

Application for Certification
On behalf of
VTech Communications Ltd.
UHF/IR Remote Controller

Model No.: 1.51DBS
FCC ID: EW7DVD15

Prepared For : VTech Communications Ltd.
23/F, Taiping Industrial Centre, Block 1,
57 Tingkok Road, Taipo, N.T., Hong Kong

Prepared By : AUDIX Technology (Shanghai) Co., Ltd.
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Report No. : ACI-F00026
Date of Test : June 28-30
Date of Report : June 30, 2000

TABLE OF CONTENTS

Page

1 GENERAL INFORMATION	21
1.1 Description of Equipment Under Test	21
1.2 Description of Test Facility	21
1.3 Measurement Uncertainty	21
2 RADIATED EMISSION TEST	22
2.1 Test Equipment	22
2.2 Block Diagram of Test Setup.....	22
2.3 Limit.....	23
2.4 Test Configuration	24
2.5 Operating Condition of EUT	24
2.6 Test Procedure	24
2.7 Test Results	25
3 FUNDAMENTAL AND SPURIOUS EMISSIONS TEST.....	26
3.1 Test Equipment	26
3.2 Block Diagram of Test Setup.....	26
3.3 Limit.....	27
3.4 Test Configuration	27
3.5 Operating Condition of EUT	27
3.6 Test Procedure	27
3.7 Test Result	28
4 BANDWIDTH MEASUREMENT	32
4.1 Test Equipment	32
4.2 Bandwidth Limit	32
4.3 Test Results.....	32
5 PHOTOGRAPHS.....	ERROR! BOOKMARK NOT DEFINED.
5.1 Radiated Emission Test.....	Error! Bookmark not defined.
5.2 Fundamental And Spurious Emissions Test	Error! Bookmark not defined.
5.3 Bandwidth Measurement	Error! Bookmark not defined.

TEST REPORT FOR FCC CERTIFICATION

Applicant : VTech Communications Ltd.

Manufacturer : VTech Communications Ltd.

EUT Description : UHF/IR Remote Controller

(A) Model No. : 1.51DBS
(B) Serial No. : ACI-20000525002
(C) Power Supply : DC 6V With Battery

Measurement Procedure Used:

*FCC RULES AND REGULATIONS PART 15 SUBPART C OCTOBER 1998
AND FCC/ANSI C63.4:1992*

The device described above is tested by AUDIX Technology (Shanghai) Co., Ltd. To determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 15 Subpart C limits.

The measurement results are contained in this test report and AUDIX Technology (Shanghai) Co., Ltd. is assumed full responsibility for the accuracy and completeness of these measurements. Also, this report shows that the Equipment Under Test (EUT) is to be technically compliant with the FCC requirements.

This report applies to above tested sample only. This report shall not be reproduced in part without written approval of AUDIX Technology (Shanghai) Co., Ltd.

Date of Test : June 28-30, 2000

Prepared by : Tellen King
(TELLEN KING)

Test Engineer : Steven Lee
For and on behalf of (STEVEN LEE)
AUDIX TECHNOLOGY (SHANGHAI) CO., LTD.

Reviewer : Hall Wang
(HALL WANG)

Approved Signatory : Jeremy Geng
(JEREMY GENG)

Authorized Signature(s)

1 GENERAL INFORMATION

1.1 Description of Equipment Under Test

Description : UHF/IR Remote Controller

Type of EUT : ☒ Production ☐ Pre-product ☐ Pro-type

Model Number : 1.51DBS

Serial No. : ACI-20000525002

FCC ID : EW7DVD15

Applicant : VTech Communications Ltd.
23/F, Taiping Industrial Centre, Block 1,
57 Tingkok Road, Taipo, N.T., Hong Kong

Manufacturer : VTech Communications Ltd.
23/F, Taiping Industrial Centre, Block 1,
57 Tingkok Road, Taipo, N.T., Hong Kong

1.2 Description of Test Facility

Site Description : Sept. 17, 1998 file on
(Semi-Anechoic Chamber) Federal Communications Commission
FCC Engineering Laboratory
7435 Oakland Mills Road
Columbia, MD 21046, USA

Name of Firm : AUDIX Technology (Shanghai) Co., Ltd.

