

APPLICATION FOR CERTIFICATION

On Behalf of  
Futaba Corporation  
Remote Control Transmitter  
Model No. : T2ER-72  
FCC ID : AZPT2ER72-75A  
Brand: Futaba

Prepared for : Futaba Corporation  
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## TABLE OF CONTENTS

Description	Page
TEST REPORT CERTIFICATION .....	4
<b>1. GENERAL INFORMATION .....</b>	<b>5</b>
1.1. Description of Device (EUT) .....	5
1.2. Description of Test Facility .....	6
1.3. Measurement Uncertainty .....	6
<b>2. POWERLINE CONDUCTED EMISSION MEASUREMENT .....</b>	<b>7</b>
<b>3. FREQUENCY STABILITY MEASUREMENT .....</b>	<b>8</b>
3.1. Test Equipment .....	8
3.2. Block Diagram of Test Setup .....	8
3.3. Test Rules and Specification Limits .....	8
3.4. Test Procedure .....	8
3.5. Test Results .....	9
<b>4. TRANSMITTER EMISSION TYPE MEASUREMENT .....</b>	<b>10</b>
4.1. Test Equipment .....	10
4.2. Block Diagram of Test Setup .....	10
4.3. Test Rules and Specification .....	10
4.4. Test Procedure .....	10
4.5. Test Results .....	10
<b>5. EMISSION BANDWIDTH MEASUREMENT .....</b>	<b>12</b>
5.1. Test Equipment .....	12
5.2. Block Diagram of Test Setup .....	12
5.3. Test Rules and Specification Limits .....	12
5.4. Test Procedure .....	12
5.5. Test Results .....	13
<b>6. UNWANTED RADIATED EMISSION MEASUREMENT .....</b>	<b>14</b>
6.1. Test Equipment .....	14
6.2. Test Setup .....	14
6.3. Test Rules and Specification Limits .....	15
6.4. Operating Condition of EUT .....	16
6.5. Test Procedure .....	16
6.6. Radiated Emission Measurement Results .....	17
<b>7. MAXIMUM TRANSMITTER POWER MEASUREMENT .....</b>	<b>26</b>
7.1. Test Equipment .....	26
7.2. Block Diagram of Test Setup .....	26
7.3. Test Rules and Specification Limits .....	27
7.4. Test Procedure .....	27
7.5. Test Results .....	28
<b>8. TRANSMITTER ANTENNA .....</b>	<b>29</b>
8.1. Test Rules and Specification Limits .....	29
8.2. Results .....	29
<b>9. POWER CAPABILITY .....</b>	<b>30</b>
9.1. Test Rules and Specification Limits .....	30
9.2. Results .....	30
<b>10. CRYSTAL CONTROL REQUIRED .....</b>	<b>31</b>
10.1. Test Rules and Specification Limits .....	31
10.2. Results .....	31
<b>11. DEVIATION TO TEST SPECIFICATIONS .....</b>	<b>32</b>

**12. PHOTOGRAPHS..... 33**  
12.1. Photos of Radiated Emission Measurement at Semi-Anechoic Chamber .....33  
12.2. Photo of Frequency Stability Measurement .....36

## TEST REPORT CERTIFICATION

Applicant : Futaba Corporation  
 Manufacturer : Futaba Corporation  
 EUT Description : Remote Control Transmitter  
 FCC ID : AZPT2ER72-75A  
 (A) Model No. : T2ER-72  
 (B) Serial No. : N/A  
 (C) Brand : Futaba  
 (D) Power Supply : DC 12V  
 (E) Test Voltage : DC 12V

**Measurement Procedure Used:**

FCC CFR 47 Rules and Regulations Part 95 Subpart C & E, Oct. 2008  
 AND TIA/EIA-603-C, 2004


The device described above was tested by AUDIX Technology Corporation to determine the maximum emission levels emanating from the device. The maximum emission levels were compared to the FCC Part 95 subpart C & E limits.

The measurement results are contained in this test report and AUDIX Technology Corporation is assumed full responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT to be technically compliant with the FCC official limits.

This report applies to above tested sample only. This report shall not be reproduced in part without written approval of AUDIX Technology Corporation.

Date of Test: Jun. 08 ~ Jul. 20, 2010

Date of Report: Jul. 20, 2010

Producer:   
 (Cherry Wang/Deputy Manager)

Review:   
 (Henning Chang/Supervisor)

Signatory:   
 (Ben Cheng/Manager)

# 1. GENERAL INFORMATION

## 1.1. Description of Device (EUT)

Description	:	Remote Control Transmitter
Model Number	:	T2ER-72
Serial Number	:	N/A
FCC ID	:	AZPT2ER72-75A
Applicant	:	Futaba Corporation 629 Oshiba, Mobara, Chiba Prefecture, Japan
Manufacturer	:	Futaba Corporation 1080 Yabutsuka Chosei-son Chosei-gun Chiba, 299-4395 Japan.
Radio Technology	:	AM Modulation
Frequency Band	:	72.19-72.79MHz
Tested Frequency	:	72.510MHz
Date of Receipt of Sample	:	May 12, 2010
Date of Test	:	Jun. 08 ~ Jul. 20, 2010

## 1.2. Description of Test Facility

Name of Firm	:	<b>AUDIX Technology Corporation</b> <b>EMC Department</b> No. 53-11, Tin-Fu Tsun, Lin-Kou Hsiang, Taipei Hsien, Taiwan
Test Location & Facility (AC)	:	<b>Semi-Anechoic Chamber</b> No. 53-11, Tin-Fu Tsun, Lin-Kou Hsiang, Taipei Hsien, Taiwan.  May 14, 2009 Renewal on Federal Communication Commission Registration Number: 90993
NVLAP Lab. Code	:	200077-0
TAF Accreditation No	:	1724

## 1.3. Measurement Uncertainty

Test Item	Frequency Range	Uncertainty (dB)
Radiation Test (Distance: 3m)	30MHz~300MHz	±2.91dB
	300MHz~1000MHz	±2.94dB

Remark: Uncertainty =  $ku_c(y)$

Test Item	Uncertainty
Emission Bandwidth	± 0.05kHz
Maximum Transmitter Power	± 0.33dB
Frequency Tolerance	± 0.0074ppm

## **2. POWERLINE CONDUCTED EMISSION MEASUREMENT**

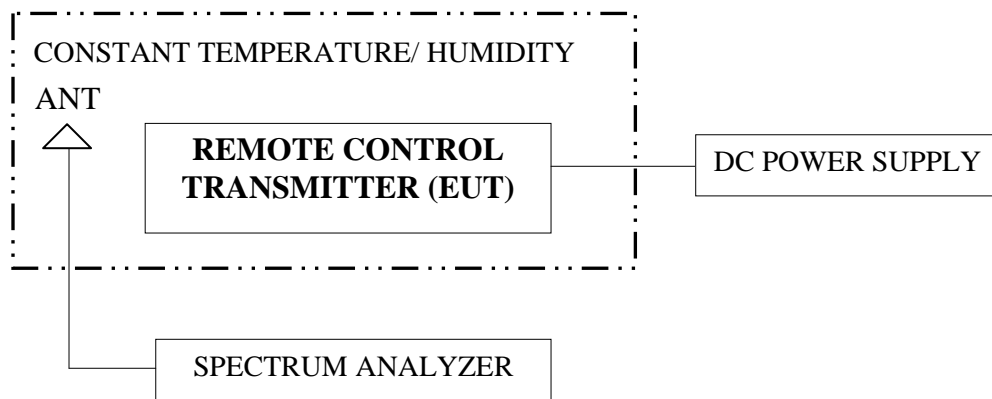
【The EUT only employs battery power for operation, no conductive emission limits are required according to FCC Part 15 Section §15.207】

### 3. FREQUENCY STABILITY MEASUREMENT

#### 3.1. Test Equipment

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Constant Temperature/ Humidity	Taichy	MHG-120LF	920538	Jun. 17, 10'	Jun. 16, 11'
2.	Spectrum Analyzer	Agilent	E4446A	US44300366	Jul. 23, 09'	Jul. 22, 10'
3.	Wide Band Antenna	Diamond	RH799	N/A	N/A	N/A

#### 3.2. Block Diagram of Test Setup



#### 3.3. Test Rules and Specification Limits

FCC Part 95 §95.623 (c)

72-76MHz: Frequency Tolerance: +/- 0.002%

#### 3.4. Test Procedure

The frequency tolerance measurements over temperature variations were made over the temperature range of  $-30^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$ . The EUT was placed inside a Constant Temperature/ Humidity and the temperature was raised hourly in  $10^{\circ}\text{C}$  steps from  $-30^{\circ}\text{C}$  up to  $+50^{\circ}\text{C}$ .

