

# FCC PART 15 Subpart C



## EMI MEASUREMENT AND TEST REPORT

For

**Shanghai Fullband Technologies Co., Ltd.**

Suite 213-215, Building 22, 498 Guo Shoujing Rd.  
Shanghai 201203, P.R. China

**FCC ID: SDECN20041028**

<b>This Report Concerns:</b> <input checked="" type="checkbox"/> Original Report	<b>Equipment Type:</b> 2.4GHz Wireless (VGA to TV) Audio/Video, Transmitter
<b>Test Engineer:</b> Daniel Deng	
<b>Report No.:</b> R0411096	
<b>Report Date:</b> 2004-11-24	
<b>Reviewed By:</b> Hang Tan	
<b>Prepared By:</b>	Bay Area Compliance Laboratory Corporation 230 Commercial Street Sunnyvale, CA 94085 Tel (408) 732-9162 Fax (408) 732-9164

**Note:** The test report is specially limited to the above 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 certification, approval, or endorsement by NVLAP, NIST or any agency of the US Government.

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## GENERAL INFORMATION

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### Product Description for Equipment Under Test (EUT)

The *Shanghai Fullband Technologies Co., Ltd.*'s product, model number: *Flyimage2000+* or the "EUT" as referred to in this report is the transmitter part of a 2.4GHz Wireless (VGA to TV) Audio/Video, DXX, operating frequency 2414 – 2468 MHz. The EUT is measured approximately 102mmL x 41mmW x 115mmH.

*\* The test data gathered are from production sample, serial number: F000032, 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.

### Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number	FCC ID
Toshiba	TV	14AF41	22612119A	DOC
Desay	DVD Player	DS-8328	S01-225534-7	DOC

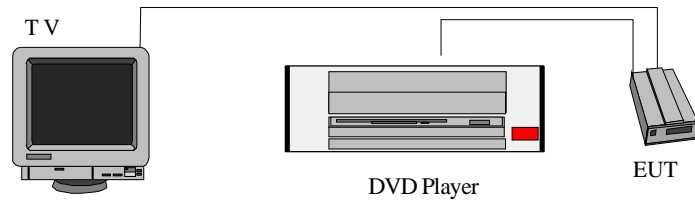
### External I/O Cabling List and Details

Cable Description	Length (M)	Port/From	To
AV Cable	1	DVD	EUT (Tx)
A/V Cable	1	TV	EUT (Tx)

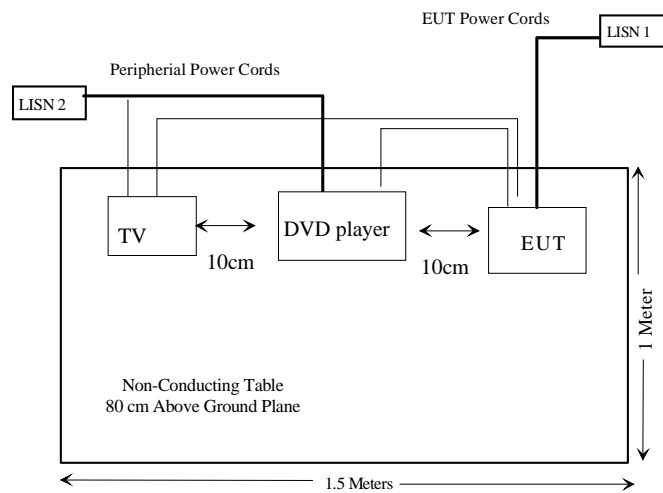
### Power Supply Information

Manufacturer	Description	Model	Serial Number	FCC ID
DVE	Switching adaptor	DSA-009F-07 A	N/A	DoC

## Configuration of Test System



## Test Setup Block Diagram



## SUMMARY OF TEST RESULTS

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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

\*: data within measurement uncertainty

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## **§15.203 - ANTENNA REQUIREMENT**

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### **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  $\pm 2.4$  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 Notebook PC 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

\* **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 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:	18°C
Relative Humidity:	45%
ATM Pressure:	1025mbar

Testing was performed by Daniel Deng on 2004-11-23.

