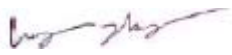


FCC PART 15 Subpart C
EMI MEASUREMENT AND TEST REPORT
For
SHENZHEN ZHONGWANG ELECTRONICS CO., LTD.

511#, Electrical Equipment Building, No. 72, ZhenHua Road
Futian, ShenZhen, P.R.C

FCC ID: Q74ZTV-812

2003-12-17

This Report Concerns: ☒ Original Report	Equipment Type: 2.4GHz Wireless A/V Color Camera
Test Engineer: Benjamin Jin 	
Report No.: R0311176 (T)	
Test Date: 2003-12-01 / 2003-12-03	
Reviewed By: Ling Zhang 	
Prepared By: Bay Area Compliance Laboratory Corporation 230 Commercial Street Sunnyvale, CA 94085 Tel (408) 732-9162 Fax (408) 732-9164	

Note: This test report is specially limited to the above client company and the product model only. It may not be duplicated without prior written consent of Bay Area Compliance Laboratory Corporation. This report **must not** be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government.

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
DESCRIPTION OF TEST CONFIGURATION	5
EQUIPMENT MODIFICATIONS	5
CONFIGURATION OF TEST SYSTEM	5
TEST SETUP BLOCK DIAGRAM	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	9
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
RDIATED EMISSIONS TEST RESULT DATA.....	14
§15.249(C) - BAND EDGES TESTING.....	16
STANDARD APPLICABLE	16
TEST PROCEDURE	16
TEST EQUIPMENT LIST AND DETAILS.....	16
ENVIRONMENTAL CONDITIONS	16
TEST RESULTS	16

GENERAL INFORMATION

Product Description for Equipment Under Test (EUT)

The SHENZHEN ZHONGWANG ELECTRONICS CO., LTD.'s product, model number: ZT-812 or the "EUT" as referred to in this report is a 2.4GHz Wireless A/V Color Camera. The EUT is measured approximately 1.8"L x 0.9"W x 0.9"H.

** The test data gathered are from production sample, serial number: 1001, 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 - 2001.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, section 15.205, 15.207, and 15.249, 15.203, 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 - 2001, 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.

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 C63.4-2001.

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.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The EUT was configured for testing according to ANSI C63.4-2001.

The final qualification test was performed with the EUT operating at normal mode

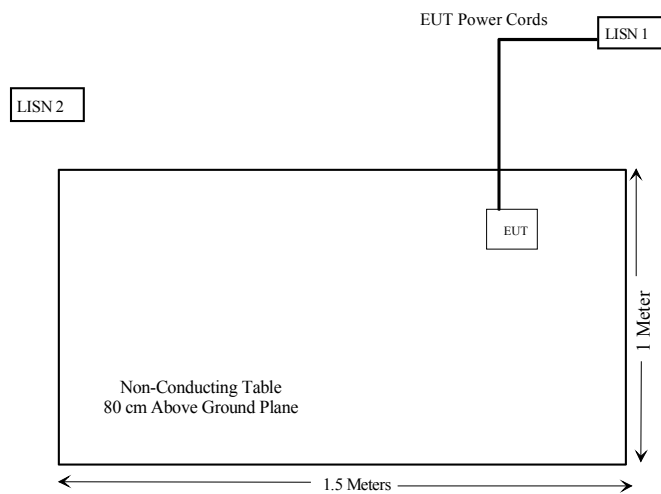
Equipment Modifications

No modifications were made to the EUT.

Configuration of Test System



Test Setup Block Diagram



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	Compliant
§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 C63.4-2001 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	2003-03-28
Rohde & Schwarz	EMI Test Receiver	ESCS30	100176	2003-05-06

* **Statement of Traceability:** BACL Corp. certifies that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

Test Procedure

During the conducted emission test, the power cord of the host system was connected to the auxiliary outlet of the first LISN.

