**MET Laboratories, Inc.** *Safety Certification - EMI - Telecom Environmental Simulation*
914 WEST PATAPSCO AVENUE • BALTIMORE, MARYLAND 21230-3432 • PHONE (410) 354-3300 • FAX (410) 354-3313
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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

January 24, 2017

KEYW Corporation
7767 Old Telegraph Rd.
Severn, MD 21144

Dear Ken O'Brien,

Enclosed is the EMC Wireless test report for compliance testing of the KEYW Corporation, MPBTS as tested to the requirements of the FCC Certification rules under Title 47 of the CFR Part 22 Subpart H and Industry Canada RSS-132 Issue 3 for Cellular Devices, CC Part 24 Subpart E and Industry Canada RSS-133 Issue 6 for Broadband PCS Devices, and Part 27 and Industry Canada RSS-139 Issue 3 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.

Jennifer Warnell
Documentation Department

Reference: (\KEYW Corporation\EMC87554F-FCC22_24_27 Rev. 2)

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# Electromagnetic Compatibility Criteria
# Test Report

for the

**KEYW Corporation**
**Model MPBTS**

**Tested under**
FCC Certification Rules
Title 47 of the CFR,
Part 22 Subpart H and RSS-132 Issue 3 for Cellular Devices;
Part 24 Subpart E and RSS-133 Issue 6 for Broadband PCS Devices
& Part 27 and RSS-139 for BRS Service

**MET Report: EMC87554F-FCC22_24_27 Rev. 2**

January 24, 2017

**Prepared For:**

**KEYW Corporation**
**7767 Old Telegraph Rd.**
**Severn, MD 21144**

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

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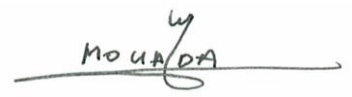

Djed Mouada
Project Engineer, Electromagnetic Compatibility Lab

Jennifer Warnell
Documentation Department

**Engineering Statement:** The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of Part 22 Subpart H, Part 24 Subpart E, and Part 27 of the FCC Rules and Industry Canada standards RSS-132 Issue 3 January 2013, RSS-133 Issue 6 January 2013, and RSS-139 Issue 3 July 2015 under normal use and maintenance.

Asad Bajwa,
Director, Electromagnetic Compatibility Lab

  

# Report Status Sheet

| Revision | Report Date | Reason for Revision |
|---|---|---|
| ∅ | July 27, 2016 | Initial Issue |
| 1 | December 7, 2016 | Engineer corrections. |
| 2 | January 24, 2017 | Editorial corrections. |

  

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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 |

# I. Executive Summary

## A. Purpose of Test

An EMC evaluation was performed to determine compliance of the KEYW Corporation MPBTS, with the requirements of Part 22 Subpart H, Part 24 Subpart E, and 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 MPBTS. KEYW Corporation should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the MPBTS, has been **permanently** discontinued.

## B. Executive Summary

The following tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 22 Subpart H, Part 24 Subpart E, and Part 27, in accordance with KEYW Corporation, purchase order number B003491.

| FCC Reference | IC Reference | Description | Compliance |
|---|---|---|---|
| §2.1049; §22.917; §24.232(d); §27.50(d)(5) | RSS-GEN Issue 4 | Occupied Bandwidth | Compliant |
| §2.1049, §24.238; §27.54 | RSS-132 Issue 3 (5.3)<br>RSS-133 Issue 6 (6.3)<br>RSS-139 Issue 3 (6.4) | Frequency stability | Compliant |
| §24.323 (d); §27.50(d)(5) | N/A | Peak to Average Ratio | Compliant |
| §2.1051; §22.917, §24.238; §27.53(g) | RSS-132 Issue 3 (5.5)<br>RSS-133 Issue 6 (6.5)<br>RSS-139 Issue 3 (6.6) | Conducted Spurious Emissions at Antenna Terminals and Band Edge | Compliant |
| §2.1046; §22.913; §24.232; §27.50(d) | RSS-132 Issue 3 (5.4)<br>RSS-133 Issue 6 (6.4)<br>RSS-139 Issue 3 (6.5) | RF Power Output (EIRP) | Compliant |
| §2.1053; §22.917, §24.238; §27.53(g) | RSS-132 Issue 3 (5.5)<br>RSS-133 Issue 6 (6.5)<br>RSS-139 Issue 3 (6.6) | Radiated Spurious Emissions from the Cabinet | Compliant |

**Table 1. Executive Summary of EMC ComplianceTesting**

# II. Equipment Configuration

# A. Overview

MET Laboratories, Inc. was contracted by KEYW Corporation to perform testing on the MPBTS, under KEYW Corporation's purchase order number B003491.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the KEYW Corporation, MPBTS.

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

| | | | | |
|---|---|---|---|---|
| **Model(s) Tested:** | MPBTS | | | |
| **Model(s) Covered:** | MPBTS | | | |
| **Filing Status:** | Original | | | |
| **EUT Specifications:** | Primary Power: 120 VAC, 60 Hz | | | |
| | FCC ID: 2AFYU26636 | | | |
| | Type of Modulations: | CDMA | | |
| | Equipment Code: | AMP | | |
| | RF Power Output | Part 22 ERP (W):142.56 | Part 24 EIRP(W):85.34 | Part 27 EIRP(W):104.47 |
| | EUT Frequency Ranges: | 869-894MHz | 1930-1990MHz | 2110-2150 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:** | Djed Mouada | | | |
| **Date(s):** | January 24, 2017 | | | |

## B. References

| | |
|---|---|
| **CFR 47, Part 22, Subpart H** | Federal Communication Commission, Code of Federal Regulations, Title 47, Part 22: Rules and Regulations for Cellular Devices. |
| **CFR 47, Part 24, Subpart E** | Federal Communication Commission, Code of Federal Regulations, Title 47, Part 24: Rules and Regulations for Personal Communications Services |
| **CFR 47, Part 27** | Federal Communication Commission, Code of Federal Regulations, Title 47, Part 27: Rules and Regulations for Advanced Wireless Services |
| **RSS-132 Issue 3 January 2013** | Cellular Telephone Systems Operating in the Bands 824-849 MHz and 869-894 MHz |
| **RSS-133 Issue 6 January 2013** | 2 GHz Personal Communications Services |
| **RSS-139 Issue 3 July 2015** | Advanced Wireless Services (AWS) Equipment Operating in the Bands 1710-1780 MHz and 2110-2180 MHz |
| **RSS-GEN Issue 4 November 2014** | General Requirements for Compliance of Radio Apparatus |
| **ANSI C63.4:2014** | Methods and Measurements of Radio-Noise Emissions from Low-Voltage Electrical And Electronic Equipment in the Range of 9 kHz to 40 GHz |
| **ISO/IEC 17025:2005** | General Requirements for the Competence of Testing and Calibration Laboratories |
| **EIA/TIA-603-D-2010** | Land Mobile FM or PM Communication Equipment Measurement and Performance Standards |

## C. Test Site

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

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

## D. Description of Test Sample

The Multi-Protocol Base Transceiver Station (MPBTS), Equipment Under Test (EUT), is a high-power, multi-protocol, multi-carrier capable base station that can be used for many cellular applications. The system is intended to be used in mobile environments installed in a vehicle with room mounted antenna, but can also function as a fixed base station.

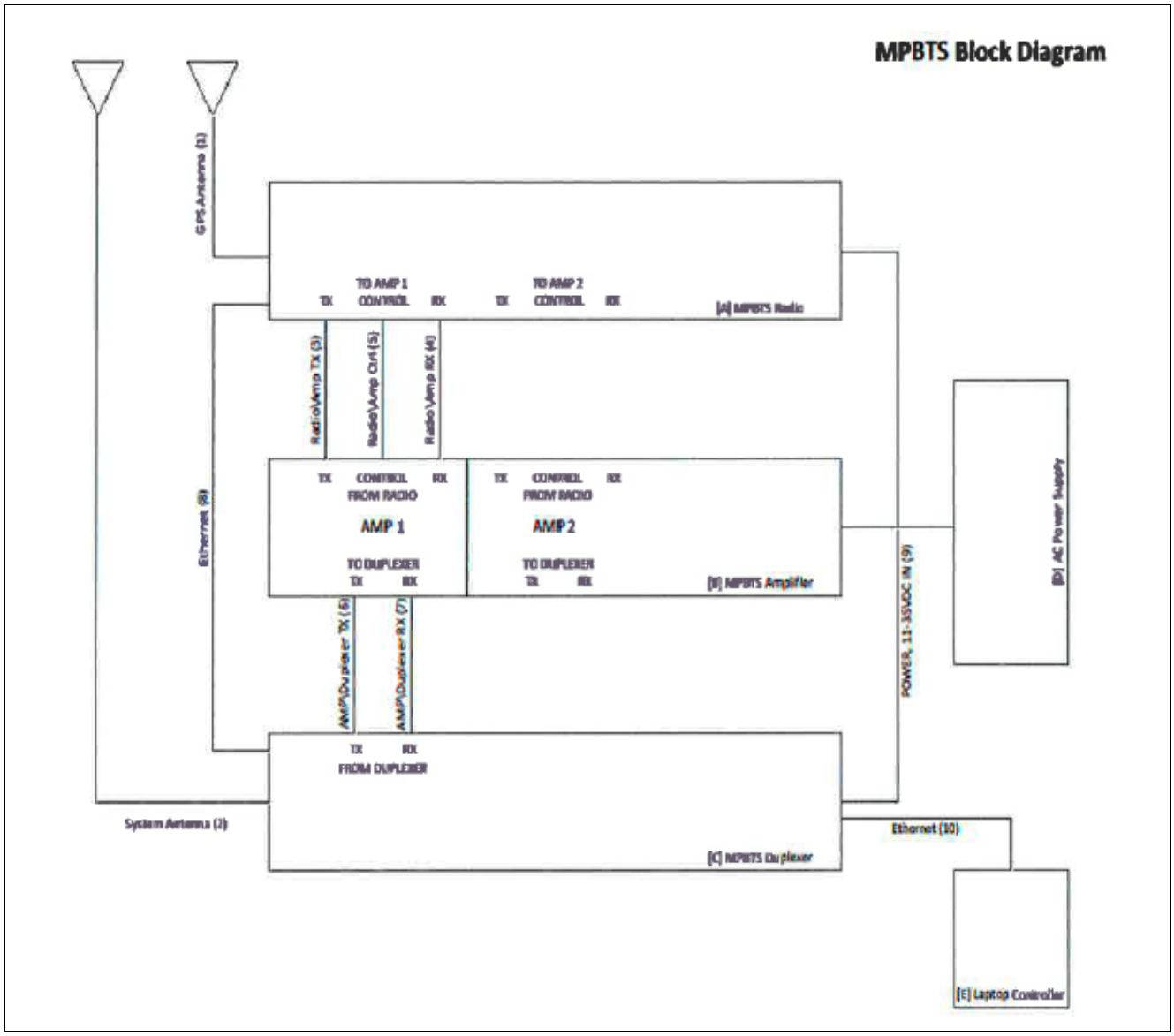



**Figure 1. Block Diagram of Equipment Configuration**

## E. Equipment Configuration

| Ref. ID | Name/Description | Model Number | Part Number | Serial Number |
|---|---|---|---|---|
| A | MPBTS Radio | TBD | -- | TBD |
| B | MPBTS Amplifier | TBD | -- | TBD |
| C | MPBTS Duplexer | TBD | -- | TBD |
| D | Power Supply | TBD | -- | TBD |

**Table 2. Equipment Configuration**

## F. Support Equipment

| Ref. ID | Name / Description | Manufacturer | Model Number | Customer Supplied Calibration Data |
|---|---|---|---|---|
| -- | System/GPS Dual Feed Antenna | Huber Suhner | 1399.99.0120 | -- |
| E | Laptop Controller | Dell | ATG | -- |

**Table 3. Support Equipment**

## G. Ports and Cabling Information

| Ref. ID | Port Name on EUT | Cable Description or Reason for No Cable | Qty. | Max Length | Shielded? (Y/N) | Termination Box ID & Port Name |
|---|---|---|---|---|---|---|
| 1 | [A] GPS Antenna | LMR200 | 1 | 15’ | Yes | GSP Antenna |
| 2 | [C] System Antenna | LMR400 | 1 | <10’ | Yes | System Antenna |
| 3 | [A] To Amp 1 TX | LMR400 | 1 | <18” | Yes | [B] From Radio TX |
| 4 | [A] To Amp 1 RX | LMR400 | 1 | <18” | Yes | [B] From Radio RX |
| 5 | [A] To Amp 1 Control | 24AWG, 12 Conductor | 1 | <18” | Yes | [B] From Radio Control |
| 6 | [B] To Duplexer TX | LMR400 | 1 | <18” | Yes | [C] From Amp TX |
| 7 | [B] to Duplexer RX | LMR400 | 1 | <18” | Yes | [C] From Amp RX |
| 8 | [A] Ethernet | 8 Conductor, CAT5 | 1 | -- | No | [C] Ethernet (Port 2) |
| 9 | [A,B,C] Power, 11-35VDC In | 14AWG, 4 Conductor SJ Cable | 3 | -- | No | AC Power Supply |
| 10 | [C] Ethernet | 8 Conductor, CAT5 | 1 | -- | No | Laptop Controller |

**Table 4. Ports and Cabling Information**

## H. Mode of Operation

The MPBTS continuously transmits a broadcast signal as part of its normal operation. There is no special operating mode required for testing.

## I. Method of Monitoring EUT Operation

1. A blinking green heartbeat indicator in the GUI and green LEDs on the radio and amplifier front panels indicate normal operation of the system.
2. Any other LED status or lack of the green heartbeat indicator indicates a problem with the system.

## 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 KEYW Corporation. upon completion of testing.

# III. Electromagnetic Compatibility Criteria for Intentional Radiators

# Electromagnetic Compatibility Criteria for Intentional Radiators

## § 2.1046 RF Power Output

**Test Requirements:** **§ 2.1046 Measurements required: RF power output:**

**§ 2.1046 (a)** For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, power output shall be measured at the RF output terminals when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in § 2.1033(c)(8).The electrical characteristics of the radio frequency load attached to the output terminals when this test is made shall be stated.

**§ 2.1046 (b)** For single sideband, independent sideband, and single channel, controlled carrier radiotelephone transmitters, the procedure specified in paragraph (a) of this section shall be employed and, in addition, the transmitter shall be modulated during the test as specified and as applicable in § 2.1046 (b) (1-5). In all tests, the input level of the modulating signal shall be such as to develop rated peak envelope power or carrier power, as appropriate, for the transmitter.

**§ 2.1046 (c)** For measurements conducted pursuant to paragraphs (a) and (b) of this section, all calculations and methods used by the applicant for determining carrier power or peak envelope power, as appropriate, on the basis of measured power in the radio frequency load attached to the transmitter output terminals shall be shown. Under the test conditions specified, no components of the emission spectrum shall exceed the limits specified in the applicable rule parts as necessary for meeting occupied bandwidth or emission limitations.

**§ 22.913 Power and antenna height limits.**

**§ 22.913(a):** The Effective radiated power (ERP) of base transmitters and cellular repeaters must not exceed 500 watts.

**§ 24.232 Power and antenna height limits.**

**§ 24.232 (a):** **(**1**)** Base stations with an emission bandwidth of 1 MHz or less are limited to 1640 watts equivalent isotropically radiated power (EIRP) with an antenna height up to 300 meters HAAT, except as described in paragraph (b) below.

(2) Base stations with an emission bandwidth greater than 1 MHz are limited to 1640 watts/MHz equivalent isotropically radiated power (EIRP) with an antenna height up to 300 meters HAAT.

**§27.50(d):**

(2) The power of each fixed or base station transmitting in the 1995-2000 MHz, the 2110-2155 MHz, or 2180-2200 MHz band and situated in any geographic location other than that described in paragraph (d)(1) of this section is limited to:

(3) A licensee operating a base or fixed station in the 2110-2155 MHz band utilizing a power greater than 1640 watts EIRP and greater than 1640 watts/MHz EIRP must coordinate such operations in advance with all Government and non-Government satellite entities in the 2025-2110 MHz band. Operations with power greater than 1640 watts EIRP and greater than 1640 watts/MHz EIRP must be coordinated in advance with the following licensees authorized to operate within 120 kilometers (75 miles) of the base or fixed station operating in this band: all Broadband Radio Service (BRS) licensees authorized under Part 27 in the 2155-2160 MHz band and all advanced wireless services (AWS) licensees authorized to operate on adjacent frequency blocks in the 2110-2155 MHz band.

**Test Procedures:** As required by 47 CFR 2.1046, RF power output measurements were made at the RF output terminals using an attenuator and spectrum analyzer or power meter. The spectrum analyzer was configured in accordance with the licensed measurement guidance procedure. The "Channel Power" measurement feature of the spectrum analyzer was used. Measurements were taken in both high and low power modes, as permissible by compliance with Intermodulation requirements. Lower power mode must be used when operating in multi-channel mode.

*RF power output measurement* was made at the RF output terminal using a spectrum analyzer, with suitable attenuation where appropriate.

