



BEC INCORPORATED

CERTIFICATION APPLICATION TEST REPORT


**TEST STANDARDS:
FCC Part 15 Subpart C Intentional Radiator**

ARRIS Model IP810 Set Top Box

REPORT BEC-1585-01

TEST DATES: 12/15/2014 – 01/14/2015

**CUSTOMER:
ARRIS Group Incorporated
101 Tournament Drive
Horsham, PA 19044**

PREPARED BY: 
Steve Fanella, Test Engineer

REVIEWED and APPROVED BY: 
Al Fanella, Test Director

The results described in this report relate only to the item(s) tested. This document shall not be reproduced except in full without prior written permission of BEC Incorporated





TABLE OF CONTENTS

| | |
|---|-----------|
| Notice To Customer | 4 |
| Revision History | 4 |
| 1.0 Administrative Information | 5 |
| 1.1 Project Details | 5 |
| 1.2 Preface | 6 |
| 1.3 Test Result Summary Table | 6 |
| 1.4 Measurement Uncertainty | 7 |
| 1.5 Condition of Received Sample | 7 |
| 1.6 Test Equipment | 7 |
| 2.0 Equipment Under Test | 8 |
| 2.1 EUT Description | 8 |
| 2.2 Receiver Classification | 8 |
| 2.3 Product Category | 8 |
| 2.4 Product Classification | 8 |
| 2.5 Test Configuration | 8 |
| 2.6 Test Configuration Rationale | 8 |
| 2.7 Test Configuration Diagram (Conducted Measurements) | 9 |
| 2.8 Test Configuration Diagram (Radiated Measurements) | 10 |
| 2.9 EUT Information, Interconnection Cabling and Support Equipment | 11 |
| 2.10 Test Signals and Test Modulation | 12 |
| 2.11 Grounding | 12 |
| 2.12 EUT Modifications | 12 |
| 2.13 EUT Pictures | 13 |
| 3.0 Applicable Requirements, Methods, and Procedures | 22 |
| 3.1 Applicable Requirements | 22 |
| 3.1.1 FCC Requirements | 22 |
| 3.1.2 Basic Test Methods and Test Procedures | 23 |
| 3.2 Deviations or Exclusions from the Requirements | 23 |
| 4.0 Test Results | 24 |
| 4.1 Conducted Emissions Power Leads, 150 kHz to 30 MHz. FCC Section 15.207(b) | 24 |
| 4.1.1 Conducted Emissions Test Procedure | 24 |
| 4.1.2 Conducted Emissions Test Results Delta Model ADP-18DRA Power Supply (01/14/2015) | 25 |
| 4.1.3 Conducted Emissions Test Results LITEON Model PA-1180-2AR1 Power Supply (01/14/2015) | 27 |
| 4.2 Spurious Radiated Emissions, 1 GHz to 25 GHz. FCC Section 15.209 | 29 |
| 4.2.1 Test Facility | 29 |
| 4.2.2 Spurious Radiated Emissions Test Procedure | 30 |
| 4.2.3 Spurious Radiated Emissions 1GHz to 25 GHz Test Results (12/18/2014) | 31 |
| 4.3 6 dB Occupied Bandwidth. FCC Section 15.247(a)(2) | 34 |
| 4.3.1 6 dB Occupied Bandwidth – Test Procedure | 34 |
| 4.3.2 6 dB Occupied Bandwidth Analyzer Display Captures Antenna 0 | 34 |
| 4.3.3 6 dB Occupied Bandwidth Analyzer Display Captures Antenna 1 | 37 |



| | | |
|------------------------------------|--|-----------|
| 4.3.4 | 6 dB Occupied Bandwidth Test Results (12/15/2014) | 40 |
| 4.4 | Maximum Peak Power Output FCC Section 15.247(b)(3) | 41 |
| 4.4.1 | Maximum Peak Power Output Test Procedure | 41 |
| 4.4.2 | Maximum Peak Power Output Analyzer Display Captures Antenna 0 | 41 |
| 4.4.3 | Maximum Peak Power Output Analyzer Display Captures Antenna 1 | 44 |
| 4.4.4 | Maximum Peak Power Output Test Results (12/15/2014) | 47 |
| 4.5 | Antenna Conducted Spurious Emissions FCC Section 15.247(d) | 48 |
| 4.5.1 | Antenna Conducted Spurious Emissions Test Procedure | 48 |
| 4.5.2 | Antenna Conducted Spurious Emissions Test Results (12/15/2014) | 48 |
| 4.6 | Power Spectral Density FCC Section 15.247(e) | 50 |
| 4.6.1 | Power Spectral Density Test Procedure | 50 |
| 4.6.2 | Power Spectral Density Analyzer Display Captures Antenna 0 | 50 |
| 4.6.3 | Power Spectral Density Analyzer Display Captures Antenna 1 | 53 |
| 4.6.4 | Power Spectral Density Test Results (12/15/2014) | 56 |
| 4.7 | Band Edge Measurement FCC Section 15.247(d) | 57 |
| 4.7.1 | Band Edge Measurement Test Procedure | 57 |
| 4.7.2 | Band Edge Measurement Analyzer Display Captures Antenna 0 | 58 |
| 4.7.3 | Band Edge Measurement Analyzer Display Captures Antenna 1 | 61 |
| 4.7.4 | Band Edge Measurement Test Data Results (01/06/2015) | 64 |
| 5.0 | Test Setup Pictures | 65 |
| 5.1 | Conducted Emissions Power Line Test Setup Picture | 65 |
| 5.2 | Conducted Emissions Antenna Test Setup Picture | 65 |
| 5.3 | Harmonic Radiated Emissions Test Setup Picture | 66 |
| Appendix A – Test Equipment | | 67 |



Notice To Customer

This report and any recommendations it contains represent the result of BEC's testing and assessment on behalf of your company. Testing has been conducted according to accepted engineering standards and practices. This report reflects testing and assessment of product samples provided by your company and may not reflect the characteristics of other samples, especially those produced at different times. Therefore this report and its findings and recommendations, if implemented, should not be construed as an assurance or implied warranty for the continuing electromagnetic compatibility (EMC) of the product. **BEC shall not be liable for incidental or consequential damages, even if advised of the possibility thereof.**

BEC will not disseminate this report to other parties without your express permission. You may reproduce this report in its entirety including this notice and the entireties of any supplemental test reports on the same product (e.g. reports on additional testing following modification). However 'you may not reproduce portions of the report (except for the entirety of the summary section) or quote from it for any purpose without specific prior written permission from BEC'.

Revision History

| Revision # | Description of Changes | Date of Changes | Date Released |
|------------|---|-----------------|---------------|
| 0 | Test Report Initial Release | N/A | 01/22/2015 |
| 1 | Added Details for Duty Cycle Correction Factor into section 4.2.2 | 03/30/2015 | 03/30/2015 |



1.0 Administrative Information

1.1 Project Details

| | |
|----------------------------------|---|
| Project Number | BEC-1585 |
| Set Top Box Manufacturer | ARRIS Group Incorporated |
| Set Top Box Model Number | IP810 |
| Set Top Box Serial Number | M11417THK354 |
| Set Top Box Sample Number | 1585-01 (Modified With SMA Ports to the Antennas) |
| Set Top Box Serial Number | M11444THC006 |
| Set Top Box Sample Number | 1585-02 (Unmodified Antennas) |
| FCC ID | ACQ-IP810 |
| Frequency of Operation | 2400 - 2483.5 MHz |
| Test Laboratory Location | BEC Incorporated 970 East High Street Pottstown, PA 19464 |
| Test Performed For | ARRIS Group Incorporated 101 Tournament Drive Horsham, PA 19044 |
| Test Personnel | Paul Banker / Steve Fanella |
| Technical Contact | Mike Welty |
| Date Received | 12/01/2014 |
| Condition Received | Suitable for test |
| Sample Type | Production unit |
| EUT Classification | Unlicensed Unintentional Radiator |
| FCC Classification | DTS- Part 15 Digital Transmission System |
| Applicable FCC Rule Part | FCC Rules Part 15.247: Operation within the bands 920-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz Direct Sequence System |



1.2 Preface

This report documents product testing conducted to verify compliance of the specified EUT with applicable standards and requirements as identified herein. EUT, test instrument configurations, test procedures, and recorded data are generally described in this report. The reader is referred to the applicable test standards for detailed procedures. The following table summarizes the test results obtained during this evaluation.

1.3 Test Result Summary Table

The ARRIS Model IP810 Set Top Box was tested and found to be compliant to the sections of the FCC Part 15 Subpart C standard listed below:

| FCC Part 15, Subpart C Intentional Radiators | Test Description | Result |
|---|--|---------------|
| 15.207(b) | Conducted Emissions, Power Leads, 150 kHz to 30 MHz | PASS |
| 15.209(a) | Spurious Radiated Emissions, 30 MHz to 1 GHz | PASS |
| 15.209, 15.205 | Spurious Radiated Emissions, 1 GHz to 25 GHz | PASS |
| 15.247(a)(2) | 6 dB Occupied Bandwidth | PASS |
| 15.247(b)(3) | Maximum Peak Power Output | PASS |
| 15.247(d) | Antenna Port, Conducted Spurious Emissions | PASS |
| 15.247(e) | Antenna Port, Power Spectral Density | PASS |
| 15.247(d) | Band Edge Measurement | PASS |



1.4 Measurement Uncertainty

| Measurement | Measurement Distance | Frequency Range | Measurement Limit | Expanded Uncertainty |
|-----------------------|----------------------|------------------|--------------------|----------------------|
| Conducted Disturbance | N/A | 150 kHz – 30 MHz | FCC Section 15.207 | 3.58 |
| Radiated Disturbance | 3 m | 30 MHz – 1 GHz | FCC Section 15.209 | 4.02 |

No adjustments to measured data presented in this report are required because all values of uncertainty are less than the CISPR 16-4-2:2003 recommendations. These uncertainties have a coverage factor of $k = 2$, which yields approximately a 95% level of confidence for the near-normal distribution typical of most measurement results.

1.5 Condition of Received Sample

An evaluation of the EUT was conducted in order to verify test subject identity and condition and to ensure suitability for testing. No evidence of physical damage was noted. The test item condition was deemed acceptable for the performance of the requested test services.

1.6 Test Equipment

All test equipment is checked to manufacturer's specifications and, when applicable, have current N.I.S.T. traceable, ISO 9002 conforming certificates of calibration. Test equipment used for the tests described herein is listed in Appendix A.



2.0 Equipment Under Test

Unless otherwise noted in the individual test results sections, testing was performed on the EUT as follows.

2.1 EUT Description

The ARRIS Model IP810 is an Advanced IP Client Video Set-Top Box with the following features and interfaces:

MoCA 2.0

Ethernet

USB 2.0

HDMI output

Composite video output

Baseband audio output

Internal IR receiver and support for external IR receiver

2.2 Receiver Classification

N/A

2.3 Product Category

FCC Part 15, Subpart C (Section 15.247)

2.4 Product Classification

RF4CE Intentional Radiator Testing Requirements for IR Signal Operation within the bands of 920-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz-Direct Sequence System

2.5 Test Configuration

The antennas within the ARRIS IP810 set top box were controlled by software which allowed the test technician to select the specific antenna within the EUT, designate the specific Channel Frequency, control the antenna power and control the antenna modulation (on/off).

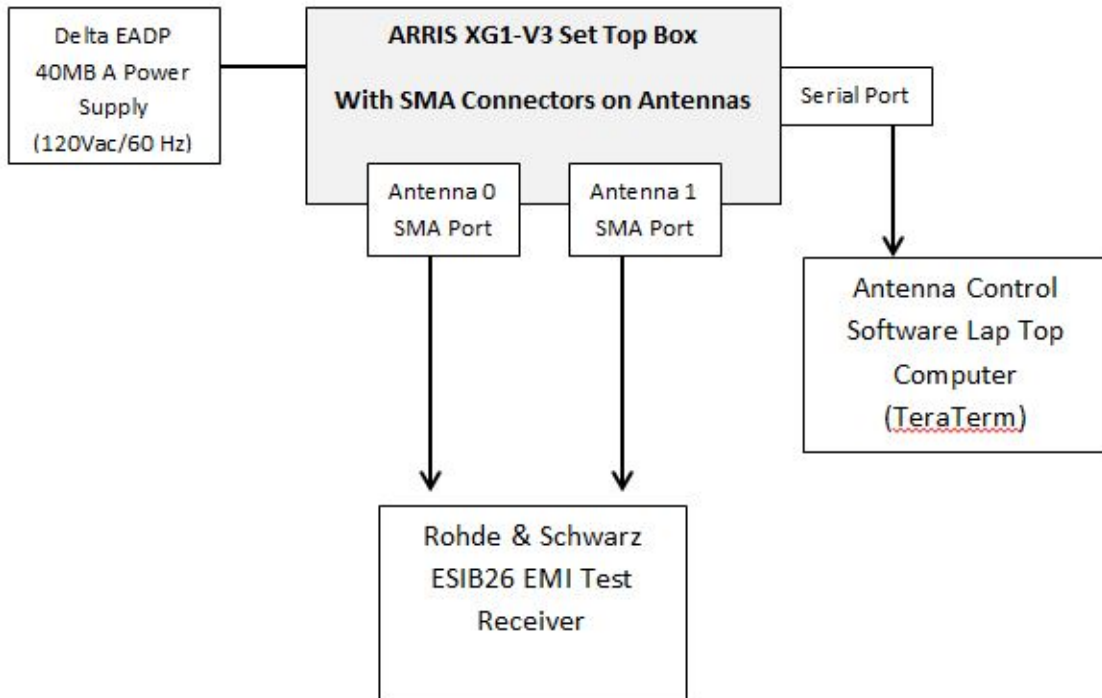
2.6 Test Configuration Rationale

The tested configuration of the EUT was required so that the test technician could view the characteristics of the antenna at specific frequencies and allow the technician to record the required measurements.



2.7 Test Configuration Diagram (Conducted Measurements)

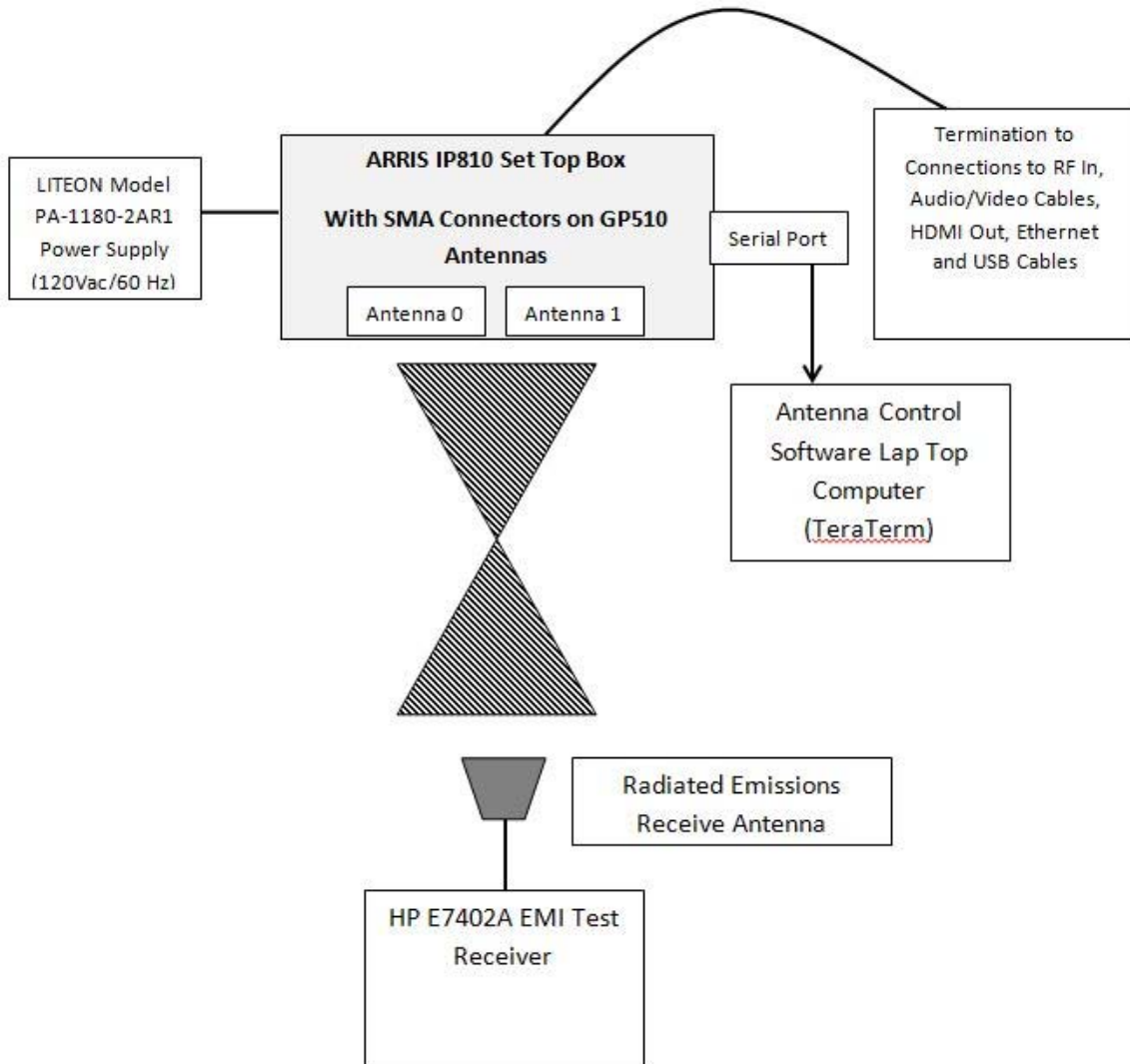
A block diagram of the EUT configuration showing interconnection cables is illustrated below. The drawing shows the physical hardware layout used for the tests along with I/O cables and AC power distribution.





2.8 Test Configuration Diagram (Radiated Measurements)

A block diagram of the EUT configuration showing interconnection cables is illustrated below. The drawing shows the physical hardware layout used for the tests along with I/O cables and AC power distribution.





2.9 EUT Information, Interconnection Cabling and Support Equipment

EUT Hardware

| Description | Manufacturer | Model | Serial Number | Sample Number |
|---|--------------|-------|---------------|---------------|
| Set Top Box (Modified Antennas with SMA Connectors) | ARRIS | IP810 | M11417THK354 | 1585-01 |
| Set Top Box (Unmodified Antennas) | ARRIS | IP810 | M11444THC006 | 1585-02 |

Interconnection Cable List (Conducted Test Setup)

| Manufacturer | Model | Type | Shielding | Length | Description |
|--------------|----------------|-------------------------------------|--------------|---------|--|
| Workhorse | WHU18-3636-036 | High Frequency RF Cable 1 to 40 GHz | Double Braid | 1 Meter | Measurement Cable from the Antenna SMA Connector to the Rohde and Schwarz ESIB26 Receiver. Asset # BEC-814 |

Interconnection Cable List (Radiated Test Setup)

| Type | Mfr/Part# | Shielding | Length | Description |
|---------------|----------------------------|--------------------------------------|--------|-------------------------|
| Audio Video | Acoustic Research/PR161 | 95% braid w/100% aluminum Mylar foil | 6 Ft | Audio & Video Out Ports |
| HDMI | Rocketfish | Braid over foil | 1.3 m | HDMI Port |
| 75-Ohm Coax | Belden-T 9114 Duobond | Double Braid | 1 m | RF In and RF Out |
| Ethernet CAT5 | Siemon Co. / MC5-8-T-07-20 | Mylar foil | 7 Ft | Ethernet Port |
| USB | Hannstar/E52534-D | Braid over foil | 2 m | USB Port |

Support Equipment

| Description | Manufacturer | Model | Serial Number |
|---|--------------|---------------|--------------------------|
| AC/DC Power Convertor for IP810 Set Top Box | LITEON | PA-1180-2AR1 | 5581240051425000106 |
| Antenna Control Software Lap Top Computer | Dell | Latitude D830 | CH-0HN338-48643-84F-0307 |



2.10 Test Signals and Test Modulation

By design this product does not have an external Modulation input connector, therefore, normal operating modulation was used for all testing reported herein. The only test where modulation was not active was during testing of the Maximum Peak Power Output FCC Section 15.247(b)(3) (Section 4.4 of this report) because the signal amplitude was higher without modulation applied when measuring.

The control unit in this product is a digital frequency transmitter. The EUT transmits to a discrete frequency on a specific channel. The RF4CE Device has 16 Channels available. The 16 Channels and frequencies that can be transmitted by the EUT are as follows:

| | | | |
|------------|-----------|------------|-----------|
| Channel 11 | 2.405 GHz | Channel 19 | 2.445 GHz |
| Channel 12 | 2.410 GHz | Channel 20 | 2.450 GHz |
| Channel 13 | 2.415 GHz | Channel 21 | 2.455 GHz |
| Channel 14 | 2.420 GHz | Channel 22 | 2.460 GHz |
| Channel 15 | 2.425 GHz | Channel 23 | 2.465 GHz |
| Channel 16 | 2.430 GHz | Channel 24 | 2.470 GHz |
| Channel 17 | 2.435 GHz | Channel 25 | 2.475 GHz |
| Channel 18 | 2.440 GHz | Channel 26 | 2.480 GHz |

For some of the required testing, the EUT was configured to transmit individually at low Channel 11 (2.405 GHz), middle Channel 19 (2.445 GHz) or high Channel 26 (2.480 GHz) during the measurement of the signal.

2.11 Grounding

During all testing presented in this report, earth grounding of the test sample was accomplished through the AC mains input power cord to the EUT and through the return of the DC line to the Controller.

2.12 EUT Modifications

No modifications were made to the ARRIS IP810 set top box.



