FCC PART 90

TEST REPORT

For

RCA Communications Systems

133 West Market Street Suite 227, Indianapolis, IN, 46204, United States

FCC ID: XYH-BR850U1

Report Type:	**Product Type:**
Original Report	Two-Way Radio

Test Engineer:	Candy Li
Report Number:	R1DG130625002-00
Report Date:	2013-07-18
Reviewed By:	Sula Huang RF Engineer
Prepared By:	Bay Area Compliance Laboratories Corp. (Shenzhen) 6/F, the 3rd Phase of WanLi Industrial Building, ShiHua Road, FuTian Free Trade Zone Shenzhen, Guangdong, China Tel: +86-755-33320018 Fax: +86-755-33320008 www.baclcorp.com.cn

TABLE OF CONTENTS

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *RCA Communications Systems*'s product, model number: *BR850U1 (FCC ID: XYH-BR850U1)* or the "EUT" in this report was a *Two-Way Radio*, which was measured approximately: 12.2 cm (L) x 5.5 cm (W) x 3.8 cm (H) (with battery, without antenna), rated with input voltage: DC 7.4V rechargeable Li-ion battery.

Technical specifications:
Frequency range: 400-470 MHz
Output power: 1.222 W (Low), 4.592 W (High) (Conducted power)
Modulation: FM
Frequency spacing: 12.5 kHz

** All measurement and test data in this report was gathered from production sample serial number: 130625002 (Assigned by BACL, Shenzhen). The EUT supplied by the applicant was received on 2013-06-25.*

Objective

This test report is prepared on behalf of *RCA Communications Systems* in accordance with Part 2, and Part 90 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, Sub-part J as well as the following individual parts:

Part 90 – Private Land Mobile Radio Service

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, 1.95 dB 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.

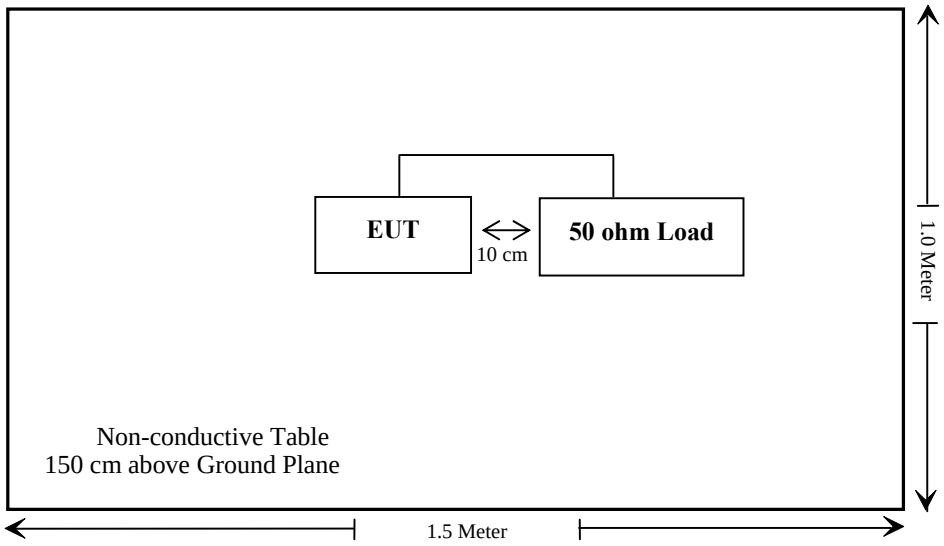
EUT Exercise software

No exercise software was used.

Equipment Modifications

No modification was made to the EUT tested.

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Results
§1.1307 (b); §2.1093	RF Exposure	Compliance
§2.1046; §90.205	RF Output Power	Compliance
§2.1047; §90.207	Modulation Characteristic	Compliance
§2.1049; §90.209; §90.210	Occupied Bandwidth & Emission Mask	Compliance
§2.1051; §90.210	Spurious Emission at Antenna Terminal	Compliance
§2.1053; §90.210	Spurious Radiated Emissions	Compliance
§2.1055; §90.213	Frequency Stability	Compliance
§90.214	Transient Frequency Behavior	Compliance

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.

Result: Compliance.

Please refer to SAR Report Number: R1DG130625002-20.

FCC §2.1046 & §90.205- RF OUTPUT POWER

Applicable Standard

FCC §2.1046 and §90.205.

Test Procedure

Conducted RF Output Power:

TIA-603-D section 2.2.1

Radiated method:

TIA 603-D section 2.2.17

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

Spectrum Analyzer setting:

RBW	***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	8386001028	2012-11-24	2013-11-23
Sunol Sciences	Broadband Antenna	JB1	A040904-2	2011-11-28	2014-11-27
HP	Synthesized Sweeper	8341B	2624A00116	2013-04-11	2014-04-10
COM POWER	Dipole Antenna	AD-100	041000	2013-06-06	2014-06-05

*** 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 ℃
Relative Humidity:	55 %
ATM Pressure:	100.1 kPa

The testing was performed by Candy Li on 2013-07-09.

