ECMG Worldwide Certification Solutions
ECMG-Worldwide-Certification-Solution, Inc.
684 West Maude Avenue Sunnyvale, CA 94085
Tel. (650) 988-0900 Fax (650) 988-6647
www.ecmg-global.com

FCC CERTIFICATION RADIO MEASUREMENT TECHNICAL REPORT

On Model Name: 2.4G Remote Controller

Model Number : RB0720

Brand Name : Height

FCC ID : XM4HLTX24V010805

Prepared for Shanghai Height Electronics Co., Ltd.

According to FCC Part 15 Subpart C 15.249

Test Report #:	*SHA-0907-8303-FCC*
Prepared by:	*Chris Huang*
Reviewed by:	*Harry Zhao*
QC Manager:	*Paul Chen*

Test Report Released by: Paul J. Chen _____ *2009, August 19*

Paul Chen *Date*

Test Location

Tests performed in a Certified ANSI Semi-Anechoic Chamber and Shielded Room performed testing.

Test Site Location: *ECMG Worldwide Certification Solution, Inc. (China)*
Building 2, 1298 Lian Xi Road, Pu Dong New Area, Shanghai, P.R. China 201204
Tel: *86-21-51909300*
Fax: *86-21-51909333*

FCC Registration Number: *172634*

Table of Contents

Government Disclaimer Notice

When government drawing, specification, or other data are used for any purpose other than in connection with a definitely related government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawing, specifications, or other data, is not to be regarded by implication or otherwise in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell patented invention that may in any way be related thereto. This report must not be used to claim product endorsement by NVLAP or any agency of the U.S. Government.

Reproduction Clause

Any reproduction of this document must be done in full. No single part of this document may be reproduced without permission from ECMG Worldwide Certification Solution, Inc., 684 West Maude Avenue Sunnyvale, CA 94085.

Administrative Data

Test Sample : 2.4G Remote Controller

Model Number : RB0720

Brand Name : HEIGHT

Date Tested : 2009, August 5th

Applicant : Shanghai Height Electronics Co., Ltd.
1500 Huiren Road, Jiading, Shanghai, China

Telephone : 86-21-51652018

Fax : 86-21-51652358

Manufacturer : Shanghai Height Electrics Co., Ltd.
1500 Huiren Road, Jiading, Shanghai, China

Telephone : 86-21-51652018

Fax : 86-21-51652358

EUT Description

Shanghai Height Electronics Co., Ltd. Model number RB0720 (referred to as the EUT in this report) is a 2.4G Remote Controller.

As the EUT is power on, it will search channels and choose a random channel to transmit signal. It will transmit two signals with a frequency space of 40MHz simultaneously. See the channel list below:

Channel	*Signal #1*	*Signal #2*
1	*2404*	*2444*
2	*2406*	*2446*
3	*2408*	*2448*
4	*2410*	*2450*
5	*2412*	*2452*
6	*2414*	*2454*
7	*2416*	*2456*
8	*2418*	*2458*
9	*2420*	*2460*
10	*2422*	*2462*
11	*2424*	*2464*
12	*2426*	*2466*
13	*2428*	*2468*
14	*2430*	*2470*
15	*2432*	*2472*
16	*2434*	*2474*

Test Summary

The Electromagnetic Compatibility requirements on model RB0720 for this test are stated below. All results listed in this report relate exclusively to this above-mentioned model as the Equipment Under Test. This report confers no approval or endorsement upon any other component, host or subsystem used in the test set-up.

EMC Test Items *Reference FCC Part 15 (2008), Subpart C*			
Specification	***Description***	***Test Results***	***Remark***
FCC Part 15.203	*Antenna Requirement*	*Compliance*	*Integral Antenna*
FCC Part 15.205	*Restricted Band of Operation*	*Compliance*	*Attachment 1*
FCC Part 15.209	*Radiated Emission Limits*	*Compliance*	*Attachment 1*
FCC Part 15.249 (a)	*Fundamental and Harmonics*	*Compliance*	*Attachment 2*
FCC Part 15.249 (d)	*Band Edge*	*Compliance*	*Attachment 3*

Test Mode Justification

The EUT is handheld product, so the test modes (Lie, Side, Stand) were done for testing.

Note: Lie mode means let EUT put flat;
Side mode means let EUT put side;
Stand mode means let EUT stand up.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

EUT Exercise Software

The EUT doesn't use software during test.

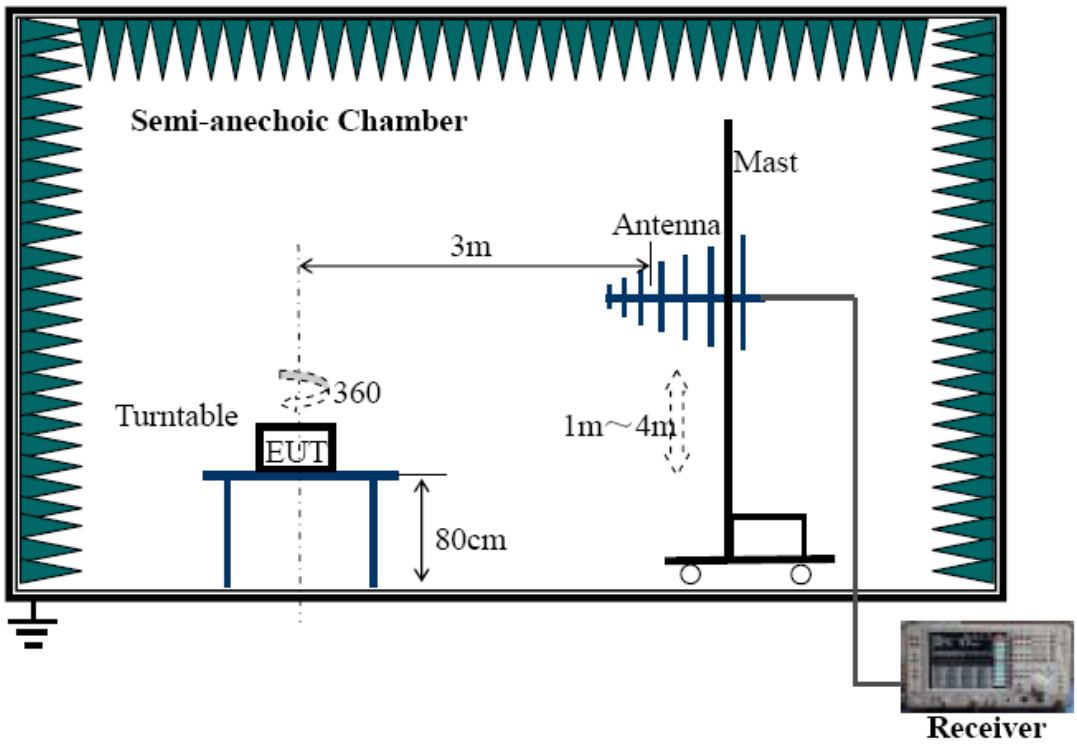
Equipment Modification

Any modifications installed previous to testing by Shanghai Height Electronics Co., Ltd. will be incorporated in each production model sold or leased in United States.
There were no modifications installed by ECMG Worldwide Certification Solution, Inc. (China) test personnel.

Test System Details

EUT	
Model Number:	RB0720
Brand Name:	Height
Serial Number:	Engineering Sample
Input Voltage:	6V DC
Description:	2.4G Remote Controller
Manufacturer:	Shanghai Height Electronics Co., Ltd.
EUT Power Supply	
AA battery *4	
Support Equipment	
None	
Cable Description	
None	

Configuration of Tested System



ATTACHMENT 1 – RADIATED EMISSION TEST RESULTS

CLIENT:	Shanghai Height Electronics Co., Ltd.	**TEST STANDARD:**	FCC Part 15.209 FCC Part 15.205
MODEL NUMBER:	RB0720	**PRODUCT:**	2.4G Remote Controller
SERIAL NO.:	Engineering Sample	**EUT DESIGNATION:**	RF Equipment
TEMPERATURE:	21°C	**HUMIDITY:**	53%RH
ATM PRESSURE:	101.6 kPa	**GROUNDING:**	No Grounding
TESTED BY:	Cloud Feng	**DATE OF TEST:**	2008, August 5

SETUP METHOD:	ANSI C63.4 : 2003
TEST PROCEDURE:	a. The EUT was placed on a rotatable table with 0.8 meters above ground. b. The EUT was set 3 meters from the interference-receiving antenna, which was mounted on the top of a variable height antenna tower. c. The antenna was varied between one meter and four meters above ground to find the maximum value of the field strength both horizontal polarization and vertical polarization of the antenna were set to make measurement. d. For each suspected emission the EUT was arranged to its worst case and then change the antenna tower height (from 1m to 4m) and turn table (from 0 degree to 360 degree) to find the maximum reading. e. If the emission level of the EUT in peak mode was 20 dB lower than the specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be tested using the quasi-peak method in about six maximal points and the results will be reported. f. Broadband antenna (Calibrated antenna) was used as receiving antenna below 1000MHz. Horn antenna were used as receiving antenna above 1000MHz. g. The bandwidth is 120 kHz below 1000 MHz, and 1 MHz above 1000 MHz Explanation of the Correction Factor are given as follows: FS= RA + AF + CF - AG Where: FS = Field Strength RA = Receiver Amplitude AF = Antenna Factor CF = Cable Attenuation Factor AG = Amplifier Gain
TESTED RANGE:	9kHz to 24.740GHz for the Remote Control
TEST VOLTAGE:	6V DC

