

*FCC PART 15, SUBPART B and C
TEST REPORT*

for

TIVO S5 MSO NETFLIX 2016

MODEL: URC-7021BC0-XXXX-R

Prepared for

UNIVERSAL ELECTRONICS, INC.
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DATE: AUGUST 29, 2016

	REPORT BODY	APPENDICES					TOTAL
		A	B	C	D	E	
PAGES	17	2	2	2	12	33	68

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GENERAL REPORT SUMMARY

This electromagnetic emission test report is generated by Compatible Electronics Inc., which is an independent testing and consulting firm. The test report is based on testing performed by Compatible Electronics personnel according to the measurement procedures described in the test specifications given below and in the "Test Procedures" section of this report.

The measurement data and conclusions appearing herein relate only to the sample tested and this report may not be reproduced without the written permission of Compatible Electronics, unless done so in full.

This report must not be used to claim product certification, approval or endorsement by NVLAP, NIST or any agency of the federal government.

Device Tested: TIVO S5 MSO NETFLIX 2016
Model: URC-7021BC0-XXXX-R
S/N: N/A

Product Description: The EUT is an RF remote control.

Modifications: The EUT was not modified in order to meet the specifications.

Customer: Universal Electronics, Inc.
201 East Sandpointe Ave., 8TH Floor
Santa Ana, California 92707

Test Dates: August 3, 4, 5, and 6, 2016

Test Specifications: Emissions requirements
CFR Title 47, Part 15, Subpart B; and Subpart C, sections 15.205, 15.209, and 15.249

Test Procedure: ANSI C63.4, ANSI C63.10

Test Deviations: The test procedure was not deviated from during the testing.



SUMMARY OF TEST RESULTS

TEST	DESCRIPTION	RESULTS
1	Spurious Radiated RF Emissions, 10 kHz – 25,000 MHz (Transmitter and Digital portion)	Complies with the Class B limits of CFR Title 47, Part 15 Subpart B; and the limits of CFR Title 47, Part 15, Subpart C, section 15.205, 15.209 and 15.249
2	Conducted RF Emissions, 150 kHz to 30 MHz	This test was not performed because the EUT operates on battery power and does not connect to the AC mains.

1. PURPOSE

This document is a qualification test report based on the emissions tests performed on the TIVO S5 MSO NETFLIX 2016, Model: URC-7021BC0-XXXX-R. The emissions measurements were performed according to the measurement procedure described in ANSI C63.4 and ANSI C63.10. The tests were performed in order to determine whether the electromagnetic emissions from the equipment under test, referred to as EUT hereafter, are within the Class B specification limits defined by CFR Title 47, Part 15, Subpart B; and Subpart C, sections 15.205, 15.209, and 15.249.



2. ADMINISTRATIVE DATA

2.1 Location of Testing

The emissions tests described herein were performed at the test facility of Compatible Electronics, 114 Olinda Drive, Brea, California 92823.

2.2 Traceability Statement

The calibration certificates of all test equipment used during the test are on file at the location of the test. The calibration is traceable to the National Institute of Standards and Technology (NIST).

2.3 Cognizant Personnel

Universal Electronics, Inc.

Jesse Mendez

Senior Electrical Core Engineer

Compatible Electronics Inc.

Kyle Fujimoto

Test Engineer

Edgar Valencia

Lab Technician

2.4 Date Test Sample was Received

The test sample was received on August 3, 2016.

2.5 Disposition of the Test Sample

The test sample has not been returned to Universal Electronics, Inc. as of the date of this test report.

2.6 Abbreviations and Acronyms

The following abbreviations and acronyms may be used in this document.

RF	Radio Frequency
EMI	Electromagnetic Interference
EUT	Equipment Under Test
P/N	Part Number
S/N	Serial Number
HP	Hewlett Packard
ITE	Information Technology Equipment
CML	Corrected Meter Limit
LISN	Line Impedance Stabilization Network
N/A	Not Applicable
DNF	Do Not Fit
URC	Universal Remote Control

3. APPLICABLE DOCUMENTS

The following documents are referenced or used in the preparation of this emissions Test Report.

SPEC	TITLE
FCC Title 47, Part 15 Subpart C	FCC Rules - Radio frequency devices (including digital devices) – Intentional Radiators
FCC Title 47, Part 15 Subpart B	FCC Rules - Radio frequency devices (including digital devices) – Unintentional Radiators
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
ANSI C63.10 2013	American National Standard for Testing Unlicensed Wireless Devices

4. DESCRIPTION OF TEST CONFIGURATION

4.1 Description of Test Configuration - Emissions

TIVO S5 MSO NETFLIX 2016, Model:URC-7021BC0-XXXX-R (EUT) is a remote control that is powered by two AA 1.5 VDC batteries.

The EUT was tested for emissions at the low, middle, and high channels while in the X, Y and Z axis. During the testing, the EUT was continuously transmitting.

The EUT was placed in a special modulated test mode to allow for continuously transmission via the Smart RF Studio 7 version 2.2.1 test software. The laptop for the test software was only used to program the EUT and then was removed during the testing.

The duty cycle was taken with the EUT in attempting to pair with a set-top box and then communicating with the set-top box. Both of these modes represent the worst case.

The X orientation is when the EUT is parallel to the ground. The Y orientation is when the EUT is perpendicular to the ground mounted vertically. The Z orientation is when the EUT is perpendicular to the ground mounted horizontally.

The EUT was tested with new batteries.

The final radiated data for the EUT as was taken in the mode described above. Please see Appendix E for the data sheets.

4.1.1 Cable Construction and Termination

The EUT has no cables.

5. LISTS OF EUT, ACCESSORIES AND TEST EQUIPMENT**5.1 EUT and Accessory List**

EQUIPMENT	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	FCC ID
TIVO S5 MSO NETFLIX 2016 (EUT)	UNIVERSAL ELECTRONICS, INC.	URC-7021BC0-XXXX-R	N/A	MG3-7021
TEST SOFTWARE FOR EUT	TEXAS INSTRUMENTS	SMART RF STUDIO 7	2.2.1	N/A
LAPTOP FOR TEST SOFTWARE	DELL	X436M A01	N/A	N/A

5.2 Emissions Test Equipment

EQUIPMENT TYPE	MANU-FACTURER	MODEL NUMBER	SERIAL NUMBER	CALIBRATION DATE	CAL. CYCLE
GENERAL TEST EQUIPMENT USED IN LAB D					
TDK TestLab	TDK RF Solutions, Inc.	9.22	700145	N/A	N/A
Computer	Hewlett Packard	p6716f	MXX1030PX0	N/A	N/A
LCD Monitor	Hewlett Packard	52031a	3CQ046N3MG	N/A	N/A
EMI Receiver, 20 Hz – 26.5 GHz	Agilent Technologies	N9038A	MY51100115	December 29, 2015	1 Year
RF RADIATED EMISSIONS TEST EQUIPMENT					
CombiLog Antenna	Com-Power	AC-220	61060	September 3, 2015	1 Year
Preamplifier	Com-Power	PA-118	551024	May 12, 2016	1 Year
Preamplifier	Com-Power	PA-840	711013	May 12, 2016	2 Year
Loop Antenna	Com-Power	AL-130	17089	February 6, 2015	2 Year
Horn Antenna	Com-Power	AH-118	071175	February 26, 2016	2 Year
Horn Antenna	Com-Power	AH-826	0071957	N/A	N/A
Antenna Mast	Com Power	AM-100	N/A	N/A	N/A
System Controller	Sunol Sciences Corporation	SC110V	112213-1	N/A	N/A
Turntable	Sunol Sciences Corporation	2011VS	N/A	N/A	N/A
Antenna-Mast	Sunol Sciences Corporation	TWR95-4	112213-3	N/A	N/A

6. TEST SITE DESCRIPTION

6.1 Test Facility Description

Please refer to section 2.1 and 7.1 of this report for emissions test location.

6.2 EUT Mounting, Bonding and Grounding

For frequencies 1 GHz and below: The EUT was mounted on a 1.0 by 1.5 meter non-conductive table 0.8 meters above the ground plane.

For frequencies above 1 GHz: The EUT was mounted on a 1.0 by 1.5 meter non-conductive table 1.5 meters above the ground plane.

The EUT was not grounded.

7. TEST PROCEDURES

The following sections describe the test methods and the specifications for the tests. Test results are also included in this section.

7.1 RF Emissions

7.1.1 Radiated Emissions Test

The EMI Receiver was used as the measuring meter. A built-in, internal preamplifier was used to increase the sensitivity of the instrument. The EMI Receiver was initially used with the Analyzer mode feature activated. In this mode, the EMI receiver can then record the actual frequency to be measured. This final reading is then taken accurately in the EMI Receiver mode, which takes into account the cable loss, amplifier gain and antenna factors, so that a true reading is compared to the true limit. A quasi-peak reading was taken only for those readings, which are marked accordingly on the data sheets.

For frequencies above 1 GHz, the readings were average by a “duty cycle correction factor”, derived from $20 \log(\text{dwell time} / 100 \text{ ms})$. This duty cycle correction factor was then subtracted from the peak reading.

The measurement bandwidths and transducers used for the radiated emissions test were:

FREQUENCY RANGE	EFFECTIVE MEASUREMENT BANDWIDTH	TRANSDUCER
9 kHz to 150 kHz	200 Hz	Loop Antenna
150 kHz to 30 MHz	9 kHz	Loop Antenna
30 MHz to 1 GHz	120 kHz	Combilog Antenna
1 GHz to 25 GHz	1 MHz	Horn Antenna

The EMI test chamber of Compatible Electronics, Inc. was used for radiated emissions testing. This test site is in full compliance with ANSI C63.4. Please see section 6.2 of this report for mounting, bonding and grounding of the EUT. The turntable supporting the EUT is remote controlled using a motor. The turntable permits EUT rotation of 360 degrees in order to maximize emissions. Also, the antenna mast allows height variation of the antenna from 1 meter to 4 meters. Data was collected in the worst case (highest emission) configuration of the EUT. At each reading, the EUT was rotated 360 degrees and the antenna height was varied from 1 to 4 meters (for E field radiated field strength). The gunsight method was used when measuring with the horn antenna in order to ensure accurate results.

Radiated Emissions Test (Continued)

The EUT was tested at a 3-meter test distance from 10 kHz to 25 GHz.

Test Results:

The EUT complies with the **Class B** limits of CFR Title 47, Part 15, Subpart B; and the limits of CFR Title 47, Part 15, Subpart C, Sections 15.209 and 15.249 for radiated emissions. Please see Appendix E for the data sheets.



