



## Test Report

Product Name: ViewSonic Tweety RF Remote Control

Model No. : 4012

FCC ID.: MG3-4012

Applicant : Universal Electronics Inc.

Address : 6101 Gateway Dr., Cypress, CA. 90630-4841

Date of Receipt : Nov. 22, 2001

Date of Test : Nov. 29, 2001

Report No. : 01BH059FI

The test results relate only to the samples tested.

The test report shall not be reproduced except in full without the written approval of Quietek Corporation.

This report must not be used to claim product endorsement by NVLAP any agency of the U.S. Government

# Test Report Certification

Test Date : Nov. 29, 2001

Report No. : 01BH059FI



Accredited by NIST (NVLAP)

NVLAP Lab Code: 200347-0

Product Name : ViewSonic Tweety RF Remote Control

Applicant : Universal Electronics Inc.

Address : 6101 Gateway Dr., Cypress, CA. 90630-4841

Manufacturer : Universal Electronics Inc.

Model No. : 4012

FCC ID. : MG3-4012

Rated Voltage : Battery 6V

Trade Name : Viewsonic

Measurement Standard : FCC Part 15 Subpart C Paragraph 15.249

Measurement Procedure : ANSI C63.4:1992

Test Result : Complied



NVLAP Lab Code : 200347-0

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Documented By : Ellie Cheng  
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Approved By : Kevin Wang  
( Kevin Wang )

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## 1. GENERAL INFORMATION

### 1.1. EUT Description

Product Name	: ViewSonic Tweety RF Remote Control
Trade Name	: Viewsonic
FCC ID.	: MG3-4012
Model No.	: 4012
Frequency Range	: 2446.7 MHz to 2464.3MHz
Channel Number	: 10
Frequency of each Channel	: Channel 1: 2446.7MHz, Channel 2: 2448.7MHz, Channel 3: 2449.7MHz, Channel 4: 2451.7MHz, Channel 5: 2454.7MHz, Channel 6: 2456.3MHz, Channel 7: 2457.3MHz, Channel 8: 2459.3MHz, Channel 9: 2462.3MHz, Channel 0: 2464.3MHz
Type of Modulation	: FSK
Type of Antenna	: Soldered on PCB
Operator Selection of Operating Frequency	: Manual Switch

Note:

1. This device is a ViewSonic Tweety RF Remote Control included a 2.4GHz transmitting function.
2. Regards to the frequent band operation; the lowest , middle and highest frequency of channel were selected to perform the test, then shown on this report.
3. These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15 Subpart C Paragraph 15.249 for non-spread spectrum devices.

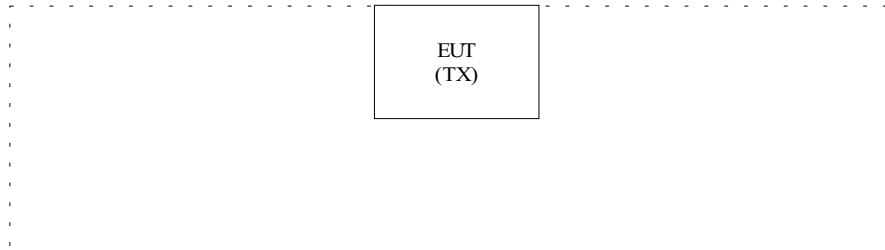
### 1.2. Operation Description

The ViewSonic Tweety RF Remote will be a dedicated 2.4 GHz RF remote with 10 channels capability. This will be a 6V product and will use 4 AAA batteries. The RF modules support up to 10 channels in the ISM band of 2446.7 MHz to 2464.3 MHz, providing a form of frequency division multiple access (FDMA).

**1.3. Tested System Details**

None

**1.4. Configuration of Tested System**



**1.5. EUT Exercise Software**

- 1.4.1 Setup the EUT and display as shown on 1.3.
- 1.4.2 Turn on the power of all equipment.
- 1.4.3 The EUT will transmit the radio signal.
- 1.4.4 Repeat the above procedure 1.4.2 to 1.4.3

**1.6. Test Facility**

Ambient conditions in the laboratory:

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	20-35
Humidity (%RH)	25-75	50-65
Barometric pressure (mbar)	860-1060	950-1000

Site Description: November 3, 1998 File on  
 Federal Communications Commission  
 FCC Engineering Laboratory  
 7435 Oakland Mills Road  
 Columbia, MD 21046  
 Reference 31040/SIT1300F2  
 September 30, 1998 Accreditation on NVLAP  
 NVLAP Lab Code: 200347-0



Site Name: Quietek Corporation

Site Address: No. 75-1, Wang-Yeh Valley, Yung-Hsing,  
 Chiung-Lin, Hsin-Chu County,  
 Taiwan, R.O.C.

