

Test Report

FCC Part15 Subpart C

Product Name : Remote control key
Model No. : CHJ-C70K
FCC ID : 2AHQH-CHJ-C70K2

Applicant : Changzhou Airwheel Technology Co.,Ltd.
Address : 9th Floor Zhongchuang building,NO.396 Tongjiang
Middle Road, Xinbei District, Changzhou City,
Jiangsu,Province, China

Date of Receipt : Aug. 26, 2015
Test Date : Aug. 27, 2015~ Nov. 06, 2015
Issued Date : Apr. 19, 2016
Report No. : 1590020R-RF-US-P06V02
Report Version : V2.0



The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standard through the calibration of the equipment and evaluated measurement uncertainty herein.

This report must not be used to claim product endorsement by TAF or any agency of the government.

The test report shall not be reproduced without the written approval of QuieTek Corporation.

Test Report Certification

Issued Date : Apr. 19, 2016
Report No. : 1590020R-RF-US-P06V02



Product Name : Remote control key
Applicant : Changzhou Airwheel Technology Co.,Ltd.
Address : 9th Floor Zhongchuang building,NO.396 Tongjiang
Middle Road, Xinbei District, Changzhou City, Jiangsu
Province, China
Manufacturer : Changzhou Airwheel Technology Co.,Ltd.
Address : 9th Floor Zhongchuang building,NO.396 Tongjiang
Middle Road, Xinbei District, Changzhou City, Jiangsu
Province, China
Model No. : CHJ-C70K
FCC ID : 2AHQH-CHJ-C70K2
EUT Voltage : DC 12V
Brand Name : Airwheel
Applicable Standard : FCC CFR Title 47 Part 15 Subpart C: 2014
ANSI C63.10: 2013; ANSI C63.4: 2014
Test Result : Complied
Performed Location : Suzhou EMC Laboratory
No.99 Hongye Rd., Suzhou Industrial Park, Suzhou,
215006, Jiangsu, China
TEL: +86-512-6251-5088 / FAX: +86-512-6251-5098
FCC Registration Number: 800392

Documented By : Alice Ni
Reviewed By : Frank he
Approved By : Harry zhao

Laboratory Information

We, **Quietek Corporation**, are an independent EMC and safety consultancy that was established the whole facility in our laboratories. The test facility has been accredited/accepted(audited or listed) by the following related bodies in compliance with ISO 17025, EN 45001 and specified testing scope:

Taiwan R.O.C.	:	BSMI, NCC,TAF
USA	:	FCC
Japan	:	VCCI
China	:	CNAS

The related certificate for our laboratories about the test site and management system can be downloaded from Quietek Corporation's Web Site :<http://www.quietek.com/tw/ctg/cts/accreditations.htm>

The address and introduction of Quietek Corporation's laboratories can be founded in our Web site :
<http://www.quietek.com/>

If you have any comments, Please don't hesitate to contact us. Our contact information is as below:

HsinChu Testing Laboratory :

No.75-2, 3rd Lin, Wangye Keng, Yonghxing Tsuen, Qionglin Shiang, Hsinchu County 307, Taiwan, R.O.C.
TEL:+886-3-592-8858 / FAX:+886-3-592-8859 E-Mail : service@quietek.com

LinKou Testing Laboratory :

No.5-22, Ruishukeng, Linkou Dist., New Taipei City 24451, Taiwan, R.O.C.
TEL : 886-2-8601-3788 / FAX : 886-2-8601-3789 E-Mail : service@quietek.com

Suzhou Testing Laboratory :

No.99 Hongye Rd., Suzhou Industrial Park, Suzhou, 215006, Jiangsu, China
TEL : +86-512-6251-5088 / FAX : 86-512-6251-5098 E-Mail : service@quietek.com

TABLE OF CONTENTS

Description	Page
1. General Information	6
1.1. EUT Description	6
1.2. Mode of Operation	8
1.3. Tested System Details	9
1.4. Configuration of Tested System	10
1.5. EUT Exercise Software	11
2. Technical Test	12
2.1. Summary of Test Result	12
2.2. Test Environment	13
3. Conducted Emission	14
3.1. Test Equipment	14
3.2. Test Setup	14
3.3. Limit	15
3.4. Test Procedure	15
3.5. Uncertainty	15
3.6. Test Result	16
4. Radiated Emission	17
4.1. Test Equipment	17
4.2. Test Setup	18
4.3. Limit	19
4.4. Test Procedure	20
4.5. Uncertainty	20
4.6. Test Result	21
5. 20dB Bandwidth	23
5.1. Test Equipment	23
5.2. Test Setup	23
5.3. Limit	23
5.4. Test Procedure	23
5.5. Uncertainty	24
5.6. Test Result	25
6. Release Time Measurement	26
6.1. Test Equipment	26
6.2. Test Setup	26
6.3. Limit	26
6.4. Test Procedure	26
6.5. Uncertainty	26
6.6. Test Result	27

History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
1590020R-RF-US-P06V02	V1.0	Initial Issued Report	Nov. 09, 2016
1590020R-RF-US-P06V02	V2.0	Modified model name	Apr. 19, 2016