7.1.2 RF Emissions Test ResultsTable 1.0 RADIATED EMISSION RESULTS
TIVO S5 MSO NETFLIX 2016, Model: URC-7021BC0-XXXX-R

Frequency MHz	Corrected Reading* dBuV	Specification Limit dBuV	Delta (Cor. Reading – Spec. Limit) dB
2475 (V) (Y-Axis)	49.85	53.97	-4.12
2475 (H) (X-Axis)	49.20	53.97	-4.77
2400 (V) (Y-Axis)	41.53	53.97	-12.44
2400 (H) (X-Axis)	40.40	53.97	-13.57
4900 (H) (X-Axis)	39.48 (Avg)	53.97	-14.49
4950 (H) (X-Axis)	39.45 (Avg)	53.97	-14.52

Notes:

(H) Horizontal
(V) Vertical
(Avg) Averaged Reading
* The complete emissions data is given in Appendix E of this report.

7.2 Fundamental Field Strength (Duty Cycle Calculations)

The Peak Transmit Radiated Field Strength was measured at a 3-meter test distance. The EMI Receiver was used to obtain the duty cycle. The data sheets are located in Appendix E.

Where

$$\delta(\text{dB}) = 20 \log \left[\sum (nt_1 + mt_2 + \dots + \xi t_x) / T \right]$$

n is the number of pulses of duration t_1

m is the number of pulses of duration t_2

ξ is the number of pulses of duration t_x

T is the period of the pulse train or 100 ms if the pulse train length is greater than 100 ms

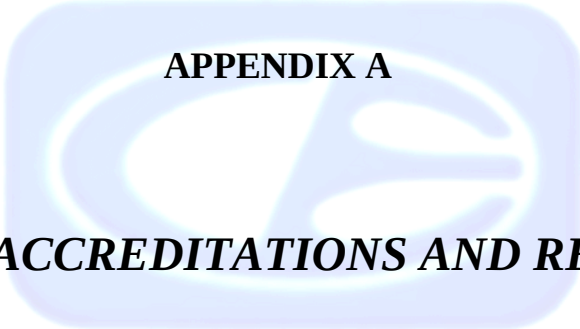
Duty Cycle Correction Factor = -20.00 dB

The EUT was tested in both advertising and data modes. Please see Appendix E for the data sheets and more detailed explanation of how the duty cycle was derived.

8. CONCLUSIONS

The TIVO S5 MSO NETFLIX 2016, Model: URC-7021BC0-XXXX-R, as tested, meets all of the Class B specification limits defined in FCC Title 47, Part 15, Subpart B; and Subpart C, sections 15.205, 15.209, and 15.249.





APPENDIX A

LABORATORY ACCREDITATIONS AND RECOGNITIONS

LABORATORY ACCREDITATIONS AND RECOGNITIONS



NVLAP LAB CODE 200528-0

® For US, Canada, Australia/New Zealand, Japan, Taiwan, Korea, and the European Union, Compatible Electronics is currently accredited by NVLAP to ISO/IEC 17025.

For the most up-to-date version of our scopes and certificates please visit

<http://celectronics.com/quality/scope/>

Quote from ISO-ILAC-IAF Communiqué on 17025:

"A laboratory's fulfilment of the requirements of ISO/IEC 17025:2005 means the laboratory meets both the technical competence requirements and management system requirements that are necessary for it to consistently deliver technically valid test results and calibrations. The management system requirements in ISO/IEC 17025:2005 (Section 4) are written in language relevant to laboratory operations and meet the principles of ISO 9001:2008 Quality Management Systems — Requirements."



ANSI listing [CETCB](#)



Compatible Electronics has been nominated as a Conformity Assessment Body (CAB) for EMC under the US/EU Mutual Recognition Agreement (MRA).

US/EU MRA list [NIST MRA site](#)



Compatible Electronics has been nominated as a Conformity Assessment Body (CAB) for Taiwan/BSMI under the US/APEC (Asia-Pacific Economic Cooperation) Mutual Recognition Agreement (MRA).

APEC MRA list [NIST MRA site](#)

We are also listed for IT products by the following country/agency:



VCCI Support member: Please visit http://www.vcci.jp/vcci_e/



FCC Listing, from FCC OET site

[FCC test lab search](#) <https://fjallfoss.fcc.gov/oetcf/eas/reports/TestFirmSearch.cfm>



Compatible Electronics IC listing can be found at:

<http://www.ic.gc.ca/eic/site/ic1.nsf/eng/home>

APPENDIX B

MODIFICATIONS TO THE EUT

MODIFICATIONS TO THE EUT

The modifications listed below were made to the EUT to pass FCC Subpart B and FCC 15.249 specifications.

All the rework described below was implemented during the test in a method that could be reproduced in all the units by the manufacturer.

No Modifications were made to the EUT during the testing.



APPENDIX C

***ADDITIONAL MODELS COVERED
UNDER THIS REPORT***

ADDITIONAL MODELS COVERED UNDER THIS REPORT

USED FOR THE PRIMARY TEST

TIVO S5 MSO NETFLIX 2016
Model: URC-7021BC0-XXXX-R
S/N: N/A

ADDITIONAL MODELS COVERED:

The following models are considered by the manufacturer to be similar to the sample tested, however the test results contained in this report relate only to the sample tested.

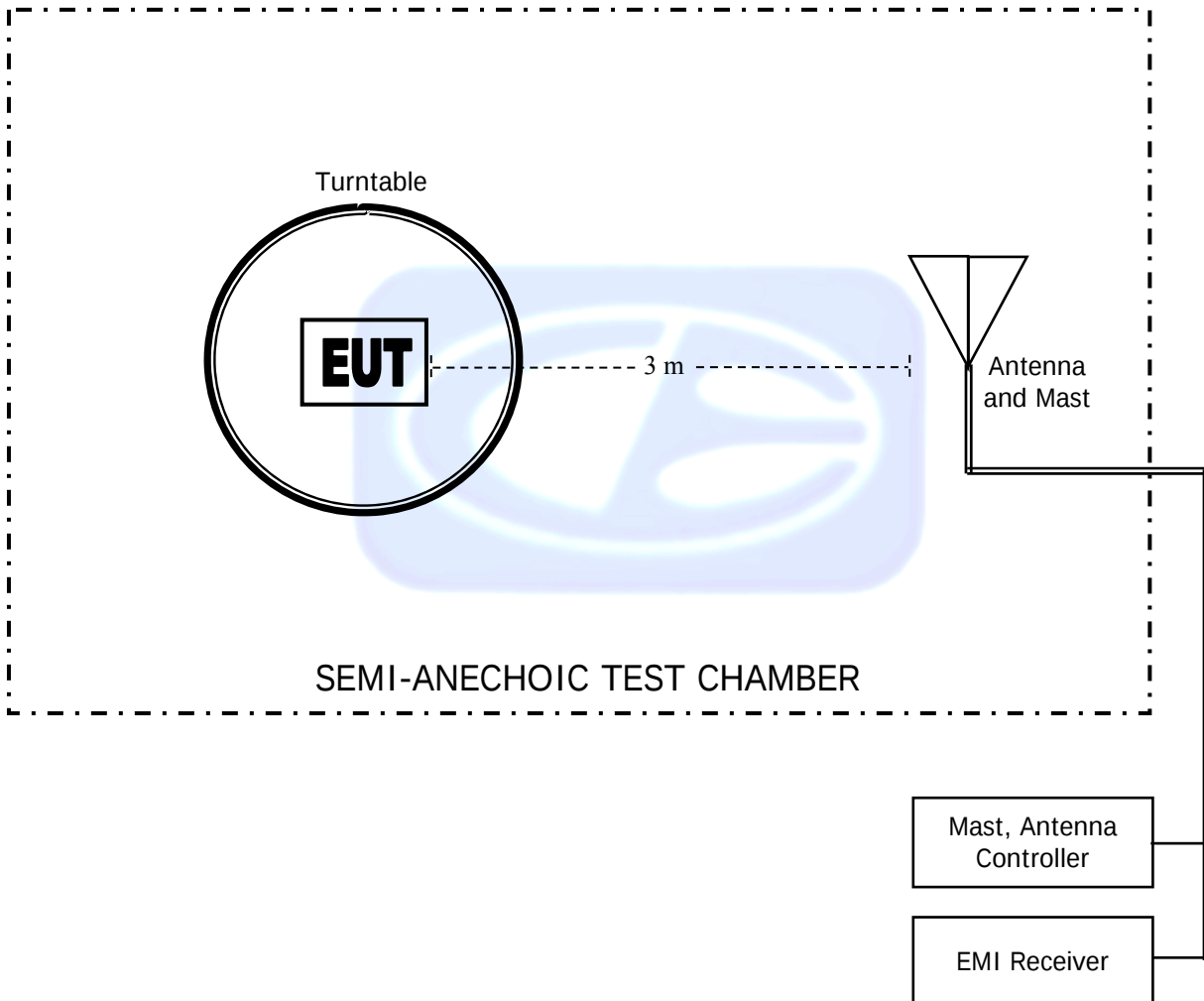
There were no additional models covered in this test.



APPENDIX D

DIAGRAMS AND CHARTS

FIGURE 1: LAYOUT OF THE SEMI-ANECHOIC TEST CHAMBER



COM-POWER AL-130**LOOP ANTENNA**

S/N: 17089

CALIBRATION DATE: FEBRUARY 6, 2015

FREQUENCY (MHz)	MAGNETIC (dB/m)	ELECTRIC (dB/m)
0.009	-33.18	18.32
0.01	-34.10	17.40
0.02	-38.65	12.85
0.03	-39.28	12.22
0.04	-40.09	11.41
0.05	-40.85	10.65
0.06	-40.88	10.62
0.07	-41.07	10.43
0.08	-41.04	10.46
0.09	-41.19	10.31
0.1	-41.20	10.30
0.2	-41.52	9.98
0.3	-41.53	9.97
0.4	-41.42	10.08
0.5	-41.53	9.97
0.6	-41.53	9.97
0.7	-41.43	10.07
0.8	-41.23	10.27
0.9	-41.13	10.37
1	-41.14	10.36
2	-40.80	10.70
3	-40.66	10.84
4	-40.61	10.89
5	-40.33	11.17
6	-40.53	10.97
7	-40.47	11.03
8	-40.48	11.02
9	-39.93	11.57
10	-39.81	11.69
15	-43.35	8.15
20	-39.16	12.34
25	-40.24	11.26
30	-43.18	8.32

COM-POWER AC-220**COMBILOG ANTENNA****S/N: 61060****CALIBRATION DATE: SEPTEMBER 3, 2015**

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
30	24.00	200	13.00
35	24.30	250	15.30
40	25.40	300	18.20
45	21.50	350	17.90
50	22.50	400	18.60
60	15.40	450	19.80
70	12.70	500	21.60
80	11.10	550	22.40
90	13.40	600	23.70
100	13.80	650	24.30
120	15.40	700	24.00
125	15.40	750	24.50
140	13.10	800	24.30
150	17.20	850	26.30
160	13.20	900	26.90
175	14.20	950	26.00
180	14.30	1000	25.60