## Summary of Test Results

According to the recorded data in following table, the EUT measures within the uncertainty measurement  $\pm 2.4$  dB, with the *worst* margin reading of:

-1.20 dB at 0.34 MHz in the line conductor

## Conducted Emissions Test Data

Frequency MHz	LINE CONDUCTED EMISSIONS			FCC CLASS B	
	Amplitude dB $\mu$ V	Detector Qp/Ave/Peak	Phase Line/Neutral	Limit dB $\mu$ V	Margin dB
0.34	58.00	QP	Line	59.20	-1.20
0.43	56.00	QP	Neutral	57.25	-1.25
0.61	54.10	QP	Neutral	56.00	-1.90
0.16	62.80	QP	Neutral	65.46	-2.66
0.22	60.00	QP	Line	62.82	-2.82
0.15	52.70	QP	Line	66.00	-13.30
0.43	33.50	Ave	Neutral	47.25	-13.75
0.16	40.70	Ave	Neutral	55.46	-14.76
0.15	39.80	Ave	Line	56.00	-16.20
0.61	22.20	Ave	Neutral	46.00	-23.80
0.22	25.80	Ave	Line	52.82	-27.02
0.34	13.80	Ave	Line	49.20	-35.40

## Plot of Conducted Emissions Test Data

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

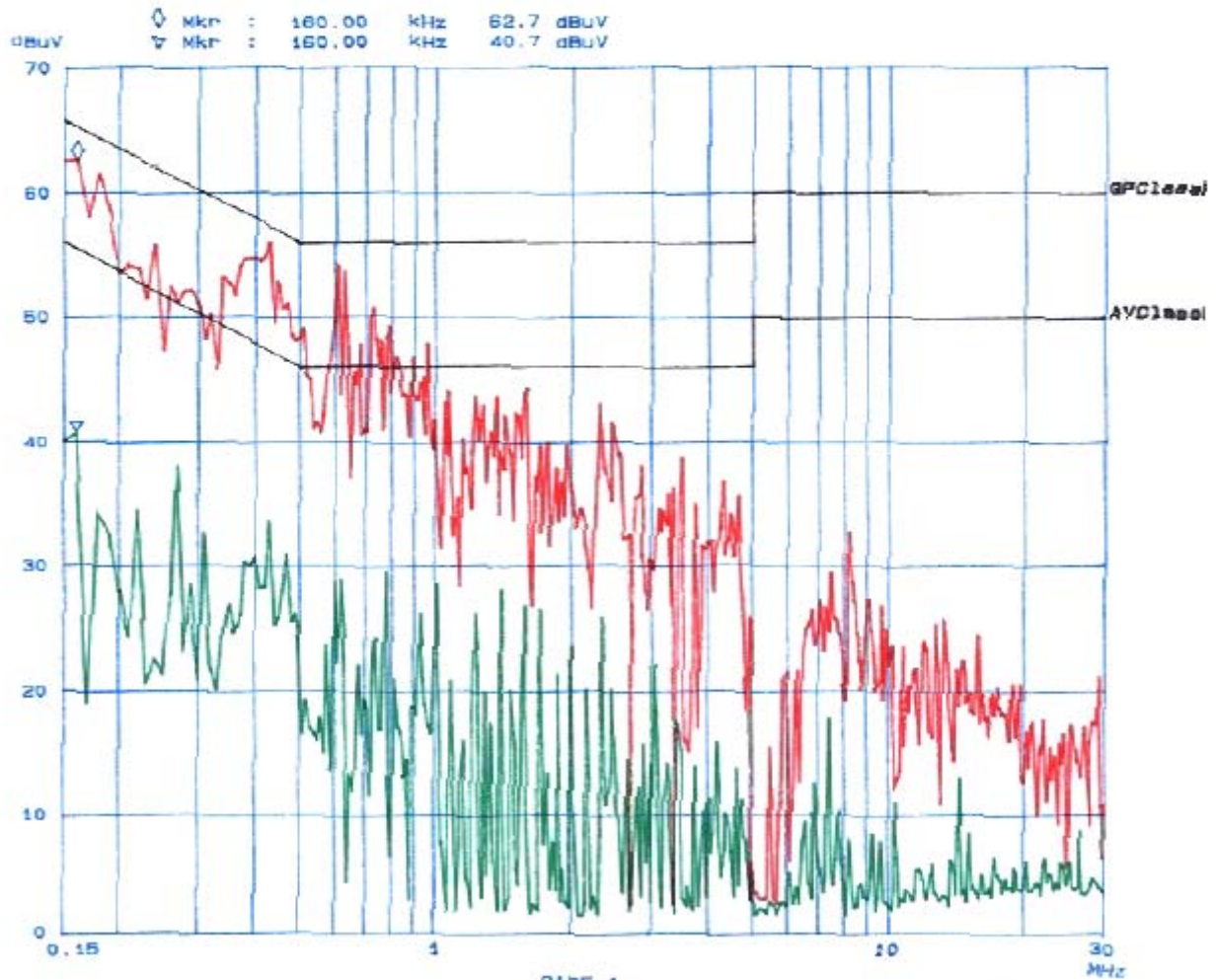
Bay Area Compliance Laboratory Corp  
Class B

