



# **FCC TEST REPORT**

**FCC ID: 2AHB5-S3T**

On Behalf of

**Zhejiang Hanshow Technology CO.,LTD.**

**Electronic shelf label**

**Model No.: Stellar-S3TN@, Stellar-S3YTN@, Stellar-STN@**

Prepared for : Zhejiang Hanshow Technology CO.,LTD.  
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Report Number : T1881223 01  
Date of Receipt : August 01, 2018  
Date of Test : August 01, 2018 - August 10, 2018  
Date of Report : August 14, 2018  
Version Number : REV0

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## TEST REPORT DECLARATION

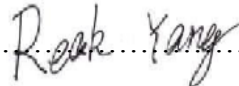
Applicant : Zhejiang Hanshow Technology CO.,LTD.  
 Address : Bld. 33, No. 966 xiuyuan Rd., BeiKeJian Innovation Park, XiuZhou District,  
 Jiaxing, Zhejiang, PRC, PC 314000  
 Manufacturer : Zhejiang Hanshow Technology CO.,LTD.  
 Address : Bld. 33, No. 966 xiuyuan Rd., BeiKeJian Innovation Park, XiuZhou District,  
 Jiaxing, Zhejiang, PRC, PC 314000  
 EUT Description : Electronic shelf label  
 (A) Model No. : Stellar-S3TN@, Stellar-S3YTN@,  
 Stellar-STN@  
 (B) Trademark : Hanshow

Measurement Standard Used:

### **FCC Rules and Regulations Part 15 Subpart C Section 15.249: 2017, ANSI C63.10:2013**

The device described above is tested by Shenzhen Alpha Product Testing Co., Ltd. to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The test results are contained in this test report and Shenzhen Alpha Product Testing Co., Ltd. is assumed full responsibility for the accuracy and completeness of test. Also, this report shows that the EUT is technically compliant with the FCC Part15 requirements.

This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Shenzhen Alpha Product Testing Co., Ltd.

Tested by (name + signature).....: Reak Yang  
 Project Engineer 

Approved by (name + signature).....: Simple Guan  
 Project Manager 

Date of issue.....: August 14, 2018

**Revision History**

| Revision | Issue Date      | Revisions              | Revised By  |
|----------|-----------------|------------------------|-------------|
| 00       | August 14, 2018 | Initial released Issue | Simple Guan |

## 1. SUMMARY OF STANDARDS AND RESULTS

### 1.1. Description of Standards and Results

The EUT have been tested according to the applicable standards as referenced below:

| <b>EMISSION</b>   |                         |                           |                |
|---|-------------------------|---------------------------|----------------|
| <b>Description of Test Item</b>   | <b>Test Requirement</b> | <b>Standard Paragraph</b> | <b>Results</b> |
| Power Line Conducted Emission Test  | FCC Part 15:2017        | Section 15.207            | <b>N/A</b>     |
| Spurious Emission Test  | FCC Part 15:2017        | Section 15.249&15.209     | <b>P</b>       |
| Occupied bandwidth  | FCC Part 15:2017        | Section 15.215            | <b>P</b>       |
| Band edge Requirement   | FCC Part 15:2017        | Section 15.249            | <b>P</b>       |
| Antenna Requirement   | FCC Part 15:2017        | Section 15.203            | <b>P</b>       |
| Note: 1. P is an abbreviation for Pass.<br>2. F is an abbreviation for Fail.<br>3. N/A is an abbreviation for Not Applicable. |                         |                           |                |

## 2. GENERAL INFORMATION

### 2.1. Description of Device (EUT)

|                     |  |
|---------------------|--|
| Description         | : Electronic shelf label   |
| Model Number        | : Stellar-S3TN@, Stellar-S3YTN@, Stellar-STN@  |
| Diff                | : There is no difference between all the models, except the model name, so this report performs the model Stellar-S3TN@. |
| Trademark           | : Hanshow  |
| Test Voltage        | : DC 3V From battery   |
| Operation frequency | : 2402-2480MHz   |
| Channel No.         | : 157  |
| Channel Separation  | : 500KHz   |
| Modulation type     | : GFSK   |
| Data Rate           | : Downlink:500K bps Uplink:100K bps  |
| Antenna Type        | : PCB Antenna, max gain 0dBi.  |
| Software version    | : V1.0   |
| Hardware version    | : HS_EL5101_5M_53_00   |
| Sample Type         | : Prototype production   |

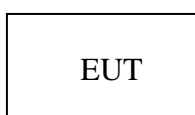
## 2.2. Accessories of Device (EUT)

Accessories 1 : N/A

## 2.3. Tested Supporting System Details

| No. | Description | Manufacturer | Model | Serial Number | Certification or DOC |
|-----|-------------|--------------|-------|---------------|----------------------|
| 1   | N/A         | N/A          | N/A   | N/A           | N/A                  |

## 2.4. Block Diagram of connection between EUT and simulators



## 2.5. Test Mode Description

Test mode:

| Mode | Channel | Frequency (MHz) |
|------|---------|-----------------|
| GFSK | CH1     | 2402            |
|      | CH80    | 2441            |
|      | CH157   | 2480            |

Note:

1. The test was used to control EUT work in Continuous TX mode, and select test channel, wireless mode
2. The EUT has been tested as an independent unit. And Continual Transmitting in maximum power.
3. New battery is used during all test.
4. For the relevant Conducted Measurement, the temporary antenna connector is used during the measurement. Antenna Connector Impedance: 50Ω , Cable Loss: 1.0 dB

Channel list:

| Channel No. | Frequency (MHz) | Channel No. | Frequency (MHz) | Channel No. | Frequency (MHz) |
|-------------|-----------------|-------------|-----------------|-------------|-----------------|
| 1           | 2402            | ...         | ...             | 154         | 2478.5          |
| 2           | 2402.5          | 79          | 2440.5          | 155         | 2479            |
| 3           | 2403            | 80          | 2441            | 156         | 2479.5          |
| 4           | 2403.5          | 81          | 2441.5          | 157         | 2480            |
| ...         | ...             | ..          |                 |             |                 |



## 2.6. Test Conditions

|                   |           |
|-------------------|-----------|
| Temperature range | 21-25°C   |
| Humidity range    | 40-75%    |
| Pressure range    | 86-106kPa |

## 2.7. Test Facility

Shenzhen Alpha Product Testing Co., Ltd.

Building i, No.2, Lixin Road, Fuyong Street, Bao'an District, 518103,  
Shenzhen, Guangdong, China

June 21, 2018 File on Federal Communication Commission

Registration Number: 293961

July 25, 2017 Certificated by IC

Registration Number: 12135A

## 2.8. Measurement Uncertainty

(95% confidence levels, k=2)

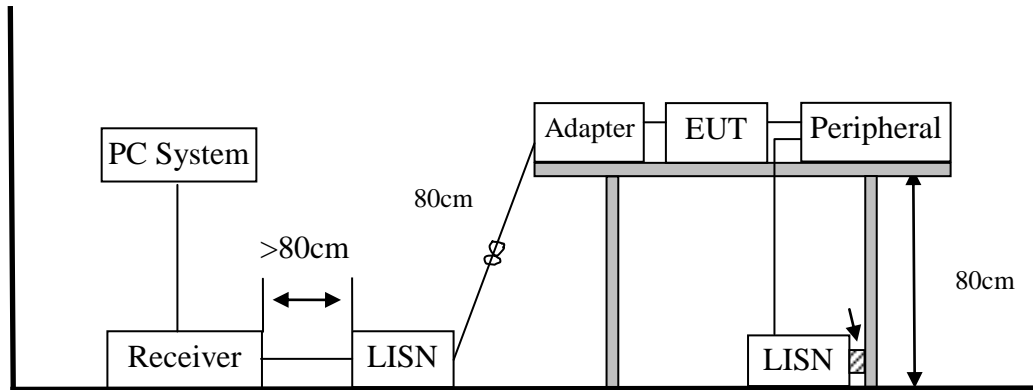
| Item   | Uncertainty          |
|--|----------------------|
| Uncertainty for Power point Conducted Emissions Test                     | 2.74dB               |
| Uncertainty for Radiation Emission test in 3m chamber<br>(below 30MHz)   | 2.13 dB(Polarize: V) |
|  | 2.57dB(Polarize: H)  |
| Uncertainty for Radiation Emission test in 3m chamber<br>(30MHz to 1GHz) | 3.77dB(Polarize: V)  |
|  | 3.80dB(Polarize: H)  |
| Uncertainty for Radiation Emission test in 3m chamber<br>(1GHz to 25GHz) | 4.16dB(Polarize: H)  |
|  | 4.13dB(Polarize: V)  |
| Uncertainty for radio frequency  | $5.4 \times 10^{-8}$ |
| Uncertainty for conducted RF Power                                       | 0.37dB               |
| Uncertainty for temperature  | 0.2°C                |
| Uncertainty for humidity   | 1%                   |
| Uncertainty for DC and low frequency voltages                            | 0.06%                |

## 2.9. Test Equipment List

| Equipment              | Manufacturer  | Model No.          | Serial No.             | Last cal.  | Cal. Due day |
|------------------------|---------------|--------------------|------------------------|------------|--------------|
| Spectrum analyzer      | Agilent       | E4407B             | MY49510055             | 2017.09.23 | 2018.09.22   |
| Horn Antenna           | SCHWARZBECK   | BBHA 9120 D        | BBHA 9120 D(1201)      | 2016.09.30 | 2018.09.29   |
| Filter                 | KANGMAI       | ZLPF-LDC-1000-1959 | 1209002075             | 2017.09.22 | 2018.09.21   |
| Filter                 | WAINWRIGHT    | WHKX2.80/18G-12SS  | SN1                    | 2017.09.22 | 2018.09.21   |
| RF Cable               | Resenberger   | Cable 4            | N/A                    | 2017.09.22 | 2018.09.21   |
| Signal Analyzer        | Agilent       | N9020A             | MY499100060            | 2017.09.23 | 2018.09.22   |
| Amplifier              | HP            | HP8347A            | 2834A00455             | 2017.09.23 | 2018.09.22   |
| Amplifier              | Agilent       | 8449B              | 3008A02664             | 2017.09.23 | 2018.09.22   |
| Filter                 | WAINWRIGHT    | WHKX1.0G/15G-10SS  | SN40                   | 2017.09.22 | 2018.09.21   |
| Test Receiver          | ROHDE&SCHWARZ | ESR                | 1316.3003K03-102082-Wa | 2017.09.23 | 2018.09.22   |
| Bilog Antenna          | SCHWARZBECK   | VULB 9168          | 9168-438               | 2016.09.30 | 2018.09.29   |
| 9*6*6 anechoic chamber | CHENYU        | 9*6*6              | N/A                    | 2016.07.21 | 2020.07.20   |
| RF Cable               | Resenberger   | Cable 1            | N/A                    | 2017.09.22 | 2018.09.21   |
| RF Cable               | Resenberger   | Cable 2            | N/A                    | 2017.09.22 | 2018.09.21   |
| RF Cable               | Resenberger   | Cable 3            | N/A                    | 2017.09.28 | 2018.09.27   |
| Loop Antenna           | SCHWARZBECK   | FMZB 1519B         | 00005                  | 2016.09.29 | 2018.09.28   |
| Horn Antenna           | SCHWARZBECK   | BBHA 9170          | BBHA 9170294           | 2017.02.22 | 2019.02.21   |
| Preamplifier           | SCHWARZBECK   | BBV9721            | 9721-031               | 2017.09.03 | 2018.09.02   |
| Attenuator             | HP            | 8494B              | DC-18G                 | 2017.10.22 | 2018.10.23   |
| Spectrum analyzer      | ROHDE&SCHWARZ | FSQ40              | 200061                 | 2017.12.28 | 2018.12.27   |
| 20dB Attenuator        | ICPROBING     | IATS1              | 82347                  | 2017.09.22 | 2018.09.21   |

### 3. POWER LINE CONDUCTED EMISSION TEST

#### 3.1. Block Diagram of Test Setup



#### 3.2. Test Limits

| Frequency       | Maximum RF Line Voltage          |                               |
|-----------------|----------------------------------|-------------------------------|
|                 | Quasi-Peak Level<br>dB( $\mu$ V) | Average Level<br>dB( $\mu$ V) |
| 150kHz ~ 500kHz | 66 ~ 56*                         | 56 ~ 46*                      |
| 500kHz ~ 5MHz   | 56                               | 46                            |
| 5MHz ~ 30MHz    | 60                               | 50                            |

- Notes:
1. Emission level=Read level + LISN factor-Preamp factor + Cable loss
  2. \* Decreasing linearly with logarithm of frequency.
  3. The lower limit shall apply at the transition frequencies.

### 3.3. Configuration of EUT on Test

The following equipment are installed on Power Line Conducted Emission Test to meet the commission requirement and operating regulations in a manner which tends to maximize its emission characteristics in a normal application.

### 3.4. Operating Condition of EUT

- (1) Setup the EUT as shown as Section 3.1.
- (2) Turn on the power of all equipment.
- (3) Let the EUT work in test mode taking the test.

### 3.5. Test Procedure

- (1) The EUT was placed on a non-metallic table, 80cm above the ground plane. The EUT Power connected to the power mains through a line impedance stabilization network (L.I.S.N. 1#). This provided a 50-ohm coupling impedance for the EUT (Please refer to the block diagram of the test setup and photographs). The other peripheral devices power cord connected to the power mains through a line impedance stabilization network (L.I.S.N.#2). Both sides of power line were checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipments and all of the interface cables were changed according to ANSI C63.10:2013 on conducted Emission test.
- (2) The frequency range from 150kHz to 30MHz is checked, the bandwidth of test receiver (R&S TEST RECEIVER ESCI) is set at 9kHz.
- (3) The frequency range from 30MHz to 1000MHz was pre-scanned with a Peak detector and all final readings of measurement from Test Receiver are Quasi-Peak and Average values.
- (4) The test results are reported on Section 3.6.

