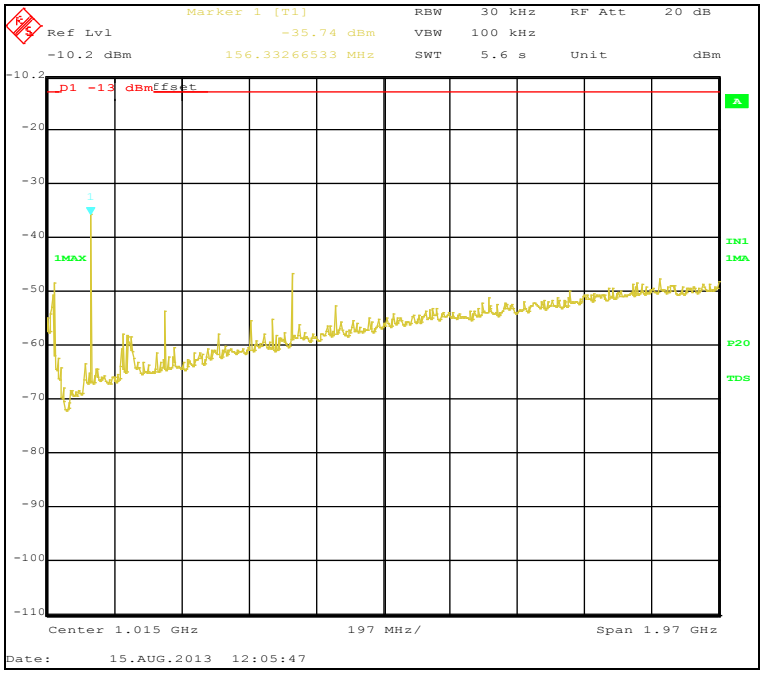
Plot 54. Radiated Spurious Emissions, Channel 1, Power Level 100, HDQPSK



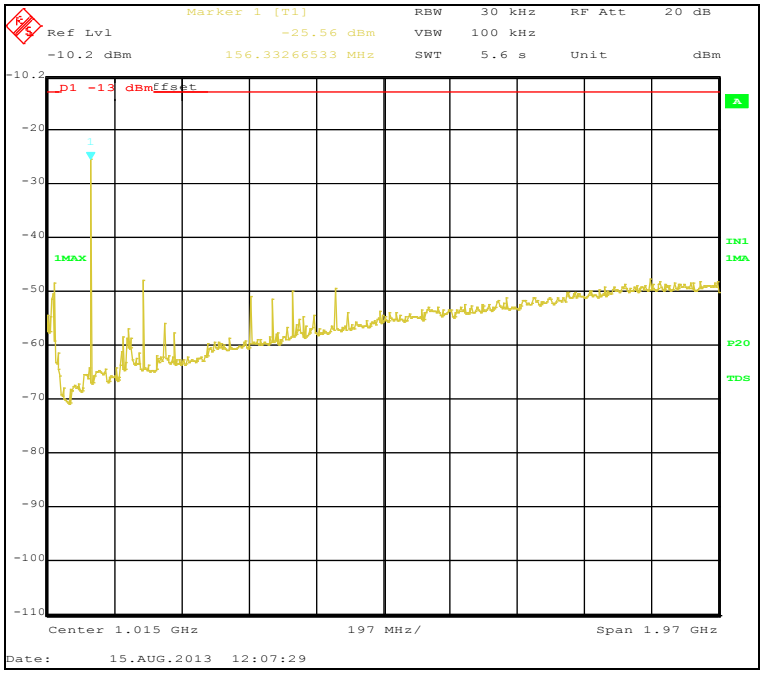
Plot 55. Radiated Spurious Emissions, Channel 2, Power Level 10, C4FM



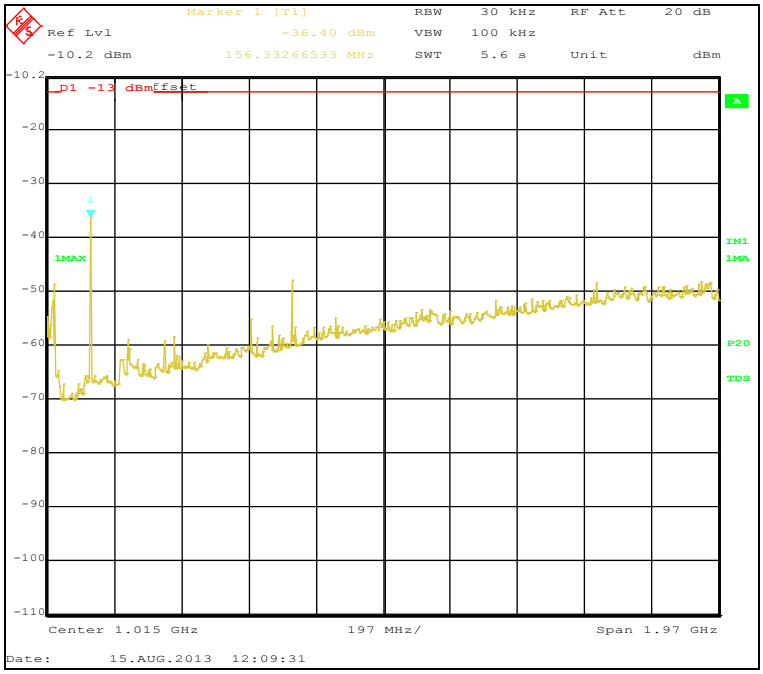
Plot 56. Radiated Spurious Emissions, Channel 2, Power Level 100, C4FM



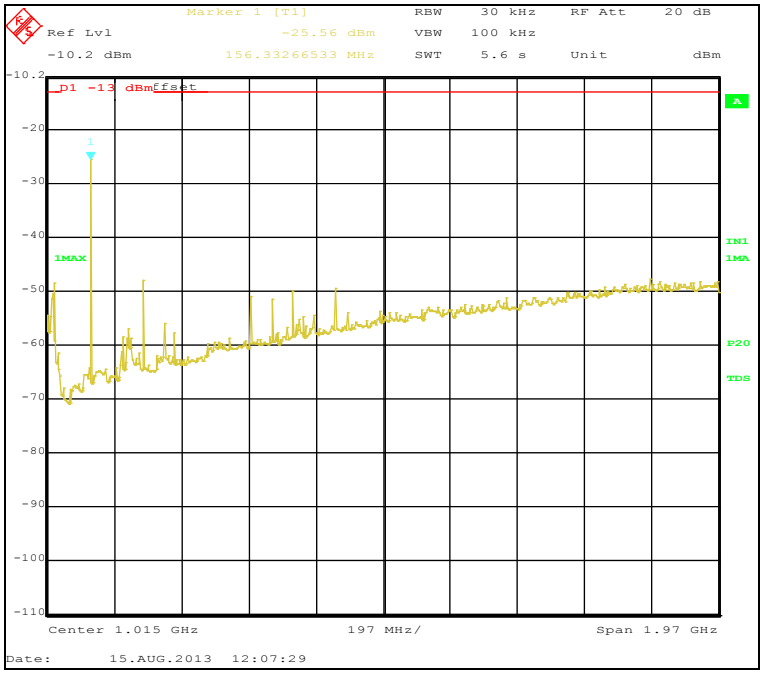
Plot 57. Radiated Spurious Emissions, Channel 2, Power Level 10, CQPSK



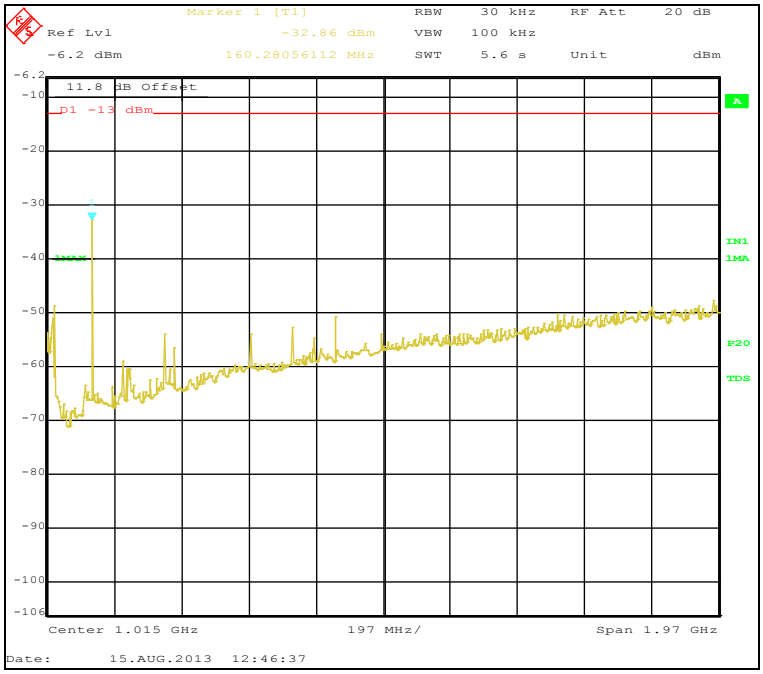
Plot 58. Radiated Spurious Emissions, Channel 2, Power Level 100, CQPSK



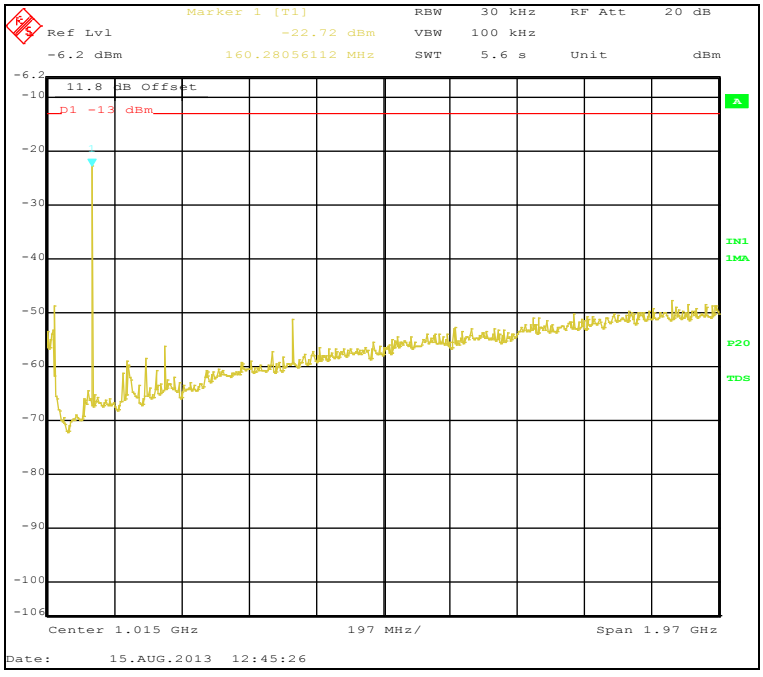
Plot 59. Radiated Spurious Emissions, Channel 2, Power Level 10, HDQPSK



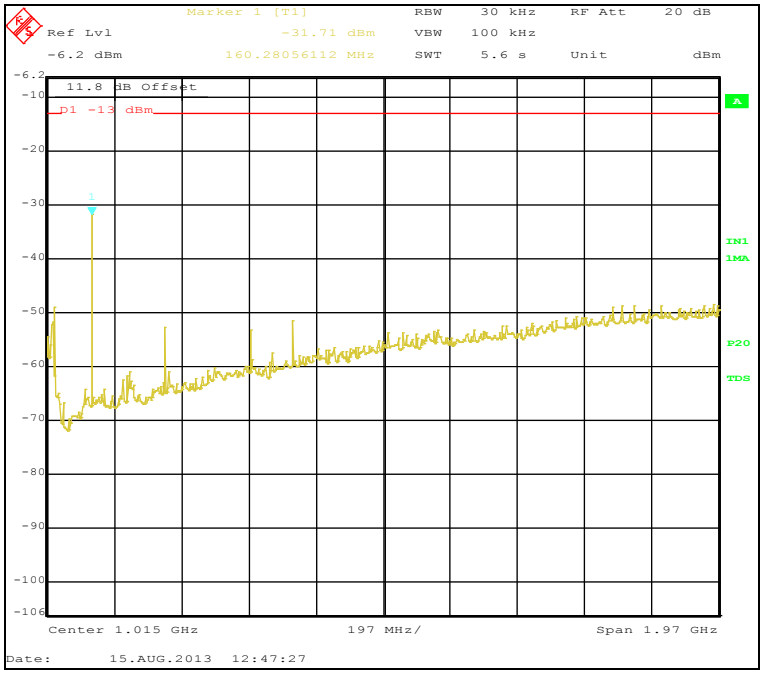
Plot 60. Radiated Spurious Emissions, Channel 2, Power Level 100, HDQPSK



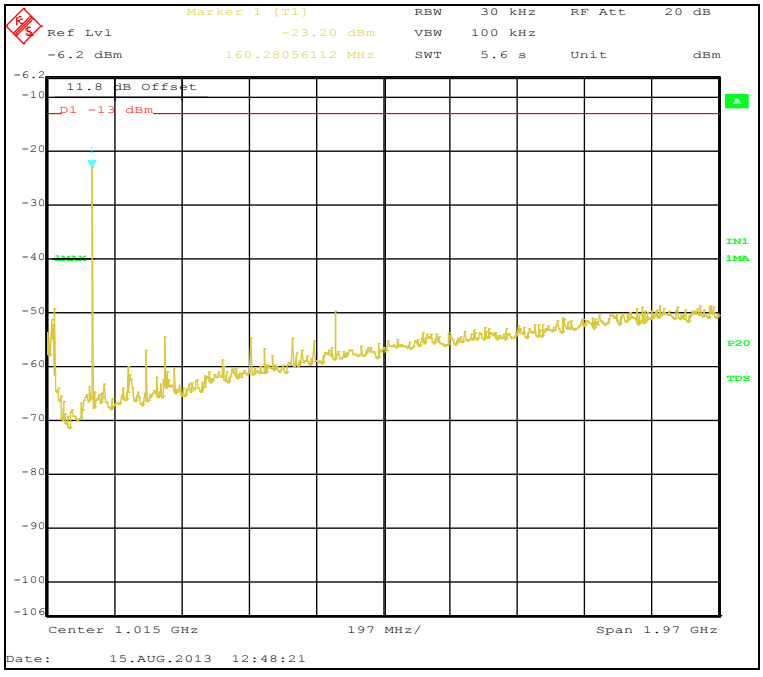
Plot 61. Radiated Spurious Emissions, Channel 3, Power Level 10, C4FM



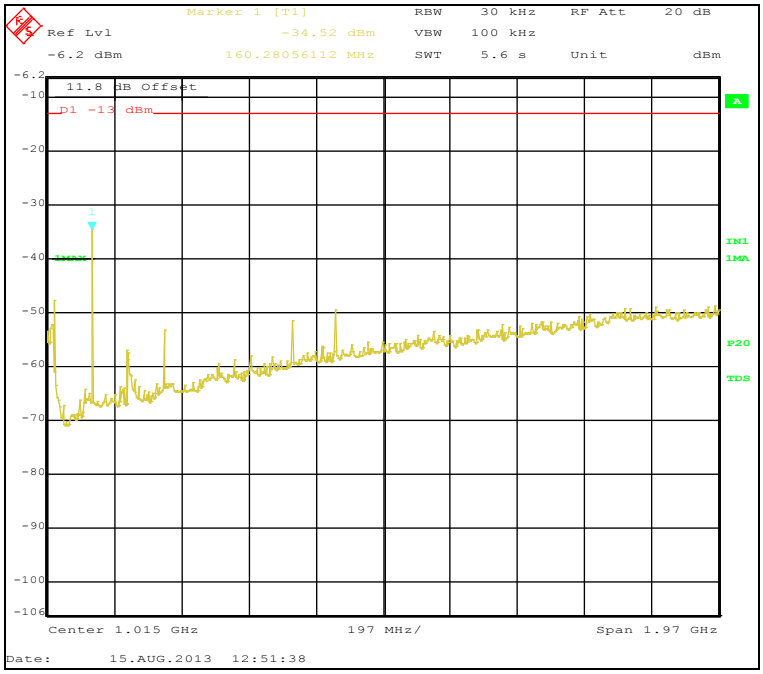
Plot 62. Radiated Spurious Emissions, Channel 3, Power Level 100, C4FM



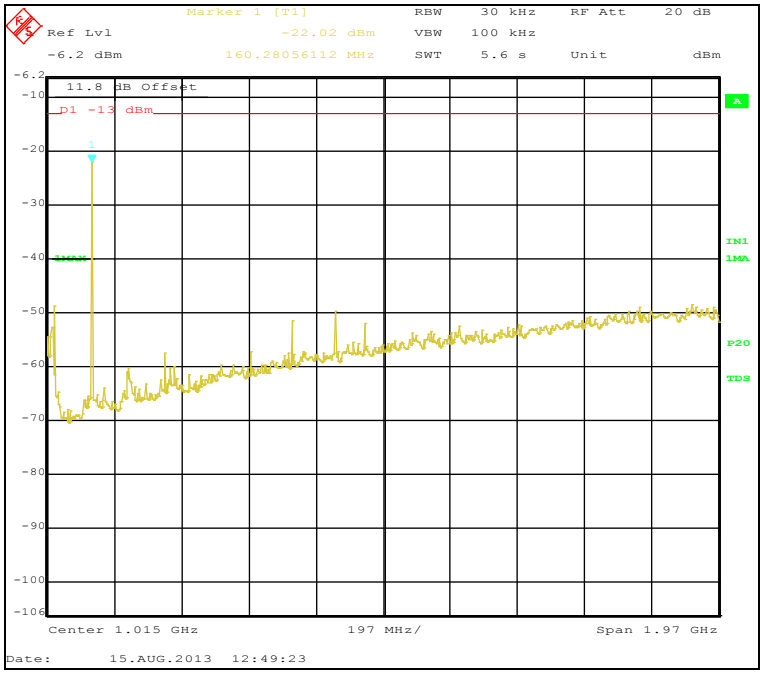
Plot 63. Radiated Spurious Emissions, Channel 3, Power Level 10, CQPSK



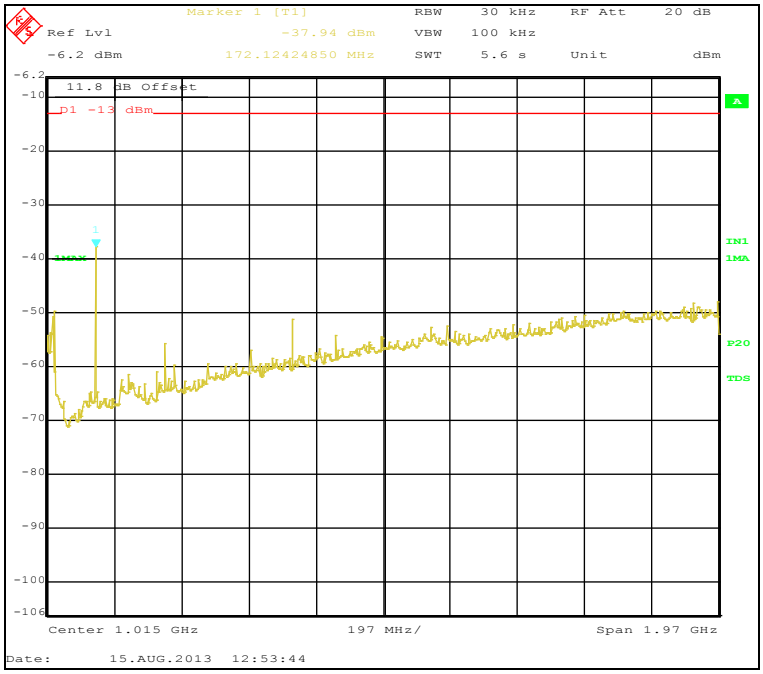
Plot 64. Radiated Spurious Emissions, Channel 3, Power Level 100, CQPSK



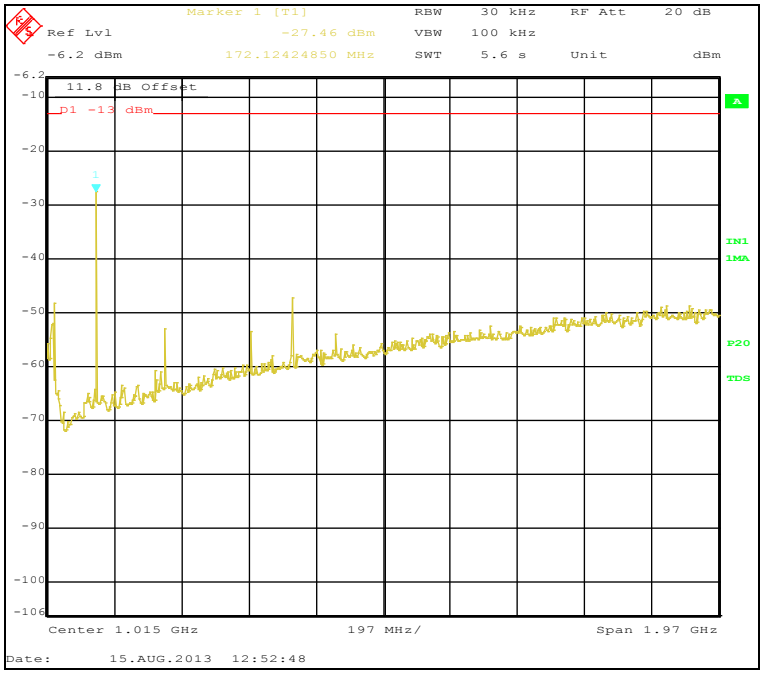
Plot 65. Radiated Spurious Emissions, Channel 3, Power Level 10, HDQPSK



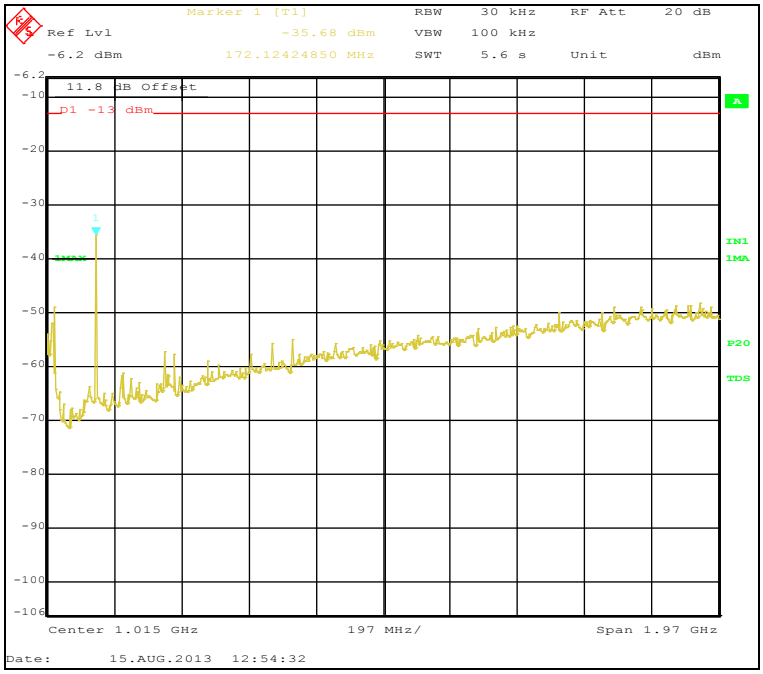
Plot 66. Radiated Spurious Emissions, Channel 3, Power Level 100, HDQPSK



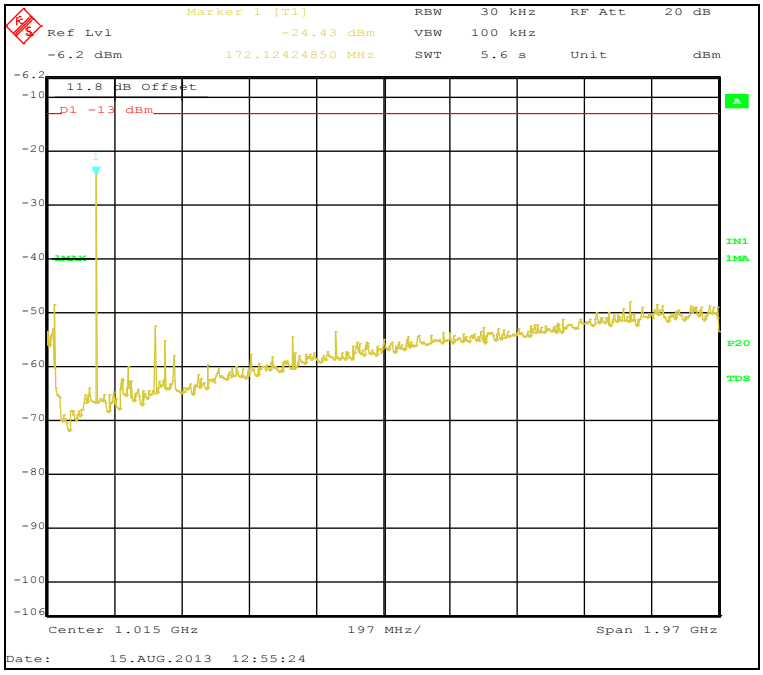
Plot 67. Radiated Spurious Emissions, Channel 4, Power Level 10, C4FM



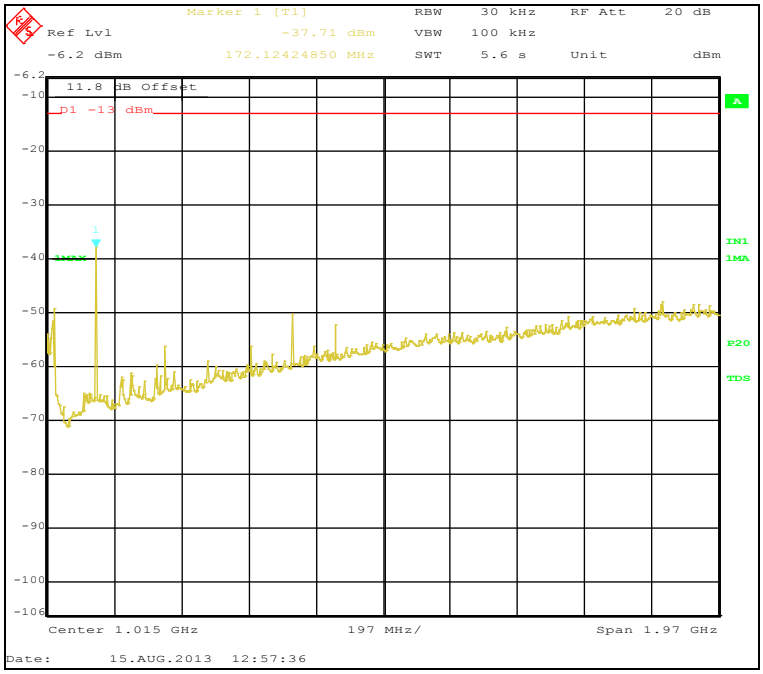
Plot 68. Radiated Spurious Emissions, Channel 4, Power Level 100, C4FM



