



FCC PART 90 EMI MEASUREMENT AND TEST REPORT

For

Shenzhen Friendcom Telecom Co. Ltd.

2/F, Multifunction Building, Dongpeng Industrial Park, Wuhao Road, North Section of Hi-tech Park, Nanshan, Shenzhen City 518057, P.R. of China

FCC ID: UU3FC401-1-06

This Report Concerns: Equipment Type:

Test Engineer: Deny Xiong

Peny Xiong

Merry Zhao

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Report No.: RSZ06121203

Test Date: 2006-12-21 to 2007-08-13

Report Date: 2007-08-16

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Note: This test report is for the customer shown above and their specific product only. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratory Corp. (Shenzhen). This report **must not** be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the Federal Government.

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *Shenzhen Friendcom Telecom Co. Ltd.*'s product, model number: *FC401-1* or the "EUT" as referred to in this report is a *Handheld Transceiver*. The EUT is measured approximately 5.3 cm L x 3.5 cmW x 15.7 cmH, DC voltage range: 10-12.8 V.

* The test data gathered are from production sample, serial number: 0612012, Provided by the manufacturer, we received the EUT on 2006-12-12.

Objective

This Type approval report is prepared on behalf of *Shenzhen Friendcom Telecom Co. Ltd.* 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-C and ANSI 63.4-2003.

All emissions measurement was performed and Bay Area Compliance Laboratory 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 Laboratory Corp. (Shenzhen) to collect test data is located in 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 Laboratory 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 November 04, 2004. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2003.

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.

Additionally, Bay Area Compliance Laboratory Corp. (Shenzhen) is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (Lab Code 200707-0).



The current scope of accreditations can be found at http://ts.nist.gov/ts/htdocs/210/214/scopes/2007070.htm.

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

Bay Area Compliance Laboratory Corp. (Shenzhen) has not done any modification on the EUT.

Configuration of Test Setup

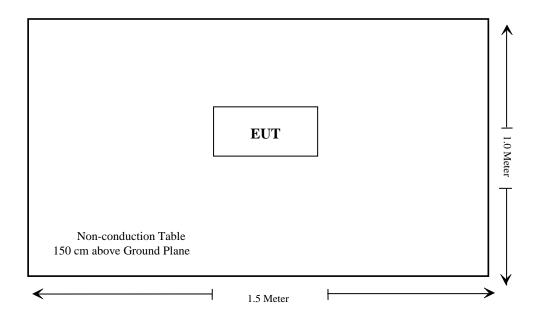






Lie Side Stand

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
\$1.1310 \$2.1093	RF Exposure	Compliant
§2.1046	Conducted Output Power	Compliant
§2.1046, §90.205	Radiated Output Power	Compliant
§2.1047	Modulation Characteristics	Compliant
\$2.1049, \$90.209	Occupied Bandwidth	Compliant
§2.1051 §90.210	Spurious Emission at Antenna Terminal	Compliant
§ 2.1053 § 90.210	Spurious Radiated Emissions	Compliant
§ 2.1055 § 90.213	Frequency stability	Compliant
§ 90.214	Transient Frequency Behavior	Compliant

§1.1310 §2.1093 - RF EXPOSURE

Standard Applicable

According to § 1.1310, systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

According to FCC Exclusion list, In the following table, fGHz is mid-band frequency in GHz, and d is the distance to a person'sbody, excluding hands, wrists, feet, and ankles.

Exposure category	low threshold	high threshold
general population	$(60/f_{\text{GHz}}) \text{ mW}, d < 2.5 \text{ cm}$ $(120/f_{\text{GHz}}) \text{ mW}, d \ge 2.5 \text{ cm}$	$(900/f_{GHz}) \text{ mW}, d \le 20 \text{ cm}$
occupational	$(375/f_{GHz}) \text{ mW}, d < 2.5 \text{ cm}$ $(900/f_{GHz}) \text{ mW}, d \ge 2.5 \text{ cm}$	$(2250/f_{GHz})$ mW, $d < 20$ cm

Routine SAR evaluation refers to that specifically required by § 2.1093, using measurements or computer simulation. When routine SAR evaluation is not required, portable transmitters with output power greater than the applicable low threshold require SAR evaluation to qualify for TCB approval.