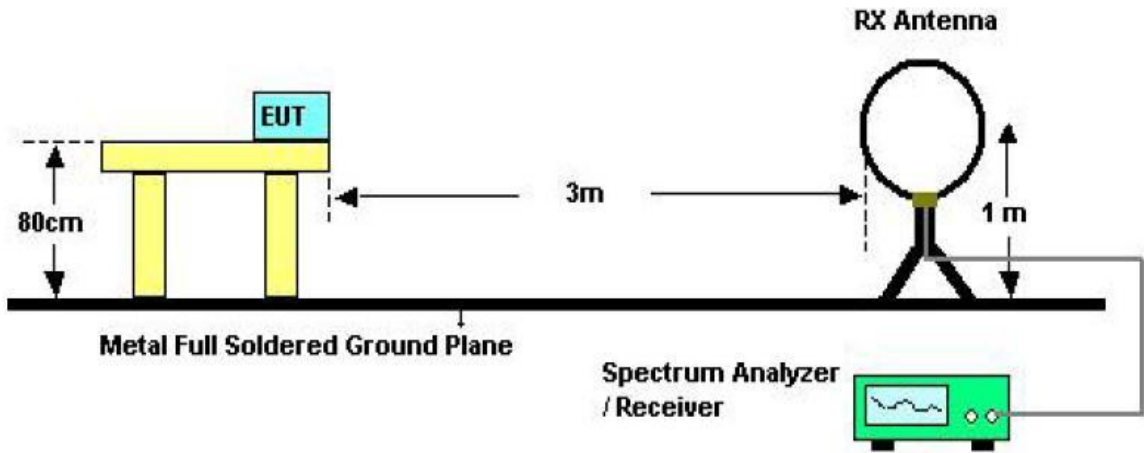
### 3.6. Test Results

|   |                          |             |       |
|---|--------------------------|-------------|-------|
| EUT   | : Electronic shelf label | Test Date   | : N/A |
| M/N   | : Stellar-S3TN@          | Temperature | : N/A |
| Test Engineer   | : N/A                    | Humidity    | : N/A |
| Test Mode   | : N/A                    |             |       |
| Test Results  | : <b>N/A</b>             |             |       |
| Note: 1. Not applicable for equipment operated with battery power supply. |                          |             |       |

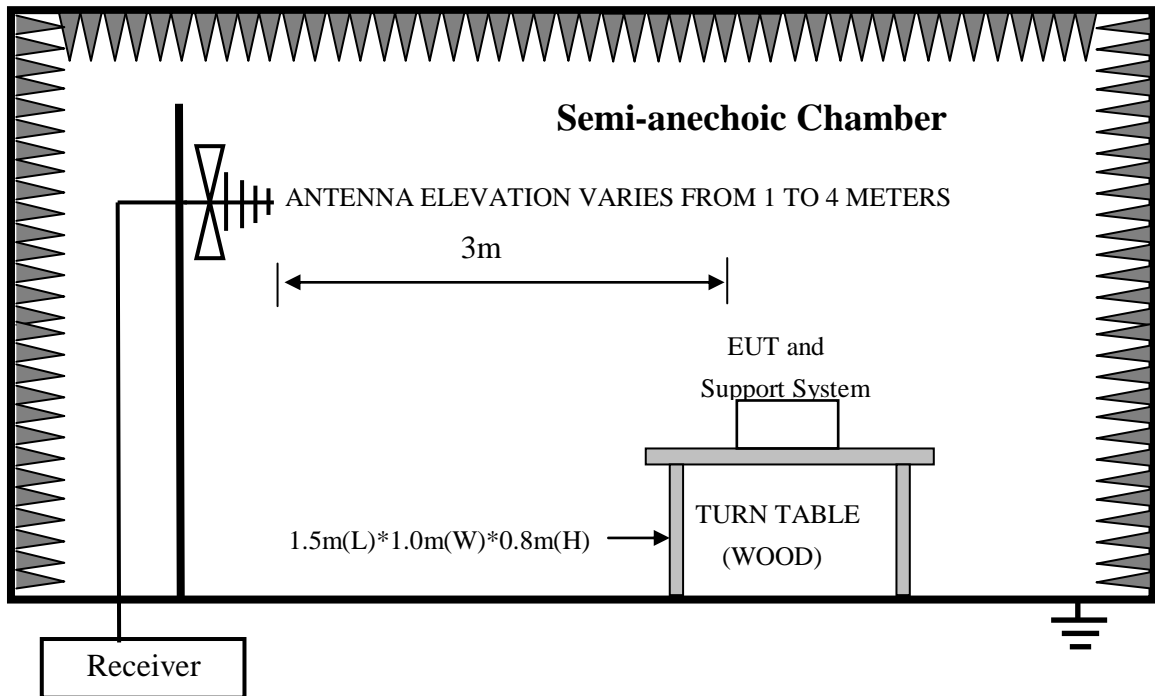
## 4. RADIATED EMISSION TEST

### 4.1. Block Diagram of Test Setup

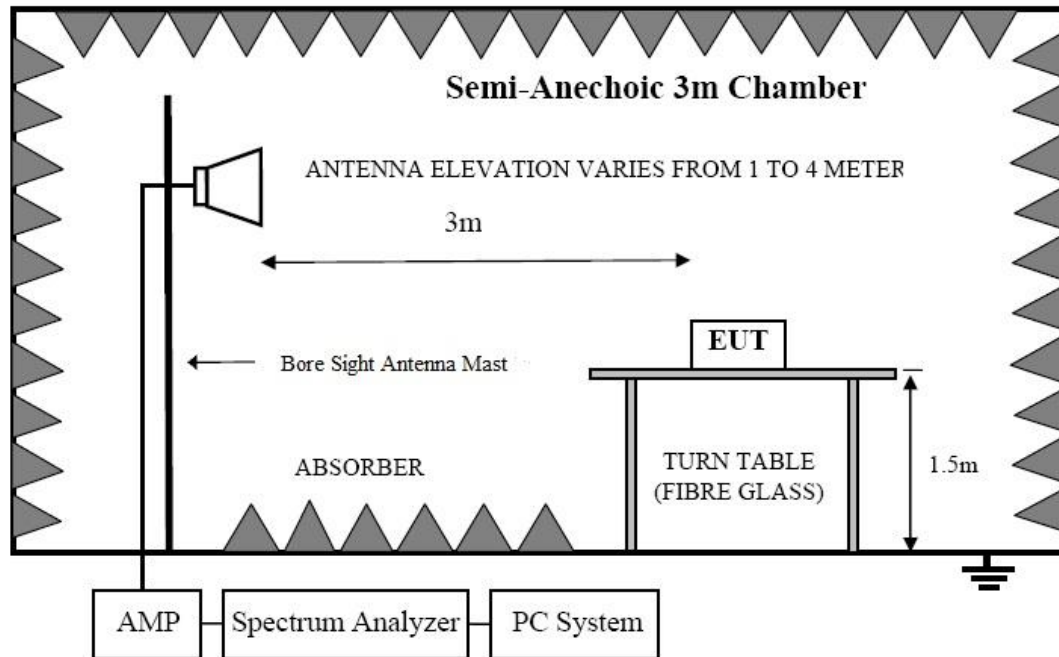
In Semi Anechoic Chamber (3m) Test Setup Diagram for 9KHz~30MHz



In Semi Anechoic Chamber (3m) Test Setup Diagram for 30MHz~1000MHz



## In Semi Anechoic Chamber (3m) Test Setup Diagram for Above 1GHz



## 4.2. Test Limit

| Frequency<br>MHz  | Distance<br>(Meters) | Field Strengths Limits |                            |
|-------------------|----------------------|------------------------|----------------------------|
|                   |                      | uV/m                   | dB uV/m                    |
| 0.009 ~ 0.490     | 300                  | 2400/F(kHz)            | ---                        |
| 0.490 ~ 1.705     | 30                   | 24000/F(kHz)           | ----                       |
| 1.705 ~ 30        | 30                   | 30                     | 29.5                       |
| 30 ~ 88           | 3                    | 100(3nW)               | 40                         |
| 88 ~ 216          | 3                    | 150(6.8nW)             | 43.5                       |
| 216 ~ 960         | 3                    | 200(12nW)              | 46                         |
| Above 960         | 3                    | 500(75nW)              | 54                         |
| Carrier frequency | 3                    | 50000(avg)             | 113.97(peak)<br>93.97(avg) |

- Notes:
1. Emission level = Read level + Antenna Factor - Preamp Factor + Cable Loss
  2. The smaller limit shall apply at the cross point between two frequency bands.
  3. Distance is the distance in meters between the measuring instrument, antenna and the closest point of any part of the device or system.
  4. For frequencies above 1000 MHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

### 4.3. Configuration of EUT on Test

The following equipment are installed on Radiated Emission Test to meet the commission requirements and operating regulations in a manner that tends to maximize its emission characteristics in normal application.

### 4.4. Operating Condition of EUT

- (1) Setup the EUT as shown as Section 4.1.
- (2) Turn on the power of all equipment.
- (3) Let the EUT work in test mode taking the test.

### 4.5. Test Procedure

- (1) The EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber for below 1GHz and 150 cm above the ground plane inside a semi-anechoic chamber for above 1GHz. An antenna was located 3m from the EUT on an adjustable mast. A pre-scan was first performed in order to find prominent radiated emissions. For final emissions measurements at each frequency of interest, the EUT were rotated and the antenna height was varied between 1m and 4m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. In order to find the maximum emission, the relative positions of equipments and all of the interface cables were changed according to ANSI C63.10: 2013 on Radiated Emission test.
- (2) For the radiated emission test above 1GHz:  
Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
- (3) Test antenna was located 4m from the EUT on an adjustable mast. Below pre-scan procedure was first performed in order to find prominent radiated emissions.
  - (a) Change work frequency or channel of device if practicable.
  - (b) Change modulation type of device if practicable.
  - (c) Rotated EUT though three orthogonal axes to determine the attitude of EUT arrangement produces highest emissions
- (4) For harmonic emissions test a appropriate high pass filter was inserted in the input port of AMP



- (5) The frequency range from 9KHz to 150KHz is checked, the bandwidth of test receiver (R&S TEST RECEIVER ESR) is set at 200Hz.  
The frequency range from 150KHz to 30MHz is checked, the bandwidth of test receiver (R&S TEST RECEIVER ESR) is set at 9KHz.  
The frequency range from 30MHz to 1000MHz is checked, the bandwidth of test receiver (R&S TEST RECEIVER ESR) is set at 120kHz.  
The frequency range from above 1GHz is checked, the bandwidth of Signal Analyzer (Signal Analyzer N9020A) is set at 1MHz.
- (6) The frequency range from 30MHz to 1000MHz was pre-scanned with a peak detector and all final readings of measurement from Test Receiver are Quasi-Peak values, the frequency range from 1GHz to 6GHz was pre-scanned with a peak detector and all final readings of measurement from Spectrum Analyzer are peak and average values checked, all measurement distance is 3m in 3m semi anechoic chamber.
- (7) Test for all x, y, z axes is performed and only the worst case of X axes was recorded in the test report.
- (8) The test results are reported on Section 4.6.

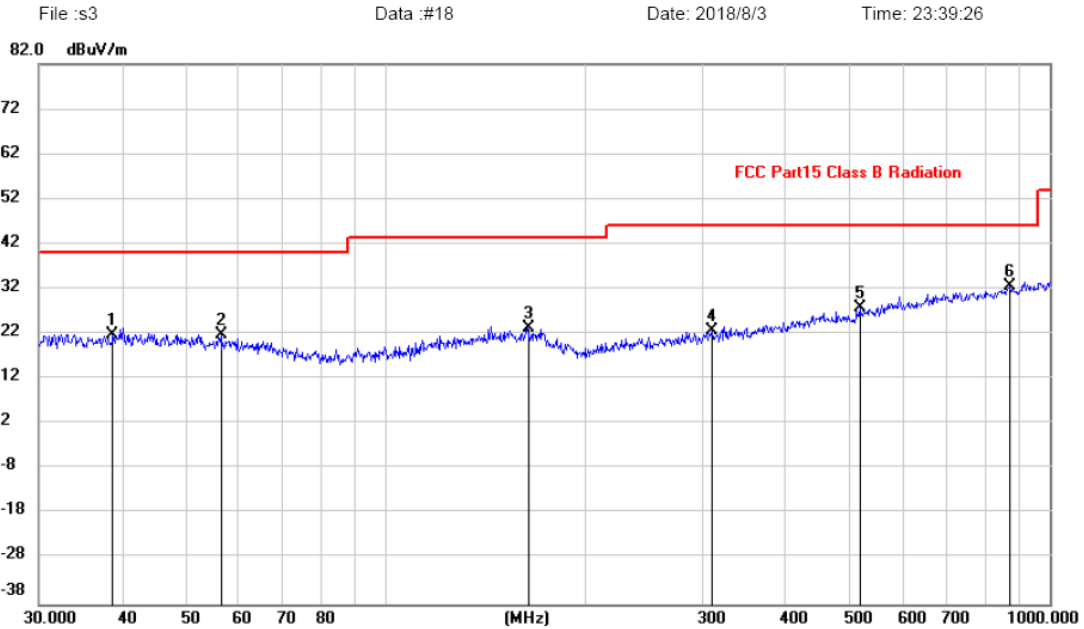
#### 4.6. Test Results

|                 |   |             |              |
|-----------------|---|-------------|--------------|
| Frequency Range | : <b>9KHz~30MHz</b>   |             |              |
| EUT             | : Electronic shelf label  | Test Date   | : 2018.08.03 |
| M/N             | : Stellar-S3TN@   | Temperature | : 24°C       |
| Test Engineer   | : Reak  | Humidity    | : 56%        |
| Test Mode       | : TX CH1, CH80, CH157   |             |              |
| Test Results    | : <b>PASS</b>   |             |              |
| Note:           | 1. Note: The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported. |             |              |

|                 |   |             |              |
|-----------------|---|-------------|--------------|
| Frequency Range | : <b>30MHz~1000MHz</b>  |             |              |
| EUT             | : Electronic shelf label  | Test Date   | : 2018.08.03 |
| M/N             | : Stellar-S3TN@   | Temperature | : 24°C       |
| Test Engineer   | : Reak  | Humidity    | : 56%        |
| Test Mode       | : TX CH1, CH80, CH157   |             |              |
| Test Results    | : <b>PASS</b>   |             |              |
| Note:           | 1. The test results are listed in next pages.<br>2. TX CH157 mode is worst case mode, and this report only reflected the worst mode.<br>3. If the limits for the measurement with the quasi-peak detector are met when using a receiver with a peak detector, the test unit shall be deemed to meet both limits and the measurement with the quasi-peak detector need not be carried out. |             |              |

|                                     |                                 |                   |
|-------------------------------------|---------------------------------|-------------------|
| Site LAB                            | Polarization: <i>Horizontal</i> | Temperature: 23.9 |
| Limit: FCC Part15 Class B Radiation | Power:                          | Humidity: 46 %    |
| EUT:                                | Distance: 3m                    |                   |
| M/N:                                |                                 |                   |
| Mode:2480                           |                                 |                   |
| Note:                               |                                 |                   |
| Engineer Signature:                 |                                 |                   |

