

FCC PART 73

TEST REPORT

For

TAW~Global, LLC

8135 COX'S DR, SUITE 211. PORTAGE, Michigan, United States, 49002.

FCC ID:XOASRC-LPFM1

Report Type: Original Report	Product Type: Source LPFM Transmitter 1.2W
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Report Number: RSZ150106015-00	
Report Date: 2015-08-27	
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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 TAW~Global, LLC's product, model number: SRC-LPFM1(FCC ID: XOASRC-LPFM1) or the "EUT" in this report was a Source LPFM Transmitter 1.2W, which was measured approximately: 14.2 cm (L) × 12.0 cm (W) × 5.5 cm (H), rated with input voltage: 120V/60Hz.

** All measurement and test data in this report was gathered from production sample serial number: 1501072 (Assigned by BACL, Shenzhen). The EUT supplied by the applicant was received on 2015-01-06.*

Objective

This test report is prepared on behalf of TAW~Global, LLC in accordance with Part 2 and Part 73 of the Federal Communication Commissions rules.

Related Submittal(s)/Grant(s)

No related submittal(s)

Test Methodology

All tests and measurements indicated in this document were performed in accordance with the Code of federal Regulations Title 47 Part 2, subpart J and Part 73-Radio Broadcast Services

Applicable Standards: TIA 603-D and ANSI 63.4-2009.

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.

Measurement uncertainty with radiated emission is 5.91 dB for 30MHz-1GHz.and 4.92 dB for above 1GHz, 1.95dB for conducted measurement.

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 December 06, 2010. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2009.

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.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in a test mode which has been done in the factory.

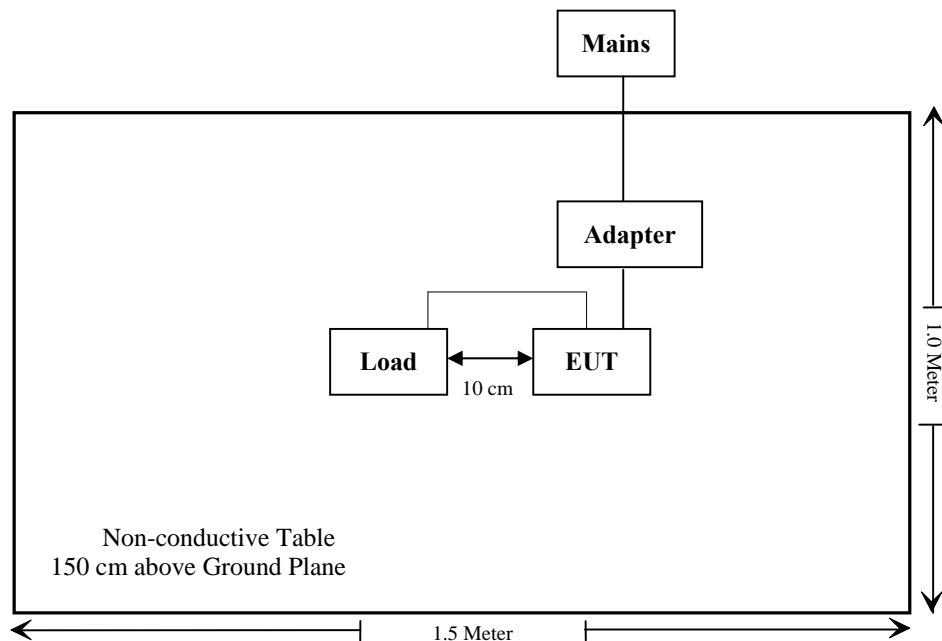
Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
N/A	100W 50 Ω Load	N/A	N/A

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Results
§1.1307 (b)(1), §2.1091	Maximum Permissible Exposure (MPE)	Compliance
§2.1046; §73.211; §73.267; §73.840	Operating Power	Compliance
§2.1047; §73.801; §73.1570	Modulation Characteristics	Compliance
§2.1049; §73.317	Occupied Bandwidth Emission	Compliance
§2.1051; §73.317(d)	Spurious Emission at Antenna Terminal	Compliance
§2.1053; §73.317	Spurious Radiated Emissions	Compliance
§2.1055; §73.1545	Carrier Frequency Departure Tolerances	Compliance

FCC§1.1307 (b) (1) & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 1.1307 (b)(1), 2.1091 systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to RF energy level in excess of the communication guidelines.

FCC Limits for Maximum Permissible Exposure (MPE)

Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Time E ² , H ² or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f ²)*	30
30-300	27.5	0.073	0.2	30
300-1500	--	--	f/1500	30
1500-100,000	--	--	1.0	30

*f = frequency in MHz

*Plane-wave equivalent power density

Result

Calculated Formulary:

Predication of MPE limit at a given distance

$$S = \frac{PG}{4\pi R^2}$$

S = power density (in appropriate units, e.g. mW/cm²)

P = power input to the antenna (in appropriate units, e.g., mW).

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain.

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

Frequency (MHz)	Antenna Gain		Conducted Power (mW)	The Minimum Distance (cm)	Calculated RF Exposure (mW/cm ²)	MPE Limit (mW/cm ²)
	(dBi)	(numeric)				
88.1	0	1	1225	30	0.108	0.2

Note: The Maximum power is 1.225 W

To maintain compliance with the FCC's RF exposure guidelines, place the equipment at least 30cm from nearby persons.

Result: Compliance

FCC §2.1046 & §73.211 & §73.267 and §73.840 - OPERATING POWER**Applicable Standard**

FCC §2.1046, §73.211, §73.267 and §73.840

The transmitter power output (TPO) of an LPFM station must be determined by the procedures set forth in §73.267 of this part. The operating TPO of an LPFM station with an authorized TPO of more than ten watts must be maintained as near as practicable to its authorized TPO and may not be less than 90% of the minimum TPO nor greater than 105% of the maximum authorized TPO. An LPFM station with an authorized TPO of ten watts or less may operate with less than the authorized power, but not more than 105% of the authorized power.

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	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	837405/023	2015-04-27	2016-04-26
HP Agilent	RF Communication test set	8920A	3325U00859	2015-06-03	2016-06-02

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

Test Data**Environmental Conditions**

Temperature:	26 °C
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

The testing was performed by Candy Li on 2015-08-27

Test Mode: Transmitting

Test Result: Compliance. Please refer to following table.