Measurement Result:

This is a portable device and the Max peak output power is 1610 mW which is below the threshold level of (375/0.460 GHz) *2=1630.43 mW for occupational service. The SAR measurement is not required.

Please refer to the RF satety training and information in the user's manual in details.

FCC ID: UU3 FC401-1-06

§2.1046 - CONDUCTED OUTPUT POWER

Applicable Standard

According to FCC §2.1046, and §90.205.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2006-09-29	2007-09-29

^{*} Statement of Tractability: Bay Area Compliance Laboratory Corp. (Shenzhen) attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

Test Procedure

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 Data

Environmental Conditions

Temperature:	25 ° C
Relative Humidity:	50%
ATM Pressure:	100.5kPa

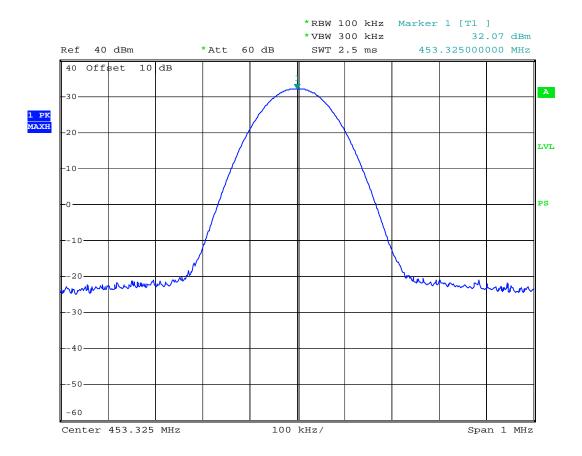
The testing was performed by Simon Mo on 2007-08-13.

Test Mode: Transmitting

Frequency Spacing (kHz)	Frequency (MHz)	Output Power (dBm)	Output Power (Watt)				
Low channel							
25	453.325	32.07	1.610				
	Middle channel						
25 460.0		31.42	1.386				
High channel							
25	468.0	30.09	1.020				

Please refer to the following plots:

