

RF TEST REPORT

Test Report No. : TK-FR11029
Standards : Part 15 Subpart C 15.249
FCC ID : ZBTRC-750
Description of Product : Remote Control
Applicant : Moneual Inc.
Manufacturer : Moneual Inc.
Model Name : RC-750
Date of test(s) : 2011.03.28 ~ 2011.03.30
Date of issue : 2011.05.23

The test results relate only to the items tested.

Test and Report Completed by :	Report Approval by :
	
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Revision history

Revision	Date of issue	Test report No.	Description
-			Initial

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1.0 General product description

Equipment model name : RC-750
 Serial number : Prototype
 EUT condition : Pre-production, not damaged
 Antenna type & gain : PCB antenna / Gain -2.43 dBi
 Frequency Range : 2403 ~ 2479 MHz
 Number of channels : 11
 Type of Modulation : GFSK
 Power Source : DC 3V

1.1 Test frequency

	Low channel	Middle channel	High channel
Frequency (MHz)	2403	2441	2479

1.2 Test mode

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

1.3 Model differences

Not applicable

1.4 Device modifications

The following modifications were necessary for compliance: Not applicable manufacturer

1.5 Peripheral devices

Device	Manufacturer	Model No.	Serial No.
N/A			

1.6 Test facility

The measurement facility is located at 477-6, Hageo-ri, Yeouju-eup, Yeouju-gun, Gyeonggi-do, 469-803, Korea. Tel: +82-31-883-5092/Fax: +82-31-883-5169.

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

1.7 Laboratory accreditations and listings

Country	Agency	Scope of accreditation	Logo
USA	FCC	3 & 10 meter Open Area Test Sites and one conducted site to perform FCC Part 15/18 measurements.	 343818
KOREA	KCC	EMI (10 meter Open Area Test Site and two conducted sites) Radio (3 & 10 meter Open Area Test Sites and one conducted site)	 KR100
Canada	IC	3 & 10 meter Open Area Test Sites and one conducted site	 4769B-1

2.0 Summary of tests

Section in FCC Part 15	Parameter	Status
15.209(a) 15.249(a) 15.249(d) 15.205	Fundamental, spurious emission and band edge radiated emission	C
Note 1: C=Complies NC=Not complies NT=Not tested NA=Not applicable		
Note 2: The data in this test report are traceable to the national or international standards.		
Note 3: The sample was tested according to the following specification: FCC Part 15.249, ANSI C63.4-2003		

2.1 Technical characteristic test

2.1.1 Fundamental, spurious emission and band edge radiated emission

Test location

Testing was performed at a test distance of 3 meter Open Area Test Site

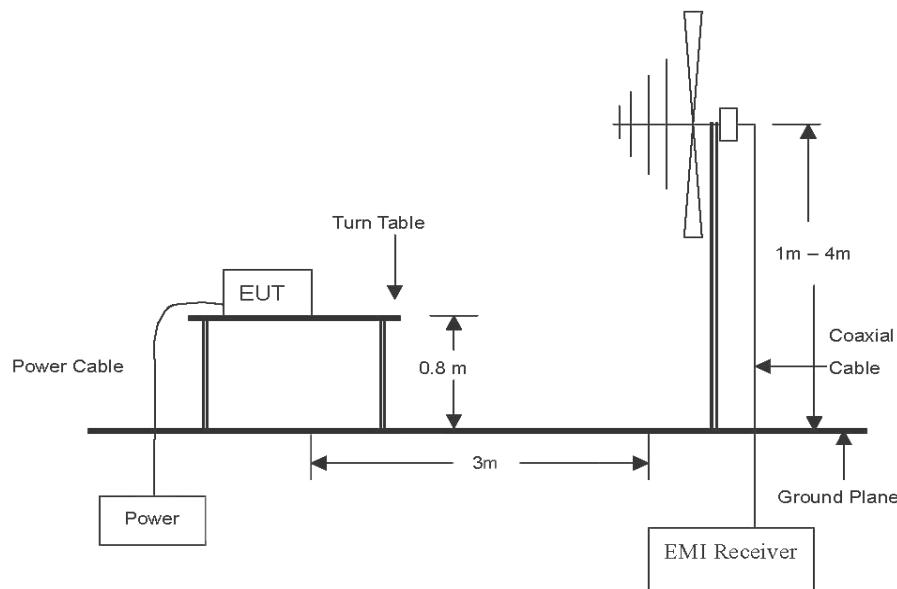
Test procedures

The height of the measuring antenna was varied between 1 to 4 m and the table was rotated a full revolution in order to obtain maximum values of the electric field intensity. The measurement was made in both the vertical and horizontal polarization, and the maximum value is presented in the report.

