



NVLAP LAB CODE 200707-0



FCC PART 90 TYPE APPROVAL

EMI MEASUREMENT AND TEST REPORT

For

Lisheng Electronic Co., Ltd.

Lisheng Industry Zone, 5# Chongxiang St., Econ. & Tech. Area,

Quanzhou, Fujian, China

FCC ID: XEPLS-7500

Report Type: Original Report	Product Type: Two Way Radio
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Report Number: <u>RSZ09060302</u>	
Report Date: <u>2009-07-02</u>	
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Note: This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. 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.

* This report may contain data that are not covered by the NVLAP accreditation and are marked with an asterisk “*” Rev. 2

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GENERAL INFORMATION

Product Description for Equipment Under Test (EUT)

The *Lisheng Electronic Co.,Ltd.*'s product, model number: *LS-7500 (FCC ID: XEPLS-7500)* or the "EUT" as referred to in this report is a *Two-Way Radio*. The EUT is measured approximately 2.6 cm L x 6.0 cmW x 11.9 cmH, powered by 7.2 Vdc.

Items	Technical Specification
Frequency Range	UHF: 450~470 MHz
Conducted output Power	3 Watt
Channel Spacing	25 kHz
Emission Designator	16K0F3E
Modulation Limit	±5kHz
Operation Voltage	7.2 Vdc±20%
Antenna Gain	< 1.8 dBi

* All measurement and test data in this report was gathered from production sample serial number: 0906012 (Assigned by BACL, Shenzhen). The EUT was received on 2009-06-03.

Objective

This Type approval report is prepared on behalf of *Lisheng Electronic 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 Laboratories 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 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 November 21, 2007. 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 Laboratories 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/Standards/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).

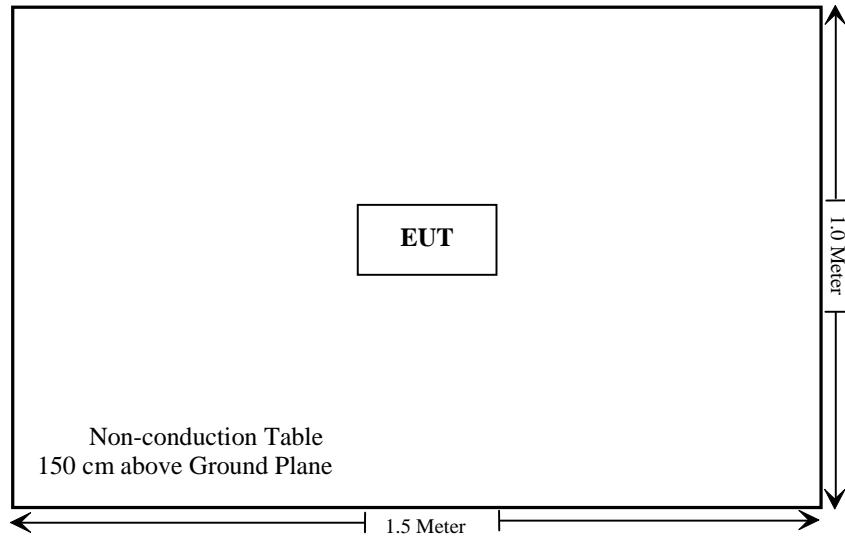
Equipment Modifications

No modifications were made to the unit tested.

Configuration of Test Setup



Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Results
§1.1307(b) §2.1093	RF Exposure	Compliant*
§2.1046 §90.205	RF Output Power	Compliant
§2.1047 §90.207	Modulation Characteristic	Compliant
§2.1049, §90.209;210	Occupied Bandwidth & Emission Mask	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

Note: * Please refer to SAR test report (report Number: R0906114-SAR)

§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 routine environmental evaluation for RF exposure prior or equipment authorization or use.

Result: Compliance.

Please refer to SAR Report, report Number: R0906114-SAR.

§2.1046 & §90.205- RF OUTPUT POWER

Applicable Standard

CFR47 2.1046, and §90.205.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Spectrum Analyzer	FSEM30	849720/019	2008-08-28	2009-08-27
SUNOL SCIENCES	Bound Band Antenna	JB1	A040904-1	2009-03-11	2010-03-11
HP	Signal Generator	HP8657A	2849U00982	2008-10-16	2009-10-16
Sunol Sciences	Bilog Antenna	JB1	A040904-2	2009-04-12	2010-04-11

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

Test Procedure

1. Conducted RF Output Power:

TIA-603-C section 2.2.1

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

Spectrum Analyzer setting:

<i>RBW</i>	<i>Video B/W</i>
<i>100 kHz</i>	<i>300 kHz</i>

2. Radiated Power (ERP)

TIA-603-C section 2.2.1.17

Test Data**Environmental Conditions**

Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	100.1 kPa

The testing was performed by Chris Peng on 2009-06-12.

Test Mode: Transmitting

Test Result: Compliance.

