# FCC Test Report

Report No.: AGC02009160304FE03

| | | |
|---|---|---|
| **FCC ID** | : | TW58912AZ |
| **APPLICATION PURPOSE** | : | Original Equipment |
| **PRODUCT DESIGNATION** | : | Wired/Wireless Rearview Camera System With Color LCD Monitor |
| **BRAND NAME** | : | N/A |
| **MODEL NAME** | : | 8912AZ(GB8912+GB7610) |
| **CLIENT** | : | ShenZhen Gospell Smarthome Electronic Co., Ltd. |
| **DATE OF ISSUE** | : | Mar.28, 2016 |
| **STANDARD(S)**<br>**TEST PROCEDURE(S)** | : | FCC Part 15 Rules |
| **REPORT VERSION** | : | V1.0 |

Attestation of Global Compliance (Shenzhen) Co., Ltd

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## Report Revise Record

| Report Version | Revise Time | Issued Date | Valid Version | Notes |
|---|---|---|---|---|
| V1.0 | / | Mar.28, 2016 | Valid | Original Report |

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## 1. VERIFICATION OF CONFORMITY

| | |
|---|---|
| **Applicant** | ShenZhen Gospell Smarthome Electronic Co., Ltd. |
| **Address** | 5Floor/Block 2, Vision(SZ) Park, Hi-Tech Industrial Park, Shenzhen, China |
| **Manufacturer** | ShenZhen Gospell Smarthome Electronic Co., Ltd. |
| **Address** | East of 01st-04st Floor,Block A, No.1 Industrial park, Fenghuanggang, South of No.1 Baotian Road, Xixiang street, Bao'an District, Shenzhen City, Guangdong Province 518126, P.R.China |
| **Product Designation** | Wired/Wireless Rearview Camera System With Color LCD Monitor |
| **Brand Name** | N/A |
| **Test Model** | 8912AZ(GB8912+GB7610) |
| **Date of test** | Mar.16, 2016 to Mar.17, 2016 |
| **Deviation** | None |
| **Condition of Test Sample** | Normal |
| **Test Result** | Pass |
| **Report Template** | AGCRT-US-BR/RF |

We hereby certify that:

The above equipment was tested by Dongguan Precise Testing Service Co., Ltd. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4 (2009) and the energy emitted by the sample EUT tested as described in this report is in compliance with radiated emission limits of FCC Rules Part 15.249.

| | | |
|---|---|---|
| Tested by | Max Zhang(Zhang Yi) | Mar.28, 2016 |
| Reviewed by | Rock Huang(Huang Dinglue) | Mar.28, 2016 |
| Approved by | Solger Zhang(Zhang Hongyi)<br>Authorized Officer | Mar.28, 2016 |

# 2. GENERAL INFORMATION

## 2.1. PRODUCT DESCRIPTION

A major technical description of EUT is described as following

| | |
|---|---|
| **Operation Frequency** | 2468MHz |
| **Maximum field strength** | 90.72dBuV(AV)@3m |
| **Modulation** | FM |
| **Number of channels** | 1 |
| **Hardware Version** | GB8912TC02 |
| **Software Version** | A0914 |
| **Antenna Designation** | Wire Antenna |
| **Antenna Gain** | 2dBi |
| **Power Supply** | DC12V |

## 3. MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement y ±U，where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2，providing a level of confidence of approximately 95 %。

| No. | Item | Uncertainty |
|---|---|---|
| 1 | Conducted Emission Test | ±3.18dB |
| 2 | All emissions,radiated | ±3.91dB |
| 3 | Temperature | ±0.5°C |
| 4 | Humidity | ±2% |

## 4. DESCRIPTION OF TEST MODES

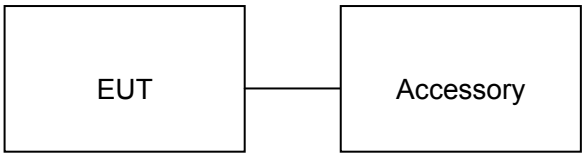
| NO. | TEST MODE DESCRIPTION |
|---|---|
| 1 | Transmitting mode |

Note:
1. All the test modes can be supply by battery, only the result of the worst case was recorded in the report, if no other cases.
2. For Radiated Emission, 3axis were chosen for testing for each applicable mode.
3. The EUT used fully-charged battery when tested.

# 5. SYSTEM TEST CONFIGURATION

## 5.1. CONFIGURATION OF EUT SYSTEM

Configure :




## 5.2. EQUIPMENT USED IN EUT SYSTEM

| Item | Equipment | Model No. | ID or Specification | Remark |
|---|---|---|---|---|
| 1 | 8912AZ(GB8912+GB7610) | N/A | TW58912AZ | EUT |

## 5.3. SUMMARY OF TEST RESULTS

| FCC RULES | DESCRIPTION OF TEST | RESULT |
|---|---|---|
| §15.249 | Radiated Emission | Compliant |
| §15.249 | Band Edges | Compliant |
| §15.215 | 20dB bandwidth | Compliant |

## 6. TEST FACILITY

| | |
|---|---|
| **Site** | Dongguan Precise Testing Service Co., Ltd. |
| **Location** | Building D, Baoding Technology Park,Guangming Road2, Dongcheng District, Dongguan, Guangdong, China. |
| **FCC Registration No.** | 371540 |
| **Description** | The test site is constructed and calibrated to meet the FCC requirements in documents ANSI C63.4:2009. |

**ALL TEST EQUIPMENT LIST**

| Name of Equipment | Manufacturer | Model Number | Serial Number | Last Calibration | Due Calibration |
|---|---|---|---|---|---|
| EMI Test Receiver | Rohde & Schwarz | ESCI | 101417 | July 4, 2015 | July 3, 2016 |
| Trilog Broadband Antenna (25M-1GHz) | SCHWARZBECK | VULB9160 | 9160-3355 | July 4, 2015 | July 3, 2016 |
| Signal Amplifier | SCHWARZBECK | BBV 9475 | 9745-0013 | July 4, 2015 | July 3, 2016 |
| RF Cable | SCHWARZBECK | AK9515E | 96221 | July 4, 2015 | July 3, 2016 |
| 3m Anechoic Chamber | CHENGYU | 966 | PTS-001 | June 6, 2015 | June 5, 2016 |
| MULTI-DEVICE Positioning Controller | Max-Full | MF-7802 | MF780208339 | N/A | N/A |
| Active loop antenna (9K-30MHz) | Schwarzbeck | FMZB1519 | 1519-038 | June 6, 2015 | June 5, 2016 |
| Spectrum analyzer | Agilent | E4407B | MY46185649 | June 6, 2015 | June 5, 2016 |
| Horn Antenna (1G-18GHz) | SCHWARZBECK | BBHA9120D | 9120D-1246 | June 6, 2015 | June 5, 2016 |
| Horn Ant (18G-40GHz) | Schwarzbeck | BBHA 9170 | 9170-181 | June 6, 2015 | June 5, 2016 |
| Temporary antenna connector | Sat | CE001 | 001 | June 6, 2015 | June 5, 2016 |

# 7. RADIATED EMISSION

## 7.1TEST LIMIT

**Standard FCC15.249**

| Fundamental Frequency | Field Strength of Fundamental (millivolts/meter) | Field Strength of Harmonics (microvolts/meter) |
|---|---|---|
| 900-928MHz | 50 | 500 |
| 2400-2483.5MHz | 50 | 500 |
| 5725-5875MHz | 50 | 500 |
| 24.0-24.25GHz | 250 | 2500 |

**Standard FCC 15.209**

| Frequency (MHz) | Distance Meters | Field Strengths Limit | |
|---|---|---|---|
| | | μ V/m | dB(μV)/m |
| 0.009 ~ 0.490 | 300 | 2400/F(kHz) | --- |
| 0.490 ~ 1.705 | 30 | 24000/F(kHz) | --- |
| 1.705 ~ 30 | 30 | 30 | --- |
| 30 ~ 88 | 3 | 100 | 40.0 |
| 88 ~ 216 | 3 | 150 | 43.5 |
| 216 ~ 960 | 3 | 200 | 46.0 |
| 960 ~ 1000 | 3 | 500 | 54.0 |
| Above 1000 | 3 | Other:74.0 dB(μV)/m (Peak) 54.0 dB(μV)/m (Average) | |

Remark: (1) Emission level dB μ V = 20 log Emission level μ V/m

(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.