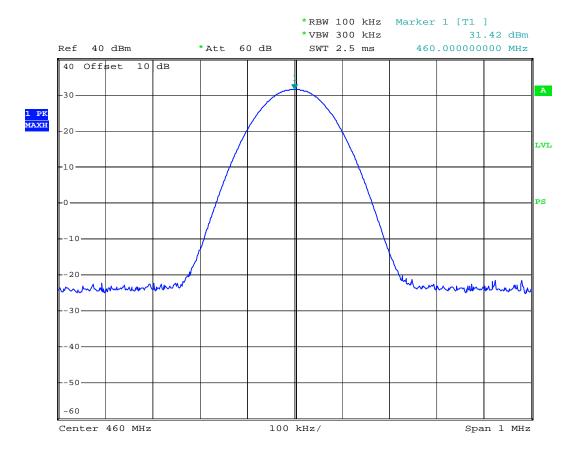
Low channel



M/N:FC401-1 CONDUCTED OUTPUT POWER LOW CHANNEL

Date: 13.AUG.2007 22:35:02

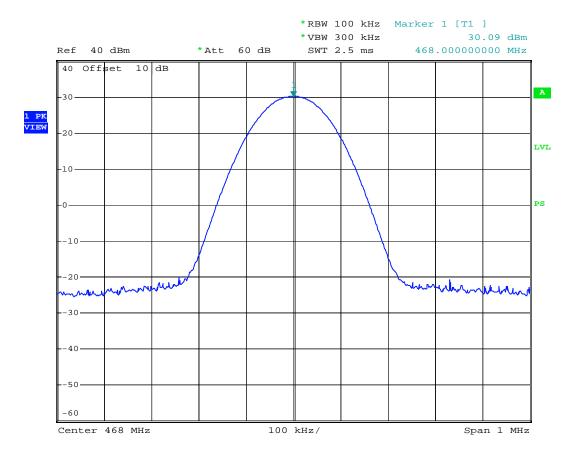
Middle channel



M/N:FC401-1 CONDUCTED OUTPUT POWER MIDDLE CHANNEL

Date: 13.AUG.2007 22:41:53

High channel



M/N:FC401-1 CONDUCTED OUTPUT POWER HIGH CHANNEL

Date: 13.AUG.2007 22:46:28

FCC ID: UU3 FC401-1-06

§2.1046, and §90.205 – RADIATED OUTPUT POWER

Applicable Standard

According to FCC §2.1046, and §90.205.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Sunol Sciences	Horn Antenna	DRH-118	A052604	2006-09-25	2007-09-25
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2006-08-14	2007-08-14
Sunol Sciences	Bilog Antenna	JB1	A040904-2	2006-08-14	2007-08-14
Agilent	Spectrum Analyzer	8564E	3943A01781	2006-11-22	2007-11-22
HP	Signal Generator	HP8657A	2849U00982	2006-09-29	2007-09-29
Giga-tronics	Signal Generator	1026	270801	2006-09-29	2007-09-29
A.H. System	Horn Antenna	SAS-200/571	135	2007-05-17	2008-05-17

^{*} Statement of Traceability: Bay Area Compliance Laboratory Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

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 ERP were measured by the substitution.

Absolute level = substituted level + Antenna gain – Cable Loss

Test Data

Environmental Conditions

Temperature:	25 ° C
Relative Humidity:	50%
ATM Pressure:	100.5kPa

The testing was performed by Simon Mo on 2007-08-13.

Test Mode: Transmitting

Indica	ated	Table	Test Ar	itenna	Sul	stituted		Antenna	Cable	FCC	Part 90
		Angle					_	Gain Correctio	Loce	Absolu	te Level
Freq. (MHz)	Amp. (dBuV)	Degree	Height (m)	Polar H/V	Freq. (MHz)	Level (dBm)	Polar H/V	n	(dB)	(dBm)	(Watt)
	Low channel										
453.325	103.72	40	1.0	V	453.325	34.5	V	0	3.76	30.74	1.1857
453.325	88.96	162	2.0	Н	453.325	17.2	Н	0	3.76	13.44	0.0220
					Middle	channel					
460	102.47	189	1.3	V	460	33.3	V	0	3.85	29.45	0.8810
460	87.35	48	1.0	Н	460	16.2	Н	0	3.85	12.35	0.0171
	High channel										
468	101.52	65	1.6	V	468	31.6	V	0	3.88	27.72	0.5915
468	86.96	218	1.1	Н	468	15.1	Н	0	3.88	11.22	0.0132

§2.1047, and §90.207 - MODULATION CHARACTERISTIC

Applicable Standard

§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	Serial Number	Calibration Date	Calibration Due Date
HP	Modulation Analyzer	8901B	3438A05208	2007-03-01	2008-03-01
NANYAN	Audio Generator	NY2201	019829	2006-12-23	2007-12-23

^{*} **Statement of Traceability:** Bay Area Compliance Laboratory Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

