

FCC PART 95 MEASUREMENT AND TEST REPORT

For

Powerwerx, Inc.

23695 Via Del Rio Yorba Linda California 92887, United States

FCC ID: 2ACK8TR505D

Product Type: Report Type: Original Report Two-way radio Rocky Kang **Test Engineer:** Rocky Kang **Report Number:** RSZ150914551-00A **Report Date:** 2015-10-30 Jimmy xiao Jimmy Xiao **Reviewed By:** RF Engineer Bay Area Compliance Laboratories Corp. (Shenzhen) 6/F, the 3rd Phase of WanLi Industrial Building **Test Laboratory:** ShiHua Road, FuTian Free Trade Zone Shenzhen, Guangdong, China Tel: +86-755-33320018 Fax: +86-755-33320008 www.baclcorp.com.cn

Note: This test report is prepared for the customer shown above and for the equipment described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp.

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GENERAL INFORMATION

Product Description for Equipment Under Test (EUT)

The *Powerwerx, Inc.*'s product, model number: *TR-505 (FCC ID: 2ACK8TR505D)* or the "EUT" in this report was a *Two-way radio*, which was measured approximately: 12.5 cm (L) x 5.8cm (W) x 4.5 cm (H), rated input voltage: DC 7.4 V battery.

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* All measurement and test data in this report was gathered from production sample serial number: 1507083 (Assigned by BACL, Shenzhen). The EUT supplied by the applicant was received on 2015-09-14.

Objective

This report is prepared on behalf of *Powerwerx*, *Inc.* in accordance with Part 2 and Part 95, Subpart A & Subpart B & Subpart E of the Federal Communication Commissions rules.

Related Submittal(s)/Grant(s)

FCC Part 95 FRF submission with FCC ID: 2ACK8TR505D.

Test Methodology

All tests and measurements indicated in this document were performed in accordance with Part 95 Subpart A, B and Subpart E of the Federal Communication Commissions rules with TIA-603-D, Land Mobile FM or PM-Communications Equipment-Measurement and Performance Standards.

All emissions measurement was performed and Bay Area Compliance Laboratories Corp. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 6/F, the 3rd Phase of WanLi Industrial Building, ShiHua Road, FuTian Free Trade Zone Shenzhen, Guangdong, China.

Test site at Bay Area Compliance Laboratories Corp. (Shenzhen) has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on October 31, 2013. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.10-2013.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 382179. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

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SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in a typical fashion (as normally used by a typical user).

Equipment Modifications

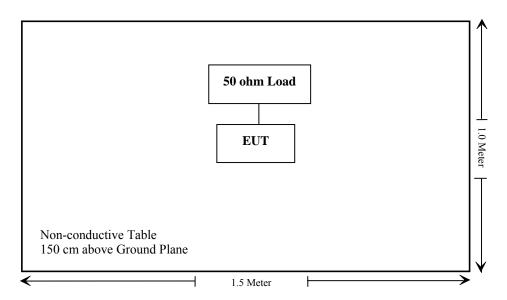
No modification was made to the EUT tested.

Support Equipment List and Details

Manufacturer Description		Model	Serial Number
N/A	50 ohm Load	N/A	N/A

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Block Diagram of Test Setup



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SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Results
§1.1307(b);§2.1093	RF Exposure	Compliance
§2.1046, §95.639(h)	RF Output Power	Compliance
§2.1047, §95.637(a)	Modulation Characteristic	Compliance
\$2.1049, \$95.633(f), \$95.635(e)	Authorized Bandwidth & Emission Mask	Compliance
§2.1053, §95.635(e)	Spurious Radiated Emissions	Compliance
§2.1055(d), §95.632(c)	Frequency Stability	Compliance

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Note: This report ONLY for MURS function

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FCC §1.1307(b) & §2.1093 - RF EXPOSURE

Applicable Standard

According to FCC §1.1307(b) and §2.1093, protable device operates Part 90 should be subjected to rountine environmental evaluation for RF exposure prior or equipment authorization or use.

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Result: Compliance.

Please refer to SAR Report Number: RSZ150914554-20A

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FCC §2.1046, §95.639(h) - RF OUTPUT POWER

Applicable Standard

Per FCC §95.639 (h) No MURS unit, under any condition of modulation, shall exceed 2 Watts transmitter power output.