**7.2. MEASUREMENT PROCEDURE**

1. Configure the EUT according to ANSI C63.4. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. For emissions above 1GHz, use 1MHz VBW and RBW for peak reading. Then 1MHz RBW and 10Hz VBW for average reading in spectrum analyzer.

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.

7. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum values.
8. If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
9. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
10. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High - Low scan is not required in this case.

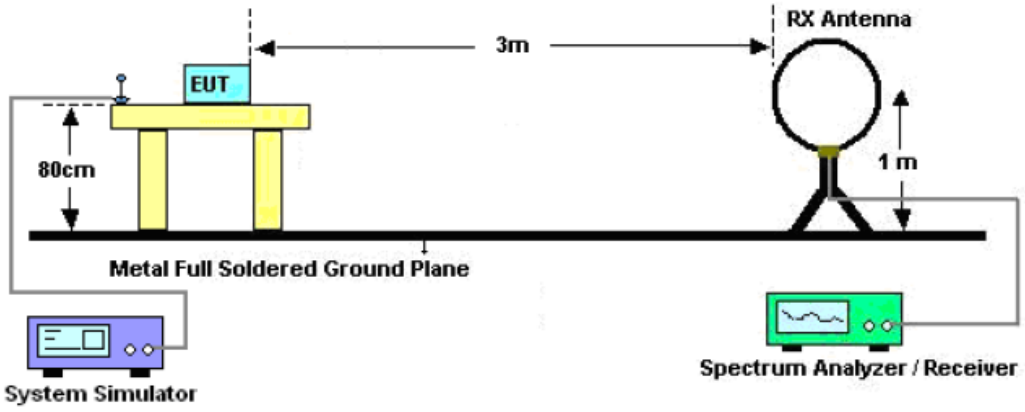
The following table is the setting of spectrum analyzer and receiver.

| Spectrum Parameter | Setting |
|---|---|
| Start ~Stop Frequency | 9KHz~150KHz/RB 200Hz for QP |
| Start ~Stop Frequency | 150KHz~30MHz/RB 9KHz for QP |
| Start ~Stop Frequency | 30MHz~1000MHz/RB 120KHz for QP |
| Start ~Stop Frequency | 1GHz~26.5GHz<br>1MHz/1MHz for Peak, 1MHz/10Hz for Average |

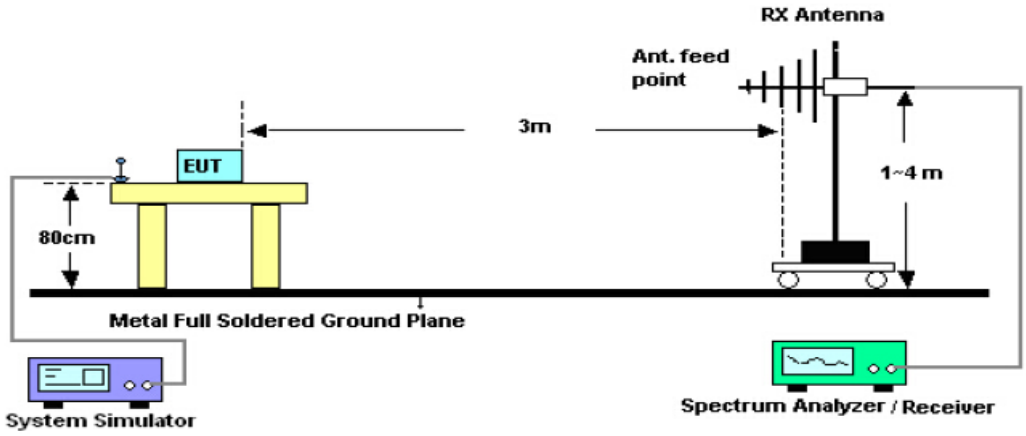
| Receiver Parameter | Setting |
|---|---|
| Start ~Stop Frequency | 9KHz~150KHz/RB 200Hz for QP |
| Start ~Stop Frequency | 150KHz~30MHz/RB 9KHz for QP |
| Start ~Stop Frequency | 30MHz~1000MHz/RB 120KHz for QP |

## 7.3. TEST SETUP

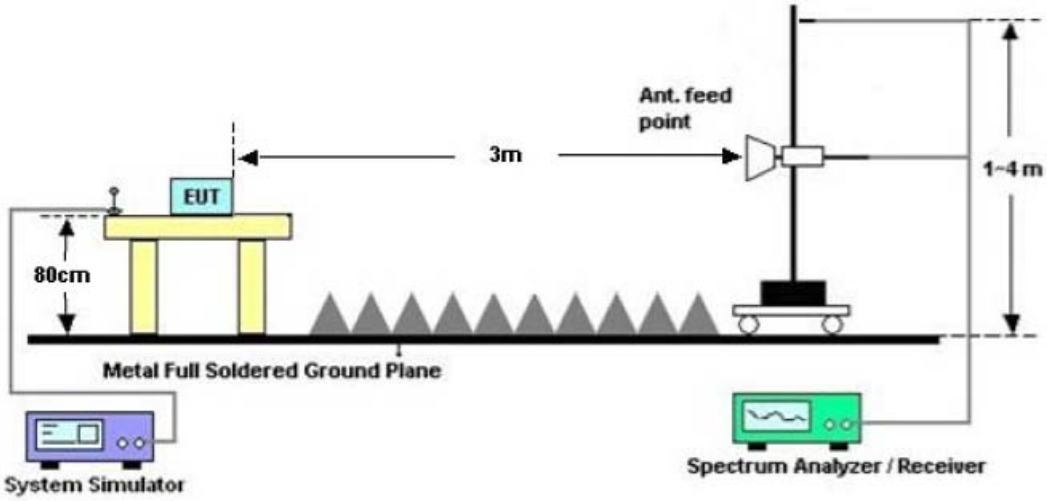
Radiated Emission Test-Setup Frequency Below 30MHz




RADIATED EMISSION TEST SETUP 30MHz-1000MHz




RADIATED EMISSION TEST SETUP ABOVE 1000MHz



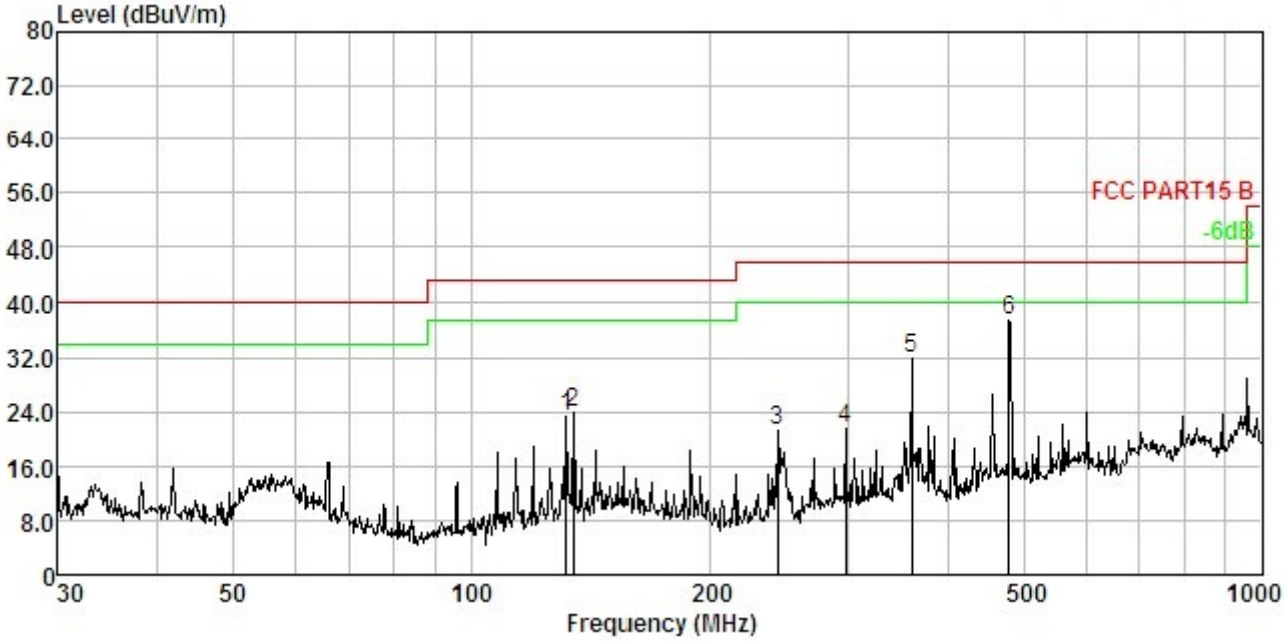
## 7.4. TEST RESULT

**RADIATED EMISSION BELOW 30MHZ**

No emission found between lowest internal used/generated frequencies to 30MHz.