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

**Test Engineer(s):** Djed Mouada

**Test Date(s):** 03/23/16

| Channel | Conducted Power (dBm) | Antenna Gain (dBi) | ERP (W) | Limit (W) |
|---|---|---|---|---|
| **Low (869.7MHz)** | 42.5 | 9 | 86.09 | 500 |
| **Mid (880.7(MHz)** | 40.54 | 9 | 54.82 | 500 |
| **High (893.3MHz)** | 44.69 | 9 | 142.56 | 500 |

**Table 5. ERP, Test Results, Part 22**

| Channel | Conducted Power (dBm) | Antenna Gain (dBi) | EIRP (W) | Limit (W) |
|---|---|---|---|---|
| **Low (1931MHz)** | 39.83 | 9 | 76.38 | 1640 |
| **Mid(1951MHz)** | 37.87 | 9 | 48.64 | 1640 |
| **High(1989MHz)** | 40.31 | 9 | 85.3 | 1640 |

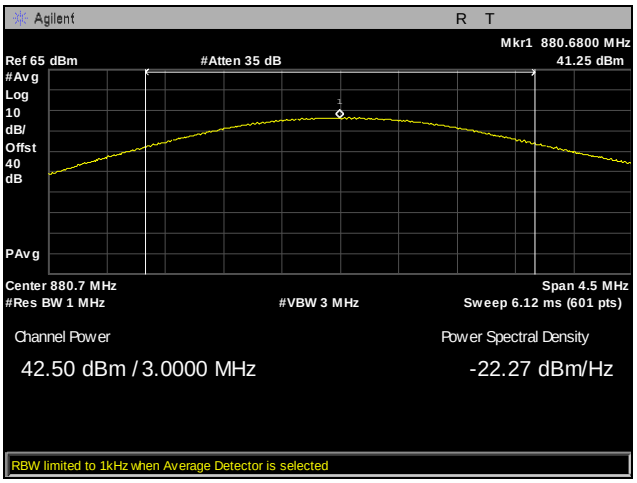
**Table 6. EIRP, Test Results, Part 24**

| Channel | Conducted Power (dBm) | Antenna Gain (dBi) | EIRP (W) | Limit (W) |
|---|---|---|---|---|
| **Low (2111MHz)** | 40.38 | 9 | 86.69 | 1640 |
| **Mid(2145MHz)** | 41.05 | 9 | 101.15 | 1640 |
| **High(2154MHz)** | 41.19 | 9 | 104.47 | 1640 |

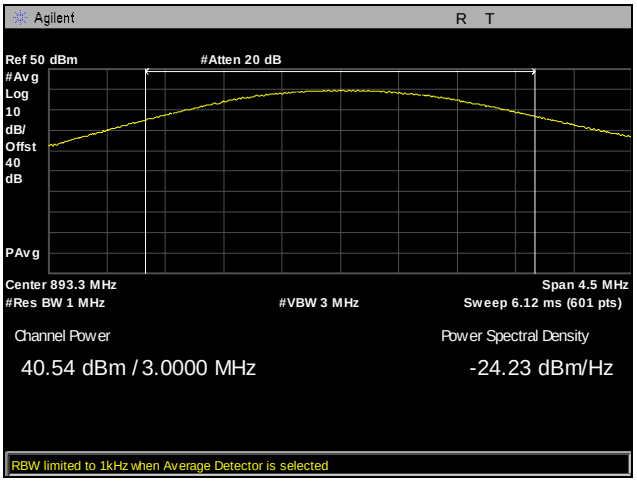
**Table 7. EIRP, Test Results, Part 27**

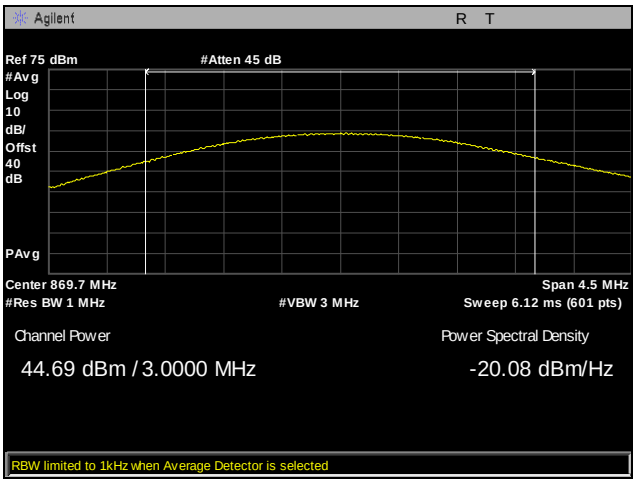
## Part 22, Conducted Power




**Plot 1. ERP, Channel 356, Conducted Power, Part 22**



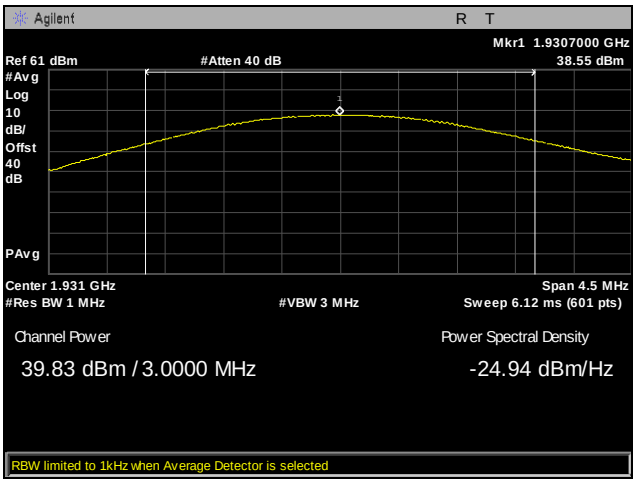

**Plot 2. ERP, Channel 777, Conducted Power, Part 22**



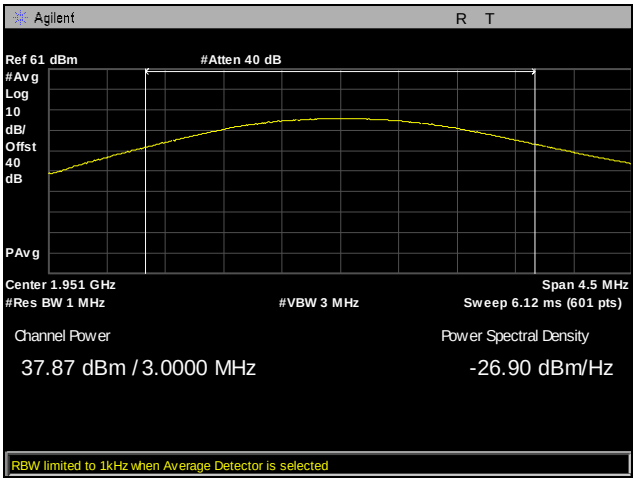

**Plot 3. ERP, Channel 1013, Conducted Power, Part 22**

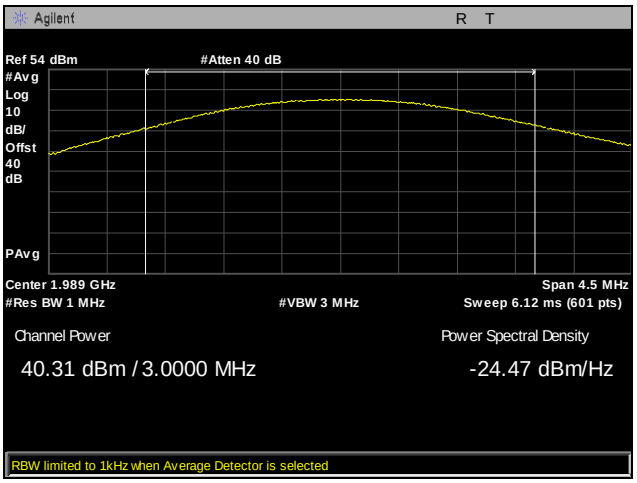
## Part 24, Conducted Power




**Plot 4. EIRP, Channel 14, Conducted Power, Part 24**



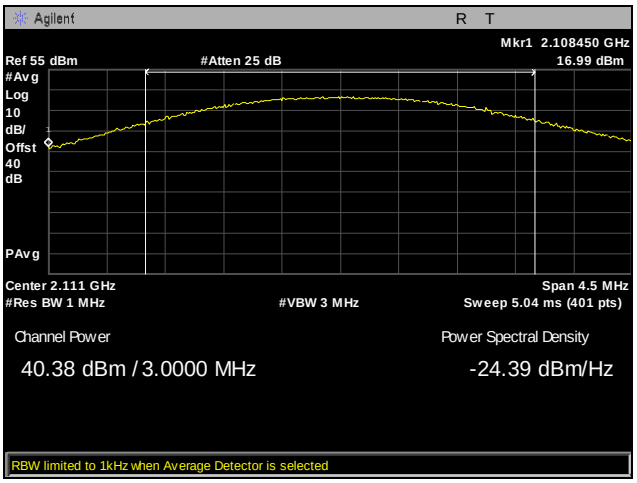

**Plot 5. EIRP, Channel 425, Conducted Power, Part 24**



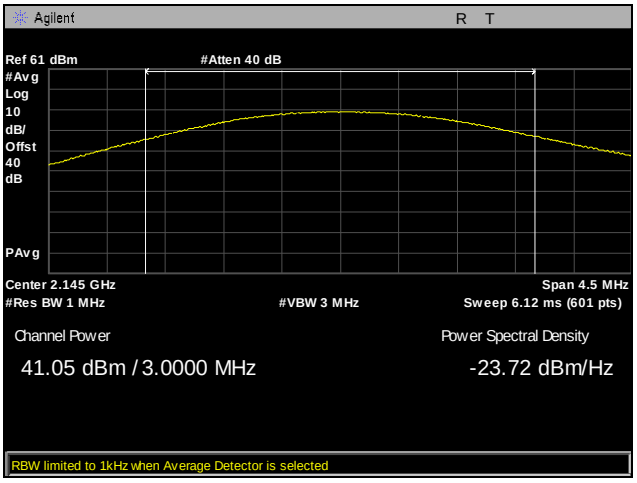

**Plot 6. EIRP, Channel 1186, Conducted Power, Part 24**

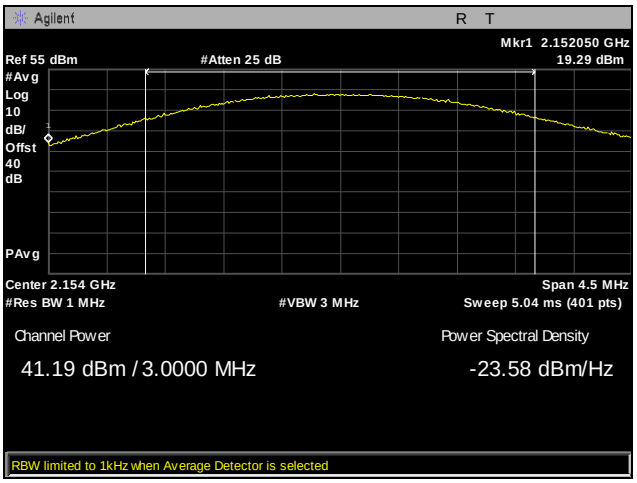
## Part 27, Conducted Power




**Plot 7. EIRP, Channel 14, Conducted Power, Part 27**




**Plot 8. EIRP, Channel 700, Conducted Power, Part 27**




**Plot 9. EIRP, Channel 886, Conducted Power, Part 27**

## § 2.1049 Occupied Bandwidth

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

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

A laptop was connected to EUT to control the RF frequency channel. The EUT was connected to a Spectrum Analyzer via attenuator. The spectrum analyzer was set in accordance with the licensed measurement procedure guidance. Measurements were carried out at the low, mid, and high channels of the TX band.

Occupied bandwidth measurements were made with a Spectrum Analyzer connected to the RF output of the amplifier, as well as the input to the amplifier.

The modulation characteristics of the base station were measured first at a maximum RF level prescribed by the OEM. The base station was then connected to the input of the amplifier and was operated at the appropriate RF level. The resulting modulated signal through the EUT was measured and compared against the original signal.

**Test Results:** Equipment complies with FCC requirements.

**Test Engineer(s):** Djed Mouada

**Test Date(s):** 03/23/16

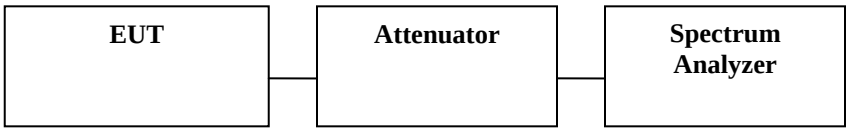
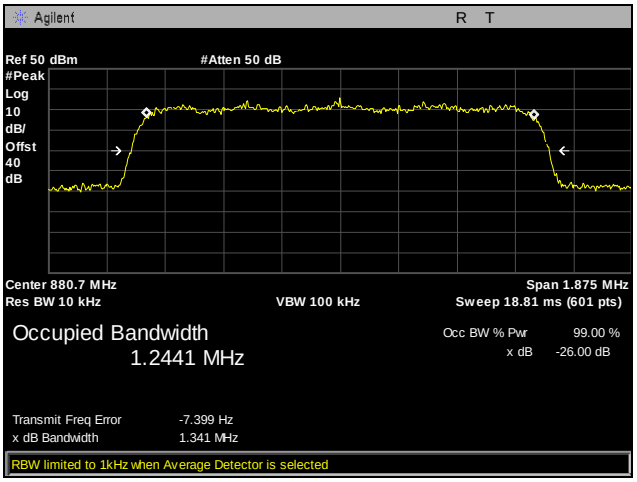
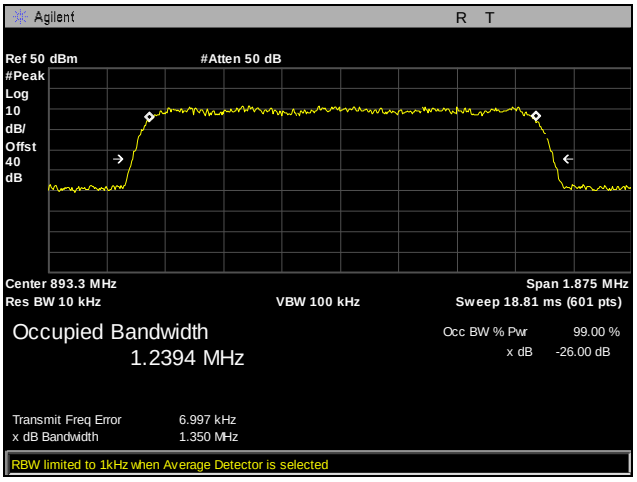



**Figure 2. Occupied Bandwidth Test Setup**

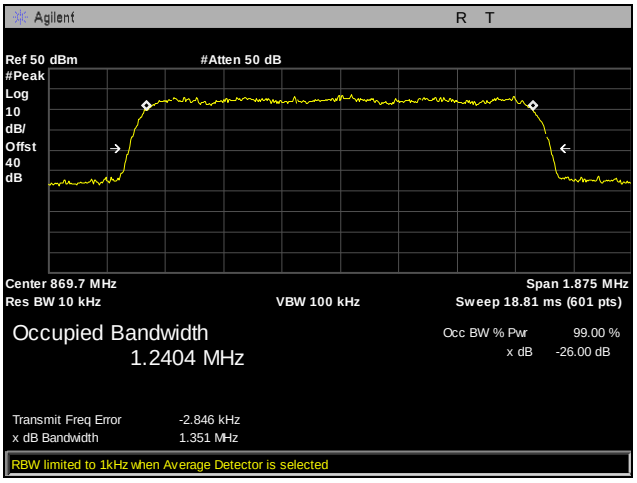
## Part 22




**Plot 10. Occupied Bandwidth, Channel 356, Part 22**



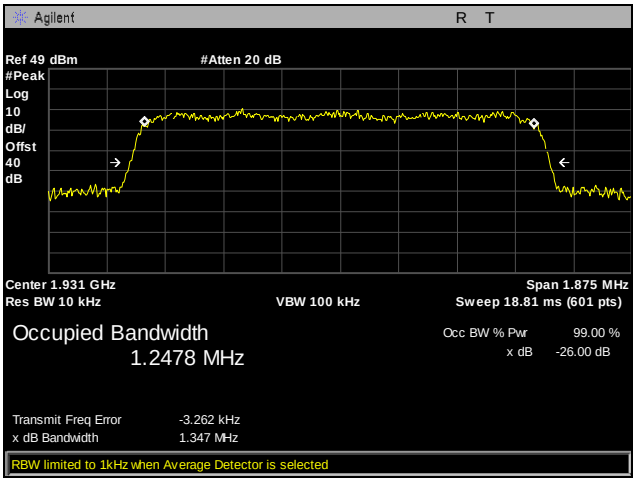

**Plot 11. Occupied Bandwidth, Channel 777, Part 22**



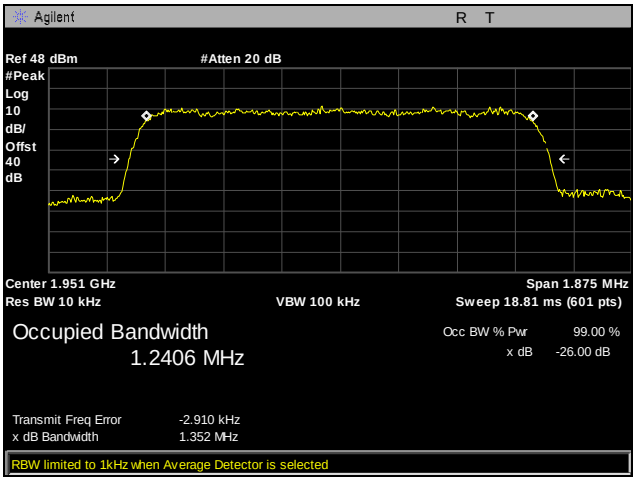

**Plot 12. Occupied Bandwidth, Channel 1013, Part 22**

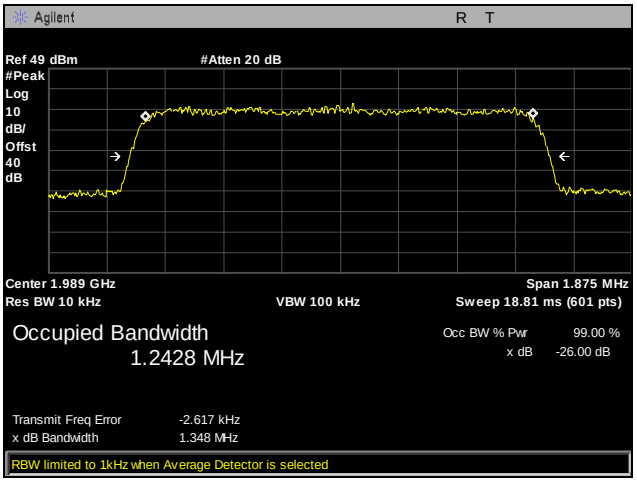
## Part 24




**Plot 13. Occupied Bandwidth, Channel 14, Part 24**



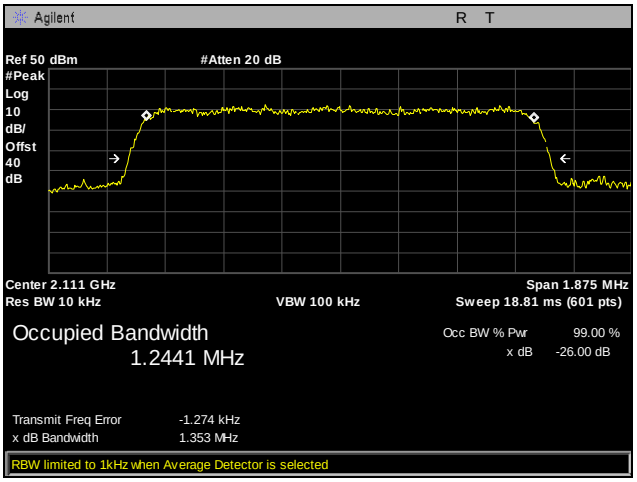

**Plot 14. Occupied Bandwidth, Channel 425, Part 24**



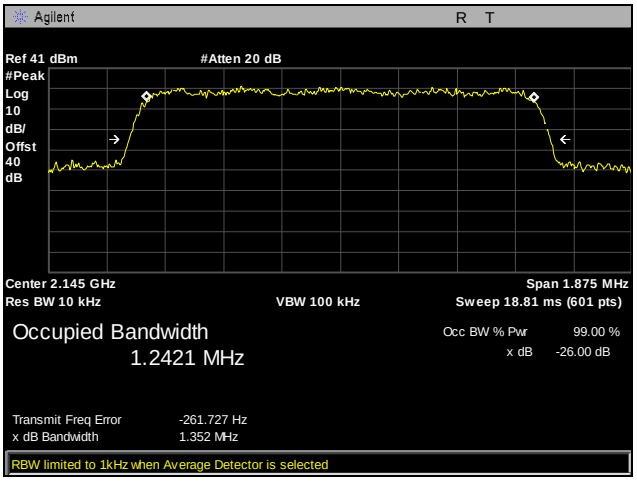

**Plot 15. Occupied Bandwidth, Channel 1186, Part 24**

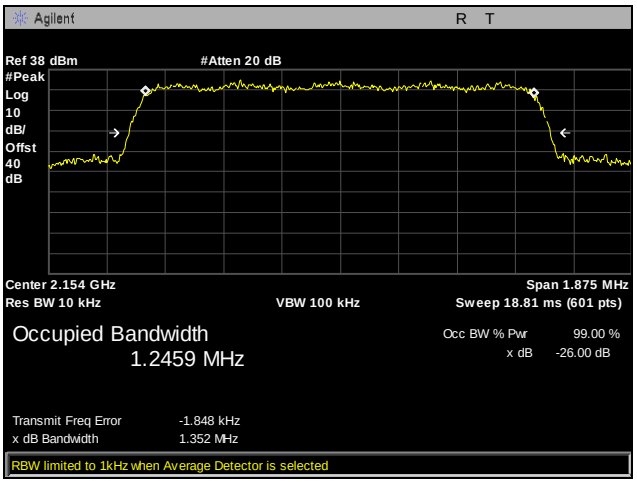
## Part 27




**Plot 16. Occupied Bandwidth, Channel 14, Part 27**




**Plot 17. Occupied Bandwidth, Channel 700, Part 27**




**Plot 18. Occupied Bandwidth, Channel 886, Part 27**

## Electromagnetic Compatibility Criteria for Intentional Radiators

## § 2.1053 Radiated Spurious Emissions

**Test Requirement(s):** **§ 2.1053 Measurements required: Field strength of spurious radiation.**

**§ 2.1053 (a)** Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data shall be supplied showing the magnitude of each harmonic and other spurious emission. For this test, single sideband, independent sideband, and controlled carrier transmitters shall be modulated under the conditions specified in paragraph (c) of § 2.1049, as appropriate. For equipment operating on frequencies below 890 MHz, an open field test is normally required with the measuring instrument antenna located in the far-field at all test frequencies. In the event it is either impractical or impossible to make open field measurements (e.g. a broadcast transmitter installed in a building) measurements will be accepted of the equipment as installed. Such measurements must be accompanied by a description of the site where the measurements were made showing the location of any possible source of reflections which might distort the field strength measurements. Information submitted shall include the relative radiated power of each spurious emission with reference to the rated power output of the transmitter, assuming all emissions are radiated from half-wave dipole antennas.