Frequency	Output Power (dBm)	Output Power (W)	Manufacturer's Rate Power (W)
88.1	30.86	1.219	1.200
98.1	30.88	1.225	
107.9	30.82	1.208	

FCC §2.1047 & §73.801 & §73.1570- MODULATION CHARACTERISTICS**Applicable Standard**

FCC §2.1047, §73.801 and §73.1570

(b) Maximum modulation levels must meet the following limitations:

(2) FM stations. The total modulation must not exceed 100 percent on peaks of frequent reoccurrence referenced to 75 kHz deviation. However, stations providing subsidiary communications services using subcarriers under provisions of §73.319 concurrently with the broadcasting of stereophonic or monophonic programs may increase the peak modulation deviation as follows:

(i) The total peak modulation may be increased 0.5 percent for each 1.0 percent subcarrier injection modulation.

(ii) In no event may the modulation of the carrier exceed 110 percent (82.5 kHz peak deviation).

Test Procedure

A 400 Hz sinusoidal signal from an audio oscillator is applied to the audio input at a level for 100%, 50%, and 25% modulation. With pre-emphasis on, apply sample from the output to the input of a modulation monitor. The audio oscillator's output level at 400 Hz is adjusted to achieve a ± 75 kHz deviation (level is recorded and used as reference). The audio oscillator level is adjusted at 50, 100, 200, 400, 1000, 2500, 5000, 7500, 10000, 12500, and 15000 Hz to retain the ± 75 kHz deviation and the change in audio oscillator level compared to the reference is recorded. Tests completed on two separate frequencies, each near the band edges.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
HP Agilent	RF Communication test set	8920A	3325U00859	2015-06-03	2016-06-02

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

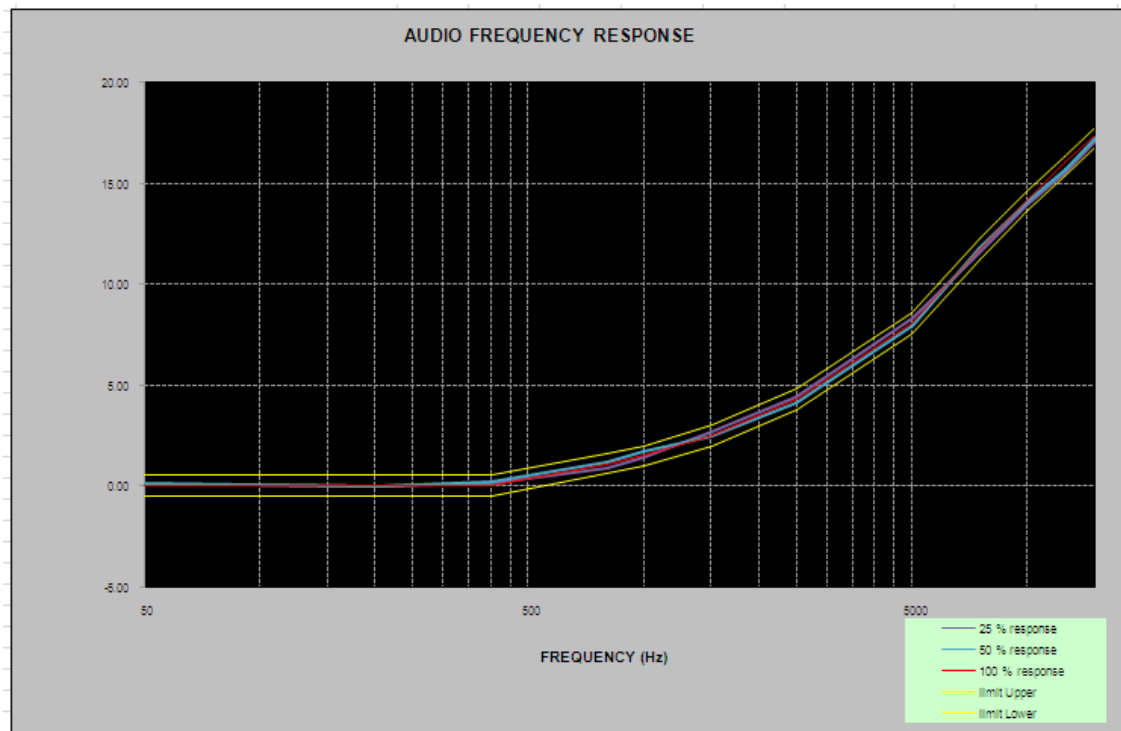
Test Data**Environmental Conditions**

Temperature:	25 °C
Relative Humidity:	47 %
ATM Pressure:	100.5 kPa

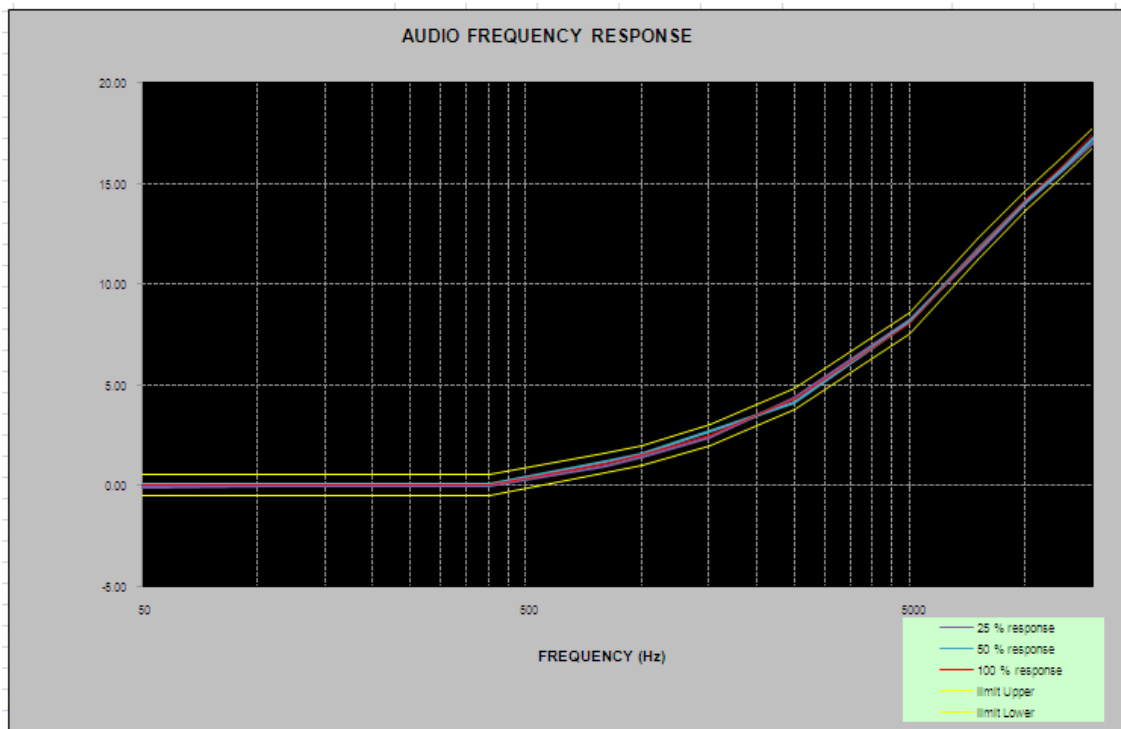
The testing was performed by Candy Li on 2015-08-27

Result: Please refer to the following plots.