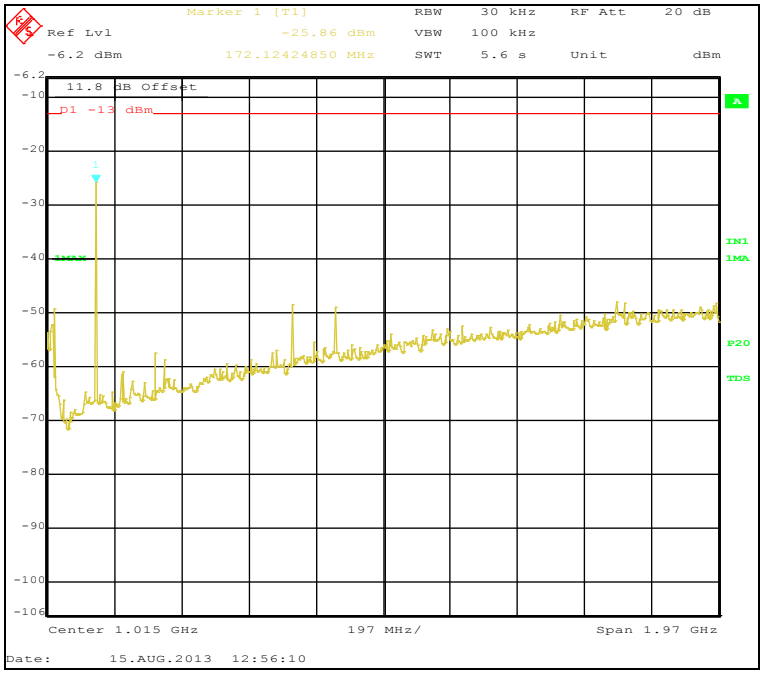
Plot 69. Radiated Spurious Emissions, Channel 4, Power Level 10, CQPSK



Plot 70. Radiated Spurious Emissions, Channel 4, Power Level 100, CQPSK

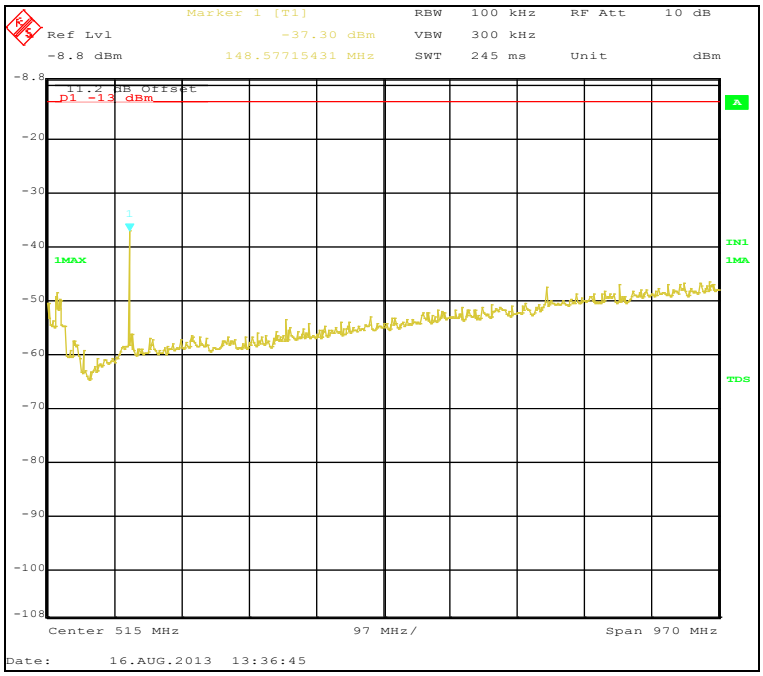


Plot 71. Radiated Spurious Emissions, Channel 4, Power Level 10, HDQPSK

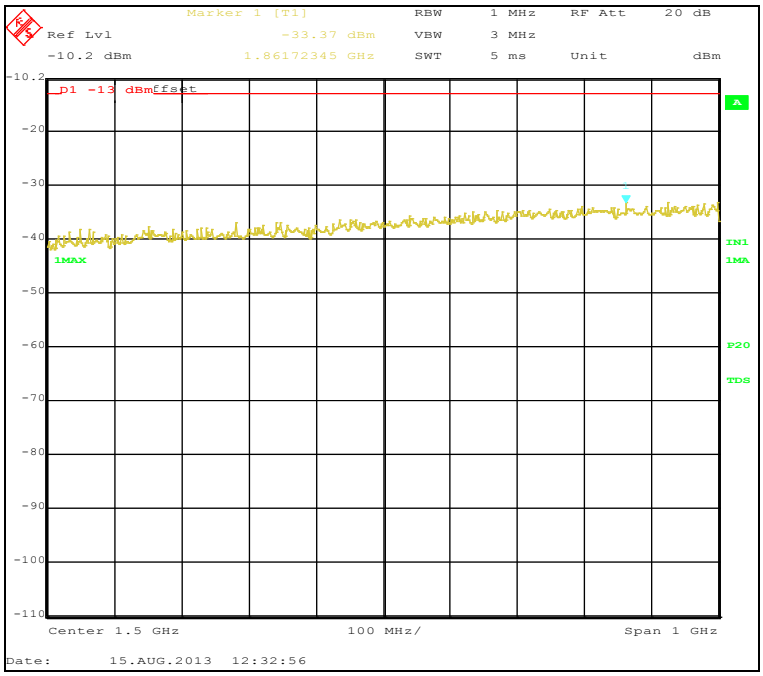


Plot 72. Radiated Spurious Emissions, Channel 4, Power Level 100, HDQPSK

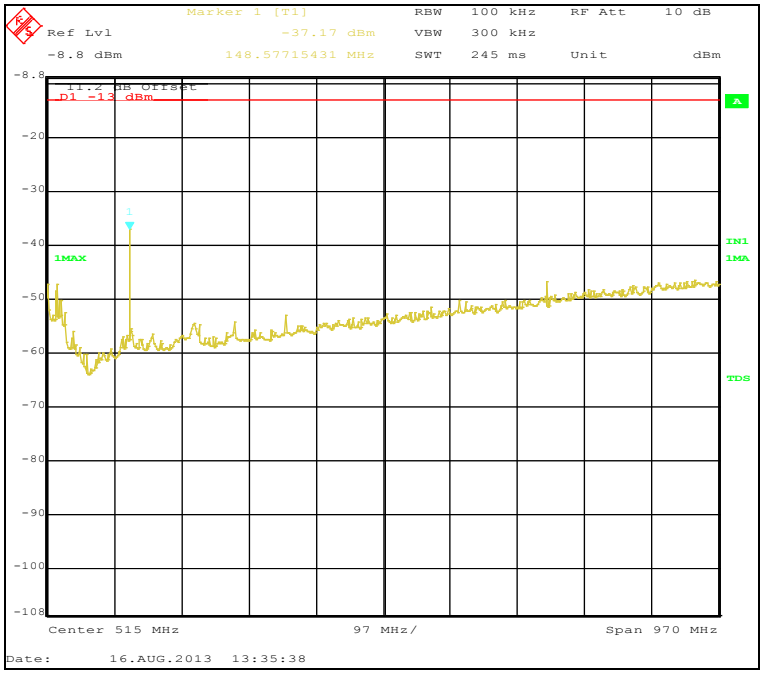
Part 80



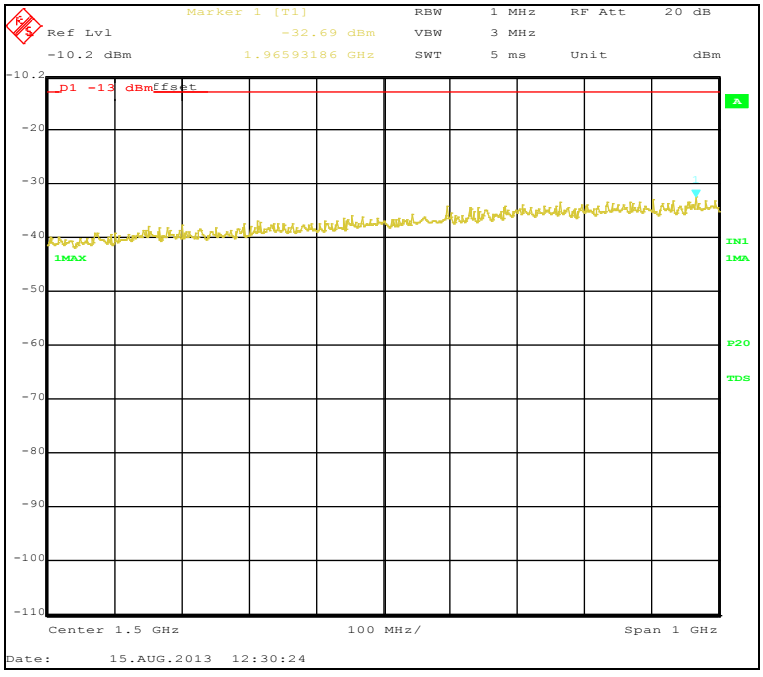
Plot 73. Radiated Spurious Emissions, Channel 1, Power Level 10, C4FM, 30 MHz – 1 GHz



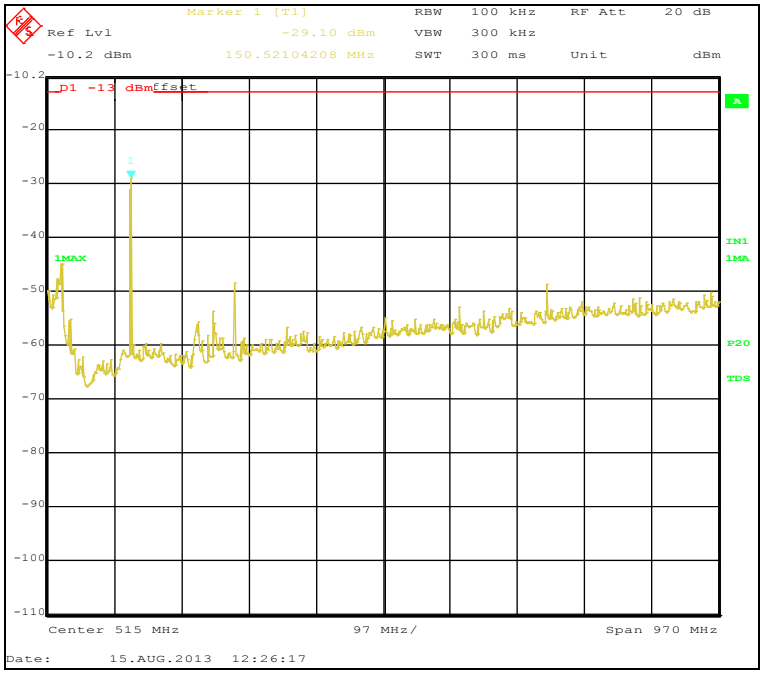
Plot 74. Radiated Spurious Emissions, Channel 1, Power Level 10, C4FM, 1 GHz – 2 GHz



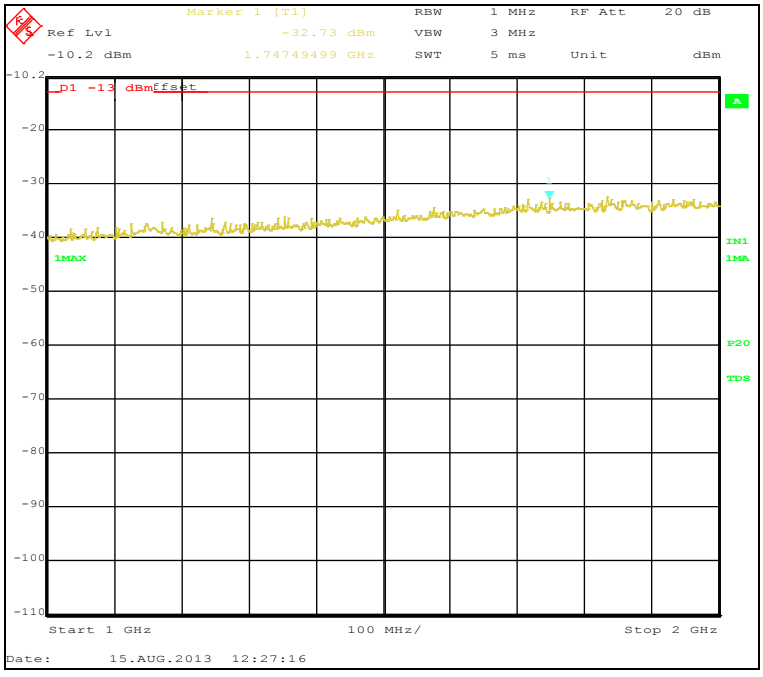
Plot 75. Radiated Spurious Emissions, Channel 1, Power Level 100, C4FM, 30 MHz – 1 GHz



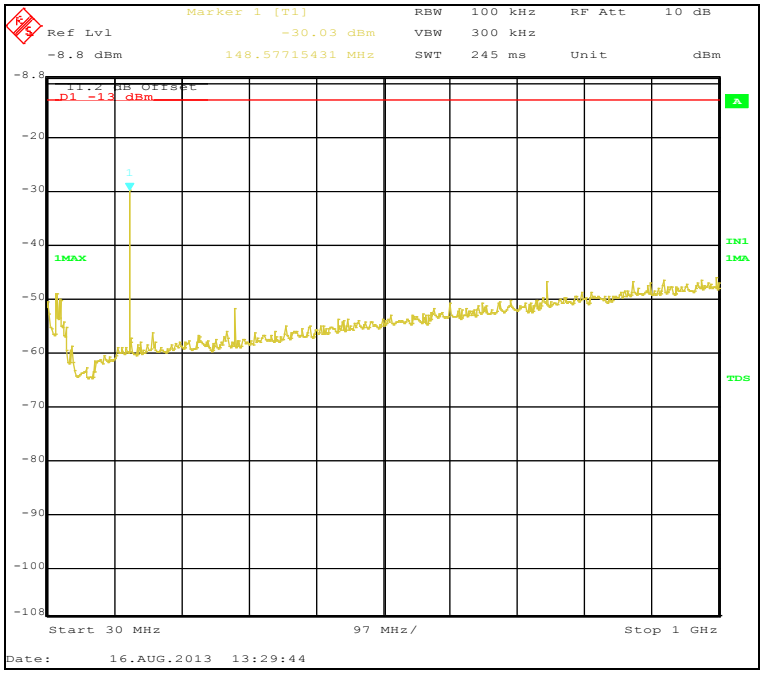
Plot 76. Radiated Spurious Emissions, Channel 1, Power Level 100, C4FM, 1 GHz – 2 GHz



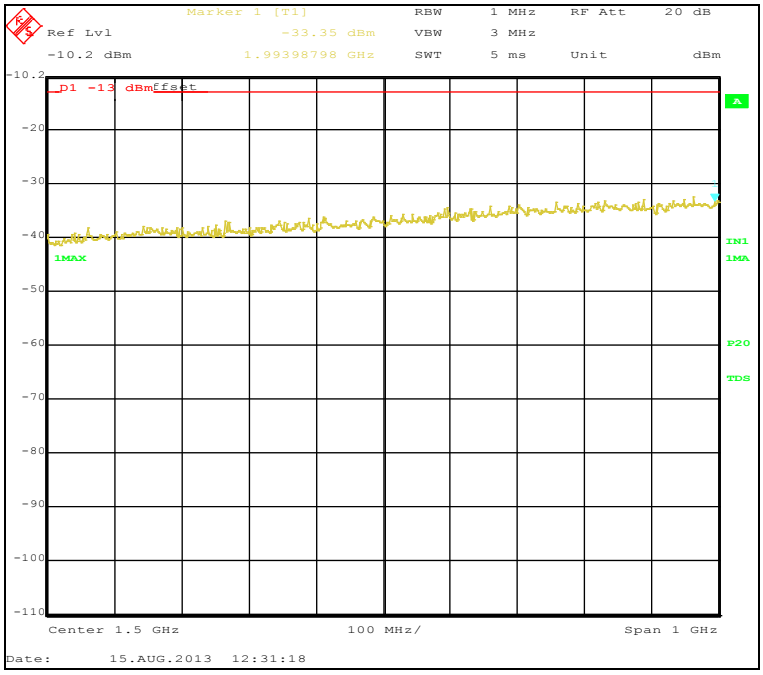
Plot 77. Radiated Spurious Emissions, Channel 1, Power Level 10, CQPSK, 30 MHz – 1 GHz



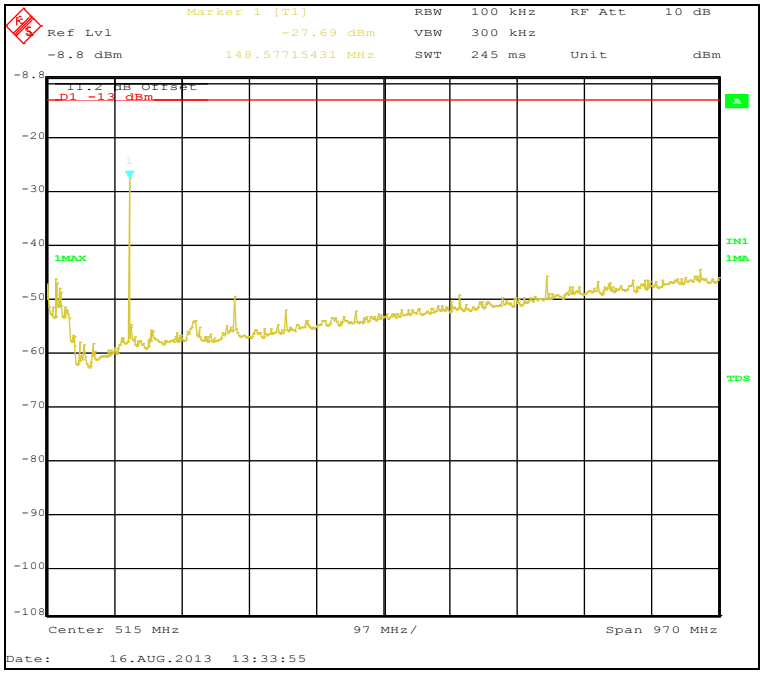
Plot 78. Radiated Spurious Emissions, Channel 1, Power Level 10, CQPSK, 1 GHz – 2 GHz



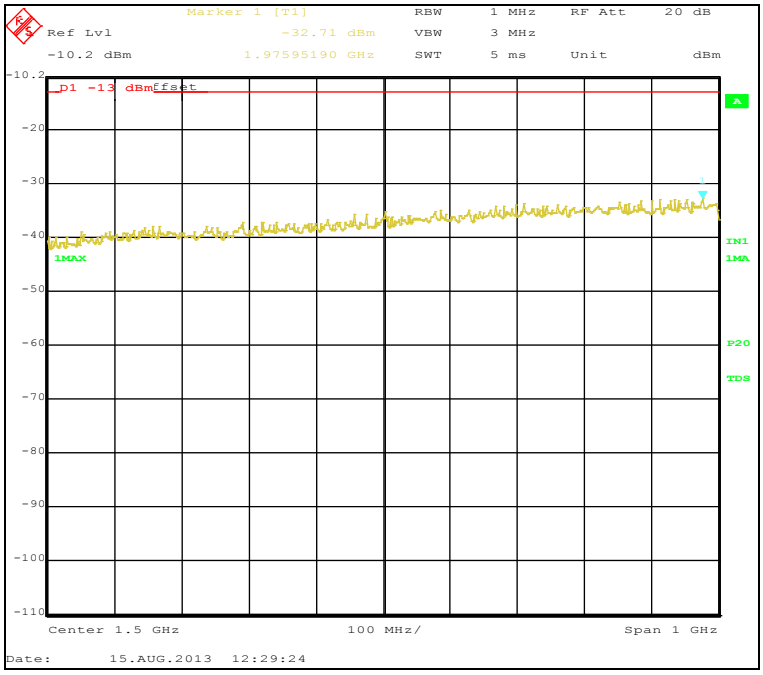
Plot 79. Radiated Spurious Emissions, Channel 1, Power Level 100, CQPSK, 30 MHz – 1 GHz



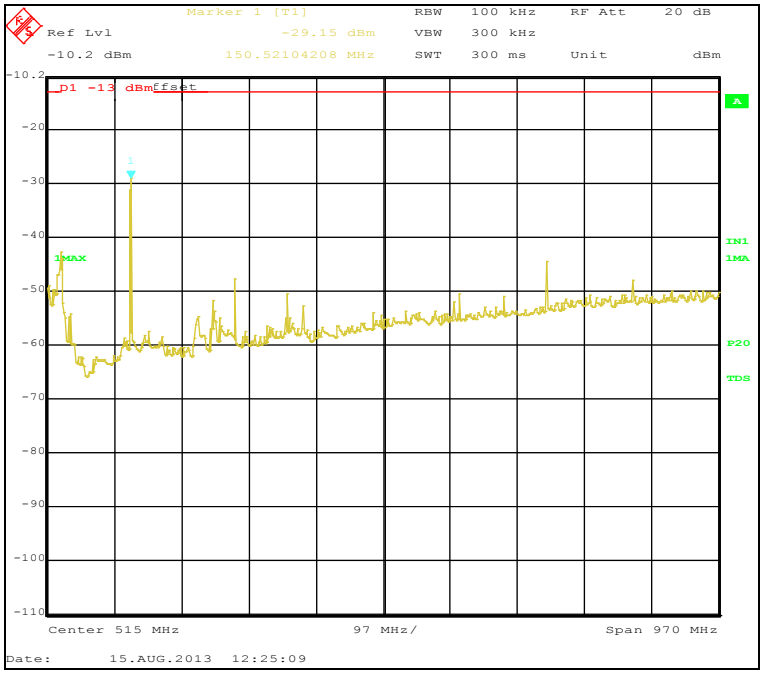
Plot 80. Radiated Spurious Emissions, Channel 1, Power Level 100, CQPSK, 1 GHz – 2 GHz



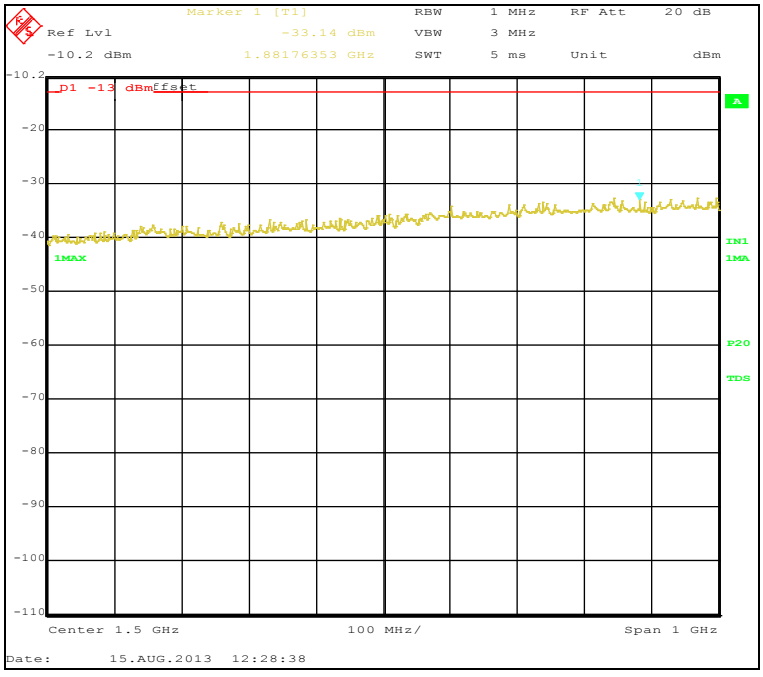
Plot 81. Radiated Spurious Emissions, Channel 1, Power Level 10, HDQPSK, 30 MHz – 1 GHz



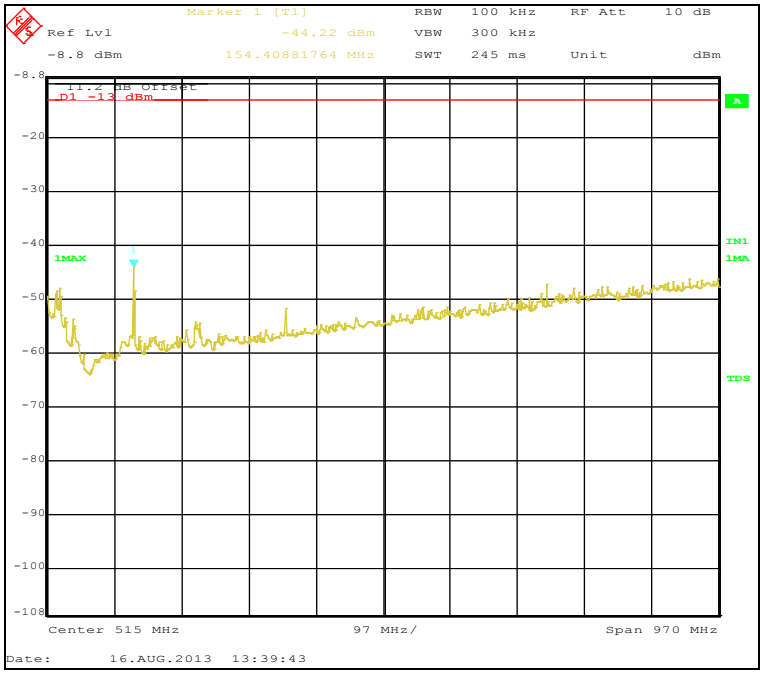
Plot 82. Radiated Spurious Emissions, Channel 1, Power Level 10, HDQPSK, 1 GHz – 2 GHz



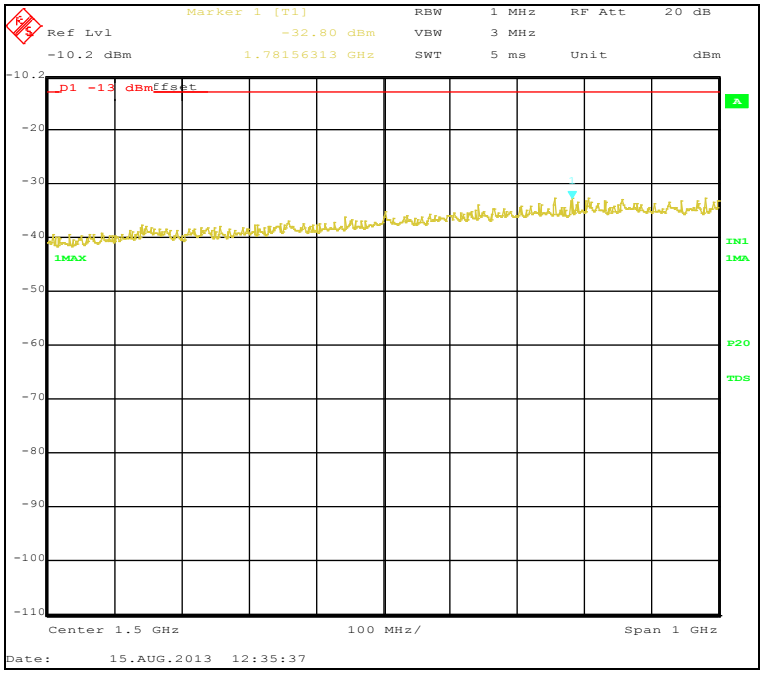
Plot 83. Radiated Spurious Emissions, Channel 1, Power Level 100, HDQPSK, 30 MHz – 1 GHz