**§ 2.1053 (b):** The measurements specified in paragraph (a) of this section shall be made for the following equipment:

**(1)** Those in which the spurious emissions are required to be 60 dB or more below the mean power of the transmitter.

**(2)** All equipment operating on frequencies higher than 25 MHz.

**(3)** All equipment where the antenna is an integral part of, and attached directly to the transmitter.

**(4)** Other types of equipment as required, when deemed necessary by the Commission.

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

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

**27.53(h) Measurements required: Field strength of spurious radiation.**

For operations in the 1710-1755 MHz and 2110-2155 MHz bands, the power of any emissions outside a licensee's frequency block shall be attenuated below the transmitter power P by at least 43+10log(P).

**Test Procedures:**

As required by 47 CFR 2.1053, *field strength of radiated spurious measurements* was made in accordance with the procedures of EIA/TIA-603-D-2010 "Land Mobile FM or PM Communications Equipment Measurement and Performance Standards".

Radiated emission measurements were performed inside a 3 meter semi-anechoic chamber. The EUT's RF ports were terminated to 50ohm load. The EUT was tested using both modulations and at the low, mid, and high channels. The EUT was rotated about $360^0$ 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. Harmonic emissions up to the $10^{th}$ or 40GHz, which ever was the lesser, were investigated.

The spectrum analyzer was configured in accordance with the licensed measurement guidance, and as per rule Parts 22 and 27.

The distance between the EUT and the test antenna was 3 meters for below 1 GHz and 1m for frequencies above 1 GHz. The EUT's RF ports were connected to a dummy load. The intensities of the radiated emissions were maximized by rotating the turntable 360 degrees and varying the receive antenna from 1 to 4m. Measurements were made with the receive antenna in both horizontal and vertical polarizations.

**Test Results:**

Equipment complies with Section 2.1053. The limit for spurs is -13 dBm. Measurements revealed that no spurs came even close to this limit. Therefore, measurements using substitution method were not performed. Also, testing was performed using a CW signal. The following plots have been corrected.

