



**MET Laboratories, Inc.** *Safety Certification - EMI - Telecom Environmental Simulation*

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January 25, 2012

Digital Receiver Technology, Inc.  
20250 Century Blvd., Suite 500  
Germantown, MD 20874

Dear Steve Hudson,

Enclosed is the EMC Wireless test report for compliance testing of the Digital Receiver Technology, Inc., DRT1301C as tested to the requirements of the FCC Certification rules under Title 47 of the CFR Part 22 Subpart H for Cellular Devices and FCC 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.

Jennifer Warnell  
Documentation Department

Reference: (\Digital Receiver Technology, Inc.\EMC32002-FCC22\_24 Rev. 1)

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## **Electromagnetic Compatibility Criteria Test Report**

for the

**Digital Receiver Technology, Inc.  
Model DRT1301C**

**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**

**MET Report: EMC32002-FCC22\_24 Rev. 1**

January 25, 2012

**Prepared For:**

**Digital Receiver Technology, Inc.  
20250 Century Blvd., Suite 500  
Germantown, MD 20874**

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



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Title 47 of the CFR,  
Part 22 Subpart H for Cellular Devices  
&  
Part 24 Subpart E for Broadband PCS Devices**

Len Knight, Project Engineer  
Electromagnetic Compatibility Lab

Jennifer Warnell  
Documentation Department

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

Shawn McMillen, Manager  
Wireless Manager, Electromagnetic Compatibility Lab



Digital Receiver Technology, Inc.  
DRT1301C

Electromagnetic Compatibility  
Report Status  
CFR Title 47 Part 22 Subpart H & Part 24 Subpart E

## Report Status Sheet

Revision	Report Date	Reason for Revision
Ø	December 19, 2011	Initial Issue
1	January 25, 2012	Revised to reflect customer corrections.



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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
dB $\mu$ A	Decibels above one <b>microamp</b>
dB $\mu$ V	Decibels above one <b>microvolt</b>
dB $\mu$ A/m	Decibels above one <b>microamp per meter</b>
dB $\mu$ V/m	Decibels above one <b>microvolt per meter</b>
DC	Direct Current
E	Electric Field
DSL	Digital Subscriber Line
ESD	Electrostatic Discharge
EUT	Equipment Under Test
<i>f</i>	Frequency
FCC	Federal Communications Commission
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
$\mu$ H	<b>microhenry</b>
$\mu$	<b>microfarad</b>
$\mu$ s	<b>microseconds</b>
NEBS	Network Equipment-Building System
PRF	Pulse Repetition Frequency
RF	Radio Frequency
RMS	Root-Mean-Square
TWT	Traveling Wave Tube
V/m	Volts <b>per meter</b>
VCP	Vertical Coupling Plane



# **I. Executive Summary**



## A. Purpose of Test

An EMC evaluation was performed to determine compliance of the Digital Receiver Technology, Inc. DRT1301C, with the requirements of Part 22 Subpart H and Part 24 Subpart E. 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 DRT1301C. Digital Receiver Technology, Inc.. should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the DRT1301C, 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 and Part 24 Subpart E, in accordance with Digital Receiver Technology, Inc., purchase order number 045971.

Reference	Description	Compliance
Part 22 Subpart H §2.1046; §22.913 Part 24 Subpart E §2.1046; §24.232	RF Power Output	Compliant
§2.1047	Modulation Characteristics	Not Applicable
§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	Compliant

**Table 1. Executive Summary of EMC Compliance Testing**





## II. Equipment Configuration

## A. Overview

MET Laboratories, Inc. was contracted by Digital Receiver Technology, Inc.. to perform testing on the DRT1301C, under Digital Receiver Technology, Inc.'s purchase order number 045971.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Digital Receiver Technology, Inc., DRT1301C.

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

<b>Model(s) Tested:</b>	DRT1301C		
<b>Model(s) Covered:</b>	DRT1301C		
<b>EUT Specifications:</b>	Primary Power: 120 VAC, 60 Hz		
	FCC ID: XLM1301C		
	Type of Modulations:	GMSK and QPSK	
	Equipment Code:	PCB	
	RF Power Output	22.48 dBm	22.12 dBm
	EUT Frequency Ranges:	869 – 894	1930 – 1990
<b>Analysis:</b>	The results obtained relate only to the item(s) tested.		
<b>Environmental Test Conditions:</b>	Temperature: 15-35° C		
	Relative Humidity: 30-60%		
	Barometric Pressure: 860-1060 mbar		
<b>Evaluated by:</b>	Len Knight		
<b>Date(s):</b>	January 25, 2012		

## B. References

<b>CFR 47, Part 22, Subpart H</b>	Federal Communication Commission, Code of Federal Regulations, Title 47, Part 22: Rules and Regulations for Cellular Devices.
<b>CFR 47, Part 24, Subpart E</b>	Federal Communication Commission, Code of Federal Regulations, Title 47, Part 24: Rules and Regulations for Personal Communications Services
<b>ANSI C63.4:2003</b>	Methods and Measurements of Radio-Noise Emissions from Low-Voltage Electrical And Electronic Equipment in the Range of 9 kHz to 40 GHz
<b>ANSI/NCSL Z540-1-1994</b>	Calibration Laboratories and Measuring and Test Equipment - General Requirements
<b>ANSI/ISO/IEC 17025:2000</b>	General Requirements for the Competence of Testing and Calibration Laboratories
<b>EIA/TIA-603-A-2001</b>	Land Mobile FM or PM Communication Equipment Measurement and Performance Standards

## C. Test Site

All testing was performed at MET Laboratories, Inc., 914 W. Patapsco Ave, Baltimore, MD 21230. All equipment used in making physical determinations is accurate and bears recent traceability to the National Institute of Standards and Technology.

Radiated Emissions measurements were performed in a 10 meter semi-anechoic chamber (equivalent to an Open Area Test Site). In accordance with §2.948(a)(3), a complete site description is contained at MET Laboratories.

## D. Description of Test Sample

The DRT1301C is a mobile cellular, PCS, and TDMA base station.

## E. Equipment Configuration

The DRT1301C was configured with 1 RXT Digital Tuner, 1 WSP Processor, 1 LOREF Reference Generator, 1 SCP System Control, and 1 CTL Computer Control.

## F. Support Equipment

Ref. ID	Name / Description	Manufacturer	Model Number	Serial Number
CF-19	Toughbook PC	Panasonic	CF-19	CF-19KDRAX6M

**Table 2. Support Equipment**

## G. Antenna

Ref. ID	Manufacturer	Model	Gain
Tx Antenna	PCTEL	MLPVD 800/1900	3 dBi Cellular/4 dBi PCS

Table 3. Antenna Information

## H. 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
	RF In1	Receive antenna	1	5	Y	
	RF Out	Transmit antenna	1	5	Y	
	ANT/REF	Adapter to Radio	1	0.2	Y	
	LAN	LAN connection to PC	1	1	Y	

Table 4. Ports and Cabling Information

## I. Mode of Operation

Operating as a mobile base station in GSM and CDMA in the Cellular and PCS bands and TDMA in the 800MHz band.

## J. Method of Monitoring EUT Operation

Running control software on a connected PC.

## K. 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.

## L. Disposition of EUT

The test sample including all support equipment submitted to the Electro-Magnetic Compatibility Lab for testing was returned to Digital Receiver Technology, 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.

**§ 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. The spectrum analyzer was set to its default settings – RBW, VBW, Sweep Time, etc. – except that the detector was set to an average detector. The “Channel Power” measurement feature of the spectrum analyzer was used.

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

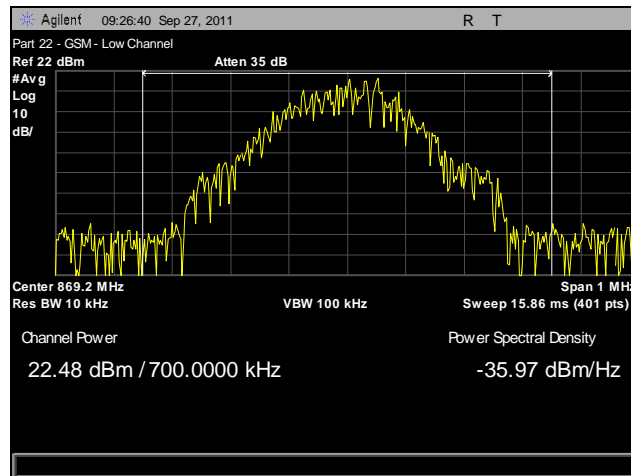
**Test Engineer(s):** Len Knight

**Test Date(s):** 09/27/11

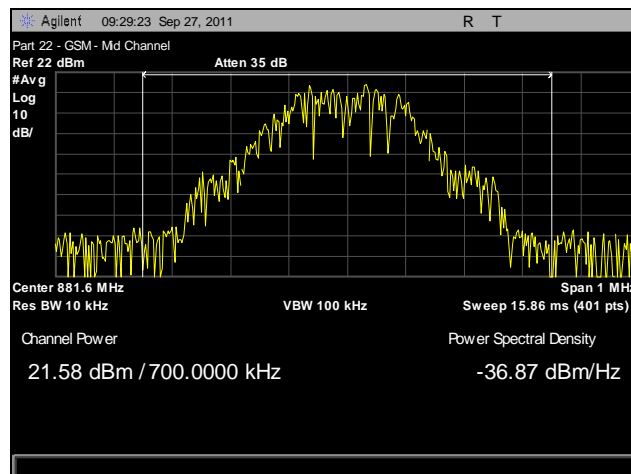


Part 22 - GSM		
Channel	Frequency (MHz)	Conducted Power (dBm)
Low	869.2	22.48
Mid	881.6	21.58
High	893.8	20.37
Part 22 - CDMA		
Channel	Frequency (MHz)	Conducted Power (dBm)
Low	869.7	13.62
Mid	881.52	13.43
High	893.31	13.11
Part 24 - GSM		
Channel	Frequency (MHz)	Conducted Power (dBm)
Low	1930.2	20.69
Mid	1960	22.12
High	1989.8	21.43
Part 24 - CDMA		
Channel	Frequency (MHz)	Conducted Power (dBm)
Low	1931.25	13.56
Mid	1960	13.26
High	1988.75	12.55

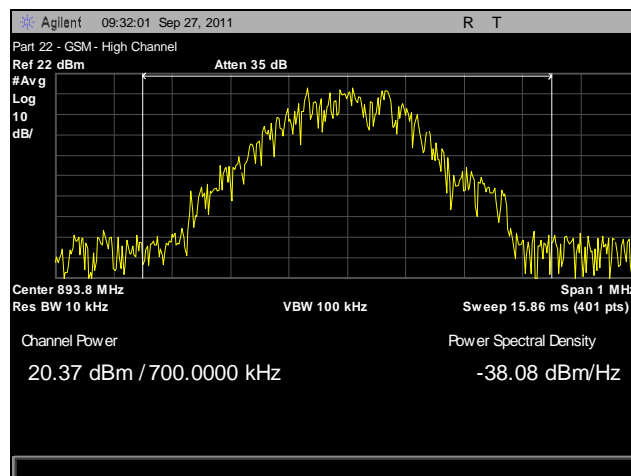
Table 5. RF Power Output, Test Results



Plot 1. RF Power, Low Channel, GSM, Part 22

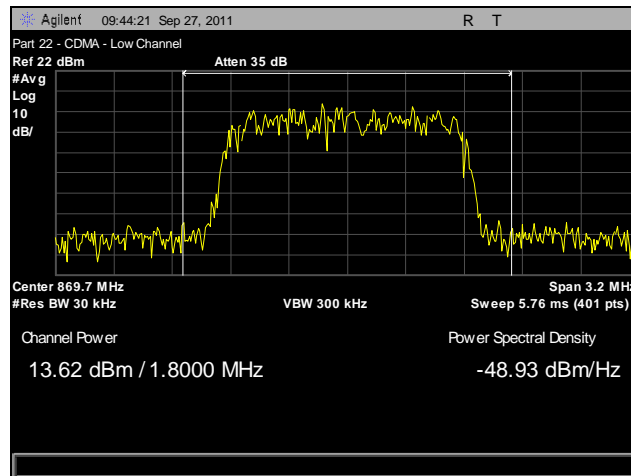


Plot 2. RF Power, Mid Channel, GSM, Part 22

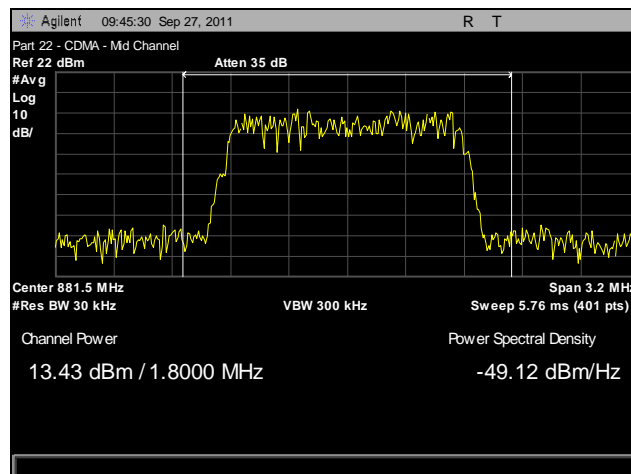


Plot 3. RF Power, High Channel, GSM, Part 22

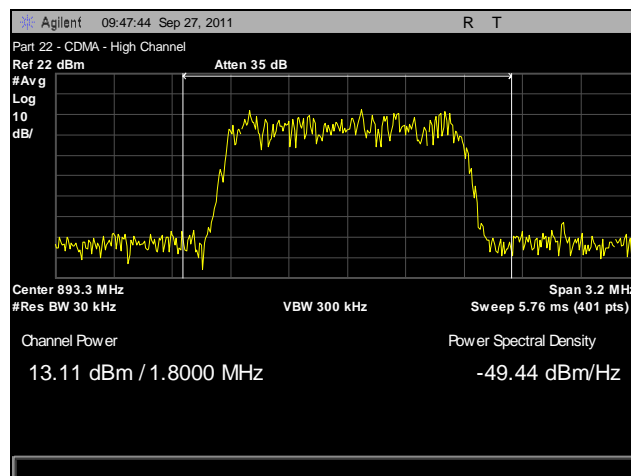




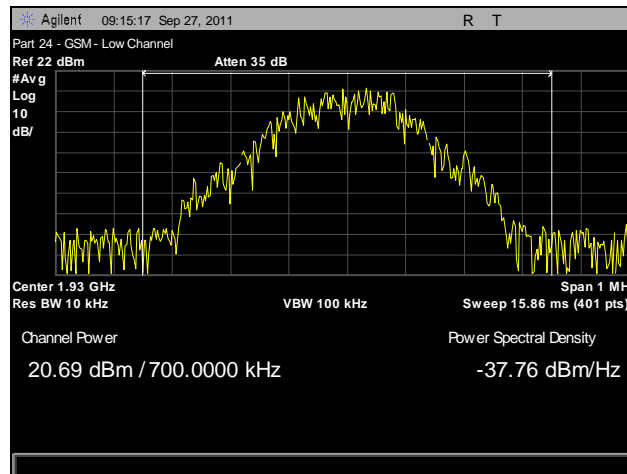
Plot 4. RF Power, Low Channel, CDMA, Part 22