Reduce the input voltage to specified extreme voltage variation from 85 to 115 percent (+/- 15%) and endpoint, record the maximum frequency change.

Set Spectrum Analyzer center frequency = fundamental frequency, RBW=3kHz, VBW=10kHz, Span=100kHz, and use the frequency counter function to measure the working frequency.



### 3.5. Test Results

**PASSED.** All the test results are attached in following pages.

#### 3.5.1. For Frequency Stability Over Temperature Variations

(Test Date: Jul. 09, 2010      Temperature: 28      Humidity: 55%)

Frequency: 72.510MHz

Temperature ( )	Frequency Measured (MHz)	Frequency Deviation (Hz)	Frequency Deviation (%)
-30.0	72.51003	+40	+0.00004
-20.0	72.51002	+20	+0.00003
-10.0	72.50998	-20	-0.00003
+00.0	72.50994	-60	-0.00008
+10.0	72.50990	-100	-0.00014
+20.0	72.50983	-170	-0.00023
+30.0	72.50974	-160	-0.00036
+40.0	72.50969	-310	-0.00043
+50.0	72.50964	-360	-0.00050

Limit=+/-0.002%

#### 3.5.2. For Frequency Stability Over Voltage Variation

(Test Date: Jul. 20, 2010      Temperature: 29      Humidity: 52%)

Frequency: 72.510MHz

Voltage (V)	Frequency Measured (MHz)	Frequency Deviation (Hz)	Frequency Deviation (%)
7.00	72.50983	-170	-0.00023
7.50	72.50985	-150	-0.00023
8.00	72.50985	-150	-0.00023
8.50	72.50984	-160	-0.00022
9.00	72.50985	-150	-0.00022
9.50	72.50985	-150	-0.00022
10.0	72.50985	-150	-0.00022
10.5	72.50985	-150	-0.00021
11.0	72.50984	-160	-0.00022
11.5	72.50983	-170	-0.00023
12.0	72.50983	-170	-0.00023
12.5	72.50983	-170	-0.00023
13.0	72.50984	-160	-0.00022
13.8	72.50984	-160	-0.00022

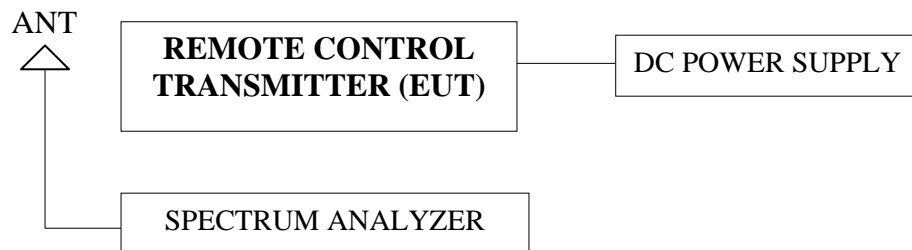
Limit=+/-0.002%

## 4. TRANSMITTER EMISSION TYPE MEASUREMENT

### 4.1. Test Equipment

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Spectrum Analyzer	Agilent	E4446A	US44300366	Jul. 23, 09'	Jul. 22, 10'
2.	Wide Band Antenna	Diamond	RH799	N/A	N/A	N/A

### 4.2. Block Diagram of Test Setup



### 4.3. Test Rules and Specification

FCC Part 95 §95.631 (b)

An R/C transmitter may transmit any appropriate non-voice emission which meets the emission limitations of §95.633.

### 4.4. Test Procedure

Setup the EUT and test equipment as shown on 4.2.

