

FCC PART 90 TYPE APPROVAL
EMI MEASUREMENT AND TEST REPORT
For
KIRISUN ELECTRONICS (SHENZHEN) CO., LTD

6/F., Bldg. H-2, East Industrial Zone of Overseas Chinese Town, Nanshan Dist., Shenzhen P.R. China

FCC ID: Q5EPT420001

July 27, 2006

This Report Concerns: ☒ Original Report	Equipment Type: Two-way radio
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Report No.: RSZ06071801	
Test Date: July 10-19, 2006	
Reviewed By: Boni Baniqued <i>Boni Baniqued</i>	
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Note: The test report is specially limited to the above company and this particular sample only.
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approval, or endorsement by NVLAP, NIST or any agency of the US Government.

TABLE OF CONTENTS

GENERAL INFORMATION.....	4
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)	4
OBJECTIVE	4
RELATED SUBMITTAL(S)/GRANT(S)	4
TEST METHODOLOGY	4
TEST FACILITY	4
LOCAL SUPPORT EQUIPMENT LIST AND DETAILS	5
SYSTEM TEST CONFIGURATION.....	6
DESCRIPTION OF TEST CONFIGURATION	6
EQUIPMENT MODIFICATIONS	6
CONFIGURATION OF TEST SETUP	7
BLOCK DIAGRAM OF TEST SETUP	7
SUMMARY OF TEST RESULTS.....	8
§1.1307(b) (1) RF EXPOSURE.....	9
§2.1046 - CONDUCTED OUTPUT POWER.....	10
APPLICABLE STANDARD	10
TEST EQUIPMENT LIST AND DETAILS.....	10
TEST PROCEDURE	10
TEST DATA	11
§2.1046, and §90.205 – RADIATED OUTPUT POWER	12
APPLICABLE STANDARD	12
TEST EQUIPMENT LIST AND DETAILS.....	12
TEST PROCEDURE	12
TEST DATA	13
§2.1047, and §90.207 - MODULATION CHARACTERISTIC	14
APPLICABLE STANDARD	14
TEST EQUIPMENT LIST AND DETAILS.....	14
TEST PROCEDURE	14
TEST DATA	14
§2.1049, and § 90.209 – OCCUPIED BANDWIDTH	17
APPLICABLE STANDARD	17
TEST EQUIPMENT LIST AND DETAILS.....	17
TEST PROCEDURE	17
TEST DATA	17
§2.1051 and §90.210 - SPURIOUS EMISSIONS AT ANTENNA TERMINALS	20
APPLICABLE STANDARD	20
TEST EQUIPMENT LIST AND DETAILS.....	20
TEST PROCEDURE	20
TEST DATA	20
§2.1053 and §90.210 - RADIATED SPURIOUS EMISSION	22
APPLICABLE STANDARD	22
TEST EQUIPMENT LIST AND DETAILS.....	22
TEST PROCEDURE	22
TEST RESULTS SUMMARY	22
TEST DATA	23
§2.1055 (d) and §90.213- FREQUENCY STABILITY	24
APPLICABLE STANDARD	24
TEST EQUIPMENT LIST AND DETAILS.....	24
TEST PROCEDURE	24

TEST DATA	24
§90.214 - TRANSIENT FREQUENCY BEHAVIOR.....	26
APPLICABLE STANDARD	26
TEST EQUIPMENT LIST AND DETAILS.....	26
TEST PROCEDURE	26
TEST DATA	26

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The KIRISUN ELECTRONICS (SHENZHEN) CO., LTD's product, model number: PT4200-01 or the "EUT" as referred to in this report is a *Two-way radio*. The EUT is measured approximately 26.0 cm L x 6.0 cmW x 3.0 cmH, rated input voltage: DC 7.4 V battery.

** The test data gathered are from production sample, serial number: 1775060400001. Provided by the manufacturer, we received the EUT on 2006-7-18.*

Objective

This Type approval report is prepared on behalf of KIRISUN ELECTRONICS (SHENZHEN) 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 EIA 137-A, TIA EIA 98-C, TIA603-C and ANSI 63.4-2003, American National Standard for Method of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

All emissions measurement was performed and Bay Area Compliance Lab 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 Lab 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 518038, P.R.China.

