

# ABEEWAY

# TEST REPORT

**SCOPE OF WORK**

FCC TESTING-U310

**REPORT NUMBER**

200731014SZN-002

**ISSUE DATE**

October 14, 2020

**[REVISED DATE]**

[-----]

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**ABEEWAY**

Application  
For  
Certification

**FCC ID: 2AOSP-U310****SMART BADGE****Model: U310****Brand Name: ABEEWAY**

2.4GHz Transceiver

Report No.: 200731014SZN-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 [10-1-19]

Prepared and Checked by:

Approved by:

*Rode Liu*  
Engineer

---

*Kidd Yang*  
Technical Supervisor  
Date: October 14, 2020

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**Intertek Testing Services Shenzhen Ltd. Longhua Branch**

101, 201, Building B, No. 308 Wuhe Avenue, Zhangkengjing Community, GuanHu Subdistrict, LongHua District, ShenZhen, P.R. China  
Tel: (86 755) 8601 6288 Fax: (86 755) 8601 6751

## MEASUREMENT/TECHNICAL REPORT

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

Equipment Type: DXX - Part 15 Low Power Communication Device Transmitter

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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.

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Transition Rules Request per 15.37?                      Yes                       No

If no, assumed Part 15, Subpart C for intentional radiator – the new 47 CFR [10-1-19 Edition] provision.

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Report prepared by:

Rode Liu  
Intertek Testing Services Shenzhen Ltd. Longhua Branch  
101, 201, Building B, No. 308 Wuhe Avenue,  
Zhangkengjing Community, GuanHu Subdistrict,  
LongHua District, ShenZhen, P.R. China  
Tel / Fax: 86-755-8614 0743/86-755-8601 6661

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## 1.0 Summary of Test Result

Applicant: ABEEWAY

Applicant Address: Les Algorithmes Aristote A, 2000 Route des Lucioles BIOT 06410 France

Manufacturer: ABEEWAY

Manufacturer Address: Les Algorithmes Aristote A, 2000 Route des Lucioles BIOT 06410 France

MODEL: U310  
FCC ID: 2AOSP-U310

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

Notes: 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 SMART BADGE employs multi-technology geolocation, combining Bluetooth BLE, GPS, LPGPS, GNSS, WIFI and LoRaWAN™ technologies. GPS, LPGPS, GNSS and WIFI functions are only used for position determination and can't transmit signals. The EUT is powered by DC 3.7V by rechargeable battery. For more detail information pls. refer to the user manual.

Antenna Type: Integral antenna

Modulation Type: GFSK

Antenna Gain: 0dBi Max

Bluetooth Version: 5.0 BLE (Single Mode)

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 a transceiver for the SMART BADGE which has Bluetooth function. The LoRaWAN™ function is recorded in the test report: 200731014SZN-003 and the other functions are recorded in the test report: 200731014SZN-001.

### 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, P.R. China. This test facility and site measurement data have been fully placed on file with the FCC (Registration 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 is powered by DC 3.7V fully rechargeable battery and charged by DC 5V from a laptop 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 rear of unit shall be flushed with the rear of the table.

The equipment under test (EUT) was configured for testing in a typical fashion (as a customer would normally use it). The EUT was placed on 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.

### 3.3 Special Accessories

No special accessories used.

### 3.4 Equipment Modification

Any modifications installed previous to testing by ABEEWAY 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.

### 3.6 Support Equipment List and Description

Description	Manufacturer	Remark
Laptop (Provided by Intertek)	Lenovo T420	T420
Laptop (Provided by Intertek)	Dell	Latitude 3480
USB cable (Provided by applicant)	ABEWAY	unshielded, 1m



## 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
- 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.

$$\begin{aligned} RA &= 62.0 \text{ dB}\mu\text{V} \\ AF &= 7.4 \text{ dB} \\ CF &= 1.6 \text{ dB} \\ AG &= 29.0 \text{ dB} \\ PD &= 0 \text{ dB} \\ AV &= -10 \text{ dB} \\ FS &= 62 + 7.4 + 1.6 - 29 + 0 = 42 \text{ dB}\mu\text{V}/\text{m} \end{aligned}$$