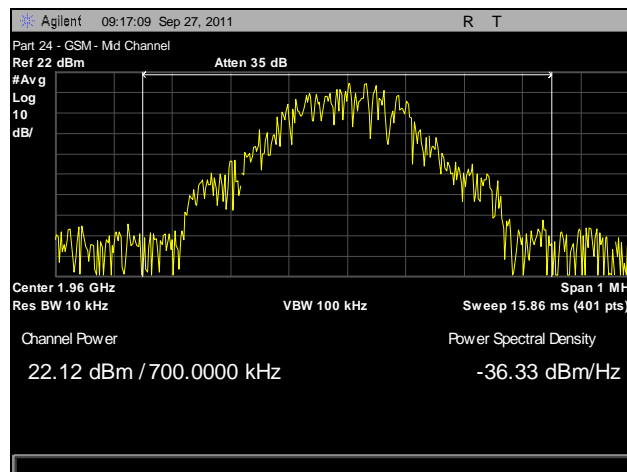
Plot 5. RF Power, Mid Channel, CDMA, Part 22



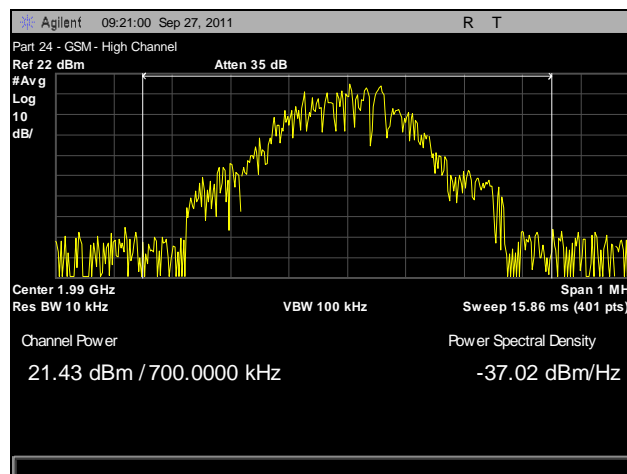
Plot 6. RF Power, High Channel, CDMA, Part 22



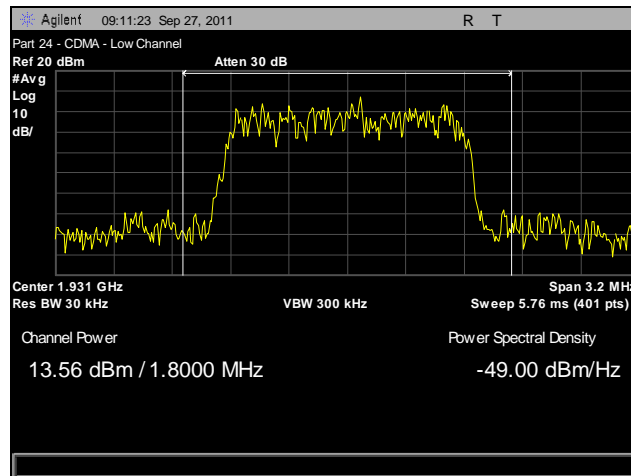
Plot 7. RF Power, Low Channel, GSM, Part 24



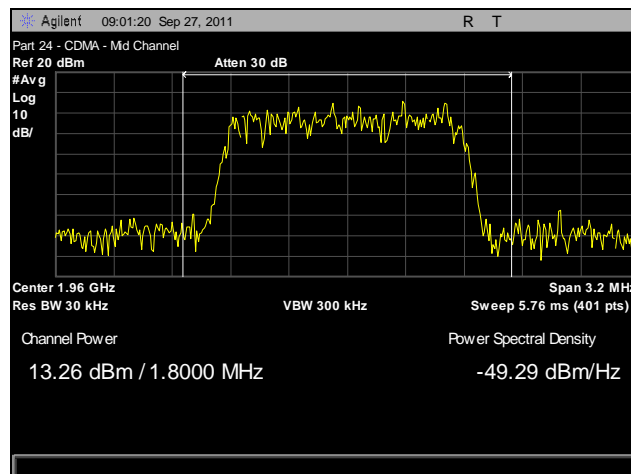
Plot 8. RF Power, Mid Channel, GSM, Part 24



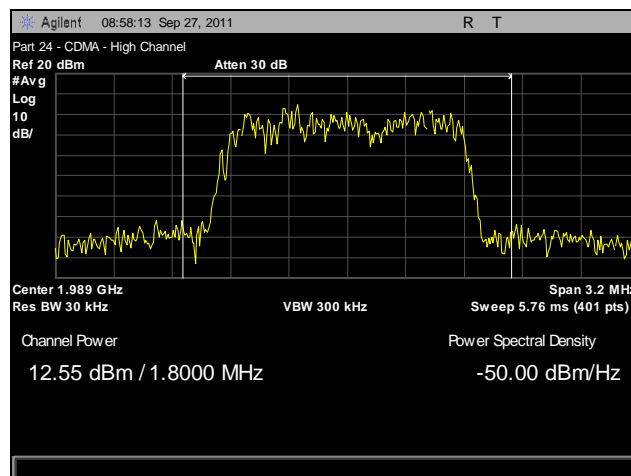
Plot 9. RF Power, High Channel, GSM, Part 24



Plot 10. RF Power, Low Channel, CDMA, Part 24



Plot 11. RF Power, Mid Channel, CDMA, Part 24



Plot 12. RF Power, High Channel, CDMA, Part 24



## § 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 port.

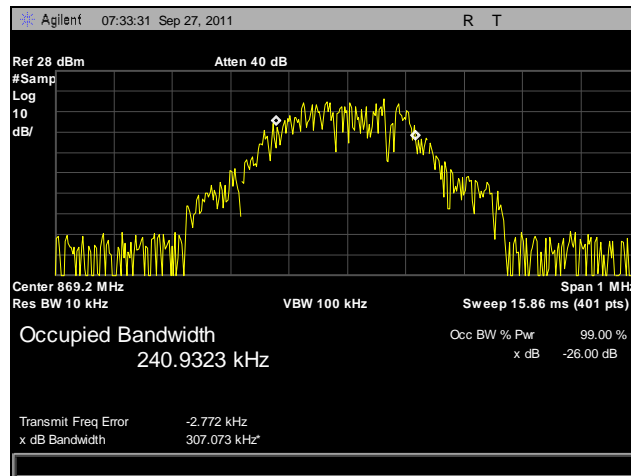
**Test Results:** The EUT complies with the requirements of this section.

**Test Engineer(s):** Len Knight

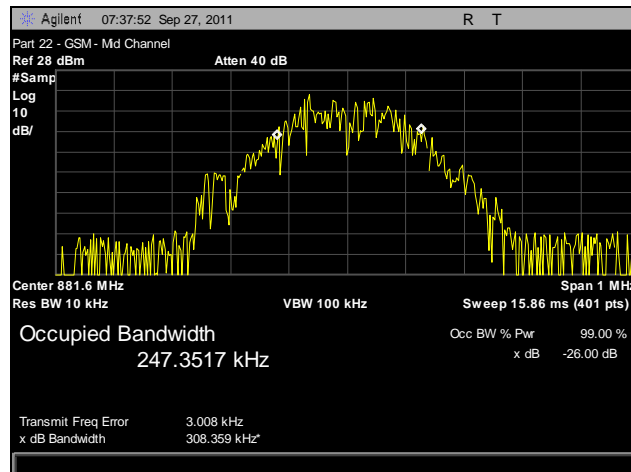
**Test Date(s):** 09/27/11

GSM Modulation – Part 22		
Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Low	869.2	307.037
Mid	881.6	308.359
High	893.8	309.713
CDMA Modulation – Part 22		
Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Low	869.7	1.357
Mid	881.52	1.357
High	893.31	1.358
GSM Modulation – Part 24		
Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Low	1930.2	314.313
Mid	1960	313.936
High	1989.8	314.098
CDMA Modulation – Part 24		
Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Low	1931.25	1.347
Mid	1960	1.367
High	1988.75	1.337

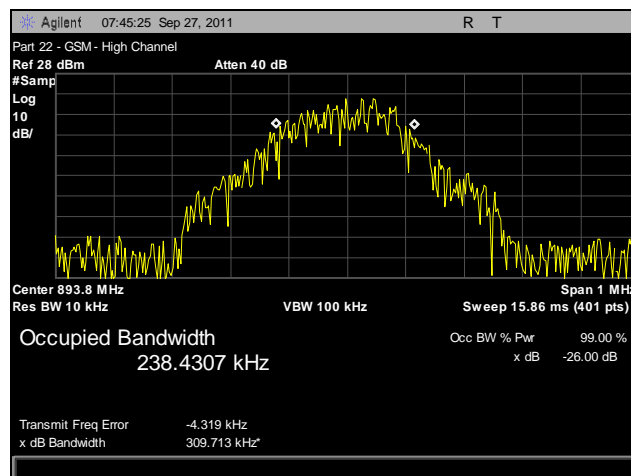
Table 6. Occupied Bandwidth, Test Results



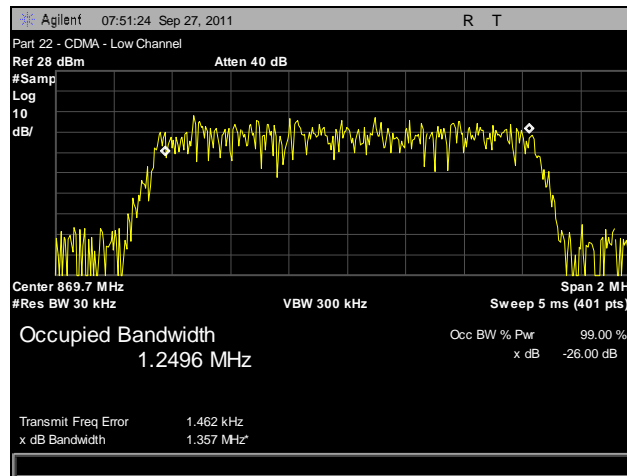
Plot 13. Occupied Bandwidth, Low Channel, GSM, Part 22



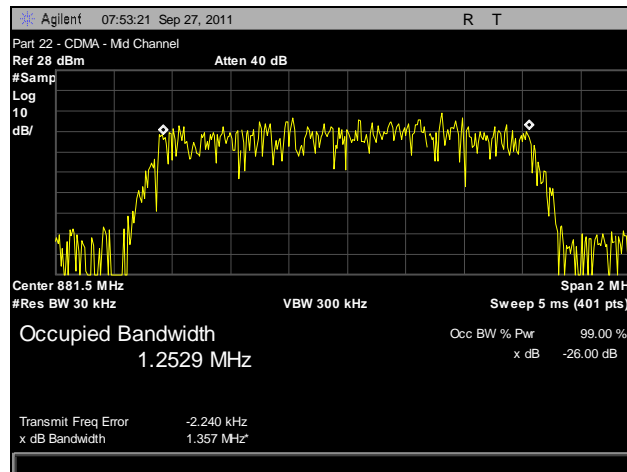
Plot 14. Occupied Bandwidth, Mid Channel, GSM, Part 22



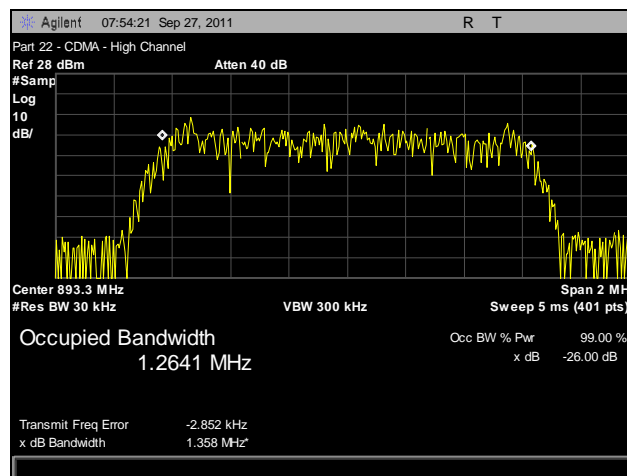
Plot 15. Occupied Bandwidth, High Channel, GSM, Part 22



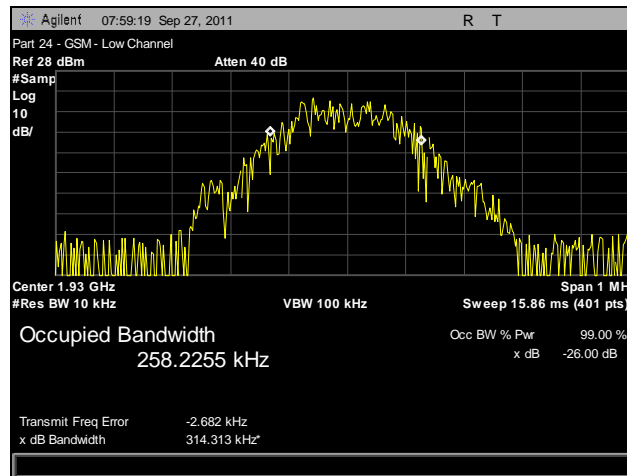
Plot 16. Occupied Bandwidth, Low Channel, CDMA, Part 22



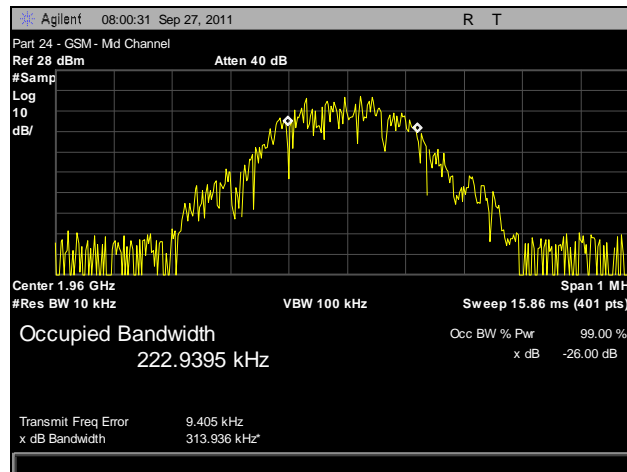
Plot 17. Occupied Bandwidth, Mid Channel, CDMA, Part 22