COM POWER AH-118**HORN ANTENNA****S/N: 071175****CALIBRATION DATE: FEBRUARY 26, 2016**

FREQUENCY (GHz)	FACTOR (dB)	FREQUENCY (GHz)	FACTOR (dB)
1.0	23.93	10.0	39.33
1.5	25.54	10.5	39.64
2.0	28.09	11.0	41.04
2.5	30.21	11.5	44.29
3.0	30.15	12.0	41.22
3.5	30.17	12.5	41.50
4.0	31.90	13.0	41.62
4.5	33.51	13.5	40.63
5.0	33.87	14.0	39.94
5.5	35.08	14.5	41.84
6.0	34.81	15.0	42.69
6.5	34.26	15.5	39.03
7.0	36.33	16.0	39.07
7.5	37.03	16.5	41.40
8.0	37.56	17.0	43.18
8.5	40.07	17.5	47.01
9.0	38.92	18.0	46.48
9.5	38.21		

COM-POWER PA-118**PREAMPLIFIER**

S/N: 551024

CALIBRATION DATE: MAY 12, 2016

FREQUENCY (GHz)	FACTOR (dB)	FREQUENCY (GHz)	FACTOR (dB)
1.0	39.82	6.0	38.77
1.1	39.70	6.5	39.01
1.2	39.79	7.0	38.78
1.3	39.82	7.5	39.05
1.4	39.99	8.0	38.88
1.5	39.91	8.5	38.59
1.6	39.96	9.0	38.52
1.7	40.08	9.5	38.18
1.8	39.90	10.0	39.10
1.9	40.07	11.0	38.95
2.0	40.25	12.0	38.62
2.5	40.50	13.0	39.58
3.0	40.65	14.0	39.82
3.5	40.95	15.0	39.38
4.0	40.46	16.0	39.64
4.5	40.01	17.0	39.65
5.0	39.39	18.0	39.96
5.5	39.25		

COM-POWER AH-826**HORN ANTENNA**

S/N: 71957

FREQUENCY (GHz)	FACTOR (dB)	FREQUENCY (GHz)	FACTOR (dB)
18.0	33.5	22.5	35.5
18.5	33.5	23.0	35.9
19.0	34.0	23.5	35.7
19.5	34.0	24.0	35.6
20.0	34.3	24.5	36.0
20.5	34.9	25.0	36.2
21.0	34.7	25.5	36.1
21.5	35.0	26.0	36.2
22.0	35.0	26.5	35.7

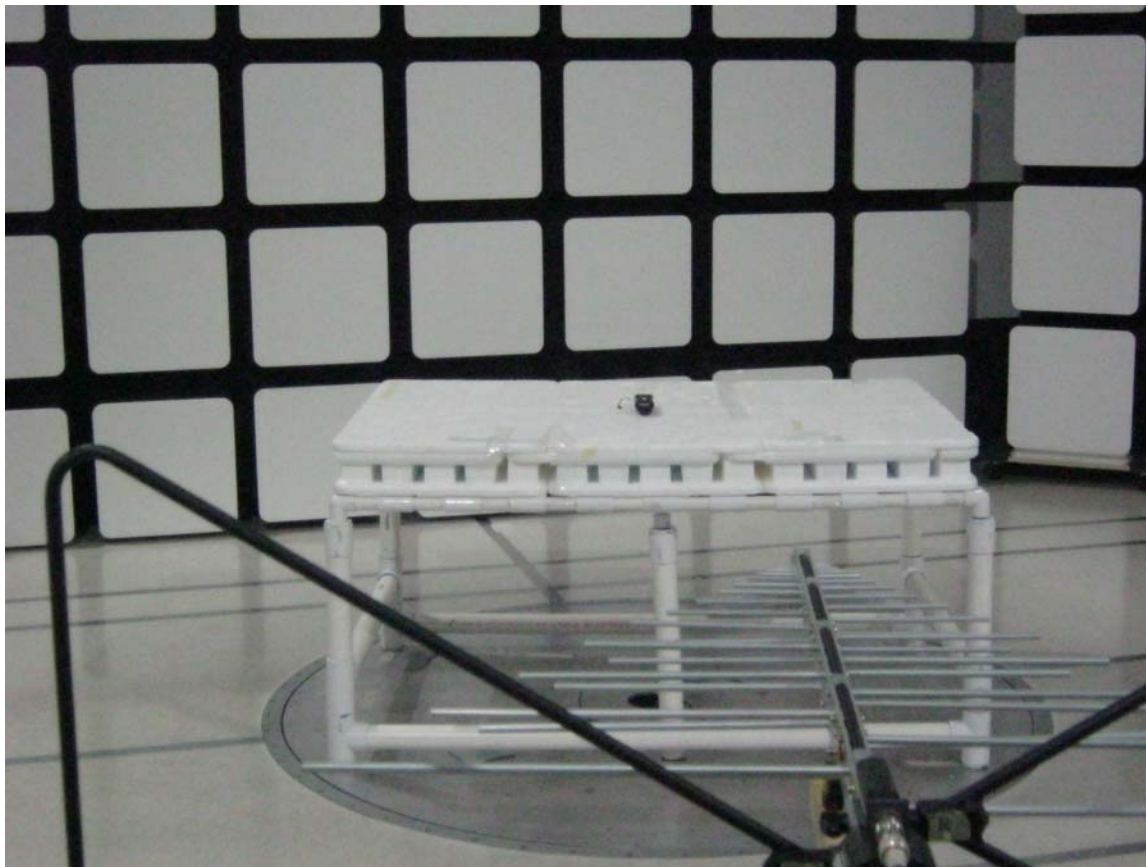
COM-POWER PA-840

MICROWAVE PREAMPLIFIER

S/N: 711013

CALIBRATION DATE: MAY 12, 2016

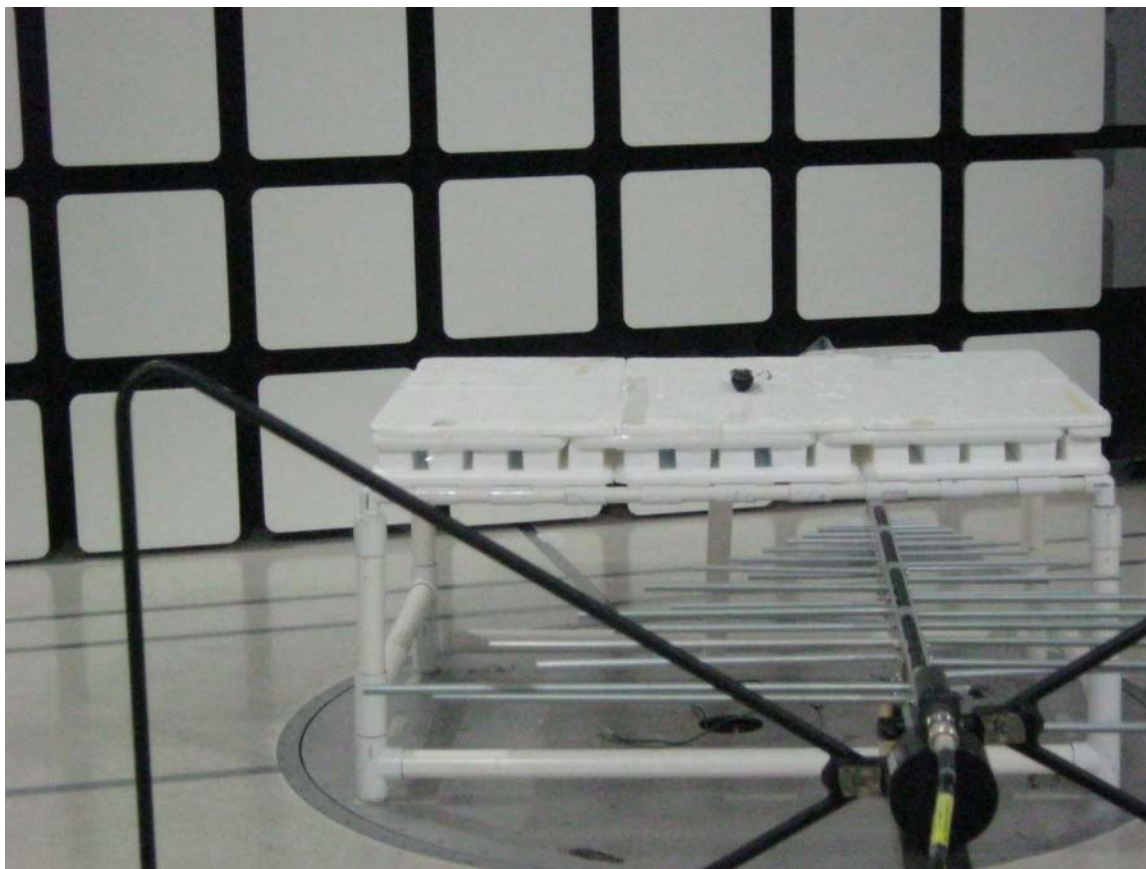
FREQUENCY (GHz)	FACTOR (dB)	FREQUENCY (GHz)	FACTOR (dB)
18.0	25.17	31.0	26.31
19.0	24.94	31.5	25.56
20.0	24.11	32.0	25.24
21.0	23.83	32.5	24.59
22.0	25.20	33.0	26.15
23.0	23.37	33.5	24.87
24.0	24.33	34.0	25.49
25.0	25.82	34.5	25.28
26.0	25.48	35.0	24.76
26.5	25.51	35.5	23.02
27.0	25.68	36.0	23.20
27.5	25.80	36.5	24.39
28.0	25.91	37.0	25.81
28.5	26.01	37.5	25.43
29.0	26.26	38.0	24.92
29.5	25.99	38.5	23.64
30.0	26.06	39.0	21.18
30.5	26.16	39.5	22.35
		40.0	21.24



FRONT VIEW

UNIVERSAL ELECTRONICS, INC.
TIVO S5 MSO NETFLIX 2016
MODEL: URC-7021BC0-XXXX-R
FCC SUBPART B AND C – RADIATED EMISSIONS – BELOW 1 GHz

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION
FOR MAXIMUM EMISSIONS**



REAR VIEW

UNIVERSAL ELECTRONICS, INC.
TIVO S5 MSO NETFLIX 2016
MODEL: URC-7021BC0-XXXX-R
FCC SUBPART B AND C – RADIATED EMISSIONS – BELOW 1 GHz

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION
FOR MAXIMUM EMISSIONS**



FRONT VIEW

UNIVERSAL ELECTRONICS, INC.
TIVO S5 MSO NETFLIX 2016
MODEL: URC-7021BC0-XXXX-R
FCC SUBPART B AND C – RADIATED EMISSIONS – ABOVE 1 GHz

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION
FOR MAXIMUM EMISSIONS**



REAR VIEW

UNIVERSAL ELECTRONICS, INC.
TIVO S5 MSO NETFLIX 2016
MODEL: URC-7021BC0-XXXX-R
FCC SUBPART B AND C – RADIATED EMISSIONS – ABOVE 1 GHz