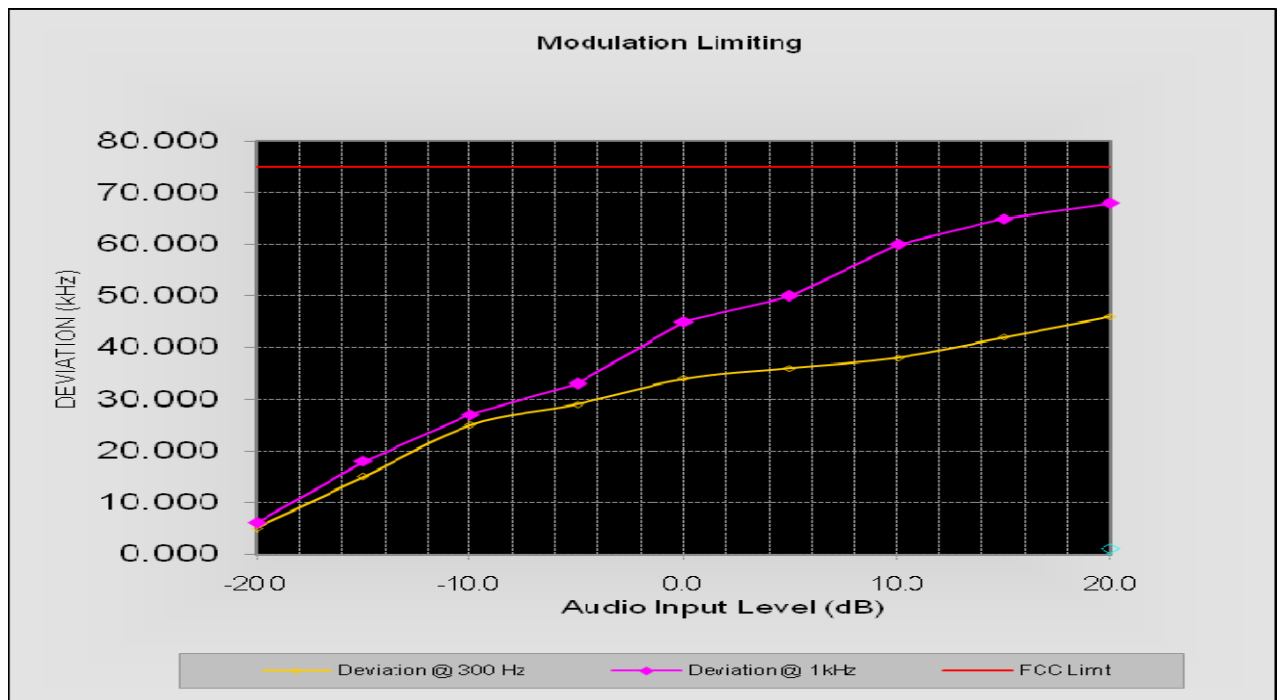
Audio Frequency Response with 88.1MHz Carrier (25, 50, 100% Modulation)



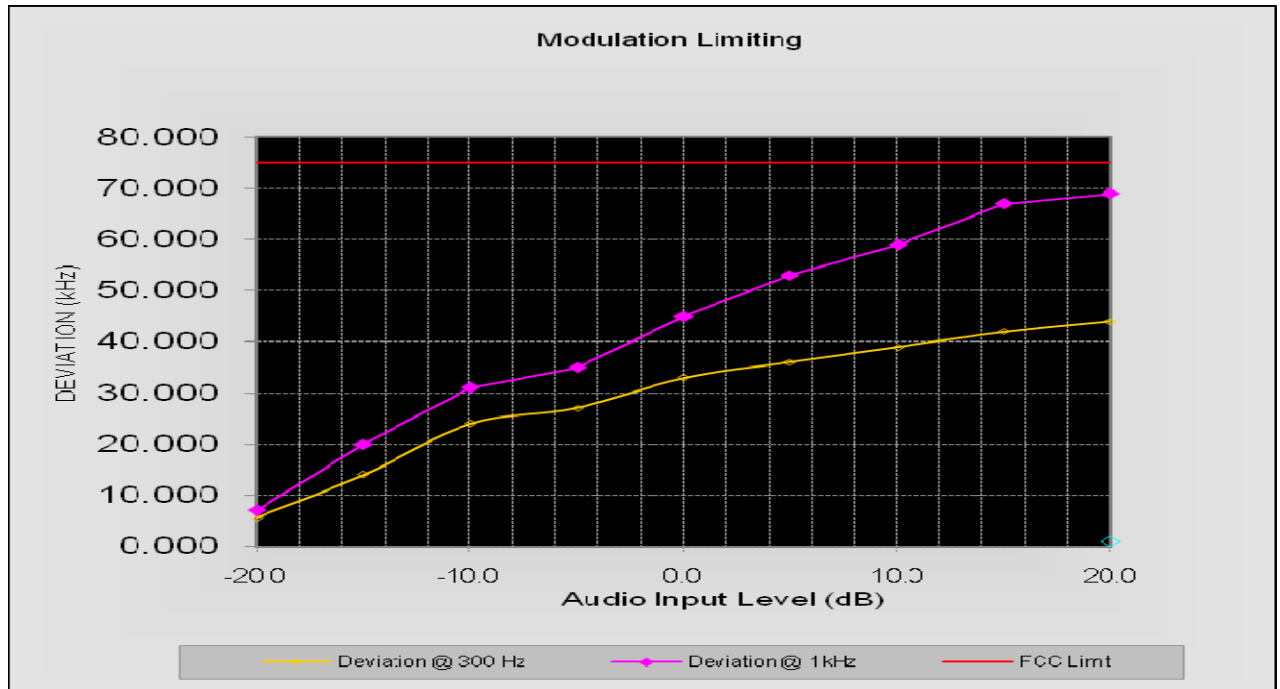
Audio Frequency Response with 107.9 MHz Carrier (25, 50, 100% Modulation)



Maximum Deviation-with 88.1MHz



Maximum Deviation-with 107.9MHz



FCC §2.1049 & §73.317 – OCCUPIED BANDWIDTH EMISSIONS**Applicable Standard**

FCC §2.1049, §73.317

(b) Any emission appearing on a frequency removed from the carrier by between 120 kHz and 240 kHz inclusive must be attenuated at least 25 dB below the level of the unmodulated carrier. Compliance with this requirement will be deemed to show the occupied bandwidth to be 240 kHz or less.