1. General Information

1.1. EUT Description

Product Name	Remote control key
Brand Name	Airwheel
Model No.	CHJ-C70K
Working Voltage	DC 12V
Frequency Range	315MHz
Channel Number	1
Type of Modulation	ASK
Data Rate	<1kbps
Antenna Type	PCB Antenna

Working Frequency of Each Channel:							
Channel	Frequency						
00	315MHz						

1.2. Mode of Operation

QuieTek has verified the construction and function in typical operation. All the test modes were carried out with the EUT in normal operation, which was shown in this test report and defined as:

Test Mode
Mode 1: Transmit

Note:

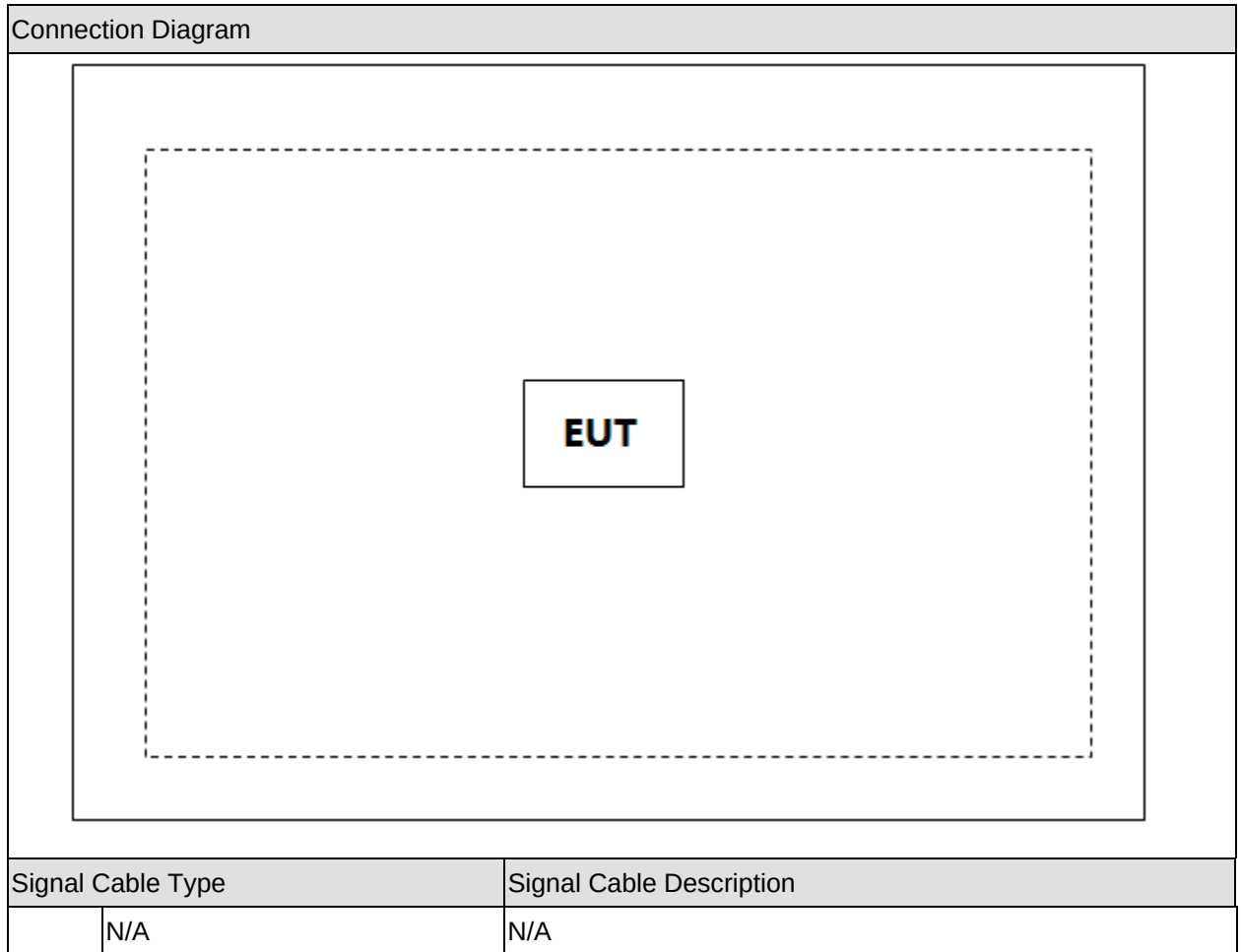
1. Regards to the frequency band operation: the lowest, middle and highest frequency of channel were selected to perform the test, then shown on this report.
2. For portable device, radiated spurious emission was verified over X, Y, Z Axis, and shown the worst case on this report.

