



BEC INCORPORATED

CERTIFICATION APPLICATION TEST REPORT

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

ARRIS Model XG1-V3 Set Top Box

REPORT BEC-1582-01

TEST DATES: 11/04/2014 – 01/06/2015

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

PREPARED BY: Steve Fanella
Steve Fanella, Test Engineer

REVIEWED and APPROVED BY: Al Fanella
Al Fanella, Test Director

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Notice To Customer

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Revision History

Revision #	Description of Changes	Date of Changes	Date Released
0	Test Report Initial Release	N/A	01/20/2015
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-1582
Set Top Box Manufacturer	ARRIS Group Incorporated
Set Top Box Model Number	XG1-V3
Set Top Box Serial Number	M11439TE0180
Set Top Box Sample Number	1582-01 (Modified With SMA Ports to the Antennas)
Set Top Box Serial Number	M11439TE0157
Set Top Box Sample Number	1582-02 (Unmodified Antennas)
FCC ID	ACQ-XG1V3
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 XG1-V3 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 XG1-V3 is an IP Video Gateway (next-gen, set-top technology). It is a high-definition set-top with multiple 1 GHz tuners that support both MPEG-2 and MPEG-4 AVC services. The all-digital XG1-V3 includes the latest audio and video output interfaces, including HDMI™, Award-winning Dolby® Digital Plus audio and Dolby Volume Leveling. With the included MoCA® home networking, the XG1-V3 provides the flexibility to serve as a multimedia client for accessing content from other compatible devices in the home. An embedded DOCSIS 2.0+ cable modem provides support for DSG and downstream channel bonding.

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 RF 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 XG1-V3 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).

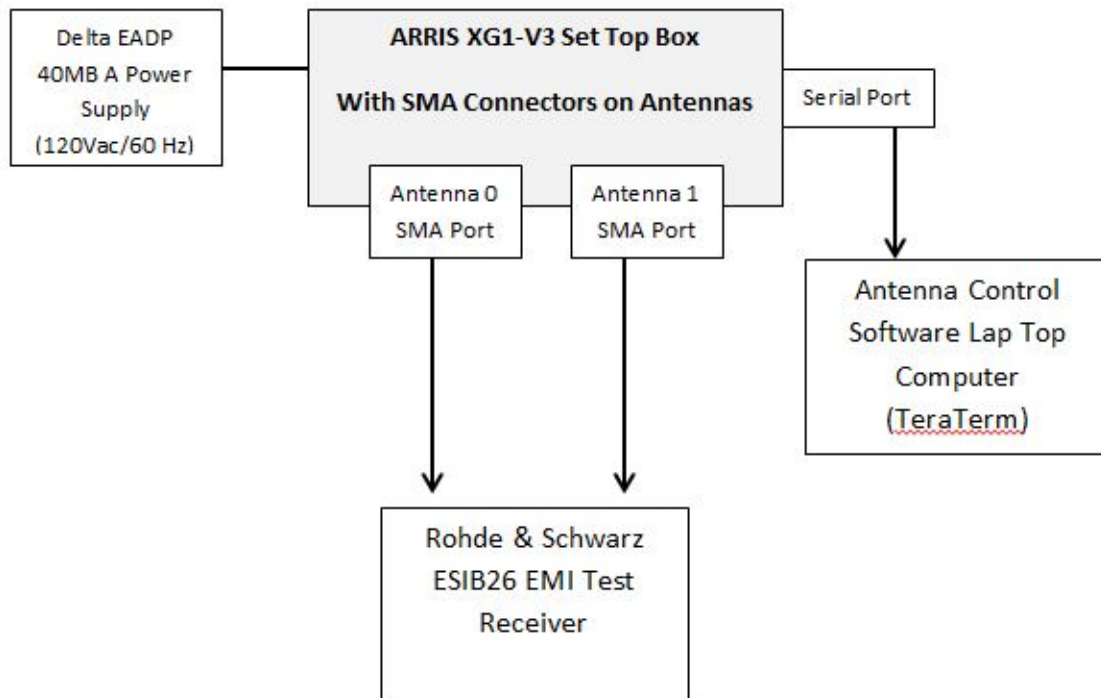
2.6 Test Configuration Rationale

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)

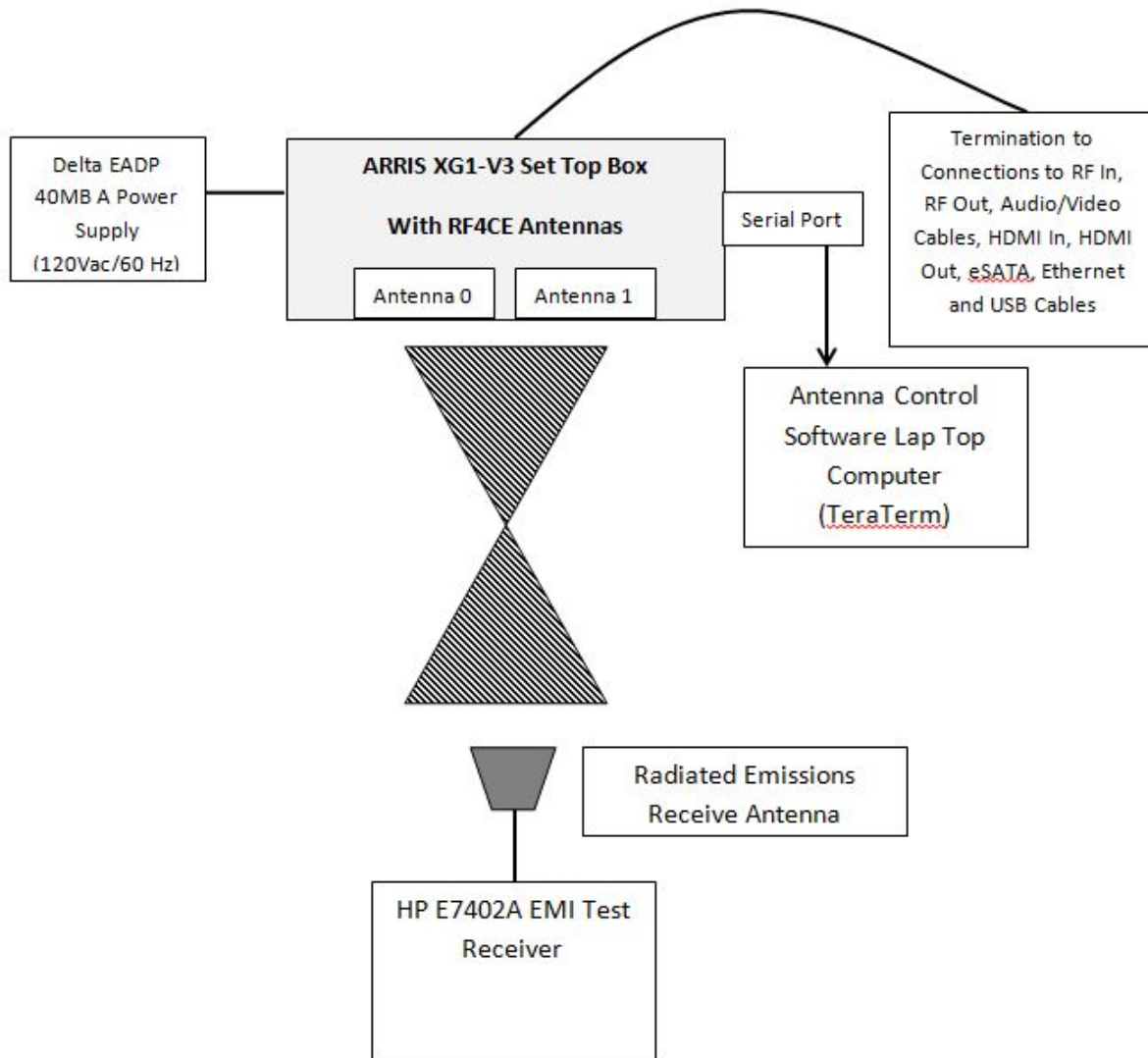
A block diagram of the EUT configuration showing interconnection cables is illustrated below. The drawing shows the physical hardware layout used for the tests along with I/O cables and AC power distribution.





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	XG1-V3 EPR2	M11439TE0180	1582-01
Set Top Box (Unmodified Antennas)	ARRIS	XG1-V3 EPR2	M11439TE0157	1582-02

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
eSATA	Keen Top Serial ATA	Braid over foil	1 m	eSATA Port I/F cable

Support Equipment

Description	Manufacturer	Model	Serial Number
AC/DC Power Convertor for XG1-V3 Set Top Box	Delta	EADP 40MB A	GXMD48M9JDP
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 XG1-V3 set top box.

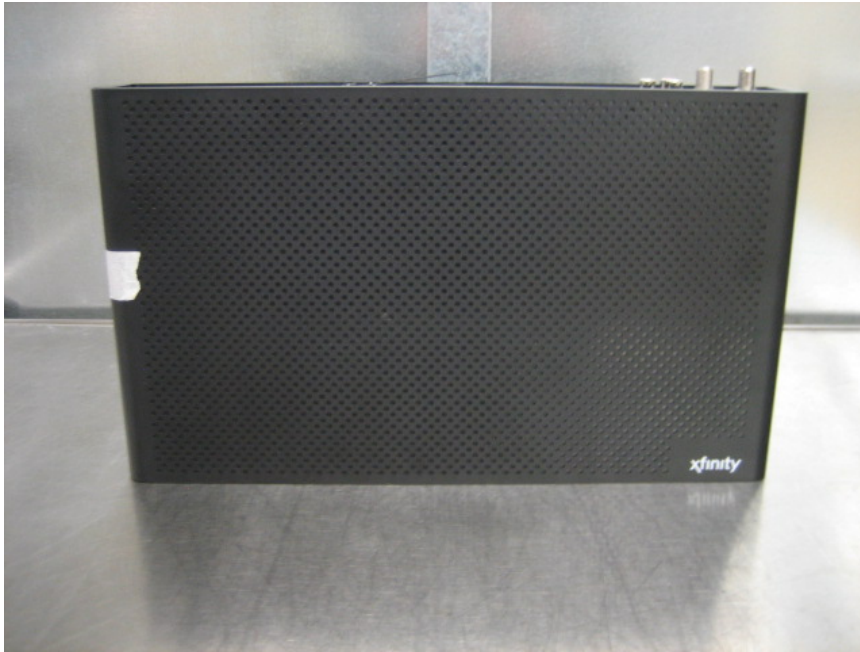


2.13 EUT Pictures

ARRIS XG1-V3 EPR2









ARRIS XG1-V3 EPR2 SAMPLE TAG 1582-01 MODIFIED ANTENNA EUT

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Compliance Test Lab

☒ Test Item ☐ Support Item

Project/Sample #: 1582-01
Customer: ARRIS
Model #: XG1 V3 EPR 2
Serial #: M11439TE0180
Item Received Date: 10/28/14
Notes: IR MODIFIED
ANTENNAS EUT
BEC-F010002

1582-01

5:DOCSIS MAC:6455B1D172C3
6:TWC SN2:E39TE0180
3:Host SN:M11439TE0180
4:eSTB MAC:44E137FDE75D

ARRIS XG1-V3 EPR2 SERIAL NUMBER MODIFIED ANTENNA EUT

1:MCARD SN:MT1438TQ8795
2:MCARD UA:0000093126524092
3:Host SN:M11439TE0180
4:eSTB MAC:44E137FDE75D
5:DOCSIS MAC:6455B1D172C3
6:TWC SN2:E39TE0180



ARRIS XG1-V3 EPR2 SAMPLE TAG 1582-02 UNMODIFIED ANTENNA EUT

BEC
BEC Incorporated
Compliance Test Lab

☒ Test Item ☐ Support Item

Project/Sample #: 1582-02

Customer: ARRIS

Model #: XG1 V3 EPR2

Serial #: M11439TE0157

Item Received Date: 10/28/14

Notes: 1R UNMODIFIED
EUT

BEC-F010002

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ANY INFORMATION FROM THIS LABEL MAY
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2. THIS LABEL IS A PROPERTY OF BEC. IT
MAY BE USED FOR IDENTIFICATION OF
ITEMS ONLY. IT IS NOT TO BE USED FOR
ANY OTHER PURPOSE. FOR INFORMATION ON HOW
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3. CARD SN: MT1438TN3198
4. eSTB MAC: D039B3E66EB3
5. DOCSIS MAC: 6455B1D172B1
6. TWC SN2: E39TE0157

ARRIS XG1-V3 EPR2 SERIAL NUMBER UNMODIFIED ANTENNA EUT

1:MCARD SN:MT1438TN3198 ←

2:MCARD UA:0000096407783183 ←

3:Host SN:M11439TE0157

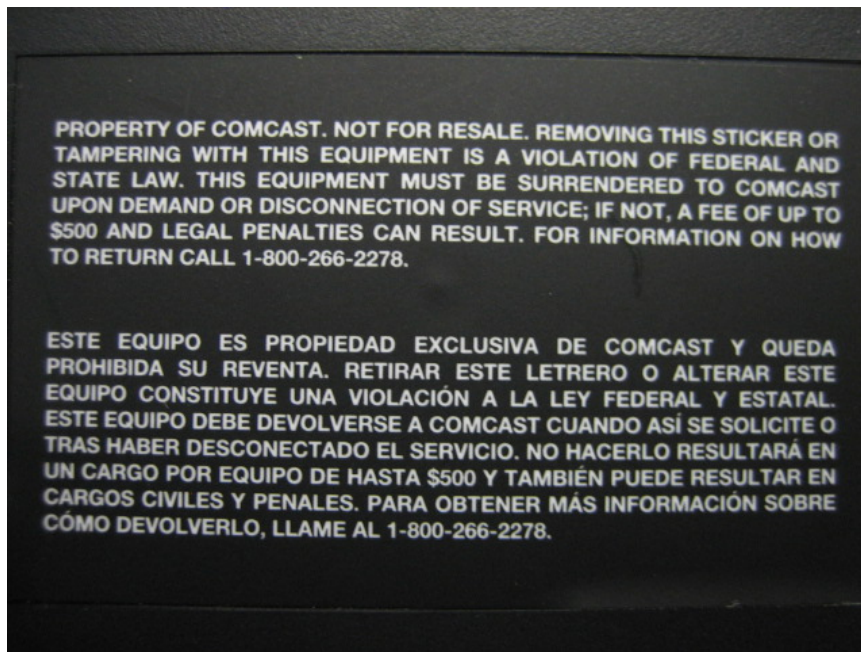
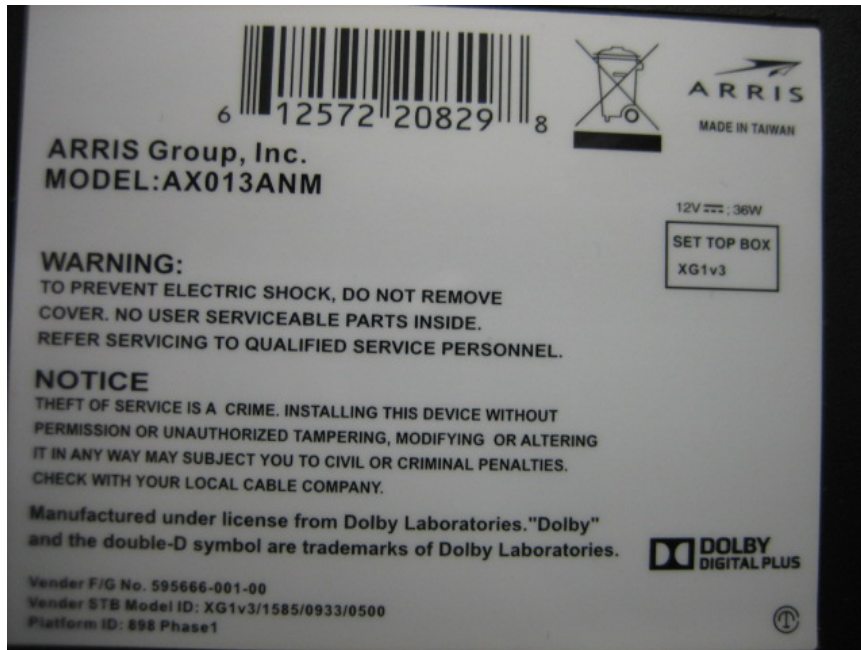
4:eSTB MAC:D039B3E66EB3

