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Test Report

Applicant	Bear River Holdings, LLC
	5000 Eldorado Pkwy, Suite 150,
Address	Frisco, Texas 75033,
	United States
FCC ID Number	FCC ID: ZEZB1727ST24G
Brand Name(s)	None
Model Number(s)/	
Item Number(s)	B1727
Product Description	2.4 GHz Wireless RC Boat Control - TX Portion
Operating Frequency	2.410-2.475 GHz
Rules/Standards	Part 15.249 of the FCC Rules
Received Date	9th September, 2016
Tested Date	12th September, 2016
Tested by	Rode Liu (Engineer of Shenzhen SEM.Test Technology Co., Ltd.)
Reviewed by	Silin Chen (EMC Manager of Shenzhen SEM.Test Technology Co., Ltd.)
Signed by	Jandy So (Manager of Shenzhen SEM.Test Technology Co., Ltd.)
Approved by	Gilbert Lui (Marketing Manager of Gakkiku Compliance Company Limited)
Report Number	GKK201609090A
Test Results	⊠ PASSED ☐ FAILED

GENERAL

The report is written by Gakkiku Technology Company. The tested device complies with the general approval requirements of the FCC Rules and the Industry Canada as identified in this test report.

TEST LOCATION

The tested device was tested at the test site of the Shenzhen SEM.Test Technology Co., Ltd., 1/F, Building A, Hongwei Industrial Park, Liuxian 2nd Road, Bao'an District, Shenzhen, 518101, Guangdong, China. The FCC Recognized 2.948 Listed Test Firm Registration Number is 934118. The Industry Canada IC OATS Filing Number/Assigned Code is 11464A.

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1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant: Bear River Holdings, LLC

Address of applicant: 5000 Eldorado Pkwy, Suite 150,

Frisco, Texas 75033, United States

Manufacturer: Bear River Holdings, LLC

Address of manufacturer: 5000 Eldorado Pkwy, Suite 150,

Frisco, Texas 75033, United States

General Description of EUT

Item	Description
Product Description:	2.4 GHz Wireless RC Boat Control - TX Portion
Brand Name(s):	
Tested Model	B1727
Number(s)/	
Item Number(s):	
Adding Model	B1727S, B1728, B1729, B1730, B1731, B1732, B1733, B1734, B1742,
Number(s)/	B1743, B1744, B1745, B1746, B1747, B1523
Item Number(s):	[All Adding Brand Name(s) and Model Number(s)/Item Number(s)
	are same electrically identical as Tested Brand Name(s) and Model
	Number(s)/Item Number(s)]
Power Source:	DC 9V Battery
Output Power:	<odbm< td=""></odbm<>
Frequency Range:	2.410-2.475 GHz
No. of Channel:	
Channel Separation:	
Antenna Type:	Fixed 30mm-long Wire Antenna
Size:	/
For more information r	refer to the circuit diagram form and the user's manual.

The test data is gathered from a production sample, provided by the manufacturer.

1.2 Test Standards

The following report is prepared on behalf of the Bear River Holdings, LLC in accordance with Part 15 Subpart B and Subpart C of the FCC Rules, and Part 15.249, 15.107, 15.203, 15.205, 15.207 and 15.209 of the FCC Rules.

The objective is to determine compliance with Part 15 Subpart C of the FCC Rules, and Part 15.249, 15.107, 15.203, 15.205, 15.207 and 15.209 of the FCC Rules.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product, which results in lowering the emission, should be checked to ensure compliance has been maintained.

1.3 Related Submittal(s)/Grant(s)

No Related Submittal(s).

1.4 Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard for Testing Unlicensed Wireless Devices, and 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.

The equipment under test (EUT) was configured to measure its highest possible emission level. The test modes were adapted according to the Operating Instructions and let the EUT keep transmitting.

1.5 Test Facility

FCC Recognized 2.948 Listed Test Firm Registration Number: 934118

EMC Laboratory of the Shenzhen SEM.Test Technology Co., Ltd. has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files and the FCC Recognized 2.948 Listed Test Firm Registration Number is 934118.

Industry Canada IC OATS Filing Number/Assigned Code: 11464A

The 3 Meter Semi-Anechoic Chamber of the Shenzhen SEM. Test Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Industry Canada IC OATS Filing Number/Assigned Code (11464A).