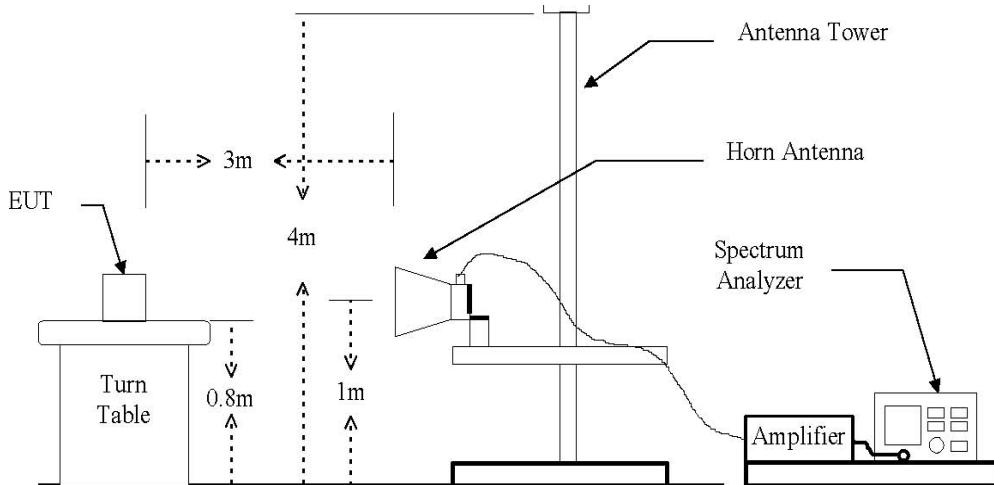
The spectrum analyzer is set to:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer 120 kHz for Peak detection (PK) or Quasi-peak detection (QP) at frequency below 1 GHz.
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz for Peak detection and frequency above 1 GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 10 Hz for Average detection (AV) at frequency above 1 GHz.

The diagram below shows the test setup that is utilized to make the measurements for emission from 30 MHz to 1 GHz emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission from 1 GHz to 24 GHz emissions.



Limit

In the section 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 (mV/m)	Field strength of harmonics (μV/m)
902 ~ 928 MHz	50	500
2 400 ~ 2 483.5 MHz	50	500
5 725 ~ 5 875 MHz	50	500
24.0 ~ 24.25 GHz	250	2500

Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Fundamental frequency (MHz)	Field strength (μV/m)	Measurement distance (m)
30 ~ 88	100*	3
88 ~ 216	150*	3
216 ~ 960	200*	3
Above 960	500	3

*** Remark**

Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54 - 72 MHz, 76 - 88 MHz, 174 - 216 MHz or 470 - 806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

In the above emission table, the tighter limit applies at the band edges.

Fundamental frequency (MHz)	Field strength (μV/m at 3 meter)	Field strength (dBμV/m at 3 meter)
30 ~ 88	100	40
88 ~ 216	150	43.5
216 ~ 960	200	46
Above 960	500	54

Test results (Below 1000 MHz)

The frequency spectrum from 30 MHz to 1000 MHz was investigated. Emission levels are not reported much lower than the limits by over 20 dB.

Radiated emissions		Ant.	Correction factors		Total	Limit	
Frequency (MHz)	Reading (dB μ V)	Pol.	Ant. factor (dB/m)	Amp + CL (dB)	Actual dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
315.2	17.12	H	13.18	1.43	31.73	46.00	14.27
329.5	16.77	H	13.50	1.49	31.76	46.00	14.24
329.5	14.39	V	13.50	1.49	29.38	46.00	16.62
415.4	13.99	V	15.13	1.73	30.85	46.00	15.15
600.4	9.90	V	18.33	2.07	30.30	46.00	15.70
780.0	7.82	H	20.57	2.38	30.77	46.00	15.23
813.9	7.65	H	20.79	2.44	30.88	46.00	15.12
837.1	7.47	H	20.95	2.48	30.90	46.00	15.10
857.7	7.52	H	21.13	2.51	31.16	46.00	14.84
862.2	7.32	H	21.18	2.51	31.01	46.00	14.99
872.7	9.02	V	21.29	2.53	32.84	46.00	13.16
874.7	9.15	V	21.32	2.53	33.00	46.00	13.00
892.6	9.36	V	21.55	2.56	33.47	46.00	12.53
924.0	8.58	V	21.96	2.61	33.15	46.00	12.85
969.8	8.28	V	22.20	2.68	33.16	54.00	20.84
980.6	7.95	V	22.21	2.70	32.86	54.00	21.14
987.3	8.92	H	22.22	2.71	33.85	54.00	20.15
999.8	7.63	H	22.23	2.73	32.59	54.00	21.41

*** Remark**

1. All spurious emission at channels are almost the same below 1 GHz, so that low channel was chosen at representative in final test.
2. Actual = Reading + Ant. factor + Amp + CL (Cable loss)
3. Detector mode: Quasi peak
4. To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ and YZ planes.