**Radiated Emission Measurement**



| No. | Mk. | Freq.    | Reading Level | Correct Factor | Measurement | Limit  | Margin | Antenna Height | Table Degree |         |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------------|--------------|---------|
|     |     | MHz      | dBuV          | dB             | dBuV/m      | dBuV/m | dB     | cm             | degree       | Comment |
| 1   |     | 38.8878  | 7.60          | 14.15          | 21.75       | 40.00  | -18.25 |                |              | peak    |
| 2   |     | 56.3948  | 8.58          | 13.16          | 21.74       | 40.00  | -18.26 |                |              | peak    |
| 3   |     | 163.7550 | 8.98          | 14.28          | 23.26       | 43.50  | -20.24 |                |              | peak    |
| 4   |     | 309.9977 | 9.16          | 13.64          | 22.80       | 46.00  | -23.20 |                |              | peak    |
| 5   |     | 517.2480 | 10.10         | 17.74          | 27.84       | 46.00  | -18.16 |                |              | peak    |
| 6   | *   | 869.1302 | 9.97          | 22.69          | 32.66       | 46.00  | -13.34 |                |              | peak    |

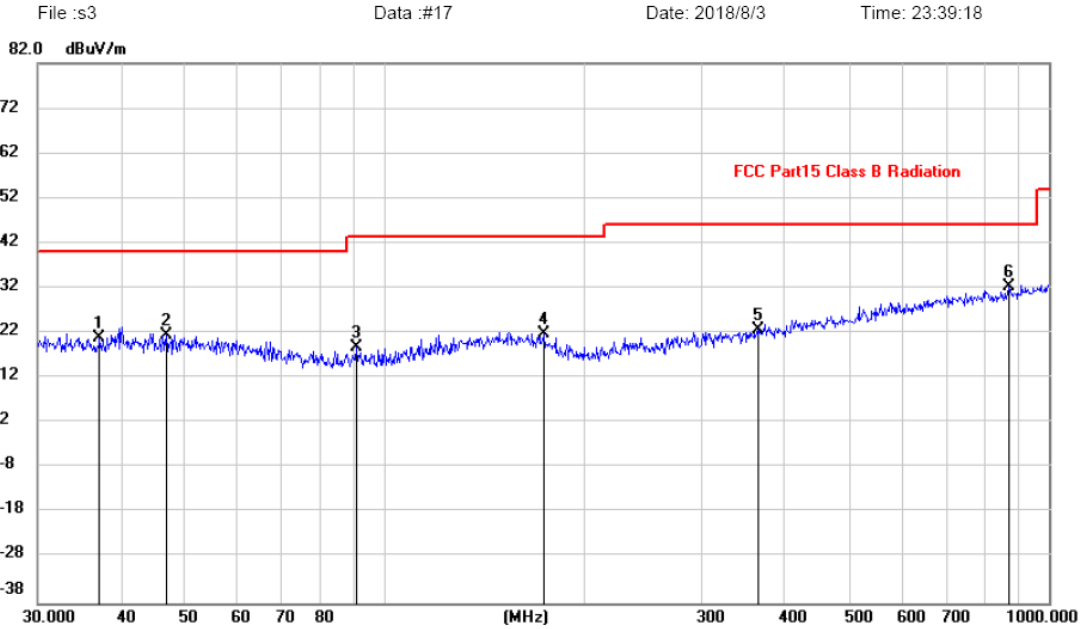
Note:1. \*:Maximum data; x:Over limit; !:over margin.  
 2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

Site LAB  
 Limit: FCC Part15 Class B Radiation  
 EUT:  
 M/N:  
 Mode:2480  
 Note:  
 Engineer Signature:

Polarization: *Vertical*  
 Power:  
 Distance: 3m

Temperature: 23.9  
 Humidity: 46 %

**Radiated Emission Measurement**



| No. | Mk. | Freq.    | Reading Level | Correct Factor | Measurement | Limit  | Margin | Antenna Height | Table Degree |         |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------------|--------------|---------|
|     |     | MHz      | dBuV          | dB             | dBuV/m      | dBuV/m | dB     | cm             | degree       | Comment |
| 1   |     | 37.2855  | 7.14          | 13.82          | 20.96       | 40.00  | -19.04 |                |              | peak    |
| 2   |     | 46.9948  | 8.01          | 13.68          | 21.69       | 40.00  | -18.31 |                |              | peak    |
| 3   |     | 90.5374  | 9.01          | 9.85           | 18.86       | 43.50  | -24.64 |                |              | peak    |
| 4   |     | 173.2051 | 8.58          | 13.25          | 21.83       | 43.50  | -21.67 |                |              | peak    |
| 5   |     | 364.2595 | 8.01          | 14.79          | 22.80       | 46.00  | -23.20 |                |              | peak    |
| 6   | *   | 872.1832 | 9.69          | 22.76          | 32.45       | 46.00  | -13.55 |                |              | peak    |

Note:1. \*:Maximum data; x:Over limit; !:over margin.  
 2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

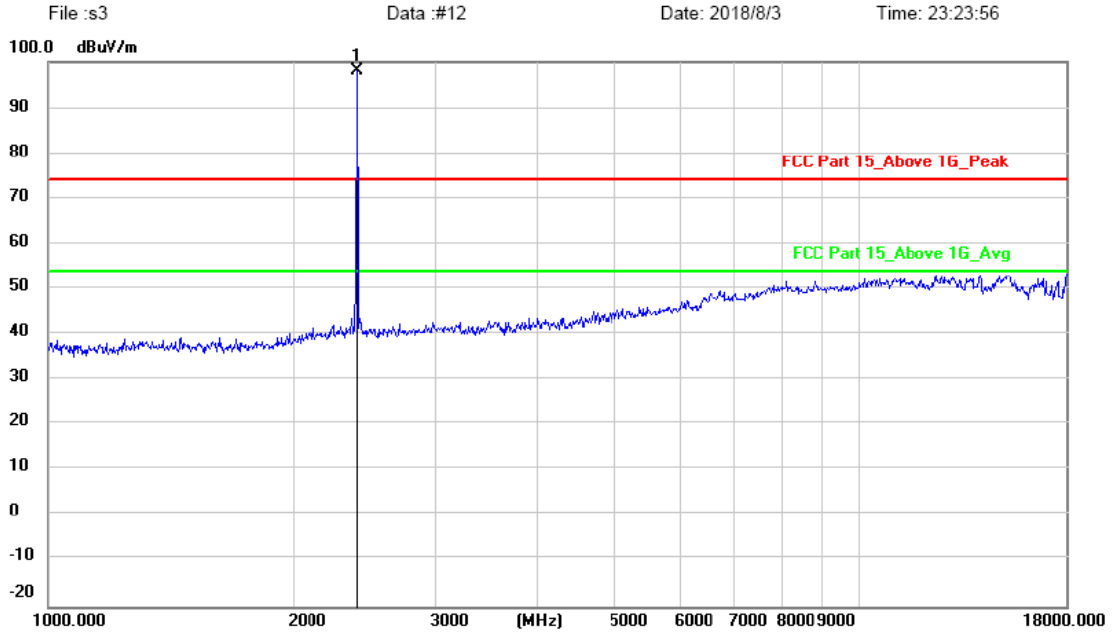
|                                     |  |
|-------------------------------------|--|
| Frequency Range : <b>1GHz~25GHz</b> |  |
| EUT : Electronic shelf label        | Test Date : 2018.08.03   |
| M/N : Stellar-S3TN@                 | Temperature : 24°C   |
| Test Engineer : Reak                | Humidity : 56%   |
| Test Mode : TX CH1, CH80, CH157     |  |
| Test Results : <b>PASS</b>          |  |
| Note:                               | <ol style="list-style-type: none"> <li>1. The plots only show the test result from 1GHz-18GHz, means the frequency above 18GHz also complies with standard requirements and at least have 20dB margin.</li> <li>2. Correct Factor=Cable Loss+ Antenna Factor-Amplifier Gain.<br/>Result=Reading + Correct Factor.<br/>Margin= Result-Limit.</li> <li>3. Spectrum Set for PK measure: RBW=1MHz, VBW=1MHz, Sweep time=Auto, Detector: PK.</li> <li>4. Spectrum Set for AV measure: RBW=1MHz, VBW=10Hz, Sweep time=Auto, Detector: Avg.</li> <li>5. If the limits for the measurement with the average detector are met when using a receiver with a peak detector, the test unit shall be deemed to meet both limits and the measurement with the average detector need not be carried out.</li> </ol> |

Site LAB  
 Limit: FCC Part 15\_Above 1G\_Peak  
 EUT:  
 M/N:  
 Mode:2402  
 Note:  
 Engineer Signature:

Polarization: **Horizontal**  
 Power:  
 Distance: 3m

Temperature: 23.9  
 Humidity: 46 %

**Radiated Emission Measurement**



| No. | Mk. | Freq.    | Reading Level | Correct Factor | Measurement | Limit  | Margin | Antenna Height | Table Degree |         |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------------|--------------|---------|
|     |     | MHz      | dBuV          | dB             | dBuV/m      | dBuV/m | dB     | cm             | degree       | Comment |
| 1   | *   | 2400.753 | 101.47        | -3.41          | 98.06       | 74.00  | 24.06  | peak           |              |         |

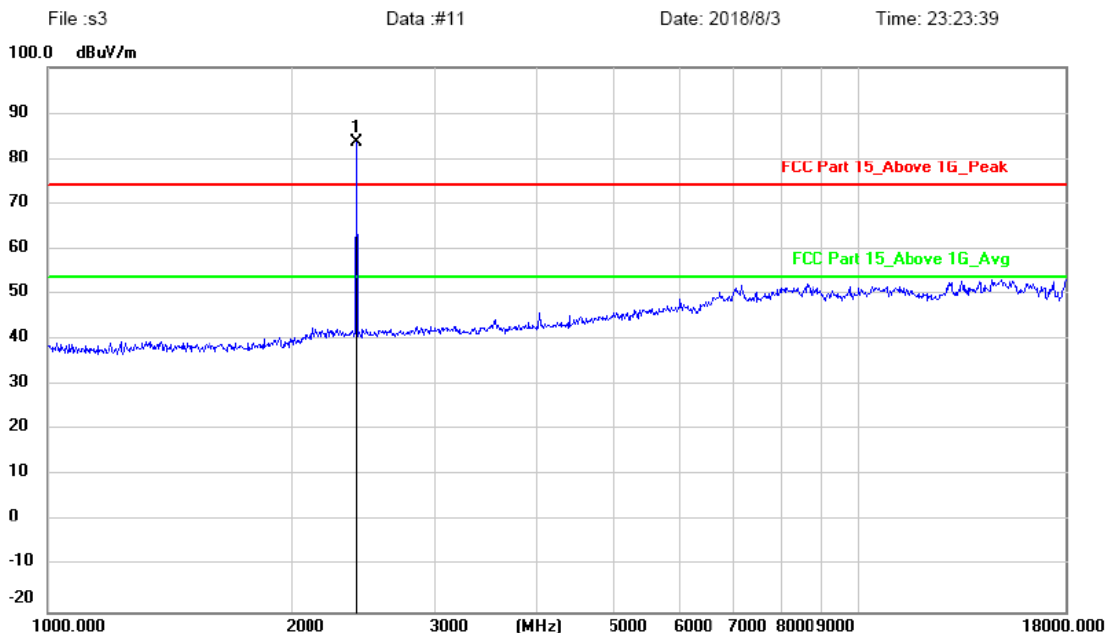
Note:1. \*:Maximum data; x:Over limit; l:over margin.  
 2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

Site LAB  
 Limit: FCC Part 15\_Above 1G\_Peak  
 EUT:  
 M/N:  
 Mode:2402  
 Note:  
 Engineer Signature:

Polarization: **Vertical**  
 Power:  
 Distance: 3m

Temperature: 23.9  
 Humidity: 46 %

**Radiated Emission Measurement**



| No. | Mk. | Freq.    | Reading Level | Correct Factor | Measurement | Limit  | Margin | Antenna Height | Table Degree |         |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------------|--------------|---------|
|     |     | MHz      | dBuV          | dB             | dBuV/m      | dBuV/m | dB     | cm             | degree       | Comment |
| 1   | *   | 2400.753 | 86.97         | -3.41          | 83.56       | 74.00  | 9.56   | peak           |              |         |

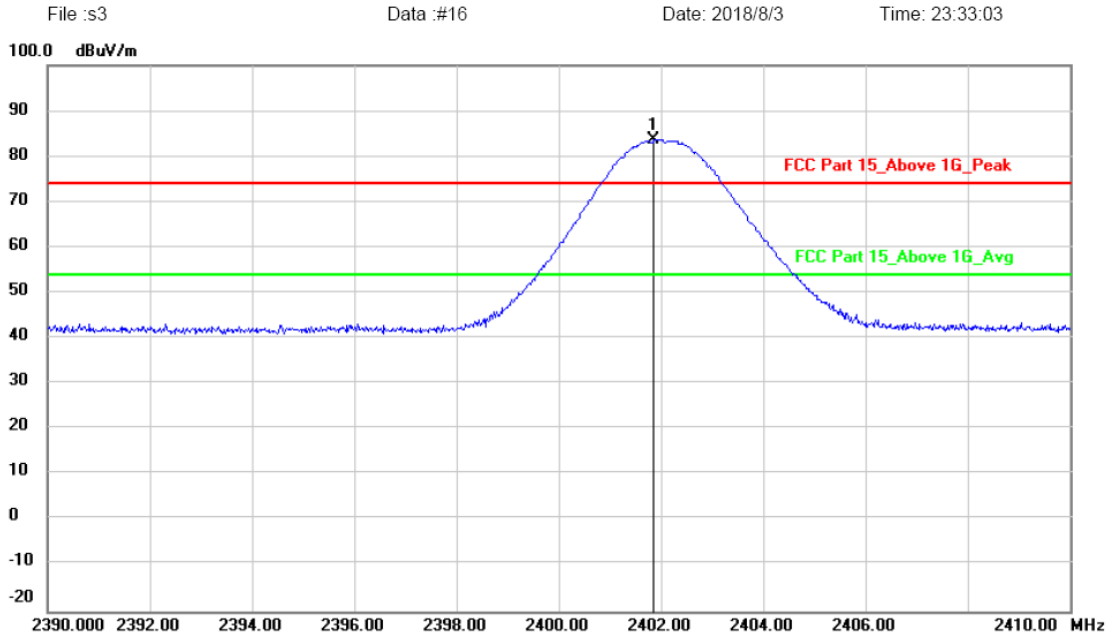
Note:1. \*:Maximum data; x:Over limit; !:over margin.  
 2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