2.13 EUT Pictures

ARRIS IP810









ARRIS IP810 SAMPLE TAG 1585-01 MODIFIED ANTENNA EUT

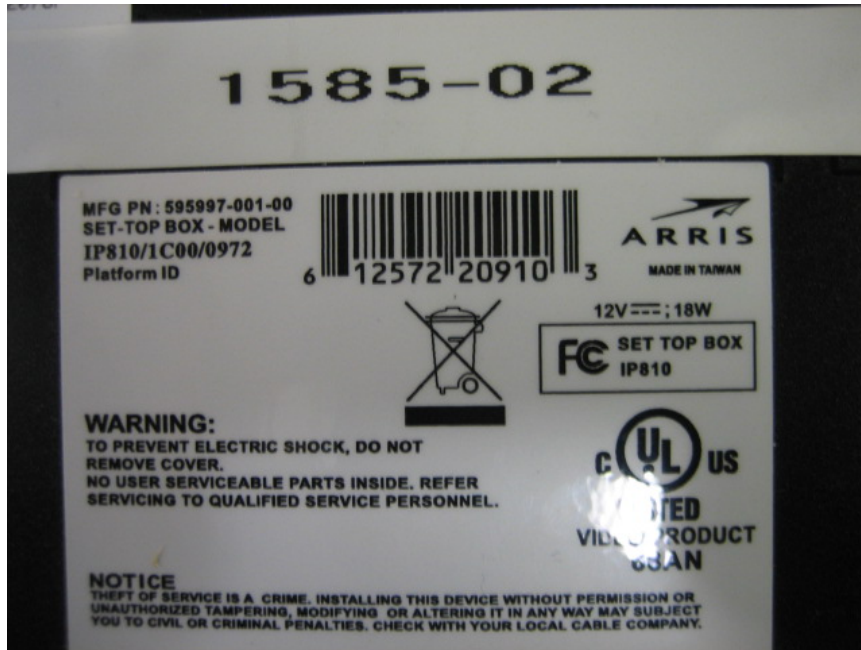


ARRIS IP810 SERIAL NUMBER MODIFIED ANTENNA EUT





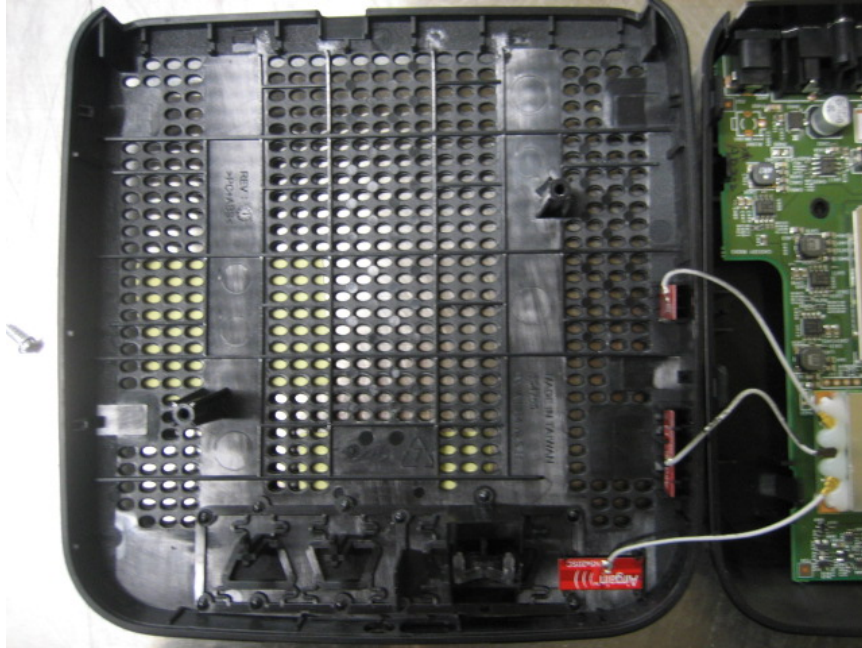
ARRIS IP810 SAMPLE TAG 1585-02 UNMODIFIED ANTENNA EUT



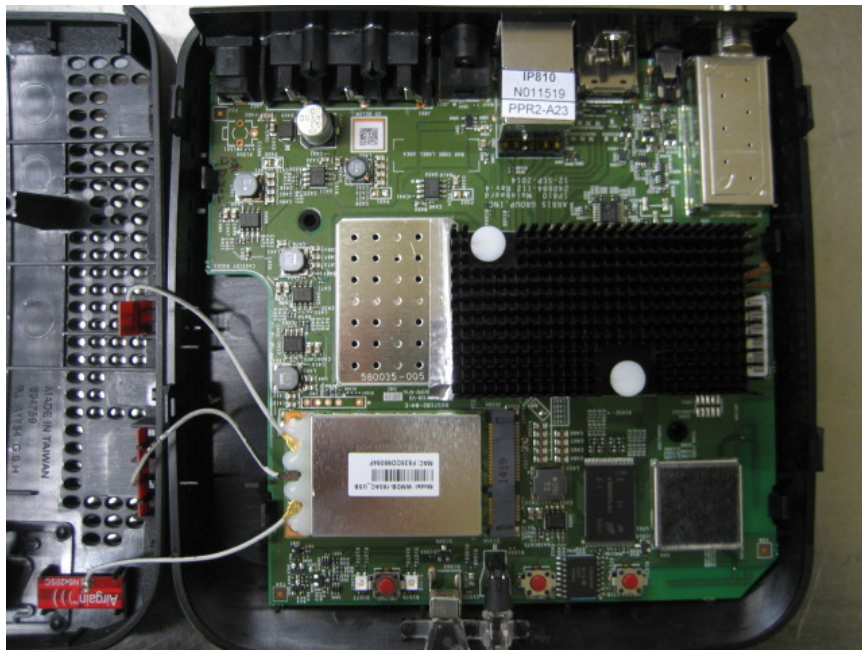
ARRIS IP810 SERIAL NUMBER UNMODIFIED ANTENNA EUT



ARRIS IP810 INSIDE TOP COVER

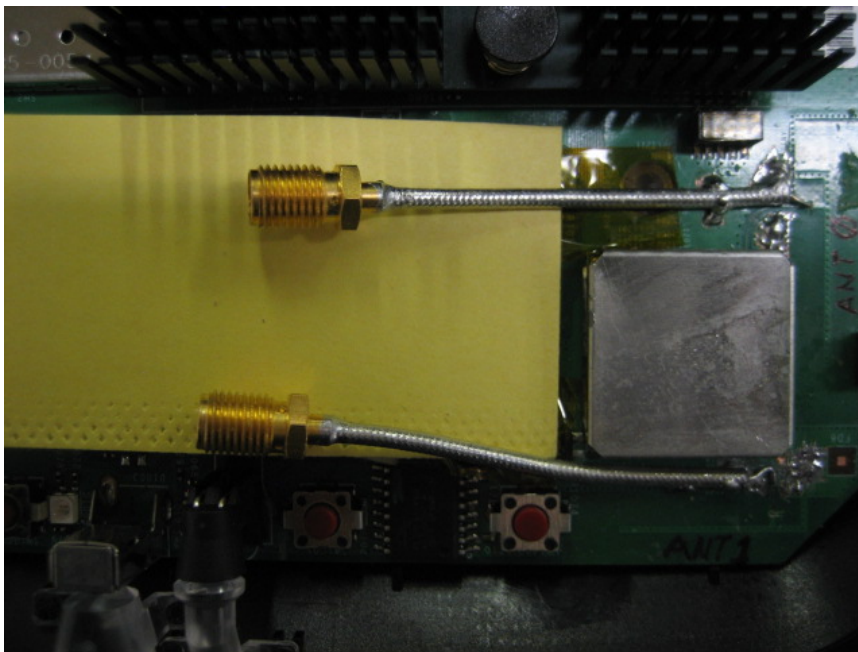
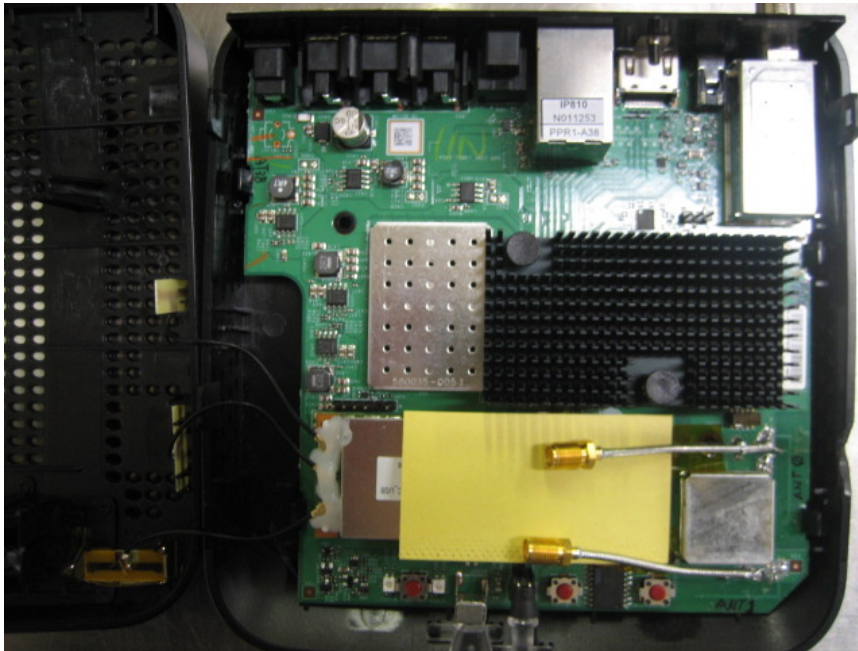


ARRIS IP810 (UNMODIFIED ANTENNAS)



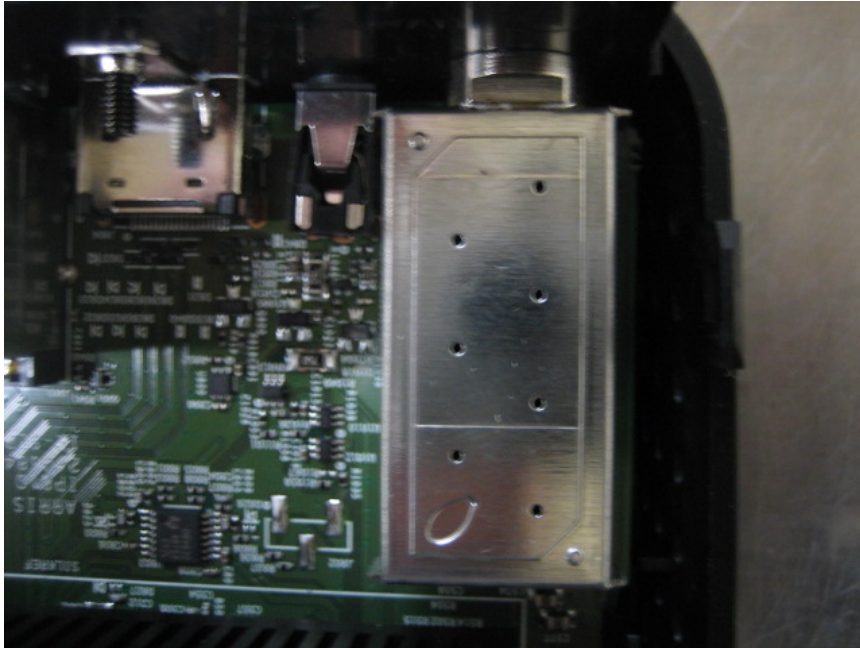


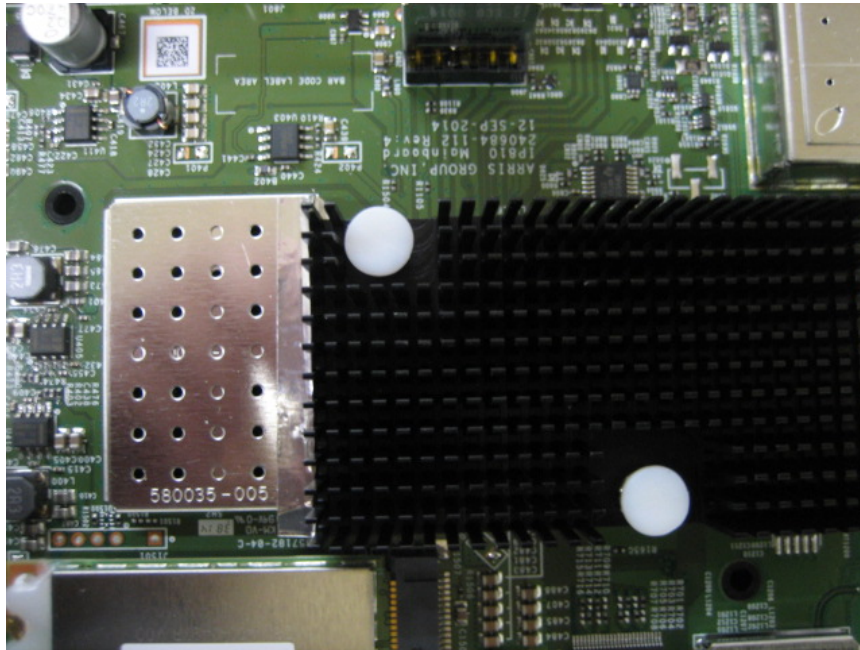
ARRIS IP810 (MODIFIED ANTENNAS)





ARRIS IP810 (SHIELDED AREAS)







3.0 Applicable Requirements, Methods, and Procedures

3.1 Applicable Requirements

The results of the measurement of the radio disturbance characteristics of the EUT described herein may be applied and where appropriate, provide a presumption of compliance to one or more of the following requirements or to other requirements at the discretion of the customer, regulatory agencies, or other entities.

3.1.1 FCC Requirements

USA

Code of Federal Regulations:

Title 47 – Telecommunication

Chapter I - Federal Communications Commission

Sub-chapter A – General

Part 15 – Radio Frequency Devices

Subpart C - Intentional Radiators

Subpart D - Unlicensed Personal Communications Service Devices

Subpart E - Unlicensed National Information Infrastructure Devices



3.1.2 Basic Test Methods and Test Procedures

ANSI C63.4, 2009, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

3.2 Deviations or Exclusions from the Requirements

No deviations or exclusions were made.



4.0 Test Results

4.1 Conducted Emissions Power Leads, 150 kHz to 30 MHz. FCC Section 15.207(b)

4.1.1 Conducted Emissions Test Procedure

AC Power Line

Conducted emissions at the power line input of the EUT were measured with an EMI receiver set to the appropriate detector and CISPR bandwidth, which was connected to the RF output of a 50 Ω , 50 μ H Line Impedance Stabilization Network (LISN) installed in each power line.

Measurements were made over the frequency range of 150 kHz to 30 MHz while the EUT was operating as described in the EUT section of this report. The significant amplitudes of emissions measured on the AC power lines of the EUT were recorded as follows:

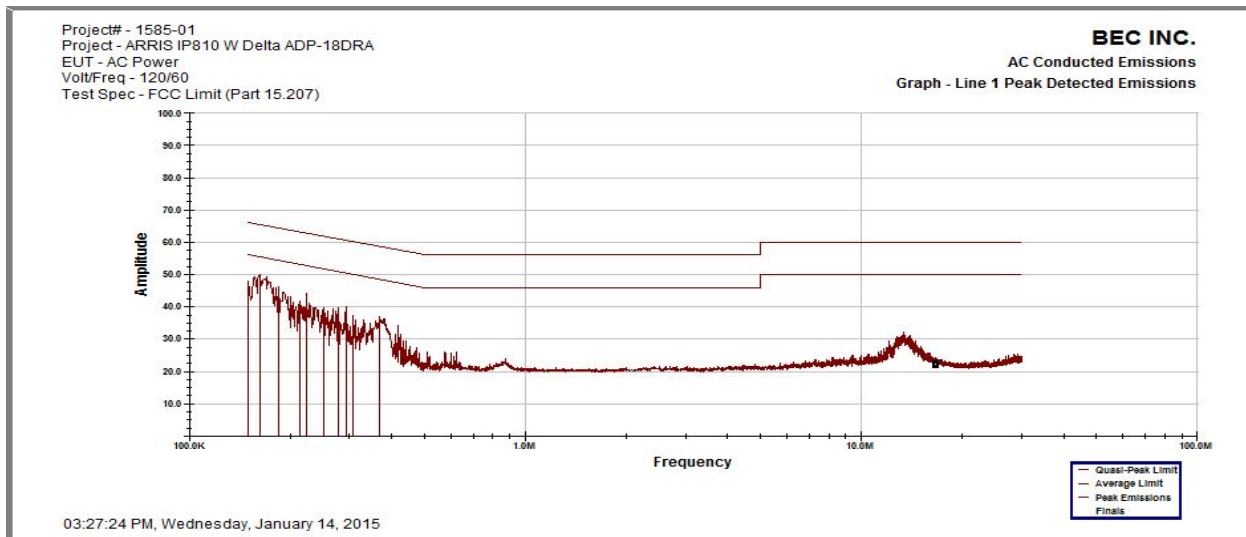
Emission (dB μ V) = Meter Reading (dB μ v) + Cable Loss (dB) + LISN Factor (dB) + Limiter Loss (dB)



4.1.2 Conducted Emissions Test Results Delta Model ADP-18DRA Power Supply (01/14/2015)

The following graphs and tables show the conducted emissions recorded on the AC power line of the EUT displayed against the FCC limits as outlined in Section 15.207(b). The Delta Model ADP-18DRA supply was powered at 120Vac/60 Hz.

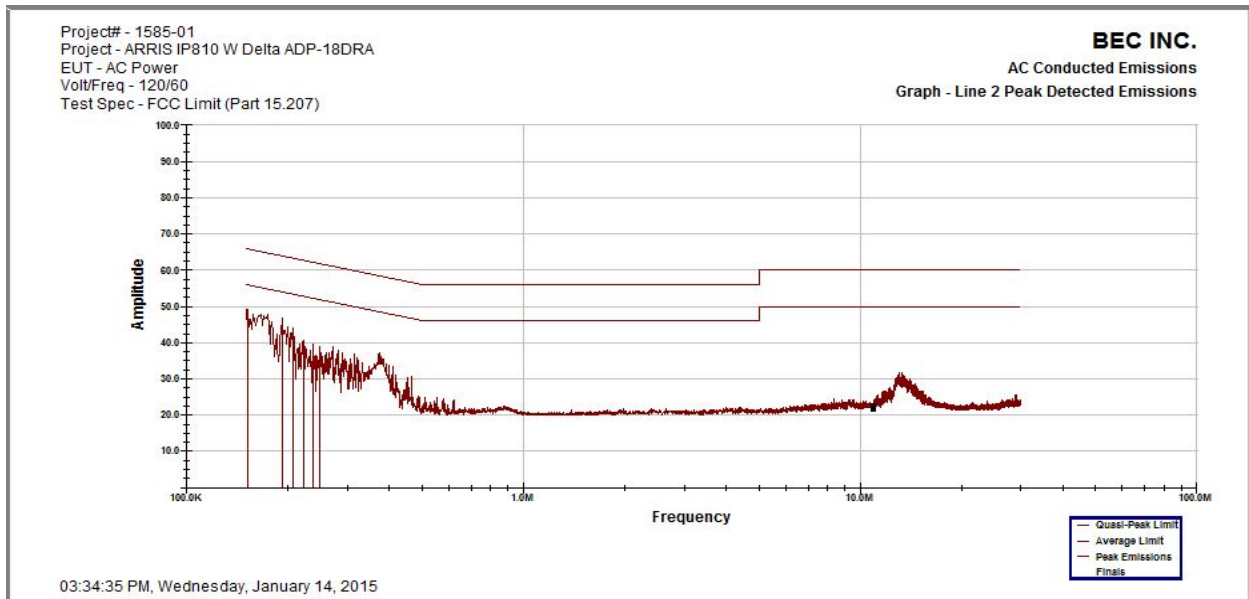
| BEC INC. | | | | | | | |
|--|-------|-------|--------|-------|-------|--------|--------|
| Line 1 Conducted Emissions | | | | | | | |
| 03:27:21 PM, Wednesday, January 14, 2015 | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Frequency | AVG | AVG | AVG | QP | QP | QP | Corr |
| MHz | dBuV | Limit | Margin | dBuV | Limit | Margin | Factor |
| 150.780 KHz | 30.79 | 55.98 | -25.19 | 44.42 | 65.98 | -21.56 | 0.130 |
| 163.668 KHz | 30.43 | 55.61 | -25.18 | 46.03 | 65.61 | -19.58 | 0.133 |
| 187.053 KHz | 25.98 | 54.94 | -28.96 | 39.76 | 64.94 | -25.18 | 0.132 |
| 212.019 KHz | 22.03 | 54.23 | -32.20 | 37.12 | 64.23 | -27.11 | 0.130 |
| 224.496 KHz | 20.14 | 53.87 | -33.73 | 35.35 | 63.87 | -28.52 | 0.130 |
| 251.312 KHz | 19.30 | 53.11 | -33.81 | 32.66 | 63.11 | -30.45 | 0.130 |
| 276.779 KHz | 21.32 | 52.38 | -31.06 | 31.39 | 62.38 | -30.99 | 0.130 |
| 291.479 KHz | 22.03 | 51.96 | -29.93 | 30.60 | 61.96 | -31.36 | 0.130 |
| 309.699 KHz | 23.13 | 51.44 | -28.31 | 29.06 | 61.44 | -32.38 | 0.132 |
| 372.113 KHz | 27.62 | 49.65 | -22.03 | 33.36 | 59.65 | -26.29 | 0.140 |
| Project# - 1585-01 | | | | | | | |
| Project - ARRIS IP810 W Delta ADP-18DRA | | | | | | | |
| EUT - AC Power | | | | | | | |
| Volt/Freq - 120/60 | | | | | | | |
| Test Spec - FCC Limit (Part 15.207) | | | | | | | |





BEC INC.
Line 2 Conducted Emissions
03:34:33 PM, Wednesday, January 14, 2015

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|--|--------|--------|---------|--------|--------|---------|--------|
| Frequency | AVG | AVG | AVG | QP | QP | QP | Corr |
| MHz | dBuV | Limit | Margin | dBuV | Limit | Margin | Factor |
| 150.967 KHz | 30.845 | 55.972 | -25.127 | 43.690 | 65.972 | -22.282 | 0.130 |
| 192.932 KHz | 30.146 | 54.773 | -24.627 | 39.709 | 64.773 | -25.065 | 0.139 |
| 207.015 KHz | 25.855 | 54.371 | -28.516 | 37.950 | 64.371 | -26.421 | 0.140 |
| 220.608 KHz | 19.375 | 53.983 | -34.608 | 34.110 | 63.983 | -29.873 | 0.140 |
| 237.612 KHz | 22.712 | 53.497 | -30.784 | 34.460 | 63.497 | -29.037 | 0.140 |
| 249.623 KHz | 19.557 | 53.154 | -33.596 | 30.750 | 63.154 | -32.404 | 0.140 |
| | | | | | | | |
| | | | | | | | |
| Project# - 1585-01 | | | | | | | |
| Project - ARRIS IP810 W Delta ADP-18DRA | | | | | | | |
| EUT - AC Power | | | | | | | |
| Volt/Freq - 120/60 | | | | | | | |
| Test Spec - FCC Limit (Part 15.207) | | | | | | | |
| | | | | | | | |



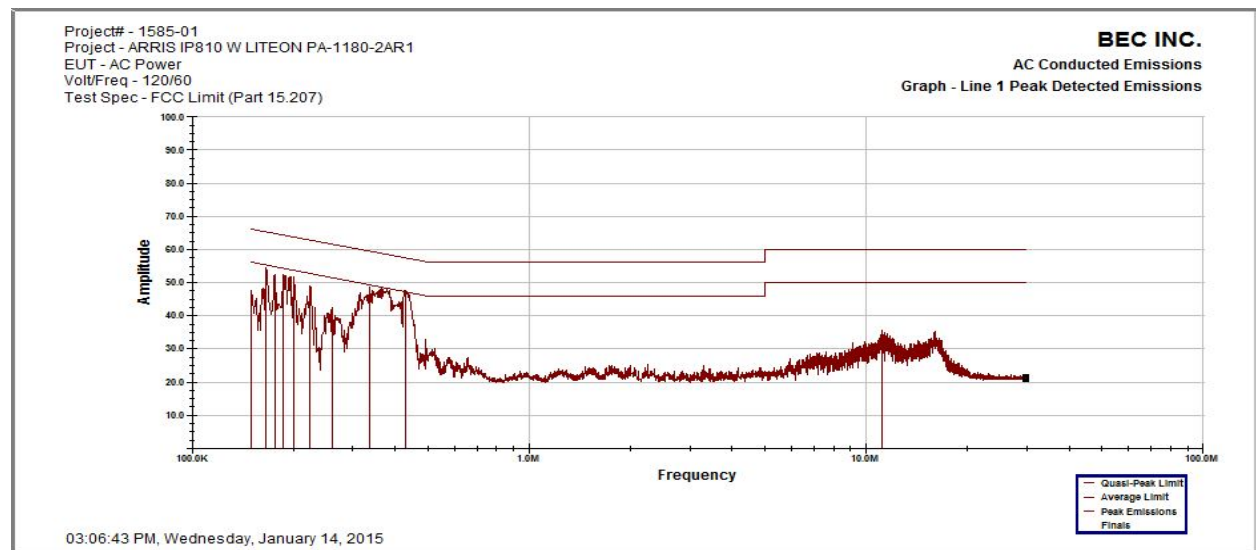
Results: All conducted emissions measured on the telecommunications port(s) of the Delta Model ADP-18DRA supply are below the limits specified in FCC Section 15.207 by a margin of at least 19.5 dB.



