

FCC PART 15 Subpart C

EMI MEASUREMENT AND TEST REPORT

For

SONGWAVE ELECTRONICS LTD.

RM 501, 5/F, PREMIER CENTRE, NO.20 CHEUNG SHUN STREET, CHEUNG SHA WAN,
H.K.

FCC ID: Q94SW-3388

July 7, 2003

This Report Concerns: <input checked="" type="checkbox"/> Original Report	Equipment Type: Mobile Shape Walkie Talkie
Test Engineer: <u>Jandy Su</u>	
Report No.: <u>RSZ03062402</u>	
Test Date: <u>June 24, 2003</u>	
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NVLAP or any agency of the U.S. Government.

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1 - GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

The *SONGWAVE ELECTRONICS LTD.*'s product, model name: *SW-3388* or the "EUT" as referred to in this report is Mobile Shape Walkie Talkie. The EUT is a Transmitter, which measures approximately 10.7cmL x 5.6cmW x 2.6cmH, rated input voltage: DC 9V.

The EUT power: DC 9V battery, we used new battery to test.

** The test data was good for test sample only. It may have deviation for other product samples.*

1.2 Objective

This document is a test report based on the Electromagnetic Interference (EMI) tests performed on the EUT. The EMI measurements were performed according to the measurement procedure described in ANSI C63.4 - 1992.

The tests were performed in order to determine whether the electromagnetic emissions from the equipment under test, referred to as EUT hereafter, are within the specification limits defined by FCC Title 47, Part 15, Subpart C, section 15.203, 15.205, 15.207, 15.209 and 15.235.

1.3 Related Submittal(s)/Grant(s)

No Related Submittals

1.4 Test Methodology

All measurements contained in this report were conducted with ANSI C63.4 - 1992, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz. All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratory, Corp. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

1.5 Test Facility

The open Area Test site used by Bay Area Compliance Laboratory Corporation to collect radiated electromagnetic disturbance and disturbance voltage measurement data is located in the No. 3 building JingHua Courtyard, Shennanzhong Rd ShenZhen, Guandong 518031, P.R. C, and 230 Commercial Street, Sunnyvale, CA 94085 USA.

Test site at Bay Area Compliance Laboratory Corporation has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports has been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997 and Article 8 of the VCCI regulations on December 25, 1997. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4 - 1992.

The Federal Communications Commission and Voluntary Control Council for Interference has the reports on file and is listed under FCC file 31040/SIT 1300F2 and VCCI Registration No.: C-1298 and R-1234. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, Bay Area Compliance Laboratory Corporation is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (NVLAP). The scope of the accreditation covers the FCC Method - 47 CFR Part 15 - Digital Devices, CISPR 22:1997 and AS/NZS 3548: Electromagnetic Interference - Limits and Methods of Measurement of Information Technology Equipment test methods under NVLAP Lab Code 200167-0.

1.6 Test Equipment List

Manufacturer	Description	Model	Serial Number	Cal. Due Date
R/S	Spectrum Analyzer	FSEM	849720/019	08/05/2004
HP	Amplifier	8447D	2944A09795	08/05/2004
ETS	Log Periodic Antenna	3146	9603-4421	09/05/2004
ETS	Biconical Antenna	3110B	3360	08/05/2004
Solar Electronics	LISN	TYPE 8012-50-R-24-BNC	21162	09/05/2004
Solar Electronics	LISN	TYPE 8012-50-R-25-BNC	21163	10/05/2004
COM Power	LISN	LI-200	12208	10/30/2003
COM Power	LISN	LI-200	12005	10/30/2003
HP	Spectrum Analyzer	8568B	2517A01610	10/30/2003
HP	Spectrum Analyzer Display Unit	8568B	2517A10039	10/30/2003
HP	Quasi-Peak Adapter	8565A	3107A01572	10/31/2004
FCC	Absorbing Clamp	F-201-23mm	90	12/21/2004

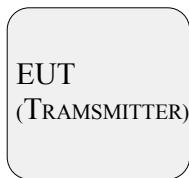
***Statement of Traceability: Bay Area Compliance Laboratory Corp.** Certifies that all calibration has been performed using suitable standards traceable to the NATIONAL INSTITUTE of STANDARDS and TECHNOLOGY.

2 - SYSTEM TEST CONFIGURATION

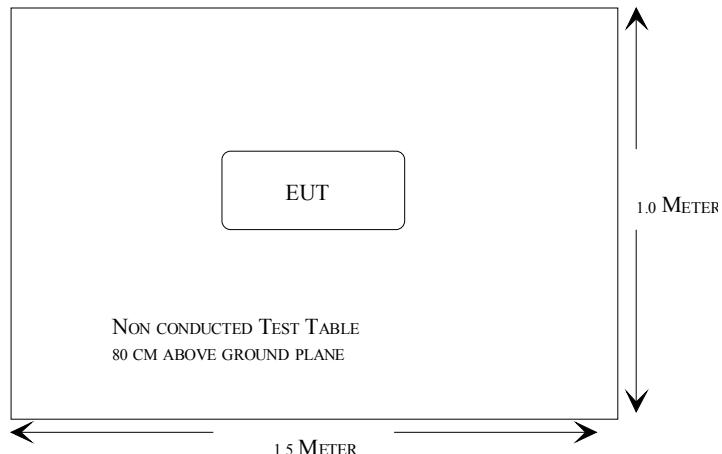
2.1 Description of Test Configuration

The EUT was configured for testing in a typical fashion (as normally used by a typical user).