Please refer to following plots

1) Conducted Output Power

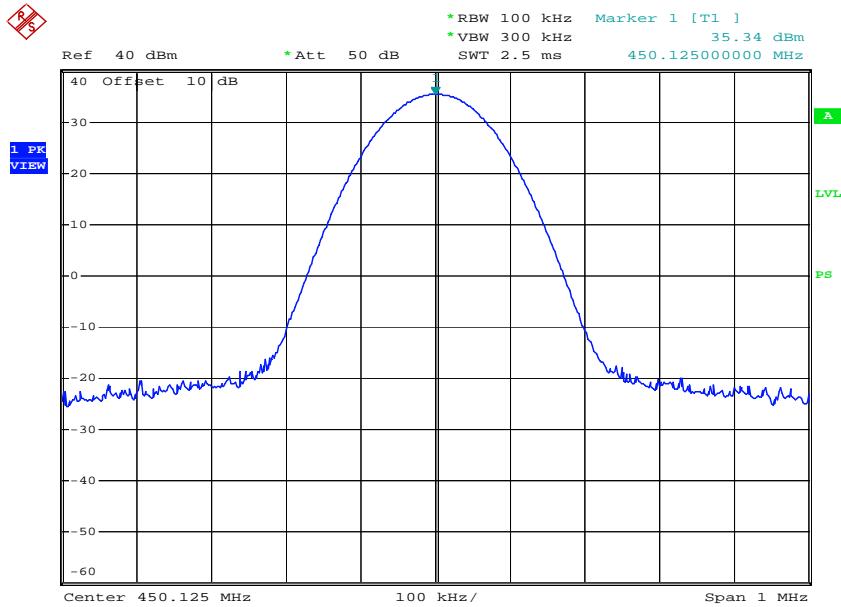
Channel Spacing (kHz)	Frequency (MHz)	Output Power (dBm)	Output Power (Watt)	Comment
25	450.1250	35.34	3.420	Low CH
25	469.9750	35.39	3.459	High CH

2) Effective Radiated Power (ERP)

Frequency Spacing (kHz)	Frequency (MHz)	Conducted Output Power (dBm)	Antenna Gain (dBi)	ERP (dBm)	ERP (Watt)	Comment
25	450.1250	35.34	1.8	34.99	3.155	Low CH
25	469.9750	35.39	1.8	35.04	3.192	High CH

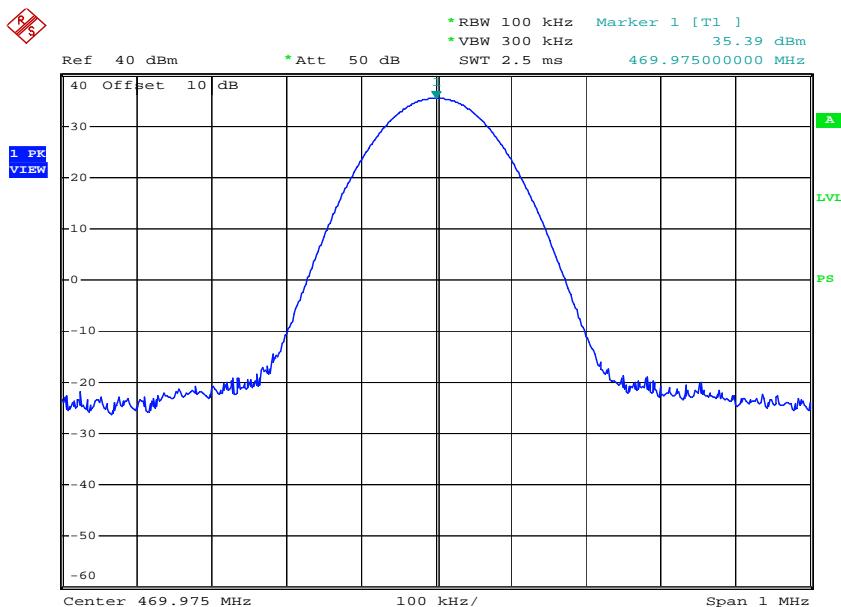
Note: * Antenna Gain = 1.8 dBi.

** EIRP (dBm) = ERP (dBm) + 2.15 (dB)

Plots of Conducted Output Power**Low CH**

Conducted output power-low channel

Date: 12.JUN.2009 00:59:53

High CH

Conducted output power-high channel

Date: 12.JUN.2009 01:03:43

§2.1047 & §90.207 - MODULATION CHARACTERISTIC

Applicable Standard

§2.1047 and §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	2009-04-28	2010-04-27
NANYAN	Audio Generator	NY2201	019829	2009-06-03	2010-06-03

