

# TEST REPORT



**CTK Co., Ltd.**  
(Ho-dong), 113, Yejik-ro, Cheoin-gu,  
Yongin-si, Gyeonggi-do, Korea  
Tel: +82-31-339-9970  
Fax: +82-31-624-9501

Report No.:  
CTK-2019-04207  
Page (1) / (24) Pages

## 1. Client

- Name : BITFINDER, INC.
- Address : 40 boardman pl, 2F, San Francisco, California, 94103, United States
- Date of Receipt : 2019-09-30

## 2. Manufacturer

- Name : BITFINDER, INC.
- Address : 13F WeWork, 343 Samil-Daero, Jung-Gu, Seoul, Republic of Korea

## 3. Use of Report : For FCC Certification

## 4. Test Sample / Model: AWAIR Omni Surface Mount / AWAOMNSURF

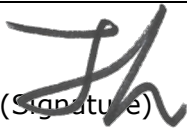
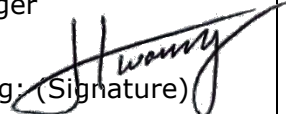
## 5. Date of Test : 2019-10-08 to 2019-10-21

## 6. Test Standard(method) used : FCC 47 CFR part 15 subpart C 15.247

## 7. Testing Environment: Temp.: (23 ± 1) °C, Humidity: (48 ± 1) % R.H.

## 8. Test Results : Compliance

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This Test Report cannot be reproduced, except in full.

|             |                                                                                               |                                                                                                         |
|-------------|-----------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| Affirmation | Tested by  | Technical Manager  |
|             | Ji-Hye Kim: (Signature)                                                                       | Won-Jae, Hwang: (Signature)                                                                             |

2019-10-22

Republic of KOREA **CTK Co., Ltd.**



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## REPORT REVISION HISTORY

| Date       | Revision                | Page No |
|------------|-------------------------|---------|
| 2019-10-22 | Issued (CTK-2019-04207) | all     |
|            |                         |         |

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## 1. General Product Description

### 1.1 Client Information

|                       |                                                                             |
|-----------------------|-----------------------------------------------------------------------------|
| <b>Company</b>        | BITFINDER, INC.                                                             |
| <b>Contact Point</b>  | 40 boardman pl, 2F, San Francisco, California, 94103, United States         |
| <b>Contact Person</b> | Name : Lee Jun Seo<br>E-mail : junseo@getawair.com<br>Tel : +82-2-6952-4827 |

### 1.2 Product Information

|                            |                                                                                        |
|----------------------------|----------------------------------------------------------------------------------------|
| <b>FCC ID</b>              | 2AF65AWAIRBKT                                                                          |
| <b>Product Description</b> | AWAIR Omni Surface Mount                                                               |
| <b>Model name</b>          | AWAOMNSURF                                                                             |
| <b>Operating Frequency</b> | 125KHz Bandwidth : 902.3 MHz to 914.9 MHz<br>500KHz Bandwidth : 903.0 MHz to 914.2 MHz |
| <b>Antenna type</b>        | Monopole Antenna                                                                       |
| <b>Antenna gain</b>        | -1 dBi                                                                                 |
| <b>Number of channels</b>  | 125KHz Bandwidth : 64<br>500KHz Bandwidth : 8                                          |
| <b>Channel Spacing</b>     | 125KHz Bandwidth : 200 kHz<br>500KHz Bandwidth : 1.6 MHz                               |
| <b>Type of Modulation</b>  | DSSS                                                                                   |
| <b>Power Source</b>        | DC 5 V, DC 12 V, PoE 48 V                                                              |
| <b>Hardware Rev</b>        | OMNI SURFACE MOUNT REV3                                                                |
| <b>Software Rev</b>        | awair-lora-backplate_1.0.0 & awair-eth-backplate_0.2.2                                 |

### 1.3 Peripheral Devices

| Device                   | Manufacturer                  | Model No.    | Serial No.      |
|--------------------------|-------------------------------|--------------|-----------------|
| Notebook Computer        | Samsung Electronics Co., Ltd. | NT-RC530     | HPFG91EC300116B |
| Adaptor                  | Tech-Power Electric Co., LTd. | NT01         | -               |
| TRAVEL ADAPTER           | Samsung Electronics Co., Ltd. | EP-TA10EWE   | SL4G307WS/B-E   |
| AWAIR Omni in-wall Mount | BITFINDER, INC.               | AWAOMNINWALL | -               |

## 2. Facility and Accreditations

### 2.1 Test Facility

The measurement facility is located at (Ho-dong), 113, Yejik-ro, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea.

### 2.2 Laboratory Accreditations and Listings

| Country | Agency | Registration Number |
|---------|--------|---------------------|
| USA     | FCC    | 805871              |
| CANADA  | ISED   | 8737A-2             |
| KOREA   | NRRA   | KR0025              |

### 2.3 Calibration Details of Equipment Used for Measurement

Test equipment and test accessories are calibrated on regular basis. The maximum time between calibrations is one year or what is recommended by the manufacturer, whichever is less. All test equipment calibrations are traceable to the Korea Research Institute of Standards and Science (KRISS), therefore, all test data recorded in this report is traceable to KRISS.

### 3. Test Specifications

#### 3.1 Standards

| FCC Part Section(s)                                                                                                                                                                                                                                                                                                                                | Requirement(s)         | Status (Note 1) | Test Condition |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|-----------------|----------------|
| 15.209                                                                                                                                                                                                                                                                                                                                             | Radiated Emissions     | C               | Radiated       |
| 15.207                                                                                                                                                                                                                                                                                                                                             | AC Conducted Emissions | C               | Line Conducted |
| <u>Note 1</u> : C=Complies NC=Not Complies NT=Not Tested NA=Not Applicable                                                                                                                                                                                                                                                                         |                        |                 |                |
| <u>Note 2</u> : The data in this test report are traceable to the national or international standards.                                                                                                                                                                                                                                             |                        |                 |                |
| <u>Note 3</u> : The sample was tested according to the following specification: FCC Part 15.247                                                                                                                                                                                                                                                    |                        |                 |                |
| <u>Note 4</u> : The tests were performed according to the method of measurements prescribed in KDB No.558074, ANSI C63.10-2013                                                                                                                                                                                                                     |                        |                 |                |
| etc. : The conformity assessment of except for this item was confirmed by the RF module installed in the device.<br>Refer to module test report. (Test Report No. SHEM160900621801 issued on Dem. 20, 2016 by SGS-CSTC Standards Technical Services(Shanghai) Co., Ltd.<br>Module FCC ID : VPYCMABZ)<br>Test was performed by modular transmitter. |                        |                 |                |

### 3.2 Mode of operation during the test

The EUT is operated in a manner representative of the typical of the equipments.  
During at testing, system components were manipulated within the confines of typical usage to maximize each emission. All modulation modes were tests.  
The results are only attached worst cases.  
This EUT is supported the DC 5 V, DC 12 V and PoE 48 V. We have done all test mode.  
Worst case is DC 5 V. So the worst data of DC 5 V are shown.