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Test Procedure

Conducted RF Output Power:

The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.

Spectrum Analyzer Setting:

R B/W Video B/W 100 kHz 300 kHz

Test Equipment List and Details

Manufacturer	Description	Model NO.	Serial NO.	Calibration Date	Calibration Due Date
HP	Signal Generator	8648C	3426A01345	2015-06-09	2016-06-09
HP	Amplifier	8447E	1937A01046	2015-05-06	2016-05-06
Rohde & Schwarz	EMI Test Receiver	ESCI	101122	2014-11-03	2015-11-03
Sunol Sciences	Bi-log Antenna	JB1	A040904-2	2014-12-07	2017-12-06
Com Power	Dipole Antenna	AD-100	041000	2015-08-18	2016-08-18

^{*} Statement of Traceability: Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

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Test Data

Environmental Conditions

Temperature:	24 °C
Relative Humidity:	50 %
ATM Pressure:	100.0 kPa

The testing was performed by Rocky Kang on 2015-10-10.

Test Mode: Transmitting

Frequency	Output Power	Output Power	Limit	Result
(MHz)	(dBm)	(W)	(W)	Result
151.88	32.27	1.69	2	Pass
154.60	32.29	1.69	2	Pass

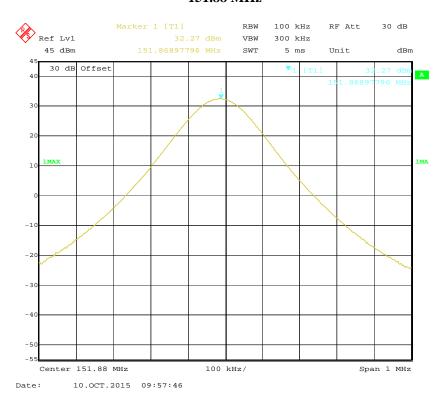
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Note: The rated power is 2W.

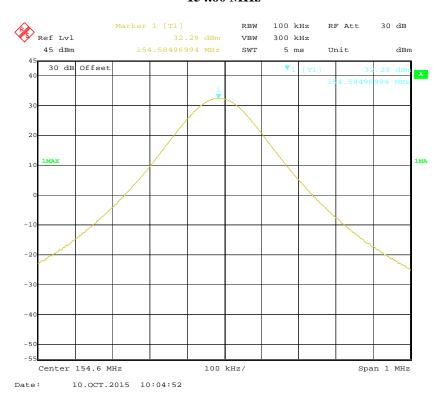
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151.88 MHz

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154.60 MHz



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FCC §2.1047 & §95.637(a) - MODULATION CHARACTERISTIC

Applicable Standard

Per FCC §2.1047 and §95.637(a): A GMRS transmitter that transmits emission type F3E must not exceed a peak frequency deviation of plus or minus 5 kHz. A FRS unit that transmits emission type F3E must not exceed a peak frequency deviation of plus or minus 2.5 kHz, and the audio frequency response must not exceed 3.125 kHz.

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Each GMRS transmitter, except a mobile station transmitter with a power output of $2.5~\mathrm{W}$ or less, must automatically prevent a greater than normal audio level from causing over-modulation. The transmitter also must include audio frequency low pass filtering, unless it complies with the applicable paragraphs of § 95.631 (without filtering.) The filter must be between the modulation limiter and the modulated stage of the transmitter. At any frequency (f in kHz) between 3 and $20~\mathrm{kHz}$, the filter must have an attenuation of at least $60~\mathrm{log}~10$ (f/3) dB greater than the attenuation at $1~\mathrm{kHz}$. Above $20~\mathrm{kHz}$, it must have an attenuation of at least $50~\mathrm{dB}$ greater than the attenuation at $1~\mathrm{kHz}$.

Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Due Date
НР	RF Communication Test Set	HP8920A	3438A05201	2015-06-13	2016-06-13

^{*} Statement of Traceability: Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

Test Procedure

Test Method: TIA/EIA-603-D

Test Data

Environmental Conditions

Temperature:	24 °C
Relative Humidity:	50 %
ATM Pressure:	100.0 kPa

The testing was performed by Rocky Kang on 2015-10-10.

Please refer to the following tables and plots.

