

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

for

CHARTER SPECTRUM RF4CE REMOTE 2018

Model: R31160BB0-00001

Prepared for

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DATE: JUNE 8, 2018

	REPORT BODY	APPENDICES					TOTAL
		A	B	C	D	E	
PAGES	17	2	2	2	12	40	75

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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: Charter Spectrum RF4CE Remote 2018
Model: R31160BB0-00001
S/N: N/A

Product Description: The EUT is a universal remote control that allows users to operate devices using radio frequency (RF) signals

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

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

Test Dates: May 3, 4, and 23, 2018

Test Specifications covered by accreditation:

CFR Title 47, Part 15, Subpart B; and Subpart C sections 15.205, 15.209, and 15.249



Test Procedures: ANSI C63.4: 2014 and ANSI C63.10: 2013

SUMMARY OF TEST RESULTS

TEST	DESCRIPTION	RESULTS
1	Spurious Radiated RF Emissions, 9 kHz –25000MHz	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 Highest reading in relation to spec limit 80.86 (Avg) dBuV/m @ 2475.00 MHz (*U = 3.67 dB)

1. PURPOSE

This document is a qualification test report based on the emissions tests performed on the Charter Spectrum RF4CE Remote 2018, Model: R31160BB0-00001. 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

Staff Engineer, Electrical

Compatible Electronics Inc.

Johnny Le

Test Technician

Kyle Fujimoto

Test Engineer

James Ross

Test Engineer

2.4 Date Test Sample was Received

The test sample was received prior to the date of this report.

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
ASK	Amplitude Shift Key
ITE	Information Technology Equipment
DoC	Declaration of Conformity
N/A	Not Applicable
Tx	Transmit
Rx	Receive
Inc.	Incorporated
IR	Infrared

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 25 GHz
ANSI C63.10: 2013	American National Standard of procedure for compliance testing of unlicensed wireless devices

4. DESCRIPTION OF TEST CONFIGURATION

4.1 Description of Test Configuration – Emissions

The Charter Spectrum RF4CE Remote 2018, Model: R31160BB0-00001 (EUT) was setup in a stand-alone configuration. The EUT was investigated in all three orthogonal axis (X, Y, & Z) at its low, middle, and high channels (2425 MHz, 2450 MHz, and 2475 MHz), respectively. During the testing, the EUT was continuously transmitting. Finally, the EUT was tested from 9 kHz to 25 GHz.

Fresh batteries were installed inside the EUT prior to the testing. The EUT was programmed via the Radio Control Console v4.0.3 firmware.

The firmware is stored in one of the network drives in the company's server.

The final radiated emissions data for the EUT was taken in the X-axis (worse case). Please see Appendix E for the data sheets.

4.1.1 Cable Construction and Termination

The EUT had no external cables.

5. LISTS OF EUT, ACCESSORIES AND TEST EQUIPMENT

5.1 EUT and Accessory List

EQUIPMENT	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	FCC ID
CHARTER SPECTRUM RF4CE REMOTE 2018 (EUT)	UNIVERSAL ELECTRONICS, INC.	R31160BB0-00001	N/A	MG3-R31160B
LAPTOP*	HEWLETT PACKARD	HSTNN-C82C	N/A	N/A
AC ADAPTER FOR LAPTOP*	HEWLETT PACKARD	HSTNN-DA40	N/A	DoC
PROGRAM BOARD*	UNIVERSAL ELECTRONICS, INC.	RMF-TX300C	N/A	N/A
FIRMWARE*	UNIVERSAL ELECTRONICS, INC.	RADIO CONTROL CONSOLE	v4.0.3	N/A

*Used to program the EUT only and was removed prior to the testing

5.2 Emissions Test Equipment

EQUIPMENT TYPE	MANU-FACTURER	MODEL NUMBER	SERIAL NUMBER	CAL. DATE	CAL. CYCLE
RF RADIATED AND CONDUCTED EMISSIONS TEST EQUIPMENT					
TDK TestLab	TDK RF Solutions, Inc.	9.22	700145	N/A	N/A
EMI Receiver	Rohde & Schwarz	ESIB40	100194	September 26, 2017	1 Year
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
Loop Antenna	Com-Power	AL-130R	121090	February 9, 2017	2 Year
CombiLog Antenna	Com-Power	AC-220	61060	July 27, 2017	1 Year
Horn Antenna	Com-Power	AH-118	071175	February 22, 2018	2 Year
Horn Antenna	Com-Power	AH-826	71957	N/A	N/A
Preamplifier	Com-Power	PAM-118A	551024	May 10, 2018	1 Year
Preamplifier	Com-Power	PA-840	711013	May 10, 2018	1 Year
Computer	Hewlett Packard	p6716f	MXX1030PX0	N/A	N/A
LCD Monitor	Hewlett Packard	52031a	3CQ046N3MG	N/A	N/A

6. TEST SITE DESCRIPTION

6.1 Test Facility Description

Please refer to section 2.1 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. Preamplifiers were 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. The effective measurement bandwidth used for the radiated emissions test was according to the frequency measured.

The frequencies below 1 GHz were quasi-peaked using the quasi-peak detector of the EMI Receiver.

The frequencies for the fundamental, high channel band edge, and harmonics above 1 GHz were averaged using a duty cycle correction factor.

All the other frequencies above 1 GHz were averaged using the average detector of the EMI Receiver.

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.

The EUT was tested at a 3-meter test distance. The six highest emissions are listed in Table 1.0.

Radiated Emissions Test (Continued)

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

Test Results:

The EUT complies with the **Class B** limits of **CFR** Title 47, Part 15, Subpart B; and Subpart C sections 15.205, 15.209 and 15.249 for radiated emissions.

7.1.2 RF Emissions Test ResultsTable 1.0 RADIATED EMISSION RESULTS
Charter Spectrum RF4CE Remote 2018
Model: R31160BB0-00001

Frequency (MHz)	Average EMI Reading (dBuV/m)	Average Specification Limit (dBuV/m)	Delta (Cor. Reading – Spec. Limit) (dB)
2475.00 (H) (Z-Axis)	80.86	93.97	-13.11
9800.00 (V) (X-Axis)	40.55	53.97	-13.42
2475.00 (H) (X-Axis)	84.51	93.97	-13.51
2450.00 (H) (Z-Axis)	80.39	93.97	-13.58
2450.00 (H) (X-Axis)	80.28	93.97	-13.70
9700.00 (V) (Z-Axis)	39.95	53.97	-14.02

Notes:

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

7.1.3 Duty Cycle Calculation

The fundamental and harmonics were measured at a 3-meter test distance. The EMI Receiver was used to obtain the final test data. The final qualification data sheets are located in Appendix E.

Where

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

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

The worst case was when the EUT was in advertising mode

Duty Cycle Correction Factor = -20.00 dB

Time of One Pulse = 2.1 ms

Total On Time = 418 ms

The time between pulses is 31.87 ms

Duty Cycle = 2.1 ms / 418 ms = 0.502%

The duty cycle is less than 10%, so the maximum Peak to Average ratio of -20 dB can be utilized.

8. CONCLUSIONS

The Charter Spectrum RF4CE Remote 2018, Model: R31160BB0-00001, 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

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Newbury Park, CA 91320
(805) 480-4044

Lake Forest Division
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Lake Forest, CA 92630
(949) 587-0400

LABORATORY ACCREDITATIONS AND RECOGNITIONS



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."



APPENDIX B

MODIFICATIONS TO THE EUT

MODIFICATIONS TO THE EUT

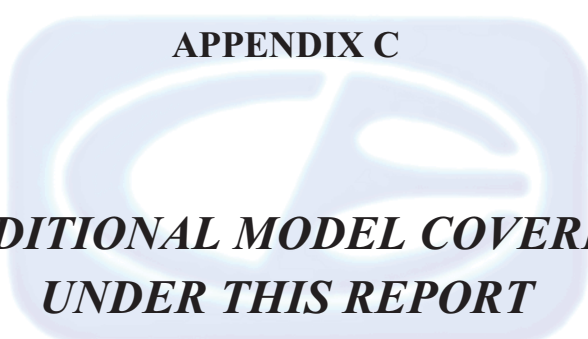
The modifications listed below were made to the EUT to pass FCC Subpart B and FCC 15.249 specifications.

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 MODEL COVERED
UNDER THIS REPORT***