**RADIATED EMISSION 30MHz- 1GHZ**

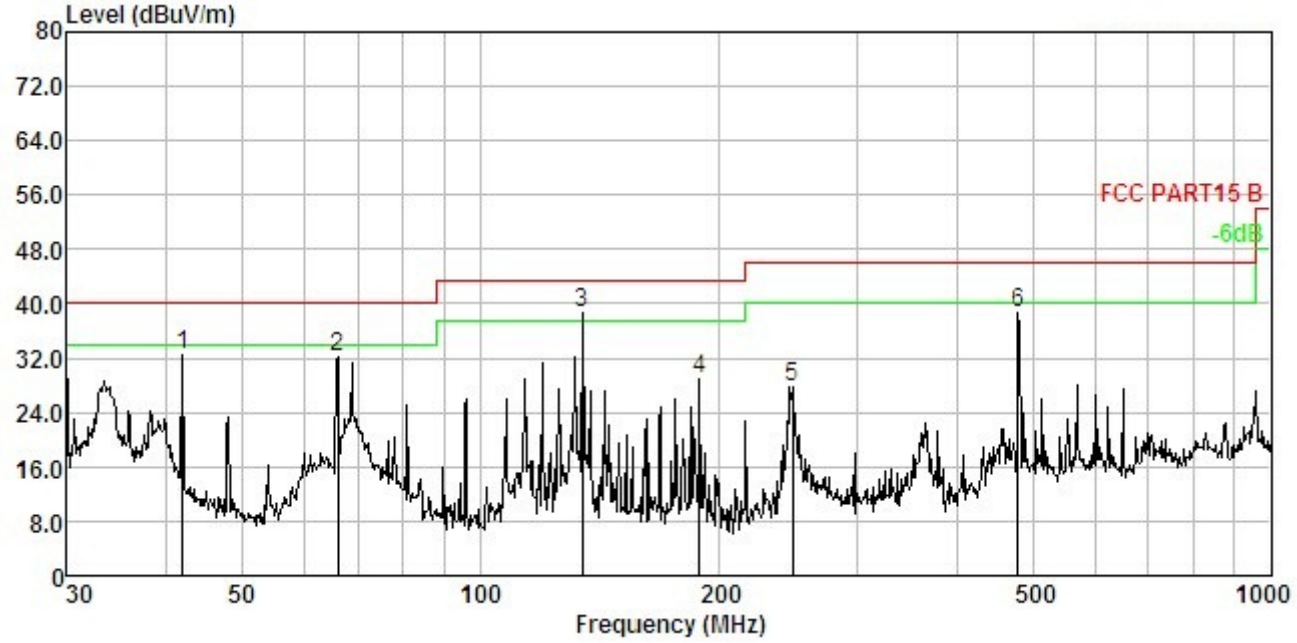
| | | | |
|---|---|---|---|
| EUT： | Wired/Wireless Rearview Camera System With Color LCD Monitor | Model Name. ： | 8912AZ(GB8912+GB7610) |
| Temperature： | 20 ℃ | Relative Humidtity： | 48% |
| Pressure： | 1010 hPa | Test Voltage ： | DC12V |
| Test Mode ： | Mode 1 | Polarization : | Horizontal |




| No. | Freq MHz | Cable Loss dB | ANT Factor dB/m | Receiver Reading dBuV | Preamp Factor dB | Emission Level dBuV/m | Limit dBuV/m | Over Limit dB | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1. | 132.221 | 2.40 | 12.80 | 38.47 | 30.49 | 23.18 | 43.50 | -20.32 | Peak |
| 2. | 135.032 | 2.42 | 13.00 | 39.11 | 30.49 | 24.04 | 43.50 | -19.46 | Peak |
| 3. | 243.377 | 2.95 | 11.78 | 37.14 | 30.70 | 21.17 | 46.00 | -24.83 | Peak |
| 4. | 297.224 | 3.13 | 13.14 | 36.04 | 30.77 | 21.54 | 46.00 | -24.46 | Peak |
| 5. | 360.448 | 3.31 | 14.40 | 45.10 | 30.83 | 31.98 | 46.00 | -14.02 | Peak |
| 6. | 478.846 | 3.56 | 16.87 | 47.85 | 30.93 | 37.35 | 46.00 | -8.65 | Peak |

**RESULT: PASS**

| | | | |
|---|---|---|---|
| EUT： | Wired/Wireless Rearview Camera System With Color LCD Monitor | Model Name. ： | 8912AZ(GB8912+GB7610) |
| Temperature： | 20 ℃ | Relative Humidtity： | 48% |
| Pressure： | 1010 hPa | Test Voltage ： | DC12V |
| Test Mode ： | Mode 1 | Polarization : | Vertical |




| No. | Freq MHz | Cable Loss dB | ANT Factor dB/m | Receiver Reading dBuV | Preamp Factor dB | Emission Level dBuV/m | Limit dBuV/m | Over Limit dB | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1. | 42.007 | 1.36 | 13.52 | 47.62 | 30.09 | 32.41 | 40.00 | -7.59 | Peak |
| 2. | 66.034 | 1.77 | 11.45 | 49.12 | 30.24 | 32.10 | 40.00 | -7.90 | Peak |
| 3. | 135.032 | 2.42 | 13.00 | 53.64 | 30.49 | 38.57 | 43.50 | -4.93 | Peak |
| 4. | 189.074 | 2.72 | 11.22 | 45.56 | 30.61 | 28.89 | 43.50 | -14.61 | Peak |
| 5. | 247.682 | 2.97 | 11.88 | 43.62 | 30.70 | 27.77 | 46.00 | -18.23 | Peak |
| 6. | 478.846 | 3.56 | 16.87 | 49.30 | 30.93 | 38.80 | 46.00 | -7.20 | Peak |

**RESULT: PASS**

**Note:**

Factor=Antenna Factor + Cable loss, Margin=Result-Limit.

The “Factor” value can be calculated automatically by software of measurement system.

## RADIATED EMISSION ABOVE 1GHZ

| | | | |
|---|---|---|---|
| EUT： | Wired/Wireless Rearview Camera System With Color LCD Monitor | Model Name. ： | 8912AZ(GB8912+GB7610) |
| Temperature： | 20 ℃ | Relative Humidtity： | 48% |
| Pressure： | 1010 hPa | Test Voltage ： | DC12V |
| Test Mode ： | Mode 1 | Polarization : | Horizontal |

| Frequency (MHz) | Meter Reading (dBμV) | Factor (dB) | Emission Level (dBμV/m) | Limits (dBμV/m) | Margin (dB) | Value Type |
|---|---|---|---|---|---|---|
| 2468.013 | 106.61 | -9.37 | 97.24 | 114 | -16.76 | peak |
| 2468.013 | 100.09 | -9.37 | 90.72 | 94 | -3.28 | AVG |
| 4936.026 | 52.10 | 3.74 | 55.84 | 74 | -18.16 | peak |
| 4936.026 | 42.04 | 3.74 | 45.78 | 54 | -8.22 | AVG |
| 7404.039 | 43.50 | 8.14 | 51.64 | 74 | -22.36 | peak |
| 7404.039 | 35.53 | 8.14 | 43.67 | 54 | -10.33 | AVG |
| Remark: | | | | | | |
| Factor = Antenna Factor + Cable Loss – Pre-amplifier. | | | | | | |

| | | | |
|---|---|---|---|
| EUT： | Wired/Wireless Rearview Camera System With Color LCD Monitor | Model Name. ： | 8912AZ(GB8912+GB7610) |
| Temperature： | 20 ℃ | Relative Humidtity： | 48% |
| Pressure： | 1010 hPa | Test Voltage ： | DC12V |
| Test Mode ： | Mode 1 | Polarization : | Vertical |

| Frequency (MHz) | Meter Reading (dBμV) | Factor (dB) | Emission Level (dBμV/m) | Limits (dBμV/m) | Margin (dB) | Value Type |
|---|---|---|---|---|---|---|
| 2468.013 | 105.61 | -9.37 | 96.24 | 114 | -17.76 | peak |
| 2468.013 | 99.45 | -9.37 | 90.08 | 94 | -3.92 | AVG |
| 4936.026 | 50.14 | 3.74 | 53.88 | 74 | -20.12 | peak |
| 4936.026 | 39.45 | 3.74 | 43.19 | 54 | -10.81 | AVG |
| 7404.039 | 42.64 | 8.14 | 50.78 | 74 | -23.22 | peak |
| 7404.039 | 34.11 | 8.14 | 42.25 | 54 | -11.75 | AVG |
| Remark: | | | | | | |
| Factor = Antenna Factor + Cable Loss – Pre-amplifier. | | | | | | |

**Note:** Other emissions from 8G to 25 GHz are considered as ambient noise. No recording in the test report.
Factor=Antenna Factor + Cable loss - Amplifier gain, Margin=Measurement-Limit.
The “Factor” value can be calculated automatically by software of measurement system.