## 2. Conducted Emission

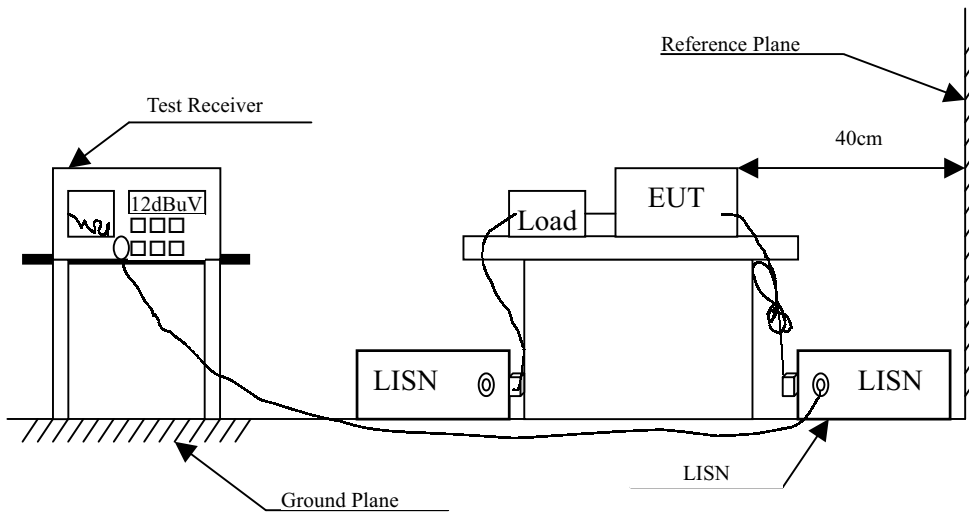
### 2.1. Test Equipment List

The following test equipment are used during the conducted emission test:

Item	Instrument	Manufacturer	Type No./Serial No	Last Cal.	Remark
1	Test Receiver	R & S	ESCS 30/825442/17	May, 2001	
2	L.I.S.N.	R & S	ESH3-Z5/825016/6	May, 2001	EUT
3	L.I.S.N.	Kyoritsu	KNW-407/8-1420-3	May, 2001	Peripherals
4	Pulse Limiter	R & S	ESH3-Z2	N/A	
5	No.2 Shielded Room			N/A	

Note: All equipment upon which need to calibrated are with calibration period of 1 year.

### 2.2. Test Setup



### 2.3. Limits

FCC Part 15 Paragraph 15.207 (dBuV)		
Frequency MHz	Limits	
	uV	dBuV
0.45 - 30	250	48.0

## 2.4. Test Procedure

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refers to the block diagram of the test setup and photographs.)

Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4:1992 on conducted measurement.

Conducted emissions were investigated over the frequency range from 0.45MHz to 30MHz using a receiver bandwidth of 9kHz.



## 2.5. Test Result of Conducted Emission

Owing to the Battery operation of EUT, this test item is not performed.