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:	22 °C
Relative Humidity:	65%
ATM Pressure:	1105mbar

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:

-23.7 dBμV at 0.150 MHz in the Neutral mode

Conducted Emissions Test Data

LINE CONDUCTED EMISSIONS				FCC CLASS B	
Frequency MHz	Amplitude dBμV	Detector Qp/Ave/Peak	Phase Line/Neutral	Limit dBμV	Margin dB
0.150	42.3	QP	Neutral	66	-23.7
0.150	41.9	QP	Line	66	-24.1
8.100	23.1	AVG	Neutral	50	-26.9
8.100	23.5	QP	Neutral	60	-36.5
8.100	12.5	AVG	Line	50	-37.5
1.370	16.5	QP	Neutral	56	-39.5
1.410	15.5	QP	Line	56	-40.5
0.150	15.4	AVG	Neutral	56	-40.6
0.150	14.2	AVG	Line	56	-41.8
1.360	4.1	AVG	Neutral	46	-41.9
1.420	3.0	AVG	Line	46	-43.0
8.100	13.7	QP	Line	60	-46.3

Plot of Conducted Emissions Test Data

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

Bay Area Compliance Laboratory Corp
Class B

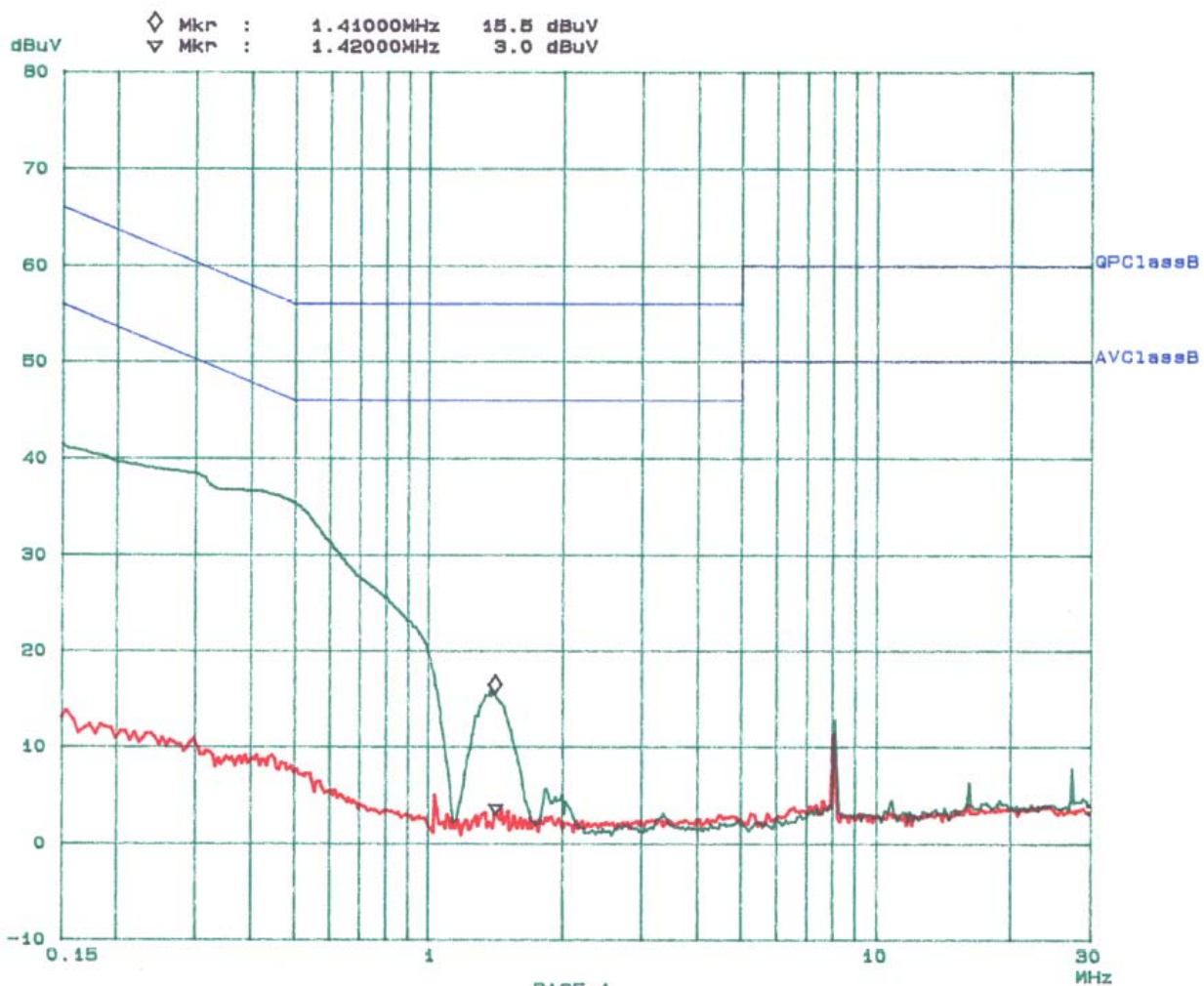
03. Dec 03 13:30

EUT: ZT-812
Manuf: Zhong Wang
Op Cond: Normal
Operator: Ming
Comment: L

Scan Settings (3 Ranges)