Site Location : 3 F., 34 Bldg., 680 Guiping Rd.,
Caohejing Hi-Tech Park,
Shanghai, China

NVLAP Lab Code : 200371-0

1.3 Measurement Uncertainty

Conducted Emission Uncertainty : U=2.66dB

Radiated Emission Uncertainty : U=3.90dB

2 RADIATED EMISSION TEST

2.1 Test Equipment

The following test equipment are used during the radiated emission test in a semi-anechoic chamber:

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	EMI Test Receiver	RS	ESVS10	844594/001	May 24, 2000	1 Year
2.	Spectrum Analyzer	HP	8593EM	3628A00167	May 28, 2000	1 Year
3.	Pre-amplifier	HP	8447D	2944A06849	June 10, 2000	1/2 Year
4.	Bilog Antenna	Chase	CBL6111	1146	June 10, 2000	1/2 Year
5.	Cable	Radiall	N-J5-6MRG58-N-J5	3# Chamber No.1	June 10, 2000	1/2 Year
6.	Cable	Radiall	N-J9-2MSYU50-9-N-J9	3# Chamber No.2	June 10, 2000	1/2 Year
7.	Cable	Radiall	N-J9-11MSYU50-9-N-J9	3# Chamber No.3	June 10, 2000	1/2 Year

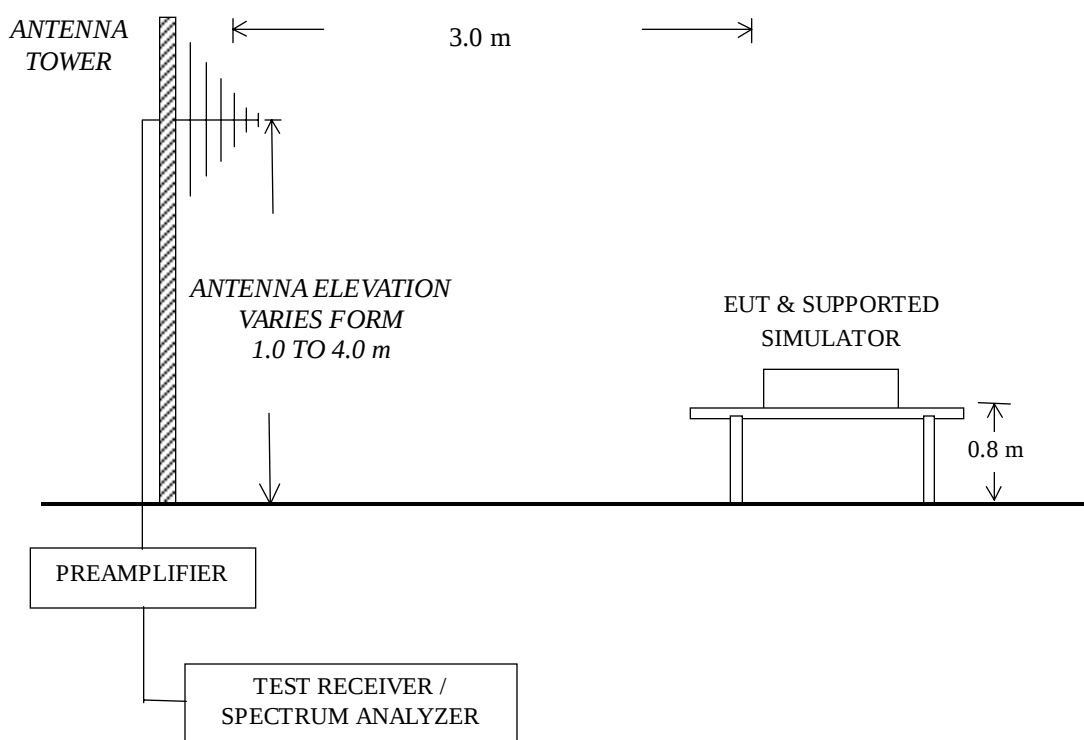
2.2 Block Diagram of Test Setup

(a) Block Diagram of EUT



(Remark: EUT is RF 384MHz Remote Controller)

