

FCC PART 15.249

EMI MEASUREMENT AND TEST REPORT

For

TwinPro International Holding limited

Rm 2303, Office Tower, Convention Plaza, 1 Harbour Rd., Wanchai, Hong Kong

FCC ID: SLC1188041129

This Report Concerns: <input checked="" type="checkbox"/> Original Report	Equipment Type: 2.4GHz Cordless Phone
Test Engineer: <u>Snell Leong/</u> <i>Snell</i>	
Report No.: <u>R0412158</u>	
Report Date: <u>2005-01-07</u> <i>Leong</i>	
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TABLE OF CONTENTS

GENERAL INFORMATION	3
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)	3
OBJECTIVE	3
RELATED SUBMITTAL(S)/GRANT(S).....	3
TEST METHODOLOGY	3
TEST FACILITY	3
SYSTEM TEST CONFIGURATION	5
JUSTIFICATION	5
SCHEMATICS AND BLOCK DIAGRAM.....	5
EQUIPMENT MODIFICATIONS	5
SUMMARY OF TEST RESULTS	6
§15.203 - ANTENNA REQUIREMENT	7
STANDARD APPLICABLE	7
ANTENNA CONNECTED CONSTRUCTION	7
§ 15.249 (C) - CONDUCTED EMISSIONS TEST DATA	8
MEASUREMENT UNCERTAINTY	8
EUT SETUP.....	8
SPECTRUM ANALYZER SETUP	8
TEST EQUIPMENT LIST AND DETAILS.....	8
TEST PROCEDURE	8
ENVIRONMENTAL CONDITIONS	8
SUMMARY OF TEST RESULTS	9
CONDUCTED EMISSIONS TEST DATA	9
PLOT OF CONDUCTED EMISSIONS TEST DATA	9
§15.209(A) - RADIATED EMISSION DATA	12
MEASUREMENT UNCERTAINTY	12
EUT SETUP.....	12
SPECTRUM ANALYZER SETUP	12
TEST EQUIPMENT LIST AND DETAILS.....	13
ENVIRONMENTAL CONDITIONS	13
TEST PROCEDURE	13
CORRECTED AMPLITUDE & MARGIN CALCULATION	13
SUMMARY OF TEST RESULTS	14
RADIATED EMISSIONS TEST RESULT DATA - HANDSET, 3METER	14
§15.249(C) – BAND-EDGE TESTING	17
STANDARD APPLICABLE	17
TEST PROCEDURE	17
TEST EQUIPMENT LIST AND DETAILS.....	17
ENVIRONMENTAL CONDITIONS	17
TEST RESULTS	17

GENERAL INFORMATION

Product Description for Equipment Under Test (EUT)

The *TwinPro International Holdings Limited*'s product, FCC ID: SLC1188041129, or the "EUT" as referred to in this report is a 2.4GHz Cordless Phone. The Base operates between frequency 2403.05-2406.95 MHz, the Handset operates between frequency 2472.00-2475.90. The Base is measured approximately 230mmL x 200mmW x 150mmH. The Handset is measured approximately 140mmL x 50mmW x 33mmH.

* *The test data gathered are from production sample, serial number: 001, 002, provided by the manufacturer.*

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 - 2003.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, section 15.205, 15.207, 15.249, 15.203 and 15.209 rules.

Related Submittal(s)/Grant(s)

No Related Submittals

Test Methodology

All measurements contained in this report were conducted with ANSI C63.4 - 2003, 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.

Test Facility

The Open Area Test site used by Bay Area Compliance Laboratory Corporation to collect radiated and conducted emission measurement data is located in the back parking lot of the building at 230 Commercial Street, Sunnyvale, California, 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 C63.4-2003.

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, BACL is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (Lab Code 200167-0). The current scope of accreditations can be found at <http://ts.nist.gov/ts/htdocs/210/214/scopes/2001670.htm>

SYSTEM TEST CONFIGURATION

Justification

The EUT was configured for testing according to ANSI C63.4-2003.