Test Mode: Transmitting

Test Result: Compliance. Please refer to following table.

Conducted Output Power：

Frequency (MHz)	Modulation	Power level	Conducted Output Power (dBm)	Conducted Output Power (W)
400.0125	FM	High	36.62	4.592
		Low	30.58	1.143
450.0125	FM	High	36.62	4.592
		Low	30.87	1.222
469.9875	FM	High	36.39	4.355
		Low	30.54	1.132

ERP: (High Power)

Frequency (MHz)	Receiver Reading (dBμV/m)	TurnTable	Rx Antenna		Substituted			Absolute Level (dBm)
		Angle Degree	Height (m)	Polar (H/V)	SG Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)	
400.0125 MHz								
400.0125	103.24	354	1.6	H	19.4	0.44	0	18.96
400.0125	116.69	126	1.8	V	32.9	0.44	0	32.46
450.0125 MHz								
450.0125	102.85	113	1.6	H	18.7	0.46	0	18.24
450.0125	116.33	167	1.7	V	32.2	0.46	0	31.74
469.9875 MHz								
469.9875	101.17	252	1.7	H	16.6	0.48	0	16.12
469.9875	114.21	314	1.6	V	29.6	0.48	0	29.12

FCC §2.1047 & §90.207 - MODULATION CHARACTERISTIC

Applicable Standard

FCC§2.1047 & §90.207:

(a) Equipment which utilizes voice modulated communication shall show the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz. For equipment which is required to have a low pass filter, the frequency response of the filter, or all of the circuitry installed between the modulation limited and the modulated stage shall be supplied.
(b) Equipment which employs modulation limiting, a curve showing the percentage of modulation versus the modulation input voltage shall be supplied.

Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Due Date
HP	RF Communication Test Set	8920A	3325U00859	2013-05-07	2014-05-07

*** 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 Procedure

Test Method: TIA/EIA-603 2.2.3

Test Data

Environmental Conditions

Temperature:	26 ℃
Relative Humidity:	56 %
ATM Pressure:	100.9 kPa

The testing was performed by Candy Li on 2013-07-05.

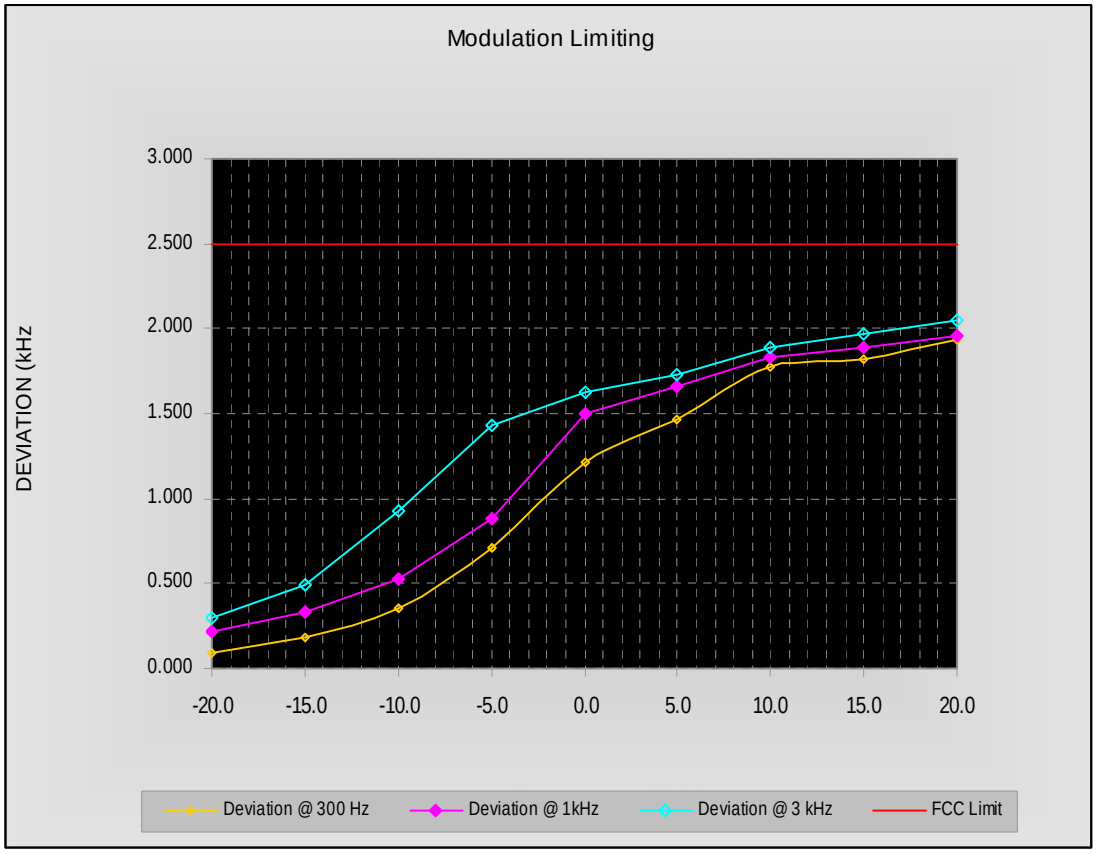
Test Mode: Transmitting

Result: Compliance.