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION
FOR MAXIMUM EMISSIONS**

APPENDIX E

DATA SHEETS

***RADIATED EMISSIONS
DATA SHEETS***

FCC 15.249

Universal Electronics, Inc.
TIVO S5 MSO NETFLIX 2016
Model: URC-7021BC0-XXXX-R

Date: 08/03/2016
Lab: D
Tested By: Kyle Fujimoto

**Low Channel
X-Axis**

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Table Angle (deg)	Ant. Height (cm)	Comments
2425	79.92	V	113.97	-34.05	Peak	143.00	175.43	
2425	59.92	V	93.97	-34.05	Avg	143.00	175.43	
4850	53.53	V	73.97	-20.44	Peak	155.50	127.01	
4850	33.53	V	53.97	-20.44	Avg	155.50	127.01	
7275	54.89	V	73.97	-19.08	Peak	182.50	159.25	
7275	34.89	V	53.97	-19.08	Avg	182.50	159.25	
9700								No Emission
9700								Detected
12125								No Emission
12125								Detected
14550								No Emission
14550								Detected
16975								No Emission
16975								Detected
19400								No Emission
19400								Detected
21825								No Emission
21825								Detected
24250								No Emission
24250								Detected

FCC 15.249

Universal Electronics, Inc.
TIVO S5 MSO NETFLIX 2016
Model: URC-7021BC0-XXXX-R

Date: 08/03/2016
Lab: D
Tested By: Kyle Fujimoto

**Low Channel
X-Axis**

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Table Angle (deg)	Ant. Height (cm)	Comments
2425	97.99	H	113.97	-15.98	Peak	109.75	175.37	
2425	79.99	H	93.97	-13.98	Avg	109.75	175.37	
4850	52.75	H	73.97	-21.22	Peak	14.00	100.25	
4850	32.75	H	53.97	-21.22	Avg	14.00	100.25	
7275	48.94	H	73.97	-25.03	Peak	82.25	127.19	
7275	28.94	H	53.97	-25.03	Avg	82.25	127.19	
9700								No Emission
9700								Detected
12125								No Emission
12125								Detected
14550								No Emission
14550								Detected
16975								No Emission
16975								Detected
19400								No Emission
19400								Detected
21825								No Emission
21825								Detected
24250								No Emission
24250								Detected

FCC 15.249

Universal Electronics, Inc.
TIVO S5 MSO NETFLIX 2016
Model: URC-7021BC0-XXXX-R

Date: 08/03/2016
Lab: D
Tested By: Kyle Fujimoto

**Low Channel
Y-Axis**

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Table Angle (deg)	Ant. Height (cm)	Comments
2425	96.07	V	113.97	-17.90	Peak	53.50	175.01	
2425	76.07	V	93.97	-17.90	Avg	53.50	175.01	
4850	56.19	V	73.97	-17.78	Peak	136.75	111.07	
4850	36.19	V	53.97	-17.78	Avg	136.75	111.07	
7275	50.21	V	73.97	-23.76	Peak	237.00	127.19	
7275	30.21	V	53.97	-23.76	Avg	237.00	127.19	
9700								No Emission
9700								Detected
12125								No Emission
12125								Detected
14550								No Emission
14550								Detected
16975								No Emission
16975								Detected
19400								No Emission
19400								Detected
21825								No Emission
21825								Detected
24250								No Emission
24250								Detected

FCC 15.249

Universal Electronics, Inc.
TIVO S5 MSO NETFLIX 2016
Model: URC-7021BC0-XXXX-R

Date: 08/03/2016
Lab: D
Tested By: Kyle Fujimoto

**Low Channel
Y-Axis**

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Table Angle (deg)	Ant. Height (cm)	Comments
2425	91.73	H	113.97	-22.24	Peak	153.25	126.83	
2425	71.73	H	93.97	-22.24	Avg	153.25	126.83	
4850	52.40	H	73.97	-21.57	Peak	110.75	111.01	
4850	32.40	H	53.97	-21.57	Avg	110.75	111.01	
7275	52.39	H	73.97	-21.58	Peak	198.25	126.65	
7275	32.39	H	53.97	-21.58	Avg	198.25	126.65	
9700								No Emission
9700								Detected
12125								No Emission
12125								Detected
14550								No Emission
14550								Detected
16975								No Emission
16975								Detected
19400								No Emission
19400								Detected
21825								No Emission
21825								Detected
24250								No Emission
24250								Detected

FCC 15.249

Universal Electronics, Inc.
TIVO S5 MSO NETFLIX 2016
Model: URC-7021BC0-XXXX-R

Date: 08/03/2016
Lab: D
Tested By: Kyle Fujimoto

Low Channel

Z-Axis

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Table Angle (deg)	Ant. Height (cm)	Comments
2425	92.88	V	113.97	-21.09	Peak	136.00	175.43	
2425	72.88	V	93.97	-21.09	Avg	136.00	175.43	
4850	51.22	V	73.97	-22.75	Peak	227.75	143.01	
4850	31.22	V	53.97	-22.75	Avg	227.75	143.01	
7275	56.11	V	73.97	-17.86	Peak	98.75	111.43	
7275	36.11	V	53.97	-17.86	Avg	98.75	111.43	
9700								No Emission
9700								Detected
12125								No Emission
12125								Detected
14550								No Emission
14550								Detected
16975								No Emission
16975								Detected
19400								No Emission
19400								Detected
21825								No Emission
21825								Detected
24250								No Emission
24250								Detected

FCC 15.249

Universal Electronics, Inc.
TIVO S5 MSO NETFLIX 2016
Model: URC-7021BC0-XXXX-R

Date: 08/03/2016
Lab: D
Tested By: Kyle Fujimoto

Low Channel
Z-Axis

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Table Angle (deg)	Ant. Height (cm)	Comments
2425	94.94	H	113.97	-19.03	Peak	357.25	127.25	
2425	74.94	H	93.97	-19.03	Avg	357.25	127.25	
4850	55.48	H	73.97	-18.49	Peak	170.75	127.19	
4850	35.48	H	53.97	-18.49	Avg	170.75	127.19	
7275	51.66	H	73.97	-22.31	Peak	166.75	111.43	
7275	31.66	H	53.97	-22.31	Avg	166.75	111.43	
9700								No Emission
9700								Detected
12125								No Emission
12125								Detected
14550								No Emission
14550								Detected
16975								No Emission
16975								Detected
19400								No Emission
19400								Detected
21825								No Emission
21825								Detected
24250								No Emission
24250								Detected

FCC 15.249

Universal Electronics, Inc.
TIVO S5 MSO NETFLIX 2016
Model: URC-7021BC0-XXXX-R

Date: 08/03/2016
Lab: D
Tested By: Kyle Fujimoto

**Middle Channel
X-Axis**

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Table Angle (deg)	Ant. Height (cm)	Comments
2450	75.25	V	113.97	-38.72	Peak	127.00	222.89	
2450	55.25	V	93.97	-38.72	Avg	127.00	222.89	
4900	56.09	V	73.97	-17.88	Peak	19.25	111.37	
4900	36.09	V	53.97	-17.88	Avg	19.25	111.37	
7350	44.33	V	73.97	-29.64	Peak	359.25	126.29	
7350	24.33	V	53.97	-29.64	Avg	359.25	126.29	
9800								No Emission
9800								Detected
12250								No Emission
12250								Detected
14700								No Emission
14700								Detected
17150								No Emission
17150								Detected
19600								No Emission
19600								Detected
22050								No Emission
22050								Detected
24500								No Emission
24500								Detected

FCC 15.249

Universal Electronics, Inc.
TIVO S5 MSO NETFLIX 2016
Model: URC-7021BC0-XXXX-R

Date: 08/03/2016
Lab: D
Tested By: Kyle Fujimoto

**Middle Channel
X-Axis**

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Table Angle (deg)	Ant. Height (cm)	Comments
2450	98.05	H	113.97	-15.92	Peak	137.00	127.67	
2450	78.05	H	93.97	-15.92	Avg	137.00	127.67	
4900	59.48	H	73.97	-14.49	Peak	57.25	143.01	
4900	39.48	H	53.97	-14.49	Avg	57.25	143.01	
7350	56.83	H	73.97	-17.14	Peak	195.25	174.95	
7350	36.83	H	53.97	-17.14	Avg	195.25	174.95	
9800								No Emission
9800								Detected
12250								No Emission
12250								Detected
14700								No Emission
14700								Detected
17150								No Emission
17150								Detected
19600								No Emission
19600								Detected
22050								No Emission
22050								Detected
24500								No Emission
24500								Detected

FCC 15.249

Universal Electronics, Inc.
TIVO S5 MSO NETFLIX 2016
Model: URC-7021BC0-XXXX-R

Date: 08/03/2016
Lab: D
Tested By: Kyle Fujimoto

**Middle Channel
Y-Axis**

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Table Angle (deg)	Ant. Height (cm)	Comments
2450	96.38	V	113.97	-17.59	Peak	53.00	126.95	
2450	76.38	V	93.97	-17.59	Avg	53.00	126.95	
4900	58.40	V	73.97	-15.57	Peak	59.25	126.77	
4900	38.40	V	53.97	-15.57	Avg	59.25	126.77	
7350	48.80	V	73.97	-25.17	Peak	59.75	127.13	
7350	28.80	V	53.97	-25.17	Avg	59.75	127.13	
9800								No Emission
9800								Detected
12250								No Emission
12250								Detected
14700								No Emission
14700								Detected
17150								No Emission
17150								Detected
19600								No Emission
19600								Detected
22050								No Emission
22050								Detected
24500								No Emission
24500								Detected

FCC 15.249

Universal Electronics, Inc.
TIVO S5 MSO NETFLIX 2016
Model: URC-7021BC0-XXXX-R

Date: 08/03/2016
Lab: D
Tested By: Kyle Fujimoto

**Middle Channel
Y-Axis**

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Table Angle (deg)	Ant. Height (cm)	Comments
2450	89.95	H	113.97	-24.02	Peak	160.25	159.55	
2450	69.95	H	93.97	-24.02	Avg	160.25	159.55	
4900	56.33	H	73.97	-17.64	Peak	288.50	143.19	
4900	36.33	H	53.97	-17.64	Avg	288.50	143.19	
7350	56.33	H	73.97	-17.64	Peak	2.75	111.19	
7350	36.33	H	53.97	-17.64	Avg	2.75	111.19	
9800								No Emission
9800								Detected
12250								No Emission
12250								Detected
14700								No Emission
14700								Detected
17150								No Emission
17150								Detected
19600								No Emission
19600								Detected
22050								No Emission
22050								Detected
24500								No Emission
24500								Detected