Site LAB  
 Limit: FCC Part 15\_Above 1G\_Peak  
 EUT:  
 M/N:  
 Mode:2402  
 Note:  
 Engineer Signature:

Polarization: **Vertical**  
 Power:  
 Distance: 3m

Temperature: 23.9  
 Humidity: 46 %

**Radiated Emission Measurement**



| No. | Mk. | Freq.    | Reading Level | Correct Factor | Measurement | Limit  | Margin | Antenna Height | Table Degree |         |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------------|--------------|---------|
|     |     | MHz      | dBuV          | dB             | dBuV/m      | dBuV/m | dB     | cm             | degree       | Comment |
| 1   | *   | 2401.860 | 86.99         | -3.41          | 83.58       | 74.00  | 9.58   | peak           |              |         |

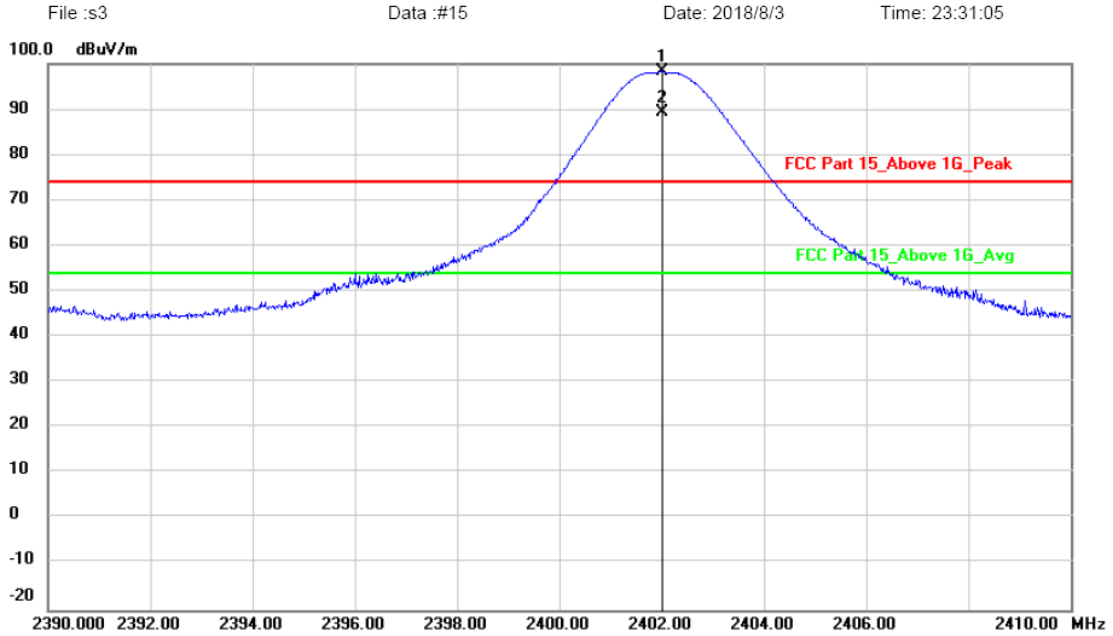
Note:1. \*:Maximum data; x:Over limit; !:over margin.  
 2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

Site LAB  
 Limit: FCC Part 15\_Above 1G\_Peak  
 EUT:  
 M/N:  
 Mode:2402  
 Note:  
 Engineer Signature:

Polarization: *Horizontal*  
 Power:  
 Distance: 3m

Temperature: 23.9  
 Humidity: 46 %

**Radiated Emission Measurement**



| No. | Mk. | Freq.    | Reading Level | Correct Factor | Measurement | Limit  | Margin | Antenna Height | Table Degree |         |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------------|--------------|---------|
|     |     | MHz      | dBuV          | dB             | dBuV/m      | dBuV/m | dB     | cm             | degree       | Comment |
| 1   | X   | 2402.020 | 101.68        | -3.41          | 98.27       | 74.00  | 24.27  |                |              | peak    |
| 2   | *   | 2402.020 | 92.73         | -3.41          | 89.32       | 54.00  | 35.32  |                |              | AVG     |

Note:1. \*:Maximum data; x:Over limit; !:over margin.  
 2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

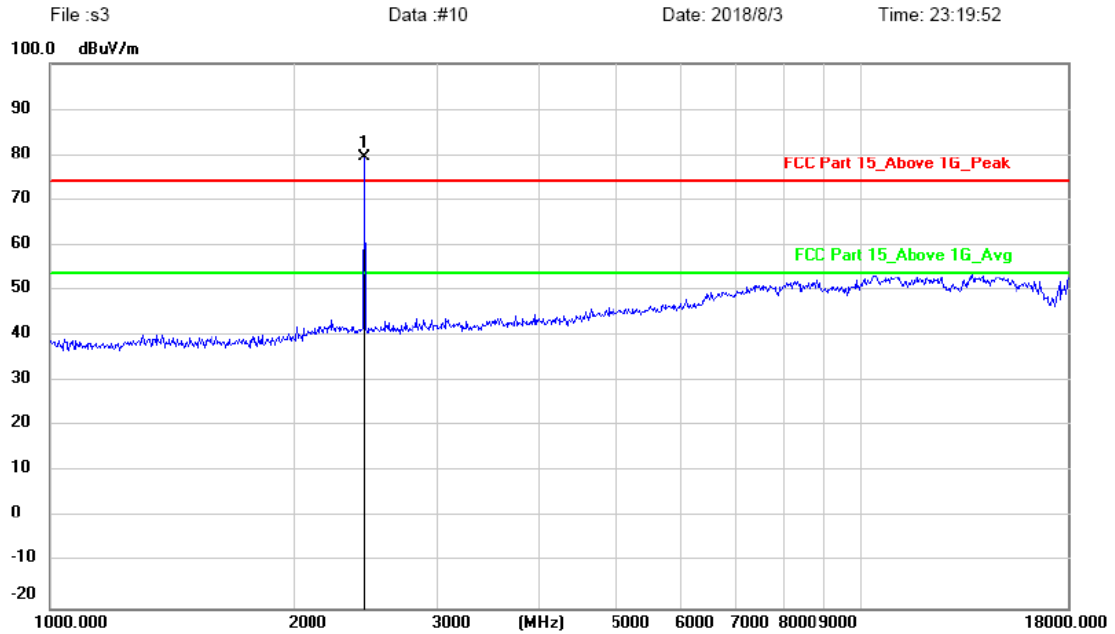


Site: LAB  
 Limit: FCC Part 15\_Above 1G\_Peak  
 EUT:  
 M/N:  
 Mode:2441  
 Note:  
 Engineer Signature:

Polarization: **Vertical**  
 Power:  
 Distance: 3m

Temperature: 23.9  
 Humidity: 46 %

**Radiated Emission Measurement**



| No. | Mk. | Freq.    | Reading Level | Correct Factor | Measurement | Limit  | Margin | Antenna Height | Table Degree |         |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------------|--------------|---------|
|     |     | MHz      | dBuV          | dB             | dBuV/m      | dBuV/m | dB     | cm             | degree       | Comment |
| 1   | *   | 2442.751 | 82.86         | -3.40          | 79.46       | 74.00  | 5.46   |                |              | peak    |

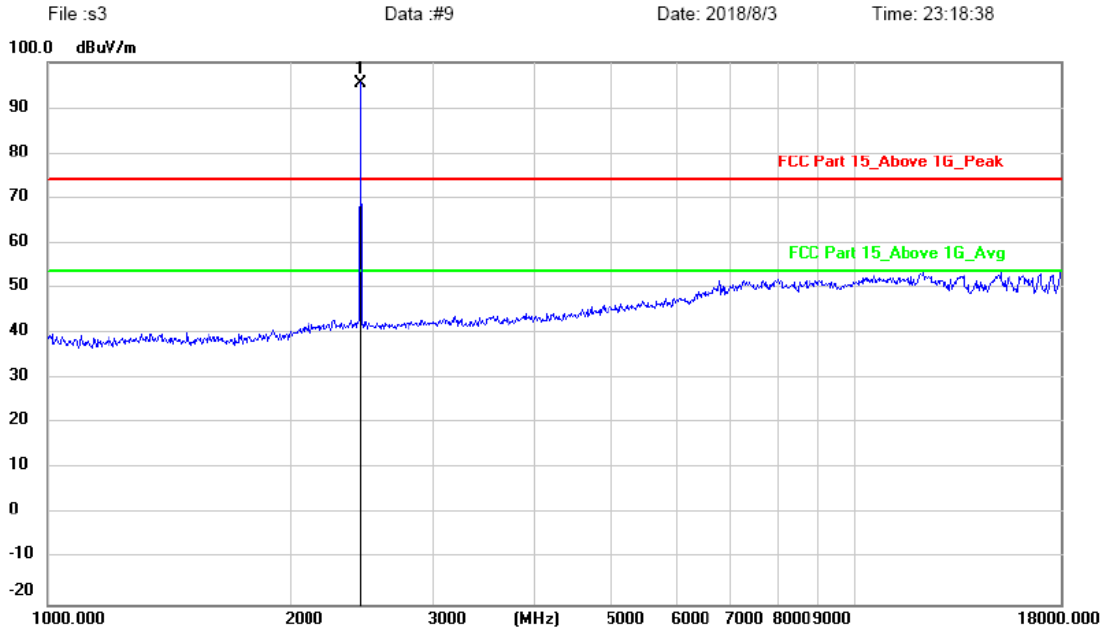
Note:1. \*:Maximum data; x:Over limit; !:over margin.  
 2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

Site LAB  
 Limit: FCC Part 15\_Above 1G\_Peak  
 EUT:  
 M/N:  
 Mode:2441  
 Note:  
 Engineer Signature:

Polarization: **Horizontal**  
 Power:  
 Distance: 3m

Temperature: 23.9  
 Humidity: 46 %

**Radiated Emission Measurement**



| No. | Mk. | Freq.    | Reading Level | Correct Factor | Measurement | Limit  | Margin | Antenna Height | Table Degree |         |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------------|--------------|---------|
|     |     | MHz      | dBuV          | dB             | dBuV/m      | dBuV/m | dB     | cm             | degree       | Comment |
| 1   | *   | 2442.751 | 98.90         | -3.40          | 95.50       | 74.00  | 21.50  |                |              | peak    |

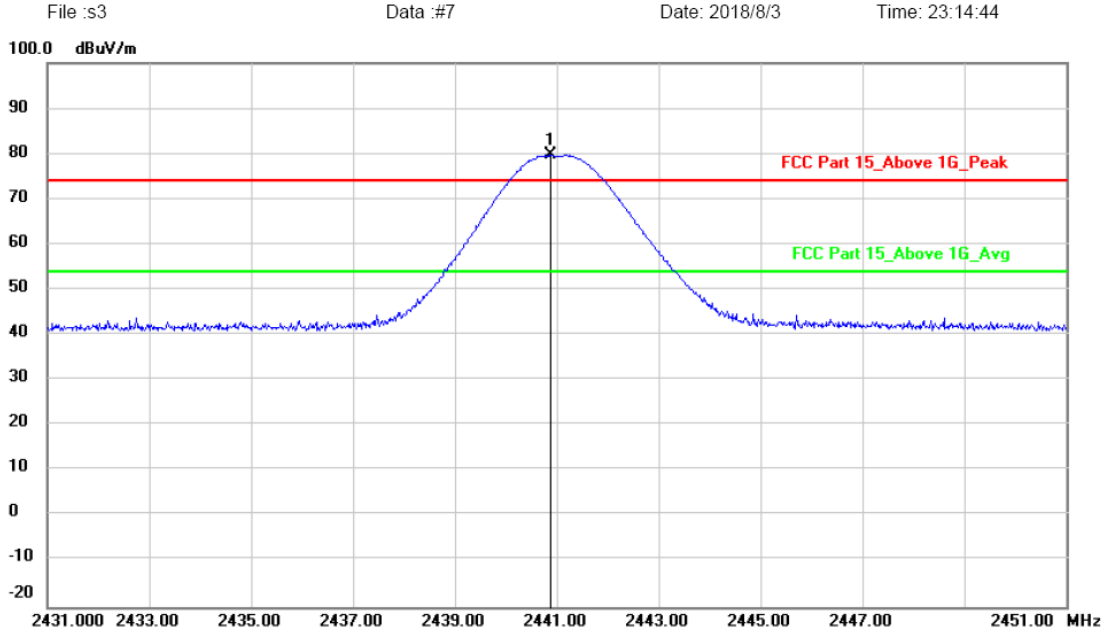
Note:1. \*:Maximum data; x:Over limit; !:over margin.  
 2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

Site LAB  
 Limit: FCC Part 15\_Above 1G\_Peak  
 EUT:  
 M/N:  
 Mode:2441  
 Note:  
 Engineer Signature:

Polarization: **Vertical**  
 Power:  
 Distance: 3m

Temperature: 23.9  
 Humidity: 46 %

**Radiated Emission Measurement**



| No. | Mk. | Freq.    | Reading Level | Correct Factor | Measurement | Limit  | Margin | Antenna Height | Table Degree |         |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------------|--------------|---------|
|     |     | MHz      | dBuV          | dB             | dBuV/m      | dBuV/m | dB     | Detector       | cm           | degree  |
| 1   | *   | 2440.880 | 83.05         | -3.40          | 79.65       | 74.00  | 5.65   | peak           |              | Comment |

