



BEC INCORPORATED

CERTIFICATION APPLICATION TEST REPORT


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

**ARRIS Model Spectrum 110A
Set Top Box**

REPORT BEC-1839-01

TEST DATES: 10/03/2017 – 11/02/2017

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

PREPARED BY: 
Steve Fanella, Test Engineer

REVIEWED and APPROVED BY: 
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	11/02/2017
1	FCC ID was changed to reflect all Caps	11/08/2017	11/08/2017



1.0 Administrative Information

1.1 Project Details

Project Number	BEC-1893
Set Top Box Manufacturer	ARRIS Group Incorporated
Set Top Box Model Number	Spectrum 110A
Set Top Box Serial Number	CA0SBJ3NC9V5
Set Top Box Sample Number	1839-03 (Modified With SMA Ports to the Antennas)
Set Top Box Serial Number	CA0TBJLD72NH
Set Top Box Sample Number	1825-05 (Unmodified Antennas)
FCC ID	ACQ-SPECTRUM110
Antenna Manufacturer	GreenPeak Technologies
Antenna Model Number	GP712
Frequency of Operation	2400 - 2483.5 MHz
Test Laboratory Location	BEC Incorporated 970 East High Street Pottstown, PA 19464
Test Personnel	Paul Banker / Steve Fanella / JR Fanella
Test Performed For	ARRIS Group Incorporated 101 Tournament Drive Horsham, PA 19044
Customer Technical Contact	Tom Piacentino
Date Received	09/30/2017
Condition Received	Suitable for test
Sample Type	Production unit
EUT Classification	Cable Set Top Box with wireless capability supporting RF4CE
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 Spectrum 110A Set Top Box was tested and found to be compliant to the sections of the FCC Part 15 Subpart C standard listed below:

Report Section	FCC Part 15, Subpart C Intentional Radiators	Test Description	Result
4.1	15.207(b)	Conducted Emissions, Power Leads, 150 kHz to 30 MHz	PASS
4.2.3	15.209(a)	Spurious Radiated Emissions, 30 MHz to 1 GHz	PASS
4.2.4	15.209, 15.205	Spurious Radiated Emissions, 1 GHz to 25 GHz	PASS
4.3	15.247(a)(2)	6 dB Occupied Bandwidth	PASS
4.4	15.247(b)(3)	Maximum Peak Power Output	PASS
4.5	15.247(d)	Antenna Port, Conducted Spurious Emissions	PASS
4.6	15.247(e)	Antenna Port, Power Spectral Density	PASS
4.7	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	3.43
Radiated Disturbance	3 Meter	30 MHz – 1 GHz	FCC Section 15.209	4.41

No adjustments to measured data presented in this report are required because all values of uncertainty are less than the CISPR 16-4-2:2011 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 Climatic Environment

Unless noted elsewhere in this report, the following were the ambient conditions in the laboratory during testing:

Temperature: $22^{\circ} \pm 5^{\circ}$

Humidity: $50\% \pm 20\%$

Barometric Pressure: $1000\text{mb} \pm 20\%$

1.7 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 Spectrum product line includes the Spectrum 110A and Spectrum 210A. Both products are video home set tops with a wideband QAM tuner capable of up to 4 tunes. Video display capability is max 1080P60. Both products have fully compliant Docsis3.0 embedded cable modems. The Spectrum 110A is capable of pause/live TV with internal SD card. The Spectrum 210A is capable of up to 4 DVR recordings with included HDD. Both products have capsense menu keys with Bluetooth and RF4CE wireless technologies.

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 GreenPeak Technologies Model GP712 RF4CE Device Information

The GreenPeak Technologies GP712 System-on-Chip is an IEEE 802.15.4 communications controller for integration into a ZigBee node. It is compliant with the IEEE Standard 802.15.4, providing robust spread spectrum data communication with a secure encrypted data flow, and supports multiple ZigBee (RF4CE1, ZigBee PRO2, ZigBee IP3) and associated low power wireless (6LowPAN4, Thread5) protocol stacks in the host processor. The GP712 is able to listen simultaneously on three different channels with antenna diversity. The GP712's interference robustness and antenna diversity offer superior performance in a crowded wireless 2.4 GHz environment. In addition, the GP712 presents a Coexistence Interface to enable coexistence with other potentially interfering radios (Bluetooth, Wi-Fi) within the same host device. The GP712 provides a high-speed serial interface (SPI or UART) to the host processor. It supports stand-alone RF4CE Duty Cycling and packet filtering through Deep Packet Inspection when the host is asleep and has an extremely low standby power enabling total system power consumption of less than 1 mW while allowing reception of remote control commands. The GP712 is optimized for low cost while providing superior performance. Its radio characteristics reduce the product's RF design complexity enabling low cost single layer applications using simple PCB antennas requiring no shielding and a minimum number of external components.



2.6 Test Configuration

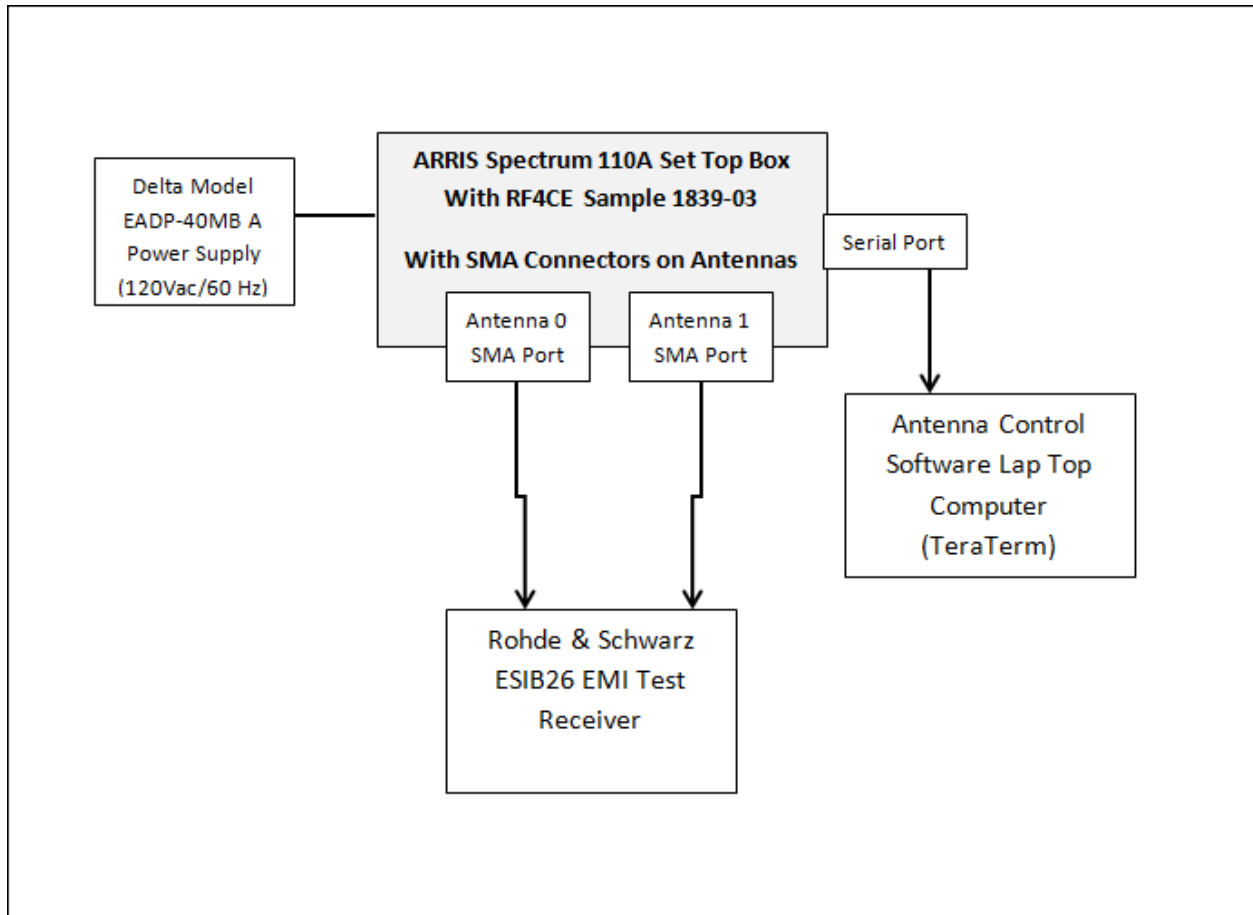
The antennas within the ARRIS Model Spectrum 110A Set Top Box were controlled by software which allowed the test technician to select the specific antenna within the EUT, designate the specific Channel Frequency, control the antenna power and control the antenna modulation (on/off).

2.7 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.

2.8 Test Configuration Diagram (Conducted Measurements)

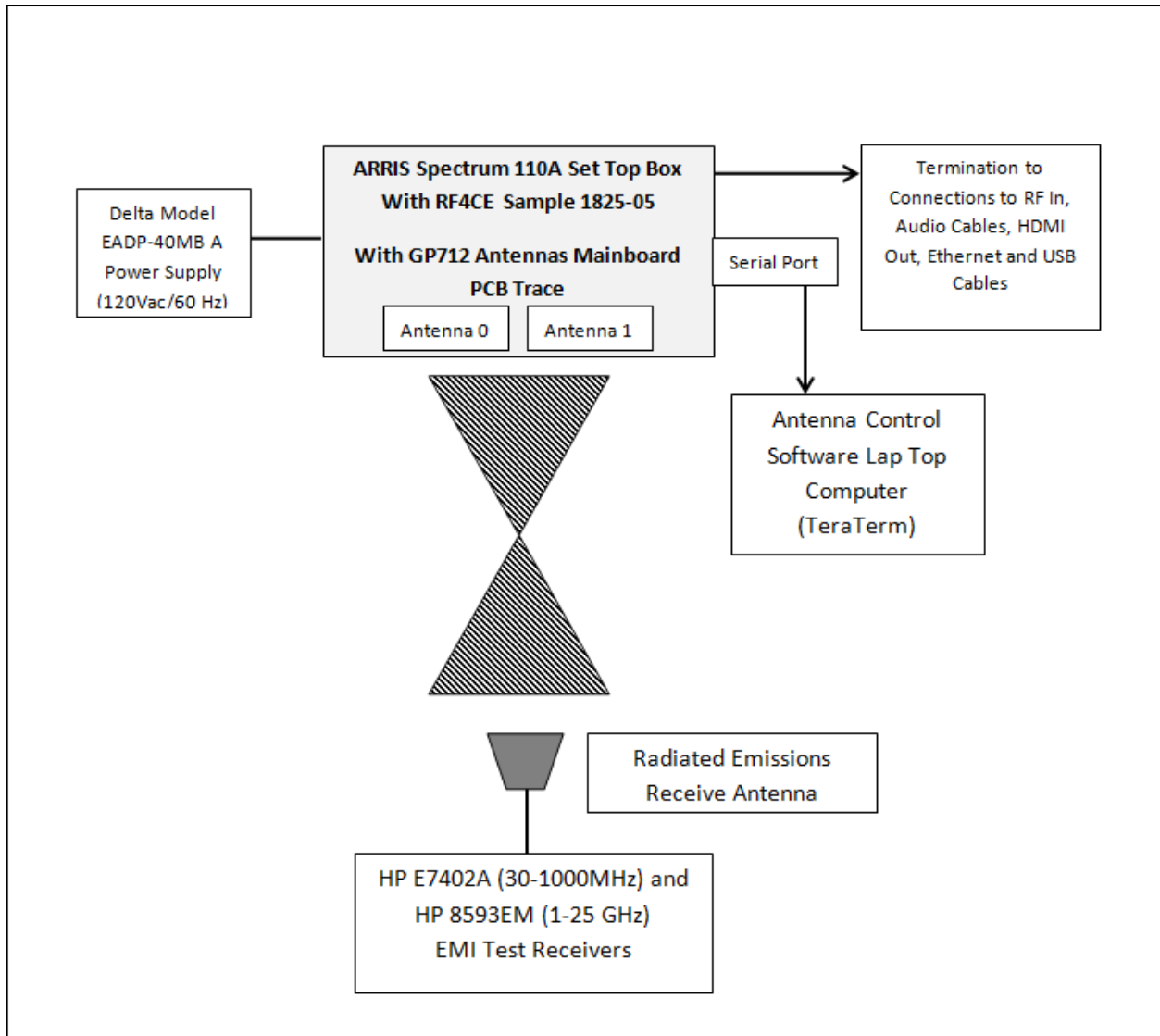
A block diagram of the EUT configuration showing interconnection cables is illustrated below. The drawing shows the physical hardware layout used for the tests along with I/O cables and AC power distribution.





2.9 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.





2.10 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	Spectrum 110A	CA0SBJ3NC9V5	1839-03
Set Top Box (Unmodified Antennas)	ARRIS	Spectrum 110A	CA0TBJLD72NH	1825-05

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	Acoustic Research/PR161	95% braid w/100% aluminum Mylar foil	6 Feet	Audio Out Ports
HDMI	Monoprice/HH-28F-04E	Double Copper Braid	4 Feet	HDMI Port (Emissions)
75-Ohm Coax	Belden-T 9114 Duobond	Double Braid	1 Meter	RF In and RF Out
Ethernet CAT5	Siemon Co. / MC5-8-T-07-20	Mylar foil	7 Feet	Ethernet Port
USB	Hannstar/E52534-D	Braid over foil	2 Meters	USB Port

Support Equipment

Description	Manufacturer	Model	Serial Number
AC/DC Power Convertor for Spectrum 110A Set Top Box	Delta	EADP-40MB A	DTDG0140300274151009035
Antenna Control Software Lap Top Computer	Dell	Latitude D830	CH-0HN338-48643-84F-0307



2.11 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.

2.12 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.

2.13 EUT Modifications

No modifications were made to the ARRIS Model Spectrum 110A Set Top Box.



2.14 EUT Pictures ARRIS Model Spectrum 110A With RF4CE Antenna Connections Conducted Testing Sample 1839-03

ARRIS MODEL SPECTRUM 110A SET TOP BOX SAMPLE 1839-03 FRONT SIDE

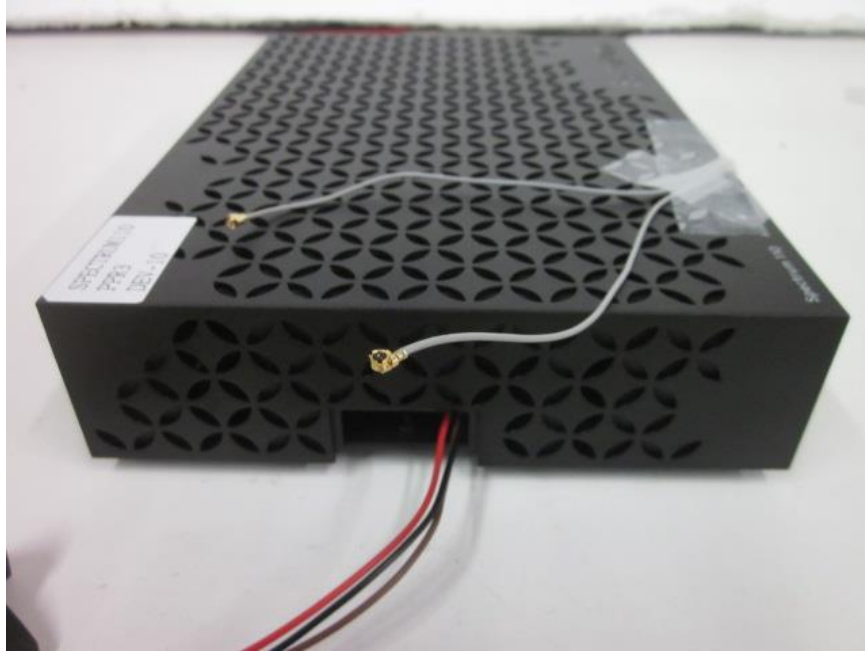


ARRIS MODEL SPECTRUM 110A SET TOP BOX SAMPLE 1839-03 REAR SIDE

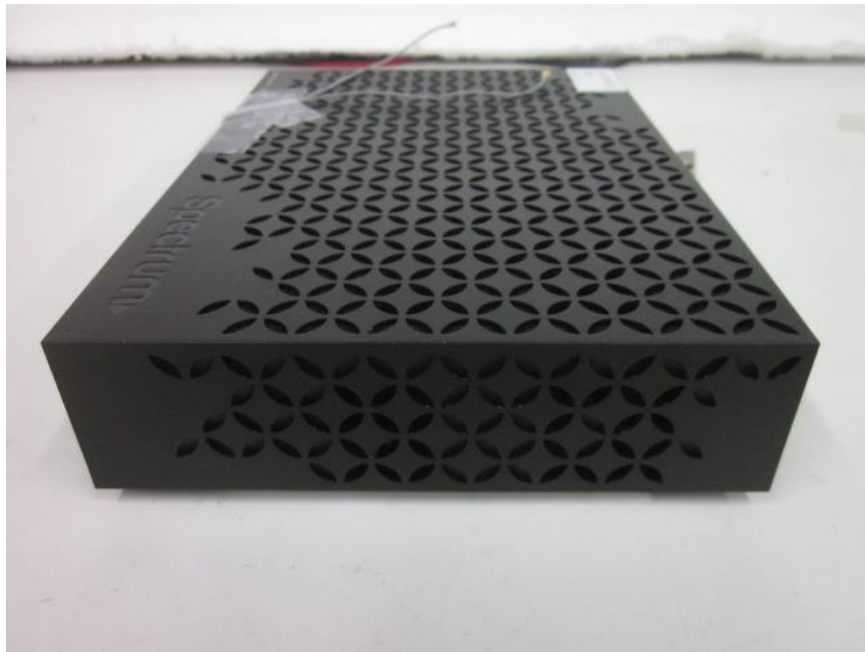




ARRIS MODEL SPECTRUM 110A SET TOP BOX SAMPLE 1839-03 LEFT SIDE



ARRIS MODEL SPECTRUM 110A SET TOP BOX SAMPLE 1839-03 RIGHT SIDE





ARRIS MODEL SPECTRUM 110A SET TOP BOX SAMPLE 1839-03 TOP SIDE







ARRIS MODEL SPECTRUM 110A SET TOP BOX SAMPLE 1839-03 BOTTOM SIDE





ARRIS MODEL SPECTRUM 110A SET TOP BOX SAMPLE 1839-03 SAMPLE TAG

  STB SN: CAOSBJ3NC9V5  eCM MAC: 20:F1:9E:7A:D3:A5  eSTB MAC: 20:F1:9E:7A:D3:A4 H/W VERSION: REV 1.3	Compliance Test Lab
	<input checked="" type="checkbox"/> Test Item <input type="checkbox"/> Support Item
	Project/Sample #: <u>1839-03</u>
	Customer: <u>ARRIS</u>
	Model #: <u>SPECTRUM 110A PRR3</u>
	Serial #: <u>CAOSBJ3NC9V5</u>
	Item Received Date: <u>10/3/17</u>
	Notes: <u>BT - RADIATED</u> <u>RF4CE - CONDUCTED</u>
	BEC-F010002