Test site at Bay Area Compliance Lab 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 and Industrial Canada registration test site No.: 5500A. 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 Lab 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>

Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number	FCC ID
NANYAN	Audio Generator	NY2201	007727	N/A

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

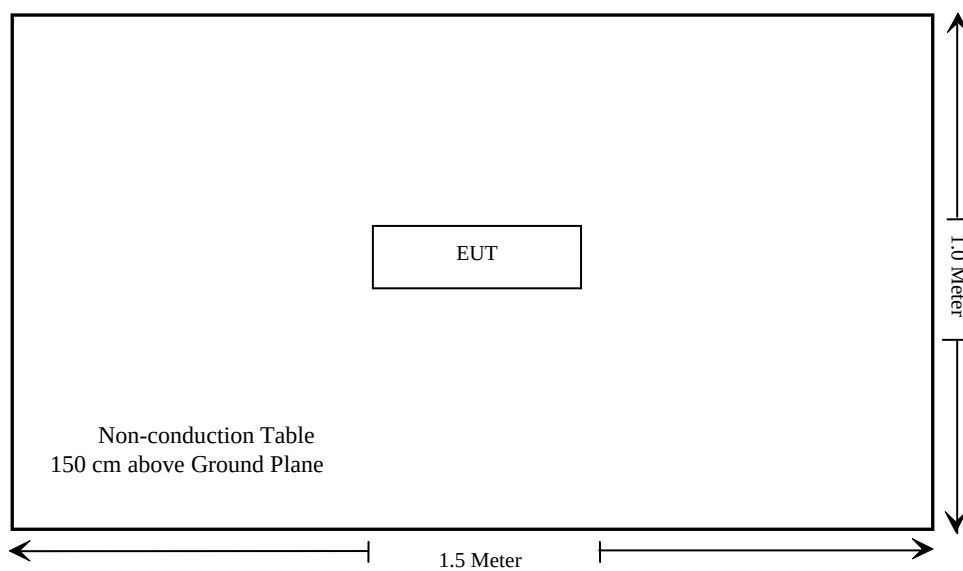
Bay Area Compliance Lab Corp. (ShenZhen) has not done any modification on the EUT.

Configuration of Test Setup



Stand

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT
§1.1307	RF Exposure	Compliant
§2.1046	Conducted Output Power	Compliant
§2.1046, §90.205	Radiated Output Power	Compliant
§2.1047 §90.207	Modulation Characteristic	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

§1.1307(b) (1) RF EXPOSURE

Standard Applicable

According to §1.1307(b)(1), 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, f_{GHz} is mid-band frequency in GHz, and d is the distance to a person's body, excluding hands, wrists, feet, and ankles.

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

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 $3936\text{mW} < 4044\text{mW} = (900/0.445\text{GHz}) \text{ mW} \times 2$
The SAR measurement is not necessary.

§2.1046 - CONDUCTED OUTPUT POWER

Applicable Standard

According to FCC §2.1046, and §90.205, maximum ERP is dependent upon the station's antenna HAAT and required service area.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde&Schwarz	EMI Test Receiver	ESCI	100035	2005-8-17	2006-8-17

* **Statement of Tractability:** Bay Area Compliance Lab 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:

<u>R B/W</u>	<u>Video B/W</u>
100 kHz	300 kHz

Test Data**Environmental Conditions**

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

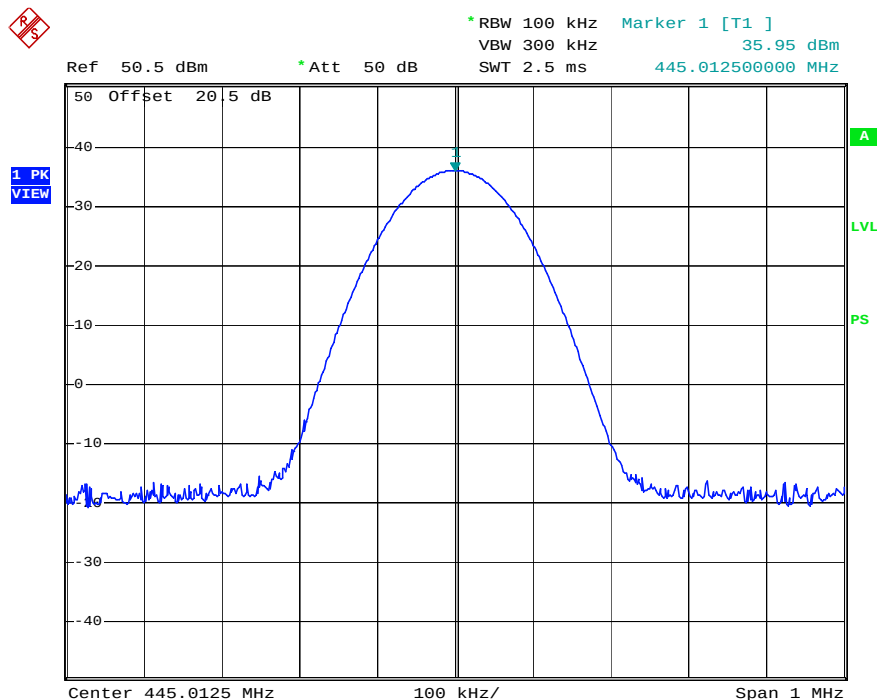
The testing was performed by Charmi Peng on 2006-7-18.

Test Result: Pass

Test Mode: Transmitting

Frequency Spacing (kHz)	Frequency (MHz)	Output Power in dBm	Output Power in W
Narrow12.5	445.0125	35.95	3.936

For Narrow 12.5kHz



Kirisun Output power

Date: 8.AUG.2006 14:07:00

§2.1046, and §90.205 – RADIATED OUTPUT POWER

Applicable Standard

According to FCC §2.1046, and §90.205, maximum ERP is dependent upon the station's antenna HAAT and required service area.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
SUNOL SCIENCES	Horn Antenna	DRH-118	A052604	2005-7-20	2006-7-20
SUNOL SCIENCES	Broadband Antenna	JB1	A040904-1	2006-4-28	2007-4-28
SUNOL SCIENCES	Broadband Antenna	JB1	A040904-2	2006-4-28	2007-4-28
Agilent	Spectrum Analyzer	8564E	3943A01781	2005-12-08	2006-12-08
HP	Signal Generator	HP8657A	2849U00982	2006-2-28	2007-2-28
Giga-tronics	Signal Generator	1026	270801	2006-2-28	2007-2-28
A.H. System	Horn Antenna	SAS-200/571	135	2006-4-28	2007-4-28

*** Statement of Traceability:** Bay Area Compliance Lab 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:	1005mbar

The testing was performed by Deny Xiong on 2006-7-10.

Test Mode: Transmitting

For Narrow band

Indicated		Table	Test Antenna			Substituted			Antenna Loss	Cable Loss	Absolute	
Frequency	Meter Reading	Angle	Height	Polar	Frequency	Level	Polar	Gain	Loss		Level	
MHz	dBuV/m	Degree	Meter	H/V	MHz	dBm	H/V	dB	dB		dBm	W
Middle Channel												
445	91.94	45	1.62	H	470	23	H	0	5.07		17.93	0.062
445	106.37	45	1.5	V	470	40.8	V	0	5.07		35.73	3.741

§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	2006-2-28	2007-2-28
NANYAN	Audio Generator	NY2201	019829	2005-12-23	2006-12-23