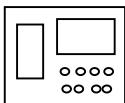
Schematics and Block Diagram

Please refer to Appendix A.

Equipment Modifications

No modifications were made to the EUT.

Test Setup Configuration



EUT

SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT
§15.203	Antenna Requirement	Compliant
§15.205	Restricted Bands of Operation	Compliant
§15.207 (a)	Conducted Emission	Compliant
§15.209 (a), §15.249 (a)	Radiated Emission	Within Measurement Uncertainty
§15.249 (c)	Band Edge Testing	Compliant

§15.203 - ANTENNA REQUIREMENT

Standard Applicable

For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

Antenna Connected Construction

The antenna connector is designed with permanent attachment and no consideration of replacement.

§ 15.249 (c) - CONDUCTED EMISSIONS TEST DATA

Measurement Uncertainty

All measurements involve certain levels of uncertainties. These uncertainties are attributed to: Spectrum analyzer, Cable loss, and LISN.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the estimated uncertainty of any conducted emission measurement at BACL is ±2.4 dB.

EUT Setup

The measurement was performed in the shielded room, using the same setup per ANSI C63.4-2003 measurement procedure. The specification used was FCC 15 Subpart C limits.

External I/O cables were draped along the edge of the test table and bundle as required.

The EUT was connected with 120Vac/60Hz power source.

Spectrum Analyzer Setup

The spectrum analyzer was set to investigate the spectrum from 150 kHz to 30MHz.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
Rohde & Schwarz	Artificial LISN	ESH2-Z5	871884/039	2004-03-28
Rohde & Schwarz	EMI Test Receiver	ESCS30	100176	2004-05-06
Fluke	Calibrated Voltmeter	189	18485-38	2004-07-18

* **Statement of Traceability:** BACL attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

Test Procedure

During the conducted emission test, the power cord of the host system was connected to the main outlet of the LISN-1.

Maximizing procedure were performed on the six (6) highest emissions of the EUT.

All data was recorded in the peak detection mode, quasi-peak and average. Quasi-Peak readings are distinguished with an “QP”. Average readings are distinguished with an “Ave”.

Environmental Conditions

Temperature:	19 °C
Relative Humidity:	54%
ATM Pressure:	1011mbar

*Testing was performed by Snell Leong on 2005-01-06.

Summary of Test Results

According to the recorded data in following table, the EUT complies with the FCC Conducted limit for a Class B device, with the *worst* margin reading of:

-6.8 dB at 0.15 MHz in the **Neutral** mode

Conducted Emissions Test Data

LINE CONDUCTED EMISSIONS				FCC CLASS B	
Frequency MHz	Amplitude dB μ V	Detector QP/Ave/Peak	Phase Line/Neutral	Limit dB μ V	Margin dB
0.15	59.2	QP	Neutral	66	-6.8
0.15	55.6	QP	Line	66	-10.4
0.37	30.8	QP	Line	56	-25.2
21.50	22.5	AVE	Neutral	50	-27.5
0.15	27.8	AVE	Neutral	56	-28.2
0.41	27.6	QP	Neutral	56	-28.4
25.40	18.5	AVE	Line	50	-31.5
0.15	23.8	AVE	Line	56	-32.2
21.50	22.2	QP	Neutral	60	-37.8
25.40	18.7	QP	Line	60	-41.3

Plot of Conducted Emissions Test Data

Plot of Conducted Emissions test data was presented hereinafter as reference.

