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
33439 WESTERN AVENUE • UNION CITY, CALIFORNIA 94587 • PHONE (510) 489-6300 • FAX (510) 489-6372
3162 BELICK STREET • SANTA CLARA, CA 95054 • PHONE (408) 748-3585 • FAX (510) 489-6372
13501 MCCALLEN PASS • AUSTIN, TEXAS 78753 • PHONE (512) 287-2500 • FAX (512) 287-2513

December 19, 2017

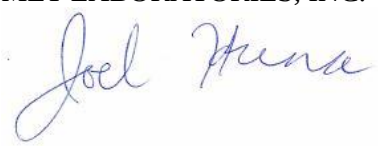
Weir Group Management Services
1 West Regent Street
Glasgow, Scotland G2 1RW

Dear Wayne Cooke,

Enclosed is the EMC Wireless test report for compliance testing of the Weir Group Management Services, Weir Industrial Gateway as tested to the requirements of the FCC Certification rules under Title 47 of the CFR Part 27 Subpart L for Broadband Radio Service (BRS) 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: (\Weir Group Management Services\EMC92659B-FCC27 Rev. 1)

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Electromagnetic Compatibility Criteria
Test Report

for the

Weir Group Management Services
Model Weir Industrial Gateway

Tested under
FCC Certification Rules
Title 47 of the CFR, Part 27 Subpart L

MET Report: EMC92659B-FCC27 Rev. 1

December 19, 2017

Prepared For:

Weir Group Management Services
1 West Regent Street
Glasgow, Scotland G2 1RW

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

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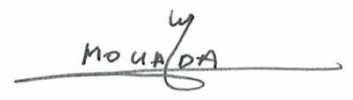

Djed Mouada, Project Engineer
Electromagnetic Compatibility Lab

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 27 L of the FCC Rules under normal use and maintenance.

John Mason,
Director, Electromagnetic Compatibility Lab

Report Status Sheet

Revision	Report Date	Reason for Revision
∅	November 29, 2017	Initial Issue.
1	December 19, 2017	Customer Name/Address Update.

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List of Tables

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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 Weir Group Management Services Weir Industrial Gateway, with the requirements of Part 27. 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 Weir Industrial Gateway. Weir Group Management Services should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the Weir Industrial Gateway, 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 27, in accordance with Weir Group Management Services, purchase order number T10536863.

Reference	Description	Compliance
§2.1046; §27.50(h)	RF Power Output	Compliant
§2.1047	Modulation Characteristics	Not Applicable
§2.1049	Occupied Bandwidth	Compliant
§27.53	Emissions in GPS Bands	Not Applicable – EUT does not operate in the 700-800 MHz bands.
§2.1051; §27.53(m)	Spurious Emissions at Antenna Terminals	Compliant
§2.1053	Radiated Spurious Emissions	Compliant
§24.323 (d)	Peak to Average Ratio	Compliant
§2.1055	Frequency Stability	Compliant

Table 1. Executive Summary of EMC ComplianceTesting

II. Equipment Configuration

A. Overview

MET Laboratories, Inc. was contracted by Weir Group Management Services to perform testing on the Weir Industrial Gateway, under Weir Group Management Services's purchase order number T10536863.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Weir Group Management Services, Weir Industrial Gateway.

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

Model(s) Tested:	Weir Industrial Gateway				
Model(s) Covered:	Weir Industrial Gateway				
EUT Specifications:	Primary Power: 120/240 VAC 50/60 Hz				
	FCC ID: 2ANXR-STXMPM				
	Equipment Code:	PCB			
	RF Output Power: Watts				
		LTE Band 4	**LTE Band 12**	**LTE Band 13**	**LTE Band 17**
	1.4MHz BW	0.893	0.392	-	-
	3MHz BW	1.009	0.369	-	-
	5MHz BW	0.902	0.357	0.498	0.4
	10MHz BW	0.942	0.366	0.497	0.406
	15MHz BW	0.897	-	-	-
	20MHz BW	0.962	-	-	-
	EUT Frequency Range:	1711.5 - 1753.5	699.7 - 715.5	777 - 787	706.5 – 713.5
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:	Djed Mouada				
Date(s):	December 19, 2017				

Table 2. EUT Summary Table

B. References

CFR 47, Part 27	Federal Communication Commission, Code of Federal Regulations, Title 47, Part 27: Rules and Regulations for Advanced Wireless 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
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-A-2010	Land Mobile FM or PM Communication Equipment Measurement and Performance Standards

Table 3. Standard References

C. Test Site

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

Radiated Emissions measurements were performed in a 3 meter semi-anechoic chamber (equivalent to an Open Area Test Site).

D. Description of Test Sample

The Weir Group Management Services Weir Industrial Gateway, Equipment Under Test (EUT), is used to monitor the operation of the components of a drilling rig, in particular the sound and vibration from the bearings in the system. This is monitored through digital signal processing to determine if the bearing is nearing the end of its life and needs to be replaced.

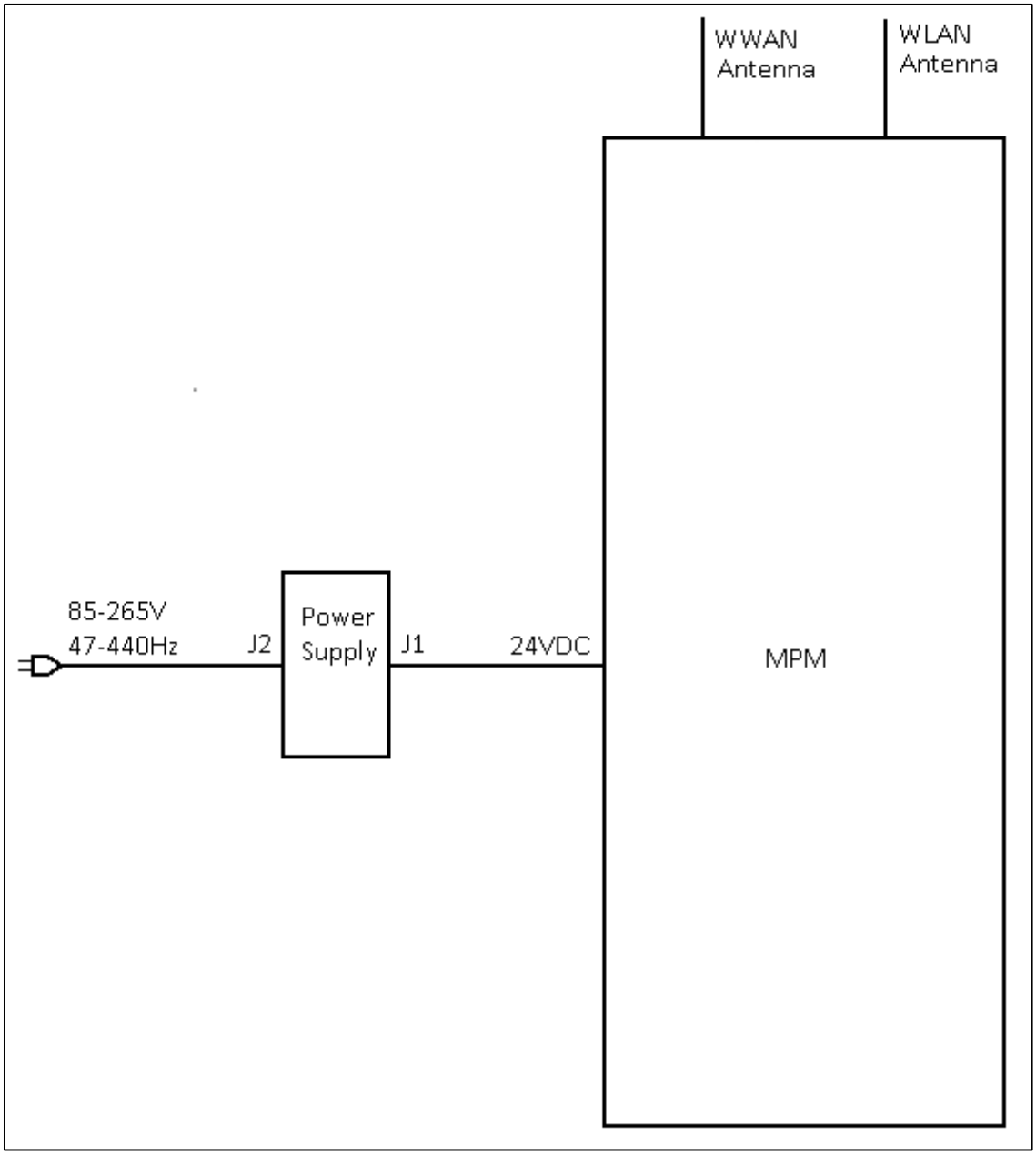


Figure 1. Block Diagram of Equipment Configuration

E. Equipment Configuration

Ref. ID	Name / Description	Model Number	Serial Number	Rev. #
A	Power Supply	CH-SAN500AC-24	161103	01
B	MPM	North America: STX-000004	006	01
P	Antenna	MY-0W4VW8-74431-5CM-0668-A00	N/A	N/A

Table 4. Equipment Configuration

F. Support Equipment

Ref. ID	Name / Description	Manufacturer	Model Number	*Customer Supplied Calibration Data
E	Ethernet Switch	Netgear	N300	N/A
F	External Laptop	Dell	Latitude E5570	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 5. Support Equipment

G. 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	AC Input	3 conductor, bare wires at AC Mains end, 14 AWG	1	10	50	No	Power Box.J2
2	24VDC	4 conductor, 14 AWG	1	2	50	No	Power Box.J1
9	LAN	8 conductor, 20 AWG	1	5	50	Yes	Ethernet switch
33	MPM	Antenna cable, 1 conductor, coax, CA120/195-XC	1	10	10	Yes	Antenna

Table 6. Ports and Cabling Information

H. Mode of Operation

Custom software (WinEMI) will exercise all ports and send the system performance to a WiFi link to be monitored by an external laptop.

I. Method of Monitoring EUT Operation

An external laptop with a WiFi link will monitor the system and display the system performance.

J. Modifications

a) Modifications to EUT

No modifications were made to the EUT.

b) Modifications to Test Standard

No modifications were made to the test standard.

K. Disposition of EUT

The test sample including all support equipment submitted to the Electro-Magnetic Compatibility Lab for testing was returned to Weir Group Management Services upon completion of testing.

III. Electromagnetic Compatibility Criteria for Intentional Radiators

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 2.1046 RF Power Output

Test Requirement(s): **§ 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.

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: Equipment complies with 47CFR 2.1046 and 27.50(h). The following page show measurements of RF Power output which is recorded below:

Test Engineer(s): Djed Mouada

Test Date(s): May 1, 2017

Band	Channel Bandwidth (MHz)	Channel #	Frequency (MHz)	Average Power (dBm)	Antenna Gain (dBi)	Antenna Gain(dBi) 2	Antenna Gain (dBi)3	EIRP / ERP 1 (W)	EIRP / ERP 2 (W)	EIRP / ERP 3 (W)	Limit (W)	Rule Part	Band Edges
4	1.4	20050	1720	19.51	4		10	0.224		0.893	1	27	
		20175	1732.5	19.26	4		10	0.212		0.843	1		
		20300	1745	19.26	4		10	0.212		0.843	1		
	3	19965	1711.5	20.04	4		10	0.254		1.009	1		
		20175	1732.5	19.29	4		10	0.213		0.849	1		
		20385	1753.5	19.63	4		10	0.231		0.918	1		
	5	19975	1712.5	19.55	4		10	0.226		0.902	1		1710
		20175	1732.5	19.35	4		10	0.216		0.861	1		
		20375	1752.5	19.05	4		10	0.202		0.804	1		1755
	10	20000	1715	19.74	4		10	0.237		0.942	1		
		20175	1732.5	19.74	4		10	0.237		0.942	1		
		20350	1750	19.31	4		10	0.214		0.853	1		L
	15	20025	1717.5	19.46	4		10	0.222		0.883	1		
		20175	1732.5	19.53	4		10	0.225		0.897	1		
		20325	1747.5	19.25	4		10	0.211		0.841	1		
	20	20050	1720	19.83	4		10	0.242		0.962	1		
		20175	1732.5	19.4	4		10	0.219		0.871	1		
		20300	1745	19.09	4		10	0.204		0.811	1		
12	1.4	23017	699.7	20.07	4	8		0.156	0.391		30	27	
		23095	707.5	20.08	4	8		0.156	0.392		30		
		23173	715.3	19.96	4	8		0.152	0.381		30		
	3	23025	700.5	19.7	4	8		0.143	0.359		30		
		23095	707.5	19.53	4	8		0.137	0.345		30		699
		23165	714.5	19.82	4	8		0.147	0.369		30		716
	5	23035	701.5	19.48	4	8		0.136	0.341		30		
		23095	707.5	19.59	4	8		0.139	0.35		30		
		23155	713.5	19.68	4	8		0.142	0.357		30		
	10	23060	704	19.53	4	8		0.137	0.345		30		
		23095	707.5	19.52	4	8		0.137	0.344		30		
		23130	711	19.79	4	8		0.146	0.366		30		
13	5	23205	779.5	21.09	4	8		0.197	0.494		30	27	
		23230	782	20.98	4	8		0.192	0.482		30		
		23255	784.5	21.12	4	8		0.198	0.498		30		777
	10												787
		23230	782	21.11	4	8		0.198	0.497		30		

17	**5**	23755	706.5	20.17	4	8		0.159	0.4		**3**	27	
		23790	710	20.14	4	8		0.158	0.397		**3**		
		23825	713.5	20.03	4	8		0.154	0.387		**3**		704
	10	23780	709	20.23	4	8		0.161	0.406		**3**		716
		23790	710	20.15	4	8		0.158	0.398		**3**		
		23825	711	20.17	4	8		0.159	0.4		**3**		

Table 7. RF Output Power, RI7LE910NAV2, LTE, Test Results

§ 2.1049 Occupied Bandwidth

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

Test Procedures: 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.

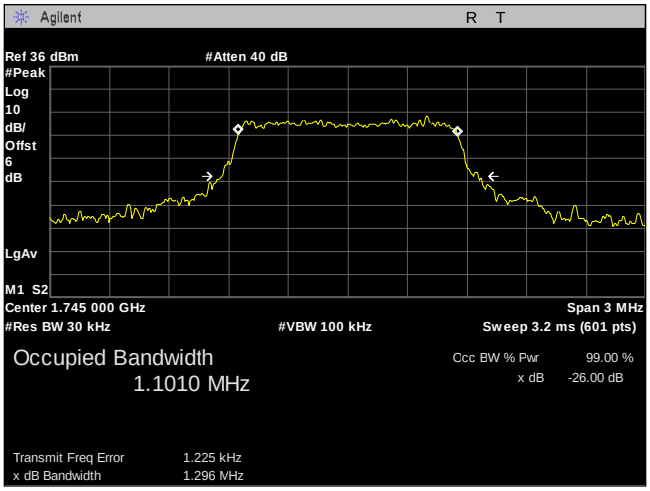
(a) Frequency = channel cf
(b) Span = 2-5 x the OBW
(c) RBW = 1-5 % of the OBW
(d) VBW 1-3 x the RBW
(e) Sweep Time = Auto
(f) Detector = peak
(g) –X dB = 26

Test Results: Equipment complies with Section 2.1049. The following pages show measurements of 99% and -26 dB Occupied Bandwidth plots.

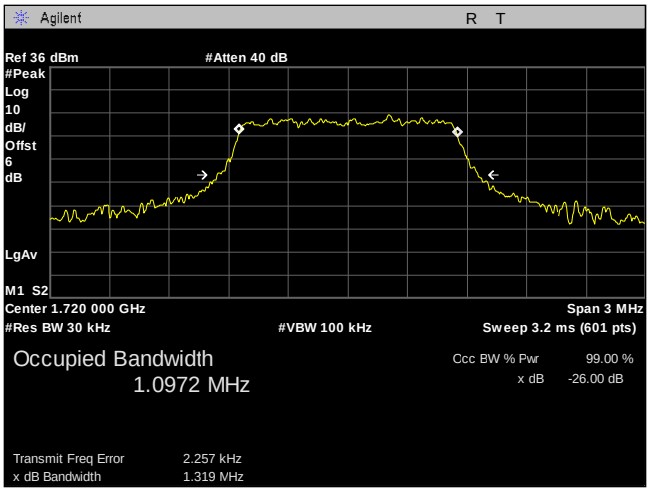
Test Engineer(s): Djed Mouada

Test Date(s): May 1, 2017

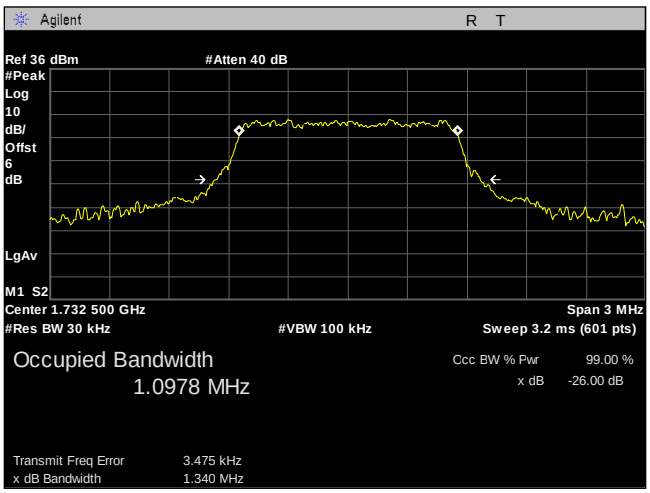
Occupied Bandwidth, LTE Band 4, 1.4MHz BW



