Zhongshan City Richsound Electronic Industrial Ltd.

Application
For
Certification

FCC ID: Z8M-BF21

TV SOUNDBAR

Model: TB230WW
Additional Model: BF21
Brand Name: RSR, NAKAMICHI
2.4GHz Transmitter

Report No.: 160726039SZN-002

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 [10-1-15]

Prepared and Checked by:

Sign on file

Powell Bao
Engineer

Approved by:

Kidd Yang
Senior Project Engineer
Date: August 15, 2016

TRF No.: FCC 15C_TX_c

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LIST OF EXHIBITS

MEASUREMENT/TECHNICAL REPORT

Zhongshan City Richsound Electronic Industrial Ltd.

Model: TB230WW
Additional Model: BF21

FCC ID: Z8M-BF21

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

Equipment Type: DXX - Part 15 Low Power Communication Device 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 C for intentional radiator – the new 47 CFR [10-1-15 Edition] provision.

Report prepared by:

Powell Bao
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Exhibit type	File Description	Filename
Test Report	Test Report	report.pdf
Test Setup Photo	Radiated Emission	radiated photos.pdf
Test Setup Photo	Conducted Emission	conducted photos.pdf
Test Report	Bandedge Plot	bandedge.pdf
Test Report	20dB BW 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
Operation Description	Technical Description	descri.pdf
ID Label/Location	Label Artwork and Location	label.pdf
User Manual	User Manual	manual.pdf
Cover Letter	Confidentiality Letter	request.pdf
Cover Letter	Letter of Agency	agency.pdf

EXHIBIT 1

GENERAL DESCRIPTION

1.0 General Description

1.1 Product Description

The equipment under test (EUT) is a TV SOUNDBAR with BT 3.0 with EDR function operating in 2402-2480MHz, and 2.4GHz wireless data transmission function operating in 2404.5-2479.5MHz with channel separation 5MHz (number of channel 16). The EUT is powered by AC 120V, 60Hz. The NFC is passive. For more detail information pls. refer to the user manual.

Antenna type of 2.4GHz transmitter: Integral antenna

Modulation Type of 2.4GHz transmitter: FSK

Antenna gain of 2.4GHz transmitter: 0dBi Max

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

The Model: BF21 is the same as the Model: TB230WW in hardware aspect and electrical aspect except that BF21 without coaxial, HDMI ARC, passive NFC function. Pls. refer list as below. The models are difference in packaging and marketing purpose only.

Model / Function	TB230WW	BF21
AUX In	☑	☑
BT	☑	☑
Optical	☑	☑
Coaxial	☑	☒
HDMI ARC	☑	☒
With Wireless subwoofer	☑	☑
Passive NFC	☑	☒

Note: Symbol ☑ indicates with this function;
Symbol ☒ indicates without this function.

1.2 Related Submittal(s) Grants

This is an application for certification of a transceiver for the TV soundbar with wireless subwoofer which has 2.4 GHz wireless data transmission (as a transmitter) function, and Bluetooth function which is filed at the same time, and related report for Bluetooth function is subjected to report: 160726039SZN-001.

1.3 Test Methodology

Both AC mains line-conducted and radiated emission measurements were performed according to the procedures in ANSI C63.10 (2013). Radiated emission measurement was performed in Semi-anechoic chamber and conducted emission measurement was performed in shield room. 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. All other measurements were made in accordance with the procedures in part 2 of CFR 47.

1.4 Test Facility

The Semi-anechoic chamber and shielding room used to collect the radiated data and conducted data are **Intertek Testing Services Shenzhen Ltd. Kejiyuan Branch** and located at 6F, D Block, 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 C63.10 (2013).

The EUT was powered by 120Vac/60Hz during the test.

The simultaneous transmission spurious was tested, only the worst case data was recorded in this report.

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.

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 rear of unit shall be flushed with the rear of the table up to 1GHz and placed in the centre of turntable above 1GHz.

2.2 EUT Exercising Software

The EUT exercise program (provided by client) used during testing was designed to exercise the various system components in a manner similar to a typical use.

2.3 Special Accessories

No special accessory attached.

2.4 Equipment Modification

Any modifications installed previous to testing by Zhongshan City Richsound Electronic Industrial 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 the test conclusion, the Measurement Uncertainty of test has been considered.

