FCC PART 15 Subpart C

EMI MEASUREMENT AND TEST REPORT

For

ShenZhen ZhongWang Electronic Co., Ltd.

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

FCC ID: Q74ZT-811T

2004-2-16

This Report Concerns:	**Equipment Type:**
☒ Original Report	Wireless A/V Color Camera

Test Engineer:	Jandy Su
Report No.:	RSZ04020504
Test Date:	2004-02-26
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GENERAL INFORMATION

Product Description for Equipment Under Test (EUT)

The *ShenZhen ZhongWang Electronic Co., Ltd.*'s product, model number: ZT-811T /ZT-820Tor the "EUT" as referred to in this report is a Wireless A/V Color Camera. The EUT is measured approximately 5.0"L x 3.5"W x 3.5"H., the above two models have the same circuit diagram, PCB and structure, the difference between the two models is general appearance of plastic cover, so we select ZT-811T to test and the test data were included in this report.

The EUT was fed by ZhongWang's Adaptor: M/N SY-07020, input: 120VAC/60Hz; output: 8VDC/200mA

Cable:

Cable Description	Length (M)	From/Port	To
Unshielded Detachable Power Cable	1.9	DC Power	EUT

** The test data gathered are from production sample, serial number: 040202, 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, and section 15.203, 15.205, 15.207, 15.209, and 15.249 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

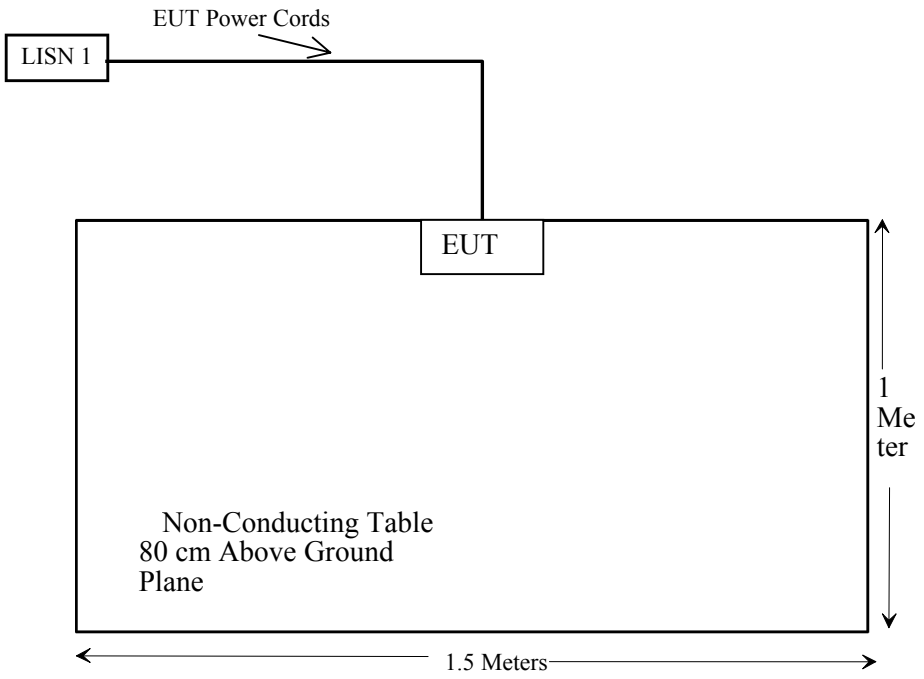
Equipment Modifications

No modifications were made to the EUT.

Configuration of Test System

EUT

Test Setup Block Diagram



SUMMARY OF TEST RESULTS

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

§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 was permanently soldered to the board.

Test Result: Pass

§ 15.207 - 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 15.207 limits.