4.1.3 Conducted Emissions Test Results LITEON Model PA-1180-2AR1 Power Supply (01/14/2015)

The following graphs and tables show the conducted emissions recorded on the AC power line of the EUT displayed against the FCC limits as outlined in Section 15.207(b). The LITEON Model PA-1180-2AR1 supply was powered at 120Vac/60 Hz.

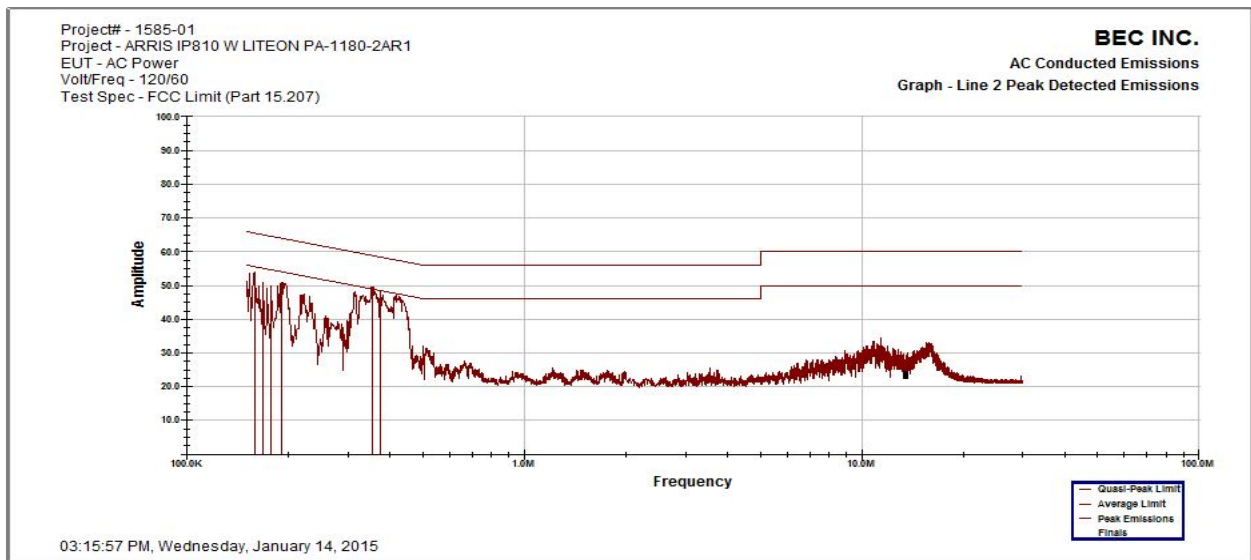
| BEC INC. | | | | | | | |
|---|-------|-------|--------|-------|-------|--------|--------|
| Line 1 Conducted Emissions | | | | | | | |
| 03:06:40 PM, Wednesday, January 14, 2015 | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Frequency | AVG | AVG | AVG | QP | QP | QP | Corr |
| MHz | dBuV | Limit | Margin | dBuV | Limit | Margin | Factor |
| 150.384 KHz | 38.29 | 55.99 | -17.70 | 52.92 | 65.99 | -13.07 | 0.130 |
| 165.120 KHz | 28.07 | 55.57 | -27.50 | 43.48 | 65.57 | -22.08 | 0.133 |
| 177.045 KHz | 36.38 | 55.23 | -18.85 | 49.15 | 65.23 | -16.07 | 0.133 |
| 186.370 KHz | 34.98 | 54.96 | -19.98 | 48.44 | 64.96 | -16.52 | 0.132 |
| 197.502 KHz | 35.51 | 54.64 | -19.14 | 48.11 | 64.64 | -16.53 | 0.130 |
| 222.882 KHz | 33.24 | 53.92 | -20.68 | 44.28 | 63.92 | -19.64 | 0.130 |
| 258.743 KHz | 25.41 | 52.89 | -27.48 | 36.51 | 62.89 | -26.38 | 0.130 |
| 341.408 KHz | 37.90 | 50.53 | -12.63 | 45.14 | 60.53 | -15.39 | 0.138 |
| 425.313 KHz | 40.20 | 48.13 | -7.93 | 46.10 | 58.13 | -12.03 | 0.140 |
| 11.184 MHz | 23.56 | 50.00 | -26.44 | 30.44 | 60.00 | -29.56 | 0.666 |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| Project# - 1585-01 | | | | | | | |
| Project - ARRIS IP810 W LITEON PA-1180-2AR1 | | | | | | | |
| EUT - AC Power | | | | | | | |
| Volt/Freq - 120/60 | | | | | | | |
| Test Spec - FCC Limit (Part 15.207) | | | | | | | |
| | | | | | | | |





BEC INC.
Line 2 Conducted Emissions
03:15:54 PM, Wednesday, January 14, 2015

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|--|--------|--------|---------|--------|--------|---------|--------|
| Frequency | AVG | AVG | AVG | QP | QP | QP | Corr |
| MHz | dBuV | Limit | Margin | dBuV | Limit | Margin | Factor |
| 157.275 KHz | 38.986 | 55.792 | -16.806 | 50.951 | 65.792 | -14.841 | 0.131 |
| 166.722 KHz | 28.058 | 55.522 | -27.464 | 44.953 | 65.522 | -20.569 | 0.133 |
| 176.594 KHz | 34.280 | 55.240 | -20.960 | 46.685 | 65.240 | -18.555 | 0.135 |
| 188.800 KHz | 34.683 | 54.891 | -20.209 | 45.768 | 64.891 | -19.124 | 0.138 |
| 355.051 KHz | 41.000 | 50.141 | -9.141 | 46.430 | 60.141 | -13.711 | 0.150 |
| 370.726 KHz | 39.198 | 49.694 | -10.496 | 45.570 | 59.694 | -14.124 | 0.150 |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| Project# - 1585-01 | | | | | | | |
| Project - ARRIS IP810 W LITEON PA-1180-2AR1 | | | | | | | |
| EUT - AC Power | | | | | | | |
| Volt/Freq - 120/60 | | | | | | | |
| Test Spec - FCC Limit (Part 15.207) | | | | | | | |
| | | | | | | | |



Results: All conducted emissions measured on the telecommunications port(s) of the LITEON Model PA-1180-2AR1 supply are below the limits specified in FCC Section 15.207 by a margin of at least 7.9 dB.



4.2 Spurious Radiated Emissions, 1 GHz to 25 GHz. FCC Section 15.209

4.2.1 Test Facility

OATS

The Open Area Test Site (OATS) is an all-weather facility with a wooden enclosure that contains a ground level 4-foot diameter turntable capable of rotating equipment 360 degrees. The enclosure is free of reflective metallic objects and extraneous electromagnetic signals. This non-metallic enclosure and the 3 and 10 meter test range existing outside the enclosure rest upon a protective insulating material, which in turn covers a flat, metal, continuous ground plane.

Instrumentation for remote control of the antenna mast, turntable, and other equipment are controlled by personnel indoors. The EUT and support peripherals required for EUT operation were placed on a table 80 cm high for tabletop equipment or directly on the turntable surface for floor standing equipment.

The test site complies with the attenuation measurements specified in ANSI C63.4 and CISPR 22.

SR#1

The Semi-Anechoic Shielded Room (SR#1) is an ferrite and absorber lined chamber which houses a 5-foot diameter turntable capable of rotating equipment 360 degrees and antenna mast for Horizontal and Vertical polarity measurements. The enclosure is free of reflective metallic objects and extraneous electromagnetic signals. This 3 meter shielded enclosure has a raised computer floor with metal tile bottoms providing a continuous ground plane.

Instrumentation for remote control of the antenna mast, turntable, and other equipment are controlled by personnel outside the chamber. The EUT and support peripherals required for EUT operation were placed on a table 80 cm high for tabletop equipment or directly on the turntable surface for floor standing equipment.

The test site complies with the attenuation measurements specified in ANSI C63.4 and CISPR 22.



4.2.2 Spurious Radiated Emissions Test Procedure

Radiated Emissions 30 MHz – 40 GHz

The EMI receiver was set to quasi-peak mode for frequencies from 30MHz to 1GHz and the appropriate CISPR bandwidths were employed. The receiver was set to average mode for frequencies above 1GHz with the appropriate CISPR bandwidths were employed. Significant emissions found during the preliminary scans were maximized by rotating the turntable and varying the antenna height. Both horizontal and vertical antenna polarities were also investigated for suspect emissions. The signals are maximized and measured using the in house generated RADE or off the shelf TILE software. The support equipment and test item(s) were powered off in turn to determine the source of the emissions where appropriate.

Field strengths were calculated as follows:

Field Strength (dB μ V/m) = Meter Reading (dB μ V) + Antenna Factor (dB/m) + Cable Loss (dB) – Amplifier Gain (dB)

Because the intentional radiator has a pulse modulated amplitude signal, a “duty cycle correction factor” must be taken against the Peak Measurement of the harmonic spurious emissions when calculating the final field strengths against the required limits. The duty cycle correction factor for the GreenPeak GP711 is 20 dB (maximum allowed by the FCC).

Section 15.35 (c) mentions: “Unless otherwise specified, e.g. Section 15.255(b), when the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds.”

The maximum duty cycle of the RF4CE set top box is gated by the remote control. The maximum repeat rate of a RF4CE remote control, while continuously pressing a key, is 1 packet per 100 ms, so the set top box can confirm every 100 ms a packet with an ACK. The duration of an ACK is ~0.5 ms.

The duration of a ACK is 0.5 ms, the interval time is 100 ms. This means that the correction factor for the average spurious emission field strength is:

$20 * \log_{10}(0.5 / 100) = - 46$ dB. FCC limits the max duty cycle correction factor to 20 dB.



4.2.3 Spurious Radiated Emissions 1GHz to 25 GHz Test Results (12/18/2014)

The following table shows the highest amplitude average detected field strengths as recorded from the EUT. These measurements were performed over the frequency range of 1.0 GHz to 25 GHz at a distance of 3 meters to satisfy FCC Section 15.209 requirements. Spurious emissions from the Antenna 0 and Antenna 1 were measured when individually set to low (Channel 11), middle (Channel 19) and high (Channel 26). The signal output was maximized with modulation.

Settings: Antenna 0, Channel 11 (2.405 GHz Fundamental) Maximum Output with Modulation

| Freq [MHz] | Peak [dBμV/m] | Calculated Average w Duty Cycle Correction Factor [dBμV/m] | Pol | Angle [deg] | Height [cm] | CF [dB] | Limit [dBμV/m] | Margin [dB] | Comment |
|------------|---------------|--|-----|-------------|-------------|---------|----------------|-------------|---------|
| 4.8110 | 56.87 | 36.87 | H | 310 | 100 | 2.28 | 53.98 | -17.11 | PASS |
| 12.0240 | 47.35 | 27.35 | H | 000 | 100 | 7.92 | 53.98 | -26.63 | PASS |
| 14.4213 | 52.62 | 32.62 | H | 325 | 100 | 10.99 | 53.98 | -21.36 | PASS |
| 16.8371 | 56.36 | 36.36 | H | 360 | 100 | 14.64 | 53.98 | -17.62 | PASS |
| 4.8110 | 51.36 | 31.36 | V | 208 | 100 | 2.28 | 53.98 | -22.62 | PASS |
| 12.0142 | 49.50 | 29.50 | V | 133 | 100 | 7.91 | 53.98 | -24.48 | PASS |
| 14.4356 | 53.12 | 33.12 | V | 157 | 100 | 10.95 | 53.98 | -20.86 | PASS |
| 16.8368 | 57.05 | 37.05 | V | 050 | 100 | 14.64 | 53.98 | -16.93 | PASS |

Settings: Antenna 0, Channel 19 (2.445 GHz Fundamental) Maximum Output with Modulation

| Freq [MHz] | Peak [dBμV/m] | Calculated Average w Duty Cycle Correction Factor [dBμV/m] | Pol | Angle [deg] | Height [cm] | CF [dB] | Limit [dBμV/m] | Margin [dB] | Comment |
|------------|---------------|--|-----|-------------|-------------|---------|----------------|-------------|---------|
| 4.8890 | 57.05 | 37.05 | H | 162 | 100 | 2.58 | 53.98 | -16.93 | PASS |
| 12.2303 | 49.51 | 29.51 | H | 022 | 100 | 8.08 | 53.98 | -24.47 | PASS |
| 14.6604 | 53.34 | 33.34 | H | 162 | 100 | 10.22 | 53.98 | -20.64 | PASS |
| 17.1085 | 60.57 | 40.57 | H | 182 | 100 | 16.68 | 53.98 | -13.41 | PASS |
| 4.8889 | 52.77 | 32.77 | V | 197 | 100 | 2.58 | 53.98 | -21.21 | PASS |
| 12.2134 | 48.24 | 28.24 | V | 200 | 100 | 8.07 | 53.98 | -25.74 | PASS |
| 14.6632 | 52.91 | 32.91 | V | 100 | 100 | 10.21 | 53.98 | -21.07 | PASS |
| 17.1145 | 58.67 | 38.67 | V | 182 | 100 | 16.70 | 53.98 | -15.31 | PASS |



Settings: Antenna 0, Channel 26 (2.480 GHz Fundamental) Maximum Output with Modulation

| Freq [MHz] | Peak [dBμV/m] | Calculated Average w Duty Cycle Correction Factor [dBμV/m] | Pol | Angle [deg] | Height [cm] | CF [dB] | Limit [dBμV/m] | Margin [dB] | Comment |
|------------|---------------|--|-----|-------------|-------------|---------|----------------|-------------|---------|
| 4.9611 | 55.29 | 35.29 | H | 186 | 100 | 2.85 | 53.98 | -18.69 | PASS |
| 12.4017 | 47.74 | 27.74 | H | 332 | 100 | 8.22 | 53.98 | -26.24 | PASS |
| 14.8901 | 50.46 | 30.46 | H | 329 | 100 | 9.40 | 53.98 | -23.52 | PASS |
| 17.3554 | 58.79 | 38.79 | H | 031 | 100 | 17.32 | 53.98 | -15.19 | PASS |
| | | | | | | | | | |
| 4.9590 | 50.03 | 30.03 | V | 150 | 100 | 2.84 | 53.98 | -23.95 | PASS |
| 12.3988 | 48.75 | 28.75 | V | 302 | 100 | 8.22 | 53.98 | -25.23 | PASS |
| 14.8807 | 53.32 | 33.32 | V | 361 | 100 | 9.43 | 53.98 | -20.66 | PASS |
| 17.3590 | 58.41 | 38.41 | V | 010 | 100 | 17.33 | 53.98 | -15.57 | PASS |

Settings: Antenna 1, Channel 11 (2.405 GHz Fundamental) Maximum Output with Modulation

| Freq [MHz] | Peak [dBμV/m] | Calculated Average w Duty Cycle Correction Factor [dBμV/m] | Pol | Angle [deg] | Height [cm] | CF [dB] | Limit [dBμV/m] | Margin [dB] | Comment |
|------------|---------------|--|-----|-------------|-------------|---------|----------------|-------------|---------|
| 4.8110 | 66.57 | 46.57 | H | 313 | 100 | 2.28 | 53.98 | -7.41 | PASS |
| 12.0106 | 47.93 | 27.93 | H | 332 | 100 | 7.91 | 53.98 | -26.05 | PASS |
| 14.4326 | 52.05 | 32.05 | H | 289 | 100 | 10.96 | 53.98 | -21.93 | PASS |
| 16.8330 | 57.46 | 37.46 | H | 051 | 100 | 14.60 | 53.98 | -16.52 | PASS |
| | | | | | | | | | |
| 4.8109 | 56.12 | 36.12 | V | 229 | 100 | 2.28 | 53.98 | -17.86 | PASS |
| 12.0160 | 49.31 | 29.31 | V | 263 | 100 | 7.91 | 53.98 | -24.67 | PASS |
| 14.4242 | 53.34 | 33.34 | V | 010 | 100 | 10.98 | 53.98 | -20.64 | PASS |
| 16.8392 | 56.34 | 36.34 | V | 346 | 100 | 14.66 | 53.98 | -17.64 | PASS |



Settings: Antenna 1, Channel 19 (2.445 GHz Fundamental) Maximum Output with Modulation

| Freq [MHz] | Peak [dBμV/m] | Calculated Average w Duty Cycle Correction Factor [dBμV/m] | Pol | Angle [deg] | Height [cm] | CF [dB] | Limit [dBμV/m] | Margin [dB] | Comment |
|------------|---------------|--|-----|-------------|-------------|---------|----------------|-------------|---------|
| 4.8890 | 64.85 | 44.85 | H | 312 | 100 | 2.58 | 53.98 | -9.13 | PASS |
| 12.2206 | 47.53 | 27.53 | H | 101 | 100 | 8.08 | 53.98 | -26.45 | PASS |
| 14.6759 | 51.64 | 31.64 | H | 143 | 100 | 10.17 | 53.98 | -22.34 | PASS |
| 17.1215 | 56.89 | 36.89 | H | 106 | 100 | 16.72 | 53.98 | -17.09 | PASS |
| | | | | | | | | | |
| 4.8890 | 56.95 | 36.95 | V | 231 | 100 | 2.58 | 53.98 | -17.03 | PASS |
| 12.2161 | 49.38 | 29.38 | V | 308 | 100 | 8.07 | 53.98 | -24.60 | PASS |
| 14.6568 | 55.46 | 35.46 | V | 260 | 100 | 10.24 | 53.98 | -18.52 | PASS |
| 17.1130 | 58.24 | 38.24 | V | 098 | 100 | 16.69 | 53.98 | -15.74 | PASS |

Settings: Antenna 1, Channel 26 (2.480 GHz Fundamental) Maximum Output with Modulation

| Freq [MHz] | Peak [dBμV/m] | Calculated Average w Duty Cycle Correction Factor [dBμV/m] | Pol | Angle [deg] | Height [cm] | CF [dB] | Limit [dBμV/m] | Margin [dB] | Comment |
|------------|---------------|--|-----|-------------|-------------|---------|----------------|-------------|---------|
| 4.9609 | 61.69 | 41.69 | H | 313 | 100 | 2.85 | 53.98 | -12.29 | PASS |
| 12.4055 | 48.55 | 28.55 | H | 332 | 100 | 8.22 | 53.98 | -25.43 | PASS |
| 14.8829 | 51.23 | 31.23 | H | 49 | 100 | 9.42 | 53.98 | -22.75 | PASS |
| 17.3555 | 59.55 | 39.55 | H | 99 | 100 | 17.32 | 53.98 | -14.43 | PASS |
| | | | | | | | | | |
| 4.9590 | 53 | 33.00 | V | 232 | 100 | 2.84 | 53.98 | -20.98 | PASS |
| 12.3917 | 48.4 | 28.40 | V | 275 | 100 | 8.21 | 53.98 | -25.58 | PASS |
| 14.8885 | 51.93 | 31.93 | V | 89 | 100 | 9.4 | 53.98 | -22.05 | PASS |
| 17.3681 | 60.55 | 40.55 | V | 226 | 100 | 17.36 | 53.98 | -13.43 | PASS |

Results: All harmonic spurious radiated emissions as recorded at a distance of 3 meters from the ARRIS Model IP810 Set Top Box are below the 3 meter limit specified by FCC Section 15.209 requirements by a margin of at least 7.4 dB.