5:DOCSIS MAC:6455B1D172B1 ←

6:TWC SN2:E39TE0157

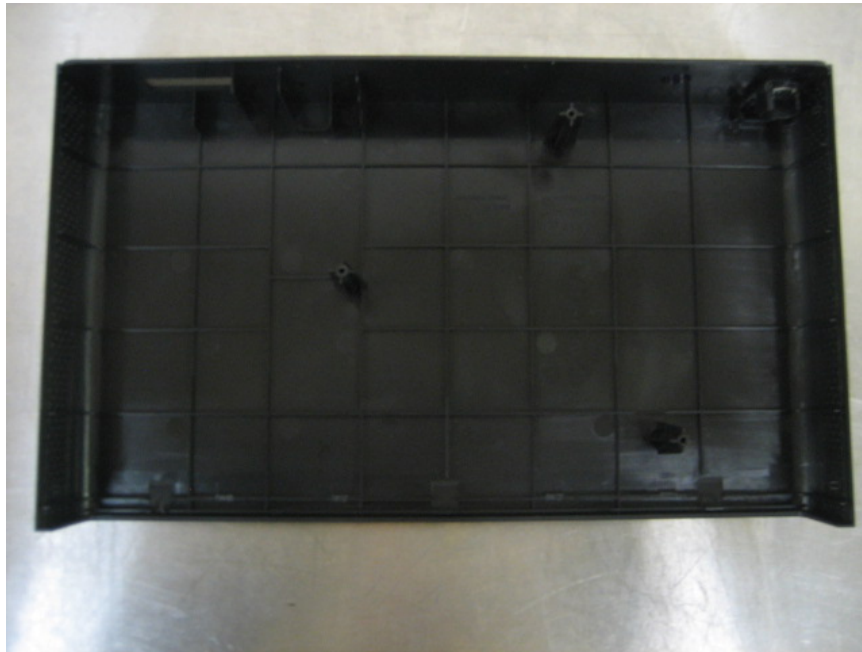
QR Code



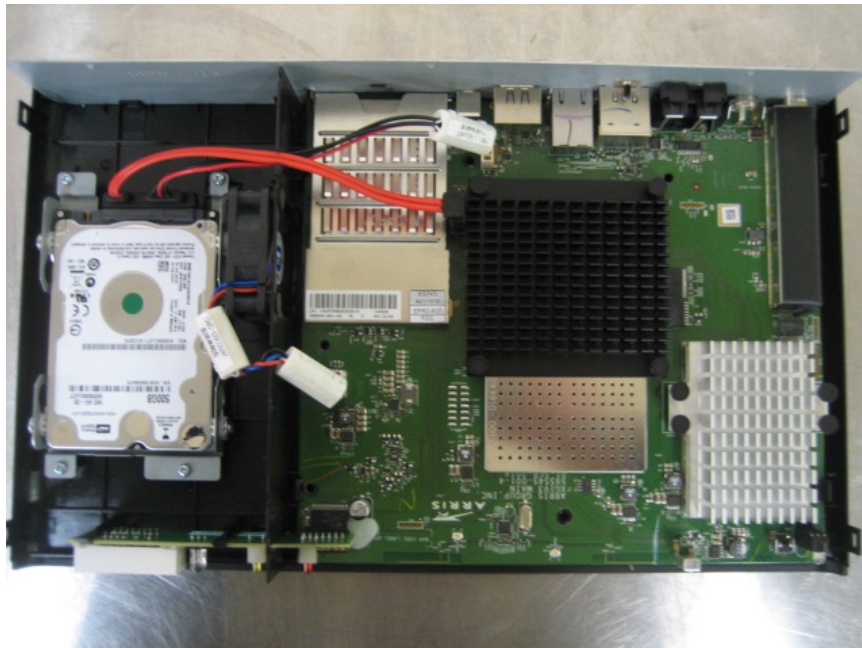




ARRIS XG1-V3 EPR2 INSIDE TOP COVER

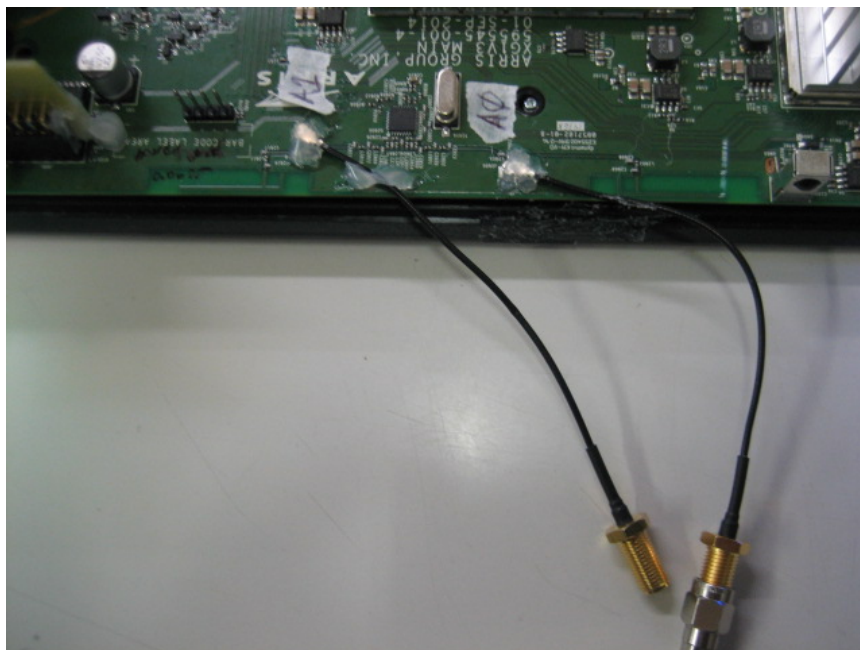
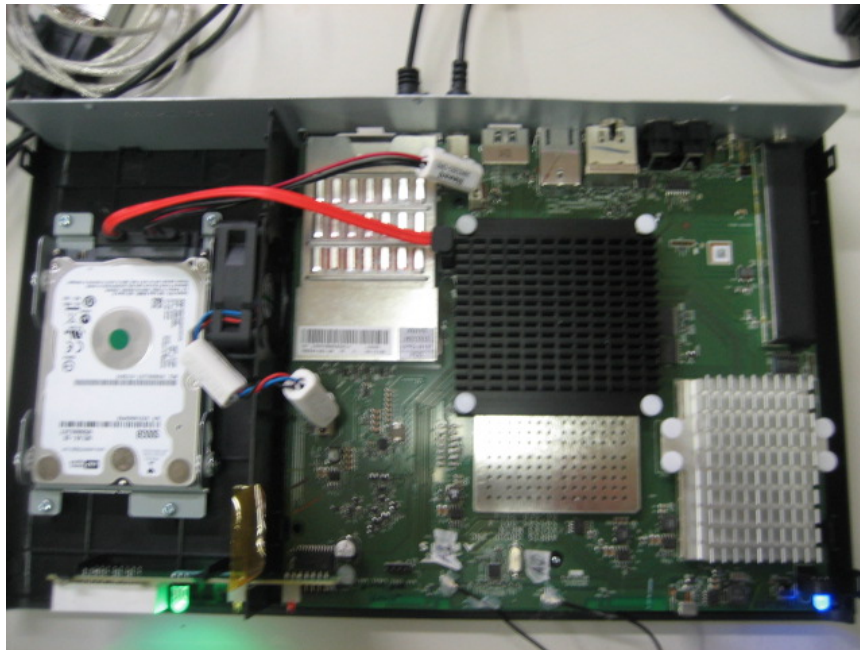


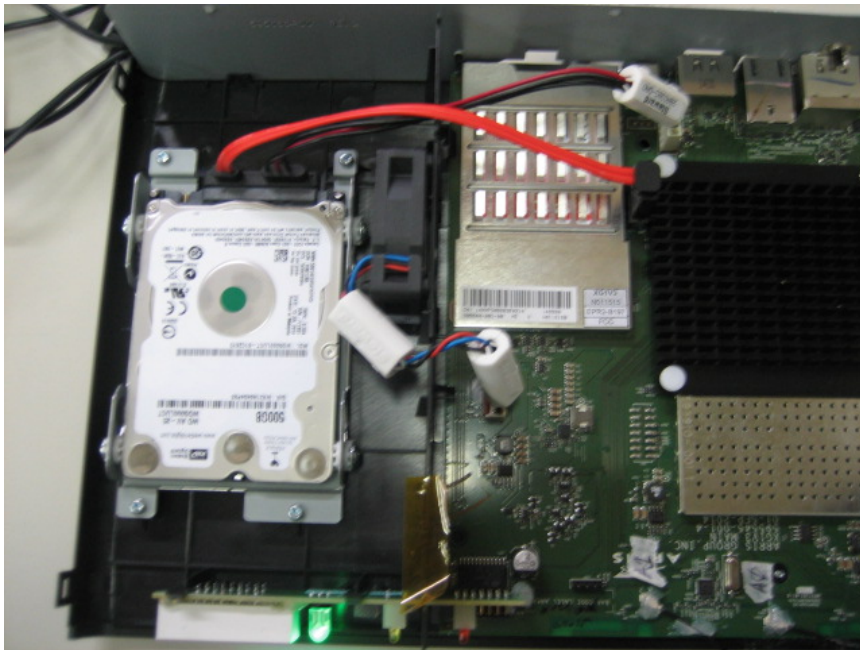
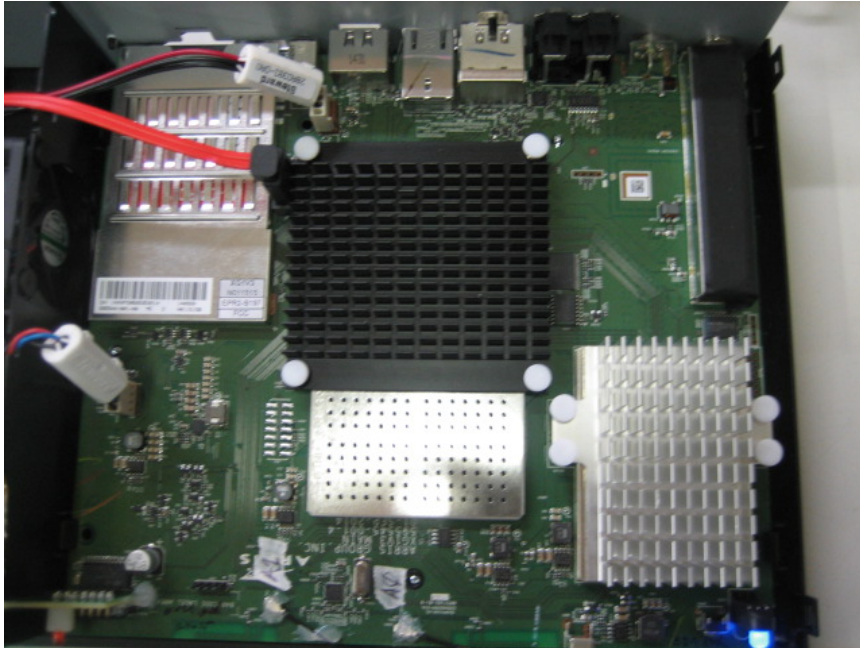
ARRIS XG1-V3 EPR2 (UNMODIFIED ANTENNAS)





ARRIS XG1-V3 EPR2 (MODIFIED ANTENNAS)







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 EADP 40MB A Power Supply (01/14/2015)

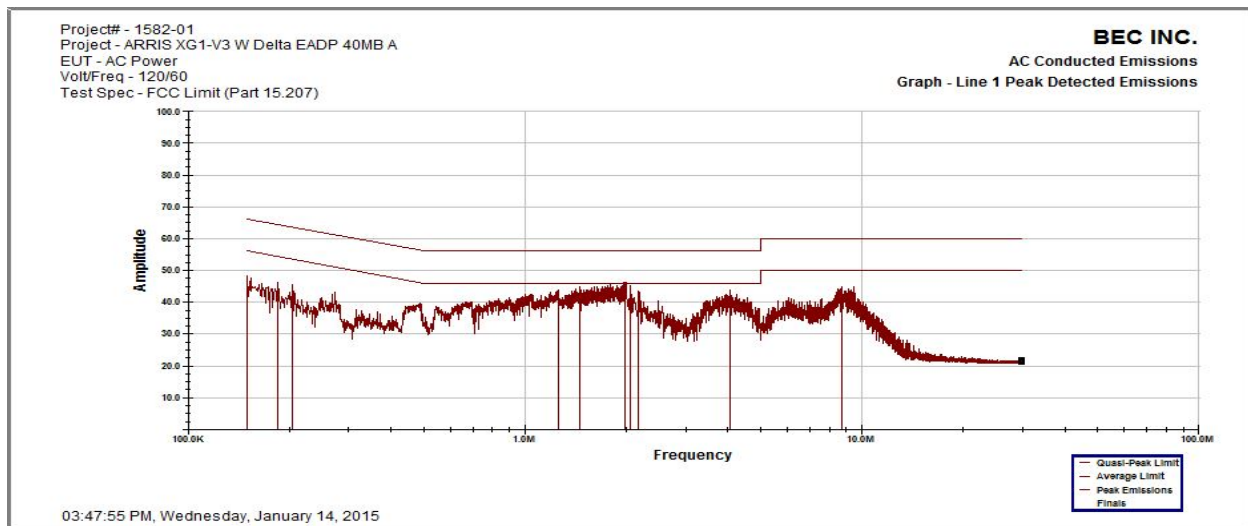
The following graphs and tables show the conducted emissions recorded on the AC power line of the EUT displayed against the FCC limits as outlined in Section 15.207(b). The Delta Model EADP 40MB A supply was powered at 120Vac/60 Hz.

BEC INC.

Line 1 Conducted Emissions

03:47:52 PM, Wednesday, January 14, 2015

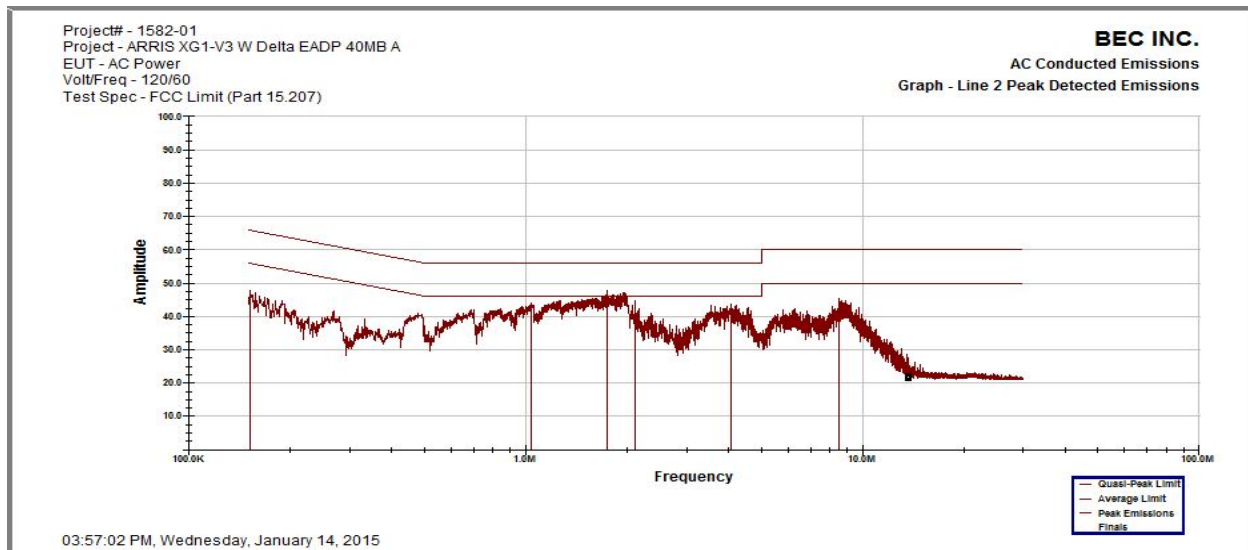
	1	2	3	4	5	6	7
Frequency	AVG	AVG	AVG	QP	QP	QP	Corr
MHz	dBuV	Limit	Margin	dBuV	Limit	Margin	Factor
150.057 KHz	19.97	56.00	-36.03	40.04	66.00	-25.96	0.130
183.103 KHz	24.64	55.05	-30.41	39.14	65.05	-25.91	0.132
202.866 KHz	23.58	54.49	-30.91	37.18	64.49	-27.31	0.130
1.253 MHz	27.01	46.00	-18.99	38.25	56.00	-17.75	0.189
1.446 MHz	28.31	46.00	-17.69	39.23	56.00	-16.77	0.202
1.990 MHz	29.37	46.00	-16.63	40.33	56.00	-15.67	0.230
2.054 MHz	29.07	46.00	-16.93	40.01	56.00	-15.99	0.232
2.160 MHz	29.14	46.00	-16.86	39.63	56.00	-16.37	0.235
3.997 MHz	31.39	46.00	-14.61	38.52	56.00	-17.48	0.305
8.686 MHz	33.64	50.00	-16.36	40.35	60.00	-19.65	0.548
Project# - 1582-01							
Project - ARRIS XG1-V3 W Delta EADP 40MB A							
EUT - AC Power							
Volt/Freq - 120/60							
Test Spec - FCC Limit (Part 15.207)							





BEC INC.
Line 2 Conducted Emissions
03:57:00 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
152.107 KHz	17.653	55.940	-38.287	39.760	65.940	-26.179	0.130
1.045 MHz	27.434	46.000	-18.566	39.374	56.000	-16.626	0.184
1.740 MHz	30.170	46.000	-15.830	40.332	56.000	-15.668	0.212
2.103 MHz	29.345	46.000	-16.655	41.005	56.000	-14.995	0.225
4.102 MHz	32.102	46.000	-13.898	39.300	56.000	-16.700	0.310
8.551 MHz	33.491	50.000	-16.509	39.994	60.000	-20.006	0.544
Project# - 1582-01							
Project - ARRIS XG1-V3 W Delta EADP 40MB A							
EUT - AC Power							
Volt/Freq - 120/60							
Test Spec - FCC Limit (Part 15.207)							



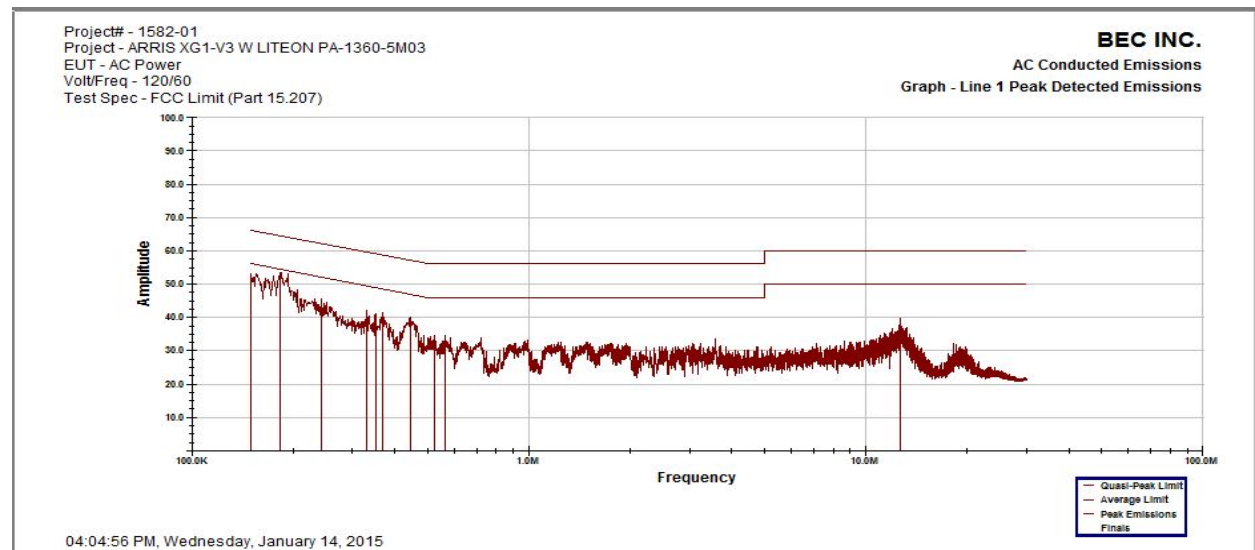
Results: All conducted emissions measured on the telecommunications port(s) of the Delta Model EADP 40MB A supply are below the limits specified in FCC Section 15.207 by a margin of at least 13.8 dB.



4.1.3 Conducted Emissions Test Results LITEON Model PA-1360-5M03 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-1360-3M03 supply was powered at 120Vac/60 Hz.