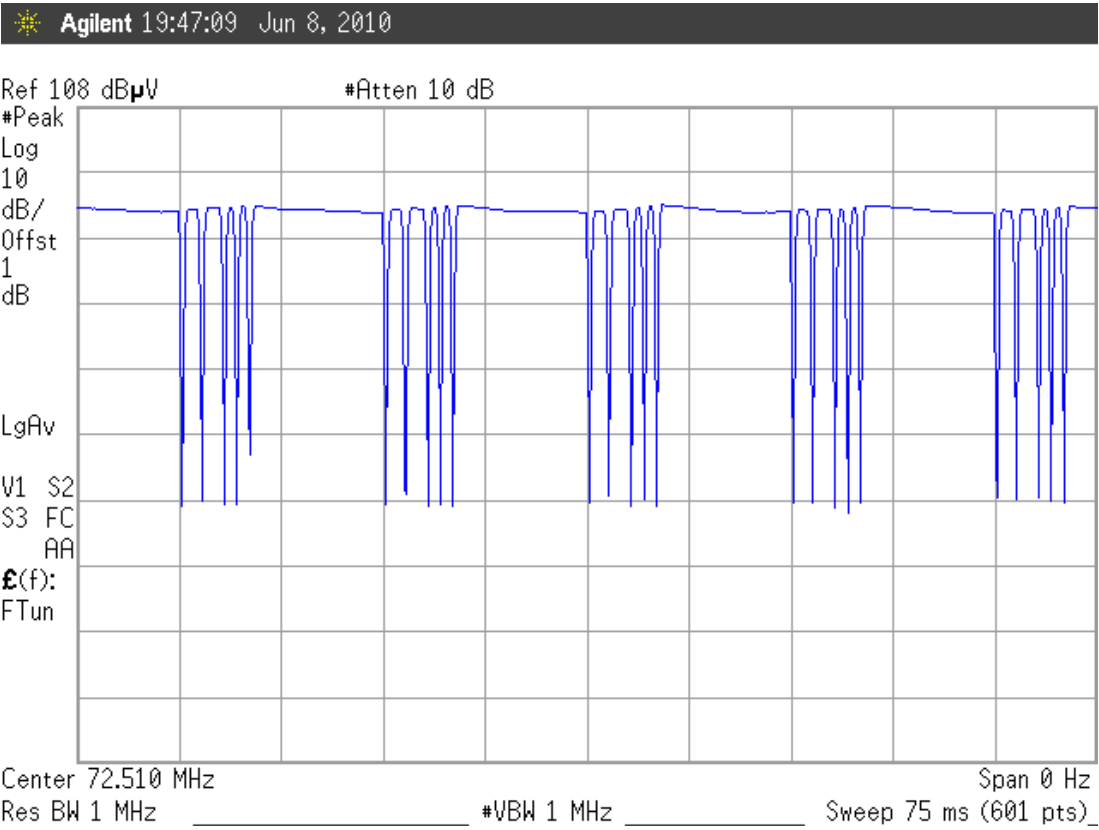
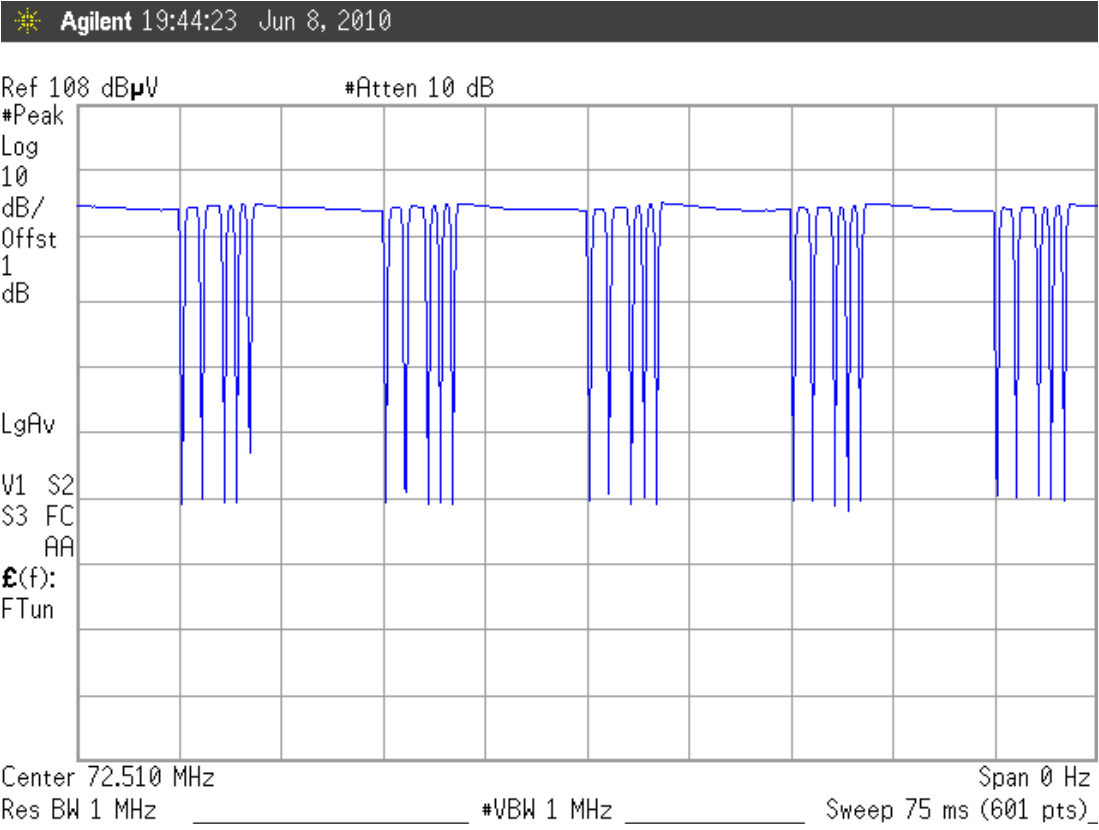
Supply the EUT with nominal operating voltage and set at test frequency (72.510MHz) on normal operation.

Set Spectrum Analyzer center frequency = fundamental frequency, RBW=1MHz, VBW=1MHz, and use the frequency counter function to measure the working frequency.

### 4.5. Test Results

The test graphs are attached in following pages.

Test Date : Jun. 08, 2010    Temperature : 22    Humidity : 69%

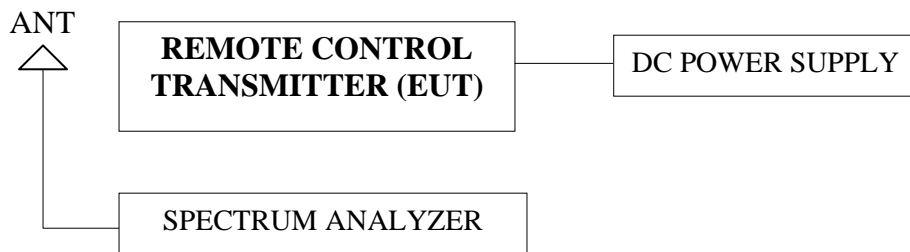


## 5. EMISSION BANDWIDTH MEASUREMENT

### 5.1. Test Equipment

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Spectrum Analyzer	Agilent	E4446A	US44300366	Jul. 23, 09'	Jul. 22, 10'
2.	Wide Band Antenna	Diamond	RH799	N/A	N/A	N/A

### 5.2. Block Diagram of Test Setup



### 5.3. Test Rules and Specification Limits

FCC Part 95 §95.633 (b)

The authorized bandwidth for any emission type transmitted by an R/C transmitter is 8 kHz.

### 5.4. Test Procedure

Setup the EUT and test equipment as shown on 5.2.

Supply the EUT with nominal operating voltage and set at test frequency (72.510MHz) on normal operation.

Set a reference level on the measuring instrument at any location that will allow measuring the specified bandwidth.

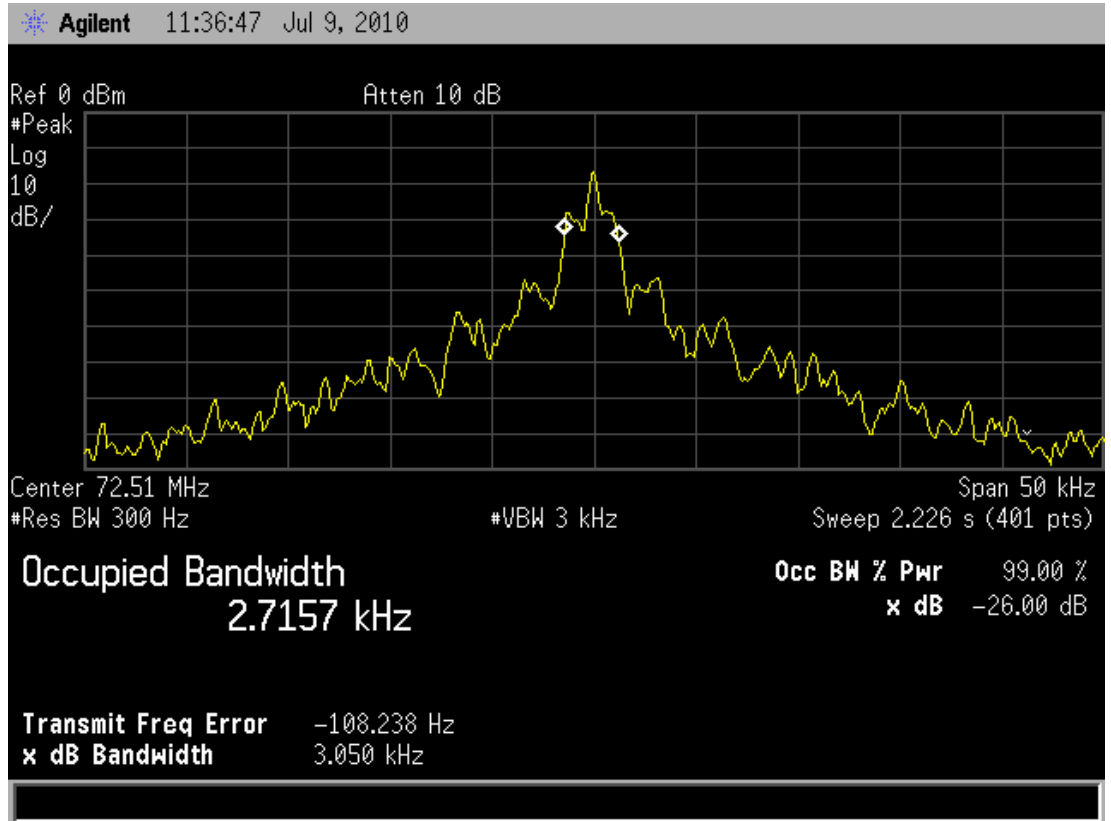
The emission bandwidth may be taken as the occupied bandwidth within which is 99% of the transmitter output power. The 20 dB bandwidth may also be used instead, when the spectral density has decreased by 20 dB from the in band spectral density. For the determination of the 20 dB bandwidth, the measurement bandwidth should be in the order of 1.0% of the emission bandwidth and VBW=3 times RBW.

