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Electromagnetic Compatibility Criteria Test Report

for the

**Advanced RF Technologies
Model ADRF-25K Dual Band (PCS + Cellular) Repeater**

**Tested under
FCC Certification Rules
Title 47 of the CFR, Part 22 Subpart H for Cellular Devices,
Part 24 Subpart E for Broadband PCS Devices
and Part 15 Subpart B for Class A Digital Devices**

MET Report: EMC80992-FCC22

August 1, 2008

Prepared For:

**Advanced RF Technologies
2607 Colorado Blvd.
Los Angeles, CA 90041**

**Prepared By:
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3162 Belick Street
Santa Clara, CA 95054**



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Anderson Soungpanya, Project Engineer
Electromagnetic Compatibility Lab



Jennifer Sanchez
Documentation Department

Engineering Statement: The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of Part 22 Subpart H, Part 24 Subpart E and Part 15 Subpart B of the FCC Rules under normal use and maintenance.



Shawn McMillen, Manager
Electromagnetic Compatibility Lab



Report Status Sheet

Revision	Report Date	Reason for Revision
Ø	August 1, 2008	Initial Issue.
1	August 29, 2008	Final Issue
2	September 4, 2008	Correct Conducted Spurious and Intermodulation Plot titles.



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List of Terms and Abbreviations

AC	Alternating Current
ACF	Antenna Correction Factor
Cal	Calibration
<i>d</i>	Measurement Distance
dB	Decibels
dBμA	Decibels above one microamp
dBμV	Decibels above one microvolt
dBμA/m	Decibels above one microamp per meter
dBμV/m	Decibels above one microvolt per meter
DC	Direct Current μ
E	Electric Field
DSL	Digital Subscriber Line
ESD	Electrostatic Discharge
EUT	Equipment Under Test
<i>f</i>	Frequency
FCC	Federal Communications Commission
GR-1089-CORE	(GR) General Requirement(s) imposed by the NEBS standard, (CORE) Central Office Recovery Express (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	Ground Reference Plane
H	Magnetic Field
HCP	Horizontal Coupling Plane
Hz	Hertz
IEC	International Electrotechnical Commission
kHz	kilohertz
kPa	kilopascal
kV	kilovolt
LISN	Line Impedance Stabilization Network
MHz	Megahertz
μH	microhenry
μ	microfarad
μs	microseconds
NEBS	Network Equipment-Building System
PRF	Pulse Repetition Frequency
RF	Radio Frequency
RMS	Root-Mean-Square
TWT	Traveling Wave Tube
V/m	Volts per meter
VCP	Vertical Coupling Plane



I. Executive Summary



A. Purpose of Test

An EMC evaluation was performed to determine compliance of the Advanced RF Technologies ADRF-25K Dual Band (PCS + Cellular) Repeater, with the requirements of Part 22 Subpart H, 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 ADRF-25K Dual Band (PCS + Cellular) Repeater. Advanced RF Technologies should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the ADRF-25K Dual Band (PCS + Cellular) Repeater, has been **permanently** discontinued

B. Executive Summary

The following tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 22 Subpart H, Part 24 Subpart E and Part 15 Subpart B, in accordance with Advanced RF Technologies, purchase order number 1253.

Reference	Description	Compliance
Part 15 Subpart B §15.109(a)	Conducted Emissions	Compliant
Part 15 Subpart B §15.107(a)	Radiated Emissions	Compliant
§2.1046; §22.913, §24.232	RF Power Output	Compliant
§2.1047	Modulation Characteristics	N/A
§2.1049	Occupied Bandwidth	Compliant
§2.1051; §22.917, §24.238	Conducted Spurious Emissions at Antenna Terminals	Compliant
§2.1053; §22.917, §24.238	Radiated Spurious Emissions from the Cabinet	Compliant
§2.1055; §22.355, §24.135	Frequency Stability	N/A
2-11-04/EAB/RF	Out of Band Rejection	Compliant

Table 1 Executive Summary of EMC Compliance Testing



II. Equipment Configuration



A. Overview

MET Laboratories, Inc. was contracted by Advanced RF Technologies to perform testing on the ADRF-25K Dual Band (PCS + Cellular) Repeater, under Advanced RF Technologies's purchase order number 1253.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Advanced RF Technologies, ADRF-25K Dual Band (PCS + Cellular) Repeater.

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

Model(s) Tested:	ADRF-25K Dual Band (PCS + Cellular) Repeater					
Model(s) Covered:	ADRF-25K Dual Band (PCS + Cellular) Repeater					
EUT Specifications:	Primary Power: 100~120 VAC					
	FCC ID: S2O-ADRF25K IC: 6146A-ADRF25K					
	Type of Modulations:	CDMA, GSM				
	Equipment Code:	AMP				
	RF Output Power:	Cellular:		PCS:		
			Downlink	Uplink	Downlink	Uplink
		CDMA	14.21dBm	9.51dBm	17.40dBm	11.80dBm
	GSM	15.32dBm	10.29dBm	19.66dBm	14.09dBm	
	EUT Frequency Ranges:	Downlink	CDMA	870.25-892.75MHz 1931.25-1988.75MHz		
			GSM	869.50-893.50MHz 1930.50-1989.50MHz		
Uplink		CDMA	825.25-847.75MHz 1851.25-1908.75MHz			
		GSM	824.50-848.50MHz 1850.50-1909.50MHz			
Analysis:	The results obtained relate only to the item(s) tested.					
Environmental Test Conditions:	Temperature: 15-35° C					
	Relative Humidity: 30-60%					
	Barometric Pressure: 860-1060 mbar					
Evaluated by:	Anderson Soungpanya					
Date(s):	August 1, 2008					

Table 2. EUT Summary Table



B. References

CFR 47, Part 22, Subpart H	Federal Communication Commission, Code of Federal Regulations, Title 47, Part 22: Rules and Regulations for Cellular Devices.
CFR 47, Part 24, Subpart E	Federal Communication Commission, Code of Federal Regulations, Title 47, Part 24: Rules and Regulations for Personal Communications Services
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

Table 3. Standard References



C. Test Site

All testing was performed at MET Laboratories, Inc., 3162 Belick Street, 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.

D. Description of Test Sample

The Advanced RF Technologies ADRF-25K Dual Band (PCS + Cellular) Repeater, is a Dual band (PCS + Cellular) bi-directional amplifier.



Photograph 1. Advanced RF Technologies ADRF-25K Dual Band (PCS + Cellular) Repeater

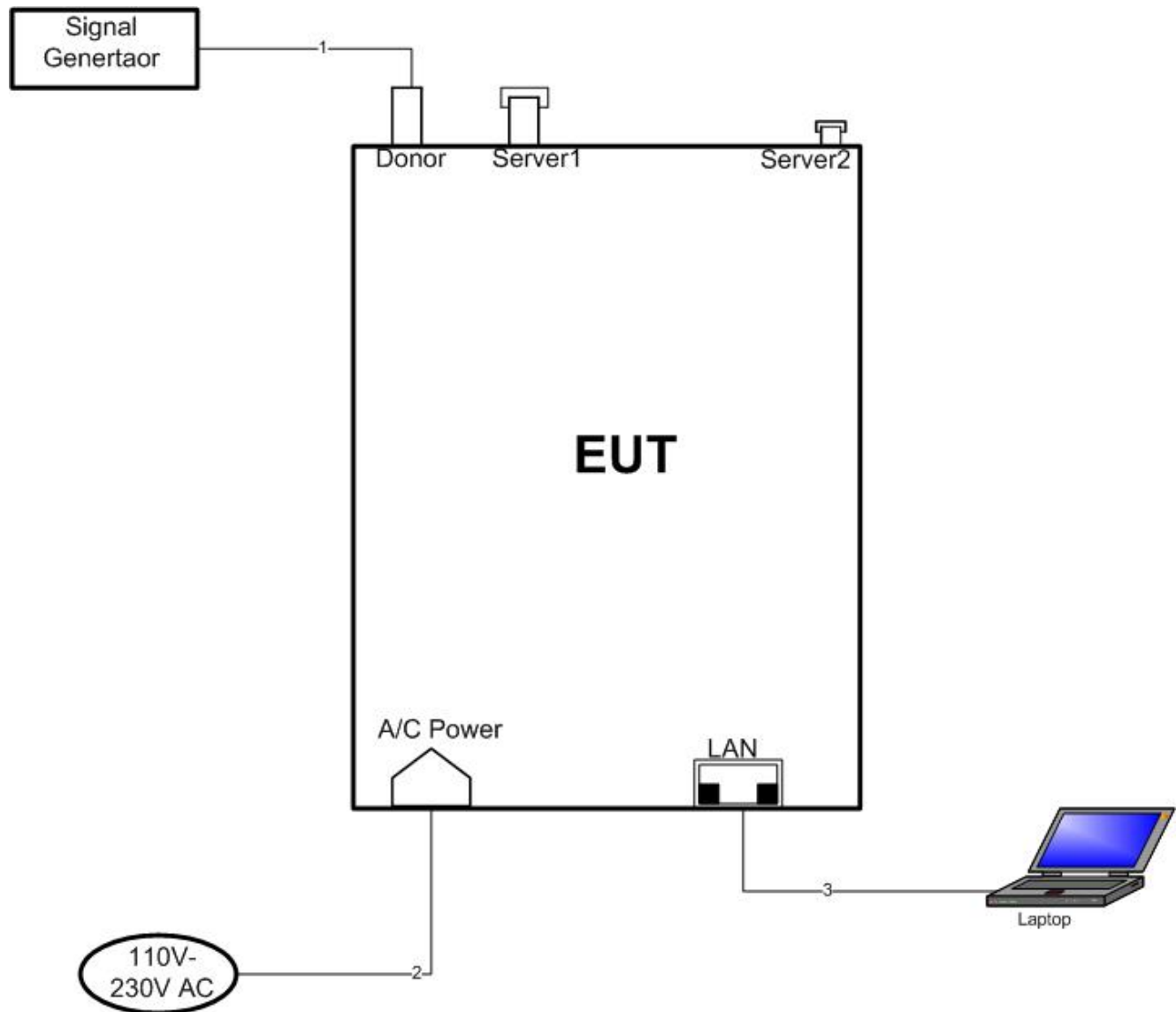


Figure 1. Block Diagram of Test Configuration (Radiated Downlink)

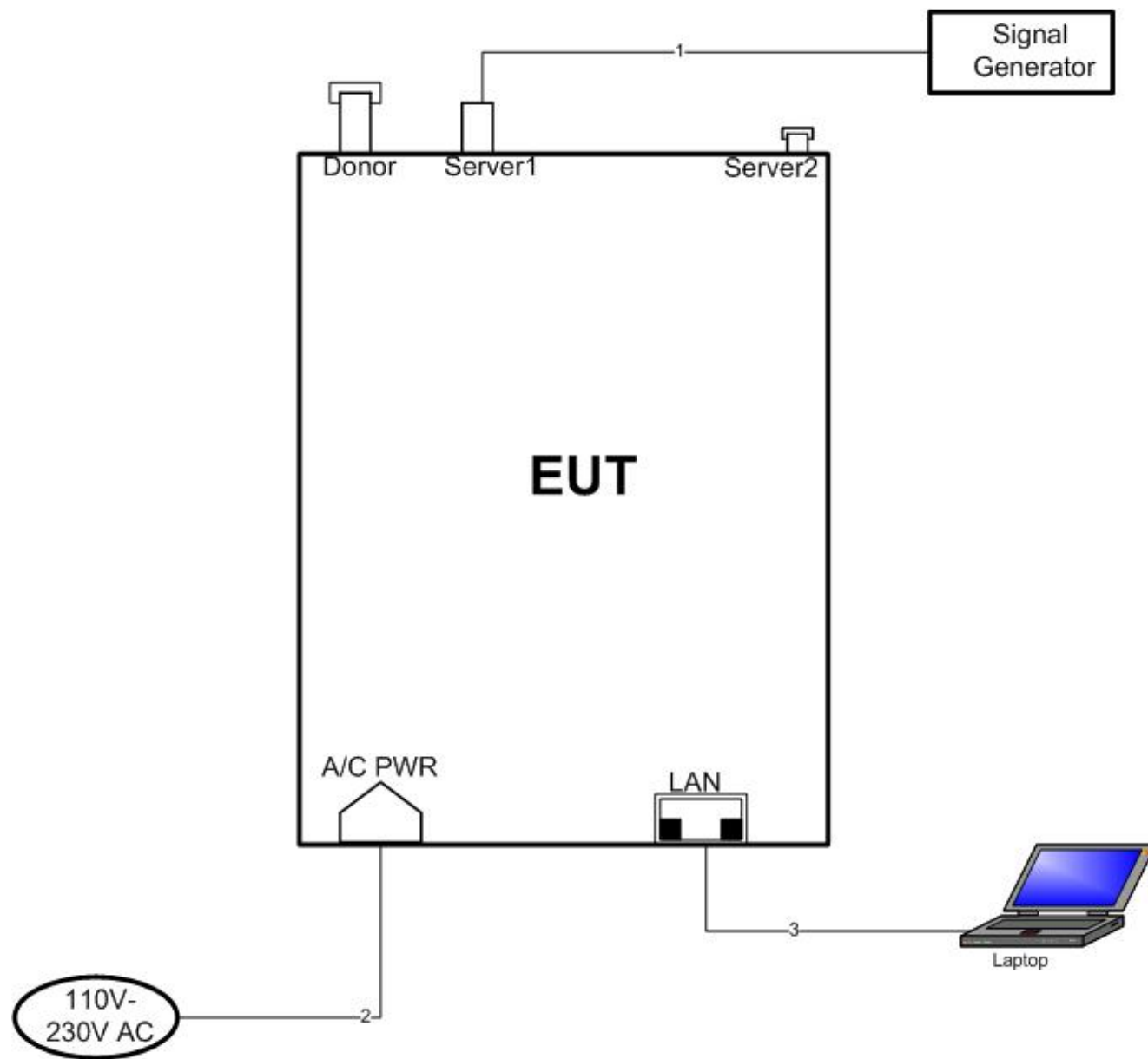


Figure 2. Block Diagram of Test Configuration (Radiated Uplink)

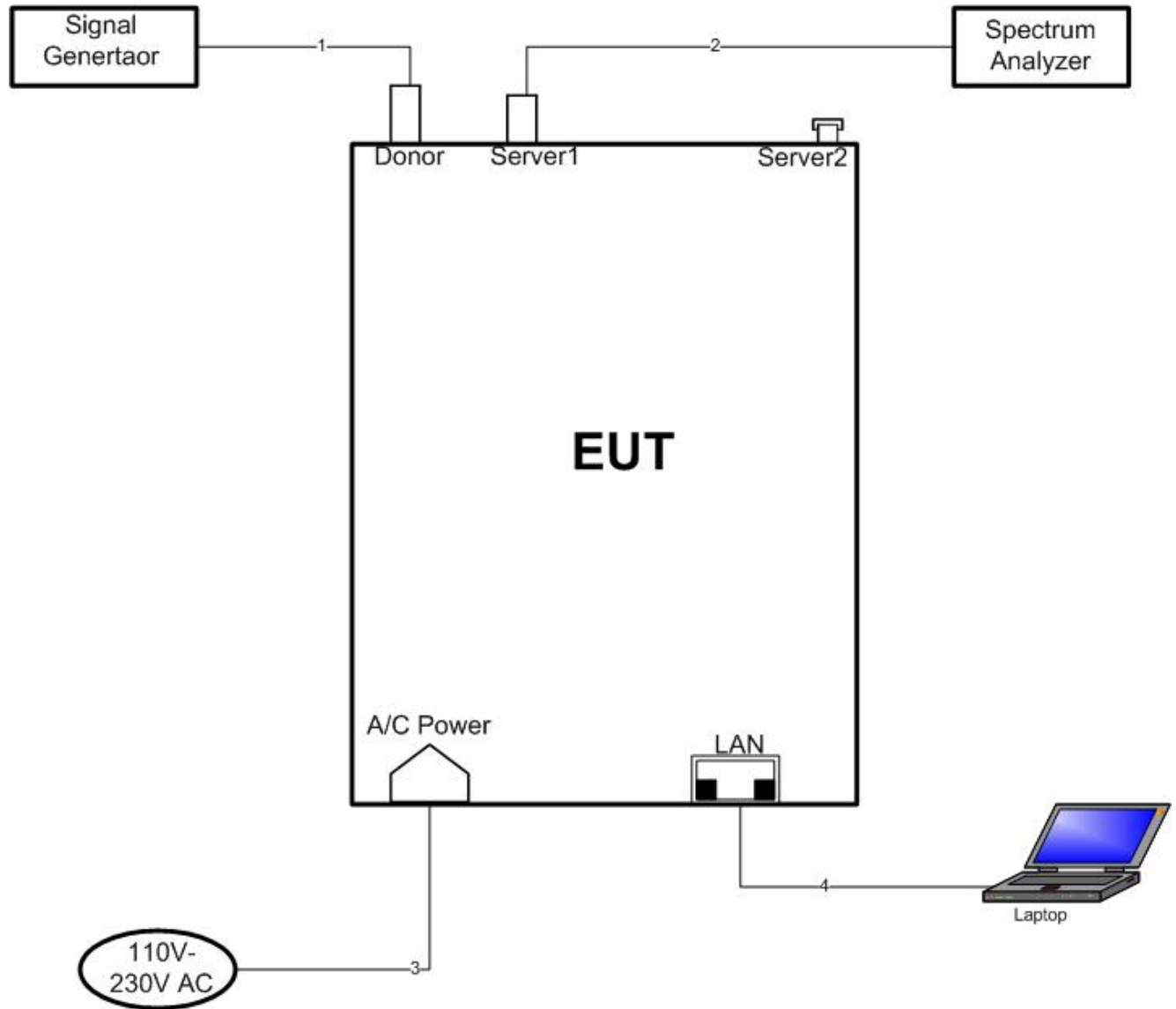


Figure 3. Block Diagram of Test Configuration (Conducted Downlink)

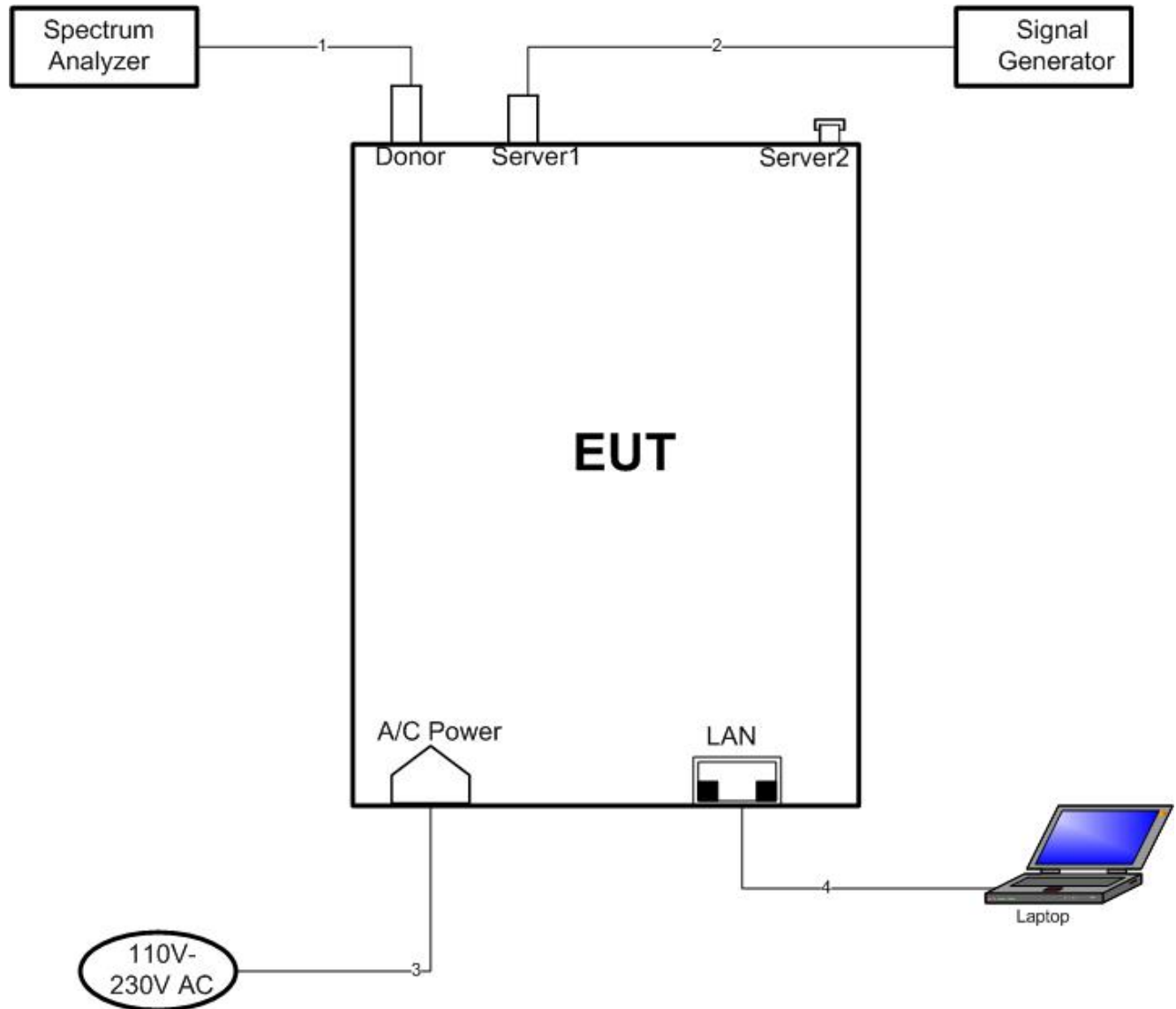


Figure 4. Block Diagram of Test Configuration (Conducted Uplink)



E. Equipment Configuration

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

Ref. ID	Name / Description	Model Number	Serial Number
	Dual-Band Repeater	ADRF-25K	A25KA080003

Table 4. Equipment Configuration

F. Support Equipment

Advanced RF Technologies supplied support equipment necessary for the operation and testing of the ADRF-25K Dual Band (PCS + Cellular) Repeater. All support equipment supplied is listed in the following Support Equipment List.

Ref. ID	Name / Description	Manufacturer	Model Number	Serial Number
	Spectrum Analyzer	Rhode and Schwarz	1164.4391.30 FSP Spectrum Analyzer 9KHz-30GHz	100663
	Signal Generator	HP	83650B	3844A00910
	Laptop	Dell	Inspiron	-

Table 5. Support Equipment



G. Ports and Cabling Information

Ref. ID	Port name on EUT	Cable Description or reason for no cable	Qty.	Length (m)	Shielded? (Y/N)	Termination Box ID & Port ID
Conducted						
Uplink Mode						
1	EUT, Donor	Co-axial Cable	1	1.5	Y	Spectrum Analyzer
2	EUT, Server1	Co-axial Cable	1	1.5	Y	Signal Generator
3	EUT, AC Power	Power Cord	1	2	N	110V-230V A/C
4	EUT, LAN	CAT5(crossover)	1	1.5	N	Laptop
Downlink Mode						
1	EUT, Donor	Co-axial Cable	1	1.5	Y	Signal Generator
2	EUT, Server1	Co-axial Cable	1	1.5	Y	Spectrum Analyzer
3	EUT, AC Power	Power Cord	1	2	N	110V-230V A/C
4	EUT, LAN	CAT5(crossover)	1	1.5	N	Laptop
Radiated						
Uplink Mode						
1	EUT, Server1	Co-axial Cable	1	1.5	Y	Signal Generator
2	EUT, AC Power	Power Cord	1	2	N	110V-230V A/C
3	EUT, LAN	CAT5 (crossover)	1	1.5	N	Laptop
Down Link Mode						
1	EUT, Donor	Co-axial Cable	1	1.5	Y	Signal Generator
2	EUT, AC Power	Power Cord	1	2	N	110V-230V A/C
3	EUT, LAN	CAT5(crossover)	1	1.5	N	Laptop

Table 6. Ports and Cabling Information



H. Mode of Operation

Normal mode of operation only. PCS and Cellular signals are injected through the donor port of the EUT.

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 Advanced RF Technologies upon completion of testing.



III. Electromagnetic Compatibility Criteria for Unintentional Radiators



Electromagnetic Compatibility Criteria for Unintentional Radiators

§ 15.107 Conducted Emissions Limits

Test Requirement(s): **15.107 (a)** “Except for Class A digital devices, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in Table 7. Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminals.”

15.107 (b) “For a Class A digital device that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in Table 7. Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminals. The lower limit applies at the band edges.”

Frequency range (MHz)	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 1 — The lower limit shall apply at the transition frequencies.				

Table 7. 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 semi-anechoic chamber. The method of testing, test conditions, and test procedures of ANSI C63.4 were used. The EUT was powered through a 50Ω/50μH LISN. An EMI receiver, connected to the measurement port of the LISN, scanned the frequency range from 150 kHz to 30 MHz in order to find the peak conducted emissions. All peak emissions within 6 dB of the limit were measured using a quasi-peak and/or average detector as appropriate.

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

Test Engineer(s): Anderson Soungpanya

Test Date(s): July 18, 2008



Conducted Emissions - Voltage, AC Power, Phase Line (120 VAC, 60 Hz)

FREQ. (MHz)	Corrected Amplitude (dBuV) QP	Limit (dBuV) QP	Margin (dB) QP	Pass/Fail QP	Corrected Amplitude (dBuV) AVG	Limit (dBuV) AVG	Margin (dB) AVG	Pass/Fail AVG
.150	53.61	79	-25.39	Pass	37.38	66	-28.62	Pass
.202	52.07	79	-26.93	Pass	50.78	66	-15.22	Pass
.303	42.05	79	-36.95	Pass	41.08	66	-24.92	Pass

Table 8. Conducted Emissions - Voltage, AC Power, Phase Line (120 VAC, 60 Hz)

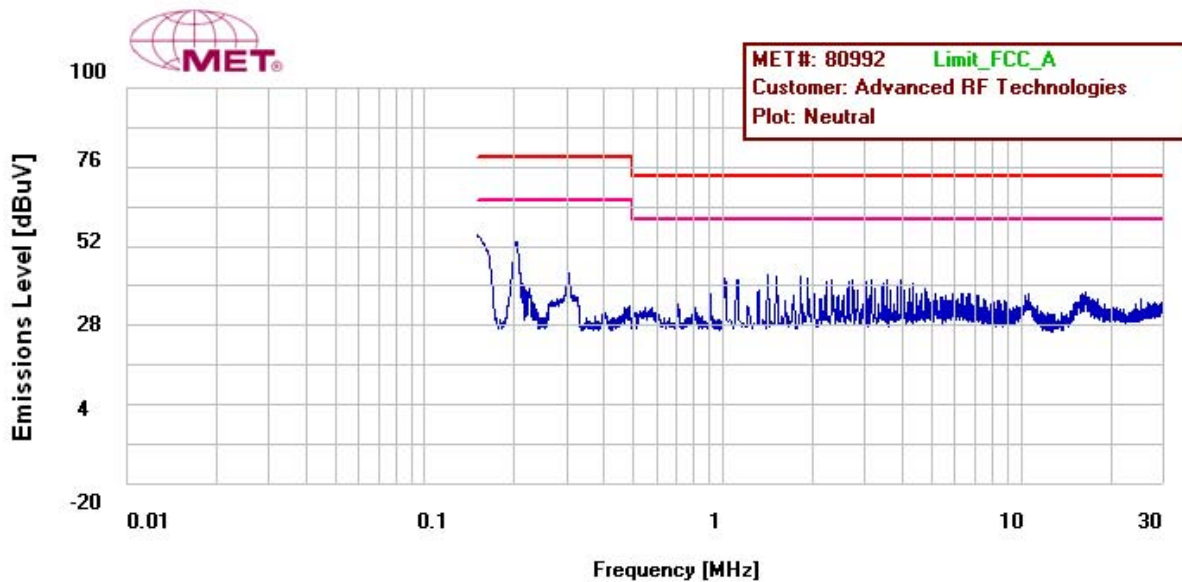
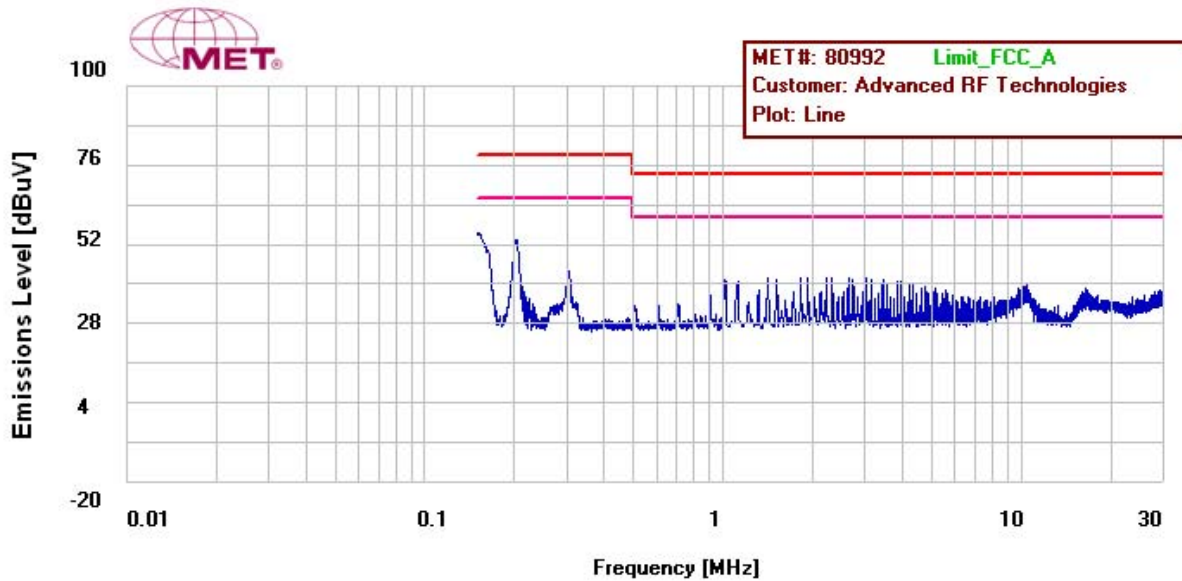
Conducted Emissions - Voltage, AC Power, Neutral Line (120 VAC, 60 Hz)

FREQ. (MHz)	Corrected Amplitude (dBuV) QP	Limit (dBuV) QP	Margin (dB) QP	Pass/Fail QP	Corrected Amplitude (dBuV) AVG	Limit (dBuV) AVG	Margin (dB) AVG	Pass/Fail AVG
.150	53.64	79	-25.36	Pass	37.94	66	-28.06	Pass
.202	52.01	79	-26.99	Pass	47.3	66	-18.7	Pass
.303	40.66	79	-38.34	Pass	40.87	66	-25.13	Pass

Table 9. Conducted Emissions - Voltage, AC Power, Neutral Line (120 VAC, 60 Hz)

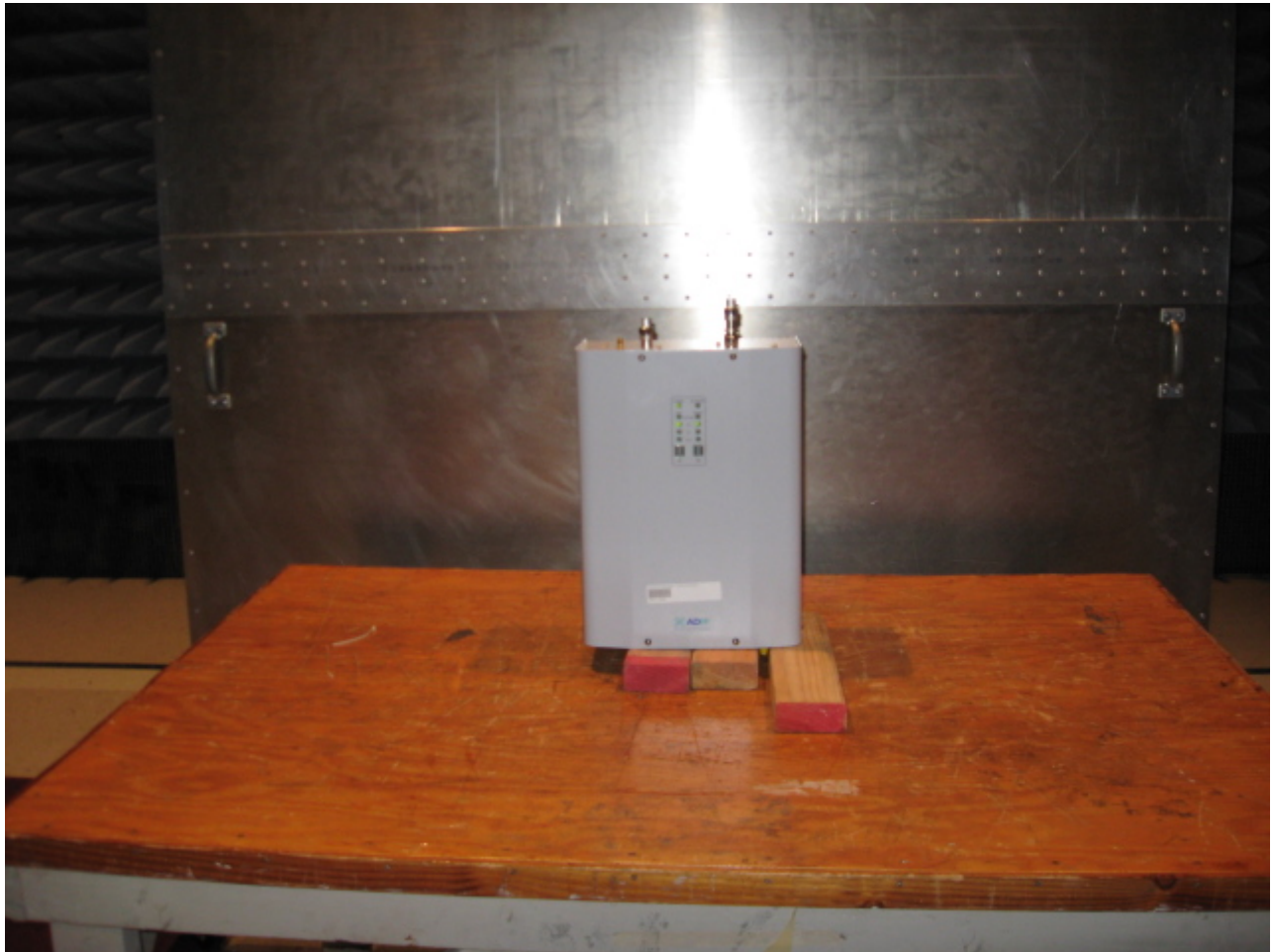


Conducted Emissions - Voltage, Worst Case Emissions, AC Power, (120 VAC, 60 Hz)





Conducted Emission Limits Test Setup



Photograph 2. Conducted Emissions Test Setup



Radiated Emission Limits

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

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

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

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

Test Procedures: The EUT was placed on a 0.8m-high wooden 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.