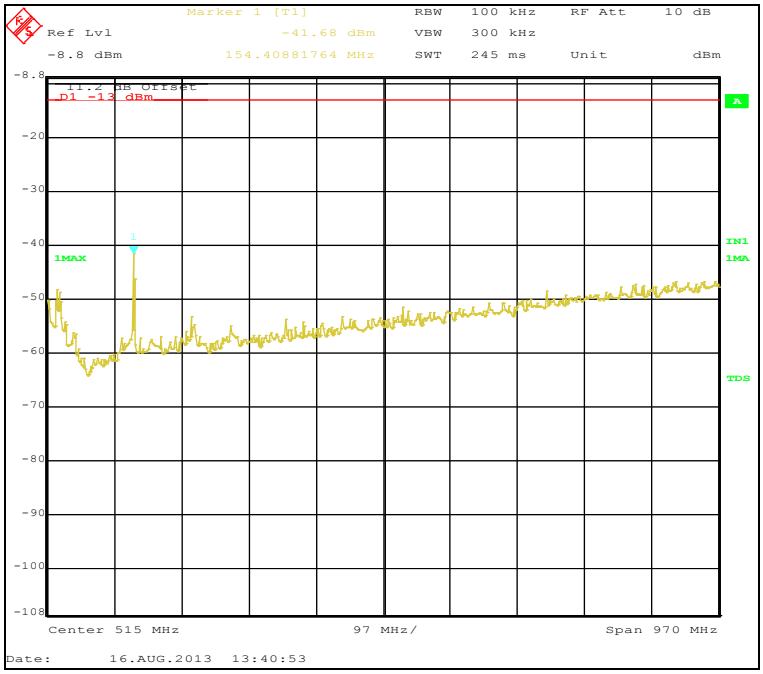
Plot 84. Radiated Spurious Emissions, Channel 1, Power Level 100, HDQPSK, 1 GHz – 2 GHz



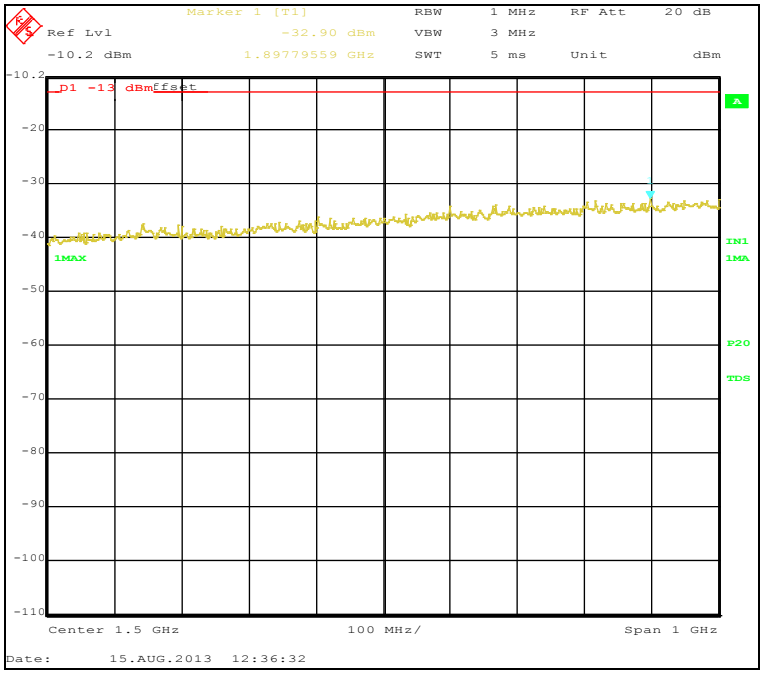
Plot 85. Radiated Spurious Emissions, Channel 2, Power Level 10, C4FM, 30 MHz – 1 GHz



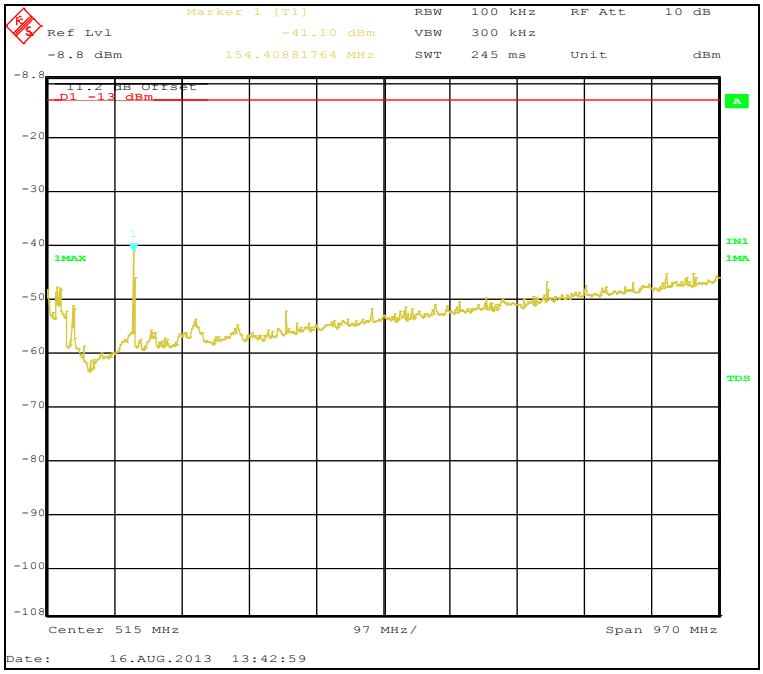
Plot 86. Radiated Spurious Emissions, Channel 2, Power Level 10, C4FM, 1 GHz – 2 GHz



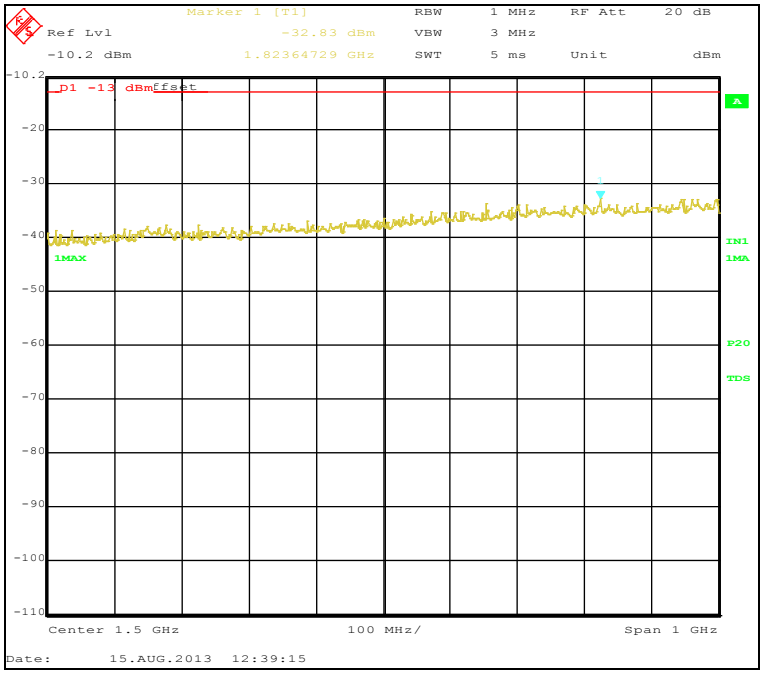
Plot 87. Radiated Spurious Emissions, Channel 2, Power Level 100, C4FM, 30 MHz – 1 GHz



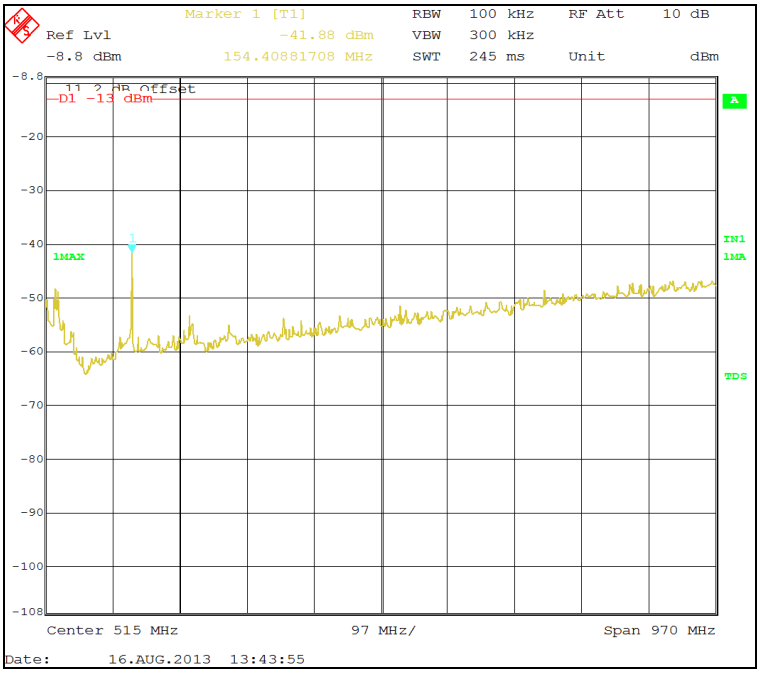
Plot 88. Radiated Spurious Emissions, Channel 2, Power Level 100, C4FM, 1 GHz – 2 GHz



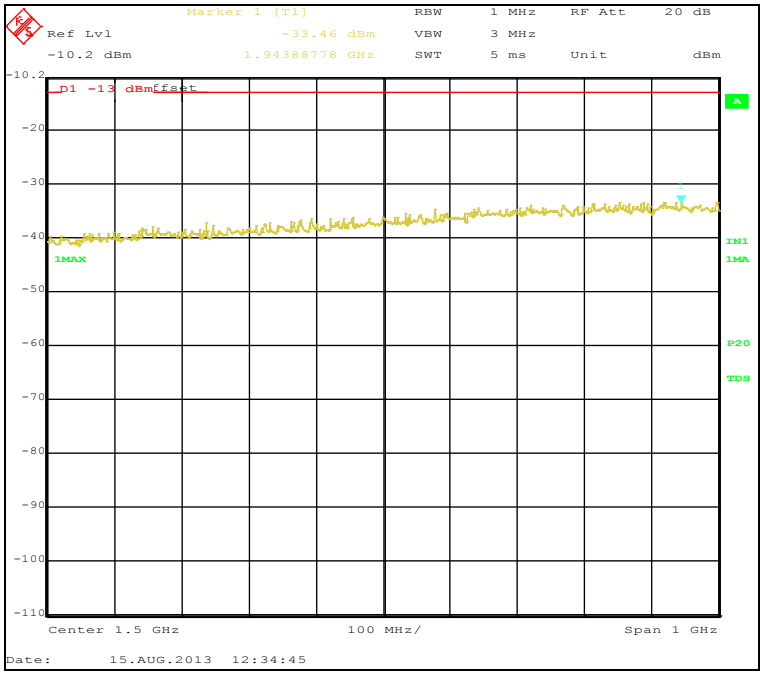
Plot 89. Radiated Spurious Emissions, Channel 2, Power Level 10, CQPSK, 30 MHz – 1 GHz



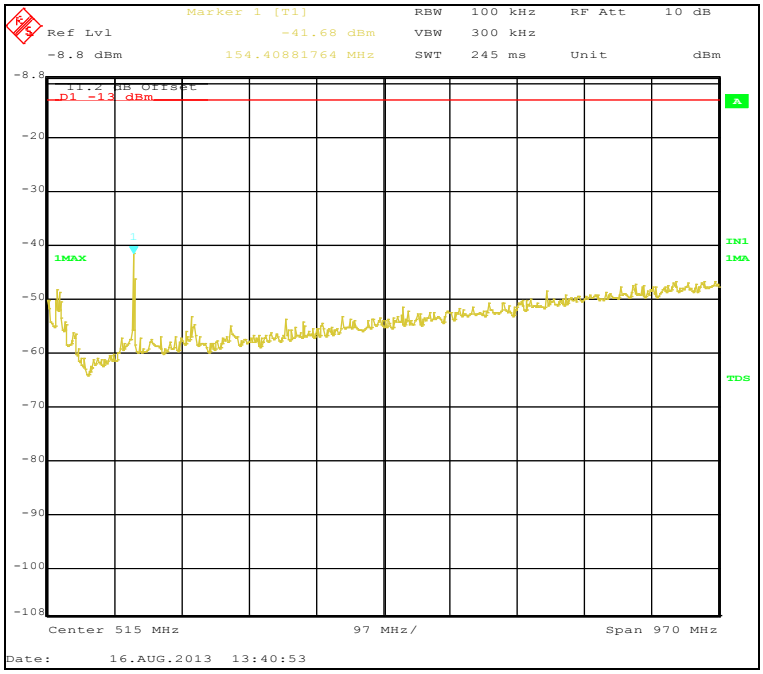
Plot 90. Radiated Spurious Emissions, Channel 2, Power Level 10, CQPSK, 1 GHz – 2 GHz



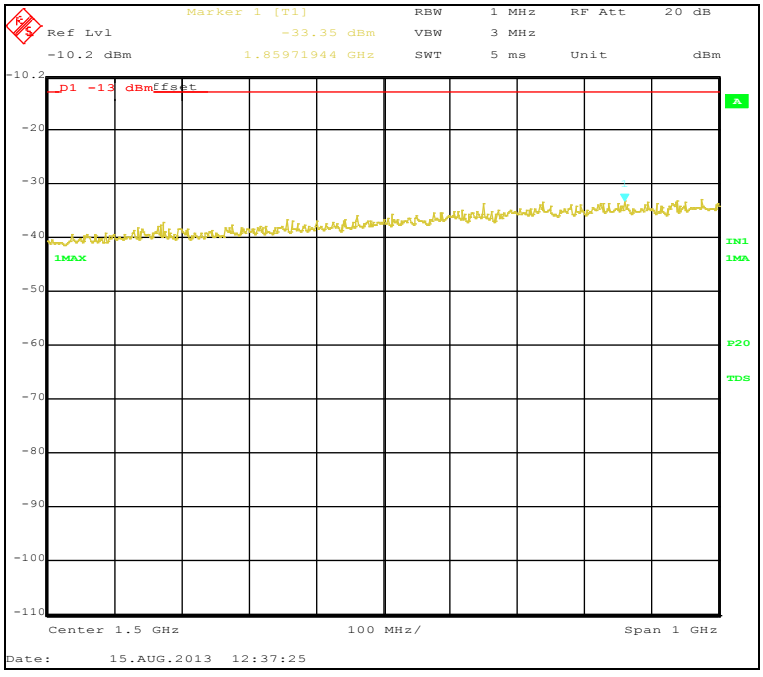
Plot 91. Radiated Spurious Emissions, Channel 2, Power Level 100, CQPSK, 30 MHz – 1 GHz



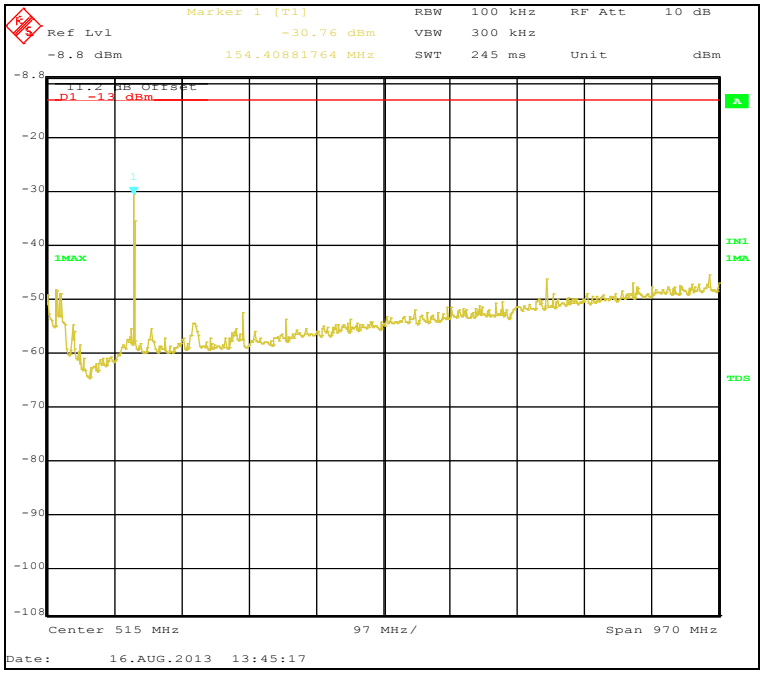
Plot 92. Radiated Spurious Emissions, Channel 2, Power Level 100, CQPSK, 1 GHz – 2 GHz



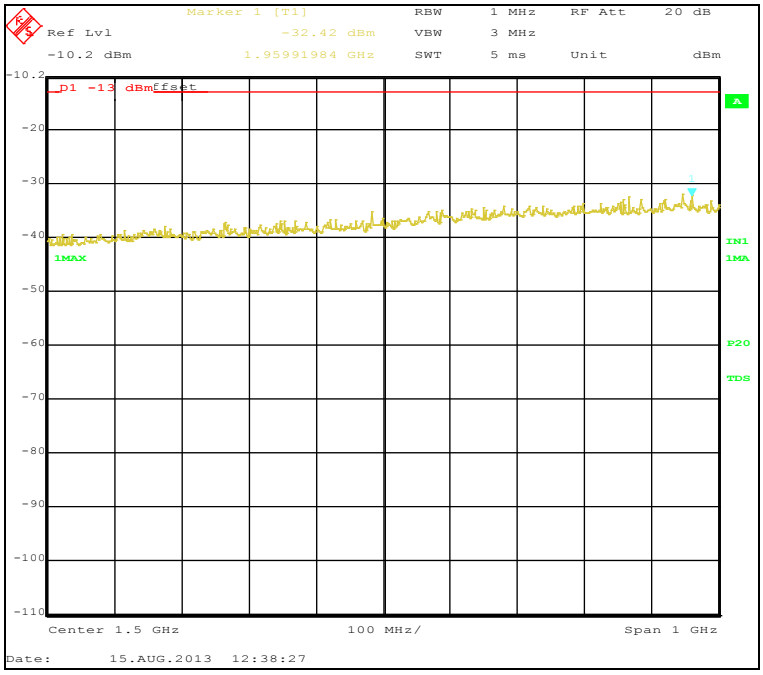
Plot 93. Radiated Spurious Emissions, Channel 2, Power Level 10, HDQPSK, 30 MHz – 1 GHz



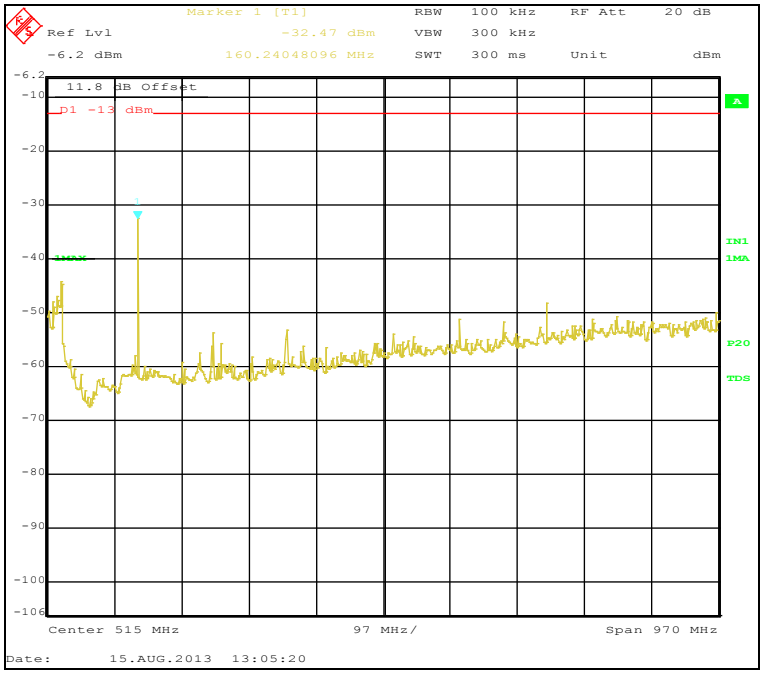
Plot 94. Radiated Spurious Emissions, Channel 2, Power Level 10, HDQPSK, 1 GHz – 2 GHz



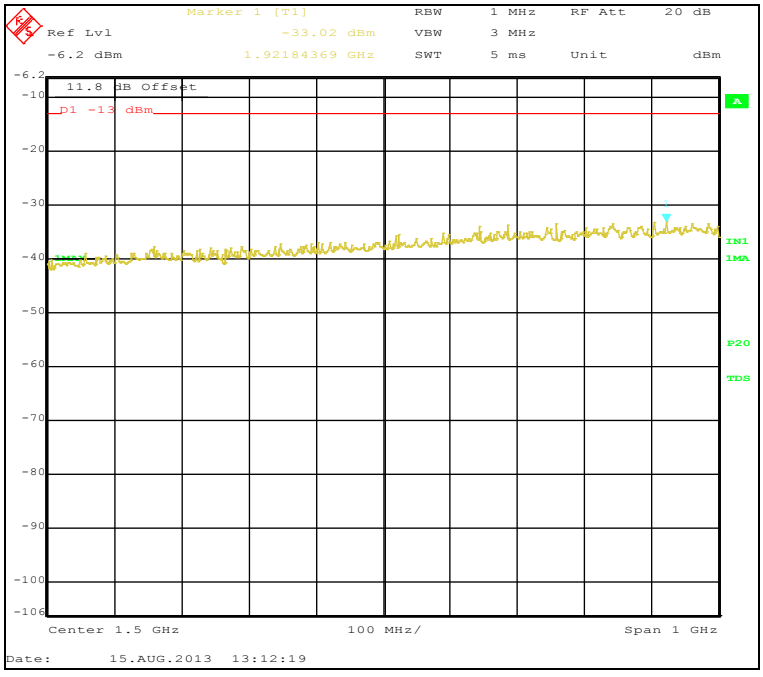
Plot 95. Radiated Spurious Emissions, Channel 2, Power Level 100, HDQPSK, 30 MHz – 1 GHz



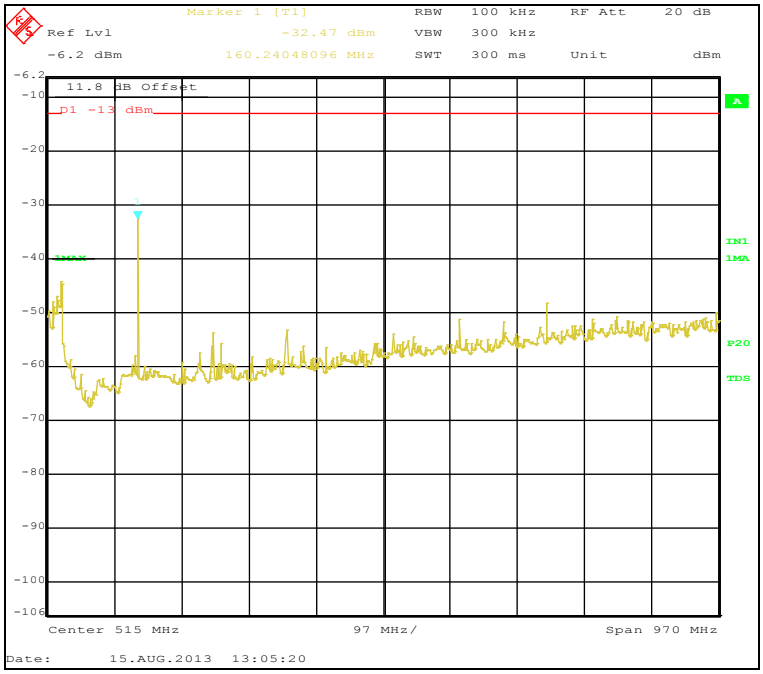
Plot 96. Radiated Spurious Emissions, Channel 2, Power Level 100, HDQPSK, 1 GHz – 2 GHz



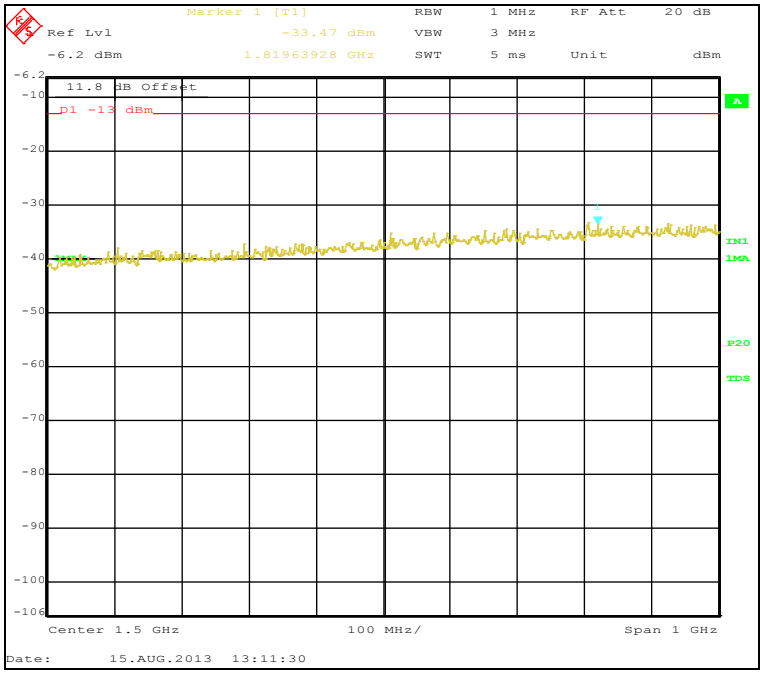
Plot 97. Radiated Spurious Emissions, Channel 3, Power Level 10, C4FM, 30 MHz – 1 GHz



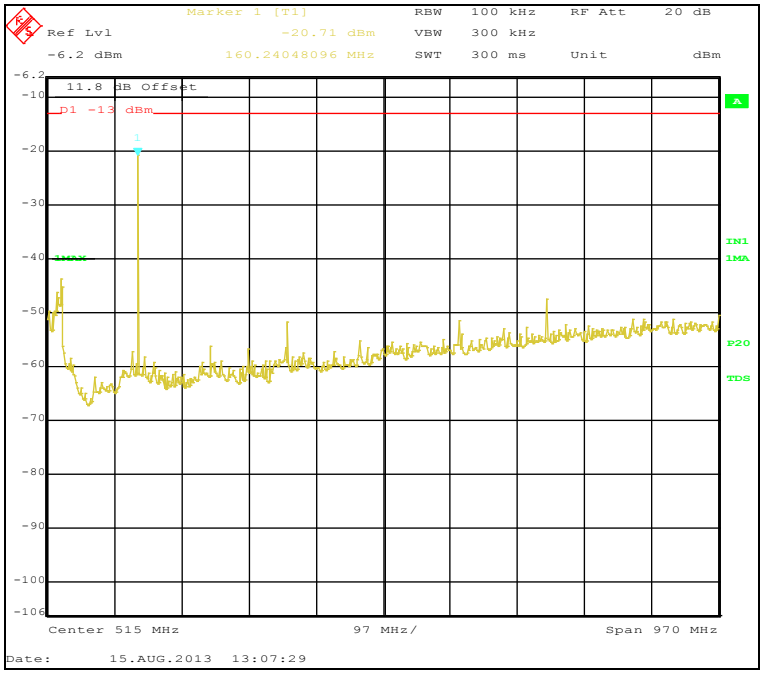
Plot 98. Radiated Spurious Emissions, Channel 3, Power Level 10, C4FM, 1 GHz – 2 GHz