1.3. Tested System Details

The types for all equipments, plus descriptions of all cables used in the tested system (including inserted cards) are:

Product		Manufacturer	Model No.	Serial No.	Power Cord
1	N/A	N/A	N/A	N/A	N/A

1.4. Configuration of Tested System



1.5. EUT Exercise Software

1	Setup the EUT and simulators as shown on above.
2	Turn on the power of all equipment. and start to test

2. Technical Test

2.1. Summary of Test Result

- ☒ No deviations from the test standards
☐ Deviations from the test standards as below description:

Performed Test Item	Normative References	Test Performed	Deviation
Conducted Emission	FCC CFR Title 47 Part 15 Subpart C: 2014 Section 15.207	N/A*)	No
Radiated Emission	FCC CFR Title 47 Part 15 Subpart C: 2014 Section 15.209 & 15.231(b)	Yes	No
20dB Bandwidth	FCC CFR Title 47 Part 15 Subpart C: 2014 Section 15.231(c)	Yes	No
Release Time	FCC CFR Title 47 Part 15 Subpart C: 2014 Section 15.231(a)(1)	Yes	No
Antenna Requirement	FCC CFR Title 47 Part 15 Subpart C: 2014 Section 15.203	Yes	No
*) Note: The EUT has no AC input port, test is not applicable.			

2.2. Test Environment

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	21
Humidity (%RH)	25-75	50
Barometric pressure (mbar)	860-1060	950-1000

3. Conducted Emission

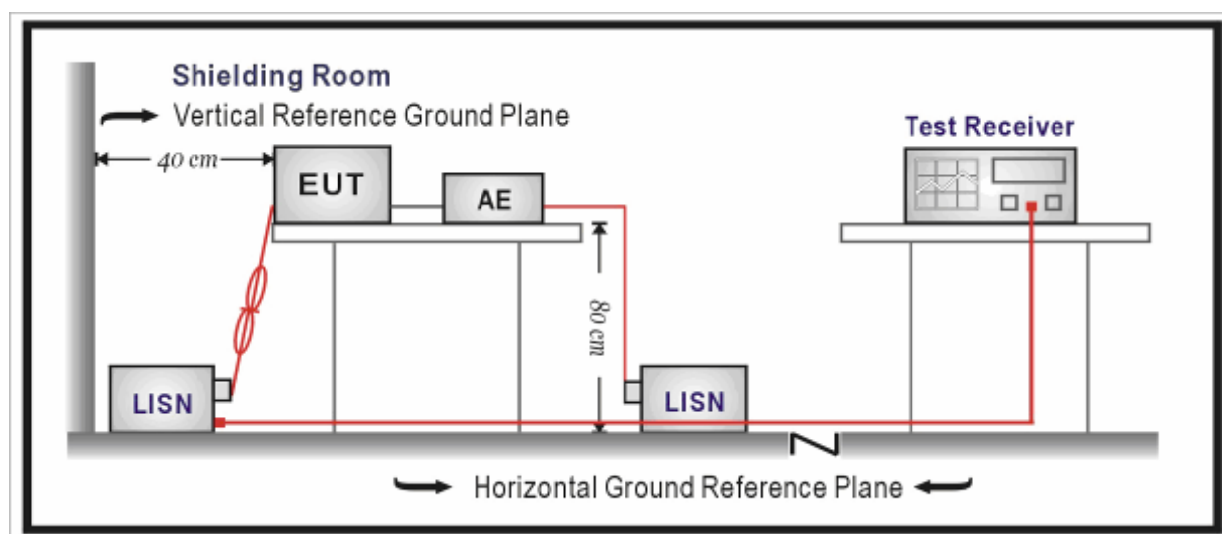
3.1. Test Equipment

Conducted Emission / TR-1

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
EMI Test Receiver	R&S	ESCI	100726	2016.09.16
Two-Line V-Network	R&S	ENV216	100043	2016.08.07
Two-Line V-Network	R&S	ENV216	100044	2016.09.16
50ohm Coaxial Switch	Anritsu	MP59B	6200464462	N/A
50ohm Termination	SHX	TF2	07081401	2016.09.16
Temperature/Humidity Meter	zhicheng	ZC1-2	TR1-TH	2016.01.07

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

3.2. Test Setup



3.3. Limit

FCC Part 15 Subpart C Paragraph 15.207 Limits		
Frequency (MHz)	QP (dBuV)	AV (dBuV)
0.15 - 0.50	66 - 56	56 – 46
0.50 - 5.0	56	46
5.0 - 30	60	50

Note 1: The lower limit shall apply at the transition frequencies.

Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

3.4. Test Procedure

The EUT was setup according to ANSI C63.4: 2014, 2014 & RSS210 and tested according to KDB 558074 for compliance to FCC 47CFR 15.247 requirements. The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface. The EUT and simulators are connected to the main power through a line impedance stabilization network (LISN). The LISN provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram of the test setup and photographs) Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source.

The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length. Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9 kHz.

3.5. Uncertainty

The measurement uncertainty is defined as ± 2.02 dB

3.6. Test Result

The EUT has no AC input port, test is not applicable.