(b) Chamber #3 Test Setup Diagram



2.3 Limit

Radiated Emission Limit

Frequency (MHz)	Distance (m)	Field strength limits ($\mu\text{V/m}$)	
		($\mu\text{V/m}$)	$\text{dB}(\mu\text{V/m})$
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
Above 960	3	500	54.0
Note 1. Emission Level $\text{dB}(\mu\text{V/m}) = 20 \lg \text{Emission Level } (\mu\text{V/m})$ Note 2. The tighter limit applies at the band edges. Note 3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.			

2.4 Test Configuration

The EUT were installed as show on sec 2.2 on conduct test to meet FCC requirement and operating in a manner which tend to maximize emission level in a normal application.

2.5 Operating Condition of EUT

- (a) Setup the EUT as shown in section 2.2..
- (b) Let the EUT work in attitude (Side /Stand/Lie) and measure it.

2.6 Test Procedure

The EUT and simulator were placed on a turn table which is 0.8 meter above ground. The turn table rotated 360 degrees to determine the position of the maximum emission level. The EUT was set 3 meters away from the receiving antenna, which was mounted on an antenna tower. The antenna moved up and down between 1 meter and 4 meters to find out the maximum emission level. Broadband antenna (Calibrated Bilog Antenna) or dipole antenna were used as receiving antenna. Both horizontal and vertical polarization of the antenna were set on measurement. In order to find the maximum emission, all of the interference cables were manipulated according to ANSI C 63.4:1992 requirements during radiated emission test.

The bandwidth setting on Test Receiver ESVS10 was 120 kHz.

The bandwidth setting on Spectrum analyzer 8593EM is 120 kHz.

The frequency range from 30 MHz to 1000 MHz was checked. The EUT rotated through three orthogonal axes to determine which attitude and configuration produces the highest emission.

2.7 Test Results

<PASS>

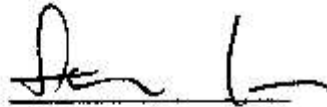
The frequency and amplitude of the highest radiated emission relative the limit is reported.
All the emissions not reported below are too low against the FCC limit.

EUT : UHF/IR Remote Controller Temperature : 21

Model No. : 1.51DBS Humidity : 53%

Test Mode : Transmitting mode Date of Test : June 30, 2000

Polarization	Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Meter Reading dB(μV)	Emission Level dB(μV/m)	Limits dB(μV/m)	Margin (dB)
Horizontal	32.910	16.92	2.18	25.54	26.03	19.59	40.00	20.41
	65.890	6.41	2.70	25.26	29.18	13.03	40.00	26.97
	104.690	11.06	3.46	25.10	29.82	19.24	43.50	24.26
	167.740	10.20	4.33	25.10	28.78	18.21	43.50	25.29
	274.440	13.55	5.54	25.10	28.84	22.83	46.00	23.17
	958.290	24.26	11.93	26.35	29.33	39.17	46.00	6.83
Vertical	34.850	16.16	2.29	25.51	27.42	20.36	40.00	19.64
	68.800	6.83	2.77	25.25	27.91	12.26	40.00	27.74
	120.210	13.23	3.65	25.10	27.33	19.11	43.50	24.39
	130.880	11.65	3.89	25.10	30.90	21.34	43.50	22.16
	218.180	10.64	4.96	25.10	32.39	22.89	46.00	23.11
	914.640	24.25	11.61	26.40	28.88	38.34	46.00	7.66
NOTE 1. Emission Level = Meter Reading + Antenna Factor + Cable Loss – Preamplifier Factor NOTE 2. All reading are Quasi-Peak values. NOTE 3. The worst emission at horizontal polarization was detected at 958.290 MHz with corrected signal level of 39.17 dB(μV/m) (limit is 46.00 dB(μV/m)), when the antenna was 1.00m height and the turn table was at 351°. NOTE 4. The worst emission at vertical polarization was detected at 914.640 MHz with corrected signal level of 38.33 dB(μV/m) (limit is 46.00 dB(μV/m)), when the antenna was 1.00m height and the turn table was at 176°. NOTE 5. 0° was the table front facing the antenna. Degree is calculated from 0° clockwise facing the antenna.								