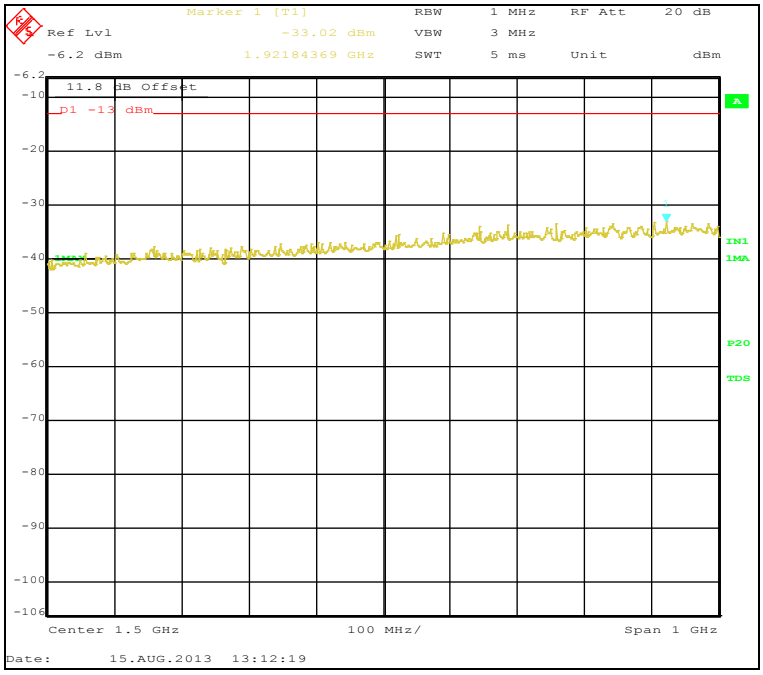
Plot 99. Radiated Spurious Emissions, Channel 3, Power Level 100, C4FM, 30 MHz – 1 GHz



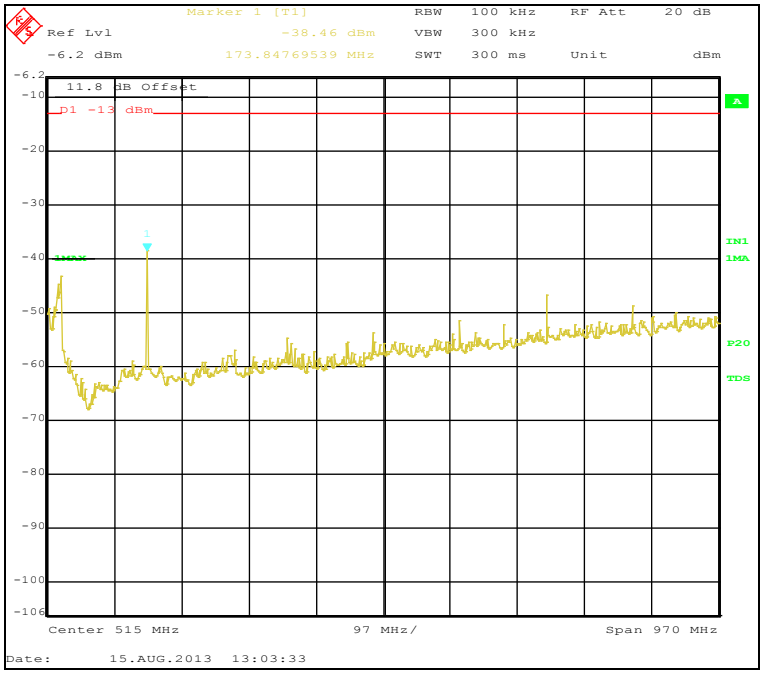
Plot 100. Radiated Spurious Emissions, Channel 3, Power Level 100, C4FM, 1 GHz – 2 GHz



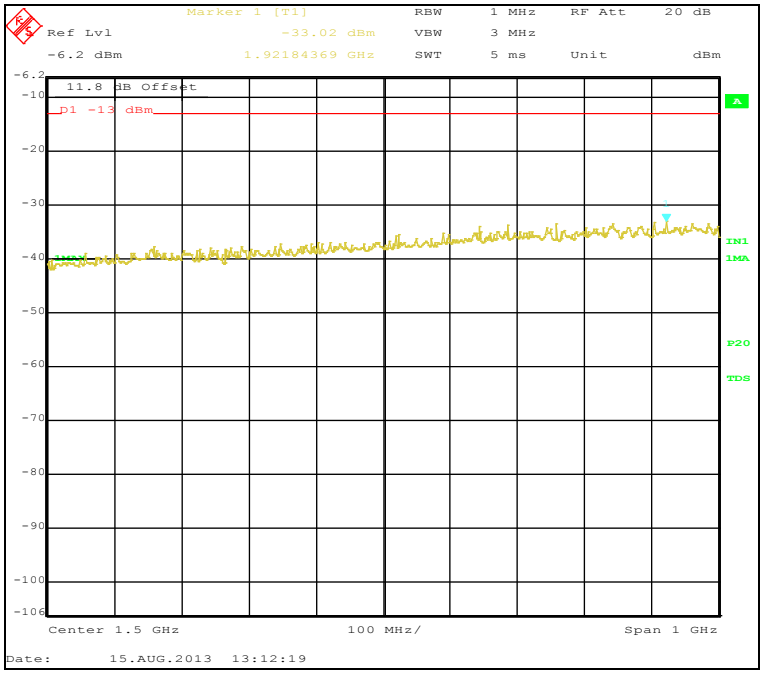
Plot 101. Radiated Spurious Emissions, Channel 3, Power Level 10, CQPSK, 30 MHz – 1 GHz



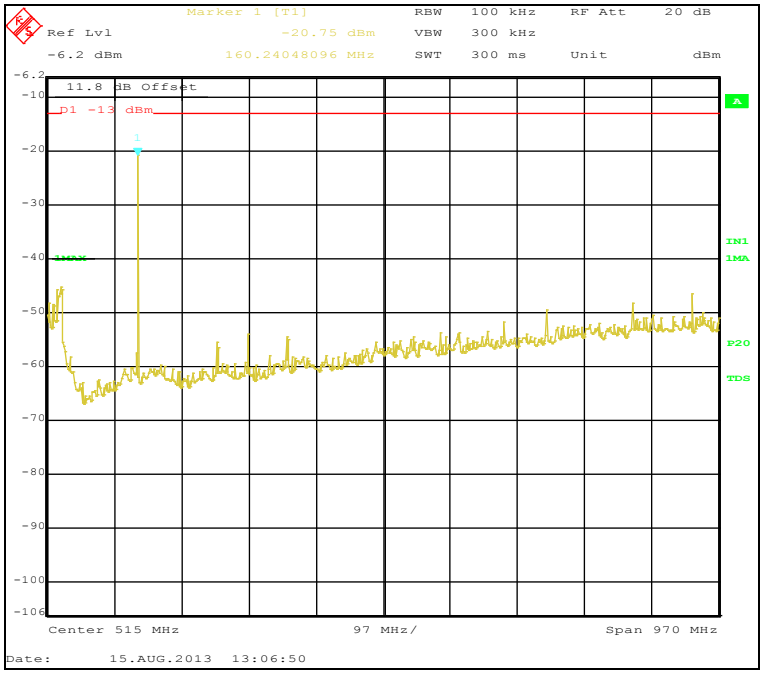
Plot 102. Radiated Spurious Emissions, Channel 3, Power Level 10, CQPSK, 1 GHz – 2 GHz



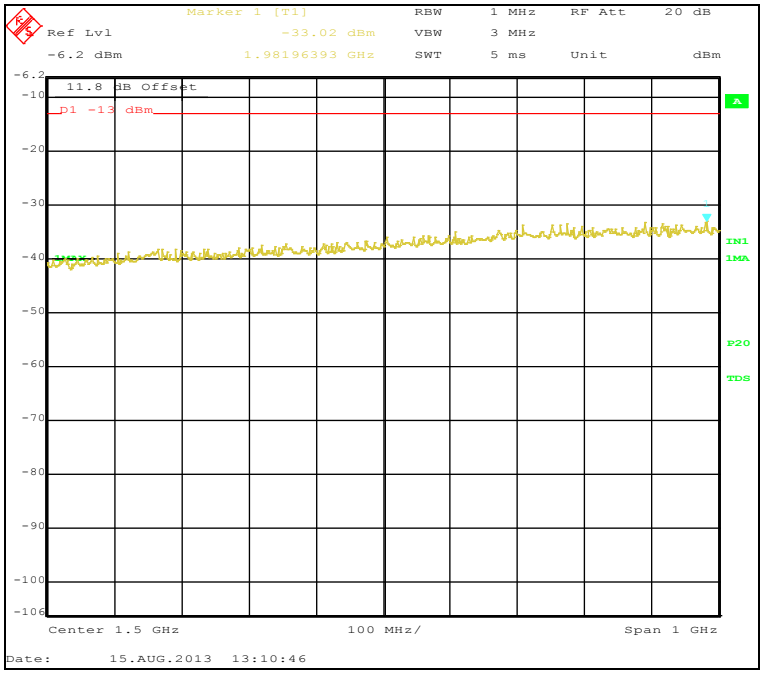
Plot 103. Radiated Spurious Emissions, Channel 3, Power Level 100, CQPSK, 30 MHz – 1 GHz



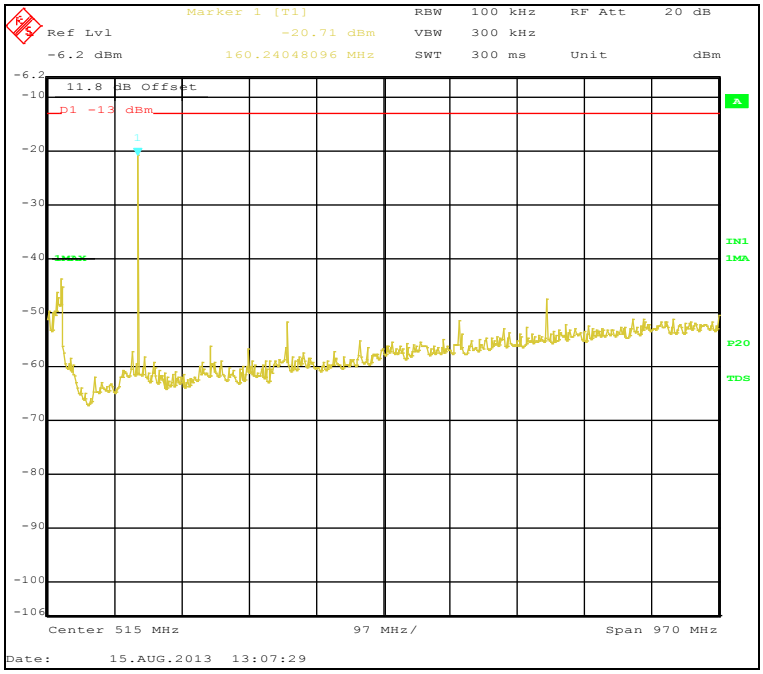
Plot 104. Radiated Spurious Emissions, Channel 3, Power Level 100, CQPSK, 1 GHz – 2 GHz



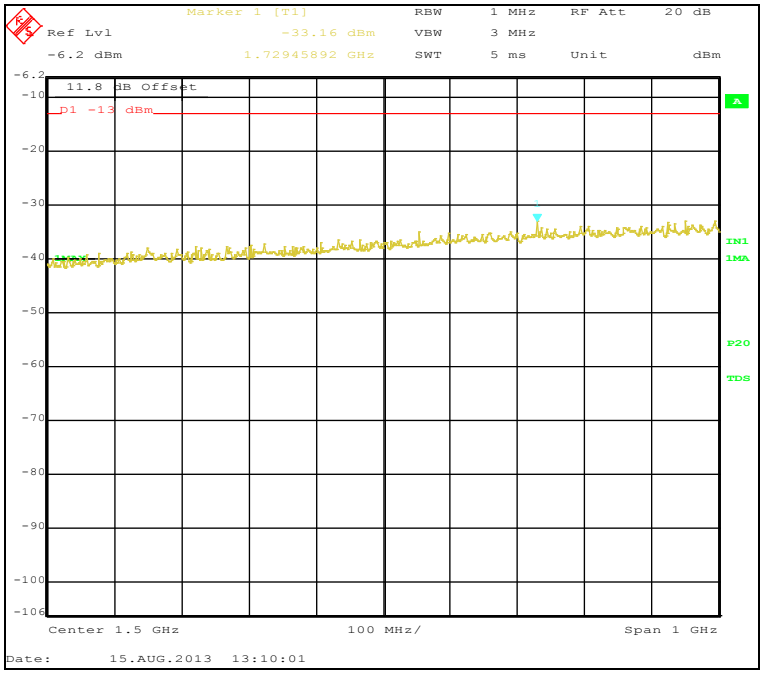
Plot 105. Radiated Spurious Emissions, Channel 3, Power Level 10, HDQPSK, 30 MHz – 1 GHz



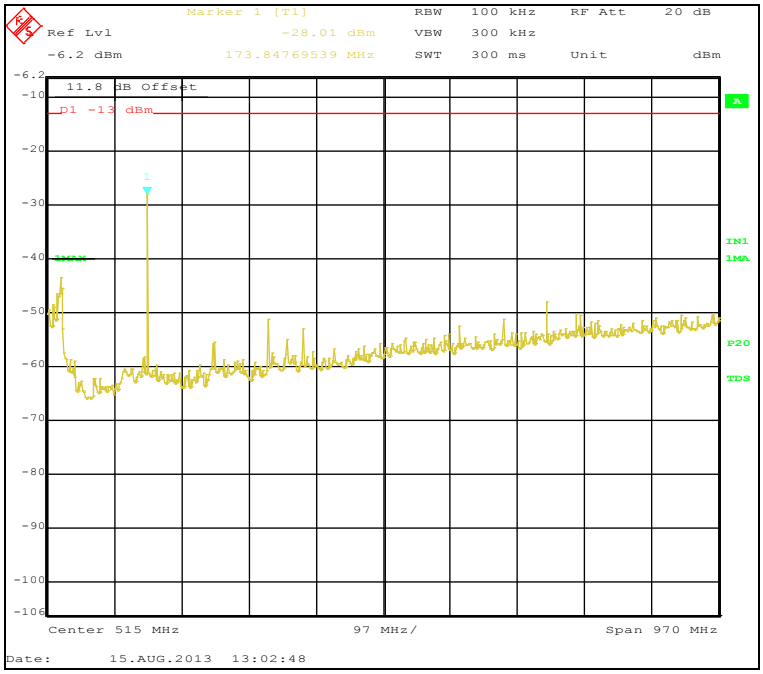
Plot 106. Radiated Spurious Emissions, Channel 3, Power Level 10, HDQPSK, 1 GHz – 2 GHz



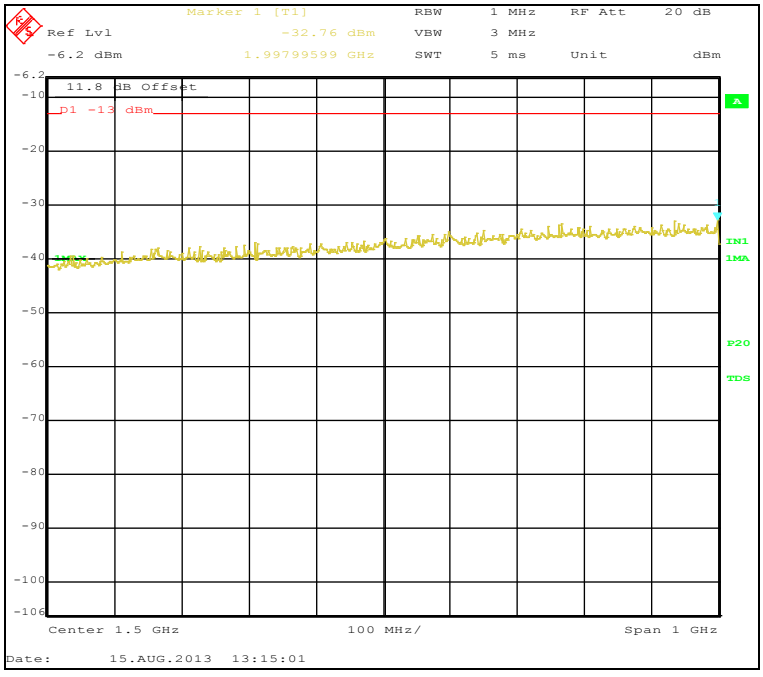
Plot 107. Radiated Spurious Emissions, Channel 3, Power Level 100, HDQPSK, 30 MHz – 1 GHz



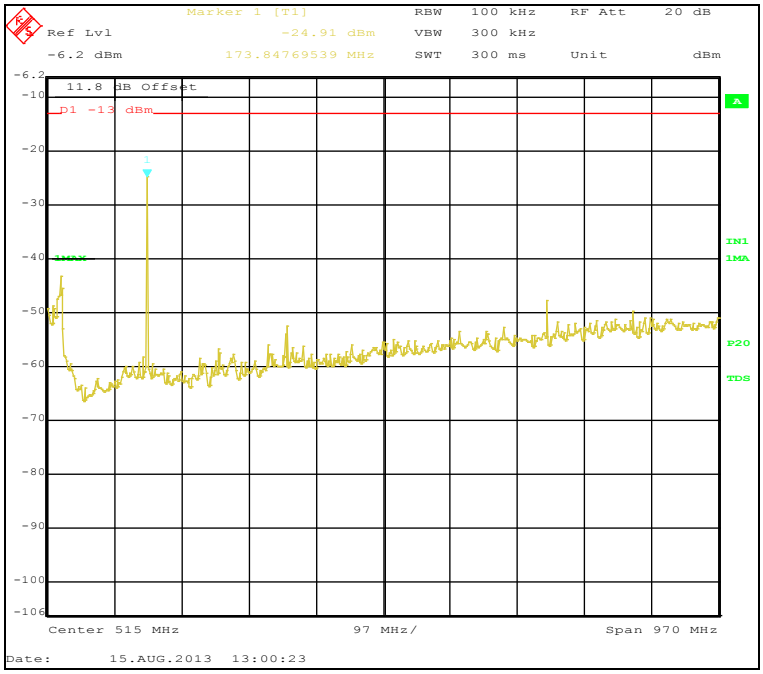
Plot 108. Radiated Spurious Emissions, Channel 3, Power Level 100, HDQPSK, 1 GHz – 2 GHz



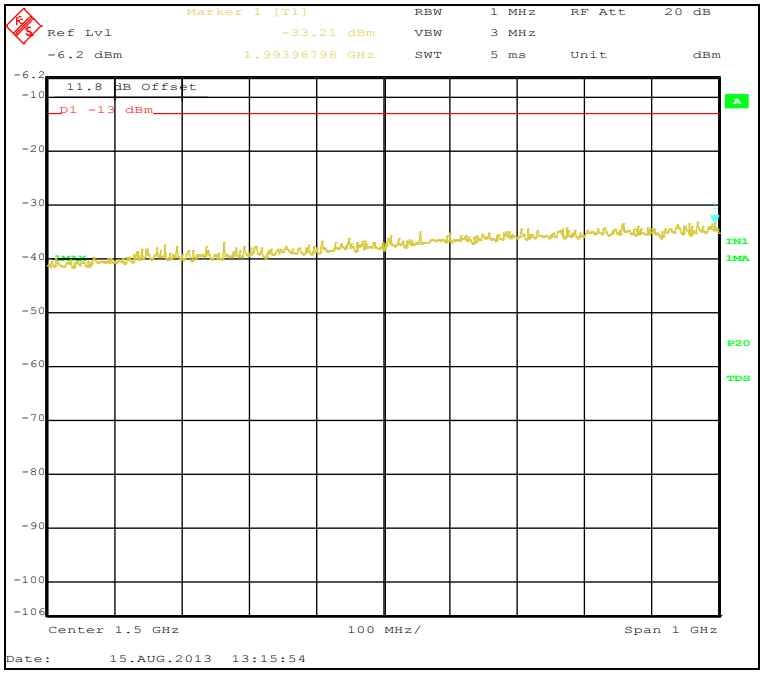
Plot 109. Radiated Spurious Emissions, Channel 4, Power Level 10, C4FM, 30 MHz – 1 GHz



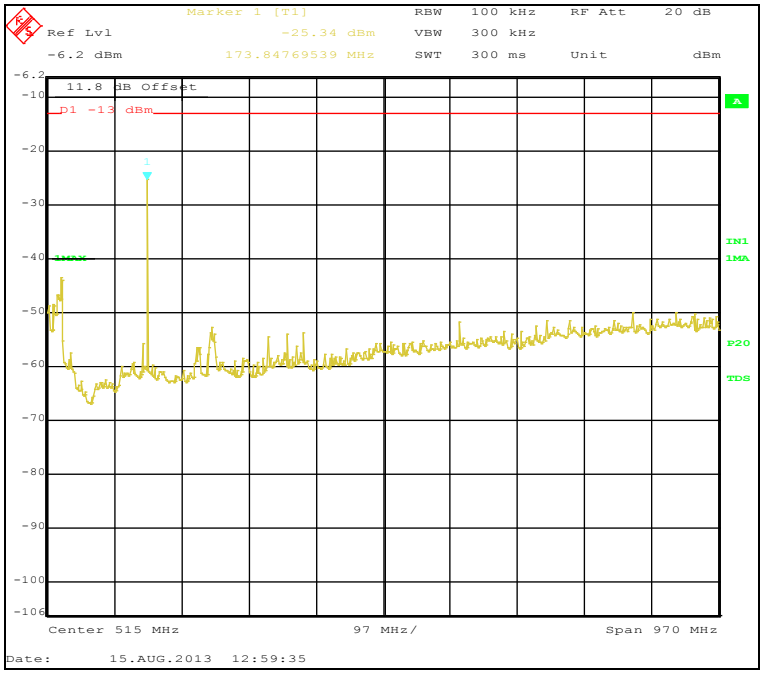
Plot 110. Radiated Spurious Emissions, Channel 4, Power Level 10, C4FM, 1 GHz – 2 GHz



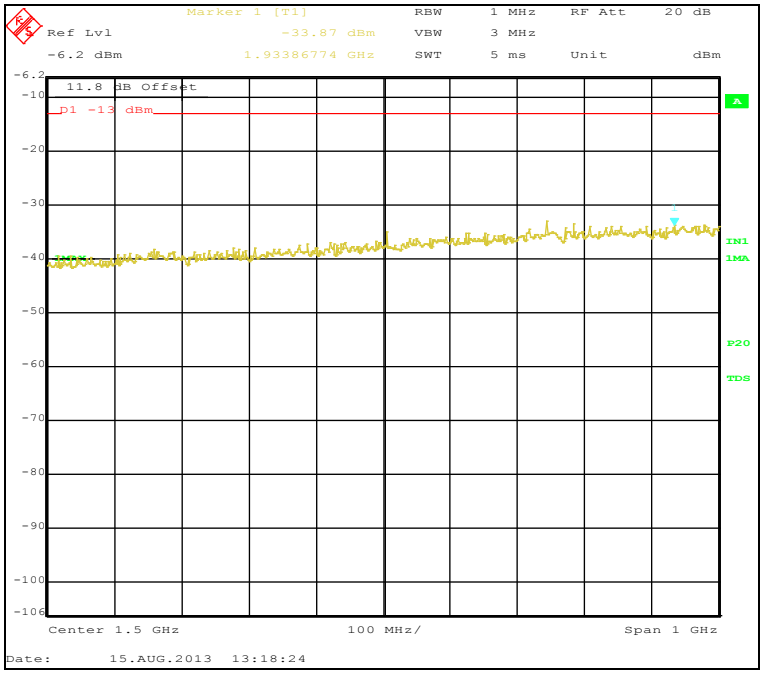
Plot 111. Radiated Spurious Emissions, Channel 4, Power Level 100, C4FM, 30 MHz – 1 GHz



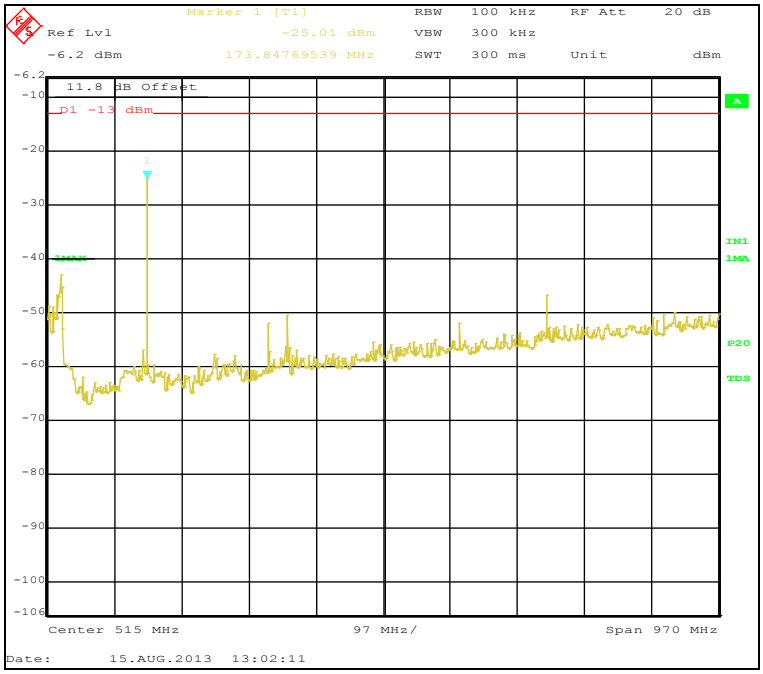
Plot 112. Radiated Spurious Emissions, Channel 4, Power Level 100, C4FM, 1 GHz – 2 GHz



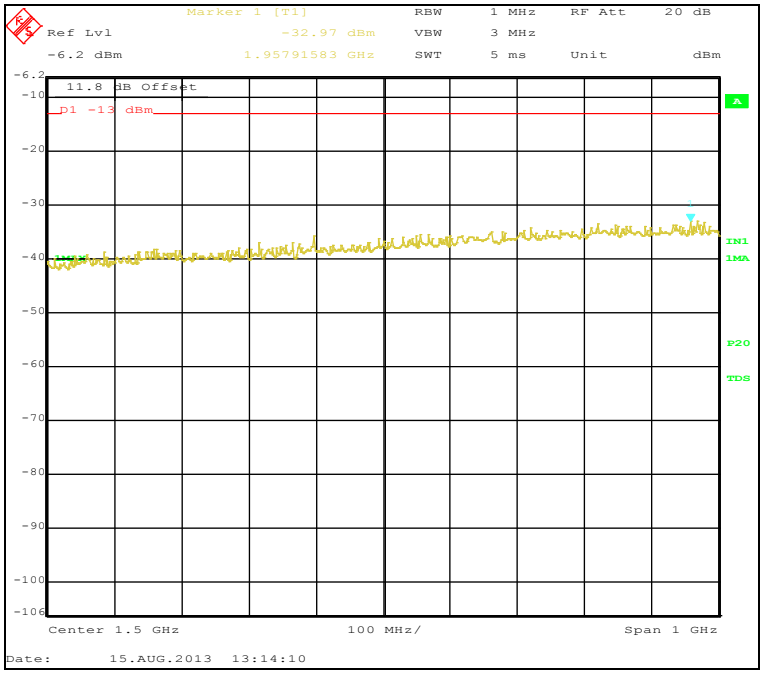
Plot 113. Radiated Spurious Emissions, Channel 4, Power Level 10, CQPSK, 30 MHz – 1 GHz



