

Dongguan Zuoqi Electronic Co.,Ltd

TEST REPORT

SCOPE OF WORK

FCC TESTING—FB-12, FB-13

REPORT NUMBER

220621025SZN-001

ISSUE DATE

[REVISED DATE]

08 July 2022

[-----]

PAGES

27

DOCUMENT CONTROL NUMBER

FCC ID 249_C

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Dongguan Zuoqi Electronic Co.,Ltd

Application
For
Certification

FCC ID: 2ASP5-FB12**Bluetooth Speaker Side Table****Model: FB-12, FB-13****Brand Name: zuoqi, Real Living**

2.4GHz Transceiver

Report No.: 220621025SZN-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 [10-1-20]

Prepared and Checked by:

Approved by:

Draven Li
Project Engineer

Ryan Chen
Project Engineer
Date: 08 July 2022

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MEASUREMENT/TECHNICAL REPORT

This report concerns (check one): Original Grant 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

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 [10-1-20 Edition] provision.

Report prepared by:

Draven Li
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1.0 Summary of Test Result

Applicant: Dongguan Zuoqi Electronic Co.,Ltd

Address: No. 6 Chuang Ye 1st Road, He Lu Village, Huangjiang Town, Dongguan City, Guangdong Province, China

Manufacturer: Dongguan Zuoqi Electronic Co.,Ltd

Address: No. 6 Chuang Ye 1st Road, He Lu Village, Huangjiang Town, Dongguan City, Guangdong Province, China

Model: FB-12

FCC ID: 2ASP5-FB12

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 Bluetooth Speaker Side Table with Bluetooth FHSS technology operating in 2402-2480MHz and Wireless Charger technology operating in 112-205KHz. The EUT is powered by DC 3.7V rechargeable battery which can be charged by adapter with DC 5V/3A, 9V/2A, 12V/1.5A. For more detail information pls. refer to the user manual.

Bluetooth Version: 5.1 (EDR)

Antenna Type: Integral antenna

Antenna Gain: -0.58 dBi max

Modulation Type: GFSK, $\pi/4$ DQPSK, 8-DPSK

The Model: FB-13 is the same as the Model: FB-12 in hardware aspect. The difference in model number serves as marketing strategy.

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 Bluetooth Speaker Side Table which has Bluetooth FHSS technology and Wireless Charger technology. Wireless Charger technology was reported in the certification report: 220621025SZN-002.

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 shield 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 DC 3.7V fully charged battery during the test, all packets DH1, DH3 & DH5 mode in modulation type GFSK, $\pi/4$ -DQPSK and 8-DPSK were tested and 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: FCC Assist 1.0.2.2

3.3 Special Accessories

No special accessories used.

3.4 Equipment Modification

Any modifications installed previous to testing by Dongguan Zuoqi Electronic 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. 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
Type-C cable	N/A (Provided by client)	Unshielded, Length 90cm
AC Adapter	Xiaomi (Provided by Intertek)	Model: MDY-09-EV Input: 100-240V~, 50/60Hz, 1.7A Output: 5V=3A, 9V=2A, 12V=1.5A
Resistor	N/A (Provided by Intertek)	5 Ω

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 $\text{dB}\mu\text{V}/\text{m}$

RA = Receiver Amplitude (including preamplifier) in $\text{dB}\mu\text{V}$

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 $\text{dB}\mu\text{V}$ 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 $\text{dB}\mu\text{V}/\text{m}$. This value in $\text{dB}\mu\text{V}/\text{m}$ was converted to its corresponding level in $\mu\text{V}/\text{m}$.

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

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

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

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

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

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

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

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

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
94.680000 MHz

Judgement: Passed by 3.1 dB

TEST PERSONNEL:

Sign on file

Draven Li, Project Engineer
Typed/Printed Name

22 June 2022

Date

Applicant: Dongguan Zuoqi Electronic Co.,Ltd

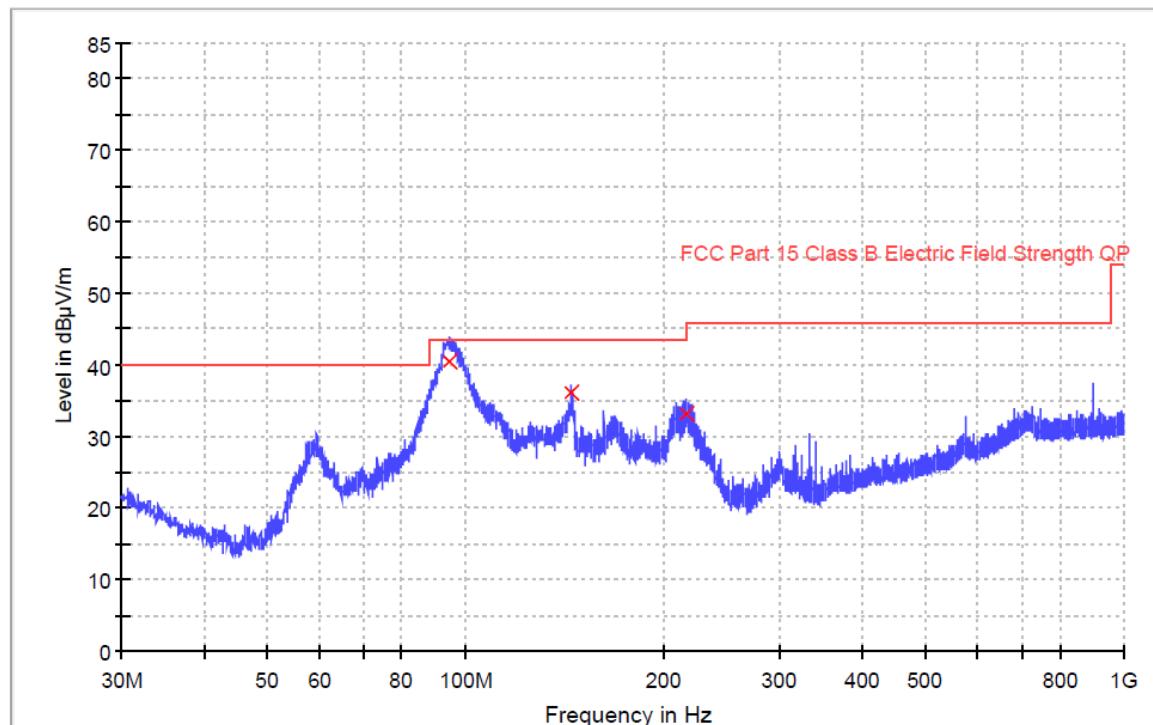
Date of Test: 22 June 2022

Model: FB-12

Worst Case Operating Mode:

Simultaneous Transmission

ANT Polarity: Horizontal



Frequency (MHz)	QuasiPeak (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dB μ V/m)
94.680000	40.4	1000.0	120.000	100.0	H	14.3	3.1	43.5
144.480000	36.2	1000.0	120.000	100.0	H	15.8	7.3	43.5
216.480000	33.1	1000.0	120.000	100.0	H	19.7	12.9	46.0

Remark:

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

Applicant: Dongguan Zuoqi Electronic Co.,Ltd

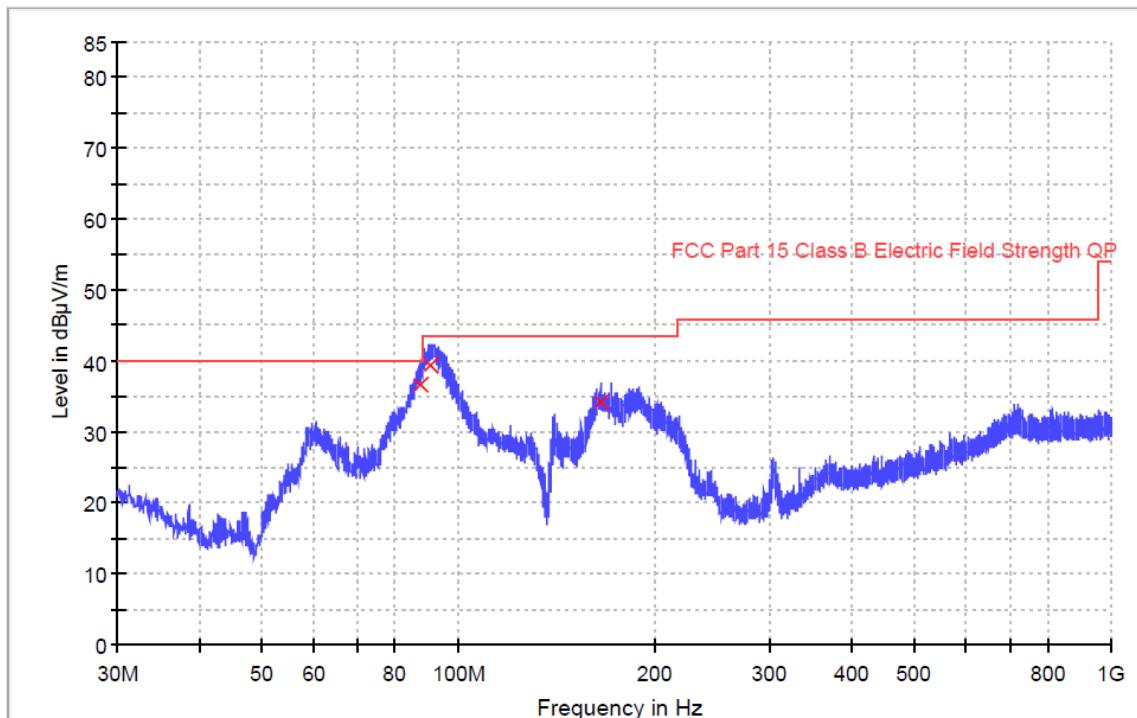
Date of Test: 22 June 2022

Model: FB-12

Worst Case Operating Mode:

Simultaneous Transmission

ANT Polarity: Vertical



Frequency (MHz)	QuasiPeak (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dB μ V/m)
87.360000	36.6	1000.0	120.000	100.0	V	13.7	3.4	40.0
90.689667	39.4	1000.0	120.000	100.0	V	13.8	4.1	43.5
164.927000	34.2	1000.0	120.000	100.0	V	17.1	9.3	43.5

Remark:

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

4.1.4 Transmitter Spurious Emissions (Radiated)

Worst Case Radiated Emission
at
9608.000 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 18.8 dB

TEST PERSONNEL:

Sign on file

Draven Li, Project Engineer
Typed/Printed Name

22 June 2022

Date

Applicant: Dongguan Zuoqi Electronic Co.,Ltd

Date of Test: 22 June 2022

Model: FB-12

Worst Case Operating Mode:

Transmitting

Table 1

Radiated Emissions

(2402MHz)

Polarization	Frequency (MHz)	Reading (dB μ V)	Pre-Amp Gain (dB)	Antenna Factor (dB/m)	Net at 3m (dB μ V/m)	Peak Limit at 3m (dB μ V/m)	Margin (dB)
Horizontal	2402.000	100.3	36.7	28.1	91.7	114.0	-22.3
Horizontal	4804.000	52.2	36.7	35.5	51.0	74.0	-23.0
Horizontal	7206.000	52.0	36.1	36.5	52.4	74.0	-21.6
Horizontal	9608.000	53.5	36.3	38.0	55.2	74.0	-18.8

Polarization	Frequency (MHz)	Reading (dB μ V)	Pre-Amp Gain (dB)	Antenna Factor (dB/m)	Average Factor (-dB)	Net at 3m (dB μ V/m)	Average Limit at 3m (dB μ V/m)	Margin (dB)
Horizontal	2402.000	100.3	36.7	28.1	22.5	69.2	94.0	-24.8
Horizontal	4804.000	52.2	36.7	35.5	22.5	28.5	54.0	-25.5
Horizontal	7206.000	52.0	36.1	36.5	22.5	29.9	54.0	-24.1
Horizontal	9608.000	53.5	36.3	38.0	22.5	32.7	54.0	-21.3

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: Draven Li

Applicant: Dongguan Zuoqi Electronic Co.,Ltd

Date of Test: 22 June 2022

Model: FB-12

Worst Case Operating Mode:

Transmitting

Table 2

Radiated Emissions

(2441MHz)

Polarization	Frequency (MHz)	Reading (dB μ V)	Pre-Amp Gain (dB)	Antenna Factor (dB/m)	Net at 3m (dB μ V/m)	Peak Limit at 3m (dB μ V/m)	Margin (dB)
Horizontal	2441.000	100.1	36.7	28.1	91.5	114.0	-22.5
Horizontal	4882.000	51.4	36.7	35.5	50.2	74.0	-23.8
Horizontal	7323.000	50.4	36.1	37.2	51.5	74.0	-22.5
Horizontal	9764.000	53.5	36.2	37.0	54.3	74.0	-19.7

Polarization	Frequency (MHz)	Reading (dB μ V)	Pre-Amp Gain (dB)	Antenna Factor (dB/m)	Average Factor (-dB)	Net at 3m (dB μ V/m)	Average Limit at 3m (dB μ V/m)	Margin (dB)
Horizontal	2441.000	100.1	36.7	28.1	22.5	69.0	94.0	-25.0
Horizontal	4882.000	51.4	36.7	35.5	22.5	27.7	54.0	-26.3
Horizontal	7323.000	50.4	36.1	37.2	22.5	29.0	54.0	-25.0
Horizontal	9764.000	53.5	36.2	37.0	22.5	31.8	54.0	-22.2

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: Dongguan Zuoqi Electronic Co.,Ltd

Date of Test: 22 June 2022

Model: FB-12

Worst Case Operating Mode:

Transmitting

Table 3

Radiated Emissions

(2480MHz)

Polarization	Frequency (MHz)	Reading (dB μ V)	Pre-Amp Gain (dB)	Antenna Factor (dB/m)	Net at 3m (dB μ V/m)	Peak Limit at 3m (dB μ V/m)	Margin (dB)
Horizontal	2480.000	98.3	36.7	28.1	89.7	114.0	-24.3
Horizontal	4960.000	49.1	36.7	35.5	47.9	74.0	-26.1
Horizontal	7440.000	49.0	36.1	37.2	50.1	74.0	-23.9
Horizontal	9920.000	51.9	36.3	38.9	54.5	74.0	-19.5

Polarization	Frequency (MHz)	Reading (dB μ V)	Pre-Amp Gain (dB)	Antenna Factor (dB/m)	Average Factor (-dB)	Net at 3m (dB μ V/m)	Average Limit at 3m (dB μ V/m)	Margin (dB)
Horizontal	2480.000	98.3	36.7	28.1	22.5	67.2	94.0	-26.8
Horizontal	4960.000	49.1	36.7	35.5	22.5	25.4	54.0	-28.6
Horizontal	7440.000	49.0	36.1	37.2	22.5	27.6	54.0	-26.4
Horizontal	9920.000	51.9	36.3	38.9	22.5	32.0	54.0	-22.0

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
2.446000MHz

Judgement: Passed by 10.9dB margin

TEST PERSONNEL:

Sign on file

Draven Li, Project Engineer

Typed/Printed Name

22 June 2022

Date

Applicant: Dongguan Zuoqi Electronic Co.,Ltd

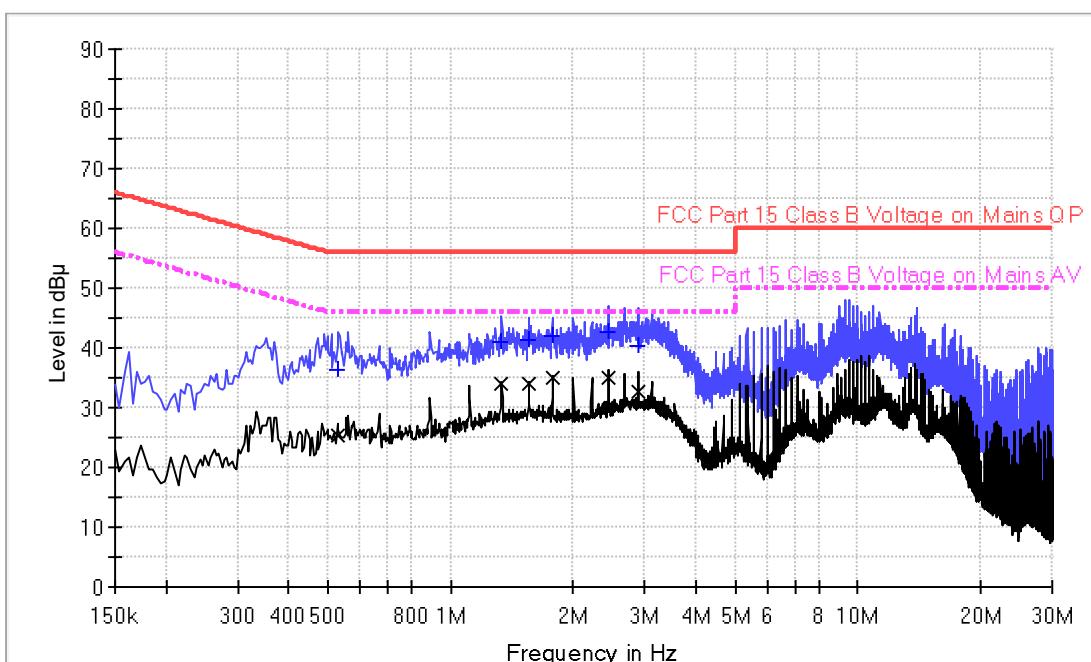
Date of Test: 22 June 2022

Model: FB-12

Worst Case Operating Mode: Simultaneous Transmission

Worst Case Test Voltage: AC 120V, 60Hz

Phase: Live

Graphic / Data Table**Conducted Emissions
Pursuant to FCC 15.207: Emissions Requirement****Limit and Margin QP**

Frequency (MHz)	Quasi Peak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.530000	36.2	9.000	L1	9.6	19.8	56.0
1.334000	41.1	9.000	L1	9.6	14.9	56.0
1.558000	41.3	9.000	L1	9.6	14.7	56.0
1.778000	41.9	9.000	L1	9.6	14.1	56.0
2.446000	42.6	9.000	L1	9.7	13.4	56.0
2.886000	40.3	9.000	L1	9.7	15.7	56.0

Limit and Margin AV

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.530000	25.3	9.000	L1	9.6	20.7	46.0
1.334000	33.9	9.000	L1	9.6	12.1	46.0
1.558000	33.9	9.000	L1	9.6	12.1	46.0
1.778000	34.8	9.000	L1	9.6	11.2	46.0
2.446000	35.1	9.000	L1	9.7	10.9	46.0
2.886000	32.6	9.000	L1	9.7	13.4	46.0

Applicant: Dongguan Zuoqi Electronic Co.,Ltd

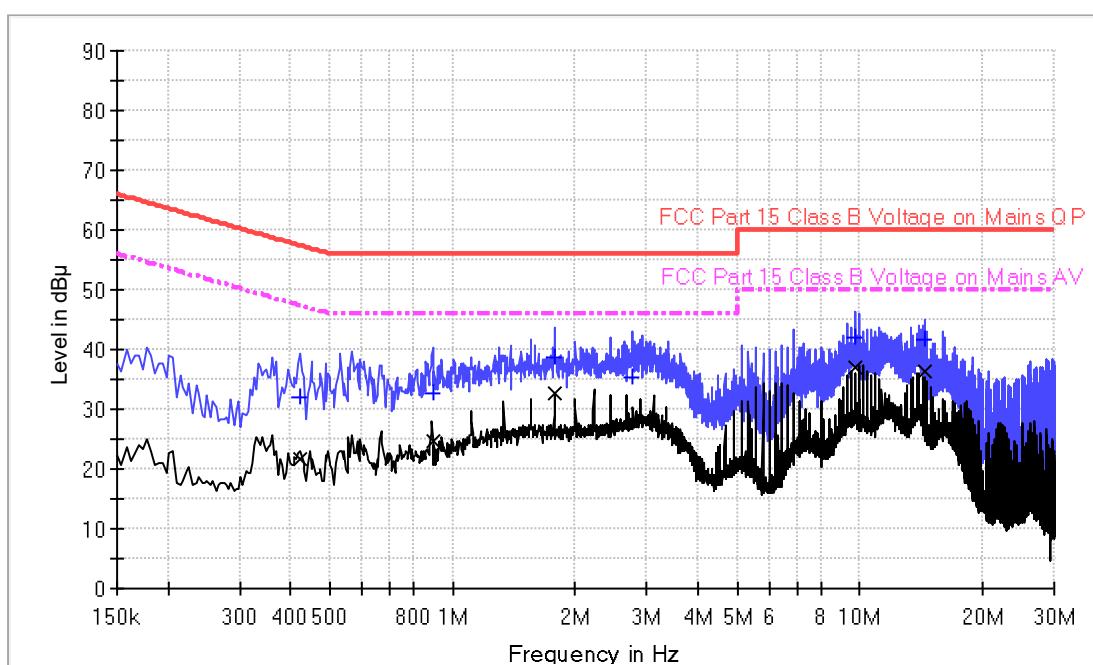
Date of Test: 22 June 2022

Model: FB-12

Worst Case Operating Mode: Simultaneous Transmission

Worst Case Test Voltage: AC 120V, 60Hz

Phase: Neutral

Graphic / Data Table**Conducted Emissions
Pursuant to FCC 15.207: Emissions Requirement****Limit and Margin QP**