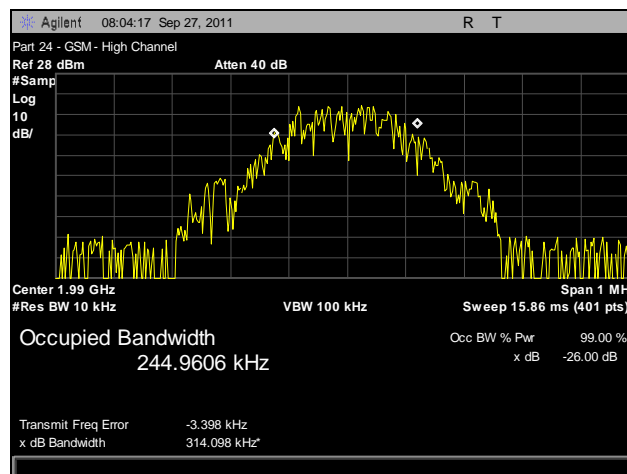
Plot 18. Occupied Bandwidth, High Channel, CDMA, Part 22



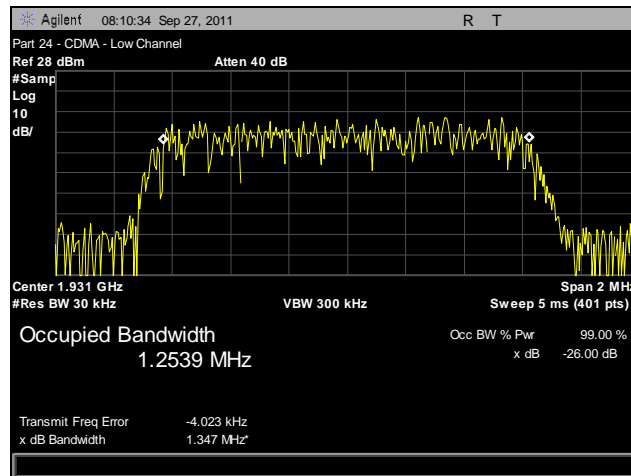
Plot 19. Occupied Bandwidth, Low Channel, GSM, Part 24



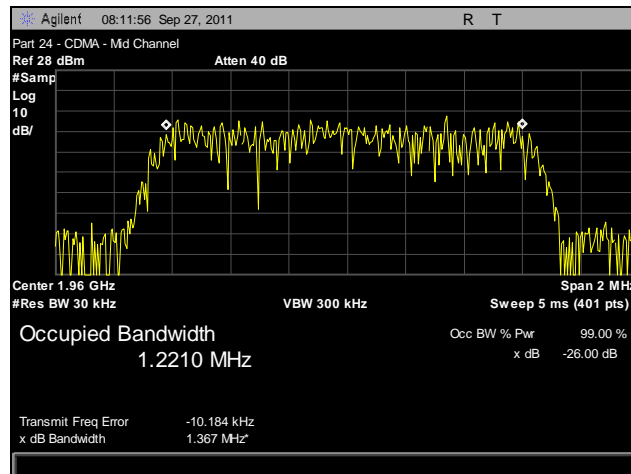
Plot 20. Occupied Bandwidth, Mid Channel, GSM, Part 24



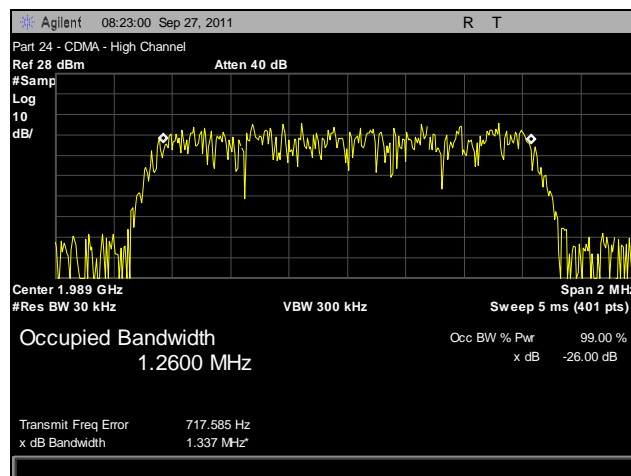
Plot 21. Occupied Bandwidth, High Channel, GSM, Part 24



Plot 22. Occupied Bandwidth, Low Channel, CDMA, Part 24



Plot 23. Occupied Bandwidth, Mid Channel, CDMA, Part 24



Plot 24. Occupied Bandwidth, High Channel, CDMA, Part 24





## 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:** The rules in this section govern the spectral characteristics of emissions in the Cellular Radiotelephone Service.

§ 22.917 (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* was made in accordance with the procedures of TIA/EIA-603-A-2001 "Land Mobile FM or PM Communications Equipment Measurement and Performance Standards".

Radiated emission measurements were performed inside a 3 meter semi-anechoic chamber. The EUT's RF ports were terminated to 50ohm load. The EUT was tested using both modulations and at the low, mid, and high channels. The EUT was rotated about 360<sup>0</sup> and the receiving antenna scanned from 1-4m in order to capture the maximum emission. The plots are corrected for cable loss, antenna correction factor, and distance correction. The field strength was mathematically corrected to an E.I.R.P. Harmonic emissions up to the 10<sup>th</sup> or 40GHz, whichever was the lesser, were investigated.

The spectrum analyzer was set to 1MHz RBW and 3MHz VBW above 1 GHz and 100 kHz RBW and 300 kHz VBW below 1 GHz. The spectrum was investigated from 30MHz to the 10<sup>th</sup> harmonic of the carrier.

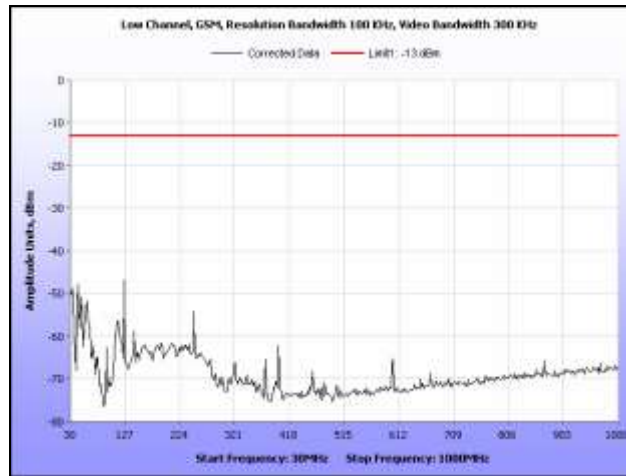
**Test Results:** The EUT complies with the requirements of this section.

**Test Engineer:** Len Knight

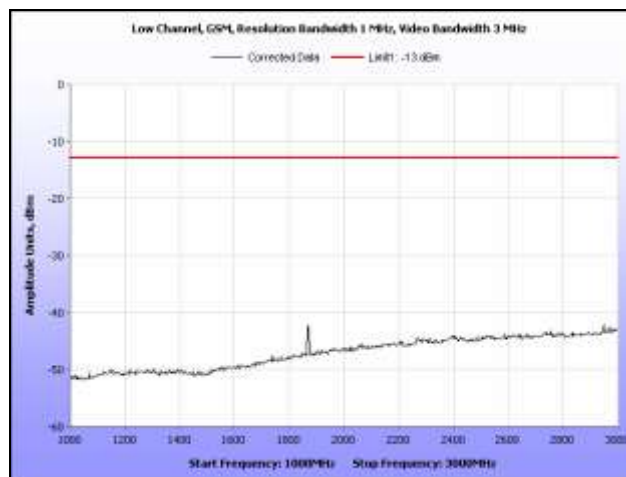
**Test Date(s):** 09/29/11 – 10/17/11



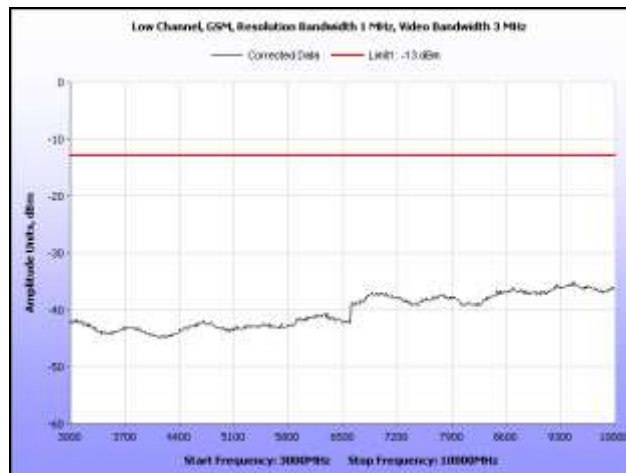
## Radiated Spurious Emissions, Part 22



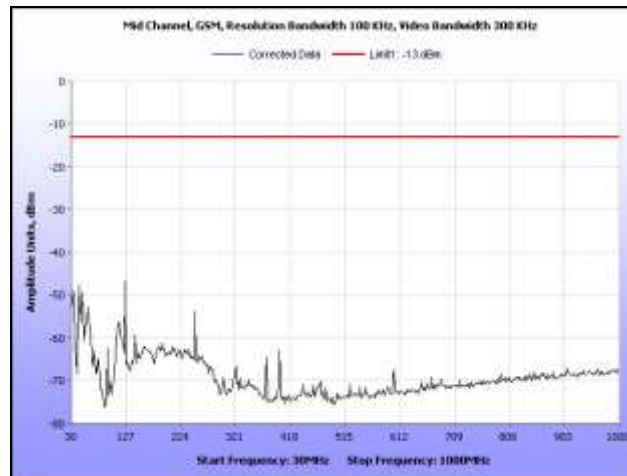
Plot 25. Radiated Spurious Emissions, Low Channel, GSM, Part 22, 30 MHz – 1 GHz



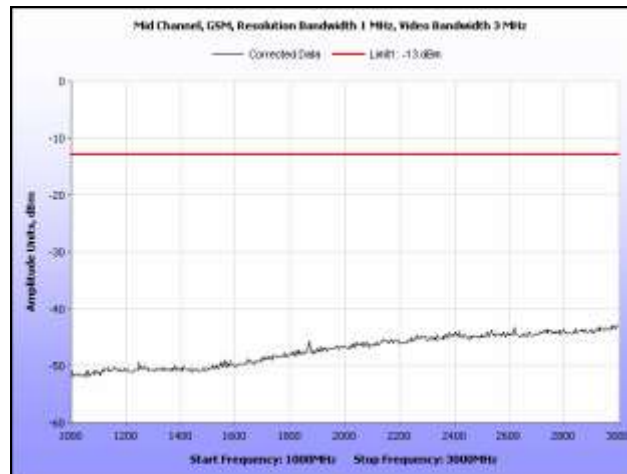
Plot 26. Radiated Spurious Emissions, Low Channel, GSM, Part 22, 1 GHz – 3 GHz



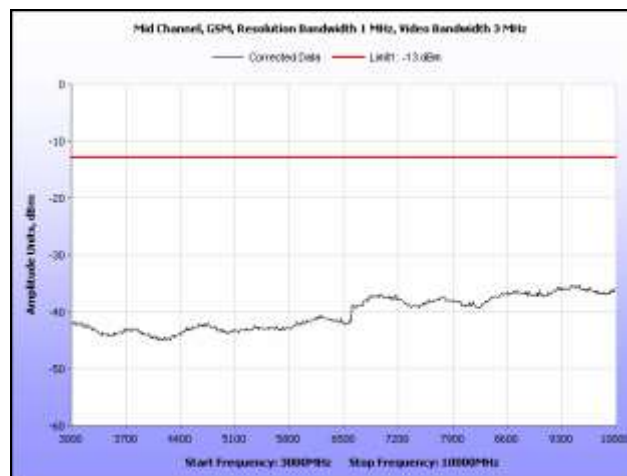
Plot 27. Radiated Spurious Emissions, Low Channel, GSM, Part 22, 3 GHz – 10 GHz



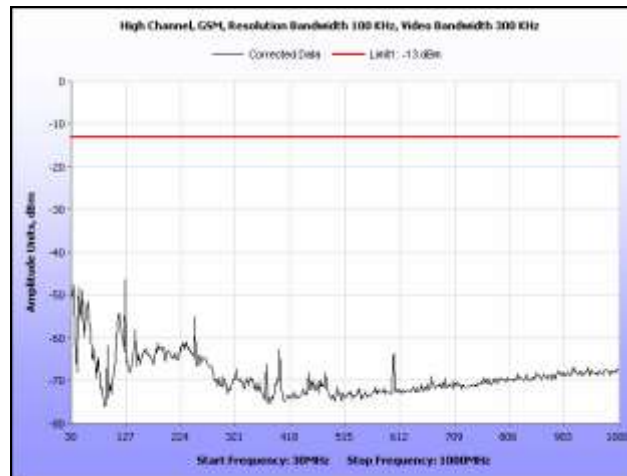
Plot 28. Radiated Spurious Emissions, Mid Channel, GSM, Part 22, 30 MHz – 1 GHz



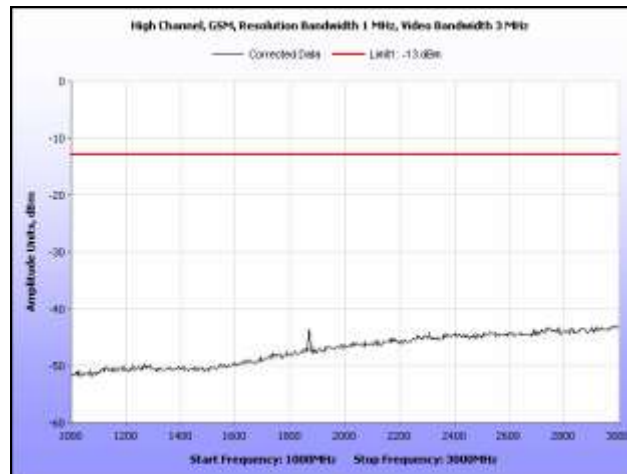
Plot 29. Radiated Spurious Emissions, Mid Channel, GSM, Part 22, 1 GHz – 3 GHz



