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December 5, 2018

Commscope
Via Mengolina, 20
Faenza -RA- , ITALY

Dear Giuliano Pompignoli,

Enclosed is the EMC Wireless test report for compliance testing of the Commscope, CAP M 7E/80-85/17E/19-F-DC 7820478-0001 and 7820478-0002 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.

Joel Huna
Documentation Department

Reference: (\\Commscope\EMC100116-FCC22_24 REV. 3)

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**Electromagnetic Compatibility Criteria
Test Report**

for the

Commscope

CAP M 7E/80-85/17E/19-F-DC 7820478-0001 and 7820478-0002

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: EMC100116-FCC22_24 REV. 3

December 5, 2018

Prepared For:

Commscope

Via Mengolina, 20

Faenza -RA-, ITALY

Prepared By:

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&
Part 24 Subpart E for Broadband PCS Devices

Bradley Jones
Project Engineer, Electromagnetic Compatibility Lab

Joel Huna
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 24 Subpart E of the FCC Rules under normal use and maintenance.

John Mason,
Director, Electromagnetic Compatibility Lab

Report Status Sheet

Revision	Report Date	Reason for Revision
∅	October 30, 2018	Initial Issue.
1	November 13, 2018	Engineer corrections
2	November 15, 2018	Engineer corrections.
3	December 5, 2018	TCB 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 μ A	Decibels above one microamp
dB μ V	Decibels above one microvolt
dB μ A/m	Decibels above one microamp per meter
dB μ V/m	Decibels above one microvolt per meter
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
μ H	microhenry
μ	microfarad
μ s	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 Commscope CAP M 7E/80-85/17E/19-F-DC 7820478-0001 and 7820478-0002, 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 CAP M 7E/80-85/17E/19-F-DC 7820478-0001 and 7820478-0002. Commscope should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the CAP M 7E/80-85/17E/19-F-DC 7820478-0001 and 7820478-0002, 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 Commscope, purchase order number 8002554399.

FCC Reference	Description	Compliance
§2.1046; §22.913; §24.232	RF Power Output	Compliant
§2.1047	Modulation Characteristics	Not Applicable
§2.1049; §22.917; §24.232(d)	Occupied Bandwidth	Compliant
§2.1051; §22.917, §24.238	Conducted Spurious Emissions at Antenna Terminals and Band Edge	Compliant
§2.1053; §22.917, §24.238	Radiated Spurious Emissions from the Cabinet	Compliant
§2.1049, §24.238	Frequency stability	Compliant
Section 3.62 FCC KDB 935210 and section 7.2.2.5.2 ANSI C63.26	Intermodulation Products	Compliant
Section 3.3 FCC KDB 935210 and section 7.2.2.2 ANSI C63.26	Filter Response	Compliant
N/A	RF Exposure	Not Applicable

Table 1. Executive Summary of EMC Compliance Testing

II. Equipment Configuration

A. Overview

MET Laboratories, Inc. was contracted by Commscope to perform testing on the CAP M 7E/80-85/17E/19-F-DC 7820478-0001 and 7820478-0002, under Commscope's purchase order number 8002554399.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Commscope, CAP M 7E/80-85/17E/19-F-DC 7820478-0001 and 7820478-0002.

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

Model(s) Tested:	CAP M 7E/80-85/17E/19-F-DC 7820478-0001 and 7820478-0002	
Model(s) Covered:	CAP M 7E/80-85/17E/19-F-DC 7820478-0001 and 7820478-0002	
Filing Status:	Original	
EUT Specifications:	Primary Power: 110VAC for EUT1 and 48VDC for EUT2	
	FCC ID: XS5-CAPM7E817E19	
	Type of Modulations:	LTE, GSM, CDMA, WCDMA
	Equipment Code:	B2I
	RF Power Output	32.1 dBm Conducted
	GSM	
	CDMA	
	WCDMA	33.14 dBm Conducted
EUT Frequency Ranges (MHz):	CDMA : 869-894MHz, 1930-1995MHz, 2110-2180 MHz GSM : 869-894 MHz, 1930-1990 MHz WCDMA : 869-894MHz, 1930-1995MHz, 2110-2180 MHz	
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:	Bradley Jones	
Date(s):	December 5, 2018	

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
ANSI C63.4:20014	Methods and Measurements of Radio-Noise Emissions from Low-Voltage Electrical And Electronic Equipment in the Range of 9 kHz to 40 GHz
ANSI C63.26: 2015	Compliance Testing of Transmitters Used in Licensed Radio Services
ISO/IEC 17025:2005	General Requirements for the Competence of Testing and Calibration Laboratories
EIA/TIA-603-D-2010	Land Mobile FM or PM Communication Equipment Measurement and Performance Standards
KDB 971168 v02r02	MEASUREMENT GUIDANCE FOR CERTIFICATION OF LICENSED DIGITAL TRANSMITTERS

C. Test Site

All testing was performed at MET Laboratories, Inc., 914 West Patapsco Avenue, 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 3 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. Measurement Uncertainty

Test Method	Typical Expanded Uncertainty	K	Confidence Level
RF Frequencies	±4.52 Hz	2	95%
RF Power Conducted Emissions	±2.32 dB	2	95%
RF Power Conducted Spurious Emissions	±2.25 dB	2	95%
RF Power Radiated Emissions	±3.01 dB	2	95%

Table 2. Uncertainty Calculations Summary

E. Description of Test Sample

The CAP M 7E/80-85/17E/19-F-DC 7820478-0001 and 7820478-0002, Equipment Under Test (EUT), is DAS (Distributed Antenna System) Remote. It does not operate in a stand-alone mode.

1.1.1 CAP M Base Unit Overview

The CAP M serves as a remote unit in an ION-E DAS. The CAP M interfaces with the CAN/TEN via an optical link. The CAP M also can be cascaded to a second unit using the same transport mechanism, and/or an auxiliary PoE (Class 3) Ethernet device such as a wireless access point. On the DL, the CAP M converts some or all the data arriving at the CAP M to analog signals and sends them to the antenna ports. On the UL, received signals are digitized and serialized into data streams which are sent back to the CAN. Each unit contains up to four transceiver paths for RF coverage. Each path is dedicated to a fixed band (set at the factory). Physically, the CAP M base unit consists of 3 major PCBAs, the Main board and 2 separate RF boards for optimization of the dissipation. A cavity Duplexer and Power supply module.

1.1.2 Main Board

The Main Board contains the FPGA, reference clocks, and power supplies for the unit. Main Board provides the interface to the ERA head end (CAN or TEN) by optical connection. The Main Board also provides the interfaces for a cascaded CAP M and/or auxiliary Ethernet port.

Additional connections to the “outside world” from the Main Board include status & alarm indicator bi-color LED, and the fan kit connector (optional). Internally, the board contains the A/D and D/A converters as well as the IF and frequency-translating components for the RF transceivers. For the initial release, the main board transceiver paths are frequency-agnostic, so that only the RF board must be changed to cover a different set of frequency bands.

1.1.3 RF Boards

The RF boards contain the PAs, LNAs, filters, and combiners for each coverage band. These bands are combined in the cavity Duplexer, 1 ANT port for SISO version and 2 ANT ports for MIMO version. The RF Boards is where all of the frequency-specific devices reside, so generally the bands supported by a CAP M unit are determined by which RF Board variant and different cavity DPX.

1.2 PowerSupply

CAP M EU version is powered via the AC connection only. AC power comes from local AC supply. For US version DC power is available, DC can come from a local DC supply or via hybrid fiber (and a hybrid fiber junction box) from the CAN/TEN.

1.3 Optical Interface

The CAP M Optical unit interface with the CAN/TEN via optical fiber, and the conversion of signals from optical to electrical takes place in the SFP+ module(s) in the OCTIS connector(s). The appropriate SFP+ units must be specified: these vary depending upon the length of fiber used and the type of fiber used (single mode, multimode). These SFP+ options can be changed in the field. Optical transport is over single mode (SM) or multimode (MM) fiber. The appropriate SFP+ is chosen by the customer during the ordering process and is installed in the OCTIS SFP connector. See ERA system for further requirements / limitations.

1.4 *List Operation bands*

BAND	DL (MHz)	UL (MHz)	Standard
12	729-746	699-716	LTE
13	746-756	777-787	LTE
5	869-894	824-849	LTE, UMTS, CDMA, GSM
66	2110-2180	1710-7180	LTE, UMTS, CDMA
25	1930-1995	1850-1915	LTE, UMTS, CDMA, GSM

1.5 *Description of power down function for CAP-M remote unit*

a) Over temperature:

Internal temperatures of the major components (PAs, FPGA, and PHY) are continuously monitored by the system controller. Over-temperature alarms are raised if any of these temperatures exceed 80°C (75° for the FPGA). If nothing is done to remedy the situation when the alarm is raised and temperatures continue to rise; the unit will shut down when any one of the temperature measurements reach 85°C (or 80°C for the FPGA).

b) Over power:

If the input power of the PA exceeds continuously the limit that will result in the maximum output power, an input power limiter (ALC = Automatic Level Control) will be active. It will actively limit the input power to a value that will result in the maximum specified output power.

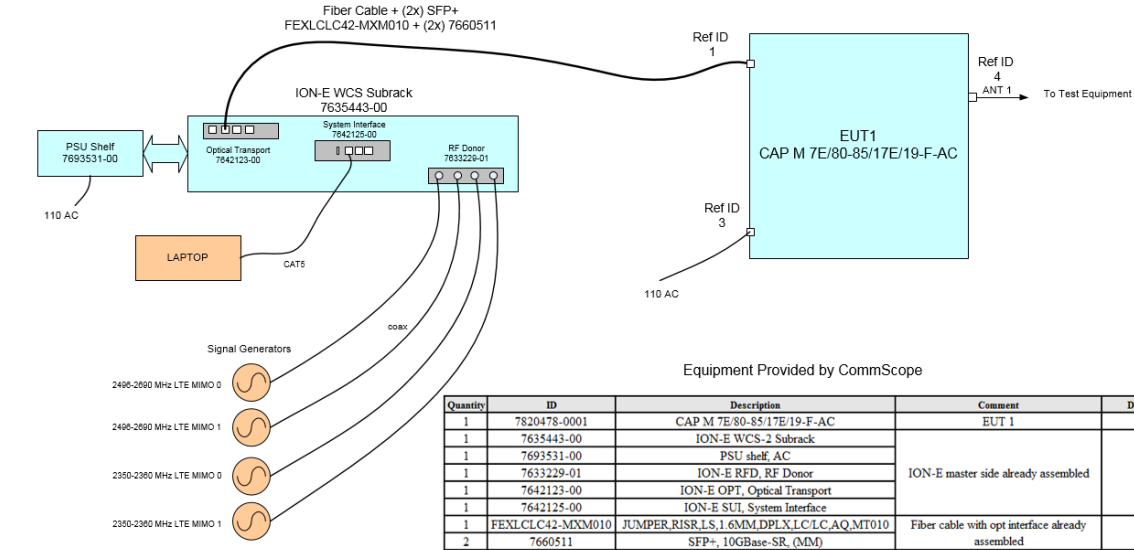
c) Over power:

Output power overdrive due to fast input power peaks will trigger a gain reduction algorithm so that the output power level is restricted to the intended maximum

d) Over current:

An electronic device turns OFF the PA when its current exceeds defined current threshold which roughly corresponds to about 4/5dB the nominal output power.

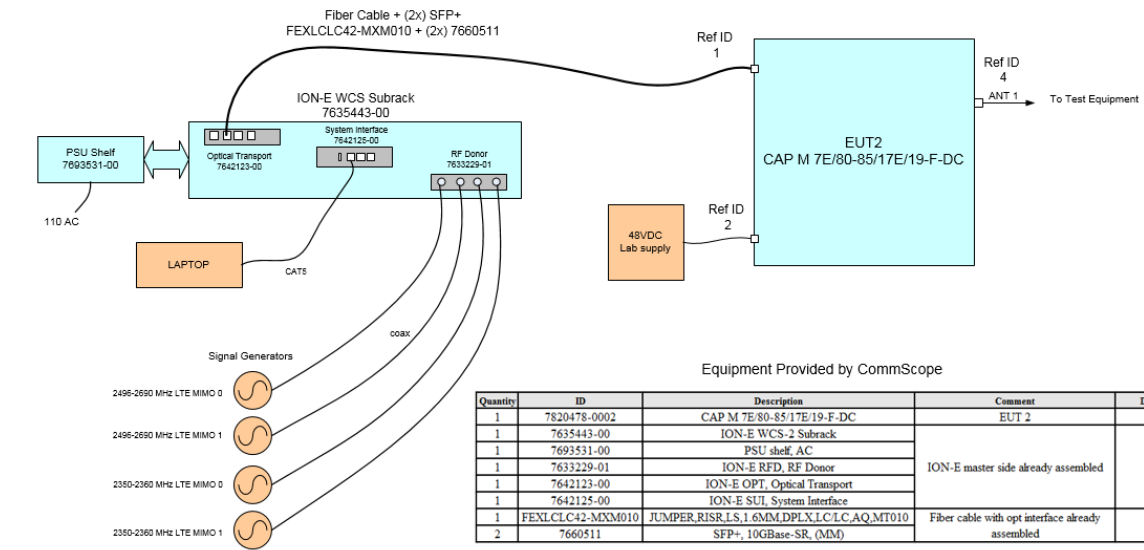
Config. 1-Setup Cap M 7E/80-85/17E/19-F-AC



Ports and Cabling

Ref. ID	Port name on EUT	Cable Description or reason for no cable	Qty	Length as tested (m)	Max Length (m)	Shielded? (Y/N)	Termination Box ID & Port Name
1	Fiber Input Cable	Customer supplied Fiber Cable	1	10		Yes	EUT Input
2	48VDC Input	DC power Cable	1	3,2		No	EUT Power Supply
3	VAC Input	AC power Cable	1	3,2		No	EUT Power Supply
4	ANT 1	Test Equipment	1	2		No	Antenna Port

Config. 2 - Setup Cap M 7E/80-85/17E/19-F-DC



Ports and Cabling

Ref. ID	Port name on EUT	Cable Description or reason for no cable	Qty	Length as tested (m)	Max Length (m)	Shielded? (Y/N)	Termination Box ID & Port Name
1	Fiber Input Cable	Customer supplied Fiber Cable	1	10		Yes	EUT Input
2	48VDC Input	DC power Cable	1	3,2		No	EUT Power Supply
3	VAC Input	AC power Cable	1	3,2		No	EUT Power Supply
4	ANT 1	Test Equipment	1	2		No	Antenna Port

Figure 1. Block Diagram of Equipment Configuration

F. Equipment Configuration

Ref. ID	Slot #	Name / Description	Model Number	Part Number	Serial Number	Rev. #
EUT1		CAP M 7E/80-85/17E/19-F-AC	7820478-0001			
EUT2		CAP M 23/23/25/25-F-DC	7820478-0002			

Table 3. Equipment Configuration

G. Support Equipment

Ref. ID	Name / Description	Manufacturer	Model Number	*Customer Supplied Calibration Data
	Laptop	Not Available		N/A
	Qty 4 - Cat 5 Cable	Not Available		N/A
	Qty 1 - Signal Generators (729-798 MHz)	Not Available		Not Available
	Qty 1 - Signal Generators (858,5-894 MHz)	Not Available		Not Available
	Qty 1 - Signal Generators (2110-2180 MHz)	Not Available		
	Qty 1 - Signal Generators (1930-1995 MHz)	Not Available		
	48VDC Power Supply	Not Available		N/A
	ION-E WCS-2 Subrack	Commscope	7635443-00	N/A
	PSU shelf, AC	Commscope	7693531-00	N/A
	ION-E RFD, RF Donor	Commscope	7633229-01	N/A
	ION-E OPT, Optical Transport	Commscope	7642123-00	N/A
	ION-E SUI, System Interface	Commscope	7642125-00	N/A
	JUMPER, RISR, LS, 1.6MM, DPLX, LC/LC, AQ, MT010	Commscope	FEXLCLC4 2-MXM010	N/A
	SFP+, 10GBase-SR, (MM)		7660511	N/A

The 'Customer Supplied Calibration Data' column will be marked as either not applicable, not available, or will contain the calibration date supplied by the customer.

Table 4. Support Equipment

H. Ports and Cabling Information

Ref. ID	Port name on EUT	Cable Description or reason for no cable	Qty	Length as tested (m)	Max Length (m)	Shielded? (Y/N)	Termination Box ID & Port Name
1	Fiber Input Cable	Customer supplied Fiber Cable	1	10		Yes	EUT Input
2	48VDC Input	DC power Cable	1	3,2		No	EUT Power Supply
3	VAC Input	AC power Cable	1	3,2		No	EUT Power Supply
4	ANT 1	Test Equipment	1	2		No	Antenna Port

Table 5. Ports and Cabling Information

I. Mode of Operation

The EUT will operate in a continuous emission mode. The unit will be tested to address FCC Part 15 B (Class B) – Unintentional Radiator Conducted and Radiated Emissions.

The EUT will also be operated in a continuous emission mode on downlink bands only addressing FCC 22H/24E & RSS-131, RSS-132, RSS-133 intentional Radiator mode for Frequency:

GSM-850UL (824-849 MHz) / DL (869-894MHz)

GSM-1900 UL(1850-1910MHz) / DL(1930-1990MHz)

WCDMA Band 25 UL(1850-1915 MHz) / DL(1930 – 1995 MHz)

WCDMA Band 66 UL(1710-1780 MHz) / DL(2110-2180 MHz)

WCDMA Band 5 UL(824-849 MHz) / DL(869-894 MHz)

CDMA Band 25 UL(1850-1915 MHz) / DL(1930-1995 MHz)

CDMA Band 66 UL(1710-1780 MHz) / DL(2110-2180MHz)

CDMA Band 5 UL (824-849 MHz) / DL(869-894MHz)

J. Method of Monitoring EUT Operation

The LED on the unit will be solid green if the unit is powered on and operational. If the unit is powered on and the LED on the unit is a solid red, the unit is not operational. It will be identified as a major hardware issue and an alarm will be raised on the GUI.

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 CommScope 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(5): The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts

§ 24.232 (c): Mobile and portable stations are limited to 2 watts EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications

Test Procedures: The EUT was tested according to the average power integration procedures of ANSI C63.26 5.2.4.4.1. The power measurement function of spectrum analyzer was used and configured in the following manner.

- (a) Frequency = channel cf
- (b) Span = 2-3 x the OBW
- (c) RBW = 1-5 % of the OBW
- (d) VBW 1-3 x the RBW
- (e) Sweep Time = Auto
- (f) Detector = Average

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

Test Engineer(s): Bradley Jones

Test Date(s): August 31, 2018



CDMA					
Band 5		frequency	Input Power	Output Power	Gain
1.25 MHz	Low	871.5	-4.22	29.17	33.39
	Middle	881.5	-4.56	29.81	34.37
	High	891.5	-4.68	29.85	34.53
Band 25		frequency	Input Power	Output Power	Gain
1.25 MHz	Low	731.5	-4.63	31.85	36.48
	Middle	737.5	-4.57	33.73	38.3
	High	743.5	-4.57	32.84	37.41
Band 66		frequency	Input Power	Output Power	Gain
1.25 MHz	Low	2112	-4.85	31.47	36.32
	Middle	2145	-4.59	32.27	36.86
	High	2178	-4.56	32.84	37.4

Table 6. RF Power Output, CDMA Bands, Test Results



WCDMA					
Band 5		frequency	Input Power	Output Power	Gain
3.84 MHz	Low	871.5	-4.54	29.32	33.86
	Middle	881.5	-4.46	29.57	34.03
	High	891.5	-4.25	29.69	33.94
Band 25		frequency	Input Power	Output Power	Gain
3.84 MHz	Low	731.5	-4.52	32.19	36.71
	Middle	737.5	-4.69	33.14	37.83
	High	743.5	-4.63	32.95	37.58
3.84 MHz					
Band 66		frequency	Input Power	Output Power	Gain
3.84 MHz	Low	2112	-4.88	31.02	35.9
	Middle	2145	-4.72	31.94	36.66
	High	2178	-4.55	32.6	37.15

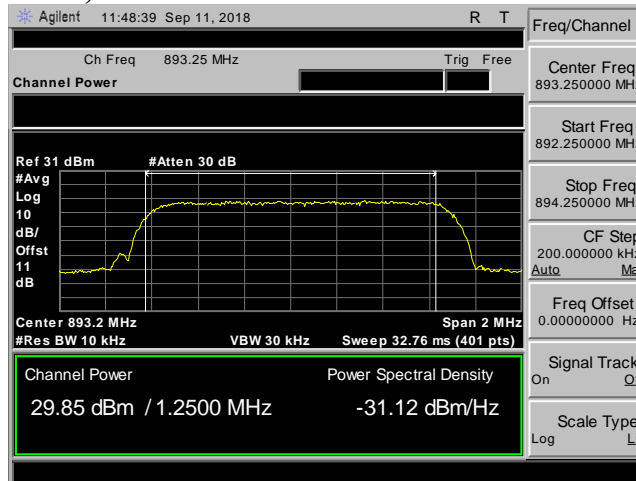
Table 7. RF Output Power, WCDMA, Test Results

GSM					
Band 5		frequency	Input Power	Output Power	Gain
200 kHz	Low	871.5	-4.26	28.14	32.4
	Middle	881.5	-4.45	28.59	33.04
	High	891.5	-4.47	28.5	32.97
Band 25		frequency	Input Power	Output Power	Gain
200 kHz	Low	1932.5	-4.21	32.11	36.32
	Middle	1960	-4.58	31.4	35.98
	High	1992	-4.66	31.8	36.46

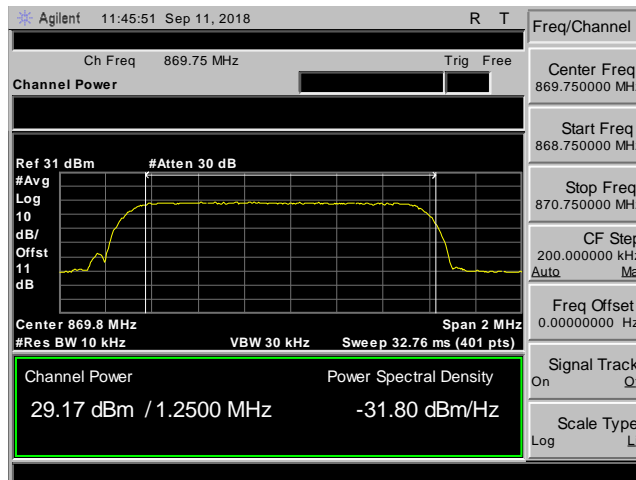
Table 8. RF Output Power, GSM, Test Results



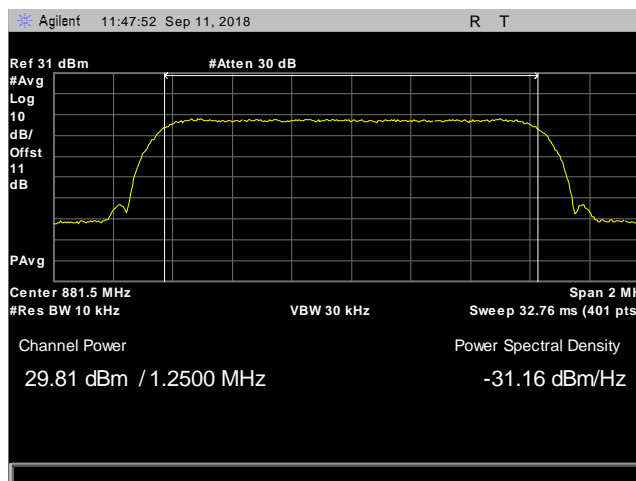
Output Power, CDMA Band 5, Test Results



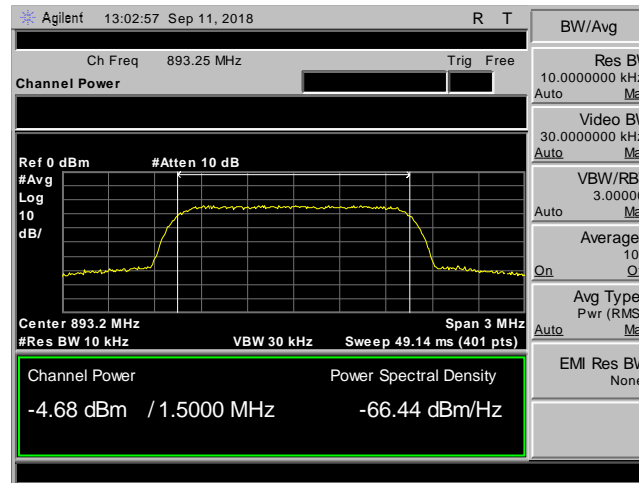
Plot 1. Output Power, CDMA850, 869 – 894 MHz, High



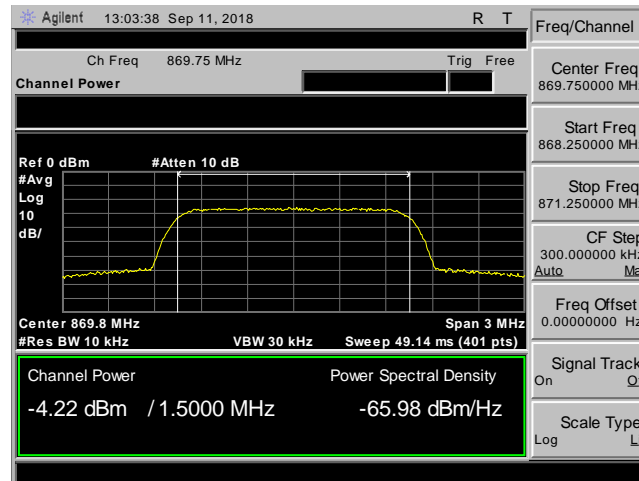
Plot 2. Output Power, CDMA850, 869 – 894 MHz, Low



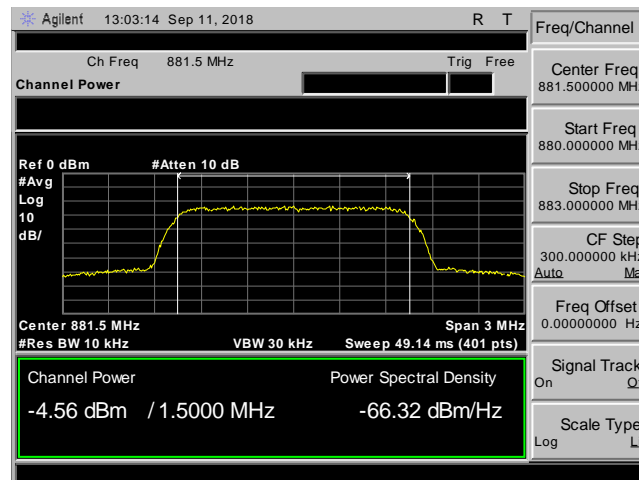
Plot 3. Output Power, CDMA850, 869 – 894 MHz, Mid



Plot 4. Output Power, CDMA850, SG, 869 – 894 MHz, High



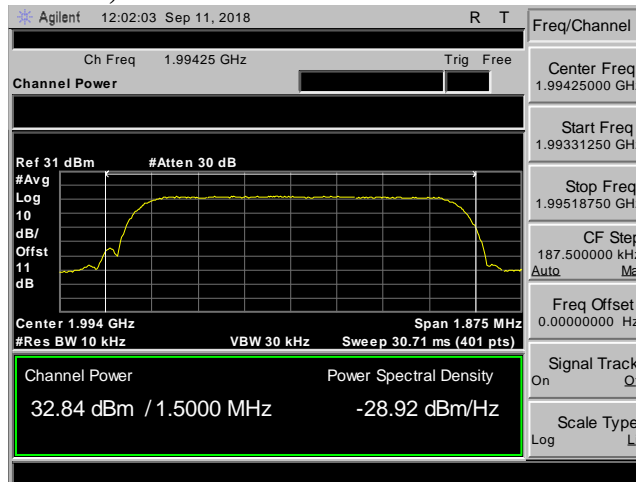
Plot 5. Output Power, CDMA850, SG, 869 – 894 MHz, Low



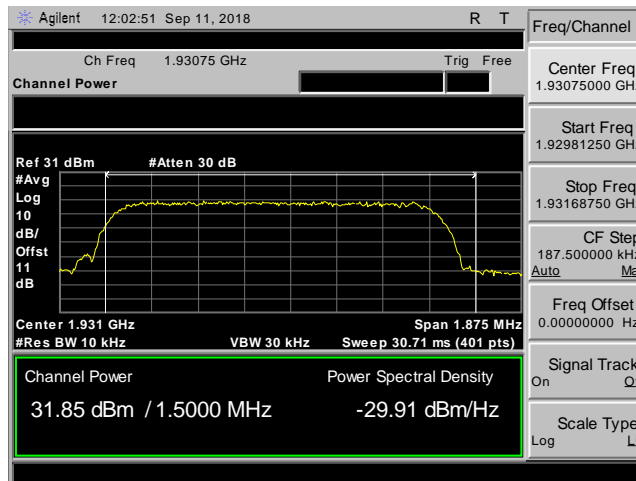
Plot 6. Output Power, CDMA850, SG, 869 – 894 MHz, Mid



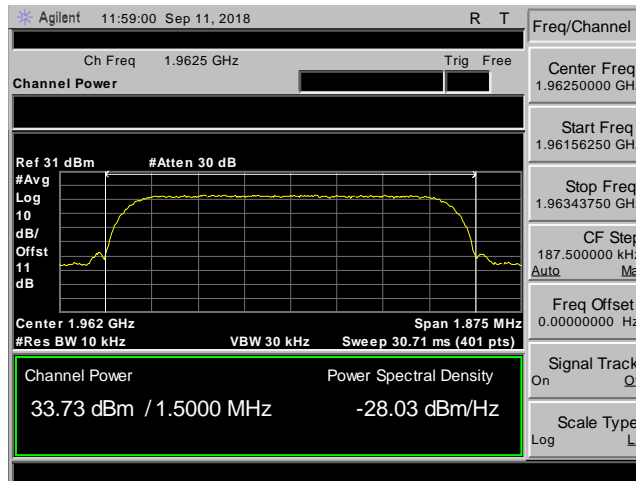
Output Power, CDMA, Band 25, Test Results



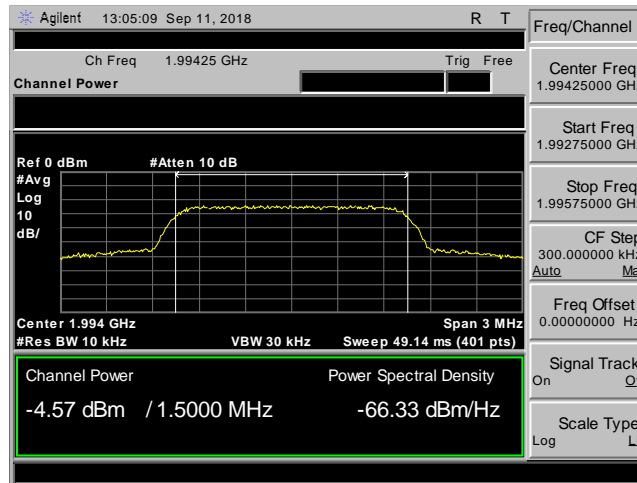
Plot 7. Output Power, CDMA1900, 1930 – 1995 MHz, High



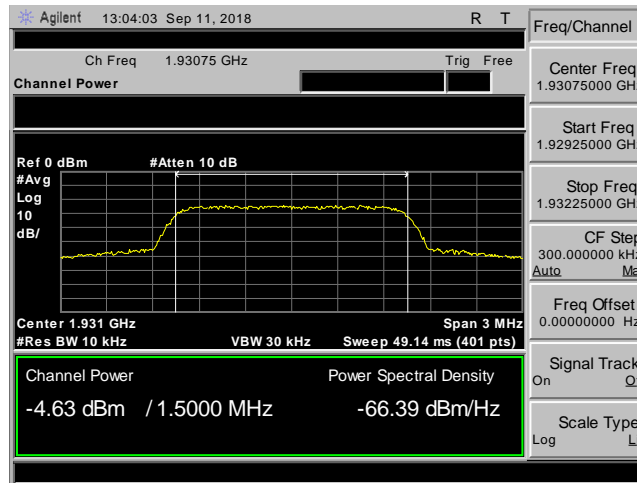
Plot 8. Output Power, CDMA1900, 1930 – 1995 MHz, Low



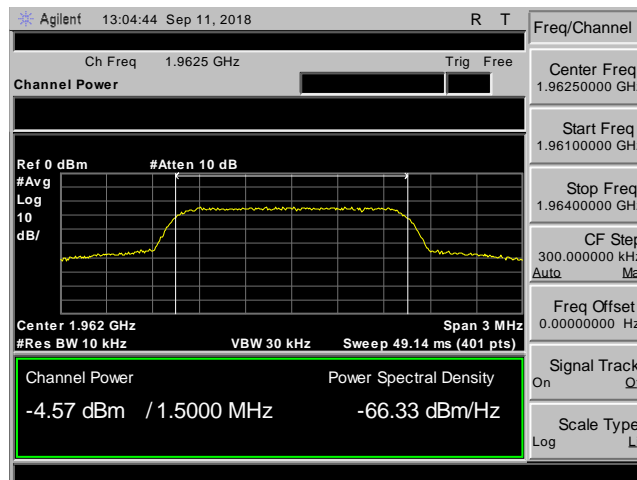
Plot 9. Output Power, CDMA1900, 1930 – 1995 MHz, Mid



Plot 10. Output Power, CDMA1900, SG, 1930 – 1995 MHz, High

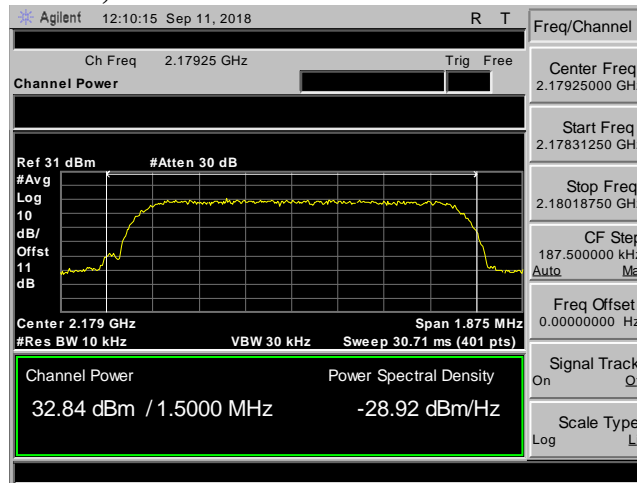


Plot 11. Output Power, CDMA1900, SG, 1930 – 1995 MHz, Low

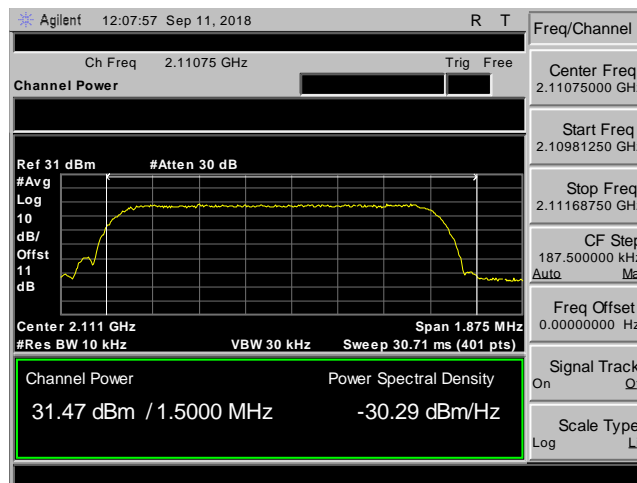


Plot 12. Output Power, CDMA1900, SG, 1930 – 1995 MHz, Mid

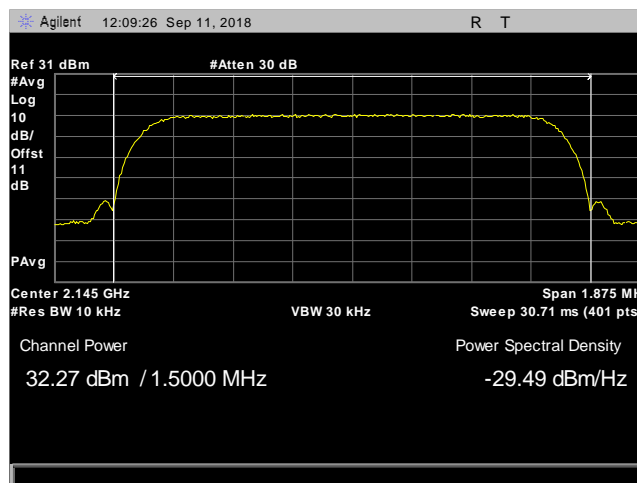
Output Power, CDMA Band 66, Test Results



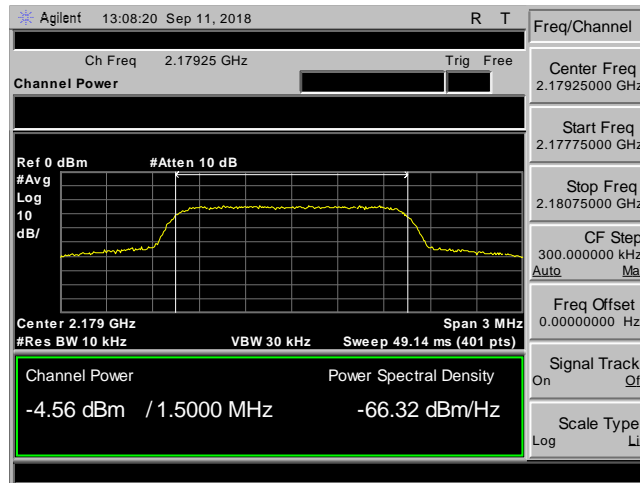
Plot 13. Output Power, CDMA2100, 2110 – 2180 MHz, High



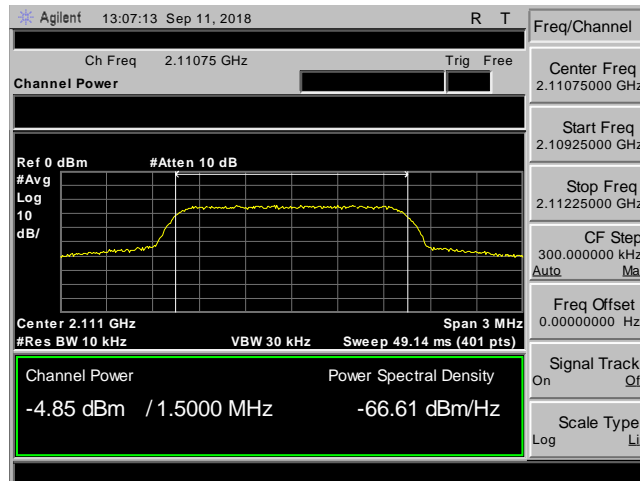
Plot 14. Output Power, CDMA2100, 2110 – 2180 MHz, Low