1.6 EUT Exercise Software

The EUT exercise program used during the testing was designed to exercise the system components. The test software is started while the whole system is on.

1.7 Accessories Equipment List and Details

Manufacturer	Description	Model	Serial Number
/	/	/	/
/	/	/	/

1.8 EUT Cable List and Details

Cable Description Length (M)		Shielded/ Unshielded	With Core/ Without Core	
/	/ /		/	

2. SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT
Part 15.203	Antenna Requirement	Compliant
Part 15.107(a)	Conducted Emission	N/A
Part 15.205	Restricted Band of Operation	Compliant
Part 15.209	Radiated Emission	Compliant
Part 15.249(a)	Field Strength	Compliant
Part 15.249(d)	Out of Band Emission	Compliant

3. Part 15.203 - ANTENNA REQUIREMENT

3.1 Standard Applicable

According to Part 15.203 of the FCC Rules, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

3.2 Test Result

This product has a fixed antenna, fulfill the requirement of this section.

4. Part 15.249(a), 15.205 & 15.209 - RADIATED EMISSION

4.1 Measurement Uncertainty

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement is ± 3.0 dB.

4.2 Standard Applicable

According to Part 15.249(a) of the FCC Rules, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental Frequency	Field strength of	Field strength of harmonics	
	fundamental	(micro-volts/meter)	
	(milli-volts/meter)		
902-928 MHz	50	500	
2400-2483.5 MHz	50	500	
5725-5875 MHz	50	500	
24.0-24.25 GHz	250	2500	

The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in Part 15.35 of the FCC Rules for limiting peak emissions apply.

EMISSIONS RADIATED OUTSIDE OF THE SPECIFIED FREQUENCY BANDS, EXCEPT FOR HARMONICS, SHALL BE ATTENUATED BY AT LEAST 20 dB BELOW THE LEVEL OF THE FUNDAMENTAL OR TO THE GENERAL RADIATED EMISSION LIMITS UNDER PART 15.209 OF THE FCC RULES, WHICHEVER IS THE LESSER ATTENUATION.

Emissions that fall in the restricted bands (Part 15.205 of the FCC Rules) must be less than 54dBuV/m otherwise the spurious and harmonics must be attenuated by at least 20dB.

4.3 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	R&S	FSP	836079/035	2016-06-04	2017-06-03
EMI Test Receiver	R&S	ESVB	825471/005	2016-06-04	2017-06-03
Pre-amplifier	Agilent	8447F	3113A06717	2016-06-04	2017-06-03
Pre-amplifier	Compliance Direction	PAP-0118	24002	2016-06-04	2017-06-03
Trilog Broadband Antenna	SCHWARZBECK	VULB9163	9163-333	2016-06-04	2017-06-03
Horn Antenna	ETS	3117	00086197	2016-06-04	2017-06-03
Horn Antenna	ETS	3116B	00088203	2016-06-04	2017-06-03
Loop Antenna	SCHWARZECK	HFRA 5165	9365	2016-06-04	2017-06-03

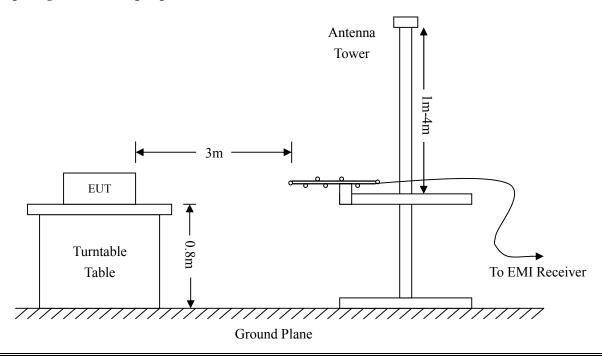
Statement of Traceability: All calibrations have been performed per the NVLAP requirements traceable to the NIST.