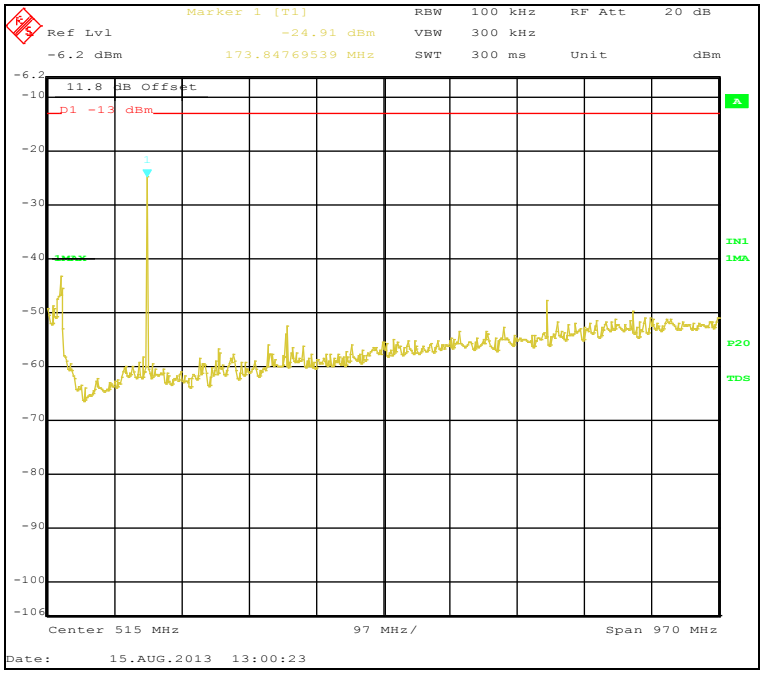
Plot 114. Radiated Spurious Emissions, Channel 4, Power Level 10, CQPSK, 1 GHz – 2 GHz



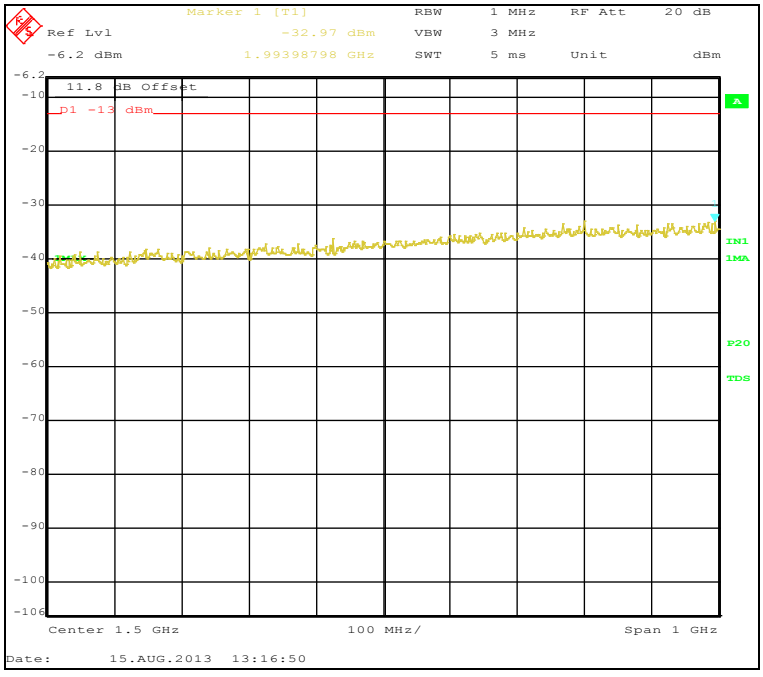
Plot 115. Radiated Spurious Emissions, Channel 4, Power Level 100, CQPSK, 30 MHz – 1 GHz



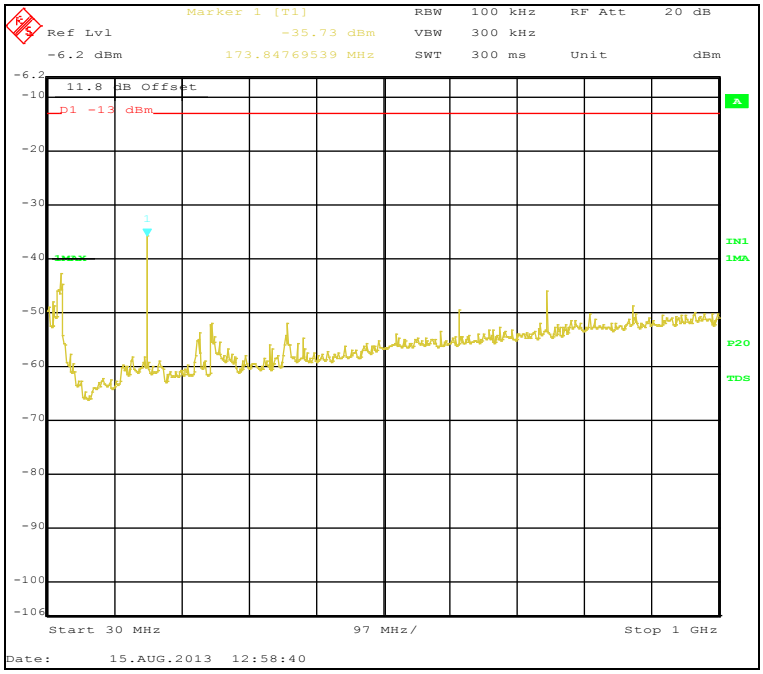
Plot 116. Radiated Spurious Emissions, Channel 4, Power Level 100, CQPSK, 1 GHz – 2 GHz



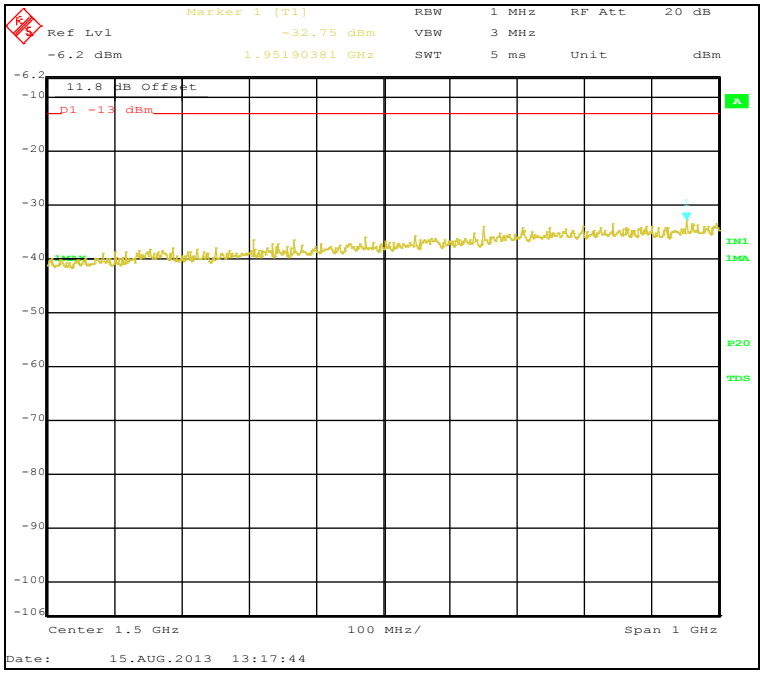
Plot 117. Radiated Spurious Emissions, Channel 4, Power Level 10, HDQPSK, 30 MHz – 1 GHz



Plot 118. Radiated Spurious Emissions, Channel 4, Power Level 10, HDQPSK, 1 GHz – 2 GHz



Plot 119. Radiated Spurious Emissions, Channel 4, Power Level 100, HDQPSK, 30 MHz – 1 GHz



Plot 120. Radiated Spurious Emissions, Channel 4, Power Level 100, HDQPSK, 1 GHz – 2 GHz

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 2.1051 Spurious Emissions at Antenna Terminals

Test Requirement(s):

§ 2.1051 Measurements required: Spurious emissions at antenna terminals: The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in § 2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

§ 22.359 Emission masks: Unless otherwise indicated in the rules governing a specific radio service, all transmitters intended for use in the Public Mobile Services must be designed to comply with the emission masks outlined in this section. If an emission outside of the authorized bandwidth causes harmful interference, the FCC may, at its discretion, require greater attenuation than specified in this section.

Test Procedures:

The transmitter port was connected through suitable attenuation to a spectrum analyzer for the following measurements.

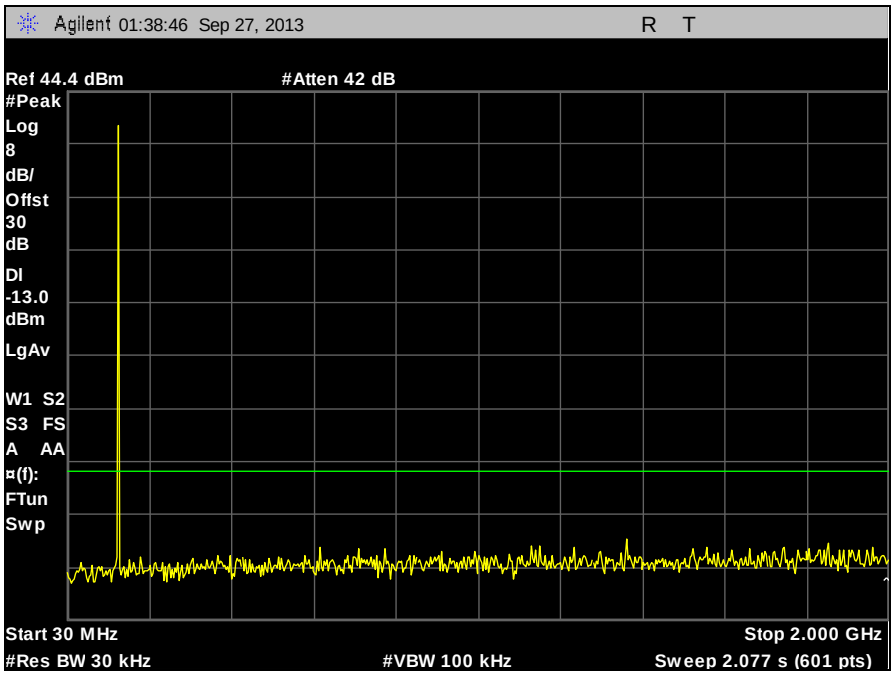
§ 22.359 (b) *Measurement procedure.* Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 30 kHz or more. In the 60 kHz bands immediately outside and adjacent to the authorized frequency range or channel, a resolution bandwidth of at least 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 Results: The EUT was compliant with the requirements of this section.

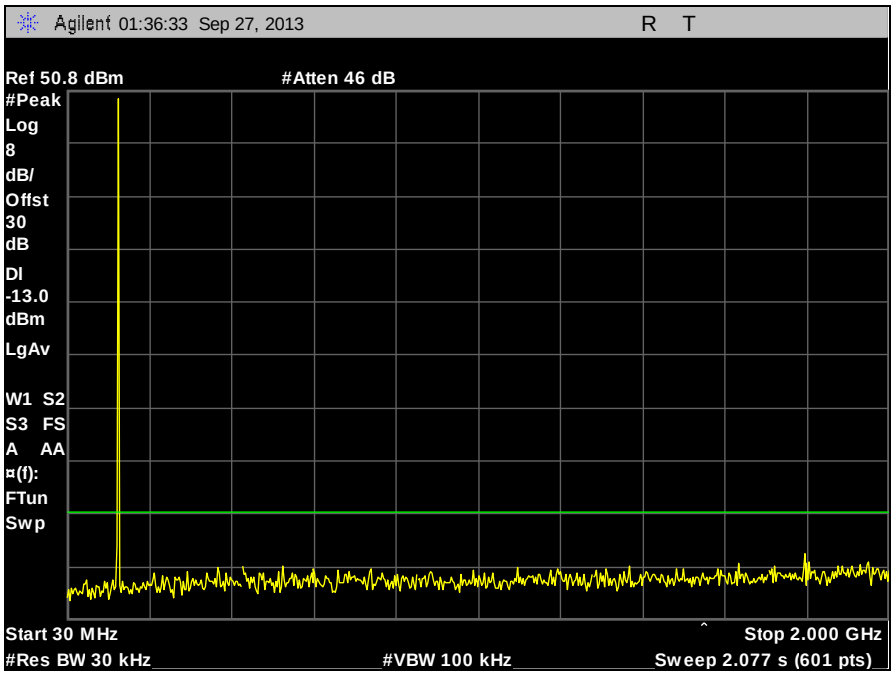
Test Engineer(s): Benjamin Taylor

Test Date(s): 08/14/13 & 08/16/13

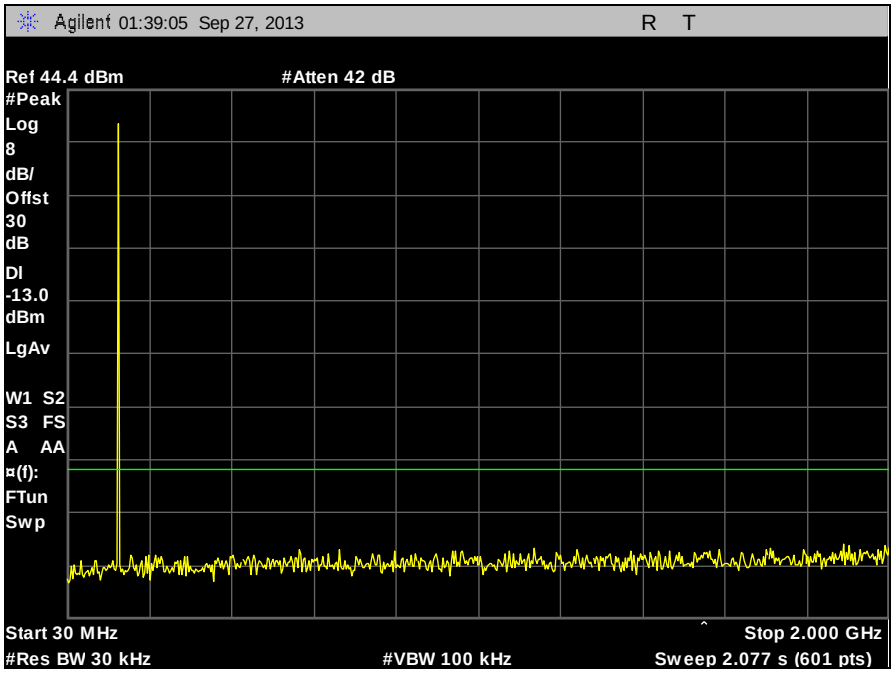
Part 22



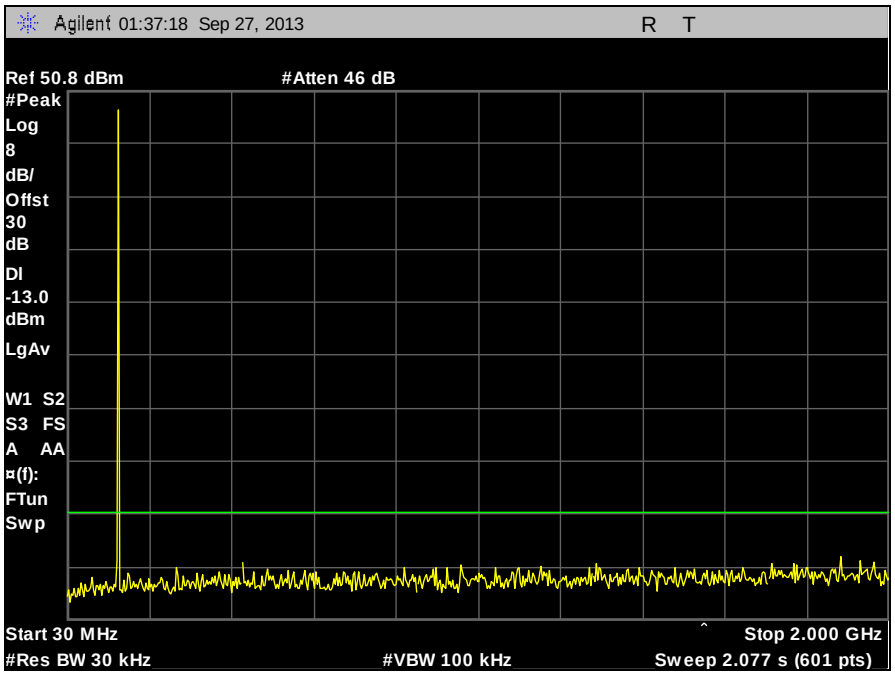
Plot 121. Spurious Emissions at Antenna Terminals, 150 MHz, C4FM, 10W



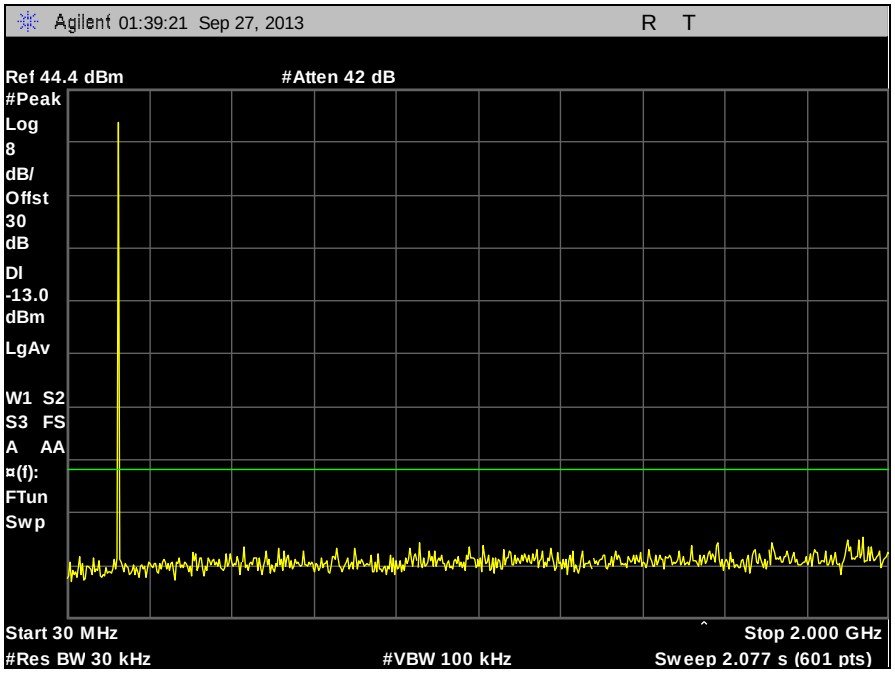
Plot 122. Spurious Emissions at Antenna Terminals, 150 MHz, C4FM, 100W



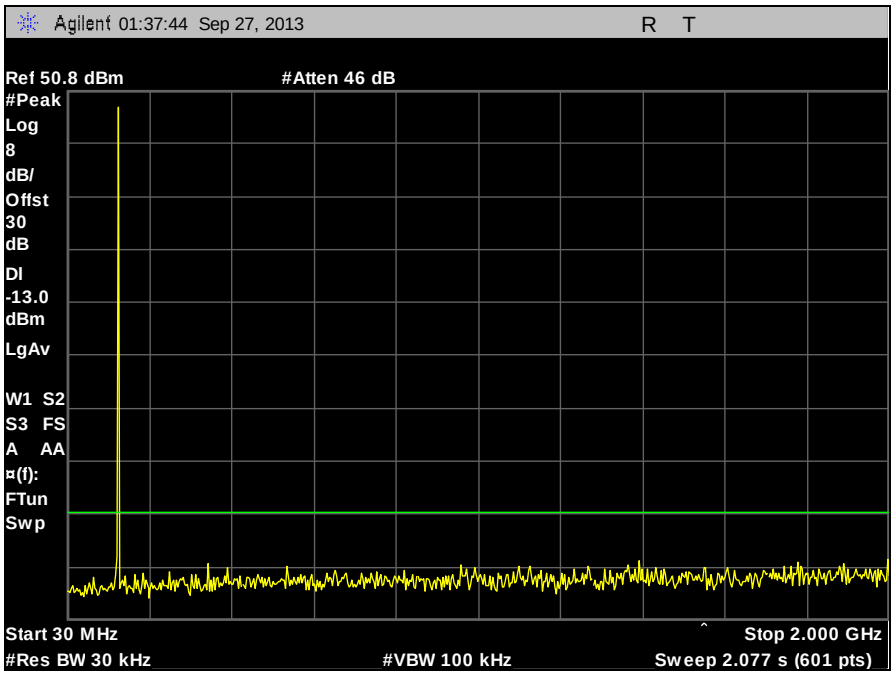
Plot 123. Spurious Emissions at Antenna Terminals, 150 MHz, CQPSK, 10W



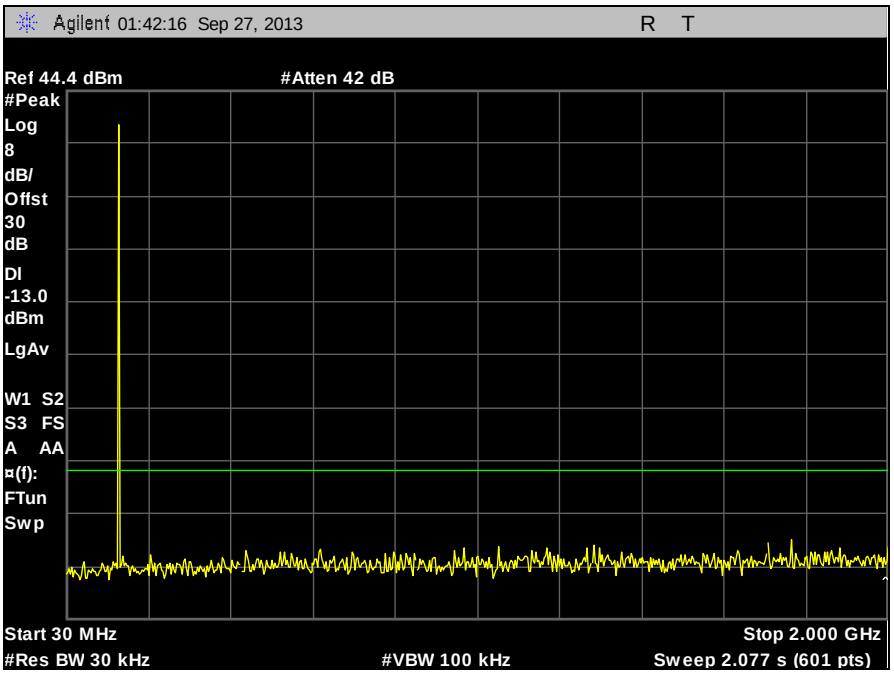
Plot 124. Spurious Emissions at Antenna Terminals, 150 MHz, CQPSK, 100W



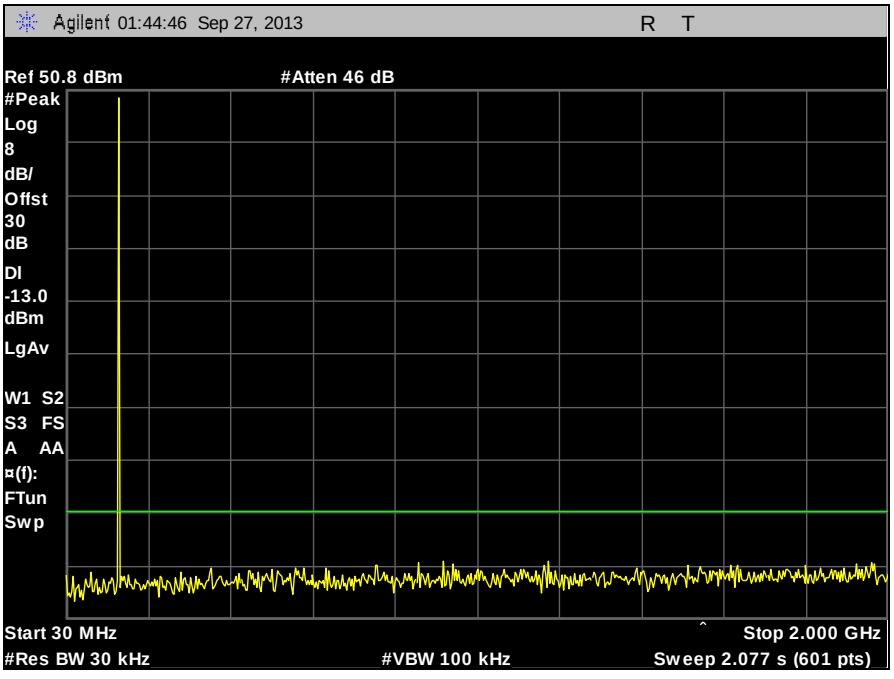
Plot 125. Spurious Emissions at Antenna Terminals, 150 MHz, HDQPSK, 10W



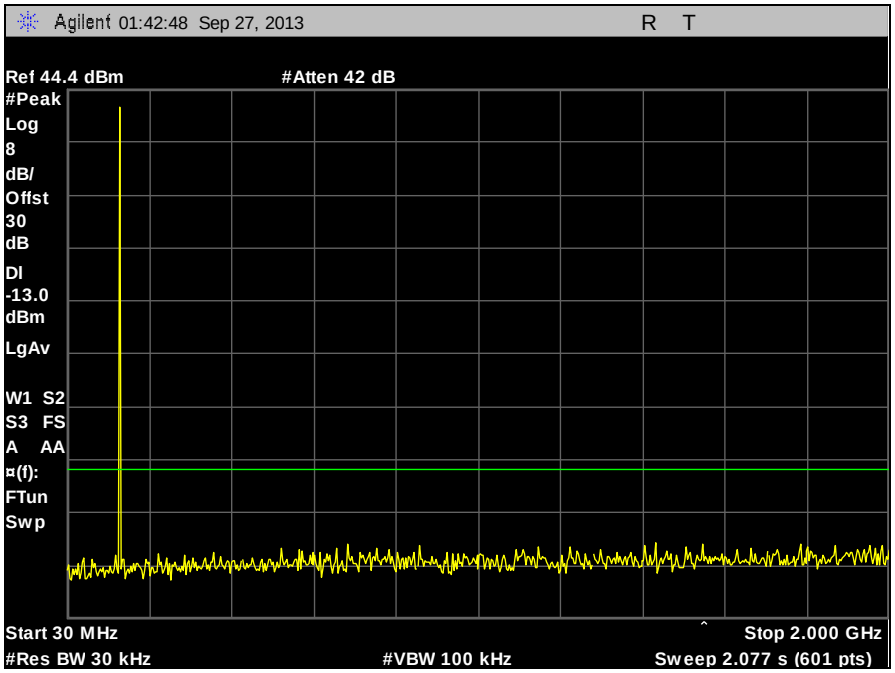
Plot 126. Spurious Emissions at Antenna Terminals, 150 MHz, HDQPSK, 100W



