MET Laboratories, Inc. *Safety Certification - EMI - Telecom Environmental Simulation*
33439 WESTERN AVENUE ! UNION CITY, CALIFORNIA 94587 ! PHONE (510) 489-6300 ! FAX (510) 489-6372

March 13, 2006

LGC Wireless, Inc.
2540 Junction Avenue
San Jose, CA 95134

Dear Tom Macall,

Enclosed is the EMC test report for compliance testing of the LGC Wireless, Inc., FSN-8519-1 Remote Unit as tested to the requirements of the FCC Certification rules under Title 47 of the CFR Part 24 Subpart E for Broadband PCS Devices.

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.

Boonmanus Seelapasay
Documentation Department

Reference: (\LGC Wireless, Inc.\EMCS19269-FCC24E)

Electromagnetic Compatibility Criteria
Test Report

for the

LGC Wireless, Inc.
InterReach Fusion Remote Unit
(FSN-8519-1)

Verified under
FCC Certification Rules
Title 47 of the CFR, Part 24 Subpart E
for Broadband PCS Devices

MET Report: EMCS19269-FCC24E

March 13, 2006

Prepared For:

LGC Wireless, Inc.
2540 Junction Avenue
San Jose, CA 95134

Prepared By:
MET Laboratories, Inc.
4855 Patrick Henry Dr., Building 6
Santa Clara, CA 95054

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InterReach Fusion Remote Unit
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Tested Under

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for Broadband PCS Devices

Shawn McMillen, Project Engineer
Electromagnetic Compatibility Lab

Boonmanus Seelapasay
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 24 Subpart E and Part 15 Subpart B of the FCC Rules under normal use and maintenance.

Tony Permsombut, Manager
Electromagnetic Compatibility Lab

Report Status Sheet

Revision	Report Date	Reason for Revision
∅	March 13, 2006	Initial Issue.

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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 µ
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
GR-1089-CORE	***(GR)*** **G**eneral **R**equirement(s) imposed by the NEBS standard, ***(CORE)*** **C**entral **O**ffice **R**ecovery **E**xpress (AT&T), ***(1089)*** specifies various parts of the General Requirements under Bellcore Technical Standard, Requirements for Electromagnetic Compatibility and Electrical Safety - Generic Criteria for Network Telecommunications Equipment
GRP	**G**round **R**eference **P**lane
H	Magnetic Field
HCP	**H**orizontal **C**oupling **P**lane
Hz	**H**ert**z**
IEC	**I**nternational **E**lectrotechnical **C**ommission
kHz	**k**ilo**h**ert**z**
kPa	**k**ilo**pa**scal
kV	**k**ilo**v**olt
LISN	**L**ine **I**mpedance **S**tabilization **N**etwork
MHz	**M**ega**h**ertz
µH	**microh**enry
µ	**microf**arad
µs	**micros**econds
NEBS	**N**etwork **E**quipment-**B**uilding **S**ystem
PRF	**P**ulse **R**epetition **F**requency
RF	**R**adio **F**requency
RMS	**R**oot-**M**ean-**S**quare
TWT	**T**raveling **W**ave **T**ube
V/m	**V**olts **per m**eter
VCP	**V**ertical **C**oupling **P**lane

I. Executive Summary

A. Purpose of Test

An EMC evaluation was performed to determine compliance of the LGC Wireless, Inc., FSN-8519-1 Remote Unit, with the requirements of Part 24 Subpart E and Part 15 Subpart B,. 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 FSN-8519-1 Remote Unit. LGC Wireless, Inc. should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the FSN-8519-1 Remote Unit, 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 24 Subpart E and Part 15 Subpart B,, in accordance with LGC Wireless, Inc. , purchase order number 716355.

Reference	Description	Results
Part 15 Subpart B §15.107(a)	Conducted Emissions	Compliant
Part 15 Subpart B §15.109(a)	Radiated Emissions	Compliant
§2.1046; §24.232	RF Power Output	Compliant
§2.1047	Modulation Characteristics	N/A
§2.1049	Occupied Bandwidth	Compliant
§2.1051; §24.238	Spurious Emissions at Antenna Terminals	Compliant
§2.1053; §24.238	Radiated Spurious Emissions	Compliant
§2.1055; §24.135	Frequency Stability	Compliant
2-11-04/EAB/RF	Out of Band Rejection	Compliant

Table 1 Executive Summary of EMC ComplianceTesting

II. Equipment Configuration

A. Overview

MET Laboratories, Inc. was contracted by LGC Wireless, Inc. to perform testing on the FSN-8519-1 Remote Unit, under LGC Wireless, Inc. 's purchase order number 716355.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the LGC Wireless, Inc., FSN-8519-1 Remote Unit.

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

Model(s) Tested:	FSN-8519-1 Remote Unit	
Model(s) Covered:	FSN-8519-1 Remote Unit	
EUT Specifications:	Primary Power: 54 VDC	
	FCC ID: NOOFSN-8519-1	
	Type of Modulations:	CDMA (F9W)
		TDMA (DXW)
		GSM (GXW)
	Equipment Code:	PCB
	RF Output Power:	CDMA – 24.0 dBm
		TDMA - 25.1 dBm
		GSM - 25.4 dBm
	EUT Frequency Ranges:	Downlink: 1930 - 1990MHz
		Uplink: 1850 - 1910MHz
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:	Shawn McMillen	
Date(s):	March 13, 2006	

B. References

CFR 47, Part 15, Subpart C	Federal Communication Commission, Code of Federal Regulations, Title 47, Part 15: General Rules and Regulations, Allocation, Assignment, and Use of Radio Frequencies
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
ANSI/NCSL Z540-1-1994	Calibration Laboratories and Measuring and Test Equipment - General Requirements
ANSI/ISO/IEC 17025:2000	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

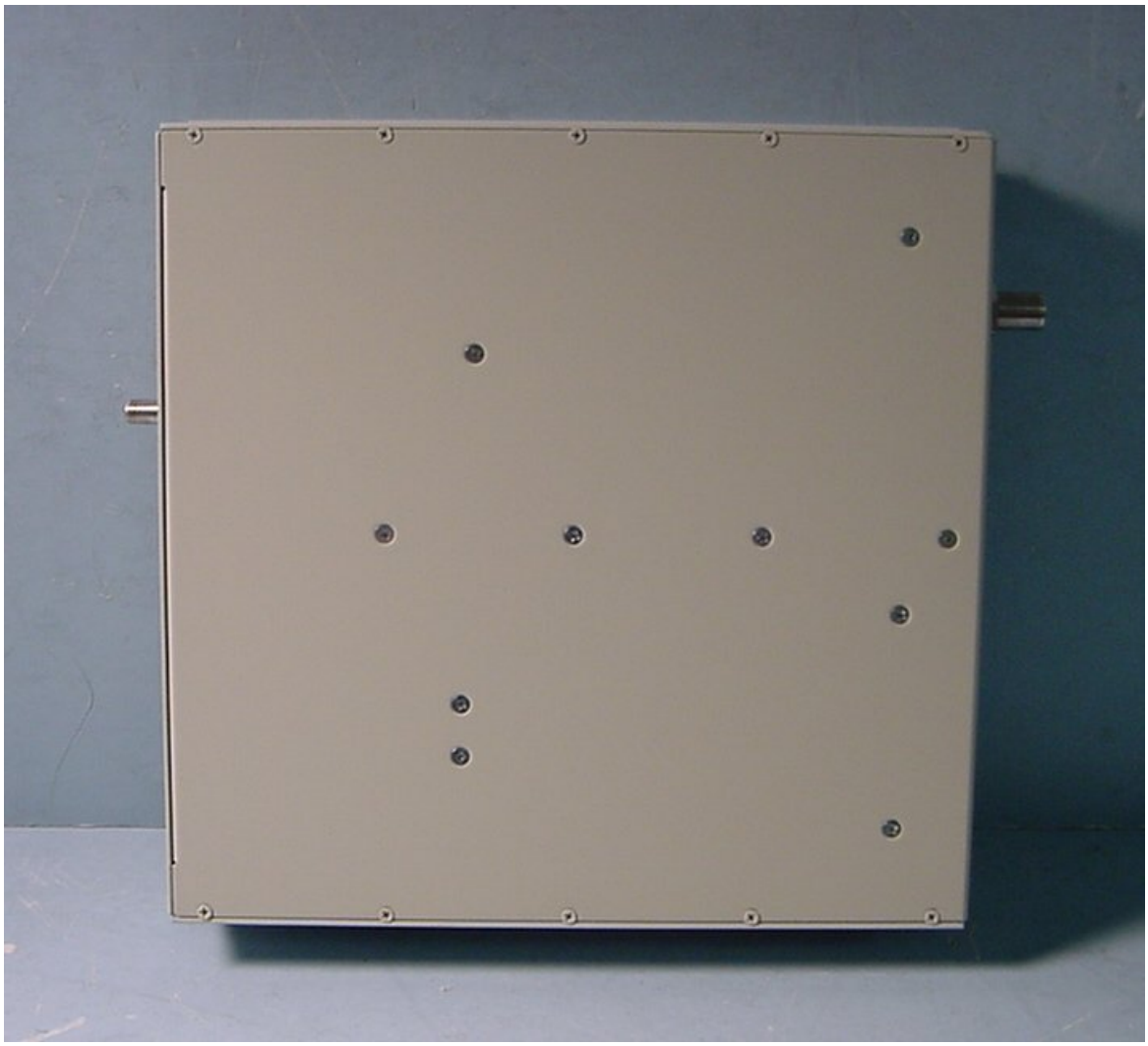
C. Test Site

All testing was performed at MET Laboratories, Inc., 4855 Patrick Henry Drive, Building 6, Santa Clara, California 95054. 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. In accordance with §2.948(d), MET Laboratories has been accredited by the National Voluntary Laboratory Accreditation Program
(Lab Code: 100273-0).

D. Description of Test Sample

The FSN-8519-1 Remote Unit, Equipment Under Test (EUT) is part of an RF signal amplifier system, consisting of the InterReach Fusion SingleStar Hub unit which communicates with the InterReach Fusion Remote Access Unit. The Hub unit connects to a base station and receives RF signal, which then converts the signal to IF signal. The IF signal is distributed to external Remote Access Unites (RAU) via coax cabling. The Remote Access Unit converts the signal back to RF and transmits it to and from wireless devices located with the RAU's area of coverage. DC power is also provided to RAU, from the Hub, via the coax cabling.



Photograph 1. LGC Wireless, Inc. FSN-8519-1 Remote Unit

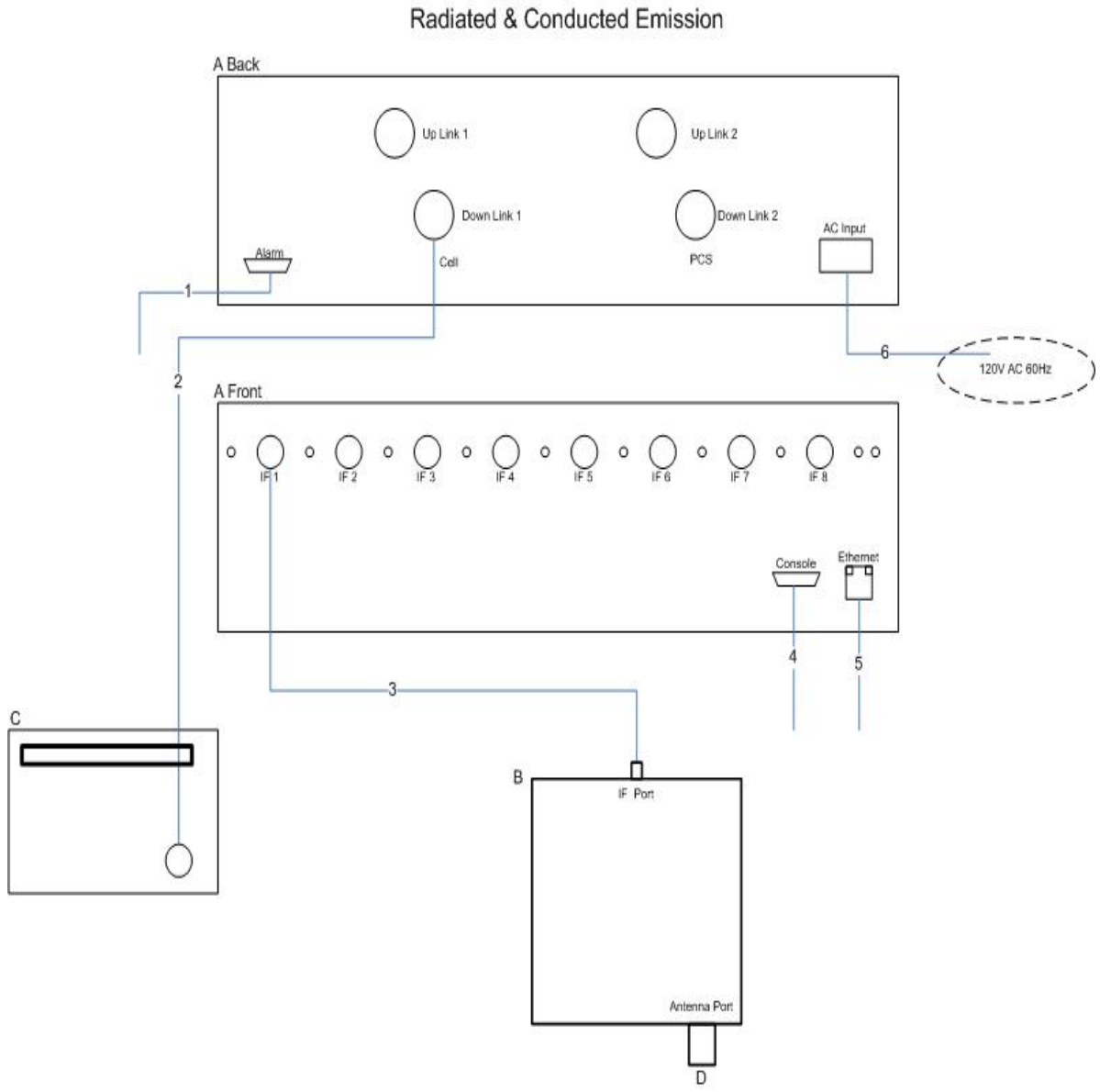


Figure 1. Block Diagram of Test Configuration

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	Part Number	Serial Number	Rev. #
A	Hub (Main board)	FSN-1-SS-1	740670-0	A	Hub (Main board)
B	RAU (Main board)	FSN-8519-1	740650-0	B	RAU (Main board)

Table 2. Equipment Configuration

F. Support Equipment

LGC Wireless, Inc. supplied support equipment necessary for the operation and testing of the FSN-8519-1 Remote Unit. All support equipment supplied is listed in the following Support Equipment List.