TEST ENGINEER: 
(STEVEN LEE)

3 FUNDAMENTAL AND SPURIOUS EMISSIONS TEST

3.1 Test Equipment

The following test equipment are used during the radiated emission test in a semi-anechoic chamber:

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Spectrum Analyzer	HP	8593EM	3628A00167	May 28, 2000	1 Year
2.	EMI Test Receiver	RS	ESVS10	844594/001	May 24, 2000	1 Year
3.	Pre-amplifier	HP	8449B	3008A00864	May 28, 2000	1 Year
4.	Pre-amplifier	HP	8447D	2944A06849	June 10, 2000	1/2 Year
5.	Horn Antenna	EMCO	EMCO3115	96074878	Mar. 04, 2000	1 Year
6.	Cable	Radiall	N-J5-6MRG58-N-J5	3# Chamber No.1	June 10, 2000	1/2 Year
7.	Cable	Radiall	N-J9-2MSYU50-9-N-J9	3# Chamber No.2	June 10, 2000	1/2 Year
8.	Cable	Radiall	N-J9-11MSYU50-9-N-J9	3# Chamber No.3	June 10, 2000	1/2 Year
9.	Cable	Radiall	SHF5/L R163065120	3# Chamber No.4	June 10, 2000	1/2 Year
10.	Cable	Radiall	SHF5/L R163065120	3# Chamber No.5	June 10, 2000	1/2 Year
11.	Cable	Radiall	SHF5/L R163065120	3# Chamber No.6	June 10, 2000	1/2 Year

3.2 Block Diagram of Test Setup

Same as section 2.2, except the antenna is Horn Antenna for frequency above 1GHz, and it is fixed in 1 meter high.

3.3 Limit

Fundamental and spurious emissions limit.

Frequency (MHz)	Distance (m)	Field strength limits of fundamental		Field strength limits Of spurious emissions	
		($\mu\text{V/m}$)	$\text{dB}(\mu\text{V/m})$	($\mu\text{V/m}$)	$\text{dB}(\mu\text{V/m})$
174 ~ 260	3	3750	71.48	375	51.48
260 ~ 470	3	3750-12500*	71.48-81.94	375-1250*	51.48-61.94
Above 470	3	12500	81.94	1250	61.94
Note 1. Emission Level $\text{dB}(\mu\text{V/m}) = 20 \lg \text{Emission Level } (\mu\text{V/m})$ Note 2. The tighter limit applies at the band edges. Note 3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system. Note 4. *means linear interpolation.					

3.4 Test Configuration

The EUT were installed as show on sec 3.2 on conduct test to meet FCC requirement and operating in a manner which tend to maximize emission level in a normal application.

3.5 Operating Condition of EUT

- (c) Setup the EUT as shown in section 3.2..
- (d) Let the EUT work in attitude (Side /Stand/Lie) and measure it.

3.6 Test Procedure

The EUT and simulator were placed on a turn table which is 0.8 meter above ground. The turn table rotated 360 degrees to determine the position of the maximum emission level. The EUT was set 3 meters away from the receiving antenna, which was mounted on an antenna tower. Broadband antenna (Calibrated antenna) were used as receiving antenna below 1000MHz. Horn antenna were used as receiving antenna above 1000MHz. Both horizontal and vertical polarization of the antenna were set on measurement. In order to find the maximum emission, all of the interference cables were manipulated according to ANSI C 63.4:1992 requirements during radiated emission test.