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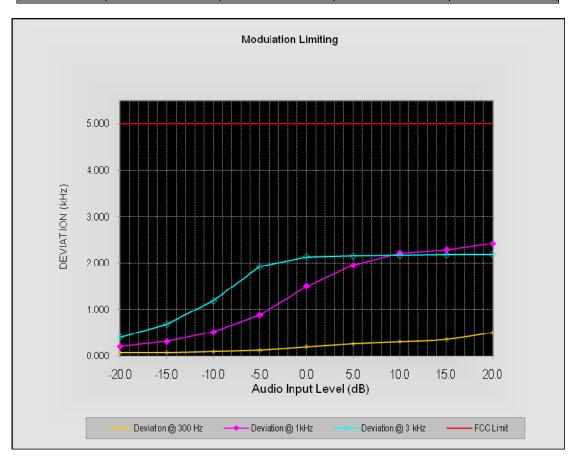
Test Mode: Transmitting

MODULATION LIMITING

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Channel: 151.88 MHz

Audio Input	Frequency Deviation (kHz)			FCC Limit
Level (dB)	(@ 300 Hz)	(@ 1000 Hz)	(@ 3000 Hz)	(kHz)
20.0	0.503	2.424	2.188	5.0
15.0	0.354	2.281	2.177	5.0
10.0	0.310	2.215	2.167	5.0
5.0	0.265	1.955	2.156	5.0
0.0	0.201	1.500	2.133	5.0
-5.0	0.132	0.878	1.927	5.0
-10.0	0.099	0.515	1.185	5.0
-15.0	0.082	0.319	0.682	5.0
-20.0	0.073	0.208	0.402	5.0



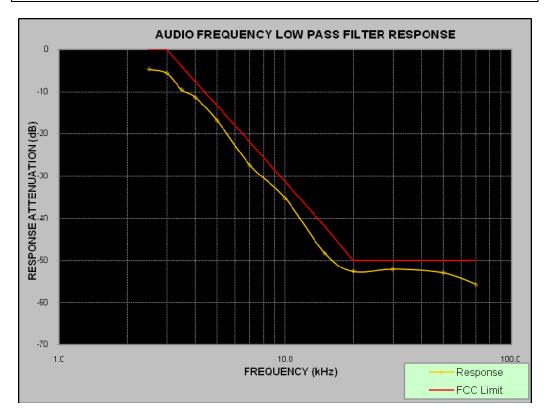
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Audio frequency Low Pass Filter Response

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Channel: 151.88 MHz

Audio Frequency (kHz)	Response Attenuation (dB)	FCC Limit (dB)
2.5	-4.65	0.0
3.0	-5.54	0.0
3.5	-9.53	-4.0
4.0	-11.26	-7.5
5.0	-16.79	-13.3
7.0	-27.45	-22.1
10.0	-35.21	-31.4
15.0	-48.34	-42.0
20.0	-52.64	-50.0
30.0	-52.12	-50.0
50.0	-52.96	-50.0
70.0	-55.66	-50.0



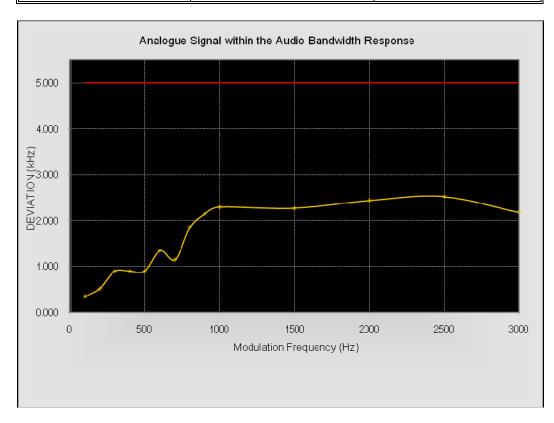
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Analog Signal within the Audio Bandwidth Response

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Channel: 151.88 MHz

Modulation Frequency (kHz)	Maximum Deviation (kHz)	Limit (kHz)
100	0.341	5.000
200.0	0.514	5.000
300.0	0.891	5.000
400.0	0.893	5.000
500.0	0.895	5.000
600.0	1.339	5.000
700.0	1.146	5.000
800.0	1.851	5.000
900.0	2.141	5.000
1000.0	2.289	5.000
1500.0	2.263	5.000
2000.0	2.432	5.000