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

The Adaptor 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	Calibration Date	Calibration Due Date
COM Power	LISN	LI-200	12208	10/30/2003	1 year
COM Power	LISN	LI-200	12005	10/30/2003	1 year
HP	Spectrum Analyzer	8568B	2517A01610	10/30/2003	1 year
HP	Spectrum Analyzer Display Unit	8568B	2517A10039	10/30/2003	1 year
HP	Quasi-Peak Adapter	8565A	3107A01572	10/30/2003	1 year
FLUKE	True RMS Multimeter	187	78540402	03/24/2003	1 year

*** 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:	23°C
Relative Humidity:	59%
ATM Pressure:	1178mbar

Test Data

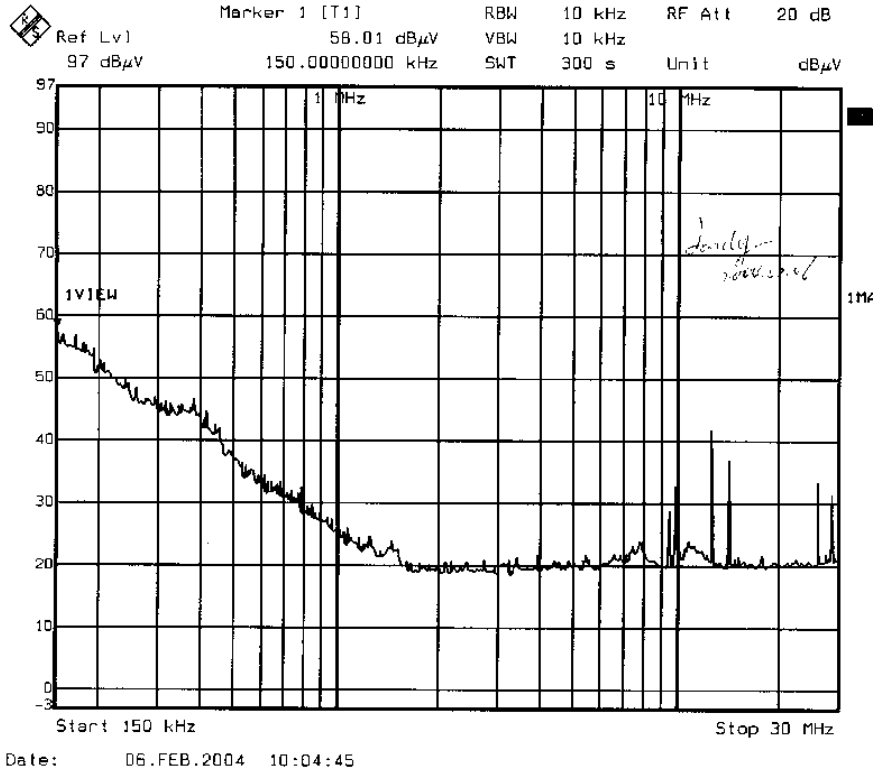
LINE CONDUCTED EMISSIONS				FCC 15.207	
Frequency MHz	Amplitude dBμV	Detector Qp/Ave/Peak	Phase Line/Neutral	Limit dBμV	Margin dB
0.18	49.4	AV	Neutral	54.49	-5.1
0.15	50.2	AV	Line	56	-5.8
0.18	56.8	QP	Neutral	64.49	-7.7
0.15	58.0	QP	Line	66	-8.0
0.38	39.8	AV	Line	48.28	-8.5
0.38	39.5	AV	Neutral	48.28	-8.8
0.38	46.6	QP	Line	58.28	-11.7
0.38	46.2	QP	Neutral	58.28	-12.1
12.69	35.3	AV	Line	50	-14.8
12.69	41.7	QP	Line	60	-18.3
26.41	28.7	AV	Neutral	50	-21.3
26.41	35.1	QP	Neutral	60	-24.9