4. Radiated Emission

4.1. Test Equipment

Radiated Emission / AC-2

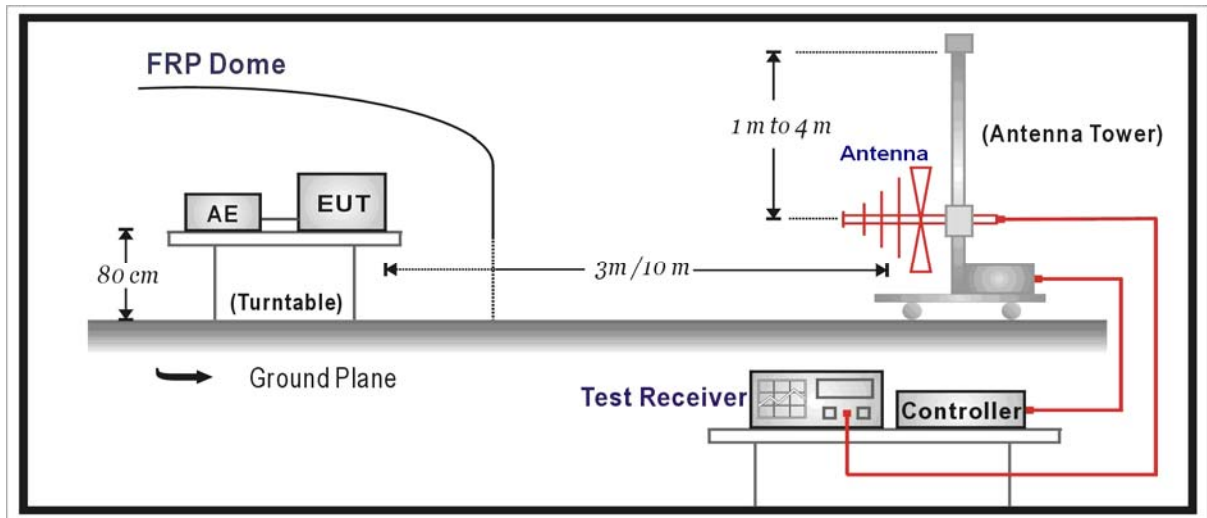
Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
EMI Test Receiver	R&S	ESCI	100573	2016.03.10
Loop Antenna	R&S	HFH2-Z2	833799/003	2015.11.25
Bilog Antenna	Teseq GmbH	CBL6112D	27611	2016.10.10
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC2-C	2016.02.28
Temperature/Humidity Meter	Zhicheng	ZC1-2	AC2-TH	2016.01.07

Radiated Emission / AC-5

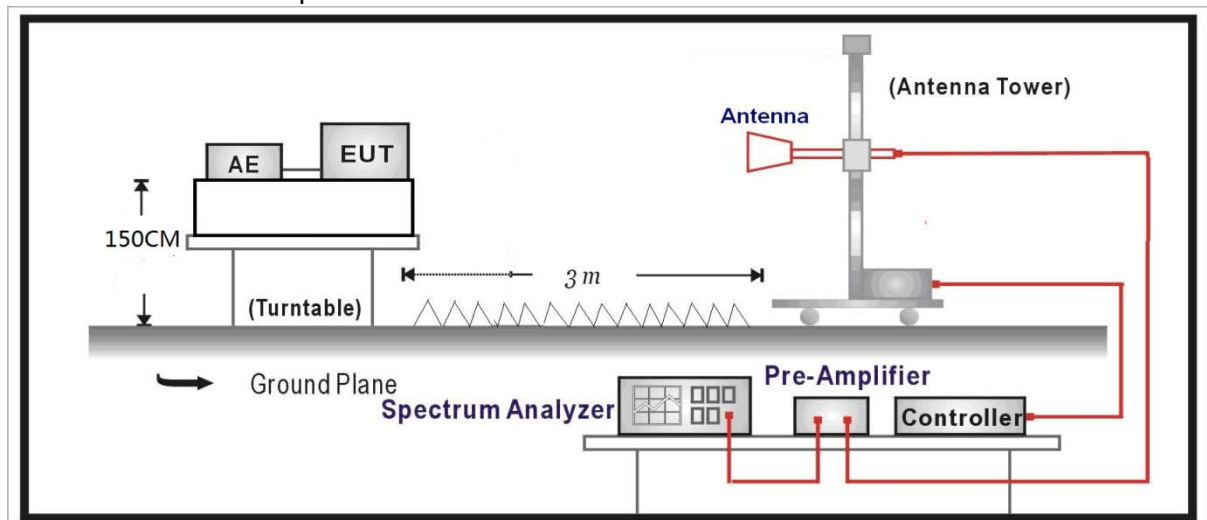
Instrument	Manufacturer	Type No.	Serial No.	Cali. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2016.05.12
Preamplifier	Miteq	NSP1800-25	1364185	2016.05.03
Preamplifier	QuieTek	AP-040G	CHM-0906001	2016.05.03
Bilog Antenna	Teseq GmbH	CBL6112D	27612	2016.10.15
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	733	2016.02.26
DRG Horn	ETS-Lindgren	3117	00167055	2016.07.16
Broad-Band Horn Antenna	Schwarzbeck	BBHA9170	294	2016.04.10
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC5-C1	2016.02.28
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC5-C2	2016.02.28
Coaxial Cable	Huber+Suhner	SUCOFLEX 102	AC5-C3	2016.02.28
Temperature/Humidity Meter	Zhicheng	ZC1-2	AC5-TH	2016.01.07

4.2. Test Setup

Below 1GHz Test Setup:



Above 1GHz Test Setup:



4.3. Limit

FCC Part 15 Subpart C Paragraph 15.209 & RSS Gen Clause 8.9		
Frequency (MHz)	Distance (m)	Level (dB μ V/m)
30 - 88	3	40
88 - 216	3	43.5
216 - 960	3	46
Above 960	3	54

Note 1: The lower limit shall apply at the transition frequency.