CONTINUE ON THE NEXT PAGE…

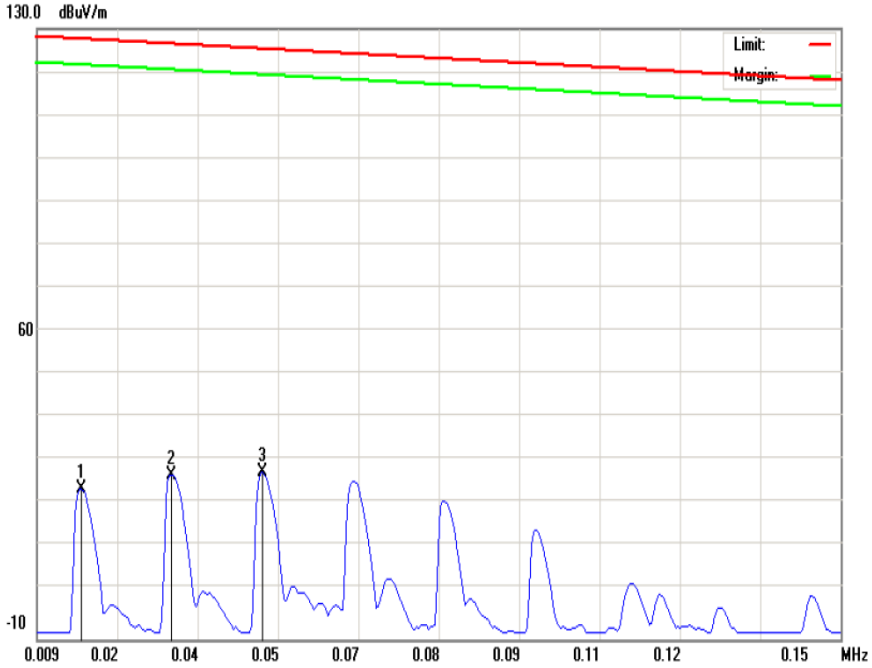
TEST STATUS:	Keep Tx in normal continuous transmission mode, modulated
RESULTS:	The EUT meets the requirements of field strength test. The test results relate only to the equipment under test provided by cli
CHANGES OR MODIFICATIONS:	There were no modifications installed by ECMG Worldwide Certification Solution, Inc. (China) test personnel.
M. UNCERTAINTY:	Freq. ± 2x10-7 x Center Freq., Amp ± 2.6 dB

15.209 Limit:

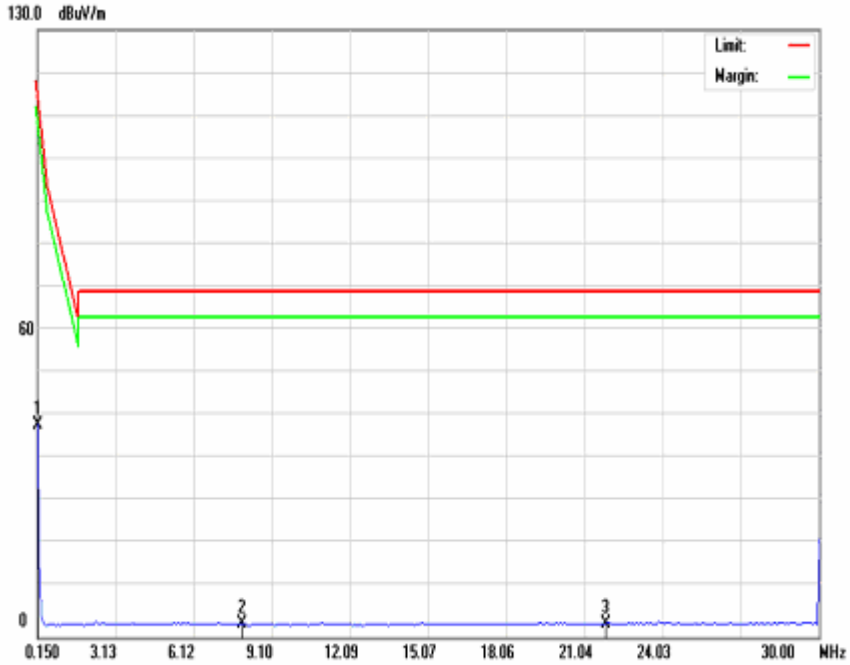
Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100 **	3
88 - 216	150 **	3
216 - 960	200 **	3
Above 960	500	3

Note: Pending the development of an appropriate measurement procedure for measurements performed below 30 MHz, when performing measurements at a closer distance than specified, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade).

Model: RB0720
Low Channel (2404MHz & 2444MHz)
Low Frequency



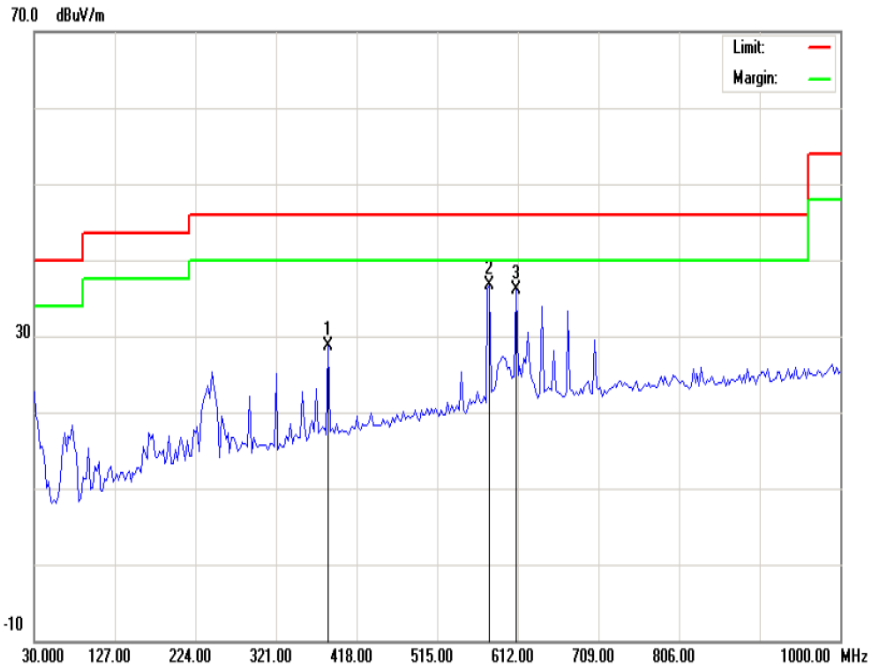
Field strength Emission Plot (Peak, Max Hold Mode 9kHz-0.15MHz)



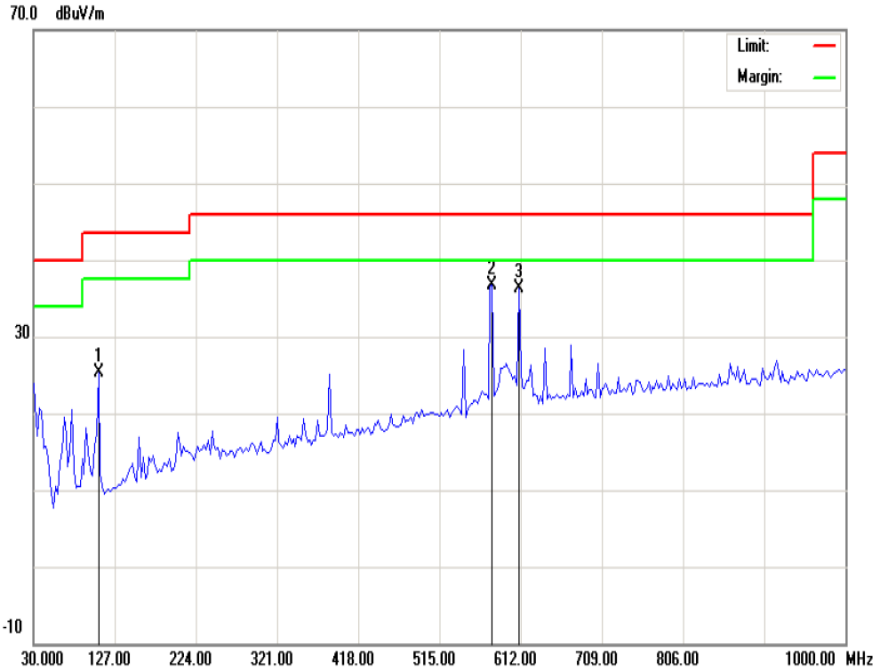
Field strength Emission Plot (Peak, Max Hold Mode 0.15MHz-30MHz)

Test Results (9kHz~30MHz)

9kHz – 0.15MHz							
Signal	**Frequency (MHz)**	**Factor (dB)**	**Corrected QP Level dB(uV/m)**	**3 Meter Limits dB(uV/m)**	**Margin (dB)**	**Angle of Turner (degree)**	**Height of Tower (cm)**
1	0.0168	8.96	24.44	127.95	-103.51	90	132
2	0.0326	8.78	27.80	126.81	-99.01	0	119
3	0.0485	8.80	28.17	125.66	-97.49	90	104
Set-up/Configuration: ANSI C63.4-2003							
Comments: None							
Note: All readings are quasi-peak unless stated otherwise, using a QPA bandwidth of 200Hz, with a 30 ms sweep time. A video filter was not used.							
0.15MHz – 30MHz							
Signal	**Frequency (MHz)**	**Factor (dB)**	**Corrected QP Level dB(uV/m)**	**3 Meter Limits dB(uV/m)**	**Margin (dB)**	**Angle of Turner (degree)**	**Height of Tower (cm)**
1	0.1500	9.02	39.00	118.33	-79.33	43	106
2	7.9856	11.17	11.83	69.50	-57.67	0	138
3	21.8659	7.82	10.27	69.50	-59.23	45	112
Set-up/Configuration: ANSI C63.4-2003							
Comments: None							
Note: All readings are quasi-peak unless stated otherwise, using a QPA bandwidth of 9kHz, with a 30 ms sweep time. A video filter was not used.							