4.4 Test Procedure

The setup of EUT is according with per ANSI C63.4-2014 measurement procedure. The specification used was with the limits of Part 15.249(a), 15.205 and 15.209 of the FCC Rules. The radiated emissions were investigated by rotating the EUT through the three (3) orthogonal planes as mandated in ANSI C63.4-2014.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm



4.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and the Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corr. Ampl. = Indicated Reading + Ant. Factor + Cable Loss - Ampl. Gain

The "Margin" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of $-6dB_{\mu}V$ means the emission is $6dB_{\mu}V$ below the maximum limit for Part 15 of the FCC Rules. The equation for margin calculation is as follows:

Margin = Corr. Ampl. - Limit of Part 15 of the FCC Rules

4.6 Environmental Conditions

Temperature:	26 °C
Relative Humidity:	52%
ATM Pressure:	1012 mbar

4.7 Summary of Test Results/Plots

According to the data below, the standards of <u>Part 15.249</u>, <u>15.205</u> and <u>15.209</u> of the <u>FCC Rules</u>, and had the worst margin of:

Note: This EUT was tested in 3 orthogonal positions and the worst case position data was reported.

Plot of Radiation Emissions Test

Radiated Disturbance

Product Description: 2.4 GHz Wireless RC Boat Control - TX Portion

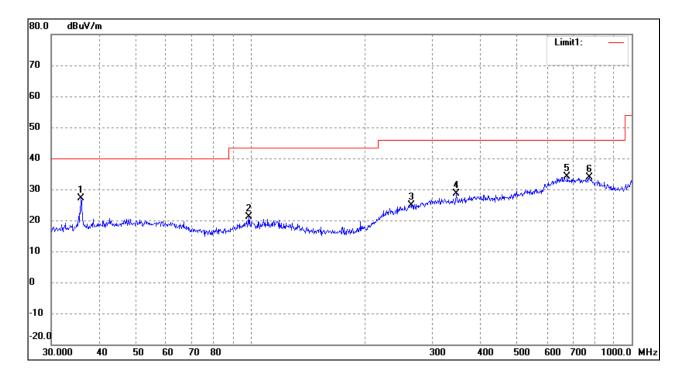
Model Number(s)/Item Number(s): B1727

Operating Condition: Transmitting below 1 GHz (Lowest Channel: 2410 MHz)

Test Specification: Horizontal & Vertical

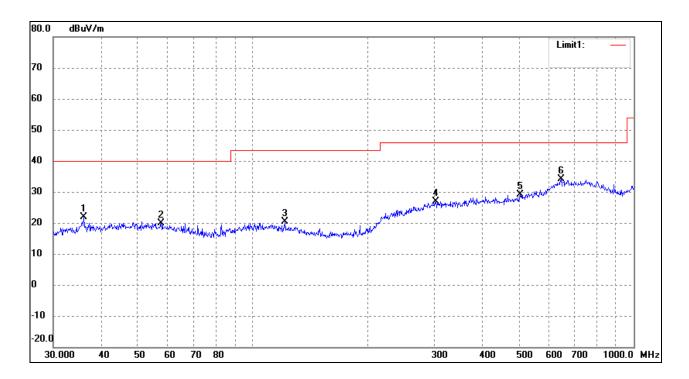
Power Source: DC 9V Battery

Horizontal:



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	Factor(dB)	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	35.8747	22.93	4.31	27.24	40.00	-12.76	157	100	Peak
2	99.1797	16.32	4.81	21.13	43.50	-22.37	124	100	Peak
3	263.8190	14.97	9.96	24.93	46.00	-21.07	133	100	Peak
4	346.8092	17.18	11.56	28.74	46.00	-17.26	299	100	Peak
5	677.5798	15.46	18.55	34.01	46.00	-11.99	235	100	Peak
6	774.1584	16.67	17.19	33.86	46.00	-12.14	256	100	Peak

Vertical:



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	Factor(dB)	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	36.1272	17.49	4.35	21.84	40.00	-18.16	137	100	Peak
2	57.5939	14.99	4.99	19.98	40.00	-20.02	169	100	Peak
3	121.5486	15.63	4.69	20.32	43.50	-23.18	124	100	Peak
4	302.4812	14.91	11.95	26.86	46.00	-19.14	137	100	Peak
5	504.7062	15.62	13.47	29.09	46.00	-16.91	246	100	Peak
6	645.1195	16.23	17.94	34.17	46.00	-11.83	271	100	Peak