### 5.5. Test Results

**PASSED.** All the test results are attached in following pages.

(Test Date: Jul 09, 2010    Temperature: 21    Humidity: 71%)

Test Frequency: 72.510MHz



## 6. UNWANTED RADIATED EMISSION MEASUREMENT

### 6.1. Test Equipment

The following test equipment was used during the radiated emission measurement:

#### 6.1.1. Radiation Measurement (for Channel Center Attenuation)

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Spectrum Analyzer	Agilent	E4446A	US44300366	Jul. 23, 09'	Jul. 22, 10'
2.	Wide Band Antenna	Diamond	RH799	N/A	N/A	N/A

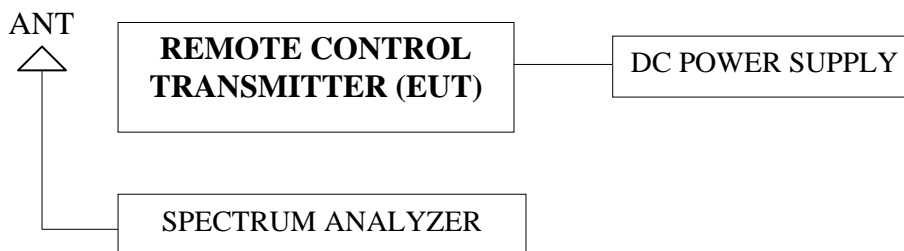
#### 6.1.2. For Frequency Range 30MHz~1000MHz (at Semi-Anechoic Chamber)

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Test Receiver	R & S	ESCS30	100339	Mar. 10, 10'	Mar. 09, 11'
2.	Spectrum Analyzer	HP	8564EC	3946A00249	Oct. 27, 09'	Oct. 26, 10'
3.	Pre-Amplifier	HP	8447D	2944A06305	Feb. 03, 10'	Feb. 02, 11'
4.	Biconical Antenna	CHASE	VBA6106A	1264	Mar. 13, 10'	Mar. 12, 11'
5.	Log Periodic Antenna	Schwarzbeck	UHALP 9108-A	0810	Mar. 13, 10'	Mar. 12, 11'

### 6.2. Test Setup

#### 6.2.1. Block Diagram of connection between EUT and simulators

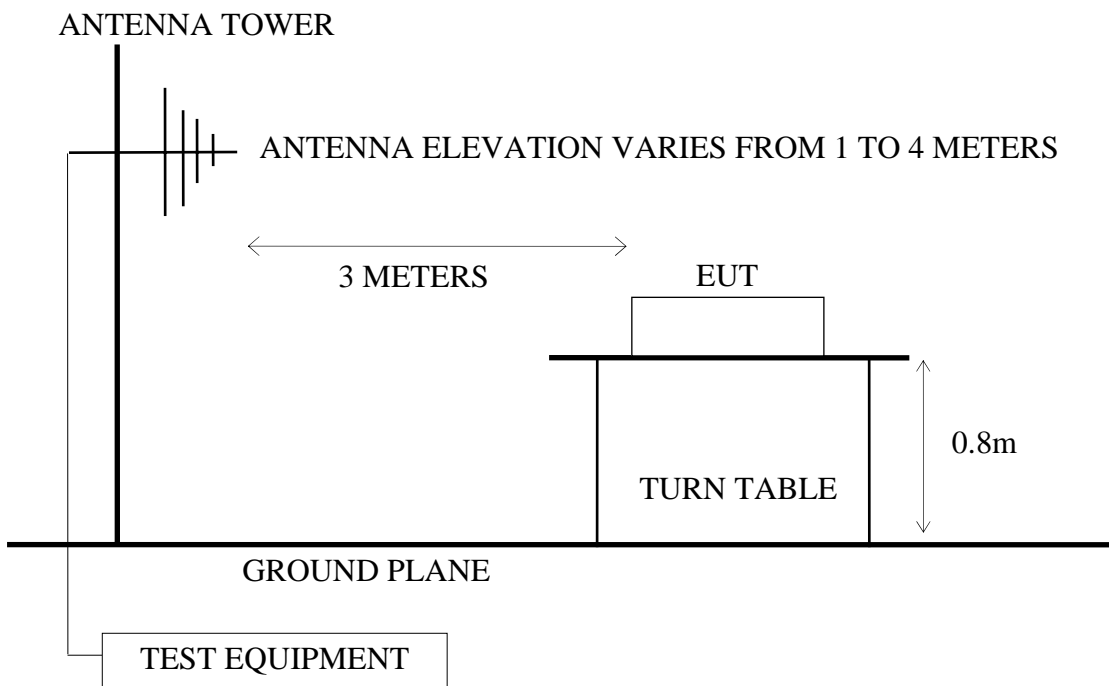
##### 6.2.1.1. Radiation Measurement for Channel Center Attenuation



##### 6.2.1.2. Radiation Measurement at Semi-Anechoic Chamber



6.2.2. Semi-Anechoic Chamber (3m) Setup Diagram for 30-1000MHz



6.3. Test Rules and Specification Limits

FCC Part 95 §95.635 (b), R/C Transmitter 72-76MHz Band

6.3.1. Transmitter, Channel Center Attenuation [Part 95 Subpart E, §95.635 (b)]

The power of each unwanted emission shall be less than Transmitted Power as specified below:

- (i) At least 25 dB on any frequency removed from the center of the authorized bandwidth by more than 50% up to and including 150% of the authorized bandwidth.
- (ii) At least 45 dB on any frequency removed from the center of the authorized bandwidth by more than 100% up to and including 125% of the authorized bandwidth.
- (iii) At least 55 dB on any frequency removed from the center of the authorized bandwidth by more than 125% up to and including 250% of the authorized bandwidth.
- (iv) At least  $56 + 10 \log (TP)$  dB on any frequency removed from the center of the authorized bandwidth by more than 250%.

6.3.2. Transmitter, Radiation Limit (Part 95 Subpart E, §95.635)

FREQUENCY MHz	DISTANCE Meters	FIELD STRENGTHS LIMITS dBμV/m
Fundamental Freq.	3	No limits
Unwanted Emission	3	77.64

Remark : (1) Channel center frequency: at least  $56 + 10 \log$  (carrier power in watts)dB.  
 (2) Distance refers to the distance in meters between the measuring antenna and the closed point of any part of the device or system.  
 (3) Unwanted emission limits = Fundamental Freq. max emission level (120.58dBμV/m) -  $56 + 10 \log$  (carrier power in watts, 0.0495W) dB.

6.4. Operating Condition of EUT

- 6.4.1. Setup the EUT and simulator as shown on 6.2.
- 6.4.2. Turned on the power of all equipment.
- 6.4.3. Set the EUT (Remote Control Transmitter) on transmitting status during the testing.