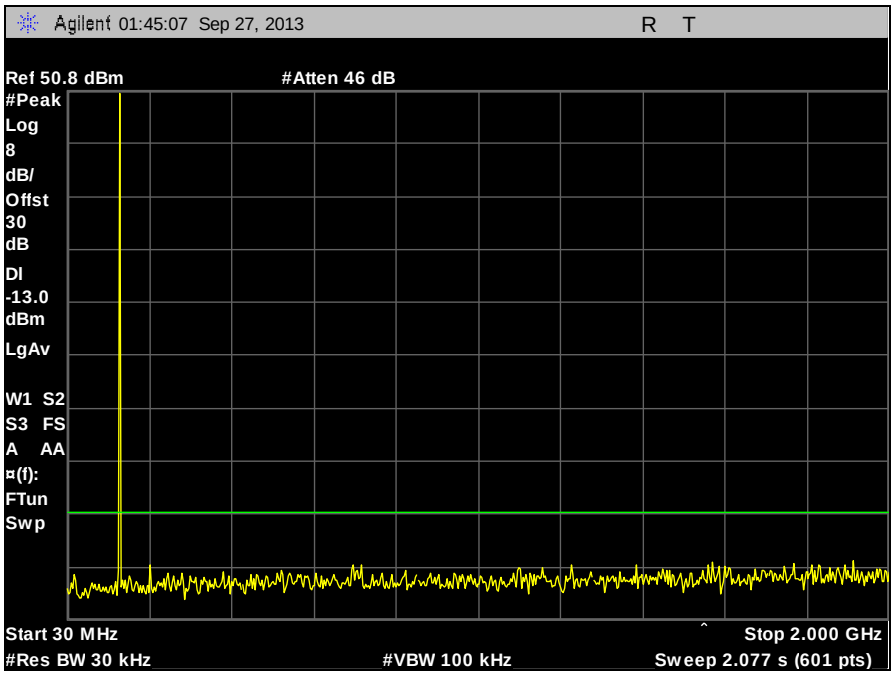
Plot 127. Spurious Emissions at Antenna Terminals, 156 MHz, C4FM, 10W



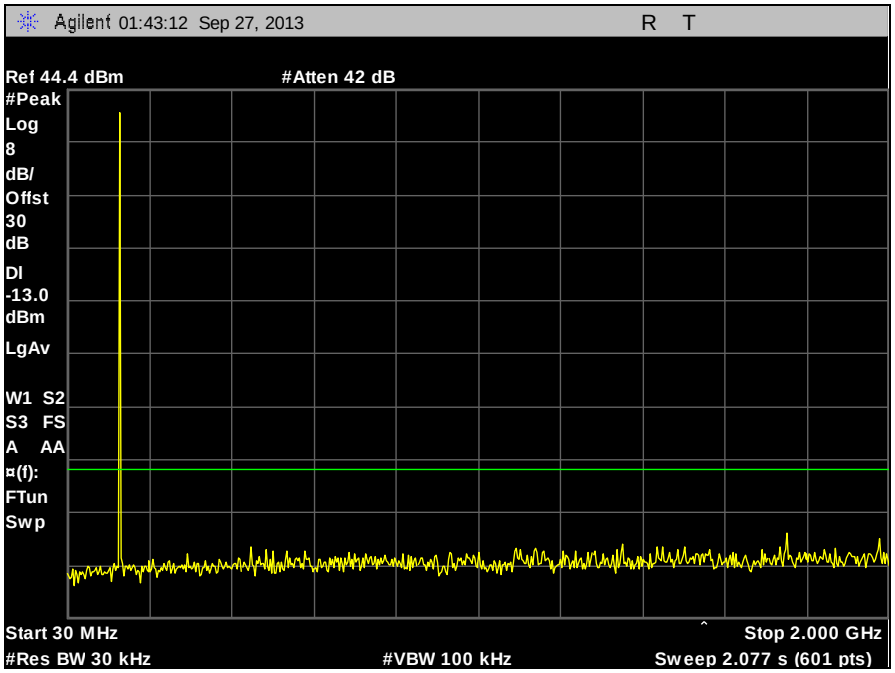
Plot 128. Spurious Emissions at Antenna Terminals, 156 MHz, C4FM, 100W



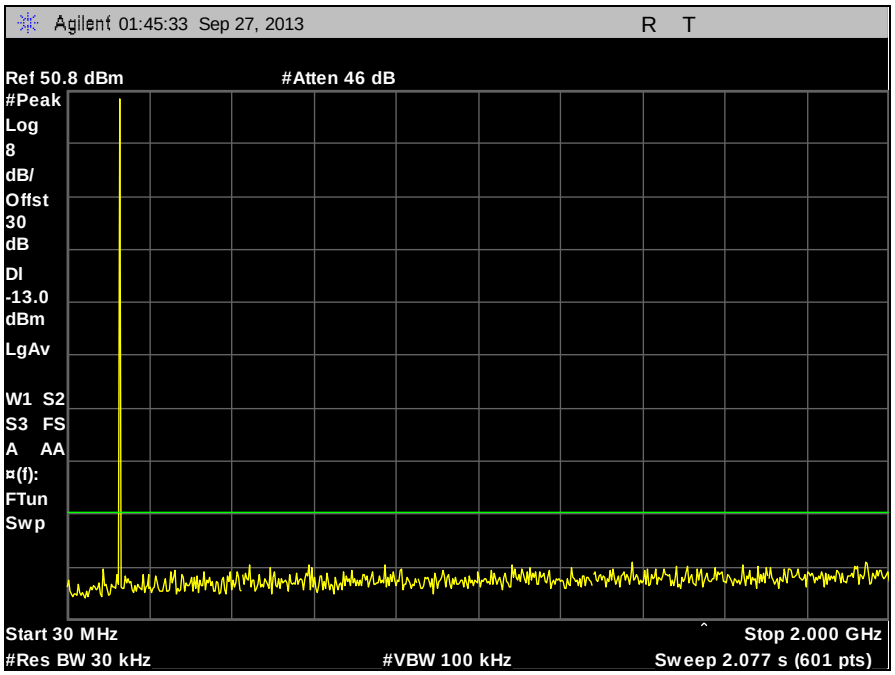
Plot 129. Spurious Emissions at Antenna Terminals, 156 MHz, CQPSK, 10W



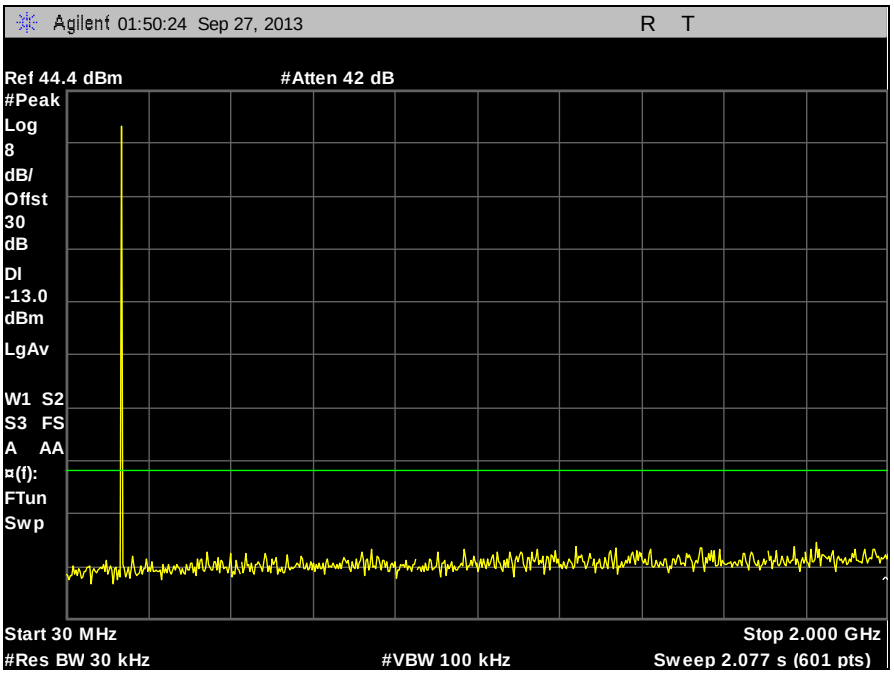
Plot 130. Spurious Emissions at Antenna Terminals, 156 MHz, CQPSK, 100W



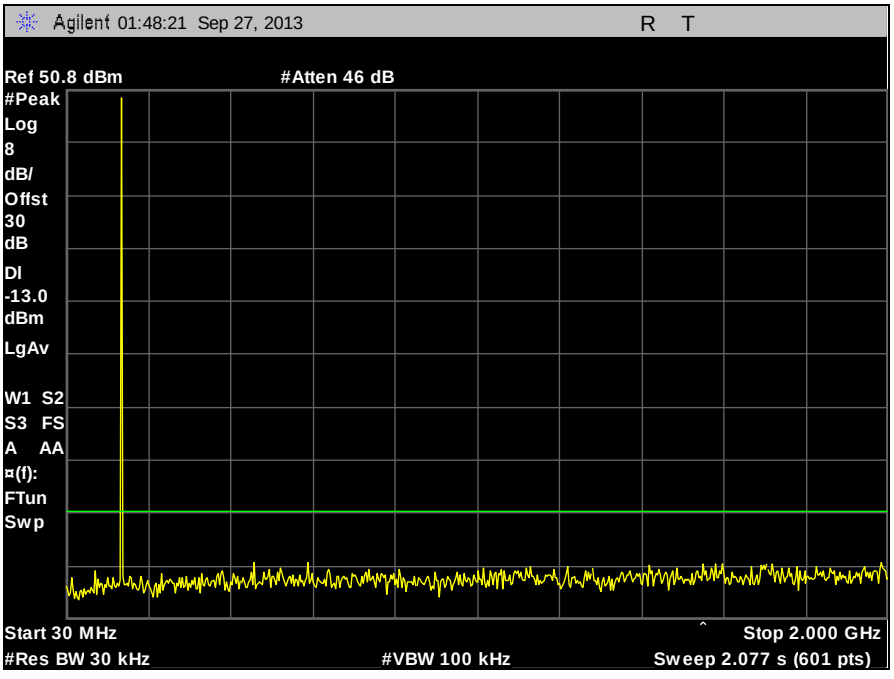
Plot 131. Spurious Emissions at Antenna Terminals, 156 MHz, HDQPSK, 10W



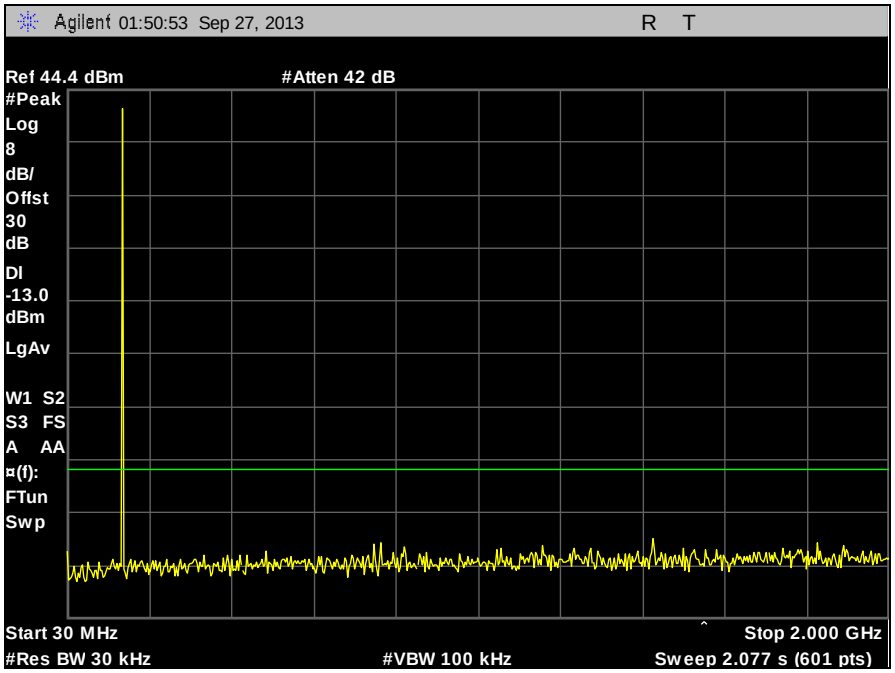
Plot 132. Spurious Emissions at Antenna Terminals, 156 MHz, HDQPSK, 100W



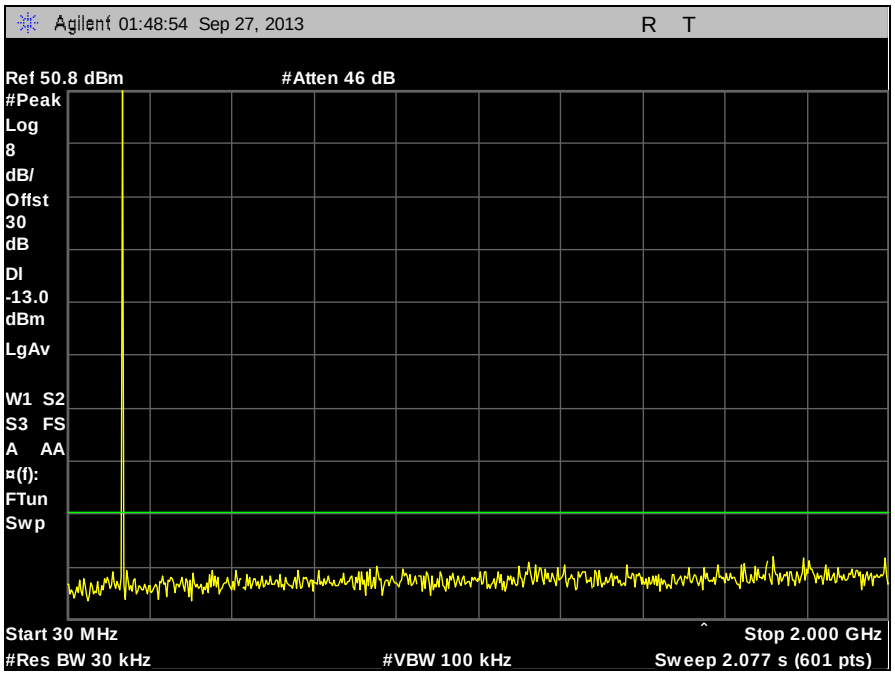
Plot 133. Spurious Emissions at Antenna Terminals, 160 MHz, C4FM, 10W



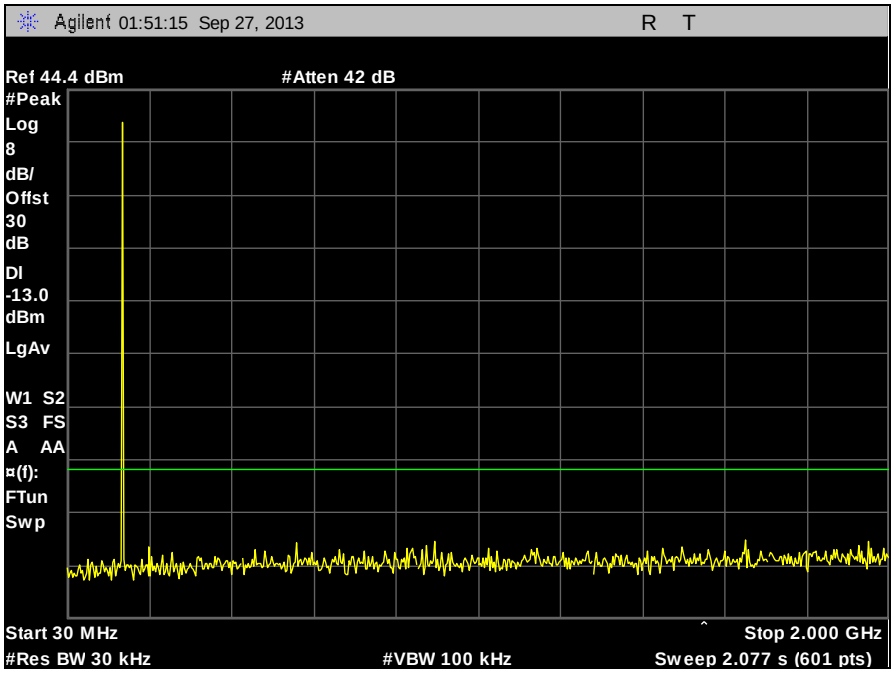
Plot 134. Spurious Emissions at Antenna Terminals, 160 MHz, C4FM, 100W



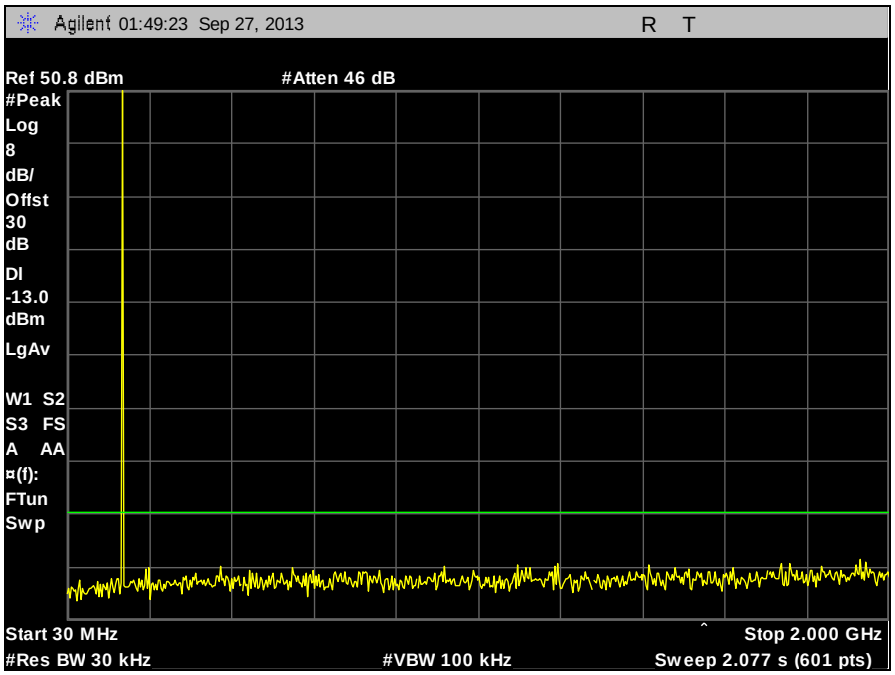
Plot 135. Spurious Emissions at Antenna Terminals, 160 MHz, CQPSK, 10W



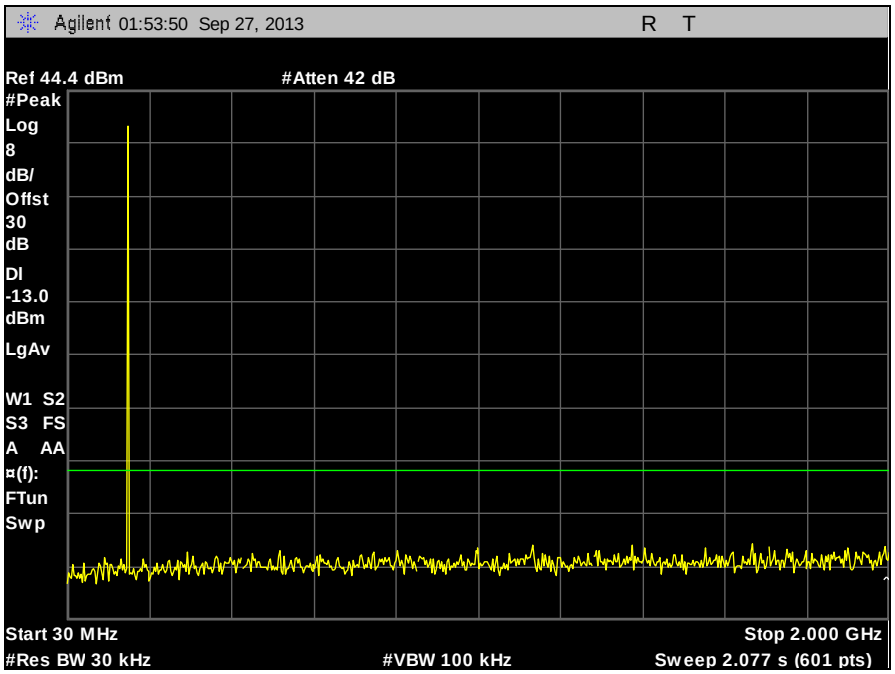
Plot 136. Spurious Emissions at Antenna Terminals, 160 MHz, CQPSK, 100W



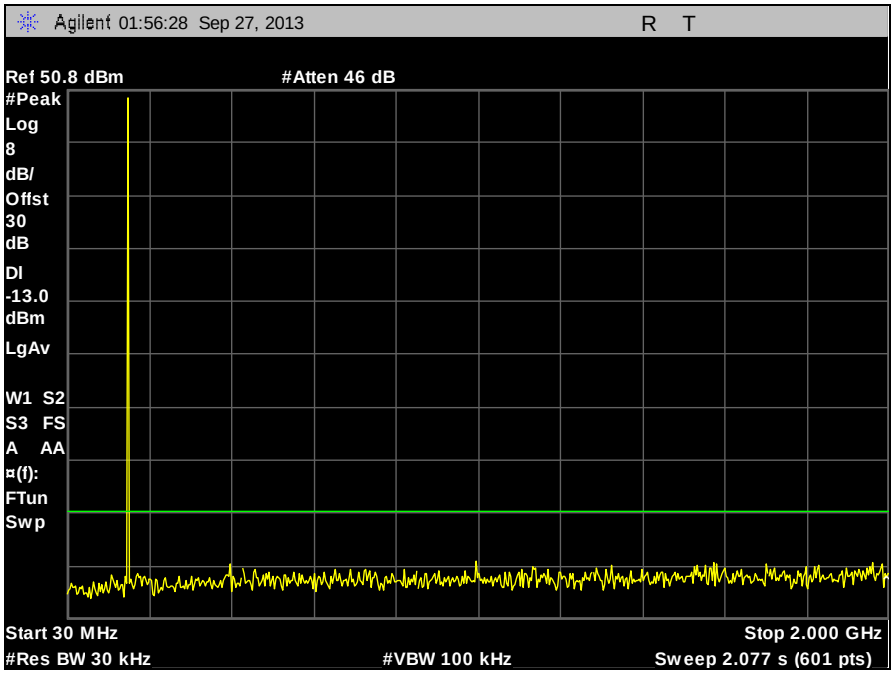
Plot 137. Spurious Emissions at Antenna Terminals, 160 MHz, HDQPSK, 10W



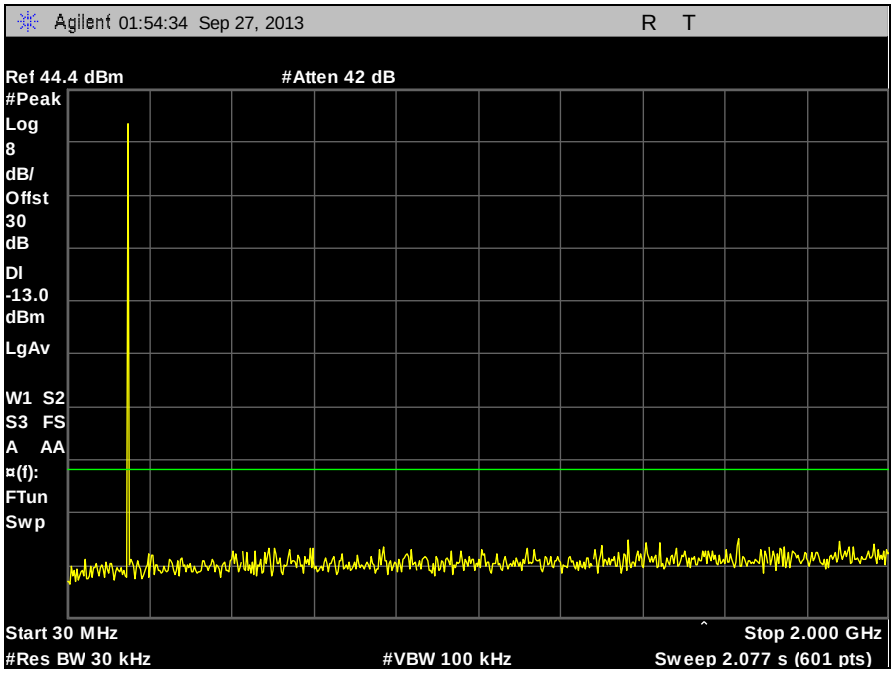
Plot 138. Spurious Emissions at Antenna Terminals, 160 MHz, HDQPSK, 100W



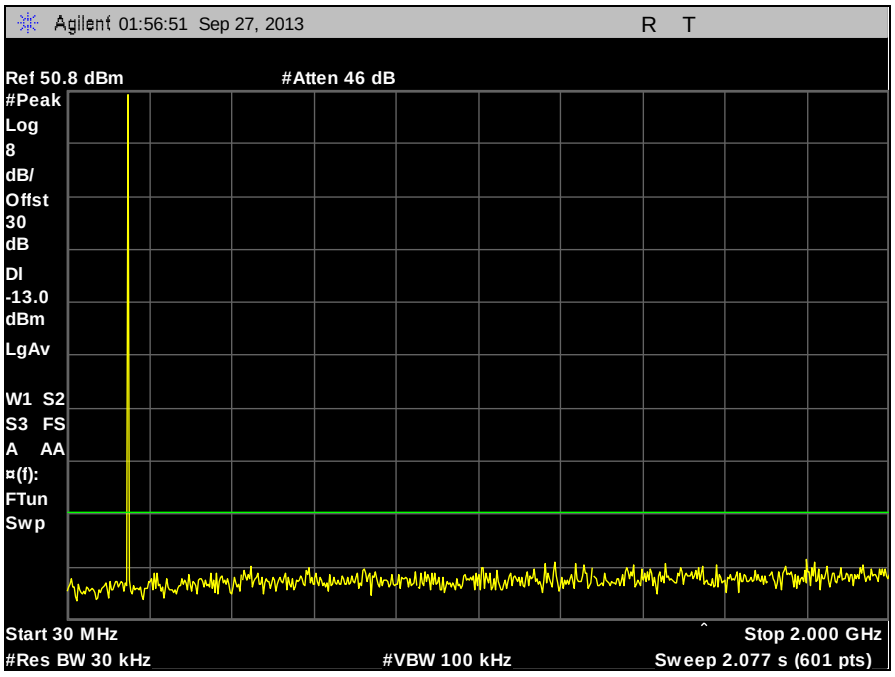
Plot 139. Spurious Emissions at Antenna Terminals, 173 MHz, C4FM, 10W