23. Nov 04 10:14

EUT: 2000+  
Manuf: FULLBAND  
Op Cond: Normal  
Operator: DANIEL  
Comment: TX N

## Scan Settings (3 Ranges)

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



*Handwritten signature*  
2004-11-23

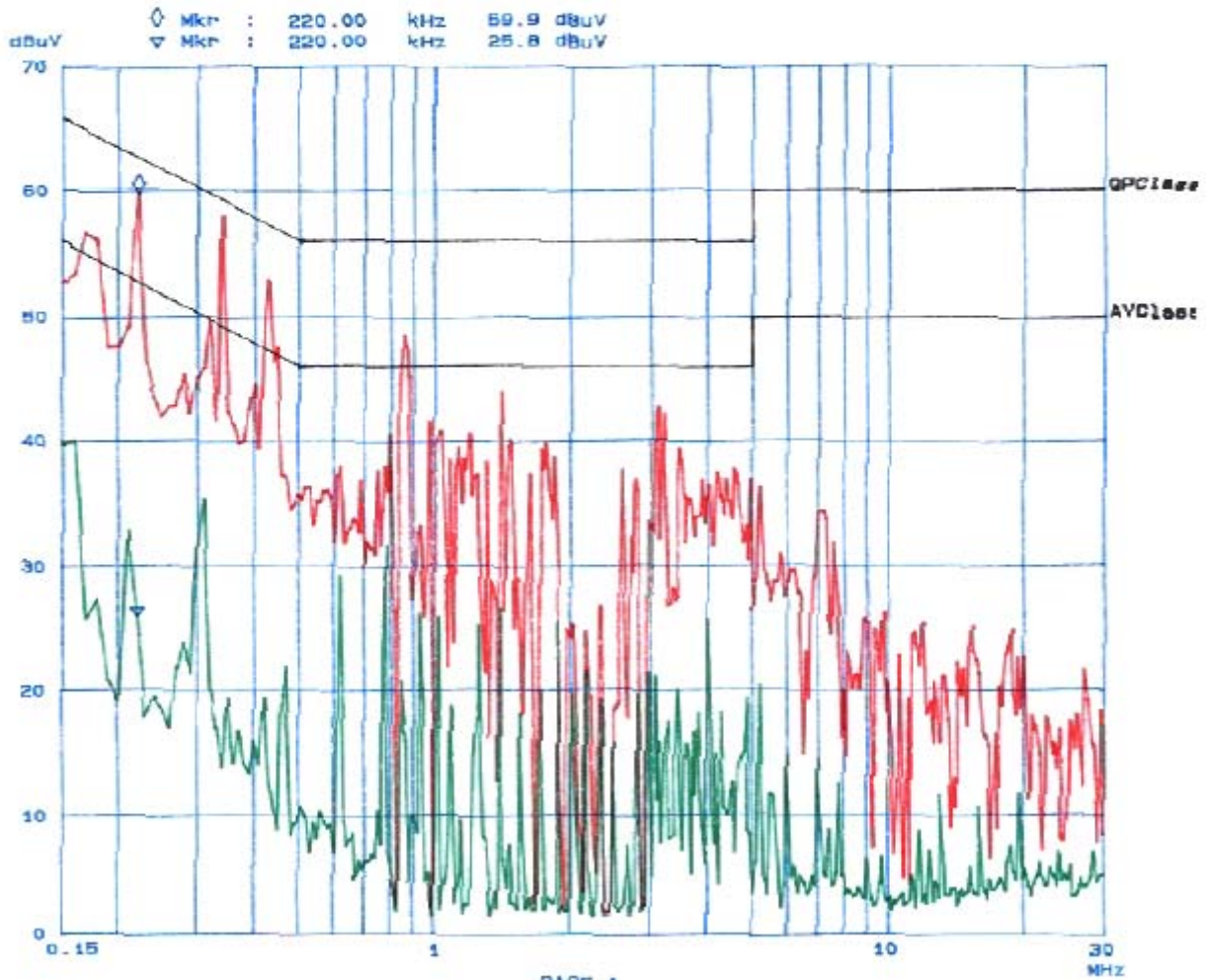
Bay Area Compliance Laboratory Corp  
Class B