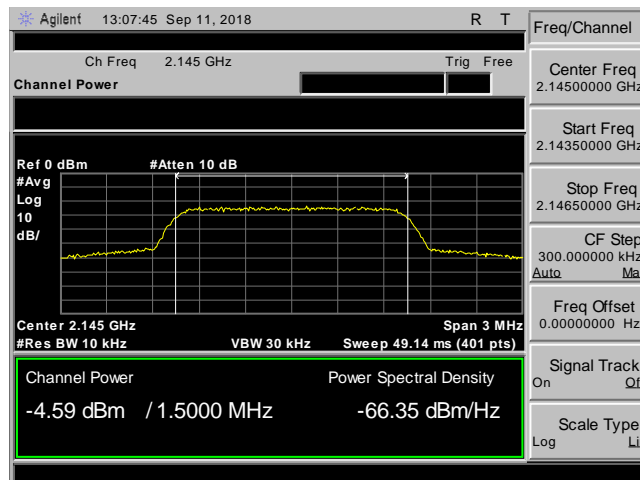
Plot 15. Output Power, CDMA2100, 2110 – 2180 MHz, Mid



Plot 16. Output Power, CDMA2100, SG, 2110 – 2180 MHz, High

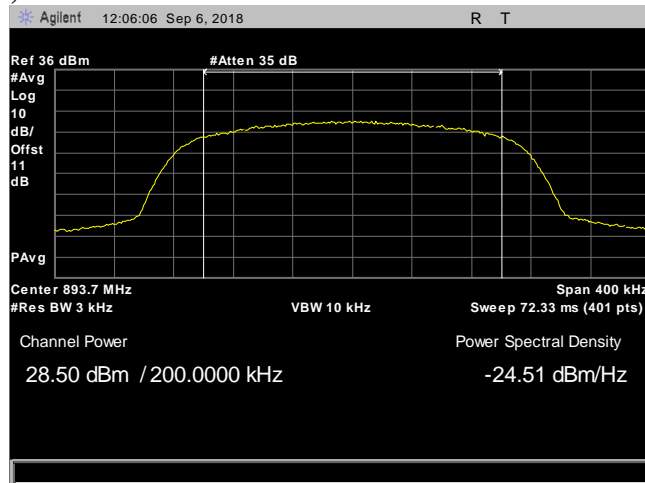


Plot 17. Output Power, CDMA2100, SG, 2110 – 2180 MHz, Low

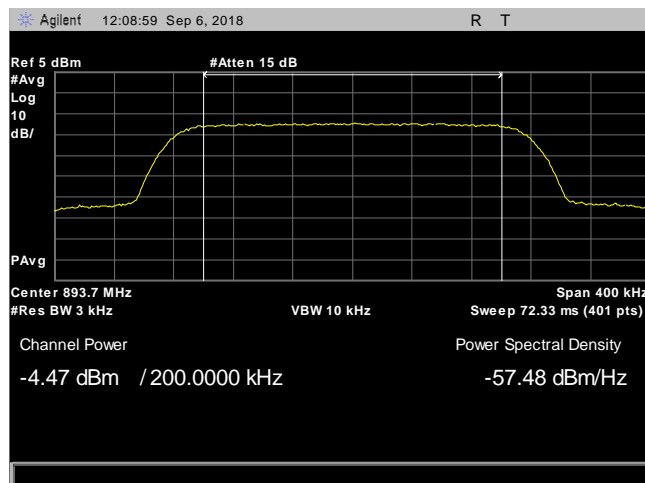


Plot 18. Output Power, CDMA2100, SG, 2110 – 2180 MHz, Mid

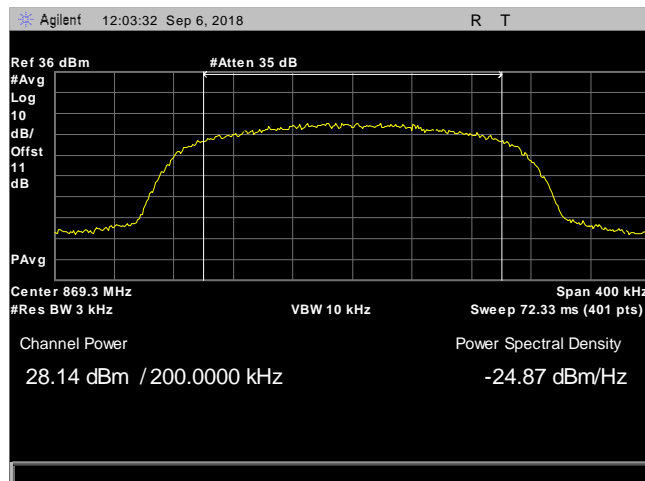
Output Power, GSM 850, Test Results



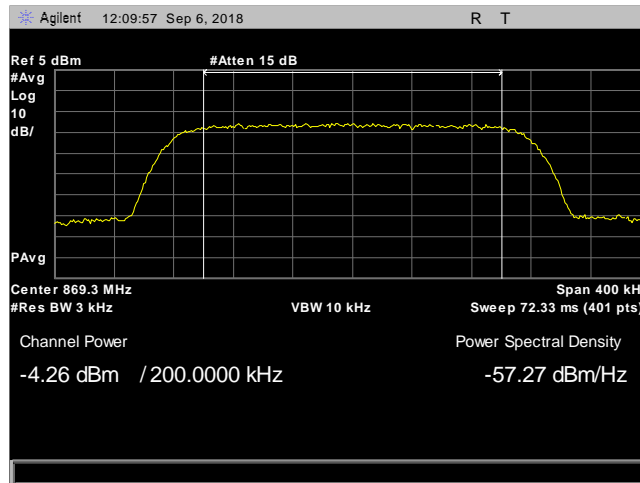
Plot 19. Output Power, CEL850, 869 – 894 MHz, High



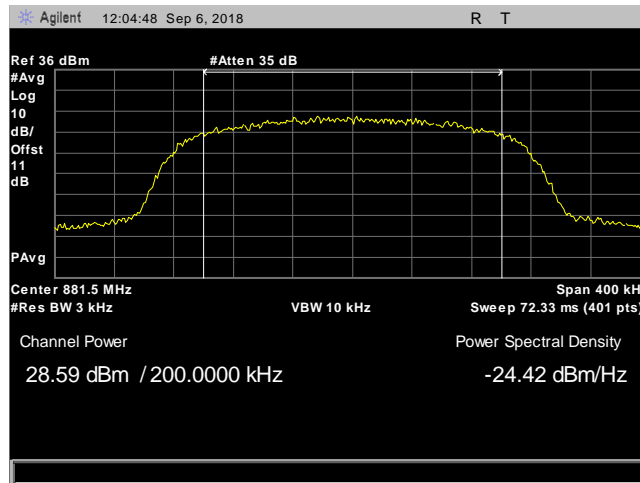
Plot 20. Output Power, CEL850, 869 – 894 MHz, High, AGC



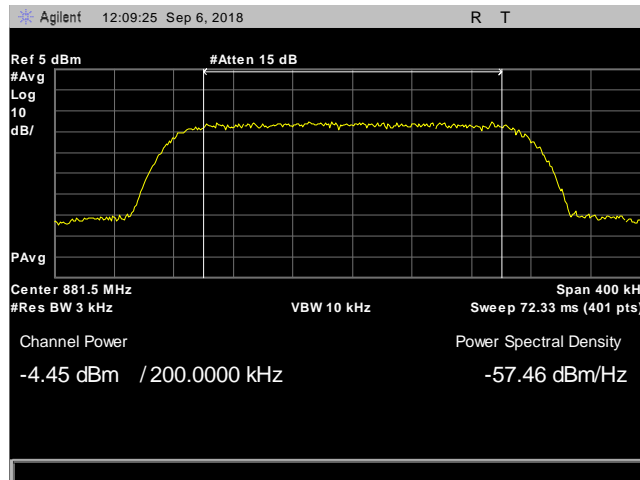
Plot 21. Output Power, CEL850, 869 – 894 MHz, Low



Plot 22. Output Power, CEL850, 869 – 894 MHz, Low, AGC



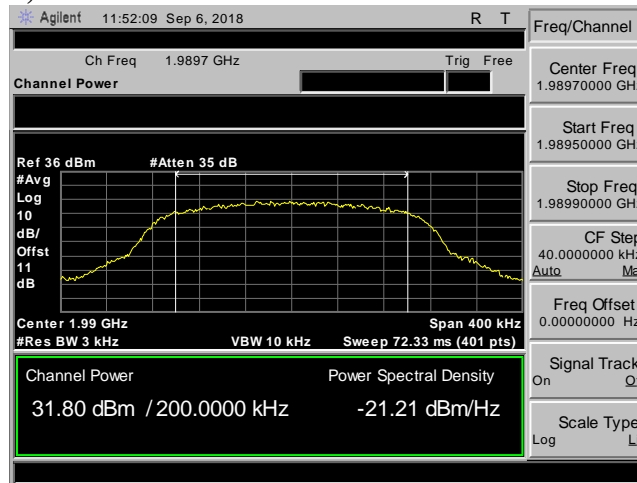
Plot 23. Output Power, CEL850, 869 – 894 MHz, Mid



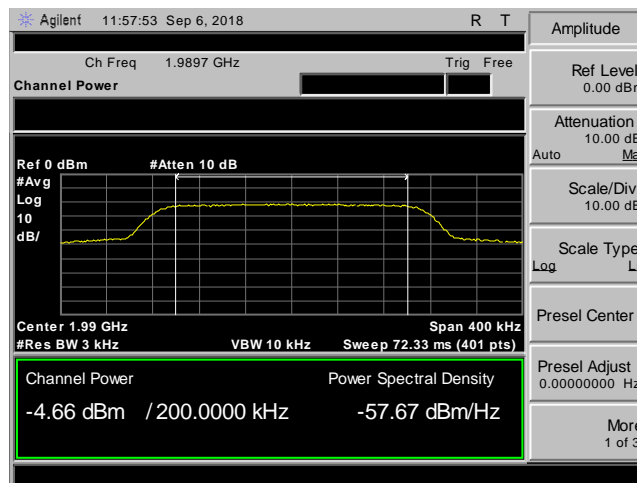
Plot 24. Output Power, CEL850, 869 – 894 MHz, Mid, AGC



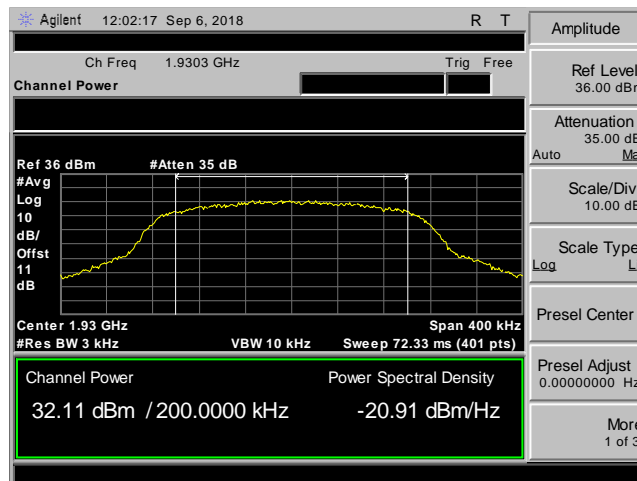
Output Power, GSM 1900, Test Results



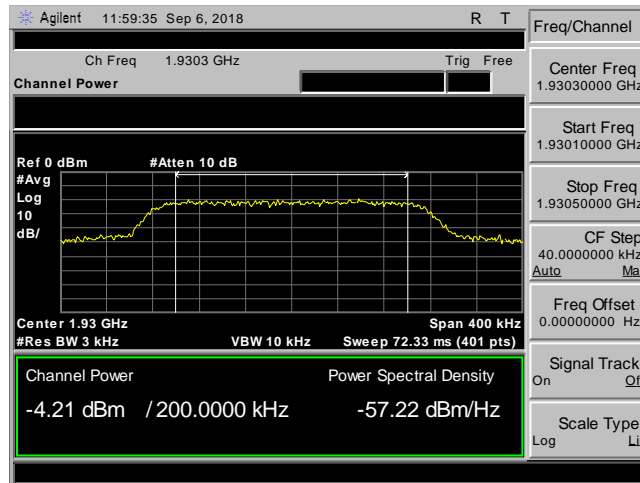
Plot 25. Output Power, PCS 1900, 1930.2 – 1989.8 MHz, High



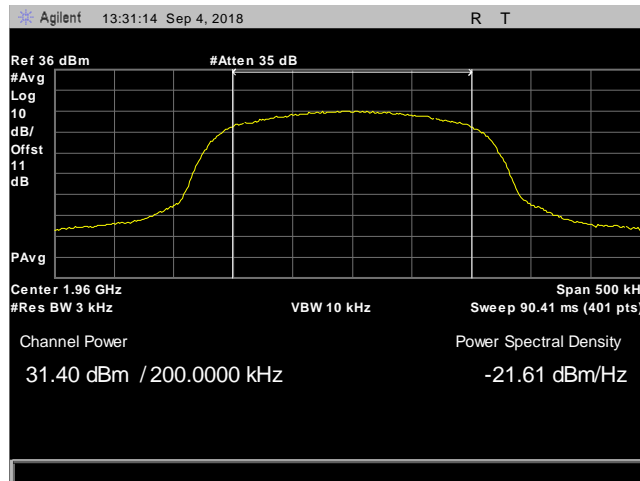
Plot 26. Output Power, PCS1900, 1930.2 – 1989.8 MHz, High, AGC



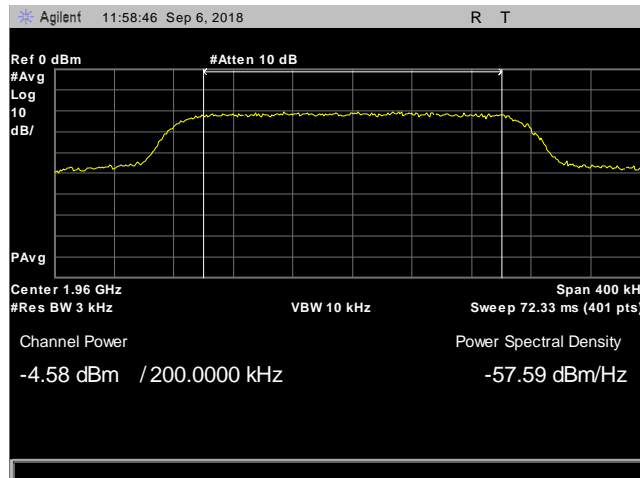
Plot 27. Output Power, PCS1900, 1930.2 – 1989.8 MHz, Low



Plot 28. Output Power, PCS1900, 1930.2 – 1989.8 MHz, Low, AGC

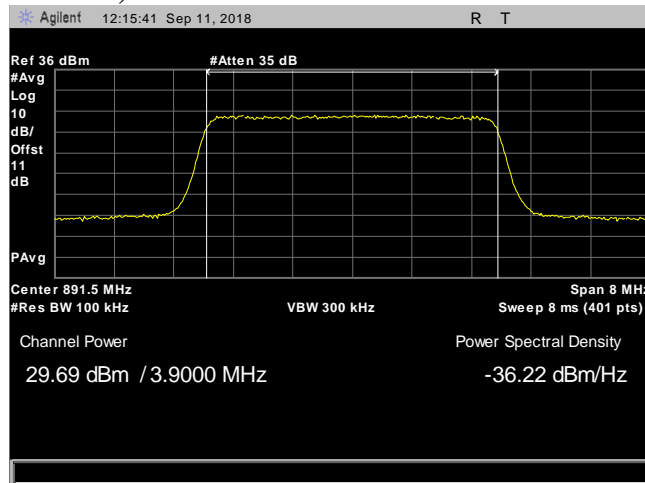


Plot 29. Output Power, PCS1900, 1930.2 – 1989.8 MHz, Mid

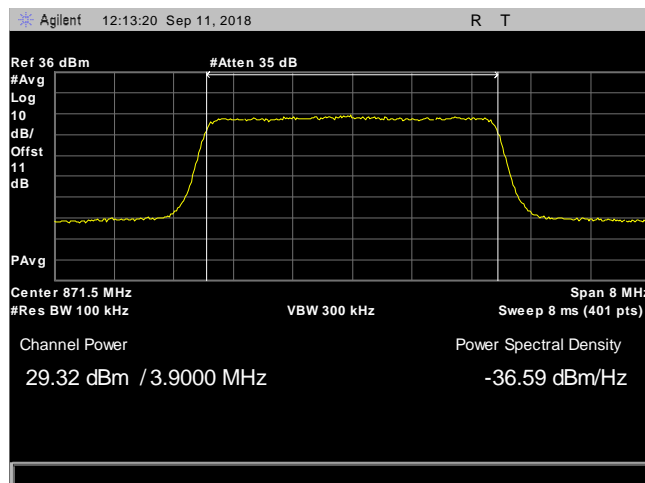


Plot 30. Output Power, PCS1900, 1930.2 – 1989.8 MHz, Mid, AGC

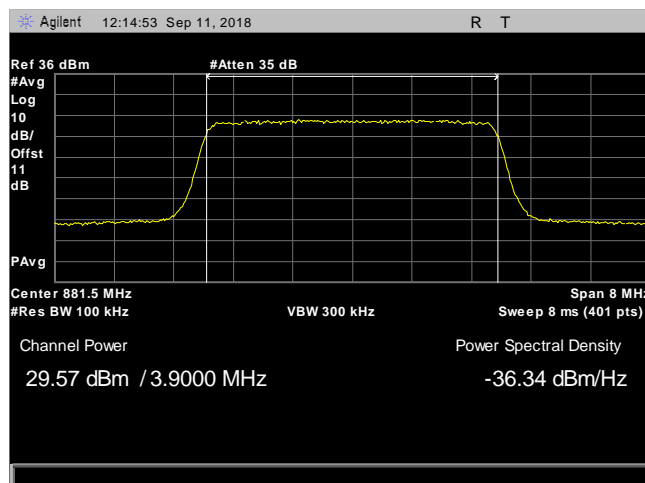
Output Power, WCDMA Band 5, Test Results



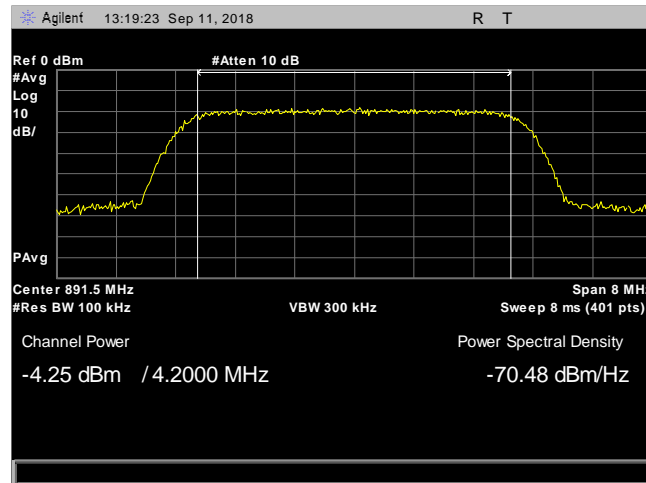
Plot 31. Output Power, WCDMA850, 869 - 894 MHz, High



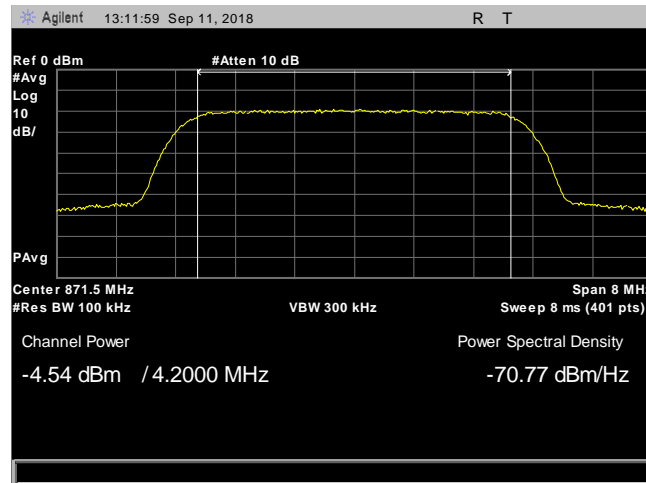
Plot 32. Output Power, WCDMA850, 869 - 894 MHz, Low



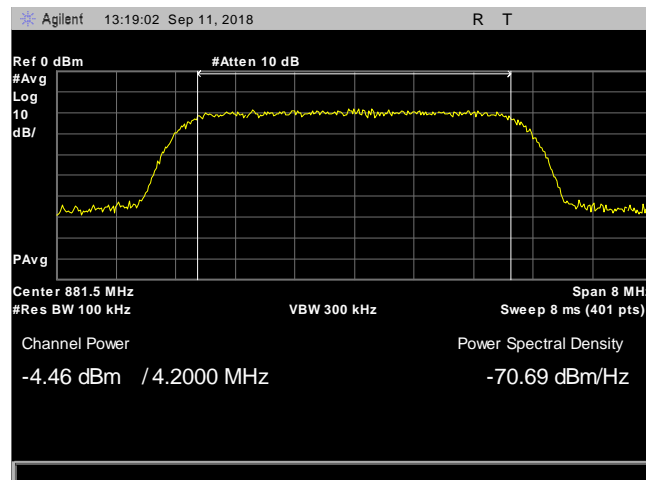
Plot 33. Output Power, WCDMA850, 869 - 894 MHz, Mid



Plot 34. Output Power, WCDMA850, SG, 869 - 894 MHz, High



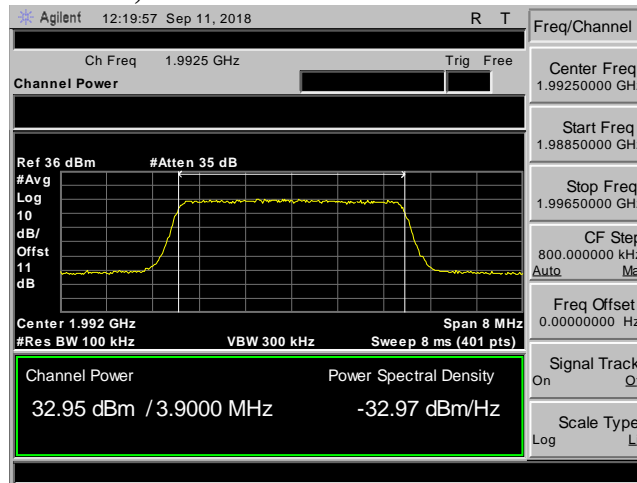
Plot 35. Output Power, WCDMA850, SG, 869 - 894 MHz, Low



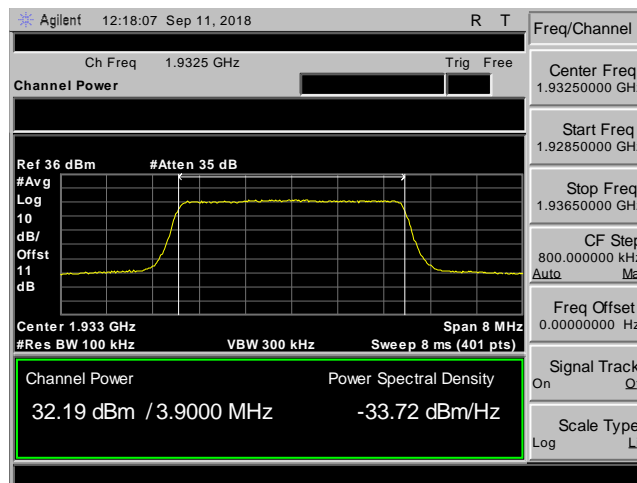
Plot 36. Output Power, WCDMA850, SG, 869 - 894 MHz, Mid



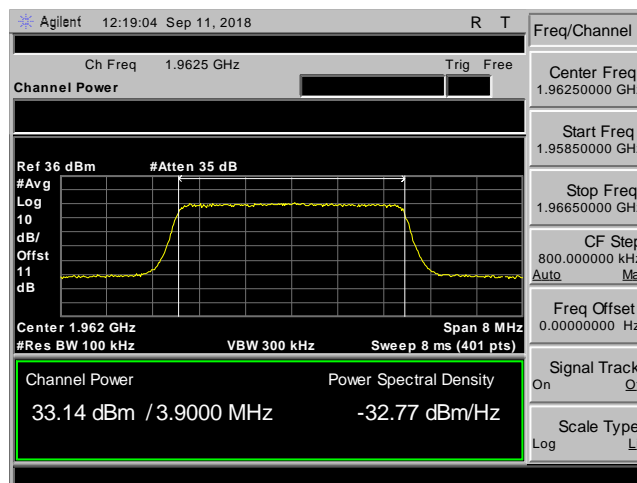
Output Power, WCDMA Band 25, Test Results



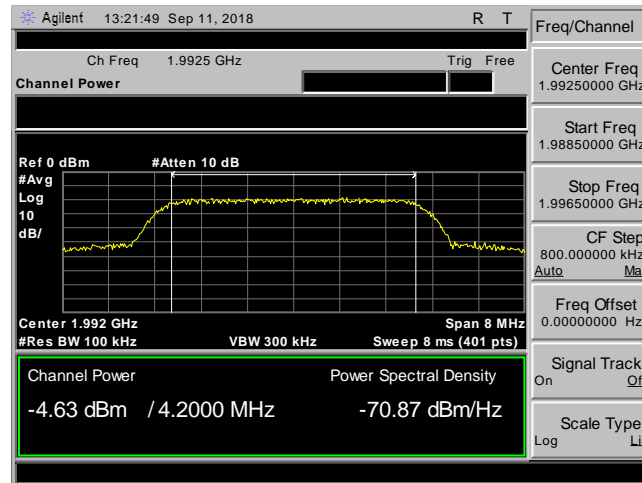
Plot 37. Output Power, WCDMA1900, 1930 - 1995 MHz, High



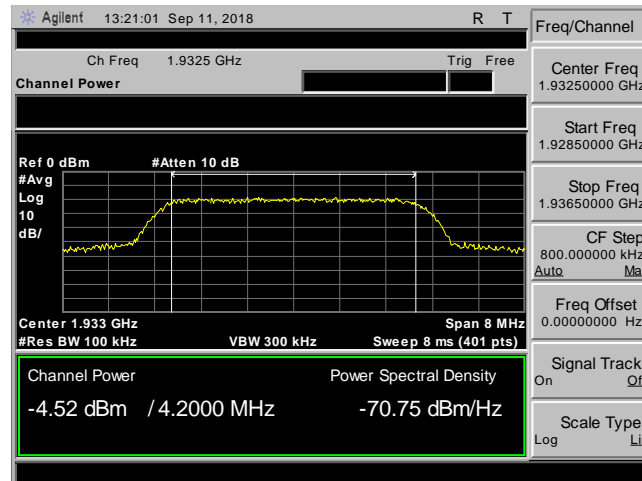
Plot 38. Output Power, WCDMA1900, 1930 - 1995 MHz, Low



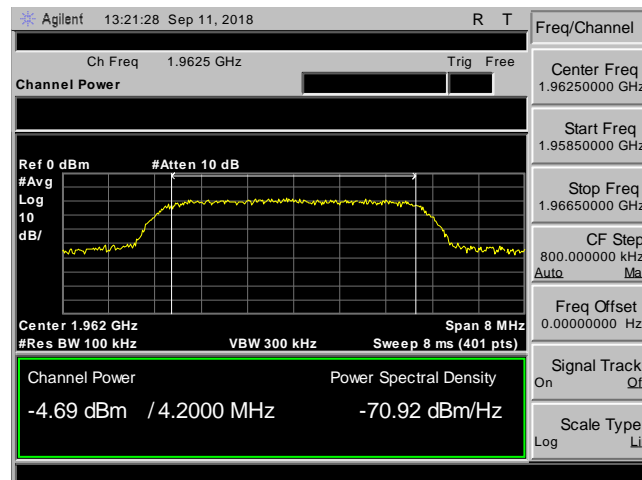
Plot 39. Output Power, WCDMA1900, 1930 - 1995 MHz, Mid



Plot 40. Output Power, WCDMA1900, SG, 1930 - 1995 MHz, High



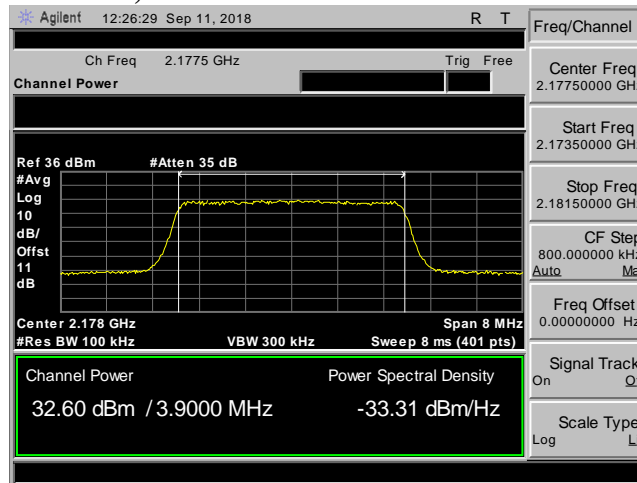
Plot 41. Output Power, WCDMA1900, SG, 1930 - 1995 MHz, Low



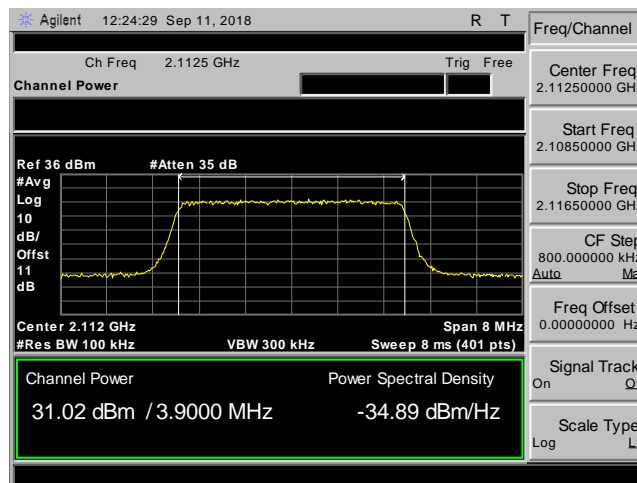
Plot 42. Output Power, WCDMA1900, SG, 1930 - 1995 MHz, Mid



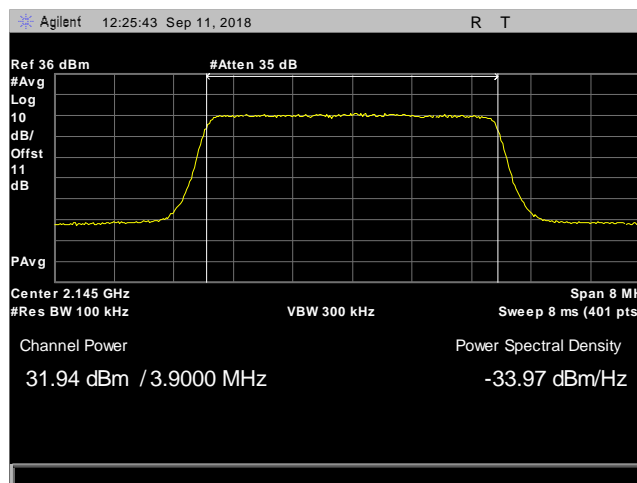
Output Power, WCDMA Band 66, Test Results



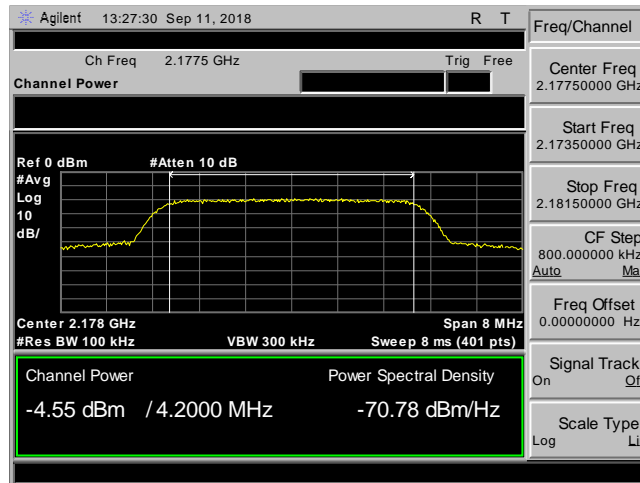
Plot 43. Output Power, WCDMA2100, 2110 - 2180 MHz, High



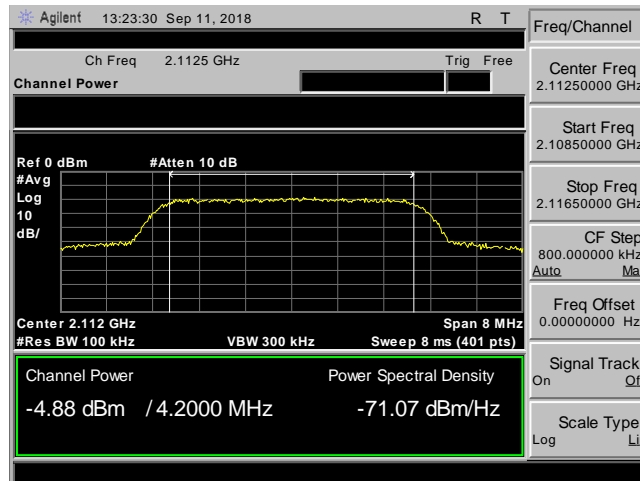
Plot 44. Output Power, WCDMA2100, 2110 - 2180 MHz, Low



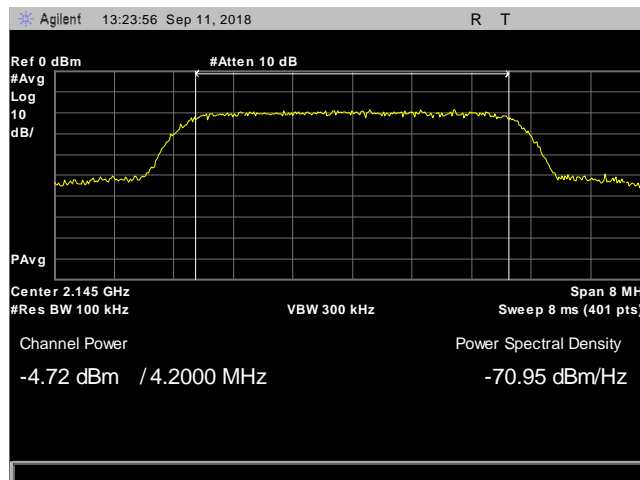
Plot 45. Output Power, WCDMA2100, 2110 - 2180 MHz, Mid



Plot 46. Output Power, SG, WCDMA2100, 2110 - 2180 MHz, High



Plot 47. Output Power, SG, WCDMA2100, 2110 - 2180 MHz, Low



Plot 48. Output Power, SG, WCDMA2100, 2110 - 2180 MHz, Mid

§ 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.

§22.917 (1) 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 (b) 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 was tested according to relative measurement procedure of ANSI C63.26 5.4.3. The OBW measurement function of the spectrum analyzer was used and configured in the following manner.

- (a) Frequency = channel cf
- (b) Span = 2-5 x the OBW
- (c) RBW = 1-5 % of the OBW
- (d) VBW 1-3 x the RBW
- (e) Sweep Time = Auto
- (f) Detector = peak
- (g) -X dB = 26

Test Results: The equipment was found compliant with FCC requirements.