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

Final Measurement: x QP / + AV
Meas Time: 1 ms

*2003-12-03*

Bay Area Compliance Laboratory Corp
Class B

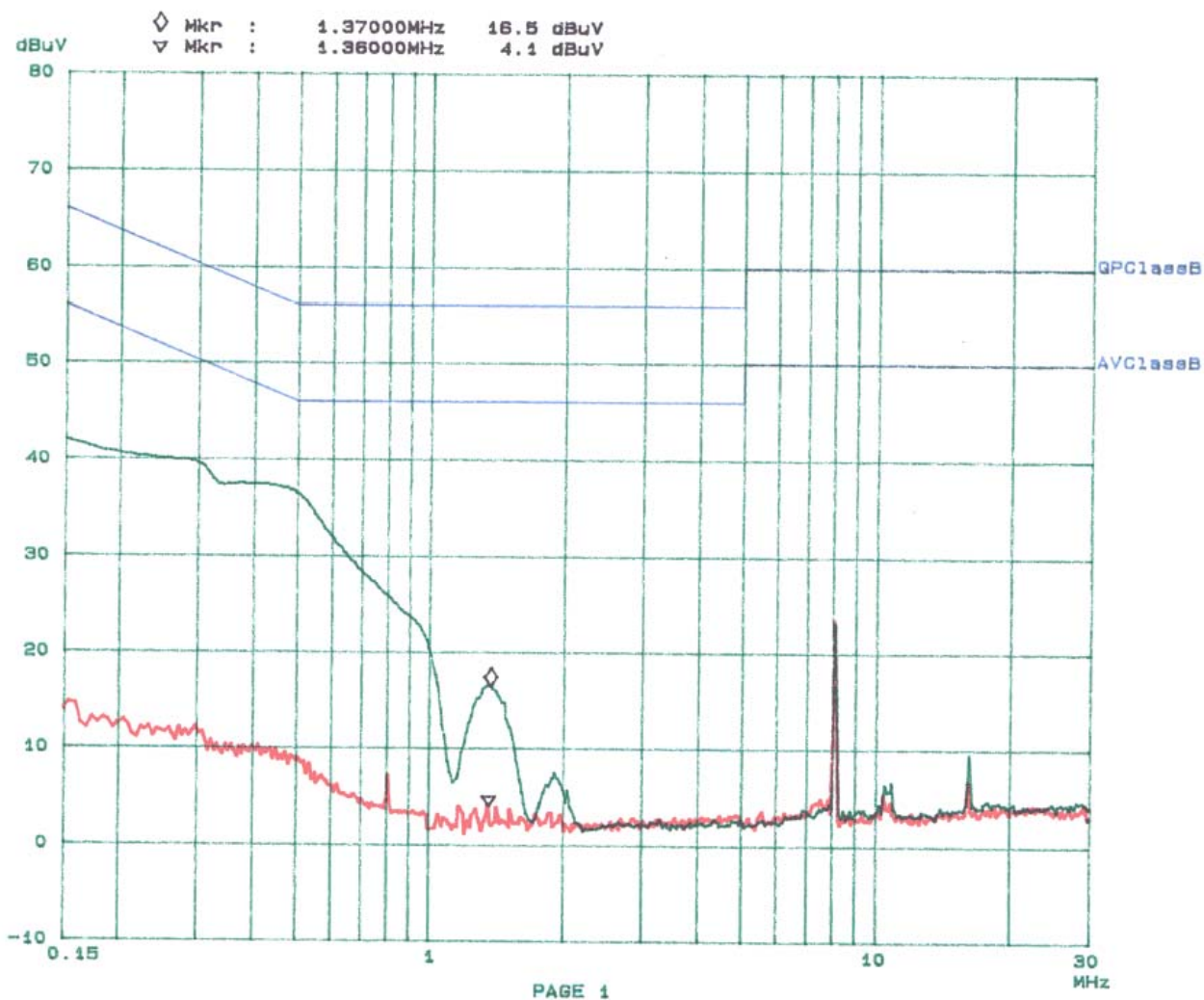
03. Dec 03 13:53

EUT: ZT-812
Manuf: Zhong Wang
Op Cond: Normal
Operator: Ming
Comment: N

Scan Settings (3 Ranges)

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

Final Measurement: x QP / + AV
Meas Time: 1 ms



§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 C63.4-2001. 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.

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

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:

<i>Frequency Range</i>	<i>RBW</i>	<i>Video B/W</i>
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	2003-07-03
HP	Amplifier	8447E	2944A10187	2003-09-23
HP	Quasi-Peak Adapter	85650A	3019A05393	2003-06-13
EMCO	Biconical Antenna	3110B	9309-1165	2003-10-11
EMCO	Log Periodic Antenna	3146	2101	2003-10-11
Agilent	Spectrum Analyzer (9KHz – 50GHz)	8565EC	3946A00131	2003-05-03
HP	Amplifier (1-26.5GHz)	8449B	3147A00400	2003-03-14
A.H.System	Horn Antenna (700MHz-18GHz)	SAS-200/571	261	2003-05-31

* **Statement of Traceability: BACL Corp.** certifies that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

Environmental Conditions

Temperature:	22 °C
Relative Humidity:	65%
ATM Pressure:	1105mbar

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 dBμV 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 -7dBμV means the emission is 7dBμV 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 complied with the FCC Title 47, Part 15, Subpart C, section 15.205, 15.207, and 15.249 after tested to 10th harmonics as required by FCC and had the worst margin of:

- 1.3 dB at 4856.00MHz in the Horizontal polarization at Low Channel
- 1.4 dB at 4896.00 MHz in the Horizontal polarization at Middle Channel