2.2 Configuration of Test System



2.3 Test Setup Block Diagram



2.4 Equipment Modifications

No modification(s) to the EUT were made by BACL to comply with the applicable limits.

3 - SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT
§ 15.203	Antenna requirement	Pass
§ 15.205	Restricted Bands of Operation	Pass
§ 15.207	Conduct Limits	Pass
§ 15.209	Radiated Emission Limits; General Requirements	Pass
§ 15.235	Operation within the Band 49.82-49.90 MHz	Pass

4 - CONDUCTED EMISSIONS TEST DATA

The EUT was battery operated, did not have AC power source, therefore conducted emissions test was omitted.

5 - RADIATED EMISSION DATA

5.1 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at BACL is ± 4.0 dB.

5.2 EUT Setup

The radiated emission tests were performed in the open area 3-meter test site, using the setup in accordance with the ANSI C63.4 - 1992. The specification used was the FCC 15 Subpart C 15.235 limits for transmitter.

The test modes were lie, stand, and side. Lie is the worst mode, and the worst mode test data was included in the test report.

The EUT was placed center of the test table.

5.3 Spectrum Analyzer Setup

According to FCC Rules, 47 CFR, Section 15.33, the system was tested to 1000 MHz.

The spectrum analyzer was set with the following configurations during the radiated emission test:

Start Frequency	30 MHz
Stop Frequency	1000 MHz
Sweep Speed	Auto
IF Bandwidth	100 KHz
Video Bandwidth	1 MHz
Quasi-Peak Adapter Bandwidth	120 KHz
Quasi-Peak Adapter Mode	Normal
Resolution Bandwidth	100 KHz

5.4 Test Procedure

For the radiated emissions test, since the EUT does not have AC power source, there was no connection to AC outlets.

Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance is with all installation combinations. All data was recorded in the peak detection mode. Quasi-peak readings was performed only when an emission was found to be marginal (within -4 dB of specification limit), and are distinguished with a "Qp" in the data table.

5.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Antenna Factor} + \text{Cable Factor} - \text{Amplifier Gain}$$

The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB μ V means the emission is 7dB μ V below the maximum limit for applicable limits. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{Applicable Limit}$$

5.6 Summary of Test Results

According to the data in section 4.7, the EUT complied with the FCC Title 47, Part 15, Subpart C, section 15.203, 15.205, 15.207, 15.209, and 15.235 after tested to 10th harmonics as required by FCC and had the worst margin of:

- 3.2 dB μ V at 99.72 MHz in the Vertical polarization, 30 – 1000MHz, 3 meters.

5.7 Radiated Emissions Test Result Data

Date of Test :	June 24, 2003	Temperature :	25°C
EUT :	Mobile Shape Walkie Talkie	Humidity :	70%
M/N :	SW-3388	Operating Mode :	Transmitting
S/N :	N/A	Test Engineer :	Jandy Su

Indicated			Table	Antenna		Correction Factor			FCC 15 Subpart C		
Frequency MHz	Ampl. dB μ V/m	Direction Degree		Height Meter	Polar H/V	Antenna dB μ V/m	Cable Loss dB μ V/m	Amp. dB	Corr. Ampl. dB μ V/m	Limit dB μ V/m	Margin dB
99.72	54	90	1.2	v	10.4	0.9	25	40.3	43.5	-3.2	QP
149.58	50.7	0	1.2	v	13.4	0.8	25	39.9	43.5	-3.6	QP
199.44	48.3	135	1.0	v	14.4	1.2	25	38.9	43.5	-4.6	QP
149.58	48.9	0	1.2	h	13.4	0.8	25	38.1	43.5	-5.4	QP
99.72	51.3	270	1.2	h	10.4	0.9	25	37.6	43.5	-5.9	QP
199.44	46.6	90	1.0	h	14.4	1.2	25	37.2	43.5	-6.3	QP
49.86	71	270	1.0	v	11.3	0.4	25	57.7	80	-22.3	Fund-AV
49.86	67.9	45	1.0	h	11.3	0.4	25	54.6	80	-25.4	Fund-AV

6 –10K BAND EDGES TESTING

Requirements: Only for 49.86MHz EUT, FCC 15.235 (b), The field strength of any emissions appearing between the band edges and up to 10 kHz above and below the 26 dB below the level of the unmodulated carrier or to the general limits in FCC 15.209, whichever permits the higher emission levels. The field strength of any emissions removed by more than 10 kHz from the band edges shall not exceed the general radiated emission limits in FCC 15.209.

6.1 Spectrum Analyzer Setup

The spectrum analyzer was set with the following configurations during the band edges testing:

Start Frequency	49.80 MHz
Stop Frequency	49.92 MHz
Sweep Speed	400 mS
Video Bandwidth	10 KHz
Resolution Bandwidth.....	10 KHz

6.2 Test Results

From the analyzer plots, we can see the emission level is lower than the general radiated emission limits in FCC 15.209.

Frequency	Attenuation	Limit
MHz	dB μ V	dB μ V
49.81	61.29	26
49.91	58.68	26

Test Results: **Pass**