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

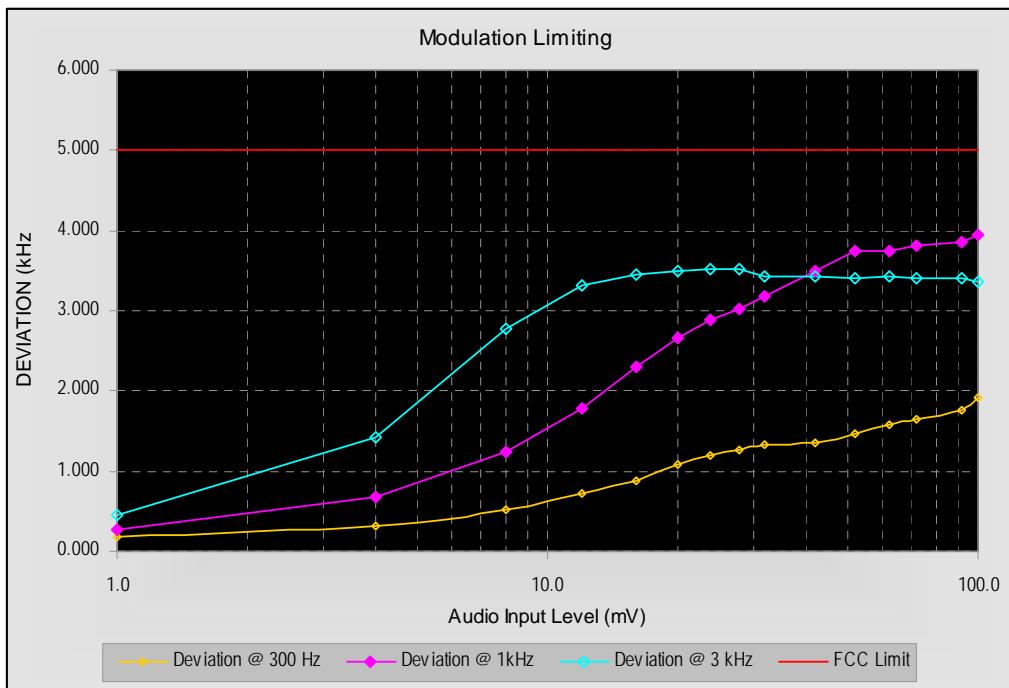
Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	100.1 kPa

The testing was performed by Chris Peng on 2009-06-13.

Test Mode: Transmitting (Middle Channel)

Carrier Frequency: 460.1250 MHz; Channel Separation= 25.0 kHz

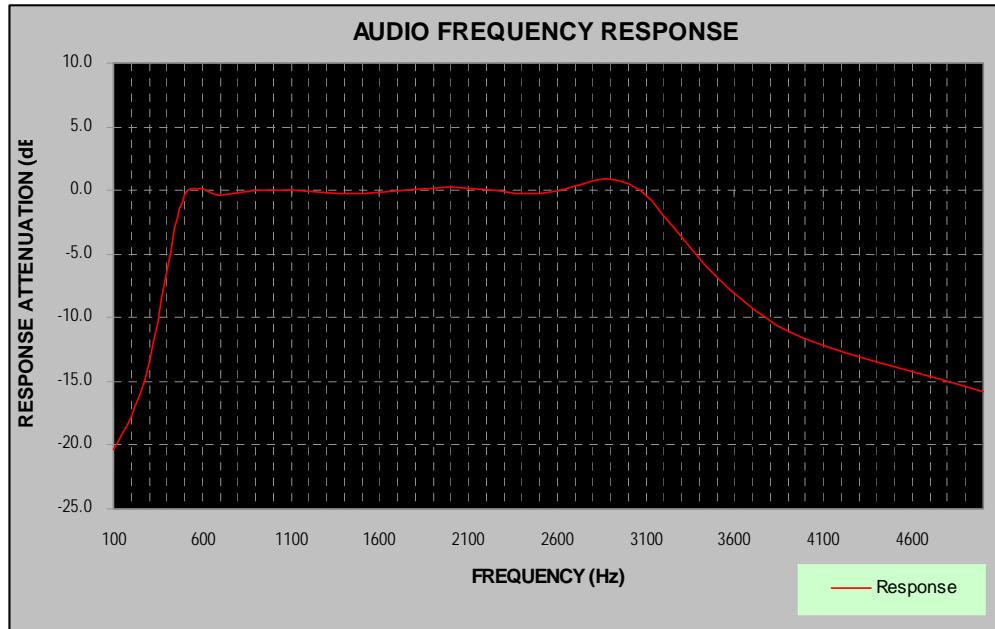
Audio Input Level (mV)	Frequency Deviation (kHz)			FCC Limit (kHz)
	(@ 300 Hz)	(@ 1000 Hz)	(@ 3000 Hz)	
1.0	0.178	0.263	0.440	5.0
4.0	0.322	0.678	1.430	5.0
8.0	0.530	1.250	2.780	5.0
12.0	0.720	1.788	3.310	5.0
16.0	0.889	2.300	3.450	5.0
20.0	1.072	2.670	3.490	5.0
24.0	1.185	2.880	3.520	5.0
28.0	1.264	3.030	3.530	5.0
32.0	1.342	3.170	3.435	5.0
42.0	1.345	3.494	3.439	5.0
52.0	1.461	3.738	3.414	5.0
62.0	1.568	3.748	3.419	5.0
72.0	1.656	3.803	3.414	5.0
92.0	1.767	3.856	3.408	5.0
100.0	1.924	3.956	3.370	5.0