Plot of Radiation Emissions Test

Radiated Disturbance

Product Description: 2.4 GHz Wireless RC Boat Control - TX Portion

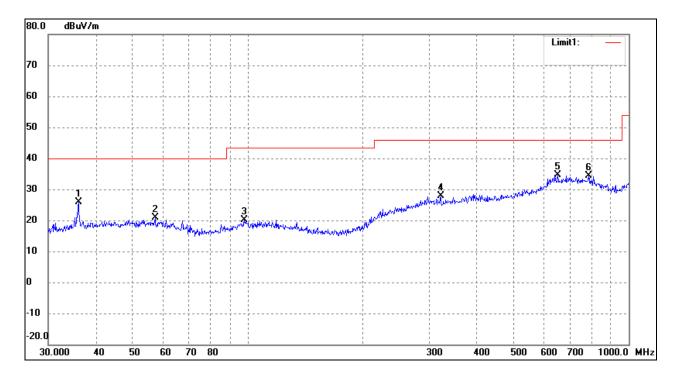
Model Number(s)/Item Number(s): B1727

Operating Condition: Transmitting below 1 GHz (Near Middle Channel: 2443 MHz)

Test Specification: Horizontal & Vertical

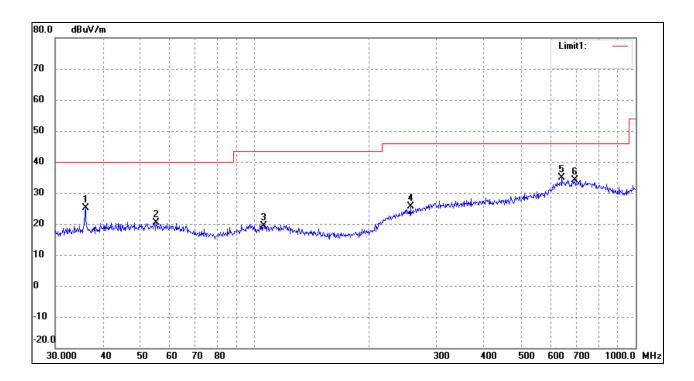
Power Source: DC 9V Battery

Horizontal:



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	Factor(dB)	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	36.0007	21.56	4.33	25.89	40.00	-14.11	146	100	Peak
2	57.1914	15.90	4.99	20.89	40.00	-19.11	199	100	Peak
3	98.1419	15.48	4.66	20.14	43.50	-23.36	115	100	Peak
4	321.0608	16.01	11.92	27.93	46.00	-18.07	122	100	Peak
5	651.9417	16.85	17.77	34.62	46.00	-11.38	156	100	Peak
6	785.0935	17.67	16.65	34.32	46.00	-11.68	285	100	Peak

Vertical:



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	Factor(dB)	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	36.0007	20.73	4.33	25.06	40.00	-14.94	39	100	Peak
2	55.2207	15.38	5.02	20.40	40.00	-19.60	97	100	Peak
3	105.6415	14.62	4.88	19.50	43.50	-24.00	144	100	Peak
4	256.5211	15.99	9.56	25.55	46.00	-20.45	159	100	Peak
5	640.6110	16.73	18.05	34.78	46.00	-11.22	183	100	Peak
6	691.9867	16.38	17.78	34.16	46.00	-11.84	239	100	Peak

Plot of Radiation Emissions Test

Radiated Disturbance

Product Description: 2.4 GHz Wireless RC Boat Control - TX Portion

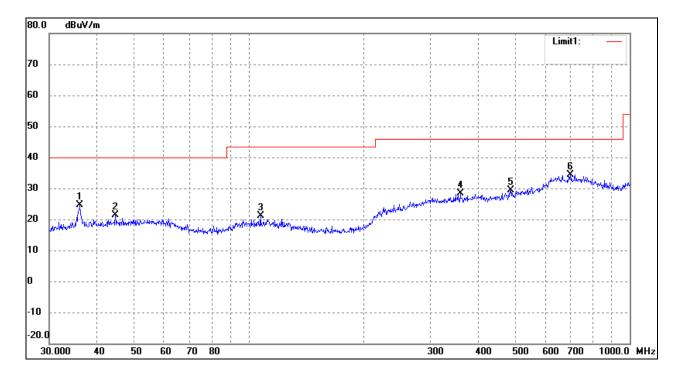
Model Number(s)/Item Number(s): B1727

Operating Condition: Transmitting below 1 GHz (Highest Channel: 2475 MHz)