Ref. ID	Name / Description	Manufacturer	Model Number	*Customer Supplied Calibration Data
C	Signal Generator	HP	8648C	3426A01174
D	50 Ohms Terminator	Narda	375BNB	07
E	Signal Generator	HP	E4432B	US38080117
F	Amplifier	Mini-Circuit	ZHL-4240W	D111903#8
G	Spectrum Analyzer	HP	E4407B	MY45102898

Table 3. Support Equipment

* The 'Customer Supplied Calibration Data' column will be marked as either not applicable, not available, or will contain the calibration date supplied by the customer.
** The AC/DC Adapter was use to power the EUT for testing purpose only, will not be sold with radio.

G. Ports and Cabling Information

Ref. ID	Port name on EUT	Cable Description or reason for no cable	Qty.	Length (m)	Shielded?	Termination Box ID & Port ID
Radiated & Conducted Emission						
1	A Back, Alarm	DB9	1	1.5	Yes	Unterminated
2	A Back, Down-Link 2	Coax	1	5	Yes	C
3	A Front, IF 1	Coax	1	25	Yes	B, IF Port
4	A Front, Console	DB9	1	1.5	Yes	Unterminated
5	A Front, Ethernet	RJ45	1	2	Yes	Unterminated
6	A Back, AC Input	AC PWR Cord	1	2	No	AC PWR Outlet
Conducted Measurement (Down-Link)						
1	A Back, Down-Link 2	Coax	1	5	Yes	F
2	F	Coax	1	1	Yes	E
3	A Front, IF 1	Coax	1	25	Yes	B, IF Port
4	B, Antenna Port	Coax	1	1.5	Yes	G
5	A Back, AC Input	AC PWR Cord	1	2	No	AC PWR Outlet
Conducted Measurement (Up-Link)						
1	B, Antenna Port	Coax	1	5	Yes	F
2	F	Coax	1	1	Yes	E
3	A Front, IF 1	Coax	1	25	Yes	B, IF Port
4	A Back, Up-Link 2	Coax	1	1.5	Yes	G
5	A Back, AC Input	AC PWR Cord	1	2	No	AC PWR Outlet
Spurious Emission (Down-Link)						
1	A Back, Down-Link 2	Coax	1	5	Yes	C
2	A Back, AC Input	AC PWR Cord	1	2	No	AC PWR Outlet
3	A Front, IF 1	Coax	1	25	Yes	B, IF Port
Spurious Emission (Up-Link)						
1	B, Antenna Port	Coax	1	5	Yes	C
2	A Back, AC Input	AC PWR Cord	1	2	No	AC PWR Outlet
3	A Front, IF 1	Coax	1	25	Yes	B, IF Port

Table 4. Ports and Cabling Information

H. Mode of Operation

A modulated carrier was supplied to both the Up Link and Down Link port at an appropriate RF level. The EUT is not equipped with any method of controlling the RF output power.

I. Method of Monitoring EUT Operation

A Spectrum Analyzer and a Power Meter was use to monitor the EUT's transmitter channel and power output.

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 LGC Wireless, Inc. 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.

§ 24.232 Power and antenna height limits.

§ 24.232 (b): Mobile/portable stations are limited to 2 watts EIRP peak power and the equipment must employ means to limit the power to the minimum necessary for successful communications.

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.

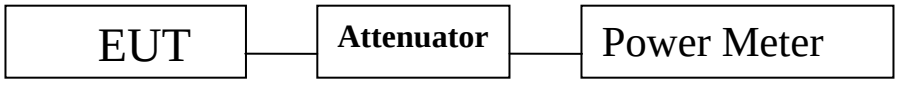
Test Results: The EUT complies with the requirements of this section. The EUT conducted power does not exceed limit at the carrier frequency.

Downlink			
Modulation	**Frequency (MHz)**	**Input Power dBm (mW)**	**Modulated Output Power dBm (mW)**
CDMA	1960	13 (20)	24.0 (251.2)
TDMA	1960	13 (20)	25.1 (323.6)
GSM	1960	13 (20)	25.4 (346.7)

Note: The Up link has no gain associated with it. The RF power supplied to the Uplink port was -40dBm.

Test Engineer(s): Shawn McMillen

Test Date(s): March 13, 2006



Block Diagram 1. RF Power Output Test Setup

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 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.

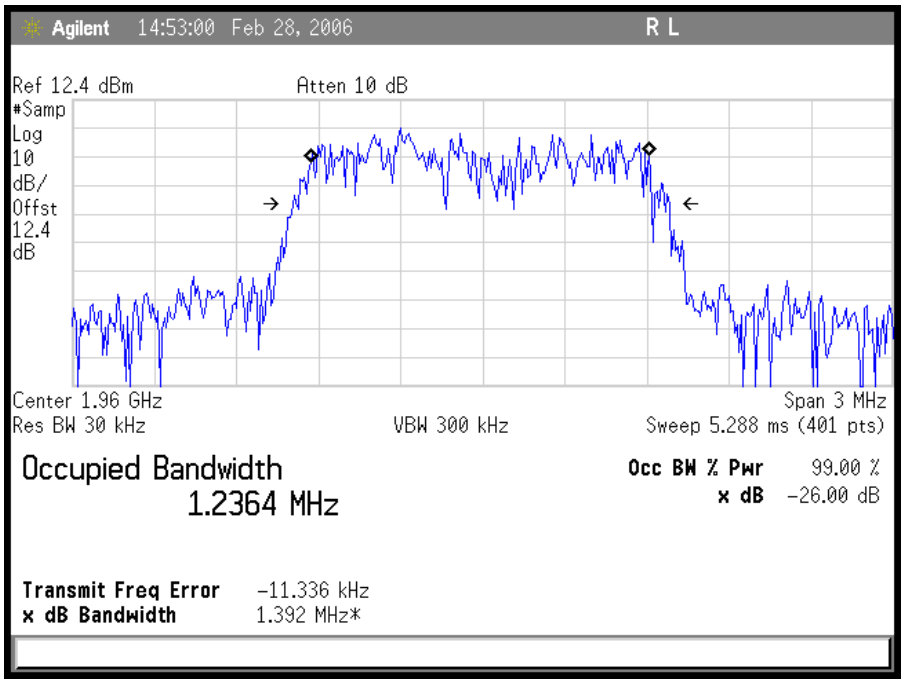
Test Procedures: As required by 47 CFR 2.1049, *occupied bandwidth measurements* were made with a Spectrum Analyzer connected to the RF ports for both Uplink and Downlink

The modulation characteristics of signal generator's carrier was measured first at a maximum RF level prescribed by the OEM. The signal generator was then connected to either the Uplink or Downlink input at the appropriate RF level. The resulting modulated signal through the EUT was measured and compared against the original signal.

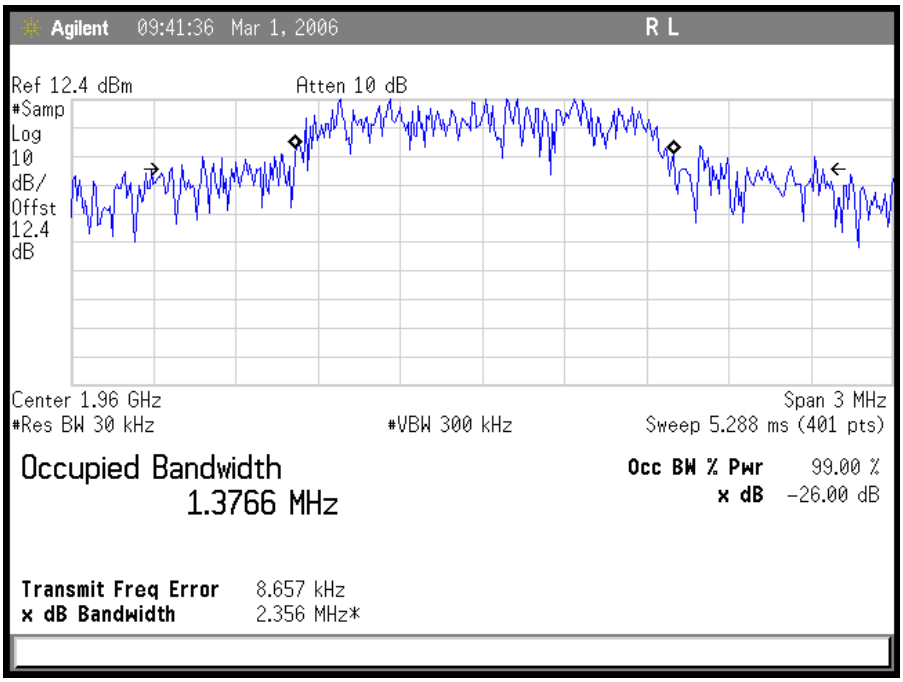
Test Results: The EUT complies with the requirements of this section.

