# TEST REPORT

| | |
|---|---|
| **Application No.:** | GZCR2109021038AT |
| **Applicant:** | APEMAN INTERNATIONAL CO., LIMITED. |
| **Address of Applicant:** | Room 126, Building 11, Huanan Avenue No.1 Huanan City International Printing paper packaging, Shenzhen, China |
| **Manufacturer:** | APEMAN INTERNATIONAL CO., LIMITED. |
| **Address of Manufacturer:** | Room 126, Building 11, Huanan Avenue No.1 Huanan City International Printing paper packaging, Shenzhen, China |
| **Factory:** | Sky Light Electronic (Shenzhen) Limited |
| **Address of Factory:** | No. 8 & 9 Building, Antuoshan High-tech Industrial Park, Xinsha Road, Shajing, Bao'An, Shenzhen, Guangdong, China |
| **Equipment Under Test (EUT):** | |
| **EUT Name:** | SEEKER Action Camera |
| **Model No.:** | SEEKER ONE |
| **Trade mark:** | Traxxas |
| **Standard(s) :** | 47 CFR Part 15, Subpart C 15.225 |
| **Date of Receipt:** | 2021-09-01 |
| **Date of Test:** | 2021-09-02 to 2021-09-08 |
| **Date of Issue:** | 2021-09-09 |
| **Test Result:** | **Pass*** |

* In the configuration tested, the EUT complied with the standards specified above.

Kobe Jian
EMC Laboratory Manager

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| Revision Record | | | | |
|---|---|---|---|---|
| **Version** | **Chapter** | **Date** | **Modifier** | **Remark** |
| *01* | | *2021-09-09* | | *Original* |
| | | | | |
| | | | | |

| **Authorized for issue by:** | | | | |
|---|---|---|---|---|
| | | **Curry Wu /Project Engineer** | | |
| | | **Ricky Liu/Reviewer** | | |

通标标准技术服务有限公司广州分公司
检验检测专用章
Inspection & Testing Services
SGS-CSTC Standards Technical Services Co., Ltd. Guangzhou Branch

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# 2 Test Summary

| Radio Spectrum Technical Requirement | | | | |
|---|---|---|---|---|
| **Item** | **Standard** | **Method** | **Requirement** | **Result** |
| Antenna Requirement | 47 CFR Part 15, Subpart C 15.225 | N/A | 47 CFR Part 15, Subpart C 15.203 | Pass |

| Radio Spectrum Matter Part | | | | |
|---|---|---|---|---|
| **Item** | **Standard** | **Method** | **Requirement** | **Result** |
| 20dB Bandwidth | 47 CFR Part 15, Subpart C 15.225 | ANSI C63.10 (2013) Section 6.9 | 47 CFR Part 15, Subpart C 15.215 | Pass |
| Conducted Emissions at Mains Terminals (150kHz-30MHz) | | ANSI C63.10 (2013) Section 6.2 | 47 CFR Part 15, Subpart C 15.207 | Pass |
| Emission Mask | | ANSI C63.10 (2013) Section 6.4 | 47 CFR Part 15, Subpart C 15.225(a)&(b)&(C ) | Pass |
| Frequency tolerance | | ANSI C63.10 (2013) Section 6.8 | 47 CFR Part 15, Subpart C 15.225(e) | Pass |
| Radiated Emissions (30MHz-1GHz) | | ANSI C63.10 (2013) Section 6.4&6.5 | 47 CFR Part 15, Subpart C 15.225(d) & 15.209 | Pass |
| Radiated Emissions (9kHz-30MHz) | | ANSI C63.10 (2013) Section 6.4&6.5 | 47 CFR Part 15, Subpart C 15.225(d) & 15.209 | Pass |

**Note:**

E.U.T./EUT means Equipment Under Test.

Pass means the test result passed the test standard requirement, please find the detailed decision rule in the report relative section.

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# 4 General Information

## 4.1 Details of E.U.T.

| | |
|---|---|
| Power supply: | DC 3.85V 1200mAh rechargeable Li-ion battery (to be charged from Type C port) |
| Test Voltage: | AC 120V, 60Hz |
| Antenna Type | Integral Antenna |
| Channel Spacing | N/A |
| Modulation Type | ASK |
| Number of Channels | 1 |
| Operation Frequency | 13.56MHz |
| Function: | 13.56MHz RFID |

## 4.2 Description of Support Units

| Description | Manufacturer | Model No. | Serial No. |
|---|---|---|---|
| -- | -- | -- | -- |
| The EUT has been tested as an independent unit. | | | |

## 4.3 Measurement Uncertainty

| Test Item | Measurement Uncertainty |
|---|---|
| 20dB Bandwidth | ± 3% |
| Conducted Emissions at Mains Terminals (150kHz-30MHz) | 3.12dB |
| Emission Mask | ± 4.5dB (Below 1GHz) |
| Frequency tolerance | ± 3% |
| Radiated Emissions (30MHz-1GHz) | ±5.06dB (3m); ±4.46dB (10m) |
| Radiated Emissions (9kHz-30MHz) | ± 4.5dB (Below 1GHz) |

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## 4.4 Test Location

All tests were performed at:

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Tel: +86 20 82155555 Fax: +86 20 82075059

No tests were sub-contracted.

## 4.5 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **NVLAP (Lab Code: 200611-0)**

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou EMC Laboratory is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP/NIST). NVLAP Code: 200611-0.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

- **ACMA**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory can also perform testing for the Australian/New Zealand Regulatory Compliance Mark (RCM).

- **SGS UK(Certificate No.: 32), SGS-TUV SAARLAND and SGS-FIMKO**

Have approved SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory as a supplier of EMC TESTING SERVICES and SAFETY TESTING SERVICES.

- **CNAS (Lab Code: L0167)**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been assessed and in compliance with CNAS-CL01:2018 accreditation criteria for testing laboratories (identical to ISO/IEC 17025:2017 General Requirements) for the Competence of Testing Laboratories.

- **FCC Recognized Accredited Test Firm(Registration No.: 486818)**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been accredited and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Designation Number: CN5016, Test Firm Registration Number: 486818.

- **ISED (Registration No.: 4620B, CAB identifier: CN0052)**

SGS-CSTC Standards Technical Services Co., Ltd., has been registered by Innovation Science and Economic Development Canada for Wireless Device Testing laboratories to test to Canadian radio equipment requirements. Registration No. 4620B, CAB identifier: CN0052.

- **VCCI (Registration No.: R-12460, C-12584, G-20107 and T-11179)**

The 10m Semi-anechoic chamber, 966 Anechoic Chamber and Shielded Room of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-12460, C-12584, G-20107 and T-11179 respectively.

- **CBTL (Lab Code: TL129)**

SGS-CSTC Standards Technical Services Co., Ltd., E&E Laboratory has been assessed and fully comply with the requirements of ISO/IEC 17025:2017, the Basic Rules, IECEE 01 and Rules of procedure IECEE 02, and the relevant IECEE CB-Scheme Operational documents.