6.5. Test Procedure

- 6.5.1. Radiation measurement for Channel Center Attenuation  
 Setup the EUT and test equipment as shown on 6.2.1.1.  
 Set the EUT at test frequency (72.510MHz).  
 Set the spectrum analyzer’s RBW at 300Hz, VBW at 300Hz, SPAN at 50kHz and center frequency at 72.510MHz.  
 The EUT was according to section 6.3.1 checked the emission level.
- 6.5.2. Radiation measurement for 30MHz~1000MHz frequency range  
 The EUT and its simulators were placed on a turn table which was 0.8 meter above the ground. The turn table rotated 360 degrees to determine the position of the maximum emission level. EUT was set 3 meters away from the receiving antenna which was mounted on an antenna tower. The antenna could be moved up and down between 1 to 4 meters to find out the maximum emission level. Broadband antenna such as calibrated biconical and log-periodical antenna were used as a receiving antenna. Both horizontal and vertical polarization of the antenna were set on measurement. In order to find the maximum emission, all of the interface cables were manipulated according to TIA/EIA-603-C regulation.

The bandwidth of the R&S Test Receiver ESCS30 was set at 120kHz. (For 30MHz to 1000MHz)

The frequency range from 30MHz to 1000MHz was measured with Quasi-Peak detector.



## 6.6. Radiated Emission Measurement Results

### **PASSED.**

(All emissions not reported below are too low against the prescribed limits.)

EUT : Remote Control Transmitter      M/N : T2ER-72

Test Date : Jun. 13, 2010      Temperature : 27      Humidity : 68%

Test Frequency: 72.510MHz

### **For radiation measurement for channel center attenuation:**

The test results are listed in section 6.6.1.

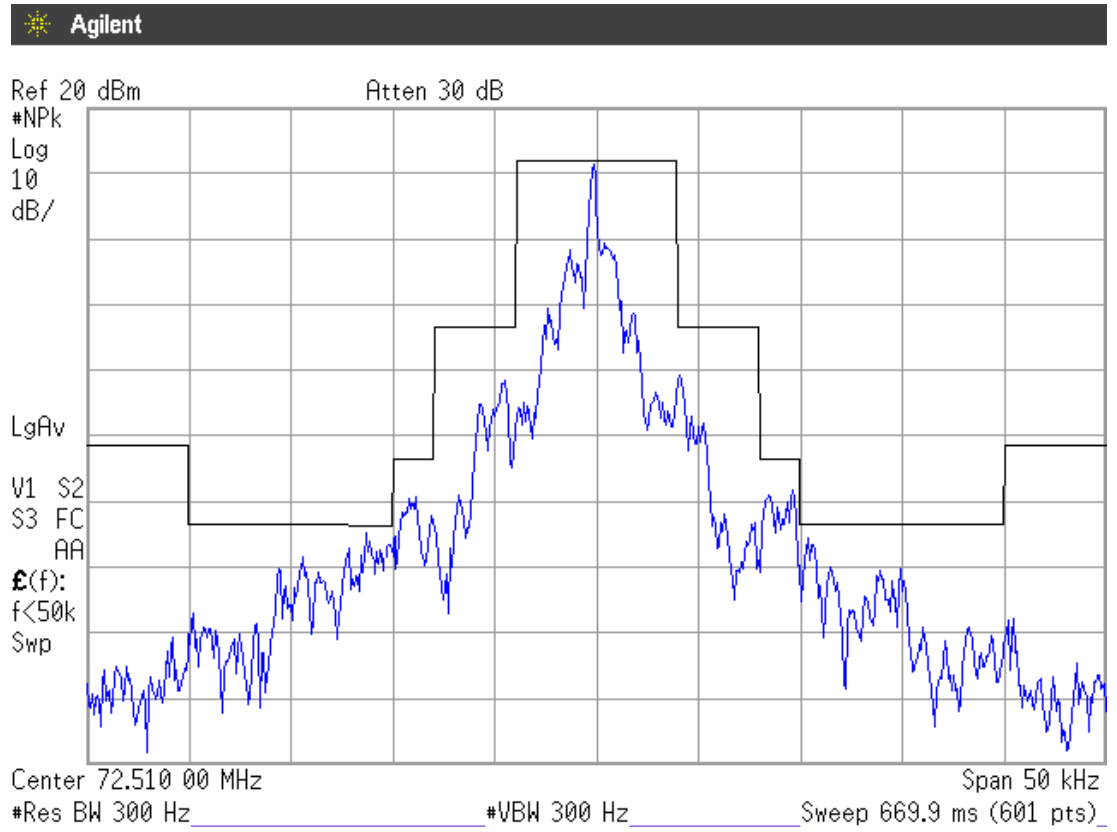
### **For 30MHz~1000MHz frequency range measurement:**

The EUT with three kinds of positions (Stand, Side and Lie) were tested during radiated measurement and all the test results are listed in section 6.6.2.

### **For ERP of Substitution Measurement:**

To select frequencies more higher to perform substitution method, the test equipment, test setup and test procedure are the same with section 7. All the test results are listed in section 6.6.3.

### 6.6.1. Channel Center Attenuation Measurement Results



6.6.2. 30MHz ~ 1000MHz Frequency Range Measurement Result

Date of Test : Jun. 13, 2010 Temperature : 27  
 EUT : Remote Control Transmitter Humidity : 68%  
 (Test Frequency: 72.510MHz)  
 Test Position : EUT on Stand

Emission Frequency MHz	Antenna Factor dB/m	Cable Loss dB	Meter Reading		Emission Level Horizontal dBμV/m	Limits dBμV/m	Margin dB
			Horizontal	dBμV			
109.380	18.13	2.20	4.81		25.14	77.64	52.50
145.290	20.40	2.59	7.51		30.50	77.64	47.14
181.740	21.32	2.90	3.12		27.34	77.64	50.30
218.190	21.91	3.20	9.04		34.15	77.64	43.49
254.640	24.19	3.56	2.40		30.15	77.64	47.49
290.280	26.08	3.80	13.74		43.62	77.64	34.02
327.300	15.17	4.20	24.71		44.08	77.64	33.56
* 363.000	16.38	4.50	33.85		54.73	77.64	22.91
399.400	17.69	4.80	20.77		43.26	77.64	34.38
* 435.800	17.41	5.30	34.02		56.73	77.64	20.91
470.800	18.32	5.80	11.78		35.90	77.64	41.74
507.900	19.14	6.80	22.43		48.37	77.64	29.27
544.300	19.13	6.94	15.49		41.56	77.64	36.08
579.300	20.96	6.40	18.65		46.01	77.64	31.63
652.800	21.79	6.30	16.77		44.86	77.64	32.78
687.800	23.26	6.50	11.49		41.25	77.64	36.39
724.900	22.10	6.60	15.84		44.54	77.64	33.10
761.300	23.68	6.70	8.82		39.20	77.64	38.44
* 796.300	24.04	6.90	21.64		52.58	77.64	25.06
833.400	24.88	7.10	9.88		41.86	77.64	35.78
* 869.800	25.71	7.20	22.94		55.85	77.64	21.79
* 911.800	24.99	7.40	33.20		65.59	77.64	12.05
* 941.900	25.46	7.50	20.17		53.13	77.64	24.51
978.300	25.88	7.70	9.32		42.90	77.64	34.74

- Remark : 1. Emission Level = Antenna Factor + Cable Loss + Meter Reading.  
 2. Measurement was up to 1000MHz, but the emissions level were too low against the official limit and not report.  
 3. The unwanted emission limits is  
 = 120.58dBμV/m – 56+10 log (0.0495W)  
 = 120.58 – 42.94 = 77.64 dBμV/m.  
 4. The “\*” frequency is performed substitution measurement, the test results is attached in section 6.6.3.