# 8. BAND EDGE EMISSION

## 8.1. MEASUREMENT PROCEDURE

1. The EUT operates at transmitting mode. The operate channel is tested to verify the largest transmission and spurious emissions power at the continuous transmission mode.

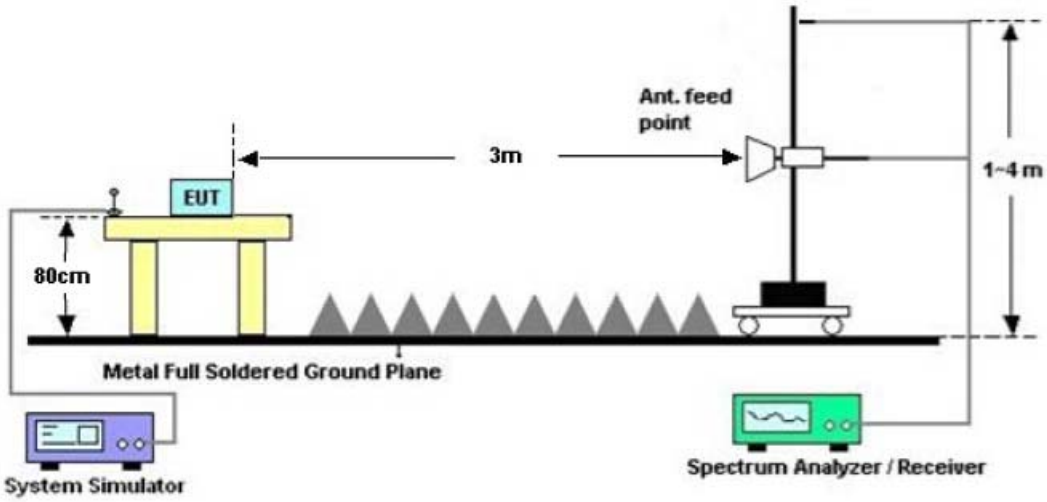
2. Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission: (a) PEAK: RBW=VBW=1MHz / Sweep=AUTO

(b) AVERAGE: RBW=1MHz ; VBW=1/on time(1KHz) / Sweep=AUTO

3. Other procedures refer to clause 7.2.

## 8.2 TEST SETUP

RADIATED EMISSION TEST SETUP




## 8.3 RADIATED TEST RESULT

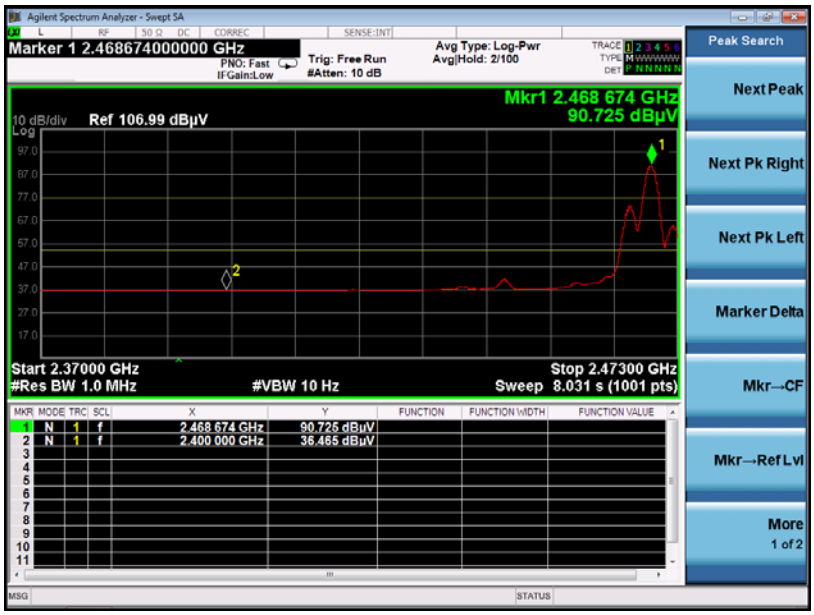
**Note**:

1. Factor=Antenna Factor + Cable loss - Amplifier gain. Field Strength=Factor + Reading level
2. The factor had been edited in the “Input Correction” of the Spectrum Analyzer. So the Amplitude of test plots is equal to Reading level plus the Factor in dB. Use the A dB(μV) to represent the Amplitude. Use the F dB(μV/m) to represent the Field Strength. So A=F.

| | | | |
|---|---|---|---|
| EUT： | Wired/Wireless Rearview Camera System With Color LCD Monitor | Model Name. ： | 8912AZ(GB8912+GB7610) |
| Temperature： | 20 ℃ | Relative Humidtity： | 48% |
| Pressure： | 1010 hPa | Test Voltage ： | DC12V |
| Test Mode ： | Mode 1 | Polarization : | Horizontal |