23. Nov 04 11:04

EUT: 2000+  
Manuf: FULLBAND  
Op Cond: Normal  
Operator: DANIEL  
Comment: Tx L

## Scan Settings (3 Ranges)

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



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## §15.209(a) - RADIATED EMISSION DATA

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### 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  $\pm 4.0$  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 Notebook PC 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><b>Frequency Range</b></i>	<i><b>RBW</b></i>	<i><b>Video B/W</b></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	Amplifier	8447D	2944A10187	2004-09-23
EMCO	Biconical Antenna	3110B	9309-1165	2004-10-11
EMCO	Log Periodic Antenna	3146	2101	2004-10-11
Agilent	Spectrum Analyzer	E4446A	1030645	2004-10-04
HP	Amplifier (1-26.5GHz)	8449B	3147A00400	2004-03-14

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

## Environmental Conditions

Temperature:	18°C
Relative Humidity:	45%
ATM Pressure:	1025mbar

Testing was performed by Daniel Deng on 2004-11-23.

## 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 measures with the measurement uncertainty  $\pm 4.0$  dB after tested to 10<sup>th</sup> harmonics as required by FCC and had the worst margin of:

- 2.90 dB at 2414.38MHz in the Vertical polarization at Low Channel
- 6.05 dB at 4900.00 MHz in the Vertical polarization at Middle Channel
- 3.37 dB at 2468.35 MHz in the Vertical polarization at High Channel
- 1.60 dB at 48.00 MHz in the Vertical polarization at Unintentional Emission