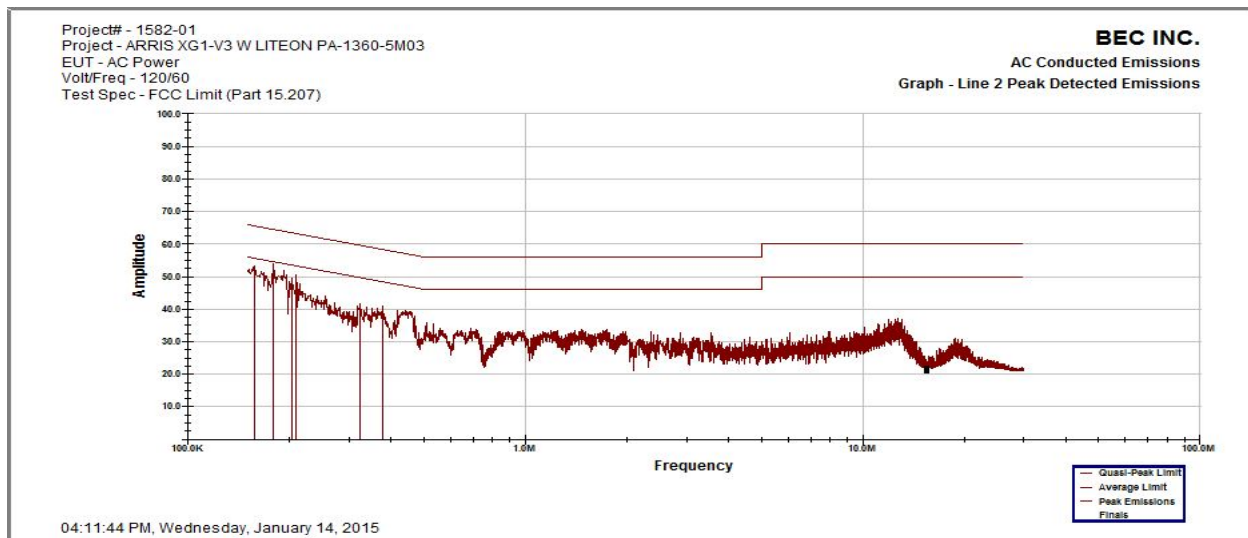
BEC INC.							
Line 1 Conducted Emissions							
04:09:41 PM, Wednesday, January 14, 2015							
	1	2	3	4	5	6	7
Frequency	AVG	AVG	AVG	QP	QP	QP	Corr
MHz	dBuV	Limit	Margin	dBuV	Limit	Margin	Factor
150.257 KHz	23.81	55.99	-32.18	46.65	65.99	-19.34	0.130
182.595 KHz	37.62	55.07	-17.45	48.42	65.07	-16.65	0.132
240.751 KHz	19.04	53.41	-34.37	37.93	63.41	-25.48	0.130
329.727 KHz	26.38	50.86	-24.48	35.21	60.86	-25.66	0.136
352.705 KHz	17.49	50.21	-32.72	34.27	60.21	-25.94	0.140
368.914 KHz	28.14	49.75	-21.61	37.03	59.75	-22.72	0.140
441.696 KHz	28.70	47.67	-18.96	36.88	57.67	-20.79	0.140
519.515 KHz	20.03	46.00	-25.97	29.28	56.00	-26.72	0.152
568.126 KHz	20.93	46.00	-25.07	29.89	56.00	-26.11	0.157
12.471 MHz	25.02	50.00	-24.98	31.61	60.00	-28.39	0.694
Project# - 1582-01							
Project - ARRIS XG1-V3 W LITEON PA-1360-5M03							
EUT - AC Power							
Volt/Freq - 120/60							
Test Spec - FCC Limit (Part 15.207)							





BEC INC.
Line 2 Conducted Emissions
04:14:45 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
156.659 KHz	20.296	55.810	-35.513	45.671	65.810	-20.138	0.131
178.438 KHz	32.451	55.187	-22.737	45.156	65.187	-20.032	0.136
200.970 KHz	34.928	54.544	-19.616	44.700	64.544	-19.844	0.140
209.148 KHz	27.153	54.310	-27.158	41.600	64.310	-22.710	0.140
326.724 KHz	28.065	50.951	-22.885	36.095	60.951	-24.855	0.145
374.572 KHz	28.220	49.584	-21.364	36.190	59.584	-23.394	0.150
Project# - 1582-01							
Project - ARRIS XG1-V3 W LITEON PA-1360-5M03							
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-1360-3M03 supply are below the limits specified in FCC Section 15.207 by a margin of at least 16.6 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 (01/06/2015)

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 [GHz}	Peak [dBuV/m]	Calculated Average w Duty Cycle Correction Factor [dBuV/m]	Pol	Angle [deg]	Height [cm]	CF [dB]	Limit [dBuV/m]	Margin [dB]	Comment
1.41791	46.34	26.34	H	039	100	-10.96	53.98	-27.64	PASS
1.49359	53.00	33.00	H	068	100	-10.44	53.98	-20.98	PASS
1.64598	66.38	46.38	H	310	100	-9.41	53.98	-7.60	PASS
4.81100	65.19	45.19	H	309	100	2.28	53.98	-8.79	PASS
1.42418	46.40	26.40	V	321	100	-10.92	53.98	-27.58	PASS
1.49983	56.68	36.68	V	066	100	-10.40	53.98	-17.30	PASS
1.56961	47.70	27.70	V	077	100	-9.93	53.98	-26.28	PASS
1.64408	41.96	21.96	V	167	100	-9.42	53.98	-32.02	PASS
4.81100	61.89	41.89	V	312	100	2.28	53.98	-12.09	PASS

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

Freq [GHz]	Peak [dBuV/m]	Calculated Average w Duty Cycle Correction Factor [dBuV/m]	Pol	Angle [deg]	Height [cm]	CF [dB]	Limit [dBuV/m]	Margin [dB]	Comment
1.41958	43.42	23.42	H	043	100	-10.95	53.98	-30.56	PASS
1.49360	53.41	33.41	H	072	100	-10.44	53.98	-20.57	PASS
1.70730	50.19	30.19	H	042	100	-8.99	53.98	-23.79	PASS
4.88890	61.00	41.00	H	309	100	2.54	53.98	-12.98	PASS
1.42369	46.08	26.08	V	319	100	-10.92	53.98	-27.90	PASS
1.49984	56.57	36.57	V	066	100	-10.40	53.98	-17.41	PASS
1.57105	48.39	28.39	V	168	100	-9.92	53.98	-25.59	PASS
4.88725	59.99	39.99	V	304	100	2.28	53.98	-13.99	PASS



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

Freq [GHz]	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
1.41840	44.63	24.63	H	036	100	-10.95	53.98	-29.35	PASS
1.49416	53.85	33.85	H	071	100	-10.44	53.98	-20.13	PASS
4.49962	51.75	31.75	H	066	100	1.10	53.98	-22.23	PASS
4.96084	60.55	40.55	H	300	100	2.85	53.98	-13.43	PASS
1.49455	56.35	36.35	V	067	100	-10.44	53.98	-17.63	PASS
1.57169	47.98	27.98	V	165	100	-9.91	53.98	-26.00	PASS
2.51101	47.66	27.66	V	353	100	-5.04	53.98	-26.32	PASS
4.96022	58.57	38.57	V	298	100	2.85	53.98	-15.41	PASS

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

Freq [GHz]	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
1.49296	53.47	33.47	H	071	100	-10.45	53.98	-20.51	PASS
1.64744	54.51	34.51	H	314	100	-9.40	53.98	-19.47	PASS
1.98438	43.78	23.78	H	137	100	-7.11	53.98	-30.20	PASS
4.81100	62.18	42.18	H	052	100	2.28	53.98	-11.80	PASS
1.49439	56.77	36.77	V	024	100	-10.44	53.98	-17.21	PASS
1.64754	53.92	33.92	V	138	100	-9.40	53.98	-20.06	PASS
1.98019	48.14	28.14	V	335	100	-7.13	53.98	-25.84	PASS
4.80899	59.47	39.47	V	135	100	2.27	53.98	-14.51	PASS



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

Freq [GHz]	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
1.42067	47.76	27.76	H	042	100	-10.94	53.98	-26.22	PASS
1.49268	54.14	34.14	H	297	100	-10.45	53.98	-19.84	PASS
1.70632	48.14	28.14	H	046	100	-9.00	53.98	-25.84	PASS
4.88903	58.10	38.10	H	51	100	2.58	53.98	-15.88	PASS
1.49291	55.75	35.75	V	071	100	-10.45	53.98	-18.23	PASS
1.70749	51.40	31.40	V	137	100	-8.99	53.98	-22.58	PASS
2.51111	48.95	28.95	V	355	100	-5.04	53.98	-25.03	PASS
4.88891	57.95	37.95	H	050	100	2.58	53.98	-16.03	PASS

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

Freq [GHz]	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
1.49318	53.36	33.36	H	299	100	-10.45	53.98	-20.62	PASS
1.75855	50.14	30.14	H	049	100	-8.64	53.98	-23.84	PASS
4.49259	49.94	29.94	H	067	100	1.10	53.98	-24.04	PASS
4.95905	54.09	34.09	H	046	100	2.84	53.98	-19.89	PASS
1.49996	55.91	35.91	V	068	100	-10.4	53.98	-18.07	PASS
2.51147	49.63	29.63	V	355	100	-5.04	53.98	-24.35	PASS
2.99853	50.30	30.30	V	065	100	-2.51	53.98	-23.68	PASS
4.96093	56.92	36.92	V	145	100	2.85	53.98	-17.06	PASS

Results: All harmonic spurious radiated emissions as recorded at a distance of 3 meters from the ARRIS Model XG1-V3 Set Top Box are below the 3 meter limit specified by FCC Section 15.209 requirements by a margin of at least 7.6 dB.



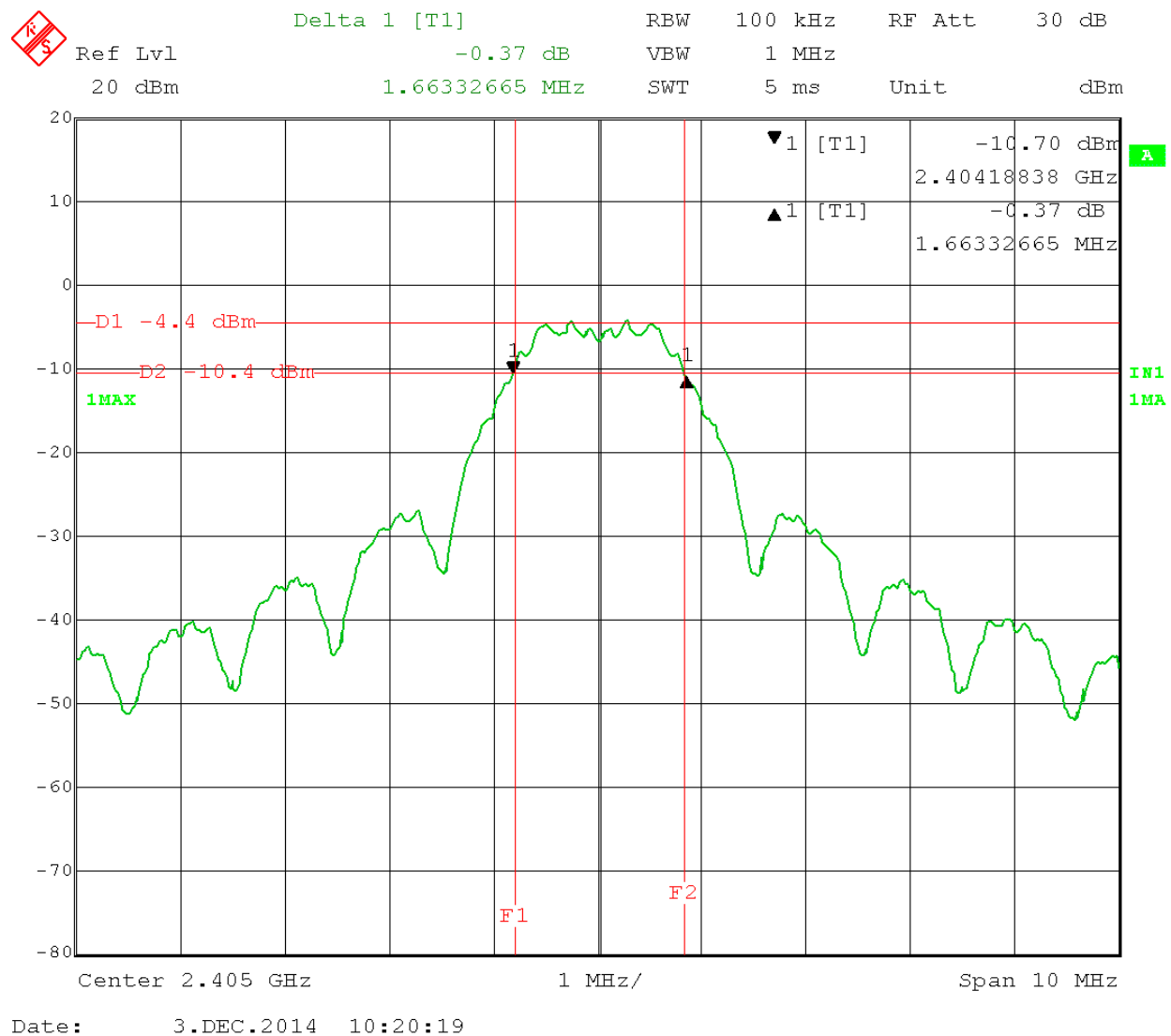
4.3 6 dB Occupied Bandwidth. FCC Section 15.247(a)(2)

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.

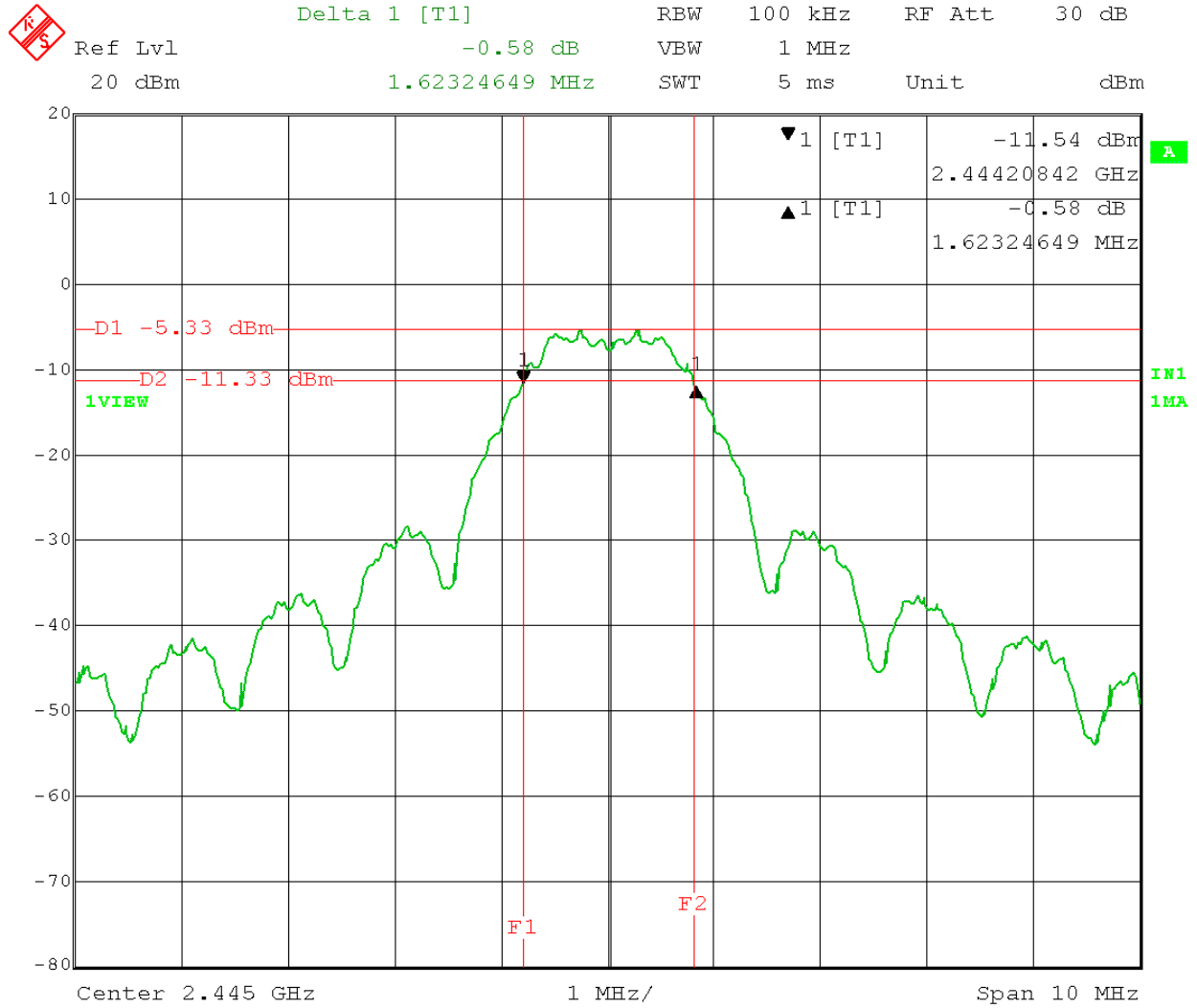
4.3.2 6 dB Occupied Bandwidth Analyzer Display Captures Antenna 0

Antenna 0, Channel 11 (2.405 GHz)