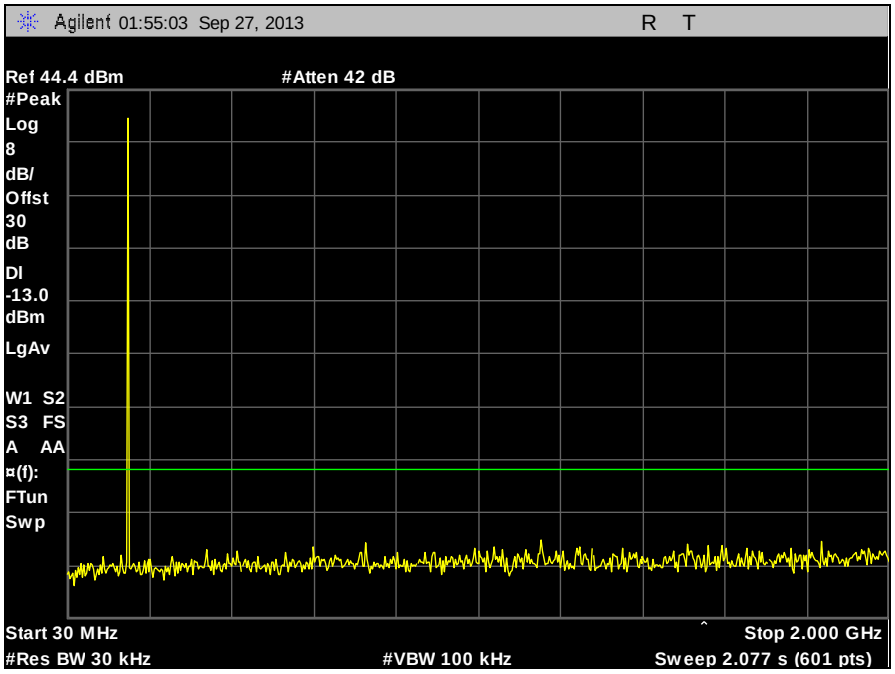
Plot 140. Spurious Emissions at Antenna Terminals, 173 MHz, C4FM, 100W



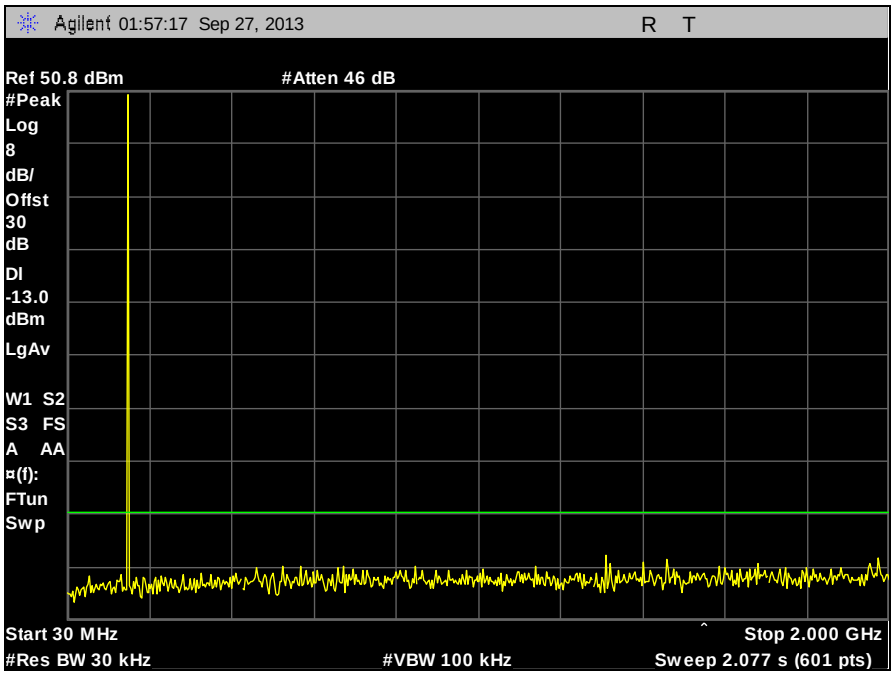
Plot 141. Spurious Emissions at Antenna Terminals, 173 MHz, CQPSK, 10W



Plot 142. Spurious Emissions at Antenna Terminals, 173 MHz, CQPSK, 100W

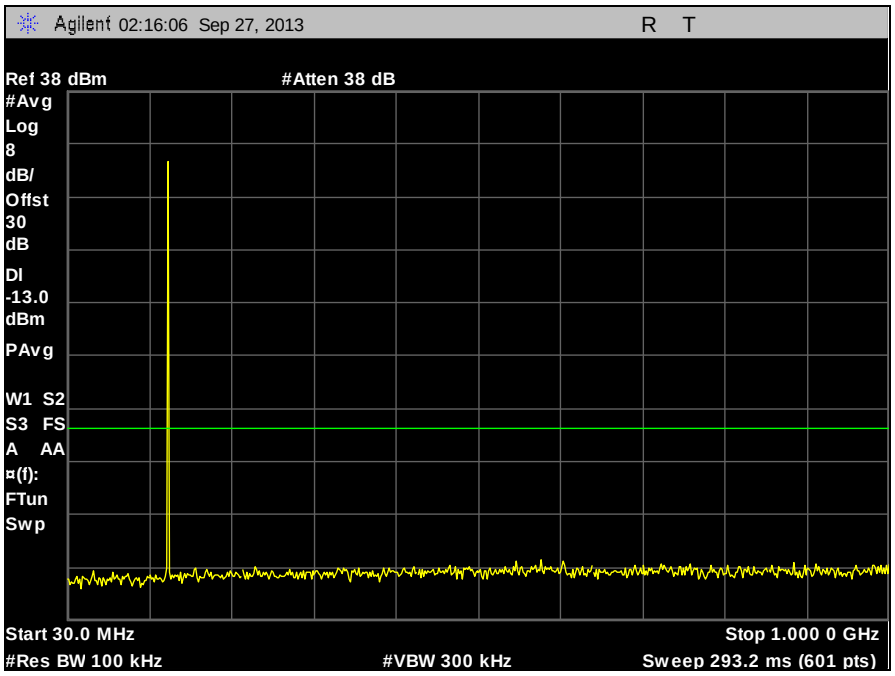


Plot 143. Spurious Emissions at Antenna Terminals, 173 MHz, HDQPSK, 10W

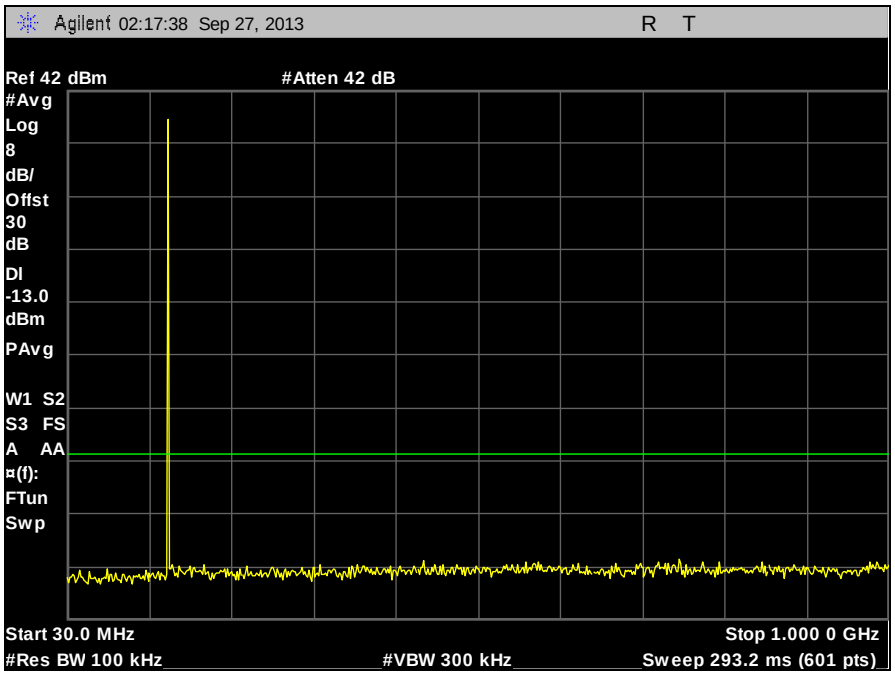


Plot 144. Spurious Emissions at Antenna Terminals, 173 MHz, HDQPSK, 100W

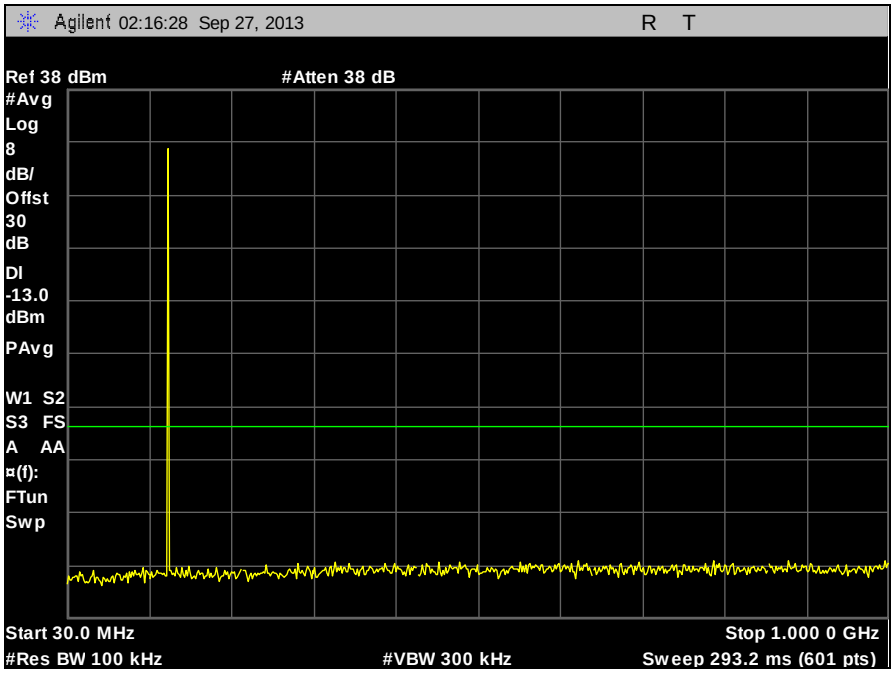
Part 80



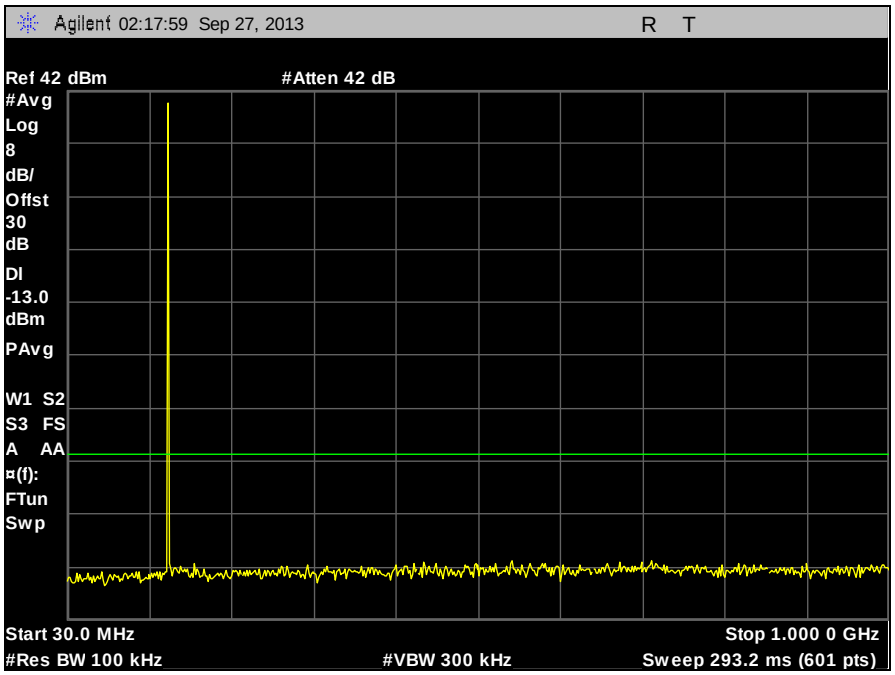
Plot 145. Spurious Emissions at Antenna Terminals, 150 MHz, C4FM, 10W



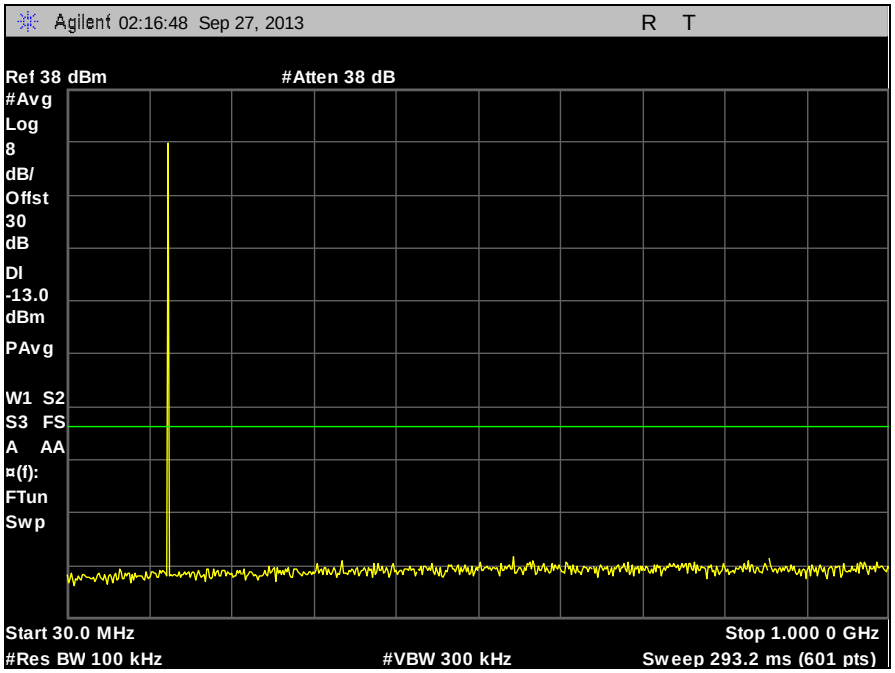
Plot 146. Spurious Emissions at Antenna Terminals, 150 MHz, C4FM, 100W



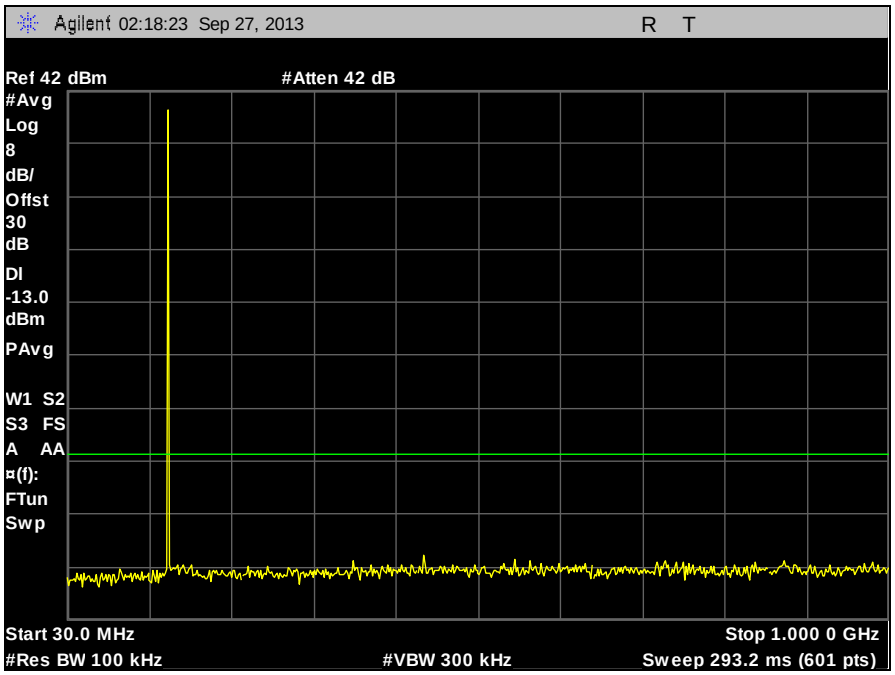
Plot 147. Spurious Emissions at Antenna Terminals, 150 MHz, CQPSK, 10W



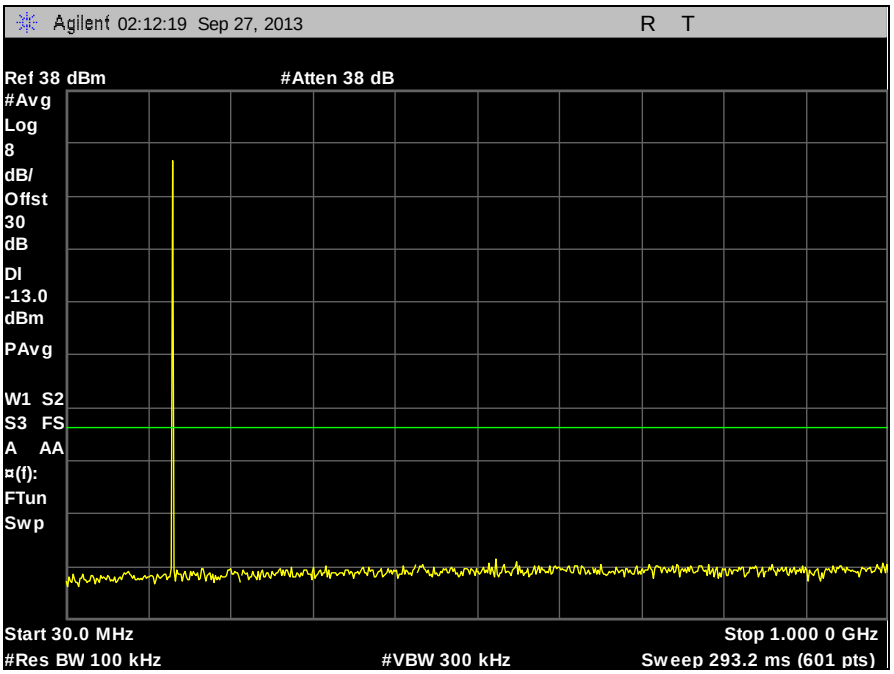
Plot 148. Spurious Emissions at Antenna Terminals, 150 MHz, CQPSK, 100W



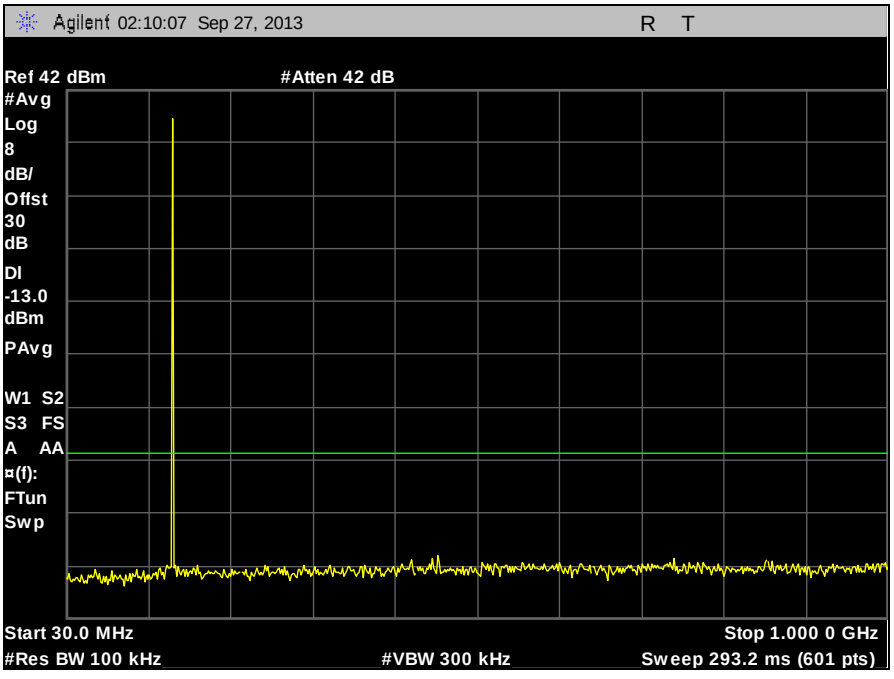
Plot 149. Spurious Emissions at Antenna Terminals, 150 MHz, HDQPSK, 10W



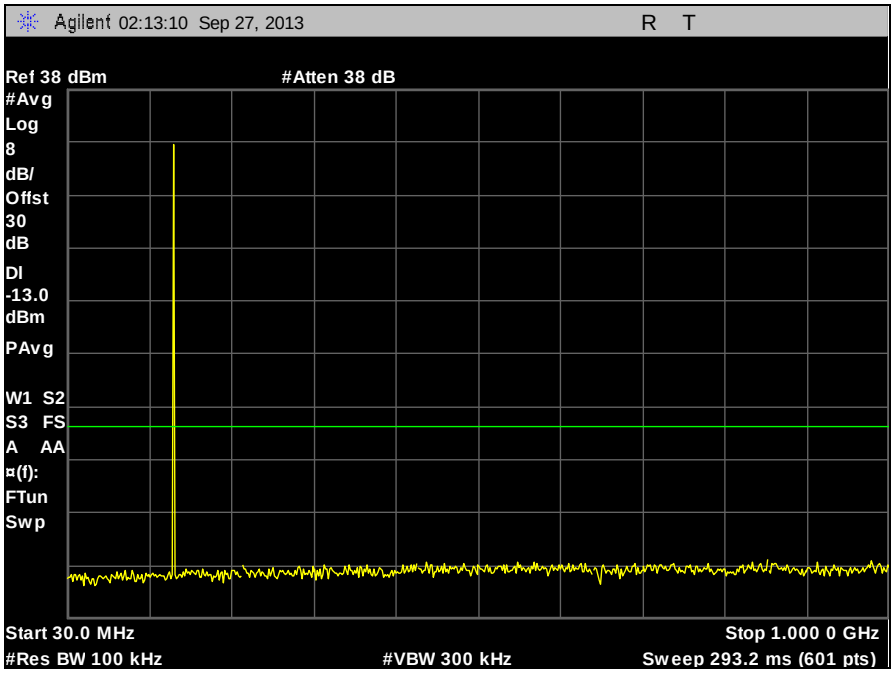
Plot 150. Spurious Emissions at Antenna Terminals, 150 MHz, HDQPSK, 100W



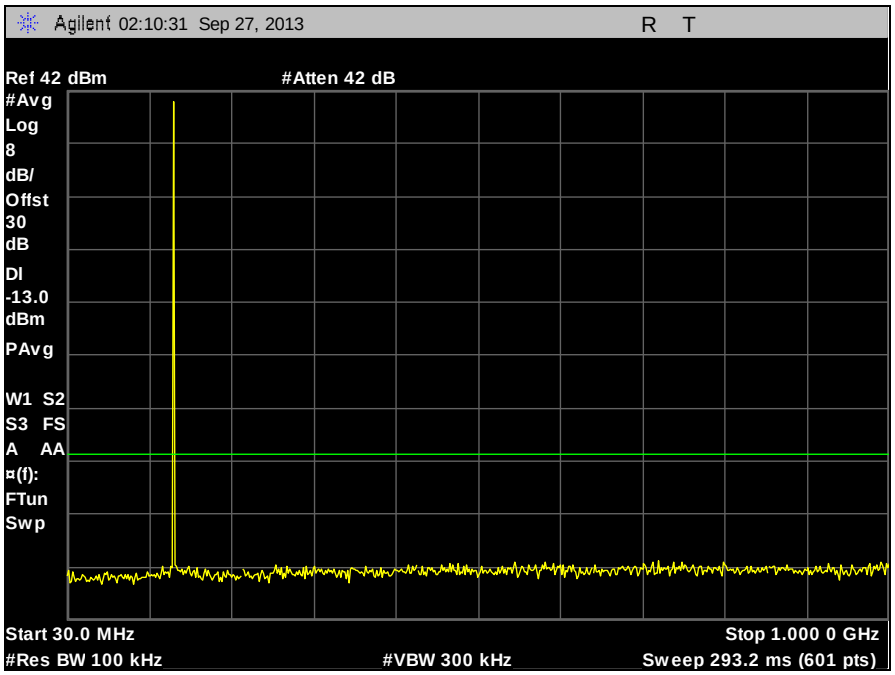
Plot 151. Spurious Emissions at Antenna Terminals, 156 MHz, C4FM, 10W



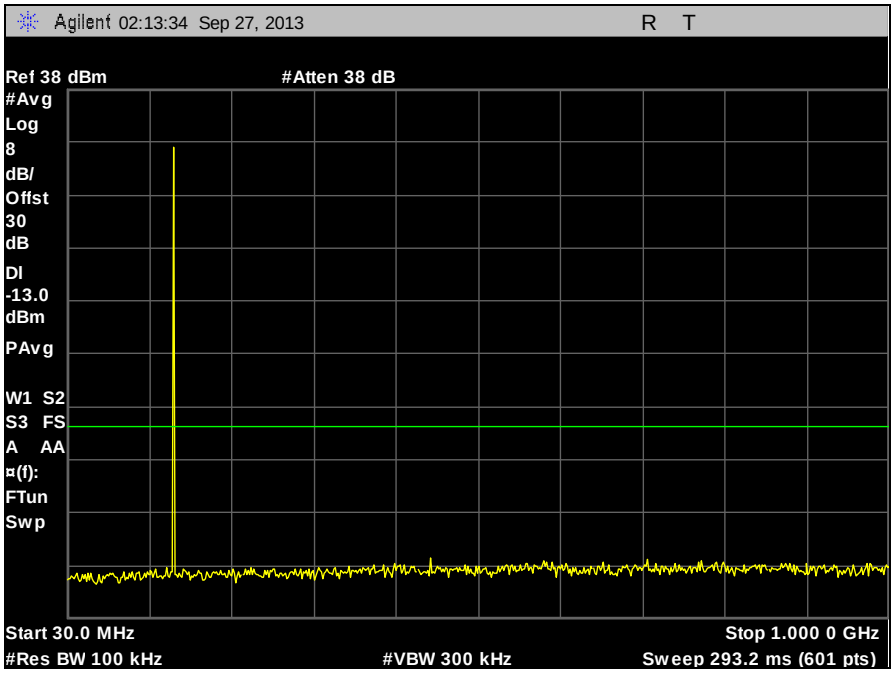
Plot 152. Spurious Emissions at Antenna Terminals, 156 MHz, C4FM, 100W



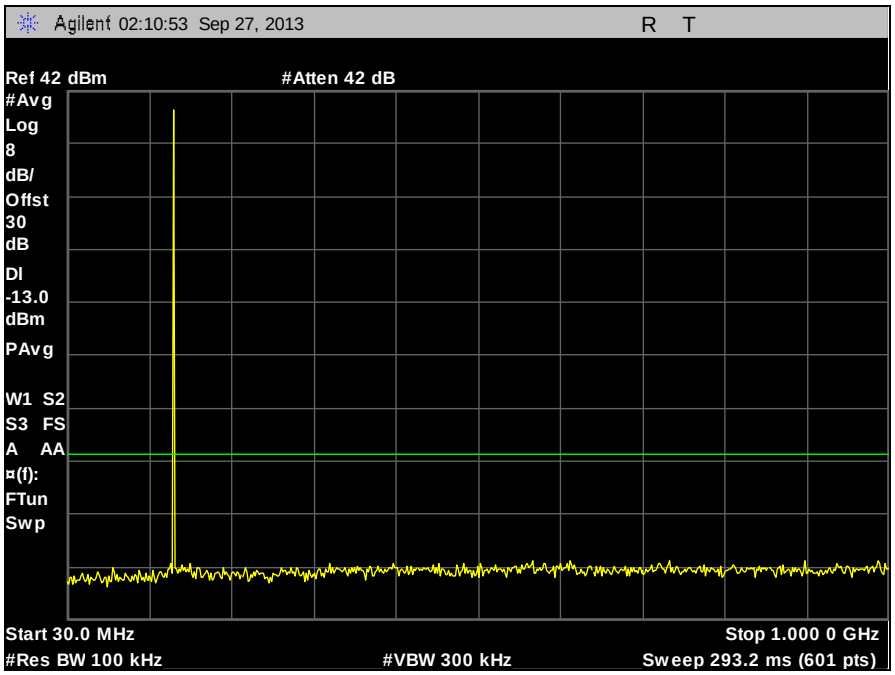
Plot 153. Spurious Emissions at Antenna Terminals, 156 MHz, CQPSK, 10W