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## 4.6 Deviation from Standards

None

## 4.7 Abnormalities from Standard Conditions

None

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# 5 Equipment List

| 20dB Bandwidth | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model No** | **Inventory No** | **Cal Date** | **Cal Due Date** |
| EXA Signal Analzer(10Hz-44GHz) | Agilent Technologies | N9010A | EMC2138 | 2020-09-17 | 2021-09-16 |
| 6dB Attenuator | HP | 8491A | EMC2062 | 2020-04-15 | 2022-04-14 |
| MI CABLE | SGS-EMC | 0.8M | EMC2136 | 2019-11-02 | 2021-11-01 |

| Conducted Emissions at Mains Terminals (150kHz-30MHz) | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model No** | **Inventory No** | **Cal Date** | **Cal Due Date** |
| Shielding Room | ChangZhou ZhongYu | 8m x 3m x 3.8m | EMC0306 | N/A | N/A |
| Two-Line V-Network | Rohde & Schwarz | ENV216 | EMC0118 | 2021-01-08 | 2022-01-06 |
| Two-Line V-Network-GZ | Rohde & Schwarz | ENV216 | EMC2135 | 2020-09-25 | 2021-09-24 |
| Coaxial Cable | HangTianXing | 2m | EMC0107 | 2020-09-09 | 2022-09-08 |
| Test Software E3c | Audix | Ver. 5.4.1221b | GZE100-62 | N/A | N/A |
| EMI Test Receiver(9kHz-3.6GHz) | Rohde & Schwarz | ESR4 | EMC2221 | 2021-06-01 | 2022-05-31 |

| Emission Mask | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model No** | **Inventory No** | **Cal Date** | **Cal Due Date** |
| Chamber cable | HangTianXing | N/A | EMC0542 | 2020-09-09 | 2022-09-08 |
| Amplifier(9kHz-1.3GHz) | HP | 8447F | EMC2065 | 2021-05-19 | 2022-05-18 |
| Active Loop Antenna-RED | ETS-Lindgren | 6502 | EMC2190 | 2019-12-27 | 2021-12-26 |
| 10m Semi-Anechoic Chamber | ETS | N/A | EMC0530 | 2019-10-20 | 2022-10-19 |
| Test Software E3 | Audix | Ver.6.120110a | GZE100-61 | N/A | N/A |
| EMI Test Receiver(1Hz-8GHz) | Rohde & Schwarz | ESW8 | EMC2220 | 2021-05-26 | 2022-05-25 |

| Frequency tolerance | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model No** | **Inventory No** | **Cal Date** | **Cal Due Date** |
| EXA Signal Analzer(10Hz-44GHz) | Agilent Technologies | N9010A | EMC2138 | 2020-09-17 | 2021-09-16 |
| 6dB Attenuator | HP | 8491A | EMC2062 | 2020-04-15 | 2022-04-14 |
| MI CABLE | SGS-EMC | 0.8M | EMC2136 | 2019-11-02 | 2021-11-01 |
| Temperature Chamber | GZ GongWen Co.Ltd. | GDJW-100 | EMC0039 | 2021-07-04 | 2022-07-03 |

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| Radiated Emissions (30MHz-1GHz) | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model No** | **Inventory No** | **Cal Date** | **Cal Due Date** |
| Chamber cable | HangTianXing | N/A | EMC0542 | 2020-09-09 | 2022-09-08 |
| Trilog Broadband Antenna(25MHz-1GHz)-Lab | SCHWARZBECK MESS-ELEKTRONIK | VULB 9168 | SEM003-18 | 2019-02-22 | 2022-02-22 |
| Amplifier(9kHz-1.3GHz) | HP | 8447F | EMC2065 | 2021-05-19 | 2022-05-18 |
| 10m Semi-Anechoic Chamber | ETS | N/A | EMC0530 | 2019-10-20 | 2022-10-19 |
| Test Software E3 | Audix | Ver.6.120110a | GZE100-61 | N/A | N/A |
| EMI Test Receiver(1Hz-8GHz) | Rohde & Schwarz | ESW8 | EMC2220 | 2021-05-26 | 2022-05-25 |

| Radiated Emissions (9kHz-30MHz) | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model No** | **Inventory No** | **Cal Date** | **Cal Due Date** |
| Chamber cable | HangTianXing | N/A | EMC0542 | 2020-09-09 | 2022-09-08 |
| Amplifier(9kHz-1.3GHz) | HP | 8447F | EMC2065 | 2021-05-19 | 2022-05-18 |
| Active Loop Antenna-RED | ETS-Lindgren | 6502 | EMC2190 | 2019-12-27 | 2021-12-26 |
| 10m Semi-Anechoic Chamber | ETS | N/A | EMC0530 | 2019-10-20 | 2022-10-19 |
| Test Software E3 | Audix | Ver.6.120110a | GZE100-61 | N/A | N/A |
| EMI Test Receiver(1Hz-8GHz) | Rohde & Schwarz | ESW8 | EMC2220 | 2021-05-26 | 2022-05-25 |

| General used equipment | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model No** | **Inventory No** | **Cal Date** | **Cal Due Date** |
| DMM | Fluke | 73 | EMC0006 | 2021-07-05 | 2022-07-05 |
| DMM | Fluke | 73 | EMC0007 | 2021-07-05 | 2022-07-05 |

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# 6 Radio Spectrum Technical Requirement

## 6.1 Antenna Requirement

### 6.1.1 Test Requirement:

47 CFR Part 15, Subpart C 15.203

### 6.1.2 Conclusion

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, 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.

EUT Antenna:

The antenna is integrated on the main PCB and no consideration of replacement.

Antenna location: Refer to internal photo.

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# 7 Radio Spectrum Matter Test Results

## 7.1 20dB Bandwidth

Test Requirement 47 CFR Part 15, Subpart C 15.215

Test Method: ANSI C63.10 (2013) Section 6.9

### 7.1.1 E.U.T. Operation

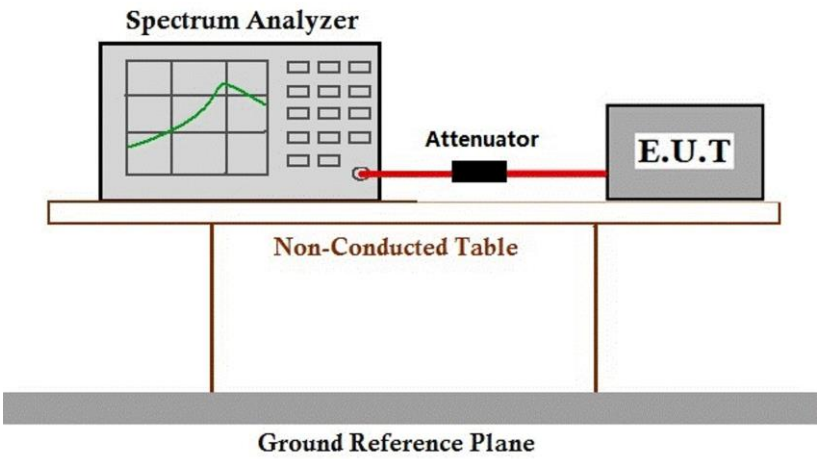
Operating Environment:

Temperature: 25.2 °C Humidity: 55.4 % RH Atmospheric Pressure: 1008 mbar

### 7.1.2 Test Mode Description

| Pre-scan / Final test | Mode Code | Description |
|---|---|---|
| **Final test** | 09 | Charge + TX mode with modulation |

### 7.1.3 Test Setup Diagram

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### 7.1.4 Measurement Procedure and Data

Remark: The setting of RBW was the minimum for the spectrum.

Cable Loss= 0.9dB

| operating frequency | 20dB Bandwidth | Limit | Result |
|---|---|---|---|
| 13.560 MHz | 0.856 kHz | --- | Pass |

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## 7.2 Conducted Emissions at Mains Terminals (150kHz-30MHz)

Test Requirement 47 CFR Part 15, Subpart C 15.207

Test Method: ANSI C63.10 (2013) Section 6.2

Limit:

| Frequency range (MHz) | Limit (dBuV) | |
|---|---|---|
| | Quasi-peak | Average |
| 0.15-0.5 | 66 to 56* | 56 to 46* |
| 0.5-5 | 56 | 46 |
| 5-30 | 60 | 50 |

* Decreases with the logarithm of the frequency.