Audio Frequency Response

Carrier Frequency: 460.1250 MHz; Channel Separation= 25.0 kHz

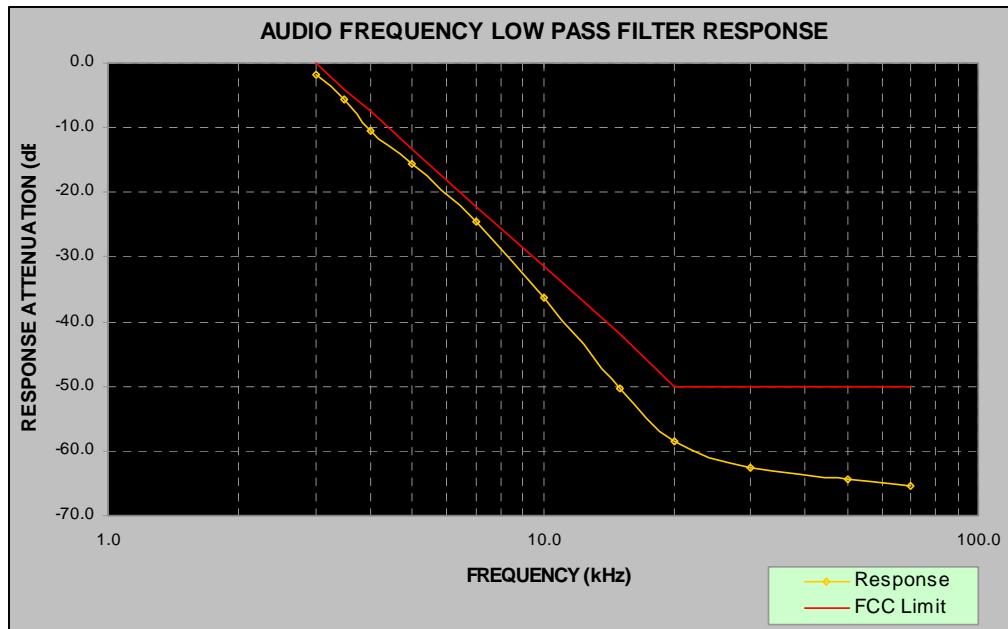
Audio Frequency (Hz)	Response Attenuation (dB)
100	-20.3
200	-17.8
300	-13.3
500	-0.3
700	-0.4
1000	0.0
1500	-0.3
2000	0.3
2500	-0.3
3000	0.5
3500	-6.8
4000	-11.7
5000	-15.9



Audio Frequency Low pass Filter Response

Carrier Frequency: 460.1250 MHz; Channel Separation= 25.0 kHz

Audio Frequency (kHz)	Response Attenuation (dB)	FCC Limit (dB)
3.0	-1.7	0.0
3.5	-5.5	-4.0
4.0	-10.6	-7.5
5.0	-15.6	-13.3
7.0	-24.6	-22.1
10.0	-36.2	-31.4
15.0	-50.3	-42.0
20.0	-58.6	-50.0
30.0	-62.5	-50.0
50.0	-64.3	-50.0
70.0	-65.5	-50.0



§2.1049 & § 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:

Low Channel: $43+10\log P=43+10\log (3.420) =48.34\text{dB}$

High Channel: $43+10\log P=43+10\log (3.459) =48.39\text{dB}$

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	2008-11-07	2009-11-06
HP	Modulation Analyzer	8901B	3438A05208	2009-04-28	2010-04-27
NANYAN	Audio Generator	NY2201	019829	2009-06-03	2010-06-03

*** Statement of Traceability:** Bay Area Compliance Laboratories 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:	56 %
ATM Pressure:	100.1 kPa

The testing was performed by Chris Peng on 2009-06-12.

Test Mode: Transmitting

Please refer to the hereinafter plots.

