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Report No.: SZEM180400345106
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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-BE1000R
Standards: 47 CFR Part 15, Subpart C 15.209
Date of Receipt: 2017-02-13(for original report SZEM170200080203)
Date of Test: 2017-02-14 to 2017-03-17(for original report SZEM170200080203)
Date of Issue: 2017-04-20(for original report SZEM170200080203)
2018-05-03(for new report SZEM180400345106)

Test Result :	Pass*
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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:				
				
		<hr/> Hank Yan /Project Engineer		
				
		<hr/> 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 Disturbance 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
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
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

Remark:

Original model No. in report SZEM170200080203: B1002-01R

The model B1002-01R was only tested in report SZEM170200080203.

New model No. in report SZEM180400345106: BE1000, BE1001, BE1002, BE1003, BE1004, BE1005, BE1006, BE1007, BE1008, BE1009

This report was an additional report copied from the report SZEM170200080203, 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 SZEM170200080203, only the different on firmware especially user interface.

Therefore original data were kept in this report.



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4 General Information

4.1 Details of E.U.T.

Operation Frequency:	10.54MHz
Antenna Type:	Loop Antenna
Power Supply:	Right headphone: DC 3.7V, 100mAh rechargeable battery Charged by the docking(Charged from Adapter via USB cable)
Cable:	USB charging line: 18.5cm, shielded

4.2 Description of Support Units

The EUT has been tested independently.



4.3 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	7.25×10^{-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

Conducted Disturbance at AC Power Line(150kHz-30MHz)					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Shielding Room	ZhongYu Electron	GB-88	SEM001-06	2016-05-13	2017-05-13
LISN	Rohde & Schwarz	ENV216	SEM007-01	2016-10-09	2017-10-09
LISN	ETS-LINDGREN	3816/2	SEM007-02	2016-04-25	2017-04-25
8 Line ISN	Fischer Custom Communications Inc.	FCC-TLISN-T8-02	EMC0120	2016-09-28	2017-09-28
4 Line ISN	Fischer Custom Communications Inc.	FCC-TLISN-T4-02	EMC0121	2016-09-28	2017-09-28
2 Line ISN	Fischer Custom	FCC-TLISN-T2-02	EMC0122	2016-09-28	2017-09-28

Radiated Emissions(9kHz-30MHz)					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
10m Semi-Anechoic Chamber	SAEMC	FSAC1018	SEM001-03	2016-05-13	2017-05-13
EMI Test Receiver (9k-3GHz)	Rohde & Schwarz	ESCI	SEM004-01	2016-04-25	2017-04-25
Trilog-Broadband Antenna(30M-1GHz)	Schwarzbeck	VULB9168	SEM003-17	2016-06-29	2019-06-29
Pre-amplifier	Sonoma Instrument Co	310N	SEM005-03	2016-04-25	2017-04-25
Active Loop Antenna	ETS-Lindgren	6502	SEM003-08	2015-08-14	2018-08-14

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	2016-05-13	2017-05-13
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



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20dB Bandwidth					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
DC Power Supply	ZhaoXin	RXN-305D	SEM011-02	2016-10-09	2017-10-09
Spectrum Analyzer	Rohde & Schwarz	FSP	SEM004-06	2016-10-09	2017-10-09
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2016-10-09	2017-10-09