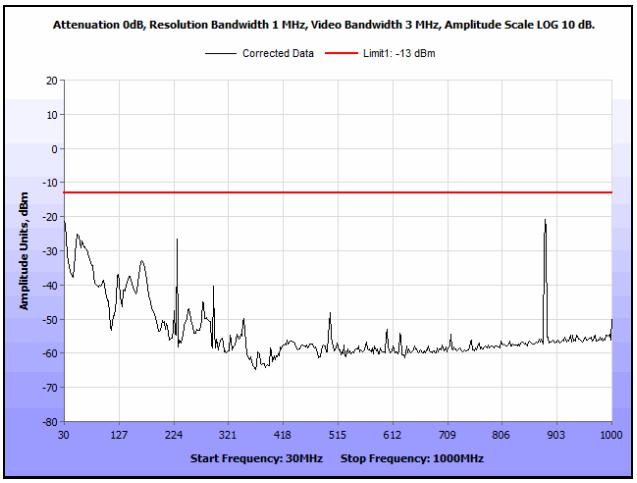
**Test Engineer:**

Djed Mouada

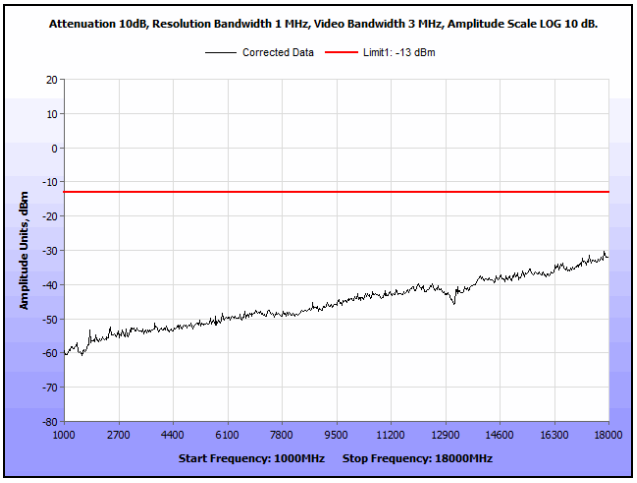
**Test Date(s):**

03/25/16

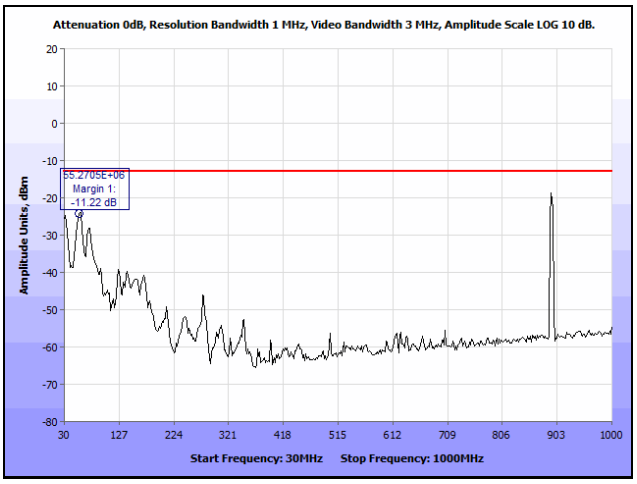
## Radiated Spurious Emissions, Part 22



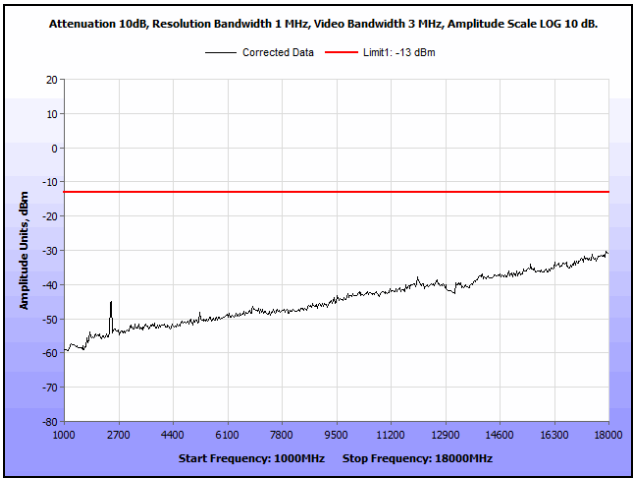

**Plot 19. Radiated Spurious Emissions, Low Channel, 30 MHz – 1 GHz, Part 22**



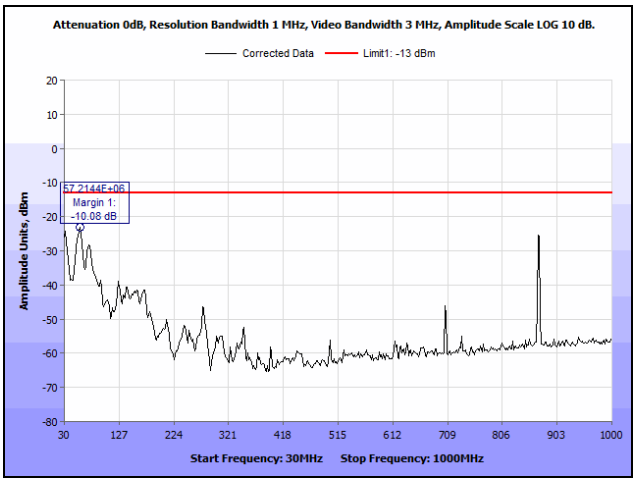

**Plot 20. Radiated Spurious Emissions, Low Channel, 1 GHz – 18 GHz, Part 22**



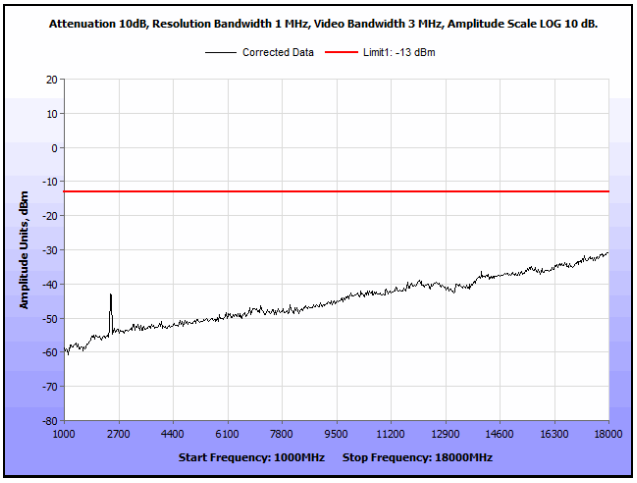

**Plot 21. Radiated Spurious Emissions, Mid Channel, 30 MHz – 1 GHz, Part 22**




**Plot 22. Radiated Spurious Emissions, Mid Channel, 1 GHz – 18 GHz, Part 22**



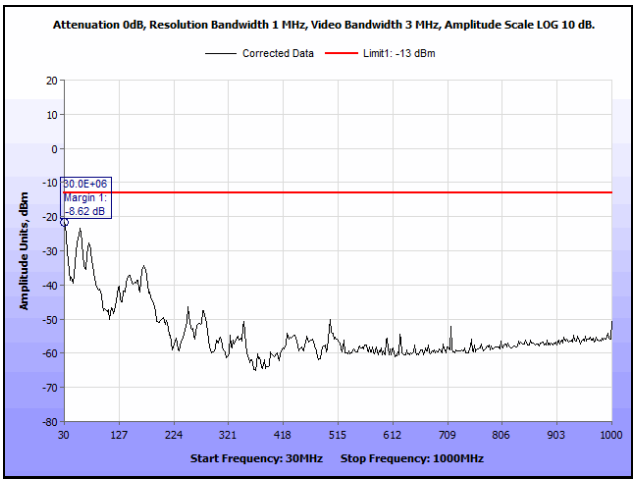

**Plot 23. Radiated Spurious Emissions, High Channel, 30 MHz – 1 GHz, Part 22**



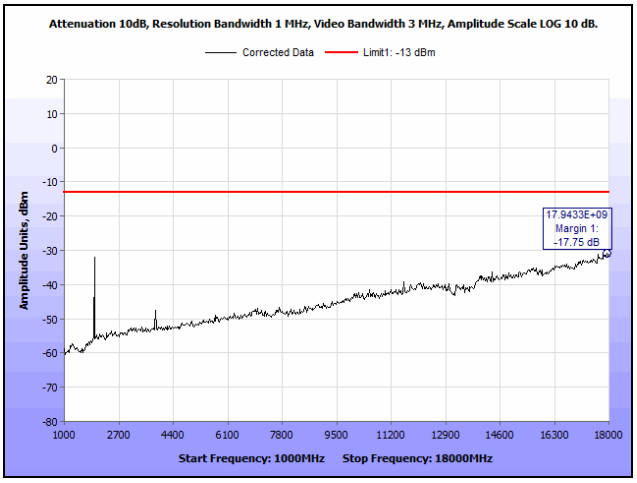

**Plot 24. Radiated Spurious Emissions, High Channel, 1 GHz – 18 GHz, Part 22**

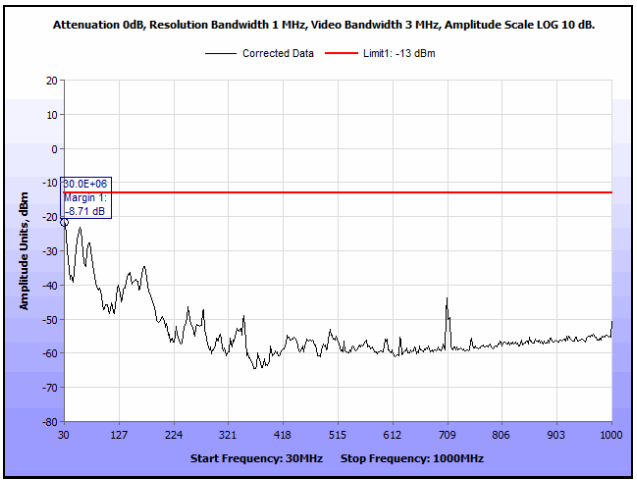
## Radiated Spurious Emissions, Part 24



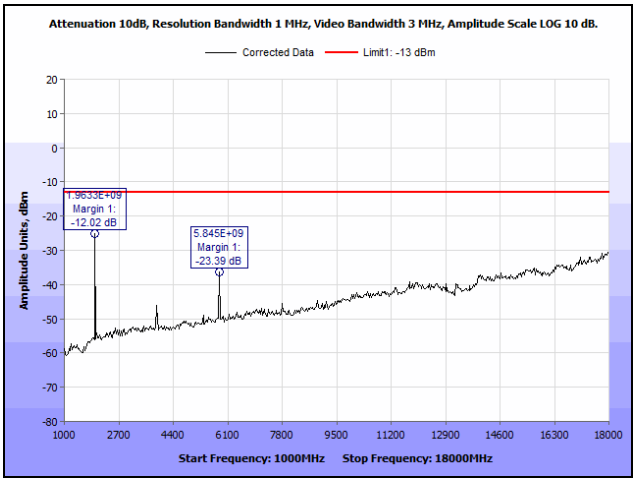

**Plot 25. Radiated Spurious Emissions, Low Channel, 30 MHz – 1 GHz, Part 24**



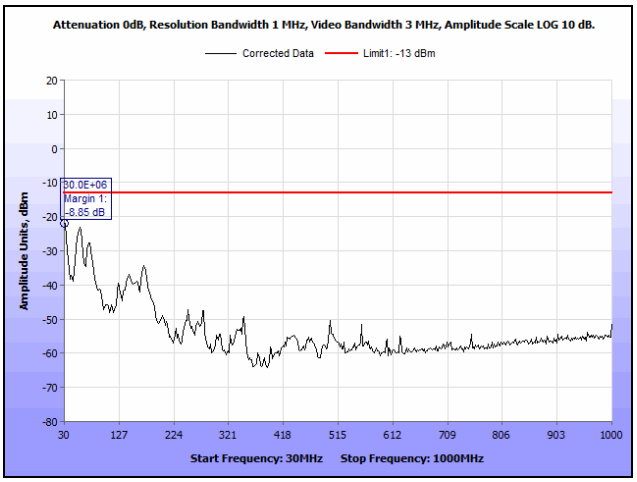

**Plot 26. Radiated Spurious Emissions, Low Channel, 1 GHz – 18 GHz, Part 24**



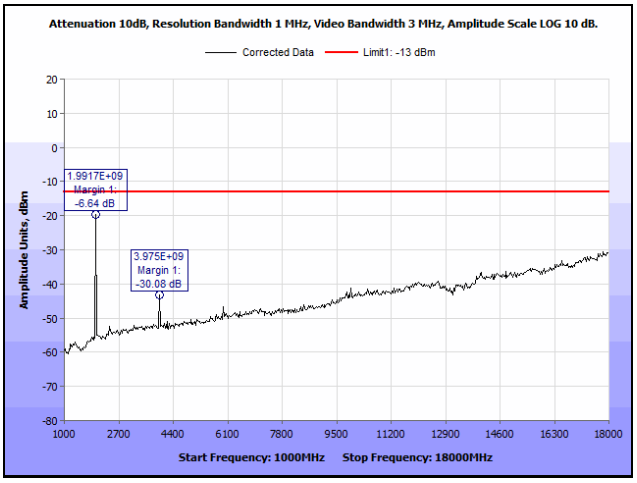

**Plot 27. Radiated Spurious Emissions, Mid Channel, 30 MHz – 1 GHz, Part 24**




**Plot 28. Radiated Spurious Emissions, Mid Channel, 1 GHz – 18 GHz, Part 24**



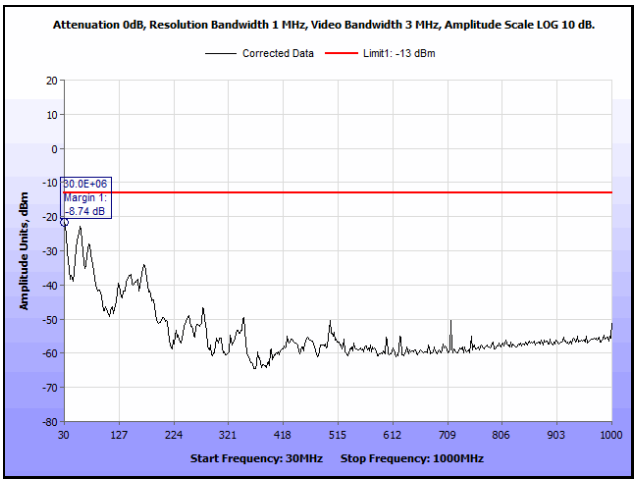

**Plot 29. Radiated Spurious Emissions, High Channel, 30 MHz – 1 GHz, Part 24**



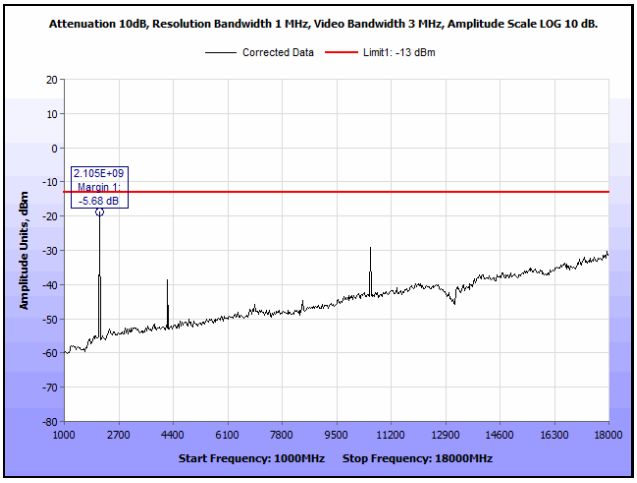

**Plot 30. Radiated Spurious Emissions, High Channel, 1 GHz – 18 GHz, Part 24**

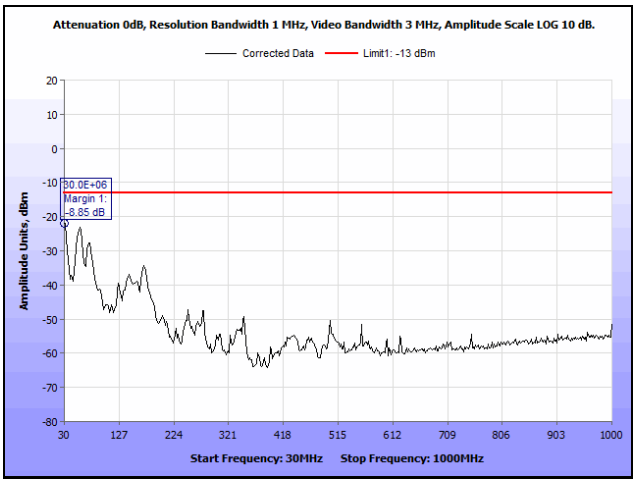
## Radiated Spurious Emissions, Part 27




**Plot 31. Radiated Spurious Emissions, Low Channel, 30 MHz – 1 GHz, Part 27**

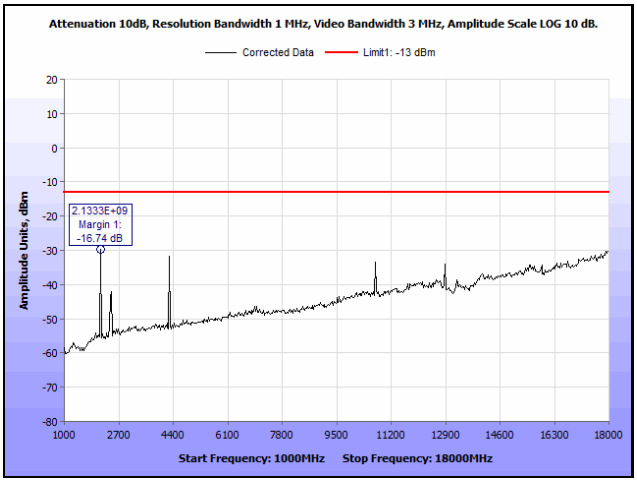



**Plot 32. Radiated Spurious Emissions, Low Channel, 1 GHz – 18 GHz, Part 27**

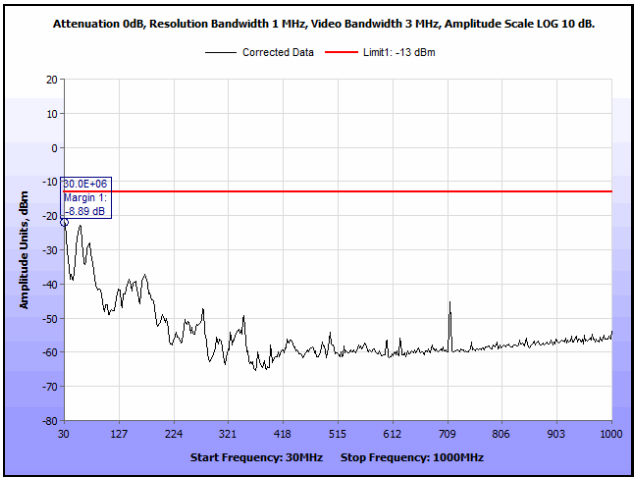



**Plot 33. Radiated Spurious Emissions, Mid Channel, 30 MHz – 1 GHz, Part 27**

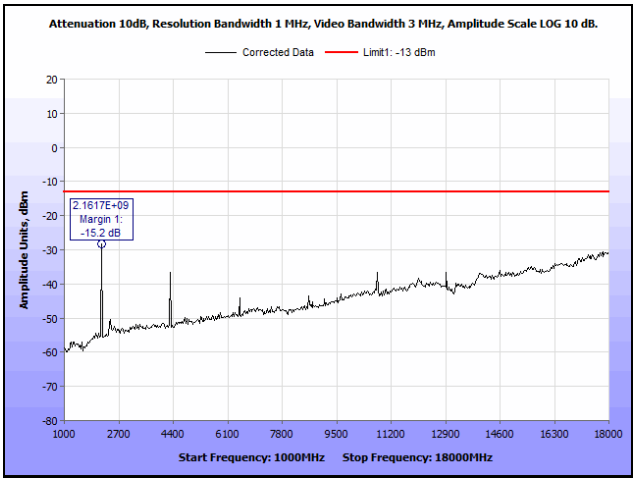
  




**Plot 34. Radiated Spurious Emissions, Mid Channel, 1 GHz – 18 GHz, Part 27**

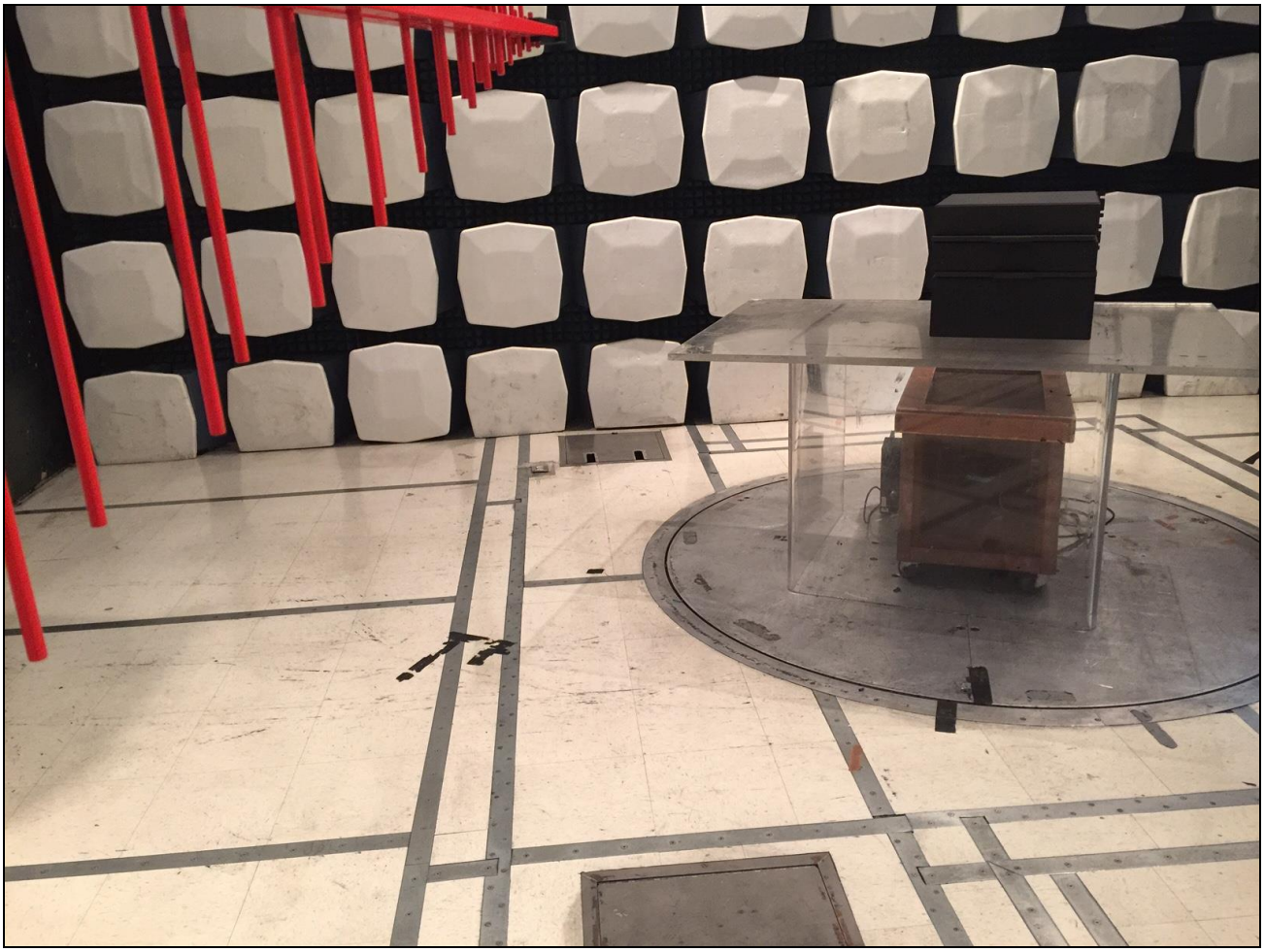



**Plot 35. Radiated Spurious Emissions, High Channel, 30 MHz – 1 GHz, Part 27**




**Plot 36. Radiated Spurious Emissions, High Channel, 1 GHz – 18 GHz, Part 27**



**Photograph 1. Radiated Spurious Emissions, Test Setup**

## Electromagnetic Compatibility Criteria for Intentional Radiators

## § 2.1051 Spurious Emissions at Antenna Terminals

**Test Requirement(s):**

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

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

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

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

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

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

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

**27.53(h):** For operations in the 1710-1755 MHz and 2110-2155 MHz bands, the power of any emissions outside a licensee's frequency block shall be attenuated below the transmitter power P by at least 43 + 10log (P).

**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 through an attenuator. The Spectrum Analyzer was set to sweep 30 MHz and up to 10th harmonic of the fundamental or 40 GHz whichever is the lesser. Measurements were made in all applicable frequency bands.

A modulated carrier generated by the base station was connected to RF input port at a maximum level as determined by the OEM. A spectrum analyzer was connected to either the RF output port for spurious emissions measurements. The spectrum was investigated from 30MHz to the 10th harmonic of the carrier.

The inter-modulation requirements were performed in a similar manner as described above. The spectrum analyzer was set to 100KHz RBW and 300KHz VBW. Two modulated carriers were injected into the EUT from the base station. The in band spurious emissions were investigated.
The filter response has also be measured and recorded.

Band Edge Plots: If a reduction of power was necessary for compliance at band edges, a second band edge plot was taken at the outermost channel that was compliant at the highest power. The channel number is noted in the caption of those plots.

**Test Results:** Equipment complies with these requirements.

**Test Engineer(s):** Djed Mouada

**Test Date(s):** 03/23/16

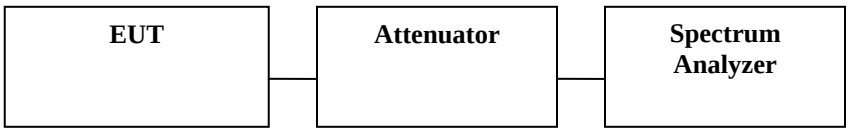
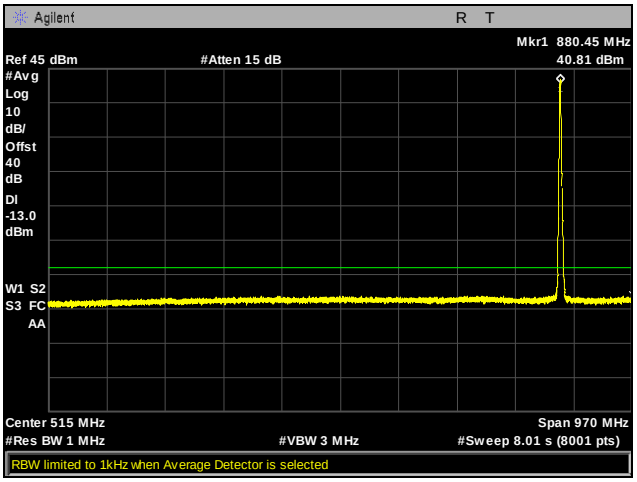
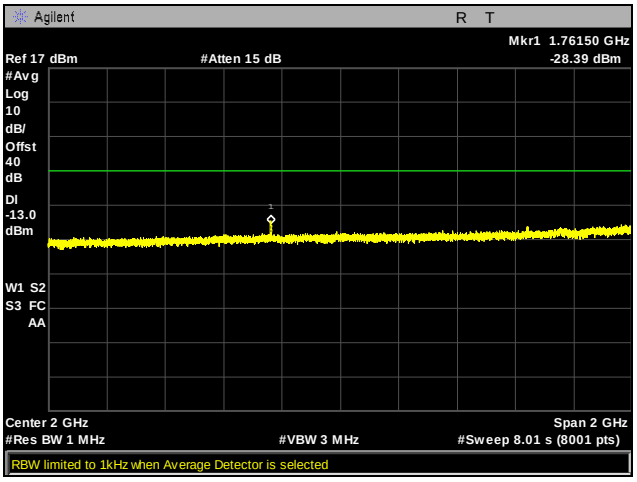