Note 2: Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

Note 3: E field strength (dB μ V/m) = 20 log E field strength (μ V/m)

Field strength of emissions from intentional radiators operated under 15.231(b) and RSS 210 Annex 1 shall not exceed the following:

Fundamental frequency (MHz)	Field strength of fundamental (μ V/m)	Field strength of spurious emissions (μ V/m)
40.66-40.70	2250	225
70-130	1250	125
130-174	11250 to 3750	1125 to 375
174-260	3750	375
260-470	13750 to 12500	1375 to 1250
Above 470	12500	1250

(1) The above field strength limits are specified at a distance of 3 meters. The tighter limits apply at the band edges.

(2) Intentional radiators operating under the provisions of this section shall demonstrate compliance with the limits on the field strength of emissions, as shown in the above table, based on the average value of the measured emissions. As an alternative, compliance with the limits in the above table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector. The specific method of measurement employed shall be specified in the application for equipment authorization. If average emission measurements are employed, the provisions in §15.35 for averaging pulsed emissions and for limiting peak emissions apply. Further, compliance with the provisions of §15.205 shall be demonstrated using the measurement instrumentation specified in that section.

(3) Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follow: for the band 130-174MHz, $\mu\text{V/m}$ at 3 meters = $56.81818(F) - 6136.3636$; for the band 260-470MHz, $\mu\text{V/m}$ at 3 meters = $41.6667(F) - 7083.3333$.

4.4. Test Procedure

The EUT was setup according to ANSI C63.4: 2014 & ANSI C63.10: 2013 for compliance to FCC 47CFR 15.231 requirements.

The EUT is placed on a turn table which is 0.8 meter above ground. The turn table is rotated 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 is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.4: 2014 on radiated measurement.

The resolution bandwidth below 1GHz setting on the field strength meter is 120 kHz and above 1GHz is 1MHz.

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

Note: When doing emission measurement above 1GHz, the horn antenna will be bended down a little (as horn antenna has the narrow beamwidth) in order to keeping the antenna in the "cone of radiation" of EUT. The 3dB beamwidth is 10~60 degrees for H-plane and 10~90 degrees for E-plane.

4.5. Uncertainty

The measurement uncertainty above 1G is defined as $\pm 3.9\text{ dB}$
below 1G is defined as $\pm 3.8\text{ dB}$

4.6. Test Result

All of the test result shown indicates the worst case, and spectrum analyzer parameters setting as shown below:

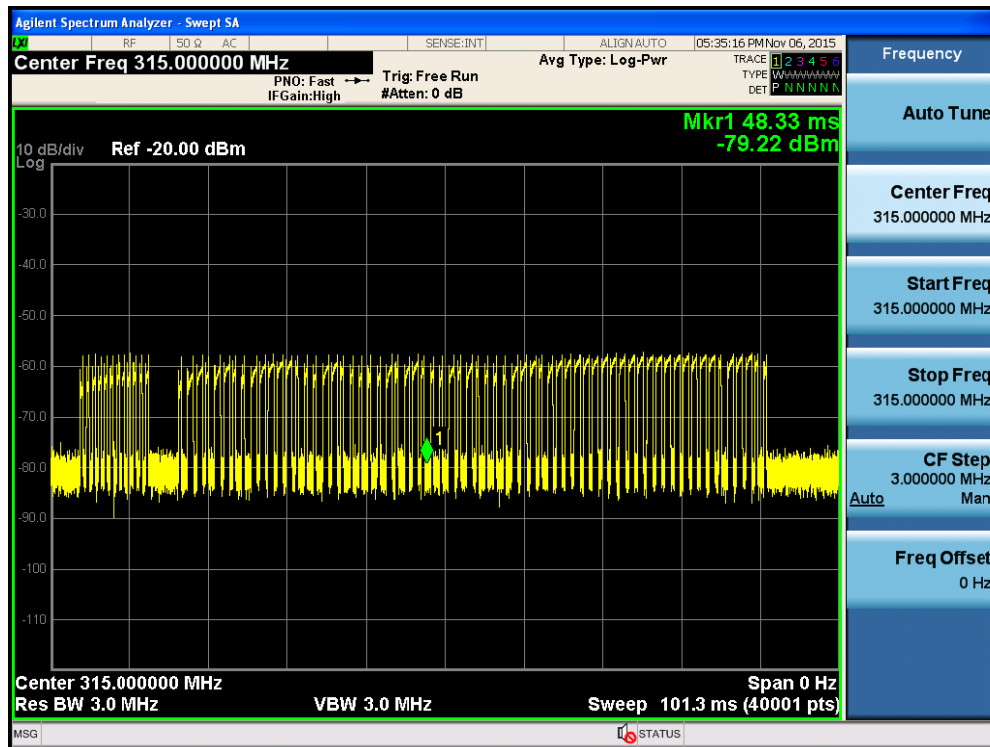
Peak detector: RBW = 1MHz, VBW = 3MHz, sweep time = 100ms;

