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Report No.: SZEM180400345102  
Page: 1 of 20

## **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)  
2018-05-03(for new report SZEM180400345102)

<b>Test Result:</b>	<b>Pass*</b>
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\* In the configuration tested, the EUT complied with the standards specified above.



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.

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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

	Page
1 COVER PAGE .....	1
2 TEST SUMMARY .....	3
3 CONTENTS .....	4
4 GENERAL INFORMATION.....	5
4.1 DETAILS OF E.U.T. ....	5
4.2 DESCRIPTION OF SUPPORT UNITS .....	5
4.3 MEASUREMENT UNCERTAINTY .....	5
4.4 TEST LOCATION .....	6
4.5 TEST FACILITY .....	6
4.6 DEVIATION FROM STANDARDS.....	6
4.7 ABNORMALITIES FROM STANDARD CONDITIONS .....	6
5 EQUIPMENT LIST .....	7
6 RADIO SPECTRUM TECHNICAL REQUIREMENT.....	9
6.1 ANTENNA REQUIREMENT .....	9
6.1.1 Test Requirement: .....	9
6.1.2 Conclusion .....	9
7 RADIO SPECTRUM MATTER TEST RESULTS .....	10
7.1 20dB BANDWIDTH.....	10
7.1.1 E.U.T. Operation.....	10
7.1.2 Test Setup Diagram.....	10
7.1.3 Measurement Procedure and Data.....	10
7.2 RADIATED EMISSIONS (9KHz-30MHz) .....	12
7.2.1 E.U.T. Operation.....	13
7.2.2 Test Setup Diagram.....	13
7.2.3 Measurement Procedure and Data.....	13
7.3 RADIATED EMISSIONS (30MHz-1GHz) .....	15
7.3.1 E.U.T. Operation.....	15
7.3.2 Test Setup Diagram.....	15
7.3.3 Measurement Procedure and Data.....	16
8 PHOTOGRAPHS .....	19
8.1 RADIATED EMISSIONS (9KHz-30MHz) TEST SETUP .....	19
8.2 RADIATED EMISSIONS (30MHz-1GHz) TEST SETUP .....	19
8.3 EUT CONSTRUCTIONAL DETAILS .....	20



## 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 °C
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:

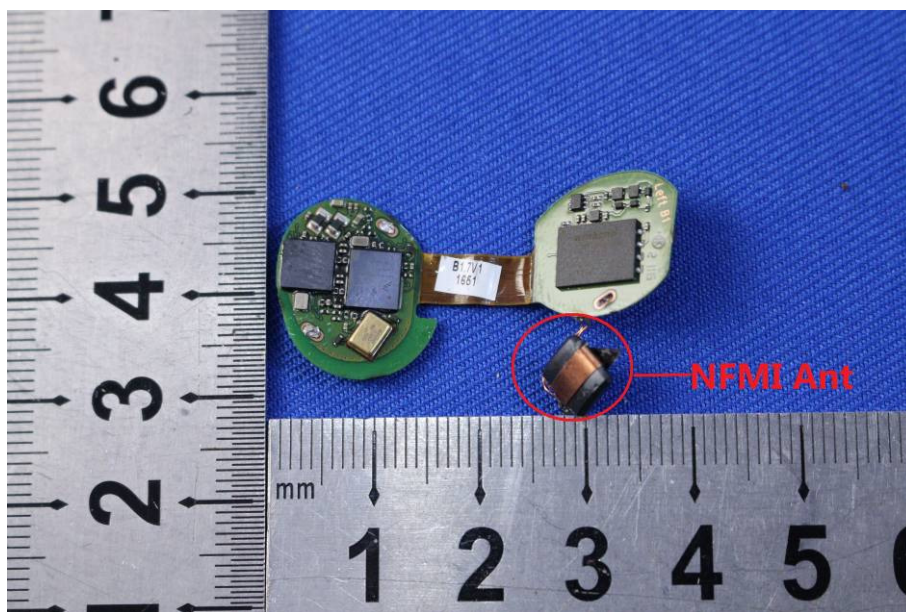
47 CFR Part 15, Subpart C 15.203

#### 6.1.2 Conclusion

Standard 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 an 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

