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

914 WEST PATAPSCO AVENUE • BALTIMORE, MARYLAND 21230-3432 • PHONE (410) 354-3300 • FAX (410) 354-3313
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13501 MCCALLEN PASS • AUSTIN, TEXAS 78753 • PHONE (512) 287-2500 • FAX (512) 287-2513

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 90 Subparts R and S.

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-FCC90RS)

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Electromagnetic Compatibility Criteria
Test Report

for the

Commscope
Model 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 90 Subparts R and S

MET Report: EMC100116-FCC90RS

December 5, 2018

Prepared For:

Commscope
Via Mengolina, 20
Faenza –RA-, ITALY

Prepared By:
MET Laboratories, Inc.
914 West Patapsco Avenue,
Baltimore, MD 21230

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Deepak Giri, 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 90 RS of the FCC Rules under normal use and maintenance.

John Mason,
Director, Electromagnetic Compatibility Lab

Report Status Sheet

Revision	Report Date	Reason for Revision
∅	December 5, 2018	Initial Issue.

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List of Terms and Abbreviations

AC	**A**lternating **C**urrent
ACF	**A**ntenna **C**orrection **F**actor
Cal	**Cal**ibration
d	**M**easurement **D**istance
dB	**D**eci**b**els
dBµA	**D**eci**b**els above one **micro**amp
dBµV	**D**eci**b**els above one **micro**volt
dBµA/m	**D**eci**b**els above one **micro**amp **per m**eter
dBµV/m	**D**eci**b**els above one **micro**volt **per m**eter
DC	**D**irect **C**urrent
E	**E**lectric Field
DSL	**D**igital **S**ubscriber **L**ine
ESD	**E**lectro**s**tatic **D**ischarge
EUT	**E**quipment **U**nder **T**est
f	**F**requency
FCC	**F**ederal **C**ommunications **C**ommission
GRP	**G**round **R**eference **P**lane
H	Magnetic Field
HCP	**H**orizontal **C**oupling **P**lane
Hz	**H**er**z**
IEC	**I**nternational **E**lectrotechnical **C**ommission
kHz	**k**ilo**h**er**z**
kPa	**k**ilo**pa**scal
kV	**k**ilo**v**olt
LISN	**L**ine **I**mpedance **S**tabilization **N**etwork
MHz	**M**ega**h**ertz
µH	**microh**enry
µ	**microf**arad
µs	**micros**econds
NEBS	**N**etwork **E**quipment-**B**uilding **S**ystem
PRF	**P**ulse **R**epetition **F**requency
RF	**R**adio **F**requency
RMS	**R**oot-**M**ean-**S**quare
TWT	**T**raveling **W**ave **T**ube
V/m	**V**olts **per m**eter
VCP	**V**ertical **C**oupling **P**lane

I. Executive Summary

A. Purpose of Test

An EMC evaluation was performed to determine compliance of the Commscope CAP M 7E/80-85/17E/19-F-DC 7820478-0001 and 7820478-0002, with the requirements of Part 90 Subparts R and S. 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 90, in accordance with Commscope, purchase order number 8002554399.

Reference	Description	Compliance
§2.1046; §90.541 90.542, 90.635 and Section 4.5.2 KDB 935210	RF Power Output	Compliant
§2.1047	Modulation Characteristics	Not Applicable
§2.1049	Occupied Bandwidth	Compliant
§2.1051; §90.543	Spurious Emissions at Antenna Terminals	Compliant
§90.543	Radiated Spurious Emissions	Compliant
§2.1055	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
90.210 and Section 4.4 KDB 935210	Emissions Mask	Compliant
Section 4.6 KDB 935210	Noise Figure	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	
EUT Specifications:	Primary Power: 110VAC for EUT1 and 48VDC for EUT2	
	FCC ID: XS5-CAPM7E817E19	
	Equipment Code:	B9B
	RF Output Power: Watts	Band 14 – 29.9 dBm Conducted Band 26 – 29.9 dBm Conducted
	EUT Frequency Range:	758 – 768 MHz and 862-869 MHz
Analysis:	The results obtained relate only to the item(s) tested.	
Environmental Test Conditions:	Temperature: 15-35º C	
	Relative Humidity: 30-60%	
	Barometric Pressure: 860-1060 mbar	
Evaluated by:	Deepak Giri	
Date(s):	December 5, 2018	

Table 2. EUT Summary Table

B. References

CFR 47, Part 90	Federal Communication Commission, Code of Federal Regulations, Title 47, Part 90: Rules and Regulations for Private Land Mobile Radio Services.
ANSI C63.4:2014	Methods and Measurements of Radio-Noise Emissions from Low-Voltage Electrical And Electronic Equipment in the Range of 9 kHz to 40 GHz
ISO/IEC 17025:2005	General Requirements for the Competence of Testing and Calibration Laboratories
EIA/TIA-603-A-2001	Land Mobile FM or PM Communication Equipment Measurement and Performance Standards
FCC KDB 935210 D02 v04 r01	Signal Boosters Basic Certification Requirements
FCC KDB 935210 D05 v01 r02	Measurements Guidance For Industrial And Non-Consumer Signal Booster, Repeater, And Amplifier Devices
ANSI C63.26 2015	American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services

Table 3. Standard References

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).

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 4. Uncertainty Calculations Summary

E. Description of Test Sample

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

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 5. 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	FEXLCLC42-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 6. 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 7. 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 addressing FCC Part 27 & RSS-131, RSS-139 Intentional Radiator mode for Frequency:
LTE Band 14UL (788-798 MHz) / DL (758 – 768 MHz) (Bandwidths 5, 10 MHz)
LTE Band 26 UL(817-824 MHz) / DL (862 – 869 MHz) (Bandwidths 5MHz)
CDMA Band 26 UL(817-824 MHz) / DL (862 – 869 MHz) (Bandwidths 1.25MHz)
WCDMA Band 26 UL(817-824 MHz) / DL (862 – 869 MHz) (Bandwidths 3.84MHz)

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, 90.219, 90.541, 90.542 and 90.635 Input Vs Output Power and Booster Gain

Test Requirement(s): **§90.219, 90.541, 90.542 and 90.635**

The power limitation and the antenna height requirements listed on the 90.219, **90.541, 90.542, and 90.635** applies to part 90R and part 90S frequency bands. The output power capability of a signal booster must be designed for deployments providing a radiated power not exceeding 5 Watts ERP for each retransmitted channel.

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): September 18, 2018

Band 14 LTE		frequency	Input Power	Output Power	Gain
5 MHz	Low	760.5	-5.17	29.9	35.07
	Middle	763	-5.26	29.79	35.05
	High	765.5	-5.16	29.54	34.7
10 MHz					
	Middle	763	-5.47	28.93	34.4

Table 8. RF Output Power, Band 14, Test Results

Band 26 LTE		frequency	Input Power	Output Power	Gain
5 MHz	Low	864.5	-5.07	29.9	34.97
	Middle	865.5	-5.01	29.79	34.8
	High	866.5	-5.38	29.83	35.21

Table 9. RF Output Power, Band 26, Test Results

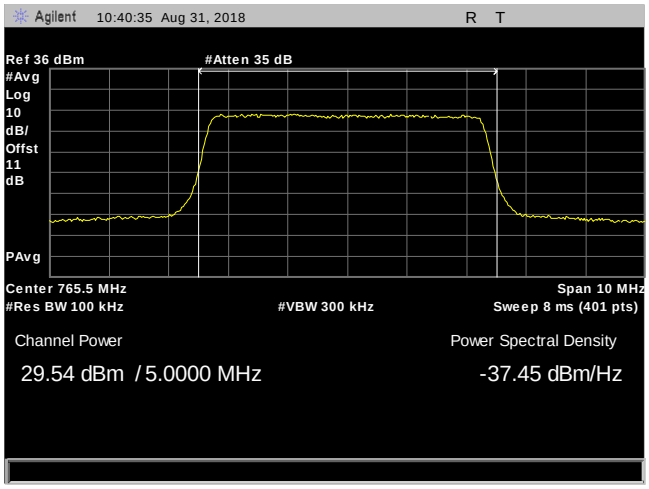
Band 26 CDMA		frequency	Input Power	Output Power	Gain
1.25 MHz	**Low**	**862.8**	**-4.36**	**29.28**	**33.64**
	Middle	**865.5**	**-4.61**	**30.32**	**34.93**
	High	**868.25**	**-4.49**	**29.84**	**34.33**

Table 10. RF Output Power, Band 26, Test Results CDMA

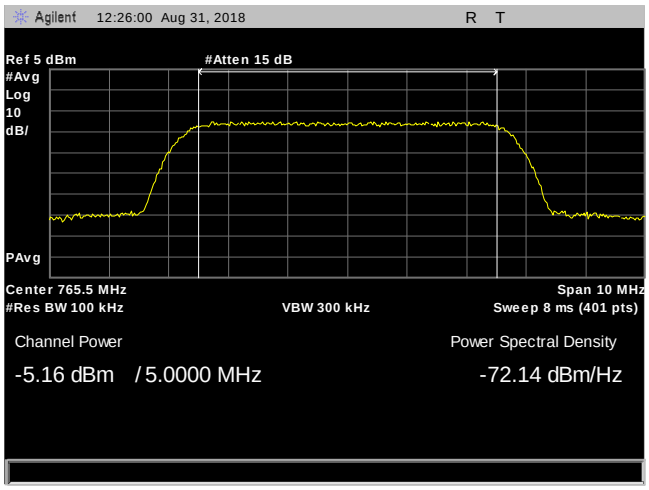
Band 26 WCDMA		frequency	Input Power	Output Power	Gain
3.84 MHz	**Low**	**864.5**	**-4.59**	**30.38**	**34.97**
	Middle	**865.5**	**-4.76**	**30**	**34.76**
	High	**866.5**	**-4.62**	**29.93**	**34.55**

Table 11. RF Output Power, Band 26, Test Results WCDMA

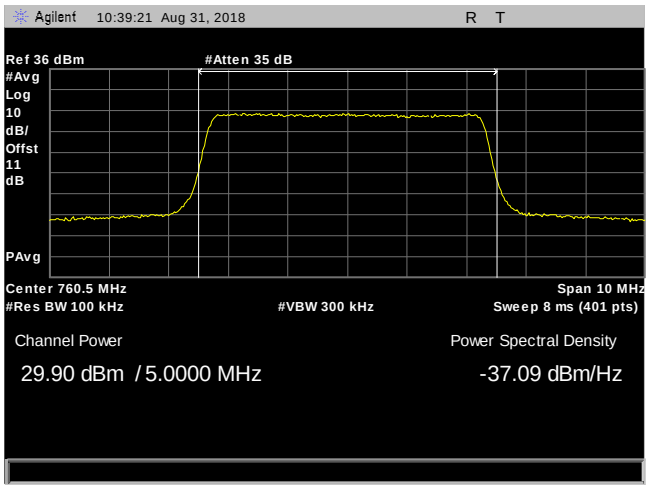
RF Output Power, Band 14, 758 – 768 MHz LTE



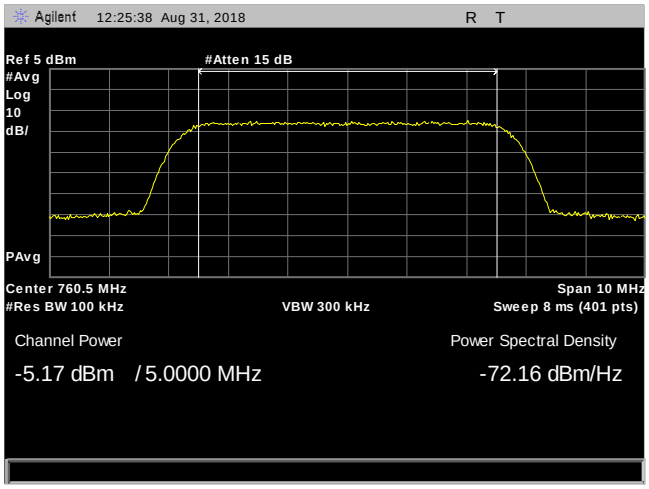
Plot 1. RF Power Output, LMR750, 5 MHz, High, 758 – 768 MHz



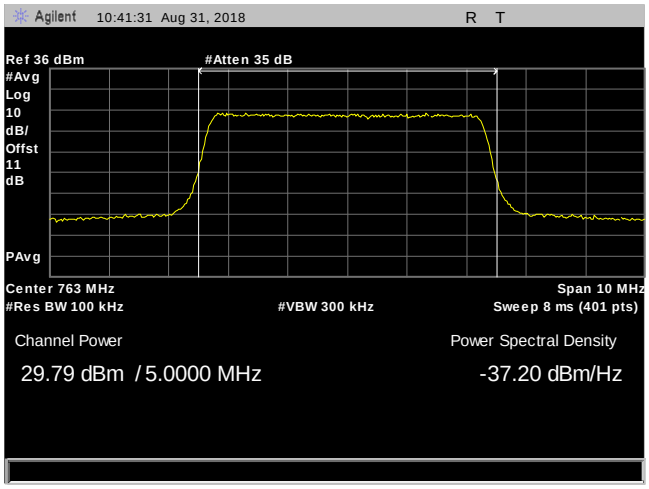
Plot 2. RF Power Output, LMR750, 5 MHz, High, 758 – 768 MHz, AGC



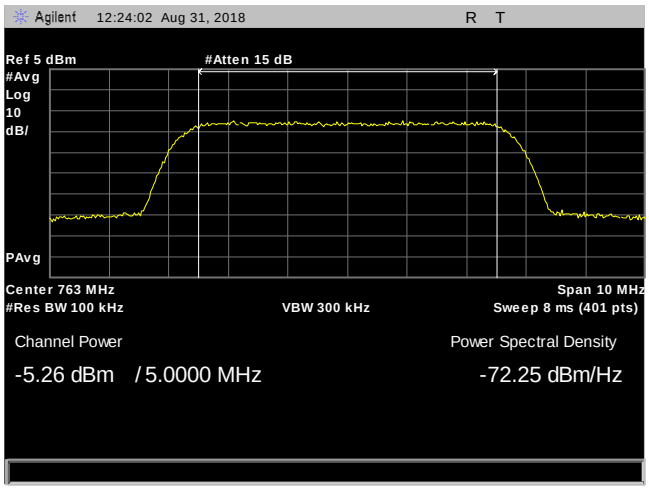
Plot 3. RF Power Output, LMR750, 5 MHz, Low, 758 – 768 MHz



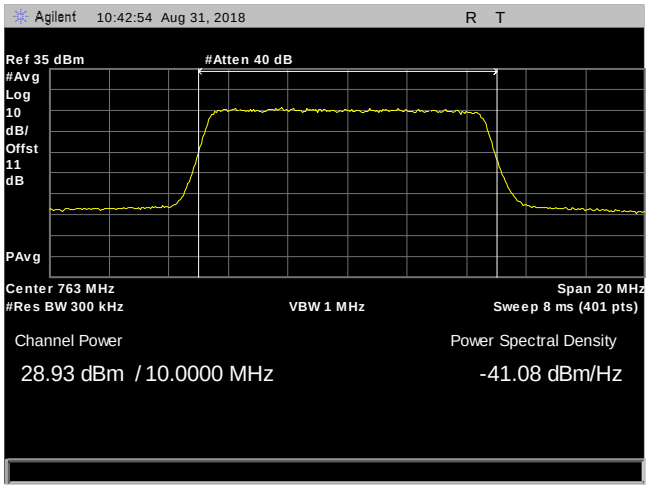
Plot 4. RF Power Output, LMR750, 5 MHz, Low, 758 – 768 MHz, AGC



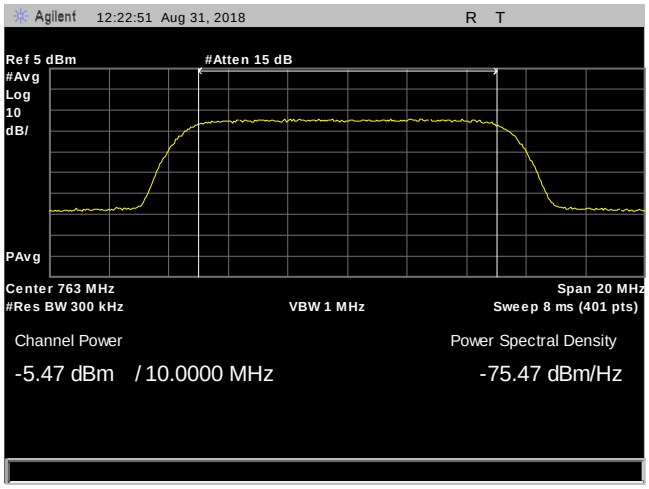
Plot 5. RF Power Output, LMR750, 5 MHz, Mid, 758 – 768 MHz



Plot 6. RF Power Output, LMR750, 5 MHz, Mid, 758 – 768 MHz, AGC

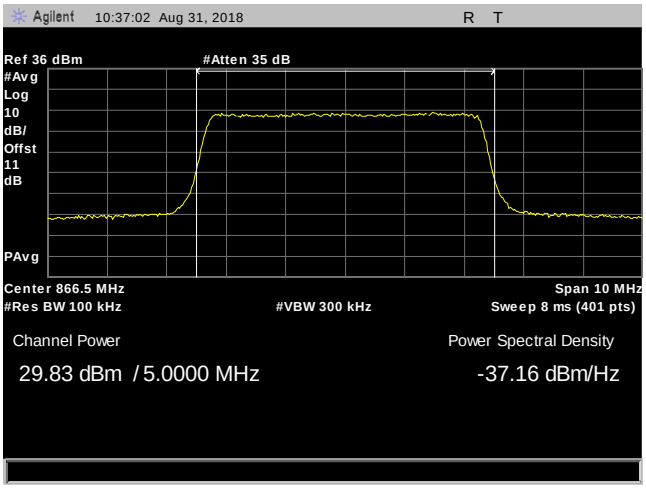


Plot 7. RF Power Output, LMR750, 10 MHz, Mid, 758 – 768 MHz

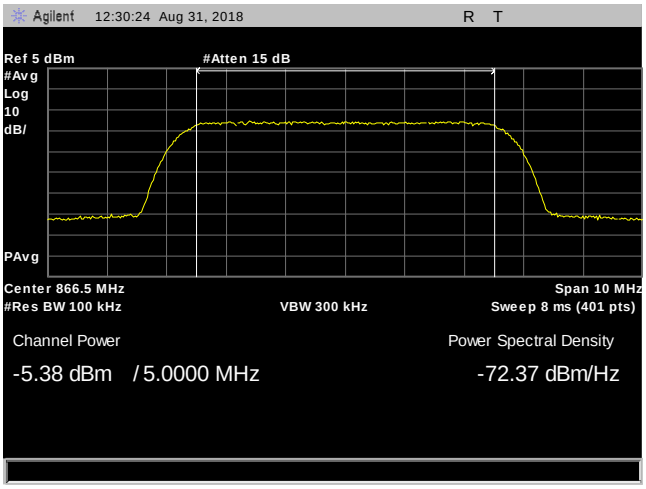


Plot 8. RF Power Output, LMR750, 10 MHz, Mid, 758 – 768 MHz, AGC

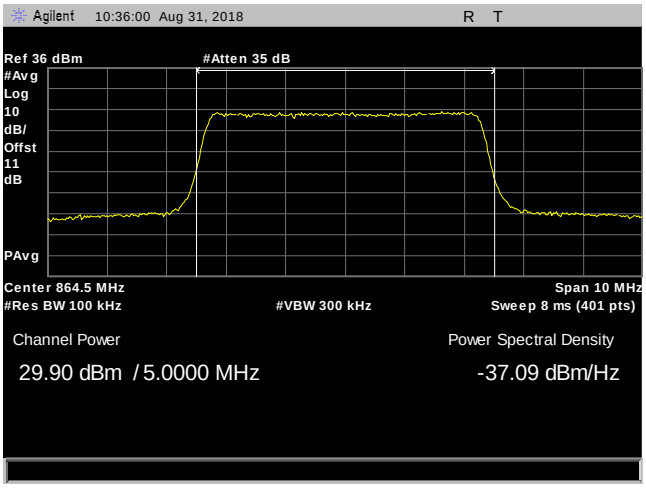
RF Output Power, Band 26, 862 – 869 MHz LTE



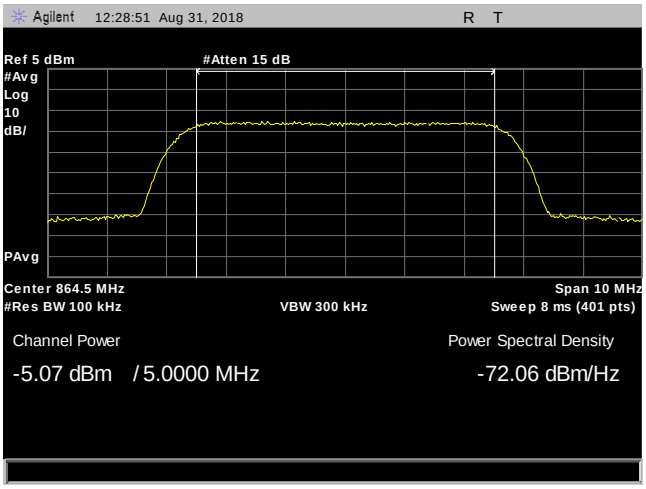
Plot 9. RF Power Output, CELL800, 5 MHz, High, 862 – 869 MHz



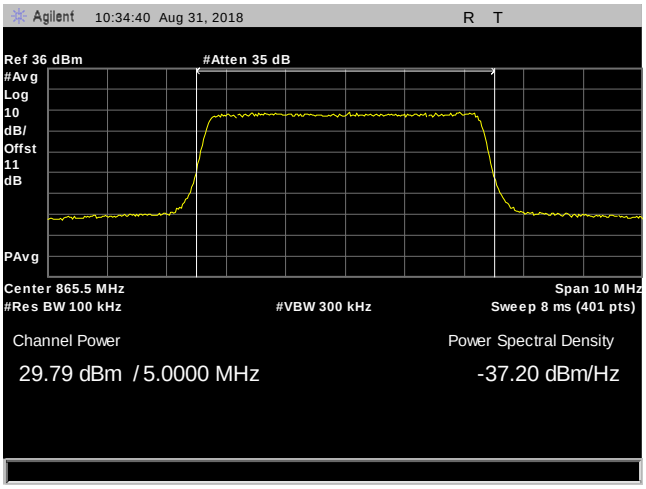
Plot 10. RF Power Output, CELL800, 5 MHz, High, 862 – 869 MHz, AGC



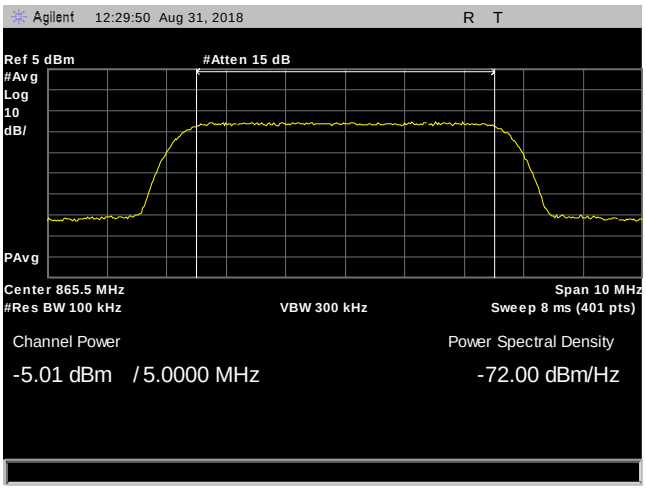
Plot 11. RF Power Output, CELL800, 5 MHz, Low, 862 – 869 MHz



