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, CALIFORNIA 95054 ● PHONE (408) 748-3585 ● FAX (510) 489-6372
13301 MCCALLEN PASS ● AUSTIN, TX 78753 ● PHONE (512) 287-2500 ● FAX (512) 287-2513

August 10, 2018

Ubiquiti Networks
1250 S. Grove Ave. Suite 100
Barrington, IL 60010

Dear Alex Pavlos,

Enclosed is the EMC Wireless test report for compliance testing of the Ubiquiti Networks, AF-LTU, tested to the requirements of Title 47 of the Code of Federal Regulations (CFR), Part 90 Subpart Y for Land Mobile Radio Services.

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 feel free to contact me.

Sincerely yours,
MET LABORATORIES, INC.

Joel Huna
Documentation Department

Reference: (\Ubiquiti Networks\EMC98975B-FCC90Y)

ACCREDITED
TESTING CERT #0591.01

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Electromagnetic Compatibility Criteria Test Report

For the

Ubiquiti Networks
AF-LTU

Tested under

The FCC Verification Rules
Contained in Title 47 of the CFR, Part 90, Subpart Y
for Private Land Mobile Radio Services

MET Report: EMC98975B-FCC90Y

August 10, 2018

Prepared For:
Ubiquiti Networks
1250 S. Grove Ave. Suite 100
Barrington, IL 60010

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

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for Private Land Mobile Radio Services

MET Report: EMC98975B-FCC90Y

Donald Salguero, 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, Subpart Y of the FCC Rules under normal use and maintenance.

John Mason,
Director, Electromagnetic Compatibility Lab

Report Status Sheet

Revision	Report Date	Reason for Revision
0	August 10, 2018	Initial issue.

Table of Contents

All references to section numbers are taken directly from the standard/specification used. Only sections requiring testing or evaluation are included.

List of- Tables

List of Figures

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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**ert**z**
IEC	**I**nternational **E**lectrotechnical **C**ommission
kHz	**k**ilo**h**ert**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

Executive Summary

1. Testing Summary

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 90, Subpart Y. All tests were conducted using measurement procedure ANSI TIA/EIA-603-A-2004.

Title 47 of the CFR, Part 90, Subpart Y, and FCC 04-265 Reference and Test Description	Compliance / Comments
2.1046; 90.1215(a) Peak Power Output	Compliant
2.1046; 90.1215(a) Peak Power Spectral Density	Compliant
2.1049; 90.210(M) Occupied Bandwidth (Emission Mask)	Compliant
2.1051; 90.210(M) Spurious Emissions at Antenna Terminals	Compliant
2.1053; 90.210(M) Radiated Spurious Emissions	Compliant
2.1055(a) (1); 90.213 Frequency Stability over Temperature Variations	Compliant
§90.1215(e) Peak Excursion	Compliant
90.1217 RF Hazards (MPE Calculation)	Compliant

Equipment Configuration

2. Equipment Configuration

2.1. Overview

MET Laboratories, Inc. was contracted by Ubiquiti Networks to perform testing on the AF-LTU under purchase order number US101740.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Ubiquiti Networks, AF-LTU.

An EMC evaluation to determine compliance of the TB 4.9 with the requirements of Part 90, Subpart Y, was conducted. (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 AF-LTU. Ubiquiti Networks should retain a copy of this document and it should be kept on file for at least five years after the manufacturing of the EUT has been **permanently** discontinued. The results obtained relate only to the item(s) tested.

Model(s) Tested:	AF-LTU	
Model(s) Covered:	AF-LTU	
EUT Specifications:	Primary Power Source: 100 – 240 VDC 50/60 Hz	
	FCC ID: SWX-AFLTU	
	Type of Modulations:	Proprietary OFDM
	Max Peak and Output Power:	26.13dBm; 0.41W
	Equipment Code:	TNB
	EUT Frequency Ranges:	4945 to 4985 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:	Donald Salguero	
Report Date(s):	August 10, 2018	

2.2. 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 semi-anechoic chamber (equivalent to an Open Area Test Site). In accordance with §2.948(a)(3), a complete site description is contained at MET Laboratories.

2.3. 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 1. Uncertainty Calculations Summary

2.4. Description of Test Sample

The Ubiquiti Networks AF-LTU, Equipment Under Test (EUT), is a 5.150GHz – 5.850GHz, Digital Transmission radio that uses OFDM MIMO Uncorrelated Cross-Polarized communication with a 100/80/60/50MHz/40MHz/30MHz/28MHz/ 20MHz/10MHz/ 7MHz/5MHz/3.5MHz bandwidth configuration. The EUT would be used outdoors and pole mounted. It is powered from a PoE adapter. The reverse-polarized connectorized has the ability when professionally installed by a user with cross-polarized antennas. This is the only matter that would be able to create a functional link to work.

2.5. Equipment Configuration

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

Ref. ID	Slot #	Name / Description	Model Number	Part Number	Serial Number	Rev. #
1		**Switching Gigabit Power Supply**	**GP-H240-100G-4**	**1514**	**0000936**	
2		**Middle Gain Omni**	**AMO-5G10**	**AM5E**	**43771**	
3		**5 GHz 34dBi Slant 45 Antenna**	**AF-5G34-S45**	**AF5C**	**07623**	
4		**Ethernet Cables**	**N/A**	**N/A**	**N/A**	
5		**GPS Antenna**	**N/A**	**N/A**	**N/A**	
6		**Sector Antenna**	**N/A**	**N/A**	**N/A**	

Table 2. Equipment Configuration

2.6. Support Equipment

Ubiquiti Networks supplied support equipment necessary for the operation and testing of the AF-LTU. All support equipment supplied is listed in the following Support Equipment List.

Ref. ID	Name / Description	Manufacturer	Model Number	*Customer Supplied Calibration Data
1	Laptop	HP	Pro Book 430 G1	N/A
2	Laptop	ASUS	X502C	N/A
3	Laptop	Apple	MacBook Pro	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 3. Support Equipment

2.7. 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	Management Port	RJ45 Ethernet	1	2		Yes	
2	Data Port	RJ45 Ethernet	1	2		Yes	
3	RP sma CH0	RF coax	1	2		Yes	
4	RP sma CH1	RF coax	1	2		Yes	

Table 4. Ports and Cabling Information

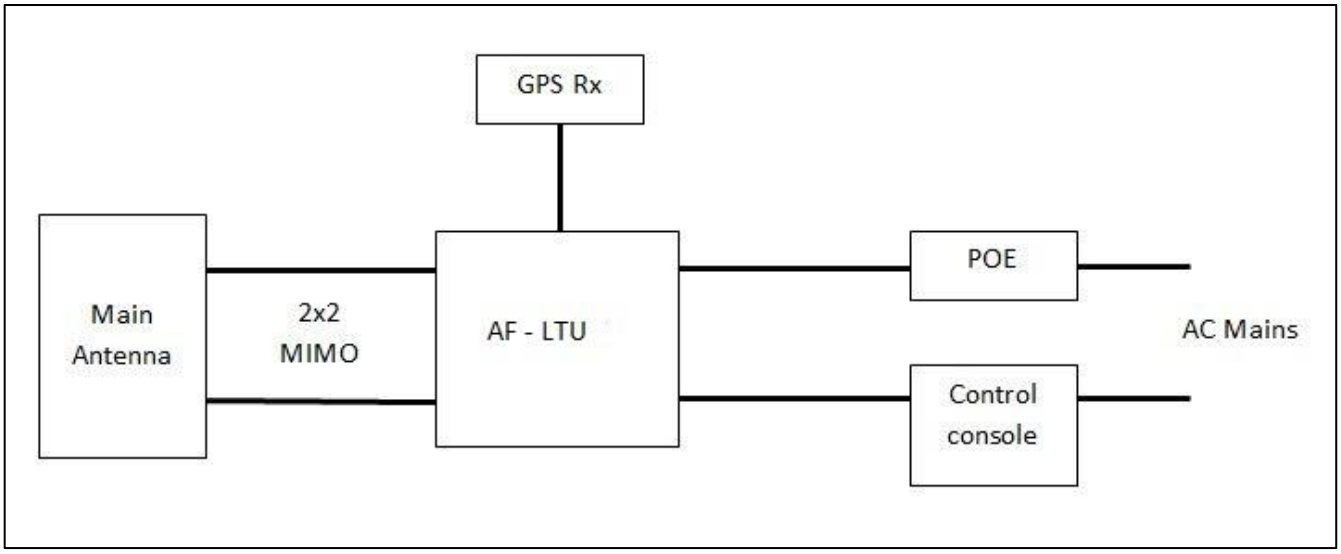


Figure 1. Block Diagram of Test Configuration

2.8. Mode of Operation

Using internal test modes only for testing purposes the radio is set up in a continuous transmit mode. This allows for frequency, power, and channel bandwidth to be adjusted for measurement purposes. Scripts and specific command line commands are used to manipulate the radio in test mode.

2.9. Method of Monitoring EUT Operation

1. A blinking green "Data" LED will indicate error-free data is being transferred on the test cable.
2. Any other LED status besides the blinking green LED (i.e. LED light off, etc) will indicate error-free data is not being transferred on the test cable.

2.10. Modifications

2.10.1. Modifications to EUT

No modifications were made to the EUT.

2.10.2. Modifications to Test Standard

No modifications were made to the test standard.

2.11. Disposition of EUT

The test sample including all support equipment submitted to the Electro-Magnetic Compatibility Lab for testing was returned to Ubiquiti Networks upon completion of testing.

III. Electromagnetic Compatibility Criteria for Intentional Radiators

3. Electromagnetic Compatibility RF Power Output Requirements

3.1. RF Power Output

Test Requirement(s): **§2.1046 and §90.1215(a) with FCC 04-265**

The transmitting power of stations operating in the 4940-4990 MHz band must not exceed the maximum limits in this section.

(a)(1) The maximum conducted output power should not exceed:

Channel Bandwidth (MHz)	Low Power - Maximum Conducted Output Power (dBm)	High Power - Maximum Conducted Output Power (dBm)
1	7	20
5	14	27
10	17	30
15	18.8	31.8
20	20	33

(2) If transmitting antennas of directional gain greater than 9 dBi are used, both the maximum conducted output power and the peak power spectral density should be reduced by the amount in decibels that the directional gain of the antenna exceeds 9 dBi. However, high power point-to-point and point-to-multipoint operations (both fixed and temporary-fixed rapid deployment) may employ transmitting antennas with directional gain up to 26 dBi without any corresponding reduction in the maximum conducted output power or spectral density. Corresponding reduction in the maximum conducted output power and peak power spectral density should be the amount in decibels that the directional gain of the antenna exceeds 26 dBi.

(c) The maximum conducted output power is measured as a conducted emission over any interval of continuous transmission using instrumentation calibrated in terms of an RMS-equivalent voltage.

Test Procedures: As required by 47 CFR 2.1046, *RF power output measurements* were made at the RF output terminals using a Spectrum Analyzer.

A laptop was connected to EUT to control the RF power output and frequency channel. The EUT was connected to a Spectrum Analyzer via an attenuator to measure the Peak power. The EUT power was adjusted enough to produce maximum output power as specified in the owner's manual. Measurements were made at the low, mid and high channels. Procedure 5.2.4.4 from ANSI C63.26-2015 was used to measure the average output power.

Test Results: Equipment is compliant with 47CFR 2.1046 and 90.1215(a) with FCC 04-265. No anomalies detected..

All RF Power output measurements were direct connection to RF output Terminal of EUT from a Spectrum Analyzer.

Test Engineer(s): Donald Salguero

Test Date(s): May 24, 2018

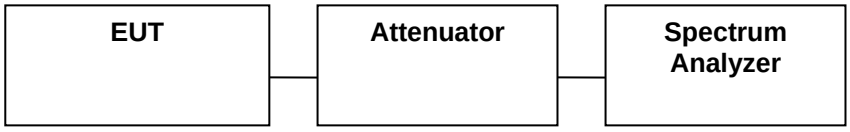


Figure 2. RF Power Output Test Setup

Center Frequency (MHz)	Chain 0 (dBm)	Chain 1 (dBm)	Sum (dBm)	Antenna Gain (dBi)	Limit (dBm)	Final Limit (dBm)	Margin
4945	22.68	22.7	25.7	19	30	30	-4.3
4965	22.64	23.45	26.07	19	30	30	-3.93
4985	22.87	23.35	26.13	19	30	30	-3.87

Table 5. RF Output Power, 10M, Test Results 1

Center Frequency (MHz)	Chain 0 (dBm)	Chain 1 (dBm)	Sum (dBm)	Antenna Gain (dBi)	Limit (dBm)	Final Limit (dBm)	Margin
4945	22.68	22.7	25.7	27	30	29	-3.3
4965	22.64	23.45	26.07	27	30	29	-2.93
4985	22.87	23.35	26.13	27	30	29	-2.87

Table 6. RF Output Power, 10M, Test Results 2

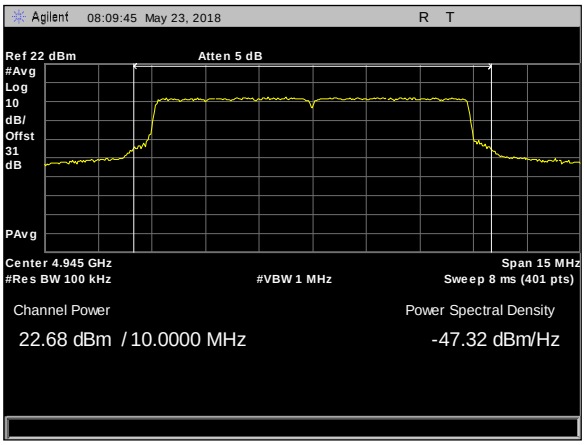
Center Frequency (MHz)	Chain 0 (dBm)	Chain 1 (dBm)	Sum (dBm)	Antenna Gain (dBi)	Limit (dBm)	Final Limit (dBm)	Margin
4950	22.63	22.65	25.65	19	33	33	-7.35
4965	22.76	22.7	25.74	19	33	33	-7.26
4980	22.93	22.88	25.92	19	33	33	-7.08

Table 7. RF Output Power, 20M, Test Results 1

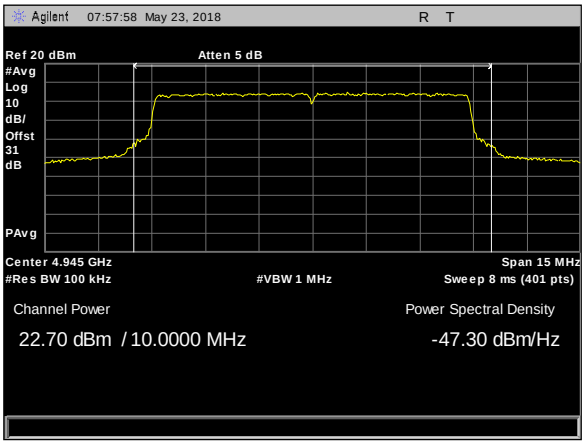
Center Frequency (MHz)	Chain 0 (dBm)	Chain 1 (dBm)	Sum (dBm)	Antenna Gain (dBi)	Limit (dBm)	Final Limit (dBm)	Margin
4950	22.63	22.65	25.65	27	33	32	-6.35
4965	22.76	22.7	25.74	27	33	32	-6.26
4980	22.93	22.88	25.92	27	33	32	-6.08

Table 8. RF Output Power, 20M, Test Results 2

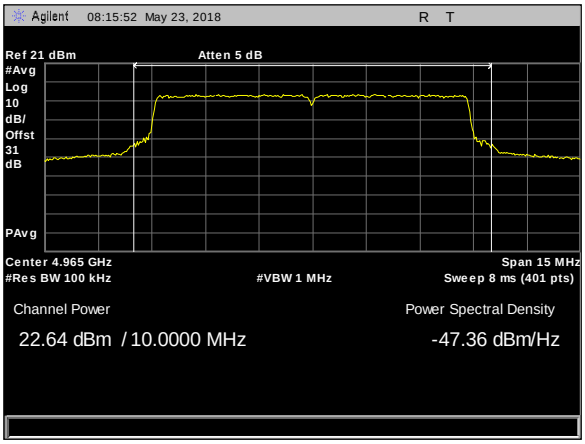
RF Power Output



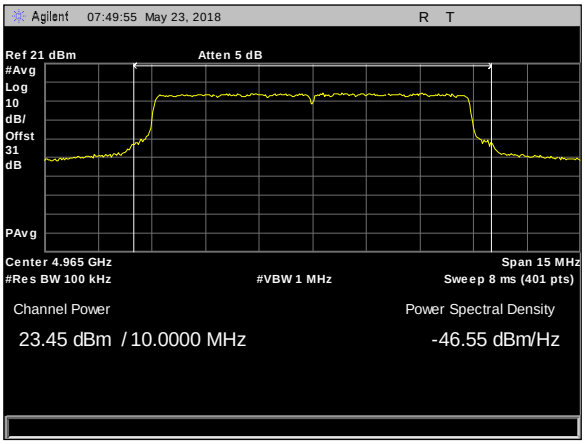
Plot 1. Output Power, LTU, 10M, 4945M, c0