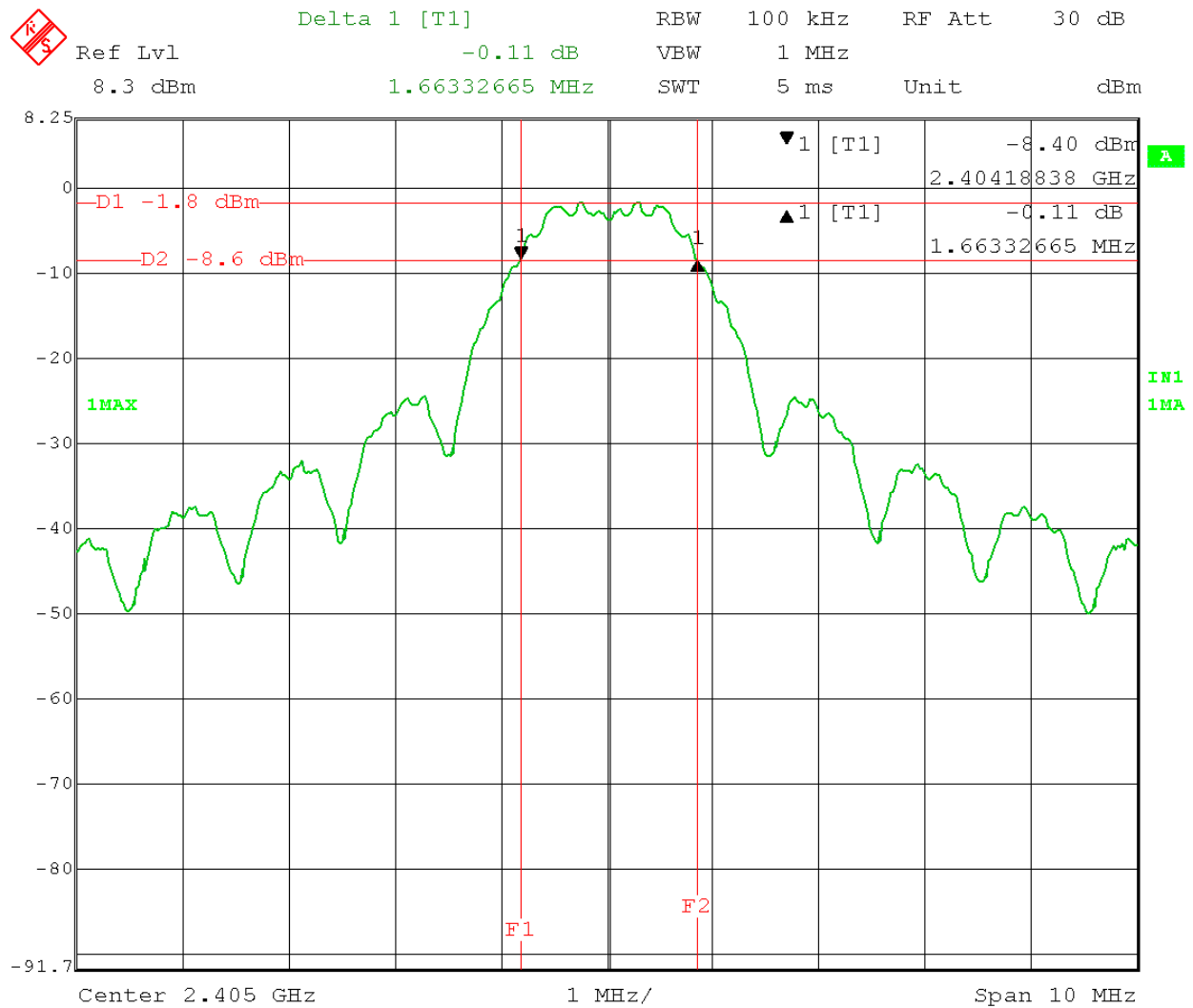
4.3 6 dB Occupied Bandwidth. FCC Section 15.247(a)(2)

4.3.1 6 dB Occupied Bandwidth – Test Procedure

The minimum 6 dB bandwidths per FCC Section 15.247(a)(2) were measured using a 50 Ohm EMI Test Receiver with settings of 100 kHz resolution bandwidth and 300 kHz video bandwidth. The Antenna 0 and Antenna 1 were set individually to low (Channel 11), middle (Channel 19) and high (Channel 26). The signal output was maximized with modulation.

4.3.2 6 dB Occupied Bandwidth Analyzer Display Captures Antenna 0


Antenna 0, Channel 11 (2.405 GHz)

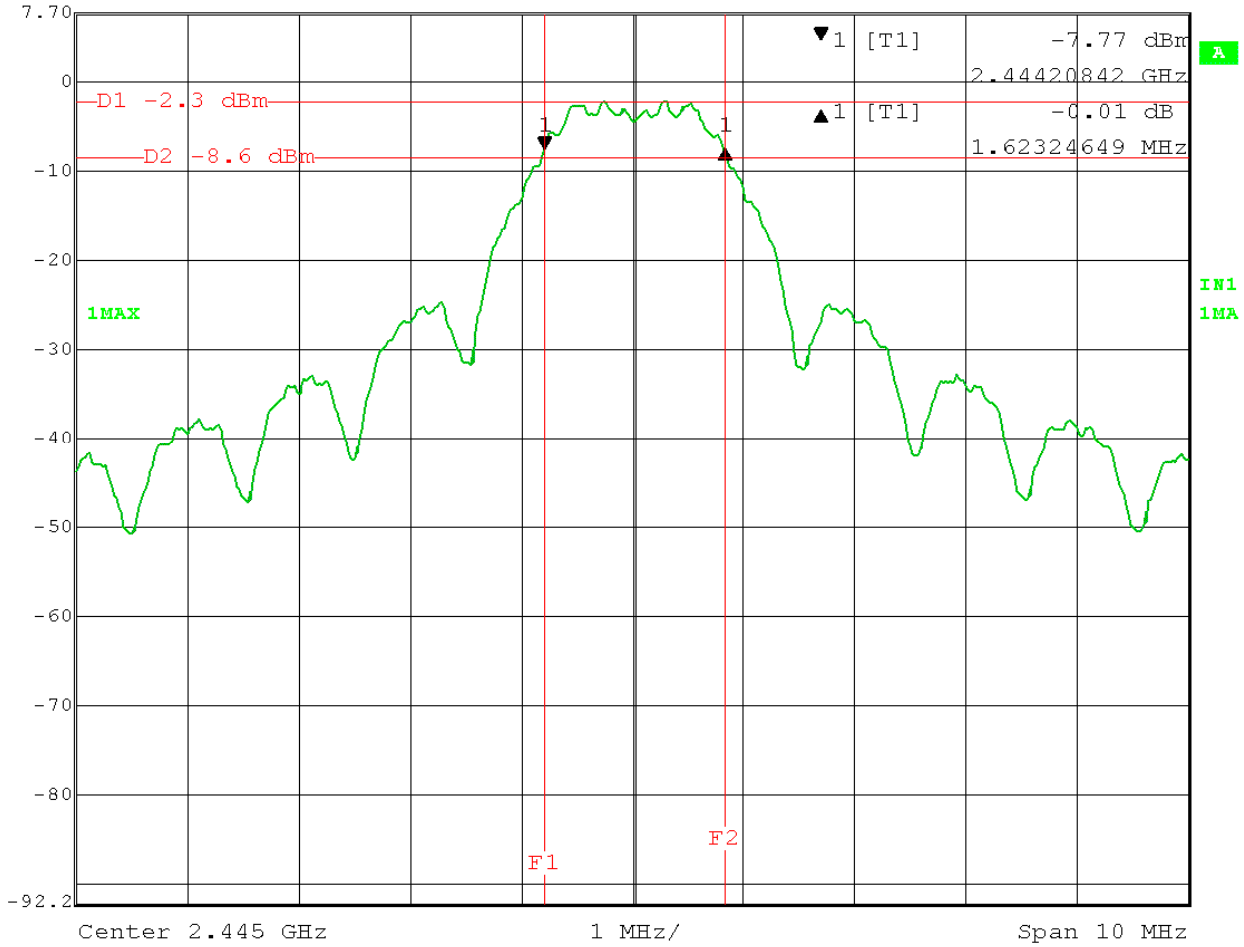


Date: 15.DEC.2014 11:29:45



Antenna 0, Channel 19 (2.445 GHz)


 Ref Lvl 7.7 dBm Delta 1 [T1] -0.01 dB RBW 100 kHz RF Att 30 dB
Unit dBm 1.62324649 MHz VBW 1 MHz SWT 5 ms

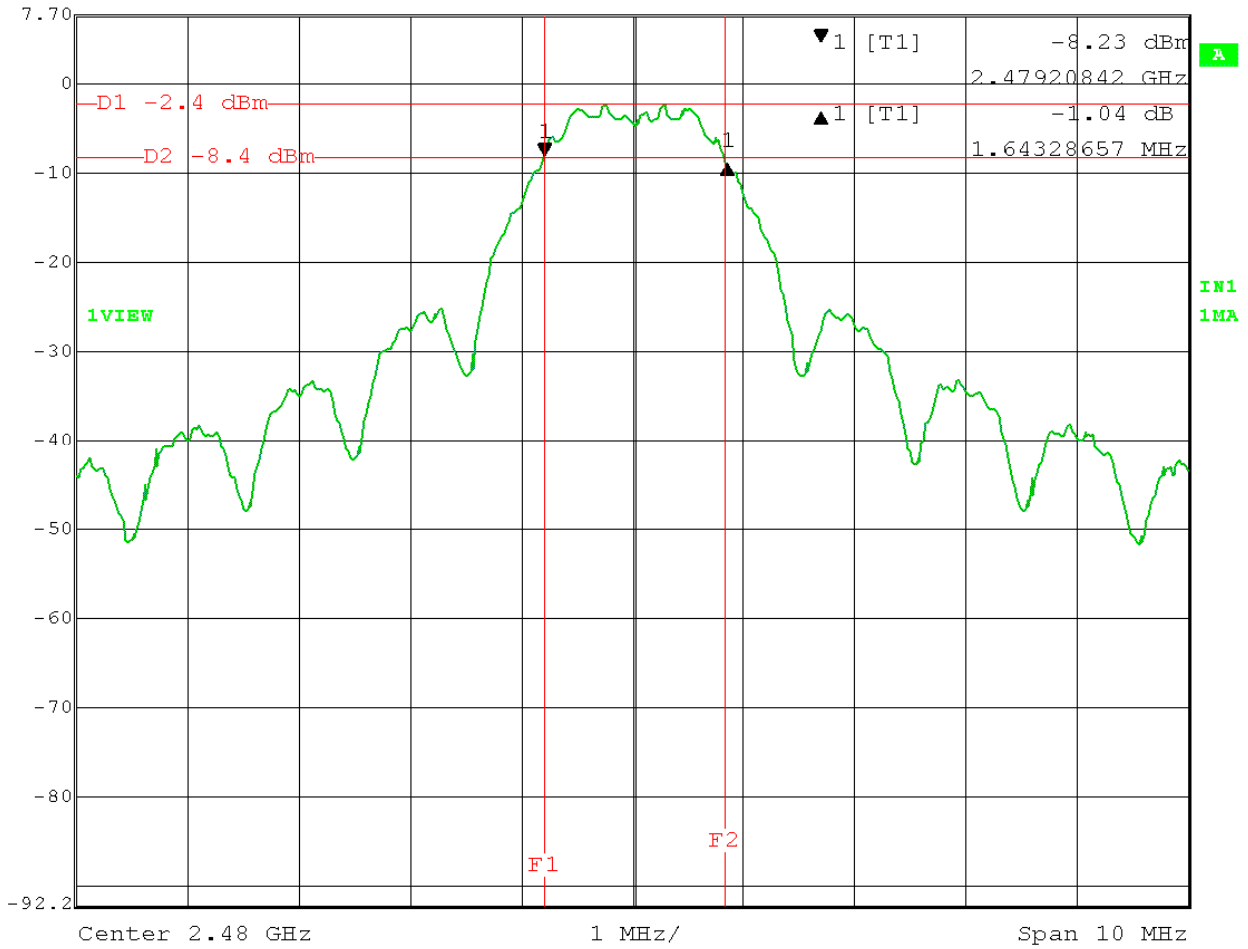


Date: 15.DEC.2014 11:35:57



Antenna 0, Channel 26 (2.480 GHz)

 Ref Lvl 7.7 dBm Delta 1 [T1] 1.64328657 MHz RBW 100 kHz RF Att 30 dB
-1.04 dB VBW 1 MHz
SWT 5 ms Unit dBm

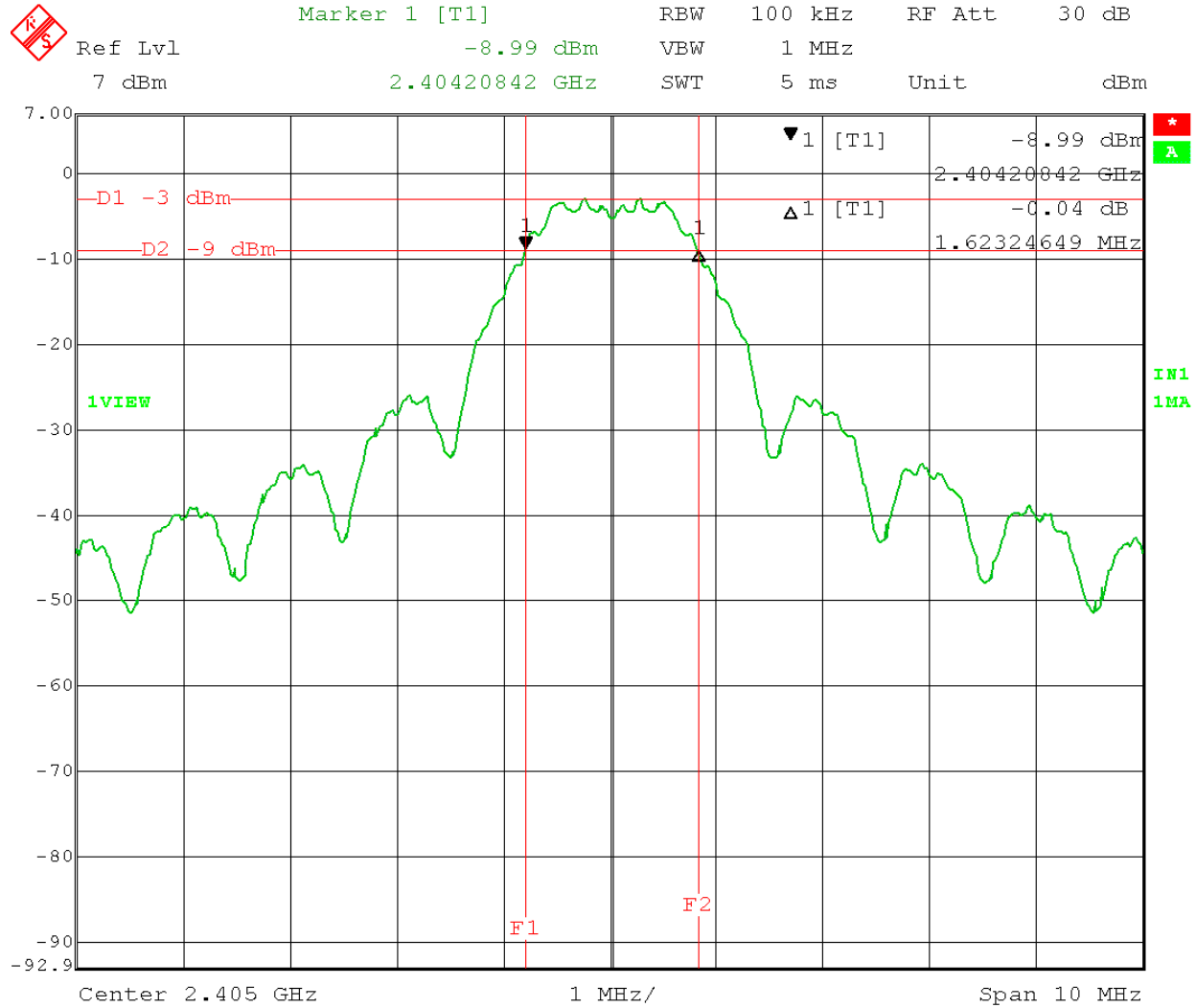


Date: 15.DEC.2014 11:44:36



4.3.3 6 dB Occupied Bandwidth Analyzer Display Captures Antenna 1


Antenna 1, Channel 11 (2.405 GHz)

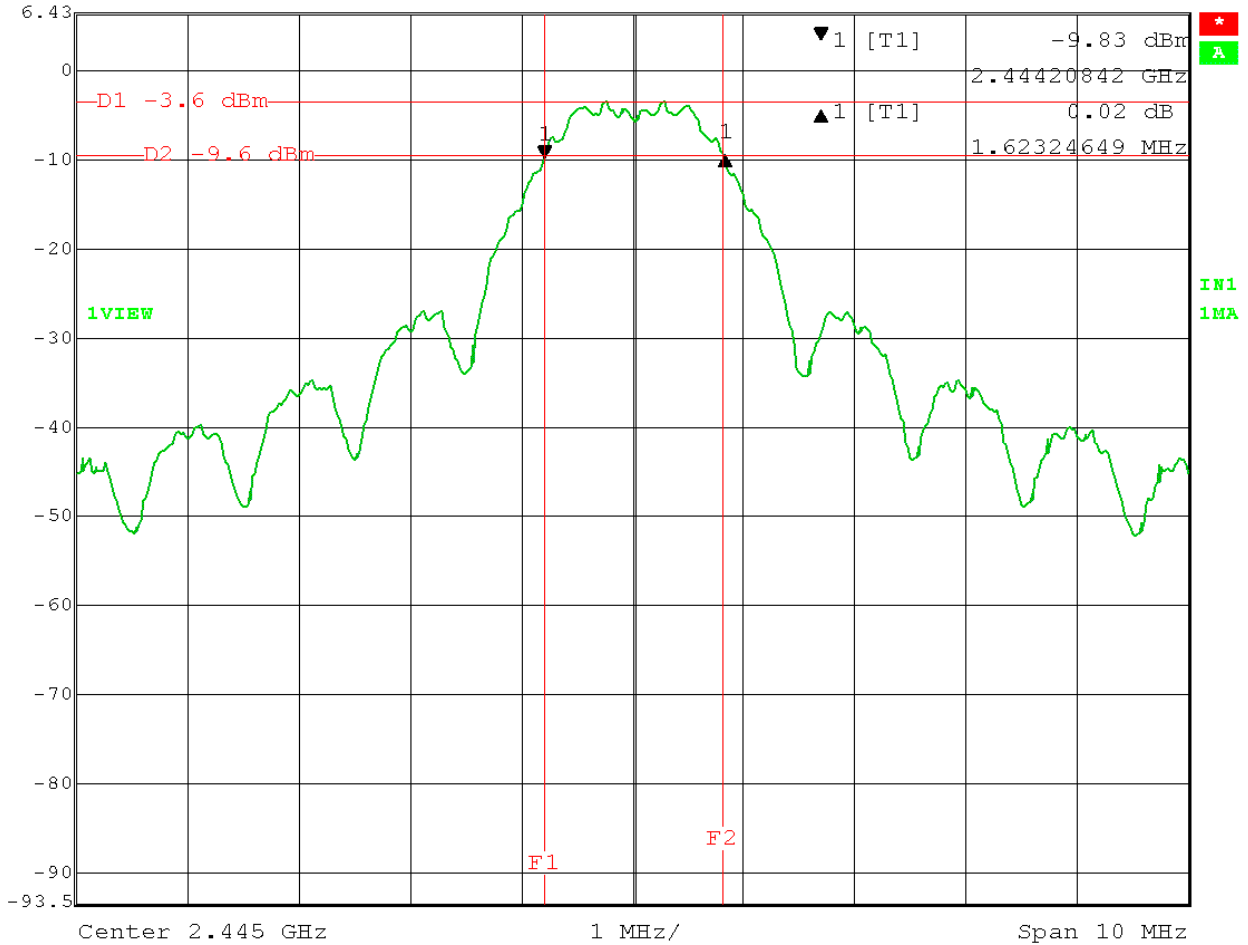


Date: 15.DEC.2014 12:16:58



Antenna 1, Channel 19 (2.445 GHz)

 Ref Lvl 6.4 dBm Delta 1 [T1] 0.02 dB RBW 100 kHz RF Att 30 dB
Unit dBm 1.62324649 MHz VBW 1 MHz SWT 5 ms

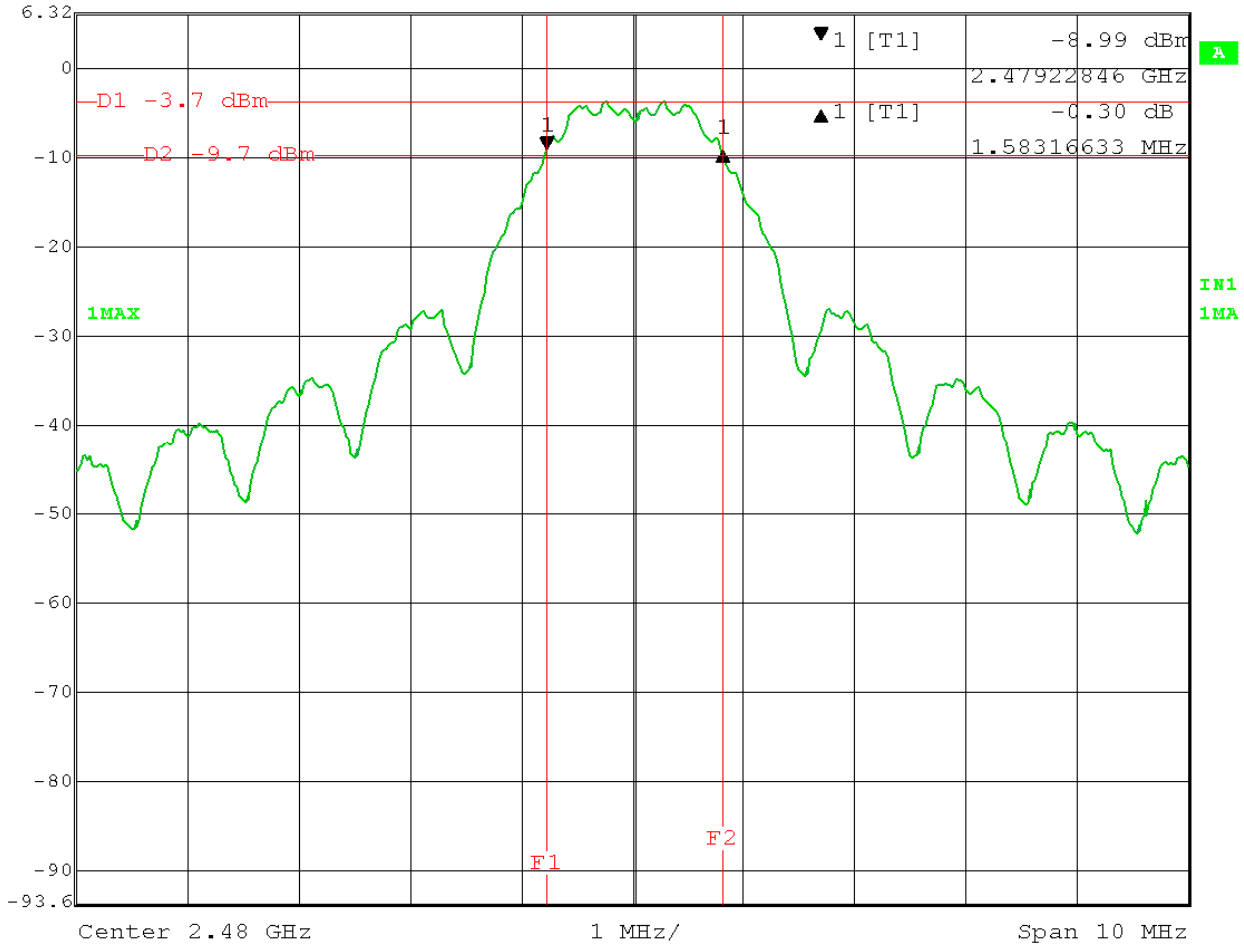


Date: 15.DEC.2014 12:20:55



Antenna 1, Channel 26 (2.480 GHz)

| | | | | | |
|--|--------------|----------------|---------|--------|-------|
| | Delta 1 [T1] | RBW | 100 kHz | RF Att | 30 dB |
| | Ref Lvl | -0.30 dB | VBW | 1 MHz | |
| | 6.3 dBm | 1.58316633 MHz | SWT | 5 ms | Unit |



Date: 15.DEC.2014 13:03:09



4.3.4 6 dB Occupied Bandwidth Test Results (12/15/2014)

Antenna 0

| Antenna Number | Freq (GHz) | 6 - dB Bandwidth (MHz) | Minimum Limit (MHz) | Pass/Fail |
|----------------|------------|------------------------|---------------------|-----------|
| 0 | 2.405 | 1.6633 | 0.5 | PASS |
| 0 | 2.445 | 1.6232 | 0.5 | PASS |
| 0 | 2.480 | 1.6433 | 0.5 | PASS |

Antenna 1

| Antenna Number | Freq (GHz) | 6 - dB Bandwidth (MHz) | Minimum Limit (MHz) | Pass/Fail |
|----------------|------------|------------------------|---------------------|-----------|
| 1 | 2.405 | 1.6232 | 0.5 | PASS |
| 1 | 2.445 | 1.6232 | 0.5 | PASS |
| 1 | 2.480 | 1.5832 | 0.5 | PASS |

Results: The 6 dB Occupied Bandwidth measurements for antenna 0 and antenna 1 of the ARRIS Model IP810 Set Top Box are compliant with the limits specified in FCC Section 15.247(a)(2).