#### Test Frequency

- 125 kHz Bandwidth

| Lowest channel | Middle channel | Highest channel |
|----------------|----------------|-----------------|
| 902.3 MHz      | 908.5 MHz      | 914.9 MHz       |

- 500 kHz Bandwidth

| Lowest channel | Middle channel | Highest channel |
|----------------|----------------|-----------------|
| 903 MHz        | 907.8 MHz      | 914.2 MHz       |

#### Modulation Type

| Modulation type | DSSS |
|-----------------|------|
|-----------------|------|

### 3.3 Maximum Measurement Uncertainty

The value of the measurement uncertainty for the measurement of each parameter.  
Coverage factor  $k = 2$ , Confidence levels of 95 %

| Description                          | Uncertainty |
|--------------------------------------|-------------|
| Conducted RF Output Power            | 1.5 dB      |
| Power Spectral Density               | 1.5 dB      |
| Occupied Bandwidth                   | 0.1 MHz     |
| Unwanted Emission(conducted)         | 3.0 dB      |
| Radiated Emissions ( $f \leq 1$ GHz) | 4.0 dB      |
| Radiated Emissions ( $f > 1$ GHz)    | 5.0 dB      |

## 4. Technical Characteristic Test

### 4.1 Radiated Emission

#### Test Location

- ☒ 10 m SAC (test distance : ☐ 10 m, ☒ 3 m)  
☒ 3 m SAC (test distance : 3 m)

#### Test Procedures

KDB 558074 - Section 8.5, 8.6  
ANSI C63.10-2013 - Section 11.11, 11.12

- 1) In the frequency range of 9 kHz to 30 MHz, magnetic field is measured with Loop Antenna. The center of the Loop Test Antenna is 1m above the ground. During the measurement the Loop Test Antenna rotates about its vertical axis for maximum response at each azimuth about the EUT.
- 2) In the frequency range above 30 MHz, Bi-Log Test Antenna(30 MHz to 1 GHz) and Horn Test Antenna(above 1 GHz) are used. Test Antenna is 3m away from the EUT. Test Antenna height is carried from 1m to 4m above the ground to determine the maximum value of the field strength. The emissions levels at both horizontal and vertical polarizations should be tested.

#### Test Settings:

Frequency Range = 9 kHz ~ 1 GHz

- a) RBW = 200 Hz(9 kHz ~150 kHz), 9 kHz(150 kHz ~ 30 MHz), 120 kHz(30 MHz ~ 1GHz)
- b) VBW ≥ RBW
- c) Detector = CISPR Quasi-peak
- d) Sweep time = auto couple

- Peak

Frequency Range = 1 GHz ~ 10 GHz (10<sup>th</sup> harmonic)

- a) RBW = 1 MHz
- b) VBW ≥ 3 × RBW
- c) Detector = Peak
- d) Sweep time = auto
- e) Trace mode = max hold

- Average (duty cycle ≥ 98%)

Frequency Range = 1 GHz ~ 10 GHz (10<sup>th</sup> harmonic)

- a) RBW = 1 MHz
- b) VBW ≥ 3 × RBW
- c) Detector = RMS
- d) Sweep time = auto
- e) Averaging type = power (i.e., RMS)
- f) Trace mode = average (at least 100 traces)

- Average (duty cycle < 98%, duty cycle variations are less than  $\pm 2\%$ )

Frequency Range = 1 GHz ~ 25 GHz (2.4 GHz 10<sup>th</sup> harmonic)

a) RBW = 1 MHz

b) VBW  $\geq 3 \times$  RBW

c) Detector = RMS

d) Sweep time = auto

e) Averaging type = power (i.e., RMS)

f) Trace mode = average (at least 100 traces)

A correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 % duty cycle.

If power averaging (RMS) mode, then the applicable correction factor is  $10 \log(1/x)$ , where x is the duty cycle.

### Limit :

FCC Part 15 § 15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

**Table 1. Restricted Frequency Bands**

| MHz                      | MHz               | MHz                 | MHz           | MHz         | GHz                     |
|--------------------------|-------------------|---------------------|---------------|-------------|-------------------------|
| 0.09-0.11                | 8.37626-8.38675   | 73-74.6             | 399.9-410     | 2690-2900   | 10.6-12.7               |
| <sup>1</sup> 0.495-0.505 | 8.41425-8.41475   | 74.8-75.2           | 608-614       | 3260-3267   | 13.25-13.4              |
| 2.1735-2.1905            | 12.29-12.293      | 108-121.94          | 960-1240      | 3332-3339   | 14.47-14.5              |
| 4.125-4.128              | 12.51975-12.52025 | 123-138             | 1300-1427     | 3345.8-3358 | 15.35-16.2              |
| 4.17725-4.17775          | 12.57675-12.57725 | 149.9-150.05        | 1435-1626.5   | 3600-4400   | 17.7-21.4               |
| 4.20725-4.20775          | 13.36-13.41       | 156.52475-156.52525 | 1645.5-1646.5 | 4500-5150   | 22.01-23.12             |
| 6.215-6.218              | 16.42-16.423      | 156.7-156.9         | 1660-1710     | 5350-5460   | 23.6-24                 |
| 6.26775-6.26825          | 16.69475-16.69525 | 162.0125-167.17     | 1718.8-1722.2 | 7250-7750   | 31.2-31.8               |
| 6.31175-6.31225          | 16.80425-16.80475 | 167.72-173.2        | 2200-2300     | 8025-8500   | 36.43-36.5              |
| 8.291-8.294              | 25.5-25.67        | 240-285             | 2310-2390     | 9000-9200   | <sup>2</sup> Above 38.6 |
| 8.362-8.366              | 37.5-38.25        | 322-335.4           | 2483.5-2500   | 9300-9500   |                         |

<sup>1</sup> Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

<sup>2</sup> Above 38.6

§ 15.205 (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

FCC Part 15 § 15.209 (a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table :

**Table 2. General Field Strength Limits for Licence-Exempt Transmitters**

| Frequency(MHz) | Field Strength<br>uV/m@3m | Field Strength<br>dBuV/m@3m | Measurement<br>Distance (meters) |
|----------------|---------------------------|-----------------------------|----------------------------------|
| 0.009-0.490    | 2400/F(kHz)               | -                           | 300                              |
| 0.490-1.705    | 24000/F(kHz)              | -                           | 30                               |
| 1.705-30       | 30                        | -                           | 30                               |
| 30-88          | 100**                     | 40                          | 3                                |
| 88-216         | 150**                     | 43.5                        | 3                                |
| 216-960        | 200**                     | 46                          | 3                                |
| Above 960      | 500                       | 54                          | 3                                |

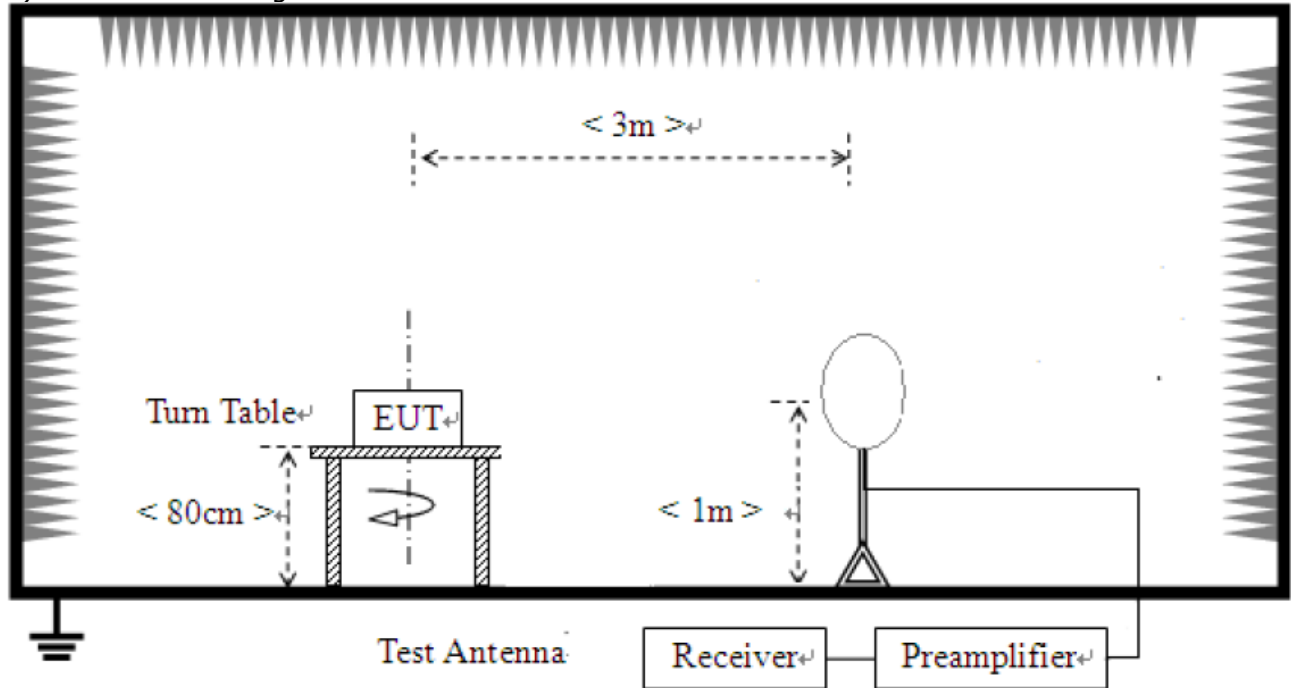
\*\* Except as provided in 15.209(g).fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72MHz, 76-88MHz, 174-216MHz, 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g.15.231 and 15.241.