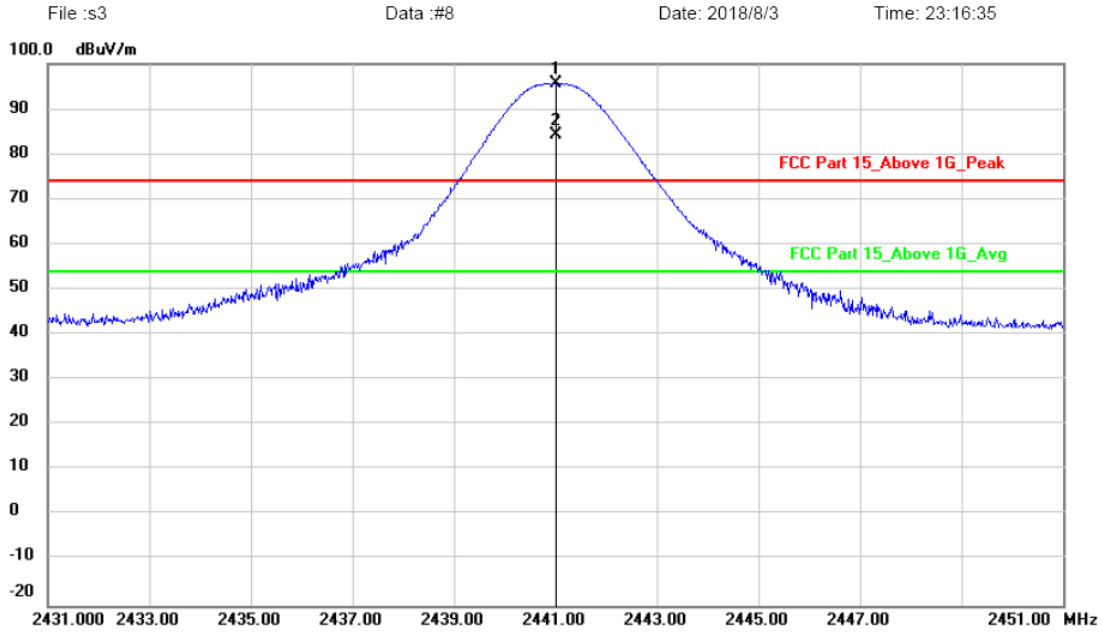
Note:1. \*:Maximum data; x:Over limit; !:over margin.  
 2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

Site LAB  
 Limit: FCC Part 15\_Above 1G\_Peak  
 EUT:  
 M/N:  
 Mode:2441  
 Note:  
 Engineer Signature:

Polarization: **Horizontal**  
 Power:  
 Distance: 3m

Temperature: 23.9  
 Humidity: 46 %

**Radiated Emission Measurement**



| No. | Mk. | Freq.    | Reading Level | Correct Factor | Measurement | Limit  | Margin | Antenna Height | Table Degree |        |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------------|--------------|--------|
|     |     | MHz      | dBuV          | dB             | dBuV/m      | dBuV/m | dB     | Detector       | cm           | degree |
| 1   | X   | 2441.020 | 99.01         | -3.40          | 95.61       | 74.00  | 21.61  | peak           |              |        |
| 2   | *   | 2441.020 | 87.72         | -3.40          | 84.32       | 54.00  | 30.32  | AVG            |              |        |

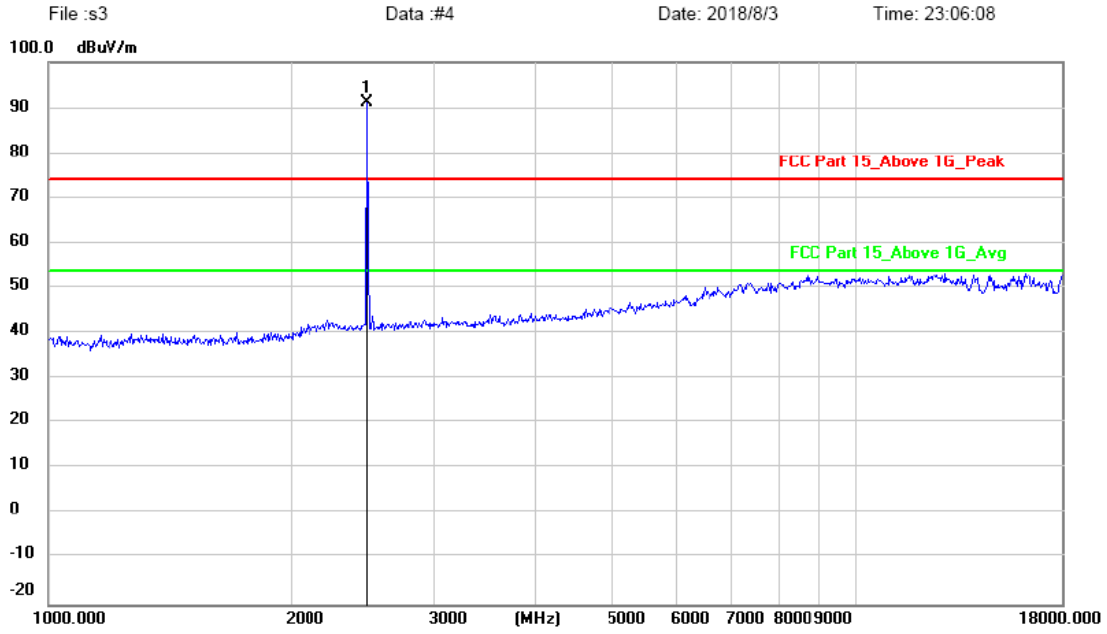
Note:1. \*:Maximum data; x:Over limit; !:over margin.  
 2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

Site LAB  
 Limit: FCC Part 15\_Above 1G\_Peak  
 EUT:  
 M/N:  
 Mode:2480  
 Note:  
 Engineer Signature:

Polarization: **Horizontal**  
 Power:  
 Distance: 3m

Temperature: 23.9  
 Humidity: 46 %

**Radiated Emission Measurement**



| No. | Mk. | Freq.    | Reading Level | Correct Factor | Measurement | Limit  | Margin | Antenna Height | Table Degree |         |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------------|--------------|---------|
|     |     | MHz      | dBuV          | dB             | dBuV/m      | dBuV/m | dB     | cm             | degree       | Comment |
| 1   | *   | 2478.310 | 94.61         | -3.39          | 91.22       | 74.00  | 17.22  | peak           |              |         |

Note: 1. \*:Maximum data; x:Over limit; !:over margin.  
 2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

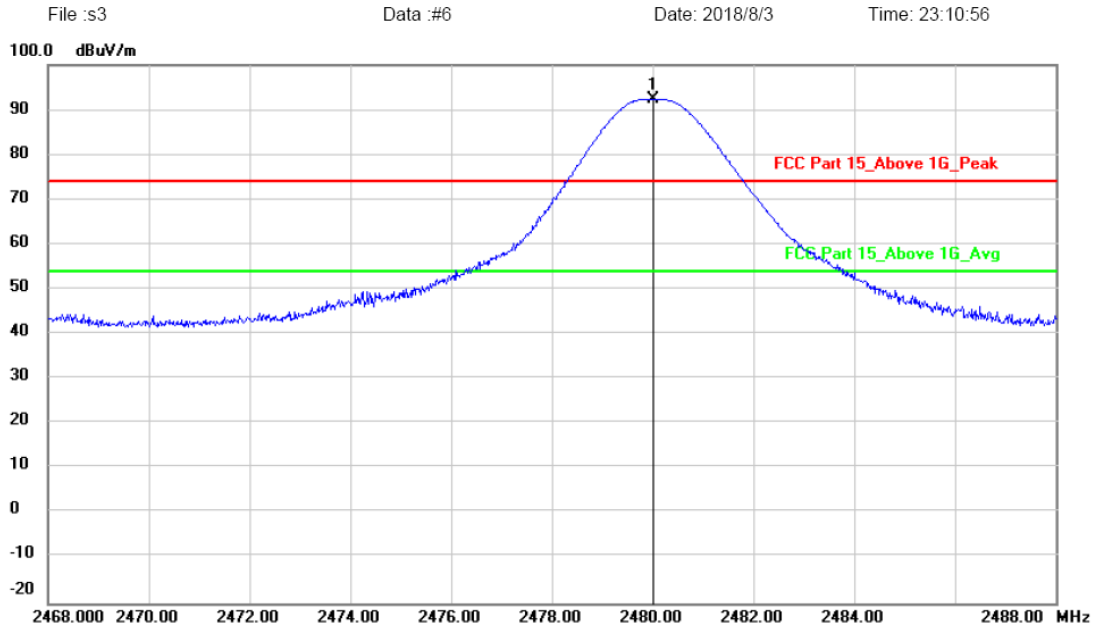


Site LAB  
 Limit: FCC Part 15\_Above 1G\_Peak  
 EUT:  
 M/N:  
 Mode:2480  
 Note:  
 Engineer Signature:

Polarization: *Horizontal*  
 Power:  
 Distance: 3m

Temperature: 23.9  
 Humidity: 46 %

**Radiated Emission Measurement**



| No. | Mk. | Freq.    | Reading Level | Correct Factor | Measurement | Limit  | Margin | Antenna Height | Table Degree |         |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------------|--------------|---------|
|     |     | MHz      | dBuV          | dB             | dBuV/m      | dBuV/m | dB     | cm             | degree       | Comment |
| 1   | *   | 2480.000 | 95.72         | -3.38          | 92.34       | 74.00  | 18.34  | peak           |              |         |

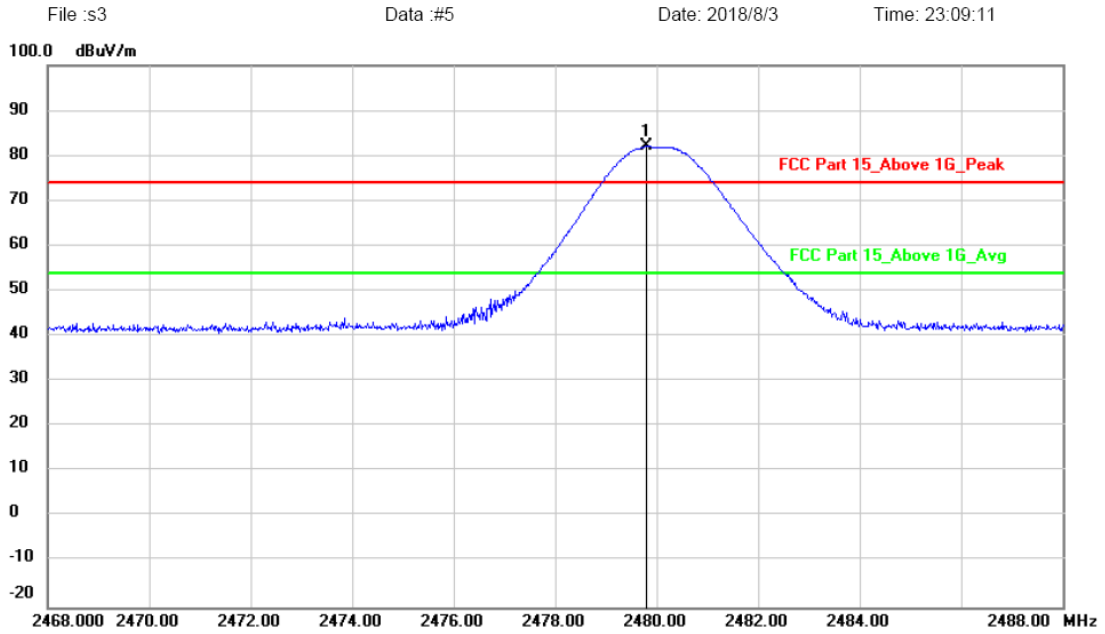
Note:1. \*:Maximum data; x:Over limit; !:over margin.  
 2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

Site LAB  
 Limit: FCC Part 15\_Above 1G\_Peak  
 EUT:  
 M/N:  
 Mode:2480  
 Note:  
 Engineer Signature:

Polarization: *Vertical*  
 Power:  
 Distance: 3m

Temperature: 23.9  
 Humidity: 46 %

**Radiated Emission Measurement**



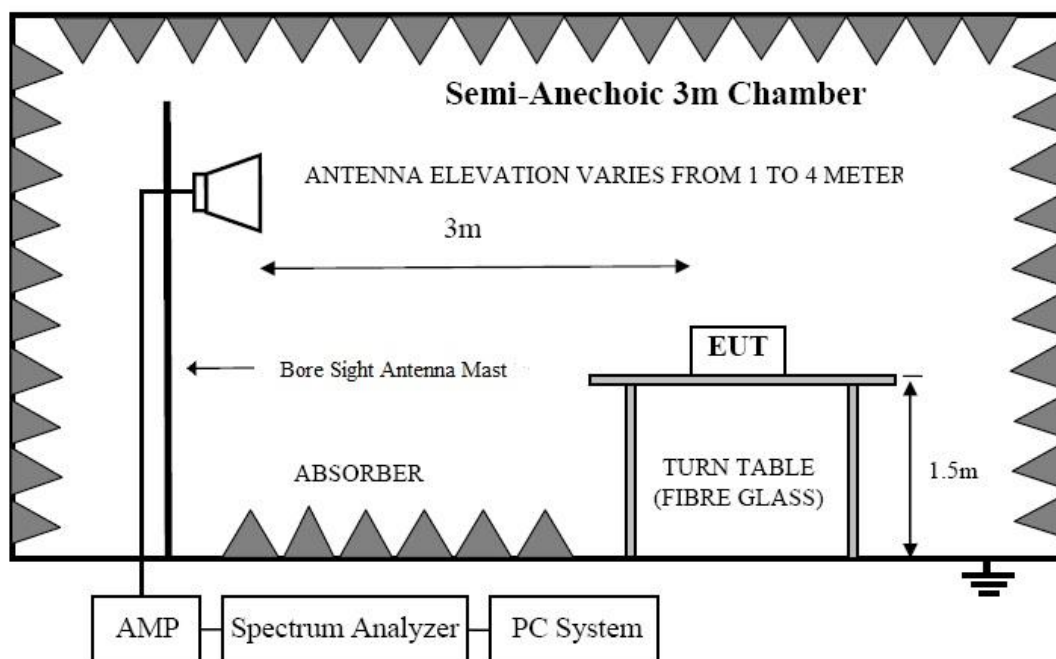
| No. | Mk. | Freq.    | Reading Level | Correct Factor | Measurement | Limit  | Margin | Antenna Height | Table Degree |         |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------------|--------------|---------|
|     |     | MHz      | dBuV          | dB             | dBuV/m      | dBuV/m | dB     | cm             | degree       | Comment |
| 1   | *   | 2479.800 | 85.43         | -3.38          | 82.05       | 74.00  | 8.05   | peak           |              |         |

Note:1. \*:Maximum data; x:Over limit; !:over margin.  
 2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.