MODULATION LIMITING

Carrier Frequency: 450.0125 MHz, Channel Separation=12.5 kHz, High Power

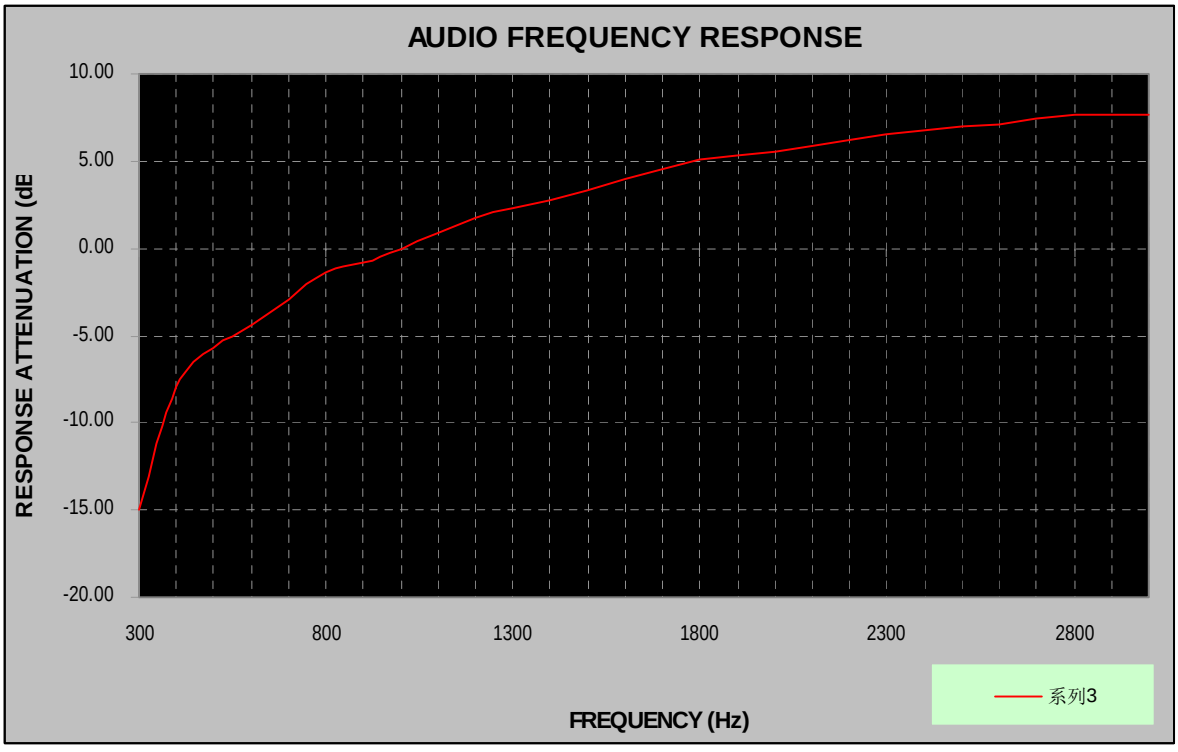
Audio Input Level [dB]	Frequency Deviation (kHz)			Limit [kHz]
	@ 300 Hz	@ 1kHz	@ 3 kHz	
20.0	1.934	1.955	2.045	2.5
15.0	1.826	1.892	1.964	2.5
10.0	1.775	1.837	1.895	2.5
5.0	1.469	1.664	1.730	2.5
0.0	1.210	1.500	1.624	2.5
-5.0	0.708	0.883	1.427	2.5
-10.0	0.352	0.528	0.931	2.5
-15.0	0.188	0.332	0.487	2.5
-20.0	0.093	0.216	0.298	2.5



Audio Frequency Response

Carrier Frequency: 450.0125 MHz, Channel Separation=12.5 kHz, High Power

Audio Frequency (Hz)	Response Attenuation (dB)
300	-14.99
400	-7.96
500	-5.71
600	-4.41
700	-2.95
800	-1.33
900	-0.82
1000	0.00
1200	1.78
1400	2.73
1600	3.95
1800	5.04
2000	5.59
2200	6.24
2400	6.73
2600	7.13
2800	7.62
3000	7.63



FCC §2.1049, §90.209 & §90.210 – OCCUPIED BANDWIDTH & EMISSION MASK

Applicable Standard

FCC §2.1049, §90.209 and §90.210

Emission Mask D—12.5 kHz channel bandwidth equipment. 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:

1) For any frequency removed from the center of the authorized bandwidth f_0 to 5.625 kHz removed from f_0, 0dB.

