Dongguan Rainbow Tech Electronic & Plastic Products Co.,Ltd

Application
For
Certification

FCC ID: 2AKV5SPC524A

Receiver

Sample Description: Projection Alarm clock with indoor and outdoor Temperature

Report No.: 161226007SZN-002

Model: SPC524

We hereby certify that the sample of the above item is considered to comply with the requirements of FCC Part 15, mention 47 CFR [10-1-15]

Prepared and Checked by:	Approved by:
Sign on file Sunny Zhou Project Engineer	Digitally signed by Kidd Yang Location: Intertek Testing Services Kidd Yang Senior Project Engineer Date: January 11, 2017

TRF No.: FCC 15C_RX_b

Intertek Testing Services Shenzhen Ltd. Kejiyuan Branch
6F, D Block, Huahan Building, Langshan Road, Nanshan District, Shenzhen, P. R. China
Tel: (86 755) 8601 6288 Fax: (86 755) 8601 6751

LIST OF EXHIBITS

MEASUREMENT/TECHNICAL REPORT

Dongguan Rainbow Tech Electronic & Plastic Products Co.,Ltd
FCC ID: 2AKV5SPC524A

This report concerns (check one:) Original Grant __X__ Class II Change _____

Equipment Type: CYY – Communications Receiver used w/Pt 15 Transmitter

---

Deferred grant requested per 47 CFR 0.457(d)(1)(ii)? Yes_____ No__X__

If yes, defer until: _____
date

Company Name agrees to notify the Commission by: _____
date

of the intended date of announcement of the product so that the grant can be issued on that date.

Transition Rules Request per 15.37? Yes_____ No__X__

If no, assumed Part 15, Subpart B for unintentional radiator - the new 47 CFR [10-1-15 Edition] provision.

Report prepared by:

Sunny Zhou
Intertek Testing Services Shenzhen Ltd.
Kejiyuan Branch
6/F, Block D, HuaHan Building, Longshan Road, Nanshan District, Shenzhen, China.
Phone: (86 755) 8614 0695
Fax: (86 755) 8601 6751

Table of Contents

List of attached file

Exhibit type	File Description	filename
Test Report	Test Report	report.pdf
Test Setup Photo	Radiated Emission	radiated photos.pdf
Test Setup Photo	Conduced Emission	conduced photos.pdf
External Photo	External Photo	external photos.pdf
Internal Photo	Internal Photo	internal photos.pdf
Block Diagram	Block Diagram	block.pdf
Schematics	Circuit Diagram	circuit.pdf
Operation Description	Technical Description	descri.pdf
ID Label/Location	Label Artwork and Location	label.pdf
User Manual	User Manual	manual.pdf
Cover Letter	Letter of Agency	agency.pdf
Cover Letter	Confidentiality Letter	request.pdf

EXHIBIT 1

GENERAL DESCRIPTION

1.0 General Description

1.1 Product Description

The equipment under test (EUT) is a receiver for a Projection Alarm clock with indoor and outdoor Temperature operating at 433.92MHz. The EUT is powered by AC120V, 60Hz or two size "AAA" DC1.5V batteries. For more detailed features description, please refer to the user's manual.

Antenna Type: Integral antenna

For electronic filing, the brief circuit description is saved with filename: descri.pdf.

1.2 Related Submittal(s) Grants

This is a single application for certification of a receiver. The transmitter, associated with this receiver, has FCC ID: 2AKV5SPC524 and has been filed at the same time.

1.3 Test Methodology

Radiated emission measurements were performed according to the procedures in ANSI C63.4 (2014). Radiated Emission measurement was performed in a Semi-anechoic chamber. Preliminary scans were performed in the Semi-anechoic chamber only to determine worst case modes. All Radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the **"Justification Section"** of this Application.

1.4 Test Facility

The Semi-anechoic chamber used to collect the radiated data is **EMTEK (Shenzhen) Co., Ltd.** and located at Bldg. 69, Majialong Industry Zone, Nanshan District, Shenzhen, Guangdong, 518052, China. This test facility and site measurement data have been fully placed on file with the FCC (Registration Number: 406365).

