MET Laboratories, Inc. *Safety Certification - EMI - Telecom Environmental Simulation*
914 W. PATAPSCO AVENUE ● BALTIMORE, MARYLAND 21230 ● PHONE (410) 354-3300 ● FAX (410) 354-3313

August 20, 2009

Harris Corporation RF Communications Division
221 Jefferson Ridge Parkway
Lynchburg, VA 24501

Dear Neil Leitch,

Enclosed is the EMC Wireless test report for compliance testing of the Harris Corporation RF Communications Division, MASTR V 700 MHz, tested to the requirements of Title 47 of the Code of Federal Regulations (CFR), Part 90 Subpart for Land Mobile Radio Services, Part 15 Subpart B, and RSS-119, Issue 9, June 2007 for a Class A Digital Device.

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

Sincerely yours,
MET LABORATORIES, INC.

Jennifer Warnell
Documentation Department

Reference: (\Harris Corporation RF Communications Division\EMC26699-FCC90 Rev. 1)

MET Laboratories, Inc. *Safety Certification - EMI - Telecom Environmental Simulation*
914 W. PATAPSCO AVENUE ● BALTIMORE, MARYLAND 21230 ● PHONE (410) 354-3300 ● FAX (410) 354-3313

Electromagnetic Compatibility Criteria Test Report

For the

Harris Corporation RF Communications Division
Model MASTR V 700 MHz

Tested under

The FCC Verification Rules
Contained in Title 47 of the CFR, Part 90
for Private Land Mobile Radio Services,
Part 15, Subpart B and RSS-119, Issue 9, June 2007 for a Class A Digital Device

MET Report: EMC26699-FCC90 Rev. 1

August 20, 2009

Prepared For:
Harris Corporation RF Communications Division
221 Jefferson Ridge Parkway
Lynchburg, VA 24501

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

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for Private Land Mobile Radio Services
Part 15, Subpart B and RSS-119, Issue 9, June 2007 for a Class A Digital Device

MET Report: EMC26699-FCC90 Rev. 1

Len Knight
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 / is not capable of operation in accordance with the requirements of Part 90, Part 15, Subpart B of the FCC Rules and RSS-119, Issue 9, June 2007 under normal use and maintenance.

Shawn McMillen, Wireless Manager
Electromagnetic Compatibility Lab

Report Status Sheet

Revision	Report Date	Reason for Revision
∅	August 11, 2009	Initial Issue.
1	August 20, 2009	Corrections per engineer.

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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
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**er**z**
IEC	**I**nternational **E**lectrotechnical **C**ommission
kHz	**k**ilo**h**er**z**
kPa	**k**ilo**pa**scal
kV	**k**ilovolt
LISN	**L**ine **I**mpedance **S**tabilization **N**etwork
MHz	**M**ega**h**ertz
µH	**micro**henry
µ	**micro**farad
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

Executive Summary

1. Testing Summary

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 90. All tests were conducted using measurement procedure from ANSI TIA/EIA-603-A-2004 and ANSI C63.4-2003 as appropriate.

Title 47 of the CFR, Part 90	IC Reference	Conformance			Comments
		Yes	No	N/A	
		Yes - Equipment complies with the Requirement *No - Equipment does not comply with the Requirement* *N/A - Not applicable to the equipment under tests*			
2.1046; 90.205 Peak Power Output	RSS-119, Section 5.4, Transmitter Output Power	✓			Measured emissions below applicable limits.
2.1047(a) Modulation Characteristics	RSS-119, Section 5.2, Types of Modulation			✓	The channels are all digitized (voice and data), the MASTR V has no analog voice channels.
2.1049; 90.210 Occupied Bandwidth (Emission Mask)	RSS-119 5.8.10.1 Adjacent Channel Power	✓			Measured emissions below applicable limits.
2.1051; 90.210 Spurious Emissions at Antenna Terminals	RSS-GEN, Section 7.2.3.1, Antenna Conducted Emissions	✓			Measured emissions below applicable limits.
2.1053; 90.210 Radiated Spurious Emissions	RSS-GEN, Section 7.2.3.2, Radiated Measurements	✓			Measured emissions below applicable limits.
2.1055(a) (1); 90.213 Frequency Stability over Temperature Variations	RSS-GEN, Section 4.7 RSS-119, Section 5.3, Transmitter Frequency Stability	✓			Measured values below applicable limits.
2.1055(d) Frequency Stability over Voltage Variations	RSS-GEN, Section 4.7 RSS-119, Section 5.3, Transmitter Frequency Stability	✓			Measured values below applicable limits.
90.214 Transient Frequency Behavior	RSS-119, Section 5.9, Transient Frequency Behavior			✓	EUT does not operate in the 150-174 MHz or 421-512 MHz bands.
90.543 Emissions Limitation – Adjacent Channel Power	RSS-119 5.8.10.1 Adjacent Channel Power	✓			Measured emissions were below applicable limits.
47 CFR Part 15.107 (a) Conducted Emission Limits for a Class A Digital Device	ICES-003 Digital Apparatus	✓			AC Power Line Conducted Emissions for intentional radiators
47 CFR Part 15.109 (a) Radiated Emission Limits for a Class A Digital Device	ICES-003 Digital Apparatus	✓			Radiated Spurious Emissions for unintentional radiators

Equipment Configuration

2. Equipment Configuration

2.1 Overview

MET Laboratories, Inc. was contracted by Harris Corporation RF Communications Division to perform testing on the MASTR V 700 MHz under purchase order number 1052721.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Harris Corporation RF Communications Division., MASTR V 700 MHz.

An EMC evaluation to determine compliance of the MASV-700M1 with the requirements of Part 90 was conducted. (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 MASV-700M1. Harris Corporation RF Communications Division. should retain a copy of this document and it should be kept on file for at least five years after the manufacturing of the EUT has been **permanently** discontinued. The results obtained relate only to the item(s) tested.

Product Name:	MASTR V		
Model(s) Tested:	MASV-700M1		
EUT Specifications:	Primary Power Source: 120 VAC, 60 Hz		
	FCC ID: OWDTR-0057-E		
	Type of Modulations:	C4FM, WCQPSK, HDQPSK	
	Peak Output Power:	764	HDQPSK – 49.30 dBm WCQPSK – 49.64 dBm C4FM – 48.79 dBm
		769	HDQPSK – 49.61 dBm WCQPSK – 49.94 dBm C4FM – 49.54 dBm
		775	HDQPSK – 49.44 dBm WCQPSK – 49.51 dBm C4FM – 49.07 dBm
		776	HDQPSK – 48.82 dBm WCQPSK – 48.27 dBm C4FM – 49.20 dBm
	Equipment Code:	TNB	
	EUT Frequency Ranges:	764-776 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:	Len Knight		
Test Date(s):	05/04/09 – 07/24/09		

2.2 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 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.

2.3 Description of Test Sample

The Harris Corporation RF Communications Division MASTR V 700 MHz, 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.

2.4 Equipment Configuration

The EUT was set up as outlined in Figure 2 - Figure 11, Block Diagram of Test Setup. All cards, racks, etc., incorporated as part of the EUT are included in the following section.

2.5 Card Identification

Ref. ID *	Name / Description	Model Number	Serial Number
TX #1	TRANSMIT MODULE #1	EA-555008-011	EP5159P-300051
TX #2	TRANSMIT MODULE #2	EA-555008-011	EP5159P-300052
TX #3	TRANSMIT MODULE #3	EA-555008-011	EP5195P-300090
TX #4	TRANSMIT MODULE #4	EA-555008-011	EP5195P-300054
PA #1	POWER AMPLIFIER #1	EA-555014-011	030960568
PA #2	POWER AMPLIFIER #2	EA-555014-011	030960578
PA #3	POWER AMPLIFIER #3	EA-555014-011	030960575
PA #4	POWER AMPLIFIER #4	EA-555014-011	030960564
RX #1	RECEIVE MODULE #1	EA-555007-011	MACM00070V
RX #2	RECEIVE MODULE #2	EA-555007-011	MACM0006RR
RX #3	RECEIVE MODULE #3	EA-555007-011	MACM0006U0
RX #4	RECEIVE MODULE #4	EA-555007-011	MACM000719
BB #1	BASEBAND MODULE #1	EA-555005	MACM000A5C
BB #2	BASEBAND MODULE #2	EA-555005	MACM000A4C
TC #1	TRAFFIC CONTROLLER #1	EA-555004	EP5197B00159
TC #2	TRAFFIC CONTROLLER #2	EA-555004	EP5197B00010
TC #3	TRAFFIC CONTROLLER #3	EA-555004	EP5197B00008
TC #4	TRAFFIC CONTROLLER #4	EA-555004	EP5197B00011
ES #1	E-SWITCH (PRIMARY)	EA-555012	MACM000A7E
ES #2	E-SWITCH (REDUNDANT)	EA-555012	MACM000A7G
PS #1	POWER SUPPLY #1	EA-555011-001	UF26097
PS #2	POWER SUPPLY #2	EA-555011-001	UC28080
PS #3	POWER SUPPLY #3	EA-555011-001	UF28066
PS #4	POWER SUPPLY #4	EA-555011-001	UF26096
FR	FREQUENCY REFERENCE	CY102784V5	836404699

Table 1. Card Identification

Attachment #1
Base Station Configurations

	Assembly:	EA-555002-001	EA-555011-001	EA-555012	EA-555012	EA-555008-011	EA-555014-011	EA-555007-011	EA-555005	EA-555004	
Configuration	Application	14-Shot Shelf	Power Supply	E-Switch (Primary)	E-Switch (Redundant)	Transmit Module	Power Amplifier	Receive Module	Baseband Module	Traffic Controller	Note
#1	Single Channel Base Station	1	1	1	0	1	1	1	1	1	
#2	Two Channel Base Station	1	2	1	1	2	2	2	1	2	
#3	Three Channel Base Station	1	3	1	1	3	3	3	2	3	
#4	Four Channel Base Station	1	4	1	1	4	4	4	2	4	maximal shelf configuration

Figure 1. Base Station

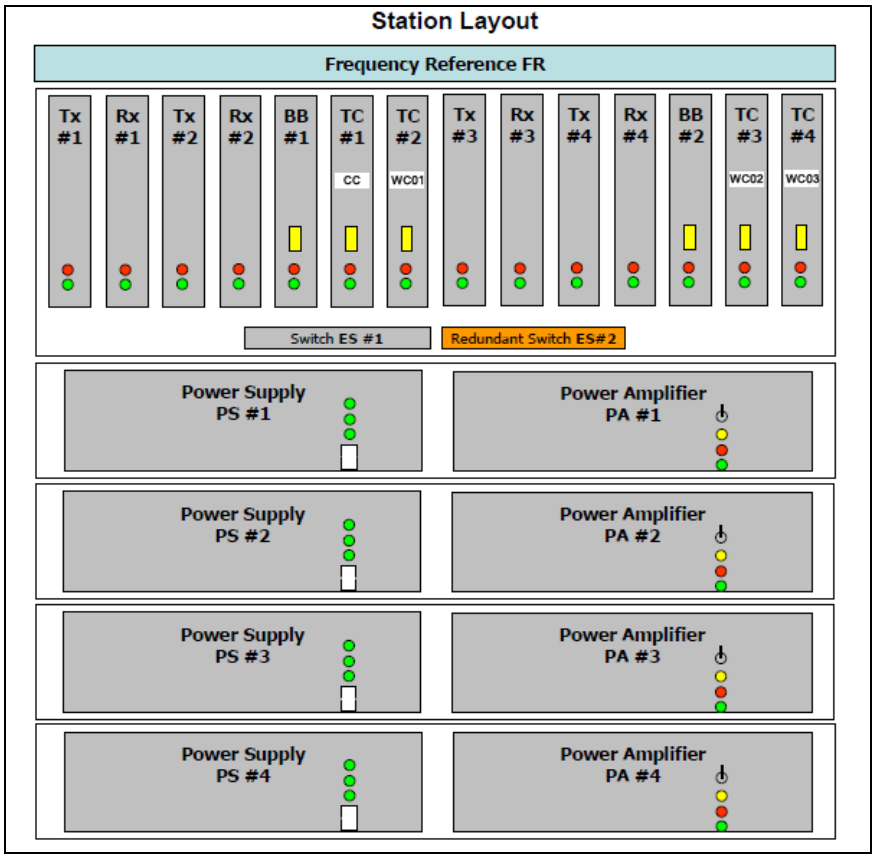


Figure 2. Station Layout

2.6 Support Equipment

Harris Corporation RF Communications Division supplied support equipment necessary for the operation and testing of the MASTR V 700 MHz. All support equipment supplied is listed in the following Support Equipment List.

Name / Description	Manufacturer	Model Number	Serial Number
HANDHELD BARCODE SCANNER	HP	LS2208-SR20361RSBRE	NONE
100 WATT DUMMY LOAD (QTY 4)	N/A	N/A	NONE

Table 2. Support Equipment

2.7 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 3. Ports and Cabling Information, Internal

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	-	-	-

Ref. ID	Port name on EUT	Cable Description or reason for no cable	Qty.	Length (m)	Shielded? (Y/N)	Termination Box ID & Port ID
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
FR	OUTPUT 1, J1	COAXIAL CABLE	1	1	Y	BB #1
FR	OUTPUT 2, J2	COAXIAL CABLE	1	1	Y	BB #2

Table 4. Ports and Cabling Information, External

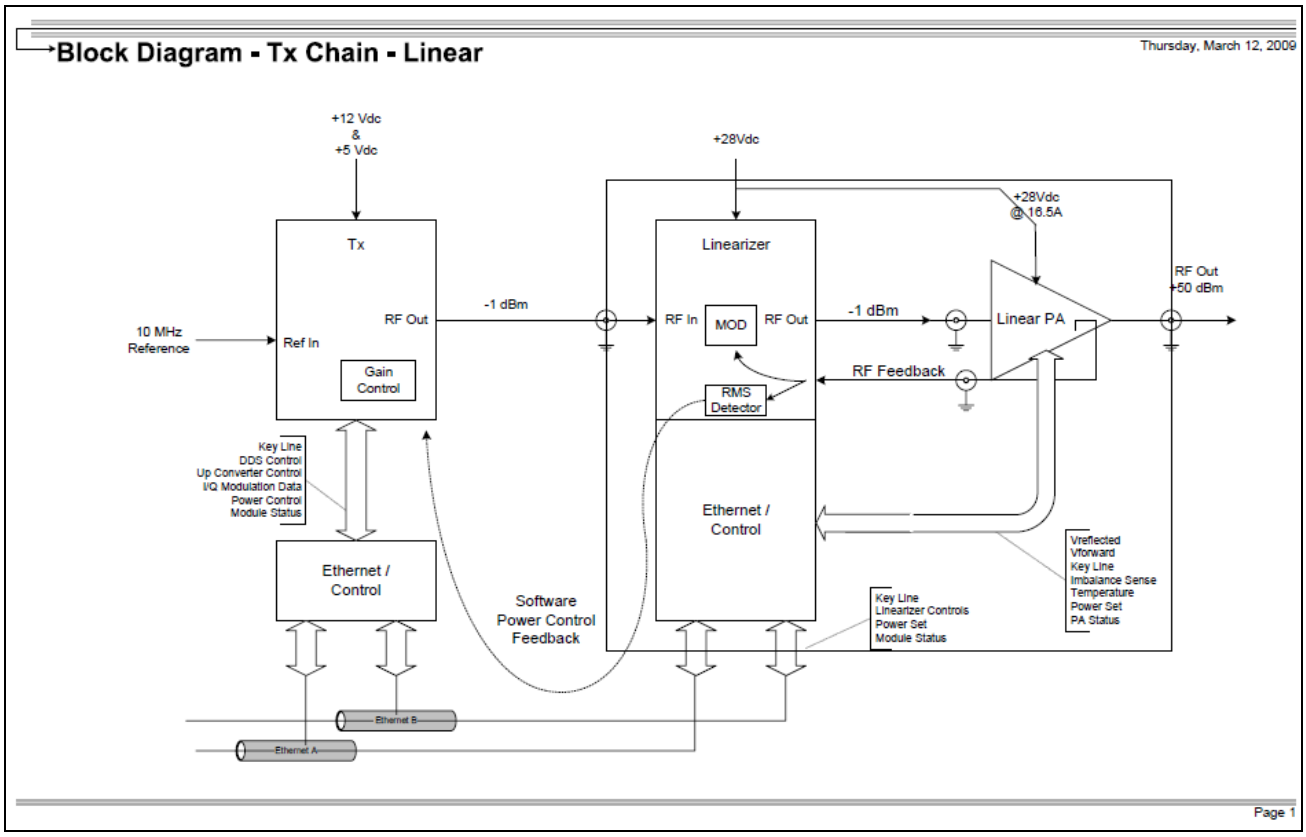


Figure 3. Block Diagram of Test Configuration, Transmitter, Linear

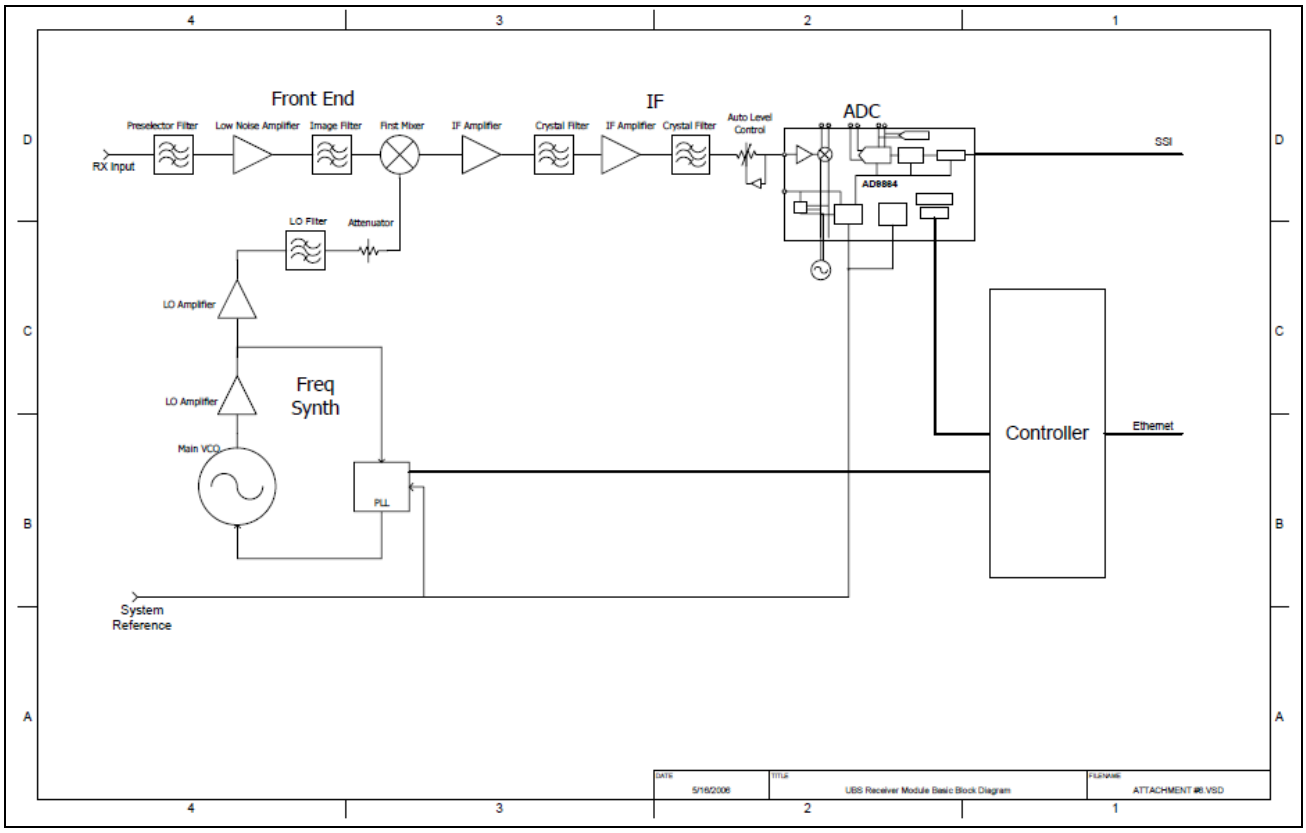


Figure 4. Block Diagram of Test Configuration, Receiver

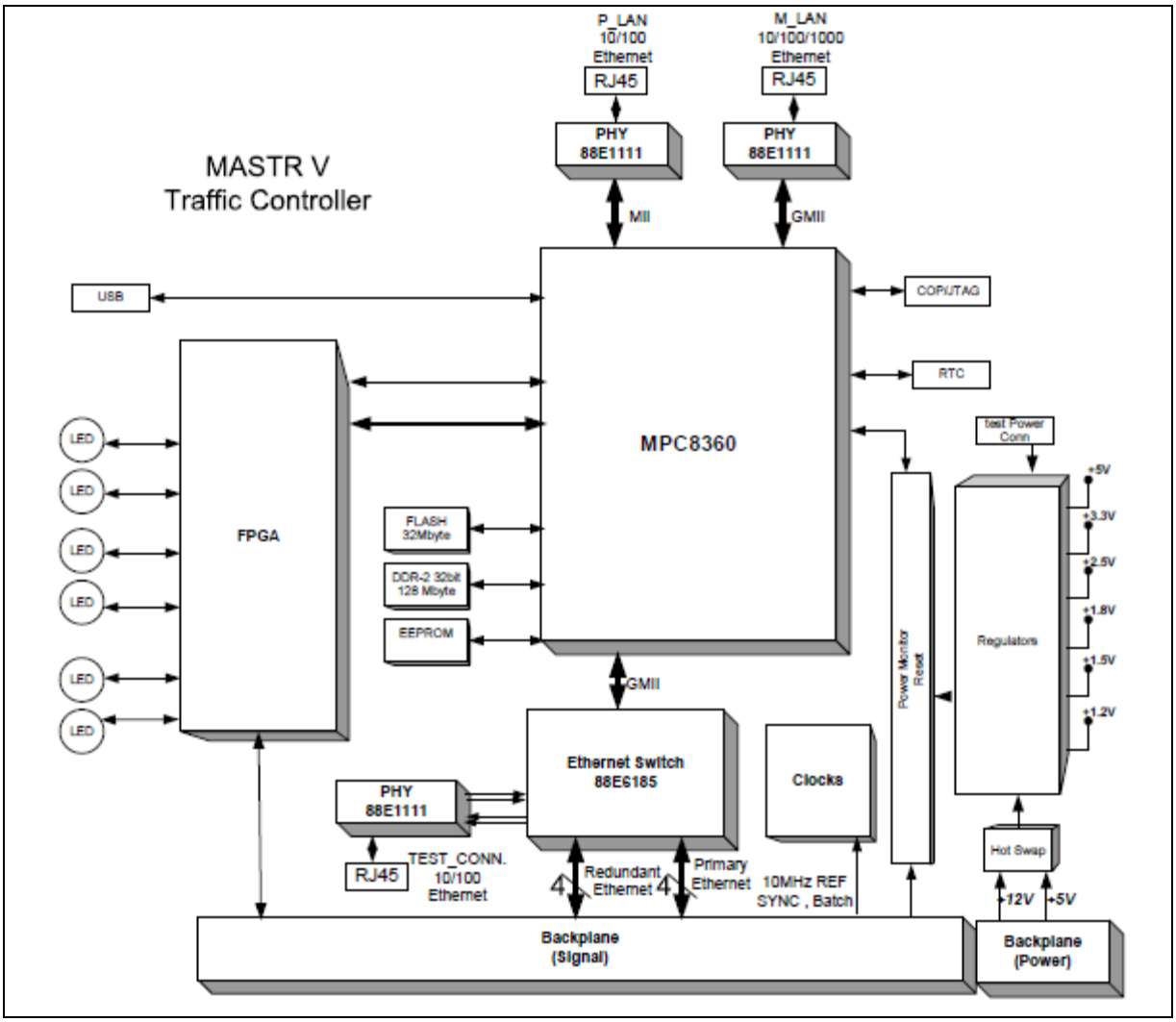


Figure 5. Block Diagram of Test Configuration, Traffic Controller

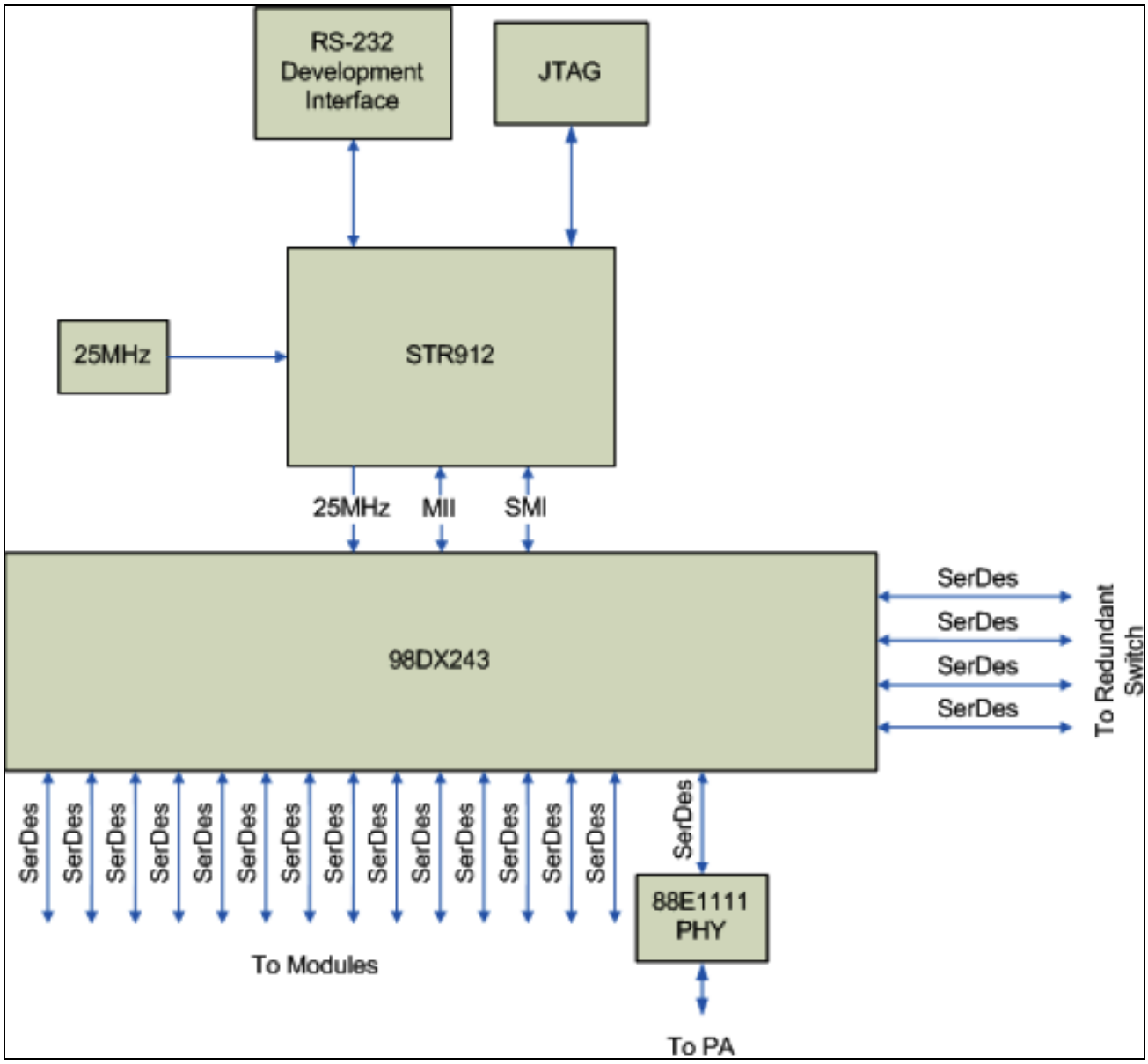


Figure 6. Block Diagram of Test Configuration, Ethernet Switch

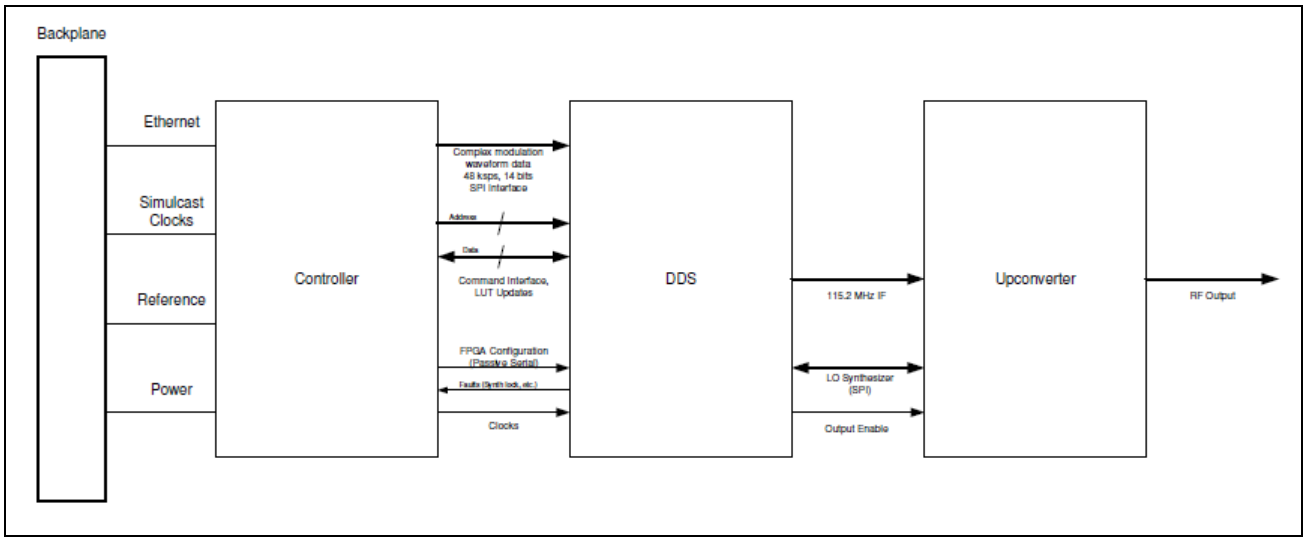


Figure 7. Block Diagram of Test Configuration, Transmit Module

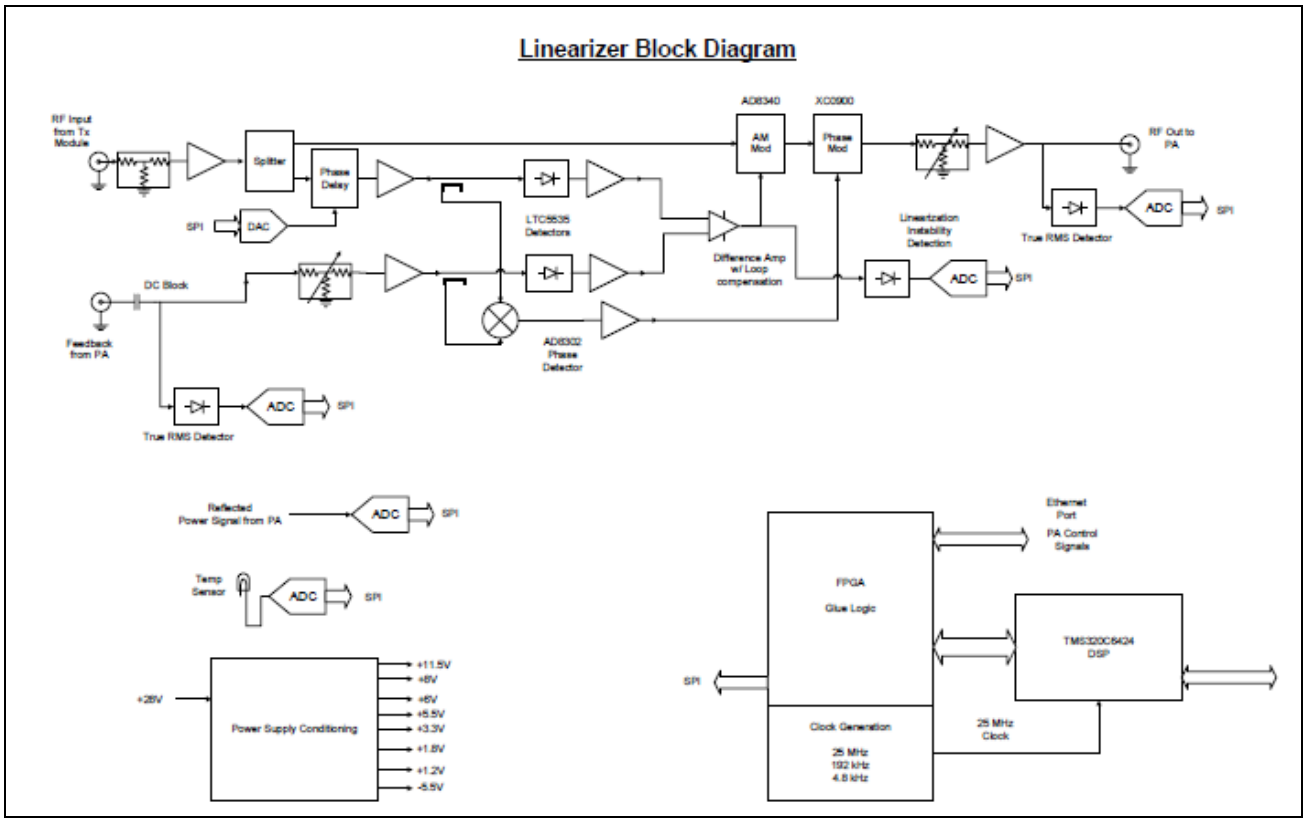


Figure 8. Block Diagram of Test Configuration, Linearizer

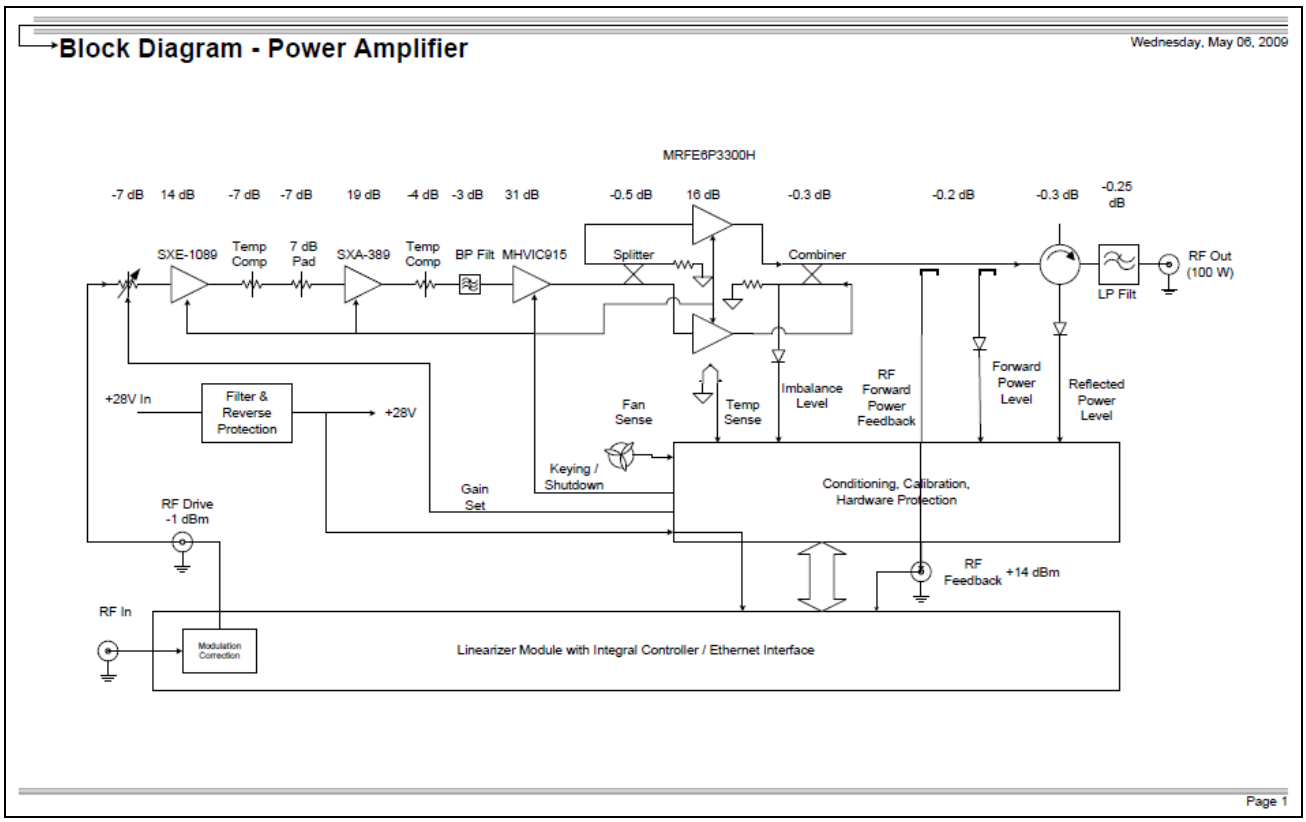


Figure 9. Block Diagram of Test Configuration, Power Amplifier

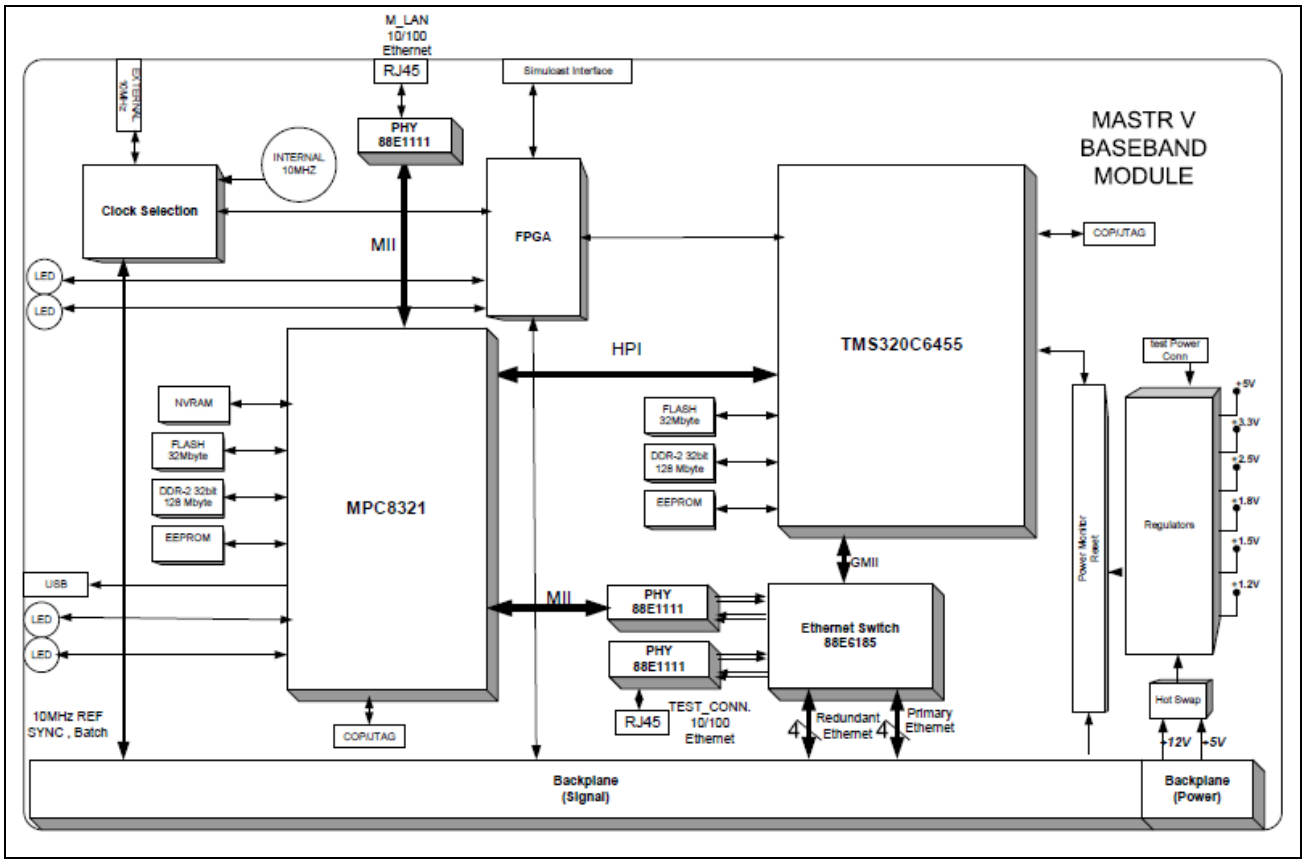


Figure 10. Block Diagram of Test Configuration, Baseband Module

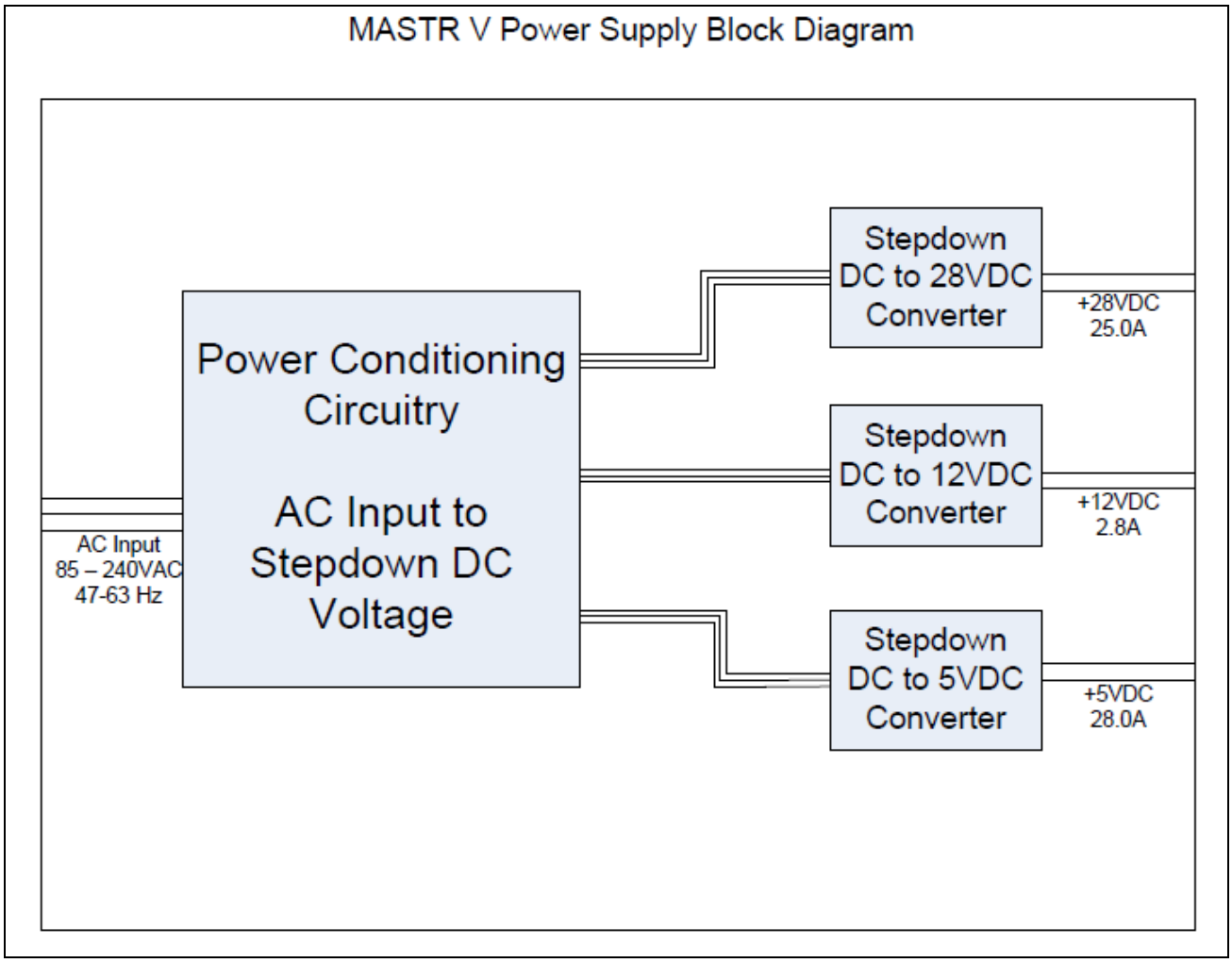


Figure 11. Block Diagram of Test Configuration, Power Supply

2.8 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".