### 7.2.1 E.U.T. Operation

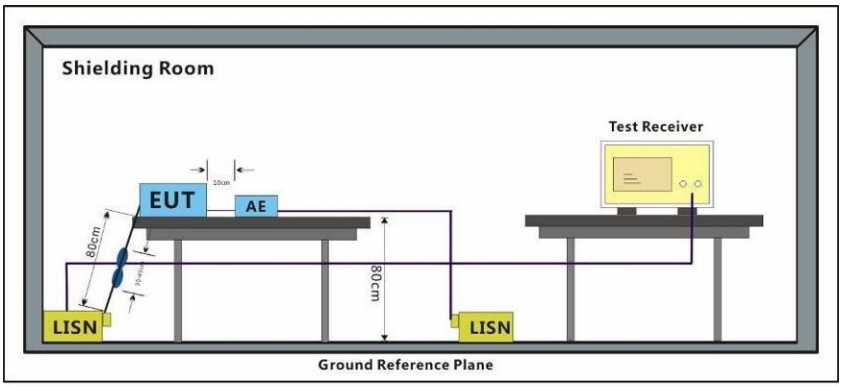
Operating Environment:

Temperature: 25.0 °C Humidity: 50.3 % RH Atmospheric Pressure: 1008 mbar

### 7.2.2 Test Mode Description

| Pre-scan / Final test | Mode Code | Description |
|---|---|---|
| **Final test** | 09 | Charge + TX mode with modulation |

### 7.2.3 Test Setup Diagram




### 7.2.4 Measurement Procedure and Data

An initial pre-scan was performed with peak detector. Quasi-Peak or Average measurement were performed at the frequencies with maximized peak emission were detected.

Measured Level = Read level + Cable Loss + LISN Factor

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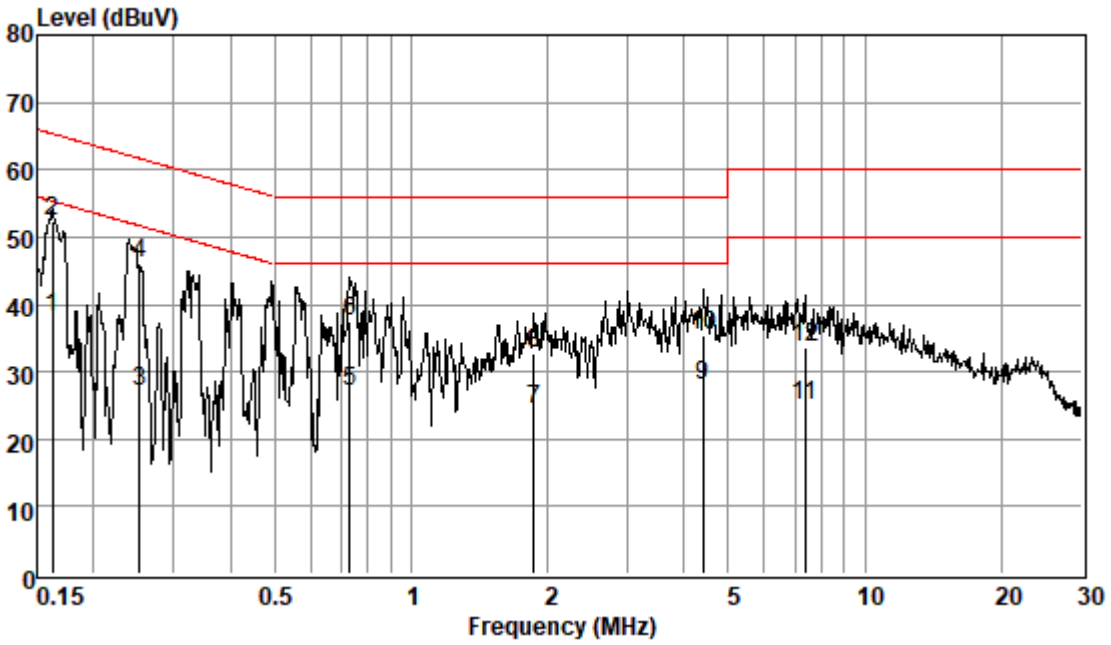
Test Mode: 09; Line: Live line




Pol :LINE
Mode :
Model :

| Frequenc MHz | Read Level dBuV | Cable Loss dB | LISN Factor dB | Measured Level dBuV | Limit Line dBuV | Over Limit dB | Remark |
|---|---|---|---|---|---|---|---|
| 0.16 | 28.24 | 0.06 | 9.62 | 37.92 | 55.34 | -17.42 | Average |
| 0.16 | 42.67 | 0.06 | 9.62 | 52.35 | 65.34 | -12.99 | QP |
| 0.25 | 17.32 | 0.06 | 9.62 | 27.00 | 51.69 | -24.69 | Average |
| 0.25 | 36.39 | 0.06 | 9.62 | 46.07 | 61.69 | -15.62 | QP |
| 0.73 | 17.48 | 0.07 | 9.63 | 27.18 | 46.00 | -18.82 | Average |
| 0.73 | 27.68 | 0.07 | 9.63 | 37.38 | 56.00 | -18.62 | QP |
| 1.87 | 14.70 | 0.11 | 9.62 | 24.43 | 46.00 | -21.57 | Average |
| 1.87 | 22.99 | 0.11 | 9.62 | 32.72 | 56.00 | -23.28 | QP |
| 4.38 | 18.19 | 0.17 | 9.64 | 28.00 | 46.00 | -18.00 | Average |
| 4.38 | 25.60 | 0.17 | 9.64 | 35.41 | 56.00 | -20.59 | QP |
| 7.37 | 15.13 | 0.21 | 9.67 | 25.01 | 50.00 | -24.99 | Average |
| 7.37 | 23.76 | 0.21 | 9.67 | 33.64 | 60.00 | -26.36 | QP |

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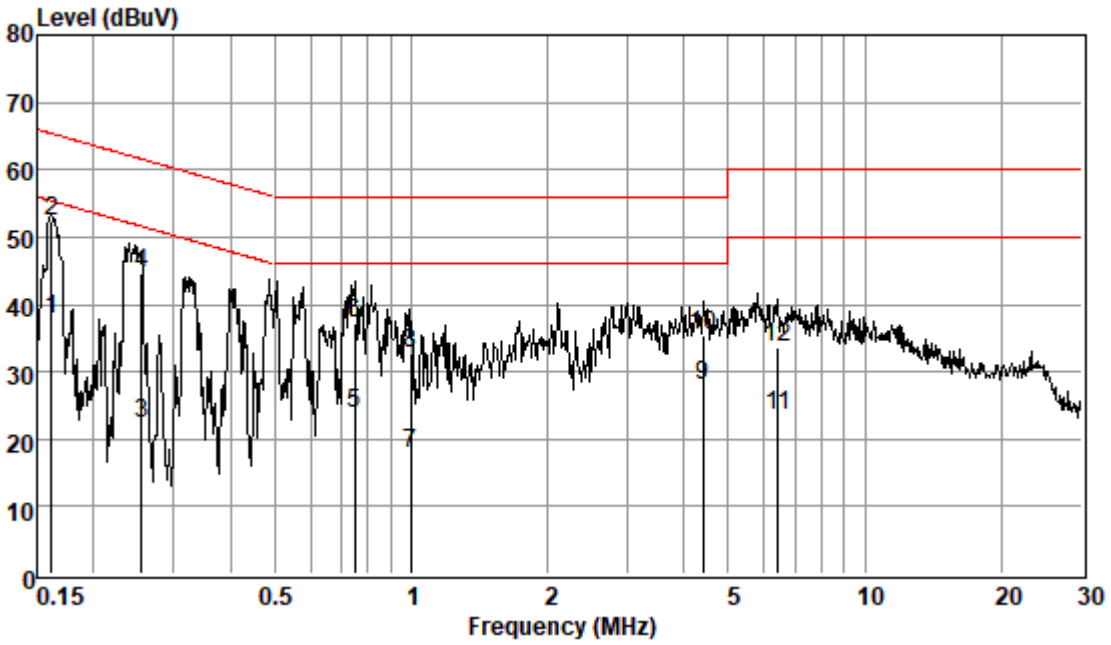
Test Mode: 09; Line: Neutral Line