## Radiated Emissions Test Result Data @ 3 Meter

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 dB	Cable DB	Amp. dB	Corr. Ampl. dBμV/m	Limit dBμV/m	Margin dB
1GHz – 25GHz, Low Channel											
2414.38	96.20	Fund/Ave	0	1.3	v	28.1	2.0	35.2	91.10	94	-2.90
4828.76	49.04	Ave	300	1.4	v	32.5	3.1	34.7	49.94	54	-4.06
2414.38	92.96	Fund/Ave	150	1.5	h	28.1	2.0	35.2	87.86	94	-6.14
4828.76	43.45	Ave	0	1.2	h	32.5	3.1	34.7	44.35	54	-9.65
3018.00	43.97	Ave	180	1.2	v	30.3	2.5	35.2	41.57	54	-12.43
7243.14	35.09	Ave	300	1.5	v	34.1	3.4	33.5	39.09	54	-14.91
7243.14	35.00	Ave	120	1.1	h	34.1	3.4	33.5	39.00	54	-15.00
2414.38	102.18	Fund/Peak	0	1.3	v	28.1	2.0	35.2	97.08	114	-16.92
4828.76	54.72	Peak	330	1.4	v	32.5	3.1	34.7	55.62	74	-18.38
4828.76	53.87	Peak	0	1.2	h	32.5	3.1	34.7	54.77	74	-19.23
3018.00	56.02	Peak	330	1.2	v	30.3	2.5	35.2	53.62	74	-20.38
2414.38	98.60	Fund/Peak	150	1.5	h	28.1	2.0	35.2	93.50	114	-20.50
7243.14	48.25	Peak	45	1.3	v	34.1	3.4	33.5	52.25	74	-21.75
7243.14	48.24	Peak	120	1.1	h	34.1	3.4	33.5	52.24	74	-21.76
2139.46	36.37	Ave	180	1.2	v	28.1	2.0	35.2	31.27	54	-22.73
3018.00	33.50	Ave	300	1.6	h	30.3	2.5	35.2	31.10	54	-22.90
2139.46	50.31	Peak	180	1.2	v	28.1	2.0	35.2	45.21	74	-28.79
2139.46	30.10	Ave	270	1.5	h	28.1	2.0	35.2	25.00	54	-29.00
3018.00	43.80	Peak	300	1.6	h	30.3	2.5	35.2	41.40	74	-32.60
2139.46	42.50	Peak	270	1.5	h	28.1	2.0	35.2	37.40	74	-36.60

**Radiated Emissions Test Result Data (Continued)**

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 dB	Cable DB	Amp. dB	Corr. Ampl. dBμV/m	Limit dBμV/m	Margin dB
1GHz – 25GHZ, Middle Channel											
4900.00	47.05	Ave	330	1.3	v	32.5	3.1	34.7	47.95	54	-6.05
2450.00	92.33	Fund/Ave	300	1.8	v	28.1	2.0	35.2	87.23	94	-6.77
2450.00	88.65	Fund/Ave	90	1.8	h	28.1	2.0	35.2	83.55	94	-10.45
7350.00	36.90	Ave	30	1.6	v	34.1	3.4	33.5	40.90	54	-13.10
4900.00	38.82	Ave	180	1.2	h	32.5	3.1	34.7	39.72	54	-14.28
7350.00	35.54	Ave	300	1.2	h	34.1	3.4	33.5	39.54	54	-14.46
4900.00	56.11	Peak	330	1.3	v	32.5	3.1	34.7	57.01	74	-16.99
2450.00	100.30	Fund/Peak	300	1.8	v	28.1	2.0	35.2	95.20	114	-18.80
3054.33	37.20	Ave	0	2.1	v	30.3	2.5	35.2	34.80	54	-19.20
3054.33	35.40	Ave	180	1.6	h	30.3	2.5	35.2	33.00	54	-21.00
7350.00	48.67	Peak	30	1.6	v	34.1	3.4	33.5	52.67	74	-21.33
7350.00	47.68	Peak	300	1.2	h	34.1	3.4	33.5	51.68	74	-22.32
2450.00	96.23	Fund/Peak	90	1.8	h	28.1	2.0	35.2	91.13	114	-22.87
4900.00	49.96	Peak	180	1.2	h	32.5	3.1	34.7	50.86	74	-23.14
3054.33	49.26	Peak	0	2.1	v	30.3	2.5	35.2	46.86	74	-27.14
3054.33	47.30	Peak	180	1.6	h	30.3	2.5	35.2	44.90	74	-29.10
1GHz – 25GHZ, High Channel											
2468.35	95.73	Fund/Ave	180	1.4	v	28.1	2.0	35.2	90.63	94	-3.37
4936.70	44.73	Ave	270	1.3	v	32.5	3.1	34.7	45.63	54	-8.37
2468.35	89.86	Fund/Ave	120	1.8	h	28.1	2.0	35.2	84.76	94	-9.24
7405.05	37.00	Ave	235	1.6	v	34.1	3.4	33.5	41.00	54	-13.00
2468.35	103.09	Fund/Peak	180	1.4	v	28.1	2.0	35.2	97.99	114	-16.01
4936.70	35.99	Ave	0	2.2	h	32.5	3.1	34.7	36.89	54	-17.11
7405.05	32.47	Ave	300	1.5	h	34.1	3.4	33.5	36.47	54	-17.53
4936.70	54.87	Peak	270	1.3	v	32.5	3.1	34.7	55.77	74	-18.23
3072.00	37.50	Ave	0	2.1	v	30.3	2.5	35.2	35.10	54	-18.90
7405.05	48.80	Peak	235	1.6	v	34.1	3.4	33.5	52.80	74	-21.20
2468.35	97.77	Fund/Peak	120	1.8	h	28.1	2.0	35.2	92.67	114	-21.33
3072.00	31.85	Ave	30	1.3	h	30.3	2.5	35.2	29.45	54	-24.55
7405.05	45.26	Peak	300	1.5	h	34.1	3.4	33.5	49.26	74	-24.74
4936.70	47.55	Peak	0	2.2	h	32.5	3.1	34.7	48.45	74	-25.55
3072.00	49.90	Peak	0	2.1	v	30.3	2.5	35.2	47.50	74	-26.50
3072.00	45.38	Peak	30	1.3	h	30.3	2.5	35.2	42.98	74	-31.02