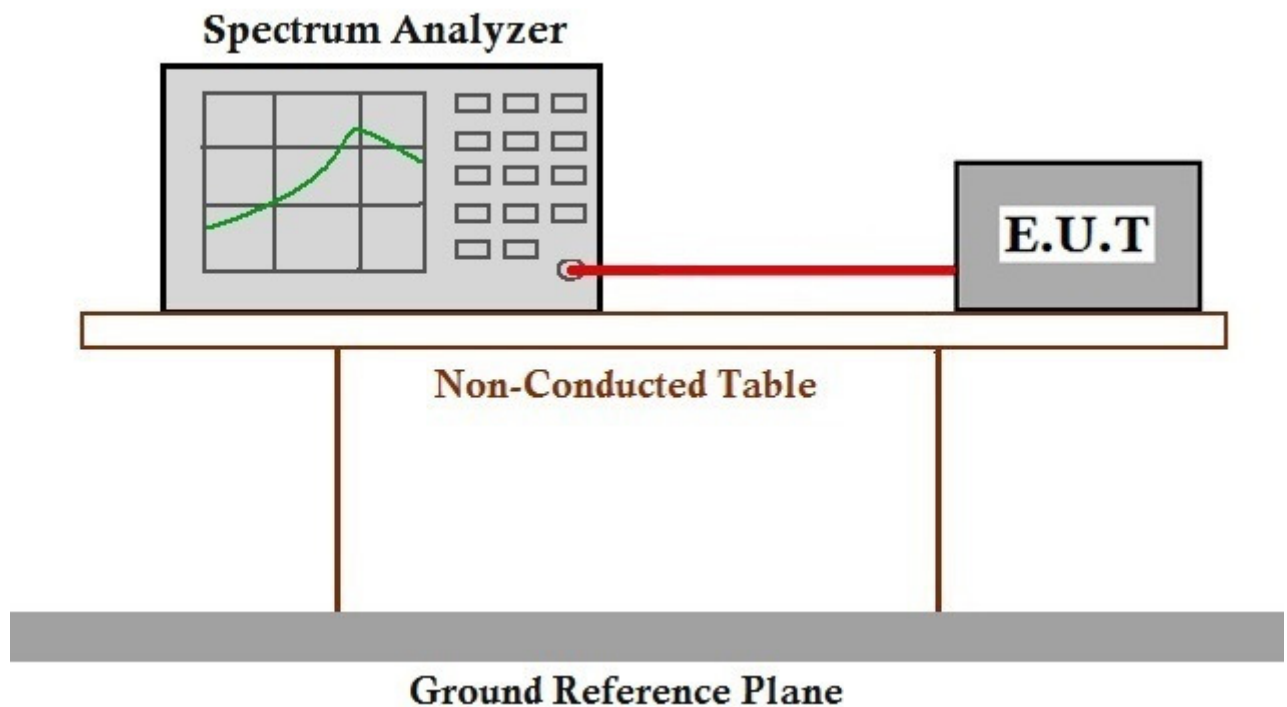
#### 7.1.1 E.U.T. Operation

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