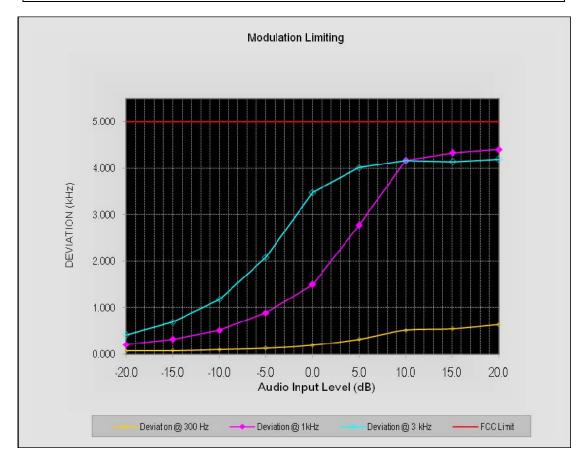
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MODULATION LIMITING

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Channel: 154.60 MHz

Audio Input	Frequency Deviation (kHz)			FCC Limit
Level (dB)	(@ 300 Hz)	(@ 1000 Hz)	(@ 3000 Hz)	(kHz)
20.0	0.635	4.408	4.197	5.0
15.0	0.553	4.328	4.143	5.0
10.0	0.516	4.172	4.165	5.0
5.0	0.326	2.773	4.019	5.0
0.0	0.193	1.500	3.482	5.0
-5.0	0.135	0.893	2.083	5.0
-10.0	0.102	0.518	1.184	5.0
-15.0	0.083	0.321	0.695	5.0
-20.0	0.072	0.209	0.417	5.0



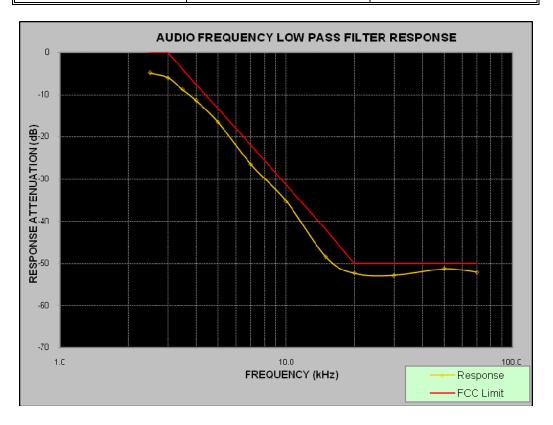
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Audio frequency Low Pass Filter Response

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Channel: 154.60 MHz

Audio Frequency (kHz)	Response Attenuation (dB)	FCC Limit (dB)
2.5	-4.83	0.0
3.0	-5.94	0.0
3.5	-8.79	-4.0
4.0	-11.34	-7.5
5.0	-16.48	-13.3
7.0	-26.58	-22.1
10.0	-35.28	-31.4
15.0	-48.47	-42.0
20.0	-52.34	-50.0
30.0	-52.84	-50.0
50.0	-51.31	-50.0
70.0	-52.14	-50.0



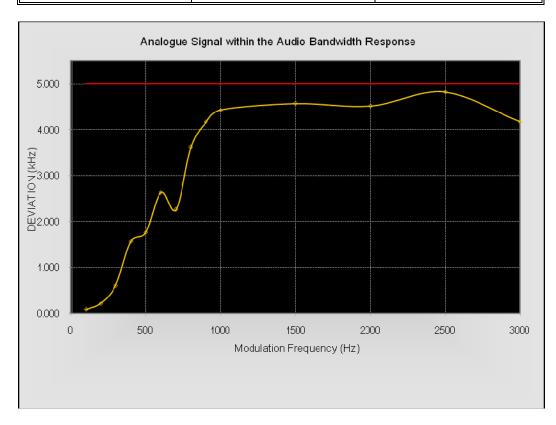
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Analog Signal within the Audio Bandwidth Response