Radiated Emission Plot –Horizontal Polarization
(Peak, Max Hold Mode)



Radiated Emission Plot –Vertical Polarization
(Peak, Max Hold Mode)

Test Results (30MHz~1GHz)

Horizontal								
Signal	**Frequency (MHz)**	**Reading Level (dBuV)**	**Factor (dB)**	**Corrected QP Level dB(uV/m)**	**3 Meter Limits dB(uV/m)**	**Margin (dB)**	**Angle of Turner (degree)**	**Height of Tower (cm)**
1	384.050	11.40	17.35	28.75	46.00	-17.25	164	120
2	578.050	16.03	20.64	36.67	46.00	-9.33	204	138
3	609.575	15.08	20.98	36.06	46.00	-9.94	117	154
Vertical								
Signal	**Frequency (MHz)**	**Reading Level (dBuV)**	**Factor (dB)**	**Corrected QP Level dB(uV/m)**	**3 Meter Limits dB(uV/m)**	**Margin (dB)**	**Angle of Turner (degree)**	**Height of Tower (cm)**
1	107.599	14.97	10.30	25.27	43.50	-18.23	217	104
2	578.049	16.03	20.64	36.67	46.00	-9.33	48	156
3	609.575	15.40	20.98	36.38	46.00	-9.62	347	120

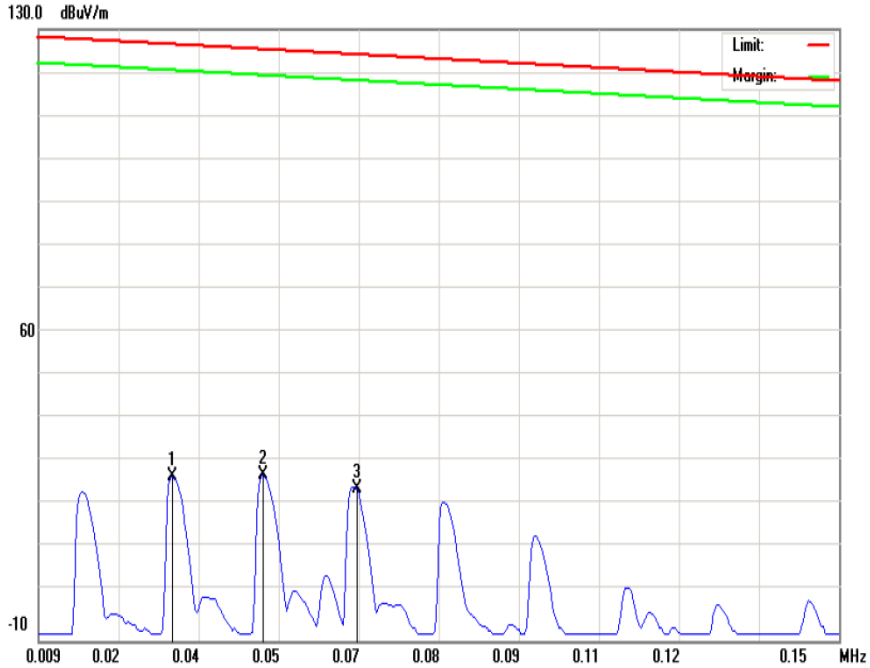
Note: All readings are quasi-peak unless stated otherwise, using a QP bandwidth of 120kHz, with a 30 ms sweep time. A video filter was not used.

Test Results (1GHz~24.44GHz)

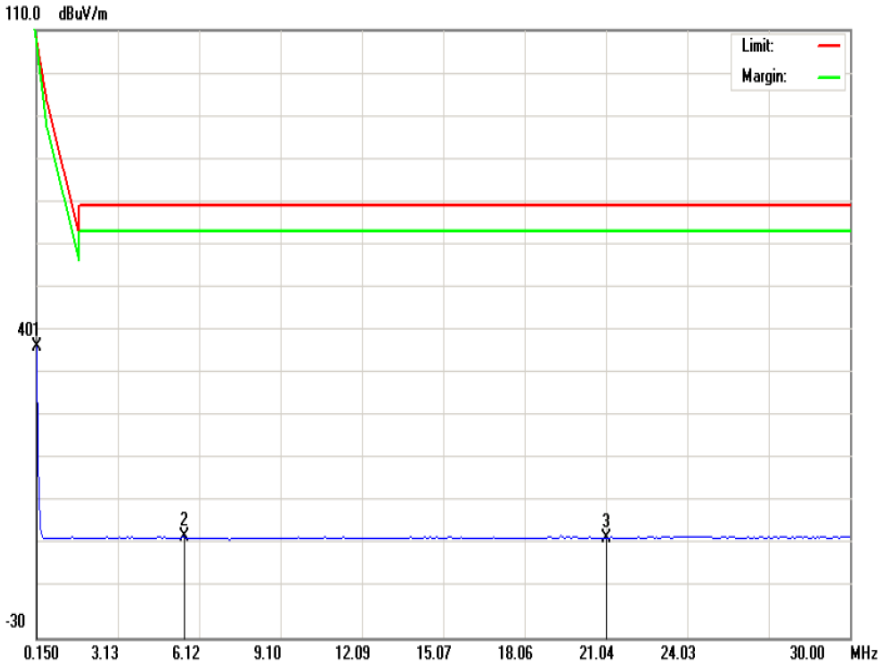
Horizontal								
Signal	**Frequency (MHz)**	**Factor (dB)**	**Corrected AV Level dB(uV/m)**	**3 Meter Limits dB(uV/m)**	**Margin (dB)**	**Corrected PK Level dB(uV/m)**	**3 Meter Limits dB(uV/m)**	**Margin (dB)**
1	1830	28.23	30.15	54.00	-23.85	38.90	74.00	-35.10
2	2970	33.27	34.42	54.00	-19.58	43.17	74.00	-30.83
3	3930	37.86	39.16	54.00	-14.84	47.95	74.00	-26.05
Vertical								
Signal	**Frequency (MHz)**	**Factor (dB)**	**Corrected AV Level dB(uV/m)**	**3 Meter Limits dB(uV/m)**	**Margin (dB)**	**Corrected PK Level dB(uV/m)**	**3 Meter Limits dB(uV/m)**	**Margin (dB)**
1	1840	28.29	29.57	54.00	-24.43	39.84	74.00	-34.16
2	3050	34.77	35.23	54.00	-18.77	46.97	74.00	-27.03
3	4360	38.46	40.15	54.00	-13.85	47.76	74.00	-26.24

Note: All readings are average and peak unless stated otherwise, using a bandwidth of 1000kHz, with a 30 ms sweep time. A video filter was not used.

Model: RB0720
Middle Channel (2418MHz & 2458MHz)



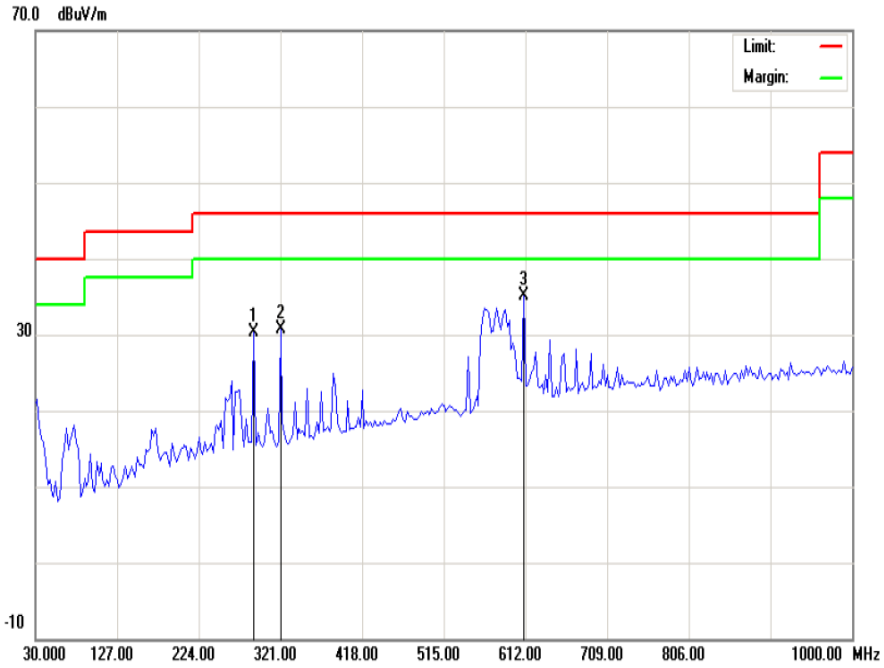
Field strength Emission Plot (Peak, Max Hold Mode 9kHz-0.15MHz)