(c) Any emission appearing on a frequency removed from the carrier by more than 240 kHz and up to and including 600 kHz must be attenuated at least 35 dB below the level of the unmodulated carrier.

(d) Any emission appearing on a frequency removed from the carrier by more than 600 kHz must be attenuated at least $43 + 10 \log_{10}(\text{Power, in watts})$ dB below the level of the unmodulated carrier, or 80 dB, whichever is the lesser attenuation.

Test Procedure

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

The resolution bandwidth of the spectrum analyzer was set at 2 kHz.

Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	837405/023	2015-04-27	2016-04-26
HP	RF Communication Test Set	8920A	3438A05201	2015-06-14	2016-06-13

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

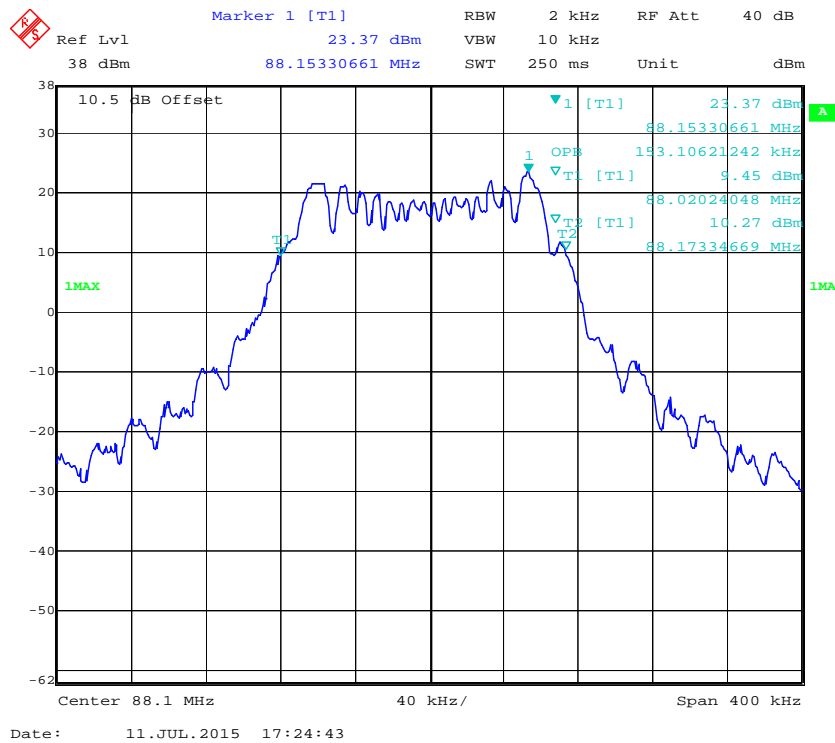
Test Data**Environmental Conditions**

Temperature:	25 °C
Relative Humidity:	47 %
ATM Pressure:	100.5 kPa

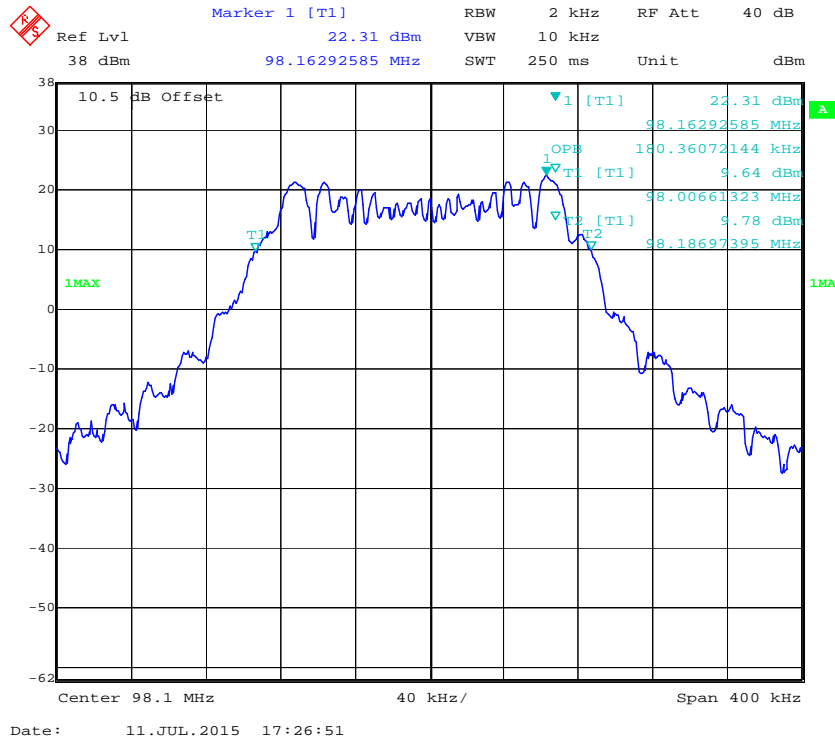
The testing was performed by Candy Li on 2015-07-11