Test Result: Pass

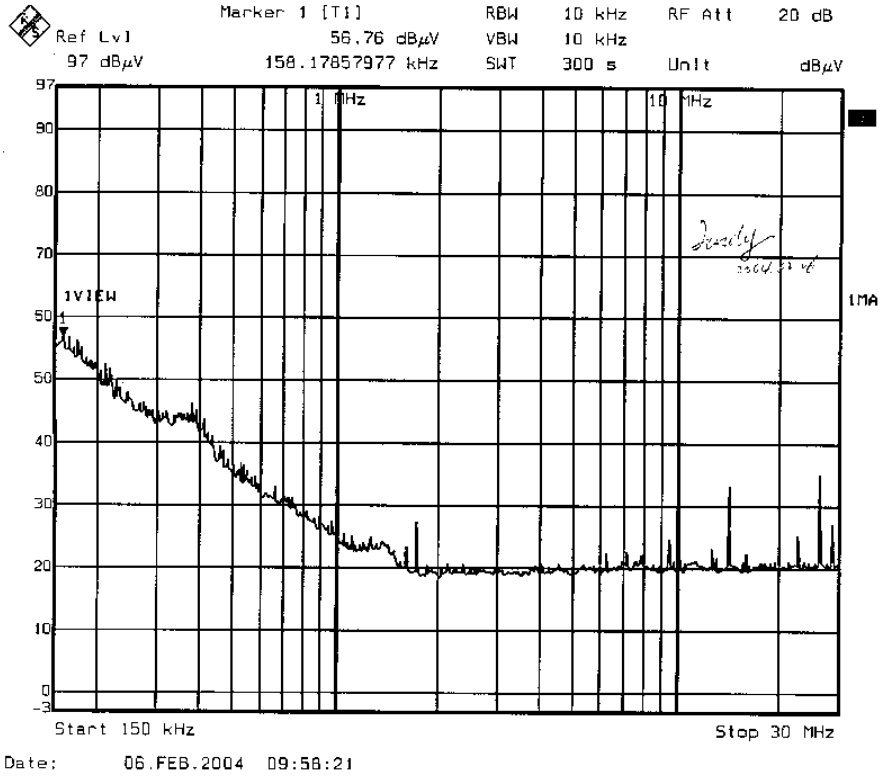
Plot(s) of Test Data

Plot(s) of test data was presented hereinafter as reference.

Line:



Neutral



§15.209(a) §15.249(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 15.209(a), 15.249(a) limits.

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

The adaptor 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:

Frequency Range	***RBW***	***Video B/W***
30 – 1000MHz	100kHz	100kHz
Above 1000MHz	1MHz	1MHz

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R/S	Spectrum Analyzer	FSEM	849720/019	08/05/2003	1 year
HP	Amplifier	8447D	2944A09795	08/05/2003	1 year
ETS	Log Periodic Antenna	3146	9603-4421	09/05/2003	1 year
ETS	Biconical Antenna	3110B	3360	08/05/2003	1 year
FLUKE	True RMS Multimeter	187	78540402	03/24/2003	1 year
HP	Amplifier (1-26.5GHz)	8449B	3147A00400	11/05/2003	1 year
A.H.System	Horn Antenna (700MHz-18GHz)	SAS-200/571	261	11/05/2003	1 year

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

Environmental Conditions

Temperature:	24 °C
Relative Humidity:	61%
ATM Pressure:	1178mbar

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:

Corr. Ampl. = Indicated Reading + Antenna Factor + Cable Factor - 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:

Margin = Corr. Ampl. - Applicable Limit

Test Data

Indicated			Table	Antenna		Correction Factor			Corrected Amplitude	FCC 15.209(a), FCC 15.249(a)	
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											
4825.98	48.43	AVE	180	1.2	V	31.2	4.9	32.5	52.0	54	-2.0
4826.25	48.59	AVE	180	1.2	H	31.2	4.9	32.5	52.2	54	-1.8
2414.26	86.71	FUND/AVE	45	1.0	H	29.4	3.4	30	89.5	94	-4.5
9652.25	46.73	AVE	60	1.0	H	33.1	7.0	38.4	48.5	54	-5.5
9655.38	44.96	AVE	60	1.0	V	33.1	7.0	38.4	46.7	54	-7.3
2413.27	80.79	FUND/AVE	45	1.2	V	29.4	3.4	30	83.5	94	-10.5
7238.94	41.52	AVE	45	1.0	H	32.4	6.0	37.2	42.7	54	-11.3
7239.14	40.52	AVE	45	1.2	V	32.4	6.0	37.2	41.7	54	-12.3
4825.98	55.83	PEAK	180	1.2	V	31.2	4.9	32.5	59.4	74	-14.6
4826.25	55.42	PEAK	180	1.2	H	31.2	4.9	32.5	59.0	74	-15.0
2414.26	90.8	FUND/ PEAK	45	1.0	H	29.4	3.4	30	93.6	114	-20.5
7239.14	51.6	PEAK	45	1.2	V	32.4	6.0	37.2	52.8	74	-21.2
9655.38	50.28	PEAK	60	1.0	V	33.1	7.0	38.4	52.0	74	-22.0
7238.94	50.33	PEAK	45	1.0	H	32.4	6.0	37.2	51.5	74	-22.5
9652.25	47.15	PEAK	60	1.0	H	33.1	7.0	38.4	48.9	74	-25.1
2413.27	83.94	FUND/ PEAK	45	1.2	V	29.4	3.4	30	86.7	114	-27.3
1GHz – 25GHz, Middle Channel											
4862.38	48.43	AVE	180	1.2	H	31.2	4.9	32.5	52.0	54	-2.0
4862.26	46.2	AVE	180	1.2	V	31.2	4.9	32.5	49.8	54	-4.2
9724.35	46.92	AVE	60	1.0	V	33.1	7.0	38.4	48.7	54	-5.3
2431.21	83.83	FUND/AVE	45	1.2	V	29.4	3.4	30	86.6	94	-7.4
9725.1	44.72	AVE	60	1.0	H	33.1	7.0	38.4	46.5	54	-7.5
7293.34	42.8	AVE	45	1.2	V	32.4	6.0	37.2	44.0	54	-10.0
7294.73	41.69	AVE	45	1.0	H	32.4	6.0	37.2	42.9	54	-11.1
2431.09	79.61	FUND/AVE	45	1.0	H	29.4	3.4	30	82.4	94	-11.6
4862.38	54.9	PEAK	180	1.2	H	31.2	4.9	32.5	58.5	74	-15.5
4862.26	54.23	PEAK	180	1.2	V	31.2	4.9	32.5	57.8	74	-16.2
7293.34	54.22	PEAK	45	1.2	V	32.4	6.0	37.2	55.4	74	-18.6
9724.35	53.66	PEAK	60	1.0	V	33.1	7.0	38.4	55.4	74	-18.6
9725.1	51.22	PEAK	60	1.0	H	33.1	7.0	38.4	53.0	74	-21.0
2431.21	88.6	FUND/ PEAK	45	1.2	V	29.4	3.4	30	91.4	114	-22.7
7294.73	49.02	PEAK	45	1.0	H	32.4	6.0	37.2	50.2	74	-23.8
2431.09	84.22	FUND/ PEAK	45	1.0	H	29.4	3.4	30	87.0	114	-27.0

Test 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 dBμV/m	Cable DB	Amp. dB	Corr. Ampl. dBμV/m	Limit dBμV/m	Margin dB
1GHz – 25GHz, High Channel											
4934.45	48.12	AVE	180	1.2	H	31.2	4.9	32.5	51.7	54	-2.3
9869.5	47.88	AVE	60	1.0	H	33.1	7.0	38.4	49.6	54	-4.4
4934.39	45.94	AVE	180	1.2	V	31.2	4.9	32.5	49.6	54	-4.5
2467.95	85.7	FUND/AVE	45	1.2	V	29.4	3.4	30	88.5	94	-5.6
2467.95	80.27	FUND/AVE	45	1.0	H	29.4	3.4	30	83.0	94	-11.0
7402.8	41.08	AVE	45	1.0	H	32.4	6.0	37.2	42.3	54	-11.8
7401.95	40.42	AVE	45	1.2	V	32.4	6.0	37.2	41.6	54	-12.4
4934.45	57.3	PEAK	180	1.2	H	31.2	4.9	32.5	60.9	74	-13.1
4934.39	52.83	PEAK	180	1.2	V	31.2	4.9	32.5	56.4	74	-17.6
7401.95	53	PEAK	45	1.2	V	32.4	6.0	37.2	54.2	74	-19.8
2467.95	89.74	FUND/ PEAK	45	1.2	V	29.4	3.4	30	92.5	114	-21.5
9869.5	48.88	PEAK	60	1.0	H	33.1	7.0	38.4	50.6	74	-23.4
7402.8	48.24	PEAK	45	1.0	H	32.4	6.0	37.2	49.4	74	-24.6
9869.59	27.01	AVE	60	1.0	V	33.1	7.0	38.4	28.8	54	-25.2
2467.95	84.32	FUND/ PEAK	45	1.0	H	29.4	3.4	30	87.1	114	-26.9
9869.59	40.81	PEAK	60	1.0	V	33.1	7.0	38.4	42.6	74	-31.4
Unintentional Emission, 30MHz to 1000MHz											
42.96	48.11	PEAK	45	1.0	v	12.1	0.4	25	35.6	40	-4.4
85.91	49.28	PEAK	45	1.0	v	9.7	0.7	25	34.7	40	-5.3
85.96	48	PEAK	180	1.2	h	9.7	0.7	25	33.4	40	-6.6
42.99	44.1	PEAK	45	1.2	h	12.1	0.4	25	31.6	40	-8.4
200.45	48.52	PEAK	45	1.2	v	10.1	1.2	25	34.8	43.5	-8.7
124.08	46.24	PEAK	180	1.2	v	12.1	1.2	25	34.5	43.5	-9.0
114.51	45.54	PEAK	60	1.0	v	11.7	1.2	25	33.4	43.5	-10.1
57.27	44.3	PEAK	180	1.2	v	10.3	0.2	25	29.8	40	-10.2
200.44	46.2	PEAK	45	1.2	h	10.1	1.2	25	32.5	43.5	-11.1
57.28	42.8	PEAK	60	1.0	h	10.3	0.2	25	28.3	40	-11.7
114.48	43.46	PEAK	270	1.0	h	11.7	1.2	25	31.4	43.5	-12.1
124.08	42.2	PEAK	90	1.2	h	12.1	1.2	25	30.5	43.5	-13.0