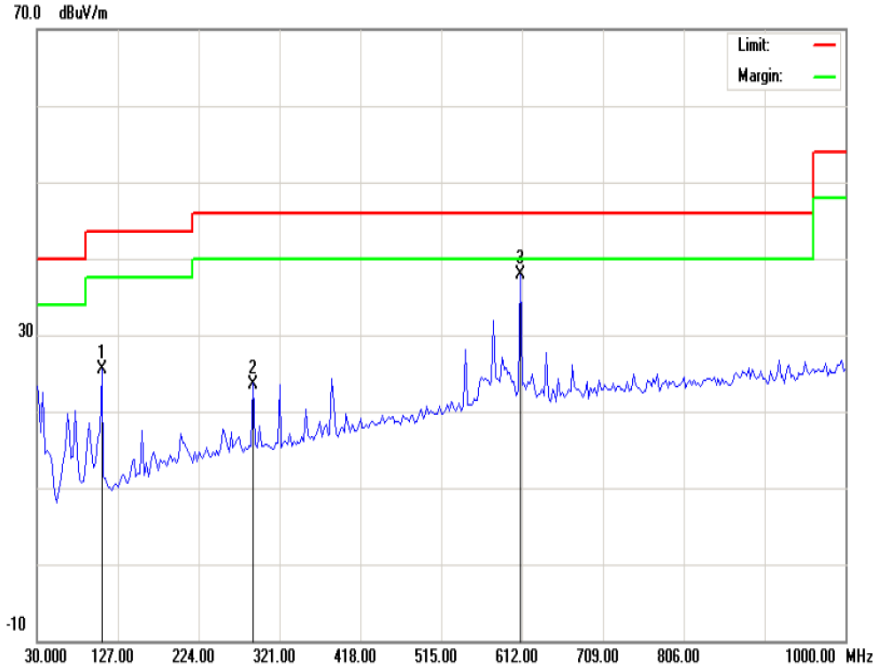
Field strength Emission Plot (Peak, Max Hold Mode 0.15MHz-30MHz)

Test Results (9kHz~30MHz)

9kHz – 0.15MHz							
Signal	**Frequency (MHz)**	**Factor (dB)**	**Corrected QP Level dB(uV/m)**	**3 Meter Limits dB(uV/m)**	**Margin (dB)**	**Angle of Turner (degree)**	**Height of Tower (cm)**
1	0.0325	8.78	27.60	126.81	-99.21	180	101
2	0.0485	8.80	27.84	125.65	-97.81	0	112
3	0.0650	8.82	24.67	124.46	-99.79	90	105
Set-up/Configuration: ANSI C63.4-2003							
Comments: None							
Note: All readings are quasi-peak unless stated otherwise, using a QPA bandwidth of 200Hz, with a 30 ms sweep time. A video filter was not used.							
0.15MHz – 30MHz							
Signal	**Frequency (MHz)**	**Factor (dB)**	**Corrected QP Level dB(uV/m)**	**3 Meter Limits dB(uV/m)**	**Margin (dB)**	**Angle of Turner (degree)**	**Height of Tower (cm)**
1	0.1500	9.02	37.05	118.33	-81.28	0	134
2	5.5976	10.46	11.02	69.50	-58.48	0	129
3	21.0450	7.83	10.54	69.50	-58.96	45	117
Set-up/Configuration: ANSI C63.4-2003							
Comments: None							
Note: All readings are quasi-peak unless stated otherwise, using a QPA bandwidth of 9kHz, with a 30 ms sweep time. A video filter was not used.							



Radiated Emission Plot –Horizontal Polarization
(Peak, Max Hold Mode)



Radiated Emission Plot –Vertical Polarization
(Peak, Max Hold Mode)

Test Results (30MHz~1GHz)

Horizontal								
Signal	**Frequency (MHz)**	**Reading Level (dBuV)**	**Factor (dB)**	**Corrected QP Level dB(uV/m)**	**3 Meter Limits dB(uV/m)**	**Margin (dB)**	**Angle of Turner (degree)**	**Height of Tower (cm)**
1	289.475	14.94	15.31	30.25	46.00	-15.75	347	129
2	321.000	14.70	15.96	30.66	46.00	-15.34	194	134
3	609.575	14.09	20.98	35.07	46.00	-10.93	118	168
Vertical								
Signal	**Frequency (MHz)**	**Reading Level (dBuV)**	**Factor (dB)**	**Corrected QP Level dB(uV/m)**	**3 Meter Limits dB(uV/m)**	**Margin (dB)**	**Angle of Turner (degree)**	**Height of Tower (cm)**
1	107.599	15.13	10.30	25.43	43.50	-18.07	220	139
2	289.475	8.29	15.31	23.60	46.00	-22.40	35	114
3	609.575	16.83	20.98	37.81	46.00	-8.19	178	100

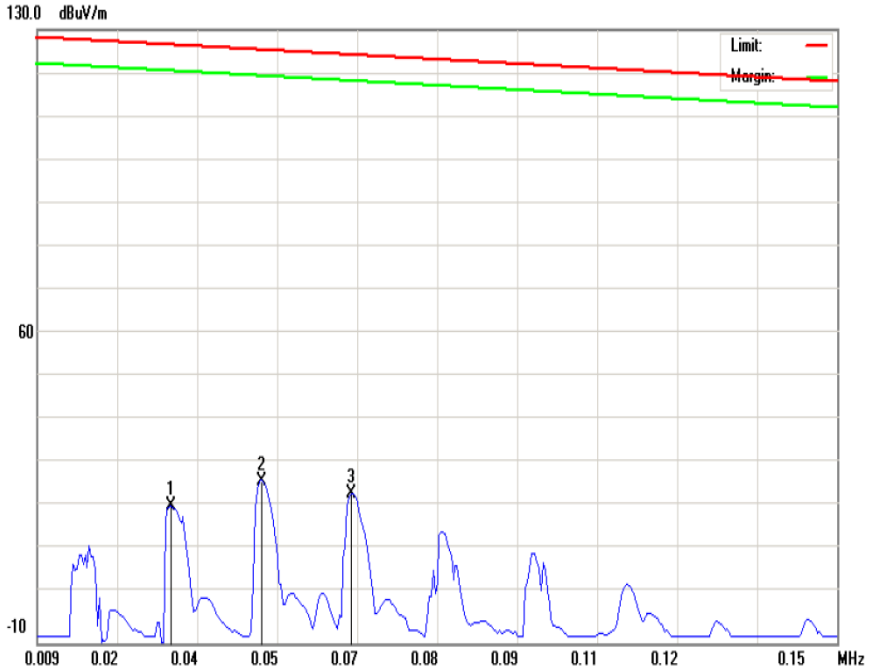
Note: All readings are quasi-peak unless stated otherwise, using a QP bandwidth of 120kHz, with a 30 ms sweep time. A video filter was not used.

Test Results (1GHz~24.58GHz)

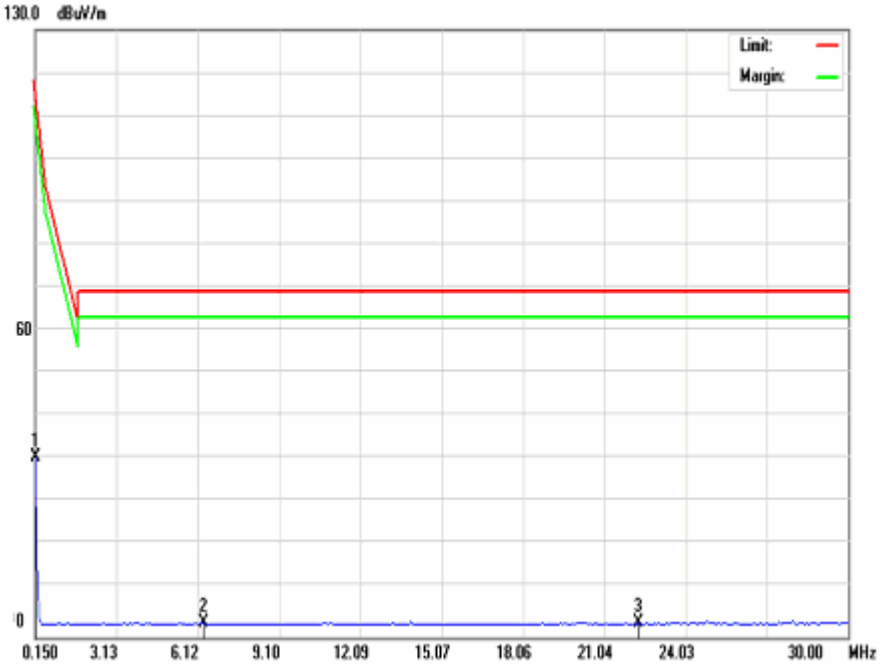
Horizontal								
Signal	**Frequency (MHz)**	**Factor (dB)**	**Corrected AV Level dB(uV/m)**	**3 Meter Limits dB(uV/m)**	**Margin (dB)**	**Corrected PK Level dB(uV/m)**	**3 Meter Limits dB(uV/m)**	**Margin (dB)**
1	1910	28.73	30.02	54.00	-23.98	39.46	74.00	-34.54
2	3420	36.07	38.94	54.00	-15.06	45.86	74.00	-28.14
3	4490	38.59	42.11	54.00	-11.89	48.40	74.00	-25.6
Vertical								
Signal	**Frequency (MHz)**	**Factor (dB)**	**Corrected AV Level dB(uV/m)**	**3 Meter Limits dB(uV/m)**	**Margin (dB)**	**Corrected PK Level dB(uV/m)**	**3 Meter Limits dB(uV/m)**	**Margin (dB)**
1	1510	26.21	28.74	54.00	-25.26	36.44	74.00	-37.56
2	2780	33.43	35.01	54.00	-18.99	46.97	74.00	-27.03
3	4620	38.72	40.28	54.00	-13.72	49.12	74.00	-24.88

Note: All readings are average and peak unless stated otherwise, using a bandwidth of 1000kHz, with a 30 ms sweep time. A video filter was not used.