2.9 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

A description of how to enable each mode and the transmitter is contained in Attachment #3a, 3b

2.10 Modifications

2.10.1 Modifications to EUT

1) Adjacent Channel Power

Transmit Module

Improve filtering to increase ripple rejection on switching voltage regulators by following change:

Change C640 and C641 from 10 uF to 22 uF

Change R683 from 0 Ohms to 1.8 Ohms

2) Radiated Spurious Emissions

Power Amplifier Assembly

Install production linearizer chassis which employs production dispensed RF gaskets around RF coaxial linearizer/PA interface. Initial units used in test employed prototype conductive foam gaskets at these interfaces. All production units will use the production dispensed gaskets which provide improved shielding

2.10.2 Modifications to Test Standard

No modifications were made to the test standard.

2.11 Disposition of EUT

The test sample including all support equipment submitted to the Electro-Magnetic Compatibility Lab for testing was returned to Harris Corporation RF Communications Division upon completion of testing.

Electromagnetic Compatibility Criteria for Unintentional Radiators

3. Electromagnetic Compatibility Criteria for Unintentional Radiators

3.1. Conducted Emissions Limits

Test Requirement(s): **15.107 (a)** "Except for Class A digital devices, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in Table 5. Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminals."

15.107 (b) "For a Class A digital device that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in Table 5. Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminals. The lower limit applies at the band edges."

Frequency range (MHz)	15.107(b), Class A Limits (dBµV)		15.107(a), Class B Limits (dBµV)	
	Quasi-Peak	Average	Quasi-Peak	Average
0.15- 0.5	79	66	66 - 56	56 - 46
0.5 – 5.0	73	60	56	46
5.0 - 30	73	60	60	50
Note — The lower limit shall apply at the transition frequencies.				

Table 5. Conducted Limits for Radio Frequency Devices calculated from FCC Part 15 Section 15.107(a) (b)

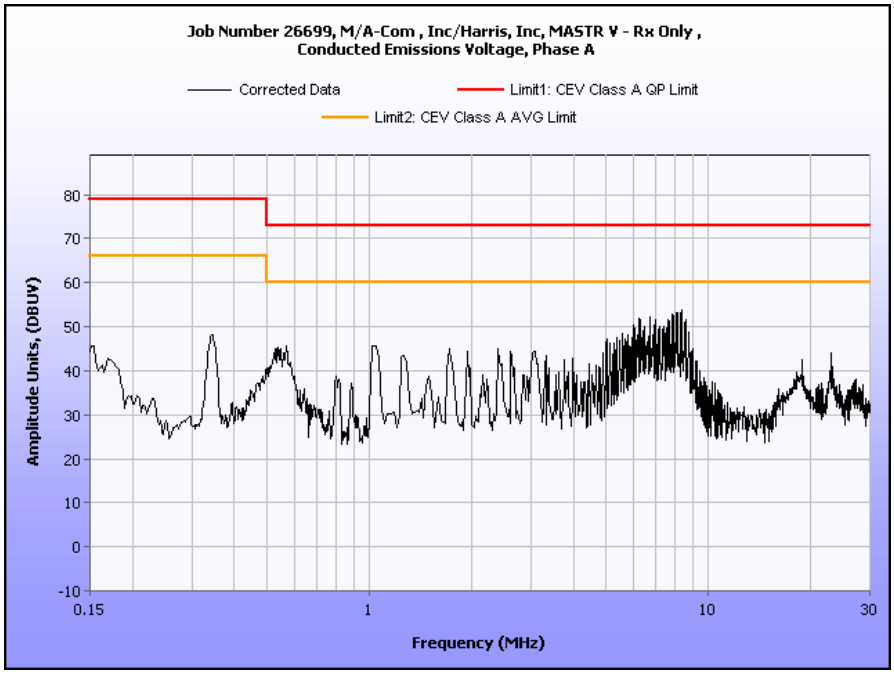
Test Procedures: The EUT was placed on a 0.8m-high wooden table inside a shielded chamber. The method of testing, test conditions, and test procedures of ANSI C63.4 were used. The EUT was powered through a 50Ω/50µH LISN. An EMI receiver, connected to the measurement port of the LISN, scanned the frequency range from 150 kHz to 30 MHz in order to find the peak conducted emissions. Multiple scans were performed with various loading. Peak emissions were compared to a quasi-peak and average limit line.

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

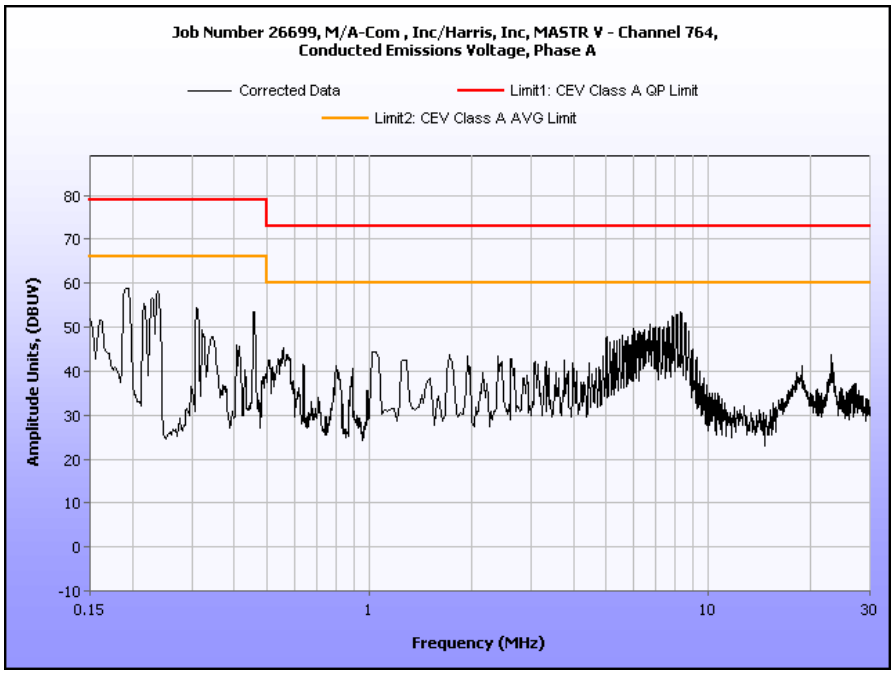
Test Engineer(s): Len Knight

Test Date(s): 07/10/09

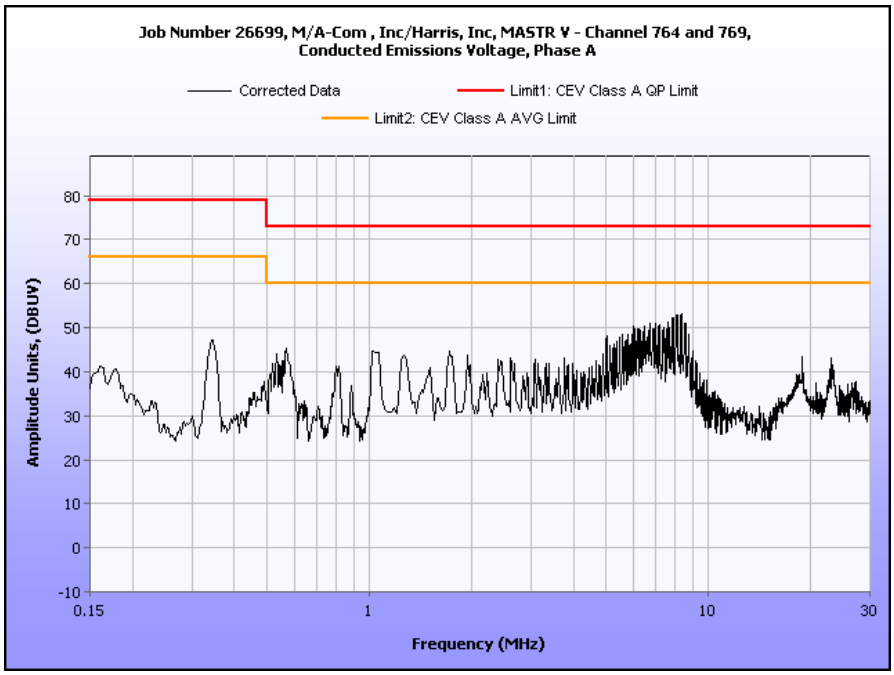
Conducted Emissions - Voltage, AC Power



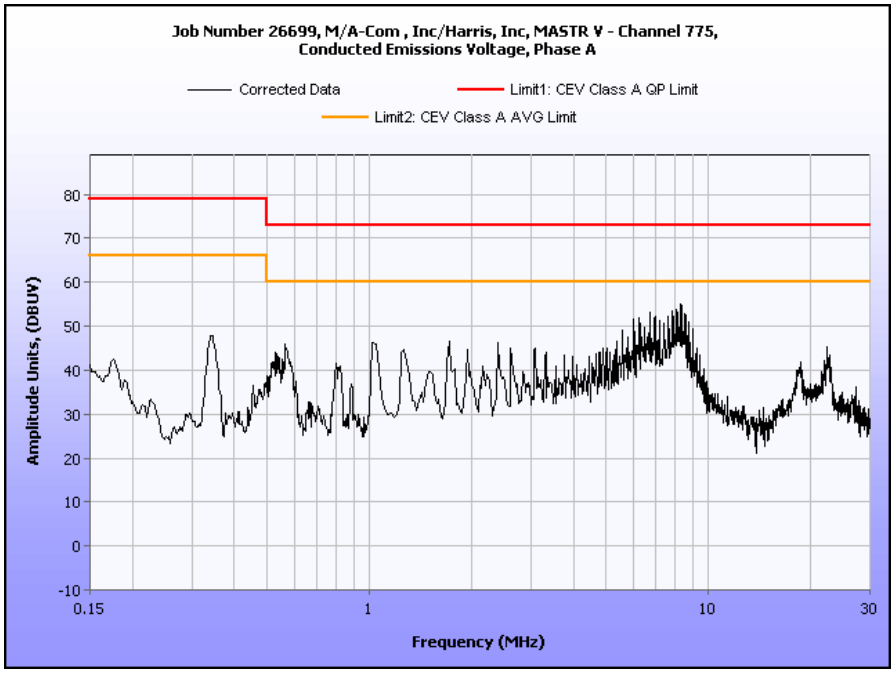
Plot 1. Conducted Emissions, Phase Line, Receiver Only



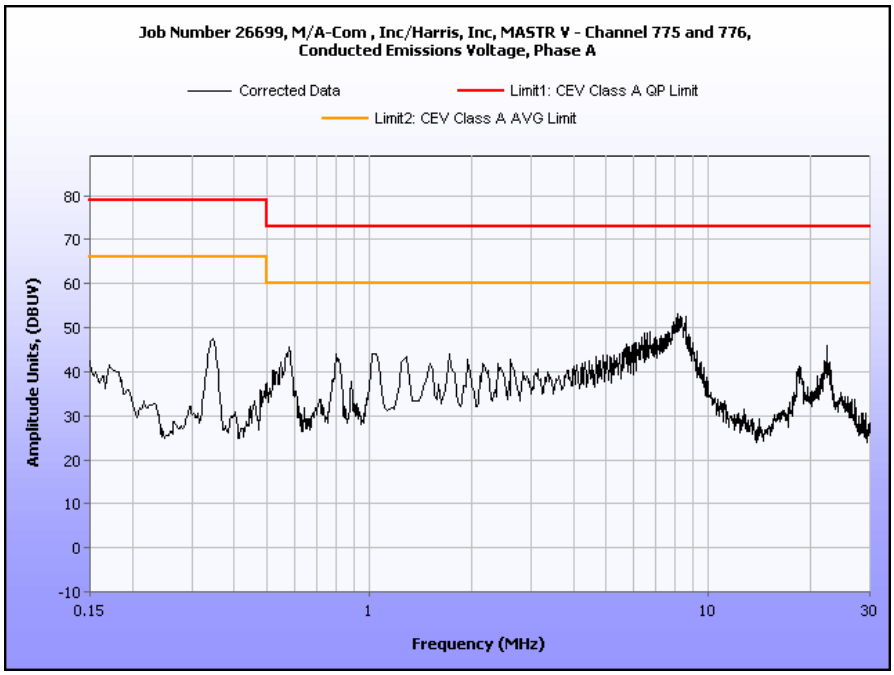
Plot 2. Conducted Emissions, Phase Line, Channel 764



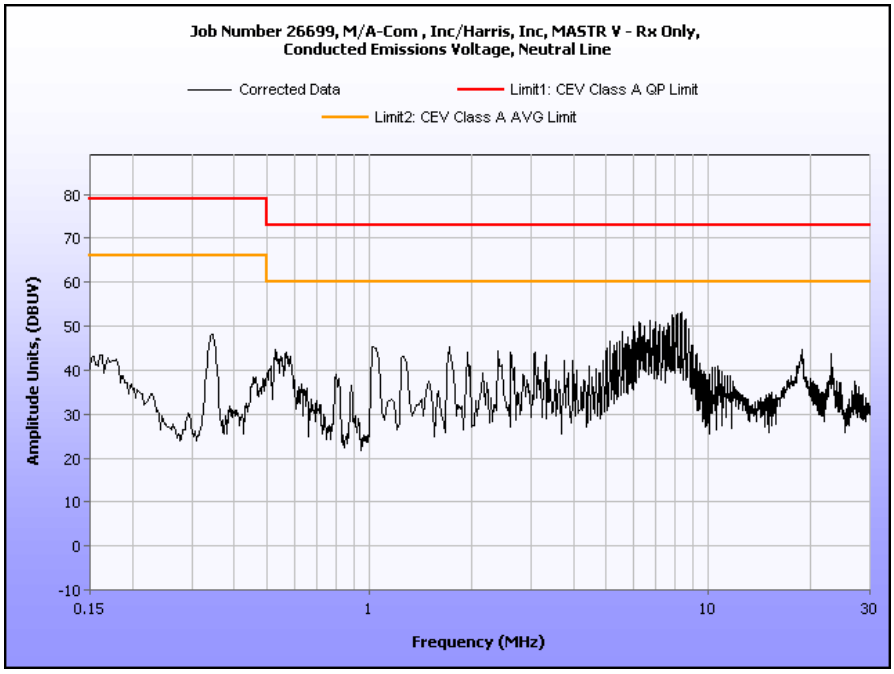
Plot 3. Conducted Emissions, Phase Line, Channels 764 and 769



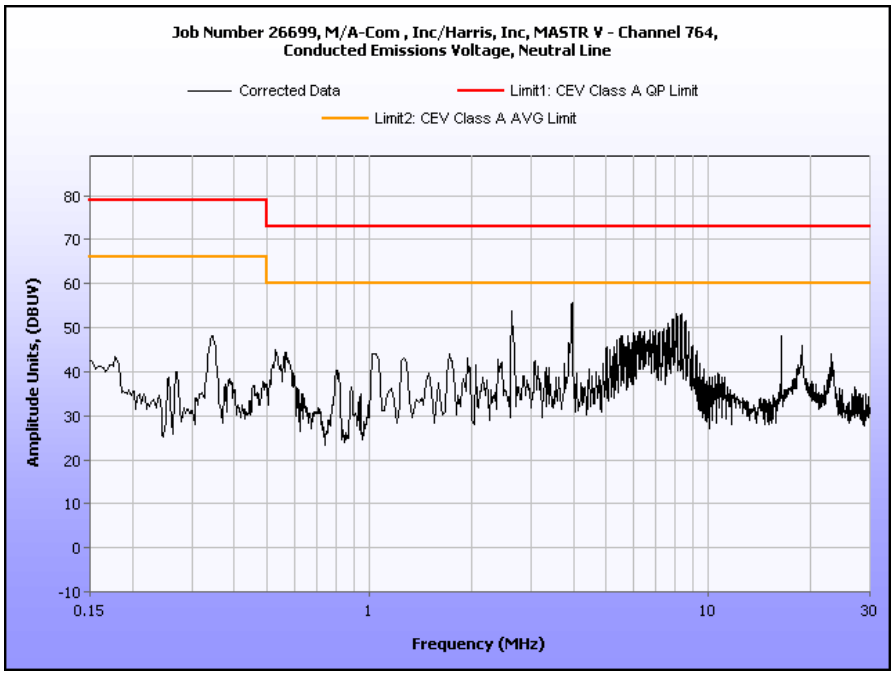
Plot 4. Conducted Emissions, Phase Line, Channel 775



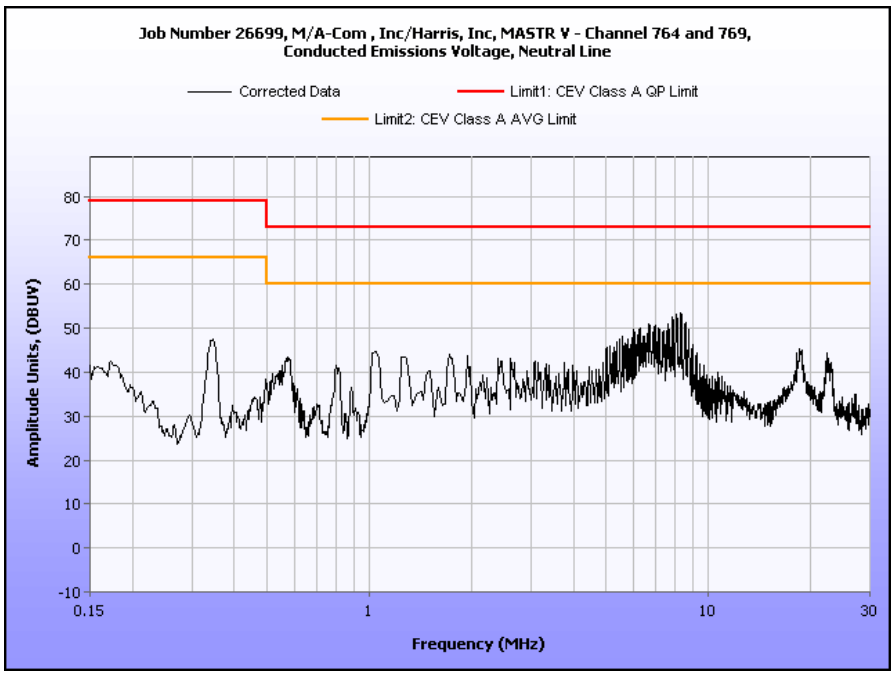
Plot 5. Conducted Emissions, Phase Line, Channels 775 and 776



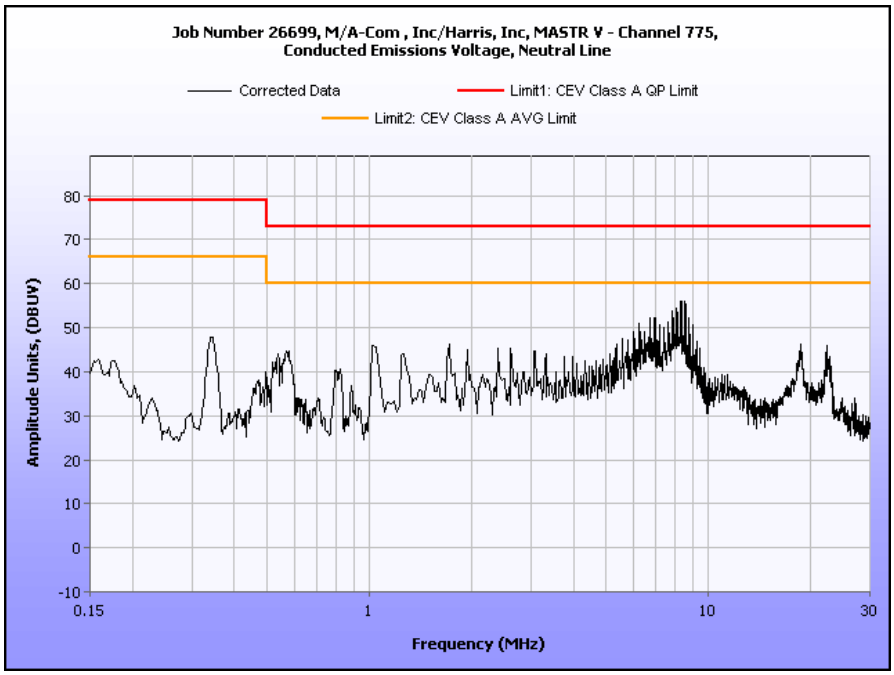
Plot 6. Conducted Emissions, Neutral Line, Receiver Only



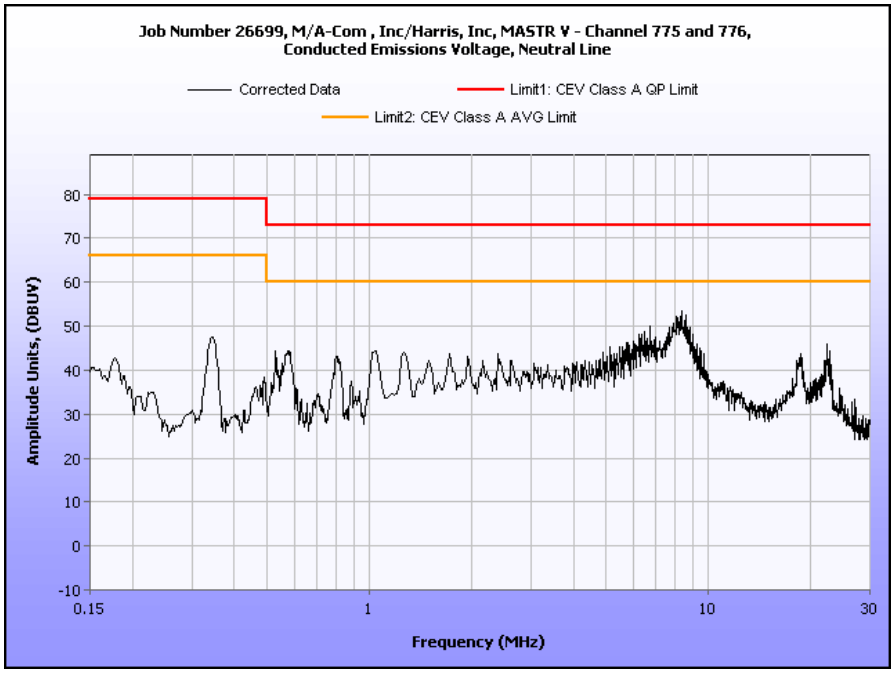
Plot 7. Conducted Emissions, Neutral Line, Channel 764



Plot 8. Conducted Emissions, Neutral Line, Channels 764 and 769

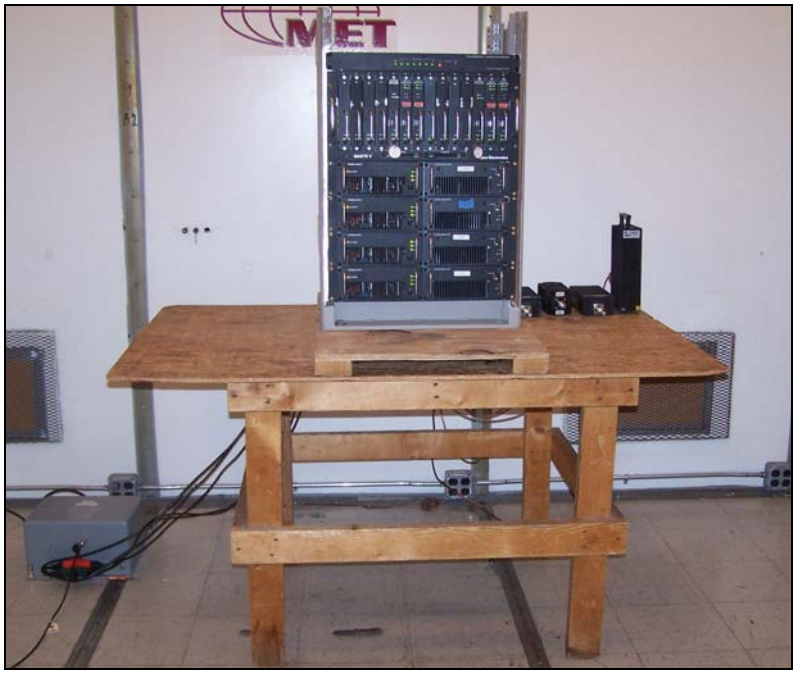


Plot 9. Conducted Emissions, Neutral Line, Channel 775



Plot 10. Conducted Emissions, Neutral Line, Channels 775 and 776

Conducted Emission Limits Test Setup



Photograph 1. Conducted Emissions, Test Setup

3.2. Radiated Emissions Limits

Test Requirement(s):

15.109 (a) Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the Class A limits expressed in Table 6.

15.109 (b) The field strength of radiated emissions from a Class A digital device, as determined at a distance of 10 meters, shall not exceed the Class A limits expressed in Table 6.

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

Table 6. Radiated Emissions Limits calculated from FCC Part 15, §15.109 (a) (b)

Test Procedures: The EUT was placed on a 0.8m-high non-conductive table inside a semi-anechoic chamber. The method of testing and test conditions of ANSI C63.4 were used. An antenna was located 3 m from the EUT on an adjustable mast. A pre-scan was first performed in order to find prominent radiated emissions. For final emissions measurements at each frequency of interest, the EUT was rotated and the antenna height was varied between 1 m and 4 m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. Unless otherwise specified, measurements were made using a quasi-peak detector with a 120 kHz bandwidth.

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

Test Engineer(s): Len Knight

Test Date(s): 05/04/09

Radiated Emissions Limits Test Results, Class A

Frequency (MHz)	EUT Azimuth (Degrees)	Antenna Polarity (H/V)	Antenna HEIGHT (m)	Uncorrected Amplitude (dBuV)	Antenna Correction Factor (dB) (+)	Cable Loss (dB) (+)	Distance Correction Factor (dB) (-)	Corrected Amplitude (dBuV/m)	Limit (dBuV/m)	Margin (dB)
30.000	58.6	H	2.49	22.50	4.90	0.10	10.46	17.04	39.00	-21.96
*30.000	0	V	1.95	44.76	3.80	0.10	10.46	38.20	39.00	-0.80
31.301	1	H	2.52	13.84	5.60	0.11	10.46	9.10	39.00	-29.90
31.301	0.9	V	1.43	34.06	4.45	0.11	10.46	28.16	39.00	-10.84
51.100	82.3	H	3.79	27.30	9.67	0.22	10.46	26.73	39.00	-12.27
51.100	2.4	V	1.02	33.84	8.71	0.22	10.46	32.31	39.00	-6.69
148.950	80.2	H	1.79	29.89	8.06	0.43	10.46	27.91	43.50	-15.59
148.950	15.8	V	1.05	34.13	7.90	0.43	10.46	32.00	43.50	-11.50
250.000	147	H	2.13	24.45	12.90	1.30	10.46	28.19	46.40	-18.21
250.000	357	V	1.13	28.37	13.00	1.30	10.46	32.21	46.40	-14.19
330.000	206	H	1.67	28.30	13.70	1.60	10.46	33.14	46.40	-13.26
330.000	78	V	1.79	22.65	14.30	1.60	10.46	28.09	46.40	-18.31
400.000	211	H	1.31	33.82	15.50	1.87	10.46	40.73	46.40	-5.67
400.000	167	V	1.00	30.59	15.50	1.87	10.46	37.50	46.40	-8.90
625.000	152	H	1.26	28.87	19.70	2.41	10.46	40.52	46.40	-5.88
625.000	334	V	1.57	25.43	20.10	2.41	10.46	37.48	46.40	-8.92
750.000	168	H	1.99	27.73	21.00	2.94	10.46	41.21	46.40	-5.19
750.000	132	V	1.76	27.37	21.20	2.94	10.46	41.05	46.40	-5.35

Table 7. Radiated Emissions Limits, Test Results, FCC Limits

Note 1: The EUT was tested at 3 m. The data has been corrected for comparison with the 10 m limit using the formula: 20log (3 m/10 m) as expressed in the 'Distance Correction' column.

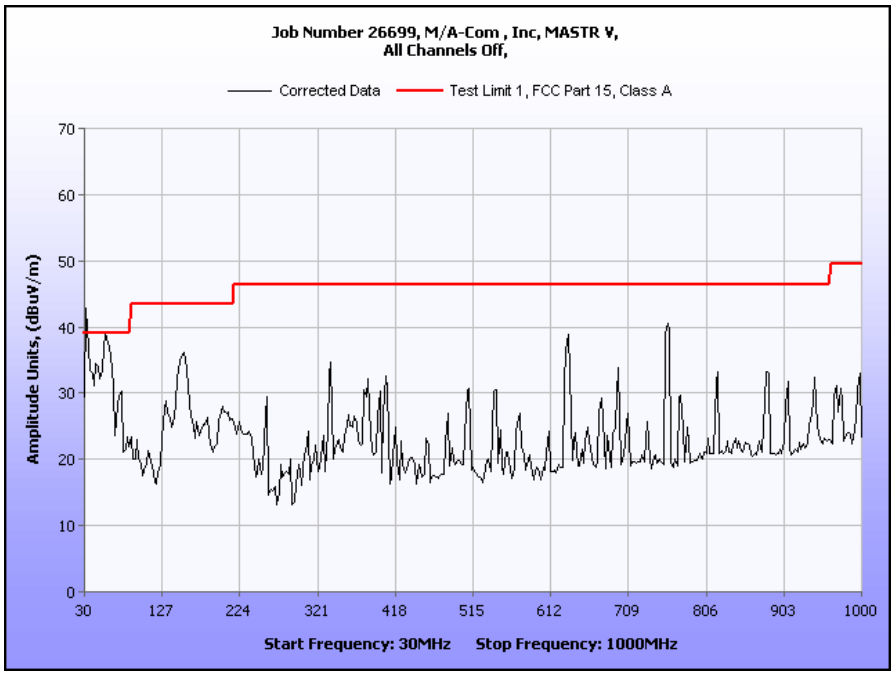
Note 2: * - At this frequency, the measured electric-field strength exhibits a margin of compliance that is less than 3 dB below the specification limit. We recommend that every emission measured, have at least a 3 dB margin to allow for deviations in the emission characteristics that may occur during the production process.

Frequency (MHz)	EUT Azimuth (Degrees)	Antenna Polarity (H/V)	Antenna HEIGHT (m)	Uncorrected Amplitude (dBuV)	Antenna Correction Factor (dB) (+)	Cable Loss (dB) (+)	Distance Correction Factor (dB) (-)	Corrected Amplitude (dBuV/m)	Limit (dBuV/m)	Margin (dB)
30.000	58.6	H	2.49	22.50	4.90	0.10	10.46	17.04	40.00	-22.96
*30.000	0	V	1.95	44.76	3.80	0.10	10.46	38.20	40.00	-1.80
31.301	1	H	2.52	13.84	5.60	0.11	10.46	9.10	40.00	-30.90
31.301	0.9	V	1.43	34.06	4.45	0.11	10.46	28.16	40.00	-11.84
51.100	82.3	H	3.79	27.30	9.67	0.22	10.46	26.73	40.00	-13.27
51.100	2.4	V	1.02	33.84	8.71	0.22	10.46	32.31	40.00	-7.69
148.950	80.2	H	1.79	29.89	8.06	0.43	10.46	27.91	40.00	-12.09
148.950	15.8	V	1.05	34.13	7.90	0.43	10.46	32.00	40.00	-8.00
250.000	147	H	2.13	24.45	12.90	1.30	10.46	28.19	47.00	-18.81
250.000	357	V	1.13	28.37	13.00	1.30	10.46	32.21	47.00	-14.79
330.000	206	H	1.67	28.30	13.70	1.60	10.46	33.14	47.00	-13.86
330.000	78	V	1.79	22.65	14.30	1.60	10.46	28.09	47.00	-18.91
400.000	211	H	1.31	33.82	15.50	1.87	10.46	40.73	47.00	-6.27
400.000	167	V	1.00	30.59	15.50	1.87	10.46	37.50	47.00	-9.50
625.000	152	H	1.26	28.87	19.70	2.41	10.46	40.52	47.00	-6.48
625.000	334	V	1.57	25.43	20.10	2.41	10.46	37.48	47.00	-9.52
750.000	168	H	1.99	27.73	21.00	2.94	10.46	41.21	47.00	-5.79
750.000	132	V	1.76	27.37	21.20	2.94	10.46	41.05	47.00	-5.95

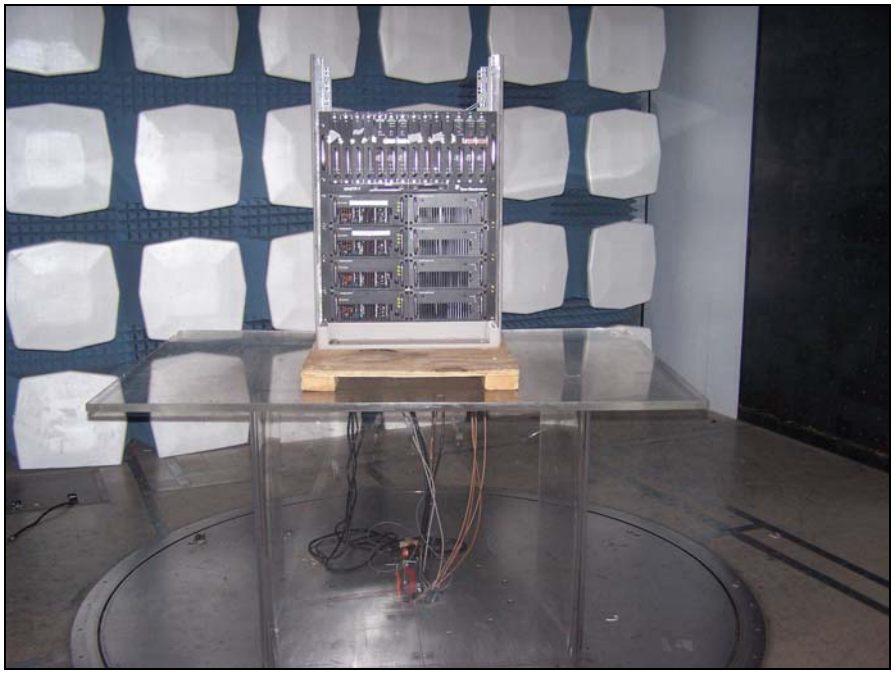
Table 8. Radiated Emissions Limits, Test Results, ICES-003 Limits

Note 1: The EUT was tested at 3 m. The data has been corrected for comparison with the 10 m limit using the formula: 20log (3 m/10 m) as expressed in the 'Distance Correction' column.