- 3.4 dB at 4936.00 MHz in the Vertical polarization at High Channel
- 10.7 dB at 240.67 MHz in the Vertical polarization at Unintentional Emission

Rdiated Emissions Test Result Data

INDICATED			TABLE	ANTENNA		CORRECTION FACTOR			CORRECTED AMPLITUDE	FCC 15 Subpart C	
Frequency MHz	Ampl. dBμV/m	Comments	Angle Degree	Height Meter	Polar H/ V	Antenna dBμV/m	Cable DB	Amp. dB	Corr. Ampl. dBμV/m	Limit dBμV/m	Margin dB
1GHz – 25GHz, Low Channel											
2428.00	84.3	FUND/AVE	45	1.8	V	28.1	3.4	35.2	80.6	94	-13.4
2428.00	100.6	FUND/PEAK	45	1.8	V	28.1	3.4	35.2	96.9	114	-17.1
2428.00	75.2	FUND/AVE	300	2.0	H	28.1	3.4	35.2	71.5	94	-22.5
2428.00	92.9	FUND/PEAK	300	2.0	H	28.1	3.4	35.2	89.2	114	-24.8
4856.00	48.3	AVE	0	1.8	H	32.5	4.9	33.0	52.7	54	-1.3
4856.00	46.3	AVE	30	1.6	V	32.5	4.9	33.0	50.7	54	-3.3
4856.00	65.7	PEAK	0	1.8	H	32.5	4.9	33.0	70.1	74	-3.9
4856.00	63.2	PEAK	30	1.6	V	32.5	4.9	33.0	67.6	74	-6.4
7284.00	59.6	PEAK	90	2.0	H	35.1	5.6	33.5	66.8	74	-7.2
7284.00	58.4	PEAK	180	1.6	V	35.1	5.6	33.5	65.6	74	-8.4
7284.00	38.3	AVE	180	1.6	V	35.1	5.6	33.5	45.5	54	-8.5
7284.00	35.9	AVE	90	2.0	H	35.1	5.6	33.5	43.1	54	-10.9
1GHz – 25GHz, Middle Channel											
2448.00	84.2	FUND/AVE	0	1.6	V	28.1	3.4	35.2	80.5	94	-13.5
2448.00	100.3	FUND/PEAK	0	1.6	V	28.1	3.4	35.2	96.6	114	-17.4
2448.00	75.1	FUND/AVE	270	1.5	H	28.1	3.4	35.2	71.4	94	-22.8
2448.00	92.7	FUND/PEAK	270	1.5	H	28.1	3.4	35.2	89.0	114	-25.0
4896.00	48.2	AVE	180	1.4	H	32.5	4.9	33.0	52.6	54	-1.4
4896.00	46.1	AVE	300	1.5	V	32.5	4.9	33.0	50.5	54	-3.5
4896.00	65.5	PEAK	180	1.4	H	32.5	4.9	33.0	69.9	74	-4.1
4896.00	62.9	PEAK	300	1.5	V	32.5	4.9	33.0	67.3	74	-6.7
7344.00	59.4	PEAK	150	1.2	H	35.1	5.6	33.5	66.6	74	-7.4
7344.00	58.3	PEAK	60	1.4	V	35.1	5.6	33.5	65.5	74	-8.5
7344.00	38.2	AVE	60	1.4	V	35.1	5.6	33.5	45.4	54	-8.6
7344.00	35.7	AVE	150	1.2	H	35.1	5.6	33.5	42.9	54	-11.1