Plot 1. Occupied Bandwidth, High Channel 1.4 MHz

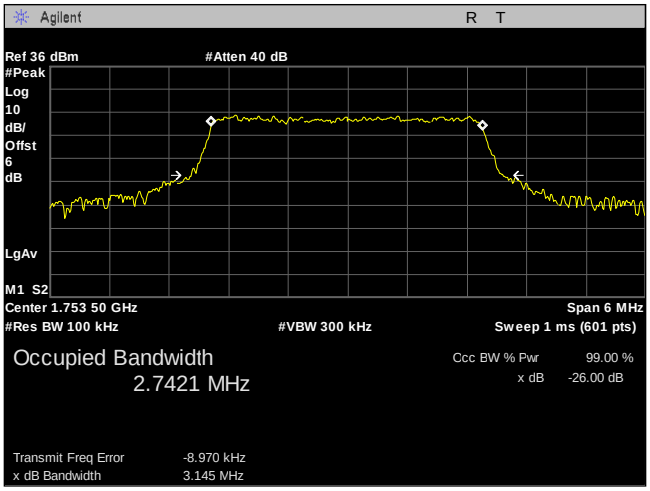


Plot 2. Occupied Bandwidth, Low Channel 1.4 MHz

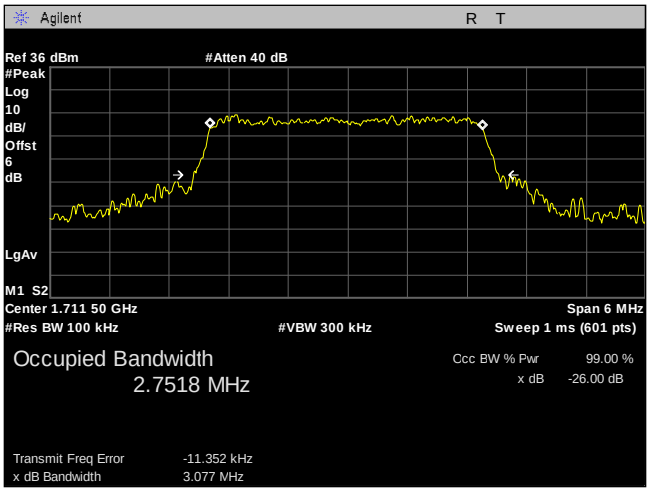


Plot 3. Occupied Bandwidth, Mid Channel 1.4 MHz

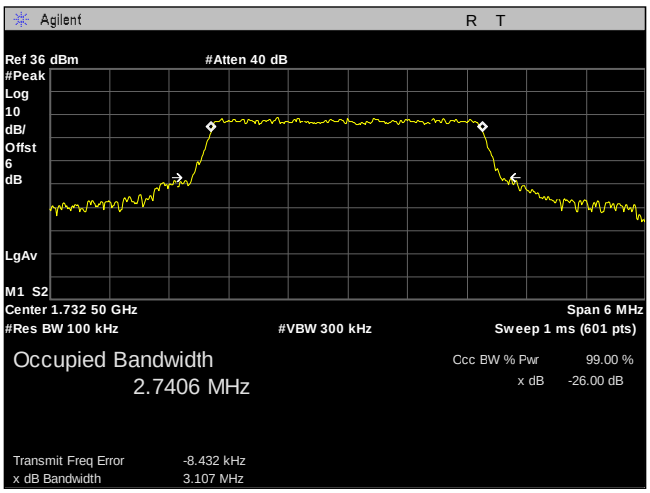
Occupied Bandwidth, LTE Band 4, 3MHz BW



Plot 4. Occupied Bandwidth, High Channel 3 MHz

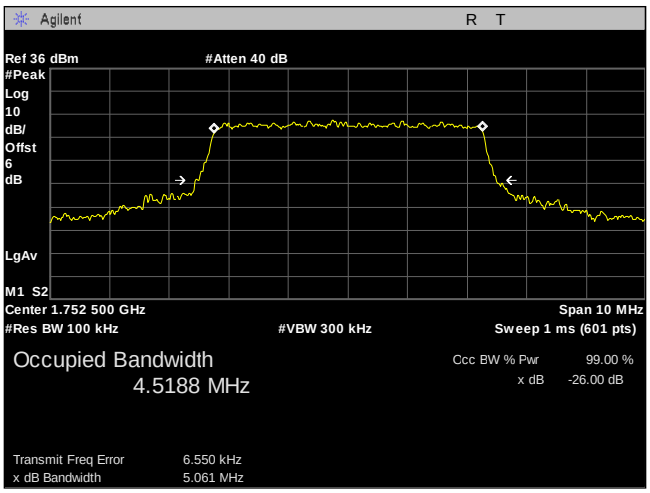


Plot 5. Occupied Bandwidth, Low Channel 3 MHz

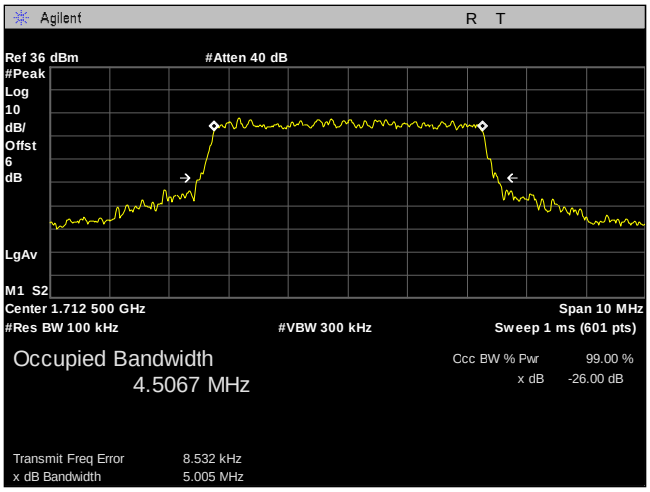


Plot 6. Occupied Bandwidth, Mid Channel 3 MHz

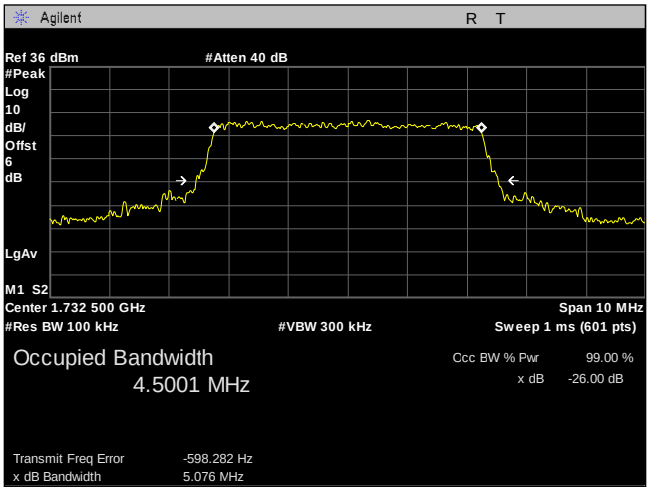
Occupied Bandwidth, LTE Band 4, 5MHz BW



Plot 7. Occupied Bandwidth, High Channel 5 MHz

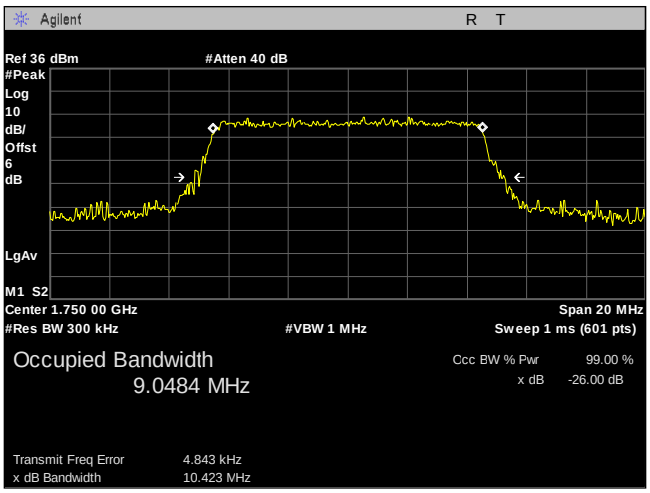


Plot 8. Occupied Bandwidth, Low Channel 5 MHz

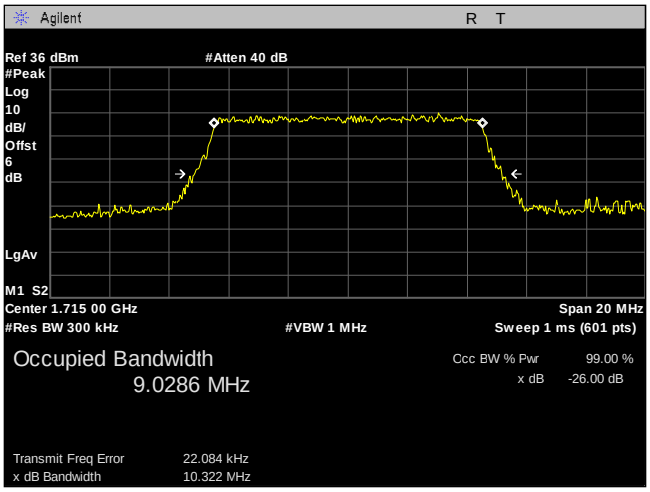


Plot 9. Occupied Bandwidth, Mid Channel 5 MHz

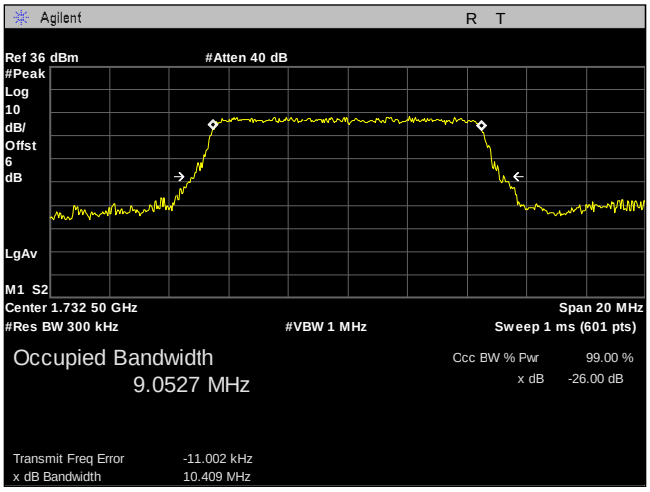
Occupied Bandwidth, LTE Band 4, 10MHz BW



Plot 10. Occupied Bandwidth, High Channel 10 MHz

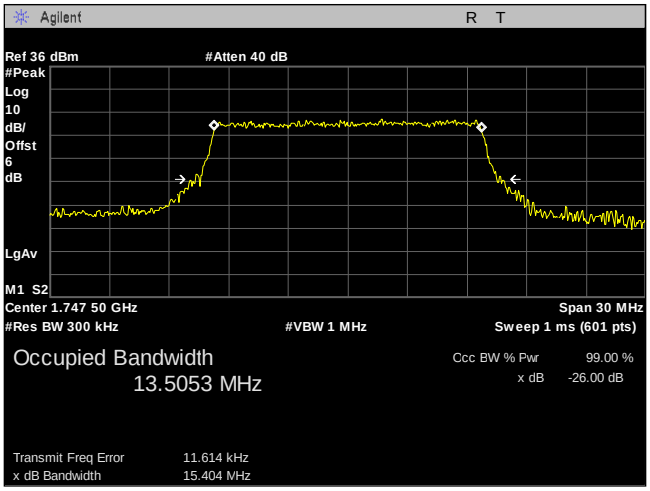


Plot 11. Occupied Bandwidth, Low Channel 10 MHz

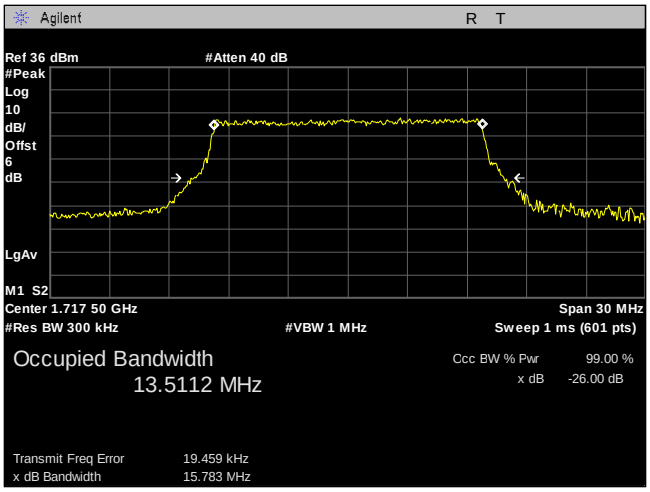


Plot 12. Occupied Bandwidth, Mid Channel 10 MHz

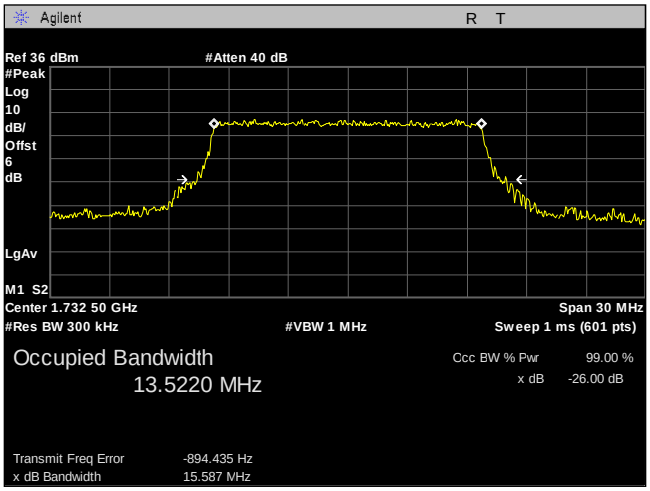
Occupied Bandwidth, LTE Band 4, 15MHz BW



Plot 13. Occupied Bandwidth, High Channel 15 MHz

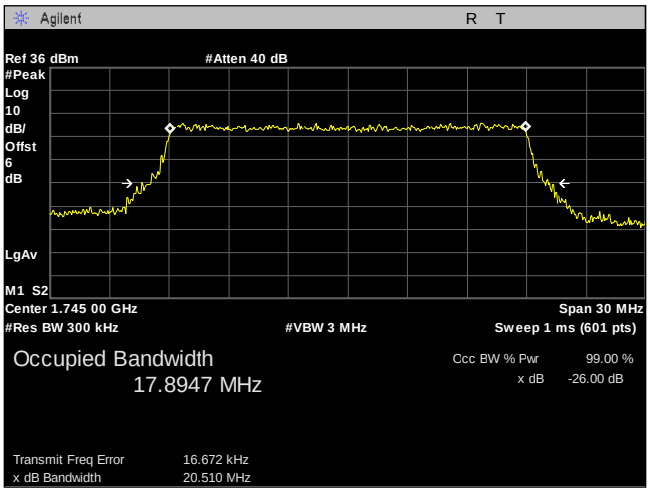


Plot 14. Occupied Bandwidth, Low Channel 15 MHz

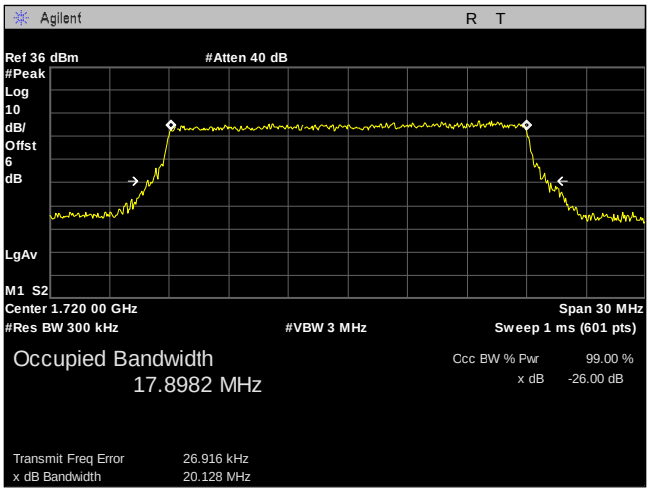


Plot 15. Occupied Bandwidth, Mid Channel 15 MHz

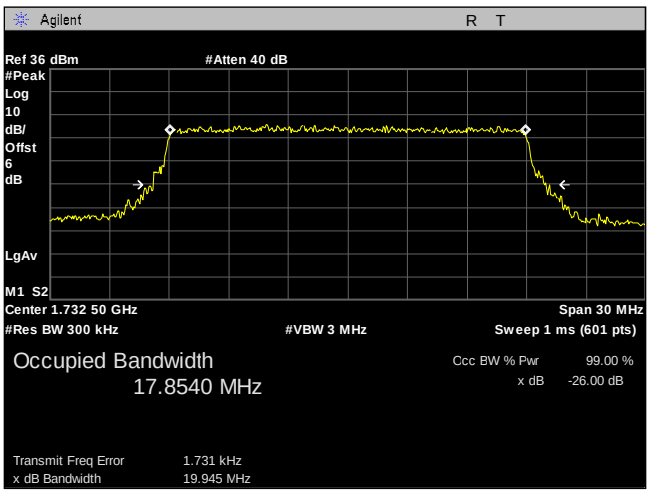
Occupied Bandwidth, LTE Band 4, 20MHz BW



Plot 16. Occupied Bandwidth, High Channel 20 MHz

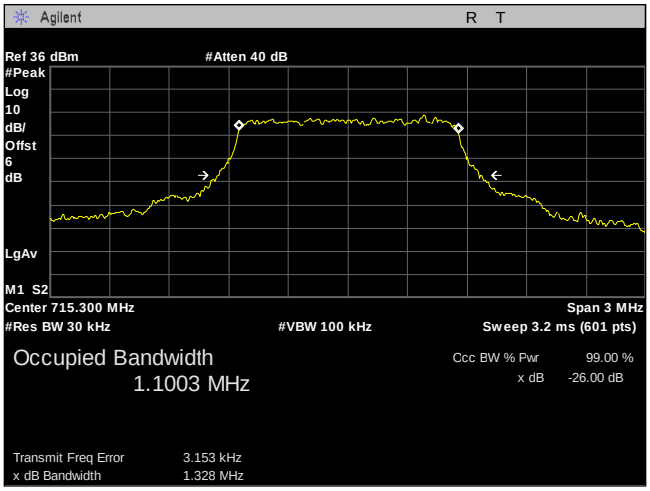


Plot 17. Occupied Bandwidth, Low Channel 20 MHz

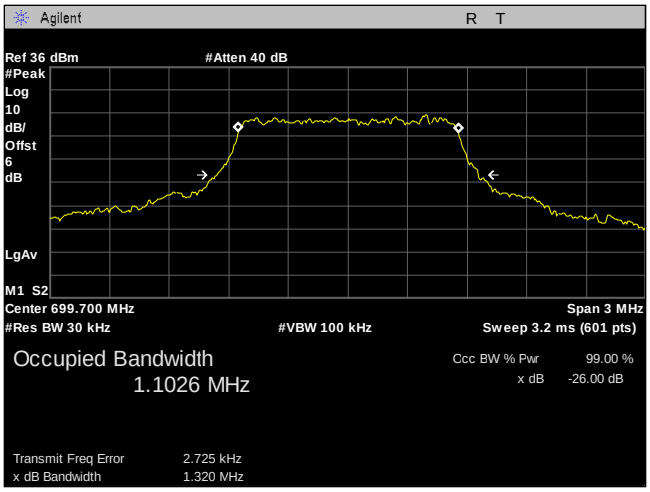


Plot 18. Occupied Bandwidth, Mid Channel 20 MHz

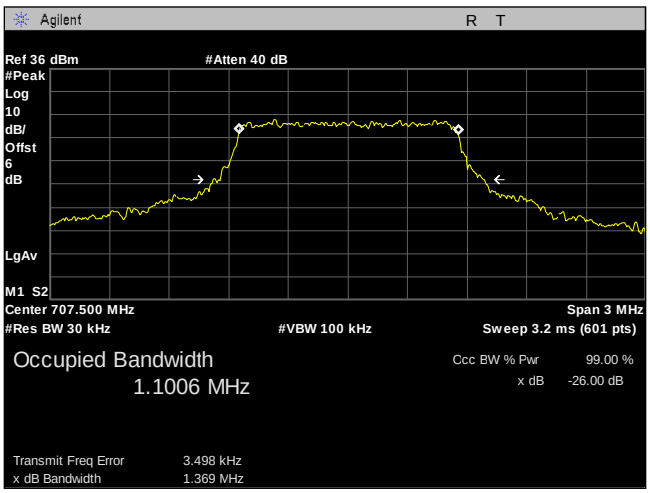
Occupied Bandwidth, LTE Band 12, 1.4MHz BW



Plot 19. Occupied Bandwidth, High Channel 1.4 MHz

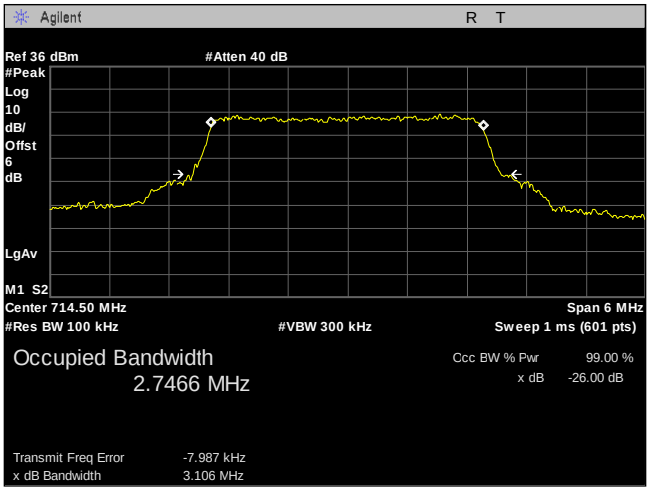


Plot 20. Occupied Bandwidth, Low Channel 1.4 MHz

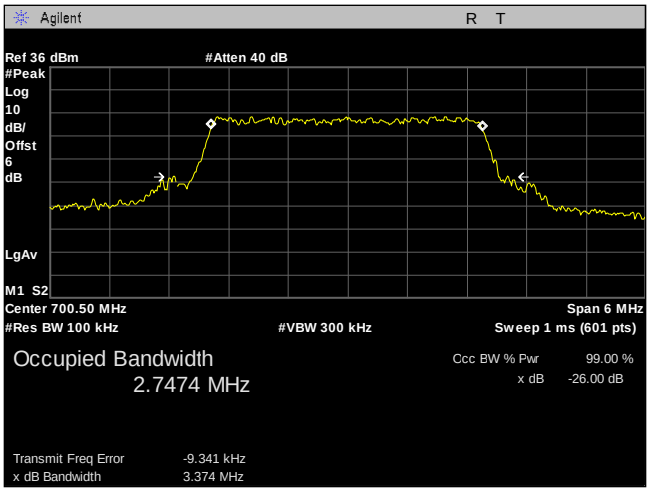


Plot 21. Occupied Bandwidth, Mid Channel 1.4 MHz

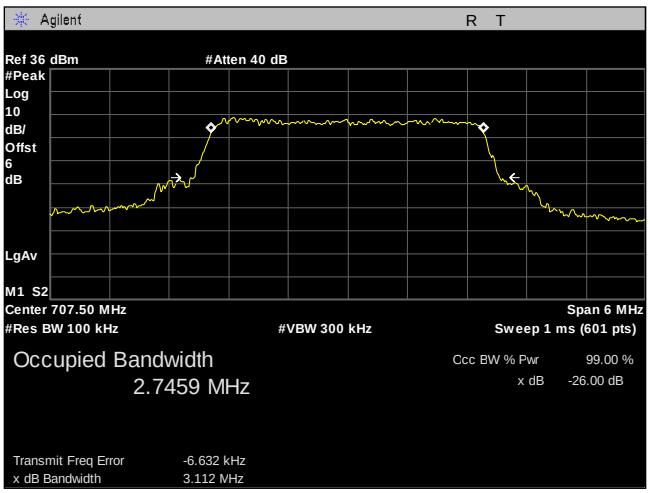
Occupied Bandwidth, LTE Band 12, 3MHz BW