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	2016-05-18	2017-05-18

6 Radio Spectrum Technical Requirement

6.1 Antenna Requirement

6.1.1 Test Requirement:

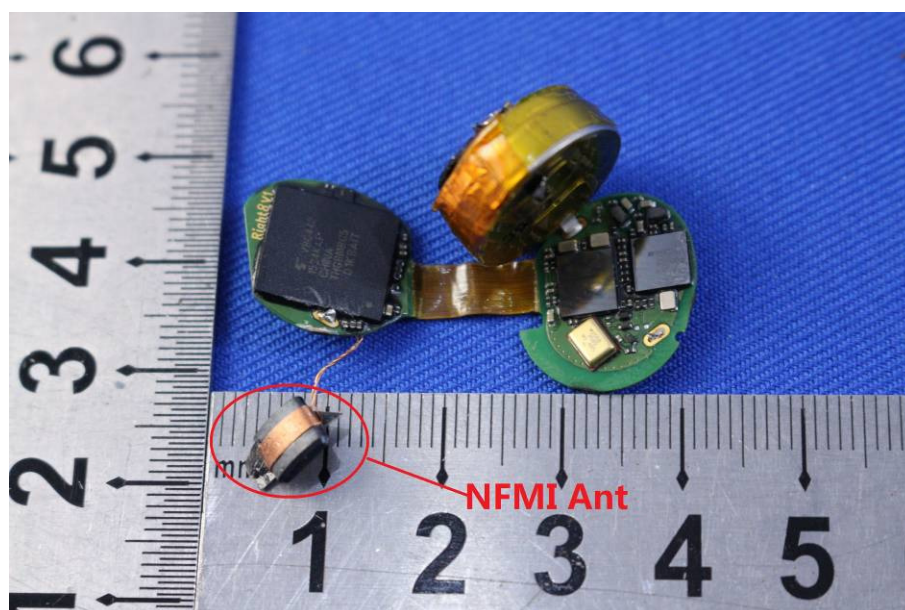
47 CFR Part 15, Subpart C 15.209

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 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.

7.1.1 E.U.T. Operation

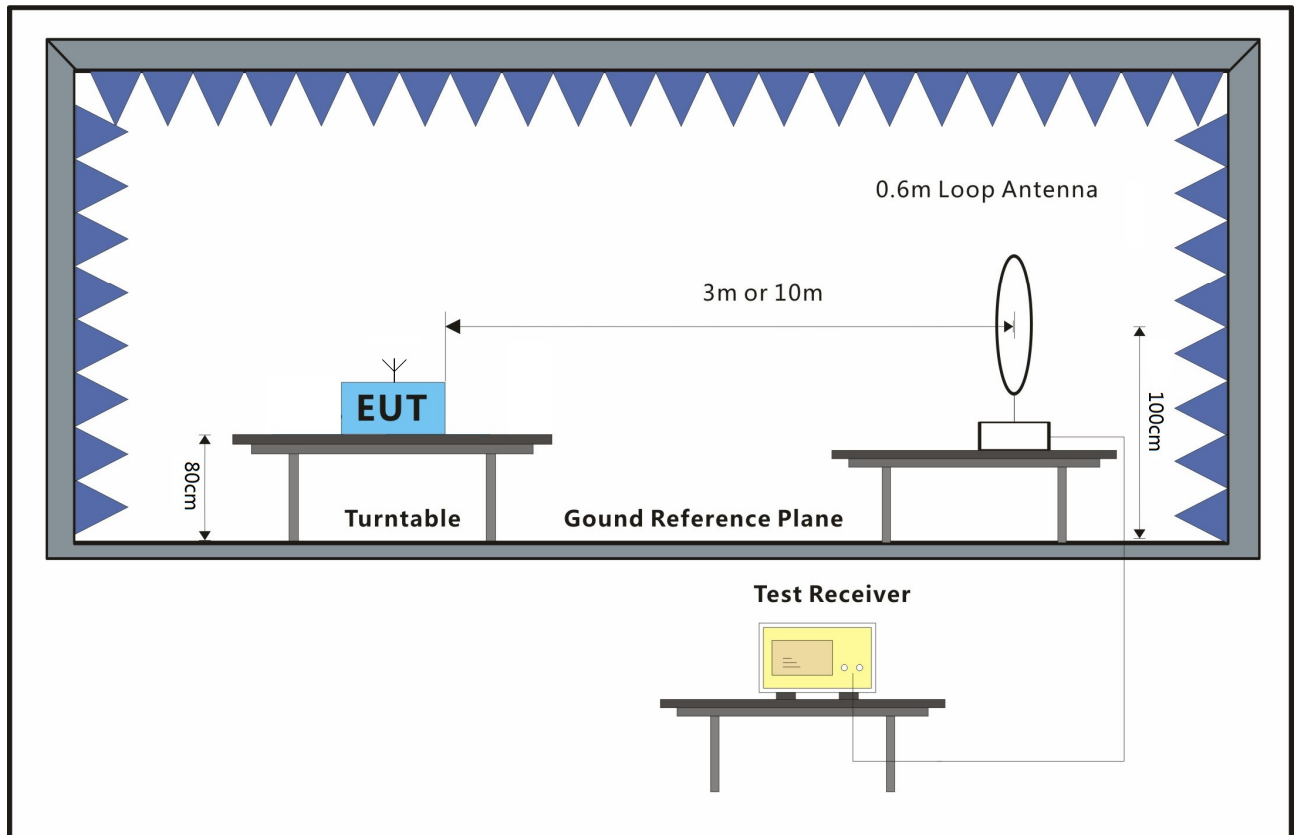
Operating Environment:

Temperature: 24 °C Humidity: 52 % RH

Atmospheric Pressure: 1015 mbar

Test mode Keep the EUT in transmitting mode.