Plot 12. RF Power Output, CELL800, 5 MHz, Low, 862 – 869 MHz, AGC

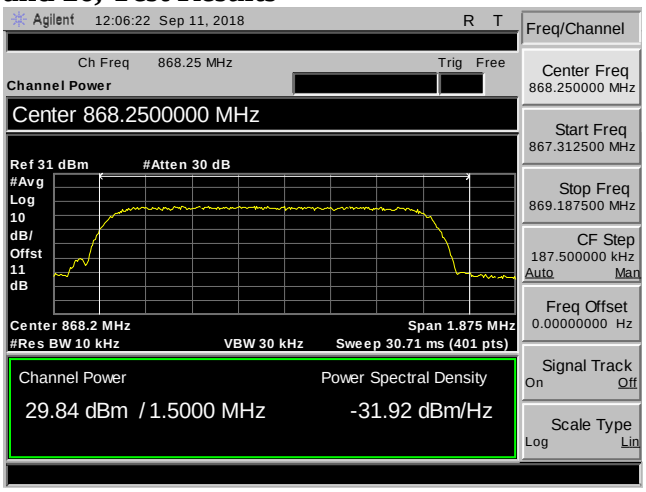


Plot 13. RF Power Output, CELL800, 5 MHz, Mid, 862 – 869 MHz

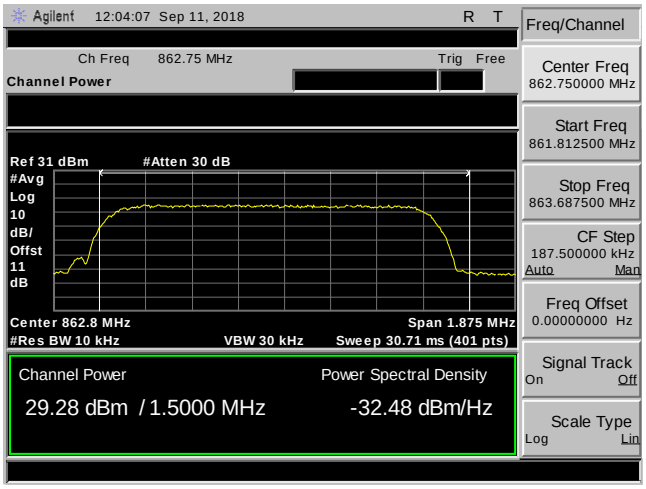


Plot 14. RF Power Output, CELL800, 5 MHz, Mid, 862 – 869 MHz, AGC

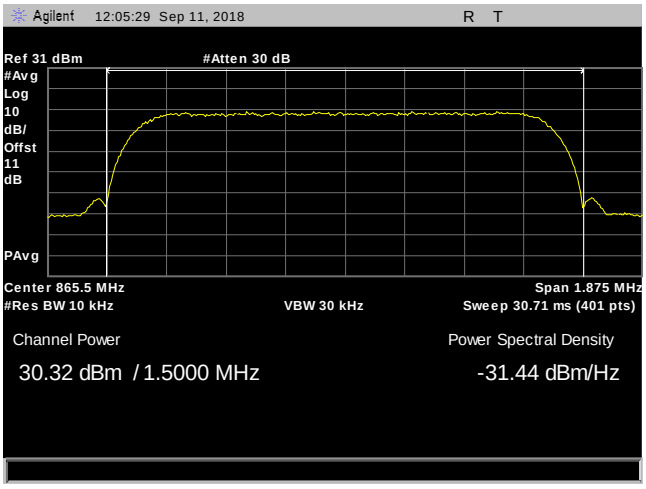
Output Power, CDMA Band 26, Test Results



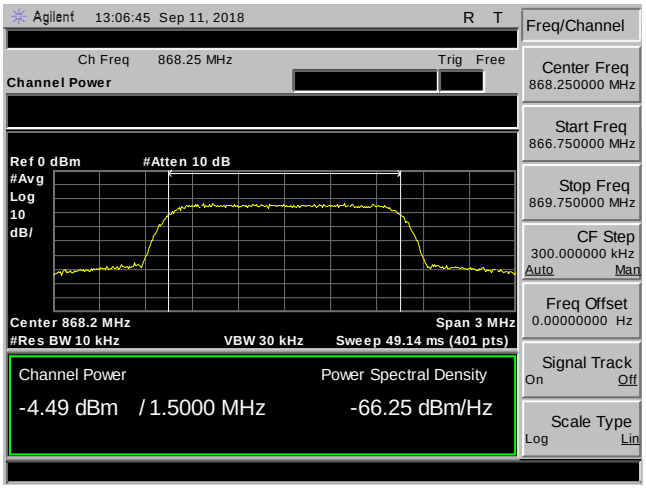
Plot 15. Output Power, CDMA800, 862 – 869 MHz, High



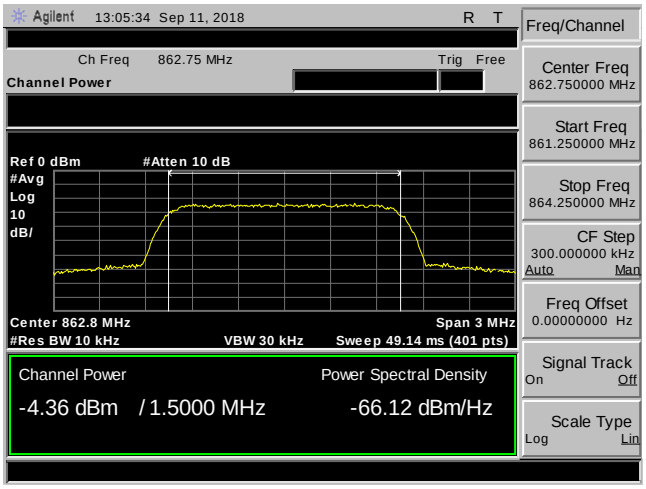
Plot 16. Output Power, CDMA800, 862 – 869 MHz, Low



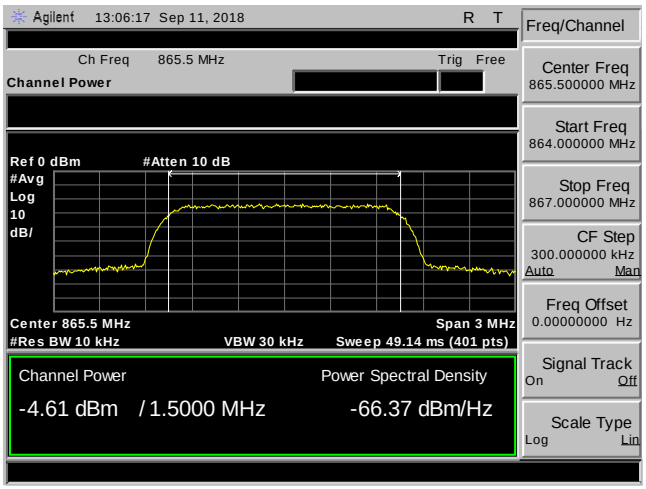
Plot 17. Output Power, CDMA800, 862 – 869 MHz, Mid



Plot 18. Output Power, CDMA800, SG, 862 – 869 MHz, High

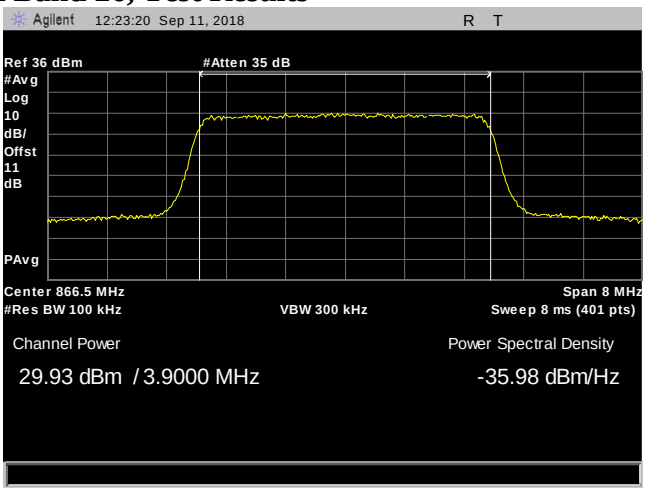


Plot 19. Output Power, CDMA800, SG, 862 – 869 MHz, Low

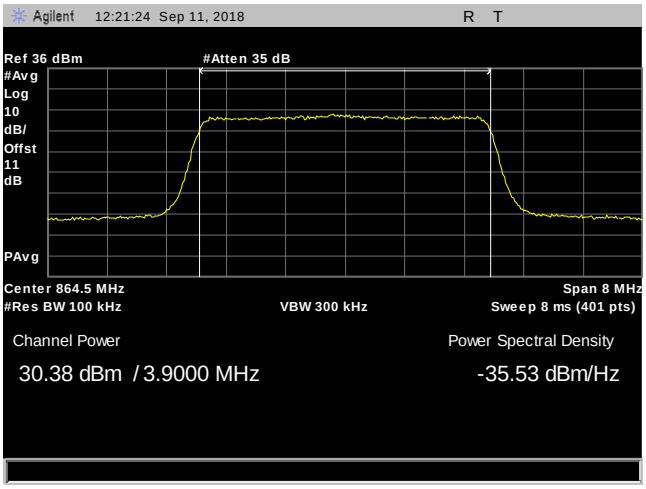


Plot 20. Output Power, CDMA800, SG, 862 – 869 MHz, Mid

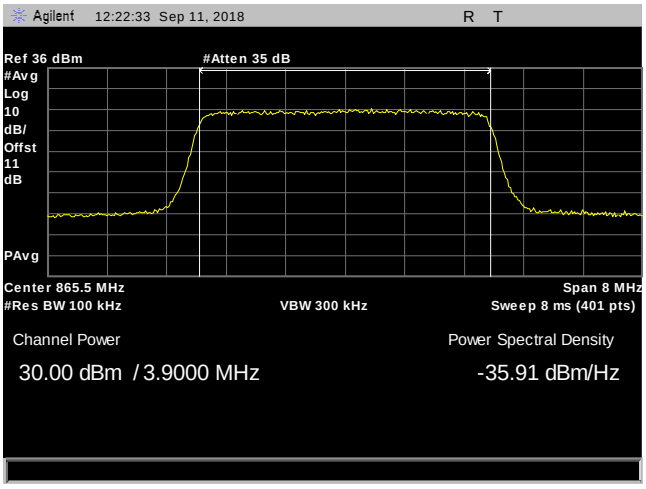
Output Power, WCDMA Band 26, Test Results



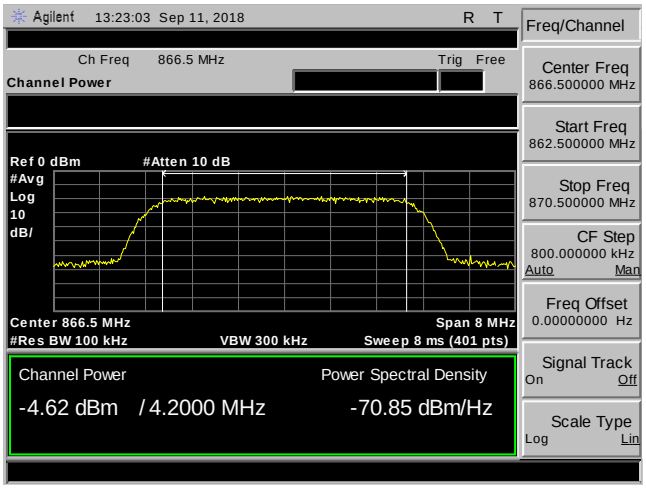
Plot 21. Output Power, WCDMA800, 862 - 869 MHz, High



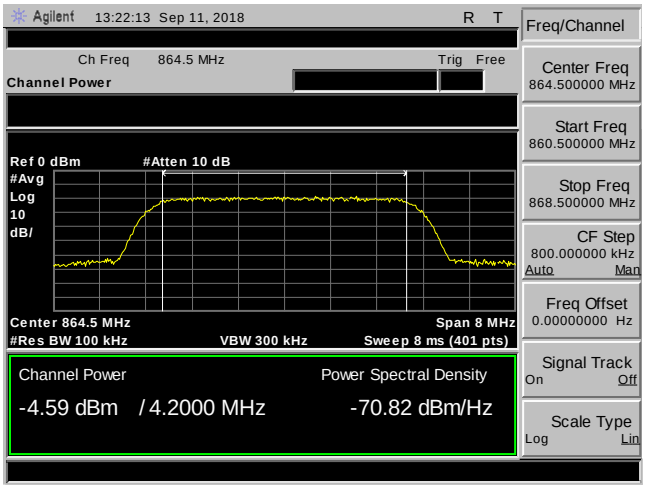
Plot 22. Output Power, WCDMA800, 862 - 869 MHz, Low



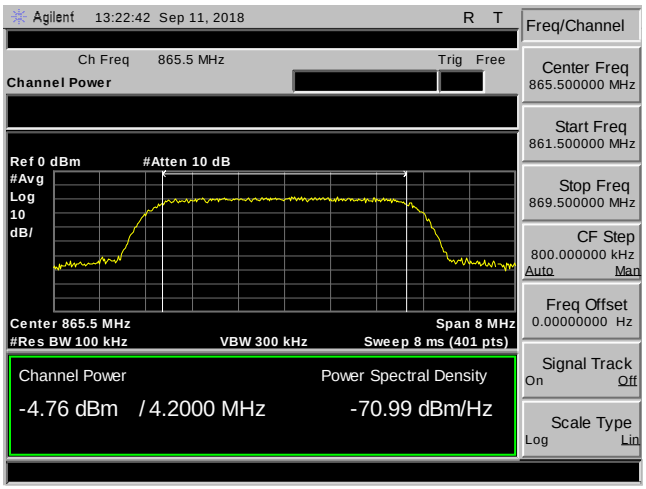
Plot 23. Output Power, WCDMA800, 862 - 869 MHz, Mid



Plot 24. Output Power, WCDMA800, SG, 862 - 869 MHz, High



Plot 25. Output Power, WCDMA800, SG, 862 - 869 MHz, Low



Plot 26. Output Power, WCDMA800, SG, 862 - 869 MHz, Mid

§ 2.1049 Occupied Bandwidth and Input Vs Output Signal Comparison

Test Requirement(s): **§ 2.1049 Measurements required: Occupied bandwidth:** The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured under the specified conditions of § 2.1049 (a) through (i) as applicable.

Test Procedures: The EUT was tested according to relative measurement procedure of ANSI C63.26 7.2.2.3 and FCC KDB 935210 Section 4.4 of D05 v01r02. The OBW measurement function of the spectrum analyzer was used and configured in the following manner. Also emission mask were drawn as per

(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: Equipment was found compliant with Section 2.1049. The following pages show measurements of 99% and -26 dB Occupied Bandwidth plots.

Test Engineer(s): Bradley Jones

Test Date(s): September 18, 2018

Band 14		frequency	Input BW	Output BW	% diff
5 MHz	Low	760.5	6.329	4.937	-28.2
	Middle	763	6.294	4.937	-27.49
	High	765.5	6.3	4.931	-27.76
10 MHz	Middle	763	12.759	10.095	-26.39

Table 12. Occupied Bandwidth, Band 14, Test Results

Band 26		frequency	Input BW	Output BW	% diff
5 MHz	Low	864.5	6.339	4.962	-27.8
	Middle	865.5	6.3	6.321	0.332
	High	866.5	6.316	4.926	-28.2

Table 13. Occupied Bandwidth, Band 26, Test Results

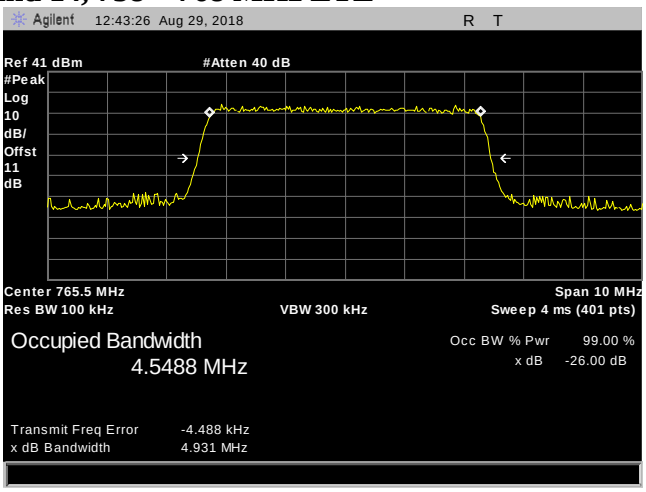
Band 26 CDMA		frequency	Input BW	Output BW	% diff
1.25 MHz	Low	862.8	1.717	1.445	-18.82352941
	Middle	865.5	1.722	1.461	-17.86447639
	High	868.25	1.718	1.44	-19.30555556

Table 14. Occupied Bandwidth, Band 26, Test Results CDMA

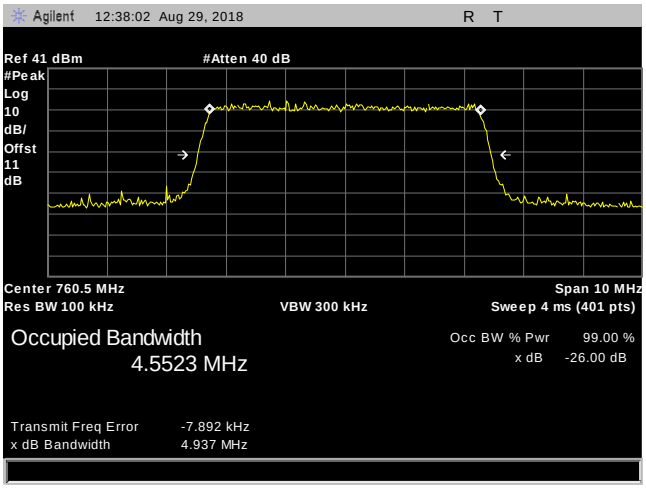
Band 26 WCDMA		**frequency**	**Input BW**	**Output BW**	**% diff**
3.84 MHz	Low	864.5	5.241	4.167	-25.77393808
	Middle	865.5	5.243	4.216	-24.35958254
	High	866.5	5.235	4.205	-24.49464923

Table 15. Occupied Bandwidth, Band 26, Test Results WCDMA

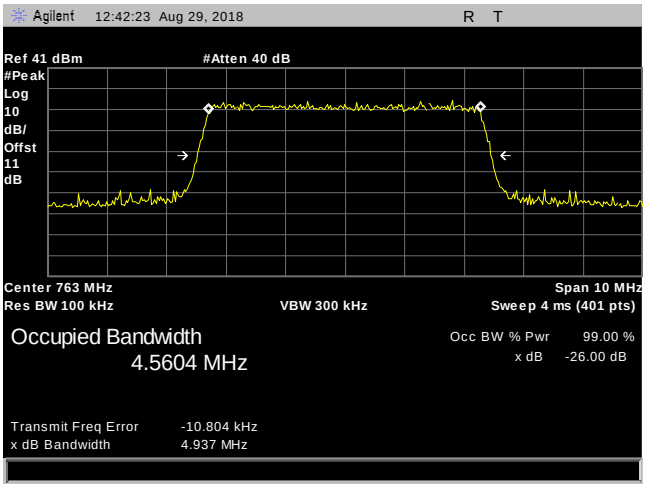
Occupied Bandwidth, Band 14, 758 – 768 MHz LTE



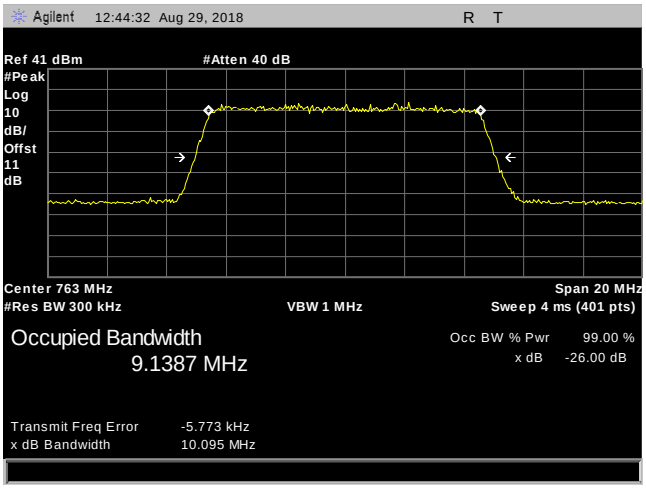
Plot 27. Occupied Bandwidth, LMR750, 5 MHz, High, 758 – 768 MHz



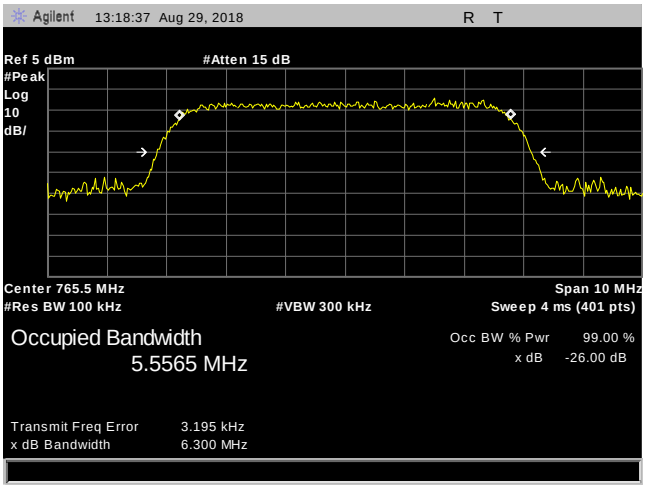
Plot 28. Occupied Bandwidth, LMR750, 5 MHz, Low, 758 – 768 MHz



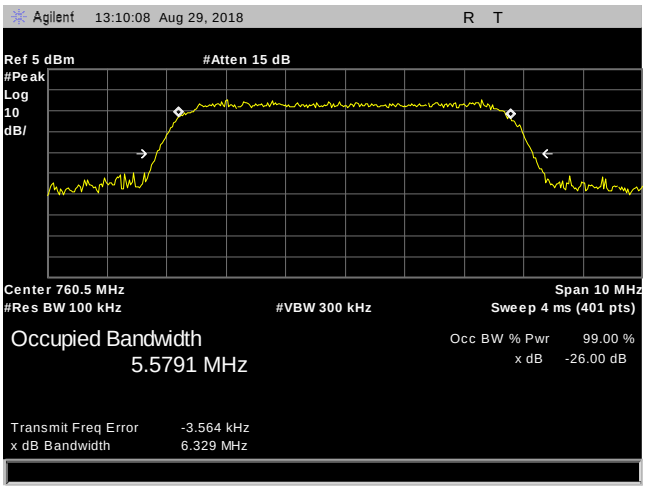
Plot 29. Occupied Bandwidth, LMR750, 5 MHz, Mid, 758 – 768 MHz



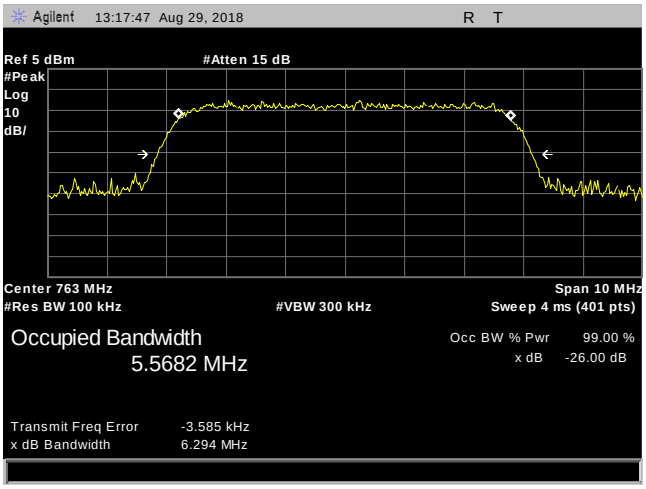
Plot 30. Occupied Bandwidth, LMR750, 10 MHz, Mid, 758 – 768 MHz



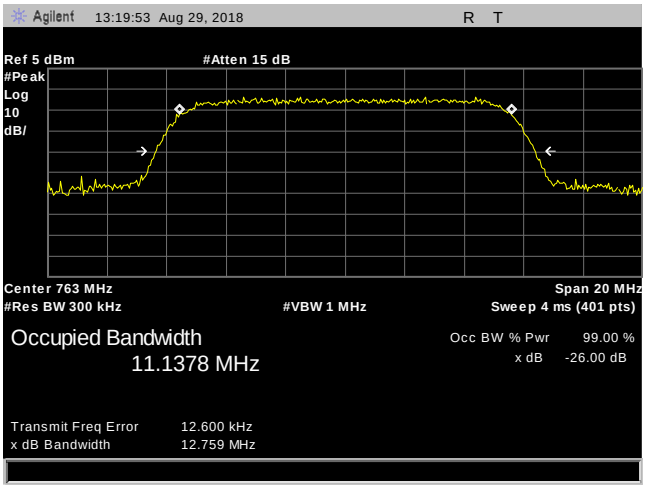
Plot 31. Occupied Bandwidth, LMR750, SG, 5 MHz, High, 758 – 768 MHz