Plot 22. Occupied Bandwidth, High Channel 3 MHz

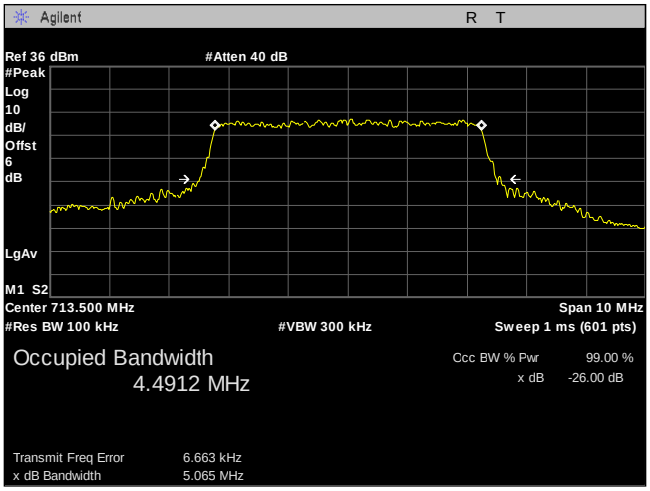


Plot 23. Occupied Bandwidth, Low Channel 3 MHz

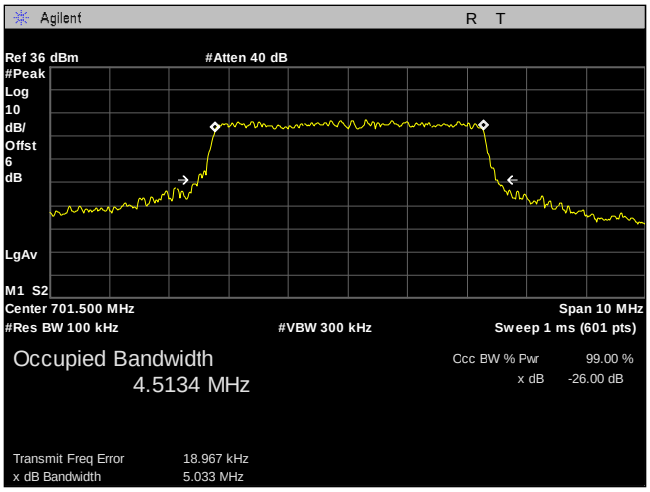


Plot 24. Occupied Bandwidth, Mid Channel 3 MHz

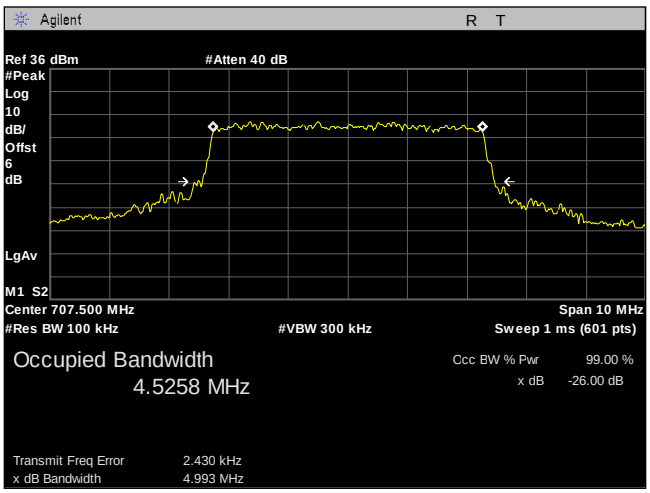
Occupied Bandwidth, LTE Band 12, 5MHz BW



Plot 25. Occupied Bandwidth, High Channel 5 Mhz

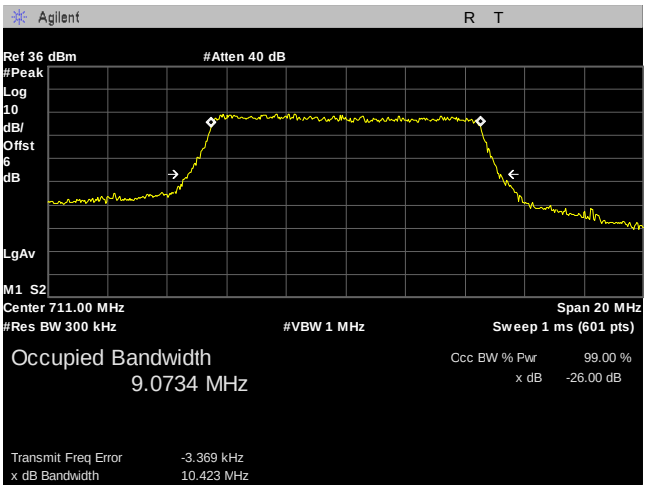


Plot 26. Occupied Bandwidth, Low Channel 5 Mhz

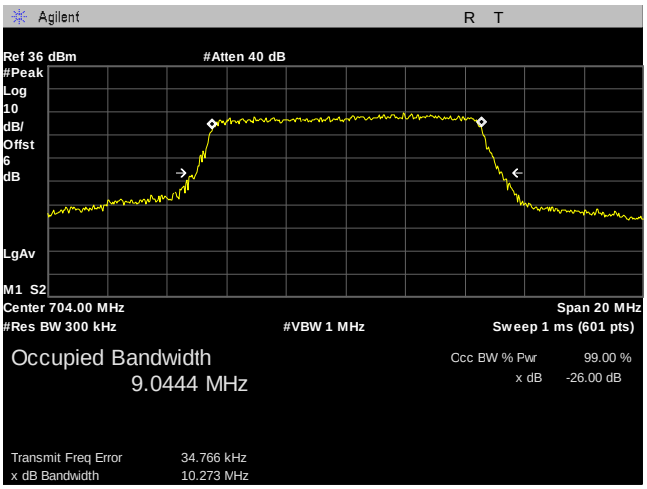


Plot 27. Occupied Bandwidth, Mid Channel 5 MHz

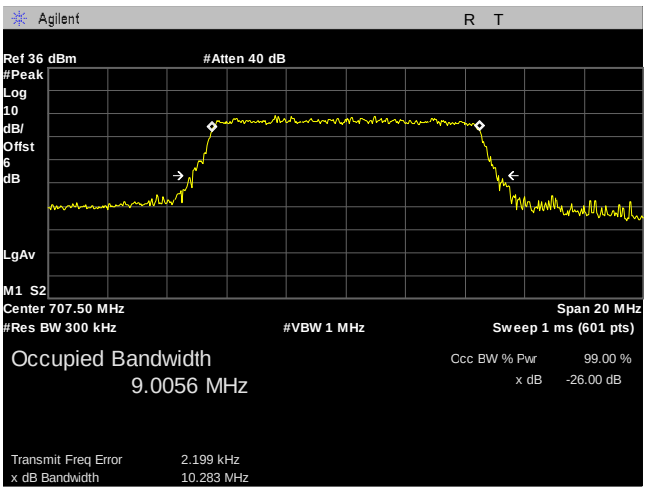
Occupied Bandwidth, LTE Band 12, 10MHz BW



Plot 28. Occupied Bandwidth, High Channel 10 MHz

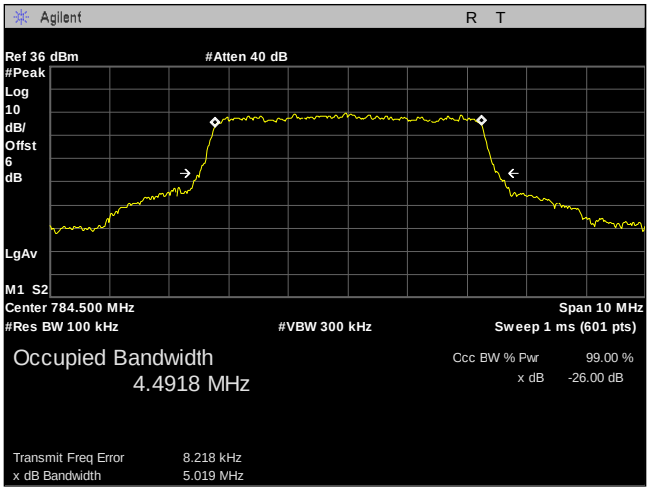


Plot 29. Occupied Bandwidth, Low Channel 10 MHz

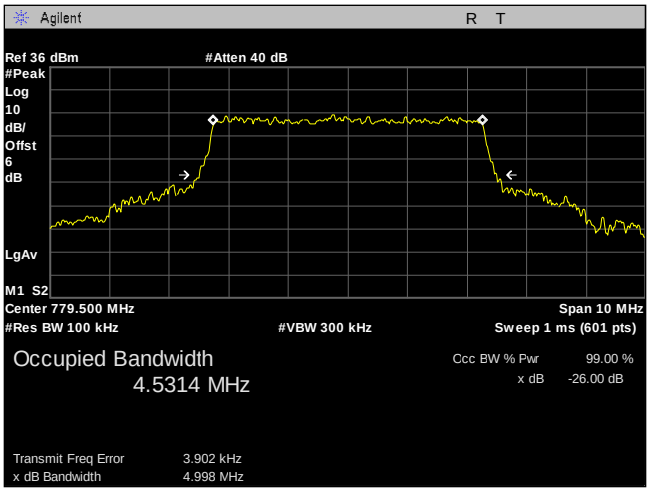


Plot 30. Occupied Bandwidth, MID Channel 10 MHz

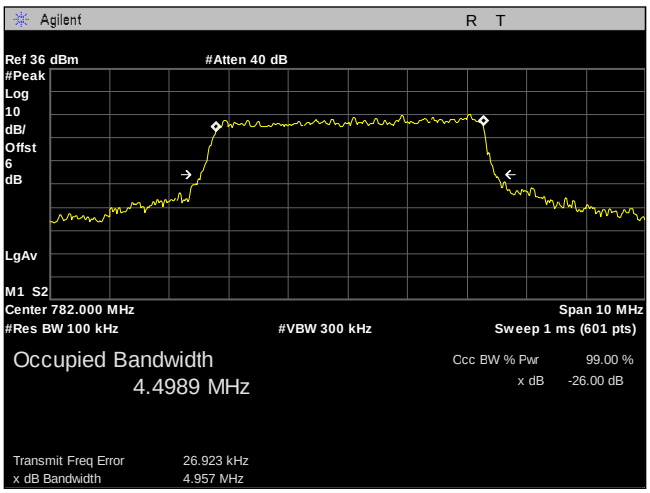
Occupied Bandwidth, LTE Band 13, 5MHz BW



Plot 31. Occupied Bandwidth, High Channel 5 MHz

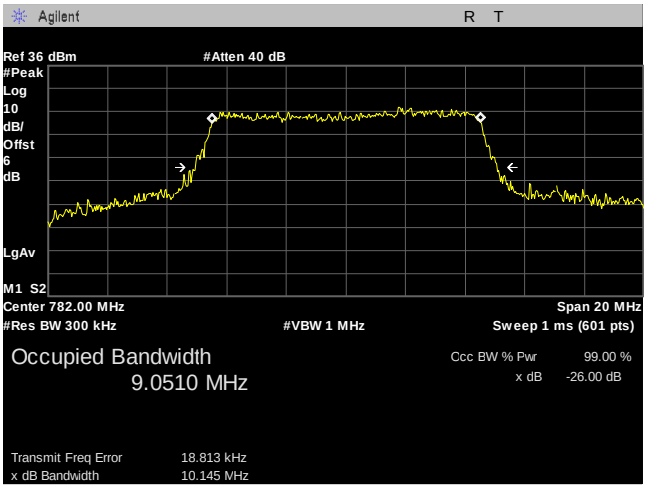


Plot 32. Occupied Bandwidth, Low Channel 5 MHz



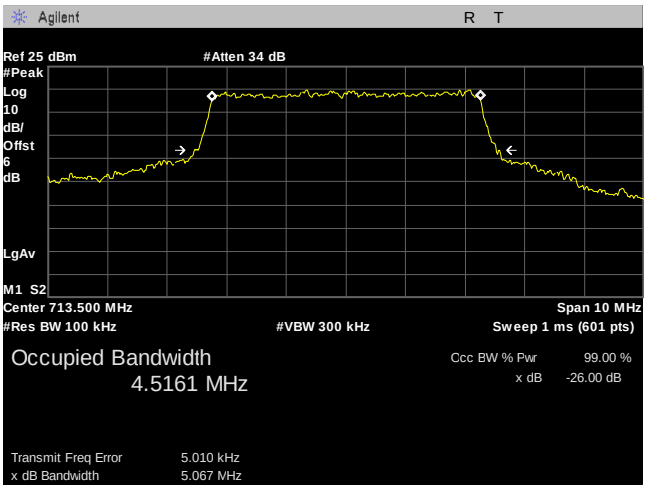
Plot 33. Occupied Bandwidth, Mid Channel 5 MHz

Occupied Bandwidth, LTE Band 13, 10MHz BW

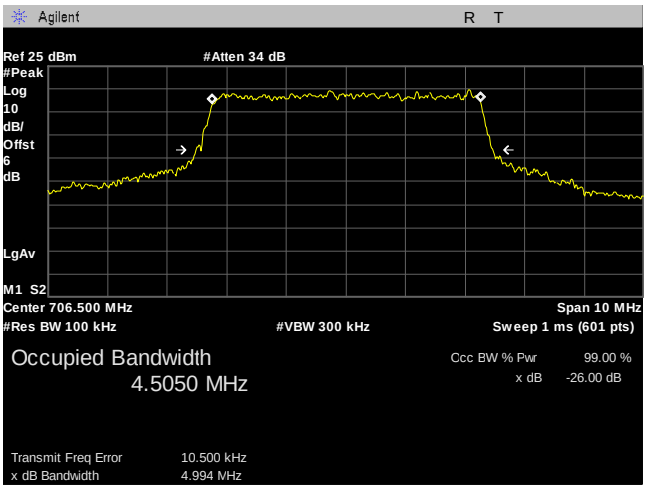


Plot 34. Occupied Bandwidth, Mid Channel 10 MHz

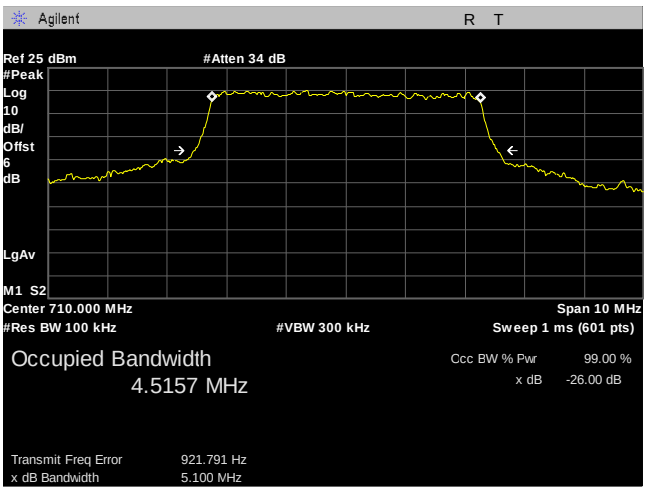
Occupied Bandwidth, LTE Band 17, 5MHz BW



Plot 35. Occupied Bandwidth, High Channel 5 MHz

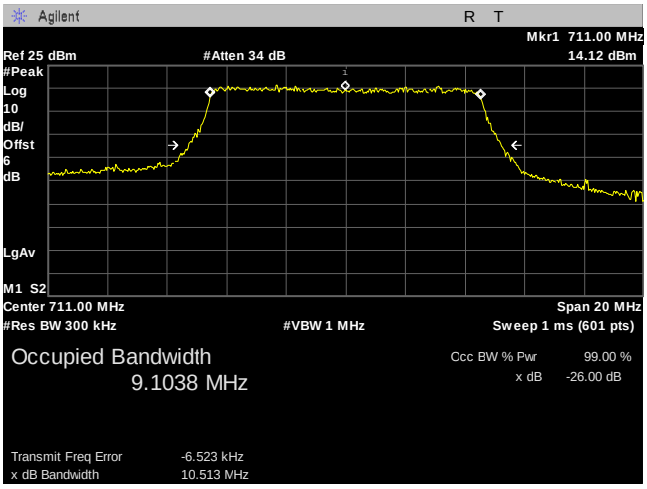


Plot 36. Occupied Bandwidth, Low Channel 5 MHz

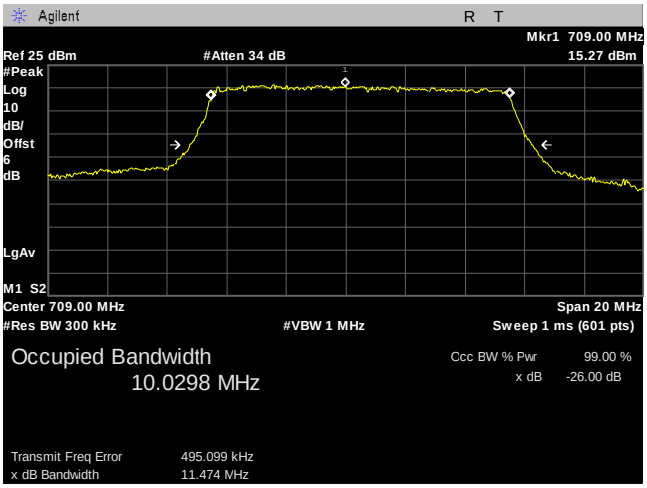


Plot 37. Occupied Bandwidth, Mid Channel 5 MHz

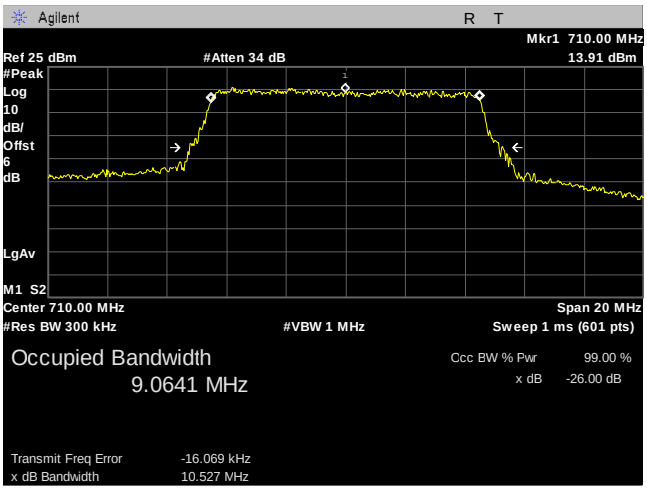
Occupied Bandwidth, LTE Band 17, 10MHz BW



Plot 38. Occupied Bandwidth, High Channel 10 MHz



Plot 39. Occupied Bandwidth, High Channel 10 MHz



Plot 40. Occupied Bandwidth, Low Channel 10 MHz

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 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 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.

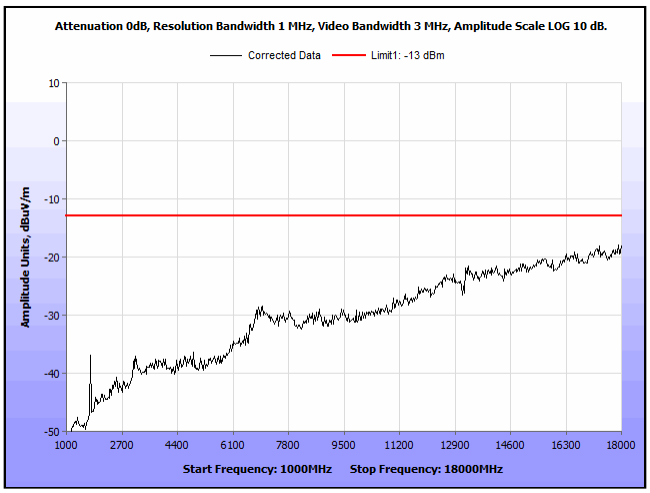
Test Results: The EUT complies with the requirements of this section.