2.6 Support Equipment List and Description

Description	Manufacturer	Model No.
iPod x2	Apple	A1446, A1421
USB Disk	TOSHIBA	UHYBS-004G-BL
Detached AC power cord	Richsound	Unshielded, Length 150cm
Audio In Cable x 2	Richsound	Unshielded, Length 100cm
Optical Cable with load	N/A	Unshielded, Length 100cm
Coaxial Cable	N/A	Unshielded, Length 120cm
Remote control	Richsound	N/A
Dummy Load	N/A	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).

3.1 Radiated Test Results

A sample calculation, configuration photographs and data tables of the emissions are included.

3.1.1 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

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
PD = Pulse Desensitization 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

Assume a receiver reading of 62.0 dBµV 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 dBµV/m. This value in dBµV/m was converted to its corresponding level in µV/m.

RA = 62.0 dBµV
AF = 7.4 dB
CF = 1.6 dB
AG = 29.0 dB
PD = 0 dB
FS = 62 + 7.4 + 1.6 - 29 + 0 = 42 dBµV/m

Level in µV/m = Common Antilogarithm [(42 dBµV/m)/20] = 125.9 µV/m

3.1.2 Radiated Emission Configuration Photograph

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

3.1.3 Radiated Emissions

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. Simultaneous transmission was considered.

Worst Case Radiated Emission
at
160.950 MHz

Judgement: Passed by 8.7 dB

TEST PERSONNEL:

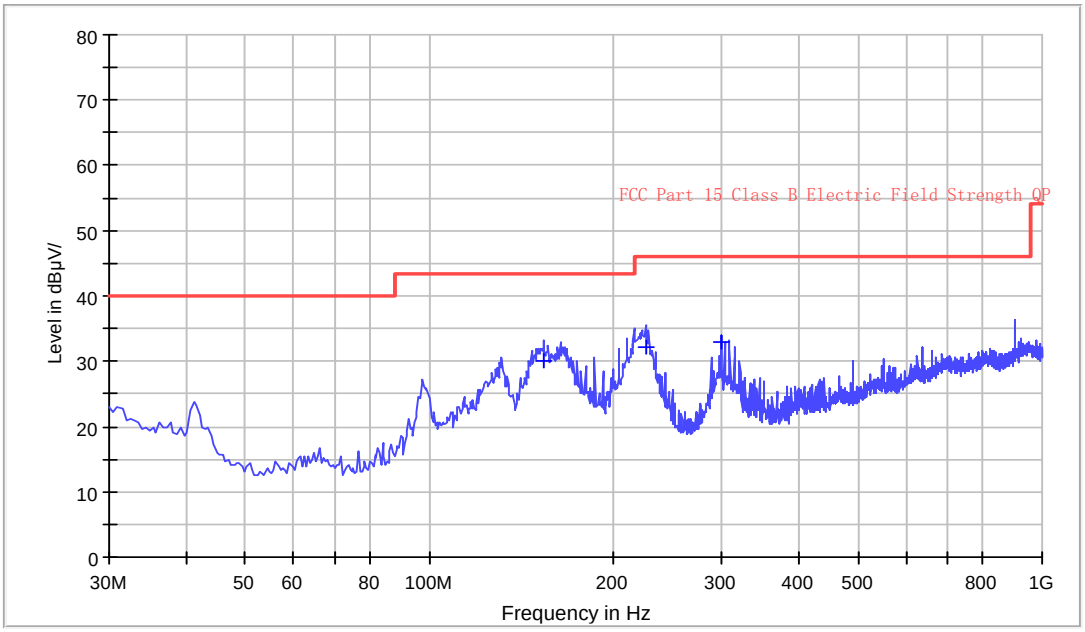
Sign on file

Powell Bao, Engineer
Typed/Printed Name

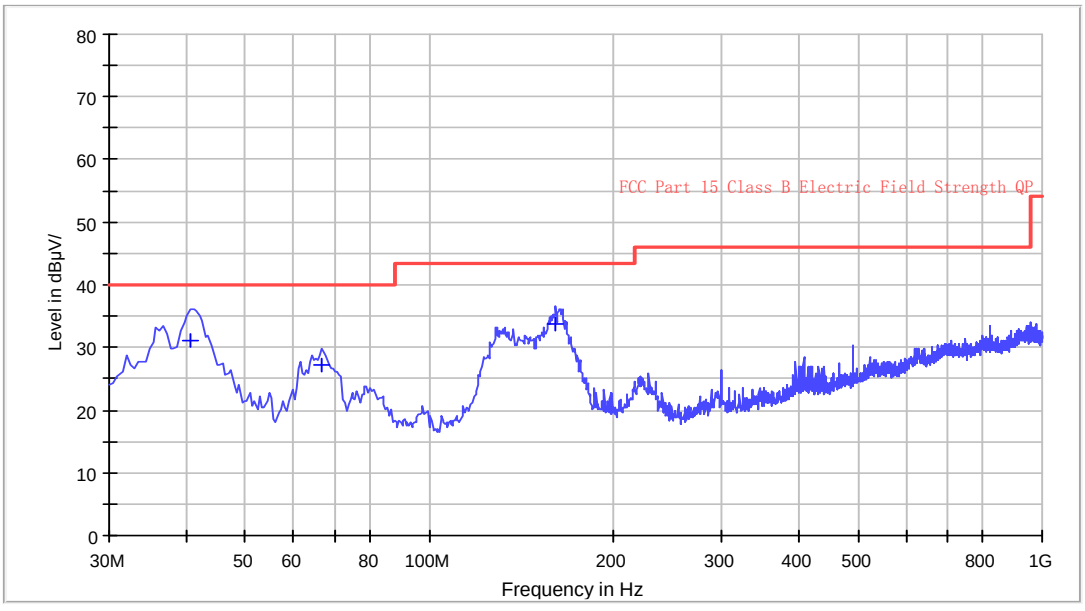
August 8, 2016
Date

Applicant: Zhongshan City Richsound Electronic Industrial Ltd. Date of Test: August 8, 2016
Model: TB230WW
Sample: 1/1
Worst Case Operating Mode: BT Link and 2.4GHz transmitter transmitting

ANT Polarity: Horizontal



ANT Polarity: Vertical



Applicant: Zhongshan City Richsound Electronic Industrial Ltd. Date of Test: August 8, 2016
Model: TB230WW
Sample: 1/1
Worst Case Operating Mode: BT Link and 2.4GHz transmitter transmitting

Table 1

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	153.675	32.4	20.0	17.6	30.0	43.5	-13.5
Horizontal	224.970	34.4	20.0	17.7	32.1	46.0	-13.9
Horizontal	300.145	40.9	20.0	12.1	33.0	46.0	-13.0
Vertical	40.670	41.6	20.0	9.6	31.2	40.0	-8.8
Vertical	66.860	39.9	20.0	7.3	27.2	40.0	-12.8
Vertical	160.950	44.1	20.0	10.7	34.8	43.5	-8.7

NOTES: 1. Quasi-Peak detector is used except for others 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 value in the margin column shows emission below limit.

4. All emissions are below the QP limit.

3.1.4 Transmitter Spurious Emissions (Radiated)

Worst Case Radiated Emission
at
7318.500 MHz

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

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 10.3 dB

TEST PERSONNEL:

Sign on file

Powell Bao, Engineer
Typed/Printed Name

August 8, 2016
Date

Applicant: Zhongshan City Richsound Electronic Industrial Ltd. Date of Test: August 8, 2016
Model: TB230WW
Sample: 1/1
Worst Case Operating Mode: Transmitting

Table 2

Radiated Emissions

(2404.5MHz)

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	2404.500	105.0	36.7	28.5	96.8	114.0	-17.2
Horizontal	4809.000	58.8	36.7	28.5	50.6	74.0	-23.4
Horizontal	7213.500	59.7	36.1	33.1	56.7	74.0	-17.3

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	2404.500	73.3	36.7	28.5	65.1	94.0	-28.9
Horizontal	4809.000	44.5	36.7	28.5	36.3	54.0	-17.7
Horizontal	7213.500	44.9	36.1	33.1	41.9	54.0	-12.1

Notes: 1. Peak Detector is used for the emission measurement (RBW=1MHz / VBW=3MHz for Peak value, and RBW=1MHz / VBW=10Hz for Average value; RBW=3MHz is used for fundamental emission measurement).

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. Horn antenna is used for the emission over 1000MHz.

Test Engineer: Powell Bao

Applicant: Zhongshan City Richsound Electronic Industrial Ltd. Date of Test: August 8, 2016
Model: TB230WW
Sample: 1/1
Worst Case Operating Mode: Transmitting

Table 3

Radiated Emissions

(2439.5MHz)

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Vertical	2439.500	102.6	36.7	28.5	94.4	114.0	-19.6
Vertical	4879.000	59.0	36.7	28.5	50.8	74.0	-23.2
Vertical	7318.500	59.1	36.1	33.1	56.1	74.0	-17.9

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)
Vertical	2439.500	73.8	36.7	28.5	65.6	94.0	-28.4
Vertical	4879.000	44.4	36.7	28.5	36.2	54.0	-17.8
Vertical	7318.500	46.7	36.1	33.1	43.7	54.0	-10.3

Notes: 1. Peak Detector is used for the emission measurement (RBW=1MHz / VBW=3MHz for Peak value, and RBW=1MHz / VBW=10Hz for Average value; RBW=3MHz is used for fundamental emission measurement).