2.15 EUT Pictures ARRIS Model Spectrum 110A No Antenna Modifications Radiated Testing Sample 1825-05

ARRIS MODEL SPECTRUM 110A SET TOP BOX SAMPLE 1825-05 FRONT SIDE

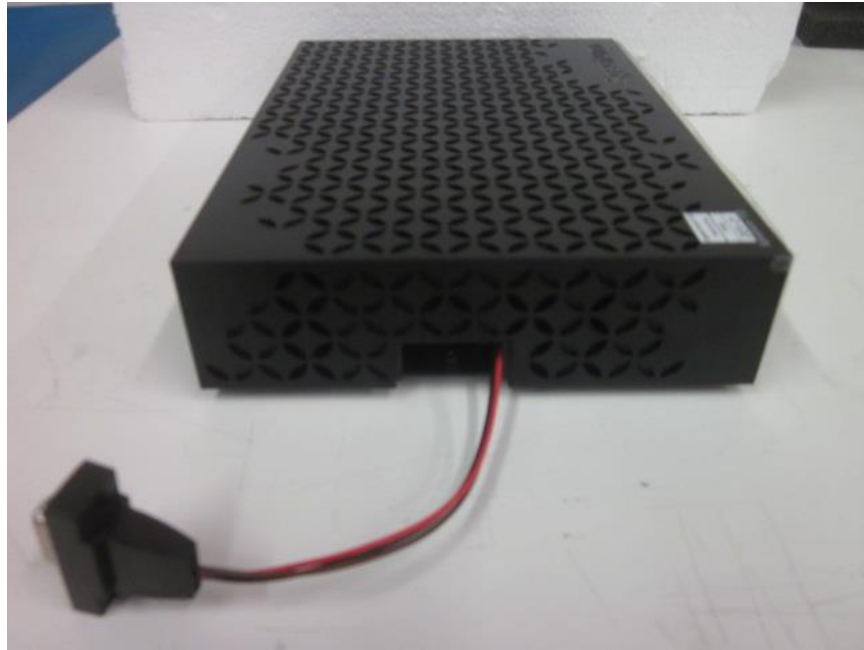


ARRIS MODEL SPECTRUM 110A SET TOP BOX SAMPLE 1825-05 REAR SIDE

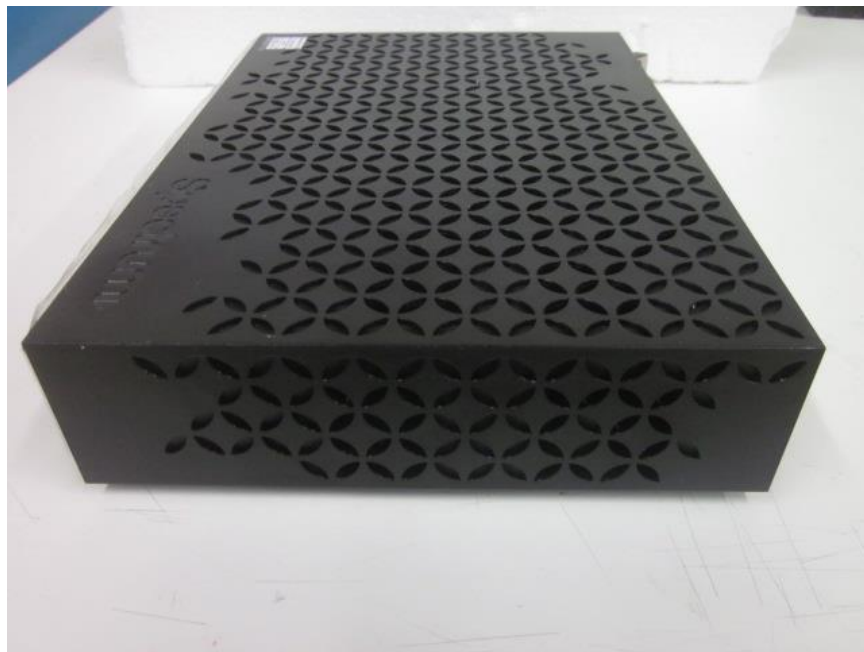




ARRIS MODEL SPECTRUM 110A SET TOP BOX SAMPLE 1825-05 LEFT SIDE



ARRIS MODEL SPECTRUM 110A SET TOP BOX SAMPLE 1825-05 RIGHT SIDE





ARRIS MODEL SPECTRUM 110A SET TOP BOX SAMPLE 1825-05 BOTTOM SIDE



BEC
BEC International
Compliance Test Lab

Project/Sample #: 1825-05
Customer: ARRIS
Model #: SPECTRUM 110A 2
Serial #: CA0TBS1272284
Item Received Date: 9/13/17
Notes: HDMI Control Mode
CH 0255
BEC 11/08/17

Test Item Support Item

ARRIS
SPECTRUM 110A 2
CA0TBS1272284

1825-05
ARRIS
SPECTRUM 110A 2
CA0TBS1272284



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: 2014, 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:

$$\text{Emission (dB}\mu\text{V)} = \text{Meter Reading (dB}\mu\text{v)} + \text{Cable Loss (dB)} + \text{LISN Factor (dB)} + \text{Limiter Loss (dB)}$$

The EUT was tested with individual conducted emissions test runs with Antenna 0 set to Channel 11, Channel 19 and Channel 26. The EUT was then tested at the same three frequencies with Antenna 1 active. The Summary Results are listed in Section 4.1.2 with the worst case of Antenna 0 set to Channel 11 (2405 MHz) shown in Section 4.1.3.

4.1.2 Conducted Emissions Summary

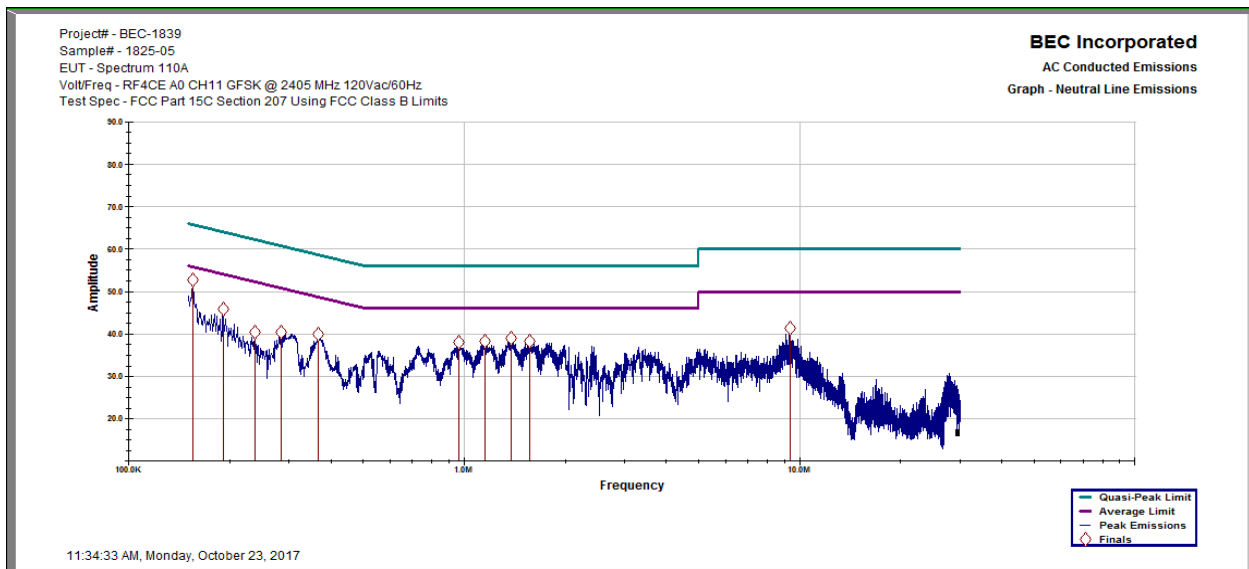
	Closest Average Margin	Closest QP Margin
Antenna 0 Channel 11 (2405 MHz)	-15.78	-18.03
Antenna 0 Channel 19 (2445 MHz)	-17.43	-17.76
Antenna 0 Channel 26 (2480 MHz)	-16.61	-17.58
Antenna 1 Channel 11 (2405 MHz)	-16.72	-17.27
Antenna 1 Channel 19 (2445 MHz)	-16.68	-17.32
Antenna 1 Channel 26 (2480 MHz)	-16.86	-17.44



4.1.3 Conducted Emissions Test Results ARRIS Spectrum 110A with Delta Model EADP-40MB A Power Supply (10/23/2017)

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.

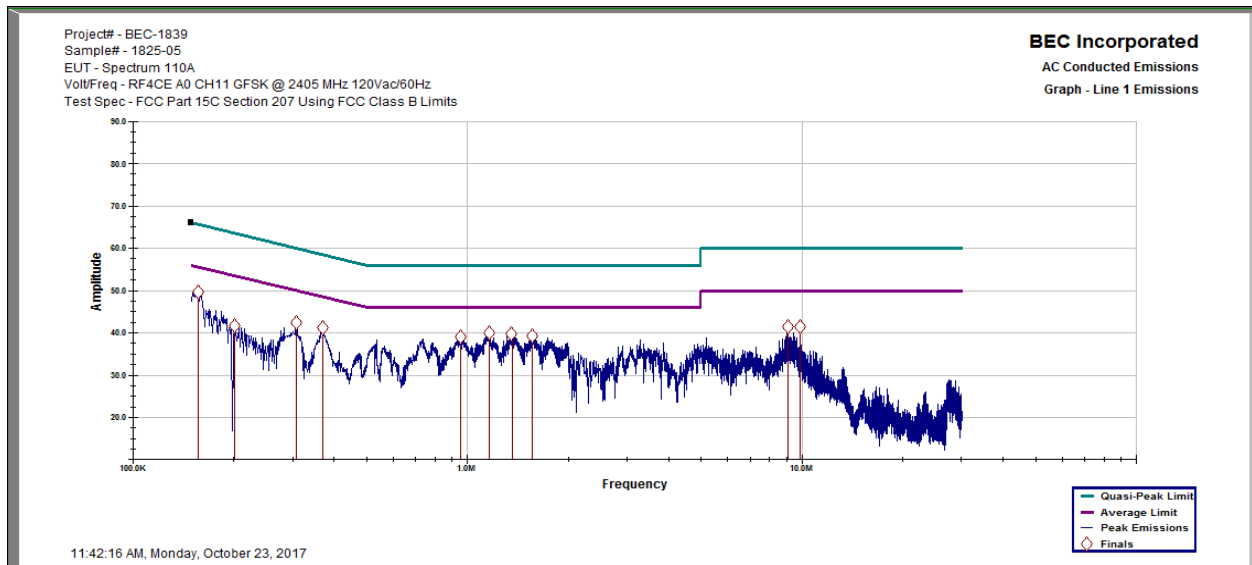
BEC Incorporated Neutral Line Conducted Emissions 11:34:30 AM, Monday, October 23, 2017							
	1	2	3	4	5	6	7
Frequency	AVG	AVG	AVG	QP	QP	QP	Corr
MHz	dBuV	Limit	Margin	dBuV	Limit	Margin	Factor
154.786 KHz	35.76	55.86	-20.10	47.83	65.86	-18.03	10.030
188.528 KHz	31.57	54.90	-23.33	38.78	64.90	-26.12	10.030
238.148 KHz	18.00	53.48	-35.49	30.46	63.48	-33.02	10.030
284.341 KHz	27.44	52.16	-24.72	36.65	62.16	-25.51	10.030
366.975 KHz	32.47	49.80	-17.33	38.27	59.80	-21.53	10.130
963.300 KHz	26.11	46.00	-19.89	35.09	56.00	-20.91	10.240
1.159 MHz	27.96	46.00	-18.04	35.66	56.00	-20.34	10.240
1.362 MHz	25.27	46.00	-20.73	34.45	56.00	-21.55	10.240
1.574 MHz	27.86	46.00	-18.14	35.29	56.00	-20.71	10.240
9.299 MHz	27.66	50.00	-22.34	34.58	60.00	-25.42	10.390
Project# - BEC-1839							
Sample# - 1825-05							
EUT - Spectrum 110A							
Volt/Freq - RF4CE A0 CH11 GFSK @ 2405 MHz 120Vac/60Hz							
Test Spec - FCC Part 15C Section 207 Using FCC Class B Limits							





BEC Incorporated
Line 1 Conducted Emissions
11:42:13 AM, Monday, October 23, 2017

	1	2	3	4	5	6	7
Frequency	AVG	AVG	AVG	QP	QP	QP	Corr
MHz	dBuV	Limit	Margin	dBuV	Limit	Margin	Factor
155.905 KHz	36.710	55.831	-19.121	47.770	65.831	-18.061	10.050
198.628 KHz	20.147	54.611	-34.463	35.360	64.611	-29.251	10.040
308.025 KHz	25.059	51.485	-26.426	38.506	61.485	-22.979	10.056
371.133 KHz	33.903	49.682	-15.779	38.510	59.682	-21.172	10.140
963.720 KHz	26.552	46.000	-19.448	36.310	56.000	-19.690	10.260
1.159 MHz	29.328	46.000	-16.672	37.090	56.000	-18.910	10.260
1.368 MHz	25.965	46.000	-20.035	35.470	56.000	-20.530	10.260
1.579 MHz	28.302	46.000	-17.698	35.930	56.000	-20.070	10.260
9.136 MHz	27.530	50.000	-22.470	34.880	60.000	-25.120	10.390
9.884 MHz	25.525	50.000	-24.475	32.350	60.000	-27.650	10.390
Project# - BEC-1839							
Sample# - 1825-05							
EUT - Spectrum 110A							
Volt/Freq - RF4CE A0 CH11 GFSK @ 2405 MHz 120Vac/60Hz							
Test Spec - FCC Part 15C Section 207 Using FCC Class B Limits							



Results: All conducted emissions measured on the ARRIS Model Spectrum 110A Set Top Box AC power port with the Delta Model EADP-40MB A supply are below the limits specified in FCC Section 15.207 by a margin of at least 15.78 dB.



4.2 Spurious Radiated Emissions, 30 MHz 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 GP712 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 30 MHz to 1000 MHz Test Results (10/20/2017, 10/23/2017 and 10/24/2017)

The following tables shows the highest amplitude average detected field strengths as recorded from the EUT. These measurements were performed over the frequency range of 30 MHz to 1000 MHz 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. Graphs for all individual runs are available upon request.

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

Frequency MHz	Peak dBuV/m	QP dBuV/m	Polarity H/V	Turntable degrees	Antenna Height cm	Correction Factors dB	FCCB Limit dBuV/m	Margin dB	Results PASS/FAIL
135.011	28.86	28.98	H	283	247	-12.8	43.52	-14.54	PASS
190.455	20.62	16.75	H	201	214	-14.13	43.52	-26.77	PASS
249.984	44.42	43.64	H	145	133	-13.3	46.02	-2.38	PASS
374.984	35.06	37.61	H	135	106	-9.99	46.02	-8.41	PASS
728.976	40.79	40.44	H	154	110	-4.57	46.02	-5.58	PASS
874.992	39.56	38.99	H	124	104	-2.35	46.02	-7.03	PASS

Frequency MHz	Peak dBuV/m	QP dBuV/m	Polarity H/V	Turntable degrees	Antenna Height cm	Correction Factors dB	FCCB Limit dBuV/m	Margin dB	Results PASS/FAIL
134.986	38.54	37.47	V	53	106	-12.8	43.52	-6.05	PASS
161.99	35.32	36.34	V	224	116	-13.69	43.52	-7.18	PASS
189.005	27.57	27.66	V	255	106	-14.25	43.52	-15.86	PASS
249.996	39.25	38.69	V	158	106	-13.3	46.02	-7.33	PASS
624.988	27.35	32.54	V	66	122	-6.4	46.02	-13.48	PASS
728.984	35.41	34.59	V	294	107	-4.57	46.02	-11.43	PASS

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

Frequency MHz	Peak dBuV/m	QP dBuV/m	Polarity H/V	Turntable degrees	Antenna Height cm	Correction Factors dB	FCCB Limit dBuV/m	Margin dB	Results PASS/FAIL
108.024	30.75	32.63	H	191	131	-14.12	43.52	-10.89	PASS
134.988	35.56	33.85	H	283	252	-12.8	43.52	-9.67	PASS
249.999	44.42	44.24	H	143	128	-13.3	46.02	-1.78	PASS
374.986	35.81	37.86	H	138	110	-9.99	46.02	-8.16	PASS
728.976	41.48	40.37	H	156	108	-4.57	46.02	-5.65	PASS
874.98	38.52	37.19	H	121	176	-2.35	46.02	-8.83	PASS

Frequency MHz	Peak dBuV/m	QP dBuV/m	Polarity H/V	Turntable degrees	Antenna Height cm	Correction Factors dB	FCCB Limit dBuV/m	Margin dB	Results PASS/FAIL
107.962	29.96	30.69	V	275	105	-14.13	43.52	-12.83	PASS
135.008	39.35	38.76	V	57	167	-12.8	43.52	-4.76	PASS
147.019	20.1	19.51	V	276	109	-13.21	43.52	-24.01	PASS
161.958	37.5	37.97	V	200	109	-13.68	43.52	-5.55	PASS
188.99	27.74	28.43	V	178	118	-14.25	43.52	-15.09	PASS
249.994	40.16	39.27	V	160	105	-13.3	46.02	-6.75	PASS



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

Frequency	Peak	QP	Polarity	Turntable	Antenna Height	Correction Factors	FCCB Limit	Margin	Results
MHz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	dBuV/m	dB	PASS/FAIL
134.969	32.2	31.8	H	295	133	-12.8	43.52	-11.72	PASS
188.99	30.01	27.49	H	207	230	-14.25	43.52	-16.03	PASS
249.989	43.92	43.19	H	143	139	-13.3	46.02	-2.83	PASS
374.976	38.47	37.07	H	191	195	-9.99	46.02	-8.95	PASS
728.986	40.89	39.88	H	142	106	-4.57	46.02	-6.14	PASS
874.978	38.43	38.43	H	121	106	-2.35	46.02	-7.59	PASS

Frequency	Peak	QP	Polarity	Turntable	Antenna Height	Correction Factors	FCCB Limit	Margin	Results
MHz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	dBuV/m	dB	PASS/FAIL
108.009	29.67	31.93	V	295	104	-14.12	43.52	-11.59	PASS
134.986	37.33	36.16	V	30	212	-12.8	43.52	-7.36	PASS
162	39.48	39.99	V	226	108	-13.69	43.52	-3.53	PASS
188.982	23.57	25.79	V	195	110	-14.25	43.52	-17.73	PASS
249.989	39.21	38.29	V	157	104	-13.3	46.02	-7.73	PASS
728.994	34.5	33.85	V	25	105	-4.57	46.02	-12.17	PASS

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

Frequency	Peak	QP	Polarity	Turntable	Antenna Height	Correction Factors	FCCB Limit	Margin	Results
MHz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	dBuV/m	dB	PASS/FAIL
108.007	31.86	33.3	H	227	126	-14.12	43.52	-10.22	PASS
249.994	40.97	41.12	H	107	130	-13.3	46.02	-4.9	PASS
374.999	39.32	39.78	H	134	107	-9.99	46.02	-6.24	PASS
405.014	28.9	31.23	H	10	110	-9.3	46.02	-14.79	PASS
728.989	42.22	41.78	H	163	103	-4.57	46.02	-4.24	PASS
874.995	39.46	38.98	H	127	154	-2.35	46.02	-7.04	PASS

Frequency	Peak	QP	Polarity	Turntable	Antenna Height	Correction Factors	FCCB Limit	Margin	Results
MHz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	dBuV/m	dB	PASS/FAIL
81	33.17	34.08	V	247	116	-18.86	40	-5.92	PASS
134.998	40.46	39.08	V	34	109	-12.8	43.52	-4.44	PASS
150.033	19.19	25.85	V	322	158	-13.38	43.52	-17.67	PASS
162.008	40.39	41.53	V	199	145	-13.69	43.52	-1.99	PASS
188.995	38.2	39.15	V	196	105	-14.25	43.52	-4.37	PASS
250.009	40.02	39.87	V	181	132	-13.3	46.02	-6.15	PASS