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

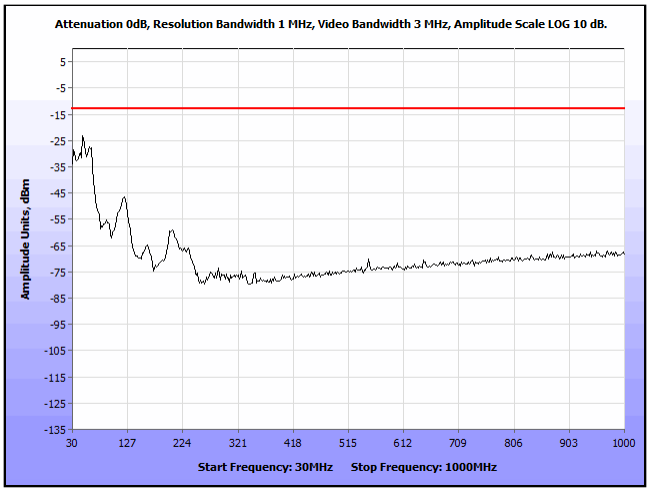
Test Engineer: Djed Mouada

Test Date(s): May 1, 2017

Radiated Spurious Emissions, LTE Band 4

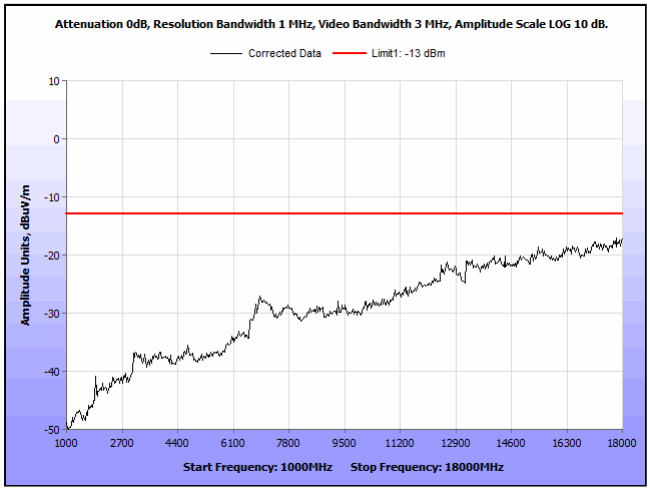


Plot 41. Radiated Spurious Emissions, band 4, 20MHzBW, 1GHz-18GHz

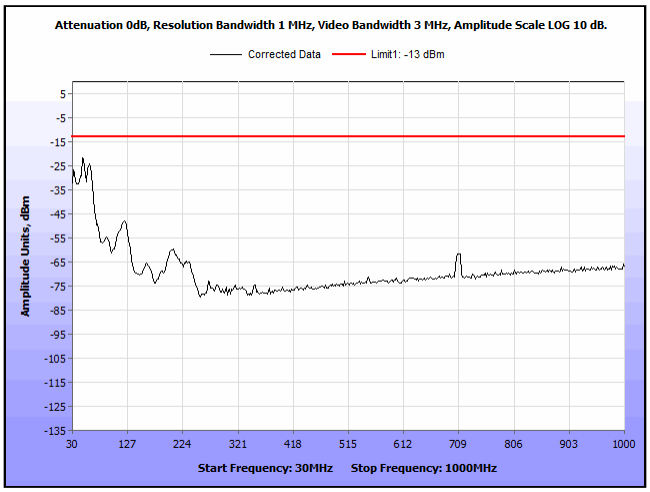


Plot 42. Radiated Spurious Emissions, band 4, 20MHzBW, -30MHz-1GHz

Radiated Spurious Emissions, LTE Band 12

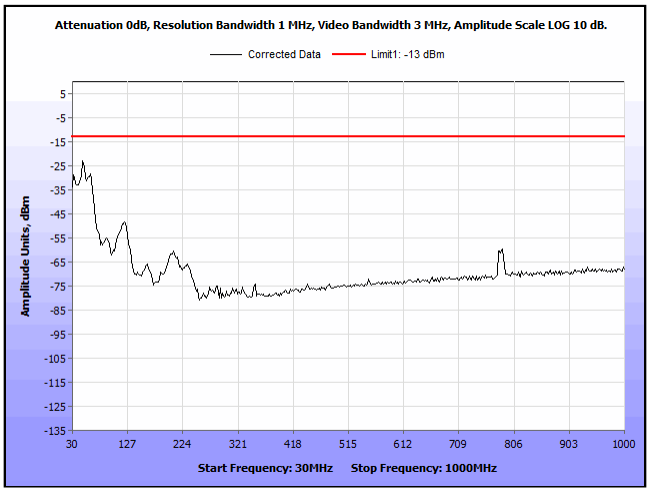


Plot 43. Radiated Spurious Emissions, band 12, 10MHzBW, 1GHz-18GHz

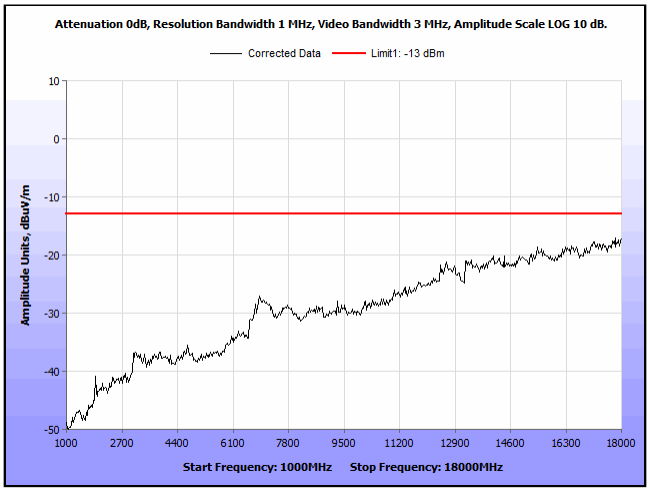


Plot 44. Radiated Spurious Emissions, band 12, 30MHz-1GHz

Radiated Spurious Emissions, LTE Band 13

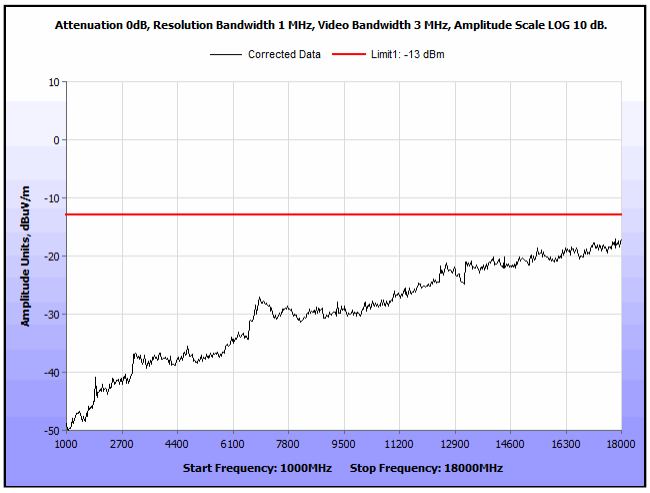


Plot 45. Radiated Spurious Emissions, band 13, 30MHz-1GHz

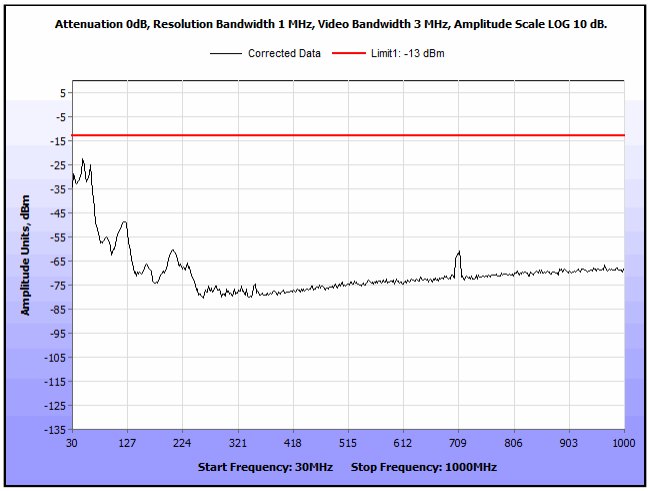


Plot 46. Radiated Spurious Emissions, band 13, 10MHzBW, 1GHz-18GHz

Radiated Spurious Emissions, LTE Band 17

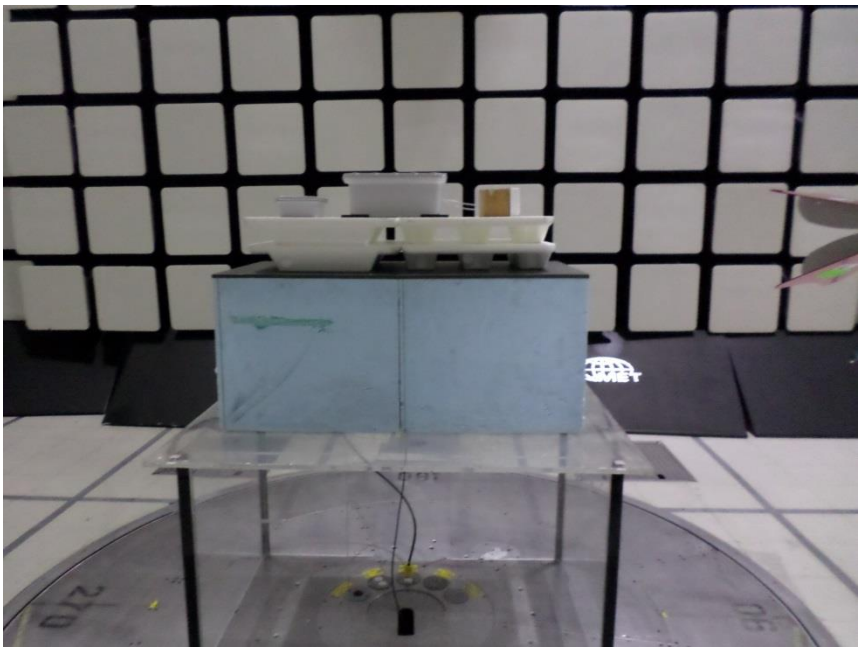


Plot 47. Radiated Spurious Emissions, band 17, 10MHzBW, 1GHz-18GHz



Plot 48. Radiated Spurious Emissions, band 17, 30MHz-1GHz

Photograph 1. Radiated Spurious Emissions, Test Setup (Below 1GHz)



Photograph 2. Radiated Spurious Emissions, Test Setup (Above 1GHz)

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 2.1051 Spurious Emissions at Antenna Terminals

Test Requirement(s): **§ 2.1051and 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 5.7.3.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 complies with the requirements of this section.

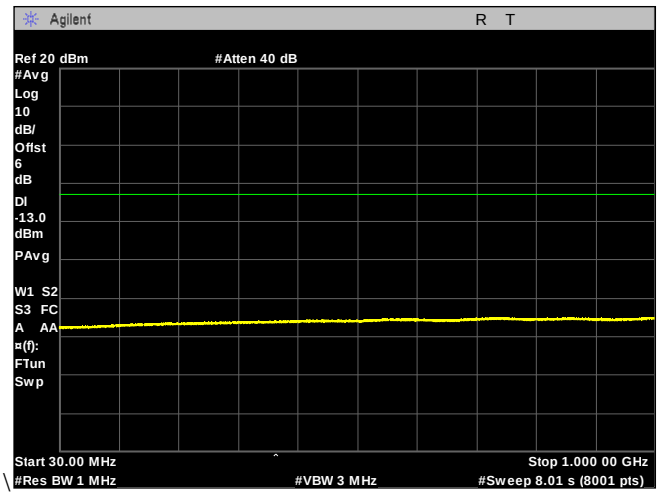
For out of band emissions, the low, mid, and high channels for each test mode were evaluated, data is presented for the worse case/ highest output channel.

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

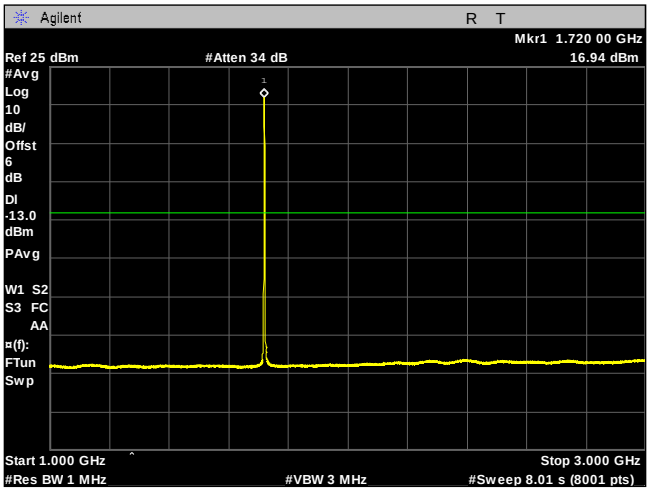
Test Engineer(s): Djed Mouada

Test Date(s): May 1, 2017

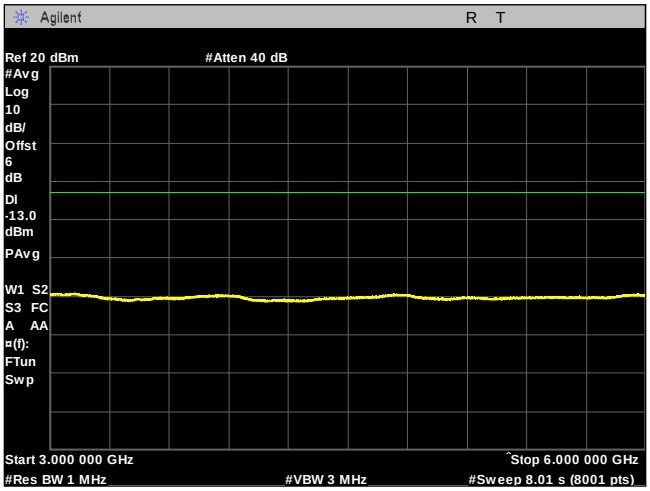
Spurious Emissions at Antenna Terminal, LTE Band 4, 1.4MHz, Low Channel



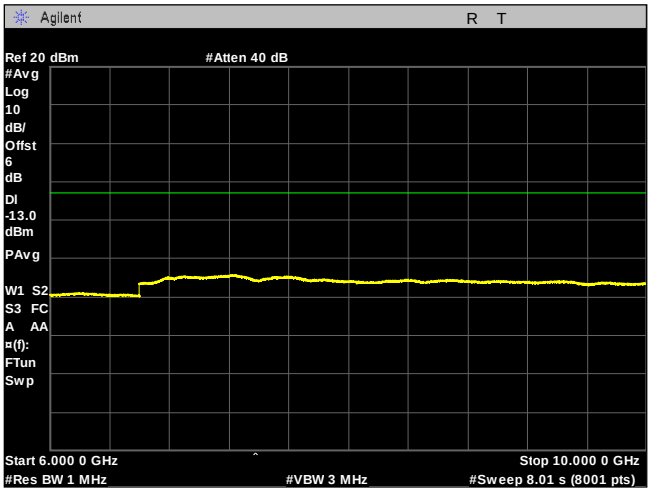
Plot 49. Spurious Emissions at Antenna Terminals, 1.4MHz BW, Low Channel, 30 MHz – 1 GHz



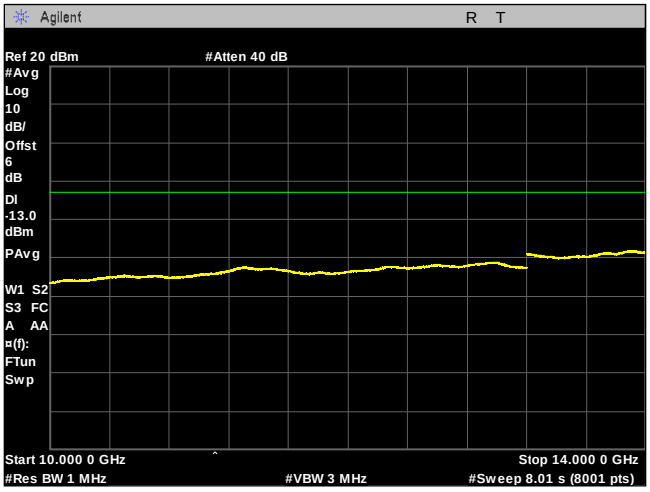
Plot 50. Spurious Emissions at Antenna Terminals, 1.4MHz BW, Low Channel, 1 GHz – 3 GHz



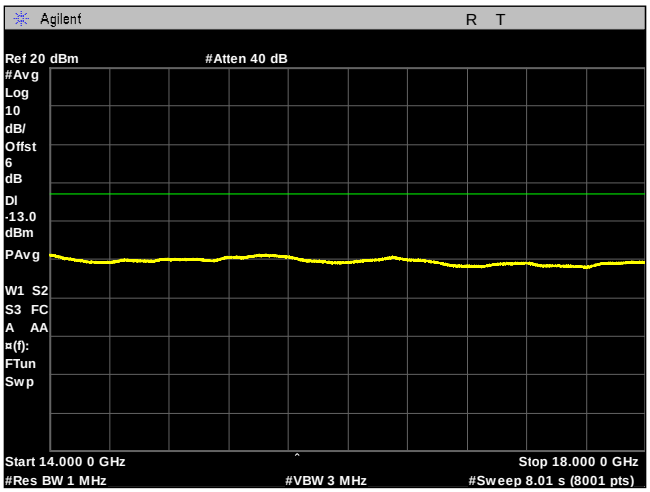
Plot 51. Spurious Emissions at Antenna Terminals, 1.4MHz BW, Low Channel, 3GHz – 6 GHz



Plot 52. Spurious Emissions at Antenna Terminals, 1.4MHz BW, Low Channel, 30MHz – 18GHz

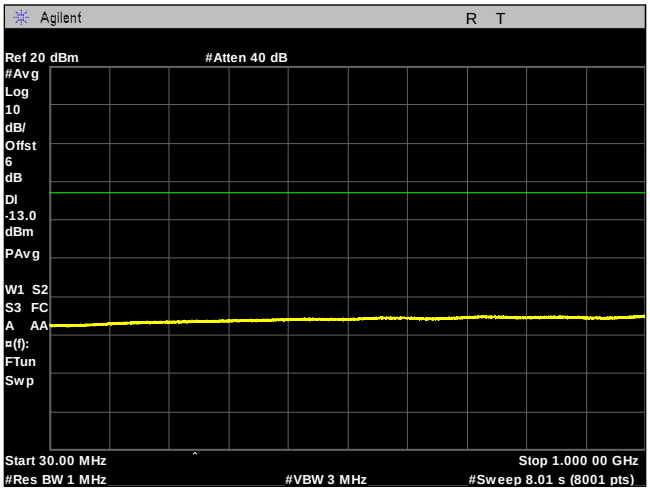


Plot 53. Spurious Emissions at Antenna Terminals, 1.4MHz BW, Low Channel, 10 GHz – 14 GHz

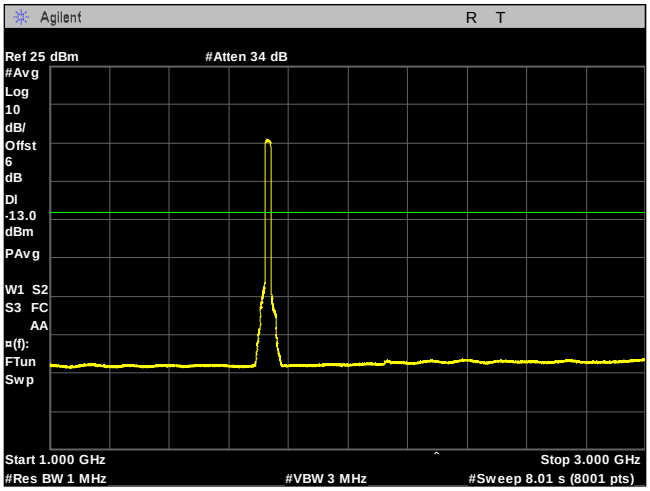


Plot 54. Spurious Emissions at Antenna Terminals, 1.4MHz BW, Low Channel, 14 GHz – 18 GHz

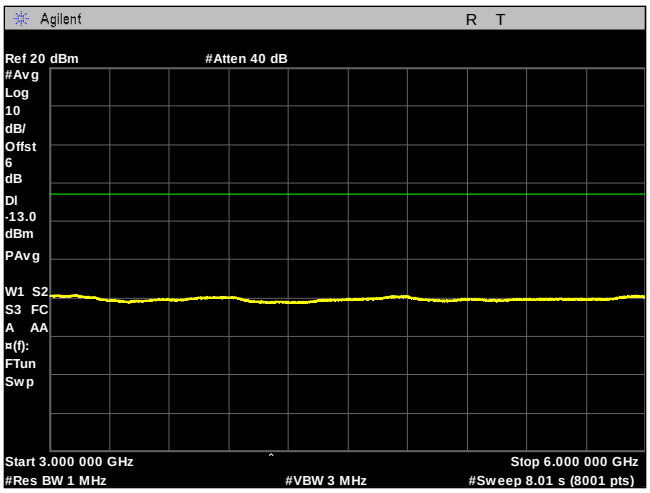
Spurious Emissions at Antenna Terminal, LTE Band 4, 20MHz, Low Channel



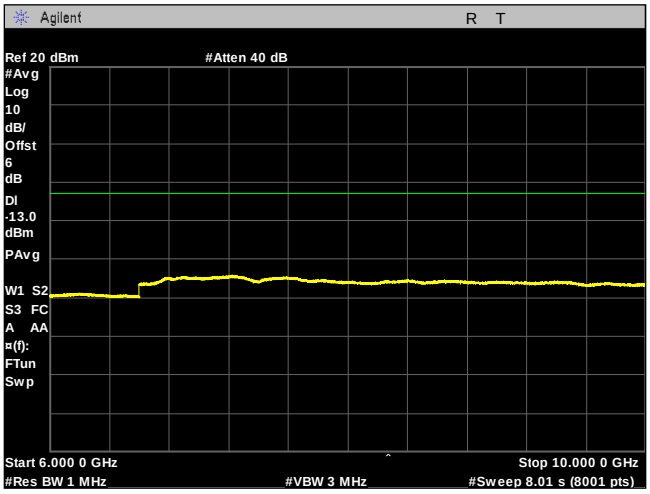
Plot 55. Spurious Emissions at Antenna Terminals, 20MHz BW, low Channel, 30MHz – 1 GHz