2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5.626 kHz but no more than 12.5 kHz, at least 7.27 (f_d –2.88 kHz) dB.

3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 12.5 kHz at least:

50+10logP

Emission Mask B. For transmitters that are equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:

1) For any frequency removed from the center of the assigned channel by more than 50 percent up to and including 100 percent of the authorized bandwidth, at least 25 dB.

2) On any frequency removed from the center of the assigned channel by more than 100 percent up to and including 250 percent, at least 35 dB.

3) On any frequency removed from the center of the assigned channel by more than 250 percent at least:

43+10logP

The resolution bandwidth was 300 Hz or greater for measuring up to 250 kHz from the edge of the authorized frequency segment, and 30 kHz or greater for measuring more than 250 kHz from the authorized frequency segment.

Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2012-11-24	2013-11-24
HP	RF Communication Test Set	8920A	3325U00859	2013-05-07	2014-05-07

*** 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 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 100 Hz and the spectrum was recorded in the frequency band ±35 kHz from the carrier frequency.

Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	55 %
ATM Pressure:	100.1 kPa

The testing was performed by Candy Li on 2013-07-09.

Test Mode: Transmitting

Modulation	Frequency (MHz)	99% Occupied Bandwidth (kHz)	26 dB Emissions Bandwidth (kHz)	Power Level
FM	450.0125	6.21	10.32	High Power

Emission Designator:

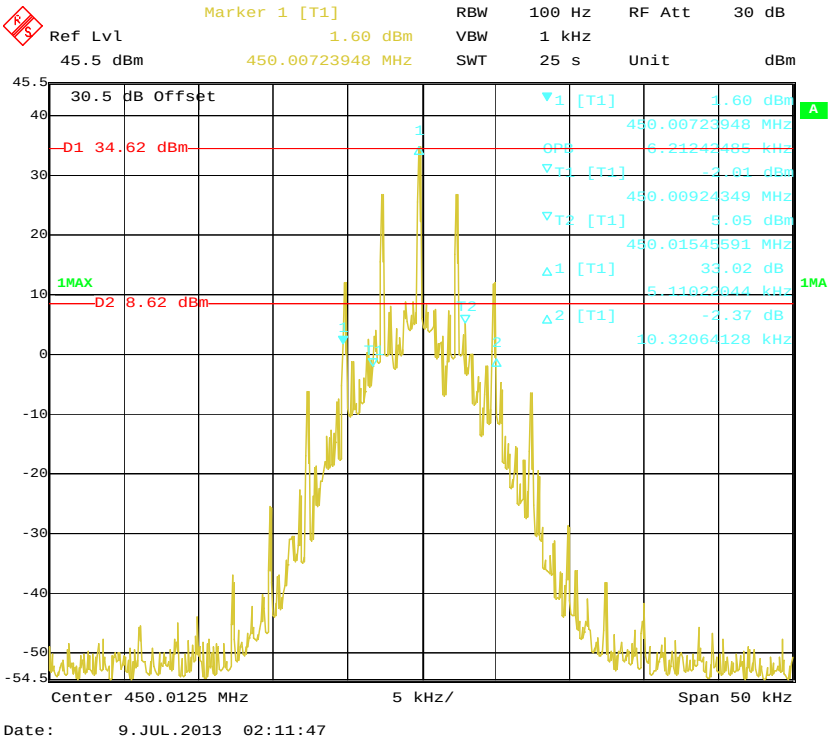
B_n=2M + 2DK

Where M = 3 kHz, D = 2.0 kHz, K = 1

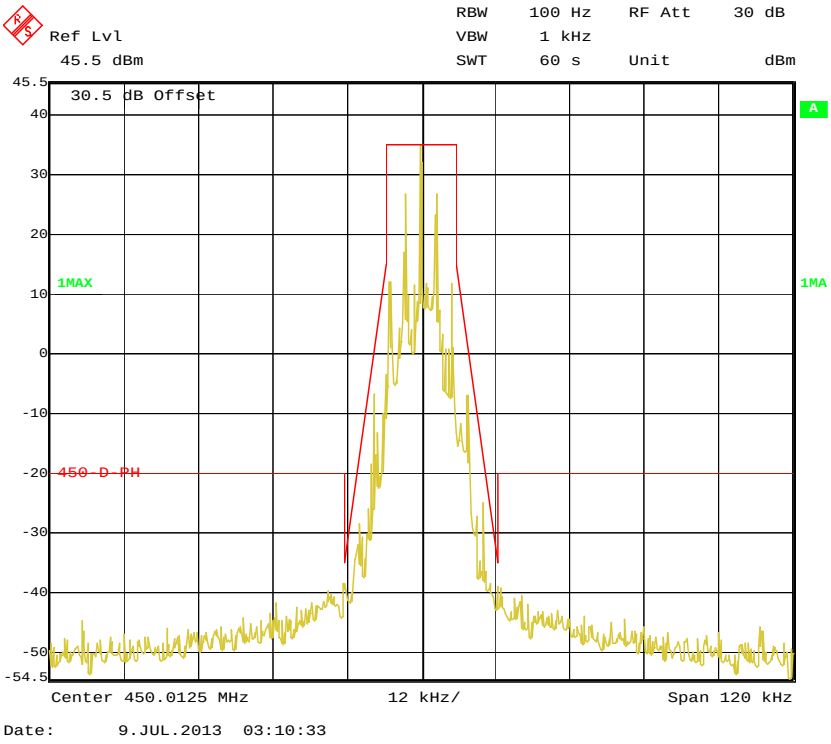
B_n =2*3 + 2*2.0 = 10.00 kHz

Type of emission: 10K0F3E

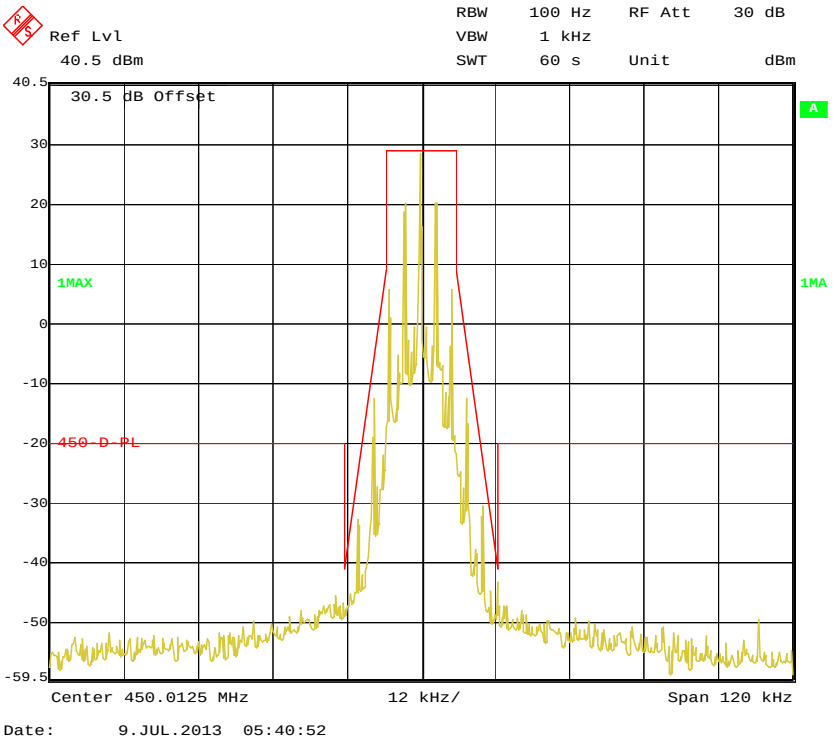
99% Occupied & 26 dB Bandwidth with High Power（Middle Channel）



Emission Mask D with High Power（Middle Channel）



Emission Mask D with Low Power (Middle Channel)



FCC §2.1051 & §90.210 - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Applicable Standard

Emission Mask D—12.5 kHz channel bandwidth equipment. 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:

1) For any frequency removed from the center of the authorized bandwidth f_0 to 5.625 kHz removed from f_0, 0 dB.

2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5.626 kHz but no more than 12.5 kHz, at least 7.27 (f_d –2.88 kHz) dB.

3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 12.5 kHz at least:

50+10logP

Emission Mask B. For transmitters that are equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:

1) For any frequency removed from the center of the assigned channel by more than 50 percent up to and including 100 percent of the authorized bandwidth, at least 25 dB.

2) On any frequency removed from the center of the assigned channel by more than 100 percent up to and including 250 percent, at least 35 dB.

3) On any frequency removed from the center of the assigned channel by more than 250 percent at least:

43+10logP

The resolution bandwidth was 300 Hz or greater for measuring up to 250 kHz from the edge of the authorized frequency segment, and 30 kHz or greater for measuring more than 250 kHz from the authorized frequency segment.

Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2012-11-24	2013-11-24

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 Data

Environmental Conditions

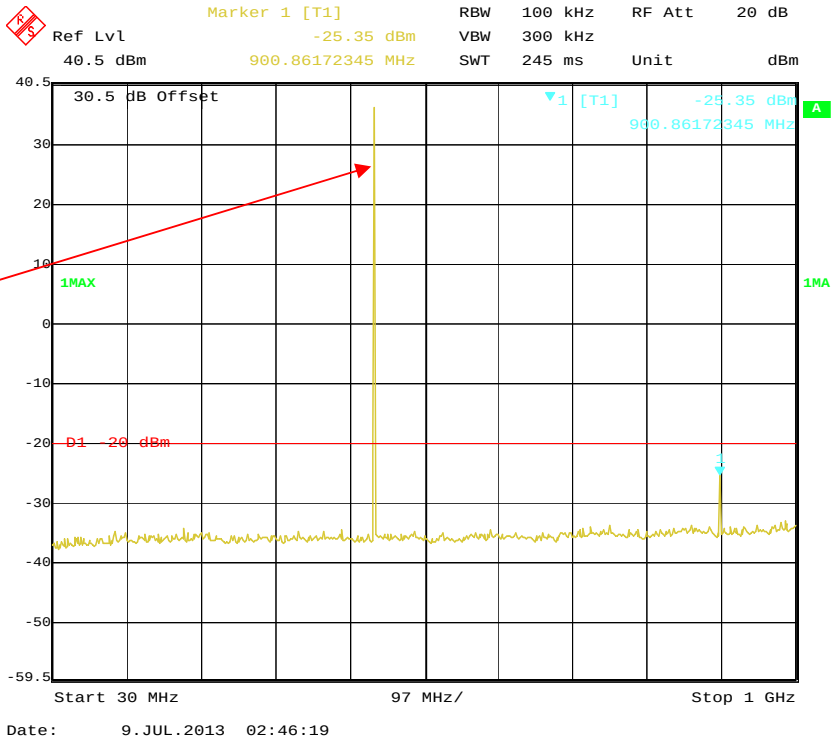
Temperature:	25 ℃
Relative Humidity:	55 %
ATM Pressure:	100.1 kPa

The testing was performed by Candy Li on 2013-07-09.

Test Mode: Transmitting

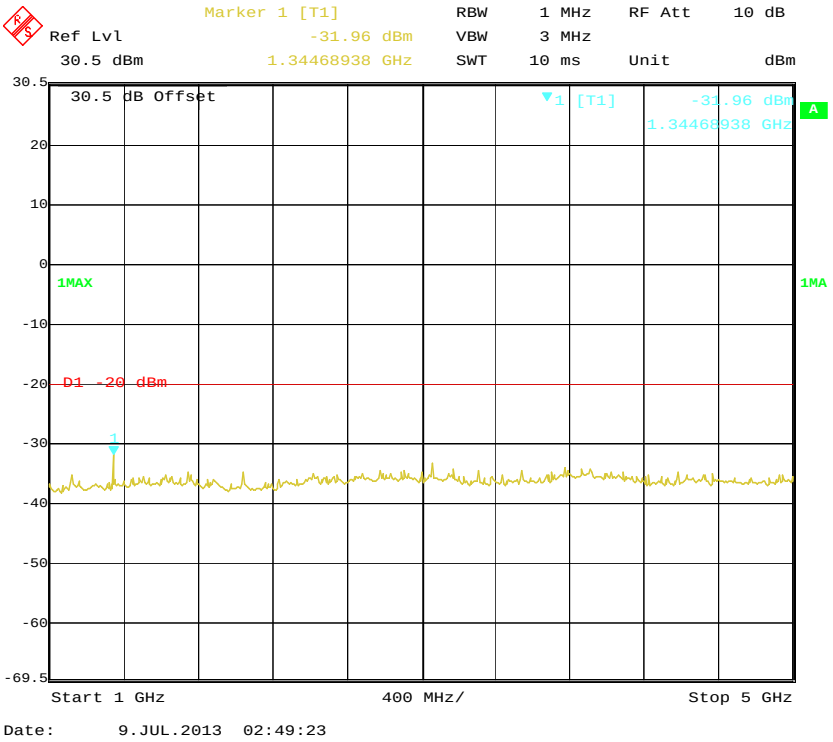
Please refer to the following plots.

30 MHz – 1 GHz, Middle Channel



Fundmental

1 GHz – 5 GHz, Middle Channel



FCC §2.1053 & §90.210 - RADIATED SPURIOUS EMISSIONS

Applicable Standard

FCC §2.1053 and §90.210

Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Due Date
Sunol Sciences	Horn Antenna	DRH-118	A052304	2011-12-01	2014-11-30
HP	Amplifier	8447E	1937A01046	2012-08-09	2013-08-09
Sunol Sciences	Broadband Antenna	JB1	A040904-2	2011-11-28	2014-11-27
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2012-11-24	2013-11-24
HP	Signal Generator	8657A	3217A04699	NCR	NCR
A.H. System	Horn Antenna	SAS-200/571	135	2012-02-11	2015-02-10
HP	Synthesized Sweeper	8341B	2624A00116	2013-05-09	2014-05-09

*** 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 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 1g (TXpwr in Watts/0.001)-the absolute level

Spurious attenuation limit in dB =43+10 Log_{10} (power out in Watts)
Spurious attenuation limit in dB =50+10 Log_{10} (power out in Watts) for EUT with a 12.5 kHz channel bandwidth.

Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	54 %
ATM Pressure:	101.0 kPa

The testing was performed by Candy Li on 2013-07-11.

