**SGS-CSTC Standards Technical Services Co., Ltd.**
**Shenzhen Branch**

No. 1 Workshop, M-10, Middle section, Science & Technology Park,
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# TEST REPORT

| | |
|---|---|
| **Application No.**: | SZEM1804003451CR |
| **Applicant:** | BRAGI GMBH |
| **Address of Applicant:** | Sendlinger Strasse 7 / Angerblock 2. OG, 80331 München, Germany |
| **Manufacturer:** | BRAGI GMBH |
| **Address of Manufacturer:** | Sendlinger Strasse 7 / Angerblock 2. OG, 80331 München, Germany |
| **Factory:** | VTech (Dongguan) Communications Ltd. |
| **Address of Factory:** | Xia Ling Bei Management Zone, Liaobu Town, Dongguan City, Guangdong Province, China |
| **Equipment Under Test (EUT):** | |
| **EUT Name:** | Bragi Ears |
| **Model No.:** | BE1000, BE1001, BE1002, BE1003, BE1004, BE1005, BE1006, BE1007, BE1008, BE1009 ♣ |
| ♣ | Please refer to section 2 of this report which indicates which model was actually tested and which were electrically identical. |
| **Trade mark:** | BRAGI |
| **FCC ID:** | 2AF5T-BE1000L |
| **Standard(s) :** | 47 CFR Part 15, Subpart C 15.209 |
| **Date of Receipt:** | 2017-09-22(for original report SZEM170901015302) |
| **Date of Test:** | 2017-09-25 to 2017-09-26(for original report SZEM170901015302) |
| **Date of Issue:** | 2017-09-30(for original report SZEM170901015302)<br>2018-05-03(for new report SZEM180400345102) |
| **Test Result:** | **Pass*** |

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

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Keny Xu
EMC Laboratory Manager

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.
If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or testing done by SGS International Electrical Approvals in connection with, distribution or use of the product described in this report must be approved by SGS International Electrical Approvals in writing.

| Revision Record | | | | |
|---|---|---|---|---|
| **Version** | **Chapter** | **Date** | **Modifier** | **Remark** |
| 01 | | 2018-05-03 | | Original |
| | | | | |
| | | | | |

| | | | | |
|---|---|---|---|---|
| **Authorized for issue by:** | | | | |
| | |  | | |
| | | **Hank Yan /Project Engineer** | | |
| | |  | | |
| | | **Eric Fu /Reviewer** | | |

# 2 Test Summary

| Radio Spectrum Technical Requirement | | | | |
|---|---|---|---|---|
| **Item** | **Standard** | **Method** | **Requirement** | **Result** |
| Antenna Requirement | 47 CFR Part 15, Subpart C 15.209 | N/A | 47 CFR Part 15, Subpart C 15.203 | Pass |

| Radio Spectrum Matter Part | | | | |
|---|---|---|---|---|
| **Item** | **Standard** | **Method** | **Requirement** | **Result** |
| Conducted Emissions at AC Power Line (150kHz-30MHz) | 47 CFR Part 15, Subpart C 15.209 | ANSI C63.10 (2013) Section 6.2 | 47 CFR Part 15, Subpart C 15.207 | N/A |
| 20dB Bandwidth | 47 CFR Part 15, Subpart C 15.209 | ANSI C63.10 (2013) Section 6.9 | 47 CFR Part 15, Subpart C 15.215 | Pass |
| Radiated Emissions (9kHz-30MHz) | 47 CFR Part 15, Subpart C 15.209 | ANSI C63.10 (2013) Section 6.4&6.5 | 47 CFR Part 15, Subpart C 15.209 | Pass |
| Radiated Emissions (30MHz-1GHz) | 47 CFR Part 15, Subpart C 15.209 | ANSI C63.10 (2013) Section 6.4&6.5 | 47 CFR Part 15, Subpart C 15.209 | Pass |

**Remark:**

Original model No. in report SZEM170901015302: B1002-01L

The model B1002-01L was only tested in report SZEM170901015302.

New model No. in report SZEM180400345102: BE1000, BE1001, BE1002, BE1003, BE1004, BE1005, BE1006, BE1007, BE1008, BE1009

This report was an additional report copied from the report SZEM170901015302, just changed the information of product description and model No.. Since the electrical circuit design, layout, components used and internal wiring for the models in this report were exactly the same as the model in the original report SZEM170901015302, only the different on firmware especially user interface.

Therefore, original data were kept in this report.