Note :

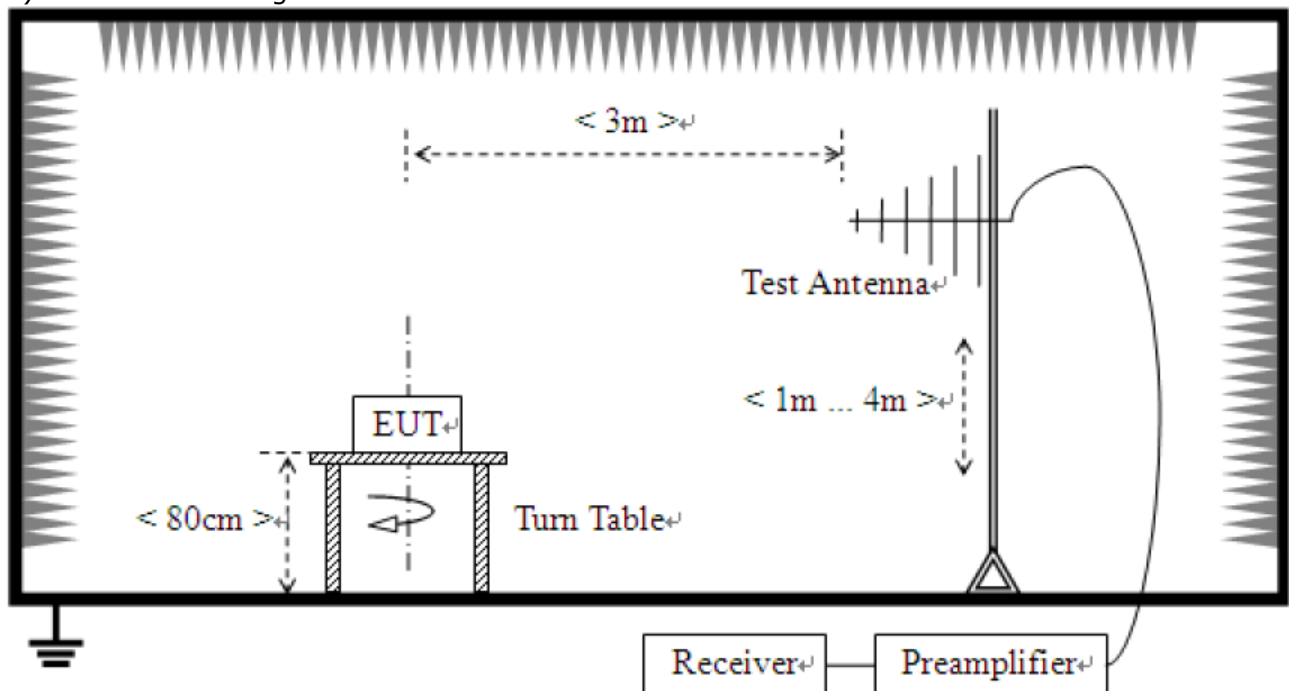
- 1) For above 1 GHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit.
- 2) For above 1 GHz, limit field strength of harmonics : 54 dBuV/m@3m (AV) and 74 dBuV/m@3m (PK)

## Test Setup:

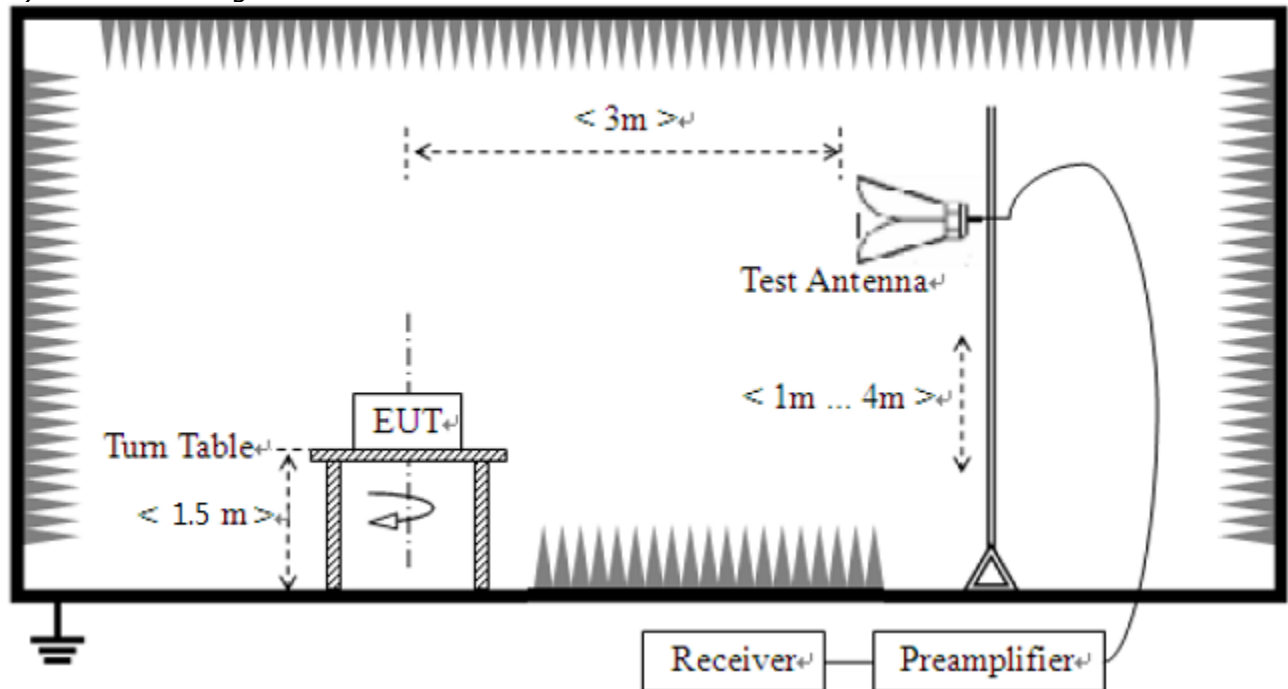
- 1) For field strength of emissions from 9 kHz to 30 MHz