Plot 32. Occupied Bandwidth, LMR750, SG, 5 MHz, Low, 758 – 768 MHz

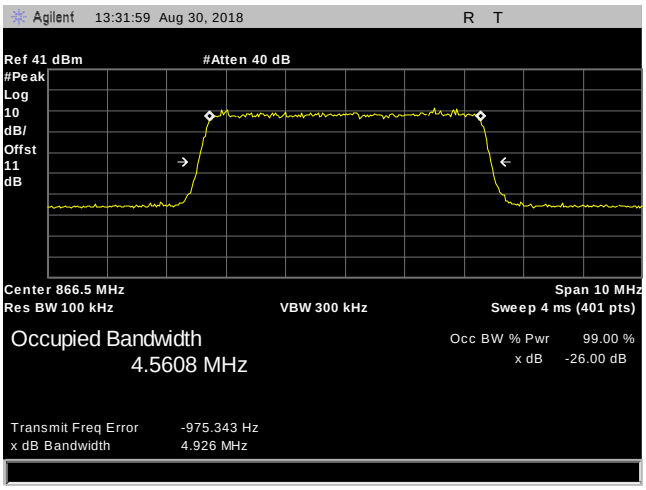


Plot 33. Occupied Bandwidth, LMR750, SG, 5 MHz, Mid, 758 – 768 MHz

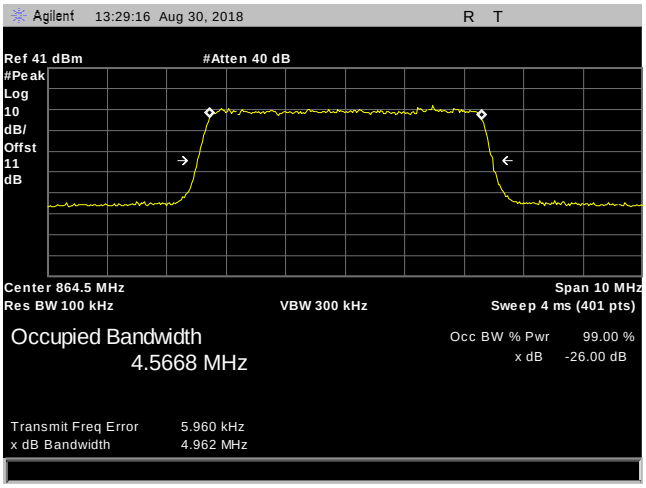


Plot 34. Occupied Bandwidth, LMR750, SG, 10 MHz, Mid, 758 – 768 MHz

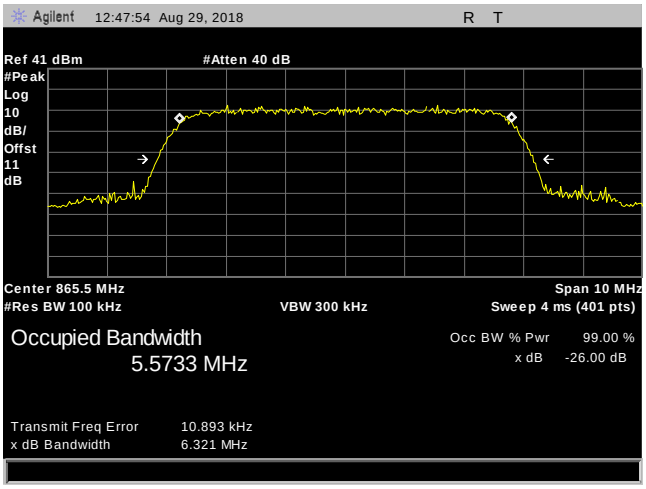
Occupied Bandwidth, Band 26, 862 – 869 MHz LTE



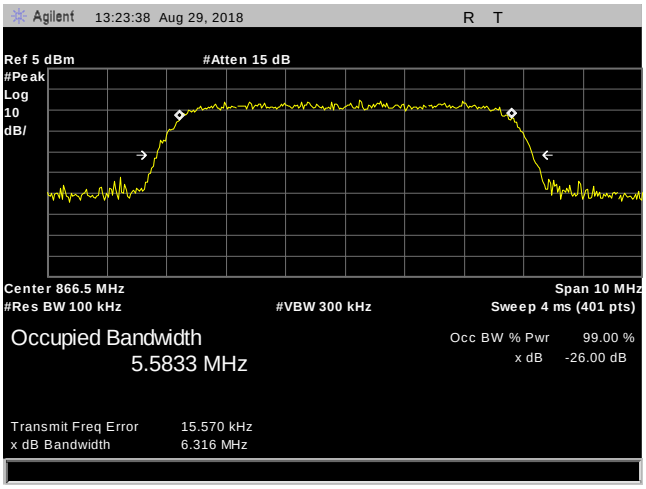
Plot 35. Occupied Bandwidth, SMR800, 5 MHz, High, 862 – 869MHz



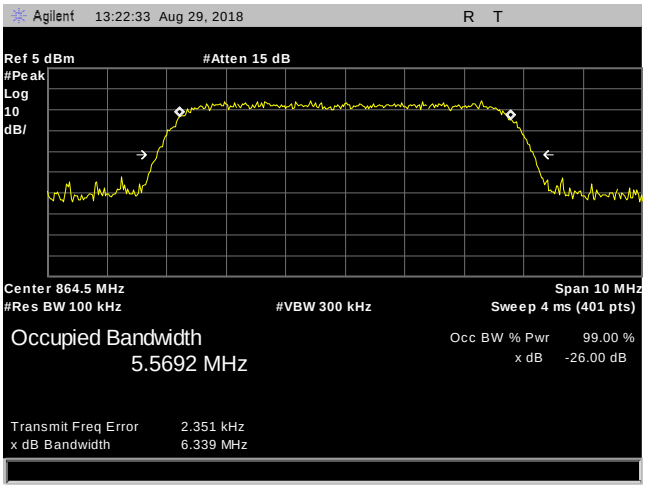
Plot 36. Occupied Bandwidth, SMR800, 5 MHz, Low, 862 – 869 MHz



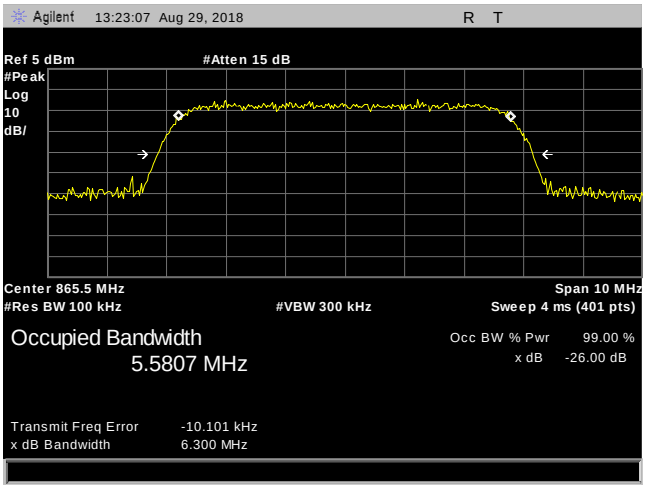
Plot 37. Occupied Bandwidth, SMR800, 5 MHz, Mid, 862 – 869 MHz



Plot 38. Occupied Bandwidth, SMR800, SG, High, 862 – 869 MHz

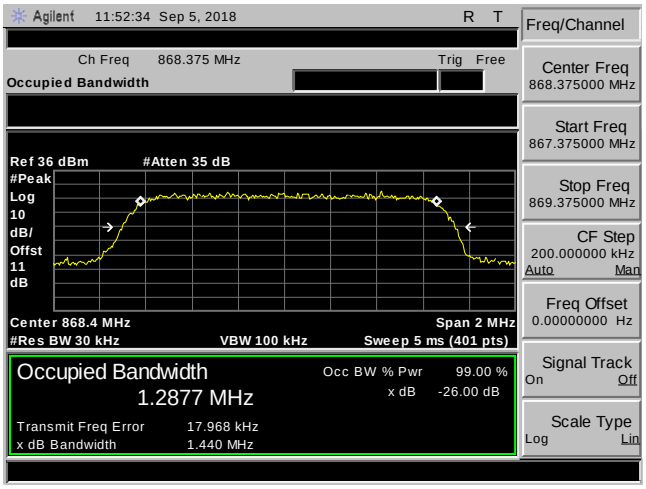


Plot 39. Occupied Bandwidth, SMR800, SG, Low, 862 – 869 MHz

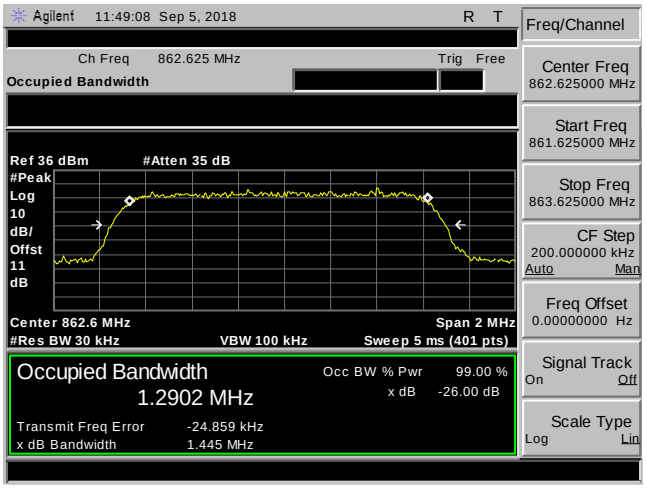


Plot 40. Occupied Bandwidth, SMR800, SG, 5 MHz, Mid, 862 – 869 MHz

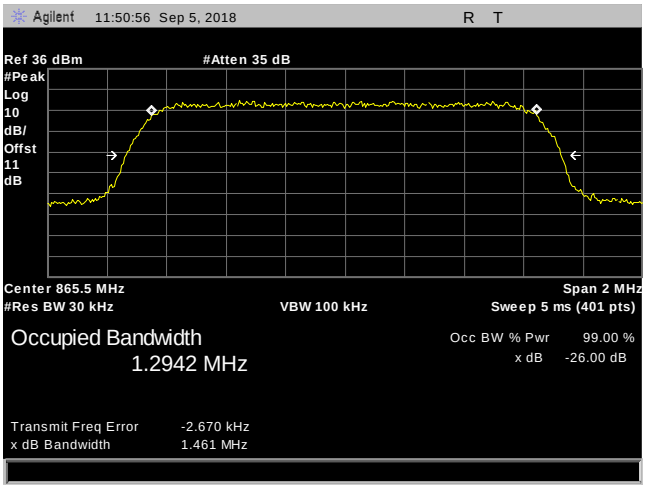
Occupied Bandwidth, CDMA Band 26, Test Results



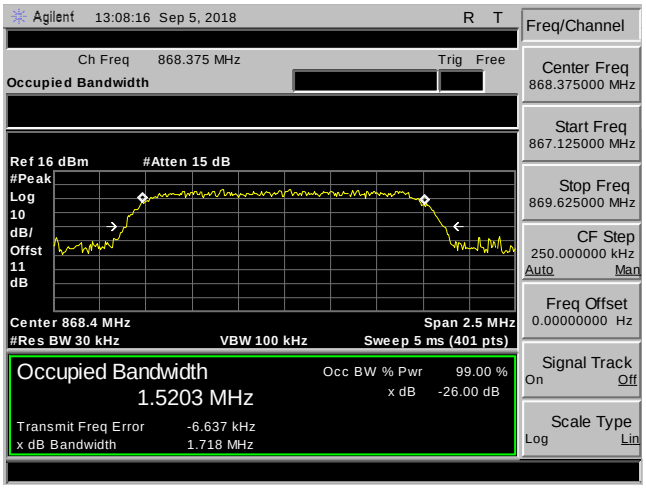
Plot 41. Occupied Bandwidth, CELL800, 862 - 869 MHz, High



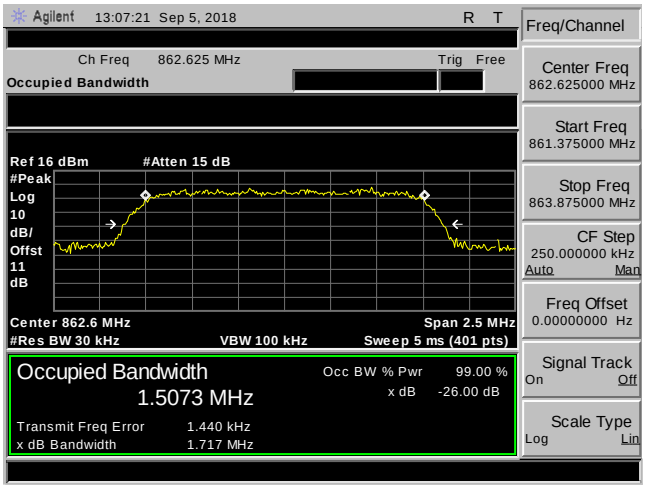
Plot 42. Occupied Bandwidth, CELL800, 862 - 869 MHz, Low



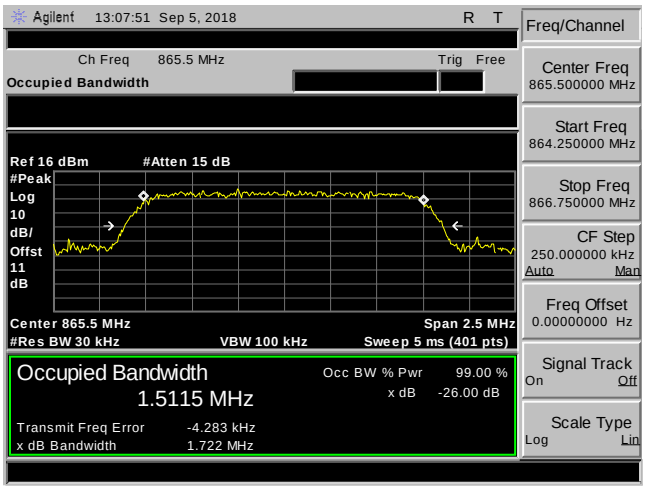
Plot 43. Occupied Bandwidth, CELL800, 862 - 869 MHz, Mid



Plot 44. Occupied Bandwidth, SG, CELL800, 862 - 869 MHz, High

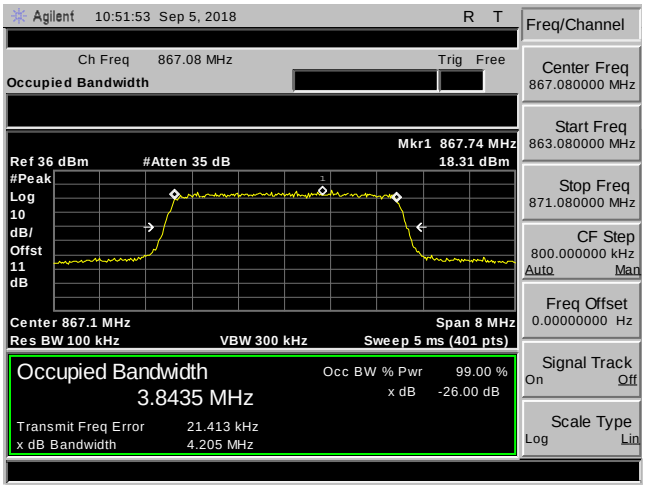


Plot 45. Occupied Bandwidth, SG, CELL800, 862 - 869 MHz, Low

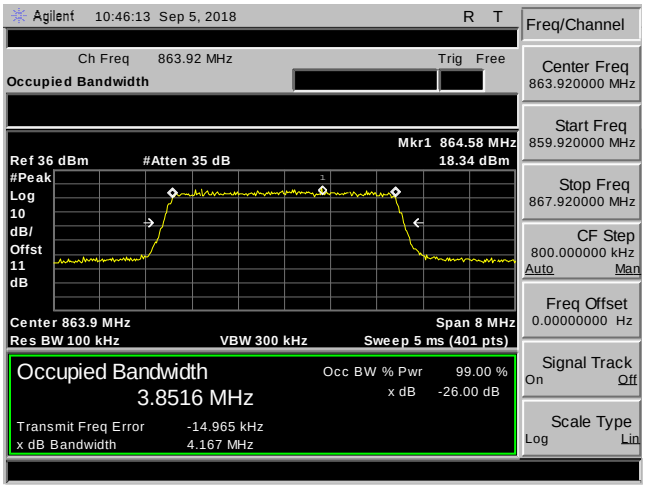


Plot 46. Occupied Bandwidth, SG, CELL800, 862 - 869 MHz, Mid

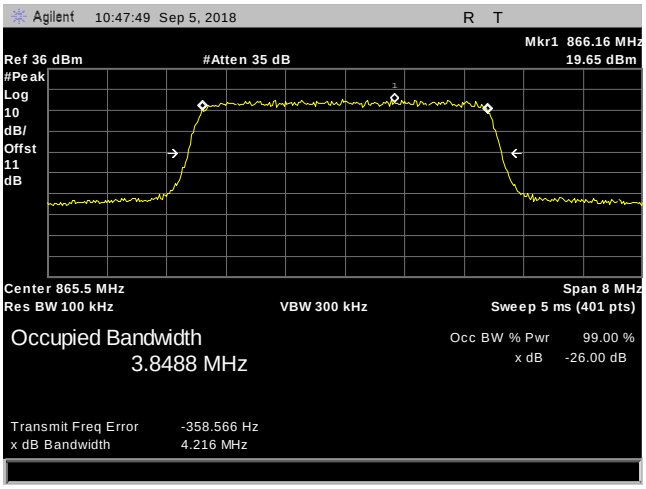
Occupied Bandwidth, WCDMA Band 26, Test Results



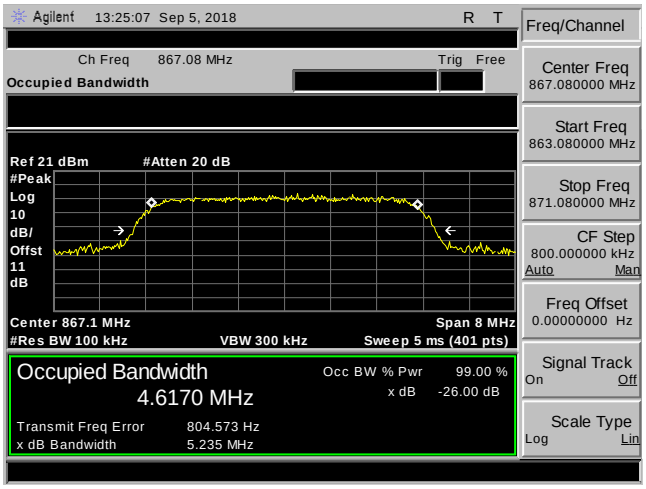
Plot 47. Occupied Bandwidth, CELL800, 862 - 869 MHz, High



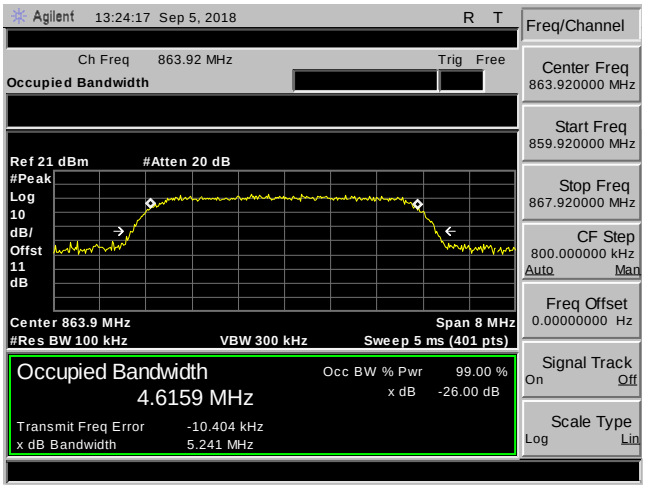
Plot 48. Occupied Bandwidth, CELL800, 862 - 869 MHz, Low



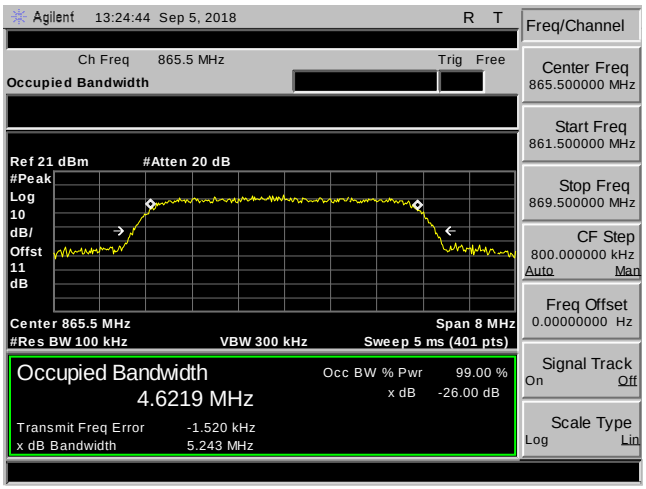
Plot 49. Occupied Bandwidth, CELL800, 862 - 869 MHz, Mid



Plot 50. Occupied Bandwidth, CELL800, SG, 862 - 869 MHz, High



Plot 51. Occupied Bandwidth, CELL800, SG, 862 - 869 MHz, Low



Plot 52. Occupied Bandwidth, CELL800, SG, 862 - 869 MHz, Mid

Electromagnetic Compatibility Criteria for Intentional Radiators

4.7 KDB 935210 D05 v01r02 and ANSI C63.26 (7.2.2.5) 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.

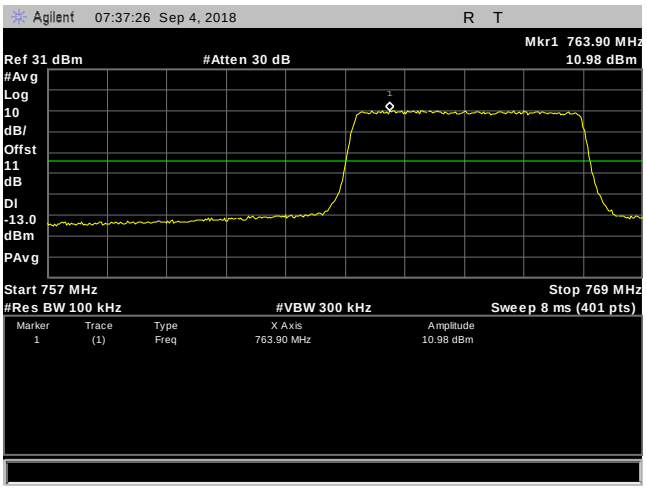
Test Procedures: Test was performed using the procedure specified in Section 3.6.2 of the KDB 935210 D05 v01r02 and Section 7.2.2.5 of ANSI C63.26 2015

Test Results: Equipment was found compliant with these requirements.