Test Engineer(s): Shawn McMillen

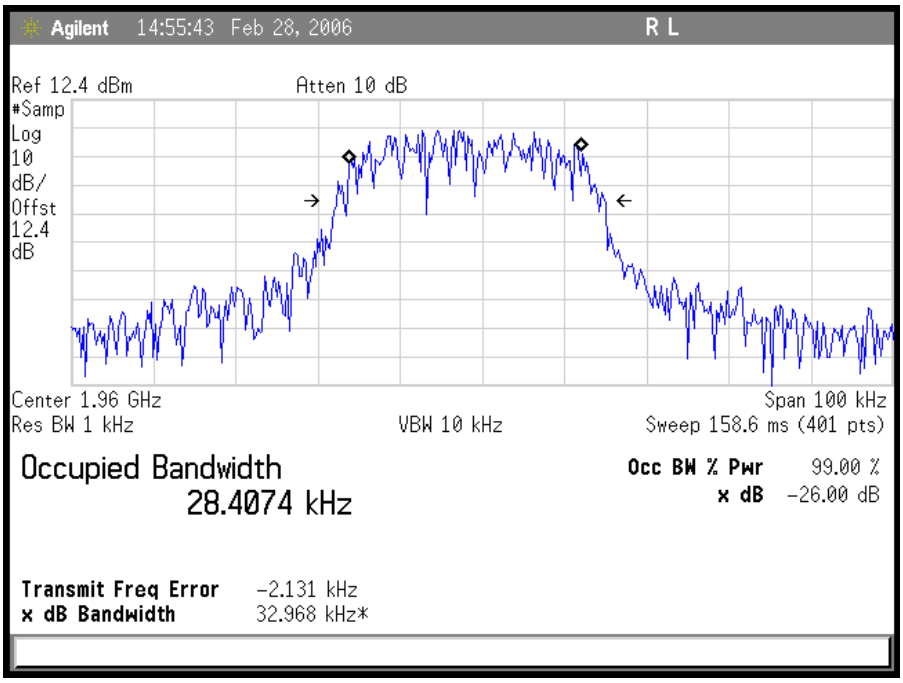
Test Date(s): February 28, 2006



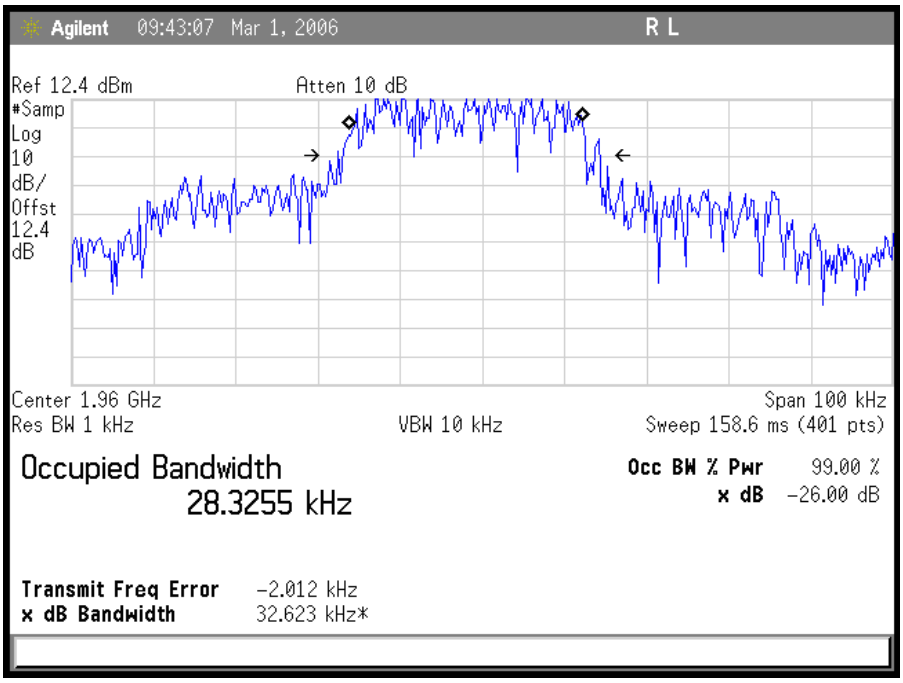
Plot 1. CDMA Downlink Input



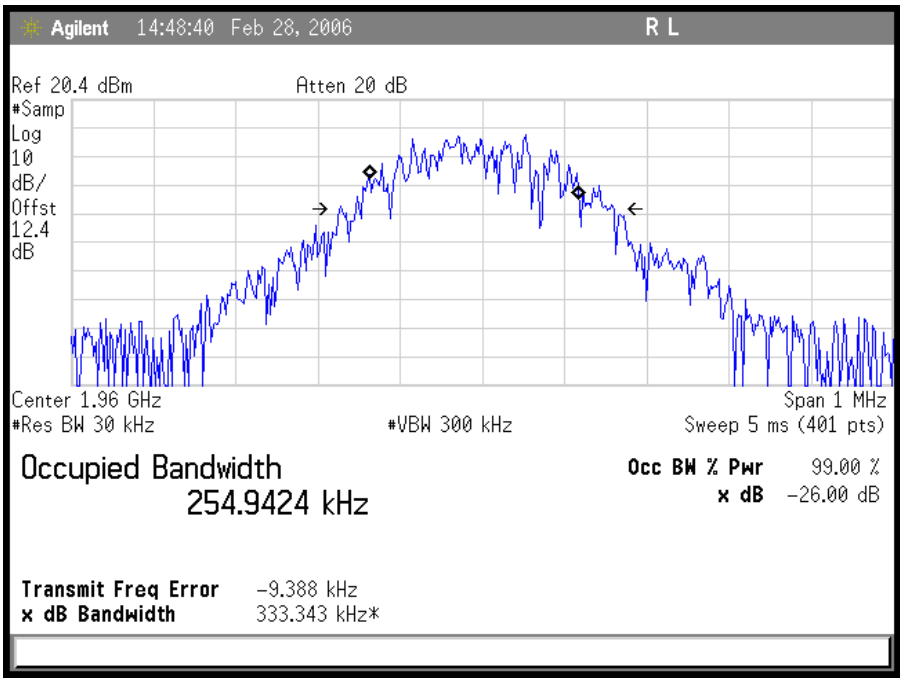
Plot 2. CDMA Downlink Output



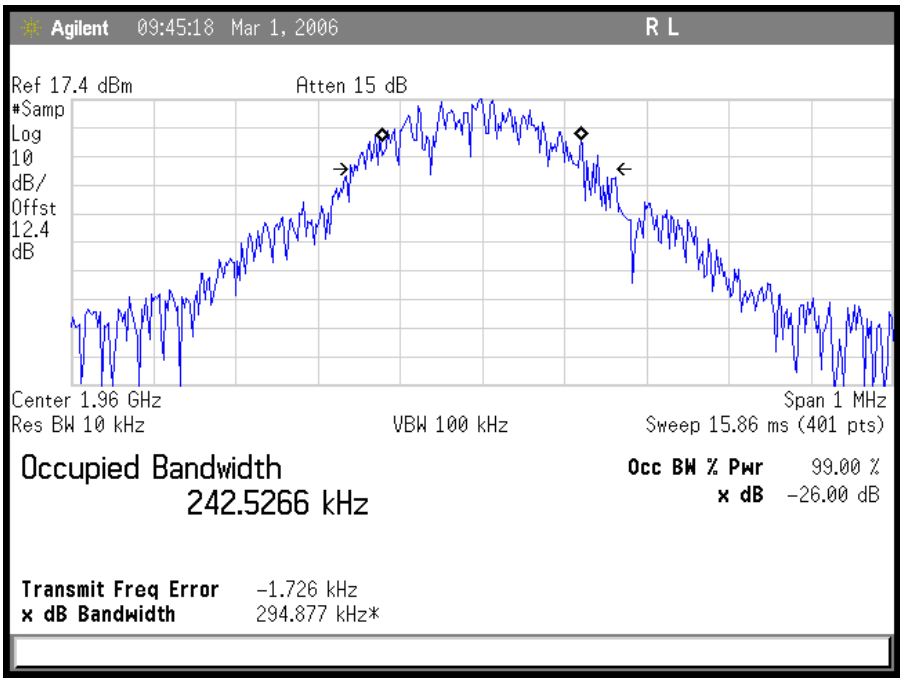
Plot 3. TDMA Downlink Input



Plot 4. TDMA Downlink Output



Plot 5. GSM Downlink Input



Plot 6. GSM Downlink Output

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.

§ 24.238 Emission limitations for Broadband PCS equipment: The rules in this section govern the spectral characteristics of emissions in the Broadband Personal Communications Service.

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

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 complies with the requirements of this section.

Test Engineer: Shawn McMillen

Test Date(s): March 13, 2006

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 2.1053 Measurements required: Field strength of spurious radiation.

Frequency (MHz)	Antenna Polarity (H/V)	Field Strength of Spurious Harmonics (dBm)	Substitution Antenna Gain (dBi)	Power into Substitution Antenna(dBm)	EIRP (dBm)	Limit (dBm)	Margin	Detector Type
3860	V	-55.2	9.6	-47.3	-37.7	-13	24.7	Peak
3860	H	-56.9	9.6	-45.2	-35.6	-13	22.6	Peak
5790	V	-58.2	11.4	-46.3	-34.9	-13	21.9	Peak
5790	H	-59.3	11.4	-47.0	-35.6	-13	22.6	Peak
Low Channel								
3920	V	-54.9	9.6	-49.3	-39.7	-13	26.7	Peak
3920	H	-56.1	9.6	-48.2	-38.6	-13	25.6	Peak
5880	V	-59.3	11.4	-46.9	-35.5	-13	22.5	Peak
5880	H	-60.2	11.4	-48.2	-36.8	-13	23.8	Peak
Mid Channel								
3980	V	-55.6	9.6	-50.2	-40.6	-13	27.6	Peak
3980	H	-58.4	9.6	-47.2	-37.6	-13	24.6	Peak
5970	V	-57.3	11.4	-48.5	-37.1	-13	24.1	Peak
5970	H	-60.8	11.4	-45.6	-34.2	-13	21.2	Peak
High Channel								

Table 5. Spurious Harmonic Uplink Test Results

Note: All other emissions were measured at the noise floor of the spectrum analyzer

Electromagnetic Compatibility Criteria for Intentional Radiators

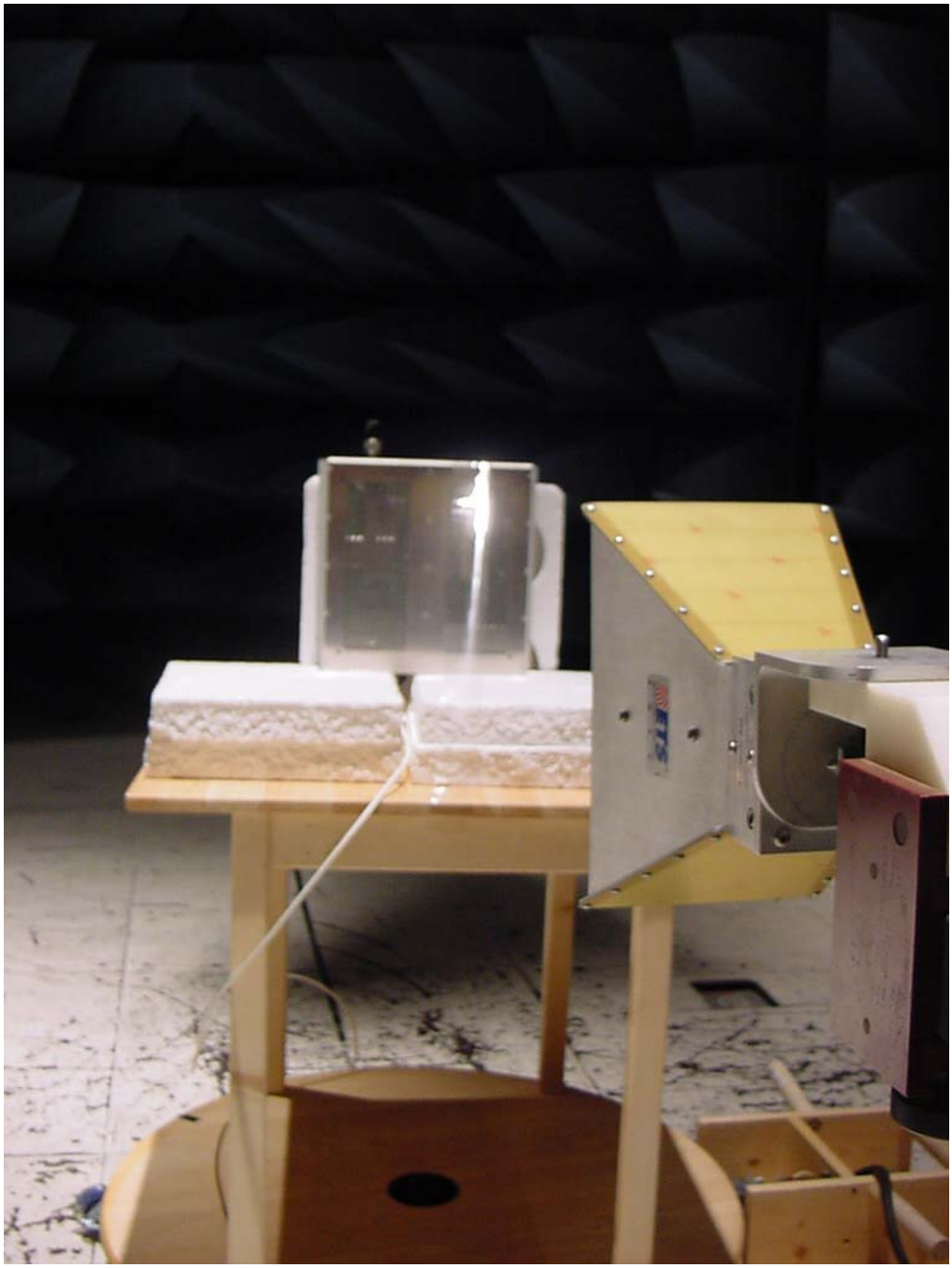
§ 2.1053 Measurements required: Field strength of spurious radiation.

Frequency (MHz)	Antenna Polarity (H/V)	Field Strength of Spurious Harmonics (dBm)	Substitution Antenna Gain (dBi)	Power into Substitution Antenna(dBm)	EIRP (dBm)	Limit (dBm)	Margin	Detector Type
3860	V	-54.2	9.6	-48.2	-37.7	-13	24.7	Peak
3860	H	-58.6	9.6	-45.8	-35.6	-13	22.6	Peak
5790	V	-61.2	11.4	-45.3	-34.9	-13	21.9	Peak
5790	H	-60.2	11.4	-48.2	-35.6	-13	22.6	Peak
Low Channel								
3920	V	-55.6	9.6	-50.2	-39.7	-13	26.7	Peak
3920	H	-56.7	9.6	-49.6	-38.6	-13	25.6	Peak
5880	V	-60.2	11.4	-47.6	-35.5	-13	22.5	Peak
5880	H	-61.2	11.4	-49.3	-36.8	-13	23.8	Peak
Mid Channel								
3980	V	-54.2	9.6	-51.2	-40.6	-13	27.6	Peak
3980	H	-57.6	9.6	-49.3	-37.6	-13	24.6	Peak
5970	V	-55.3	11.4	-50.3	-37.1	-13	24.1	Peak
5970	H	-57.1	11.4	-47.2	-34.2	-13	21.2	Peak
High Channel								

Table 6. Spurious Harmonic Downlink Test Results

Note: All other emissions were measured at the noise floor of the spectrum analyzer

Electromagnetic Compatibility Criteria for Intentional Radiators



Photograph 2. Test Equipment and setup for various Radiated Measurements

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.

§ 24.238 Emission limitations for Broadband PCS equipment: The rules in this section govern the spectral characteristics of emissions in the Broadband Personal Communications Service.

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

Test Procedures:

A modulated carrier generated by the signal generator carrier was connected to either the Uplink or Downlink RF port at a maximum level as determined by the OEM A spectrum analyzer was connected to either the Uplink or Downlink port depending on the circuitry being measured. The spectrum analyzer was set to 1MHz RBW and 3MHz VBW. The spectrum was investigated from 30MHz to the 10^{th} harmonic of the carrier.

The inter-modulation requirements were performed in a similar manner as described above. The spectrum analyzer was set to 100KHz RBW and 300KHz VBW. Two modulated carriers were injected into the EUT. One carrier was set at the band edge of either the Uplink or Downlink band and the other at carrier set at 6MHz deviation from the first carrier. The in band spurious emissions were investigated.

Test Results:

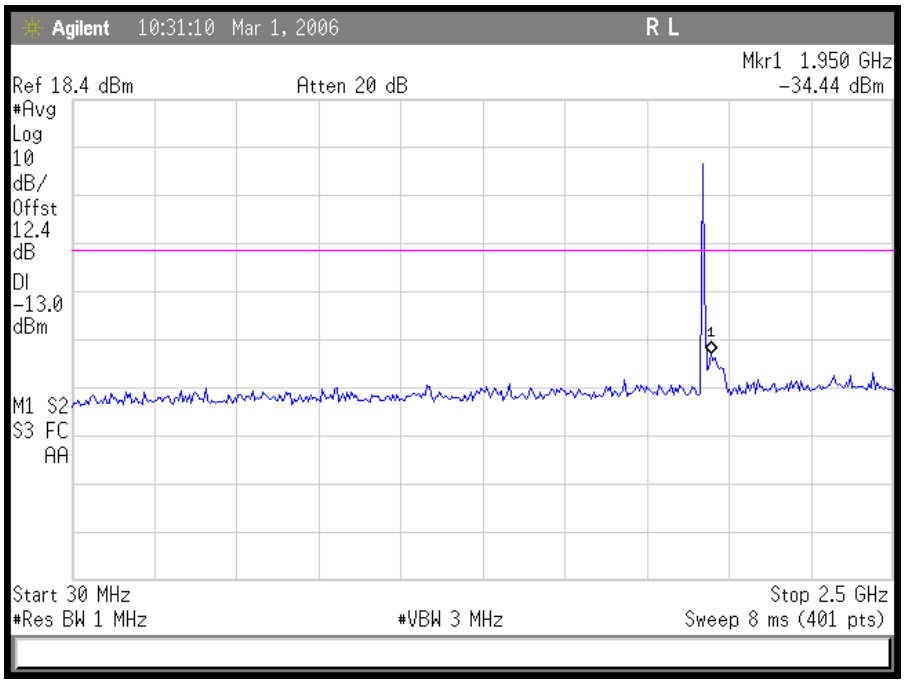
The EUT complies with the requirements of this section. There were no detectable spurious emissions for this EUT.