ADDITIONAL MODEL COVERED UNDER THIS REPORT

USED FOR THE PRIMARY TEST

Charter Spectrum RF4CE Remote 2018
Model: R31160BB0-00001
S/N: N/A

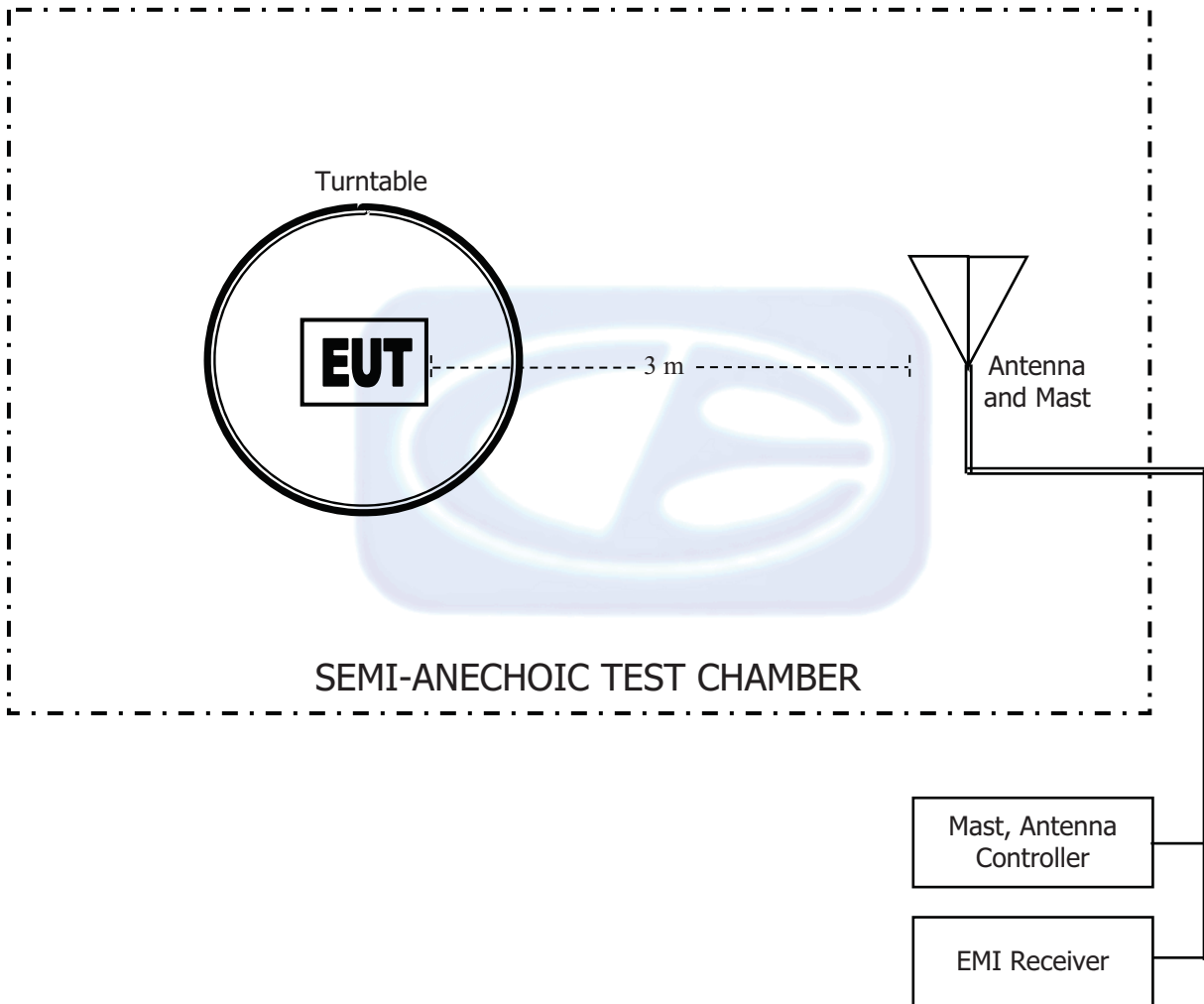
There are no additional models covered under this report.



APPENDIX D

DIAGRAMS AND CHARTS

***FIGURE 1: LAYOUT OF THE SEMI -ANECHOIC
TEST CHAMBER***



COM-POWER AL-130R**LOOP ANTENNA****S/N: 121090****CALIBRATION DATE: FEBRUARY 9, 2017**

FREQUENCY (MHz)	MAGNETIC (dB/m)	ELECTRIC (dB/m)
0.009	-36.17	15.33
0.01	-35.86	15.64
0.02	-37.30	14.20
0.03	-36.58	14.92
0.04	-36.99	14.51
0.05	-37.66	13.84
0.06	-37.53	13.97
0.07	-37.64	13.86
0.08	-37.52	13.98
0.09	-37.62	13.88
0.1	-37.59	13.91
0.2	-37.79	13.71
0.3	-37.80	13.70
0.4	-37.70	13.80
0.5	-37.79	13.71
0.6	-37.79	13.71
0.7	-37.69	13.81
0.8	-37.49	14.01
0.9	-37.39	14.11
1	-37.39	14.11
2	-37.09	14.41
3	-37.09	14.41
4	-37.19	14.31
5	-36.98	14.52
6	-37.17	14.33
7	-37.05	14.45
8	-36.85	14.65
9	-36.84	14.66
10	-36.75	14.75
15	-37.16	14.34
20	-36.44	15.06
25	-37.88	13.62
30	-39.14	12.36

COM-POWER AC-220**COMBILOG ANTENNA****S/N: 61060****CALIBRATION DATE: JULY 27, 2017**

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
30	23.80	200	14.10
35	24.00	250	15.30
40	24.70	300	17.70
45	22.90	350	17.70
50	22.10	400	19.00
60	17.60	450	21.30
70	12.70	500	21.00
80	11.20	550	22.30
90	13.10	600	23.40
100	14.40	650	22.90
120	15.30	700	24.60
125	15.00	750	24.50
140	12.80	800	25.40
150	16.50	850	26.40
160	12.90	900	27.20
175	14.30	950	27.80
180	14.50	1000	26.80

COM POWER AH-118**HORN ANTENNA****S/N: 071175****CALIBRATION DATE: FEBRUARY 22, 2018**

FREQUENCY (GHz)	FACTOR (dB)	FREQUENCY (GHz)	FACTOR (dB)
1.0	23.71	10.0	40.08
1.5	25.46	10.5	40.75
2.0	29.26	11.0	41.78
2.5	27.95	11.5	41.02
3.0	29.03	12.0	40.32
3.5	29.70	12.5	40.96
4.0	30.71	13.0	40.29
4.5	31.62	13.5	39.48
5.0	33.23	14.0	39.89
5.5	35.07	14.5	42.75
6.0	34.43	15.0	40.98
6.5	34.98	15.5	38.54
7.0	36.75	16.0	39.40
7.5	37.10	16.5	39.40
8.0	37.66	17.0	41.74
8.5	39.29	17.5	42.58
9.0	37.75	18.0	44.68
9.5	38.23		

COM-POWER PAM-118A**PREAMPLIFIER****S/N: 551024****CALIBRATION DATE: MAY 10, 2018**

FREQUENCY (GHz)	FACTOR (dB)	FREQUENCY (GHz)	FACTOR (dB)
1.0	40.99	6.0	39.01
1.1	39.77	6.5	39.00
1.2	39.02	7.0	39.69
1.3	39.44	7.5	38.96
1.4	39.64	8.0	38.57
1.5	40.23	8.5	39.17
1.6	40.17	9.0	38.82
1.7	40.23	9.5	39.30
1.8	39.48	10.0	38.90
1.9	39.85	11.0	38.86
2.0	39.99	12.0	39.87
2.5	40.38	13.0	39.55
3.0	40.64	14.0	38.92
3.5	40.68	15.0	39.33
4.0	40.87	16.0	39.60
4.5	40.04	17.0	40.28
5.0	39.54	18.0	39.58
5.5	39.58		

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 10, 2018**

FREQUENCY (GHz)	FACTOR (dB)	FREQUENCY (GHz)	FACTOR (dB)
18.0	26.90	31.0	24.56
19.0	24.65	31.5	25.84
20.0	25.74	32.0	26.93
21.0	24.78	32.5	27.76
22.0	24.83	33.0	25.76
23.0	24.81	33.5	26.76
24.0	25.52	34.0	26.51
25.0	24.90	34.5	27.49
26.0	25.92	35.0	27.64
26.5	26.53	35.5	27.45
27.0	26.41	36.0	25.08
27.5	24.78	36.5	25.61
28.0	25.13	37.0	24.69
28.5	29.29	37.5	24.10
29.0	28.44	38.0	24.83
29.5	27.51	38.5	24.41
30.0	27.12	39.0	24.44
30.5	26.42	39.5	22.96
		40.0	22.29



FRONT VIEW

UNIVERSAL ELECTRONICS, INC.
CHARTER SPECTRUM RF4CE REMOTE 2018
MODEL: R31160BB0-00001
FCC SUBPART B AND C – RADIATED EMISSIONS – BELOW 1 GHz

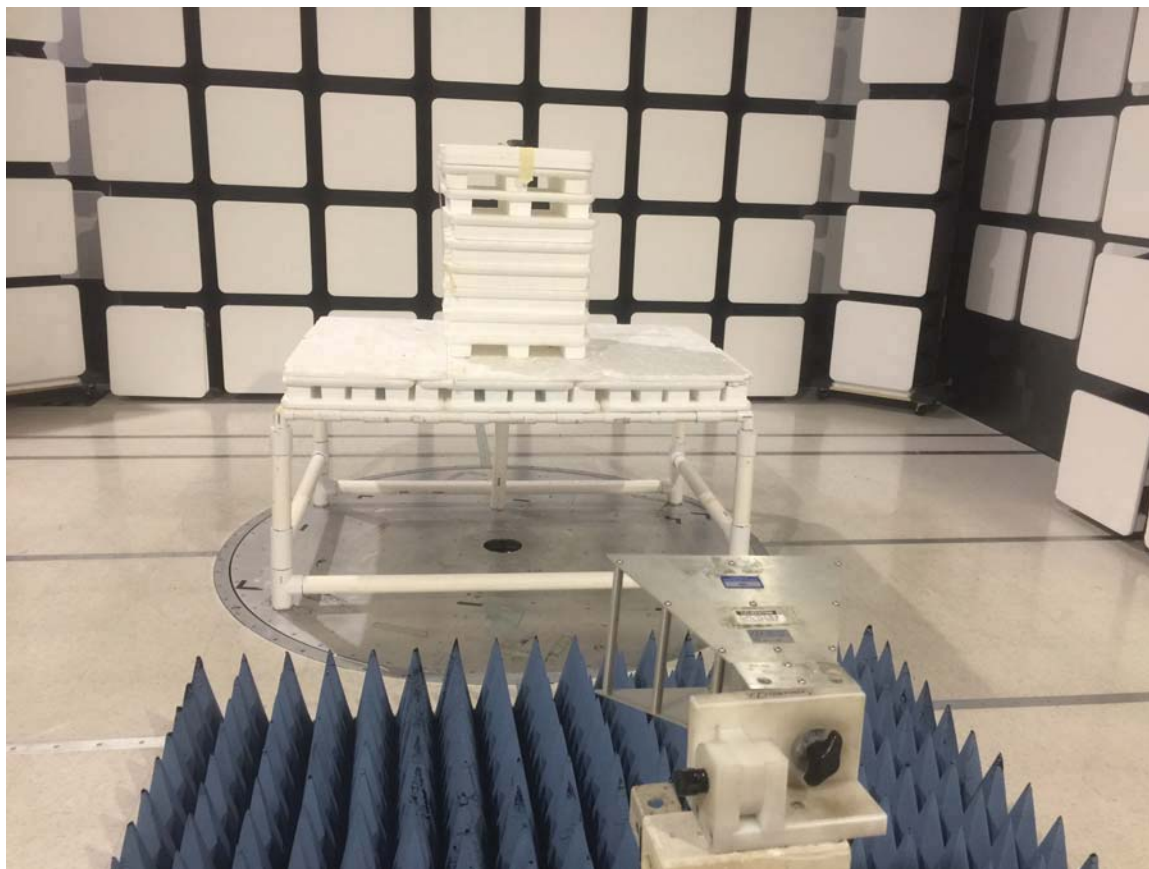
**PHOTOGRAPH SHOWING THE EUT CONFIGURATION
FOR MAXIMUM EMISSIONS**



REAR VIEW

UNIVERSAL ELECTRONICS, INC.
CHARTER SPECTRUM RF4CE REMOTE 2018
MODEL: R31160BB0-00001
FCC SUBPART B AND C – RADIATED EMISSIONS – BELOW 1 GHz