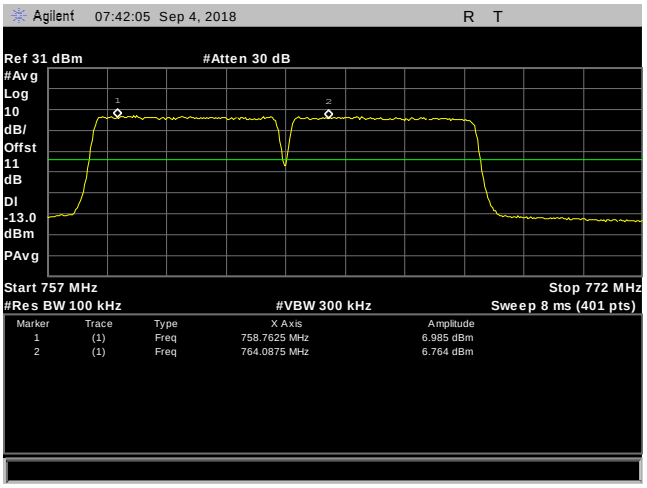
Test Engineer(s): Deepak Giri

Test Date(s): September 21, 2018

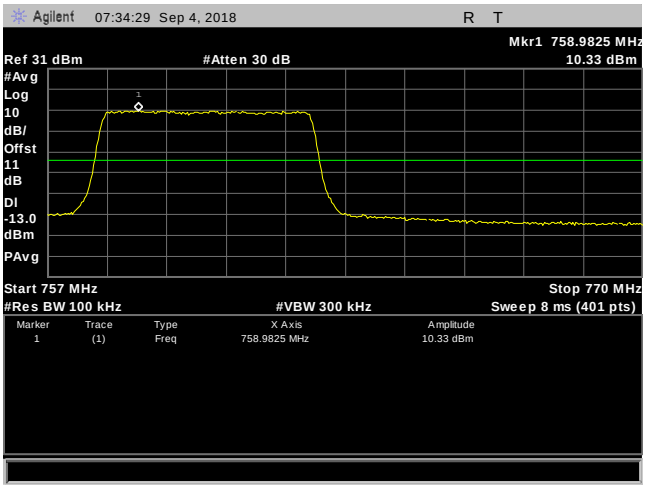
Intermodulation, Test Results



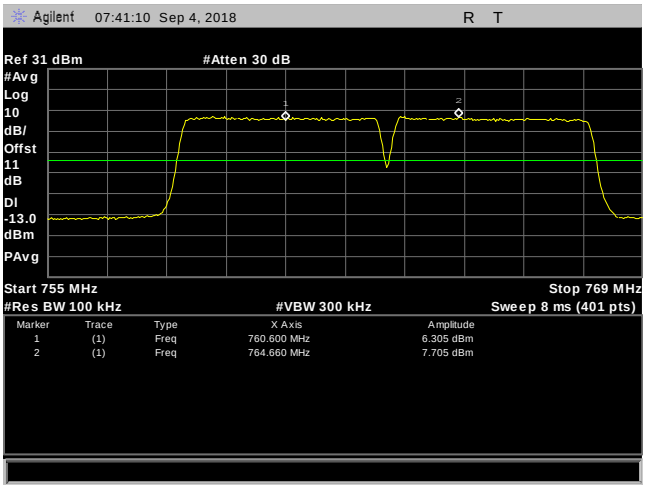
Plot 53. Intermodulation, 10 MHz, Low Channel, One Signal, LMR 750, Band 14



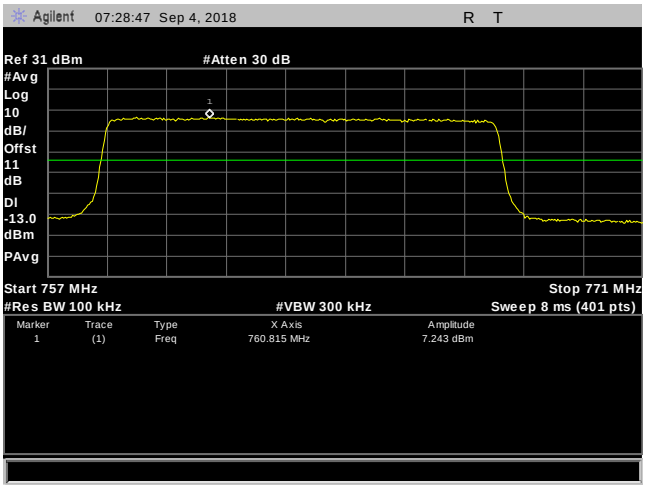
Plot 54. Intermodulation, 5 MHz, High Channel, two Signal, LMR 750, Band 14



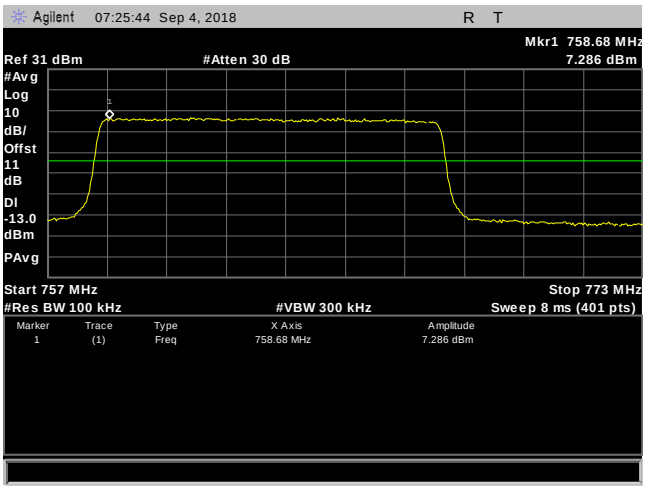
Plot 55. Intermodulation, 5 MHz, High Channel, one Signal, LMR 750, Band 14



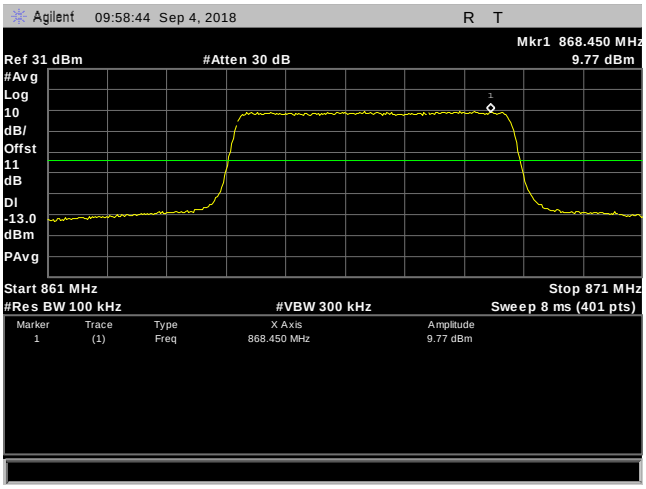
Plot 56. Intermodulation, 5 MHz, Low Channel, two Signal, LMR 750, Band 14



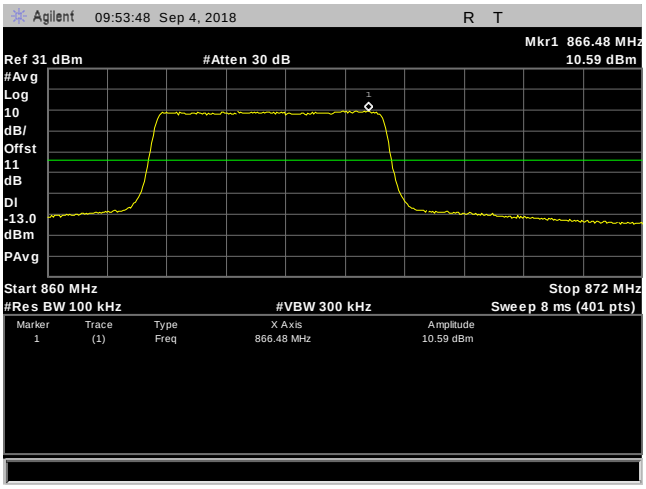
Plot 57. Intermodulation, 5 MHz, Low Channel, one Signal, LMR 750, Band 14



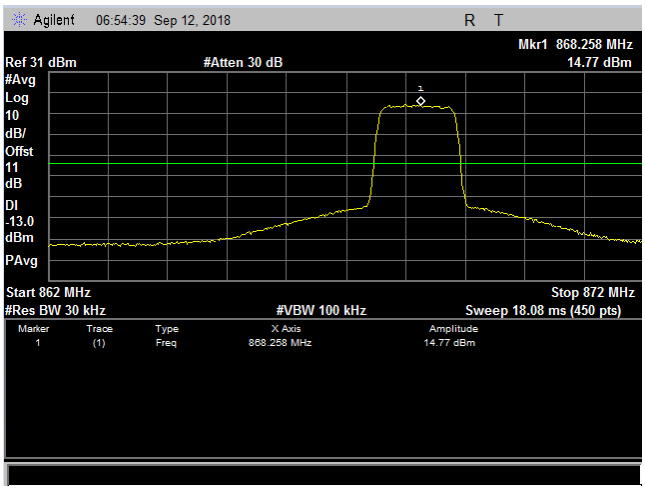
Plot 58. Intermodulation 10 MHz, High Channel, two Signal, LMR 750, Band 14



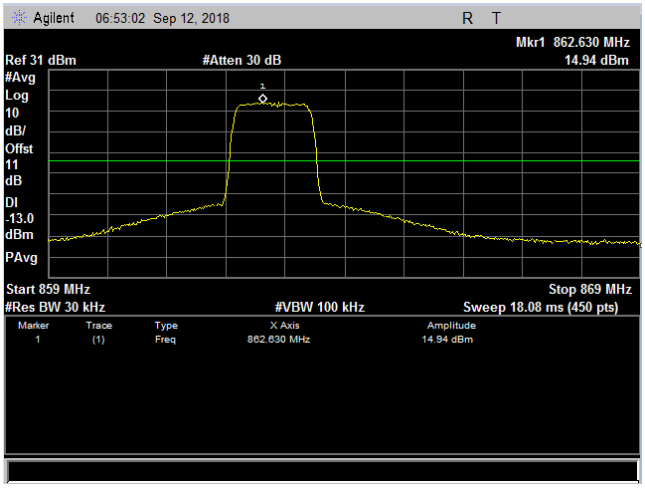
Plot 59. Intermodulation, 5 MHz, High Channel, One Signal, SMR 800_CELL 850, Band 26



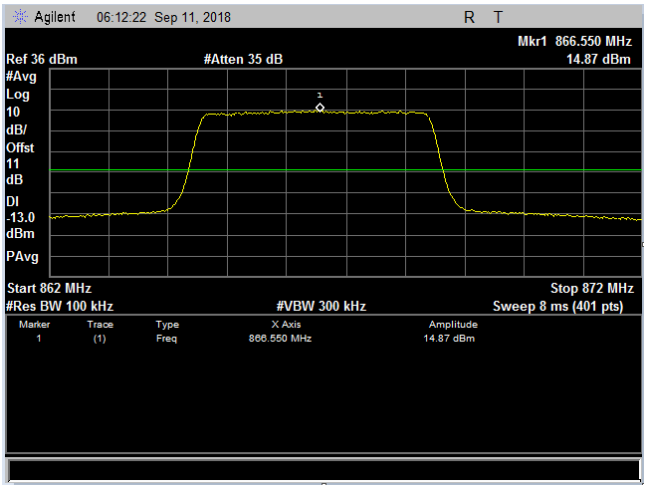
Plot 60. Intermodulation, 5 MHz, Low Channel, One Signal, SMR 800_CELL 850, Band 26



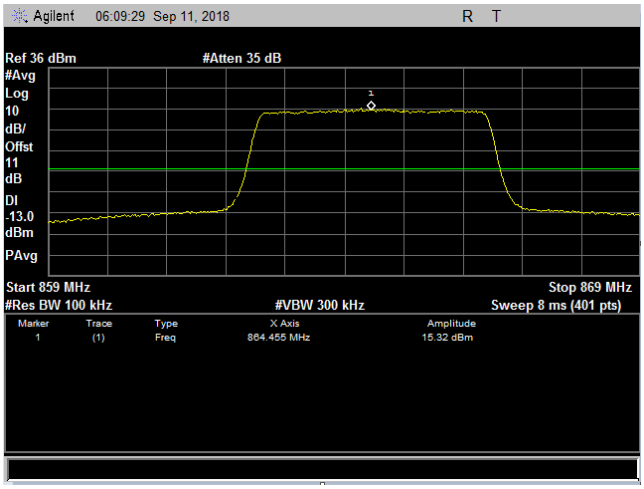
Plot 61. Intermodulation, CDMA SMR800, High Channel, One Signal Intermodulation



Plot 62. Intermodulation, CDMA SMR800, Low Channel, One Signal Intermodulation



Plot 63. Intermodulation, SMR 800 WCDMA, High Channel, One Signal Intermodulation



Plot 64. Intermodulation, SMR 800 WCDMA, Low Channel, One Signal Intermodulation

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.

Test Procedures: The EUT was tested according to field strength method of ANSI C63.26 7.2.2.7. 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 place 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 360^0 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.

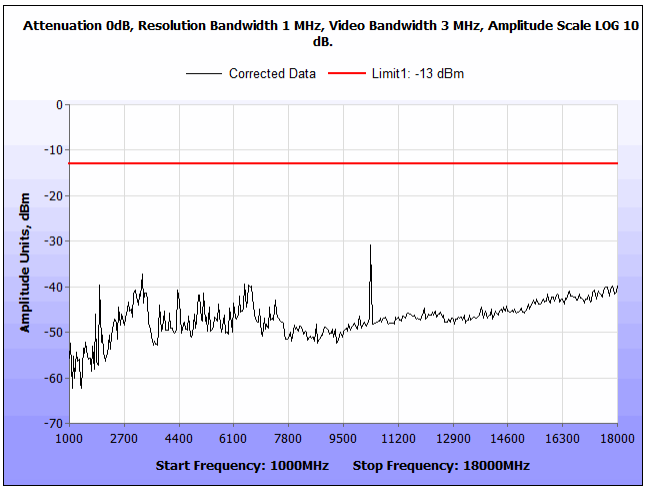
Test Results: The EUT was found compliant with the requirements of this section.

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

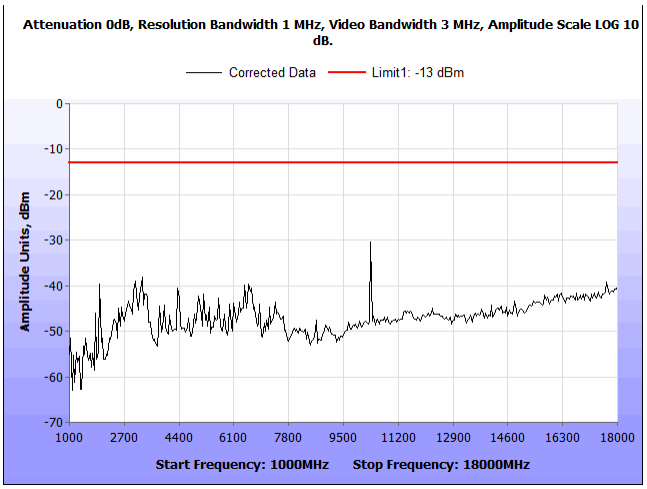
Test Engineer: Bradley Jones

Test Date(s): September 26, 2018

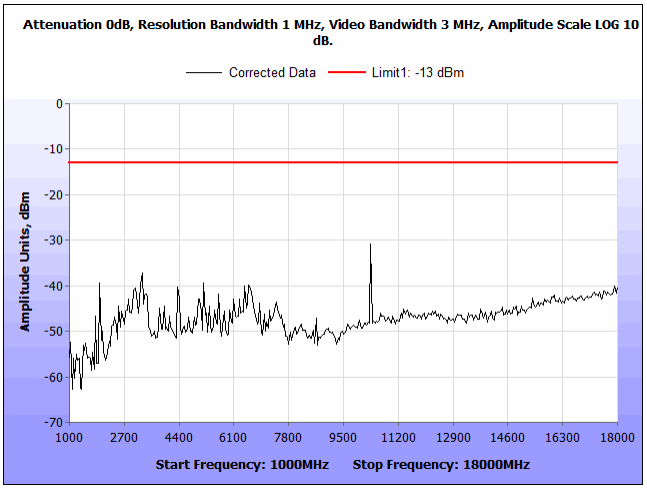
Radiated Spurious Emissions, Band 14, 758 – 768 MHz



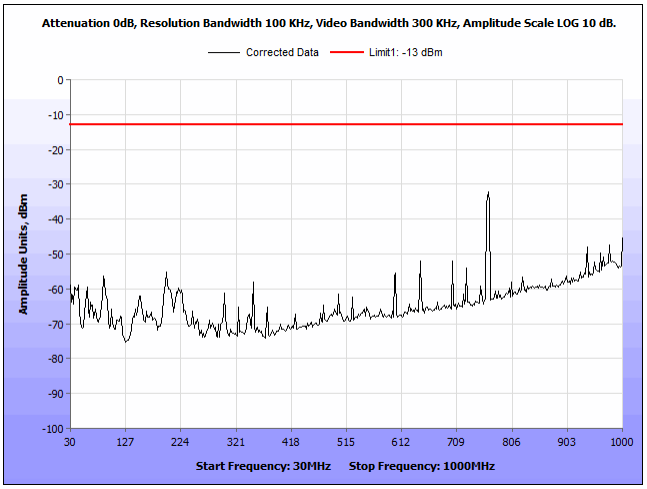
Plot 65. Radiated Spurious Emissions, 700SW, 5 MHz, 1 – 18 GHz, High



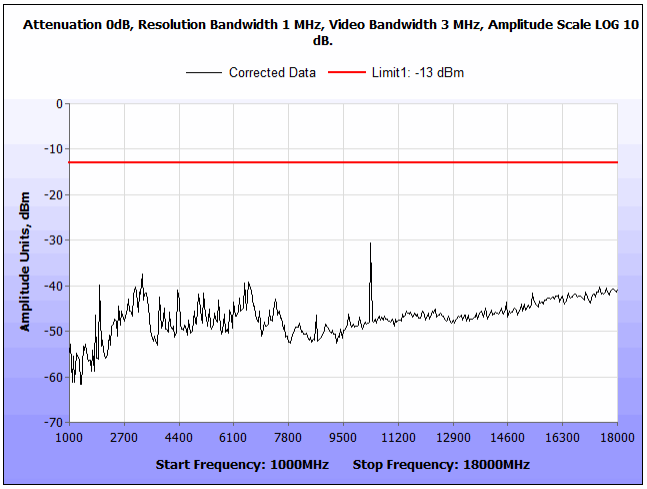
Plot 66. Radiated Spurious Emissions, 700SW, 5 MHz, 1 – 18 GHz, Low



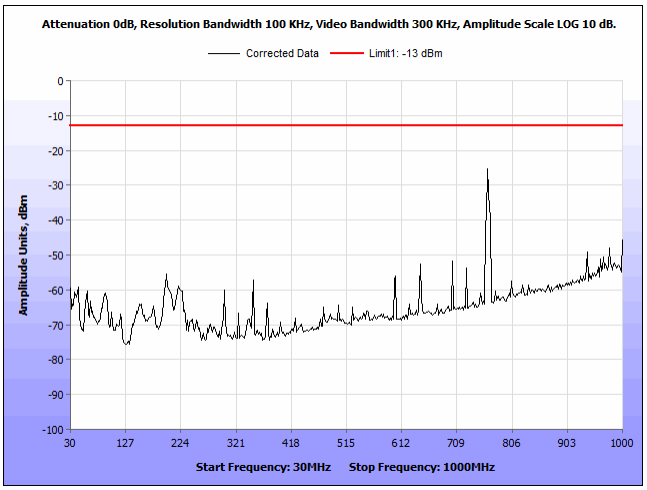
Plot 67. Radiated Spurious Emissions, 700SW, 5 MHz, 1 – 18 GHz, Mid



Plot 68. Radiated Spurious Emissions, 700SW, 5 MHz, 30 MHz – 1 GHz

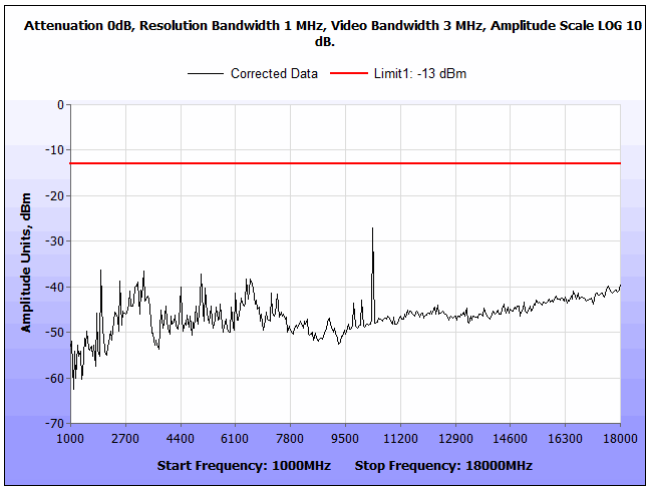


Plot 69. Radiated Spurious Emissions, 700SW, 10 MHz, 1 – 18 GHz, Mid

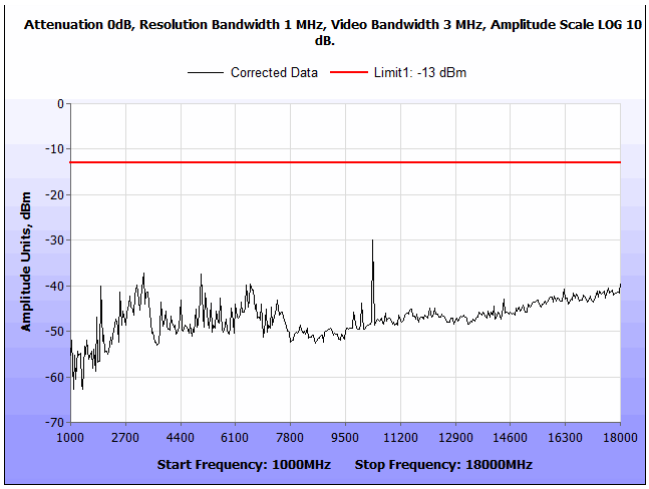


Plot 70. Radiated Spurious Emissions, 700SW, 10 MHz, 30 MHz – 1 GHz

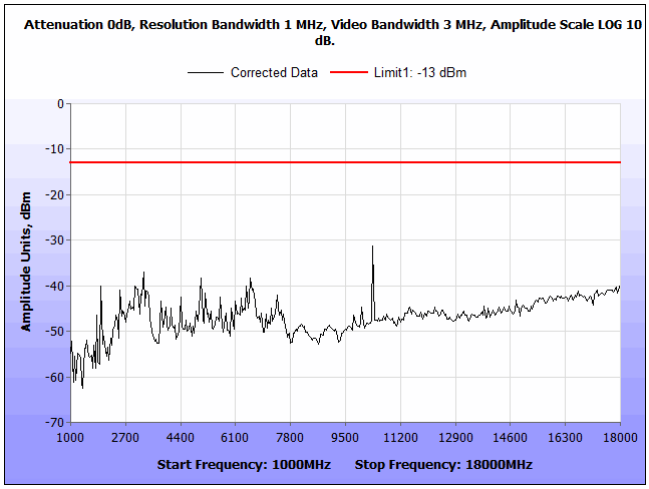
Radiated Spurious Emissions, Band 26, 862 – 869 MHz



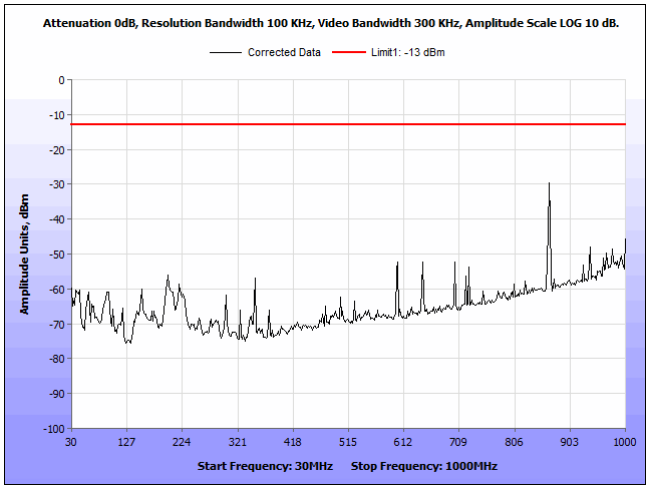
Plot 71. Radiated Spurious Emissions, CELL800, 5 MHz, 1 – 18 GHz, High