Radiated Emissions Test Result Data (Continued)

INDICATED			TABLE	ANTENNA		CORRECTION FACTOR			CORRECTED AMPLITUDE	FCC 15 Subpart C	
Frequency MHz	Ampl. dB μ V/m	Comments	Angle Degree	Height Meter	Polar H/ V	Antenna dB μ V/m	Cable DB	Amp. dB	Corr. Ampl. dB μ V/m	Limit dB μ V/m	Margin dB
1GHz – 25GHZ, High Channel											
2468.00	84.3	FUND/AVE	15	2.2	V	28.1	3.4	35.2	80.6	94	-13.4
2468.00	98.7	FUND/PEAK	15	2.2	V	28.1	3.4	35.2	95.0	114	-19.0
2468.00	75.4	FUND/AVE	90	1.6	H	28.1	3.4	35.2	71.7	94	-22.3
2468.00	89.8	FUND/PEAK	90	1.6	H	28.1	3.4	35.2	86.1	114	-27.9
4936.00	46.2	AVE	0	1.5	V	32.5	4.9	33.0	50.6	54	-3.4
7404.00	62.7	PEAK	0	1.5	V	35.1	5.6	33.5	69.9	74	-4.1
4936.00	44.5	AVE	180	1.6	H	32.5	4.9	33.0	48.9	54	-5.1
7404.00	40.3	AVE	0	1.5	V	35.1	5.6	33.5	47.5	54	-6.5
4936.00	62.9	PEAK	0	1.5	V	32.5	4.9	33.0	67.3	74	-6.7
7404.00	38.5	AVE	180	2.0	H	35.1	5.6	33.5	45.7	54	-8.3
7404.00	57.6	PEAK	180	2.0	H	35.1	5.6	33.5	64.8	74	-9.2
4936.00	57.7	PEAK	180	1.6	H	32.5	4.9	33.0	62.1	74	-11.9
Unintentional Emission, 30MHz to 1000MHz											
240.67	44.3		180	1.5	V	13.8	2.2	25.0	35.3	46	-10.7
252.02	44.2		210	1.8	V	13.3	2.2	25.0	34.6	46	-11.4
194.56	41.2		0	1.2	H	13.7	2.1	25.0	32.0	43.6	-11.6
81.30	38.5		270	1.4	H	9.5	1.2	25.0	24.2	40	-15.8

§15.249(c) - BAND EDGES 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. Due Date
HP	Spectrum Analyzer	8565EC	3946A00131	2003-05-03

* **Statement of Traceability: BACL Corp.** certifies that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

Environmental Conditions

Temperature:	22 °C
Relative Humidity:	65%
ATM Pressure:	1105mbar

Test Results

Refer to the attached plots.