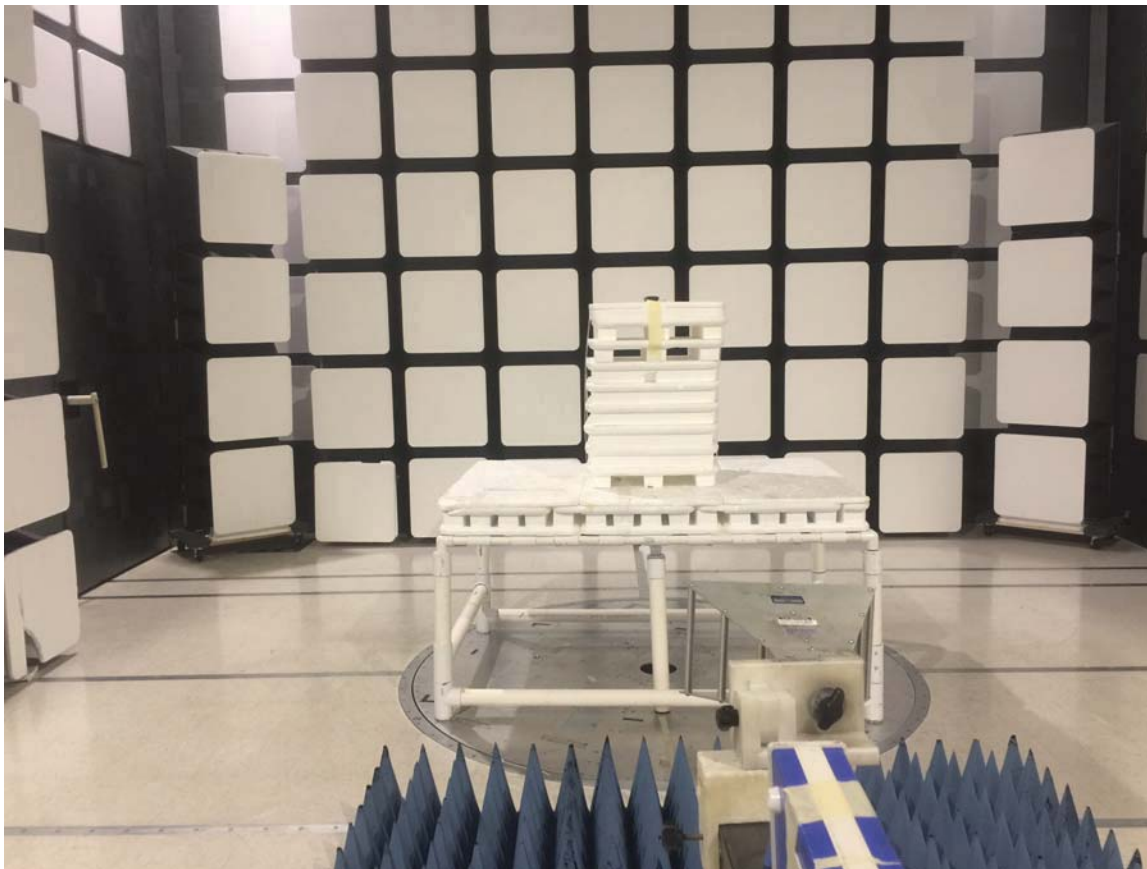
**PHOTOGRAPH SHOWING THE EUT CONFIGURATION
FOR MAXIMUM EMISSIONS**



FRONT VIEW

UNIVERSAL ELECTRONICS, INC.
CHARTER SPECTRUM RF4CE REMOTE 2018
MODEL: R31160BB0-00001
FCC SUBPART B AND C – RADIATED EMISSIONS – ABOVE 1 GHz

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



REAR VIEW

UNIVERSAL ELECTRONICS, INC.
CHARTER SPECTRUM RF4CE REMOTE 2018
MODEL: R31160BB0-00001
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***

Title: Pre-Scan - FCC Class B
File: Rohde & Schwarz X axis - Pre-Scan worse case - FCC Class B - 30 MHz to 1000 MHz.set
Operator: Tom Szydal
EUT Type: Charter Spectrum RF4CE Remote Control
EUT Condition: The EUT was set to continuously transmit during the test
Comments: Universal Electronics, Inc.
Charter Spectrum RF4CE Remote 2018
Model: R31160BB0-00001
X axis worse case

5/23/2018 10:21:57 AM
Sequence: Preliminary Scan



Title: Radiated Final - FCC Class B
File: Rohde & Schwarz axis - Final-Scan worse case - FCC Class B - 30 MHz to 1000 MHz.set
Operator: Tom Szydal
EUT Type: Charter Spectrum RF4CE Remote Control
EUT Condition: The EUT was set to continuously transmit during the test
Comments: Universal Electronics, Inc.
Charter Spectrum RF4CE Remote 2018
Model: R31160BB0-00001
X axis - worse case

5/23/2018 1:47:05 PM
Sequence: Final Measurements

FCC Class B

Freq (MHz)	Pol	(PEAK) EMI (dB μ V/m)	(QP) EMI (dB μ V/m)	(PEAK) Margin (dB)	(QP) Margin (dB)	Limit (dB μ V/m)	Transducer (dB)	Cable (dB)	Ttbl Aql (deg)	Twr Ht (cm)
34.20	H	28.14	22.17	-11.86	-17.83	40.00	23.97	0.85	117.25	340.34
122.70	H	20.06	14.89	-23.44	-28.61	43.50	15.13	1.19	266.25	127.62
150.40	H	21.47	16.51	-22.03	-26.99	43.50	16.32	1.30	179.50	307.92
174.60	H	19.46	14.43	-24.04	-29.07	43.50	14.24	1.30	155.00	160.22
820.50	H	33.02	27.91	-12.98	-18.09	46.00	25.81	2.80	207.25	127.62
952.70	H	35.67	30.14	-10.33	-15.86	46.00	27.75	3.10	216.25	111.32



FCC 15.249

Universal Electronics, Inc.
Charter Spectrum RF4CE Remote 2018
Model: R31160BB0-00001

Date: 05/03/2018
Lab: D
Tested By: Johnny Le

Harmonics - Low Channel
Transmit Mode - X-Axis

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Table Angle (deg)	Ant. Height (cm)	Comments
4850.00	51.07	V	73.97	-22.90	Peak	347.75	100.00	
4850.00	31.07	V	53.97	-22.90	Avg	347.75	100.00	
7275.00	50.29	V	73.97	-23.68	Peak	149.50	100.00	
7275.00	30.29	V	53.97	-23.68	Avg	149.50	100.00	
9700.00	59.16	V	73.97	-14.81	Peak	154.25	100.00	
9700.00	39.16	V	53.97	-14.81	Avg	154.25	100.00	
12125.00								No Emission
12125.00								Detected
14550.00								No Emission
14550.00								Detected
16975.00								No Emission
16975.00								Detected
19400.00								No Emission
19400.00								Detected
21825.00								No Emission
21825.00								Detected
24250.00								No Emission
24250.00								Detected

FCC 15.249

Universal Electronics, Inc.
 Charter Spectrum RF4CE Remote 2018
 Model: R31160BB0-00001

Date: 05/03/2018
 Lab: D
 Tested By: Johnny Le

Harmonics - Low Channel
Transmit Mode - Y-Axis

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Table Angle (deg)	Ant. Height (cm)	Comments
4850.00	53.55	V	73.97	-20.42	Peak	173.00	137.29	
4850.00	33.55	V	53.97	-20.42	Avg	173.00	137.29	
7275.00	55.19	V	73.97	-18.78	Peak	329.00	217.71	
7275.00	35.19	V	53.97	-18.78	Avg	329.00	217.71	
9700.00	57.46	V	73.97	-16.51	Peak	321.25	100.00	
9700.00	37.46	V	53.97	-16.51	Avg	321.25	100.00	
12125.00								No Emission
12125.00								Detected
14550.00								No Emission
14550.00								Detected
16975.00								No Emission
16975.00								Detected
19400.00								No Emission
19400.00								Detected
21825.00								No Emission
21825.00								Detected
24250.00								No Emission
24250.00								Detected

FCC 15.249

Universal Electronics, Inc.
Charter Spectrum RF4CE Remote 2018
Model: R31160BB0-00001

Date: 05/03/2018
Lab: D
Tested By: Johnny Le

**Harmonics - Low Channel
Transmit Mode - Z-Axis**

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Table Angle (deg)	Ant. Height (cm)	Comments
4850.00	54.90	V	73.97	-19.07	Peak	274.75	154.91	
4850.00	34.90	V	53.97	-19.07	Avg	274.75	154.91	
7275.00	50.58	V	73.97	-23.39	Peak	76.00	100.00	
7275.00	30.58	V	53.97	-23.39	Avg	76.00	100.00	
9700.00	59.95	V	73.97	-14.02	Peak	156.50	100.00	
9700.00	39.95	V	53.97	-14.02	Avg	156.50	100.00	
12125.00								No Emission
12125.00								Detected
14550.00								No Emission
14550.00								Detected
16975.00								No Emission
16975.00								Detected
19400.00								No Emission
19400.00								Detected
21825.00								No Emission
21825.00								Detected
24250.00								No Emission
24250.00								Detected