Plot 72. Radiated Spurious Emissions, CELL800, 5 MHz, 1 – 18 GHz, Low

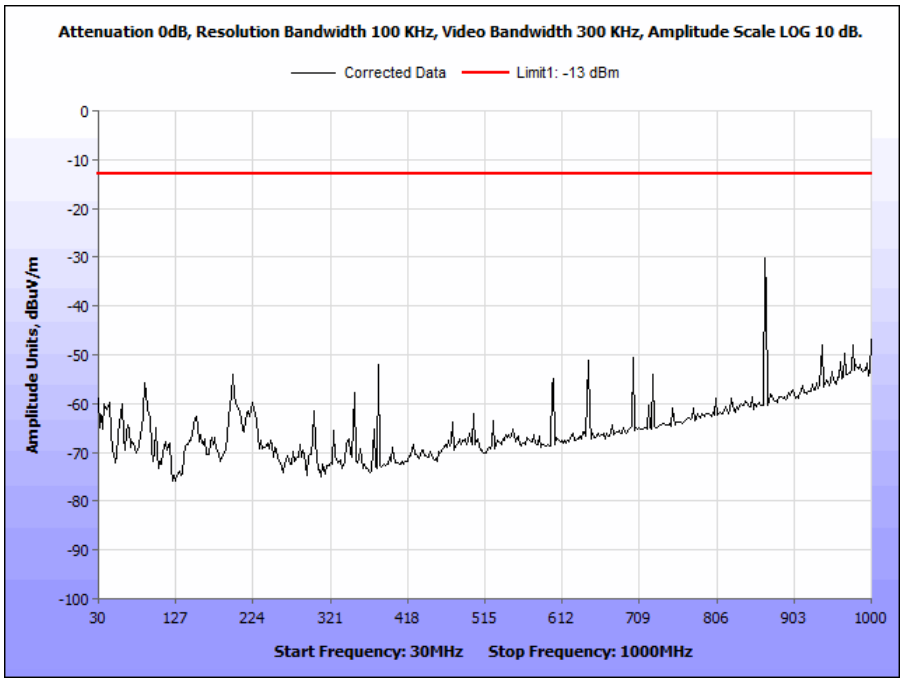


Plot 73. Radiated Spurious Emissions, CELL800, 5 MHz, 1 – 18 GHz, Mid

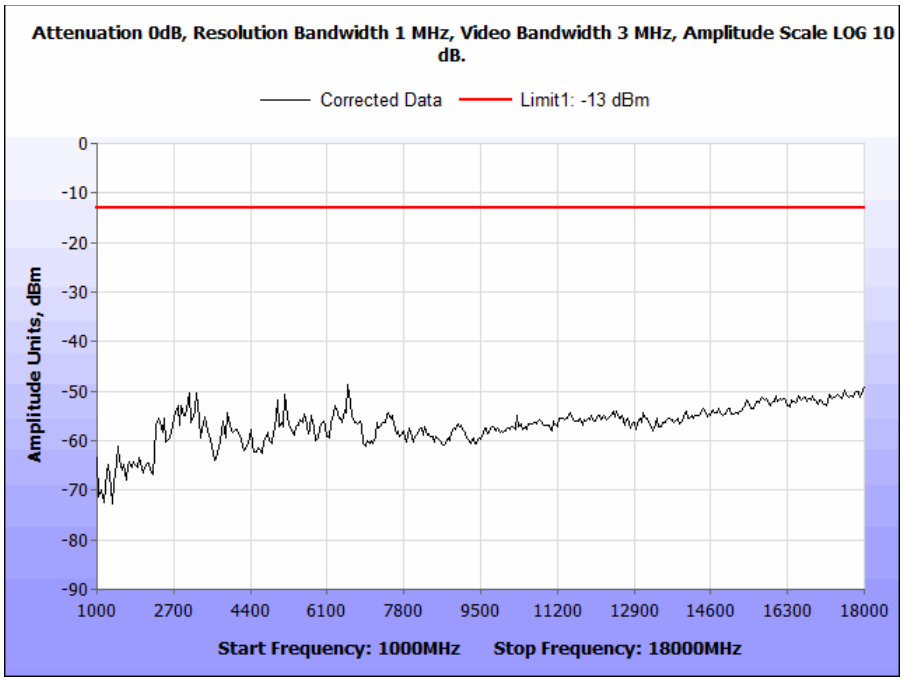


Plot 74. Radiated Spurious Emissions, CELL800, 5 MHz, 30 MHz – 1 GHz

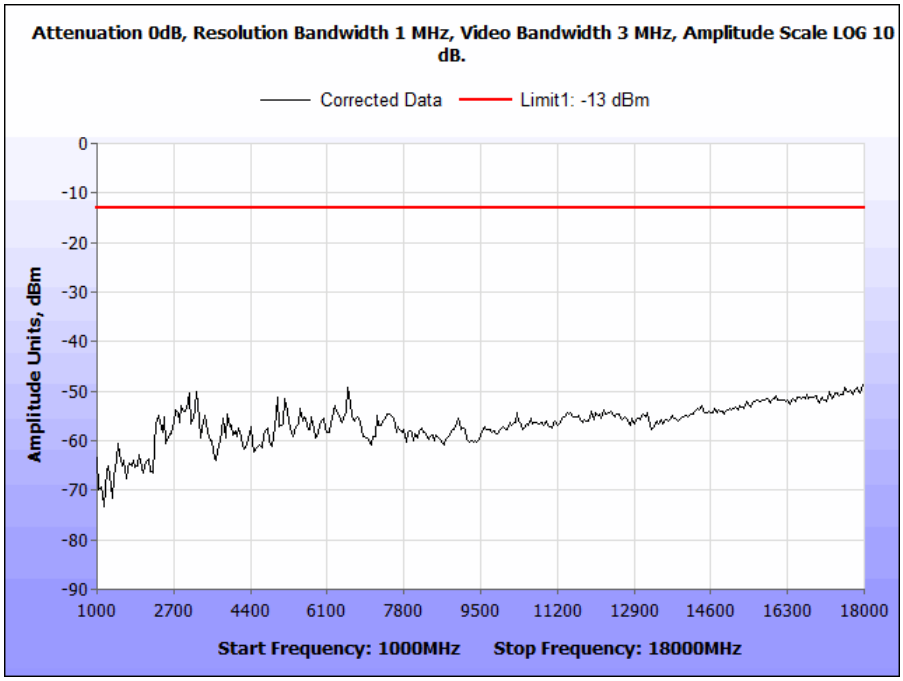
Radiated Spurious Emissions, CDMA Band 26, Test Results



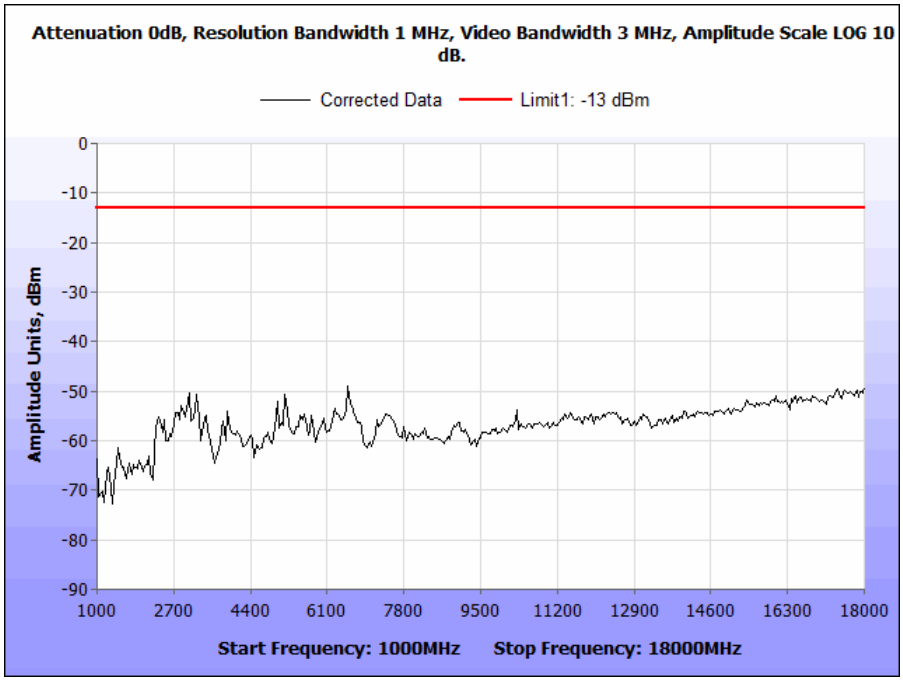
Plot 75. Radiated Emissions, CDMA SMR 800, 30 MHz – 1 GHz



Plot 76. Radiated Emissions, CDMA SMR 800, High Channel

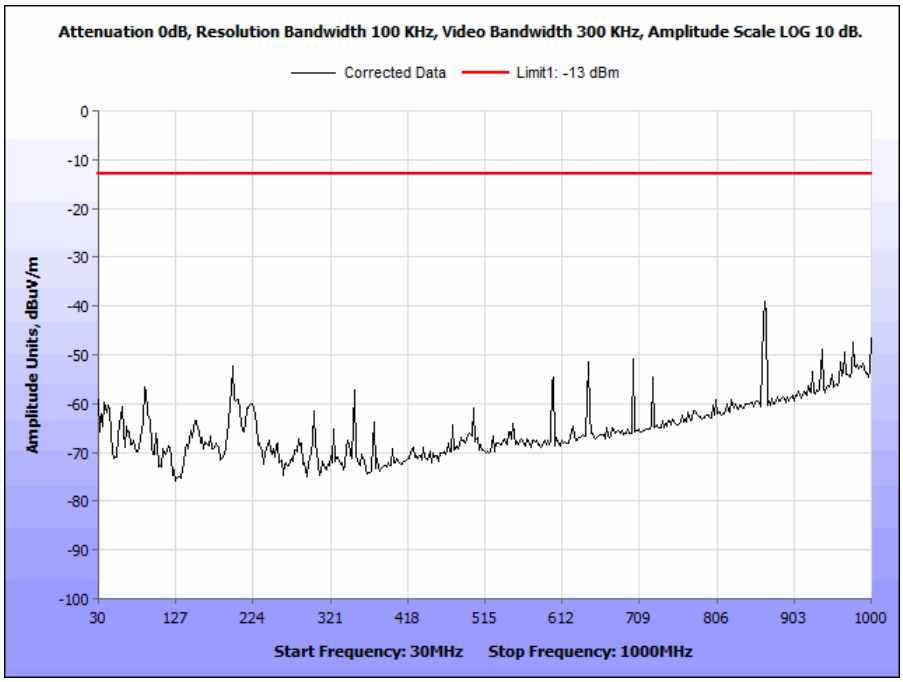


Plot 77. Radiated Emissions, CDMA SMR 800, Low Channel

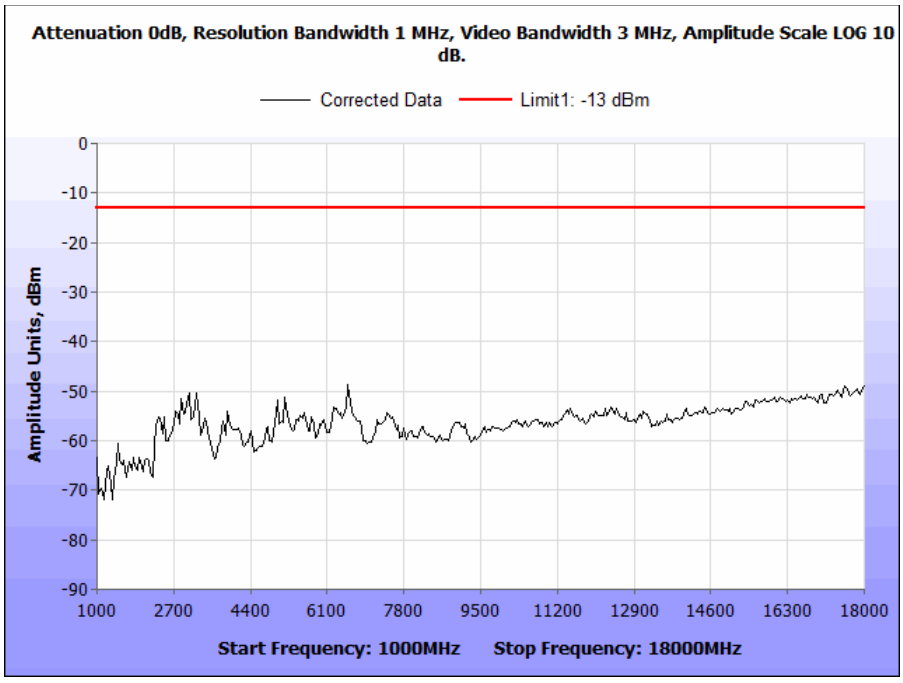


Plot 78. Radiated Emissions, CDMA SMR 800, Mid Channel

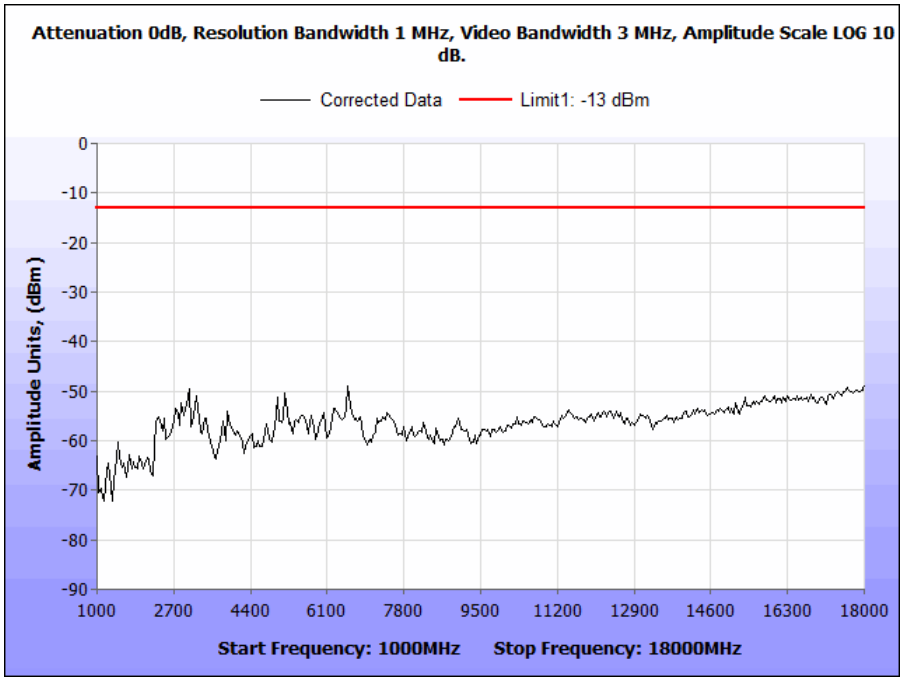
Radiated Spurious Emissions, WCDMA Band 26, Test Results



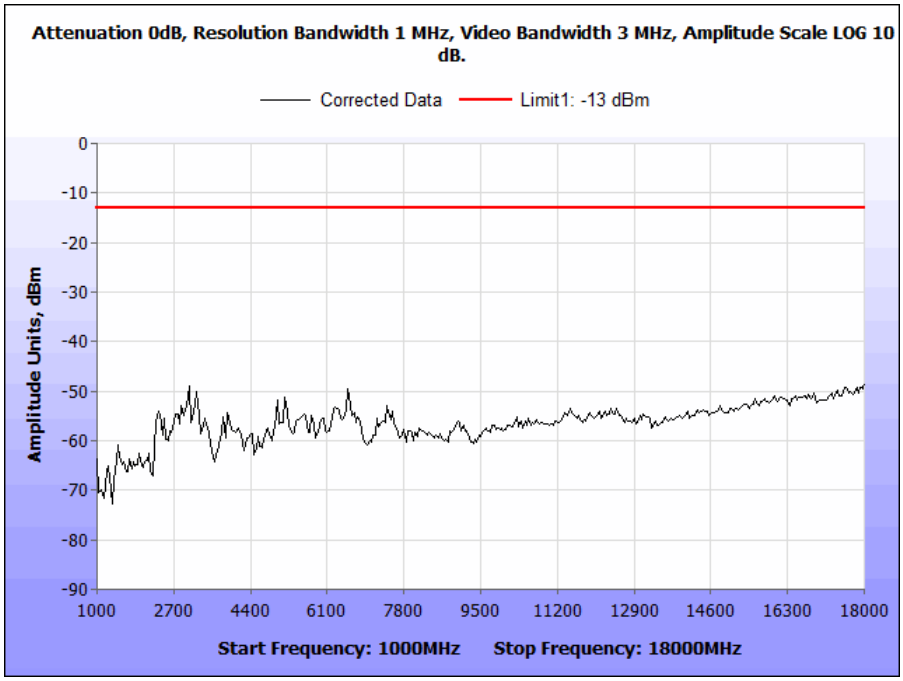
Plot 79. Radiated Emissions, WCDMA Band 26, 30 MHz – 1 GHz



Plot 80. Radiated Emissions, 1 – 18 GHz WCDMA Band 26, High Channel



Plot 81. Radiated Emissions, WCDMA 1 – 18 GHz Band 26, Low Channel



Plot 82. Radiated Emissions, WCDMA 1 – 18 GHz Band 26, Mid Channel

Electromagnetic Compatibility Criteria for Intentional Radiators

§2.1055 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.

§27.54 The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

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 – 30 degree Celsius to 50 degree Celsius. 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 30, 2018

Part 90 S DL-862-869 MHz and UL - 817 - 824 MHz					
Temp Degrees C	Voltage (AC)	Assigned Frequency (Hz)	Measured Frequency (Hz)	PPM	PPM Limit
-30	102		865,500,035	1.00	1.50
-30	120	865,500,036	865,500,036	0.00	1.50
-30	138		865,500,035	1.00	1.50
-20	102		865,500,035	1.00	1.50
-20	120	865,500,035	865,500,035	0.00	1.50
-20	138		865,500,034	1.00	1.50
-10	102		865,500,033	1.00	1.50
-10	120	865,500,033	865,500,033	0.00	1.50
-10	138		865,500,034	1.00	1.50
0	102		865,500,028	1.00	1.50
0	120	865,500,029	865,500,029	0.00	1.50
0	138		865,500,030	1.00	1.50
10	102		865,500,031	1.00	1.50
10	120	865,500,032	865,500,032	0.00	1.50
10	138		865,500,033	1.00	1.50
20	102		865,500,030	1.00	1.50
20	120	865,500,031	865,500,031	0.00	1.50
20	138		865,500,032	1.00	1.50
30	102		865,500,031	1.00	1.50
30	120	865,500,030	865,500,030	0.00	1.50
30	138		865,500,031	1.00	1.50
40	102		865,500,035	1.00	1.50
40	120	865,500,036	865,500,036	0.00	1.50
40	138		865,500,035	1.00	1.50
50	102		865,500,037	1.00	1.50
50	120	865,500,038	865,500,038	0.00	1.50
50	138		865,500,037	1.00	1.50

Table 16. Frequency Stability, Part 90R, 817 – 842 MHz

Part 90 R DL-758-768 MHz and UL – 788-798 MHz					
Temp Degrees C	Voltage (AC)	Assigned Frequency (Hz)	Measured Frequency (Hz)	PPM	PPM Limit
-30	102		763,000,025	1.00	1.50
-30	120	763,000,026	763,000,026	0.00	1.50
-30	138		763,000,025	1.00	1.50
-20	102		763,000,026	1.00	1.50
-20	120	763,000,026	763,000,026	0.00	1.50
-20	138		763,000,026	1.00	1.50
-10	102		763,000,025	1.00	1.50
-10	120	763,000,025	763,000,025	0.00	1.50
-10	138		763,000,025	1.00	1.50
0	102		763,000,026	1.00	1.50
0	120	763,000,026	763,000,026	0.00	1.50
0	138		763,000,026	1.00	1.50
10	102		763,000,026	1.00	1.50
10	120	763,000,026	763,000,026	0.00	1.50
10	138		763,000,026	1.00	1.50
20	102		763,000,026	1.00	1.50
20	120	763,000,026	763,000,026	0.00	1.50
20	138		763,000,026	1.00	1.50
30	102		763,000,026	1.00	1.50
30	120	763,000,026	763,000,026	0.00	1.50
30	138		763,000,026	1.00	1.50
40	102		763,000,025	1.00	1.50
40	120	763,000,025	763,000,025	0.00	1.50
40	138		763,000,025	1.00	1.50
50	102		763,000,027	1.00	1.50
50	120	763,000,027	763,000,027	0.00	1.50
50	138		763,000,027	1.00	1.50

Table 17. Frequency Stability, Part 90R, 758 – 768 MHz and 788 – 798 MHz

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 2.1051 Spurious Emissions at Antenna Terminals

Test Requirement(s): **§ 2.1051 and 27.53(m) 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.

Test Procedures: The EUT was tested according to the unwanted emissions procedures of ANSI C63.26 7.2.2.5.3.The spectrum analyzer was used and configured in the following manner:

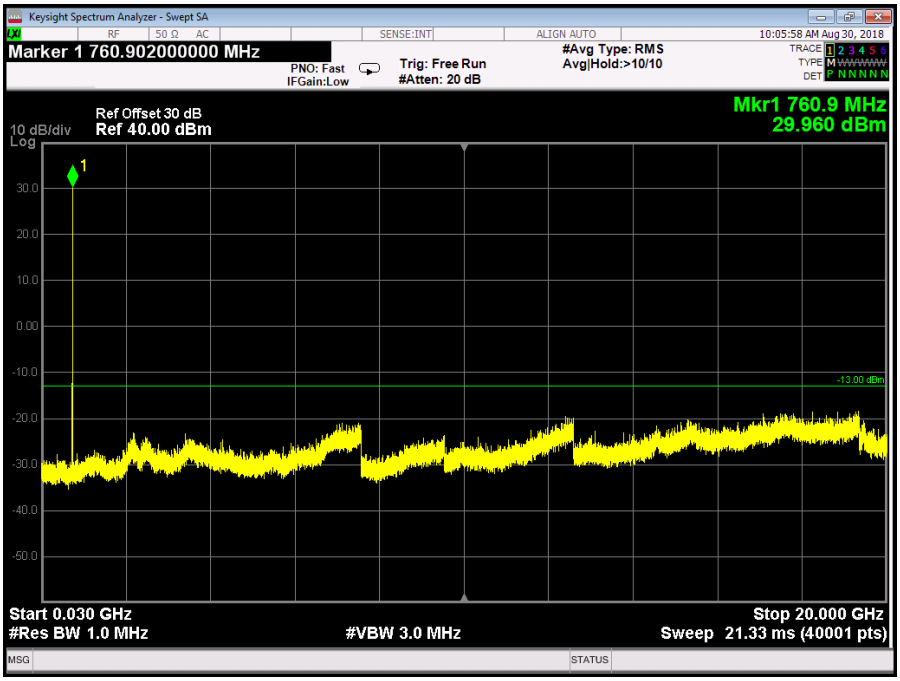
(a) Frequency Range = 30MHz – 10th Harmonic
(b) RBW = 1% of the OBW, or greater
(c) VBW 1-3 x the RBW
(d) Detector = Peak
(e) Sweet Time = Auto

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

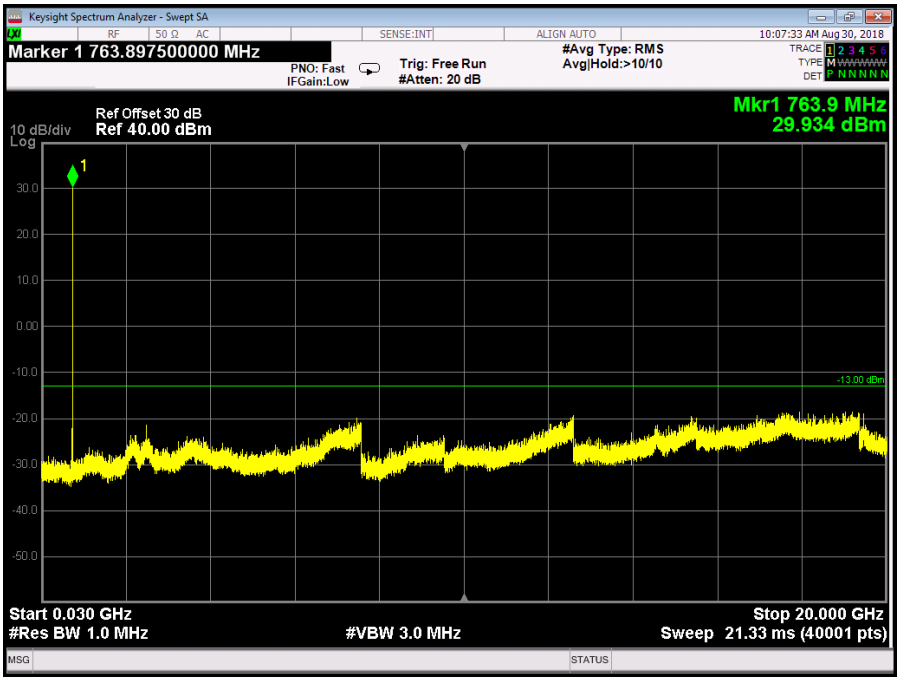
Test Engineer(s): Bradley Jones and Deepak Giri