Model: RB0720
High Channel (2434MHz & 2474MHz)



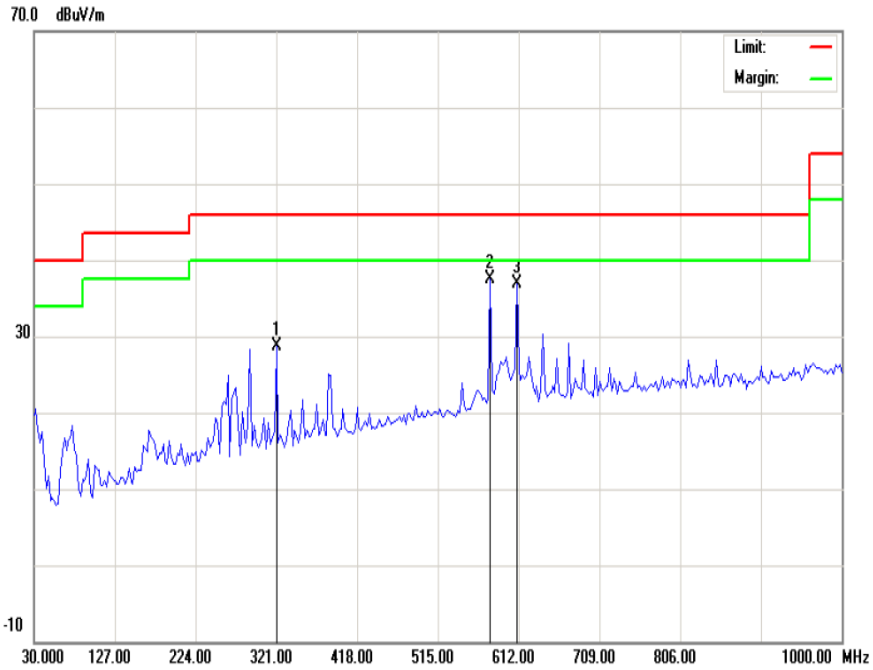
Field strength Emission Plot (Peak, Max Hold Mode 9kHz-0.15MHz)



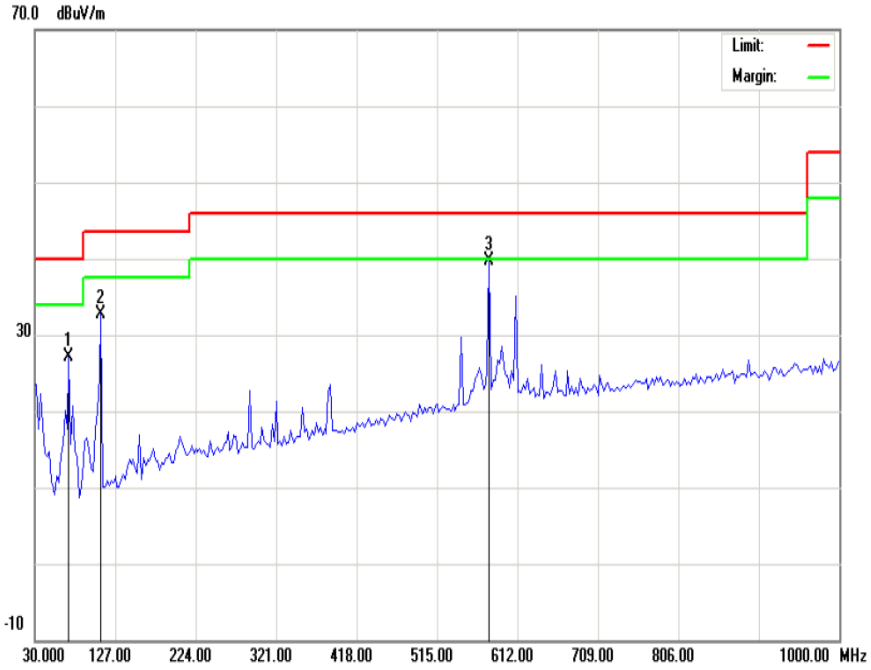
Field strength Emission Plot (Peak, Max Hold Mode 0.15MHz-30MHz)

Test Results (9kHz~30MHz)

9kHz – 0.15MHz							
Signal	**Frequency (MHz)**	**Factor (dB)**	**Corrected QP Level dB(uV/m)**	**3 Meter Limits dB(uV/m)**	**Margin (dB)**	**Angle of Turner (degree)**	**Height of Tower (cm)**
1	0.0326	8.78	21.23	126.81	-105.58	180	165
2	0.0485	8.80	27.10	125.66	-98.56	90	183
3	0.0643	8.83	24.05	124.52	-100.47	90	150
Set-up/Configuration: ANSI C63.4-2003							
Comments: None							
Note: All readings are quasi-peak unless stated otherwise, using a QPA bandwidth of 200Hz, with a 30 ms sweep time. A video filter was not used.							
0.15MHz – 30MHz							
Signal	**Frequency (MHz)**	**Factor (dB)**	**Corrected QP Level dB(uV/m)**	**3 Meter Limits dB(uV/m)**	**Margin (dB)**	**Angle of Turner (degree)**	**Height of Tower (cm)**
1	0.1500	9.02	31.34	118.33	-86.99	0	101
2	6.3439	11.32	11.90	69.50	-57.60	0	127
3	22.3136	7.76	10.54	69.50	-58.96	45	143
Set-up/Configuration: ANSI C63.4-2003							
Comments: None							
Note: All readings are quasi-peak unless stated otherwise, using a QPA bandwidth of 9kHz, with a 30 ms sweep time. A video filter was not used.							



Radiated Emission Plot –Horizontal Polarization
(Peak, Max Hold Mode)



Radiated Emission Plot –Vertical Polarization
(Peak, Max Hold Mode)

Test Results (30MHz~1GHz)

Horizontal								
Signal	**Frequency (MHz)**	**Reading Level (dBuV)**	**Factor (dB)**	**Corrected QP Level dB(uV/m)**	**3 Meter Limits dB(uV/m)**	**Margin (dB)**	**Angle of Turner (degree)**	**Height of Tower (cm)**
1	321.000	12.71	15.96	28.67	46.00	-17.33	84	116
2	578.050	16.80	20.64	37.44	46.00	-8.56	143	100
3	609.575	16.01	20.98	36.99	46.00	-9.01	206	104
Vertical								
Signal	**Frequency (MHz)**	**Reading Level (dBuV)**	**Factor (dB)**	**Corrected QP Level dB(uV/m)**	**3 Meter Limits dB(uV/m)**	**Margin (dB)**	**Angle of Turner (degree)**	**Height of Tower (cm)**
1	71.225	17.86	9.34	27.20	40.00	-12.80	104	102
2	110.025	22.29	10.39	32.68	43.50	-10.82	281	112
3	578.050	19.02	20.64	39.66	46.00	-6.34	119	104

Note: All readings are quasi-peak unless stated otherwise, using a QP bandwidth of 120kHz, with a 30 ms sweep time. A video filter was not used.

Test Results (1GHz~24.74GHz)

Horizontal								
Signal	**Frequency (MHz)**	**Factor (dB)**	**Corrected AV Level dB(uV/m)**	**3 Meter Limits dB(uV/m)**	**Margin (dB)**	**Corrected PK Level dB(uV/m)**	**3 Meter Limits dB(uV/m)**	**Margin (dB)**
1	2500	31.95	33.72	54.00	-20.28	41.76	74.00	-32.24
2	2750	33.27	35.18	54.00	-18.82	43.17	74.00	-30.83
3	4780	38.88	40.06	54.00	-13.94	47.76	74.00	-26.24
Vertical								
Signal	**Frequency (MHz)**	**Factor (dB)**	**Corrected AV Level dB(uV/m)**	**3 Meter Limits dB(uV/m)**	**Margin (dB)**	**Corrected PK Level dB(uV/m)**	**3 Meter Limits dB(uV/m)**	**Margin (dB)**
1	3210	35.34	37.00	54.00	-17.00	45.42	74.00	-28.58
2	3570	36.59	38.59	54.00	-15.41	46.69	74.00	-27.31
3	3940	37.89	39.16	54.00	-14.84	48.28	74.00	-25.72

Note: All readings are average and peak unless stated otherwise, using a bandwidth of 1000kHz, with a 30 ms sweep time. A video filter was not used.