**Figure 3. Spurious Emissions at Antenna Terminals Test Setup**

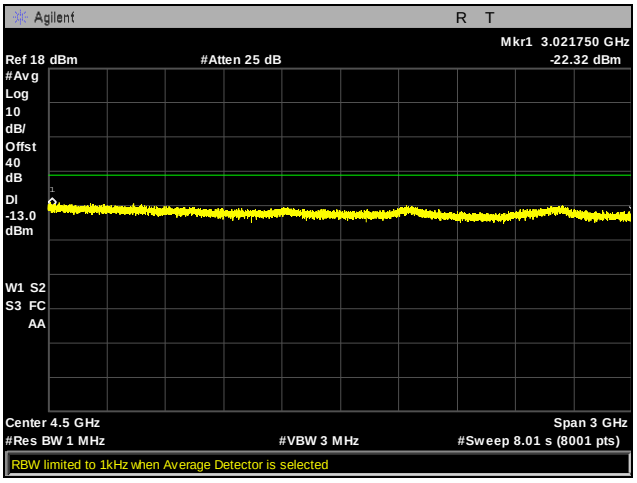
## Part 22



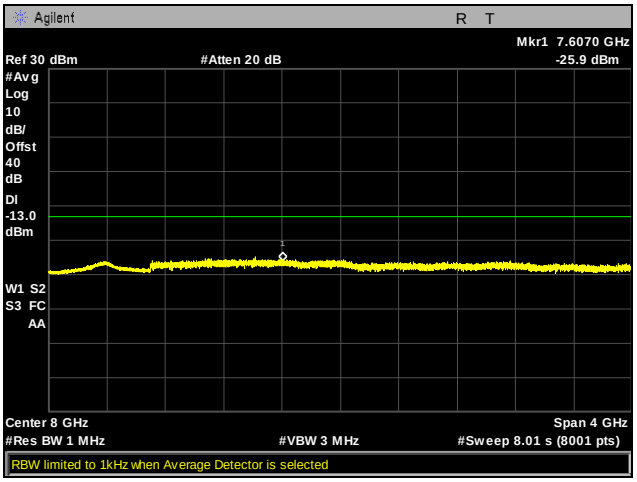

**Plot 37. Conducted Spurious Emissions, Channel 356, 30 MHz – 1 GHz, Part 22**



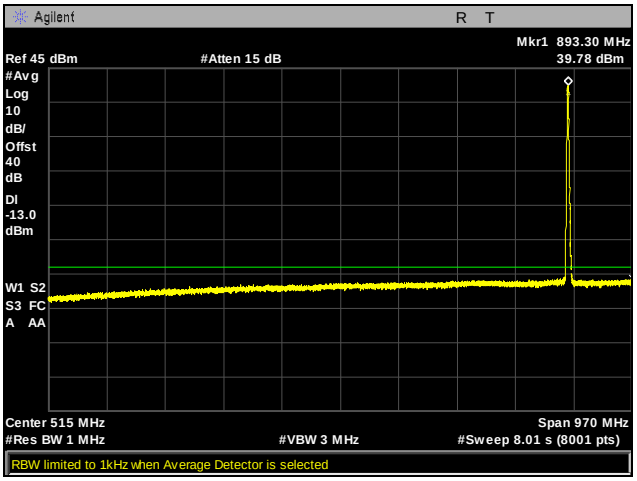

**Plot 38. Conducted Spurious Emissions, Channel 356, 1 GHz – 3 GHz, Part 22**



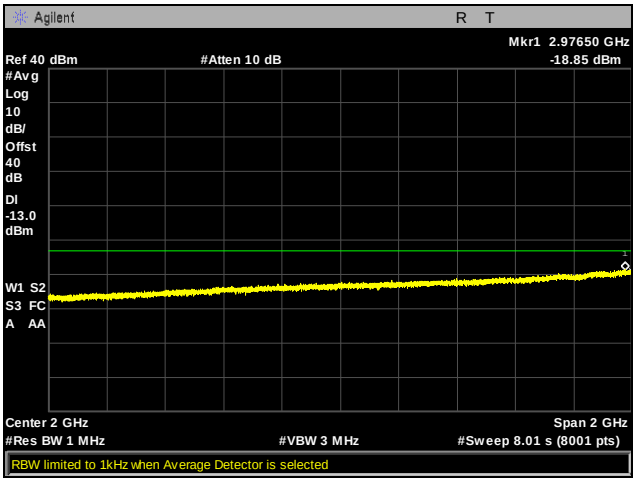

**Plot 39. Conducted Spurious Emissions, Channel 356, 3 GHz – 6 GHz, Part 22**



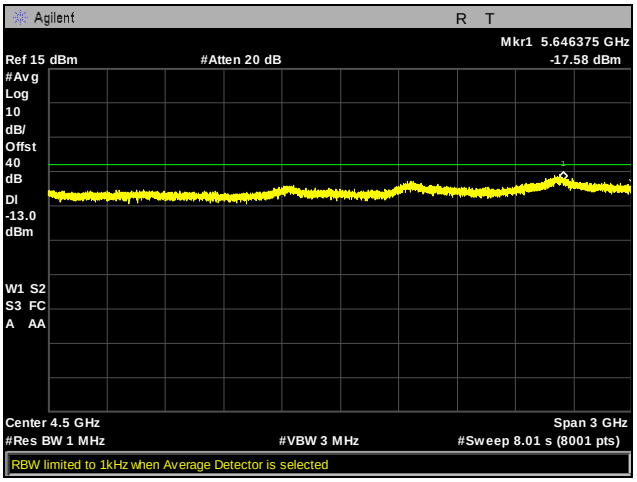

**Plot 40. Conducted Spurious Emissions, Channel 356, 6 GHz – 10 GHz, Part 22**



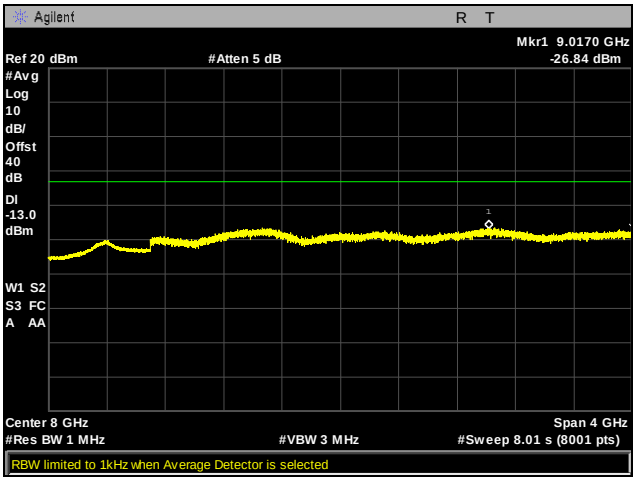

**Plot 41. Conducted Spurious Emissions, Channel 777, 30 MHz – 1 GHz, Part 22**



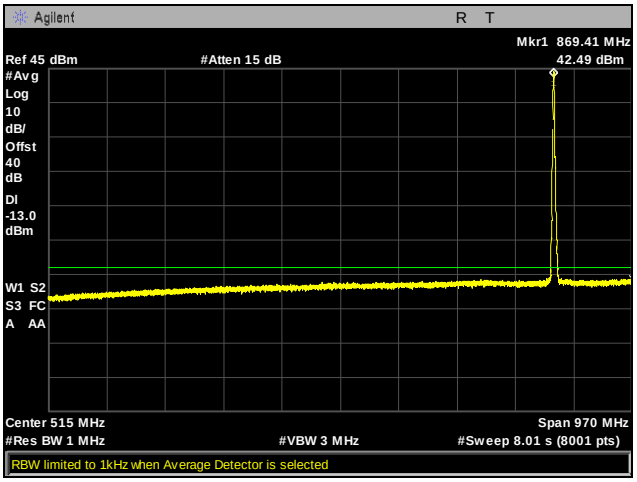

**Plot 42. Conducted Spurious Emissions, Channel 777, 1 GHz – 3 GHz, Part 22**




**Plot 43. Conducted Spurious Emissions, Channel 777, 3 GHz – 6 GHz, Part 22**

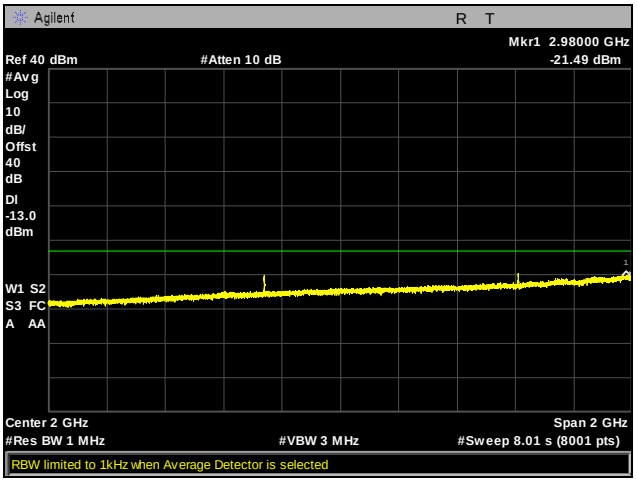



**Plot 44. Conducted Spurious Emissions, Channel 777, 6 GHz – 10 GHz, Part 22**

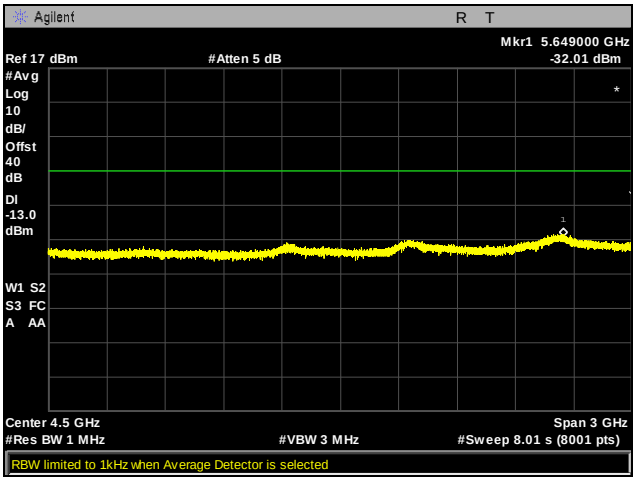



**Plot 45. Conducted Spurious Emissions, Channel 1013, 30 MHz – 1 GHz, Part 22**

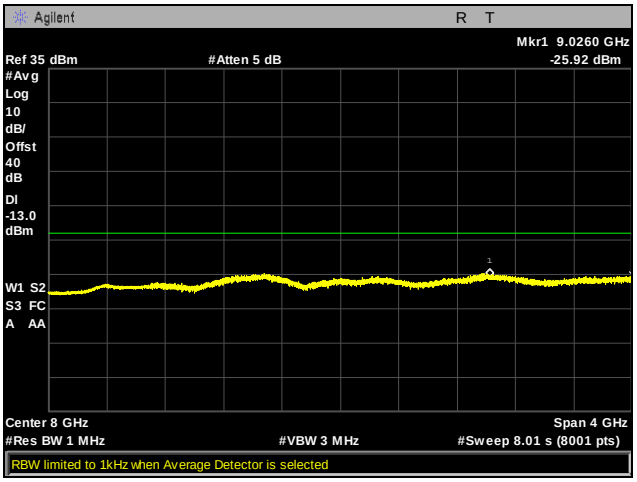
  




**Plot 46. Conducted Spurious Emissions, Channel 1013, 1 GHz – 3 GHz, Part 22**



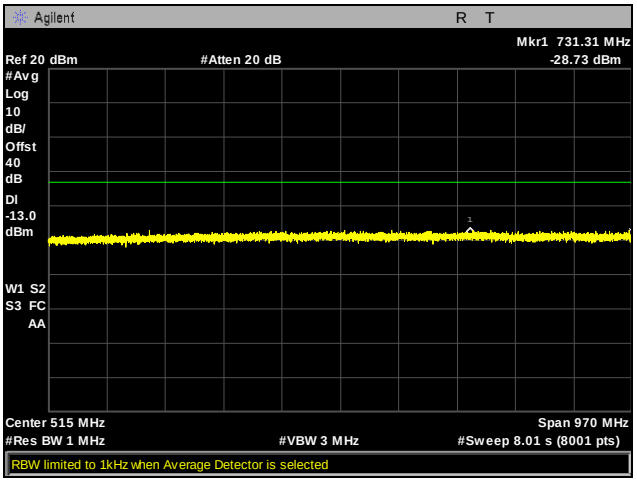

**Plot 47. Conducted Spurious Emissions, Channel 1013, 3 GHz – 6 GHz, Part 22**



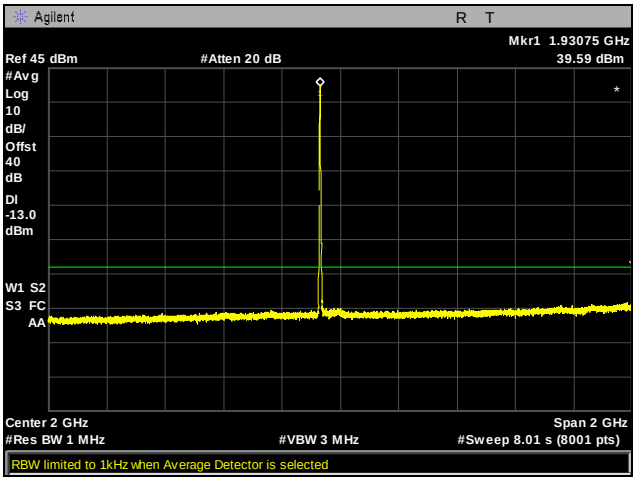

**Plot 48. Conducted Spurious Emissions, Channel 1013, 6 GHz – 10 GHz, Part 22**

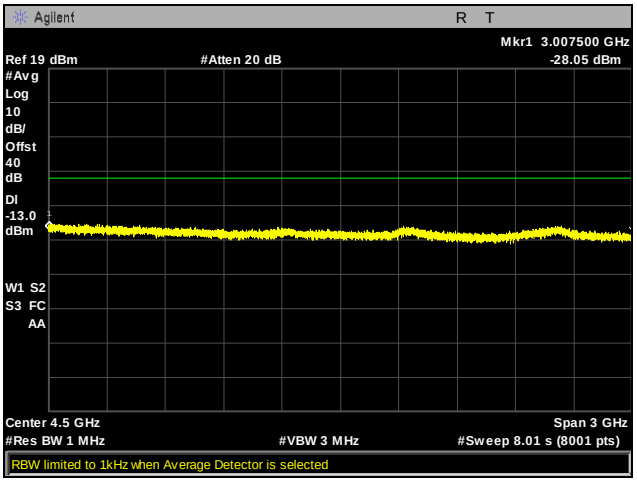
## Part 24



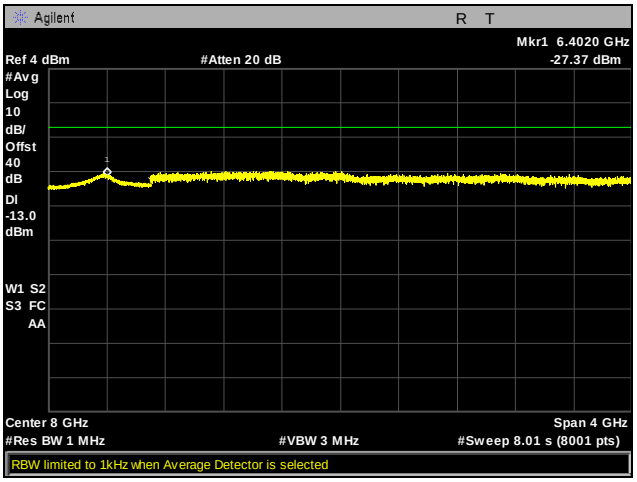

**Plot 49. Conducted Spurious Emissions, Channel 14, 30 MHz – 1 GHz, Part 24**



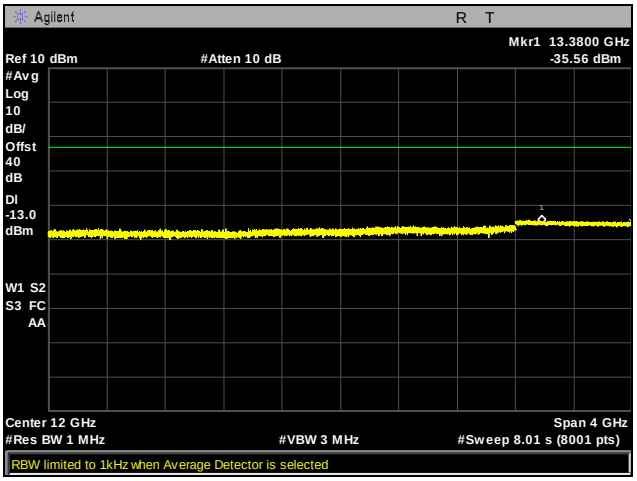

**Plot 50. Conducted Spurious Emissions, Channel 14, 1 GHz – 3 GHz, Part 24**



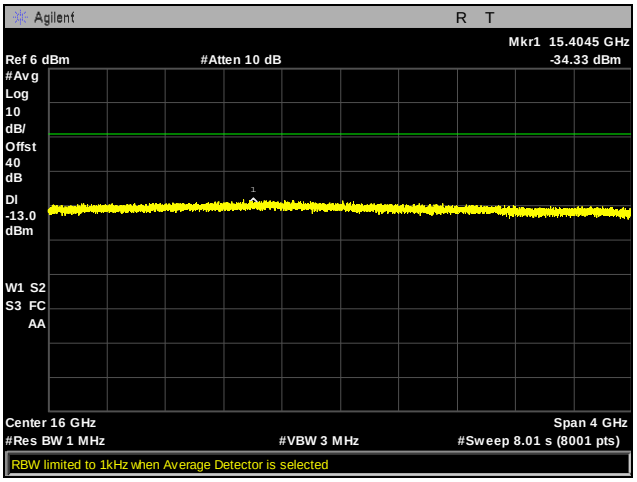

**Plot 51. Conducted Spurious Emissions, Channel 14, 3 GHz – 6 GHz, Part 24**




**Plot 52. Conducted Spurious Emissions, Channel 14, 6 GHz – 10 GHz, Part 24**

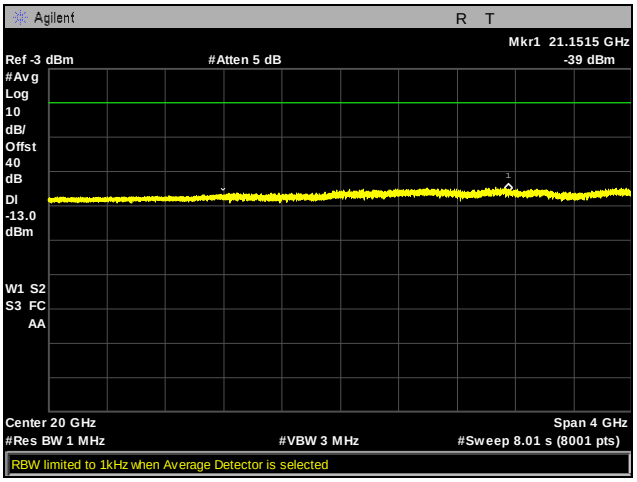



**Plot 53. Conducted Spurious Emissions, Channel 14, 10 GHz – 14 GHz, Part 24**

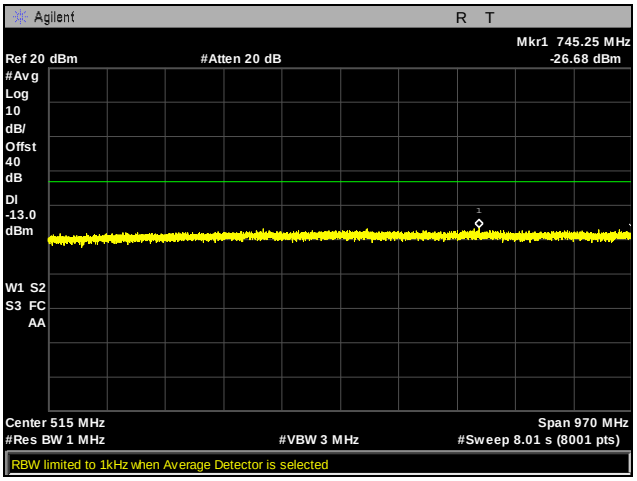



**Plot 54. Conducted Spurious Emissions, Channel 14, 14 GHz – 18 GHz, Part 24**

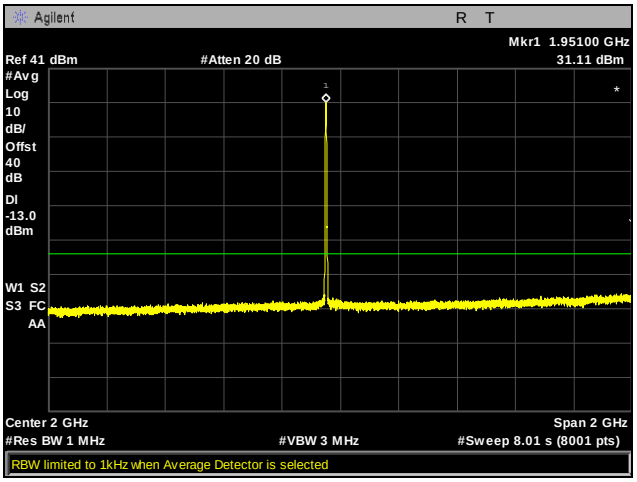
  




**Plot 55. Conducted Spurious Emissions, Channel 14, 18 GHz – 22 GHz, Part 24**

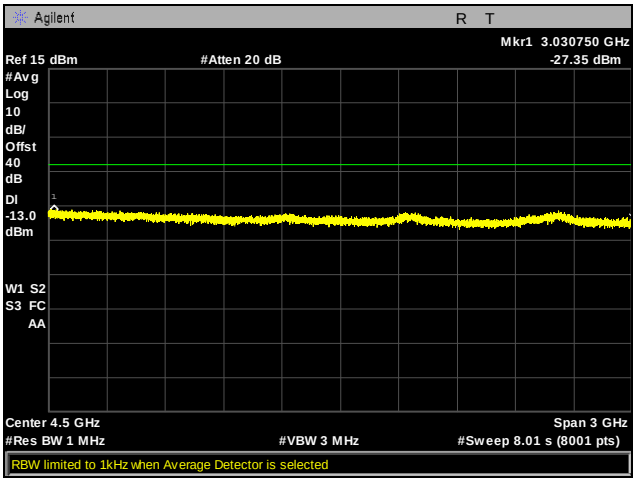



**Plot 56. Conducted Spurious Emissions, Channel 425, 30 MHz – 1 GHz, Part 24**

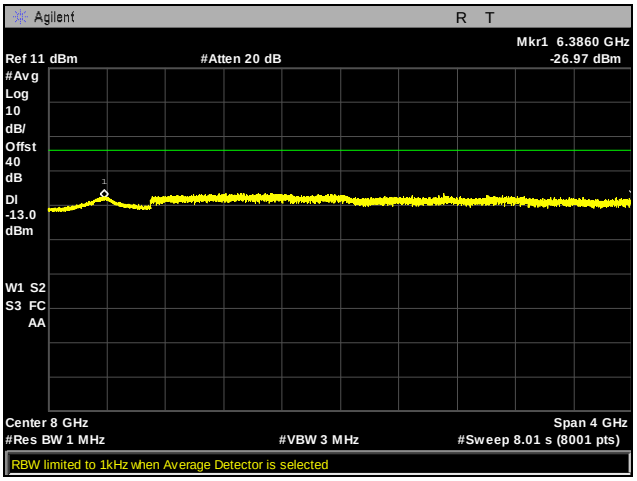



**Plot 57. Conducted Spurious Emissions, Channel 425, 1 GHz – 3 GHz, Part 24**

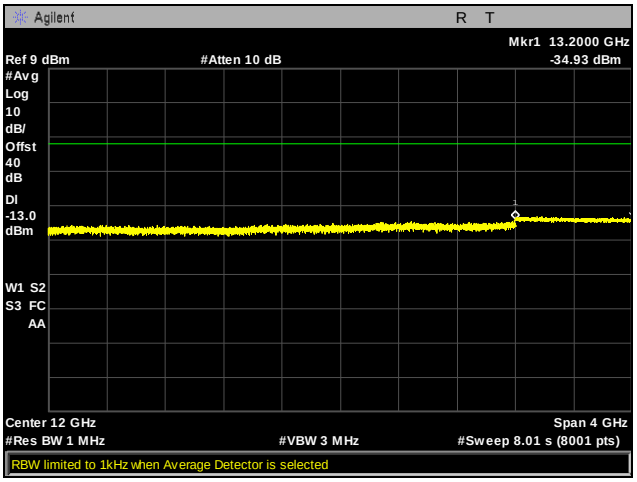
  



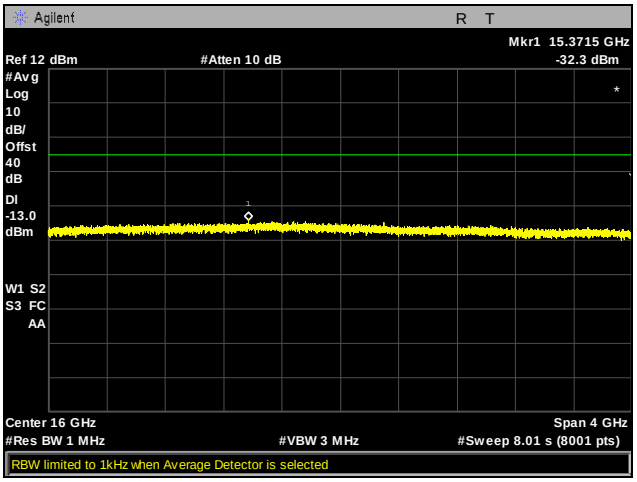

**Plot 58. Conducted Spurious Emissions, Channel 425, 3 GHz – 6 GHz, Part 24**



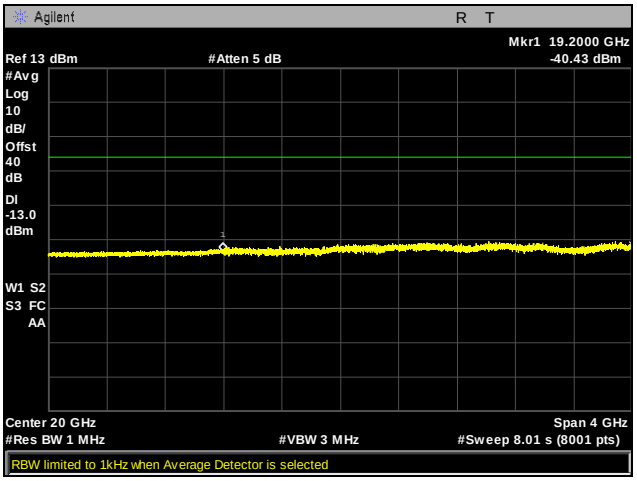

**Plot 59. Conducted Spurious Emissions, Channel 425, 6 GHz – 10 GHz, Part 24**



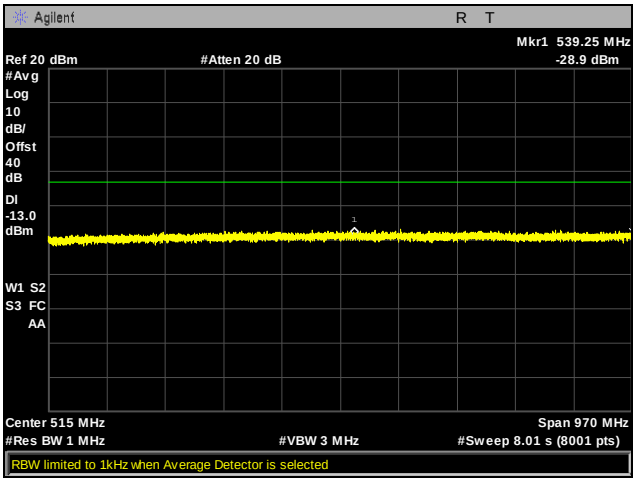

**Plot 60. Conducted Spurious Emissions, Channel 425, 10 GHz – 14 GHz, Part 24**




**Plot 61. Conducted Spurious Emissions, Channel 425, 14 GHz – 18 GHz, Part 24**

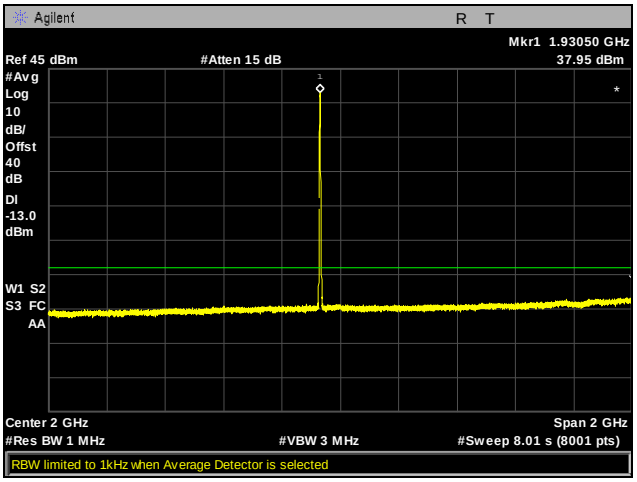



**Plot 62. Conducted Spurious Emissions, Channel 425, 18 GHz – 22 GHz, Part 24**

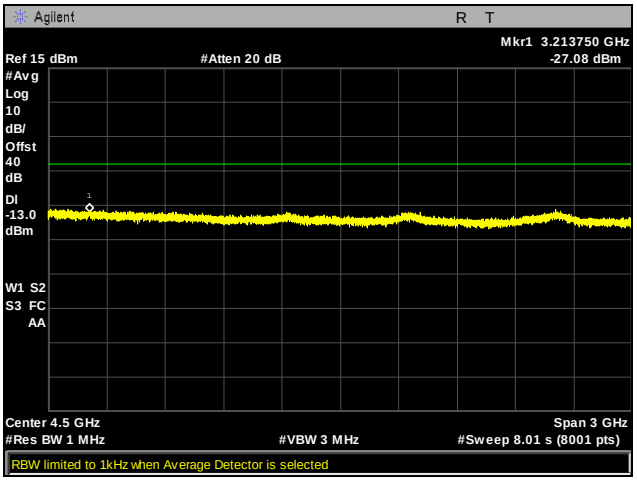



**Plot 63. Conducted Spurious Emissions, Channel 1186, 30 MHz – 1 GHz, Part 24**

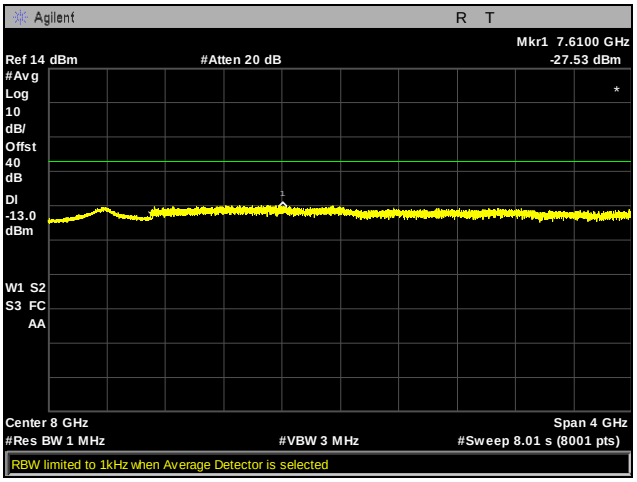
  