- 2) For field strength of emissions from 30 MHz to 1 GHz



3) For field strength of emissions above 1 GHz



## Test results

### 1) 9 kHz to 30 MHz

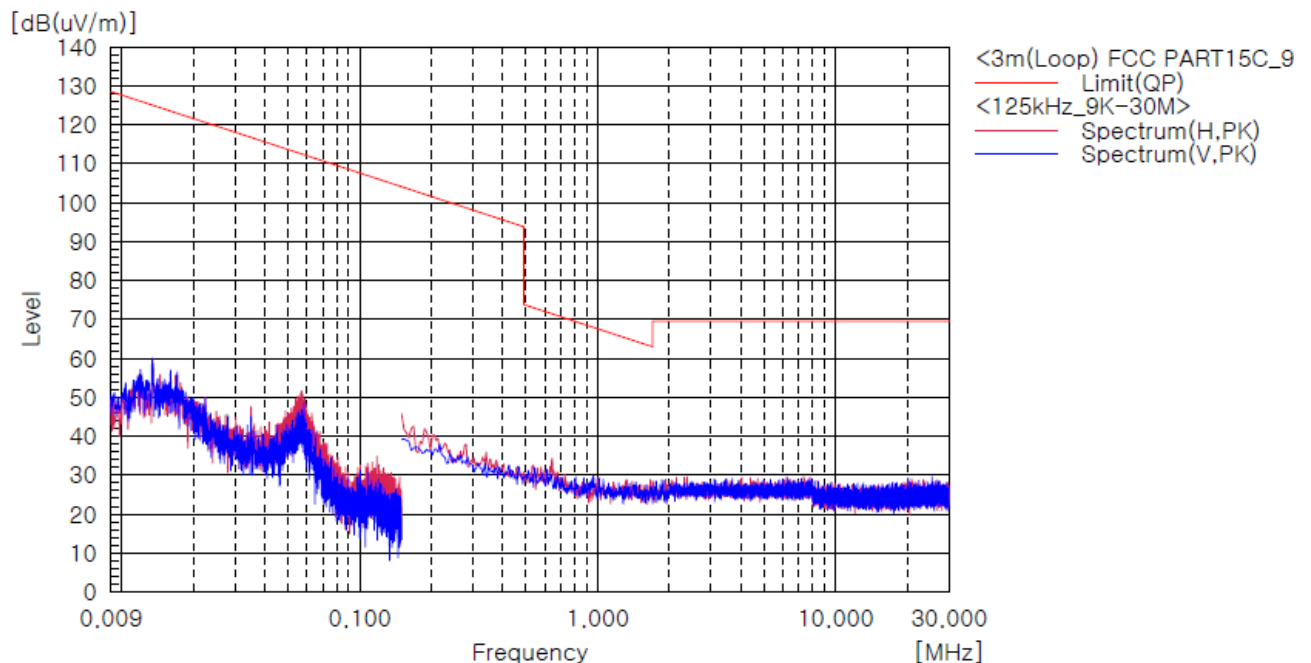
#### Test mode : 125 kHz Bandwidth\_Worst Case

The requirements are:

☒ Complies

### Test Data

Test Model : AWAOMNSURF  
Test Mode : 125kHz\_9K-30M  
Tester : KIM JI HYE



| Frequency<br>[MHz] | (P) | Reading<br>QP<br>[dBuV] | dB<br>[1/m] | Result<br>QP<br>[dBuV/m] | Limit<br>QP<br>[dBuV/m] | Margin<br>QP<br>[dB] |
|--------------------|-----|-------------------------|-------------|--------------------------|-------------------------|----------------------|
|--------------------|-----|-------------------------|-------------|--------------------------|-------------------------|----------------------|

The emissions 9 kHz to 30MHz were 20 dB lower than the limit.

### Remark :

- The Unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in stand-up position(Z axis) and the worst case was recorded.
- Distance extrapolation factor =  $40 \log (\text{specific distance} / \text{test distance})$  (dB)

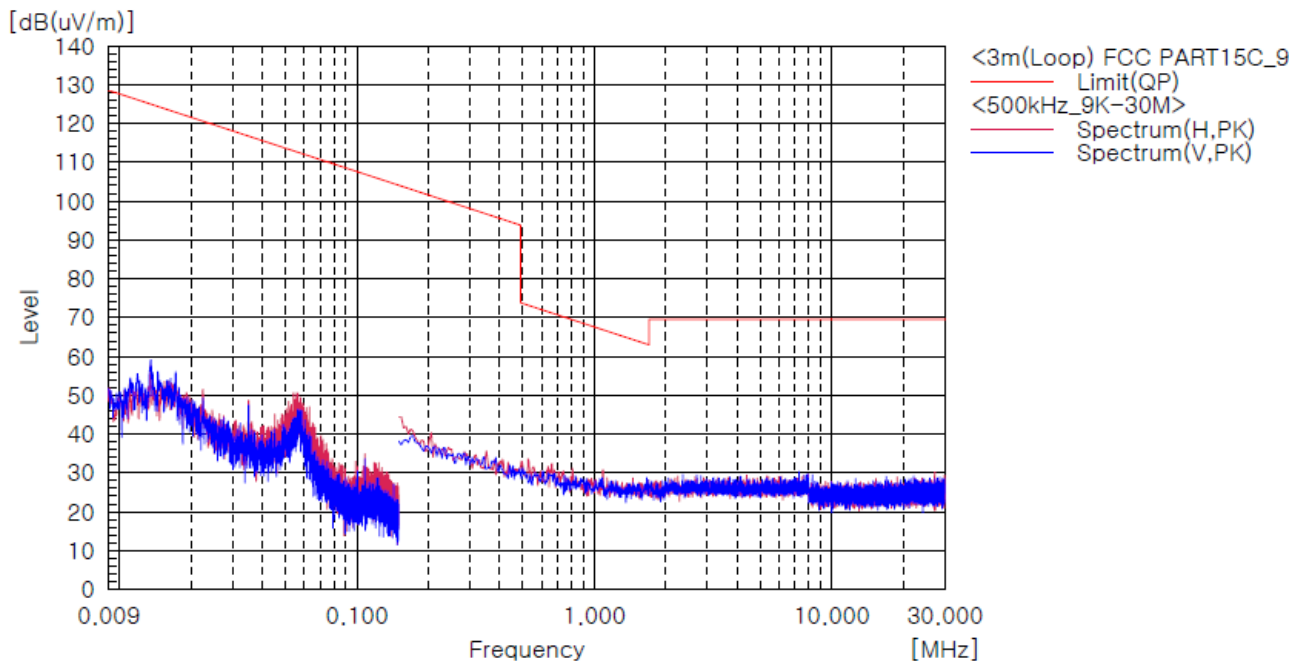
**Test mode : 500 kHz Bandwidth\_Worst Case**

The requirements are:

☒ Complies

**Test Data**

Test Model : AWAOMNSURF  
Test Mode : 500kHz\_9K-30M  
Tester : KIM JI HYE



| Frequency<br>[MHz] | (P) | Reading<br>QP<br>[dBuV] | dB<br>[1/m] | Result<br>QP<br>[dBuV/m] | Limit<br>QP<br>[dBuV/m] | Margin<br>QP<br>[dB] |
|--------------------|-----|-------------------------|-------------|--------------------------|-------------------------|----------------------|
|--------------------|-----|-------------------------|-------------|--------------------------|-------------------------|----------------------|

The emissions 9 kHz to 30MHz were 20 dB lower than the limit.

**Remark :**

1. The Unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in stand-up position(Z axis) and the worst case was recorded.
2. Distance extrapolation factor = 40 log (specific distance / test distance) (dB)

## 2) 30 MHz to 1 GHz

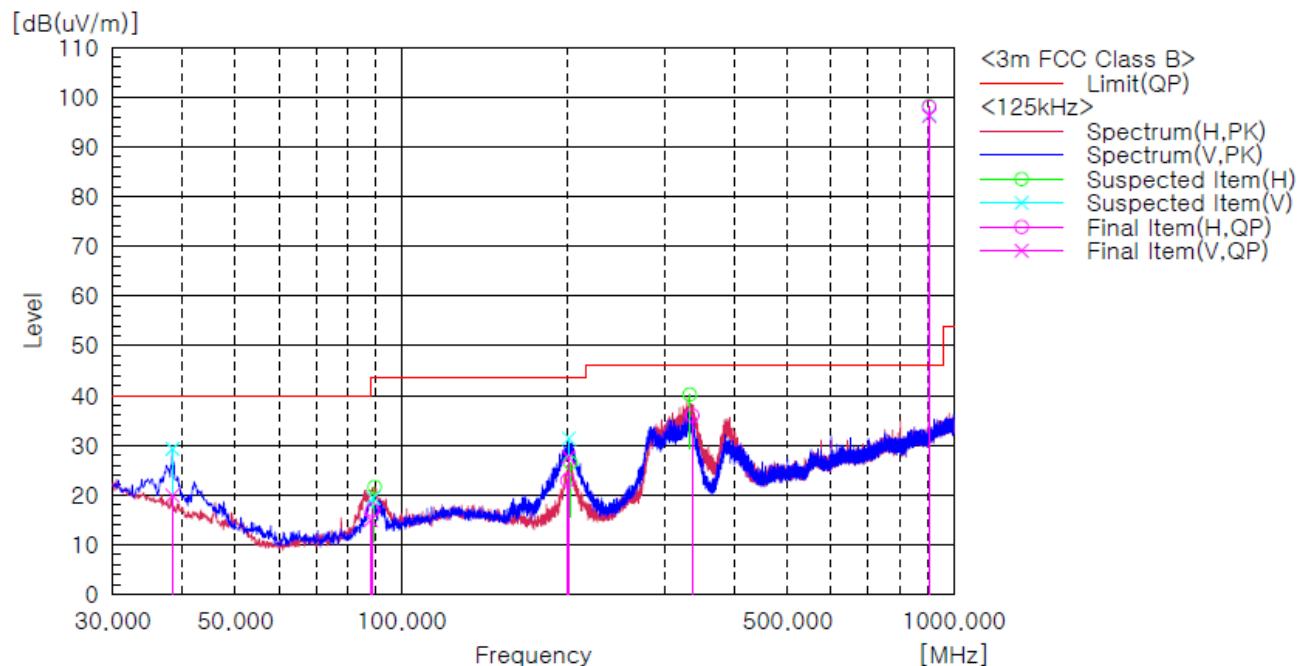
**Test mode : 125 kHz Bandwidth\_Worst case**