Report No.: RSZ150914551-00A

Channel: 154.60 MHz

Modulation Frequency (kHz)	Maximum Deviation (kHz)	Limit (kHz)
100.0	0.085	5.000
200.0	0.215	5.000
300.0	0.604	5.000
400.0	1.567	5.000
500.0	1.756	5.000
600.0	2.634	5.000
700.0	2.256	5.000
800.0	3.616	5.000
900.0	4.163	5.000
1000.0	4.426	5.000
1500.0	4.568	5.000
2000.0	4.516	5.000



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FCC §2.1049 & §95.633(f) & §95.635(e)- AUTHOURIZED BANDWIDTH AND EMISSION MASK

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Applicable Standard

According to §95.633(f), the authorized bandwidth for any emission type transmitted by a MURS transmitter is specified as follows:

- (1) Emissions on frequencies 151.820 MHz, 151.880 MHz, and 151.940 MHz are limited to 11.25 kHz.
- (2) Emissions on frequencies 154.570 and 154.600 MHz are limited to 20.0 kHz.
- (3) Provided, however, that all A3E emissions are limited to 8 kHz.

According to §95.635(e), for transmitters designed to operate in the MURS, transmitters shall comply with the following:

Frequency	Mask with audio low pass filter	Mask without audio low pass filter
151.820 MHz, 151.880 MHz and 151.940 MHz	(1)	(1)
154.570 MHz and 154.600 MHz	(2)	(3)

- (1) Emission Mask 1—For transmitters designed to operate with a 12.5 kHz channel bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:
- (i) On any frequency from the center of the authorized bandwidth f_o to 5.625 kHz removed from f_o : Zero dB.
- (ii) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5.625 kHz but no more than 12.5 kHz: at least 7.27(f_d –2.88 kHz) dB.
- (iii) On any frequency removed from the center of the authorized bandwidth by a displacement frequency $(f_d \text{ in kHz})$ of more than 12.5 kHz: at least $50 + 10 \log (P) dB$ or 70 dB, whichever is the lesser attenuation.
- (2) Emission Mask 2—For transmitters designed to operate with a 25 kHz channel bandwidth that are equipped with an audio low-pass filter, the power of any emission must be below the unmodulated carrier power (P) as follows:
- (i) On any frequency removed from the assigned frequency by more than 50 percent, but not more than 100 percent of the authorized bandwidth: at least 25 dB.
- (ii) On any frequency removed from the assigned frequency by more than 100 percent, but not more than 250 percent of the authorized bandwidth: at least 35 dB.
- (iii) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: at least 43 + 10 log (P) dB.

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(3) Emission Mask 3—For transmitters designed to operate with a 25 kHz channel bandwidth that are not equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier output power (P) as follows:

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- (i) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5 kHz, but not more than 10 kHz: at least 83 log (f_d/5) dB.
- (ii) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 10 kHz, but not more than 250 percent of the authorized bandwidth: at least 29 log (f_d 2 /11) dB or 50 dB, whichever is the lesser attenuation.
- (iii) On any frequency removed from the center of the authorized bandwidth by more than 250 percent of the authorized bandwidth: at least $43 + 10 \log (P) dB$.

Test Procedure

TIA-603-D, section 2.2.11

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
НР	RF Communication Test Set	HP8920A	3438A05201	2015-06-13	2016-06-13
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2015-12-11	2015-12-11

^{*} Statement of Traceability: Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	24 ℃
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

The testing was performed by Rocky Kang on 2015-10-10.

Test Mode: Transmitting

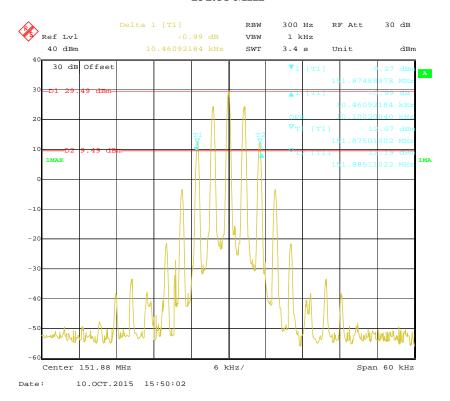
Frequency (MHz)	20dB Bandwidth (kHz)	Limit (kHz)	Result
151.88	10.46	11.25	Pass
154.60	15.75	20.00	Pass