### 3. Radiated Emission

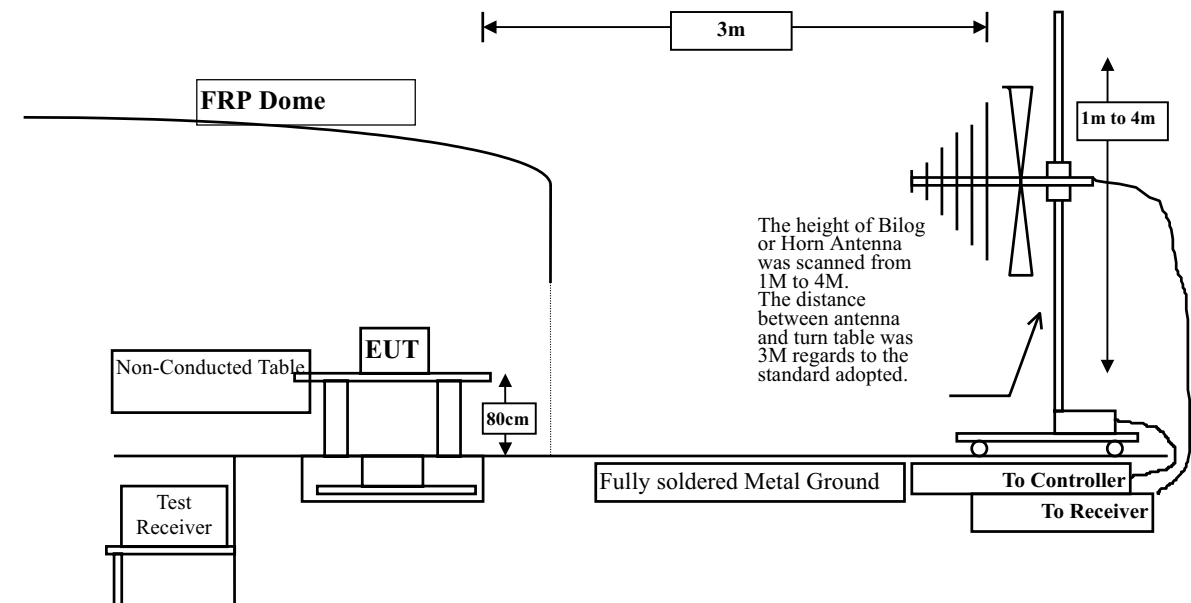
#### 3.1. Test Equipment

The following test equipment are used during the radiated emission test:

Test Site	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
Site # 1	X Test Receiver	R & S	ESCS 30 / 825442/14	May, 2001
	X Spectrum Analyzer	Advantest	R3261C / 71720140	May, 2001
	X Pre-Amplifier	HP	8447D/3307A01812	May, 2001
	X Bilog Antenna	Chase	CBL6112B / 12452	Sep., 2001
	X Horn Antenna	EM	EM6917 / 103325	May, 2001
Site # 2	Test Receiver	R & S	ESCS 30 / 825442/17	May, 2001
	Spectrum Analyzer	Advantest	R3261C / 71720609	May, 2001
	Pre-Amplifier	HP	8447D/3307A01814	May, 2001
	Bilog Antenna	Chase	CBL6112B / 2455	Sep., 2001
	Horn Antenna	EM	EM6917 / 103325	May, 2001

- Note:
1. All equipments that need to calibrate are with calibration period of 1 year.
  2. Mark "X" test instruments are used to measure the final test results.

#### 3.2. Test Setup



### 3.3. Limits

#### ➤ Fundamental and Harmonics Emission Limits

Frequency MHz	Field Strength of Fundamental		Field Strength of Harmonics	
	(mV/m @3m)	(dBuV/m @3m)	(uV/m @3m)	(dBuV/m @3m)
2400-2483.5	50	94 (Average)	500	54 (Average)
		114 (Peak)		74 (Peak)

#### ➤ General Radiated Emission Limits

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

Frequency MHz	15.209 Limits (dBuV/m @3m)
30-88	40
88-216	43.5
216-960	46
Above 960	54

- Remarks :
1. RF Voltage (dBuV/m) = 20 log RF Voltage (uV/m)
  2. In the Above Table, the tighter limit applies at the band edges.
  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.

### 3.4. Test Procedure

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.

Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.4:1992 on radiated measurement.

Radiated emissions were investigated over the frequency range from 30MHz to 1GHz using a receiver bandwidth of 120kHz. Radiated was performed at an antenna to EUT distance of 3 meters.

The frequency range from 30MHz to 10th harmonics is checked.

### 3.5. Test Result of Radiated Emission

Product : ViewSonic Tweety RF Remote Control  
 Test Item : Fundamental Radiated Emission Data  
 Test Site : No.1 OATS  
 Test Mode : Normal Operation

Freq.	Cable	Probe	PreAMP	Reading	Emission Margin Limit		
MHz	Loss	Factor	dB	Level	Level	dB	dBuV/m
	dB	dB/m	dB	dBuV	dBuV/m	dB	dBuV/m
<b>Peak Detector (Horizontal)</b>							
Channel 1							
2446.700	3.88	29.35	34.90	75.17	73.49	40.51	114.00
Channel 5							
2454.740	3.89	29.39	34.90	74.77	73.16	40.84	114.00
Channel 0							
2464.340	3.89	29.39	34.90	78.63	77.02	36.98	114.00
<b>Peak Detector (Vertical)</b>							
Channel 1							
2446.650	3.88	29.35	34.90	76.44	74.76	39.24	114.00
Channel 5							
2454.650	3.89	29.39	34.90	76.13	74.52	39.48	114.00
Channel 0							
2464.250	3.89	29.39	34.90	76.12	74.51	39.49	114.00

Note:

1. All Readings below 1GHz are Quasi-Peak, above are average value.
2. Emission Level = Reading Level + Probe Factor + Cable loss-PreAMP
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : ViewSonic Tweety RF Remote Control  
 Test Item : Harmonic Radiated Emission Data  
 Test Site : No.1 OATS  
 Test Mode : Channel 1