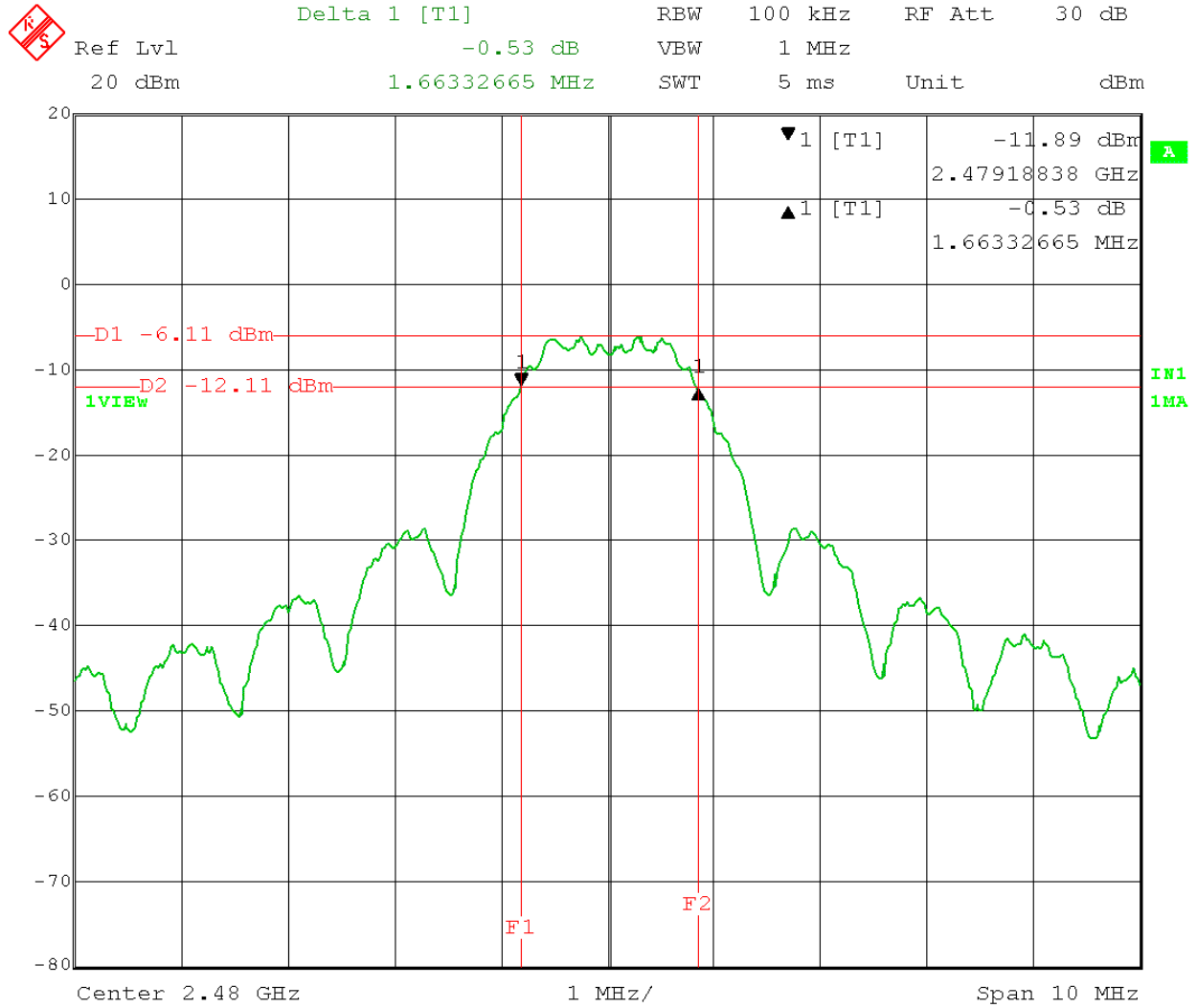
Antenna 0, Channel 19 (2.445 GHz)



Date: 3.DEC.2014 10:53:02



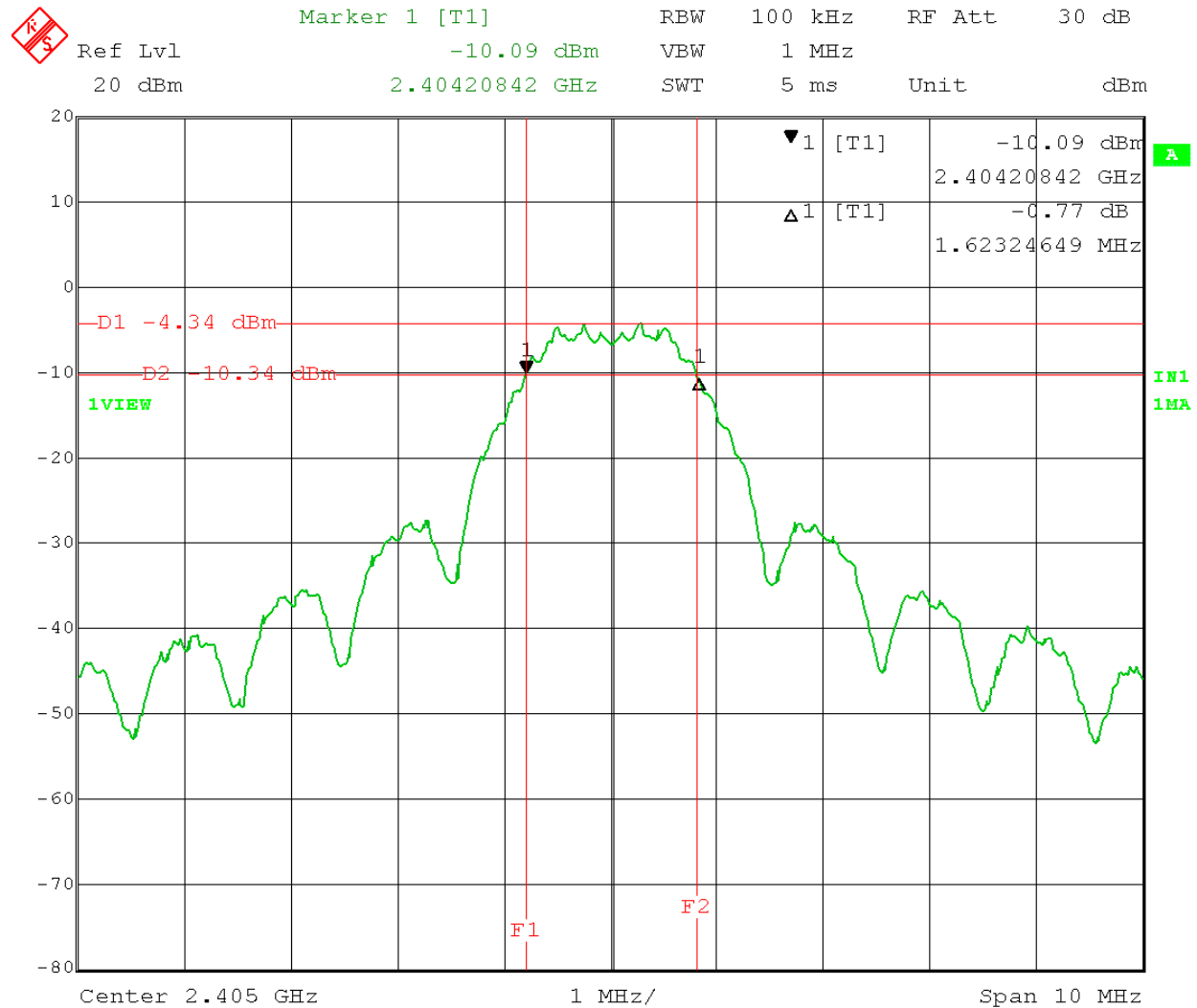
Antenna 0, Channel 26 (2.480 GHz)



Date: 3.DEC.2014 11:02:48

4.3.3 6 dB Occupied Bandwidth Analyzer Display Captures Antenna 1

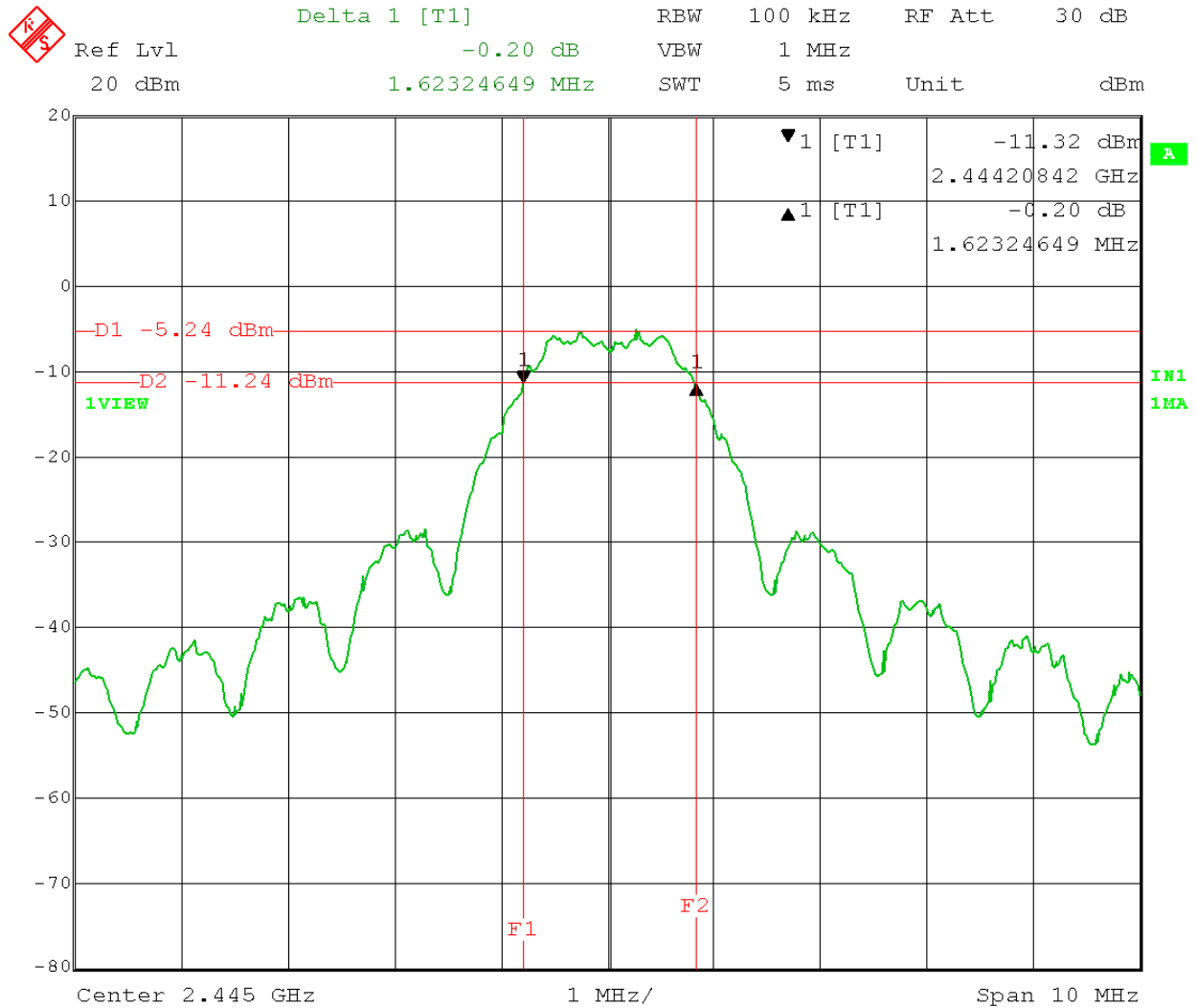
Antenna 1, Channel 11 (2.405 GHz)



Date: 3.DEC.2014 11:34:25



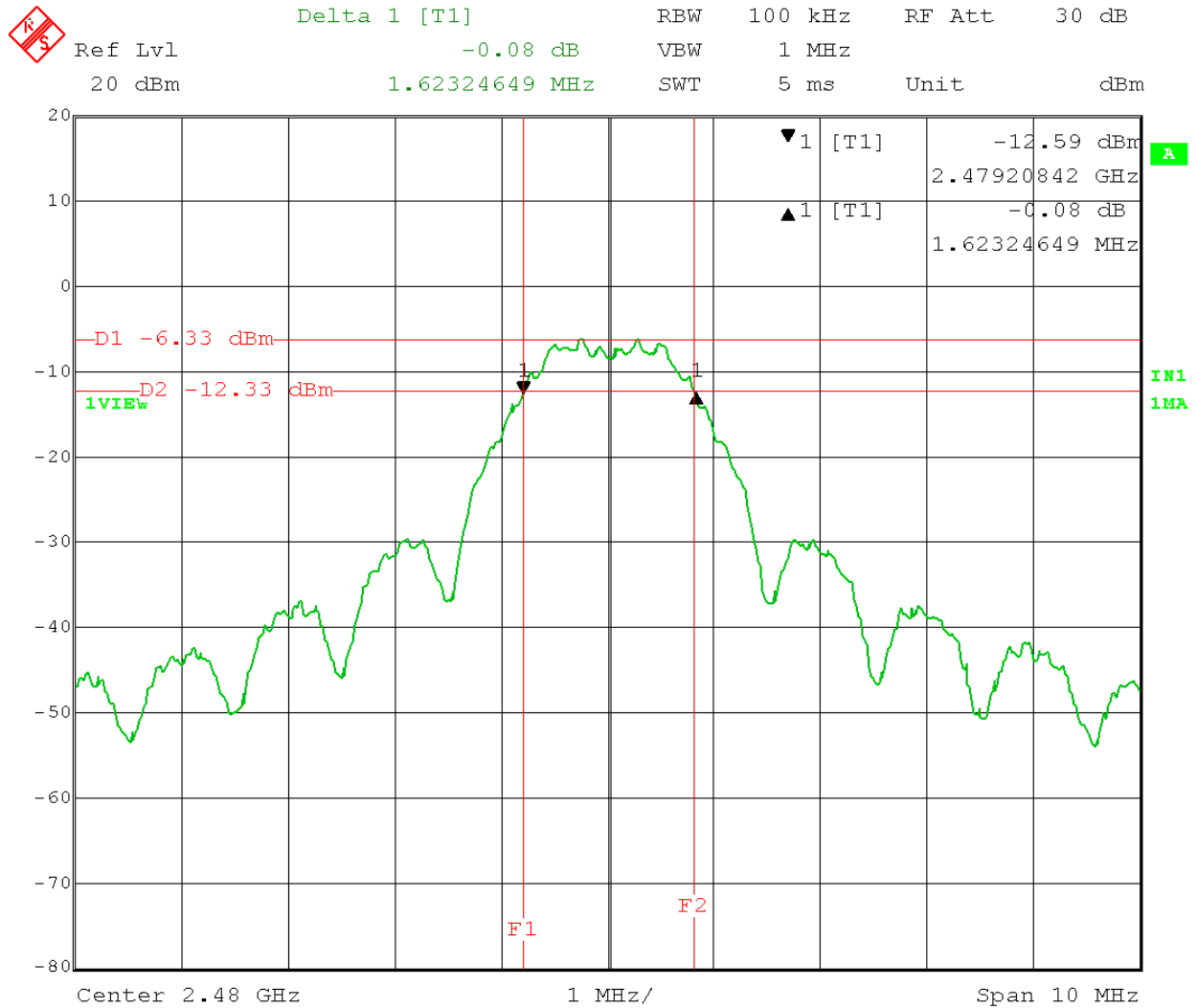
Antenna 1, Channel 19 (2.445 GHz)



Date: 3.DEC.2014 11:24:07



Antenna 1, Channel 26 (2.480 GHz)



Date: 3.DEC.2014 11:20:45



4.3.4 6 dB Occupied Bandwidth Test Results (12/03/2014)

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	1.6633	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	1.6232	0.5	PASS

Results: The 6 dB Occupied Bandwidth measurements for antenna 0 and antenna 1 of the ARRIS Model XG1-V3 Set Top Box are compliant with the limits specified in FCC Section 15.247(a)(2).



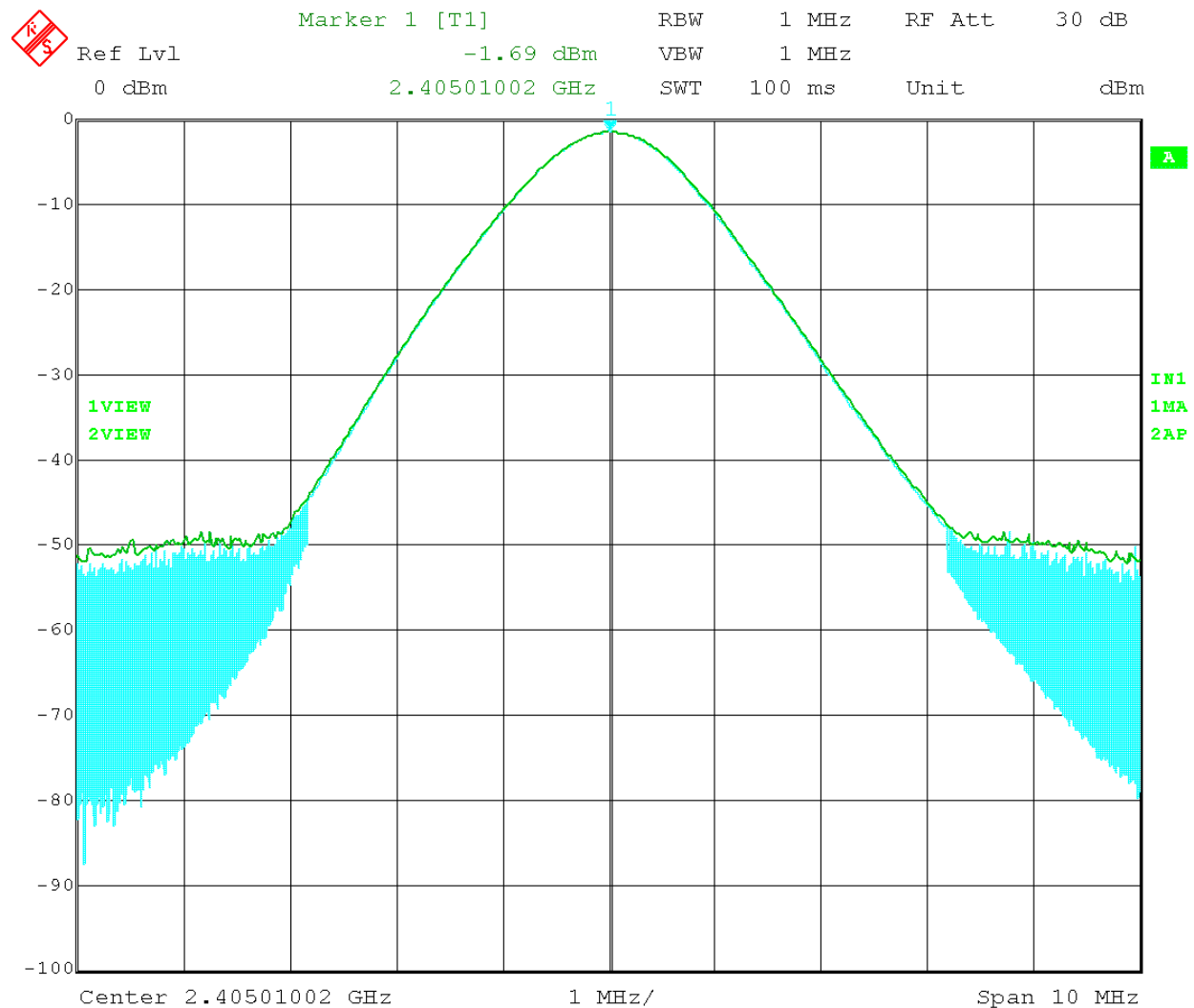
4.4 Maximum Peak Power Output FCC Section 15.247(b)(3)

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)