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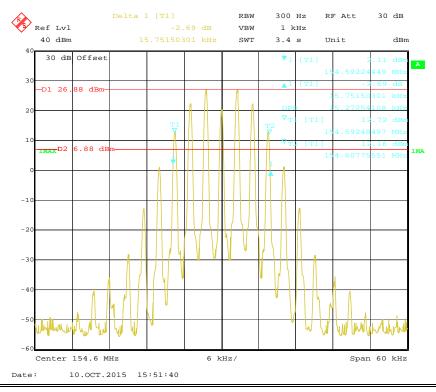
99% Occupied Bandwidth & 20 dB Emissions Bandwidth:

151.88 MHz

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154.60 MHz

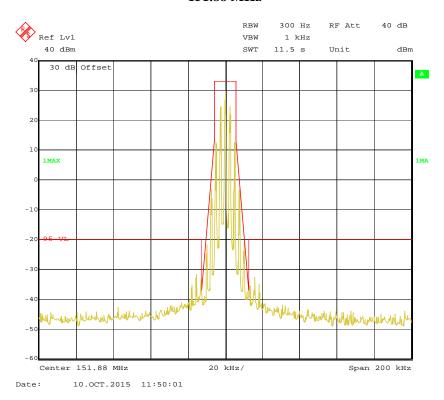


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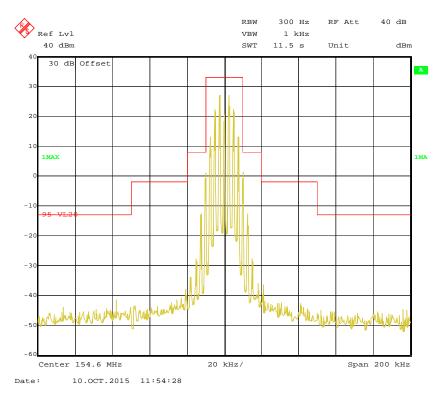
Emission Mask:

151.88 MHz

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154.60 MHz



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FCC §2.1053 & §95.635(e) - RADIATED SPURIOUS EMISSION

Applicable Standard

FCC §2.1053 and §95.635

Test Procedure

The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load, which was also placed on the turntable.

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The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.

The frequency range up to tenth harmonic of the fundamental frequency was investigated.

Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Spurious emissions in dB =10 1g (TXpwr in Watts/0.001)-the absolute level For 151.820 MHz, 151.880 MHz and 151.940 MHz: Spurious attenuation limit in dB = $50+10 \text{ Log}_{10}$ (power out in Watts) For 154.570 MHz and 154.600 MHz: Spurious attenuation limit in dB = $43+10 \text{ Log}_{10}$ (power out in Watts)

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
HP	Amplifier	8447E	1937A01046	2015-05-06	2016-05-05
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2014-11-03	2015-11-03
Sunol Sciences	Bi-log Antenna	JB1	A040904-2	2014-12-07	2017-12-06
Mini	Amplifier	ZVA-183-S+	5969001149	2015-04-23	2016-04-22
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2014-12-11	2015-12-11
A.H. System	Horn Antenna	SAS-200/571	135	2015-02-10	2016-02-10

^{*} Statement of Traceability: Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

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Test Data

Environmental Conditions

Temperature:	24 ℃
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

The testing was performed by Rocky Kang on 2015-10-10.

Test Mode: Transmitting

Channel: 151.88MHz

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Indicat	ed	Table	Test A	est Antenna		Substituted				
Frequency (MHz)	Receiver Reading (dBuV)	Angle Degree	Height (m)	Polar (H/V)	Level (dBm)	Antenna Gain	Cable Loss (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
303.76	45.78	8	1.0	Н	-49.2	0	0.36	-49.56	-20	29.56
303.76	50.95	291	2.2	V	-44.1	0	0.36	-44.46	-20	24.46
455.64	36.78	150	2.2	Н	-60.2	0	0.47	-60.67	-20	40.67
455.64	48.96	267	1.5	V	-48.0	0	0.47	-48.47	-20	28.47
607.52	46.65	43	1.2	Н	-50.4	0	0.57	-50.97	-20	30.97
607.52	56.89	205	1.1	V	-40.1	0	0.57	-40.67	-20	20.67
1063.16	43.31	181	1.2	Н	-53.6	6.10	1.50	-49.00	-20	29.00
1063.16	44.75	359	2.3	V	-53.6	6.10	1.50	-49.00	-20	29.00