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. Horn antenna is used for the emission over 1000MHz.

Test Engineer: Powell Bao

Applicant: Zhongshan City Richsound Electronic Industrial Ltd. Date of Test: August 8, 2016
Model: TB230WW
Sample: 1/1
Worst Case Operating Mode: Transmitting

Table 4

Radiated Emissions

(2479.5MHz)

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Limit at 3m (dBµV/m)	Margin (dB)
Vertical	2479.500	102.1	36.7	28.6	94.0	114.0	-20.0
Vertical	4959.000	58.8	36.7	28.6	50.7	74.0	-23.3
Vertical	7438.500	59.7	36.1	33.4	57.0	74.0	-17.0

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)
Vertical	2479.500	75.0	36.7	28.6	66.9	94.0	-27.1
Vertical	4959.000	44.1	36.7	28.6	36.0	54.0	-18.0
Vertical	7438.500	45.8	36.1	33.4	43.1	54.0	-10.9

Notes: 1. Peak Detector is used for the emission measurement (RBW=1MHz / VBW=3MHz for Peak value, and RBW=1MHz / VBW=10Hz for Average value; RBW=3MHz is used for fundamental emission measurement).

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. Horn antenna is used for the emission over 1000MHz.

Test Engineer: Powell Bao

3.2 Conducted Emission at Mains Terminal

3.2.1 Conducted Emissions Configuration Photograph

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

3.2.2 Conducted Emissions

Worst Case Live-Conducted Configuration
At

0.374 MHz

Judgement: Passed by 17.1 dB margin

TEST PERSONNEL:

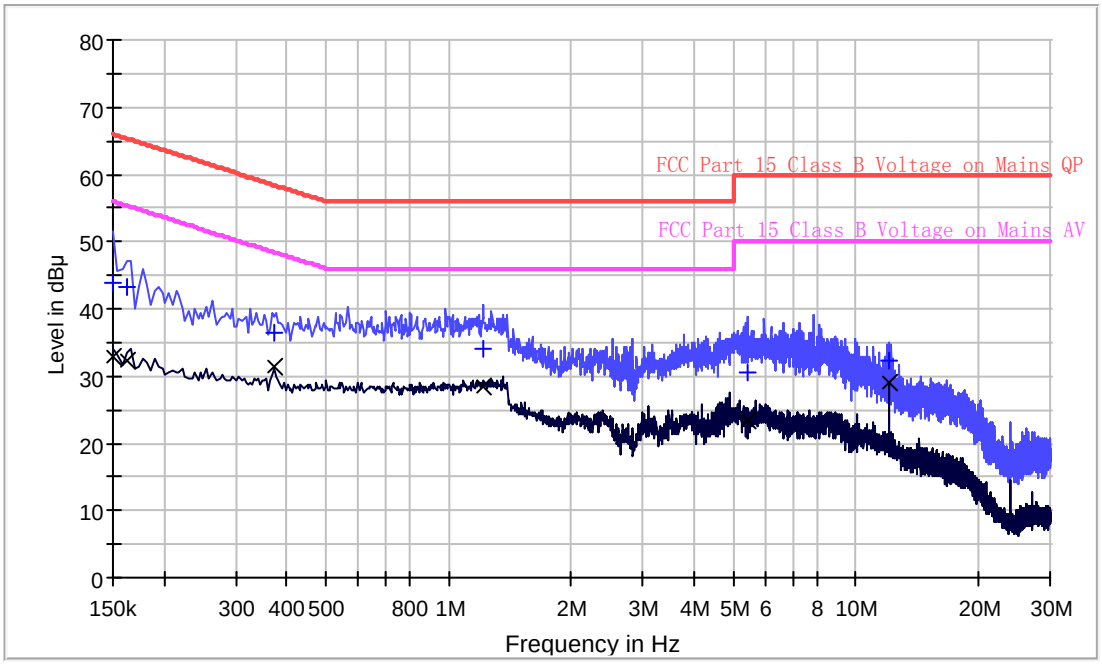
Sign on file

Powell Bao, Engineer
Typed/Printed Name

August 8, 2016
Date

Applicant: Zhongshan City Richsound Electronic Industrial Ltd. Date of Test: August 8, 2016
Model: TB230WW
Sample: 1/1
Worst Case Operating Mode: BT Link and 2.4GHz transmitter transmitting
Phase: Live