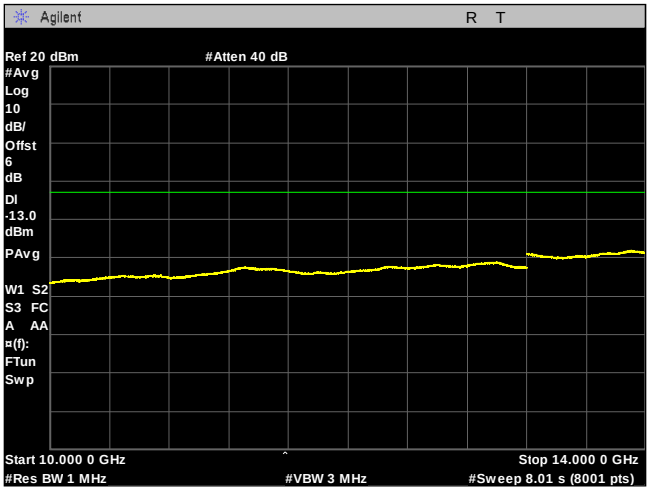
Plot 56. Spurious Emissions at Antenna Terminals, 20MHz BW, low Channel, 1 GHz – 3 GHz



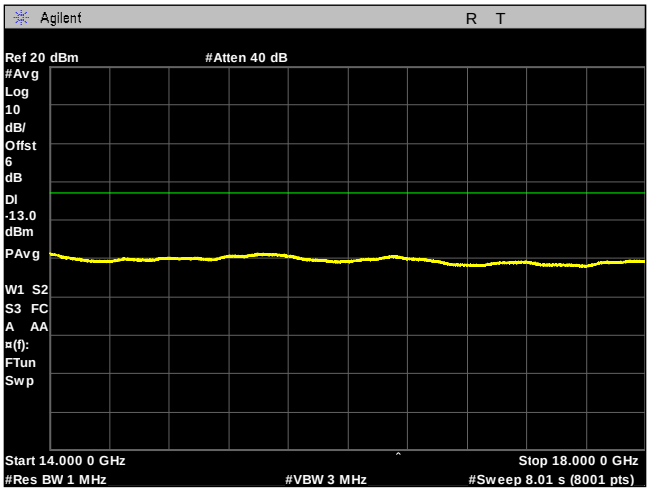
Plot 57. Spurious Emissions at Antenna Terminals, 20MHz BW, low Channel, 3 GHz – 6 GHz



Plot 58. Spurious Emissions at Antenna Terminals, 20MHz BW, low Channel, 6 GHz – 10 GHz

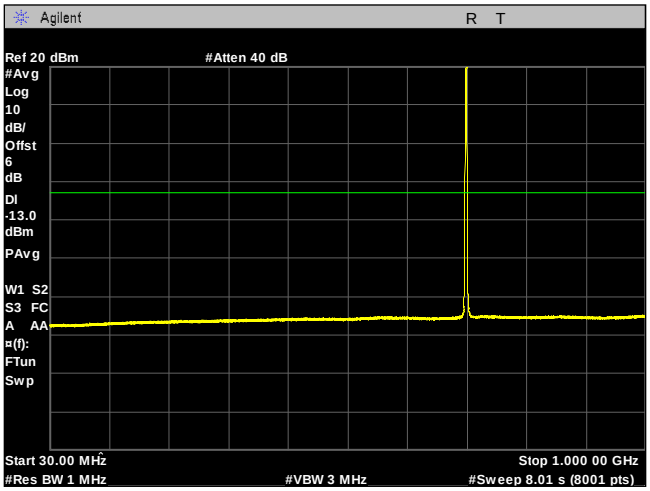


Plot 59. Spurious Emissions at Antenna Terminals, 20MHz BW, low Channel, 10 GHz – 14 GHz

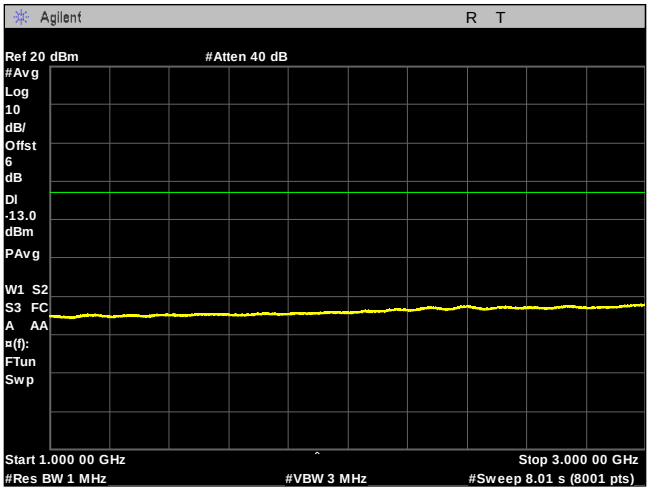


Plot 60. Spurious Emissions at Antenna Terminals, 20MHz BW, low Channel, 14 GHz – 18 GHz

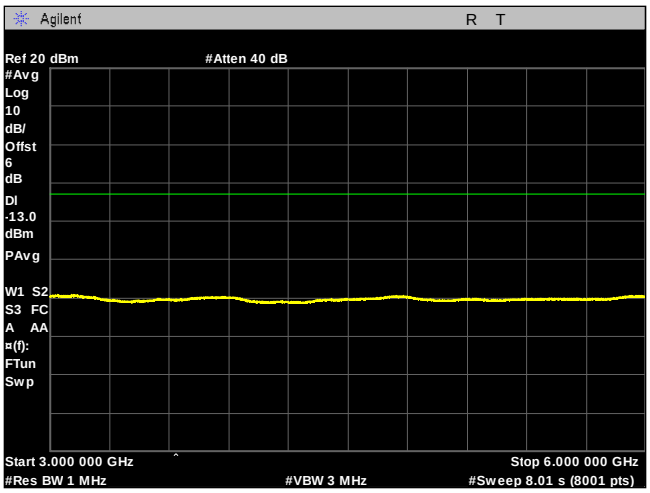
Spurious Emissions at Antenna Terminal, LTE Band 12, 1.4MHz, Mid Channel



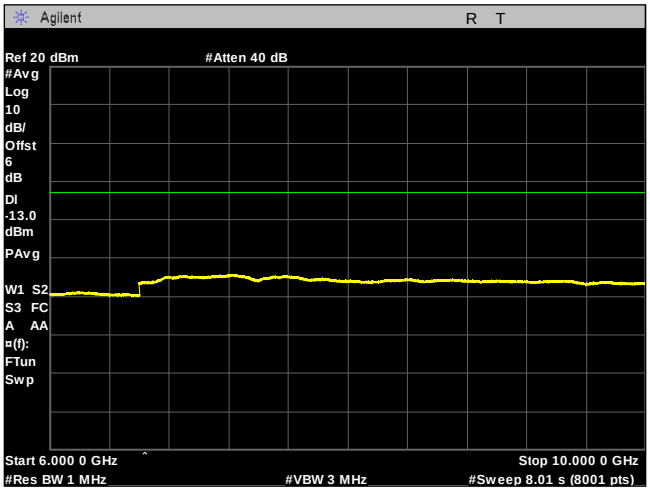
Plot 61. Spurious Emissions at Antenna Terminals, 1.4 MHz BW, Mid Channel, 30 MHz – 1 GHz



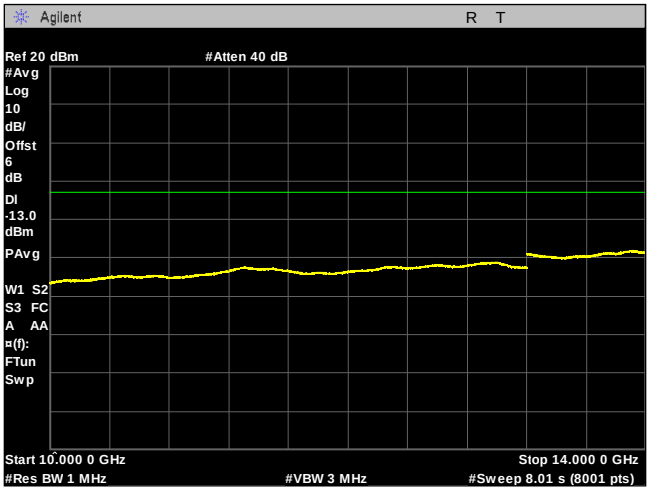
Plot 62. Spurious Emissions at Antenna Terminals, 1.4 MHz BW, Mid Channel, 1 GHz – 3 GHz



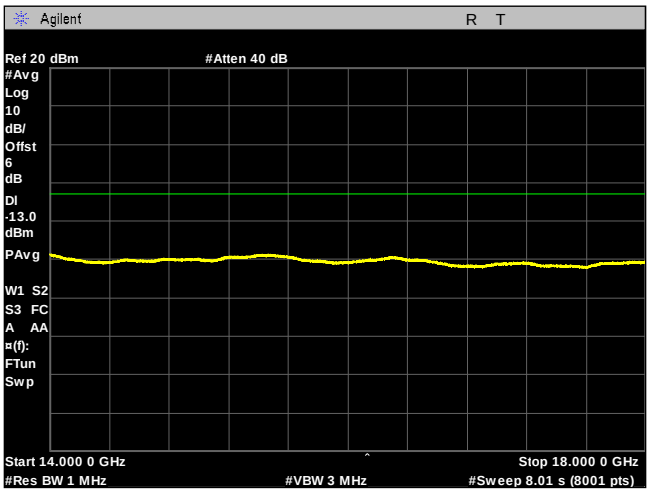
Plot 63. Spurious Emissions at Antenna Terminals, 1.4 MHz BW, Mid Channel, 3 GHz – 6 GHz



Plot 64. Spurious Emissions at Antenna Terminals, 1.4 MHz BW, Mid Channel, 6 GHz – 10 GHz

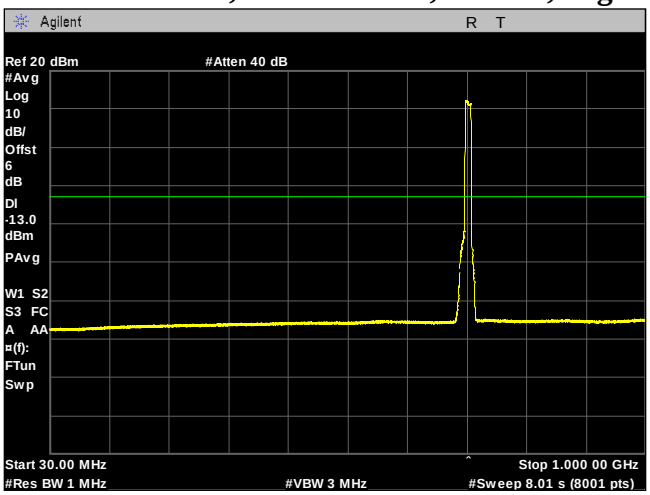


Plot 65. Spurious Emissions at Antenna Terminals, 1.4 MHz BW, Mid Channel, 10 GHz – 14 GHz

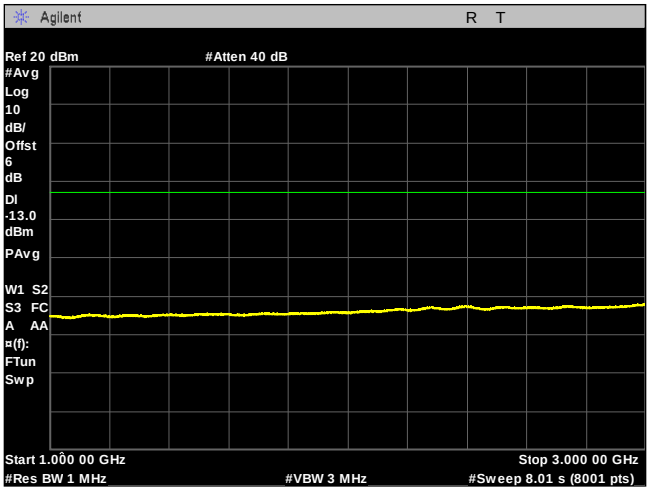


Plot 66. Spurious Emissions at Antenna Terminals, 1.4 MHz BW, Mid Channel, 14 GHz – 18 GHz

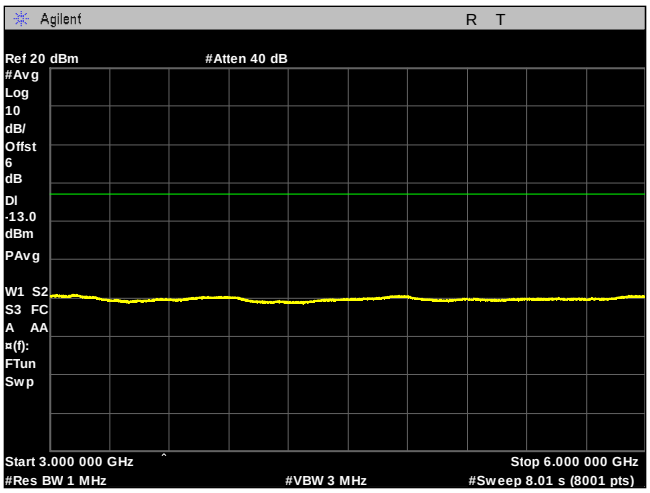
Spurious Emissions at Antenna Terminal, LTE Band 12, 10MHz, High Channel



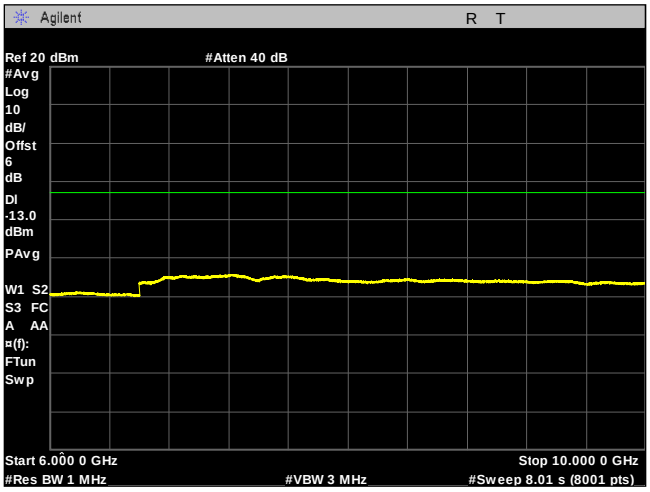
Plot 67. Spurious Emissions at Antenna Terminals, 10 MHz BW, High Channel, 30 MHz – 1 GHz



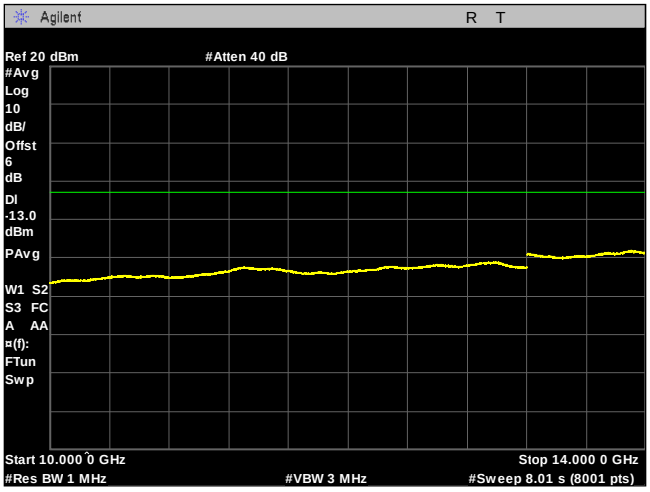
Plot 68. Spurious Emissions at Antenna Terminals, 10 MHz BW, High Channel, 1 GHz – 3 GHz



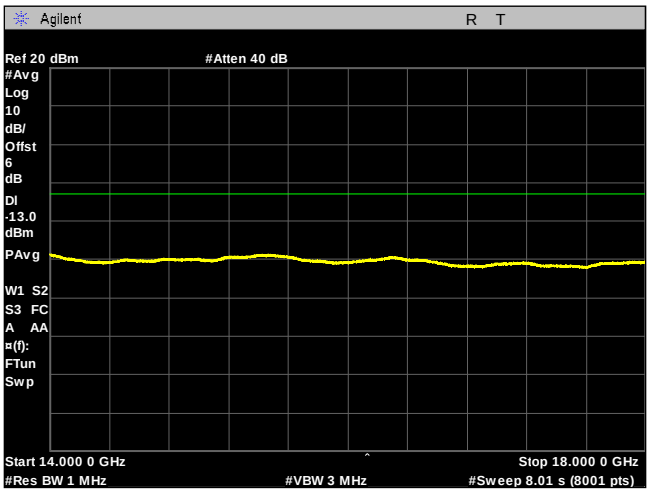
Plot 69. Spurious Emissions at Antenna Terminals, 10 MHz BW, High Channel, 3 GHz – 6 GHz



Plot 70. Spurious Emissions at Antenna Terminals, 10 MHz BW, High Channel, 6 GHz – 10 GHz

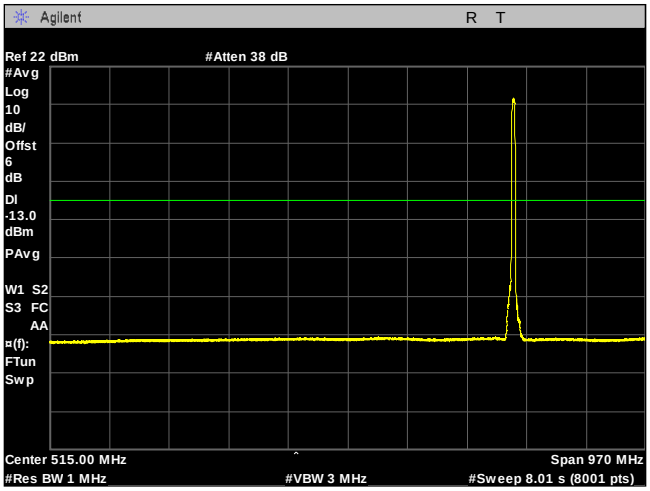


Plot 71. Spurious Emissions at Antenna Terminals, 10 MHz BW, High Channel, 10 GHz – 14 GHz

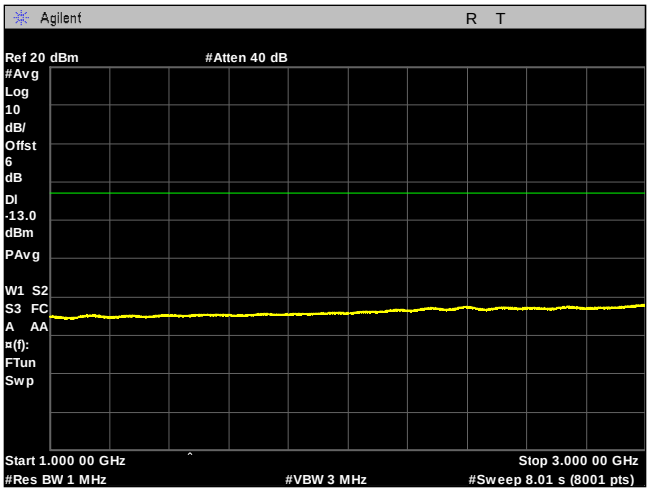


Plot 72. Spurious Emissions at Antenna Terminals, 10 MHz BW, High Channel, 14 GHz – 18 GHz

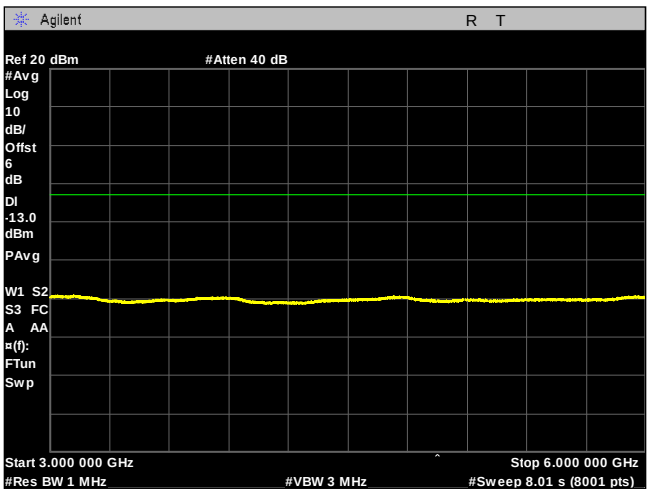
Spurious Emissions at Antenna Terminal, LTE Band 13, 5MHz, High Channel