Date of Test : Jun. 13, 2010 Temperature : 27  
 EUT : Remote Control Transmitter Humidity : 68%  
 (Test Frequency: 72.510MHz)  
 Test Position : EUT on Stand

Emission Frequency MHz	Antenna Factor dB/m	Cable Loss dB	Meter Reading Vertical dBμV	Emission Level Vertical dBμV/m	Limits dBμV/m	Margin dB
36.480	22.01	1.20	14.60	37.81	77.64	39.83
109.380	18.13	2.20	10.90	31.23	77.64	46.41
145.290	20.40	2.59	22.16	45.15	77.64	32.49
181.740	21.32	2.90	7.45	31.67	77.64	45.97
218.190	21.91	3.20	11.39	36.50	77.64	41.14
254.640	24.19	3.56	0.63	28.38	77.64	49.26
290.280	26.08	3.80	15.40	45.28	77.64	32.36
362.300	16.38	4.50	33.34	54.22	77.64	23.42
399.400	17.69	4.80	11.77	34.26	77.64	43.38
435.800	17.41	5.30	34.02	56.73	77.64	20.91
507.900	19.14	6.80	26.52	52.46	77.64	25.18
544.300	19.13	6.94	11.68	37.75	77.64	39.89
579.300	20.96	6.40	20.05	47.41	77.64	30.23
652.800	21.79	6.30	17.08	45.17	77.64	32.47
687.800	23.26	6.50	12.17	41.93	77.64	35.71
724.900	22.10	6.60	11.71	40.41	77.64	37.23
761.300	23.68	6.70	7.85	38.23	77.64	39.41
796.300	24.04	6.90	18.38	49.32	77.64	28.32
869.800	25.71	7.20	24.22	57.13	77.64	20.51
904.800	24.84	7.40	12.20	44.44	77.64	33.20
941.900	25.46	7.50	22.58	55.54	77.64	22.10
978.300	25.88	7.70	9.71	43.29	77.64	34.35

- Remark : 1. Emission Level = Antenna Factor + Cable Loss + Meter Reading.  
 2. Measurement was up to 1000MHz, but the emissions level were too low against the official limit and not report.  
 3. The unwanted emission limits is  
 $= 120.58\text{dB}\mu\text{V}/\text{m} - 56 + 10 \log(0.0495\text{W})$   
 $= 120.58 - 42.94 = 77.64 \text{ dB}\mu\text{V}/\text{m}.$

Date of Test : Jun. 13, 2010 Temperature : 27

EUT : Remote Control Transmitter Humidity : 68%  
(Test Frequency: 72.510MHz)

Test Position : EUT on Side

Emission Frequency MHz	Antenna Factor dB/m	Cable Loss dB	Meter Reading Horizontal dBµV	Emission Level Horizontal dBµV/m	Limits dBµV/m	Margin dB
36.480	22.01	1.20	1.75	24.96	77.64	52.68
97.230	16.75	2.05	5.15	23.95	77.64	53.69
109.380	18.13	2.20	14.40	34.73	77.64	42.91
145.290	20.40	2.59	25.76	48.75	77.64	28.89
184.740	21.32	2.90	15.53	39.75	77.64	37.89
218.190	21.91	3.20	15.96	41.07	77.64	36.57
254.640	24.19	3.56	5.87	33.62	77.64	44.02
290.280	26.08	3.80	18.48	48.36	77.64	29.28
327.300	15.17	4.20	21.08	40.45	77.64	37.19
362.300	16.38	4.50	29.20	50.08	77.64	27.56
399.400	17.69	4.80	13.20	35.69	77.64	41.95
435.800	17.41	5.30	14.90	37.61	77.64	40.03
470.800	18.32	5.80	13.29	37.41	77.64	40.23
507.900	19.14	6.80	24.71	50.65	77.64	26.99
544.300	19.13	6.94	20.04	46.11	77.64	31.53
579.300	20.96	6.40	19.56	46.92	77.64	30.72
652.800	21.79	6.30	15.18	43.27	77.64	34.37
687.800	23.26	6.50	7.83	37.59	77.64	40.05
724.900	22.10	6.60	14.45	43.15	77.64	34.49
745.900	22.91	6.65	7.17	36.73	77.64	40.91
761.300	23.68	6.70	7.64	38.02	77.64	39.62
796.300	24.04	6.90	16.67	47.61	77.64	30.03
833.400	24.88	7.10	6.72	38.70	77.64	38.94
869.800	25.71	7.20	25.82	58.73	77.64	18.91
904.800	24.84	7.40	9.63	41.87	77.64	35.77
941.900	25.46	7.50	24.06	57.02	77.64	20.62
978.300	25.88	7.70	6.77	40.35	77.64	37.29

- Remark : 1. Emission Level = Antenna Factor + Cable Loss + Meter Reading.  
 2. Measurement was up to 1000MHz, but the emissions level were too low against the official limit and not report.  
 3. The unwanted emission limits is  
 = 120.58dBµV/m – 56+10 log (0.0495W)  
 = 120.58 – 42.94 = 77.64 dBµV/m.

Date of Test : Jun. 13, 2010 Temperature : 27  
 EUT : Remote Control Transmitter Humidity : 68%  
 (Test Frequency: 72.510MHz)  
 Test Position : EUT on Side

Emission Frequency MHz	Antenna Factor dB/m	Cable Loss dB	Meter Reading Vertical dBμV	Emission Level Vertical dBμV/m	Limits dBμV/m	Margin dB
36.480	22.01	1.20	8.42	31.63	77.64	46.01
109.380	18.13	2.20	9.85	30.18	77.64	47.46
145.290	20.40	2.59	18.63	41.62	77.64	36.02
181.740	21.32	2.90	3.24	27.46	77.64	50.18
218.190	21.91	3.20	25.80	50.91	77.64	26.73
254.640	24.19	3.56	3.32	31.07	77.64	46.57
290.280	26.08	3.80	16.48	46.36	77.64	31.28
327.300	15.17	4.20	22.61	41.98	77.64	35.66
364.400	16.52	4.50	27.40	48.42	77.64	29.22
399.400	17.69	4.80	13.57	36.06	77.64	41.58
435.800	17.41	5.30	25.49	48.20	77.64	29.44
470.800	18.32	5.80	17.44	41.56	77.64	36.08
507.900	19.14	6.80	20.60	46.54	77.64	31.10
544.300	19.13	6.94	12.83	38.90	77.64	38.74
579.300	20.96	6.40	15.96	43.32	77.64	34.32
652.800	21.79	6.30	12.78	40.87	77.64	36.77
724.900	22.10	6.60	7.99	36.69	77.64	40.95
745.900	22.91	6.65	7.10	36.66	77.64	40.98
796.300	24.04	6.90	11.60	42.54	77.64	35.10
833.400	24.88	7.10	4.27	36.25	77.64	41.39
869.800	25.71	7.20	18.85	51.76	77.64	25.88
904.800	24.84	7.40	6.41	38.65	77.64	38.99
978.300	25.88	7.70	10.09	43.67	77.64	33.97

- Remark : 1. Emission Level = Antenna Factor + Cable Loss + Meter Reading.  
 2. Measurement was up to 1000MHz, but the emissions level were too low against the official limit and not report.  
 3. The unwanted emission limits is  
 = 120.58dBμV/m – 56+10 log (0.0495W)  
 = 120.58 – 42.94 = 77.64 dBμV/m.