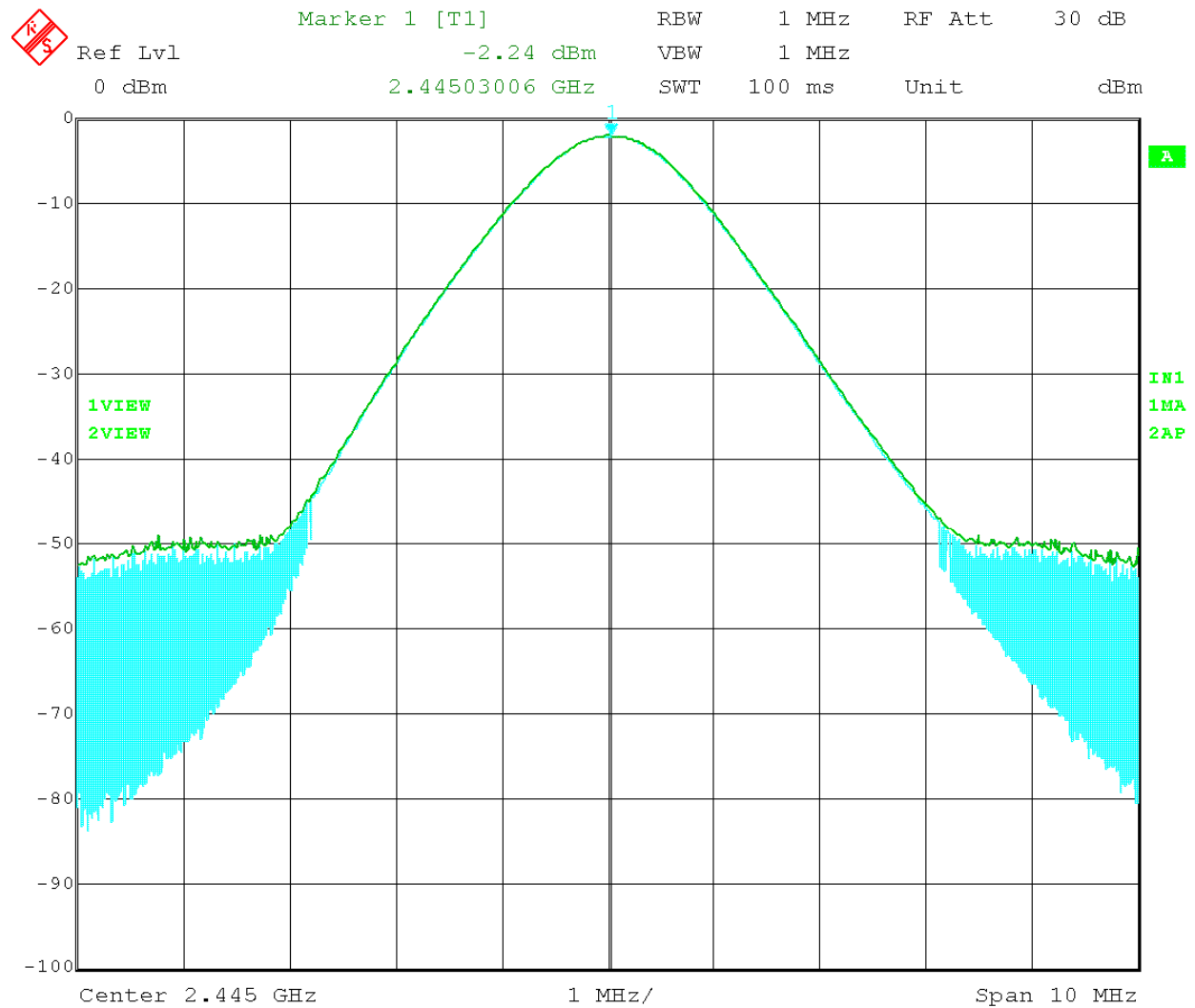


Date: 2.DEC.2014 11:47:54

Report # BEC- 1582-01 REV1 ARRIS XG1-V3 FCC Part 15.247 Test Report Release Date: 01/20/2015



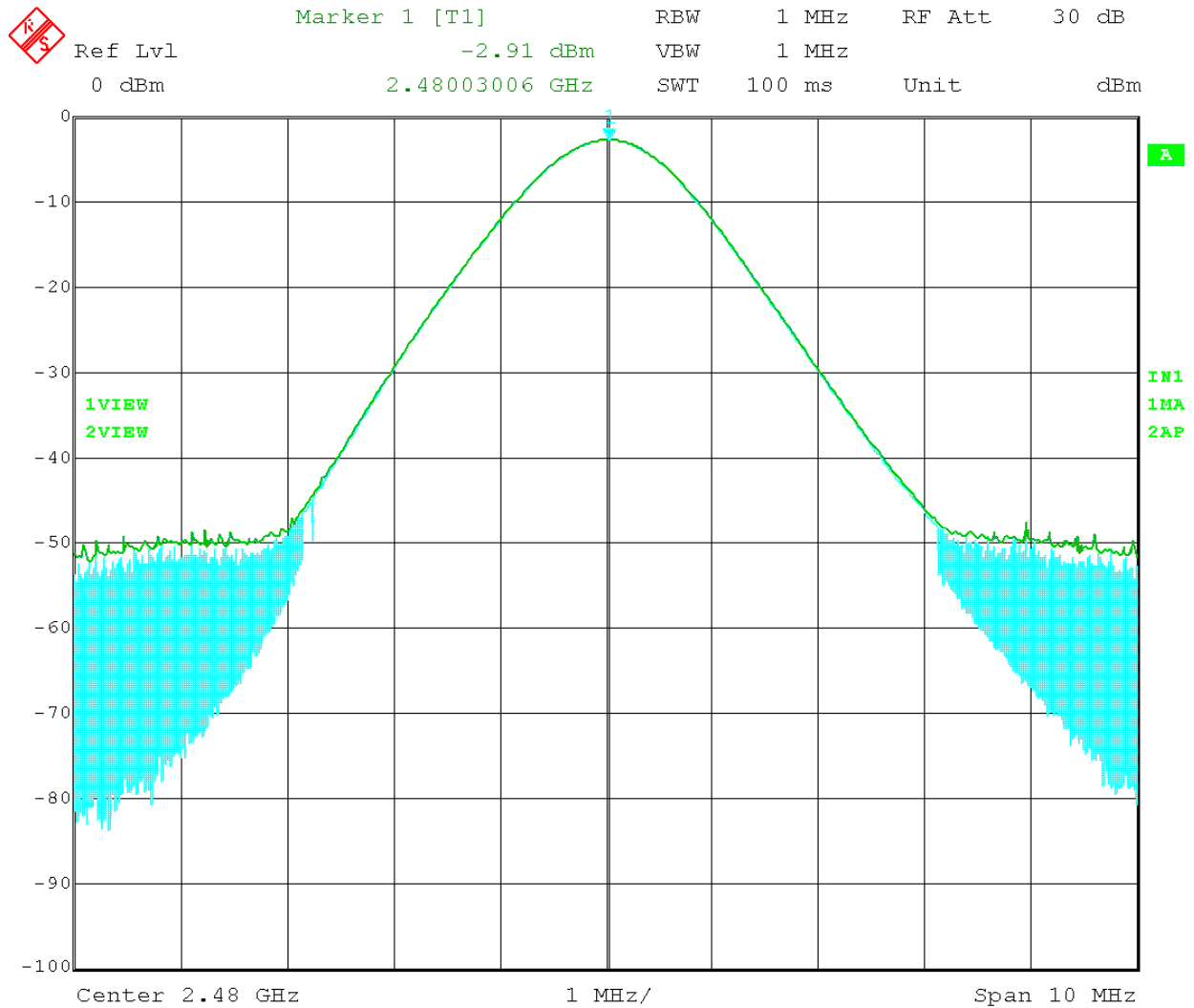
Antenna 0, Channel 19 (2.445 GHz)



Date: 2.DEC.2014 11:50:55



Antenna 0, Channel 26 (2.480 GHz)

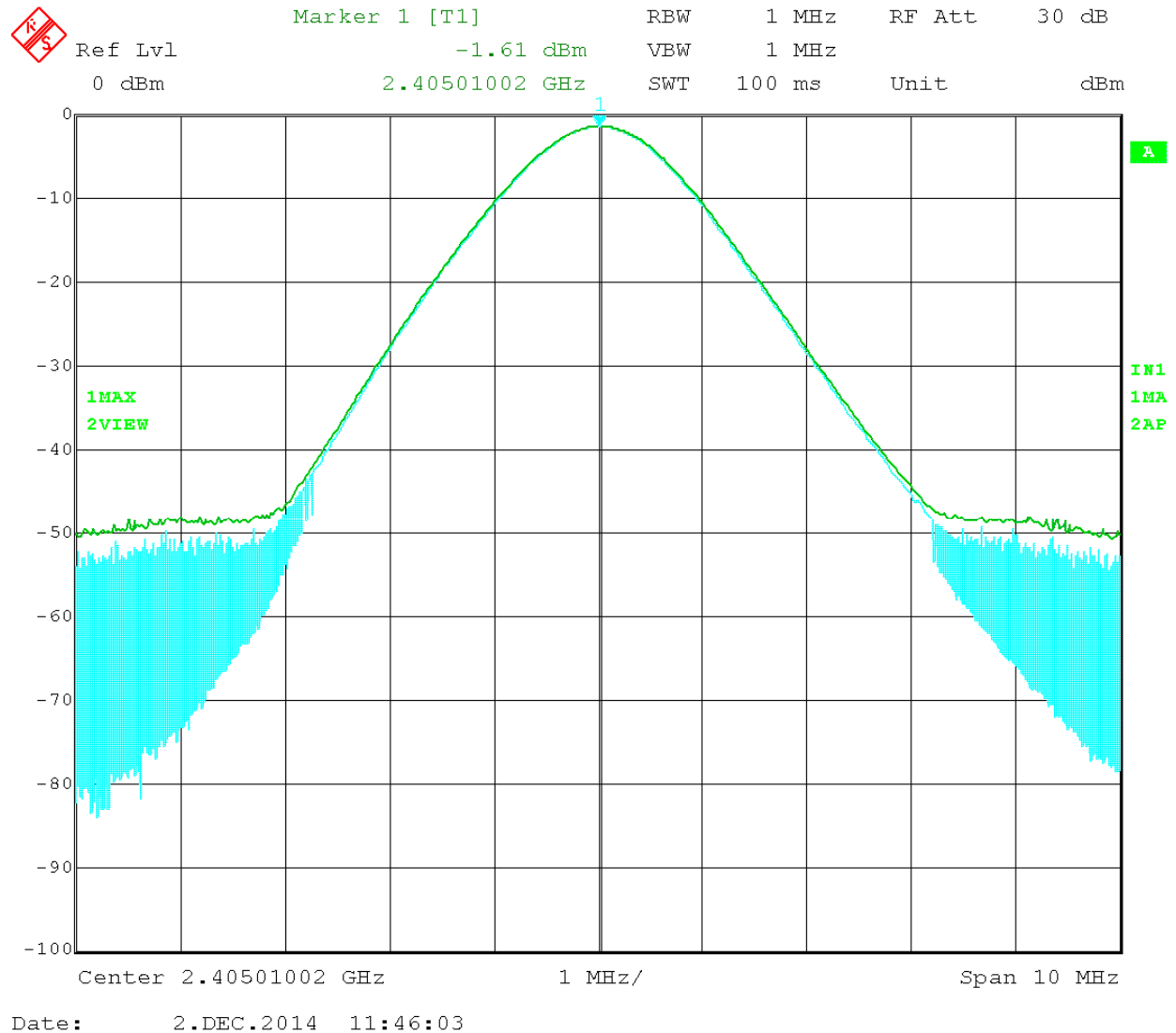


Date: 2.DEC.2014 11:52:10



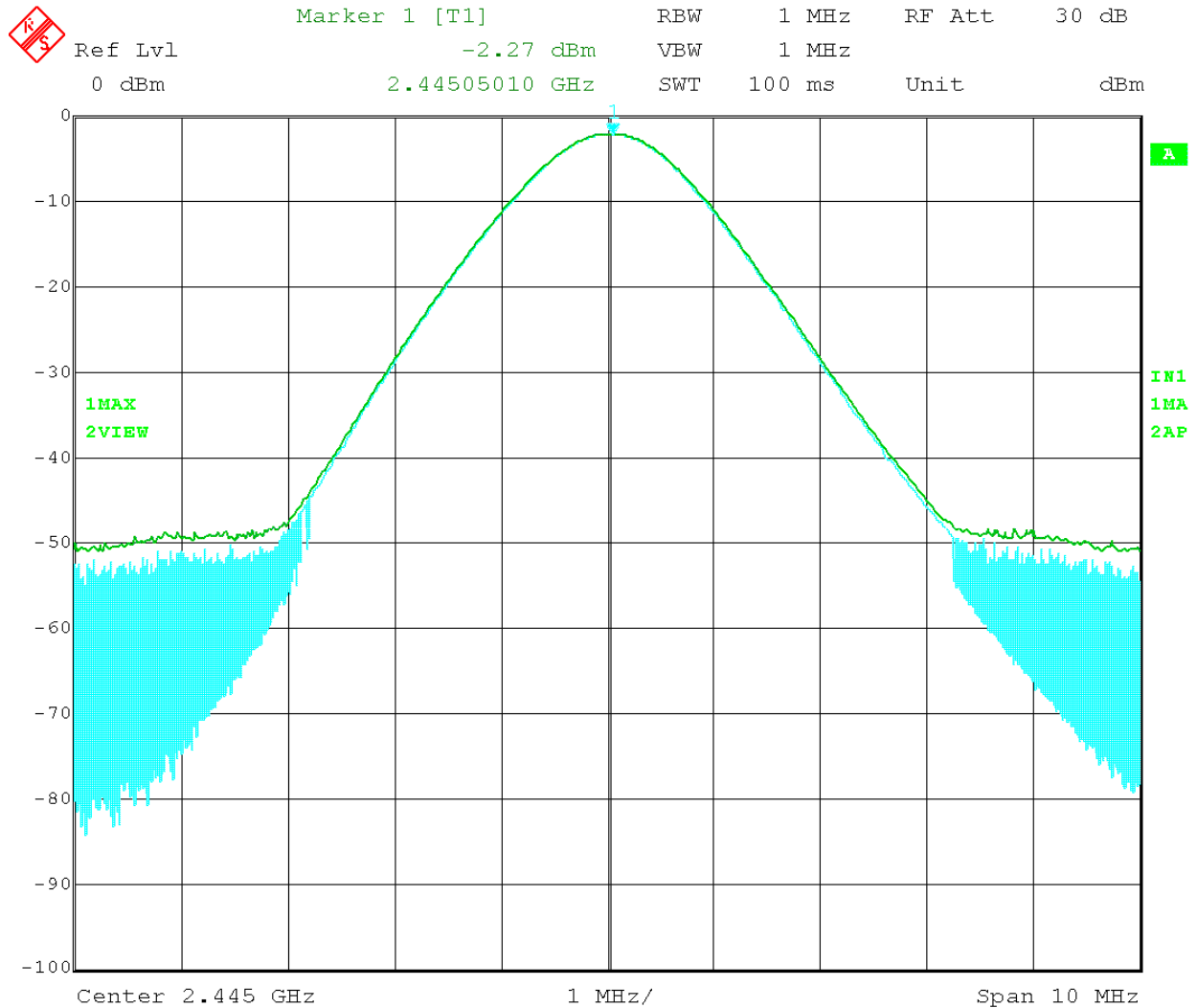
4.4.3 Maximum Peak Power Output Analyzer Display Captures Antenna 1

Antenna 1, Channel 11 (2.405 GHz)





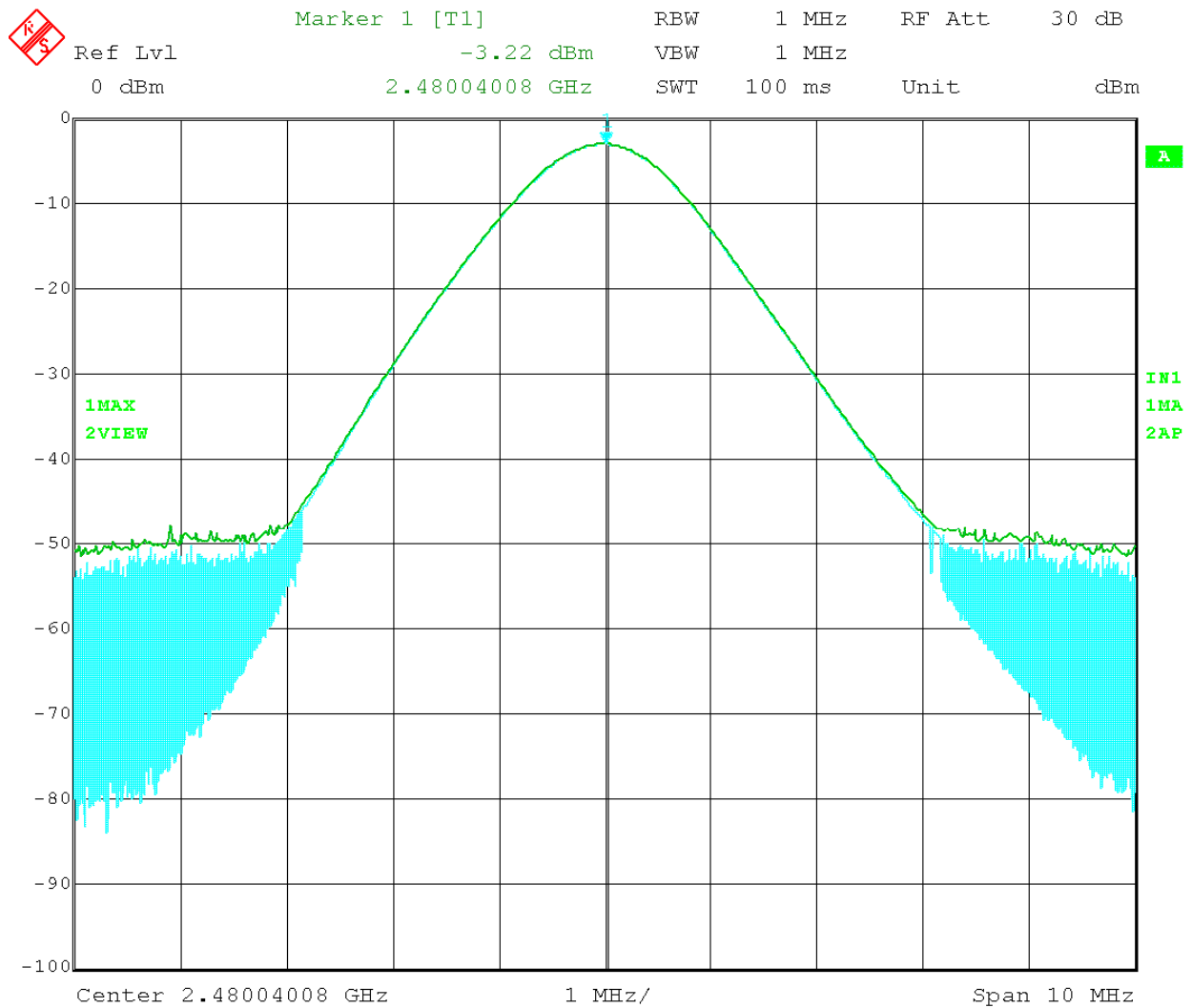
Antenna 1, Channel 19 (2.445 GHz)