(Emissions measured at 3m were normalized using an inverse proportionality factor of 20dB per decade for comparison to the 10 m limit.)

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

Test Engineer(s): Anderson Soungpanya

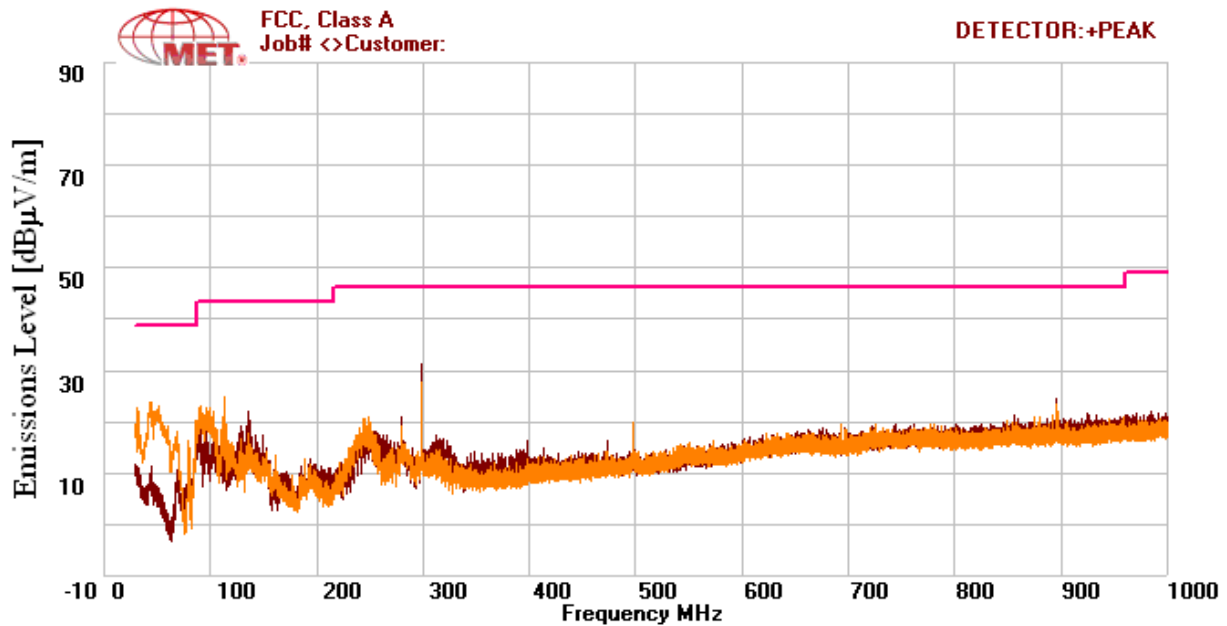
Test Date(s): July 18, 2008



Radiated Emissions Limits Test Results, Class A

Frequency (MHz)	Antenna Polarity	EUT Azimuth (Degrees)	Antenna Height (cm)	Uncorrected Amplitude (dBuV)	ACF (dB/m)	CBL (dB)	DCF (dB)	Corrected Amplitude (dBuV)	Limit (dBuV)	Margin (dB)
298.59	H	92	100	24.33	13.872	2.62	-10.46	30.362	46.4	-16.038
298.59	V	302	100	20.55	13.344	2.62	-10.46	26.054	46.4	-20.346
51.47	V	185	100	23.57	7.406	0.882	-10.46	21.398	39	-17.602
31.64	V	0	100	11.62	16.752	0.677	-10.46	18.589	39	-20.411
113.04	V	199	100	18.66	13.304	1.418	-10.46	22.922	43.5	-20.578
89.24	V	172	100	19.67	10.002	1.2	-10.46	20.412	43.5	-23.088

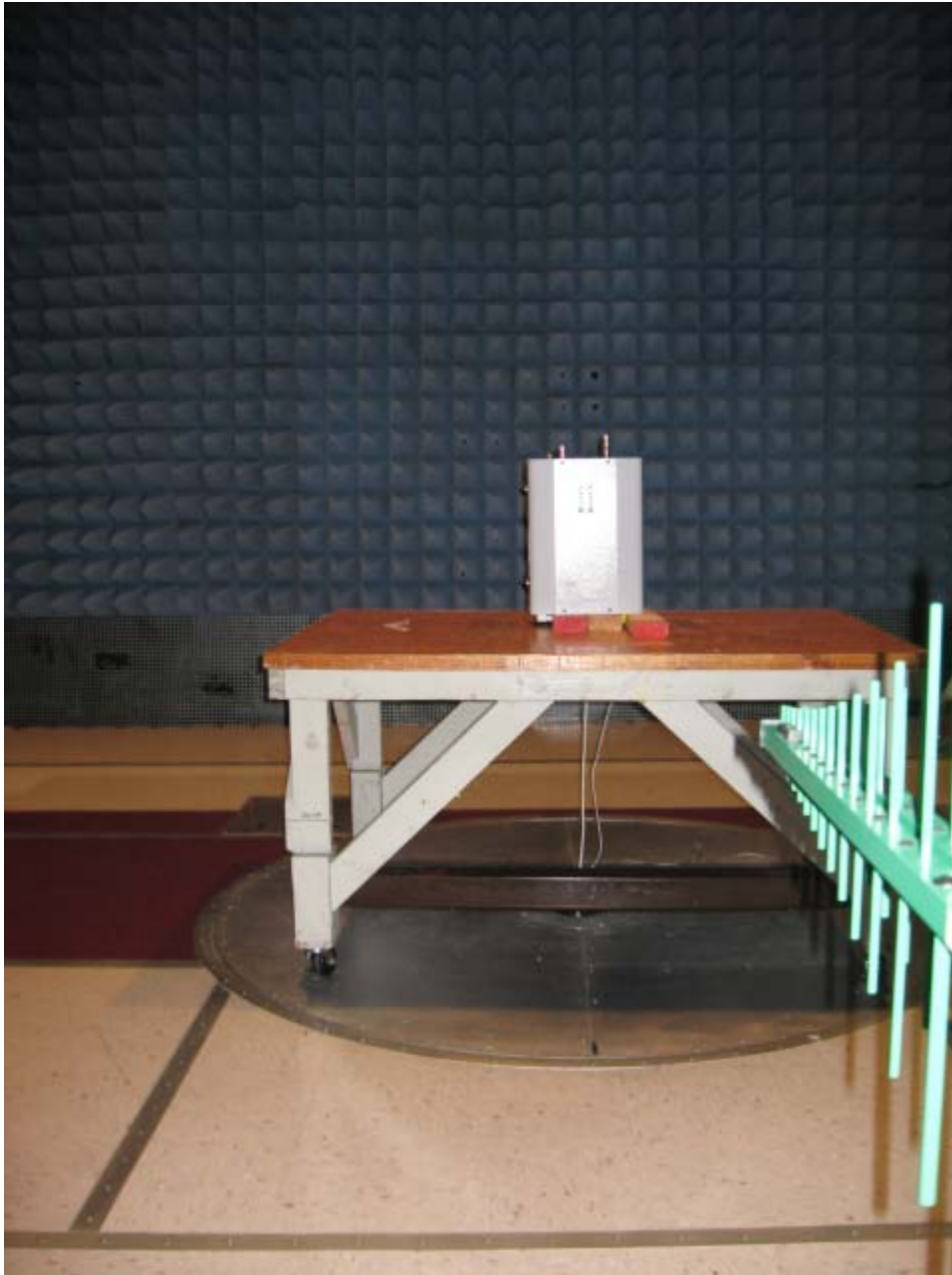
Table 11. Radiated Emissions Limits Test Results



Plot 1. Radiated Emissions Test Results



Radiated Emission Limits Test Setup



Photograph 3. Radiated Emission Limits Test Setup



IV. Electromagnetic Compatibility Criteria for Intentional Radiators



Electromagnetic Compatibility Criteria for Intentional Radiators

§ 2.1046 RF Power Output

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

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

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

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

§ 22.913 Power and antenna height limits.

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

§ 24.232 Power and antenna height limits.

§ 24.232 (b): Mobile/portable stations are limited to 2 watts e.i.r.p. 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.

Test Engineer(s): Anderson Soungpanya

Test Date(s): July 23, 2008



Block Diagram 1. RF Power Output Test Setup



CDMA UpLink			
Carrier Channel	Frequency (MHz)	Measured Average Input Power dBm	Measured Average Output Power dBm
Low	825.25	-59.6	9.42
Mid	836.50	-61.4	9.51
High	847.75	-56.60	9.08
CDMA DownLink			
Carrier Channel	Frequency (MHz)	Measured Average Input Power dBm	Measured Average Output Power dBm
Low	870.25	-54.8	13.90
Mid	881.50	-55.0	14.21
High	892.75	-55.8	14.20

Table 12. RF Output Power – Cellular, CDMA Mode

GSM UpLink			
Carrier Channel	Frequency (MHz)	Measured Average Input Power dBm	Measured Average Output Power dBm
Low	824.50	-60.60	10.29
Mid	836.50	-61.00	10.23
High	848.50	-58.00	9.63
GSM DownLink			
Carrier Channel	Frequency (MHz)	Measured Average Input Power dBm	Measured Average Output Power dBm
Low	869.50	-55.8	14.7
Mid	881.50	-52.0	15.32
High	893.50	-56.20	14.82

Table 13. RF Output Power – Cellular, GSM Mode



Downlink			
Modulation	Frequency (MHz)	Input Power dBm	Modulated Output Power dBm (mW)
CDMA	1931.25	-62.80	17.40
CDMA	1960.00	-63.60	17.14
CDMA	1988.75	-63.20	17.12

Uplink			
Modulation	Frequency (MHz)	Input Power dBm	Modulated Output Power dBm (mW)
CDMA	1851.25	-67.20	11.09
CDMA	1880.00	-66.40	11.80
CDMA	1908.75	-67.60	10.67

Table 14. RF Output Power – PCS, CDMA Mode

Downlink			
Modulation	Frequency (MHz)	Input Power dBm	Modulated Output Power dBm (mW)
GSM	1930.50	-60.40	19.66
GSM	1960.00	-59.80	19.33
GSM	1989.50	-59.60	18.94

Uplink			
Modulation	Frequency (MHz)	Input Power dBm	Modulated Output Power dBm (mW)
GSM	1850.5	-66.00	13.44
GSM	1880.0	-66.20	14.09
GSM	1909.5	-64.00	14.02

Table 15. RF Output Power – PCS, GSM Mode



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.

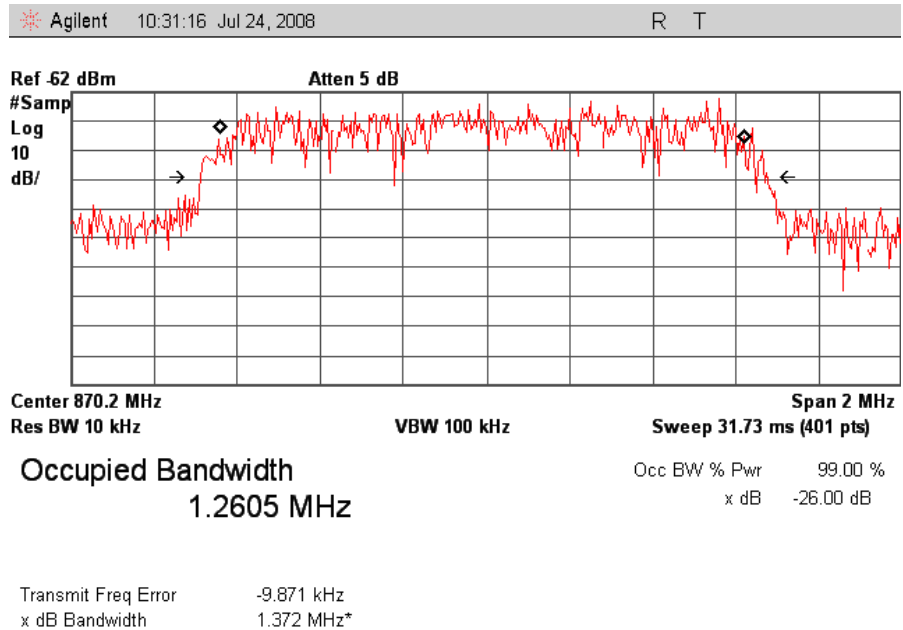
Test Engineer(s): Anderson Soungpanya

Test Date(s): July 24, 2008

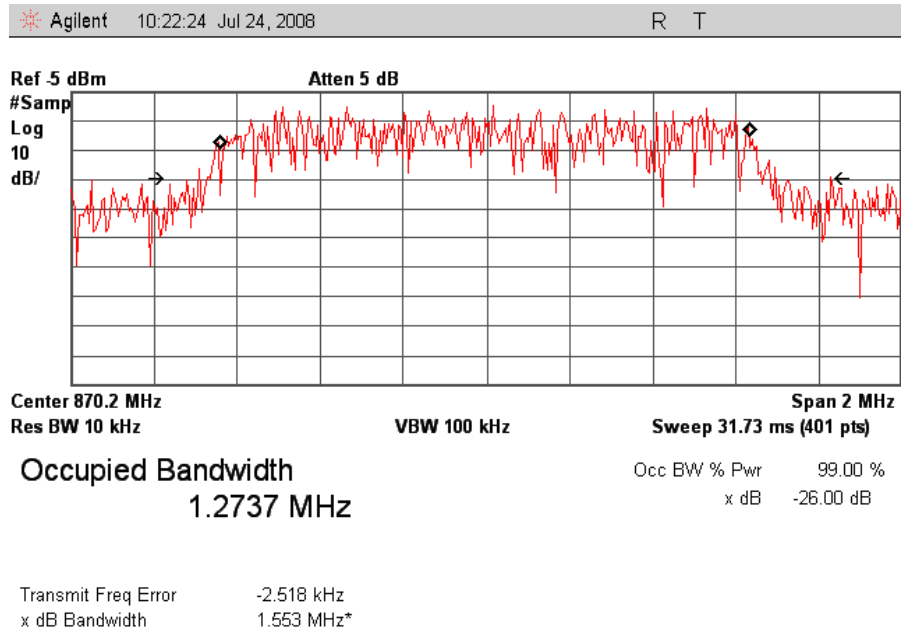


Electromagnetic Compatibility Criteria for Intentional Radiators

Occupied Bandwidth Test Results – Cellular, CDMA



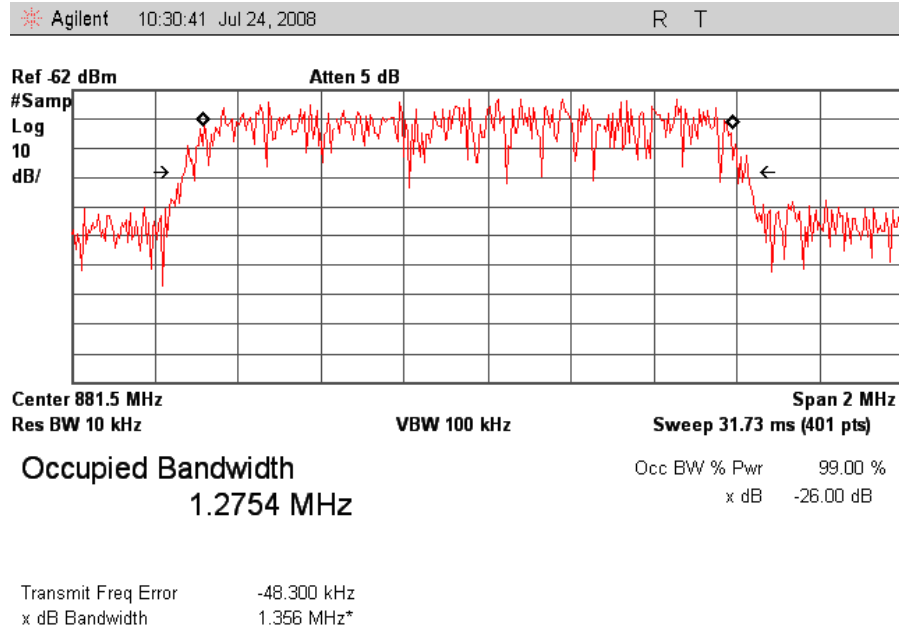
Plot 2. Occupied Bandwidth, CDMA Downlink, Low Channel Input



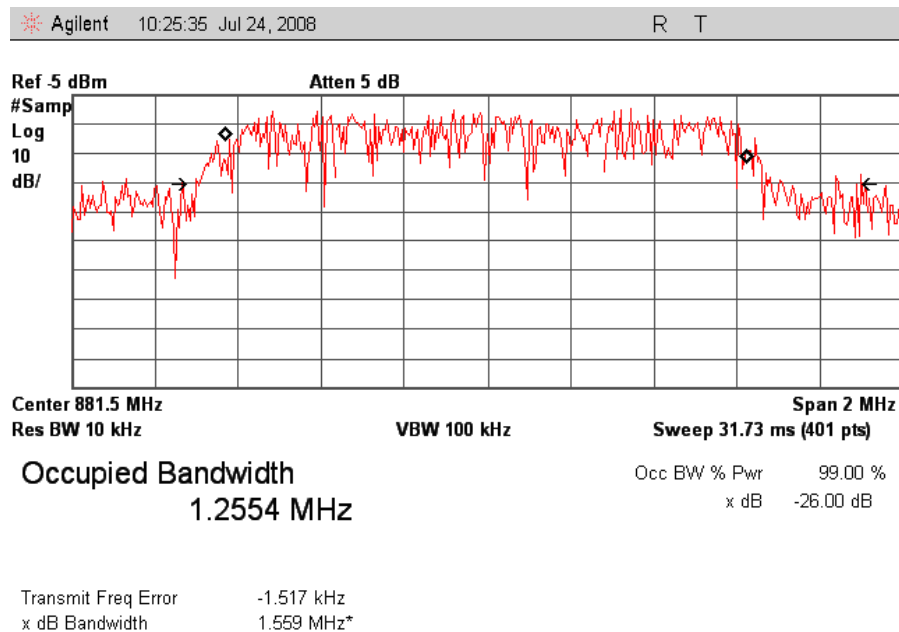
Plot 3. Occupied Bandwidth, CDMA Downlink, Low Channel Output



Occupied Bandwidth Test Results – Cellular, CDMA



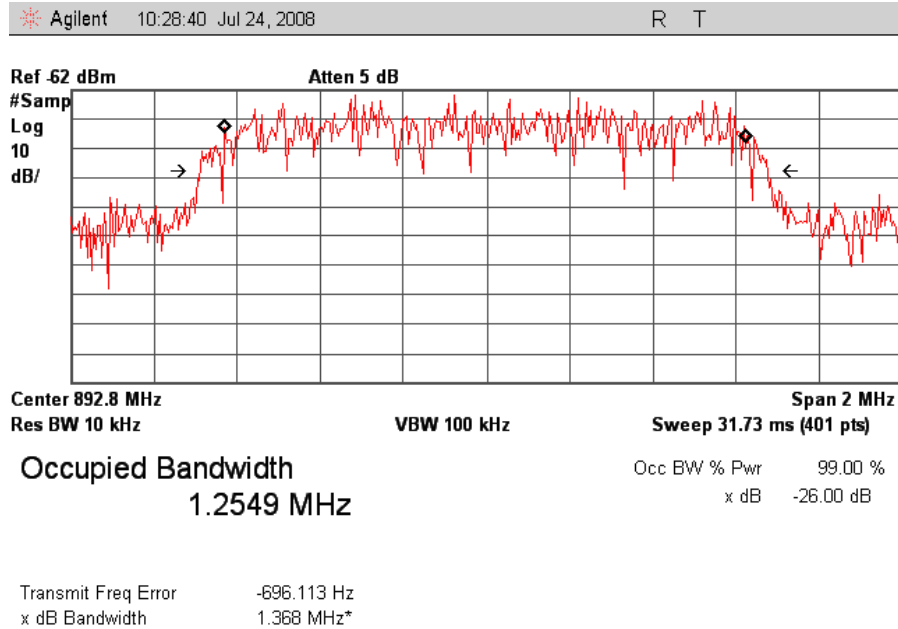
Plot 4. Occupied Bandwidth, CDMA Downlink, Mid Channel Input



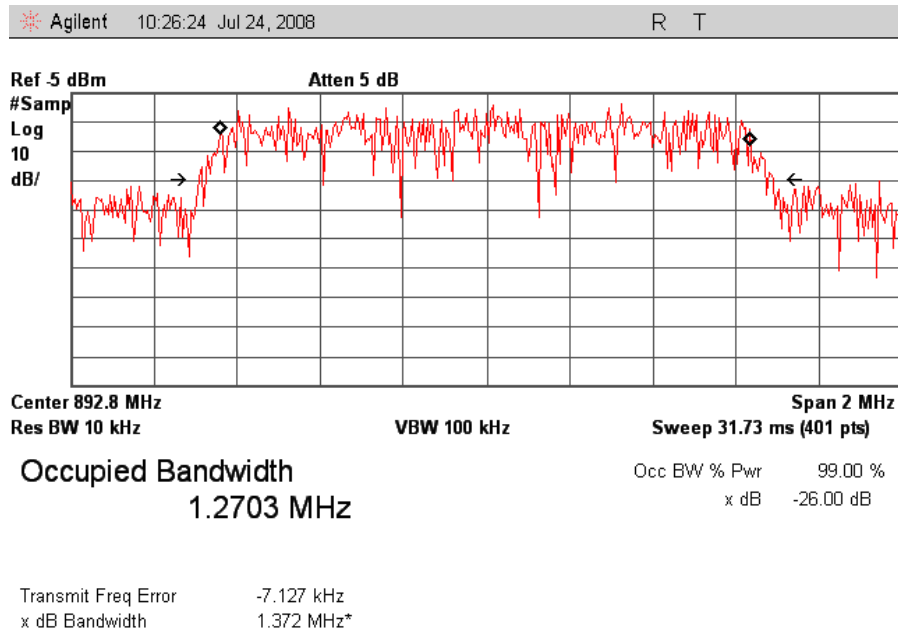
Plot 5. Occupied Bandwidth, CDMA Downlink, Mid Channel Output



Occupied Bandwidth Test Results – Cellular, CDMA



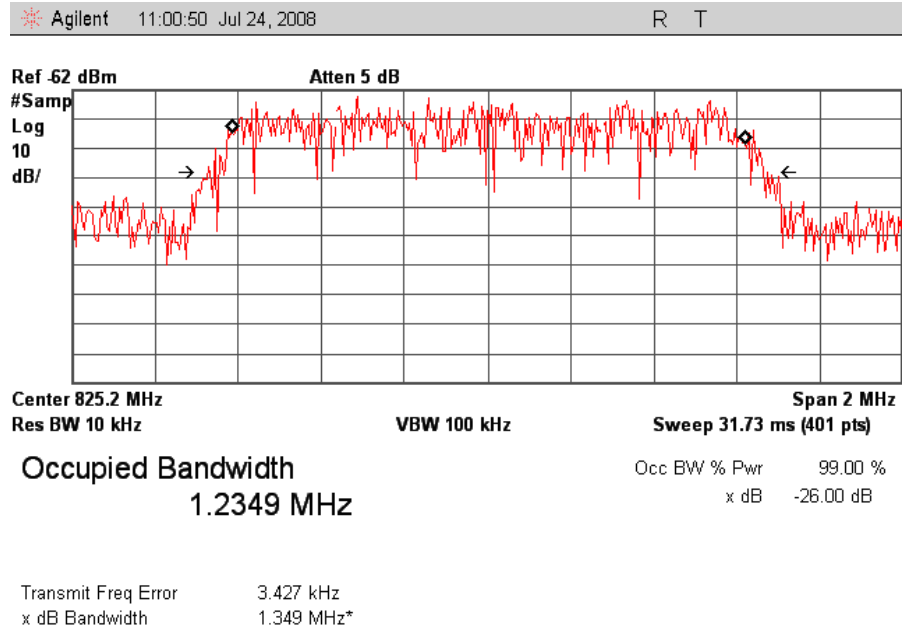
Plot 6. Occupied Bandwidth, CDMA Downlink, High Channel Input



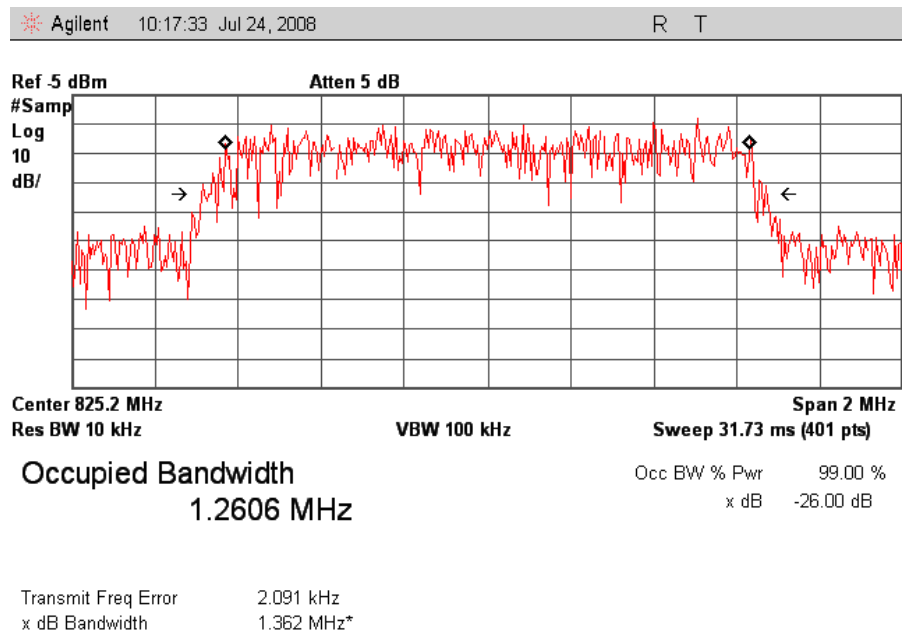
Plot 7. Occupied Bandwidth, CDMA Downlink, High Channel Output



Occupied Bandwidth Test Results – Cellular, CDMA



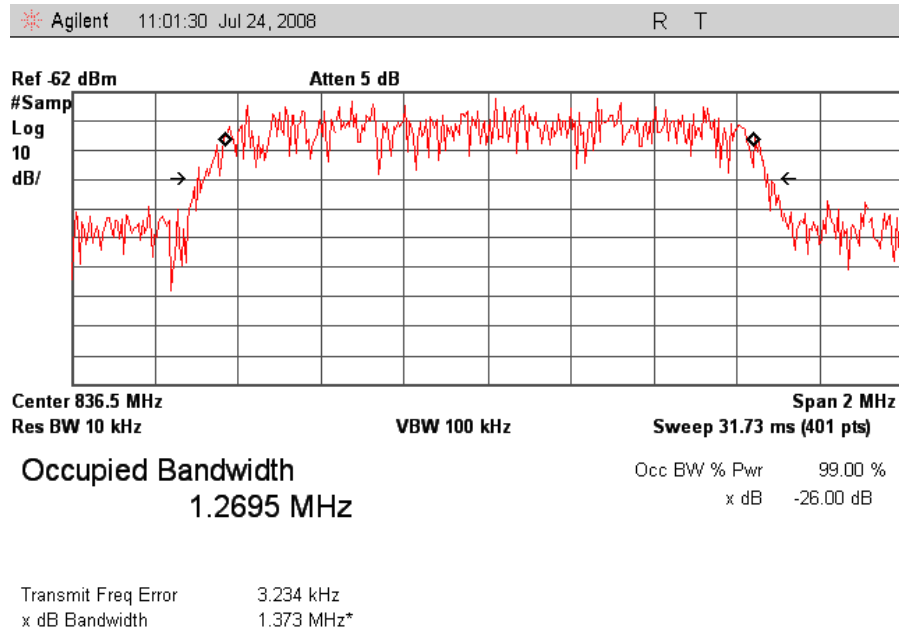
Plot 8. Occupied Bandwidth, CDMA Uplink, Low Channel Input



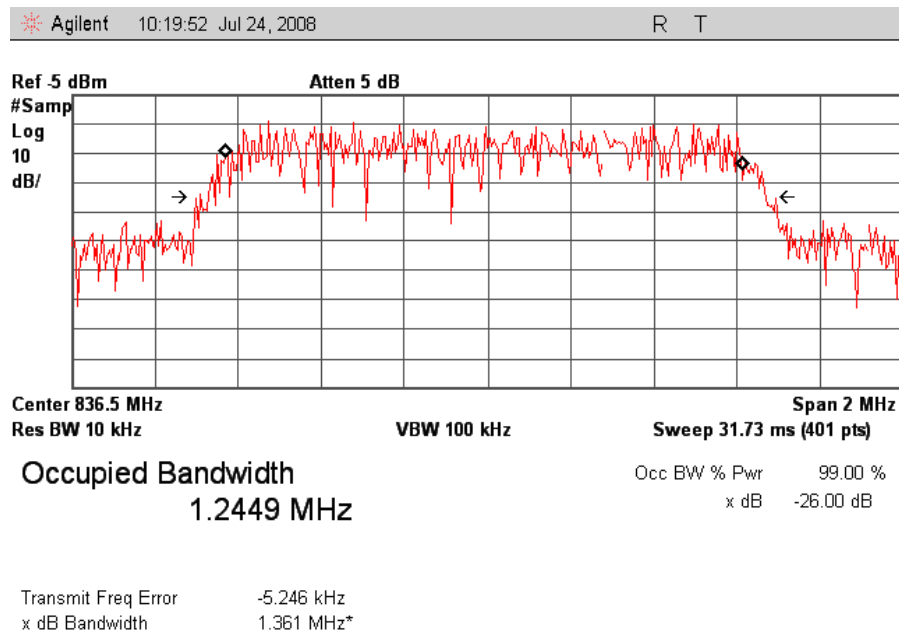
Plot 9. Occupied Bandwidth, CDMA Uplink, Low Channel Output