Test Engineer(s): Bradley Jones

Test Date(s): August 30, 2018

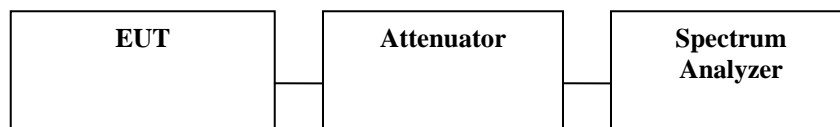
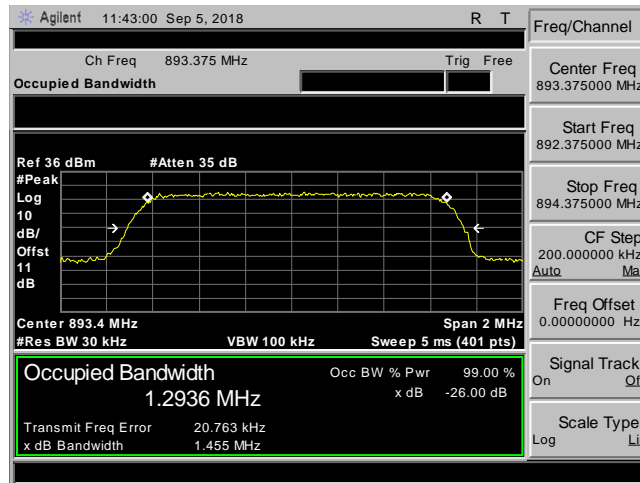


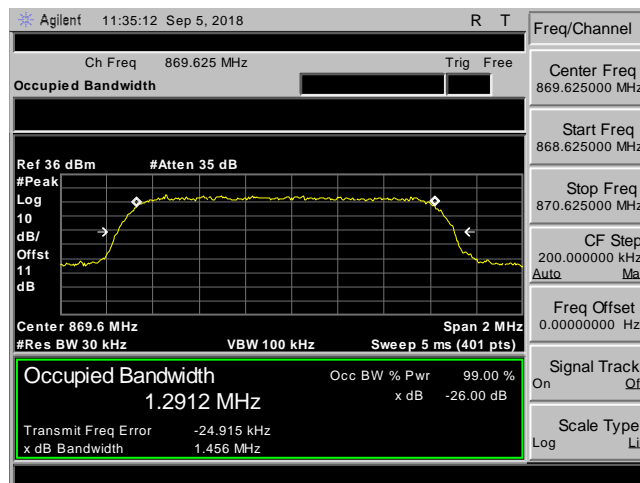
Figure 2. Occupied Bandwidth Test Setup



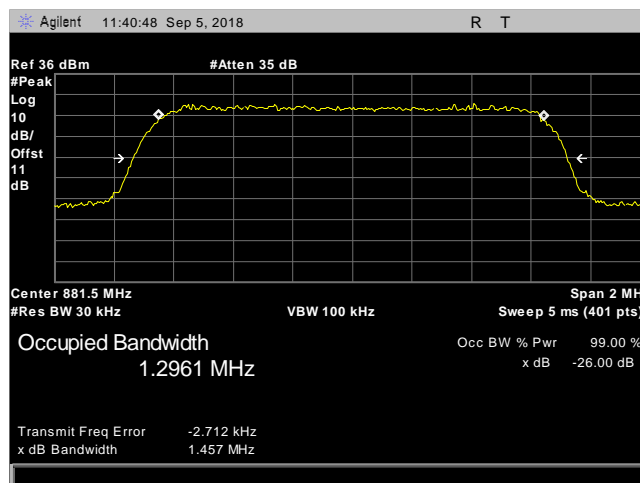
Occupied Bandwidth, CDMA Band 5, Test Results



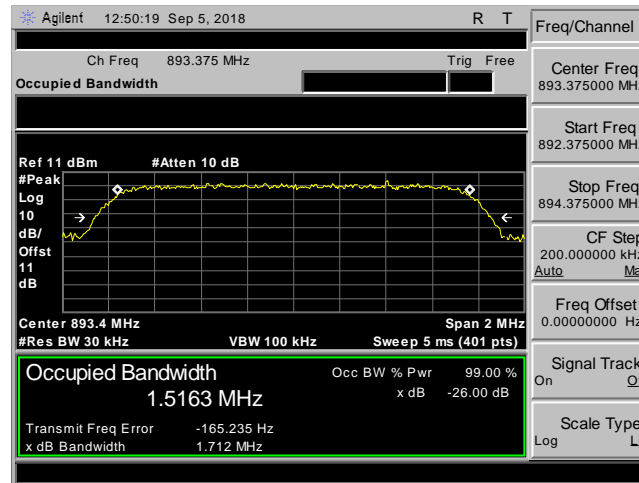
Plot 49. Occupied Bandwidth, CDMA850, 869 - 894 MHz, High



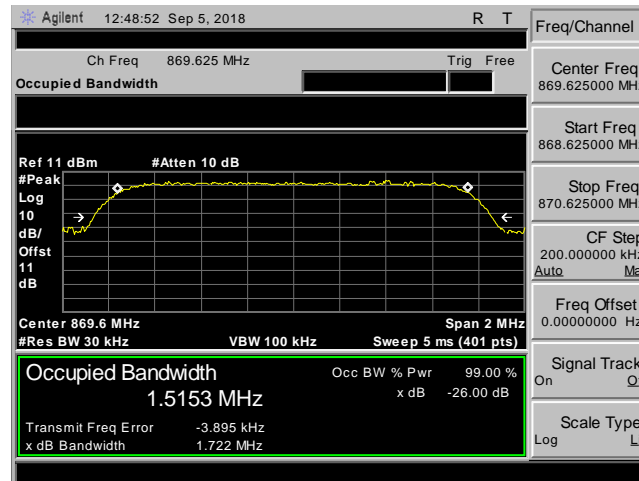
Plot 50. Occupied Bandwidth, CDMA850, 869 - 894 MHz, Low



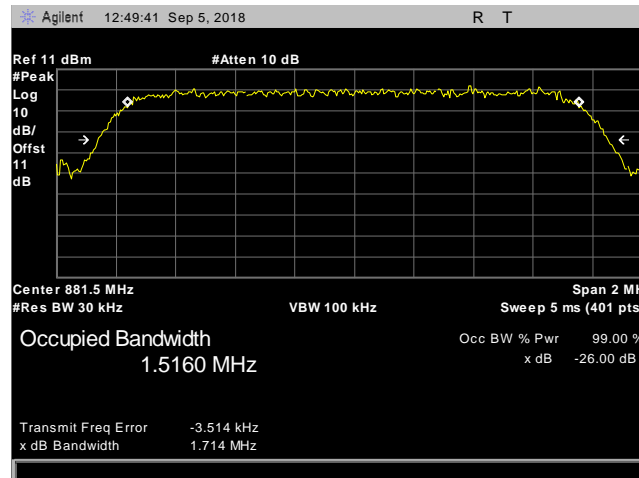
Plot 51. Occupied Bandwidth, CDMA850, 869 - 894 MHz, Mid



Plot 52. Occupied Bandwidth, CDMA850, SG, 869 - 894 MHz, High



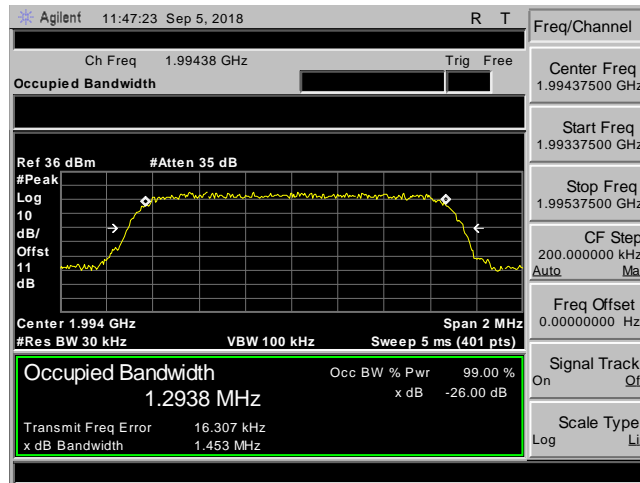
Plot 53. Occupied Bandwidth, CDMA850, SG, 869 - 894 MHz, Low



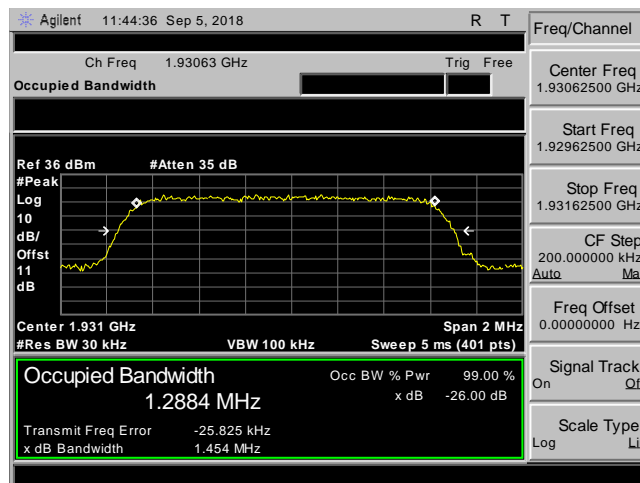
Plot 54. Occupied Bandwidth, CDMA850, SG, 869 - 894 MHz, Mid



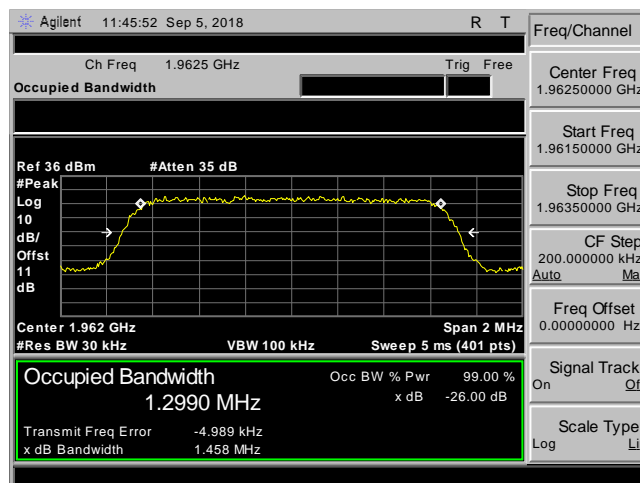
Occupied Bandwidth, CDMA Band 25, Test Results



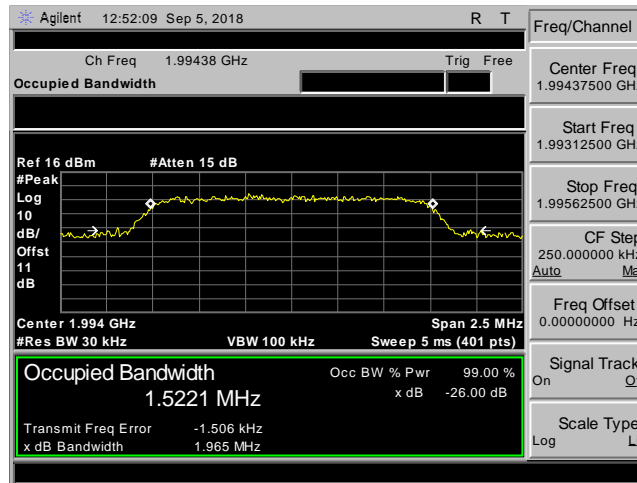
Plot 55. Occupied Bandwidth, PCS1900, 1930 - 1995 MHz, High



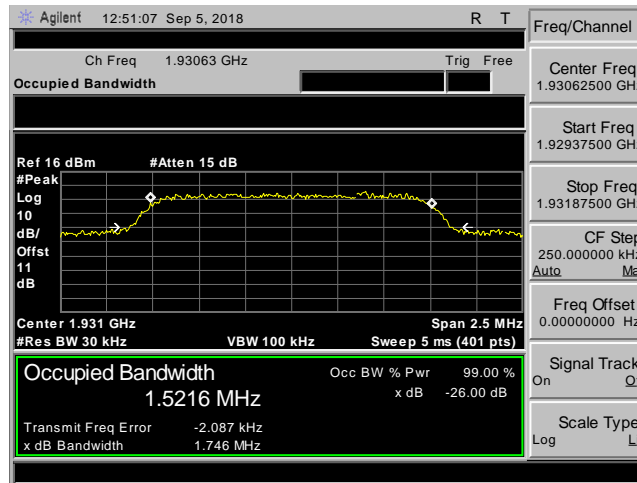
Plot 56. Occupied Bandwidth, PCS1900, 1930 - 1995 MHz, Low



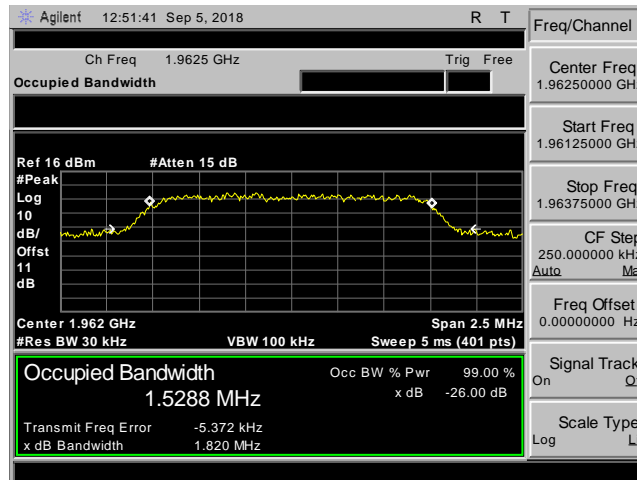
Plot 57. Occupied Bandwidth, PCS1900, 1930 - 1995 MHz, Mid



Plot 58. Occupied Bandwidth, PCS1900, SG, 1930 - 1995 MHz, High

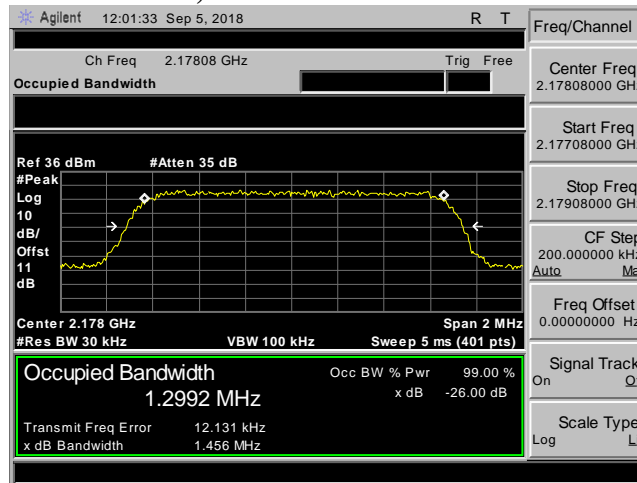


Plot 59. Occupied Bandwidth, PCS1900, SG, 1930 - 1995 MHz, Low

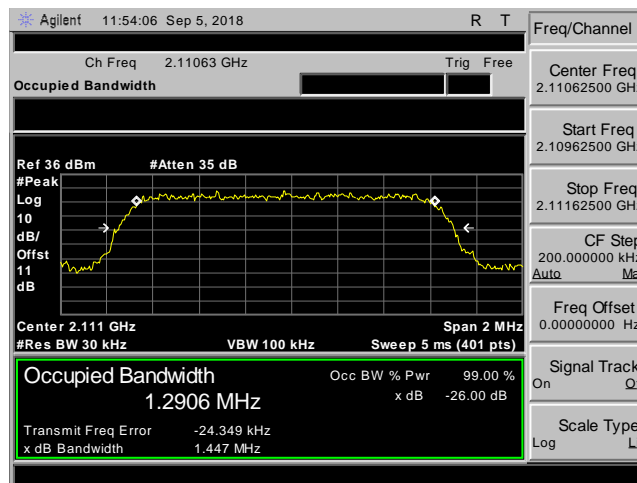


Plot 60. Occupied Bandwidth, PCS1900, SG, 1930 - 1995 MHz, Mid

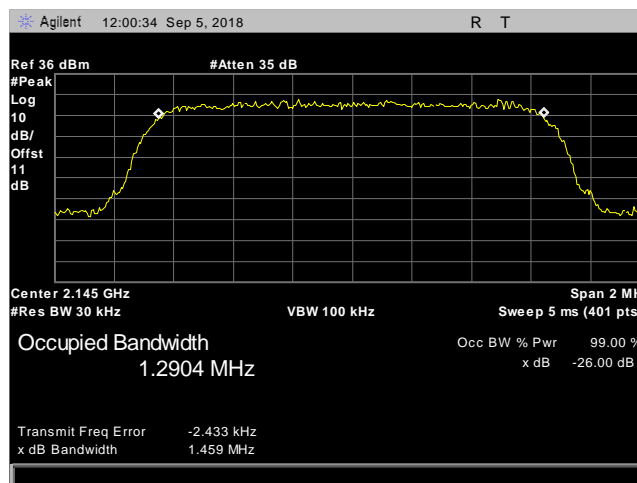
Occupied Bandwidth, CDMA Band 66, Test Results



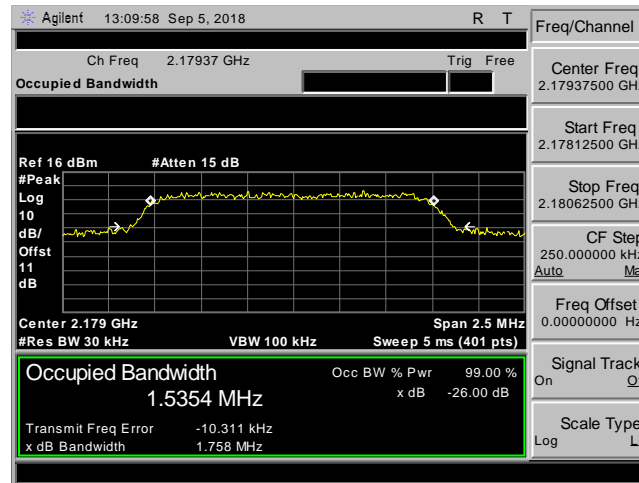
Plot 61. Occupied Bandwidth, AWS2100, 2110 - 2180 MHz, High



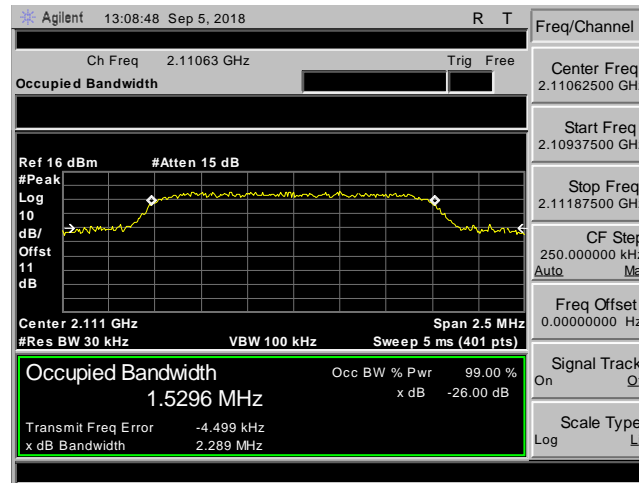
Plot 62. Occupied Bandwidth, AWS2100, 2110 - 2180 MHz, Low



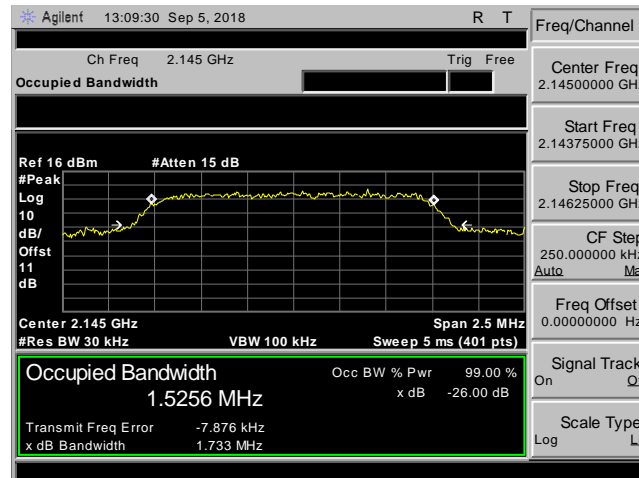
Plot 63. Occupied Bandwidth, AWS2100, 2110 - 2180 MHz, Mid



Plot 64. Occupied Bandwidth, AWS2100, SG, 2110 - 2180 MHz, High



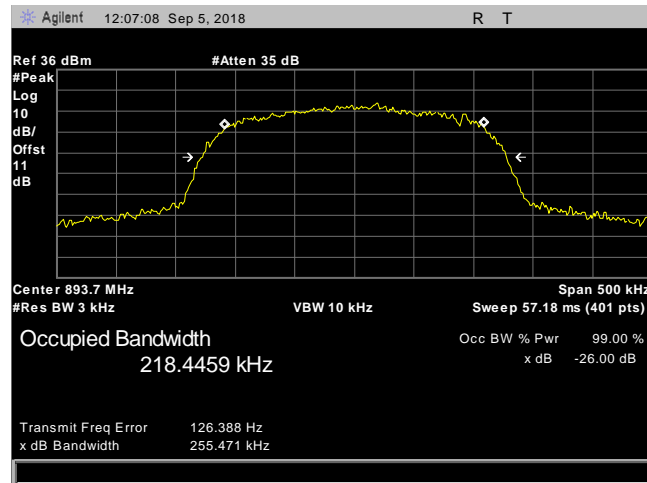
Plot 65. Occupied Bandwidth, AWS2100, SG, 2110 - 2180 MHz, Low



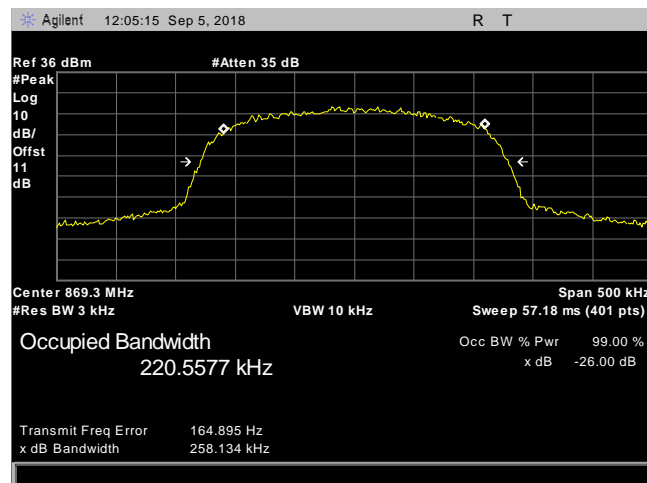
Plot 66. Occupied Bandwidth, AWS2100, SG, 2110 - 2180 MHz, Mid



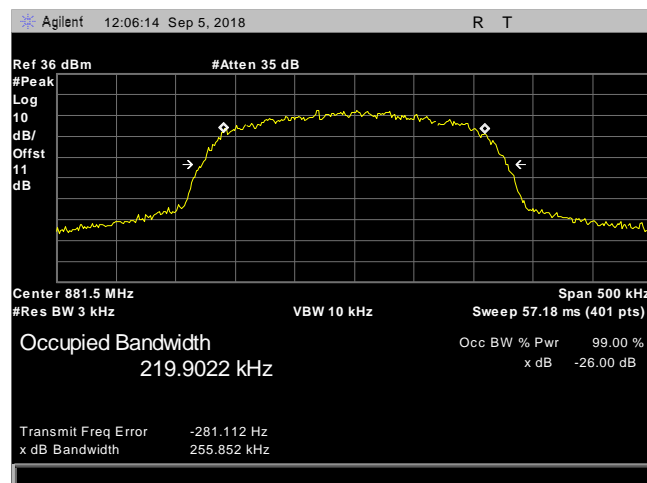
Occupied Bandwidth, GSM 850, Test Results



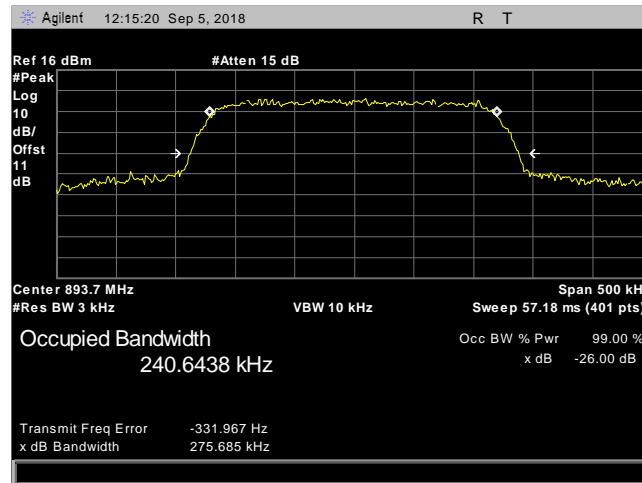
Plot 67. Occupied Bandwidth, GSM850, 869.2 - 893.8 MHz, High



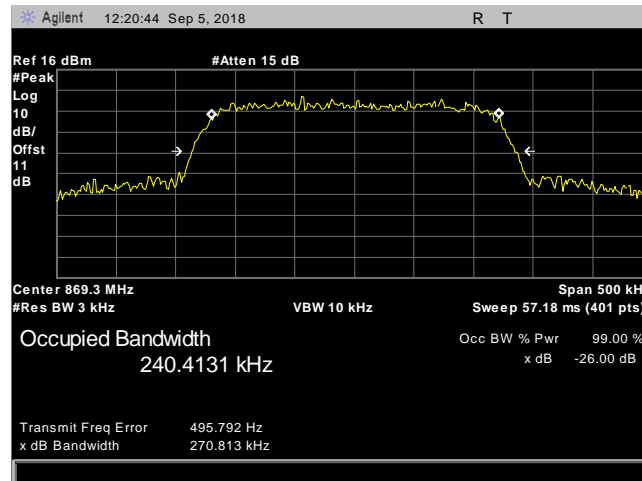
Plot 68. Occupied Bandwidth, GSM850, 869.2 - 893.8 MHz, Low



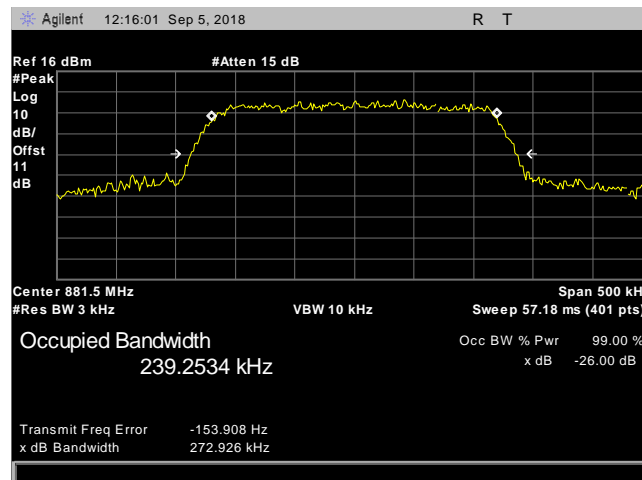
Plot 69. Occupied Bandwidth, GSM850, 869.2 - 893.8 MHz, Mid



Plot 70. Occupied Bandwidth, GSM850, SG, 869.2 - 893.8 MHz, High

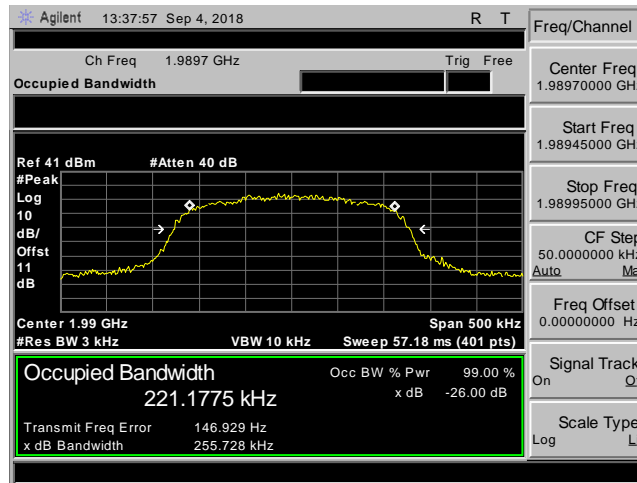


Plot 71. Occupied Bandwidth, GSM850, SG, 869.2 - 893.8 MHz, Low

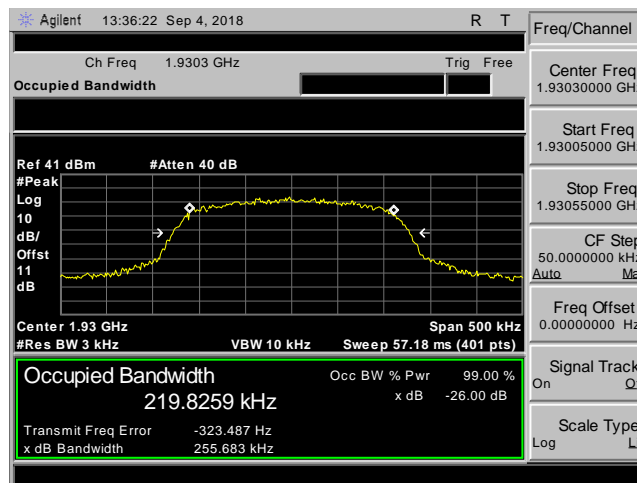


Plot 72. Occupied Bandwidth, GSM850, SG, 869.2 - 893.8 MHz, Mid

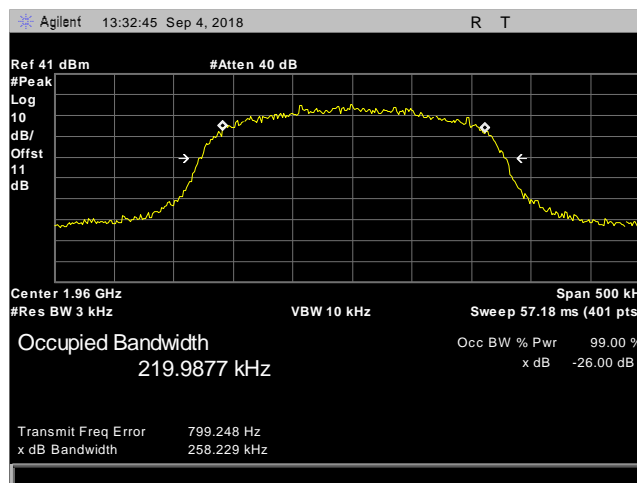
Occupied Bandwidth, GSM 1900, Test Results



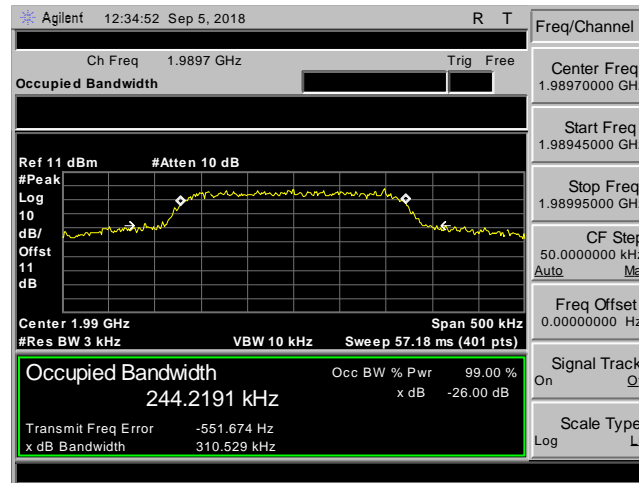
Plot 73. Occupied Bandwidth, PCS1900, 1930.2 - 1989.8 MHz, High



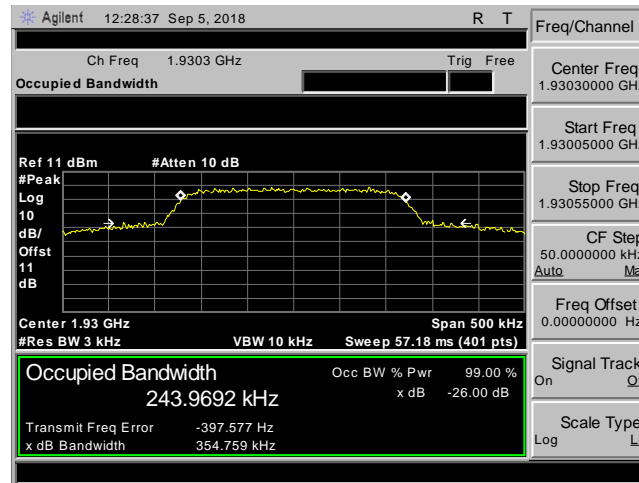
Plot 74. Occupied Bandwidth, PCS1900, 1930.2 - 1989.8 MHz, Low



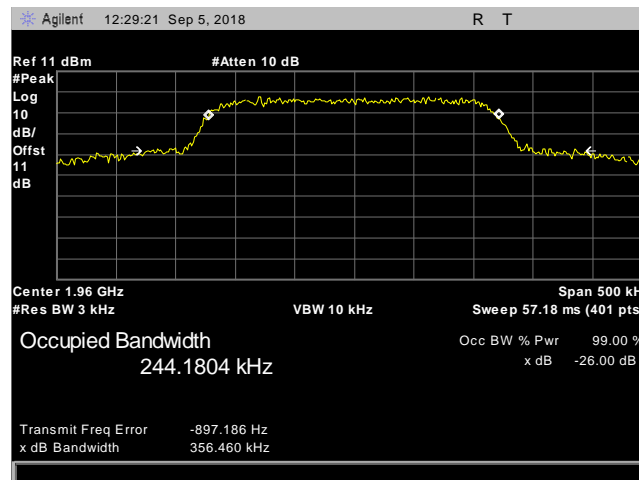
Plot 75. Occupied Bandwidth, PCS1900, 1930.2 - 1989.8 MHz, Mid



Plot 76. Occupied Bandwidth, PCS1900, SG, 1930.2 - 1989.8 MHz, High



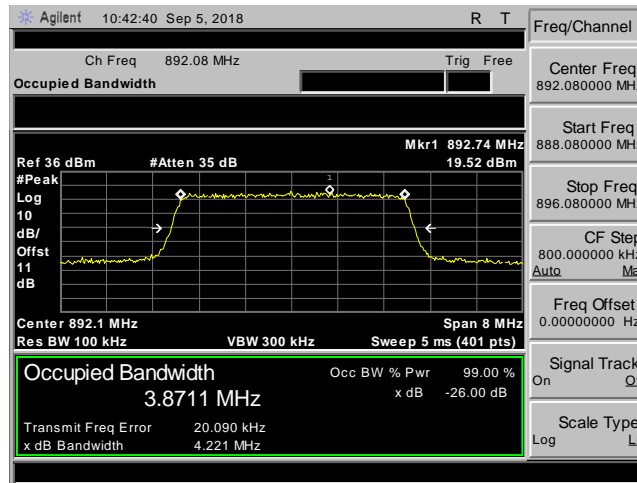
Plot 77. Occupied Bandwidth, PCS1900, SG, 1930.2 - 1989.8 MHz, Low



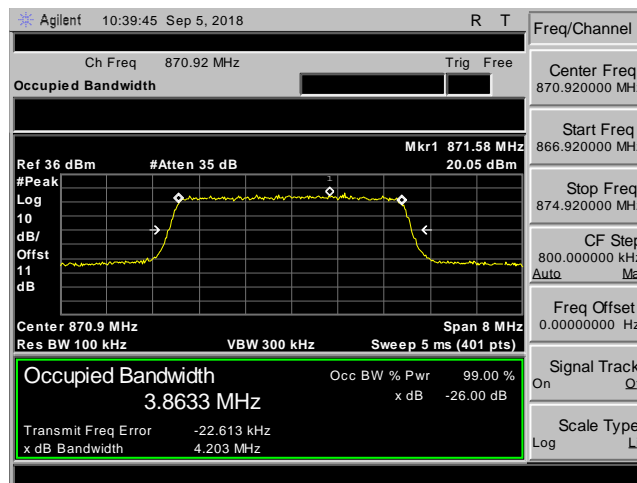
Plot 78. Occupied Bandwidth, PCS1900, SG, 1930.2 - 1989.8 MHz, Mid



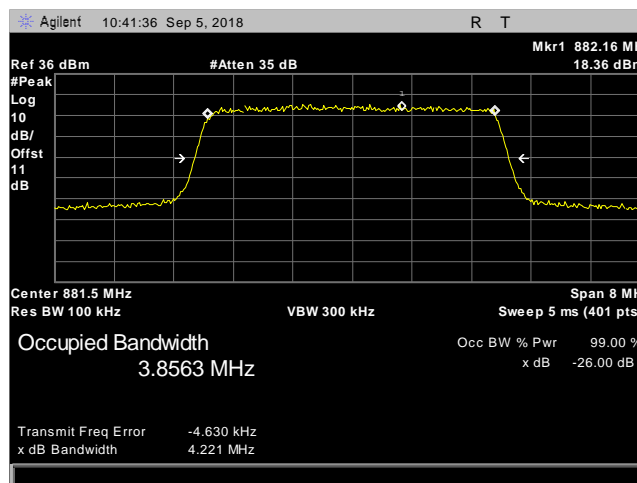
Occupied Bandwidth, WCDMA Band 5, Test Results



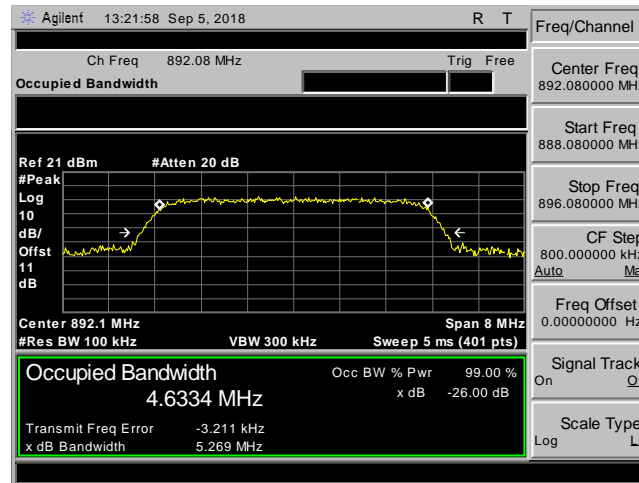
Plot 79. Occupied Bandwidth, CEL850, 869 - 894 MHz, High



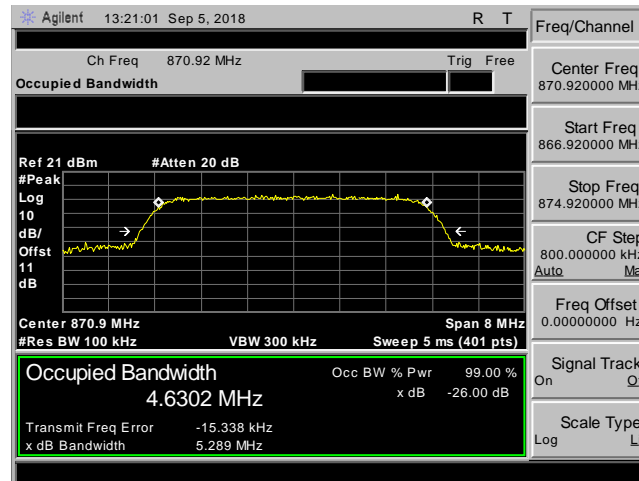
Plot 80. Occupied Bandwidth, CEL850, 869 - 894 MHz, Low



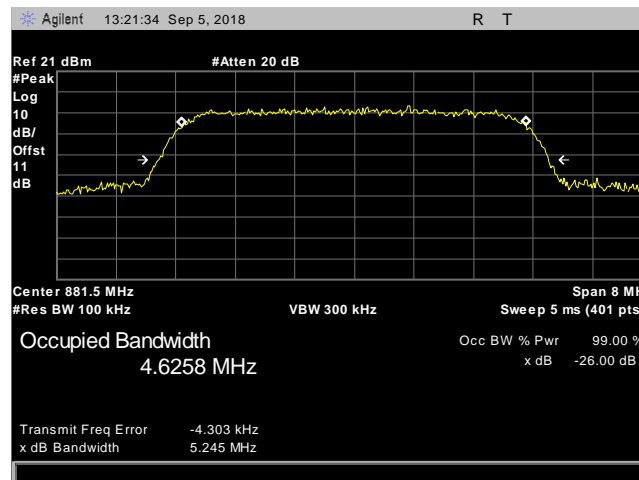
Plot 81. Occupied Bandwidth, CEL850, 869 - 894 MHz, Mid



Plot 82. Occupied Bandwidth, CEL850, SG, 869 - 894 MHz, High



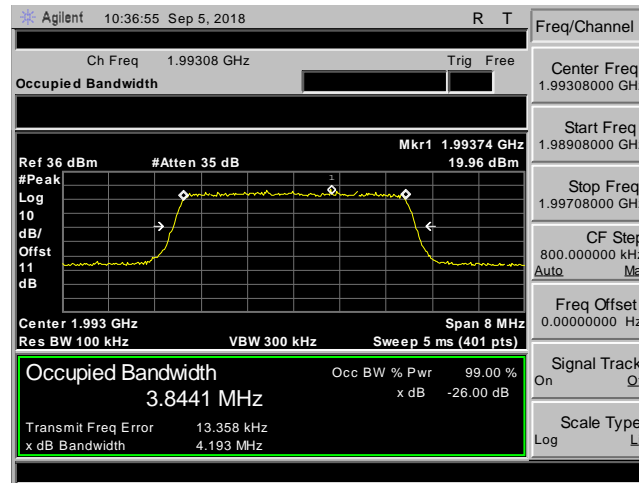
Plot 83. Occupied Bandwidth, CEL850, SG, 869 - 894 MHz, Low



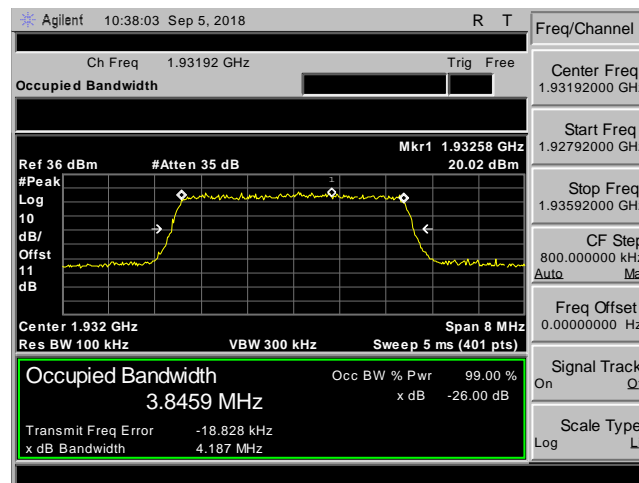
Plot 84. Occupied Bandwidth, CEL850, SG, 869 - 894 MHz, Mid