Freq.	Cable	Probe	PreAMP	Reading	Emission	Margin	Limit
MHz	Loss	Factor	dB	Level	Level	dB	dBuV/m
	dB	dB/m		dBuV	dBuV/m		
<b>Peak Detector (Horizontal)</b>							
4893.466	6.34	33.58	34.74	49.46	54.63	19.37	74.00
7335.959	8.41	36.34	34.90	45.29	< 55.14	18.86	74.00
9784.665	10.28	37.46	35.10	44.71	< 57.35	16.65	74.00
<b>Average Detector (Horizontal)</b>							
4893.466	6.34	33.58	34.74	44.83	50.00	4.00	54.00
7335.959	8.41	36.34	34.90	33.00	< 42.85	11.15	54.00
9784.665	10.28	37.46	35.10	31.62	< 44.26	9.74	54.00
<b>Peak Detector (Vertical)</b>							
4893.667	6.34	33.58	34.74	46.98	52.15	21.85	74.00
7336.160	8.41	36.34	34.90	44.85	< 54.70	19.30	74.00
9784.865	10.28	37.46	35.10	44.27	< 56.91	17.09	74.00
<b>Average Detector (Vertical)</b>							
7336.160	8.41	36.34	34.90	33.03	< 42.88	11.12	54.00
9784.865	10.28	37.46	35.10	31.65	< 44.29	9.71	54.00

Note:

1. All Readings below 1GHz are Quasi-Peak, above are average value.
2. Emission Level = Reading Level + Probe Factor + Cable loss-PreAMP
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : ViewSonic Tweety RF Remote Control  
 Test Item : Harmonic Radiated Emission Data  
 Test Site : No.1 OATS  
 Test Mode : Channel 5

Freq.	Cable Loss	Probe Factor	PreAMP	Reading Level	Emission Level	Margin	Limit
MHz	dB	dB/m	dB	dBuV	dBuV/m	dB	dBuV/m
<b>Peak Detector (Horizontal)</b>							
4909.533	6.35	33.60	34.74	48.35	53.57	20.43	74.00
7360.326	8.42	36.36	34.90	44.14	< 54.02	19.98	74.00
9816.731	10.31	37.46	35.10	43.88	< 56.55	17.45	74.00
<b>Average Detector (Horizontal)</b>							
7360.326	8.42	36.36	34.90	31.98	< 41.86	12.14	54.00
9816.731	10.31	37.46	35.10	31.55	< 44.22	9.78	54.00
<b>Peak Detector (Vertical)</b>							
4909.633	6.35	33.60	34.74	46.77	51.99	22.01	74.00
7364.034	8.42	36.36	34.90	44.41	< 54.29	19.71	74.00
9816.831	10.31	37.46	35.10	44.54	< 57.21	16.79	74.00
<b>Average Detector (Vertical)</b>							
7364.034	8.42	36.36	34.90	33.03	< 42.91	11.09	54.00
9816.831	10.31	37.46	35.10	31.58	< 44.25	9.75	54.00

Note:

1. All Readings below 1GHz are Quasi-Peak, above are average value.
2. Emission Level = Reading Level + Probe Factor + Cable loss-PreAMP
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : ViewSonic Tweety RF Remote Control  
 Test Item : Harmonic Radiated Emission Data  
 Test Site : No.1 OATS  
 Test Mode : Channel 0

Freq.	Cable	Probe	PreAMP	Reading	Emission	Margin	Limit
MHz	Loss	Factor	dB	Level	Level	dB	dBuV/m
	dB	dB/m	dB	dBuV	dBuV/m	dB	dBuV/m
<b>Peak Detector (Horizontal)</b>							
4928.751	6.37	33.62	34.73	47.26	52.52	21.48	74.00
7392.050	8.45	36.39	34.90	44.65	54.59	19.41	74.00
9856.150	10.33	37.47	35.10	44.55	57.25	16.75	74.00
<b>Average Detector (Horizontal)</b>							
7392.050	8.45	36.39	34.90	31.55	41.49	12.51	54.00
9856.150	10.33	37.47	35.10	31.92	44.62	9.38	54.00
<b>Peak Detector (Vertical)</b>							
4928.701	6.37	33.62	34.73	47.34	52.60	21.40	74.00
7391.849	8.45	36.39	34.90	44.20	54.14	19.86	74.00
9856.250	10.33	37.47	35.10	45.23	57.93	16.07	74.00
<b>Average Detector (Vertical)</b>							
7391.849	8.45	36.39	34.90	31.61	41.55	12.45	54.00
9856.250	10.33	37.47	35.10	32.13	44.83	9.17	54.00

Note:

1. All Readings below 1GHz are Quasi-Peak, above are average value.
2. Emission Level = Reading Level + Probe Factor + Cable loss-PreAMP
3. The average measurement was not performed when the peak measured data under the limit of average detection.