The requirements are:

☒ Complies

### Test Data

Test Model : AWAOMNSURF  
Test Mode : 125kHz  
Tester : KIM JI HYE



### Final Result

| No. | Frequency [MHz] | (P) | Reading QP [dB(uV)] | c.f [dB(1/m)] | Result QP [dB(uV/m)] | Limit QP [dB(uV/m)] | Margin QP [dB] | Height [cm] | Angle [deg] |
|-----|-----------------|-----|---------------------|---------------|----------------------|---------------------|----------------|-------------|-------------|
| 1   | 38.488          | V   | 30.5                | -10.6         | 19.9                 | 40.0                | 20.1           | 100.0       | 44.0        |
| 2   | 88.036          | V   | 29.9                | -14.9         | 15.0                 | 43.5                | 28.5           | 100.0       | 64.0        |
| 3   | 88.644          | H   | 31.9                | -14.9         | 17.0                 | 43.5                | 26.5           | 209.0       | 355.0       |
| 4   | 200.793         | V   | 41.2                | -13.6         | 27.6                 | 43.5                | 15.9           | 100.0       | 352.0       |
| 5   | 199.802         | H   | 36.5                | -13.6         | 22.9                 | 43.5                | 20.6           | 101.0       | 121.0       |
| 6   | 336.276         | H   | 43.3                | -7.3          | 36.0                 | 46.0                | 10.0           | 101.0       | 215.0       |
| 7   | 902.300         | V   | 91.2                | 5.0           | 96.2                 | 46.0                | -50.2          | 100.0       | 50.0        |
| 8   | 902.300         | H   | 93.0                | 5.0           | 98.0                 | 46.0                | -52.0          | 101.0       | 12.0        |

### Remark :

- The Unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in stand-up position(Z axis) and the worst case was recorded.
- Result = Reading + c.f(Correction factor)
- Correction factor = Antenna factor + Cable loss + 6 dB attenuator - Amp Gain
- No.7 and No. 8 are the carrier frequencies.

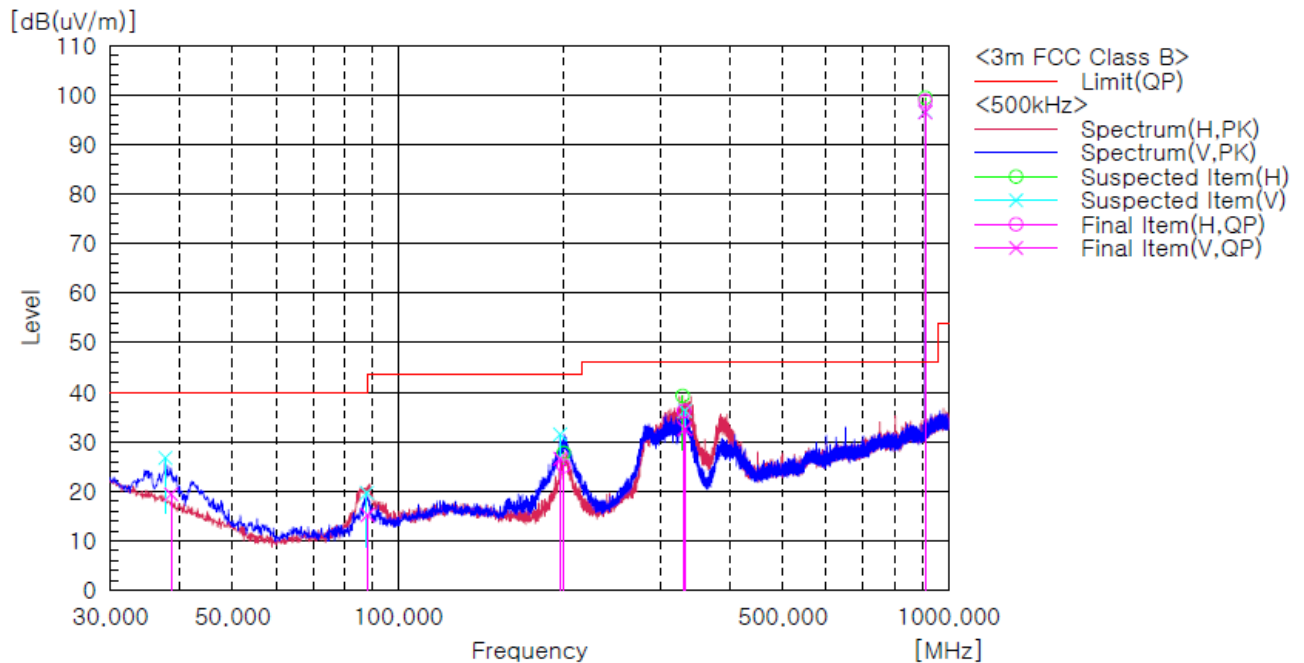
**Test mode : 500 kHz Bandwidth\_Worst case**

The requirements are:

☒ Complies

**Test Data**

Test Model : AWAOMNSURF  
Test Mode : 500kHz  
Tester : KIM JI HYE



**Final Result**

| No. | Frequency<br>[MHz] | (P) | Reading<br>QP<br>[dB(uV)] | c.f<br>[dB(1/m)] | Result<br>QP<br>[dB(uV/m)] | Limit<br>QP<br>[dB(uV/m)] | Margin<br>QP<br>[dB] | Height<br>[cm] | Angle<br>[deg] |
|-----|--------------------|-----|---------------------------|------------------|----------------------------|---------------------------|----------------------|----------------|----------------|
| 1   | 38.662             | V   | 30.1                      | -10.7            | 19.4                       | 40.0                      | 20.6                 | 101.0          | 349.0          |
| 2   | 87.983             | V   | 30.1                      | -14.9            | 15.2                       | 40.0                      | 24.8                 | 101.0          | 36.0           |
| 3   | 196.961            | V   | 40.3                      | -13.7            | 26.6                       | 43.5                      | 16.9                 | 101.0          | 352.0          |
| 4   | 199.983            | H   | 38.7                      | -13.6            | 25.1                       | 43.5                      | 18.4                 | 100.0          | 289.0          |
| 5   | 330.778            | H   | 43.7                      | -7.5             | 36.2                       | 46.0                      | 9.8                  | 100.0          | 215.0          |
| 6   | 331.670            | V   | 40.1                      | -7.5             | 32.6                       | 46.0                      | 13.4                 | 101.0          | 342.0          |
| 7   | 907.800            | V   | 91.1                      | 5.4              | 96.5                       | 46.0                      | -50.5                | 101.0          | 50.0           |
| 8   | 907.800            | H   | 93.4                      | 5.4              | 98.8                       | 46.0                      | -52.8                | 100.0          | 12.0           |

**Remark :**

1. The Unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in stand-up position(Z axis) and the worst case was recorded.
2. Result = Reading + c.f(Correction factor)
3. Correction factor = Antenna factor + Cable loss + 6 dB attenuator - Amp Gain
4. No.7 and No. 8 are the carrier frequencies.

