

# Zhong Shan City Richsound Electronic Industrial Ltd.

## TEST REPORT

### SCOPE OF WORK

FCC TESTING—HS218, HS218R, AV2103A, AV2103B,  
AV2103C, AV2108F, TS218, TS218R

### REPORT NUMBER

210913028SZN-002

### ISSUE DATE

04 November 2021

### [REVISED DATE]

[-----]

### PAGES

26

### DOCUMENT CONTROL NUMBER

FCC ID 249\_C

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**Zhong Shan City Richsound Electronic Industrial Ltd.**

Application  
For  
Certification

**FCC ID: Z8M-TB218DWWWB****2.1CH Soundbar with Wireless Subwoofer, Wireless Subwoofer****Model: HS218, HS218R, AV2103A, AV2103B, AV2103C, AV2108F, TS218, TS218R****Brand Name: Hisense, TOSHIBA****2.4GHz Transceiver****Report No.: 210913028SZN-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 [10-1-20]

Prepared and Checked by:

Approved by:

*Draven Li*  
*Project Engineer*

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*Peter Kang*  
*Senior Technical Supervisor*  
*Date: 04 November 2021*

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**1.0 Summary of Test Result**

Applicant: Zhong Shan City Richsound Electronic Industrial Ltd.  
Address: No.16, East Shagang Road, Gangkou, Zhongshan, Guangdong, China.  
Manufacturer: Zhong Shan City Richsound Electronic Industrial Ltd.  
Address: No.16, East Shagang Road, Gangkou, Zhongshan, Guangdong, China.

**Model: HS218****FCC ID: Z8M-TB218DWWWB**

Test Specification	Reference	Results
Transmitter Radiated Emission	15.249 &15.209 &15.205	Pass
Conducted Emission	15.207	Pass
Band edge	15.249 &15.209 &15.205	Pass
20dB Bandwidth	15.215(c)	Pass

Note: The EUT uses an Integral Antenna which in accordance to Section 15.203 is considered sufficient to comply with the provisions of this section.

## 2.0 General Description

### 2.1 Product Description

The equipment under test (EUT) is a 2.1CH Soundbar with Wireless Subwoofer, Wireless Subwoofer with Bluetooth FHSS and BLE technology operating in 2402-2480MHz. The EUT is powered by AC 120V, 60Hz. For more detail information pls. refer to the user manual.

Bluetooth Version: 5.2 (BLE)

Antenna Type: Integral antenna

Antenna Gain: 0 dBi max

Modulation Type: GFSK

The Model: HS218R, AV2103A, AV2103B, AV2103C, AV2108F, TS218, TS218R are the same as the Model: HS218 in hardware and electrical aspect. The differences in model number and trademark serves as packaging and marketing purpose only.

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

### 2.2 Related Submittal(s) Grants

This is an application for certification of transceiver for the 2.1CH Soundbar with Wireless Subwoofer, Wireless Subwoofer which has Bluetooth FHSS and BLE technology. FHSS technology was reported in the certification report: 210913028SZN-001. Other digital functions were reported in the verification report: 210913028SZN-003.

### 2.3 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.

### 2.4 Test Facility

The Semi-anechoic chamber and shielding room used to collect the radiated data and conducted data are **Intertek Testing Services Shenzhen Ltd. Longhua Branch** and located at 101, 201, Building B, No. 308 Wuhe Avenue, Zhangkengjing Community, GuanHu Subdistrict, LongHua District, Shenzhen. This test facility and site measurement data have been fully placed on file with File Number: CN1188.

### 3.0 System Test Configuration

#### 3.1 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 AC120V, 60Hz during the test, only the worst data was reported in this report.

For maximizing emissions below 30 MHz, the EUT was rotated through 360°, the centre of the loop antenna was placed 1 meter above the ground, and the antenna polarization was changed. 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 Section 4.

The EUT and transmitting antenna was centered on 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.

#### 3.2 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.

Test Software: EMI Test Tool

#### 3.3 Special Accessories

No special accessories used.

#### 3.4 Equipment Modification

Any modifications installed previous to testing by Zhong Shan 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. Longhua Branch.

### 3.5 Measurement Uncertainty

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

Measurement Uncertainty	Uncertainty
Channel Bandwidth	±3.46%
Spurious emission (Above 18GHz)	±5.3dB
Spurious emission (6GHz to 18GHz)	±5.1dB
Radiated emission (1GHz to 6GHz)	±4.8dB
Radiated emission (Up to 1GHz)	±4.8dB
AC Conducted emission	±3.6 dB
Temperature	±1°C
Humidity	±5%

### 3.6 Support Equipment List and Description

Description	Manufacturer	Model No.
Mobile Phone	SAMSUNG	S7
Test TV	SONY	KDL-24EX520
DVD	SONY	BDP-BX59
USB Memory	SanDisk	SDCZ36-002G-P36
Remote controller	N/A (Provided by Client)	N/A
HDMI Cable	N/A (Provided by Client)	Shielded with ferrite cores, Length 150cm
AC power Cable*2	N/A (Provided by Client)	Unshielded, Length 150cm
Optical Cable	N/A (Provided by Client)	Unshielded, Length 150cm
Coaxial Cable	N/A	Unshielded, Length 150cm
AUX Cable	N/A	Unshielded, Length 100cm



## 4.0 Emission Results

Data is included worst-case configuration (the configuration which resulted in the highest emission levels).