Test Procedure

Test Method: TIA/EIA-603 2.2.3

Test Data

Environmental Conditions

Temperature:	25 ° C
Relative Humidity:	50%
ATM Pressure:	1005mbar

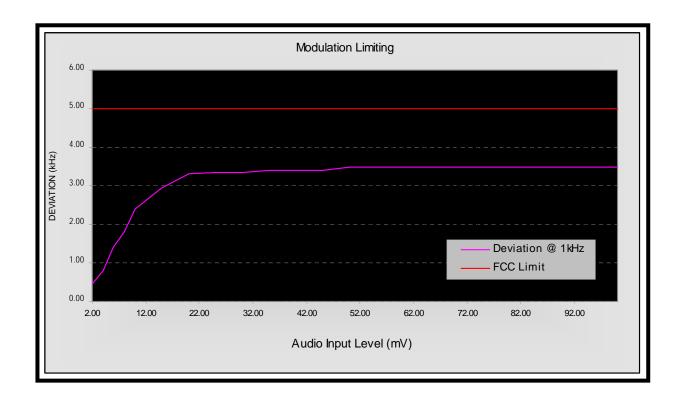
The testing was performed by Simon Mo on 2007-08-10.

Test Result: Pass

Test Mode: Transmitting

AUDIO INPUT LEVEL [mV]	DEVIATION (@ 1kHz) [kHz]	FCC Limit [kHz]
2.00	0.45	5.00
4.00	0.79	5.00
6.00	1.40	5.00
8.00	1.80	5.00
10.00	2.40	5.00
15.00	2.95	5.00
20.00	3.32	5.00
25.00	3.35	5.00
30.00	3.35	5.00
35.00	3.40	5.00
40.00	3.40	5.00
45.00	3.40	5.00
50.00	3.50	5.00
60.00	3.50	5.00
70.00	3.50	5.00
80.00	3.50	5.00
90.00	3.50	5.00
100.00	3.50	5.00

NOTE: The modulation signal is a fixed or constant single tone frequency of 1 kHz only.



§2.1049, and § 90.209 – OCCUPIED BANDWIDTH

Applicable Standard

§2.1049, §90.209 and §90.210

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 dB

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

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2006-09-29	2007-09-29
HP	Modulation Analyzer	8901B	3438A05208	2007-03-01	2008-03-01
NANYAN	Audio Generator	NY2201	019829	2006-12-23	2007-12-23

^{*} Statement of Traceability: Bay Area Compliance Laboratory Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

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 300 Hz and the spectrum was recorded in the frequency band ± 50 kHz from the carrier frequency.

Test Data

Environmental Conditions

Temperature:	25 ° C
Relative Humidity:	50%
ATM Pressure:	100.5kPa

The testing was performed by Deny Xiong on 2006-12-27.

Test Result: Pass

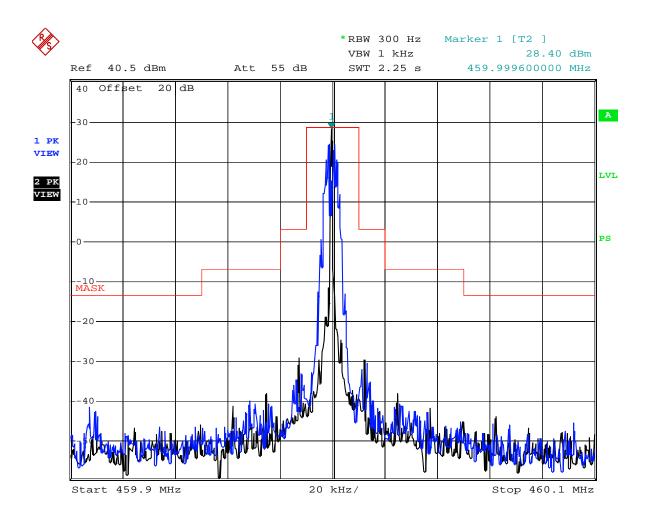
Test Mode: Transmitting

Emission Designator:

For 25.0 kHz Channel Spacing: 2M+2D = 2x3+2x5.0 = 16K0F3E

Please refer to the hereinafter plots.