Product : ViewSonic Tweety RF Remote Control  
 Test Item : General Radiated Emission Data  
 Test Site : No.1 OATS  
 Test Mode : Channel 1

Freq. MHz	Cable Loss dB	Probe Factor dB/m	PreAMP Reading		Emission Margin Limit		
			Level dB	Level dBuV	Level dBuV/m	Level dB	Level dBuV/m

**Horizontal:**

*53.280	1.11	5.17	26.86	47.80	27.22	12.78	40.00
76.560	1.21	8.20	26.87	34.40	16.94	23.06	40.00
143.490	1.48	11.06	26.89	30.20	15.86	27.64	43.50
543.130	3.12	15.95	26.57	29.00	21.51	24.49	46.00
765.260	4.04	17.17	26.22	29.00	23.99	22.01	46.00
891.360	4.55	17.88	26.02	29.40	25.81	20.19	46.00

**Vertical:**

*49.400	1.10	6.64	26.86	47.00	27.88	12.12	40.00
83.350	1.24	9.43	26.87	32.00	15.80	24.20	40.00
115.360	1.37	11.70	26.88	29.60	15.79	27.71	43.50
326.820	2.24	13.51	26.91	28.40	17.24	28.76	46.00
593.570	3.33	15.91	26.49	30.20	22.96	23.04	46.00
760.410	4.02	17.24	26.23	29.60	24.63	21.37	46.00

## Note:

1. All Readings below 1GHz are Quasi-Peak, above are average value.
2. “ \* ”, means this data is the worst emission level.
3. Emission Level = Reading Level + Probe Factor + Cable loss- Pre Amp.

Product : ViewSonic Tweety RF Remote Control  
 Test Item : General Radiated Emission Data  
 Test Site : No.1 OATS  
 Test Mode : Channel 5

Freq.	Cable	Probe	PreAMP	Reading	Emission Margin Limit		
MHz	Loss	Factor	dB	Level	Level	dB	dBuV/m
	dB	dB/m	dB	dBuV	dBuV/m	dB	dBuV/m

**Horizontal:**

*49.400	1.10	6.64	26.86	46.80	27.68	12.32	40.00
76.560	1.21	8.20	26.87	34.20	16.74	23.26	40.00
143.490	1.48	11.06	26.89	30.60	16.26	27.24	43.50
318.090	2.20	13.20	26.92	29.00	17.48	28.52	46.00
581.930	3.28	15.89	26.51	29.60	22.27	23.73	46.00
717.730	3.84	16.70	26.29	30.00	24.25	21.75	46.00

**Vertical:**

*50.370	1.10	6.24	26.86	46.20	26.68	13.32	40.00
83.350	1.24	9.43	26.87	33.00	16.80	23.20	40.00
260.860	1.96	12.79	26.94	28.60	16.42	29.58	46.00
333.610	2.26	12.68	26.90	29.80	17.85	28.15	46.00
551.860	3.16	15.92	26.55	29.20	21.73	24.27	46.00
778.840	4.09	17.23	26.20	29.80	24.93	21.07	46.00

**Note:**

1. All Readings below 1GHz are Quasi-Peak, above are average value.
2. “ \* ”, means this data is the worst emission level.
3. Emission Level = Reading Level + Probea Factor + Cable loss- Pre Amp.

Product : ViewSonic Tweety RF Remote Control  
 Test Item : General Radiated Emission Data  
 Test Site : No.1 OATS  
 Test Mode : Channel 0

Freq.	Cable	Probe	PreAMP	Reading	Emission Margin Limit		
MHz	Loss	Factor	dB	Level	Level	dB	dBuV/m
	dB	dB/m	dB	dBuV	dBuV/m	dB	dBuV/m

**Horizontal:**

*32.910	1.03	15.27	26.85	44.80	34.25	5.75	40.00
49.400	1.10	6.64	26.86	45.00	25.88	14.12	40.00
76.560	1.21	8.20	26.87	33.40	15.94	24.06	40.00
143.490	1.48	11.06	26.89	30.80	16.46	27.04	43.50
638.190	3.52	16.22	26.42	30.20	23.52	22.48	46.00
888.450	4.54	17.76	26.02	29.40	25.68	20.32	46.00

**Vertical:**

*50.370	1.10	6.24	26.86	46.00	26.48	13.52	40.00
61.040	1.14	5.11	26.86	44.20	23.59	16.41	40.00
83.350	1.24	9.43	26.87	32.40	16.20	23.80	40.00
131.850	1.44	11.92	26.89	29.40	15.87	27.63	43.50
457.770	2.77	14.23	26.70	30.80	21.10	24.90	46.00
743.920	3.95	17.28	26.25	29.80	24.78	21.22	46.00

**Note:**

1. All Readings below 1GHz are Quasi-Peak, above are average value.
2. “ \* ”, means this data is the worst emission level.
3. Emission Level = Reading Level + Probe Factor + Cable loss- Pre Amp.