# 3 Contents

# 4 General Information

## 4.1 Details of E.U.T.

Power supply: Left headphone: DC 3.7V, 120mAh rechargeable battery;
Which both charged by the docking(Charged from Adapter via USB cable)

Cable: USB charging line: 18.5cm, shielded

## 4.2 Description of Support Units

| Description | Manufacturer | Model No. | Serial No. |
|---|---|---|---|
| Laptop | Lenovo | T430u | REF. No.SEA1800 |
| Adapter | Apple | A1357 W010A051 | REF. No.SEA0500 |
| Router | NETGEAR | DGN2200 | REF. No.SEA2200 |
| Mouse | Lenovo | M-U0025-O | REF. No.:SEA2400 |

## 4.3 Measurement Uncertainty

| No. | Item | Measurement Uncertainty |
|---|---|---|
| 1 | Radio Frequency | $7.25 \times 10^{-8}$ |
| 2 | Duty cycle | 0.37% |
| 3 | Occupied Bandwidth | 3% |
| 4 | RF conducted power | 0.75dB |
| 5 | RF power density | 2.84dB |
| 6 | Conducted Spurious emissions | 0.75dB |
| 7 | RF Radiated power | 4.5dB (below 1GHz) |
| | | 4.8dB (above 1GHz) |
| 8 | Radiated Spurious emission test | 4.5dB (30MHz-1GHz) |
| | | 4.8dB (1GHz-18GHz) |
| 9 | Temperature test | 1℃ |
| 10 | Humidity test | 3% |
| 11 | Supply voltages | 1.5% |
| 12 | Time | 3% |

## 4.4 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen Branch

No. 1 Workshop, M-10, Middle Section, Science & Technology Park, Shenzhen, Guangdong, China. 518057.

Tel: +86 755 2601 2053 Fax: +86 755 2671 0594

No tests were sub-contracted.

## 4.5 Test Facility

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

**• CNAS (No. CNAS L2929)**

CNAS has accredited SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

**• A2LA (Certificate No. 3816.01)**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

**• VCCI**

The 3m Fully-anechoic chamber for above 1GHz, 10m Semi-anechoic chamber for below 1GHz, Shielded Room for Mains Port Conducted Interference Measurement and Telecommunication Port Conducted Interference Measurement of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-20026, R-14188, C-12383 and T-11153 respectively.

**• FCC –Designation Number: CN1178**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized as an accredited testing laboratory.

Designation Number: CN1178. Test Firm Registration Number: 406779.

**• Industry Canada (IC)**

Two 3m Semi-anechoic chambers and the 10m Semi-anechoic chamber of SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab have been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 4620C-1, 4620C-2, 4620C-3.

## 4.6 Deviation from Standards

None

## 4.7 Abnormalities from Standard Conditions

None

# 5 Equipment List

| Radiated Emissions (9kHz-30MHz) | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model No** | **Inventory No** | **Cal Date** | **Cal Due Date** |
| 10m Semi-Anechoic Chamber | SAEMC | FSAC1018 | SEM001-03 | 2017-05-10 | 2018-05-10 |
| Measurement Software | AUDIX | e3 V8.2014-6-27 | N/A | N/A | N/A |
| EMI Test Receiver (9kHz-3GHz) | Rohde & Schwarz | ESCI | SEM004-01 | 2017-04-14 | 2018-04-13 |
| Trilog-Broadband Antenna (30MHz-1GHz) | Schwarzbeck | VULB9168 | SEM003-17 | 2016-01-26 | 2019-01-26 |
| Pre-amplifier | Sonoma Instrument Co | 310N | SEM005-03 | 2017-06-05 | 2018-06-04 |
| Active Loop Antenna | ETS-Lindgren | 6502 | SEM003-08 | 2017-08-22 | 2020-08-21 |

| Radiated Emissions (30MHz-1GHz) | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model No** | **Inventory No** | **Cal Date** | **Cal Due Date** |
| 3m Semi-Anechoic Chamber | ETS-LINDGREN | N/A | SEM001-01 | 2017-08-05 | 2020-08-04 |
| Measurement Software | AUDIX | e3 V8.2014-6-27 | N/A | N/A | N/A |
| EMI Test Receiver | Agilent Technologies | N9038A | SEM004-05 | 2016-10-09 | 2017-10-09 |
| BiConiLog Antenna (26-3000MHz) | ETS-LINDGREN | 3142C | SEM003-01 | 2014-11-01 | 2017-11-01 |
| Double-ridged horn (1-18GHz) | ETS-LINDGREN | 3117 | SEM003-11 | 2015-10-17 | 2018-10-17 |
| Horn Antenna (18-26GHz) | ETS-LINDGREN | 3160 | SEM003-12 | 2014-11-24 | 2017-11-24 |

| General used equipment | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model No** | **Inventory No** | **Cal Date** | **Cal Due Date** |
| Humidity/ Temperature Indicator | Shanghai Meteorological Industry Factory | ZJ1-2B | SEM002-03 | 2016-10-12 | 2017-10-12 |
| Humidity/ Temperature Indicator | Shanghai Meteorological Industry Factory | ZJ1-2B | SEM002-04 | 2016-10-12 | 2017-10-12 |
| Humidity/ Temperature Indicator | Mingle | N/A | SEM002-08 | 2016-10-12 | 2017-10-12 |
| Barometer | Changchun Meteorological Industry Factory | DYM3 | SEM002-01 | 2017-04-18 | 2018-04-18 |