Average detector: Peak Level – DCCF

For the operating frequency 315MHz, the fundamental emission limit level shall be $41.6667 \times (315) - 7083.3333 \mu\text{V/m} = 75.63 \text{ dB } \mu\text{V/m}$, the harmonics emission limit level shall be $55.63 \text{ dB } \mu\text{V/m}$, based on average detector.

For the DCCF (Duty cycle correction factor)

CHJ-C70K



$$\text{DCCF} = -20 \log(10147/40001) = 11.91 \text{ dB}$$

Note1: The transmission train is hard to mark, so we use the points which are above -40dBm to show transmission train total time. And the points over the whole points is the duty cycle. All key is tested and the worst case is showed above.

2: All keys are tested and showed the worst case above(Key #3).

CHJ-C70K

Mode 1: Transmitter

Antenna	Frequency (MHz)	Reading Level (dBuV/m)	Factor (dB)	Measured Peak Level (dBuV/m)	DCCF (dB)	Measured Averaged Level (dBuV/m)	Limit (dBuV/m)		Over Limit (dB)	
							PK	AV	PK	AV
H	315.06	44.68	24.46	71.61	11.91	59.70	95.63	75.63	-24.02	-15.9
V	315.06	49.02	21.16	75.69	11.91	63.78	95.63	75.63	-19.94	-11.9
H	630.00	36.43	27.13	65.93	11.91	54.02	75.63	55.63	-9.70	-1.6
V	630.00	35.36	29.50	65.27	11.91	53.36	75.63	55.63	-10.36	-2.3
H	945.00	29.84	34.47	64.31	11.91	52.40	75.63	55.63	-11.32	-3.2
V	945.00	31.79	32.50	64.29	11.91	52.38	75.63	55.63	-11.34	-3.3
H	1260.00	83.12	-15.91	67.21	11.91	55.30	75.63	55.63	-8.42	-0.3
V	1260.00	83.24	-15.91	67.33	11.91	55.42	75.63	55.63	-8.30	-0.2
H	1575.00	73.79	-15.02	58.77	11.91	46.86	74.00	54.00	-15.23	-7.1
V	1575.00	71.34	-15.02	56.32	11.91	44.41	74.00	54.00	-17.68	-9.6
H	1890.00	73.83	-12.31	61.52	11.91	49.61	75.63	55.63	-14.11	-6.0
V	1890.00	72.07	-12.31	59.76	11.91	47.85	75.63	55.63	-15.87	-7.8

Note 1: When the harmonic emission falls into the 15.205 restriction band, use 15.209 limits.

Note 2: The radiated emission was verified over X, Y, Z Axis, and found the worst case is Y Axis. Only record the test data of this direction.

Note 3: For below 1GHz, Measure Level = Reading Level + Cable Loss + Antenna Factor; For above 1GHz, Measure Level = Reading Level + Cable Loss + Antenna Factor - Preamplifier Gain.

Note 4: For frequency higher than 1890MHz and other frequency, no significant emission detected.