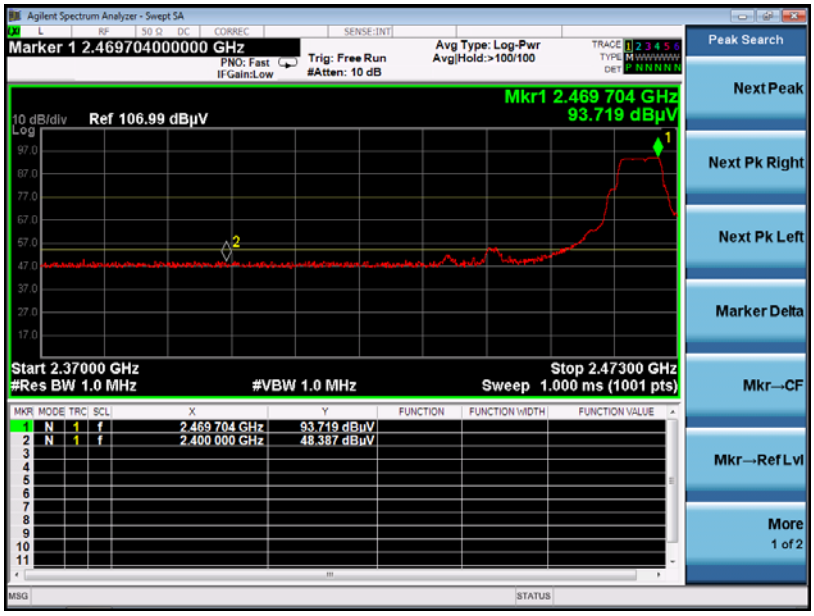
PK Value

AV Value

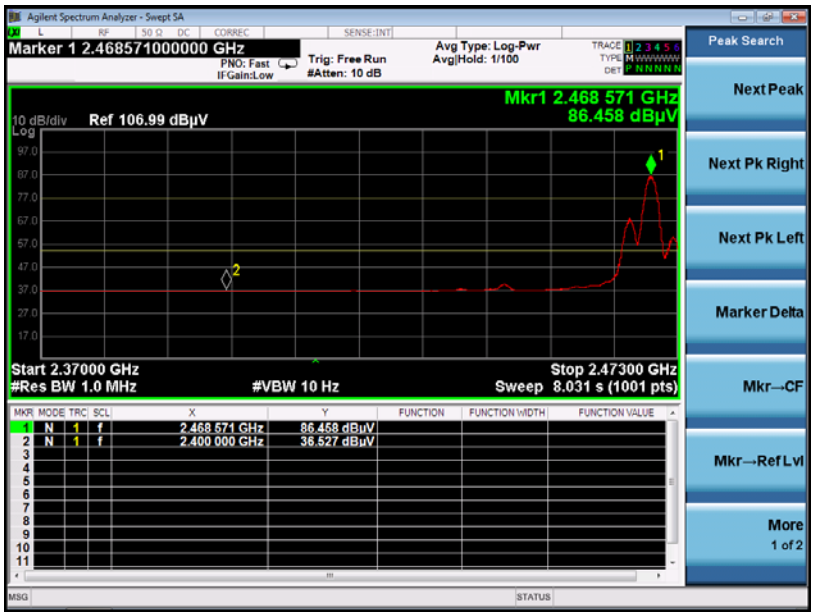


| | | | |
|---|---|---|---|
| EUT： | Wired/Wireless Rearview Camera System With Color LCD Monitor | Model Name. ： | 8912AZ(GB8912+GB7610) |
| Temperature： | 20 ℃ | Relative Humidtity： | 48% |
| Pressure： | 1010 hPa | Test Voltage ： | DC12V |
| Test Mode ： | Mode 1 | Polarization : | Vertical |

PK Value




AV Value



| | | | |
|---|---|---|---|
| EUT： | Wired/Wireless Rearview Camera System With Color LCD Monitor | Model Name. ： | 8912AZ(GB8912+GB7610) |
| Temperature： | 20 ℃ | Relative Humidtity： | 48% |
| Pressure： | 1010 hPa | Test Voltage ： | DC12V |
| Test Mode ： | Mode 1 | Polarization : | Horizontal |

PK Value

AV Value

| | | | |
|---|---|---|---|
| EUT： | Wired/Wireless Rearview Camera System With Color LCD Monitor | Model Name. ： | 8912AZ(GB8912+GB7610) |
| Temperature： | 20 ℃ | Relative Humidtity： | 48% |
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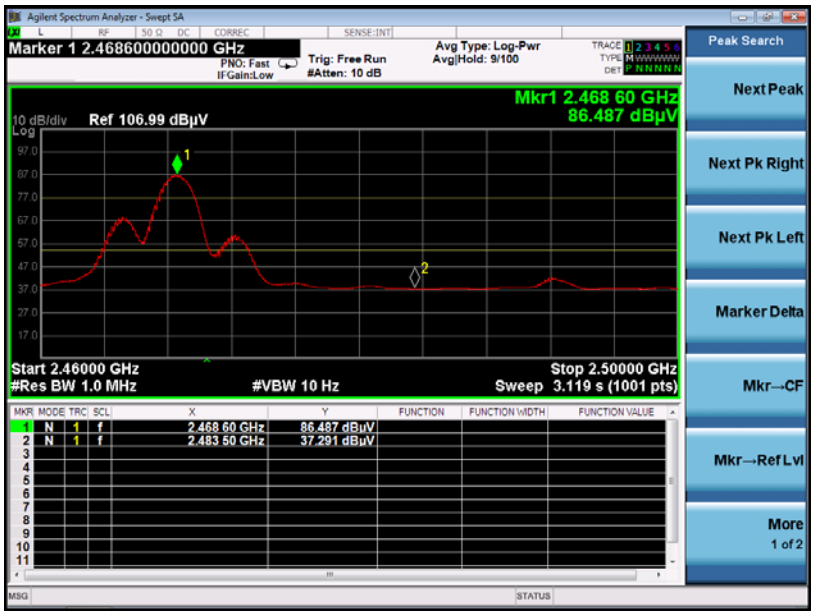
| Test Mode ： | Mode 1 | Polarization : | Vertical |

PK Value

AV Value

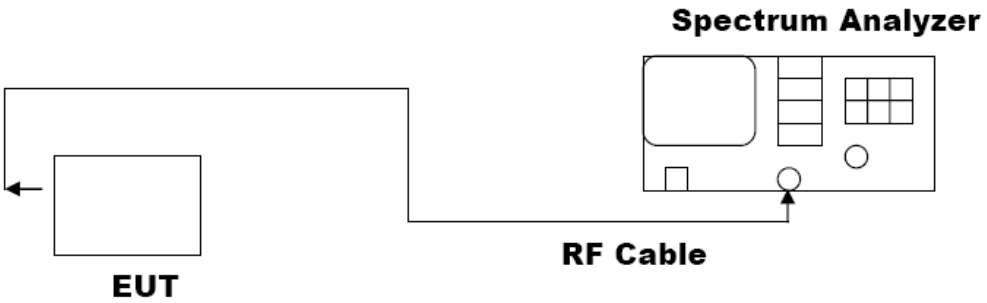


# 9. 20DB BANDWIDTH

## 9.1. MEASUREMENT PROCEDURE

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
3. Set SPA Centre Frequency = Operation Frequency, RBW= 100 KHz, VBW⩾3×RBW.
4. Set SPA Trace 1 Max hold, then View.

## 9.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)




## 9.3. MEASUREMENT RESULTS

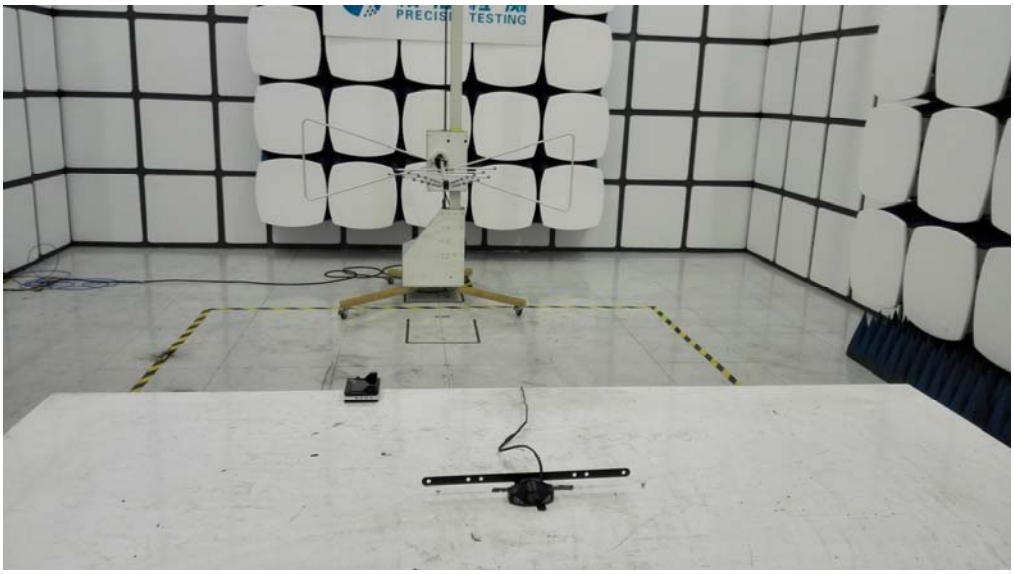
| | |
|---|---|
| **TEST ITEM** | 20DB BANDWIDTH |
| **TEST MODE** | Mode1 |

| Test Data (MHz) | | Criteria |
|---|---|---|
| Operating Channel | 9.817 | PASS |