Test Date(s): September 18, 2018

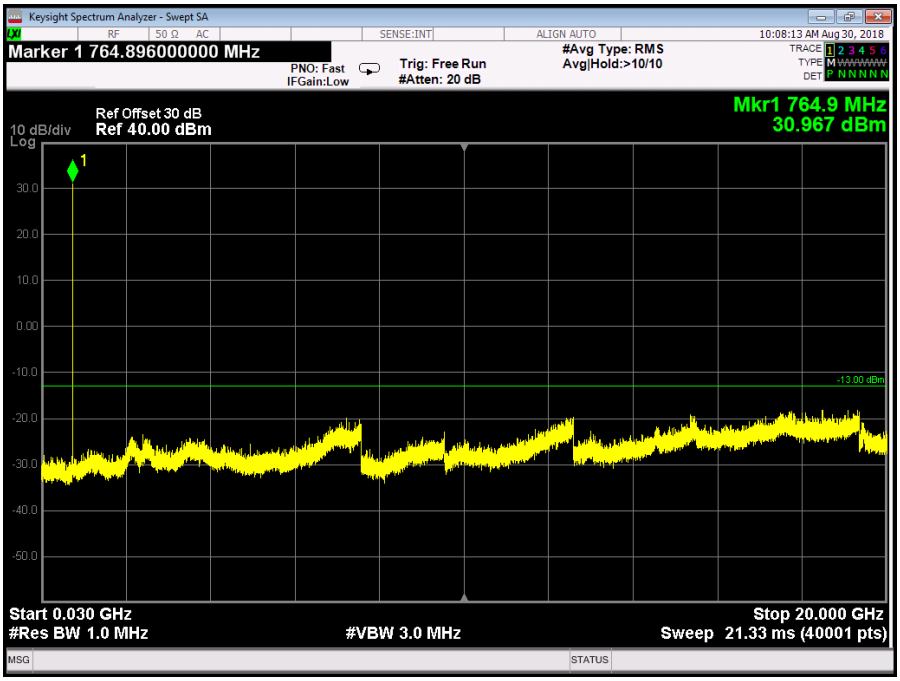
Conducted Spurious Emissions, Band 14, 758 – 768 MHz



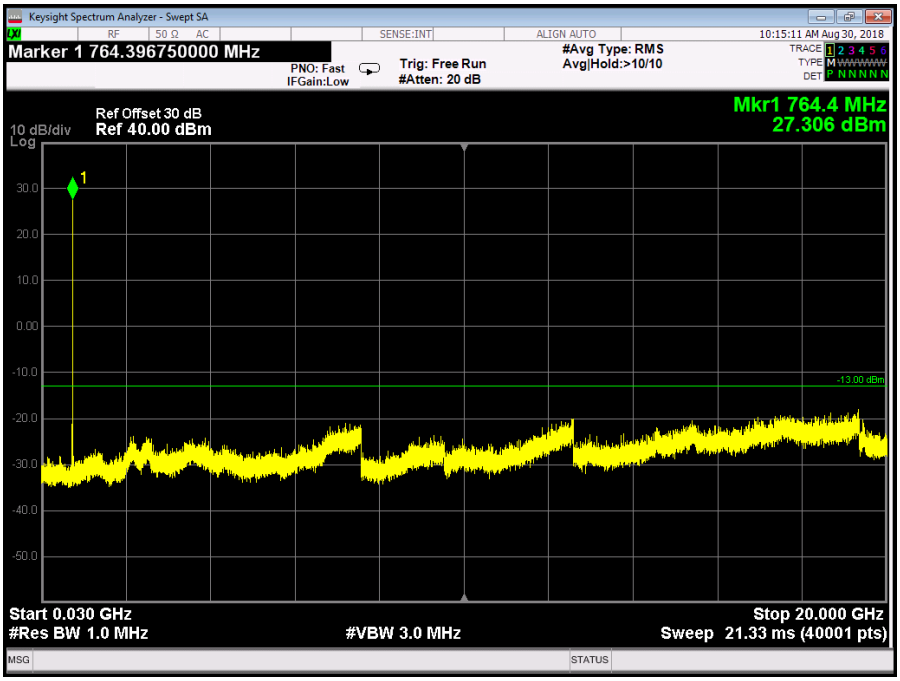
Plot 83. Spurious Emissions at Antenna Terminals, LMR750, 5 MHz, Low



Plot 84. Spurious Emissions at Antenna Terminals, LMR750, 5 MHz, Mid

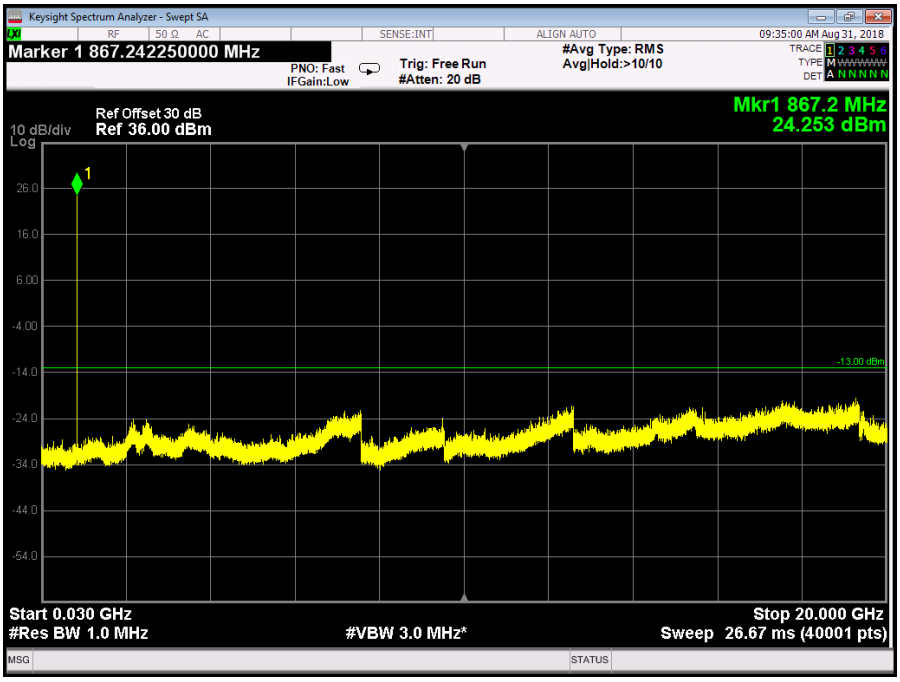


Plot 85. Spurious Emissions at Antenna Terminals, LMR750, 10 MHz, High

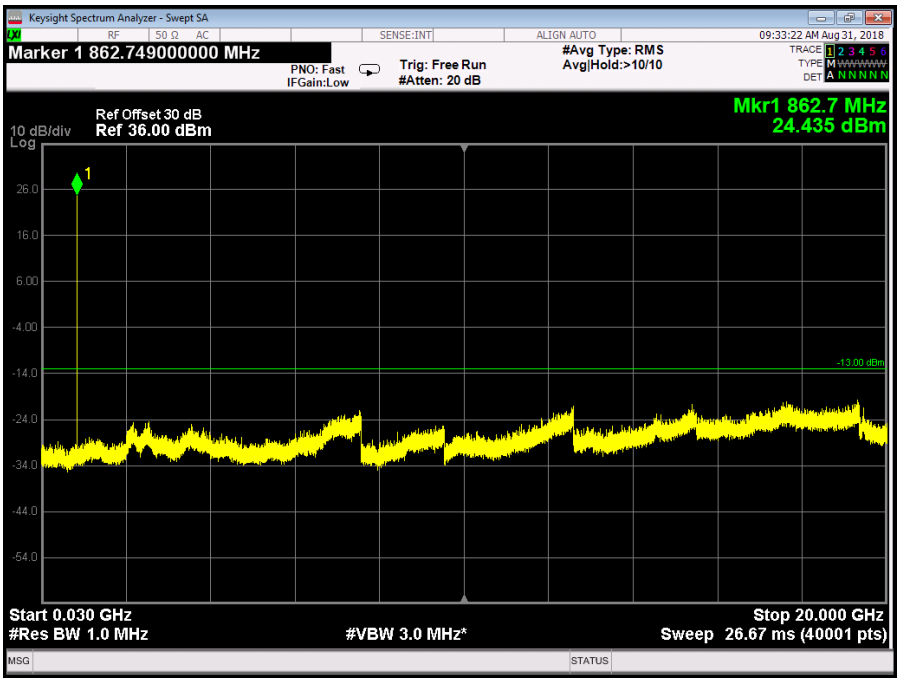


Plot 86. Spurious Emissions at Antenna Terminals, LMR750, 10 MHz, Mid

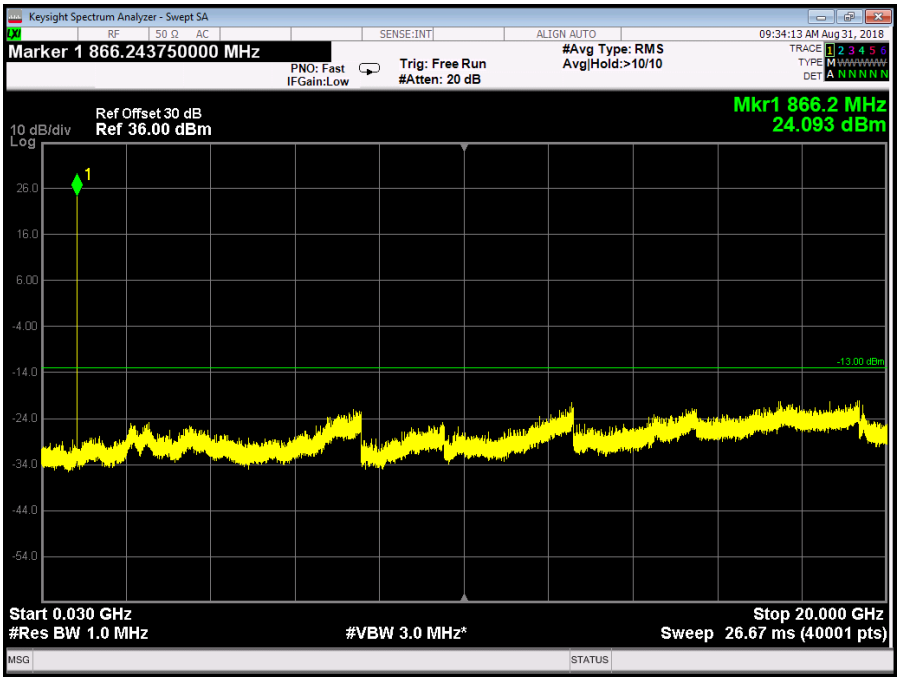
Conducted Spurious Emissions, Band 27, 862 – 869 MHz



Plot 87. Spurious Emissions at Antenna Terminals, SMR800, 5 MHz, 862 – 869 MHz, High

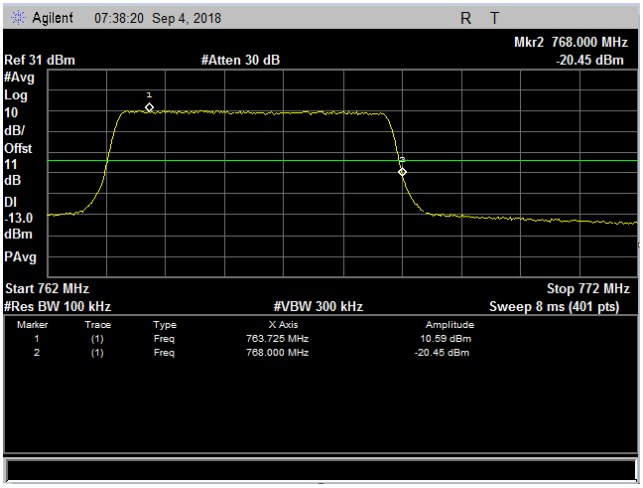


Plot 88. Spurious Emissions at Antenna Terminals, SMR800, 5 MHz, 862 – 869 MHz, Low

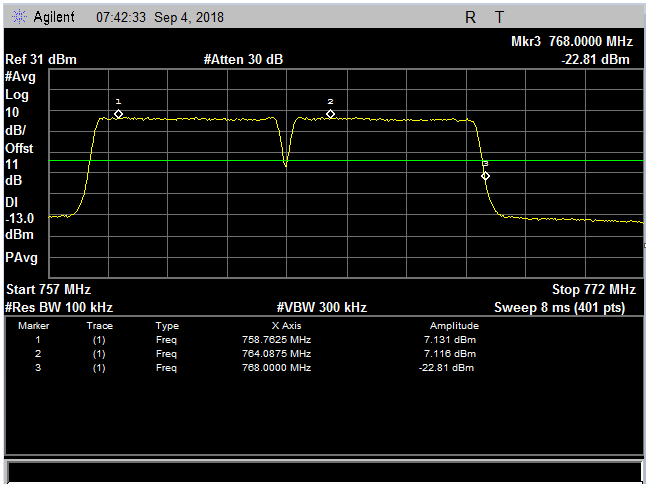


Plot 89. Spurious Emissions at Antenna Terminals, SMR800, 5 MHz, 862 – 869 MHz, Mid

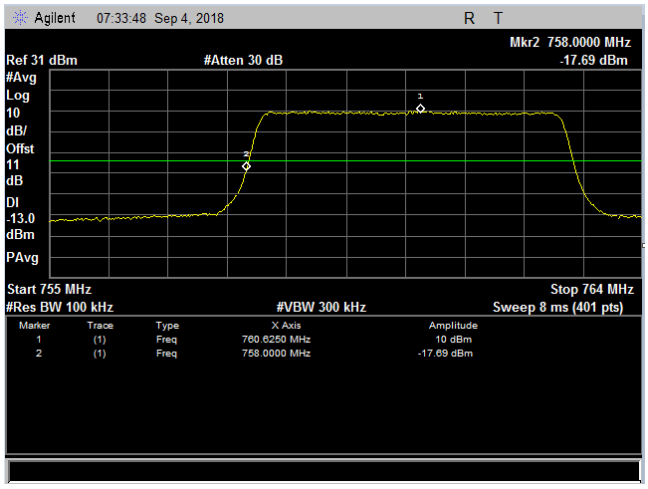
Band Edge



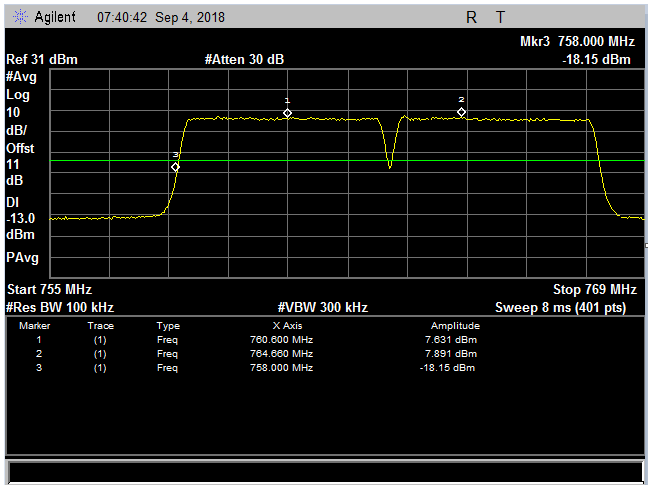
Plot 90. 5 MHz, High Channel Band Edge, One Signal, LMR 750, Band 14



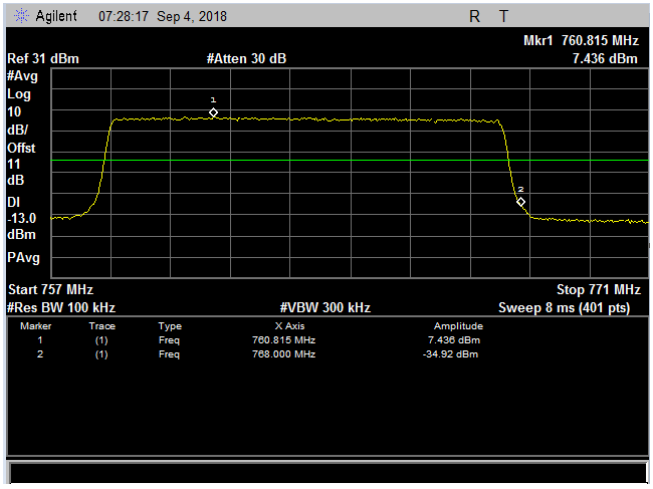
Plot 91. 5 MHz, High Channel Band Edge, Two Signal LMR 750, Band 14



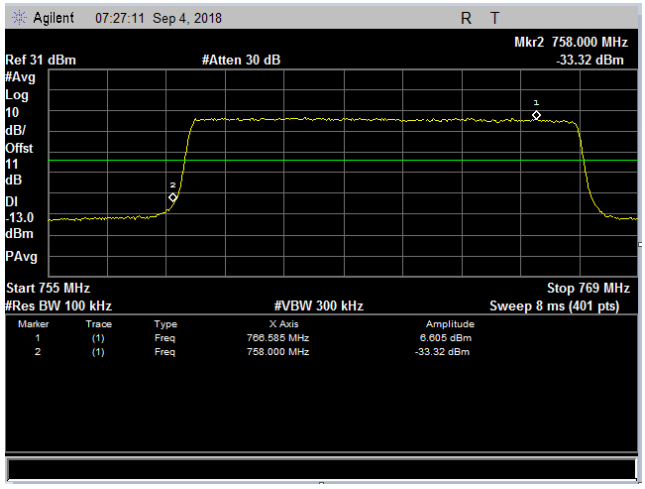
Plot 92. 5 MHz, Low Channel Band Edge, One Signal, LMR 750, Band 14



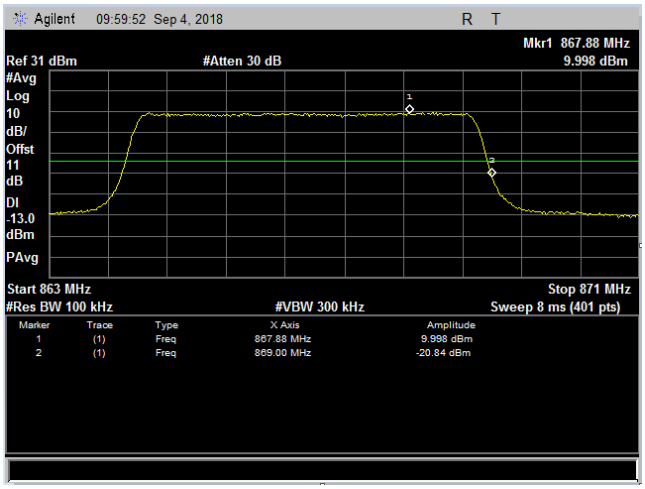
Plot 93. 5 MHz, Low Channel Band Edge, Two Signal, LMR 750, Band 14



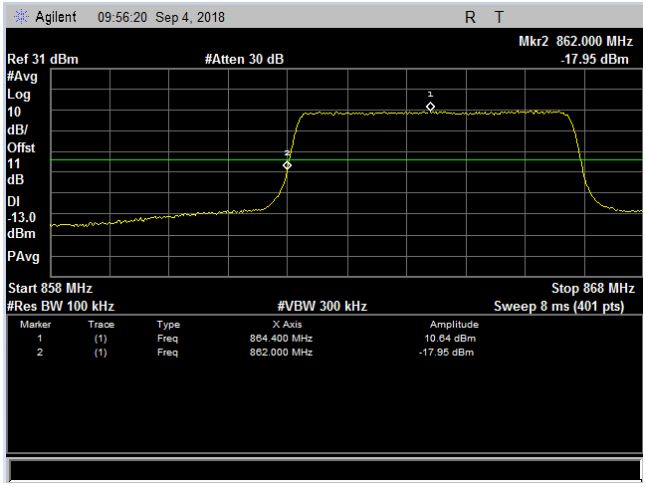
Plot 94. 10 MHz, High Channel Band Edge, One Signal, LMR 750, Band 14



Plot 95. 10 MHz, Low Channel Band Edge, One Signal, LMR 750, Band 14

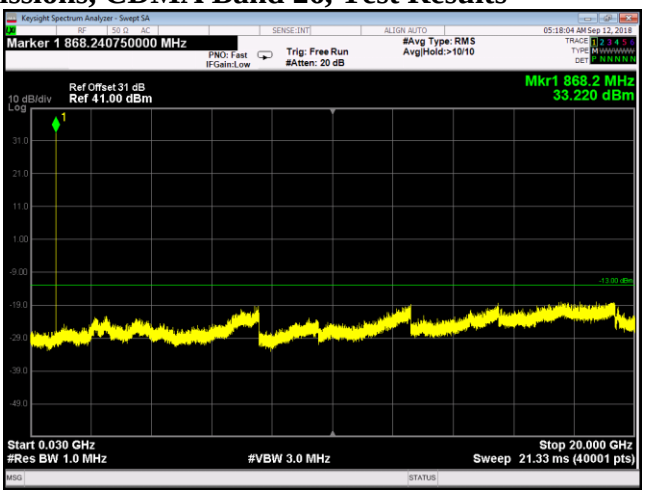


Plot 96. 5 MHz High Channel Band Edge, One Signal SMR 800_CELL 850 Band 26

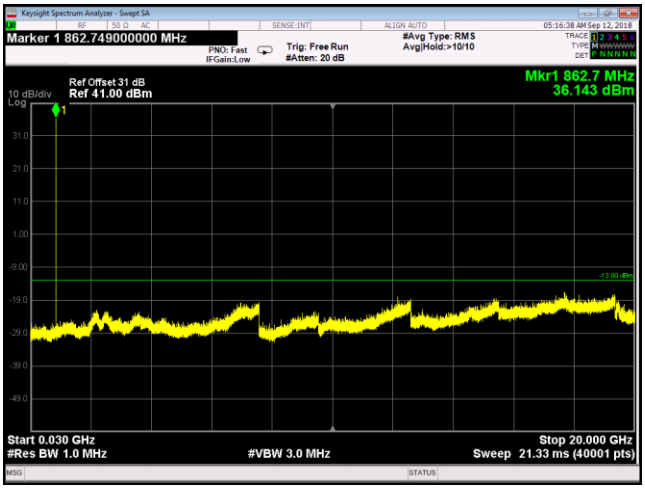


Plot 97. 5 MHz Low Channel Band Edge, One Signal, SMR 800_CELL 850 Band 26

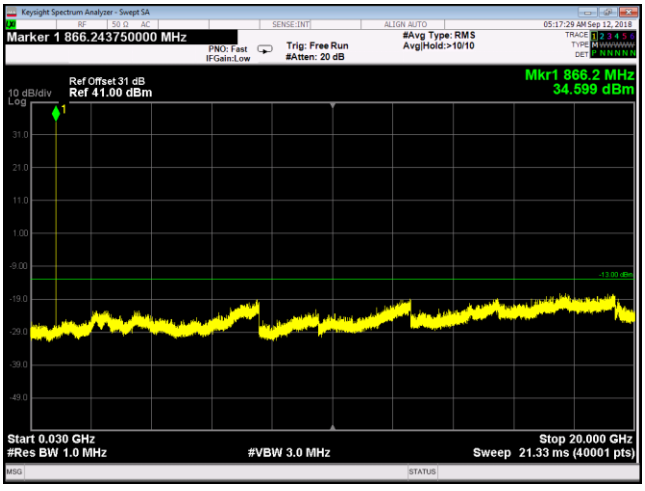
Conducted Spurious Emissions, CDMA Band 26, Test Results