Test Result	Pass
-------------	------

5. 20dB Bandwidth

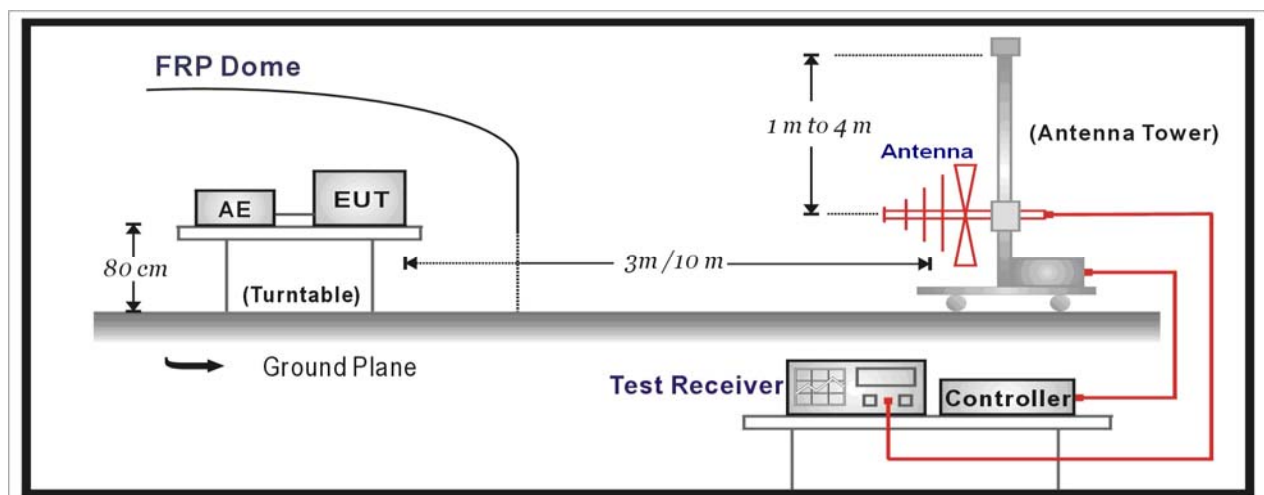
5.1. Test Equipment

20dB Bandwidth / AC-3

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
EMI Test Receiver	R&S	ESCI	100573	2016.03.10
Loop Antenna	R&S	HFH2-Z2	833799/003	2015.11.25
Bilog Antenna	Teseq GmbH	CBL6112D	27611	2016.10.10
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC2-C	2016.02.28
Temperature/Humidity Meter	Zhicheng	ZC1-2	AC2-TH	2016.01.07

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

5.2. Test Setup



5.3. Limit

The 20 dB bandwidth of the emission shall be no wider than 0.25% of the center frequency. Therefore, the 20dB bandwidth of the emission limit shall be $315\text{MHz} \times 0.25\% = 0.7875\text{MHz}$.

5.4. Test Procedure

The EUT was tested according to ANSI C63.10: 2013 for compliance to FCC 47CFR 15.231(c) requirements.

Set RBW = 10 kHz, VBW = 30kHz, Span=1MHz, use 20dB bandwidth function to test the result.

5.5. Uncertainty

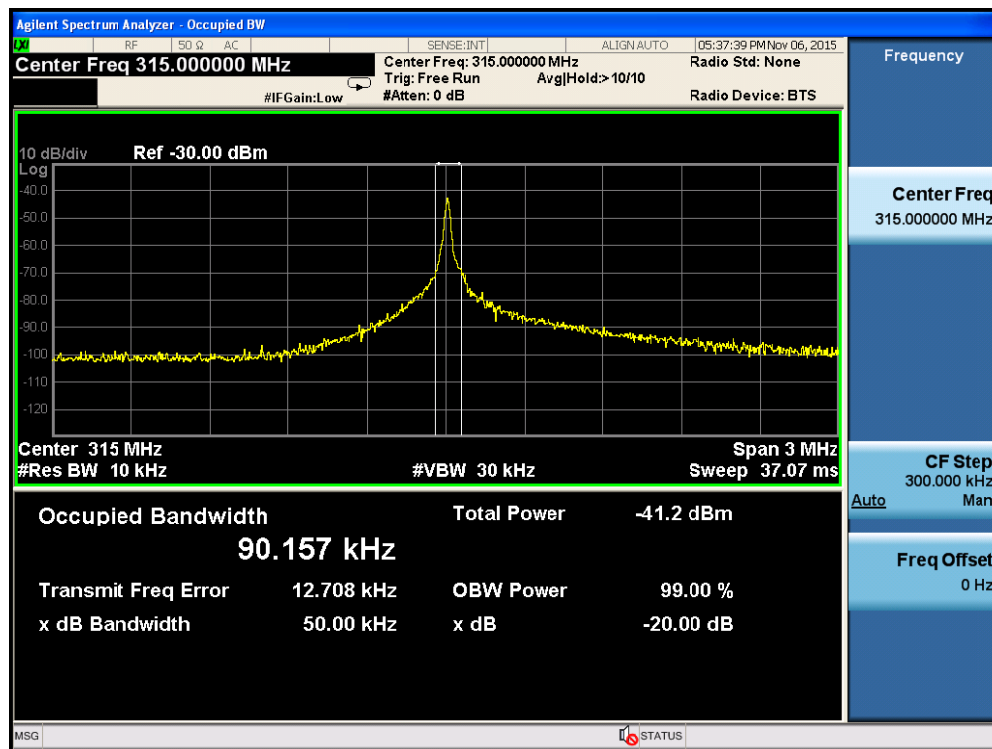
The measurement uncertainty is defined as ± 1 kHz

5.6. Test Result

Product	Remote control key
Test Item	20dB Bandwidth
Test Site	AC-3
Test Mode	Mode 1: Transmit

Frequency (MHz)	20dB Bandwidth (kHz)	Limit (kHz)	99% Bandwidth (kHz)	Result
315	50.00	787.5	90.157	Pass