## 4. Band Edge

### 4.1. Test Equipment

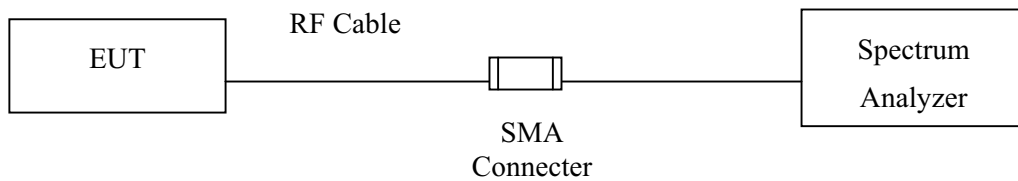
The following test equipments are used during the band edge tests:

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
X	Spectrum Analyzer	Advantest	R3272 / 72421194	May, 2001
X	Test Receiver	R & S	ESCS 30 / 825442/14	May, 2001
X	Spectrum Analyzer	Advantest	R3261C / 71720140	May, 2001
X	Pre-Amplifier	HP	8447D/3307A01812	May, 2001
X	Bilog Antenna	Chase	CBL6112B / 12452	Sep., 2001
X	Horn Antenna	EM	EM6917 / 103325	May, 2001

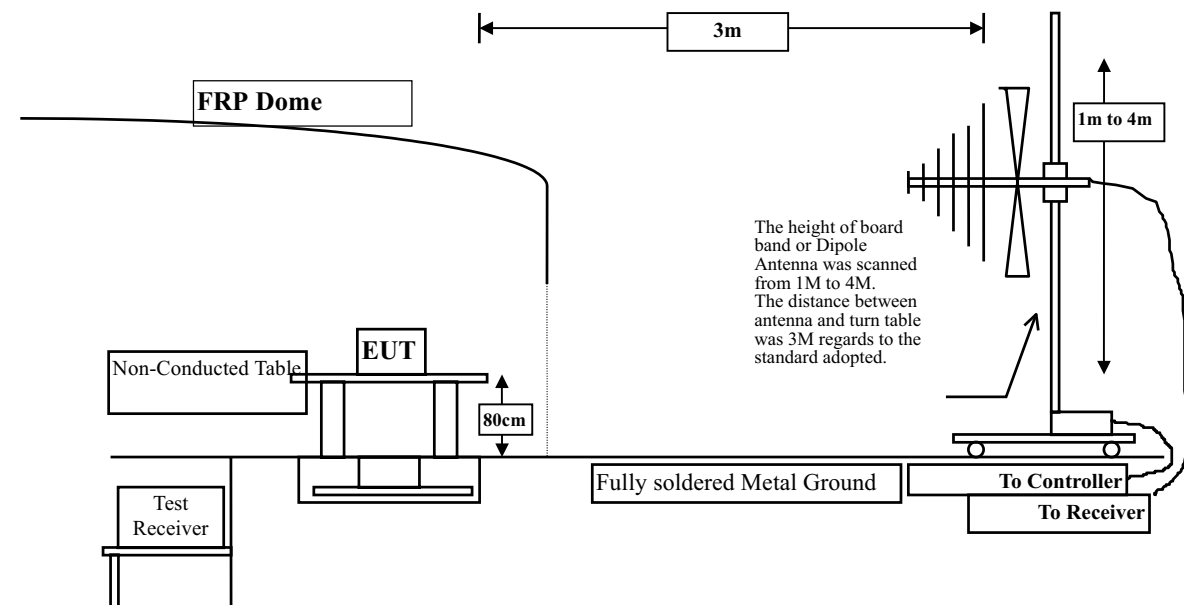
- Note: 1. All equipments that need to calibrate are with calibration period of 1 year.  
 2. Mark "X" test instruments are used to measure the final test results.