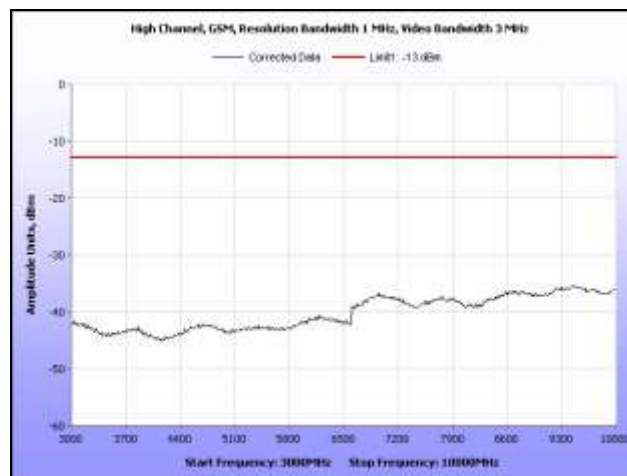
Plot 30. Radiated Spurious Emissions, Mid Channel, GSM, Part 22, 3 GHz – 10 GHz



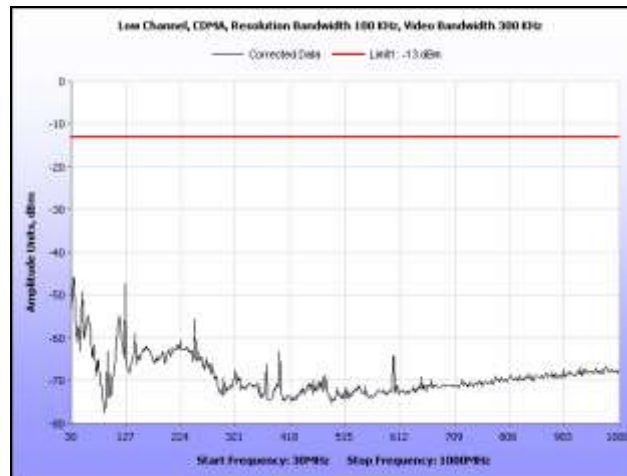
Plot 31. Radiated Spurious Emissions, High Channel, GSM, Part 22, 30 MHz – 1 GHz



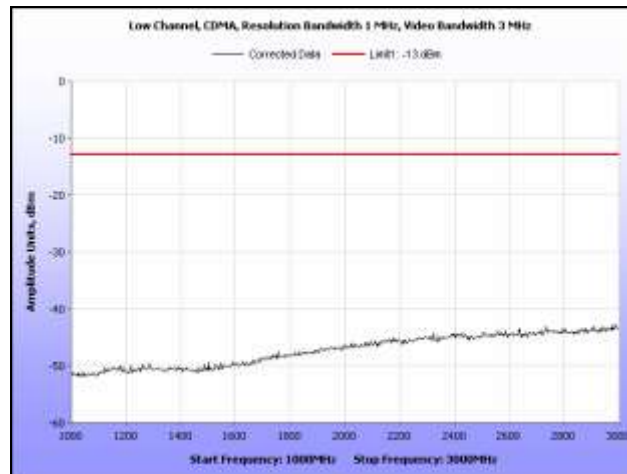
Plot 32. Radiated Spurious Emissions, High Channel, GSM, Part 22, 1 GHz – 3 GHz



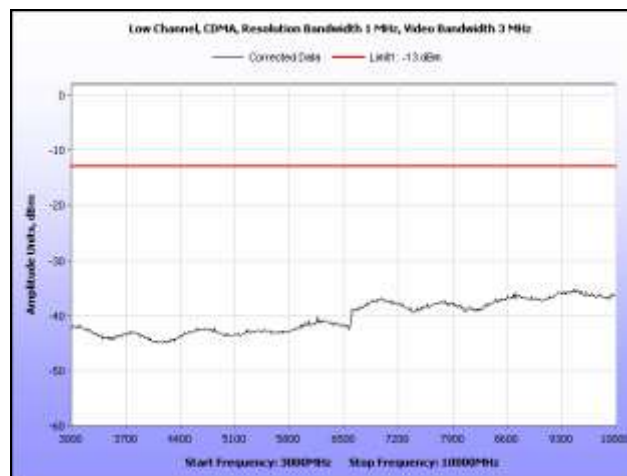
Plot 33. Radiated Spurious Emissions, High Channel, GSM, Part 22, 3 GHz – 10 GHz



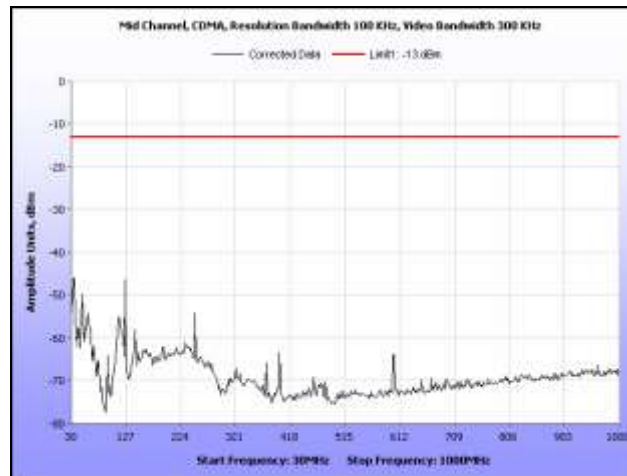
Plot 34. Radiated Spurious Emissions, Low Channel, CDMA, Part 22, 30 MHz – 1 GHz



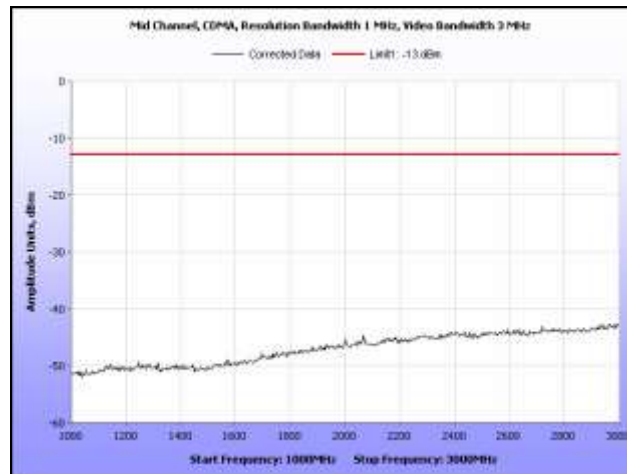
Plot 35. Radiated Spurious Emissions, Low Channel, CDMA, Part 22, 1 GHz – 3 GHz



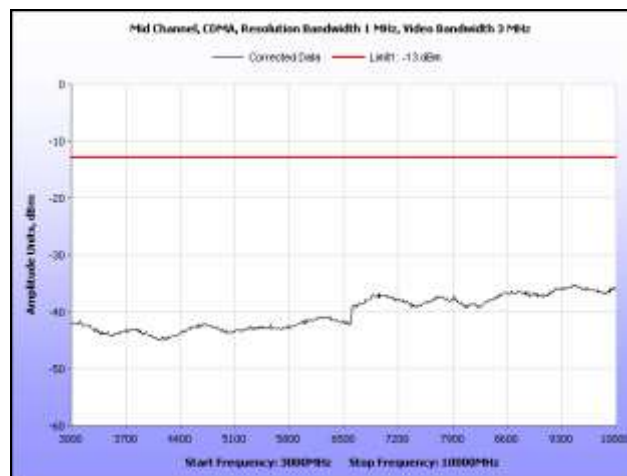
Plot 36. Radiated Spurious Emissions, Low Channel, CDMA, Part 22, 3 GHz – 10 GHz



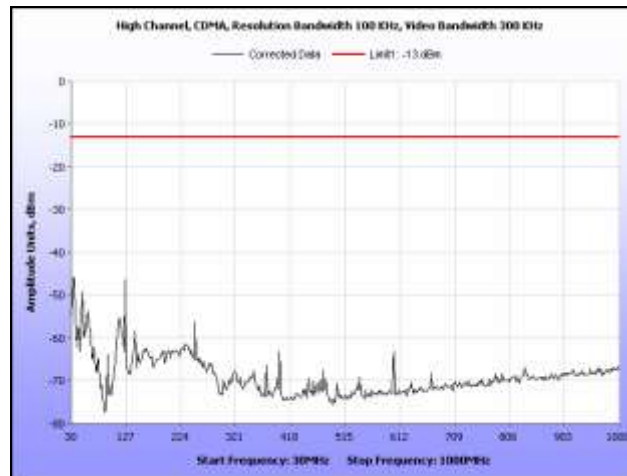
Plot 37. Radiated Spurious Emissions, Mid Channel, CDMA, Part 22, 30 MHz – 1 GHz



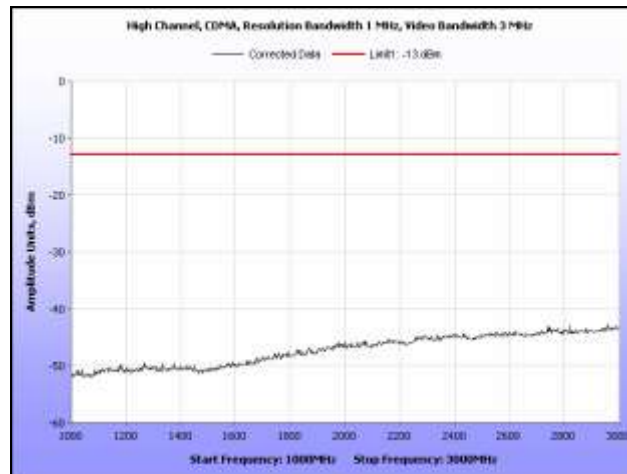
Plot 38. Radiated Spurious Emissions, Mid Channel, CDMA, Part 22, 1 GHz – 3 GHz



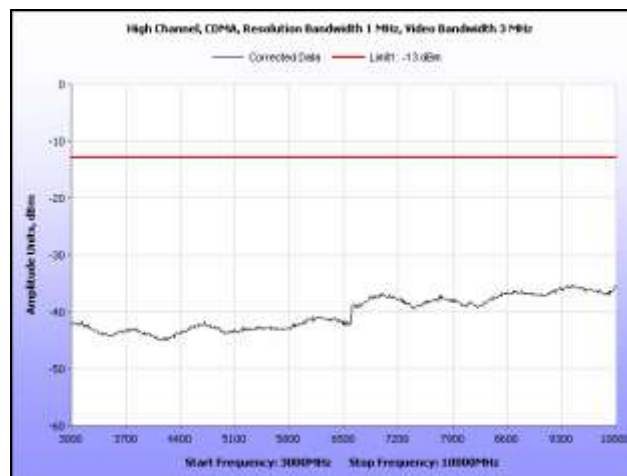
Plot 39. Radiated Spurious Emissions, Mid Channel, CDMA, Part 22, 3 GHz – 10 GHz



Plot 40. Radiated Spurious Emissions, High Channel, CDMA, Part 22, 30 MHz – 1 GHz



Plot 41. Radiated Spurious Emissions, High Channel, CDMA, Part 22, 1 GHz – 3 GHz

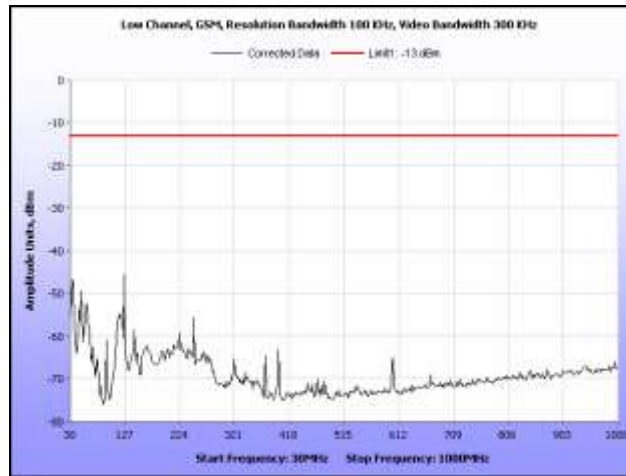


Plot 42. Radiated Spurious Emissions, High Channel, CDMA, Part 22, 3 GHz – 10 GHz





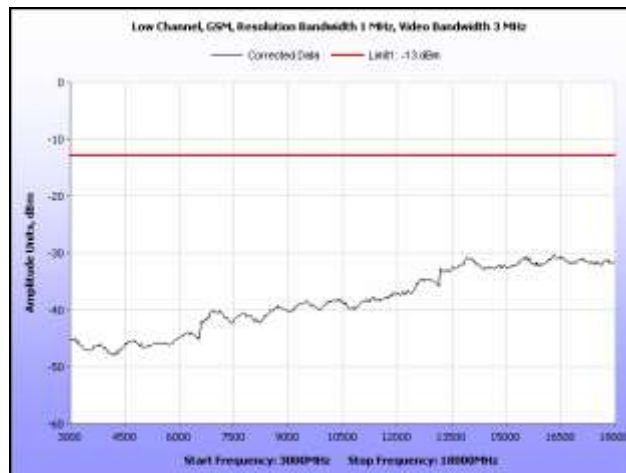
## Radiated Spurious Emissions, Part 24



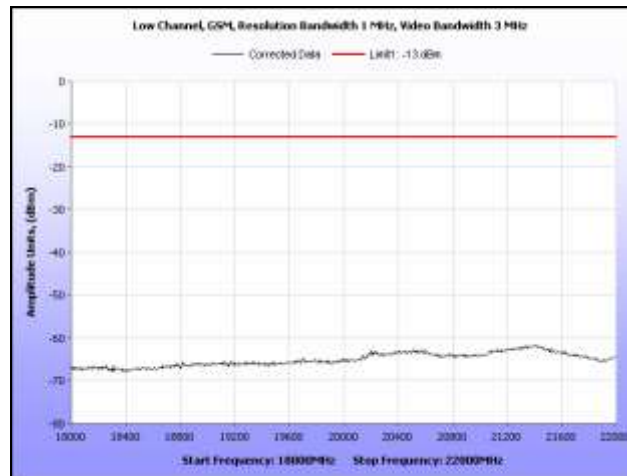
Plot 43. Radiated Spurious Emissions, Low Channel, GSM, Part 24, 30 MHz – 1 GHz



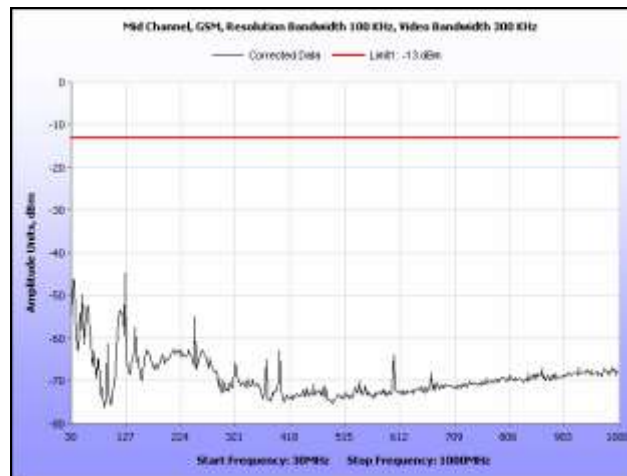
Plot 44. Radiated Spurious Emissions, Low Channel, GSM, Part 24, 1 GHz – 3 GHz