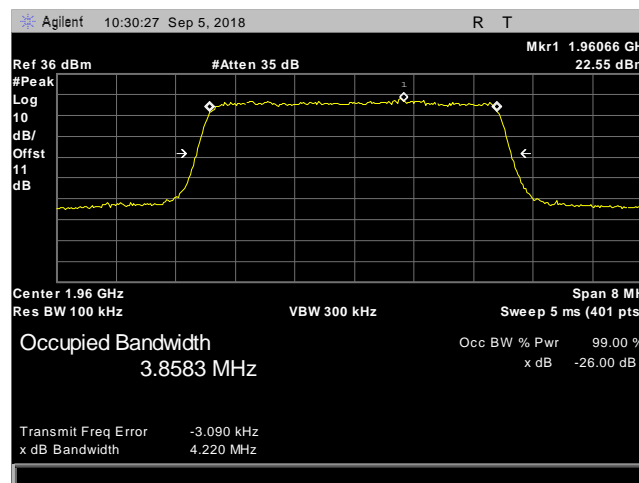
Occupied Bandwidth, WCDMA Band 25, Test Results



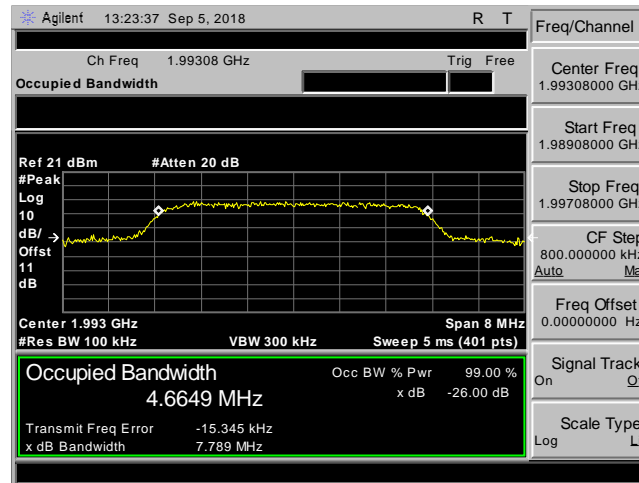
Plot 85. Occupied Bandwidth, PCS1900, 1930 - 1990 MHz, High



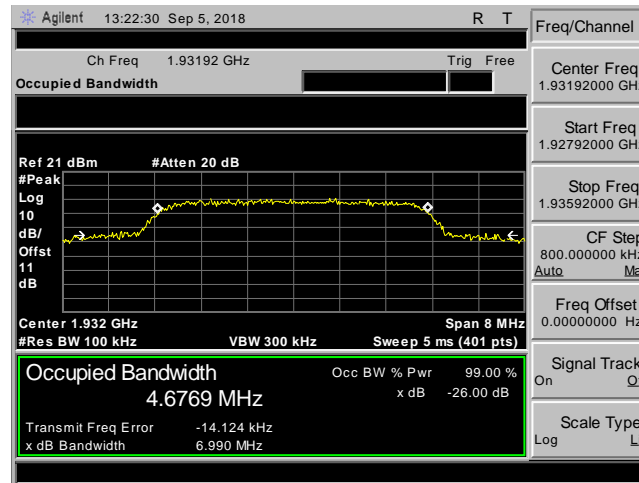
Plot 86. Occupied Bandwidth, PCS1900, 1930 - 1990 MHz, Low



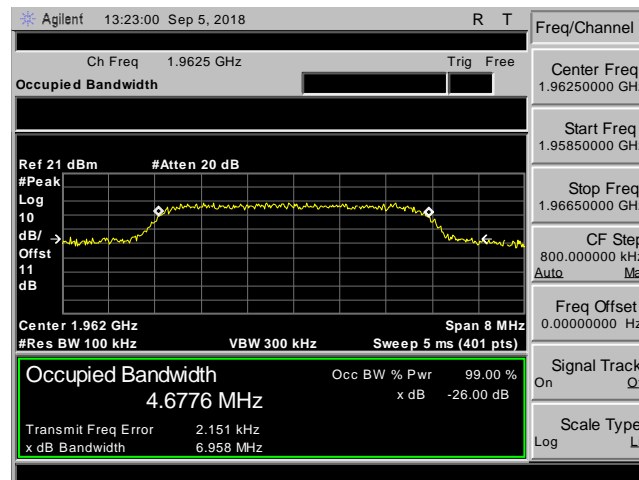
Plot 87. Occupied Bandwidth, PCS1900, 1930 - 1990 MHz, Mid



Plot 88. Occupied Bandwidth, PCS1900, SG, 1930 - 1990 MHz, High



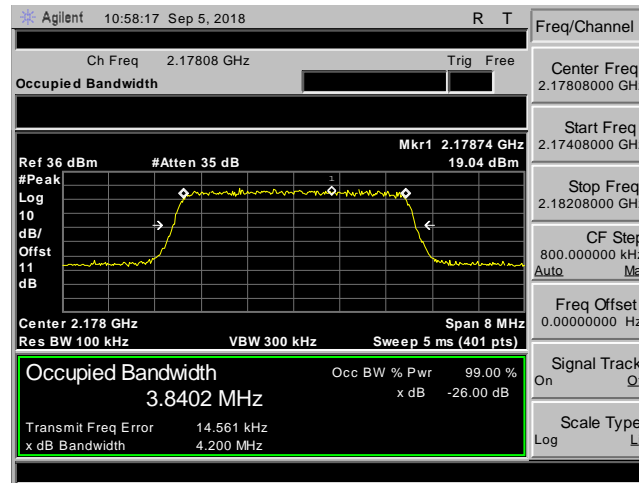
Plot 89. Occupied Bandwidth, PCS1900, SG, 1930 - 1990 MHz, Low



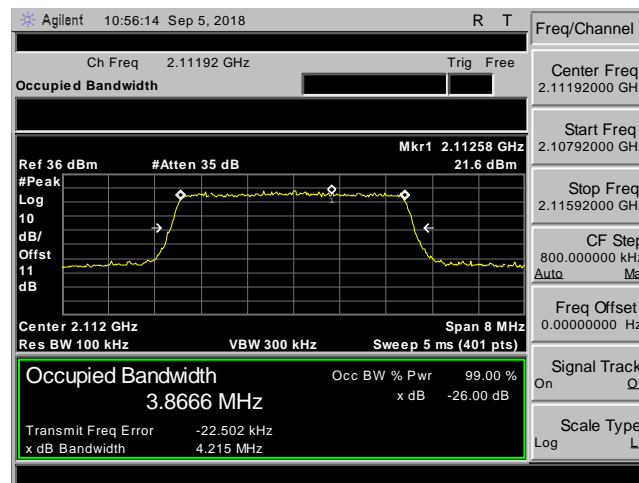
Plot 90. Occupied Bandwidth, PCS1900, SG, 1930 - 1990 MHz, Mid



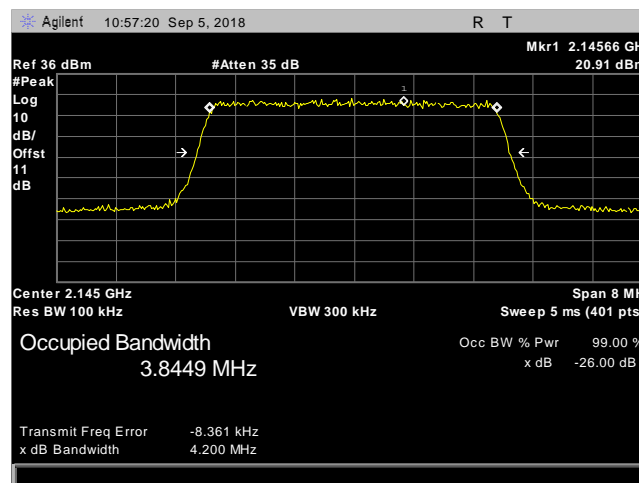
Occupied Bandwidth, WCDMA Band 66, Test Results



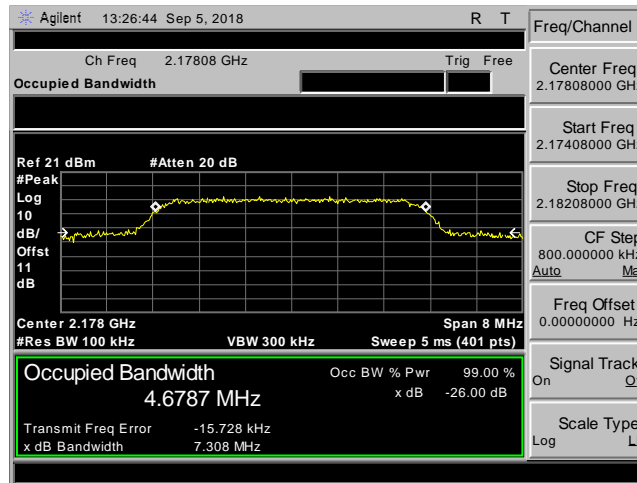
Plot 91. Occupied Bandwidth, AWS2100, 2110 - 2180 MHz, High



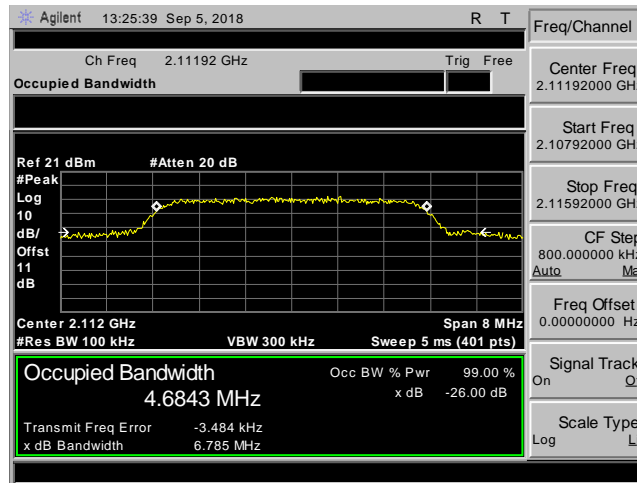
Plot 92. Occupied Bandwidth, AWS2100, 2110 - 2180 MHz, Low



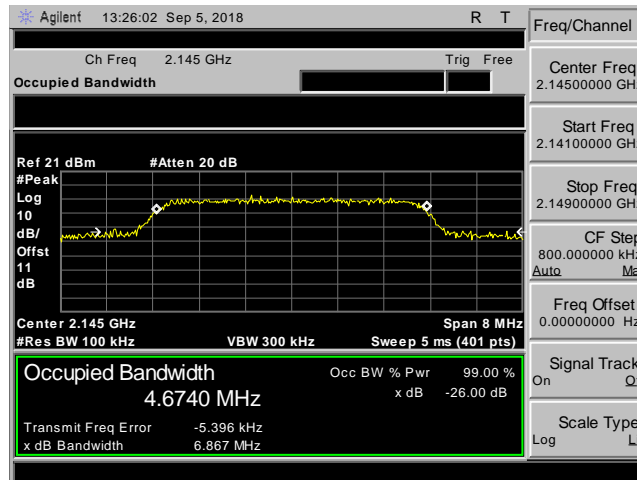
Plot 93. Occupied Bandwidth, AWS2100, 2110 - 2180 MHz, Mid



Plot 94. Occupied Bandwidth, AWS2100, SG, 2110 - 2180 MHz, High



Plot 95. Occupied Bandwidth, AWS2100, SG, 2110 - 2180 MHz, Low



Plot 96. Occupied Bandwidth, AWS2100, SG, 2110 - 2180 MHz, Mid



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 $43 + 10 \log(P)$.

§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: The EUT was tested according to field strength method of ANSI C63.26 5.5.4. The spectrum analyzer was used and configured in the following manner:

- (a) Frequency Range = Lowest Generated – 10th Harmonic
- (b) RBW = 1MHz
- (c) VBW 1-3 x the RBW
- (d) Detector = Average

Radiated emission measurements were performed inside a 3 meter chamber that satisfies the site requirements of ANSI C63.4-2014. The EUT was placed on an rf transparent 80 cm table for measurements below 1GHz and an rf transparent 1.5 meter table for measurements above 1GHz. The EUT's RF ports were terminated to 50ohm load. The EUT was tested using all modulations and at the low, mid, and high channels. The EUT was rotated about 360^o 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.

Emissions below 30MHz and above 18GHz were more than 20dB below the limit. The worse-case configurations are reported.

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

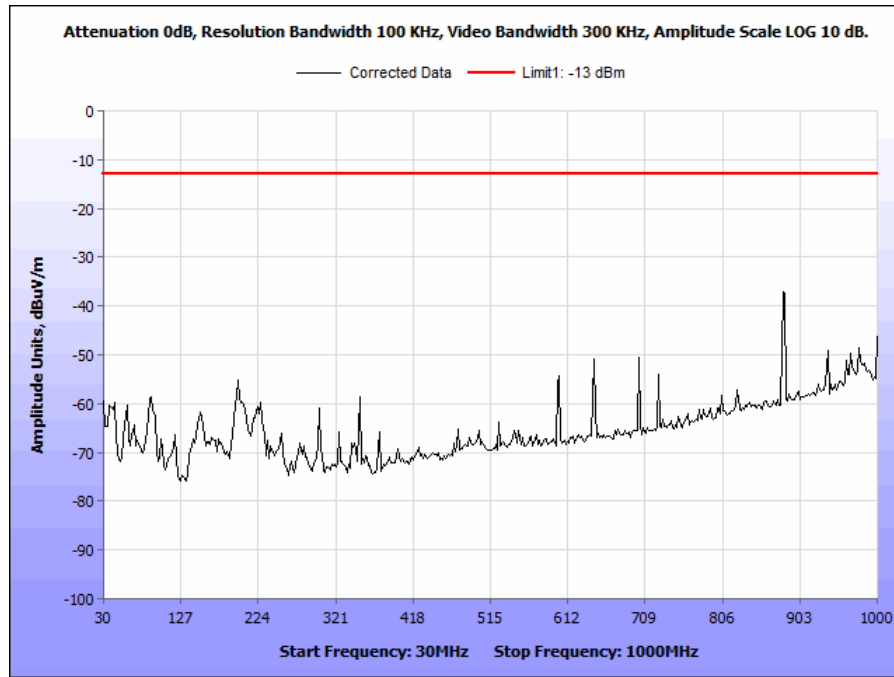
Measurements were made in each configuration. Data is presented for the worse case configuration.

Test Engineer: Bradley Jones

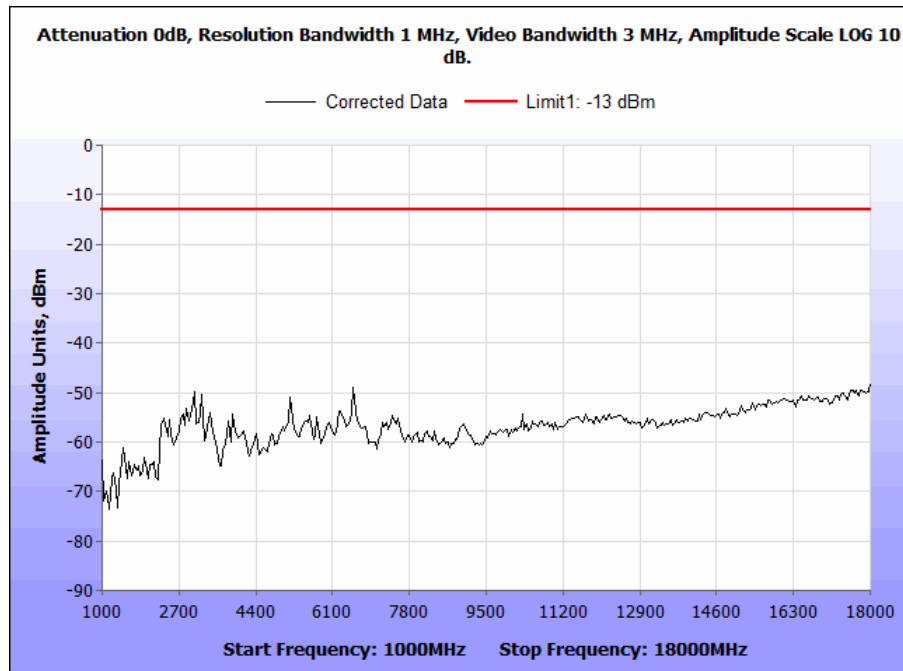
Test Date(s): September 26, 2018



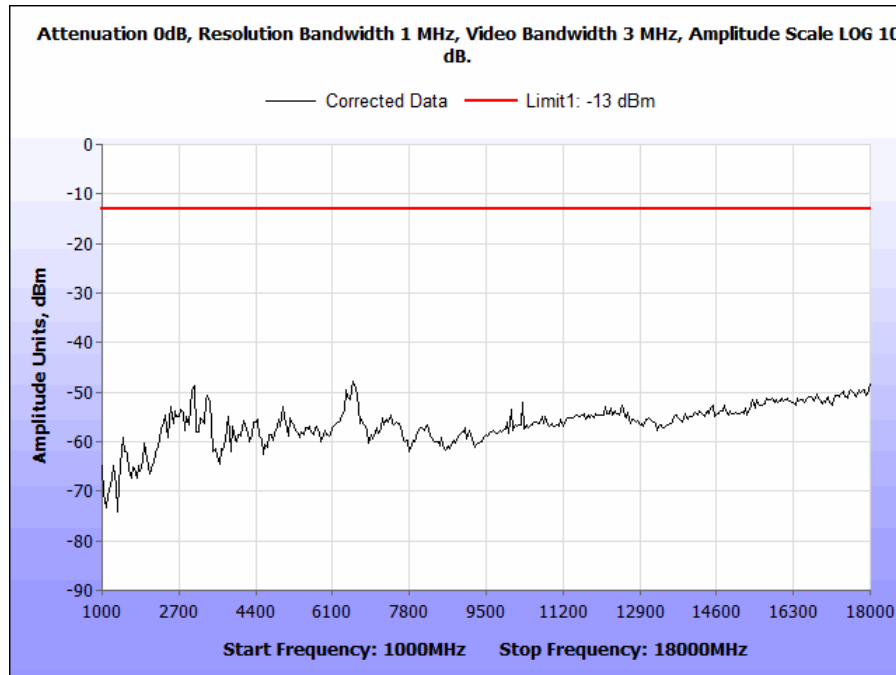
Radiated Spurious Emissions, CDMA Band 5, Test Results



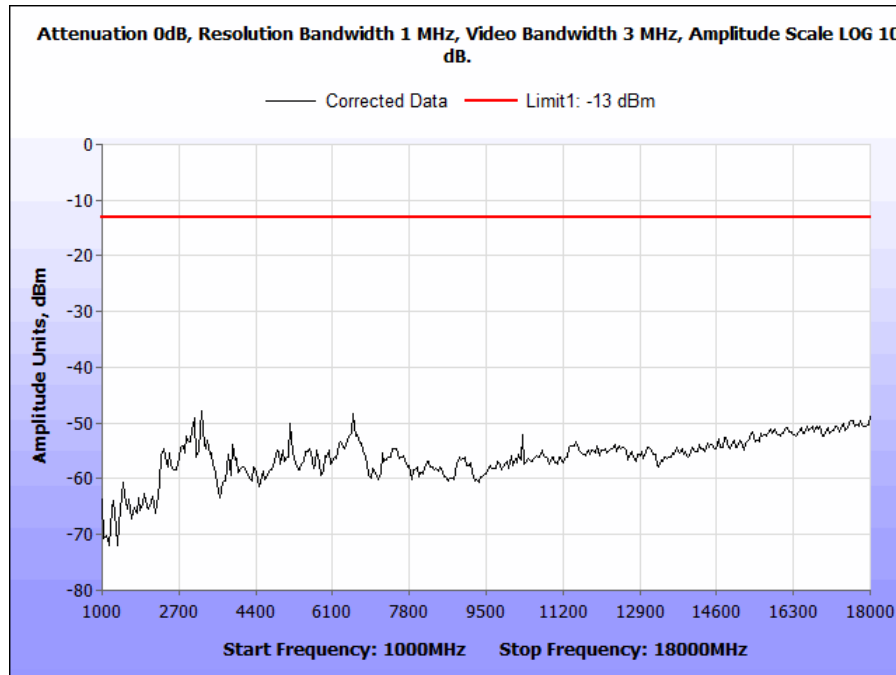
Plot 97. Radiated Emissions, CDMA Cell 850, 30 MHz – 1 GHz



Plot 98. Radiated Emissions, CDMA Cell 850, High Channel

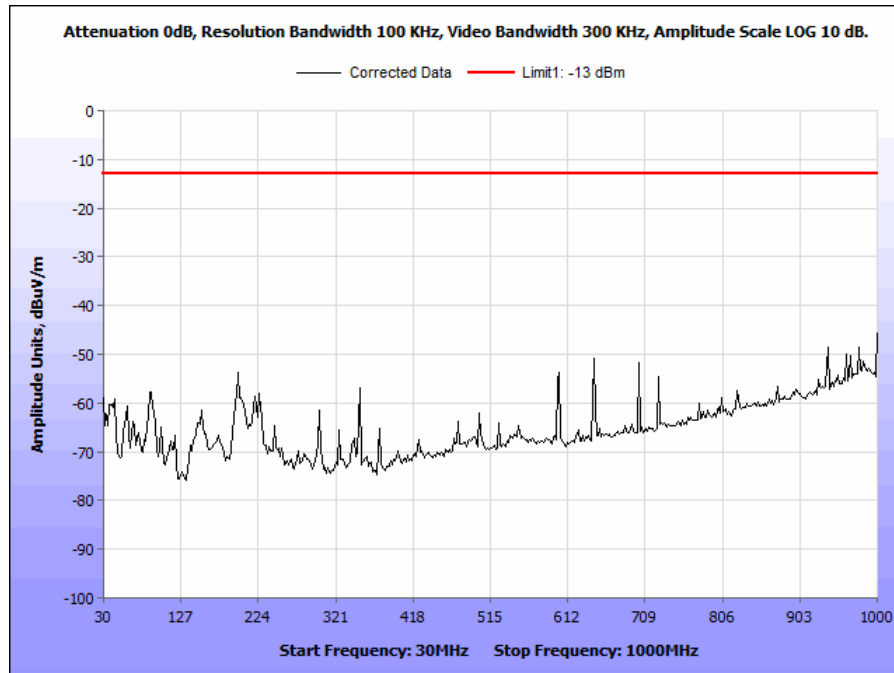


Plot 99. Radiated Emissions, CDMA Cell 850, Low Channel

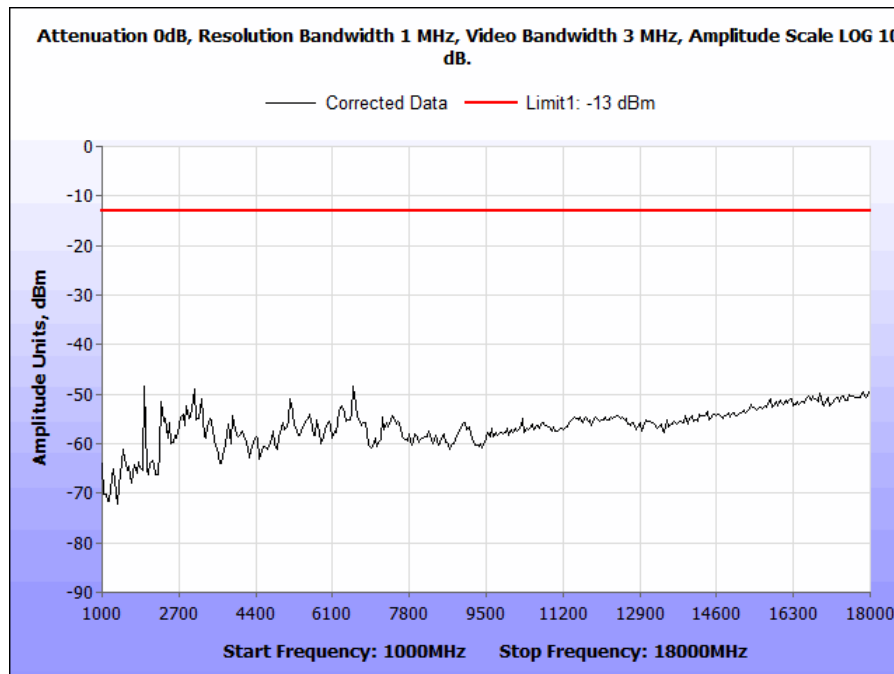


Plot 100. Radiated Emissions, CDMA Cell 850, Mid Channel

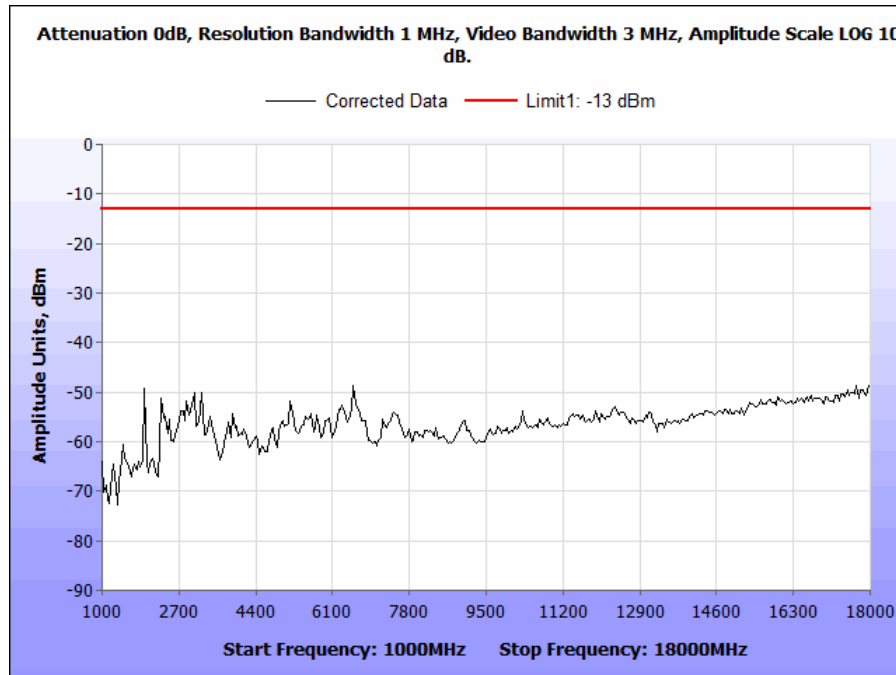
Radiated Spurious Emissions, CDMA Band 25, Test Results



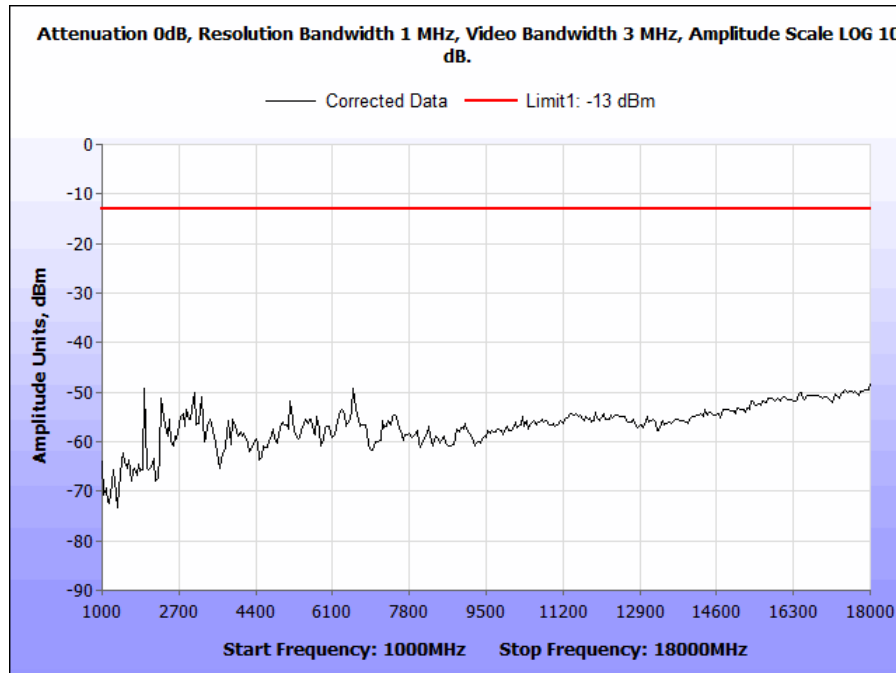
Plot 101. Radiated Emissions, PCS 1900, 30 MHz – 1 GHz



Plot 102. Radiated Emissions, PCS 1900, High



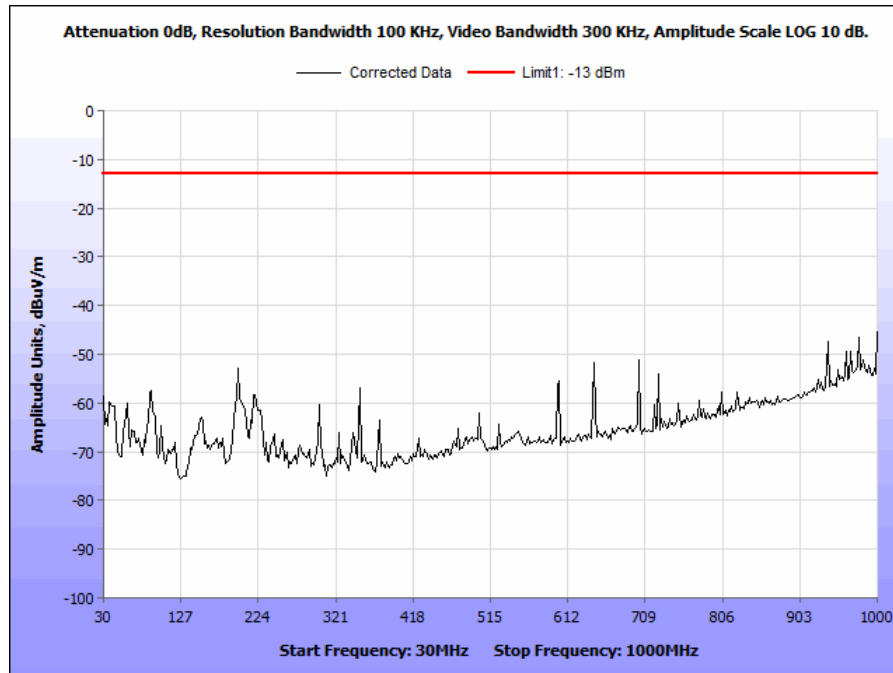
Plot 103. Radiated Emissions, PCS 1900, Low



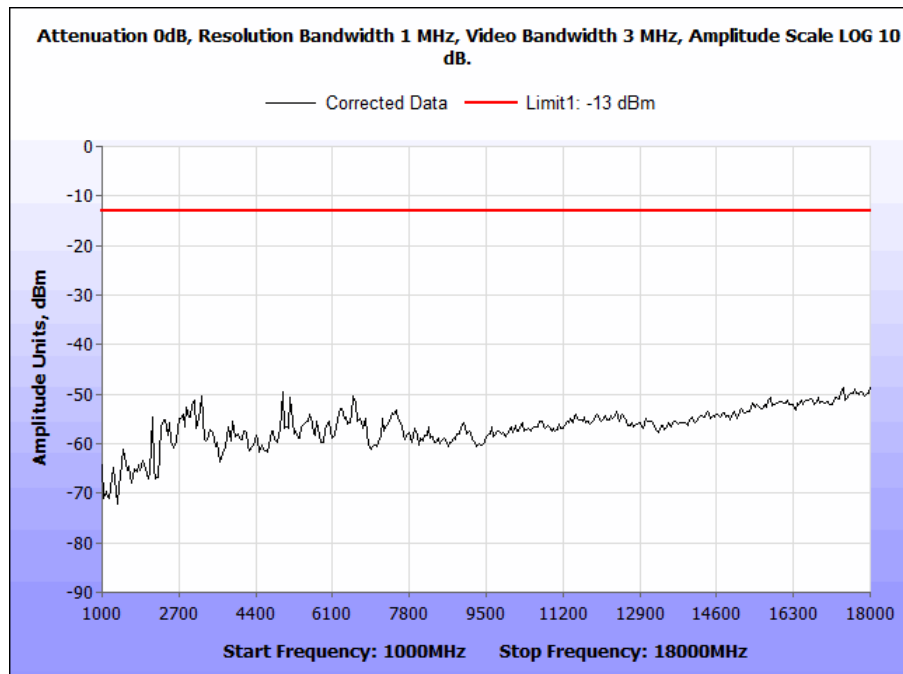
Plot 104. Radiated Emissions, PCS 1900, Mid



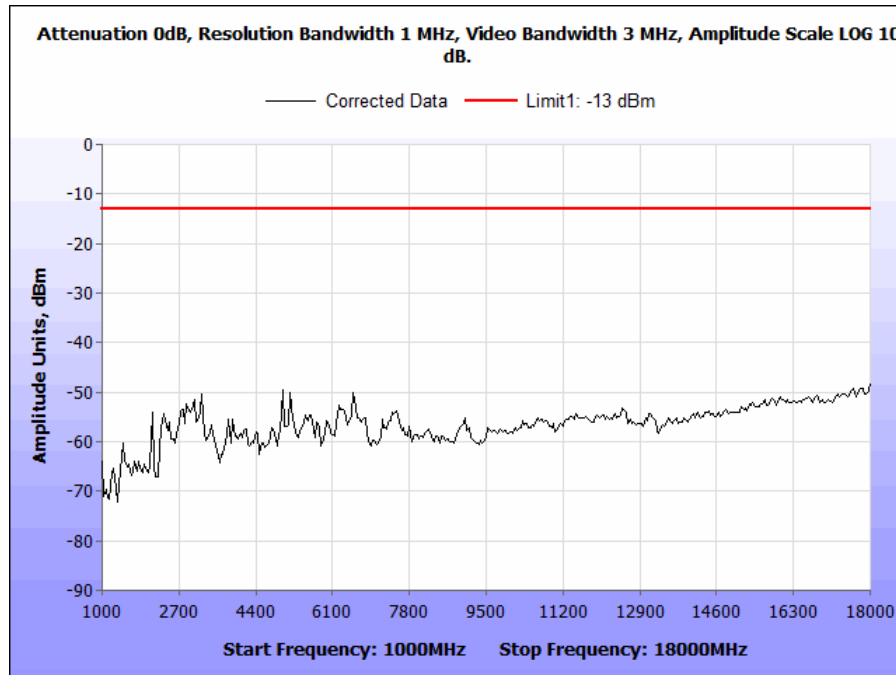
Radiated Spurious Emissions,



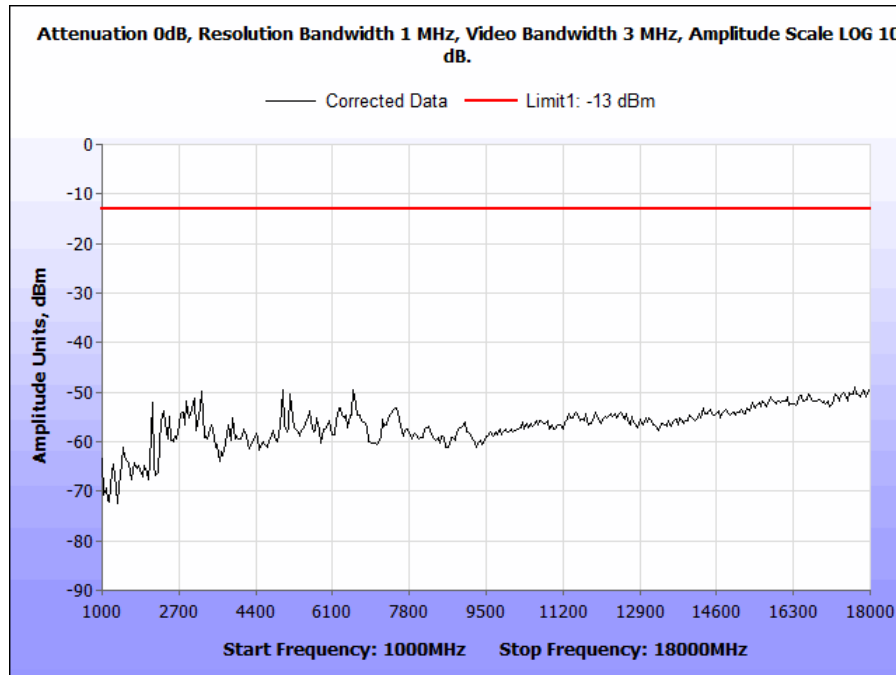
Plot 105. Radiated Emissions, CDMA Band 66, 30 MHz – 1 GHz