*** Statement of Traceability:** Bay Area Compliance Lab 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

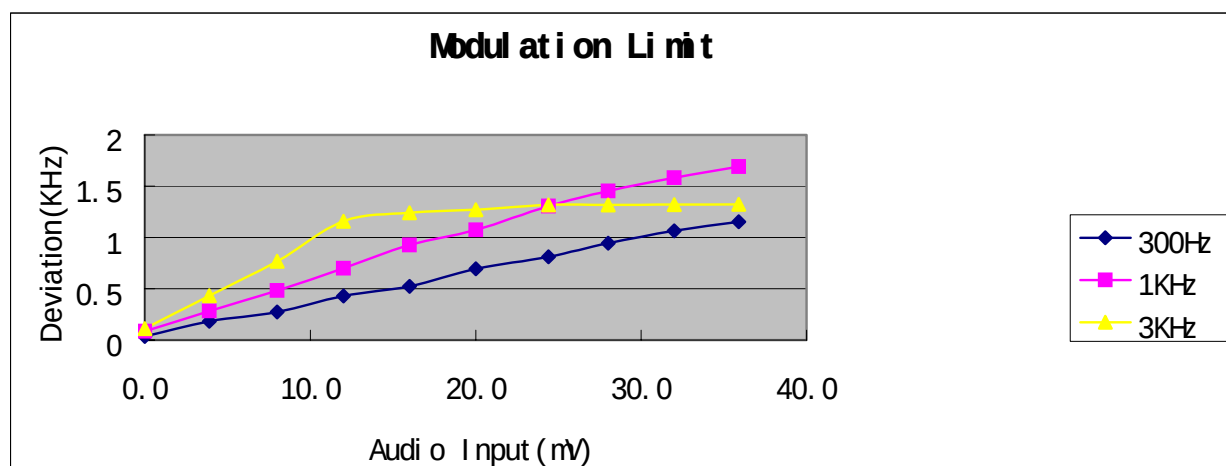
The testing was performed by Charmi Peng on 2006-7-18.

Test Result: Pass

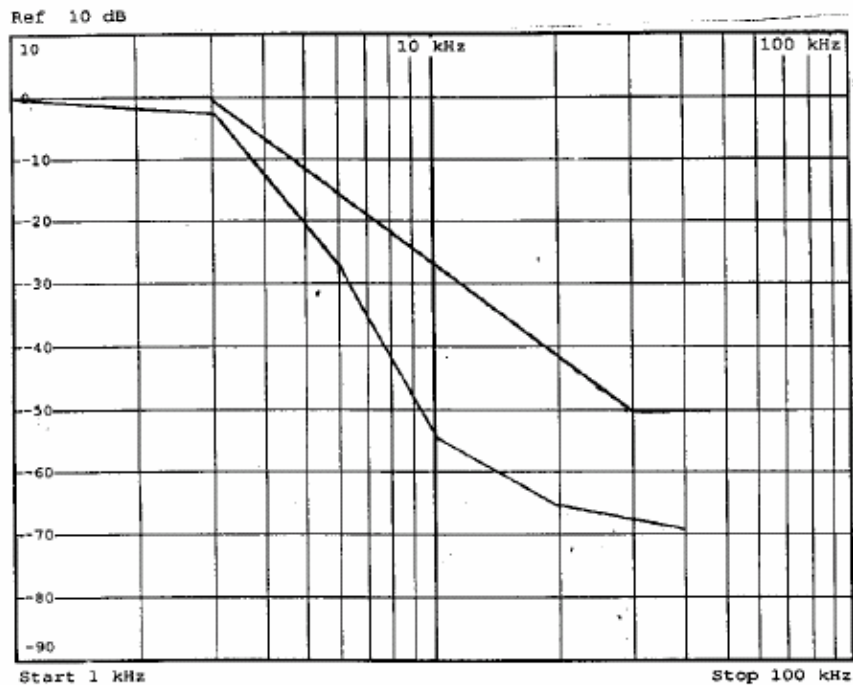
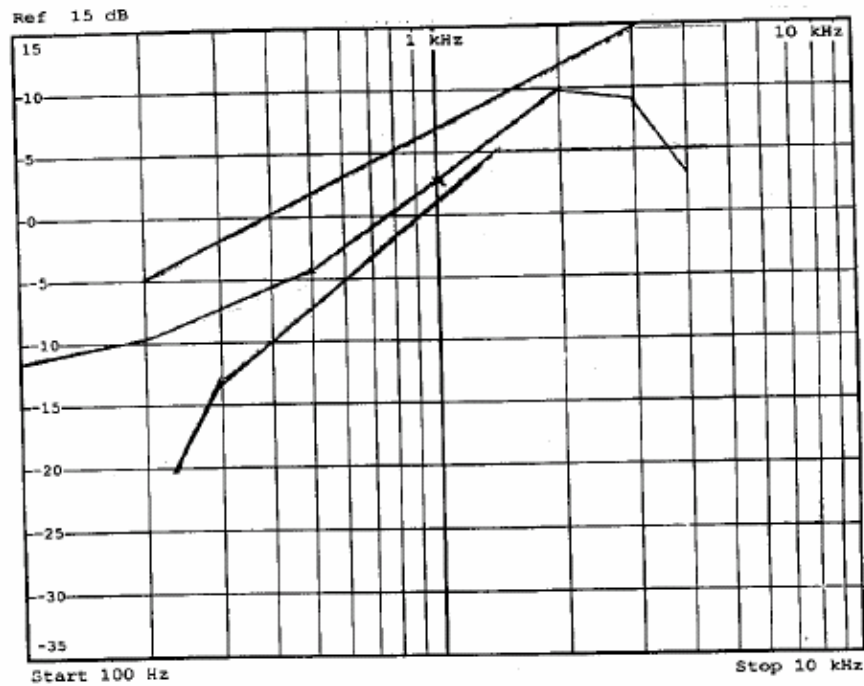
Test Mode: Transmitting