Date of Test : Jun. 13, 2010 Temperature : 27  
 EUT : Remote Control Transmitter Humidity : 68%  
 (Test Frequency: 72.510MHz)  
 Test Position : EUT on Lie

Emission Frequency MHz	Antenna Factor dB/m	Cable Loss dB	Meter Reading		Emission Level		Margin dB
			Horizontal dBμV	Horizontal dBμV/m	Limits dBμV/m		
109.380	18.13	2.20	11.39	31.72	77.64	45.92	
145.290	20.40	2.59	22.96	45.95	77.64	31.69	
181.740	21.32	2.90	11.79	36.01	77.64	41.63	
218.190	21.91	3.20	17.18	42.29	77.64	35.35	
254.640	24.19	3.56	7.58	35.33	77.64	42.31	
290.280	26.08	3.80	19.55	49.43	77.64	28.21	
327.300	15.17	4.20	23.09	42.46	77.64	35.18	
362.300	16.38	4.50	31.49	52.37	77.64	25.27	
399.400	17.69	4.80	16.81	39.30	77.64	38.34	
435.800	17.41	5.30	28.40	51.11	77.64	26.53	
470.800	18.32	5.80	15.43	39.55	77.64	38.09	
507.900	19.14	6.80	26.80	52.74	77.64	24.90	
544.300	19.13	6.94	19.10	45.17	77.64	32.47	
579.300	20.96	6.40	22.00	49.36	77.64	28.28	
652.800	21.79	6.30	13.44	41.53	77.64	36.11	
724.900	22.10	6.60	16.71	45.41	77.64	32.23	
796.300	24.04	6.90	19.15	50.09	77.64	27.55	
833.400	24.88	7.10	8.46	40.44	77.64	37.20	
869.800	25.71	7.20	27.67	60.58	77.64	17.06	
904.800	24.84	7.40	11.27	43.51	77.64	34.13	
941.900	25.46	7.50	27.17	60.13	77.64	17.51	
978.300	25.88	7.70	13.53	47.11	77.64	30.53	

- Remark : 1. Emission Level = Antenna Factor + Cable Loss + Meter Reading.  
 2. Measurement was up to 1000MHz, but the emissions level were too low against the official limit and not report.  
 3. The unwanted emission limits is  
 = 120.58dBμV/m – 56+10 log (0.0495W)  
 = 120.58 – 42.94 = 77.64 dBμV/m.

Date of Test : Jun. 13, 2010 Temperature : 27  
 EUT : Remote Control Transmitter Humidity : 68%  
 (Test Frequency: 72.510MHz)  
 Test Position : EUT on Lie

Emission Frequency MHz	Antenna Factor dB/m	Cable Loss dB	Meter Reading Vertical dBμV	Emission Level Vertical dBμV/m	Limits dBμV/m	Margin dB
36.480	22.01	1.20	5.30	28.51	77.64	49.13
102.090	17.29	2.10	13.83	33.22	77.64	44.42
145.290	20.40	2.59	14.66	37.65	77.64	39.99
181.740	21.32	2.90	3.27	27.49	77.64	50.15
218.190	21.91	3.20	19.67	44.78	77.64	32.86
290.280	26.08	3.80	10.36	40.24	77.64	37.40
327.300	15.17	4.20	17.63	37.00	77.64	40.64
362.300	16.38	4.50	23.78	44.66	77.64	32.98
399.400	17.69	4.80	8.01	30.50	77.64	47.14
435.800	17.41	5.30	19.37	42.08	77.64	35.56
470.800	18.32	5.80	10.23	34.35	77.64	43.29
507.900	19.14	6.80	20.51	46.45	77.64	31.19
544.300	19.13	6.94	12.07	38.14	77.64	39.50
579.300	20.96	6.40	16.98	44.34	77.64	33.30
652.800	21.79	6.30	7.17	35.26	77.64	42.38
724.900	22.10	6.60	11.48	40.18	77.64	37.46
745.900	22.91	6.65	6.93	36.49	77.64	41.15
796.300	24.04	6.90	11.28	42.22	77.64	35.42
869.800	25.71	7.20	17.95	50.86	77.64	26.78
904.800	24.84	7.40	6.00	38.24	77.64	39.40
941.900	25.46	7.50	18.96	51.92	77.64	25.72

- Remark : 1. Emission Level = Antenna Factor + Cable Loss + Meter Reading.  
 2. Measurement was up to 1000MHz, but the emissions level were too low against the official limit and not report.  
 3. The unwanted emission limits is  
 = 120.58dBμV/m – 56+10 log (0.0495W)  
 = 120.58 – 42.94 = 77.64 dBμV/m.



## 6.6.3. ERP of Substitution Measurement Result

Frequency (MHz)	Filed Strength (dBuV/m)	0dBm Factor (dBuV/m)	Antenna Gain (dB)	Cable Loss (dB)	ERP (dBm)	Limit (dBm)	Over Limit (dB)
363.00	54.73	87.86	-7.49	0.21	-42.97	-25.98	-16.99
435.80	56.73	87.70	-6.21	0.22	-39.54	-25.98	-13.56
796.30	52.58	86.40	-6.43	0.26	-42.65	-25.98	-16.67
869.80	55.85	86.10	-6.27	0.26	-38.92	-25.98	-12.94
911.80	65.59	85.32	-6.33	0.26	-28.46	-25.98	-2.48
941.90	53.13	85.11	-6.43	0.26	-40.81	-25.98	-14.83

0dBm Correction= SG level in E-field –Ant. Gain + cable loss

ERP=EUT maximum E-field – 0dBm Correction Factor – 2.14dB

Limit = output power – [56+10 log (0.0495W)] = 16.96-42.94=-25.98dBm.

## 7. MAXIMUM TRANSMITTER POWER MEASUREMENT

### 7.1. Test Equipment

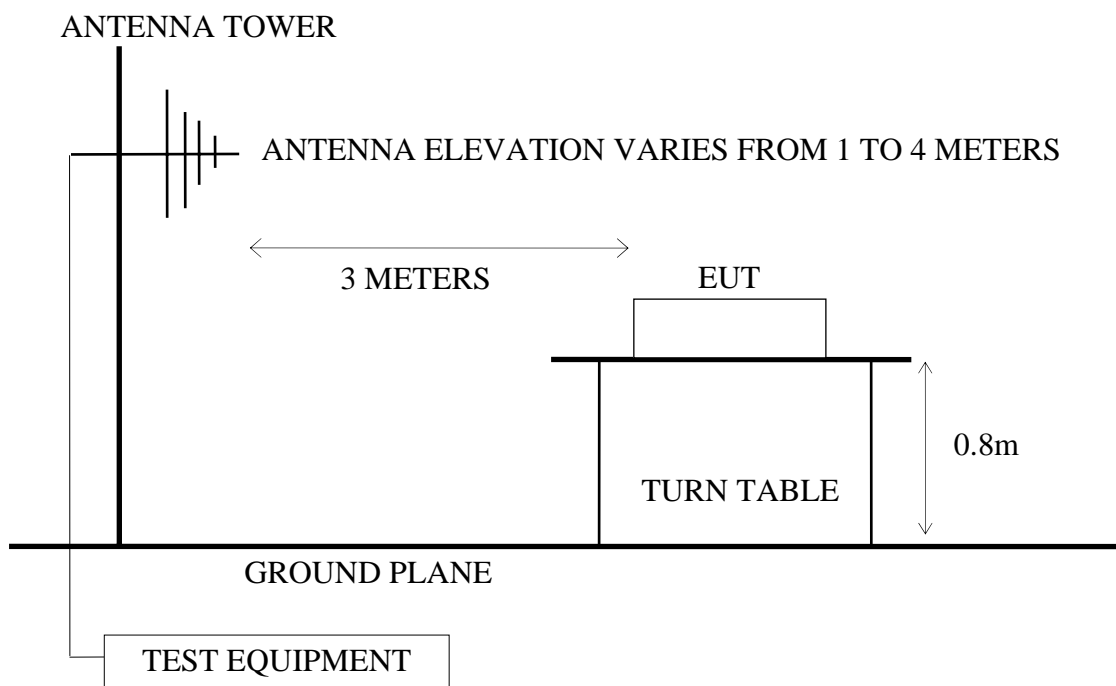
Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Test Receiver	R & S	ESCS30	100339	Mar. 10, 10'	Mar. 09, 11'
2.	Spectrum Analyzer	HP	8564EC	3946A00249	Oct. 27, 09'	Oct. 26, 10'
3.	Pre-Amplifier	HP	8447D	2944A06305	Feb. 03, 10'	Feb. 02, 11'
4.	Biconical Antenna	CHASE	VBA6106A	1264	Mar. 13, 10'	Mar. 12, 11'
5.	Log Periodic Antenna	Schwarzbeck	UHALP 9108-A	0810	Mar. 13, 10'	Mar. 12, 11'
6.	Signal Generator	HP	83732B	US34490489	Jun. 01, 10'	May 31, 11'
7.	Precision Conical Dipole Antenna	ARC Seibersdorf	PCD3100	6201/03	Feb. 21, 08'	Feb. 20, 11'