Frequency (MHz)	Quasi Peak (dB μ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.422000	32.1	9.000	N	9.5	25.3	57.4
0.894000	32.7	9.000	N	9.5	23.3	56.0
1.778000	38.6	9.000	N	9.5	17.4	56.0
2.754000	35.2	9.000	N	9.5	20.8	56.0
9.778000	41.9	9.000	N	9.7	18.1	60.0
14.438000	41.7	9.000	N	10.0	18.3	60.0

Limit and Margin AV

Frequency (MHz)	Average (dB μ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.422000	21.6	9.000	N	9.5	25.8	47.4
0.894000	24.7	9.000	N	9.5	21.3	46.0
1.778000	32.5	9.000	N	9.5	13.5	46.0
2.754000	27.9	9.000	N	9.5	18.1	46.0
9.778000	36.9	9.000	N	9.7	13.1	50.0
14.438000	36.4	9.000	N	10.0	13.6	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

$$\begin{aligned} &= 91.7 \text{ dB}\mu\text{v}/\text{m} - 36.92 \text{ dB} \\ &= 54.78 \text{ dB}\mu\text{v}/\text{m} \end{aligned}$$

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

$$\begin{aligned} &= 69.2 \text{ dB}\mu\text{v}/\text{m} - 36.92 \text{ dB} \\ &= 32.28 \text{ dB}\mu\text{v}/\text{m} \end{aligned}$$

(ii) Highest frequency channel (2480MHz):

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

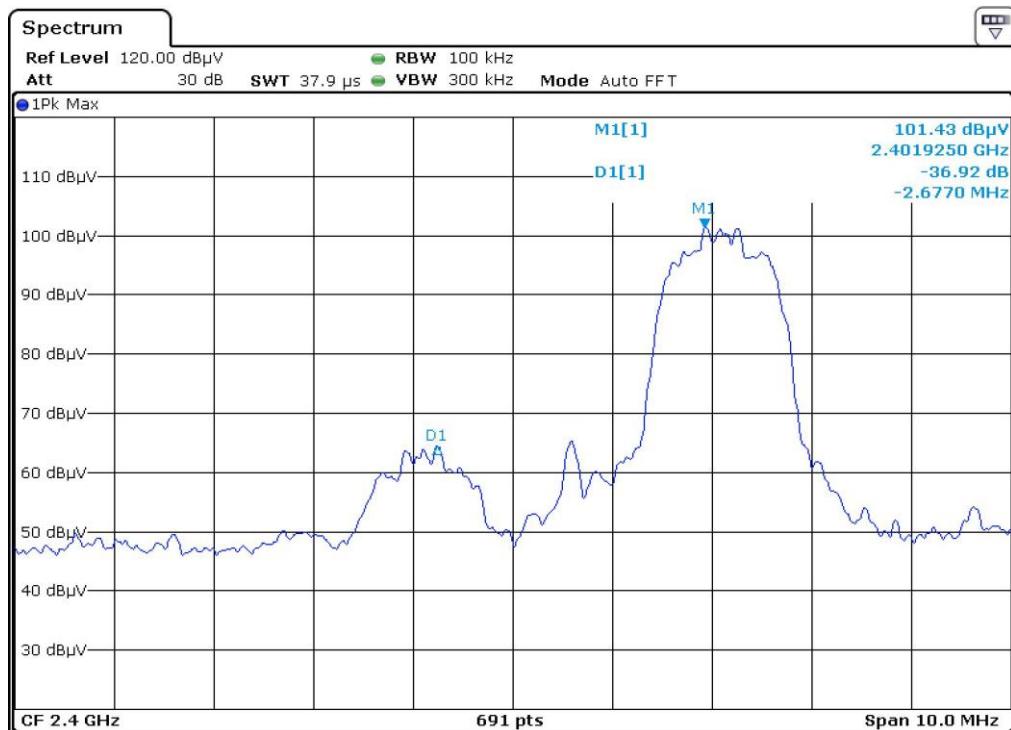
$$\begin{aligned} &= 89.7 \text{ dB}\mu\text{v}/\text{m} - 45.65 \text{ dB} \\ &= 44.05 \text{ dB}\mu\text{v}/\text{m} \end{aligned}$$