### 4.1 Radiated Test Results

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

#### 4.1.1 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.

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

Where

- FS = Field Strength in dB $\mu$ V/m
- RA = Receiver Amplitude (including preamplifier) in dB $\mu$ V
- CF = Cable Attenuation Factor in dB
- AF = Antenna Factor in dB/m
- 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:

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

Assume a receiver reading of 62.0 dB $\mu$ 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 $\mu$ V/m. This value in dB $\mu$ V/m was converted to its corresponding level in  $\mu$ V/m.

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

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

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

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

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

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

$$FS = 62 + 7.4 + 1.6 - 29 + 0 = 42 \text{ dB}\mu\text{V/m}$$

$$\text{Level in } \mu\text{V/m} = \text{Common Antilogarithm } [(42 \text{ dB}\mu\text{V/m})/20] = 125.9 \mu\text{V/m}$$

#### 4.1.2 Radiated Emission Configuration Photograph

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

#### 4.1.3 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.

Worst Case Radiated Emission  
at  
59.520000 MHz

Judgement: Passed by 5.5 dB

#### **TEST PERSONNEL:**

*Sign on file*

Draven Li, Project Engineer  
*Typed/Printed Name*

23 September 2021  
*Date*

Applicant: Zhong Shan City Richsound Electronic Industrial Ltd.

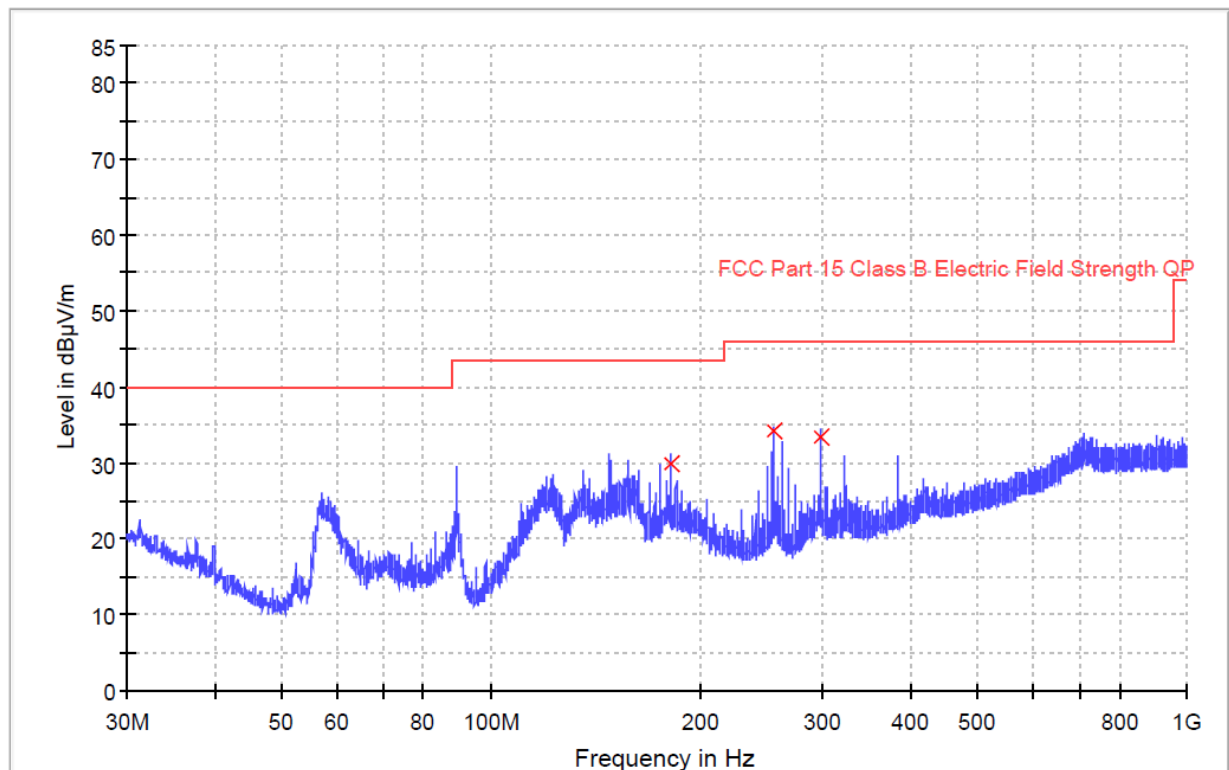
Date of Test: 23 September 2021

Model: HS218

Worst Case Operating Mode:

Simultaneous Transmission

ANT Polarity: Horizontal



Frequency (MHz)	QuasiPeak (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dBuV/m)
181.514000	29.9	1000.0	120.000	100.0	H	17.6	13.6	43.5
255.363333	34.3	1000.0	120.000	100.0	H	20.0	11.7	46.0
296.976333	33.4	1000.0	120.000	100.0	H	20.3	12.6	46.0

Remark:

1. Corr. (dB/m) = Antenna Factor (dB/m) + Cable Loss (dB)
2. QuasiPeak (dBuV/m) = Corr. (dB/m) + Read Level (dBuV)
3. Margin (dB) = Limit Line(dBuV/m) – Level (dBuV/m)

Applicant: Zhong Shan City Richsound Electronic Industrial Ltd.