FCC 15.249

Universal Electronics, Inc.
Charter Spectrum RF4CE Remote 2018
Model: R31160BB0-00001

Date: 05/03/2018
Lab: D
Tested By: Johnny Le

Harmonics - Low Channel
Transmit Mode - X-Axis

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Table Angle (deg)	Ant. Height (cm)	Comments
4850.00	55.18	H	73.97	-18.79	Peak	119.00	159.98	
4850.00	35.18	H	53.97	-18.79	Avg	119.00	159.98	
7275.00	52.05	H	73.97	-21.92	Peak	97.50	130.31	
7275.00	32.05	H	53.97	-21.92	Avg	97.50	130.31	
9700.00	56.05	H	73.97	-17.92	Peak	79.75	109.00	
9700.00	36.05	H	53.97	-17.92	Avg	79.75	109.00	
12125.00								No Emission
12125.00								Detected
14550.00								No Emission
14550.00								Detected
16975.00								No Emission
16975.00								Detected
19400.00								No Emission
19400.00								Detected
21825.00								No Emission
21825.00								Detected
24250.00								No Emission
24250.00								Detected

FCC 15.249Universal Electronics, Inc.
Charter Spectrum RF4CE Remote 2018
Model: R31160BB0-00001Date: 05/03/2018
Lab: D
Tested By: Johnny Le**Harmonics - Low Channel
Transmit Mode - Y-Axis**

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Table Angle (deg)	Ant. Height (cm)	Comments
4850.00	46.62	H	73.97	-27.36	Peak	210.75	100.00	
4850.00	26.62	H	53.97	-27.36	Avg	210.75	100.00	
7275.00	47.55	H	73.97	-26.42	Peak	337.75	100.00	
7275.00	27.55	H	53.97	-26.42	Avg	337.75	100.00	
9700.00	56.58	H	73.97	-17.39	Peak	323.00	107.62	
9700.00	36.58	H	53.97	-17.39	Avg	323.00	107.62	
12125.00								No Emission
12125.00								Detected
14550.00								No Emission
14550.00								Detected
16975.00								No Emission
16975.00								Detected
19400.00								No Emission
19400.00								Detected
21825.00								No Emission
21825.00								Detected
24250.00								No Emission
24250.00								Detected

FCC 15.249

Universal Electronics, Inc.
Charter Spectrum RF4CE Remote 2018
Model: R31160BB0-00001

Date: 05/03/2018
Lab: D
Tested By: Johnny Le

Harmonics - Low Channel
Transmit Mode - Z-Axis

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Table Angle (deg)	Ant. Height (cm)	Comments
4850.00	55.23	H	73.97	-18.74	Peak	316.25	139.74	
4850.00	35.23	H	53.97	-18.74	Avg	316.25	139.74	
7275.00	52.87	H	73.97	-21.10	Peak	349.50	113.17	
7275.00	32.87	H	53.97	-21.10	Avg	349.50	113.17	
9700.00	58.17	H	73.97	-15.80	Peak	114.75	100.00	
9700.00	38.17	H	53.97	-15.80	Avg	114.75	100.00	
12125.00								No Emission
12125.00								Detected
14550.00								No Emission
14550.00								Detected
16975.00								No Emission
16975.00								Detected
19400.00								No Emission
19400.00								Detected
21825.00								No Emission
21825.00								Detected
24250.00								No Emission
24250.00								Detected

FCC 15.249Universal Electronics, Inc.
Charter Spectrum RF4CE Remote 2018
Model: R31160BB0-00001Date: 05/03/2018
Lab: D
Tested By: Johnny Le**Harmonics - Middle Channel
Transmit Mode - X-Axis**

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Table Angle (deg)	Ant. Height (cm)	Comments
4900.00	52.21	V	73.97	-21.76	Peak	181.50	221.77	
4900.00	32.21	V	53.97	-21.76	Avg	181.50	221.77	
7350.00	50.12	V	73.97	-23.85	Peak	344.00	100.00	
7350.00	30.12	V	53.97	-23.85	Avg	344.00	100.00	
9800.00	60.55	V	73.97	-13.42	Peak	198.50	100.00	
9800.00	40.55	V	53.97	-13.42	Avg	198.50	100.00	
12250.00								No Emission
12250.00								Detected
14700.00								No Emission
14700.00								Detected
17150.00								No Emission
17150.00								Detected
19600.00								No Emission
19600.00								Detected
22050.00								No Emission
22050.00								Detected
24500.00								No Emission
24500.00								Detected

FCC 15.249

Universal Electronics, Inc.
Charter Spectrum RF4CE Remote 2018
Model: R31160BB0-00001

Date: 05/03/2018
Lab: D
Tested By: Johnny Le

Harmonics - Middle Channel
Transmit Mode - Y-Axis

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Table Angle (deg)	Ant. Height (cm)	Comments
4900.00	51.62	V	73.97	-22.35	Peak	348.25	100.00	
4900.00	31.62	V	53.97	-22.35	Avg	348.25	100.00	
7350.00	55.17	V	73.97	-18.80	Peak	127.50	203.98	
7350.00	35.17	V	53.97	-18.80	Avg	127.50	203.98	
9800.00	57.78	V	73.97	-16.19	Peak	143.75	100.00	
9800.00	37.78	V	53.97	-16.19	Avg	143.75	100.00	
12250.00								No Emission
12250.00								Detected
14700.00								No Emission
14700.00								Detected
17150.00								No Emission
17150.00								Detected
19600.00								No Emission
19600.00								Detected
22050.00								No Emission
22050.00								Detected
24500.00								No Emission
24500.00								Detected

FCC 15.249

Universal Electronics, Inc.
Charter Spectrum RF4CE Remote 2018
Model: R31160BB0-00001

Date: 05/03/2018
Lab: D
Tested By: Johnny Le

Harmonics - Middle Channel
Transmit Mode - Z-Axis

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Table Angle (deg)	Ant. Height (cm)	Comments
4900.00	55.52	V	73.97	-18.45	Peak	266.00	137.05	
4900.00	35.52	V	53.97	-18.45	Avg	266.00	137.05	
7350.00	51.80	V	73.97	-22.17	Peak	59.75	100.00	
7350.00	31.80	V	53.97	-22.17	Avg	59.75	100.00	
9800.00	59.44	V	73.97	-14.53	Peak	159.75	117.11	
9800.00	39.44	V	53.97	-14.53	Avg	159.75	117.11	
12250.00								No Emission
12250.00								Detected
14700.00								No Emission
14700.00								Detected
17150.00								No Emission
17150.00								Detected
19600.00								No Emission
19600.00								Detected
22050.00								No Emission
22050.00								Detected
24500.00								No Emission
24500.00								Detected

FCC 15.249Universal Electronics, Inc.
Charter Spectrum RF4CE Remote 2018
Model: R31160BB0-00001Date: 05/03/2018
Lab: D
Tested By: Johnny Le**Harmonics - Middle Channel
Transmit Mode - X-Axis**

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Table Angle (deg)	Ant. Height (cm)	Comments
4900.00	56.69	H	73.97	-17.28	Peak	297.00	150.43	
4900.00	36.69	H	53.97	-17.28	Avg	297.00	150.43	
7350.00	53.91	H	73.97	-20.06	Peak	270.00	100.00	
7350.00	33.91	H	53.97	-20.06	Avg	270.00	100.00	
9800.00	58.30	H	73.97	-15.67	Peak	294.25	100.00	
9800.00	38.30	H	53.97	-15.67	Avg	294.25	100.00	
12250.00								No Emission
12250.00								Detected
14700.00								No Emission
14700.00								Detected
17150.00								No Emission
17150.00								Detected
19600.00								No Emission
19600.00								Detected
22050.00								No Emission
22050.00								Detected
24500.00								No Emission
24500.00								Detected

FCC 15.249Universal Electronics, Inc.
Charter Spectrum RF4CE Remote 2018
Model: R31160BB0-00001Date: 05/03/2018
Lab: D
Tested By: Johnny Le**Harmonics - Middle Channel
Transmit Mode - Y-Axis**

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Table Angle (deg)	Ant. Height (cm)	Comments
4900.00	48.89	H	73.97	-25.08	Peak	360.00	100.00	
4900.00	28.89	H	53.97	-25.08	Avg	360.00	100.00	
7350.00	49.73	H	73.97	-24.24	Peak	244.50	100.00	
7350.00	29.73	H	53.97	-24.24	Avg	244.50	100.00	
9800.00	56.38	H	73.97	-17.59	Peak	254.75	249.00	
9800.00	36.38	H	53.97	-17.59	Avg	254.75	249.00	
12250.00								No Emission
12250.00								Detected
14700.00								No Emission
14700.00								Detected
17150.00								No Emission
17150.00								Detected
19600.00								No Emission
19600.00								Detected
22050.00								No Emission
22050.00								Detected
24500.00								No Emission
24500.00								Detected

FCC 15.249

Universal Electronics, Inc.
 Charter Spectrum RF4CE Remote 2018
 Model: R31160BB0-00001

Date: 05/03/2018
 Lab: D
 Tested By: Johnny Le

Harmonics - Middle Channel
Transmit Mode - Z-Axis

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Table Angle (deg)	Ant. Height (cm)	Comments
4900.00	55.26	H	73.97	-18.71	Peak	322.75	125.71	
4900.00	35.26	H	53.97	-18.71	Avg	322.75	125.71	
7350.00	54.58	H	73.97	-19.39	Peak	351.75	100.00	
7350.00	34.58	H	53.97	-19.39	Avg	351.75	100.00	
9800.00	58.10	H	73.97	-15.87	Peak	260.00	109.00	
9800.00	38.10	H	53.97	-15.87	Avg	260.00	109.00	
12250.00								No Emission
12250.00								Detected
14700.00								No Emission
14700.00								Detected
17150.00								No Emission
17150.00								Detected
19600.00								No Emission
19600.00								Detected
22050.00								No Emission
22050.00								Detected
24500.00								No Emission
24500.00								Detected