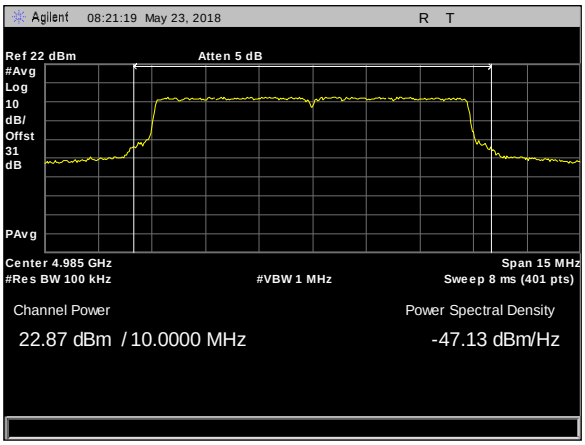
Plot 2. Output Power, LTU, 10M, 4945M, c1



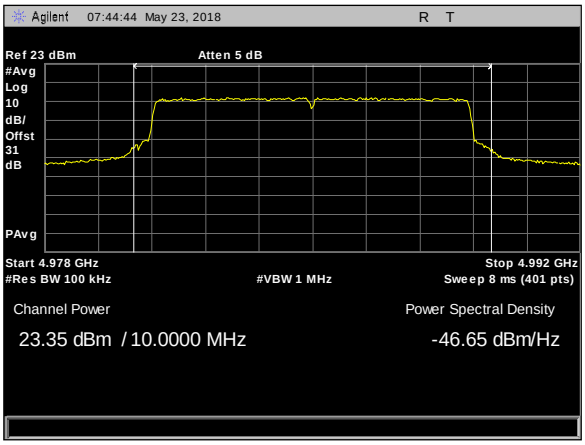
Plot 3. Output Power, LTU, 10M, 4965M, c0



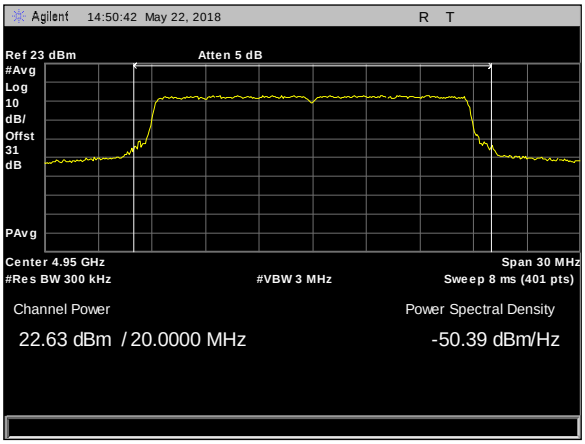
Plot 4. Output Power, LTU, 10M, 4965M, c1



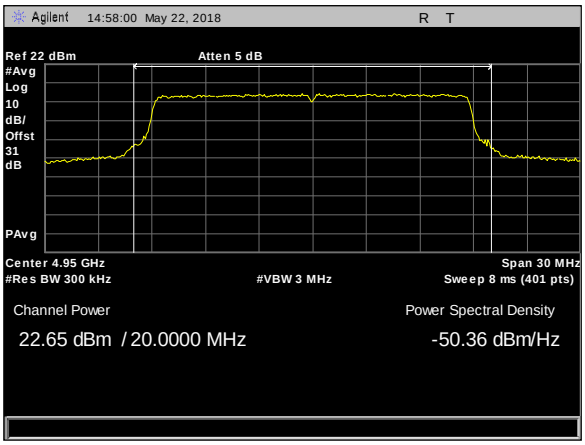
Plot 5. Output Power, LTU, 10M, 4985M, c0



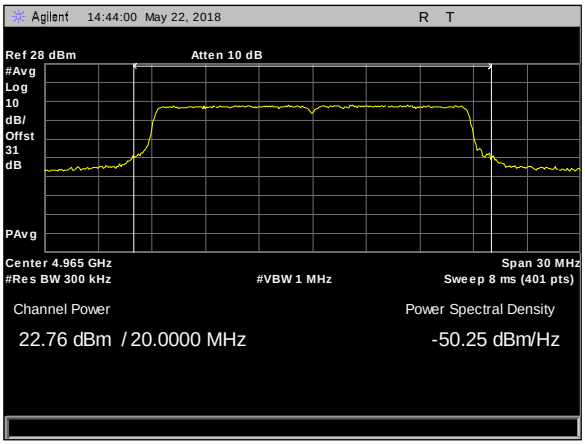
Plot 6. Output Power, LTU, 10M, 4985M, c1



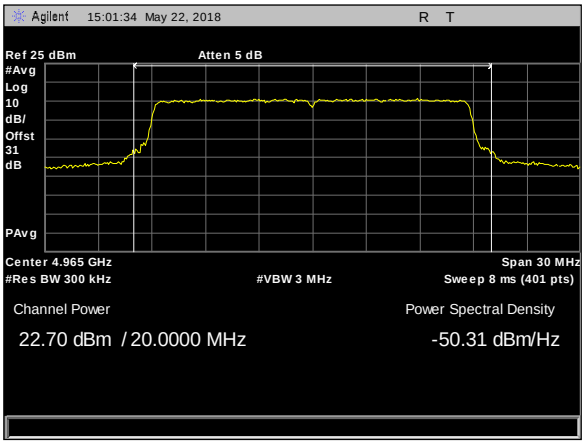
Plot 7. Output Power, LTU, 20M, 4950M, c0



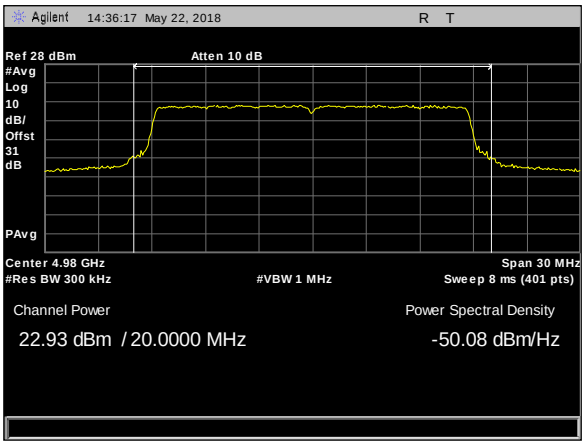
Plot 8. Output Power, LTU, 20M, 4950M, c1



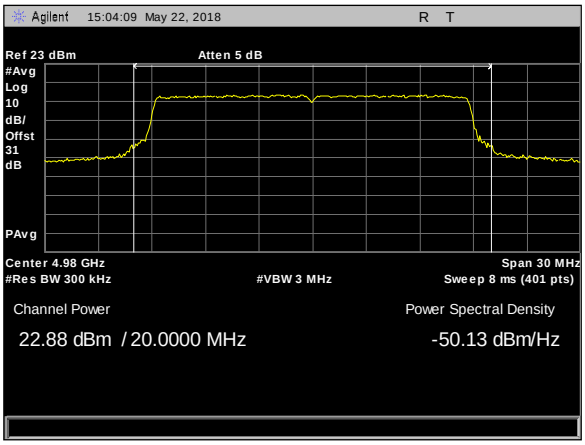
Plot 9. Output Power, LTU, 20M, 4965M, c0



Plot 10. Output Power, LTU, 20M, 4965M, c1



Plot 11. Output Power, LTU, 20M, 4980M, c0



Plot 12. Output Power, LTU, 20M, 4980M, c1

3.2. Peak Power Spectral Density

Test Requirement(s): **§90.1215(a) with FCC 04-265**

2) High power devices are also limited to a peak power spectral density of 21 dBm per one MHz. High power devices using channel bandwidths other than those listed above are permitted; however, they are limited to peak power spectral density of 21 dBm/MHz. If transmitting antennas of directional gain greater than 9 dBi are used, both the maximum conducted output power and the peak power spectral density should be reduced by the amount in decibels that the directional gain of the antenna exceeds 9 dBi. However, high power point-to-point and point-to-multipoint operations (both fixed and temporary-fixed rapid deployment) may employ transmitting antennas with directional gain up to 26 dBi without any corresponding reduction in the maximum conducted output power or spectral density. Corresponding reduction in the maximum conducted output power and peak power spectral density should be the amount in decibels that the directional gain of the antenna exceeds 26 dBi.

(d) The peak power spectral density is measured as conducted emission by direct connection of a calibrated test instrument to the equipment under test. If the device cannot be connected directly, alternative techniques acceptable to the Commission may be used. Measurements are made over a bandwidth of one MHz or the 26 dB emission bandwidth of the device, whichever is less. A resolution bandwidth less than the measurement bandwidth can be used, provided that the measured power is integrated to show total power over the measurement bandwidth. If the resolution bandwidth is approximately equal to the measurement bandwidth, and much less than the emission bandwidth of the equipment under test, the measured results shall be corrected to account for any difference between the resolution bandwidth of the test instrument and its actual noise bandwidth.

Test Procedures: As required by 47 CFR 2.1046, *RF power output measurements* were made at the RF output terminals using a Directional Coupler through a Spectrum Analyzer and Power Meter.

A laptop was connected to EUT to control the RF power output and frequency channel. The EUT was connected to a Spectrum Analyzer via an attenuator to measure the Peak power. The EUT power was adjusted enough to produce maximum output power as specified in the owner's manual. Measurements were made at the low, mid and high channels. Procedure 5.2.4.4 from ANSI C63.26-2015 was used to measure the power spectral density. The power integration function on the spectrum analyzer was used to measure the PSD. A factor of 60dB was added to the measurement to convert the units from dBm/Hz to dBm/MHz

Test Results: Equipment is compliant with 47 CFR 2.1046 and 90.1215(a) with FCC 04-265.

The following pages show measurements of Peak Power Spectral Density plots which is recorded below:

Test Engineer(s): Donald Salguero

Test Date(s): May 24, 2018

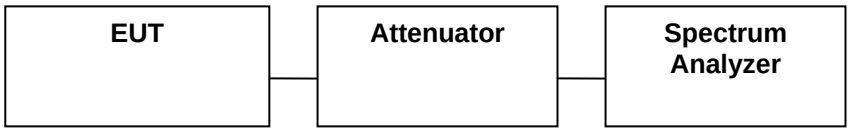


Figure 3. Peak Spectral Density Test Setup

Center Frequency (MHz)	Chain 0 (dBm)	Chain 1 (dBm)	Sum (dBm)	Antenna Gain (dBi)	Limit (dBm)	Final Limit (dBm)	Margin
4945	15.98	15.44	18.73	19	21	21	-2.27
4965	15.81	15.24	18.54	19	21	21	-2.46
4985	15.31	14.88	18.11	19	21	21	-2.89

Table 9. Peak Power Spectral Density, 10M, Test Results 1

Center Frequency (MHz)	Chain 0 (dBm)	Chain 1 (dBm)	Sum (dBm)	Antenna Gain (dBi)	Limit (dBm)	Final Limit (dBm)	Margin
4945	15.98	15.44	18.73	27	21	20	-1.27
4965	15.81	15.24	18.54	27	21	20	-1.46
4985	15.31	14.88	18.11	27	21	20	-1.89

Table 10. Peak Power Spectral Density, 10M, Test Results 2

Center Frequency (MHz)	Chain 0 (dBm)	Chain 1 (dBm)	Sum (dBm)	Antenna Gain (dBi)	Limit (dBm)	Final Limit (dBm)	Margin
4950	12.44	12.1	15.28	19	21	21	-5.72
4965	12.75	12.15	15.47	19	21	21	-5.53
4980	12.39	11.88	15.15	19	21	21	-5.85

Table 11. Peak Power Spectral Density, 20M, Test Results 1

Center Frequency (MHz)	Chain 0 (dBm)	Chain 1 (dBm)	Sum (dBm)	Antenna Gain (dBi)	Limit (dBm)	Final Limit (dBm)	Margin
4950	12.44	12.1	15.28	27	21	20	-4.72
4965	12.75	12.15	15.47	27	21	20	-4.53
4980	12.39	11.88	15.15	27	21	20	-4.85

Table 12. Peak Power Spectral Density, 20M, Test Results 2

4. Electromagnetic Compatibility Occupied Bandwidth Requirements

4.1. Occupied Bandwidth (Emission Mask)

Test Requirement(s): **§2.1049 and §90.210 (M) with FCC 04-265 (Emissions Mask M)**

(m) Emission Mask M. For high power transmitters (greater that 20 dBm) operating in the 4940-4990 MHz frequency band, the power spectral density of the emissions must be attenuated below the output power of the transmitter as follows:

(1) On any frequency removed from the assigned frequency between 0-45% of the authorized bandwidth (BW): 0 dB.

(2) On any frequency removed from the assigned frequency between 45-50% of the authorized bandwidth: 568 log (% of (BW)/45) dB.

(3) On any frequency removed from the assigned frequency between 50-55% of the authorized bandwidth: 26 + 145 log (% of BW/50) dB.

(4) On any frequency removed from the assigned frequency between 55-100% of the authorized bandwidth: 32 + 31 log (% of (BW)/55) dB.

(5) On any frequency removed from the assigned frequency between 100-150% of the authorized bandwidth: 40 + 57 log (% of (BW)/100) dB.

(6) On any frequency removed from the assigned frequency between above 150% of the authorized bandwidth: 50 dB or 55 + 10 log (P) dB, whichever is the lesser attenuation.

(7) The zero dB reference is measured relative to the highest average power of the fundamental emission measured across the designated channel bandwidth using a resolution bandwidth of at least one percent of the occupied bandwidth of the fundamental emission and a video bandwidth of 30 kHz. The power spectral density is the power measured within the resolution bandwidth of the measurement device divided by the resolution bandwidth of the measurement device. Emission levels are also based on the use of measurement instrumentation employing a resolution bandwidth of at least one percent of the occupied bandwidth.

Test Procedures: As required by 47 CFR 2.1049, *occupied bandwidth measurements* were made at the RF output terminals using a Spectrum Analyzer.

For the Emission mask, a laptop was connected to EUT to control the RF power output and frequency channel. The EUT was connected to a Spectrum Analyzer via attenuator. The measured highest Average Power was set relative to zero dB reference. The RBW of the Spectrum Analyzer was set to at least 1% of the channel bandwidth, VBW equal to 30kHz. The EUT power was adjusted at the maximum output power level. Measurements were carried out at the low, mid and high channels of the TX band.

Test Results: Equipment is compliant with Section 2.1049 and 90.210(M) with FCC 04-265 (Emission Mask M). The EUT does not exceed the Emission Masks limit.