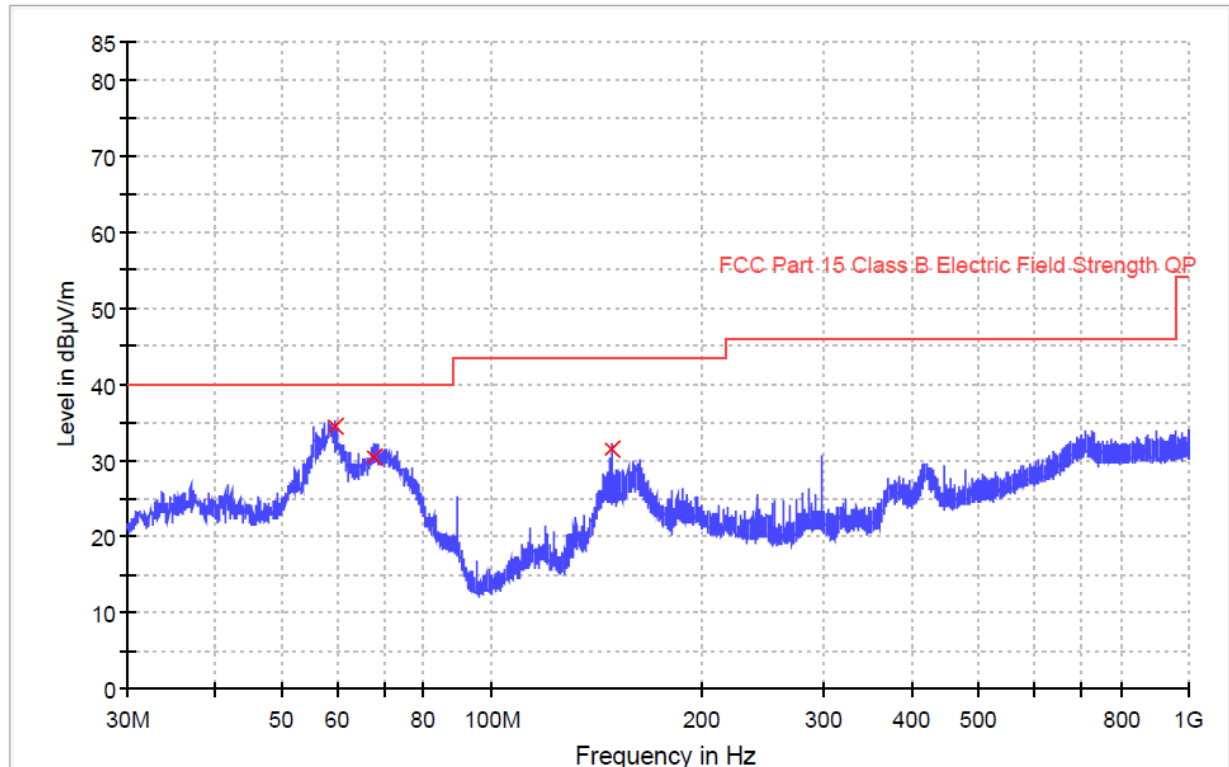
Date of Test: 23 September 2021

Model: HS218

Worst Case Operating Mode:

Simultaneous Transmission

ANT Polarity: Vertical



Frequency (MHz)	QuasiPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dBμV/m)
59.520000	34.5	1000.0	120.000	100.0	V	13.4	5.5	40.0
67.700667	30.3	1000.0	120.000	100.0	V	13.7	9.7	40.0
148.501667	31.4	1000.0	120.000	100.0	V	16.2	12.1	43.5

Remark:

1. Corr. (dB/m) = Antenna Factor (dB/m) + Cable Loss (dB)
2. QuasiPeak (dBμV/m) = Corr. (dB/m) + Read Level (dBμV)
3. Margin (dB) = Limit Line(dBμV/m) – Level (dBμV/m)

## 4.1.4 Transmitter Spurious Emissions (Radiated)

Worst Case Radiated Emission  
at  
2440.000 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 2.8 dB

**TEST PERSONNEL:**

*Sign on file*

Draven Li, Project Engineer  
*Typed/Printed Name*

23 September 2021  
*Date*

Applicant: Zhong Shan City Richsound Electronic Industrial Ltd.