Test Equipment	Manufacturer	Model	Serial No.	Last Cal.	Cal. Due Date
EMI Receiver	HP	85462A	3650A00363	11/29/08	11/28/09
EMI Test Receiver RF Unit	R&S	ESMI-RF	DE23873	11/29/08	11/28/09
EMI Test Receiver Display Unit	R&S	ESAI-D	825035/005	11/29/08	11/28/09
Loop Antenna	EMCO	6502	2053	11/29/08	11/28/09
Broadband Antenna	Sunol	JB5	A110503	11/29/08	11/28/09
Horn Antenna	R&S	HF906	4044.4507.02	05/13/09	05/12/10
Double-Ridged Horn Antenna	A-infor	JXTXLB-SJ-180400-15	WK293382	05/17/09	05/16/10
Note: All testing were performed using internationally recognized standards. All test instruments were calibrated.					

SIGNED BY: _____ **REVIEWED BY:** _____

ENGINEER **SENIOR ENGINEER**

ATTACHMENT 2 – FUNDAMENTAL AND HARMONIC FIELD STRENGTH TEST RESULTS

CLIENT:	Shanghai Height Electronics Co., Ltd.	**TEST STANDARD:**	FCC Part 15.249 (a)
MODEL NUMBER:	RB0720	**PRODUCT:**	2.4G Remote Controller
SERIAL NO.:	Engineering Sample	**EUT DESIGNATION:**	RF Equipment
TEMPERATURE:	21°C	**HUMIDITY:**	53%RH
ATM PRESSURE:	101.6 kPa	**GROUNDING:**	No Grounding
TESTED BY:	Cloud Feng	**DATE OF TEST:**	2008, August 5

SETUP METHOD: ANSI C63.4 : 2003

TEST PROCEDURE:

a. The EUT was placed on a rotatable table with 0.8 meters above ground.

b. The EUT was set 3 meters from the interference-receiving antenna, which was mounted on the top of a variable height antenna tower.

c. The antenna was varied between one meter and four meters above ground to find the maximum value of the field strength both horizontal polarization and vertical polarization of the antenna were set to make measurement.

d. For each suspected emission the EUT was arranged to its worst case and then change the antenna tower height (from 1m to 4m) and turn table (from 0 degree to 360 degree) to find the maximum reading.

e. If the emission level of the EUT in peak mode was 20 dB lower than the specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be tested using the quasi-peak method in about six maximal points and the results will be reported.

f. Broadband antenna (Calibrated antenna) was used as receiving antenna below 1000MHz. Horn antenna were used as receiving antenna above 1000MHz.

g. The bandwidth is 120 kHz below 1000 MHz, and 1 MHz above 1000 MHz

Explanation of the Correction Factor are given as follows:

FS= RA + AF + CF - AG

Where: FS = Field Strength

RA = Receiver Amplitude

AF = Antenna Factor

CF = Cable Attenuation Factor

AG = Amplifier Gain

FCC 15.249 limit

15.249 (a) Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental Frequency	Field Strength of Fundamental	Field Strength of Harmonics

		(milivolts/meter)	(microvolts/meter)
	902-928MHz	50	500
	2400-2483.5MHz	50	500
	5725-5875MHz	50	500
	24.0-24.25GHz	250	2500
TESTED RANGE:	2.4GHz to 24.74GHz for the Remote Control		
TEST VOLTAGE:	6V DC		
TEST STATUS:	Set Remote Control to generate signal at low, middle and high channels continually		
RESULTS:	The EUT meets the requirements of the fundamental and harmonic field strength. The test results relate only to the equipment under test provided by client.		
CHANGES OR MODIFICATIONS:	There were no modifications installed by ECMG Worldwide Certification Solution, Inc.(China) test personnel.		
M. UNCERTAINTY:	Freq. ± 2x10-7 x Center Freq., Amp ± 2.6 dB		

Peak Field Strength=Peak Read Level + Factor

Factor = Antenna Factor + Cable Loss - Preamp Factor

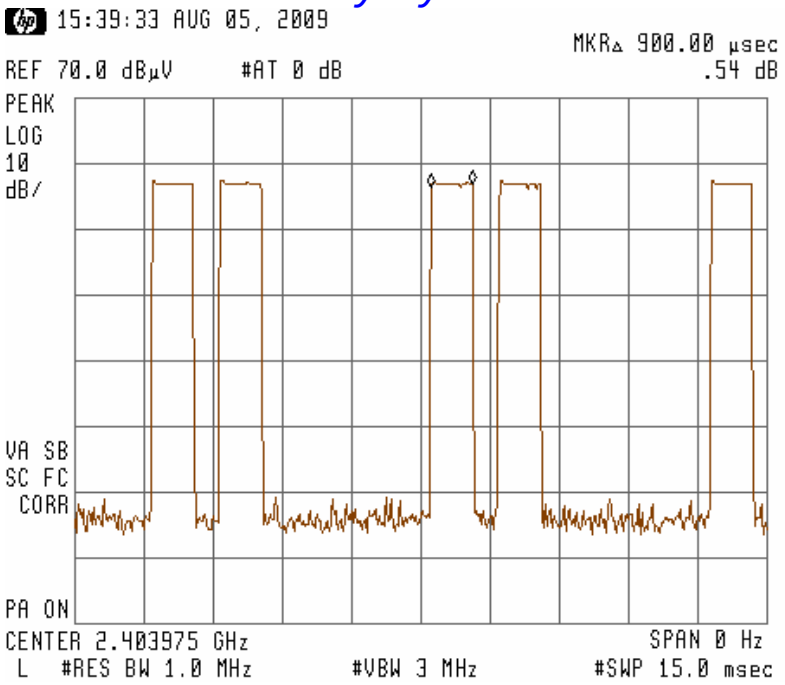
Average Field Strength=Peak Field Strength - Duty Cycle Correction Factor

Duty Cycle Correction Factor is calculated by averaging the sum of the pulse train. Correction factor is measured as follows:

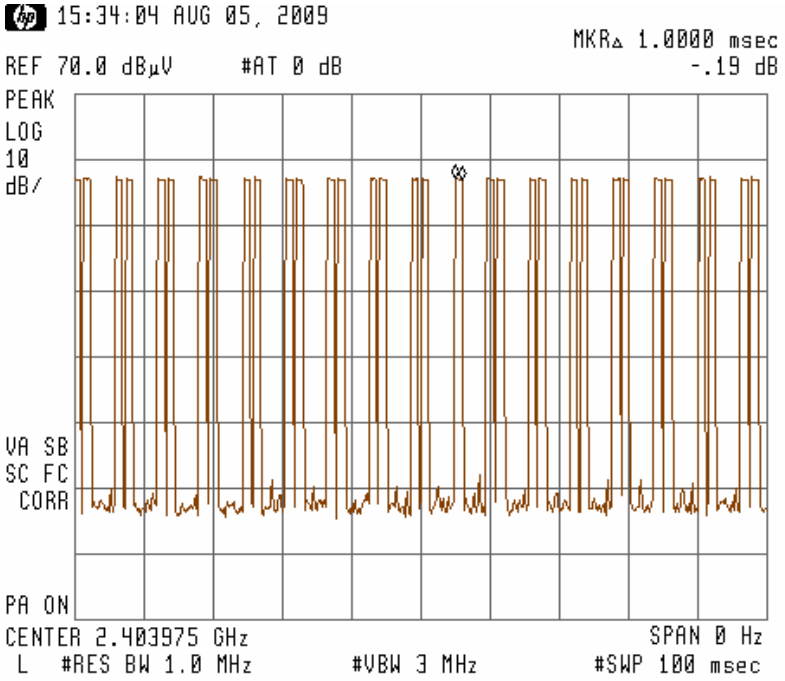
Keep the EUT in continuous transmission mode (modulated), and set the spectrum to the fundamental frequency and set the span width to 0 Hz. Then connect a storage oscilloscope to the video output of the spectrum that is used to detect the pulse train. Adjust the oscilloscope settings to observe the pulse train and determine the number and width of the pulses, as well as the period of the train.

*Duty cycle = 0.9ms*33/100mS=29.7%*
So the Duty Cycle Correction Factor= 20|log29.7%|=10.54dB
(See the plot below)

Duty Cycle Test



Test Plot #1



Test Plot #2

For Remote Controller
For Channel 1 (2404MHz & 2444MHz) Lie mode
Test Results (2.4GHz~24.04GHz)

Horizontal								
Signal	**Frequency (MHz)**	**Factor (dB)**	**Corrected PK Level (dBuV/m)**	**3 Meter PK Limits (dB uV/m)**	**Margin (dB)**	**Corrected AV Level (dBuV/m)**	**3 Meter AV Limits (dBuV/m)**	**Margin (dB)**
1	2404	28.40	76.86	114.00	-37.14	65.48	94.00	-28.52
2	4808	30.05	50.54	74.00	-23.46	43.67	54.00	-10.33
3	7212	36.96	48.54	74.00	-25.46	43.99	54.00	-10.01
4	9616	38.23	48.19	74.00	-25.81	43.19	54.00	-10.81
5	12020	41.47	45.68	74.00	-28.32	41.75	54.00	-12.25
HIGHER HARMONICS		--	<60	74.00	-14.00	<40	54.00	-14.00
Vertical								
Signal	**Frequency (MHz)**	**Factor (dB)**	**Corrected PK Level (dBuV/m)**	**3 Meter PK Limits (dB uV/m)**	**Margin (dB)**	**Corrected AV Level (dBuV/m)**	**3 Meter AV Limits (dBuV/m)**	**Margin (dB)**
1	2404	28.40	80.74	114.00	-33.26	71.83	94.00	-22.17
2	4808	30.05	54.92	74.00	-19.08	45.92	54.00	-8.08
3	7212	36.96	51.74	74.00	-22.26	43.01	54.00	-10.99
4	9616	38.23	51.52	74.00	-22.48	43.74	54.00	-10.26
5	12020	41.47	50.78	74.00	-23.22	42.93	54.00	-11.07
HIGHER HARMONICS		--	<60	74.00	-14.00	<40	54.00	-14.00

Note: All readings are peak and average unless stated otherwise, using a bandwidth of 1000kHz, with a 30 ms sweep time. A video filter was not used.