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

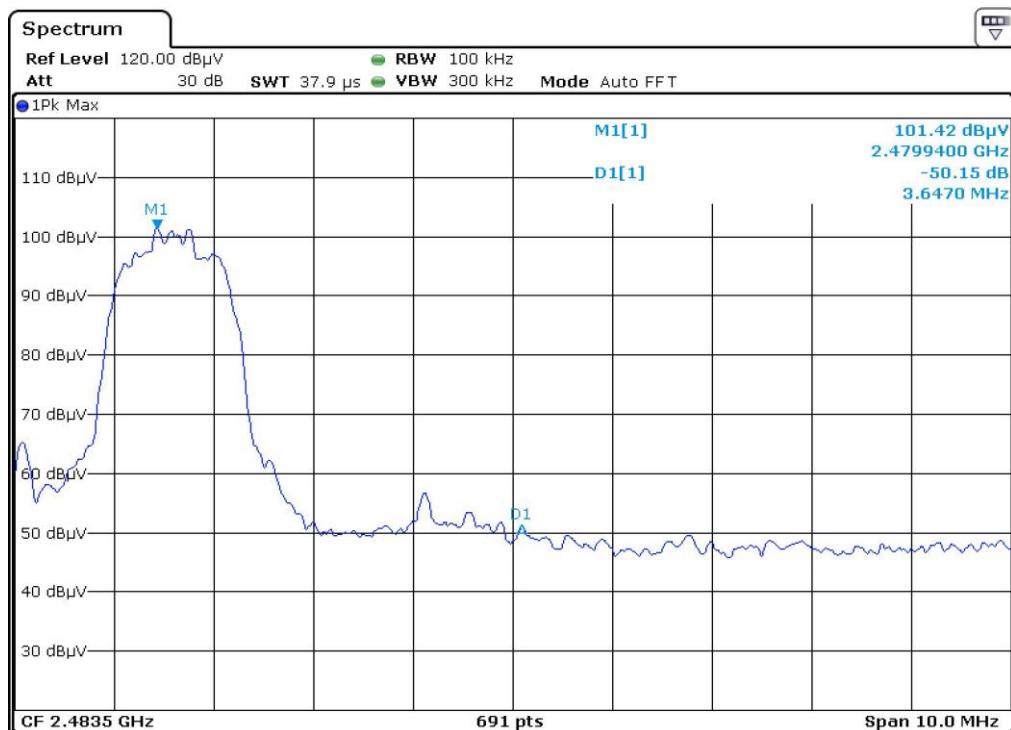
$$\begin{aligned} &= 67.2 \text{ dB}\mu\text{v}/\text{m} - 45.65 \text{ dB} \\ &= 21.55 \text{ dB}\mu\text{v}/\text{m} \end{aligned}$$

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

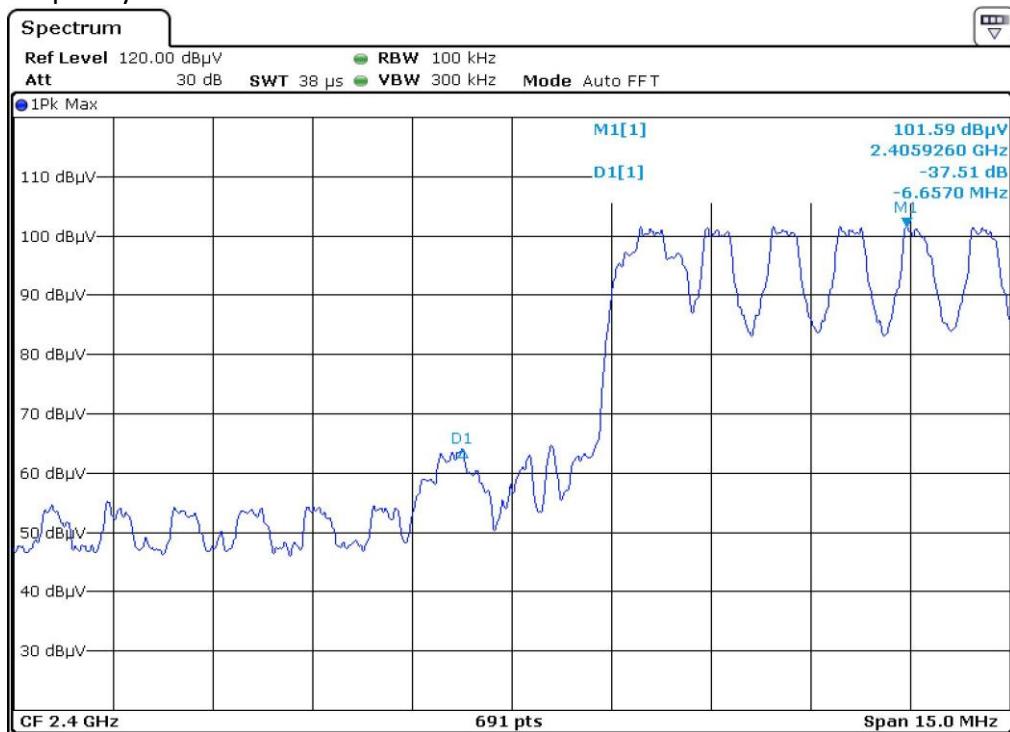
Hopping function off
Lowest frequency Channel