FCC 15.249

Universal Electronics, Inc.
TIVO S5 MSO NETFLIX 2016
Model: URC-7021BC0-XXXX-R

Date: 08/03/2016
Lab: D
Tested By: Kyle Fujimoto

Middle Channel
Z-Axis

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Table Angle (deg)	Ant. Height (cm)	Comments
2450	93.74	V	113.97	-20.23	Peak	154.25	191.37	
2450	73.74	V	93.97	-20.23	Avg	154.25	191.37	
4900	55.45	V	73.97	-18.52	Peak	303.00	111.19	
4900	35.45	V	53.97	-18.52	Avg	303.00	111.19	
7350	53.66	V	73.97	-20.31	Peak	281.50	143.01	
7350	33.66	V	53.97	-20.31	Avg	281.50	143.01	
9800								No Emission
9800								Detected
12250								No Emission
12250								Detected
14700								No Emission
14700								Detected
17150								No Emission
17150								Detected
19600								No Emission
19600								Detected
22050								No Emission
22050								Detected
24500								No Emission
24500								Detected

FCC 15.249

Universal Electronics, Inc.
TIVO S5 MSO NETFLIX 2016
Model: URC-7021BC0-XXXX-R

Date: 08/03/2016
Lab: D
Tested By: Kyle Fujimoto

Middle Channel
Z-Axis

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Table Angle (deg)	Ant. Height (cm)	Comments
2450	89.91	H	113.97	-24.06	Peak	354.00	191.37	
2450	69.91	H	93.97	-24.06	Avg	354.00	191.37	
4900	58.39	H	73.97	-15.58	Peak	298.00	159.13	
4900	38.39	H	53.97	-15.58	Avg	298.00	159.13	
7350	50.37	H	73.97	-23.60	Peak	22.50	173.94	
7350	30.37	H	53.97	-23.60	Avg	22.50	173.94	
9800								No Emission
9800								Detected
12250								No Emission
12250								Detected
14700								No Emission
14700								Detected
17150								No Emission
17150								Detected
19600								No Emission
19600								Detected
22050								No Emission
22050								Detected
24500								No Emission
24500								Detected

FCC 15.249

Universal Electronics, Inc.
TIVO S5 MSO NETFLIX 2016
Model: URC-7021BC0-XXXX-R

Date: 08/03/2016
Lab: D
Tested By: Kyle Fujimoto

**High Channel
X-Axis**

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Table Angle (deg)	Ant. Height (cm)	Comments
2475	79.75	V	113.97	-34.22	Peak	140.75	238.83	
2475	59.75	V	93.97	-34.22	Avg	140.75	238.83	
4950	53.64	V	73.97	-20.33	Peak	40.50	223.67	
4950	33.64	V	53.97	-20.33	Avg	40.50	223.67	
7425	55.26	V	73.97	-18.71	Peak	206.00	191.55	
7425	35.26	V	53.97	-18.71	Avg	206.00	191.55	
9900								No Emission
9900								Detected
12375								No Emission
12375								Detected
14850								No Emission
14850								Detected
17325								No Emission
17325								Detected
19800								No Emission
19800								Detected
22275								No Emission
22275								Detected
24750								No Emission
24750								Detected

FCC 15.249

Universal Electronics, Inc.
TIVO S5 MSO NETFLIX 2016
Model: URC-7021BC0-XXXX-R

Date: 08/03/2016
Lab: D
Tested By: Kyle Fujimoto

**High Channel
X-Axis**

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Table Angle (deg)	Ant. Height (cm)	Comments
2475	98.26	H	113.97	-15.71	Peak	130.75	126.71	
2475	78.26	H	93.97	-15.71	Avg	130.75	126.71	
4950	59.45	H	73.97	-14.52	Peak	8.50	207.55	
4950	39.45	H	53.97	-14.52	Avg	8.50	207.55	
7425	48.36	H	73.97	-25.61	Peak	214.00	111.37	
7425	28.36	H	53.97	-25.61	Avg	214.00	111.37	
9900								No Emission
9900								Detected
12375								No Emission
12375								Detected
14850								No Emission
14850								Detected
17325								No Emission
17325								Detected
19800								No Emission
19800								Detected
22275								No Emission
22275								Detected
24750								No Emission
24750								Detected

FCC 15.249

Universal Electronics, Inc.
TIVO S5 MSO NETFLIX 2016
Model: URC-7021BC0-XXXX-R

Date: 08/03/2016
Lab: D
Tested By: Kyle Fujimoto

**High Channel
Y-Axis**

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Table Angle (deg)	Ant. Height (cm)	Comments
2475	94.70	V	113.97	-19.27	Peak	50.00	110.83	
2475	74.70	V	93.97	-19.27	Avg	50.00	110.83	
4950	59.42	V	73.97	-14.55	Peak	303.50	207.49	
4950	39.42	V	53.97	-14.55	Avg	303.50	207.49	
7425	50.16	V	73.97	-23.81	Peak	226.25	223.55	
7425	30.16	V	53.97	-23.81	Avg	226.25	233.55	
9900								No Emission
9900								Detected
12375								No Emission
12375								Detected
14850								No Emission
14850								Detected
17325								No Emission
17325								Detected
19800								No Emission
19800								Detected
22275								No Emission
22275								Detected
24750								No Emission
24750								Detected

FCC 15.249

Universal Electronics, Inc.
TIVO S5 MSO NETFLIX 2016
Model: URC-7021BC0-XXXX-R

Date: 08/03/2016
Lab: D
Tested By: Kyle Fujimoto

**High Channel
Y-Axis**

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Table Angle (deg)	Ant. Height (cm)	Comments
2475	91.81	H	113.97	-22.16	Peak	134.00	126.77	
2475	71.81	H	93.97	-22.16	Avg	134.00	126.77	
4950	58.25	H	73.97	-15.72	Peak	85.50	127.19	
4950	38.25	H	53.97	-15.72	Avg	85.50	127.19	
7425	52.73	H	73.97	-21.24	Peak	180.75	207.61	
7425	32.73	H	53.97	-21.24	Avg	180.75	207.61	
9900								No Emission
9900								Detected
12375								No Emission
12375								Detected
14850								No Emission
14850								Detected
17325								No Emission
17325								Detected
19800								No Emission
19800								Detected
22275								No Emission
22275								Detected
24750								No Emission
24750								Detected

FCC 15.249

Universal Electronics, Inc.
TIVO S5 MSO NETFLIX 2016
Model: URC-7021BC0-XXXX-R

Date: 08/03/2016
Lab: D
Tested By: Kyle Fujimoto

High Channel
Z-Axis

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Table Angle (deg)	Ant. Height (cm)	Comments
2475	92.79	V	113.97	-21.18	Peak	155.50	206.83	
2475	72.79	V	93.97	-21.18	Avg	155.50	206.83	
4950	58.95	V	73.97	-15.02	Peak	60.00	123.47	
4950	38.95	V	53.97	-15.02	Avg	60.00	123.47	
7425	54.16	V	73.97	-19.81	Peak	287.25	111.13	
7425	34.16	V	53.97	-19.81	Avg	287.25	111.13	
9900								No Emission
9900								Detected
12375								No Emission
12375								Detected
14850								No Emission
14850								Detected
17325								No Emission
17325								Detected
19800								No Emission
19800								Detected
22275								No Emission
22275								Detected
24750								No Emission
24750								Detected

FCC 15.249

Universal Electronics, Inc.
TIVO S5 MSO NETFLIX 2016
Model: URC-7021BC0-XXXX-R

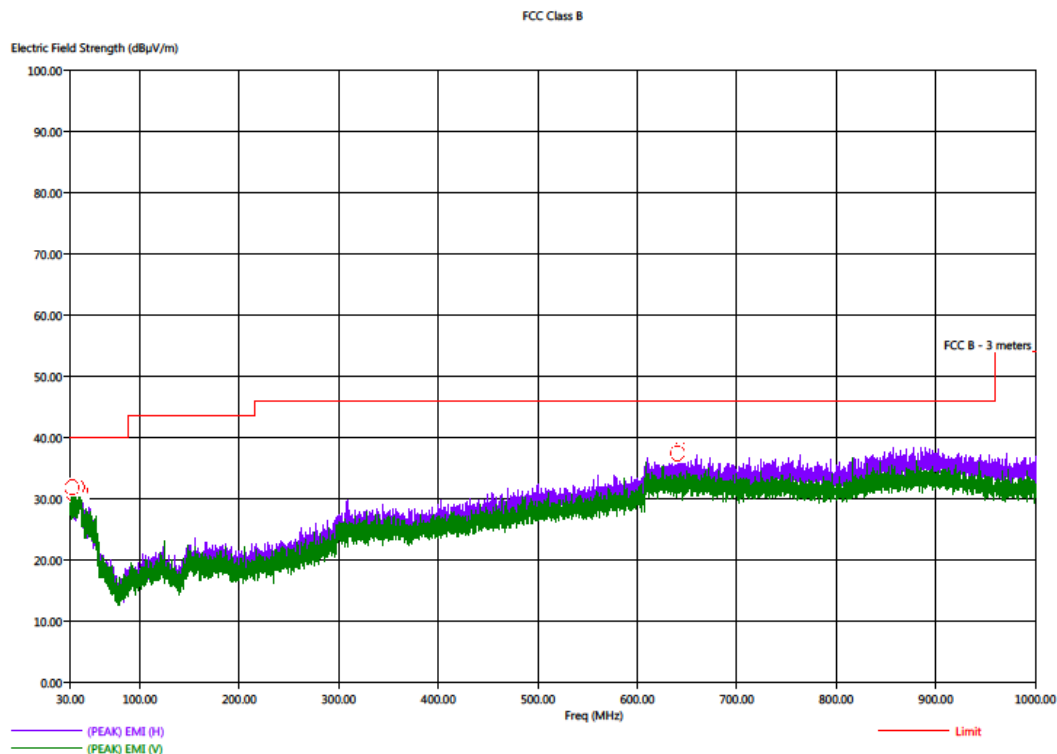
Date: 08/03/2016
Lab: D
Tested By: Kyle Fujimoto

High Channel
Z-Axis

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Table Angle (deg)	Ant. Height (cm)	Comments
2475	91.75	H	113.97	-22.22	Peak	0.00	110.89	
2475	71.75	H	93.97	-22.22	Avg	0.00	110.89	
4950	57.89	H	73.97	-16.08	Peak	203.25	223.43	
4950	37.89	H	53.97	-16.08	Avg	203.25	223.43	
7425	51.29	H	73.97	-22.68	Peak	51.75	249.94	
7425	31.29	H	53.97	-22.68	Avg	51.75	249.94	
9900								No Emission
9900								Detected
12375								No Emission
12375								Detected
14850								No Emission
14850								Detected
17325								No Emission
17325								Detected
19800								No Emission
19800								Detected
22275								No Emission
22275								Detected
24750								No Emission
24750								Detected

Title: Pre-Scan - FCC Class B
 File: Aqilent - Pre-Scan - FCC Class B - Z-Axis - 30 MHz to 1000 MHz.set
 Operator: Kyle Fujimoto
 EUT Type: Tivo S5 MSO Netflix 2016
 EUT Condition: The EUT is continuously transmitting - Z-Axis
 Comments: Company: Universal Electronics, Inc.
 Model: URC-7021BC0-XXXX-R