Test results (Above 1000 MHz)

A. Low channel (2403 MHz)

Radiated emissions			Ant.	Correction factors		Total	Limit	
Frequency (MHz)	Reading (dB μ V)	Detector mode	Pol.	Ant. factor (dB/m)	Amp + CL (dB)	Actual dB μ N/m	Limit (dB μ N/m)	Margin (dB)
2403	81.69	P	H	28.34	-27.93	82.10	114.00	31.90
2403	63.12	A	H	28.34	-27.93	63.53	94.00	30.47
2403	85.51	P	V	28.34	-27.93	85.92	114.00	28.08
2403	63.76	A	V	28.34	-27.93	64.17	94.00	29.83
2390*	53.62	P	H	28.31	-27.94	53.99	74.00	20.01
2390*	32.33	A	H	28.31	-27.94	32.70	54.00	21.30
2390*	54.67	P	V	28.31	-27.94	55.04	74.00	18.96
2390*	33.51	A	V	28.31	-27.94	33.88	54.00	20.12
4806*	30.50	P	H	33.91	-22.28	42.13	74.00	31.87
4806*	30.83	P	V	33.91	-22.28	42.46	74.00	31.54

B. Middle channel (2441 MHz)

Radiated emissions			Ant.	Correction factors		Total	Limit	
Frequency (MHz)	Reading (dB μ V)	Detector mode	Pol.	Ant. factor (dB/m)	Amp + CL (dB)	Actual dB μ N/m	Limit (dB μ N/m)	Margin (dB)
2441	85.40	P	H	28.42	-27.89	85.93	114.00	28.07
2441	64.39	A	H	28.42	-27.89	64.92	94.00	29.08
2441	84.55	P	V	28.42	-27.89	85.08	114.00	28.92
2441	63.47	A	V	28.42	-27.89	64.00	94.00	30.00
4882*	30.81	P	H	34.16	-22.05	42.92	74.00	31.08
4882*	31.18	P	V	34.16	-22.05	43.29	74.00	30.71

C. High channel (2479 MHz)

Radiated emissions			Ant.	Correction factors		Total	Limit	
Frequency (MHz)	Reading (dB _A N)	Detector mode	Pol.	Ant. factor (dB/m)	Amp + CL (dB)	Actual dB _A N/m)	Limit (dB _A N/m)	Margin (dB)
2479	82.93	P	H	28.49	-27.85	83.57	114.00	30.43
2479	63.14	A	H	28.49	-27.85	63.78	94.00	30.22
2479	83.38	P	V	28.49	-27.85	84.02	114.00	29.98
2479	63.34	A	V	28.49	-27.85	63.98	94.00	30.02
2483.5*	54.78	P	H	28.50	-27.85	55.43	74.00	18.57
2483.5*	32.91	A	H	28.50	-27.85	33.56	54.00	20.44
2483.5*	58.51	P	V	28.50	-27.85	59.16	74.00	14.84
2483.5*	32.09	A	V	28.50	-27.85	32.74	54.00	21.26
4958*	30.53	P	H	34.41	-21.81	43.13	74.00	30.87
4958*	30.43	P	V	34.41	-21.81	43.03	74.00	30.97

※ Remark

1. “*” means the restricted band.
2. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
3. Radiated emissions measured in frequency above 1000 MHz were made with an instrument using peak/average detector mode.
4. Average test would be performed if the peak result were greater than the average limit.
5. Actual = Reading + Ant. factor + Amp + CL (Cable loss)
6. To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ and YZ planes.

Appendix A – Test equipment used for test

Equipment	Manufacturer	Model	Calibration due.
Spectrum Analyzer	R&S	FSV30	2012-01-07
EMI Test Receiver	LIG NEX1	ISA-80	2011-07-26
High Pass Filter	Wainwright Instrument	WHJS3000-10TT	2012-01-07
Trilog-Broadband Antenna	Schwarzbeck	VULB 9168	2013-04-28
Horn Antenna	A.H. Systems	SAS-571	2013-03-22
Preamplifier	HP	8449B	2011-07-27

Test setup photo and configuration

Radiated field emissions