Note 2: * - At this frequency, the measured electric-field strength exhibits a margin of compliance that is less than 3 dB below the specification limit. We recommend that every emission measured, have at least a 3 dB margin to allow for deviations in the emission characteristics that may occur during the production process.



Plot 11. Radiated Emissions, Pre-Scan



Photograph 2. Radiated Emission Limits, Test Setup

Electromagnetic Compatibility Criteria for Intentional Radiators

4. Electromagnetic Compatibility RF Power Output Requirements

4.1. RF Power Output

Test Requirement(s): **§2.1046 and §90.215**

Test Procedures: As required by 47 CFR 2.1046, *RF power output measurements* were made at the RF output terminals of the EUT.

Conducted power measurements made were average. A laptop was connected to EUT to control the RF power output, modulation, and frequency channel. The EUT was connected through an attenuator to a Spectrum Analyzer capable of making power measurements. The EUT power was adjusted enough to produce maximum output power as specified in the owner's manual.

Test Results: Equipment complies with 47CFR 2.1046 and 90.215.

Frequency (MHz)	Modulation	Measured Power (dBm)
764	C4FM	48.79
	HDQPSK	49.30
	WCQPSK	49.64
769	C4FM	49.54
	HDQPSK	49.61
	WCQPSK	49.94
775	C4FM	49.07
	HDQPSK	49.44
	WCQPSK	49.51
776	C4FM	49.20
	HDQPSK	48.82
	WCQPSK	48.27

Table 9. RF Power Output, Test Results

Test Engineer(s): Len Knight

Test Date(s): 05/20/09

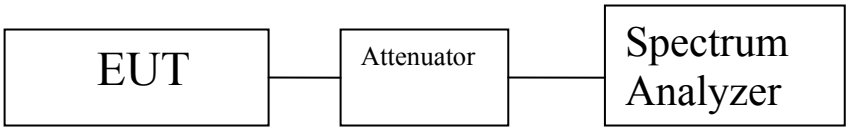
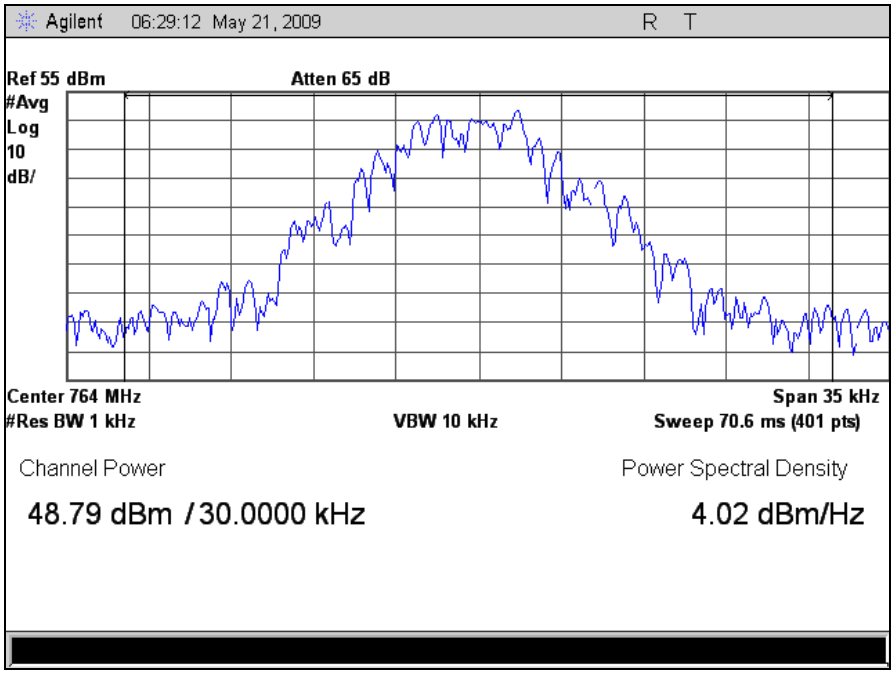
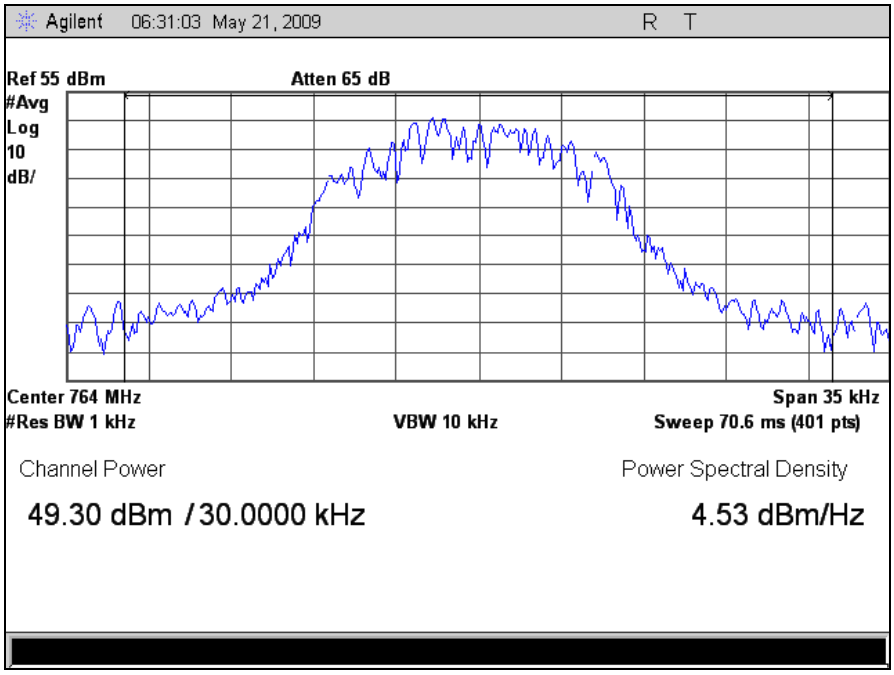


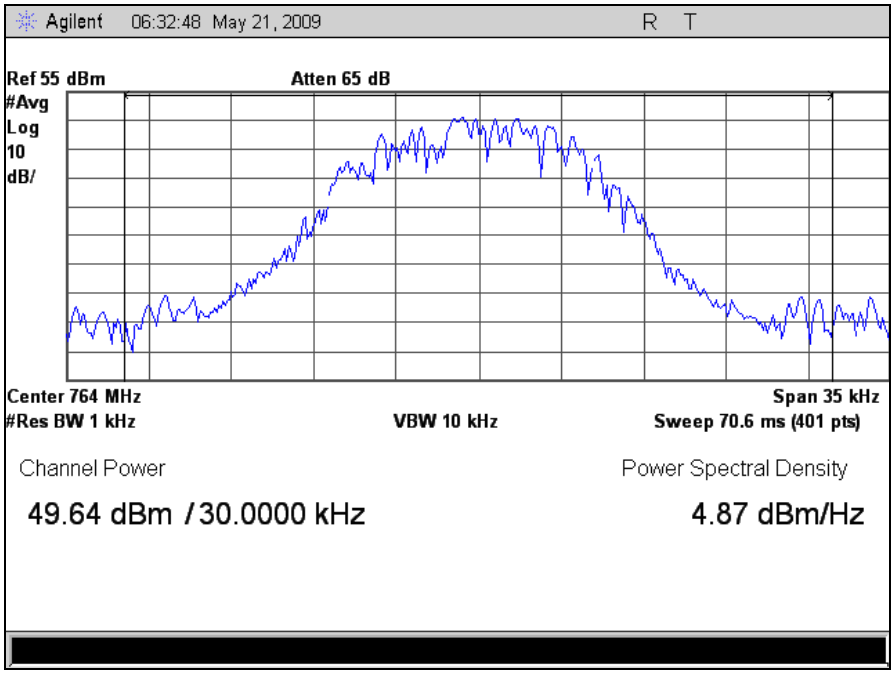
Figure 12. RF Power Output Test Setup



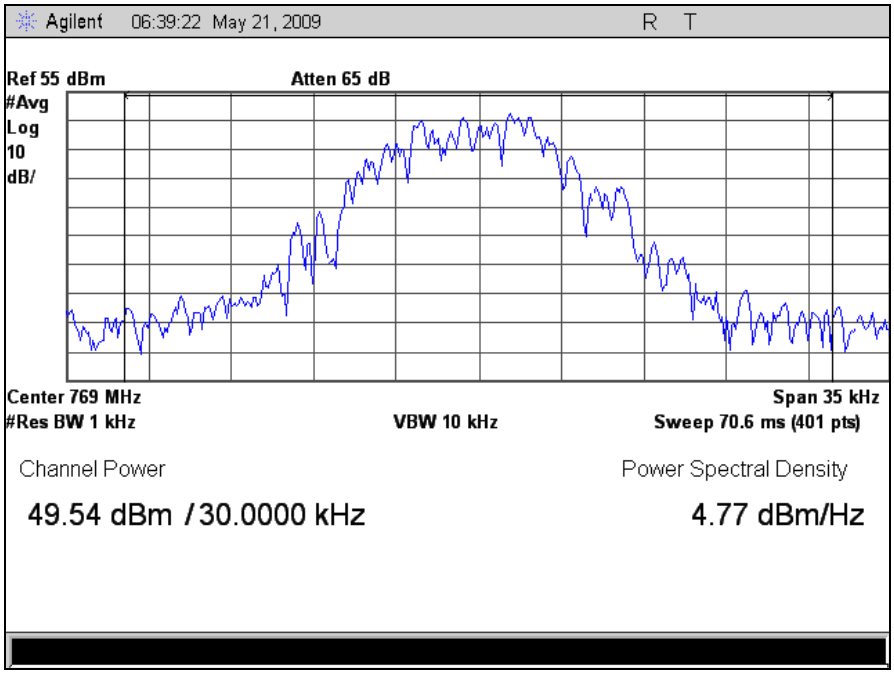
Plot 12. RF Power Output, Channel 764, C4FM



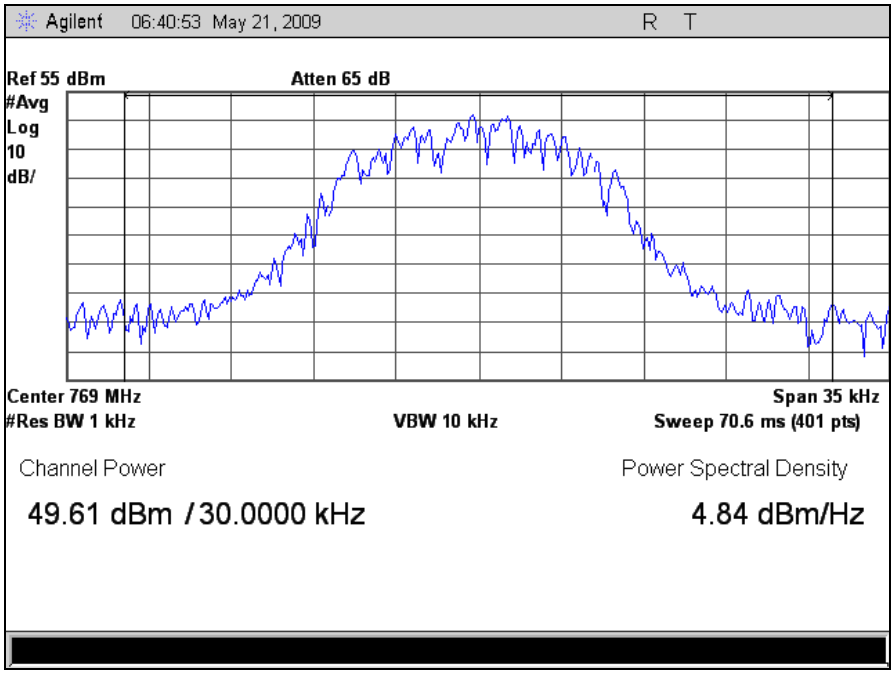
Plot 13. RF Power Output, Channel 764, HDQPSK



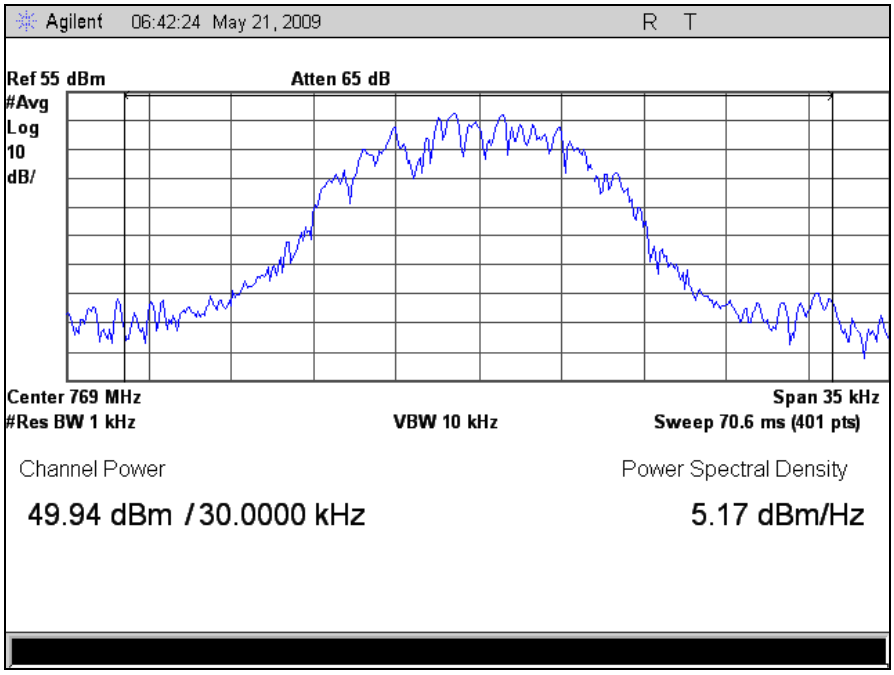
Plot 14. RF Power Output, Channel 764, WCQPSK



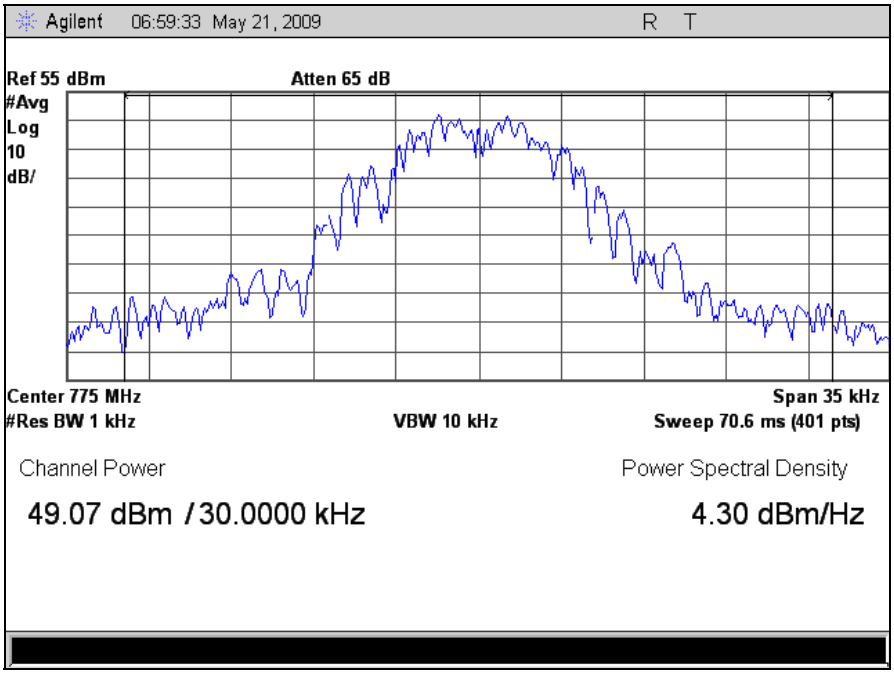
Plot 15. RF Power Output, Channel 769, C4FM



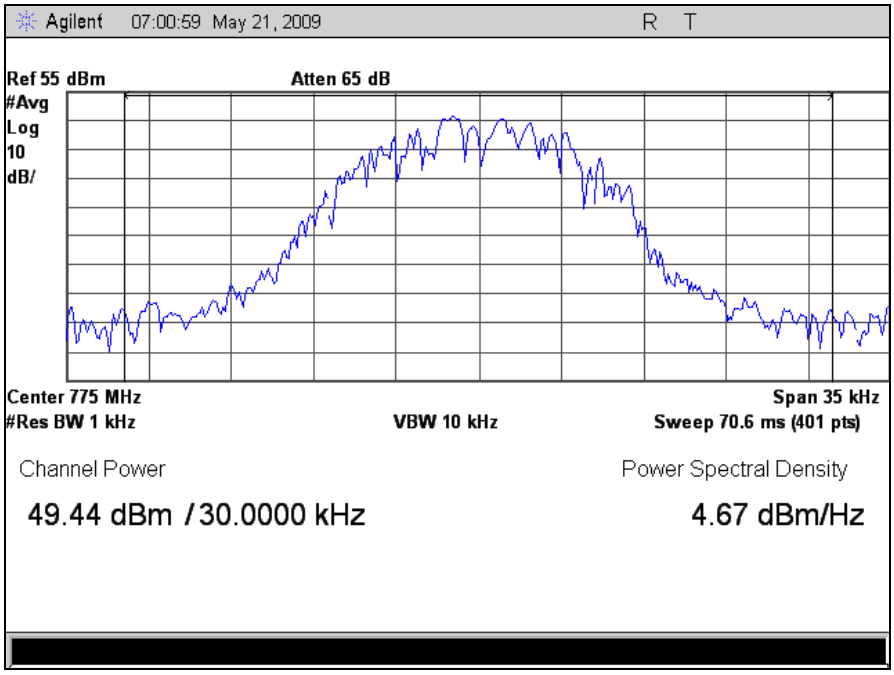
Plot 16. RF Power Output, Channel 769, HDQPSK



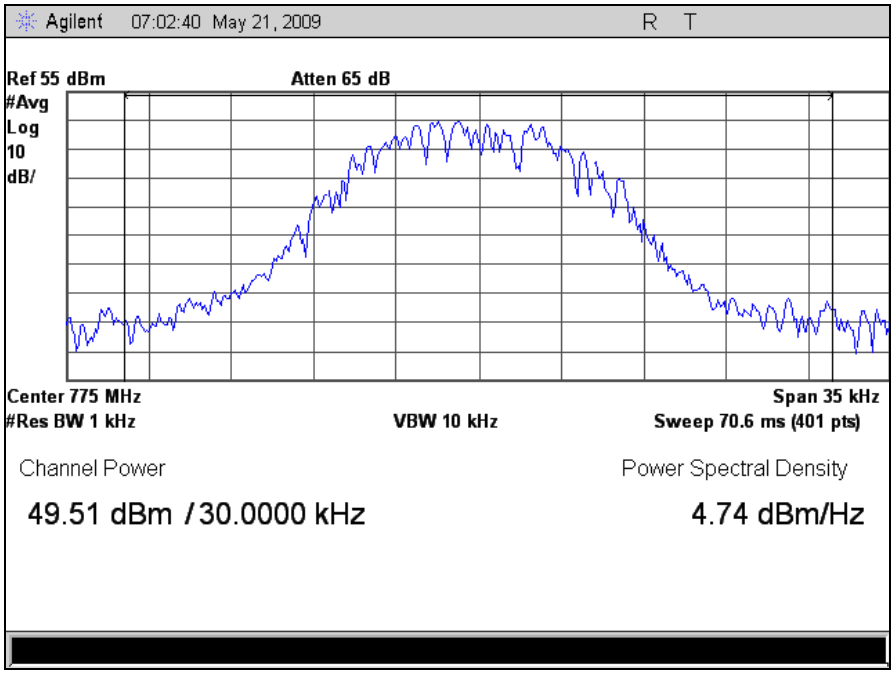
Plot 17. RF Power Output, Channel 769, WCQPSK



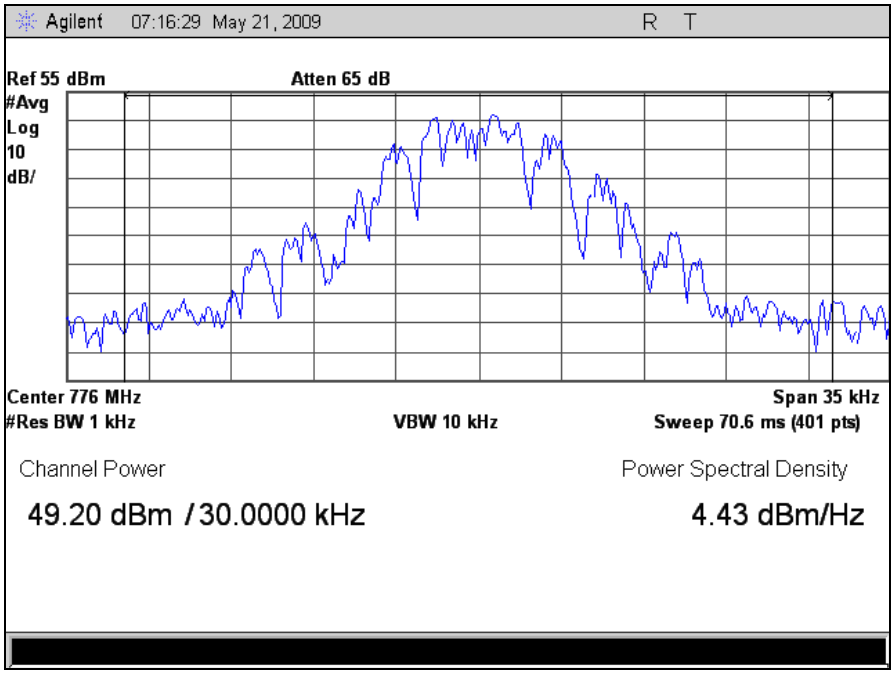
Plot 18. RF Power Output, Channel 775, C4FM



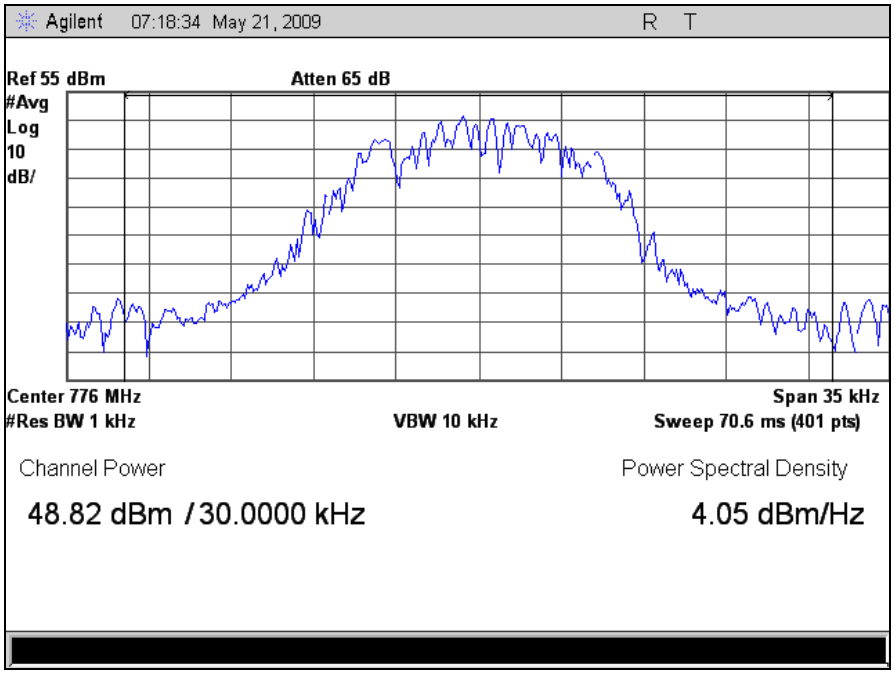
Plot 19. RF Power Output, Channel 775, HDQPSK



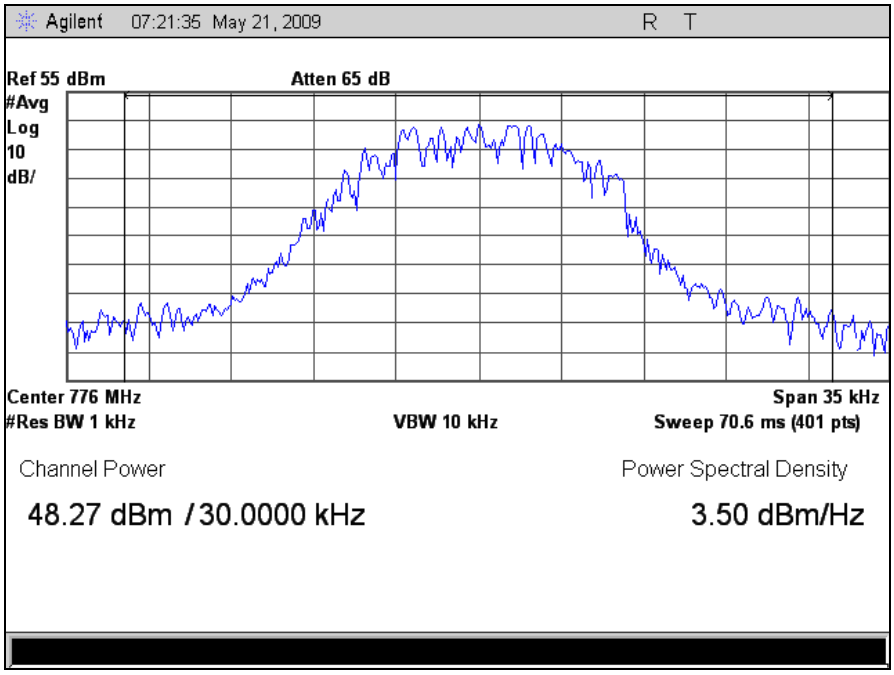
Plot 20. RF Power Output, Channel 775, WCQPSK



Plot 21. RF Power Output, Channel 776, C4FM



Plot 22. RF Power Output, Channel 776, HDQPSK



Plot 23. RF Power Output, Channel 776, WCQPSK

5. Electromagnetic Compatibility Occupied Bandwidth Requirements

5.1. Occupied Bandwidth (Emission Mask)

Test Requirement(s): **§2.1049 and §90.210 Mask C**

Test Procedures: As required by 47 CFR 2.1049, *occupied bandwidth measurements* were made at the RF output terminals of the EUT.

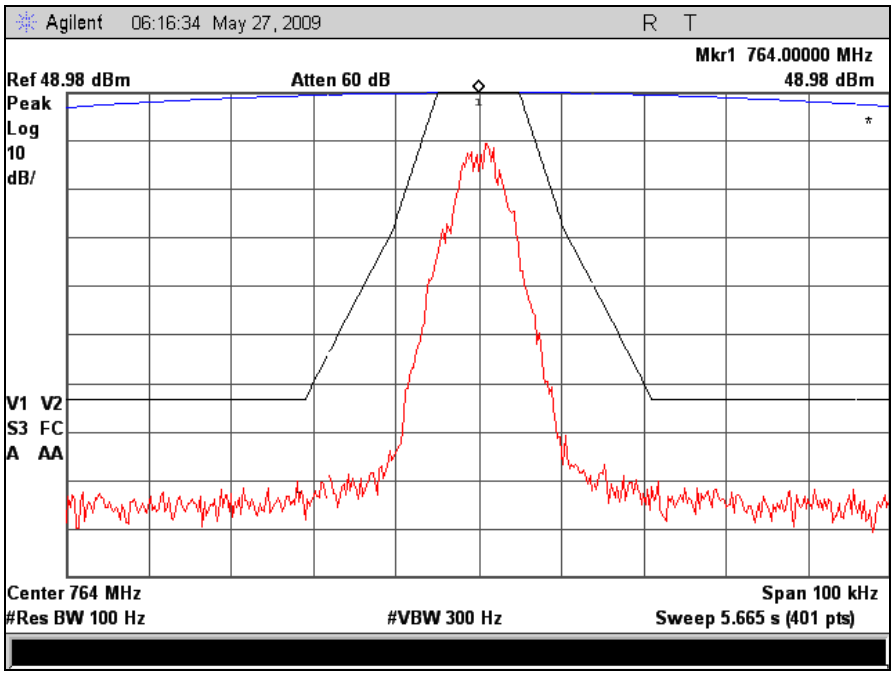
A laptop was connected to EUT to control the RF power output, m and frequency channel. The EUT was connected through an attenuator to a Spectrum Analyzer. The measured highest Average Power was set relative to zero dB reference. The RBW of the Spectrum Analyzer was set to at least 1% of the channel bandwidth. The EUT power was adjusted at the maximum output power level.

Test Results: Equipment complies with Section 2.1049 and 90.210 Mask C. The EUT does not exceed the Emission Masks limit.

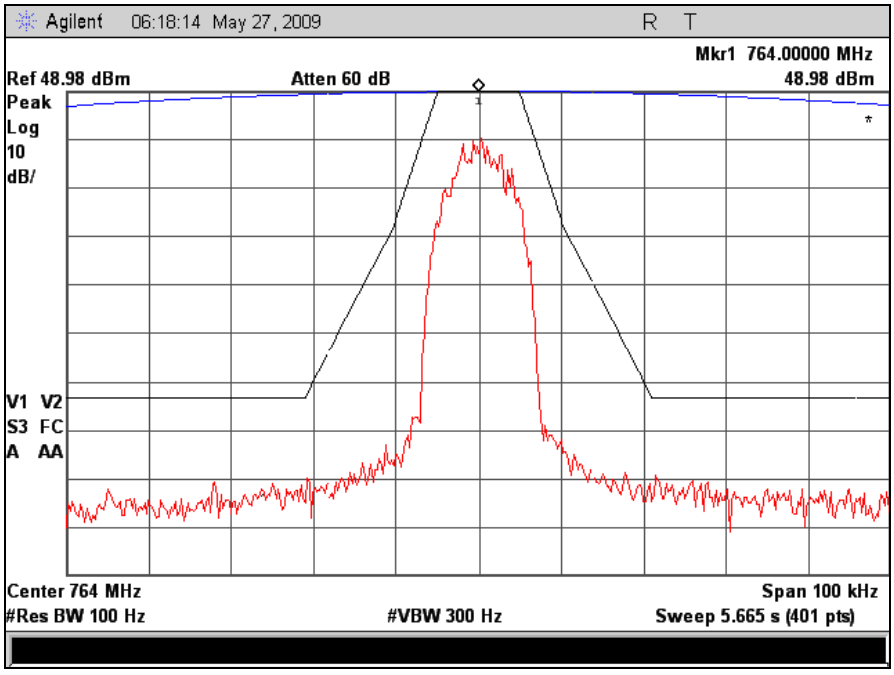
The following pages show measurements of Emission Mask plots:

Test Engineer(s): Len Knight

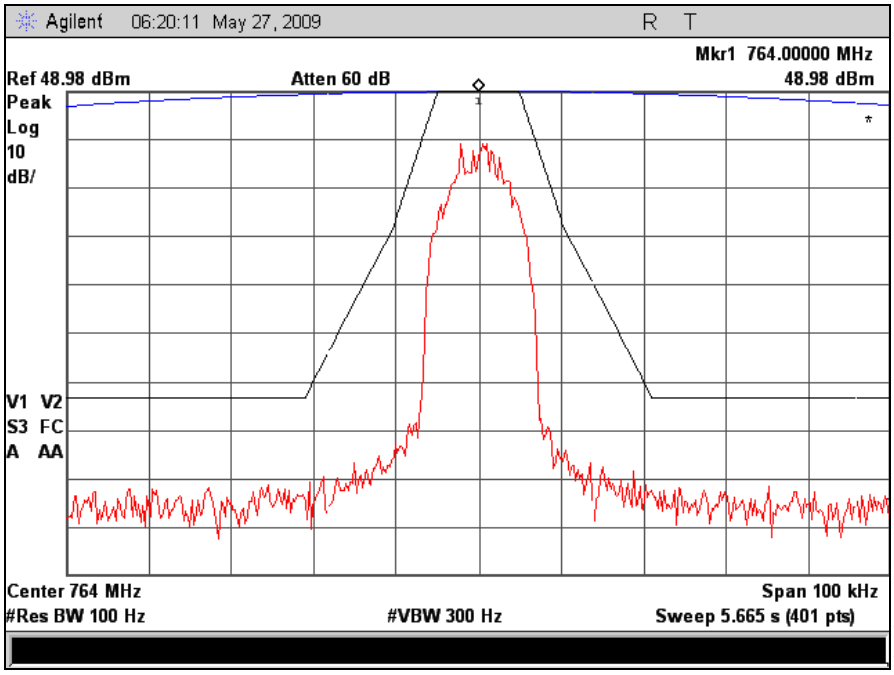
Test Date(s): 05/27/09



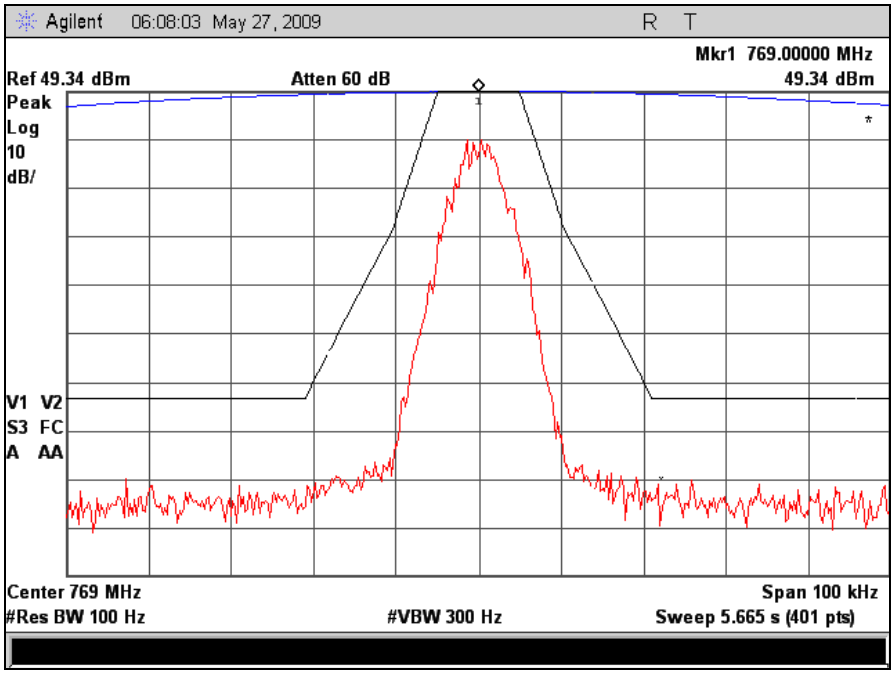
Plot 24. Mask C, Channel 764, C4FM



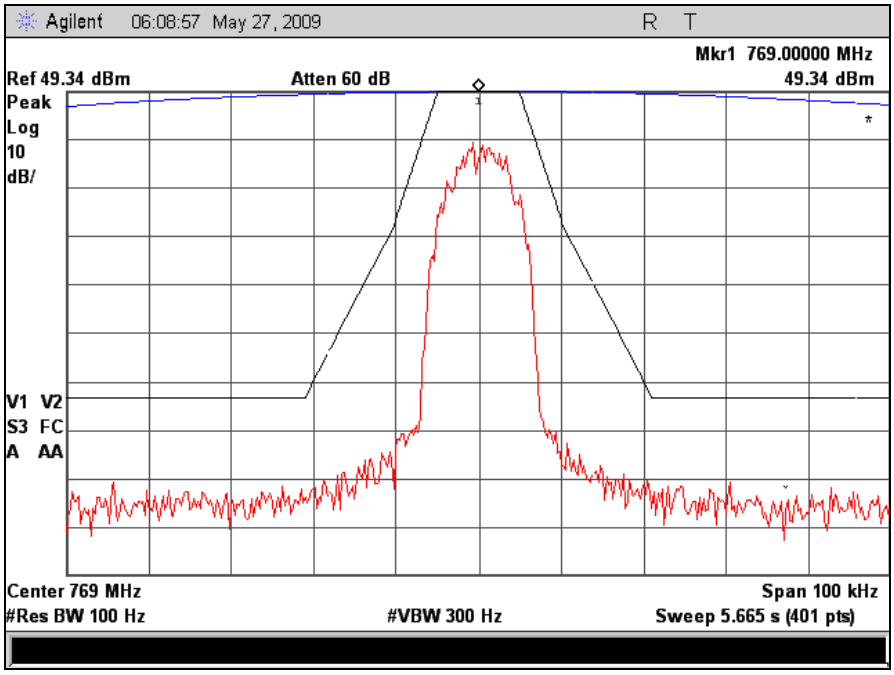
Plot 25. Mask C, Channel 764, HDQPSK



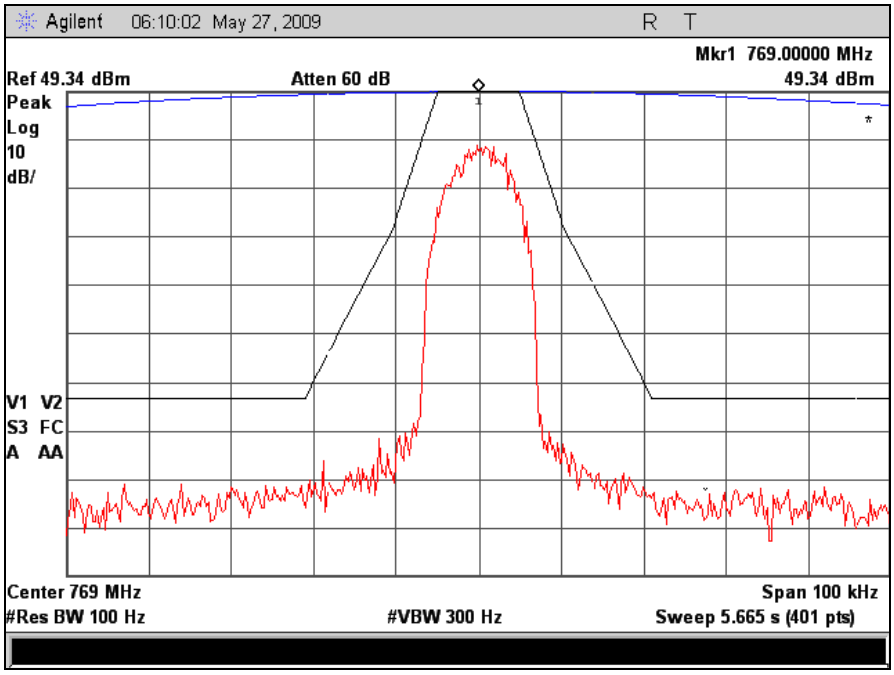
Plot 26. Mask C, Channel 764, WCQPSK



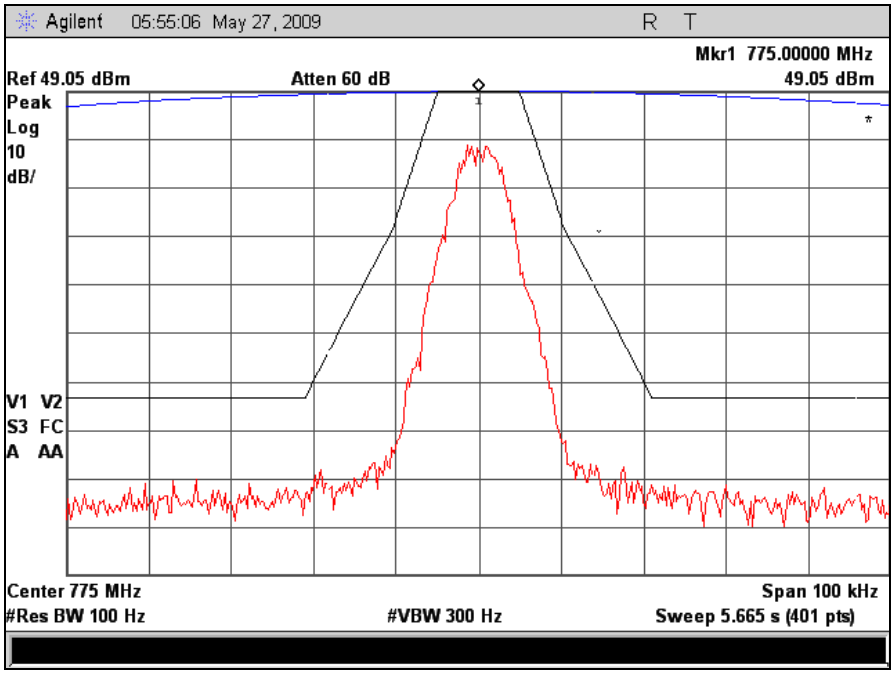
Plot 27. Mask C, Channel 769, C4FM



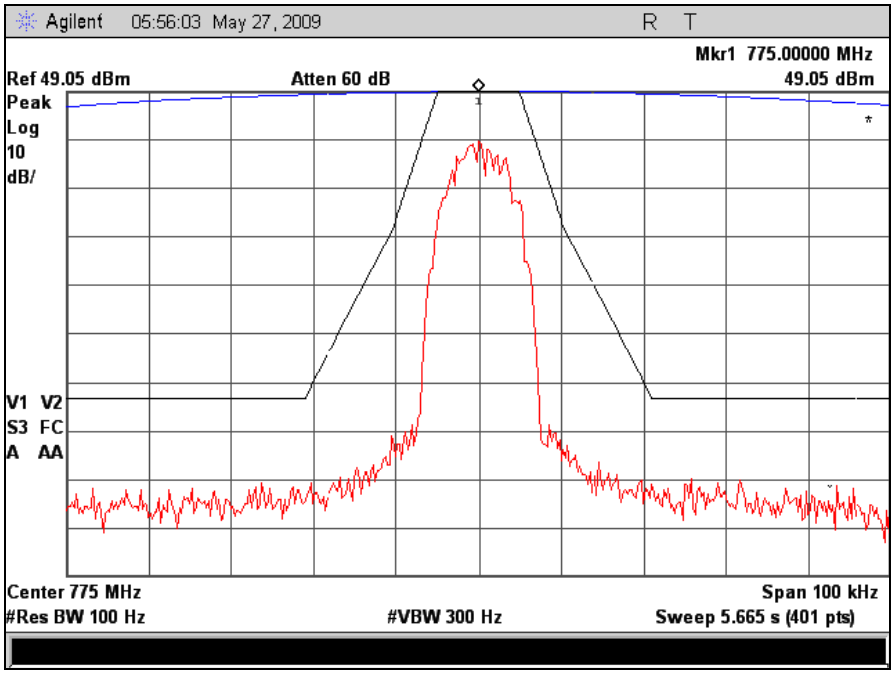
Plot 28. Mask C, Channel 769, HDQPSK



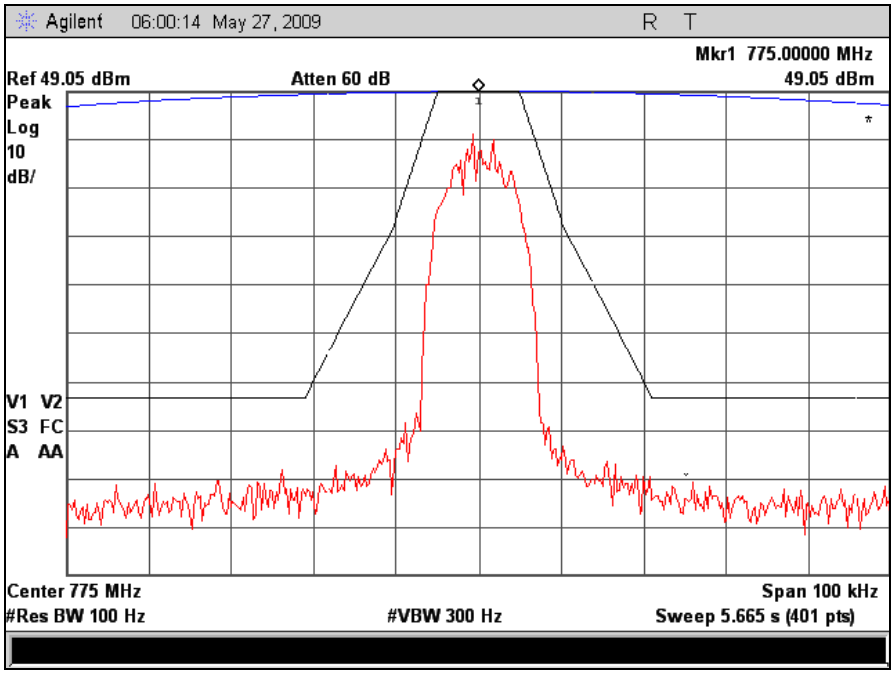
Plot 29. Mask C, Channel 769, WCQPSK



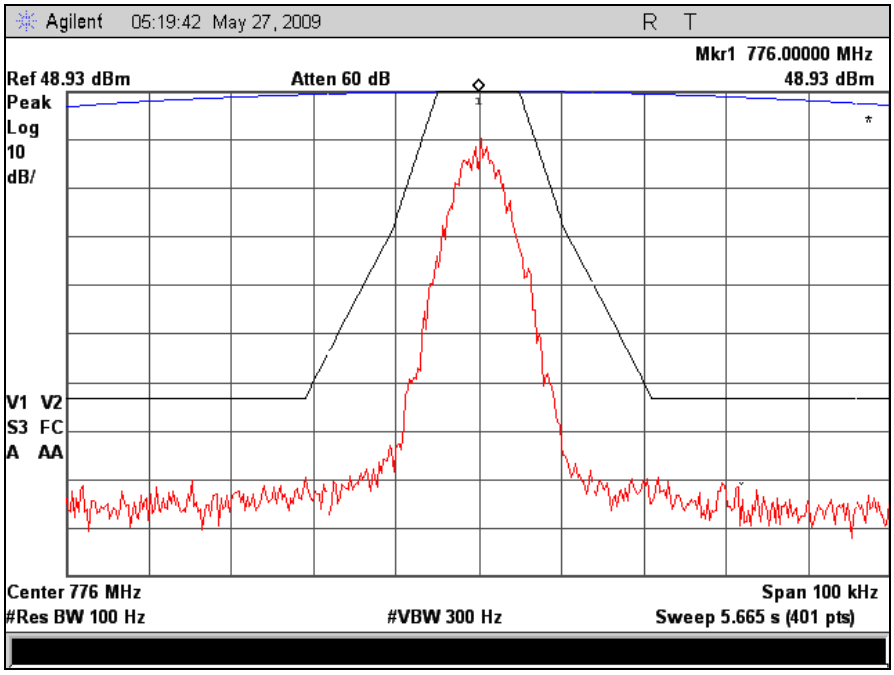
Plot 30. Mask C, Channel 775, C4FM



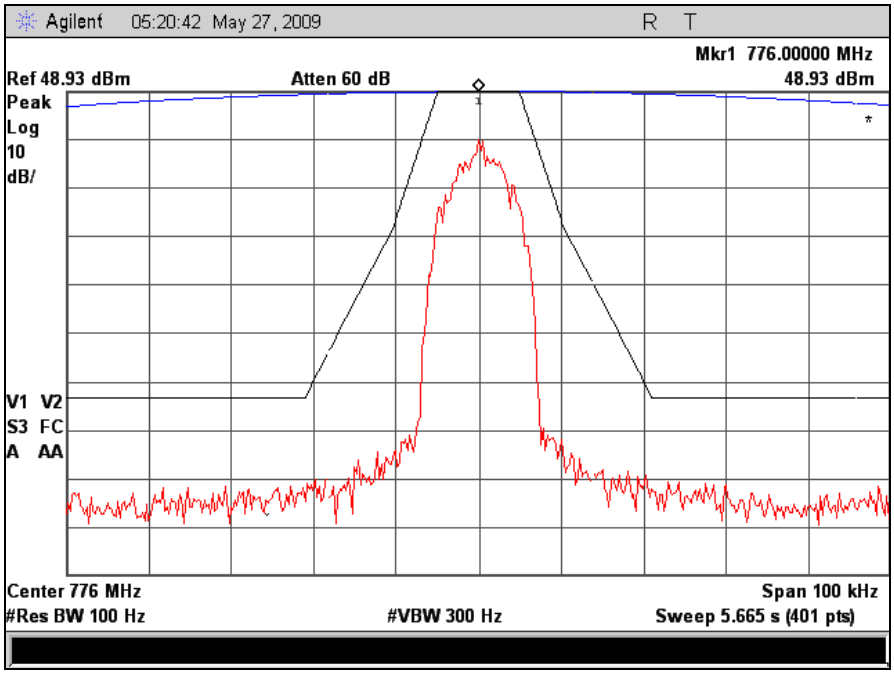
Plot 31. Mask C, Channel 775, HDQPSK



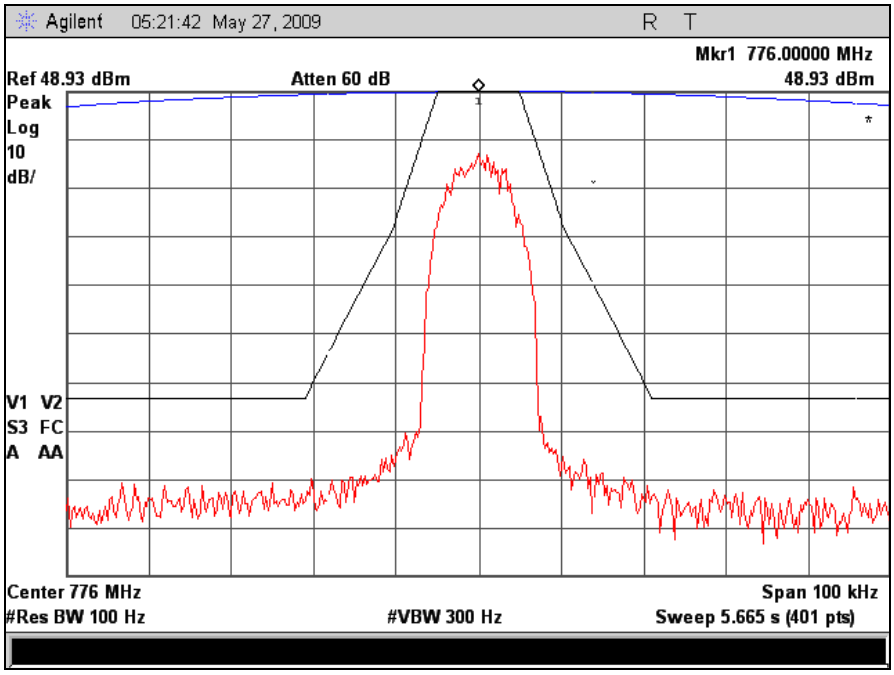
Plot 32. Mask C, Channel 775, WCQPSK



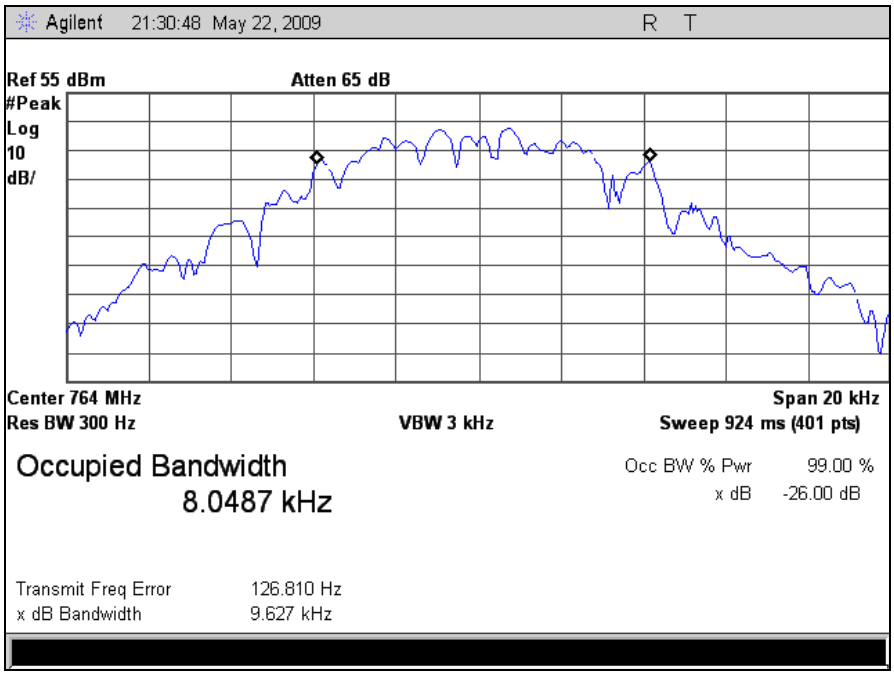
Plot 33. Mask C, Channel 776, C4FM



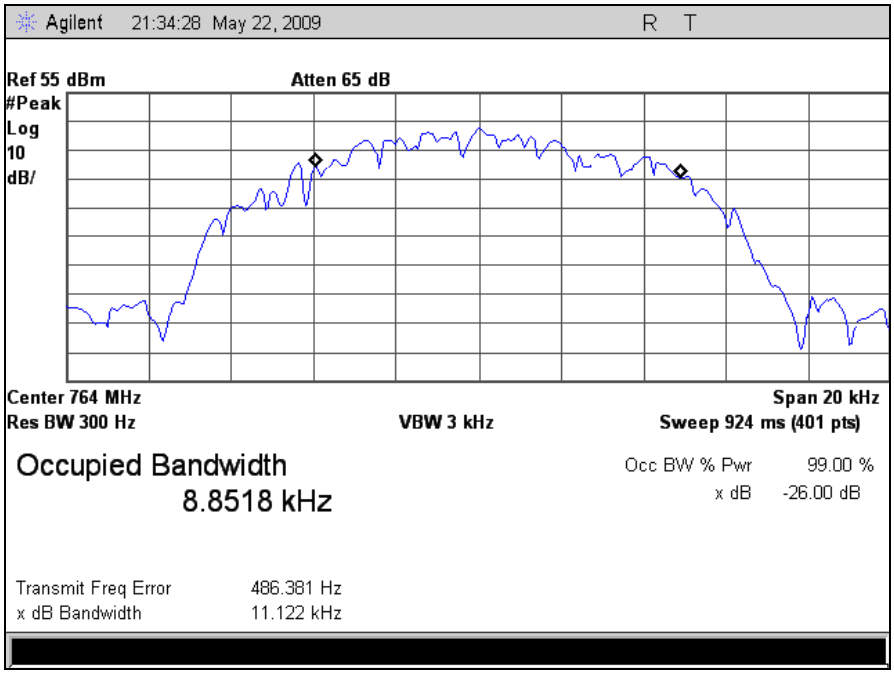
Plot 34. Mask C, Channel 776, HDQPSK



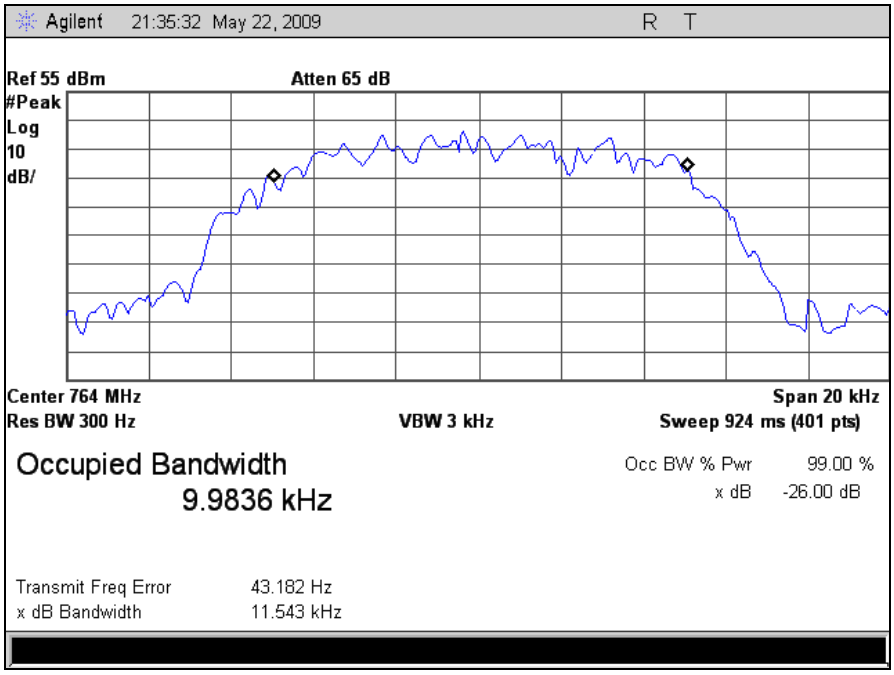
Plot 35. Mask C, Channel 776, WCQPSK



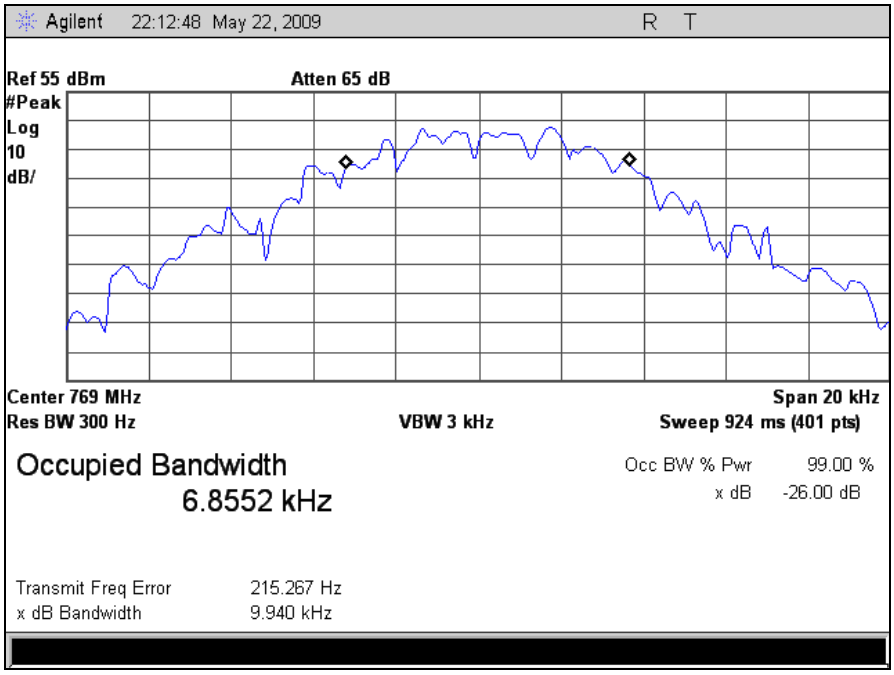
Plot 36. Occupied Bandwidth, Channel 764, C4FM



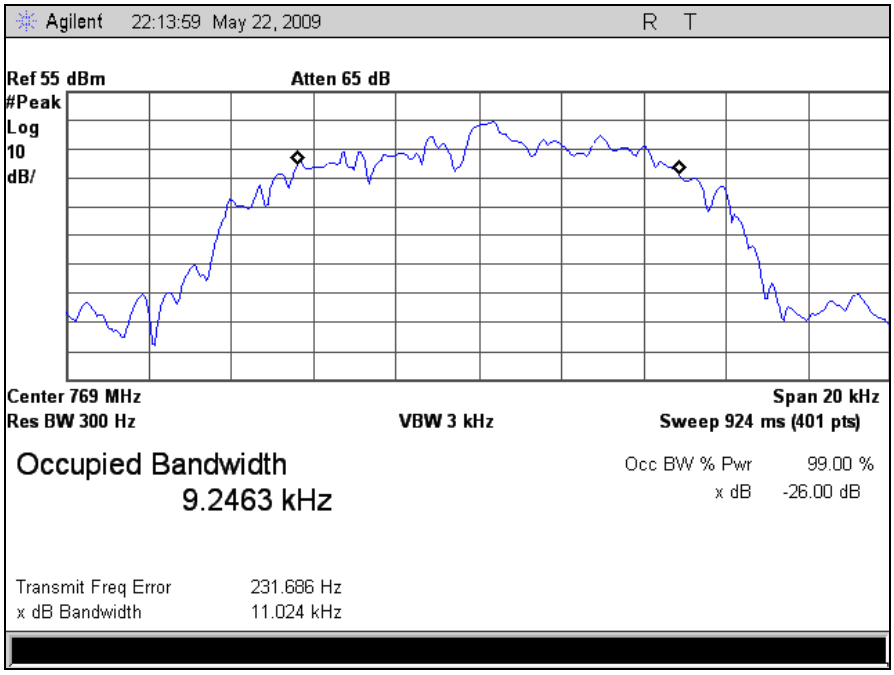
Plot 37. Occupied Bandwidth, Channel 764, HDQPSK



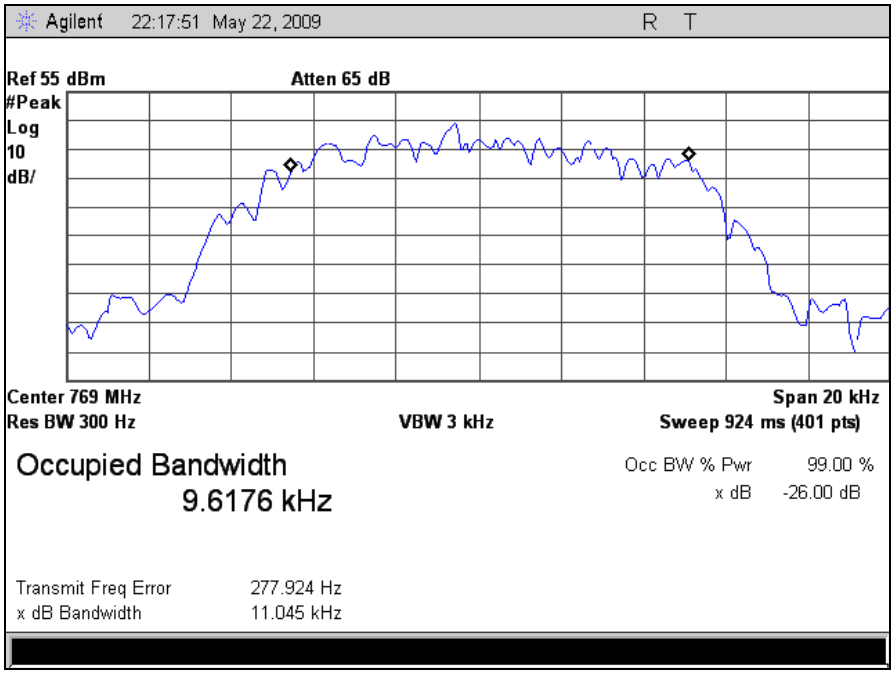
Plot 38. Occupied Bandwidth, Channel 764, WCQPSK



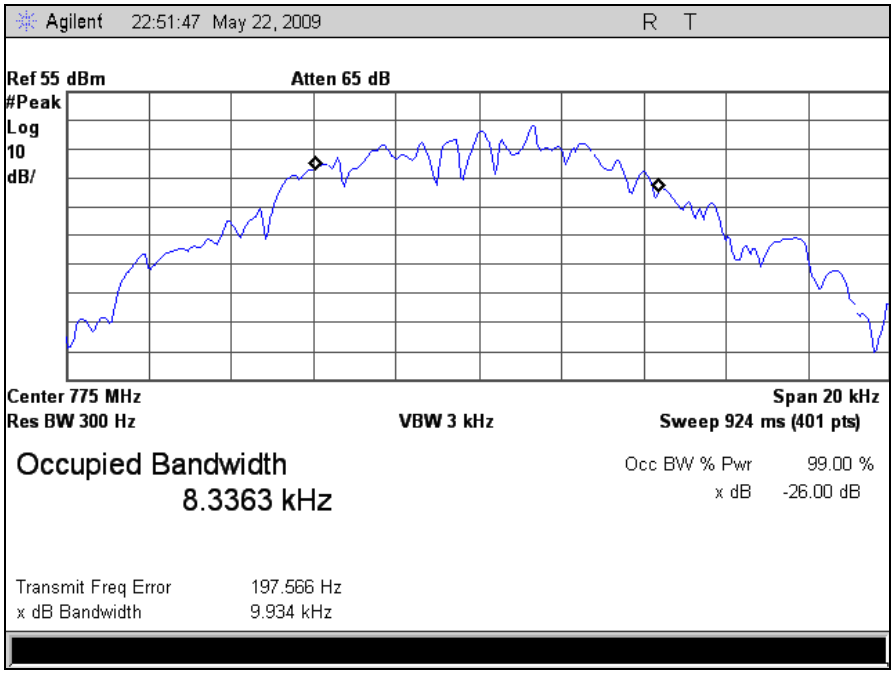
Plot 39. Occupied Bandwidth, Channel 769, C4FM



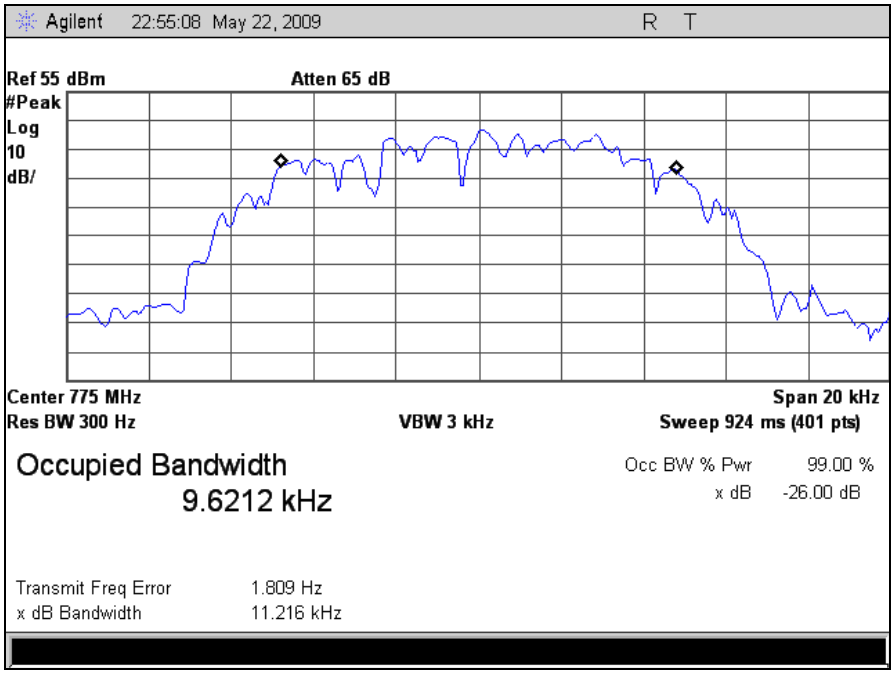
Plot 40. Occupied Bandwidth, Channel 769, HDQPSK



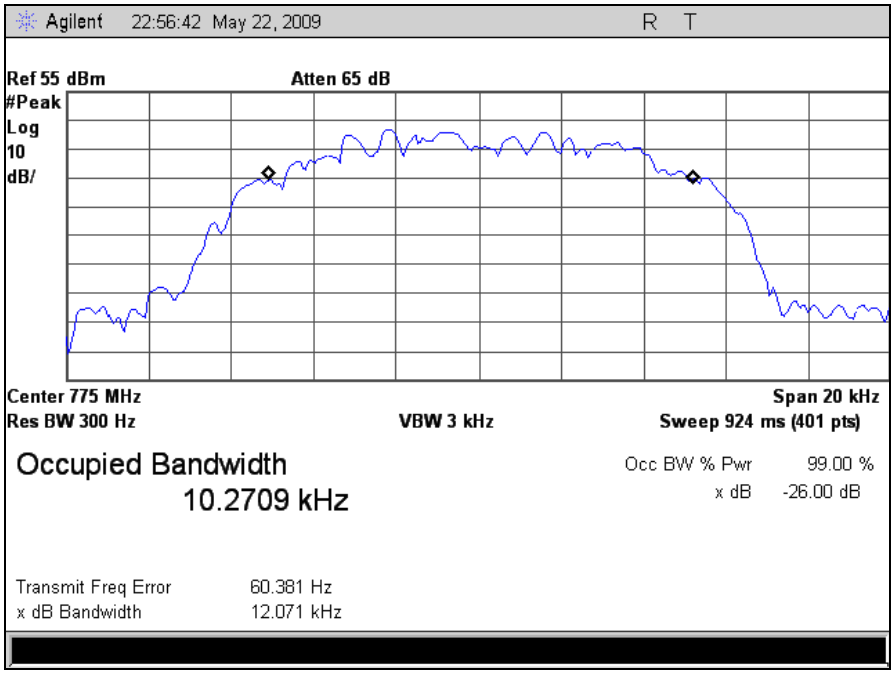
Plot 41. Occupied Bandwidth, Channel 769, WCQPSK



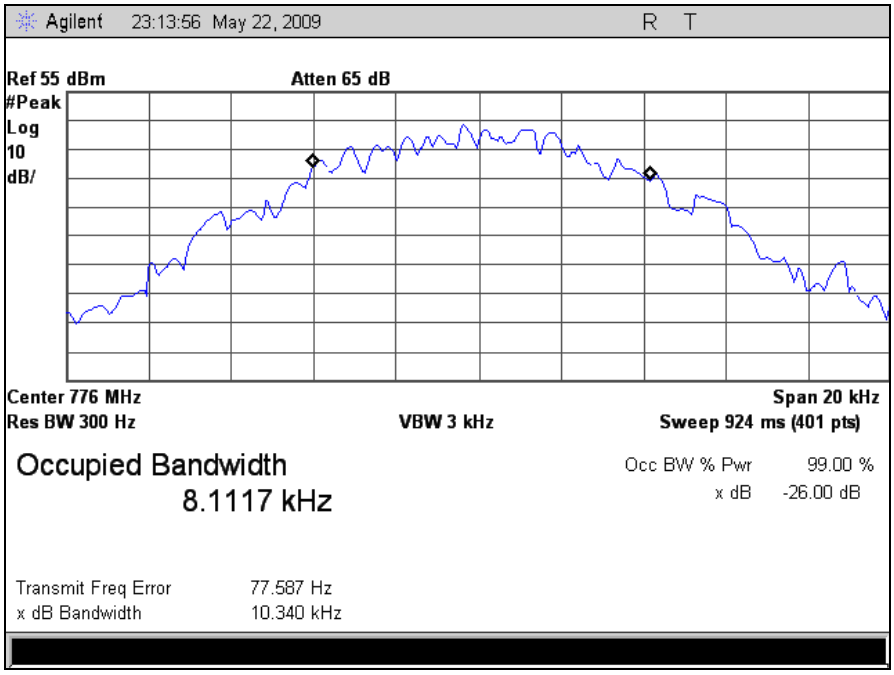
Plot 42. Occupied Bandwidth, Channel 775, C4FM



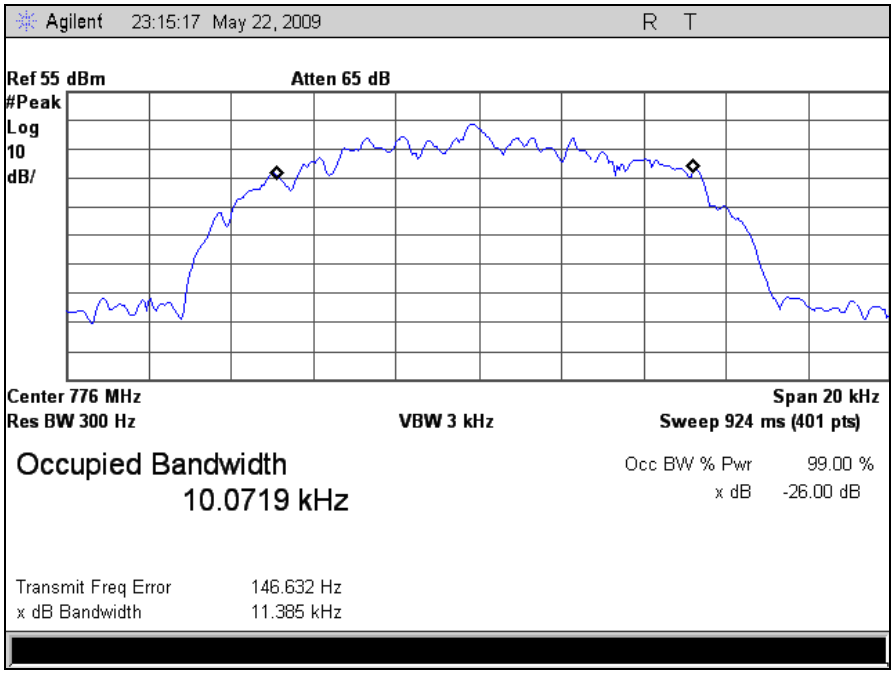
Plot 43. Occupied Bandwidth, Channel 775, HDQPSK



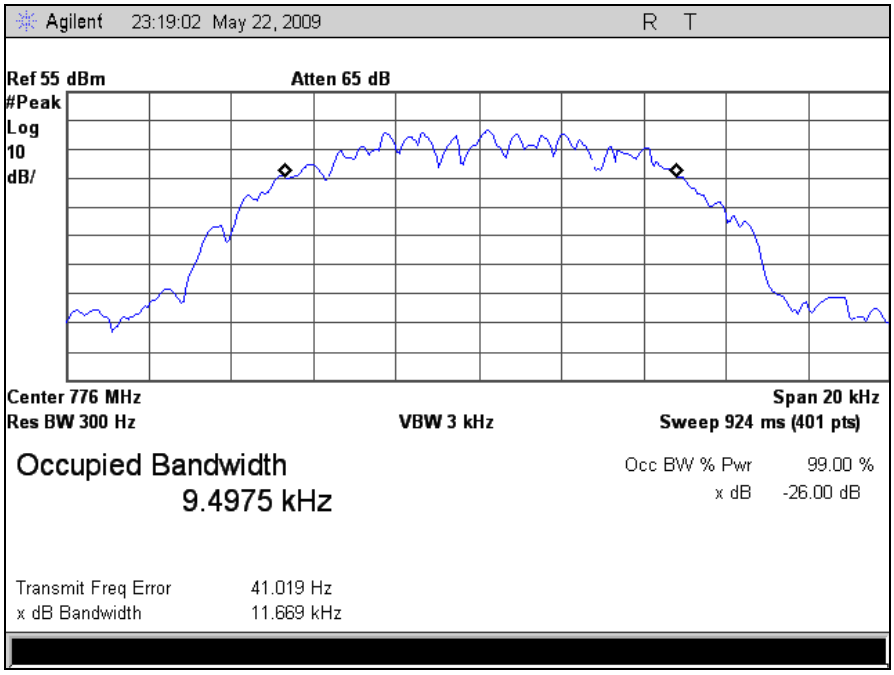
Plot 44. Occupied Bandwidth, Channel 775, WCQPSK



Plot 45. Occupied Bandwidth, Channel 776, C4FM



Plot 46. Occupied Bandwidth, Channel 776, HDQPSK



Plot 47. Occupied Bandwidth, Channel 776, WCQPSK

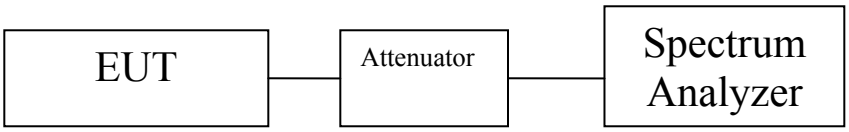


Figure 13. Occupied Bandwidth (Emission Mask) Test Setup

6. Electromagnetic Compatibility Spurious Emissions at Antenna Terminal Requirements

6.1. Spurious Emissions at Antenna Terminals

Test Requirement(s): **§2.1051 and §90.210(C)**

Test Procedures: As required by 47 CFR 2.1051, *spurious emissions at antenna terminal measurements* were made at the RF output terminals of the EUT.

A laptop was connected to EUT to control the RF power output, modulation, and frequency channel. The EUT was connected through an attenuator to a Spectrum Analyzer. The Spectrum Analyzer was set to sweep 30 MHz and up to 10th harmonic of the fundamental or 40GHz which ever is the lesser.