The shield room used to collect the conducted data is **Intertek Testing Services Shenzhen Ltd. Kejiyuan Branch** and located at 6F, Block D,Huahan Building, Langshan Road, Nanshan District, Shenzhen, P. R. China. This test facility and site measurement data have been fully placed on file with the FCC (Registration Number: 242492).

EXHIBIT 2

SYSTEM TEST CONFIGURATION

2.0 System Test Configuration

2.1 Justification

The system was configured for testing in a typical fashion (as a customer would normally use it), and in the confines as outlined in ANSI C63.4 (2014).

The EUT was powered by AC120V, 60Hz during testing.

For maximizing emissions, the EUT was rotated through 360°, the antenna height was varied from 1 meter to 4 meters above the ground plane, and the antenna polarization was changed. The step by step procedure for maximizing emissions led to the data reported in Exhibit 3.0.

The rear of unit shall be flushed with the rear of the table.

The equipment under test (EUT) was configured for testing in a typical fashion (as a customer would normally use it). The EUT was placed on turntable, which enabled the engineer to maximize emissions through its placement in the three orthogonal axes.

2.2 EUT Exercising Software

There was no special software to exercise the device. Once the unit is powered up, it received continuously.

2.3 Special Accessories

N/A

2.4 Equipment Modification

Any modifications installed previous to testing by Dongguan Rainbow Tech Electronic & Plastic Products Co.,Ltd will be incorporated in each production model sold/leased in the United States.

No modifications were installed by Intertek Testing Services Shenzhen Ltd Kejiyuan Branch.

2.5 Measurement Uncertainty

When determining of the test conclusion, the Measurement Uncertainty of test has been considered.

2.6 Support Equipment List and Description

N/A

EXHIBIT 3

EMISSION RESULTS

3.0 **Emission Results**

Data is included of the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included.

3.1 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG

where FS = Field Strength in dBµV/m
RA = Receiver Amplitude (including preamplifier) in dBµV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows:

FS = RR + LF

where FS = Field Strength in dBµV/m
RR = RA - AG in dBµV
LF = CF + AF in dB

Assume a receiver reading of 52.0 dBµV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB are added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dBµV/m. This value in dBµV/m was converted to its corresponding level in µV/m.

RA = 52.0 dBµV/m
AF = 7.4 dB
CF = 1.6 dB
AG = 29.0 dB
FS = RR + LF
FS = 23 + 9 = 32 dBµV/m

RR = 23.0 dBµV
LF = 9.0 dB

Level in µV/m = Common Antilogarithm [(32 dBµV/m)/20] = 39.8 µV/m

3.2 Radiated Emission Configuration Photograph

Worst Case Radiated Emission
at
563.254 MHz

For electronic filing, the worst case radiated emission configuration photographs are saved with filename: radiated photos.doc.

3.3 Radiated Emission Data

The data on the following page lists the significant emission frequencies, the limit and the margin of compliance. Numbers with a minus sign are below the limit.

Judgement: Passed by 12.8 dB

TEST PERSONNEL:

Sunny Zhou, Project Engineer
Typed/Printed Name

December 18, 2016
Date

Applicant: Dongguan Rainbow Tech Electronic & Plastic Products Co.,Ltd
Date of Test: December 18, 2016
Test Mode: Receive

Table 1

FCC Class B Radiated Emissions

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	31.456	25.0	20.0	17.8	22.8	40.0	-17.2
Horizontal	488.210	25.8	20.0	21.7	27.5	46.0	-18.5
Horizontal	563.254	23.4	20.0	29.8	33.2	46.0	-12.8
Vertical	38.232	28.3	20.0	13.0	21.3	40.0	-18.7
Vertical	221.456	39.2	20.0	12.3	31.5	46.0	-14.5
Vertical	456.578	30.3	20.0	20.2	30.5	46.0	-15.5

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	1324.576	42.6	36.8	24.6	30.4	54.0	-23.6
Horizontal	1814.561	39.7	36.8	28.2	31.1	54.0	-22.9

NOTES:
1. Peak Detector Data unless otherwise stated.
2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.
3. Negative sign in the column shows value below limit.
4. All emissions below 1000MHz are below the QP limit and all emissions above 1000MHz are below the average limit.