Emission Designator

According to CFR47 §2.201 & §2.202

Channel separation= 25.0 kHz

Bn = 2M + 2DK

M = 3000 Hz

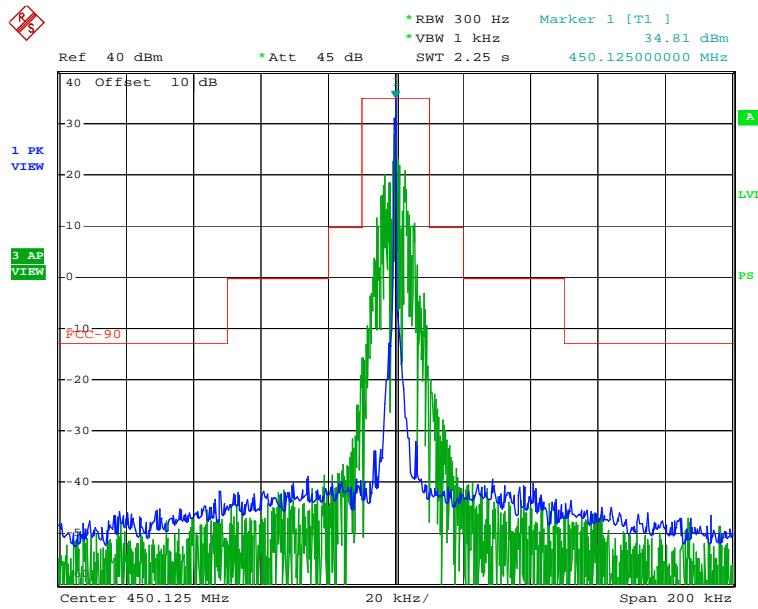
D = 5.0 KHz

K = 1

Bn = 2*(3000) +2*(5000) = 16

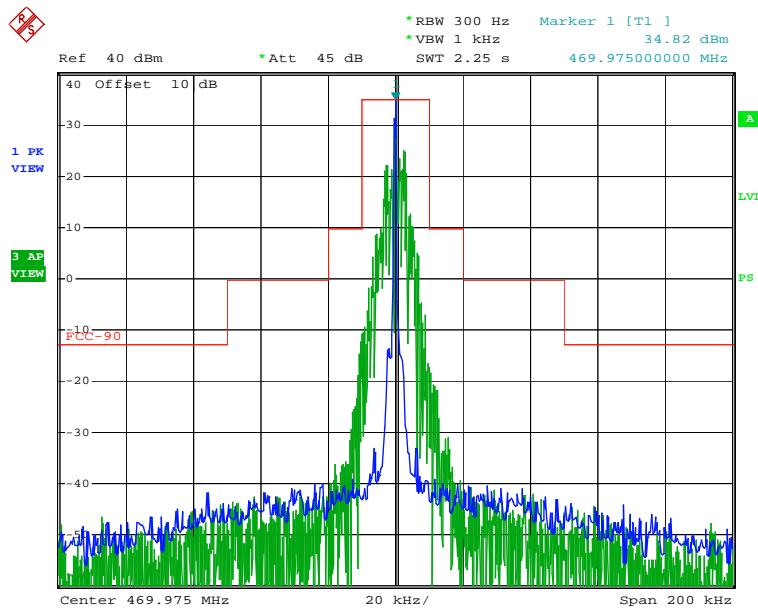
Emission Designator: 16K0F3E

Please refer to the emission mask plots hereinafter.

Emission Mask (Low CH)

emission mask for low channel

Date: 12.JUN.2009 12:10:32

Emission Mask (High CH)

emission mask for high channel

Date: 12.JUN.2009 12:17:28

§2.1051 & §90.210 - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Applicable Standard

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:
$$43 + 10\log(P) \text{ dB}$$

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	Serial Number	Calibration Date	Calibration Due Date
Rohde&Schwarz	Spectrum Analyzer	FSEM30	849720/019	2008-08-28	2009-08-27
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2008-11-07	2009-11-06

*** Statement of Traceability:** Bay Area Compliance Laboratories 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 EUT 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

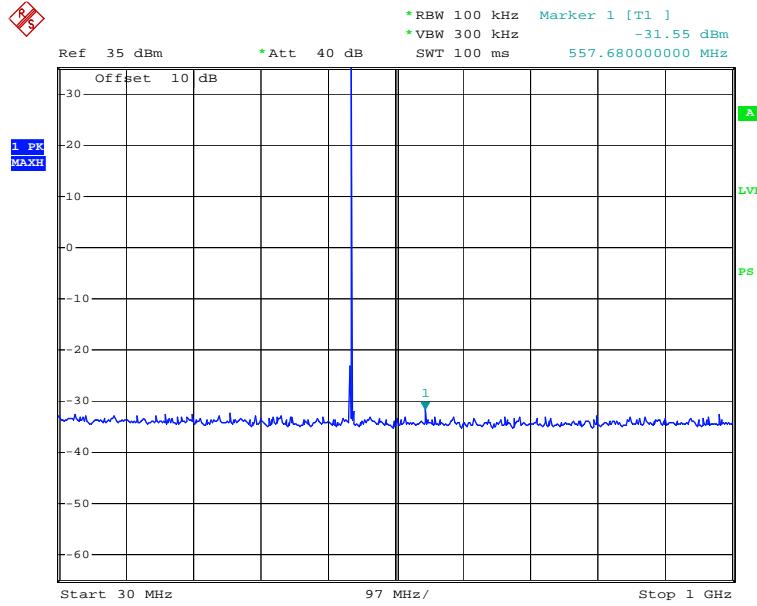
Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	100.1 kPa

The testing was performed by Chris Peng on 2009-06-12.