# 6 Radio Spectrum Technical Requirement

## 6.1 Antenna Requirement

### 6.1.1 Test Requirement:

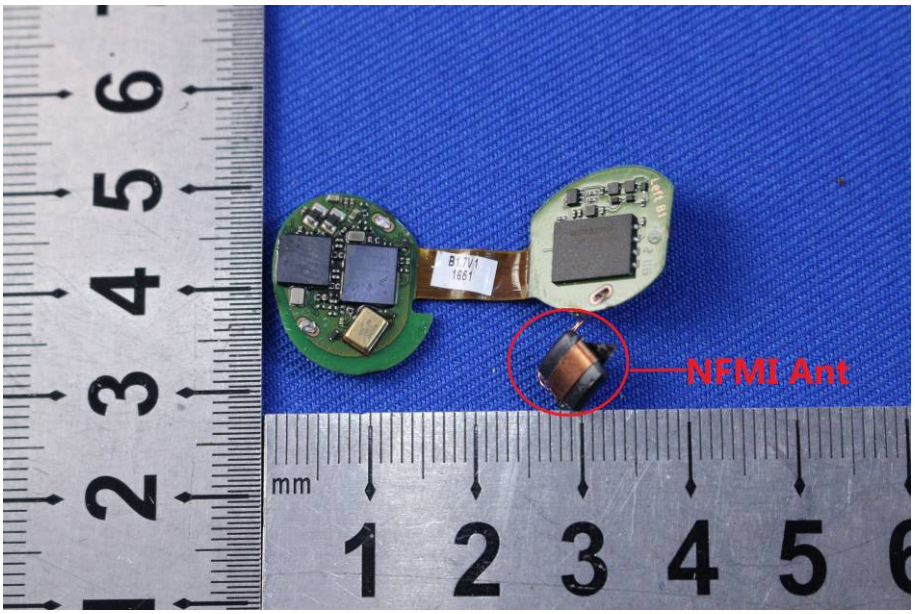
47 CFR Part 15, Subpart C 15.203

### 6.1.2 Conclusion

Standard Requirment:

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 antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit permanently attached antenna or of an 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. The best-case gain of the antenna is 0dBi.