Test Mode: Transmitting

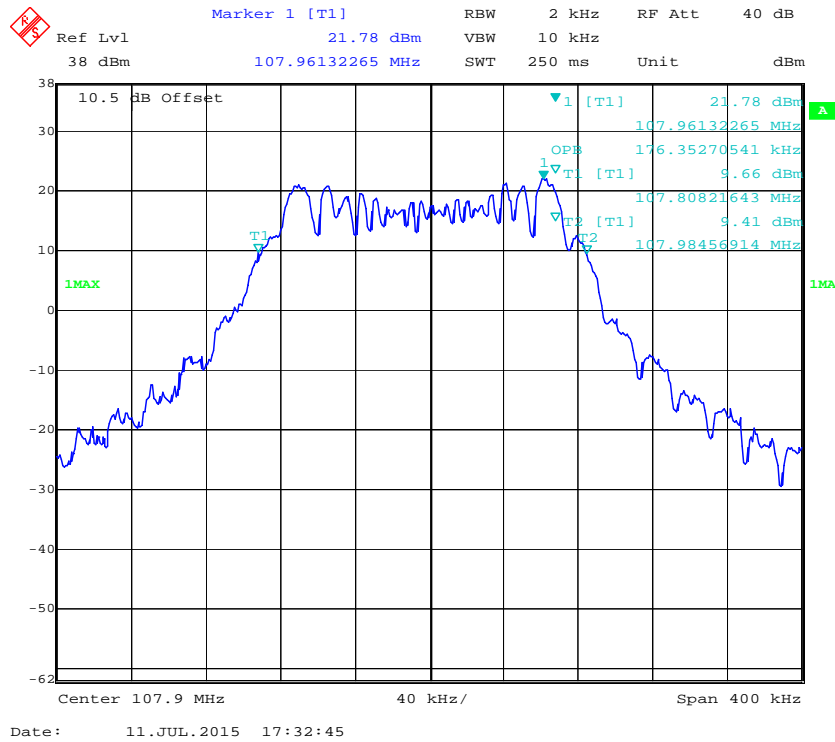
Mode	Frequency (MHz)	99% Occupied Bandwidth (kHz)
FM	88.1	153.11
FM	98.1	180.36
FM	107.9	176.35