The following pages show measurements of Emission Mask plots:

Test Engineer(s): Donald Salguero

Test Date(s): May 24, 2018

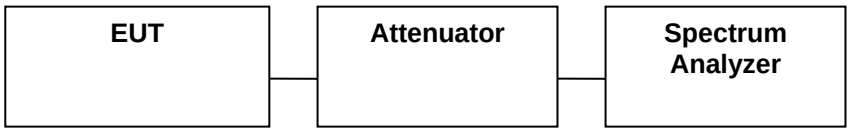


Figure 4. Occupied Bandwidth (Emission Mask) Test Setup

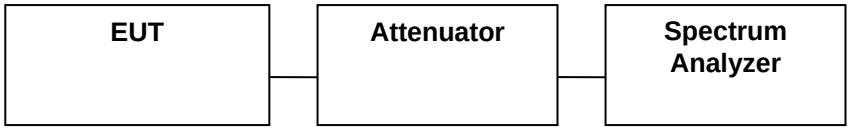
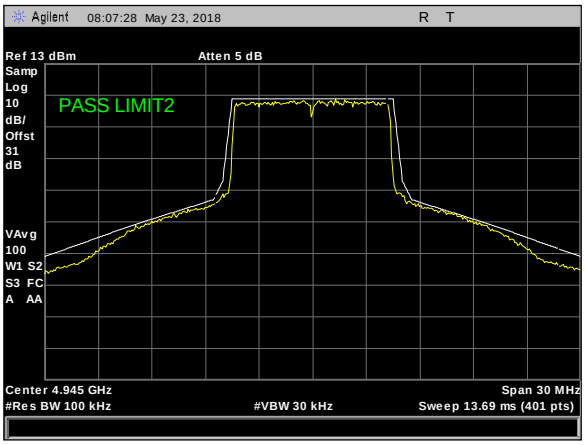


Figure 5. Occupied Bandwidth Test Setup

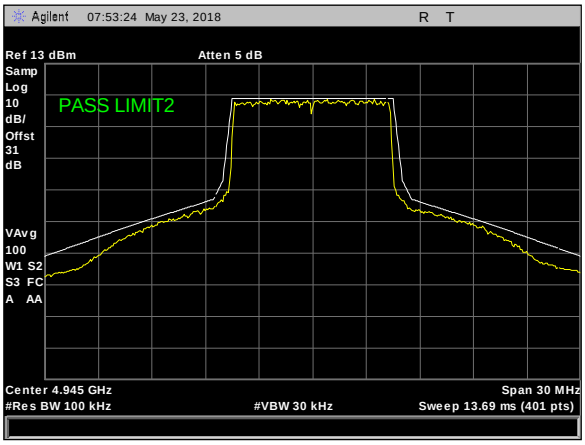
Nominal Bandwidth (MHz)	Center Frequency (MHz)	99% BW (MHz)
10	4945	8.7849
	4965	8.772
	4985	8.7682
20	4950	17.5689
	4965	17.6245
	4980	17.6125

Table 13. Occupied Bandwidth, Test Results

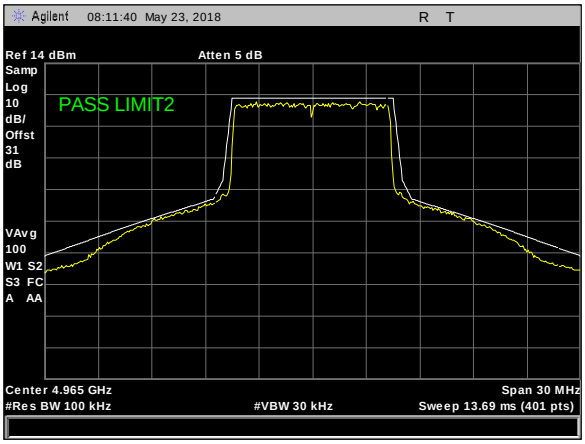
Emission Mask



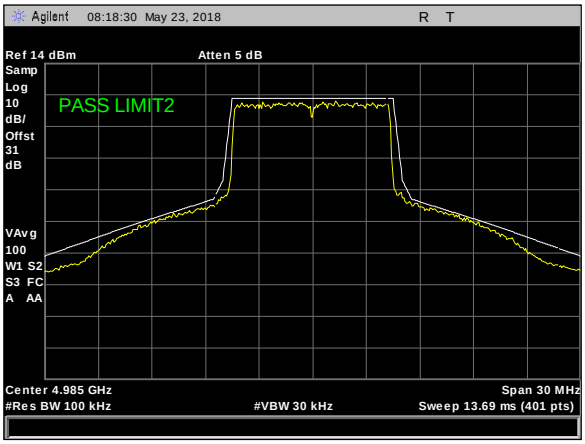
Plot 13. High Power Emission Mask, 10M, 4945M low channel, LTU, c0



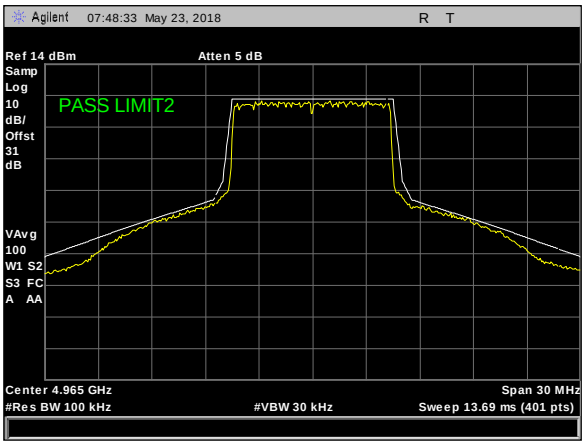
Plot 14. High Power Emission Mask, 10M, 4945M low channel, LTU, c1



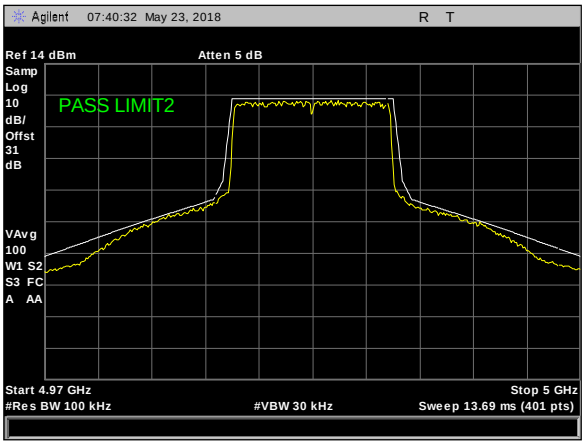
Plot 15. High Power Emission Mask, 10M, 4965M mid channel, LTU, c0



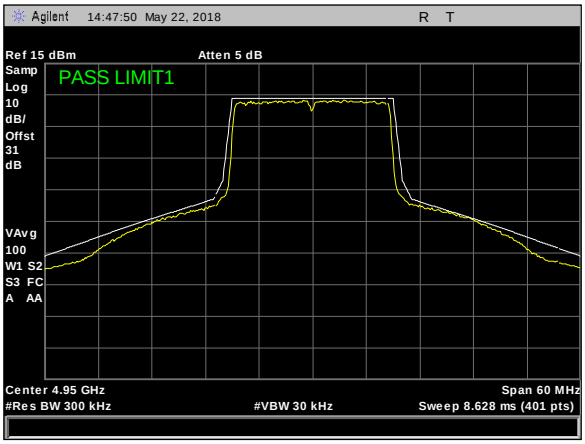
Plot 16. High Power Emission Mask, 10M, 4985M high channel, LTU, c0



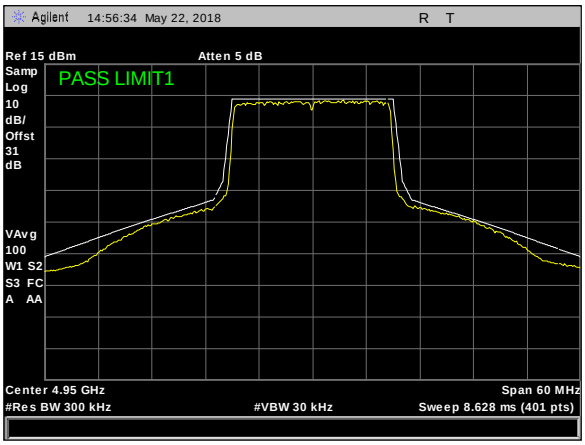
Plot 17. High Power Emission Mask, 10M, 4965M mid channel, LTU, c1



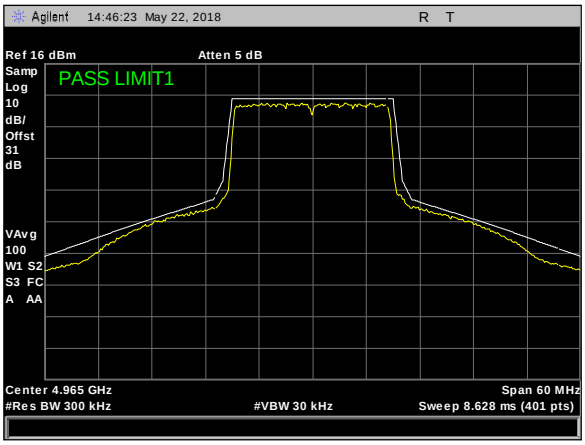
Plot 18. High Power Emission Mask, 10M, 4985M high channel, LTU, c1



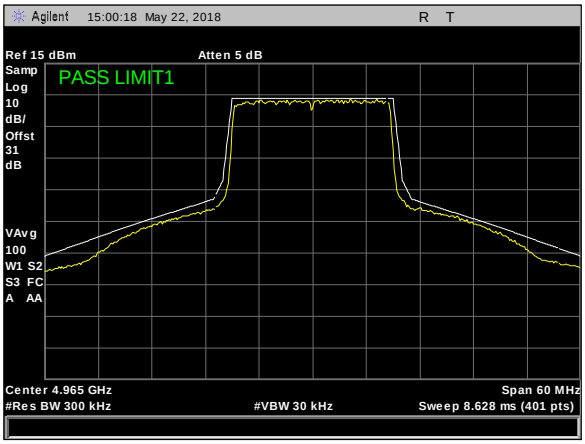
Plot 19. High Power Emission Mask, 20M, 4950M low channel, LTU, c0



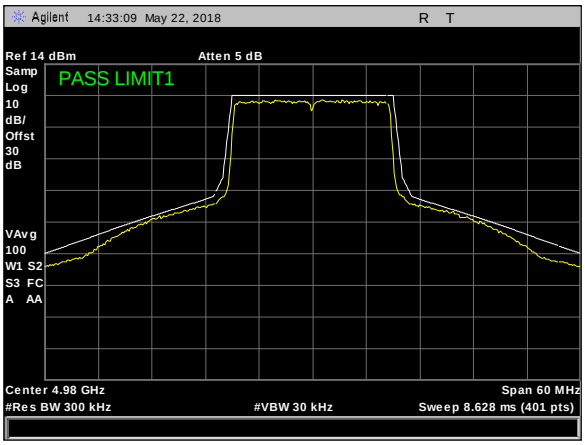
Plot 20. High Power Emission Mask, 20M, 4950M low channel, LTU, c1



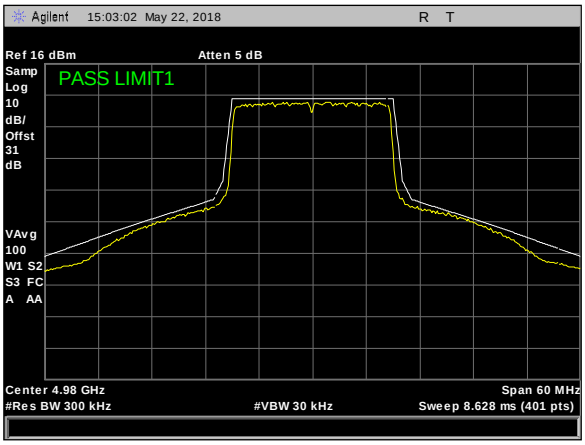
Plot 21. High Power Emission Mask, 20M, 4965M mid channel, LTU, c0



Plot 22. High Power Emission Mask, 20M, 4965M mid channel, LTU, c1

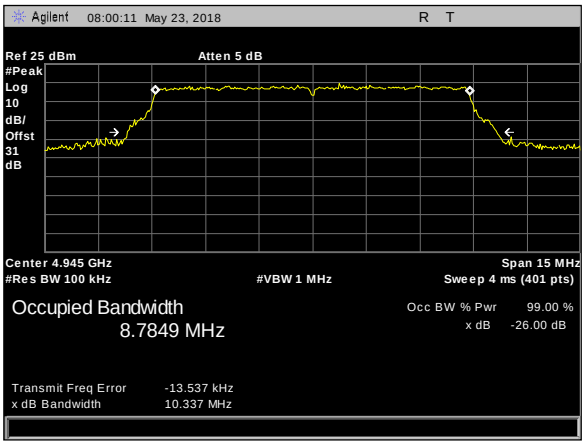


Plot 23. High Power Emission Mask, 20M, 4980M high channel, LTU, c0

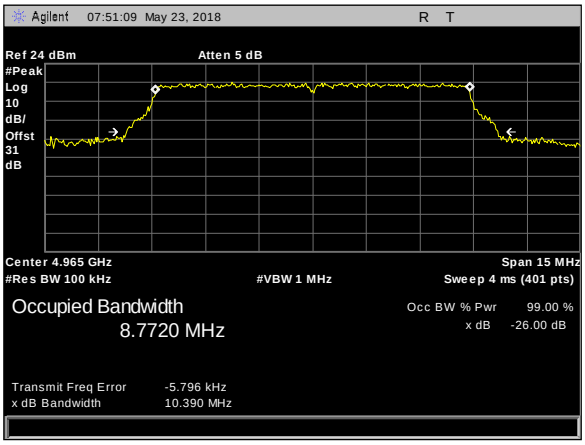


Plot 24. High Power Emission Mask, 20M, 4980M high channel, LTU, c1

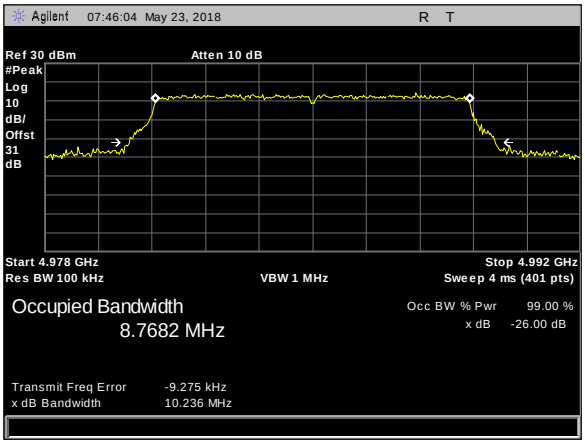
Occupied Bandwidth



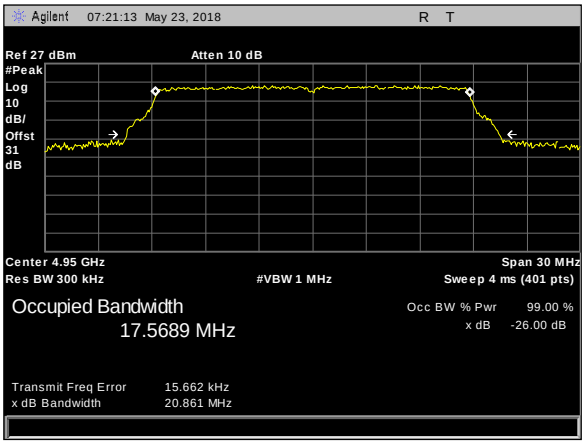
Plot 25. Occupied Bandwidth, 10M, 4945



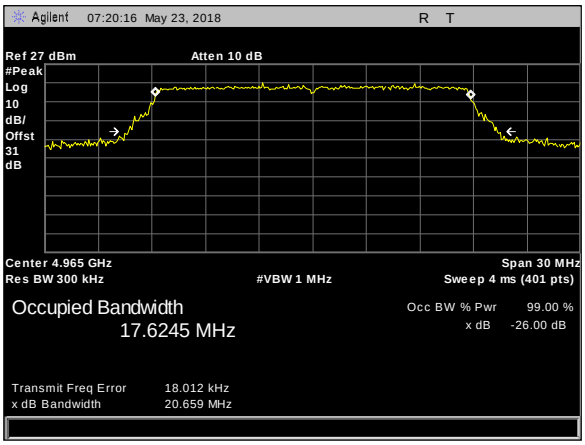
Plot 26. Occupied Bandwidth, 10M, 4965



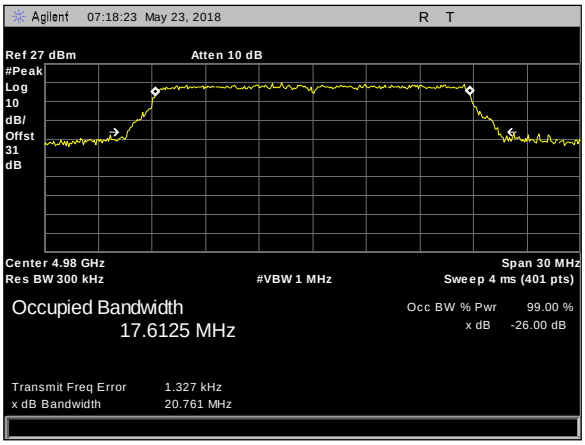
Plot 27. Occupied Bandwidth, 10M, 4985



Plot 28. Occupied Bandwidth, 20M, 4950



Plot 29. Occupied Bandwidth, 20M, 4965



Plot 30. Occupied Bandwidth, 20M, 4980

5. Electromagnetic Compatibility Spurious Emissions at Antenna Terminal Requirements

5.1. Spurious Emissions at Antenna Terminals

Test Requirement(s): **§2.1051 and §90.210(M) with FCC 04-265**

(m) Emission Mask M. For high power transmitters (greater that 20 dBm) operating in the 4940-4990 MHz frequency band, the power spectral density of the emissions must be attenuated below the output power of the transmitter as follows:

(6) On any frequency removed from the assigned frequency between above 150% of the authorized bandwidth: 50 dB or 55 + 10 log (P) dB, whichever is the lesser attenuation.