Date of Test: 23 September 2021

Model: HS218

Worst Case Operating Mode:

Transmitting

Table 1

## Radiated Emissions

(2402MHz)

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-Amp Gain (dB)	Antenna Factor (dB/m)	Net at 3m (dBμV/m)	Peak Limit at 3m (dBμV/m)	Margin (dB)
Vertical	2402.000	100.6	36.7	28.1	92.0	114.0	-22.0
Vertical	4804.000	38.7	36.7	35.5	37.5	74.0	-36.5
Vertical	7206.000	43.9	36.1	36.5	44.3	74.0	-29.7
Vertical	9608.000	47.2	36.2	37.0	48.0	74.0	-26.0

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-Amp Gain (dB)	Antenna Factor (dB/m)	Net at 3m (dBμV/m)	Average Limit at 3m (dBμV/m)	Margin (dB)
Vertical	2402.000	99.6	36.7	28.1	91.0	94.0	-3.0
Vertical	4804.000	33.5	36.7	35.5	32.3	54.0	-21.7
Vertical	7206.000	37.2	36.1	36.5	37.6	54.0	-16.4
Vertical	9608.000	42.4	36.2	37.0	43.2	54.0	-10.8

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: Draven Li

Applicant: Zhong Shan City Richsound Electronic Industrial Ltd.

Date of Test: 23 September 2021

Model: HS218

Worst Case Operating Mode:

Transmitting

Table 2

## Radiated Emissions

(2440MHz)

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-Amp Gain (dB)	Antenna Factor (dB/m)	Net at 3m (dBμV/m)	Peak Limit at 3m (dBμV/m)	Margin (dB)
Vertical	2440.000	100.7	36.7	28.1	92.1	114.0	-21.9
Vertical	4880.000	40.0	36.7	35.5	38.8	74.0	-35.2
Vertical	7320.000	43.8	36.1	37.2	44.9	74.0	-29.1
Vertical	9760.000	48.7	36.2	37.0	49.5	74.0	-24.5

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-Amp Gain (dB)	Antenna Factor (dB/m)	Net at 3m (dBμV/m)	Average Limit at 3m (dBμV/m)	Margin (dB)
Vertical	2440.000	99.8	36.7	28.1	91.2	94.0	-2.8
Vertical	4880.000	34.6	36.7	35.5	33.4	54.0	-20.6
Vertical	7320.000	36.8	36.1	37.2	37.9	54.0	-16.1
Vertical	9760.000	43.1	36.2	37.0	43.9	54.0	-10.1

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: Draven Li

Applicant: Zhong Shan City Richsound Electronic Industrial Ltd.

Date of Test: 23 September 2021

Model: HS218

Worst Case Operating Mode:

Transmitting

Table 3

## Radiated Emissions

(2480MHz)

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-Amp Gain (dB)	Antenna Factor (dB/m)	Net at 3m (dBμV/m)	Peak Limit at 3m (dBμV/m)	Margin (dB)
Vertical	2480.000	98.9	36.7	28.1	90.3	114.0	-23.7
Vertical	4960.000	41.2	36.7	35.5	40.0	74.0	-34.0
Vertical	7440.000	43.1	36.1	37.2	44.2	74.0	-29.8
Vertical	9920.000	46.0	36.3	38.9	48.6	74.0	-25.4

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-Amp Gain (dB)	Antenna Factor (dB/m)	Net at 3m (dBμV/m)	Average Limit at 3m (dBμV/m)	Margin (dB)
Vertical	2480.000	97.7	36.7	28.1	89.1	94.0	-4.9
Vertical	4960.000	34.9	36.7	35.5	33.7	54.0	-20.3
Vertical	7440.000	38.9	36.1	37.2	40.0	54.0	-14.0
Vertical	9920.000	40.9	36.3	38.9	43.5	54.0	-10.5

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: Draven Li



#### 4.2 Conducted Emission Configuration Photograph

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

##### 4.2.1 Conducted Emission

Worst Case Conducted Configuration  
at  
0.374000MHz

Judgement: Passed by 10.0dB margin

#### **TEST PERSONNEL:**

*Sign on file*

Draven Li, Project Engineer  
*Typed/Printed Name*

23 September 2021  
*Date*

Applicant: Zhong Shan City Richsound Electronic Industrial Ltd.