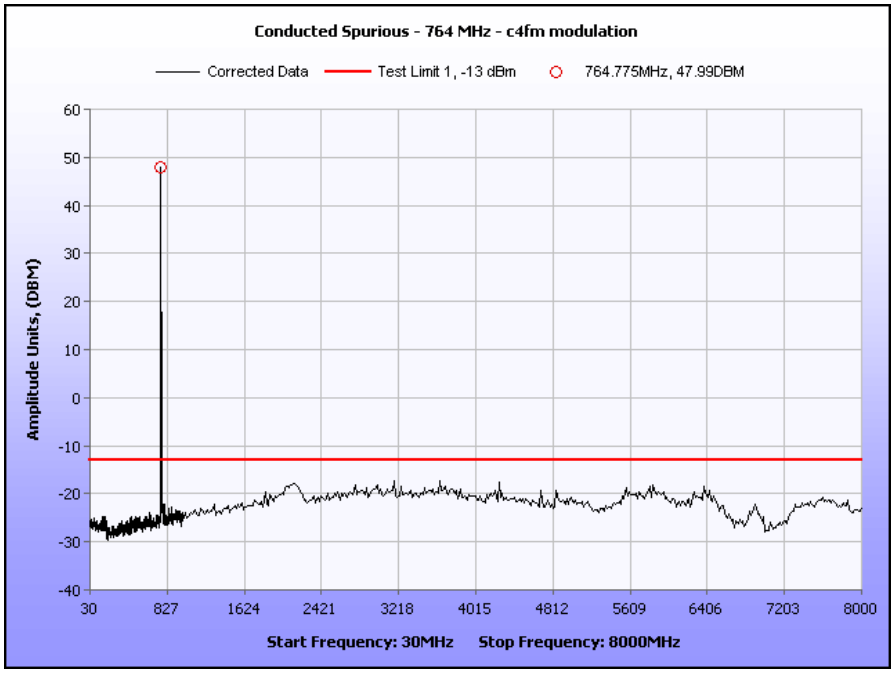
For measurements below 1 GHz, the RBW = 100 kHz and the VBW = 3 x RBW.
For measurements above 1 GHz, the RBW = 1 MHz and the VBW = 3 x RBW.

All plots are corrected for cable and attenuator loss.

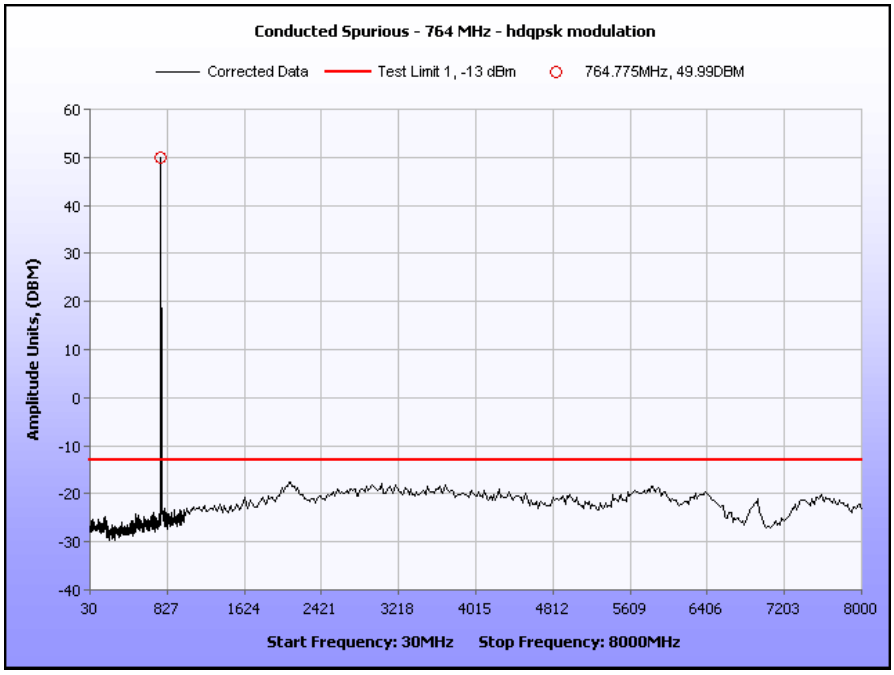
Test Results: Equipment complies with Section 2.1051 and 90.210(C).

Test Engineer(s): Len Knight

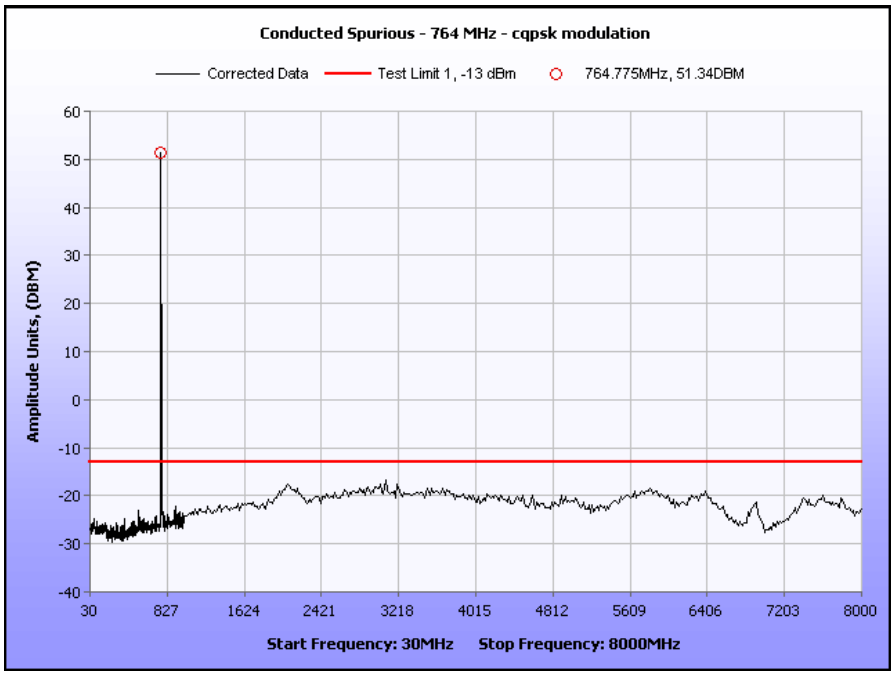
Test Date(s): 05/25/09



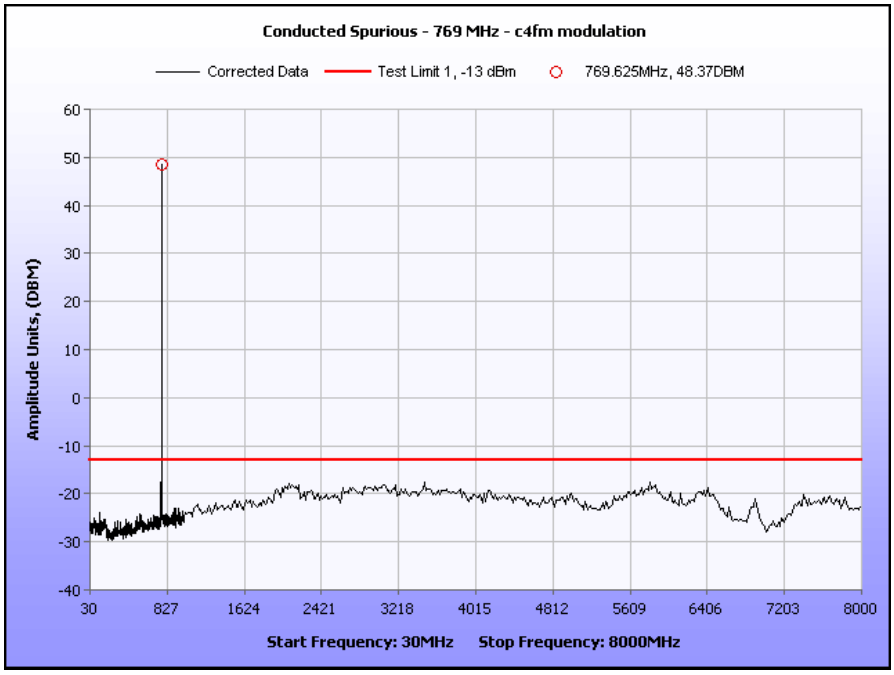
Plot 48. Conducted Spurious Emissions, Channel 764, C4FM



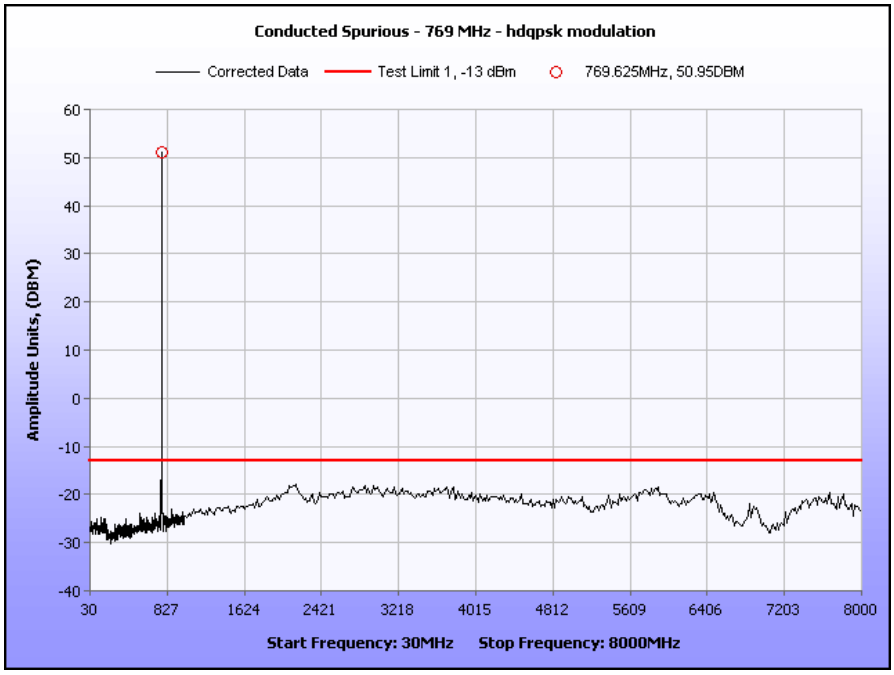
Plot 49. Conducted Spurious Emissions, Channel 764, HDQPSK



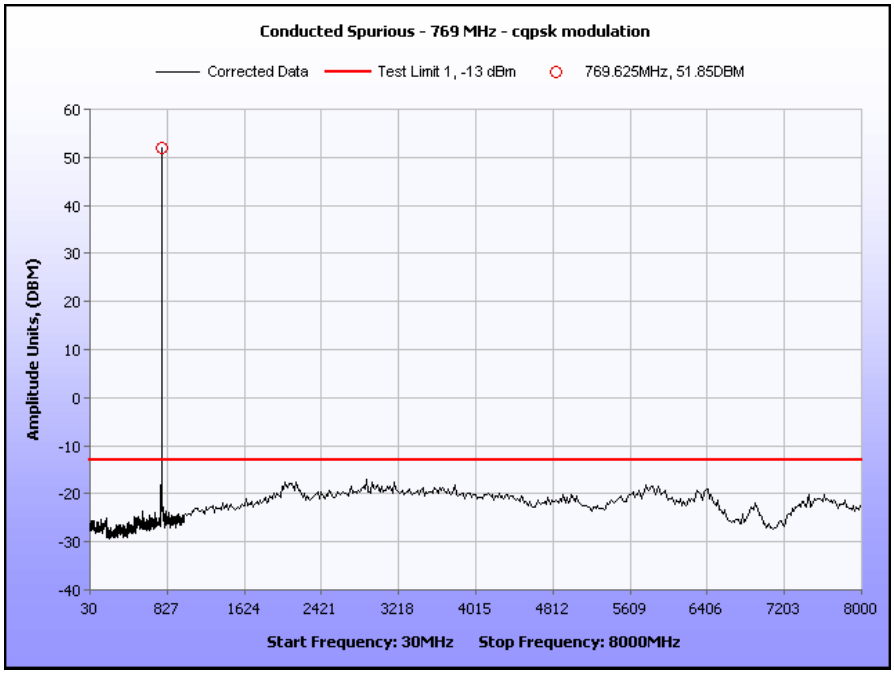
Plot 50. Conducted Spurious Emissions, Channel 764, WCQPSK



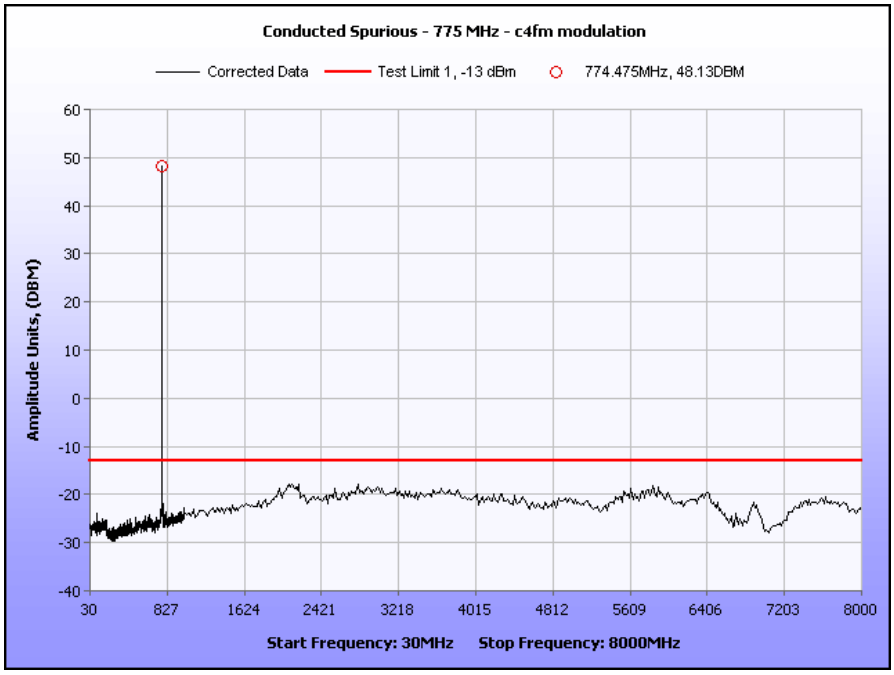
Plot 51. Conducted Spurious Emissions, Channel 769,C4FM



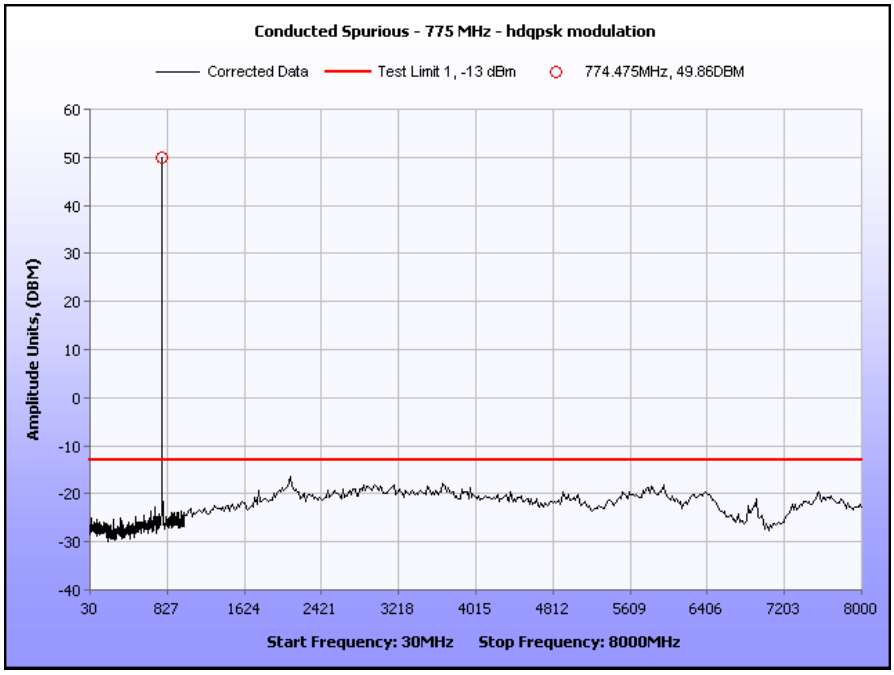
Plot 52. Conducted Spurious Emissions, Channel 769, HDQPSK



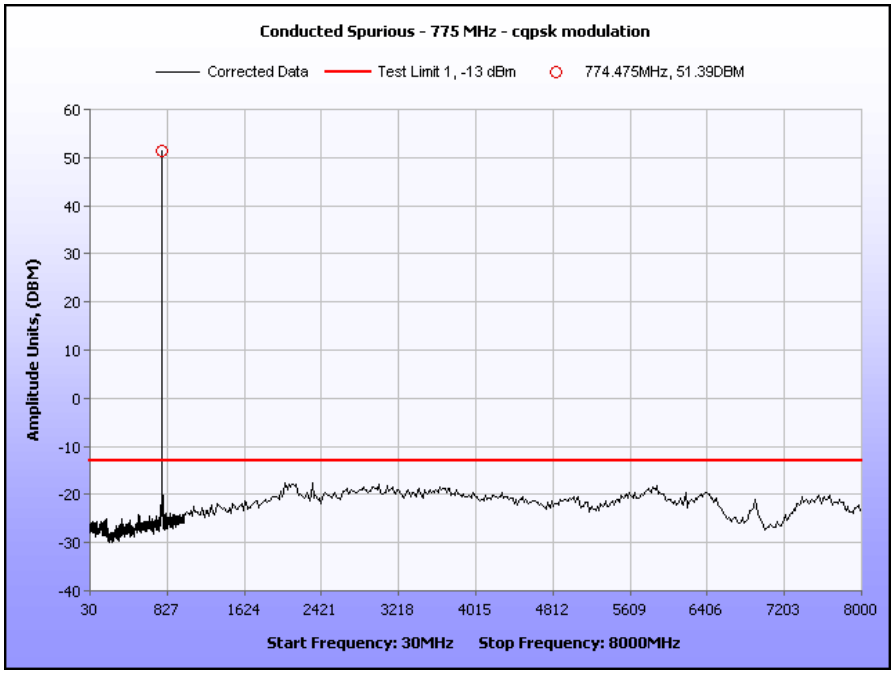
Plot 53. Conducted Spurious Emissions, Channel 769, WCQPSK



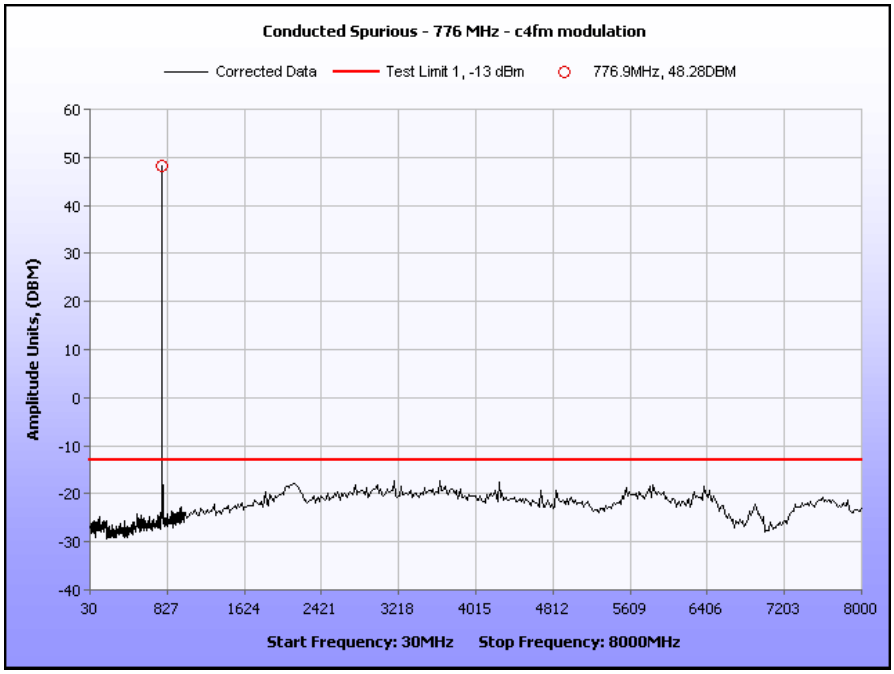
Plot 54. Conducted Spurious Emissions, Channel 775,C4FM



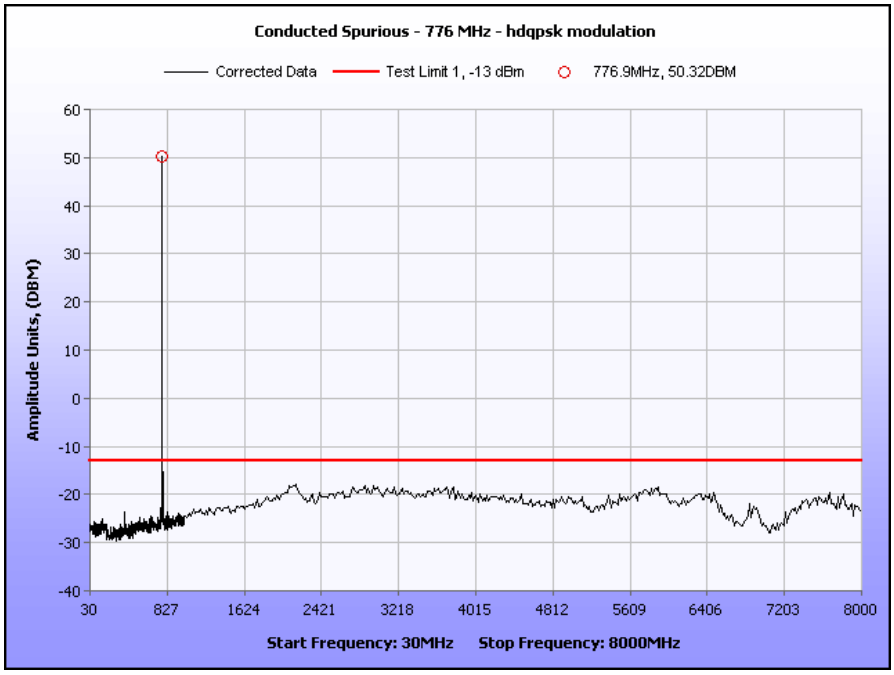
Plot 55. Conducted Spurious Emissions, Channel 775, HDQPSK



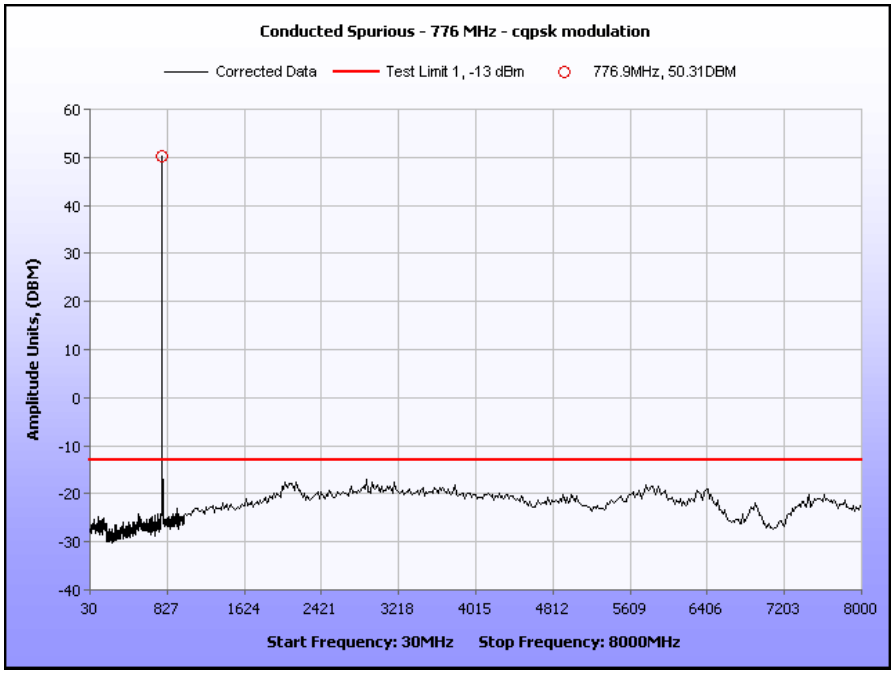
Plot 56. Conducted Spurious Emissions, Channel 3, WCQPSK, 30 MHz – 1 GHz



Plot 57. Conducted Spurious Emissions, Channel 776,C4FM



Plot 58. Conducted Spurious Emissions, Channel 776, HDQPSK



Plot 59. Conducted Spurious Emissions, Channel 776, WCQPSK

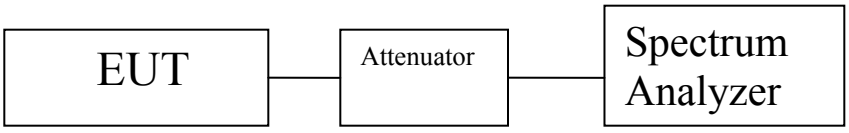


Figure 14. Spurious Emissions at Antenna Terminals Test Setup

Electromagnetic Compatibility Radiated Emissions Requirements

6.2. Radiated Spurious Emissions

Test Requirement(s): **§2.1053 and §90.210**

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

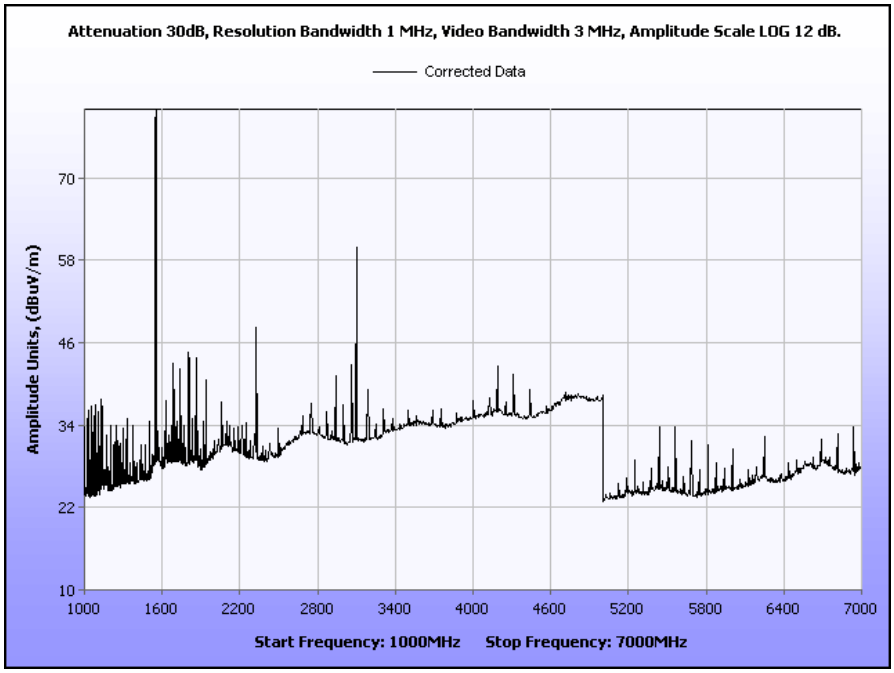
Radiated emission measurements were performed inside a 3 meter semi-anechoic chamber. The EUT was set at a distance of 3m from the receiving antenna. The EUT's RF ports were terminated to 50 ohm loads. The EUT was set to transmit at its maximum power level. The EUT was rotated about 360^0 and the receiving antenna scanned from 1-4m in order to capture the maximum emission. The transmitter was modulated using WCQPSK since that proved to be the highest power level.

Plots were captured and corrected for antenna correction factor and cable loss. The strength of the harmonics were measured using the antenna substitution method.

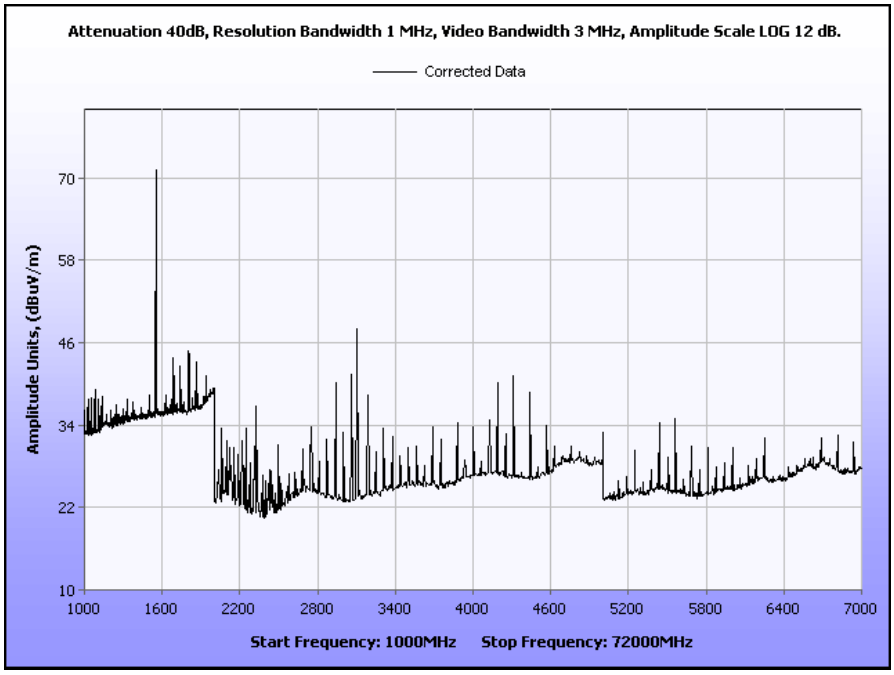
Test Results: Equipment complies with Section 2.1053 and 90.210.

Test Engineer(s): Len Knight

Test Date(s): 06/04/09, 06/17/09, and 07/08/09



Plot 60. Channel 775, Scan 1 – 7 GHz



Plot 61. Channel 776, Scan 1 – 7 GHz

764 MHz							
Freq (MHz)	**Pol H/V**	**Measured (dBuV)**	**Sig Gen (dBm)**	**Pwr to Sub (dBm)**	**Ant Gain (dBi)**	**EIRP (dBm)**	**Limit (dBm)**
1528	V	76.6	-22.9	-29.67	5.3	-24.37	-13
2292	V	44.86	-49.3	-59.44	5.77	-53.67	-13
3056	V	60.6	-29.7	-42.15	6.6	-35.55	-13
3820	V	30.3	-59.5	-72.1	8.3	-63.8	-13
4584	V	39.3	-51	-65.2	9.23	-55.97	-13
1528	H	85	-14.5	-21.39	5.3	-16.09	-13
2292	H	49.2	-45	-51.7	4.9	-46.8	-13
3056	H	64.5	-25.4	-37.5	6.62	-30.88	-13
3820	H	26.2	-55.1	-66.9	8.31	-58.59	-13
4584	H	32.7	-44.1	-58	9.1	-48.9	-13

Table 10. Radiated Spurious Emissions, Test Results, 764 MHz

769 MHz							
Freq (MHz)	**Pol H/V**	**Measured (dBuV)**	**Sig Gen (dBm)**	**Pwr to Sub (dBm)**	**Ant Gain (dBi)**	**EIRP (dBm)**	**Limit (dBm)**
1538	V	53.5	-20.3	-23.4	5.3	-18.1	-13
2307	V	58.2	-35.1	-45.25	5.77	-39.48	-13
3076	V	62.3	-28.3	-40.81	6.6	-34.21	-13
3845	V	38.8	-51.3	-64.2	8.3	-55.9	-13
4614	V	31.1	-42.7	-56.5	9.29	-47.21	-13
1538	H	47.6	-26.3	-29.7	5.3	-24.4	-13
2307	H	65.7	-28.1	-40	4.9	-35.1	-13
3076	H	64.7	-25.1	-37	6.63	-30.37	-13
3845	H	39.4	-42.3	-54.1	8.31	-45.79	-13
4614	H	31.4	-45.2	-59.2	9.2	-50	-13

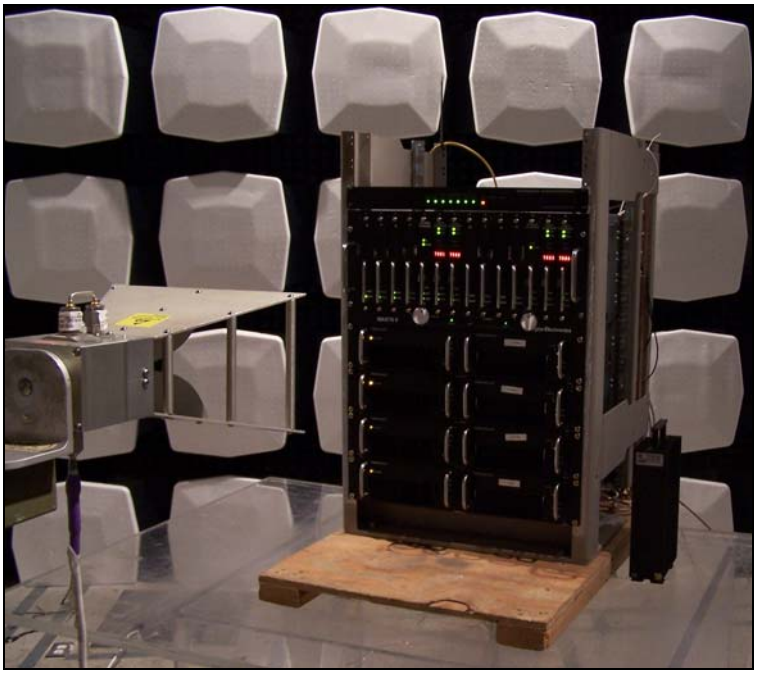
Table 11. Radiated Spurious Emissions, Test Results, 769 MHz

775 MHz							
Freq (MHz)	**Pol H/V**	**Measured (dBuV)**	**Sig Gen (dBm)**	**Pwr to Sub (dBm)**	**Ant Gain (dBi)**	**EIRP (dBm)**	**Limit (dBm)**
1550	V	79.9	-19.2	-27.34	5.3	-22.04	-13
2325	V	58.6	-35.2	-47.1	5.77	-41.33	-13
3100	V	54.9	-36.1	-48.2	6.6	-41.6	-13
3875	V	35.1	-54.1	-67.2	8.3	-58.9	-13
4650	V	26.8	-62	-75.8	9.29	-66.51	-13
1550	H	84.6	-14.9	-21.3	5.3	-16	-13
2325	H	53.1	-49	-51.9	4.9	-47	-13
3100	H	60.6	-29.2	-41.4	6.65	-34.75	-13
3875	H	38.6	-42.3	-54.3	8.32	-45.98	-13
4650	H	26.1	-49.7	-63	9.2	-53.8	-13

Table 12. Radiated Spurious Emissions, Test Results, 775 MHz

776 MHz							
Freq (MHz)	Pol H/V	Measured (dBuV)	Sig Gen (dBm)	Pwr to Sub (dBm)	Ant Gain (dBi)	EIRP (dBm)	Limit (dBm)
1552	V	86.1	-14	-20.5	5.3	-15.2	-13
2328	V	46.2	-47.7	-57.74	5.77	-51.97	-13
3104	V	61.7	-29	-41.52	6.6	-34.92	-13
3880	V	32.9	-57.2	-70	8.3	-61.7	-13
4656	V	27.4	-62.9	-76.3	9.3	-67	-13
1552	H	85.5	-14.1	-20.61	5.3	-15.31	-13
2328	H	47.2	-43.1	-55.8	4.9	-50.9	-13
3104	H	62.1	-27.1	-39.8	6.65	-33.15	-13
3880	H	34.1	-46.9	-58.2	8.32	-49.88	-13
4656	H	27.1	-49	-62.1	9.23	-52.87	-13

Table 13. Radiated Spurious Emissions, Test Results, 776 MHz



Photograph 3. Radiated Emissions, Test Setup

7. Electromagnetic Compatibility Frequency Stability Requirements

7.1. Frequency Stability

Test Requirement(s): **§2.1055 and §90.213**

Test Procedures: As required by 47 CFR 2.1055, *Frequency Stability measurements* were made at the RF output terminals of the EUT.

The EUT was placed in an Environmental Chamber with all support equipments are outside of the chamber on a table. The EUT was set to transmitter an un-modulated carrier. The reference frequency at 20°C was observed and put on 'view' under Trace 1 of the Spectrum Analyzer. As temperature or voltage was varied, the drift in frequency was observed in Trace 2. The frequency error was measured using delta markers between Trace 1 and 2. The frequency drift was investigated for every 10°C increment until the unit was stabilized then recorded the reading in tabular format with the temperature range of -30 to 60°C.

Voltage supplied to the EUT was 120 VAC reference temperature was at 20°C. The voltage was varied by ± 15 % of nominal

Test Results: Equipment complies with Section 2.1055 and 90.213

Test Engineer(s): Len Knight

Test Date(s): 06/01/09

Frequency Stability Test Results

Reference Freq.: 764 MHz at 20°C

Temperature (centigrade)	Drift (ppm)	
	Hz	ppm
60	-8	-0.0105
50	-2	-0.0026
40	-2	-0.0026
30	-2	-0.0026
20	Ref	Ref
10	3	0.0039
0	5	0.0065
-10	6	0.0079
-20	8	0.0105
-30	10	0.0131

Table 14. Frequency Stability, Test Results, 764 MHz

Reference Freq.: 776 MHz at 20°C

Temperature (centigrade)	Drift (ppm)	
	Hz	ppm
60	-7	-0.009
50	-4	-0.0052
40	-3	-0.0039
30	-3	-0.0039
20	Ref	Ref
10	0	0
0	2	0.0026
-10	3	0.0039
-20	6	0.0077
-30	8	0.0103

Table 15. Frequency Stability, Test Results, 776 MHz

Reference Freq.: 764 MHz at 120 VAC and 20°C

Measured voltage (+/- 15% of nominal)	Drift (ppm)	
	Hz	ppm
102	1	0.0013
138	0	0

Table 16. Frequency vs. Voltage, Test Results, 764 MHz

Reference Freq.: 776 MHz at 120 VAC and 20°C

Measured voltage (+/- 15% of nominal)	Drift (ppm)	
	Hz	ppm
102	1	0.0013
138	0	0

Table 17. Frequency vs. Voltage, Test Results, 776 MHz

Photograph 4. Frequency Stability, Test Setup

8. Electromagnetic Compatibility Adjacent Channel Power Requirements

8.1. Adjacent Channel Power

Test Requirement(s): **§90.543(a)**

Transmitters designed to operate in 764 – 776 MHz and 794 – 806 MHz frequency bands must meet the emission limitations in this section.

(a) The adjacent channel power (ACP) requirements for transmitters designed for various channel sizes are shown in the following tables. Mobile station requirements apply to handheld, car mounted and control station units. The tables specify a value for the ACP as a function of the displacement from the channel center frequency and measurement bandwidth. In the following tables, "(s)" indicates a swept measurement may be used.