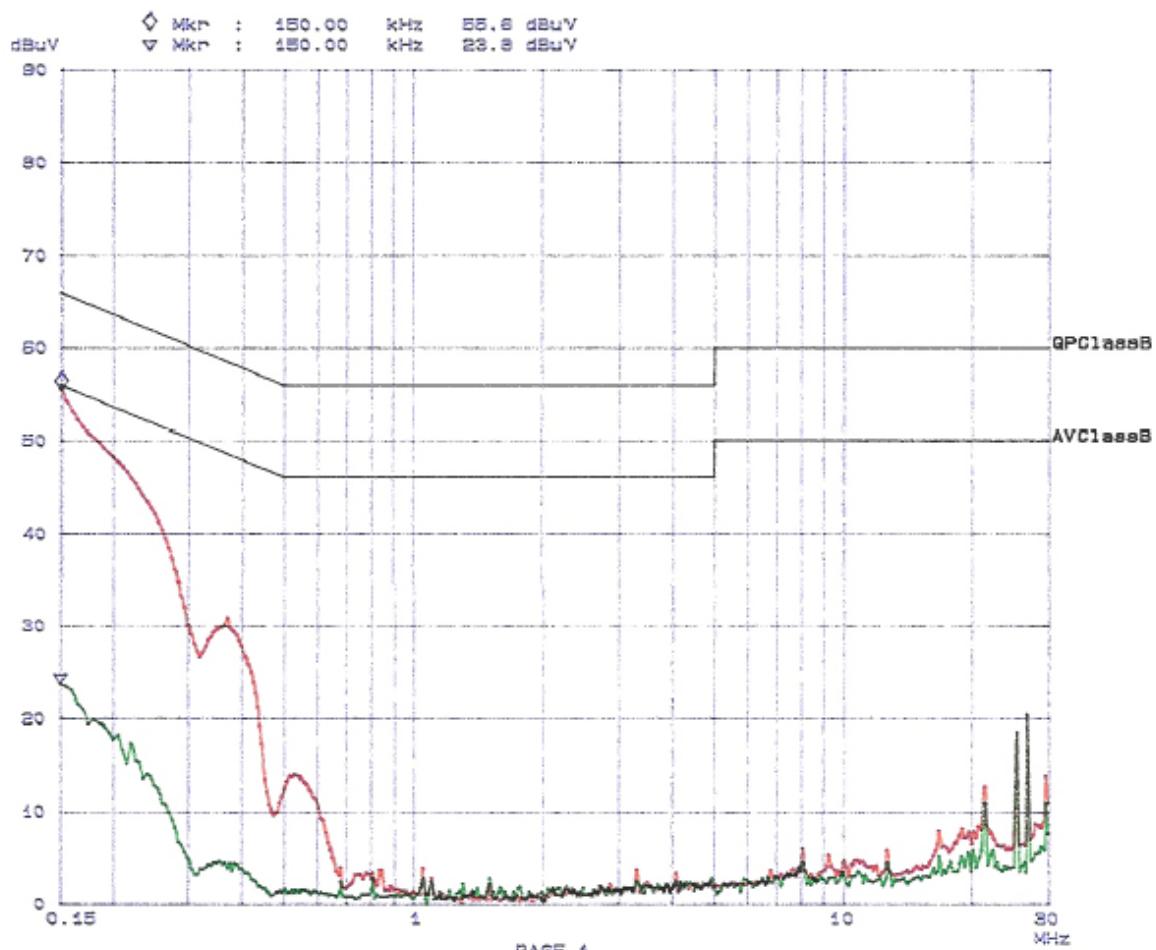
BayArea Compliance Laboratory Corp
Class B

06. Jan 05 18:18

EUT: 2.4 GHz Cordless Phone
Manuf: TwinPro International Holdings Limited
Op Cond: Normal
Operator: Shell
Comment: L
120V

Scan Settings (3 Ranges)

Frequencies			Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp
150K	1M	5K	5K	QP+AV	20ms	15dBBLN	OFF
1M	5M	10K	5K	QP+AV	1ms	15dBBLN	OFF
5M	30M	100K	5K	QP+AV	1ms	15dBBLN	OFF