Test Mode: Transmitting

Low Channel

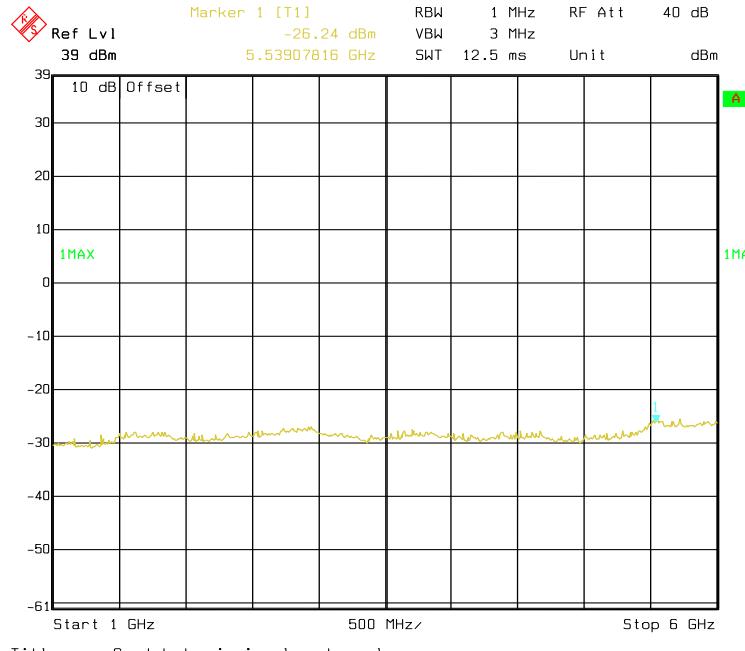
(30 MHz-1 GHz)



conducted emission-low channel

Date: 12.JUN.2009 21:38:28

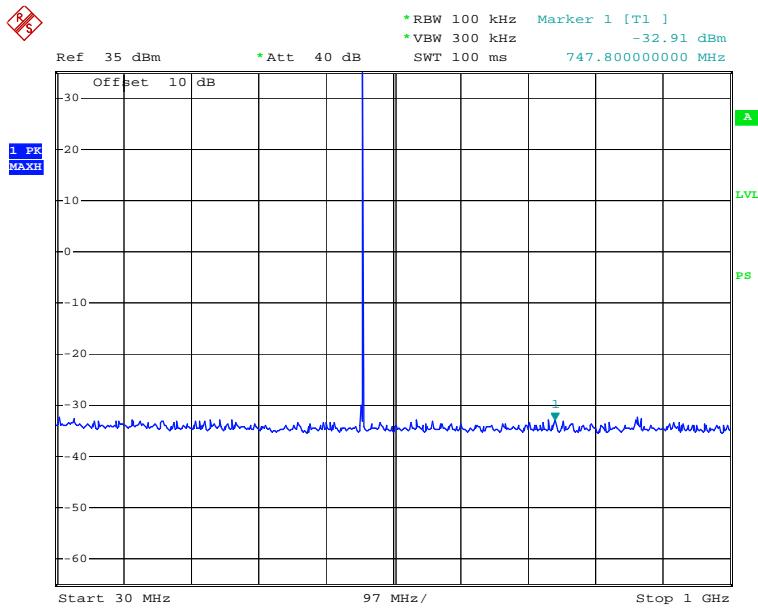
(1 GHz-6 GHz)



Title: Conducted emission-low channel

High Channel

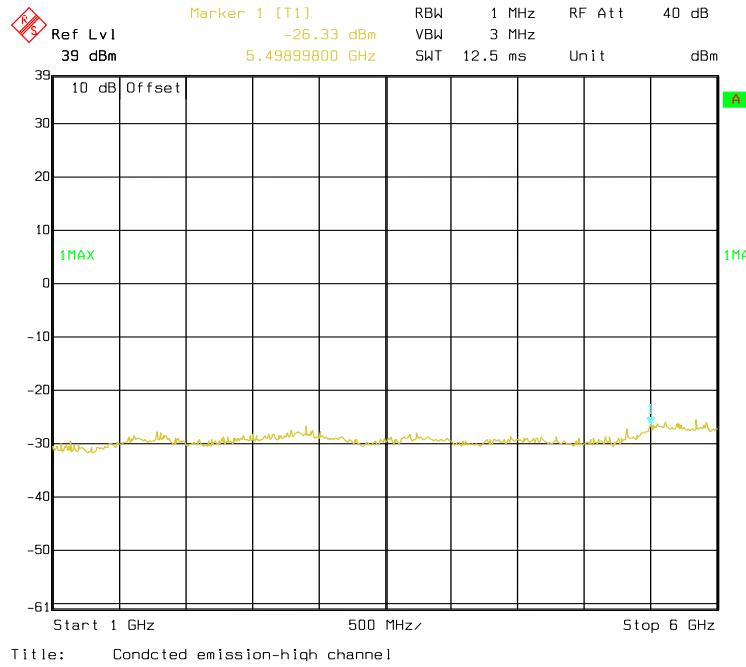
(30 MHz-1 GHz)



conducted emission-high channel

Date: 12.JUN.2009 21:40:12

(1 GHz-6 GHz)



Title: Conducted emission-high channel

§2.1053 & §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	2008-09-25	2009-09-25
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2009-03-11	2010-03-11
Sunol Sciences	Bilog Antenna	JB1	A040904-2	2009-04-12	2010-04-11
Rohde&Schwarz	Spectrum Analyzer	FSEM30	849720/019	2008-08-28	2009-08-27
HP	Signal Generator	HP8657A	2849U00982	2008-10-16	2009-10-16
A.H. System	Horn Antenna	SAS-200/571	135	2009-05-17	2010-05-17
HP	Synthesized Sweeper	8341B	2624A00116	2008-11-07	2009-11-06

* **Statement of Traceability:** Bay Area Compliance Laboratories 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 lg (power out in Watts)

Test Results Summary

16.0 dB at 900.250 MHz in the Horizontal polarization (Low CH)
17.7 dB at 3289.825 MHz in the Vertical polarization (High CH)

Test Data

Environmental Conditions

Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	100.1 kPa

The testing was performed by Chris Peng on 2009-06-14.