Test Procedures: As required by 47 CFR 2.1051, *spurious emissions at antenna terminal measurements* were made at the RF output terminals using a Spectrum Analyzer.

A laptop was connected to EUT to control the RF power output and frequency channel. The EUT was connected to a Spectrum Analyzer and a Power Meter to monitor the output power level. The Spectrum Analyzer was set to sweep 30 MHz and up to 10th harmonic of the fundamental or 40GHz whichever is the lesser. Measurements were made at the low, mid and high channels.

The Conducted Spurious Emissions *Limit* is obtained by the following plots. Note: only noise floor was measurable above 18GHz.

Test Results: Equipment is compliant with Section 2.1051 and 90.210(M) with FCC 04-265.

Test Engineer(s): Donald Salguero

Test Date(s): May 24, 2018

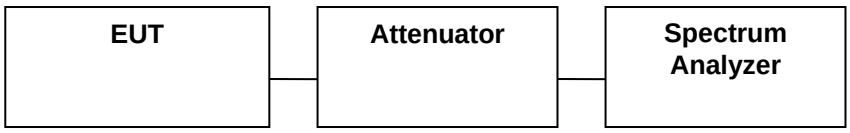
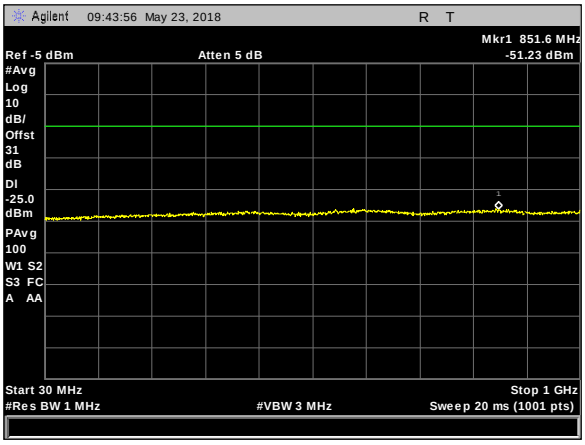
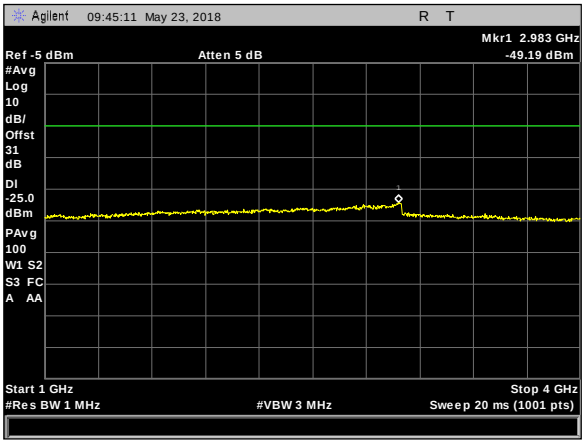


Figure 6. Spurious Emissions at Antenna Terminals Test Setup

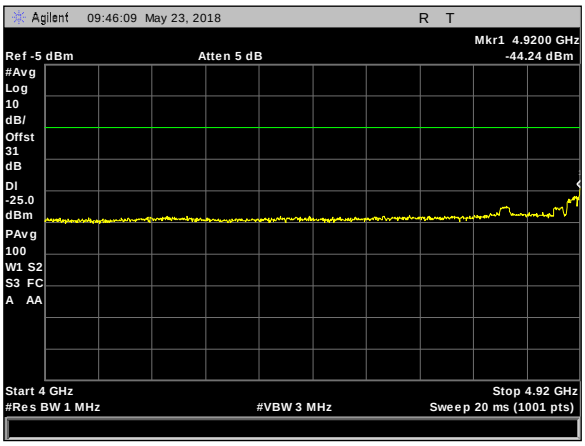
Conducted Spurious Emissions



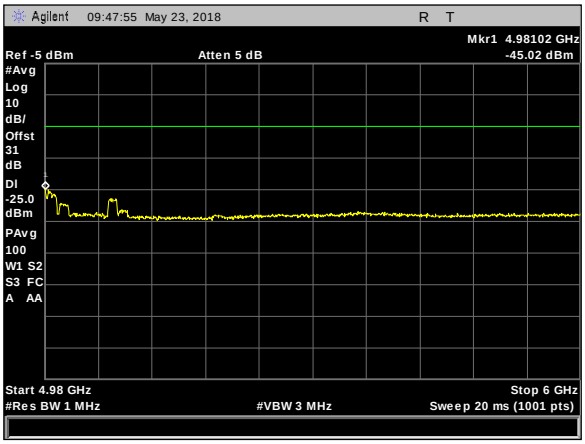
Plot 31. Spurious Conducted Emissions at Antenna Terminals, 20M, 4950M, 0.03 - 1 GHz



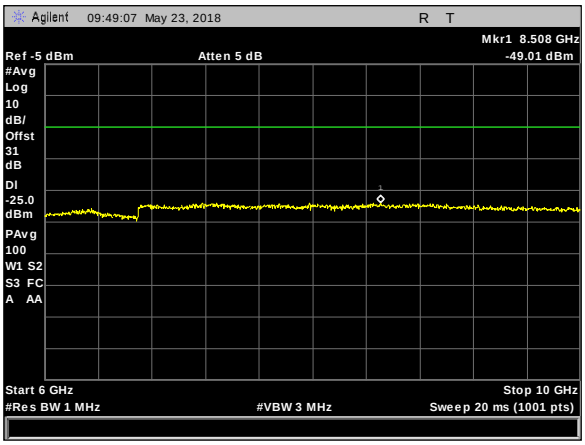
Plot 32. Spurious Conducted Emissions at Antenna Terminals, 20M, 4950M, 1 - 4 GHz



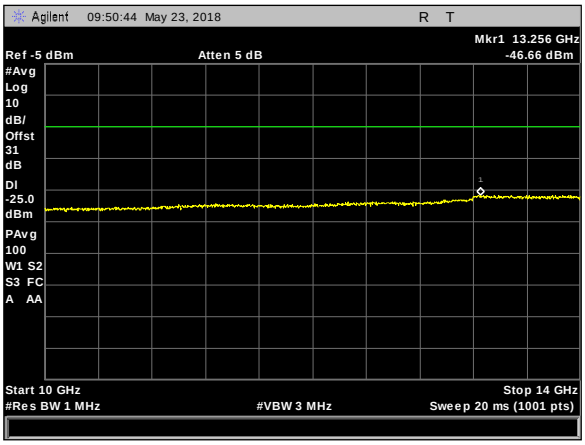
Plot 33. Spurious Conducted Emissions at Antenna Terminals, 20M, 4950M, 4 - 4.920 GHz



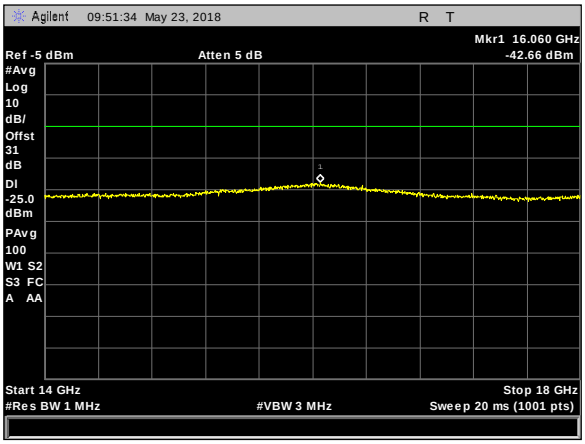
Plot 34. Spurious Conducted Emissions at Antenna Terminals, 20M, 4950M, 4.98 - 6 GHz



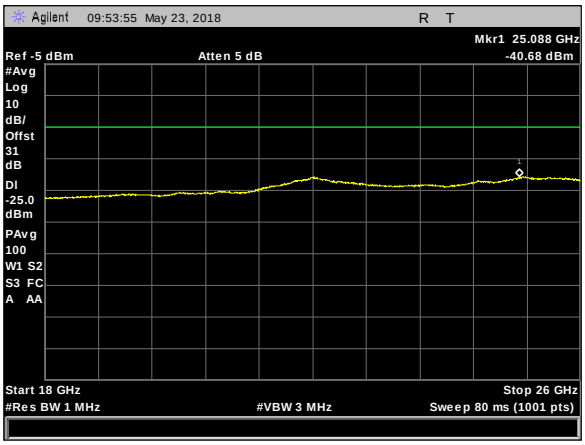
Plot 35. Spurious Conducted Emissions at Antenna Terminals, 20M, 4950M, 6 - 10 GHz



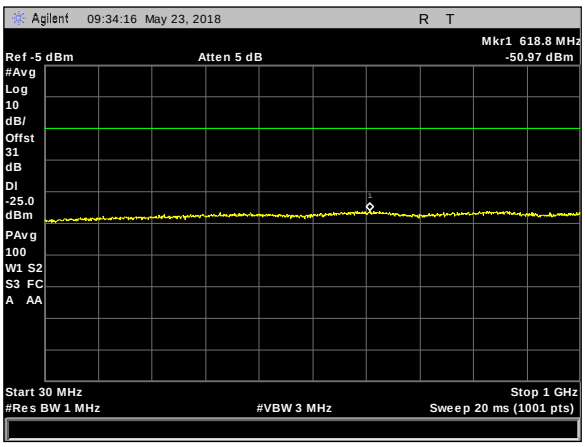
Plot 36. Spurious Conducted Emissions at Antenna Terminals, 20M, 4950M, 10 - 14 GHz



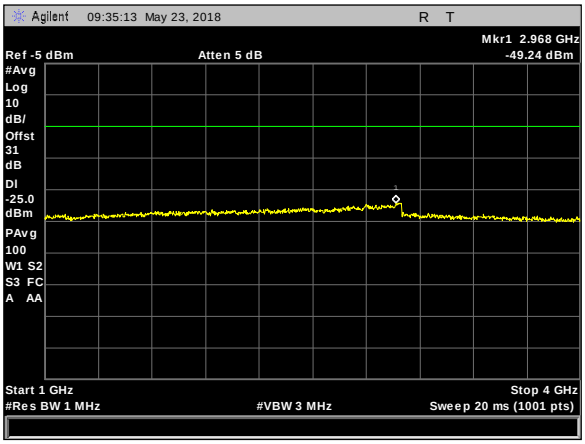
Plot 37. Spurious Conducted Emissions at Antenna Terminals, 20M, 4950M, 14 - 18 GHz



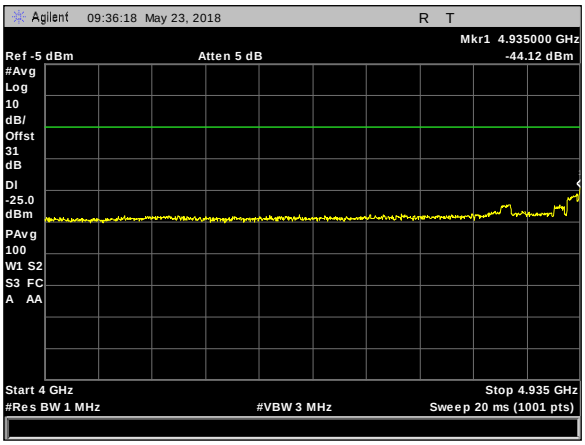
Plot 38. Spurious Conducted Emissions at Antenna Terminals, 20M, 4950M, 18 - 26 GHz



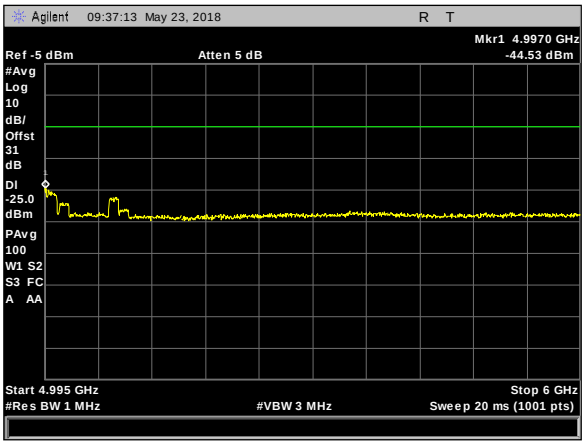
Plot 39. Spurious Conducted Emissions at Antenna Terminals, 20M, 4965M, 0.03 - 1 GHz



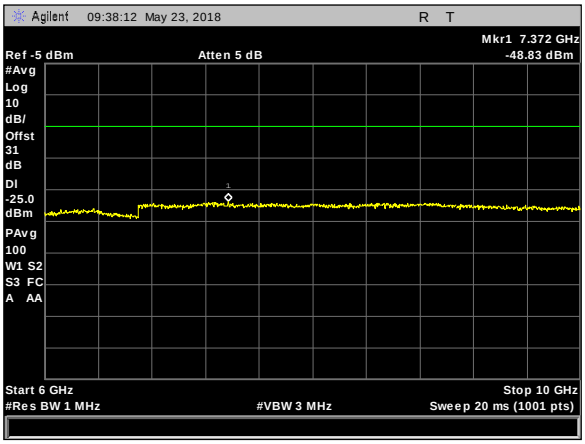
Plot 40. Spurious Conducted Emissions at Antenna Terminals, 20M, 4965M, 1 - 4 GHz



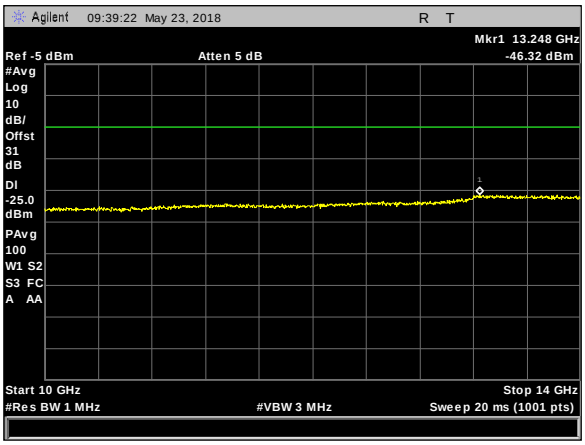
Plot 41. Spurious Conducted Emissions at Antenna Terminals, 20M, 4965M, 4 - 4.935 GHz



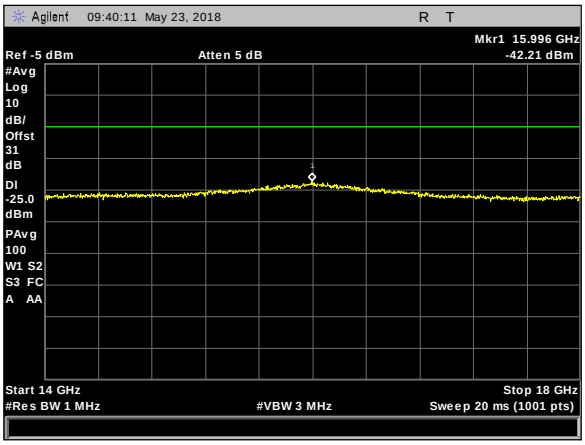
Plot 42. Spurious Conducted Emissions at Antenna Terminals, 20M, 4965M, 4.995 - 6 GHz



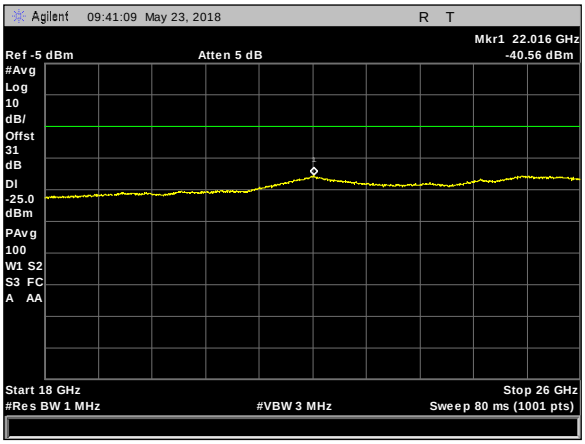
Plot 43. Spurious Conducted Emissions at Antenna Terminals, 20M, 4965M, 6 - 10 GHz