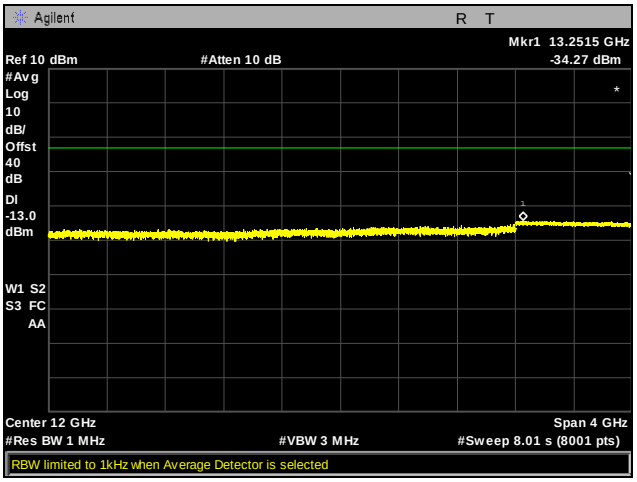

**Plot 64. Conducted Spurious Emissions, Channel 1186, 1 GHz – 3 GHz, Part 24**



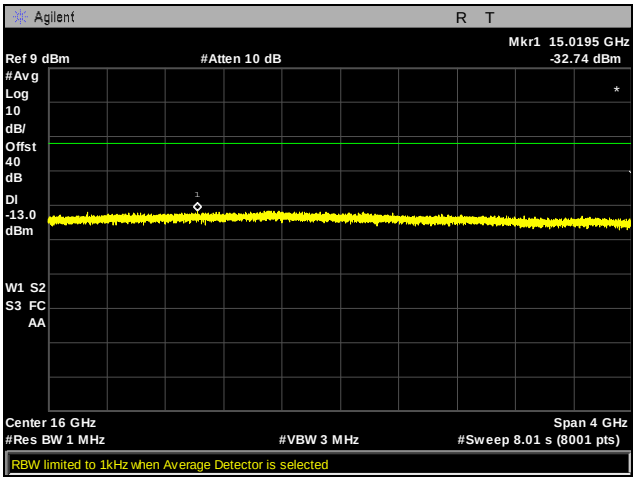

**Plot 65. Conducted Spurious Emissions, Channel 1186, 3 GHz – 6 GHz, Part 24**



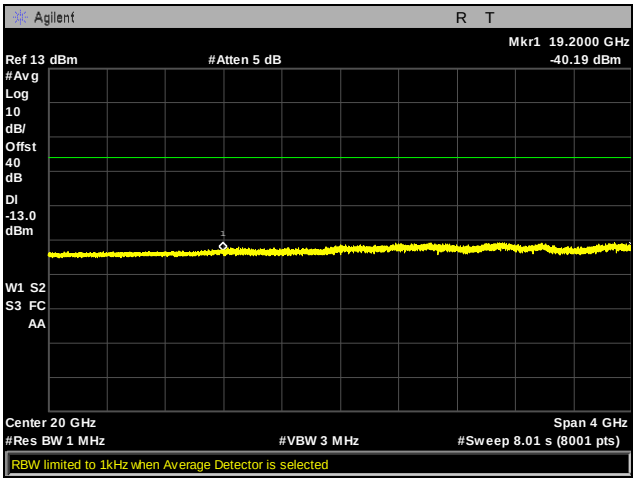

**Plot 66. Conducted Spurious Emissions, Channel 1186, 6 GHz – 10 GHz, Part 24**




**Plot 67. Conducted Spurious Emissions, Channel 1186, 10 GHz – 14 GHz, Part 24**

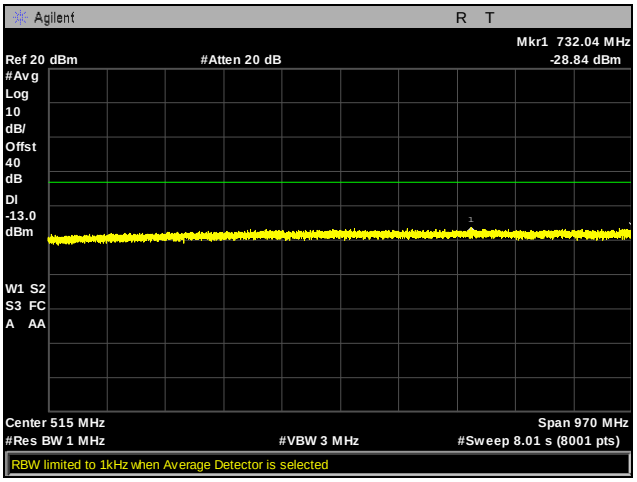



**Plot 68. Conducted Spurious Emissions, Channel 1186, 14 GHz – 18 GHz, Part 24**

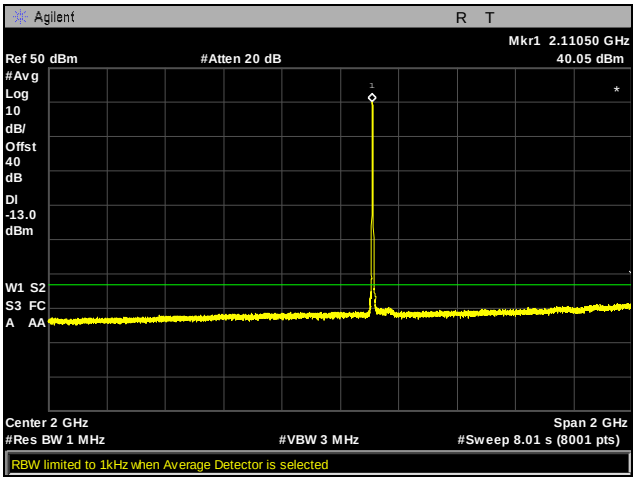



**Plot 69. Conducted Spurious Emissions, Channel 1186, 18 GHz – 22 GHz, Part 24**

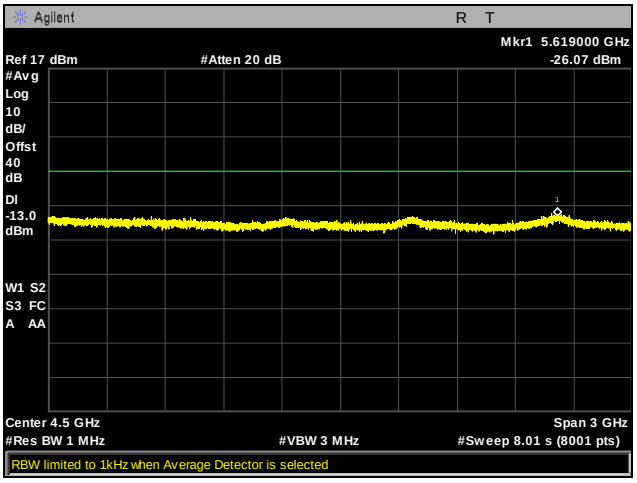
## Part 27



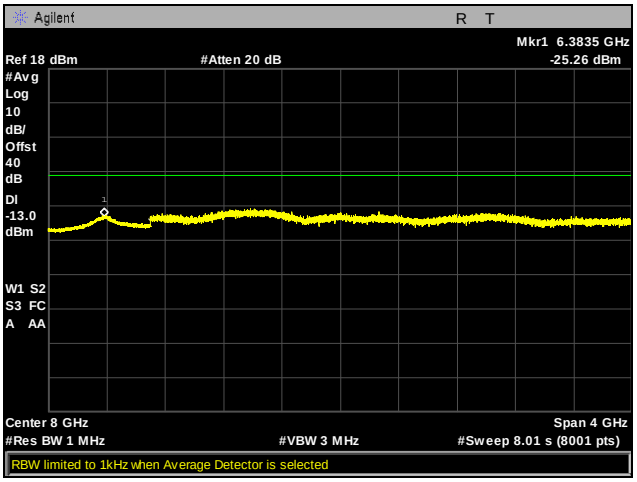

**Plot 70. Conducted Spurious Emissions, Channel 14, 30 MHz – 1 GHz, Part 27**



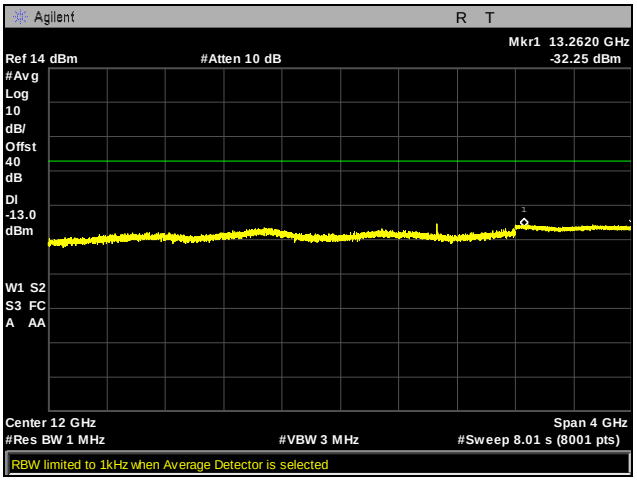

**Plot 71. Conducted Spurious Emissions, Channel 14, 1 GHz – 3 GHz, Part 27**



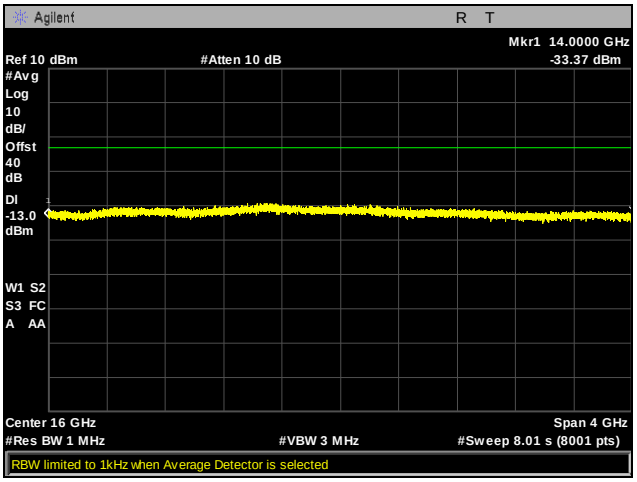

**Plot 72. Conducted Spurious Emissions, Channel 14, 3 GHz – 6 GHz, Part 27**




**Plot 73. Conducted Spurious Emissions, Channel 14, 6 GHz – 10 GHz, Part 27**

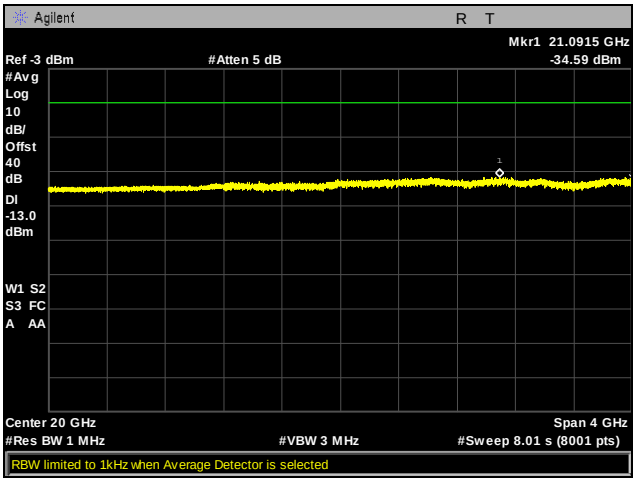



**Plot 74. Conducted Spurious Emissions, Channel 14, 10 GHz – 14 GHz, Part 27**

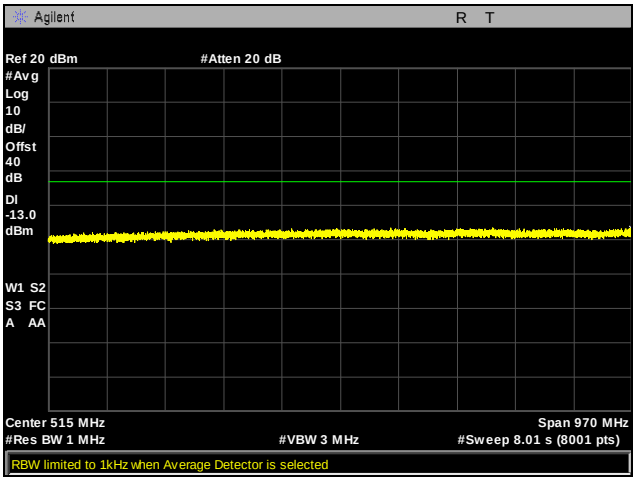



**Plot 75. Conducted Spurious Emissions, Channel 14, 14 GHz – 18 GHz, Part 27**

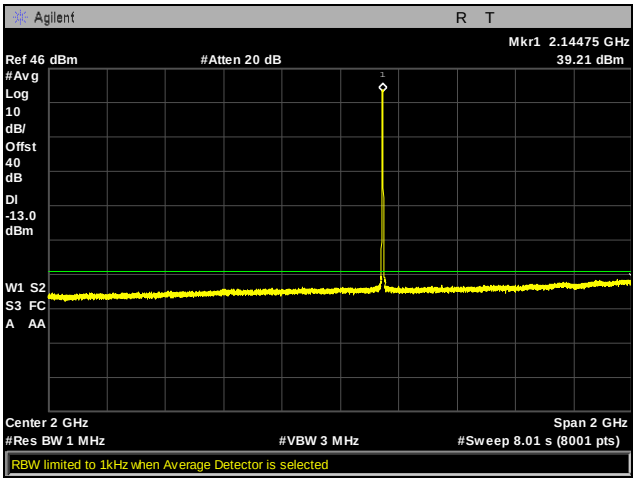
  



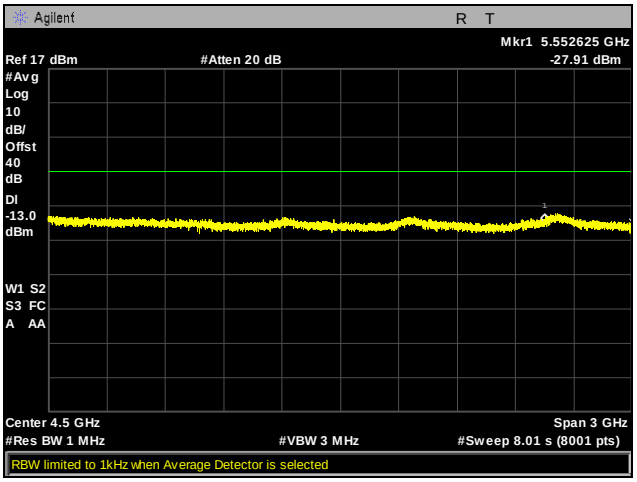

**Plot 76. Conducted Spurious Emissions, Channel 14, 18 GHz – 22 GHz, Part 27**



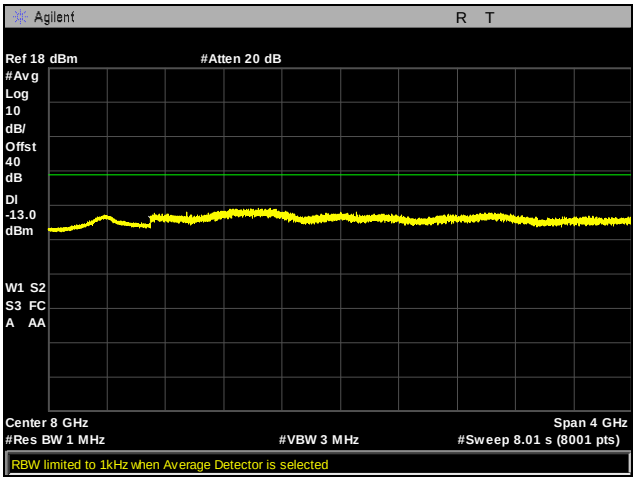

**Plot 77. Conducted Spurious Emissions, Channel 700, 30 MHz – 1 GHz, Part 27**



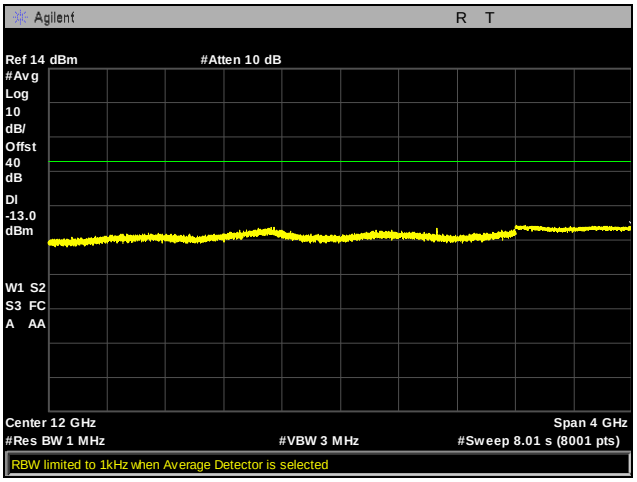

**Plot 78. Conducted Spurious Emissions, Channel 700, 1 GHz – 3 GHz, Part 27**




**Plot 79. Conducted Spurious Emissions, Channel 700, 3 GHz – 6 GHz, Part 27**

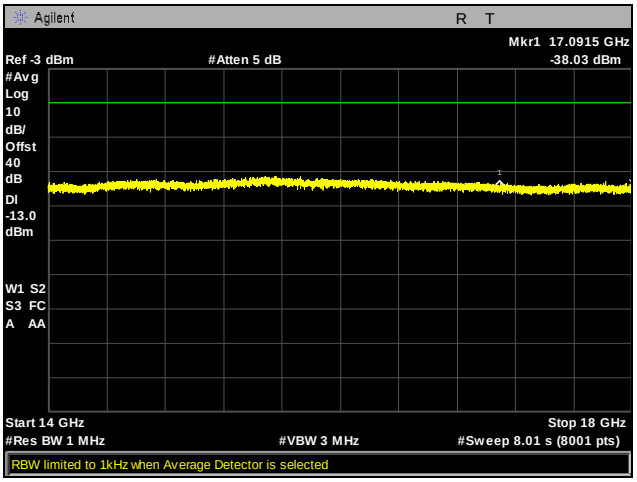



**Plot 80. Conducted Spurious Emissions, Channel 700, 6 GHz – 10 GHz, Part 27**

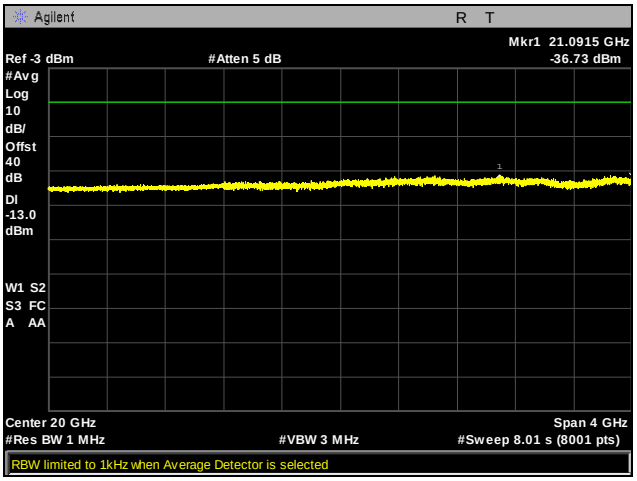



**Plot 81. Conducted Spurious Emissions, Channel 700, 10 GHz – 14 GHz, Part 27**

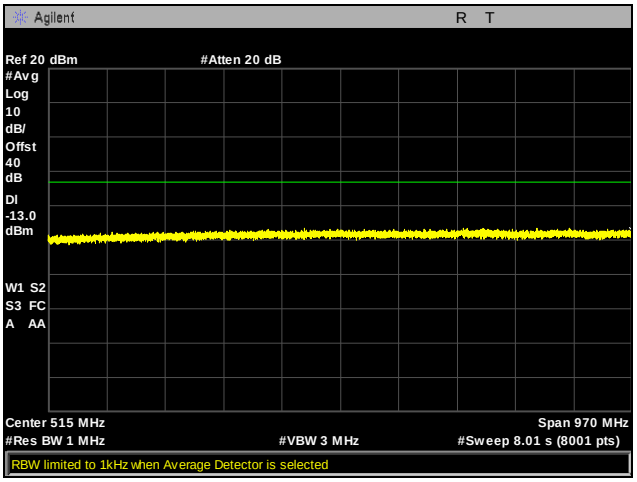
  




**Plot 82. Conducted Spurious Emissions, Channel 700, 14 GHz – 18 GHz, Part 27**

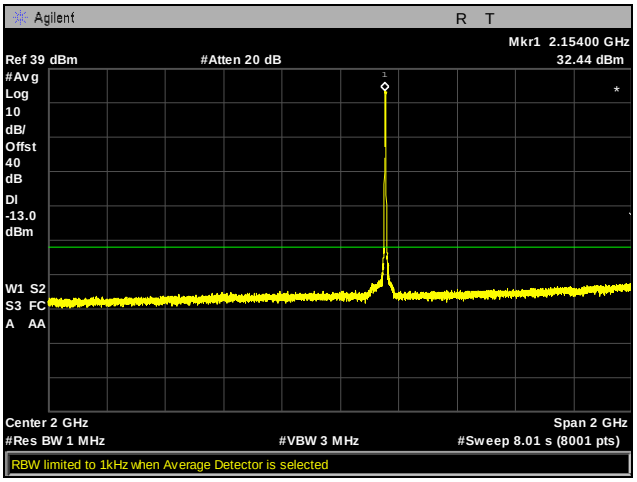



**Plot 83. Conducted Spurious Emissions, Channel 700, 18 GHz – 22 GHz, Part 27**

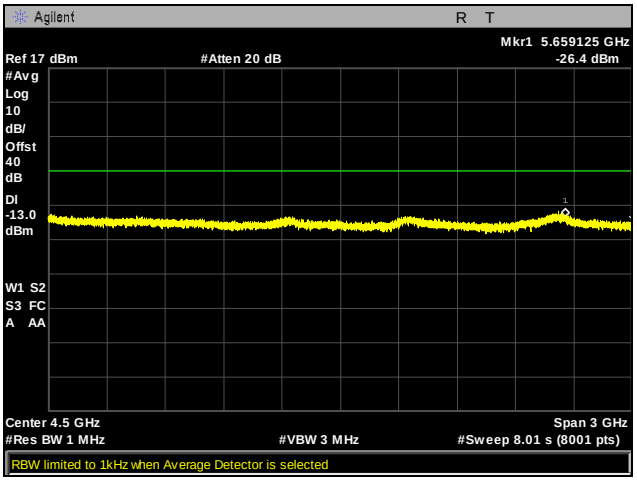



**Plot 84. Conducted Spurious Emissions, Channel 886, 30 MHz – 1 GHz, Part 27**

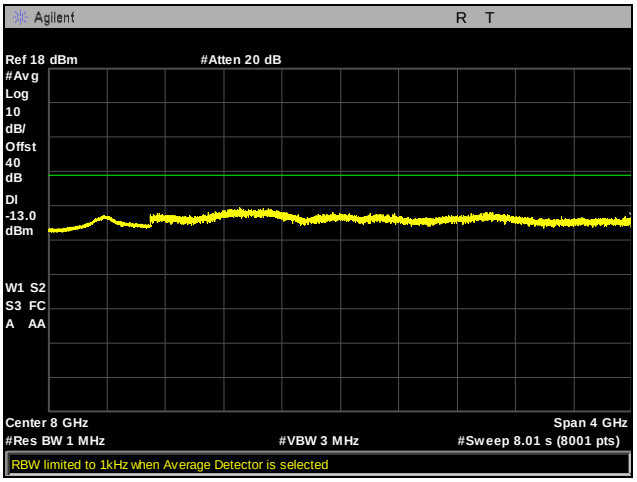
  




**Plot 85. Conducted Spurious Emissions, Channel 886, 1 GHz – 3 GHz, Part 27**

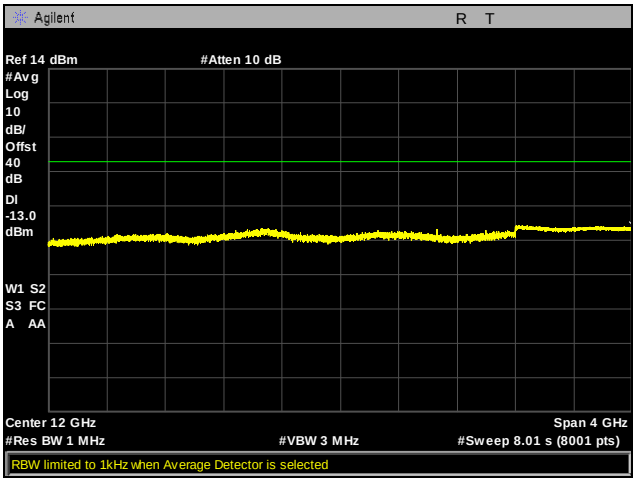



**Plot 86. Conducted Spurious Emissions, Channel 886, 3 GHz – 6 GHz, Part 27**

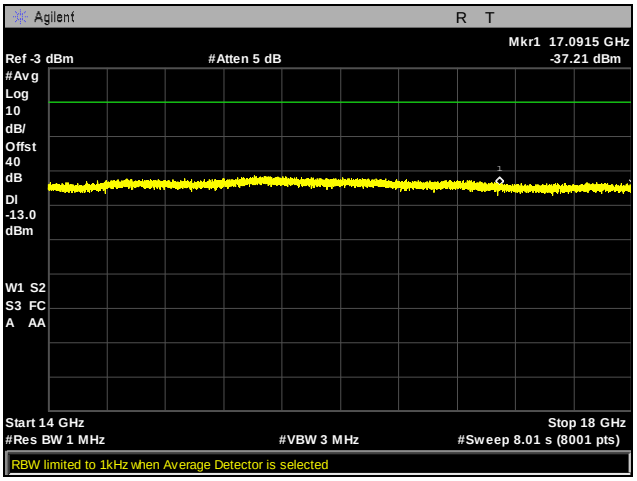



**Plot 87. Conducted Spurious Emissions, Channel 886, 6 GHz – 10 GHz, Part 27**

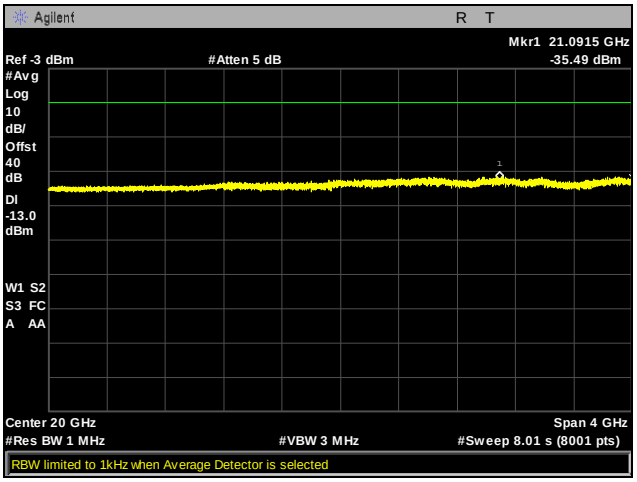
  




**Plot 88. Conducted Spurious Emissions, Channel 886, 10 GHz – 14 GHz, Part 27**



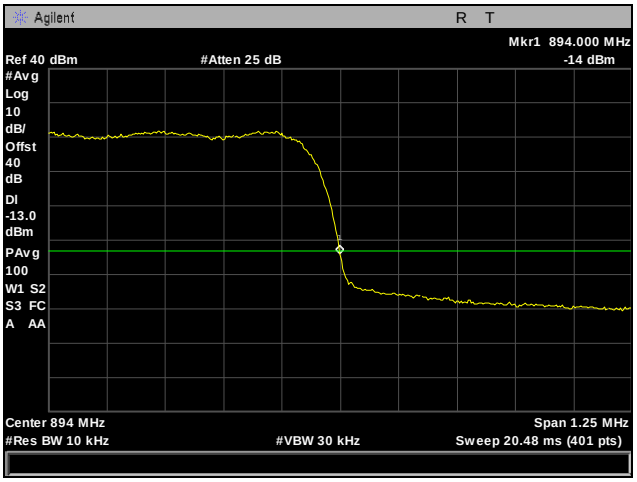

**Plot 89. Conducted Spurious Emissions, Channel 886, 14 GHz – 18 GHz, Part 27**



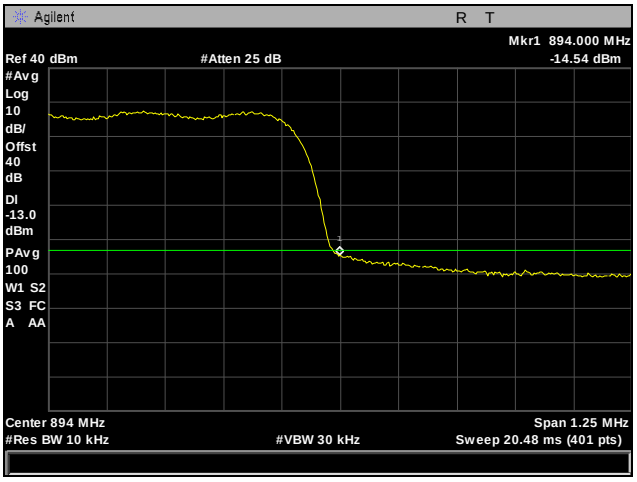

**Plot 90. Conducted Spurious Emissions, Channel 886, 18 GHz – 22 GHz, Part 27**

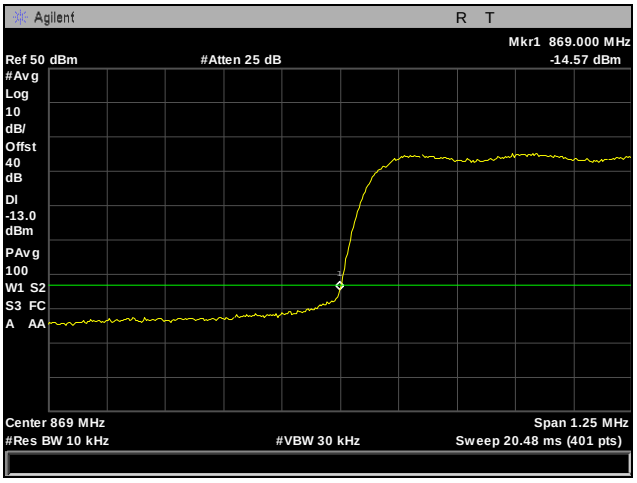