Date: 2.DEC.2014 11:37:08



Antenna 1, Channel 26 (2.480 GHz)



Date: 2.DEC.2014 11:33:53



4.4.4 Maximum Peak Power Output Test Results (12/02/2014)

Antenna 0

Frequency GHz	Measured Level dBm	Cable Loss dB	Total		Limit		Margin	
			dBm	Watts	dBm	Watts	dBm	Watts
2.405	-1.69	0.6	-1.09	0.00078	30	1	-31.09	-0.99922
2.445	-2.24	0.6	-1.64	0.00069	30	1	-31.64	-0.99931
2.480	-2.91	0.6	-2.31	0.00059	30	1	-32.31	-0.99941

Antenna 1

Frequency GHz	Measured Level dBm	Cable Loss dB	Total		Limit		Margin	
			dBm	Watts	dBm	Watts	dBm	Watts
2.405	-1.61	0.6	-1.01	0.00079	30	1	-31.01	-0.99921
2.445	-2.27	0.6	-1.67	0.00068	30	1	-31.67	-0.99932
2.480	-3.22	0.6	-2.62	0.00055	30	1	-32.62	-0.99945

Results: The Peak Power Output measurements for antenna 0 and antenna 1 of the ARRIS Model XG1-V3 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 (12/04/2014)

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	12.0140	-51.03	2.19	-48.84	-21.84	PASS
11	2.405	14.4190	-59.85	2.5	-57.35	-21.84	PASS
11	2.405	No other harmonics to 24 GHz					
19	2.445	12.2060	-50.34	2.19	-48.15	-21.99	PASS
19	2.445	No other harmonics to 24 GHz					
26	2.480	12.3990	-49.18	2.19	-46.99	-23.23	PASS
26	2.480	No other harmonics to 24 GHz					

Antenna 1

Channel	Fundamental Channel Freq (GHz)	Freq (GHz)	Measured Level (dBm)	BEC#814 Cable Loss (dB)	Total Corrected Level (dBm)	Output Spurious Limit (dBm)	Pass/Fail
11	2.405	12.0140	-60.83	2.5	-58.33	-21.7	PASS
11	2.405	14.4190	-59.4	2.5	-56.9	-21.7	PASS
11	2.405	No other harmonics to 24 GHz					
19	2.445	12.2060	-56.45	2.19	-54.26	-22.07	PASS
19	2.445	No other harmonics to 24 GHz					
26	2.480	12.3990	-54.6	2.19	-52.41	-23.59	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 XG1-V3 Set Top Box are compliant with the limits specified in FCC Section 15.247(d).



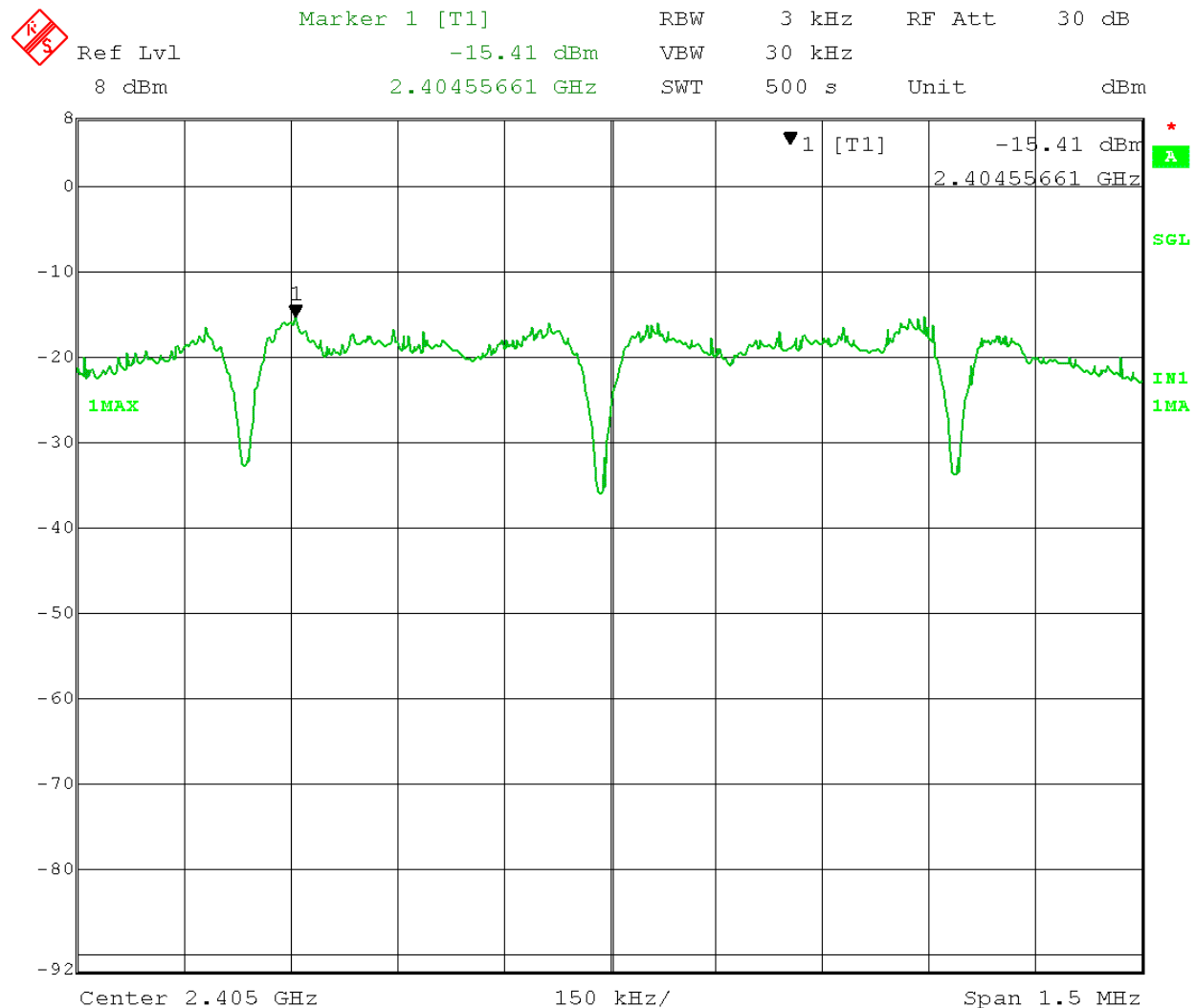
4.6 Power Spectral Density FCC Section 15.247(e)

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: 3.DEC.2014 14:59:12

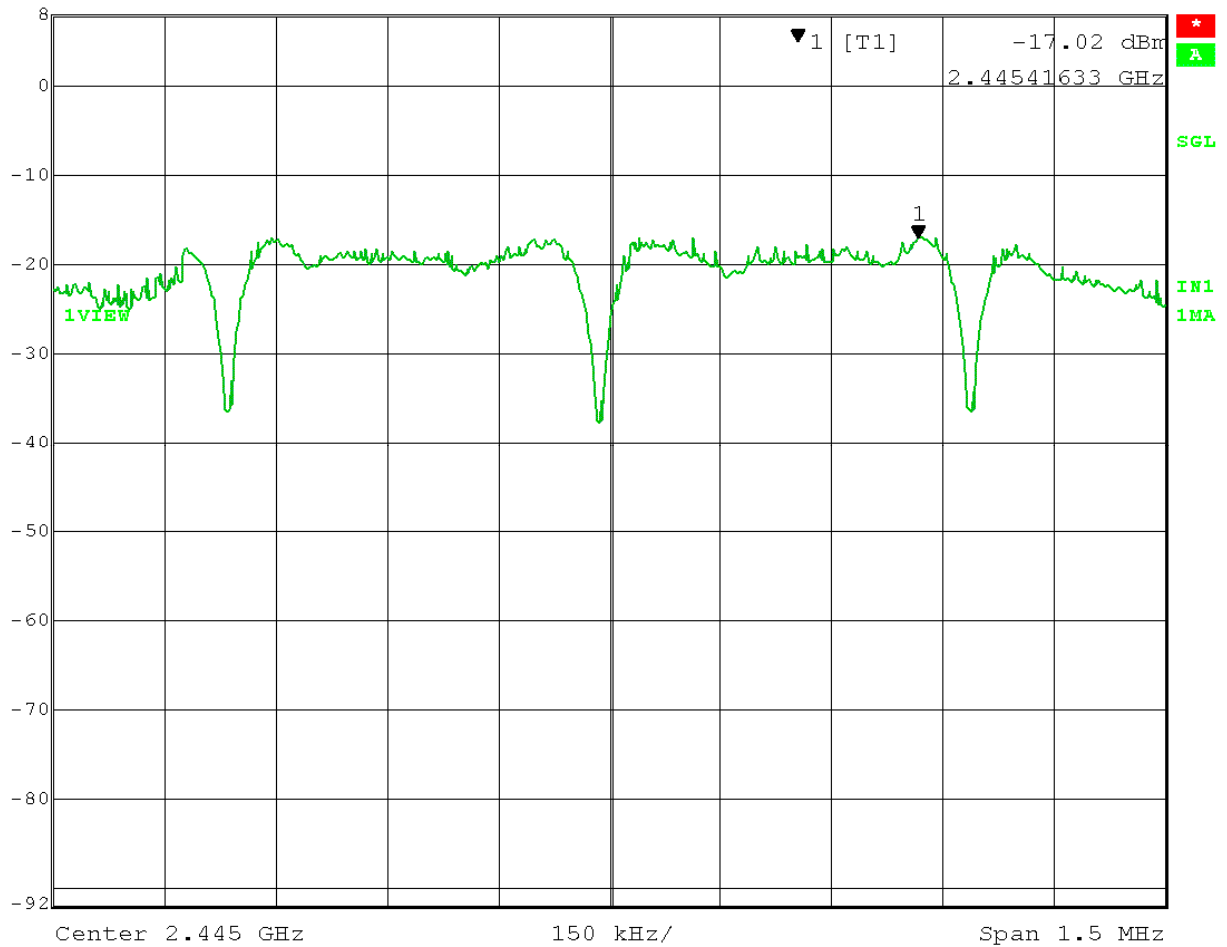
Report # BEC- 1582-01 REV1 ARRIS XG1-V3 FCC Part 15.247 Test Report Release Date: 01/20/2015



Antenna 0, Channel 19 (2.445 GHz)



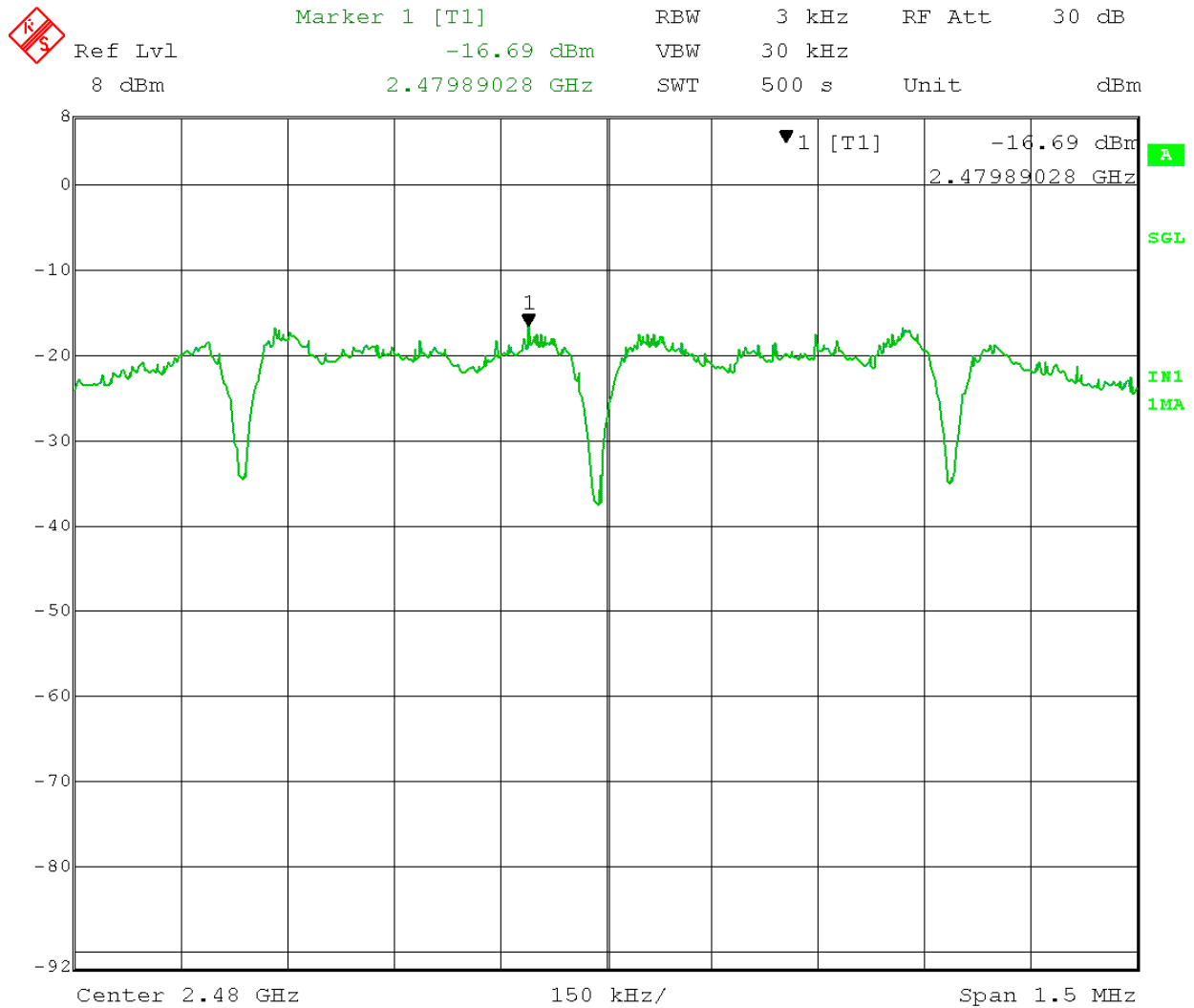
Ref Lvl 8 dBm
Marker 1 [T1] -17.02 dBm
2.44541633 GHz
RBW 3 kHz
VBW 30 kHz
SWT 500 s
RF Att 30 dB
Unit dBm



Date: 3.DEC.2014 15:18:05



Antenna 0, Channel 26 (2.480 GHz)

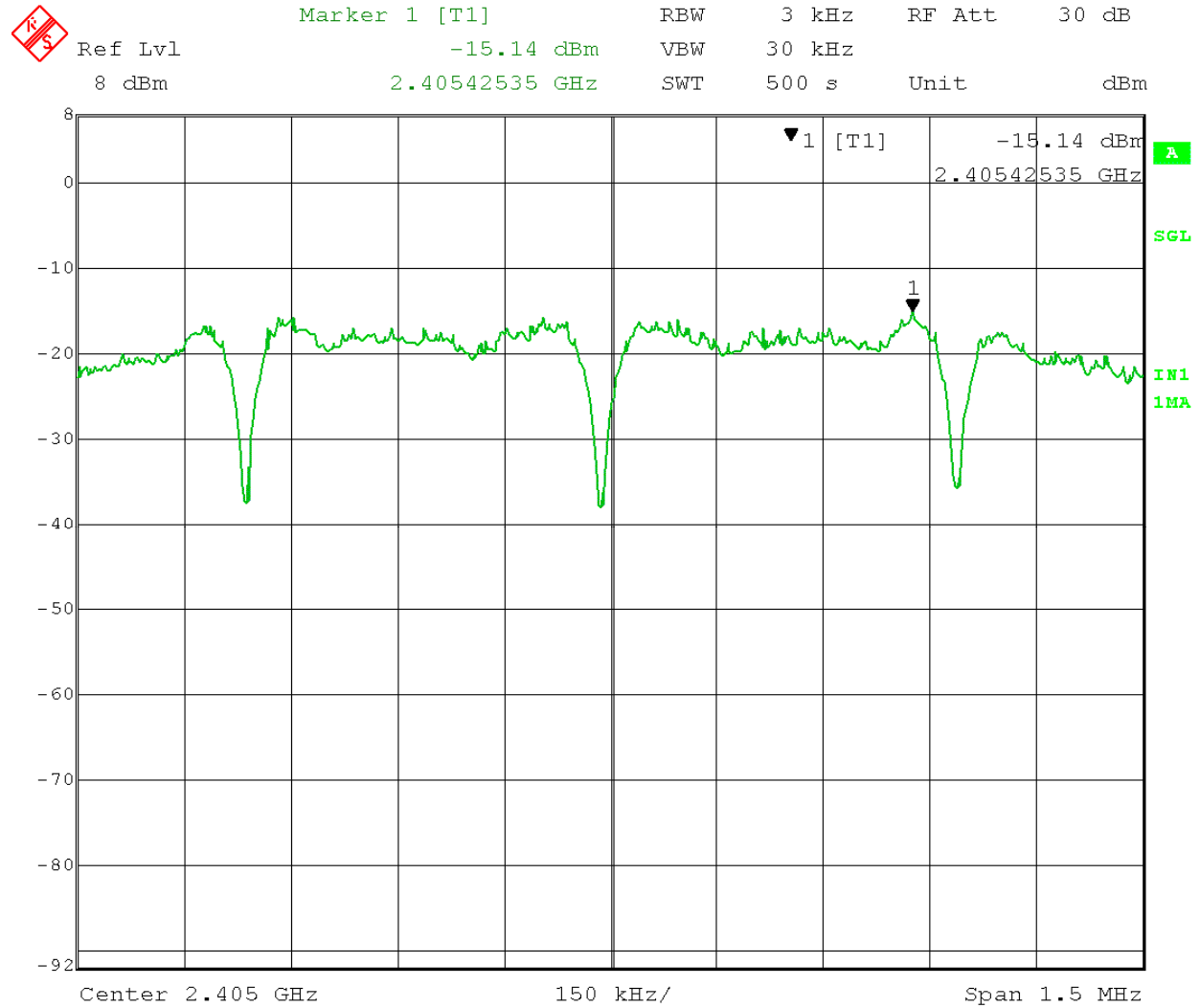


Date: 3.DEC.2014 15:34:31



4.6.3 Power Spectral Density Analyzer Display Captures Antenna 1

Antenna 1, Channel 11 (2.405 GHz)