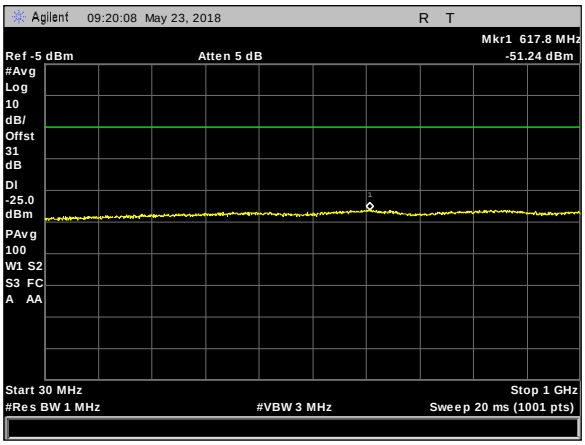
Plot 44. Spurious Conducted Emissions at Antenna Terminals, 20M, 4965M, 10 - 14 GHz



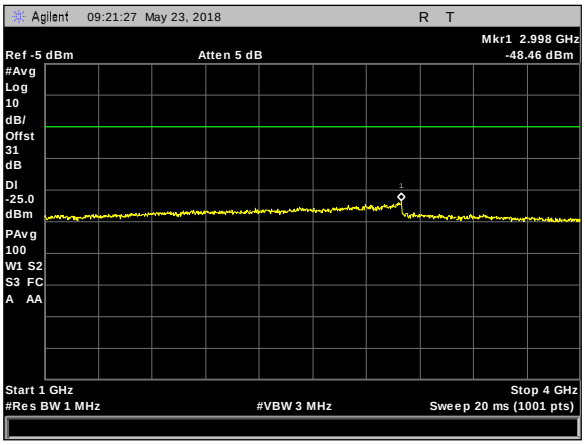
Plot 45. Spurious Conducted Emissions at Antenna Terminals, 20M, 4965M, 14 - 18 GHz



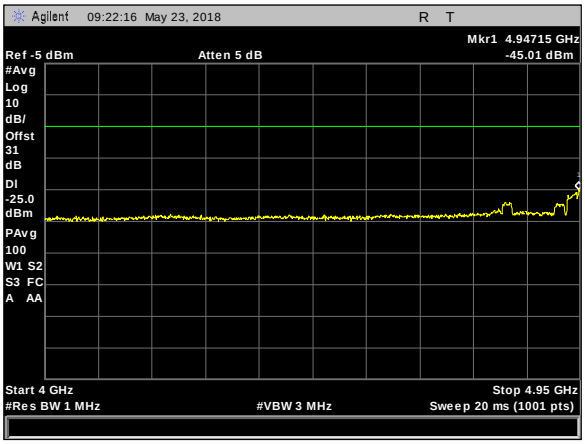
Plot 46. Spurious Conducted Emissions at Antenna Terminals, 20M, 4965M, 18 - 26 GHz



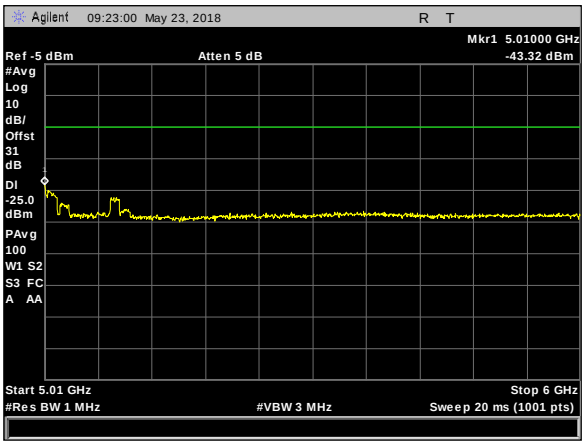
Plot 47. Spurious Conducted Emissions at Antenna Terminals, 20M, 4980M, 0.03 - 1 GHz



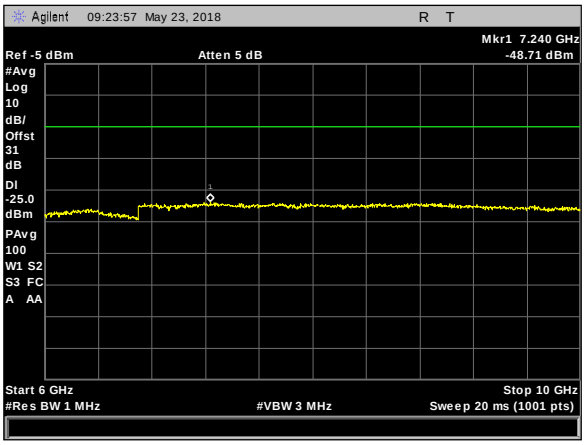
Plot 48. Spurious Conducted Emissions at Antenna Terminals, 20M, 4980M, 1 - 4 GHz



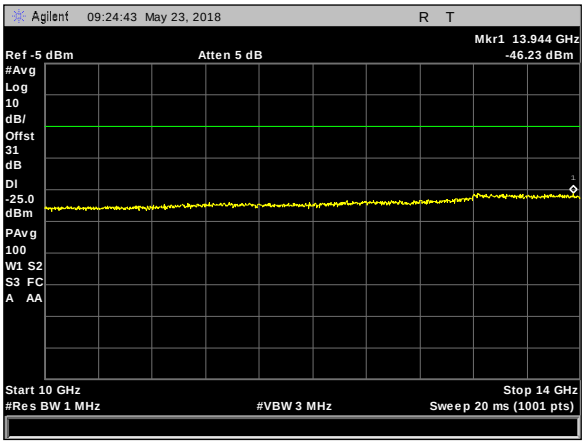
Plot 49. Spurious Conducted Emissions at Antenna Terminals, 20M, 4980M, 4 - 4.95 GHz



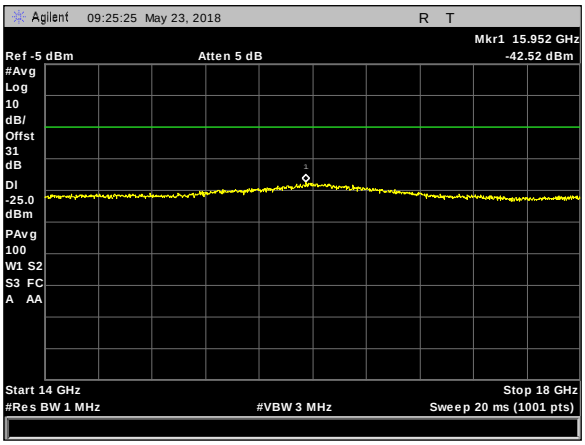
Plot 50. Spurious Conducted Emissions at Antenna Terminals, 20M, 4980M, 5.01 - 6 GHz



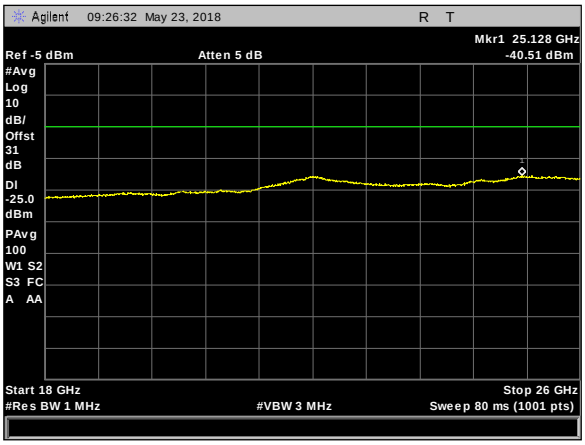
Plot 51. Spurious Conducted Emissions at Antenna Terminals, 20M, 4980M, 6 - 10 GHz



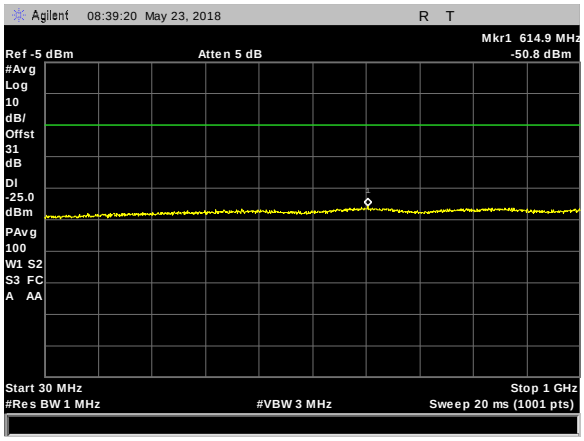
Plot 52. Spurious Conducted Emissions at Antenna Terminals, 20M, 4980M, 10 - 14 GHz



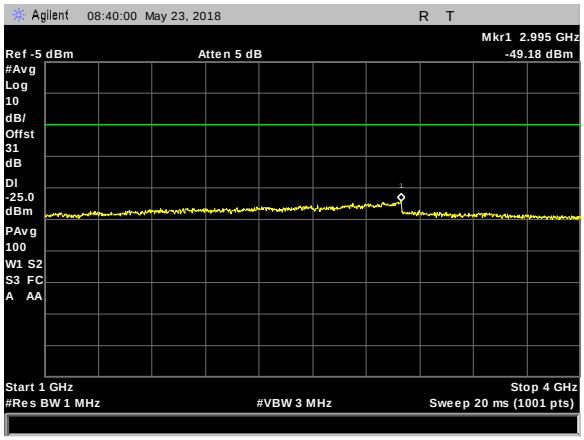
Plot 53. Spurious Conducted Emissions at Antenna Terminals, 20M, 4980M, 14 - 18 GHz



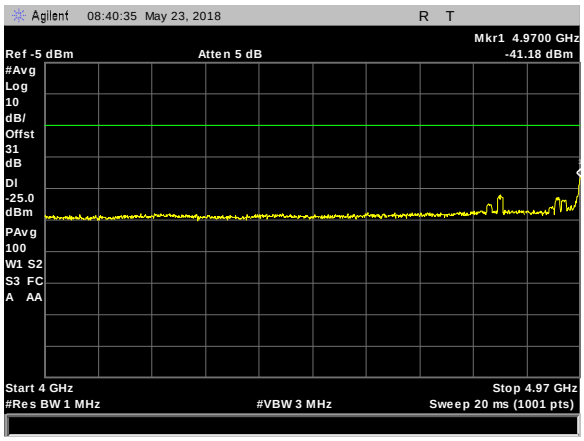
Plot 54. Spurious Conducted Emissions at Antenna Terminals, 20M, 4980M, 18 - 26 GHz



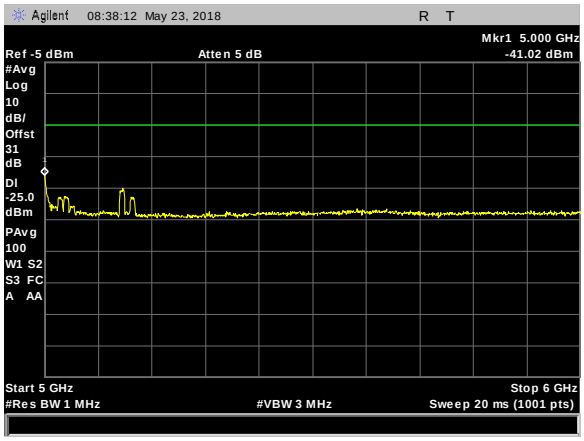
Plot 55. Spurious Conducted Emissions at Antenna Terminals, 4985M High Channel, 10M BW, 0.03 - 1 GHz



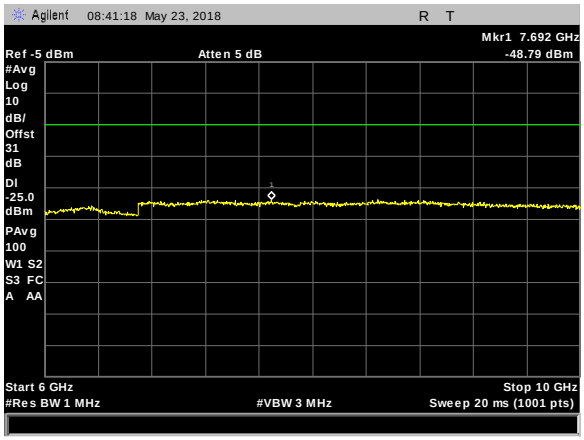
Plot 56. Spurious Conducted Emissions at Antenna Terminals, 4985M High Channel, 10M BW, 1 - 4 GHz



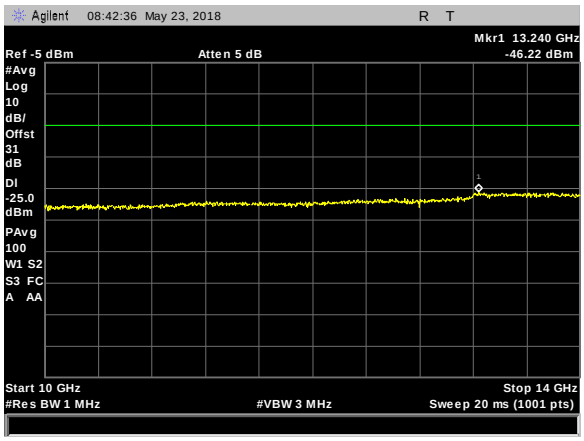
Plot 57. Spurious Conducted Emissions at Antenna Terminals, 4985M High Channel, 10M BW, 4 - 4.97 GHz



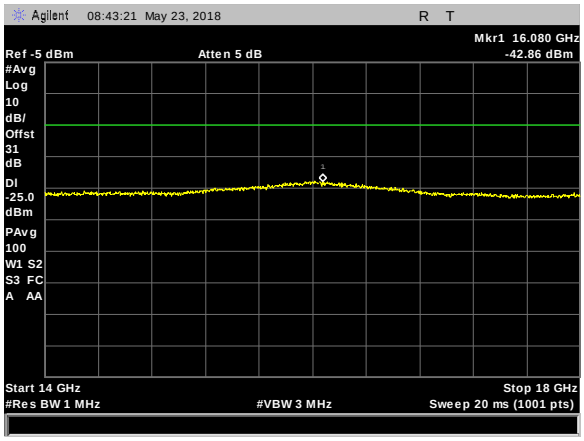
Plot 58. Spurious Conducted Emissions at Antenna Terminals, 4985M High Channel, 10M BW, 5 - 6 GHz



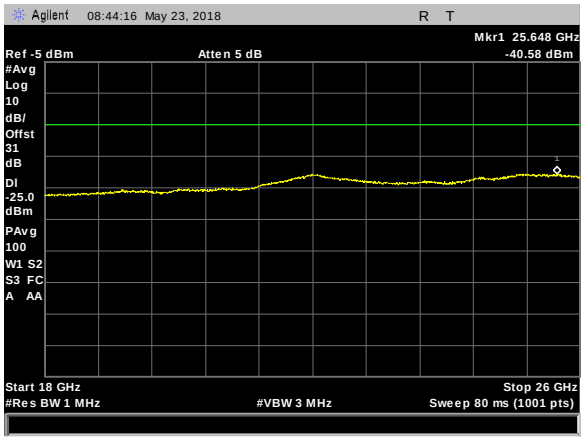
Plot 59. Spurious Conducted Emissions at Antenna Terminals, 4985M High Channel, 10M BW, 6 - 10 GHz



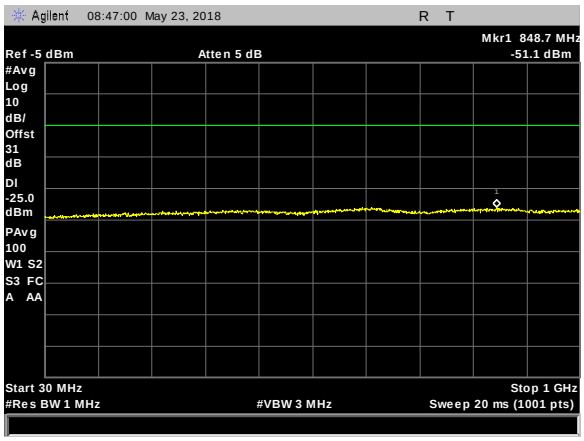
Plot 60. Spurious Conducted Emissions at Antenna Terminals, 4985M High Channel, 10M BW, 10 - 14 GHz