Plot 106. Radiated Emissions, CDMA Band 66, High Channel

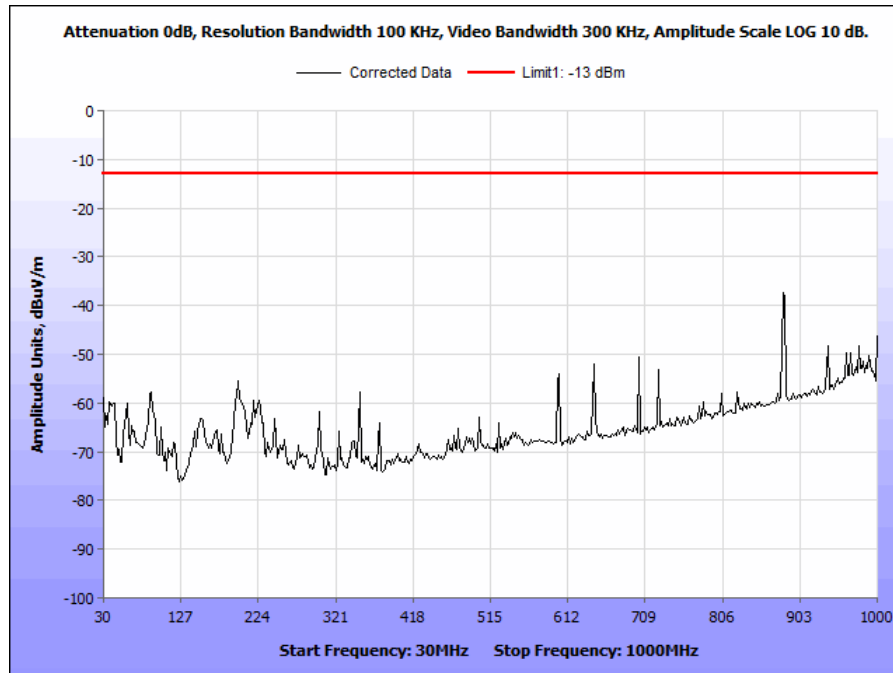


Plot 107. Radiated Emissions, CDMA Band 66, Low Channel

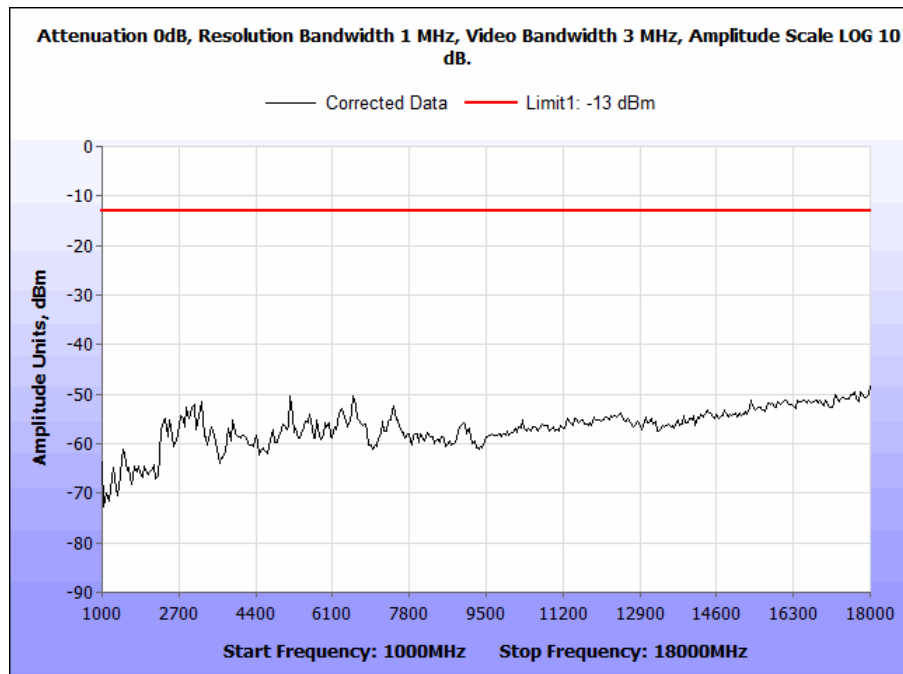


Plot 108. Radiated Emissions, CDMA Band 66, Mid Channel

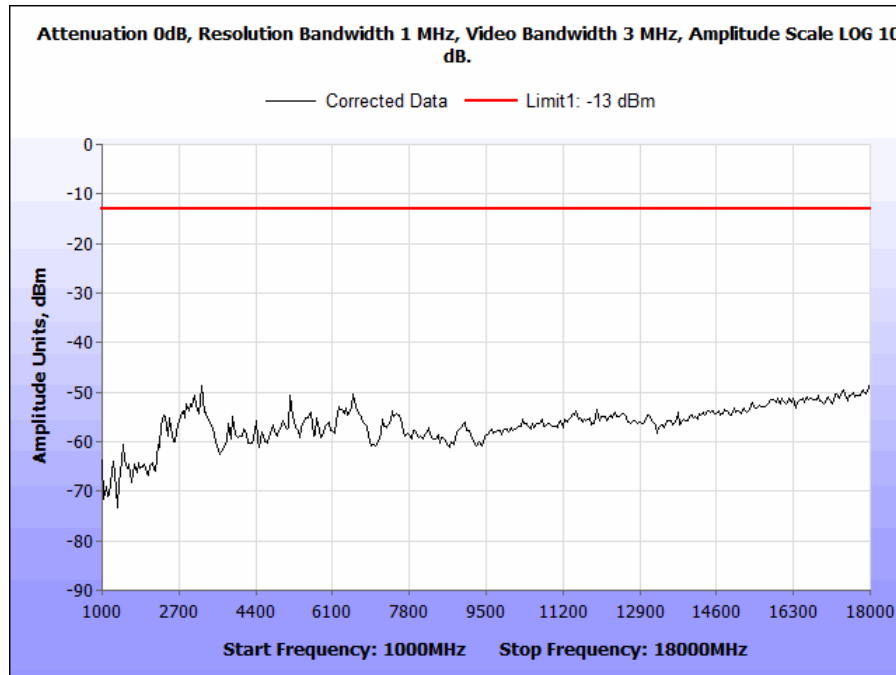
Radiated Spurious Emissions, GSM 850, Test Results



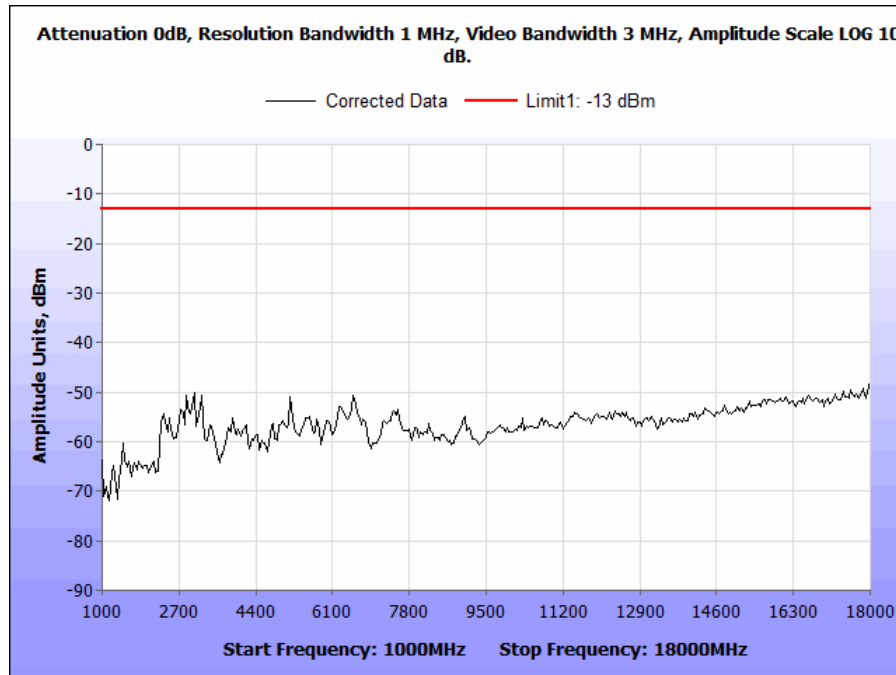
Plot 109. Radiated Emissions, GSM 850, 30 MHz – 1 GHz



Plot 110. Radiated Emissions, GSM 850, High Channel

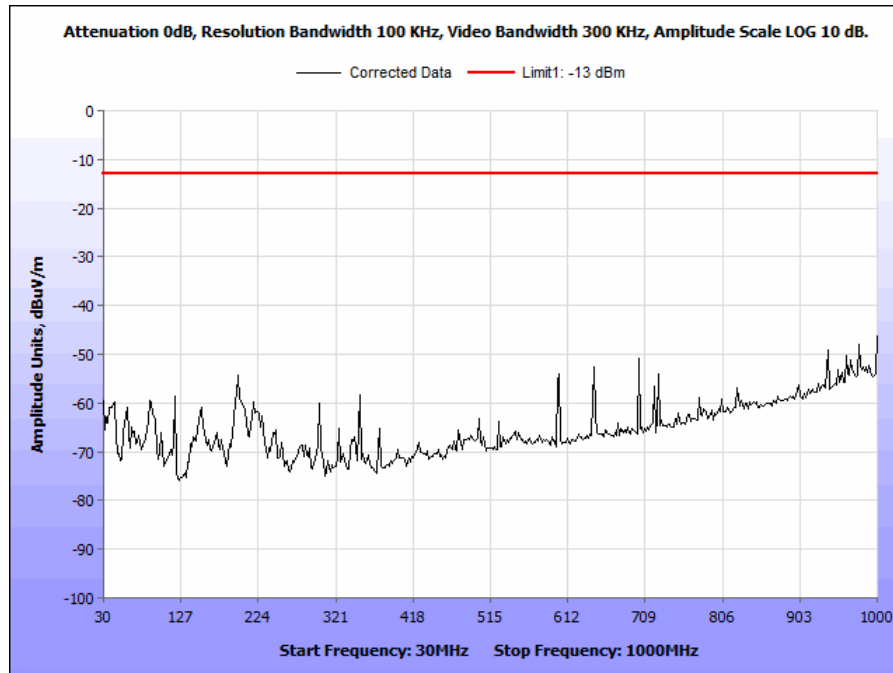


Plot 111. Radiated Emissions, GSM 850, Low Channel

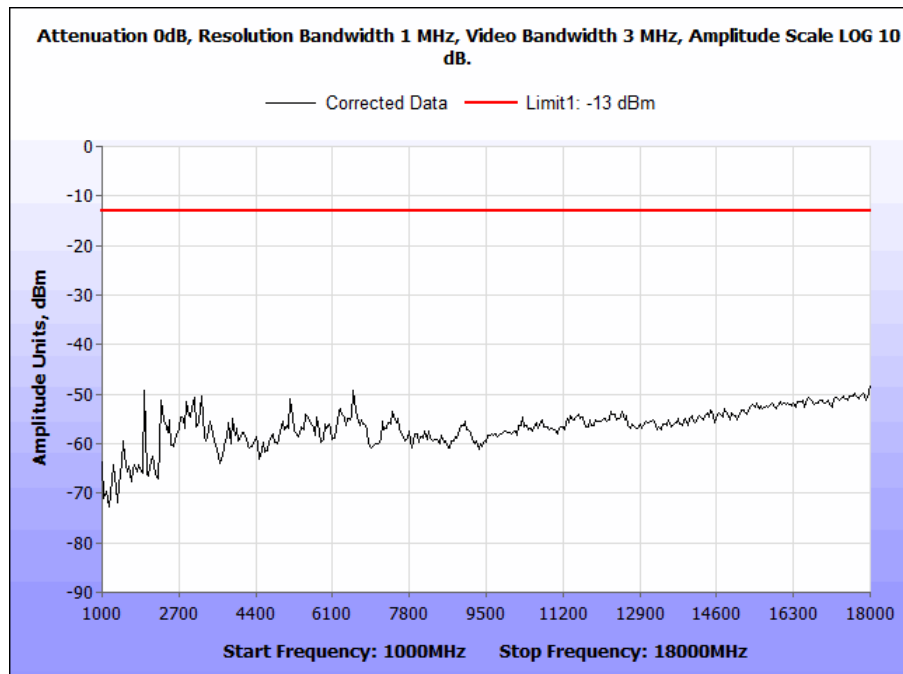


Plot 112. Radiated Emissions, GSM 850, Mid Channel

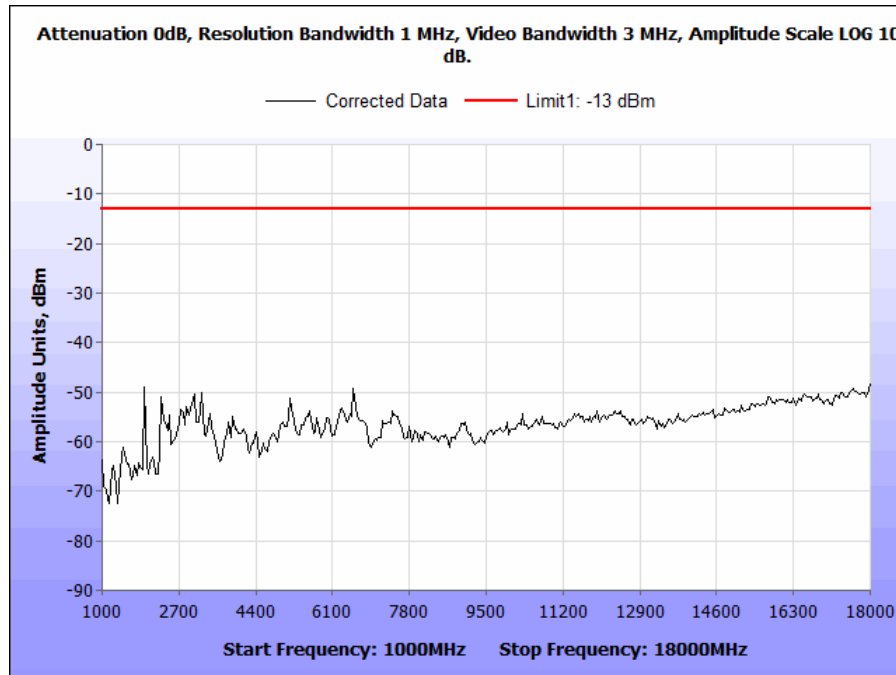
Radiated Spurious Emissions, GSM 1900, Test Results



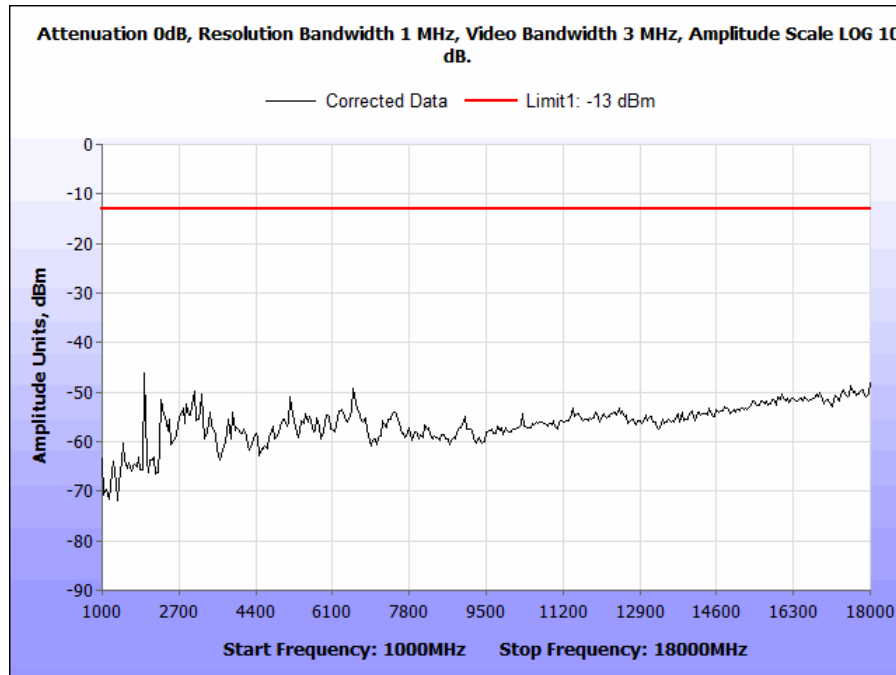
Plot 113. Radiated Emissions, GSM 1900, 30 MHz – 1 GHz



Plot 114. Radiated Emissions, GSM 1900, High Channel



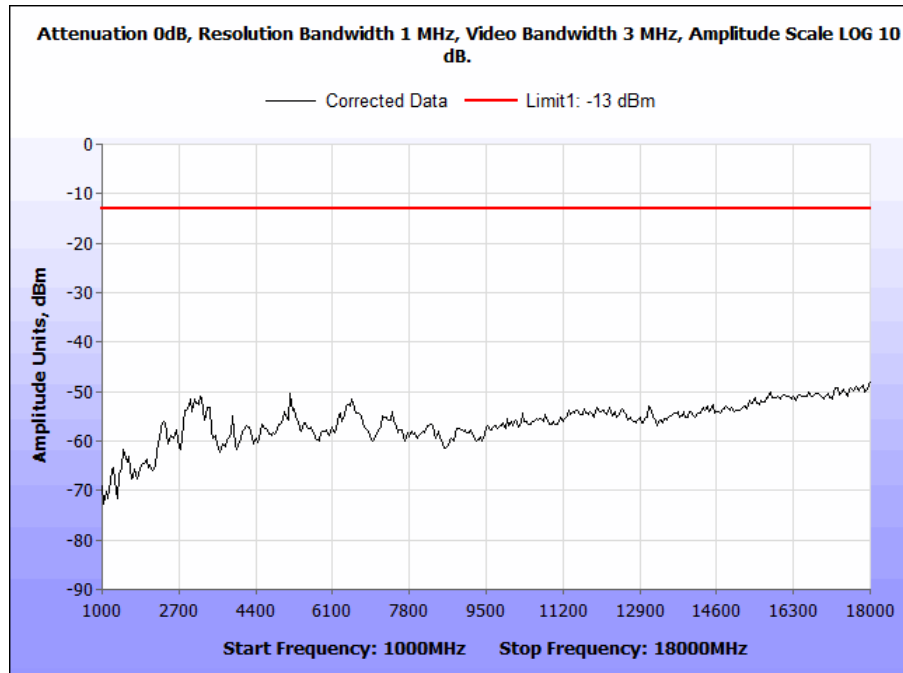
Plot 115. Radiated Emissions, GSM 1900, Low Channel



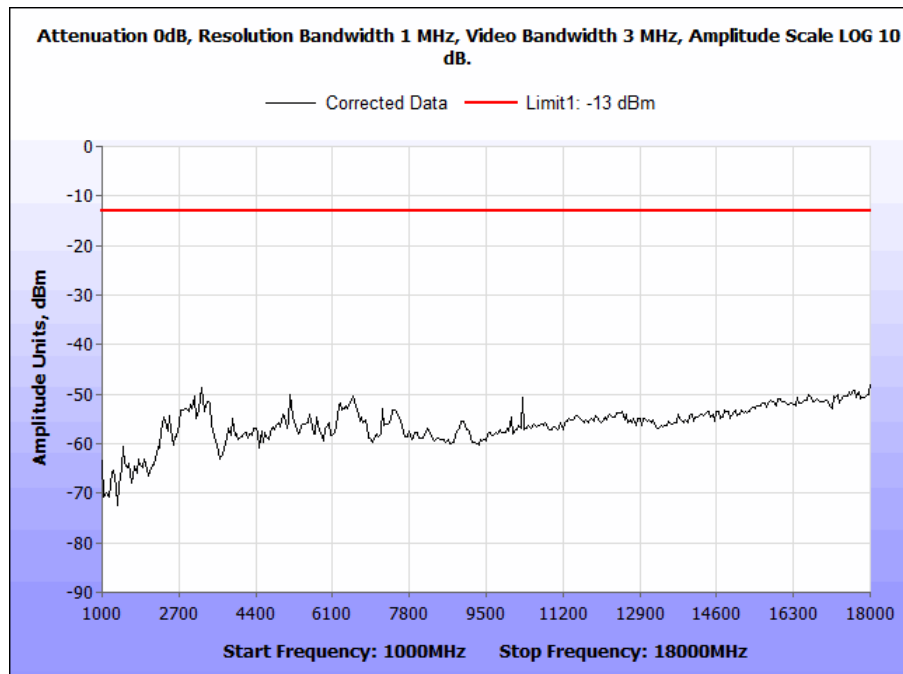
Plot 116. Radiated Emissions, GSM 1900, Mid Channel



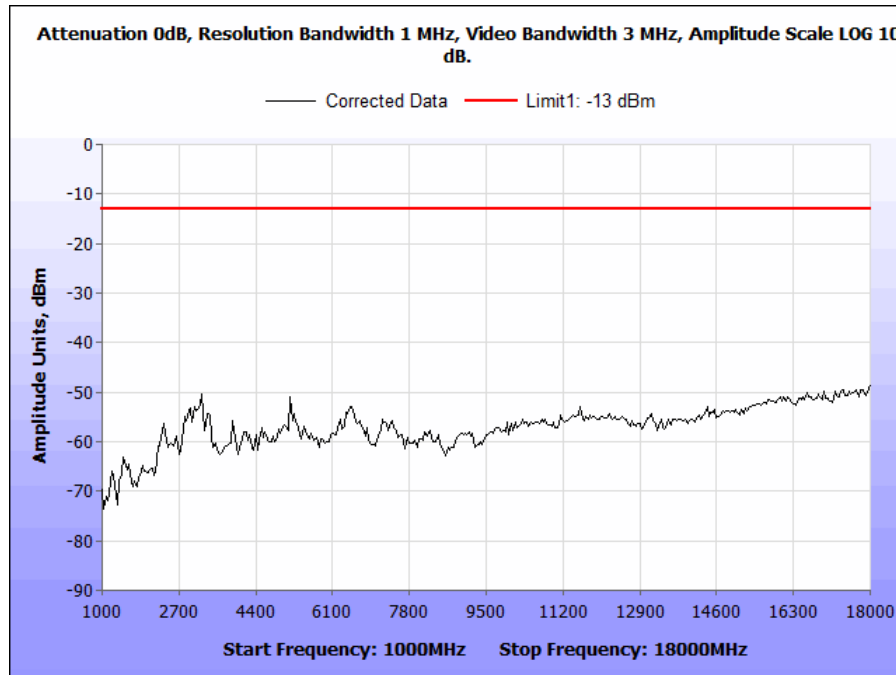
Radiated Spurious Emissions, WCDMA Band 5, Test Results



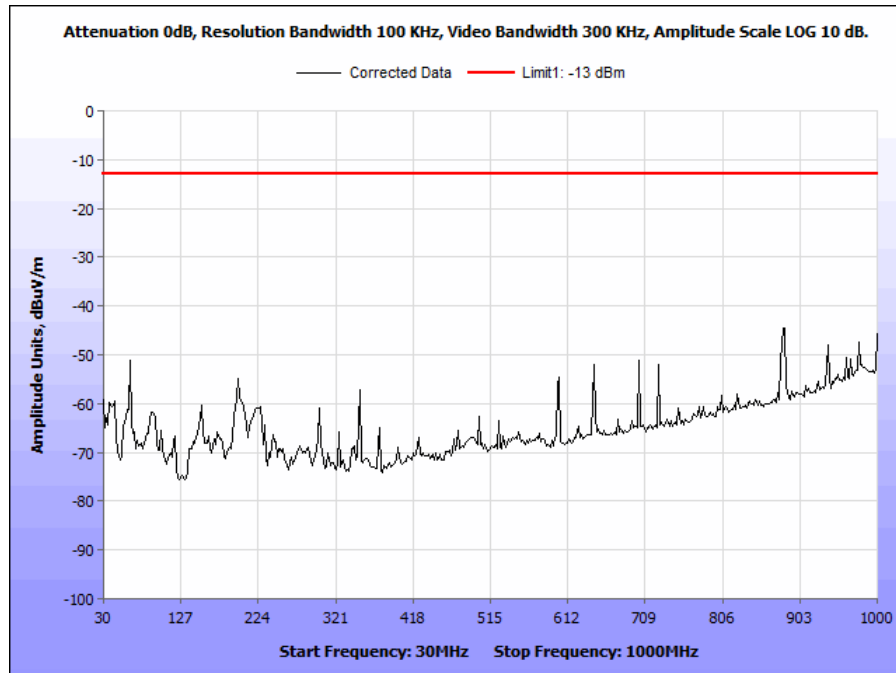
Plot 117. Radiated Emissions, WCDMA Band 5, High Channel



Plot 118. Radiated Emissions, WCDMA Band 5, Low Channel

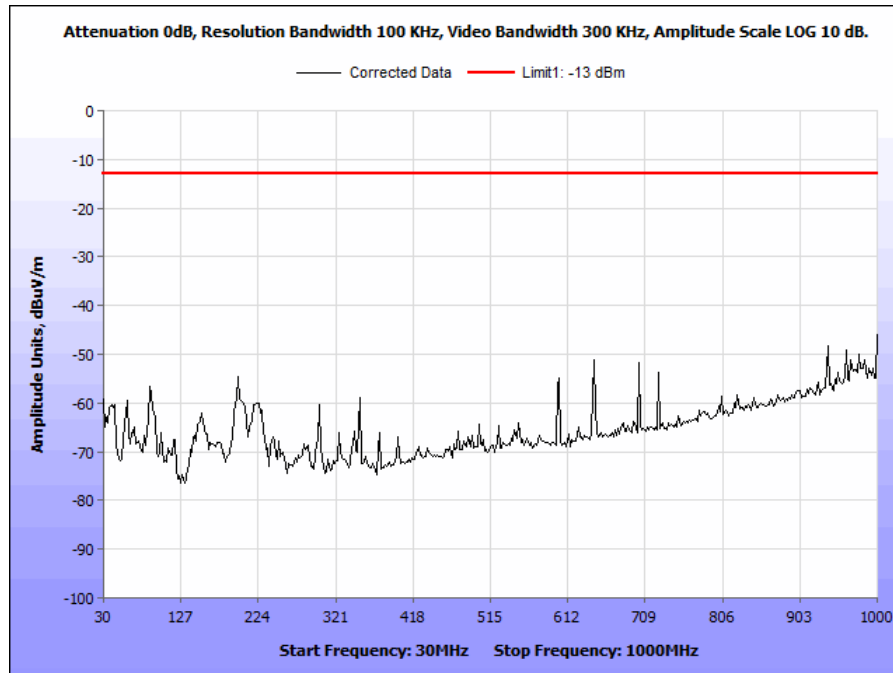


Plot 119. Radiated Emissions, WCDMA Band 5, Mid Channel

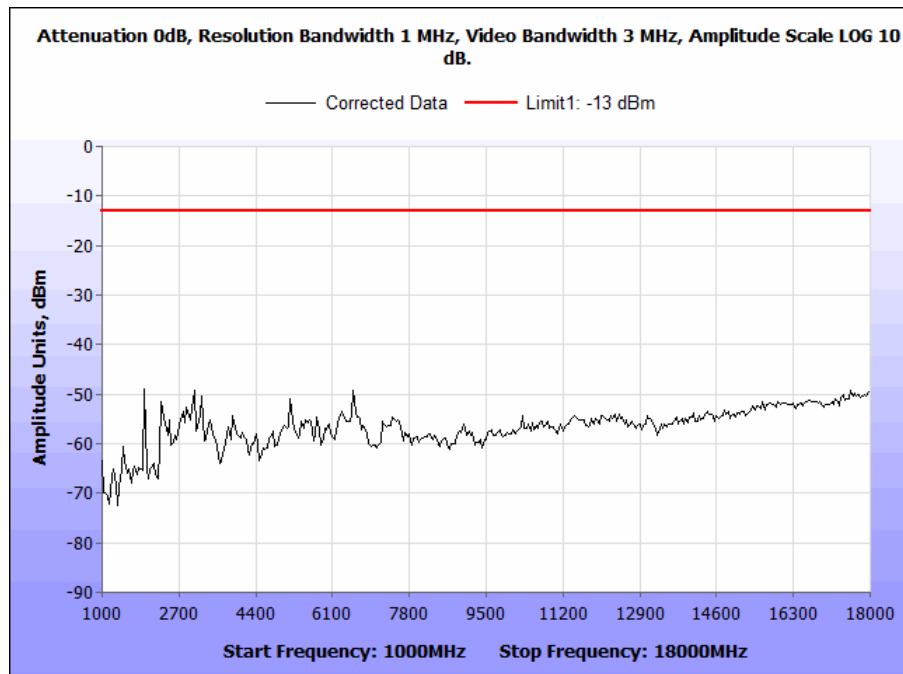


Plot 120. Radiated Emissions, WCDMA Band 5, 30 MHz – 1 GHz

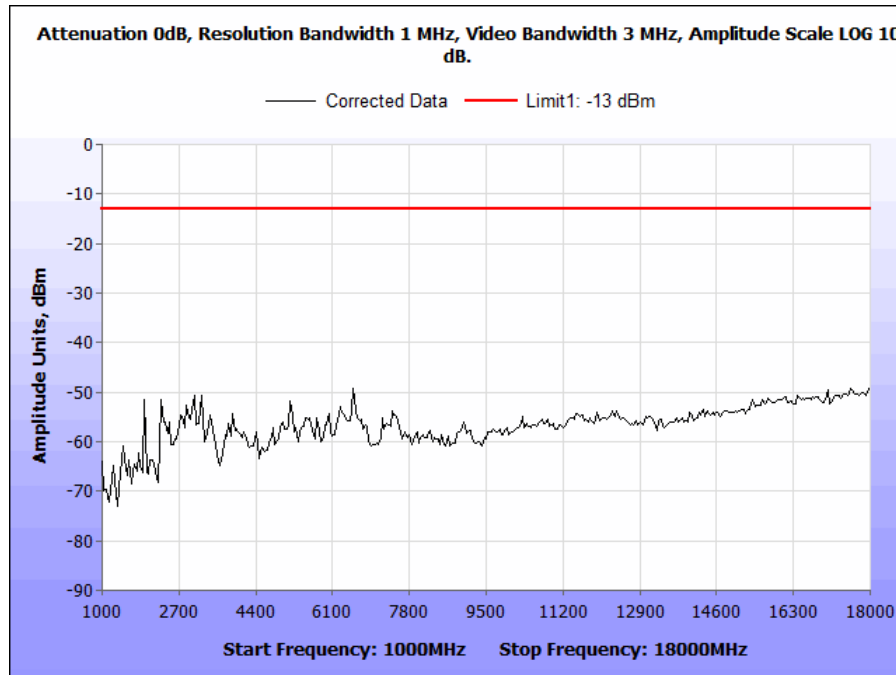
Radiated Spurious Emissions, WCDMA Band 25, Test Results



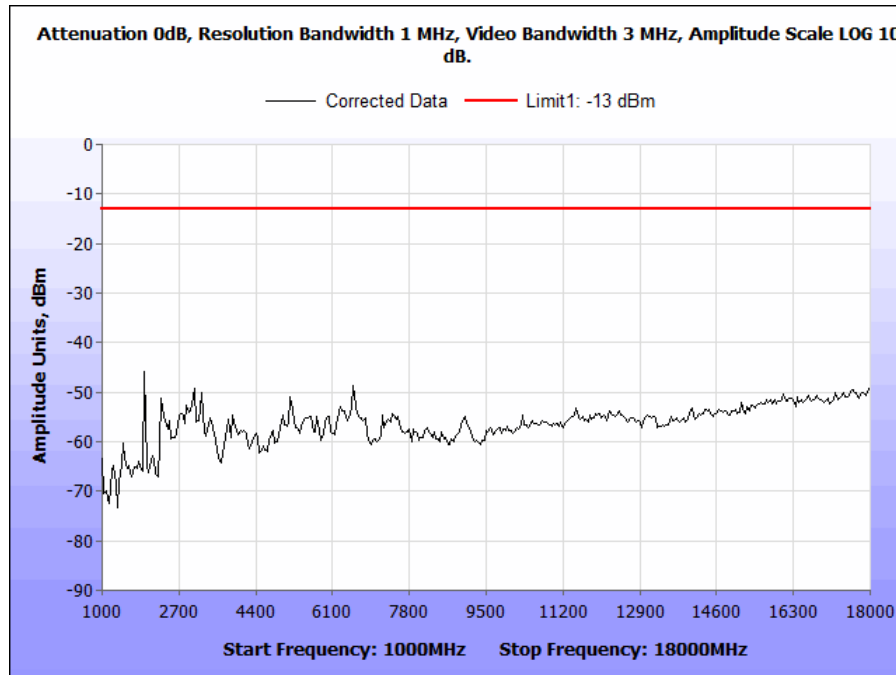
Plot 121. Radiated Emissions, WCDMA Band 25, 30 MHz – 1 GHz



Plot 122. Radiated Emissions, WCDMA Band 25, High Channel

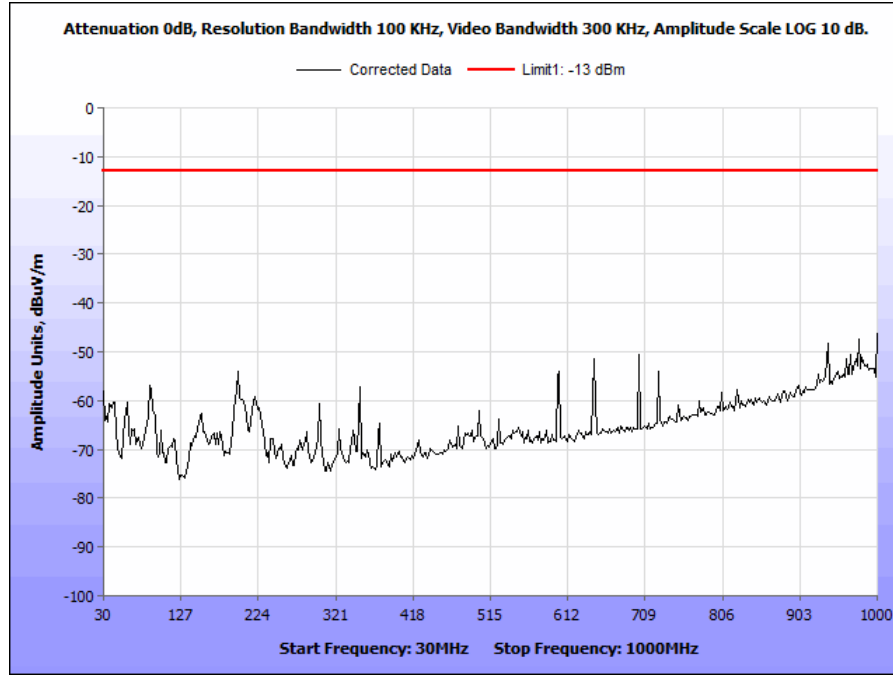


Plot 123. Radiated Emissions, WCDMA Band 25, Low Channel

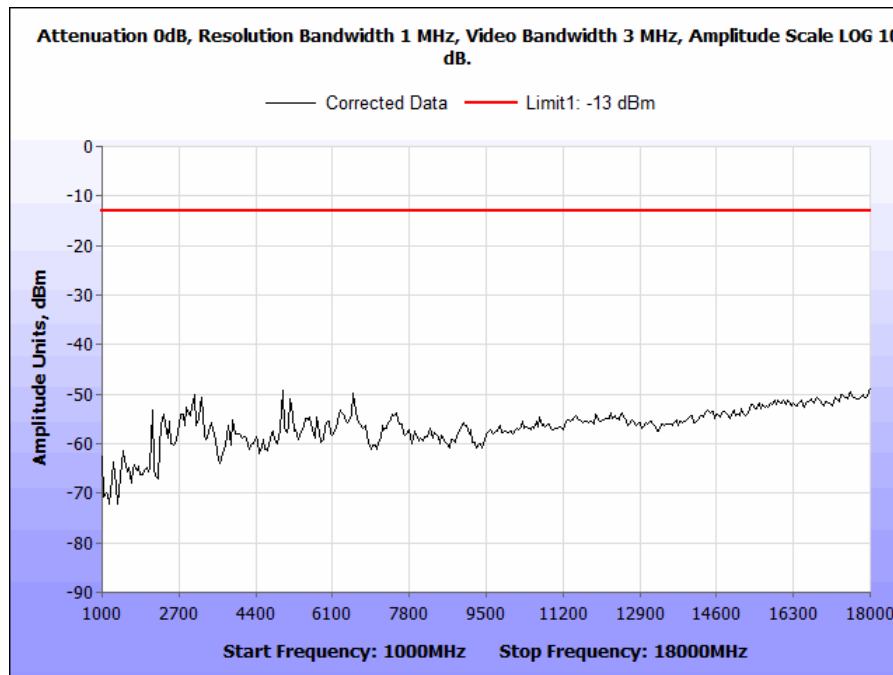


Plot 124. Radiated Emissions, WCDMA Band 25, Mid Channel

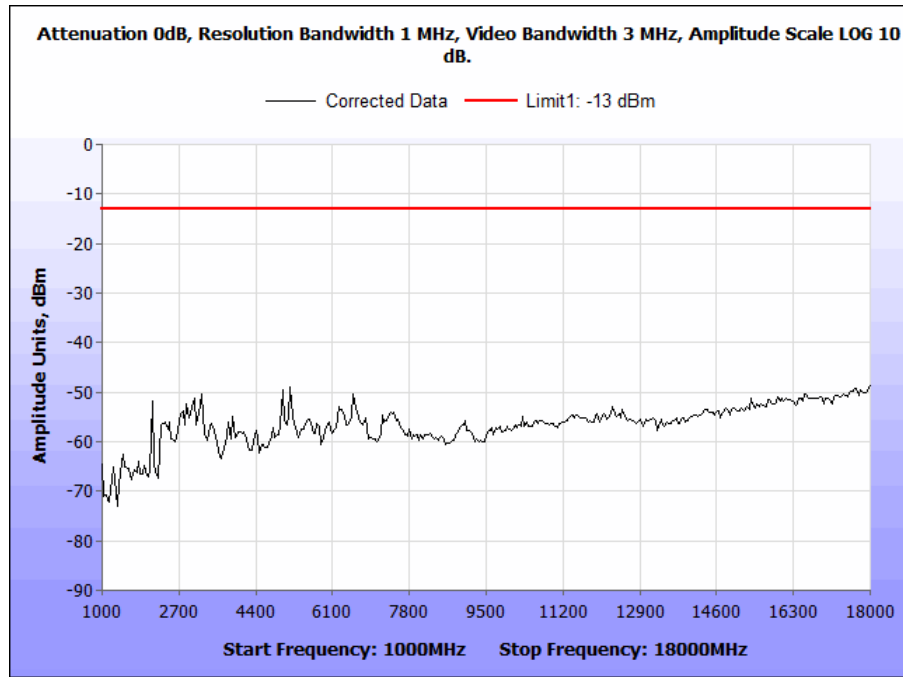
Radiated Spurious Emissions, WCDMA Band 66, Test Results



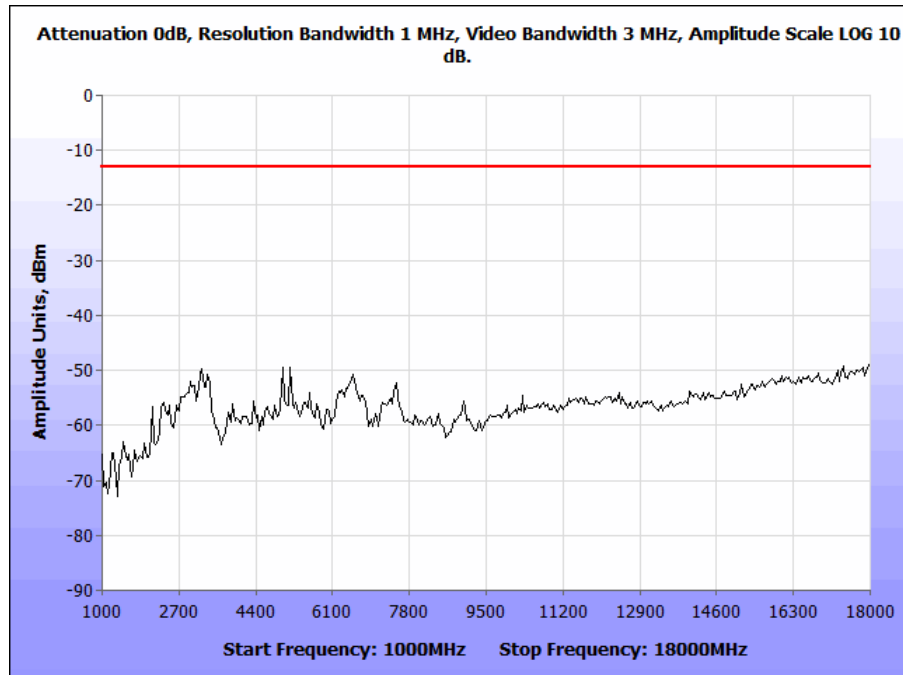
Plot 125. Radiated Emissions, WCDMA Band 66, 30 MHz – 1 GHz



Plot 126. Radiated Emissions, WCDMA Band 66, High Channel



Plot 127. Radiated Emissions, WCDMA Band 66, Low Channel



Plot 128. Radiated Emissions, WCDMA Band 66, Mid Channel

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.

§ 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.

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

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

Test Procedures: The EUT was tested according to the unwanted emissions procedures of ANSI C63.26 5.7.3. The spectrum analyzer was used and configured in the following manner:

- (e) Frequency Range = 30MHz – 10th Harmonic
- (f) RBW = 1% of the OBW, or greater
- (g) VBW 1-3 x the RBW
- (h) Detector = Peak
- (i) Sweet Time = Auto

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

For out of band emissions, the low, mid, and high channels for each test mode were evaluated, data is presented for the worse case/ highest output channel.