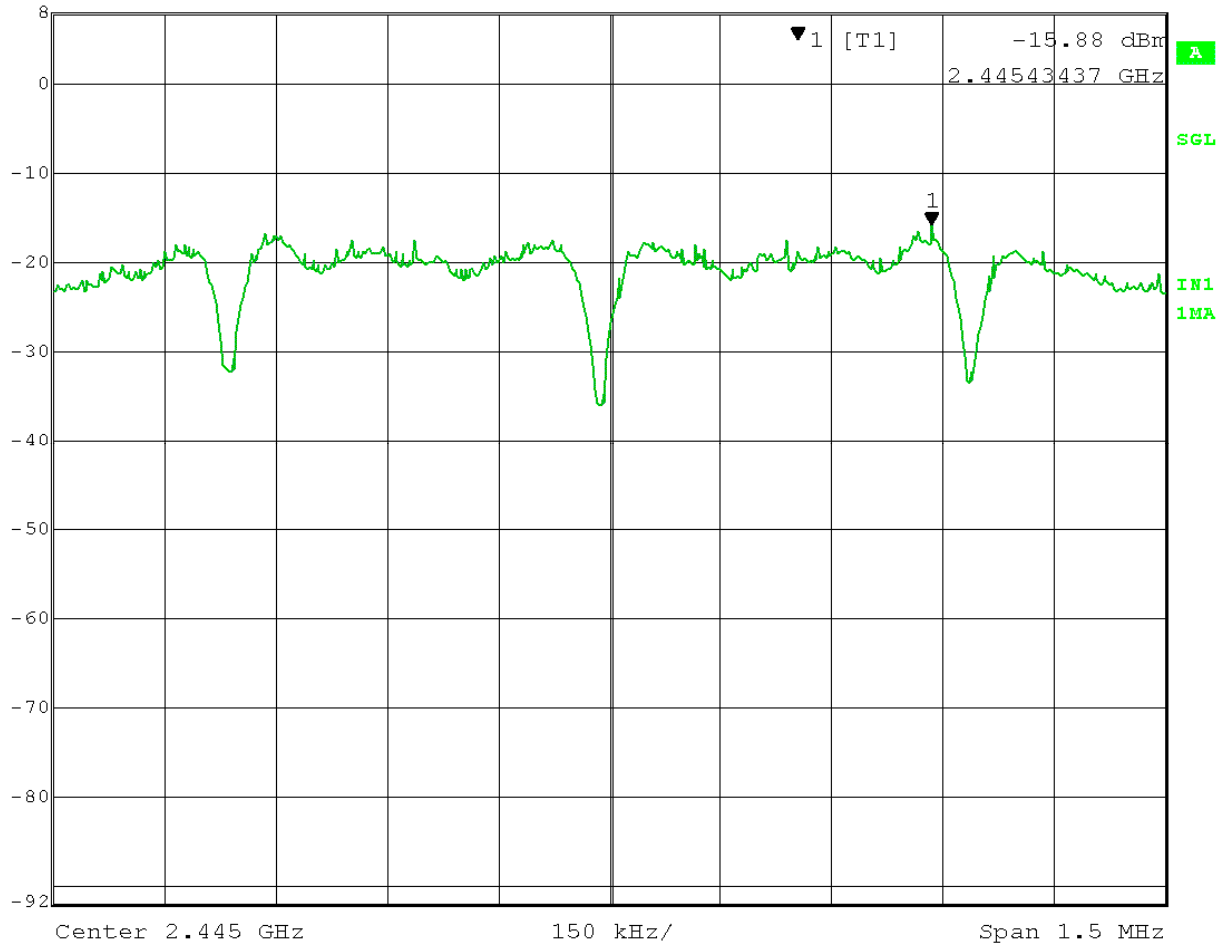
Date: 3.DEC.2014 15:52:23



Antenna 1, Channel 19 (2.445 GHz)



Ref Lvl 8 dBm
Marker 1 [T1] -15.88 dBm
2.44543437 GHz
RBW 3 kHz
VBW 30 kHz
SWT 500 s
RF Att 30 dB
Unit dBm



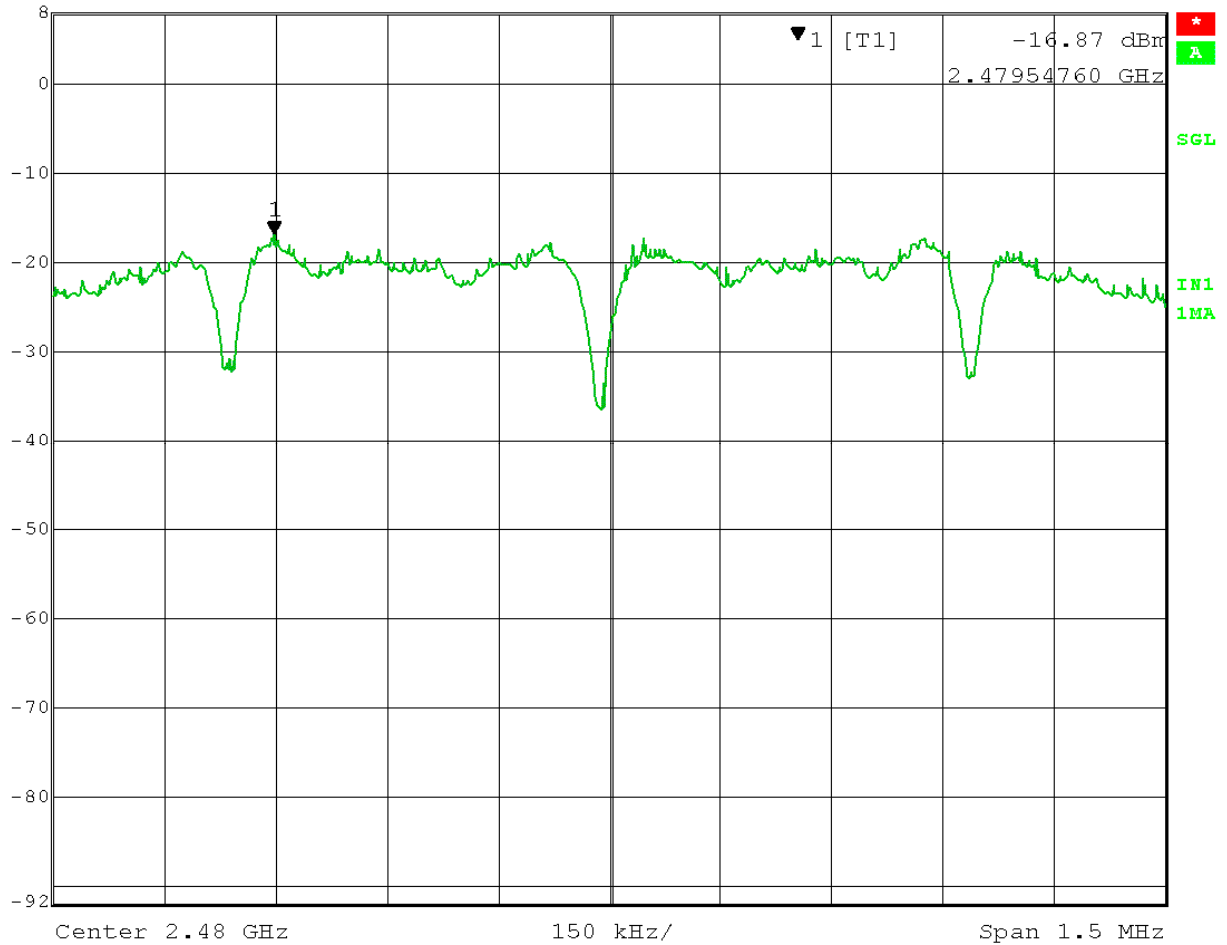
Date: 3.DEC.2014 16:08:58



Antenna 1, Channel 26 (2.480 GHz)



Ref Lvl 8 dBm
Marker 1 [T1] -16.87 dBm
2.47954760 GHz
RBW 3 kHz
VBW 30 kHz
SWT 500 s
RF Att 30 dB
Unit dBm



Date: 3.DEC.2014 16:23:38



4.6.4 Power Spectral Density Test Results (12/02/2014)

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	2.405	-15.41	0.6	-14.81	8	PASS
0	CH.19	2.445	-17.02	0.6	-16.42	8	PASS
0	CH.26	2.480	-16.69	0.6	-16.09	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	2.405	-15.14	0.6	-14.54	8	PASS
1	CH.19	2.445	-15.88	0.6	-15.28	8	PASS
1	CH.26	2.480	-16.87	0.6	-16.27	8	PASS

Results: The Power Spectral Density measurements for antenna 0 and antenna 1 of the ARRIS Model XG1-V3 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

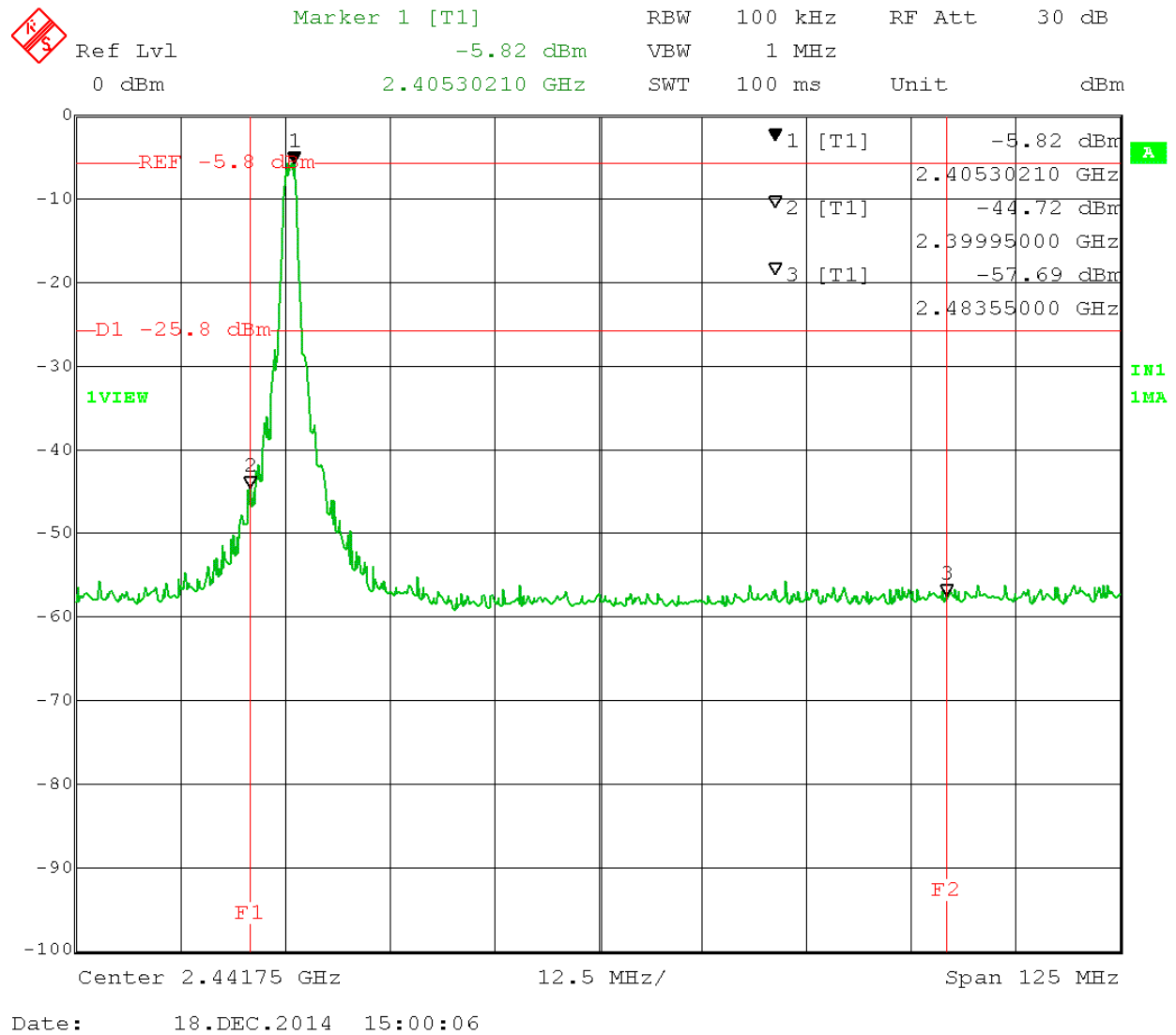
The data was recorded in three screen captures from the Spectrum Analyzer. Parameters particular to each measurement are as follows:

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



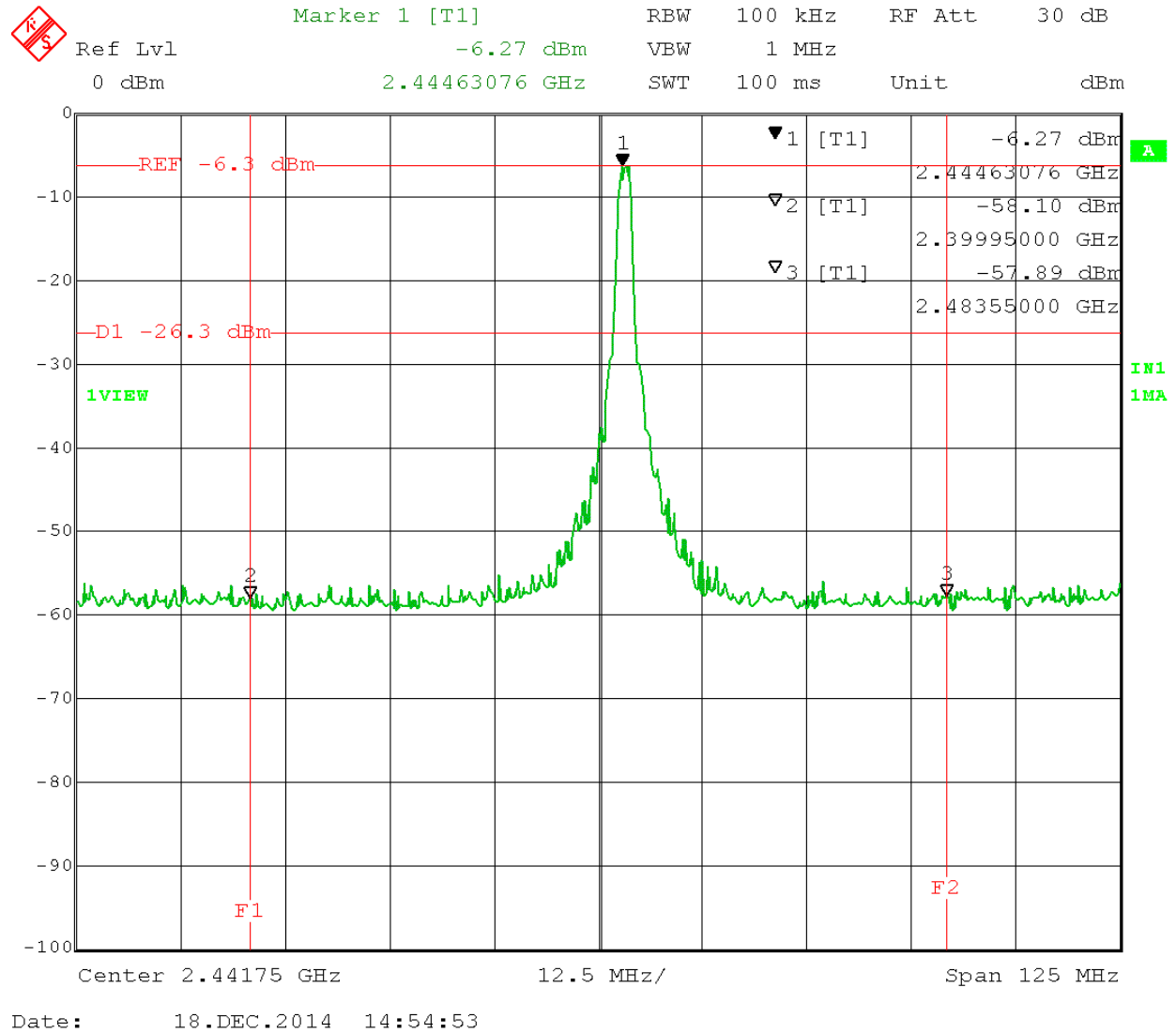
4.7.2 Band Edge Measurement Analyzer Display Captures Antenna 0

Antenna 0, Channel 11 (2.405 GHz)



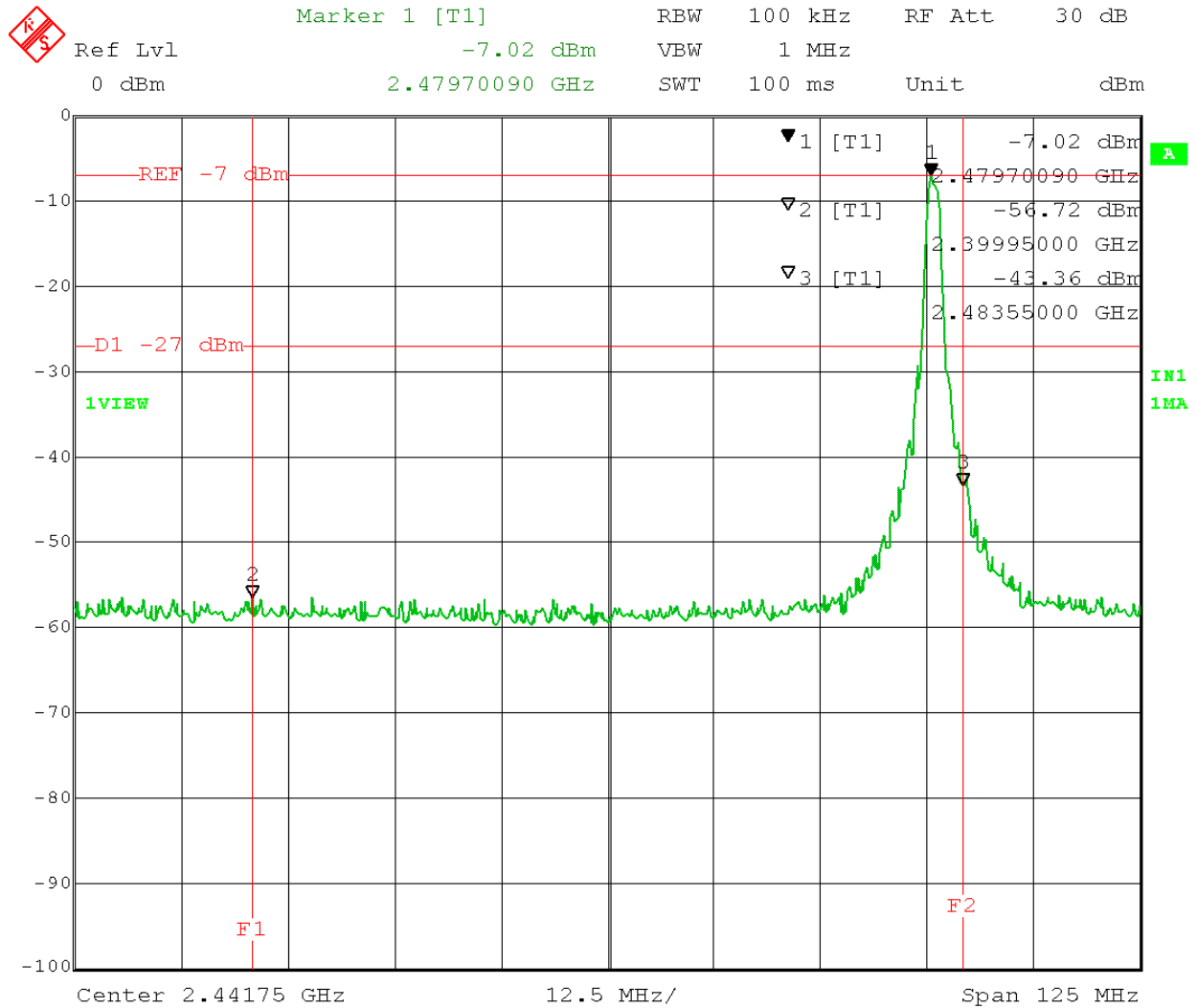


Antenna 0, Channel 19 (2.445 GHz)