Pol :NEUTRAL
Mode :
Model :

| Frequenc MHz | Read Level dBuV | Cable Loss dB | LISN Factor dB | Measured Level dBuV | Limit Line dBuV | Over Limit dB | Remark |
|---|---|---|---|---|---|---|---|
| 0.16 | 28.28 | 0.06 | 9.55 | 37.89 | 55.38 | -17.49 | Average |
| 0.16 | 42.66 | 0.06 | 9.55 | 52.27 | 65.38 | -13.11 | QP |
| 0.25 | 12.75 | 0.06 | 9.55 | 22.36 | 51.60 | -29.24 | Average |
| 0.25 | 34.86 | 0.06 | 9.55 | 44.47 | 61.60 | -17.13 | QP |
| 0.75 | 14.18 | 0.07 | 9.55 | 23.80 | 46.00 | -22.20 | Average |
| 0.75 | 27.64 | 0.07 | 9.55 | 37.26 | 56.00 | -18.74 | QP |
| 1.00 | 8.36 | 0.07 | 9.55 | 17.98 | 46.00 | -28.02 | Average |
| 1.00 | 23.01 | 0.07 | 9.55 | 32.63 | 56.00 | -23.37 | QP |
| 4.38 | 18.22 | 0.17 | 9.56 | 27.95 | 46.00 | -18.05 | Average |
| 4.38 | 25.57 | 0.17 | 9.56 | 35.30 | 56.00 | -20.70 | QP |
| 6.42 | 13.68 | 0.20 | 9.57 | 23.45 | 50.00 | -26.55 | Average |
| 6.42 | 23.70 | 0.20 | 9.57 | 33.47 | 60.00 | -26.53 | QP |

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## 7.3 Emission Mask

Test Requirement 47 CFR Part 15, Subpart C 15.225(a)&(b)&(C )

Test Method: ANSI C63.10 (2013) Section 6.4

Measurement Distance: 3 m

Limit:

(a) The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.

(b) Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

(c) Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

(d) The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in § 15.209.

**Below 30MHz**

The test was performed at a 3m test site.

The level at 30m test distance is below:

The factor calculated by the following equation:

$$FS_{\text{limit}} = FS_{\max} - 40\log\left(\frac{d_{\text{limit}}}{d_{\text{measure}}}\right)$$

where

| | |
|---|---|
| $FS_{\text{limit}}$ | is the calculation of field strength at the limit distance, expressed in dBμV/m |
| $FS_{\max}$ | is the measured field strength, expressed in dBμV/m |
| $d_{\text{measure}}$ | is the distance of the measurement point from the EUT |
| $d_{\text{limit}}$ | is the reference distance or the distance of the $\lambda/2\pi$ point |

### 7.3.1 E.U.T. Operation

Operating Environment:

Temperature: 24.7 °C Humidity: 55.2 % RH Atmospheric Pressure: 1008 mbar

### 7.3.2 Test Mode Description

| Pre-scan / Final test | Mode Code | Description |
|---|---|---|
| **Final test** | 09 | Charge + TX mode with modulation |

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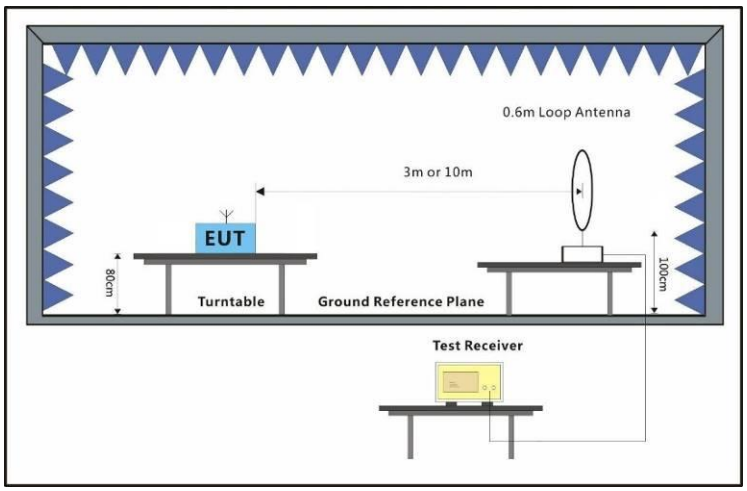
### 7.3.3 Test Setup Diagram




### 7.3.4 Measurement Procedure and Data

For testing performed with the loop antenna, the center of the loop was positioned 1 m above the ground and positioned with its plane vertical at the specified distance from the EUT. During testing the loop was rotated about its vertical axis for maximum response at each azimuth and also investigated with the loop positioned in the horizontal plane. Only the worst case (horizontal) was recorded in the report.

The radiation measurements are performed in X, Y, Z axis positioning. And found the X axis positioning which it is worse case, only the test worst case mode is recorded in the report.

Measured Level l=Read Level + Antenna Factor + Cable Loss - Preamp Factor + Extrapolation Correction

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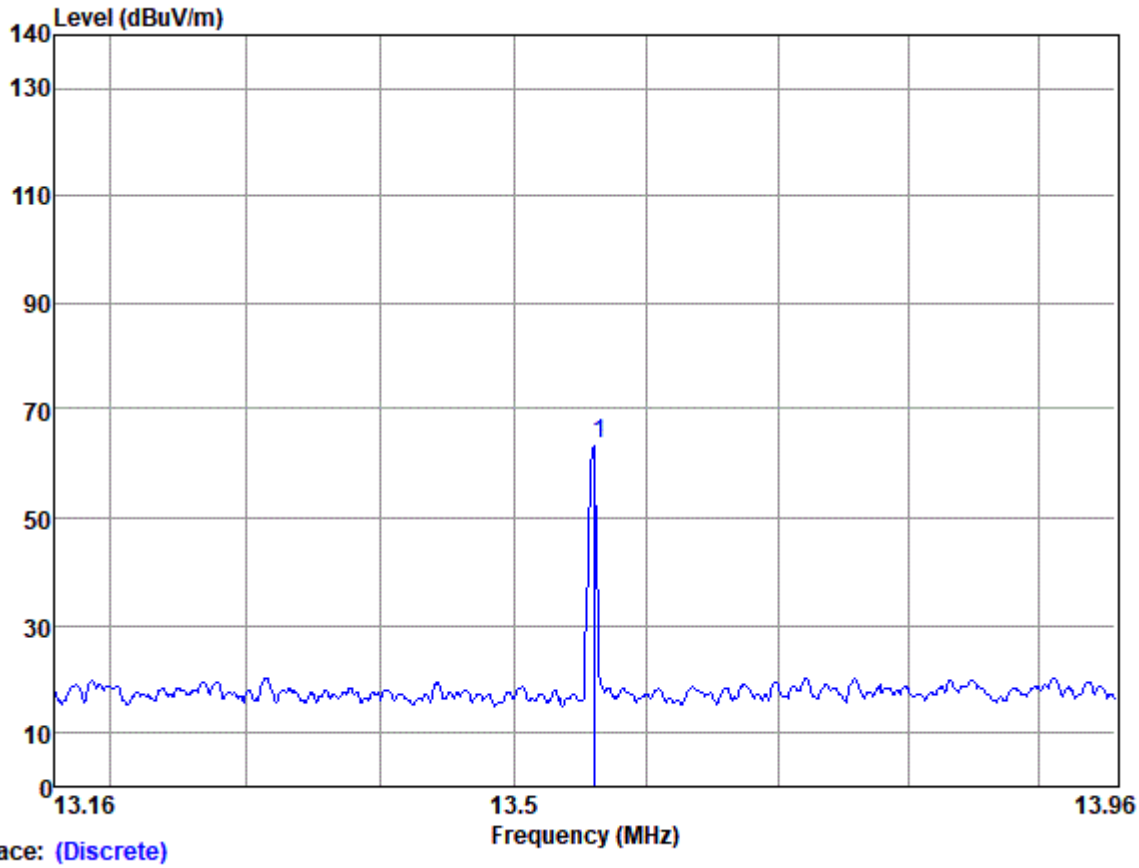
Test Mode: 09