Test Engineer(s):

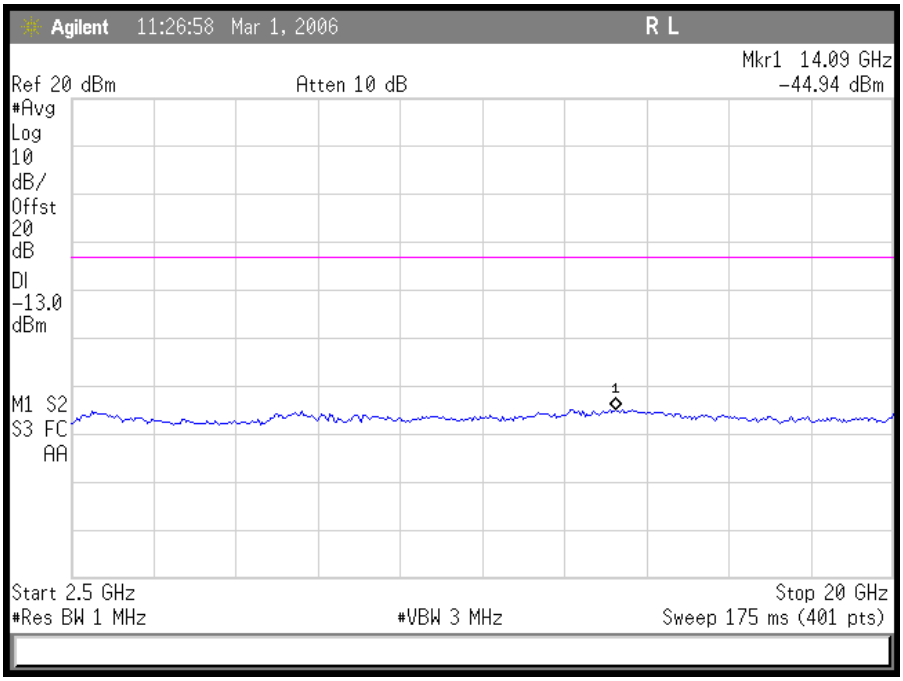
Shawn McMillen

Test Date(s):

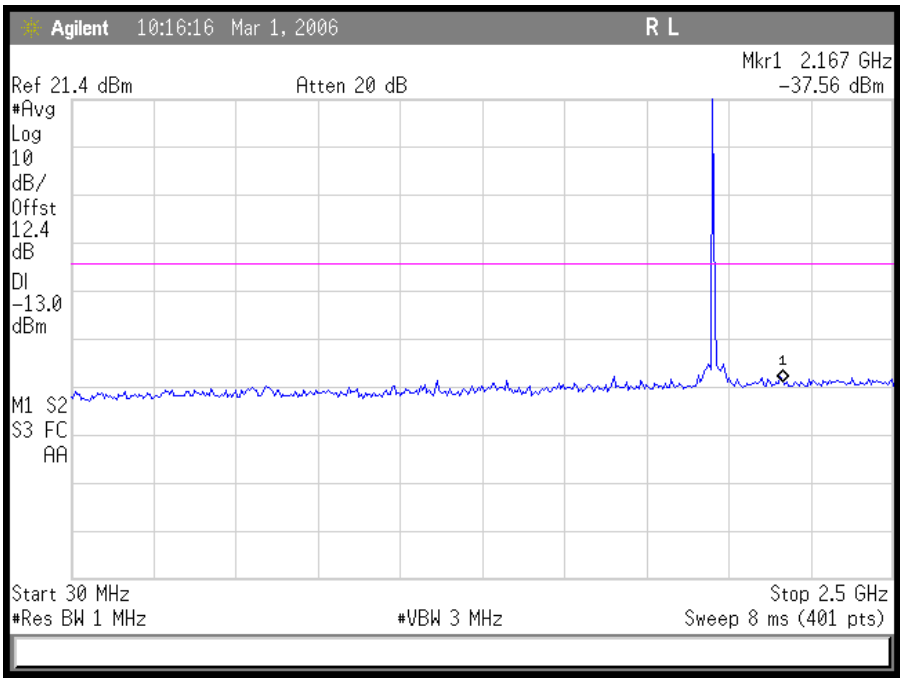
March 1, 2006



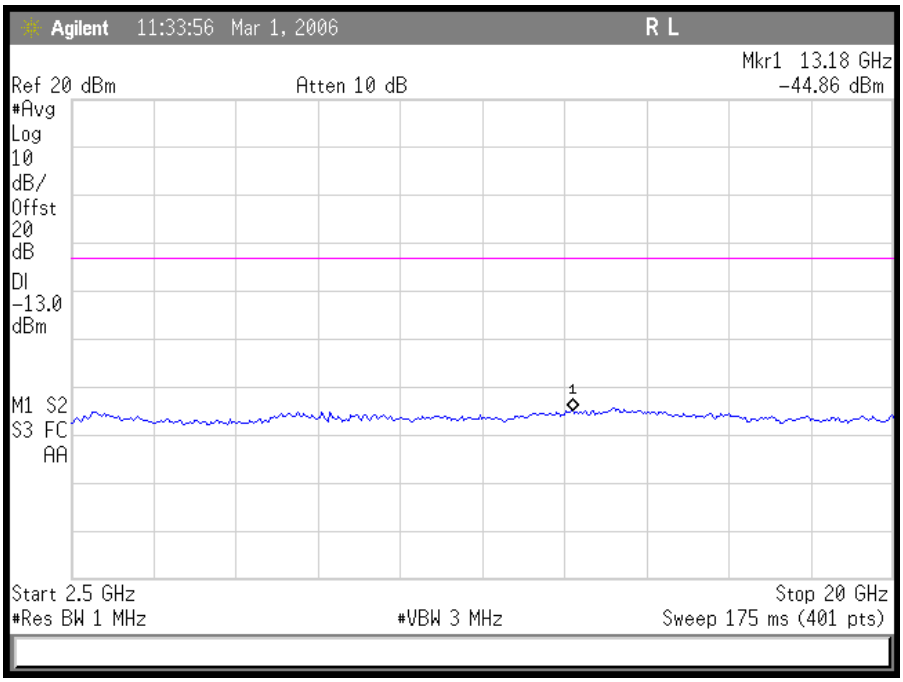
Plot 7. CDMA Downlink Low CH Conducted Emissions 30 MHz – 2.5 GHz



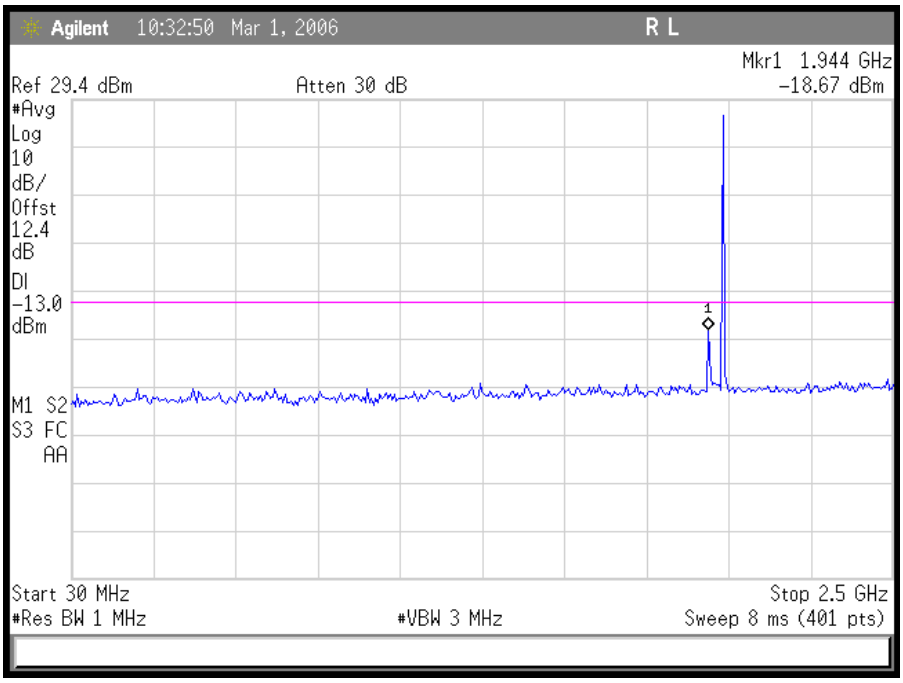
Plot 8. CDMA Downlink Low CH Conducted Emissions 2.5 GHz – 20 GHz



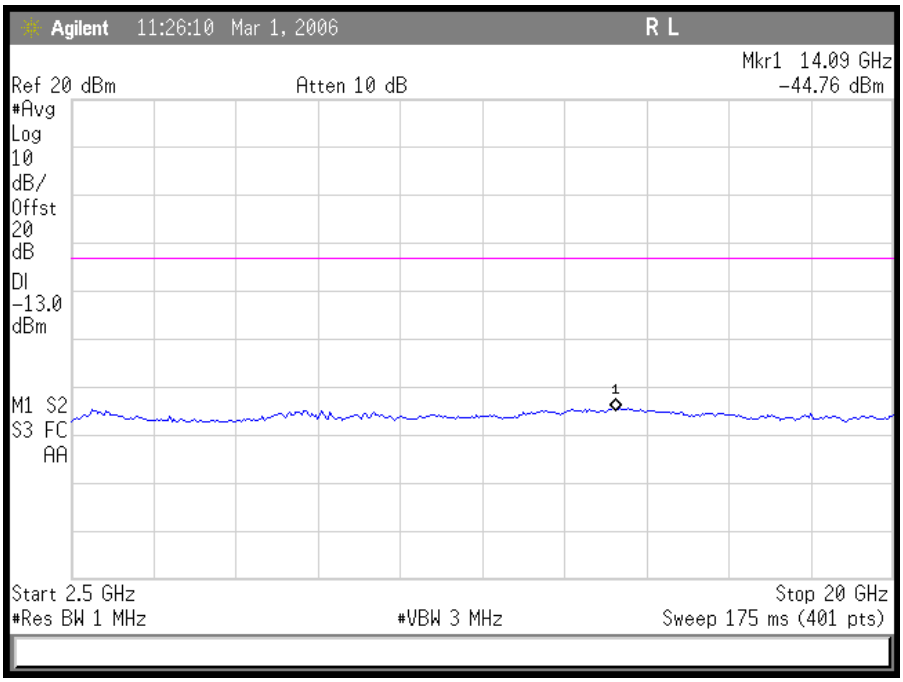
Plot 9. CDMA Downlink Mid CH Conducted Emissions 30 MHz – 2.5 GHz



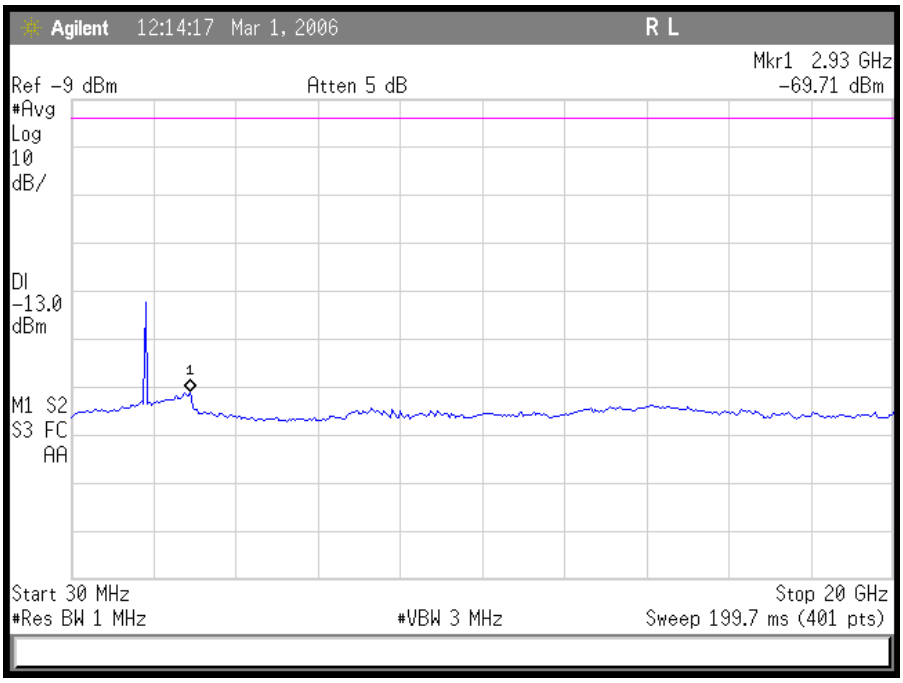
Plot 10. CDMA Downlink Mid CH Conducted Emissions 2.5 GHz – 20 GHz



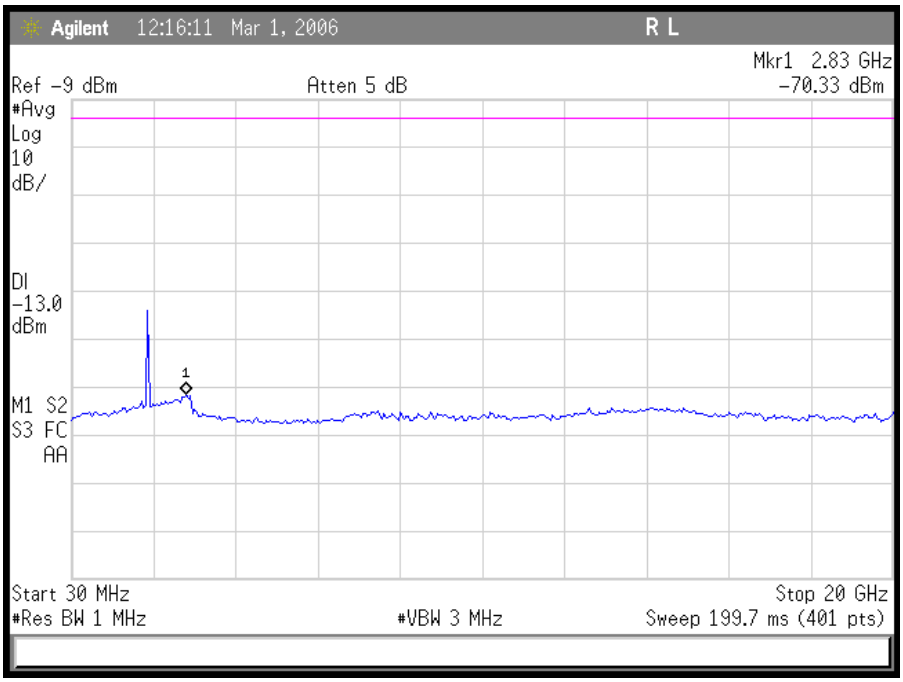
Plot 11. CDMA Downlink High CH Conducted Emissions 30 MHz – 2.5 GHz



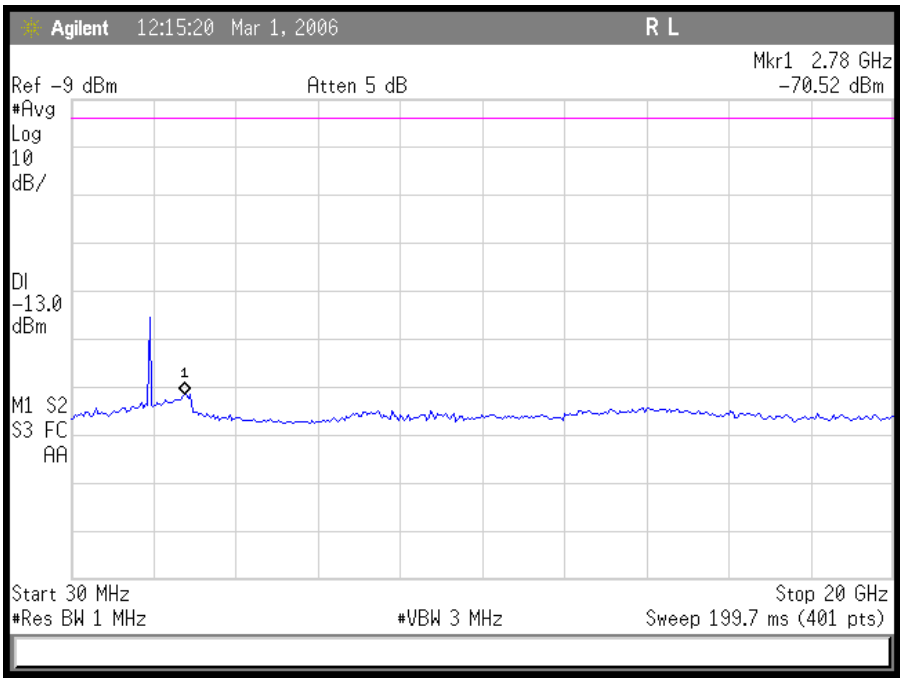
Plot 12. CDMA Downlink High CH Conducted Emissions 2.5 GHz – 20 GHz