Plot 98. Spurious Emissions at Antenna Terminals, CDMA800, 862 - 869 MHz, High

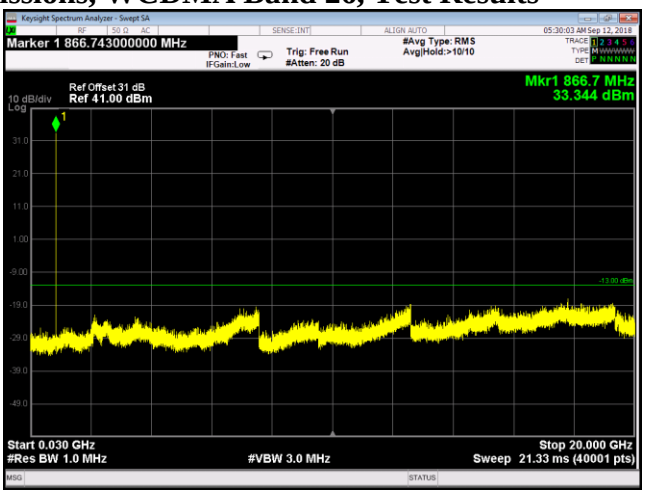


Plot 99. Spurious Emissions at Antenna Terminals, CDMA800, 862 - 869 MHz, Low

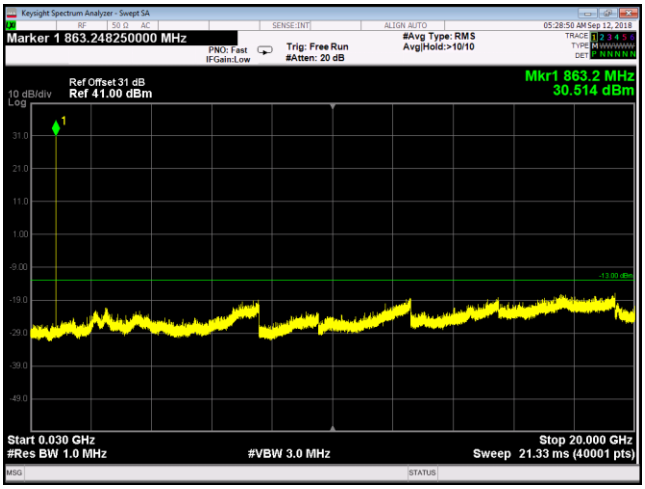


Plot 100. Spurious Emissions at Antenna Terminals, CDMA800, 862 - 869 MHz, Mid

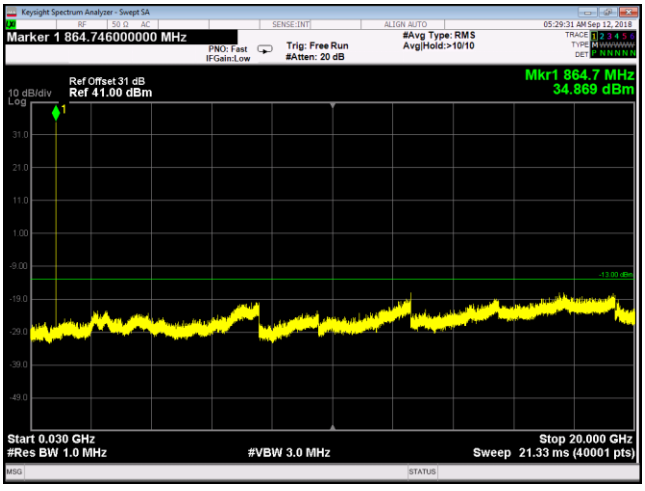
Conducted Spurious Emissions, WCDMA Band 26, Test Results



Plot 101. Spurious Emissions at Antenna Terminals, WCDMA800, 862 - 869 MHz, High

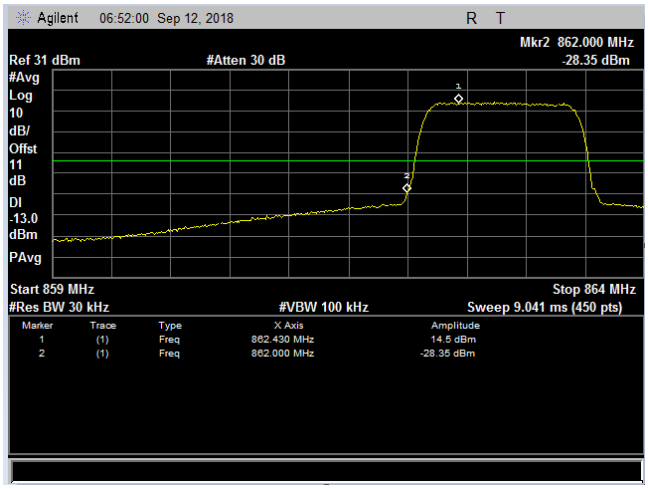


Plot 102. Spurious Emissions at Antenna Terminals, WCDMA800, 862 - 869 MHz, Low

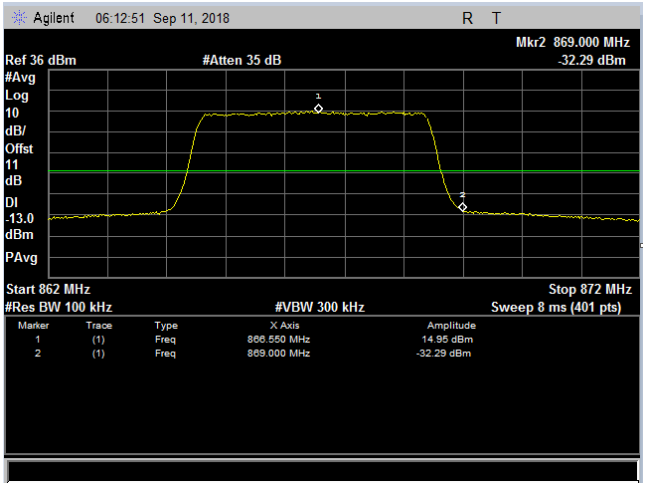


Plot 103. Spurious Emissions at Antenna Terminals, WCDMA800, 862 - 869 MHz, Mid

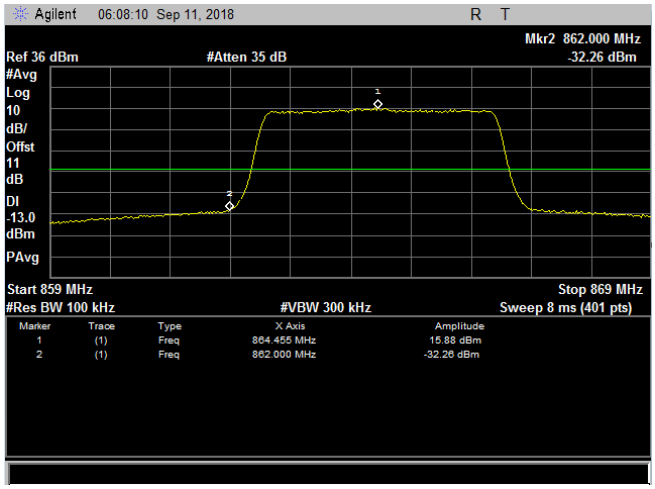
Band-Edge Channel Power, Test Results



Plot 104. Band-Edge Channel Power, SMR800, Low Channel, One Signal Band Edge



Plot 105. Band-Edge Channel Power, SMR800, High Channel, One Signal Band Edge



Plot 106. Band-Edge Channel Power, SMR800, Low Channel, One Signal Band Edge

Electromagnetic Compatibility Criteria for Intentional Radiators

7.2.2.2 ANSI C63.26 2015 Filter Response

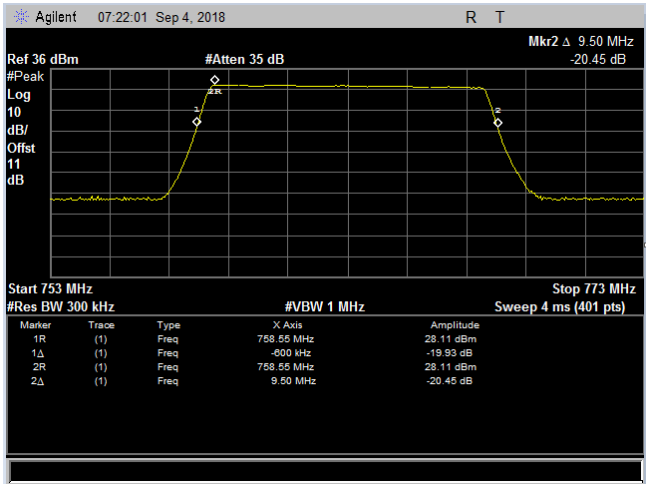
Test Procedures: Test was performed according to section 4.3 of the FCC KDB 935210 D05 v01r02 and section 7.2.2.2 of ANSI C63.26.

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

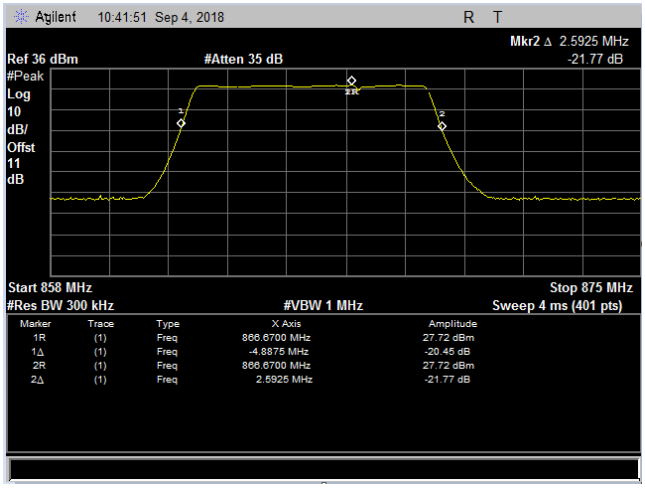
Test Engineer(s): Deepak Giri

Test Date(s): September 21, 2018

Filter Response



Plot 107. Filter Response, 758 – 768 MHz, Out of Band Rejection, LMR 750, band 14



Plot 108. Filter Response, 862 – 869 MHz, Out of Band Rejection Cell SMR 800, Band 26

Electromagnetic Compatibility Criteria for Intentional Radiators

§90.210 and 4.4 KDB 935210 D05 Emissions Mask

Test Requirement(s): ***Emission Mask B:*** For transmitters that are equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:

(1) On any frequency removed from the assigned frequency by more than 50 percent, but not more than 100 percent of the authorized bandwidth: At least 25 dB.

(2) On any frequency removed from the assigned frequency by more than 100 percent, but not more than 250 percent of the authorized bandwidth: At least 35 dB.

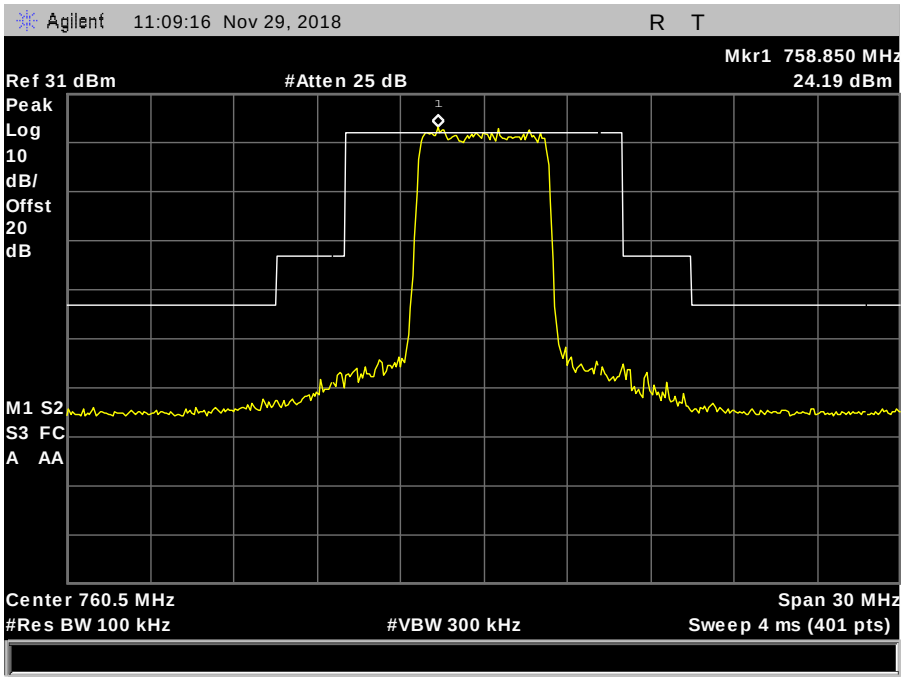
(3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43 + 10 log (P) dB.

Test Procedures: Test was performed at specified on section 4.4 of KDB 935210 D05 v01r02.

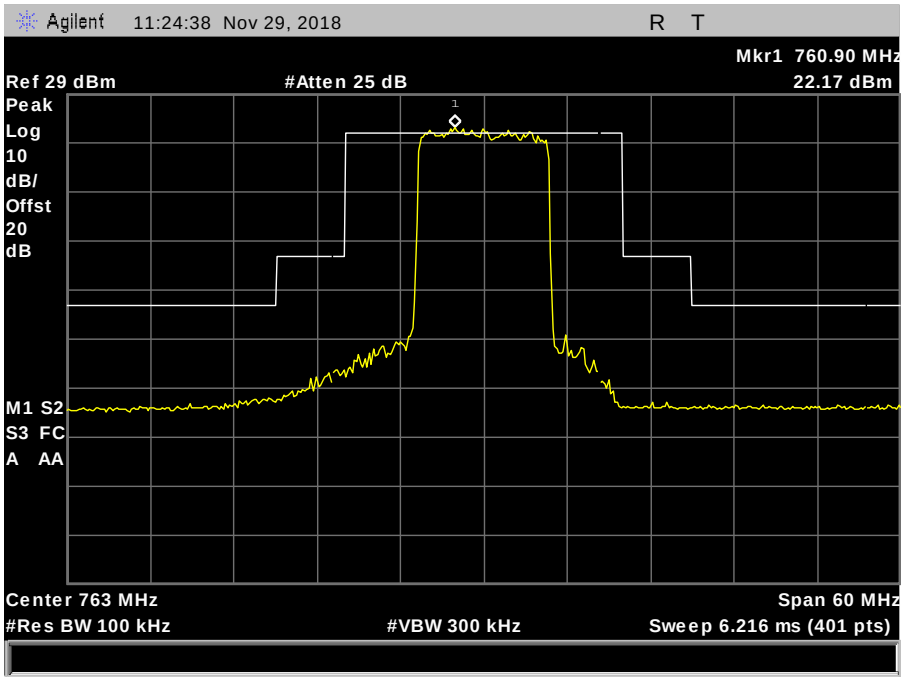
Test Results: The equipment was found compliant with the requirements of this section.

Test Engineer(s): Bradley Jones and Deepak Giri

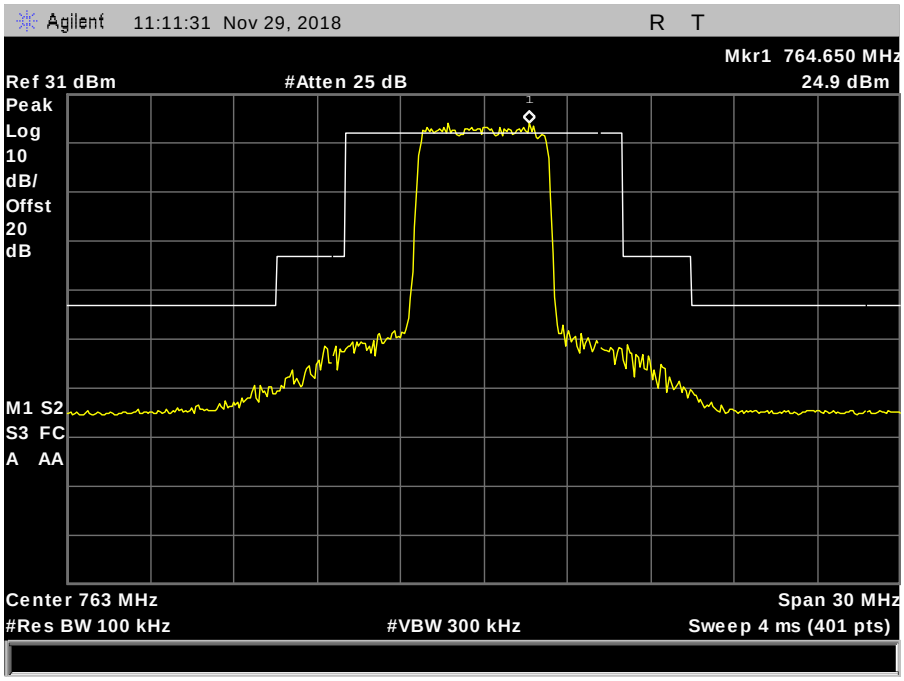
Test Date(s): November 30, 2018



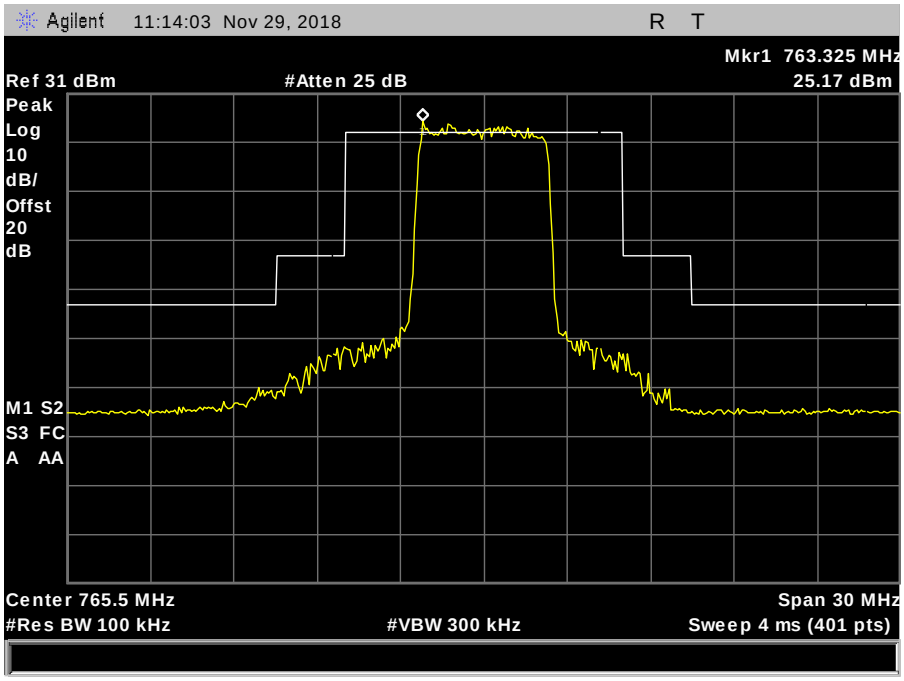
Plot 109. Emissions Mask, FCC90R, 760.5 MHz, Low Channel, 5 MHz



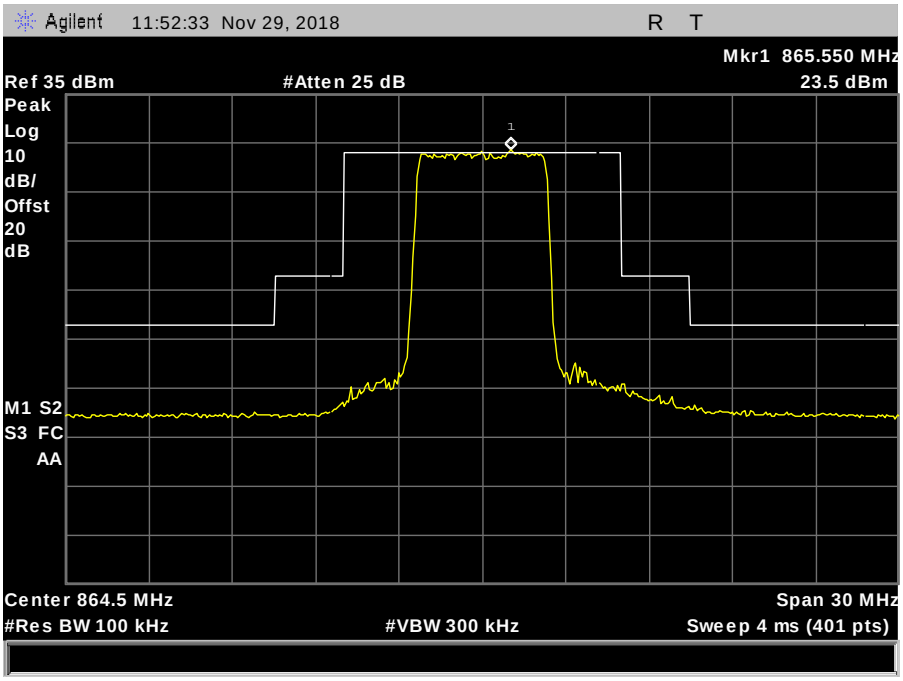
Plot 110. Emissions Mask, FCC90R, 763 MHz, Channel 10 MHz



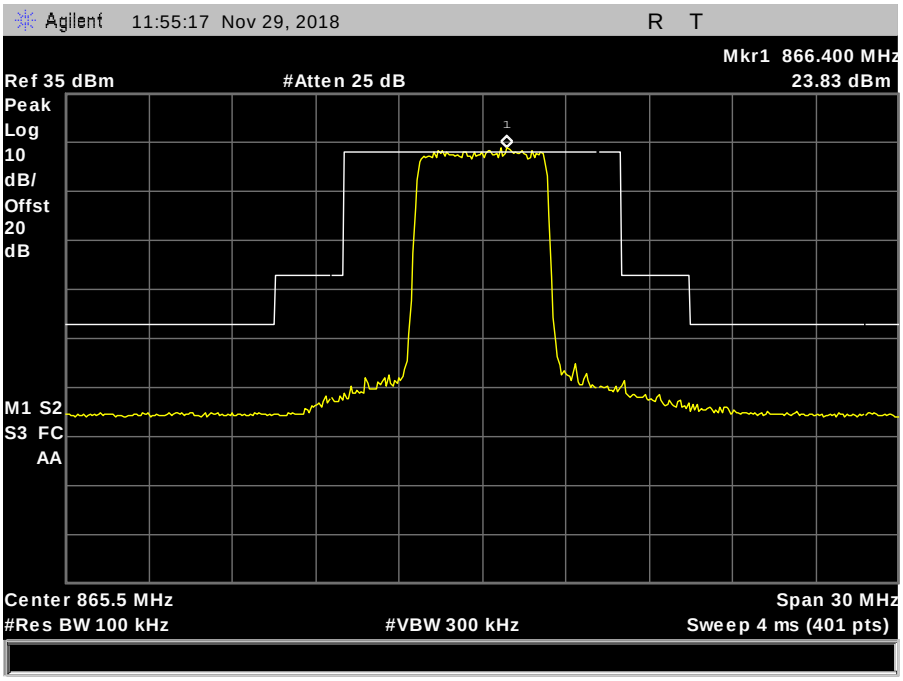
Plot 111. Emissions Mask, FCC90R, 763 MHz, Mid Channel 5 MHz



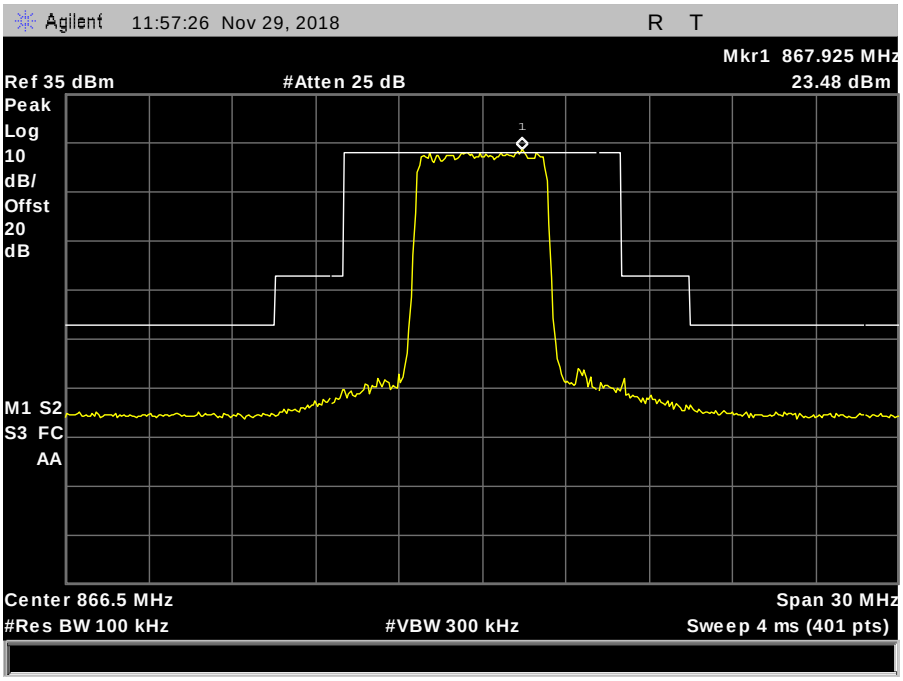
Plot 112. Emissions Mask, FCC90R, 765.5 MHz, High Channel 5 MHz