Trace: (Discrete)

```
Site        : SGS
Job         :
Model       :
Power       :
Test Mode   :
```

| | Freq | Read Level | Anterna Factor | Cable Loss | Preamp Factor | Measured Level | Limit Line | Over Limit | Pol/ Phase | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB/m | dB | dB | dBuV/m | dBuV/m | dBuV | | |
| 1 | 13.56 | 79.95 | 8.96 | 0.58 | 29.25 | 60.24 | 69.54 | -9.48 | HORIZONTAL | QP |

| Frequency (MHz) | Level (dBuV/m) @3m | Limit (dBuV/m) @30m | Convert Factor (dB) | Level (dBuV/m) @ 30m | Over limit (dB) |
|---|---|---|---|---|---|
| 13.560 | 60.24 | 84 | 40 | 20.24 | -63.76 |

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## 7.4 Frequency tolerance

Test Requirement 47 CFR Part 15, Subpart C 15.225(e)

Test Method: ANSI C63.10 (2013) Section 6.8

Limit: ±0.01%(±1.356kHz)

### 7.4.1 E.U.T. Operation

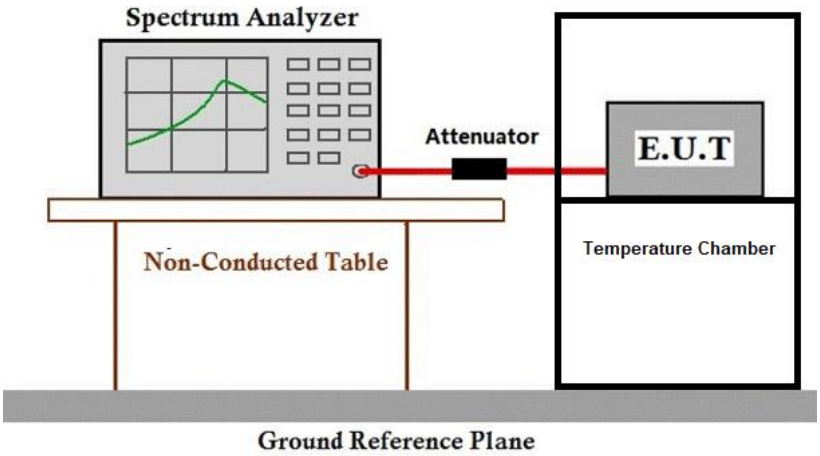
Operating Environment:

Temperature: 23.6 °C Humidity: 50.5 % RH Atmospheric Pressure: 1008 mbar

### 7.4.2 Test Mode Description

| Pre-scan / Final test | Mode Code | Description |
|---|---|---|
| **Final test** | 09 | Charge + TX mode with modulation |

### 7.4.3 Test Setup Diagram

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### 7.4.4 Measurement Procedure and Data

| Measurement Conditions | | Limit: ±100ppm | | Verdict |
|---|---|---|---|---|
| Voltage (V AC) | Temperature (°C) | Frequency Measured (MHz) | Test data (ppm) | |
| $V_{norm}$ : 120 | -20 | 13.560275 | 20.28 | PASS |
| | -10 | 13.560299 | 22.05 | PASS |
| | 0 | 13.560386 | 28.47 | PASS |
| | +10 | 13.560426 | 31.42 | PASS |
| | $T_{normal}$ : +20 | 13.560000 | 0.00 | PASS |
| | +30 | 13.560137 | 10.10 | PASS |
| | +40 | 13.560142 | 10.47 | PASS |
| | +50 | 13.560284 | 20.94 | PASS |
| $V_{max}$ : 132 | $T_{normal}$ : +20 | 13.560155 | 11.43 | PASS |
| $V_{min}$ : 108 | | 13.560161 | 11.87 | PASS |

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## 7.5 Radiated Emissions (30MHz-1GHz)

Test Requirement 47 CFR Part 15, Subpart C 15.225(d) & 15.209

Test Method: ANSI C63.10 (2013) Section 6.4&6.5

Limit:

| Frequency | Field strength (microvolt/meter) | Limit (dBuV/m) | Remark | Measurement distance (m) |
|---|---|---|---|---|
| 30MHz-88MHz | 100 | 40.0 | Quasi-peak | 3 |
| 88MHz-216MHz | 150 | 43.5 | Quasi-peak | 3 |
| 216MHz-960MHz | 200 | 46.0 | Quasi-peak | 3 |
| 960MHz-1GHz | 500 | 54.0 | Quasi-peak | 3 |

### 7.5.1 E.U.T. Operation

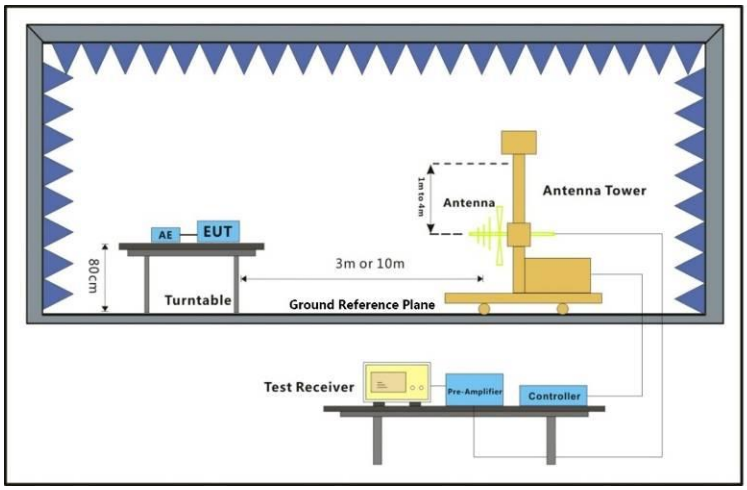
Operating Environment:

Temperature: 25.1 °C Humidity: 54.2 % RH Atmospheric Pressure: 1008 mbar

### 7.5.2 Test Mode Description

| Pre-scan / Final test | Mode Code | Description |
|---|---|---|
| Final test | 09 | Charge + TX mode with modulation |

### 7.5.3 Test Setup Diagram

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### 7.5.4 Measurement Procedure and Data

a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

h. The radiation measurements are performed in X, Y, Z axis positioning. And found the X axis positioning which it is worse case, only the test worst case mode is recorded in the report.

Remark 1: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

Remark 2: For frequencies above 1GHz, 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. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.