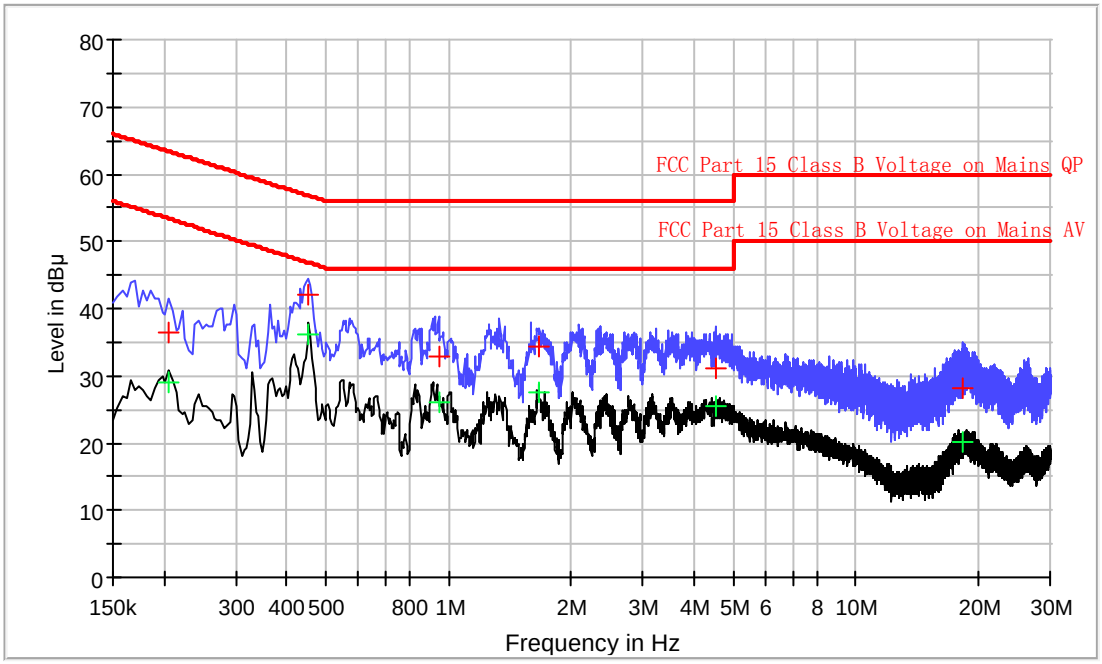
Test Engineer: Sunny Zhou

3.4 Conducted Emission

Worst Case Conducted emission at 0.454MHz is Passed by 10.6dB margin

For electronic filing, the worst case conducted emission configuration photograph is saved with filename: conducted photos.pdf.

Applicant: Dongguan Rainbow Tech Electronic & Plastic Products Co.,Ltd
Date of Test: December 18, 2016
Test Mode: Receive
Line: Live
Conducted Emission Test - FCC