Occupied Bandwidth Test Results – Cellular, CDMA



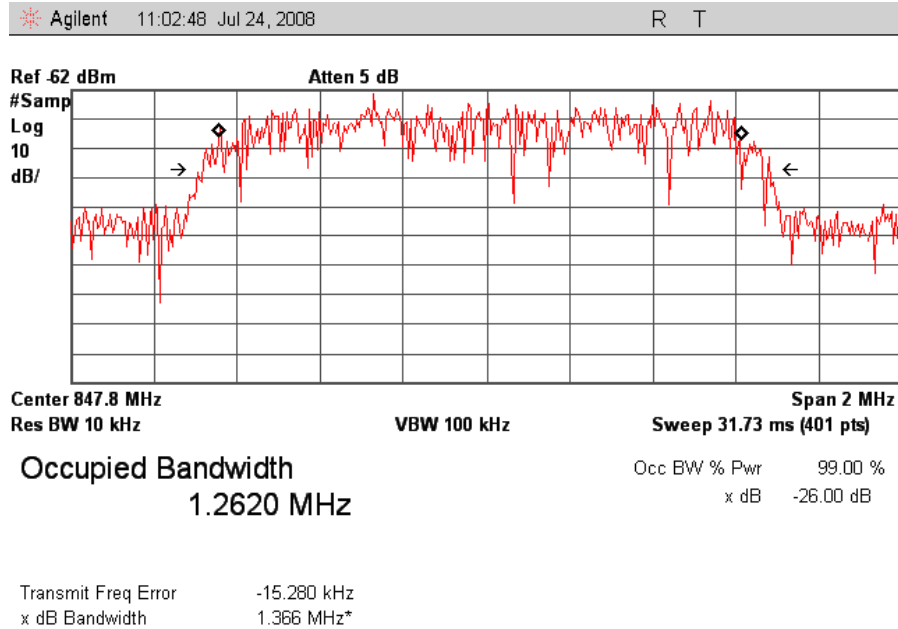
Plot 10. Occupied Bandwidth, CDMA Uplink, Mid Channel Input



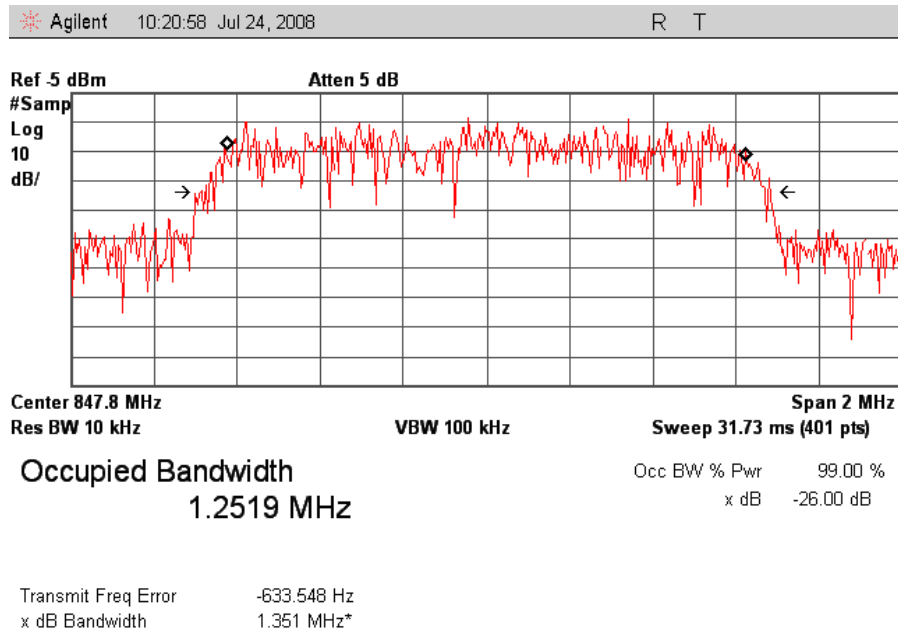
Plot 11. Occupied Bandwidth, CDMA Uplink, Mid Channel Output



Occupied Bandwidth Test Results – Cellular, CDMA



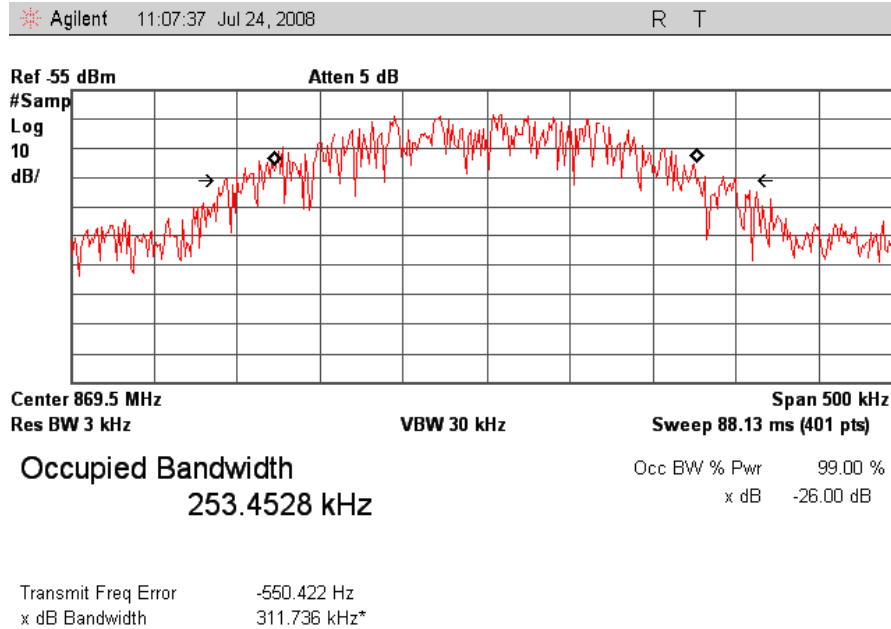
Plot 12. Occupied Bandwidth, CDMA Uplink, High Channel Input



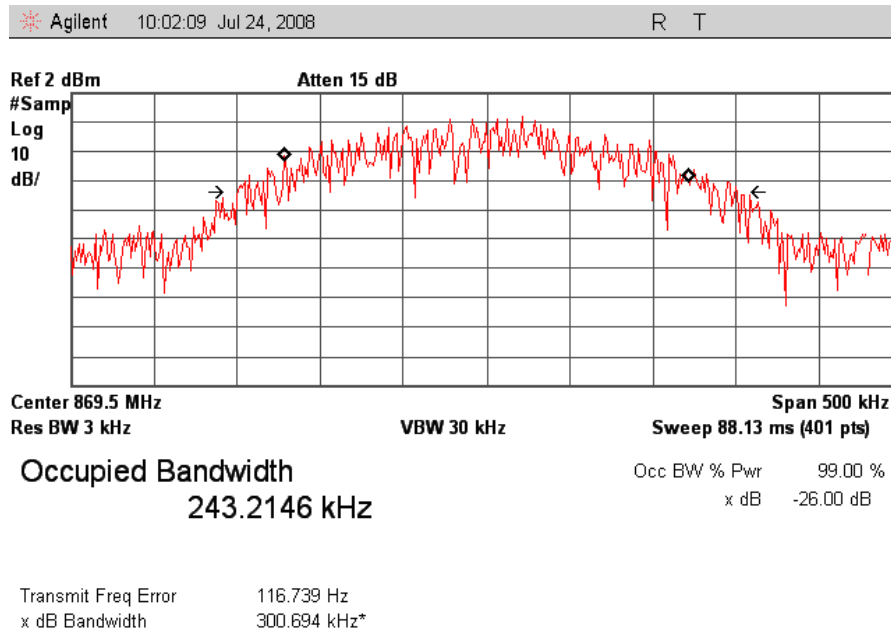
Plot 13. Occupied Bandwidth, CDMA Uplink, High Channel Output



Occupied Bandwidth Test Results – Cellular, GSM



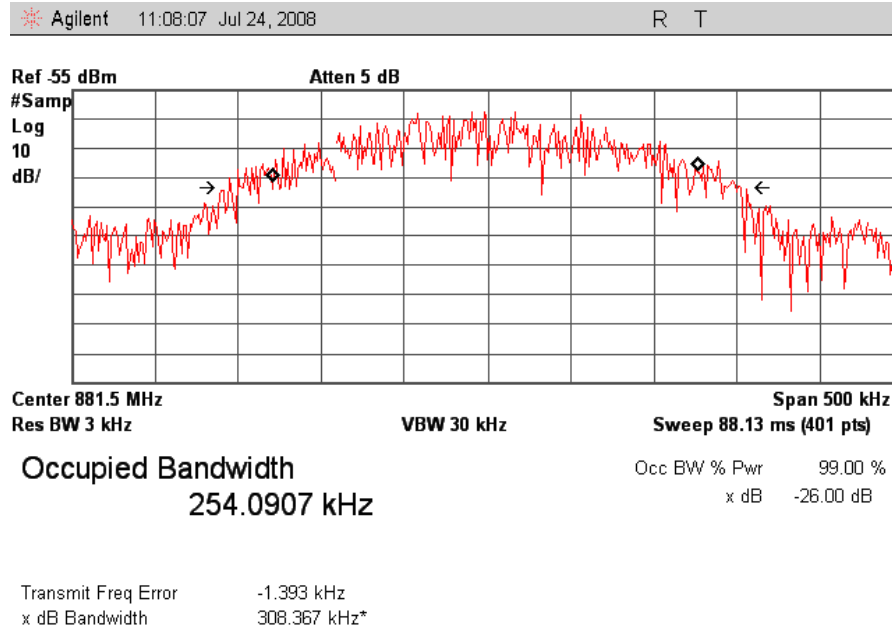
Plot 14. Occupied Bandwidth, GSM Downlink, Low Channel Input



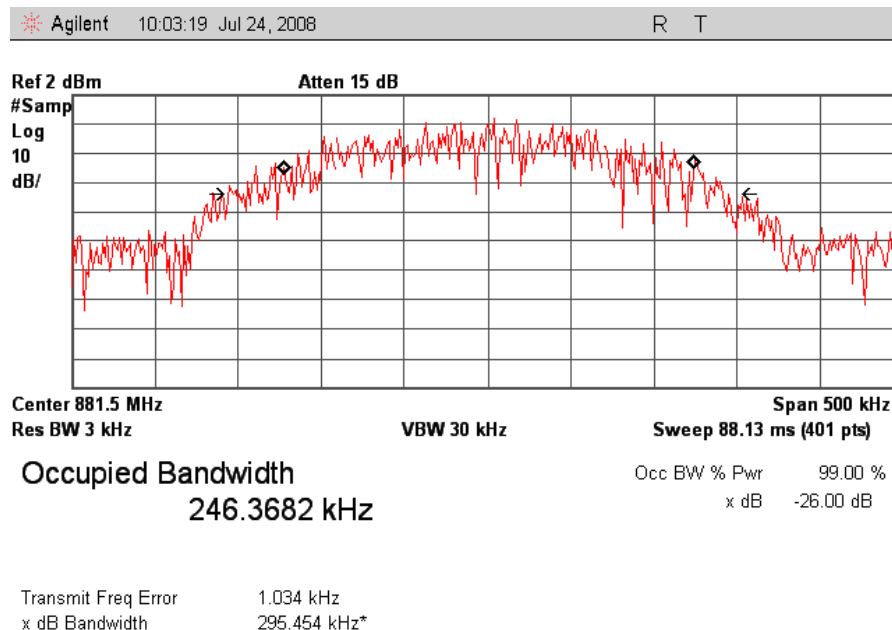
Plot 15. Occupied Bandwidth, GSM Downlink, Low Channel Output



Occupied Bandwidth Test Results – Cellular, GSM



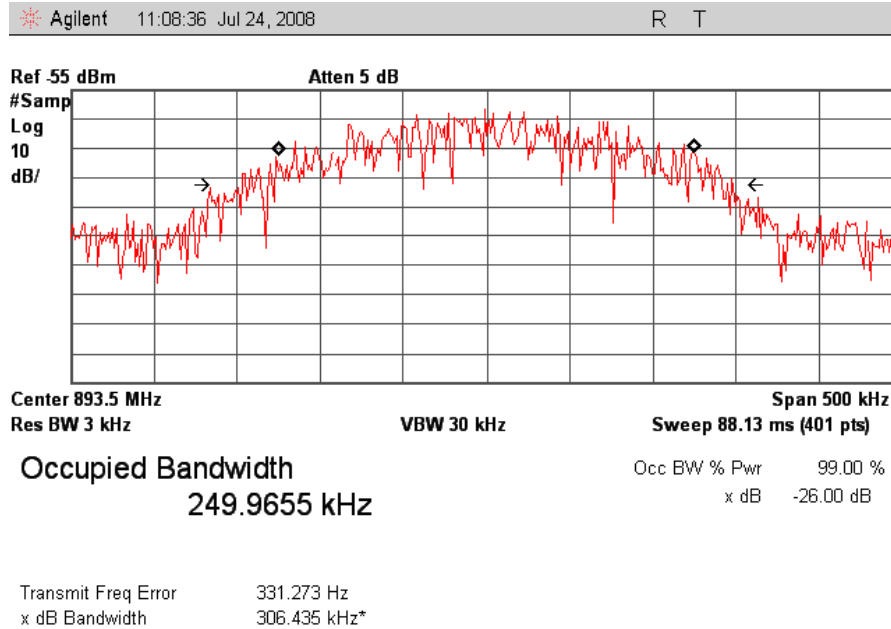
Plot 16. Occupied Bandwidth, GSM Downlink, Mid Channel Input



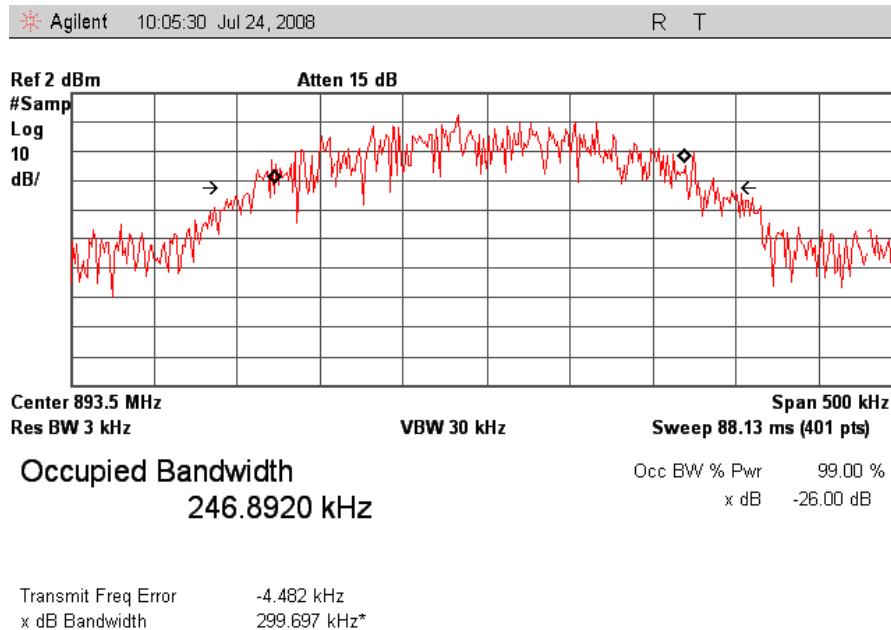
Plot 17. Occupied Bandwidth, GSM Downlink, Mid Channel Output



Occupied Bandwidth Test Results – Cellular, GSM



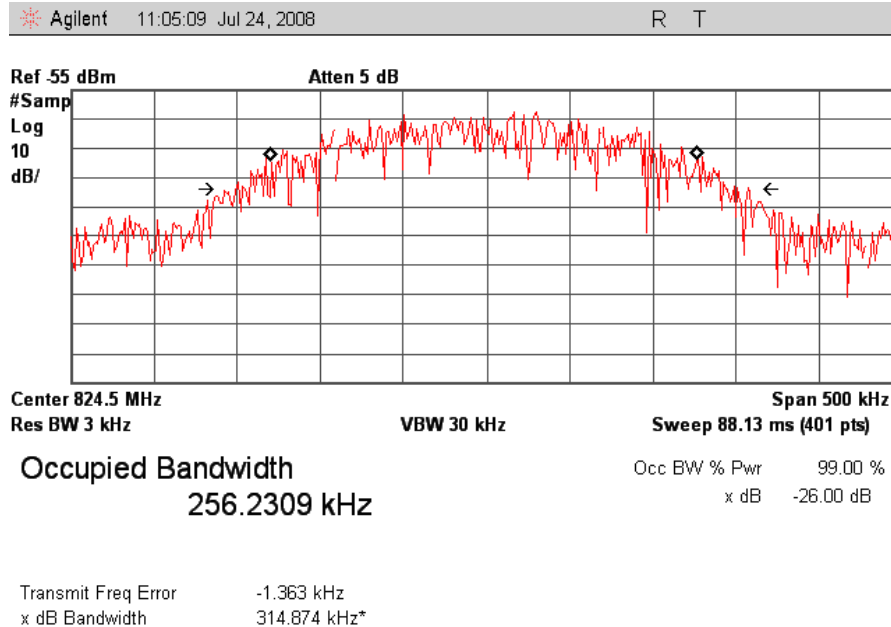
Plot 18. Occupied Bandwidth, GSM Downlink, High Channel Input



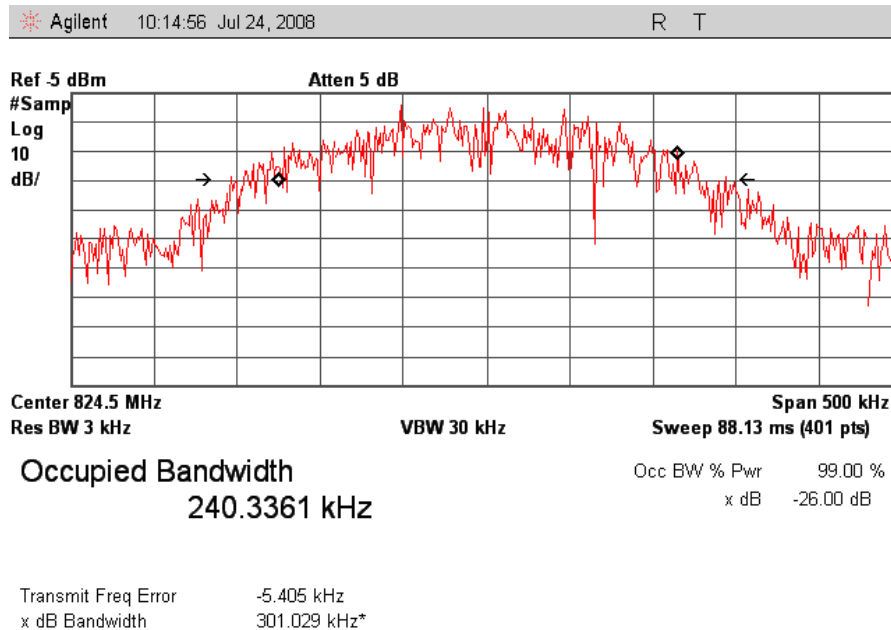
Plot 19. Occupied Bandwidth, GSM Downlink, High Channel Output



Occupied Bandwidth Test Results – Cellular, GSM



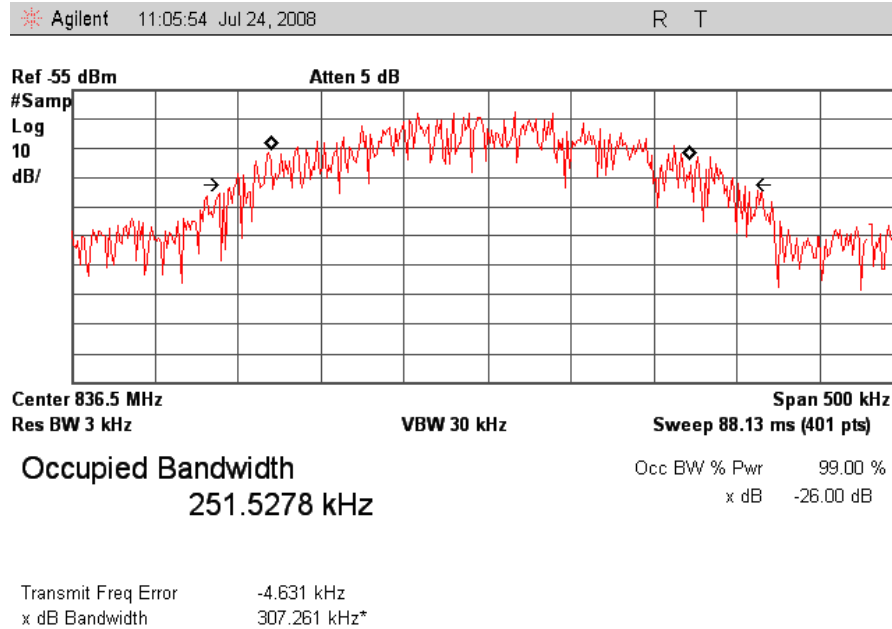
Plot 20. Occupied Bandwidth, GSM Uplink, Low Channel Input



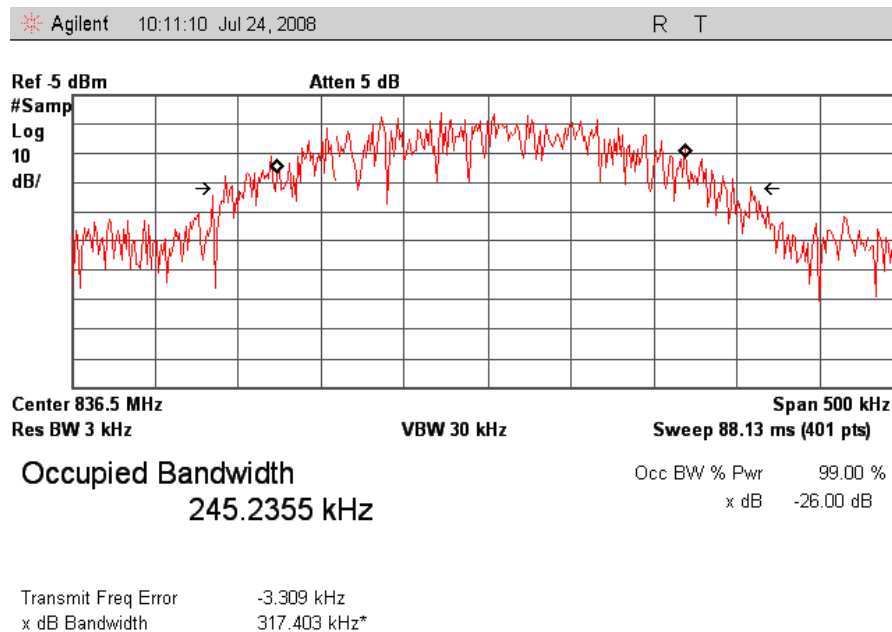
Plot 21. Occupied Bandwidth, GSM Uplink, Low Channel Output



Occupied Bandwidth Test Results – Cellular, GSM



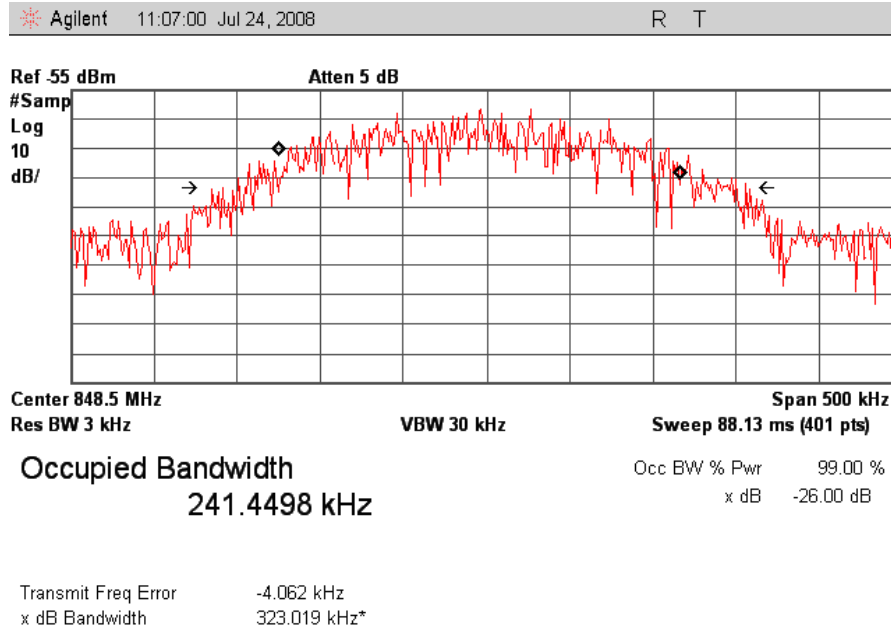
Plot 22. Occupied Bandwidth, GSM Uplink, Mid Channel Input



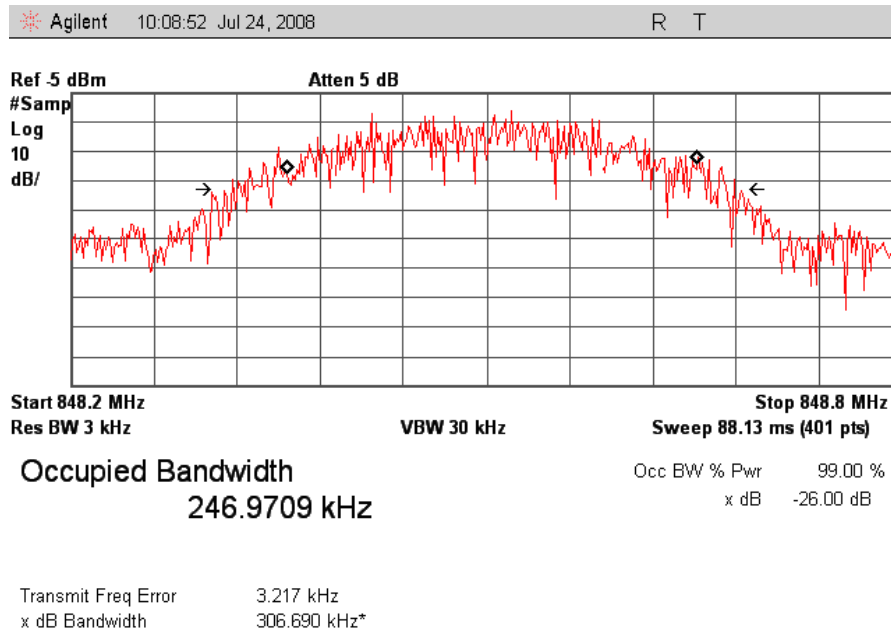
Plot 23. Occupied Bandwidth, GSM Uplink, Mid Channel Output



Occupied Bandwidth Test Results – Cellular, GSM



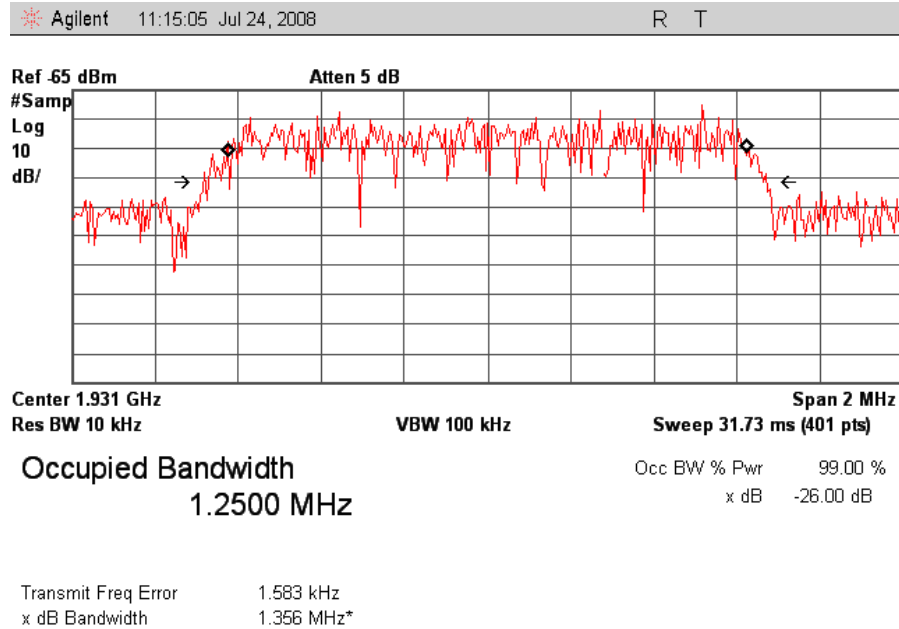
Plot 24. Occupied Bandwidth, GSM Uplink, High Channel Input



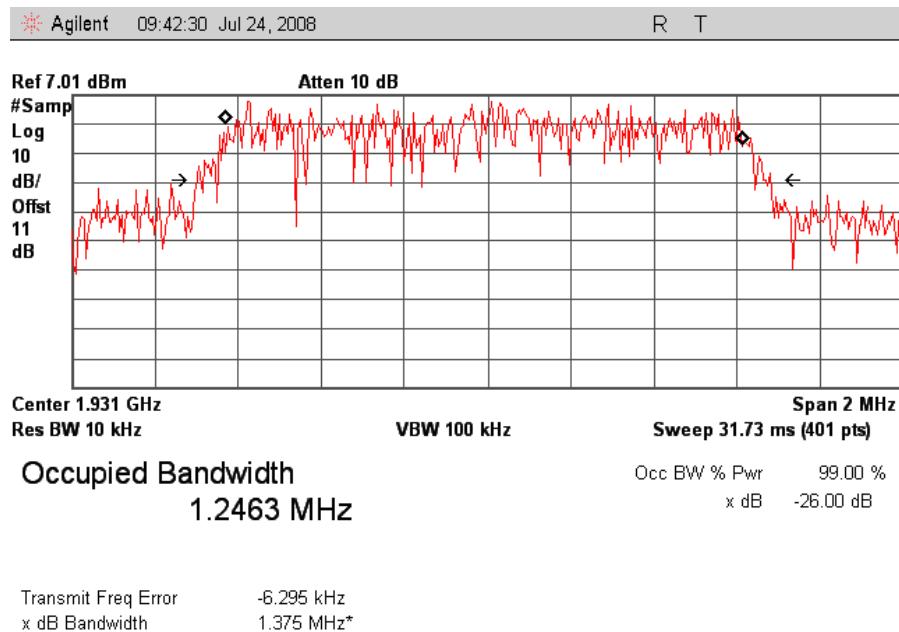
Plot 25. Occupied Bandwidth, GSM Uplink, High Channel Output



Occupied Bandwidth Test Results – PCS, CDMA



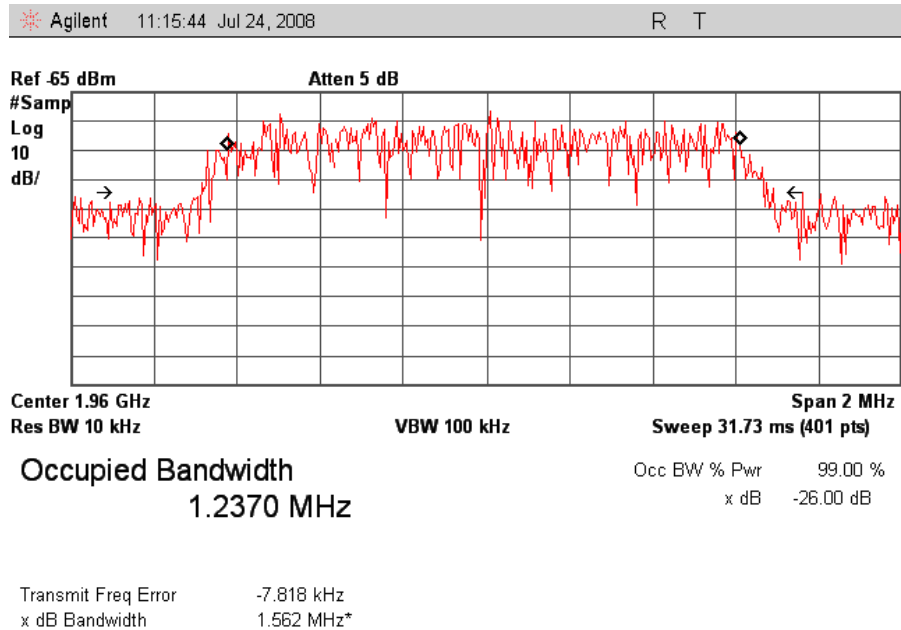
Plot 26. Occupied Bandwidth, CDMA Downlink, Low Channel Input



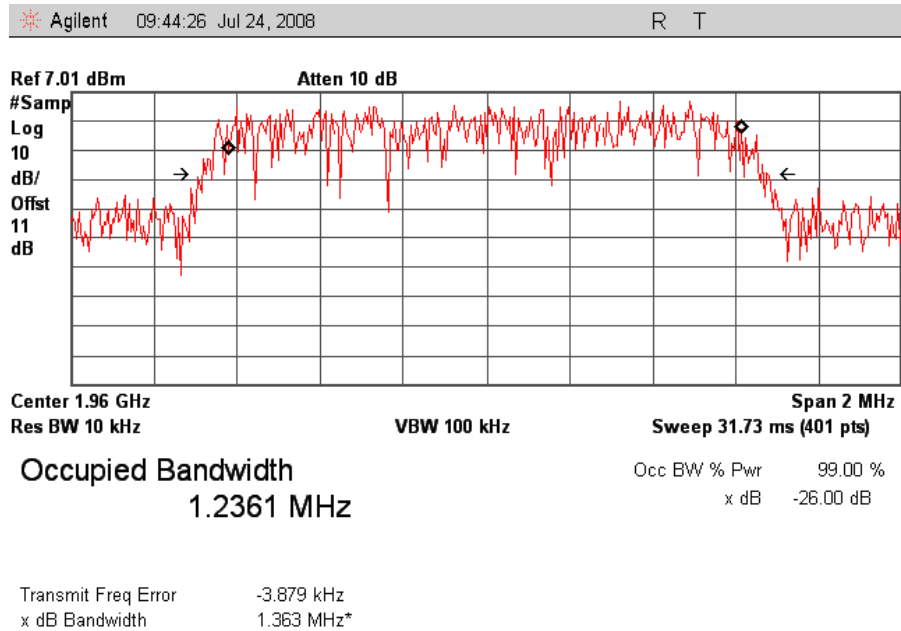
Plot 27. Occupied Bandwidth, CDMA Downlink, Low Channel Output