The bandwidth setting on Spectrum analyzer 8593EM is 120 kHz below 1000 MHz.
The bandwidth setting on Spectrum analyzer 8593EM is 1 MHz above 1000 MHz.

The frequency range from 30 MHz to 4000 MHz was checked. The EUT rotated through three orthogonal axes to determine which attitude and configuration produces the highest emission.

3.7 Test Result

<PASS>

The frequency and amplitude of the highest radiated emission relative the limit is reported.
All the emissions not reported below are too low against the FCC limit.

EUT : UHF/IR Remote Controller Temperature : 21

Model No. : 1.51DBS Humidity : 53%

Test Mode Transmitting mode (Side) Date of Test : June 28, 2000
(Attitude) : _____

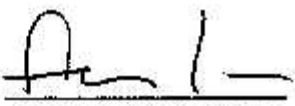
Polarization	Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Correction factor (dB)	Meter Reading dB(μV)	Emission Level dB(μV/m)	Limits dB(μV/m)	Margin (dB)
Horizontal	384.025	16.34	6.62	25.89	-14.40	83.53	66.20	79.00	12.80
	768.060	22.34	10.10	26.60	-14.40	41.15	32.59	61.94	29.35
	1536.140	25.90	5.80	26.70	-14.40	44.50	35.10	61.94	26.84
Vertical	384.025	16.34	6.62	25.89	-14.40	91.27	73.94	79.00	5.06
	768.060	22.34	10.10	26.60	-14.40	40.50	31.94	61.94	30.00
	1536.140	25.90	5.80	26.70	-14.40	41.50	32.10	61.94	29.84

Note 1. All readings are peak values.

Note 2. Emission Level = Antenna Factor + Cable Loss + Meter Reading – Preamplifier Factor + Correction Factor

Note 3. Correction factor is calculated by averaging the sum of the pulse widths over one complete pulse train.

Correction Factor = $20\lg(2/10.5) = -14.40$ (dB)

TEST ENGINEER: 
(STEVEN LEE)

<PASS>

The frequency and amplitude of the highest radiated emission relative the limit is reported.
All the emissions not reported below are too low against the FCC limit.

EUT : UHF/IR Remote Controller Temperature : 21

Model No. : 1.51DBS Humidity : 53%

Test Mode Transmitting mode (Stand) Date of Test : June 28, 2000
(Attitude) : _____

Polarization	Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Correction Factor (dB)	Meter Reading dB(μV)	Emission Level dB(μV/m)	Limits dB(μV/m)	Margin (dB)
Horizontal	384.025	16.34	6.62	25.89	-14.40	88.87	71.54	79.00	7.46
	768.060	22.34	10.10	26.60	-14.40	40.45	31.89	61.94	30.05
	1536.140	25.90	5.80	26.70	-14.40	38.50	29.10	61.94	32.84
Vertical	384.025	16.34	6.62	25.89	-14.40	90.53	73.20	79.00	5.8
	768.060	22.34	10.10	26.60	-14.40	35.75	27.19	61.94	34.75
	1536.140	25.90	5.80	26.70	-14.40	48.64	39.24	61.94	22.70

Note 1. All readings are peak values.

Note 2. Emission Level = Antenna Factor + Cable Loss + Meter Reading – Preamp Factor + Correction Factor

Note 3. Correction factor is calculated by averaging the sum of the pulse widths over one complete pulse train.

Correction Factor = $20\lg(2/10.5) = -14.40$ (dB)

TEST ENGINEER: 
(STEVEN LEE)

<PASS>

The frequency and amplitude of the highest radiated emission relative the limit is reported.
All the emissions not reported below are too low against the FCC limit.