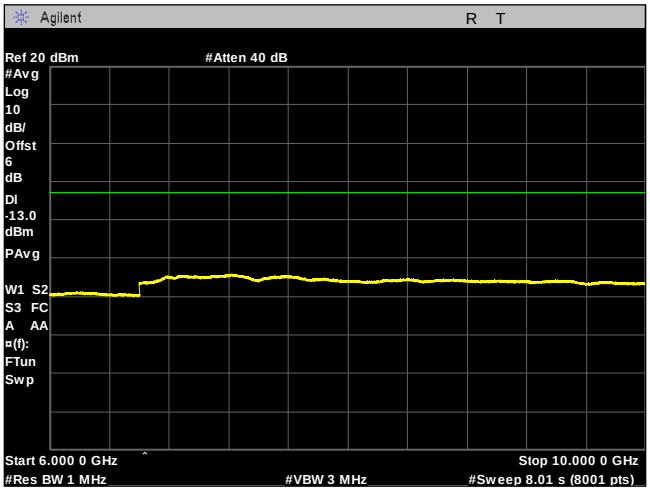
Plot 73. Spurious Emissions at Antenna Terminals, 5 MHz BW, High Channel, 30 MHz – 1 GHz



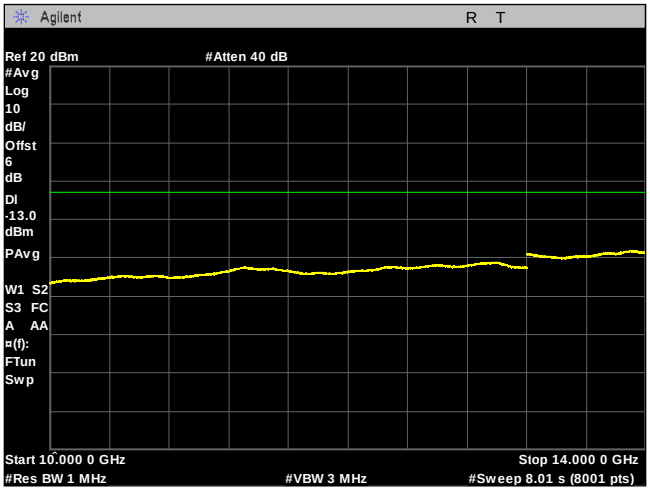
Plot 74. Spurious Emissions at Antenna Terminals, 5 MHz BW, High Channel, 1 GHz – 3 GHz



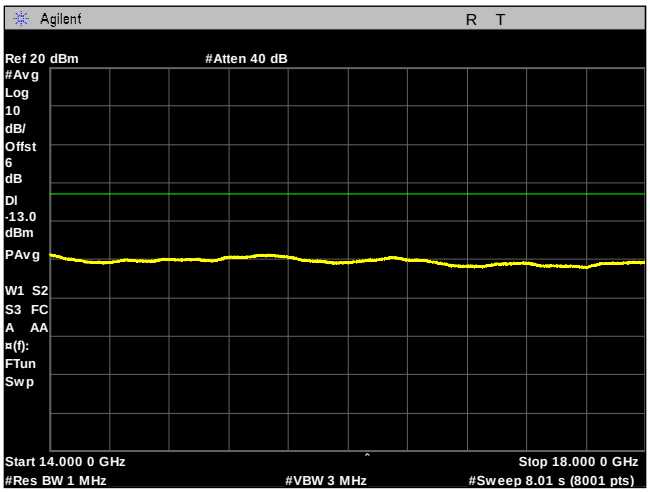
Plot 75. Spurious Emissions at Antenna Terminals, 5 MHz BW, High Channel, 3 GHz – 6 GHz



Plot 76. Spurious Emissions at Antenna Terminals, 5 MHz BW, High Channel, 6 GHz – 10 GHz

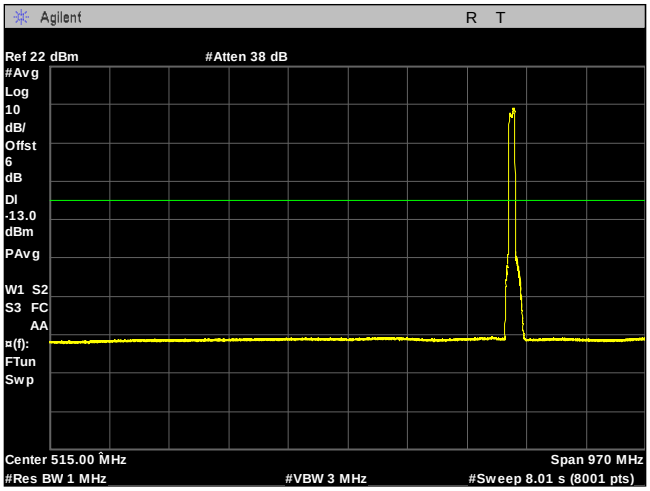


Plot 77. Spurious Emissions at Antenna Terminals, 5 MHz BW, High Channel, 10 GHz – 14 GHz

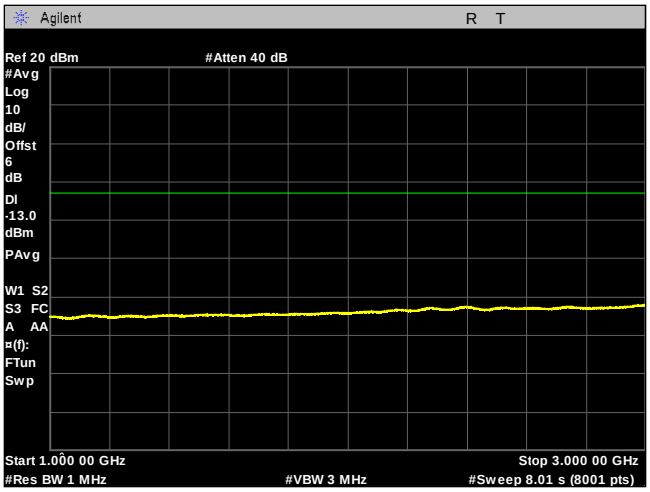


Plot 78. Spurious Emissions at Antenna Terminals, 5 MHz BW, High Channel, 14 GHz – 18 GHz

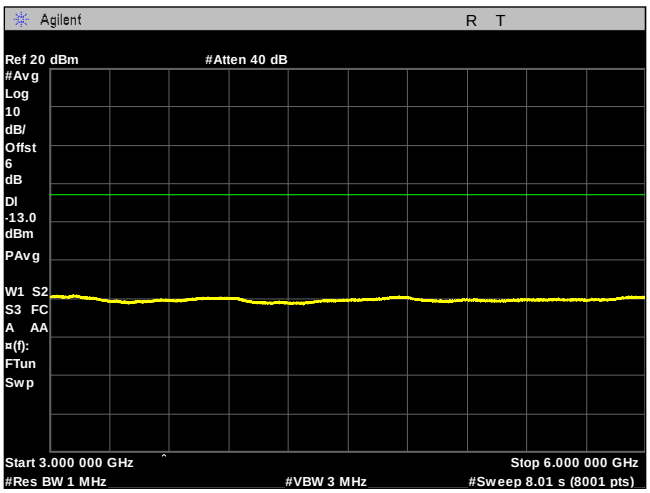
Spurious Emissions at Antenna Terminal, LTE Band 13, 10MHz, Mid Channel



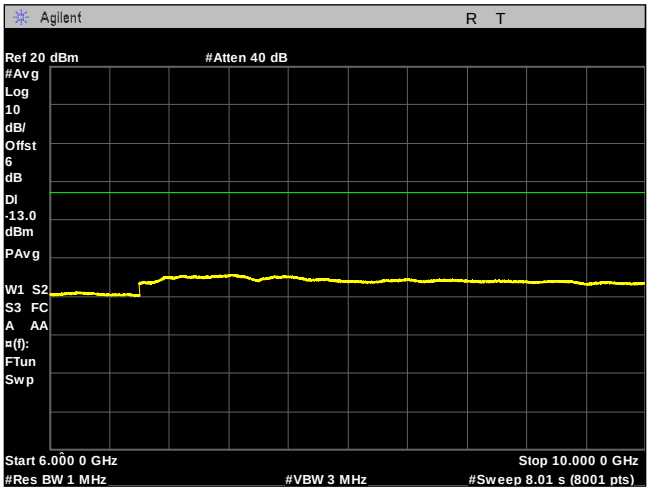
Plot 79. Spurious Emissions at Antenna Terminals, 10 MHz BW, Mid Channel, 30MHz – 1 GHz



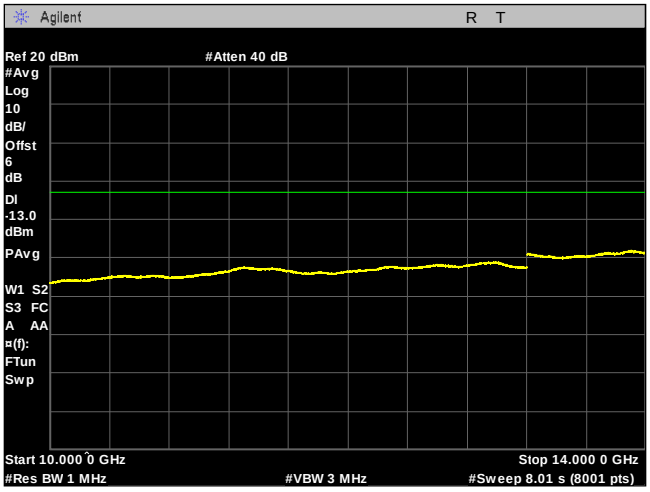
Plot 80. Spurious Emissions at Antenna Terminals, 10 MHz BW, Mid Channel, 1 GHz – 3 GHz



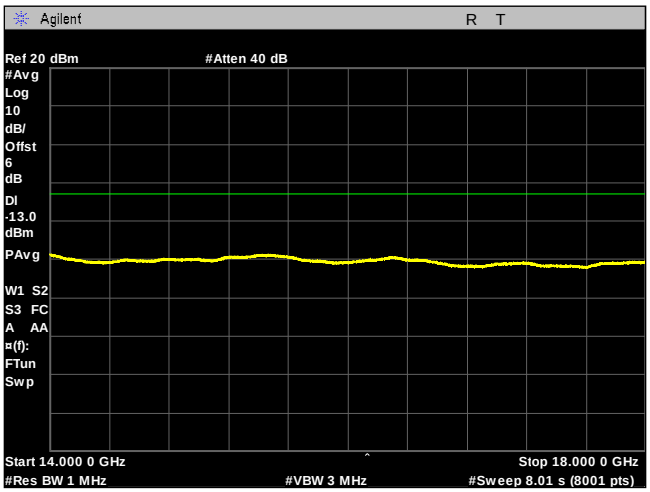
Plot 81. Spurious Emissions at Antenna Terminals, 10 MHz BW, Mid Channel, 3 GHz – 6 GHz



Plot 82. Spurious Emissions at Antenna Terminals, 10 MHz BW, Mid Channel, 6 GHz – 10 GHz

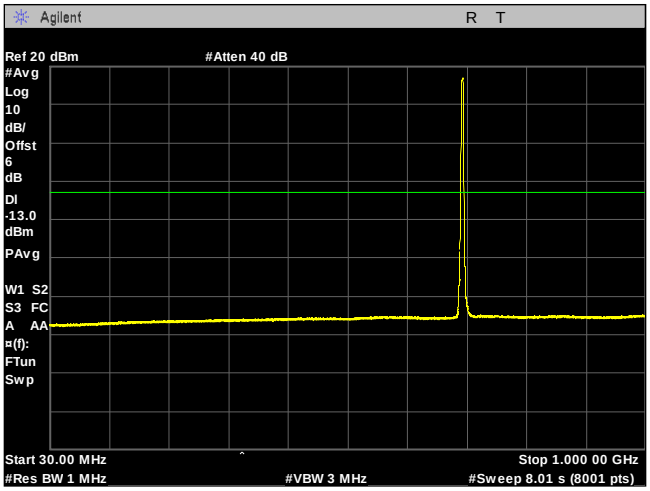


Plot 83. Spurious Emissions at Antenna Terminals, 10 MHz BW, Mid Channel, 10 GHz – 14 GHz

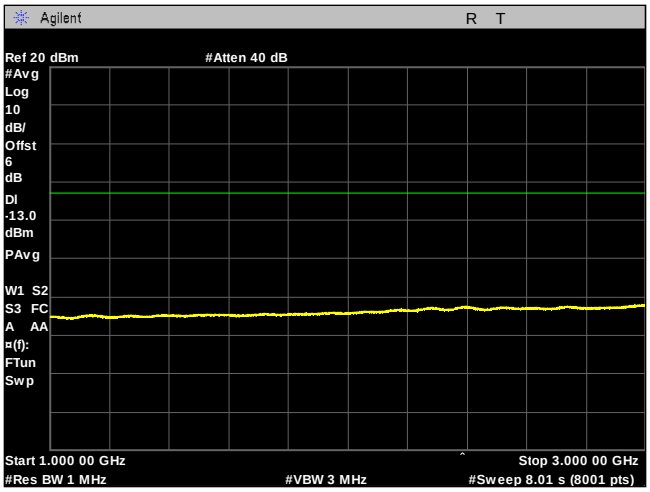


Plot 84. Spurious Emissions at Antenna Terminals, 10 MHz BW, Mid Channel, 14 GHz – 18GHz

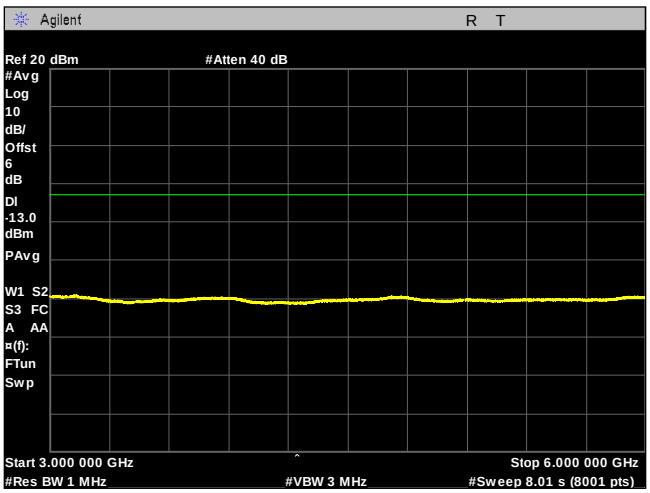
Spurious Emissions at Antenna Terminal, LTE Band 17, 5MHz, Low Channel



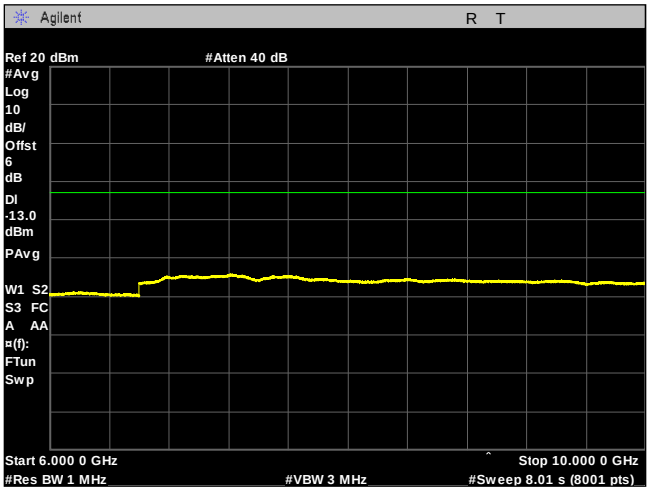
Plot 85. Spurious Emissions at Antenna Terminals, 5 MHz BW, High Channel, 30MHz – 1 GHz



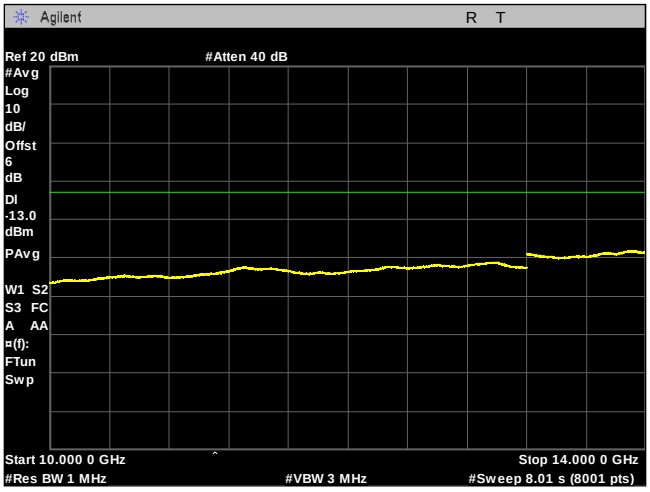
Plot 86. Spurious Emissions at Antenna Terminals, 5 MHz BW, High Channel, 1 GHz – 3 GHz



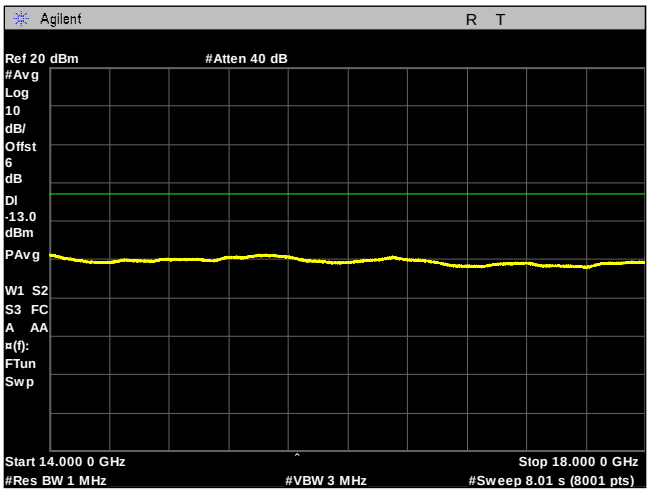
Plot 87. Spurious Emissions at Antenna Terminals, 5 MHz BW, High Channel, 3 GHz – 6 GHz



Plot 88. Spurious Emissions at Antenna Terminals, 5 MHz BW, High Channel, 6 GHz – 10 GHz

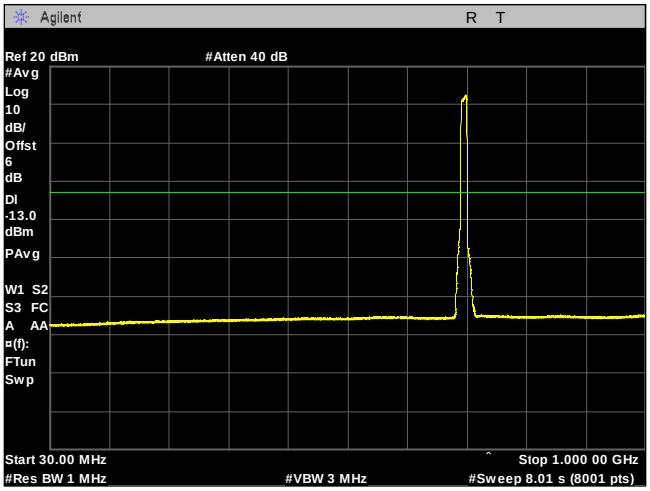


Plot 89. Spurious Emissions at Antenna Terminals, 5 MHz BW, High Channel, 10 GHz – 14 GHz

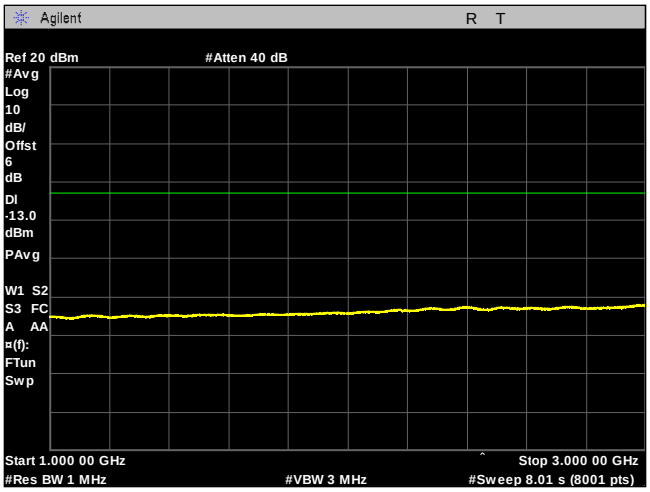


Plot 90. Spurious Emissions at Antenna Terminals, 5 MHz BW, High Channel, 14 GHz – 18 GHz

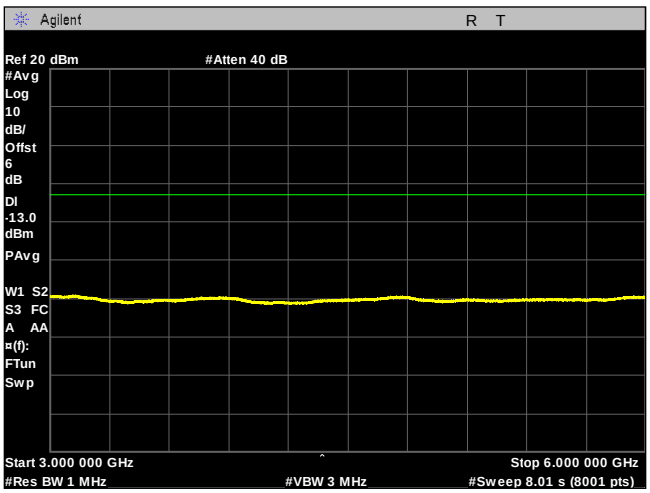
Spurious Emissions at Antenna Terminal, LTE Band 17, 10MHz, Low Channel