8/5/2016 8:3645 AM
 Sequence: Preliminary Scan



Note #1: Z-Axis is the Worst Case

Note #2: No additional spurious emissions were found between 10 kHz – 30 MHz and 1 GHz – 25 GHz

Title: Radiated Final - 30-1000 MHz - FCC Class B
 File: Aqilent - Final Scan - FCC Class B - Z-Axis - 30 MHz to 1000 MHz.set
 Operator: Kyle Fujimoto
 EUT Type: Tivo S5 MSO Netflix 2016
 EUT Condition: The EUT is continuously transmitting - Z-Axis
 Comments: Customer: Universal Electronics, Inc.
 Model: URC-7021BC0-XXXX-R

8/5/2016 8:48:12 AM
 Sequence: Final Measurements

FCC Class B

Freq (MHz)	Pol	(PEAK) EMI (dBµV/m)	(OPI) EMI (dBµV/m)	(PEAK) Margin (dB)	(OPI) Margin (dB)	Limit (dBµV/m)	Transducer (dB)	Cable (dB)
38.10	V	32.38	27.66	-7.62	-12.34	40.00	24.97	0.42
39.30	H	33.39	27.91	-6.61	-12.09	40.00	25.20	0.42
849.80	H	38.41	32.99	-7.59	-13.01	46.00	26.29	2.52
888.20	H	38.17	33.43	-7.83	-12.57	46.00	26.76	2.61
896.70	H	39.40	33.50	-6.60	-12.50	46.00	26.86	2.63
909.50	H	38.77	33.23	-7.23	-12.77	46.00	26.72	2.65

1

No additional spurious emissions were found between 10 kHz – 30 MHz and 1 GHz – 25 GHz

***BAND EDGES
DATA SHEETS***

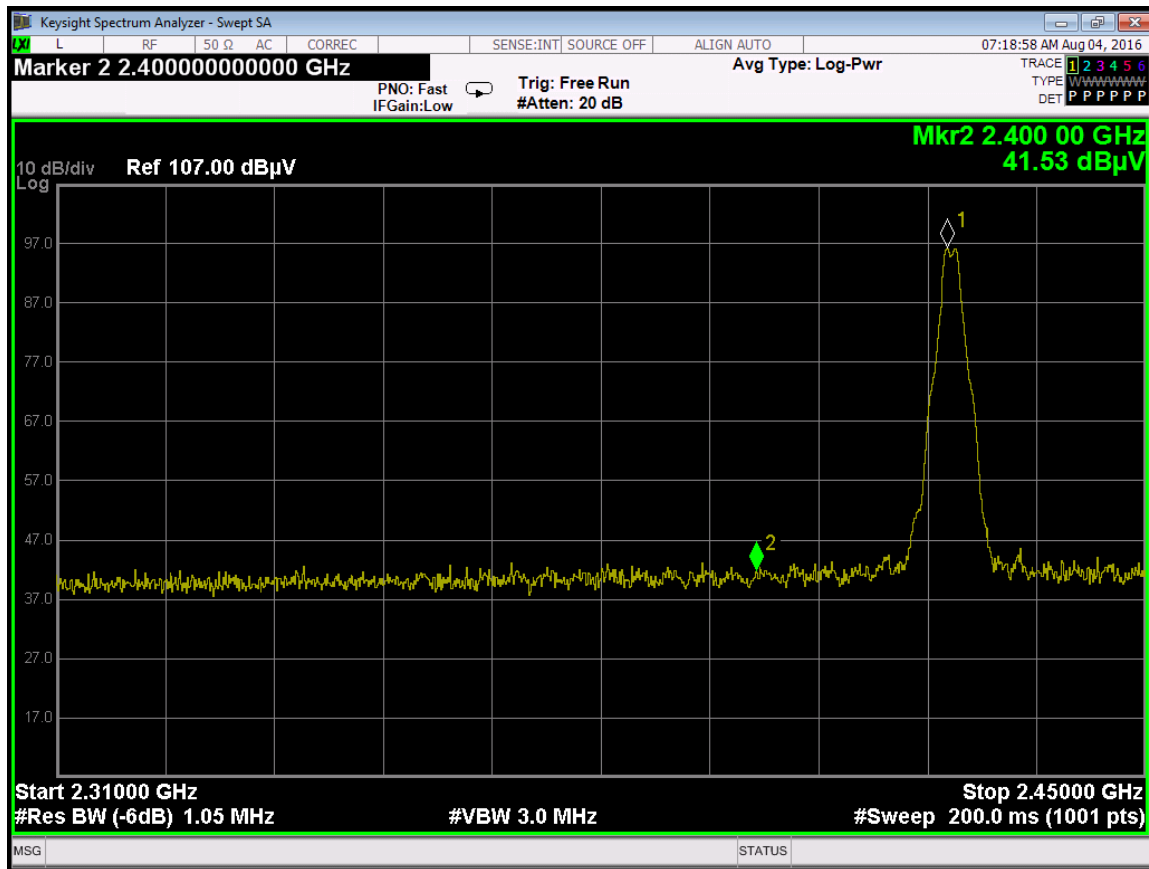
FCC 15.249

Universal Electronics, Inc.
TIVO S5 MSO NETFLIX 2016
Model: URC-7021BC0-XXXX-R

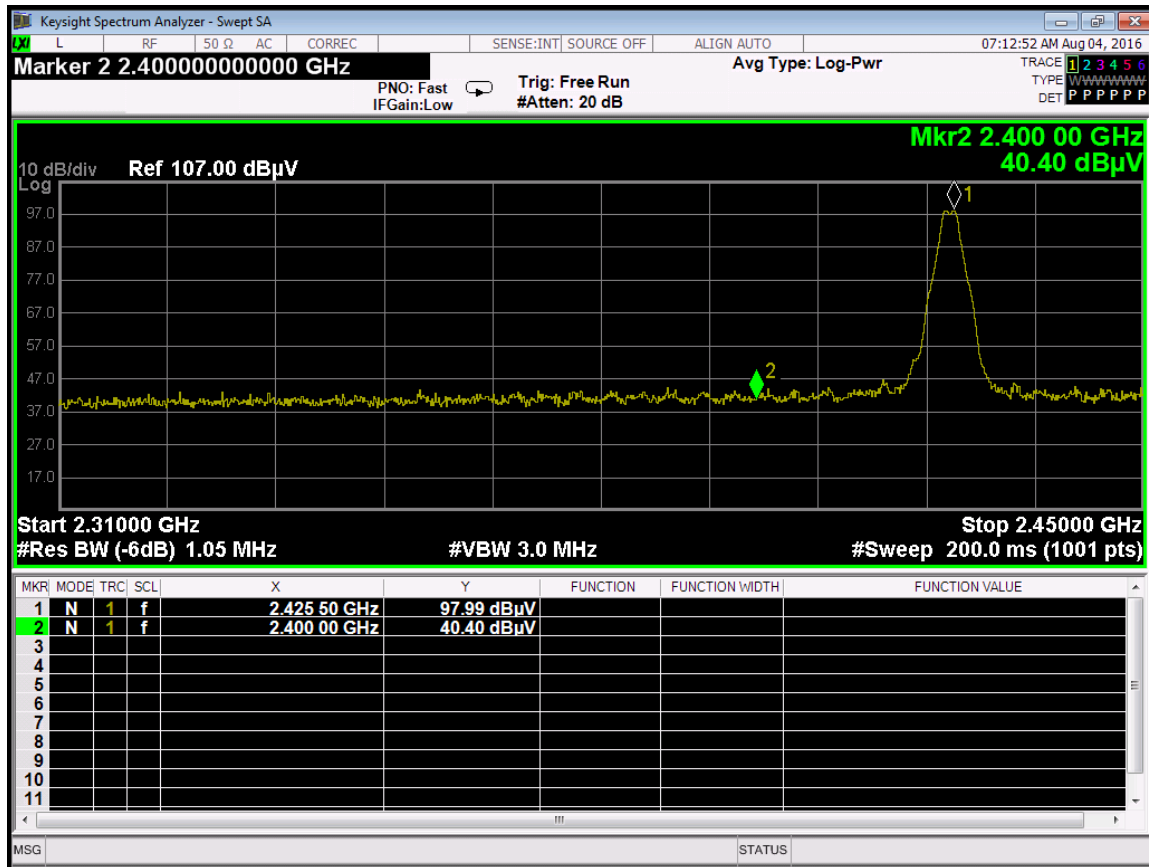
Date: 08/03/2016
Lab: D
Tested By: Kyle Fujimoto

**Band Edges
Worst Case Axis**

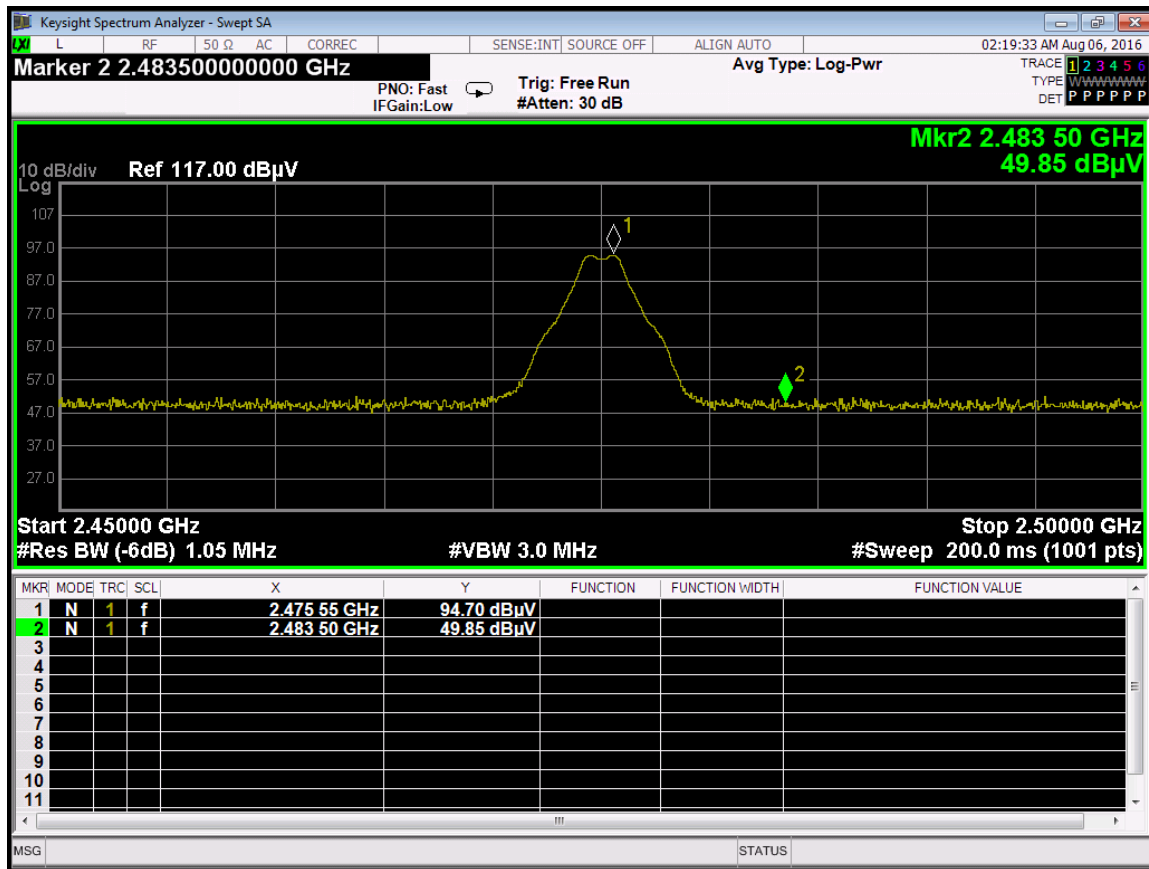
Freq. (MHz)	Level (dBuV)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Table Angle (deg)	Ant. Height (cm)	Comments
2425	96.07	V	113.97	-17.90	Peak	53.50	175.01	Fundamental
2425	76.07	V	93.97	-17.90	Avg	53.50	175.01	Low Channel - Y-Axis
2400	41.53	V	53.97	-12.44	Peak	53.50	175.01	Band Edge
								Low Channel - Y-Axis
2425	97.99	H	113.97	-15.98	Peak	109.75	175.37	Fundamental
2425	79.99	H	93.97	-13.98	Avg	109.75	175.37	Low Channel - X-Axis
2400	40.40	H	53.97	-13.57	Peak	109.75	175.37	Band Edge
								Low Channel - X-Axis
2483.5	94.70	V	113.97	-19.27	Peak	50.00	110.83	Fundamental
2483.5	74.70	V	93.97	-19.27	Avg	50.00	110.83	High Channel - Y-Axis
2475	49.85	V	53.97	-4.12	Peak	50.00	110.83	Band Edge
								High Channel - Y-Axis
2483.5	98.26	H	113.97	-15.71	Peak	130.75	126.71	Fundamental
2483.5	78.26	H	93.97	-15.71	Avg	130.75	126.71	High Channel - X-Axis
2475	49.20	H	53.97	-4.77	Peak	115.75	126.77	Band Edge
								High Channel - X-Axis