Date of Test: 23 September 2021

Model: HS218

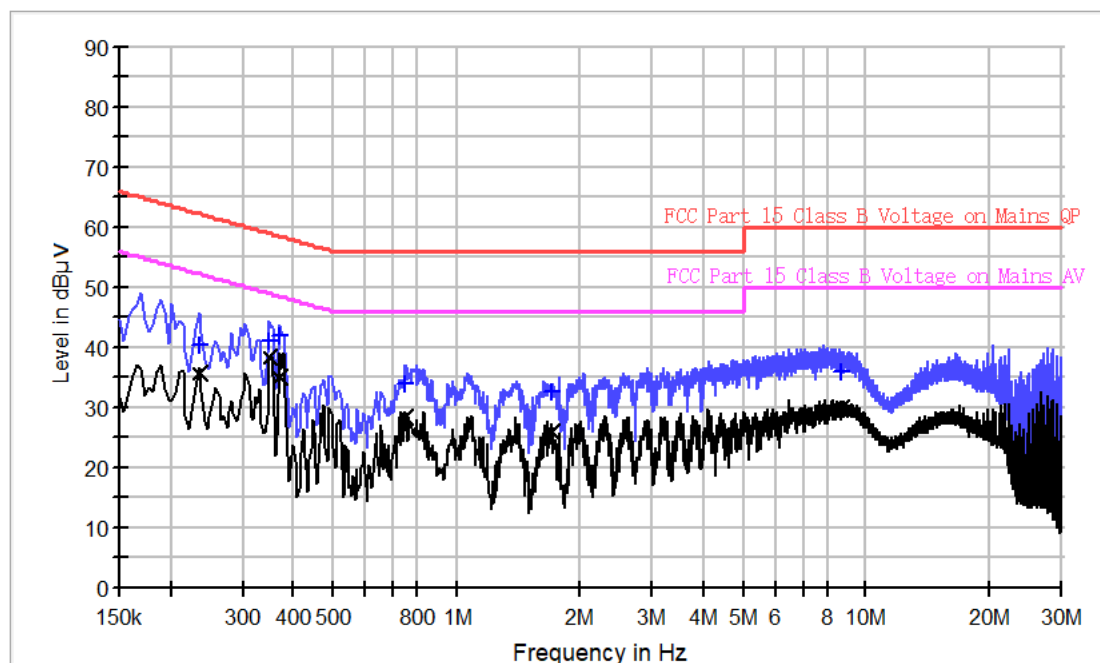
Worst Case Operating Mode: Simultaneous Transmission

Phase: Live

Test Voltage: AC 120V/60Hz

## Graphic / Data Table

### Conducted Emissions Pursuant to FCC 15.207: Emissions Requirement



#### Result Table QP

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.234000	40.2	9.000	L1	9.6	22.1	62.3
0.350000	41.1	9.000	L1	9.6	17.9	59.0
0.370000	42.0	9.000	L1	9.6	16.5	58.5
0.750000	34.1	9.000	L1	9.6	21.9	56.0
1.702000	32.5	9.000	L1	9.6	23.5	56.0
8.702000	35.9	9.000	L1	9.8	24.1	60.0

#### Result Table AV

Frequency (MHz)	Average (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.234000	35.8	9.000	L1	9.6	16.5	52.3
0.350000	38.2	9.000	L1	9.6	10.8	49.0
0.370000	34.9	9.000	L1	9.6	13.6	48.5
0.750000	28.3	9.000	L1	9.6	17.7	46.0
1.702000	25.9	9.000	L1	9.6	20.1	46.0
8.702000	30.0	9.000	L1	9.8	20.0	50.0

Applicant: Zhong Shan City Richsound Electronic Industrial Ltd.

Date of Test: 23 September 2021

Model: HS218

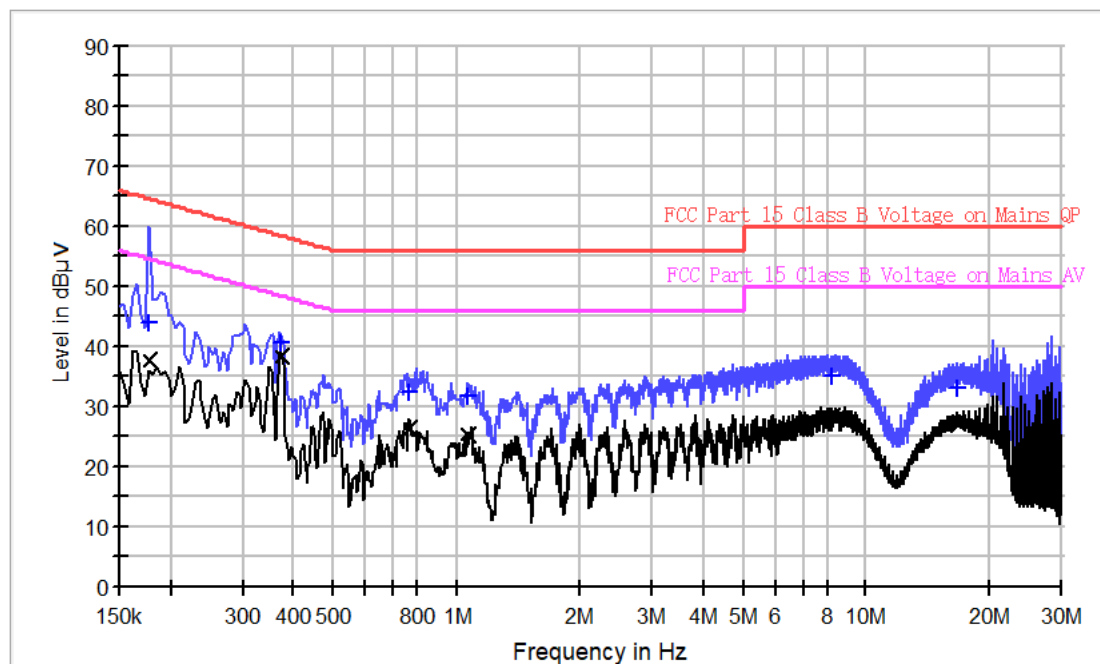
Worst Case Operating Mode: Simultaneous Transmission