Test Specification: Horizontal & Vertical

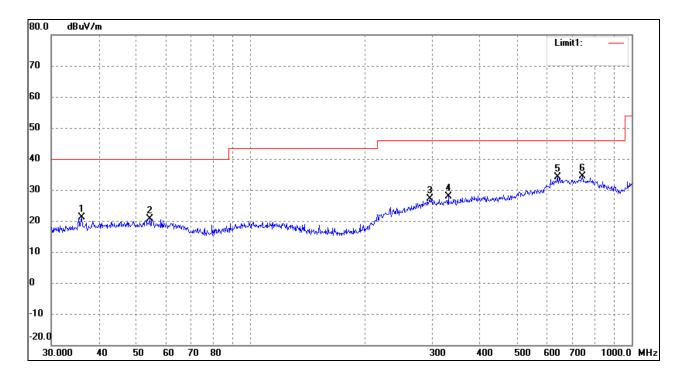
Power Source: DC 9V Battery

Horizontal:



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	Factor(dB)	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	36.1272	20.39	4.35	24.74	40.00	-15.26	162	100	Peak
2	44.7434	16.43	4.95	21.38	40.00	-18.62	106	100	Peak
3	107.5101	16.29	4.87	21.16	43.50	-22.34	117	100	Peak
4	359.1860	16.56	11.89	28.45	46.00	-17.55	163	100	Peak
5	487.3151	16.48	12.84	29.32	46.00	-16.68	26	100	Peak
6	699.3046	17.20	17.23	34.43	46.00	-11.57	279	100	Peak

Vertical:



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	Factor(dB)	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	36.1272	16.89	4.35	21.24	40.00	-18.76	143	100	Peak
2	54.4516	15.56	5.03	20.59	40.00	-19.41	276	100	Peak
3	295.1469	15.26	11.78	27.04	46.00	-18.96	127	100	Peak
4	330.1949	16.32	11.64	27.96	46.00	-18.04	179	100	Peak
5	638.3686	16.11	18.01	34.12	46.00	-11.88	296	100	Peak
6	742.2587	15.34	18.93	34.27	46.00	-11.73	252	100	Peak

Spurious Emission above 1 GHz

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	H/V	
			Lowest Chanr	nel: 2410 MHz			
2410	89.13	-5.46	83.67	114	-30.33	Н	Peak
2410	76.06	-5.46	70.60	94	-23.40	Н	Average
4820	54.80	0.58	55.38	74	-18.62	Н	Peak
4820	35.72	0.58	36.30	54	-17.70	Н	Average
7230	53.21	3.71	56.92	74	-17.08	Н	Peak
7230	33.36	3.71	37.07	54	-16.93	Н	Average
2430	87.88	-5.46	82.42	114	-31.58	V	Peak
2430	74.40	-5.46	68.94	94	-25.06	V	Average
4820	53.36	0.58	53.94	74	-20.06	V	Peak
4820	33.51	0.58	34.09	54	-19.91	V	Average
7230	48.77	3.71	52.48	74	-21.52	V	Peak
7230	32.62	3.71	36.33	54	-17.67	V	Average
		Ne	ar Middle Cha	annel: 2443 M	Hz		
2443	88.41	-4.95	83.46	114	-30.54	Н	Peak
2443	74.48	-4.95	69.53	94	-24.47	Н	Average
4886	53.76	0.63	54.39	74	-19.61	Н	Peak
4886	34.12	0.63	34.75	54	-19.25	Н	Average
7329	48.46	3.74	52.20	74	-21.80	Н	Peak
7329	32.67	3.74	36.41	54	-17.59	Н	Average
2443	84.59	-4.95	79.64	114	-34.36	V	Peak
2443	74.13	-4.95	69.18	94	-24.82	V	Average
4886	54.59	0.63	55.22	74	-18.78	V	Peak
4886	33.36	0.63	33.99	54	-20.01	V	Average
7329	50.37	3.74	54.11	74	-19.89	V	Peak
7329	32.71	3.74	36.45	54	-17.55	V	Average