Test Mode: Transmitting

30MHz - 5GHz:

Frequency (MHz)	Receiver Reading (dBμV)	Turn Table Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	FCC Part 90	
			Height (m)	Polar (H/V)	SG Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)		Limit (dBm)	Margin (dB)
Low Channel: 400.0125 MHz, Channel Spacing 12.5 kHz										
800	34.48	163	1.2	H	-61.8	0.66	0	-62.46	-20	42.46
800	32.56	349	1.9	V	-63.7	0.66	0	-64.36	-20	44.36
1200	47.92	138	1.8	H	-50.5	0.80	8.50	-42.80	-20	22.80
1200	49.45	89	1.1	V	-51.5	0.80	8.50	-43.80	-20	23.80
1600	46.99	21	1.6	H	-56.6	0.95	9.40	-48.15	-20	28.15
1600	49.52	113	2.0	V	-52.5	0.95	9.40	-44.05	-20	24.05
3600	48.38	188	1.7	H	-49.9	2.45	10.50	-41.85	-20	21.85
3600	47.68	358	2.1	V	-48.4	2.45	10.50	-40.35	-20	20.35
Middle Channel: 450.0125 MHz, Channel Spacing 12.5 kHz										
900	34.19	170	1.3	H	-62.1	0.69	0	-62.79	-20	42.79
900	32.43	233	1.5	V	-63.9	0.69	0	-64.59	-20	44.59
1350	48.31	139	1.4	H	-50.1	0.84	8.50	-42.44	-20	22.44
1350	50.35	203	2.4	V	-49.2	0.84	8.50	-41.54	-20	21.54
1800	50.45	296	1.4	H	-53.1	1.00	9.40	-44.70	-20	24.70
1800	47.06	82	2.0	V	-52.8	1.00	9.40	-44.40	-20	24.40
3600	45.84	320	2.4	H	-52.5	2.45	10.50	-44.45	-20	24.45
3600	47.97	291	1.2	V	-48.1	2.45	10.50	-40.05	-20	20.05
High Channel: 469.9875 MHz, Channel Spacing 12.5 kHz										
940	34.55	86	1.4	H	-61.8	0.73	0	-62.53	-20	42.53
940	32.21	272	1.7	V	-64.1	0.73	0	-64.83	-20	44.83
1880	49.93	313	1.9	H	-48.8	1.03	9.40	-40.43	-20	20.43
1880	46.99	203	1.8	V	-51.6	1.03	9.40	-43.23	-20	23.23
2824	48.45	317	1.5	H	-48.7	1.59	10.80	-39.49	-20	19.49
2824	48.77	82	1.2	V	-46.3	1.59	10.80	-37.09	-20	17.09
3290	49.78	302	1.4	H	-44.6	2.08	10.80	-35.88	-20	15.88
3290	46.64	260	1.5	V	-46.9	2.08	10.80	-38.18	-20	18.18

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

FCC §2.1055 & §90.213- FREQUENCY STABILITY

Applicable Standard

FCC §2.1055 & §90.213

Test Procedure

Frequency Stability vs. Temperature:
The EUT was placed inside the temperature chamber. The Power 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.

The frequency stability shall be measured with variation of primary supply voltage as follows:

(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.

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	2014-05-09
ESPEC	Temperature & Humidity Chamber	EL-10KA	09107726	2012-11-02	2013-11-01
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:	26 ℃
Relative Humidity:	56 %
ATM Pressure:	100.9 kPa

The testing was performed by Candy Li on 2013-07-05.

Test Mode: Transmitting

Reference Frequency: 450.0125 MHz, Limit: 2.5 ppm, 12.5 kHz			
Test Environment		**Frequency Measure with Time Elapsed**	
Temperature (℃)	**Power Supplied (V_{DC})**	**Measured Frequency (MHz)**	**Frequency Error (ppm)**
Frequency Stability versus Input Temperature			
50	7.4	450.01246	-0.09
40	7.4	450.01231	-0.42
30	7.4	450.01247	-0.07
20	7.4	450.01225	-0.56
10	7.4	450.01211	-0.87
0	7.4	450.01206	-0.98
-10	7.4	450.01236	-0.31
-20	7.4	450.01202	-1.07
-30	7.4	450.01207	-0.96
Frequency Stability versus Input Voltage			
20	5.8	450.01224	-0.58

Note: the battery operation end point is 5.8V which is specified by manufacturer.

FCC §90.214 - TRANSIENT FREQUENCY BEHAVIOR

Applicable Standard

Regulations: FCC §90.214
Test method: ANSI/TIA-603-D 2010, section 2.2.19.3

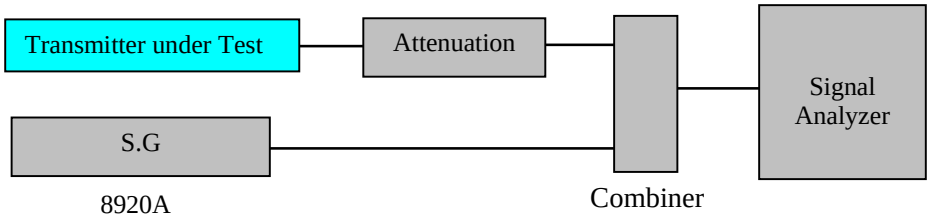
Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2012-11-24	2013-11-24
HP	RF Communication Test Set	8920A	3325U00859	2013-05-07	2014-05-07