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

Frequency MHz	Peak dBuV/m	QP dBuV/m	Polarity H/V	Turntable degrees	Antenna Height cm	Correction Factors dB	FCCB Limit dBuV/m	Margin dB	Results PASS/FAIL
134.996	35.03	33.63	H	280	247	-12.8	43.52	-9.89	PASS
189.01	31.35	30.7	H	231	109	-14.24	43.52	-12.82	PASS
249.996	43.06	41.97	H	280	118	-13.3	46.02	-4.05	PASS
374.999	37.15	39.14	H	180	109	-9.99	46.02	-6.88	PASS
728.981	42.39	42.1	H	151	110	-4.57	46.02	-3.92	PASS
874.993	38.79	38.56	H	124	148	-2.35	46.02	-7.46	PASS

Frequency MHz	Peak dBuV/m	QP dBuV/m	Polarity H/V	Turntable degrees	Antenna Height cm	Correction Factors dB	FCCB Limit dBuV/m	Margin dB	Results PASS/FAIL
80.98	31.28	33.04	V	265	173	-18.86	40	-6.96	PASS
134.998	40.84	41.87	V	50	145	-12.8	43.52	-1.65	PASS
162	40.82	41.91	V	223	110	-13.69	43.52	-1.61	PASS
188.982	36.08	38.23	V	201	103	-14.25	43.52	-5.29	PASS
250.004	41.43	41.01	V	184	107	-13.3	46.02	-5.01	PASS
728.979	37.71	37.48	V	257	135	-4.57	46.02	-8.54	PASS

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

Frequency MHz	Peak dBuV/m	QP dBuV/m	Polarity H/V	Turntable degrees	Antenna Height cm	Correction Factors dB	FCCB Limit dBuV/m	Margin dB	Results PASS/FAIL
107.979	32.07	33.31	H	218	138	-14.13	43.52	-10.21	PASS
250.004	44.91	45.35	H	148	121	-13.3	46.02	-0.67	PASS
375.006	39.17	39.45	H	28	111	-10	46.02	-6.57	PASS
704.359	19	17.35	H	217	227	-4.83	46.02	-28.67	PASS
729.014	43	42.97	H	165	109	-4.57	46.02	-3.05	PASS
875	39.48	39.35	H	108	170	-2.35	46.02	-6.67	PASS

Frequency MHz	Peak dBuV/m	QP dBuV/m	Polarity H/V	Turntable degrees	Antenna Height cm	Correction Factors dB	FCCB Limit dBuV/m	Margin dB	Results PASS/FAIL
81	35.04	35.66	V	251	180	-18.86	40	-4.34	PASS
135.016	36.64	33.74	V	36	219	-12.8	43.52	-9.78	PASS
147.044	20.62	24.19	V	134	144	-13.21	43.52	-19.33	PASS
162.01	41.39	42.86	V	233	110	-13.69	43.52	-0.66	PASS
189	38.64	39.25	V	181	104	-14.25	43.52	-4.27	PASS
250.001	41.05	40.6	V	157	105	-13.3	46.02	-5.42	PASS

Results: All harmonic spurious radiated emissions as recorded at a distance of 3 meters from the ARRIS Model Spectrum 110A Set Top Box are below the 3 meter limit specified by FCC Section 15.209 requirements by a margin of at least 0.66 dB.



4.2.4 Spurious Radiated Emissions 1GHz to 25 GHz Test Results (10/30/2017)

The following tables 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. Graphs for all individual runs are available upon request.

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

Frequency	Peak Level	Avg Level	Ant Pol	Azimuth	Ant Hght	C/F	FCC Part 15C	FCC Part 15C	FCC Part 15C	FCC Part 15C	Results
Hz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	Avg Limit	Avg Margin	Peak Limit	Peak Margin	
4811060000	57.7	51.73	H	52	211.9	2.28	53.98	-22.253	73.98	-16.278	PASS

Frequency	Peak Level	Avg Level	Ant Pol	Azimuth	Ant Hght	C/F	FCC Part 15C	FCC Part 15C	FCC Part 15C	FCC Part 15C	Results
Hz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	Avg Limit	Avg Margin	Peak Limit	Peak Margin	
3588860000	37.92	28.08	V	219	110	-0.32	53.98	-45.898	73.98	-36.056	PASS
4809250000	58.88	52.12	V	313	103	2.28	53.98	-21.862	73.98	-15.105	PASS

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

Frequency	Peak Level	Avg Level	Ant Pol	Azimuth	Ant Hght	C/F	FCC Part 15C	FCC Part 15C	FCC Part 15C	FCC Part 15C	Results
Hz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	Avg Limit	Avg Margin	Peak Limit	Peak Margin	
4888840000	52.01	40.22	H	94	125.1	2.58	53.98	-33.762	73.98	-21.972	PASS

Frequency	Peak Level	Avg Level	Ant Pol	Azimuth	Ant Hght	C/F	FCC Part 15C	FCC Part 15C	FCC Part 15C	FCC Part 15C	Results
Hz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	Avg Limit	Avg Margin	Peak Limit	Peak Margin	
2444290000	30.05	24.38	V	316	100	-5.32	53.98	-29.595	73.98	-43.933	PASS
3580550000	40.92	28.04	V	316	184	-0.34	53.98	-25.945	73.98	-33.062	PASS
4891010000	61.1	54.4	V	99.8	153.3	2.59	53.98	-16.99	73.98	-10.29	PASS

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

Frequency	Peak Level	Avg Level	Ant Pol	Azimuth	Ant Hght	C/F	FCC Part 15C	FCC Part 15C	FCC Part 15C	FCC Part 15C	Results
Hz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	Avg Limit	Avg Margin	Peak Limit	Peak Margin	
2480500000	34.73	27.73	H	94	121.5	-5.18	53.98	-46.251	73.98	-39.248	PASS
4961050000	51.22	44.56	H	92	118	2.85	53.98	-29.423	73.98	-22.758	PASS

Frequency	Peak Level	Avg Level	Ant Pol	Azimuth	Ant Hght	C/F	FCC Part 15C	FCC Part 15C	FCC Part 15C	FCC Part 15C	Results
Hz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	Avg Limit	Avg Margin	Peak Limit	Peak Margin	
2479450000	38.27	32.49	V	95	149	-5.18	53.98	-21.495	73.98	-35.712	PASS
4958960000	60.21	54.51	V	98	147	2.84	53.98	-19.468	73.98	-13.766	PASS



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

Frequency	Peak Level	Avg Level	Ant Pol	Azimuth	Ant Hght	C/F	FCC Part 15C	FCC Part 15C	FCC Part 15C	FCC Part 15C	Results
Hz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	Avg Limit	Avg Margin	Peak Limit	Peak Margin	
4810960000	52.18	44.31	H	92	128.1	2.28	53.98	-29.671	73.98	-21.798	PASS

Frequency	Peak Level	Avg Level	Ant Pol	Azimuth	Ant Hght	C/F	FCC Part 15C	FCC Part 15C	FCC Part 15C	FCC Part 15C	Results
Hz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	Avg Limit	Avg Margin	Peak Limit	Peak Margin	
3572600000	38.57	27.97	V	343	143	-0.37	53.98	-46.013	73.98	-35.408	PASS
4808990000	55.36	49.28	V	93	135	2.27	53.98	-24.703	73.98	-18.616	PASS

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

Frequency	Peak Level	Avg Level	Ant Pol	Azimuth	Ant Hght	C/F	FCC Part 15C	FCC Part 15C	FCC Part 15C	FCC Part 15C	Results
Hz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	Avg Limit	Avg Margin	Peak Limit	Peak Margin	
4888970000	50.19	43.67	H	90	104.8	2.58	53.98	-30.309	73.98	-23.792	PASS

Frequency	Peak Level	Avg Level	Ant Pol	Azimuth	Ant Hght	C/F	FCC Part 15C	FCC Part 15C	FCC Part 15C	FCC Part 15C	Results
Hz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	Avg Limit	Avg Margin	Peak Limit	Peak Margin	Results
3581890000	37.94	27.83	V	166	213	-0.34	53.98	-46.145	73.98	-36.038	PASS
4891020000	52.24	45.57	V	73	142	2.59	53.98	-28.407	73.98	-21.744	PASS

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

Frequency	Peak Level	Avg Level	Ant Pol	Azimuth	Ant Hght	C/F	FCC Part 15C	FCC Part 15C	FCC Part 15C	FCC Part 15C	Results
Hz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	Avg Limit	Avg Margin	Peak Limit	Peak Margin	
2480600000	31.9	25.5	H	317	207	-5.18	53.98	-48.48	73.98	-42.078	PASS
4960990000	51.87	45.53	H	313	122.9	2.85	53.98	-28.453	73.98	-22.108	PASS

Frequency	Peak Level	Avg Level	Ant Pol	Azimuth	Ant Hght	C/F	FCC Part 15C	FCC Part 15C	FCC Part 15C	FCC Part 15C	Results
Hz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	Avg Limit	Avg Margin	Peak Limit	Peak Margin	
2479380000	34.67	31.14	V	93	104	-5.18	53.98	-42.845	73.98	-39.312	PASS
3602990000	38.22	28.21	V	234	182	-0.27	53.98	-45.765	73.98	-35.76	PASS
4961030000	55.21	48.94	V	94	105	2.85	53.98	-25.036	73.98	-18.768	PASS

Results: All harmonic spurious radiated emissions as recorded at a distance of 3 meters from the ARRIS Model Spectrum 110A Set Top Box are below the 3 meter limit specified by FCC Section 15.209 requirements by a margin of at least 10.29 dB.



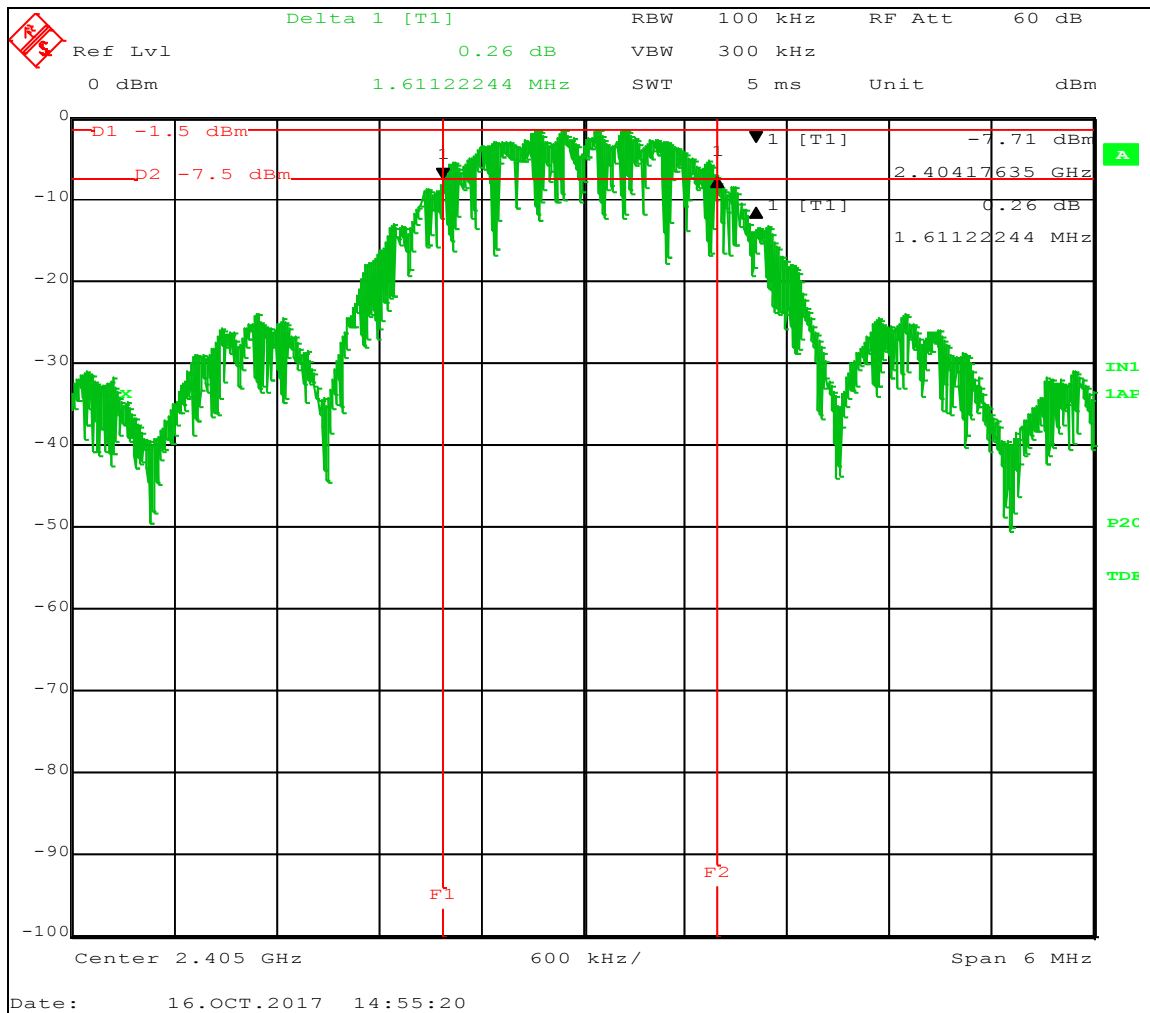
4.3 6 dB Occupied Bandwidth. FCC Section 15.247(a)(2)

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.

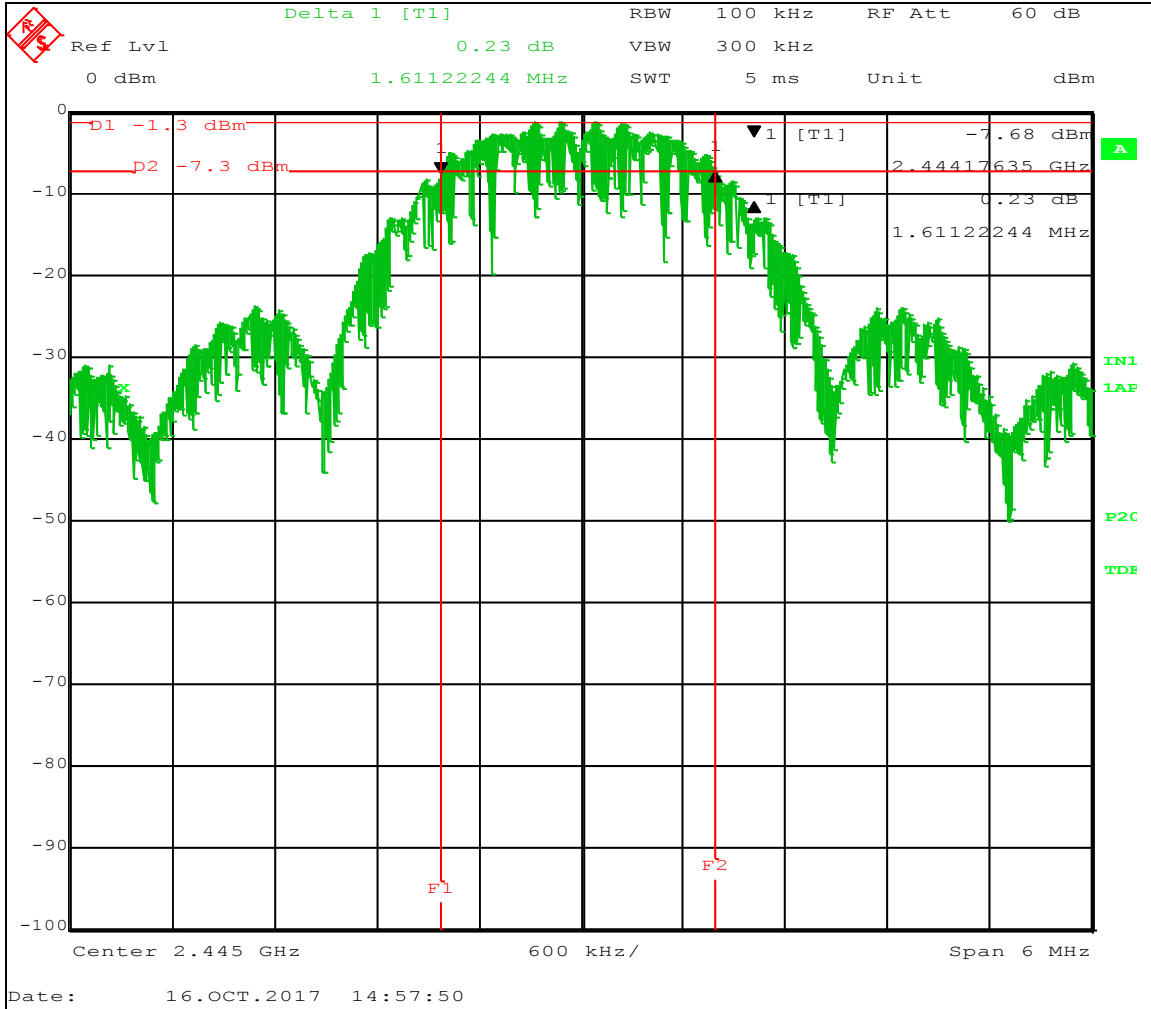
4.3.2 6 dB Occupied Bandwidth Analyzer Display Captures Antenna 0

Antenna 0, Channel 11 (2.405 GHz)



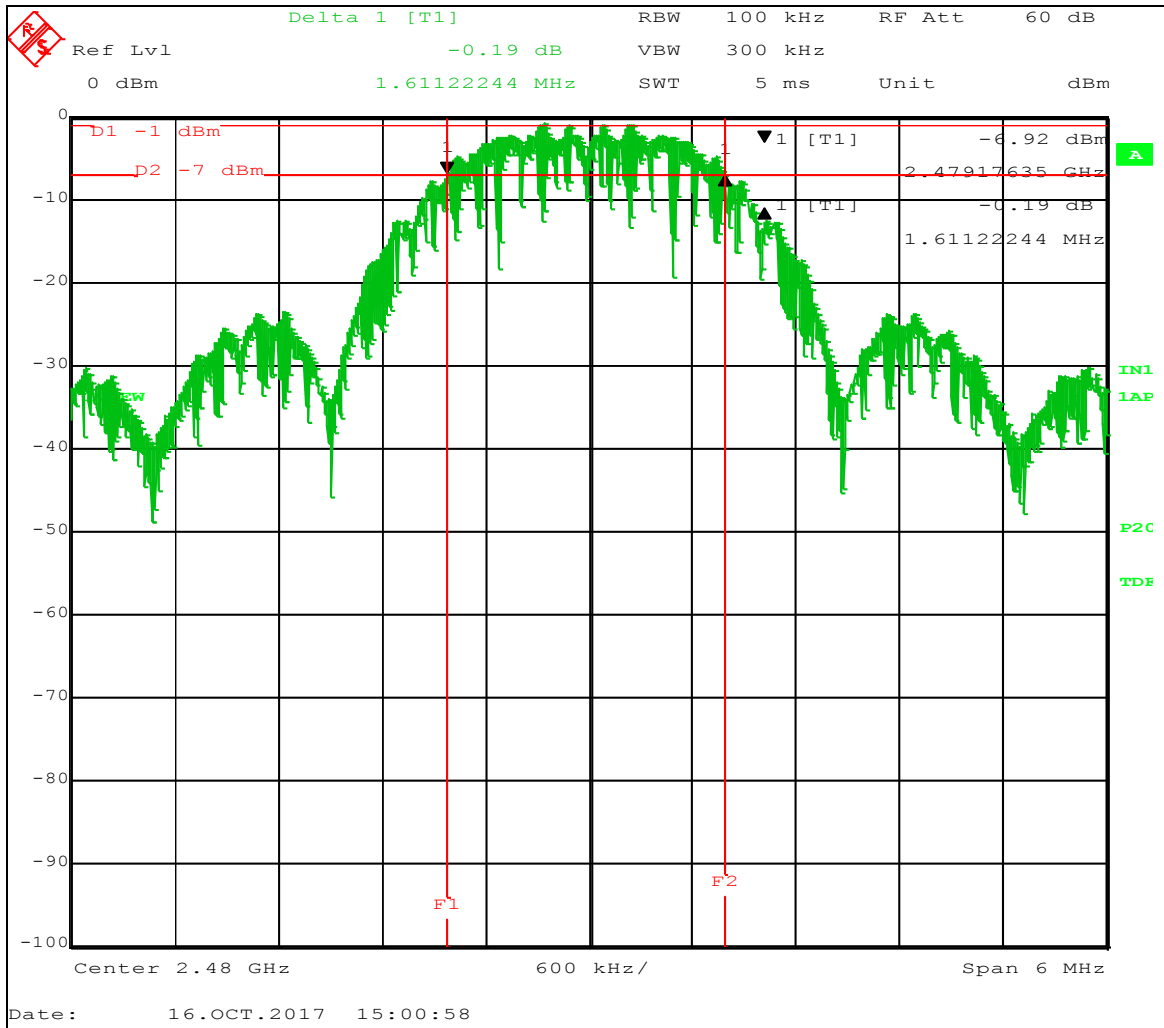


Antenna 0, Channel 19 (2.445 GHz)