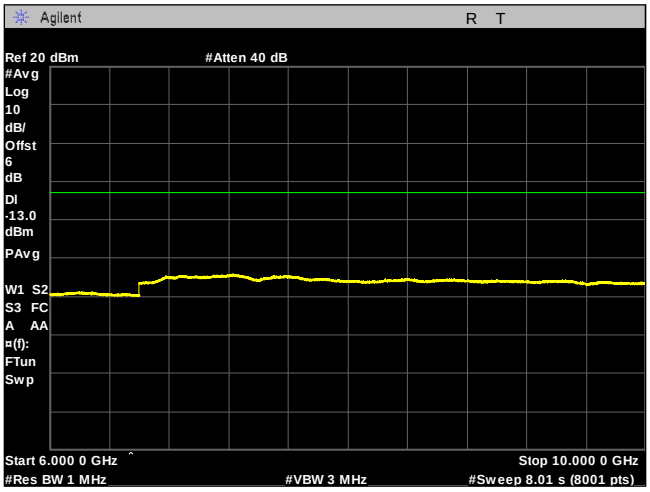
Plot 91. Spurious Emissions at Antenna Terminals, 10 MHz BW, Low Channel, 30 MHz – 1 GHz



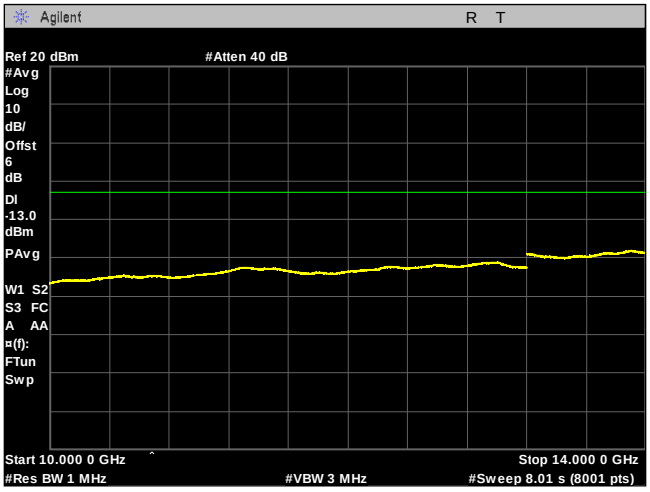
Plot 92. Spurious Emissions at Antenna Terminals, 10 MHz BW, Low Channel, 1 GHz – 3 GHz



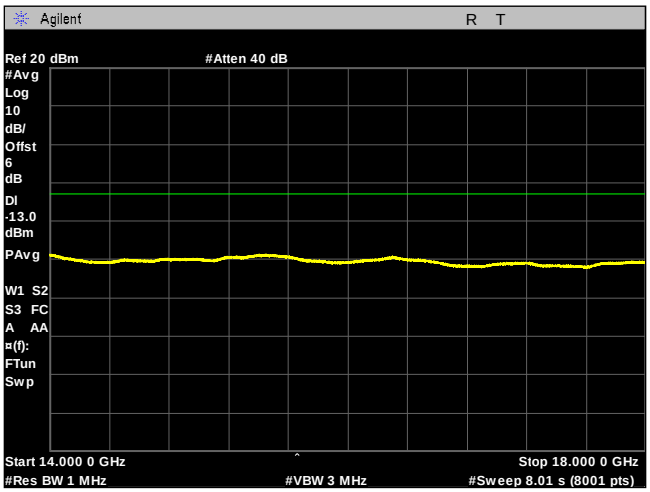
Plot 93. Spurious Emissions at Antenna Terminals, 10 MHz BW, Low Channel, 3 GHz – 6 GHz



Plot 94. Spurious Emissions at Antenna Terminals, 10 MHz BW, Low Channel, 6 GHz – 10 GHz

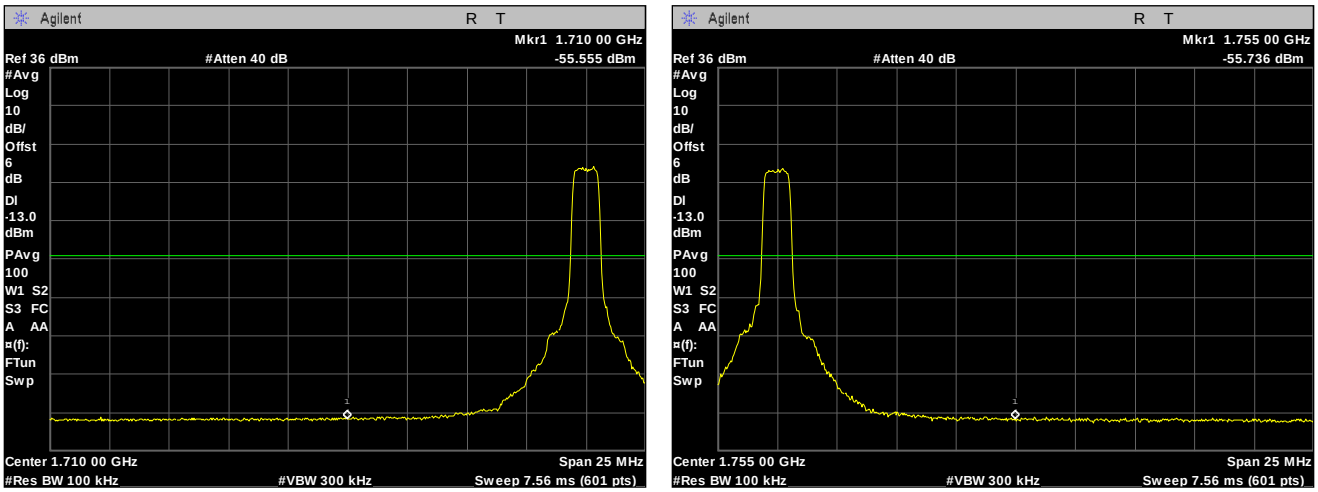


Plot 95. Spurious Emissions at Antenna Terminals, 10 MHz BW, Low Channel, 10 GHz – 14 GHz

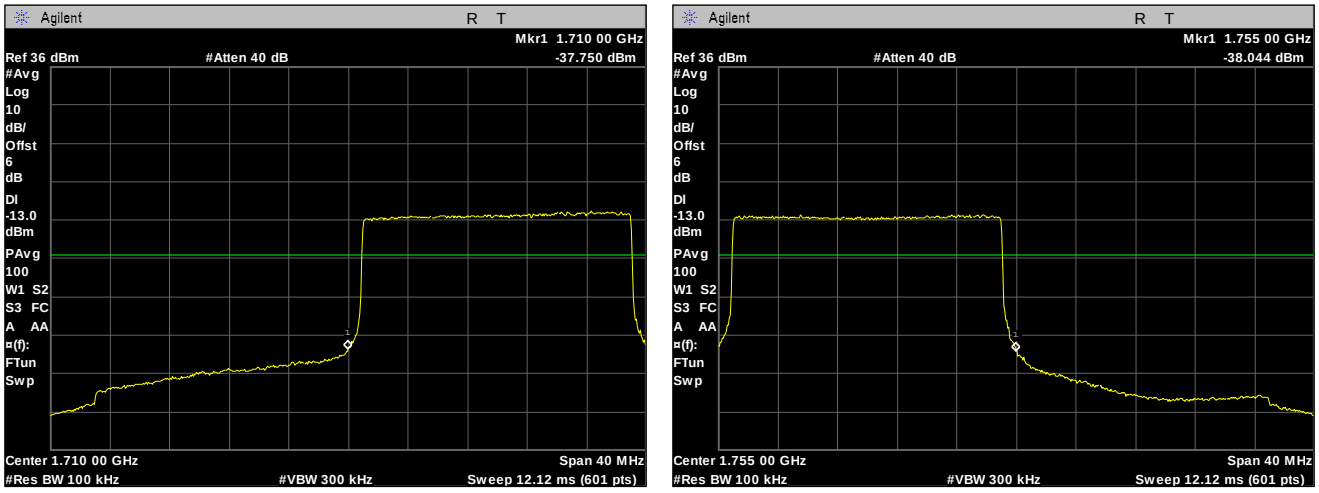


Plot 96. Spurious Emissions at Antenna Terminals, 10 MHz BW, Low Channel, 14 GHz – 18 GHz

Band Edge Measurements, LTE Band 4

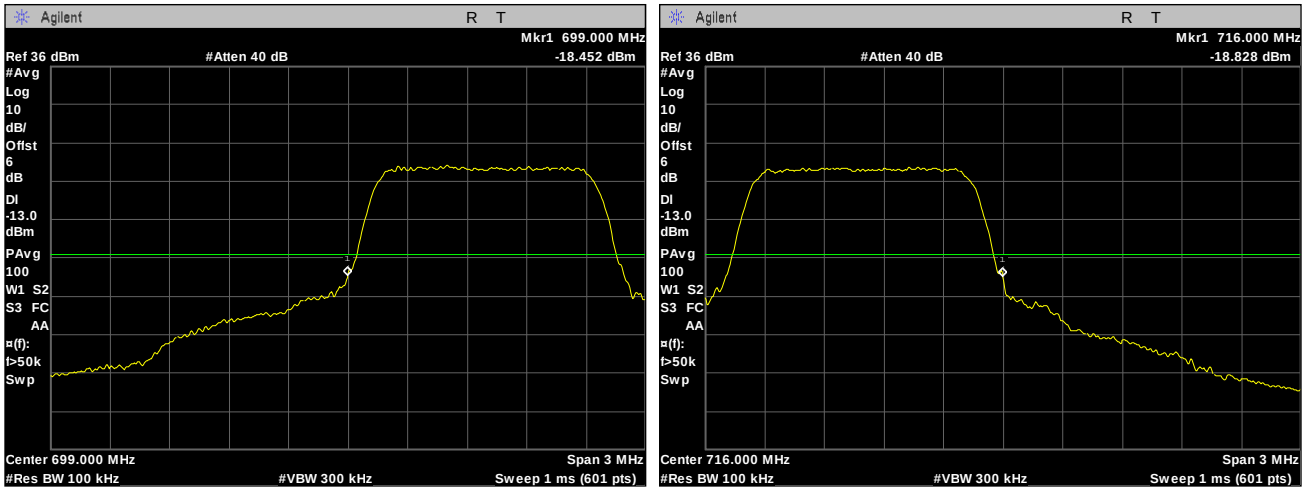


Plot 97. Spurious Emissions at Antenna Terminals, 1.4 MHz BW, Band Edge

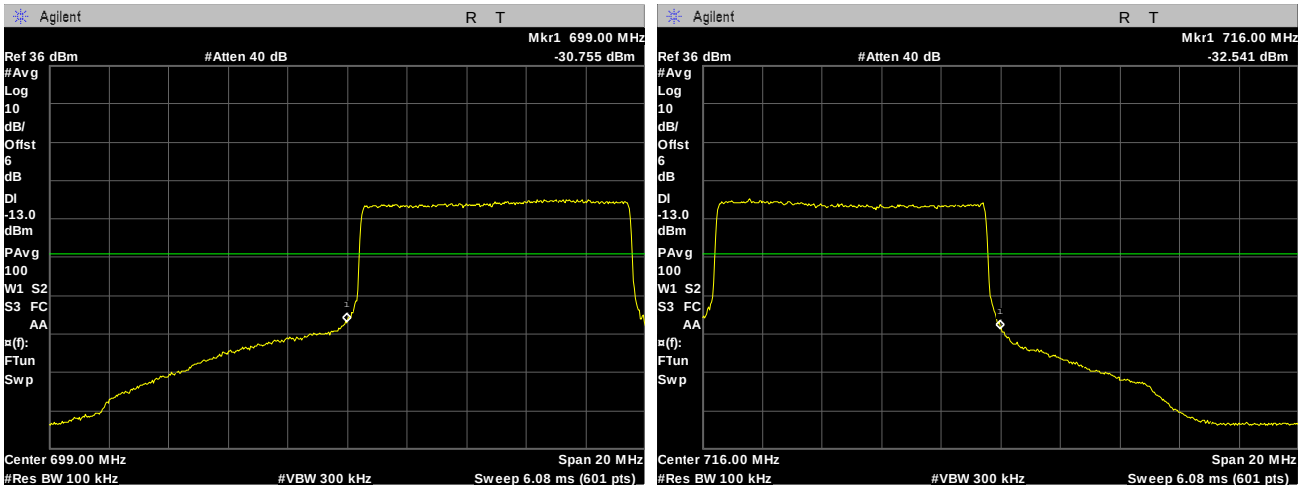


Plot 98. Spurious Emissions at Antenna Terminals, 20 MHz BW, Band Edge

Band Edge Measurements, LTE Band 12

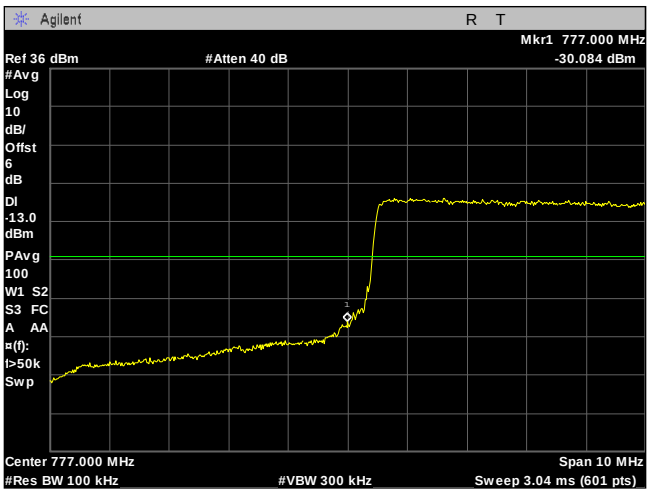


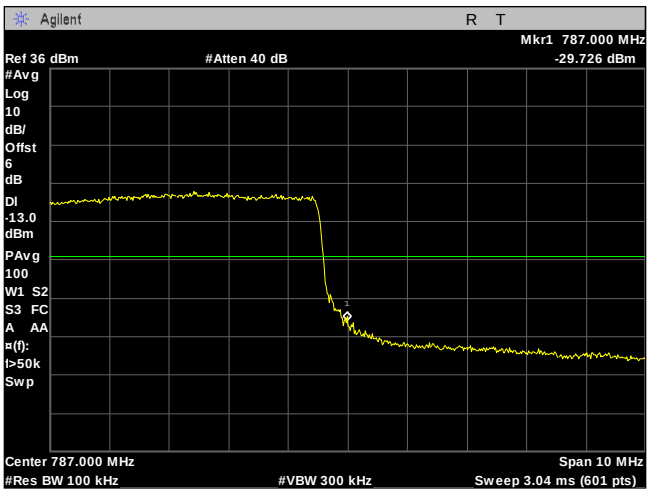
Plot 99. Spurious Emissions at Antenna Terminals, 1.4 MHz BW, Band Edge



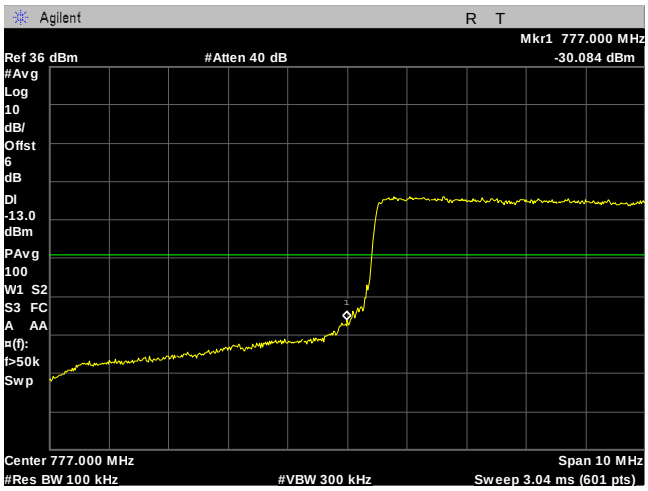
Plot 100. Spurious Emissions at Antenna Terminals, 10 MHz BW, Band Edge

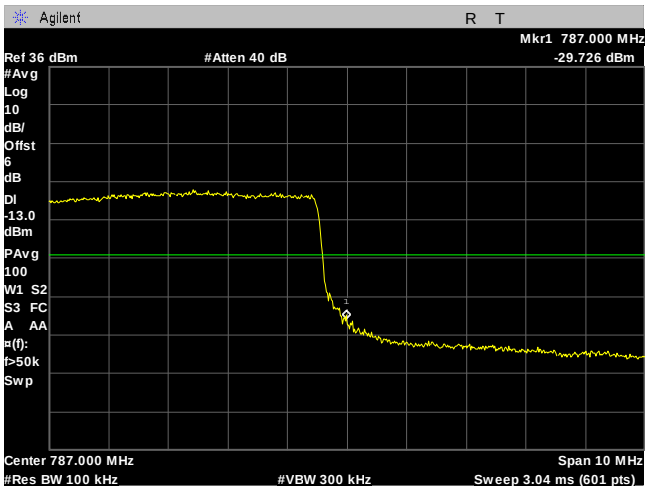
Band Edge Measurements, LTE Band 13





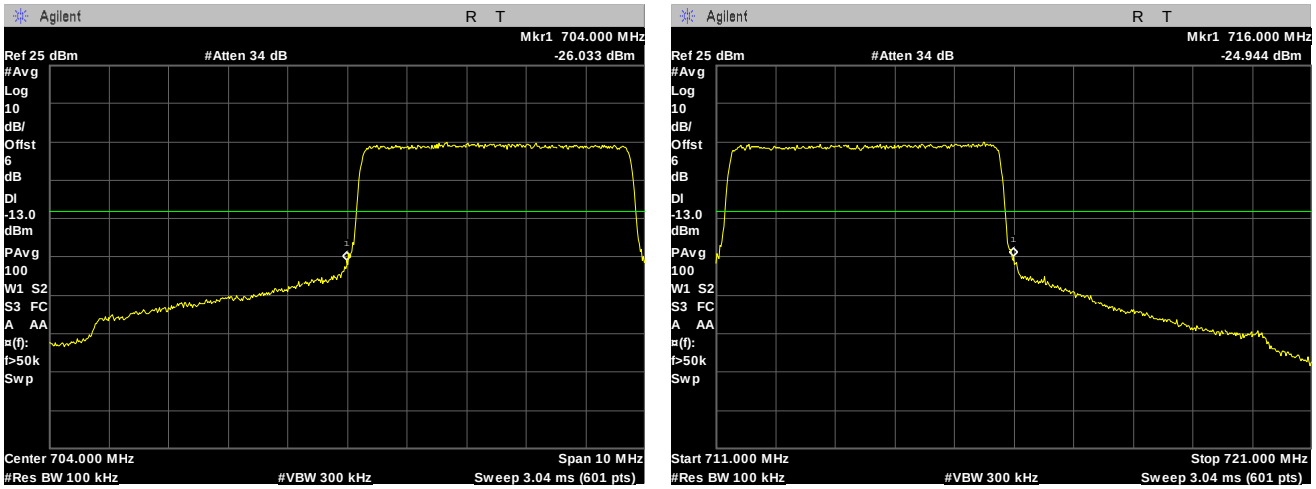
Plot 101. Spurious Emissions at Antenna Terminals, 5 MHz BW, Band Edge



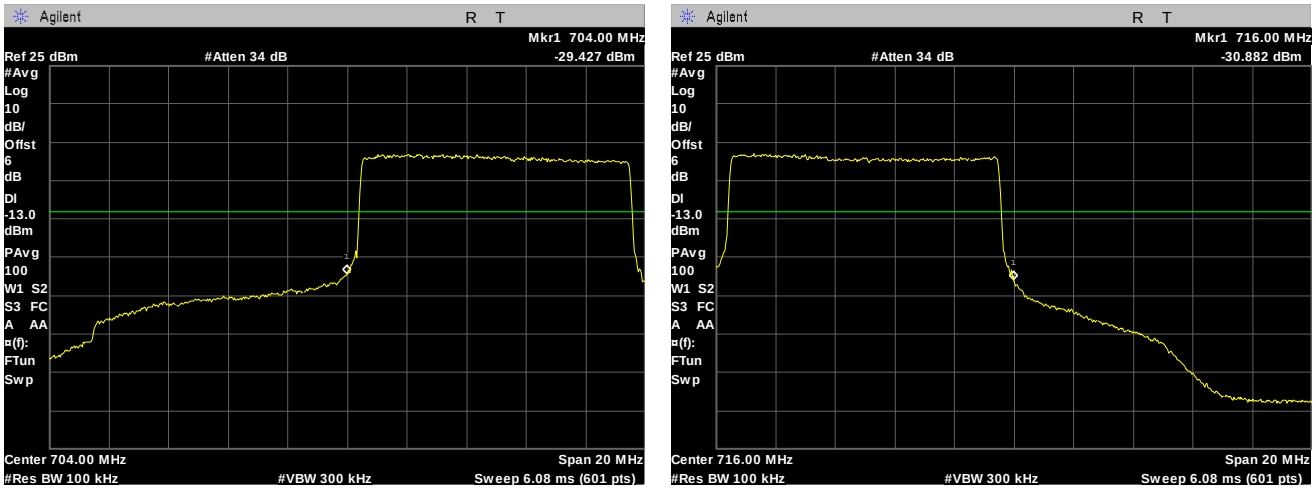


Plot 102. Spurious Emissions at Antenna Terminals, 10 MHz BW, Band Edge

Band Edge Measurements, LTE Band 17



Plot 103. Spurious Emissions at Antenna Terminals, 5 MHz BW, Band Edge



Plot 104. Spurious Emissions at Antenna Terminals, 10 MHz BW, Band Edge

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 24.232(d) Peak to Average Ratio

Test Requirement(s): **§ 27.50 (a)(B)** B) The peak-to-average power ratio (PAPR) of the transmitter output power must not exceed 13 dB.