Phase: Neutral

Test Voltage: AC 120V/60Hz

## Graphic / Data Table

### Conducted Emissions Pursuant to FCC 15.207: Emissions Requirement



#### Result Table QP

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.178000	44.1	9.000	N	9.5	20.5	64.6
0.374000	40.7	9.000	N	9.5	17.7	58.4
0.770000	32.4	9.000	N	9.5	23.6	56.0
1.066000	31.7	9.000	N	9.5	24.3	56.0
8.242000	34.8	9.000	N	9.6	25.2	60.0
16.674000	33.0	9.000	N	10.2	27.0	60.0

#### Result Table AV

Frequency (MHz)	Average (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.178000	37.6	9.000	N	9.5	17.0	54.6
0.374000	38.4	9.000	N	9.5	10.0	48.4
0.770000	26.3	9.000	N	9.5	19.7	46.0
1.066000	25.3	9.000	N	9.5	20.7	46.0
8.242000	28.3	9.000	N	9.6	21.7	50.0
16.674000	27.4	9.000	N	10.2	22.6	50.0

## 5.0 Equipment Photographs

For electronic filing, the photographs of the tested EUT are saved with filename: external photos.pdf & internal photos.pdf.

## 6.0 Product Labelling

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

## 7.0 Technical Specifications

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

## 8.0 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.

## 9.0 Miscellaneous Information

This miscellaneous information includes details of the measured bandedge, 20dB Bandwidth, the test procedure and calculation of factor such as pulse desensitization.

### 9.1 Bandedge Plot

The test plots are attached as below. From the below plots, 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) Lowest frequency channel (2402MHz):**

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

$$\begin{aligned} &= 92.0 \text{ dB}\mu\text{V/m} - 53.46 \text{ dB} \\ &= 38.54 \text{ dB}\mu\text{V/m} \end{aligned}$$

Average Resultant field strength = Fundamental emissions (average value) – delta from the bandedge plot

$$\begin{aligned} &= 91.0 \text{ dB}\mu\text{V/m} - 53.46 \text{ dB} \\ &= 37.54 \text{ dB}\mu\text{V/m} \end{aligned}$$

#### **(ii) Highest frequency channel (2480MHz):**

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

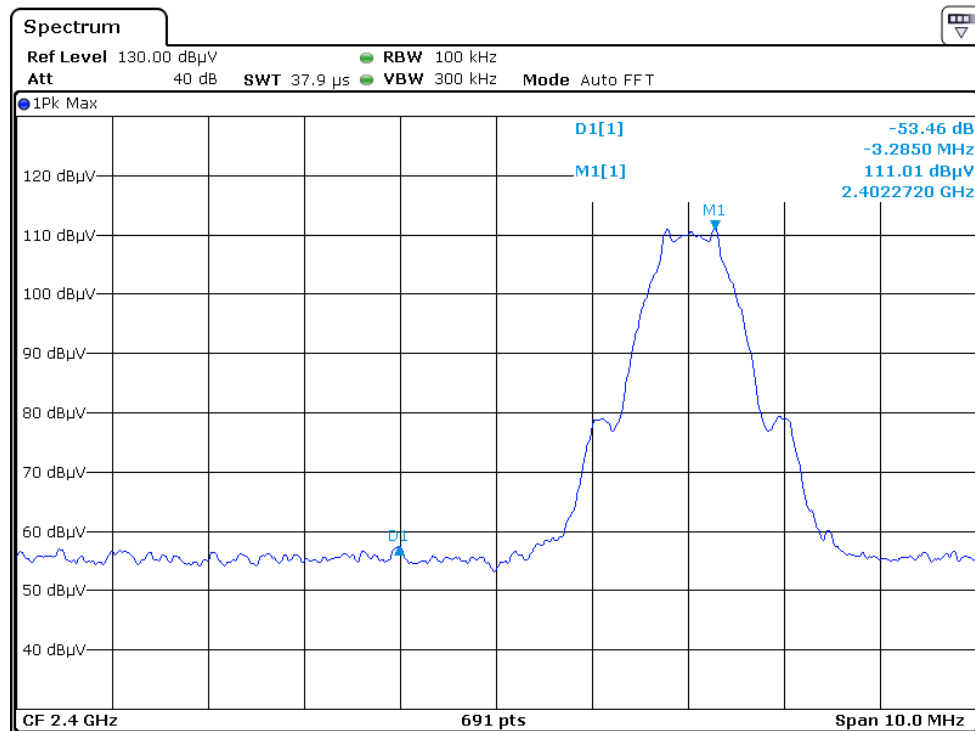
$$\begin{aligned} &= 90.3 \text{ dB}\mu\text{V/m} - 53.75 \text{ dB} \\ &= 36.55 \text{ dB}\mu\text{V/m} \end{aligned}$$

Average Resultant field strength = Fundamental emissions (average value) – delta from the bandedge plot