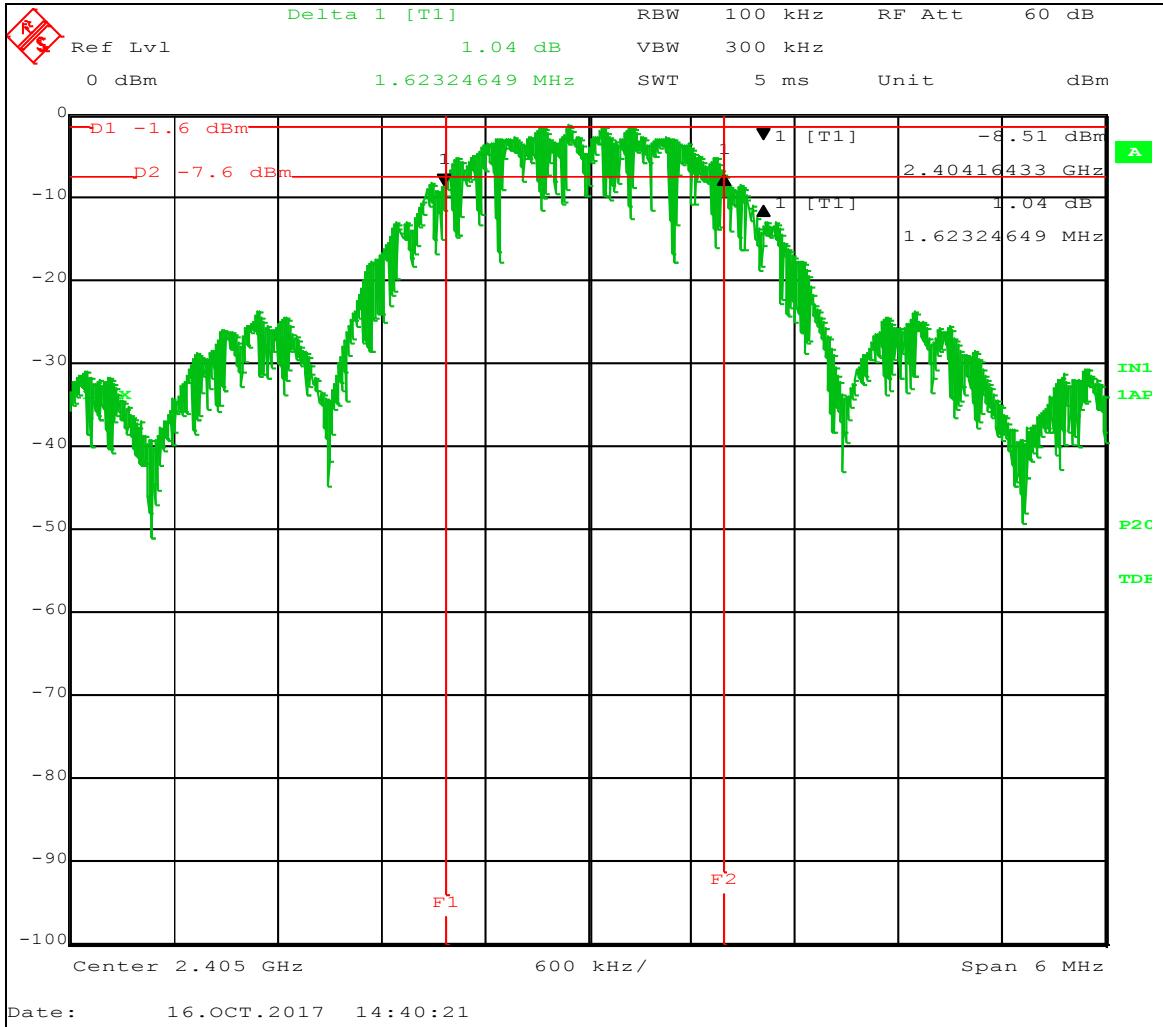
Antenna 0, Channel 26 (2.480 GHz)





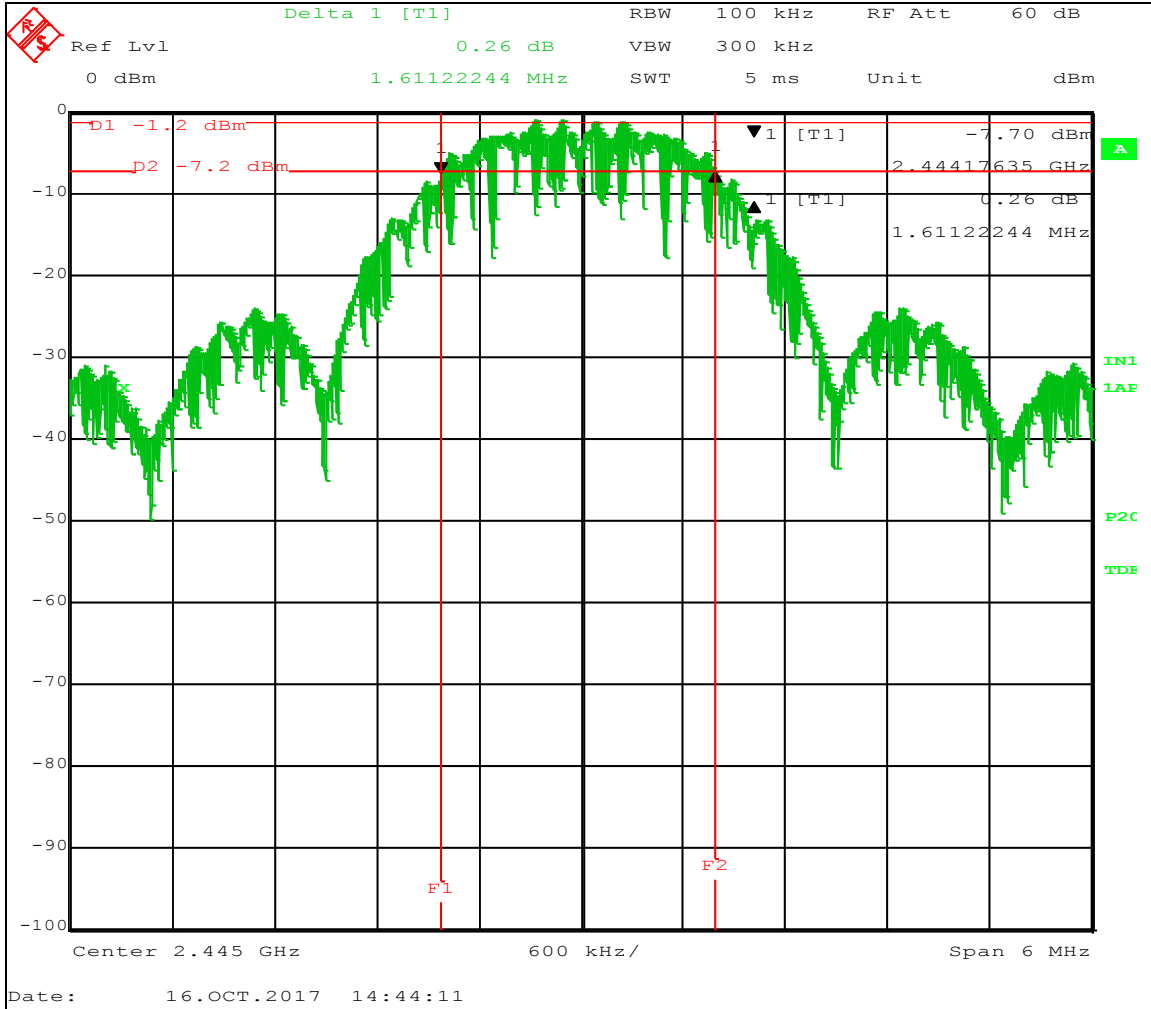
4.3.3 6 dB Occupied Bandwidth Analyzer Display Captures Antenna 1

Antenna 1, Channel 11 (2.405 GHz)



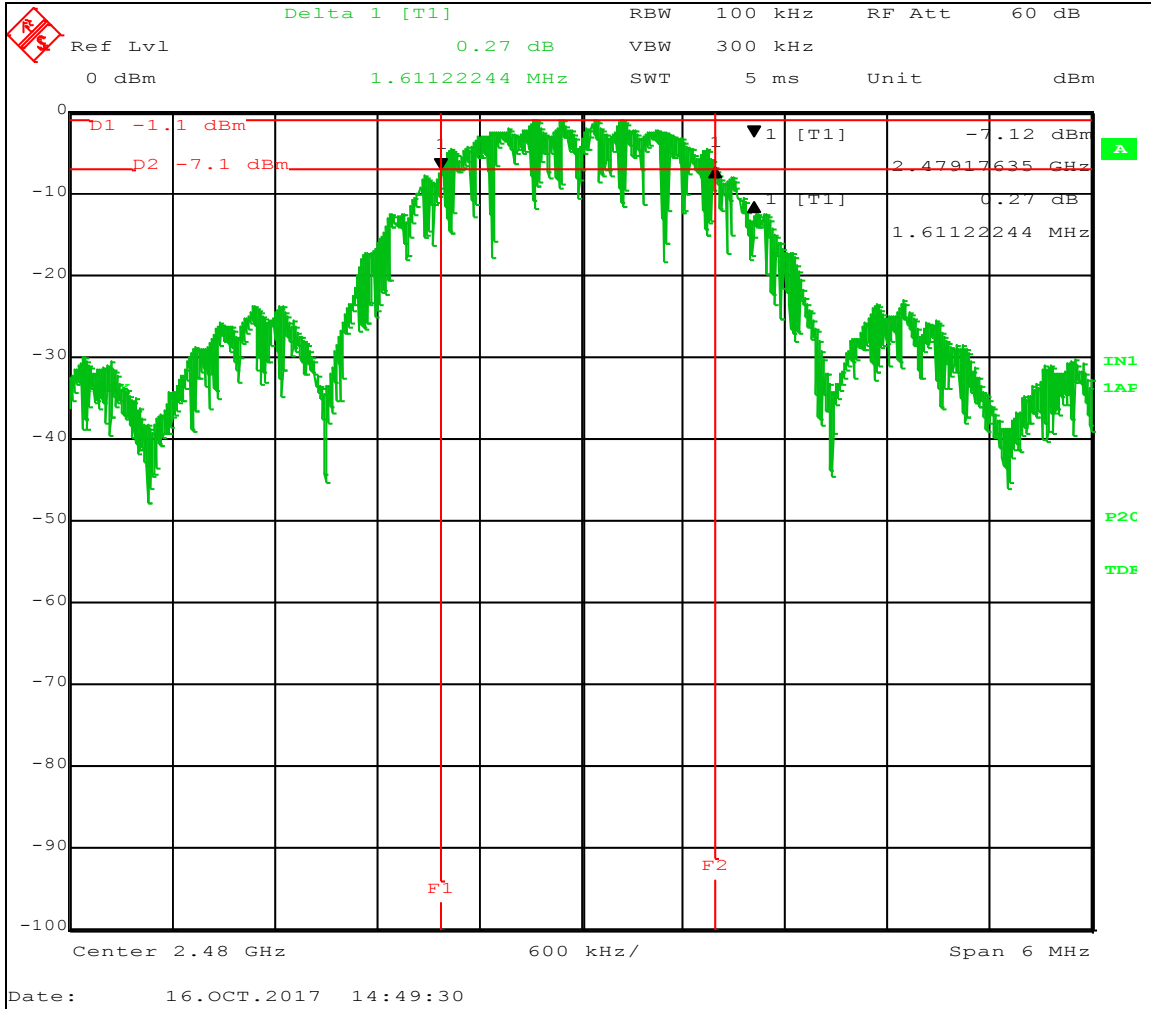


Antenna 1, Channel 19 (2.445 GHz)





Antenna 1, Channel 26 (2.480 GHz)





4.3.4 6 dB Occupied Bandwidth Test Results (10/16/2017)

Antenna 0

Antenna Number	Freq (GHz)	6 - dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass/Fail
0	2.405	1.6112	0.5	PASS
0	2.445	1.6112	0.5	PASS
0	2.480	1.6112	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	1.6112	0.5	PASS
1	2.480	1.6112	0.5	PASS

Results: The 6 dB Occupied Bandwidth measurements for antenna 0 and antenna 1 of the ARRIS Model Spectrum 110A Set Top Box are compliant with the limits specified in FCC Section 15.247(a)(2).



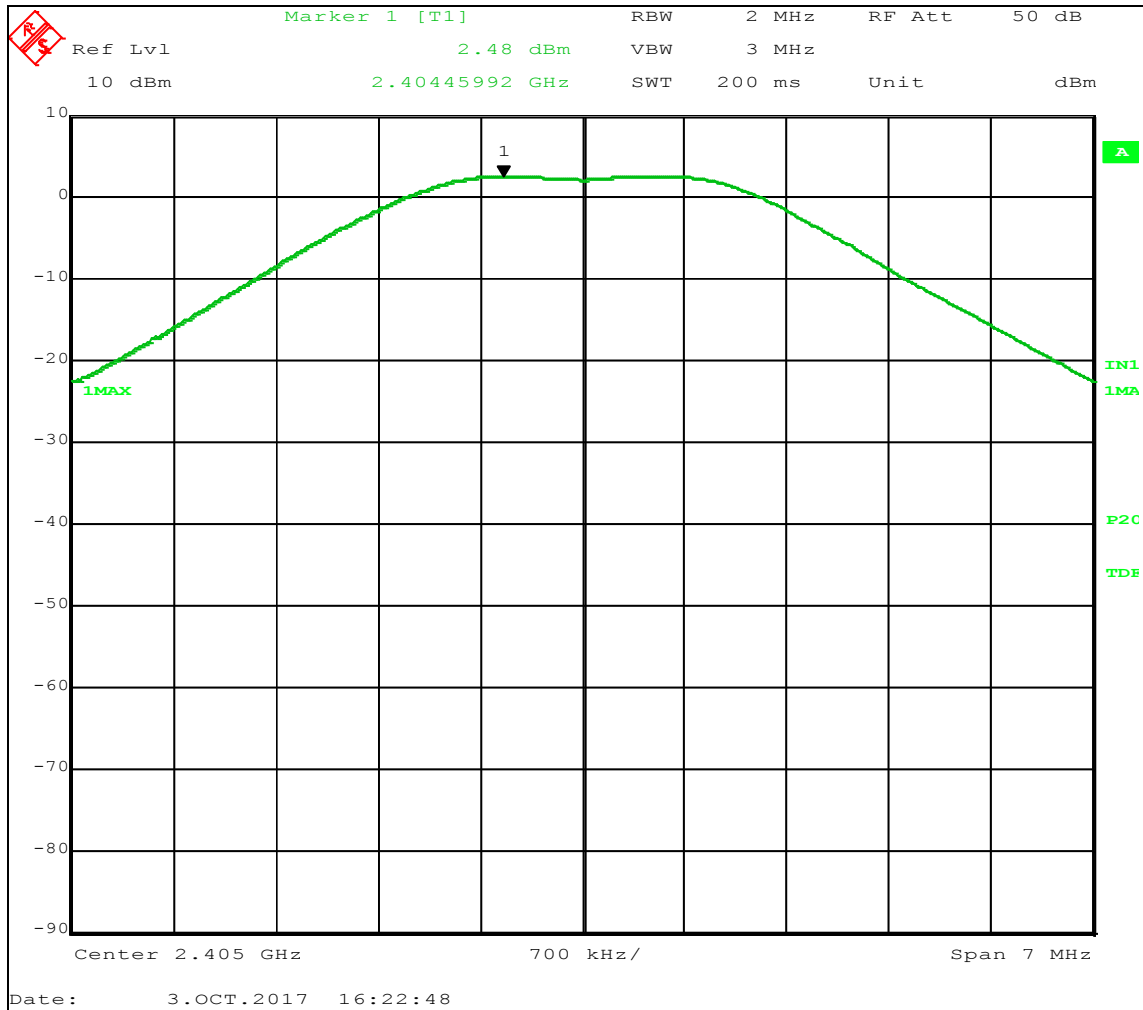
4.4 Maximum Peak Power Output FCC Section 15.247(b)(3)

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 with and without modulation. The results shown in this section are the ones measured with modulation since there was a slight difference in the amplitude with vs without modulation. BEC has data for both modulated and unmodulated signals on file if requested.