Test Procedures: The EUT was tested using the spectrum analyzers peak to average power measurement function.

Test Results: Equipment complies with these requirements.

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

Test Engineer(s): Djed Mouada

Test Date(s): May 1, 2017

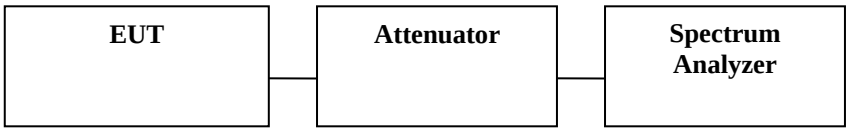
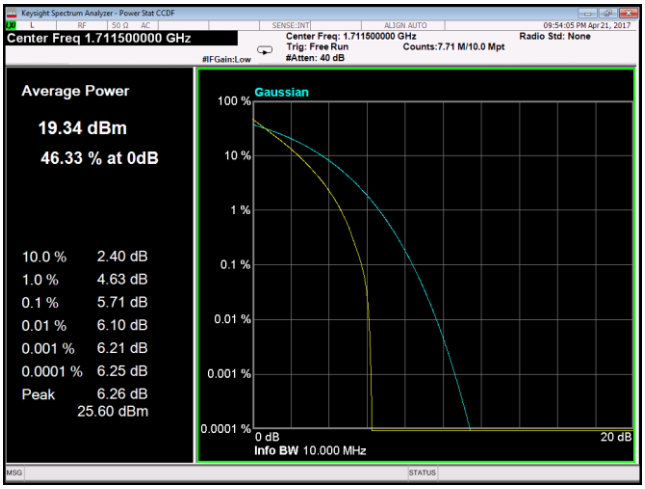
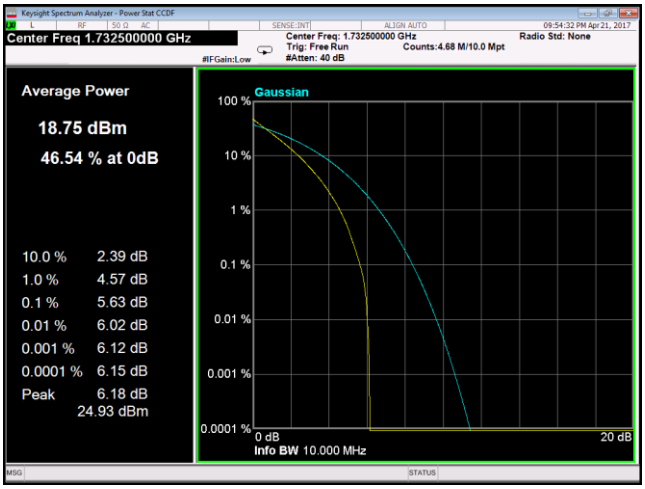


Figure 2. Spurious Emissions at Antenna Terminals Test Setup

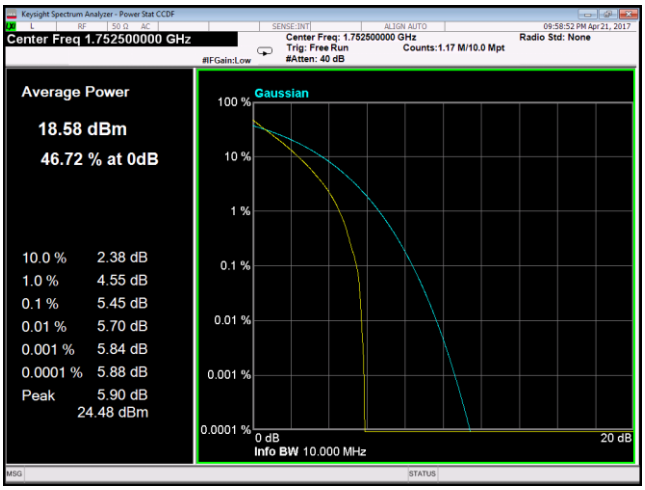
Peak to Average Ratio, Band 4



Plot 105. Peak to Average Ratio, Band 4, 3MHz, Low channel

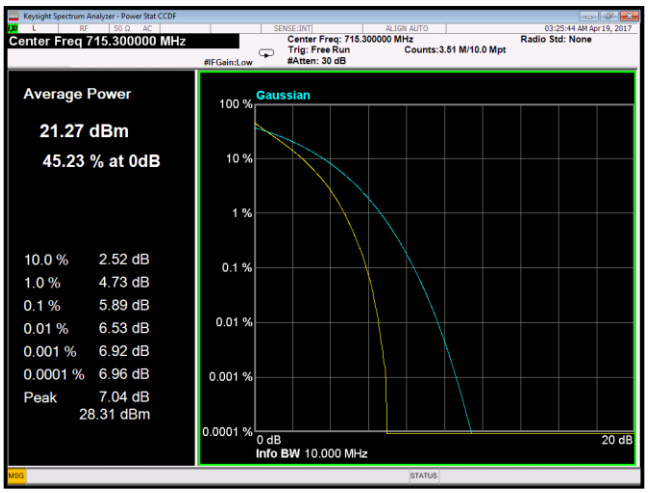


Plot 106. Peak to Average Ratio, Band 4, 3MHz, Mid Channel

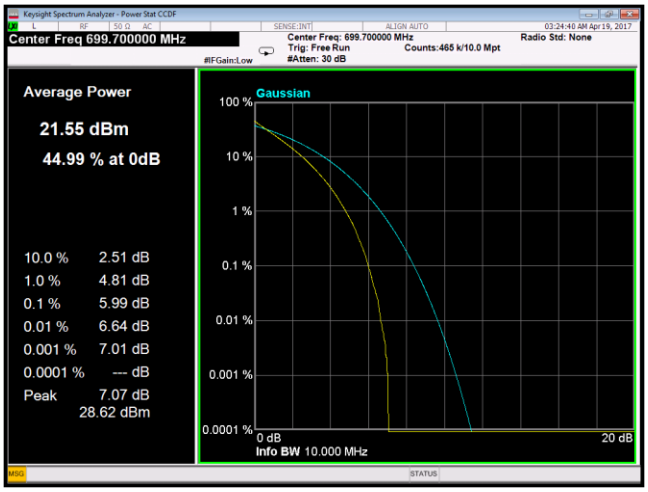


Plot 107. Peak to Average Ratio, Band 4, 3MHz, High Channel

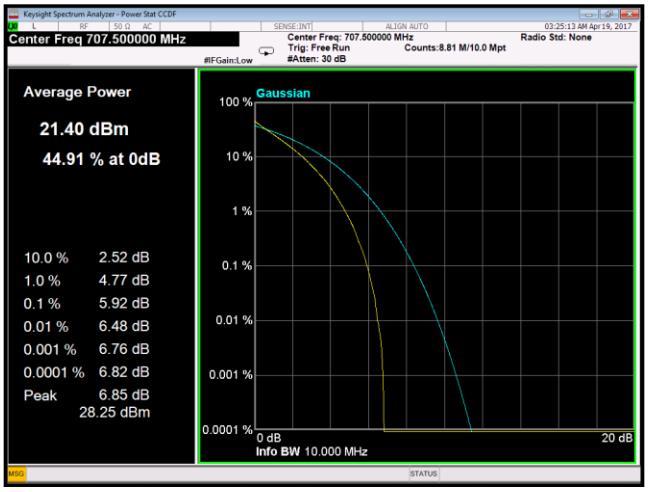
Peak to Average Ratio, Band 12



Plot 108. Peak to Average Ratio, Band 12, 1.4MHz, High channel

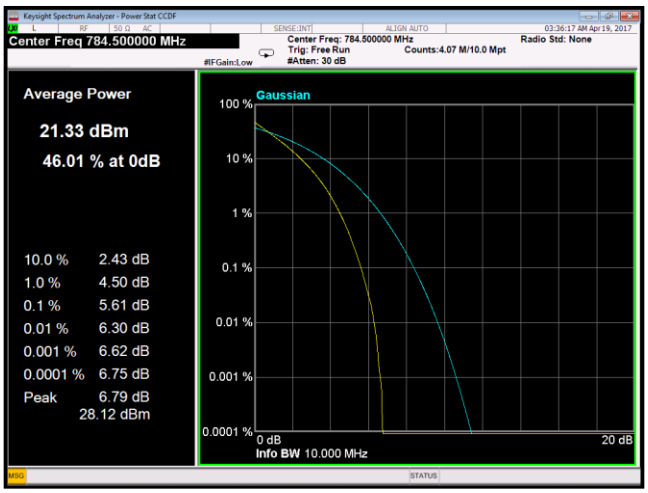


Plot 109. Peak to Average Ratio, Band 12, 1.4MHz, Low channel

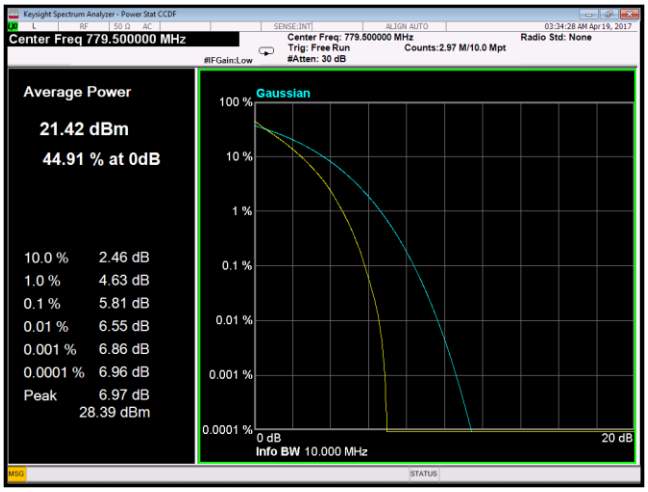


Plot 110. Peak to Average Ratio, Band 12, 1.4MHz, Mid channel

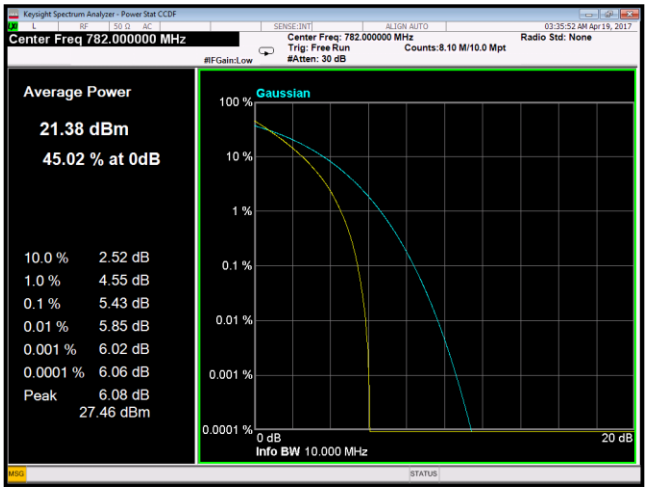
Peak to Average Ratio, Band 13



Plot 111. Peak to Average Ratio, Band 13, 5MHz, High channel

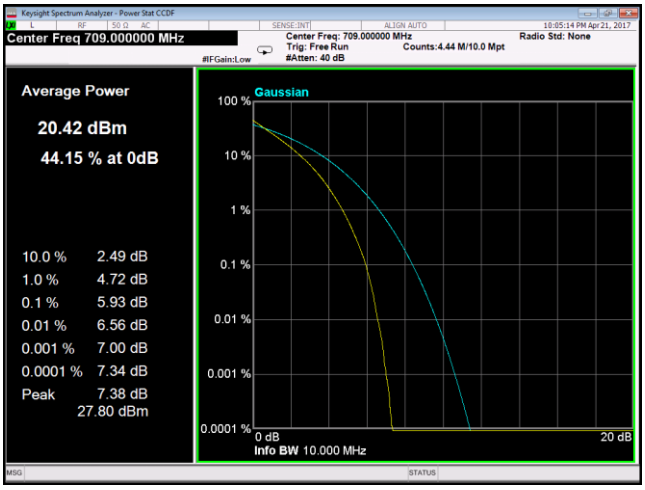


Plot 112. Peak to Average Ratio, Band 13, 5MHz, Low channel

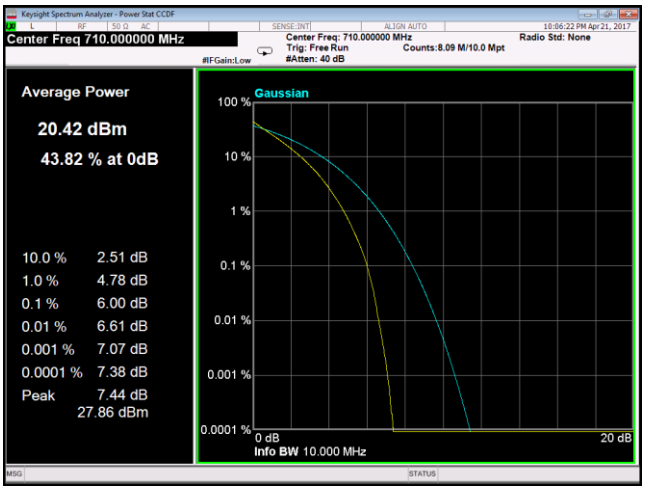


Plot 113. Peak to Average Ratio, Band 13, 5MHz, Mid channel

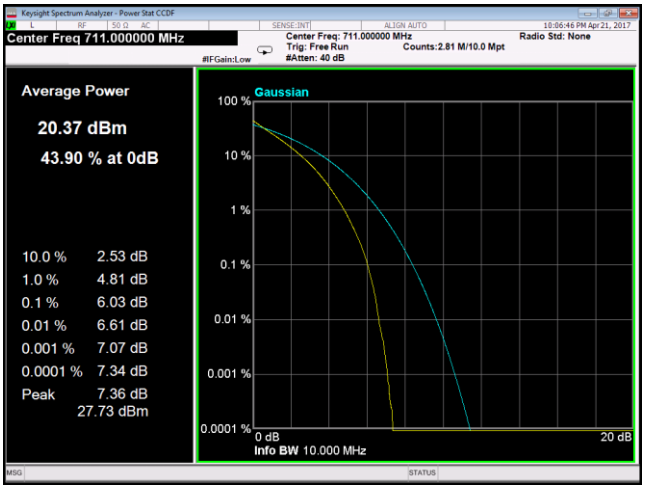
Peak to Average Ratio, Band 17



Plot 114. Peak to Average Ratio, Band 17, 10MHz, High channel



Plot 115. Peak to Average Ratio, Band 17, 10MHz, High channel



Plot 116. Peak to Average Ratio, Band 17, 10MHz, High 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. The operating voltage is varied to +/- 15 % of the nominal voltage at normal temperature.

Test Results: Equipment complies with the requirements of this section.

Test Engineer(s): Djed Mouada

Test Date(s): May 1, 2017

LTE Band 4 20MHz					
Voltage (DC)	**Trmperature**	**low 26dB point**	**Band Edge**	**High 26dB point**	**Band Edge**
110	-20	1710.011233	1710	1754.99614	1755
110	-10	1710.11457	1710	1754.99014	1755
110	0	1710.102545	1710	1754.990035	1755
110	10	1710.110027	1710	1754.991001	1755
110	20	1710.031	1710	1754.990021	1755
110	30	1710.00745	1710	1754.99112	1755
110	40	1710.0047	1710	1754.991133	1755
110	50	1710.001334	1710	1754.990981	1755
110	55	1710.0351	1710	1754.999055	1755
93.5	20	1710.032	1710	1754.989917	1755
108	20	1710.032	1710	1754.998854	1755

Table 8. Frequency Stability, Part 27, LTE Band, 420 MHz, Test Results

LTE Band 12 10 MHz					
Voltage (DC)	**low 26dB point**	**Band Edge**	**High 26dB point**	**Band Edge**	**Band Edge**
110	-20	699.1109	699	715.9958001	716
110	-10	699.1098	699	715.998221	716
110	0	699.101	699	715.998001	716
110	10	699.1009	699	715.989901	716
110	20	699.113	699	715.959	716
110	30	699.1004	699	715.95001	716
110	40	699.1101	699	715.98801	716
110	50	699.1098	699	715.980047	716
110	55	699.1004	699	715.9590041	716
93.5	20	699.112	699	715.957	716
108	20	699.111	699	715.957	716

Table 9. Frequency Stability, Part 27, LTE Band 1210 MHz, Test Results

LTE Band 13 10MHz					
Voltage (DC)	Temperature	low 26dB point	Band Edge	High 26dB point	Band Edge
110	-20	777.121	777	786.9885201	787
110	-10	777.1568	777	786.954818	787
110	0	777.1161	777	786.9867955	787
110	10	777.0842	777	786.9535976	787
110	20	777.18	777	786.9632968	787
110	30	777.0638	777	7869.980207	787
110	40	777.0472	777	786.9783054	787
110	50	777.0378	777	786.8789359	787
110	55	777.1413	777	786.9876636	787
93.5	20	777.19	777	786.9800214	787
108	20	777.23	777	786.9800014	787

Table 10. Frequency Stability, Part 27, LTE Band 1310 MHz, Test Results

LTE Band 17 20MHz					
Voltage (DC)	low 26dB point	Band Edge	High 26dB point	Band Edge	Band Edge
110	-20	704.1014	704	715.99098	716
110	-10	704.0019	704	715.98524	716
110	0	704.1003	704	715.98521	716
110	10	704.1101	704	715.985098	716
110	20	704.105	704	715.98	716
110	30	704.1005	704	715.9804	716
110	40	704.1005	704	715.998901	716
110	50	704.1008	704	715.998014	716
110	55	704.1015	704	715.98725	716
93.5	20	704.105	704	715.978901	716
108	20	704.105	704	715.989001	716

Table 11. Frequency Stability, Part 27, LTE Band 1720 MHz, Test Results

Frequency Stability, Test Setup

Photograph 3. Frequency Stability, Test Setup

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.407(f) RF Exposure

RF Exposure Requirements: **§1.1307(b)(1) and §1.1307(b)(2):** Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines.

RF Radiation Exposure Limit: **§1.1310:** As specified in this section, the Maximum Permissible Exposure (MPE) Limit shall be used to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation as specified in Sec. 1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of Sec. 2.1093 of this chapter.

MPE Limit Calculation: EUT's operating frequencies @ Band 4; highest conducted power = 20.04 dBm therefore, **Limit for Uncontrolled exposure: 1 mW/cm^2 or 10 W/m^2**

Equation from page 18 of OET 65, Edition 97-01

Equation from page 18 of OET 65, Edition 97-01

$$S = PG / 4\pi R2 \quad \text{or} \quad R = \sqrt{PG / 4\pi S}$$

where, S = Power Density
P = Power Input to antenna
G = Antenna Gain
R = Minimum Distance between User and Antenna (20 cm)

FCC									
Frequency (MHz)	**Con. Pwr. (dBm)**	**Con. Pwr. (mW)**	**Ant. Gain (dBi)**	**Ant. Gain numeric**	**Pwr. Density (mW/cm^2)**	**Limit (mW/cm^2)**	**Margin**	**Distance (cm)**	**Result**
1711.5	20.04	100.925	10	10	0.20078	1	0.79922	20	Pass

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
1T8818	Spectrum Analyzer	Agilent Technologies	E4407B	2/24/2017	2/24/2018
1T4753	Antenna - Bilog	Sunol Sciences	JB6	10/24/2016	4/24/2018
1T4563	LISN (10 AMP)	Solar Electronics Company	9322-50-R-10-BNC	3/13/2017	9/13/2018
1T4300	SEMI-ANECHOIC CHAMBER # 1 (NSA)	EMC TEST SYSTEMS	NONE	2/6/2015	2/6/2018
1T4409	EMI Receiver	Rohde & Schwarz	ESIB7	12/7/2016	12/7/2018
1T4269	Antenna: Loop	EMCO	10/28/1917	1/11/2016	7/11/2017
1T4483	Antenna; Horn	ETS-Lindgren	7/13/1908	4/19/2017	10/19/2018
1T4771	PSA Spectrum Analyzer	Agilent Technologies	E4446A	8/10/2016	2/10/2018

Table 12. 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