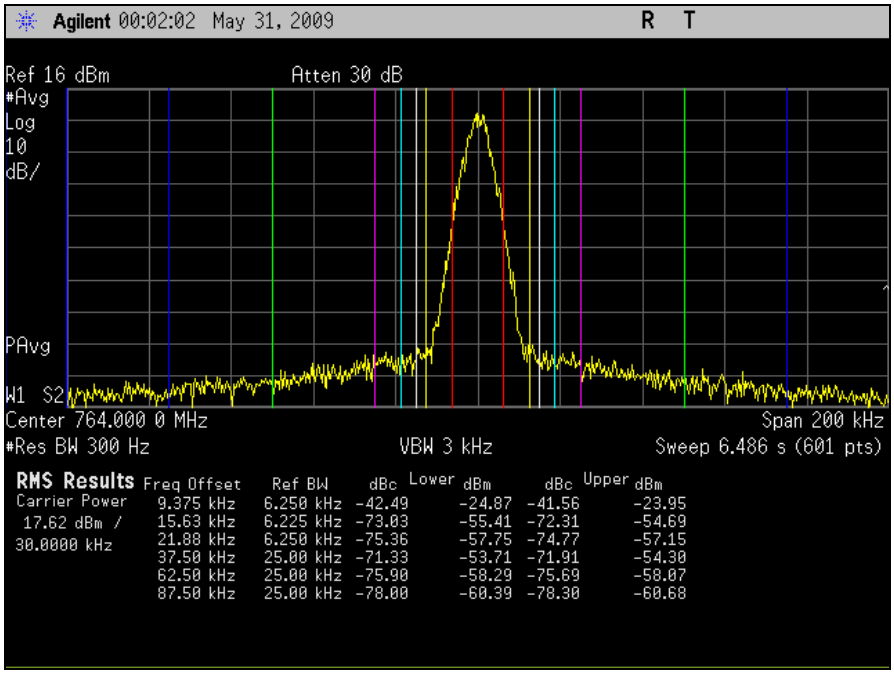
12.5 kHz Base Transmitter ACP Requirements		
Offset from center frequency (kHz)	**Measurement bandwidth (kHz)**	**Maximum ACP (dBc)**
9.375	6.25	-40
15.625	6.25	-60
21.875	6.25	-60
37.5	25	-60
62.5	25	-65
87.5	25	-65
150	100	-65
250	100	-65
350	100	-65
> 400 kHz to 12 MHz	30 (s)	-80
12 MHz to paired receive band	30 (s)	-80
In the paired receive band	30 (s)	-100

Test Procedures: The EUT was connected to a spectrum analyzer capable of making Adjacent Channel Power measurements.

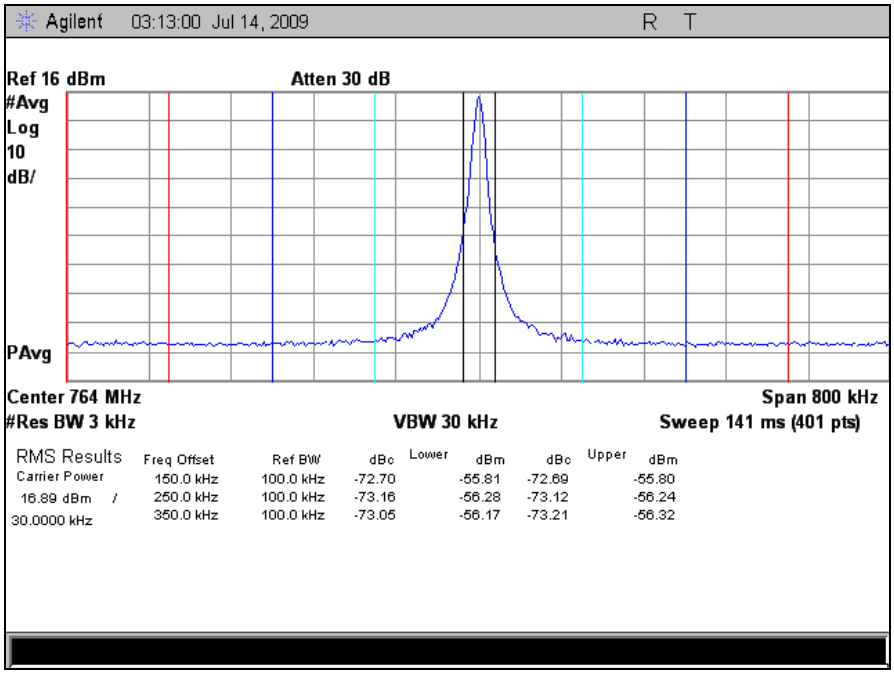
Test Results: Equipment complies with Section 90.543(a)

Test Engineer(s): Len Knight

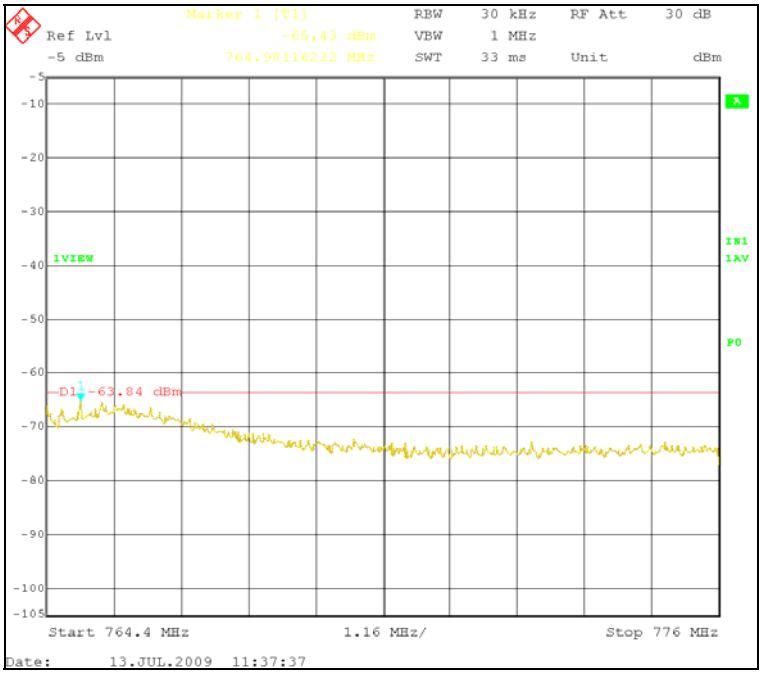
Test Date(s): 06/01/09



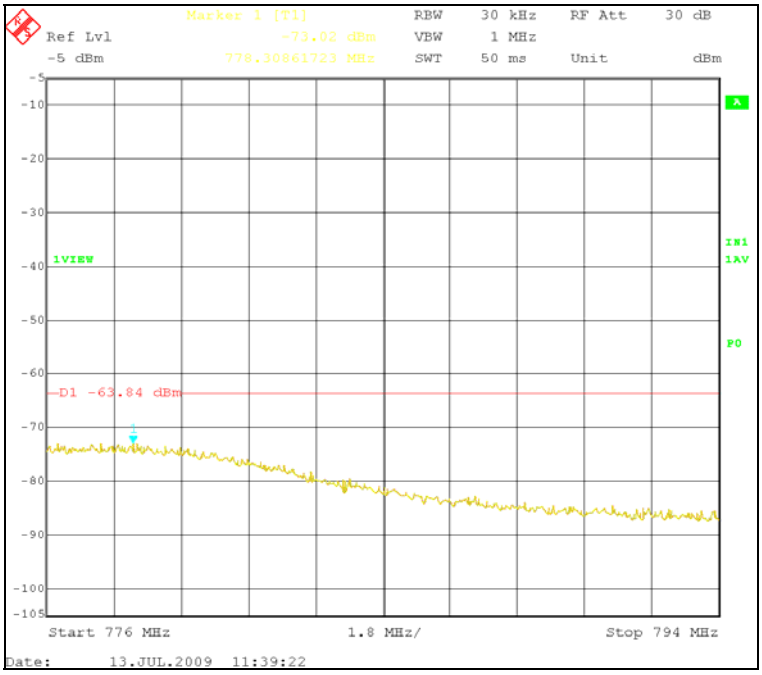
Plot 62. Adjacent Channel Power, Channel 764, C4FM, 1



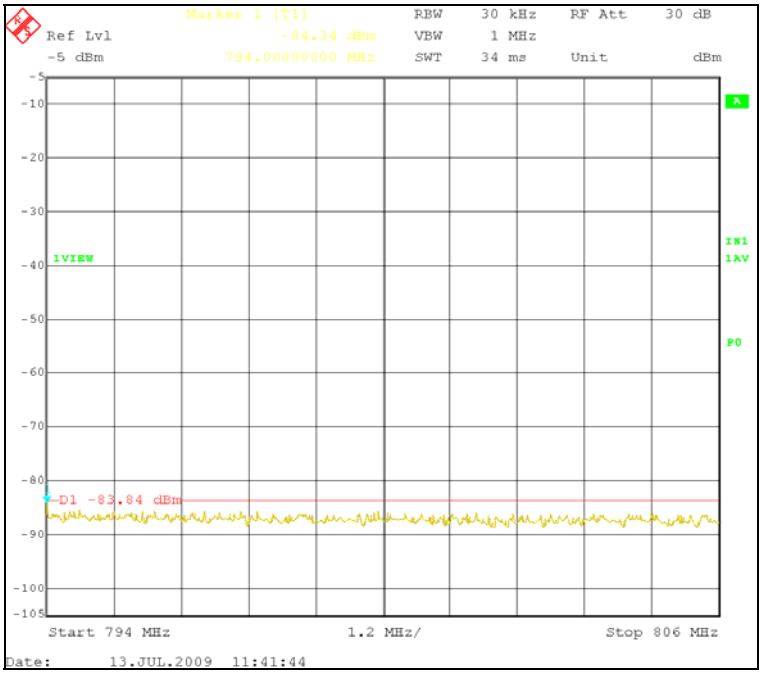
Plot 63. Adjacent Channel Power, Channel 764, C4FM, 2



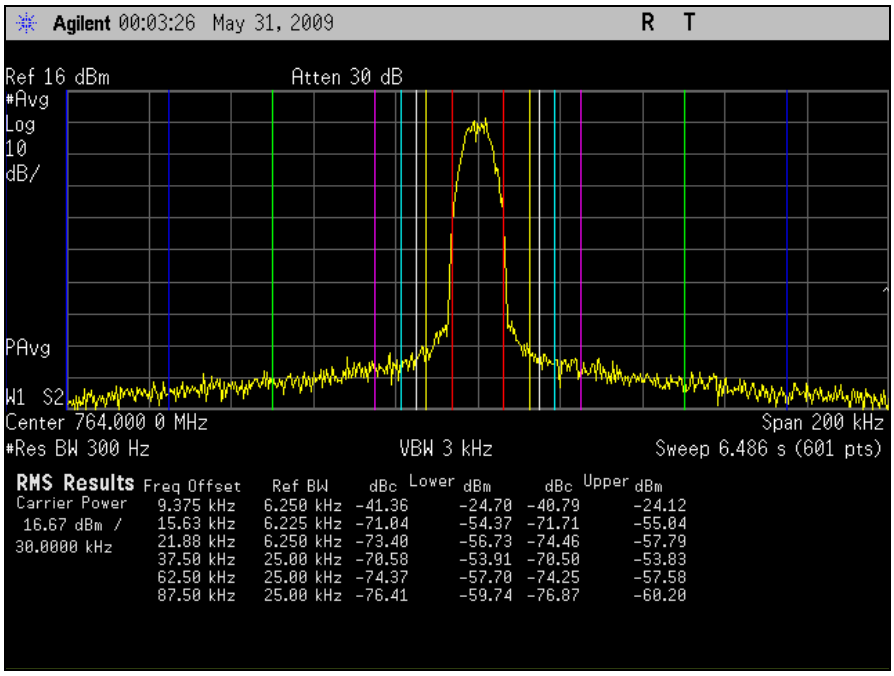
Plot 64. Adjacent Channel Power, Channel 764, 400 kHz – 12 MHz. C4FM



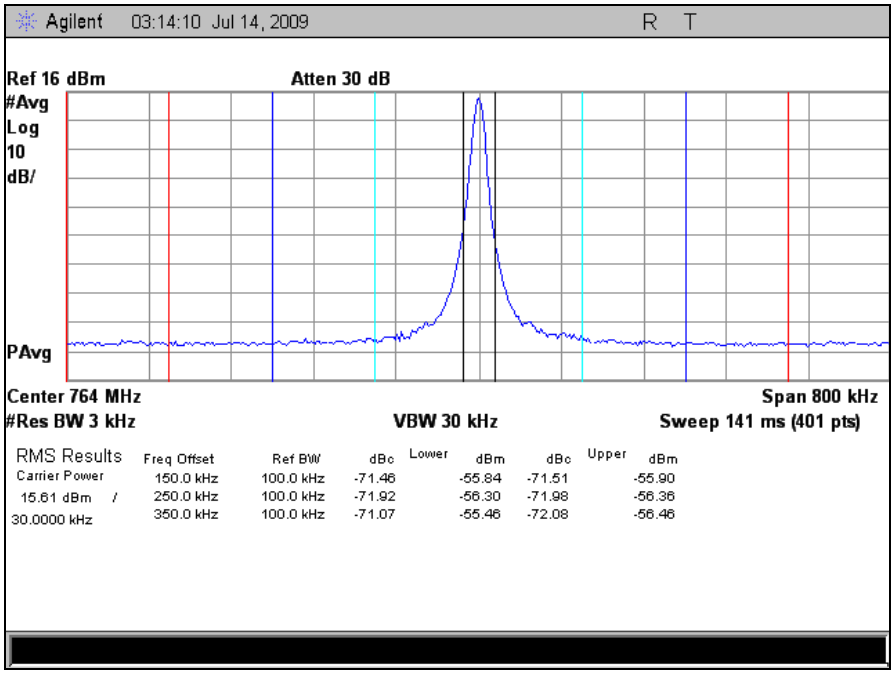
Plot 65. Adjacent Channel Power, Channel 764, 12 MHz – Paired Receive Band, C4FM



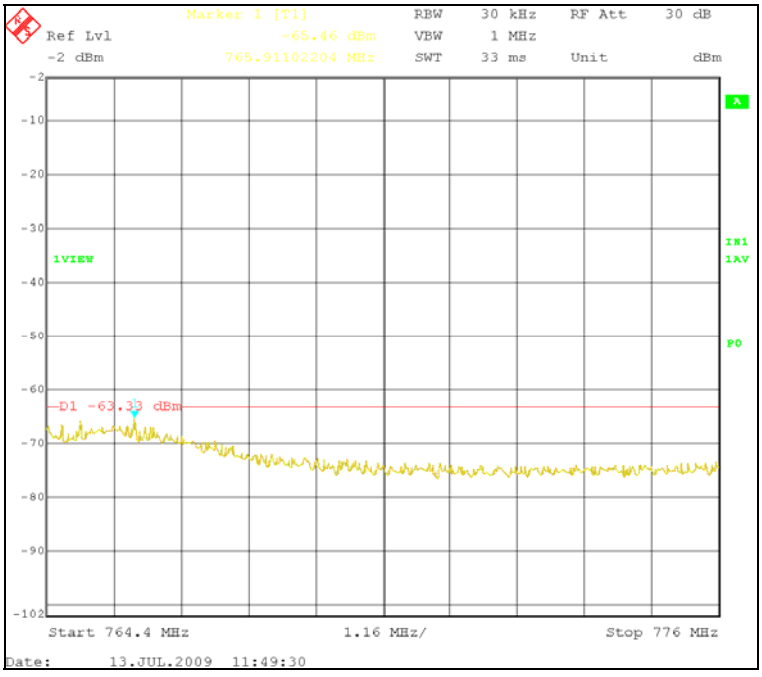
Plot 66. Adjacent Channel Power, Channel 764, Paired Receive Band, C4FM



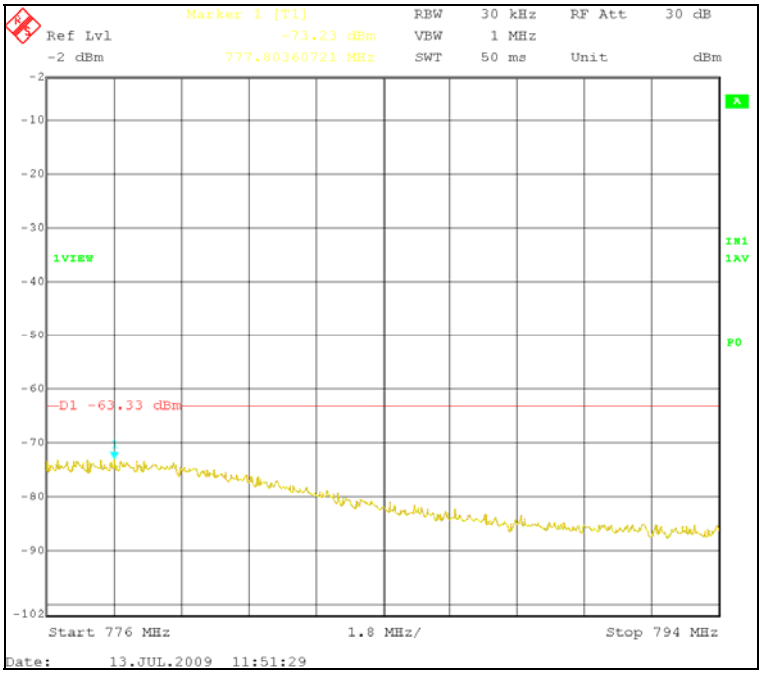
Plot 67. Adjacent Channel Power, Channel 764, HDQPSK, 1



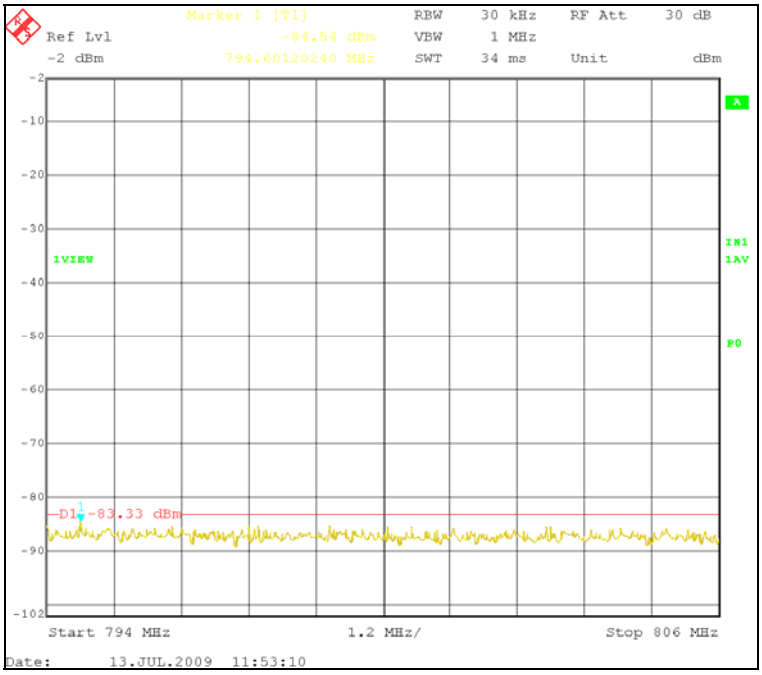
Plot 68. Adjacent Channel Power, Channel 764, HDQPSK, 2



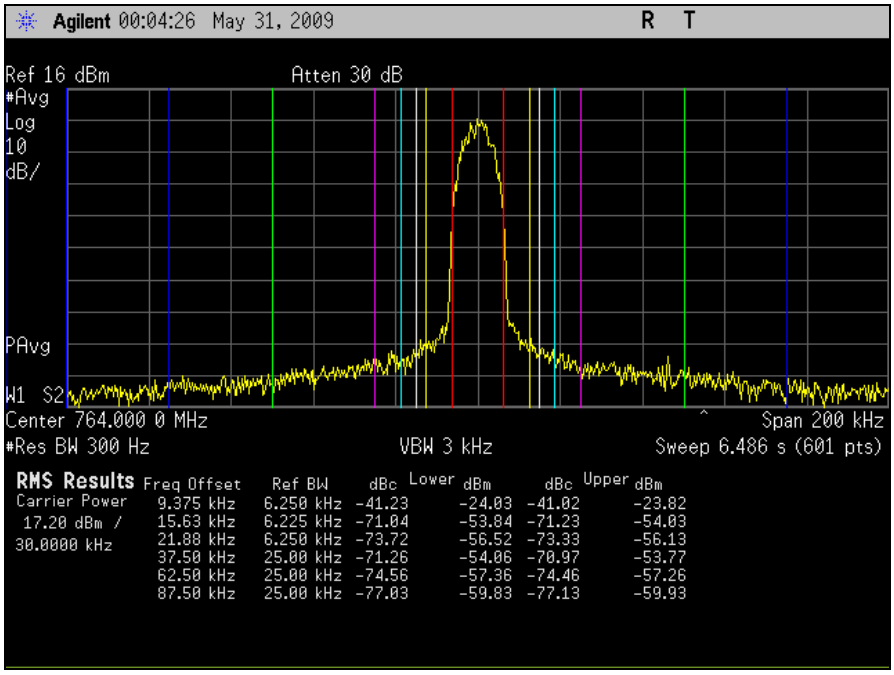
Plot 69. Adjacent Channel Power, Channel 764, 400 kHz – 12 MHz. HDQPSK



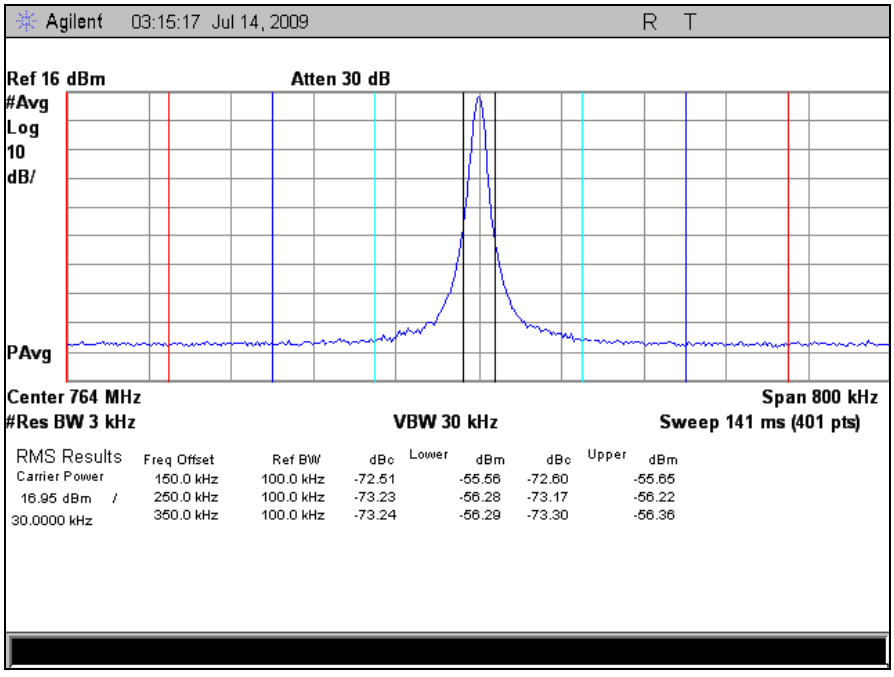
Plot 70. Adjacent Channel Power, Channel 764, 12 MHz – Paired Receive Band, HDQPSK



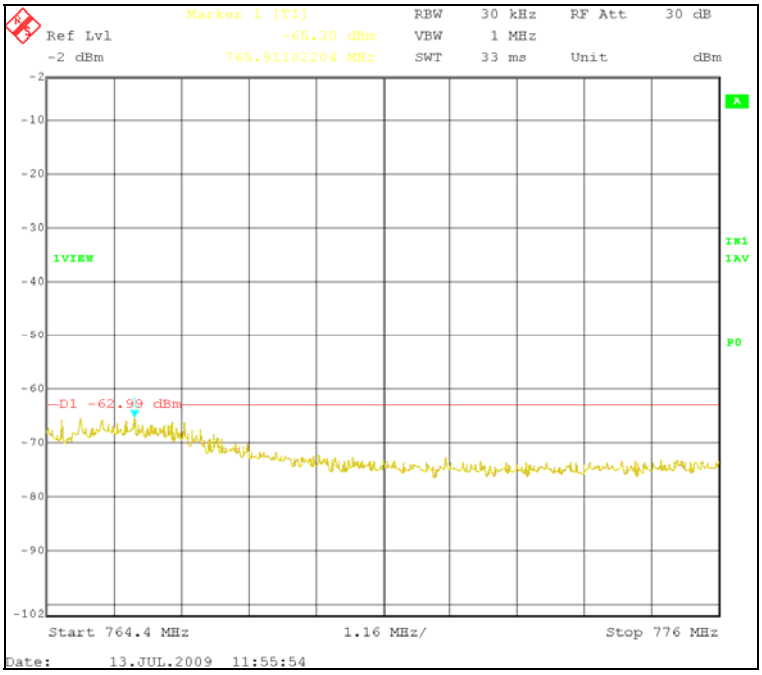
Plot 71. Adjacent Channel Power, Channel 764, Paired Receive Band, HDQPSK



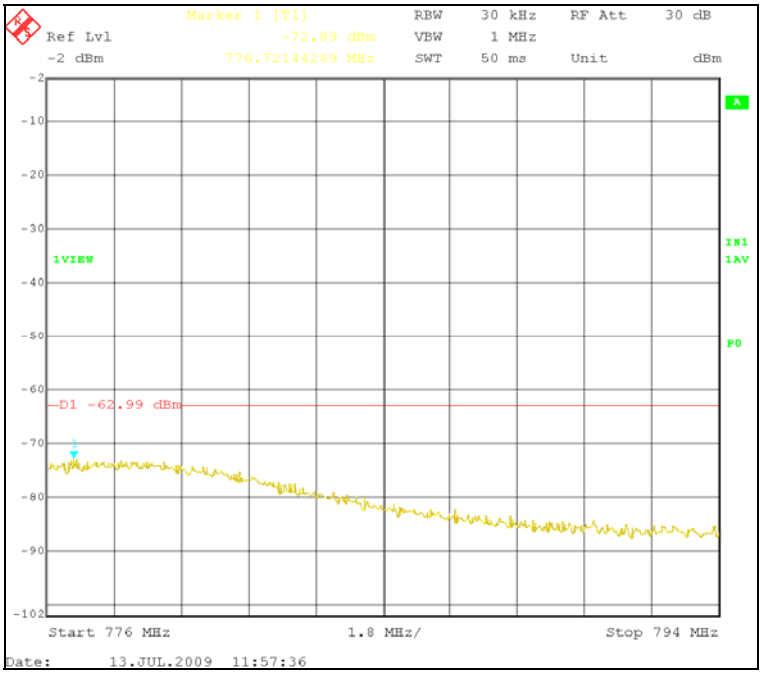
Plot 72. Adjacent Channel Power, Channel 764, WCQPSK, 1



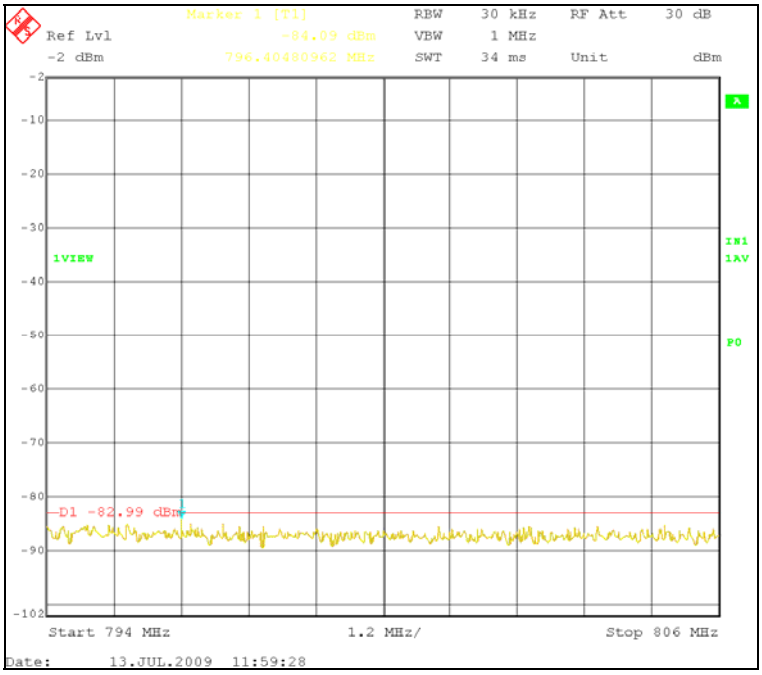
Plot 73. Adjacent Channel Power, Channel 764, WCQPSK, 2



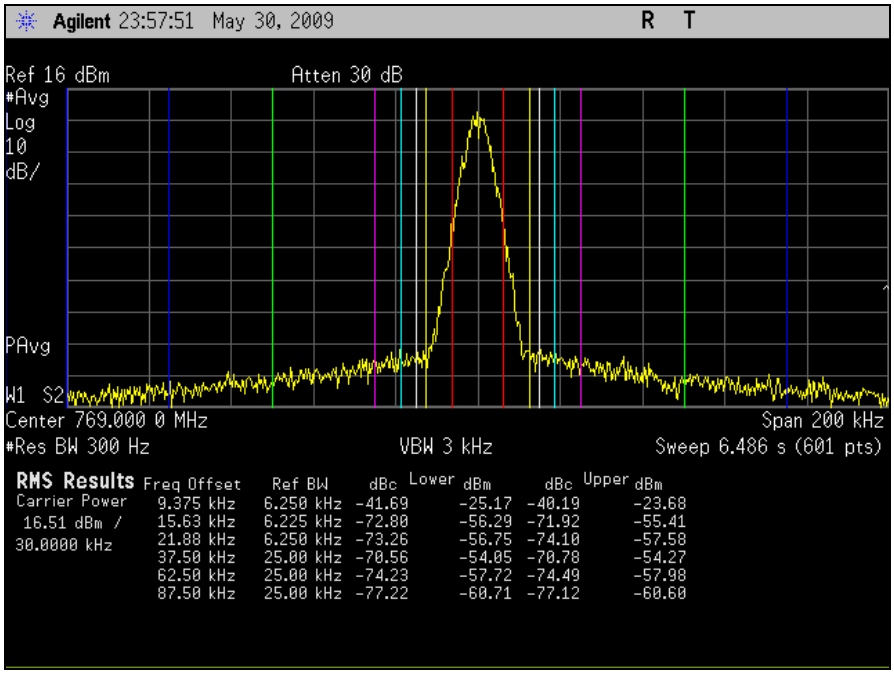
Plot 74. Adjacent Channel Power, Channel 764, 400 kHz – 12 MHz. WCQPSK



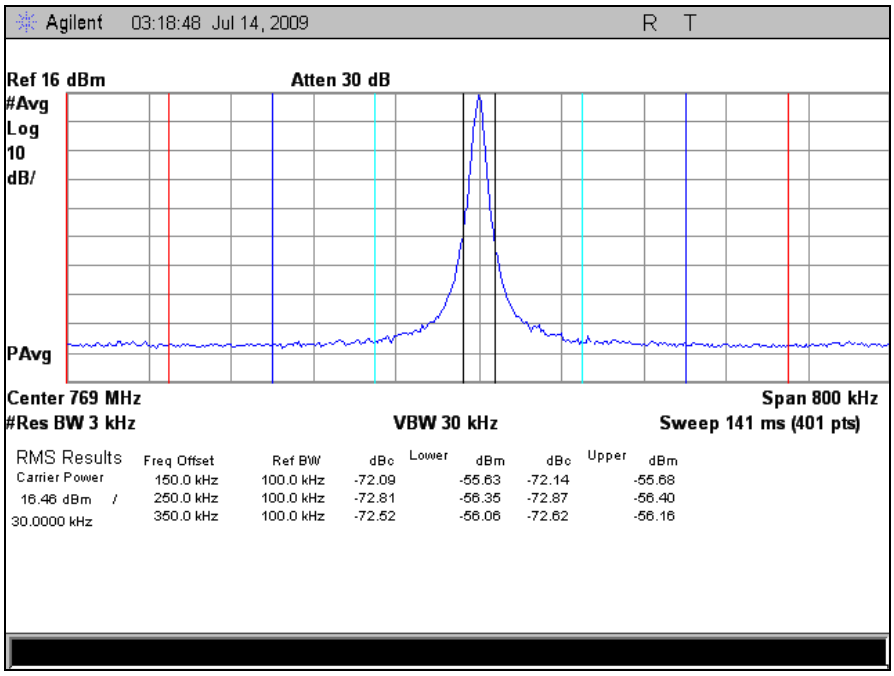
Plot 75. Adjacent Channel Power, Channel 764, 12 MHz – Paired Receive Band, WCQPSK



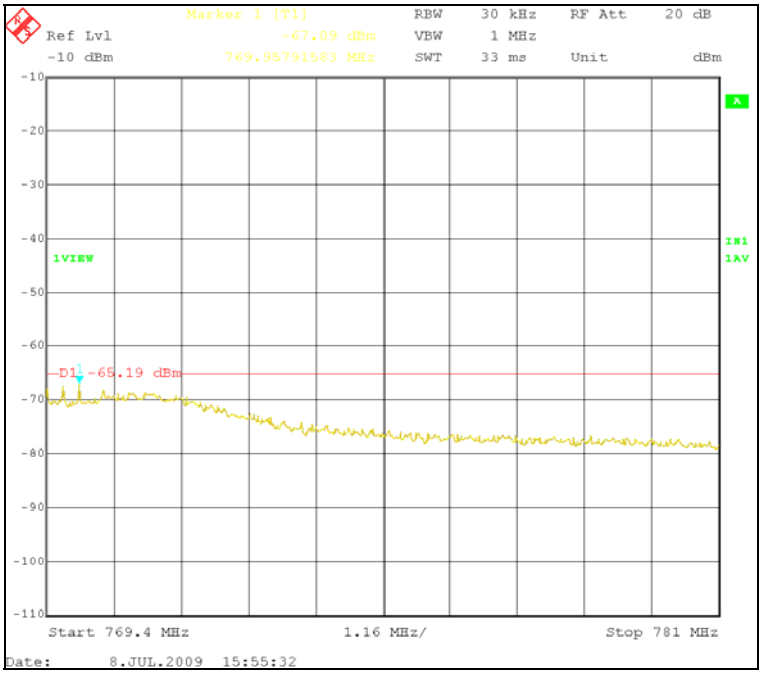
Plot 76. Adjacent Channel Power, Channel 764, Paired Receive Band, WCQPSK



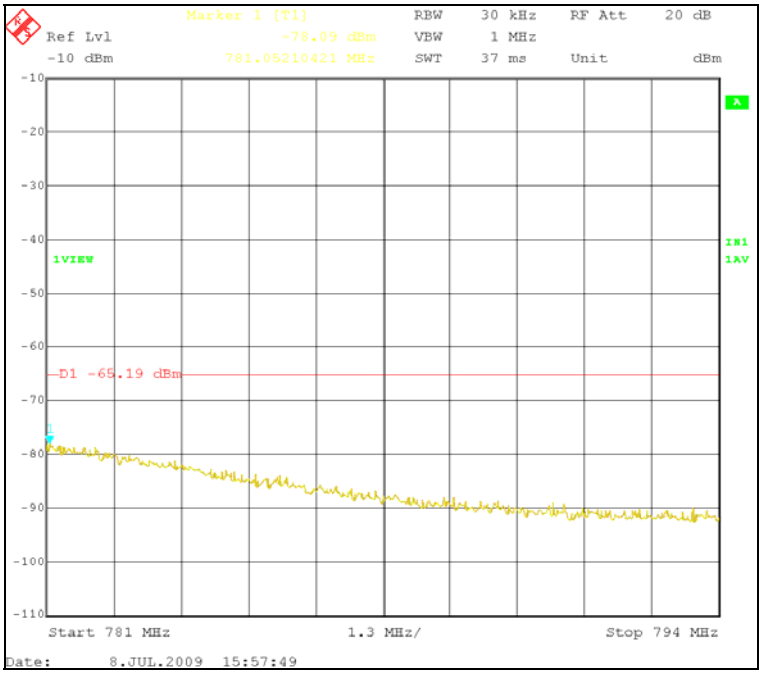
Plot 77. Adjacent Channel Power, Channel 769, C4FM, 1



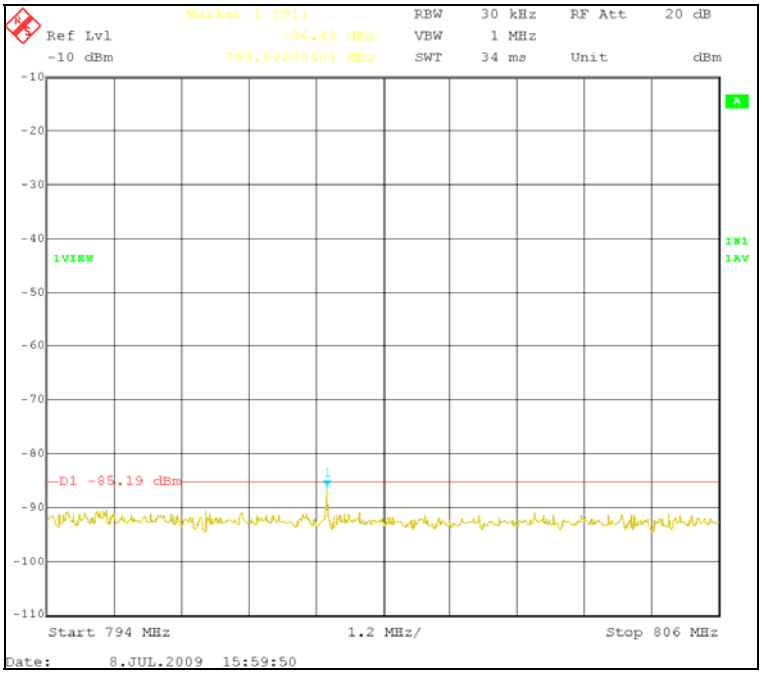
Plot 78. Adjacent Channel Power, Channel 769, C4FM, 2



