



Gillyboo Corporation
Application
For
Certification
FCC ID: 2AFCYQC14012
Transmitter

Sample Description: Wireless electronic basketball with LED screen
Model: NBA25
Additional Models: QC14012, FS25, RW25

Report No.: SZHH00965404-001

We hereby certify that the sample of the above item is considered to comply with the requirements of FCC Part 15, Subpart C for Intentional Radiator, mention 47 CFR [10-1-13]

Prepared and Checked by:

Approved by:

Sign on file

Jimmy Wen
Senior Engineer

Andy Yan
Senior Project Engineer
Date: July 17, 2015

- The test results reported in this test report shall refer only to the sample actually tested and shall not refer or be deemed to refer to bulk from which such a sample may be said to have been obtained.
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TRF no.: FCC 15C_TX_b
FCC ID: 2AFCYQC14012

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LIST OF EXHIBITS

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MEASUREMENT/TECHNICAL REPORT

Gillyboo Corporation

FCC ID: 2AFCYQC14012

This report concerns (check one) Original Grant ☒ Class II Change ☐

Equipment Type: DSC - Part 15 Security/Remote Control Transmitter

Deferred grant requested per 47 CFR 0.457(d)(1)(ii)? Yes ☐ No ☒

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 ☒

If no, assumed Part 15, Subpart C for intentional radiator – the new 47 CFR [10-1-13 Edition] provision.

Report prepared by:

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List of attached file

Exhibit type	File Description	filename
Test Report	Test Report	report.pdf
Timing	Timing	Timing.pdf
Operation Description	Technical Description	descri.pdf
Test Setup Photo	Radiated Emission	radiated photos.pdf
Test Report	Bandwidth Plot	bw.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
ID Label/Location	Label Artwork and Location	label.pdf
User Manual	User Manual	manual.pdf
Test Report	Average Factor	af.pdf
Cover Letter	Letter of Agency	agency.pdf
Certification Agreement	Certification Agreement	agreement.pdf



EXHIBIT 1

GENERAL DESCRIPTION



1.0 General Description

1.1 Product Description

The equipment under test (EUT) is a transmitter for Wireless electronic basketball with LED screen operating at 315MHz which is operated by a crystal. The EUT was powered by two 1.5V size AAA batteries. For more detailed features description, please refer to the user's manual.

The Models: QC14012, FS25, RW25 are the same as the model: NBA25 in hardware aspect, The difference in model No. and appearance silkscreen for marketing purpose.

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

The time domain features is saved with file name: Timing.pdf

Antenna Type: Integral antenna
Modulation Type: ASK

The brief circuit description is saved with file name: descri.pdf

1.2 Related Submittal(s) Grants

This is an application for certification of a transmitter. The receiver, associated with this transmitter, has FCC ID: 2AFCYNBA25 and has been filed at the same time.

1.3 Test Methodology

Radiated emission measurement was performed according to the procedures in ANSI C63.4 (2009). Radiated emission measurement was performed in semi-anechoic chamber. For radiated emission measurement, preliminary scans were performed in the semi-anechoic chamber only to determine the 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 and shield room used to collect the radiated data and conducted data are **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 (2009).

The EUT was power by two new 1.5V Size AAA batteries 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. This step by step procedure for maximizing emissions led to the data reported in Exhibit 3.0.

The unit was operated standalone and placed in the center of the turntable.

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 a turn table, which enabled the engineer to maximize emissions through its placement in the three orthogonal axes.

The frequency range from 9KHz to 3.15 GHz was searched for spurious emissions from the device. Only those emissions reported were detected. All other emissions were at least 20 dB below the applicable limits.

2.2 EUT Exercising Software

There was no special software to exercise the device.

2.3 Special Accessories

There are no special accessories necessary for compliance of this product.