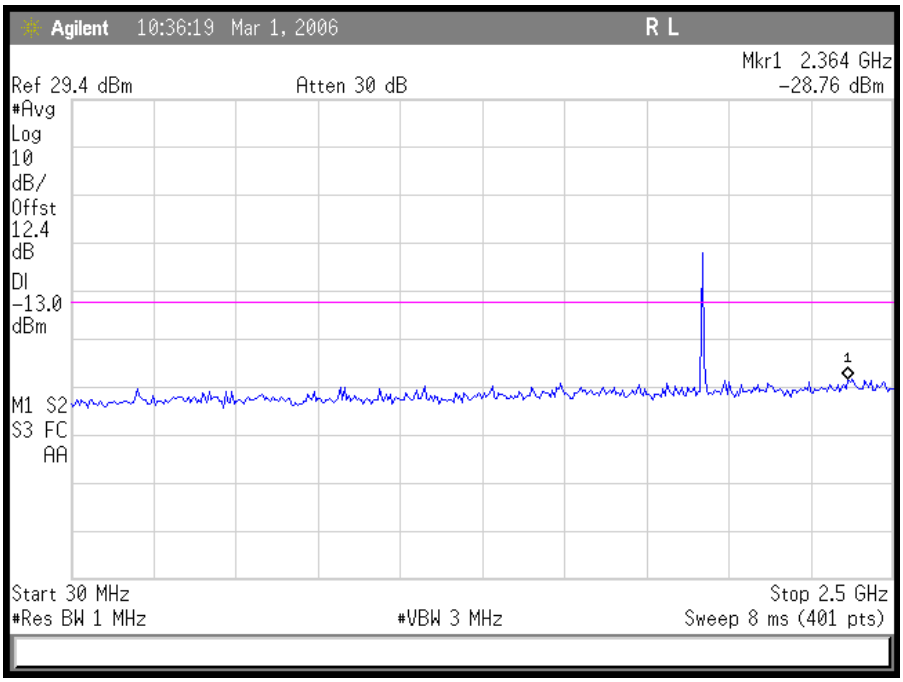
Plot 13. CDMA Uplink Low CH Conducted Emissions 30 MHz – 20 GHz



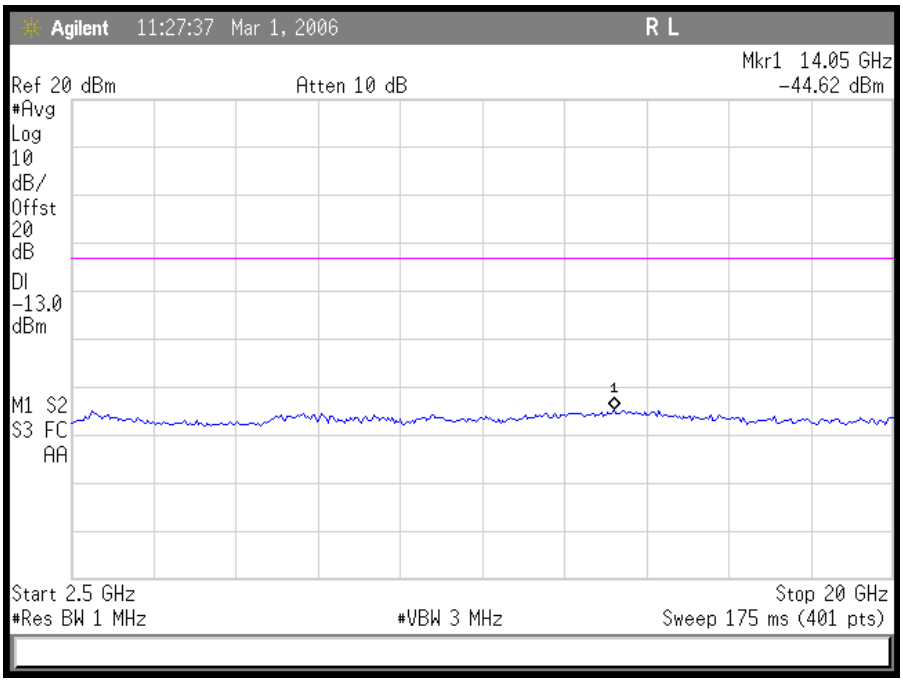
Plot 14. CDMA Uplink Mid CH Conducted Emissions 30 MHz – 20 GHz



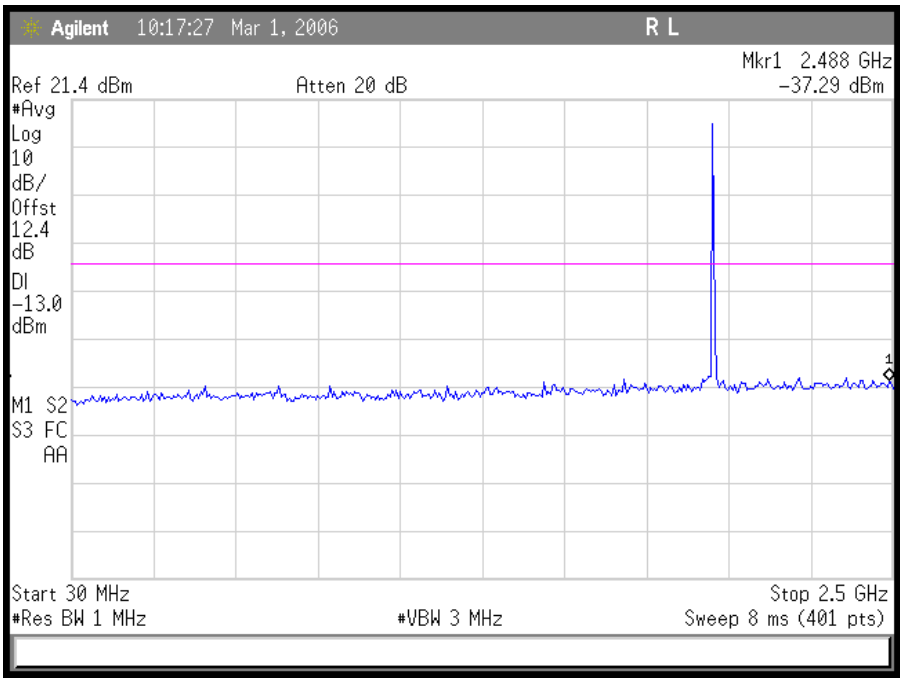
Plot 15. CDMA Uplink High CH Conducted Emissions 30 MHz – 20 GHz



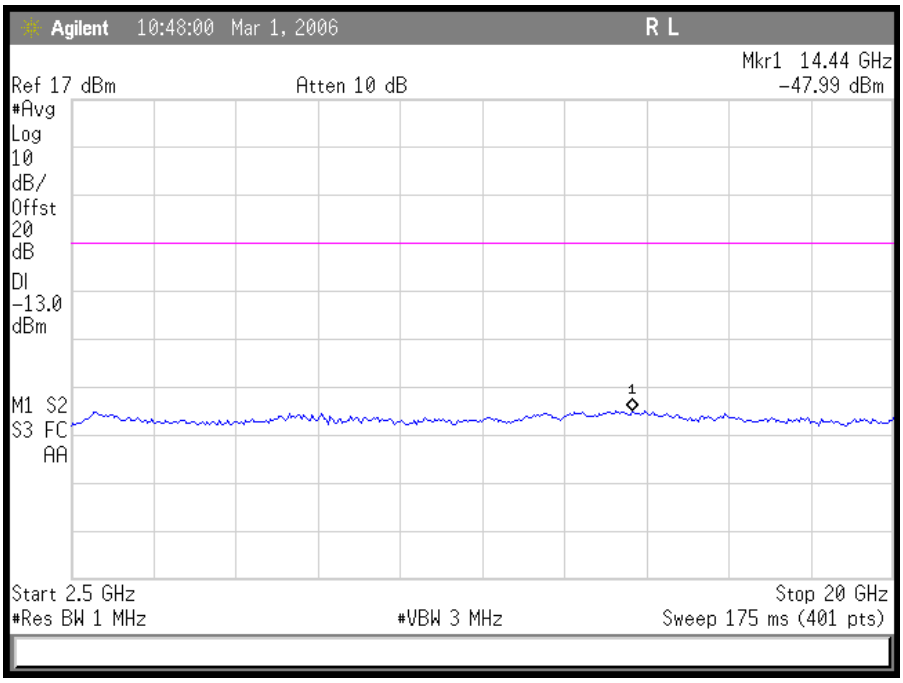
Plot 16. TDMA Downlink Low CH Conducted Emissions 30 MHz – 2.5 GHz



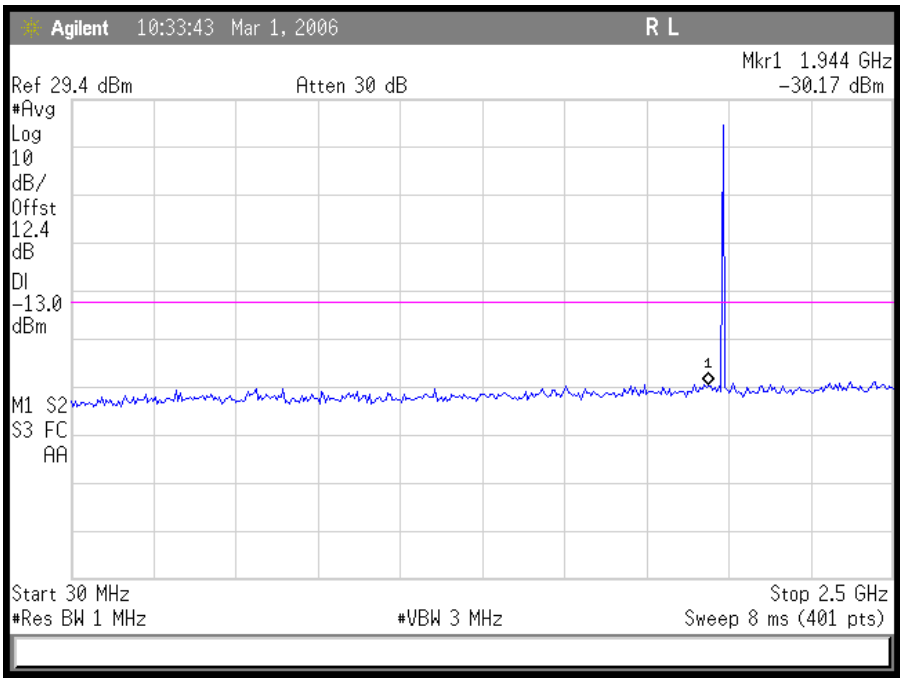
Plot 17. TDMA Downlink Low CH Conducted Emissions 2.5 GHz – 20 GHz



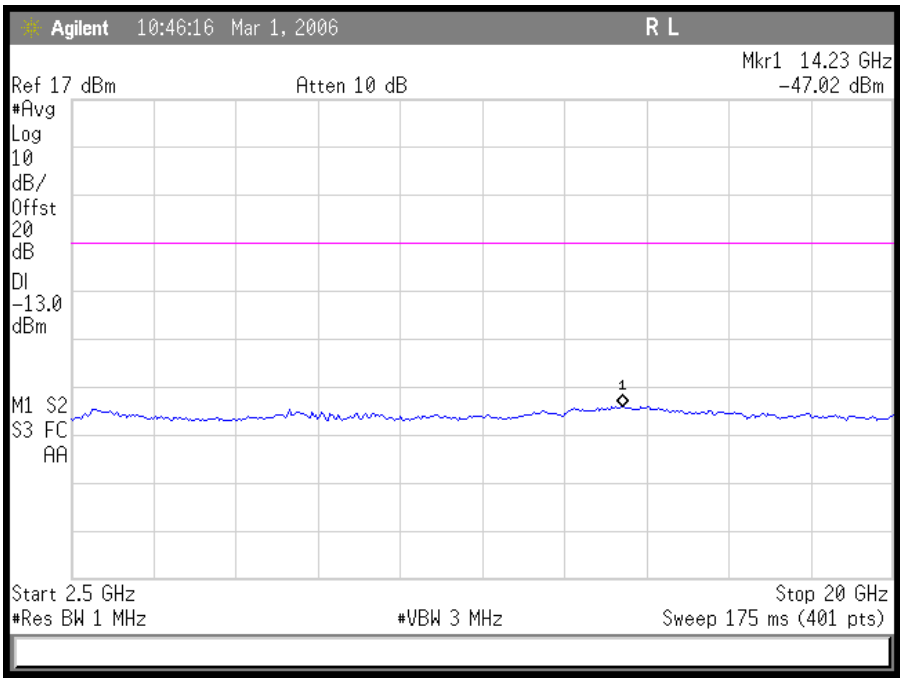
Plot 18. TDMA Downlink Mid CH Conducted Emissions 30 MHz – 2.5 GHz



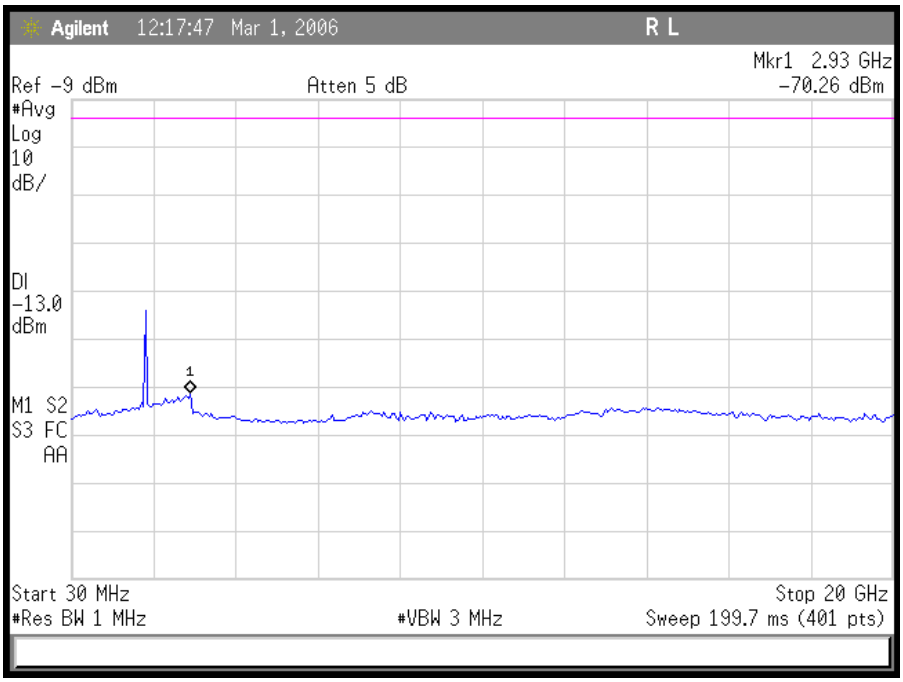
Plot 19. TDMA Downlink Mid CH Conducted Emissions 2.5 GHz – 20 GHz