For band edge emissions, each bandwidth mode was evaluated. Data is presented for the worse case configurations.

Test Engineer(s): Bradley Jones

Test Date(s): August 30, 2018

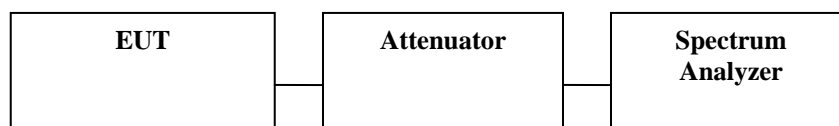
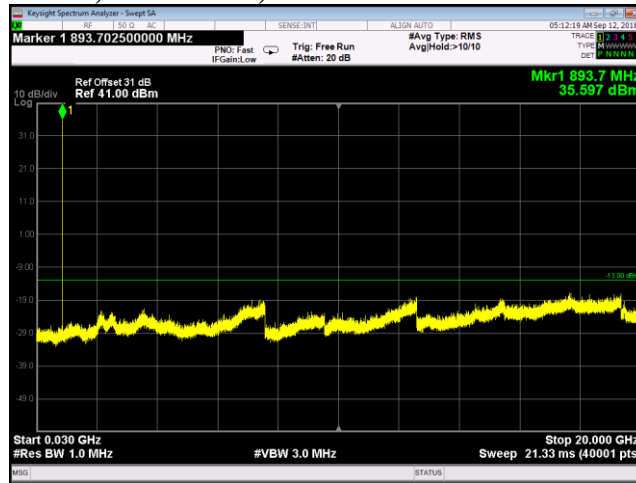
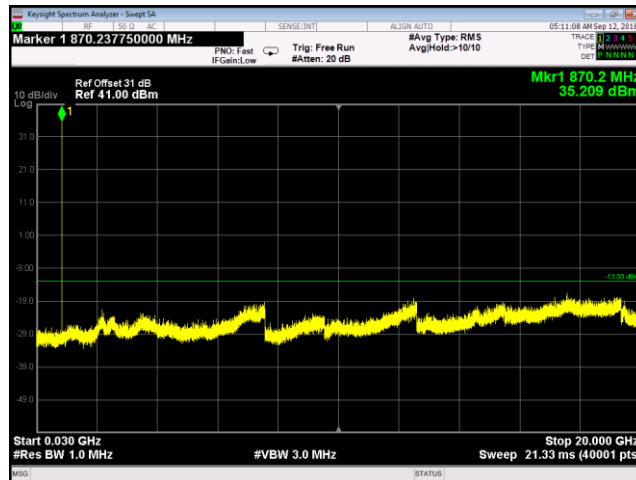


Figure 3. Spurious Emissions at Antenna Terminals Test Setup

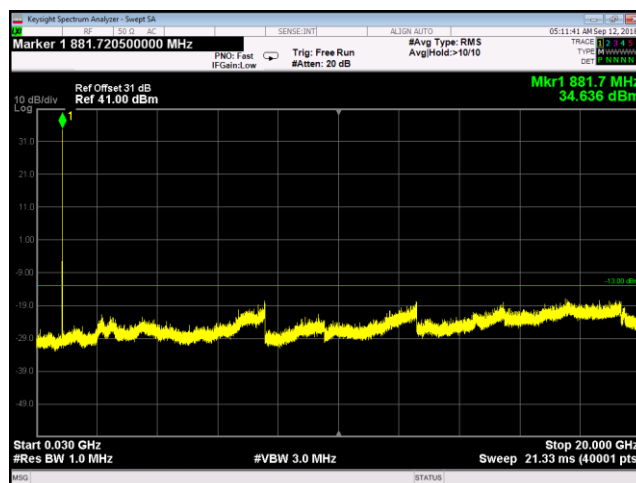
Conducted Spurious Emissions, CDMA850, Test Results



Plot 129. Spurious Emissions at Antenna Terminals, CDMA850, 869 - 894 MHz, High

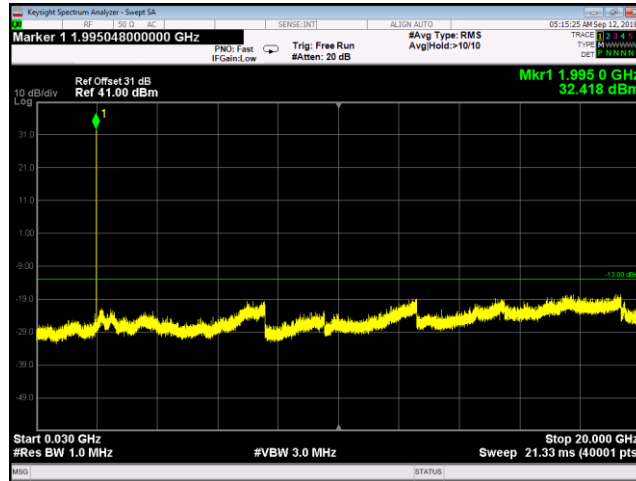


Plot 130. Spurious Emissions at Antenna Terminals, CDMA850, 869 - 894 MHz, Low

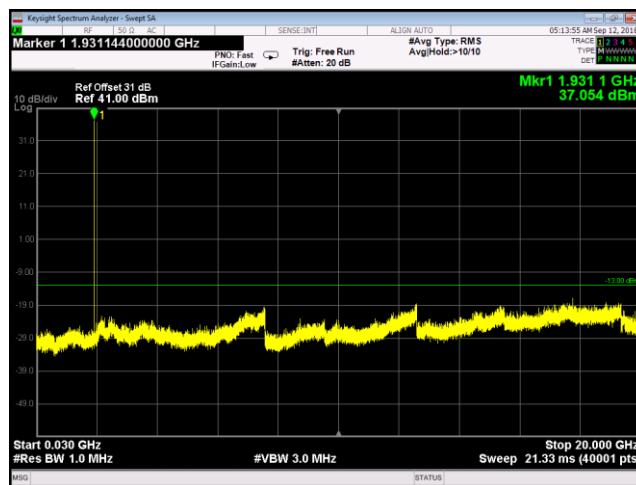


Plot 131. Spurious Emissions at Antenna Terminals, CDMA850, 869 - 894 MHz, Mid

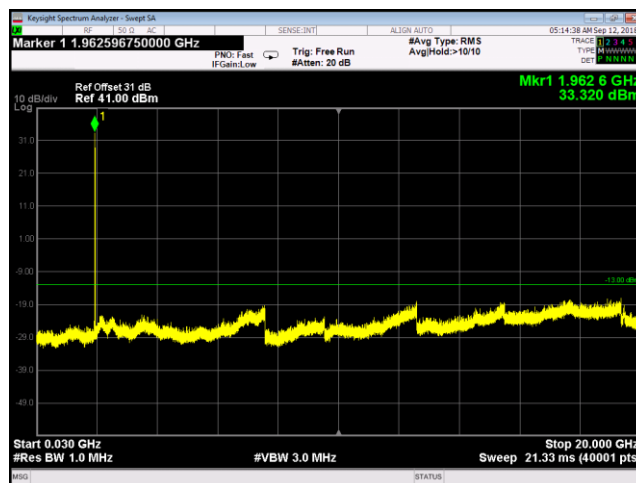
Conducted Spurious Emissions, CDMA Band 25, Test Results



Plot 132. Spurious Emissions at Antenna Terminals, CDMA1900, 1930 - 1995 MHz, High

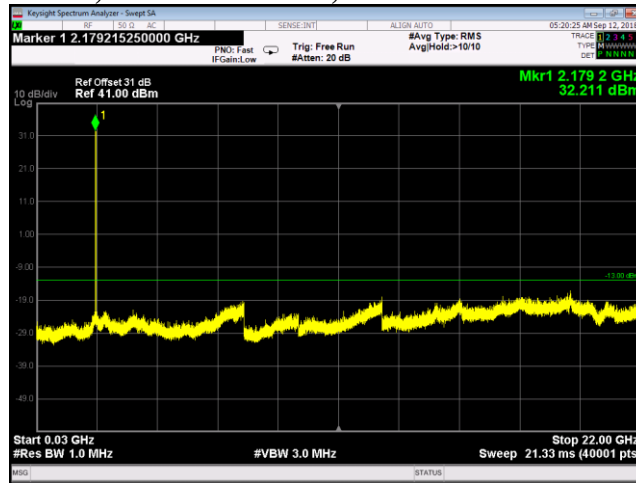


Plot 133. Spurious Emissions at Antenna Terminals, CDMA1900, 1930 - 1995 MHz, Low

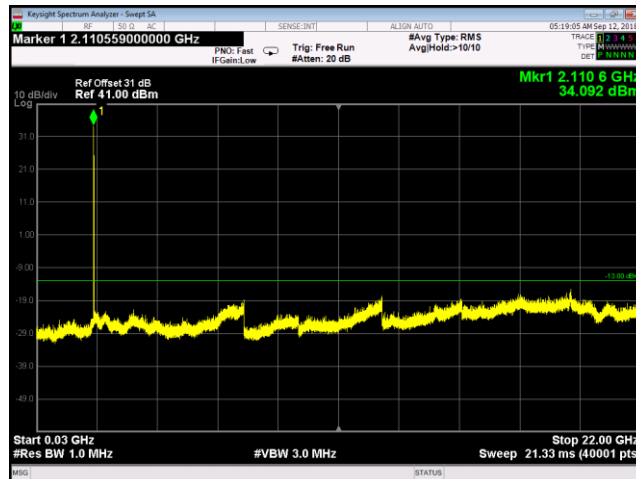


Plot 134. Spurious Emissions at Antenna Terminals, CDMA1900, 1930 - 1995 MHz, Mid

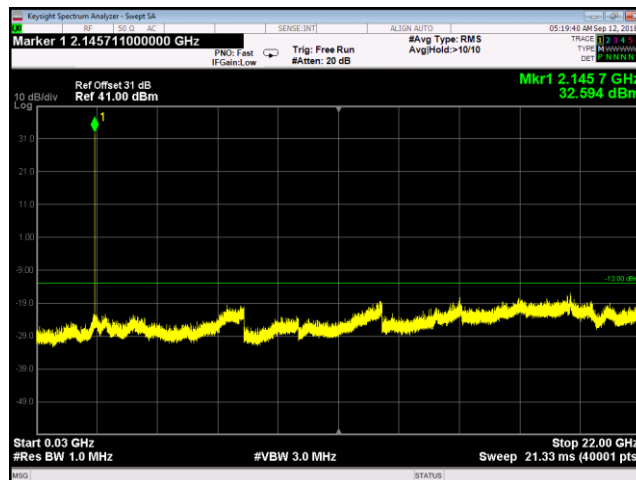
Conducted Spurious Emissions, CDMA Band 66, Test Results



Plot 135. Spurious Emissions at Antenna Terminals, CDMA2100, 2110 - 2180 MHz, High

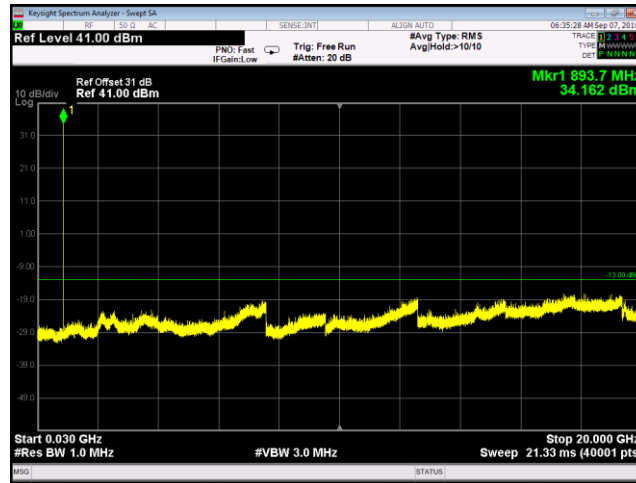


Plot 136. Spurious Emissions at Antenna Terminals, CDMA2100, 2110 - 2180 MHz, Low

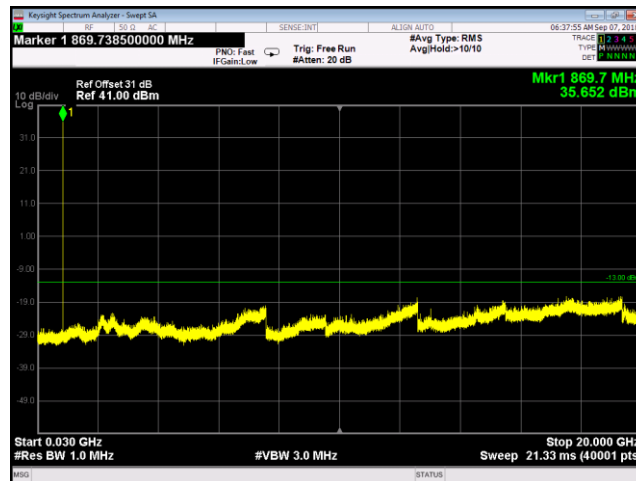


Plot 137. Spurious Emissions at Antenna Terminals, CDMA2100, 2110 - 2180 MHz, Mid

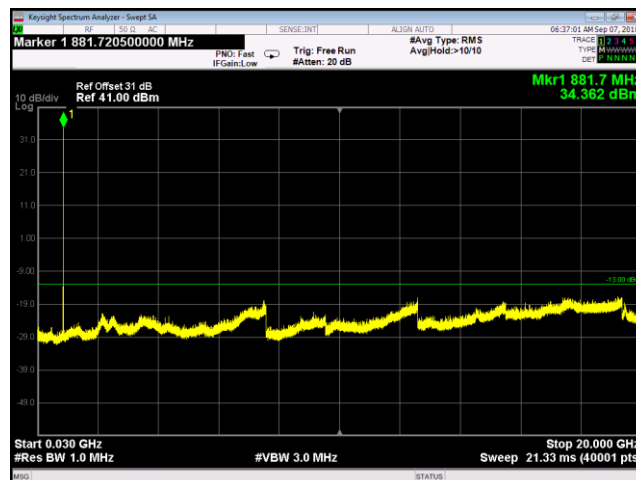
Conducted Spurious Emissions, GSM 850, Test Results



Plot 138. Spurious Emissions at Antenna Terminals, GSM 850, 869 - 894 MHz, High

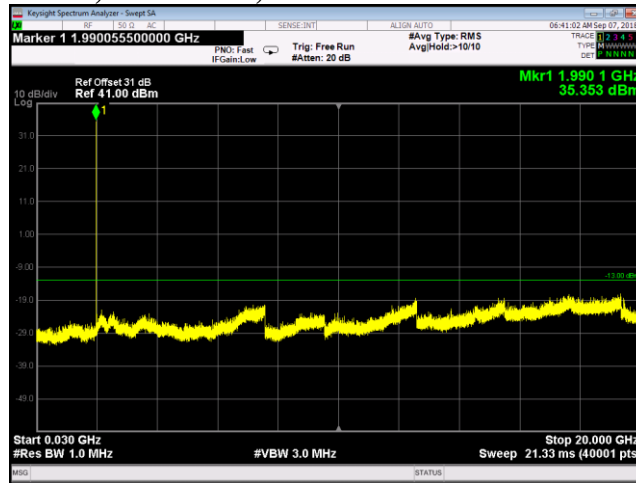


Plot 139. Spurious Emissions at Antenna Terminals, GSM 850, 869 - 894 MHz, Low

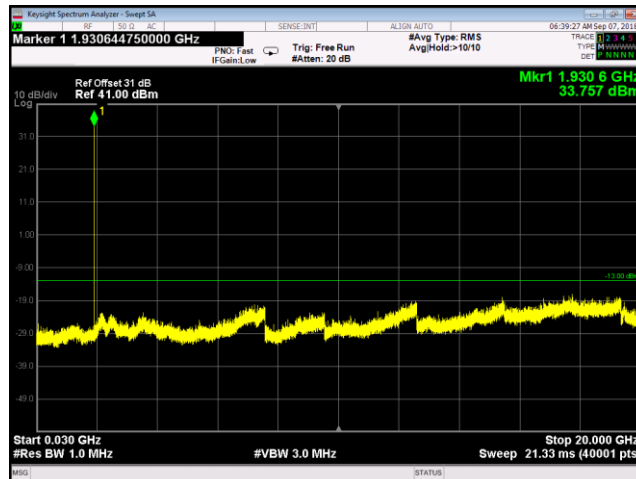


Plot 140. Spurious Emissions at Antenna Terminals, GSM 850, 869 - 894 MHz, Mid

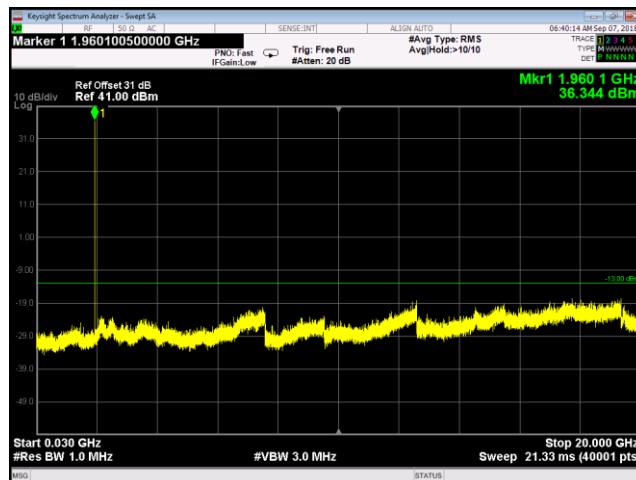
Conducted Spurious Emissions, GSM 1900, Test Results



Plot 141. Spurious Emissions at Antenna Terminals, GSM1900, 1930 - 1990 MHz, High

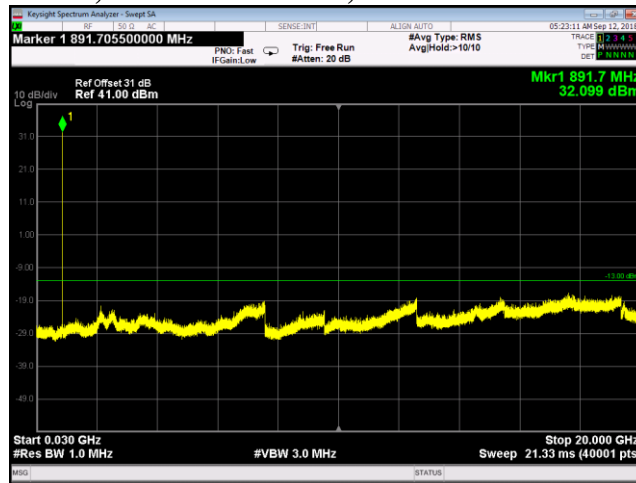


Plot 142. Spurious Emissions at Antenna Terminals, GSM1900, 1930 - 1990 MHz, Low

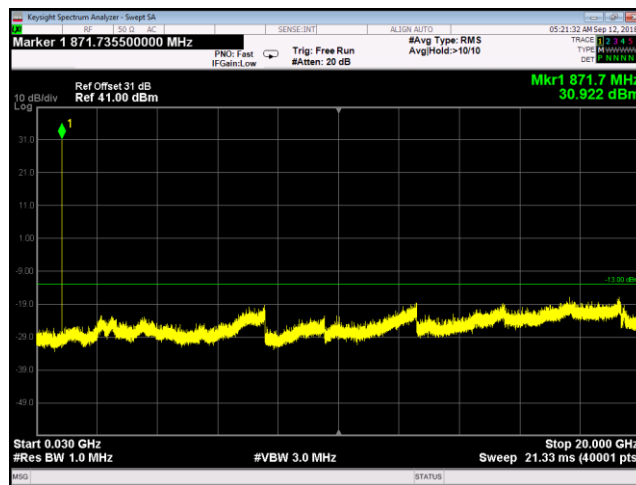


Plot 143. Spurious Emissions at Antenna Terminals, GSM1900, 1930 - 1990 MHz, Mid

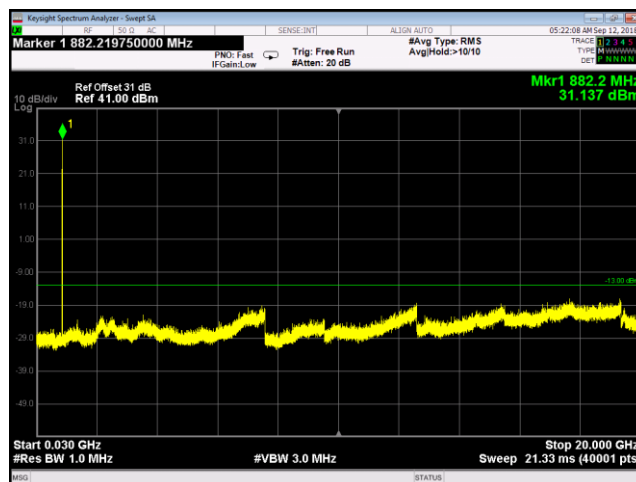
Conducted Spurious Emissions, WCDMA Band 5, Test Results



Plot 144. Spurious Emissions at Antenna Terminals, WCDMA850, 824 - 869 MHz, High

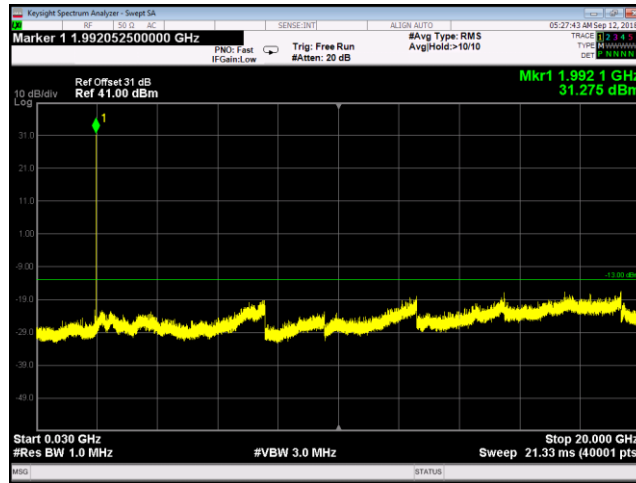


Plot 145. Spurious Emissions at Antenna Terminals, WCDMA850, 824 - 869 MHz, Low

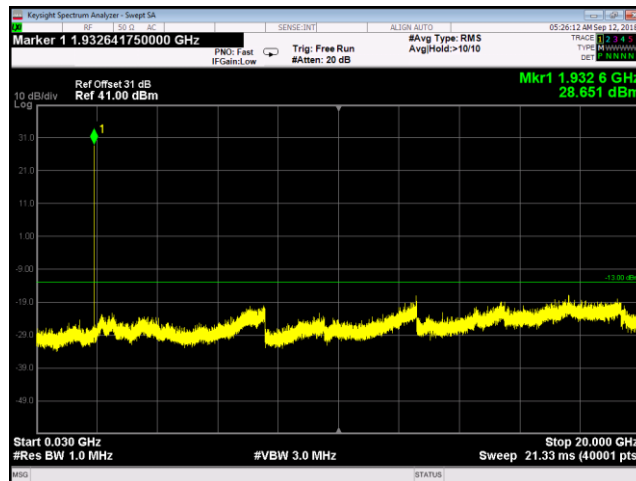


Plot 146. Spurious Emissions at Antenna Terminals, WCDMA850, 824 - 869 MHz, Mid

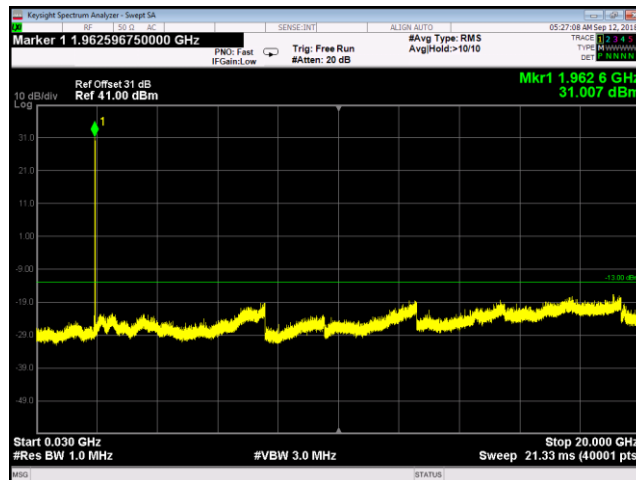
Conducted Spurious Emissions, WCDMA Band 25, Test Results



Plot 147. Spurious Emissions at Antenna Terminals, WCDMA1900, 1930 - 1995 MHz, High

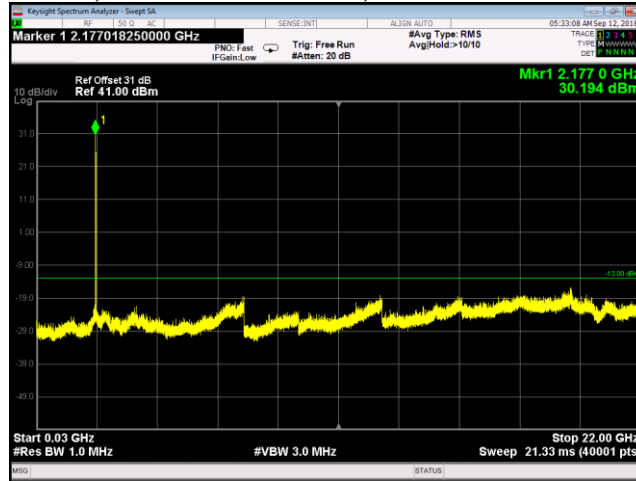


Plot 148. Spurious Emissions at Antenna Terminals, WCDMA1900, 1930 - 1995 MHz, Low

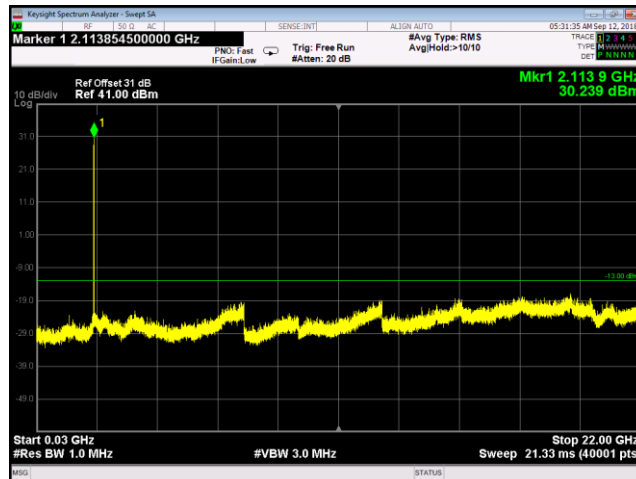


Plot 149. Spurious Emissions at Antenna Terminals, WCDMA1900, 1930 - 1995 MHz, Mid

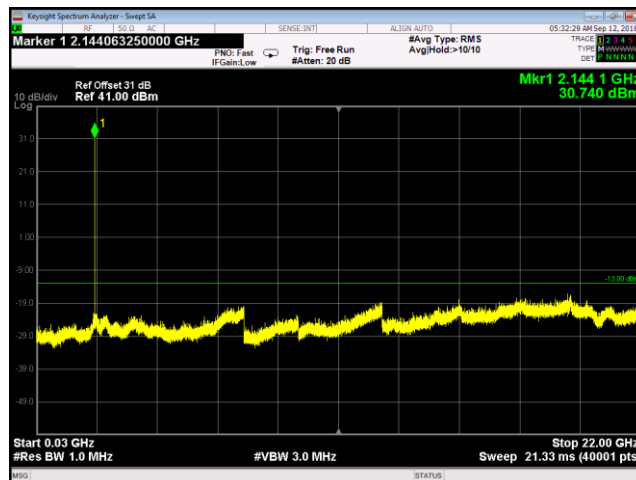
Conducted Spurious Emissions, WCDMA Band 66, Test Results



Plot 150. Spurious Emissions at Antenna Terminals, WCDMA2100, 2110 - 2180 MHz, High

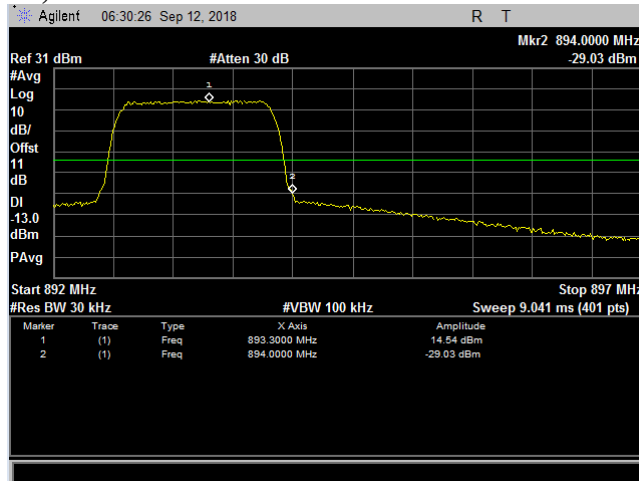


Plot 151. Spurious Emissions at Antenna Terminals, WCDMA2100, 2110 - 2180 MHz, Low

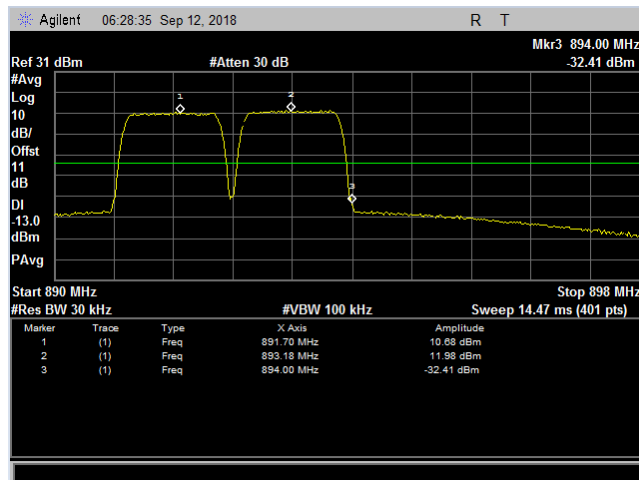


Plot 152. Spurious Emissions at Antenna Terminals, WCDMA2100, 2110 - 2180 MHz, Mid

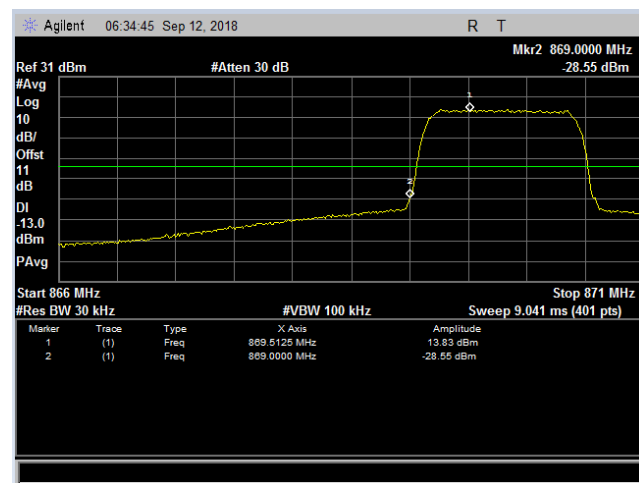
Band-Edge Channel Power, Test Results



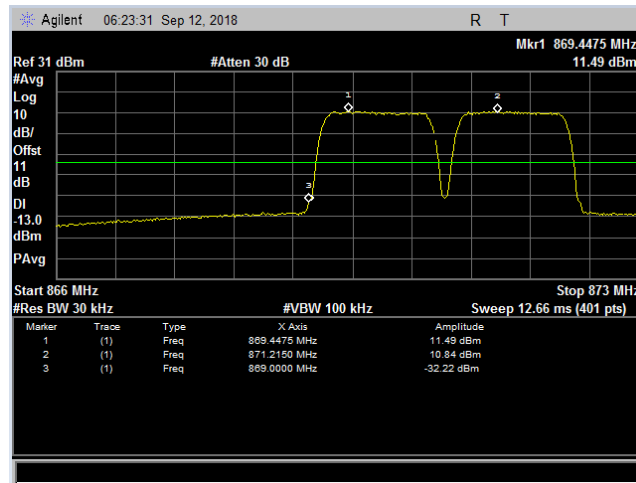
Plot 153. Band-Edge Channel Power, CDMA Cell 850, High Channel, One Signal Band Edge



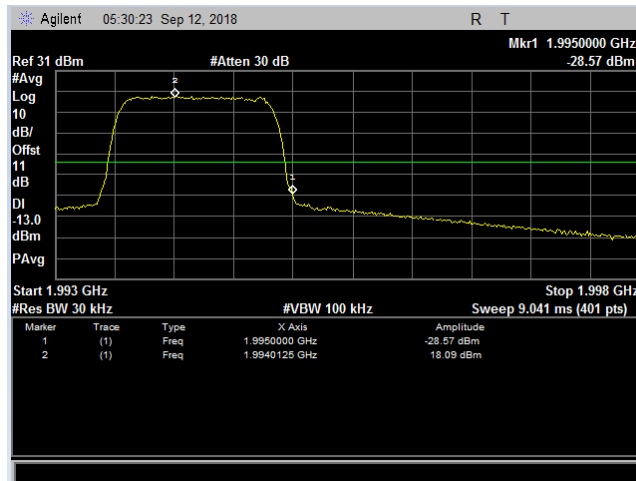
Plot 154. Band-Edge Channel Power, CDMA Cell 850, High Channel, Two Signal Band Edge



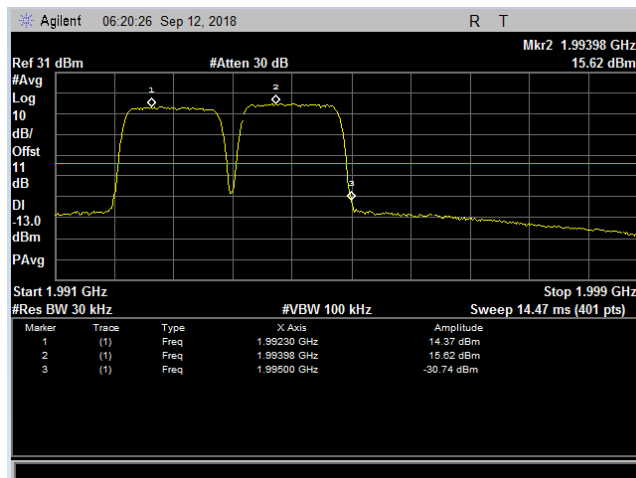
Plot 155. Band-Edge Channel Power, CDMA Cell 850, Low Channel, One Signal Band Edge



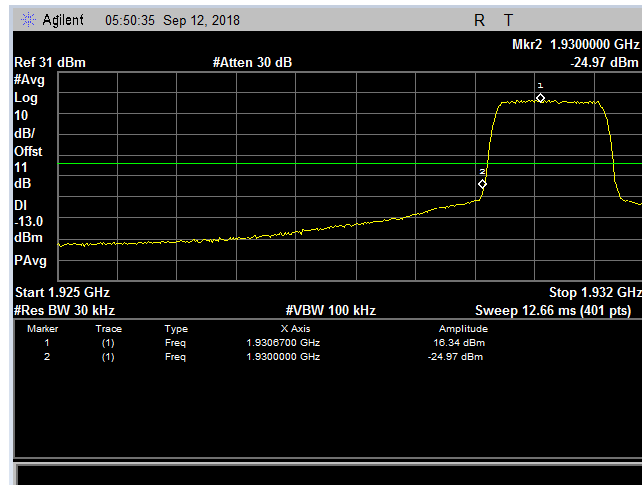
Plot 156. Band-Edge Channel Power, CDMA Cell 850, Low Channel, Two Signal Band Edge



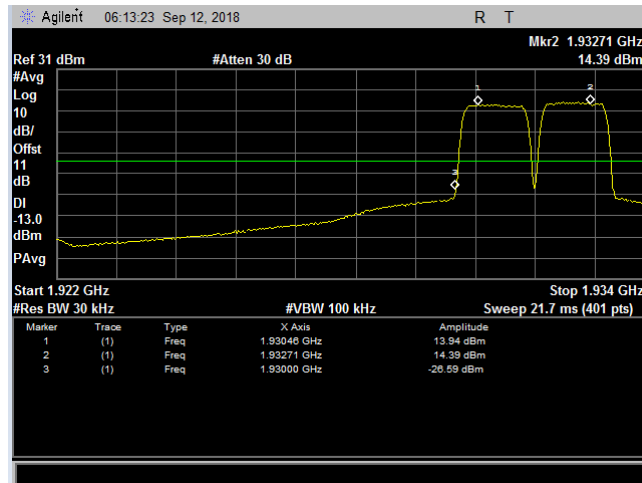
Plot 157. Band-Edge Channel Power, CDMA PCS 1900, High Channel, One Signal Band Edge



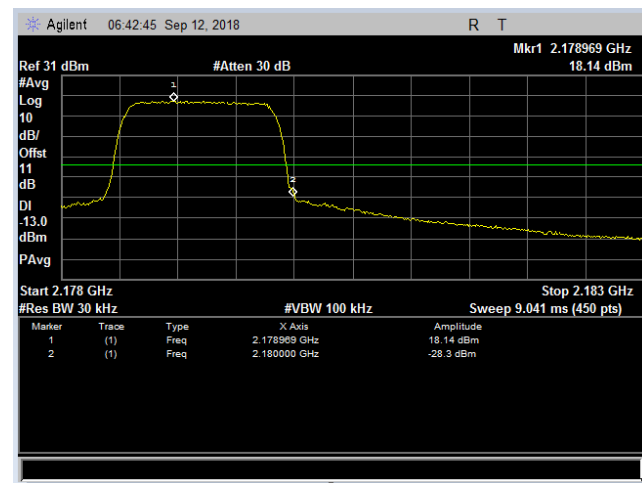
Plot 158. Band-Edge Channel Power, CDMA PCS 1900, High Channel, Two Signal Band Edge



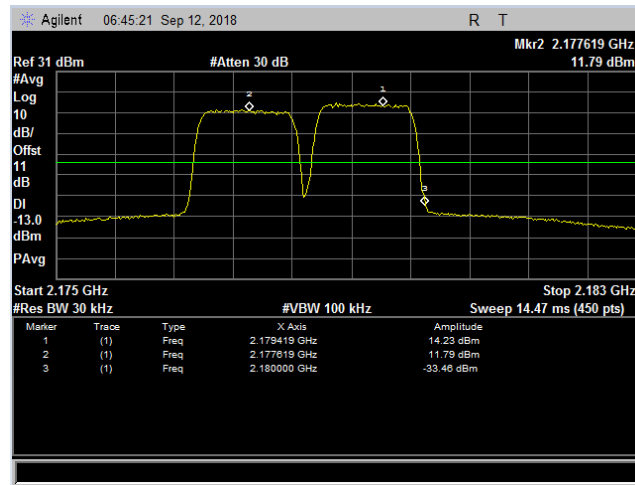
Plot 159. Band-Edge Channel Power, CDMA PCS 1900, Low Channel, One Signal Band Edge