Occupied Bandwidth Test Results – PCS, CDMA



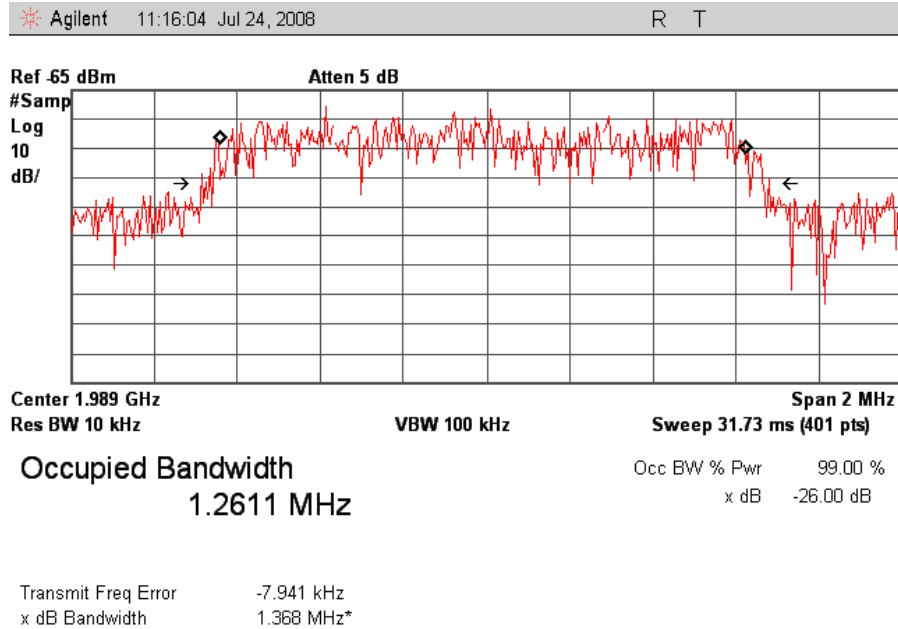
Plot 28. Occupied Bandwidth, CDMA Downlink, Mid Channel Input



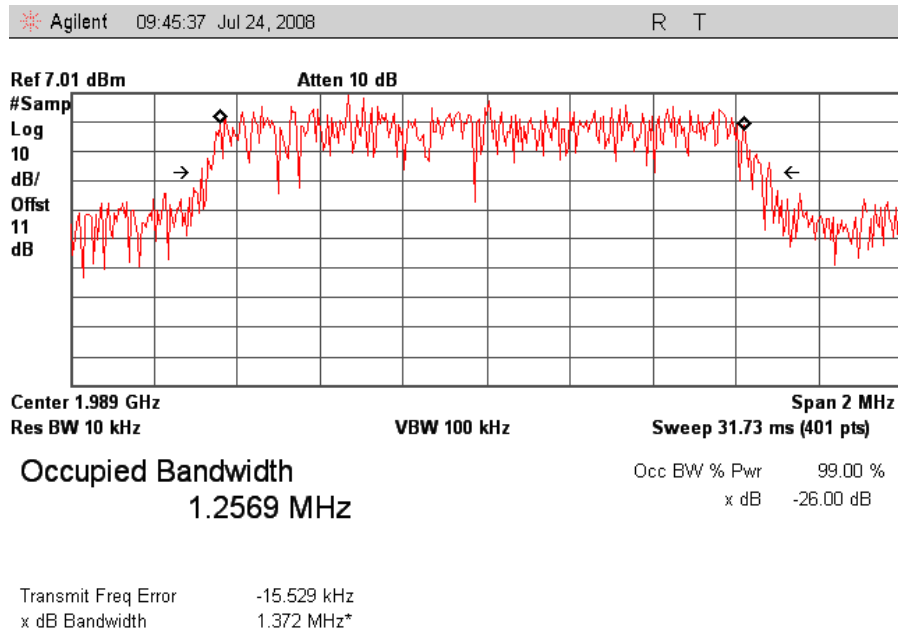
Plot 29. Occupied Bandwidth, CDMA Downlink, Mid Channel Output



Occupied Bandwidth Test Results – PCS, CDMA



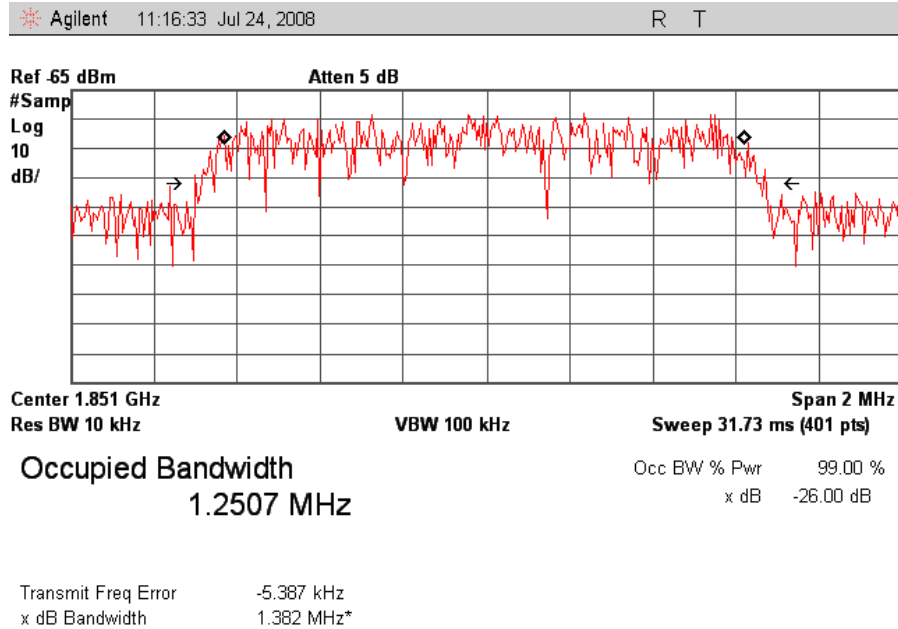
Plot 30. Occupied Bandwidth, CDMA Downlink, High Channel Input



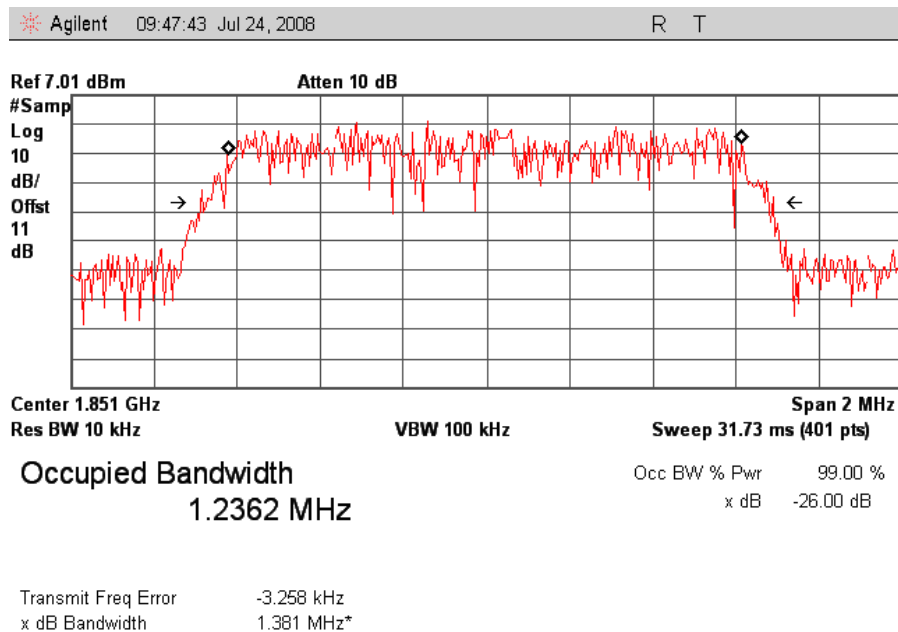
Plot 31. Occupied Bandwidth, CDMA Downlink, High Channel Output



Occupied Bandwidth Test Results – PCS, CDMA



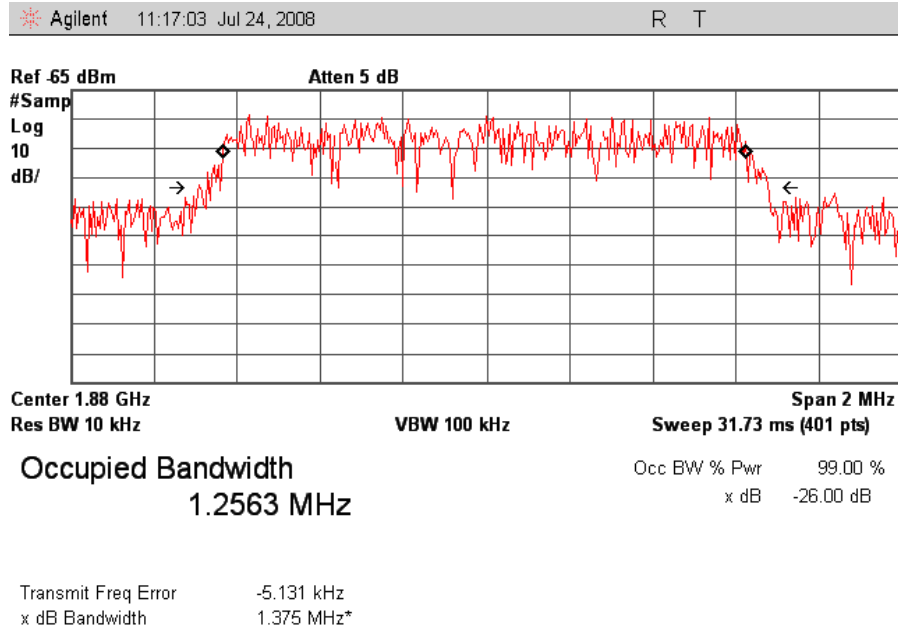
Plot 32. Occupied Bandwidth, CDMA Uplink, Low Channel Input



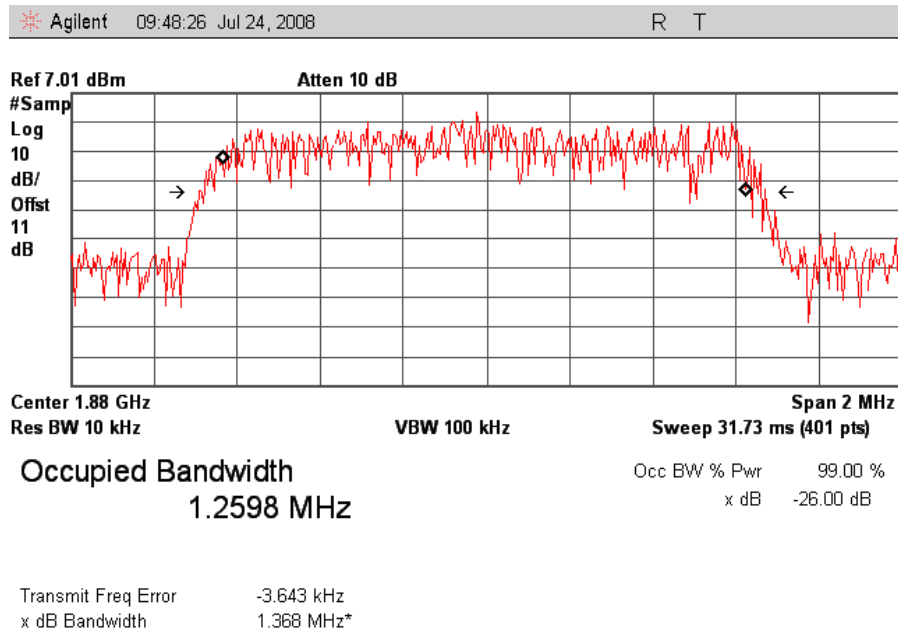
Plot 33. Occupied Bandwidth, CDMA Uplink, Low Channel Output



Occupied Bandwidth Test Results – PCS, CDMA



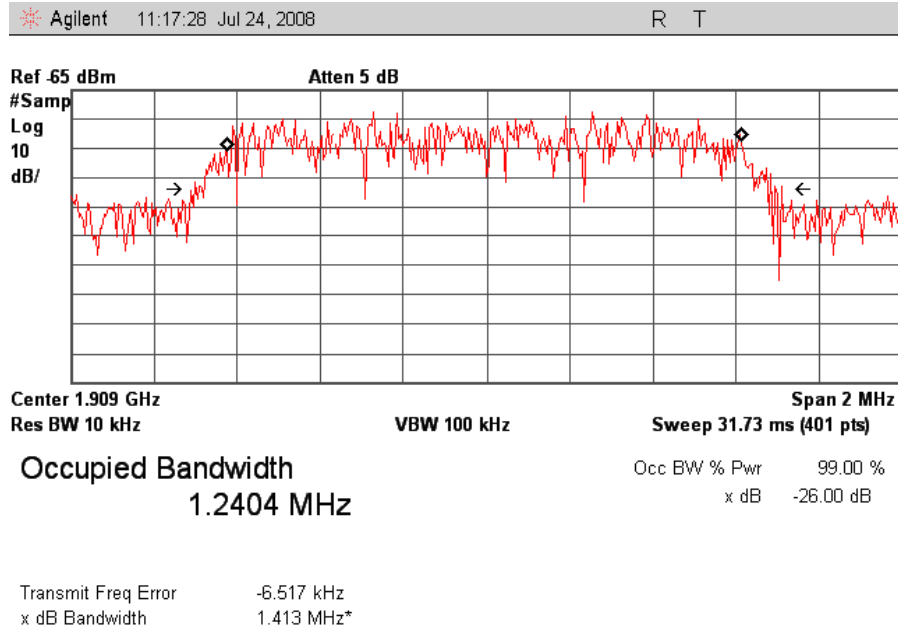
Plot 34. Occupied Bandwidth, CDMA Uplink, Mid Channel Input



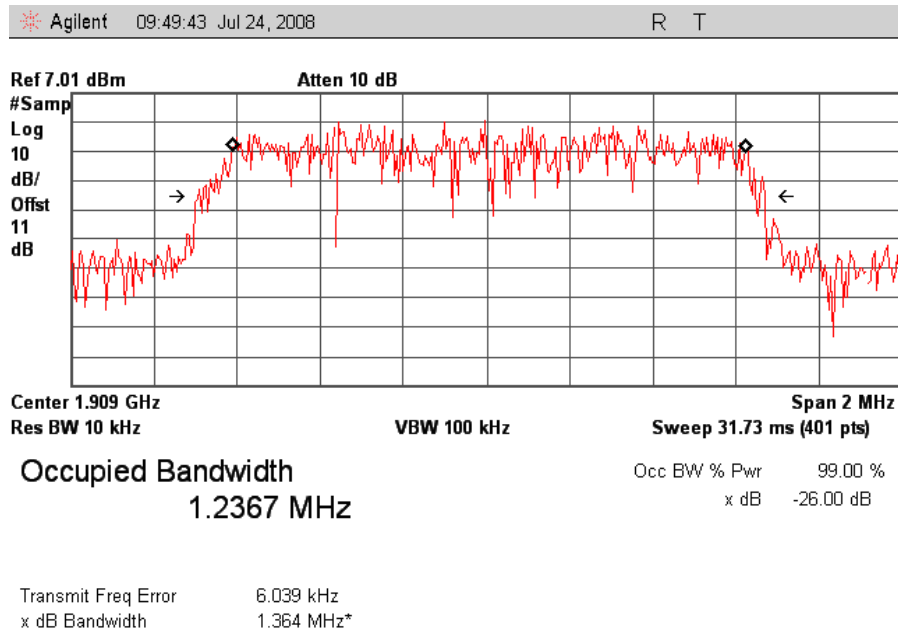
Plot 35. Occupied Bandwidth, CDMA Uplink, Mid Channel Output



Occupied Bandwidth Test Results – PCS, CDMA



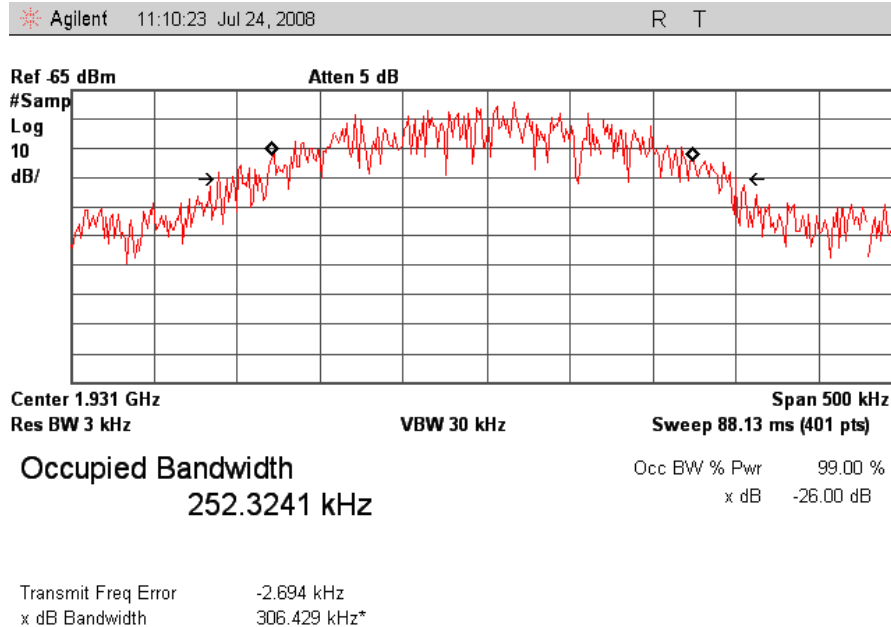
Plot 36. Occupied Bandwidth, CDMA Uplink, High Channel Input



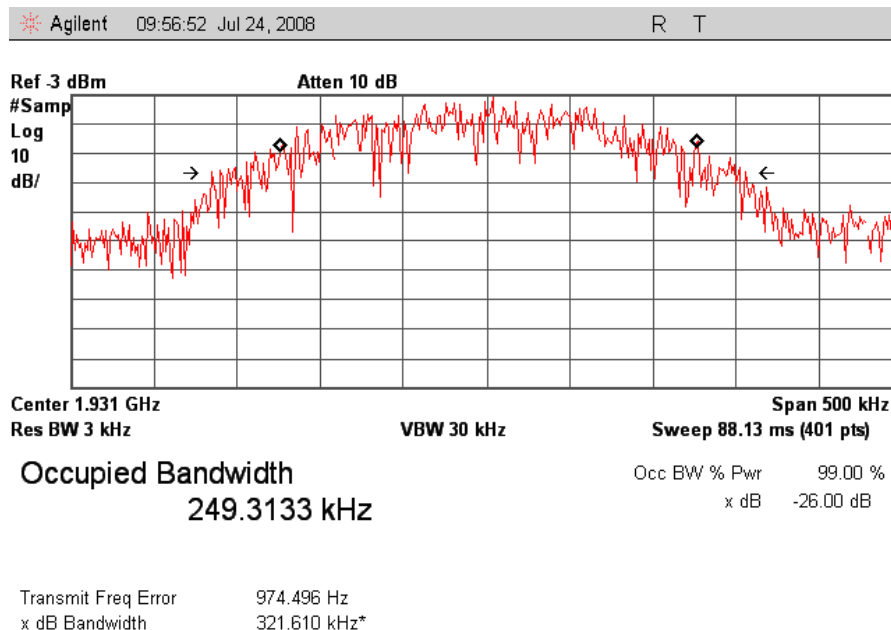
Plot 37. Occupied Bandwidth, CDMA Uplink, High Channel Output



Occupied Bandwidth Test Results – PCS, GSM



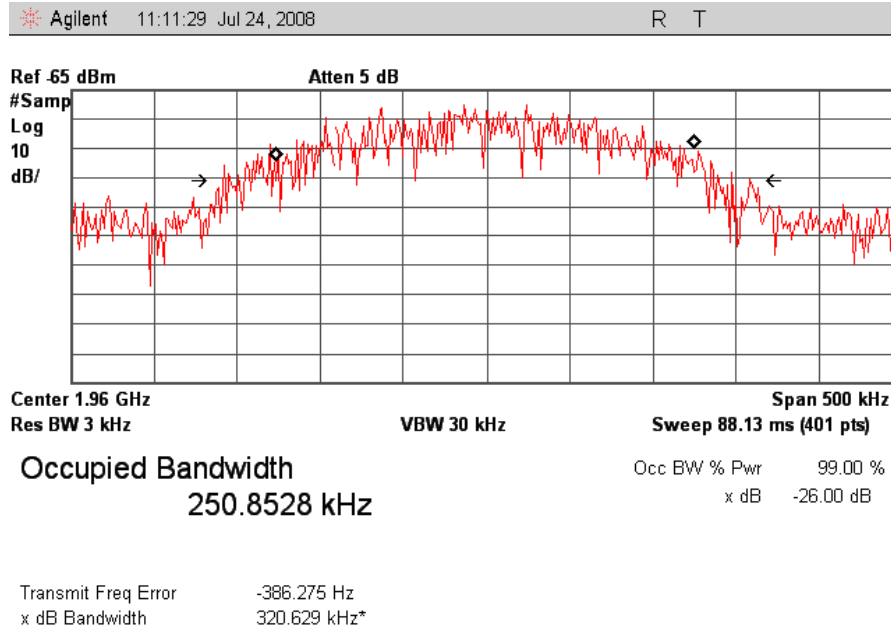
Plot 38. Occupied Bandwidth, GSM Downlink, Low Channel Input



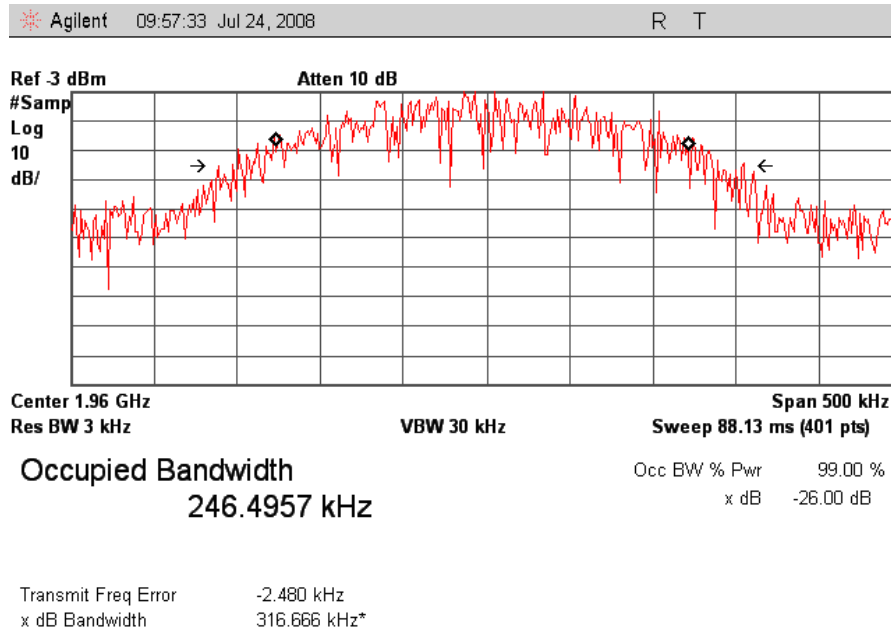
Plot 39. Occupied Bandwidth, GSM Downlink, Low Channel Output



Occupied Bandwidth Test Results – PCS, GSM



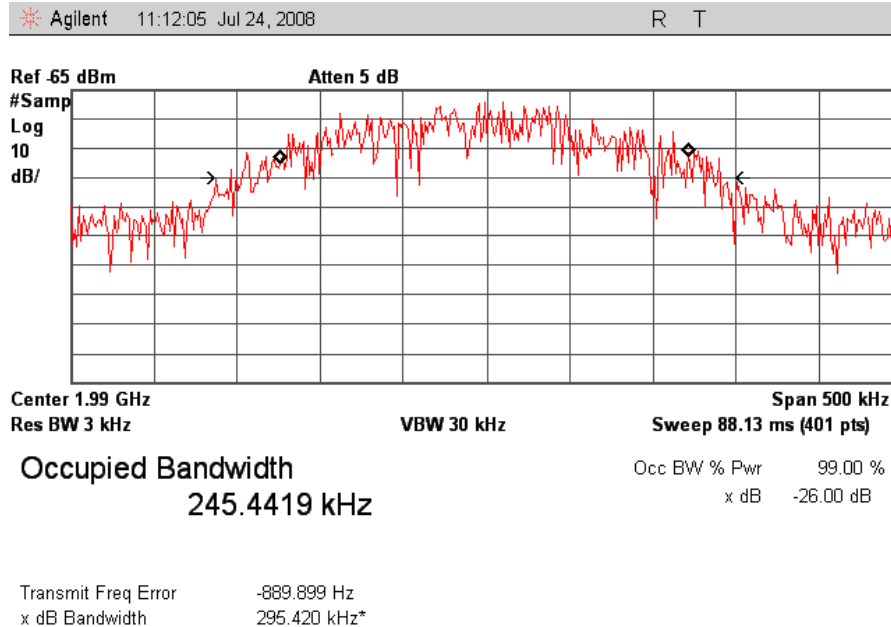
Plot 40. Occupied Bandwidth, GSM Downlink, Mid Channel Input



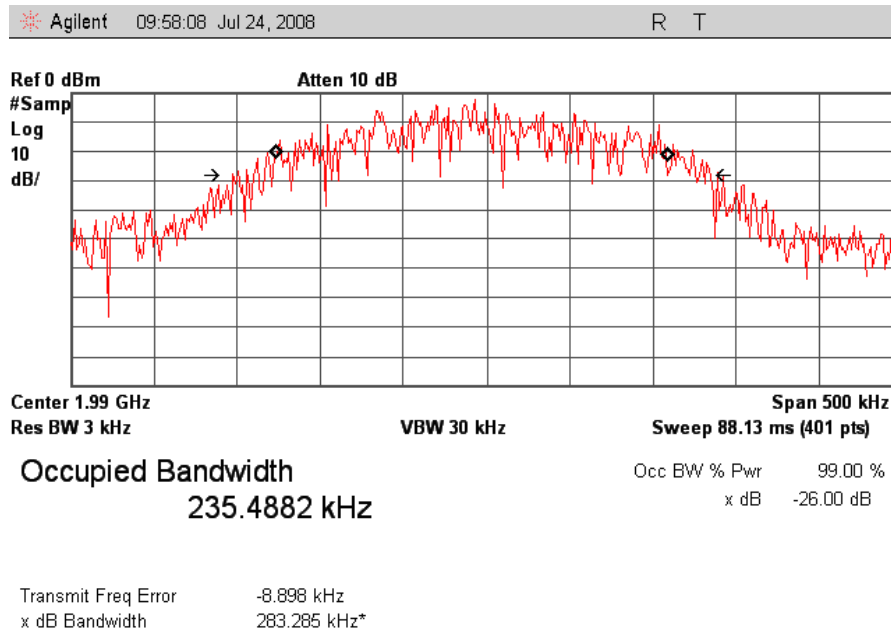
Plot 41. Occupied Bandwidth, GSM Downlink, Mid Channel Output



Occupied Bandwidth Test Results – PCS, GSM



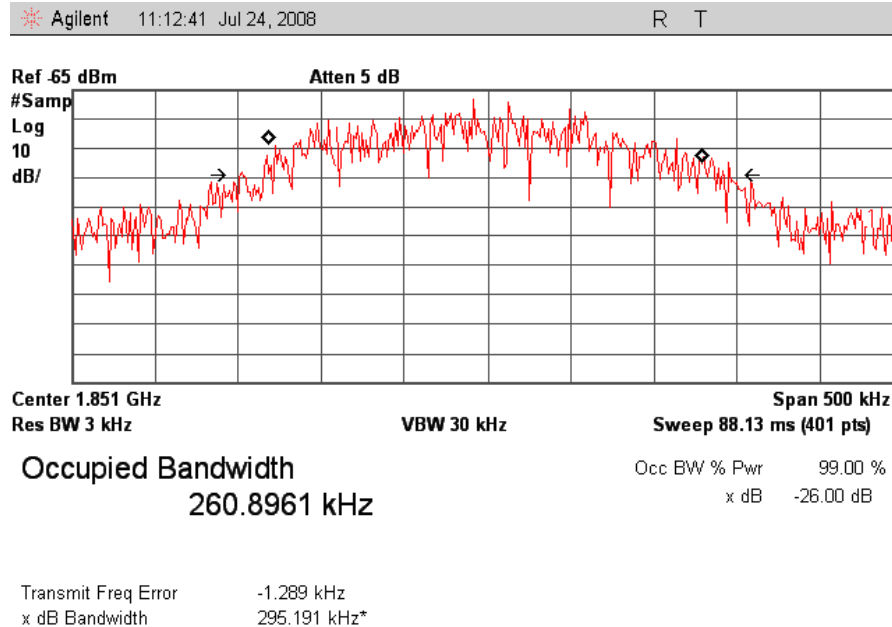
Plot 42. Occupied Bandwidth, GSM Downlink, High Channel Input



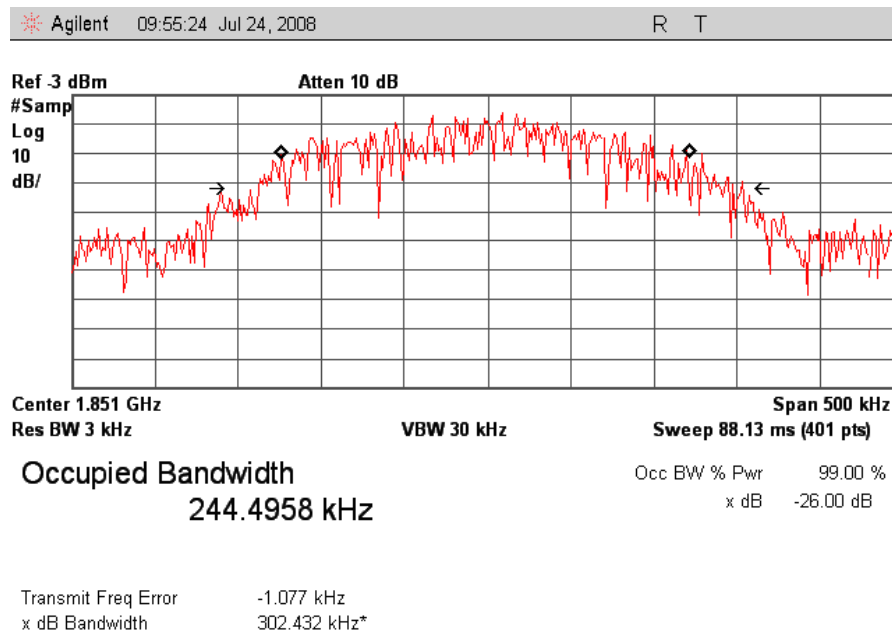
Plot 43. Occupied Bandwidth, GSM Downlink, High Channel Output



Occupied Bandwidth Test Results – PCS, GSM



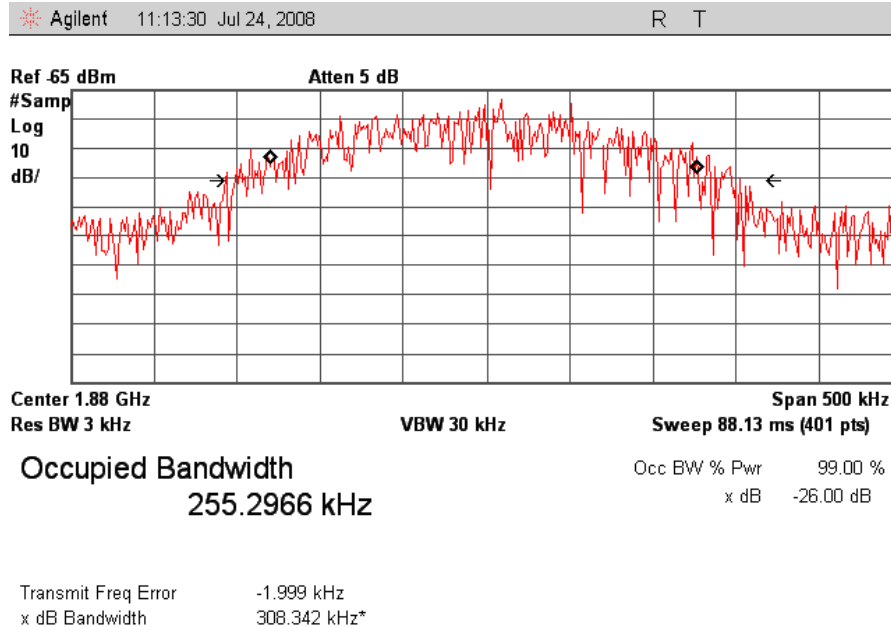
Plot 44. Occupied Bandwidth, GSM Uplink, Low Channel Input