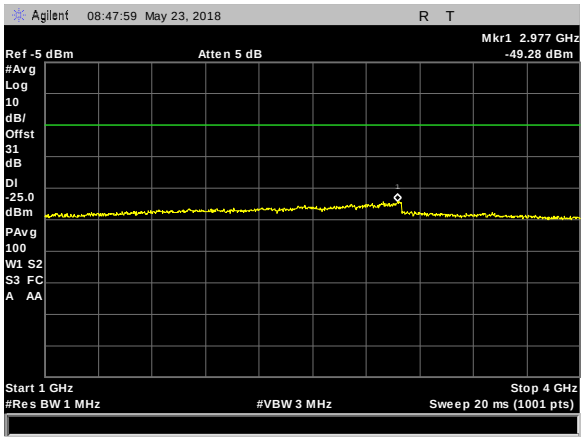
Plot 61. Spurious Conducted Emissions at Antenna Terminals, 4985M High Channel, 10M BW, 14 - 18 GHz



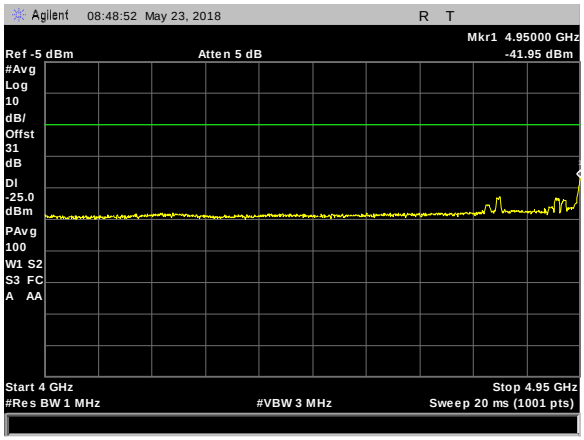
Plot 62. Spurious Conducted Emissions at Antenna Terminals, 4985M High Channel, 10M BW, 18 - 26 GHz



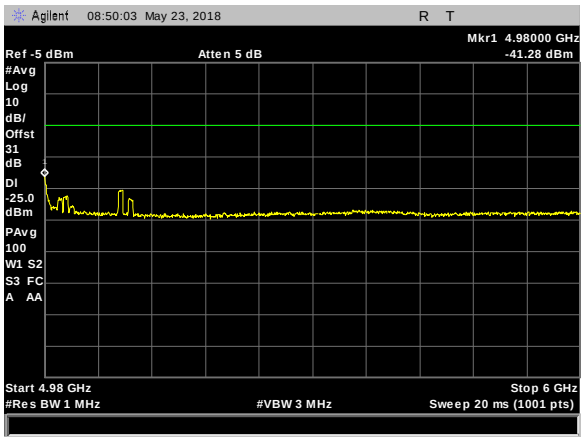
Plot 63. Spurious Conducted Emissions at Antenna Terminals, 4965M Mid Channel, 10M BW, 0.03 - 1 GHz



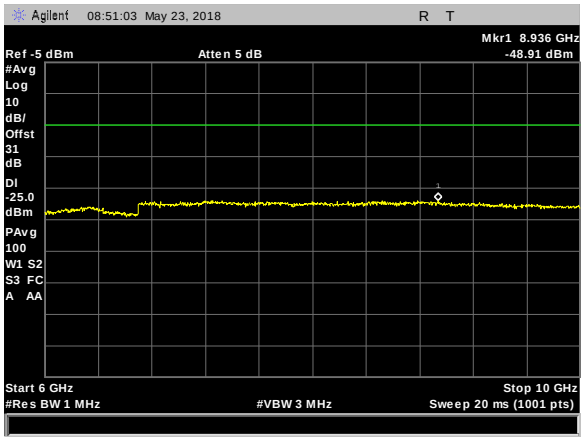
Plot 64. Spurious Conducted Emissions at Antenna Terminals, 4965M Mid Channel, 10M BW, 1 - 4 GHz



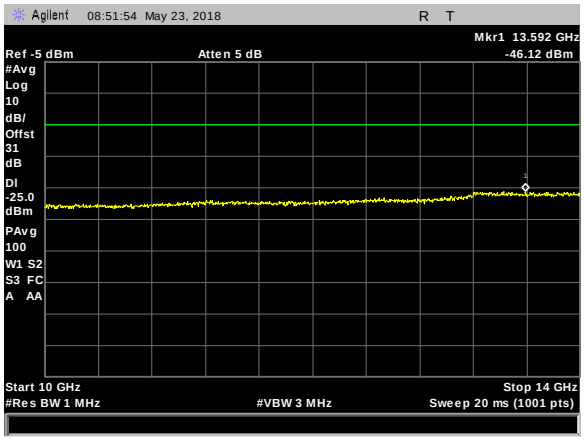
Plot 65. Spurious Conducted Emissions at Antenna Terminals, 4965M Mid Channel, 10M BW, 4 - 4.95 GHz



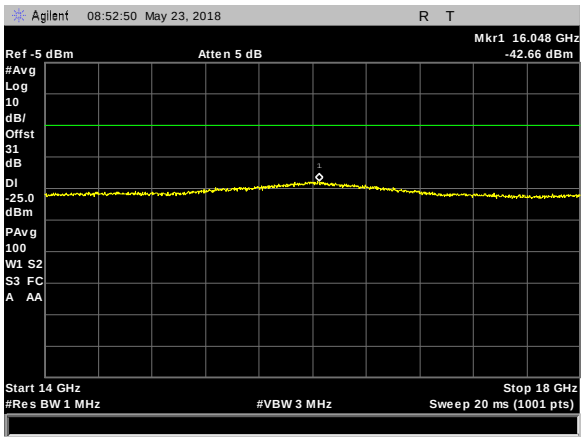
Plot 66. Spurious Conducted Emissions at Antenna Terminals, 4965M Mid Channel, 10M BW, 4.98 - 6 GHz



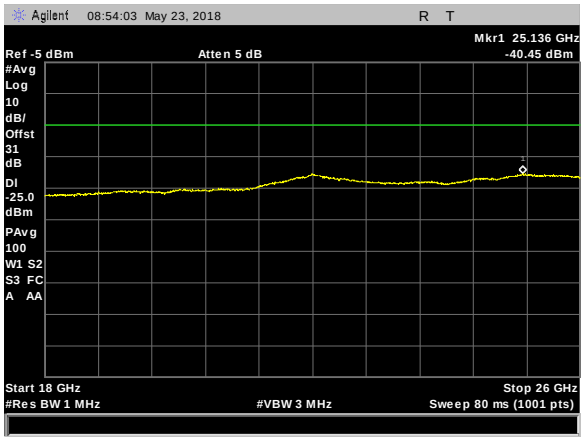
Plot 67. Spurious Conducted Emissions at Antenna Terminals, 4965M Mid Channel, 10M BW, 6 - 10 GHz



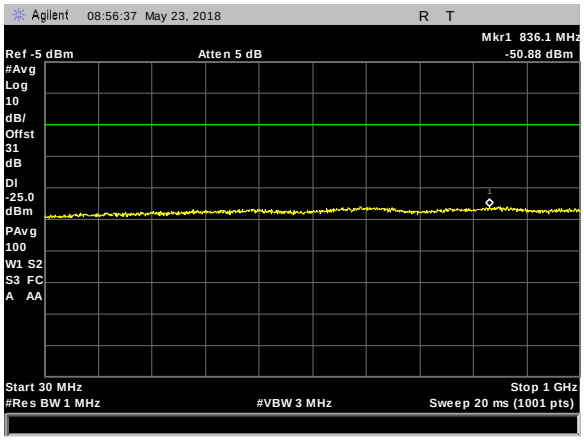
Plot 68. Spurious Conducted Emissions at Antenna Terminals, 4965M Mid Channel, 10M BW, 10 - 14 GHz



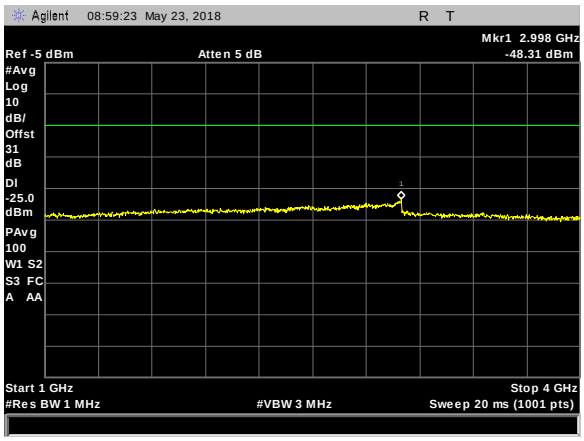
Plot 69. Spurious Conducted Emissions at Antenna Terminals, 4965M Mid Channel, 10M BW, 14 - 18 GHz



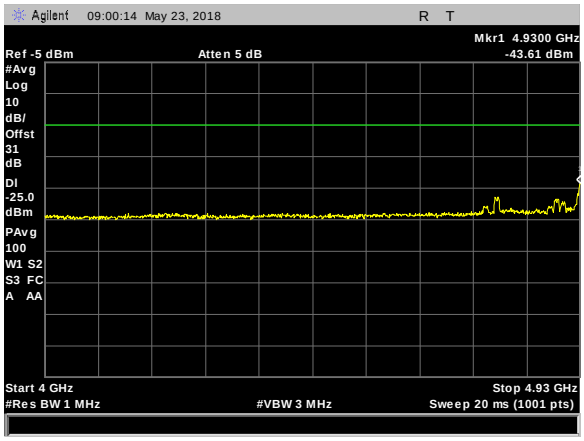
Plot 70. Spurious Conducted Emissions at Antenna Terminals, 4965M Mid Channel, 10M BW, 18 - 26 GHz



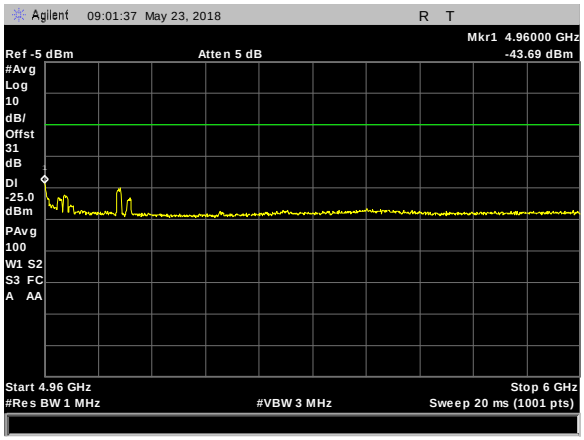
Plot 71. Spurious Conducted Emissions at Antenna Terminals, 4945M Low Channel, 10M BW, 0.03 - 1 GHz



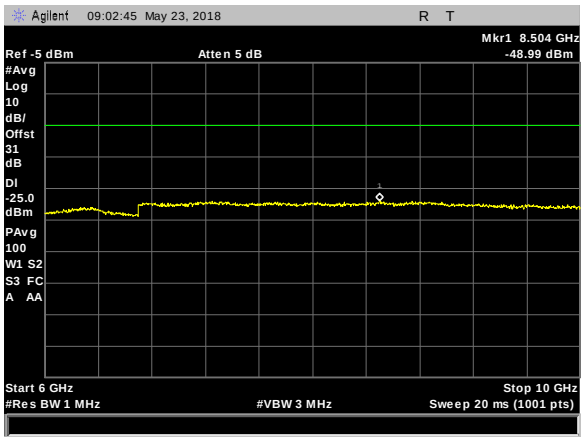
Plot 72. Spurious Conducted Emissions at Antenna Terminals, 4945M Low Channel, 10M BW, 1 - 4 GHz



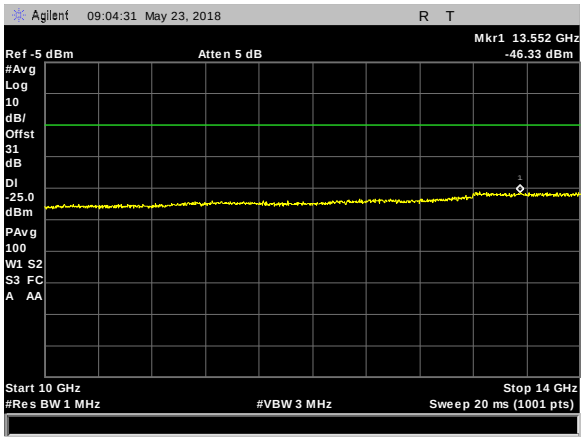
Plot 73. Spurious Conducted Emissions at Antenna Terminals, 4945M Low Channel, 10M BW, 4 - 4.93 GHz



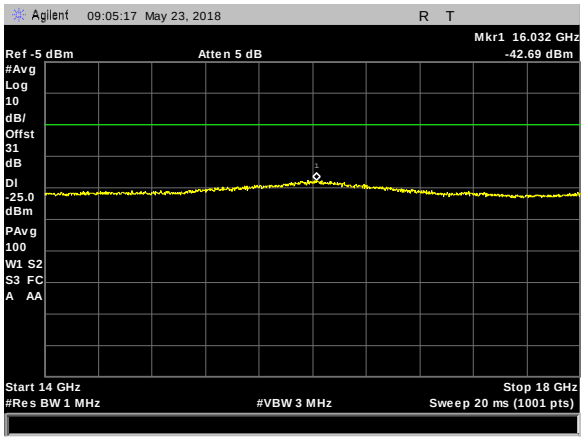
Plot 74. Spurious Conducted Emissions at Antenna Terminals, 4945M Low Channel, 10M BW, 4.96 - 6 GHz



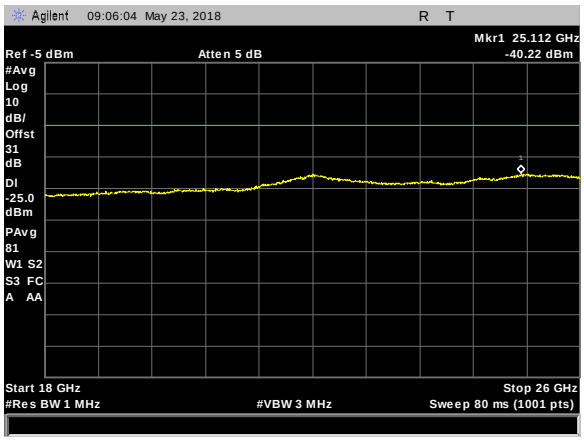
Plot 75. Spurious Conducted Emissions at Antenna Terminals, 4945M Low Channel, 10M BW, 6 - 10 GHz



Plot 76. Spurious Conducted Emissions at Antenna Terminals, 4945M Low Channel, 10M BW, 10 - 14 GHz



Plot 77. Spurious Conducted Emissions at Antenna Terminals, 4945M Low Channel, 10M BW, 14 - 18 GHz



Plot 78. Spurious Conducted Emissions at Antenna Terminals, 4945M Low Channel, 10M BW, 18 - 26 GHz

6. Electromagnetic Compatibility Radiated Emissions Requirements

6.1. Radiated Emissions

Test Requirement(s): **§2.1053 and §90.210**

(m) Emission Mask M. For high power transmitters (greater that 20 dBm) operating in the 4940-4990 MHz frequency band, the power spectral density of the emissions must be attenuated below the output power of the transmitter as follows:

(6) On any frequency removed from the assigned frequency between above 150% of the authorized bandwidth: 50 dB or 55 + 10 log (P) dB, whichever is the lesser attenuation.

Test Procedures: As required by 47 CFR 2.1053, *field strength of radiated spurious measurements* were made in accordance with the procedures of TIA/EIA-603-A-2001 "Land Mobile FM or PM Communications Equipment Measurement and Performance Standards".

Radiated emission measurements below 1GHz were performed inside a semi-anechoic chamber. The EUT was set at a distance of 3m from the receiving antenna on a table with a nominal height of 80cm above the ground plane. Above 1GHz, the measurements were done inside a fully anechoic chamber. The EUT was placed 1m away from the receive antenna on a table with a nominal height of 1.5m above the ground plane. The EUT's RF ports were terminated to 50ohm load. The EUT was set to transmit at the low, mid and high channels of the transmitter frequency range at its maximum power level. The EUT was rotated about 360^0 and the receiving antenna scanned from 1-4m in order to capture the maximum emission. The maximum EIRP of the emission was calculated as per KDB 971168 section 5.8.4 equation (d). These steps were carried out with the receiving antenna in both vertical and horizontal polarization. Harmonic emissions up to the 10^{th} or 40GHz, which ever was the lesser, were investigated.