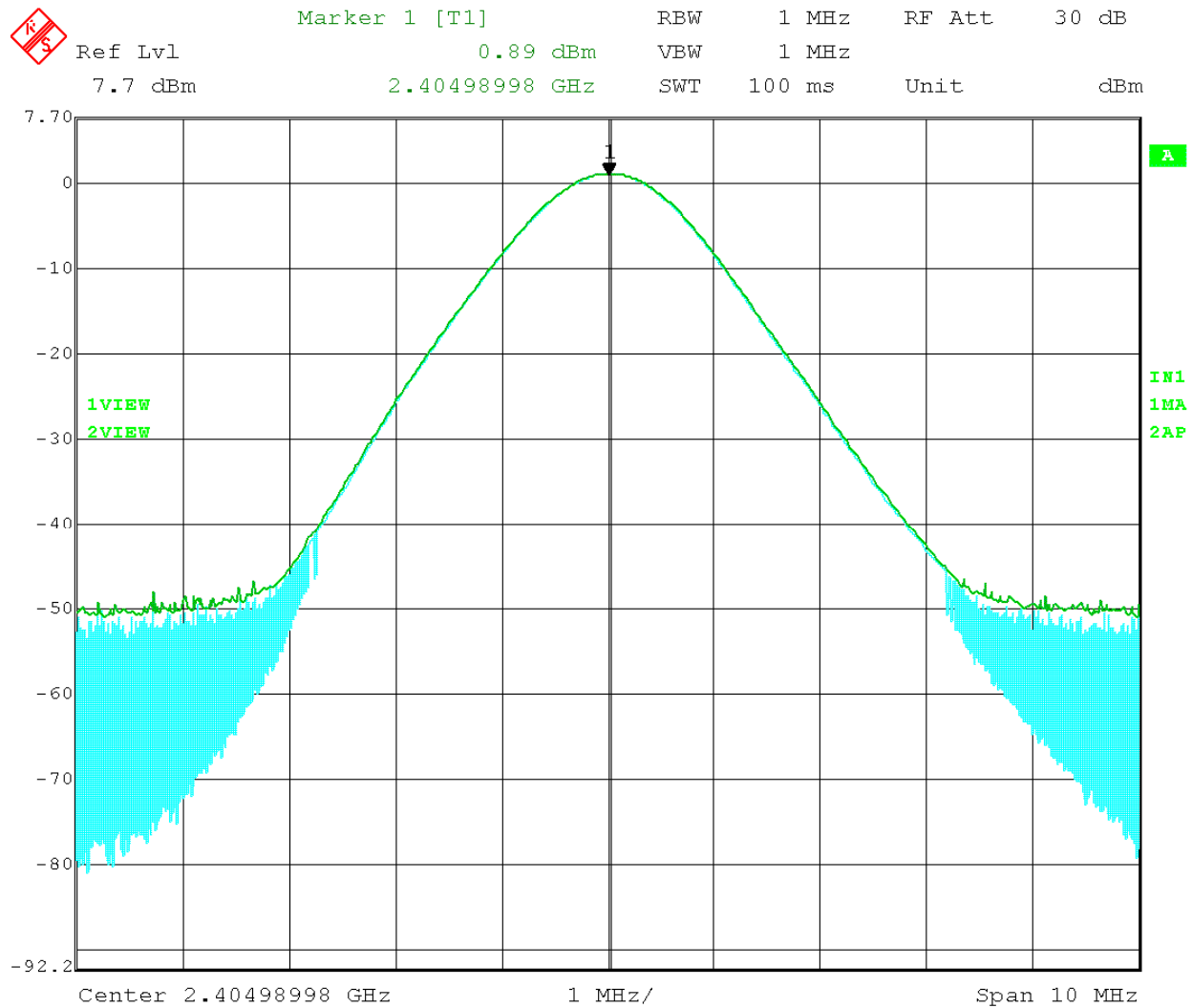
4.4 Maximum Peak Power Output FCC Section 15.247(b)(3)

4.4.1 Maximum Peak Power Output Test Procedure

A conducted power measurement of the output frequency was measured for both Antenna 0 and Antenna 1. The Antenna 0 and Antenna 1 were set individually to low (Channel 11), middle (Channel 19) and high (Channel 26). The signal output was maximized without modulation. Signal was measured with no modulation since the peak of the signal was higher when modulation was turned off.

4.4.2 Maximum Peak Power Output Analyzer Display Captures Antenna 0

Antenna 0, Channel 11 (2.405 GHz)



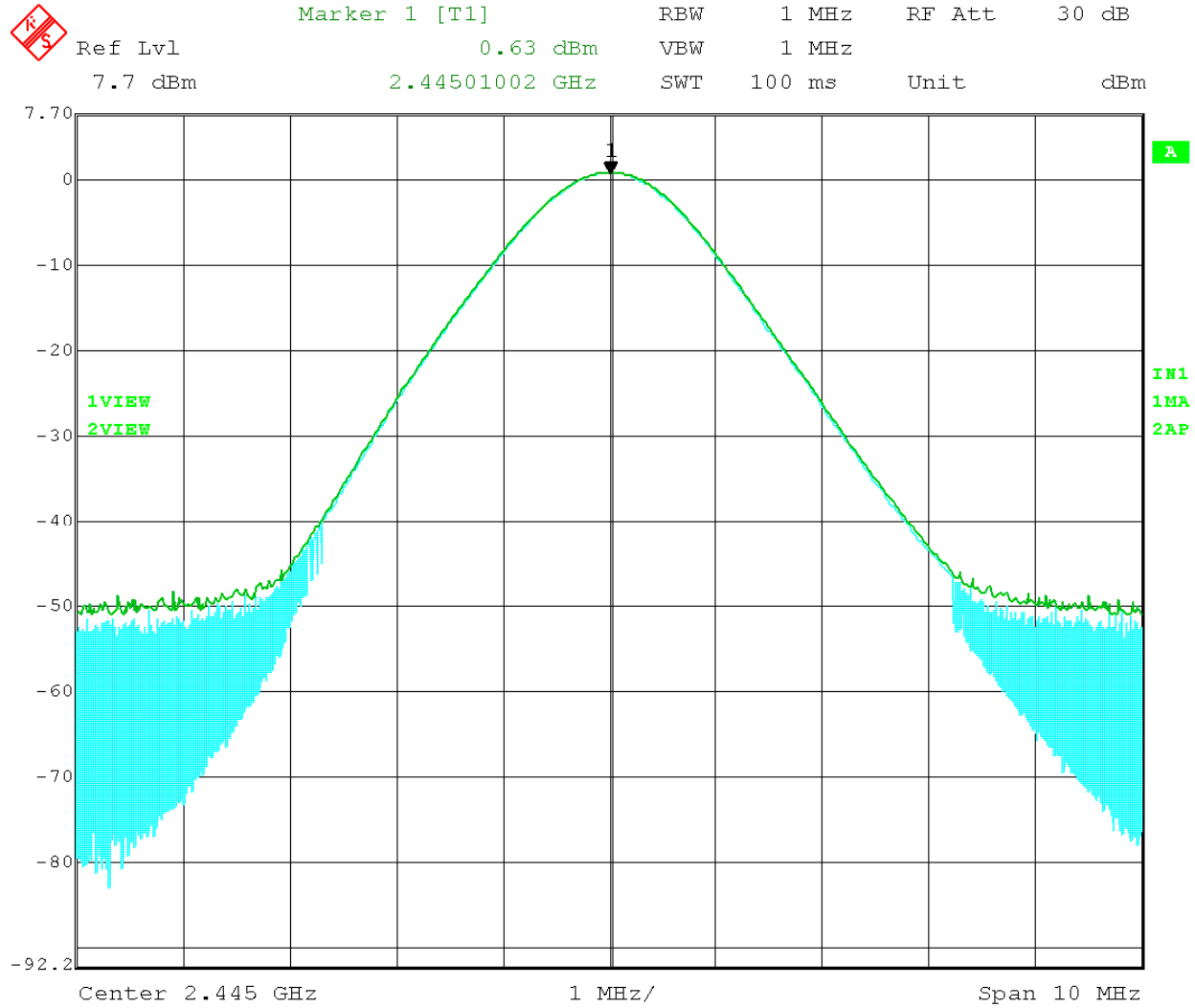
Date: 15.DEC.2014 11:54:22

Report # BEC- 1585-01 REV1 ARRIS IP810 FCC Part 15.247 Test Report

Release Date: 01/22/2015



Antenna 0, Channel 19 (2.445 GHz)



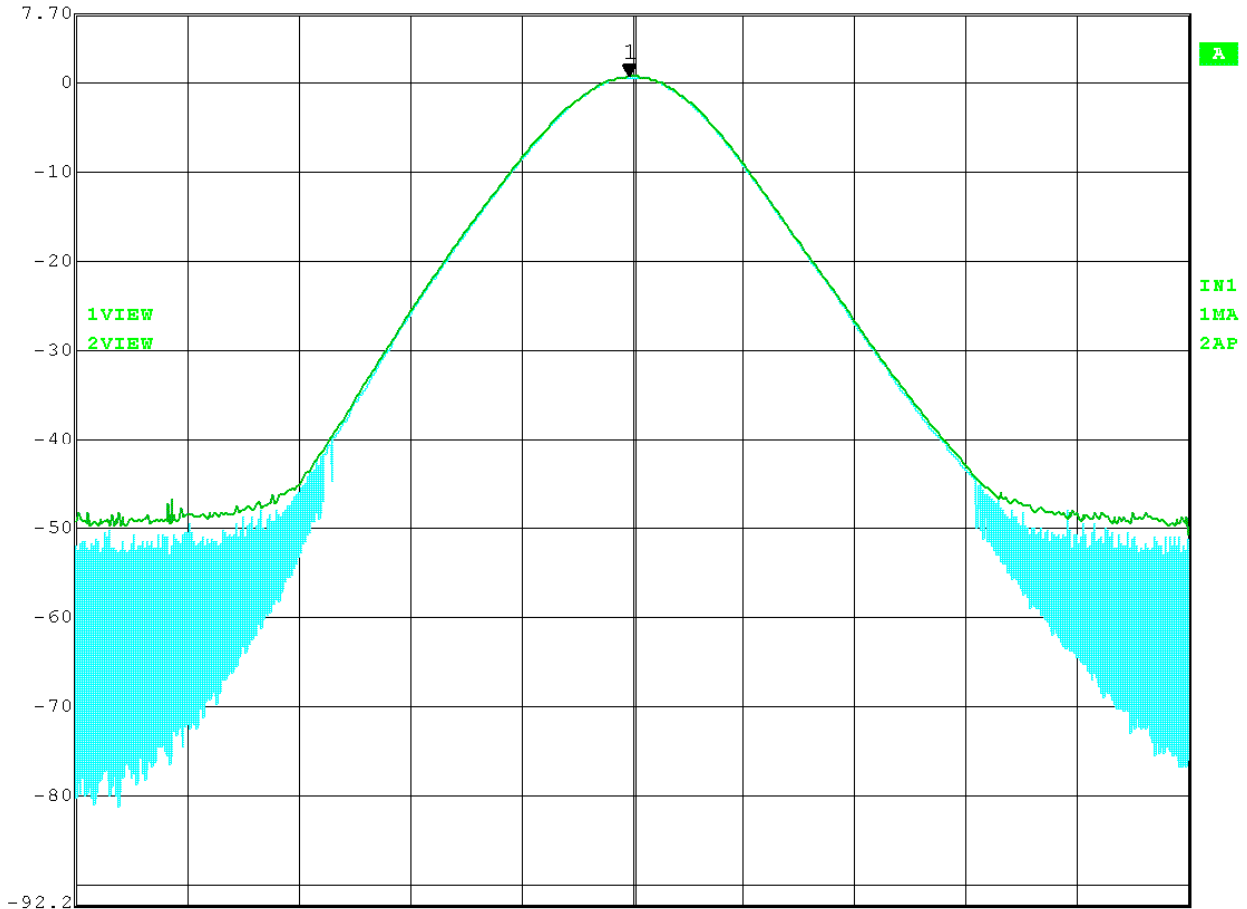
Date: 15.DEC.2014 11:52:46



Antenna 0, Channel 26 (2.480 GHz)



Marker 1 [T1] RBW 1 MHz RF Att 30 dB
Ref Lvl 0.47 dBm VBW 1 MHz
7.7 dBm 2.47996994 GHz SWT 100 ms Unit dBm



Center 2.48 GHz

1 MHz/

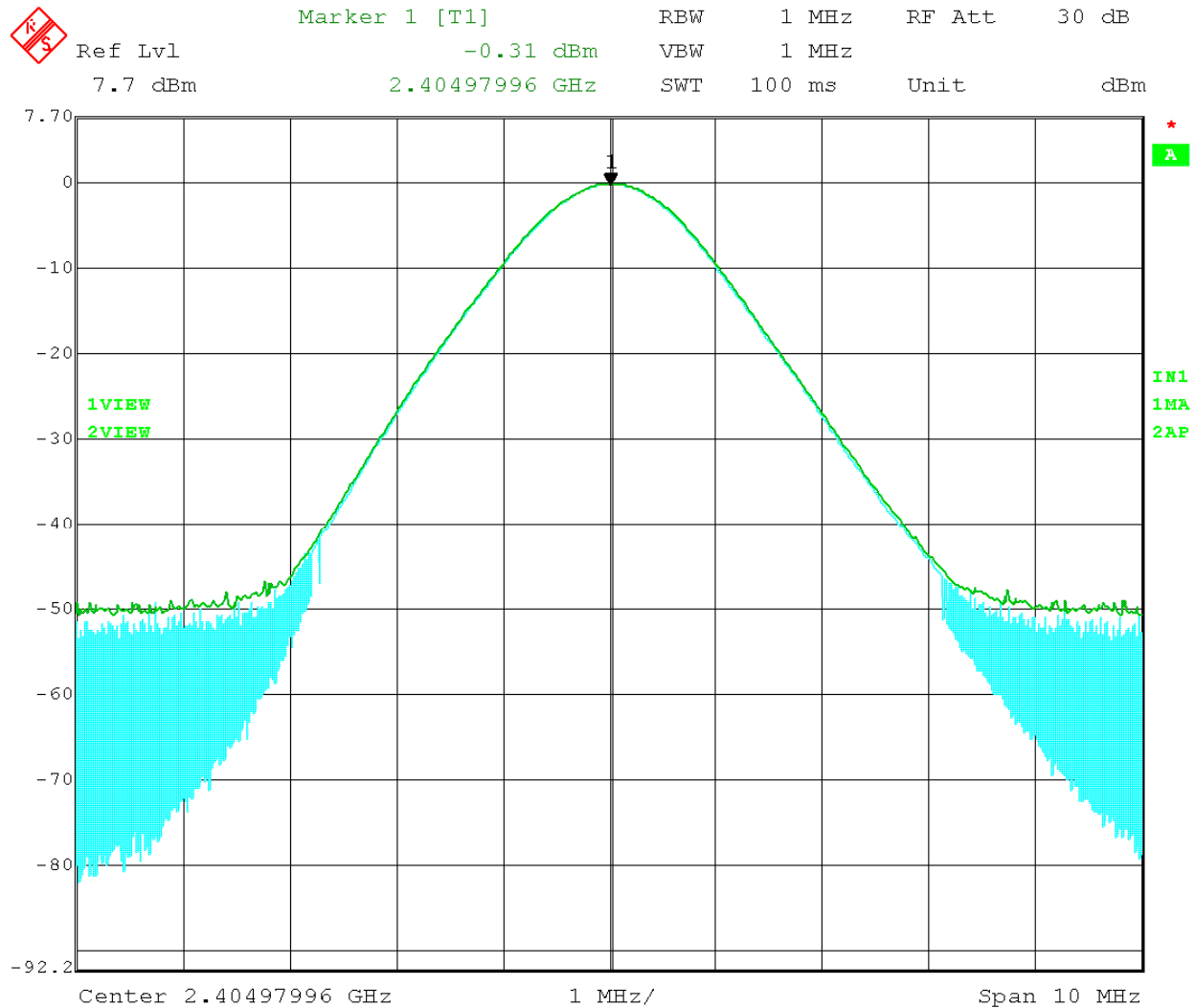
Span 10 MHz

Date: 15.DEC.2014 11:49:31



4.4.3 Maximum Peak Power Output Analyzer Display Captures Antenna 1

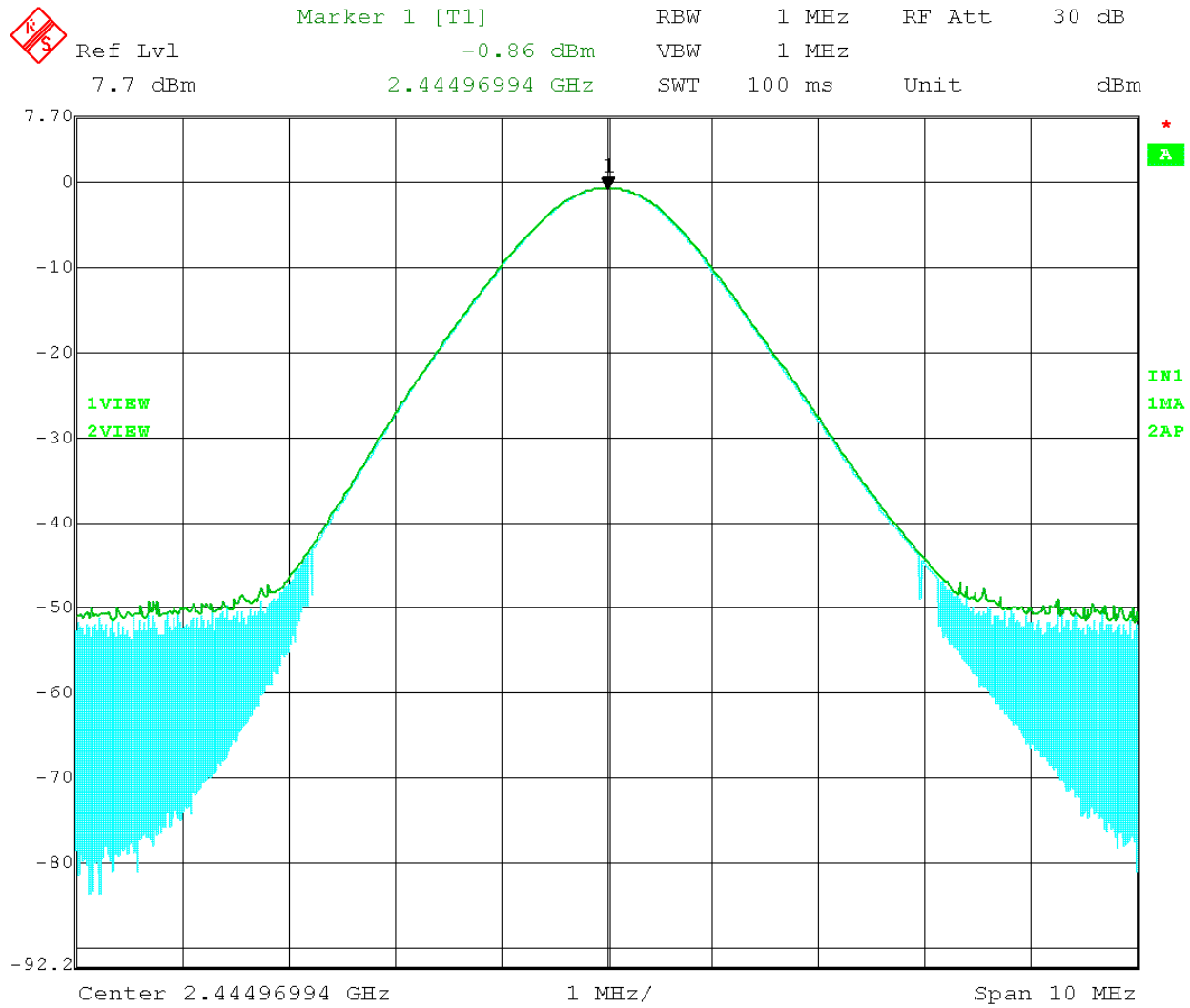
Antenna 1, Channel 11 (2.405 GHz)