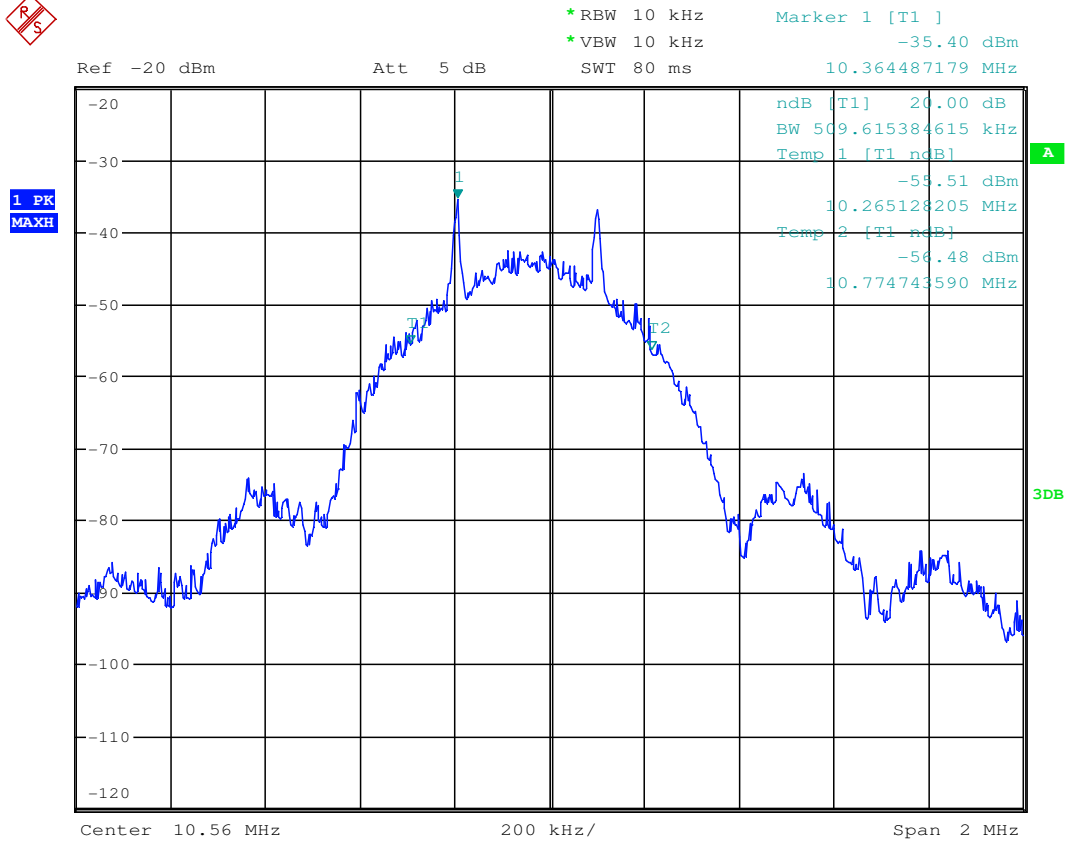
#### 7.1.3 Measurement Procedure and Data