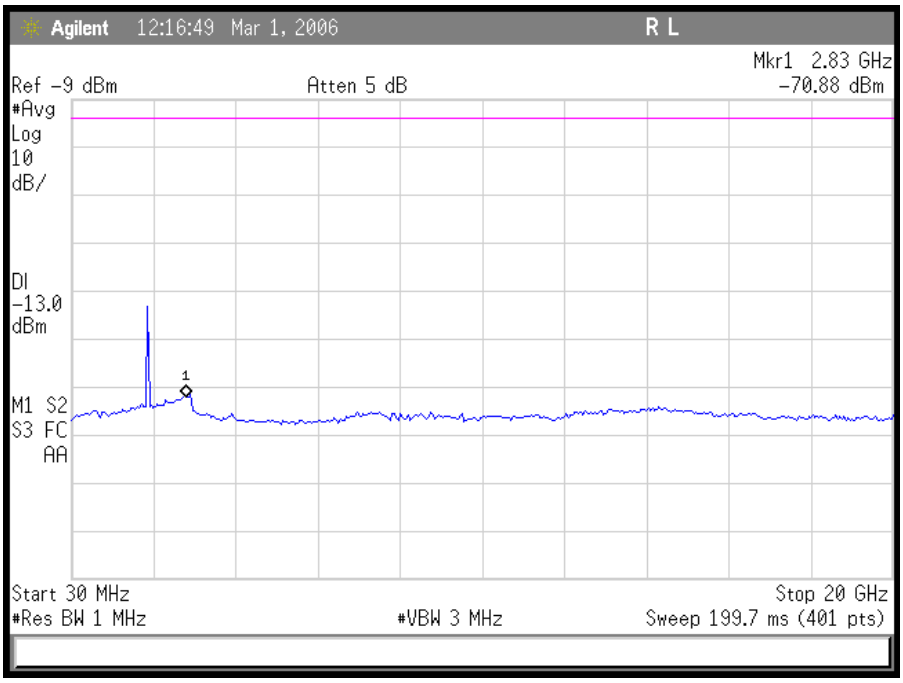
Plot 20. TDMA Downlink High CH Conducted Emissions 30 MHz – 2.5 GHz



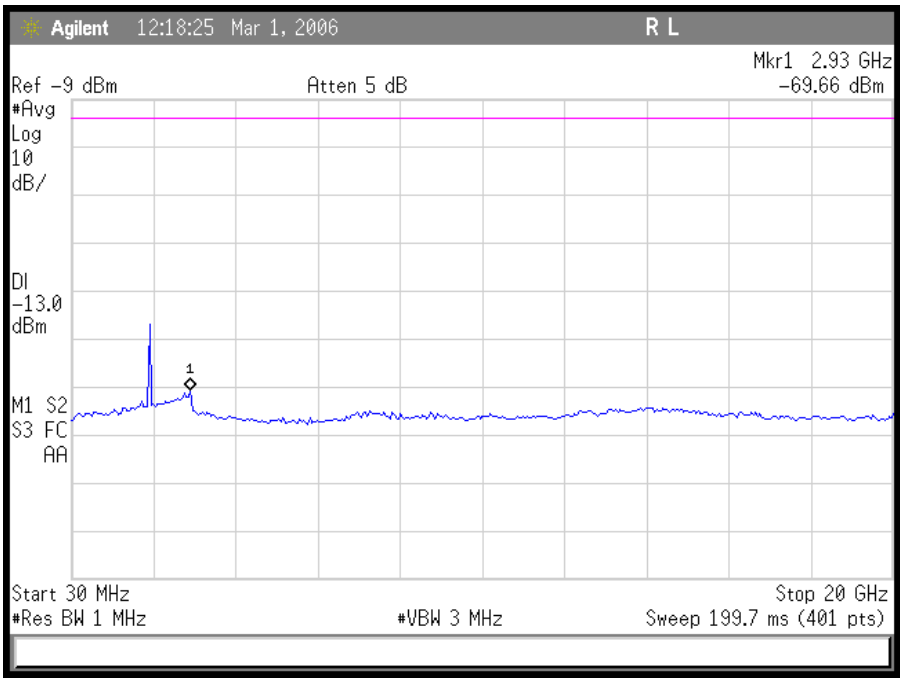
Plot 21. TDMA Downlink High CH Conducted Emissions 2.5 GHz – 20 GHz



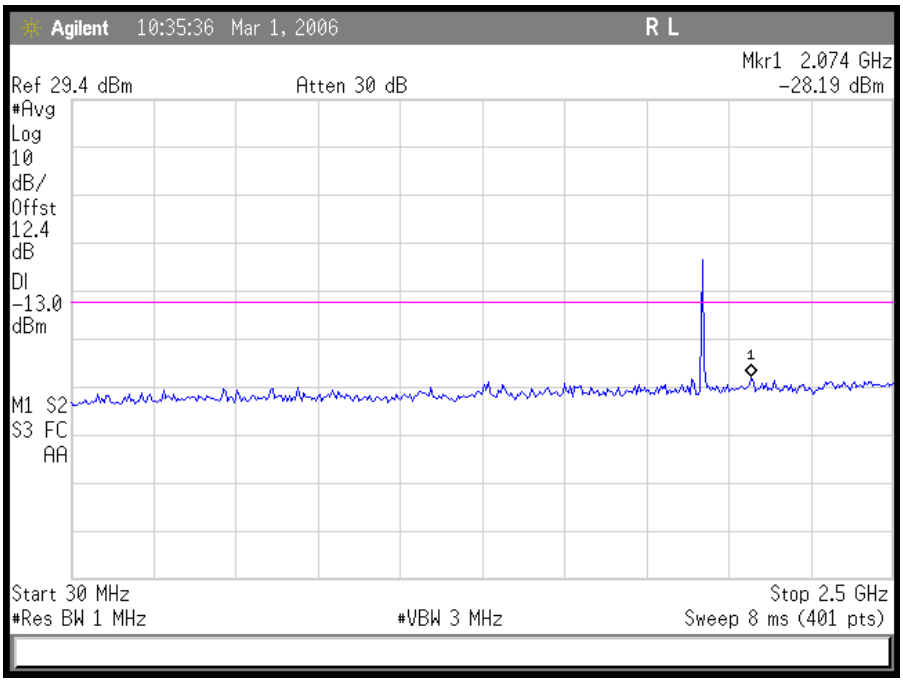
Plot 22. TDMA Uplink Low CH Conducted Emissions 30 MHz – 20 GHz



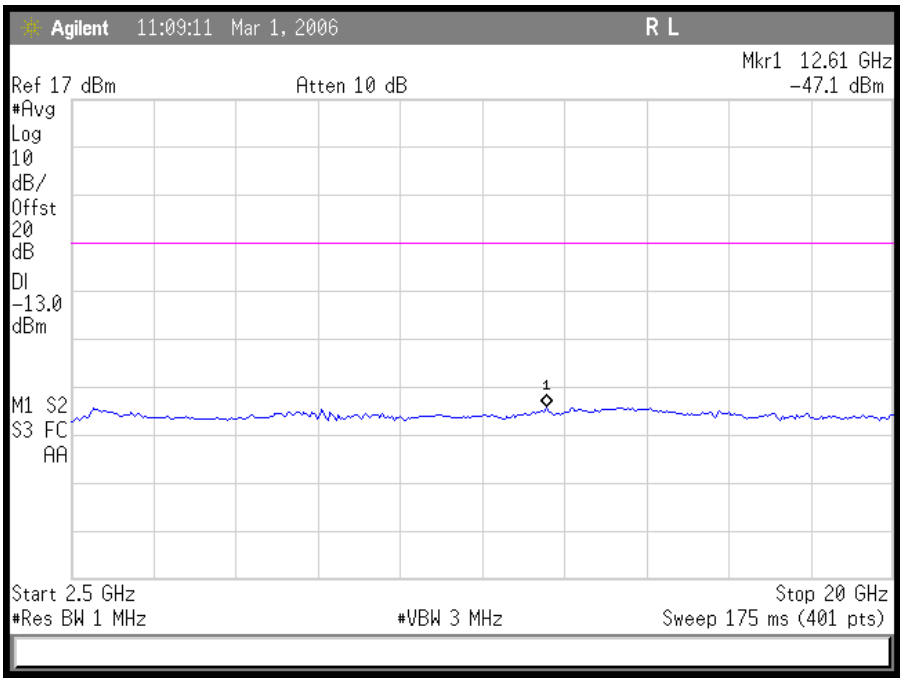
Plot 23. TDMA Uplink Mid CH Conducted Emissions 30 MHz – 20 GHz



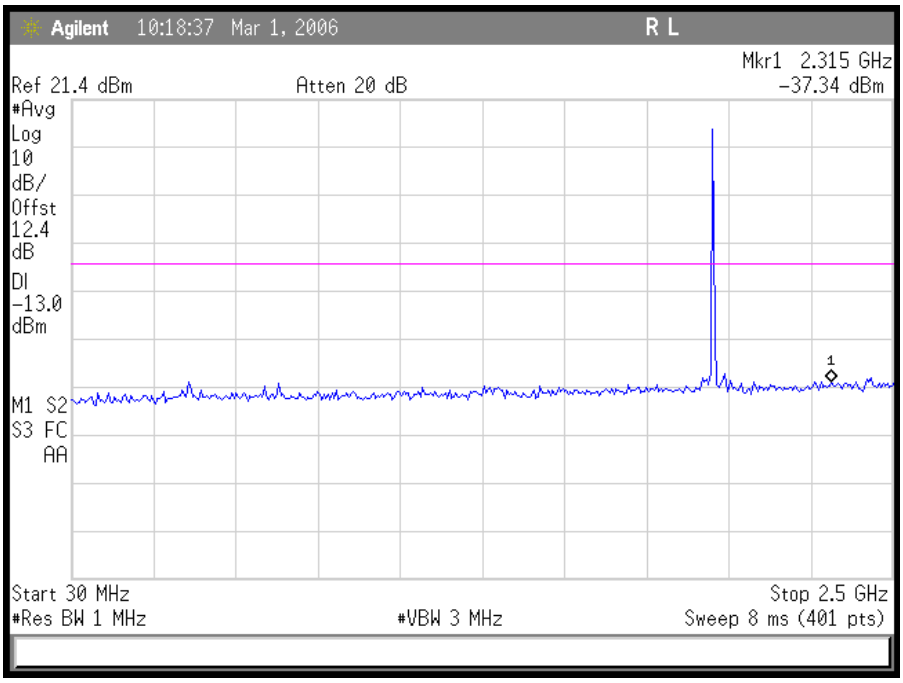
Plot 24. TDMA Uplink High CH Conducted Emissions 30 MHz – 20 GHz



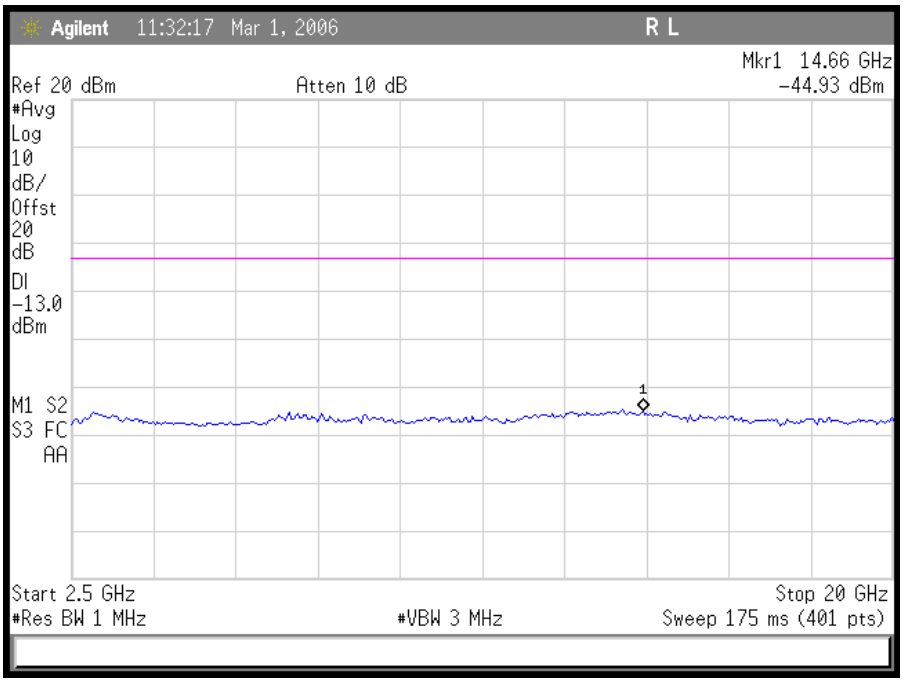
Plot 25. GSM Downlink Low CH Conducted Emissions 30 MHz – 2.5 GHz



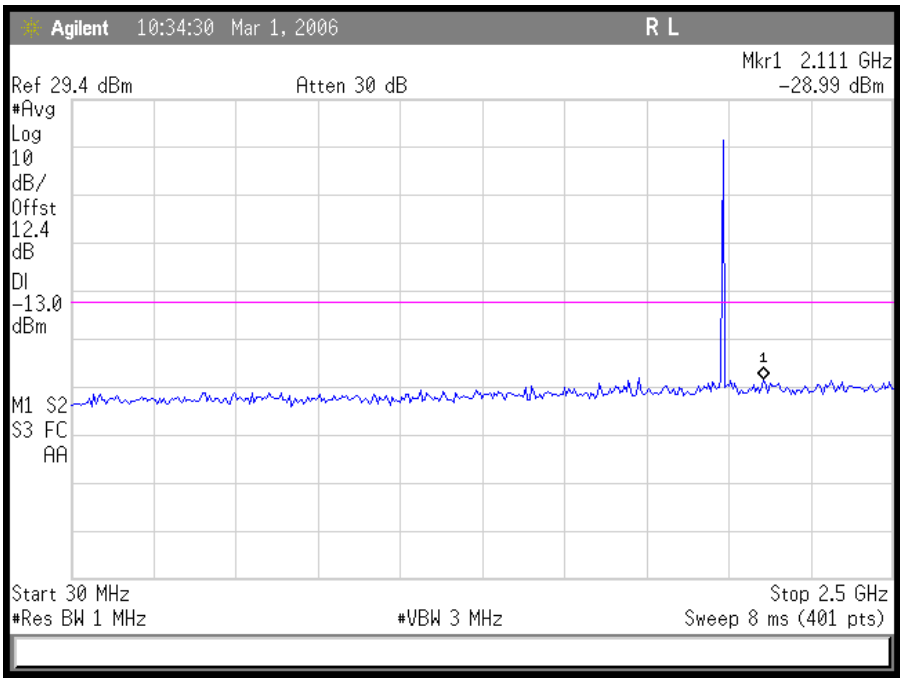
Plot 26. GSM Downlink Low CH Conducted Emissions 2.5 GHz – 20 GHz