For 12.5 kHz Channel Bandwidth:

Audio Input (mV)	300Hz Deviation (kHz)	1kHz Deviation (kHz)	3kHz Deviation (kHz)
0.0	0.035	0.086	0.111
4.0	0.183	0.282	0.431
8.0	0.273	0.481	0.769
12.0	0.428	0.701	1.160
16.0	0.525	0.927	1.241
20.0	0.693	1.074	1.271
24.0	0.813	1.305	1.317
28.0	0.944	1.453	1.319
32.0	1.064	1.581	1.320
36.0	1.152	1.691	1.323



Audio Low pass Filter Characteristic:



§2.1049, and § 90.209 – OCCUPIED BANDWIDTH

Applicable Standard

§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 5.625kHz 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 5.626kHz but no more than 12.5kHz, 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 12.5kHz at least:

$$50 + 10 \log P = 50 + 10 \log (4.742) = 56.76 \text{ dB}$$

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 250kHz 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	2005-8-17	2006-8-17
HP	Modulation Analyzer	8901B	3438A05208	2006-2-28	2007-2-28
NANYAN	Audio Generator	NY2201	019829	2005-12-23	2006-12-23

* **Statement of Traceability:** Bay Area Compliance Lab 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:	1005mbar

The testing was performed by Charmi Peng on 2006-7-10.

Test Result: Pass.

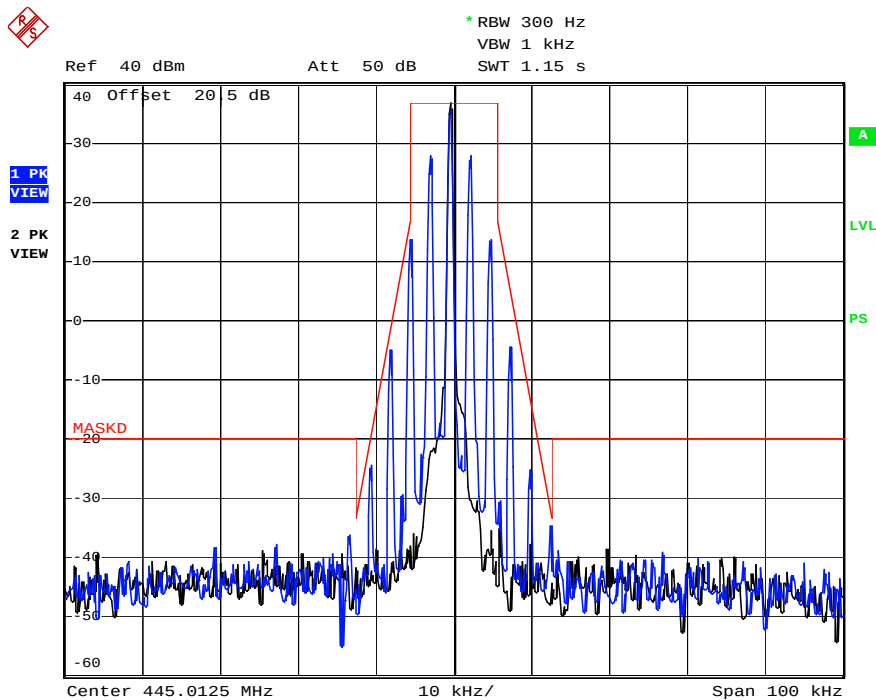
Test Mode: Transmitting

Please refer to the hereinafter plots.