## 5. BAND EDGE TEST

### 5.1. Block Diagram of Test Setup



### 5.2. Test Limit

Please refer section 15.249 and section 15.205.

249(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in section 15.209, whichever is the lesser attenuation.

249(e) As shown in section 15.35(b), for frequencies above 1000 MHz, the above field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For point-to-point operation under paragraph (b) of this section, the peak field strength shall not exceed 2500 millivolts/meter at 3 meters along the antenna azimuth.

### 5.3. Configuration of EUT on Test

The following equipment are installed on Radiated Emission Test to meet the commission requirements and operating regulations in a manner that tends to maximize its emission characteristics in normal application.

### 5.4. Operating Condition of EUT

- (1) Setup the EUT as shown as Section 5.1.
- (2) Turn on the power of all equipment.
- (3) Let the EUT work in test mode taking the test.

### 5.5. Test Procedure

- (1) The EUT was placed on a non-metallic table, 150 cm above the ground plane inside a semi-anechoic chamber. An antenna was located 3m from the EUT on an adjustable mast. A pre-scan was first performed in order to find prominent radiated emissions. For final emissions measurements at each frequency of interest, the EUT were rotated and the antenna height was varied between 1m and 4m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. In order to find the maximum emission, the relative positions of equipments and all of the interface cables were changed according to ANSI C63.10: 2013 on Radiated Emission test.
- (2) For the radiated emission test above 1GHz:  
Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
- (3) Test antenna was located 4m from the EUT on an adjustable mast. Below pre-scan procedure was first performed in order to find prominent radiated emissions.
  - (a) Change work frequency or channel of device if practicable.
  - (b) Change modulation type of device if practicable.
  - (c) Rotated EUT though three orthogonal axes to determine the attitude of EUT arrangement produces highest emissions

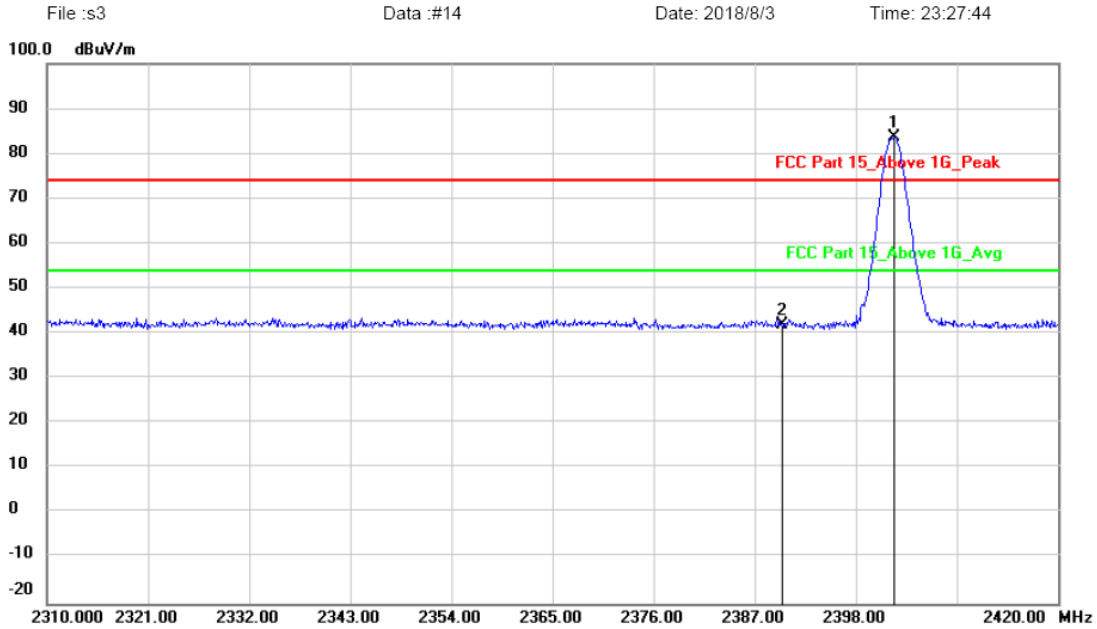
- (5) The frequency range from above 1GHz is checked, the bandwidth of Signal Analyzer (Signal Analyzer N9020A) is set at 1MHz.
- (6) The frequency range from 1GHz to 6GHz was pre-scanned with a peak detector and all final readings of measurement from Spectrum Analyzer are peak and average values checked, all measurement distance is 3m in 3m semi anechoic chamber.
- (7) Test for all x, y, z axes is performed and only the worst case of X axes was recorded in the test report.
- (8) The test results are reported on Section 5.6.

## 5.6. Test Results

|               |  |             |              |
|---------------|--|-------------|--------------|
| EUT           | : Electronic shelf label   | Test Date   | : 2018.08.03 |
| M/N           | : Stellar-S3TN@  | Temperature | : 24°C       |
| Test Engineer | : Reak   | Humidity    | : 56%        |
| Test Mode     | : TX 2402MHz, TX 2480MHz   |             |              |
| Test Results  | : <b>PASS</b>  |             |              |
| Note:         | <p>1. Means other frequency and mode comply with standard requirements and at least have 20dB margin.</p> <p>2. Correct Factor=Cable Loss+ Antenna Factor-Amplifier Gain.<br/>Result=Reading + Correct Factor.<br/>Margin= Result-Limit.</p> <p>3. Spectrum Set for PK measure: RBW=1MHz, VBW=1MHz, Sweep time=Auto, Detector: PK.</p> <p>4. Spectrum Set for AV measure: RBW=1MHz, VBW=10Hz, Sweep time=Auto, Detector: Avg.</p> <p>5. If the limits for the measurement with the average detector are met when using a receiver with a peak detector, the test unit shall be deemed to meet both limits and the measurement with the average detector need not be carried out.</p> |             |              |

|                                  |                               |                   |
|----------------------------------|-------------------------------|-------------------|
| Site: LAB                        | Polarization: <b>Vertical</b> | Temperature: 23.9 |
| Limit: FCC Part 15_Above 1G_Peak | Power:                        | Humidity: 46 %    |
| EUT:                             | Distance: 3m                  |                   |
| M/N:                             |                               |                   |
| Mode:2402                        |                               |                   |
| Note:                            |                               |                   |
| Engineer Signature:              |                               |                   |

**Radiated Emission Measurement**



| No. | Mk. | Freq.    | Reading Level | Correct Factor | Measurement | Limit  | Margin | Antenna Height | Table Degree |         |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------------|--------------|---------|
|     |     | MHz      | dBuV          | dB             | dBuV/m      | dBuV/m | dB     | cm             | degree       | Comment |
| 1   | *   | 2402.180 | 86.96         | -3.41          | 83.55       | 74.00  | 9.55   | peak           |              |         |
| 2   |     | 2390.000 | 45.36         | -3.40          | 41.96       | 74.00  | -32.04 | peak           |              |         |

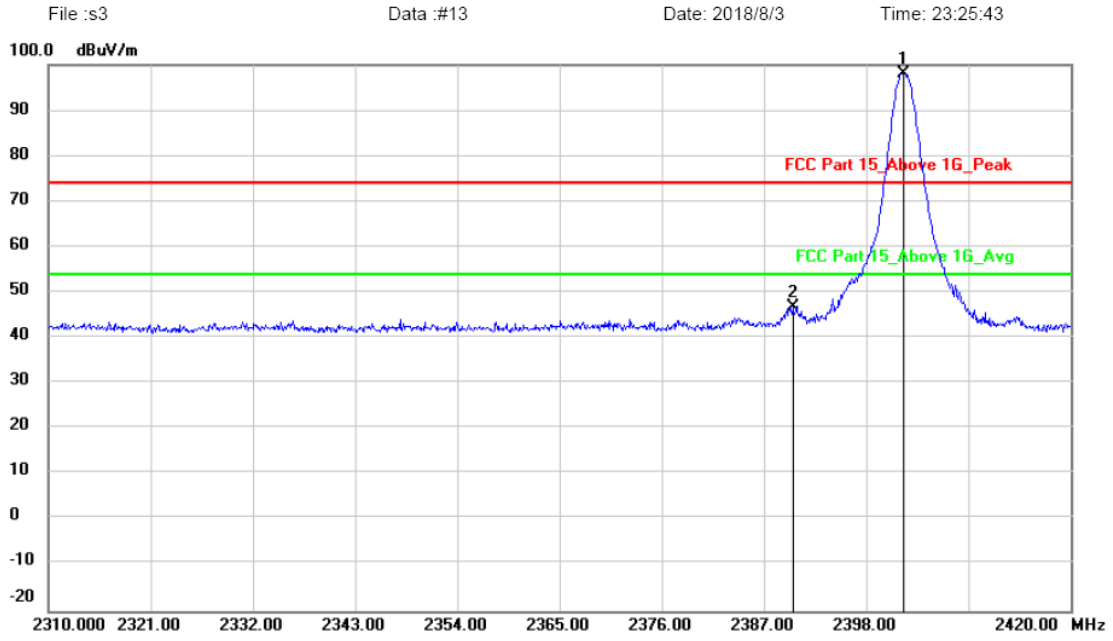
Note:1. \*:Maximum data; x:Over limit; !:over margin.  
 2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

Site LAB  
 Limit: FCC Part 15\_Above 1G\_Peak  
 EUT:  
 M/N:  
 Mode:2402  
 Note:  
 Engineer Signature:

Polarization: *Horizontal*  
 Power:  
 Distance: 3m

Temperature: 23.9  
 Humidity: 46 %

**Radiated Emission Measurement**



| No. | Mk. | Freq.<br>MHz | Reading<br>Level<br>dBuV | Correct<br>Factor<br>dB | Measure-<br>ment<br>dBuV/m | Limit<br>dBuV/m | Margin<br>dB | Antenna<br>Height<br>cm | Table<br>Degree | Comment |
|-----|-----|--------------|--------------------------|-------------------------|----------------------------|-----------------|--------------|-------------------------|-----------------|---------|
| 1   | *   | 2402.070     | 101.60                   | -3.41                   | 98.19                      | 74.00           | 24.19        | peak                    |                 |         |
| 2   |     | 2390.000     | 50.06                    | -3.40                   | 46.66                      | 74.00           | -27.34       | peak                    |                 |         |

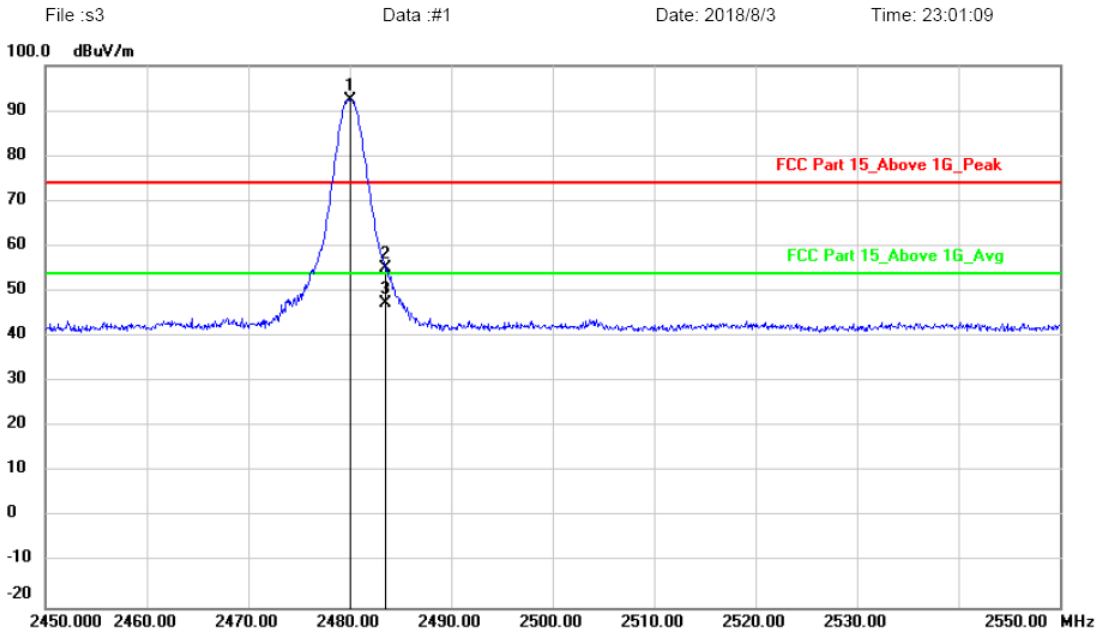
Note:1. \*:Maximum data; x:Over limit; !:over margin.  
 2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

Site LAB  
 Limit: FCC Part 15\_Above 1G\_Peak  
 EUT:  
 M/N:  
 Mode:2478  
 Note:  
 Engineer Signature:

Polarization: *Horizontal*  
 Power:  
 Distance: 3m

Temperature: 23.9  
 Humidity: 46 %

**Radiated Emission Measurement**



| No. | Mk. | Freq.    | Reading Level | Correct Factor | Measurement | Limit  | Margin | Antenna Height | Table Degree |         |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------------|--------------|---------|
|     |     | MHz      | dBuV          | dB             | dBuV/m      | dBuV/m | dB     | cm             | degree       | Comment |
| 1   | *   | 2480.000 | 95.74         | -3.38          | 92.36       | 74.00  | 18.36  |                |              | peak    |
| 2   |     | 2483.500 | 58.55         | -3.38          | 55.17       | 74.00  | -18.83 |                |              | peak    |
| 3   |     | 2483.500 | 50.60         | -3.38          | 47.22       | 54.00  | -6.78  |                |              | AVG     |

Note:1. \*:Maximum data; x:Over limit; !:over margin.  
 2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