# 7 Radio Spectrum Matter Test Results

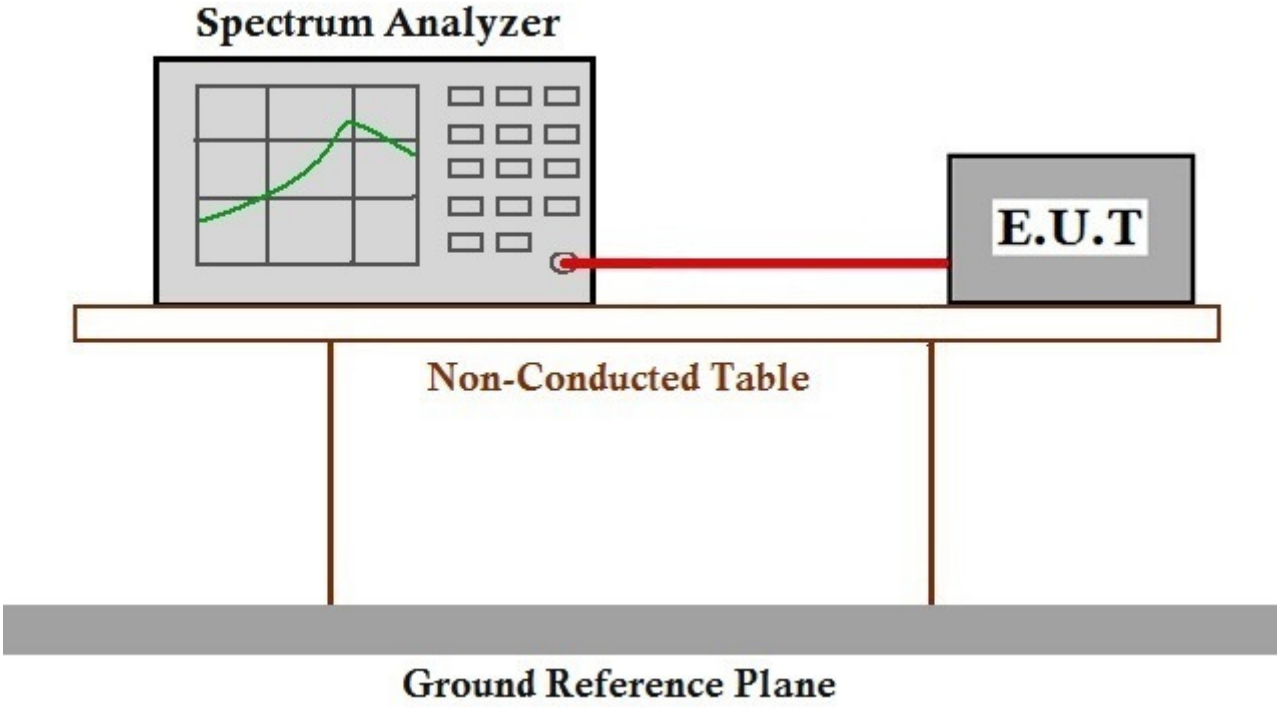
## 7.1 20dB Bandwidth

Test Requirement 47 CFR Part 15, Subpart C 15.215
Test Method: ANSI C63.10 (2013) Section 6.9

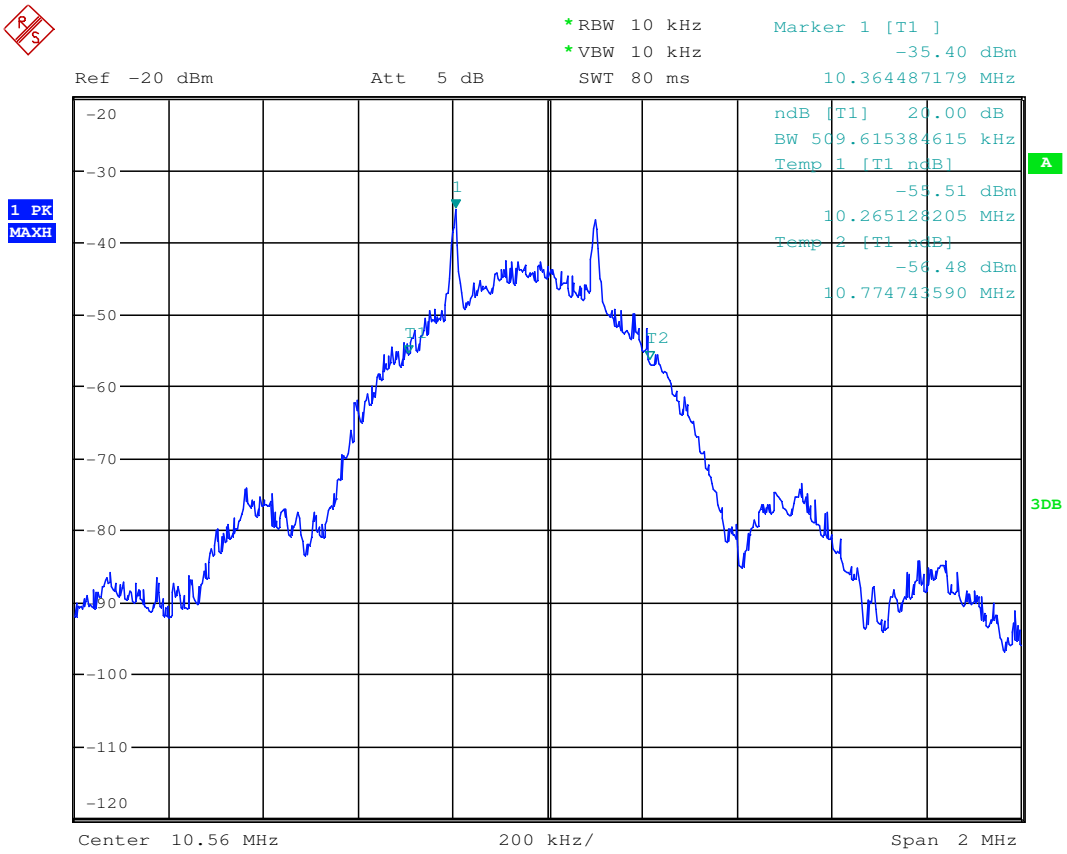
### 7.1.1 E.U.T. Operation

Operating Environment:
Temperature: 24 °C Humidity: 54 % RH Atmospheric Pressure: 1010 mbar
Test mode c:TX mode_Keep the EUT in transmitting with modulation mode.