Test Mode: Transmitting

Indicated		Table Angle Degree	Test Antenna		Substituted					Absolute Level (dBm)	FCC Part 90	
Frequency (MHz)	Amp. (dB μ V/m)		Height (m)	Polar (H/V)	Frequency (MHz)	S.G. Level (dBm)	Ant. Polar (H/V)	Antenna Gain Cord.	Cable Loss (dB)		Limit (dBm)	Margin (dB)
Low Channel 450.1250 MHz												
900.250	44.86	0	2.0	H	900.250	-28.3	H	0	0.7	-29.0	-13	16.0
900.250	41.05	270	1.0	V	900.250	-31.7	V	0	0.7	-32.4	-13	19.4
3150.875	60.98	98	2.0	H	3150.875	-42.0	H	7.5	1.3	-35.8	-13	22.8
2250.625	56.29	156	1.0	V	2250.625	-44.7	V	6.7	1.1	-39.1	-13	26.1
2700.750	54.81	90	1.2	V	2700.75	-45.2	V	7.3	1.2	-39.1	-13	26.1
1350.375	62.82	160	1.2	V	1350.375	-45.2	V	6.3	0.8	-39.7	-13	26.7
3150.875	53.46	270	1.6	V	3150.875	-46.1	V	7.5	1.3	-39.9	-13	26.9
1350.375	59.13	168	1.7	H	1350.375	-46.0	H	6.3	0.8	-40.5	-13	27.5
1800.500	60.44	360	1.0	V	1800.500	-46.3	V	6.1	1.0	-41.2	-13	28.2
1800.500	57.47	360	2.0	H	1800.500	-46.7	H	6.1	1.0	-41.6	-13	28.6
2700.750	57.16	360	1.6	H	2700.750	-47.8	H	7.3	1.2	-41.7	-13	28.7
2250.625	55.49	139	1.9	H	2250.625	-49.5	H	6.7	1.1	-43.9	-13	30.9
High Channel 469.9750 MHz												
3289.825	62.86	256	1.1	V	3289.825	-36.2	V	6.9	1.4	-30.7	-13	17.7
939.950	41.70	360	1.6	H	939.950	-30.6	H	0	0.7	-31.3	-13	18.3
3289.825	64.19	297	1.7	H	3289.825	-37.7	H	6.9	1.4	-32.2	-13	19.2
939.950	34.29	136	1.2	V	939.950	-37.7	V	0	0.7	-38.4	-13	25.4
3759.800	55.14	270	1.2	V	3759.800	-44.4	V	6.9	1.5	-39.0	-13	26.0
3759.800	54.29	0	1.8	H	3759.800	-45.3	H	6.9	1.5	-39.9	-13	26.9
1409.925	56.22	186	1.8	H	1409.925	-48.8	H	6.4	0.9	-43.3	-13	30.3
1409.925	55.16	108	1.3	V	1409.925	-51.9	V	6.4	0.9	-46.4	-13	33.4

§2.1055 & §90.213 - FREQUENCY STABILITY

Applicable Standard

CFR47 §2.1055& §90.213

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
WUHUAN	Temperature & Humidity Chamber	HTP205	20021115	2009-05-09	2010-05-09
Hewlett-Packard	Frequency Counter	5342A	2317A08289	2009-04-22	2010-04-22

* **Statement of Traceability:** Bay Area Compliance Laboratories 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 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:	56 %
ATM Pressure:	100.1 kPa

The testing was performed by Chris Peng on 2009-06-13.

Test Mode: Transmitting

1) Frequency Stability versus temperature

Reference Frequency: 460.1250 MHz, Limit: ± 5.0 ppm			
Test Environment		Measurement Frequency (MHz)	Frequency Error (ppm)
Temperature (°C)	Power Supplied (Vdc)		
60	7.2	460.12534	0.7389296
40	7.2	460.12528	0.6085303
30	7.2	460.12532	0.6954632
20	7.2	460.12530	0.6519967
10	7.2	460.12530	0.6519967
0	7.2	460.12532	0.6954632
-10	7.2	460.12530	0.6519967
-20	7.2	460.12532	0.6954632
-30	7.2	460.12536	0.7823961

2) Frequency Stability versus Voltage

Reference Frequency: 460.1250 MHz, Limit: ± 5.0 ppm			
Test Environment		Measurement Frequency (MHz)	Frequency Error (ppm)
Temperature (°C)	Power Supplied (Vdc)		
20	5.76	460.12532	0.6954632
20	8.64	460.12561	1.3257267