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

Report No.: SZEM180400345102

Page: 11 of 20





## 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.

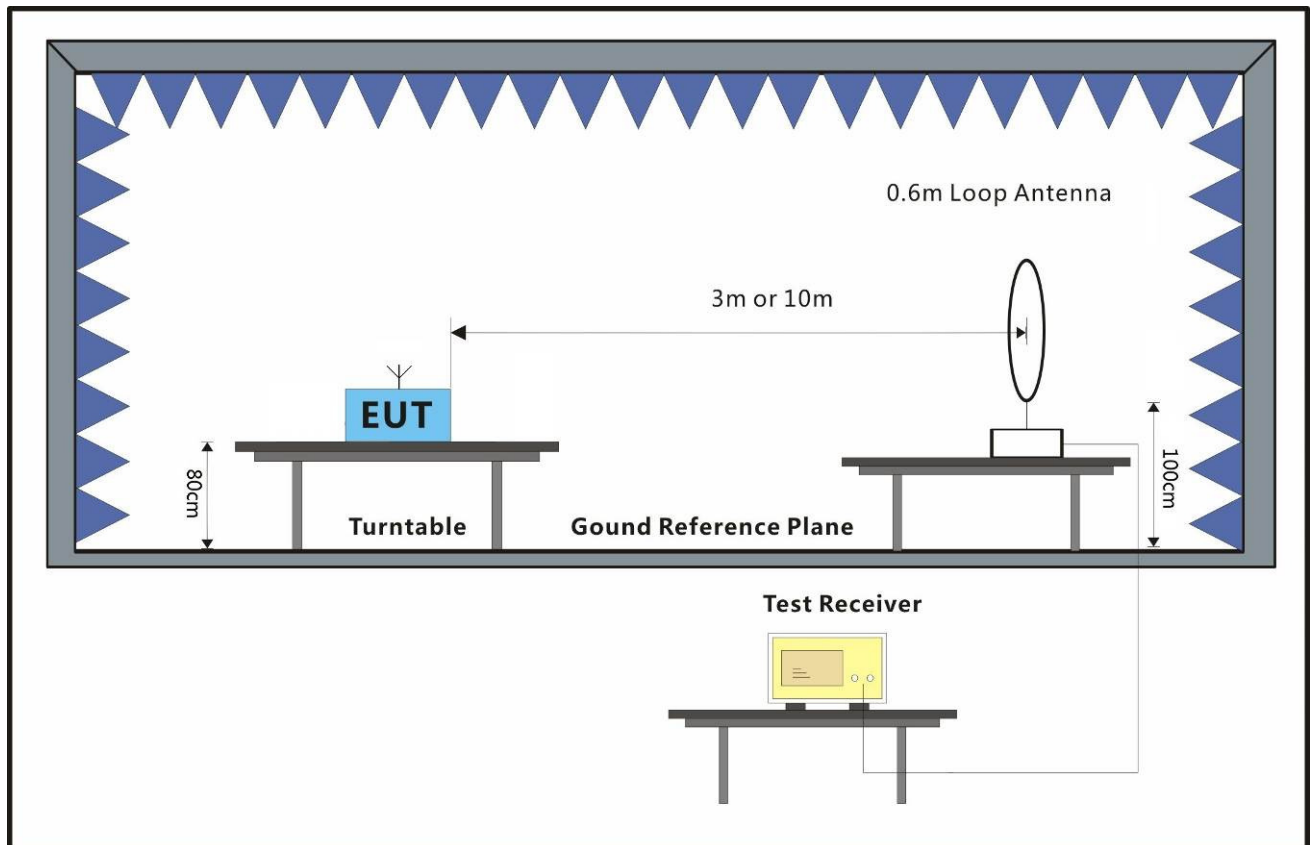
### 7.2.1 E.U.T. Operation

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.