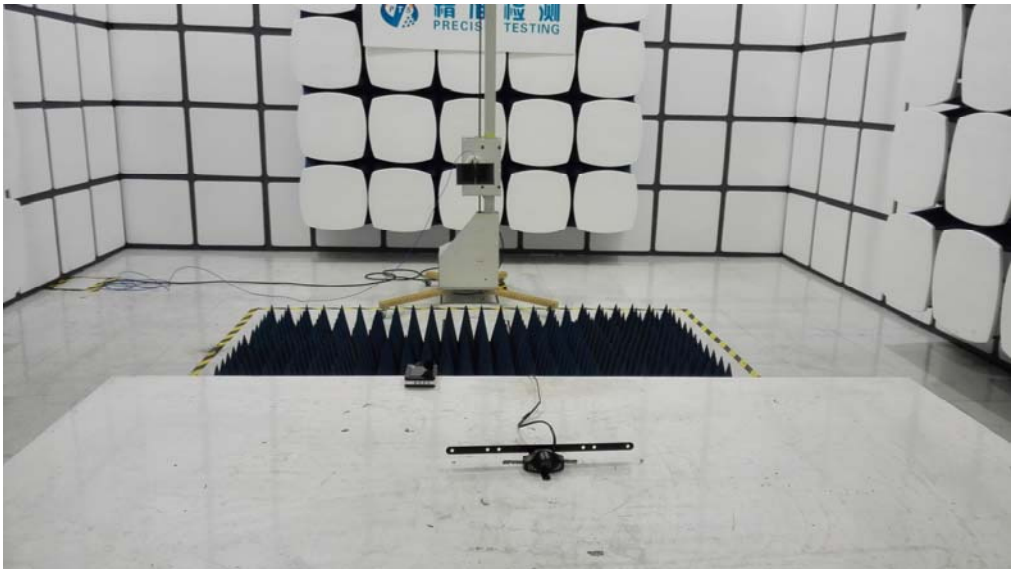
TEST PLOT OF BANDWIDTH

# APPENDIX A: PHOTOGRAPHS OF TEST SETUP

RADIATED EMISSION TEST SETUP BELOW 1GHz



RADIATED EMISSION TEST SETUP ABOVE 1GHz

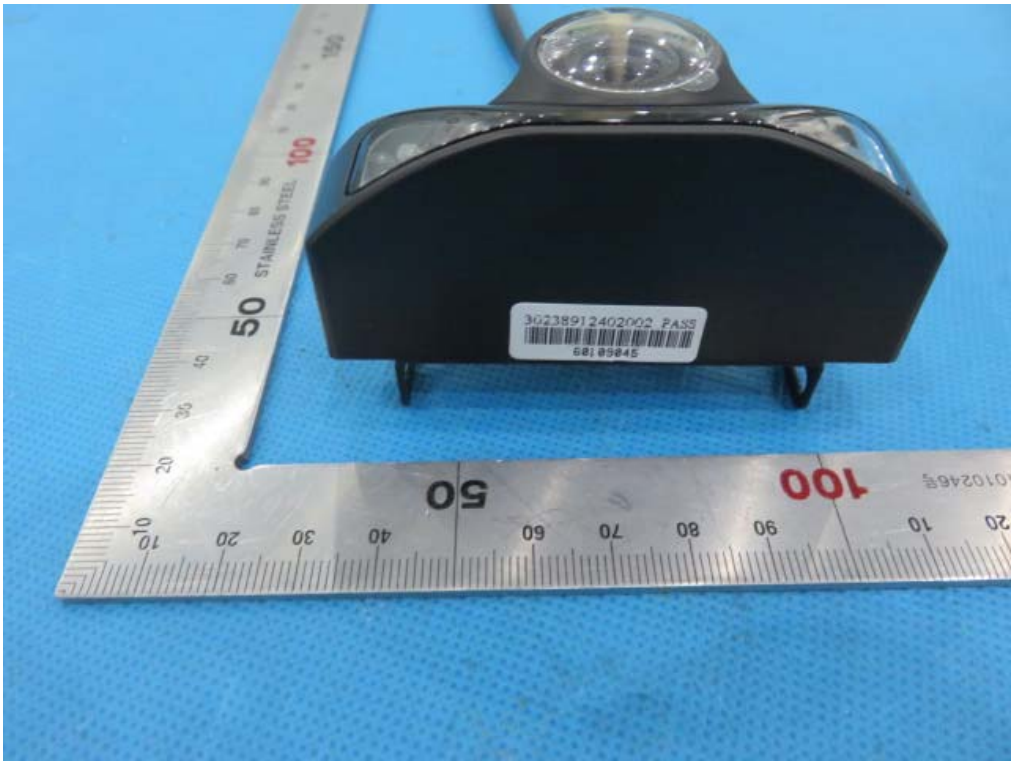


# APPENDIX B: PHOTOGRAPHS OF EUT

ALL VIEW OF EUT

TOP VIEW OF EUT