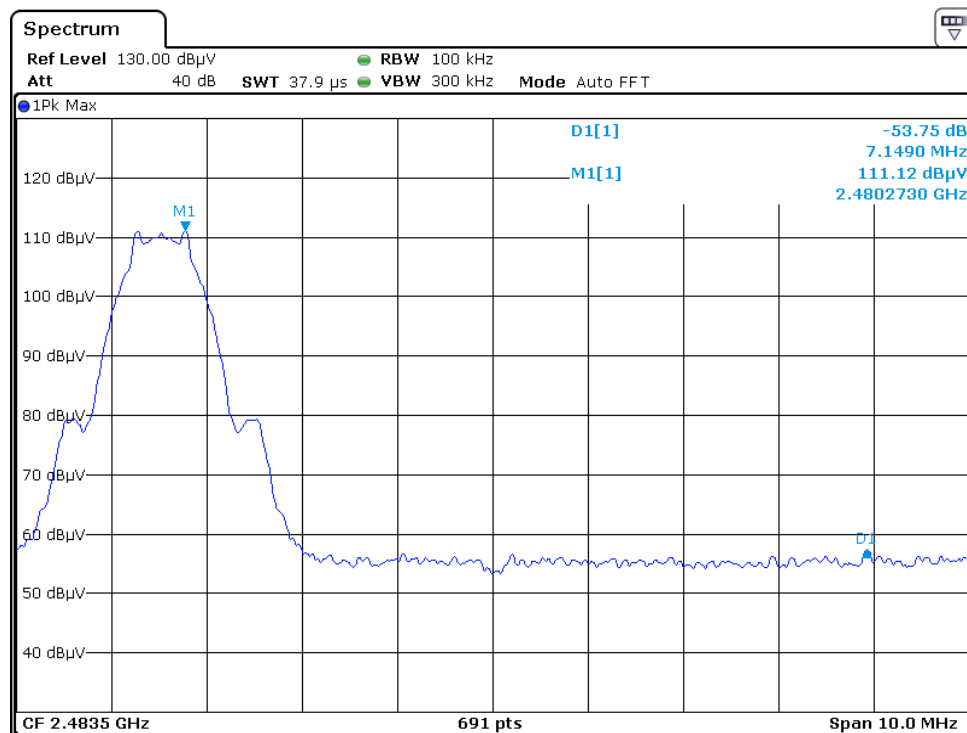
$$\begin{aligned} &= 89.1 \text{ dB}\mu\text{V/m} - 53.75 \text{ dB} \\ &= 35.35 \text{ dB}\mu\text{V/m} \end{aligned}$$

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).

## Lowest frequency Channel

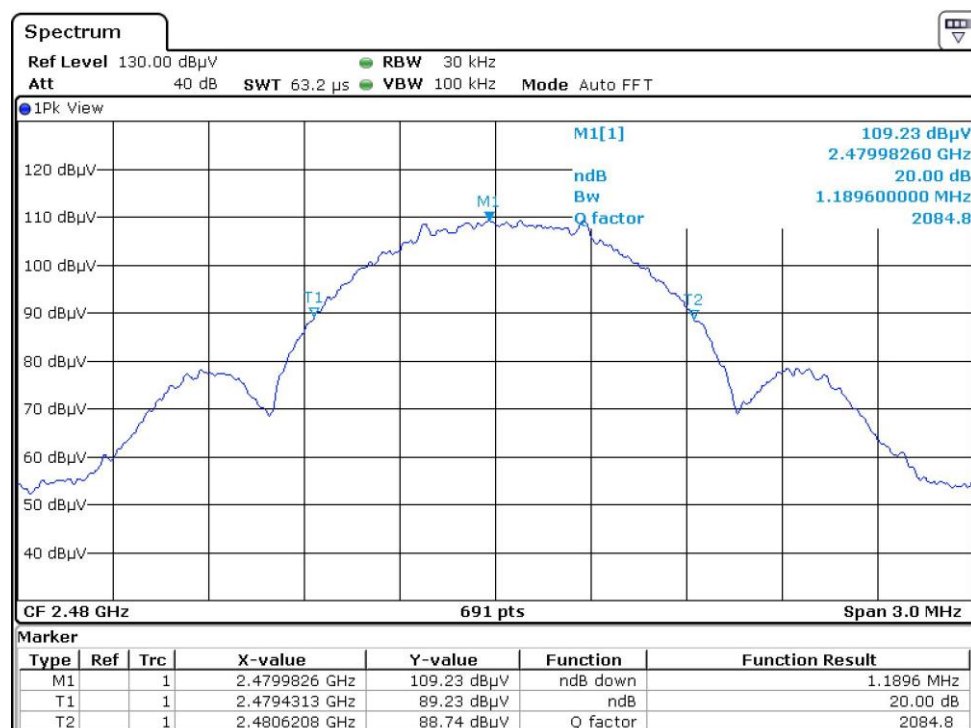
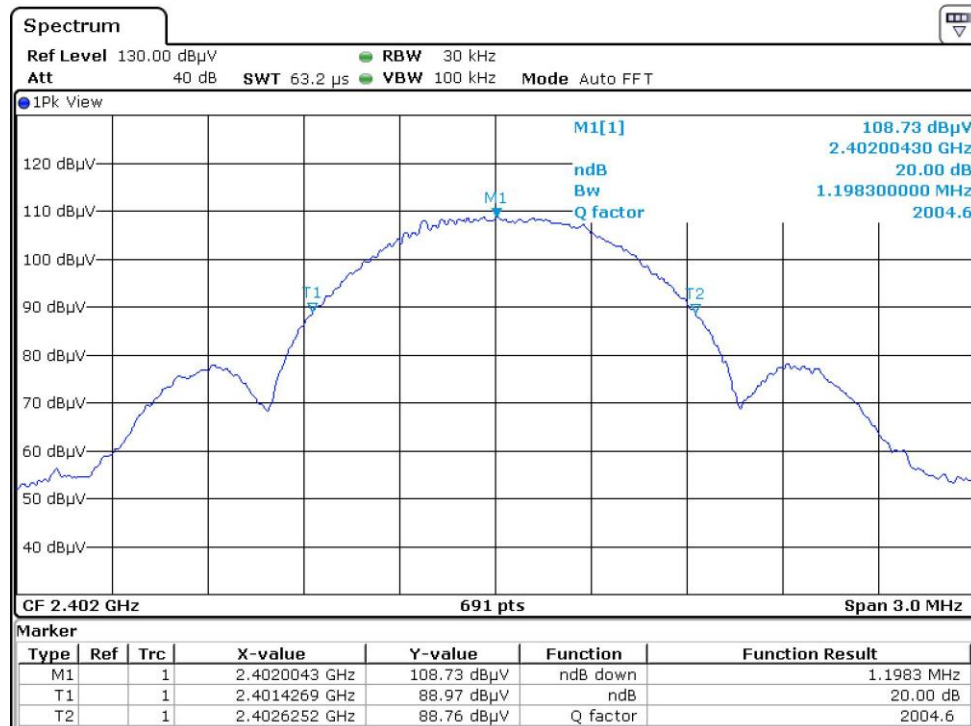