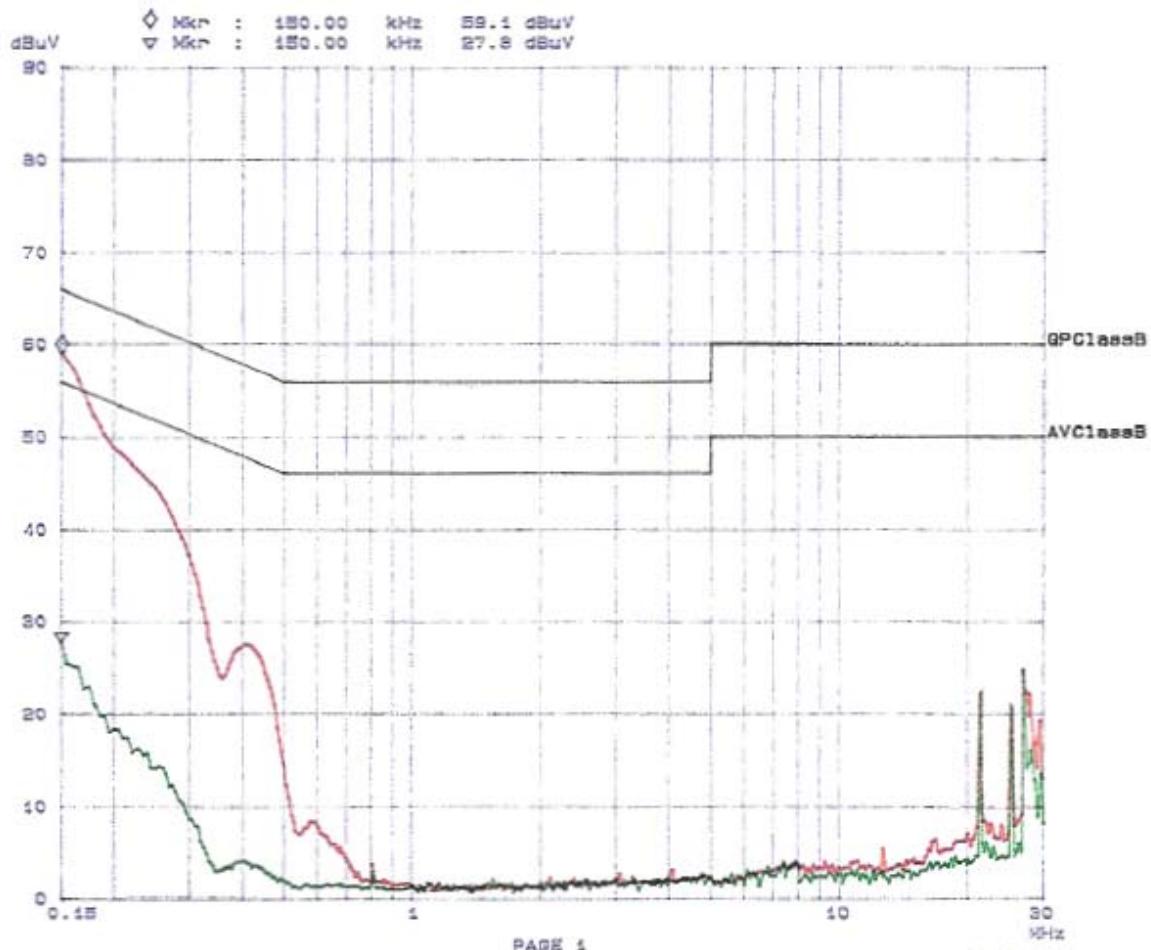
06/Jan/05
Shell

BayArea Compliance Laboratory Corp
Class B

06. Jan 05 18:38

EUT: 2.4 GHz Cordless Phone
Manuf: TwinPro International Holdings Limited
Op Cond: Normal
Operator: Shell
Comment: N
120V

Scan Settings [3 Ranges]
Frequencies Receiver Settings
Start Stop Step IF BW Detector M-Time Atten Preamp
150k 1M 5k 9k QP+AV 20ms 15dBLLN OFF
1M 5M 10k 9k QP+AV 1ms 15dBLLN OFF
5M 30M 100k 9k QP+AV 1ms 15dBLLN OFF



§15.209(a) - RADIATED EMISSION DATA

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.