BOTTOM VIEW OF EUT

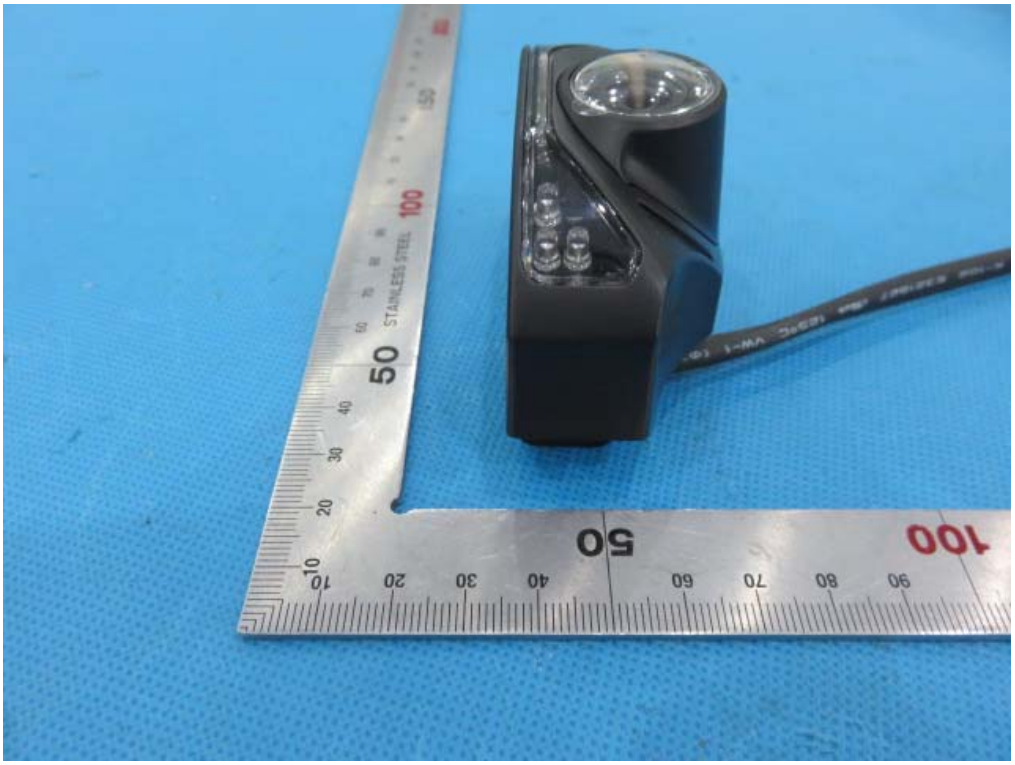



FRONT VIEW OF EUT

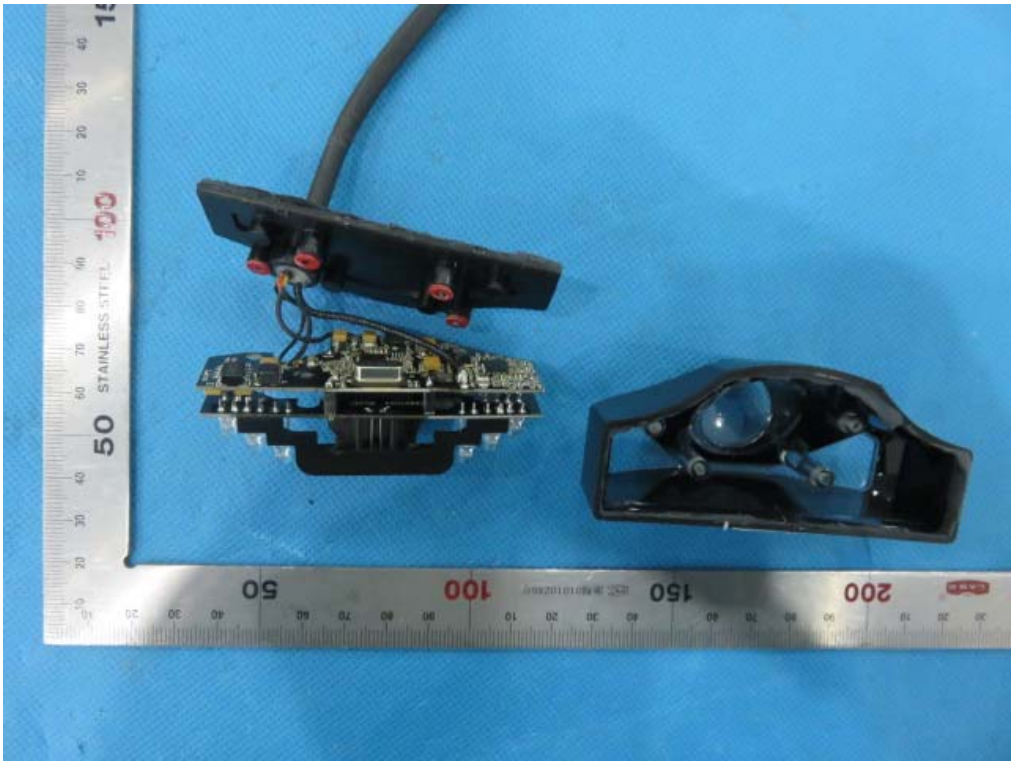
BACK VIEW OF EUT

LEFT VIEW OF EUT

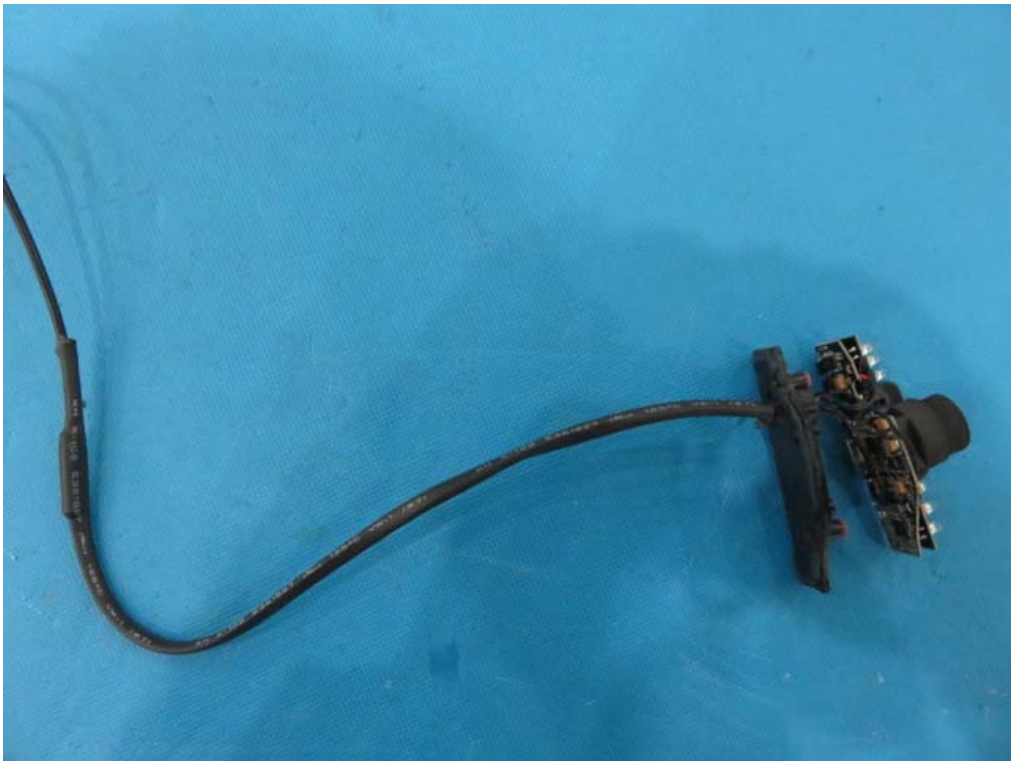
RIGHT VIEW OF EUT



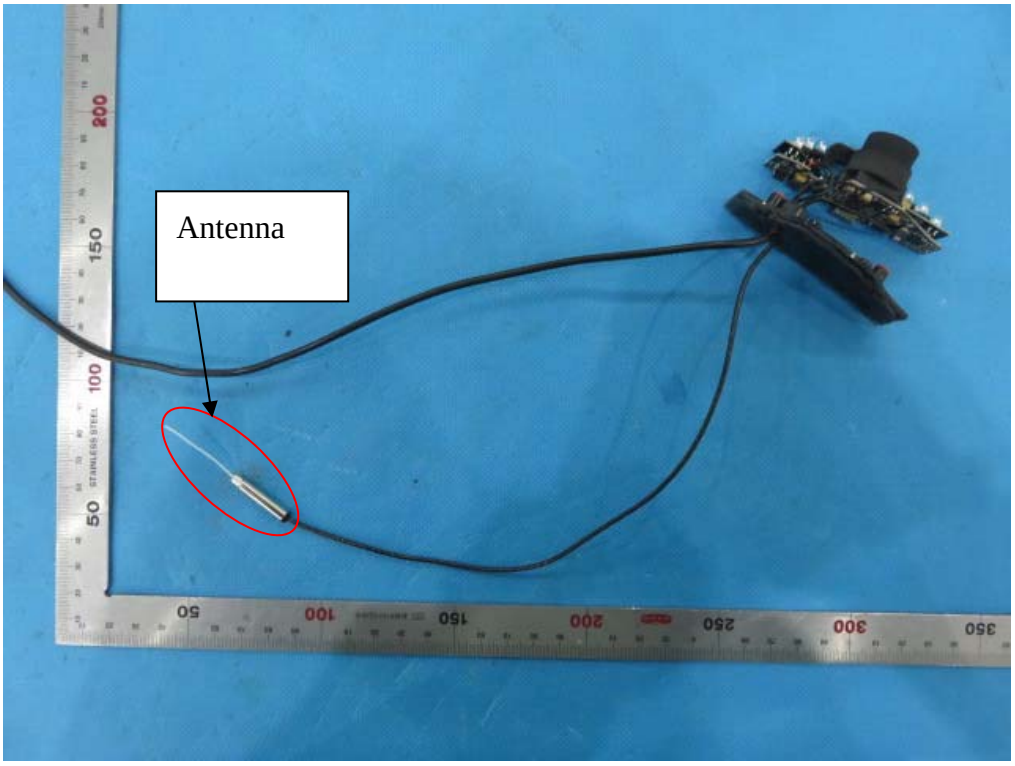
OPEN VIEW OF EUT



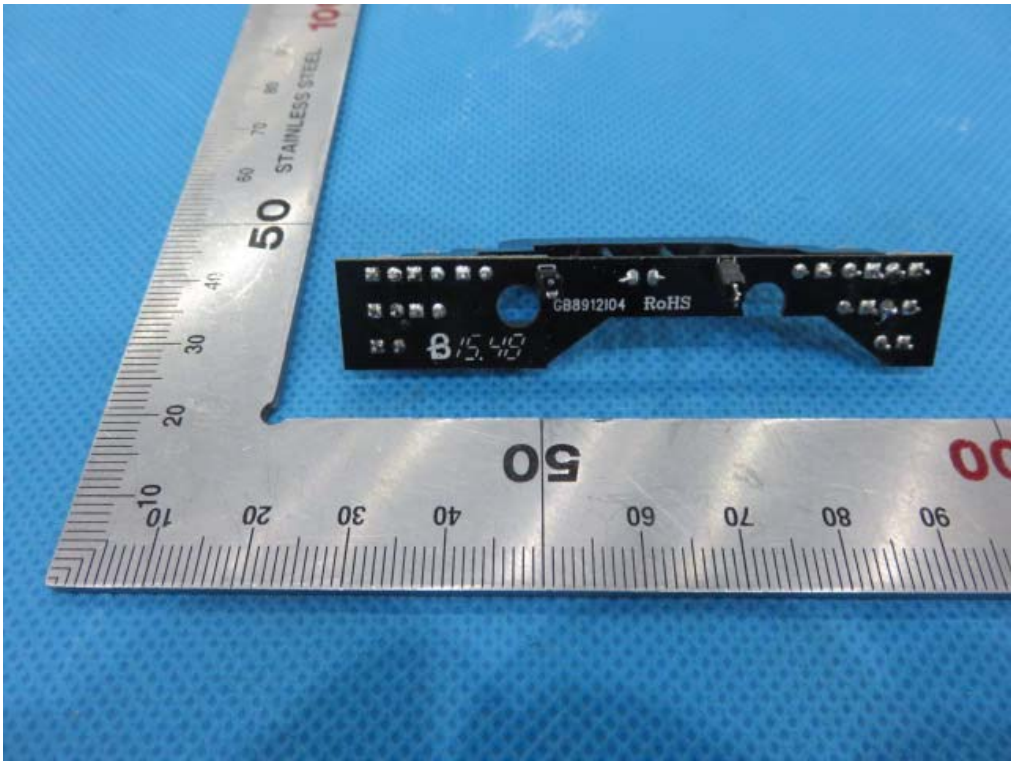