Conducted Emission Test - FCC



Result Table QP

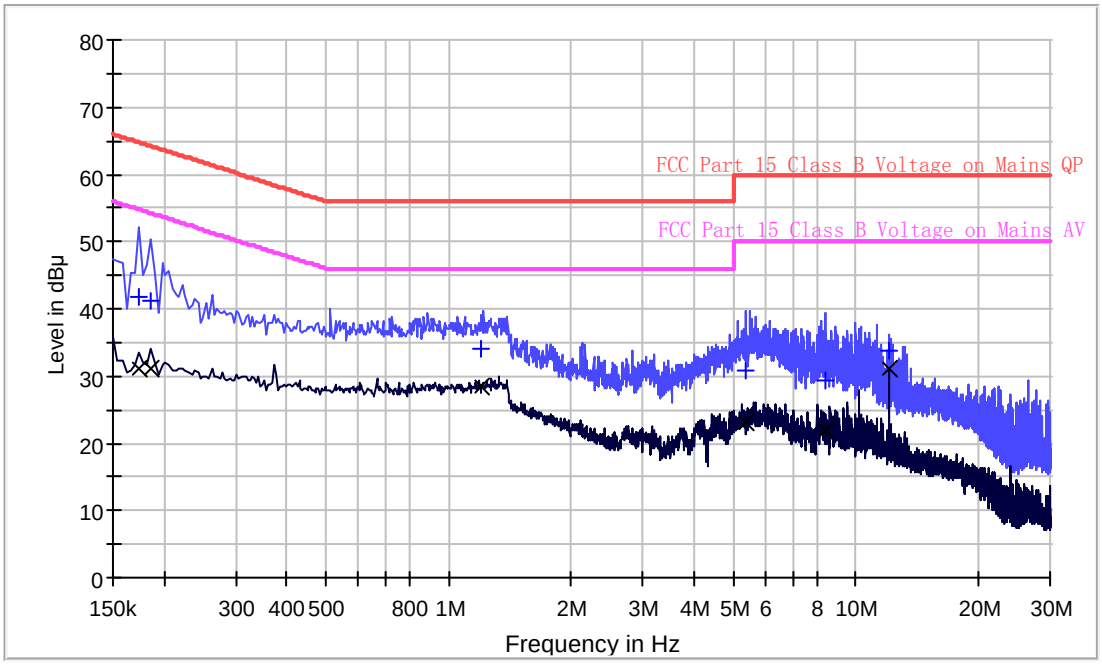
Frequency (MHz)	QuasiPeak (dB µ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.150	43.8	L1	9.5	22.2	66.0
0.162	43.2	L1	9.5	22.2	65.4
0.374	36.4	L1	9.6	22.0	58.4
1.218	34.0	L1	9.6	22.0	56.0
5.422	30.4	L1	9.7	29.6	60.0
12.010	32.2	L1	9.8	27.8	60.0

Result Table AV

Frequency (MHz)	Average (dB µ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.150	32.8	L1	9.5	23.2	56.0
0.162	32.4	L1	9.5	23.0	55.4
0.374	31.3	L1	9.6	17.1	48.4
1.218	28.4	L1	9.6	17.6	46.0
5.422	23.5	L1	9.7	26.5	50.0
12.010	29.1	L1	9.8	20.9	50.0

Applicant: Zhongshan City Richsound Electronic Industrial Ltd. Date of Test: August 8, 2016
Model: TB230WW
Sample: 1/1
Worst Case Operating Mode: BT Link and 2.4GHz transmitter transmitting
Phase: Neutral

Conducted Emission Test - FCC



Result Table QP

Frequency (MHz)	QuasiPeak (dB µ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.174	41.9	N	9.6	22.9	64.8
0.186	41.2	N	9.6	23.0	64.2
1.206	34.1	N	9.6	21.9	56.0
5.374	31.0	N	9.7	29.0	60.0
8.398	29.3	N	9.7	30.7	60.0
12.010	33.8	N	9.8	26.2	60.0

Result Table AV

Frequency (MHz)	Average (dB µ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.174	31.1	N	9.6	23.7	54.8
0.186	31.2	N	9.6	23.0	54.2
1.206	28.4	N	9.6	17.6	46.0
5.374	23.0	N	9.7	27.0	50.0
8.398	22.0	N	9.7	28.0	50.0
12.010	31.2	N	9.8	18.8	50.0

EXHIBIT 4

EQUIPMENT PHOTOGRAPHS

4.0 Equipment Photographs

For electronic filing, the photographs of the tested EUT are saved with filename: external photos.pdf & 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 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 details of the measured bandedge, the test procedure and calculation of factor such as pulse desensitization.