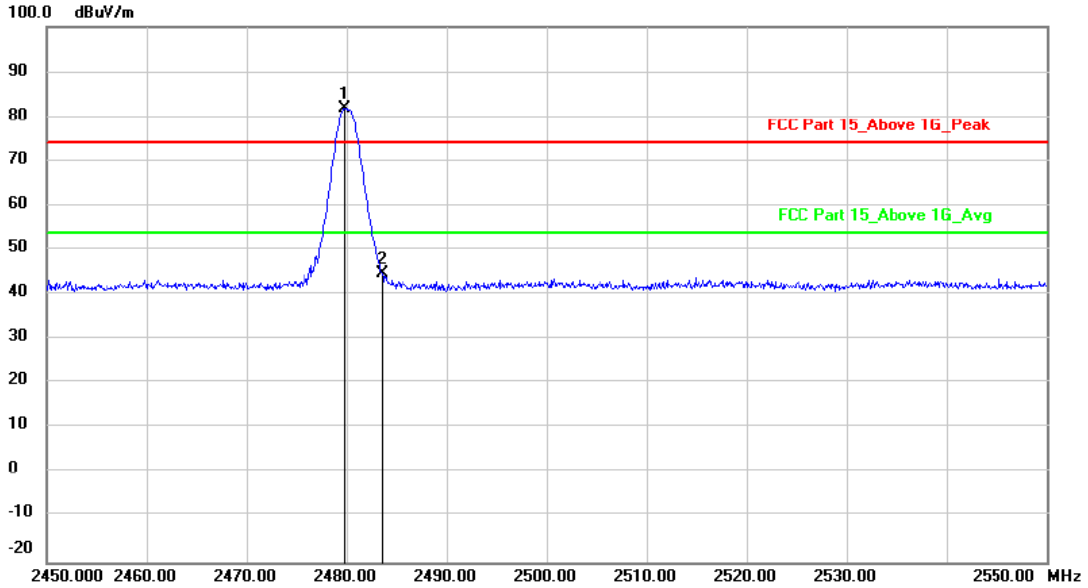
Site LAB  
 Limit: FCC Part 15\_Above 1G\_Peak  
 EUT:  
 M/N:  
 Mode:2480  
 Note:  
 Engineer Signature:

Polarization: **Vertical**  
 Power:  
 Distance: 3m

Temperature: 23.9  
 Humidity: 46 %

**Radiated Emission Measurement**

File :s3                      Data :#2                      Date: 2018/8/3                      Time: 23:03:11



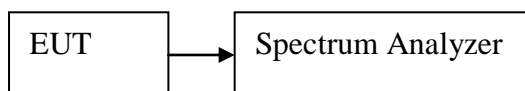
| No. | Mk. | Freq.<br>MHz | Reading<br>Level<br>dBuV | Correct<br>Factor<br>dB | Measure-<br>ment<br>dBuV/m | Limit<br>dBuV/m | Margin<br>dB | Antenna<br>Height<br>cm | Table<br>Degree | Detector | Comment |
|-----|-----|--------------|--------------------------|-------------------------|----------------------------|-----------------|--------------|-------------------------|-----------------|----------|---------|
| 1   | *   | 2479.800     | 85.16                    | -3.38                   | 81.78                      | 74.00           | 7.78         |                         |                 | peak     |         |
| 2   |     | 2483.500     | 47.91                    | -3.38                   | 44.53                      | 74.00           | -29.47       |                         |                 | peak     |         |

Note: 1. \*:Maximum data; x:Over limit; !:over margin.  
 2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.



## 6. OCCUPIED BANDWIDTH TEST

### 6.1. Block Diagram of Test Setup



### 6.2. Test Limit

Please refer section 15.249 and section 15.205.

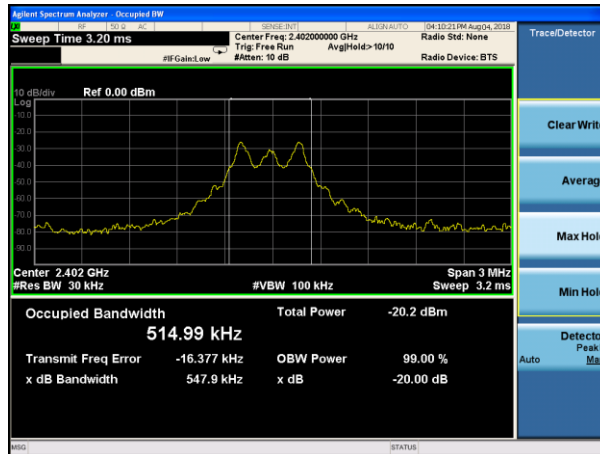
### 6.3. Test Procedure

- (1) The bandwidth is measured at an amplitude level reduced 20dB from the reference level. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency. Once the reference level is established, the equipment is conditioned with typical modulating signal to produce the worst-case (i.e. the widest) bandwidth.
- (2) The test receiver RBW set 30KHz, VBW set 100KHz, Sweep time set auto.

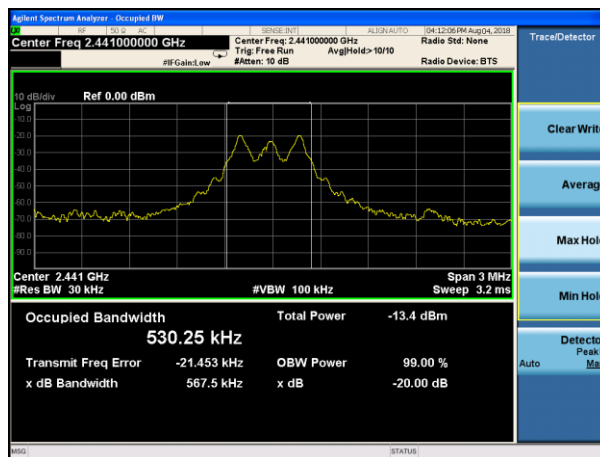
### 6.4. Test Results

| EUT   | : Electronic shelf label             | Test Date               | : 2018.08.04           |                |
|---|--------------------------------------|-------------------------|------------------------|----------------|
| M/N   | : Stellar-S3TN@                      | Temperature             | : 24°C                 |                |
| Test Engineer                                       | : Reak                               | Humidity                | : 56%                  |                |
| Test Mode   | : TX 2402MHz, TX 2441MHz, TX 2480MHz |                         |                        |                |
| Test Results  | : <b>PASS</b>                        |                         |                        |                |
| Mode  | Frequency<br>MHz                     | 20dB Bandwidth<br>(KHz) | 99% Bandwidth<br>(KHz) | Limit<br>(kHz) |
| GFSK  | 2402                                 | 547.9                   | 514.99                 | /              |
| GFSK  | 2441                                 | 567.5                   | 530.25                 | /              |
| GFSK  | 2480                                 | 549.8                   | 521.12                 | /              |
| Note: 1. The test results are listed in next pages. |                                      |                         |                        |                |

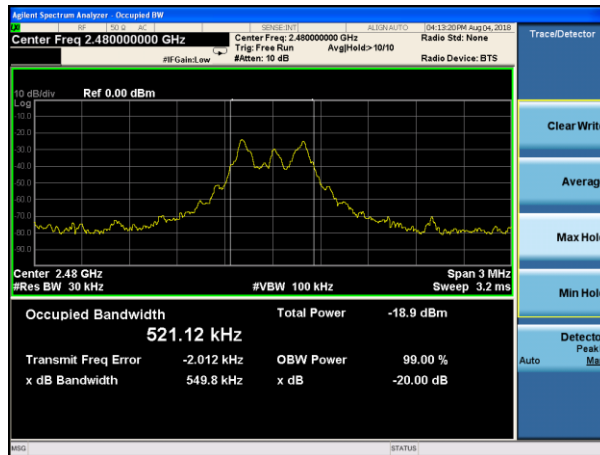
Frequency: 2402MHz



Frequency: 2441MHz



Frequency: 2480MHz



## **7. ANTENNA REQUIREMENT**

### **7.1. Standard Requirement**

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

### **7.2. Antenna Connected Construction**

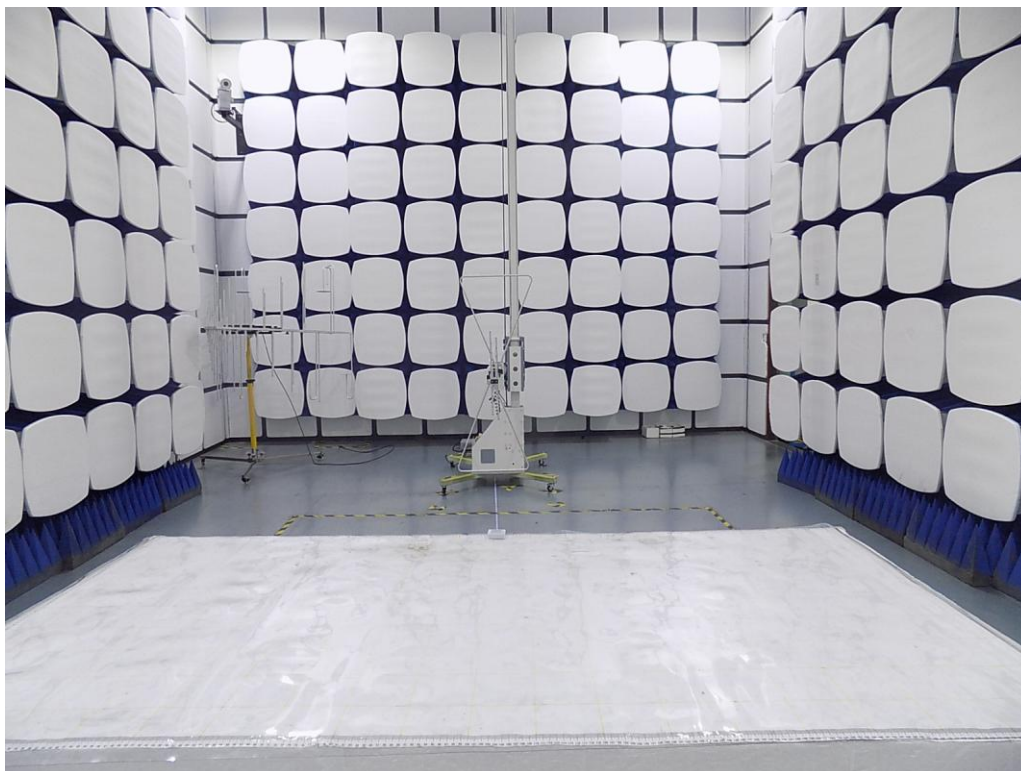
The directional gains of antenna used for transmitting is 0dBi, and the antenna is PCB antenna no consideration of replacement. Please see EUT photo for details.

### **7.3. Results**

The EUT antenna is PCB Antenna. It complies with the standard requirement.

## 8. PHOTOGRAPH

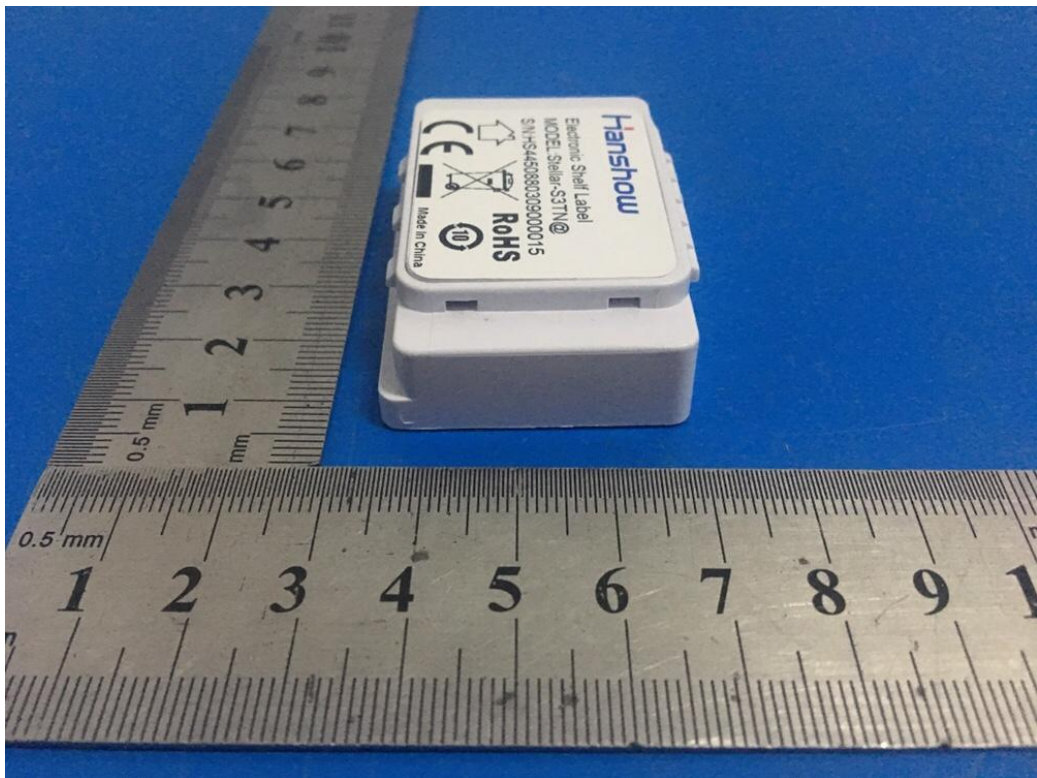
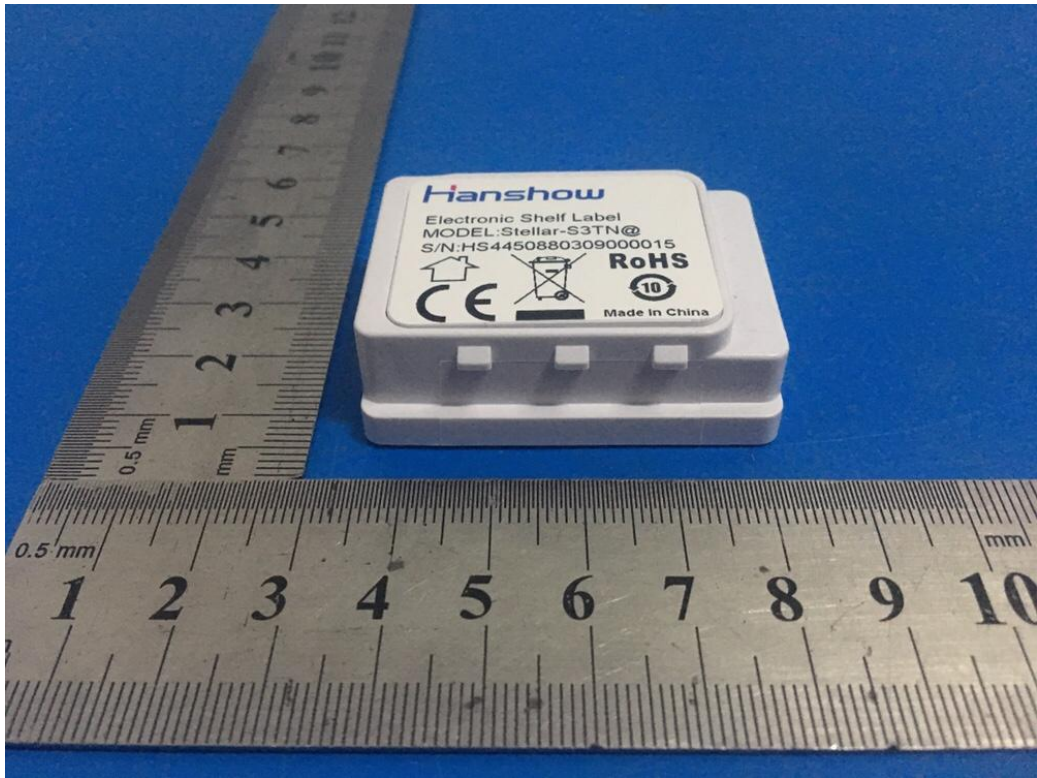
### 8.1.Photos of Radiated Emission Test (In Semi Anechoic Chamber)