No peaks were found above 18 GHz.

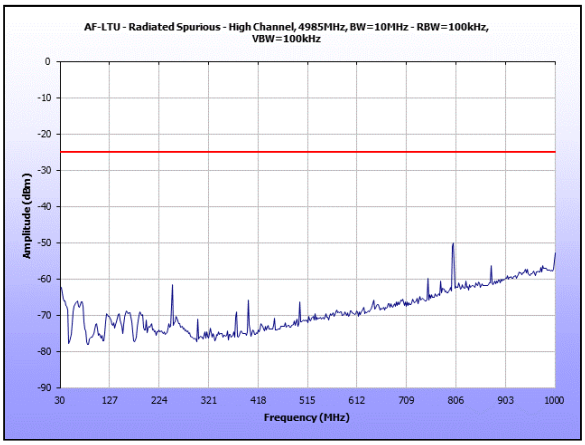
Note: only noise floor was measurable above 18GHz.

Test Results: Equipment is compliant with Section 2.1053 and 90.210.

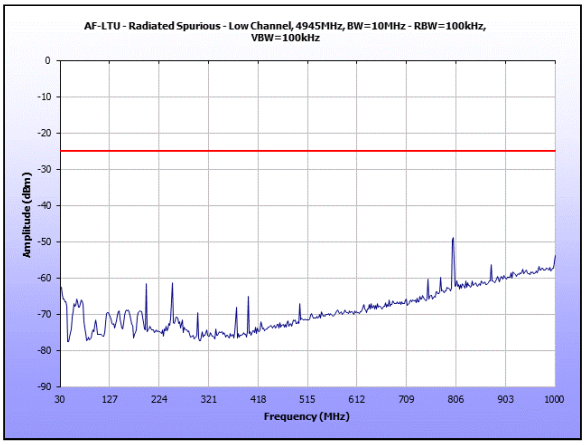
Test Engineer(s): Donald Salguero

Test Date(s): May 29, 2018

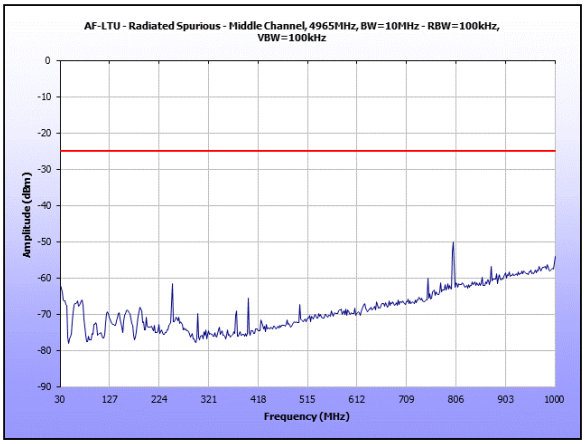
Radiated Spurious Emissions



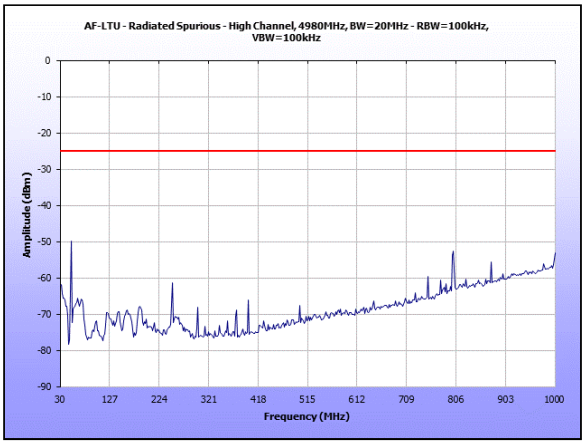
Plot 79. Radiated Spurious Emissions, 10M, High Channel, 30-1000MHz



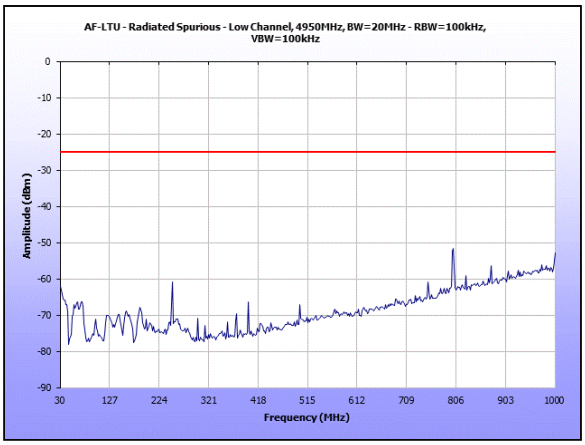
Plot 80. Radiated Spurious Emissions, 10M, low Channel, 30-1000MHz



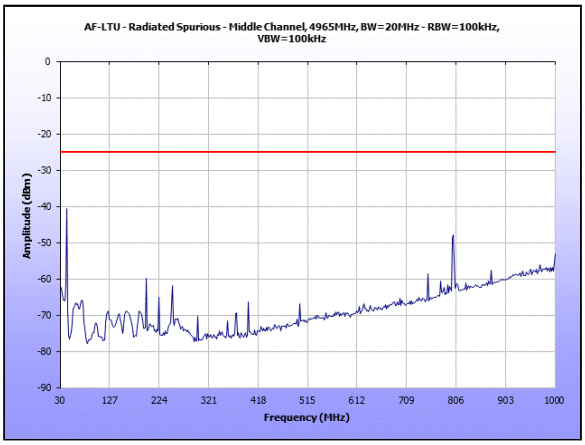
Plot 81. Radiated Spurious Emissions, 10M, mid Channel, 30-1000MHz



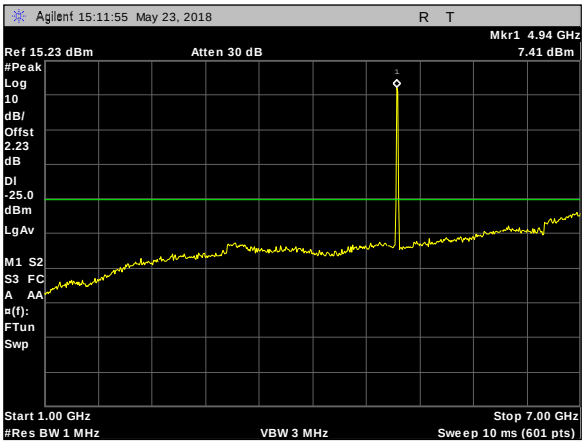
Plot 82. Radiated Spurious Emissions, 20M, High Channel, 30-1000MHz



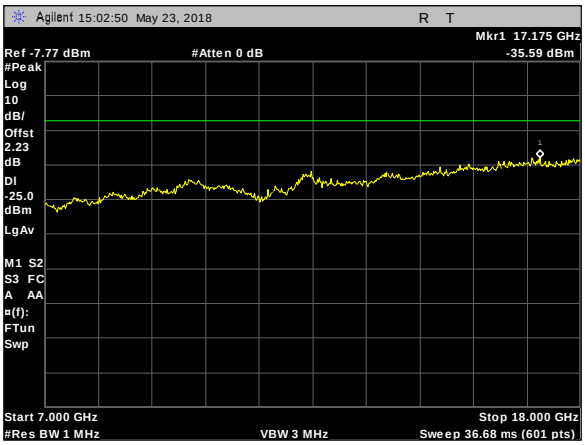
Plot 83. Radiated Spurious Emissions, 20M, Low Channel, 30-1000MHz



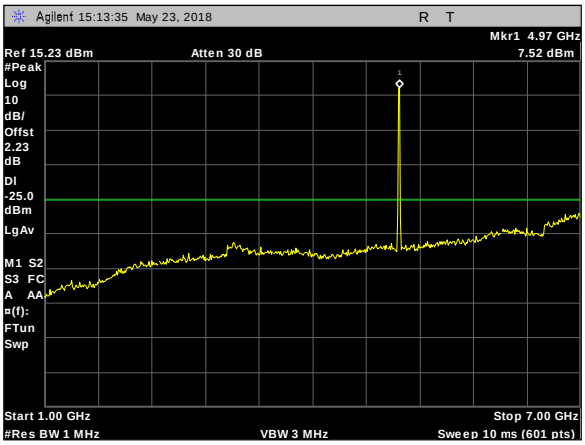
Plot 84. Radiated Spurious Emissions, 20M, Mid Channel, 30-1000MHz



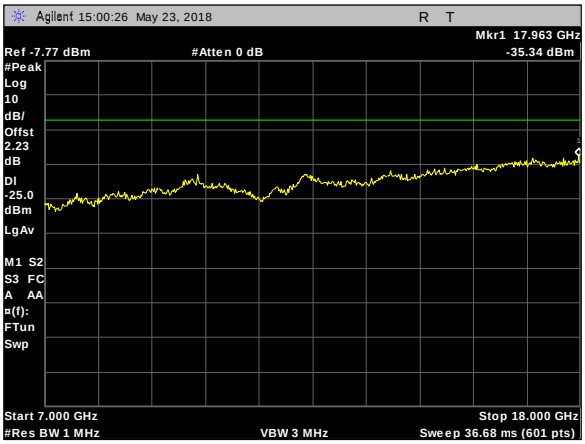
Plot 85. Radiated Spurious Emissions, 10M, 4945M, 1 - 7 GHz



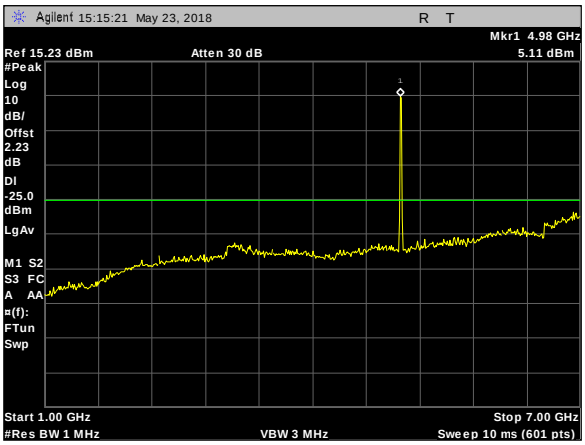
Plot 86. Radiated Spurious Emissions, 10M, 4945M, 7 - 18 GHz



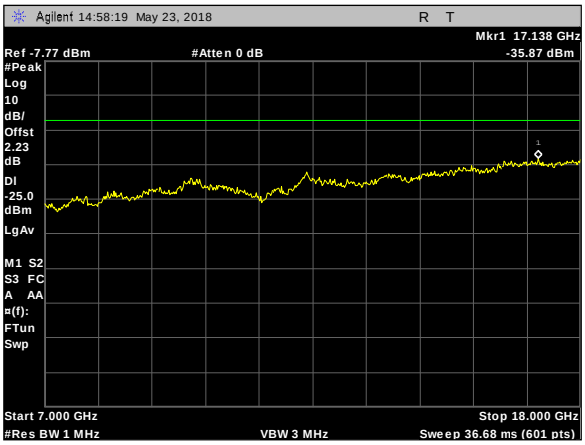
Plot 87. Radiated Spurious Emissions, 10M, 4965M, 1 - 7 GHz



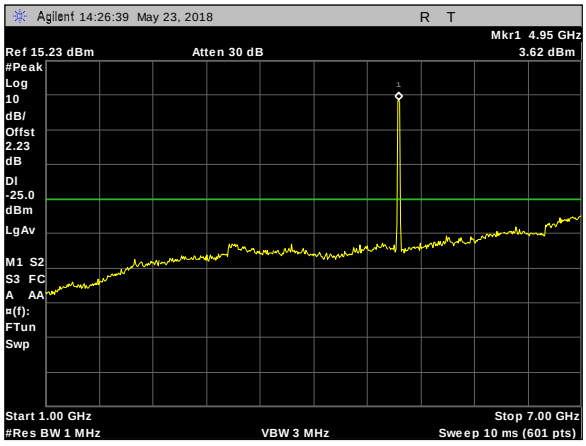
Plot 88. Radiated Spurious Emissions, 10M, 4965M, 7 - 18 GHz



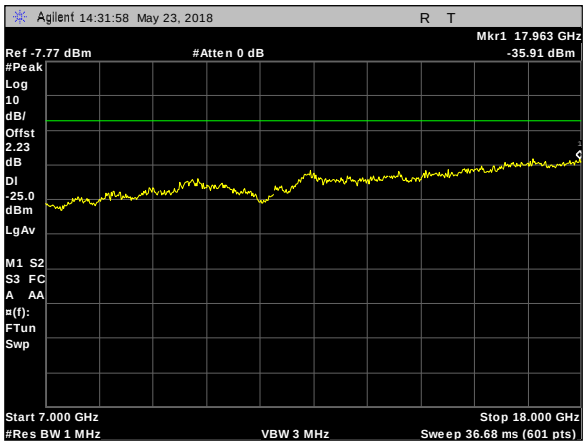
Plot 89. Radiated Spurious Emissions, 10M, 4985M, 1 - 7 GHz



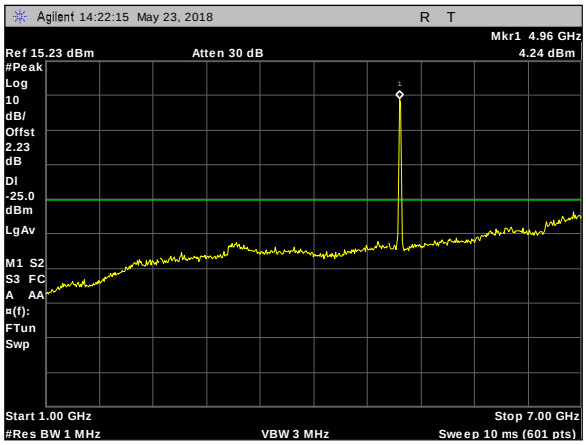
Plot 90. Radiated Spurious Emissions, 10M, 4985M, 7 - 18 GHz



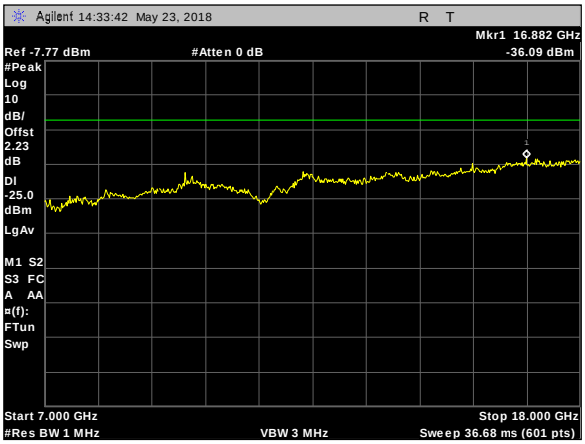
Plot 91. Radiated Spurious Emissions, 20M, 4950M, 1 - 7 GHz



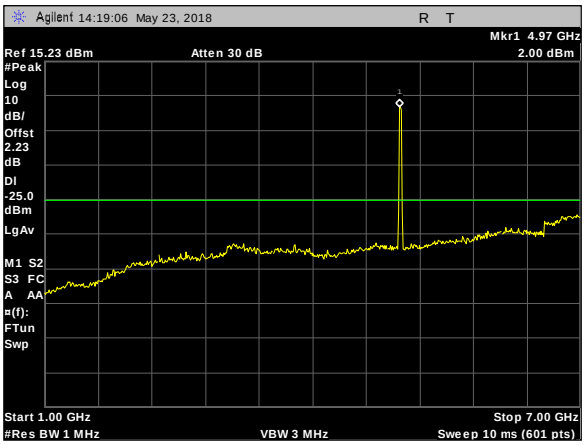
Plot 92. Radiated Spurious Emissions, 20M, 4950M, 7 - 18 GHz



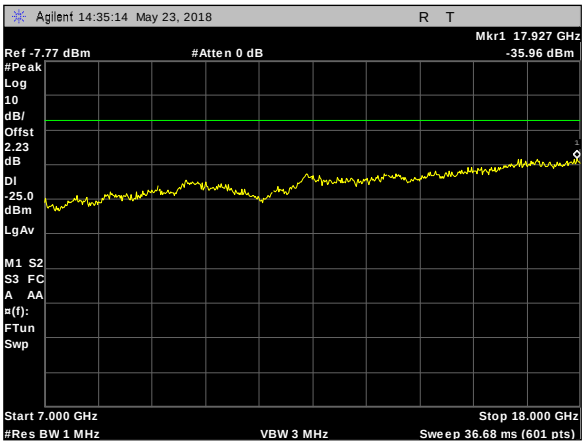
Plot 93. Radiated Spurious Emissions, 20M, 4965M, 1 - 7 GHz



Plot 94. Radiated Spurious Emissions, 20M, 4965M, 7 - 18 GHz



Plot 95. Radiated Spurious Emissions, 20M, 4980M, 1 - 7 GHz



Plot 96. Radiated Spurious Emissions, 20M, 4980M, 7 - 18 GHz

7. Electromagnetic Compatibility Frequency Stability Requirements

7.1. Frequency Stability

Test Requirement(s): **§2.1055 and §90.213**

(a) The frequency stability shall be measured with variation of ambient temperature as follows:

(1) From −30° to + 50° centigrade for all equipment except that specified in paragraphs (a) (2) and (3) of this section.