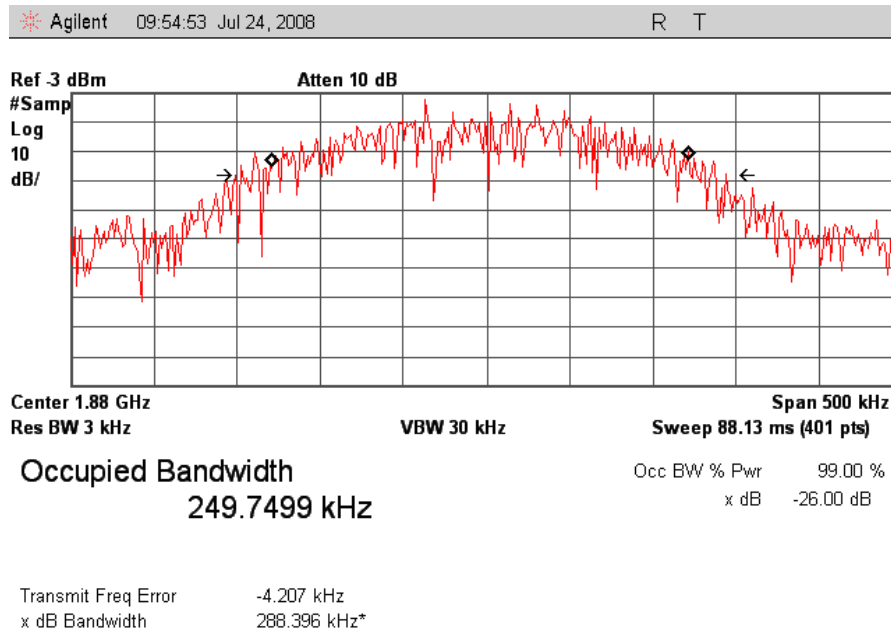
Plot 45. Occupied Bandwidth, GSM Uplink, Low Channel Output



Occupied Bandwidth Test Results – PCS, GSM



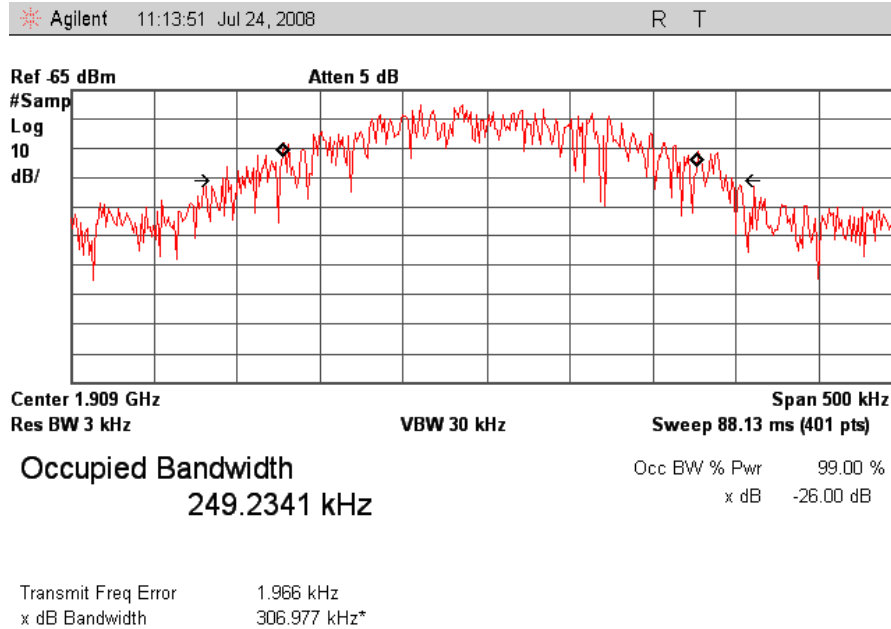
Plot 46. Occupied Bandwidth, GSM Uplink, Mid Channel Input



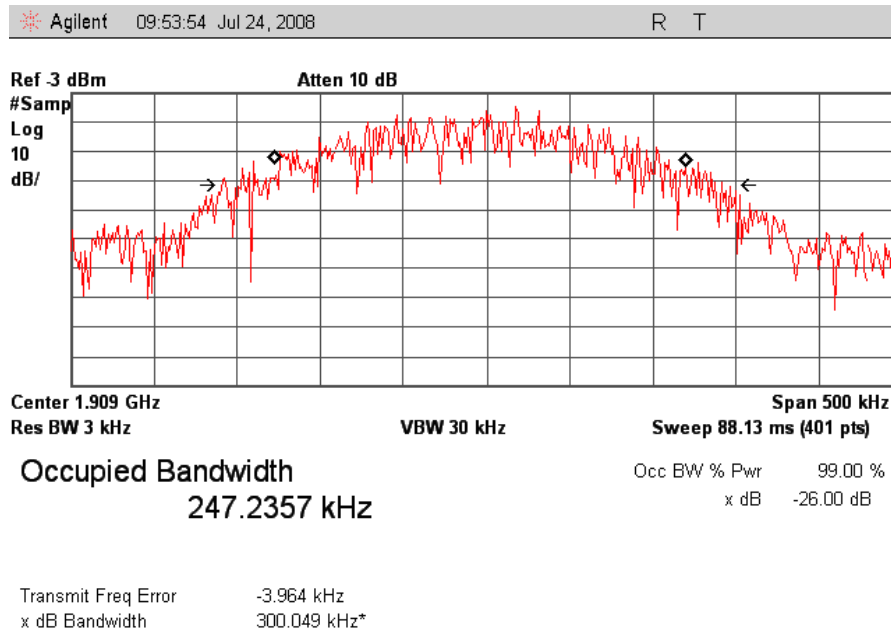
Plot 47. Occupied Bandwidth, GSM Uplink, Mid Channel Output



Occupied Bandwidth Test Results – PCS, GSM



Plot 48. Occupied Bandwidth, GSM Uplink, High Channel Input



Plot 49. Occupied Bandwidth, GSM Uplink, High Channel 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.

§ 22.917 Emission limitations Cellular equipment, § 24.238 Emission limitations for Broadband PCS equipment: The rules in this section govern the spectral characteristics of emissions in the Cellular Radiotelephone Service.

§ 22.917 (a), § 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° 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 10th or 40GHz, which ever was the lesser, were investigated.

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 10th 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.

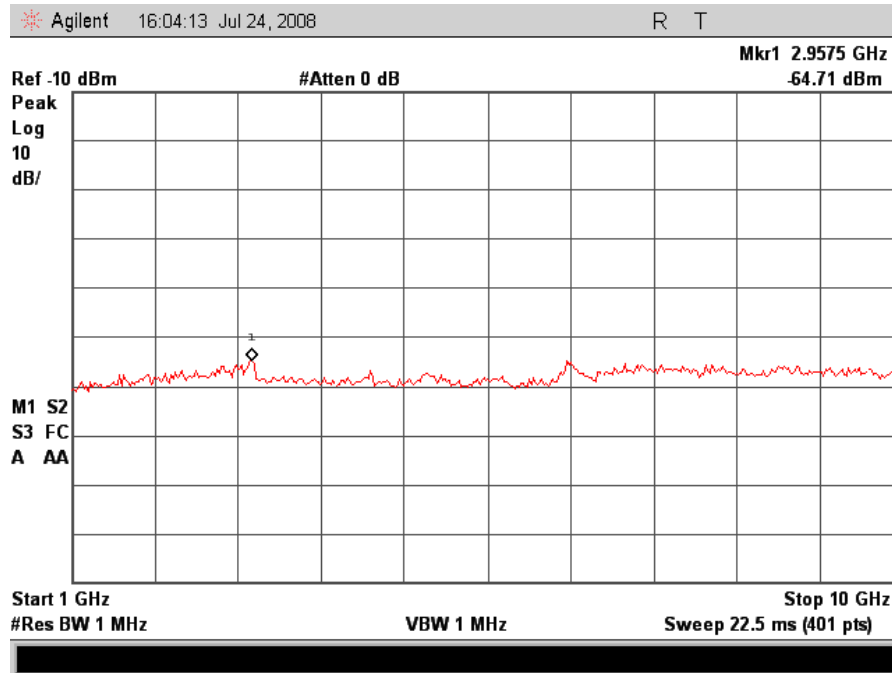
Test Results: The EUT complies with the requirements of this section.

Test Engineer: Anderson Soungpanya

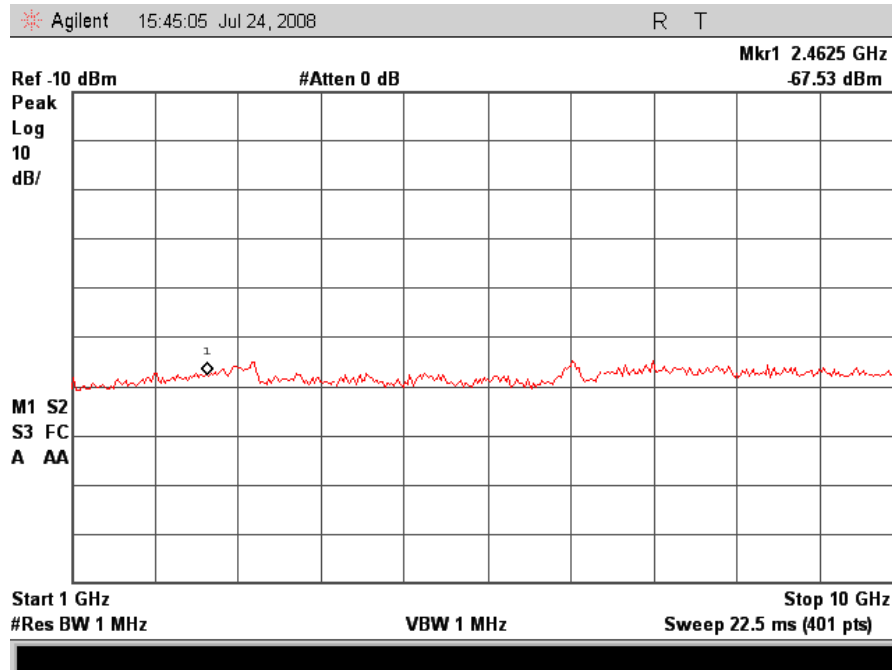
Test Date(s): July 24, 2008



Electromagnetic Compatibility Criteria for Intentional Radiators Radiated Spurious Emissions Test Results – Cellular Band



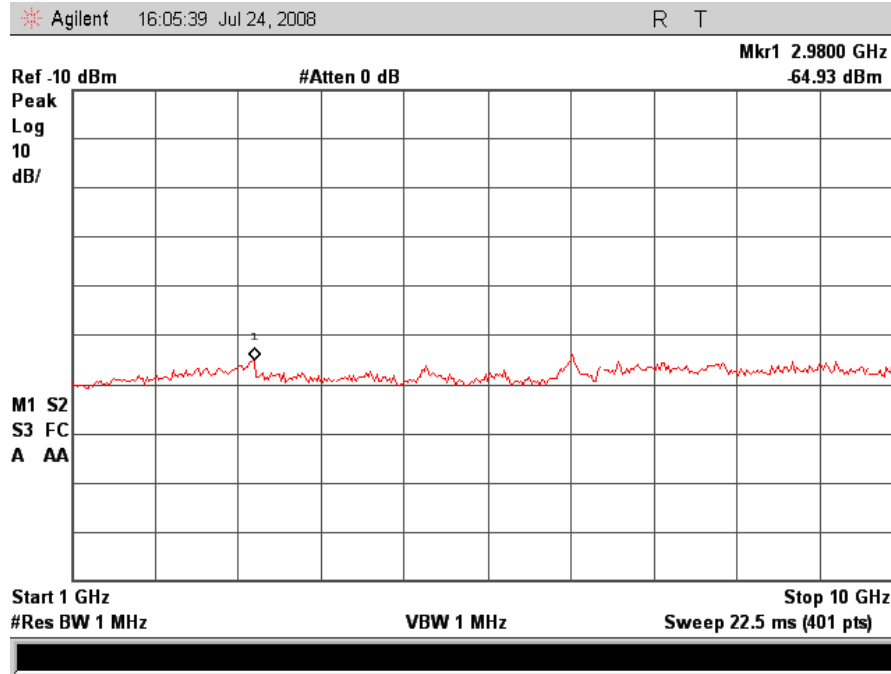
Plot 50. Radiated Spurious Emissions – Low Channel, Downlink



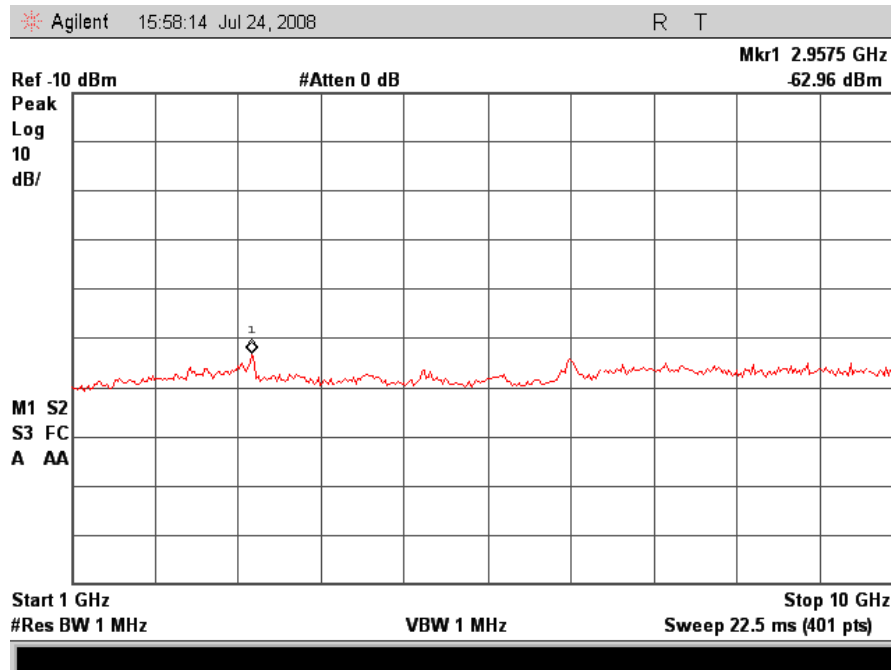
Plot 51. Radiated Spurious Emissions – Low Channel, Uplink



Radiated Spurious Emissions Test Results – Cellular Band



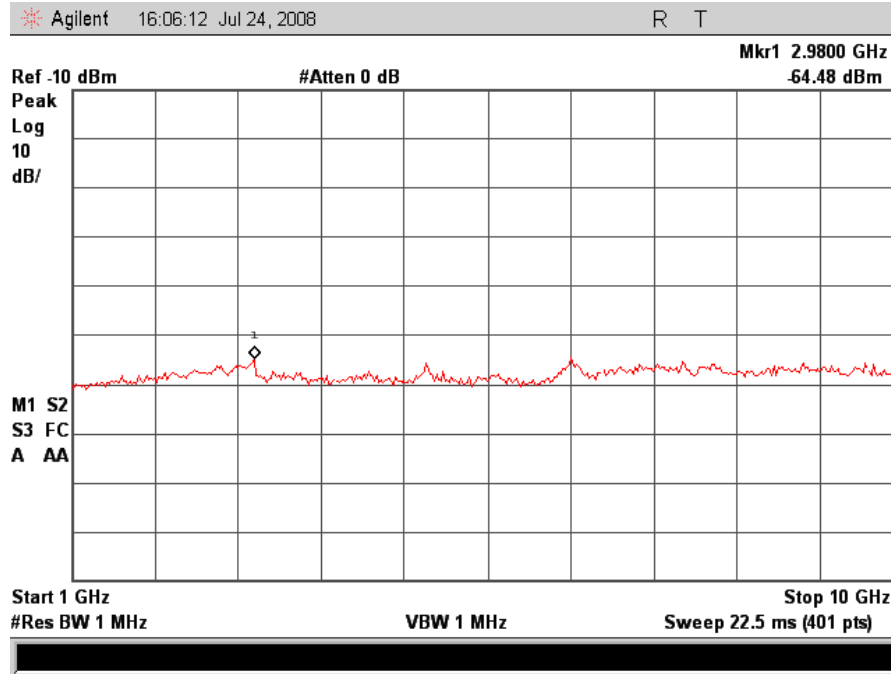
Plot 52. Radiated Spurious Emissions – Mid Channel, Downlink



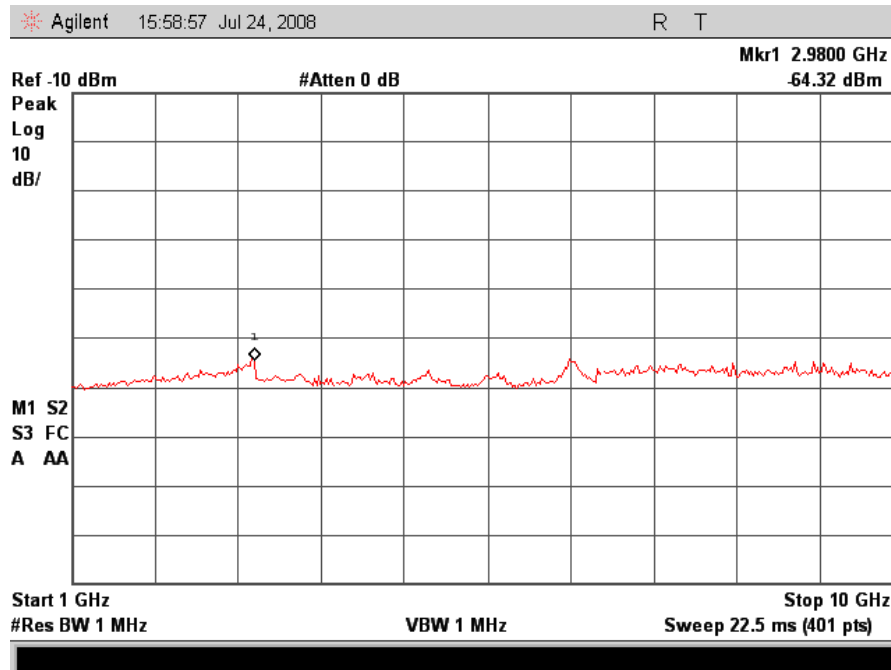
Plot 53. Radiated Spurious Emissions – Mid Channel, Uplink



Radiated Spurious Emissions Test Results – Cellular Band



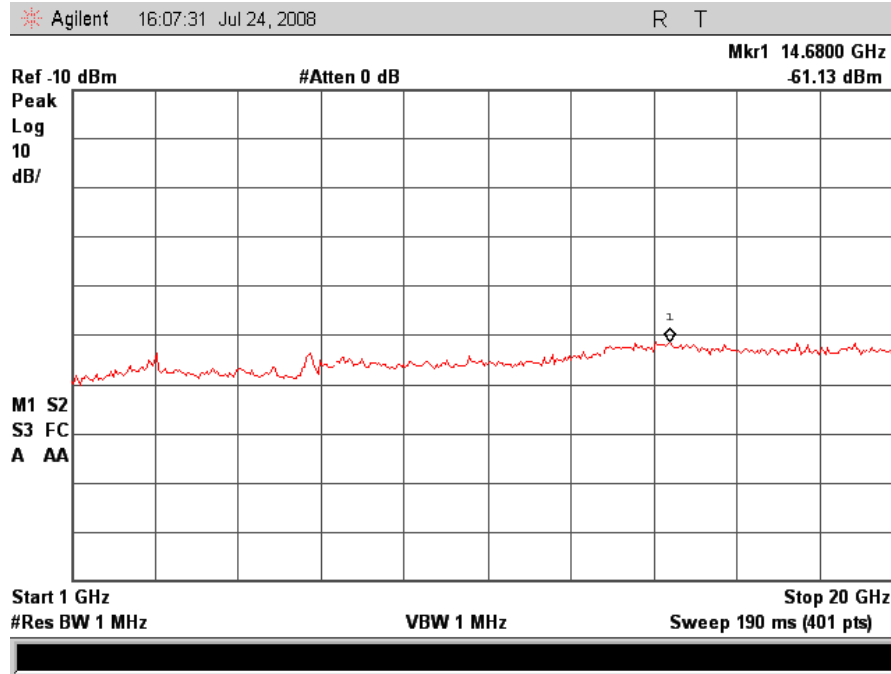
Plot 54. Radiated Spurious Emissions – High Channel, Downlink



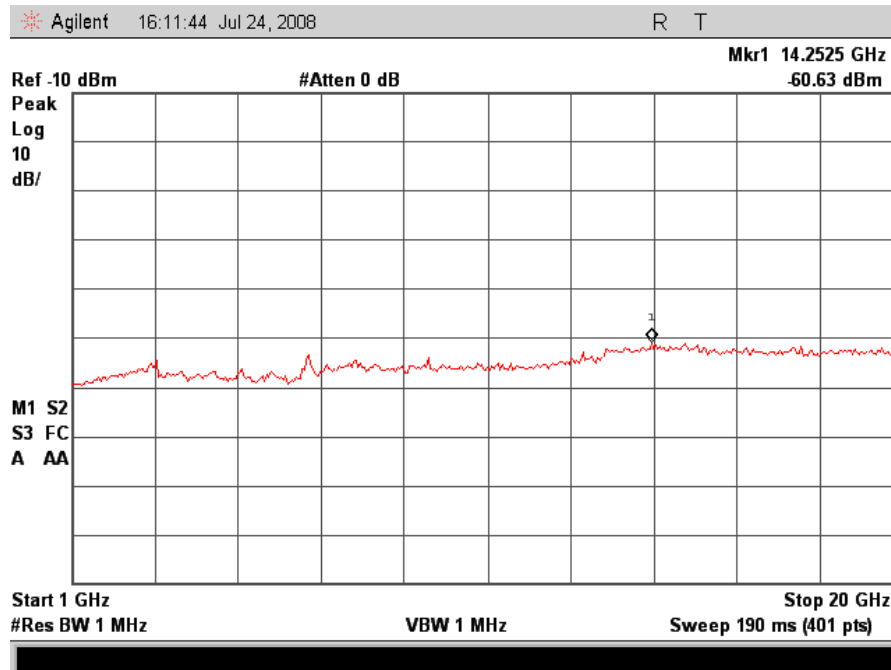
Plot 55. Radiated Spurious Emissions – High Channel, Uplink



Radiated Spurious Emissions Test Results – PCS Band



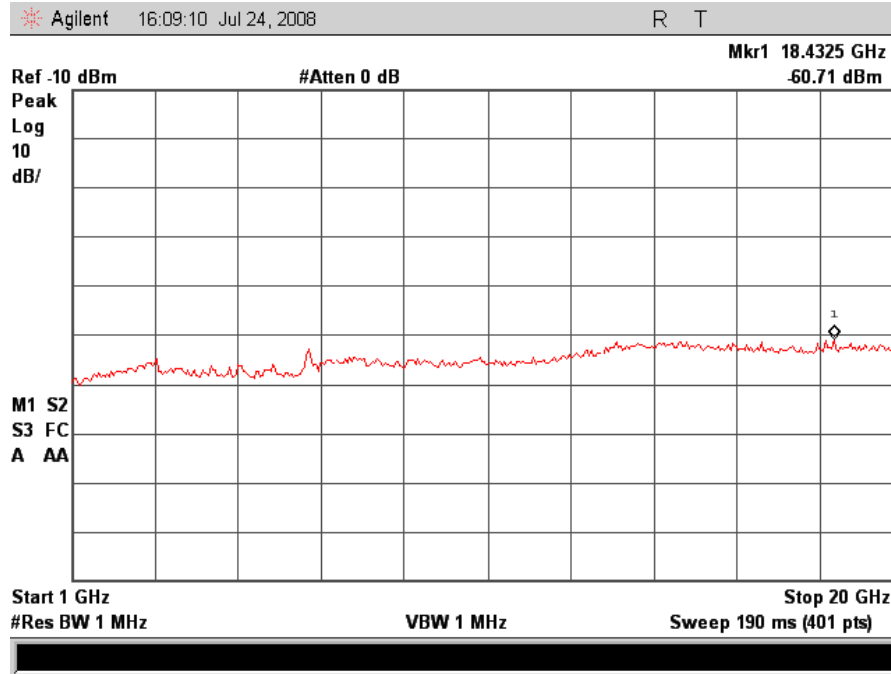
Plot 56. Radiated Spurious Emissions – Low Channel, Downlink



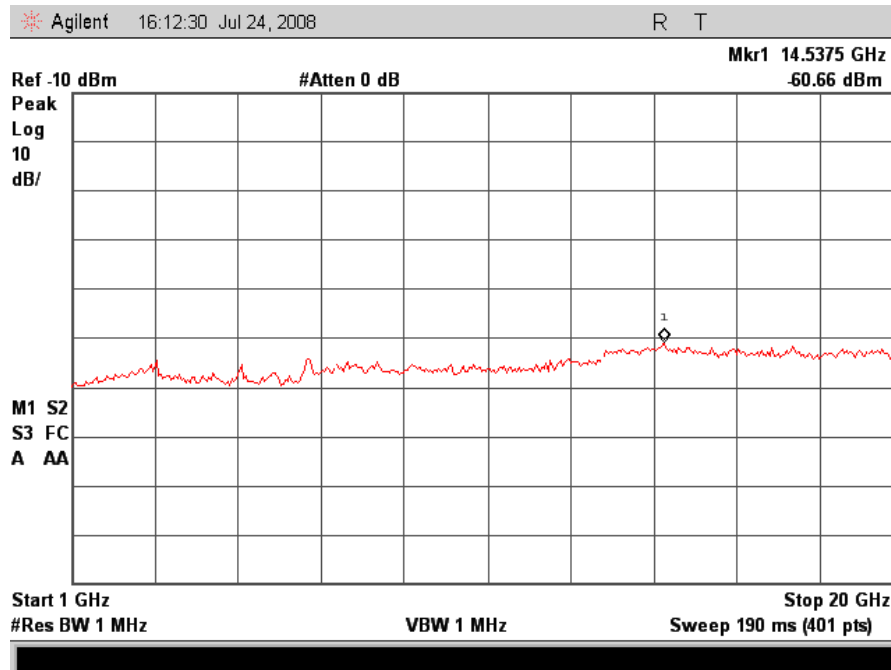
Plot 57. Radiated Spurious Emissions – Low Channel, Uplink



Radiated Spurious Emissions Test Results – PCS Band



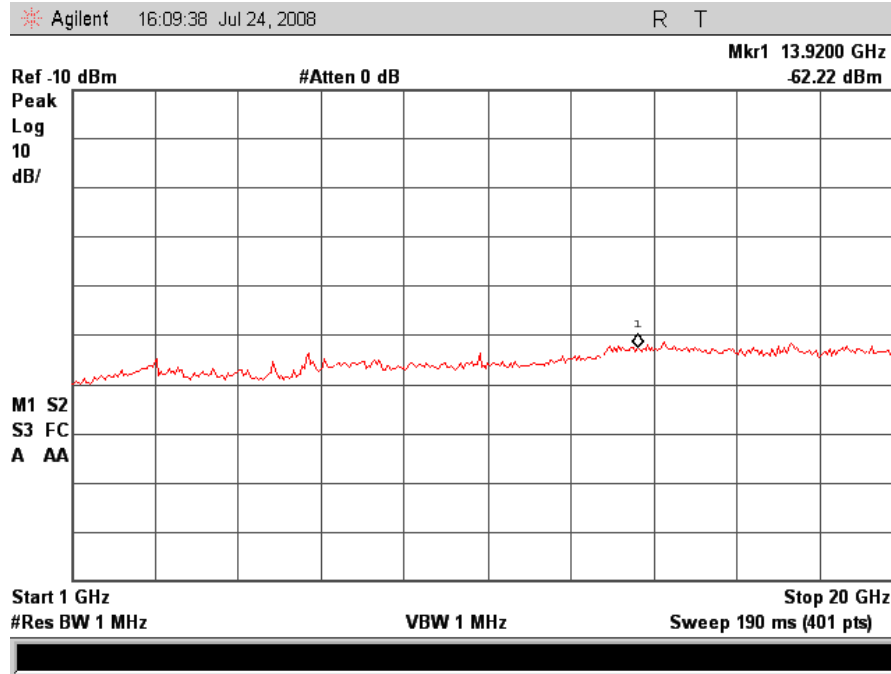
Plot 58. Radiated Spurious Emissions – Mid Channel, Downlink



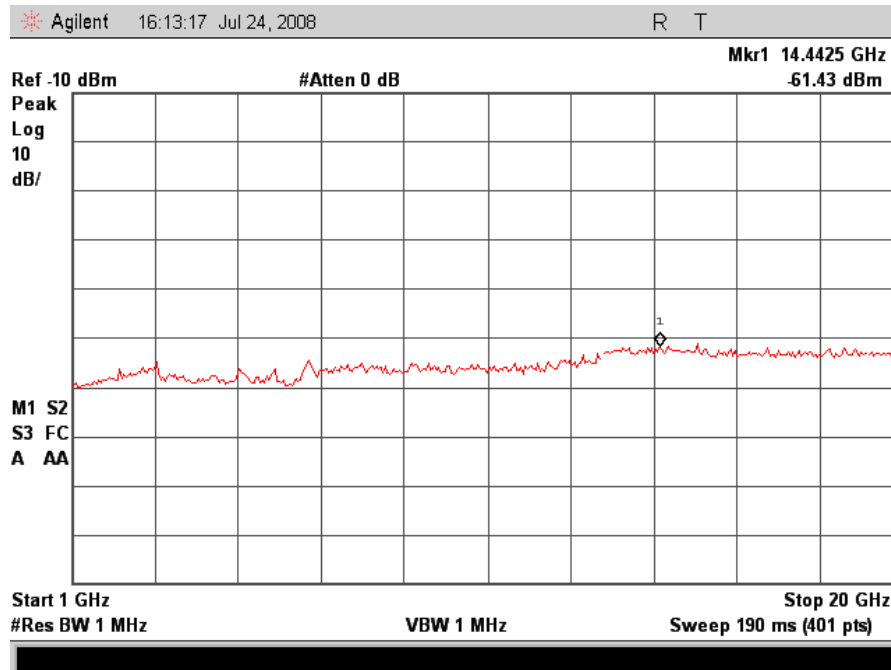
Plot 59. Radiated Spurious Emissions – Mid Channel, Uplink



Radiated Spurious Emissions Test Results – PCS Band



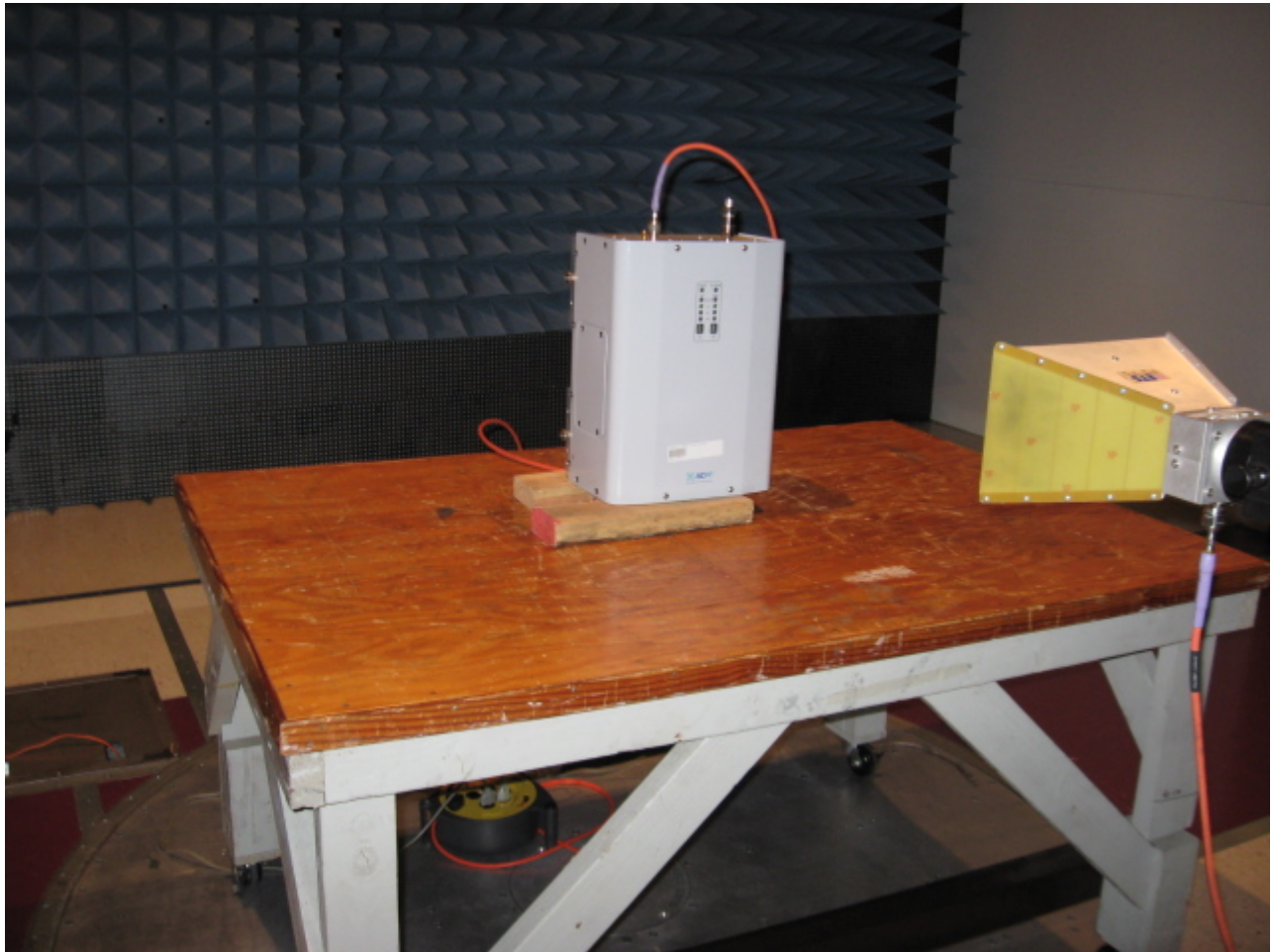
Plot 60. Radiated Spurious Emissions – High Channel, Downlink



Plot 61. Radiated Spurious Emissions – High Channel, Uplink



Electromagnetic Compatibility Criteria for Intentional Radiators



Photograph 3. 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.