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

## 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. Simultaneous transmission was considered during the test.

Worst Case Radiated Emission  
at  
71.939040 MHz

Judgement: Passed by 0.5 dB

### **TEST PERSONNEL:**

*Sign on file*

Rode Liu, Engineer  
*Typed/Printed Name*

15 August 2020  
*Date*

Applicant: ABEWAY

Date of Test: 15 August 2020

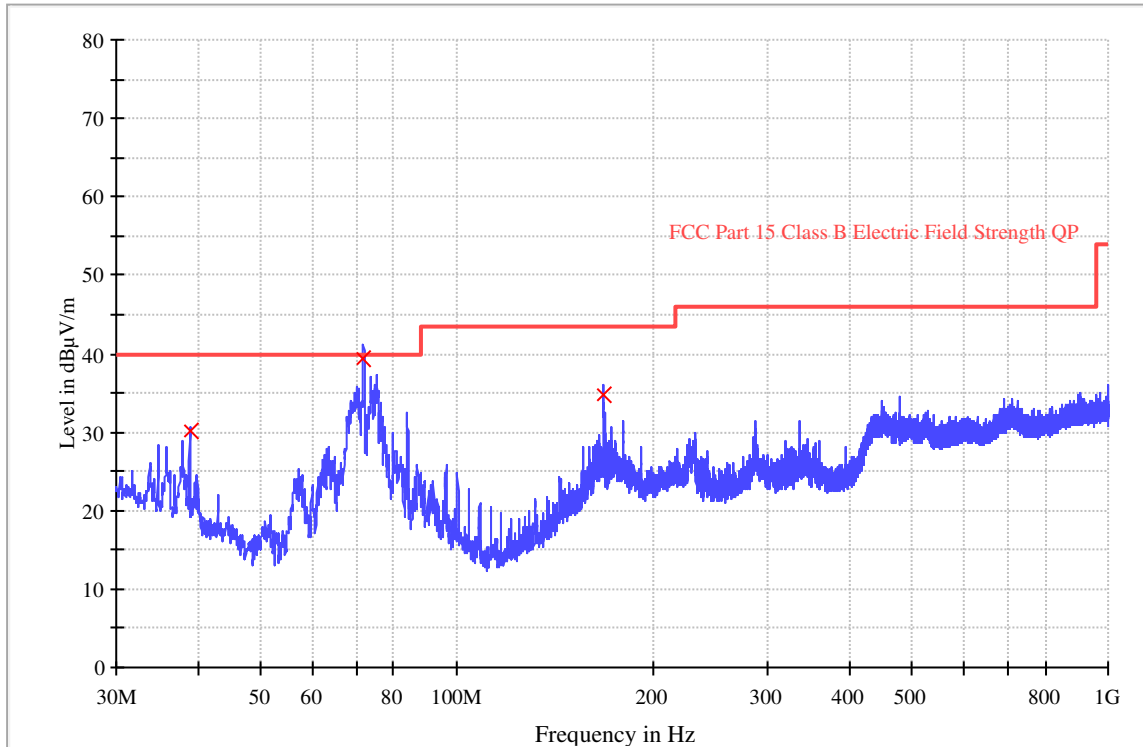
Worst Case Operating Mode:

Model: U310

BT Link

ANT Polarity: Horizontal

FCC Part 15



Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
38.891667	30.2	1000.0	120.000	0.0	H	14.1	9.8	40.0
71.939040	39.5	1000.0	120.000	0.0	H	8.9	0.5	40.0
167.998667	34.8	1000.0	120.000	0.0	H	11.9	8.7	43.5

Remark:

1. Corr. = 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)

Applicant: ABEEWAY

Date of Test: 15 August 2020

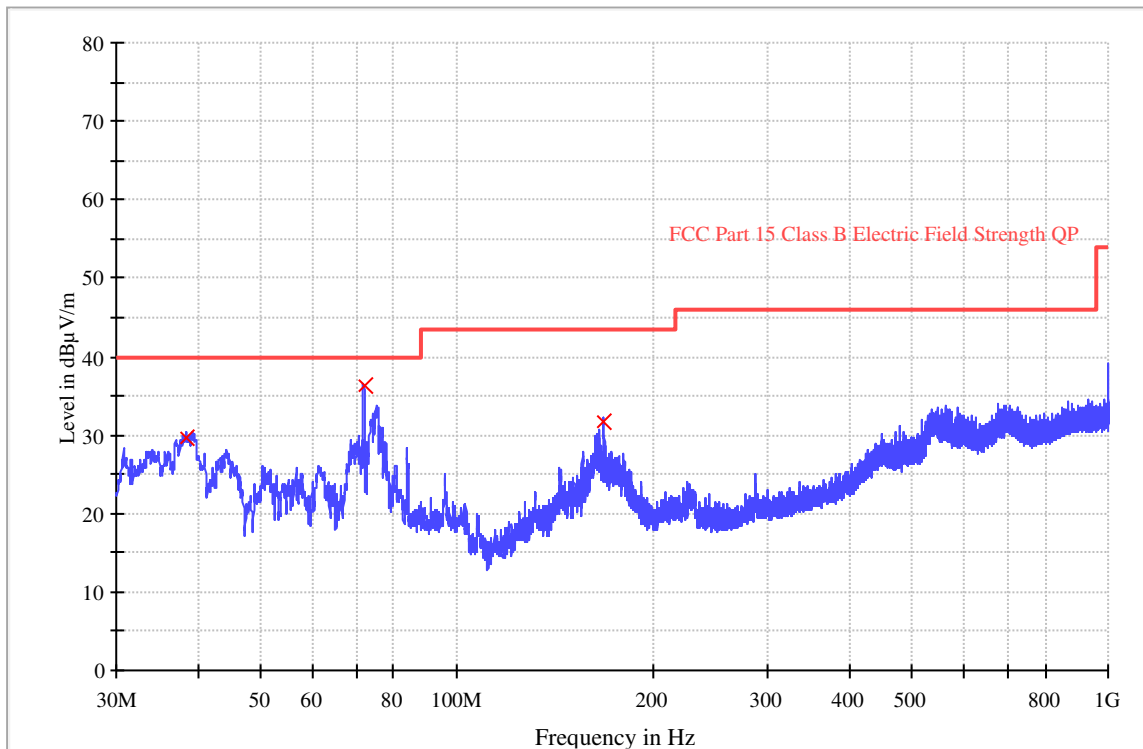
Worst Case Operating Mode:

Model: U310

BT Link

ANT Polarity: Vertical

FCC Part 15



Frequency (MHz)	QuasiPeak (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBuV/m)
38.503667	29.7	1000.0	120.000	0.0	V	14.3	10.3	40.0
71.960000	36.3	1000.0	120.000	0.0	V	8.9	3.7	40.0
167.998667	31.7	1000.0	120.000	0.0	V	11.9	11.8	43.5

Remark:

1. Corr. = 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)

## 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 9.8 dB

**TEST PERSONNEL:**

*Sign on file*

Rode Liu, Engineer  
*Typed/Printed Name*

15 August 2020  
*Date*

Applicant: ABEEWAY

Date of Test: 15 August 2020

Worst Case Operating Mode:

Model: U310

Transmitting

Table 1

**Radiated Emissions**

(2402MHz)

Polarization	Frequency (MHz)	Reading (dB $\mu$ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dB $\mu$ V/m)	Peak Limit at 3m (dB $\mu$ V/m)	Margin (dB)
Vertical	2402.000	98.7	36.7	28.1	90.1	114.0	-23.9
Vertical	4804.000	47.9	36.7	35.5	46.7	74.0	-27.3
Vertical	7206.000	53.6	36.1	36.5	54.0	74.0	-20.0
Vertical	9608.000	56.7	36.2	37.0	57.5	74.0	-16.5

Polarization	Frequency (MHz)	Reading (dB $\mu$ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dB $\mu$ V/m)	Average Limit at 3m (dB $\mu$ V/m)	Margin (dB)
Vertical	2402.000	91.3	36.7	28.1	82.7	94.0	-11.3
Vertical	4804.000	34.8	36.7	35.5	33.6	54.0	-20.4
Vertical	7206.000	40.4	36.1	36.5	40.8	54.0	-13.2
Vertical	9608.000	43.4	36.2	37.0	44.2	54.0	-9.8

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: Rode Liu

Applicant: ABEEWAY

Date of Test: 15 August 2020

Worst Case Operating Mode:

Model: U310

Transmitting

Table 2

**Radiated Emissions**

(2440MHz)

Polarization	Frequency (MHz)	Reading (dB $\mu$ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dB $\mu$ V/m)	Peak Limit at 3m (dB $\mu$ V/m)	Margin (dB)
Vertical	2440.000	96.9	36.7	28.1	88.3	114.0	-25.7
Vertical	4880.000	48.3	36.7	35.5	47.1	74.0	-26.9
Vertical	7320.000	53.3	36.1	37.2	54.4	74.0	-19.6
Vertical	9760.000	56.5	36.2	37.0	57.3	74.0	-16.7