Emission Mask B for 25 kHz Channel Bandwidth:



M/N:FC401-1 Emission mask

Date: 27.DEC.2006 15:44:33

FCC ID: UU3 FC401-1-06

§2.1051 and §90.210 - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Applicable Standard

§2.1051and §90.210 (25 kHz bandwidth and 20 kHz bandwith)

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

43+10log(P) dB.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2006-09-29	2007-09-29
Agilent	Spectrum Analyzer	8564E	3943A01781	2006-11-22	2007-11-22

^{*} **Statement of Traceability:** Bay Area Compliance Laboratory Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

Test Procedure

The RF output of the Handheld Transceiver was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 100 kHz. Sufficient scans were taken to show any out of band emissions up to 10^{th} harmonic.

Test Data

Environmental Conditions

Temperature:	25 ° C
Relative Humidity:	50%
ATM Pressure:	100.5kPa

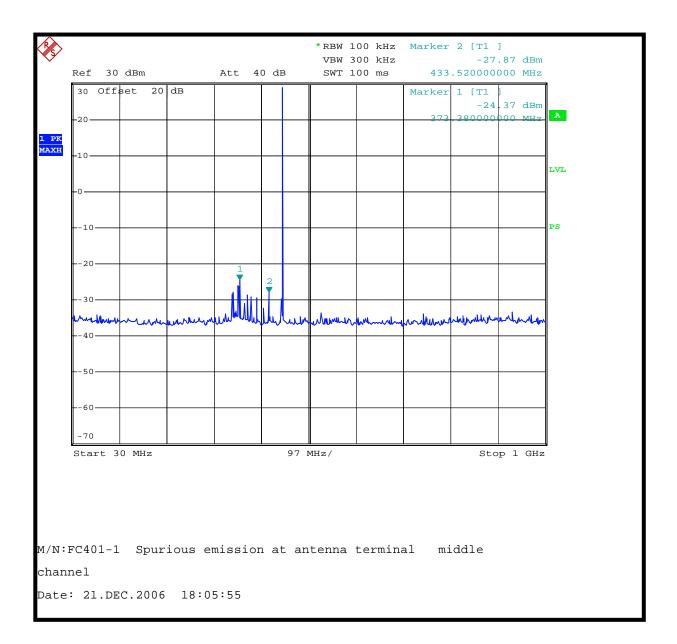
The testing was performed by Deny Xiong on 2006-12-21.

Test Result: Pass

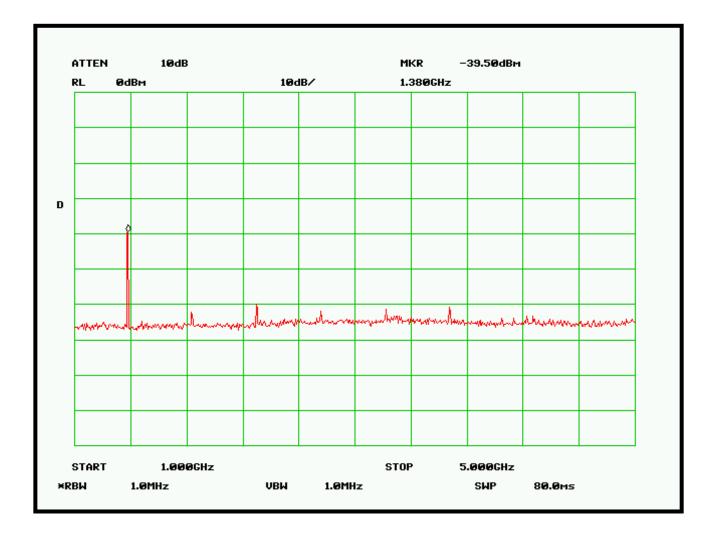
Test Mode: Transmitting

Please refer to the following plots.