### 4.2. Test Setup

#### RF Conducted Measurement:



#### RF Radiated Measurement:



#### **4.3. Test Condition**

Standard Temperature and Humidity, Standard Test Voltage

#### **4.4. Standard Requirement**

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 50 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

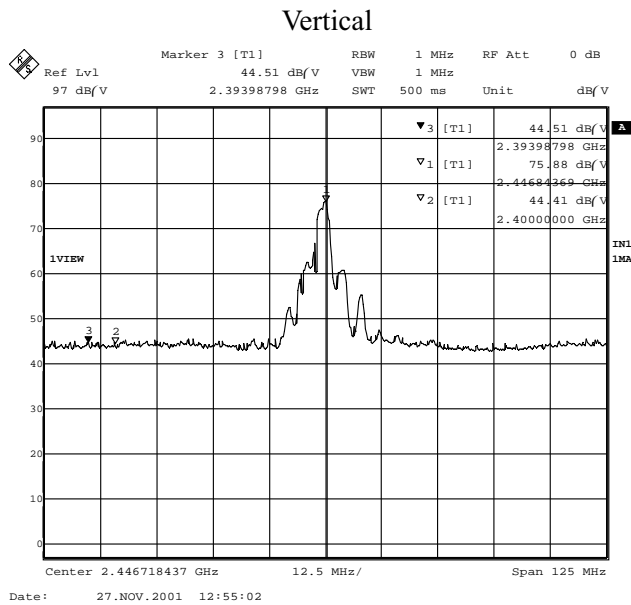
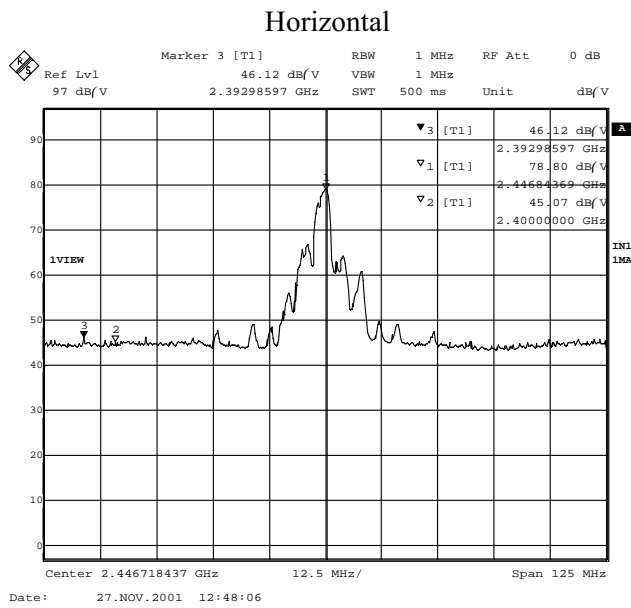
### 4.5. Test Result of Band Edge

Product : ViewSonic Tweety RF Remote Control  
 Test Item : Band Edge Data  
 Test Site : No.1 OATS  
 Test Mode : Channel 1

**RF Radiated Measurement:**

Channel No.	Frequency (MHz)	Reading Level (dBuV)	Measurement Level (dBuV/m)	Limit	Result
1 (Horizontal)	2392.986	46.12	44.26	54	Pass
1 (Vertical)	2393.988	44.51	42.65	54	Pass

**Figure Channel 1:**

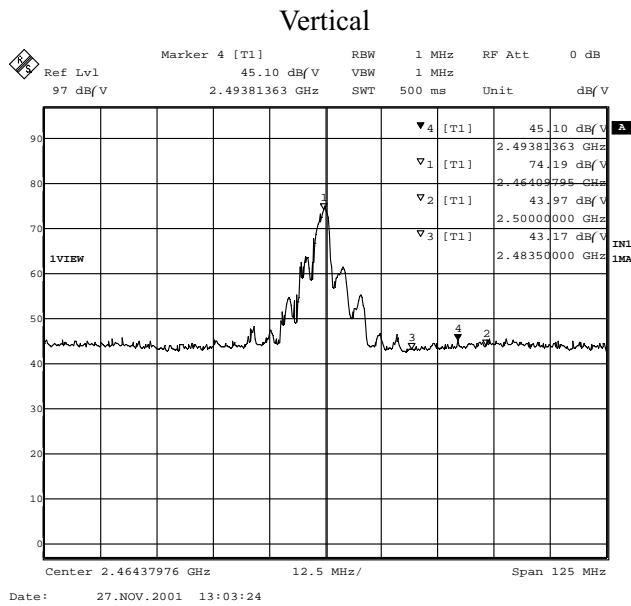
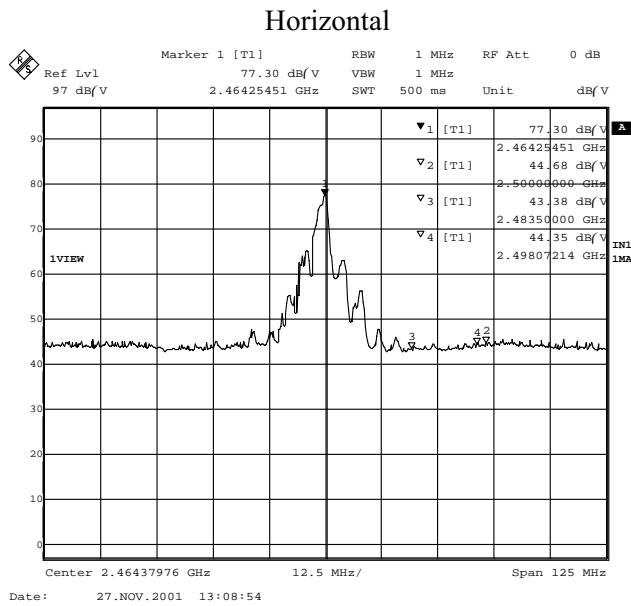