88.1 MHz, Occupied Bandwidth

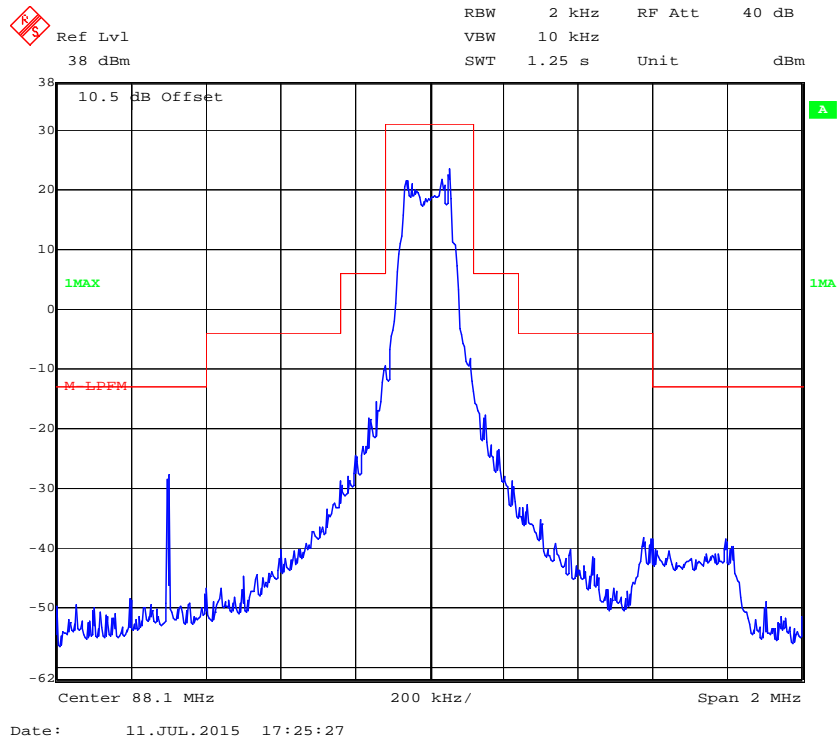
98.1 MHz, Occupied Bandwidth



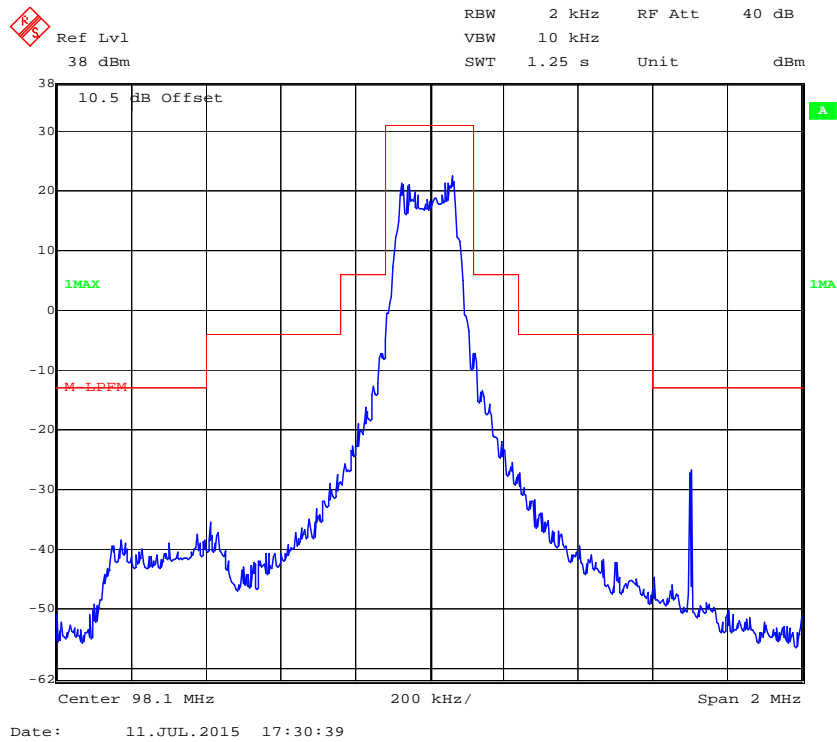
107.9 MHz, Occupied Bandwidth



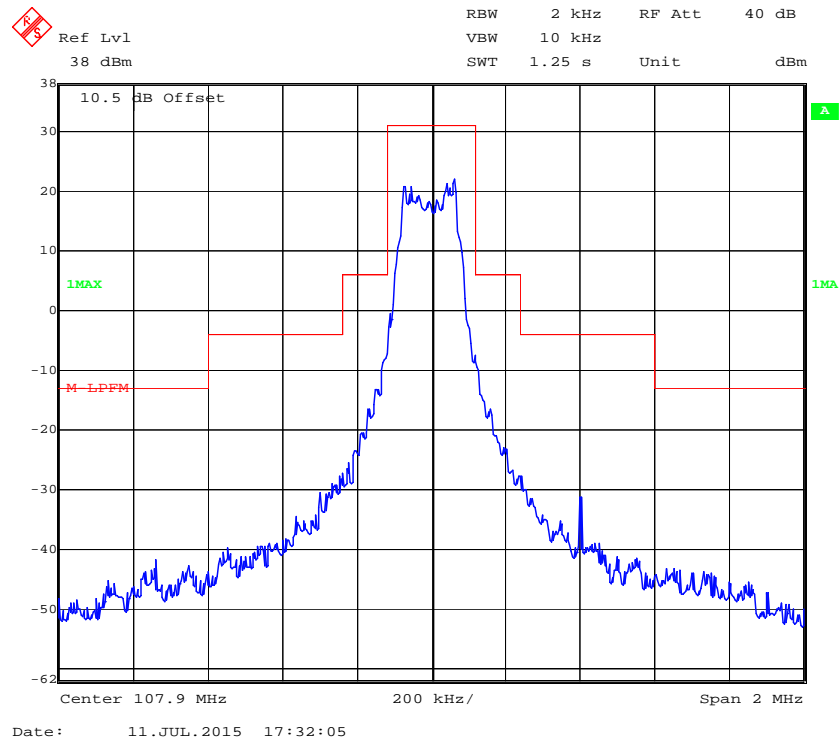
88.1 MHz, Emission Mask



98.1 MHz, Emission Mask



107.9 MHz, Emission Mask



FCC §2.1051 & §73.317 (d) - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Applicable Standard

FCC §2.1051 & §73.317 (d)-Any emission appearing on a frequency removed from the carrier by more than 600 kHz must be attenuated at least $43 + 10 \log_{10}$ (Power, in watts) dB below the level of the unmodulated carrier, or 80 dB, whichever is the lesser attenuation.

Test Procedure

The RF output of the EUT was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 100 kHz for below 1GHz, and 1MHz for above 1GHz. sufficient scans were taken to show any out of band emissions up to 10th harmonic.

Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	837405/023	2015-04-27	2016-04-26

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

Test Data

Environmental Conditions

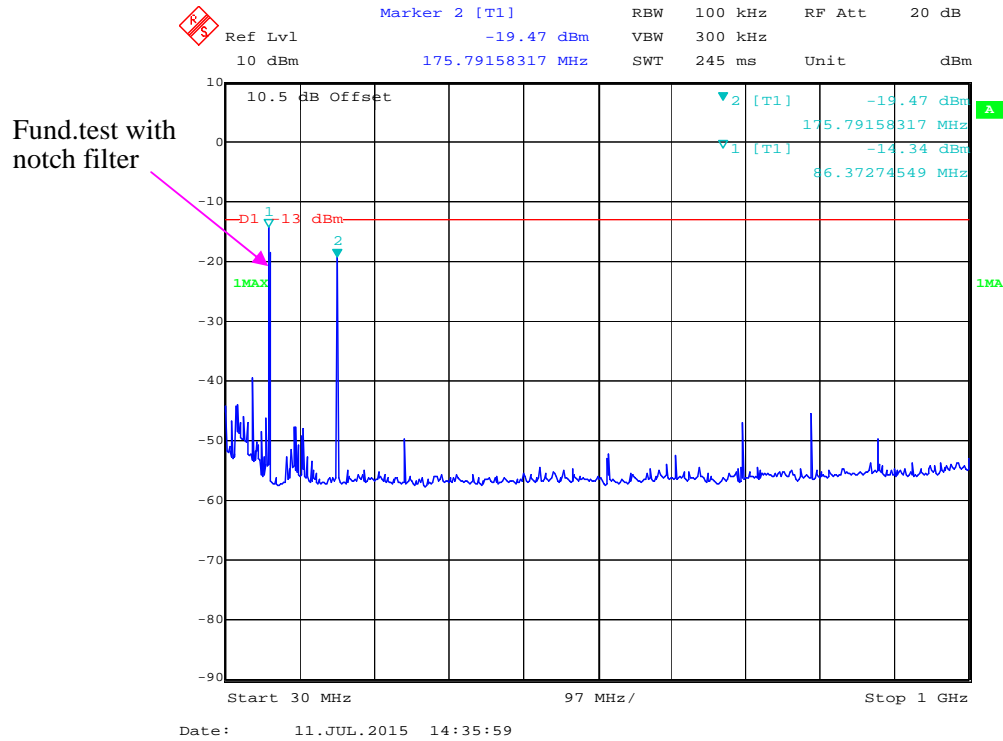
Temperature:	26 °C
Relative Humidity:	47 %
ATM Pressure:	100.5 kPa

The testing was performed by Candy Li on 2015-07-11

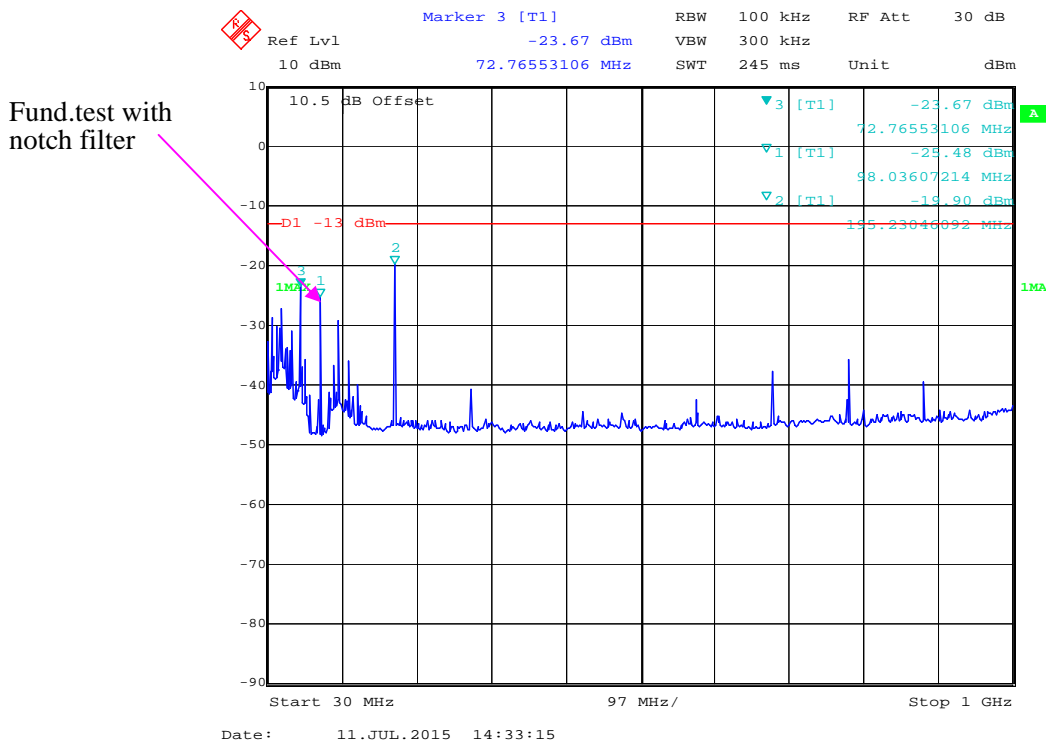
Test Mode: Transmitting

Please refer to the following plots.