Channel: 154.60 MHz

Indicat	ed	Table	Test A	Test Antenna		Substituted				
Frequency (MHz)	Receiver Reading (dBuV)	Angle Degree	Height (m)	Polar (H/V)	Level (dBm)	Antenna Gain	Cable Loss (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
309.20	45.47	154	1.4	Н	-49.5	0	0.36	-49.86	-13	36.86
309.20	46.71	268	1.2	V	-48.3	0	0.36	-48.66	-13	35.66
463.80	45.38	92	1.1	Н	-51.6	0	0.47	-52.07	-13	39.07
463.80	58.91	161	2.3	V	-38.1	0	0.47	-38.57	-13	25.57
618.40	64.18	147	2.0	Н	-32.8	0	0.57	-33.37	-13	20.37
618.40	72.35	55	1.9	V	-24.7	0	0.57	-25.27	-13	12.27
1082.20	45.12	278	1.4	Н	-51.8	6.10	1.50	-47.20	-13	34.20
1082.20	46.79	126	2.5	V	-51.5	6.10	1.50	-46.90	-13	33.90

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FCC§2.1055 (d), §95.632(c) - FREQUENCY STABILITY

Applicable Standard

According to FCC §2.1055(a) (1), the frequency stability shall be measured with variation of ambient temperature from –30 °C to +50 °C, and according to FCC 2.1055(d) (2), the frequency stability shall be measured with reducing primary supply voltage to the battery operating end point which is specified by the manufacturer.

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According to FCC §95.632(c), MURS transmitters must maintain a frequency stability of 5.0 ppm, or 2.0 ppm if designed to operate with a 6.25 kHz bandwidth.

Test Procedure

Frequency Stability vs. Temperature: The equipment under test was connected to an external DC power supply and the RF output was connected to a Frequency Counter via feed-through attenuators. The EUT was placed inside the temperature chamber. The DC leads and RF output cable exited the chamber through an opening made for the purpose.

After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from the Frequency Counter.

Frequency Stability vs. Voltage:

- 1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.
- (2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating end point which shall be specified by the manufacturer.

The output frequency was recorded for each voltage.

Test Equipment List and Details

Manufacturer	Description Model NO. Serial NO		Serial NO.	Calibration Date	Calibration Due Date
Hewlett-Packard	Frequency Counter	5343A	2232A00827	2013-05-09	2016-05-08
WUHUAN	Temperature & Humidity Chamber	HTP205	20021115	NCR	NCR

^{*} Statement of Traceability: Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

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Test Data

Environmental Conditions

Temperature:	24℃
Relative Humidity:	52%
ATM Pressure:	101.0 kPa

The testing was performed by Rocky Kang on 2015-10-10.

Test Mode: Transmitting

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Reference Frequency: 151.88 MHz, Limit: ±5 ppm				
Environment Temperature (°C)	Power Supplied (V _{DC})	Measurement Frequency (MHz)	Frequency Error (ppm)	
Frequency Stability Ver. Temperature				
50	7.4	151.880037	0.244	
40	7.4	151.880031	0.204	
30	7.4	151.880039	0.257	
20	7.4	151.880035	0.230	
10	7.4	151.880036	0.237	
0	7.4	151.880039	0.257	
-10	7.4	151.880030	0.198	
-20	7.4	151.880034	0.224	
-25	7.4	151.880032	0.211	
Frequency Stability Ver. Input Voltage				
20	6.4	151.880031	0.204	

MURS

Reference Frequency: 154.60 MHz, Limit: ±5 ppm				
Environment Temperature (°C)	Power Supplied (V _{DC})	Measurement Frequency (MHz)	Frequency Error (ppm)	
Frequency Stability Ver. Temperature				
50	7.4	154.600039	0.252	
40	7.4	154.600034	0.220	
30	7.4	154.600032	0.207	
20	7.4	154.600036	0.233	
10	7.4	154.600033	0.213	
0	7.4	154.600032	0.207	
-10	7.4	154.600035	0.226	
-20	7.4	154.600037	0.239	
-25	7.4	154.600034	0.220	
Frequency Stability Ver. Input Voltage				
20	6.4	154.600037	0.239	

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

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