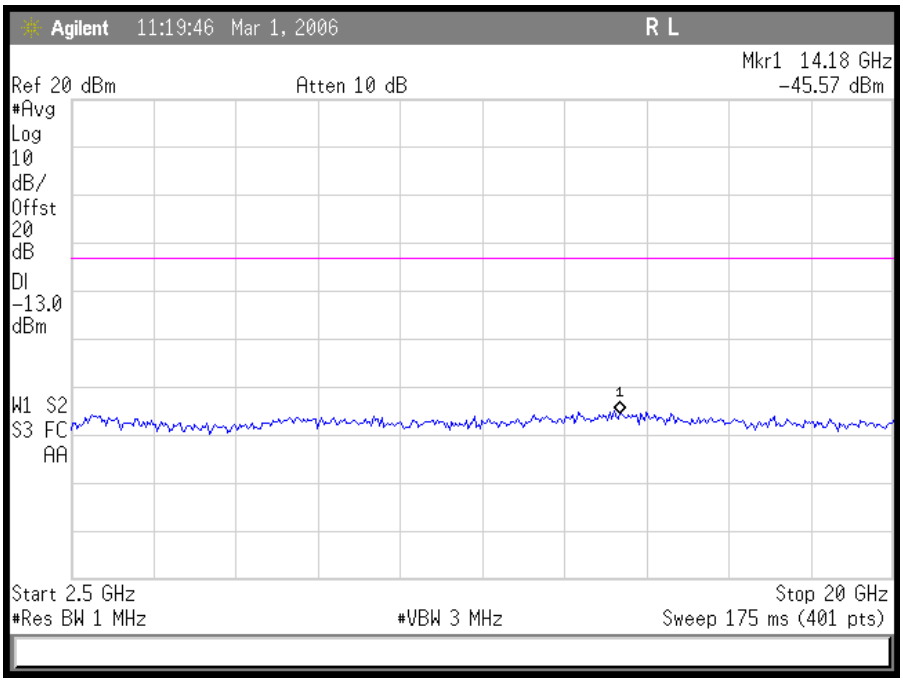
Plot 27. GSM Downlink Mid CH Conducted Emissions 30 MHz – 2.5 GHz



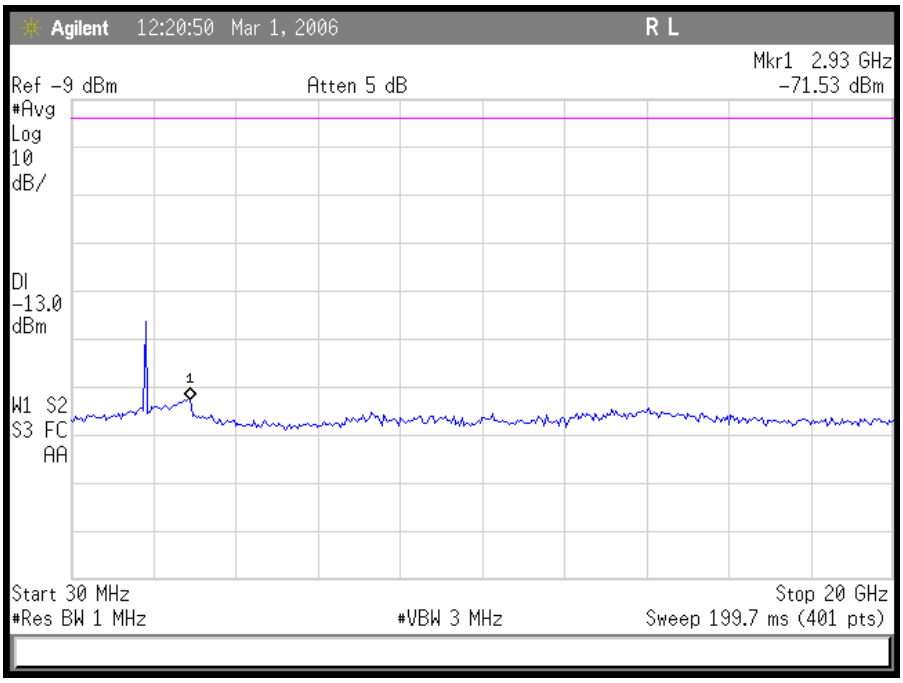
Plot 28. GSM Downlink Mid CH Conducted Emissions 2.5 GHz – 20 GHz



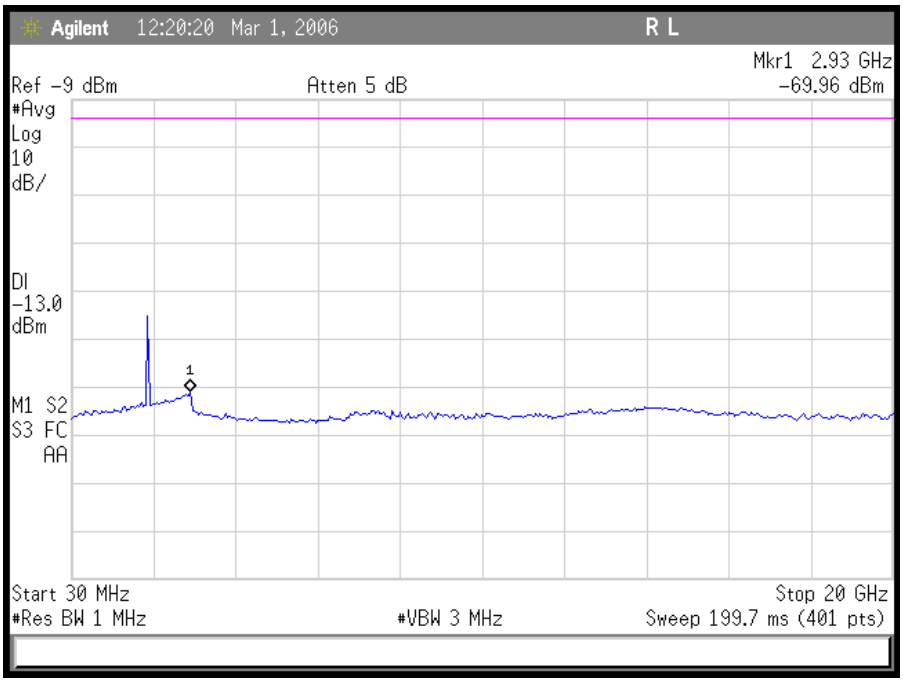
Plot 29. GSM Downlink High CH Conducted Emissions 30 MHz – 2.5 GHz



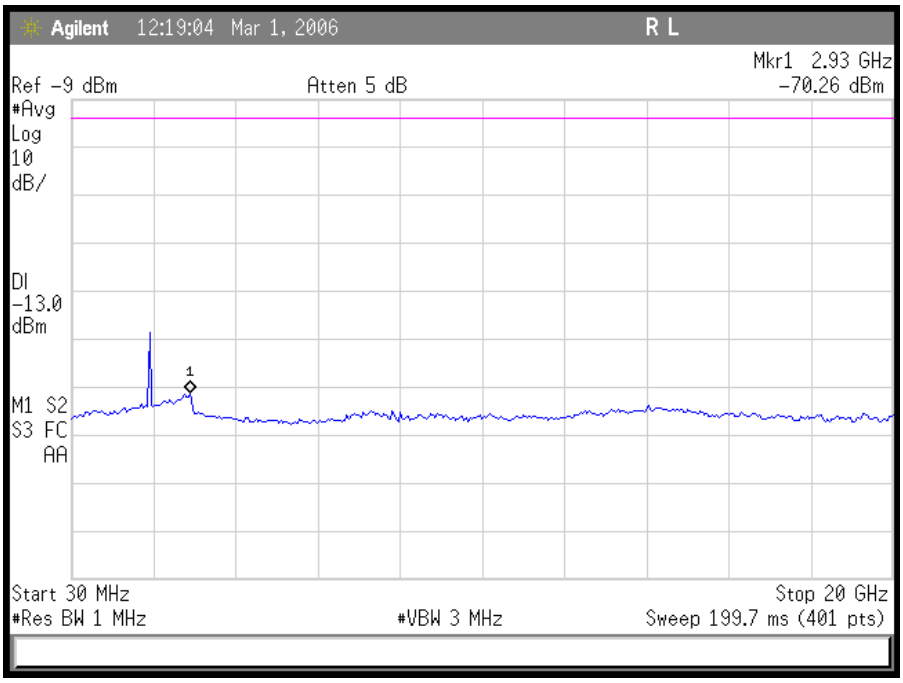
Plot 30. GSM Downlink High CH Conducted Emissions 2.5 GHz – 20 GHz



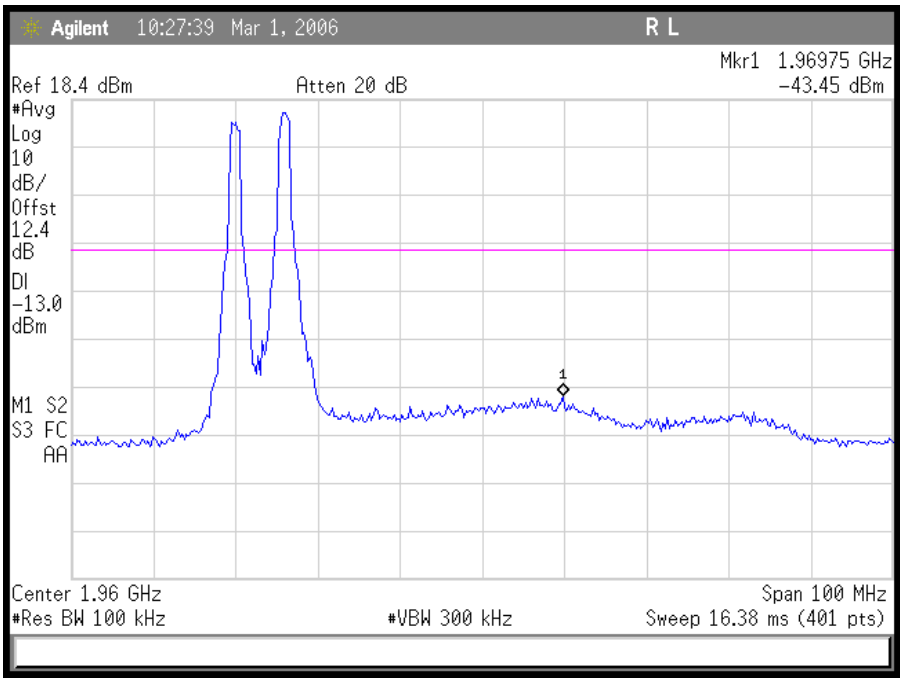
Plot 31. GSM Uplink Low CH Conducted Emissions 30 MHz – 20 GHz



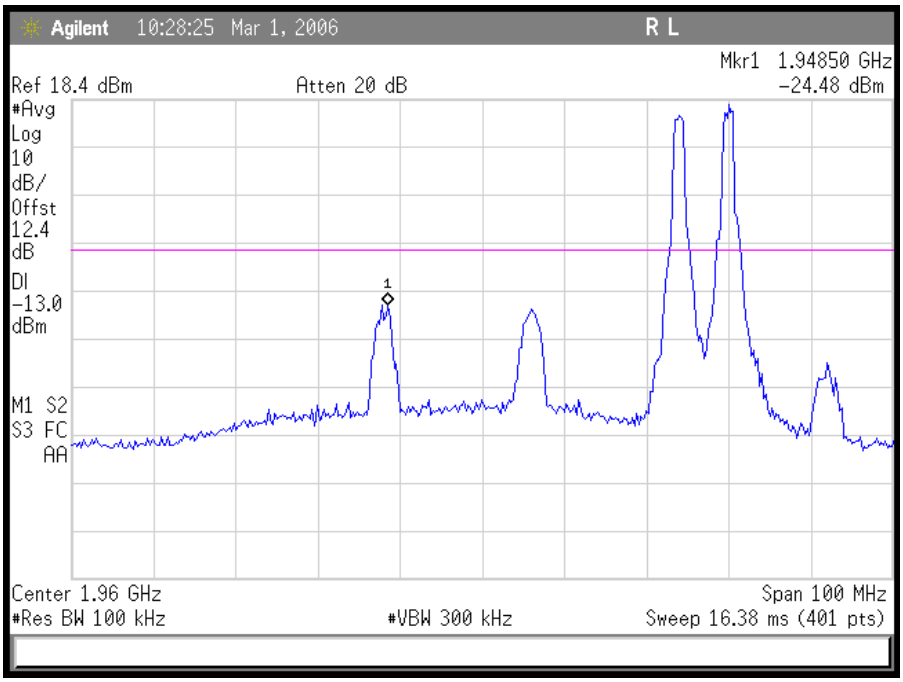
Plot 32. GSM Uplink Mid CH Conducted Emissions 30 MHz – 20 GHz



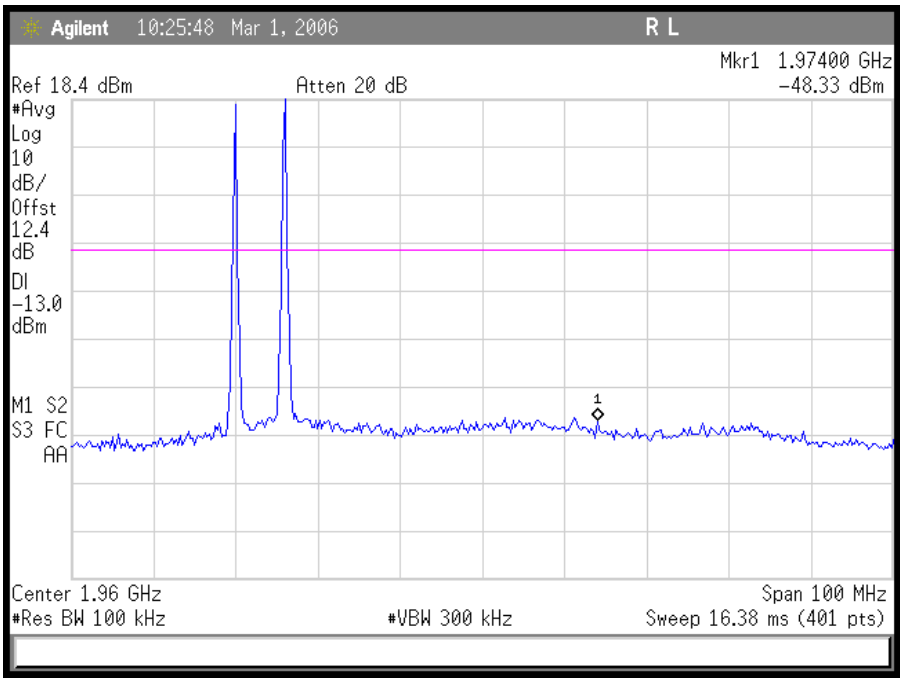
Plot 33. GSM Uplink High CH Conducted Emissions 30 MHz – 20 GHz