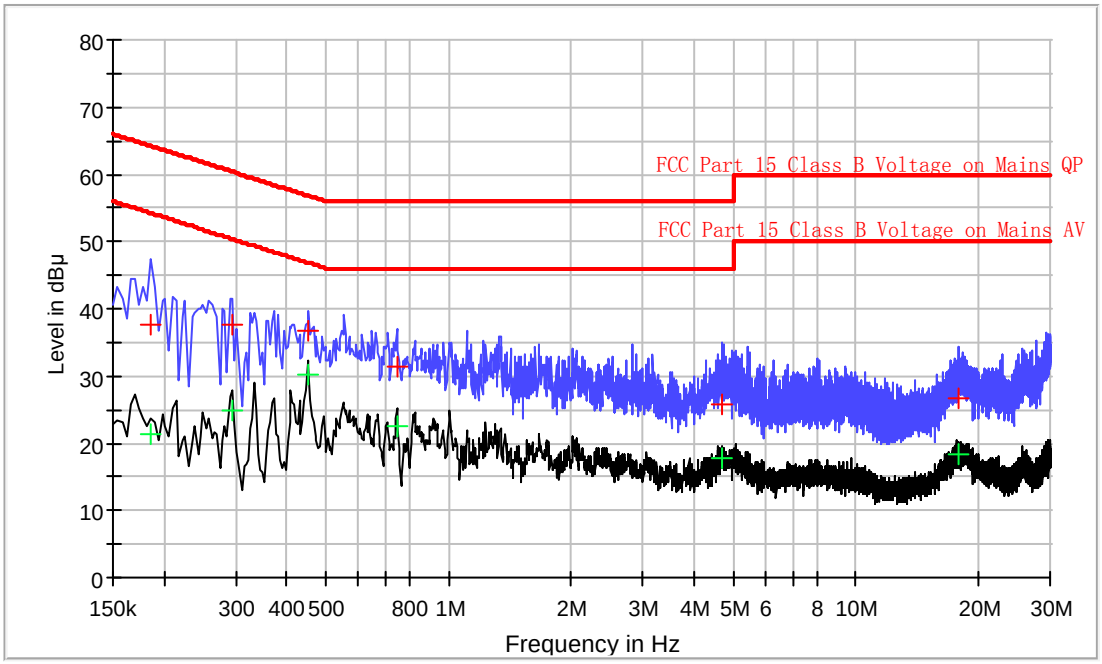
Result Table QP

Frequency (MHz)	QuasiPeak (dB µ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.206	36.5	L1	9.8	26.9	63.4
0.454	42.1	L1	9.8	14.7	56.8
0.946	32.9	L1	9.9	23.1	56.0
1.666	34.3	L1	9.9	21.7	56.0
4.510	31.2	L1	9.8	24.8	56.0
18.338	28.2	L1	9.8	31.8	60.0

Result Table AV

Frequency (MHz)	Average (dB µ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.206	28.9	L1	9.8	24.5	53.4
0.454	36.2	L1	9.8	10.6	46.8
0.946	26.2	L1	9.9	19.8	46.0
1.666	27.7	L1	9.9	18.3	46.0
4.510	25.3	L1	10.0	20.7	46.0
18.338	20.1	L1	10.3	29.9	50.0

Applicant: Dongguan Rainbow Tech Electronic & Plastic Products Co.,Ltd
Date of Test: December 18, 2016
Test Mode: Receive
Line: Neutral
Conducted Emission Test - FCC



Result Table QP

Frequency (MHz)	QuasiPeak (dB µ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.186	37.5	N	10.0	26.7	64.2
0.294	37.6	N	10.1	22.8	60.4
0.450	36.7	N	10.1	20.2	56.9
0.746	31.3	N	10.2	24.7	56.0
4.686	25.9	N	10.3	30.1	56.0
17.974	26.6	N	10.5	33.4	60.0

Result Table AV

Frequency (MHz)	Average (dB µ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.186	21.3	N	10.0	32.9	54.2
0.294	24.8	N	10.1	25.6	50.4
0.450	30.1	N	10.1	16.8	46.9
0.746	22.6	N	10.2	23.4	46.0
4.686	17.6	N	10.3	28.4	46.0
17.974	18.5	N	10.5	31.5	50.0

EXHIBIT 4

EQUIPMENT PHOTOGRAPHS

4.0 **Equipment Photographs**

For electronic filing, the photographs are saved with filename: external photos.doc and internal photos.doc.

EXHIBIT 5

PRODUCT LABELLING

5.0 **Product Labelling**

For electronics filing, the FCC ID label artwork and the label location are saved with filename: label.pdf.