Polarization	Frequency (MHz)	Reading (dB $\mu$ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dB $\mu$ V/m)	Average Limit at 3m (dB $\mu$ V/m)	Margin (dB)
Vertical	2440.000	91.1	36.7	28.1	82.5	94.0	-11.5
Vertical	4880.000	35.8	36.7	35.5	34.6	54.0	-19.4
Vertical	7320.000	39.6	36.1	37.2	40.7	54.0	-13.3
Vertical	9760.000	43.3	36.2	37.0	44.1	54.0	-9.9

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: Rode Liu

Applicant: ABEEWAY

Date of Test: 15 August 2020

Worst Case Operating Mode:

Model: U310

Transmitting

Table 3

**Radiated Emissions**

(2480MHz)

Polarization	Frequency (MHz)	Reading (dB $\mu$ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dB $\mu$ V/m)	Peak Limit at 3m (dB $\mu$ V/m)	Margin (dB)
Vertical	2480.000	96.9	36.7	28.1	88.3	114.0	-25.7
Vertical	4960.000	50.7	36.7	35.5	49.5	74.0	-24.5
Vertical	7440.000	52.7	36.1	37.2	53.8	74.0	-20.2
Vertical	9920.000	55.5	36.3	38.9	58.1	74.0	-15.9

Polarization	Frequency (MHz)	Reading (dB $\mu$ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dB $\mu$ V/m)	Average Limit at 3m (dB $\mu$ V/m)	Margin (dB)
Vertical	2480.000	89.8	36.7	28.1	81.2	94.0	-12.8
Vertical	4960.000	37.4	36.7	35.5	36.2	54.0	-17.8
Vertical	7440.000	39.7	36.1	37.2	40.8	54.0	-13.2
Vertical	9920.000	41.4	36.3	38.9	44.0	54.0	-10.0

- 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: Rode Liu



## 4.2 Conducted Emission Configuration Photograph

For electronic filing, the worst case radiated emission configuration photographs are saved with filename: conducted photos.pdf. Simultaneous transmission was considered during the test.