§90.214 - TRANSIENT FREQUENCY BEHAVIOR

Applicable Standard

CFR47 §90.214

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
TEKTRONIX	Digital Phosphor Oscilloscope	TDS 7104	B020518	2009-04-28	2010-04-27
HP	Modulation Analyzer	8901B	3438A05208	2009-04-28	2010-04-27
HP	Signal Generator	HP8657A	2849U00982	2008-10-16	2009-10-16

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

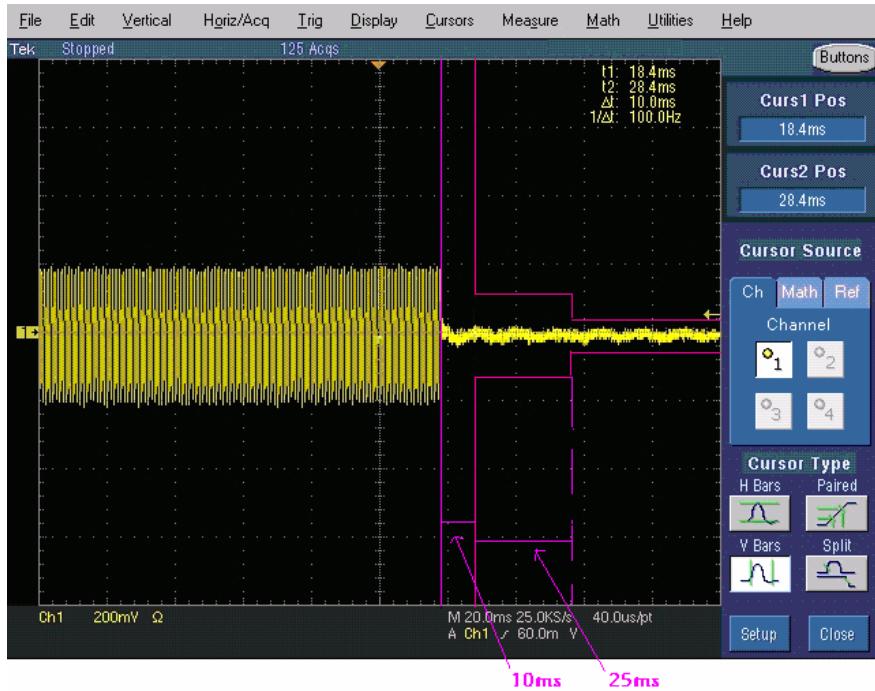
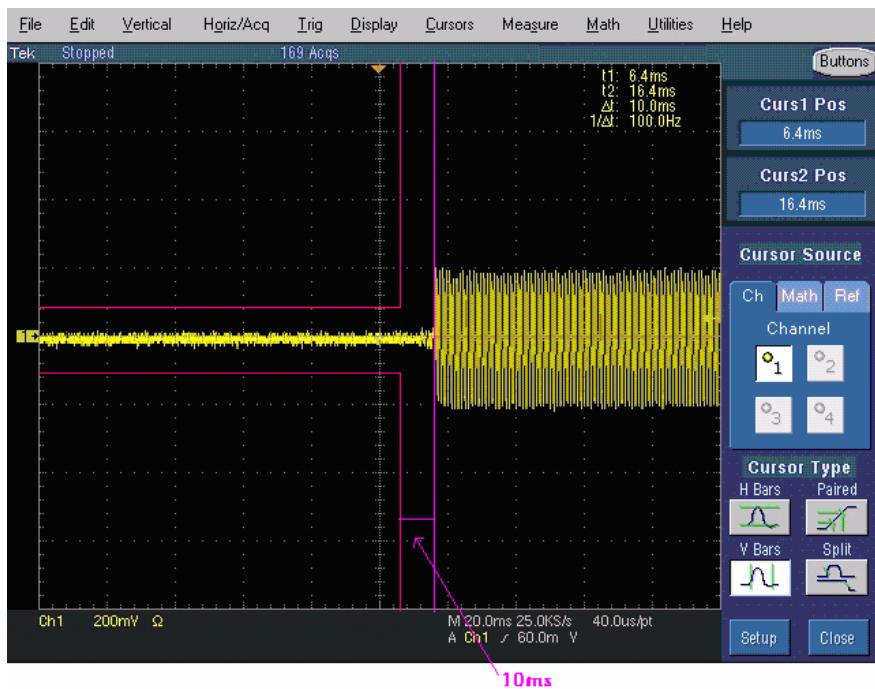
Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	100.1 kPa

The testing was performed by Chris Peng on 2009-06-13.

Test Result: Compliance.

Please refer to the following table and plots.

Frequency (MHz)	Channel Separation (kHz)	Transient Period (ms)	Transient Frequency	Result
460.1250	25.0	10	<+/-25.0 kHz	Pass
		25	<+/-12.5 kHz	
		10	<+/-25.0 kHz	

Turn on**Turn off********* END OF REPORT *******