Test Result: Pass

§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	Calibration Date	Calibration Due Date
R/S	Spectrum Analyzer	FSEM	849720/019	08/05/2003	1 year
HP	Amplifier	8447D	2944A09795	08/05/2003	1 year
ETS	Log Periodic Antenna	3146	9603-4421	09/05/2003	1 year
ETS	Biconical Antenna	3110B	3360	08/05/2003	1 year
FLUKE	True RMS Multimeter	187	78540402	03/24/2003	1 year
HP	Amplifier (1-26.5GHz)	8449B	3147A00400	11/05/2003	1 year
A.H.System	Horn Antenna (700MHz-18GHz)	SAS-200/571	261	11/05/2003	1 year

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

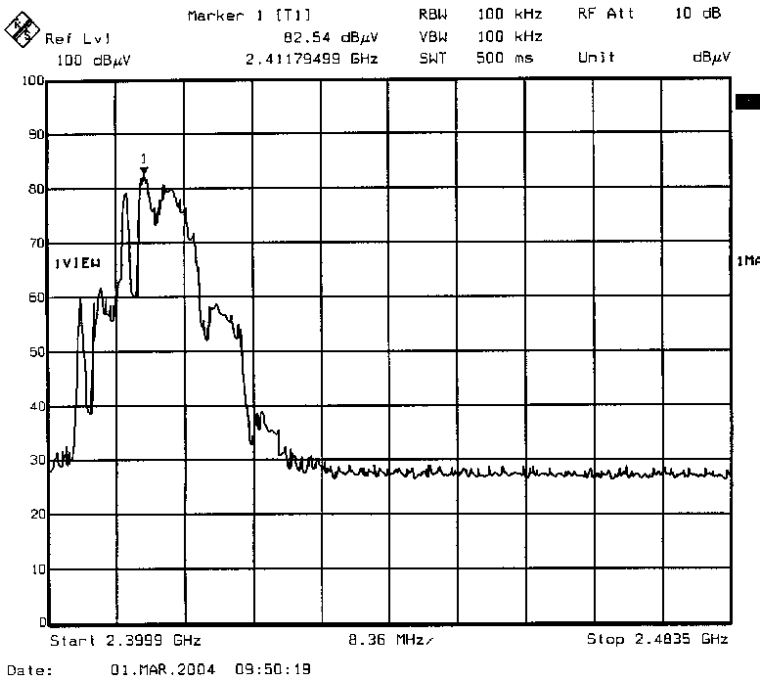
Environmental Conditions

Temperature:	24 °C
Relative Humidity:	59%
ATM Pressure:	1178mbar

Test Result: Pass

Refer to the attached plots.

Low Channel



High Channel