### 4.2.1 Conducted Emission

Worst Case Conducted Configuration  
at  
0.458MHz

Judgement: Passed by 17.0dB margin

#### **TEST PERSONNEL:**

*Sign on file*

Rode Liu, Engineer  
*Typed/Printed Name*

15 August 2020  
*Date*

Applicant: ABEEWAY

Date of Test: 15 August 2020

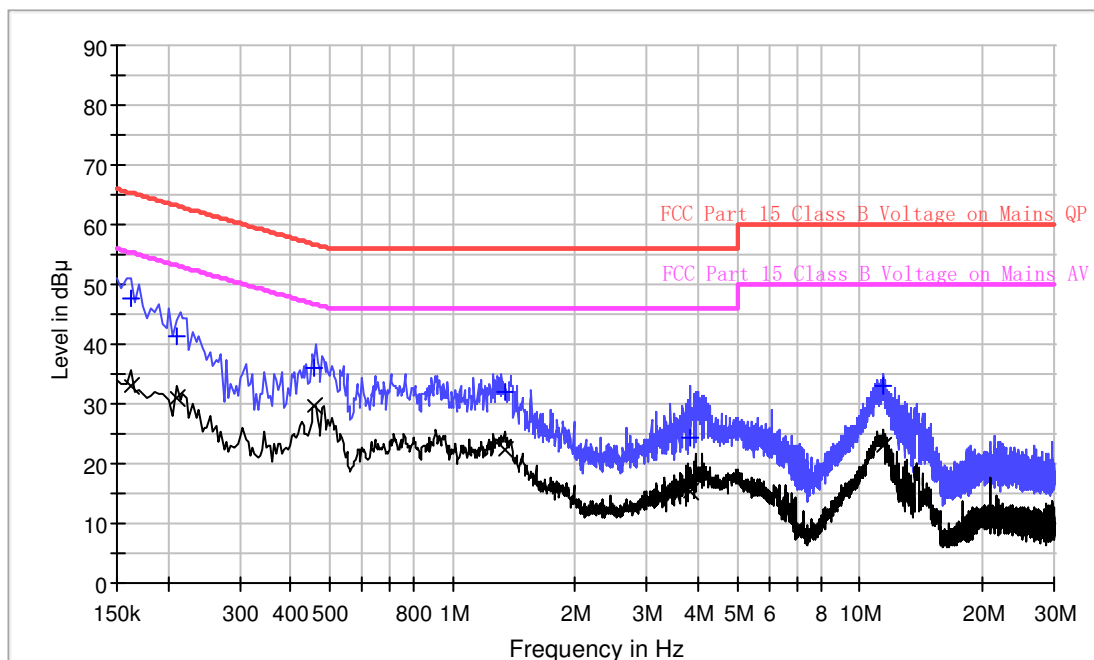
Model: U310

Worst Case Operating Mode: BT Link

Phase: Live

## Graphic / Data Table

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



#### Limit and Margin QP

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.162000	47.8	9.000	L1	9.7	17.6	65.4
0.210000	41.2	9.000	L1	9.7	22.0	63.2
0.458000	35.9	9.000	L1	9.7	20.8	56.7
1.338000	32.0	9.000	L1	9.7	24.0	56.0
3.838000	24.2	9.000	L1	9.8	31.8	56.0
11.438000	33.1	9.000	L1	10.0	26.9	60.0

#### Limit and Margin AV

Frequency (MHz)	Average (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.162000	32.9	9.000	L1	9.7	22.5	55.4
0.210000	31.0	9.000	L1	9.7	22.2	53.2
0.458000	29.7	9.000	L1	9.7	17.0	46.7
1.338000	22.3	9.000	L1	9.7	23.7	46.0
3.838000	15.3	9.000	L1	9.8	30.7	46.0
11.438000	23.0	9.000	L1	10.0	27.0	50.0

Applicant: ABEEWAY

Date of Test: 15 August 2020

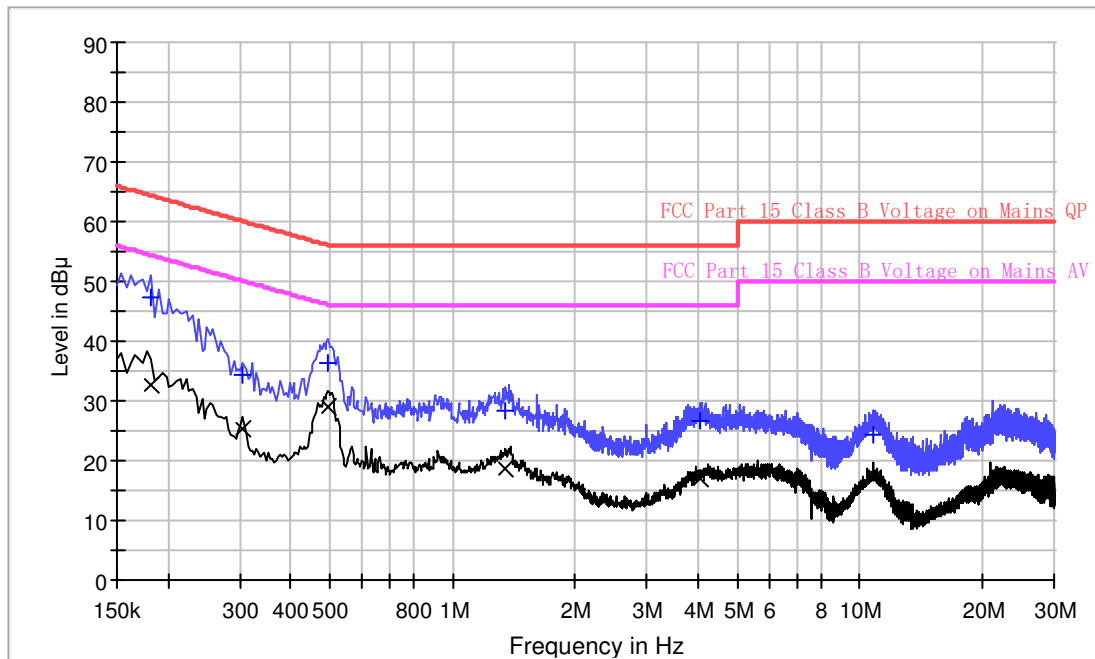
Model: U310

Worst Case Operating Mode: BT Link

Phase: Neutral

## Graphic / Data Table

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



#### Limit and Margin QP

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.182000	47.4	9.000	N	9.7	17.0	64.4
0.306000	34.2	9.000	N	9.7	25.9	60.1
0.494000	36.4	9.000	N	9.7	19.7	56.1
1.350000	28.2	9.000	N	9.7	27.8	56.0
4.066000	26.7	9.000	N	9.8	29.3	56.0
10.810000	24.2	9.000	N	10.0	35.8	60.0