FCC 15.249Universal Electronics, Inc.
Charter Spectrum RF4CE Remote 2018
Model: R31160BB0-00001Date: 05/03/2018
Lab: D
Tested By: Johnny Le**Harmonics - High Channel
Transmit Mode - X-Axis**

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Table Angle (deg)	Ant. Height (cm)	Comments
4950.00	49.72	H	73.97	-24.26	Peak	160.00	207.68	
4950.00	29.72	H	53.97	-24.26	Avg	160.00	207.68	
7425.00	50.92	H	73.97	-23.06	Peak	169.00	199.80	
7425.00	30.92	H	53.97	-23.06	Avg	169.00	199.80	
9900.00	59.59	H	73.97	-14.38	Peak	200.25	100.00	
9900.00	39.59	H	53.97	-14.38	Avg	200.25	100.00	
12375.00								No Emission
12375.00								Detected
14850.00								No Emission
14850.00								Detected
17325.00								No Emission
17325.00								Detected
19800.00								No Emission
19800.00								Detected
22275.00								No Emission
22275.00								Detected
24750.00								No Emission
24750.00								Detected

FCC 15.249

Universal Electronics, Inc.
Charter Spectrum RF4CE Remote 2018
Model: R31160BB0-00001

Date: 05/03/2018
Lab: D
Tested By: Johnny Le

Harmonics - High Channel
Transmit Mode - Y-Axis

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Table Angle (deg)	Ant. Height (cm)	Comments
4950.00	52.41	V	73.97	-21.56	Peak	34.50	203.00	
4950.00	32.41	V	53.97	-21.56	Avg	34.50	203.00	
7425.00	56.12	V	73.97	-17.85	Peak	130.00	100.00	
7425.00	36.12	V	53.97	-17.85	Avg	130.00	100.00	
9900.00	56.73	V	73.97	-17.24	Peak	139.75	100.00	
9900.00	36.73	V	53.97	-17.24	Avg	139.75	100.00	
12375.00								No Emission
12375.00								Detected
14850.00								No Emission
14850.00								Detected
17325.00								No Emission
17325.00								Detected
19800.00								No Emission
19800.00								Detected
22275.00								No Emission
22275.00								Detected
24750.00								No Emission
24750.00								Detected

FCC 15.249

Universal Electronics, Inc.
Charter Spectrum RF4CE Remote 2018
Model: R31160BB0-00001

Date: 05/03/2018
Lab: D
Tested By: Johnny Le

Harmonics - High Channel
Transmit Mode - Z-Axis

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Table Angle (deg)	Ant. Height (cm)	Comments
4950.00	55.65	V	73.97	-18.32	Peak	92.25	100.00	
4950.00	35.65	V	53.97	-18.32	Avg	92.25	100.00	
7425.00	51.85	V	73.97	-22.12	Peak	235.75	156.82	
7425.00	31.85	V	53.97	-22.12	Avg	235.75	156.82	
9900.00	59.63	V	73.97	-14.34	Peak	331.75	109.00	
9900.00	39.63	V	53.97	-14.34	Avg	334.75	109.00	
12375.00								No Emission
12375.00								Detected
14850.00								No Emission
14850.00								Detected
17325.00								No Emission
17325.00								Detected
19800.00								No Emission
19800.00								Detected
22275.00								No Emission
22275.00								Detected
24750.00								No Emission
24750.00								Detected

FCC 15.249

Universal Electronics, Inc.
Charter Spectrum RF4CE Remote 2018
Model: R31160BB0-00001

Date: 05/03/2018
Lab: D
Tested By: Johnny Le

Harmonics - High Channel
Transmit Mode - X-Axis

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Table Angle (deg)	Ant. Height (cm)	Comments
4950.00	56.03	H	73.97	-17.94	Peak	159.75	141.89	
4950.00	36.03	H	53.97	-17.94	Avg	159.75	141.89	
7425.00	54.26	H	73.97	-19.71	Peak	93.75	100.00	
7425.00	34.26	H	53.97	-19.71	Avg	93.75	100.00	
9900.00	57.85	H	73.97	-16.13	Peak	337.50	100.00	
9900.00	37.85	H	53.97	-16.13	Avg	337.50	100.00	
12375.00								No Emission
12375.00								Detected
14850.00								No Emission
14850.00								Detected
17325.00								No Emission
17325.00								Detected
19800.00								No Emission
19800.00								Detected
22275.00								No Emission
22275.00								Detected
24750.00								No Emission
24750.00								Detected

FCC 15.249Universal Electronics, Inc.
Charter Spectrum RF4CE Remote 2018
Model: R31160BB0-00001Date: 05/03/2018
Lab: D
Tested By: Johnny Le**Harmonics - High Channel
Transmit Mode - Y-Axis**

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Table Angle (deg)	Ant. Height (cm)	Comments
4950.00	48.46	H	73.97	-25.51	Peak	190.00	100.00	
4950.00	28.46	H	53.97	-25.51	Avg	190.00	100.00	
7425.00	51.05	H	73.97	-22.92	Peak	149.75	243.86	
7425.00	31.05	H	53.97	-22.92	Avg	149.75	243.86	
9900.00	56.47	H	73.97	-17.50	Peak	81.75	238.25	
9900.00	36.47	H	53.97	-17.50	Avg	81.75	238.25	
12375.00								No Emission
12375.00								Detected
14850.00								No Emission
14850.00								Detected
17325.00								No Emission
17325.00								Detected
19800.00								No Emission
19800.00								Detected
22275.00								No Emission
22275.00								Detected
24750.00								No Emission
24750.00								Detected

FCC 15.249

Universal Electronics, Inc.
 Charter Spectrum RF4CE Remote 2018
 Model: R31160BB0-00001

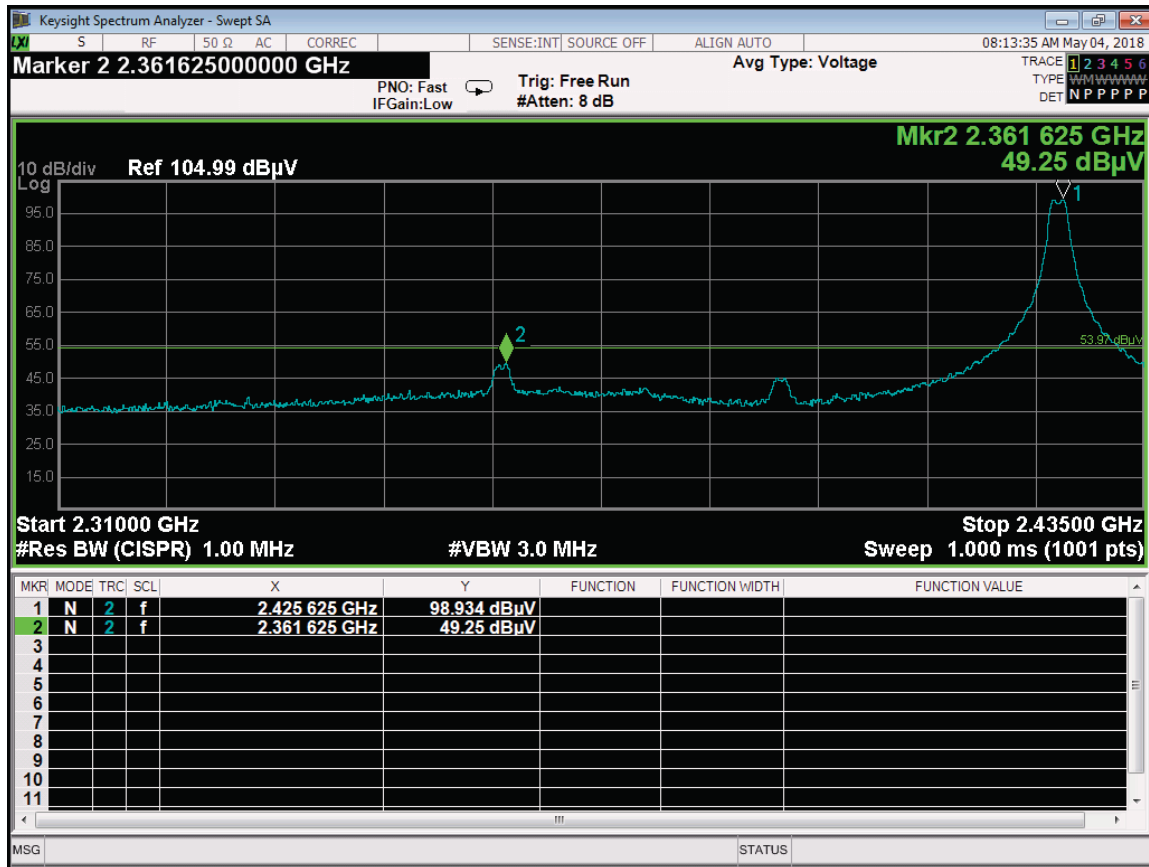
Date: 05/03/2018
 Lab: D
 Tested By: Johnny Le