### 7.1.2 Test Setup Diagram




### 7.1.3 Measurement Procedure and Data



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

Test Requirement 47 CFR Part 15, Subpart C 15.209
Test Method: ANSI C63.10 (2013) Section 6.4&6.5
Measurement Distance: 10m
Limit:

| Frequency(MHz) | Field strength(microvolts/meter) | Measurement distance(meters) |
|---|---|---|
| 0.009-0.490 | 2400/F(kHz) | 300 |
| 0.490-1.705 | 24000/F(kHz) | 30 |
| 1.705-30.0 | 30 | 30 |
| 30-88 | 100 | 3 |
| 88-216 | 150 | 3 |
| 216-960 | 200 | 3 |
| Above 960 | 500 | 3 |
| Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, 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. | | |

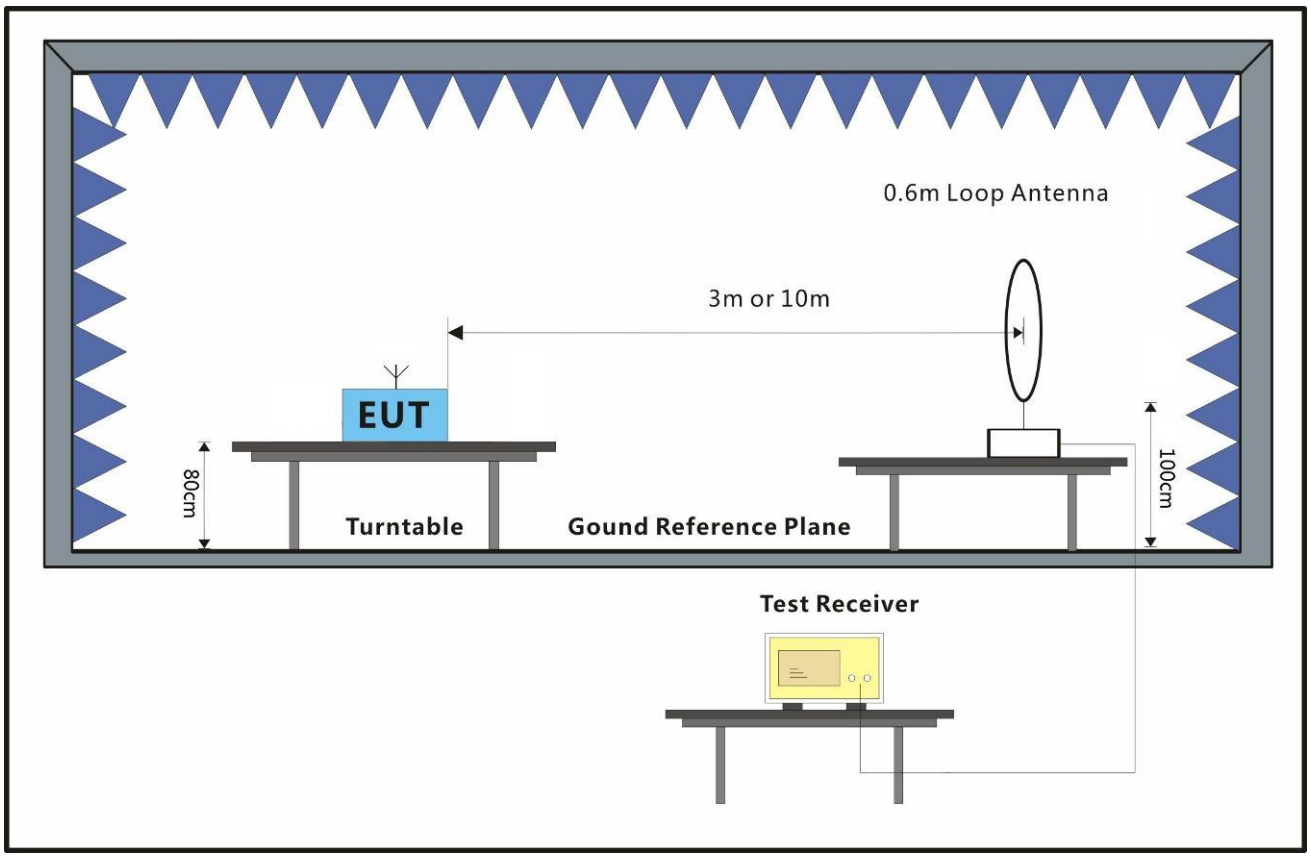
### 7.2.1 E.U.T. Operation

Operating Environment:

Temperature: 24 °C Humidity: 54 % RH Atmospheric Pressure: 1010 mbar

Test mode c:TX mode_Keep the EUT in transmitting with modulation mode.

### 7.2.2 Test Setup Diagram




### 7.2.3 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 position of vertical was shown in the report.

**Emission of fundamental**

| Frequency (MHz) | Cable Loss (dB) | Antenna Factor (dB/m) | Read Level (dBuV) | Level @10m (dBuV/m) | Level @30m (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) |
|---|---|---|---|---|---|---|---|
| 10.364 | 0.51 | 10.65 | 11.95 | 23.11 | 4.03 | 29.55 | -25.52 |