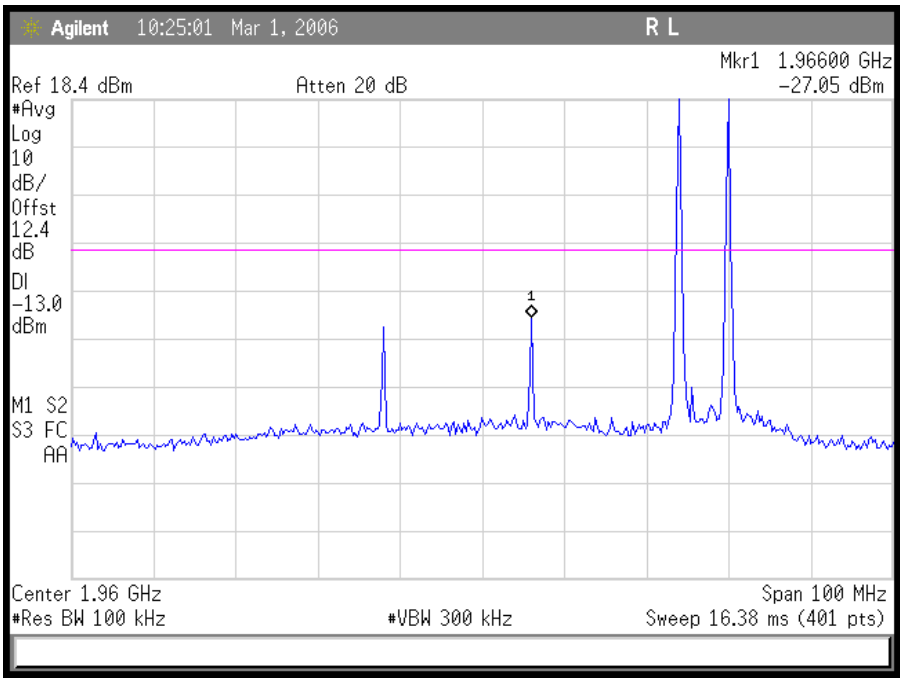
Plot 34. CDMA Downlink Low End Intermodulation



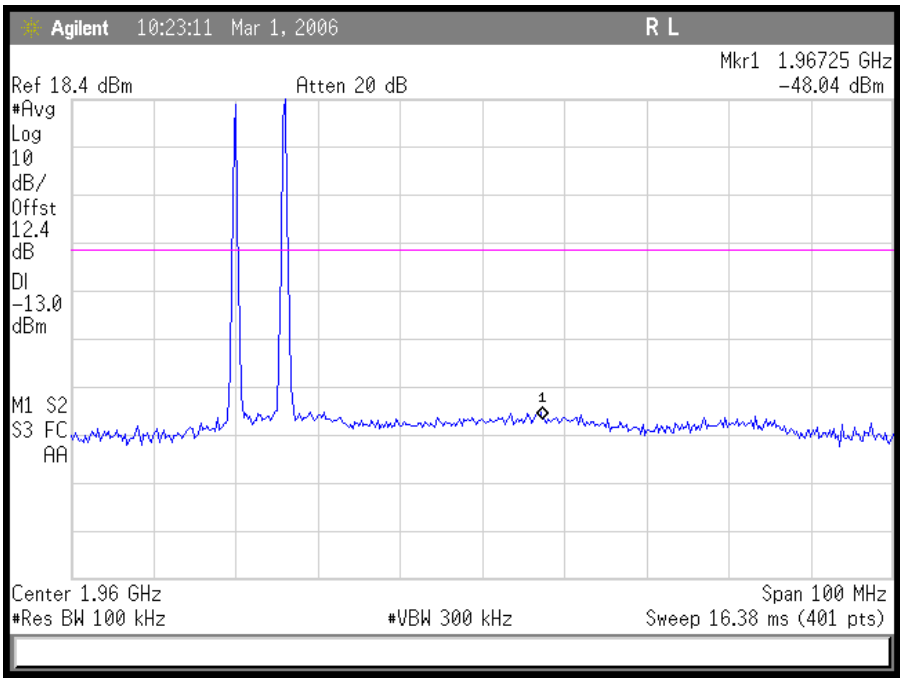
Plot 35. CDMA Downlink High End Intermodulation



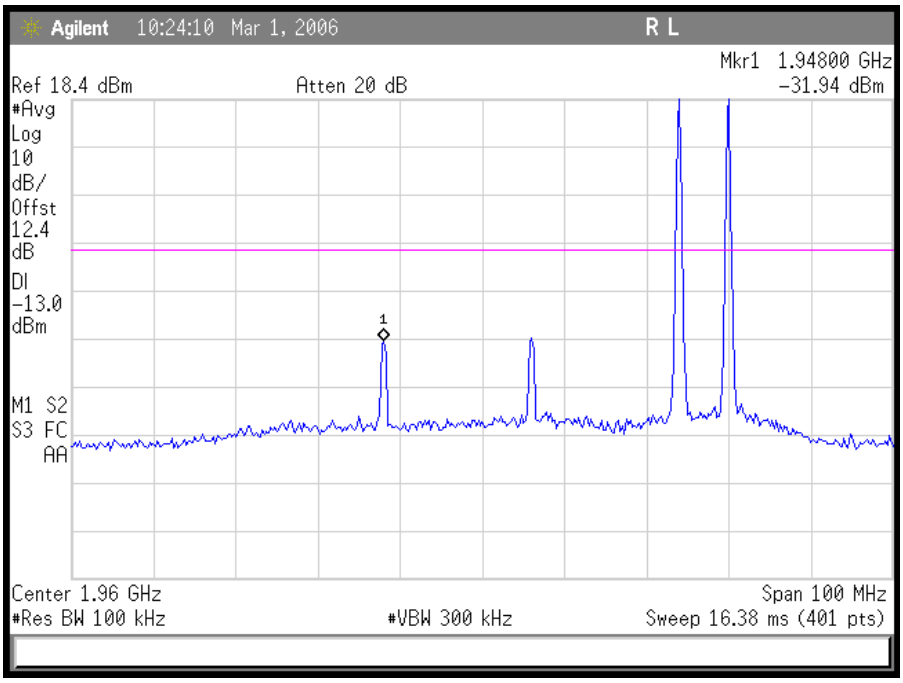
Plot 36. TDMA Downlink Low End Intermodulation



Plot 37. TDMA Downlink High End Intermodulation



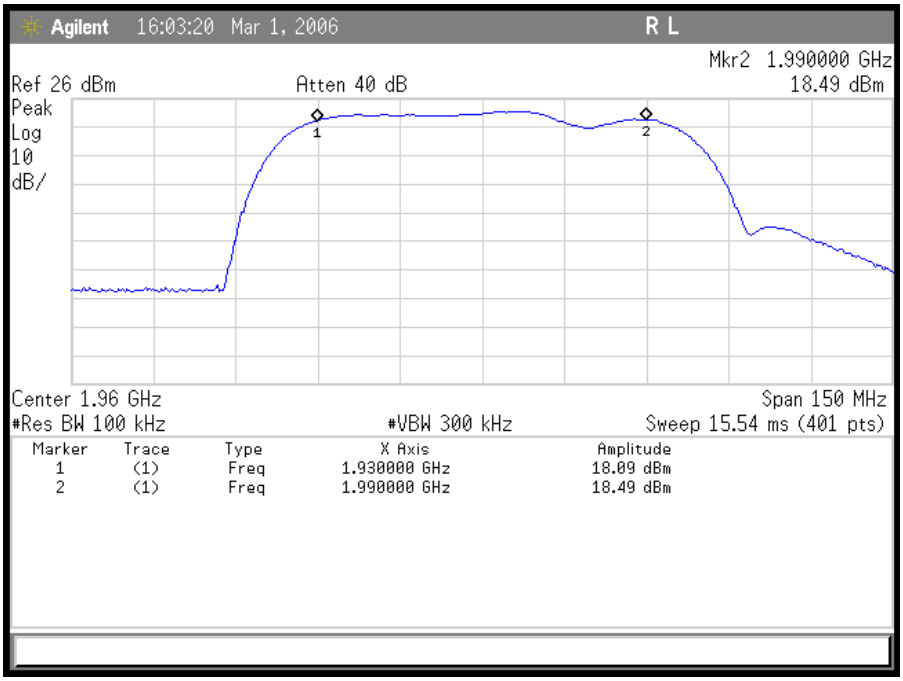
Plot 38. GSM Downlink Low End Intermodulation



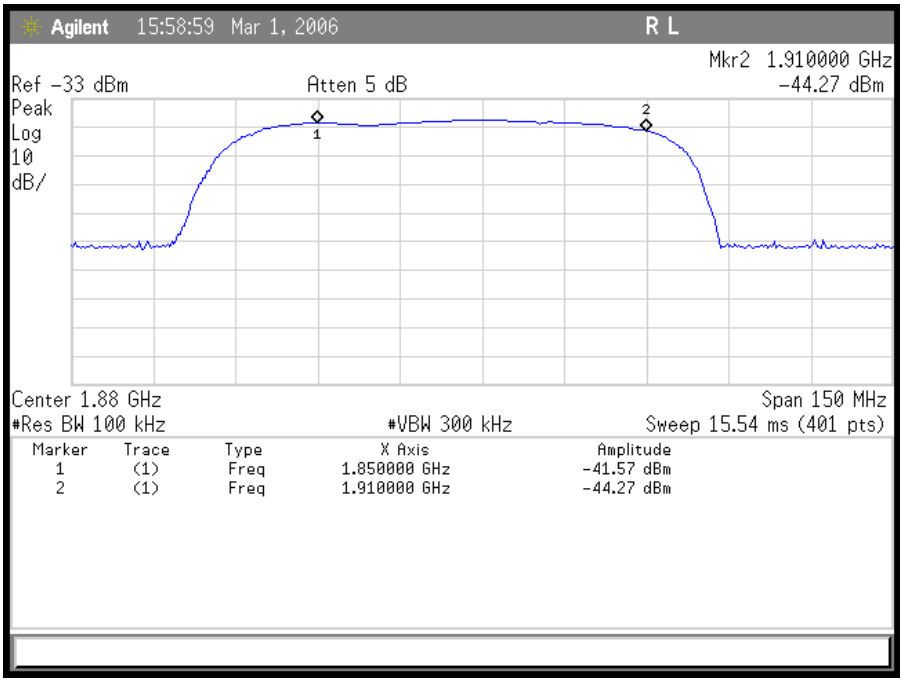
Plot 39. GSM Downlink High End Intermodulation

Electromagnetic Compatibility Criteria for Intentional Radiators

2-11-04/EAB/RF Out of Band Rejection



Plot 40. Part 24 Out of Band Rejection Down Link



Plot 41. Part 24 Out of Band Rejection Uplink

Electromagnetic Compatibility Criteria for Intentional Radiators

§2.1055 Frequency Stability over Temperature and Voltage Variations

Test Requirement(s): §2.1055(a)(1) §24.235

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 complies with Section 2.1055 and 24.235

Test Engineer(s): Shawn McMillen

Test Date(s): March 13, 2006

Frequency Stability Test Results

Reference Freq.: 1959.999420MHz at 20°C

Temperature (Celsius)	Measured Freq (MHz)	Drift ppm
50	1959.998834	0.299
40	1959.998890	0.270
30	1959.999887	-0.238
20	Reference	
10	1959.998851	0.290
0	1959.998861	0.285
-10	1959.998956	0.237
-20	1959.998895	0.268
-30	1959.998869	0.281

Table 7. Temperature Vs. Frequency Test Results

Reference: 120Vac at 20°C **Freq.** = 1959.999420MHz

Measured Voltage(dc) +/-15% of nominal	Measured Freq (MHz)	Drift (Hz)
102	1959.999424	-0.002
138	1959.999424	-0.004

Table 8. Frequency vs. Voltage 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 ANSI/NCSL Z540-1-1994 and ANSI/ISO/IEC 17025:2000.

MET Asset #	Equipment	Manufacturer	Model	Last Cal Date	Cal Due Date
1S2421	EMI RECEIVER	ROHDE&SCHWARZ	ESIB 7	2/9/2006	2/9/2007
1S2184	BILOG ANTENNA	CHASE	CBL6112A	1/12/2006	1/12/2007
1S2121	PRE-AMPLIFIER	HEWLETT PACKARD	8449B	10/14/2005	10/14/2006
1S2198	ANTENNA, HORN	EMCO	3115	7/14/2005	7/14/2006
1S2202	ANTENNA, HORN, 1 METER	EMCO	3116	3/23/2004	3/23/2007
N/A	HIGH PASS FILTER	MICRO-TRONICS	HPM13146	SEE NOTE	
1S2263	CHAMBER, 10 METER	RANTEC	N2-14	7/25/2005	7/25/2006
1S2430	WIDEBAND POWER METER	ANRITSU COMPANY	ML2488A	1/12/2006	1/12/2007
1S2432	WIDEBAND POWER SENSOR	ANRITSU COMPANY	MA2491A	1/12/2006	1/12/2007
1S2034	COUPLER, DIRECTIONAL 1-20 GHz	KRYTAR	101020020	SEE NOTE	
1S2041	COUPLER, BI DIRECTIONALCOAXIAL	NARDA	N/A	SEE NOTE	
1S2460	Analyzer, Spectrum 9 kHz-40GHz	Agilent	E4407B	07/06/2005	07/06/2008
1S2430	WIDEBAND POWER METER	ANRITSU COMPANY	ML2488A	1/12/2006	1/12/2007
1S2432	WIDEBAND POWER SENSOR	ANRITSU COMPANY	MA2491A	1/12/2006	1/12/2007
1S2034	COUPLER, DIRECTIONAL 1-20 GHz	KRYTAR	101020020	SEE NOTE	
1S2041	COUPLER, BI DIRECTIONALCOAXIAL	NARDA	N/A	SEE NOTE	
1S2128	Harmonic Mixer	Hewlett Packard	11970A	N/A	3/10/2006
1S2129	Harmonic Mixer	Hewlett Packard	11970K	N/A	3/10/2006

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.

VI. Exhibits

Exhibit A, Hopping Capability Requirements

Exhibit B, Non-Coordination Requirements

End of Report