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	H/V	
]	Highest Chanı	nel: 2475 MH	Z		
2475	88.77	-4.63	84.14	114	-29.86	Н	Peak
2475	73.95	-4.63	69.32	94	-24.68	Н	Average
4950	54.67	0.68	55.35	74	-18.65	Н	Peak
4950	31.21	0.68	31.89	54	-22.11	Н	Average
7425	49.62	3.79	53.41	74	-20.59	Н	Peak
7425	31.49	3.79	35.28	54	-18.72	Н	Average
2475	83.79	-4.63	79.16	114	-34.84	V	Peak
2475	68.69	-4.63	64.06	94	-29.94	V	Average
4950	50.39	0.68	51.07	74	-22.93	V	Peak
4950	33.56	0.68	34.24	54	-19.76	V	Average
7425	47.82	3.79	51.61	74	-22.39	V	Peak
7425	33.71	3.79	37.50	54	-16.40	V	Average

Note: Testing is carried out with frequency range 9 kHz to the tenth harmonics, which above 5th Harmonics are attenuated more than 20 dB below the permissible limits or the field strength is too small to be measured.

The measurements greater than 20 dB below the limit from 9 kHz to 30 MHz.

5. Part 15.249(b) - OUT OF BAND EMISSIONS

5.1 Standard Applicable

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits under Part 15.209 of the FCC Rules, whichever is the lesser attenuation.

5.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	R&S	FSP	836079/035	2016-06-04	2017-06-03
EMI Test Receiver	R&S	ESVB	825471/005	2016-06-04	2017-06-03
Pre-amplifier	Agilent	8447F	3113A06717	2016-06-04	2017-06-03
Pre-amplifier	Compliance Direction	PAP-0118	24002	2016-06-04	2017-06-03
Trilog Broadband Antenna	SCHWARZBECK	VULB9163	9163-333	2016-06-04	2017-06-03
Horn Antenna	ETS	3117	00086197	2016-06-04	2017-06-03
Spectrum Analyzer	Agilent	E4402B	US41192821	2016-06-04	2017-06-03
Attenuator	ATTEN	ATS100-4-20	/	2016-06-04	2017-06-03

Statement of Traceability: All calibrations have been performed per the NVLAP requirements traceable to the NIST.

5.3 Test Procedure

As the radiation test, set the Lowest and Highest Transmitting Channel, observed the outside band of 2400MHz to 2438.5MHz, than mark the higher-level emission for comparing with the FCC Rules.

5.4 Environmental Conditions

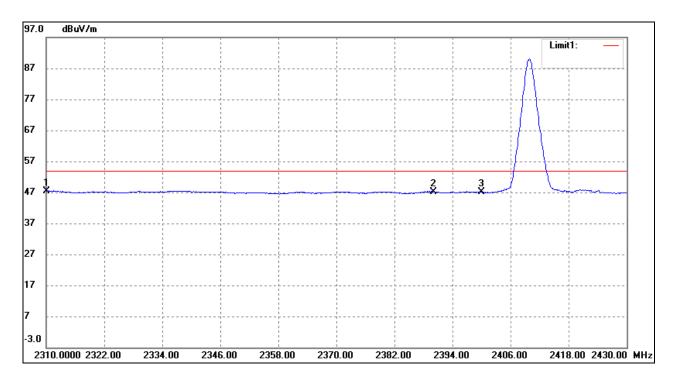
Temperature:	25 °C
Relative Humidity:	54%
ATM Pressure:	1012 mbar

5.5 Summary of Test Results/Plots

Test Result Pass

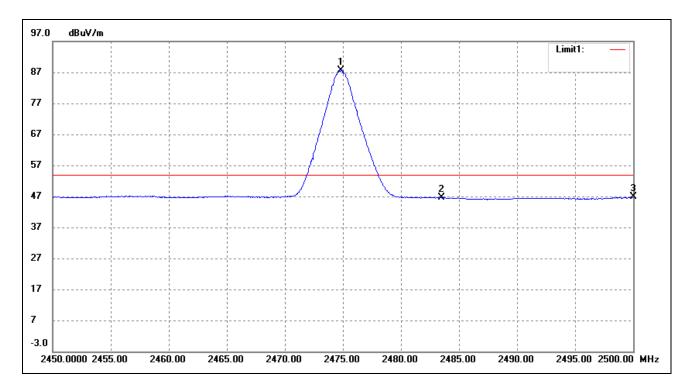
Refer to the attached plots.