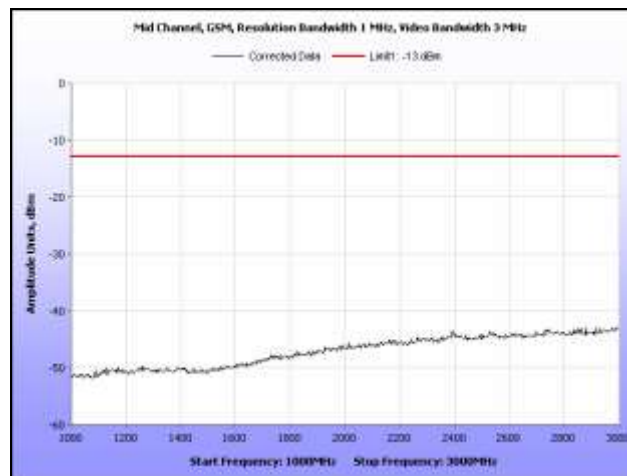
Plot 45. Radiated Spurious Emissions, Low Channel, GSM, Part 24, 3 GHz – 18 GHz



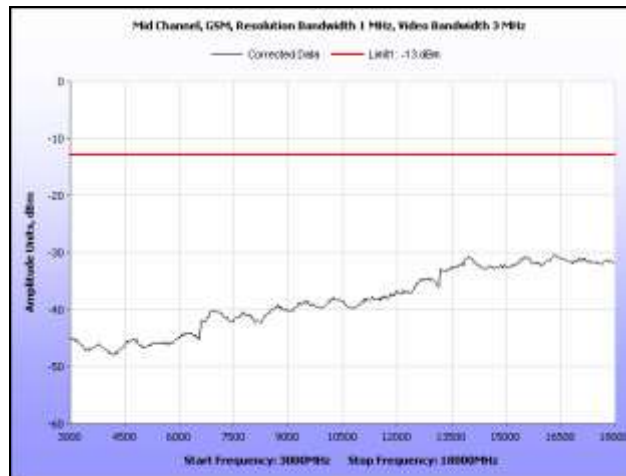
Plot 46. Radiated Spurious Emissions, Low Channel, GSM, Part 24, 18 GHz – 22 GHz



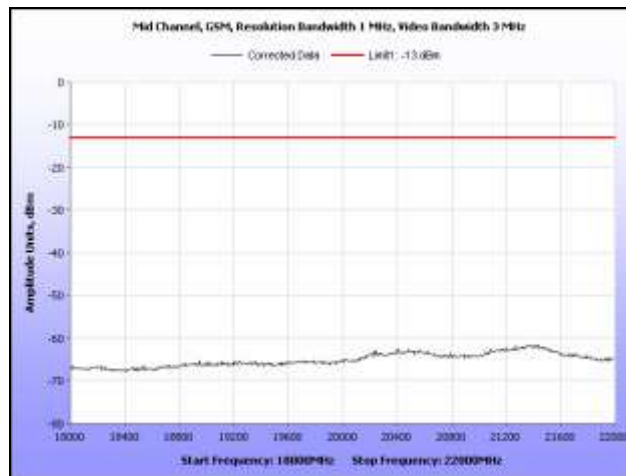
Plot 47. Radiated Spurious Emissions, Mid Channel, GSM, Part 24, 30 MHz – 1 GHz



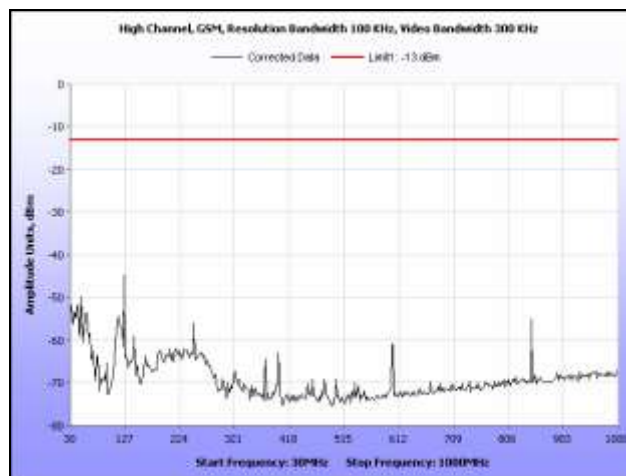
Plot 48. Radiated Spurious Emissions, Mid Channel, GSM, Part 24, 1 GHz – 3 GHz



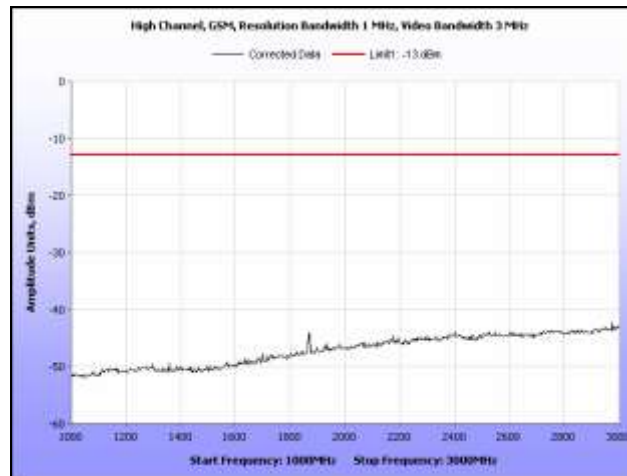
Plot 49. Radiated Spurious Emissions, Mid Channel, GSM, Part 24, 3 GHz – 18 GHz



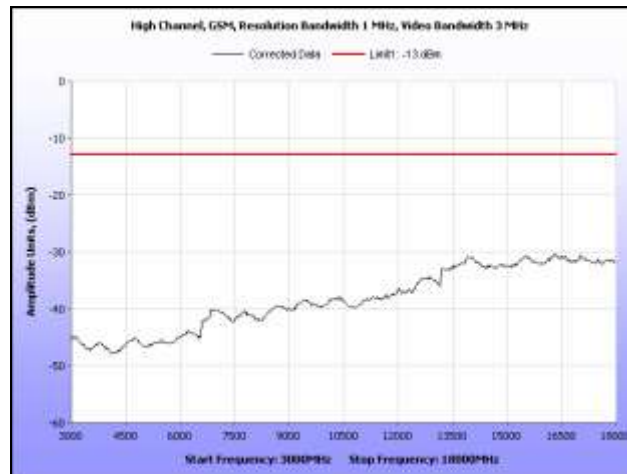
Plot 50. Radiated Spurious Emissions, Mid Channel, GSM, Part 24, 18 GHz – 22 GHz



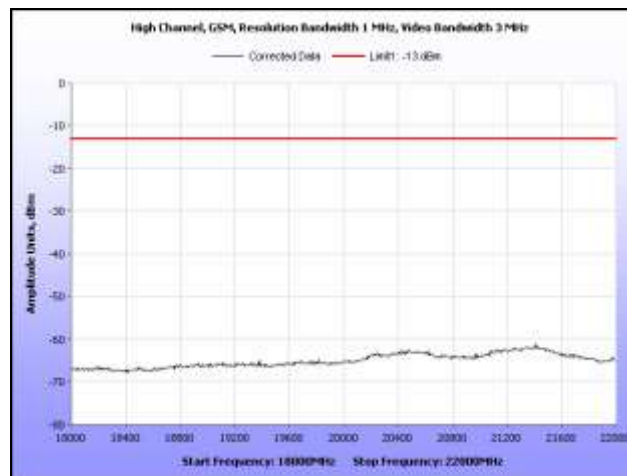
Plot 51. Radiated Spurious Emissions, High Channel, GSM, Part 24, 30 MHz – 1 GHz



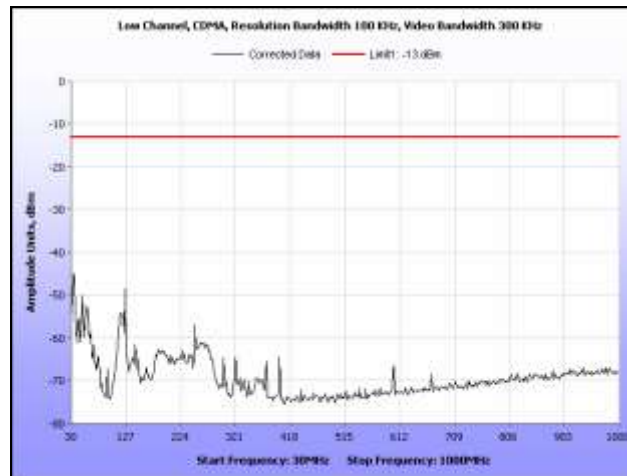
Plot 52. Radiated Spurious Emissions, High Channel, GSM, Part 24, 1 GHz – 3 GHz



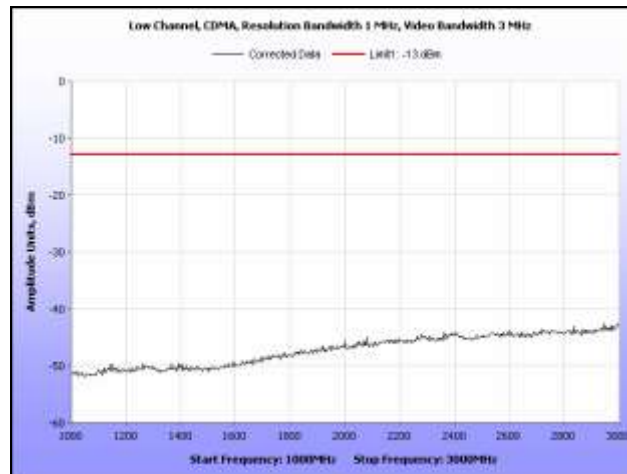
Plot 53. Radiated Spurious Emissions, High Channel, GSM, Part 24, 3 GHz – 18 GHz



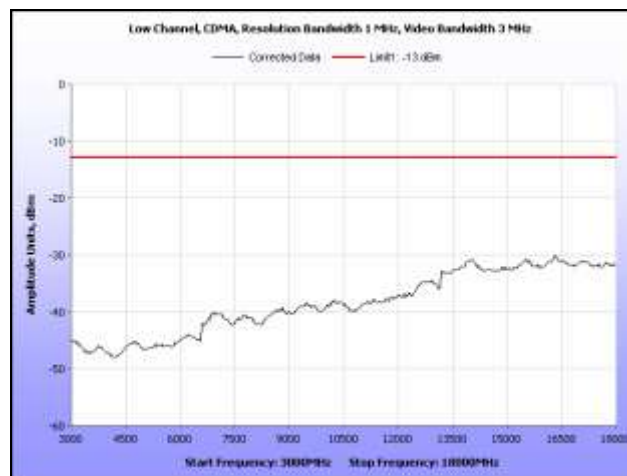
Plot 54. Radiated Spurious Emissions, High Channel, GSM, Part 24, 18 GHz – 22 GHz



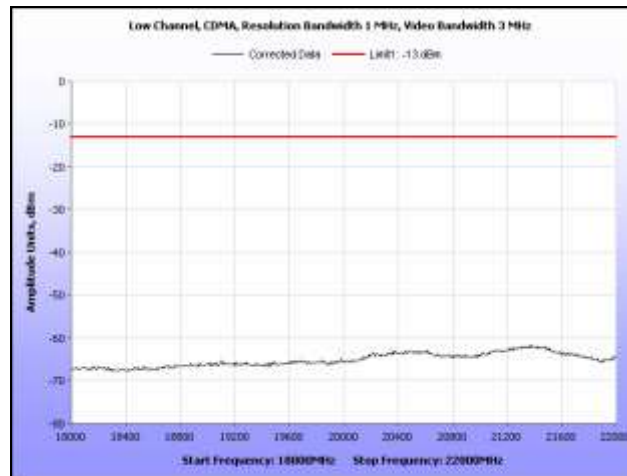
Plot 55. Radiated Spurious Emissions, Low Channel, CDMA, Part 24, 30 MHz – 1 GHz



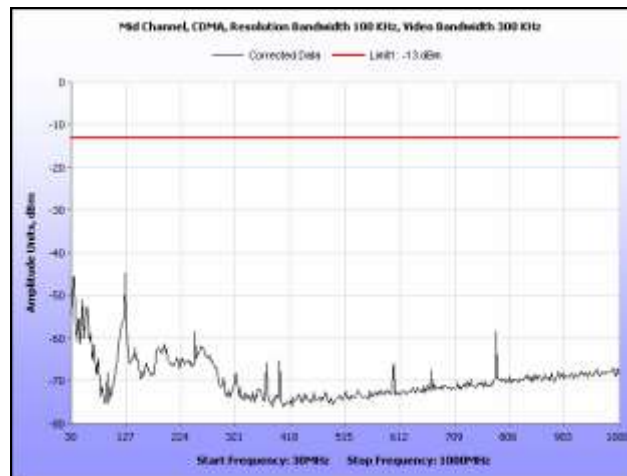
Plot 56. Radiated Spurious Emissions, Low Channel, CDMA, Part 24, 1 GHz – 3 GHz



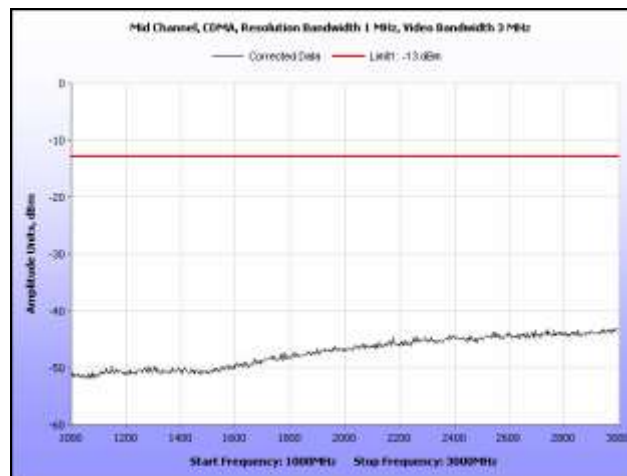
Plot 57. Radiated Spurious Emissions, Low Channel, CDMA, Part 24, 3 GHz – 18 GHz