30 -1000 MHz



$1000 - 5000 \, MHz$



§2.1053 and §90.210 - RADIATED SPURIOUS EMISSIONS

Applicable Standard

§2.1053 and §90.210

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Sunol Sciences	Horn Antenna	DRH-118	A052604	2006-09-25	2007-09-25
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2006-08-14	2007-08-14
Sunol Sciences	Bilog Antenna	JB1	A040904-2	2006-08-14	2007-08-14
Agilent	Spectrum Analyzer	8564E	3943A01781	2006-11-22	2007-11-22
НР	Signal Generator	HP8657A	2849U00982	2006-09-29	2007-09-29
Giga-tronics	Signal Generator	1026	270801	2006-09-29	2007-09-29
A.H. System	Horn Antenna	SAS-200/571	135	2007-05-17	2008-05-17

^{*} Statement of Traceability: Bay Area Compliance Laboratory Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

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 Log (TXpwr in Watts/0.001)-the absolute level

Spurious attenuation limit in $dB = 43+10 \text{ Log}_{10}$ (power out in Watts)

Test Results Summary

According to the recorded data in the following table, the EUT complied with the FCC Part 90, with the worst margin of: -1.15dB at 920MHz: Transmitting in Middle channel.

Test Data

Environmental Conditions

Temperature:	25 ° C
Relative Humidity:	50%
ATM Pressure:	100.5kPa

The testing was performed by Simon Mo on 2007-08-10.

Test Mode: Transmitting

Indicated F Frequency (MHz)	Reading Level (dBuV)	Table Angle (Degree)	Test A Height (m)	ntenna Polarity (H/V)	Substituted ERP (dBm)	Transmission Power (dBm)	Attenuation (dBc)	Limit (dBc)	Margin (dB)
		l			Middle Channel (4	460.00 MHz)			
920	62.24	126	1.4	V	-30.24	29.45	59.69	42.45	-17.24
920	60.12	168	1.2	Н	-31.14	29.45	60.59	42.45	-18.14
1380	62.33	158	1.2	V	-32.33	29.45	61.78	42.45	-19.33
1380	60.23	156	1.2	Н	-33.03	29.45	62.48	42.45	-20.03
1840	59.17	146	1.2	V	-34.43	29.45	63.88	42.45	-21.43
1840	56.83	48	1.4	Н	-34.53	29.45	63.98	42.45	-21.53
2760	52.10	424	1.3	Н	-34.91	29.45	64.36	42.45	-21.91
4140	53.67	63	1.6	V	-34.94	29.45	64.39	42.45	-21.94
4600	46.17	149	1.5	V	-35.58	29.45	65.03	42.45	-22.58
2300	57.37	86	1.2	V	-35.62	29.45	65.07	42.45	-22.62
2300	54.33	46	1.2	Н	-35.82	29.45	65.27	42.45	-22.82
3220	53.17	136	1.2	Н	-36.87	29.45	66.32	42.45	-23.87
4600	53.67	136	1.2	Н	-38.58	29.45	68.03	42.45	-25.58
4140	51.05	68	1.2	Н	-38.64	29.45	68.09	42.45	-25.64
2760	55.33	55	1.5	V	-38.71	29.45	68.16	42.45	-25.71
3680	56.17	30	1.6	V	-39.67	29.45	69.12	42.45	-26.67
3680	54.33	58	1.3	Н	-40.17	29.45	69.62	42.45	-27.17
3220	56.45	168	1.2	V	-41.87	29.45	71.32	42.45	-28.87

NOTES:

 $\begin{array}{l} Limit~(dBc)=43+10~log~(P)~dB~=43+10~log~(0.8810)=42.45dBc\\ Margin~(dB)=Limit~-~Attenuation \end{array}$

§2.1055 (d) and §90.213- FREQUENCY STABILITY

Applicable Standard

§2.1055 (d)

§90.213

For output power > 2 watts, the limit is 5.0ppm.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
WUHUAN	Temperature & Humidity Chamber	HTP205	20021115	2006-12-28	2007-12-28
Hewlett-Packard	Frequency Counter	5342A	2317A08289	2007-03-01	2008-03-01

FCC ID: UU3 FC401-1-06

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 f Spectrum Analyzer 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.

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.