Emission Designator:

For 12.5 KHz Channel Spacing: $2M+2D = 2 \times 3 + 2 \times 2.5 = 11K0F3E$

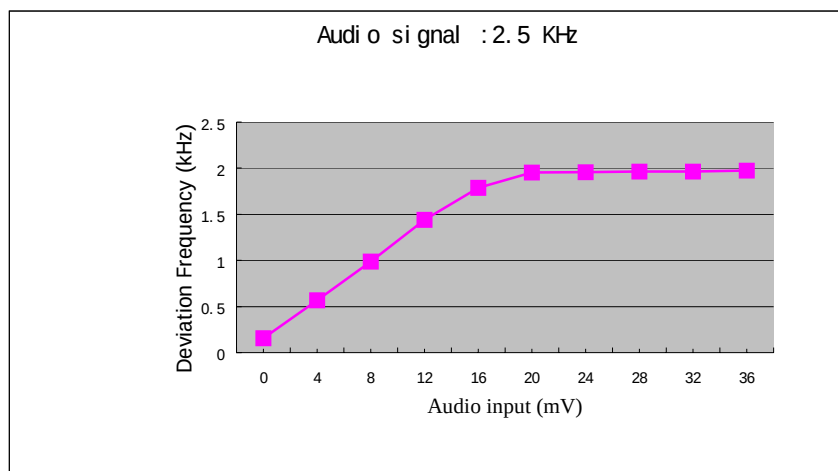
Emission Mask D for 12.5 KHz Channel Bandwidth:



Kirisun Two-way radio M/N:PT42000 Emission mask Narrowband

Date: 18.JUL.2006 15:50:49

Audio input (mV)	Frequency Deviation (kHz)
0	0.156
4	0.568
8	0.987
12	1.442
16	1.787
20	1.954
24	1.955
28	1.963
32	1.965
36	1.973



§2.1051 and §90.210 - SPURIOUS EMISSIONS AT ANTENNA TERMINALS**Applicable Standard**

§90.210 (12.5 kHz bandwidth only)

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

$$50+10\log P=50+10\log (4.742) = 56.76\text{dB}$$

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde&Schwarz	EMI Test Receiver	ESCI	100035	2005-8-17	2006-8-17

*** Statement of Traceability:** Bay Area Compliance Lab 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 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 10th harmonic.

Test Data**Environmental Conditions**

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

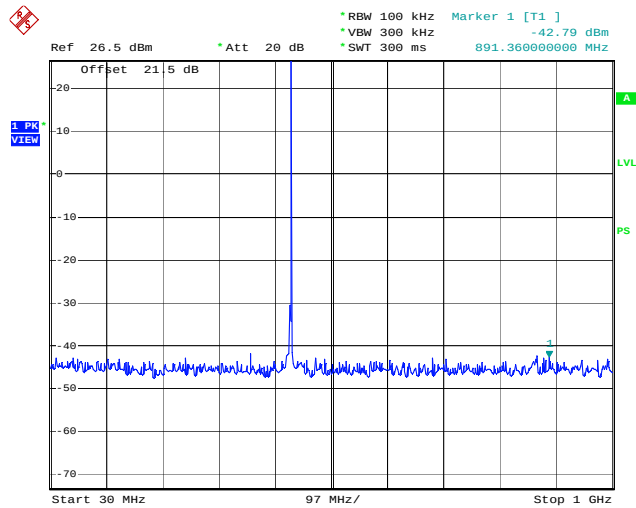
The testing was performed by Charmi Peng on 2006-7-18.