CHJ-C70K



6. Release Time Measurement

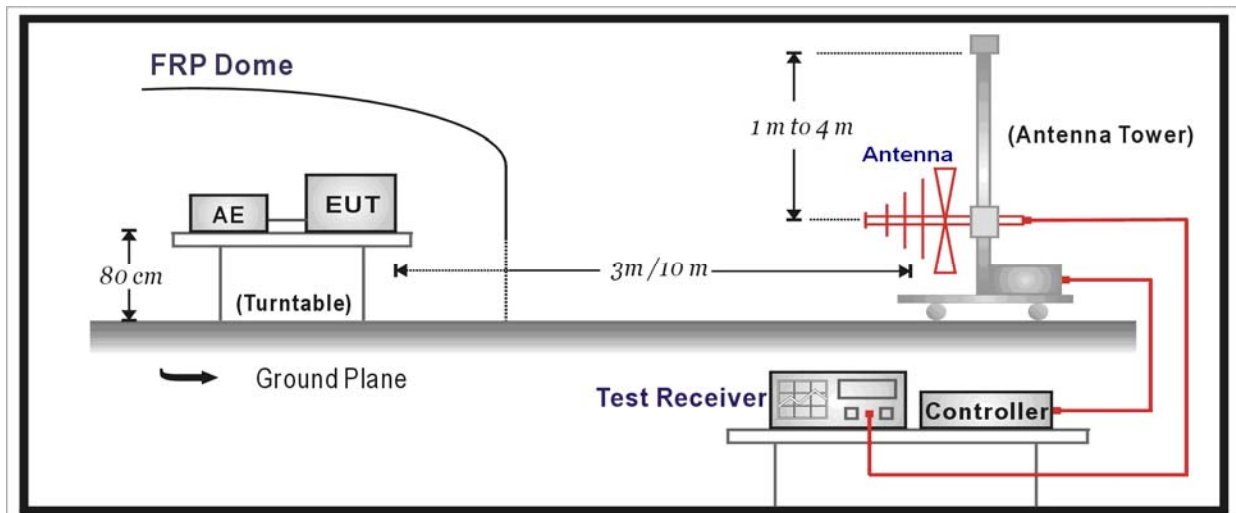
6.1. Test Equipment

20dB Bandwidth / TR-8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
EMI Test Receiver	R&S	ESCI	100573	2016.03.10
Loop Antenna	R&S	HFH2-Z2	833799/003	2015.11.25
Bilog Antenna	Teseq GmbH	CBL6112D	27611	2016.10.10
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC2-C	2016.02.28
Temperature/Humidity Meter	Zhicheng	ZC1-2	AC2-TH	2016.01.07

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

6.2. Test Setup



6.3. Limit

A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

6.4. Test Procedure

The EUT was tested under radiated method. Set the center frequency at the operating frequency and set the span to zero. Set suitable sweep time and capture the transmission after make the switch on. After release the switch record the time plots to check the release time.

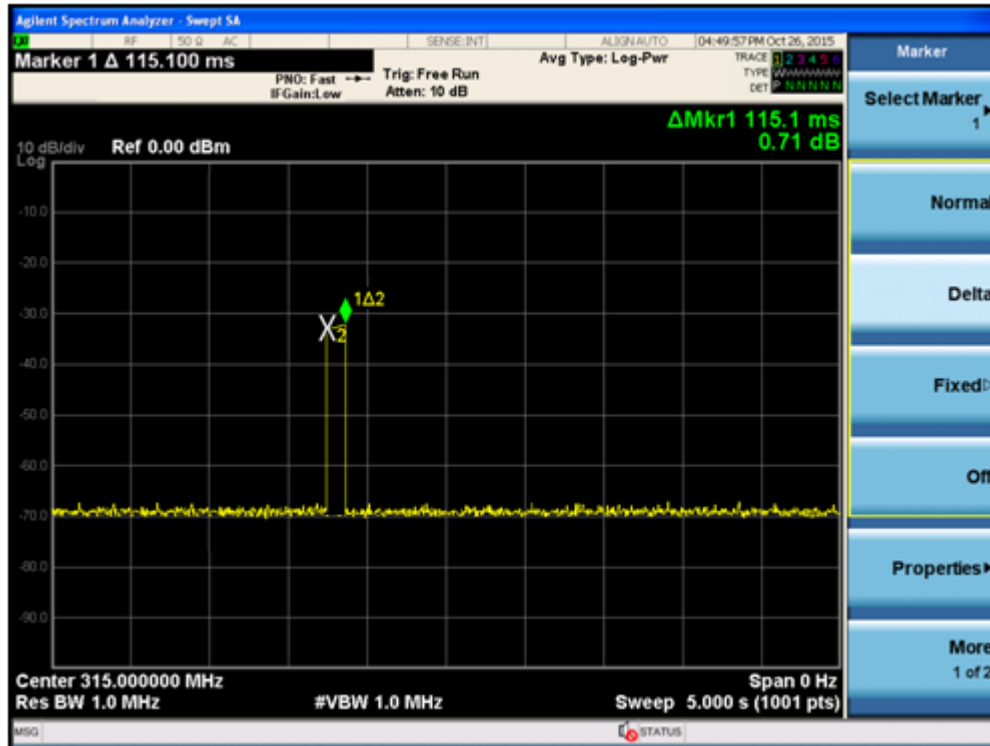
6.5. Uncertainty

The measurement uncertainty is defined as $\pm 0.00005\text{ms}$.

6.6. Test Result

Press on the EUT and then release, and it will be shut down within 345ms, cease transmitting within 5s, so the test result for this item is pass. The release time is marked as Mkr1 and the stop transmitting time is marked as Δ Mkr1.

CHJ-C70K



The End