EUT Setup

The radiated emission tests were performed in the open area 3-meter test site, using the setup in accordance with ANSI C63.4-2003. The specification used was the FCC 15 Subpart C limits.

The spacing between the peripherals was 10 centimeters.

External I/O cables were draped along the edge of the test table and bundle as required.

Spectrum Analyzer Setup

According to FCC Rules, 47 CFR 15.33 (a) (1), the system was tested to 25GHz.

During the radiated emission test, the spectrum analyzer was set with the following configurations:

<u>Frequency Range</u>	<u>RBW</u>	<u>Video B/W</u>
Below 30MHz	10kHz	10kHz
30 – 1000MHz	100kHz	100kHz
Above 1000MHz	1MHz	1MHz

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
HP	Spectrum Analyzer	8568B	2601A02165	2004-07-03
HP	Amplifier	8447E	2944A10187	2004-09-23
HP	Quasi-Peak Adapter	85650A	3019A05393	2004-06-13
EMCO	Biconical Antenna	3110B	9309-1165	2004-10-11
EMCO	Log Periodic Antenna	3146	2101	2004-10-11
Agilent	Spectrum Analyzer (9KHz – 50GHz)	8565EC	3946A00131	2004-05-03
HP	Amplifier (1-26.5GHz)	8449B	3147A00400	2004-03-14
A.H.System	Horn Antenna (700MHz-18GHz)	SAS-200/571	261	2004-05-31

* **Statement of Traceability:** BACL attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

Environmental Conditions

Temperature:	19°C
Relative Humidity:	54%
ATM Pressure:	1011mbar

*Testing was performed by Snell Leong on 2005-01-06.

Test Procedure

For the radiated emissions test, the power cord of the EUT was connected to the AC floor outlet.

Maximizing procedure was performed on the six (6) highest emissions to ensure EUT is compliant 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 limits), and are distinguished with a "Qp" in the data table.

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 means the emission is 7dB below the maximum limit for applicable limits. The equation for margin calculation is as follows:

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

Summary of Test Results

According to the recorded data in following table, the EUT measured test data within the measurement uncertainty of ± 4.0 , and had the worst margin of:

Handset:

- 3.3 dB at 4944 MHz in the Horizontal polarization at Low Channel
- 1.8 dB at 4951.80 MHz in the Horizontal polarization at High Channel
- 5.7 dB at 825.3 MHz in the Vertical polarization at Unintentional Emission

Base:

- 8.7 dB at 2403.05 MHz in the Vertical polarization at Low Channel
- 7.2 dB at 2406.95 MHz in the Vertical polarization at High Channel
- 0.7 dB at 801.68 MHz in the Horizontal polarization at Unintentional Emission

Radiated Emissions Test Result Data - Handset, 3Meter

INDICATED			TABLE	ANTENNA		CORRECTION FACTOR			CORRECTED AMPLITUDE	FCC 15 Subpart C	
Frequency MHz	Ampl. dB μ V	Comments		Angle Degree	Height Meter	Polar H/V	Antenna dB	Cable dB		Corr. Ampl. dB μ V/m	Limit dB μ V/m
Handset: 1-25GHz, Low Channel											
4944.00	49.7	Ave.	120	1.5	H	32.5	3.1	34.6	50.7	54	-3.3
4944.00	46.6	Ave.	45	1.2	V	32.5	3.1	34.6	47.6	54	-6.4
2472.00	89.3	Fund/Ave.	120	1.2	V	28.1	2.0	35.5	83.9	94	-10.1
2472.00	88.3	Fund/Ave.	150	1.5	H	28.1	2.0	35.5	82.9	94	-11.1
7416.00	37.6	Ave.	180	1.2	H	34.1	3.4	34.6	40.5	54	-13.5
7416.00	37.3	Ave.	90	1.5	V	34.1	3.4	34.6	40.2	54	-13.8
4944.00	53.2	Peak	180	1.5	V	32.5	3.1	34.6	54.2	74	-19.8
7416.00	48.5	Peak	90	1.2	V	34.1	3.4	34.6	51.4	74	-22.6
4944.00	49.9	Peak	45	1.2	H	32.5	3.1	34.6	50.9	74	-23.1
2472.00	89.5	Fund/Peak	90	1.6	V	28.1	2.0	35.5	84.1	114	-29.9
2472.00	89.0	Fund/Peak	120	1.5	H	28.1	2.0	35.5	83.6	114	-30.4
7416.00	39.4	Peak	90	1.5	H	34.1	3.4	34.6	42.3	74	-31.7