2.4 Equipment Modification

Any modifications installed previous to testing by Gillyboo Corporation 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 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 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 reading on the Spectrum Analyzer to the factors associated with preamplifiers (if any), antennas, cables, pulse desensitization and average factors (when specified limit is in average and measurements are made with peak detectors). A sample calculation is included below.

$$FS = RA + AF + CF - AG + PD + AV$$

where

- FS = Field Strength in dB μ V/m
- RA = Receiver Amplitude (including preamplifier) in dB μ V
- CF = Cable Attenuation Factor in dB
- AF = Antenna Factor in dB
- AG = Amplifier Gain in dB
- PD = Pulse Desensitization in dB
- AV = Average Factor in -dB

In the radiated emission table which follows, the reading shown on the data table may reflect the preamplifier gain. An example of the calculations, where the reading does not reflect the preamplifier gain, follows:

$$FS = RA + AF + CF - AG + PD + AV$$



3.1 Field Strength Calculation (cont'd)

Example

Assume a receiver reading of 62.0 dB μ V is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted. The pulse desensitization factor of the spectrum analyzer was 0 dB, and the resultant average factor was -10 dB. The net field strength for comparison to the appropriate emission limit is 32 dB μ V/m. This value in dB μ V/m was converted to its corresponding level in μ V/m.

$$RA = 62.0 \text{ dB}\mu\text{V}$$

$$AF = 7.4 \text{ dB}$$

$$CF = 1.6 \text{ dB}$$

$$AG = 29.0 \text{ dB}$$

$$PD = 0 \text{ dB}$$

$$AV = -10 \text{ dB}$$

$$FS = 62 + 7.4 + 1.6 - 29 + 0 + (-10) = 32 \text{ dB}\mu\text{V/m}$$

$$\text{Level in } \mu\text{V/m} = \text{Common Antilogarithm } [(32 \text{ dB}\mu\text{V/m})/20] = 39.8 \mu\text{V/m}$$



3.2 Radiated Emission Configuration Photograph

Worst Case Radiated Emission

315 MHz

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



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 16.5 dB

TEST PERSONNEL:

Jimmy Wen Senior Engineer

Typed/Printed Name

July 13, 2015

Date



Applicant: Gillyboo Corporation
Date of Test: July 13, 2015
Mode: TX Transmit
Sample: 1/1

Table 1

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Average Factor (-dB)	Net at 3m (dBμV/m)	Limit at 3m (dBμV/m)	Margin (dB)
Horizontal	315.000	73.1	20.0	15.6	9.6	59.1	75.6	-16.5
Horizontal	630.000	41.8	20.0	24.0	9.6	36.2	55.6	-19.4
Horizontal	945.000	42.1	20.0	24.5	9.6	37.0	55.6	-18.6
Horizontal	1260.000	38.9	20.0	27.2	9.6	36.5	55.6	-19.1
Horizontal	*1575	37.5	20.0	29.0	9.6	36.9	54.0	-17.1
Horizontal	1890.000	37.4	20.0	29.8	9.6	37.6	55.6	-18.0
Horizontal	*2205	35.0	20.0	31.1	9.6	36.5	54.0	-17.5

Notes: 1. Peak Detector Data unless otherwise stated.

2. All measurements were made at 3 meter. Harmonic emissions not detected at the 3 meter distance 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 value in the margin column shows emission below limit.

4. All emissions below the Average limit.

5. "*" Emission within restricted band fulfils the requirement of section 15.209.

Test Engineer: Jimmy Wen



EXHIBIT 4

EQUIPMENT PHOTOGRAPHS



4.0 **Equipment Photographs**

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



EXHIBIT 5
PRODUCT LABELLING



5.0 **Product Labelling**

For electronic 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 schematics are saved with filename: block.pdf and circuit.pdf



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 details of the measured bandwidth, the test procedure and calculation of factors such as pulse desensitization and averaging factor.



8.1 Measured Bandwidth

For electronic filing, the plot shows the fundamental emission when modulated is saved with filename: bw.pdf. From the plot, the 20dB bandwidth is 0.1563 MHz and less than the limit of 0.7875MHz. It fulfils the requirement of 15.231(C).