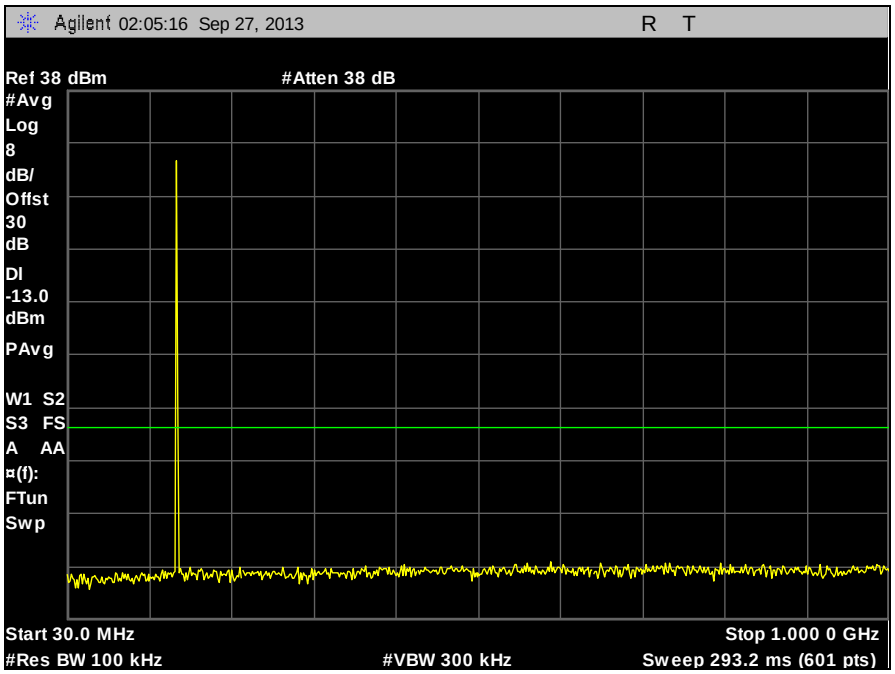
Plot 154. Spurious Emissions at Antenna Terminals, 156 MHz, CQPSK, 100W



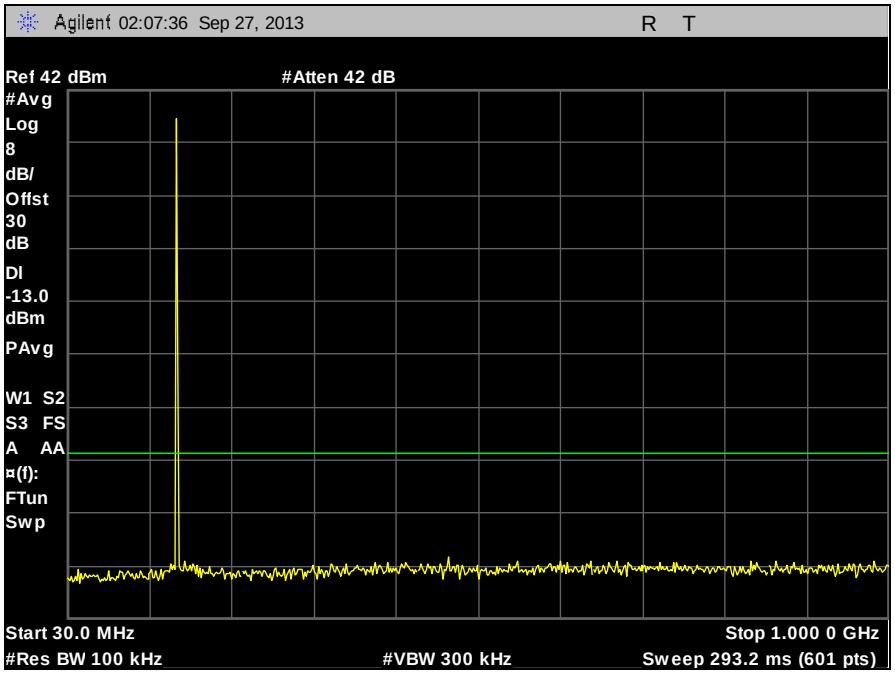
Plot 155. Spurious Emissions at Antenna Terminals, 156 MHz, HDQPSK, 10W



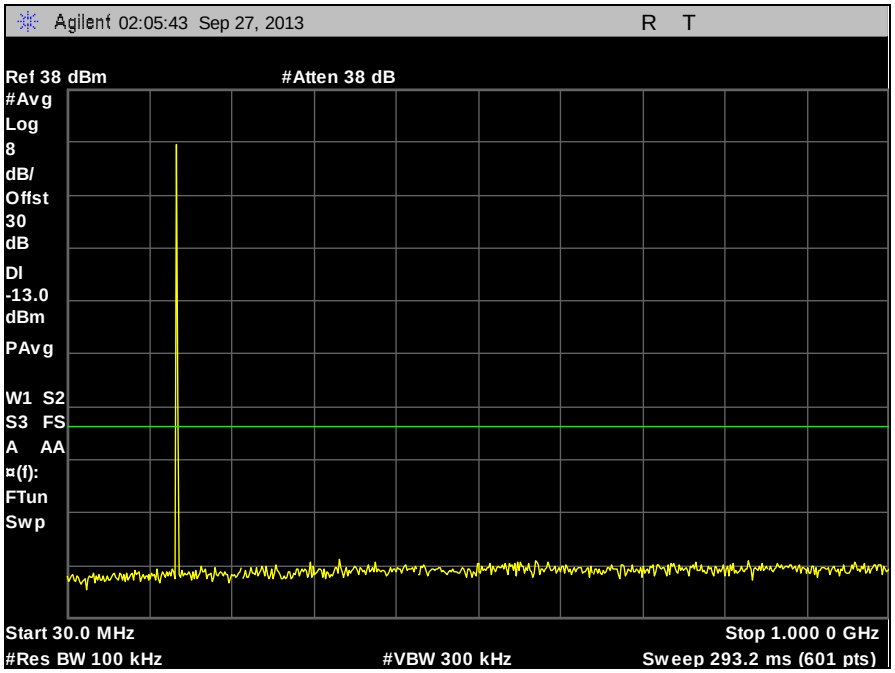
Plot 156. Spurious Emissions at Antenna Terminals, 156 MHz, HDQPSK, 100W



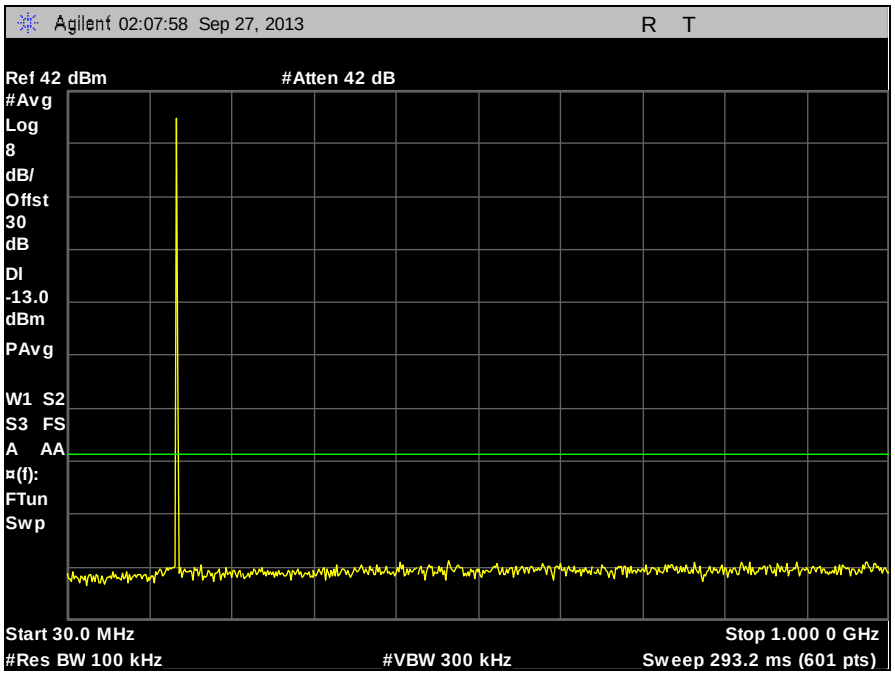
Plot 157. Spurious Emissions at Antenna Terminals, 160 MHz, C4FM, 10W



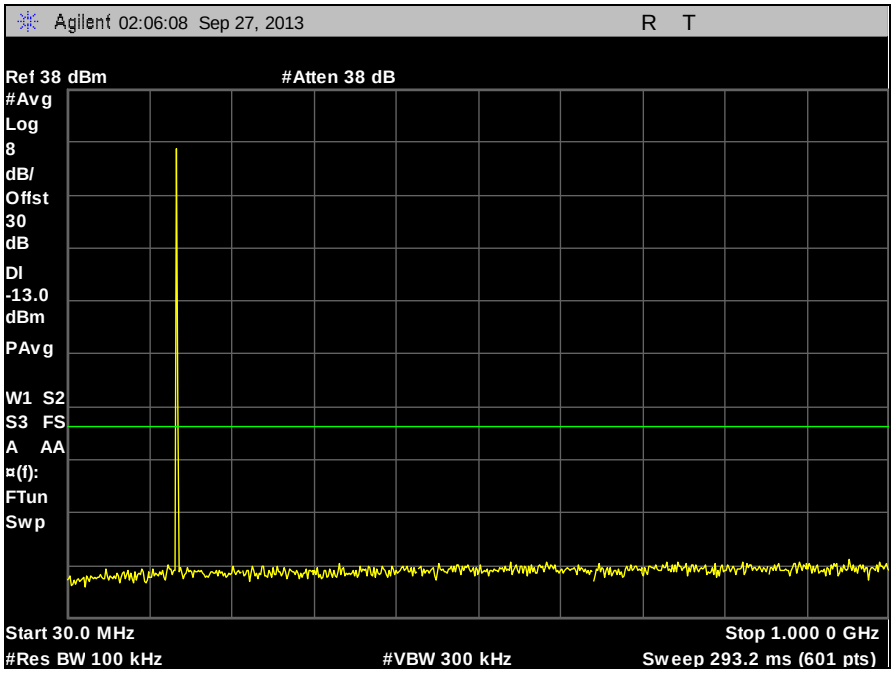
Plot 158. Spurious Emissions at Antenna Terminals, 160 MHz, C4FM, 100W



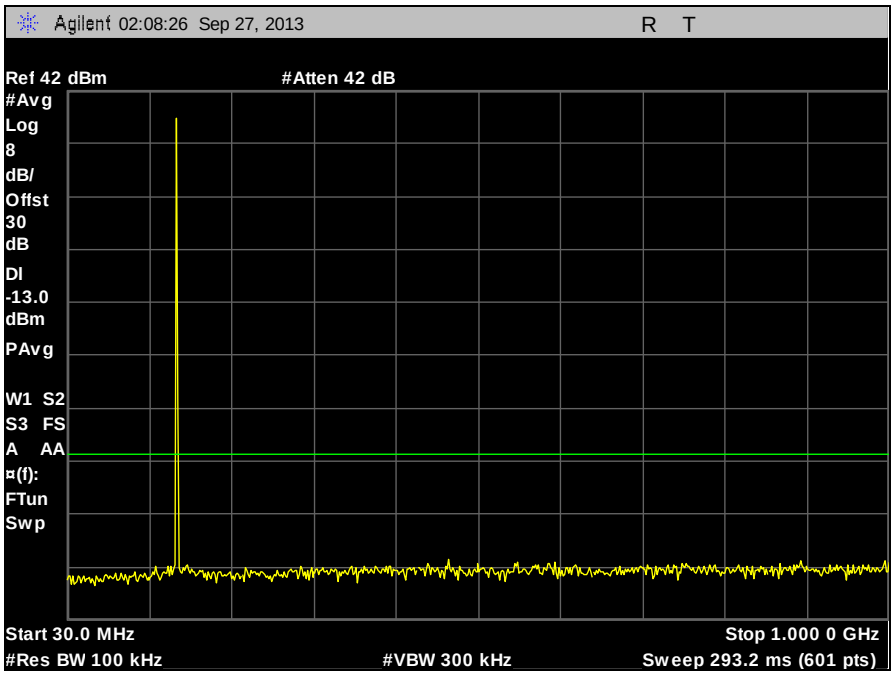
Plot 159. Spurious Emissions at Antenna Terminals, 160 MHz, CQPSK, 10W



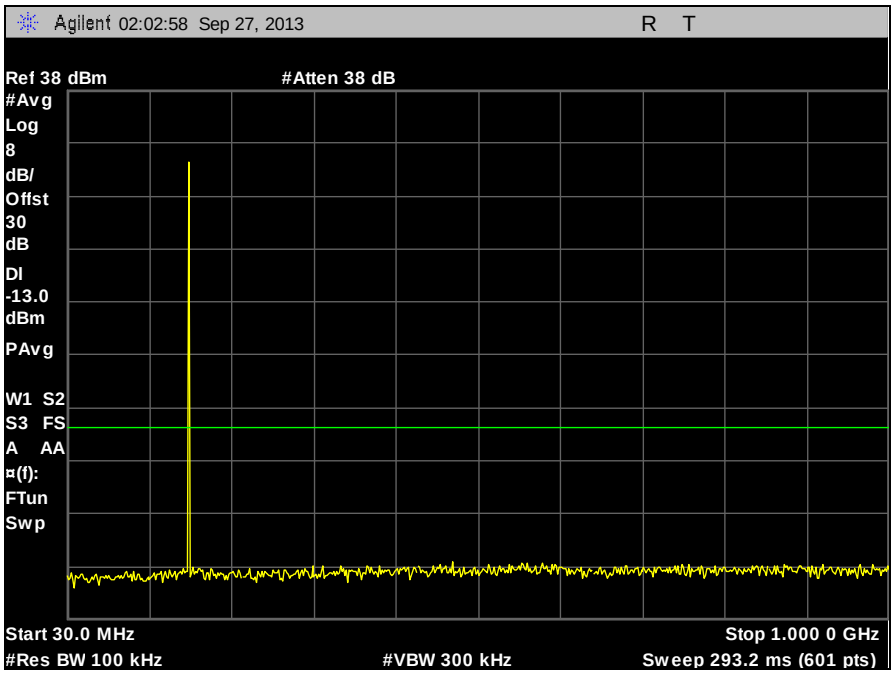
Plot 160. Spurious Emissions at Antenna Terminals, 160 MHz, CQPSK, 100W



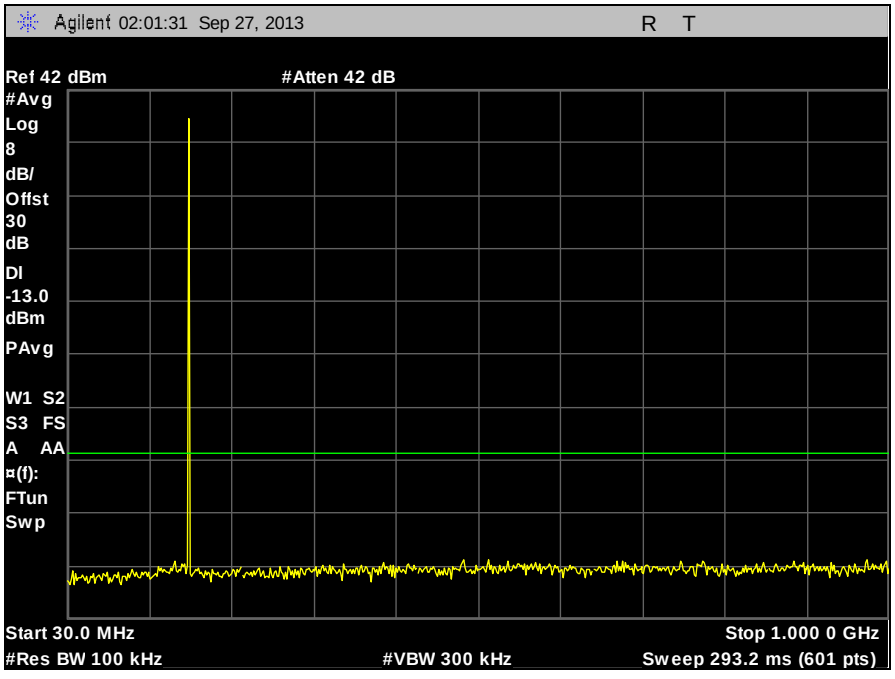
Plot 161. Spurious Emissions at Antenna Terminals, 160 MHz, HDQPSK, 10W



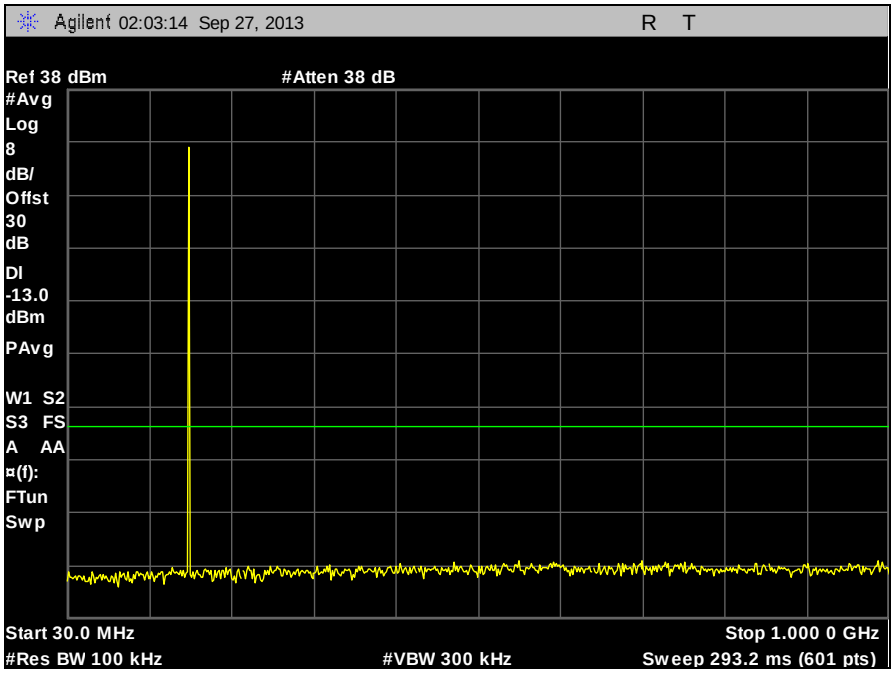
Plot 162. Spurious Emissions at Antenna Terminals, 160 MHz, HDQPSK, 100W



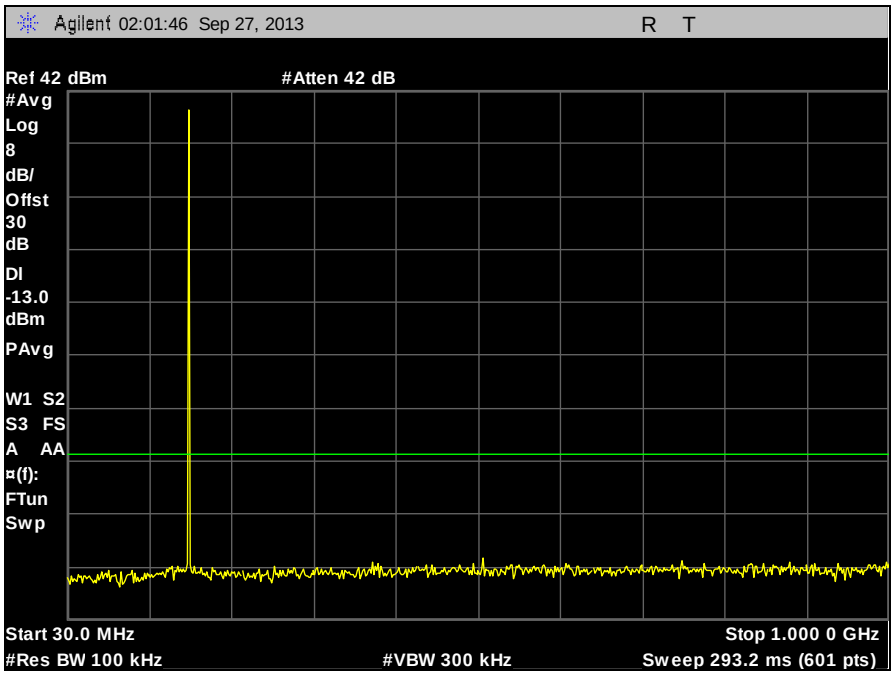
Plot 163. Spurious Emissions at Antenna Terminals, 173 MHz, C4FM, 10W



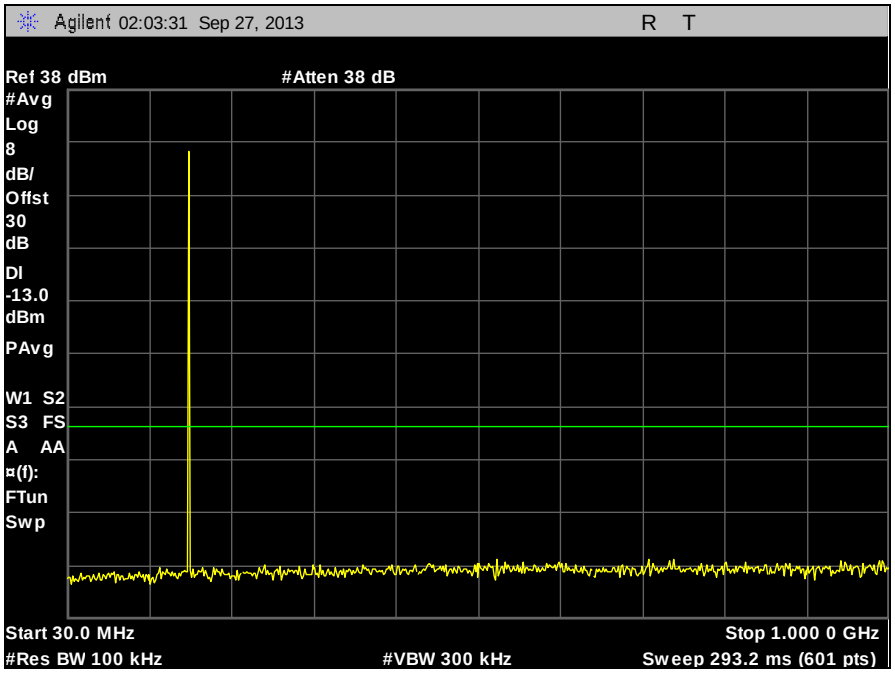
Plot 164. Spurious Emissions at Antenna Terminals, 173 MHz, C4FM, 100W



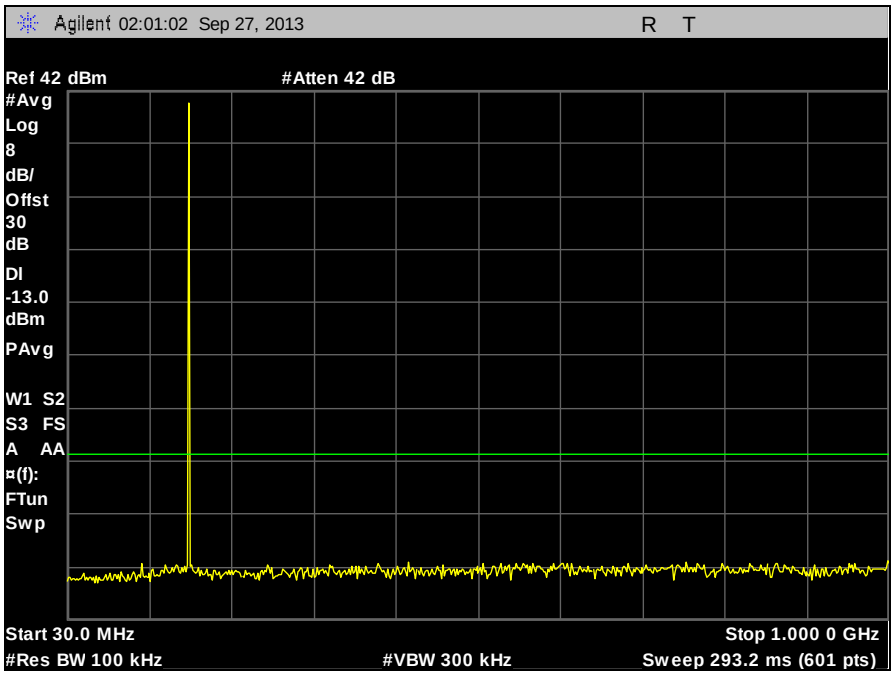
Plot 165. Spurious Emissions at Antenna Terminals, 173 MHz, CQPSK, 10W



Plot 166. Spurious Emissions at Antenna Terminals, 173 MHz, CQPSK, 100W



Plot 167. Spurious Emissions at Antenna Terminals, 173 MHz, HDQPSK, 10W



Plot 168. Spurious Emissions at Antenna Terminals, 173 MHz, HDQPSK, 100W

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 equipments are 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): Benjamin Taylor

Test Date(s): 08/16/13

Temperature (degree Celcius)	AC Voltage	Frequency Drift (ppm)	Frequency Drift (Hz)
-30	120	0.053	7.95066E-06
-20	120	0.033	4.95041E-06
-10	120	0.033	4.95041E-06
0	120	0.033	4.95041E-06
10	120	0	0
20	102	0.013	1.95016E-06
20	120	- - - -	- - - -
20	138	0.033	4.95041E-06
30	120	0	0
40	120	-0.007	-1.0501E-06
50	120	-0.007	-1.0501E-06
60	120	-0.007	-1.0501E-06

Table 6. Frequency Stability, Test Results

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
1T4612	SPECTRUM ANALYZER	AGILENT TECHNOLOGIES	E4407B	05/23/2012	11/23/2013
1T4300	SEMI-ANECHOIC CHAMBER # 1 (NSA)	EMC TEST SYSTEMS	NONE	07/24/2012	01/24/2014
1T4751	ANTENNA - BILOG	SUNOL SCIENCES	JB6	01/08/2013	07/08/2014
1T4409	EMI RECEIVER	ROHDE & SCHWARZ	ESIB7	07/16/2012	07/16/2014
1T4787	HYGROMETER / THERMOMETER / BAROMETER / DEW POINT PEN	CONTROL COMPANY	15-078-198, FB70423, 245CD	02/15/2012	02/15/2014
1T4818	COMB GENERATOR	COM-POWER	CGO-520	SEE NOTE	

Table 7. 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