*** 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 Procedure

TIA-603-D 2.2.19.3



Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	55 %
ATM Pressure:	100.1 kPa

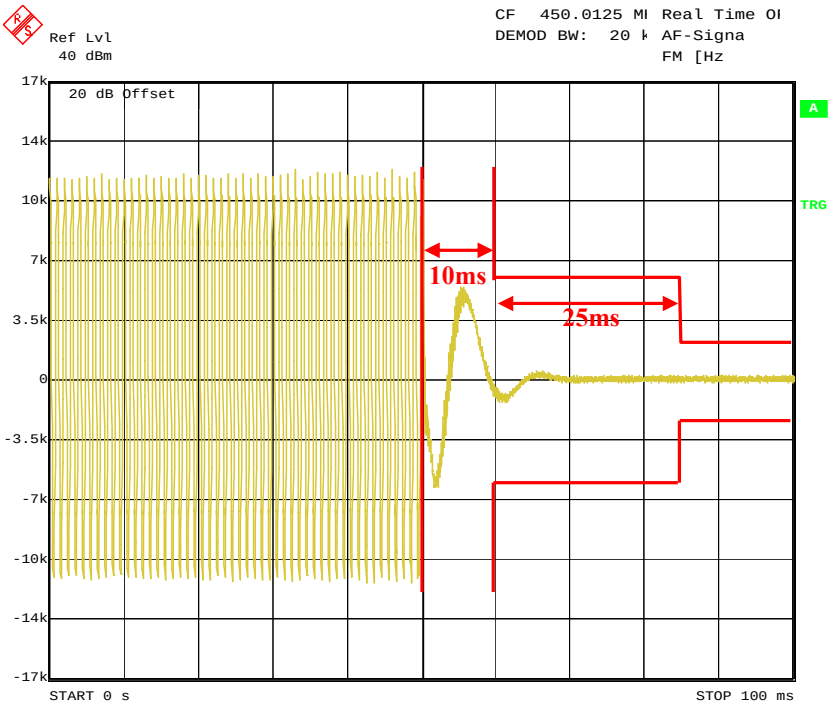
The testing was performed by Candy Li on 2013-07-09.

Test Mode: Transmitting

Channel Spacing (kHz)	Transient Period (ms)	Transient Frequency	Result
12.5	＜10(t_1)	±12.5 kHz	Pass
	＜25(t_2)	±6.25 kHz	
	＜10(t_3)	±12.5 kHz	

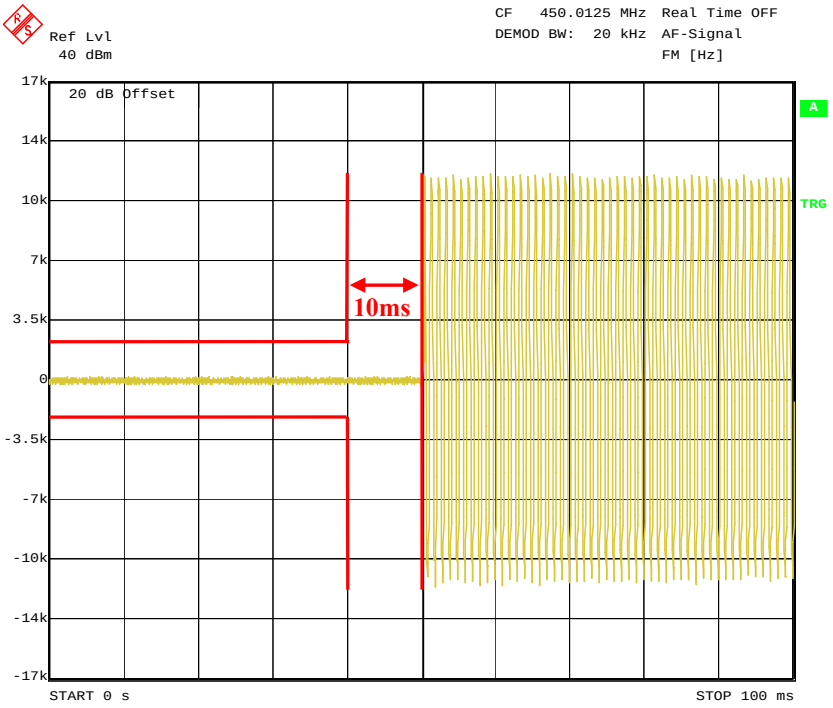
Please refer to the following plots.

Turn on (Channel Spacing=12.5 kHz，Middle Channel)



Date: 9.JUL.2013 04:45:52

Turn off (Channel Spacing=12.5 kHz，Middle channel)



Date: 9.JUL.2013 05:05:36

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