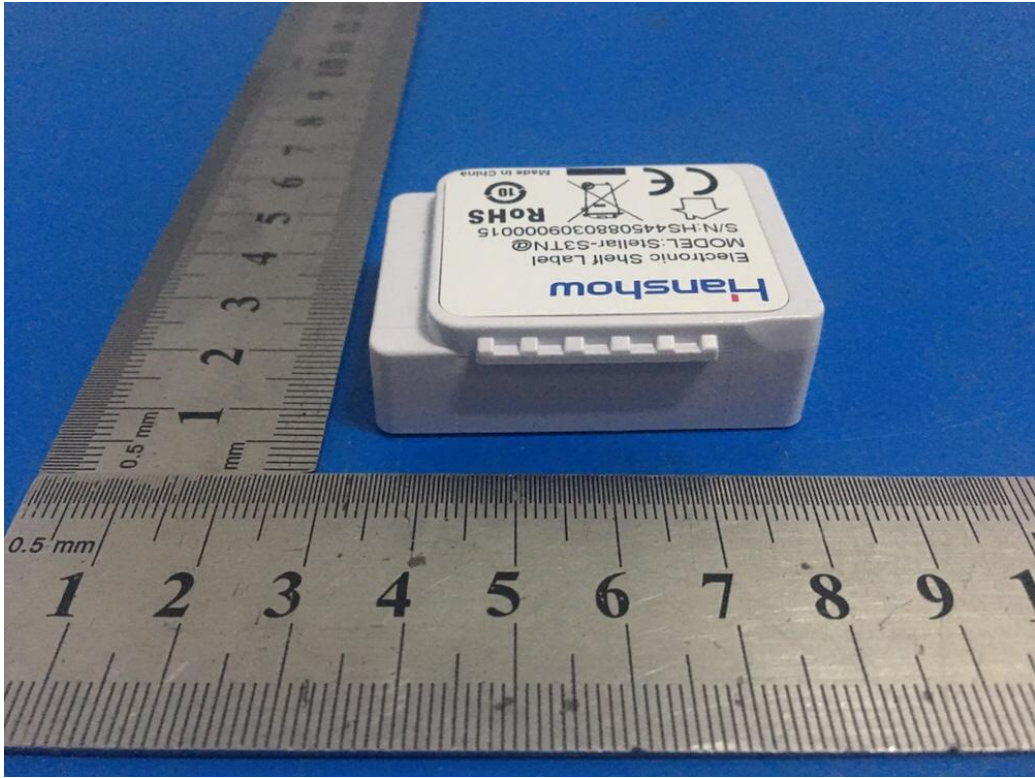


### 9. PHOTOS OF THE EUT

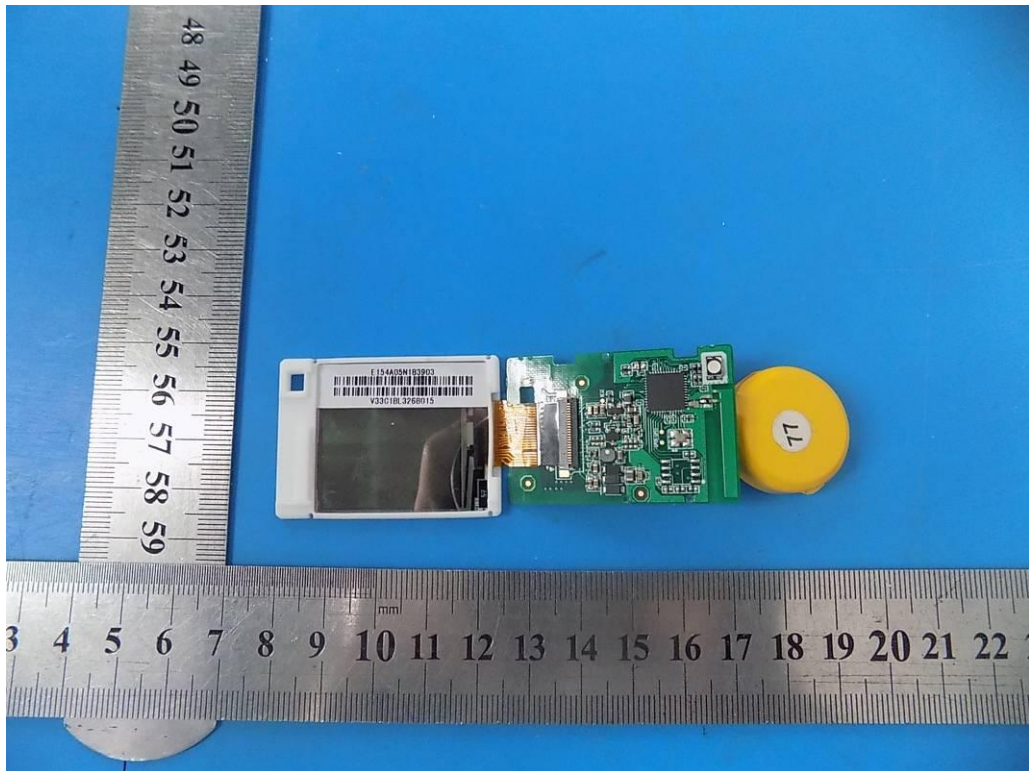
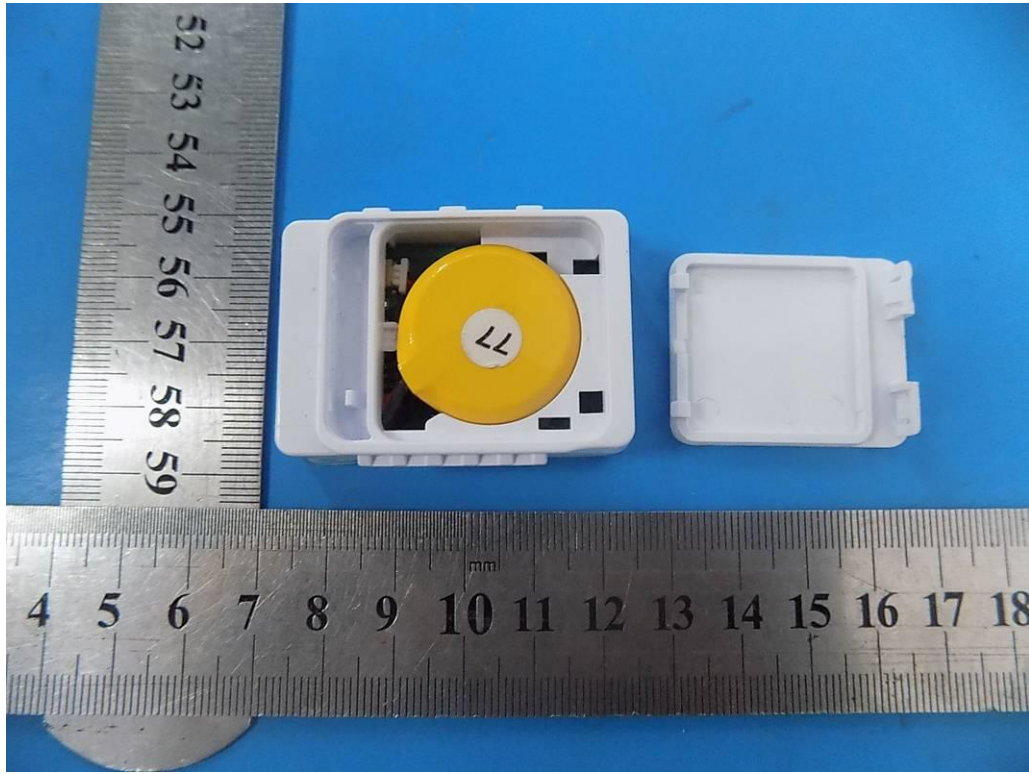




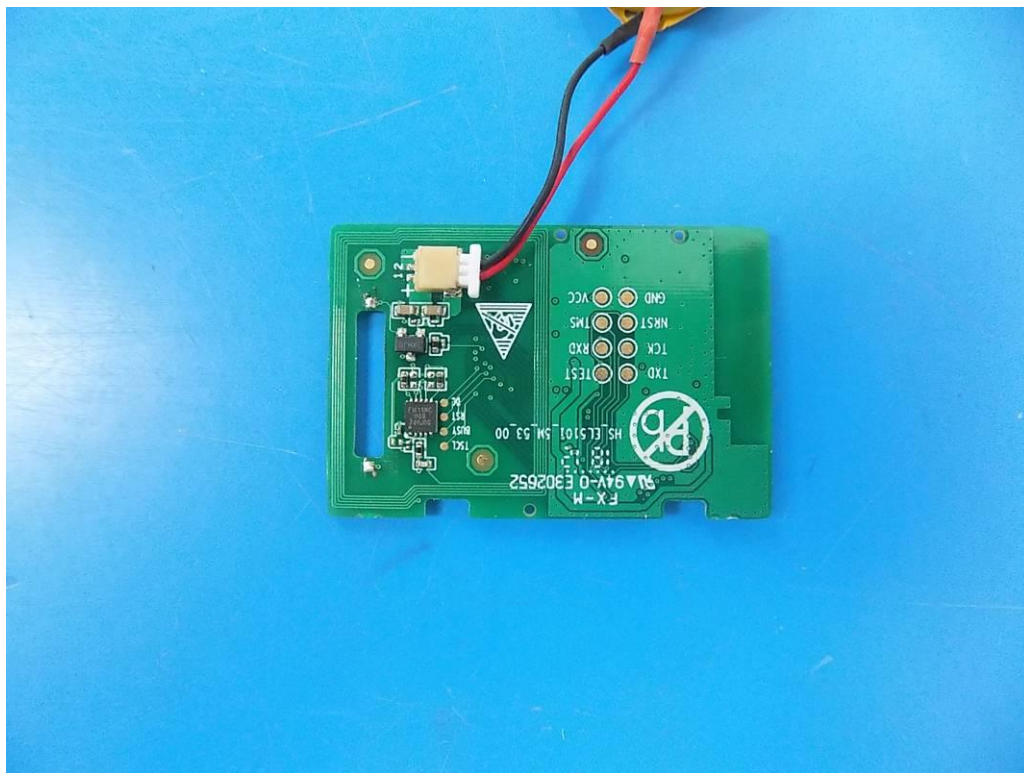
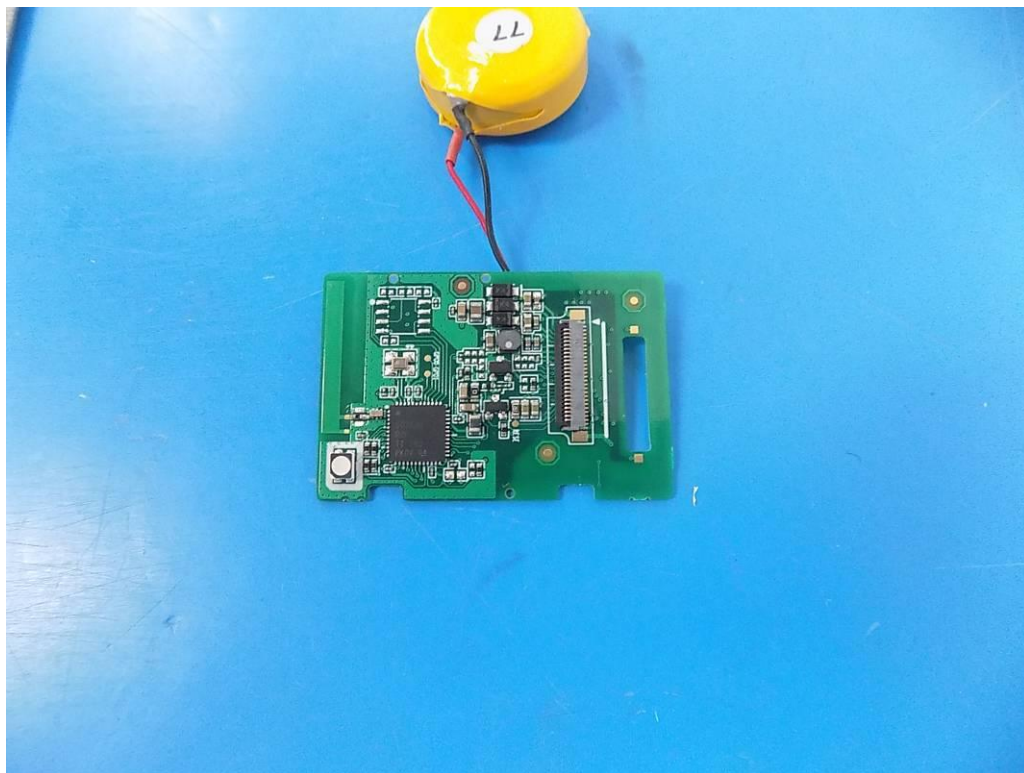














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