Radiated Emissions Test Result Data – Handset, 3M (Continued)

INDICATED			TABLE	ANTENNA		CORRECTION FACTOR			CORRECTED AMPLITUDE	FCC 15 Subpart C		
Frequency MHz	Ampl. dB μ V	Comments		Angle Degree	Height Meter	Polar H/V	Antenna dB	Cable dB		Corr. Ampl. dB μ V/m	Limit dB μ V/m	Margin dB
Handset: 1-25GHz High Channel												
4951.80	51.2	Ave.	200	1.5	H	32.5	3.1	34.6	52.2	54	-1.8	
2475.90	91.2	Fund/Ave.	180	1.2	V	28.1	2.0	35.5	85.8	94	-8.2	
4951.80	43.7	Ave.	180	1.2	V	32.5	3.1	34.6	44.7	54	-9.3	
2475.90	85.3	Fund/Ave.	200	1.5	H	28.1	2.0	35.5	79.9	94	-14.1	
7427.70	35.1	Ave.	200	1.2	V	34.1	3.4	35.5	37.1	54	-16.9	
4951.80	54.6	Peak	180	1.5	H	32.5	3.1	34.6	55.6	74	-18.4	
7427.70	31.3	Ave.	180	1.5	H	34.1	3.4	35.5	33.3	54	-20.7	
2475.90	94.3	Fund/Peak	120	1.2	V	28.1	2.0	35.5	88.9	114	-25.1	
4951.80	47.5	Peak	200	1.2	V	32.5	3.1	34.6	48.5	74	-25.5	
2475.90	88.2	Fund/Peak	180	1.5	H	28.1	2.0	35.5	82.8	114	-31.2	
7427.70	39.5	Peak	250	1.5	H	34.1	3.4	35.5	41.5	74	-32.5	
7427.70	37.3	Peak	180	1.2	V	34.1	3.4	35.5	39.3	74	-34.7	
Unintentional Emission, 30MHz to 1000MHz												
825.3	42.3		90	1.5	V	22.3	3.7	28.0	40.3	46	-5.7	
825.3	40.2		90	1.5	H	22.3	3.7	27.0	39.2	46	-6.8	