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

Report No.: SZEM180400345102

Page: 14 of 20

**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

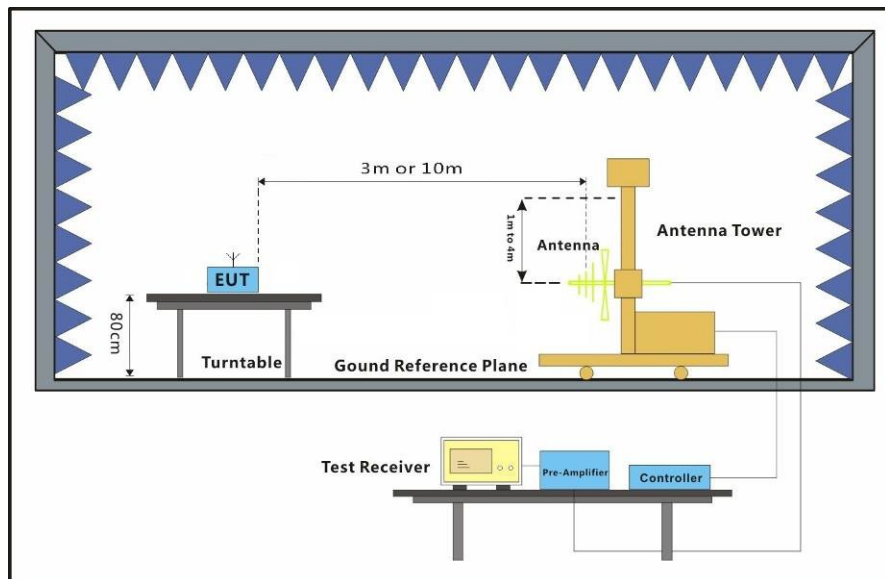
#### 7.3.1 E.U.T. Operation

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**

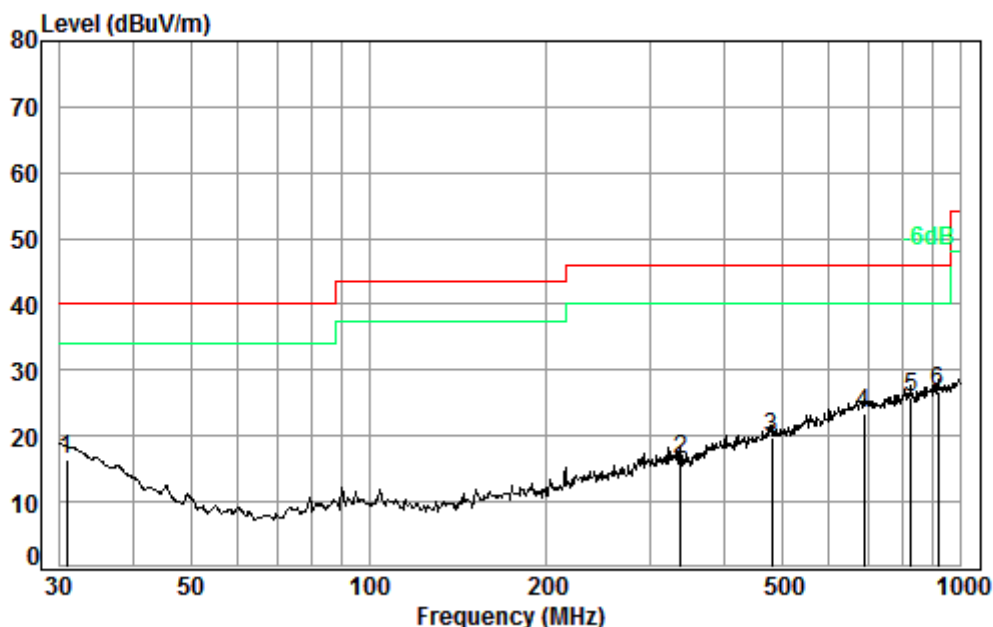
- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground for below 1GHz at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which 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;



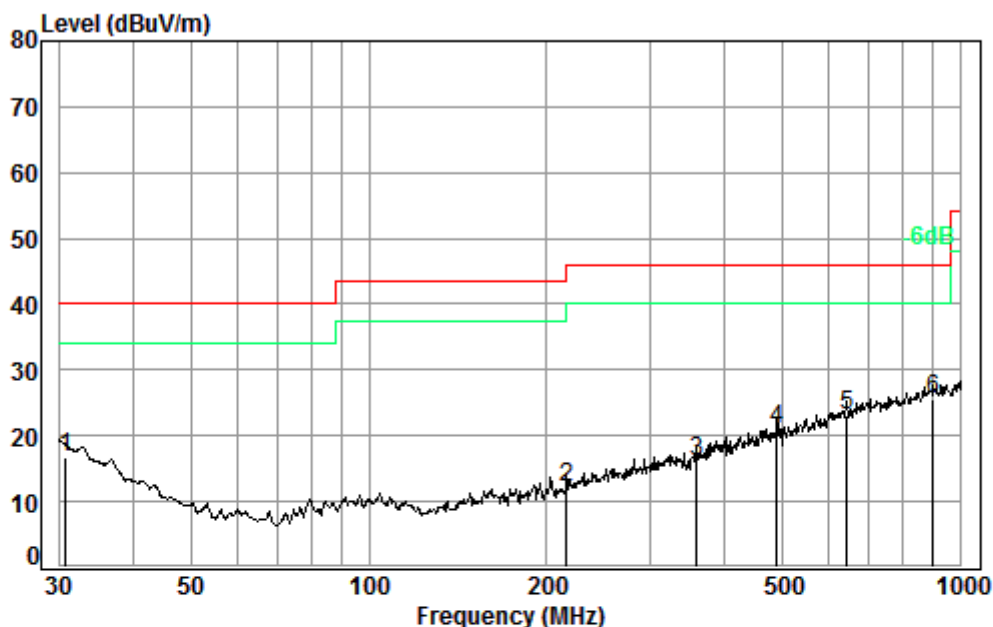
Condition: 3m HORIZONTAL

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	Limit 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