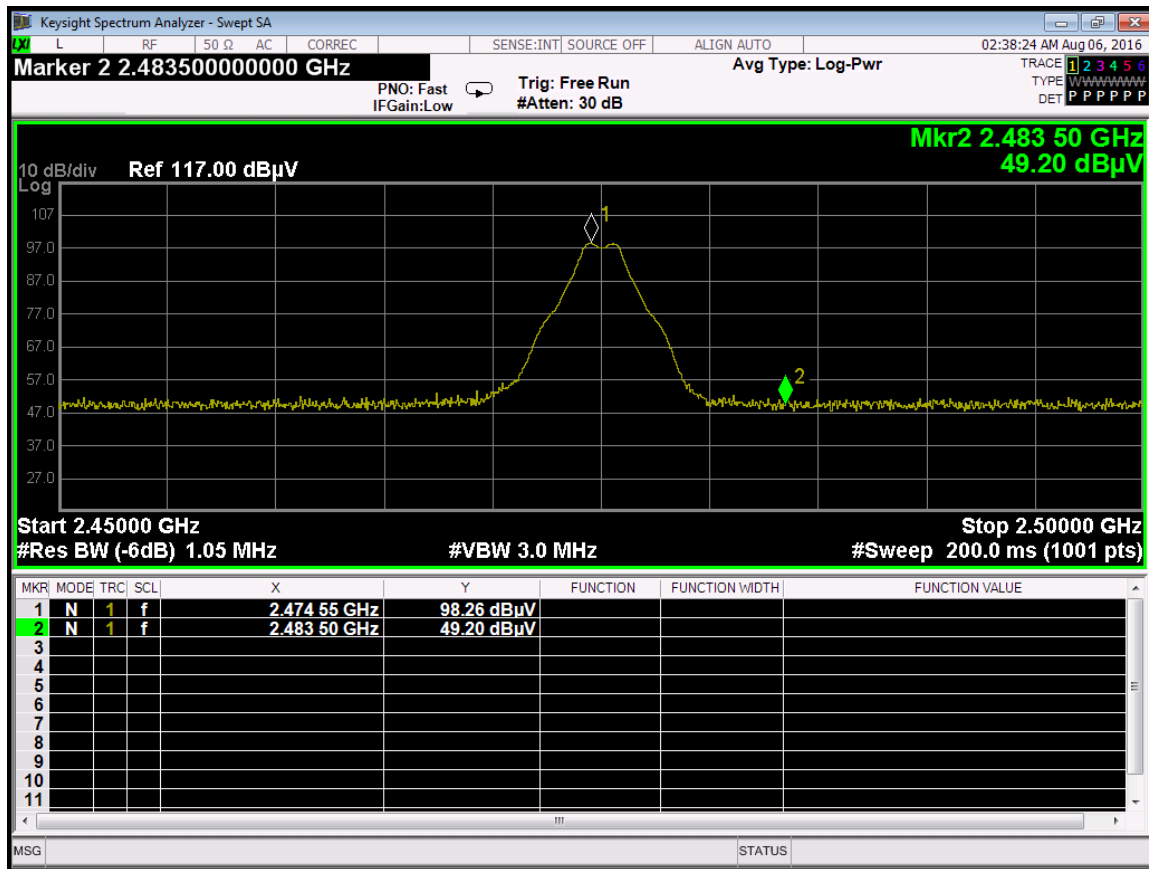
Band Edge – Low Channel – Vertical – Y-Axis