Test Results (2.4GHz~24.44GHz)

Horizontal

Signal	Frequency (MHz)	Factor (dB)	Corrected PK Level (dBuV/m)	3 Meter PK Limits (dB uV/m)	Margin (dB)	Corrected AV Level (dBuV/m)	3 Meter AV Limits (dBuV/m)	Margin (dB)
1	2444	28.48	80.18	114.00	-33.82	70.43	94.00	-23.57
2	4888	31.34	52.01	74.00	-21.99	43.87	54.00	-10.13
3	7332	37.15	50.44	74.00	-23.56	40.65	54.00	-13.35
4	9776	38.43	50.54	74.00	-23.46	41.39	54.00	-12.61
5	12220	42.23	49.95	74.00	-24.05	42.14	54.00	-11.86
HIGHER HARMONICS		--	<60	74.00	-14.00	<40	54.00	-14.00

Vertical

Signal	Frequency (MHz)	Factor (dB)	Corrected PK Level (dBuV/m)	3 Meter PK Limits (dB uV/m)	Margin (dB)	Corrected AV Level (dBuV/m)	3 Meter AV Limits (dBuV/m)	Margin (dB)
1	2444	28.48	77.94	114.00	-36.06	65.92	94.00	-28.08
2	4888	31.34	50.45	74.00	-23.55	42.10	54.00	-11.9
3	7332	37.15	51.93	74.00	-22.07	42.65	54.00	-11.35
4	9776	38.43	51.45	74.00	-22.55	42.93	54.00	-11.07
5	12220	42.23	51.28	74.00	-22.72	41.63	54.00	-12.37
HIGHER HARMONICS		--	<60	74.00	-14.00	<40	54.00	-14.00

Note: All readings are peak and average unless stated otherwise, using a bandwidth of 1000kHz, with a 30 ms sweep time. A video filter was not used.

For Remote Controller
For Channel 8 (2418MHz & 2458MHz) Side mode
Test Results (2.4GHz~24.18GHz)

Horizontal								
Signal	**Frequency (MHz)**	**Factor (dB)**	**Corrected PK Level (dBuV/m)**	**3 Meter PK Limits (dB uV/m)**	**Margin (dB)**	**Corrected AV Level (dBuV/m)**	**3 Meter AV Limits (dBuV/m)**	**Margin (dB)**
1	2418	28.42	79.78	114.00	-34.22	71.43	94.00	-22.57
2	4836	30.10	50.14	74.00	-23.86	42.39	54.00	-11.61
3	7254	36.99	51.84	74.00	-22.16	42.94	54.00	-11.06
4	9672	38.28	50.54	74.00	-23.46	40.93	54.00	-13.07
5	12090	41.60	51.03	74.00	-22.97	42.54	54.00	-11.46
HIGHER HARMONICS		--	<60	74.00	-14.00	<40	54.00	-14.00
Vertical								
Signal	**Frequency (MHz)**	**Factor (dB)**	**Corrected PK Level (dBuV/m)**	**3 Meter PK Limits (dB uV/m)**	**Margin (dB)**	**Corrected AV Level (dBuV/m)**	**3 Meter AV Limits (dBuV/m)**	**Margin (dB)**
1	2418	28.42	79.38	114.00	-34.62	72.05	94.00	-21.95
2	4836	30.10	52.01	74.00	-21.99	42.84	54.00	-11.16
3	7254	36.99	50.54	74.00	-23.46	42.91	54.00	-11.09
4	9672	38.28	51.11	74.00	-22.89	40.32	54.00	-13.68
5	12090	41.60	50.28	74.00	-23.72	42.01	54.00	-11.99
HIGHER HARMONICS		--	<60	74.00	-14.00	<40	54.00	-14.00
Note: All readings are peak and average unless stated otherwise, using a bandwidth of 1000kHz, with a 30 ms sweep time. A video filter was not used.								

Test Results (2.4GHz~24.58GHz)

Horizontal

Signal	Frequency (MHz)	Factor (dB)	Corrected PK Level (dBuV/m)	3 Meter PK Limits (dB uV/m)	Margin (dB)	Corrected AV Level (dBuV/m)	3 Meter AV Limits (dBuV/m)	Margin (dB)
1	2458	28.48	77.64	114.00	-36.36	69.03	94.00	-24.97
2	4916	31.40	52.01	74.00	-21.99	43.49	54.00	-10.51
3	7374	37.33	51.83	74.00	-22.17	42.83	54.00	-11.17
4	9832	38.58	51.29	74.00	-22.71	43.02	54.00	-10.98
5	12290	42.28	50.42	74.00	-23.58	43.19	54.00	-10.81
HIGHER HARMONICS		--	<60	74.00	-14.00	<40	54.00	-14.00

Vertical

Signal	Frequency (MHz)	Factor (dB)	Corrected PK Level (dBuV/m)	3 Meter PK Limits (dB uV/m)	Margin (dB)	Corrected AV Level (dBuV/m)	3 Meter AV Limits (dBuV/m)	Margin (dB)
1	2458	28.53	78.65	114.00	-35.35	70.33	94.00	-23.67
2	4916	31.40	53.01	74.00	-20.99	44.85	54.00	-9.15
3	7374	37.33	51.38	74.00	-22.62	42.19	54.00	-11.81
4	9832	38.58	52.11	74.00	-21.89	43.18	54.00	-10.82
5	12290	42.28	51.87	74.00	-22.13	42.84	54.00	-11.16
HIGHER HARMONICS		--	<60	74.00	-14.00	<40	54.00	-14.00

Note: All readings are peak and average unless stated otherwise, using a bandwidth of 1000kHz, with a 30 ms sweep time. A video filter was not used.

For Remote Control of LR4
For Channel 16 (2434MHz & 2474MHz) Standing mode
Test Results (2.4GHz~24.34GHz)

Horizontal								
Signal	**Frequency (MHz)**	**Factor (dB)**	**Corrected PK Level (dBuV/m)**	**3 Meter PK Limits (dB uV/m)**	**Margin (dB)**	**Corrected AV Level (dBuV/m)**	**3 Meter AV Limits (dBuV/m)**	**Margin (dB)**
1	2434	28.42	80.13	114.00	-33.87	71.39	94.00	-22.61
2	4868	31.36	52.83	74.00	-21.17	42.77	54.00	-11.23
3	7302	37.30	50.78	74.00	-23.22	42.90	54.00	-11.10
4	9736	38.45	52.32	74.00	-21.68	43.18	54.00	-10.82
5	12170	42.04	52.09	74.00	-21.91	42.90	54.00	-11.10
HIGHER HARMONICS		--	<60	74.00	-14.00	<40	54.00	-14.00
Vertical								
Signal	**Frequency (MHz)**	**Factor (dB)**	**Corrected PK Level (dBuV/m)**	**3 Meter PK Limits (dB uV/m)**	**Margin (dB)**	**Corrected AV Level (dBuV/m)**	**3 Meter AV Limits (dBuV/m)**	**Margin (dB)**
1	2434	28.42	78.54	114.00	-35.46	70.03	94.00	-23.97
2	4868	31.36	52.83	74.00	-21.17	43.17	54.00	-10.83
3	7302	37.30	53.01	74.00	-20.99	44.89	54.00	-9.11
4	9736	38.45	52.35	74.00	-21.65	44.93	54.00	-9.07
5	12170	42.04	50.54	74.00	-23.46	43.64	54.00	-10.36
HIGHER HARMONICS		--	<60	74.00	-14.00	<40	54.00	-14.00

Note: All readings are peak and average unless stated otherwise, using a bandwidth of 1000kHz, with a 30 ms sweep time. A video filter was not used.

Test Results (2.4GHz~24.74GHz)

Horizontal

Signal	Frequency (MHz)	Factor (dB)	Corrected PK Level (dBuV/m)	3 Meter PK Limits (dB uV/m)	Margin (dB)	Corrected AV Level (dBuV/m)	3 Meter AV Limits (dBuV/m)	Margin (dB)
1	2474	28.58	76.98	114.00	-37.02	68.71	94.00	-25.29
2	4938	31.52	52.44	74.00	-21.56	43.18	54.00	-10.82
3	7422	37.54	51.84	74.00	-22.16	42.86	54.00	-11.14
4	9896	38.69	51.56	74.00	-22.44	42.88	54.00	-11.12
5	12370	42.40	50.56	74.00	-23.44	42.73	54.00	-11.27
HIGHER HARMONICS		--	<60	74.00	-14.00	<40	54.00	-14.00

Vertical

Signal	Frequency (MHz)	Factor (dB)	Corrected PK Level (dBuV/m)	3 Meter PK Limits (dB uV/m)	Margin (dB)	Corrected AV Level (dBuV/m)	3 Meter AV Limits (dBuV/m)	Margin (dB)
1	2474	28.58	76.23	114.00	-47.65	68.12	94.00	-25.88
2	4938	31.52	52.64	74.00	-21.12	43.01	54.00	-10.99
3	7422	37.54	52.18	74.00	-14.64	42.73	54.00	-11.27
4	9896	38.69	52.84	74.00	-14.15	42.14	54.00	-11.86
5	12370	42.40	52.94	74.00	-10.54	43.23	54.00	-10.77
HIGHER HARMONICS		--	<60	74.00	-14.00	<40	54.00	-14.00

Note: All readings are peak and average unless stated otherwise, using a bandwidth of 1000kHz, with a 30 ms sweep time. A video filter was not used.