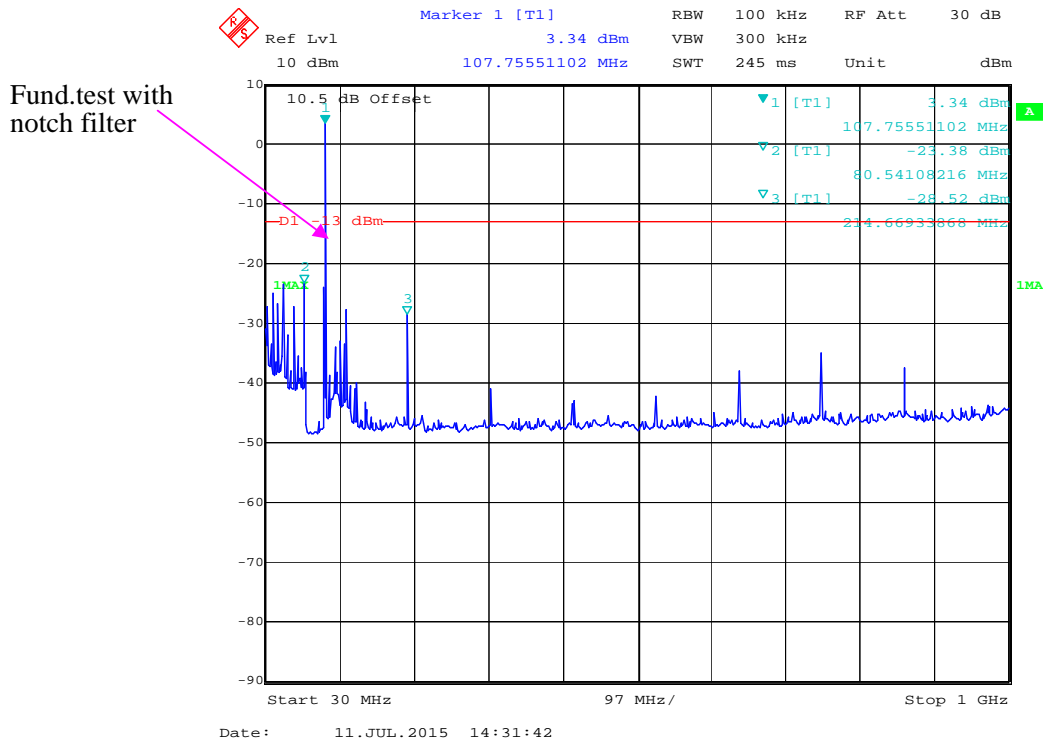
30 MHz – 1 GHz for Low Channel 88.1 MHz



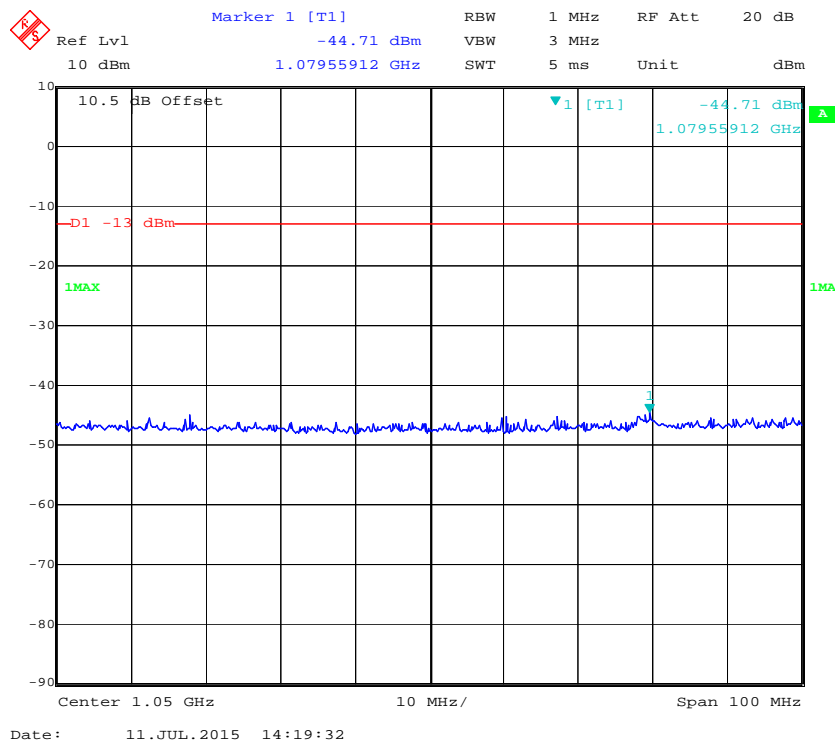
30 MHz – 1 GHz for Middle Channel 98.1 MHz



30 MHz – 1 GHz for High Channel 107.9 MHz



1- 1.1 GHz for High Channel 107.9 MHz



FCC §2.1053 & §73.317 - RADIATED SPURIOUS EMISSIONS

Applicable Standard

FCC §2.1053 and §73.317

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.

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 teeth 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 lg (TXpwr in Watts/0.001)-the absolute level

Spurious attenuation limit in dB = 43 + 10 Log₁₀ (power out in Watts).