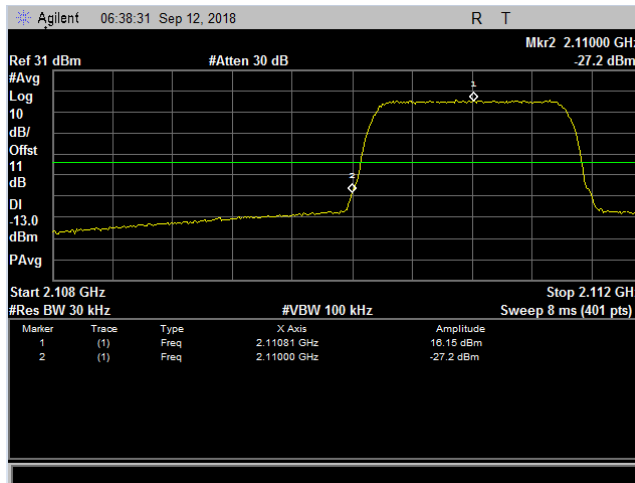
Plot 160. Band-Edge Channel Power, CDMA PCS 1900, Low Channel, Two Signal Band Edge



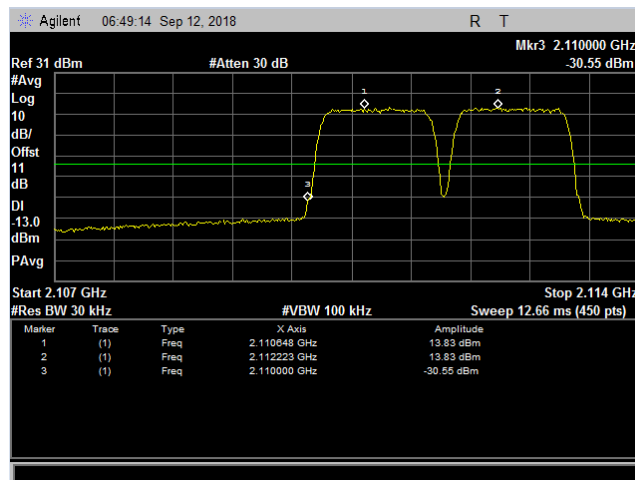
Plot 161. Band-Edge Channel Power, CDMA AWS2100, High Channel, One Signal Band Edge



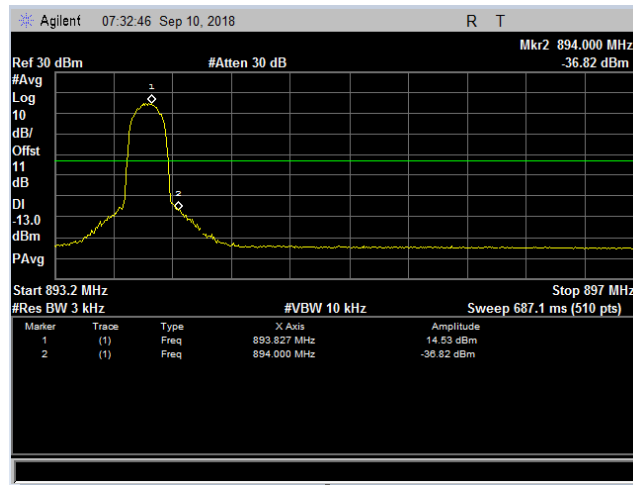
Plot 162. Band-Edge Channel Power, CDMA AWS2100, High Channel, Two Signal Band Edge



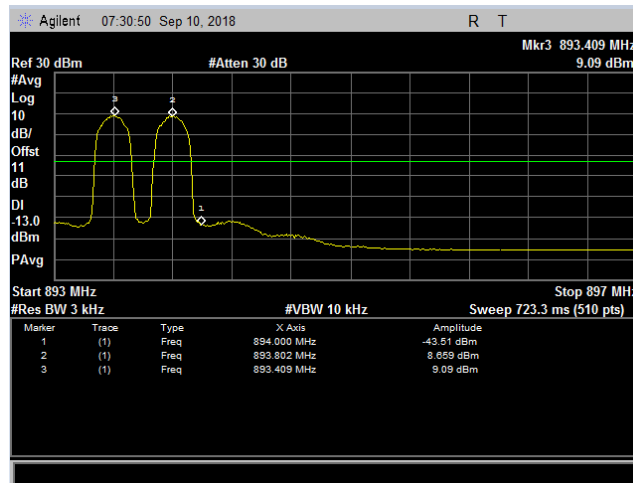
Plot 163. Band-Edge Channel Power, CDMA AWS2100, Low Channel, One Signal Band Edge



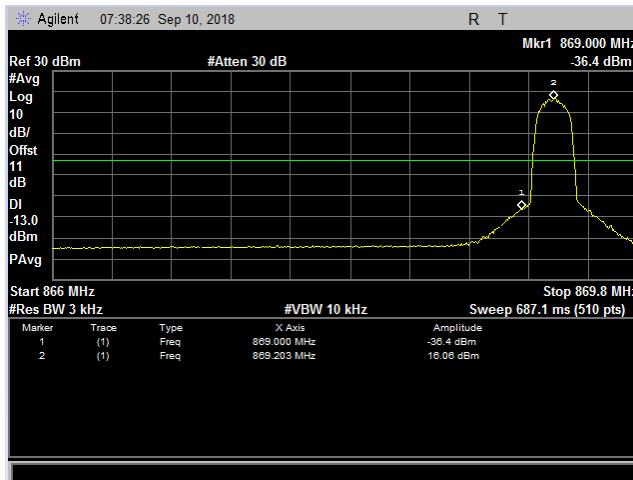
Plot 164. Band-Edge Channel Power, CDMA AWS2100, Low Channel, Two Signal Edge



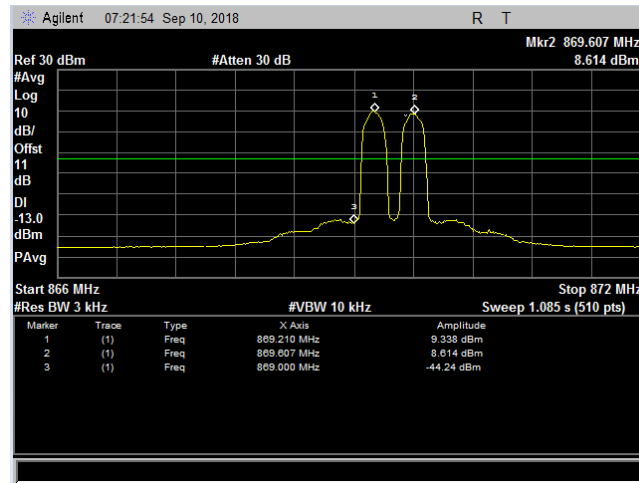
Plot 165. Band-Edge Channel Power, GSM CELL 850, High Channel, One Signal Band Edge



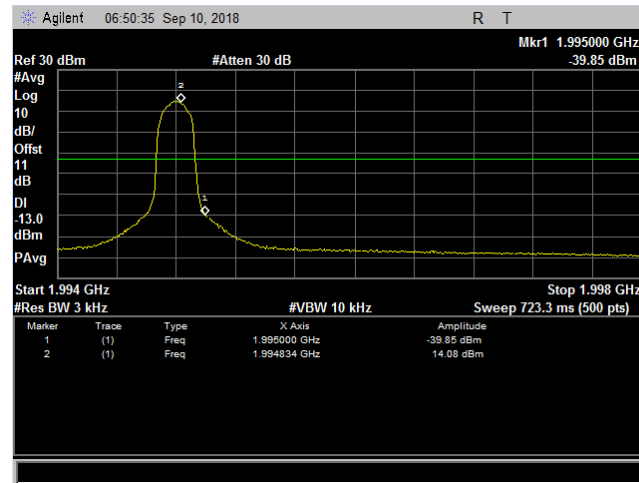
Plot 166. Band-Edge Channel Power, GSM CELL 850, High Channel, Two Signal Band Edge



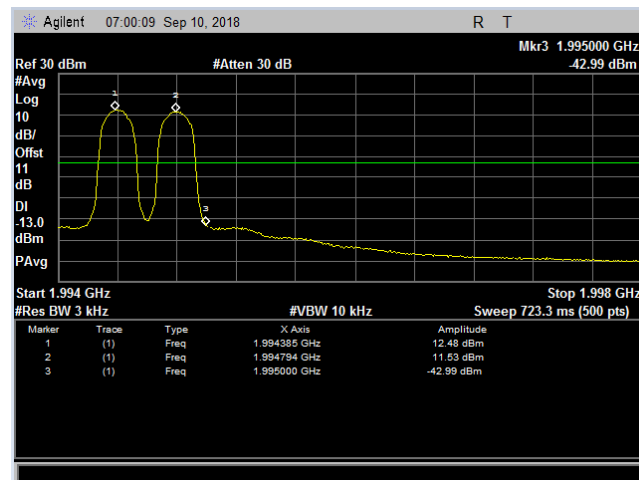
Plot 167. Band-Edge Channel Power, GSM CELL 850, Low Channel, One Signal Band Edge



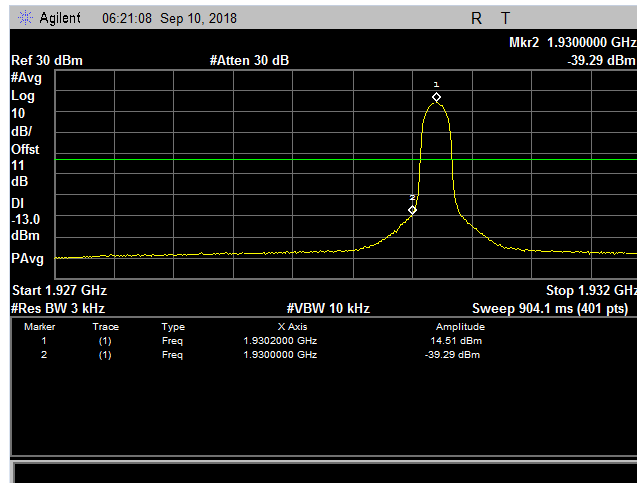
Plot 168. Band-Edge Channel Power, GSM CELL 850, Low Channel, Two Signal Band Edge



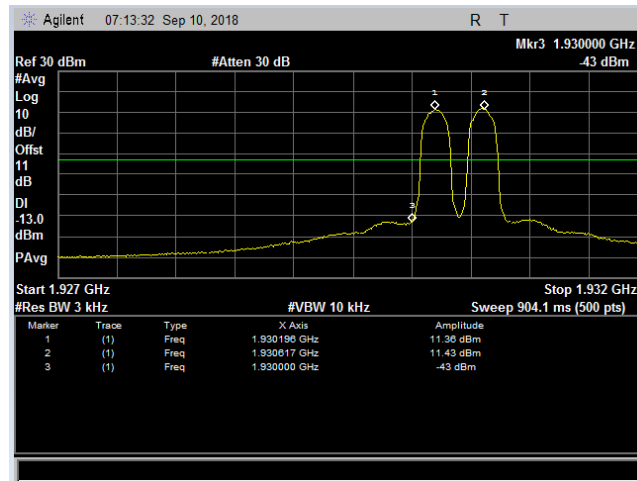
Plot 169. Band-Edge Channel Power, GSM 1900, High Channel, One Signal Band Edge



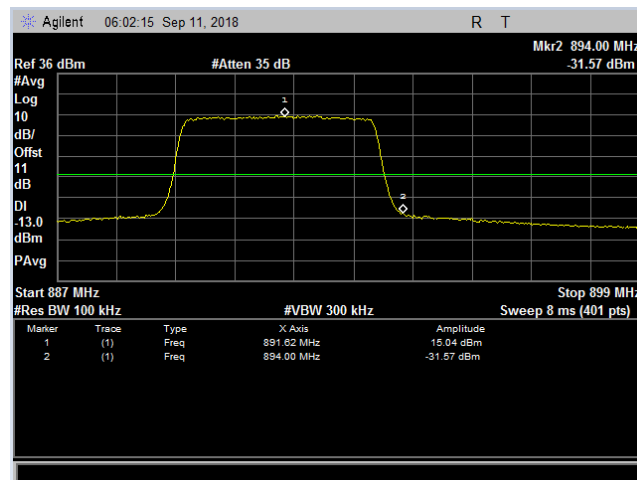
Plot 170. Band-Edge Channel Power, GSM 1900, High Channel, Two Signal Band Edge



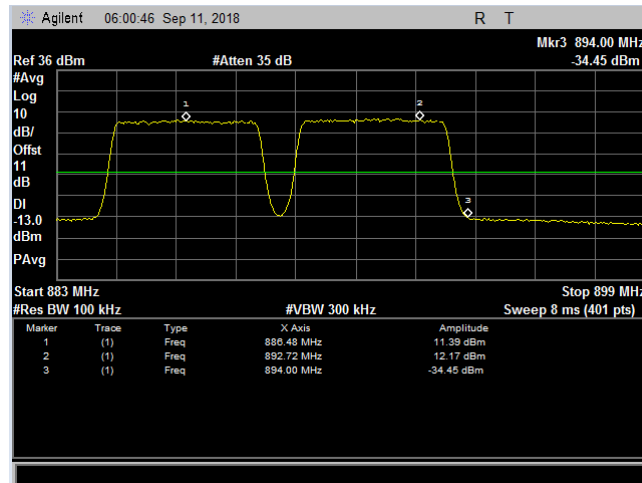
Plot 171. Band-Edge Channel Power, GSM 1900, Low Channel, One Signal Band Edge



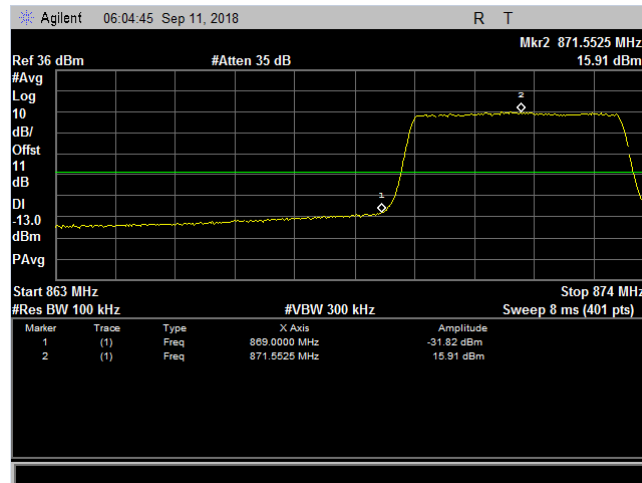
Plot 172. Band-Edge Channel Power, GSM 1900, Low Channel, Two Signal Band Edge



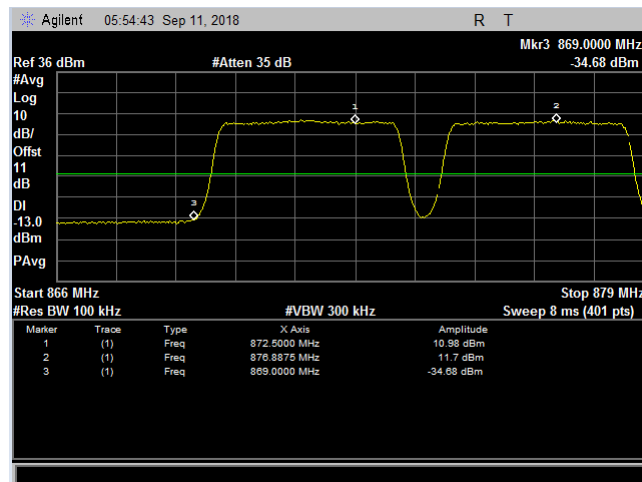
Plot 173. Band-Edge Channel Power, WCDMA 850, High Channel, One Signal Band Edge



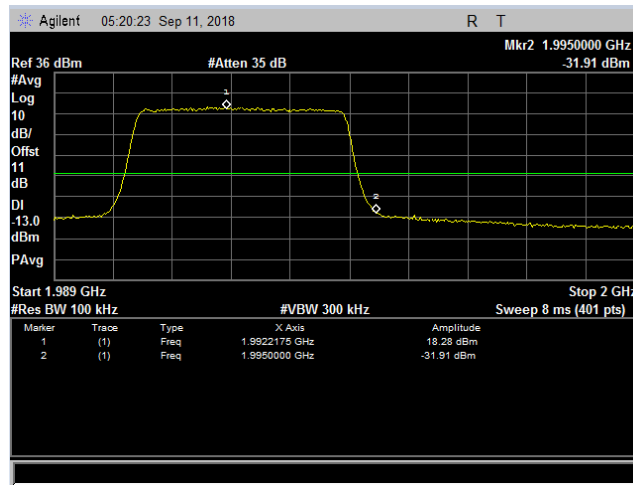
Plot 174. Band-Edge Channel Power, WCDMA 850, High Channel, Two Signal Band Edge



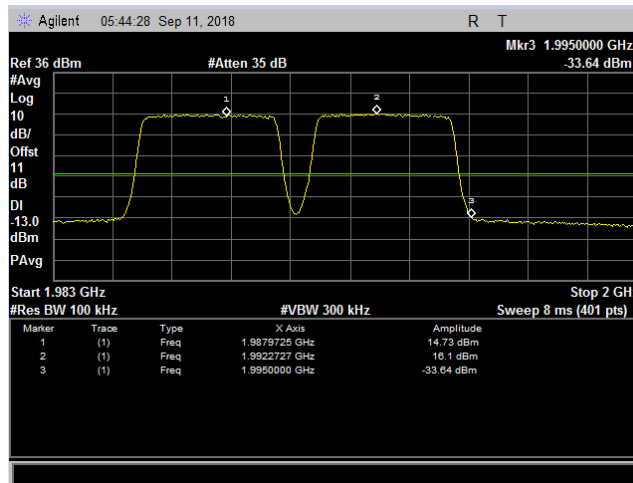
Plot 175. Band-Edge Channel Power, WCDMA 850, Low Channel, One Signal Band Edge



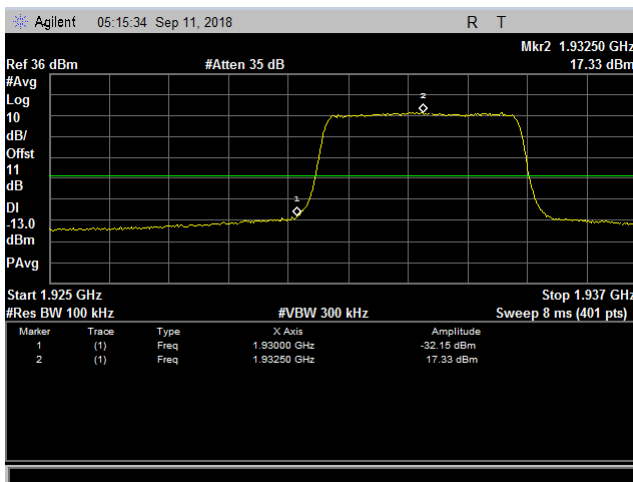
Plot 176. Band-Edge Channel Power, WCDMA 850, Low Channel, Two Signal Band Edge



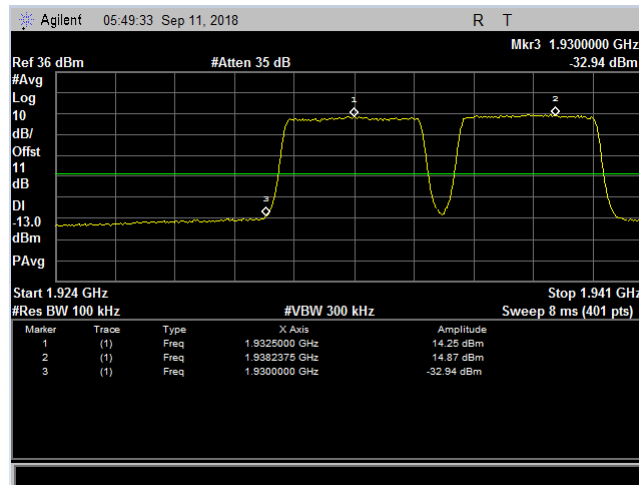
Plot 177. Band-Edge Channel Power, WCDMA 1900, High Channel, One Signal Band Edge



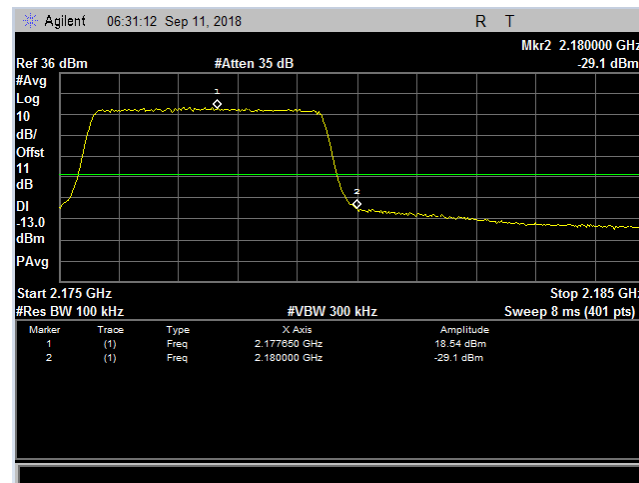
Plot 178. Band-Edge Channel Power, WCDMA 1900, High Channel, Two Signal Band Edge



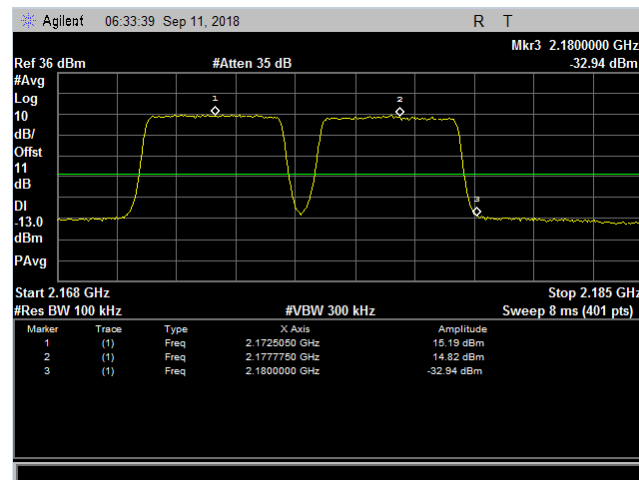
Plot 179. Band-Edge Channel Power, WCDMA 1900, Low Channel, One Signal Band Edge



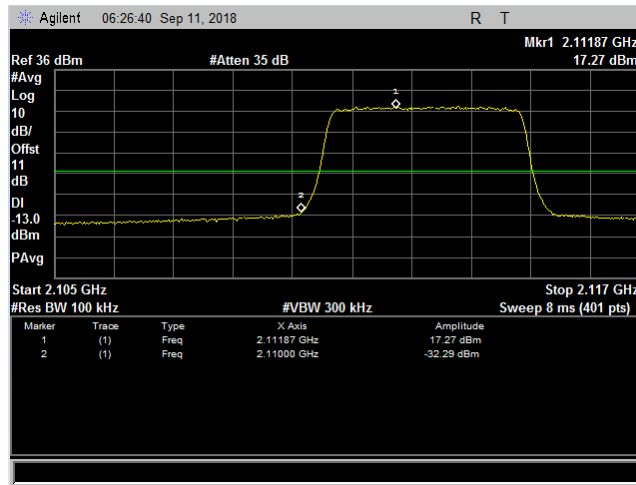
Plot 180. Band-Edge Channel Power, WCDMA 1900, Low Channel, Two Signal Band Edge



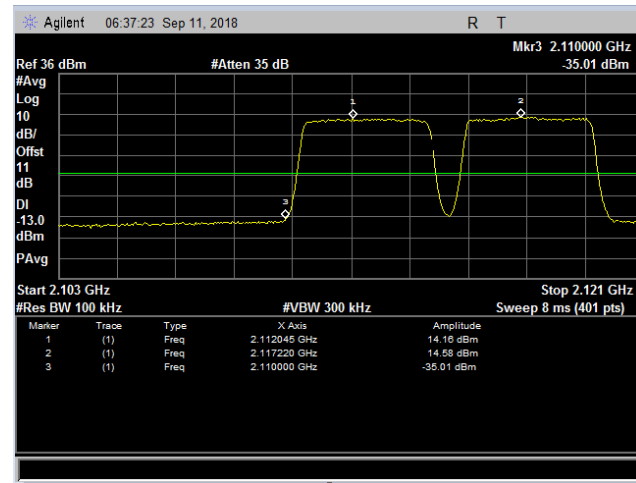
Plot 181. Band-Edge Channel Power, WCDMA AWS 1700, High Channel, One Signal Band Edge



Plot 182. Band-Edge Channel Power, WCDMA AWS 1700, High Channel, Two Signal Band Edge



Plot 183. Band-Edge Channel Power, WCDMA AWS 1700, Low Channel, One Signal Band Edge



Plot 184. Band-Edge Channel Power, WCDMA AWS 1700, Low Channel, Two Signal Band Edge



Electromagnetic Compatibility Criteria for Intentional Radiators

§2.1049 Frequency Stability

Test Requirement(s): §2.1055 (a) The frequency stability shall be measured with variation of ambient temperature.
(d) The frequency stability shall be measured with variation of primary supply voltage.

§24.235 The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Test Procedures: The EUT was placed inside a temperature chamber and Frequency measurements were made at the extremes of the specified temperature range and at intervals of 10° centigrade through the range. The operating voltage is varied to +/- 15 % of the nominal voltage at normal temperature.

Test Results: Equipment was found compliant with the requirements of this section.

Test Engineer(s): Bradley Jones

Test Date(s): November 29, 2018



Temp Degrees C	Voltage (AC)	Assigned Frequency (Hz)	Measured Frequency (Hz)	PPM	PPM Limit
-30	102		881,500,023	1.00	1.50
-30	120	881,500,024	881,500,024	0.00	1.50
-30	138		881,500,024	1.00	1.50
-20	102		881,500,024	1.00	1.50
-20	120	881,500,024	881,500,024	0.00	1.50
-20	138		881,500,024	1.00	1.50
-10	102		881,500,024	1.00	1.50
-10	120	881,500,024	881,500,024	0.00	1.50
-10	138		881,500,024	1.00	1.50
0	102		881,500,025	1.00	1.50
0	120	881,500,025	881,500,025	0.00	1.50
0	138		881,500,025	1.00	1.50
10	102		881,500,025	1.00	1.50
10	120	881,500,026	881,500,026	0.00	1.50
10	138		881,500,025	1.00	1.50
20	102		881,500,025	1.00	1.50
20	120	881,500,025	881,500,025	0.00	1.50
20	138		881,500,025	1.00	1.50
30	102		881,500,025	1.00	1.50
30	120	881,500,025	881,500,025	0.00	1.50
30	138		881,500,025	1.00	1.50
40	102		881,500,024	1.00	1.50
40	120	881,500,025	881,500,025	0.00	1.50
40	138		881,500,025	1.00	1.50
50	102		881,500,024	1.00	1.50
50	120	881,500,024	881,500,024	0.00	1.50
50	138		881,500,024	1.00	1.50

Table 9. Frequency Stability, 869 - 894 MHz, Test Results



Temp Degrees C	Voltage (AC)	Assigned Frequency (Hz)	Measured Frequency (Hz)	PPM	PPM Limit
-30	102		737,500,020	1.00	1.50
-30	120	737,500,020	737,500,020	0.00	1.50
-30	138		737,500,019	1.00	1.50
-20	102		737,500,019	1.00	1.50
-20	120	737,500,019	737,500,019	0.00	1.50
-20	138		737,500,020	1.00	1.50
-10	102		737,500,019	1.00	1.50
-10	120	737,500,019	737,500,019	0.00	1.50
-10	138		737,500,019	1.00	1.50
0	102		737,500,018	1.00	1.50
0	120	737,500,019	737,500,019	0.00	1.50
0	138		737,500,019	1.00	1.50
10	102		737,500,019	1.00	1.50
10	120	737,500,019	737,500,019	0.00	1.50
10	138		737,500,019	1.00	1.50
20	102		737,500,020	1.00	1.50
20	120	737,500,020	737,500,020	0.00	1.50
20	138		737,500,019	1.00	1.50
30	102		737,500,021	1.00	1.50
30	120	737,500,020	737,500,020	0.00	1.50
30	138		737,500,020	1.00	1.50
40	102		737,500,021	1.00	1.50
40	120	737,500,022	737,500,022	0.00	1.50
40	138		737,500,021	1.00	1.50
50	102		737,500,023	1.00	1.50
50	120	737,500,022	737,500,022	0.00	1.50
50	138		737,500,023	1.00	1.50

Table 10. Frequency Stability, 729 - 746 MHz, Test Results



Temp Degrees C	Voltage (AC)	Assigned Frequency (Hz)	Measured Frequency (Hz)	PPM	PPM Limit
-30	102		751,000,020	1.00	1.50
-30	120	751,000,020	751,000,020	0.00	1.50
-30	138		751,000,020	1.00	1.50
-20	102		751,000,021	1.00	1.50
-20	120	751,000,021	751,000,021	0.00	1.50
-20	138		751,000,021	1.00	1.50
-10	102		751,000,021	1.00	1.50
-10	120	751,000,022	751,000,022	0.00	1.50
-10	138		751,000,022	1.00	1.50
0	102		751,000,023	1.00	1.50
0	120	751,000,023	751,000,023	0.00	1.50
0	138		751,000,024	1.00	1.50
10	102		751,000,023	1.00	1.50
10	120	751,000,024	751,000,024	0.00	1.50
10	138		751,000,023	1.00	1.50
20	102		751,000,024	1.00	1.50
20	120	751,000,025	751,000,025	0.00	1.50
20	138		751,000,024	1.00	1.50
30	102		751,000,024	1.00	1.50
30	120	751,000,024	751,000,024	0.00	1.50
30	138		751,000,024	1.00	1.50
40	102		751,000,024	1.00	1.50
40	120	751,000,024	751,000,024	0.00	1.50
40	138		751,000,024	1.00	1.50
50	102		751,000,023	1.00	1.50
50	120	751,000,023	751,000,023	0.00	1.50
50	138		751,000,023	1.00	1.50

Table 11. Frequency Stability, 746 - 756 MHz, Test Results



Electromagnetic Compatibility Criteria for Intentional Radiators

Intermodulation

Test Requirement(s): Spurious emissions shall be measured using a single test signal sequentially tuned to the low, middle, and high channels or frequencies within each authorized frequency band of operation. Out-of-band/out-of-block emissions (including intermodulation products) shall be measured under each of the following two stimulus conditions: a) two adjacent test signals sequentially tuned to the lower and upper frequency band/block edges; b) a single test signal, sequentially tuned to the lowest and highest frequencies or channels within the frequency band/block under examination.

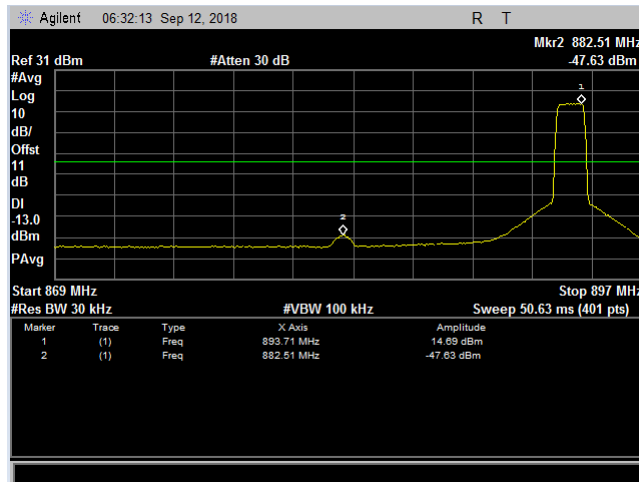
Test Procedures: Test was performed using the procedure specified in Section 3.6.2 of the KDB 935210 D05 v01r02.

Test Results: Equipment was found compliant with the requirements of this section.

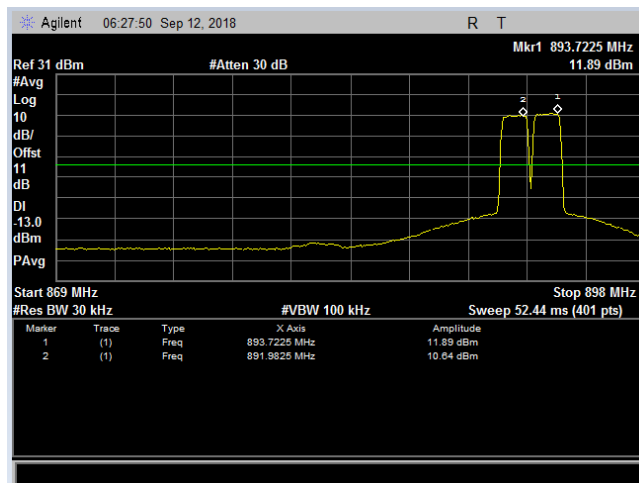
Test Engineer(s): Deepak Giri

Test Date(s): September 19, 2018

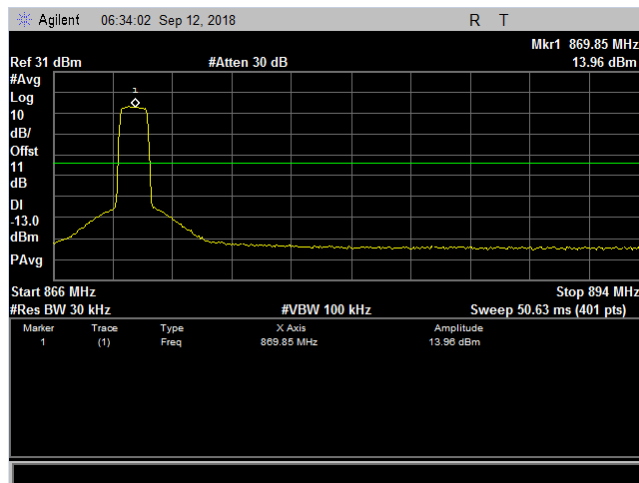
Intermodulation, Test Results



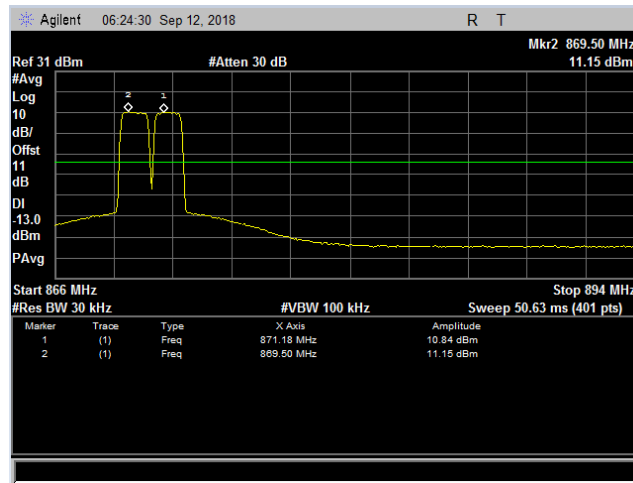
Plot 185. Intermodulation, CDMA Cell 850, High Channel, One Signal Intermodulation



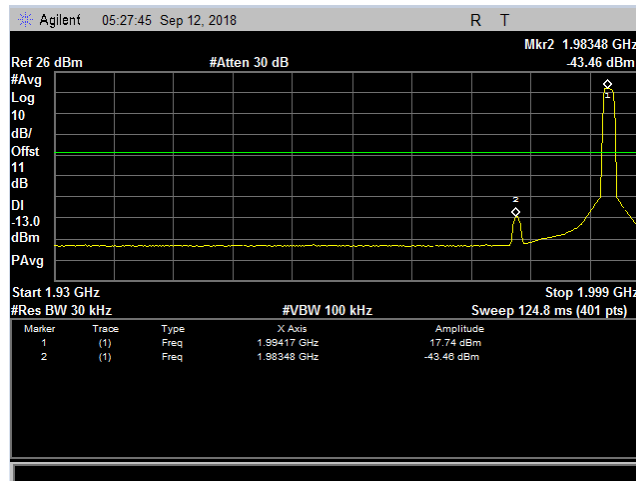
Plot 186. Intermodulation, CDMA Cell 850, High Channel, Two Signal Intermodulation



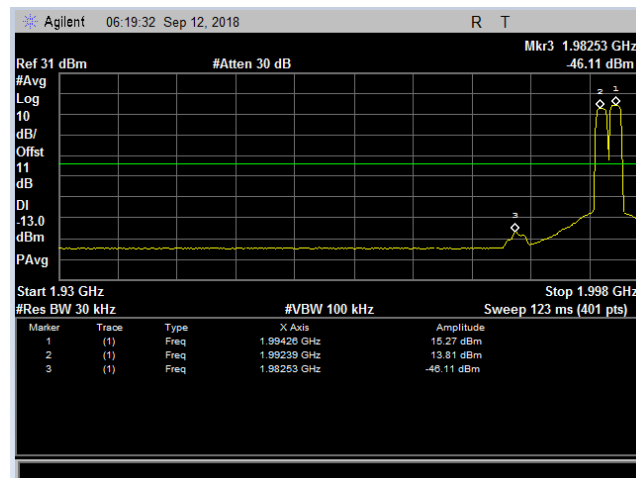
Plot 187. Intermodulation, CDMA Cell 850, Low Channel, One Signal Intermodulation



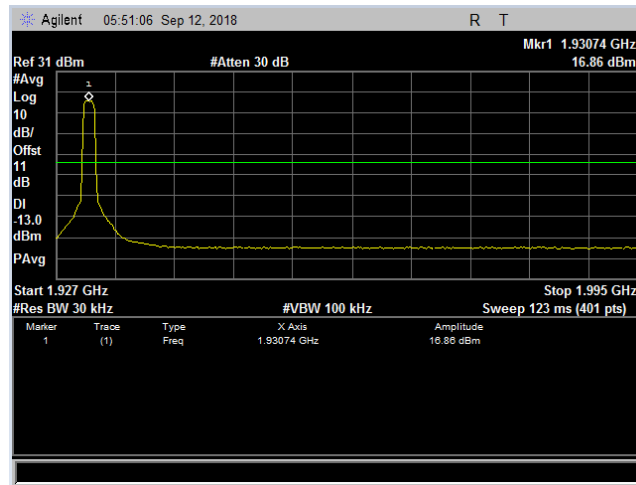
Plot 188. Intermodulation, CDMA Cell 850, Low Channel, Two Signal Intermodulation



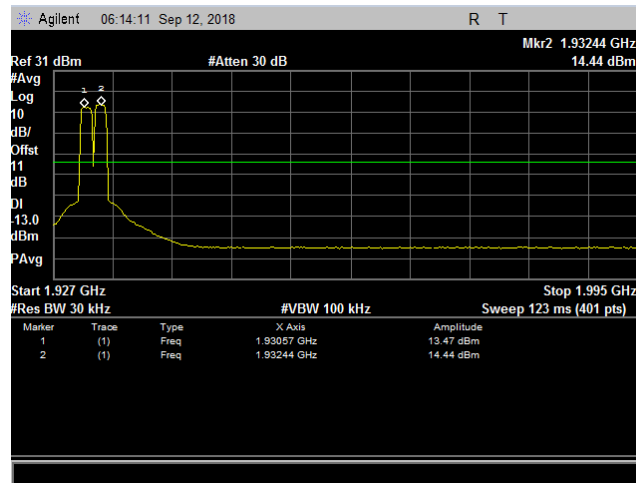
Plot 189. Intermodulation, CDMA PCS 1900, High Channel, One Signal Intermodulation