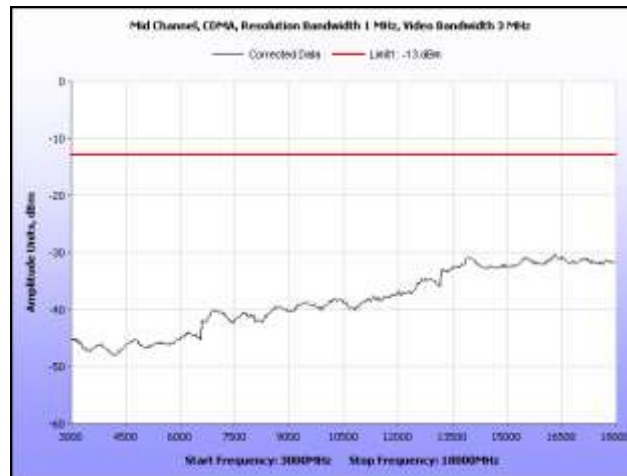
Plot 58. Radiated Spurious Emissions, Low Channel, CDMA, Part 24, 18 GHz – 22 GHz



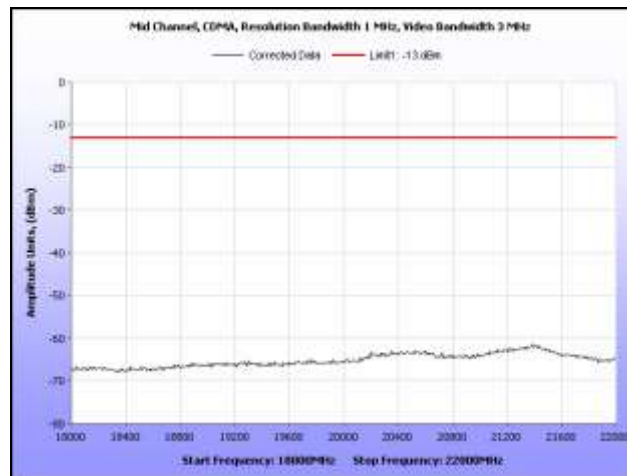
Plot 59. Radiated Spurious Emissions, Mid Channel, CDMA, Part 24, 30 MHz – 1 GHz



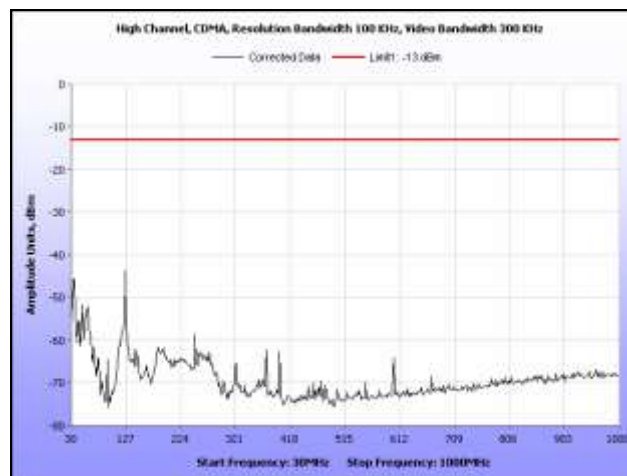
Plot 60. Radiated Spurious Emissions, Mid Channel, CDMA, Part 24, 1 GHz – 3 GHz



Plot 61. Radiated Spurious Emissions, Mid Channel, CDMA, Part 24, 3 GHz – 18 GHz

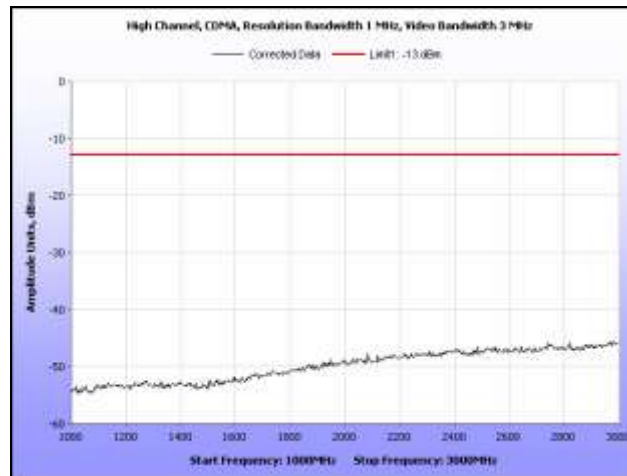


Plot 62. Radiated Spurious Emissions, Mid Channel, CDMA, Part 24, 18 GHz – 22 GHz

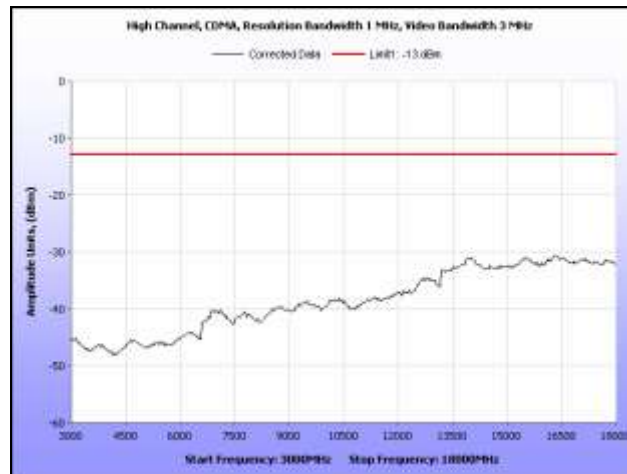


Plot 63. Radiated Spurious Emissions, High Channel, CDMA, Part 24, 30 MHz – 1 GHz

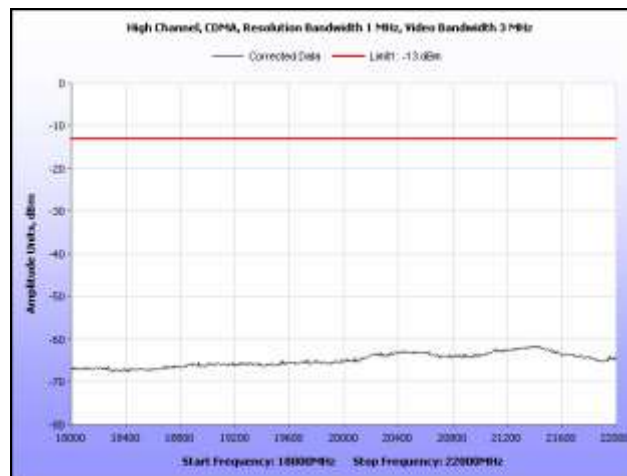




Plot 64. Radiated Spurious Emissions, High Channel, CDMA, Part 24, 1 GHz – 3 GHz



Plot 65. Radiated Spurious Emissions, High Channel, CDMA, Part 24, 3 GHz – 18 GHz



Plot 66. Radiated Spurious Emissions, High Channel, CDMA, Part 24, 18 GHz – 22 GHz





## Electromagnetic Compatibility Criteria for Intentional Radiators

### § 2.1051 Spurious Emissions at Antenna Terminals

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

**§ 22.917** The rules in this section govern the spectral characteristics of emissions in the Cellular Radiotelephone Service.

**§ 22.917 (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.

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

**§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.

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

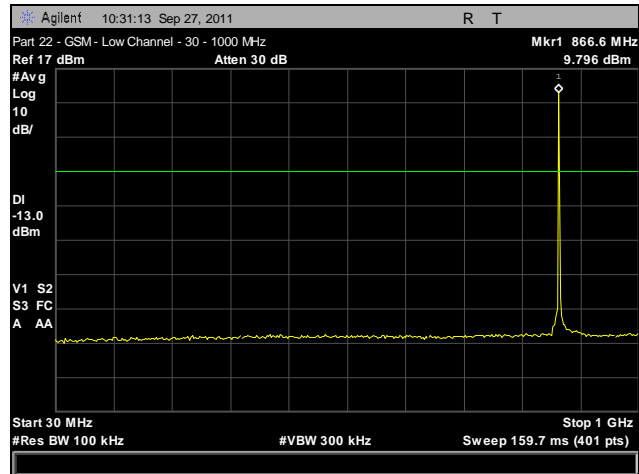


**Test Procedures:** The EUT's RF Output Power port was connected to a spectrum analyzer through an attenuator. The EUT was operated at both modulations and at the low, mid and high channels. Measurements were taken with an average detector up to the 10<sup>th</sup> harmonic of the carrier. The spectrum analyzer was set to 1 MHz RBW and 3 MHz RBW for testing.

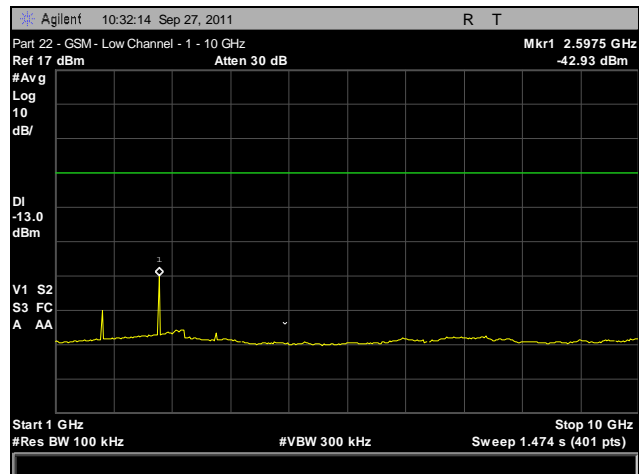
**Test Results:** The EUT complies with the requirements of this section.

**Test Engineer(s):** Len Knight

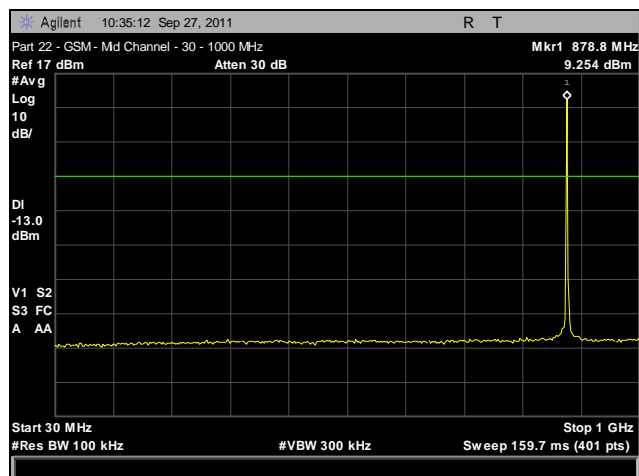
**Test Date(s):** 09/27/11



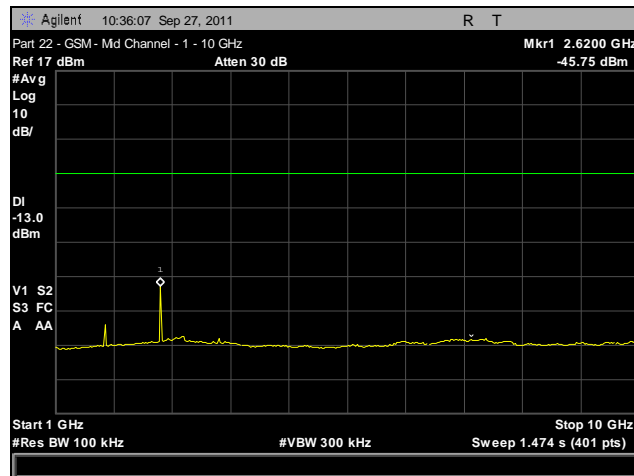
Plot 67. Conducted Spurious Emissions, Low Channel, GSM, Part 22, 30 MHz – 1 GHz



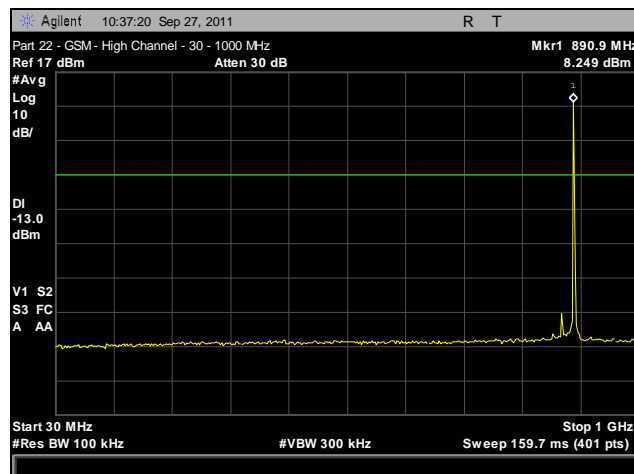
Plot 68. Conducted Spurious Emissions, Low Channel, GSM, Part 22, 1 GHz – 10 GHz



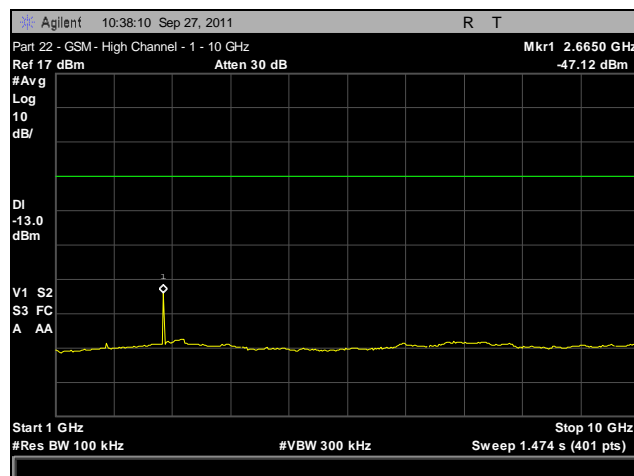
Plot 69. Conducted Spurious Emissions, Mid Channel, GSM, Part 22, 30 MHz – 1 GHz



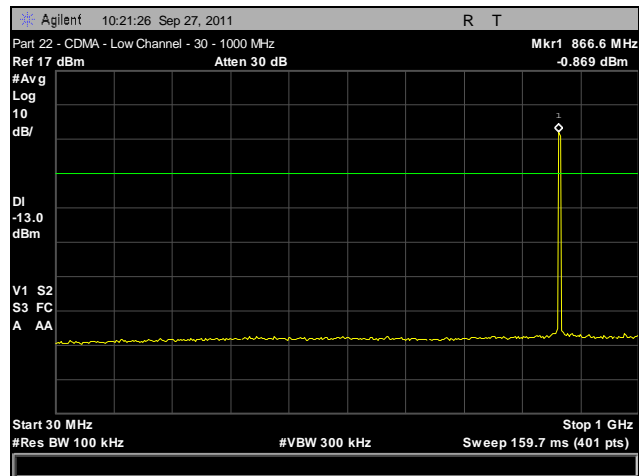
Plot 70. Conducted Spurious Emissions, Mid Channel, GSM, Part 22, 1 GHz – 10 GHz