## Highest frequency Channel



## 9.2 20dB bandwidth

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. The test plots are reported as below.



**9.3 Discussion of Pulse Desensitization**

Pulse desensitivity is not applicable for this device since the transmitter transmits the RF signal continuously.

**9.4 Transmitter Duty Cycle Calculation, FCC Rule 15.35(b, c)**

The EUT antenna output port was connected to the input of the spectrum analyzer. The analyzer center frequency was set to EUT RF channel carrier. The SWEP function on the analyzer was set to ZERO SPAN. The Transmitter ON time was determined from the resultant time-amplitude display:

	See attached spectrum analyzer chart (s) for Transmitter timing
	See Transmitter timing diagram provided by manufacturer
x	Not applicable, duty cycle was not used.



## 9.5 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 and approximately 0.8 meter up to 1GHz and 1.5 meter above 1GHz 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. A detailed description for the calculation of the average factor can be found in section 9.4.

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.

## 9.5 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.

## 10.0 Test Equipment List

Equipment No.	Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Due Date
SZ061-12	BiConiLog Antenna	ETS	3142E	00166158	04-Aug-2021	04-Aug-2024
SZ185-01	EMI Receiver	R&S	ESCI	100547	22-Dec-2020	22-Dec-2021
SZ061-08	Horn Antenna	ETS	3115	00092346	05-Sep-2021	05-Sep-2024
SZ061-06	Active Loop Antenna	Electro-Metrics	EM-6876	217	18-May-2021	18-May-2023
SZ056-03	Spectrum Analyzer	R&S	FSP 30	101148	10-May-2021	10-May-2022
SZ056-06	Signal Analyzer	R&S	FSV 40	101101	22-Dec-2020	22-Dec-2021
SZ181-04	Preamplifier	Agilent	8449B	3008A02474	10-May-2021	10-May-2022
SZ188-01	Anechoic Chamber	ETS	RFD-F/A-100	4102	15-Dec-2018	15-Dec-2021
SZ062-23	RF Cable	RADIAL	SF104PE	--	27-Oct-2020	27-Oct-2021
SZ062-35	RF Cable	RADIAL	A50-3.5M3.5M-8M	--	27-Oct-2020	27-Oct-2021
SZ062-30	RF Cable	RADIAL	A50-3.5M3.5M-4.5M	--	27-Oct-2020	27-Oct-2021
SZ062-31	RF Cable	RADIAL	A50-3.5M3.5M-1M		27-Oct-2020	27-Oct-2021
SZ067-04	Notch Filter	Micro-Tronics	BRM50702-02	--	11-May-2021	11-May-2022
SZ185-02	EMI Test Receiver	R&S	ESCI	100692	27-Oct-2020	27-Oct-2021
SZ187-01	Two-Line V-Network	R&S	ENV216	100072	27-Oct-2020	27-Oct-2021
SZ187-02	Two-Line V-Network	R&S	ENV216	100072	12-May-2021	12-May-2022
SZ062-16	RF Cable	HUBER+SUHNER	CBL2-BN-1m	110127-2231000	13-Nov-2020	13-Nov-2021
SZ188-03	Shielding Room	ETS	RFD-100	4100	07-Jan-2020	07-Jan-2023

\*\*\*\*\* End of Report\*\*\*\*\*