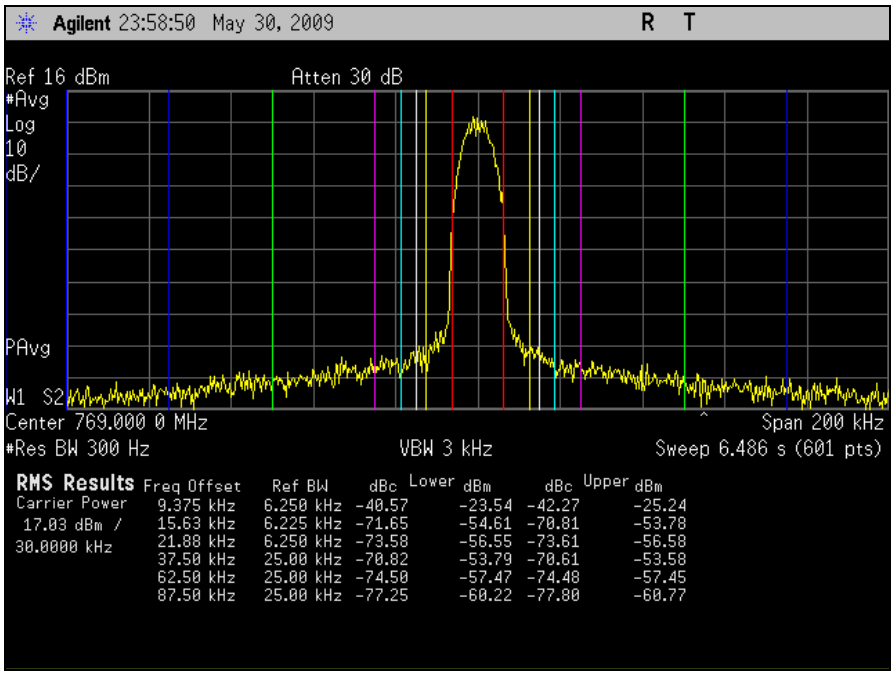
Plot 79. Adjacent Channel Power, Channel 769, 400 kHz – 12 MHz. C4FM



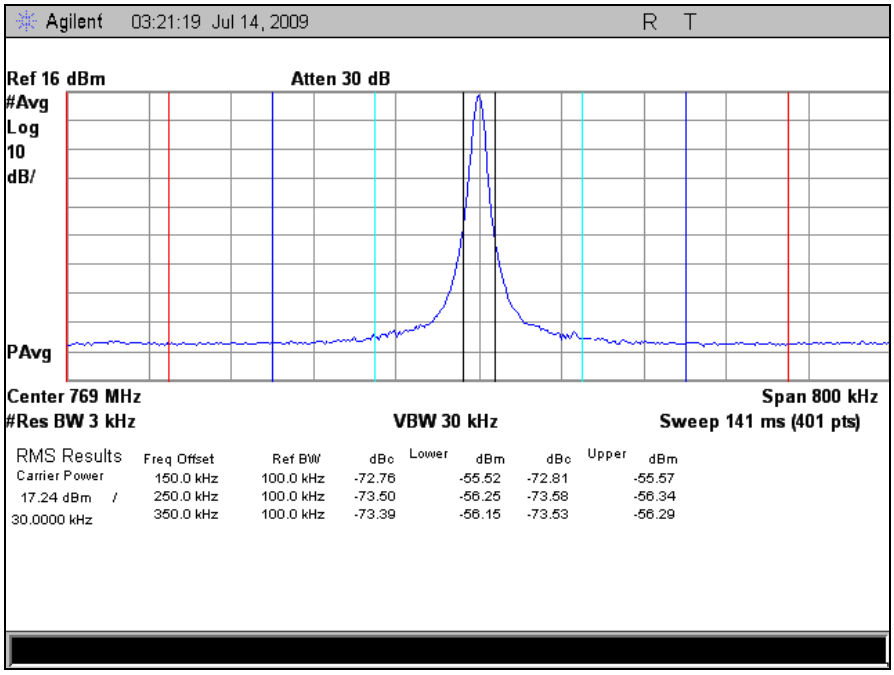
Plot 80. Adjacent Channel Power, Channel 769, 12 MHz – Paired Receive Band, C4FM



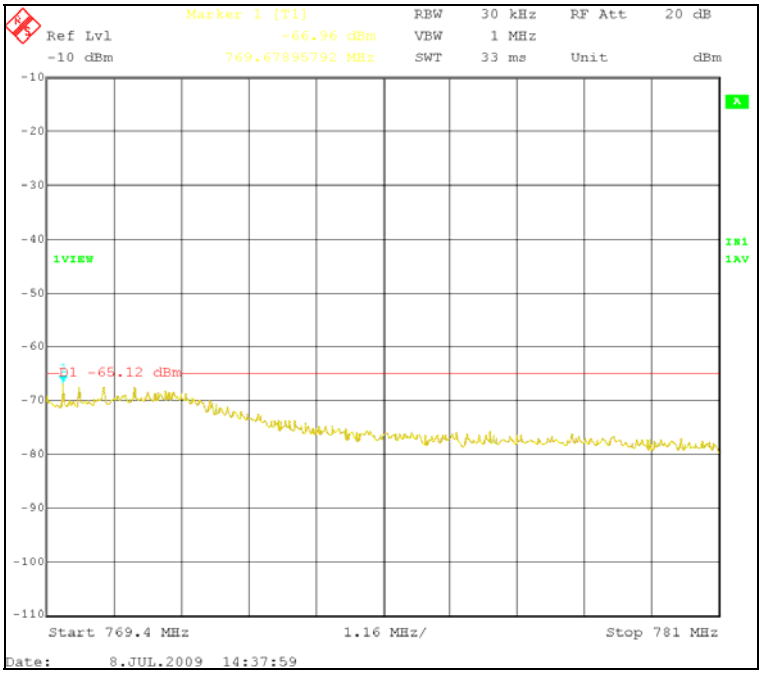
Plot 81. Adjacent Channel Power, Channel 769, Paired Receive Band, C4FM



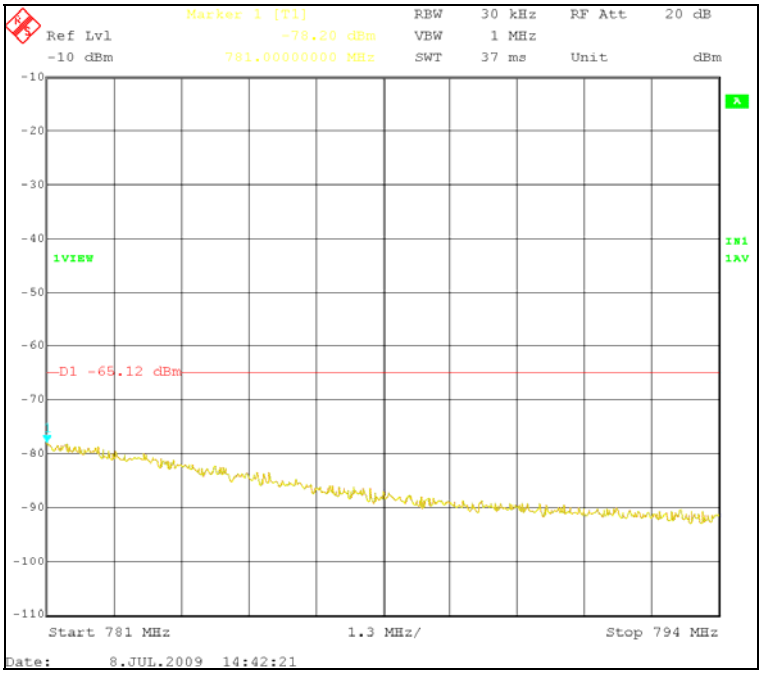
Plot 82. Adjacent Channel Power, Channel 769, HDQPSK, 1



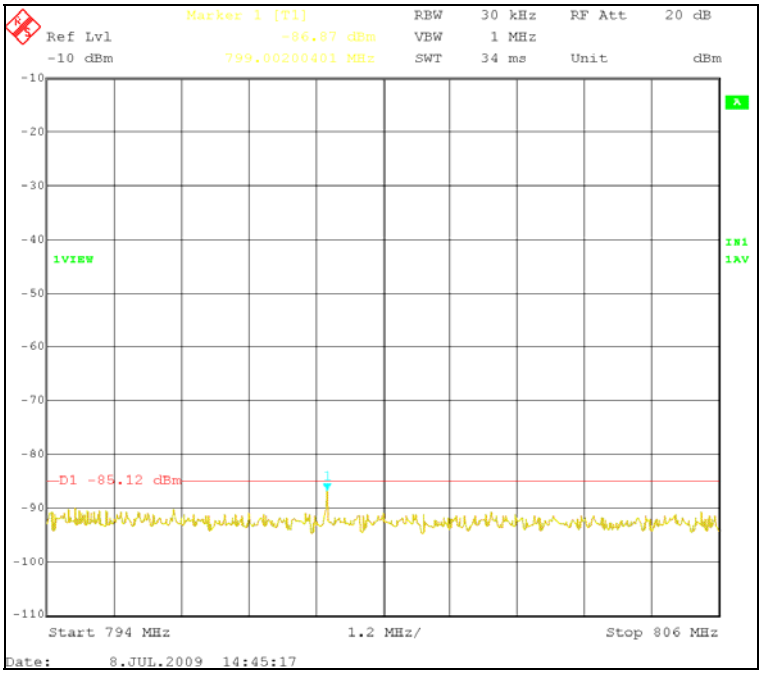
Plot 83. Adjacent Channel Power, Channel 769, HDQPSK, 2



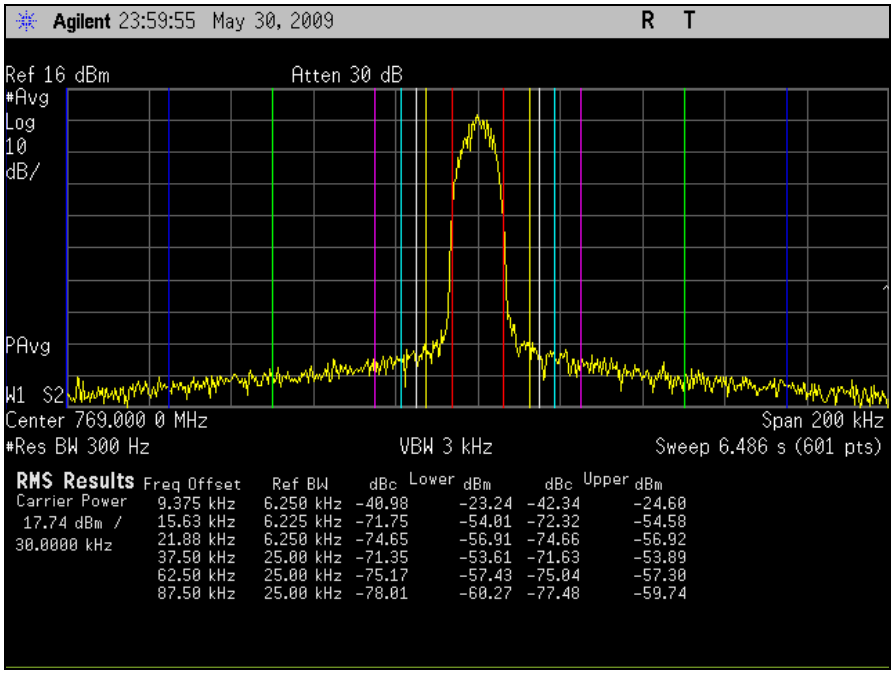
Plot 84. Adjacent Channel Power, Channel 769, 400 kHz – 12 MHz. HDQPSK



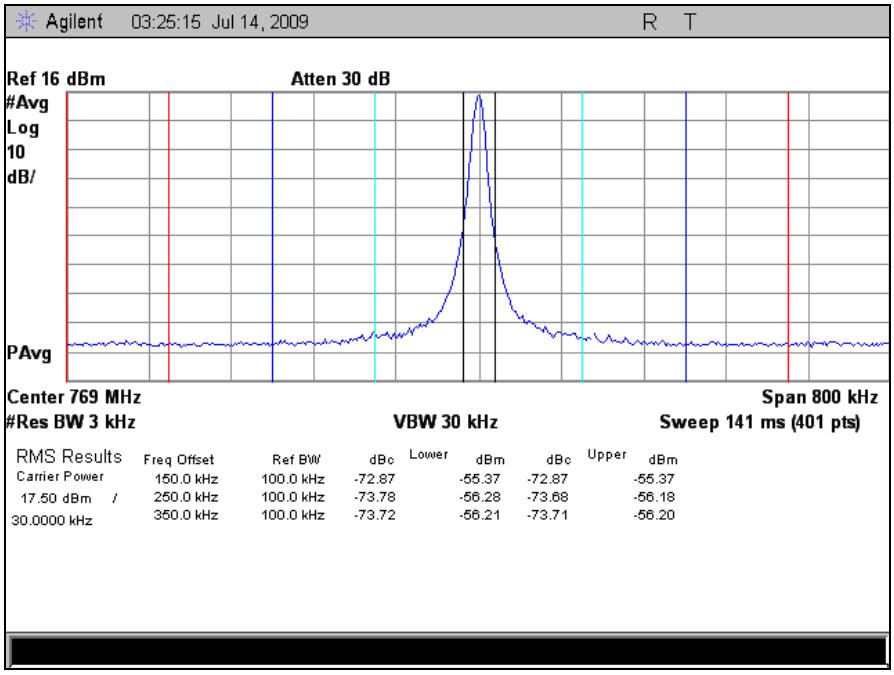
Plot 85. Adjacent Channel Power, Channel 769, 12 MHz – Paired Receive Band, HDQPSK



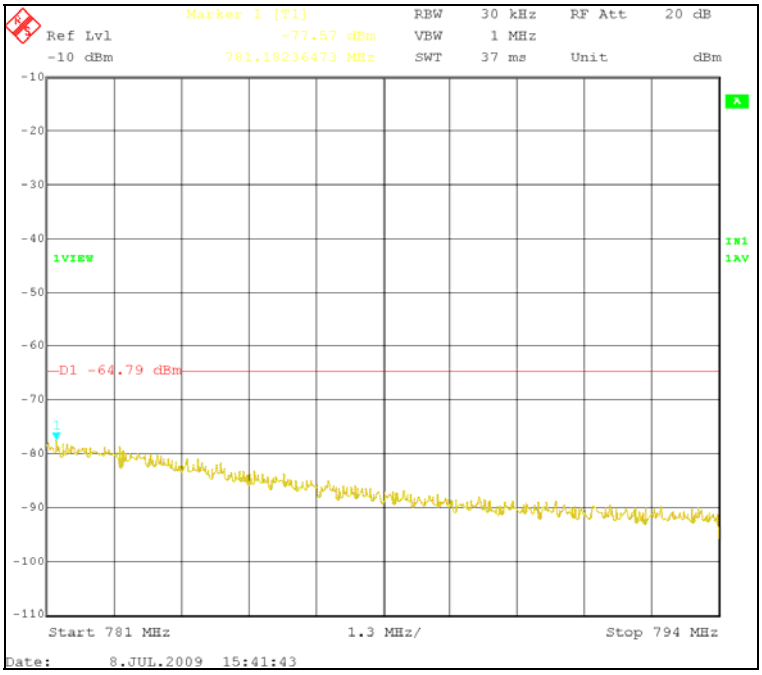
Plot 86. Adjacent Channel Power, Channel 769, Paired Receive Band, HDQPSK



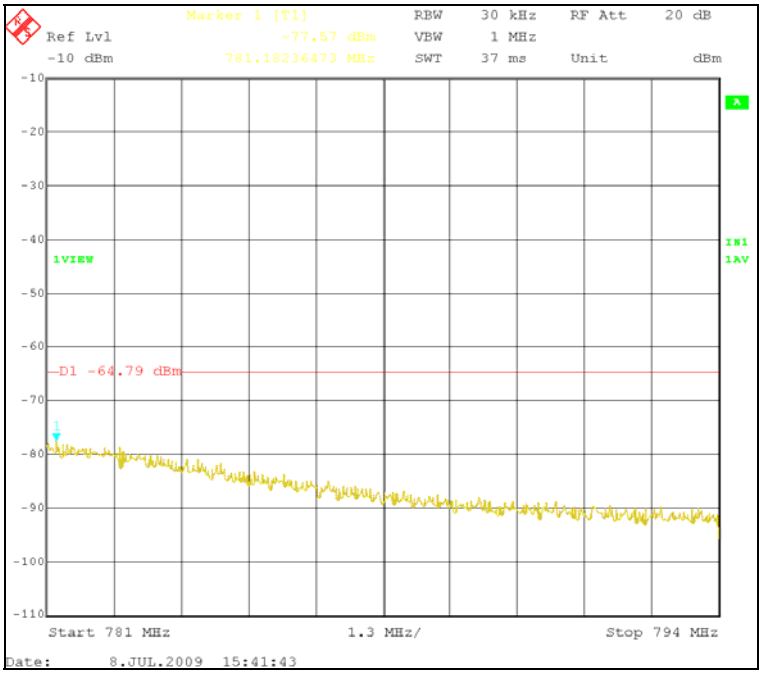
Plot 87. Adjacent Channel Power, Channel 769, WCQPSK, 1



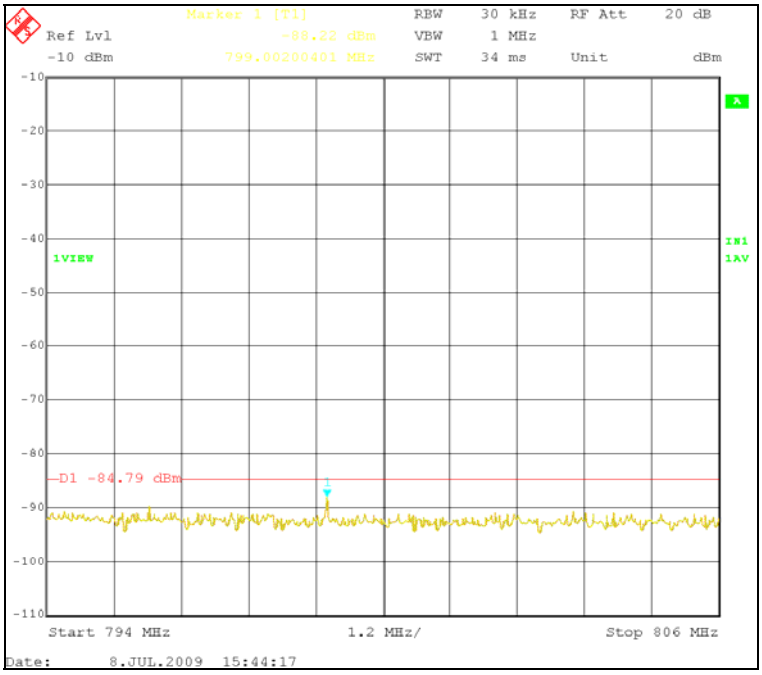
Plot 88. Adjacent Channel Power, Channel 769, WCQPSK, 2



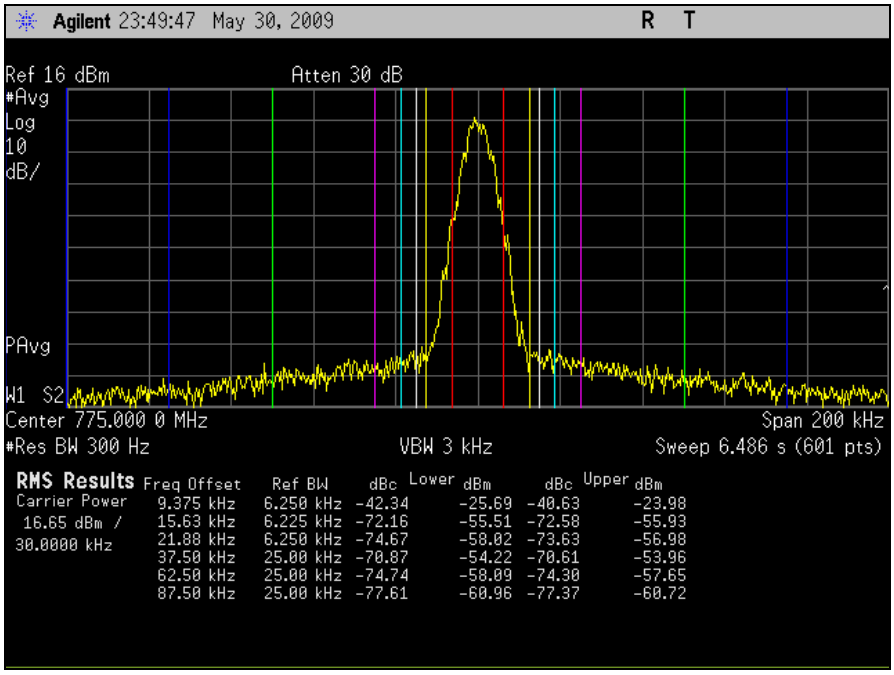
Plot 89. Adjacent Channel Power, Channel 769, 400 kHz – 12 MHz. WCQPSK



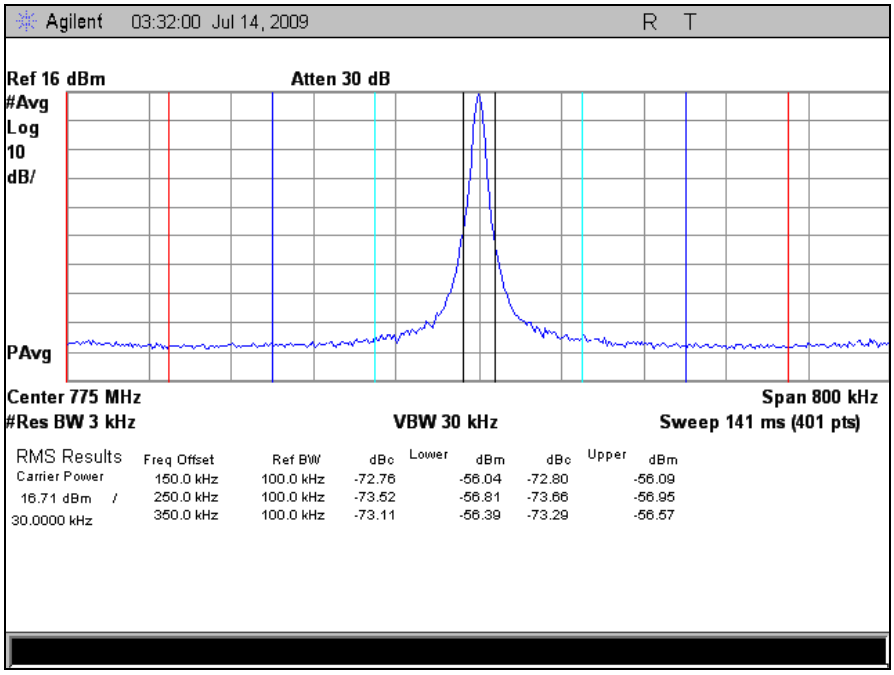
Plot 90. Adjacent Channel Power, Channel 769, 12 MHz – Paired Receive Band, WCQPSK



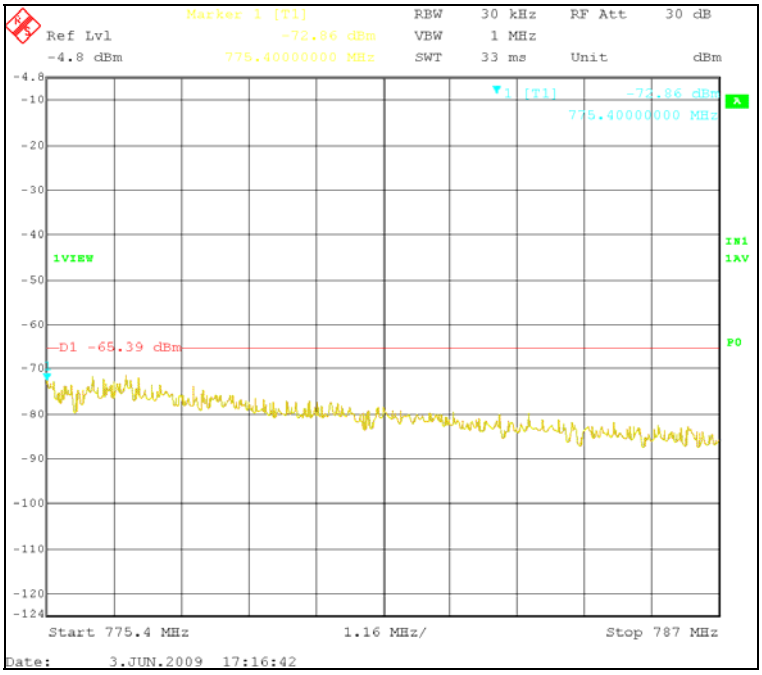
Plot 91. Adjacent Channel Power, Channel 769, Paired Receive Band, WCQPSK



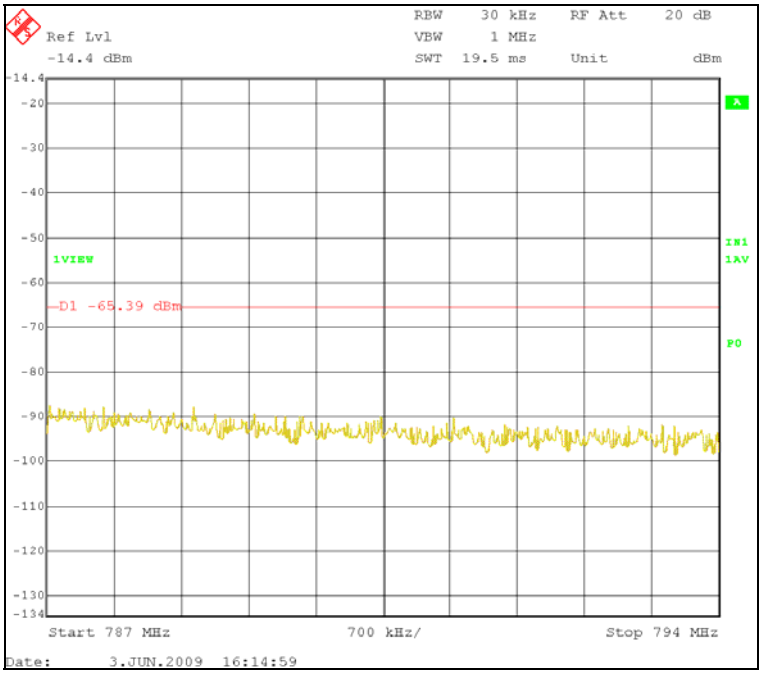
Plot 92. Adjacent Channel Power, Channel 775, C4FM, 1



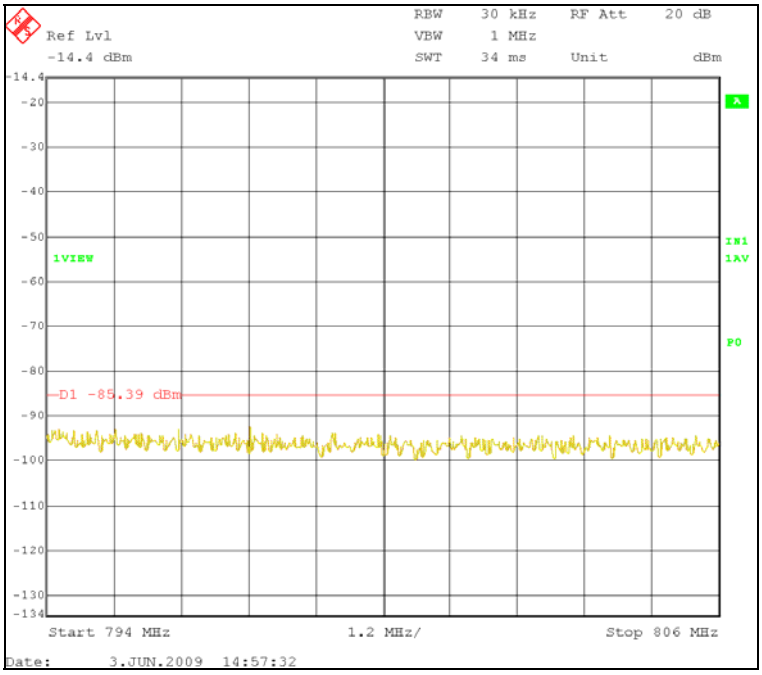
Plot 93. Adjacent Channel Power, Channel 775, C4FM, 2



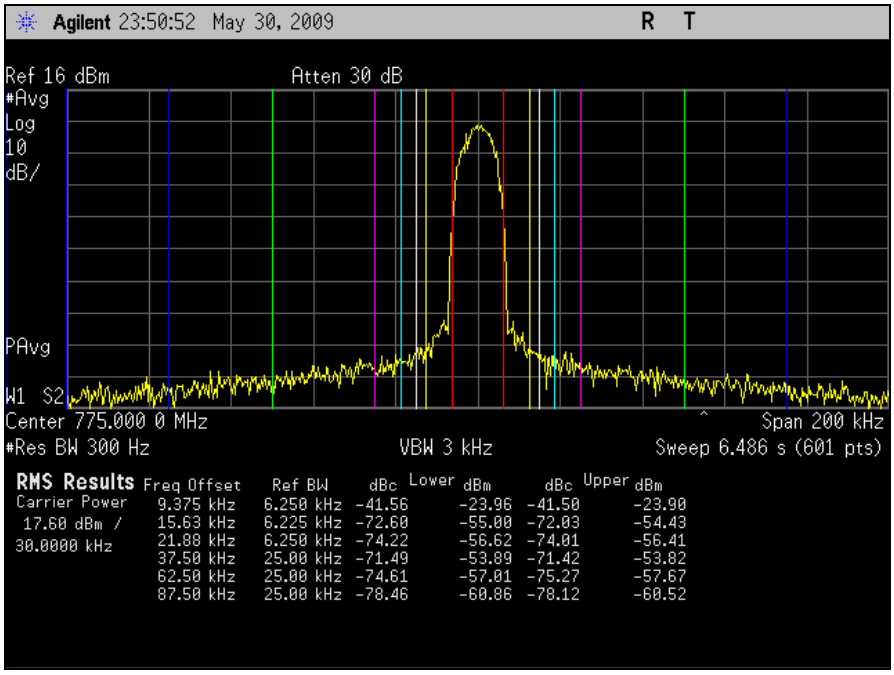
Plot 94. Adjacent Channel Power, Channel 775, 400 kHz – 12 MHz. C4FM



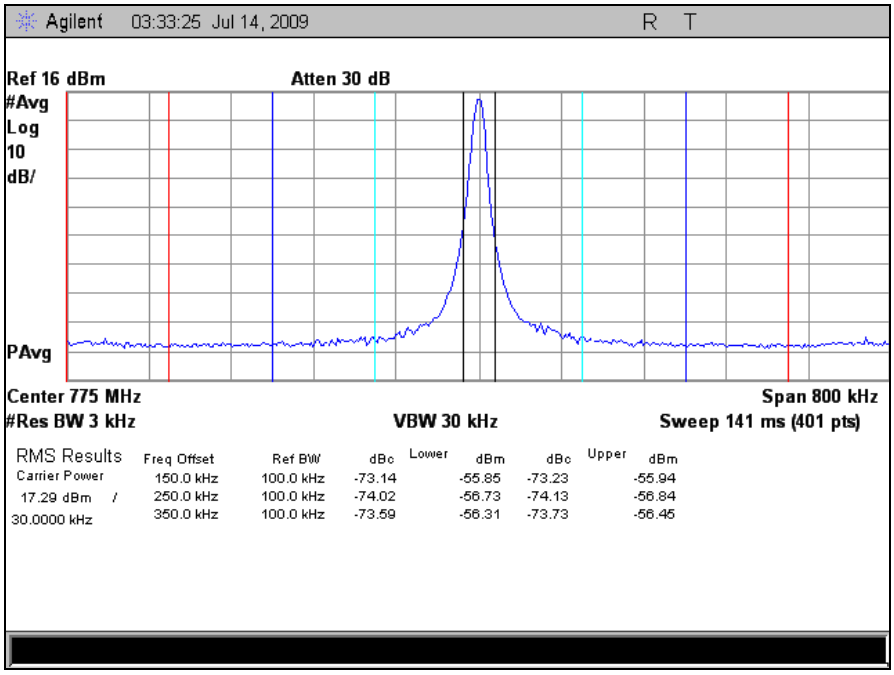
Plot 95. Adjacent Channel Power, Channel 775, 12 MHz – Paired Receive Band, C4FM



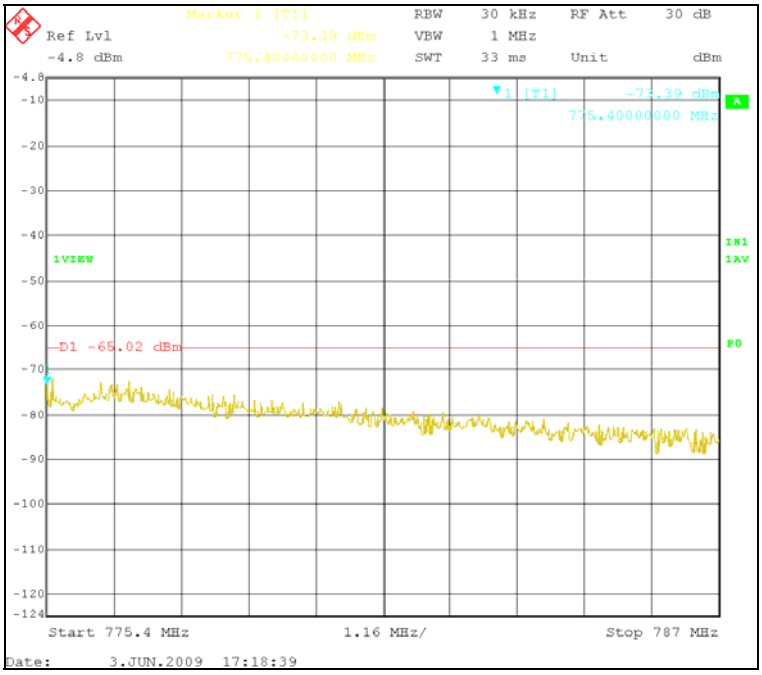
Plot 96. Adjacent Channel Power, Channel 775, Paired Receive Band, C4FM



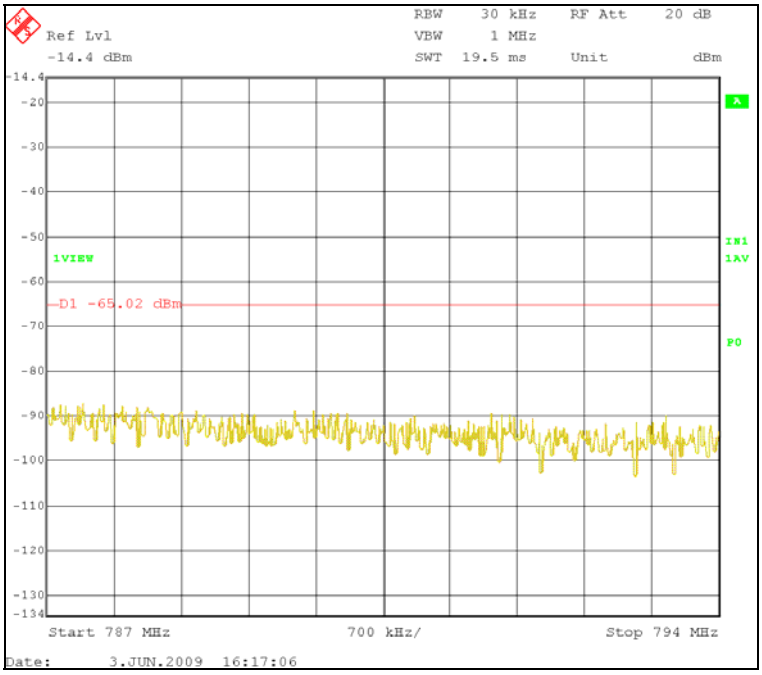
Plot 97. Adjacent Channel Power, Channel 775, HDQPSK, 1



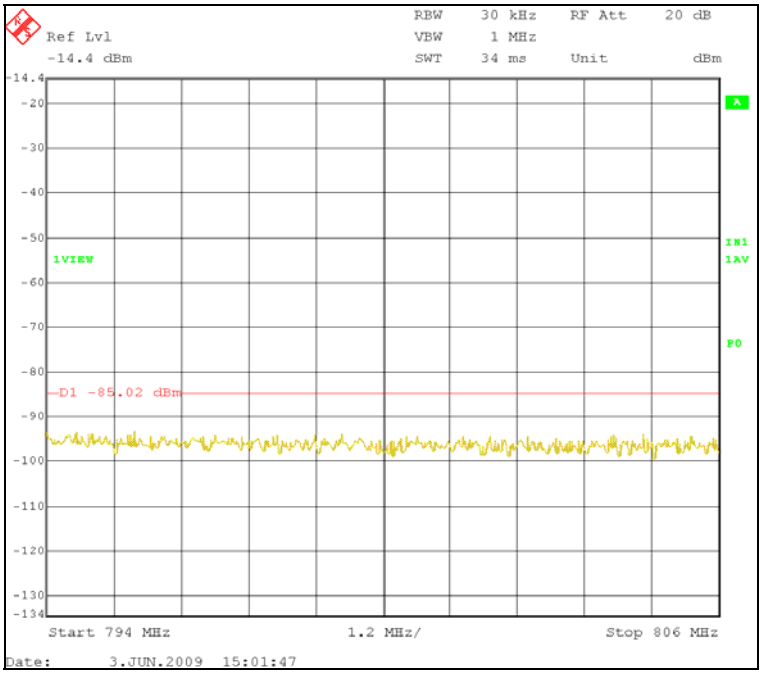
Plot 98. Adjacent Channel Power, Channel 775, HDQPSK, 2



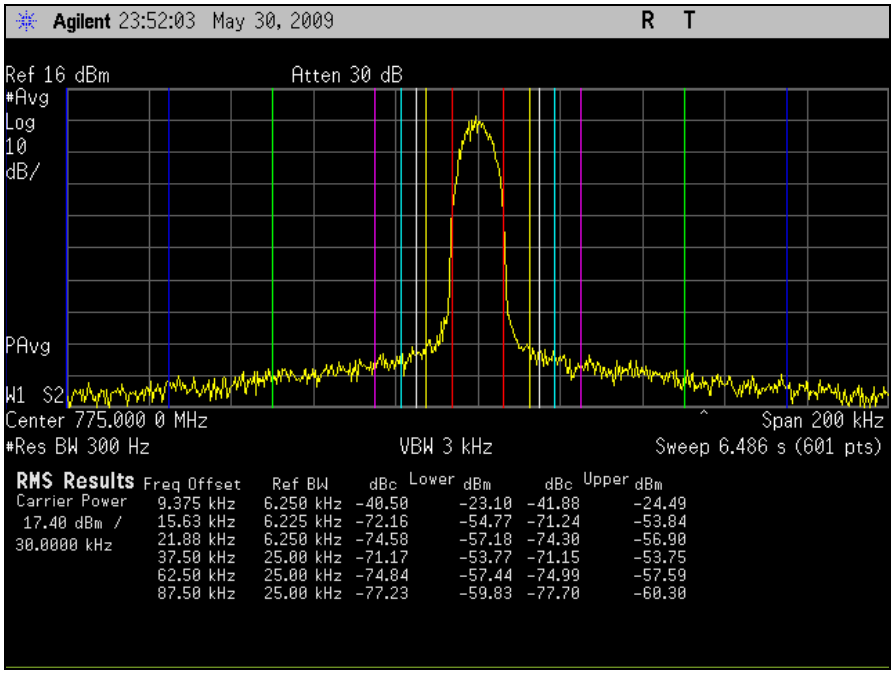
Plot 99. Adjacent Channel Power, Channel 775, 400 kHz – 12 MHz. HDQPSK