Date: 15.DEC.2014 11:58:14



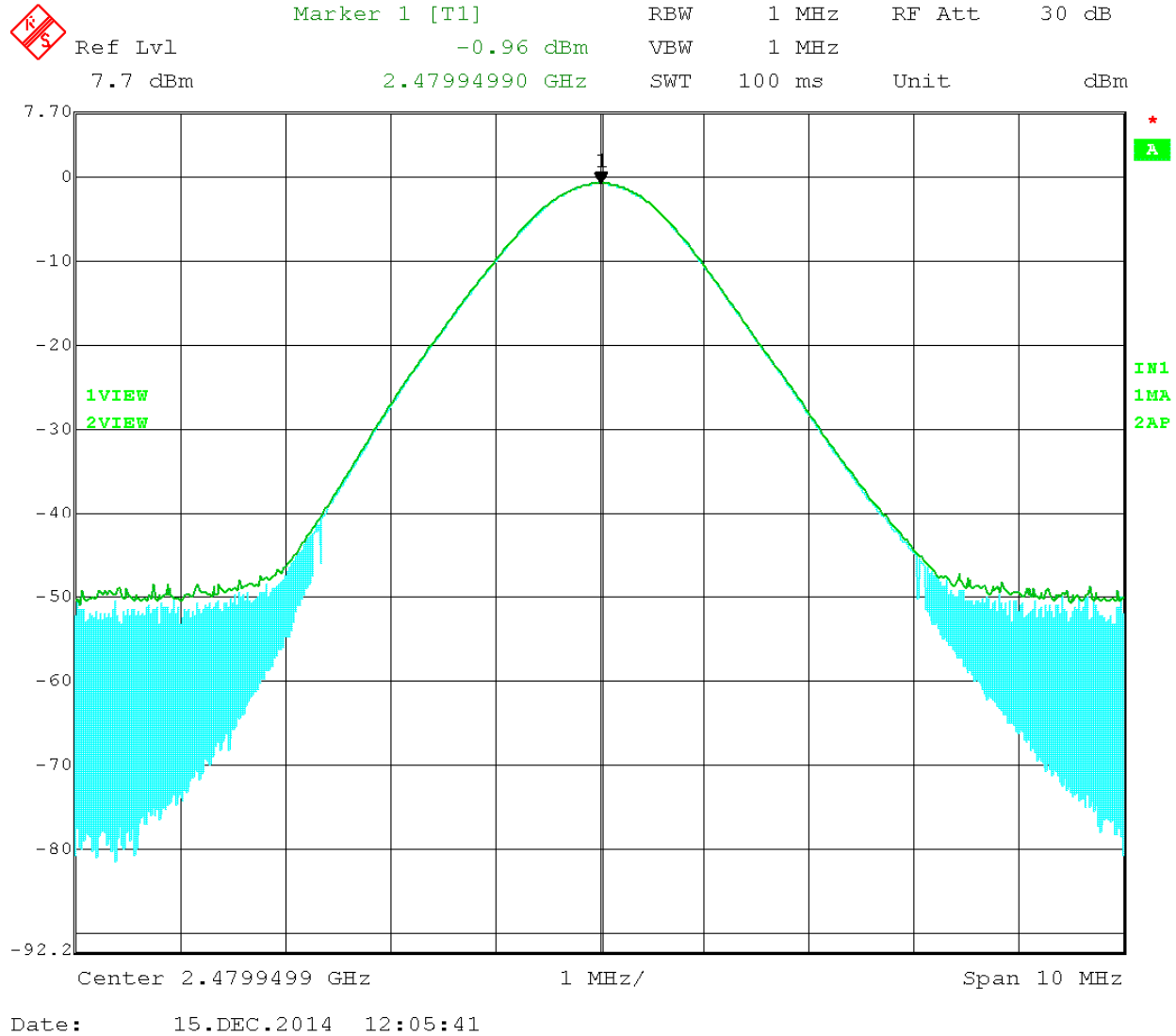
Antenna 1, Channel 19 (2.445 GHz)



Date: 15.DEC.2014 12:04:31



Antenna 1, Channel 26 (2.480 GHz)





4.4.4 Maximum Peak Power Output Test Results (12/15/2014)

Antenna 0

| Frequency GHz | Measured Level dBm | Cable Loss dB | Total | | Limit | | Margin | |
|---------------|--------------------|---------------|-------|---------|-------|-------|--------|----------|
| | | | dBm | Watts | dBm | Watts | dBm | Watts |
| 2.405 | 0.89 | 0.63 | 1.52 | 0.00142 | 30 | 1 | -28.48 | -0.99858 |
| 2.445 | 0.63 | 0.63 | 1.26 | 0.00134 | 30 | 1 | -28.74 | -0.99866 |
| 2.480 | 0.47 | 0.63 | 1.1 | 0.00129 | 30 | 1 | -28.9 | -0.99871 |

Antenna 1

| Frequency GHz | Measured Level dBm | Cable Loss dB | Total | | Limit | | Margin | |
|---------------|--------------------|---------------|-------|---------|-------|-------|--------|----------|
| | | | dBm | Watts | dBm | Watts | dBm | Watts |
| 2.405 | -0.31 | 0.63 | 0.32 | 0.00108 | 30 | 1 | -29.68 | -0.99892 |
| 2.445 | -0.86 | 0.63 | -0.23 | 0.00095 | 30 | 1 | -30.23 | -0.99905 |
| 2.480 | -0.96 | 0.63 | -0.33 | 0.00093 | 30 | 1 | -30.33 | -0.99907 |

Results: The Peak Power Output measurements for antenna 0 and antenna 1 of the ARRIS Model IP810 Set Top Box are compliant with the limits specified in FCC Section 15.247(b)(3).



4.5 Antenna Conducted Spurious Emissions FCC Section 15.247(d)

4.5.1 Antenna Conducted Spurious Emissions Test Procedure

A conducted power measurement of the output frequency was measured for both Antenna 0 and Antenna 1. The Antenna 0 and Antenna 1 were set individually to low (Channel 11), middle (Channel 19) and high (Channel 26). The signal output was maximized with modulation.

4.5.2 Antenna Conducted Spurious Emissions Test Results (12/15/2014)

Antenna 0

| Channel | Fundamental Channel Frequency (GHz) | Measured Antenna Conducted Frequency (GHz) | Measured Antenna Conducted Frequency Level (dBm) | BEC#814 Cable Loss (dB) | Total Corrected Level (dBm) | Output Spurious Limit (dBm) | Pass/Fail |
|---------|-------------------------------------|--|--|-------------------------|-----------------------------|-----------------------------|-----------|
| 11 | 2.405 | 4.7650 | -61.44 | 0.92 | -60.52 | -21.84 | PASS |
| 11 | 2.405 | 7.2084 | -69.88 | 1.06 | -68.82 | -21.84 | PASS |
| 11 | 2.405 | No other harmonics to 24 GHz | | | | | |
| 19 | 2.445 | 4.9038 | -62.68 | 0.95 | -61.73 | -21.99 | PASS |
| 19 | 2.445 | 12.2320 | -65.64 | 2.27 | -63.37 | -21.84 | PASS |
| 19 | 2.445 | No other harmonics to 24 GHz | | | | | |
| 26 | 2.480 | 4.9499 | -62.96 | 0.95 | -62.01 | -23.23 | PASS |
| 26 | 2.480 | 12.3707 | -63.35 | 2.27 | -61.08 | -21.84 | PASS |
| 26 | 2.480 | No other harmonics to 24 GHz | | | | | |



Antenna 1

| Channel | Fundamental Channel Frequency (GHz) | Measured Antenna Conducted Frequency (GHz) | Measured Antenna Conducted Frequency Level (dBm) | BEC#814 Cable Loss (dB) | Total Corrected Level (dBm) | Output Spurious Limit (dBm) | Pass/Fail | |
|---------|-------------------------------------|--|--|-------------------------|-----------------------------|-----------------------------|-----------|--|
| 11 | 2.405 | 4.7655 | -64.07 | 0.92 | -63.15 | -21.7 | PASS | |
| 11 | 2.405 | 7.2084 | -69.41 | 1.06 | -68.35 | -21.7 | PASS | |
| 11 | 2.405 | No other harmonics to 24 GHz | | | | | | |
| 19 | 2.445 | 4.8577 | -65.77 | 0.95 | -64.82 | -22.07 | PASS | |
| 19 | 2.445 | 7.2084 | -69.31 | 1.06 | -68.25 | -21.7 | PASS | |
| 19 | 2.445 | No other harmonics to 24 GHz | | | | | | |
| 26 | 2.480 | 4.9499 | -65.22 | 0.95 | -64.27 | -23.59 | PASS | |
| 26 | 2.480 | 7.2084 | -68.94 | 1.06 | -67.88 | -21.7 | PASS | |
| 26 | 2.480 | No other harmonics to 24 GHz | | | | | | |

Results: The Antenna Conducted Spurious Emissions measurements for antenna 0 and antenna 1 of the ARRIS Model IP810 Set Top Box are compliant with the limits specified in FCC Section 15.247(d).



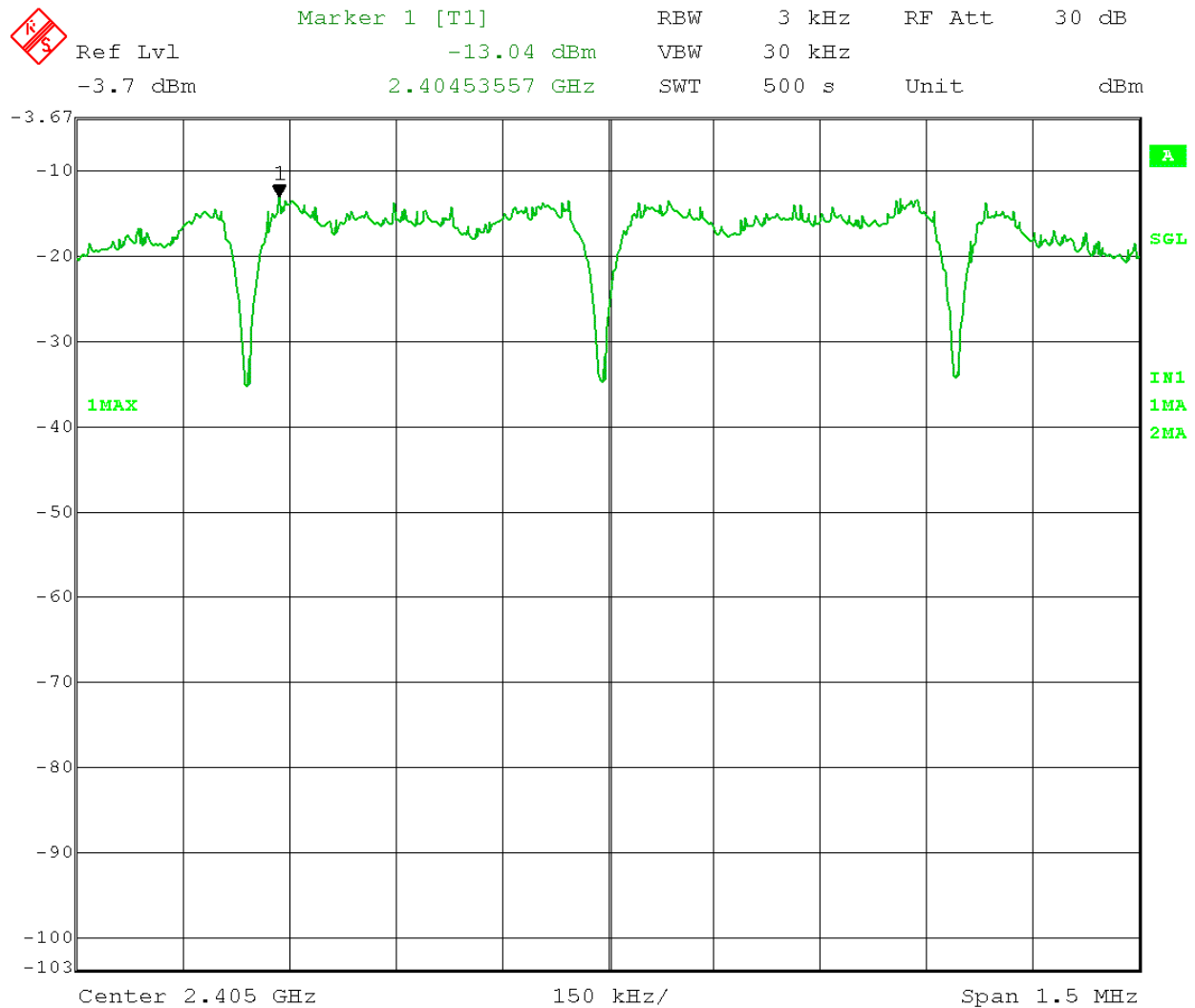
4.6 Power Spectral Density FCC Section 15.247(e)

4.6.1 Power Spectral Density Test Procedure

A conducted power measurement of the output frequency was measured for both Antenna 0 and Antenna 1. The Antenna 0 and Antenna 1 were set individually to low (Channel 11), middle (Channel 19) and high (Channel 26). The signal output was maximized with modulation.

4.6.2 Power Spectral Density Analyzer Display Captures Antenna 0

Antenna 0, Channel 11 (2.405 GHz)



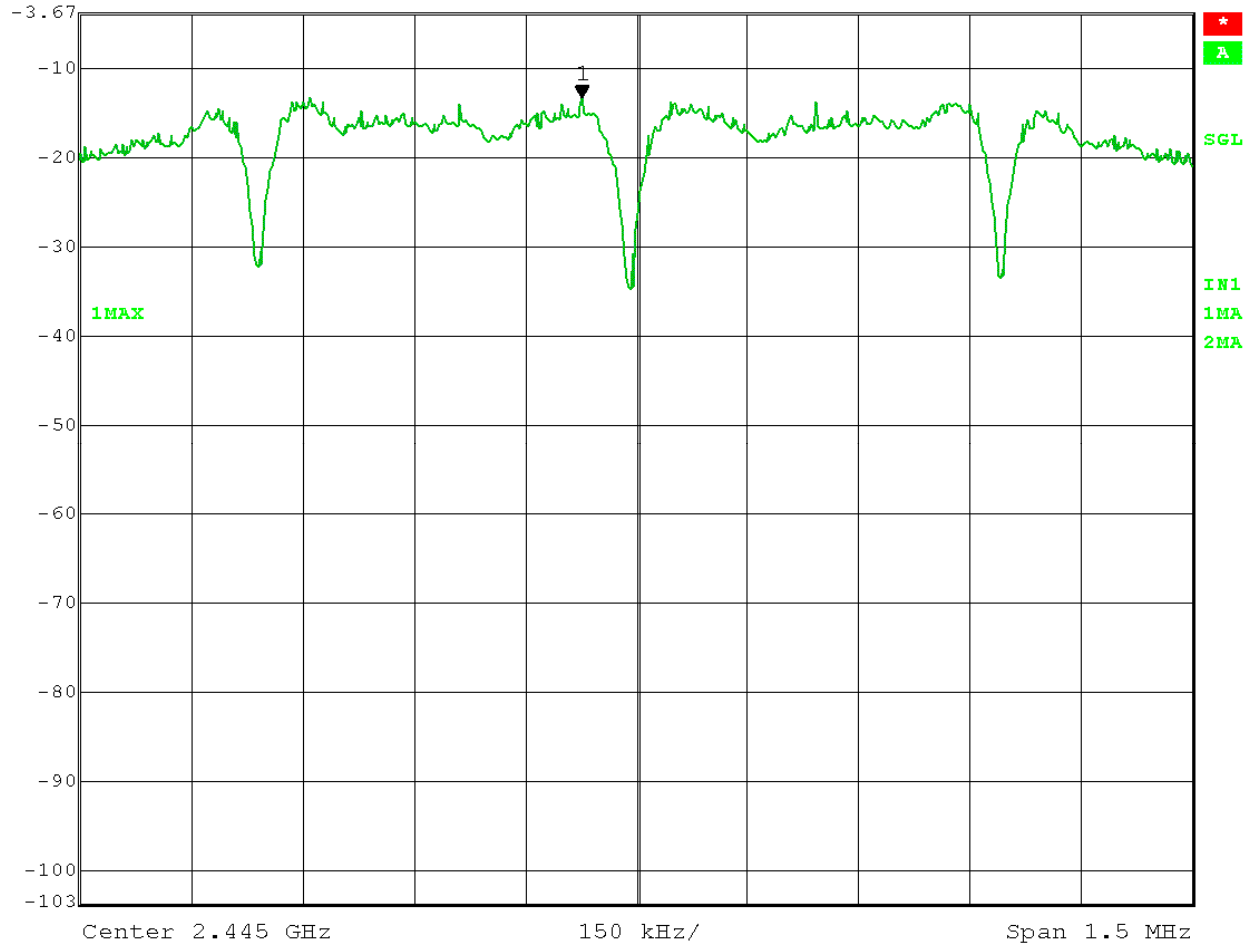
Date: 15.DEC.2014 14:42:22



Antenna 0, Channel 19 (2.445 GHz)



Ref Lvl Marker 1 [T1] RBW 3 kHz RF Att 30 dB
-3.7 dBm -13.30 dBm VBW 30 kHz
 2.44492635 GHz SWT 500 s Unit dBm



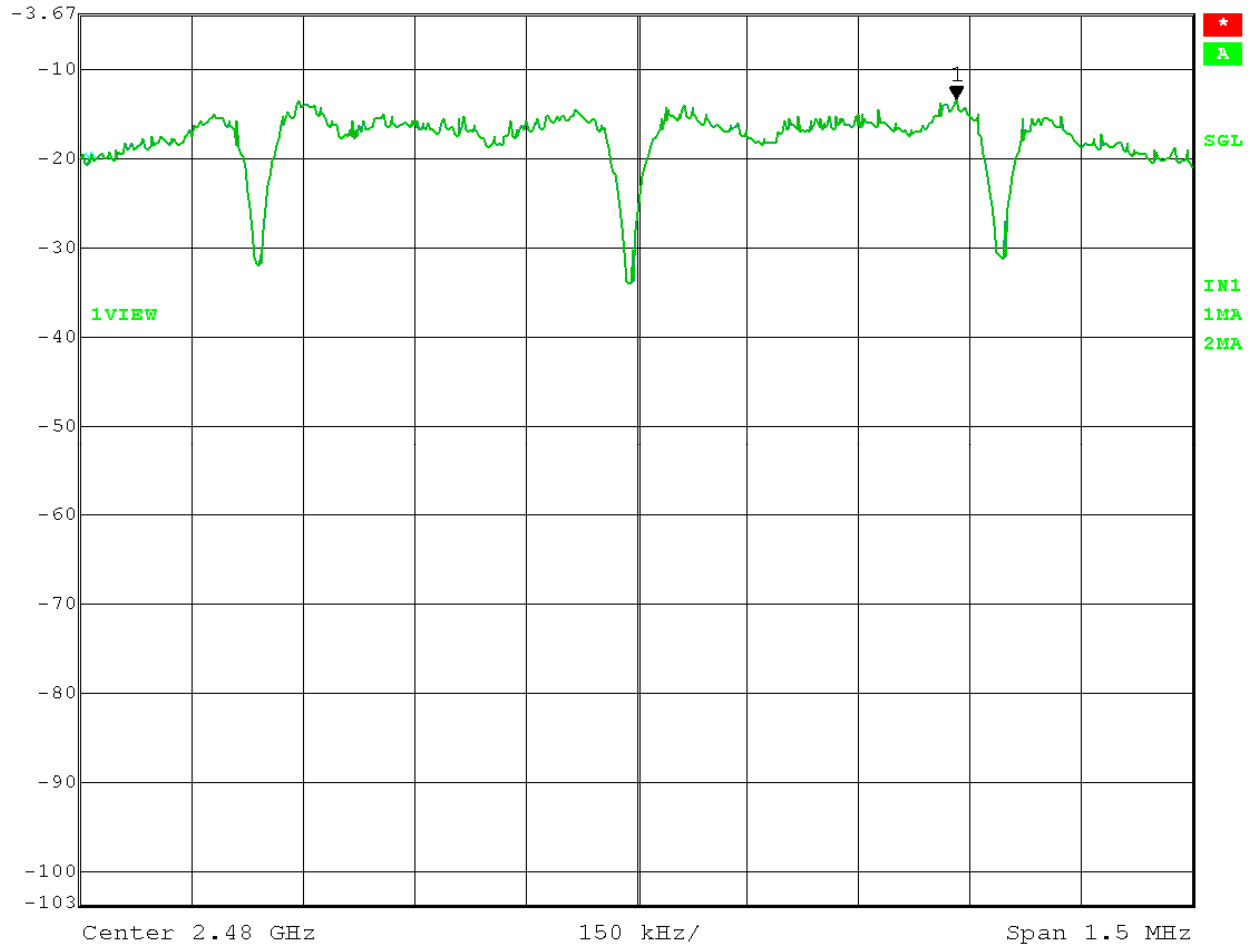
Date: 15.DEC.2014 15:06:22



Antenna 0, Channel 26 (2.480 GHz)



| | | | | | |
|----------|----------------|-----|--------|--------|-------|
| Ref Lvl | Marker 1 [T1] | RBW | 3 kHz | RF Att | 30 dB |
| -3.7 dBm | -13.37 dBm | VBW | 30 kHz | | |
| | 2.48043136 GHz | SWT | 500 s | Unit | dBm |

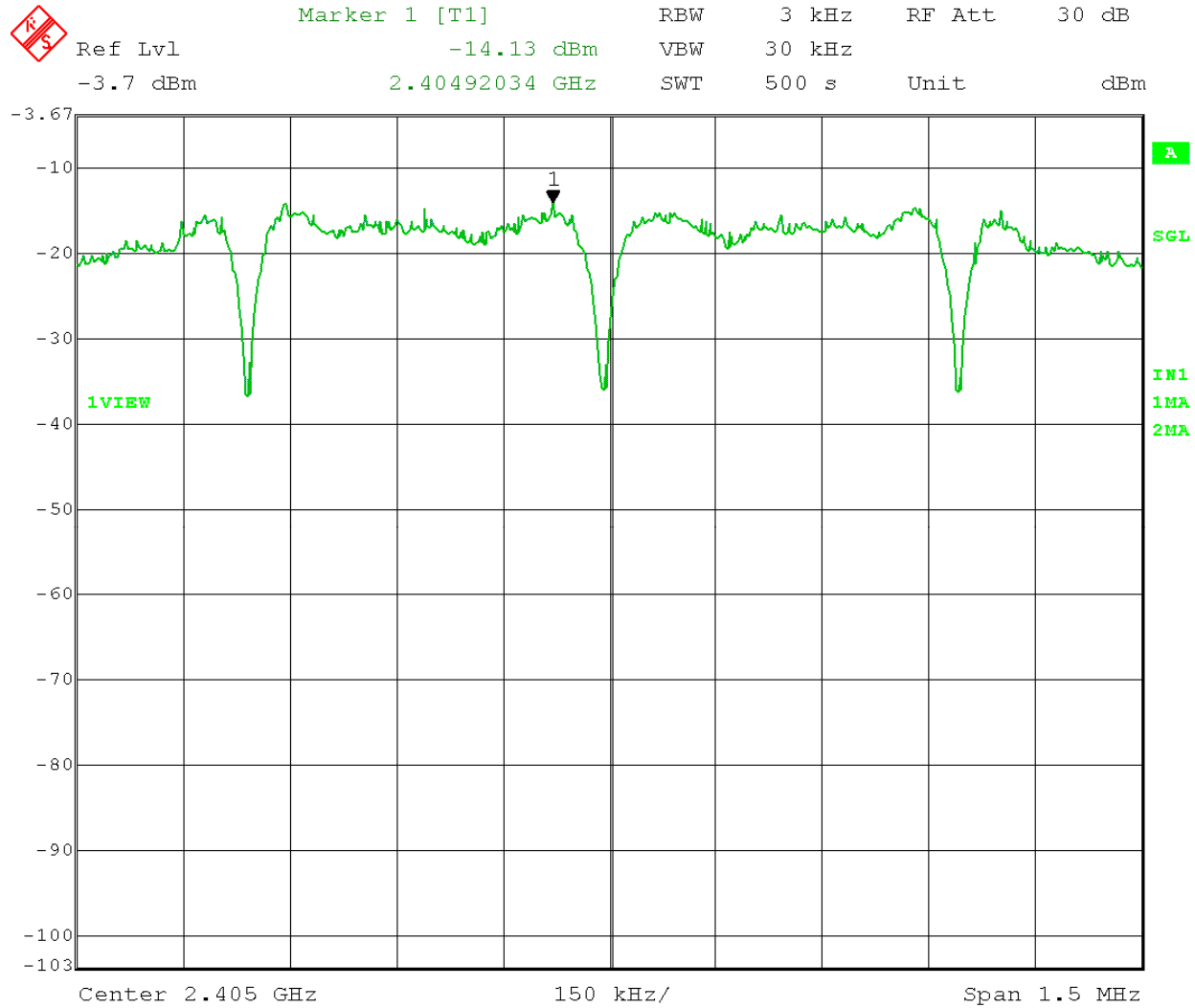


Date: 15.DEC.2014 15:24:36



4.6.3 Power Spectral Density Analyzer Display Captures Antenna 1

Antenna 1, Channel 11 (2.405 GHz)