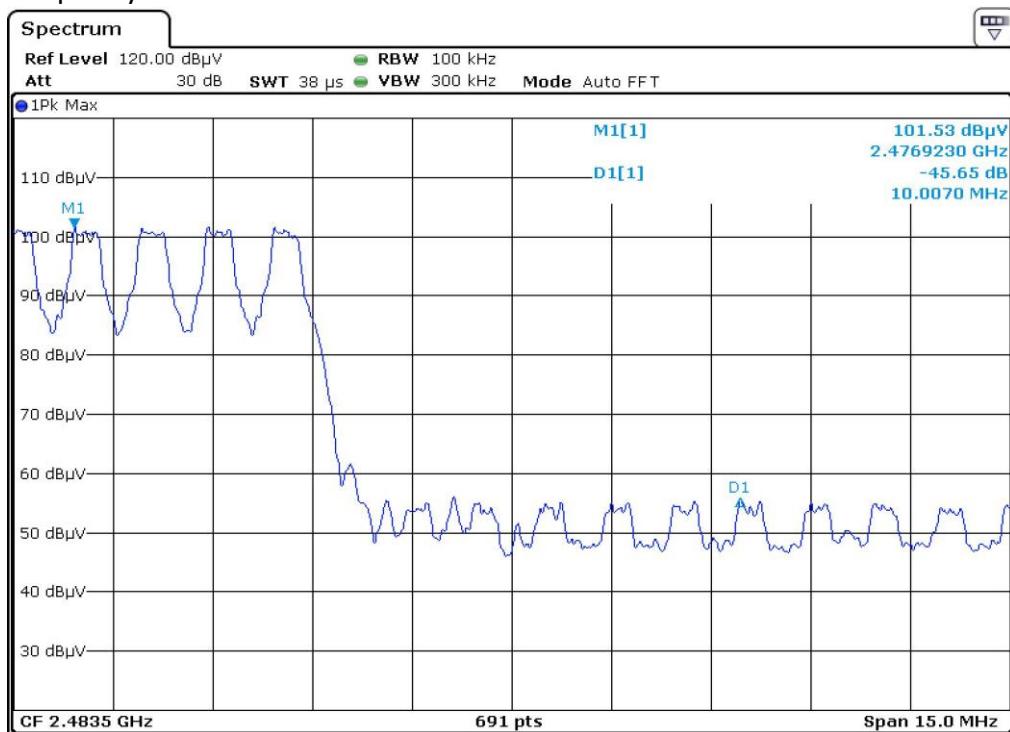
Highest frequency Channel



Hopping function on
Lowest frequency Channel

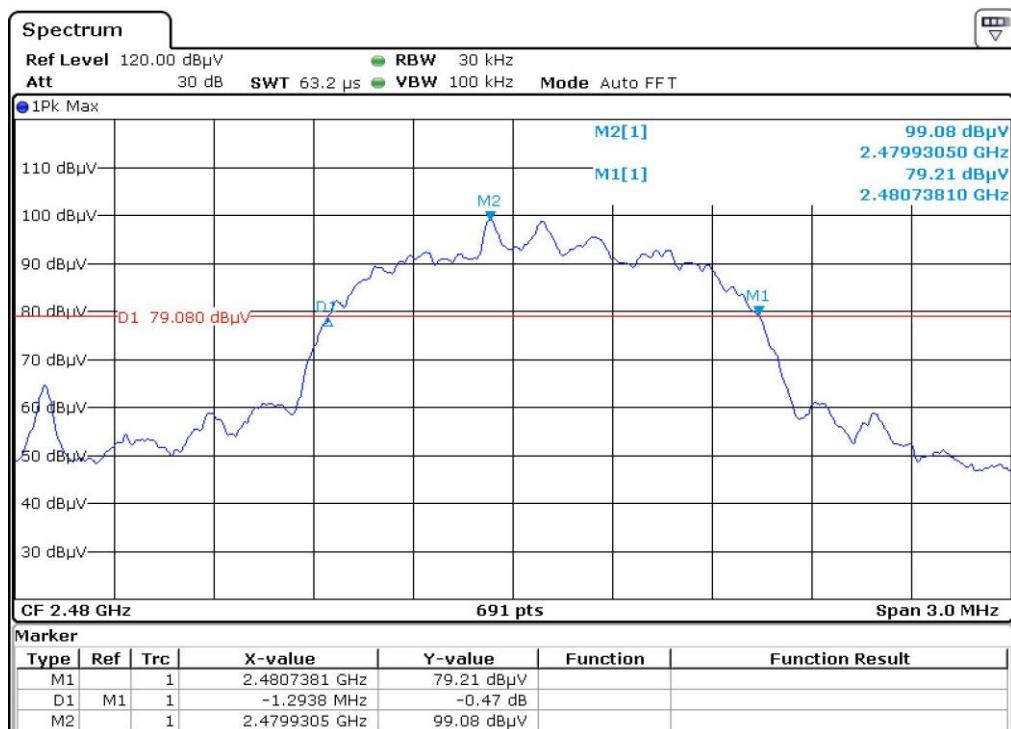
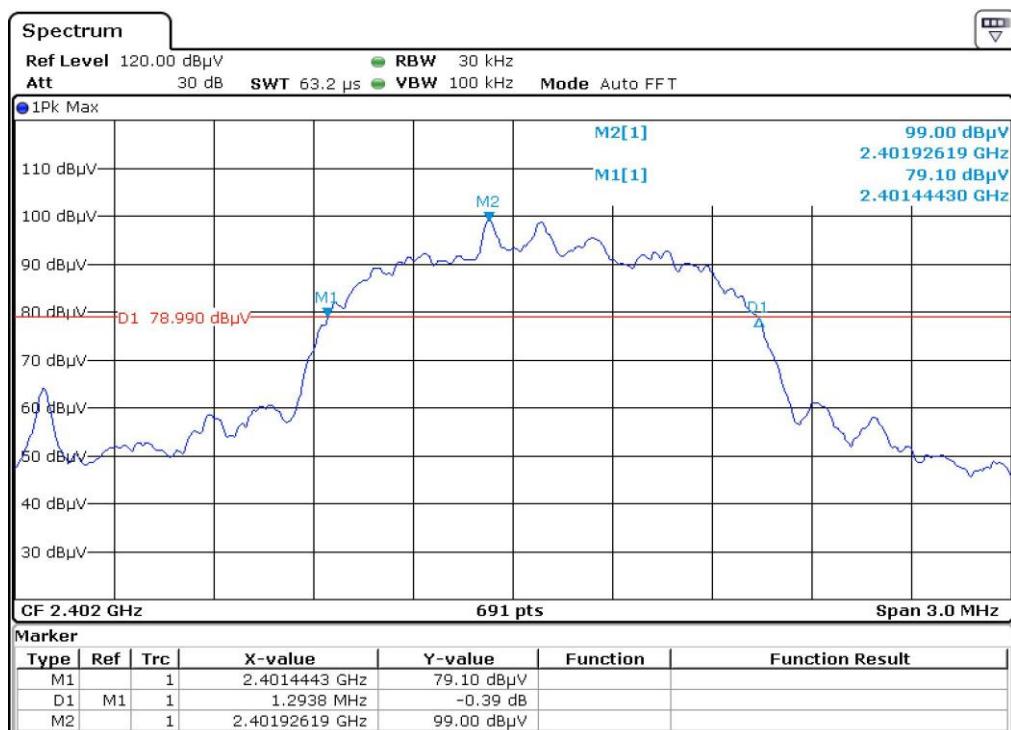