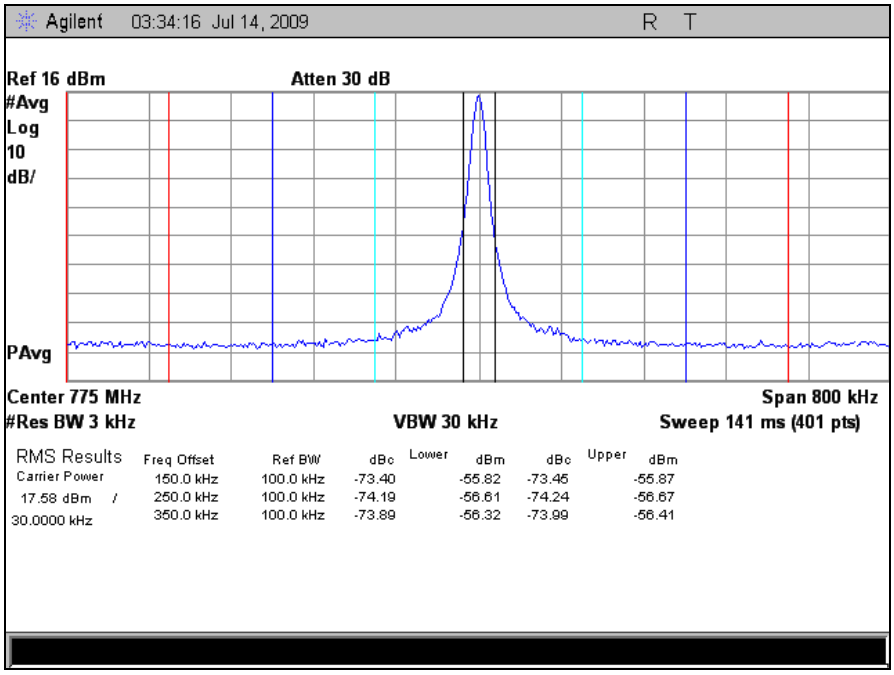
Plot 100. Adjacent Channel Power, Channel 775, 12 MHz – Paired Receive Band, HDQPSK



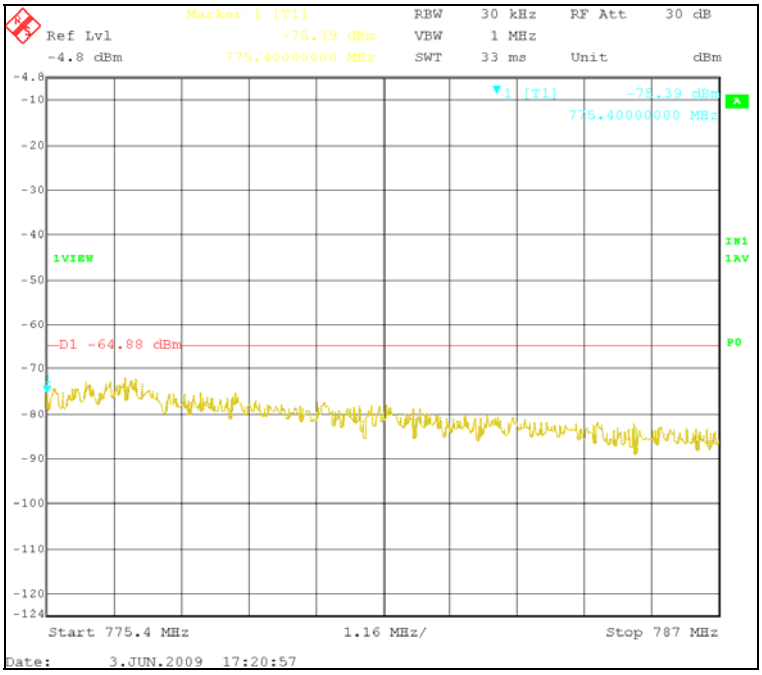
Plot 101. Adjacent Channel Power, Channel 775, Paired Receive Band, HDQPSK



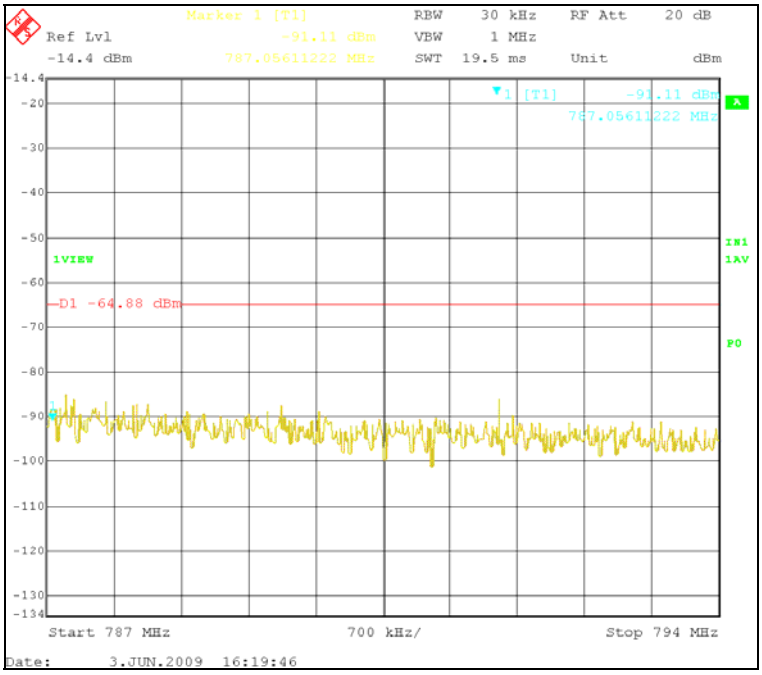
Plot 102. Adjacent Channel Power, Channel 775, WCQPSK, 1



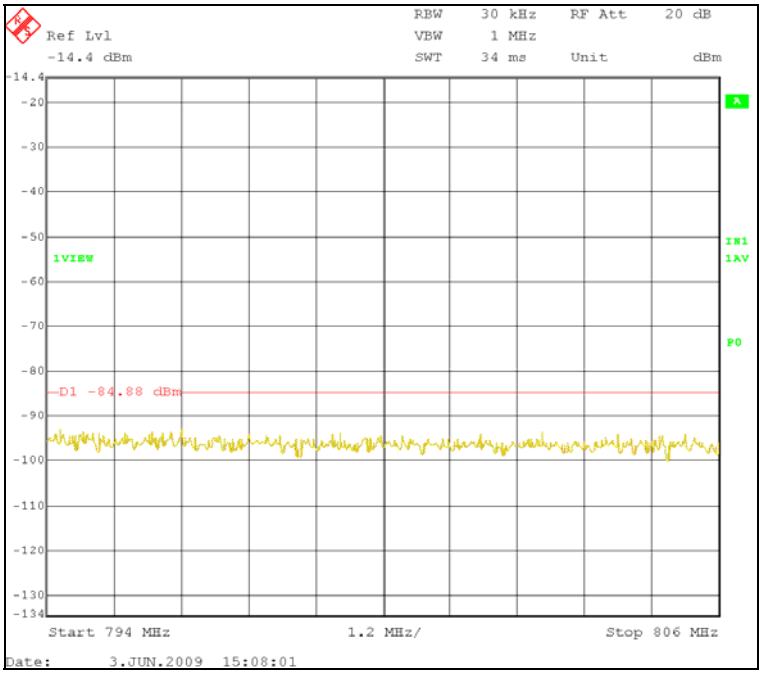
Plot 103. Adjacent Channel Power, Channel 775, WCQPSK, 2



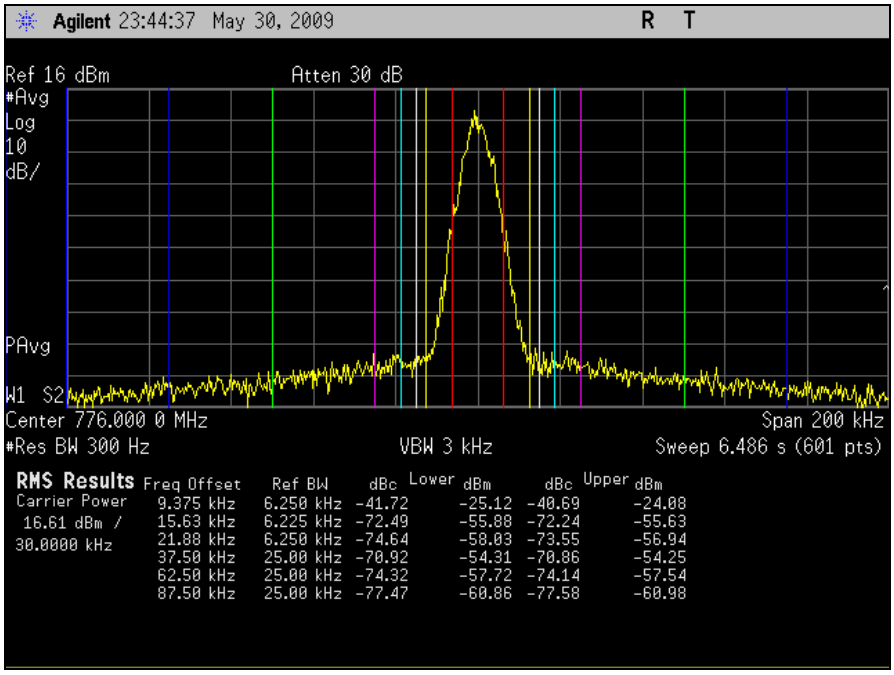
Plot 104. Adjacent Channel Power, Channel 775, 400 kHz – 12 MHz. WCQPSK



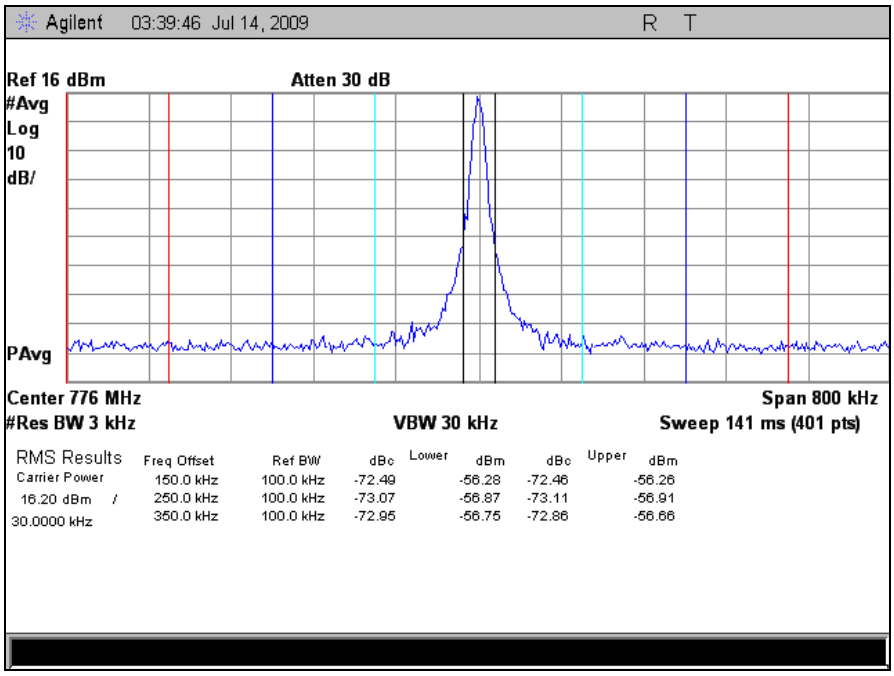
Plot 105. Adjacent Channel Power, Channel 775, 12 MHz – Paired Receive Band, WCQPSK



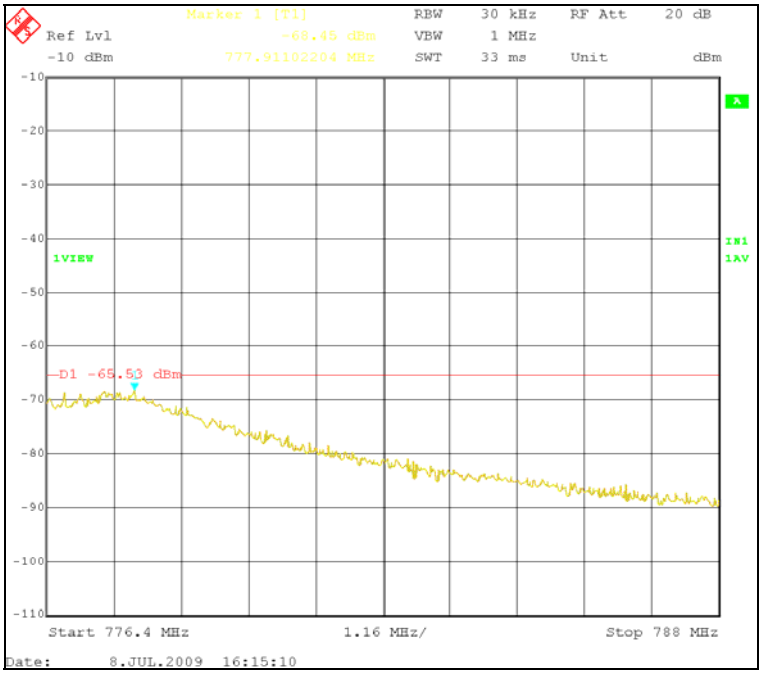
Plot 106. Adjacent Channel Power, Channel 775, Paired Receive Band, WCQPSK



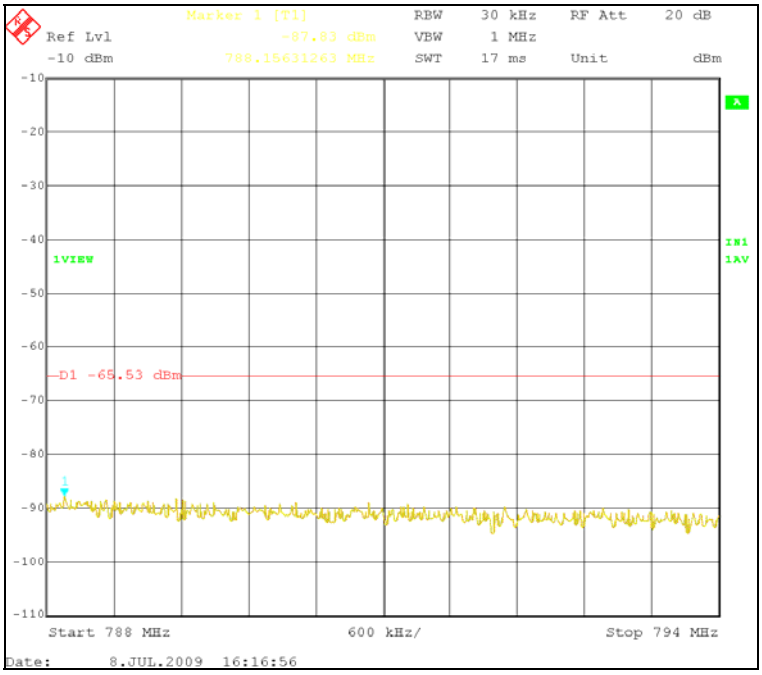
Plot 107. Adjacent Channel Power, Channel 776, C4FM, 1



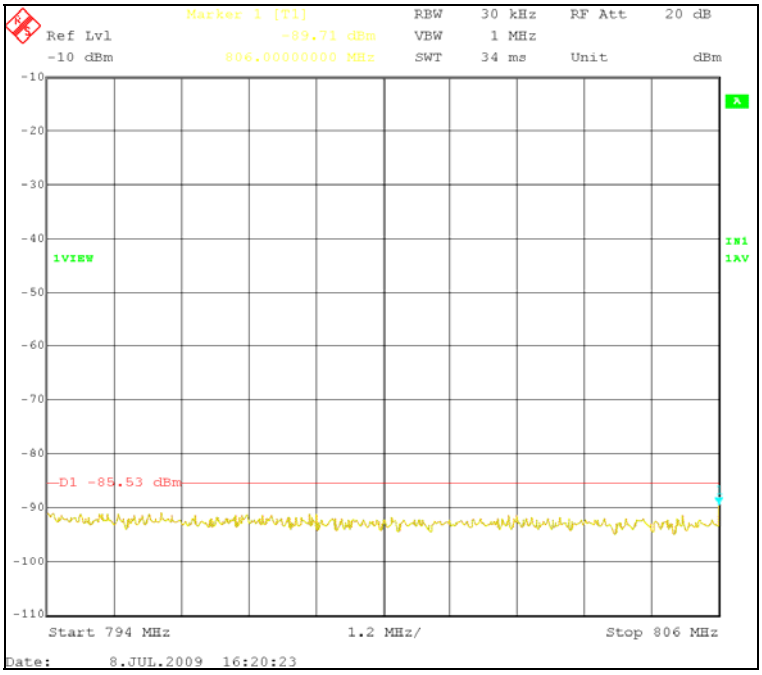
Plot 108. Adjacent Channel Power, Channel 776, C4FM, 2



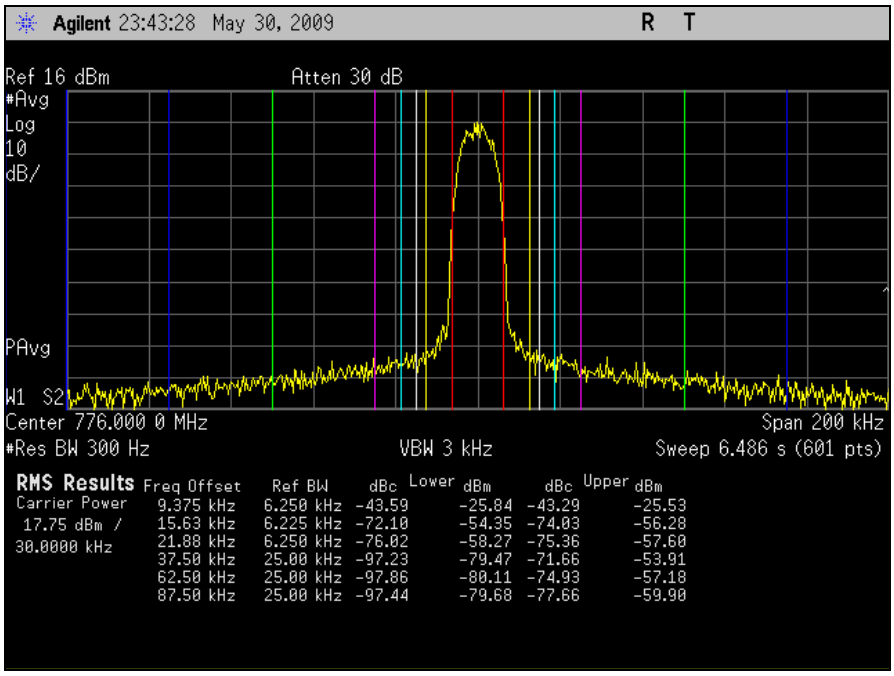
Plot 109. Adjacent Channel Power, Channel 776, 400 kHz – 12 MHz. C4FM



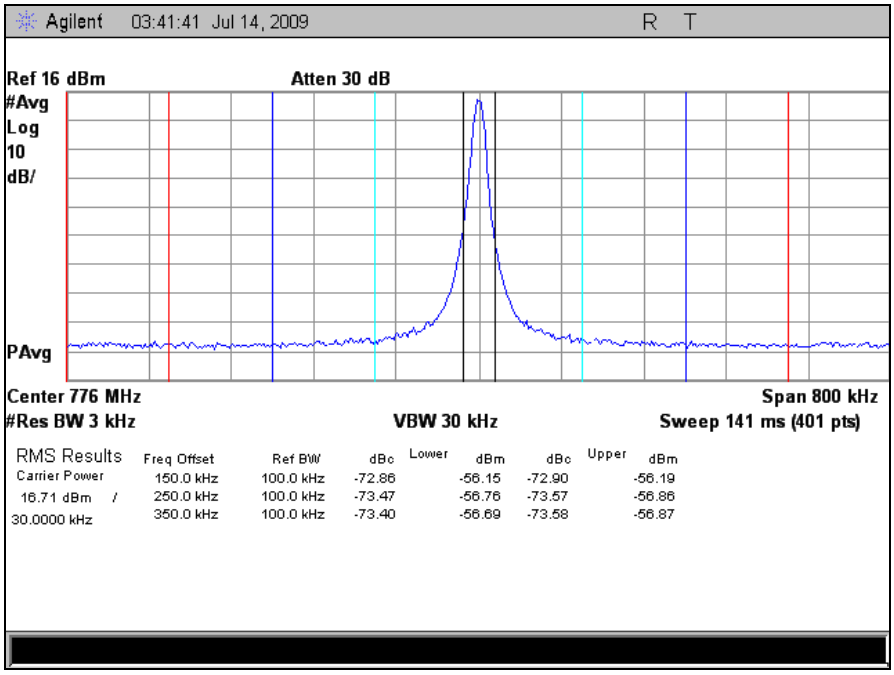
Plot 110. Adjacent Channel Power, Channel 776, 12 MHz – Paired Receive Band, C4FM



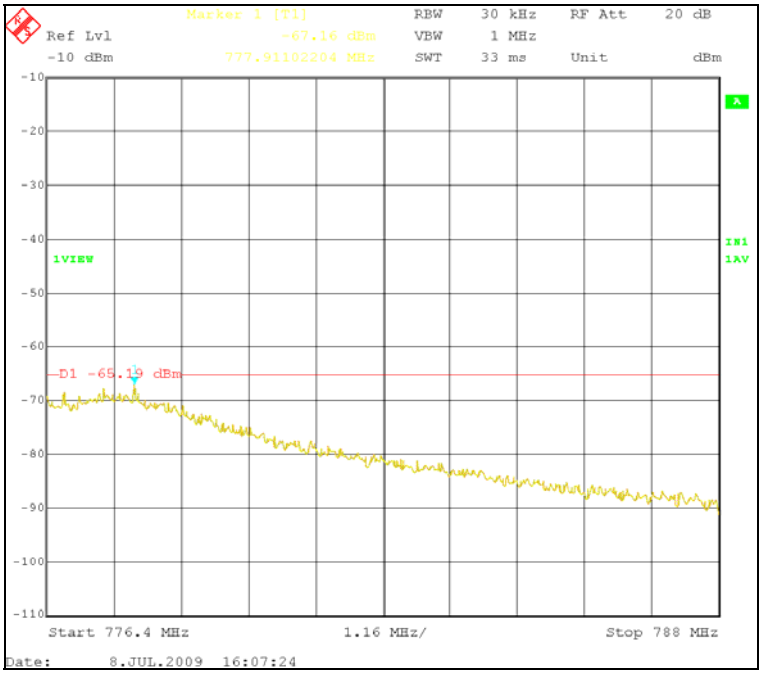
Plot 111. Adjacent Channel Power, Channel 776, Paired Receive Band, C4FM



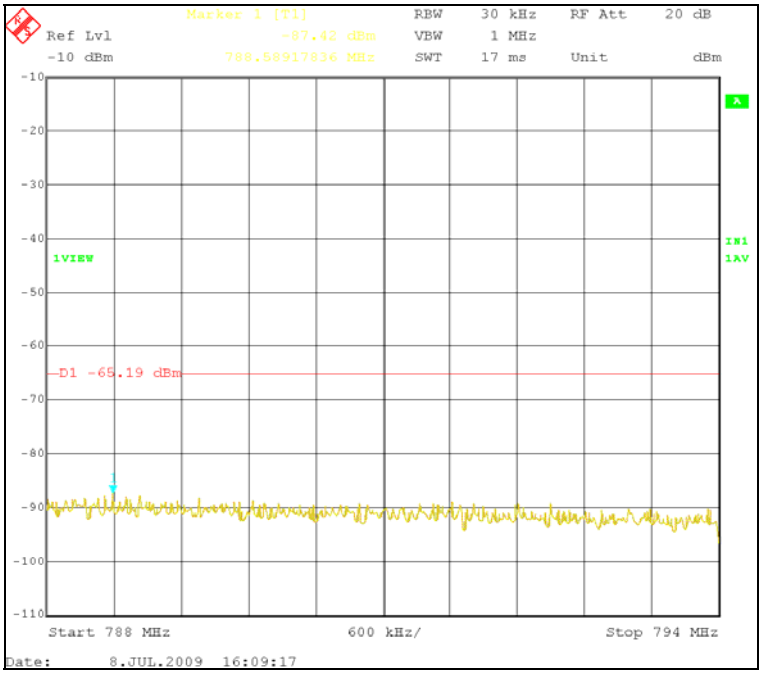
Plot 112. Adjacent Channel Power, Channel 776, HDQPSK, 1



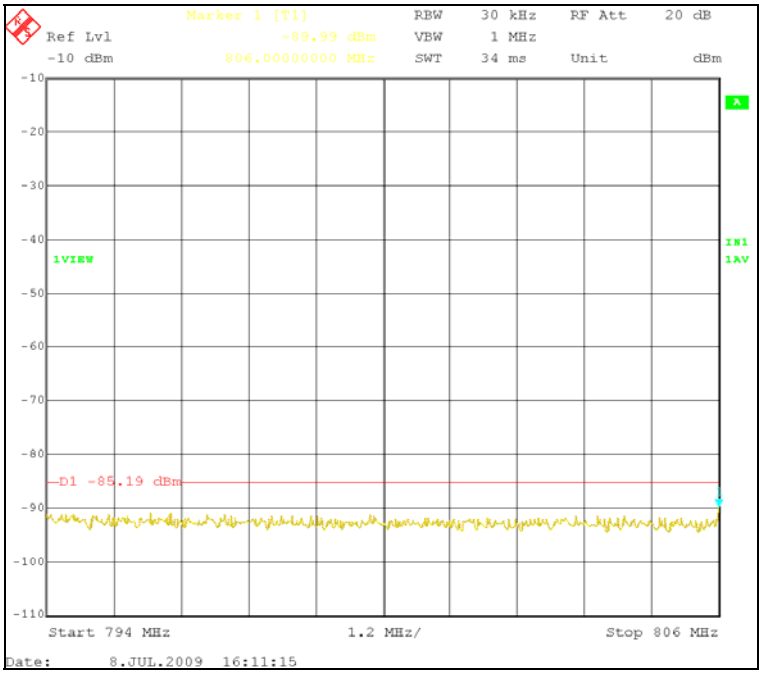
Plot 113. Adjacent Channel Power, Channel 776, HDQPSK, 2



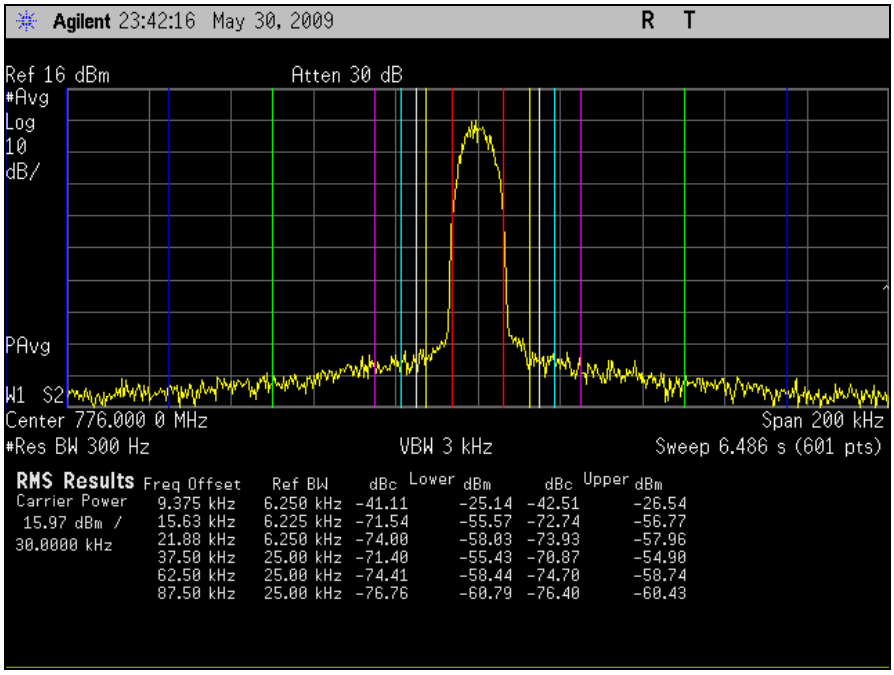
Plot 114. Adjacent Channel Power, Channel 776, 400 kHz – 12 MHz. HDQPSK



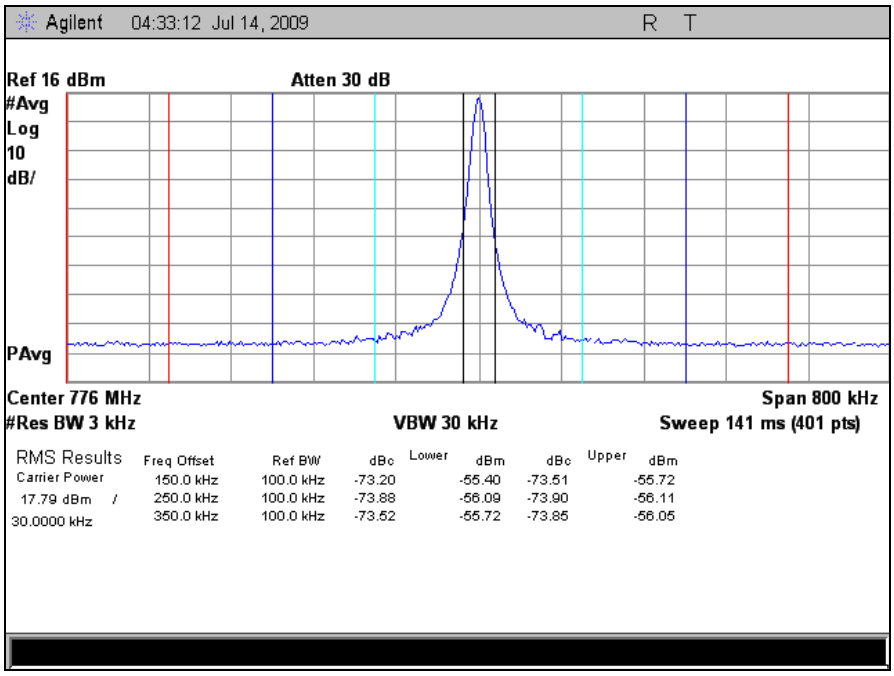
Plot 115. Adjacent Channel Power, Channel 776, 12 MHz – Paired Receive Band, HDQPSK



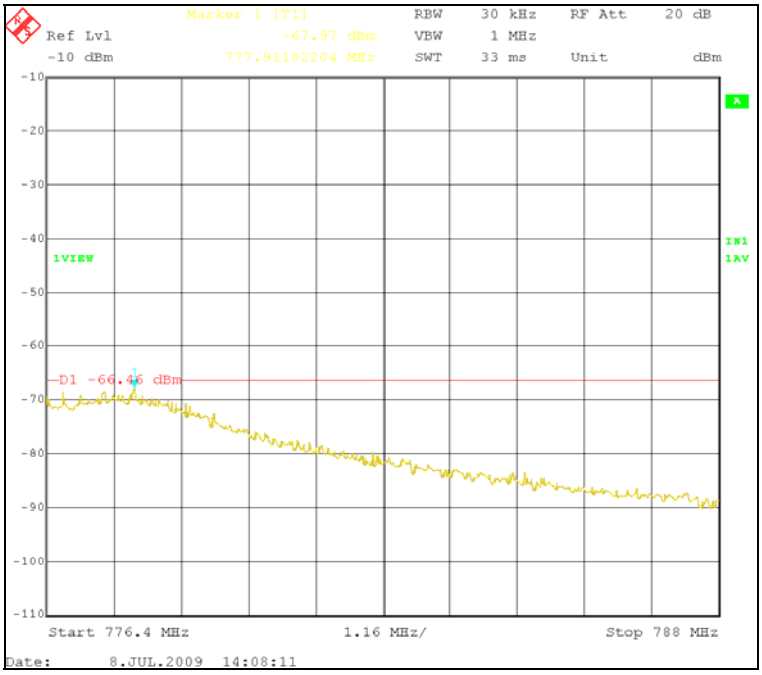
Plot 116. Adjacent Channel Power, Channel 776, Paired Receive Band, HDQPSK



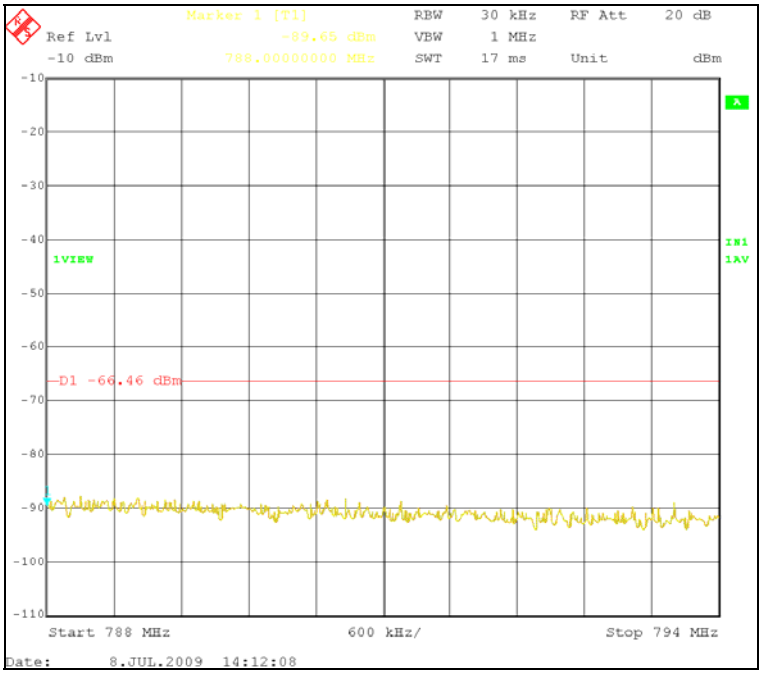
Plot 117. Adjacent Channel Power, Channel 776, WCQPSK, 1



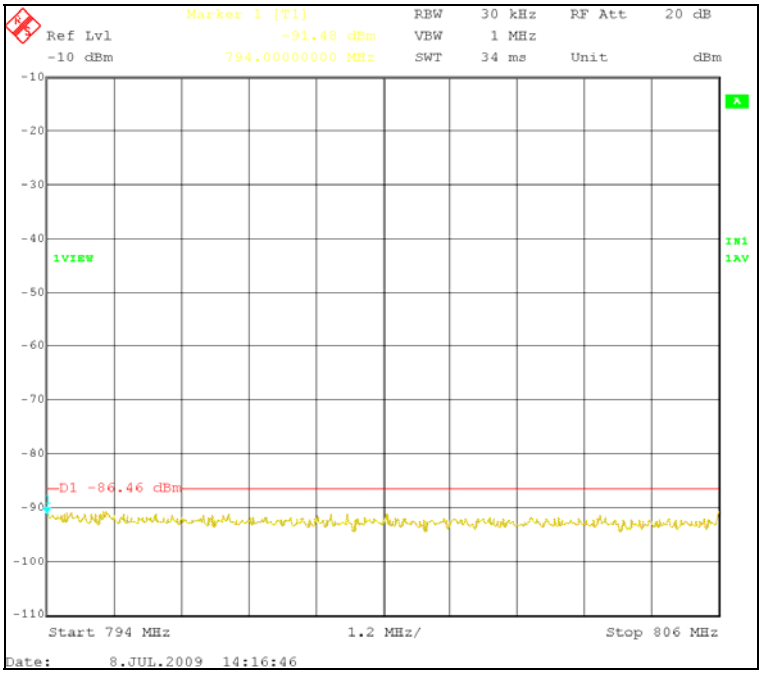
Plot 118. Adjacent Channel Power, Channel 776, WCQPSK, 2



Plot 119. Adjacent Channel Power, Channel 776, 400 kHz – 12 MHz. WCQPSK



Plot 120. Adjacent Channel Power, Channel 776, 12 MHz – Paired Receive Band, WCQPSK



Plot 121. Adjacent Channel Power, Channel 769, Paired Receive Band, WCQPSK

Test Equipment

9. Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ANSI/NCSL Z540-1-1994 and ANSI/ISO/IEC 17025:2000.

MET Asset #	Equipment	Manufacturer	Model	Last Cal Date	Cal Due Date
1T4502	COMB GENERATOR	COM-POWER	CGC-255	09/08/2008	09/08/2009
1T4621	ESA-E SERIES SPECTRUM ANALYZER	AGILENT	E4402B	03/20/2009	03/20/2010
1T4630	THERMO/HYGROMETER	CONTROL COMPANY	S6-627-9	02/18/2008	02/18/2010
1T4612	ESA-E SERIES SPECTRUM ANALYZER	AGILENT	E4407B	02/17/2009	02/17/2010
1T4409	EMI RECEIVER	ROHDE & SCHWARZ	ESIB7	05/07/2009	05/07/2010
1T4409	EMI RECEIVER	ROHDE & SCHWARZ	ESIB7	05/07/2009	05/07/2010
1T4300	SEMI-ANECHOIC CHAMBER # 1	EMC TEST SYSTEMS	NONE	08/24/2007	08/24/2009
1T4303	ANTENNA; BILOG	SCHAFNER - CHASE EMC	CBL6140A	07/07/2008	07/07/2009
1T4576	ACTIVE HORN ANTENNA	COM-POWER	AHA-118	04/09/2009	04/09/2010
1T4681	SPECTRUM ANALYZER	AGILENT	E4448A	09/17/2008	09/17/2009
1T4514	SYNTH SWEEP GENERATOR	AGILENT	83752B/1E1	04/22/2009	04/22/2010
1T4483	DOUBLE RIDGE WAVEGUIDE HORN	ETS LINDGREN	3117	06/03/2009	06/03/2010
1T4258	DIGITAL MULTIMETER	FLUKE	83	11/20/2008	11/20/2009
1T4494	AC POWER SUPPLY	CALIFORNIA INSTRUMENTS	1501TC	SEE NOTE	
1T4621	ESA-E SERIES SPECTRUM ANALYZER	AGILENT	E4402B	03/20/2009	03/20/2010
1T4612	ESA-E SERIES SPECTRUM ANALYZER	AGILENT	E4407B	02/17/2009	02/17/2010
2T5297	PROGRAMMER CONTROLLER	THERMOTRON	6800	06/20/2008	07/20/2009
2T5295	TEMPERATURE CHAMBER	THERMOTRON	F270 CH(V) 30-30/ECA	SEE NOTE	

Certification & User's Manual Information

10. Certification Label & User's Manual Information

10.1. 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 provision that such a determination of compliance be made and is the responsibility of the party responsible for verification of the equipment.

The following is extracted from Title 47 of the Code of Federal Regulations, Part 2, Subpart Y — 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, whichever is applicable.

§ 2.902 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.

§ 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.

10.2. 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.

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