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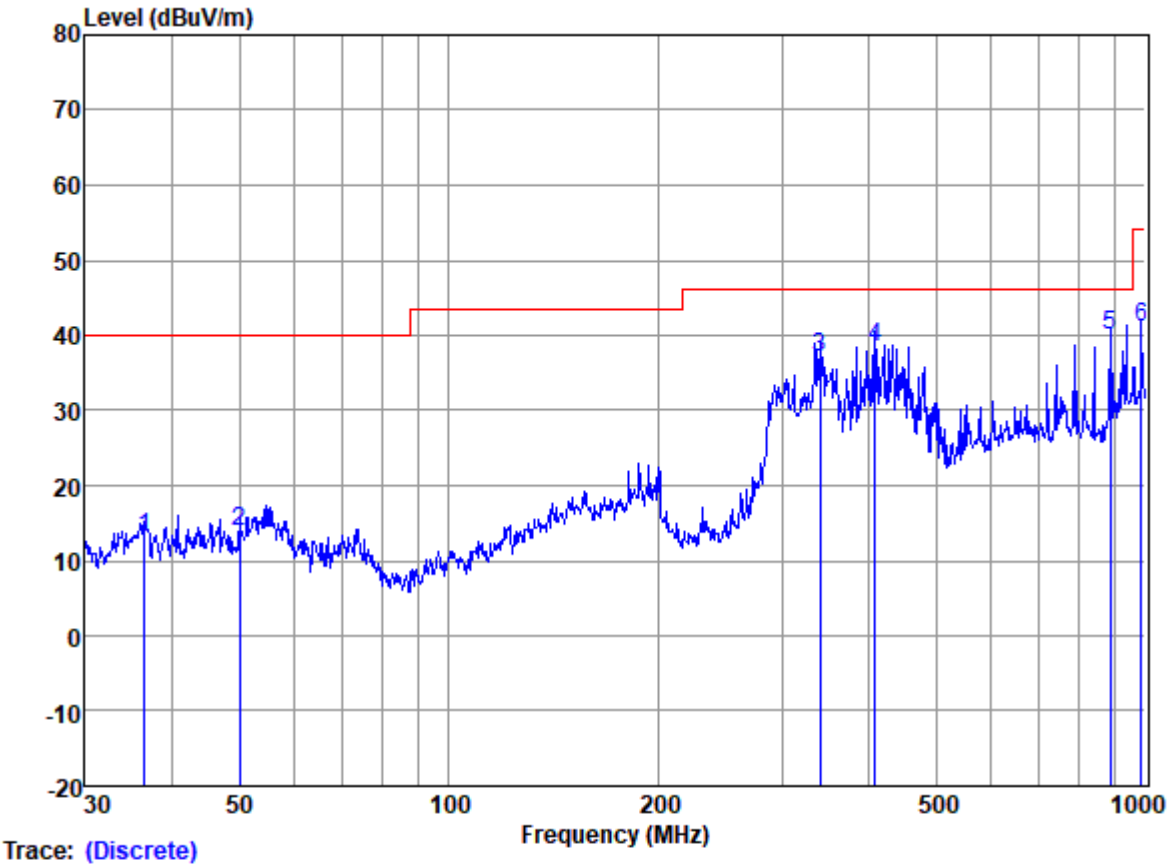
Test Mode: 09; Polarity: Horizontal




Site : SGS
Job :
Model :
Power :
Test Mode :

| | Freq | Read Level | Antenna Factor | Cable Loss | Preamp Factor | Measured Level | Limit Line | Over Limit | Pol/ Phase | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB/m | dB | dB | dBuV/m | dBuV/m | dBuV | | |
| 1 | 36.51 | 26.23 | 13.06 | 1.08 | 27.18 | 13.19 | 40.00 | -26.81 | HORIZONTAL | |
| 2 | 50.06 | 25.96 | 13.90 | 1.14 | 27.17 | 13.83 | 40.00 | -26.17 | HORIZONTAL | |
| 3 | 340.78 | 46.01 | 14.50 | 3.50 | 26.86 | 37.15 | 46.00 | -8.85 | HORIZONTAL | |
| 4 | 408.95 | 45.98 | 15.88 | 3.97 | 27.36 | 38.47 | 46.00 | -7.53 | HORIZONTAL | |
| 5 | 890.73 | 37.86 | 23.10 | 6.86 | 27.86 | 39.96 | 46.00 | -6.04 | HORIZONTAL | |
| 6 | 986.07 | 37.12 | 24.17 | 7.37 | 27.68 | 40.98 | 54.00 | -13.02 | HORIZONTAL | |

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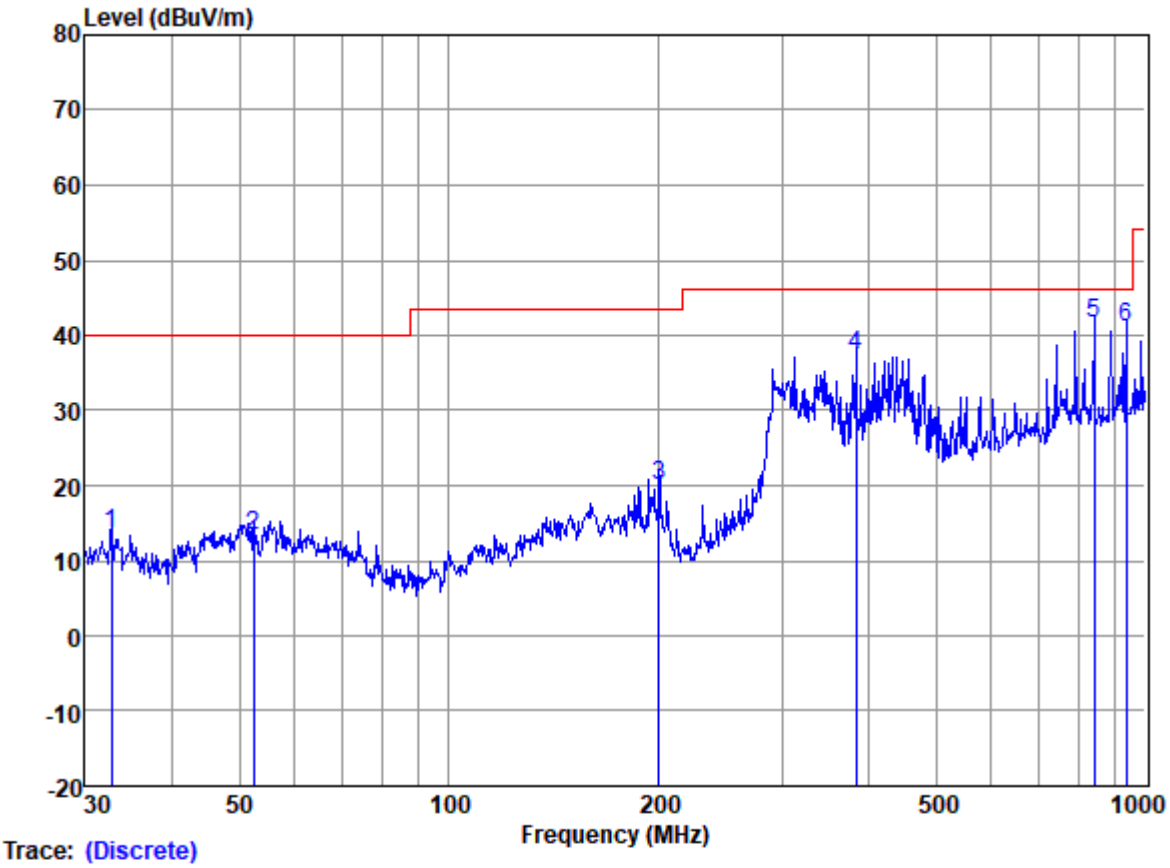
Test Mode: 09; Polarity: Vertical