§ 22.917, §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.

§ 22.917 (a), § 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 10th 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.

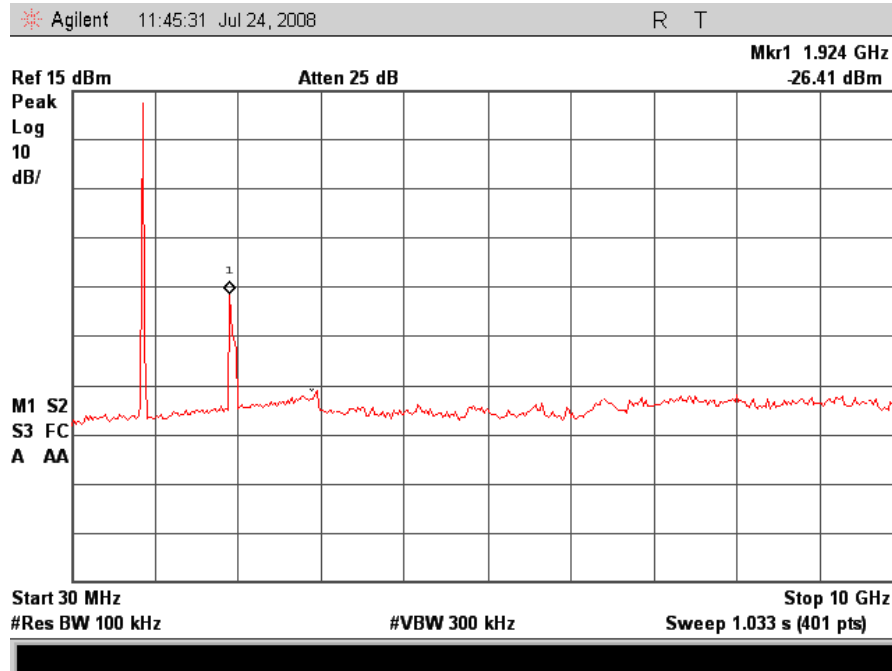
Test Engineer(s): Anderson Soungpanya

Test Date(s): July 24, 2008

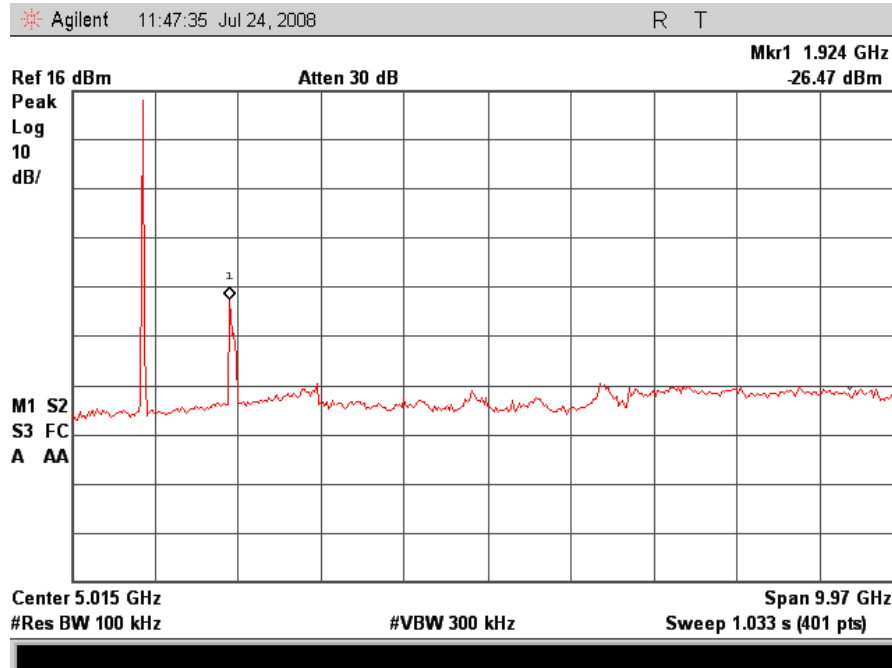


Spurious Emissions at Antenna Terminals Test Results

§ 2.1051 Spurious Emissions at Antenna Terminals – Cellular, CDMA



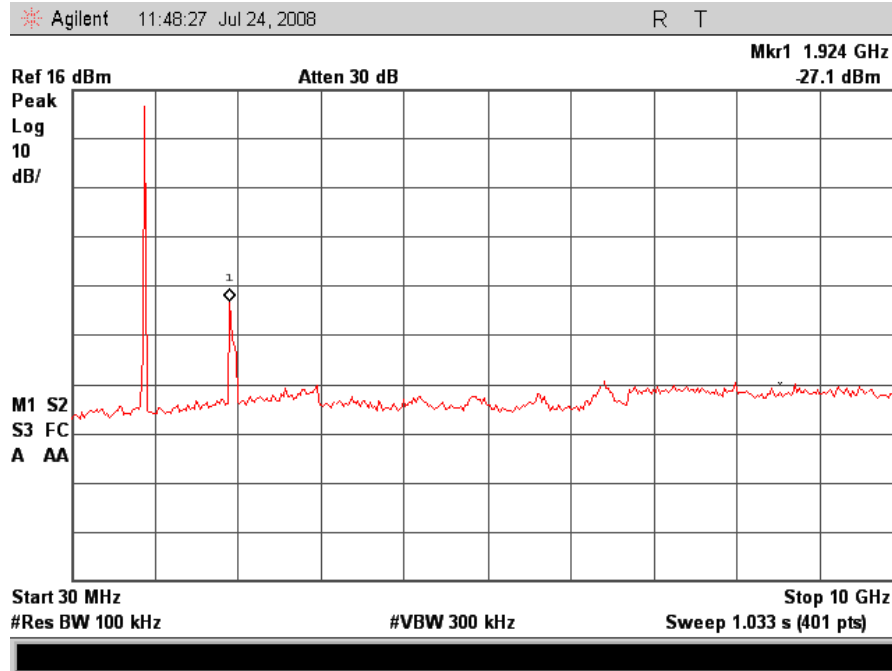
Plot 62. Conducted Spurious Emissions, CDMA Low Channel Downlink, 30MHz – 10GHz



Plot 63. Conducted Spurious Emissions, CDMA Mid Channel Downlink, 30MHz – 10GHz



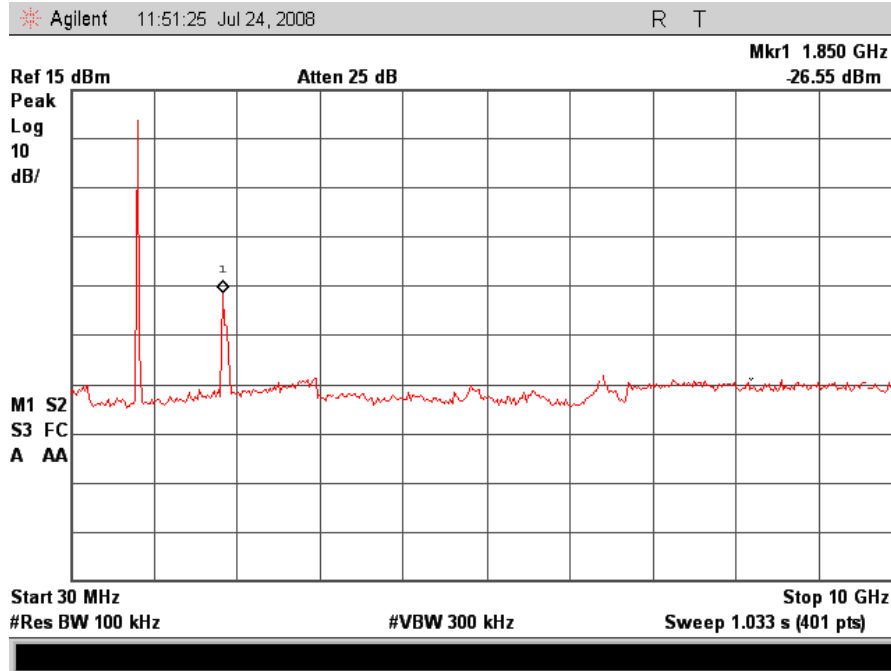
§ 2.1051 Spurious Emissions at Antenna Terminals – Cellular, CDMA



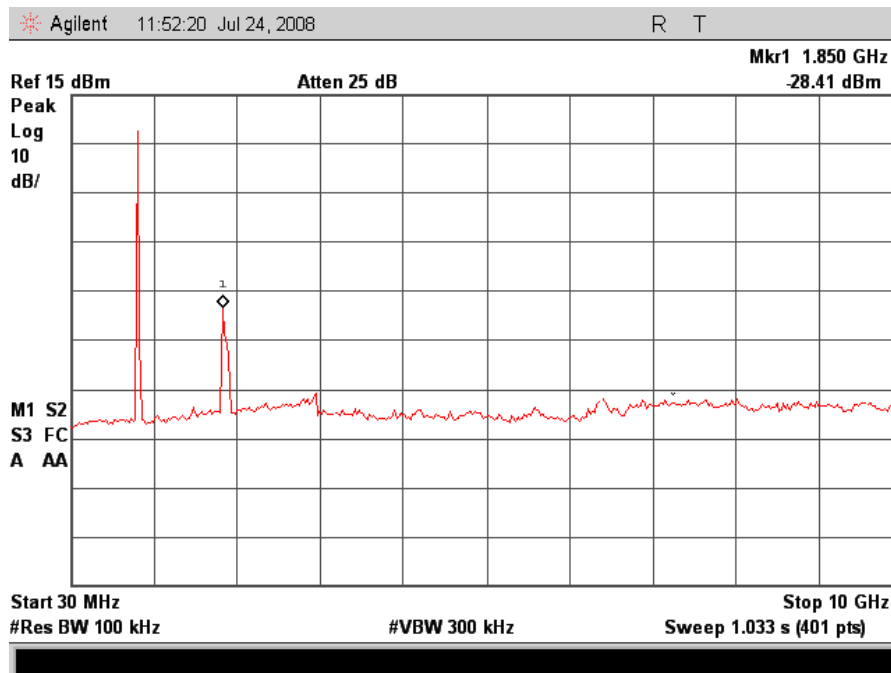
Plot 64. Conducted Spurious Emissions, CDMA High Channel Downlink, 30MHz – 10GHz



§ 2.1051 Spurious Emissions at Antenna Terminals – Cellular, CDMA



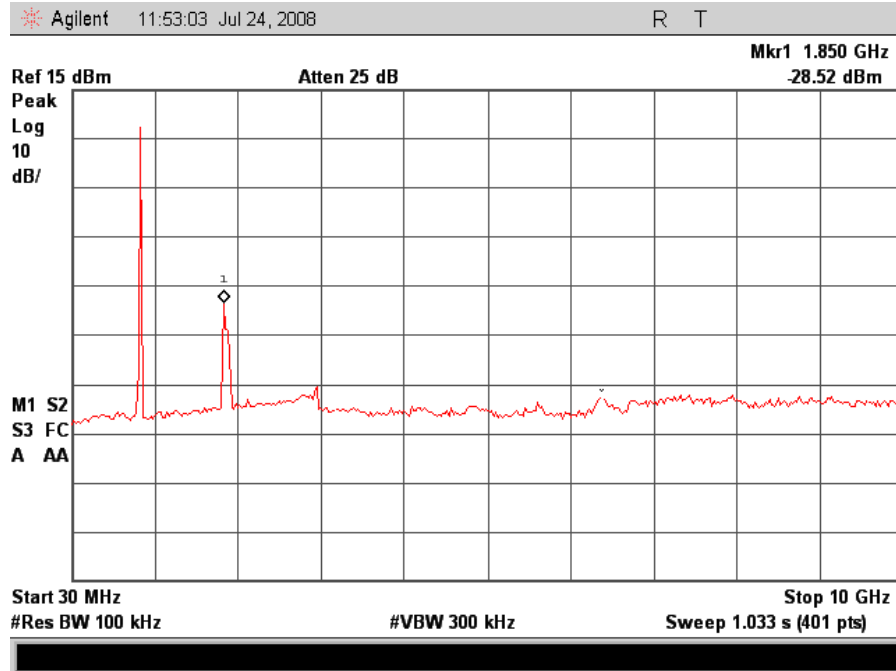
Plot 65. Conducted Spurious Emissions, CDMA Low Channel Uplink, 30MHz – 10GHz



Plot 66. Conducted Spurious Emissions, CDMA Mid Channel Uplink, 30MHz – 10GHz



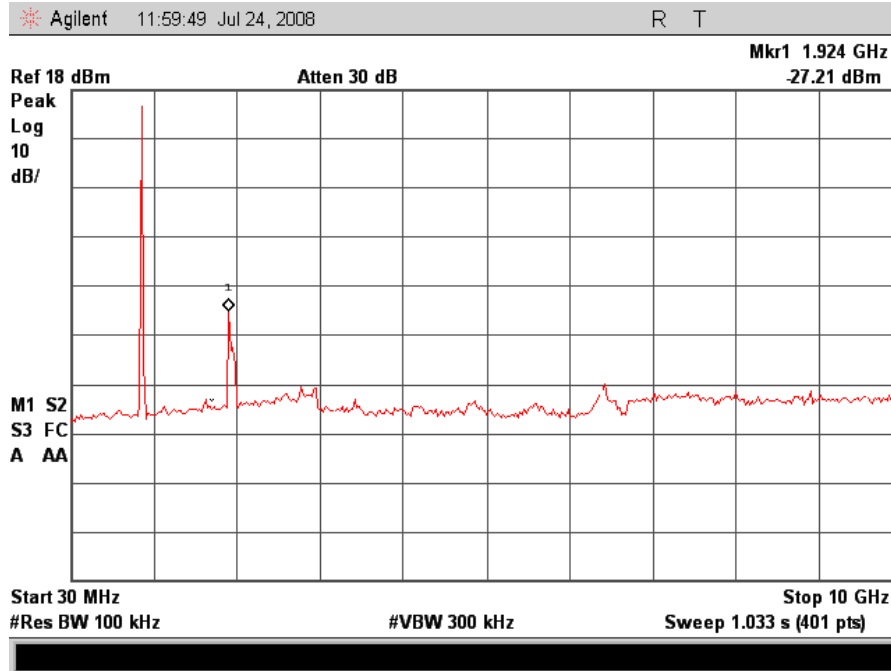
§ 2.1051 Spurious Emissions at Antenna Terminals – Cellular, CDMA



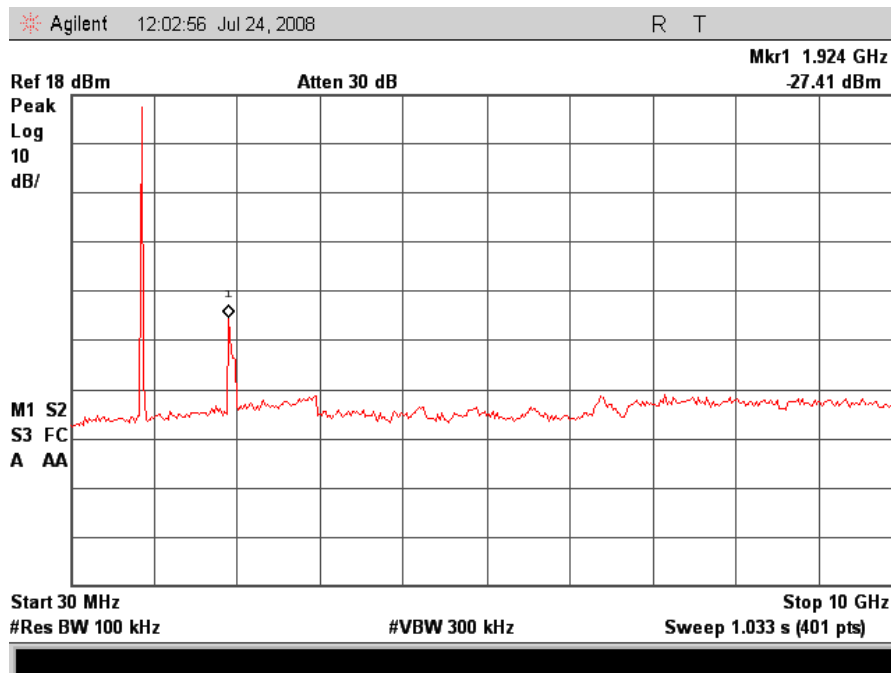
Plot 67. Conducted Spurious Emissions, CDMA High Channel Uplink, 30MHz – 10GHz



§ 2.1051 Spurious Emissions at Antenna Terminals – Cellular, GSM



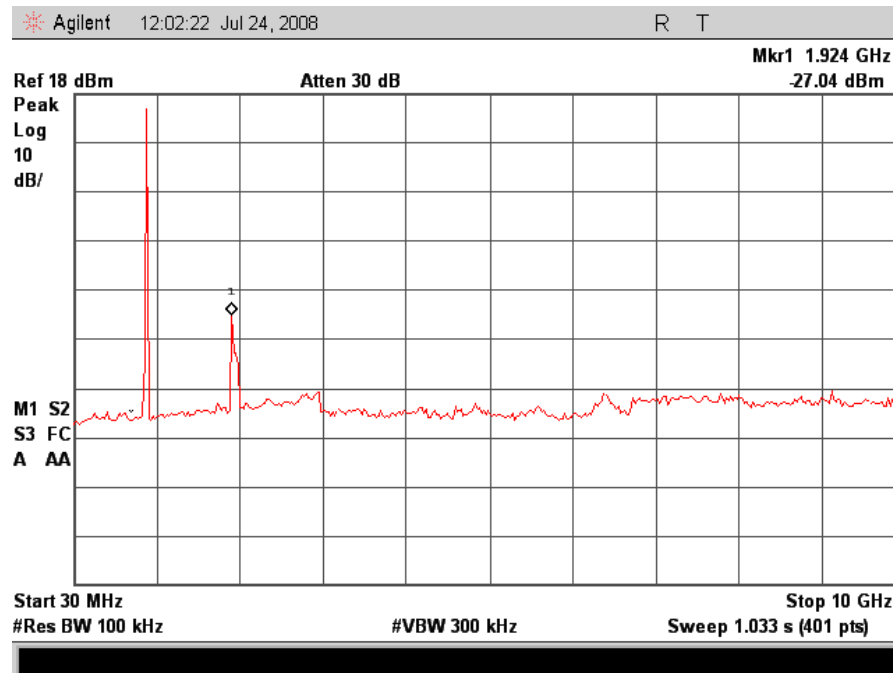
Plot 68. Conducted Spurious Emissions, GSM Low Channel Downlink, 30MHz – 10GHz



Plot 69. Conducted Spurious Emissions, GSM Mid Channel Downlink, 30MHz – 10GHz



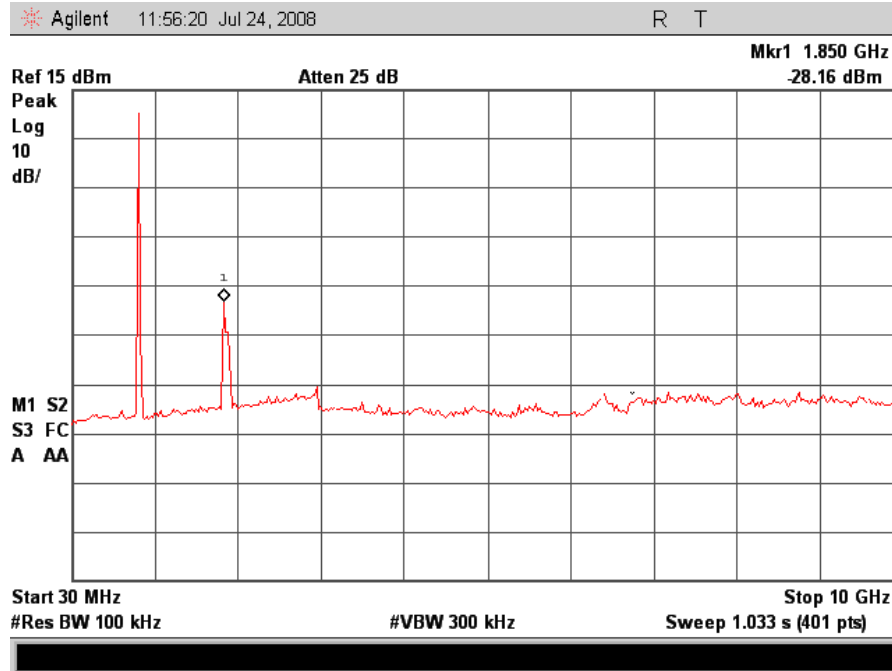
§ 2.1051 Spurious Emissions at Antenna Terminals – Cellular, GSM



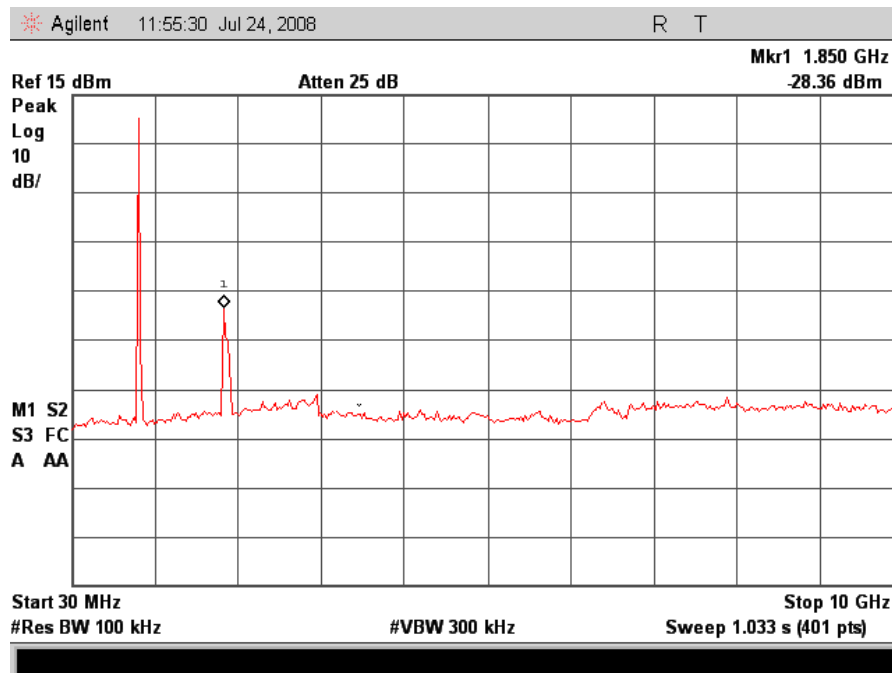
Plot 70. Conducted Spurious Emissions, GSM High Channel Downlink, 30MHz – 10GHz



§ 2.1051 Spurious Emissions at Antenna Terminals – Cellular, GSM



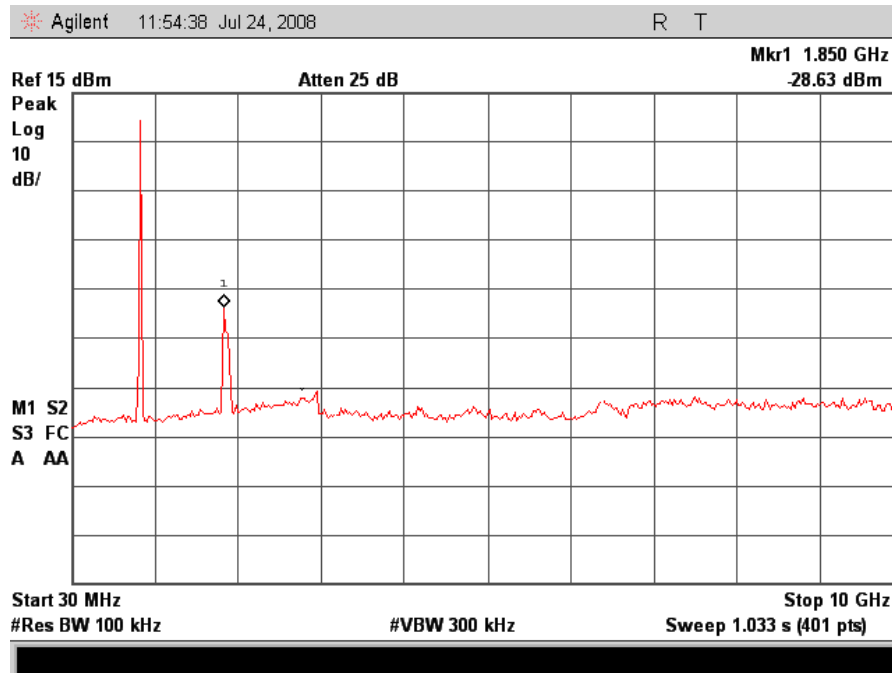
Plot 71. Conducted Spurious Emissions, CDMA Low Channel Uplink, 30MHz – 10GHz



Plot 72. Conducted Spurious Emissions, CDMA Mid Channel Uplink, 30MHz – 10GHz



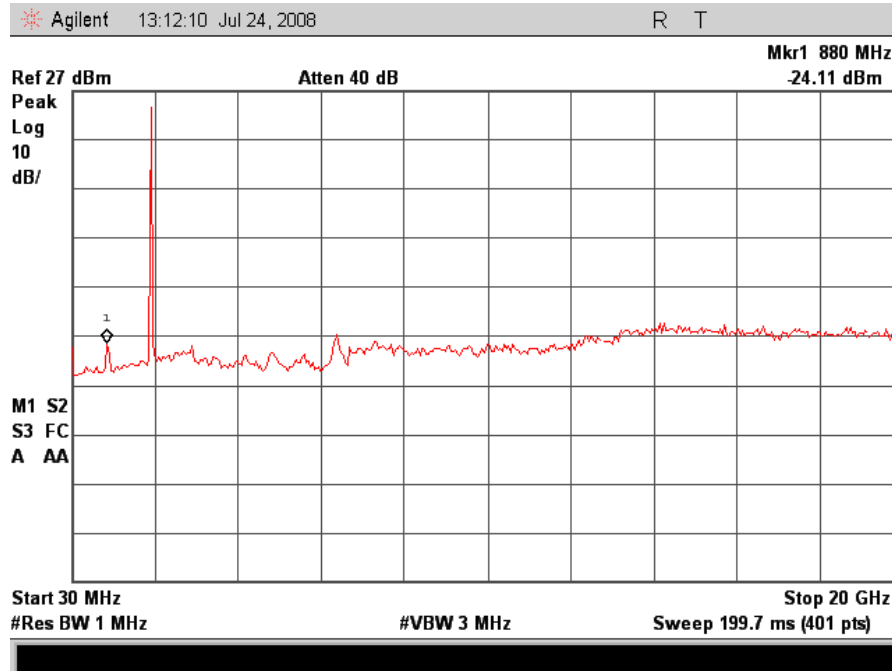
§ 2.1051 Spurious Emissions at Antenna Terminals – Cellular, GSM



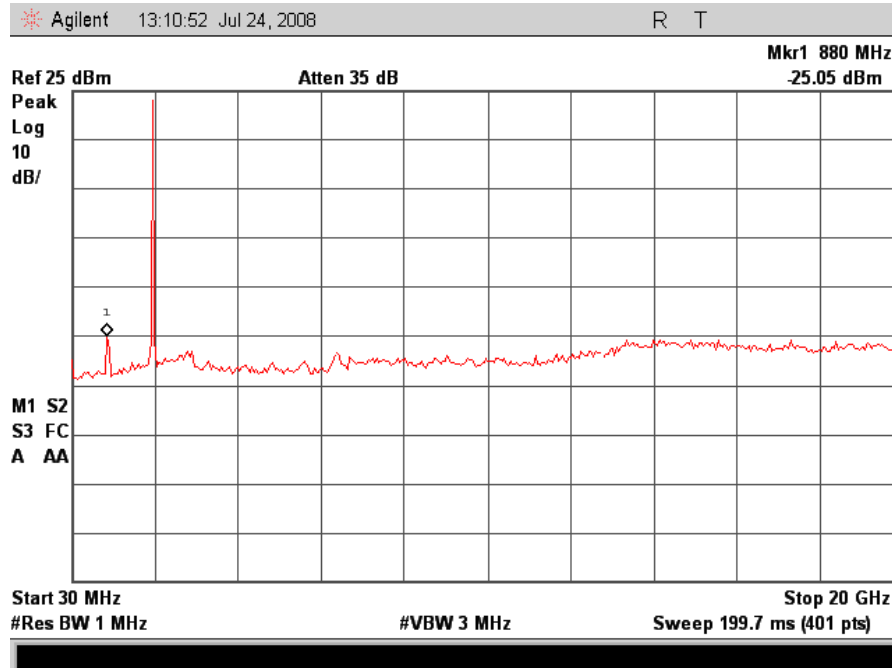


Spurious Emissions at Antenna Terminals Test Results

§ 2.1051 Spurious Emissions at Antenna Terminals – PCS, CDMA



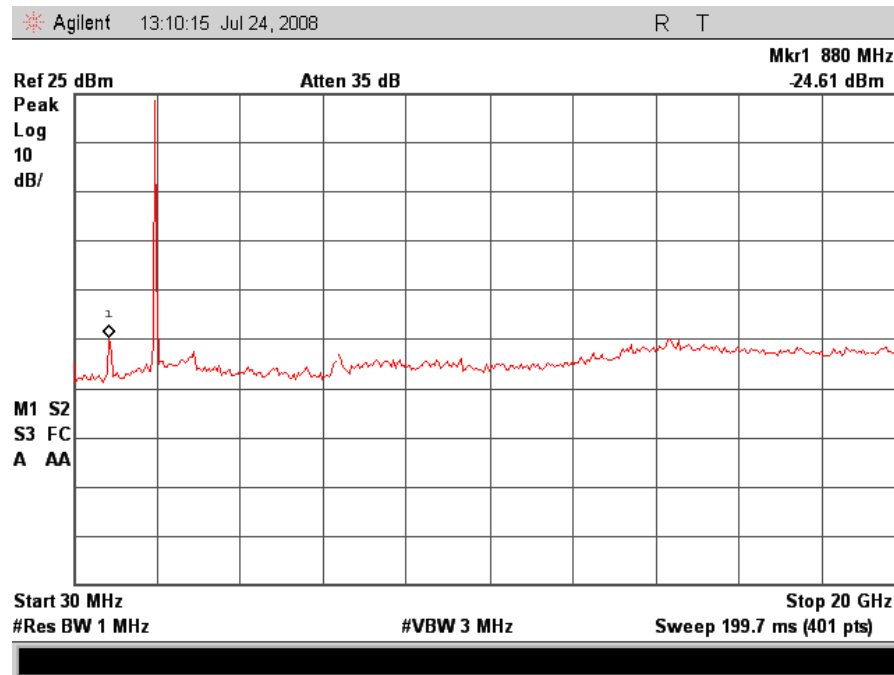
Plot 74. Conducted Spurious Emissions, CDMA Low Channel Downlink, 30MHz – 20GHz