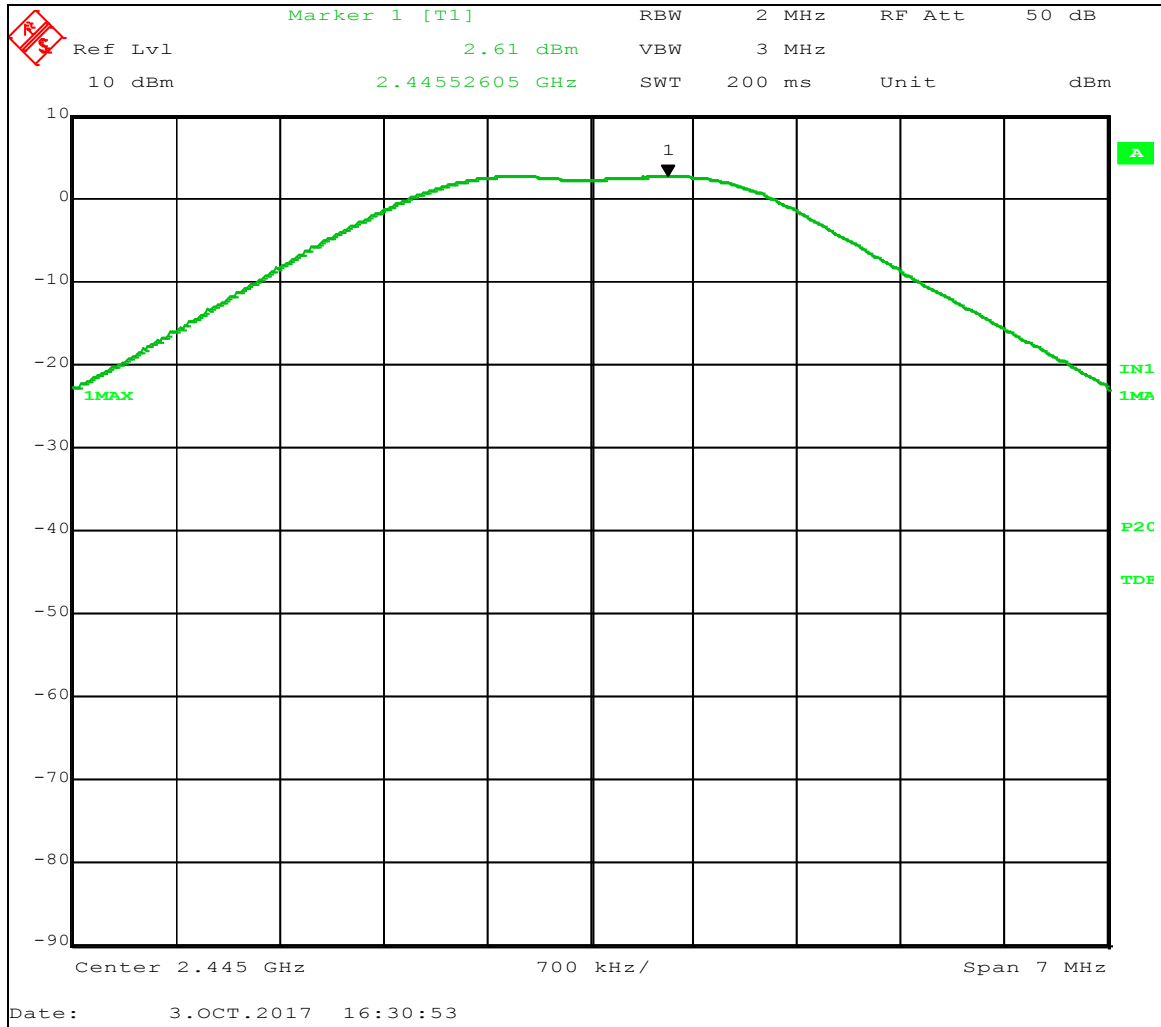
4.4.2 Maximum Peak Power Output Analyzer Display Captures Antenna 0

Antenna 0, Channel 11 (2.405 GHz)



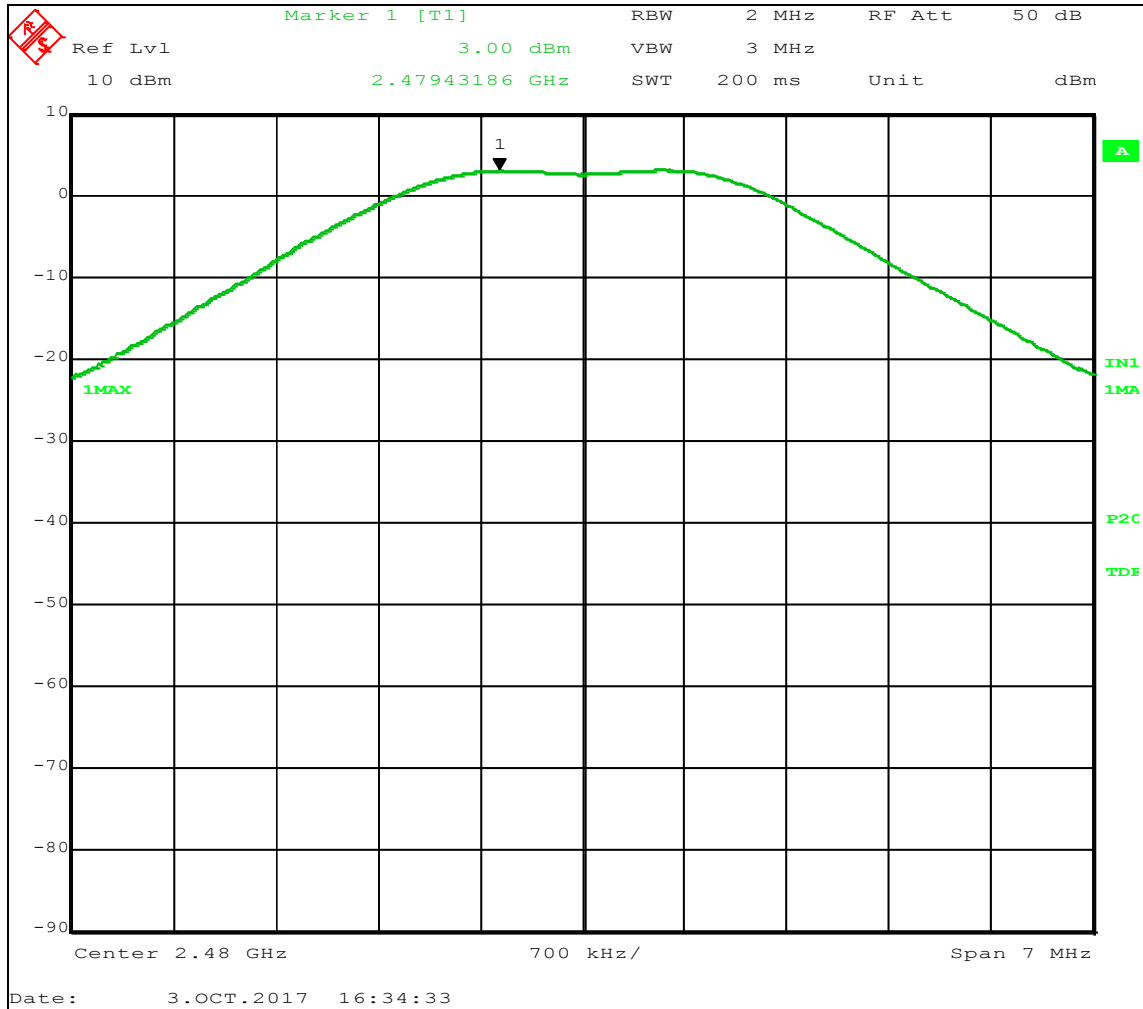


Antenna 0, Channel 19 (2.445 GHz)





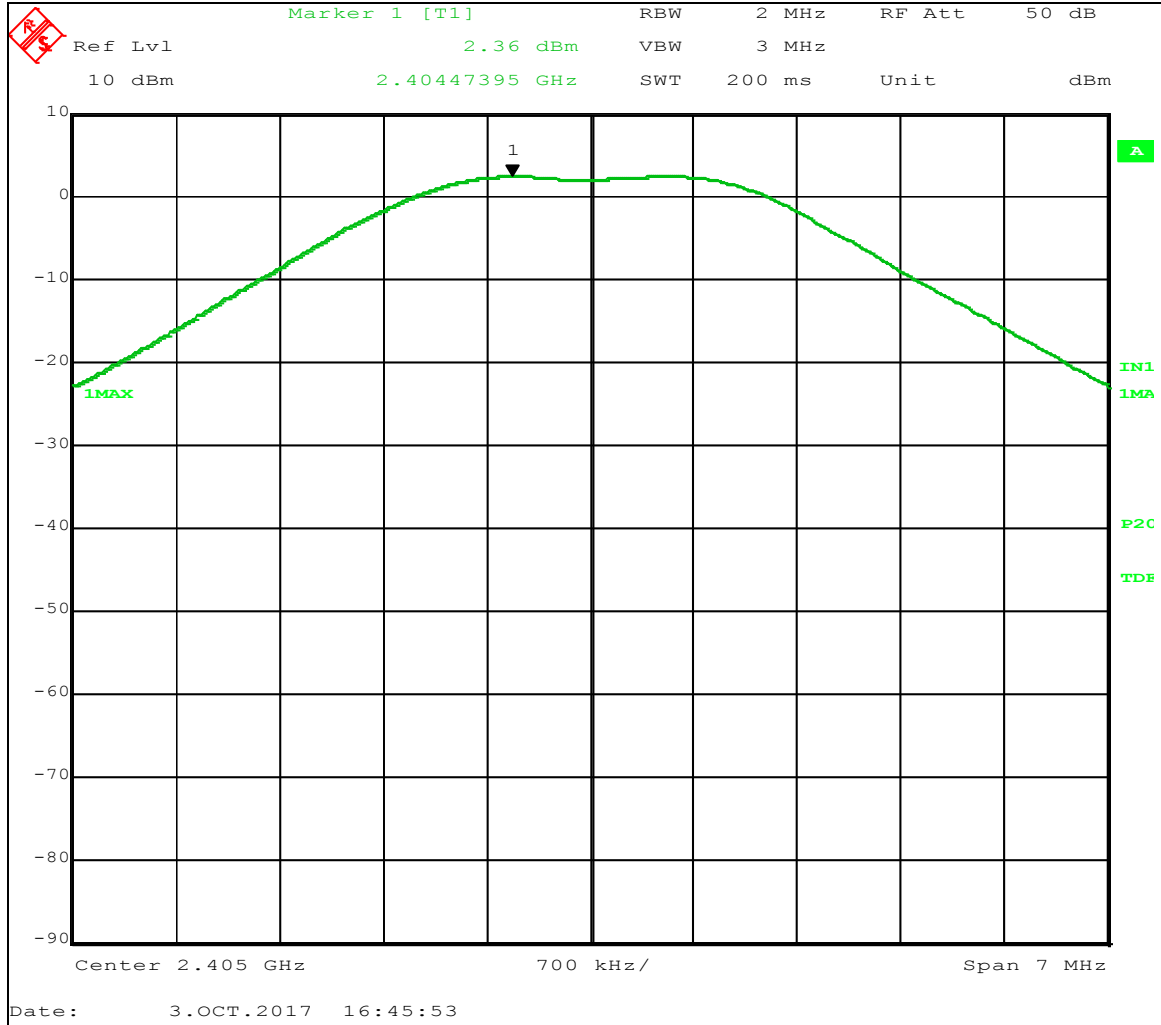
Antenna 0, Channel 26 (2.480 GHz)





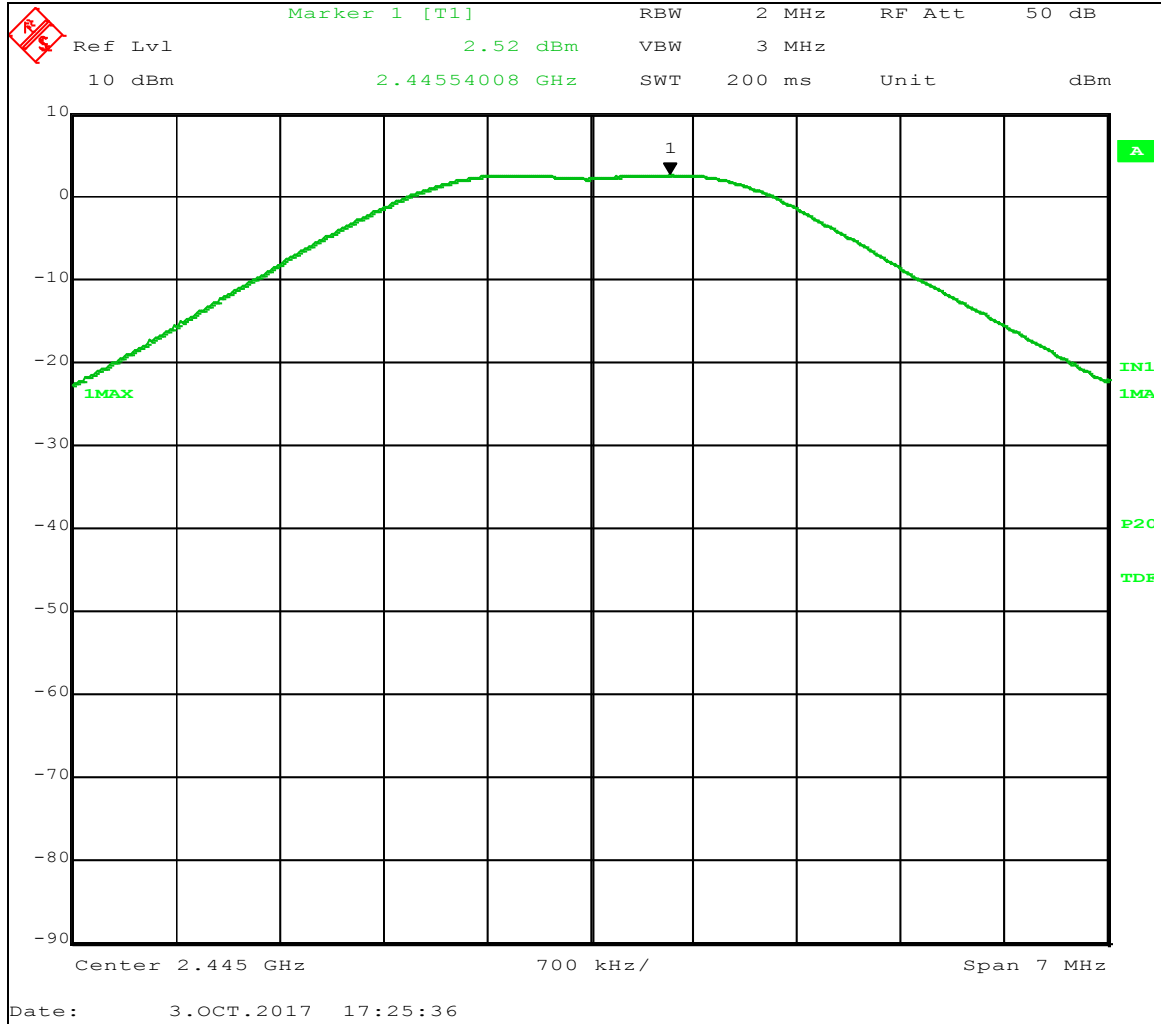
4.4.3 Maximum Peak Power Output Analyzer Display Captures Antenna 1

Antenna 1, Channel 11 (2.405 GHz)



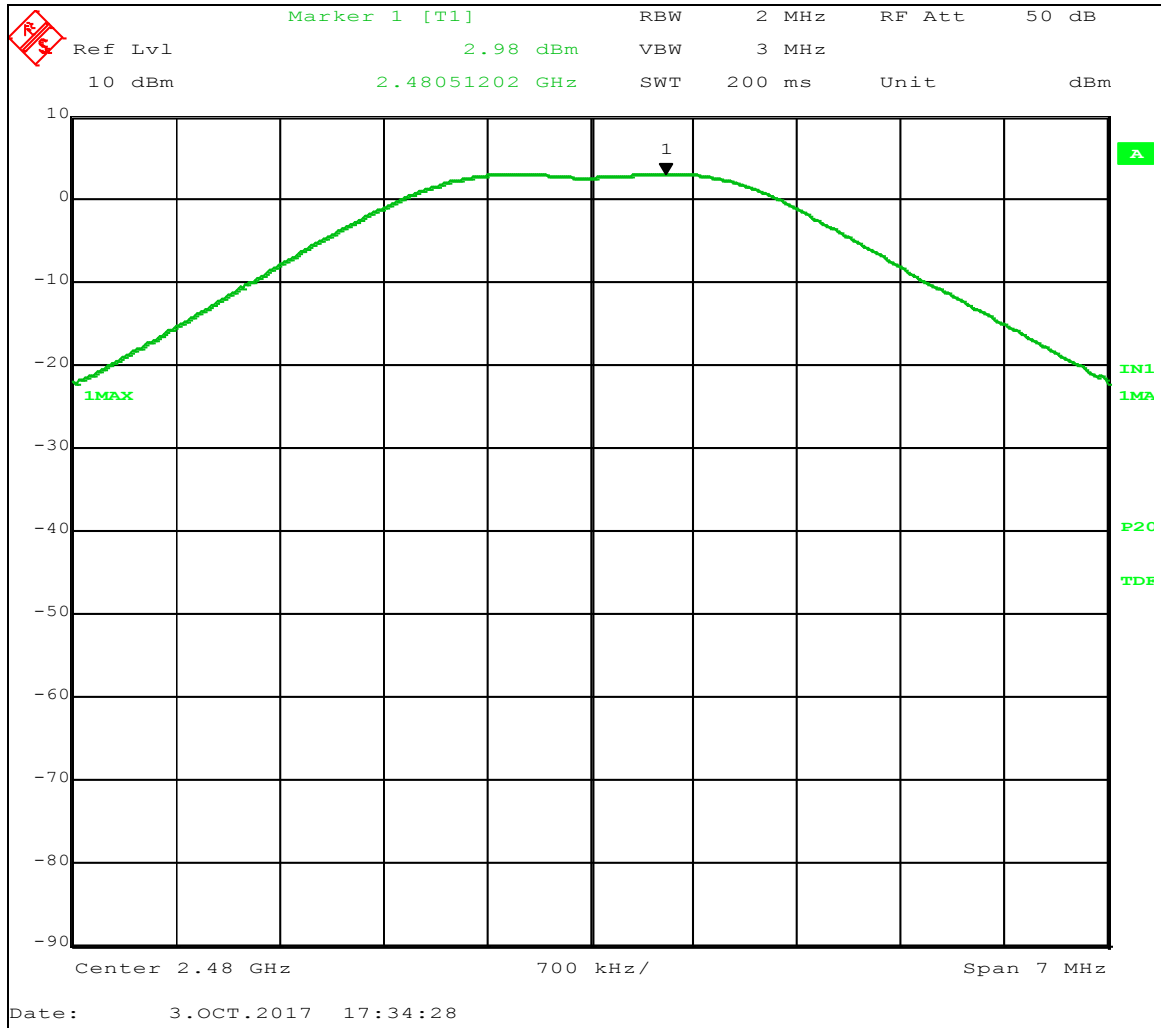


Antenna 1, Channel 19 (2.445 GHz)





Antenna 1, Channel 26 (2.480 GHz)





4.4.4 Maximum Peak Power Output Test Results (10/03/2017)

Channel	Antenna #		Frequency (GHz)	Measured Level (dBm)	Cable # 814 Loss (dB)	Total		Limit		Margin	
						dBm	Watts	dBm	Watts	dBm	Watts
11	0	GFSK-Modulated	2.405	2.48	0.62	3.10	0.002	30.00	1.000	-26.90	-0.998
19	0		2.445	2.61	0.63	3.24	0.002	30.00	1.000	-26.76	-0.998
26	0		2.480	3.00	0.63	3.63	0.002	30.00	1.000	-26.37	-0.998
11	0	GFSK-Unmodulated	2.405	2.48	0.62	3.10	0.002	30.00	1.000	-26.90	-0.998
19	0		2.445	2.60	0.63	3.23	0.002	30.00	1.000	-26.77	-0.998
26	0		2.480	3.00	0.63	3.63	0.002	30.00	1.000	-26.37	-0.998

Channel	Antenna #		Frequency (GHz)	Measured Level (dBm)	Cable # 814 Loss (dB)	Total		Limit		Margin	
						dBm	Watts	dBm	Watts	dBm	Watts
11	1	GFSK-Modulated	2.405	2.36	0.62	2.98	0.002	30.00	1.000	-27.02	-0.998
19	1		2.445	2.52	0.63	3.15	0.002	30.00	1.000	-26.85	-0.998
26	1		2.480	2.98	0.63	3.61	0.002	30.00	1.000	-26.39	-0.998
11	1	GFSK-Unmodulated	2.405	2.31	0.62	2.93	0.002	30.00	1.000	-27.07	-0.998
19	1		2.445	2.48	0.63	3.11	0.002	30.00	1.000	-26.89	-0.998
26	1		2.480	3.00	0.63	3.63	0.002	30.00	1.000	-26.37	-0.998

Results: The Peak Power Output measurements for antenna 0 and antenna 1 of the ARRIS Model Spectrum 110A Set Top Box are compliant with the limits specified in FCC Section 15.247(b)(3).