Site : SGS
Job :
Model :
Power :
Test Mode :

| | Freq | Read Level | Antenna Factor | Cable Loss | Preamp Factor | Measured Level | Limit Line | Over Limit | Pol/ Phase | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB/m | dB | dB | dBuV/m | dBuV/m | dBuV | | |
| 1 | 32.75 | 27.12 | 12.74 | 1.05 | 27.19 | 13.72 | 40.00 | -26.28 | VERTICAL | |
| 2 | 52.39 | 25.37 | 13.96 | 1.16 | 27.17 | 13.32 | 40.00 | -26.68 | VERTICAL | |
| 3 | 199.99 | 33.97 | 10.20 | 2.52 | 26.73 | 19.96 | 43.50 | -23.54 | VERTICAL | |
| 4 | 383.93 | 45.36 | 15.50 | 3.87 | 27.26 | 37.47 | 46.00 | -8.53 | VERTICAL | |
| 5 | 842.13 | 40.29 | 22.72 | 6.46 | 27.96 | 41.51 | 46.00 | -4.49 | VERTICAL | |
| 6 | 938.83 | 38.02 | 23.80 | 7.12 | 27.78 | 41.16 | 46.00 | -4.84 | VERTICAL | |

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## 7.6 Radiated Emissions (9kHz-30MHz)

Test Requirement 47 CFR Part 15, Subpart C 15.225(d) & 15.209

Test Method: ANSI C63.10 (2013) Section 6.4&6.5

Limit:

| Frequency (MHz) | Field strength (microvolts/meter) | Limit (dBuV/m) | Detector | Measurement 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 | 40.0 | QP | 3 |
| 88-216 | 150 | 43.5 | QP | 3 |
| 216-960 | 200 | 46.0 | QP | 3 |
| 960-1000 | 500 | 54.0 | QP | 3 |
| Above 1000 | 500 | 54.0 | AV | 3 |

According to ANSI C63.10 Section 6.4, the test data shall convert by below formula:

If both the single point and the limit distance are equal to or closer to the EUT than λ/2π, then extrapolation to the limit distance shall be calculated using Equation (4):

$$FS_{\text{limit}} = FS_{\max} - 40\log\left(\frac{d_{\text{limit}}}{d_{\text{measure}}}\right) \quad (4)$$

where

$FS_{\text{limit}}$ is the calculation of field strength at the limit distance, expressed in dBμV/m
$FS_{\max}$ is the measured field strength, expressed in dBμV/m
$d_{\text{near field}}$ is the λ/2π distance
$d_{\text{measure}}$ is the distance of the measurement point from the EUT
$d_{\text{limit}}$ is the reference distance or the distance of the λ/2π point

**Table 5—Relationship of frequency and wavelength (informative)**

| Frequency (MHz) | λ (m) | 0.625λ (m) | λ/2π |
|---|---|---|---|
| 0.009 | 33333.3 | 20833.3 | 5305.2 |
| 0.1 | 3000.0 | 1875.0 | 477.5 |
| 0.3 | 1000.0 | 625.0 | 159.2 |
| 1 | 300.0 | 187.5 | 47.7 |
| 4.76 | 63.0 | 39.4 | 10.0 |
| 16 | 18.8 | 11.7 | 3.0 |
| 30 | 10.0 | 6.3 | 1.6 |

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### 7.6.1 E.U.T. Operation

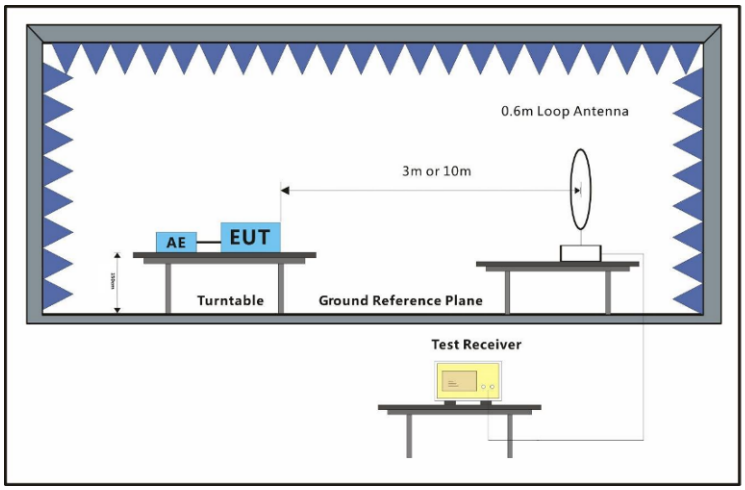
Operating Environment:

Temperature: 25.1 °C Humidity: 54.2 % RH Atmospheric Pressure: 1008 mbar

### 7.6.2 Test Mode Description

| Pre-scan / Final test | Mode Code | Description |
|---|---|---|
| **Final test** | 02 | TX mode with modulation |

### 7.6.3 Test Setup Diagram




### 7.6.4 Measurement Procedure and Data

Measurement distance: 10 m

For testing performed with the loop antenna, the center of the loop was positioned 1 m above the ground and positioned with its plane vertical at the specified distance from the EUT. During testing the loop was rotated about its vertical axis for maximum response at each azimuth and also investigated with the loop positioned in the horizontal plane. Only the worst case (horizontal) was recorded in the report.

The radiation measurements are performed in X, Y, Z axis positioning. And found the X axis positioning which it is worse case, only the test worst case mode is recorded in the report.

Measured Level l=Read Level + Antenna Factor + Cable Loss - Preamp Factor + Extrapolation Correction

The point 5 is the fundamental operating frequency of the EUT and refer to section 7.3 for details.

All the test data below the background of emissions in the frequency band, and the peak field strength of any emission is not exceeding the maximum permitted average limits specified above. So, no measurement data was shown.

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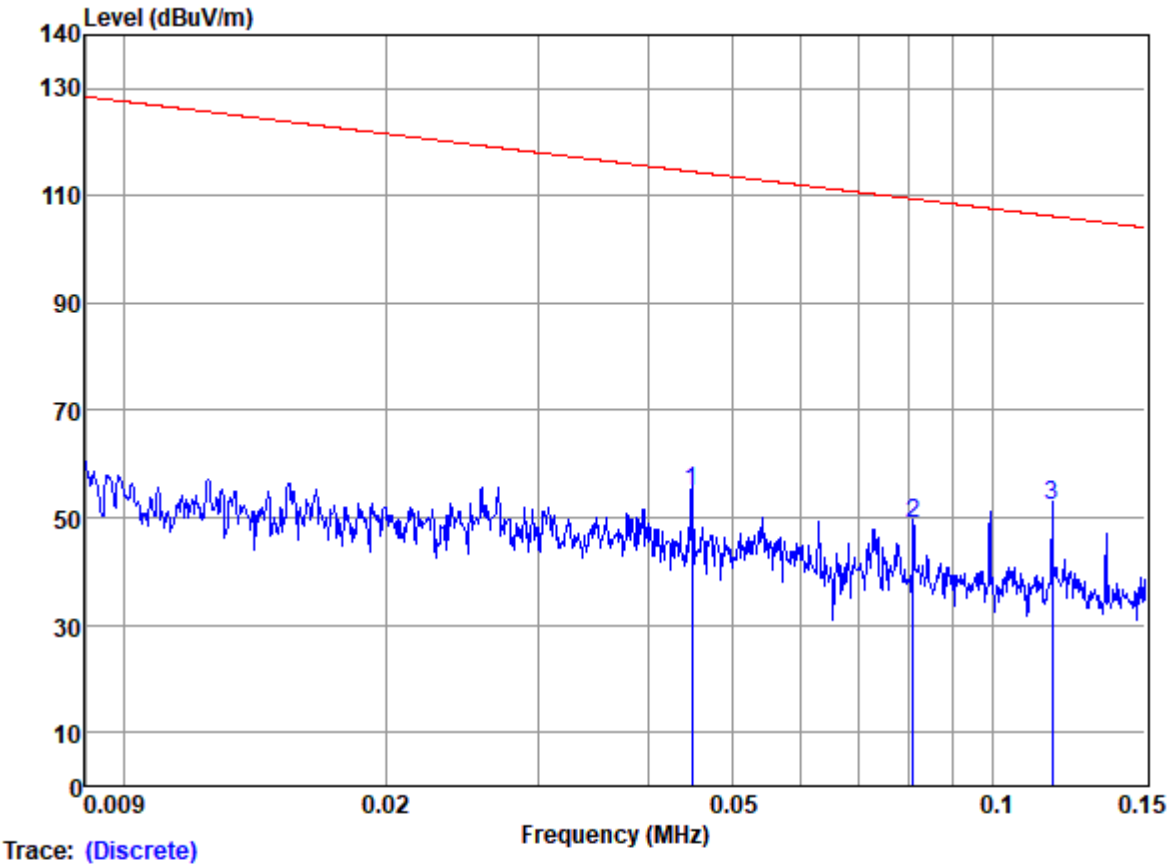
Test Mode: 09