Plot 113. Emissions Mask, FCC90S, 864.5 MHz, Low Channel

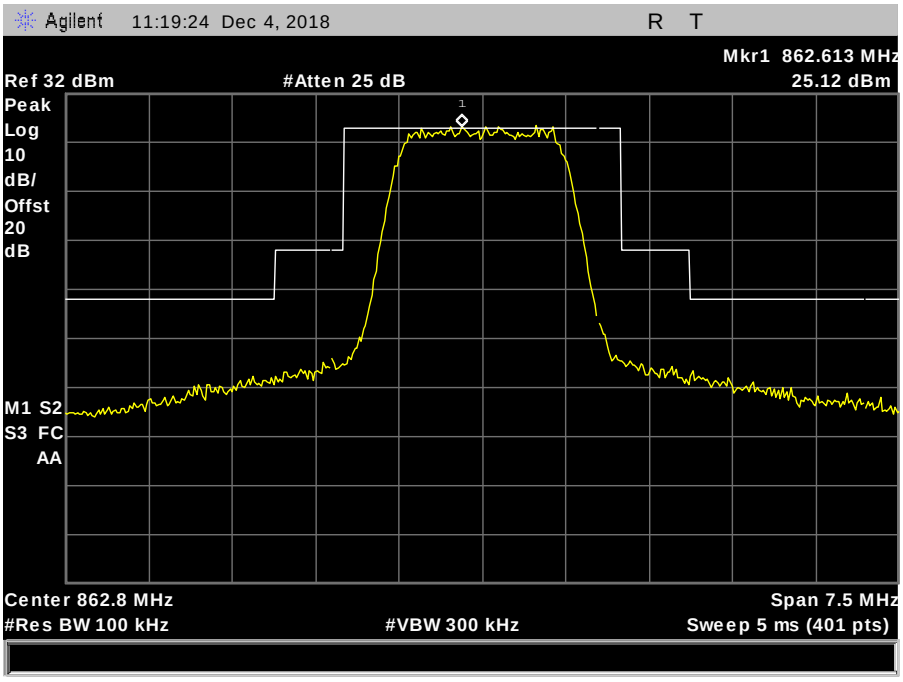


Plot 114. Emissions Mask, FCC90S, 865.5 MHz, Mid Channel

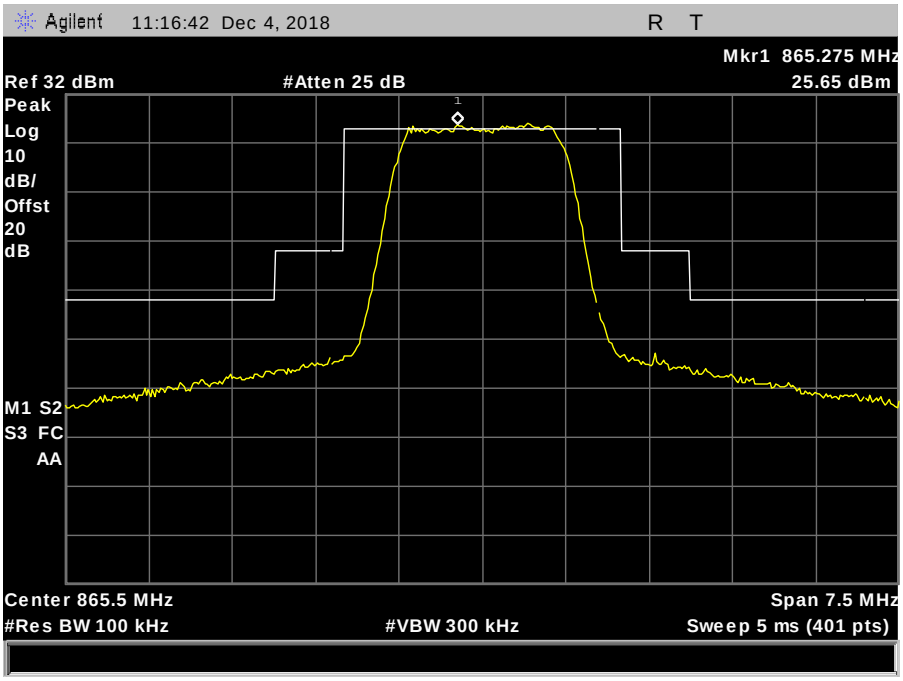


Plot 115. Emissions Mask, FCC90S, 866.5 MHz, High Channel

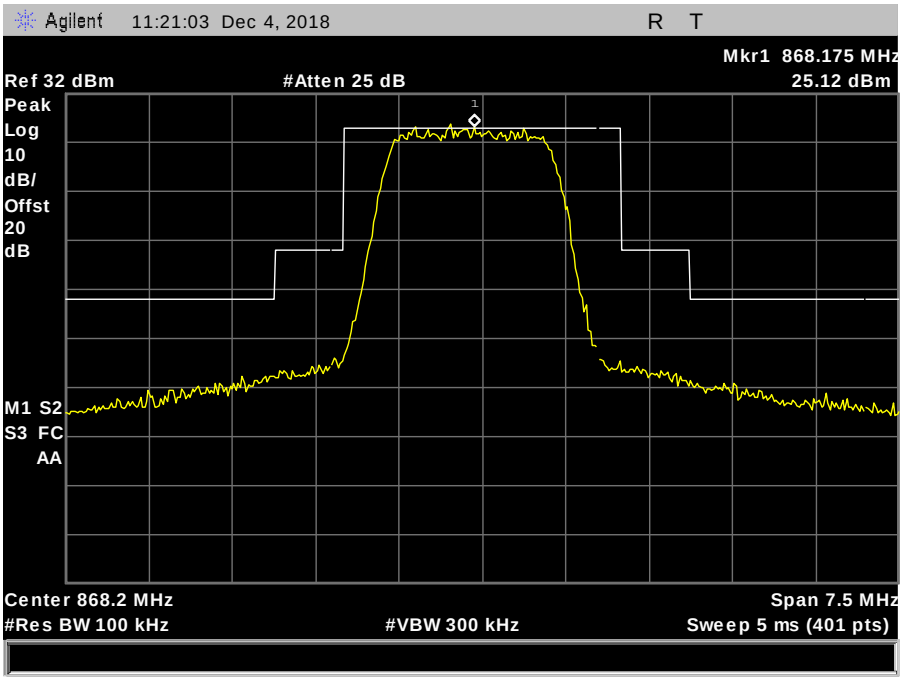
Emissions Mask for CDMA:



Plot 116. Emissions Mask, FCC90S, 862.8 MHz, Low Channel CDMA

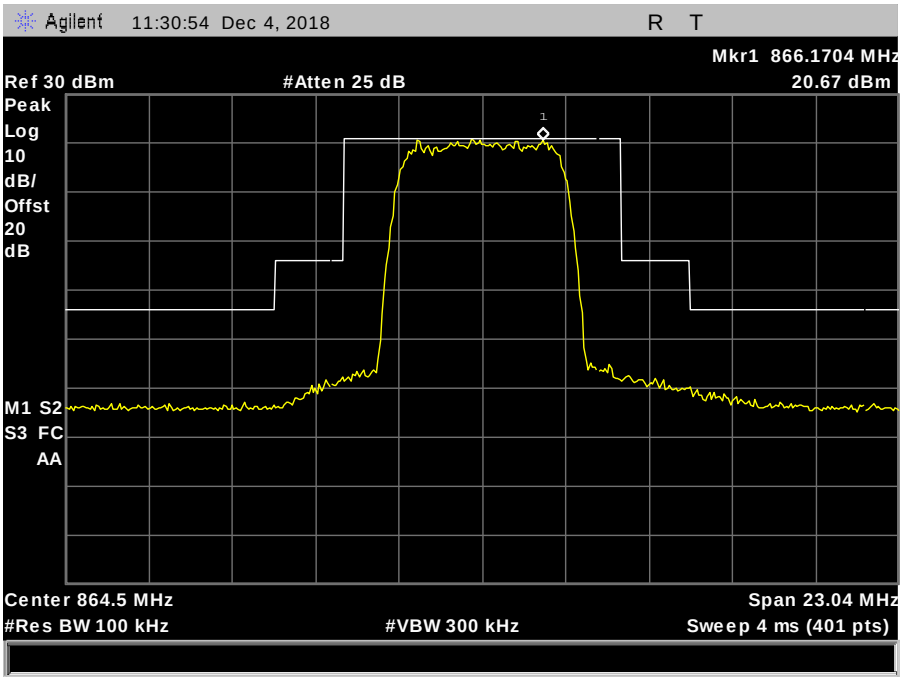


Plot 117. Emissions Mask, FCC90S, 865.5 MHz, Mid Channel CDMA

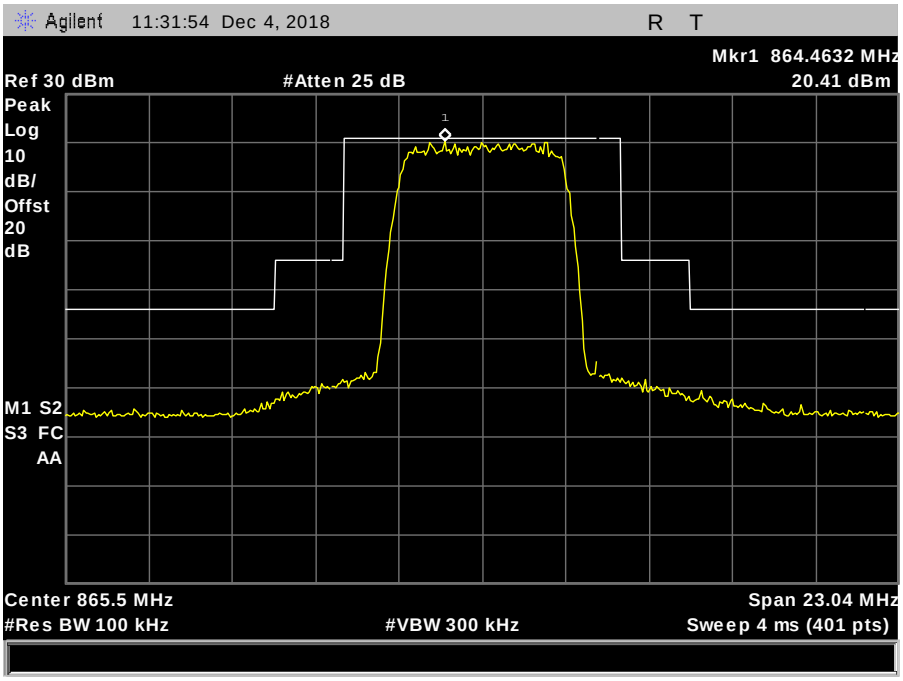


Plot 118. Emissions Mask, FCC90S, 868.25 MHz, High Channel CDMA

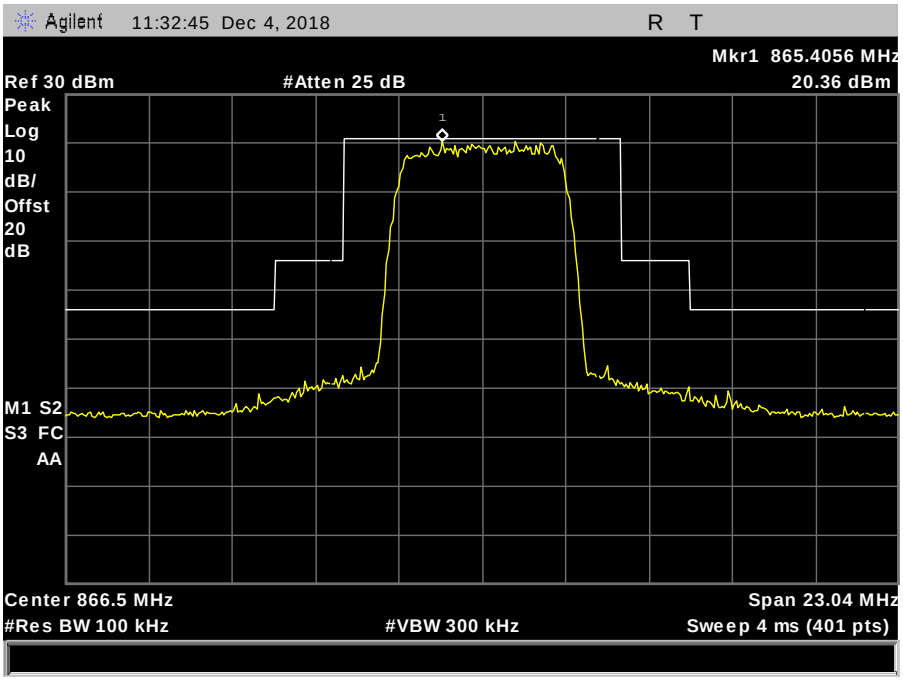
Emissions Mask for WCDMA:



Plot 119. Emissions Mask, FCC90S, 864.5 MHz, Low Channel WCDMA



Plot 120. Emissions Mask, FCC90S, 865.5 MHz, Mid Channel WCDMA



Plot 121. Emissions Mask, FCC90S, 866.5 MHz, High Channel WCDMA

Electromagnetic Compatibility Criteria for Intentional Radiators

§90.219 Noise Figure

Test Requirement(s): **90.219 (e2)** The noise figure of a signal booster must not exceed 9 dB in either direction.

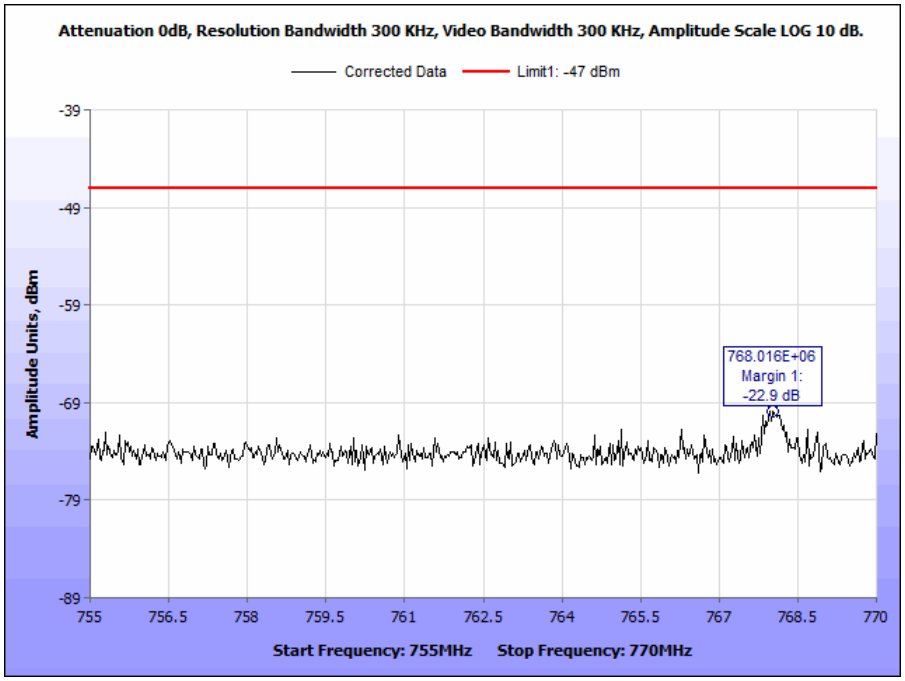
Section V KDB 935210 D02v04r01 For the remote unit of a conventional fiber-connected host/remote DAS booster system, it is acceptable to submit compliance information and test data consistent with Section 90.219(d)(6)(ii) (i.e., ERP of noise ≤ −43 dBm in 10 kHz RBW) for the downlink path only, in place of Section 90.219(e)(2) noise figure test data (i.e., NF ≤ 9 dB for both UL and DL). Test reports must provide explicit details about the instrumentation and test procedure used for Section 90.219(d)(6)(ii) testing.

Test Procedures: Test was performed in accordance with section 4.6 of FCC KDB 935210.

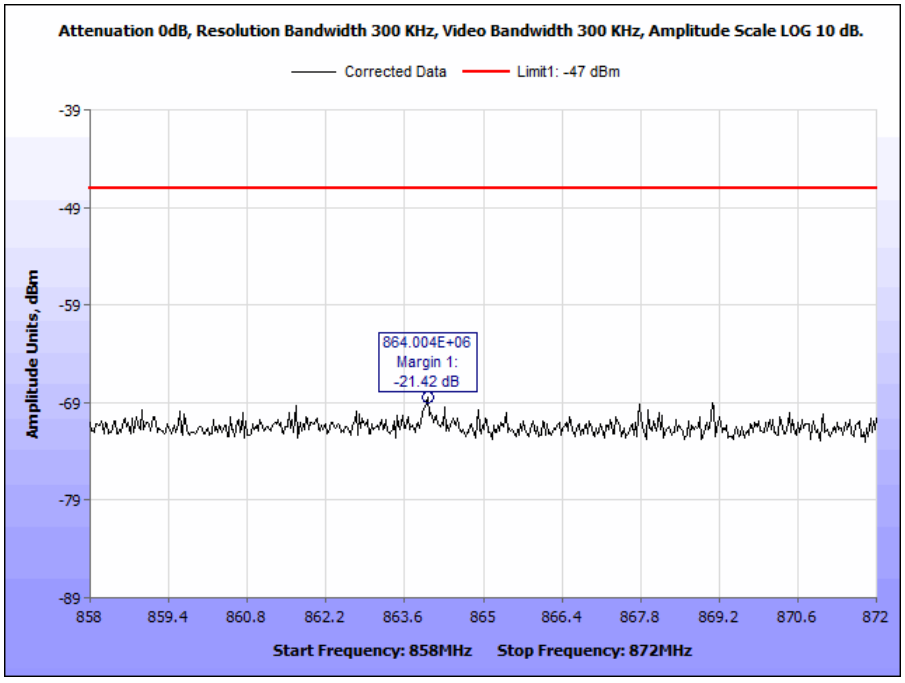
Test Results: The equipment was found compliant with the requirements of this section.

Test Engineer(s): Bradley Jones and Deepak Giri

Test Date(s): November 30, 2018



Plot 122. Noise Figure, ERP, FCC90R, 758 - 768 MHz



Plot 123. Noise Figure, ERP, FCC90S, 862 - 869 MHz

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
2T5801	High Temperature Chamber (T8)	Tenney	TFO-28	08/27/2018	08/27/2019

Table 18. Test Equipment List

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

V. Certification & User's Manual Information

Certification & User's Manual Information

A. Certification Information

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

§ 2.801 Radio-frequency device defined.

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

(a) The various types of radio communication transmitting devices described throughout this chapter.

(b) The incidental, unintentional and intentional radiators defined in Part 15 of this chapter.

(c) The industrial, scientific, and medical equipment described in Part 18 of this chapter.

(d) Any part or component thereof which in use emits radio-frequency energy by radiation, conduction, or other means.

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

(a) Except as provided elsewhere in this chapter, no person shall sell or lease, or offer for sale or lease (including advertising for sale or lease), or import, ship or distribute for the purpose of selling or leasing or offering for sale or lease, any radio frequency device unless:

(1) In the case of a device subject to certification, such device has been authorized by the Commission in accordance with the rules in this chapter and is properly identified and labeled as required by §2.925 and other relevant sections in this chapter; or

(2) In the case of a device that is not required to have a grant of equipment authorization issued by the Commission, but which must comply with the specified technical standards prior to use, such device also complies with all applicable administrative (including verification of the equipment or authorization under a Declaration of Conformity, where required), technical, labeling and identification requirements specified in this chapter.

(d) Notwithstanding the provisions of paragraph (a) of this section, the offer for sale solely to business, commercial, industrial, scientific or medical users (but not an offer for sale to other parties or to end users located in a residential environment) of a radio frequency device that is in the conceptual, developmental, design or pre-production stage is permitted prior to equipment authorization or, for devices not subject to the equipment authorization requirements, prior to a determination of compliance with the applicable technical requirements *provided* that the prospective buyer is advised in writing at the time of the offer for sale that the equipment is subject to the FCC rules and that the equipment will comply with the appropriate rules before delivery to the buyer or to centers of distribution.

(e)(1) Notwithstanding the provisions of paragraph (a) of this section, prior to equipment authorization or determination of compliance with the applicable technical requirements any radio frequency device may be operated, but not marketed, for the following purposes and under the following conditions:

(i) Compliance testing;

(ii) Demonstrations at a trade show provided the notice contained in paragraph (c) of this section is displayed in a conspicuous location on, or immediately adjacent to, the device;

(iii) Demonstrations at an exhibition conducted at a business, commercial, industrial, scientific or medical location, but excluding locations in a residential environment, provided the notice contained in paragraphs (c) or (d) of this section, as appropriate, is displayed in a conspicuous location on, or immediately adjacent to, the device;

(iv) Evaluation of product performance and determination of customer acceptability, provided such operation takes place at the manufacturer's facilities during developmental, design or pre-production states; or

(v) Evaluation of product performance and determination of customer acceptability where customer acceptability of a radio frequency device cannot be determined at the manufacturer's facilities because of size or unique capability of the device, provided the device is operated at a business, commercial, industrial, scientific or medical user's site, but not at a residential site, during the development, design or pre-production stages.

(e)(2) For the purpose of paragraphs (e)(1)(iv) and (e)(1)(v) of this section, the term *manufacturer's facilities* includes the facilities of the party responsible for compliance with the regulations and the manufacturer's premises, as well as the facilities of other entities working under the authorization of the responsible party in connection with the development and manufacture, but not the marketing, of the equipment.

(f) For radio frequency devices subject to verification and sold solely to business, commercial, industrial, scientific and medical users (excluding products sold to other parties or for operation in a residential environment), parties responsible for verification of the devices shall have the option of ensuring compliance with the applicable technical specifications of this chapter at each end user's location after installation, provided that the purchase or lease agreement includes a proviso that such a determination of compliance be made and is the responsibility of the party responsible for verification of the equipment.

Certification & User's Manual Information

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

§ 2.901 Basis and Purpose

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

(b) The following sections describe the verification procedure, the procedure for a Declaration of Conformity, and the procedures to be followed in obtaining certification from the Commission and the conditions attendant to such a grant.

§ 2.907 Certification.

(a) Certification is an equipment authorization issued by the Commission, based on representation and test data submitted by the applicant.

(b) Certification attaches to all units subsequently marketed by the grantee which are identical (see Section 2.908) to the sample tested except for permissive changes or other variations authorized by the Commission pursuant to Section 2.1043.

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

Certification & User's Manual Information

§ 2.948 Description of measurement facilities.

(a) Each party making measurements of equipment that is subject to an equipment authorization under Part 15 or Part 18 of this chapter, regardless of whether the measurements are filed with the Commission or kept on file by the party responsible for compliance of equipment marketed within the U.S. or its possessions, shall compile a description of the measurement facilities employed.

(1) If the measured equipment is subject to the verification procedure, the description of the measurement facilities shall be retained by the party responsible for verification of the equipment.

(i) If the equipment is verified through measurements performed by an independent laboratory, it is acceptable for the party responsible for verification of the equipment to rely upon the description of the measurement facilities retained by or placed on file with the Commission by that laboratory. In this situation, the party responsible for the verification of the equipment is not required to retain a duplicate copy of the description of the measurement facilities.

(ii) If the equipment is verified based on measurements performed at the installation site of the equipment, no specific site calibration data is required. It is acceptable to retain the description of the measurement facilities at the site at which the measurements were performed.

(2) If the equipment is to be authorized by the Commission under the certification procedure, the description of the measurement facilities shall be filed with the Commission's Laboratory in Columbia, Maryland. The data describing the measurement facilities need only be filed once but must be updated as changes are made to the measurement facilities or as otherwise described in this section. At least every three years, the organization responsible for filing the data with the Commission shall certify that the data on file is current.

Certification & User's Manual Information

1. Label and User's Manual Information

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

§ 15.19 Labeling requirements.

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

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

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

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

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

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

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

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

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

§ 15.21 Information to user.

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

Verification & User's Manual Information

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

§ 15.105 Information to the user.

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

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

– Reorient or relocate the receiving antenna.

– Increase the separation between the equipment and receiver.

– Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

– Consult the dealer or an experienced radio/TV technician for help.

End of Report