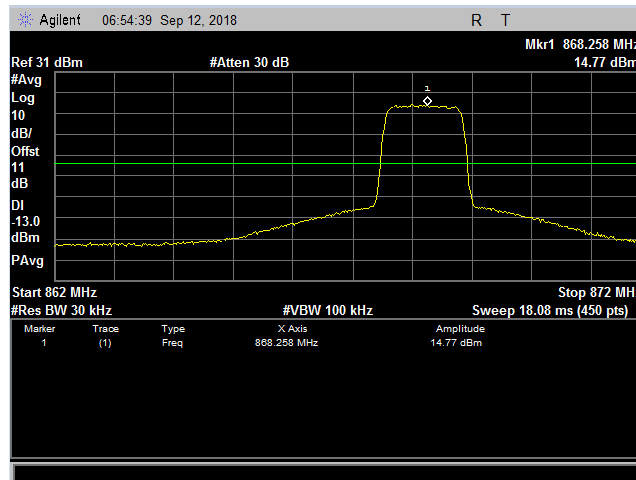
Plot 190. Intermodulation, CDMA PCS 1900, High Channel, Two Signal Intermodulation



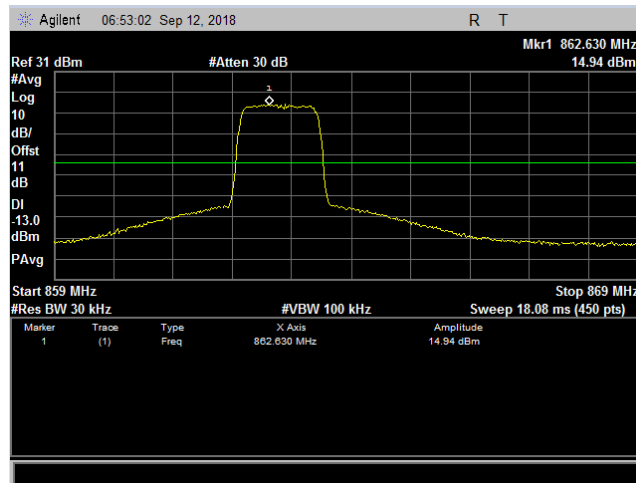
Plot 191. Intermodulation, CDMA PCS 1900, Low Channel, One Signal Intermodulation



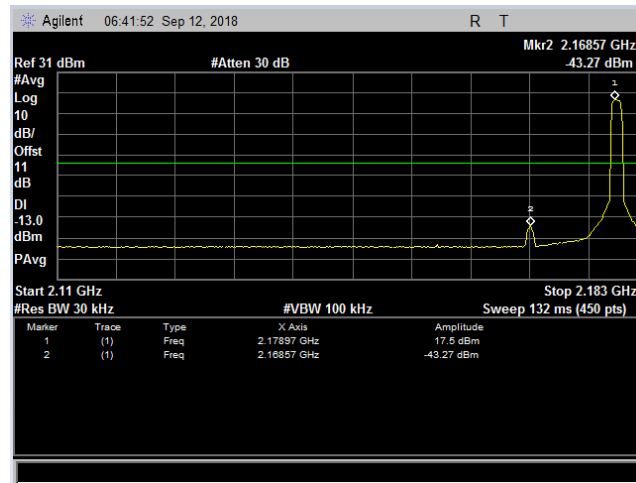
Plot 192. Intermodulation, CDMA PCS 1900, Low Channel, Two Signal Intermodulation



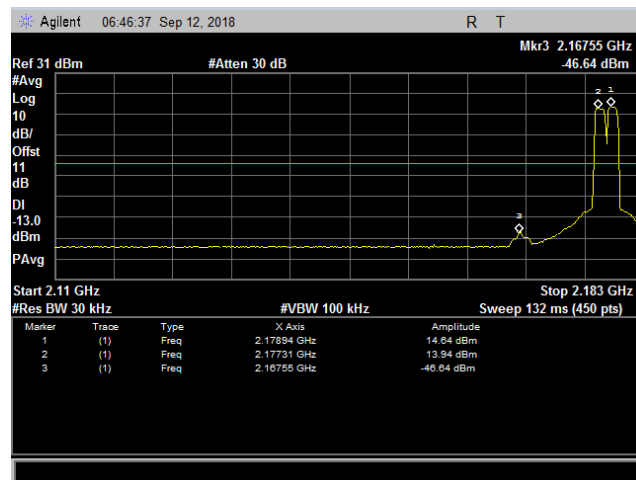
Plot 193. Intermodulation, CDMA SMR800, High Channel, One Signal Intermodulation



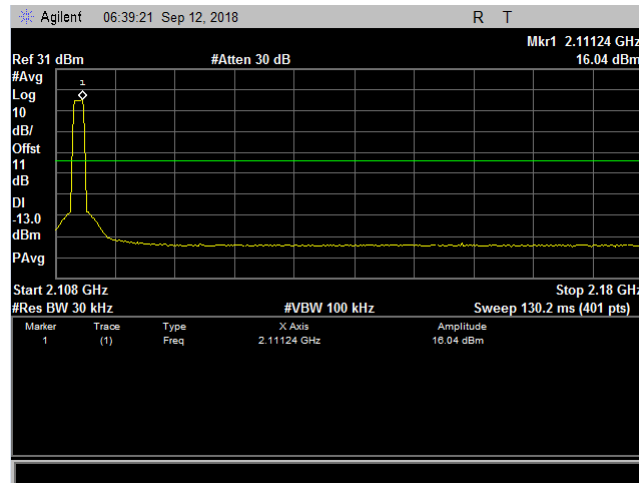
Plot 194. Intermodulation, CDMA SMR800, Low Channel, One Signal Intermodulation



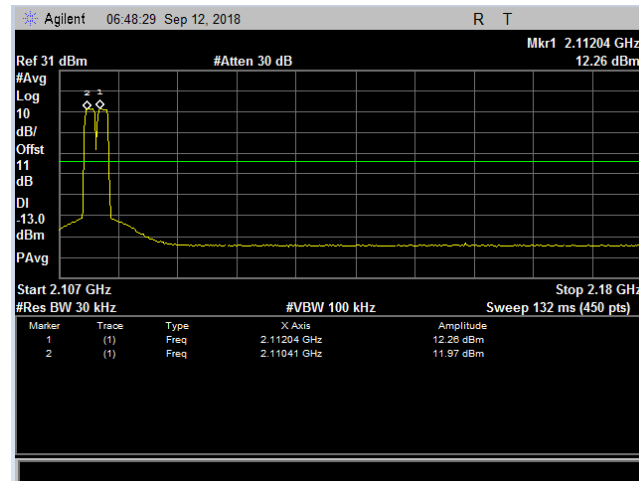
Plot 195. Intermodulation, CDMA AWS2100, High Channel, One Signal Intermodulation



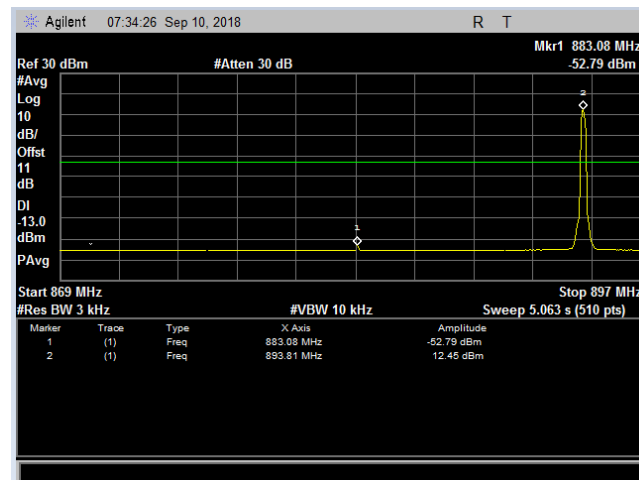
Plot 196. Intermodulation, CDMA AWS2100, High Channel, Two Signal Intermodulation



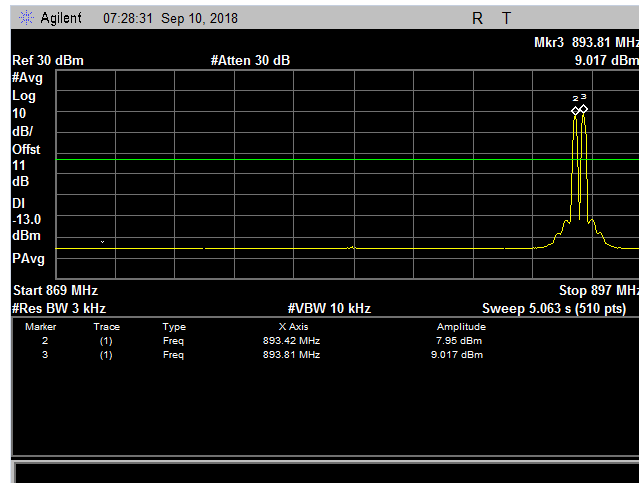
Plot 197. Intermodulation, CDMA AWS2100, Low Channel, One Signal Intermodulation



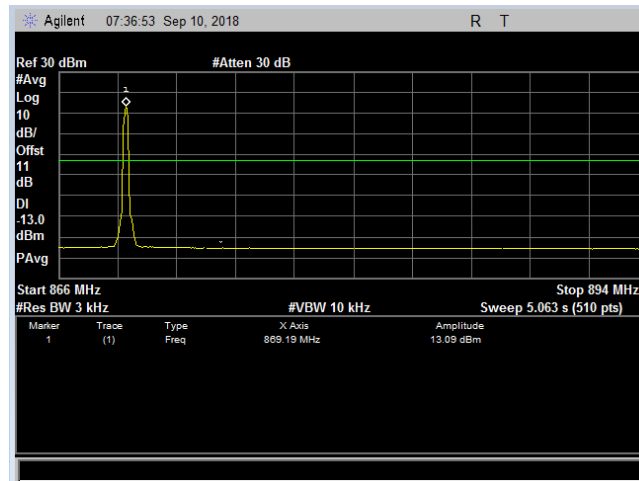
Plot 198. Intermodulation, CDMA AWS2100, Low Channel, Two Signal Intermodulation



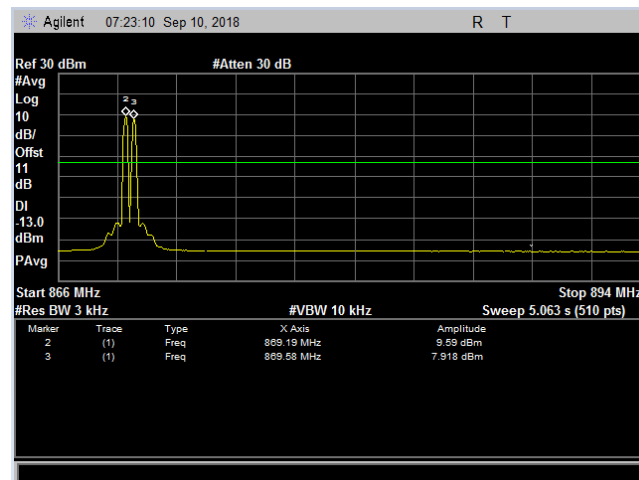
Plot 199. Intermodulation, GSM Cell 850, High Channel, One Signal Intermodulation



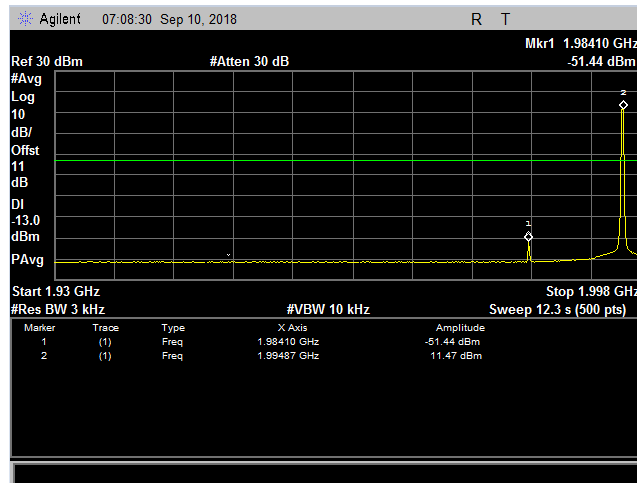
Plot 200. Intermodulation, GSM Cell 850, High Channel, Two Signal Intermodulation



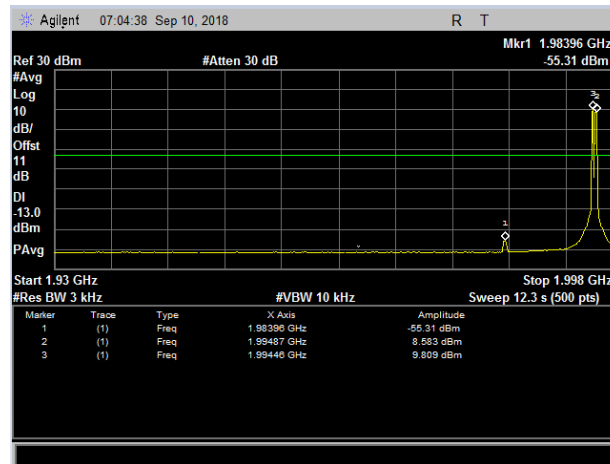
Plot 201. Intermodulation, GSM Cell 850, Low Channel, One Signal Intermodulation



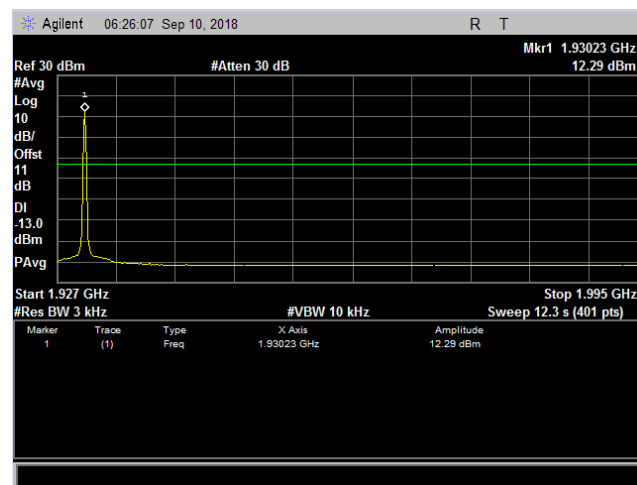
Plot 202. Intermodulation, GSM Cell 850, Low Channel, Two Signal Intermodulation



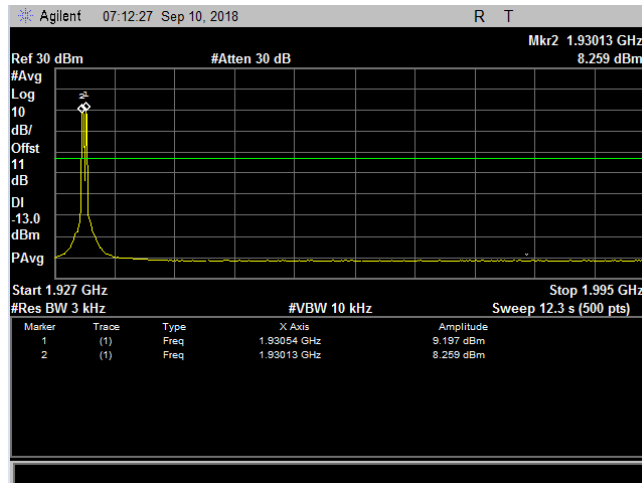
Plot 203. Intermodulation, GSM 1900, High Channel, One Signal Intermodulation



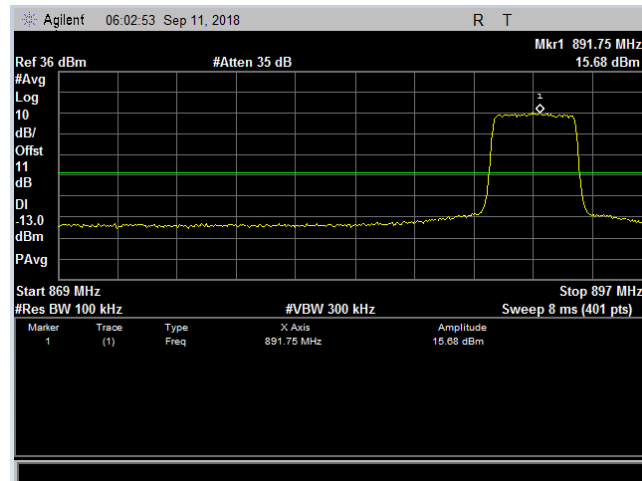
Plot 204. Intermodulation, GSM 1900, High Channel, Two Signal Intermodulation



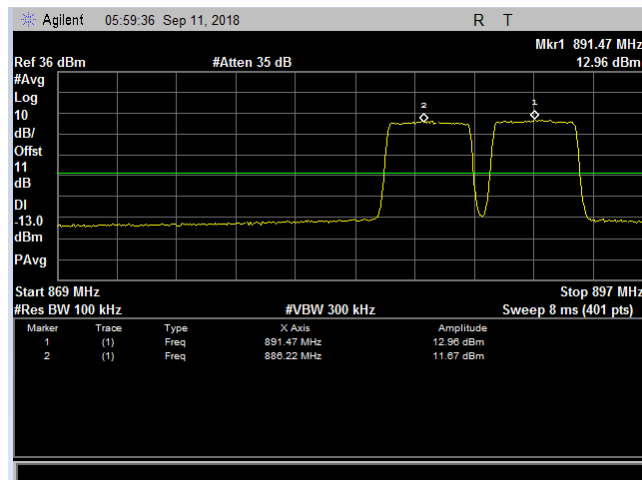
Plot 205. Intermodulation, GSM 1900, Low Channel, One Signal Intermodulation



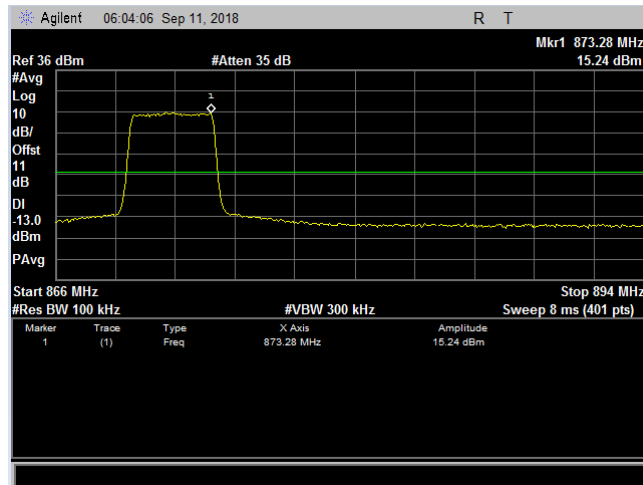
Plot 206. Intermodulation, GSM 1900, Low Channel, Two Signal Intermodulation



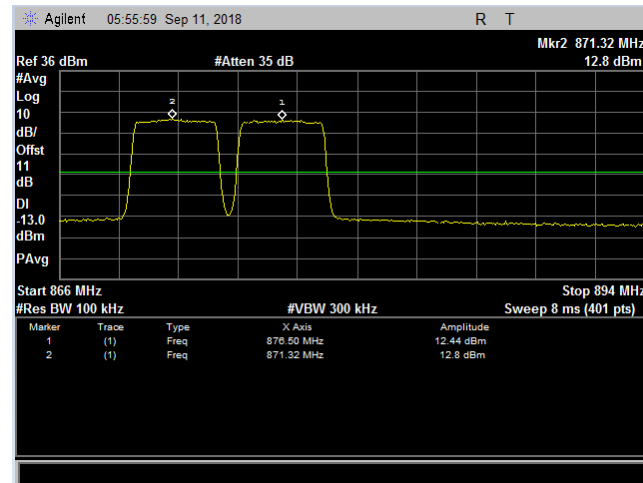
Plot 207. Intermodulation, WCDMA 850, High Channel, One Signal Intermodulation



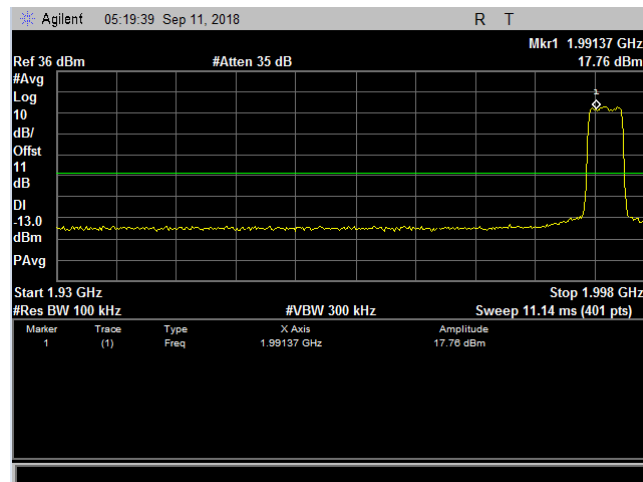
Plot 208. Intermodulation, WCDMA 850, High Channel, Two Signal Intermodulation



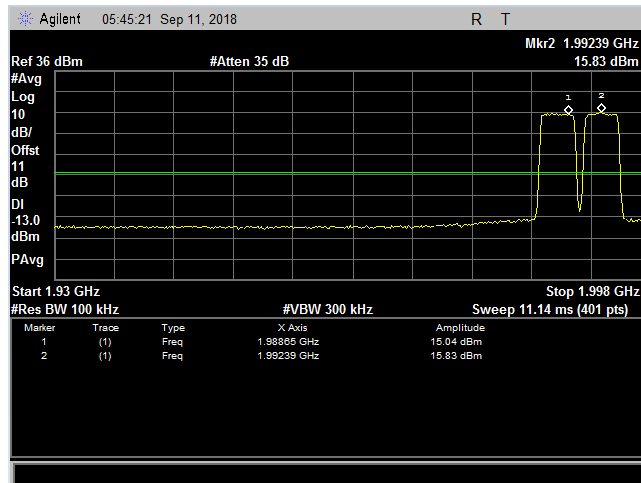
Plot 209. Intermodulation, WCDMA 850, Low Channel, One Signal Intermodulation



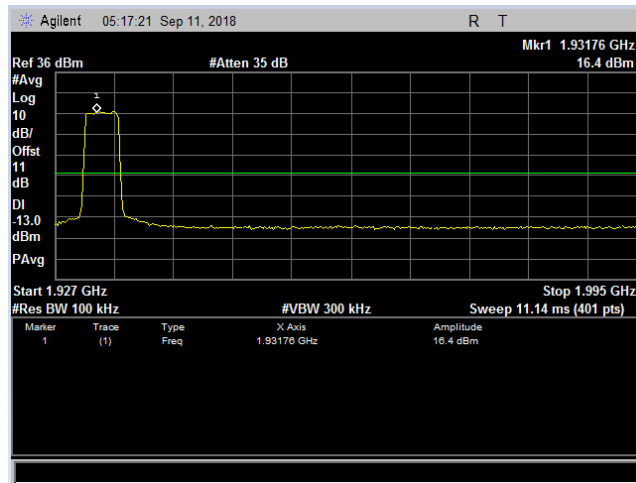
Plot 210. Intermodulation, WCDMA 850, Low Channel, Two Signal Intermodulation



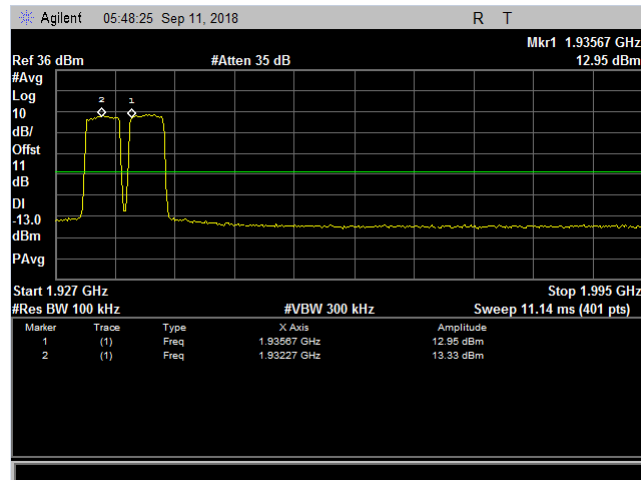
Plot 211. Intermodulation, WCDMA 1900, High Channel, One Signal Intermodulation



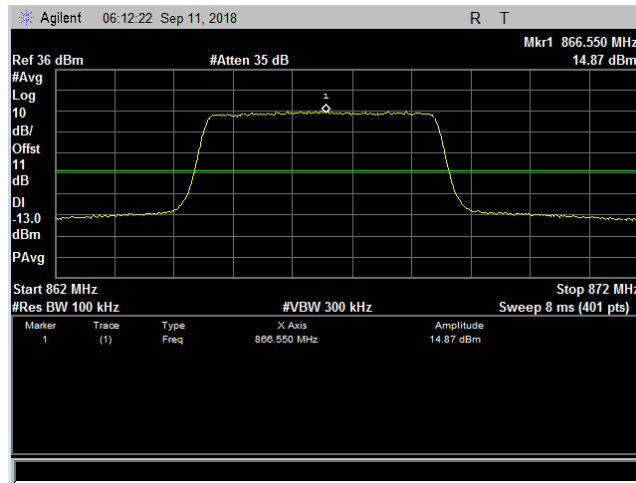
Plot 212. Intermodulation, WCDMA 1900, High Channel, Two Signal Intermodulation



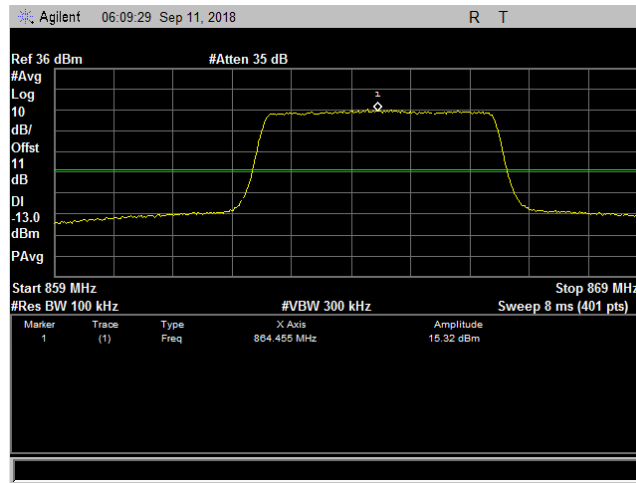
Plot 213. Intermodulation, WCDMA 1900, Low Channel, One Signal Intermodulation



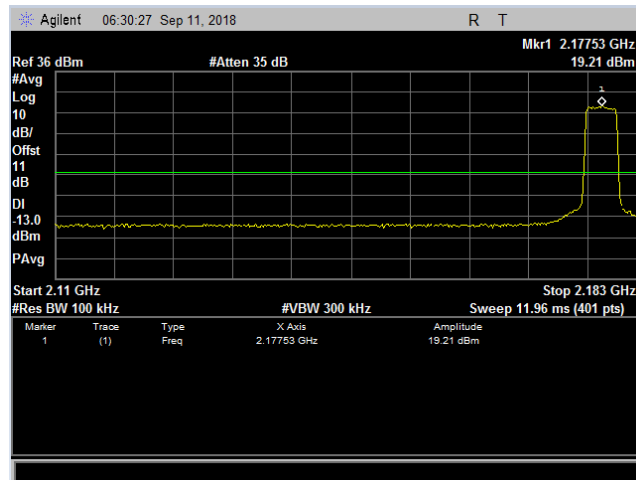
Plot 214. Intermodulation, WCDMA 1900, Low Channel, Two Signal Intermodulation



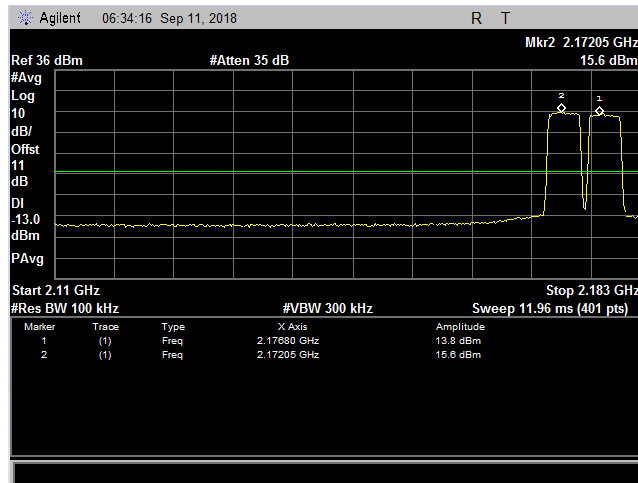
Plot 215. Intermodulation, SMR 800, High Channel, One Signal Intermodulation



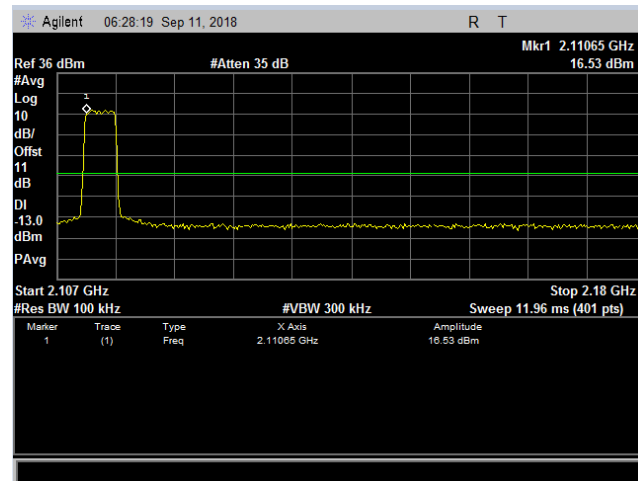
Plot 216. Intermodulation, SMR 800, Low Channel, One Signal Intermodulation



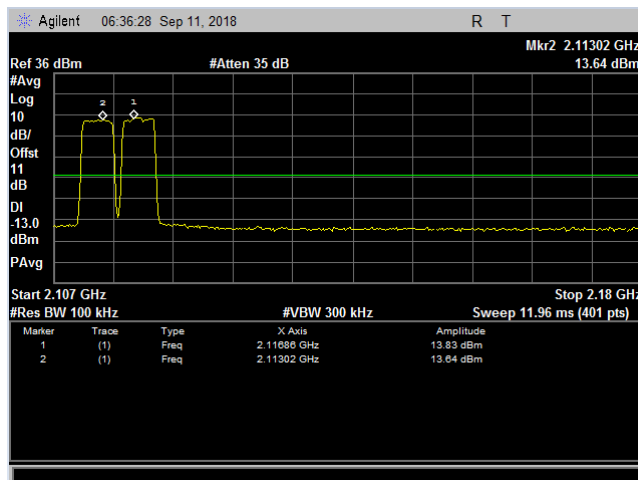
Plot 217. Intermodulation, WCDMA AWS1700, High Channel, One Signal Intermodulation



Plot 218. Intermodulation, WCDMA AWS1700, High Channel, Two Signal Intermodulation



Plot 219. Intermodulation, WCDMA AWS1700, Low Channel, One Signal Intermodulation



Plot 220. Intermodulation, WCDMA AWS1700, Low Channel, Two Signal Intermodulation



Electromagnetic Compatibility Criteria for Intentional Radiators

Filter Response

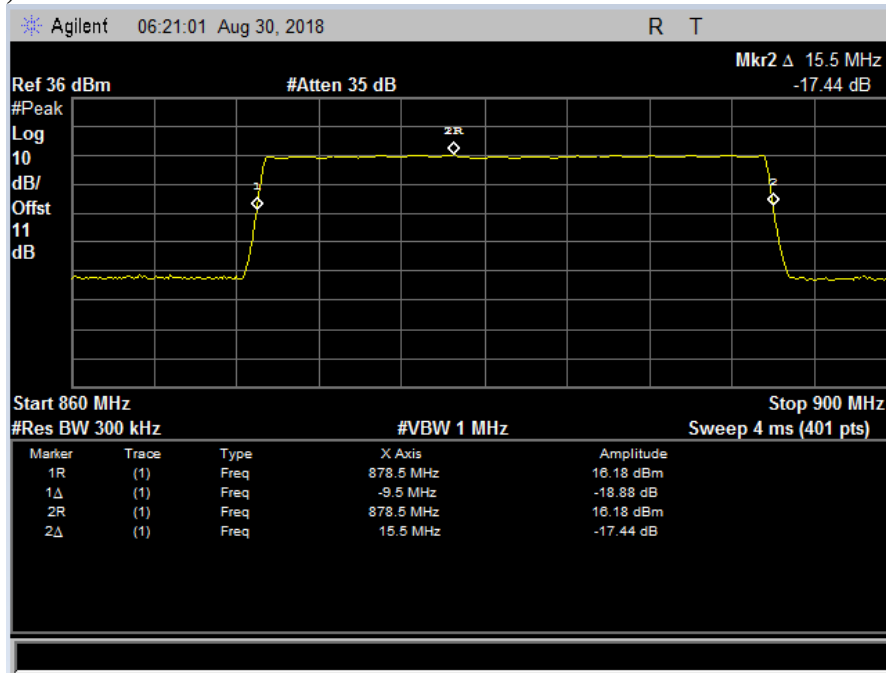
Test Procedures: Test was performed according to section 3.3 of the FCC KDB 935210 D05 v01r02.

Test Results: Equipment was found compliant with the requirements of this section.

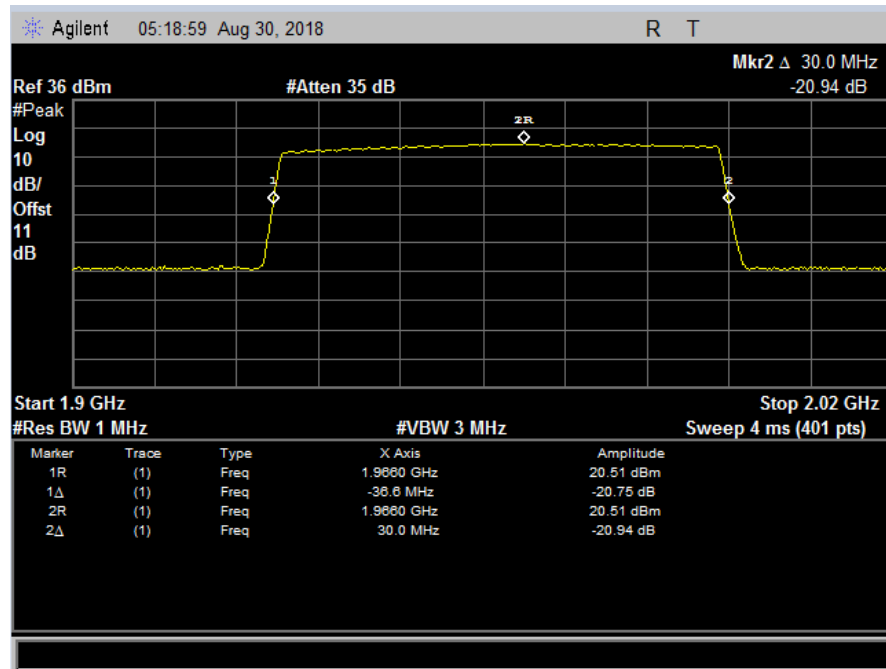
Test Engineer(s): Bradley Jones

Test Date(s): September 19, 2018

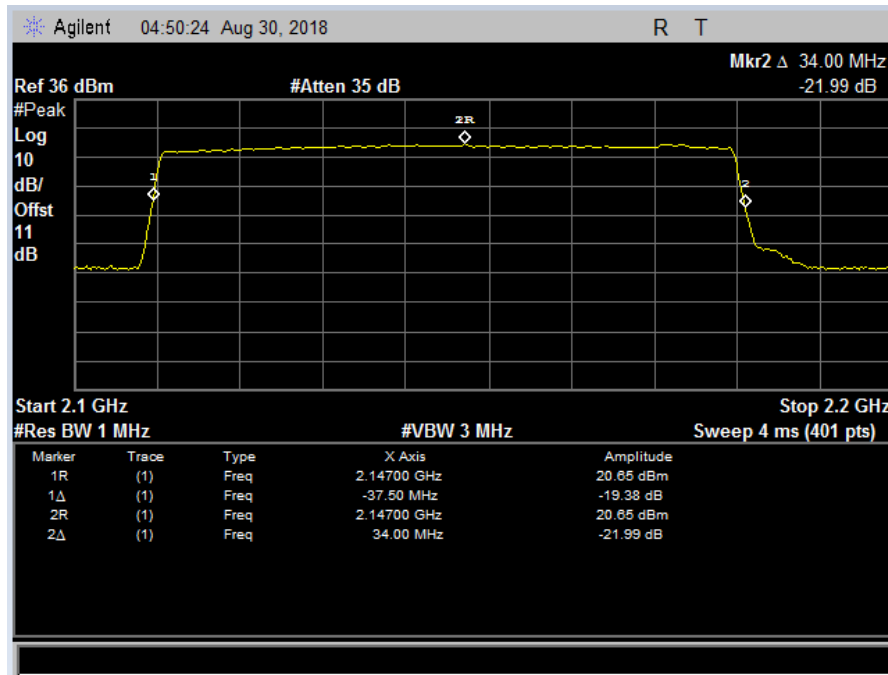
Filter Response, Test Results



Plot 221. Filter Response, 869 – 894 MHz, Band of Rejection Cell 850



Plot 222. Filter Response, 1930 – 1995 MHz, Out of Band Rejection, PCS 1900



Plot 223. Filter Response, 2110 – 2180 MHz, Out of Band Rejection, AWS Band



IV. Test Equipment



Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2005.

MET Asset #	Equipment	Manufacturer	Model	Last Cal Date	Cal Due Date
1T4300A	SEMI-ANECHOIC CHAMBER # 1 (FCC)	EMC TEST SYSTEMS	NONE	01/31/2016	01/31/2019
1T4751	Antenna - Bilog	Sunol Sciences	JB6	07/30/2018	01/30/2020
1T4409	EMI Receiver	Rohde & Schwarz	ESIB7	12/07/2016	12/07/2018
1T4149	High-Frequency Anechoic Chamber	Ray Proof	81	08/23/2001	08/23/2002
1T4483	Antenna; Horn	ETS-Lindgren	3117	04/19/2017	10/19/2018
1T8831	Signal Analyzer (CXA)	Keysight Technologies	N9000A	01/29/2018	01/29/2019
1T4612	Spectrum Analyzer	Agilent Technologies	E4407B	05/15/2018	11/15/2019
1T4497	Signal Generator	Agilent Technologies	E4432B	04/22/2016	10/22/2017
1T4299	Signal Generator	HP	E4432B	12/12/2016	06/12/2018
1T8743	Preamplifier	A.H. Systems, Inc.	PAM-0118P	03/11/2015	03/11/2016
1T4483	Antenna; Horn	ETS-Lindgren	3117	04/19/2017	10/19/2018
1T8831	Signal Analyzer (CXA)	Keysight Technologies	N9000A	01/29/2018	01/29/2019

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



End of Report