Harmonics - High Channel
Transmit Mode - Z-Axis

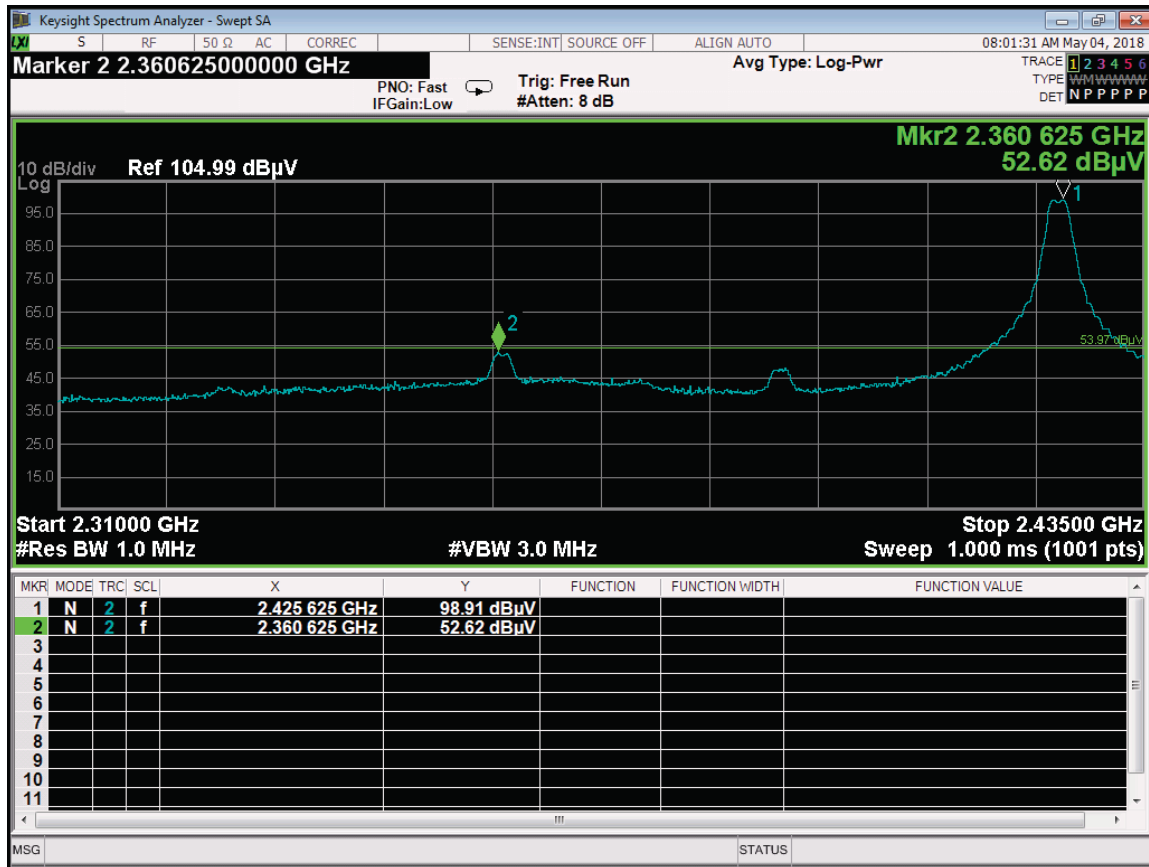
Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Table Angle (deg)	Ant. Height (cm)	Comments
4950.00	54.20	H	73.97	-19.77	Peak	209.25	122.00	
4950.00	34.20	H	53.97	-19.77	Avg	209.25	122.00	
7425.00	54.03	H	73.97	-19.95	Peak	188.50	100.00	
7425.00	34.03	H	53.97	-19.95	Avg	188.50	100.00	
9900.00	59.11	H	73.97	-14.86	Peak	290.00	111.62	
9900.00	39.11	H	53.97	-14.86	Avg	290.00	111.62	
12375.00								No Emission
12375.00								Detected
14850.00								No Emission
14850.00								Detected
17325.00								No Emission
17325.00								Detected
19800.00								No Emission
19800.00								Detected
22275.00								No Emission
22275.00								Detected
24750.00								No Emission
24750.00								Detected

Report Number: **B80523D1**
FCC Part 15 Subpart B and FCC Section 15.249 Test Report
Charter Spectrum RF4CE Remote 2018
Model: R31160BB0-00001

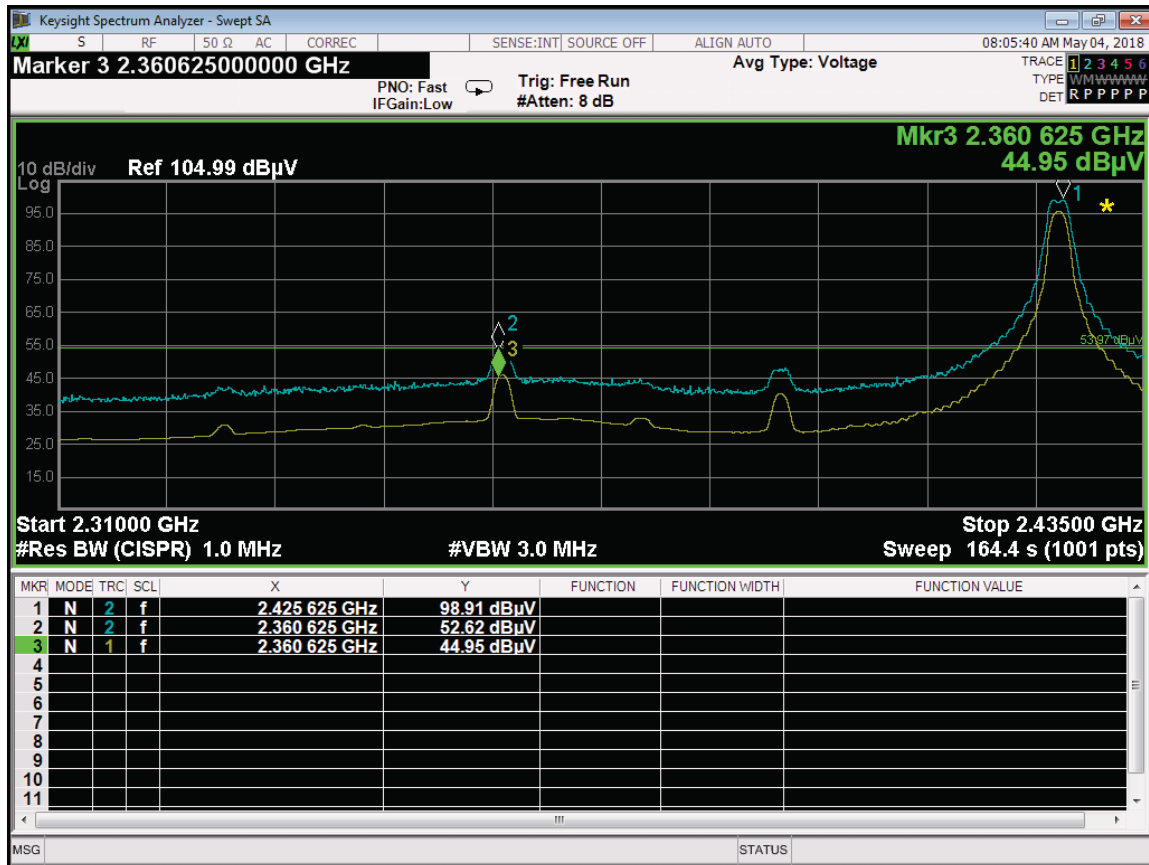
***BAND EDGES
DATA SHEETS***



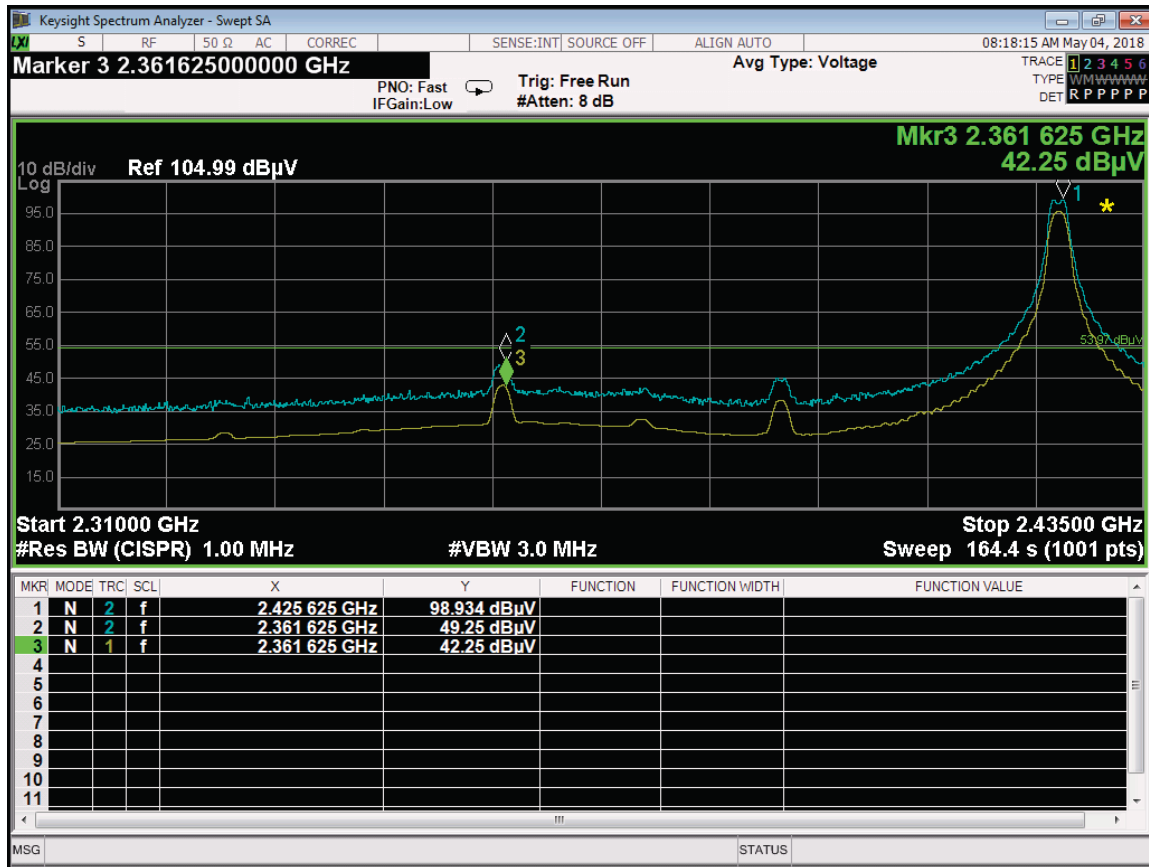
Band Edge - 2425 MHz - Horizontal - Z-Axis Worst Case - Peak