#### Limit and Margin AV

Frequency (MHz)	Average (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.182000	32.8	9.000	N	9.7	21.6	54.4
0.306000	25.3	9.000	N	9.7	24.8	50.1
0.494000	29.1	9.000	N	9.7	17.0	46.1
1.350000	18.8	9.000	N	9.7	27.2	46.0
4.066000	16.9	9.000	N	9.8	29.1	46.0
10.810000	16.9	9.000	N	10.0	33.1	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

$$\begin{aligned} &= 90.1 \text{ dB}\mu\text{v/m} - 49.52 \text{ dB} \\ &= 40.58 \text{ dB}\mu\text{v/m} \end{aligned}$$

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

$$\begin{aligned} &= 82.7 \text{ dB}\mu\text{v/m} - 49.52 \text{ dB} \\ &= 33.18 \text{ dB}\mu\text{v/m} \end{aligned}$$

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

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

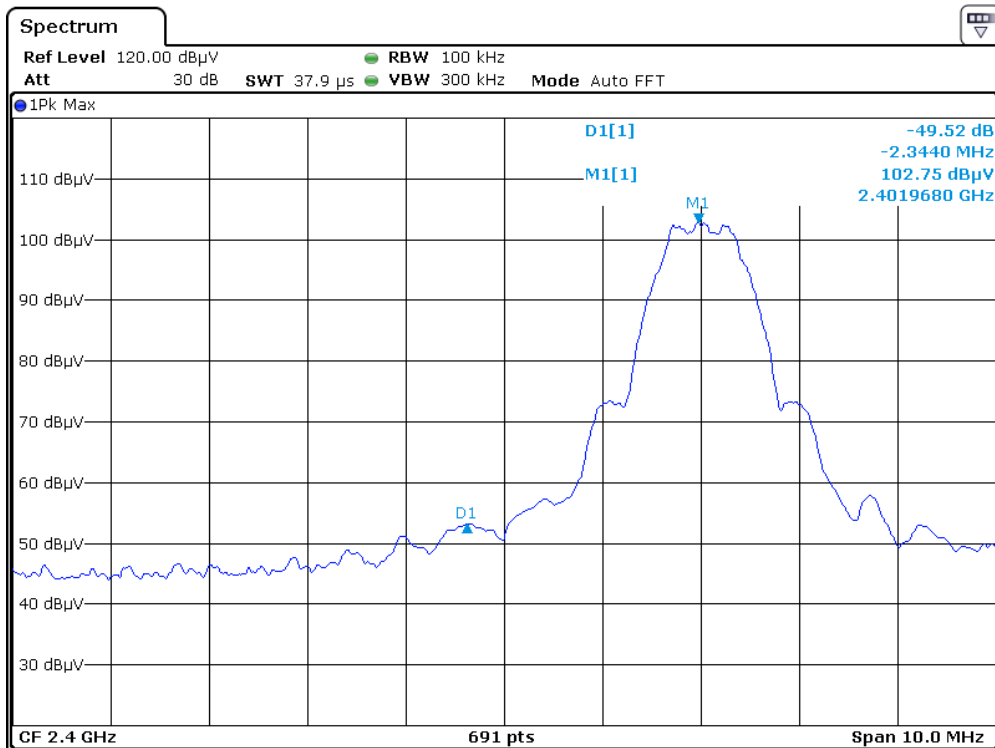
$$\begin{aligned} &= 88.3 \text{ dB}\mu\text{v/m} - 55.2 \text{ dB} \\ &= 33.1 \text{ dB}\mu\text{v/m} \end{aligned}$$

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

$$\begin{aligned} &= 81.2 \text{ dB}\mu\text{v/m} - 55.2 \text{ dB} \\ &= 26.0 \text{ dB}\mu\text{v/m} \end{aligned}$$