Band Edge – Low Channel – Horizontal – X-Axis

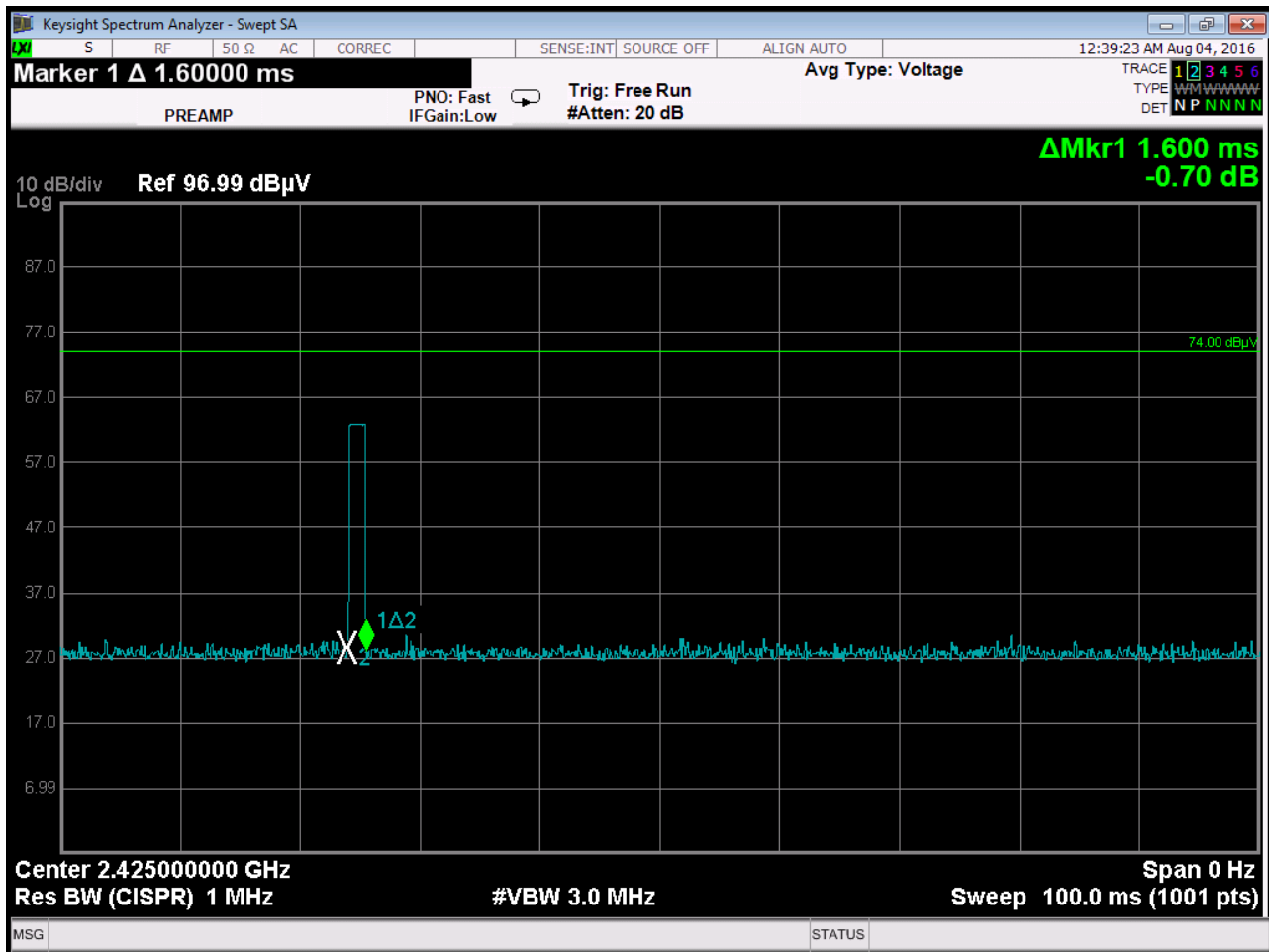


Band Edge – High Channel – Vertical – Y-Axis

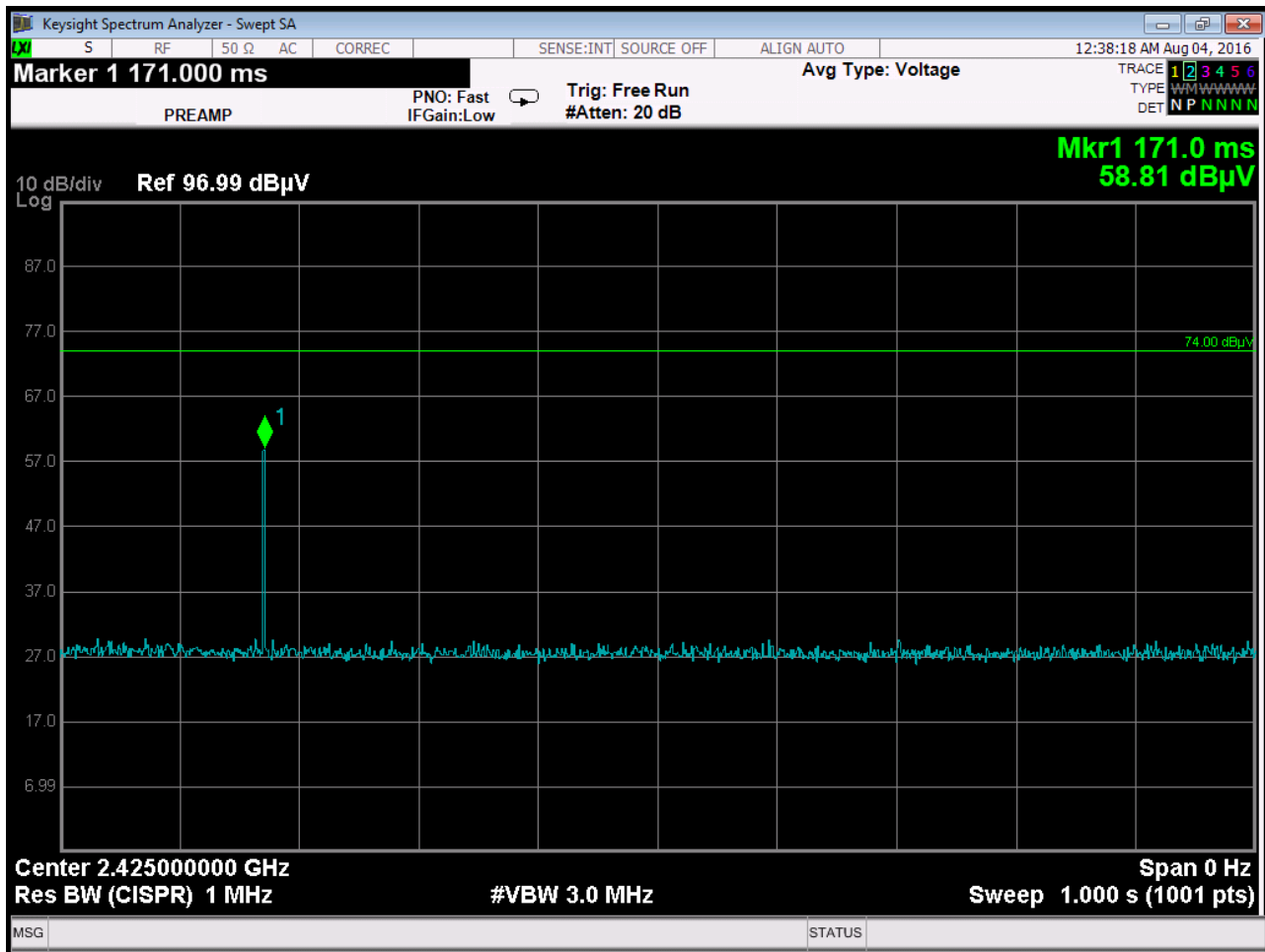


Band Edge – High Channel – Horizontal – X-Axis

***DUTY CYCLE
DATA SHEETS***



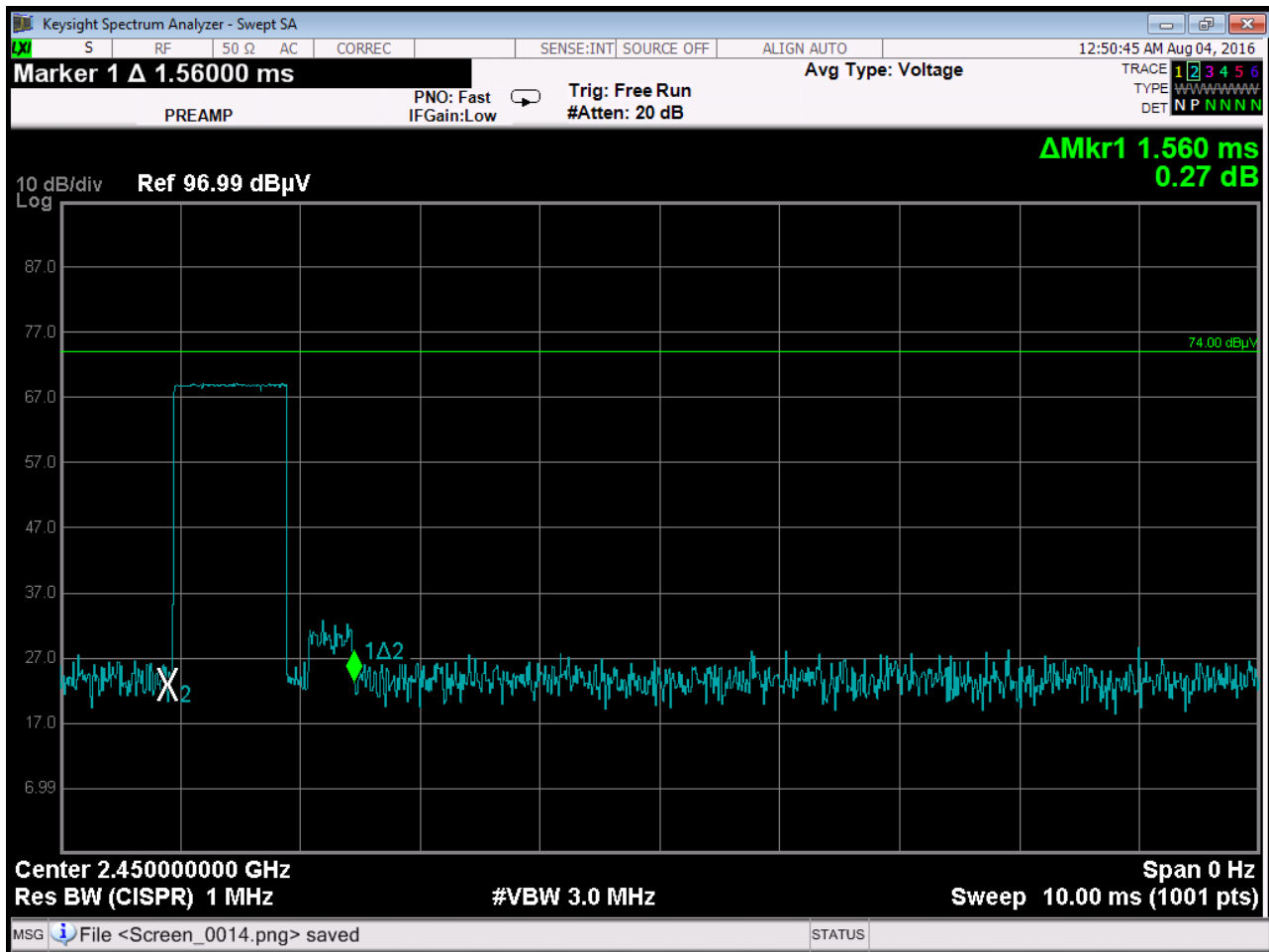
Time of One Pulse – 1.60 ms – Advertising Mode



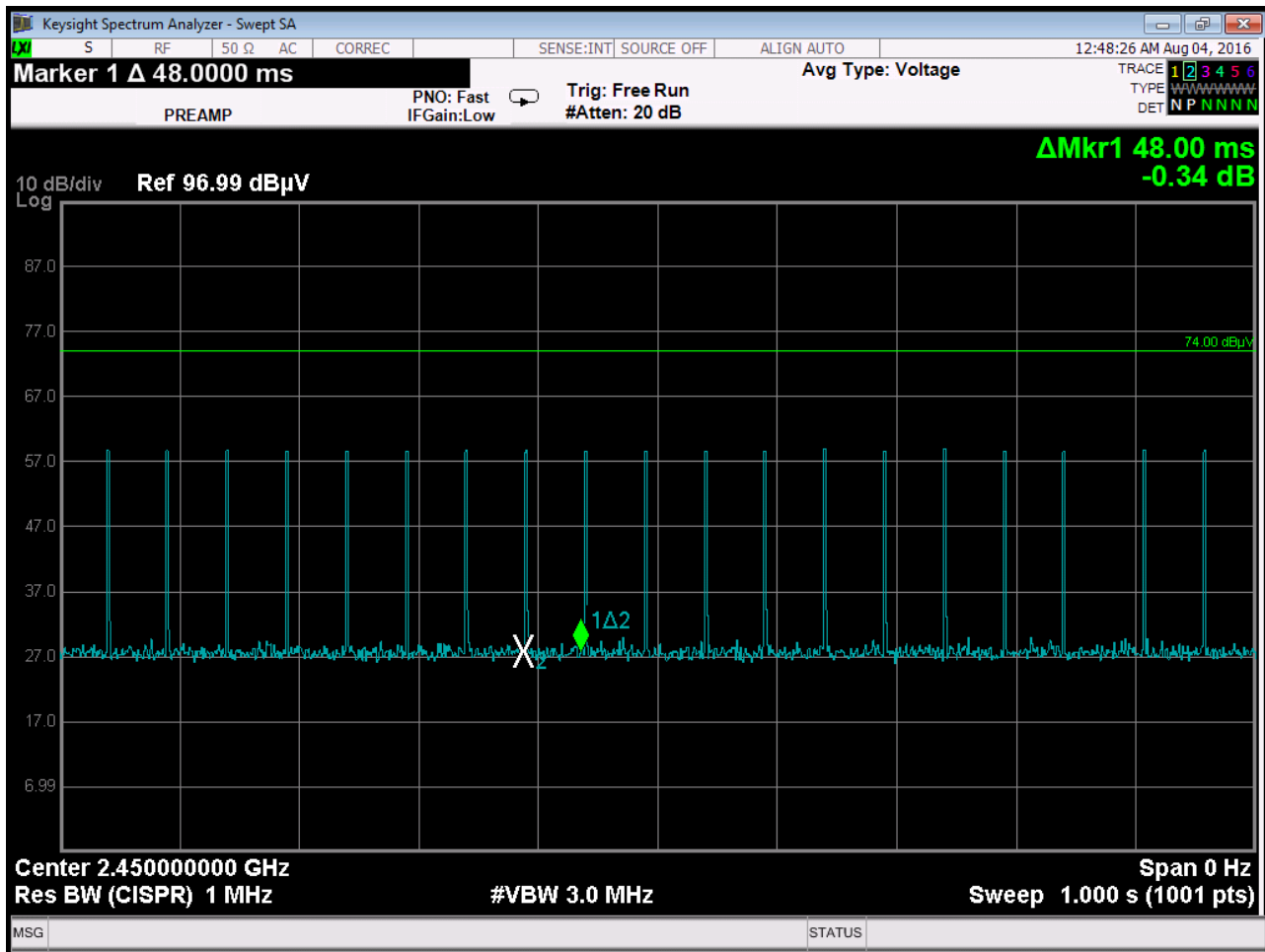
Worst Case 1 Pulse per 100 ms

Duty Cycle = (1.60 ms / 100 ms) = 1.60%

The maximum -20 dB Peak to Average Ratio
 can be utilized.



Time of One Pulse – 1.56 ms – Data Mode



Worst Case 48 ms between pulses

Duty Cycle = (1.56 ms / 48 ms) = 3.25%

The maximum -20 dB

Peak to Average Ratio can be utilized.