Highest frequency Channel



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. The effective period (Teff) is approximately 625 μ s for Bluetooth. With a resolution bandwidth (3dB) of 1MHz, so the pulse desensitivity factor is 0dB.

9.4 Calculation of Average Factor

Based on the Bluetooth Specification Version 5.1 (EDR mode) and worst case AFH mode, transmitter ON time is independent of packet type (DH1, DH3 and DH5) and packet length, the AFH mode Duty cycle connection factor as below:

Channel hop rate = 800 hops/second (AFH Mode)

Adjusted channel hop rate for DH5 mode = 133.33 hops/second

Time per channel hop = 1 / 133.33 hops/second = 7.5 ms

Time to cycle through all channels = 7.5 x 20 channels = 150 ms

Number of times transmitter hits on one channel = 100 ms / 150 ms = 1 time(s)

Worst case dwell time = 7.5 ms

Duty cycle connection factor = $20\log_{10} (7.5\text{ms} / 100\text{ms}) = -22.5 \text{ dB}$

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 floor-standing EUT was placed on a non-conductive table whose total height equaled 10cm. All units of equipment forming the system under test (includes the EUT as well as connected peripherals and associated equipment or devices) shall be arranged such that a nominal 0.1 m separation is achieved between the neighboring units. Where the mains cable supplied by the manufacturer is longer than 1 m, the excess should be folded at the centre into a bundle no longer than 0.4 m, so that its length is shortened to 1 m.

The EUT was set 3 meters (or 10 meters) away from the receiving antenna that was mounted on a non-conductive mast. The antenna can move up and down between 1 to 4 meters to find out the maximum emission level.

The turntable can rotate 360 degree to determine the position of the maximum emission level.

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
SZ185-03	EMI Receiver	R&S	ESCI	100547	20-Dec-2021	20-Dec-2022
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	16-May-2022	16-May-2023
SZ056-06	Signal Analyzer	R&S	FSV 40	101101	20-Dec-2021	20-Dec-2022
SZ181-04	Preamplifier	Agilent	8449B	3008A02474	16-May-2022	16-May-2023
SZ188-01	Anechoic Chamber	ETS	RFD-F/A-100	4102	12-Dec-2021	12-Dec-2024
SZ062-23	RF Cable	RADIALL	SF104PE	--	26-Oct-2021	26-Oct-2022
SZ062-35	RF Cable	RADIALL	A50-3.5M3.5M-8M	--	26-Oct-2021	26-Oct-2022
SZ062-30	RF Cable	RADIALL	A50-3.5M3.5M-4.5M	--	26-Oct-2021	26-Oct-2022
SZ062-31	RF Cable	RADIALL	A50-3.5M3.5M-1M		26-Oct-2021	26-Oct-2022
SZ067-04	Notch Filter	Micro-Tronics	BRM50702-02	--	17-May-2022	17-May-2023
SZ185-02	EMI Test Receiver	R&S	ESCI	100692	12-Jul-2021	12-Jul-2022
SZ187-01	Two-Line V-Network	R&S	ENV216	100072	02-Nov-2021	02-Nov-2022
SZ062-16	RF Cable	HUBER+SUHNER	CBL2-BN-1m	110127-2231000	26-Oct-2021	26-Oct-2022
SZ188-03	Shielding Room	ETS	RFD-100	4100	07-Jan-2020	07-Jan-2023

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