## Band Edge, Part 22



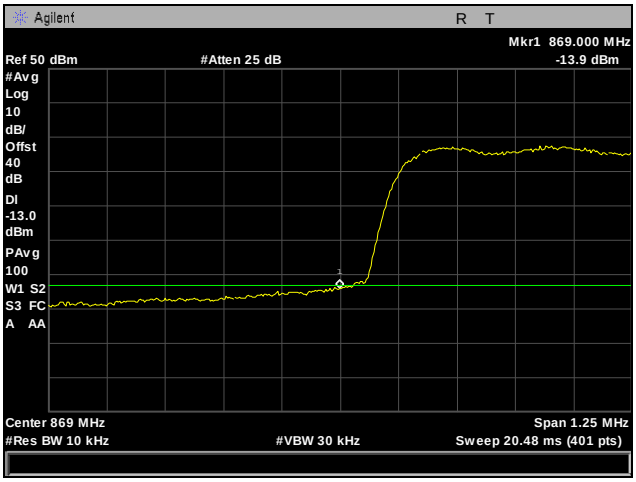

**Plot 91. Conducted Band Edge, Channel 777, Part 22**




**Plot 92. Conducted Band Edge, Channel 776 (Full Power), Part 22**

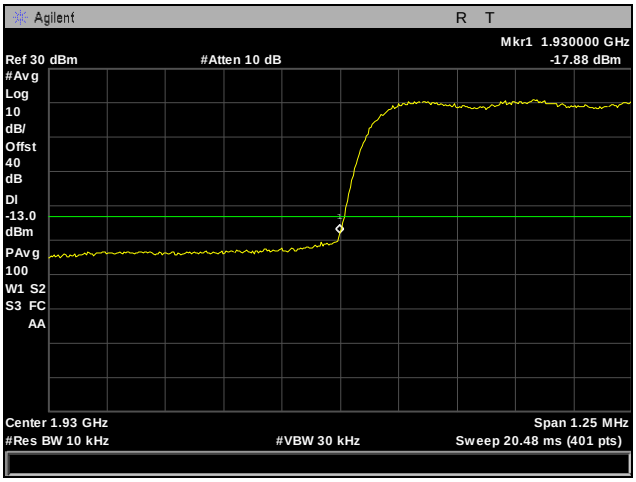



**Plot 93. Conducted Band Edge, Channel 1013, Part 22**

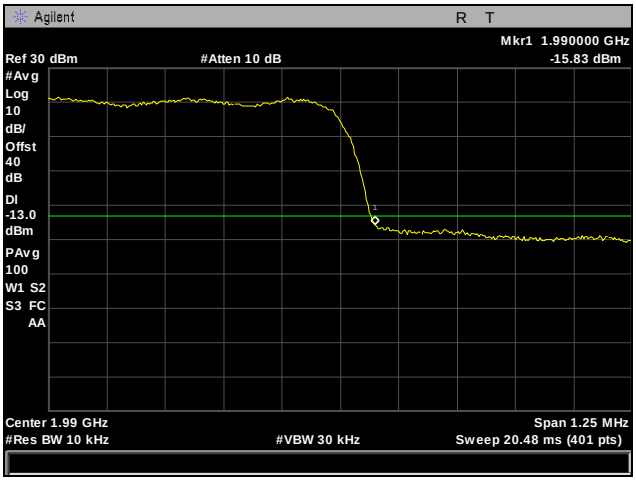



**Plot 94. Conducted Band Edge, Channel 1015 (Full Power), Part 22**

## Band Edge, Part 24

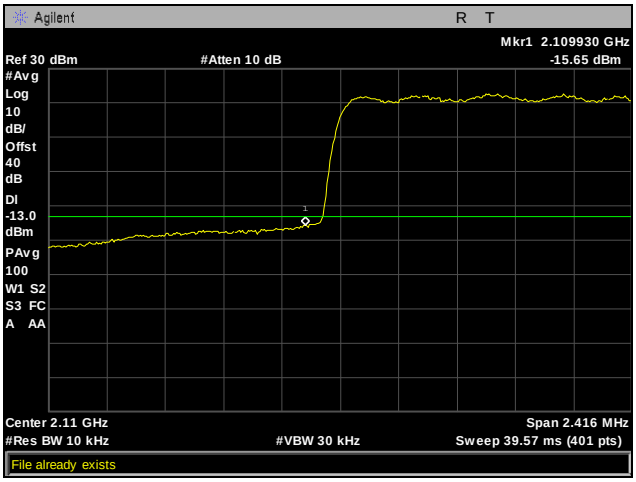



**Plot 95. Conducted Band Edge, Channel 14, Part 24**

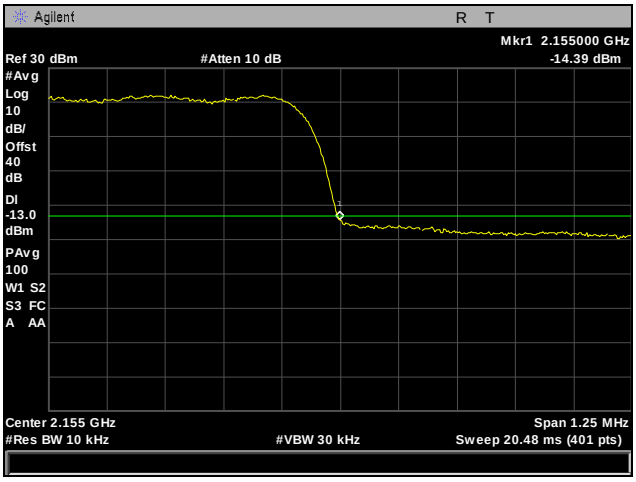



**Plot 96. Conducted Band Edge, Channel 1186, Part 24**

# Band Edge, Part 27




**Plot 97. Conducted Band Edge, Channel 14, Part 27**




**Plot 98. Conducted Band Edge, Channel 886, Part 27**

## Electromagnetic Compatibility Criteria for Intentional Radiators

## § 24.232(d) Peak to Average Ratio

**Test Requirement(s):** **§ 24.232(d)** Power measurements for transmissions by stations authorized under this section may be made either in accordance with a Commission-approved average power technique or in compliance with paragraph (e) of this section. In both instances, equipment employed must be authorized in accordance with the provisions of §24.51. In measuring transmissions in this band using an average power technique, the peak-to-average ration (PAR) of the transmission may not exceed 13 dB.

**Test Procedures:**

**Test Results:** Equipment complies with these requirements.

**Test Engineer(s):** Djed Mouada

**Test Date(s):** 03/23/16

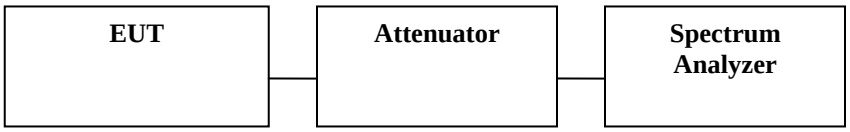
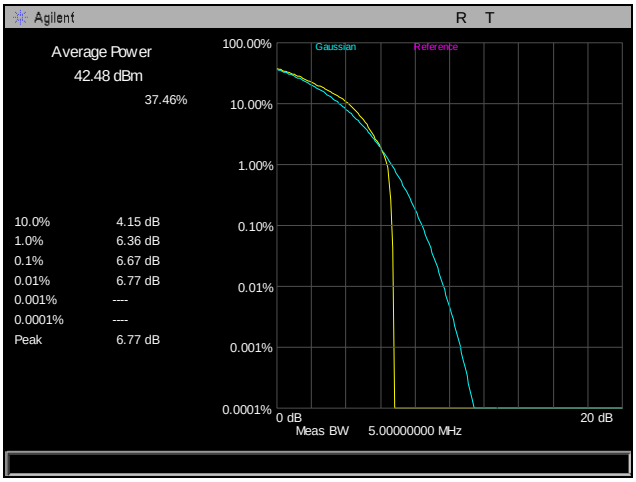
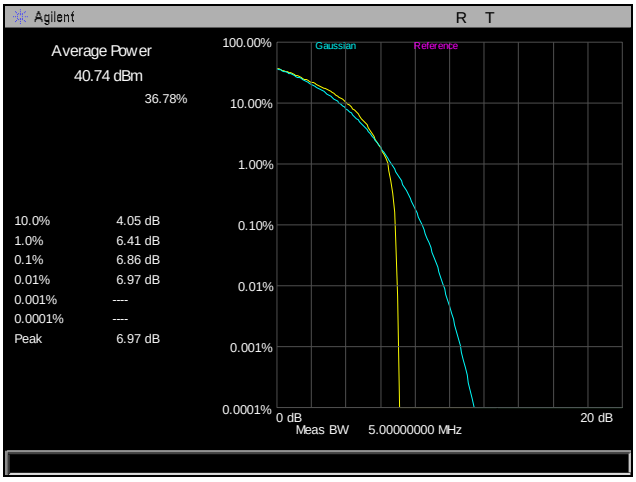



**Figure 4. Spurious Emissions at Antenna Terminals Test Setup**

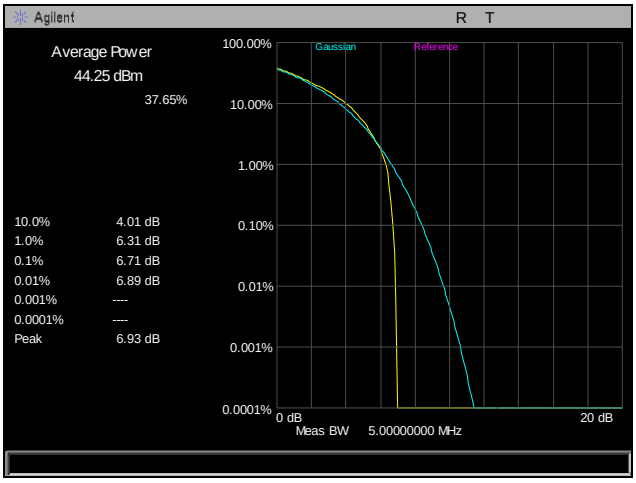
## Part 22




**Plot 99. Peak to Average Ratio, Channel 356, Part 22**

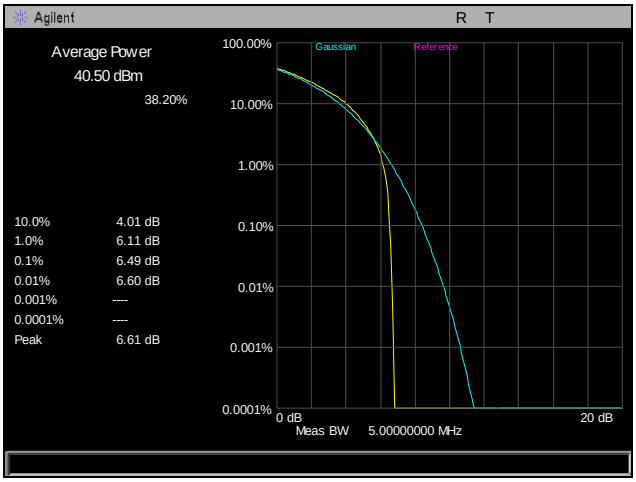



**Plot 100. Peak to Average Ratio, Channel 777, Part 22**

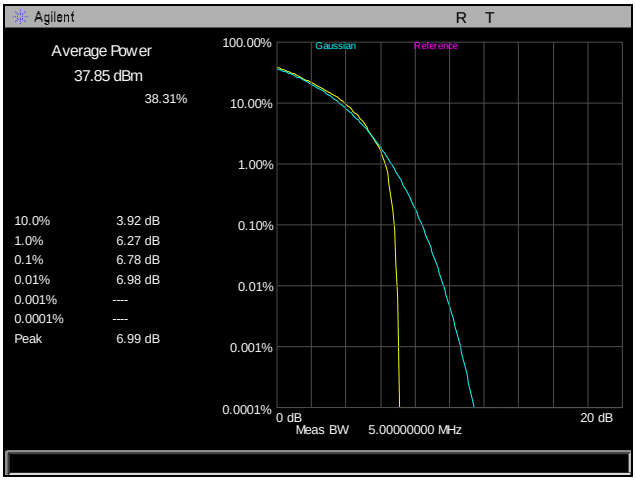



**Plot 101. Peak to Average Ratio, Channel 1013, Part 22**

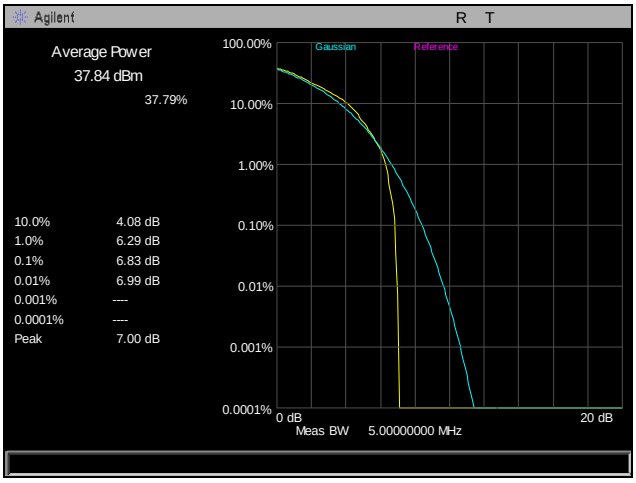
## Part 24




**Plot 102. Peak to Average Ratio, Channel 14, Part 24**

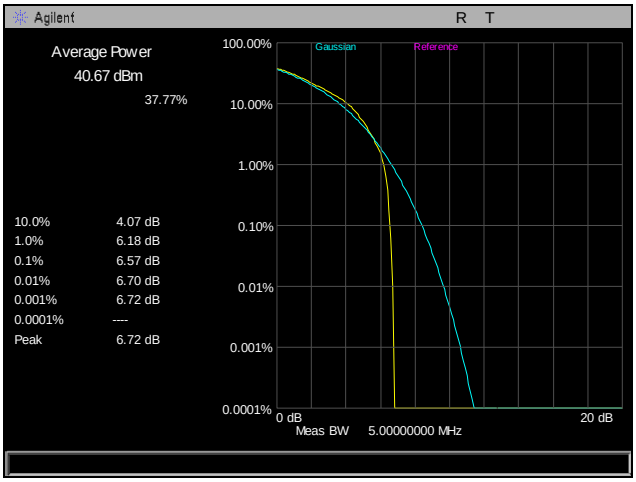



**Plot 103. Peak to Average Ratio, Channel 425, Part 24**

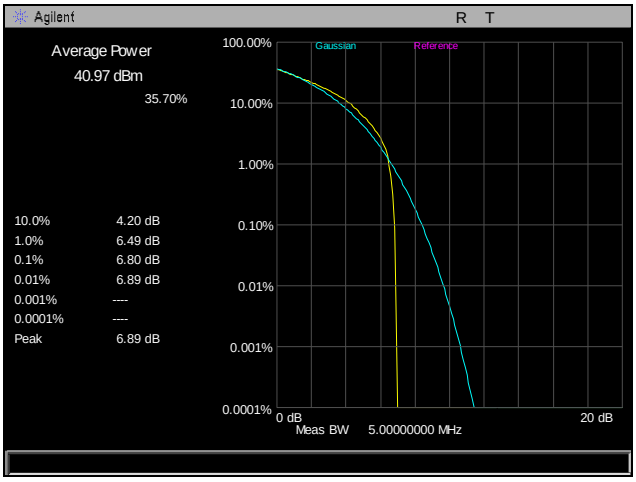



**Plot 104. Peak to Average Ratio, Channel 1186, Part 24**

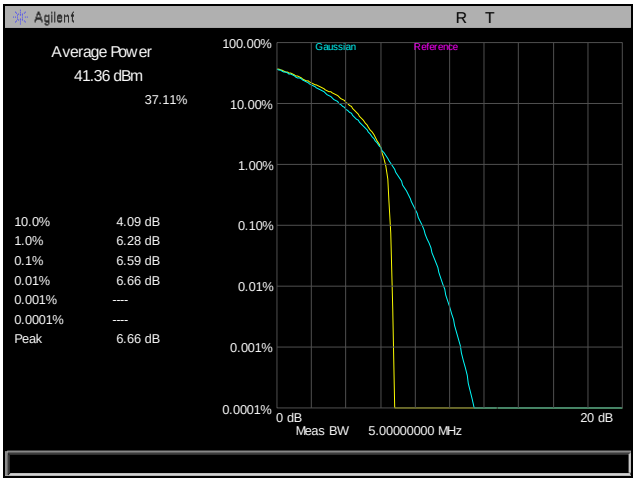
## Part 27




**Plot 105. Peak to Average Ratio, Channel 14, Part 27**




**Plot 106. Peak to Average Ratio, Channel 700, Part 27**




**Plot 107. Peak to Average Ratio, Channel 886, Part 27**

| Channel | PAR | Limit |
|---|---|---|
| **Low (880.7MHz)** | 6.67 | 13 |
| **Mid(869.7MHz)** | 6.86 | 13 |
| **High(893.3MHz)** | 6.71 | 13 |
| **Low(1931MHz)** | 6.49 | 13 |
| **Mid(1951MHz)** | 6.78 | 13 |
| **High (1989MHz)** | 6.83 | 13 |
| **Low(2111MHz)** | 6.57 | 13 |
| **Mid(2145MHz)** | 6.80 | 13 |
| **High(2154MHz)** | 6.59 | 13 |

**Table 8. PAR Table**

## Electromagnetic Compatibility Criteria for Intentional Radiators

### §2.1049 Frequency Stability 2.1049

**Test Requirement(s):** §2.1049 §24.238

**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 than 10° centigrade through the range. The operating voltage is varied to +/- 15 % of the nominal voltage at normal temperature. The frequency deviations are then compared to frequency of normal operation and shall not exceed 1ppm.

Part 27 frequency stability test requires the -26 dB points of edge channels to be contained within the operating band at the same temperature and voltage conditions stated above.