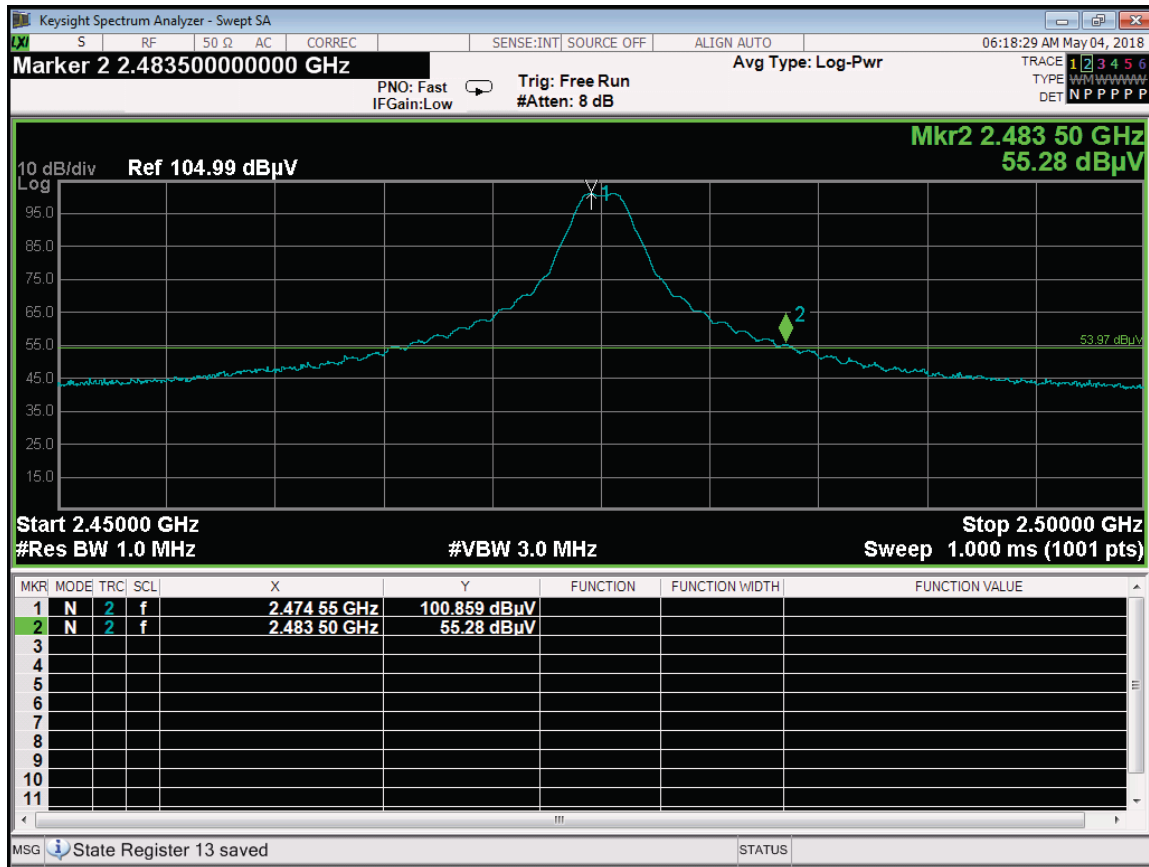
Band Edge - 2425 MHz - Vertical - Y-Axis Worst Case - Peak



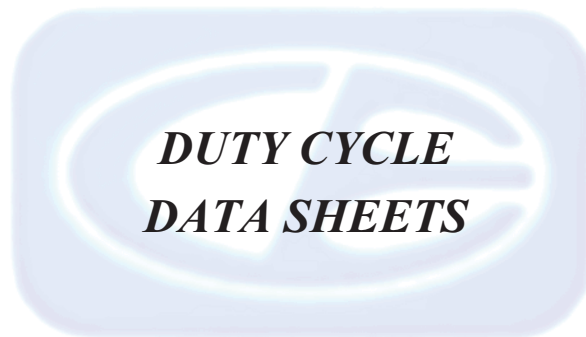
Band Edge - 2425 MHz - Vertical - Y-Axis Worst Case - Average