**Spurious Emission:**

| Frequency (MHz) | Cable Loss (dB) | Antenna Factor (dB/m) | Read Level (dBuV) | Level @10m (dBuV/m) | Level @30m (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) |
|---|---|---|---|---|---|---|---|
| 0.16 | 0.07 | 11.73 | 12.52 | 24.32 | 14.78 | 43.52 | -28.74 |
| 0.51 | 0.11 | 11.71 | 15.7 | 27.52 | 17.98 | 33.45 | -15.47 |
| 2.31 | 0.35 | 12.14 | 8.35 | 20.84 | 11.30 | 29.55 | -18.25 |
| 6.52 | 0.45 | 11.44 | 8.57 | 20.46 | 10.92 | 29.55 | -18.63 |
| 12.38 | 0.55 | 10.54 | 7.6 | 18.69 | 9.15 | 29.55 | -20.40 |
| 19.74 | 0.67 | 9.54 | 10.47 | 20.68 | 11.14 | 29.55 | -18.41 |

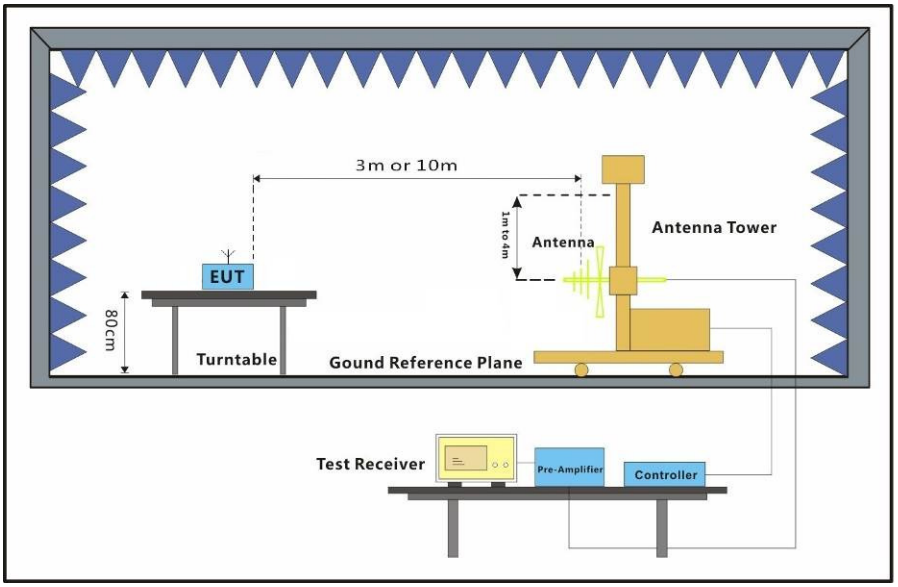
## 7.3 Radiated Emissions (30MHz-1GHz)

Test Requirement 47 CFR Part 15, Subpart C 15.209
Test Method: ANSI C63.10 (2013) Section 6.4&6.5
Measurement Distance: 3m

### 7.3.1 E.U.T. Operation

Operating Environment:
Temperature: 25 °C Humidity: 55 % RH Atmospheric Pressure: 1010 mbar
Test mode c:TX mode_Keep the EUT in transmitting with modulation mode.

### 7.3.2 Test Setup Diagram



**7.3.3 Measurement Procedure and Data**

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

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

c. 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.

d. 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.

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

f. 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.

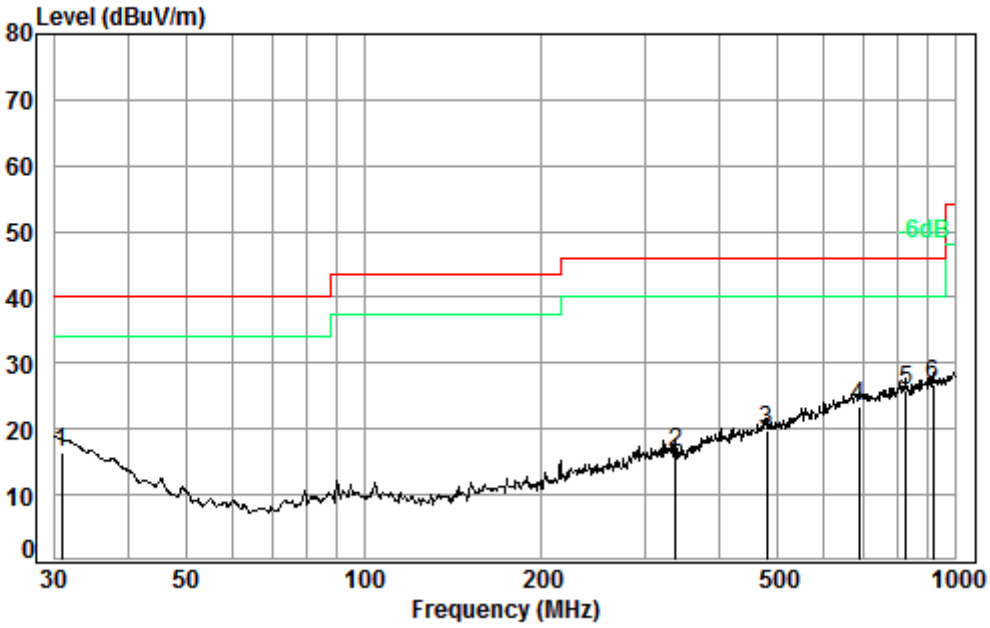
g. Test the EUT in the lowest channel,the middle channel,the Highest channel

h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode,And found the X axis positioning which it is worse case.

i. Repeat above procedures until all frequencies measured was complete.