**Test Results:** Equipment complies with this section.

**Test Engineer(s):** Djed Mouada

**Test Date(s):** 03/23/16

| CDMA 1900 Voltage (DC) | 14 Temperature | Calculated Frequency | Δ Hz | Δ ppm | Limit |
|---|---|---|---|---|---|
| 12 | -30 | 1930.7 | -500 | 0.259 | 1 |
| 12 | -20 | 1930.7015 | 1000 | 0.5179 | 1 |
| 12 | -10 | 1930.7003 | -200 | 0.1036 | 1 |
| 12 | 0 | 1930.702 | 1500 | 0.7769 | 1 |
| 12 | 10 | 1930.7015 | 1000 | 0.5179 | 1 |
| 12 | 20 | 1930.7005 | ---- | | 1 |
| 12 | 30 | 1930.701 | 500 | 0.259 | 1 |
| 12 | 40 | 1930.7 | -500 | 0.259 | 1 |
| 12 | 50 | 1930.7005 | 0 | 0 | 1 |
| 10.2 | 20 | 1930.7 | -500.0000002 | 0.259 | 1 |
| 13.8 | 20 | 1930.7 | -500.0000002 | 0.259 | 1 |

**Table 9. Frequency Stability, Test Results, Part 24**

| CDMA 2100 Voltage (DC) | Temperature | High 26dB point | Band Edge | Low 26dB point | Band Edge |
|---|---|---|---|---|---|
| 12 | -30 | 2154.973 | 2155 | 2110.039 | 2110 |
| 12 | -20 | 2154.974 | 2155 | 2110.045 | 2110 |
| 12 | -10 | 2154.899 | 2155 | 2110.039 | 2110 |
| 12 | 0 | 2154.898 | 2155 | 2110.047 | 2110 |
| 12 | 10 | 2154.89 | 2155 | 2110.07 | 2110 |
| 12 | 20 | 2154.854 | 2155 | 2110.049 | 2110 |
| 12 | 30 | 2154.87 | 2155 | 2110.14 | 2110 |
| 12 | 40 | 2154.8 | 2155 | 2110.2 | 2110 |
| 12 | 50 | 2154.75 | 2155 | 2110.3 | 2110 |
| 10.2 | 20 | 2154.72 | 2155 | 2110.19 | 2110 |
| 13.8 | 20 | 2154.71 | 2155 | 2110.19 | 2110 |

**Table 10. Frequency Stability, Test Results, Part 27**

**Photograph 2. Frequency Stability, Test Setup**

## Maximum Permissible 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: EUT's operating frequency @ 893.3 MHz; **Limit for Uncontrolled exposure: 1 $mW/cm^2$ or 10 $W/m^2$**

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

$$S = PG / 4\pi R^2 \quad \text{or} \quad R = \sqrt{(PG / 4\pi S)}$$

where, S = Power Density ($mW/cm^2$)
P = Power Input to antenna (mW)
G = Antenna Gain (numeric value)
R = Distance (cm)

**Test Results**:

| 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 |
|---|---|---|---|---|---|---|---|---|---|
| 893.3 | 44.69 | 29444.216 | 9.5 | 8.913 | 1 | 1 | 0 | 144.509 | Pass |

The safe distance where Power Density is less than the MPE Limit listed above was found to be 144.509 cm.

# 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 |
|---|---|---|---|---|---|
| 1T6658 | SPECTRUM ANALYZER | AGILENT | E4407B | 12/09/2015 | 12/09/2016 |
| 1T4497 | SIGNAL GENERATOR | AGILENT TECHNOLOGIES | E4432B | 10/06/2014 | 04/06/2016 |
| 1T4483 | ANTENNA; HORN | ETS-LINDGREN | 3117 | 10/08/2015 | 04/08/2017 |
| 1T4771 | PSA SPECTRUM ANALYZER | AGILENT TECHNOLOGIES | E4446A | 11/25/2014 | 05/25/2016 |
| 1T4300B | SEMI-ANECHOIC 3M CHAMBER # 1 D (2043A-1) (IC) | EMC TEST SYSTEMS | NONE | 01/11/2015 | 01/11/2018 |
| 1T4409 | EMI RECEIVER | ROHDE & SCHWARZ | ESIB7 | 10/29/2014 | 10/29/2016 |
| 1T4751 | ANTENNA - BILOG | SUNOL SCIENCES | JB6 | 2/26/2016 | 8/26/2017 |
| 331T4442 | PRE-AMPLIFIER, MICROWAVE | MITEQ | AFS42-01001800-30-10P | SEE NOTE | |
| 1T4859 | DIGITAL BAROMETER, HYGROMETER, THERMOMETER | CONTROL COMPANY | 15-078-198, FB70423, 245CD | 2/10/2016 | 2/10/2018 |
| 2T5280 | TEMPERATURE CHAMBER | THERMOTRON | F270-CH(V) 30-30/ECA | 1/8/2016 | 1/8/2017 |

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

# End of Report