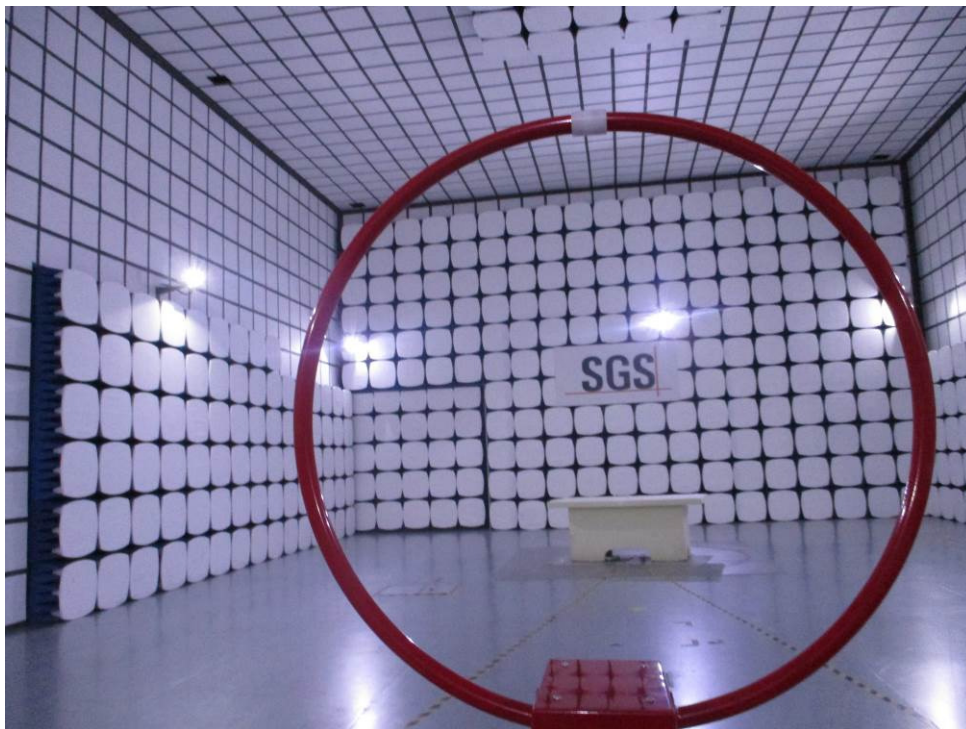
Remark:

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

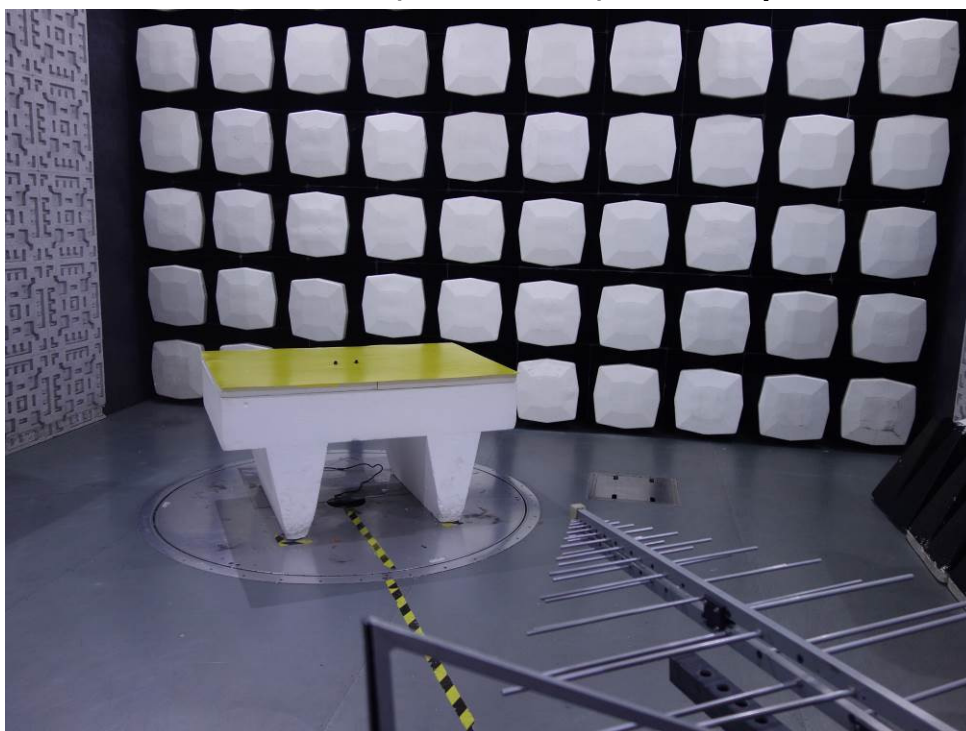
Final Test Level =Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor

## 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.