### 3) above 1 GHz

#### Test mode : 125 kHz Bandwidth

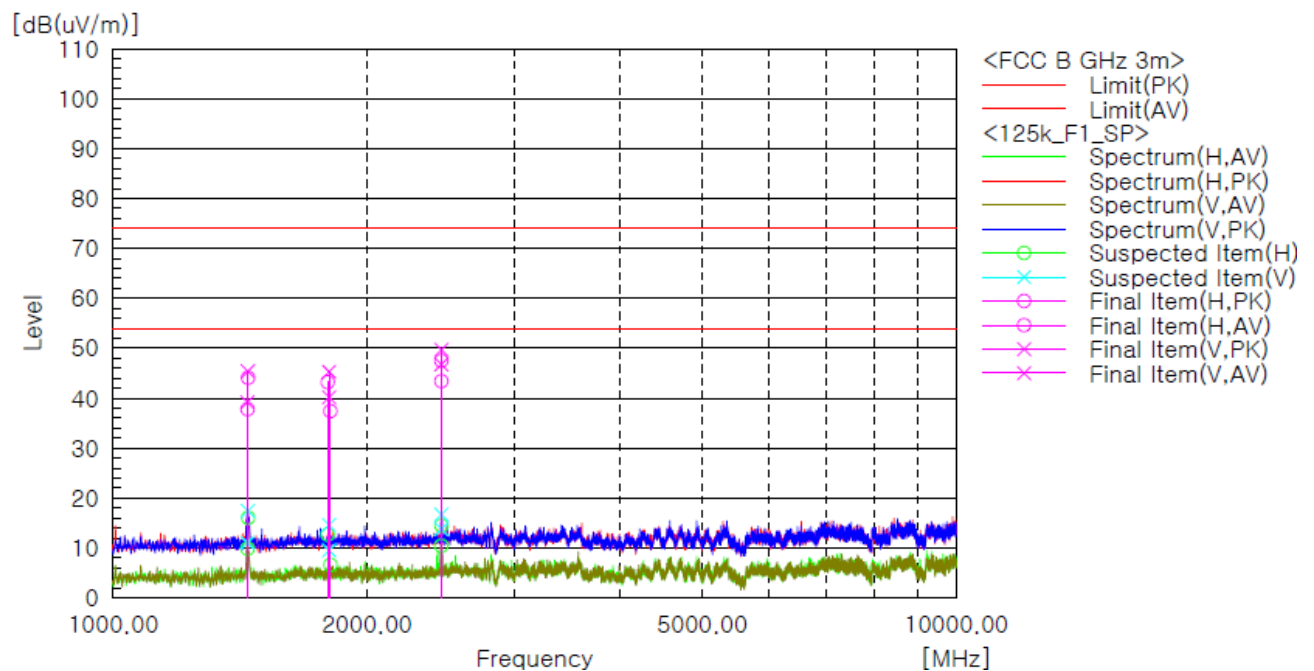
The requirements are:

☒ Complies

#### Test Data

Model Name : AWAOMNSURF  
Manufacturer : BITFINDER INC.  
Mode : 125k\_F1\_SP

Model Type :



Low (902.3 MHz)

| Frequency<br>[MHz] | (P) | Limit<br>PK<br>[dBuV/m] | Result<br>PK<br>[dBuV/m] | Margin<br>PK<br>[dB] |
|--------------------|-----|-------------------------|--------------------------|----------------------|
| 1 446.63           | H   | 54.00                   | 44.10                    | 9.90                 |
| 1 445.50           | V   | 54.00                   | 45.40                    | 8.60                 |
| 1 797.63           | H   | 54.00                   | 43.20                    | 10.80                |
| 1 804.38           | V   | 54.00                   | 45.30                    | 8.70                 |
| 2 452.38           | H   | 54.00                   | 47.50                    | 6.50                 |
| 2 452.38           | V   | 54.00                   | 49.70                    | 4.30                 |

Mid (908.5 MHz)

| Frequency<br>[MHz] | (P) | Limit<br>PK<br>[dBuV/m] | Result<br>PK<br>[dBuV/m] | Margin<br>PK<br>[dB] |
|--------------------|-----|-------------------------|--------------------------|----------------------|
| 1 445.50           | H   | 54.00                   | 45.00                    | 9.00                 |
| 1 443.25           | V   | 54.00                   | 44.80                    | 9.20                 |
| 1 816.75           | H   | 54.00                   | 43.90                    | 10.10                |
| 1 816.75           | V   | 54.00                   | 47.00                    | 7.00                 |
| 2 452.38           | H   | 54.00                   | 49.50                    | 4.50                 |
| 2 458.00           | V   | 54.00                   | 45.70                    | 8.30                 |

High (914.9 MHz)

| Frequency<br>[MHz] | (P) | Limit<br>PK<br>[dBuV/m] | Result<br>PK<br>[dBuV/m] | Margin<br>PK<br>[dB] |
|--------------------|-----|-------------------------|--------------------------|----------------------|
| 1 445.50           | H   | 54.00                   | 44.80                    | 9.20                 |
| 1 446.63           | V   | 54.00                   | 45.40                    | 8.60                 |
| 1 829.13           | H   | 54.00                   | 43.90                    | 10.10                |
| 1 829.13           | V   | 54.00                   | 46.50                    | 7.50                 |
| 2 453.50           | H   | 54.00                   | 47.90                    | 6.10                 |
| 2 454.63           | V   | 54.00                   | 49.30                    | 4.70                 |

**Remarks**

1. The Unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in stand-up position(Z axis) and the worst case was recorded.
2. Result = Reading + c.f(correction factor)
3. Correction factor = Antenna factor + Cable loss - Amp Gain
4. The peak value is lower than the average limit value. (Peak < 54 dBuV/m)

**Test mode : 500 kHz Bandwidth**

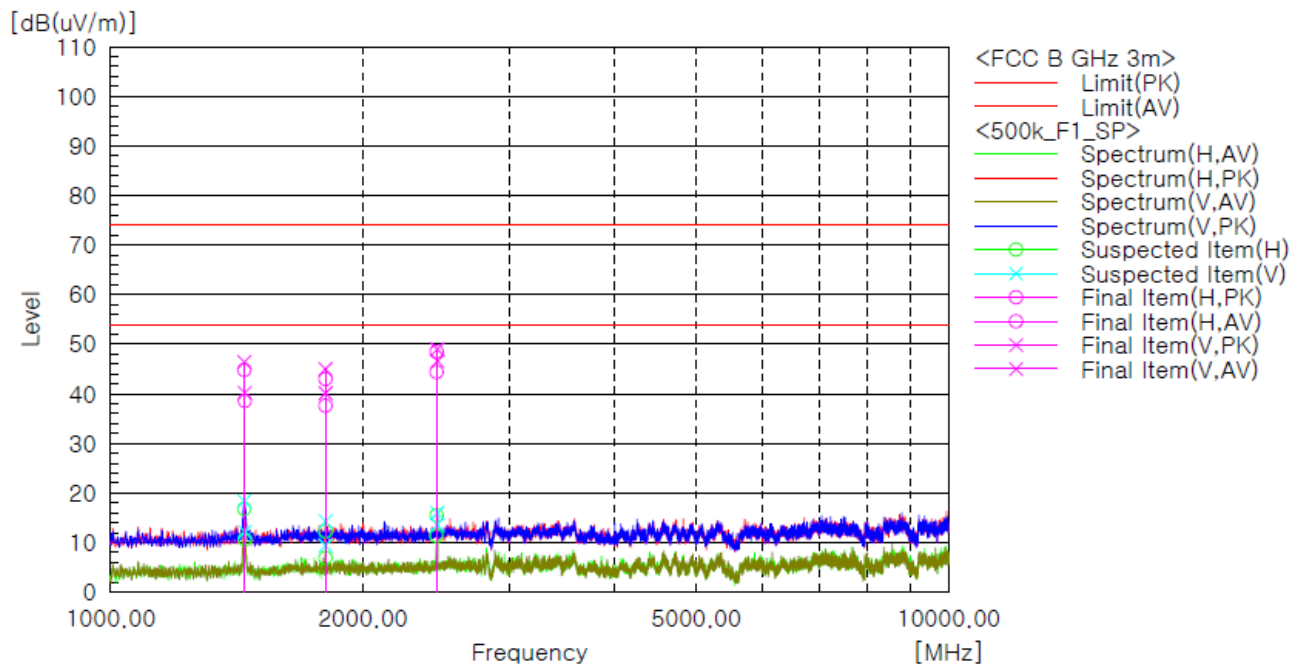
The requirements are:

☒ Complies

**Test Data**

Model Name : AWAOMNSURF  
Manufacturer : BITFINDER INC.  
Mode : 500k\_F1\_SP

Model Type :



Low (903.0 MHz)

| Frequency<br>[MHz] | (P) | Limit<br>PK<br>[dBuV/m] | Result<br>PK<br>[dBuV/m] | Margin<br>PK<br>[dB] |
|--------------------|-----|-------------------------|--------------------------|----------------------|
| 1 444.38           | H   | 54.00                   | 44.80                    | 9.20                 |
| 1 444.38           | V   | 54.00                   | 46.40                    | 7.60                 |
| 1 805.50           | H   | 54.00                   | 43.00                    | 11.00                |
| 1 805.50           | V   | 54.00                   | 45.00                    | 9.00                 |
| 2 450.13           | H   | 54.00                   | 48.50                    | 5.50                 |
| 2 454.63           | V   | 54.00                   | 49.00                    | 5.00                 |

Mid (907.8 MHz)

| Frequency<br>[MHz] | (P) | Limit<br>PK<br>[dBuV/m] | Result<br>PK<br>[dBuV/m] | Margin<br>PK<br>[dB] |
|--------------------|-----|-------------------------|--------------------------|----------------------|
| 1 445.50           | H   | 54.00                   | 44.10                    | 9.90                 |
| 1 443.25           | V   | 54.00                   | 46.40                    | 7.60                 |
| 1 814.50           | H   | 54.00                   | 43.80                    | 10.20                |
| 1 814.50           | V   | 54.00                   | 46.30                    | 7.70                 |
| 2 469.25           | H   | 54.00                   | 47.10                    | 6.90                 |
| 2 451.25           | V   | 54.00                   | 47.30                    | 6.70                 |

High (914.2 MHz)

| Frequency<br>[MHz] | (P) | Limit<br>PK<br>[dBuV/m] | Result<br>PK<br>[dBuV/m] | Margin<br>PK<br>[dB] |
|--------------------|-----|-------------------------|--------------------------|----------------------|
| 1 443.25           | H   | 54.00                   | 43.90                    | 10.10                |
| 1 447.75           | V   | 54.00                   | 46.40                    | 7.60                 |
| 1 828.00           | H   | 54.00                   | 44.00                    | 10.00                |
| 1 828.00           | V   | 54.00                   | 45.50                    | 8.50                 |
| 2 472.63           | H   | 54.00                   | 46.30                    | 7.70                 |
| 2 449.00           | V   | 54.00                   | 48.40                    | 5.60                 |

**Remarks**

1. The Unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in stand-up position(Z axis) and the worst case was recorded.
2. Result = Reading + c.f(correction factor)
3. Correction factor = Antenna factor + Cable loss - Amp Gain
4. The peak value is lower than the average limit value. (Peak < 54 dBuV/m)

## 4.2 AC Conducted Emissions

A radio apparatus that is designed to be connected to the public utility (AC) power line shall ensure that the radio frequency voltage, which is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz-30 MHz, shall not exceed the limits.

### Instrument Settings

IF Band Width: 9 kHz

### Test Procedures

ANSI C63.10-2013 - Section 6.2

The EUT was placed on a non-metallic table 0.8m above the metallic, grounded floor and 0.4m from the reference ground plane wall. The distance to other metallic surfaces was at least 0.8m.

Amplitude measurements were performed with a quasi-peak detector and an average detector.

### Limit

| Frequency<br>(MHz) | Conducted Limit (dBuV) |           |
|--------------------|------------------------|-----------|
|                    | Quasi-peak             | Average** |
| 0.15 ~ 0.5         | 66 to 56*              | 56 to 46* |
| 0.5 ~ 5            | 56                     | 46        |
| 5 ~ 30             | 60                     | 50        |

\* The level decreases linearly with the logarithm of the frequency.

\*\* A linear average detector is required.

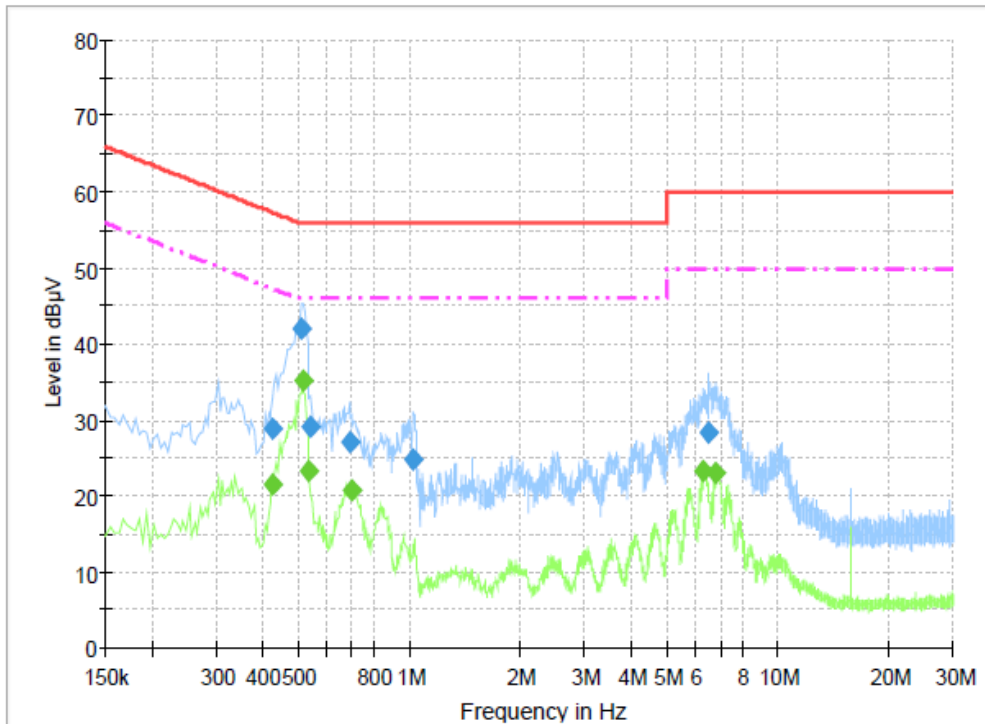
### Test Results

The requirements are:

☒ Complies

## Test Data

[LINE]