EXHIBIT 6

TECHNICAL SPECIFICATIONS

6.0 **Technical Specifications**

For electronic filing, the block diagram and schematic of the tested EUT are saved with filename: block.pdf and circuit.pdf respectively.

EXHIBIT 7

INSTRUCTION MANUAL

7.0 **Instruction Manual**

For electronic filing, a preliminary copy of the Instruction Manual is saved with filename: manual.pdf.

This manual will be provided to the end-user with each unit sold/leased in the United States.

EXHIBIT 8

MISCELLANEOUS INFORMATION

8.0 Miscellaneous Information

This miscellaneous information includes emission measuring procedure.

8.1 Emissions Test Procedures

The following is a description of the test procedure used by Intertek Testing Services in the measurements of Superheterodyne Receiver operating under Part 15, Subpart B rules.

The test set-up and procedures described below are designed to meet the requirements of ANSI C63.4 – 2014.

The Superheterodyne Receiver equipment under test (EUT) is placed on a styrene turntable which is four feet in diameter and approximately 0.8 meter in height above the ground plane. During the radiated emissions test, the turntable is rotated and any cables leaving the EUT are manipulated to find the configuration resulting in maximum emissions. The antenna height and polarization are varied during the testing to search for maximum signal levels. The height of the antenna is varied from one to four meters.

Detector function for radiated emissions are in QP mode from the frequency band 30MHz to 1GHz with RBW setting 120kHz and in PK&AV mode from frequency band 1GHz to 2GHz with RBW setting 1MHz.

For radiated emission, the frequency range scanned is 30MHz to 2GHz.

8.1 Emissions Test Procedures (cont'd)

The EUT is warmed up for 15 minutes prior to the test.

AC power to the unit is varied from 85% to 115% nominal and variation in the fundamental emission field strength is recorded. If battery powered, a new, fully charged battery is used.

Conducted measurements were made as described in ANSI C63.4 - 2014.

The IF bandwidth used for measurement of radiated signal strength was 10 kHz for emission below 30 MHz and 120 kHz for emission from 30 MHz to 1000 MHz. Where pulsed transmissions of short enough pulse duration warrant, a greater bandwidth is selected according to the recommendations of Hewlett Packard Application Note 150-2. Above 1000 MHz, a resolution bandwidth of 1 MHz is used

Receiver measurements are normally conducted at a measurement distance of three meters. However, to assure low enough noise floor in the restricted bands and above 1 GHz, signals are acquired at a distance of one meter or less. All measurements are extrapolated to three meters using inverse scaling, but those measurements taken at a closer distance are so marked.

EXHIBIT 9

TEST EQUIPMENT LIST

9.0 Test Equipment List

Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Due Date
EMI Receiver	R&S	ESU	1302.6005.26	28-May-2016	28-May-2017
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170399	28-May-2016	28-May-2017
Active Loop Antenna	ARA	PLA-1030/B	1029	28-May-2016	28-May-2017
Bilog Antenna	Schwarzbeck	VULB9163	142	28-May-2016	28-May-2017
Spectrum Analyzer	R&S	FSP 30	101148	28-May-2016	28-May-2017
Spectrum Analyzer	R&S	FSV 40	101506	28-May-2016	28-May-2017
Preamplifier	HP	8447D	2944A07999	28-May-2016	28-May-2017
RF Cable	Schwarzbeck	AK9513	ACRX1	28-May-2016	28-May-2017
RF Cable	Schwarzbeck	AK9513	ACRX2	28-May-2016	28-May-2017
RF Cable	Schwarzbeck	AK9513	ACRX3	28-May-2016	28-May-2017
Notch Filter	Micro-Tronics	BRM50702-02	--	28-May-2016	28-May-2017
EMI Test Receiver	R&S	ESCI	100692	1-Nov-2016	1-Nov-2017
Two-Line V-Network	R&S	ENV216	100073	1-Jul-2016	1-Jul-2017
Shielding Room	ETS	RFD-100	4100	17-Aug-2016	17-Aug-2018