(2) From −20° to + 50° centigrade for equipment to be licensed for use in the Maritime Services under part 80 of this chapter, except for Class A, B, and S Emergency Position Indicating Radiobeacons (EPIRBS), and equipment to be licensed for use above 952 MHz at operational fixed stations in all services, stations in the Local Television Transmission Service and Point-to-Point Microwave Radio Service under part 21 of this chapter, equipment licensed for use aboard aircraft in the Aviation Services under part 87 of this chapter, and equipment authorized for use in the Family Radio Service under part 95 of this chapter.

(3) From 0° to + 50° centigrade for equipment to be licensed for use in the Radio Broadcast Services under part 73 of this chapter.

Test Procedures: As required by 47 CFR 2.1055, *Frequency Stability measurements* were made at the RF output terminals using a Directional Coupler through a Spectrum Analyzer and Power Meter.

The EUT was placed in the Environmental Chamber and support equipments are outside the chamber on a table. The EUT was set to transmit a CW signal corresponding to the low, mid and high Channels for 5, 10, & 20MHz Bandwidths. The frequency counter option on the Spectrum Analyzer was used to measure frequency deviations. The frequency drift was investigated for every 10^{C} increment until the unit is stabilized then recorded the reading in tabular format with the temperature range of -40 to 60^{C}.

Voltage supplied to EUT is 120 VAC reference temperature was done at 20 ^{C}. The voltage was varied by ± 15 % of nominal.

Test Results: Equipment is compliant with Section 2.1055 and 90.213.

Test Engineer(s): Donald Salguero

Test Date(s): May 29, 2018

Temperature (°C)	Frequency at Nominal Voltage (MHz)	Maximum deviation from frequency at 20°C (ppm)	Maximum deviation from frequency at 20°C (%)
Nominal frequency (MHz): 4980			
50	4980.018	4.41767	-0.00044177
40	4980.021	5.02008	-0.00050201
30	4980.013	3.41366	-0.00034137
20	4979.996	0.00000	0.00000000
10	4979.985	2.20884	0.00022088
0	4979.977	3.81526	0.00038153
-10	4979.969	5.42169	0.00054217
-20	4979.966	6.02410	0.00060241
-30	4979.969	5.42169	0.00054217
Voltage (DC)	**Frequency at Nominal Voltage (MHz)**	**Maximum deviation from frequency at 20°C (ppm)**	**Maximum deviation from frequency at 20°C (%)**
102	4980.012	3.21285	-0.00032129
138	4980.007	2.20884	-0.00022088

Table 14. Frequency Stability, 4980 – 20M, Test Results

7.2. Peak Excursion

Test Requirements: **§90.1215(e):** The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the maximum conducted output power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

Test Procedure: The EUT was connected directly to the spectrum analyzer through cabling and attenuation. Procedure 5.2.3.4 from ANSI C63.26-2015 was used to measure the peak to average ratio. RBW was set to the respective reference bandwidth for the 10M and 20M channels. Record the maximum PAPR level associated with a probability of 0.1%.

Test Results: Equipment was compliant with the peak excursion ratio limits of this section**.**

Test Engineer(s): Donald Salguero

Test Date(s): May 24, 2018

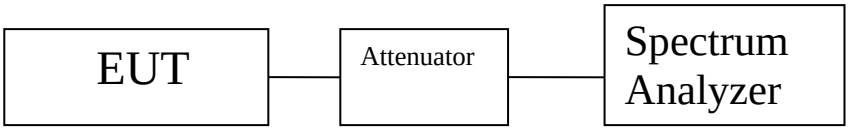
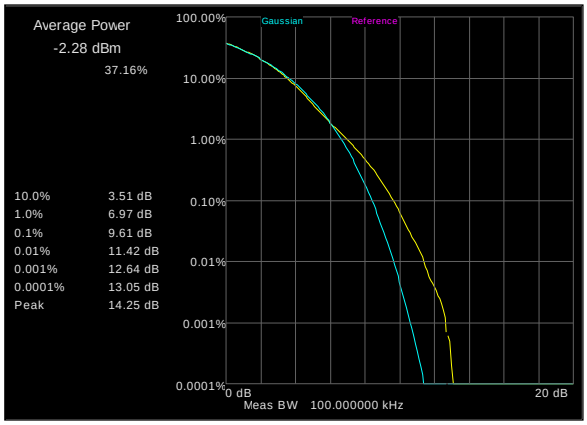
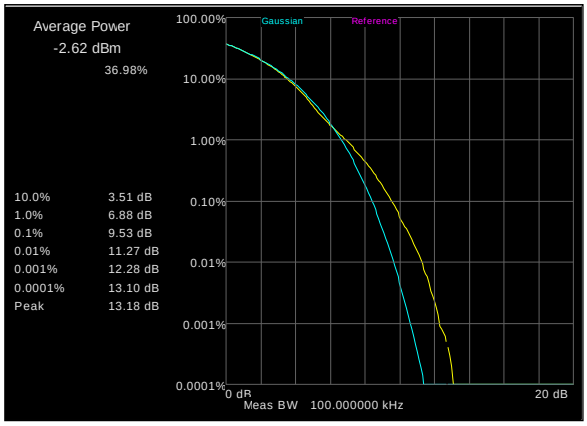


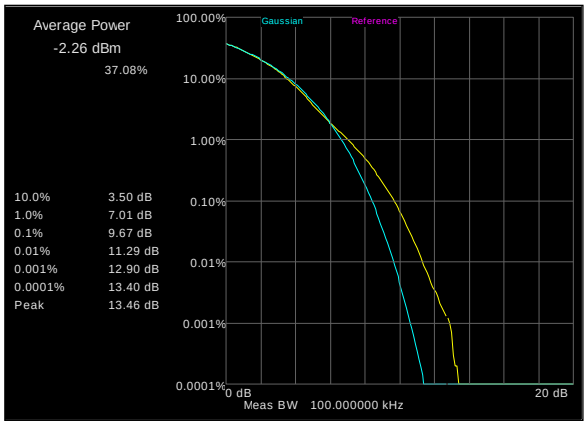
Figure 7. Peak Excursion Ration Test Setup



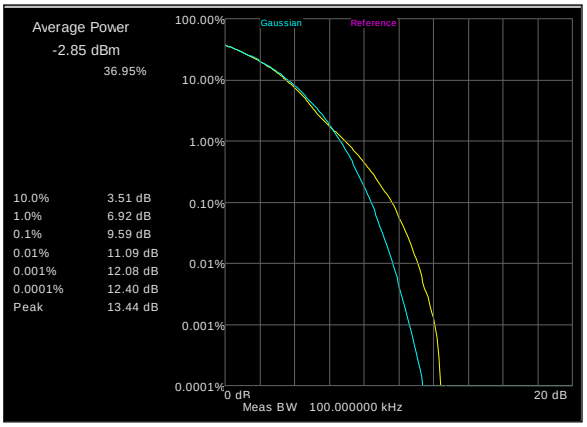
Plot 97. Peak Excursion, 10M, 4945M, c0



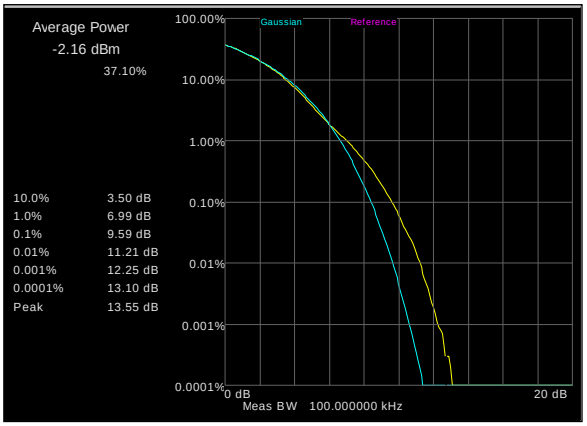
Plot 98. Peak Excursion, 10M, 4945M, c1



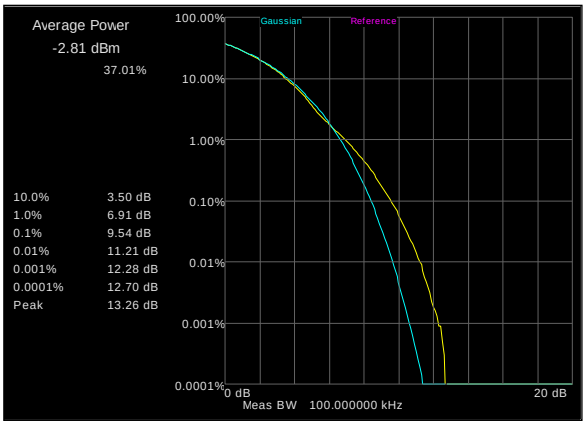
Plot 99. Peak Excursion, 10M, 4965M, c0



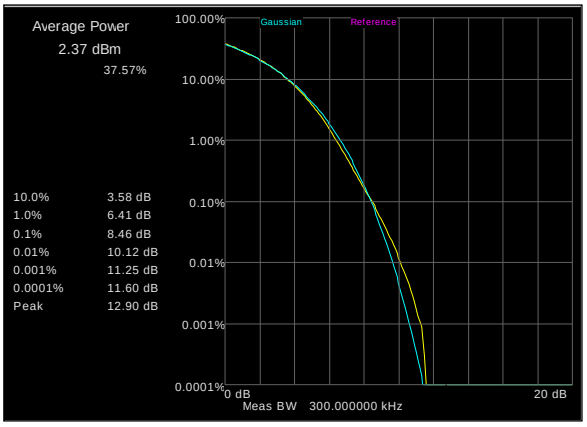
Plot 100. Peak Excursion, 10M, 4965M, c1



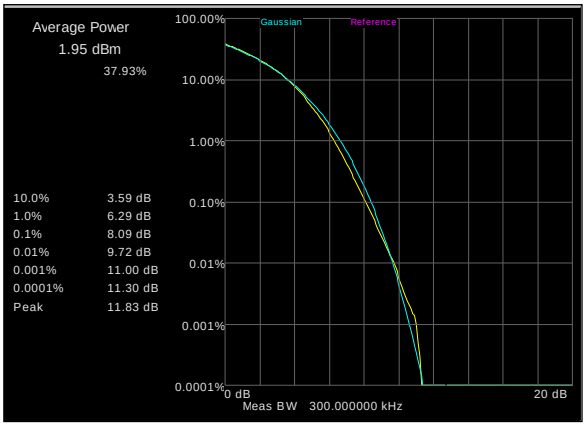
Plot 101. Peak Excursion, 10M, 4985M, c0



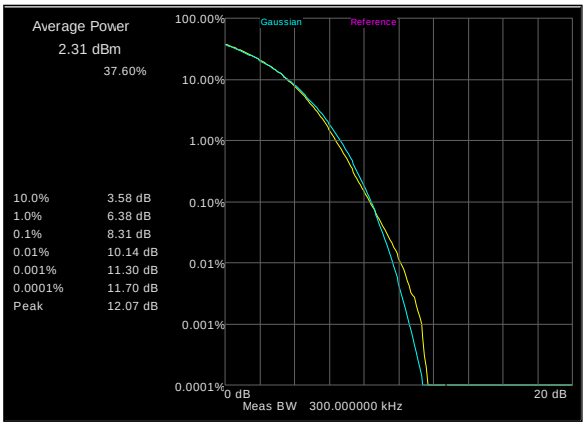
Plot 102. Peak Excursion, 10M, 4985M, c1



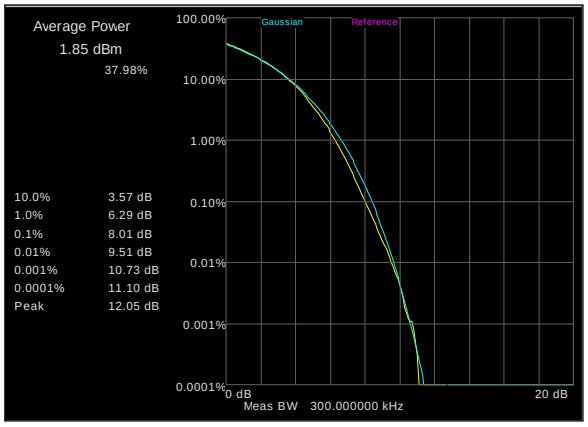
Plot 103. Peak Excursion, 20M, 4950M, c0



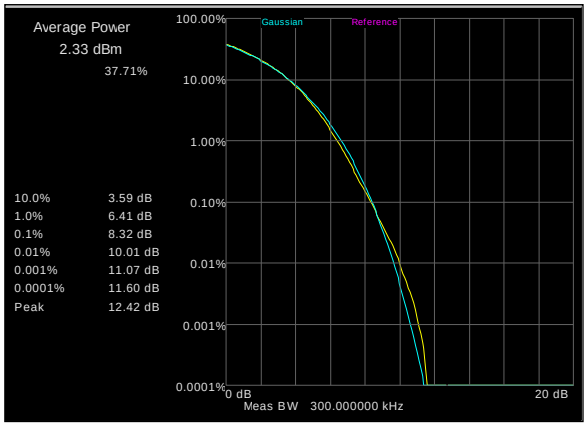
Plot 104. Peak Excursion, 20M, 4950M, c1



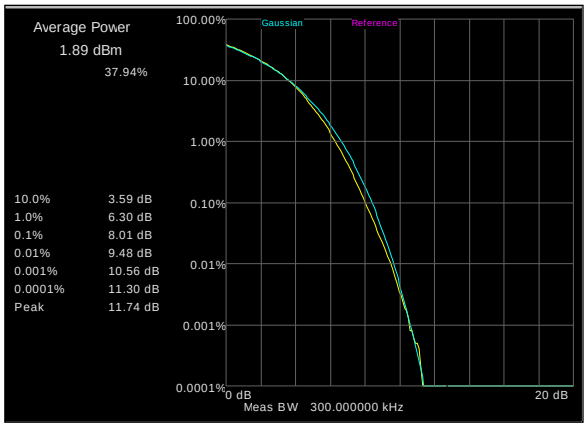
Plot 105. Peak Excursion, 20M, 4965M, c0



Plot 106. Peak Excursion, 20M, 4965M, c1



Plot 107. Peak Excursion, 20M, 4980M, c0



Plot 108. Peak Excursion, 20M, 4980M, c1

8. RF Exposure Requirements

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.

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**
4985	26.13	410.204	27	501.187	1	1	0	127.907	Pass

9. 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
1T4442	Pre-amplifier, Microwave	Miteq	AFS42-01001800-30-10P	Func Verify	
1T8743	Preamplifier	A.H. Systems, Inc.	PAM-0118P	Func Verify	
1T4483	Antenna; Horn	ETS-Lindgren	3117	4/19/2017	10/19/2018
1T4751	Antenna - Bilog	Sunol Sciences	JB6	2/28/2017	8/28/2018
1T4409	EMI Receiver	Rohde & Schwarz	ESIB7	12/7/2016	12/7/2018
1T4505	Temperature Chamber	Test Equity	115	2/11/2018	8/6/2019
1T4612	Spectrum Analyzer	Agilent Technologies	E4407B	5/15/2018	11/15/2019
1T4771	PSA Spectrum Analyzer	Agilent Technologies	E4446A	5/16/2018	11/16/2019

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

Certification & User's Manual Information

10. Certification Label & User's Manual Information

10.1. 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 provision that such a determination of compliance be made and is the responsibility of the party responsible for verification of the equipment.

The following is extracted from Title 47 of the Code of Federal Regulations, Part 2, Subpart Y — 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, whichever is applicable.

§ 2.902 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.

§ 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.

10.2. 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.

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