EUT : UHF/IR Remote Controller Temperature : 21

Model No. : 1.51DBS Humidity : 53%

Test Mode Transmitting mode (Lie) Date of Test : June 6, 2000
(Attitude) : _____

Polarization	Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Correction Factor (dB)	Meter Reading dB(μV)	Emission Level dB(μV/m)	Limits dB(μV/m)	Margin (dB)
Horizontal	384.025	16.34	6.62	25.89	-14.40	89.95	72.62	79.00	6.38
	768.060	22.34	10.10	26.60	-14.40	36.58	28.02	61.94	33.92
	1536.140	25.90	5.80	26.70	-14.40	36.77	27.37	61.94	34.57
Vertical	384.025	16.34	6.62	25.89	-14.40	84.65	67.32	79.00	11.68
	768.060	22.34	10.10	26.60	-14.40	40.68	32.12	61.94	29.82
	1536.140	25.90	5.80	26.70	-14.40	43.77	34.37	61.94	27.57

Note 1. All readings are peak values.

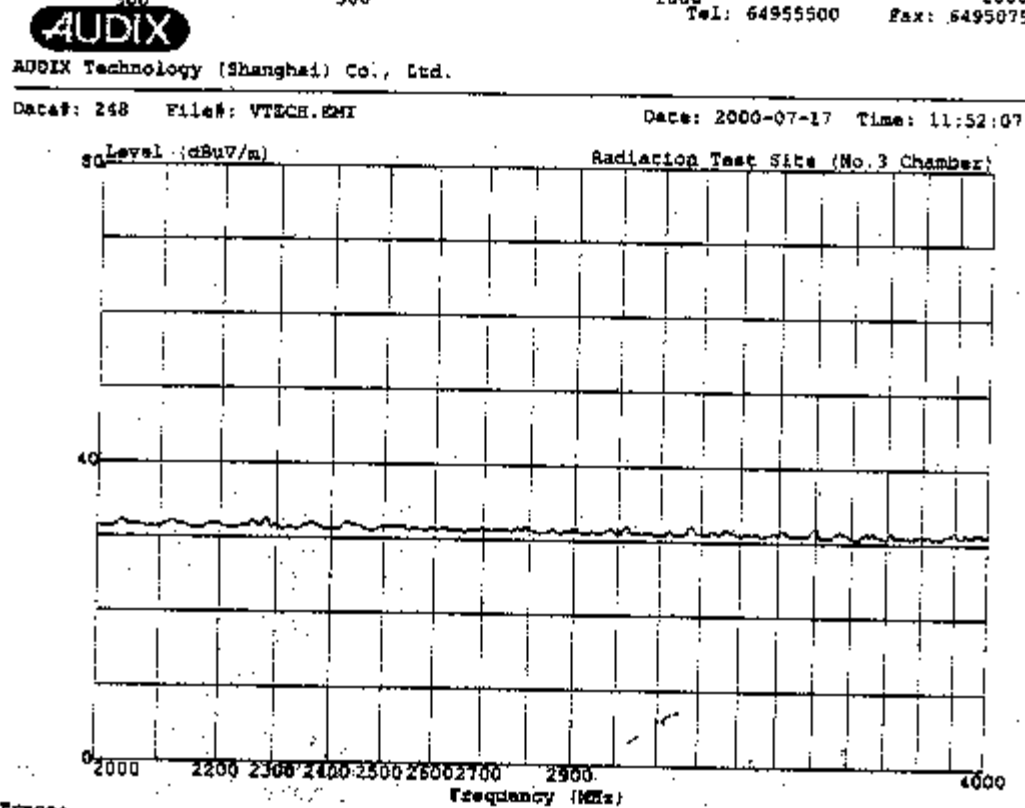
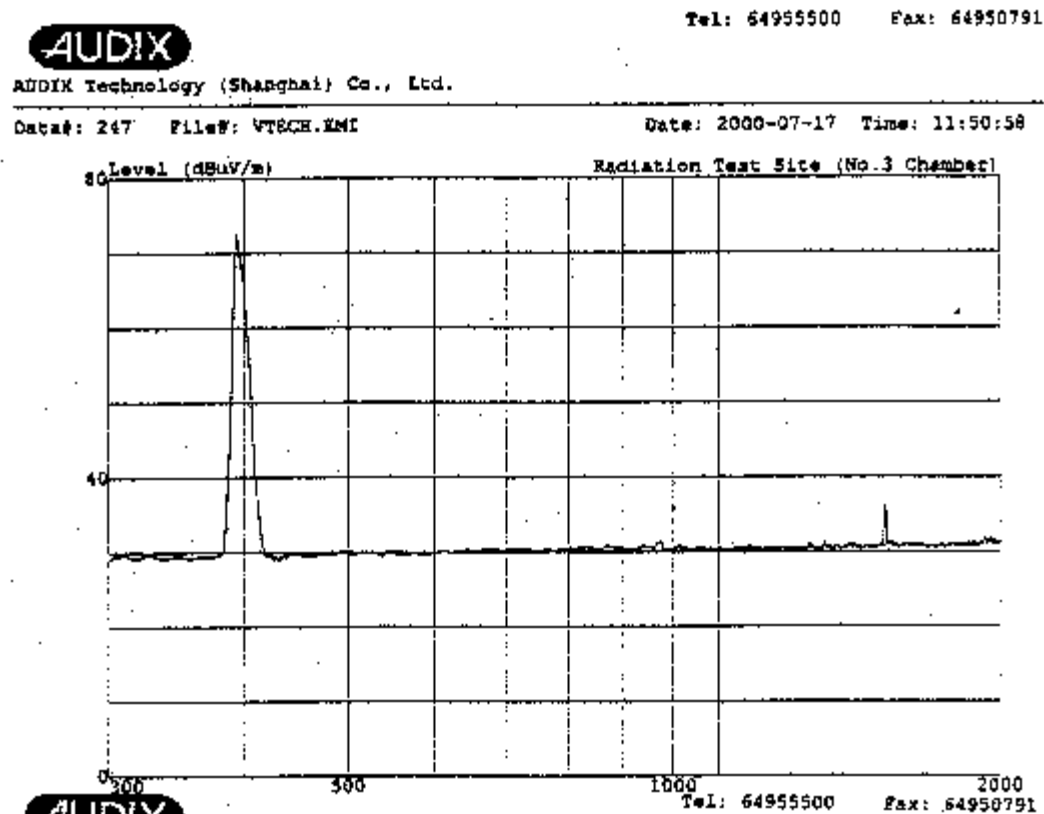
Note 2. Emission Level = Antenna Factor + Cable Loss + Meter Reading – Preamp Factor + Correction Factor