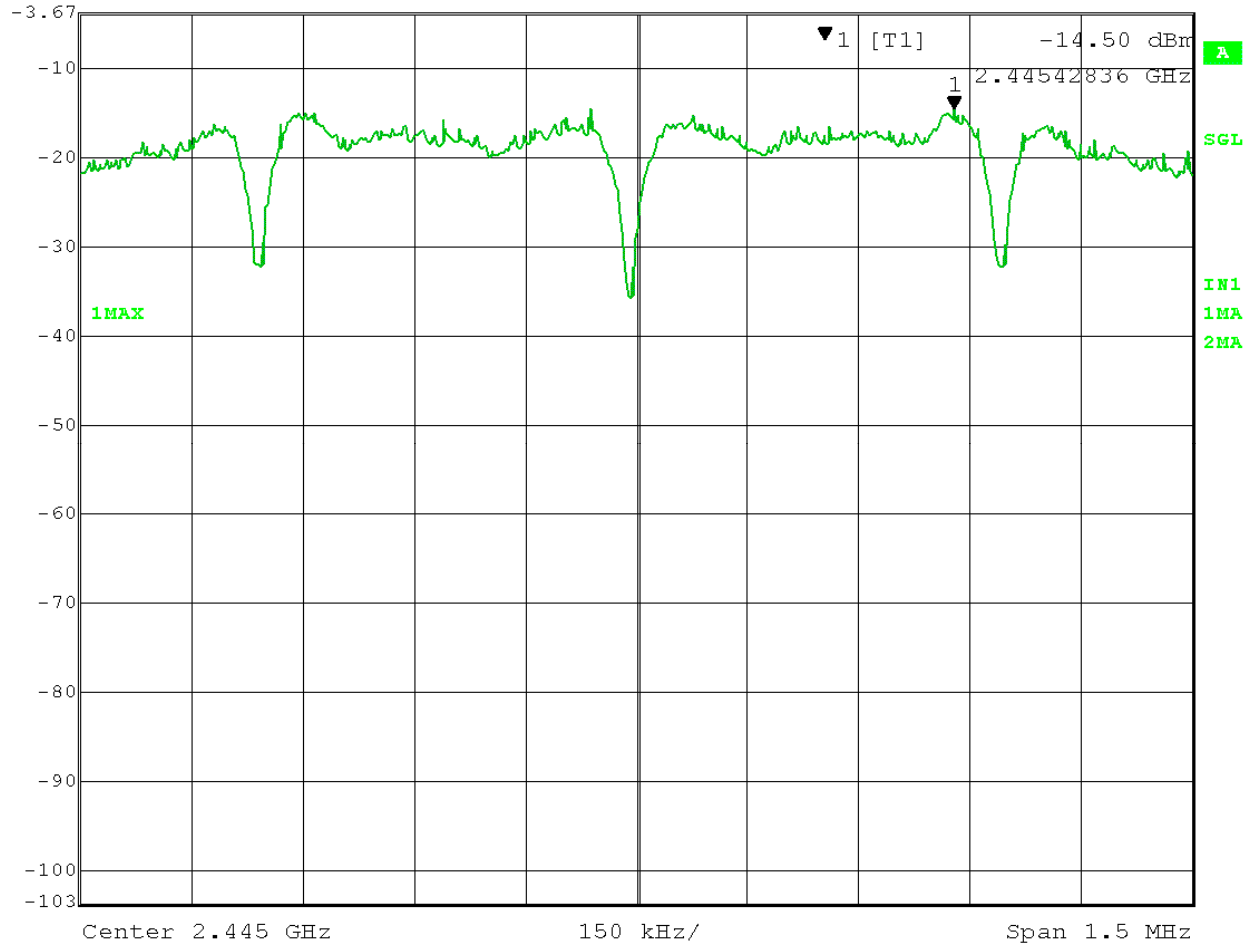
Date: 15.DEC.2014 14:24:14



Antenna 1, Channel 19 (2.445 GHz)



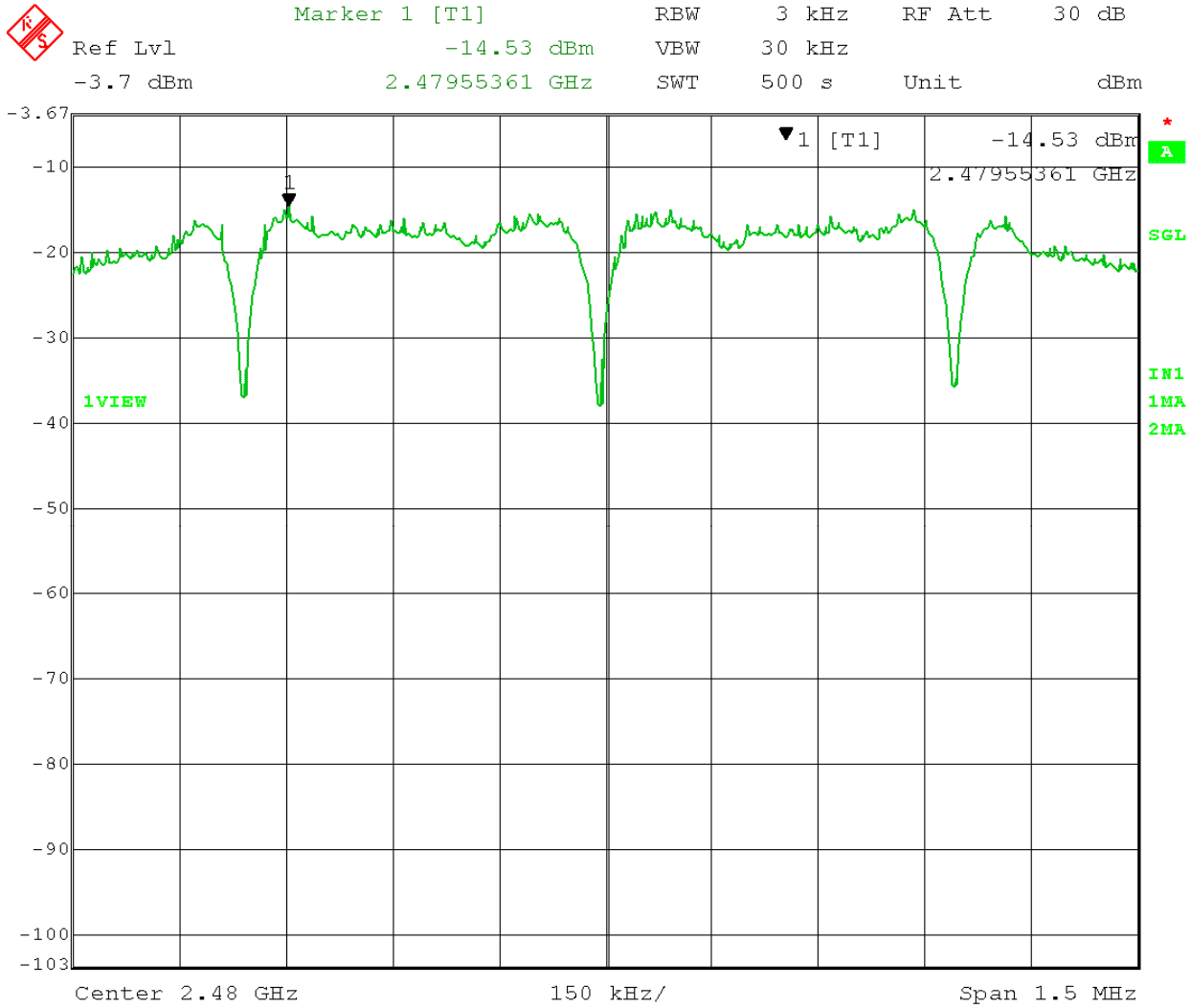
| | | | | | |
|----------|----------------|-----|--------|--------|-------|
| Ref Lvl | Marker 1 [T1] | RBW | 3 kHz | RF Att | 30 dB |
| -3.7 dBm | -14.50 dBm | VBW | 30 kHz | | |
| | 2.44542836 GHz | SWT | 500 s | Unit | dBm |



Date: 15.DEC.2014 13:42:07



Antenna 1, Channel 26 (2.480 GHz)



Date: 15.DEC.2014 13:26:33



4.6.4 Power Spectral Density Test Results (12/15/2014)

Antenna 0

| Antenna | Channel | Freq (GHz) | Measured Power Spectral Density (dBm) | Cable Loss (dB) | Total Power Spectral Density (dBm) | Power Spectral Density Limit (dBm) | Pass/Fail |
|---------|---------|------------|---------------------------------------|-----------------|------------------------------------|------------------------------------|-----------|
| 0 | CH.11 | 2.4045 | -13.04 | 0.63 | -12.41 | 8 | PASS |
| 0 | CH.19 | 2.4449 | -13.3 | 0.63 | -12.67 | 8 | PASS |
| 0 | CH.26 | 2.4804 | -13.37 | 0.63 | -12.74 | 8 | PASS |

Antenna 1

| Antenna | Channel | Freq (GHz) | Measured Power Spectral Density (dBm) | Cable Loss (dB) | Total Power Spectral Density (dBm) | Power Spectral Density Limit (dBm) | Pass/Fail |
|---------|---------|------------|---------------------------------------|-----------------|------------------------------------|------------------------------------|-----------|
| 1 | CH.11 | 2.4049 | -14.13 | 0.63 | -13.5 | 8 | PASS |
| 1 | CH.19 | 2.4454 | -14.5 | 0.63 | -13.87 | 8 | PASS |
| 1 | CH.26 | 2.4796 | -14.53 | 0.63 | -13.9 | 8 | PASS |

Results: The Power Spectral Density measurements for antenna 0 and antenna 1 of the ARRIS Model IP810 Set Top Box are compliant with the limits specified in FCC Section 15.247(e).



4.7 Band Edge Measurement FCC Section 15.247(d)

4.7.1 Band Edge Measurement Test Procedure

Band edge measurements were recorded on the EUT while operating with a modulated carrier at three frequencies (low middle and high) in the operating band of 2.4 GHz to 2.48 GHz. The measurement procedure used was the conducted output power method, where the antenna output port of the EUT was connected to the receiver input port for direct measurement.

The frequencies and associated channel numbers chosen for measurement were as follows:

| Channel | Frequency (GHz) |
|---------|-----------------|
| 11 | 2.405 |
| 19 | 2.445 |
| 26 | 2.480 |

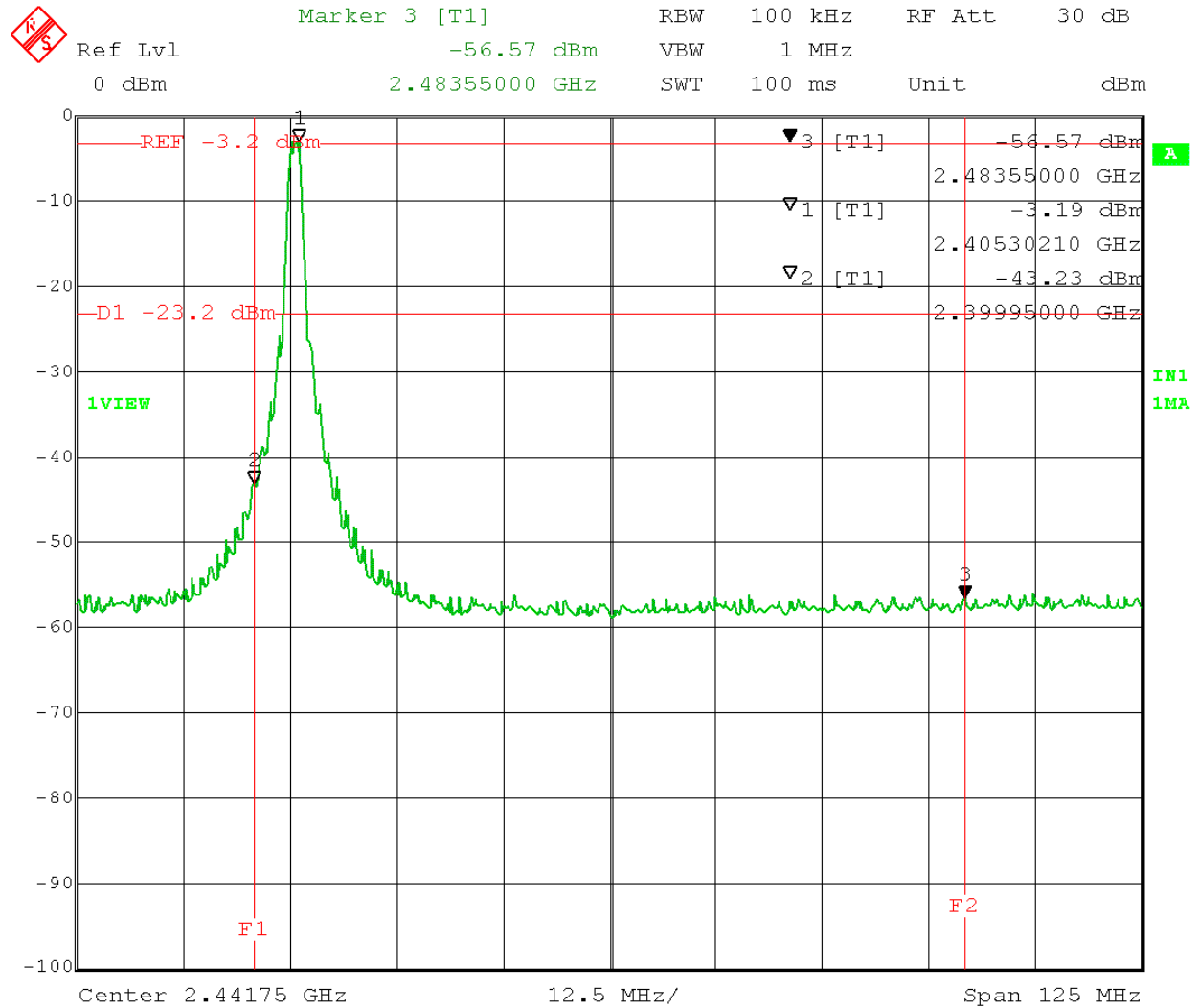
The data was recorded in three screen captures from the Spectrum Analyzer. Parameters particular to each measurement are as follows:

| | |
|----------------------|---------|
| Center Frequency | |
| Resolution Bandwidth | 100 kHz |
| Video Bandwidth | 1 MHz |
| Span | 125 MHz |
| Scale: | dBm |
| Reference Level: | 0 dBm |



4.7.2 Band Edge Measurement Analyzer Display Captures Antenna 0

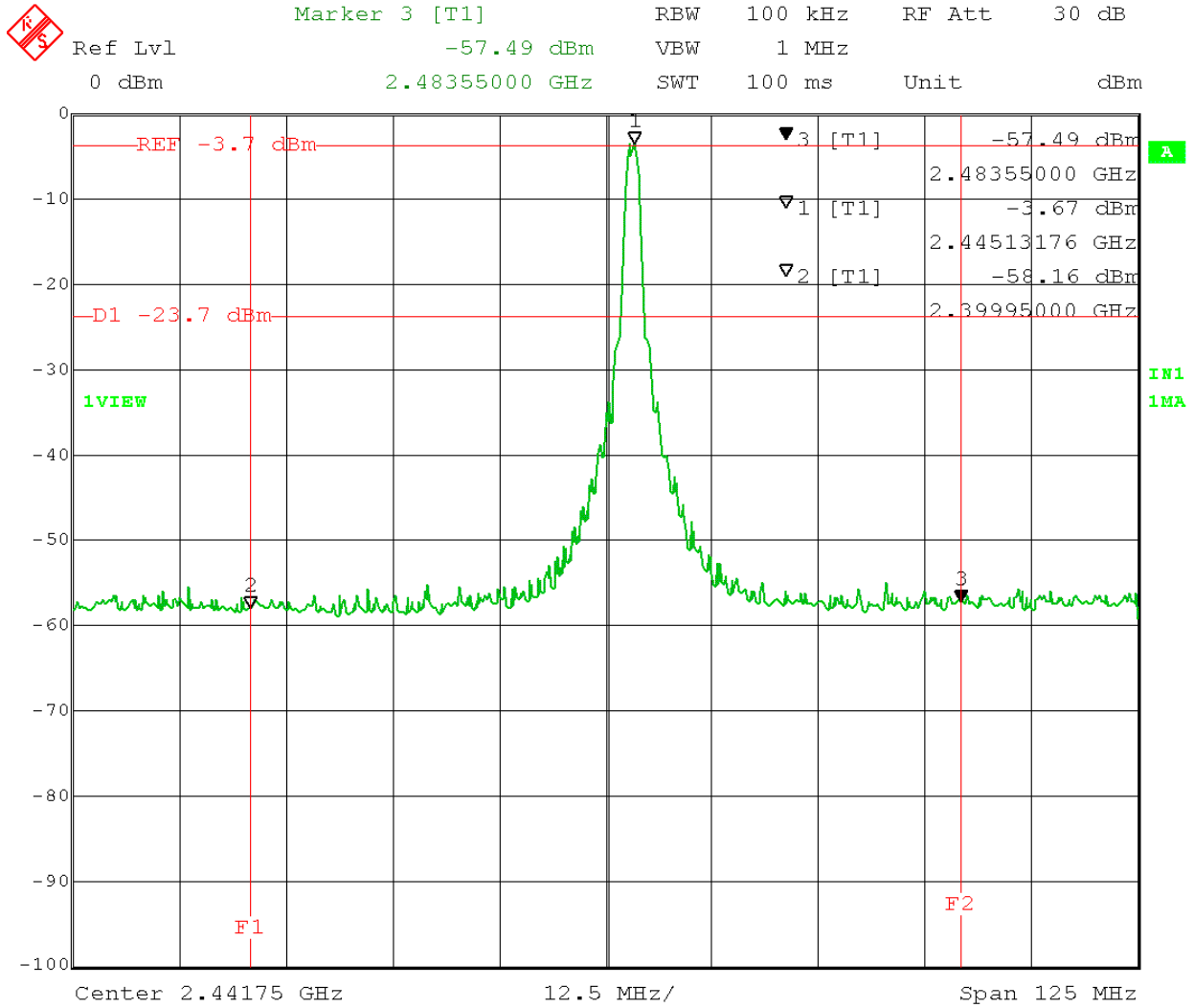
Antenna 0, Channel 11 (2.405 GHz)



Date: 6.JAN.2015 15:31:55



Antenna 0, Channel 19 (2.445 GHz)

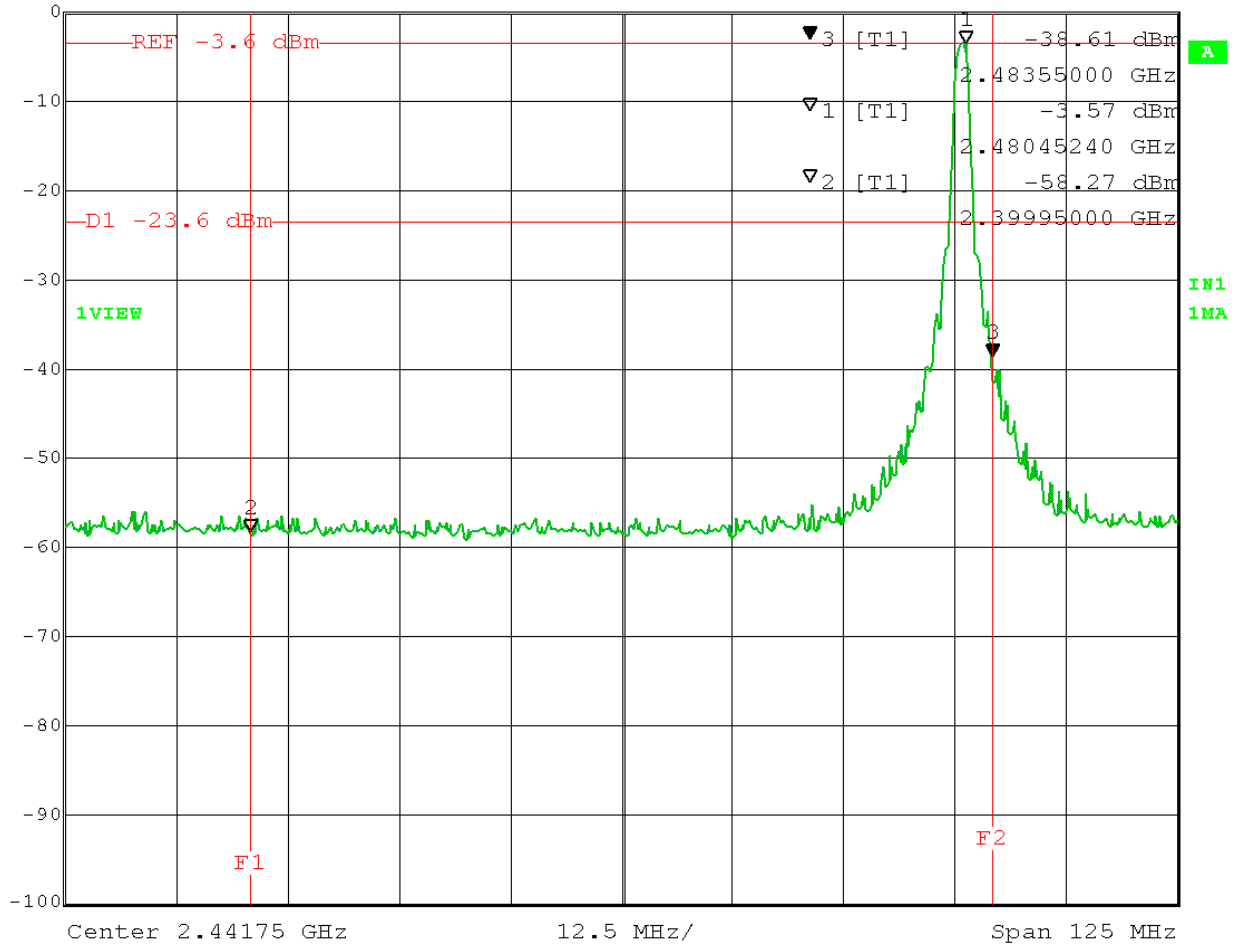


Date: 6.JAN.2015 15:38:27

Antenna 0, Channel 26 (2.480 GHz)