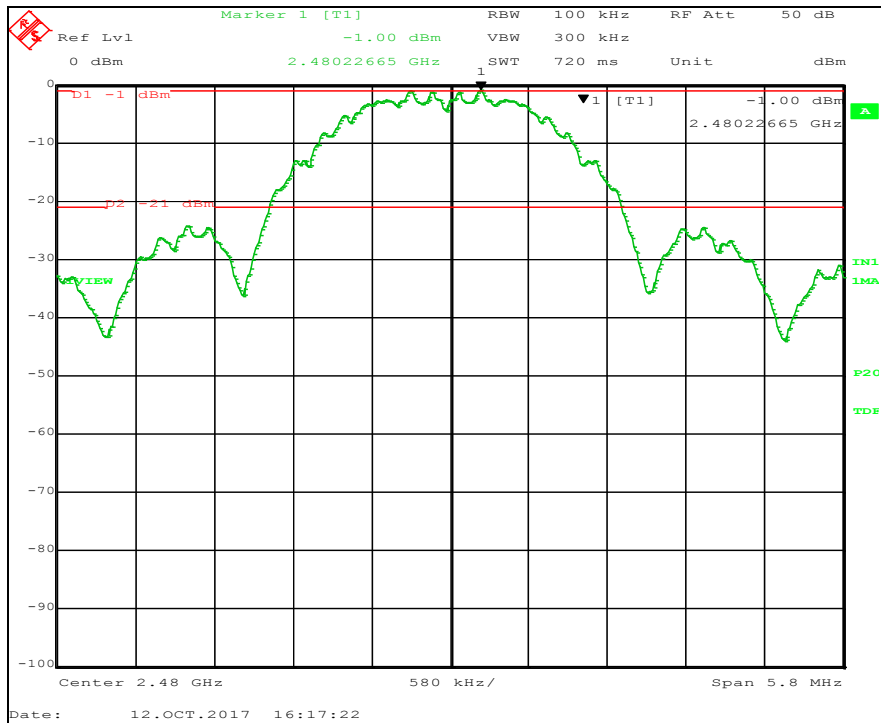
4.5 Antenna Conducted Spurious Emissions FCC Section 15.247(d)

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. Three Frequency Sections were examined in the range of 30 to 1000 MHz, 1 to 10 GHz and 10 to 25 GHz. In Section 4.5.3 we have the screen captures for Antenna 1, Channel 26 @ 2480 MHz since this was the highest output measured in all of the configurations.

4.5.2 Antenna Conducted Spurious Emissions Fundamental Frequency Maximum Output for 20 dB Reference.

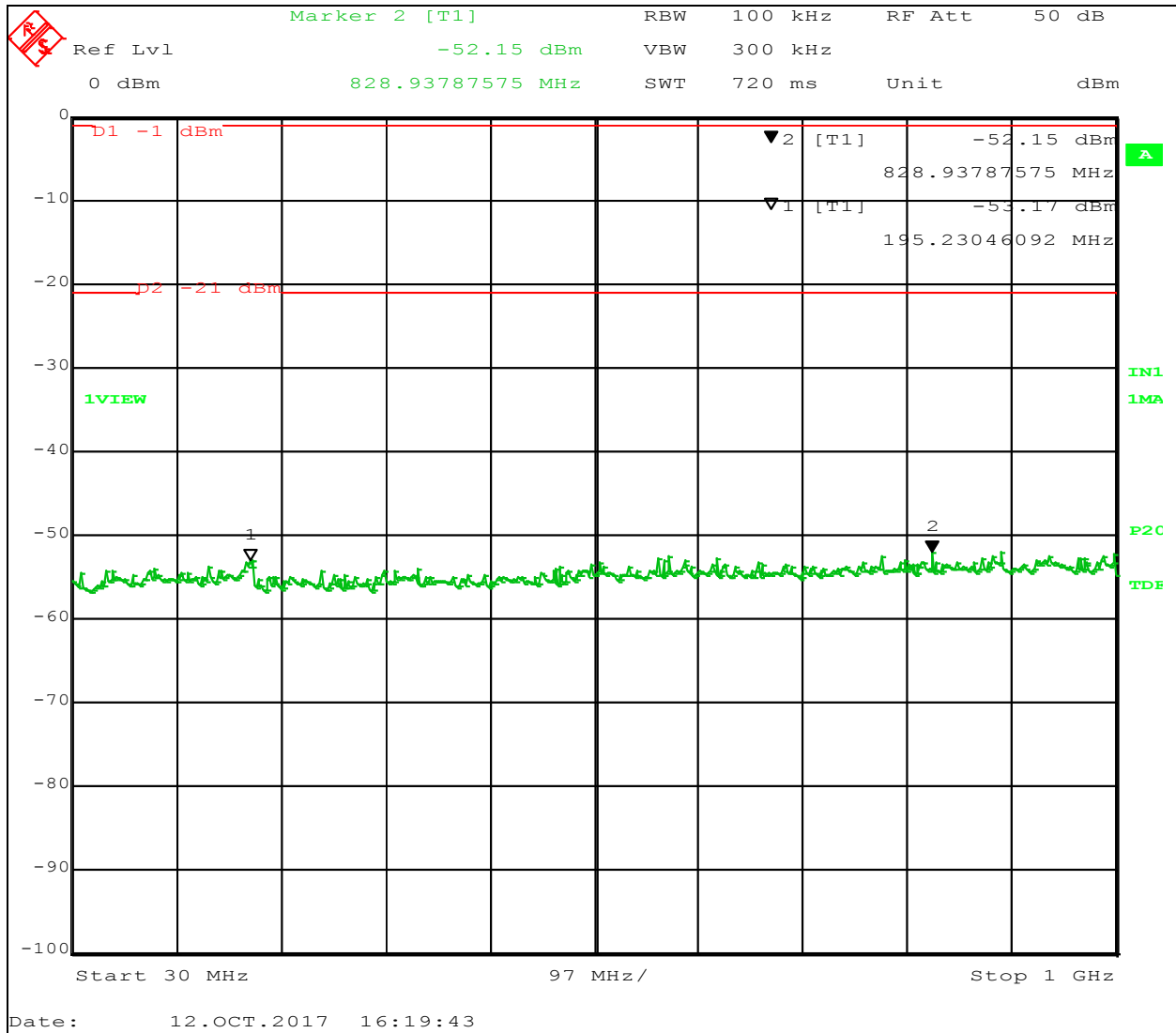
Modulation	Antenna	Channel	Freq (GHz)	Max Output (dBm) to Ref for the 20 dB Levels Limits
GFSK	0	CH.11	2.405	-1.39
	0	CH.19	2.445	-1.21
	0	CH.26	2.480	-1.12
GFSK	1	CH.11	2.405	-1.78
	1	CH.19	2.445	-1.45
	1	CH.26	2.480	-1.00





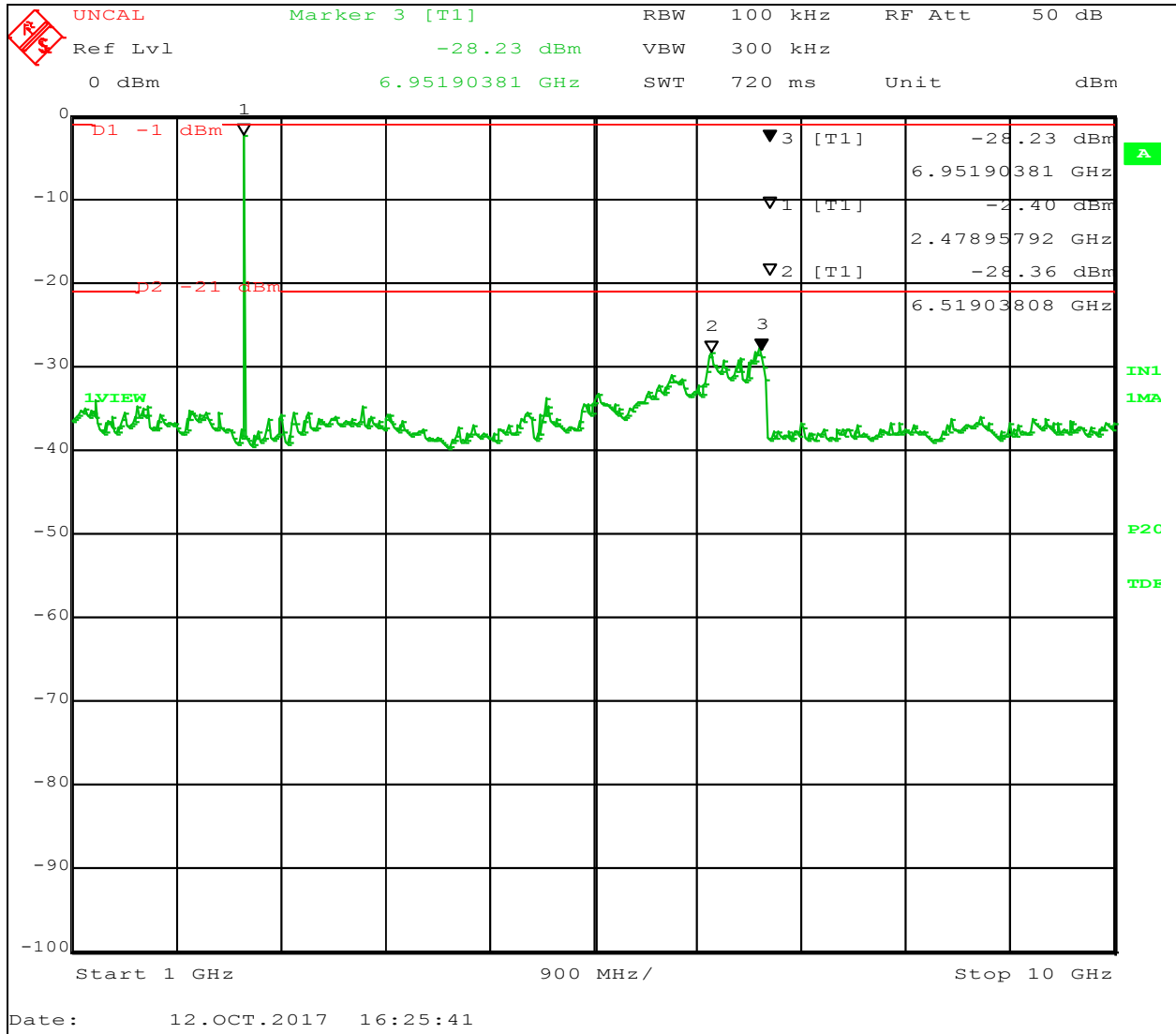
4.5.3 Antenna Conducted Spurious Emissions Test Results (10/12/2017)

Frequency Range: 30 MHz to 1000 MHz



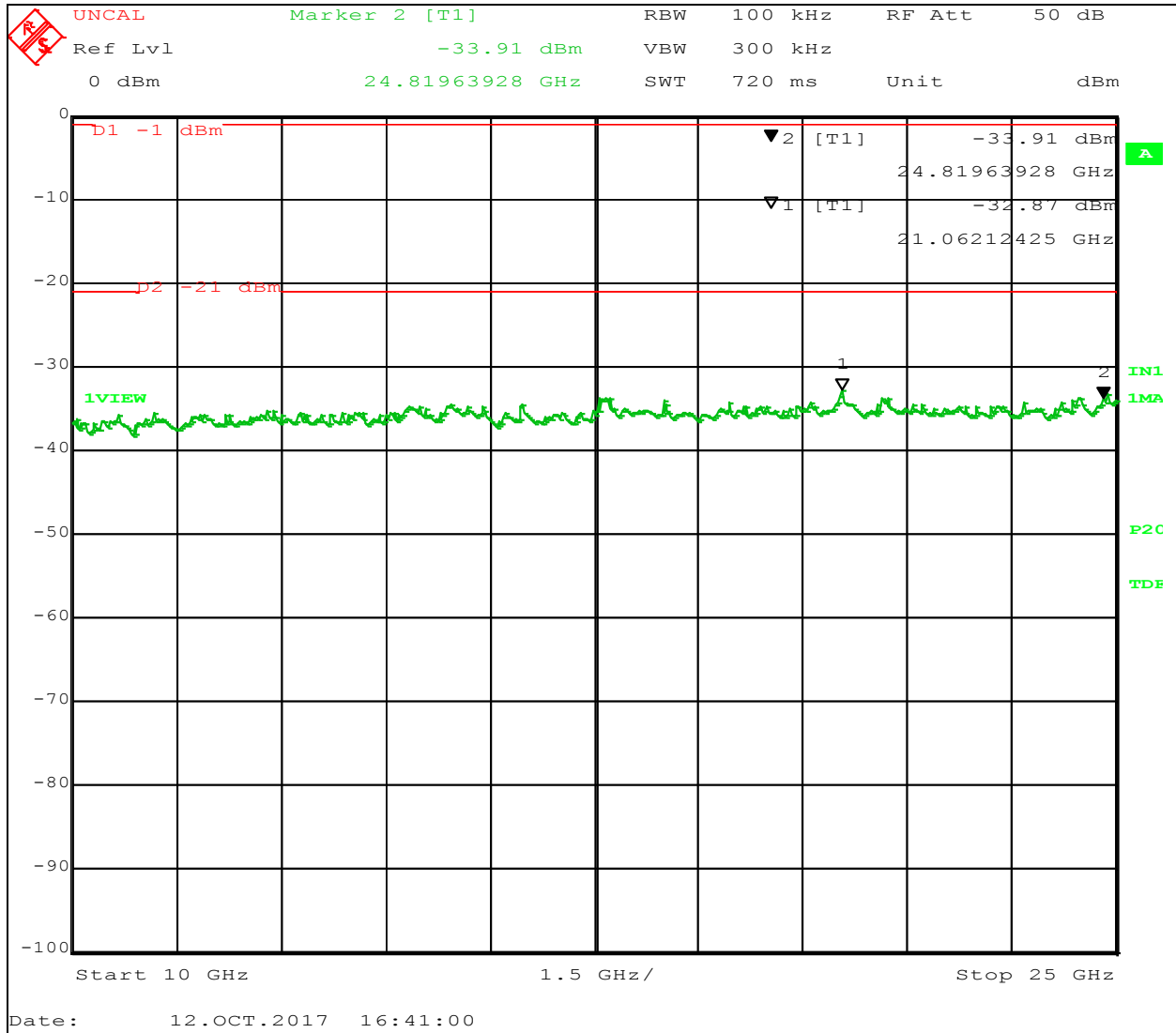


Frequency Range: 1 to 10 GHz





Frequency Range: 10 to 25 GHz



Results: The Antenna Conducted Spurious Emissions measurements for antenna 0 and antenna 1 of the ARRIS Model Spectrum 110A Set Top Box are compliant with the limits specified in FCC Section 15.247(d).



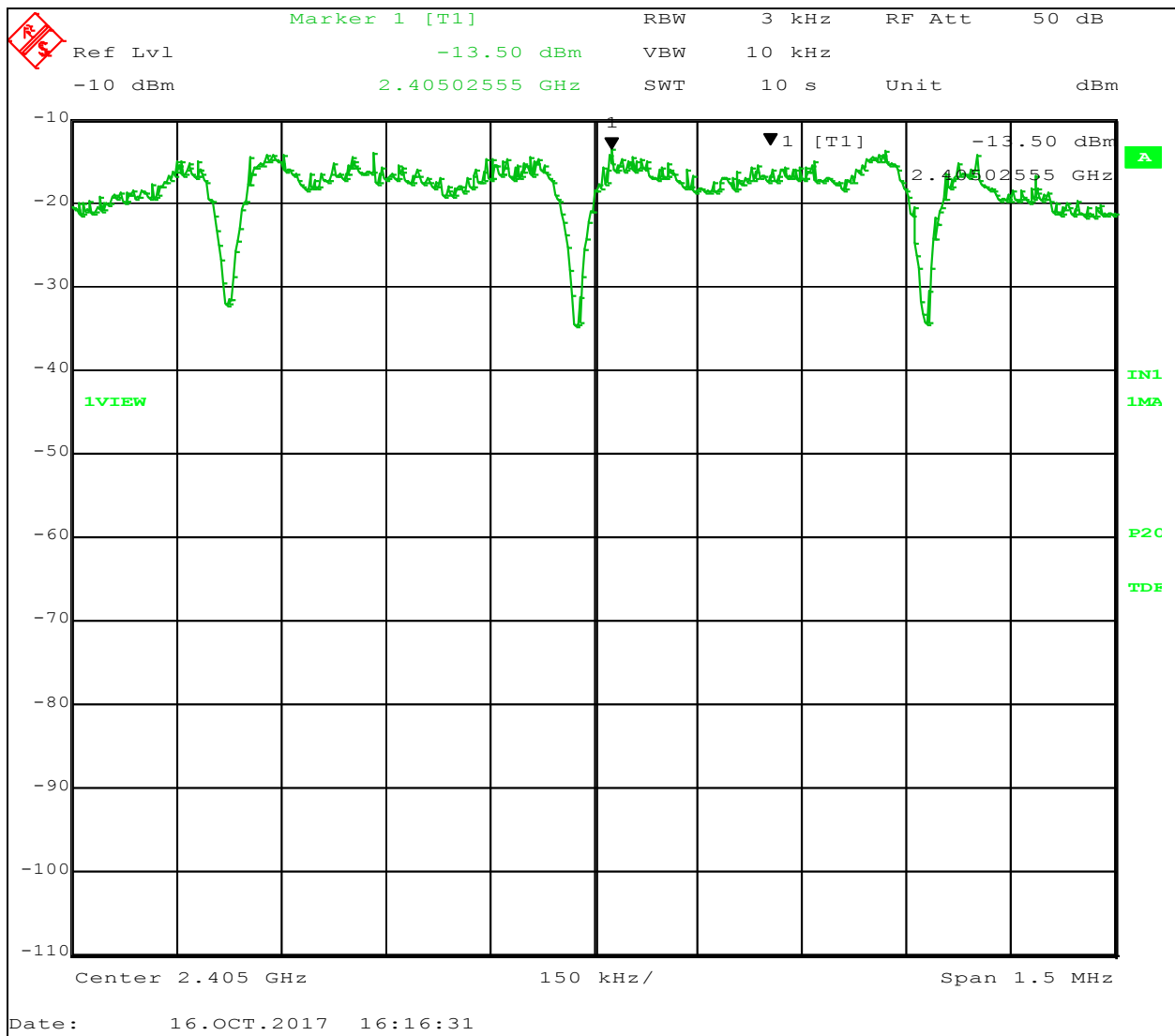
4.6 Power Spectral Density FCC Section 15.247(e)

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.