Note 3. Correction factor is calculated by averaging the sum of the pulse widths over one complete pulse train.

Correction Factor = $20\lg(2/10.5) = -14.40$ (dB)

TEST ENGINEER: 
(STEVEN LEE)

Wave Shape (Frequency From 300MHz to 4GH)



Trace: Limit: 3m Probe:
 Project No : 20000526-1014
 Applicant : VTECH Communication Co., Ltd
 EUT : Remote controller
 M/W : 1.51DBS
 Power Supply : DC 6V With battery
 Test Mode :

Ref Trace:

TEST ENGINEER: *Steven Lee*
 (STEVEN LEE)

4 BANDWIDTH MEASUREMENT

4.1 Test Equipment

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Spectrum Analyzer	HP	8593EM	3628A00167	May 28, 2000	1 Year
2.	Bilog Antenna	Chase	CBL6111	1146	June 10, 2000	1/2 Year

4.2 Bandwidth Limit

The bandwidth of the emission shall be no wider than 0.25% of the center frequency.
Bandwidth is determined at the points 20dB down from the modulated carrier.

$$\text{Bandwidth Limit} = 0.25\% \times 384(\text{MHz}) = 0.96(\text{MHz})$$

4.3 Test Results

<PASS>

The Bandwidth of the Fundament emission is

$$\text{B.W.} = 384.0180 - 384.0320 = 0.014\text{MHz}$$