Test Result: Pass

Test Mode: Transmitting

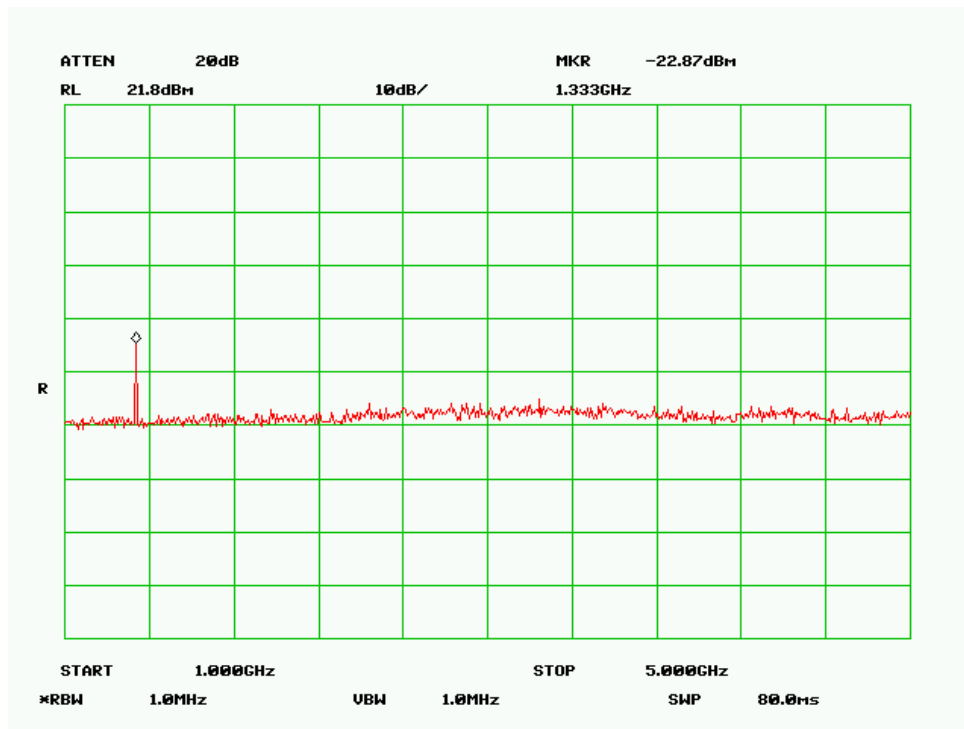
For 12.5 KHz Channel bandwidth:

(30MHz-1GHz)



Kirisun Two-way radio M/N:PT42000 Spurious emission at antenna terminal Mid channel (30MHz-1GHz)
Date: 18.JUL.2006 09:39:52

(1GHz-5GHz)



§2.1053 and §90.210 - RADIATED SPURIOUS EMISSION

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	2005-7-20	2006-7-20
SUNOL SCIENCES	Broadband Antenna	JB1	A040904-1	2006-4-28	2007-4-28
SUNOL SCIENCES	Broadband Antenna	JB1	A040904-2	2006-4-28	2007-4-28
Agilent	Spectrum Analyzer	8564E	3943A01781	2005-12-08	2006-12-08
HP	Signal Generator	HP8657A	2849U00982	2006-2-28	2007-2-28
Giga-tronics	Signal Generator	1026	270801	2006-2-28	2007-2-28
A.H. System	Horn Antenna	SAS-200/571	135	2006-4-28	2007-4-28

*** Statement of Traceability:** Bay Area Compliance Lab 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 lg (TXpwr in Watts/0.001)-the absolute level

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

Spurious attenuation limit in dB = 50 + 10 Log₁₀ (power out in Watts) for EUT with a 12.5 KHz channel bandwidth.

Test Results Summary

Middle Channel: -12.43 dB at 1335.0 MHz

Test Data**Environmental Conditions**

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

The testing was performed by Deny Xiong on 2006-7-10.