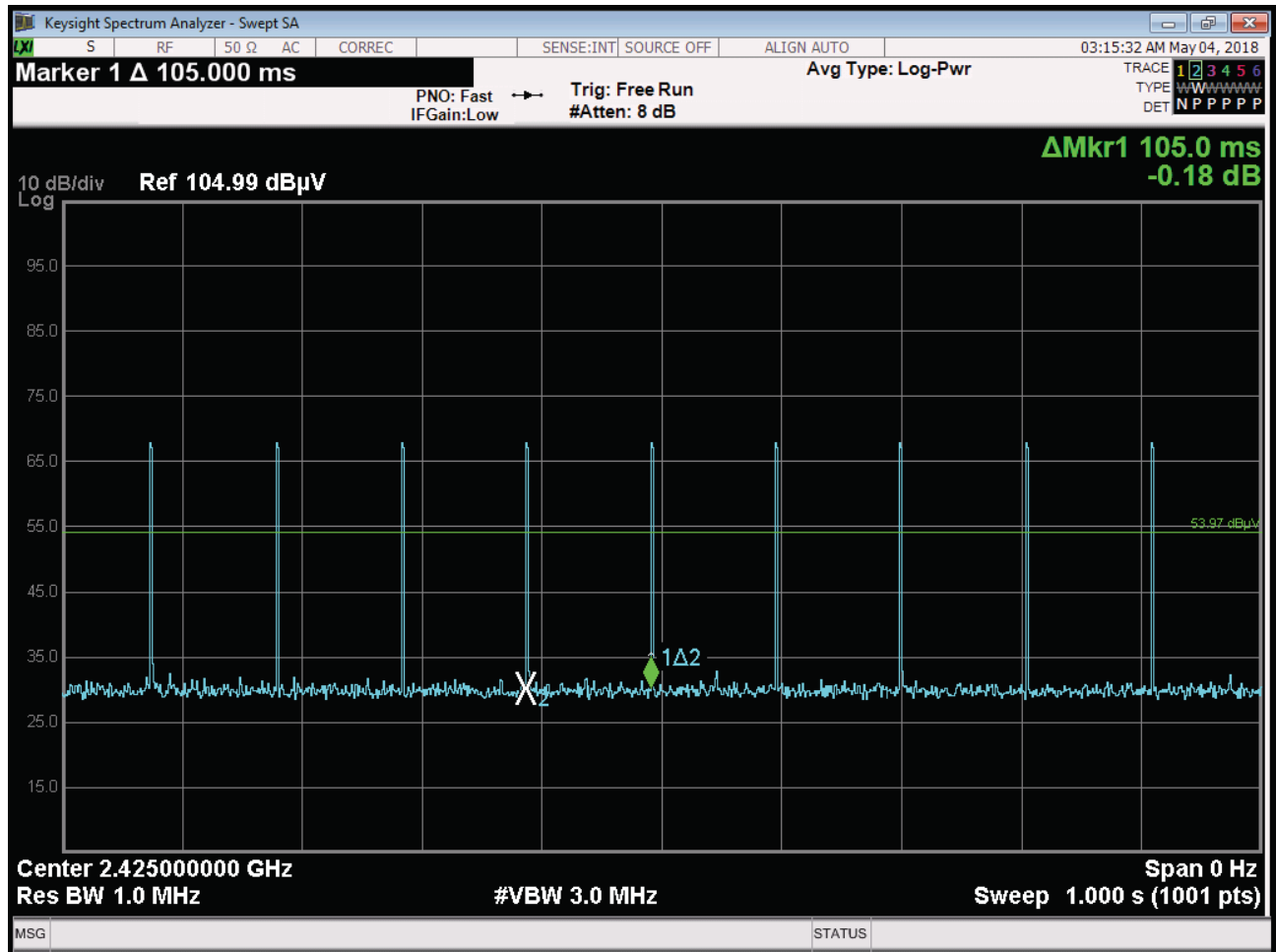


Band Edge - 2425 MHz - Vertical - Z-Axis Worst Case - Average

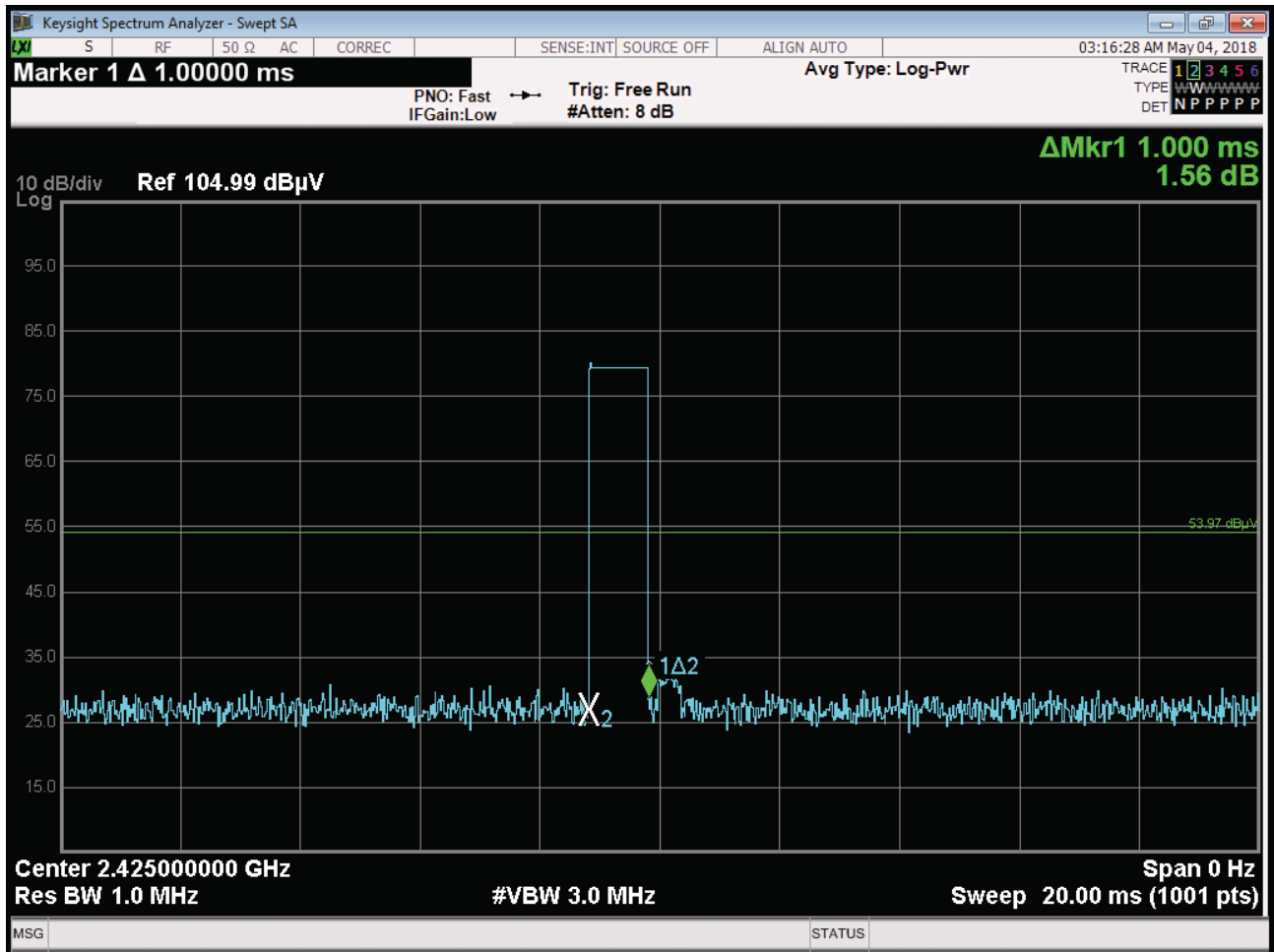


Band Edge - 2475 MHz - Horizontal - Z-Axis Worst Case





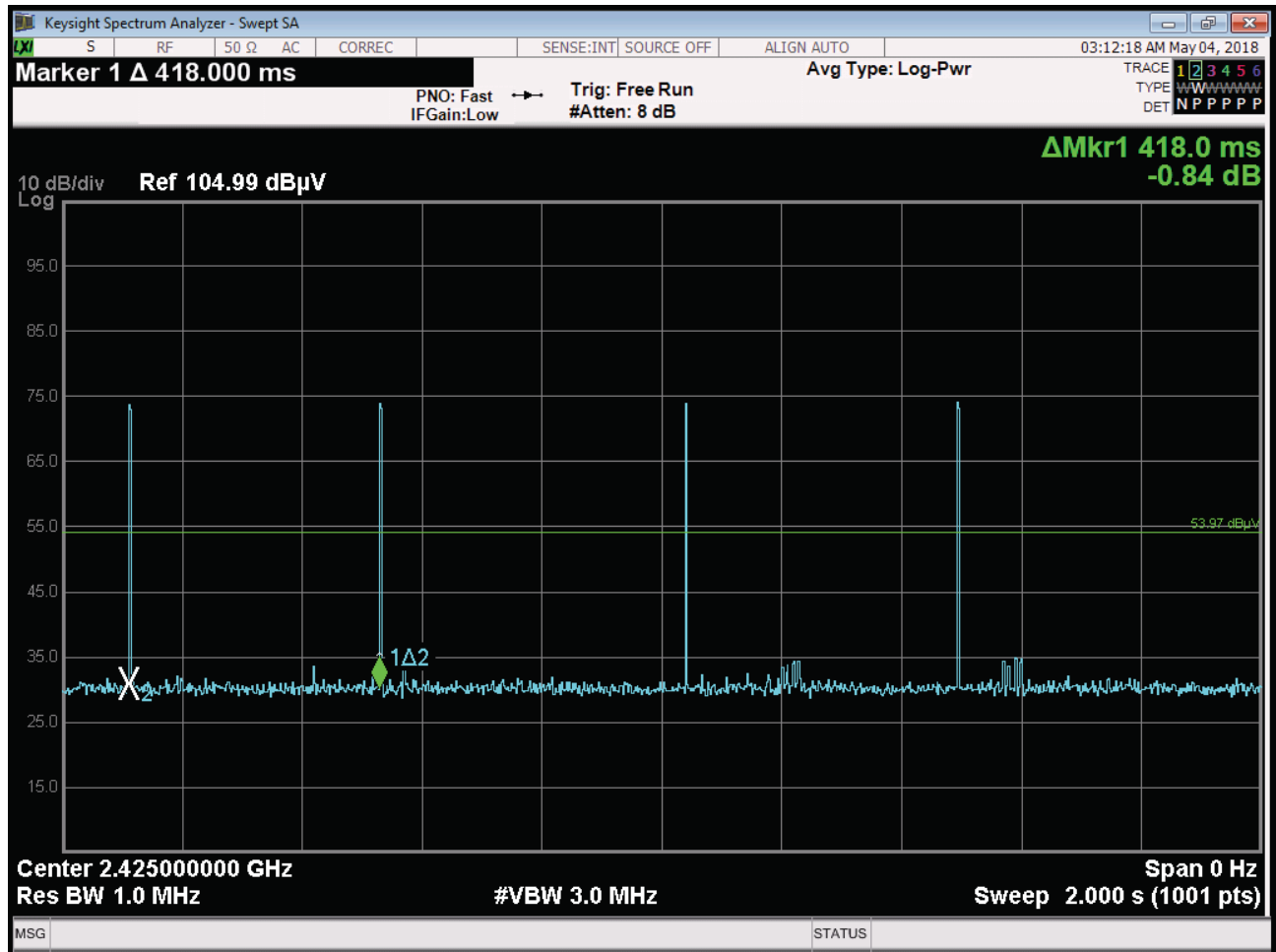
Time of Pulse with Blanking Interval = 105 ms
Pairing Mode



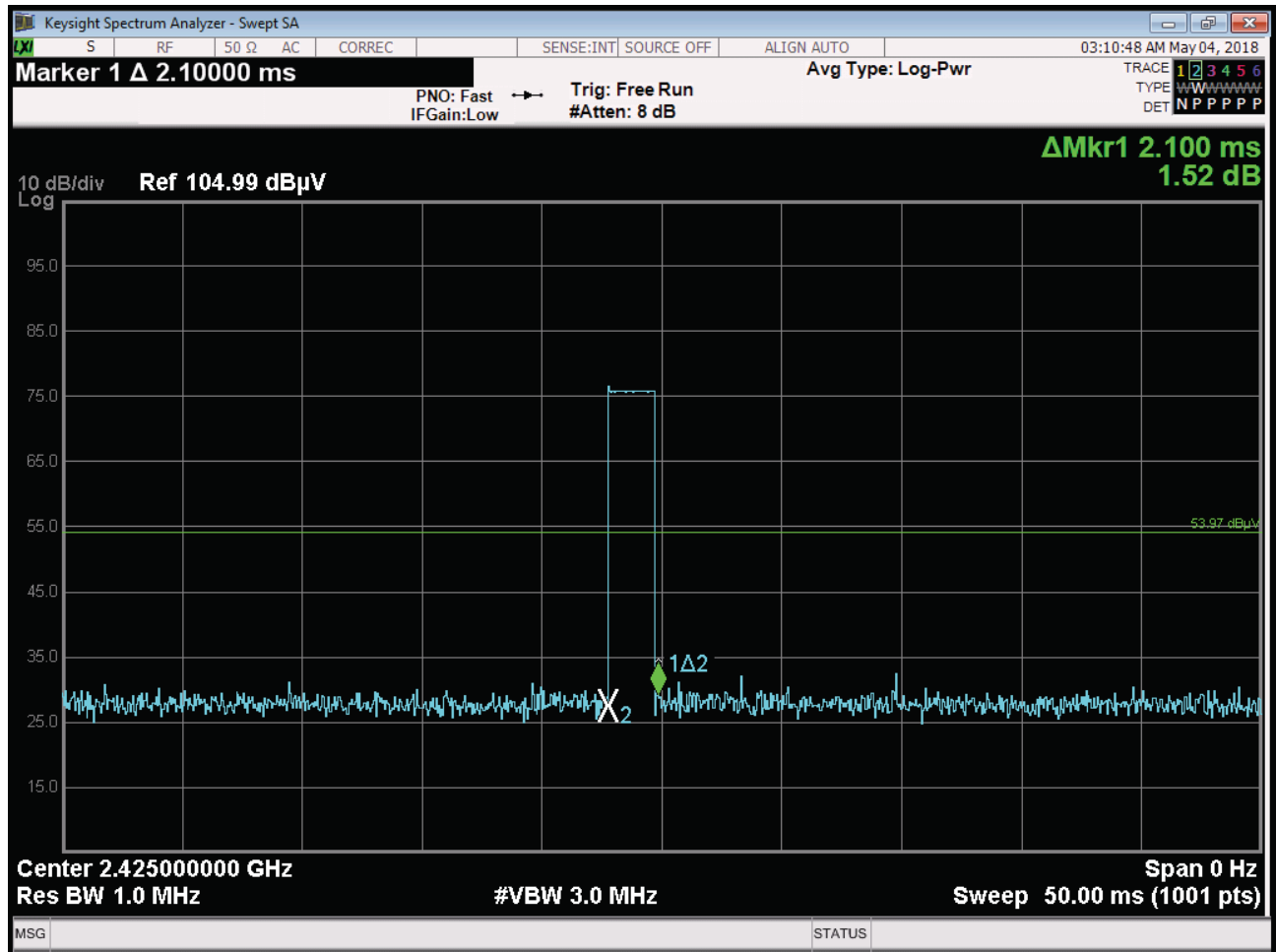
Time of One Pulse Train = 1.0 ms
Pairing Mode

Duty Cycle = 1.0 ms / 100 ms = 1.0%

The maximum 20 dB peak to average ratio can be utilized.



Time of Pulse with Blanking Interval = 418 ms
Advertising Mode



Time of One Pulse Train = 2.1 ms
 Advertising Mode

Duty Cycle = 2.1 ms / 100 ms = 2.1%

The maximum 20 dB peak to average ratio can be utilized.