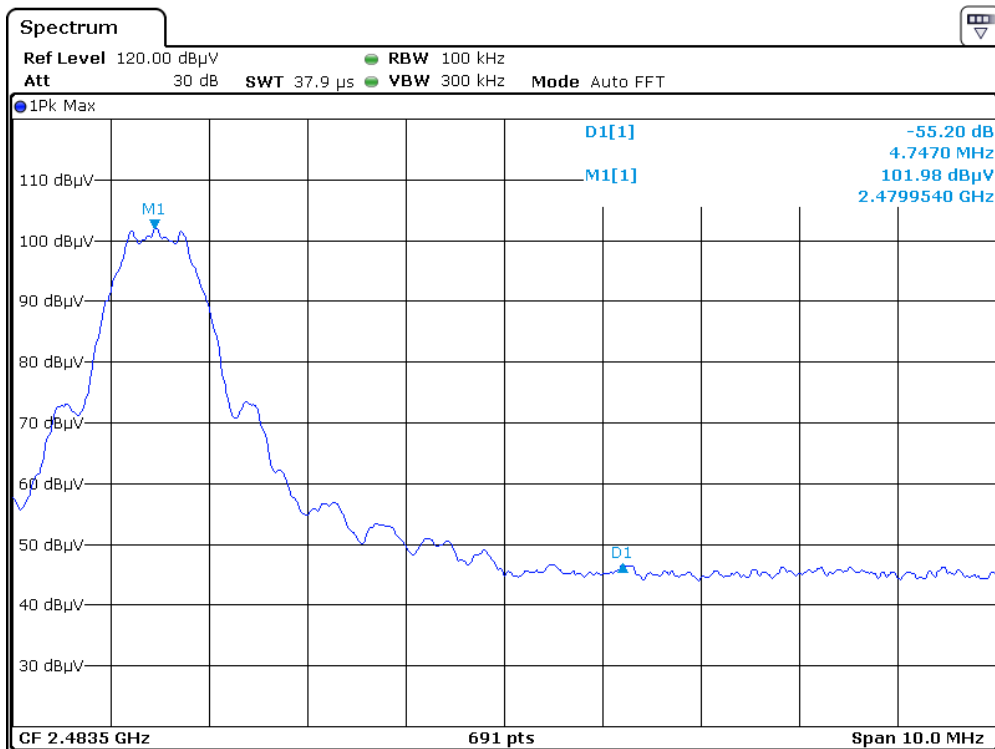
The resultant field strength meets the general radiated emission limit in section 15.209, which does not exceed 74dB $\mu$ v/m (Peak Limit) and 54dB $\mu$ v/m (Average Limit).