INTERNAL VIEW OF EUT-1



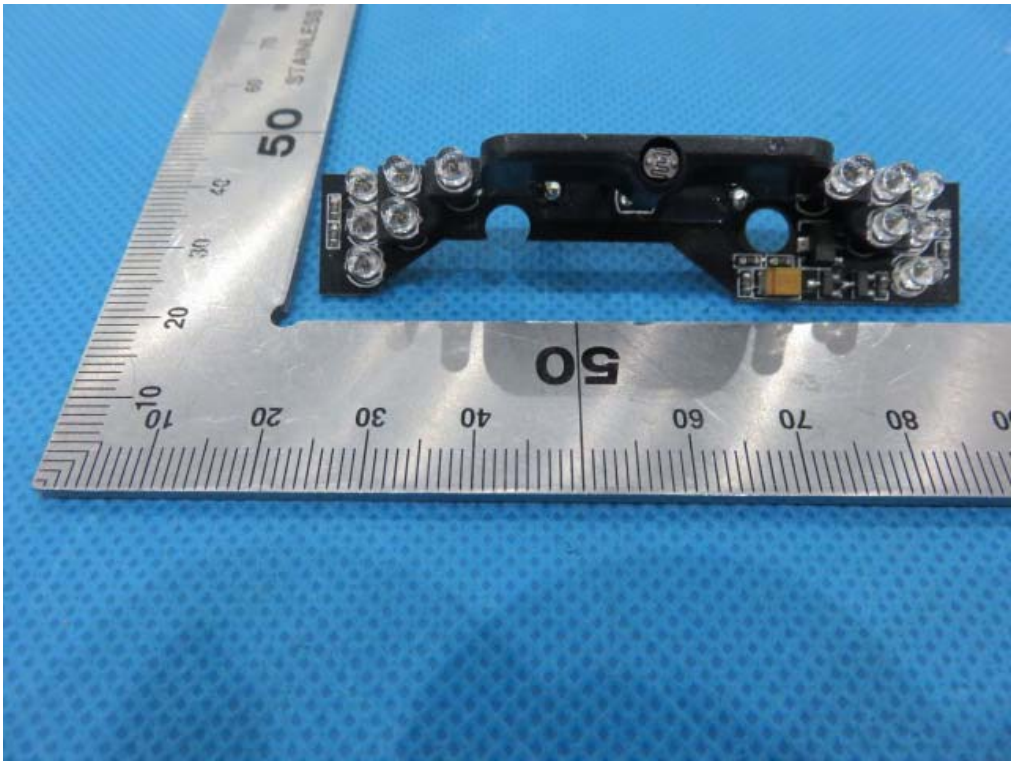
INTERNAL VIEW OF EUT-2



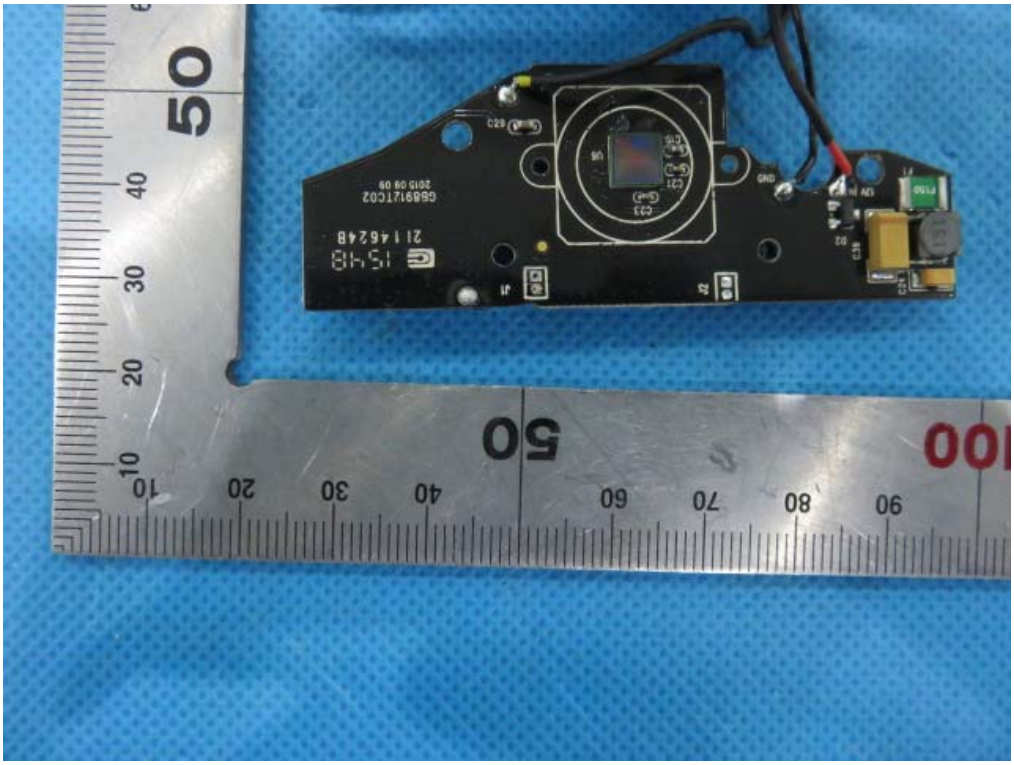
INTERNAL VIEW OF EUT-3



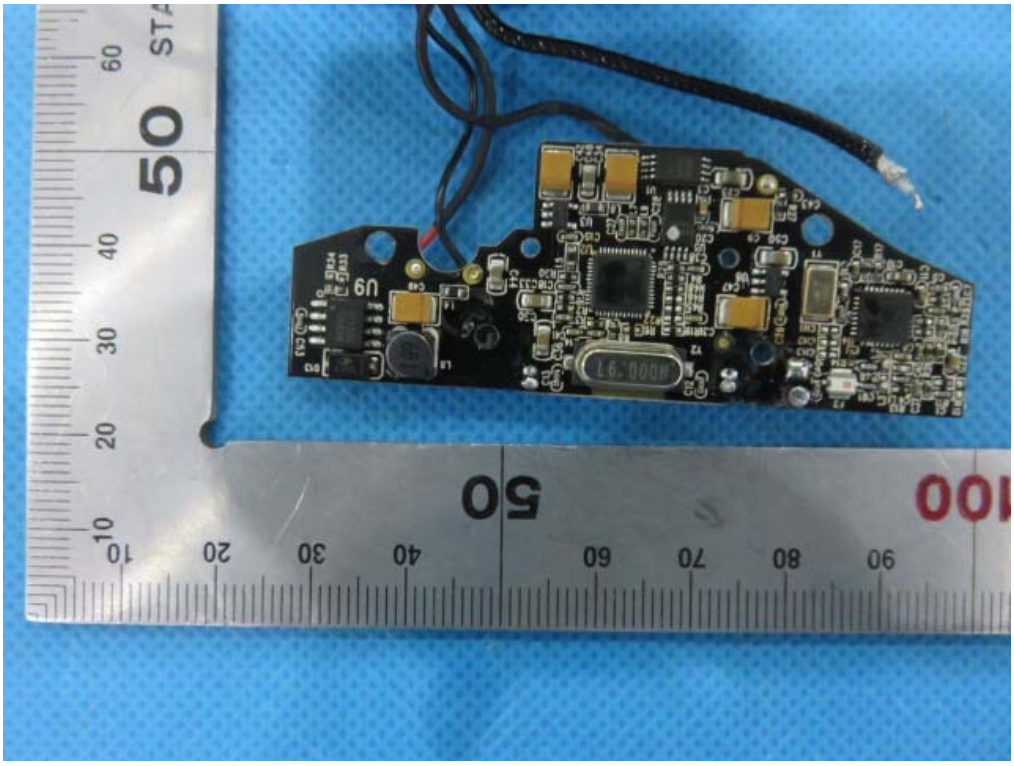

INTERNAL VIEW OF EUT-4



INTERNAL VIEW OF EUT-5



INTERNAL VIEW OF EUT-6



**----END OF REPORT----**