Test Equipment	Manufacturer	Model	Serial No.	Last Cal.	Cal. Due Date
EMI Receiver	HP	85462A	3650A00363	11/29/08	11/28/09
EMI Test Receiver RF Unit	R&S	ESMI-RF	DE23873	11/29/08	11/28/09
EMI Test Receiver Display Unit	R&S	ESAI-D	825035/005	11/29/08	11/28/09
Broadband Antenna	Sunol	JB5	A110503	11/29/08	11/28/09
Horn Antenna	R&S	HF906	4044.4507.02	05/13/09	05/12/10
Double-Ridged Horn Antenna	A-infor	JXTXLB-SJ-180400-15	WK293382	05/17/09	05/16/10
Note: All testing were performed using internationally recognized standards. All test instruments were calibrated.					

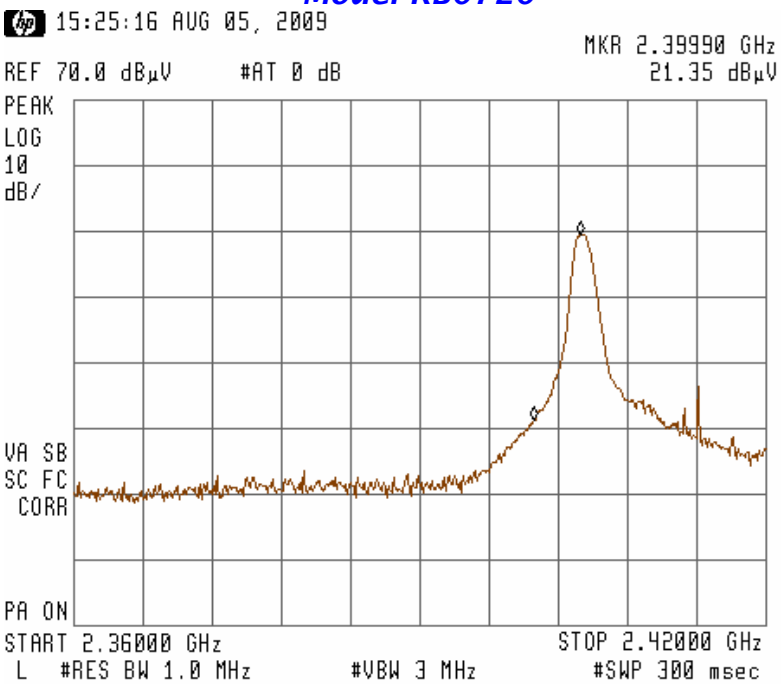
SIGNED BY: Cloud Feng **ENGINEER**

REVIEWED BY: Hang Zhao **SENIOR ENGINEER**

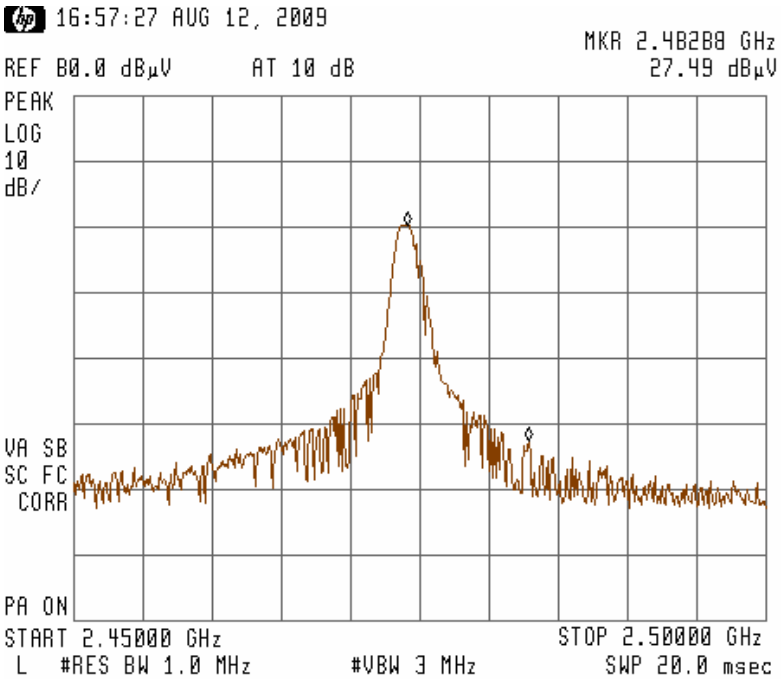
ATTACHMENT 3 – Band Edge Test

CLIENT:	Shanghai Height Electronics Co., Ltd.	**TEST STANDARD:**	FCC Part 15.249 (d)
MODEL NUMBER:	RB0720	**PRODUCT:**	2.4G Remote Controller
SERIAL NO.:	Engineering Sample	**EUT DESIGNATION:**	RF Equipment
TEMPERATURE:	21°C	**HUMIDITY:**	53%RH
ATM PRESSURE:	101.6 kPa	**GROUNDING:**	No Grounding
TESTED BY:	Cloud Feng	**DATE OF TEST:**	2008, August 5

SETUP METHOD:	ANSI C63.4 - 2003
BANDEDGE REQUIREMENT:	FCC 15.249 (d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to general radiated emission limits in Section 15.209, which is the lesser attenuation.
TEST PROCEDURE:	Set the spectrum as follow: Span=wide enough to capture the peak level of the emission operating on the channel closest to the band-edge, as well as any modulation products which fall outside of the authorized band of operation. RBW=1000kHz; VBW≧RBW; Sweep=Auto; Detector=Peak; Trace=Maxhold; Allow the trace to stabilize and use the search peak function to set the marker to the peak of the useful emission, then use delta-mark function to mark the maximum emission outside of the band, record the delta level to see if it's more than 50dB. Or see if the emissions outside the operating frequencies can satisfy the limit 15.209.
TEST VOLTAGE:	6V DC
TEST STATUS:	Channel 1 for low and Channel 16 for high
RESULTS:	The EUT meets band edge requirement. The test results relate only to the equipment under test provided by client.
CHANGES OR MODIFICATIONS:	There were no modifications installed by ECMG Worldwide Certification Solution, Inc.(China) test personnel.
M. UNCERTAINTY:	Freq. $\pm$ 2x10^{-7} x Center Freq., Amp $\pm$ 2.6 dB



Channel 1 (2404MHz)



Channel 16 (2474MHz)

Band Edge Test Plot with antenna horizontal

Band Edge Test Table

Antenna Horizontal								
Signal	**Frequency (MHz)**	**Factor (dB)**	**Corrected PK Level (dBuV/m)**	**3 Meter PK Limits (dB uV/m)**	**Margin (dB)**	**Corrected AV Level (dBuV/m)**	**3 Meter AV Limits (dBuV/m)**	**Margin (dB)**
1	2400	28.21	49.56	74.00	-24.44	42.84	54.00	-11.16
2	2483.5	28.70	56.19	74.00	-17.81	47.94	54.00	-6.06
Antenna Vertical								
Signal	**Frequency (MHz)**	**Factor (dB)**	**Corrected PK Level (dBuV/m)**	**3 Meter PK Limits (dB uV/m)**	**Margin (dB)**	**Corrected AV Level (dBuV/m)**	**3 Meter AV Limits (dBuV/m)**	**Margin (dB)**
1	2400	28.21	53.74	74.00	-20.26	45.34	54.00	-8.66
2	2483.5	28.70	52.01	74.00	-21.99	44.53	54.00	-9.47

Note #1: The peak and average readings are using a resolution bandwidth of 1MHz and video bandwidth of 3MHz.

Note #2: Corrected level = Reading level + Factor; Factor = Antenna Factor + Cable Factor – Preamp Gain.

Test Equipment	Manufacturer	Model	Serial No.	Last Cal.	Cal. Due Date
EMI Receiver	HP	85462A	3650A00363	11/29/08	11/28/09
EMI Test Receiver RF Unit	R&S	ESMI-RF	DE23873	11/29/08	11/28/09
EMI Test Receiver Display Unit	R&S	ESAI-D	825035/005	11/29/08	11/28/09
Broadband Antenna	Sunol	JB5	A110503	11/29/08	11/28/09
Horn Antenna	R&S	HF906	4044.4507.02	05/13/09	05/12/10
Note: All testing were performed using internationally recognized standards. All test instruments were calibrated.					

SIGNED BY: Cloud Feng _____ **REVIEWED BY:** Hang Zhao _____

ENGINEER **SENIOR ENGINEER**