Plot 75. Conducted Spurious Emissions, CDMA Mid Channel Downlink, 30MHz – 20GHz



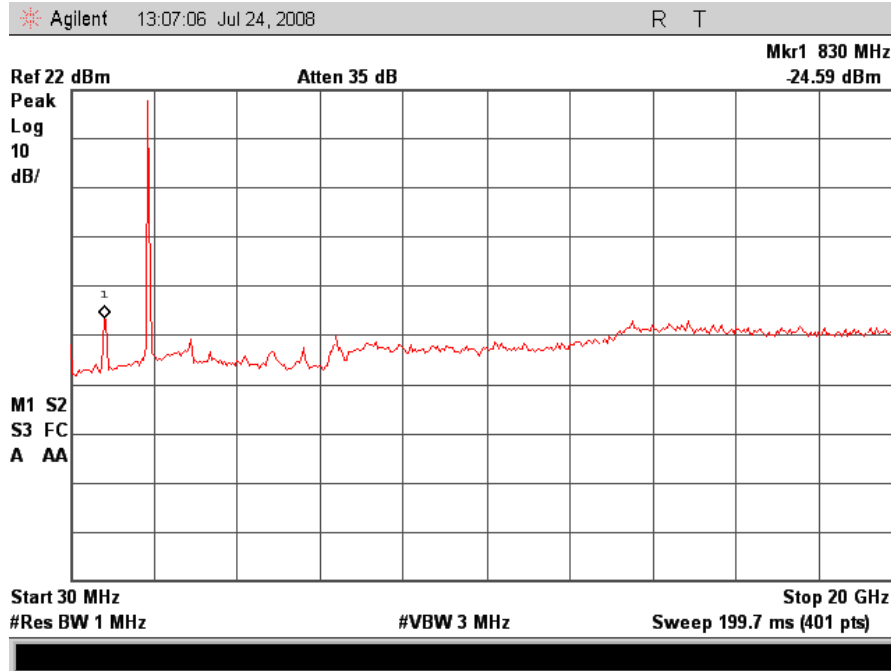
§ 2.1051 Spurious Emissions at Antenna Terminals – PCS, CDMA



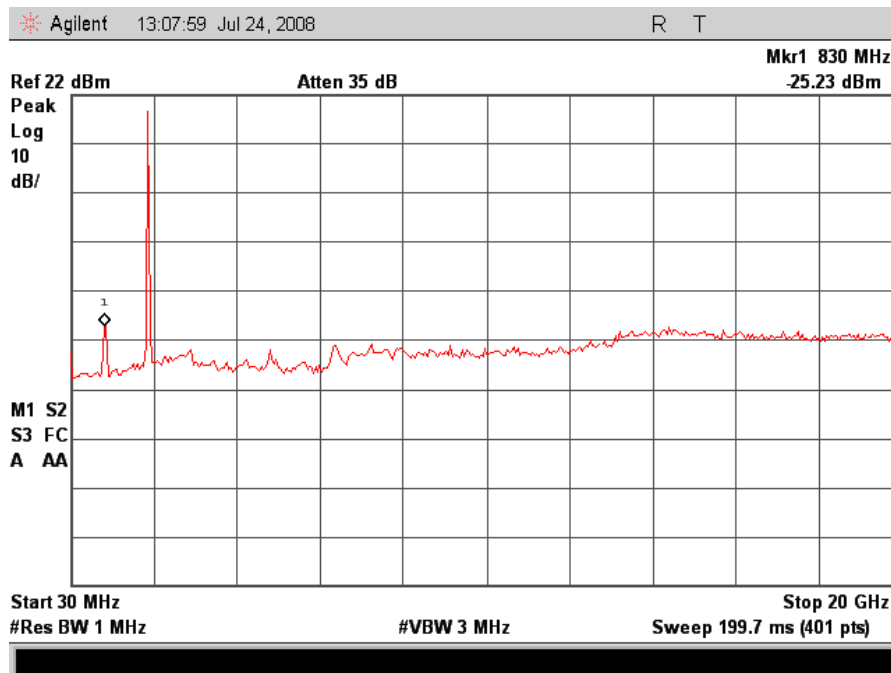
Plot 76. Conducted Spurious Emissions, CDMA High Channel Downlink, 30MHz – 20GHz



§ 2.1051 Spurious Emissions at Antenna Terminals – PCS, CDMA



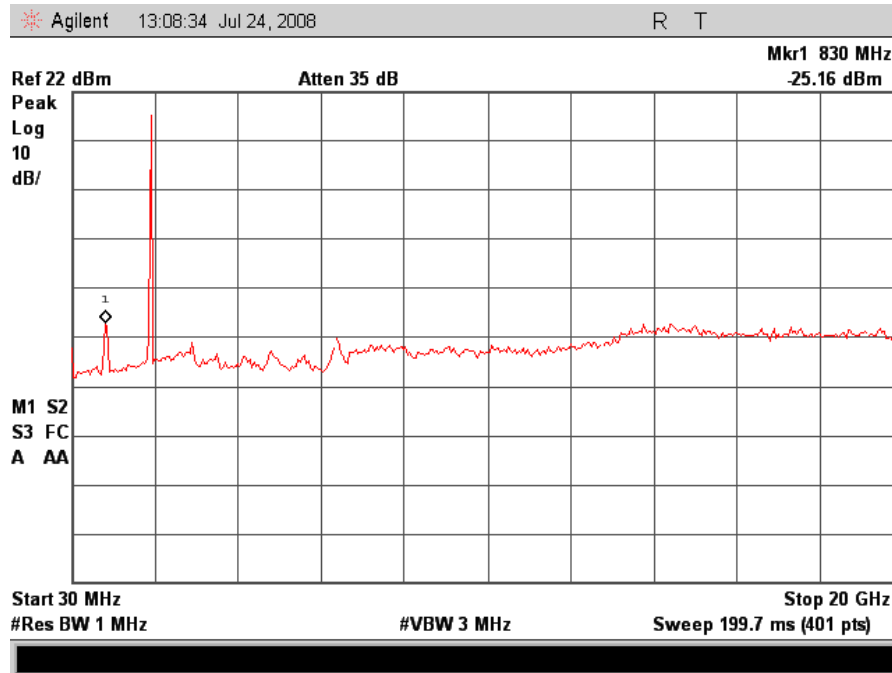
Plot 77. Conducted Spurious Emissions, CDMA Low Channel Uplink, 30MHz – 20GHz



Plot 78. Conducted Spurious Emissions, CDMA Mid Channel Uplink, 30MHz – 20GHz



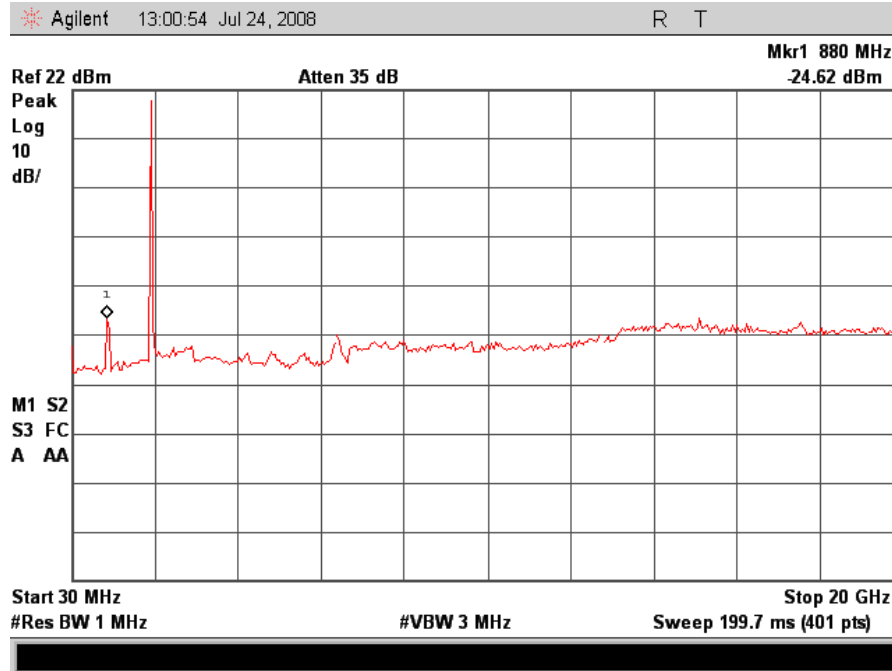
§ 2.1051 Spurious Emissions at Antenna Terminals – PCS, CDMA



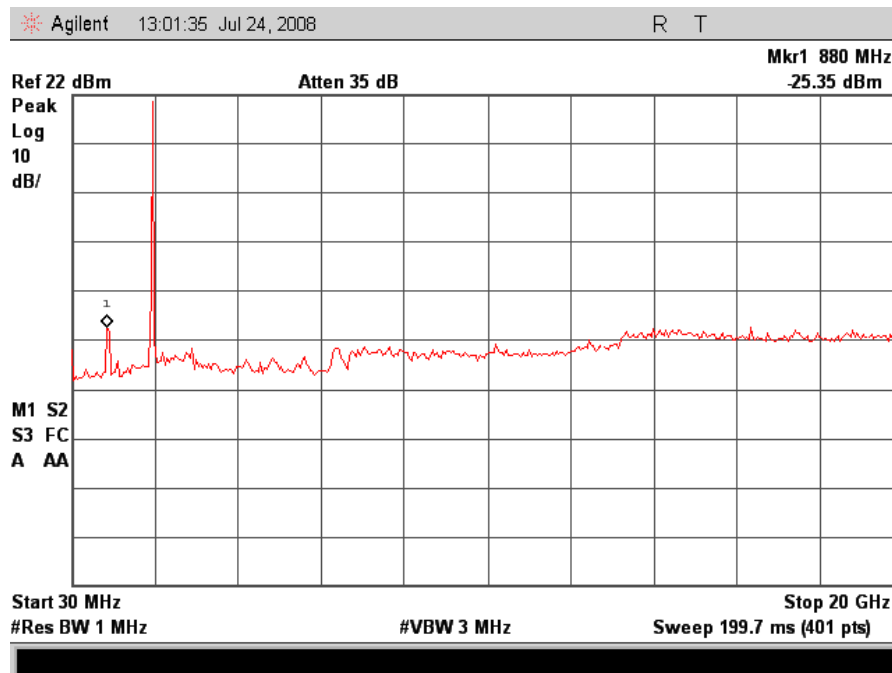
Plot 79. Conducted Spurious Emissions, CDMA High Channel Uplink, 30MHz – 20GHz



§ 2.1051 Spurious Emissions at Antenna Terminals – PCS, GSM



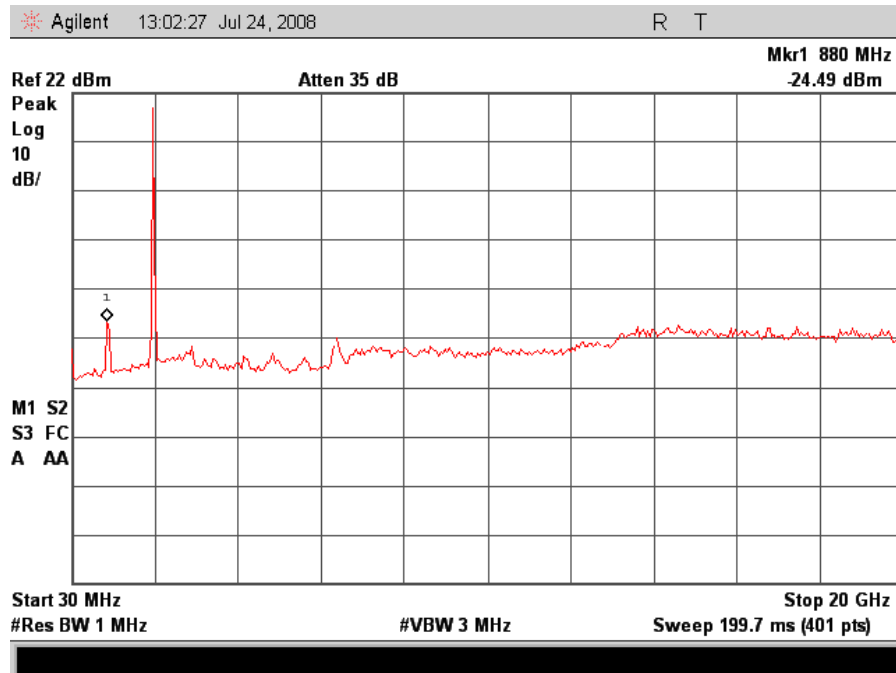
Plot 80. Conducted Spurious Emissions, GSM Low Channel Downlink, 30MHz – 20GHz



Plot 81. Conducted Spurious Emissions, GSM Mid Channel Downlink, 30MHz – 20GHz

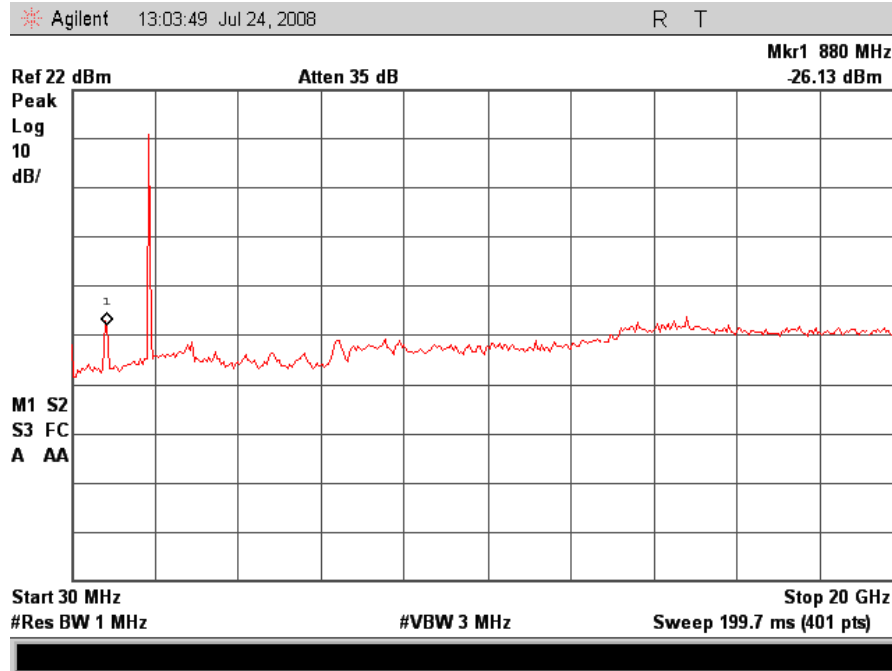


§ 2.1051 Spurious Emissions at Antenna Terminals – PCS, GSM

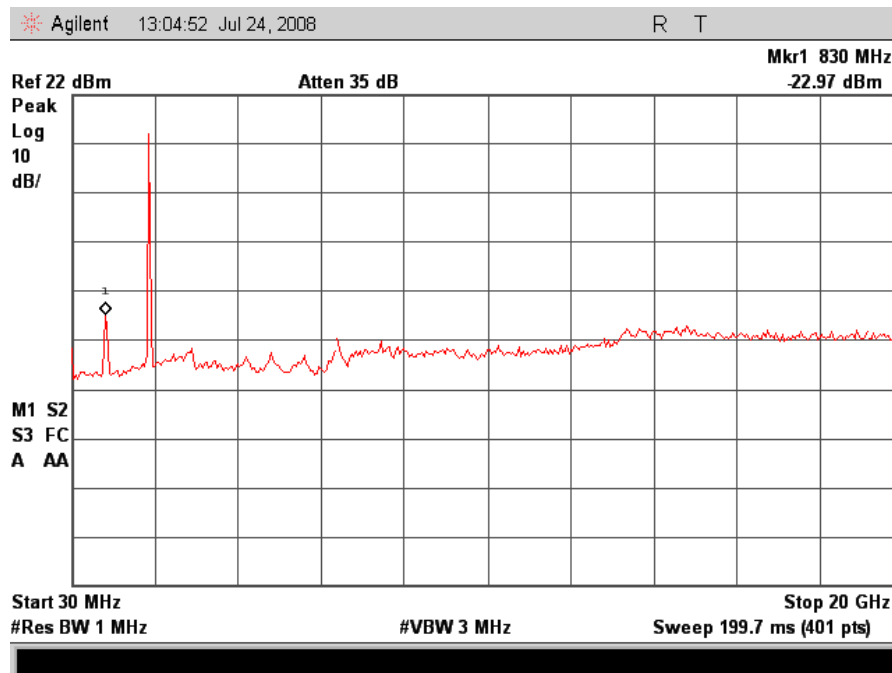




§ 2.1051 Spurious Emissions at Antenna Terminals – PCS, GSM



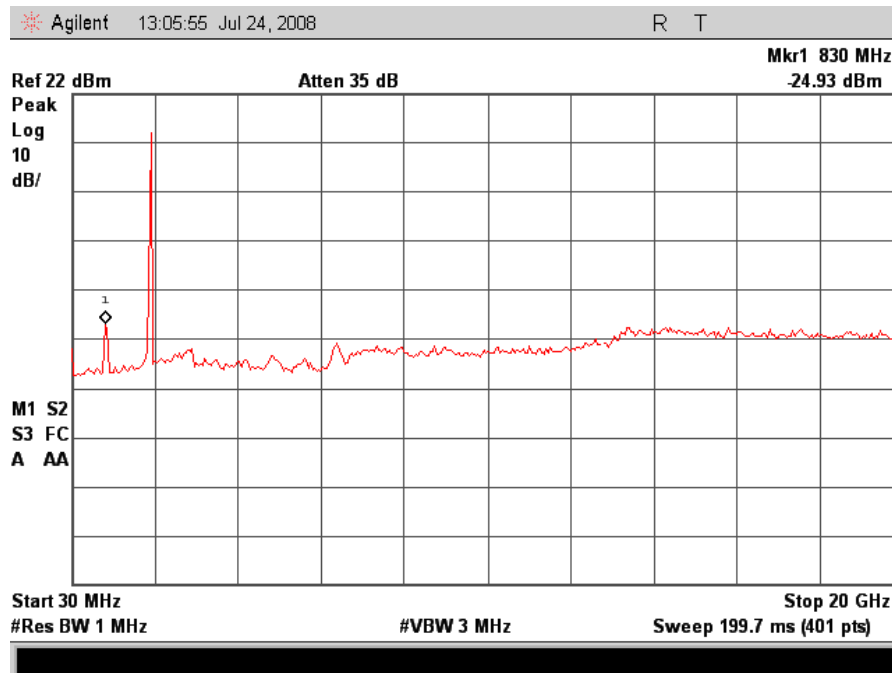
Plot 83. Conducted Spurious Emissions, GSM Low Channel Uplink, 30MHz – 20GHz



Plot 84. Conducted Spurious Emissions, GSM Mid Channel Uplink, 30MHz – 20GHz



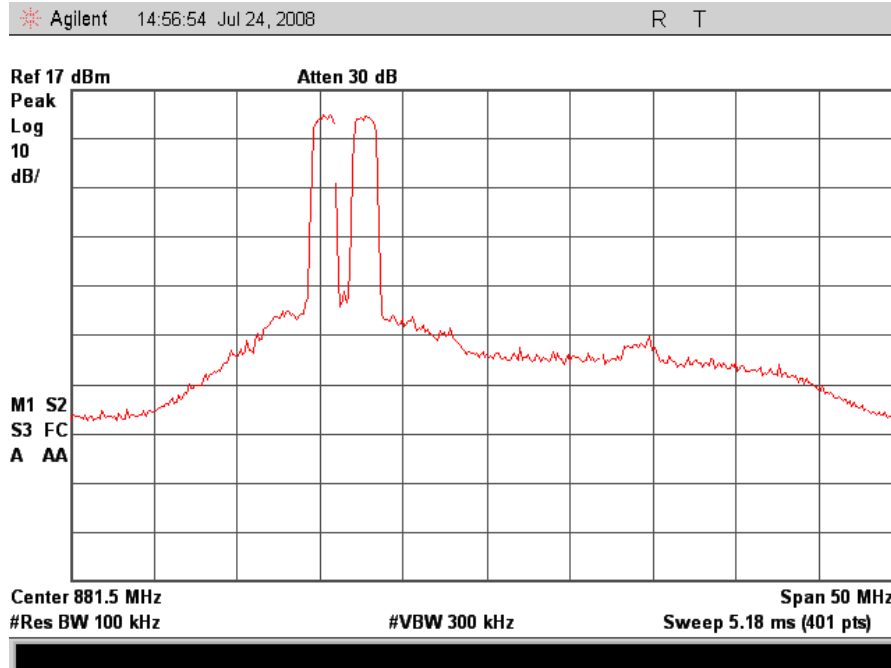
§ 2.1051 Spurious Emissions at Antenna Terminals – PCS, GSM



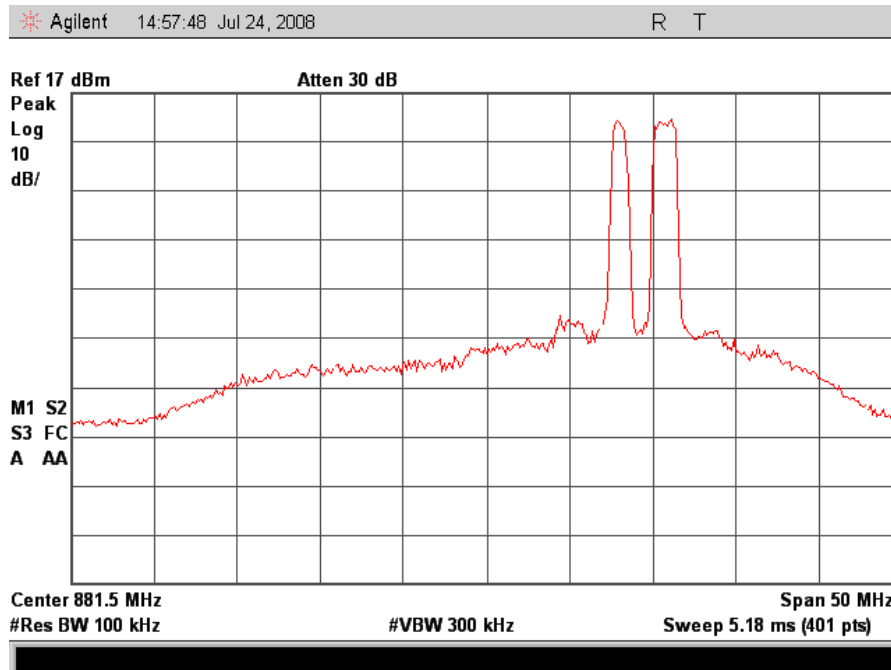
Plot 85. Conducted Spurious Emissions, GSM High Channel Uplink, 30MHz – 20GHz



§ 2.1051 Spurious Emissions at Antenna Terminals – Cellular, CDMA



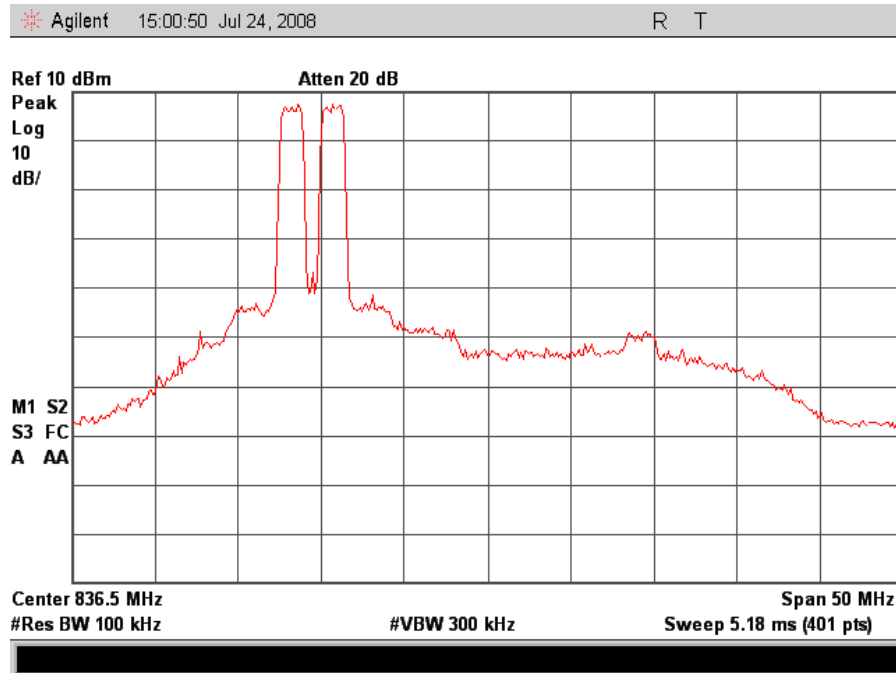
Plot 86. CDMA Intermodulation, Downlink Low End



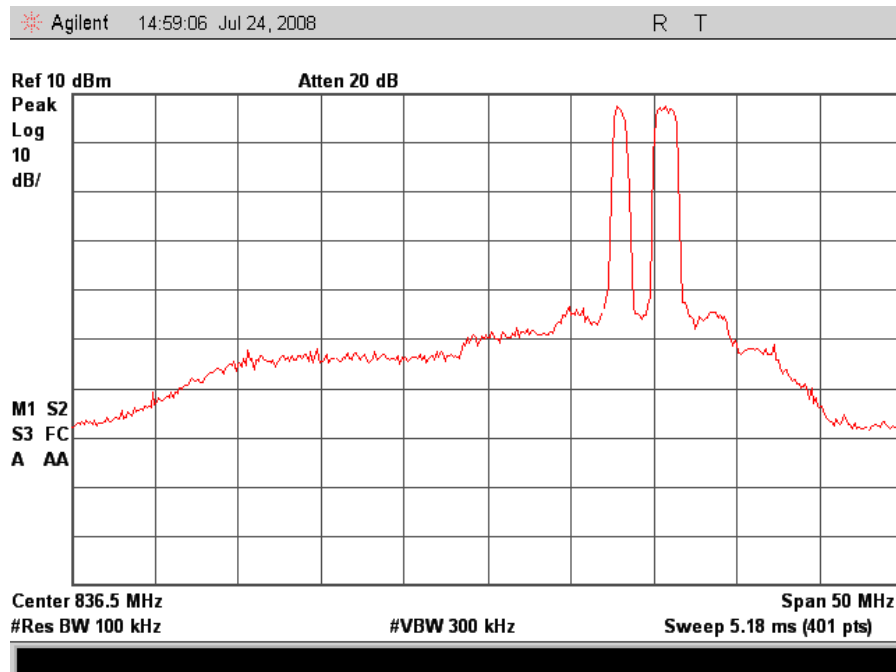
Plot 87. CDMA Intermodulation, Downlink High End



§ 2.1051 Spurious Emissions at Antenna Terminals – Cellular, CDMA



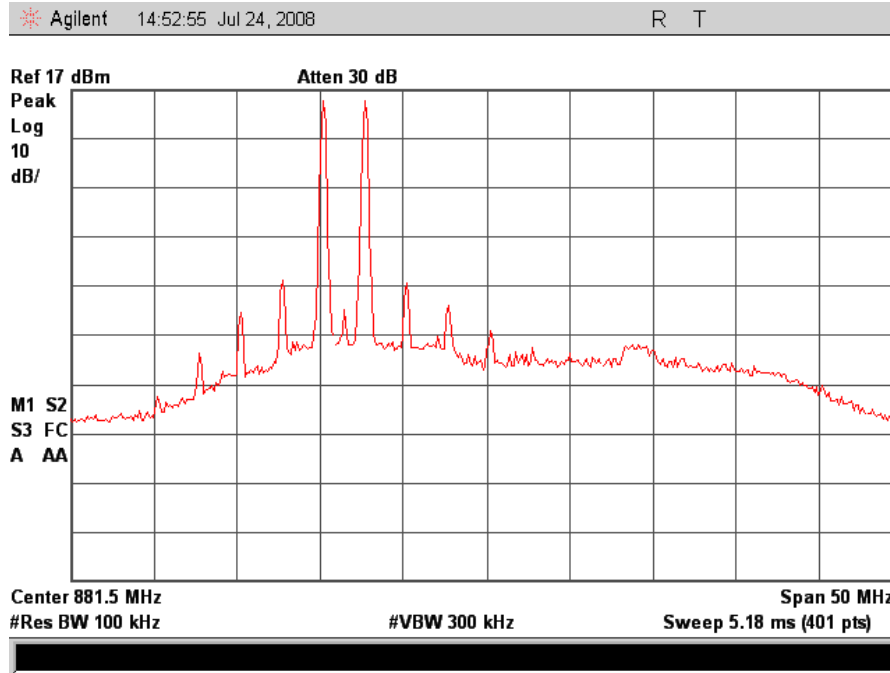
Plot 88. CDMA Intermodulation, Uplink Low End



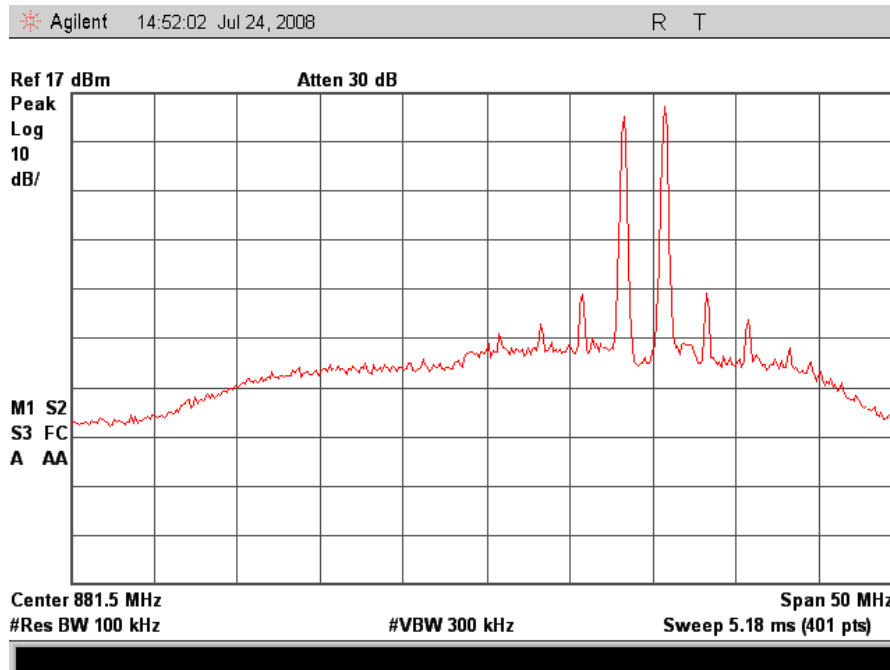
Plot 89. CDMA Intermodulation, Uplink High End



§ 2.1051 Spurious Emissions at Antenna Terminals – Cellular, GSM



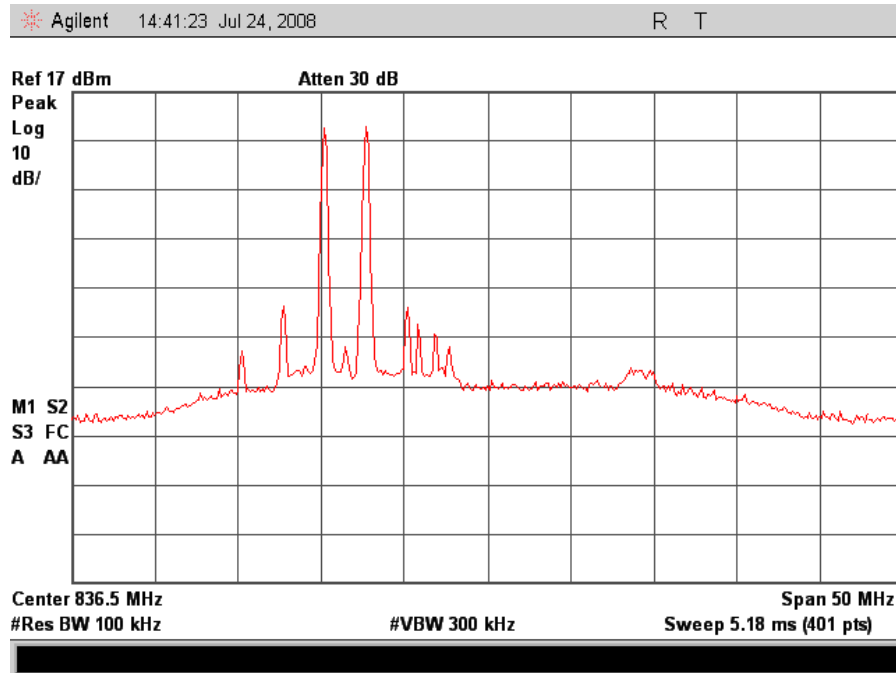
Plot 90. GSM Intermodulation, Downlink Low End