### 7.2. Block Diagram of Test Setup

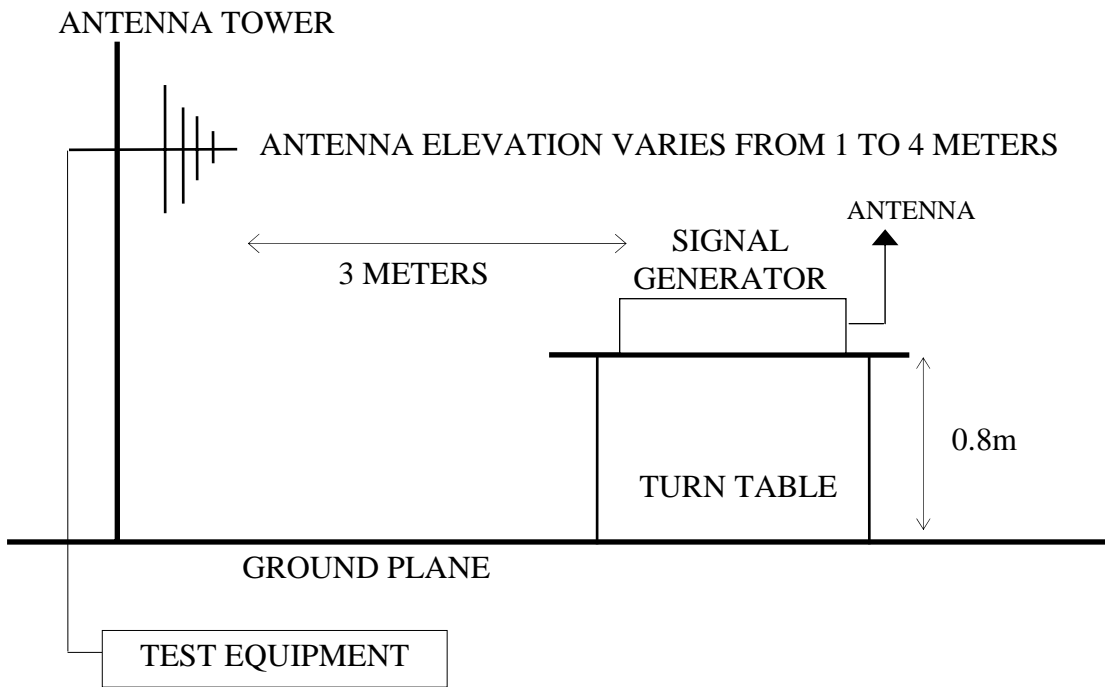
#### 7.2.1. Block Diagram of connection between EUT and simulators



#### 7.2.2. Semi-Anechoic Chamber (3m) Setup Diagram



7.2.3. Semi-Anechoic Chamber (3m) Setup Diagram (Substitution Setup)



7.3. Test Rules and Specification Limits

FCC Part 95 §95.639 (b)-(3)

No R/C transmitter, under any condition of modulation, shall exceed a carrier power or peak envelope TP (single-sideband only) of: 0.75W in the 72–76 MHz frequency band.

7.4. Test Procedure

The EUT and its simulators were placed on a turn table which was 0.8 meter above the ground. The turn table rotated 360 degrees to determine the position of the maximum emission level. EUT was set 3 meters away from the receiving antenna which was mounted on an antenna tower. The antenna could be moved up and down between 1 to 4 meters to find out the maximum emission level. Broadband antenna such as calibrated biconical and log-periodical antenna were used as a receiving antenna. Both horizontal and vertical polarization of the antenna were set on measurement. In order to find the maximum emission, all of the interface cables were manipulated according to TIA/EIA-603-C regulation.

Replace the antenna with a proper Antenna (substitution antenna). The substitution antenna shall be oriented for vertical polarization and, if necessary, the length of the substitution antenna shall be adjusted to correspond to the frequency of transmitting.

The substitution antenna shall be connected to a calibrated signal generator. If necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver. The test antenna shall be raised and lowered through the specified range of the height to ensure that the maximum signal is received. The input signal to substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, that is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuation setting of the measuring receiver. The input level to the substitution antenna shall be recorded as power level in dBm, corrected for any change of input attenuator setting of the measuring receiver. The measurement shall be repeated with the test antenna and the substitution antenna oriented for horizontal polarization.

The bandwidth of the R&S Test Receiver ESCS30 was set at 120kHz.

7.5. Test Results

**PASSED.** All the test results are attached in following pages.

(Test Date: Jun. 16, 2010      Temperature: 28      Humidity: 51%)

EUT maximum E-field (dBuV/m)	SG Level 0dBm in E-field (dBuV/m)	ANT Gain (dBi)	Cable Loss (dB)	0dBm Correction Factor(dB)
-----	72.7	-28.6	0.19	101.49
120.58	-----	-----	-----	-----
<b>ERP (W)</b>	<b>0.0495</b>			

0dBm Correction= SG level in E-field –Ant. Gain + cable loss

**ERP=EUT maximum E-field – 0dBm Correction Facotr-2.14dB**

**=120.58-103.63-2.14= 16.96dBm=0.0495W**

## 8. TRANSMITTER ANTENNA

### 8.1. Test Rules and Specification Limits

FCC Part 95 §95.647

The antenna of each R/C station transmitting in the 72–76 MHz band, must be an integral part of the transmitter. The antenna must have no gain (as compared to a half-wave dipole) and must be vertically polarized.

### 8.2. Results

**PASSED.**

T2ER-72 can fulfill the requirement above, Please refer to the attached photos.



## **9. POWER CAPABILITY**

### **9.1. Test Rules and Specification Limits**

FCC Part 95 §95.649

No CB, R/C, LPRS, FRS, MICS, MURS or WMTS unit shall incorporate provisions for increasing its transmitter power to any level in excess of the limits specified in §95.639.

### **9.2. Results**

All the components employed by EUT have the power capability less than 0.75W either being assembled or individual.

## **10. CRYSTAL CONTROL REQUIRED**

### **10.1. Test Rules and Specification Limits**

FCC Part 95 §95.651

All transmitters used in the Personal Radio Services must be crystal controlled, except an R/C station that transmits in the 26–27 MHz frequency band, a FRS unit, a LPRS unit, a MURS unit, a MICS transmitter, or a WMTS unit.

### **10.2. Results**

The Crystal was plug in the transmitter by the manufacture, and not accessible to the user.

## **11.DEVIATION TO TEST SPECIFICATIONS**

**【NONE】**