Site : SGS
Job :
Model :
Power :
Test Mode :

| | Freq | Read Level | Anterna Factor | Cable Loss | Preamp Factor | Measured Level | Limit Line | Over Limit | Pol/ Phase | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB/m | dB | dB | dBuV/m | dBuV/m | dBuV | | |
| 1 | 0.04 | 72.14 | 11.96 | 0.05 | 29.24 | 54.91 | 114.54 | -59.63 | HORIZONTAL | Average |
| 2 | 0.08 | 67.42 | 10.70 | 0.05 | 29.43 | 48.74 | 109.43 | -60.69 | HORIZONTAL | Average |
| 3 | 0.12 | 71.12 | 10.45 | 0.05 | 29.47 | 52.15 | 106.23 | -54.08 | HORIZONTAL | Average |

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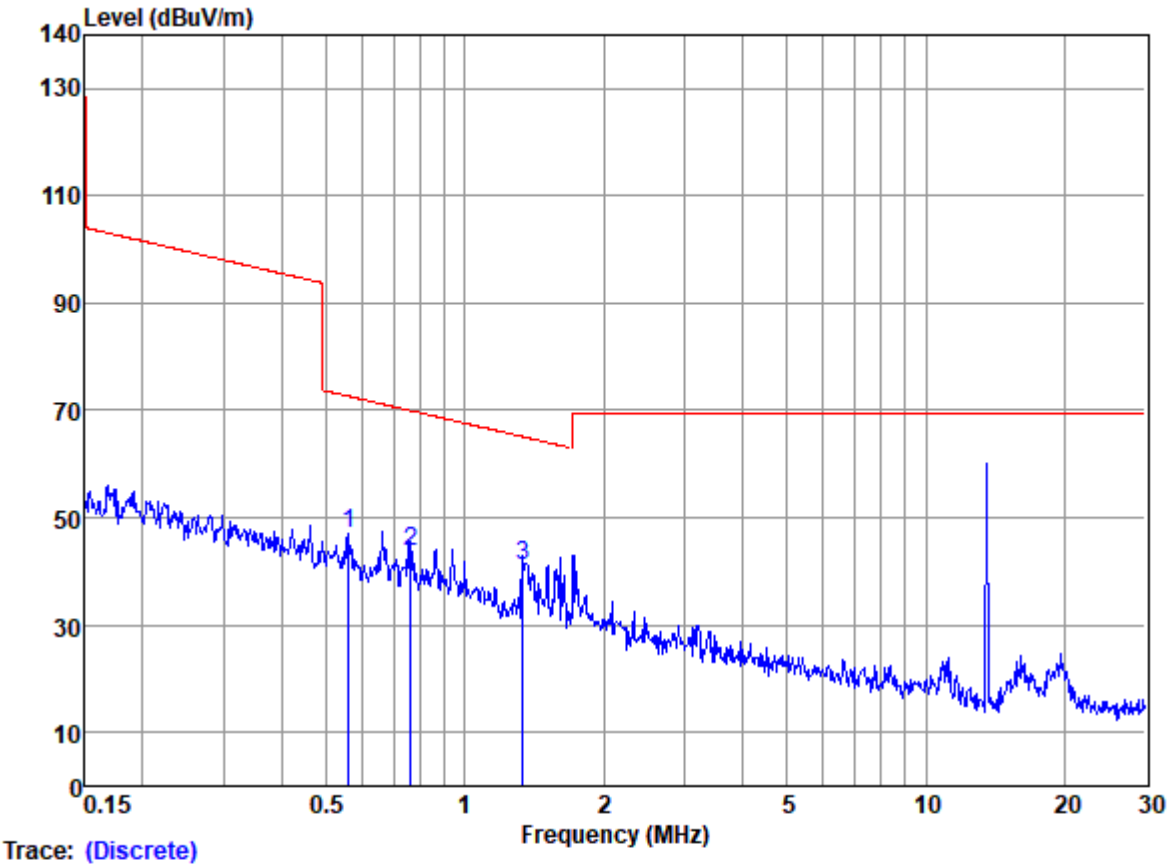
Test Mode: 09




Site : SGS
Job :
Model :
Power :
Test Mode :

| | Freq | Read Level | Anterna Factor | Cable Loss | Preamp Factor | Measured Level | Limit Line | Over Limit | Pol/ Phase | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB/m | dB | dB | dBuV/m | dBuV/m | dBuV | | |
| 1 | 0.56 | 65.82 | 10.67 | 0.09 | 29.42 | 47.16 | 72.62 | -25.46 | HORIZONTAL | QP |
| 2 | 0.76 | 62.44 | 10.49 | 0.12 | 29.41 | 43.64 | 69.95 | -26.31 | HORIZONTAL | QP |
| 3 | 1.34 | 59.59 | 10.60 | 0.15 | 29.40 | 40.94 | 65.08 | -24.14 | HORIZONTAL | QP |

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| Frequency (MHz) | Level @ 3m (dBuV/m) | Limit @ 300m (dBuV/m) | Limit @ 30m (dBuV/m) | Factor (dB) | Level @ 300m (dBuV/m) | Level @ 30m (dBuV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|
| 0.04499 | 54.91 | 34.54 | - | 80.00 | -25.09 | - | -59.63 |
| 0.08100 | 48.74 | 29.43 | - | 80.00 | -31.26 | - | -60.69 |
| 0.11710 | 52.15 | 26.23 | - | 80.00 | -27.85 | - | -54.08 |
| 0.56111 | 47.16 | - | 32.62 | 40.00 | - | 7.16 | -25.46 |
| 0.76297 | 43.64 | - | 29.95 | 40.00 | - | 3.64 | -26.31 |
| 1.33800 | 40.94 | - | 25.08 | 40.00 | - | 0.94 | -24.14 |

Remark:

1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level =Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor

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# 8 Test Setup Photo

Refer to Appendix - Test Setup Photo for GZCR2109021038AT

# 9 EUT Constructional Details (EUT Photos)

Refer to Appendix - external and internal photos for GZCR2109021038AT

- End of the Report -

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