Radiated Emissions Test Result Data - Base, 3Meter

INDICATED			TABLE	ANTENNA		CORRECTION FACTOR			CORRECTED AMPLITUDE	FCC 15 Subpart C	
Frequency MHz	Ampl. dB μ V	Comments	Angle Degree	Height Meter	Polar H/V	Antenna dB	Cable dB	Amp. dB	Corr. Ampl. dB μ V/m	Limit dB μ V/m	Margin dB
Base: 1-25GHz, Low Channel											
2403.05	90.7	Fund/Ave.	180	1.2	V	28.1	2.0	35.5	85.3	94	-8.7
2403.05	90.0	Fund/Ave.	200	1.5	H	28.1	2.0	35.5	84.6	94	-9.4
4806.10	41.3	Ave.	180	1.2	V	32.5	3.1	34.6	42.3	54	-11.7
7209.50	39.2	Ave.	200	1.2	V	34.1	3.4	35.5	41.2	54	-12.8
4806.10	39.3	Ave.	200	1.5	H	32.5	3.1	34.6	40.3	54	-13.7
7249.50	38.2	Ave.	180	1.5	H	34.1	3.4	35.5	40.2	54	-13.8
2403.05	92.2	Fund/Peak	120	1.2	V	28.1	2.0	35.5	86.8	114	-27.2
2403.05	91.8	Fund/Peak	180	1.5	H	28.1	2.0	35.5	86.4	114	-27.6
4806.10	45.1	Peak	200	1.2	V	32.5	3.1	34.6	46.1	74	-27.9
4806.10	44.2	Peak	180	1.5	H	32.5	3.1	34.6	45.2	74	-28.8
7209.50	41.3	Peak	180	1.2	V	34.1	3.4	35.5	43.3	74	-30.7
7209.50	40.0	Peak	250	1.5	H	34.1	3.4	35.5	42.0	74	-32.0
Base: 1-25GHz, High Channel											
2406.95	92.2	Fund/Ave.	90	1.6	V	28.1	2.0	35.5	86.8	94	-7.2
4813.90	42.7	Ave.	180	1.5	V	32.5	3.1	34.6	43.7	54	-10.3
4813.90	41.1	Ave.	210	1.2	H	32.5	3.1	34.6	42.1	54	-11.9
2406.95	86.8	Fund/Ave.	0	1.5	H	28.1	2.0	35.5	81.4	94	-12.6
7220.85	33.2	Ave.	80	1.6	V	34.1	3.4	35.5	35.2	54	-18.8
7220.85	32.0	Ave.	80	1.6	H	34.1	3.4	35.5	34.0	54	-20.0
2406.95	93.9	Fund/Peak	120	1.2	V	28.1	2.0	35.5	88.5	114	-25.5
4813.90	45.1	Peak	180	1.5	V	32.5	3.1	34.6	46.1	74	-27.9
4813.90	44.5	Peak	210	1.2	H	32.5	3.1	34.6	45.5	74	-28.5
2406.95	89.5	Fund/Peak	0	1.5	H	28.1	2.0	35.5	84.1	114	-29.9
7220.85	36.1	Peak	180	1.5	V	34.1	3.4	35.5	38.1	74	-35.9
7220.85	35.4	Peak	180	1.5	H	34.1	3.4	35.5	37.4	74	-36.6
Unintentional Emission, 30MHz to 1000MHz											
801.68	48.5		0	2.5	H	22.6	2.2	28.0	45.3	46	-0.7
801.68	48.2		180	1.5	V	22.6	2.2	28.0	45.0	46	-1.0
955.03	45.6		0	2.2	V	23.7	2.5	27.5	44.3	46	-1.7
772.94	46.0		90	2.2	H	22.2	2.1	28.6	41.7	46	-4.3
772.94	45.1		90	2.0	V	22.2	2.1	28.6	40.8	46	-5.2
955.10	38.8		0	2.5	H	23.7	2.5	27.5	37.5	46	-8.5

§15.249(c) – BAND-EDGE TESTING

Standard Applicable

Requirements: FCC 15.249 (c), the emission power at the START and STOP frequencies shall be at least 50 dB below the level of the fundamental or to the general radiated emission limits in FCC 15.209, whichever is the lesser attenuation.

Test Procedure

With the EUT's antenna attached, the EUT's radiated emission power was received by the test antenna which was connected to the spectrum analyzer with the START and STOP frequencies set to the EUT's operation band.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
HP	Spectrum Analyzer	8565EC	3946A00131	2004-05-03

* **Statement of Traceability:** BACL attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

Environmental Conditions

Temperature:	19°C
Relative Humidity:	54%
ATM Pressure:	1011mbar

Testing was performed by Snell Leong on 2005-01-06.

Test Results

Refer to the attached plots.