Figure 8.1 Bandwidth



8.2 Discussion of Pulse Desensitization

The determination of pulse desensitivity was made in accordance with Hewlett Packard Application Note 150-2, *Spectrum Analysis ... Pulsed RF*.

The effective period (T_{eff}) was approximately 2.174ms for a digital "1" bit, as shown in the plots of Exhibit 8.3. With a resolution bandwidth (3 dB) of 100 kHz, the pulse desensitivity factor was 0 dB.



8.3 Calculation of Average Factor

Averaging factor in dB = $20 \log (\text{duty cycle})$

The specification for output field strengths in accordance with the FCC rules specifies measurements with an average detector. During testing, a spectrum analyzer incorporating a peak detector was used. Therefore, a reduction factor can be applied to the resultant peak signal level and compared to the limit for measurement instrumentation incorporating an average detector.

The time period over which the duty cycle is measured is 100 milliseconds, or the repetition cycle, whichever is a shorter time frame. The worst case (highest percentage on) duty cycle is used for the calculation. The duty cycle is measured by placing the spectrum analyzer in zero scan (receiver mode) and linear mode at maximum bandwidth (3 MHz at 3 dB down) and viewing the resulting time domain signal output from the analyzer on a Tektronix oscilloscope. The oscilloscope is used because of its superior time base and triggering facilities.

A plot of the worst-case duty cycle as detected in this manner are saved with filename: af.pdf

The duty cycle is simply the on-time divided by the period:

The duration of one cycle = 100ms
Effective period of the cycle = $4.348 \times 4 + 5.507 + 6.232 + 2.174 + 1.739$
= 33.044ms

DC = $33.044\text{ms} / 100\text{ms} = 0.33044$ or 33.044%

Therefore, the averaging factor is found by $20 \log_{10} 0.33044 = -9.6 \text{ dB}$



8.4 Emissions Test Procedures

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

The test set-up and procedures described below are designed to meet the requirements of ANSI C63.4 - 2009.

The transmitting equipment under test (EUT) is placed on a wooden turntable which is four feet in diameter and approximately one 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 EUT is adjusted through all three orthogonal axes to obtain maximum emission levels. The antenna height and polarization are varied during the testing to search for maximum signal levels.

Detector function for radiated emissions is in peak mode. Average readings, when required, are taken by measuring the duty cycle of the equipment under test and subtracting the corresponding amount in dB from the measured peak readings. A detailed description for the calculation of the average factor can be found in Exhibit 8.3.

The frequency range scanned is from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or 40 GHz, whichever is lower.



8.4 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.

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 transmissions of short enough pulse duration warrant, a greater bandwidth pulsed is selected according to the recommendations of Hewlett Packard Application Note 150-2. A discussion of whether pulse desensitivity is applicable to this unit is included in this report (See Exhibit 8.2). Above 1000 MHz, a resolution bandwidth of 1 MHz is used.

Transmitter 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 No.	Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Due Date
SZ061-04	BiConiLog Antenna	ETS	3142C	00066460	Oct-19-2014	Oct-19-2015
SZ185-01	EMI Receiver	R&S	ESCI	100547	Feb-7-2015	Feb-7-2016
SZ061-08	Horn Antenna	ETS	3115	00092346	Oct-19-2014	Oct-19-2015
SZ061-06	Active Loop Antenna	Electro-Metrics	EM-6876	217	Apr-7-2014	Oct-7-2015
SZ056-03	Spectrum Analyzer	R&S	FSP 30	101148	Oct-7-2014	Oct-7-2015
SZ181-04	Preamplifier	Agilent	8449B	3008A02474	Feb-7-2015	Feb-7-2016
SZ188-01	Anechoic Chamber	ETS	RFD-F/A-100	4102	Apr-19-2015	Apr-19-2016
SZ062-02	RF Cable	RADIAL	RG 213U	--	Apr-7-2015	Oct-7-2015
SZ062-12	RF Cable	RADIAL	0.04-26.5GHz	--	Apr-7-2015	Oct-7-2015