Antenna 0, Channel 26 (2.480 GHz)

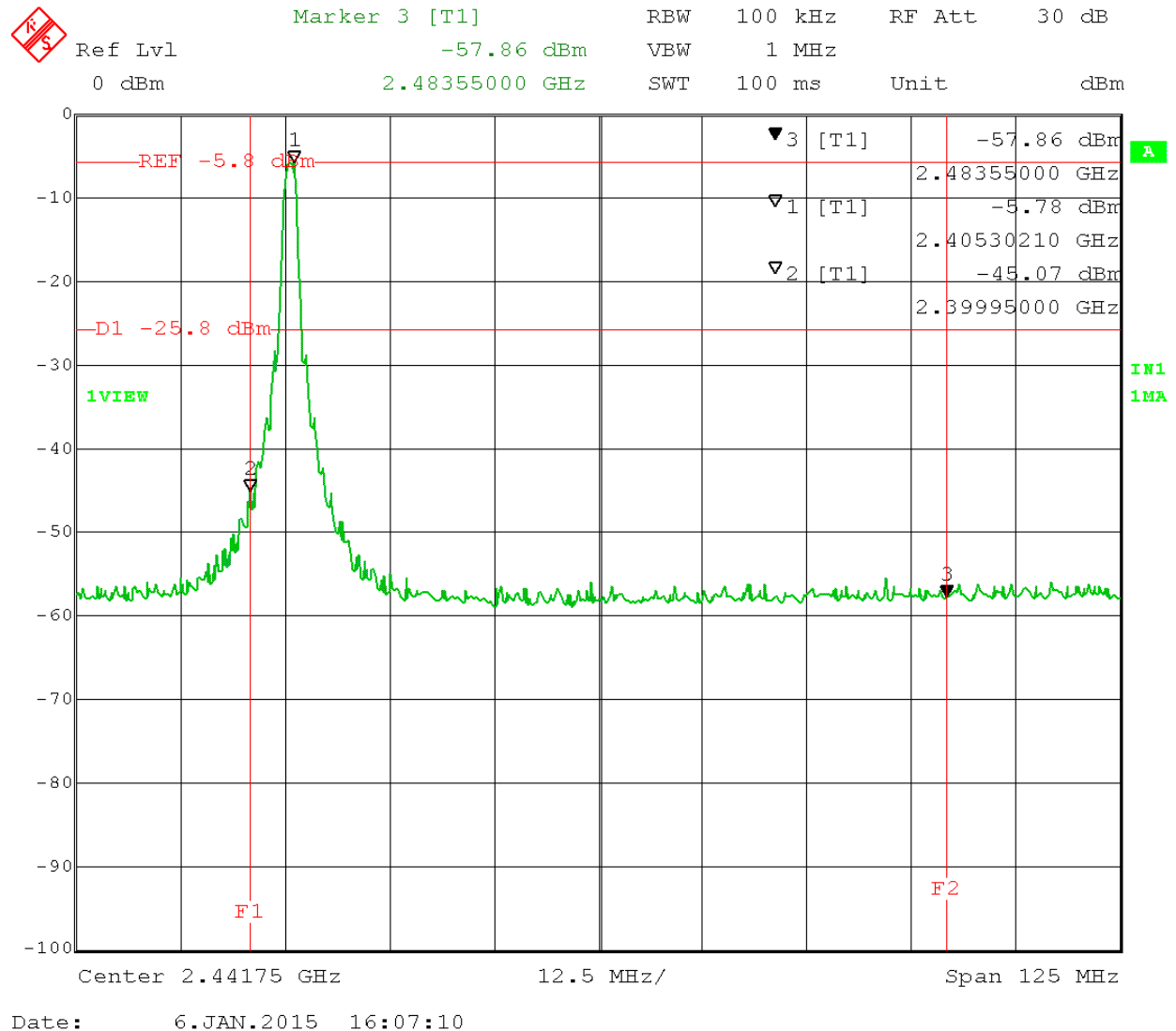


Date: 18.DEC.2014 14:52:56



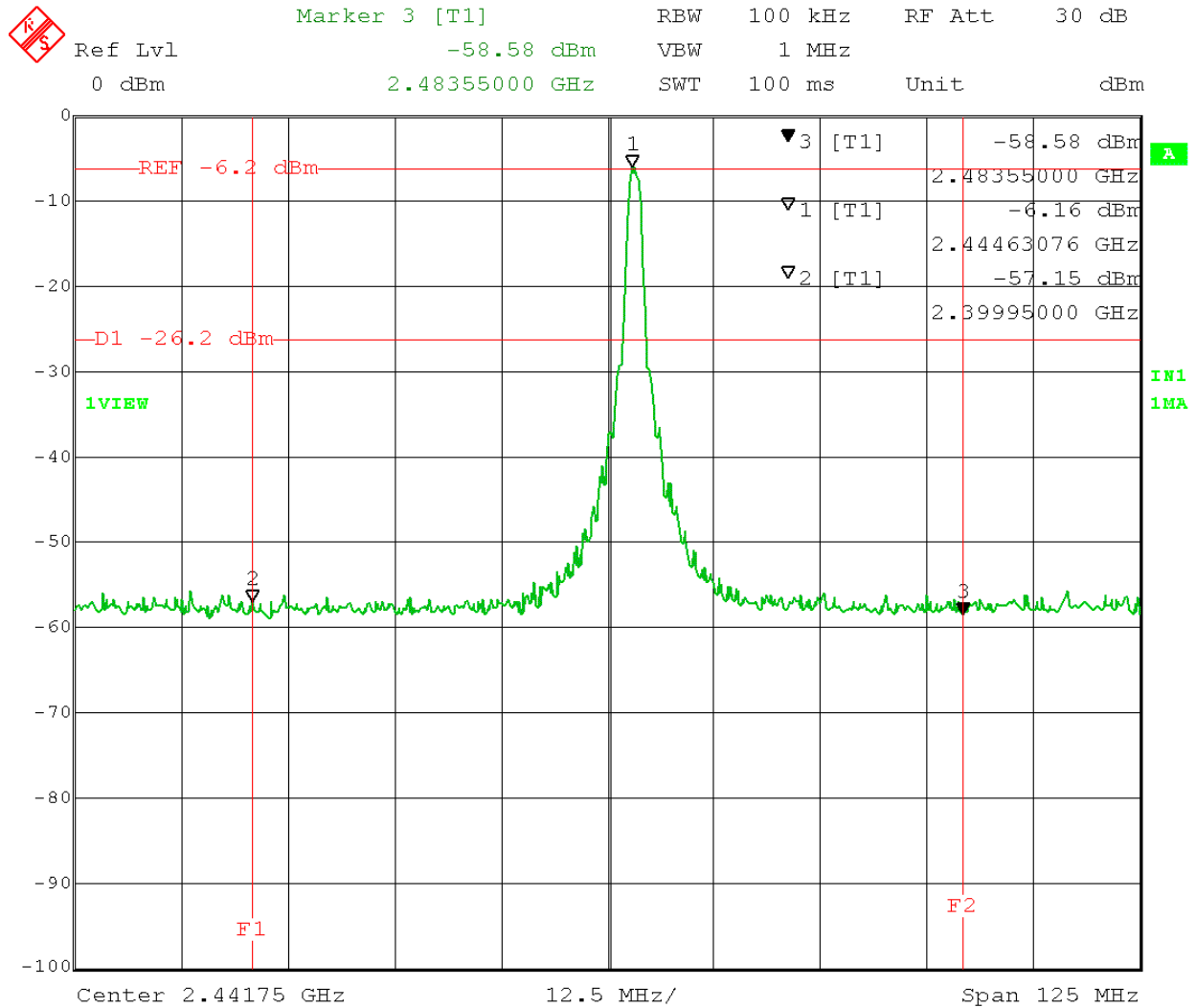
4.7.3 Band Edge Measurement Analyzer Display Captures Antenna 1

Antenna 1, Channel 11 (2.405 GHz)





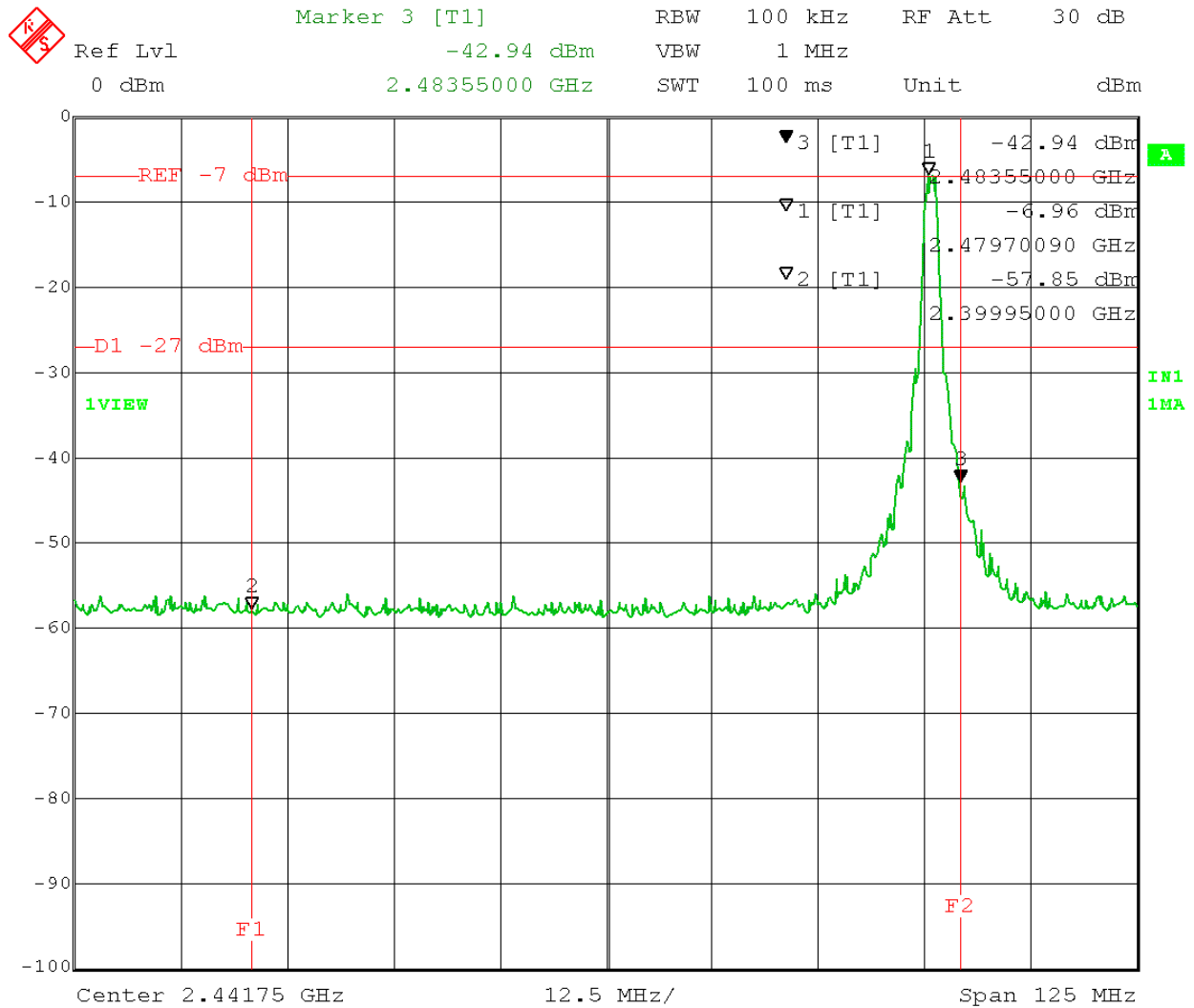
Antenna 1, Channel 19 (2.445 GHz)



Date: 6.JAN.2015 16:10:57



Antenna 0, Channel 26 (2.480 GHz)



Date: 6.JAN.2015 16:14:16



4.7.4 Band Edge Measurement Test Data Results (12/18/2014 and 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	-5.82	-25.8	2.4	2.4835	2.39995	-44.72	2.48355	-57.69
19	2.4446	-6.27	-26.3	2.4	2.4835	2.39995	-58.10	2.48355	-57.89
26	2.4797	-7.02	-27.0	2.4	2.4835	2.39995	-56.72	2.48355	-43.36

Antenna 1

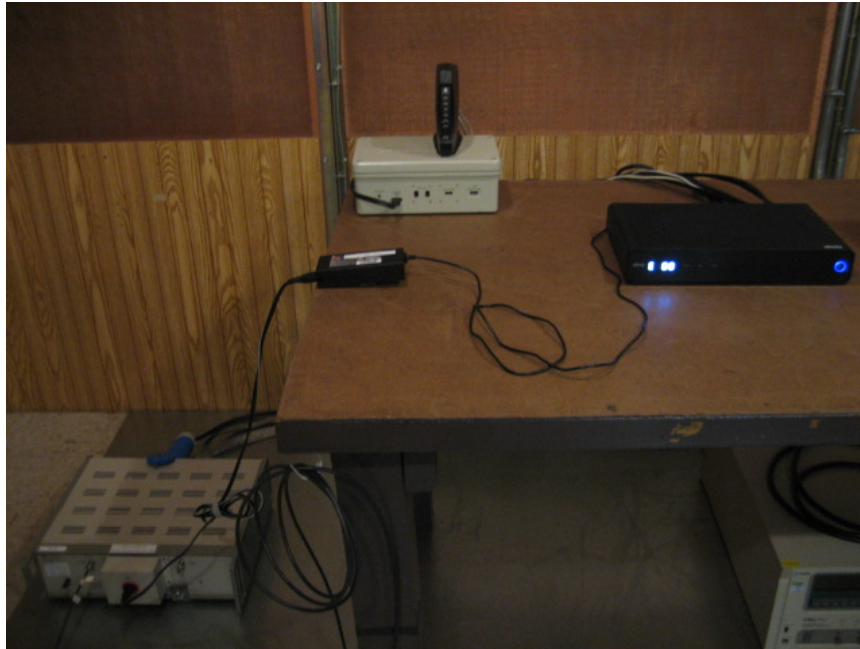
Channel	Measurement Frequency (GHz)	Peak Amplitude (dBm)	20 dB Limit	Lower Edge of Freq Band (GHz)	Upper Edge of Freq Band (GHz)	Lower Measured Freq (GHz)	Lower Measured Amplitude (dBm)	Upper Measured Frequency (GHz)	Upper Measured Amplitude (dBm)
11	2.4053	-5.78	-25.8	2.4	2.4835	2.39995	-45.07	2.48355	-57.86
19	2.4446	-6.16	-26.2	2.4	2.4835	2.39995	-57.15	2.48355	-58.58
26	2.4797	-6.96	-27	2.4	2.4835	2.39995	-57.85	2.48355	-42.94

Results: The Band Edge measurements for antenna 0 and antenna 1 of the ARRIS Model XG1-V3 Set Top Box are compliant with the limits specified in FCC Section 15.247(d).

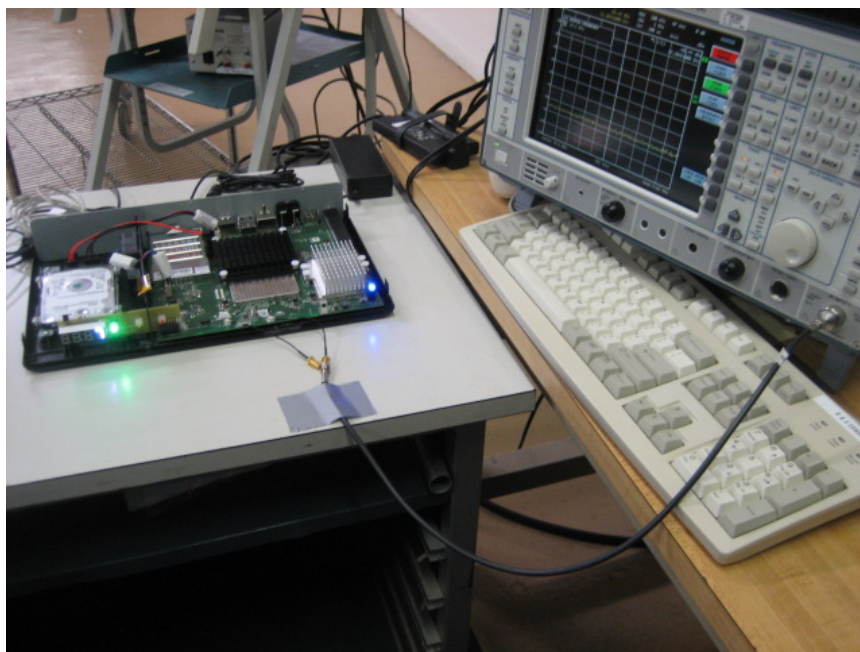


5.0 Test Setup Pictures

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