Product : ViewSonic Tweety RF Remote Control  
 Test Item : Band Edge Data  
 Test Site : No.1 OATS  
 Test Mode : Channel 0

**RF Radiated Measurement:**

Channel No.	Frequency (MHz)	Reading (dBuV)	Measurement Level (dBuV/m)	Limit	Result
0 (Horizontal)	2498.072	44.35	42.86	54	Pass
0 (Vertical)	2493.814	45.10	43.61	54	Pass

**Figure Channel 0:**



## 5. EMI Reduction Method During Compliance Testing

No modification was made during testing.



## Attachment 1 : EUT Test Photographs

**Attachment 1: EUT Test Setup Photographs**

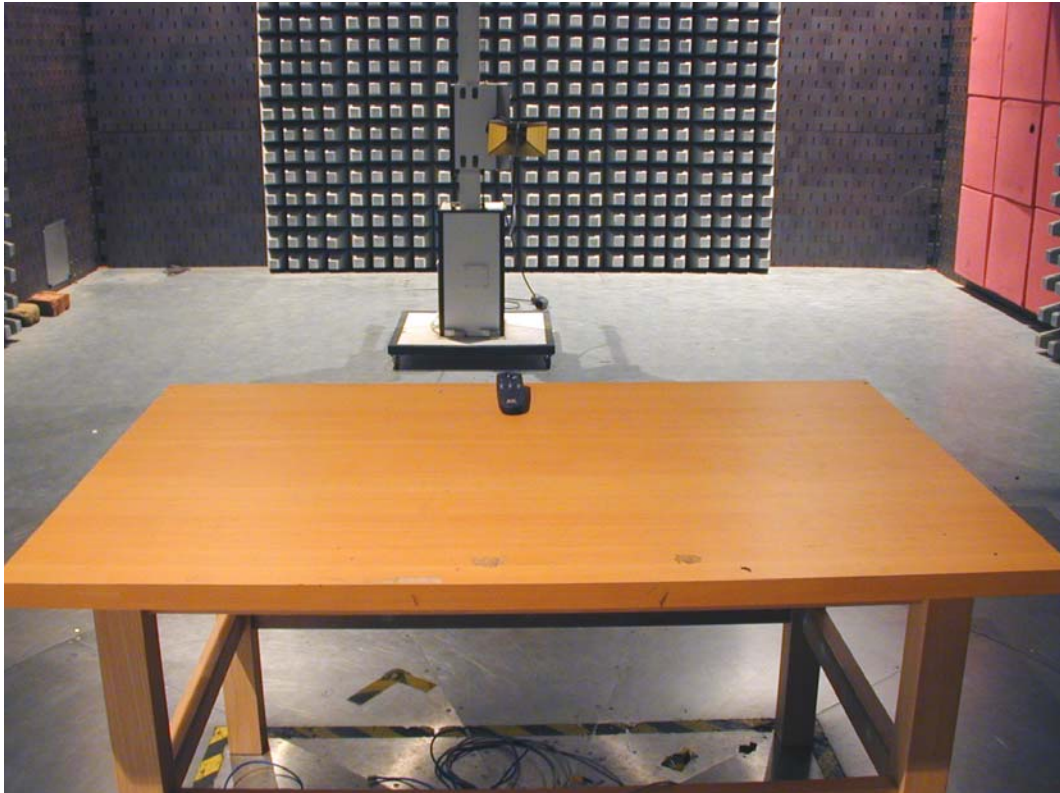
Front View of Radiated Test



Back View of Radiated Test



Front View of Radiated Test (Horn)



Back View of Radiated Test (Horn)