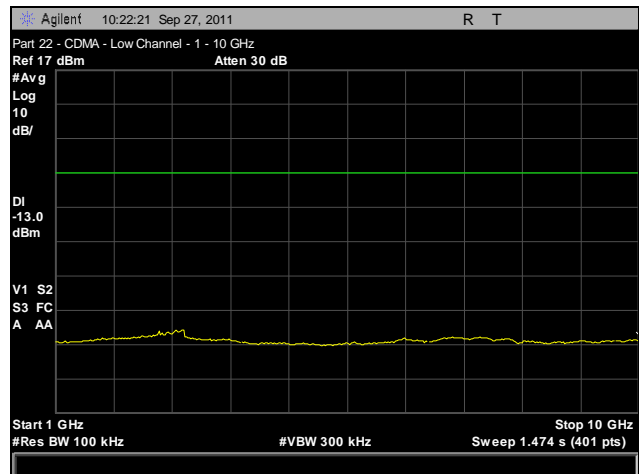
Plot 71. Conducted Spurious Emissions, High Channel, GSM, Part 22, 30 MHz – 1 GHz



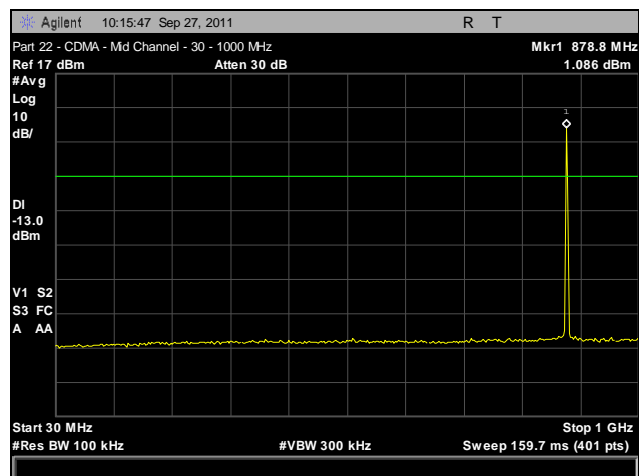
Plot 72. Conducted Spurious Emissions, High Channel, GSM, Part 22, 1 GHz – 10 GHz



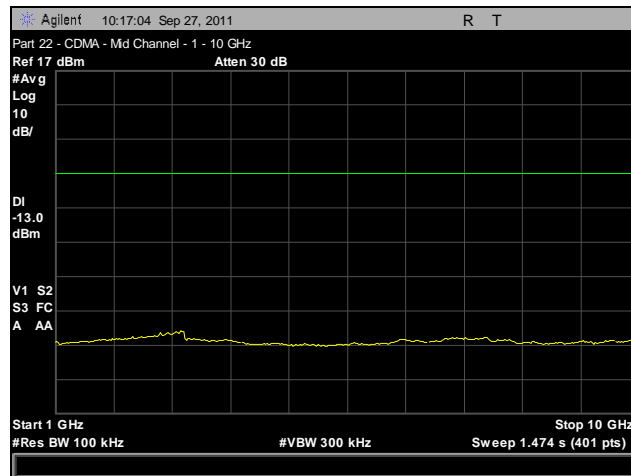
Plot 73. Conducted Spurious Emissions, Low Channel, CDMA, Part 22, 30 MHz – 1 GHz



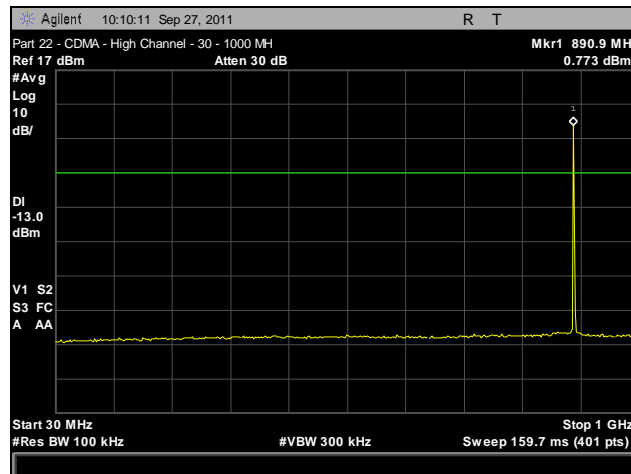
Plot 74. Conducted Spurious Emissions, Low Channel, CDMA, Part 22, 1 GHz – 10 GHz



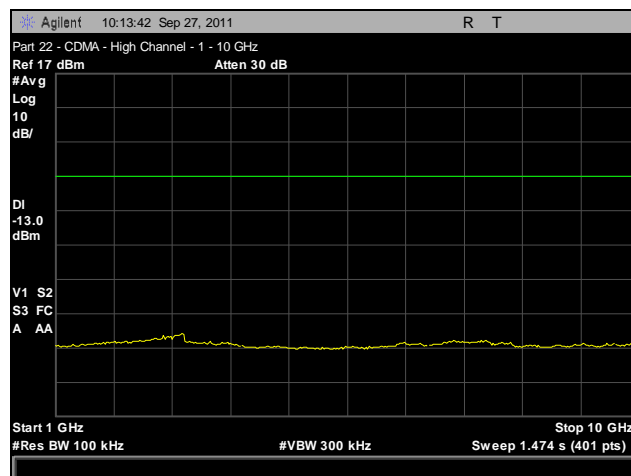
Plot 75. Conducted Spurious Emissions, Mid Channel, CDMA, Part 22, 30 MHz – 1 GHz



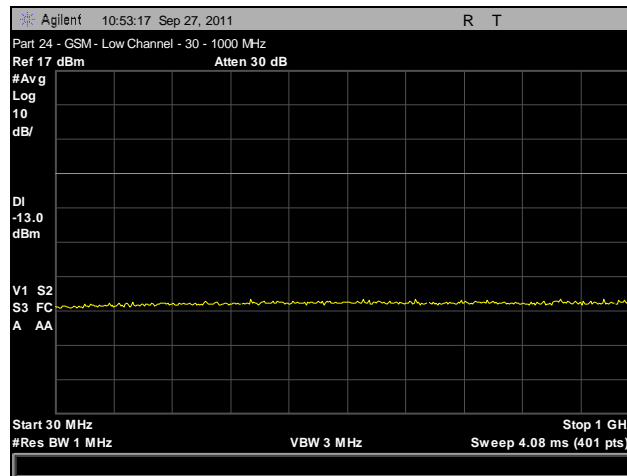
Plot 76. Conducted Spurious Emissions, Mid Channel, CDMA, Part 22, 1 GHz – 10 GHz



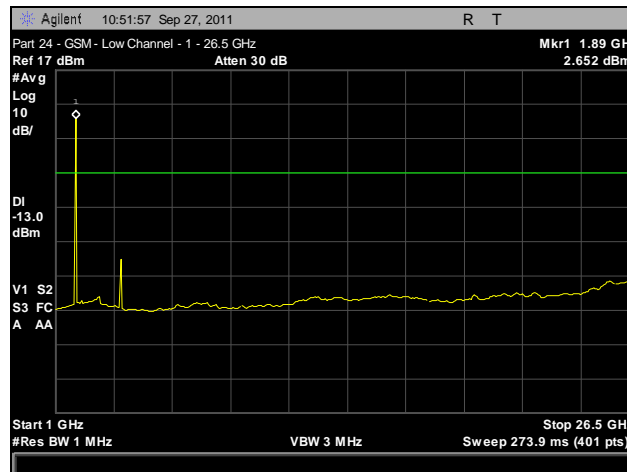
Plot 77. Conducted Spurious Emissions, High Channel, CDMA, Part 22, 30 MHz – 1 GHz



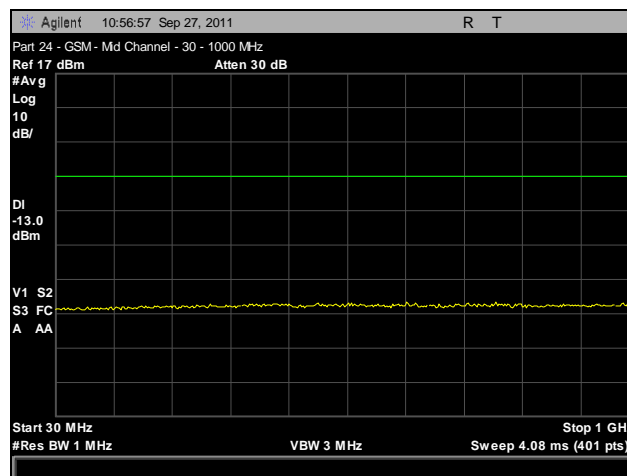
Plot 78. Conducted Spurious Emissions, High Channel, CDMA, Part 22, 1 GHz – 10 GHz



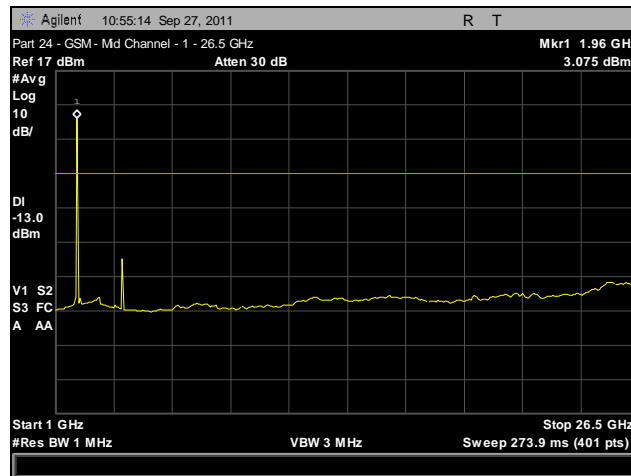
Plot 79. Conducted Spurious Emissions, Low Channel, GSM, Part 24, 30 MHz – 1 GHz



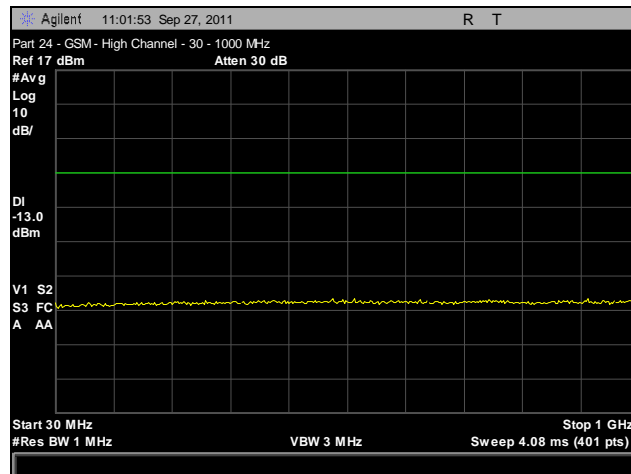
Plot 80. Conducted Spurious Emissions, Low Channel, GSM, Part 24, 1 GHz – 26.5 GHz



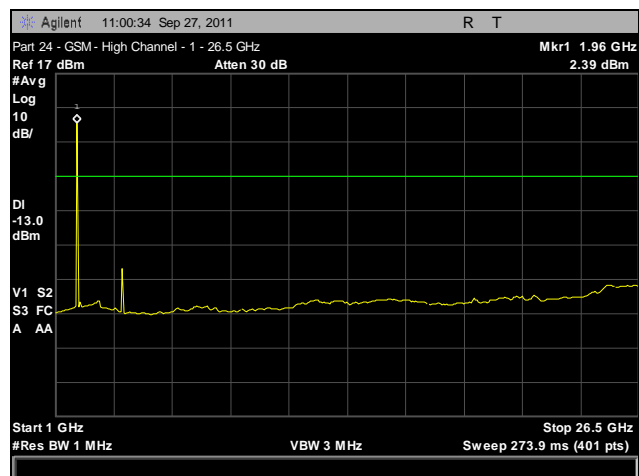
Plot 81. Conducted Spurious Emissions, Mid Channel, GSM, Part 24, 30 MHz – 1 GHz



Plot 82. Conducted Spurious Emissions, Mid Channel, GSM, Part 24, 1 GHz – 26.5 GHz

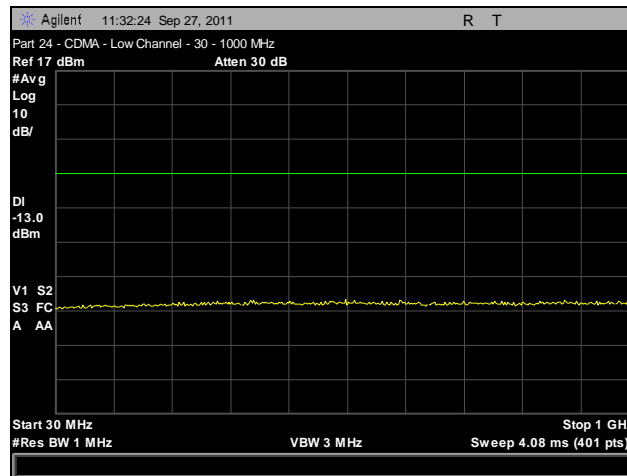


Plot 83. Conducted Spurious Emissions, High Channel, GSM, Part 24, 30 MHz – 1 GHz

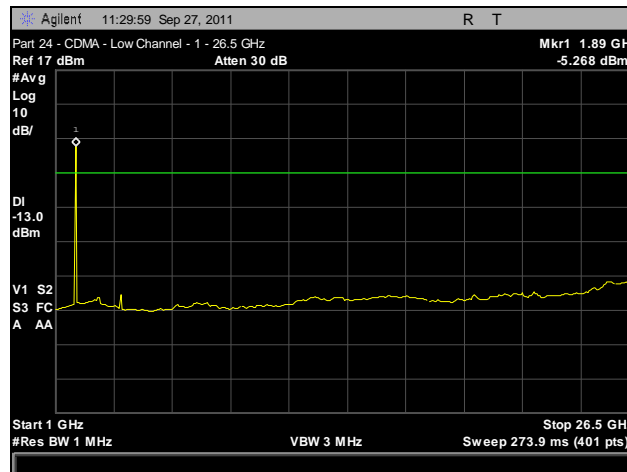


Plot 84. Conducted Spurious Emissions, High Channel, GSM, Part 24, 1 GHz – 26.5 GHz