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2014-11-03	2015-11-03
HP	Amplifier	8447E	1937A01046	2015-05-06	2016-05-06
Sunol Sciences	Broadband Antenna	JB3	A111513	2014-06-18	2017-06-17
Rohde & Schwarz	Signal Analyzer	FSIQ26	837405/023	2014-08-22	2015-08-22
Sunol Sciences	Horn Antenna	DRH-118	A052304	2013-12-01	2016-11-30
HP	Synthesized Sweeper	8341B	2624A00116	2015-06-03	2016-06-03
Mini-Circuits	Amplifier	ZVA-183-S+	5969001149	2015-04-23	2016-04-23
A.H. System	Horn Antenna	SAS-200/571	135	2015-02-11	2018-02-10
COM POWER	Dipole Antenna	AD-100	041000	NCR	NCR

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

Test Data**Environmental Conditions**

Temperature:	27 °C
Relative Humidity:	45 %
ATM Pressure:	101.0 kPa

The testing was performed by Candy Li on 2015-07-10

Test Mode: Transmitting

Frequency (MHz)	Receiver Reading (dBμV)	Turntable Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	FCC Part 73	
			Height (m)	Polar (H/V)	SG Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)		Limit (dBm)	Margin (dB)
Low Channel 88.1 MHz										
528.60	50.23	304	1.2	H	-46.8	0.51	0	-47.31	-13	34.31
528.60	43.16	316	2.1	V	-53.8	0.51	0	-54.31	-13	41.31
704.80	55.96	88	1.8	H	-41.0	0.62	0	-41.62	-13	28.62
704.80	45.12	330	1.2	V	-51.9	0.62	0	-52.52	-13	39.52
792.90	55.94	343	1.1	H	-41.1	0.65	0	-41.75	-13	28.75
792.90	53.37	351	1.6	V	-43.6	0.65	0	-44.25	-13	31.25
881.00	59.18	79	1.8	H	-41.1	0.70	0	-41.80	-13	28.80
881.00	54.68	347	1.3	V	-43.6	0.70	0	-44.30	-13	31.30
Middle Channel 98.1 MHz										
294.30	48.96	194	1.6	H	-48.0	0.34	0	-48.34	-13	35.34
294.30	44.51	236	1.3	V	-52.5	0.34	0	-52.84	-13	39.84
686.70	60.78	303	1.7	H	-36.2	0.59	0	-36.79	-13	23.79
686.70	53.46	115	2.0	V	-43.5	0.59	0	-44.09	-13	31.09
784.80	55.67	147	1.8	H	-41.3	0.65	0	-41.95	-13	28.95
784.80	54.01	214	1.5	V	-43.0	0.65	0	-43.65	-13	30.65
882.90	61.02	305	2.0	H	-36.0	0.70	0	-36.70	-13	23.70
882.90	55.37	78	1.8	V	-41.6	0.70	0	-42.30	-13	29.30
High Channel 107.9 MHz										
323.70	52.33	312	1.9	H	-44.7	0.36	0	-45.06	-13	32.06
323.70	45.89	144	1.3	V	-51.1	0.36	0	-51.46	-13	38.46
647.40	66.27	351	1.4	H	-30.7	0.57	0	-31.27	-13	18.27
647.40	62.76	327	1.5	V	-34.2	0.57	0	-34.77	-13	21.77
755.30	55.94	199	1.8	H	-41.1	0.65	0	-41.75	-13	28.75
755.30	50.07	297	2.1	V	-46.9	0.65	0	-47.55	-13	34.55
863.20	60.55	306	2.3	H	-36.4	0.70	0	-37.10	-13	24.10
863.20	55.40	249	1.6	V	-41.6	0.70	0	-42.30	-13	29.30
1079.00	43.17	259	1.8	H	-57.4	1.50	6.10	-52.80	-13	39.80
1079.00	39.88	192	2.2	V	-61.8	1.50	6.10	-57.20	-13	44.20

Note: Absolute Level = SG Level - Cable loss + Antenna Gain; Margin = Limit - Absolute Level

FCC §2.1055 & §73.1545- FREQUENCY STABILITY

Applicable Standard

FCC §2.1055 and §73.1545

- (a) AM stations. The departure of the carrier frequency for monophonic transmissions or center frequency for stereophonic transmissions may not exceed ± 20 Hz from the assigned frequency.
- (b) FM stations. (1) The departure of the carrier or center frequency of an FM station with an authorized transmitter output power more than 10 watts may not exceed ± 2000 Hz from the assigned frequency. (2) The departure of the carrier or center frequency of an FM station with an authorized transmitter output power of 10 watts or less may not exceed ± 3000 Hz from the assigned frequency.
- (c) TV stations. (1) The departure of the visual carrier frequency of a TV station may not exceed ± 1000 Hz from the assigned visual carrier frequency. (2) The departure of the aural carrier frequency of a TV station may not exceed ± 1000 Hz from the actual visual carrier frequency plus exactly 4.5 MHz.
- (d) International broadcast stations. The departure of the carrier frequency of an International broadcast station may not exceed 0.0015% of the assigned frequency on which the station is transmitting.
- (e) Class A TV stations. The departure of the carrier frequency of Class A TV stations may not exceed the values specified in §74.761 of this chapter. Provided, however, that Class A TV stations licensed to operate with a carrier offset, including those stations licensed with a maximum effective radiated power and/or antenna height greater than the values specified in their initial Class A TV station authorization, must comply with paragraph (c) of this section.

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 counter.

Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Due Date
Hewlett-Packard	Frequency Counter	5343A	2232A00827	2013-05-09	2016-05-08
ESPEC	Temperature & Humidity Chamber	EL-10KA	09107726	2014-11-01	2015-11-01
Long Wei	DC Power Supply	TPR-6420D	398363	NCR	NCR

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

Test Data**Environmental Conditions**

Temperature:	27 °C
Relative Humidity:	45 %
ATM Pressure:	101.0 kPa

The testing was performed by Candy Li on 2015-07-09..

Test Mode: Transmitting

Reference Frequency: 98.1 MHz, Limit: ± 3000 Hz			
Test Environment		Frequency Measure	
Temperature (°C)	Power Supplied (V _{DC})	Measured Carrier Frequency (MHz)	Frequency Error (Hz)
0	85%	98.100496	+496
	100%	98.100503	+503
	115%	98.100507	+507
10	85%	98.100513	+513
	100%	98.100504	+504
	115%	98.100511	+511
20	85%	98.100493	+493
	100%	98.100501	+501
	115%	98.100512	+512
30	85%	98.100521	+521
	100%	98.100506	+506
	115%	98.100514	+514
40	85%	98.100503	+503
	100%	98.100509	+509
	115%	98.100499	+499
50	85%	98.100497	+497
	100%	98.100508	+508
	115%	98.100505	+505

The temperature range is declared by client, which shows in user manual.

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