Test Mode: Transmitting (Middle channel)

Indicated		Table	Test Antenna		Substituted			Antenna Gain Correction	Cable Loss dB	Absolute Level	FCC Part 90	
Frequency MHz	Meter Reading dBuV/m	Angle Degree	Height Meter	Polar H/V	Frequency MHz	Level dBm	Polar H/V			dBm	Limit dBm	Margin
Middle Channel : CH2												
1335	70.01	146	1.6	V	1335	-38.6	V	6.5	0.33	-32.43	-20	-12.43
890	37.34	280	1.6	V	890	-28.6	V	0	7.62	-36.22	-20	-16.22
3115	56.38	24	1.6	V	3115	-48.6	V	6.9	0.57	-42.27	-20	-22.27
1335	65.39	254	1.6	H	1335	-48.6	H	6.5	0.33	-42.43	-20	-22.43
2670	54.07	204	1.6	H	2670	-51.3	H	7.0	0.38	-44.68	-20	-24.68
3115	55.21	130	1.4	H	3115	-51.7	H	6.9	0.57	-45.37	-20	-25.37
890	28.15	354	1.5	H	890	-40.1	H	0	7.62	-47.72	-20	-27.72
2225	56.11	268	1.5	V	2225	-55.6	V	7.0	0.32	-48.92	-20	-28.92
1780	56.09	104	1.3	V	1780	-55.3	V	6.1	0.43	-49.63	-20	-29.63
2670	57.24	158	1.6	V	2670	-56.7	V	7.0	0.38	-50.08	-20	-30.08
2225	50.19	109	1.2	H	2225	-58.4	H	7.0	0.32	-51.72	-20	-31.72
1780	52.15	128	1.5	H	1780	-60.2	H	6.1	0.43	-54.53	-20	-34.53

§2.1055 (d) and §90.213- FREQUENCY STABILITY

Applicable Standard

§2.1055 (d)

§90.213

For output power > 2 watts and channel bandwidth is 12.5 KHz, the limit is 2.5 ppm.

/

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
WUHUAN	Temperature & Humidity Chamber	HTP205	20021115	2006-1-2	2007-1-2
Hewlett-Packard	Frequency Counter	5342A	2317A08289	2006-1-26	2007-1-26

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

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 Spectrum Analyzer.

Frequency Stability vs. Voltage: An external variable DC power supply Source. The voltage was set to 115% of the nominal value and was then decreased until the transmitter light no longer illuminated; i.e., the end point. The output frequency was recorded for each voltage.

Test Data

Environmental Conditions

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

The testing was performed by Charmi Peng on 2006-7-18.

Test Result: Pass

Test Mode: Transmitting

For Narrow

Reference Frequency: 445.0125 MHz, Limit: 2.5 ppm			
Environment Temperature (°C)	Power Supplied (Vdc)	Frequency Measure with Time Elapsed	
		MCF (MHz)	PPM Error
50	7.4	445.012003	-1.12
40	7.4	445.012041	-1.03
30	7.4	445.012101	-0.90
20	7.4	445.012158	-0.77
10	7.4	445.012011	-1.10
0	7.4	445.011975	-1.18
-10	7.4	445.011862	-1.43
-20	7.4	445.011736	-1.72
-30	7.4	445.011713	-1.77

Frequency Stability versus Input Voltage

Reference Frequency: 445.0125 MHz, Limit: 2.5 ppm		
Power Supplied (Vdc)	Frequency Measure with Time Elapsed	
	Frequency (MHz)	PPM Error
6.3	445.012124	-0.84

§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	2006-1-24	2007-1-24
HP	Modulation Analyzer	8901B	3438A05208	2006-2-28	2007-2-28
HP	Signal Generator	HP8657A	2849U00982	2006-2-28	2007-2-28

*** Statement of Traceability:** Bay Area Compliance Lab 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:	1005mbar

The testing was performed by Charmi Peng on 2006-7-19.

Test Result: Pass

Test Mode: Transmitting

For Narrowband:

Operation Frequency (MHz)	Channel Separation (kHz)	Transient Period (ms)	Transient Frequency	Result
445.0125	12.5	10	<+/-12.5 kHz	Pass
		25	<+/-6.25 kHz	
		10	<+/-12.5 kHz	

For Narrowband

Turn on



Turn off