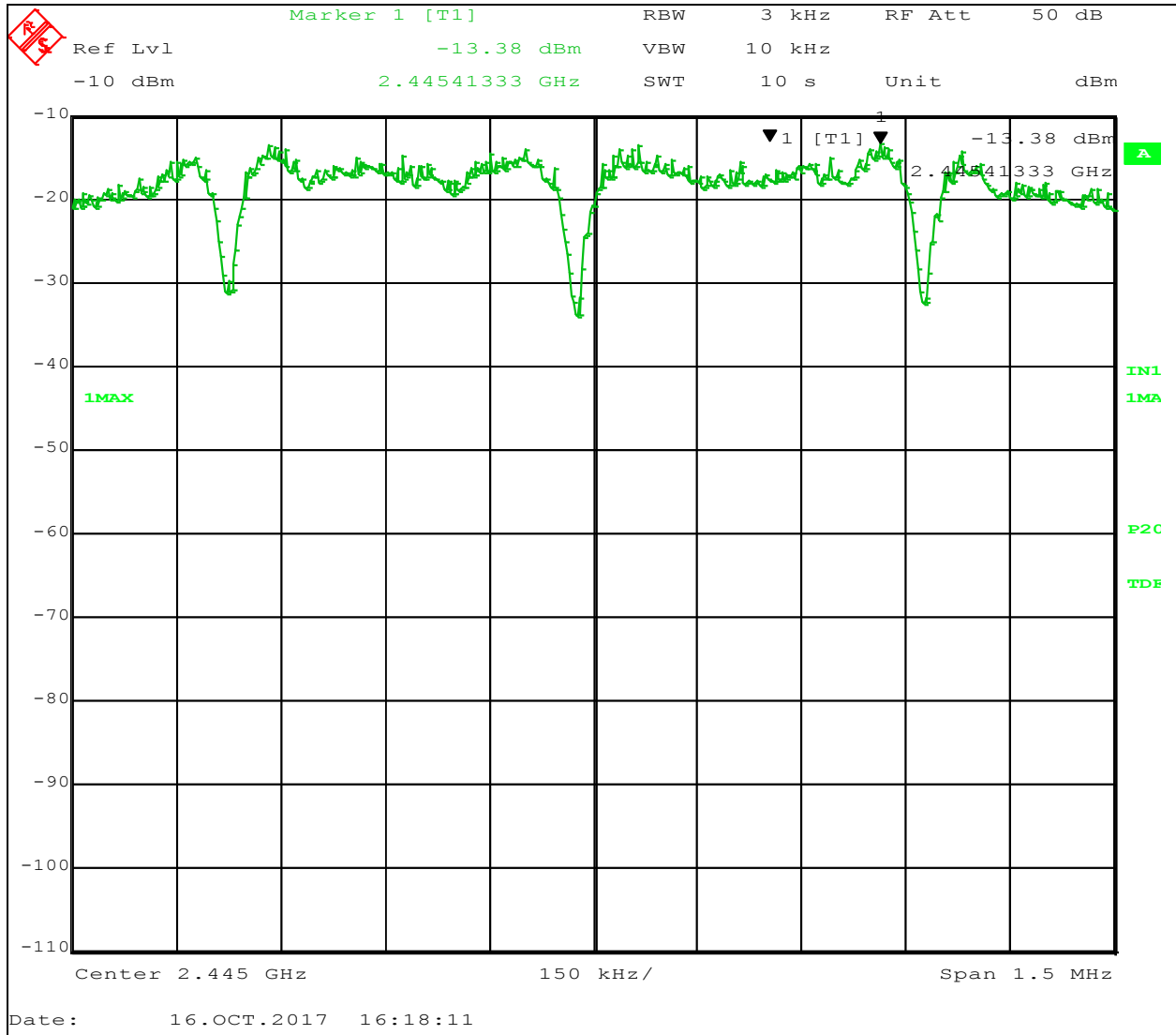
4.6.2 Power Spectral Density Analyzer Display Captures Antenna 0

Antenna 0, Channel 11 (2.405 GHz)



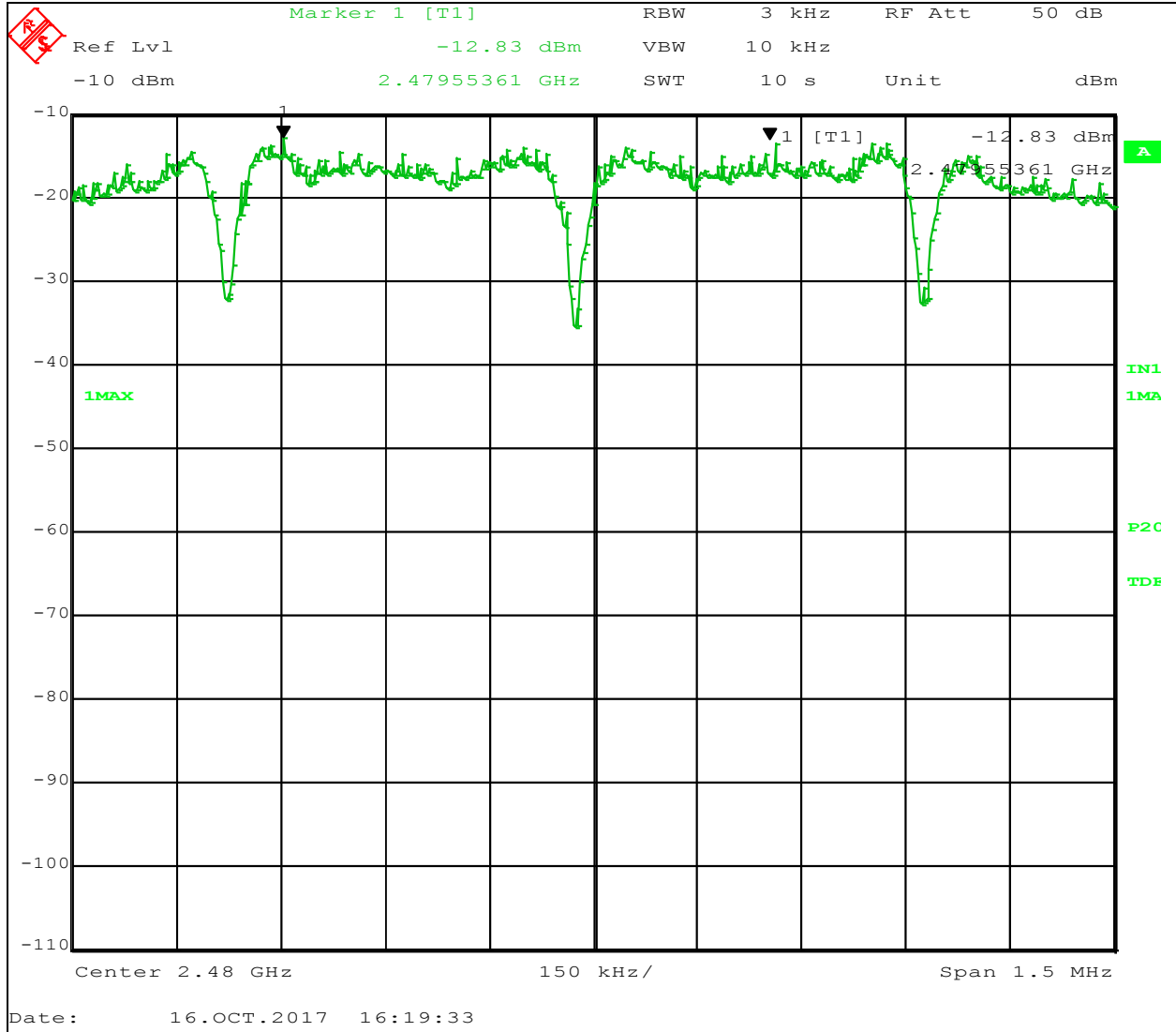


Antenna 0, Channel 19 (2.445 GHz)



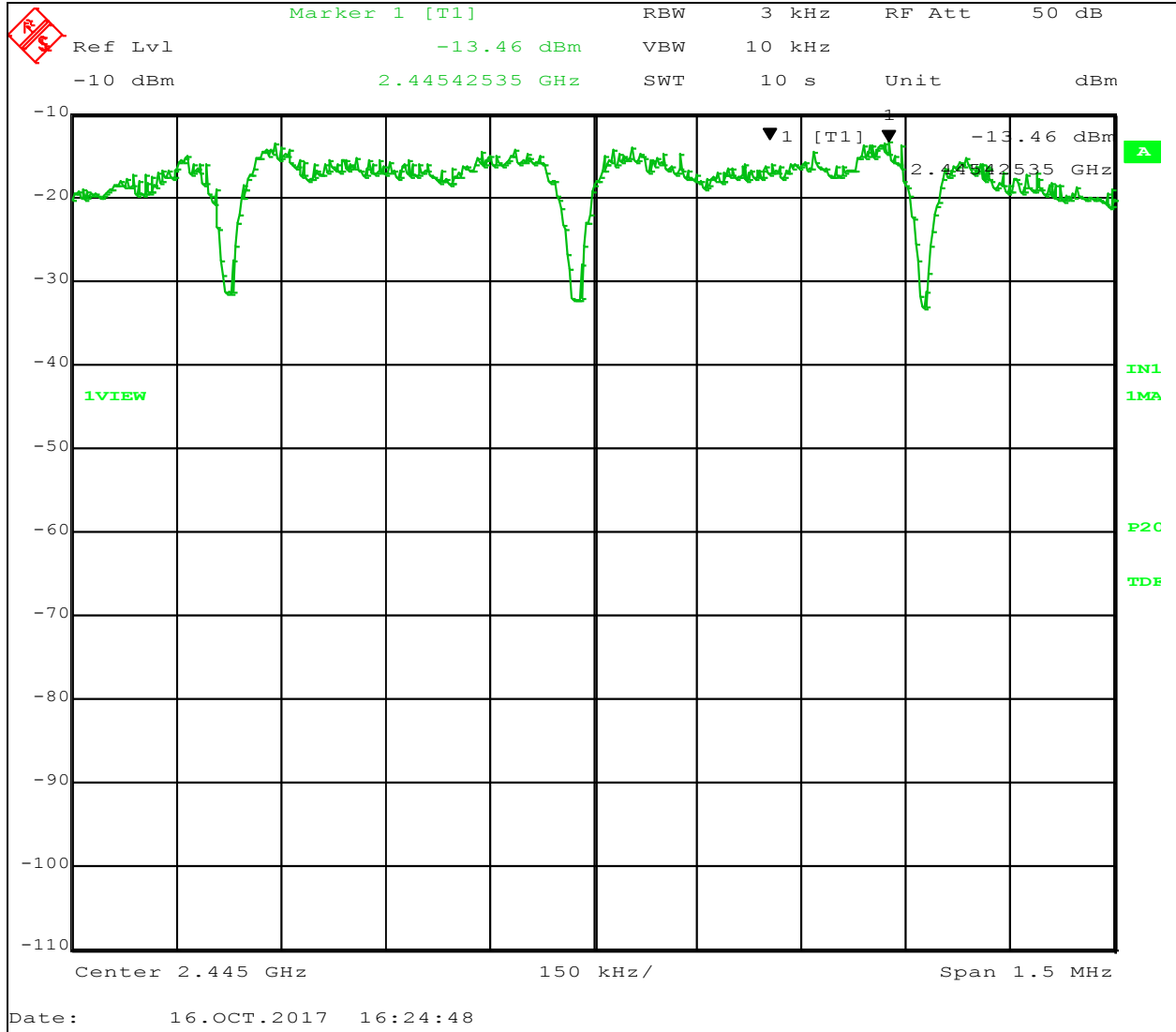


Antenna 0, Channel 26 (2.480 GHz)



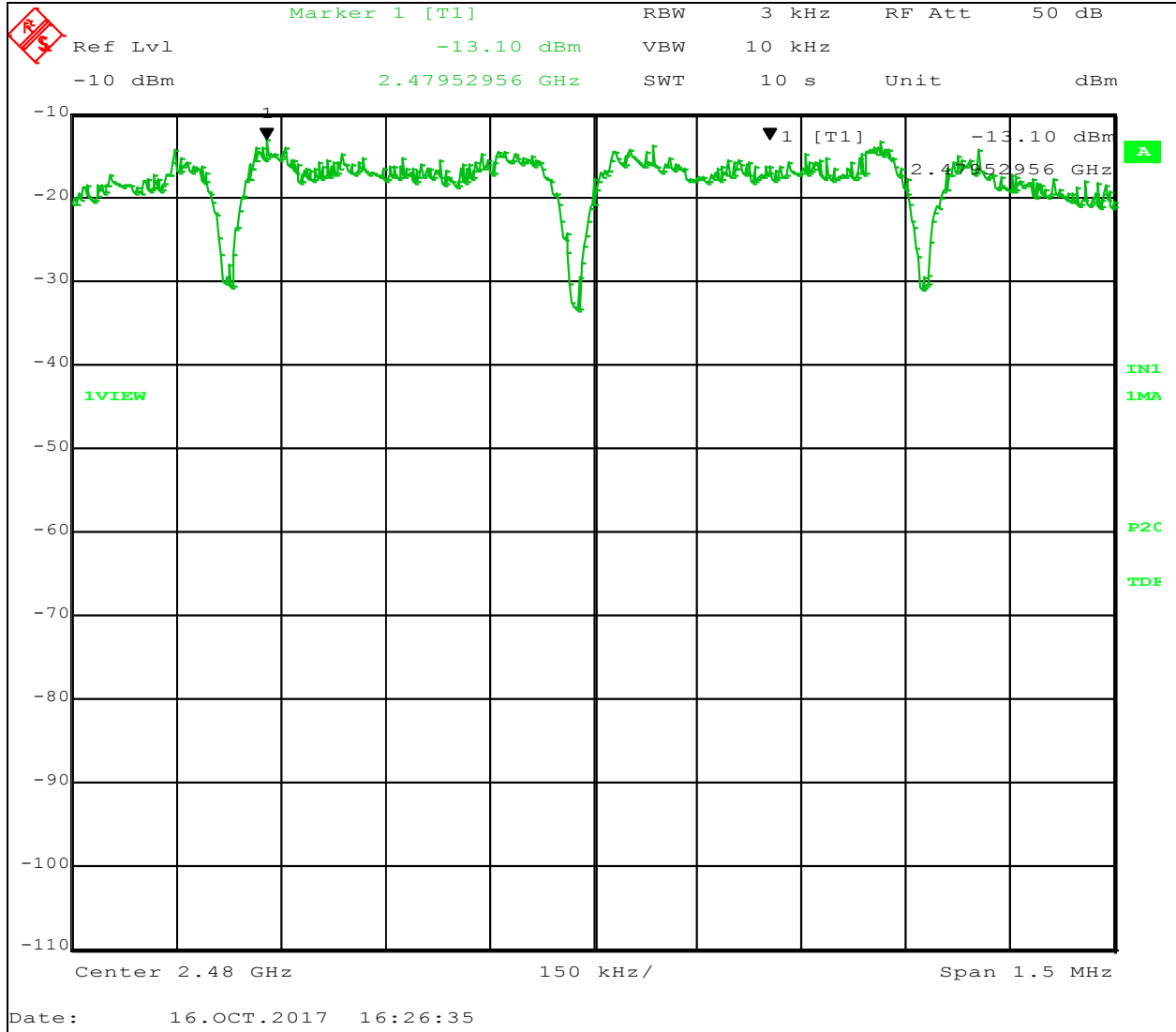


Antenna 1, Channel 19 (2.445 GHz)





Antenna 1, Channel 26 (2.480 GHz)





4.6.4 Power Spectral Density Test Results (10/16/2017)

Modulation	Channel	Antenna	Freq (GHz)	Measured Power Spectral Density (dBm)	Cable Loss (dB)	Total Power Spectral Density (dBm)	Power Spectral Density Limit (dBm)	Pass/Fail
GFSK	CH.11	0	2.405	-13.50	0.62	-12.88	8.00	PASS
	CH.19	0	2.445	-12.38	0.63	-11.75	8.00	PASS
	CH.26	0	2.480	-12.83	0.63	-12.2	8.00	PASS
GFSK	CH.11	1	2.405	-13.70	0.62	-13.08	8.00	PASS
	CH.19	1	2.445	-13.46	0.63	-12.83	8.00	PASS
	CH.26	1	2.480	-13.10	0.63	-12.47	8.00	PASS

Results: The Power Spectral Density measurements for antenna 0 and antenna 1 of the ARRIS Model Spectrum 110A 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 2.4835 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
26	2.480

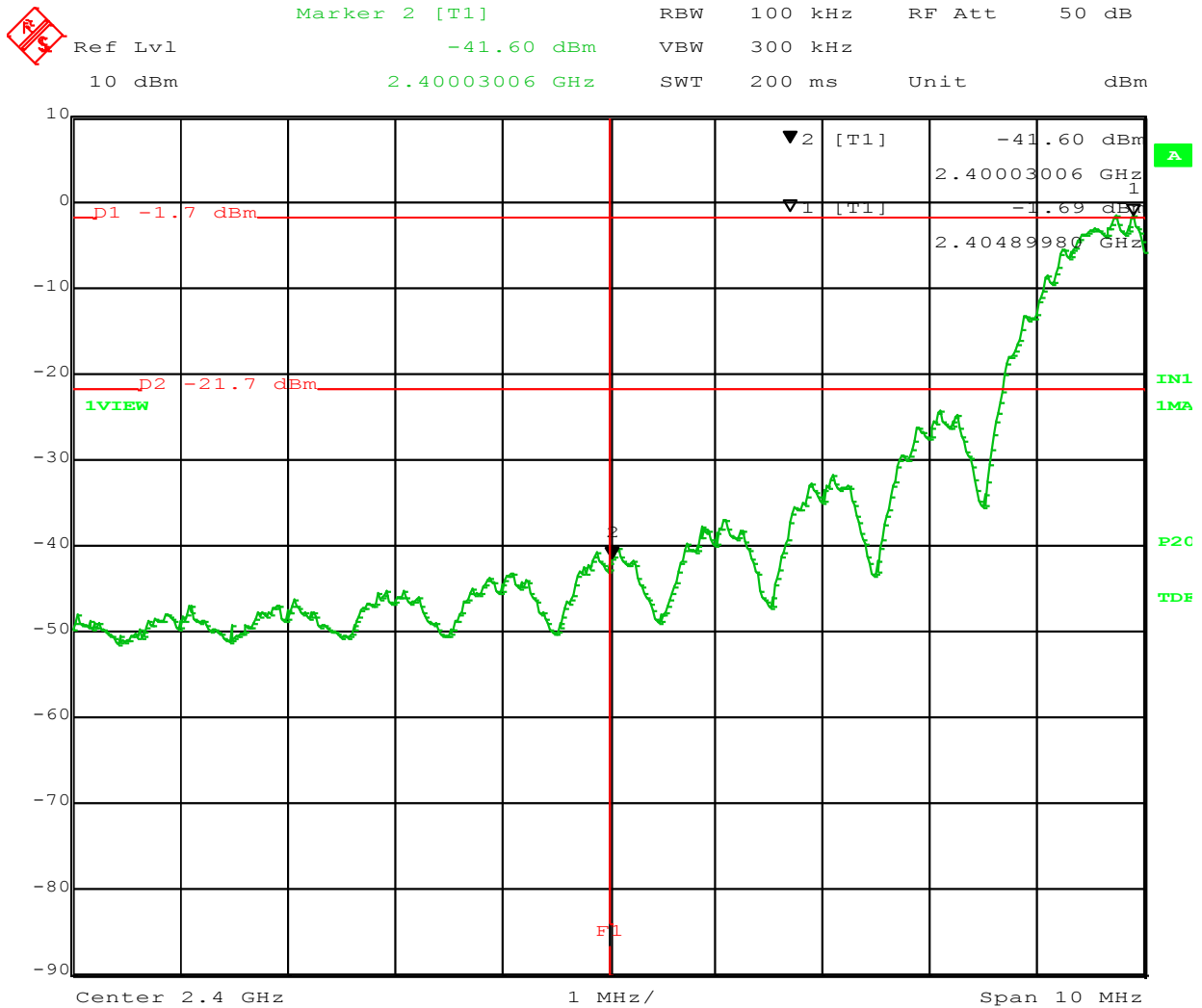
The data was recorded in two screen captures for each of the antennas (0 and 1) at the lower and higher transmit frequencies from the Spectrum Analyzer. Parameters particular to each measurement are as follows:

Center Frequency: Lower Band Limit 2.4 GHz and Higher Band Limit 2.4835 GHz
Resolution Bandwidth: 100 kHz
Video Bandwidth: 300 kHz
Span: 10 MHz
Scale: dBm
Reference Level: 10 dBm