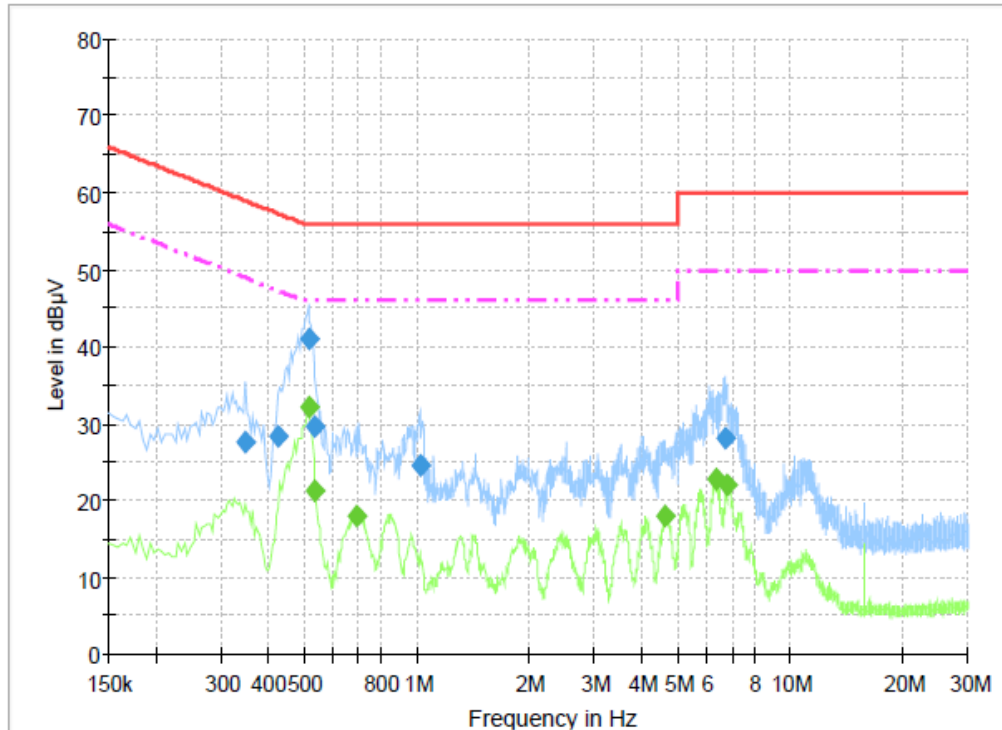
## Final Result 1

| Frequency (MHz) | QuasiPeak (dBμV) | Meas. Time (ms) | Bandwidth (kHz) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBμV) |
|-----------------|------------------|-----------------|-----------------|--------|------|------------|-------------|--------------|
| 0.429000        | 28.8             | 1000.0          | 9.000           | On     | L1   | 10.0       | 28.5        | 57.3         |
| 0.510000        | 41.9             | 1000.0          | 9.000           | On     | L1   | 10.0       | 14.1        | 56.0         |
| 0.541500        | 29.0             | 1000.0          | 9.000           | On     | L1   | 10.0       | 27.0        | 56.0         |
| 0.690000        | 27.0             | 1000.0          | 9.000           | On     | L1   | 10.0       | 29.0        | 56.0         |
| 1.027500        | 24.8             | 1000.0          | 9.000           | On     | L1   | 9.9        | 31.2        | 56.0         |
| 6.513000        | 28.4             | 1000.0          | 9.000           | On     | L1   | 10.0       | 31.6        | 60.0         |

## Final Result 2

| Frequency (MHz) | CAverage (dBμV) | Meas. Time (ms) | Bandwidth (kHz) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBμV) |
|-----------------|-----------------|-----------------|-----------------|--------|------|------------|-------------|--------------|
| 0.429000        | 21.5            | 1000.0          | 9.000           | On     | L1   | 10.0       | 25.7        | 47.3         |
| 0.514500        | 35.2            | 1000.0          | 9.000           | On     | L1   | 10.0       | 10.8        | 46.0         |
| 0.537000        | 23.3            | 1000.0          | 9.000           | On     | L1   | 10.0       | 22.7        | 46.0         |
| 0.699000        | 20.7            | 1000.0          | 9.000           | On     | L1   | 10.0       | 25.3        | 46.0         |
| 6.315000        | 23.3            | 1000.0          | 9.000           | On     | L1   | 10.0       | 26.7        | 50.0         |
| 6.823500        | 23.1            | 1000.0          | 9.000           | On     | L1   | 10.0       | 26.9        | 50.0         |

[NEUTRAL]



### Final Result 1

| Frequency (MHz) | QuasiPeak (dBμV) | Meas. Time (ms) | Bandwidth (kHz) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBμV) |
|-----------------|------------------|-----------------|-----------------|--------|------|------------|-------------|--------------|
| 0.348000        | 27.6             | 1000.0          | 9.000           | On     | N    | 10.0       | 31.4        | 59.0         |
| 0.429000        | 28.3             | 1000.0          | 9.000           | On     | N    | 10.0       | 29.0        | 57.3         |
| 0.514500        | 41.0             | 1000.0          | 9.000           | On     | N    | 10.0       | 15.0        | 56.0         |
| 0.537000        | 29.6             | 1000.0          | 9.000           | On     | N    | 10.0       | 26.4        | 56.0         |
| 1.023000        | 24.6             | 1000.0          | 9.000           | On     | N    | 9.9        | 31.4        | 56.0         |
| 6.738000        | 28.0             | 1000.0          | 9.000           | On     | N    | 10.1       | 32.0        | 60.0         |

### Final Result 2

| Frequency (MHz) | CAverage (dBμV) | Meas. Time (ms) | Bandwidth (kHz) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBμV) |
|-----------------|-----------------|-----------------|-----------------|--------|------|------------|-------------|--------------|
| 0.514500        | 32.2            | 1000.0          | 9.000           | On     | N    | 10.0       | 13.8        | 46.0         |
| 0.537000        | 21.2            | 1000.0          | 9.000           | On     | N    | 10.0       | 24.8        | 46.0         |
| 0.694500        | 18.1            | 1000.0          | 9.000           | On     | N    | 9.9        | 27.9        | 46.0         |
| 4.650000        | 18.0            | 1000.0          | 9.000           | On     | N    | 10.1       | 28.0        | 46.0         |
| 6.337500        | 22.7            | 1000.0          | 9.000           | On     | N    | 10.1       | 27.3        | 50.0         |
| 6.828000        | 22.0            | 1000.0          | 9.000           | On     | N    | 10.1       | 28.0        | 50.0         |

## APPENDIX A – Test Equipment Used For Tests

|    | Name of Equipment   | Manufacturer                | Model No.                           | Serial No.    | Cal Date   | Due Date   |
|----|---------------------|-----------------------------|-------------------------------------|---------------|------------|------------|
| 1  | EMI Test Receiver   | Rohde & Schwarz             | ESCI7                               | 100814        | 2019-10-22 | 2020-10-22 |
| 2  | Bilog Antenna       | Schaffner                   | CBL6111C                            | 2551          | 2018-05-10 | 2020-05-10 |
| 3  | Active Loop Antenna | SCHWARZBECK                 | FMZB 1513                           | 1513-125      | 2018-05-02 | 2020-05-02 |
| 4  | 6dB Attenuator      | Rohde & Schwarz             | DNF                                 | 272.4110.50-2 | 2019-10-25 | 2020-10-25 |
| 5  | AMPLIFIER           | SONOMA                      | 310                                 | 291721        | 2019-01-28 | 2020-01-28 |
| 6  | Preamplifier        | Agilent                     | 8449B                               | 3008A02011    | 2018-12-03 | 2019-12-03 |
| 7  | EMI Test Receiver   | Rohde & Schwarz             | ESU40                               | 100336        | 2019-01-29 | 2020-01-29 |
| 8  | Preamplifier        | Agilent                     | 8449B                               | 3008A02011    | 2018-12-03 | 2019-12-03 |
| 9  | Horn Antenna        | ETS-Lindgren                | 3117                                | 00154525      | 2019-02-22 | 2021-02-22 |
| 10 | Band Reject Filter  | Wainwright Instruments GmbH | WRCG902/930<br>-894/938-<br>50/12SS | SN1           | 2019-01-21 | 2020-01-21 |
| 11 | EMI Test Receiver   | R&S                         | ESCI3                               | 100032        | 2019-01-29 | 2020-01-29 |
| 12 | LISN                | Rohde & Schwarz             | ENV216                              | 101236        | 2019-10-22 | 2020-10-22 |

|   | Cable    | Manufacturer       | Model No.    | Serial No. | Check Date |
|---|----------|--------------------|--------------|------------|------------|
| 1 | RF Cable | HUBER+SUHNER       | SUCOFLEX 102 | MY073/2    | 2018-12-19 |
| 2 | RF Cable | HUBER+SUHNER       | SUCOFLEX 102 | MY4728/2   | 2018-12-19 |
| 3 | RF Cable | HUBER+SUHNER       | SUCOFLEX 104 | MY27558/4  | 2018-12-19 |
| 4 | RF Cable | HUBER+SUHNER       | SUCOFLEX 104 | N/A        | 2018-12-19 |
| 5 | RF Cable | HUBER+SUHNER       | SUCOFLEX 104 | MY27573/4  | 2018-12-19 |
| 6 | RF Cable | HUBER+SUHNER       | SUCOFLEX 106 | N/A        | 2018-12-19 |
| 7 | RF Cable | Canare Corporation | L-5D2W       | N/A        | 2018-12-19 |