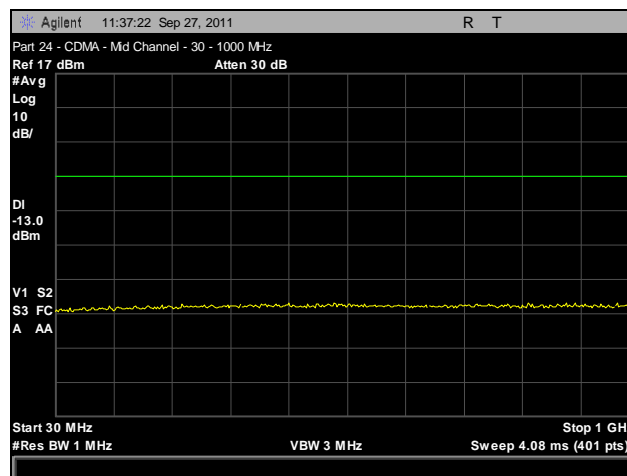




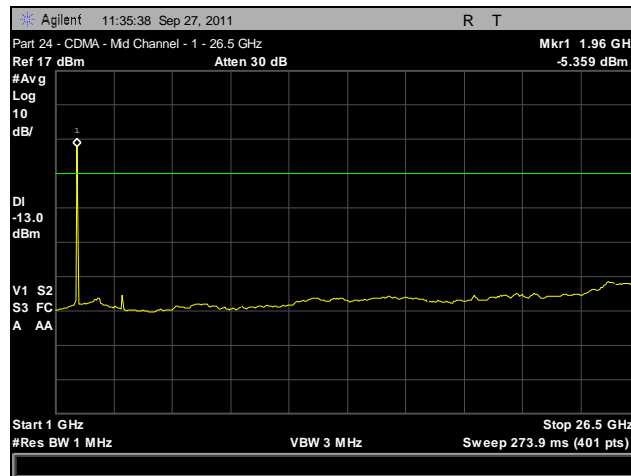
Plot 85. Conducted Spurious Emissions, Low Channel, CDMA, Part 24, 30 MHz – 1 GHz



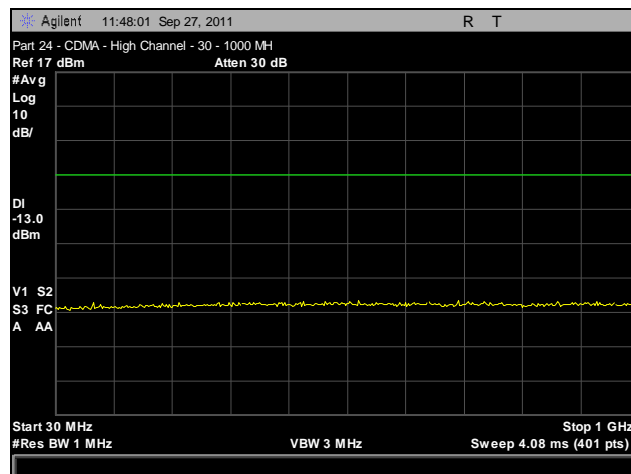
Plot 86. Conducted Spurious Emissions, Low Channel, CDMA, Part 24, 1 GHz – 26.5 GHz



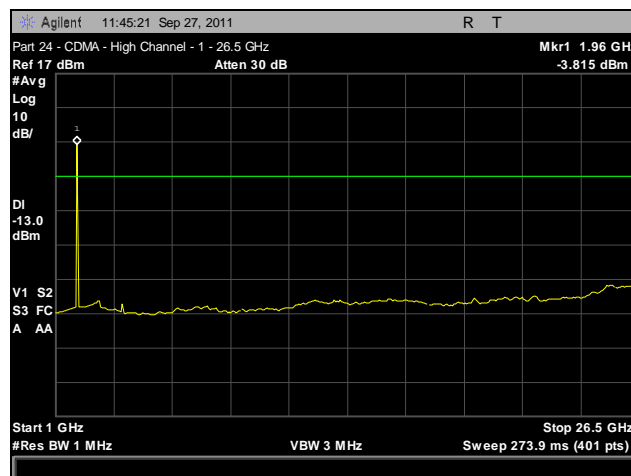
Plot 87. Conducted Spurious Emissions, Mid Channel, CDMA, Part 24, 30 MHz – 1 GHz



Plot 88. Conducted Spurious Emissions, Mid Channel, CDMA, Part 24, 1 GHz – 26.5 GHz



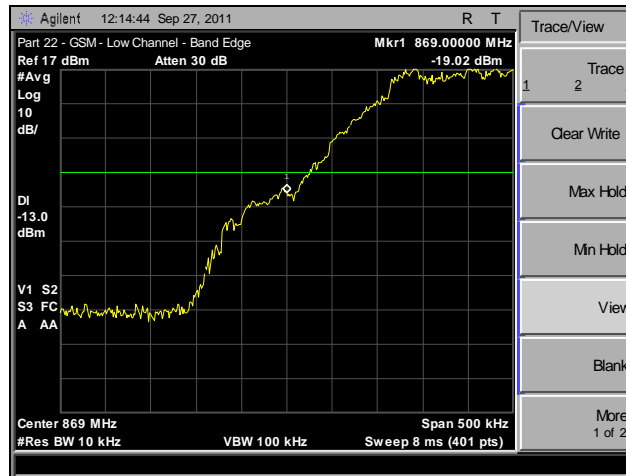
Plot 89. Conducted Spurious Emissions, High Channel, CDMA, Part 24, 30 MHz – 1 GHz



Plot 90. Conducted Spurious Emissions, High Channel, CDMA, Part 24, 1 GHz – 26.5 GHz



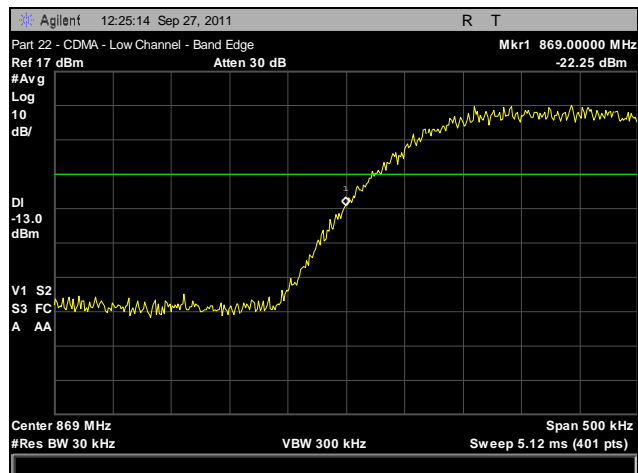
## Band Edge



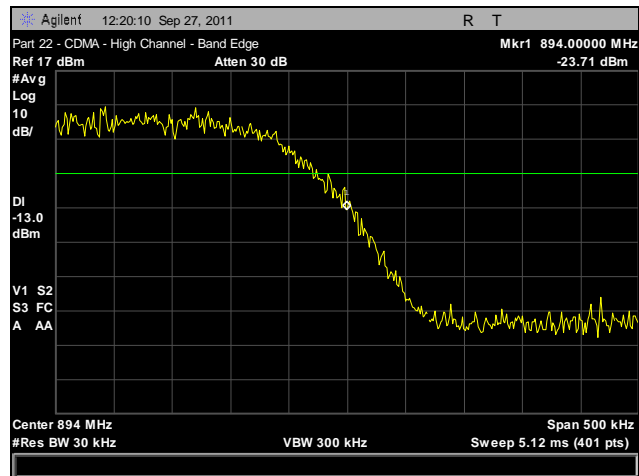
Plot 91. Band Edge, Part 22, GSM, Low Channel



Plot 92. Band Edge, Part 22, GSM, High Channel



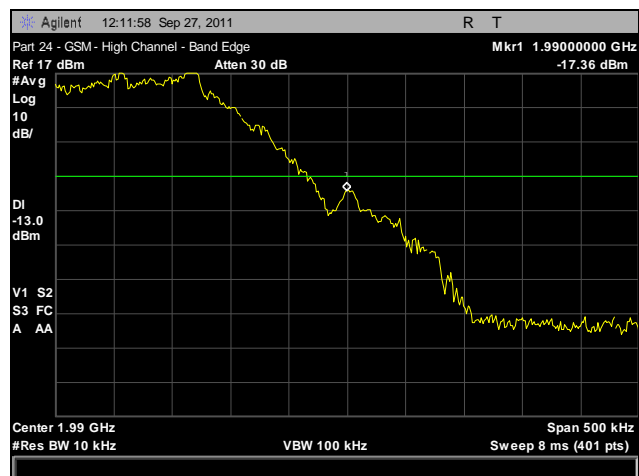
Plot 93. Band Edge, Part 22, CDMA, Low Channel



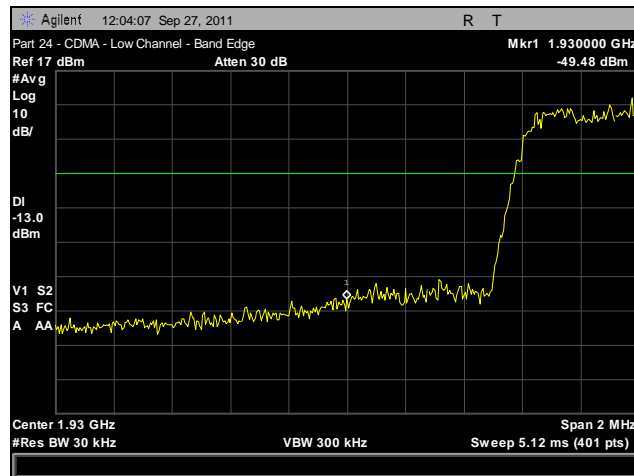
Plot 94. Band Edge, Part 22, CDMA, High Channel



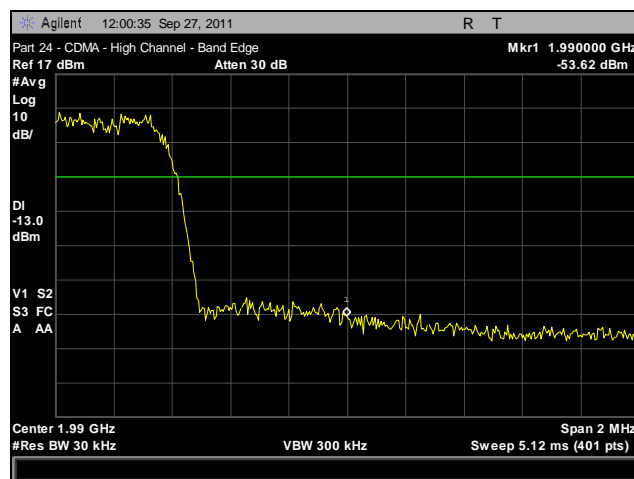
Plot 95. Band Edge, Part 24, GSM, Low Channel



Plot 96. Band Edge, Part 24, GSM, High Channel



Plot 97. Band Edge, Part 24, CDMA, Low Channel



Plot 98. Band Edge, Part 24, CDMA, High Channel



## Electromagnetic Compatibility Criteria for Intentional Radiators

### Frequency Stability

**Test Requirement(s):** §2.1055

**Test Procedures:** As required by 47 CFR 2.1055, *Frequency Stability measurements* were made at the RF output terminals using a direct connect to a Spectrum Analyzer.

The EUT was placed in the Environmental Chamber with the support equipment on the outside. The EUT was set to transmit at its mid channel using a CW carrier. The frequency drift was investigated for every 10°C increment until the unit was stabilized. Measurements were made using the frequency counter function of the spectrum analyzer.

Voltage supplied to EUT is 120 VAC reference temperature was done at 20°C. The voltage was varied by  $\pm 15\%$  of nominal

**Test Results:** Equipment is compliant with Section 2.1055, 22.863, and 24.235.

**Test Engineer(s):** Len Knight

**Test Date(s):** 10/03/11



Temperature (deg C)	Frequency (MHz)	Drift (ppm)
-30	881.600049	0.019
-20	881.600044	0.014
-10	881.600041	0.010
0	881.600035	0.003
10	881.600032	0.000
20	881.600032	ref
30	881.600032	0.000
40	881.600031	-0.001
50	881.600028	-0.005

Table 7. Frequency Stability, Test Results, Part 22

Temperature (deg C)	Frequency (MHz)	Drift (ppm)
-30	1960.000110	0.020
-20	1960.000098	0.014
-10	1960.000091	0.011
0	1960.000078	0.004
10	1960.000071	0.001
20	1960.000070	ref
30	1960.000072	0.001
40	1960.000050	-0.010
50	1960.000063	-0.004

Table 8. Frequency Stability, Test Results, Part 24

Voltage (VAC)	Frequency (MHz)	Drift (ppm)
120	881.600032	ref
102	881.600031	-0.001
138	881.600031	-0.001

Voltage (VAC)	Frequency (MHz)	Drift (ppm)
120	1960.000070	ref
102	1960.000071	0.001
138	1960.000071	0.001



## 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
1T4377	TRUE RMS MULTIMETER	FLUKE	189	12/23/2010	12/23/2011
1T4621	ESA-E SERIES SPECTRUM ANALYZER	AGILENT TECHNOLOGIES	E4402B	05/31/2011	05/31/2012
1T4505	TEMPERATURE CHAMBER	TEST EQUITY	115	11/29/2010	11/29/2011
1T4612	SPECTRUM ANALYZER	AGILENT TECHNOLOGIES	E4407B	09/27/2010	09/27/2011
1T4149	HIGH-FREQUENCY ANECHOIC CHAMBER	RAY-PROOF	81	NOT REQUIRED	
1T4728	PROGRAMMABLE AC POWER SOURCE	QUADTECH	31010	SEE NOTE	
1T4752	PRE-AMPLIFIER	MITEQ	JS44-18004000-35-8P	SEE NOTE	
1T4757	ANTENNA; HORN	ETS-LINDGREN	3117	01/10/2011	01/10/2012
1T4744	ANTENNA, HORN	ETS-LINDGREN	3116	06/14/2011	06/14/2012
1T4409	EMI RECEIVER	ROHDE & SCHWARZ	ESIB7	06/14/2011	06/14/2012
1T4634	THERMO/HYGRO/BAROMETER	CONTROL COMPANY	02-401	03/11/2010	03/11/2012
1T4300	SEMI-ANECHOIC CHAMBER # 1	EMC TEST SYSTEMS	NONE	08/23/2010	08/23/2013
1T4751	ANTENNA - BILOG	SUNOL SCIENCES	JB6	11/03/2010	11/03/2011
1T4568	RADIATING NOISE SOURCE	MET LABORATORIES	N/A	SEE NOTE	
1T4771	SPECTRUM ANALYZER	AGILENT	E4446A	06/25/2011	06/25/2012

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



Digital Receiver Technology, Inc.  
DRT1301C

Electromagnetic Compatibility  
End of Report  
CFR Title 47 Part 22 Subpart H & Part 24 Subpart E

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# End of Report