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

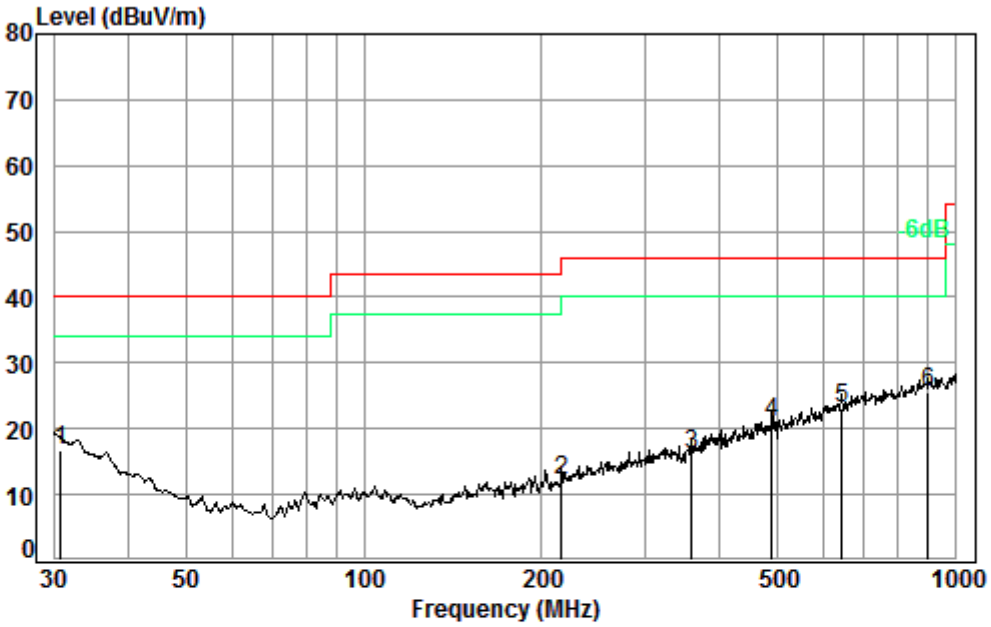
Mode: c; Polarization: Horizontal;




Condition: 3m HORIZONTAL
Job No. : 10153CR
Test mode: c

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit |
|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB |
| 1 | 30.85 | 0.60 | 18.22 | 27.35 | 24.97 | 16.44 | 40.00 | -23.56 |
| 2 | 337.22 | 2.02 | 14.36 | 26.68 | 26.63 | 16.33 | 46.00 | -29.67 |
| 3 | 478.85 | 2.52 | 17.80 | 27.60 | 26.96 | 19.68 | 46.00 | -26.32 |
| 4 | 687.15 | 2.88 | 21.50 | 27.43 | 26.52 | 23.47 | 46.00 | -22.53 |
| 5 | 824.60 | 3.31 | 22.40 | 27.16 | 27.18 | 25.73 | 46.00 | -20.27 |
| 6 pp | 916.07 | 3.62 | 23.26 | 26.71 | 26.51 | 26.68 | 46.00 | -19.32 |