Test Data

Environmental Conditions

Temperature:	25 ° C
Relative Humidity:	50%
ATM Pressure:	100.5kPa

The testing was performed by Deny Xiong on 2006-12-27.

Test Result: Pass

Test Mode: Transmitting

^{*} Statement of Traceability: Bay Area Compliance Laboratory Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

Frequency Stability versus Temperature:

Reference Frequency:460.0 MHz, Limit: ±5 ppm						
Environment Temperature	Power Supplied	Frequency Me	asure with Time Elapsed			
(°C)	(Vdc)	MCF (MHz)	Error (ppm)			
55	11.1	460.000010	0.0217			
50	11.1	460.000010	0.0217			
40	11.1	460.000008	0.0174			
30	11.1	460.000006	0.0130			
20	11.1	460.000002	0.0043			
10	11.1	460.000002	0.0043			
0	11.1	460.000002	0.0043			
-10	11.1	460.000002	0.0043			
-20	11.1	460.000001	0.0022			
-30	11.1	460.000002	0.0043			

Frequency Stability versus Input Voltage:

Reference Frequency: 460.00 MHz, Limit: ±5 ppm					
Power Supplied	Supplied Frequency Measure with Time Elapsed				
(Vdc) Frequency (MHz) Error (ppn					
9.5	460.000003	0.0065			

§90.214 - TRANSIENT FREQUENCY BEHAVIOR

Applicable Standard

§90.214

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
TEKTRONIX	Digital Phosphor Oscilloscope	TDS 7104	B020518	2007-03-01	2008-03-01
HP	Modulation Analyzer	8901B	3438A05208	2007-03-01	2008-03-01
НР	Signal Generator	HP8657A	2849U00982	2006-09-29	2007-09-29

^{*} **Statement of Traceability:** Bay Area Compliance Laboratory Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

Test Procedure

TIA/EIA-603 2.2.19

Test Data

Environmental Conditions

Temperature:	25 ° C
Relative Humidity:	50%
ATM Pressure:	100.5kPa

The testing was performed by Deny Xiong on 2006-12-27.

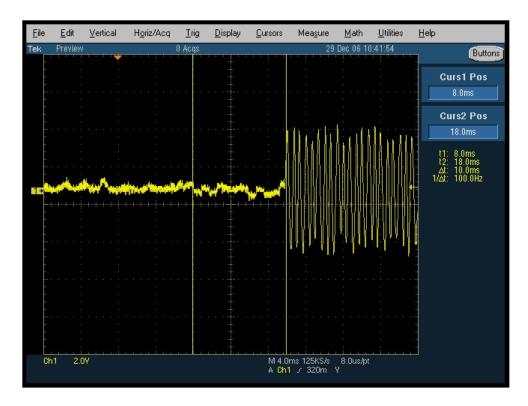
Test Result: Pass

Test Mode: Transmitting

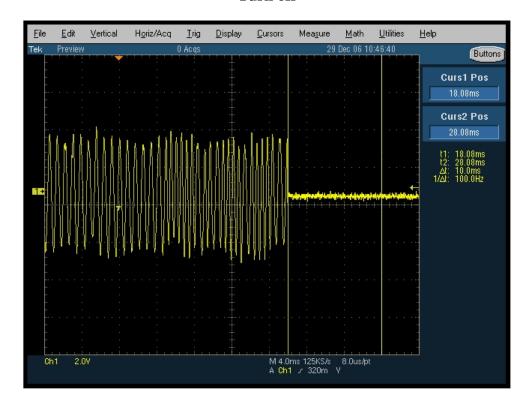
Operation Frequency (MHz)	Channel Separation (kHz)	Transient Period (ms)	Transient Frequency	Result	
460	25	<10	+/-25.0 kHz		
		<25	+/-12.5 kHz	Pass	
		<10	+/-25.0kHz		

Please refer to the following plots:

Turn on



Turn off



END OF REPORT