## Lowest frequency Channel



Date: 11 AUG 2020 10:25:31

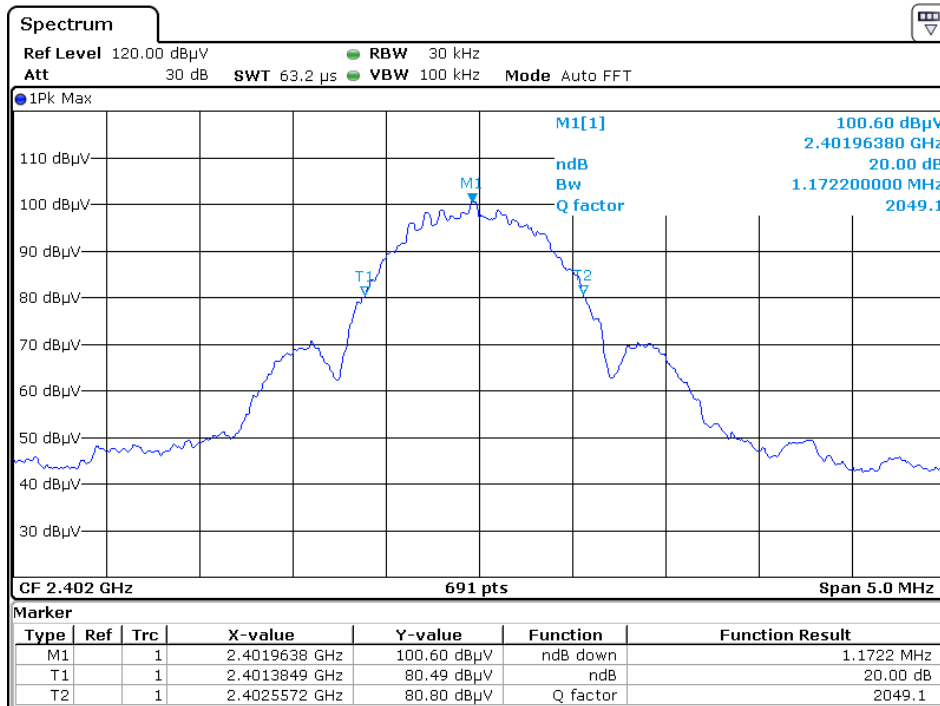
## Highest frequency Channel



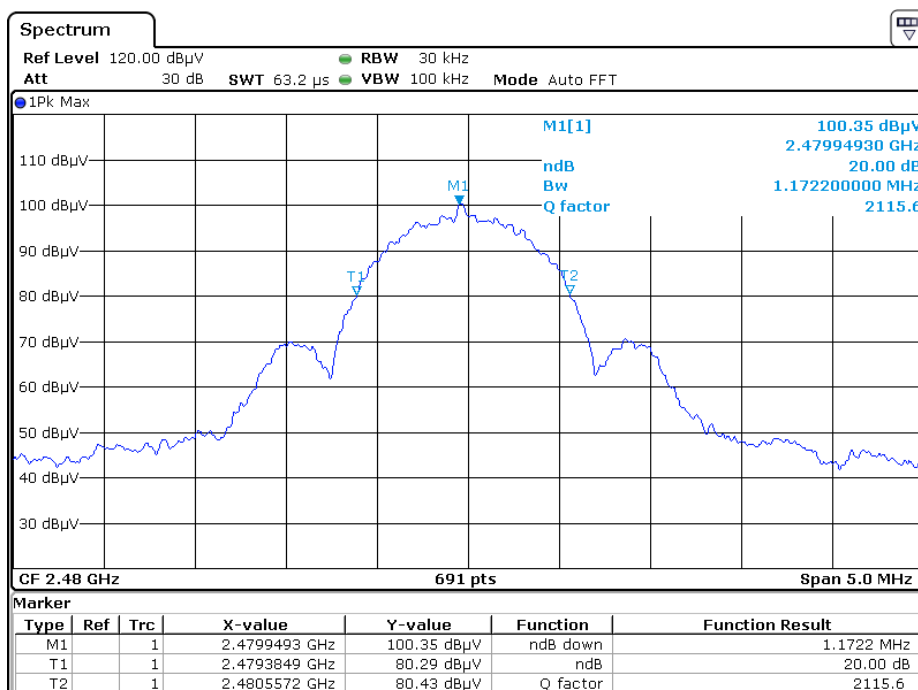
Date: 11 AUG 2020 10:31:35

## 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.



Date: 11 AUG 2020 10:24:25



Date: 11 AUG 2020 10:30:32

## 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
SZ061-03	Biconilog Antenna	ETS	3142C	--	2019-05-24	2021-05-24
SZ061-06	Active Loop Antenna	Electro-Metrics	EM-6876	217	2019-05-24	2021-05-24
SZ061-08	Horn Antenna	ETS	3115	00092346	2019-09-07	2021-09-07
SZ061-07	Pyramidal Horn Antenna	ETS	3160-09	00083067	2019-08-13	2021-08-13
SZ056-03	Spectrum Analyzer	R&S	FSP30	101148	2020-05-27	2021-05-27
SZ185-01	EMI Receiver	R & S	ESCI	100547	2019-12-24	2020-12-24
SZ181-04	Preamplifier	Agilent	8449B	3008A024 74	2020-05-27	2021-05-27
SZ188-01	Anechoic Chamber	ETS	RFD-F/A-100	4102	2018-12-15	2020-12-15
SZ062-02	RF Cable	RADIALL	RG 213U	--	2020-06-12	2020-12-12
SZ062-05	RF Cable	RADIALL	0.04-26.5GHz	--	2019-08-24	2020-08-24
SZ062-12	RF Cable	RADIALL	0.04-26.5GHz	--	2019-08-24	2020-08-24
SZ067-04	Notch Filter	Micro-Tronics	BRM5070 2-02	--	2020-05-27	2021-05-27
SZ185-02	EMI Test Receiver	R&S	ESCI	100692	2019-10-29	2020-10-29
SZ187-02	Two-Line V-Network	R&S	ENV216	100073	2020-05-27	2021-05-27
SZ188-03	Shielding Room	ETS	RFD-100	4100	2020-01-07	2023-01-07
SZ062-16	RF Cable	HUBER+SUHNER	CBL2-BN-1m	110127-2231000	2019-10-30	2020-10-30

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