Mode :c; Polarization: Vertical




Condition: 3m VERTICAL
Job No. : 10153CR
Test mode: c

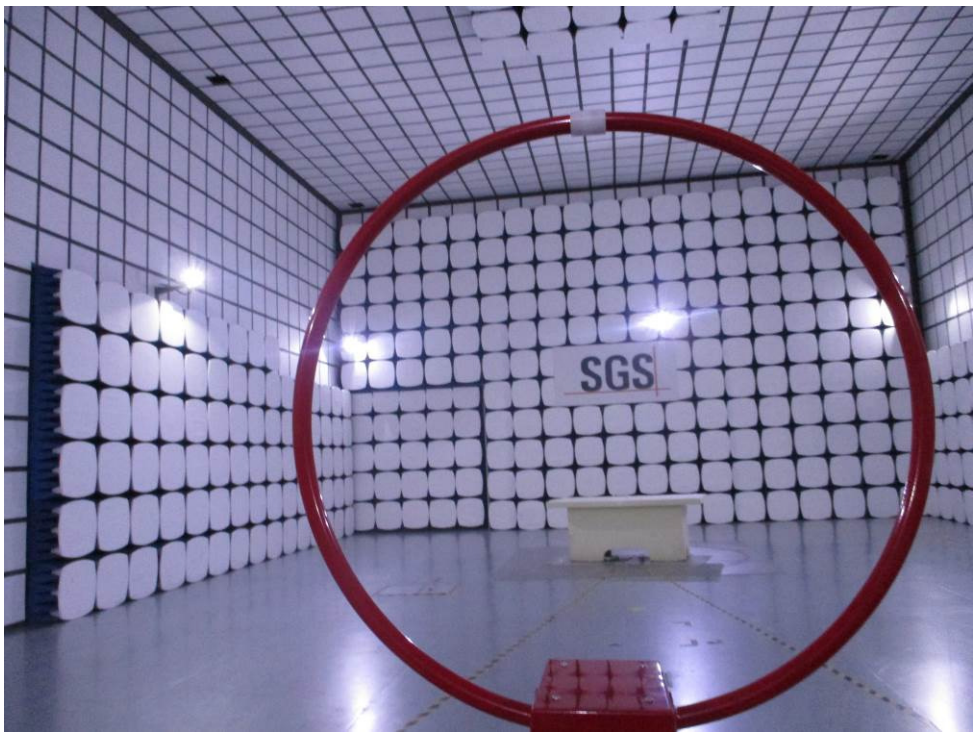
| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit |
|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB |
| 1 | 30.75 | 0.60 | 18.28 | 27.35 | 25.08 | 16.61 | 40.00 | -23.39 |
| 2 | 216.02 | 1.49 | 11.03 | 26.64 | 26.15 | 12.03 | 46.00 | -33.97 |
| 3 | 357.93 | 2.08 | 14.57 | 26.85 | 26.32 | 16.12 | 46.00 | -29.88 |
| 4 | 489.03 | 2.56 | 17.80 | 27.66 | 28.18 | 20.88 | 46.00 | -25.12 |
| 5 | 642.86 | 2.79 | 20.57 | 27.49 | 27.25 | 23.12 | 46.00 | -22.88 |
| 6 pp | 900.15 | 3.60 | 23.20 | 26.78 | 25.57 | 25.59 | 46.00 | -20.41 |

Remark:

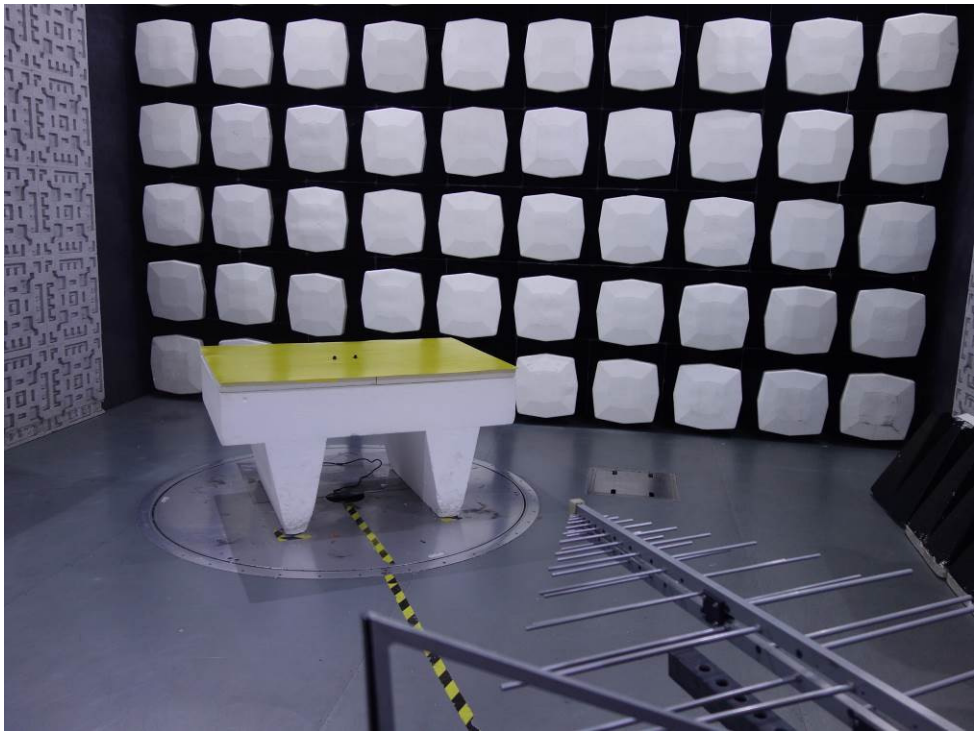
1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:
Final Test Level =Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor

# 8 Photographs

## 8.1 Radiated Emissions (9kHz-30MHz) Test Setup




## 8.2 Radiated Emissions (30MHz-1GHz) Test Setup



## 8.3 EUT Constructional Details

Refer to Appendix A - Photographs of EUT Constructional Details for SZEM1804003451CR.