**Radiated Emissions Test Result Data (Continued)**

INDICATED			TABLE	ANTENNA		CORRECTION FACTOR			CORRECTED AMPLITUDE	FCC 15 Subpart C	
Frequency MHz	Ampl. dB $\mu$ V/m	Comments	Angle Degree	Height Meter	Polar H/ V	Antenna dB	Cable DB	Amp. dB	Corr. Ampl. dB $\mu$ V/m	Limit dB $\mu$ V/m	Margin dB
Unintentional Emission, 30MHz to 1000MHz											
48.00	54.30		200	1.1	V	11.3	1.5	28.7	38.40	40	-1.60
36.00	51.77		100	1.1	V	13.3	1.4	28.6	37.87	40	-2.13
72.00	54.54		170	1.1	V	9.6	1.8	28.6	37.34	40	-2.66
252.00	54.40		0	1.3	H	11.7	3.4	27.6	41.90	46	-4.10
288.00	52.90		270	1.2	H	12.6	3.6	27.4	41.70	46	-4.30
216.00	52.30		180	1.3	H	10.1	3.1	27.7	37.80	43.5	-5.70
240.00	52.35		220	1.3	H	11.3	3.3	27.6	39.35	46	-6.65
84.00	49.85		180	1.2	V	9.6	1.9	28.6	32.75	40	-7.25
40.04	44.82		135	1.2	V	12.1	1.4	28.7	29.62	40	-10.38
36.00	42.30		120	1.2	H	13.3	1.4	28.6	28.40	40	-11.60
72.00	45.50		200	1.2	H	9.6	1.8	28.6	28.30	40	-11.70
48.00	41.16		150	1.3	H	11.3	1.5	28.7	25.26	40	-14.74

## §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. Due 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:	18°C
Relative Humidity:	45%
ATM Pressure:	1025mbar

Testing was performed by Daniel Deng on 2004-11-23.

### Test Results

Frequency	Reading	Direction	Height	Polar	Antenna Loss	Cable loss	Amplifier	Correction Factor	FCC	FCC	
MHz	dBuV/m	Degree	Meter	H / V	dB	dB	dB	dBuV/m	Limit	Margin	Comments
2400	69.81	0	2.3	v	28.1	2	33.5	66.41	74	-7.59	PK
2483.5	62.3	330	2.5	v	28.1	2	33.5	58.9	74	-15.1	PK
2400	55.65	0	2.3	v	28.1	2	33.5	52.25	54	-1.75	Ave
2483.5	49.97	330	2.5	v	28.1	2	33.5	46.57	54	-7.43	Ave

Note : below 2400MHZ and up 2483.5MHZ pls refer to Radiated Emission data.