Lower Bandedge



No.	Frequency	Reading	Correct	Result	Limit	Margin	Detector
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2310.000	31.08	16.33	47.41	54.00	-6.59	Average
	2310.000	44.28	15.90	60.18	74.00	-13.82	Peak
2	2390.000	31.81	15.44	47.25	54.00	-6.75	Average
	2390.000	56.05	15.10	71.15	74.00	-2.85	Peak
3	2400.000	31.70	15.33	47.03	54.00	-6.97	Average
	2400.000	50.83	15.00	65.83	74.00	-8.17	Peak

Upper Bandedge



No.	Frequency	Reading	Correct	Result	Limit	Margin	Detector
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2474.800	72.23	15.39	87.62	/	/	Average
2	2483.500	31.11	15.41	46.52	54.00	-7.48	Average
	2483.500	51.58	15.41	66.99	74.00	-7.01	Peak
3	2500.000	31.35	15.43	46.78	54.00	-7.22	Average
	2500.000	44.60	15.43	60.03	74.00	-13.97	Peak

6. Emission Bandwidth

6.1 Standard Applicable

According to Part 15.215 (c) of the FCC Rules, intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

6.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	Agilent	E4402B	US41192821	2016-06-04	2017-06-03
Attenuator	ATTEN	ATS100-4-20	/	2016-06-04	2017-06-03

6.3 Test Procedure

According to the ANSI C63.10-2013, the emission bandwidth test method as follows:

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

Set span = 1 MHz, centered on a transmitting channel

RBW ≥1% 20 dB Bandwidth, VBW ≥RBW

Sweep = auto

Detector function = Peak

Trace = max hold

All the trace to stabilize, use the marker-to-peak function to set the marker to the peak of the emission, use the marker-delta function to measure and record the 20dB down and 99% bandwidth of the emission.

6.4 Environmental Conditions

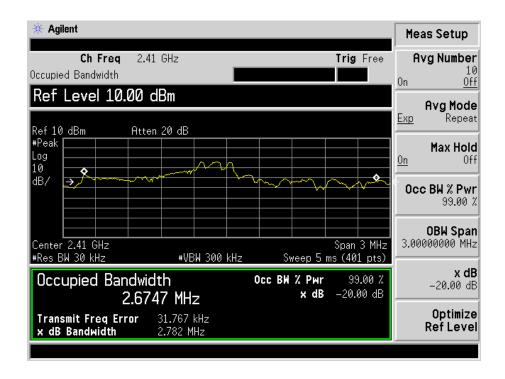
Temperature:	25 °C
Relative Humidity:	53%
ATM Pressure:	1018 mbar

6.5 Summary of Test Results/Plots

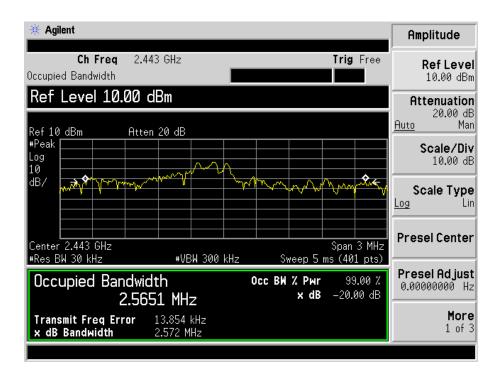
Channel	Frequency (MHz)	20dB Bandwidth (MHz)	99% Bandwidth (MHz)
Lowest Channel	2410	2.782	2.6747
Near Middle Channel	2443	2.572	2.5651
Highest Channel	2475	2.470	2.3836

Please refer to the following test plots

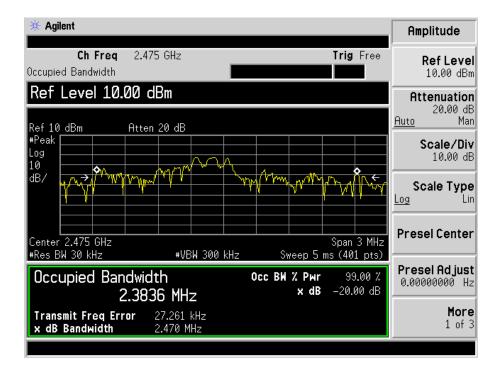
Lowest Channel:



Near Middle Channel:



Highest Channel:



***** END OF REPORT *****