4.7.2 Band Edge Measurement Analyzer Display Captures Antenna 0

Antenna 0, Channel 11 (2.405 GHz)



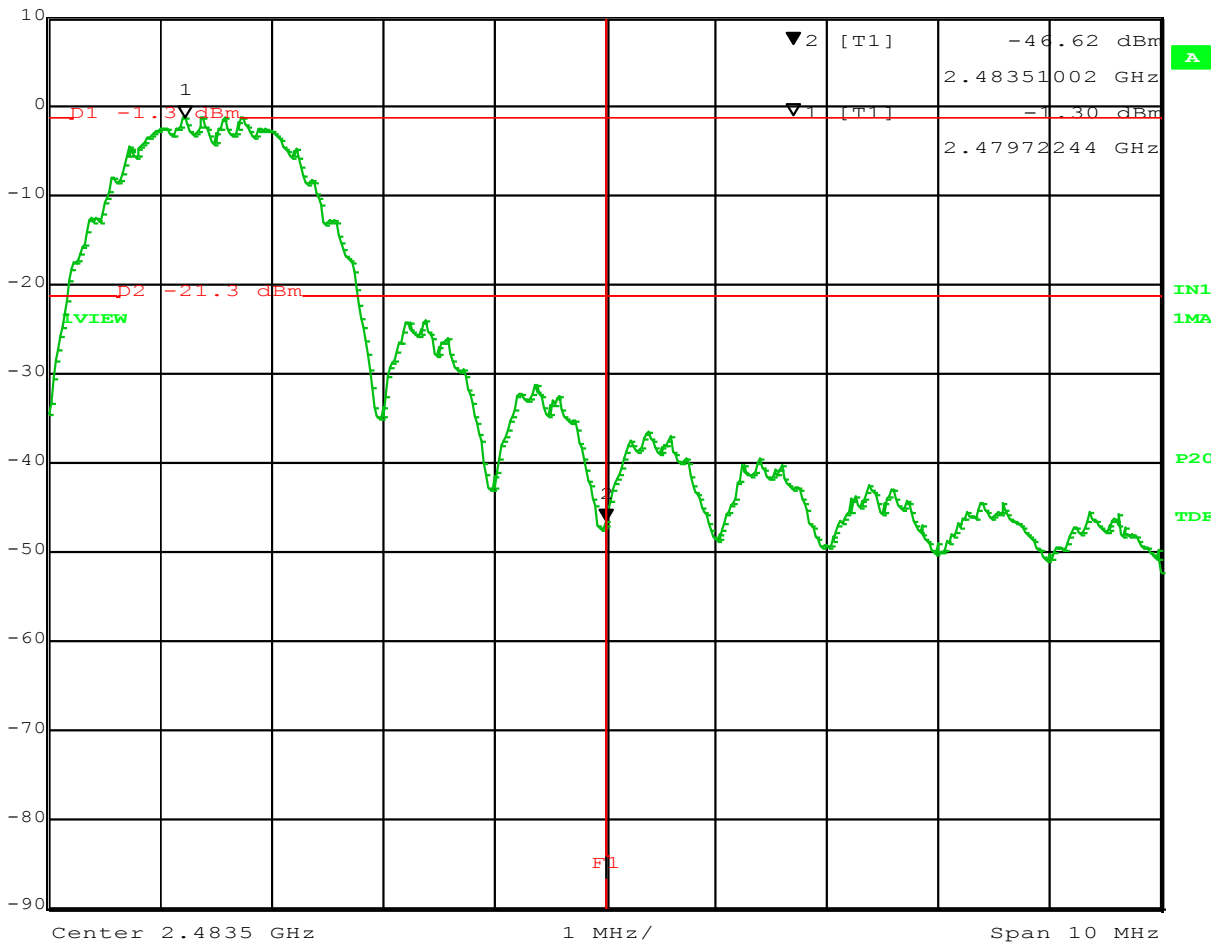
Date: 2.NOV.2017 09:53:44



Antenna 0, Channel 26 (2.480 GHz)



Ref Lvl 10 dBm
Marker 2 [T1] 2.48351002 GHz -46.62 dBm
RBW 100 kHz RF Att 50 dB
VBW 300 kHz
SWT 200 ms Unit dBm

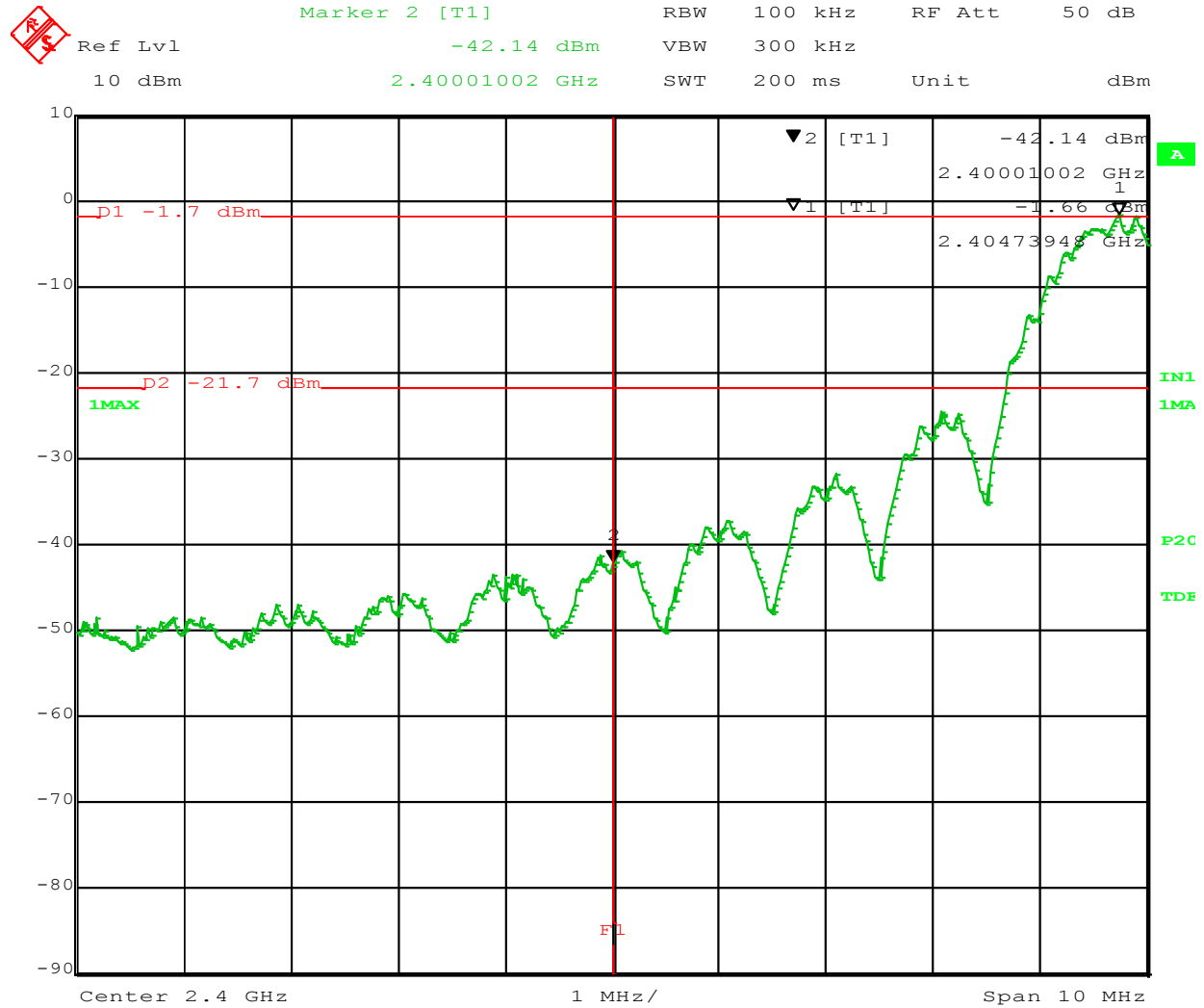


Date: 2.NOV.2017 09:56:12



4.7.3 Band Edge Measurement Analyzer Display Captures Antenna 1

Antenna 1, Channel 11 (2.405 GHz)



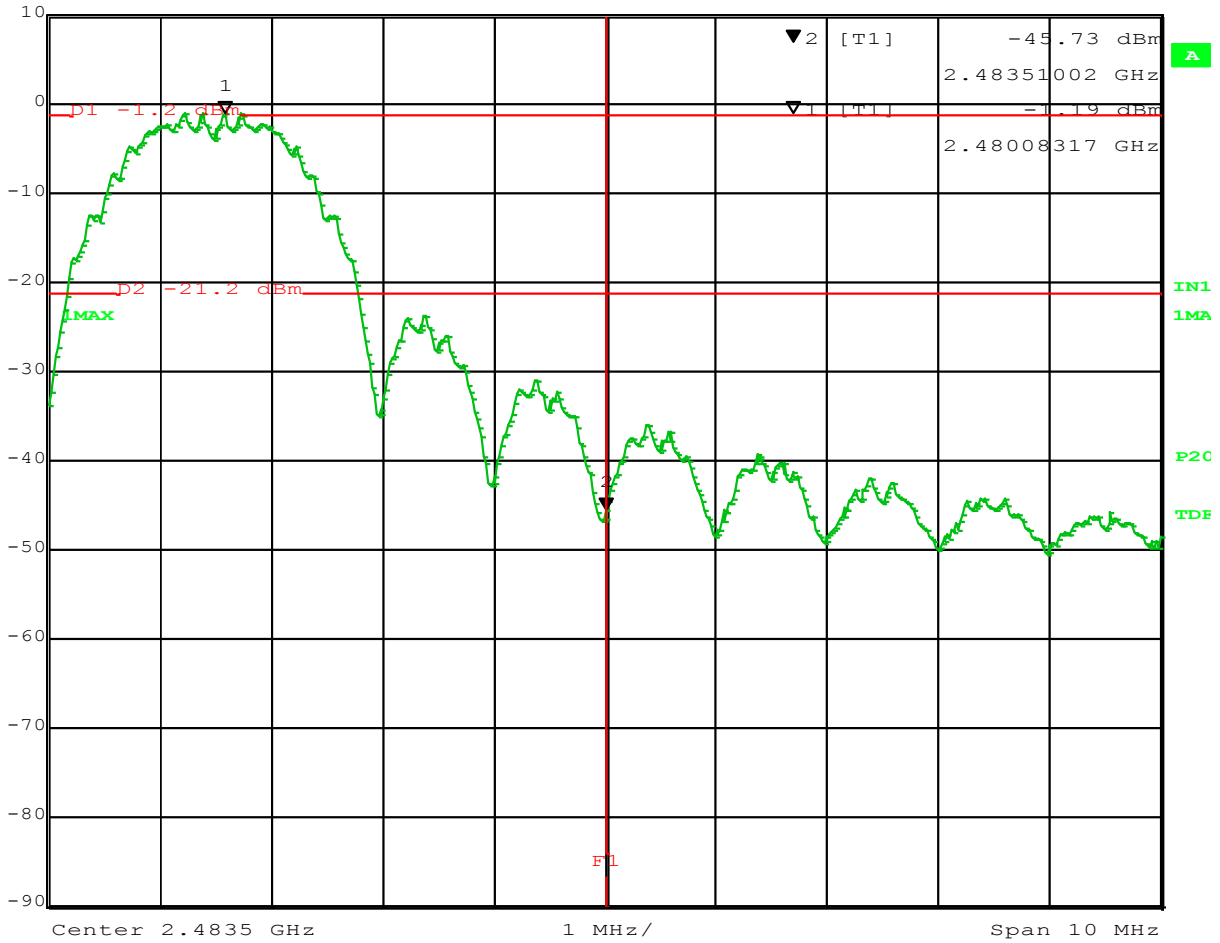
Date: 2.NOV.2017 10:07:58



Antenna 1, Channel 26 (2.480 GHz)



Ref Lvl 10 dBm
Marker 2 [T1] 2.48351002 GHz -45.73 dBm
RBW 100 kHz RF Att 50 dB
VBW 300 kHz
SWT 200 ms Unit dBm



Date: 2.NOV.2017 10:04:16



4.7.4 Band Edge Measurement Test Data Results (11/02/2017)

Antenna 0

Channel	Measurement Frequency (GHz)	Peak Amplitude (dBm)	20 dB Limit	Lower Edge of Frequency Band (GHz)	Upper Edge of Frequency Band (GHz)	Lower Measured Frequency (GHz)	Lower Measured Amplitude (dBm)	Upper Measured Frequency (GHz)	Upper Measured Amplitude (dBm)	Results
11	2.405	-1.69	-21.69	2.4	2.4835	2.40003	-41.6			PASS
26	2.48	-1.3	-21.3	2.4	2.4835			2.48351	-46.62	PASS

Antenna 1

Channel	Measurement Frequency (GHz)	Peak Amplitude (dBm)	20 dB Limit	Lower Edge of Frequency Band (GHz)	Upper Edge of Frequency Band (GHz)	Lower Measured Frequency (GHz)	Lower Measured Amplitude (dBm)	Upper Measured Frequency (GHz)	Upper Measured Amplitude (dBm)	Results
11	2.405	-1.66	-21.66	2.4	2.4835	2.40001	-42.14			PASS
26	2.48	-1.19	-21.19	2.4	2.4835			2.48351	-45.73	PASS

Results: The Band Edge measurements for antenna 0 and antenna 1 of the ARRIS Model Spectrum 110A Set Top Box are compliant with the limits specified in FCC Section 15.247(d).

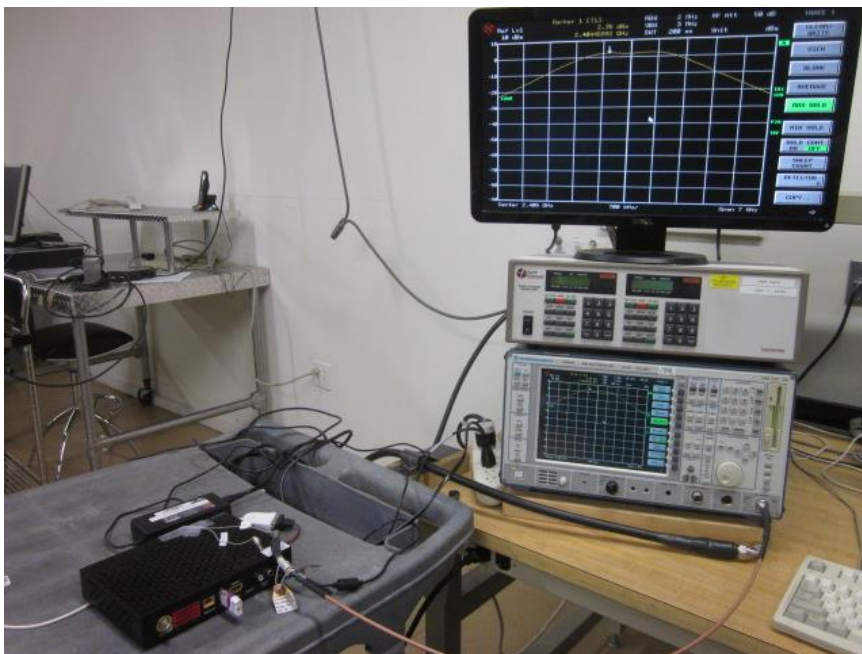


5.0 Test Setup Pictures

5.1 Conducted Emissions Power Line Test Setup Picture

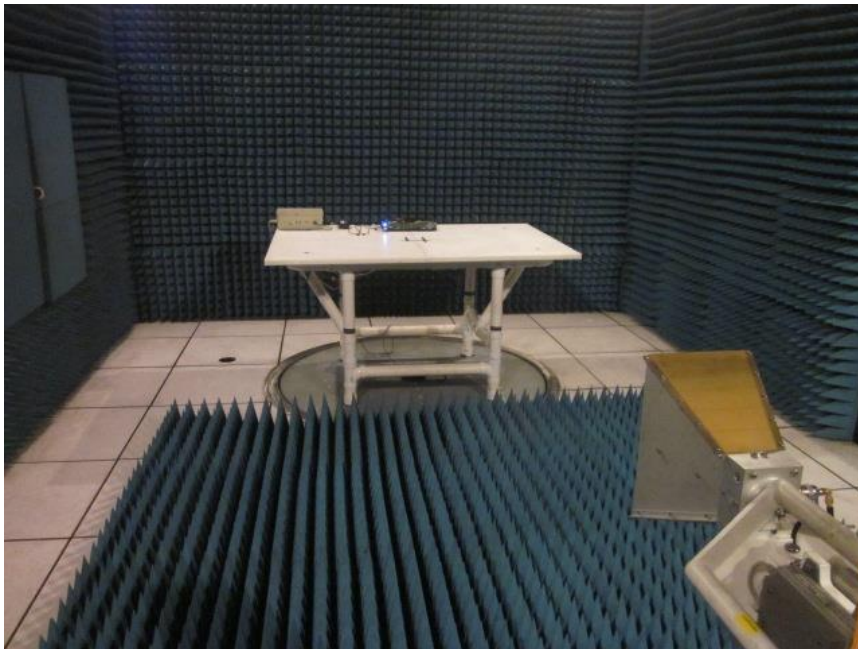


5.2 Conducted Emissions Antenna Test Setup Picture





5.3 Harmonic Radiated Emissions Test Setup Pictures





Appendix A – Test Equipment

Equipment	Manufacturer	Model #	Serial #	BEC #	Calibration Date	Calibration Cycle	Calibration Due Date
EMI Receiver (20 Hz – 26.5 GHz)	Rohde & Schwarz	ESIB 26	836119/006	1010	07/01/16	2 Years	07/01/18
Antenna (30 MHz - 6 GHz)	Sunol Sciences	JB6	A020714	882	04/01/16	2 Years	04/01/18
9kHz-3GHz EMC Analyzer	Agilent	E7402A	US39440162	883	02/16/16	2 Years	02/16/18
Amplifier (.09 – 1300 MHz)	Hewlett Packard	8447F	3313A06658	807	01/18/17	2 Years	01/18/19
EMC Analyzer (9 kHz - 1.8 GHz)	Hewlett Packard	8591EM	3536A00746	821	10/14/14	3 Years	10/14/17
GTEM (30 MHz – 1 GHz)	ETS Lindgren	5317	1014	1001	No Cal. Required	No Cal. Required	No Cal. Required
EMC Analyzer (9 kHz - 26.5 GHz)	Hewlett Packard	8593EM	3710A00214	1026	03/02/17	2 Years	03/02/19
Amplifier System (0.5 – 50 GHz)	Hewlett Packard	83015A 83017A	3123A00360 & 3332A00219	1027	10/03/16	2 Years	10/03/18
Double Ridged Horn Antenna (1 - 18 GHz)	EMCO	3115	9705-5225	1028	10/19/16	2 Years	10/19/18
Antenna (18 - 26.5 GHz)	Hewlett Packard	84125- 80008	N/A	1056	10/19/16	2 Years	10/19/18



EMI Receiver (9 kHz - 6.5 GHz)	Hewlett Packard	8546A	3325A00158	761	11/05/13	3 Years	11/05/16
Four Line V-LISN	Teseq	NNB 52	253551	950	06/15/17	1 Year	06/15/18
Shielded Room #1	ETS Lindgren	12-2/2-0	4078	859	12/16/15	2 Years	12/16/17
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	05/16/17	1 Year	05/16/18
Temp/Humidity Meter	Control Company	4096	151872672	780	11/19/15	2 Years	11/19/17
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