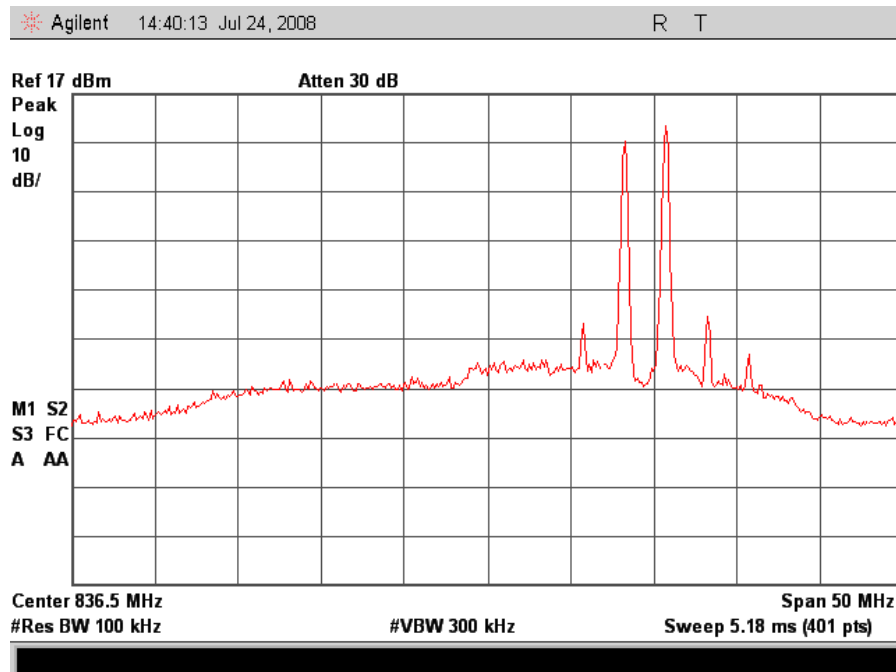
Plot 91. GSM Intermodulation, Downlink High End



§ 2.1051 Spurious Emissions at Antenna Terminals – Cellular, GSM



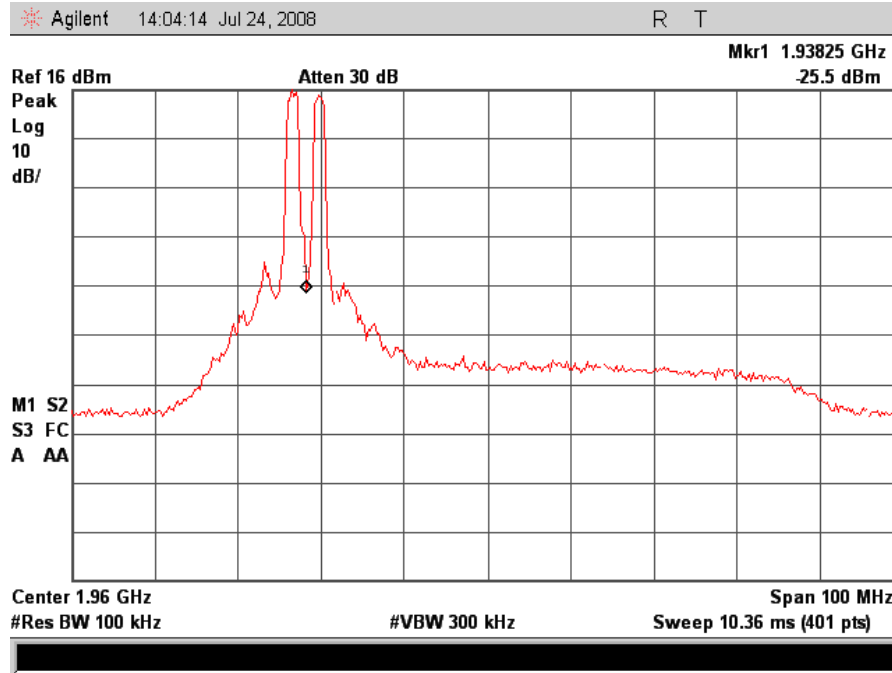
Plot 92. GSM Intermodulation, Uplink Low End



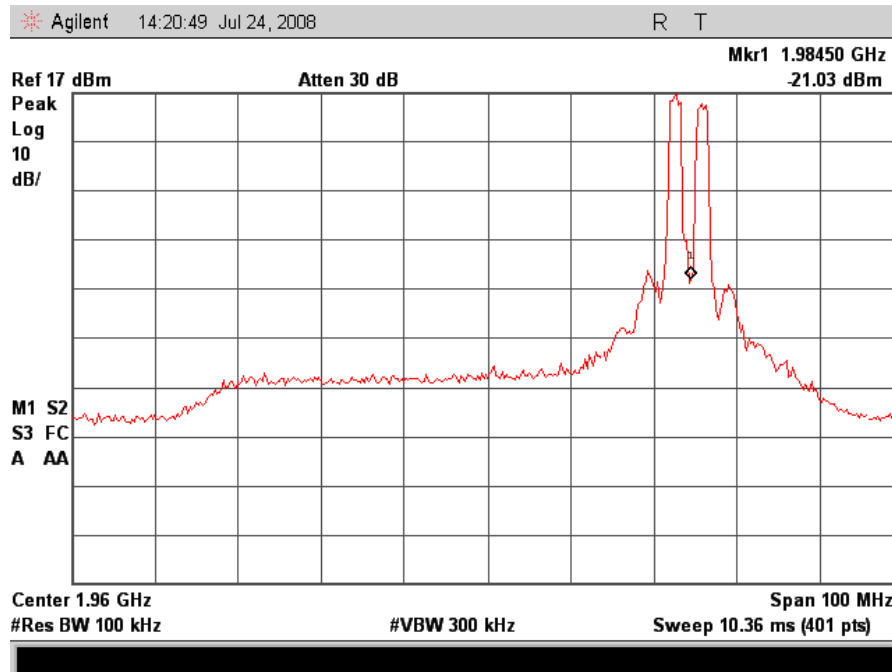
Plot 93. GSM Intermodulation, Uplink High End



§ 2.1051 Spurious Emissions at Antenna Terminals – PCS, CDMA



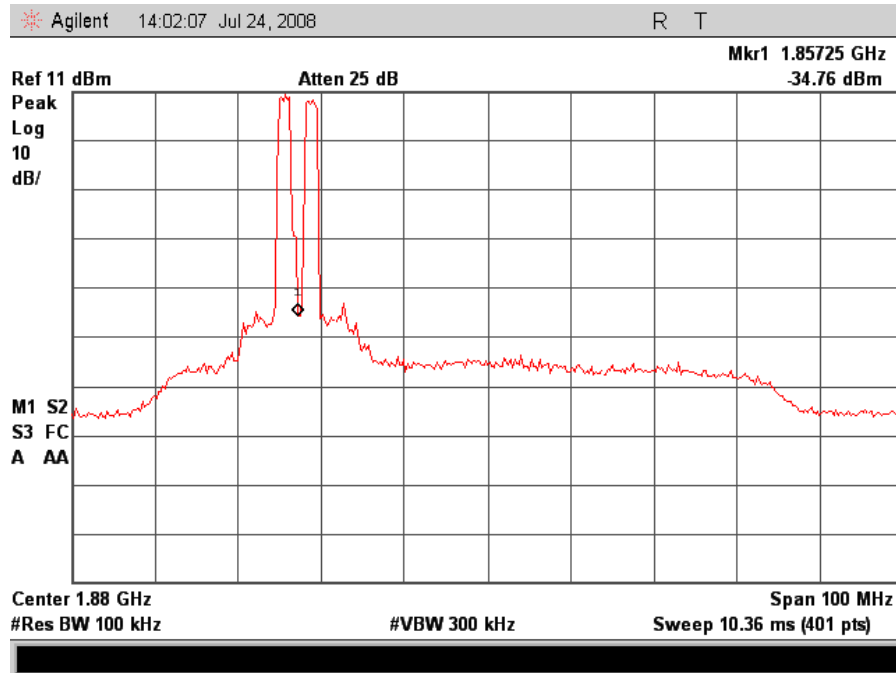
Plot 94. CDMA Intermodulation, Downlink Low End



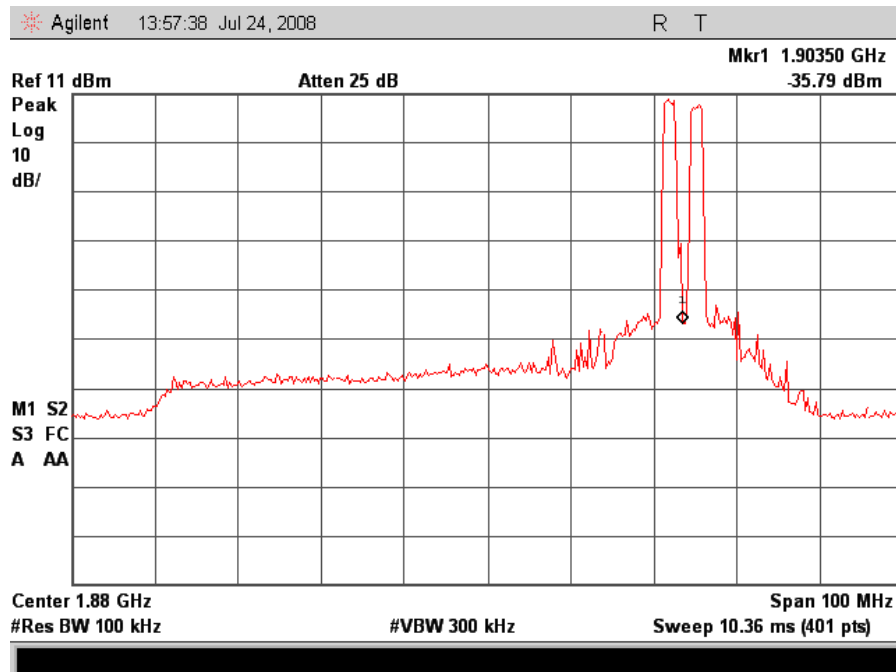
Plot 95. CDMA Intermodulation, Downlink High End



§ 2.1051 Spurious Emissions at Antenna Terminals – PCS, CDMA



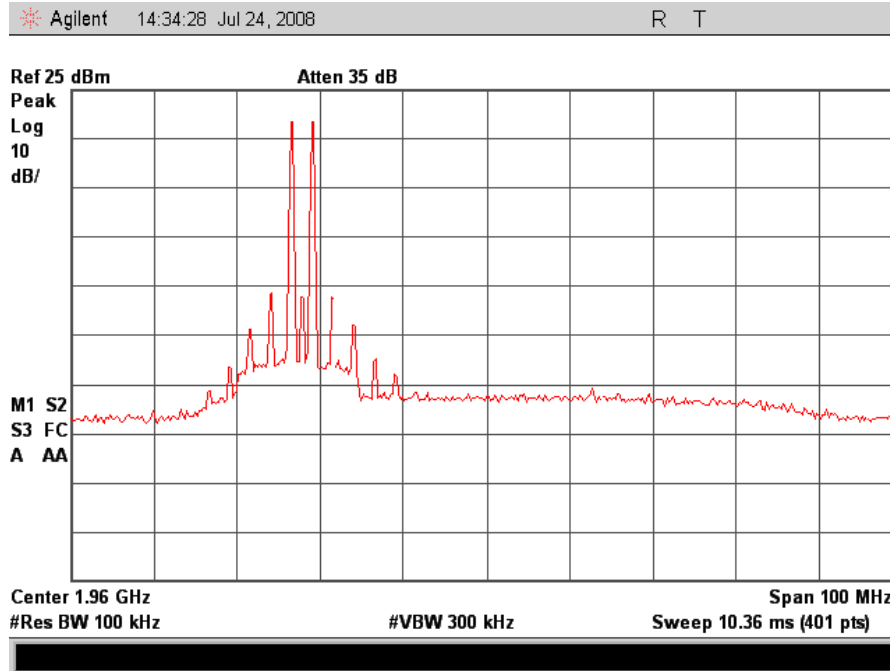
Plot 96. CDMA Intermodulation, Uplink Low End



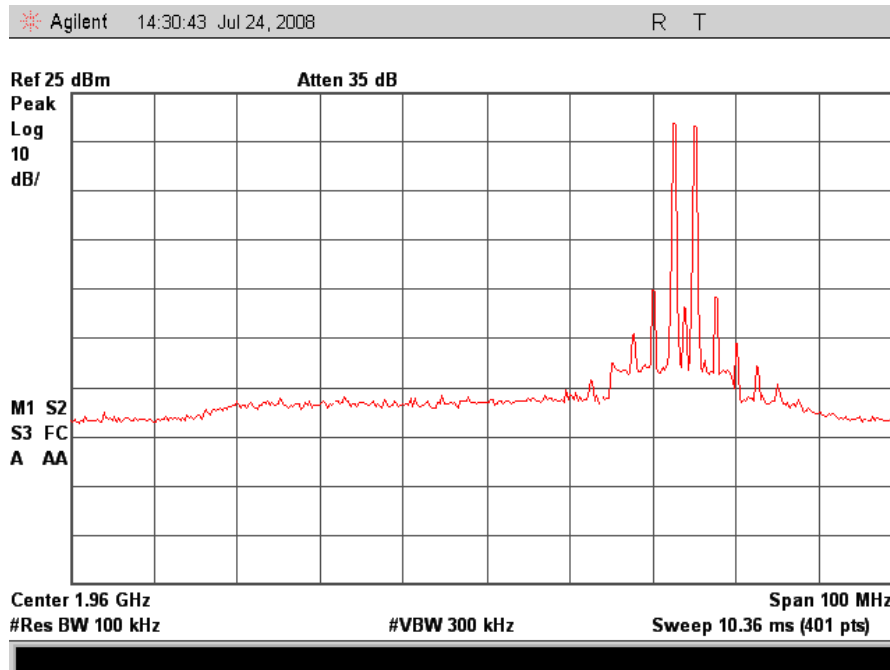
Plot 97. CDMA Intermodulation, Uplink High End



§ 2.1051 Spurious Emissions at Antenna Terminals – PCS, GSM



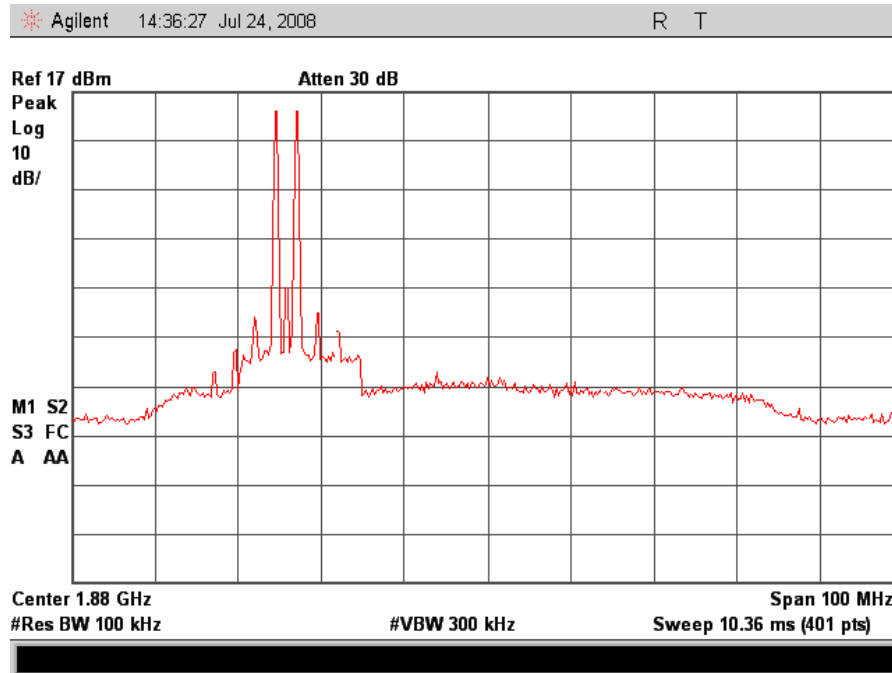
Plot 98. GSM Intermodulation, Downlink Low End



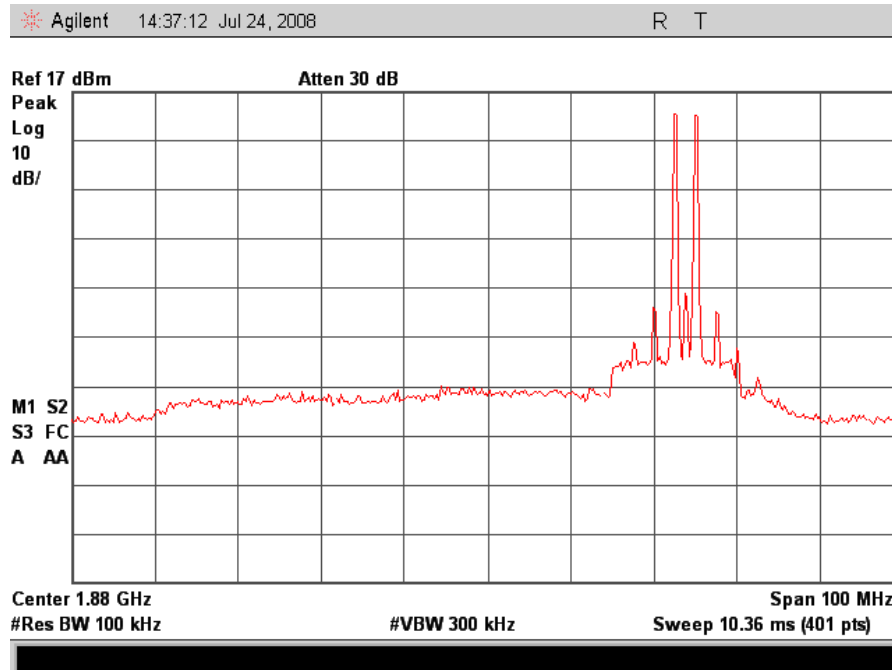
Plot 99. GSM Intermodulation, Downlink High End



§ 2.1051 Spurious Emissions at Antenna Terminals – PCS, GSM



Plot 100. GSM Intermodulation, Uplink Low End

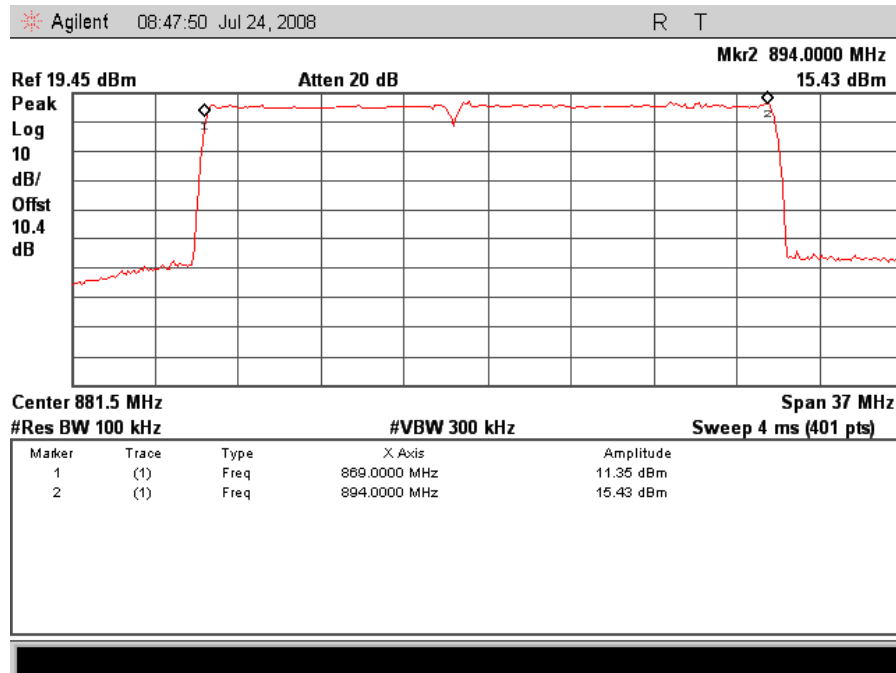


Plot 101. GSM Intermodulation, Uplink High End

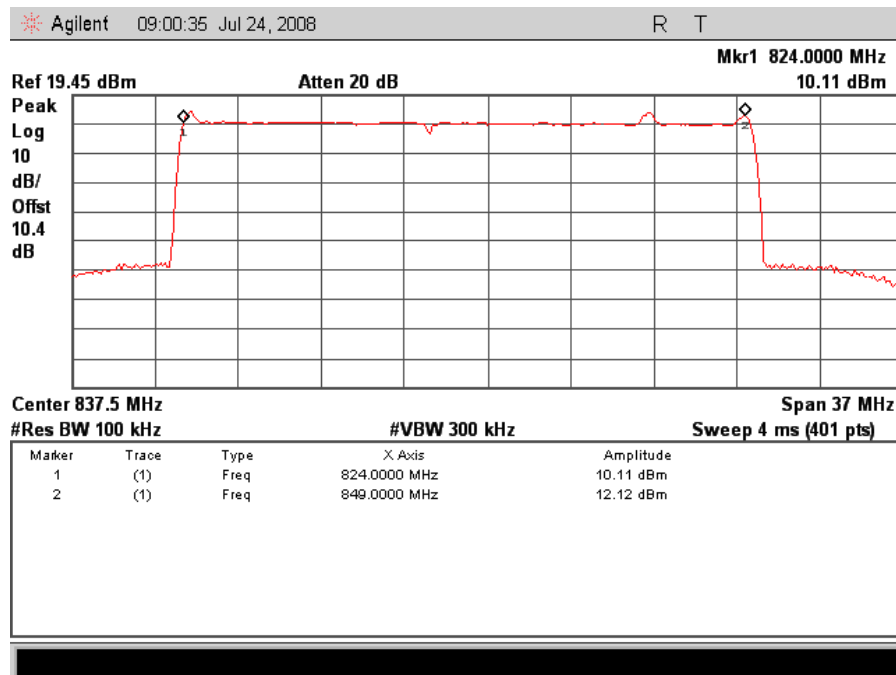


Electromagnetic Compatibility Criteria for Intentional Radiators

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



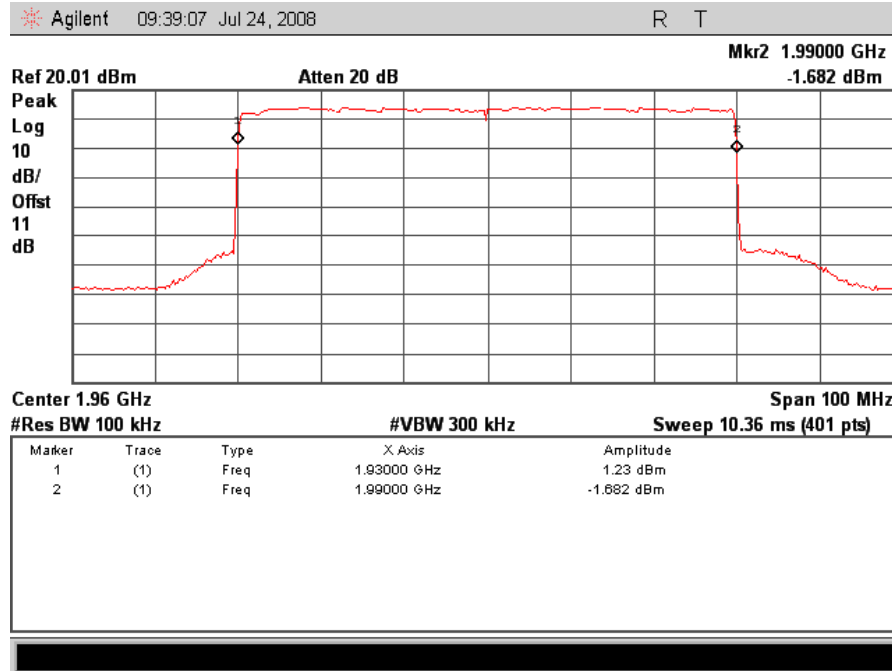
Plot 102. Out of Band Rejection, Downlink



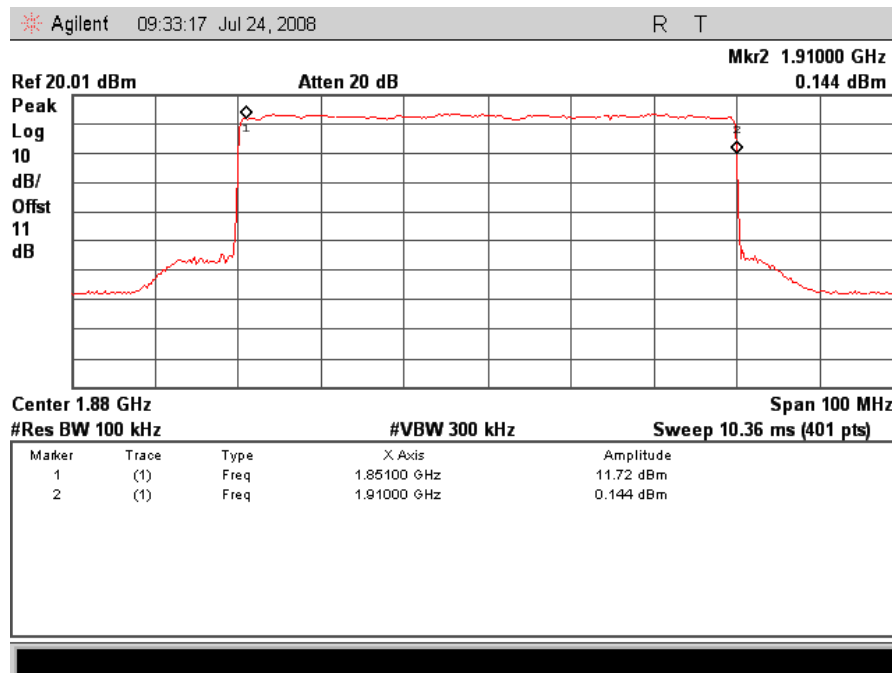
Plot 103. Out of Band Rejection, Uplink



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



Plot 104. Out of Band Rejection, Downlink



Plot 105. Out of Band Rejection, Uplink



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 Test Receiver	Rohde & Schwarz	ESIB7	4/18/2008	4/18/2009
1S2508	AC LISN	Solar Electronics	Type 9252-50-R-24-BNC	4/22/08	4/22/09
1S2438	Transient Limiter	Agilent	11947A	10/25/07	10/25/08
1S2460	Spectrum Analyzer	Agilent	E4407B	3/24/08	3/24/09
1S2198	Horn Antenna	EMCO	3115	8/31/07	8/31/08
1S2121	Preamplifier	HP	8449B	10/26/08	10/26/09
1S2460	Spectrum Analyzer	Agilent	E4407B	3/23/08	3/23/09
1S2501	EMI Test Receiver	Rohde & Schwarz	ESU 40	4/8/08	4/8/09
1S2485	Bilog Antenna	Teseq	CBL-6112D	1/21/08	1/21/09
IS2278	Signal Generator	Agilent/HP	83650B	09/26/2007	09/26/2008
1S2482	5m Semi-Anechoic Chamber	Panashield	N/A	11/18/07	11/18/08
N/A	High Pass Filter	MICRO-TRONICS	HPM13146	See Note	

Table 16. Test Equipment List

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



V. Certification & User's Manual Information



Certification & User's Manual Information

A. Certification Information

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

§ 2.801 Radio-frequency device defined.

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

- (a) The various types of radio communication transmitting devices described throughout this chapter.
- (b) *The incidental, unintentional and intentional radiators defined in Part 15 of this chapter.*
- (c) The industrial, scientific, and medical equipment described in Part 18 of this chapter.
- (d) Any part or component thereof which in use emits radio-frequency energy by radiation, conduction, or other means.

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

- (a) Except as provided elsewhere in this chapter, no person shall sell or lease, or offer for sale or lease (including advertising for sale or lease), or import, ship or distribute for the purpose of selling or leasing or offering for sale or lease, any radio frequency device unless:
 - (1) In the case of a device subject to certification, such device has been authorized by the Commission in accordance with the rules in this chapter and is properly identified and labeled as required by §2.925 and other relevant sections in this chapter; or
 - (2) In the case of a device that is not required to have a grant of equipment authorization issued by the Commission, but which must comply with the specified technical standards prior to use, such device also complies with all applicable administrative (including verification of the equipment or authorization under a Declaration of Conformity, where required), technical, labeling and identification requirements specified in this chapter.
- (d) Notwithstanding the provisions of paragraph (a) of this section, the offer for sale solely to business, commercial, industrial, scientific or medical users (but not an offer for sale to other parties or to end users located in a residential environment) of a radio frequency device that is in the conceptual, developmental, design or pre-production stage is permitted prior to equipment authorization or, for devices not subject to the equipment authorization requirements, prior to a determination of compliance with the applicable technical requirements *provided* that the prospective buyer is advised in writing at the time of the offer for sale that the equipment is subject to the FCC rules and that the equipment will comply with the appropriate rules before delivery to the buyer or to centers of distribution.



- (e)(1) Notwithstanding the provisions of paragraph (a) of this section, prior to equipment authorization or determination of compliance with the applicable technical requirements any radio frequency device may be operated, but not marketed, for the following purposes and under the following conditions:
- (i) *Compliance testing;*
 - (ii) Demonstrations at a trade show provided the notice contained in paragraph (c) of this section is displayed in a conspicuous location on, or immediately adjacent to, the device;
 - (iii) Demonstrations at an exhibition conducted at a business, commercial, industrial, scientific or medical location, but excluding locations in a residential environment, provided the notice contained in paragraphs (c) or (d) of this section, as appropriate, is displayed in a conspicuous location on, or immediately adjacent to, the device;
 - (iv) Evaluation of product performance and determination of customer acceptability, provided such operation takes place at the manufacturer's facilities during developmental, design or pre-production states; or
 - (v) Evaluation of product performance and determination of customer acceptability where customer acceptability of a radio frequency device cannot be determined at the manufacturer's facilities because of size or unique capability of the device, provided the device is operated at a business, commercial, industrial, scientific or medical user's site, but not at a residential site, during the development, design or pre-production stages.
- (e)(2) For the purpose of paragraphs (e)(1)(iv) and (e)(1)(v) of this section, the term *manufacturer's facilities* includes the facilities of the party responsible for compliance with the regulations and the manufacturer's premises, as well as the facilities of other entities working under the authorization of the responsible party in connection with the development and manufacture, but not the marketing, of the equipment.
- (f) For radio frequency devices subject to verification and sold solely to business, commercial, industrial, scientific and medical users (excluding products sold to other parties or for operation in a residential environment), parties responsible for verification of the devices shall have the option of ensuring compliance with the applicable technical specifications of this chapter at each end user's location after installation, provided that the purchase or lease agreement includes a proviso that such a determination of compliance be made and is the responsibility of the party responsible for verification of the equipment.



Certification & User's Manual Information

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

§ 2.901 Basis and Purpose

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

§ 2.907 Certification.

- (a) Certification is an equipment authorization issued by the Commission, based on representation and test data submitted by the applicant.
- (b) Certification attaches to all units subsequently marketed by the grantee which are identical (see Section 2.908) to the sample tested except for permissive changes or other variations authorized by the Commission pursuant to Section 2.1043.

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



Certification & User's Manual Information

§ 2.948 Description of measurement facilities.

- (a) Each party making measurements of equipment that is subject to an equipment authorization under Part 15 or Part 18 of this chapter, regardless of whether the measurements are filed with the Commission or kept on file by the party responsible for compliance of equipment marketed within the U.S. or its possessions, shall compile a description of the measurement facilities employed.
 - (1) If the measured equipment is subject to the verification procedure, the description of the measurement facilities shall be retained by the party responsible for verification of the equipment.
 - (i) *If the equipment is verified through measurements performed by an independent laboratory, it is acceptable for the party responsible for verification of the equipment to rely upon the description of the measurement facilities retained by or placed on file with the Commission by that laboratory. In this situation, the party responsible for the verification of the equipment is not required to retain a duplicate copy of the description of the measurement facilities.*
 - (ii) If the equipment is verified based on measurements performed at the installation site of the equipment, no specific site calibration data is required. It is acceptable to retain the description of the measurement facilities at the site at which the measurements were performed.
 - (2) If the equipment is to be authorized by the Commission under the certification procedure, the description of the measurement facilities shall be filed with the Commission's Laboratory in Columbia, Maryland. The data describing the measurement facilities need only be filed once but must be updated as changes are made to the measurement facilities or as otherwise described in this section. At least every three years, the organization responsible for filing the data with the Commission shall certify that the data on file is current.



Certification & User's Manual Information

Label and User's Manual Information

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

§ 15.19 Labeling requirements.

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

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

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

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

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

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

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

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

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

§ 15.21 Information to user.

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



Verification & User's Manual Information

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

§ 15.105 Information to the user.

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

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.



End of Report