8.1 Bandedge Plot

For electronic filing, the plot shows the fundamental emission when modulated is saved with filename: bandedge.pdf. From the plot, the field strength of any emissions outside of the specified frequency band are attenuated to the general radiated emission limits in section 15.209. It fulfils the requirement of 15.249(d).

Peak Measurement

Bandedge compliance is determined by applying marker-delta method, i.e (Bandedge Plot).

(i) Lower channel 2404.5MHz:

Peak Resultant field strength = Fundamental emissions (peak value) – delta from the bandedge plot

= 96.8 dBµv/m-47.7dB
= 49.1 dBµv/m

(ii) Upper channel 2479.5MHz:

Peak Resultant field strength = Fundamental emissions (peak value) – delta from the bandedge plot

= 94.0 dBµv/m-45.9 dB
= 48.1 dBµv/m

The resultant field strength meets the general radiated emission limit in section 15.209, which does not exceed 74dBµv/m (Peak Limit) and 54dBµv/m (Average Limit).

8.1 Bandedge Plot (cont'd)

Pursuant to FCC part 15 Section 15.215(c), the 20dB bandwidth of the emission was contained within the frequency band designated (mentioned as above) which the EUT operated. The effects, if any, from frequency sweeping, frequency hopping, other modulation techniques and frequency stability over excepted variations in temperature and supply voltage were considered.

Figure 8.1 Bandwidth

8.2 Discussion of Pulse Desensitization

Pulse desensitivity is not applicable for this device. The EUT was set to transmit continuously. With a resolution bandwidth (3dB) of 1MHz, so the pulse desensitivity factor is 0dB.

8.3 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 C63.10 - 2013.

The transmitting equipment under test (EUT) is placed on a styrene turntable which is four feet in diameter, up to 1GHz 0.8m and above 1GHz 1.5m 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 adjust 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.

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.

Detector function for conducted emissions is in QP & AV mode and IFBW setting is 9 kHz from the frequency band 150 kHz to 30MHz.

8.3 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 are made as described in ANSI C63.10 - 2013.

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 (RBW 3MHz used for fundamental emission).

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.

EXHIBIT9

TEST EQUIPMENT LIST

9.0 Test Equipment List

Equipment No.	Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Due Date
SZ061-12	BiConiLog Antenna	ETS	3142E	00166158	15-Sep-2015	15-Sep-2016
SZ185-01	EMI Receiver	R&S	ESCI	100547	23-Jan-2016	23-Jan-2017
SZ061-08	Horn Antenna	ETS	3115	00092346	17-Oct-2015	17-Oct-2016
SZ061-06	Active Loop Antenna	Electro-Metrics	EM-6876	217	3-Sep-2015	3-Sep-2016
SZ056-03	Spectrum Analyzer	R&S	FSP 30	101148	11-May-2016	11-May-2017
EM031-03	Spectrum Analyzer	R&S	FSV 40	101506	14-Jun-2016	14-Jun-2017
SZ181-04	Preamplifier	Agilent	8449B	3008A02474	6-Jun-2016	6-Jun-2017
SZ188-01	Anechoic Chamber	ETS	RFD-F/A-100	4102	23-Jan-2016	23-Jan-2017
SZ062-02	RF Cable	RADIALL	RG 213U	--	16-Apr-2016	16-Apr-2018
SZ062-05	RF Cable	RADIALL	0.04-26.5GHz	--	27-Jun-16	27-Dec-2016
SZ062-12	RF Cable	RADIALL	0.04-26.5GHz	--	6-Apr-2016	6-Oct-2016
SZ067-04	Notch Filter	Micro-Tronics	BRM50702-02	--	6-Apr-2016	6-Oct-2016
SZ185-02	EMI Test Receiver	R&S	ESCI	100692	23-May-2016	23-May-2017
SZ187-01	Two-Line V-Network	R&S	ENV216	100072	3-Nov-2015	3-Nov-2016
SZ187-02	Two-Line V-Network	R&S	ENV216	100073	3-Nov-2015	3-Nov-2016
SZ188-03	Shielding Room	ETS	RFD-100	4100	1-Jul-2016	1-Jul-2017