Marker 3 [T1] RBW 100 kHz RF Att 30 dB
Ref Lvl -38.61 dBm VBW 1 MHz
0 dBm 2.48355000 GHz SWT 100 ms Unit dBm

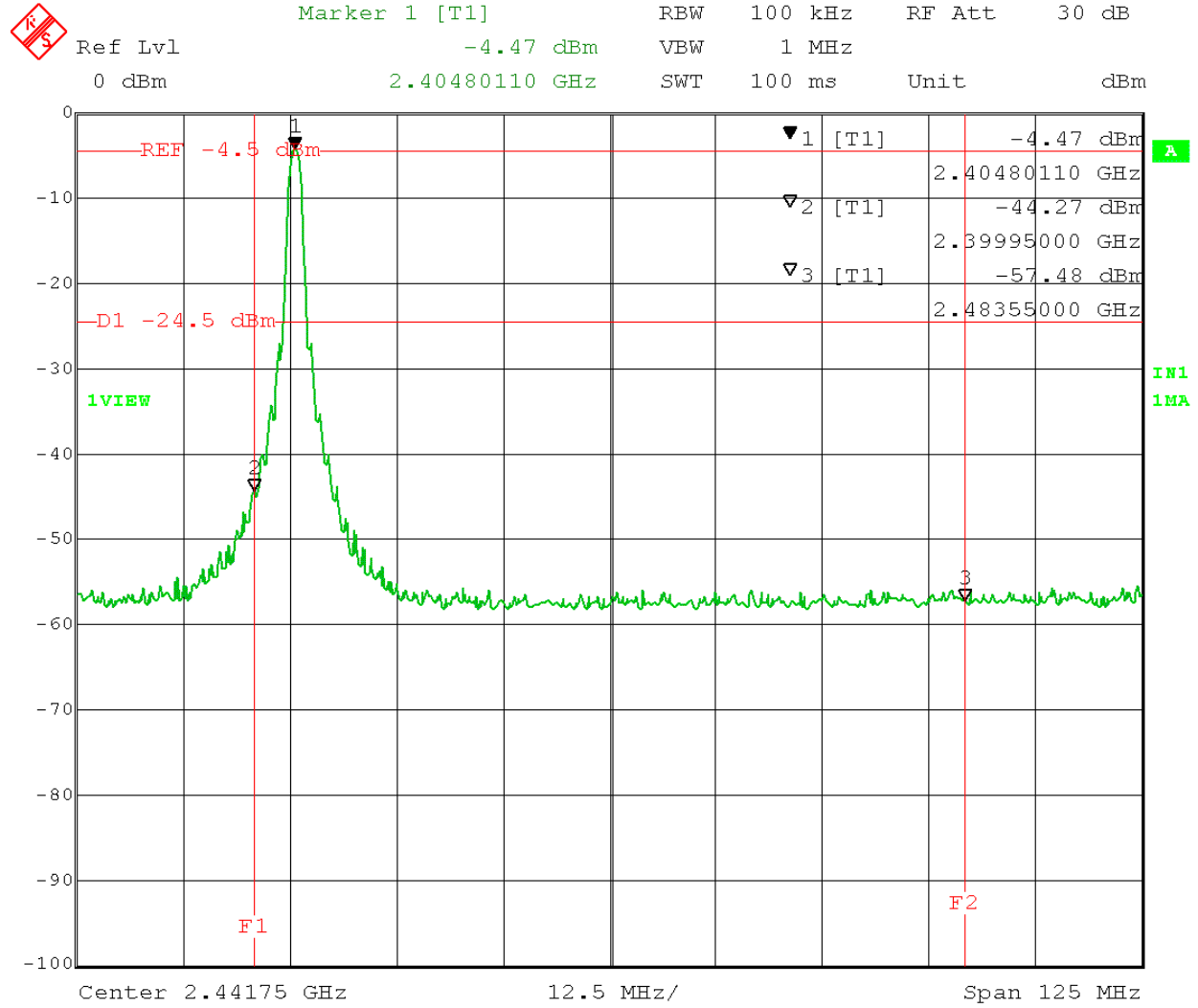


Date: 6.JAN.2015 15:42:48



4.7.3 Band Edge Measurement Analyzer Display Captures Antenna 1

Antenna 1, Channel 11 (2.405 GHz)



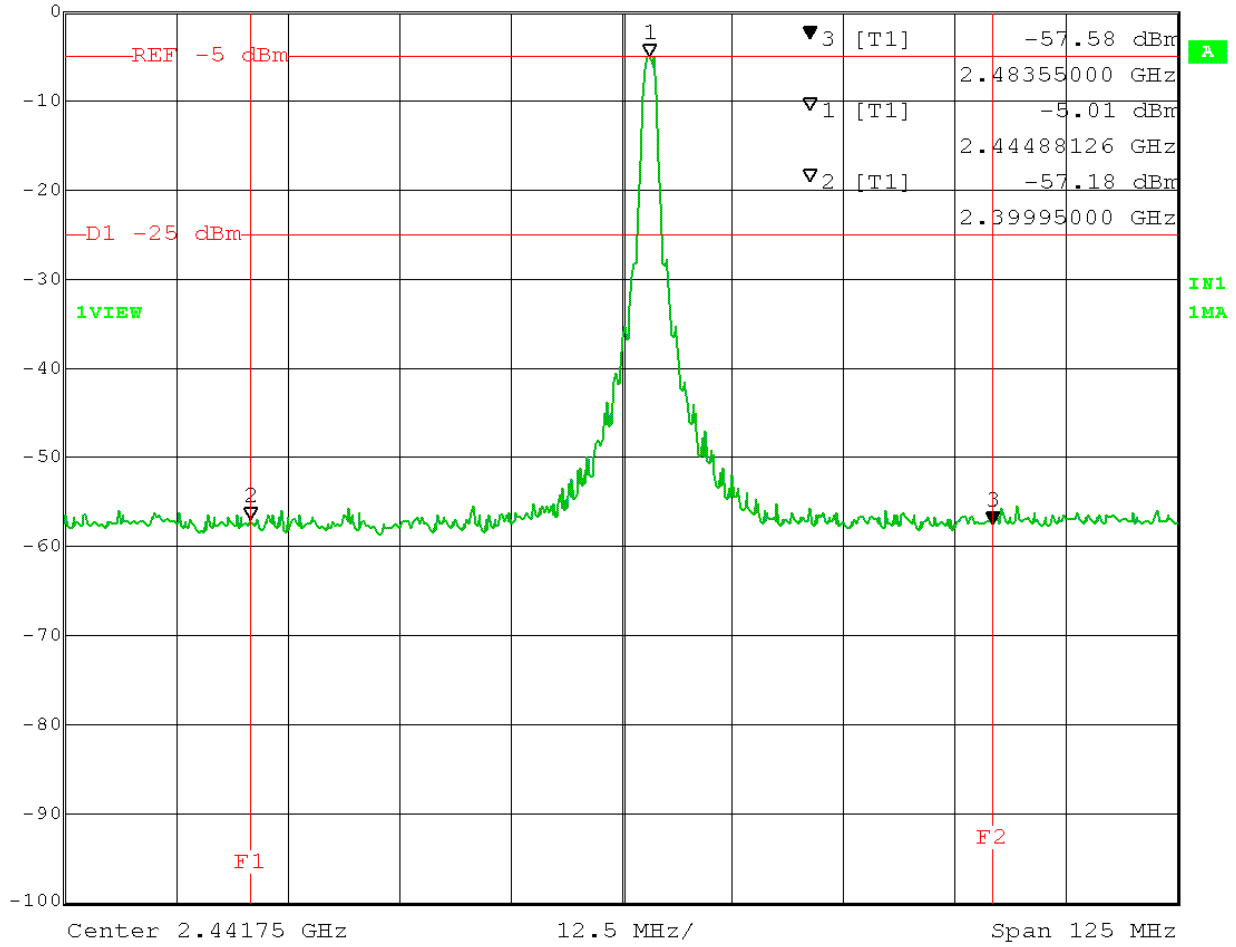
Date: 6.JAN.2015 14:01:00



Antenna 1, Channel 19 (2.445 GHz)



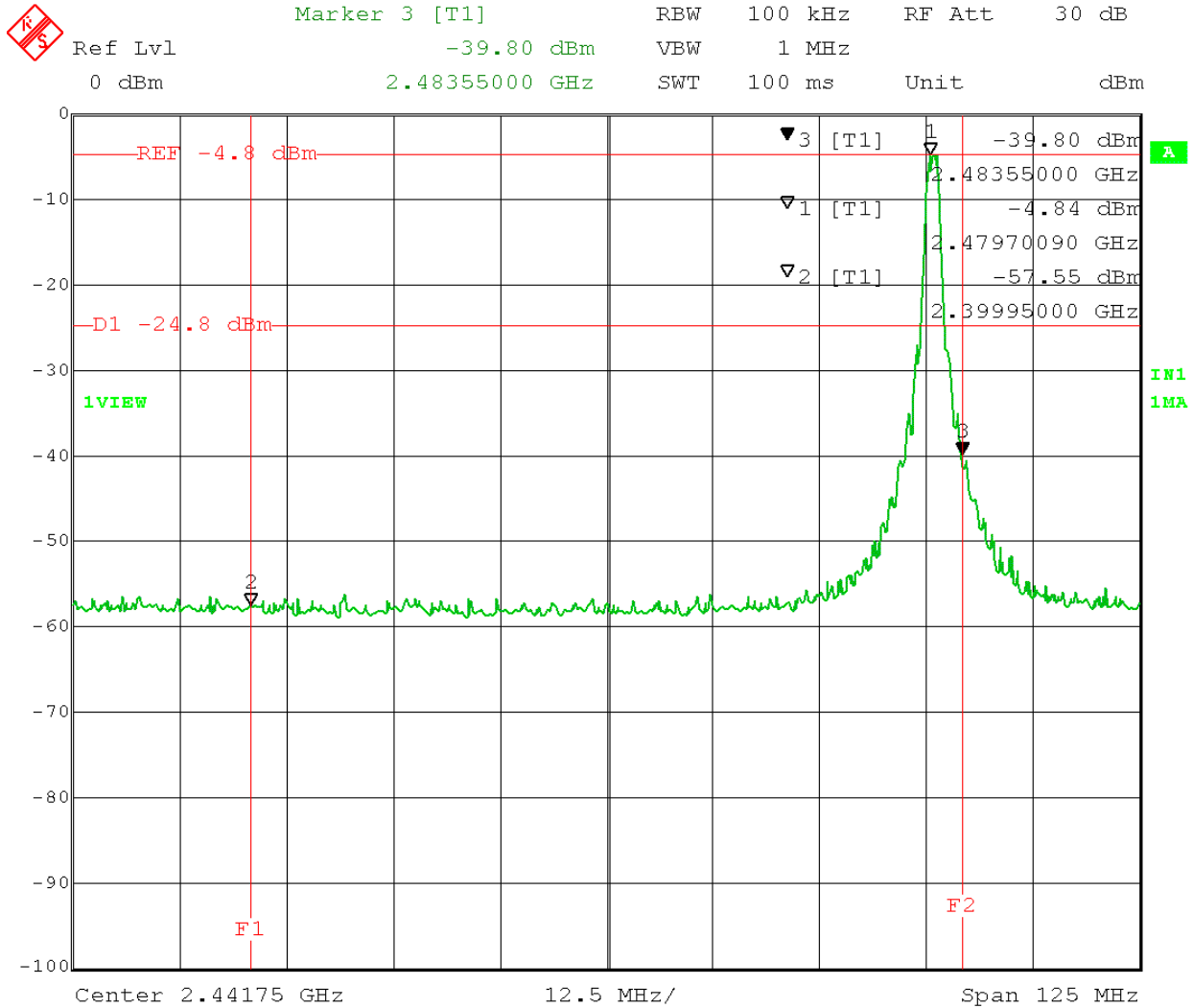
Marker 3 [T1] RBW 100 kHz RF Att 30 dB
Ref Lvl -57.58 dBm VBW 1 MHz
0 dBm 2.48355000 GHz SWT 100 ms Unit dBm



Date: 6.JAN.2015 14:54:51



Antenna 0, Channel 26 (2.480 GHz)



Date: 6.JAN.2015 15:53:42



4.7.4 Band Edge Measurement Test Data Results (01/06/2015)

Antenna 0

| Channel | Measurement Frequency (GHz) | Peak Amplitude (dBm) | 20 dB Limit | Lower Edge of Freq Band (GHz) | Upper Edge of Freq Band (GHz) | Lower Measured Freq (GHz) | Lower Measured Amplitude (dBm) | Upper Measured Frequency (GHz) | Upper Measured Amplitude (dBm) |
|---------|-----------------------------|----------------------|-------------|-------------------------------|-------------------------------|---------------------------|--------------------------------|--------------------------------|--------------------------------|
| 11 | 2.4053 | -3.19 | -23.2 | 2.4 | 2.4835 | 2.39995 | -43.23 | 2.48355 | -56.57 |
| 19 | 2.4451 | -3.67 | -23.7 | 2.4 | 2.4835 | 2.39995 | -58.16 | 2.48355 | -57.49 |
| 26 | 2.4804 | -3.57 | -23.6 | 2.4 | 2.4835 | 2.39995 | -58.27 | 2.48355 | -38.61 |

Antenna 1

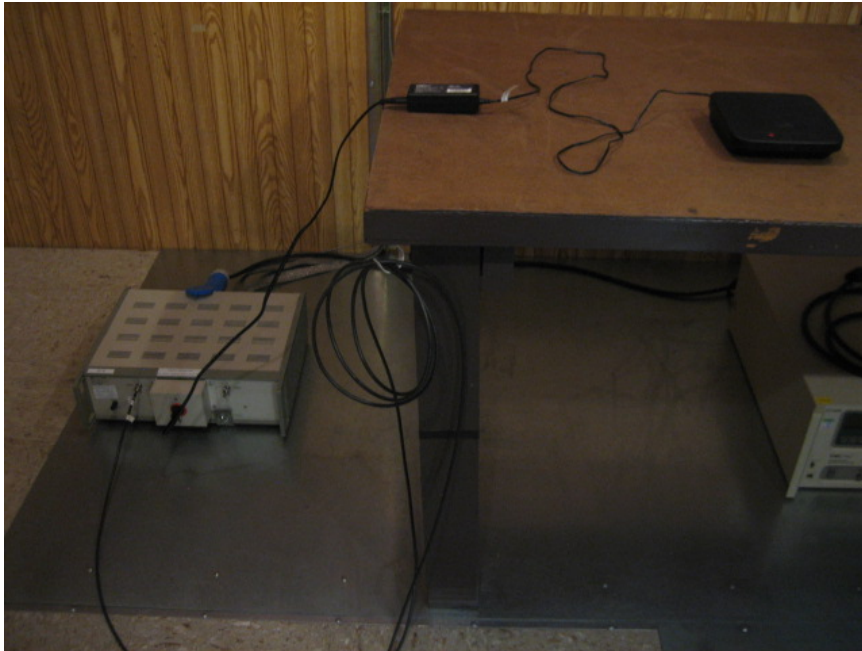
| Channel | Measurement Frequency (GHz) | Peak Amplitude (dBm) | 20 dB Limit | Lower Edge of Freq Band (GHz) | Upper Edge of Freq Band (GHz) | Lower Measured Freq (GHz) | Lower Measured Amplitude (dBm) | Upper Measured Frequency (GHz) | Upper Measured Amplitude (dBm) |
|---------|-----------------------------|----------------------|-------------|-------------------------------|-------------------------------|---------------------------|--------------------------------|--------------------------------|--------------------------------|
| 11 | 2.4048 | -4.47 | -24.5 | 2.4 | 2.4835 | 2.39995 | -44.27 | 2.48355 | -57.48 |
| 19 | 2.4448 | -5.01 | -25 | 2.4 | 2.4835 | 2.39995 | -57.18 | 2.48355 | -57.58 |
| 26 | 2.4797 | -4.84 | -24.8 | 2.4 | 2.4835 | 2.39995 | -57.55 | 2.48355 | -39.8 |

Results: The Band Edge measurements for antenna 0 and antenna 1 of the ARRIS Model IP810 Set Top Box are compliant with the limits specified in FCC Section 15.247(d).

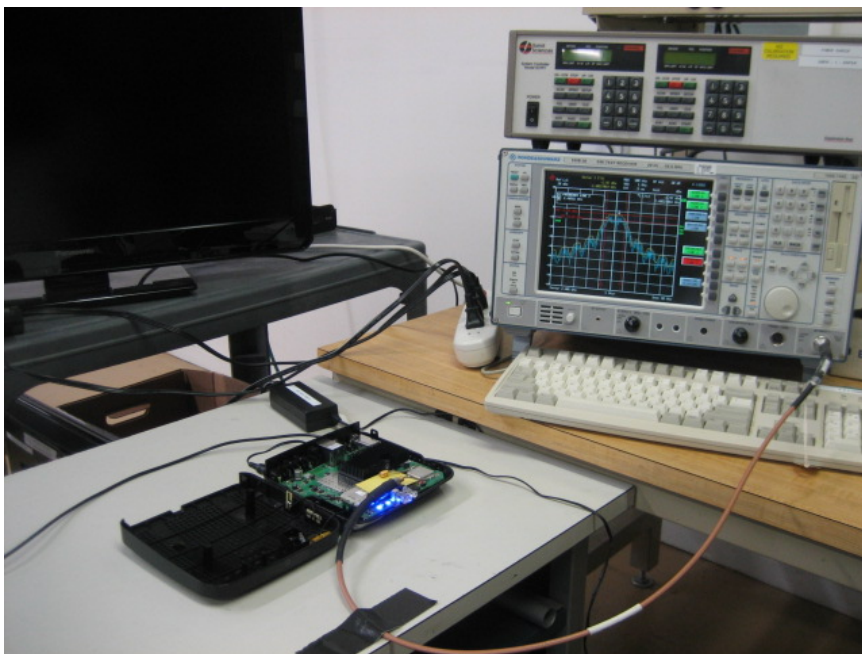


5.0 Test Setup Pictures

5.1 Conducted Emissions Power Line Test Setup Picture



5.2 Conducted Emissions Antenna Test Setup Picture





5.3 Harmonic Radiated Emissions Test Setup Picture





Appendix A – Test Equipment

| Equipment | Manufacturer | Model # | Serial # | BEC # | Calibration Date | Calibration Cycle | Calibration Due Date |
|--|-----------------|------------------|-------------------------------|-------|------------------|-------------------|----------------------|
| Antenna (30 MHz - 6 GHz) | Sunol Sciences | JB6 | A022108 | 712 | 04/25/14 | 2 Years | 04/25/16 |
| EMI Receiver (20 Hz – 26.5 GHz) | Rohde & Schwarz | ESIB 26 | 836119/006 | 1010 | 06/18/14 | 1 Year | 06/18/15 |
| 9kHz-3GHz EMC Analyzer | Agilent | E7402A | US39440162 | 883 | 12/22/14 | 1 Year | 12/22/15 |
| Amplifier (.1 – 1300 MHz) | Hewlett Packard | 8447F | 2805A02896 | 1003 | No Cal. Required | No Cal. Required | No Cal. Required |
| EMC Analyzer (9 kHz - 1.8 GHz) | Hewlett Packard | 8591EM | 3536A00746 | 821 | 10/14/14 | 2 Years | 10/14/16 |
| GTEM (30 MHz – 1 GHz) | ETS Lindgren | 5317 | 1014 | 1001 | No Cal. Required | No Cal. Required | No Cal. Required |
| Spectrum Analyzer (9 kHz - 40 GHz) | Hewlett Packard | 8564E | 3410A00129 | 769 | 08/07/12 | 3 Years | 08/07/15 |
| Amplifier System (0.5 – 50 GHz) | Hewlett Packard | 83015A 83017A | 3123A00360 & 3332A00219 | 1027 | 09/09/14 | 2 Year | 09/09/16 |
| Double Ridged Horn Antenna (1 - 18 GHz) | EMCO | 3115 | 9705-5225 | 1028 | 10/08/14 | 2 Years | 10/06/16 |
| Antenna (18 - 26.5 GHz) | Hewlett Packard | 84125-80008 | N/A | 1056 | 10/08/14 | 2 Years | 10/08/16 |



| | | | | | | | |
|---|----------------------------|----------------|------------|-----|------------------|------------------|------------------|
| EMI Receiver (9 kHz - 6.5 GHz) | Hewlett Packard | 8546A | 3325A00158 | 761 | 05/11/13 | 2 Years | 05/11/15 |
| Amplifier (.1 – 1300 MHz) | Hewlett Packard | 8447F | 3313A06658 | 807 | No Cal. Required | No Cal. Required | No Cal. Required |
| Limiter | Hewlett Packard | 11867A | 01423 | 802 | 04/23/13 | 2 Years | 04/23/15 |
| LISN (9 kHz – 30 MHz) | EMCO | 4825/2 | 9803-1047 | 750 | 04/12/13 | 2 Years | 04/12/15 |
| Shielded Room #1 | ETS Lindgren | 12-2/2-0 | 4078 | 859 | 05/14/13 | 1 Year | 05/14/15 |
| Intentional Radiator Testing High Frequency RF Test Cable | Workhorse | WHU18-3636-036 | N/A | 814 | 12/04/14 | 2 Years | 12/04/16 |
| OATS Site (30 MHz – 1 GHz) | BEC | N/A | N/A | 705 | 05/07/14 | 1 Year | 05/07/15 |
| Temp/Humidity Meter | Control Company | 4096 | 140055652 | 780 | 01/21/14 | 2 Years | 01/21/16 |
| Software (Tile Instrument Control System) | Quantum Change/EMC Systems | Version 3 | N/A | N/A | No Cal. Required | No Cal. Required | No Cal. Required |
| Radiated Emissions Test Software | BEC | RADE | 2.2 | N/A | No Cal. Required | No Cal. Required | No Cal. Required |