7.1.2 Test Setup Diagram



7.1.3 Measurement 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.



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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)
10.682	0.51	10.65	14.66	25.82	6.74	29.55	-22.81

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)
0.53805	0.12	11.75	3.80	15.67	-3.41	33.38	-36.79
2.956	0.38	12.20	-10.93	1.65	-17.43	29.55	-46.98
5.433	0.43	11.76	-16.99	-4.80	-23.88	29.55	-53.43
13.403	0.57	10.48	-22.09	-11.04	-30.12	29.55	-59.67
21.433	0.69	9.28	-21.78	-11.81	-30.89	29.55	-60.44
29.702	0.78	7.85	-19.25	-10.62	-29.70	29.55	-59.25

7.2 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

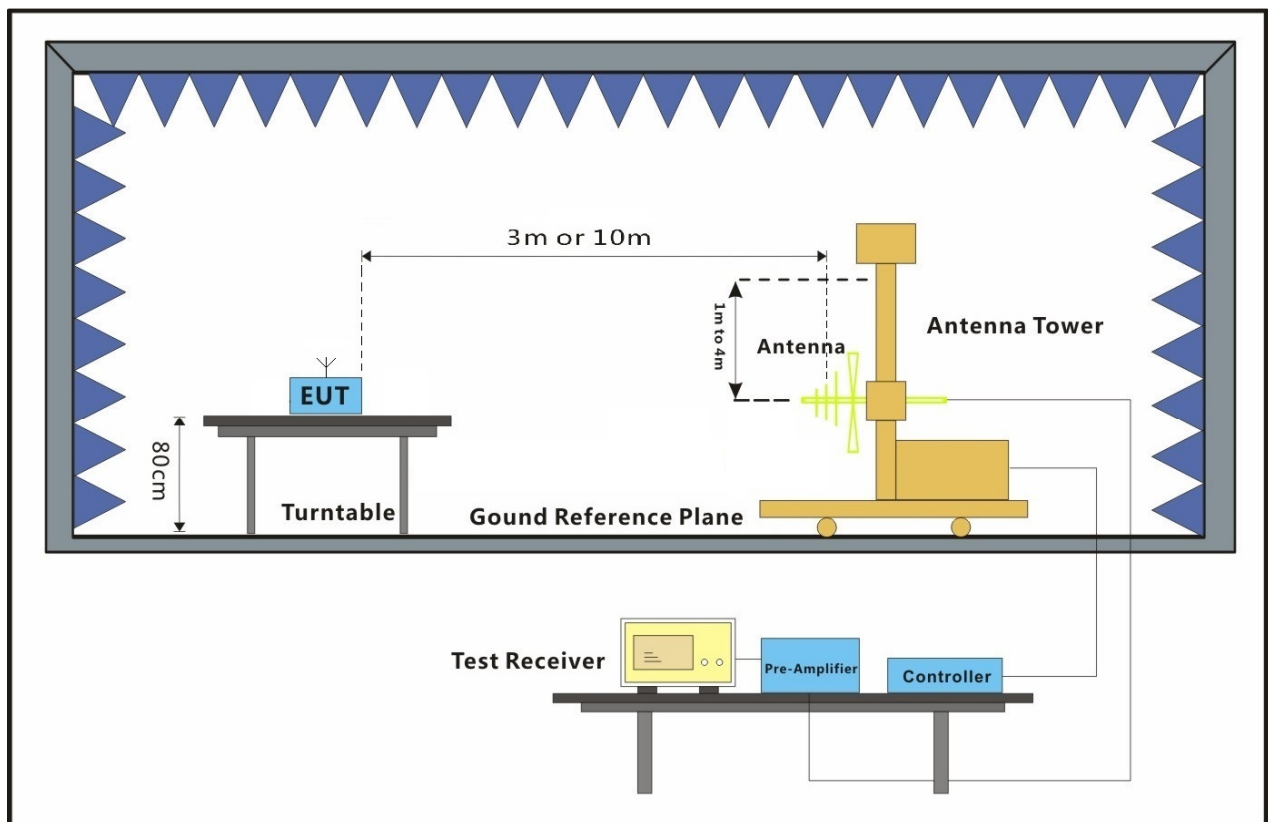
7.2.1 E.U.T. Operation

Operating Environment:

Temperature: 25 °C Humidity: 50 % RH Atmospheric Pressure: 1020 mbar

Test mode Keep the EUT in transmitting mode.

7.2.2 Test Setup Diagram



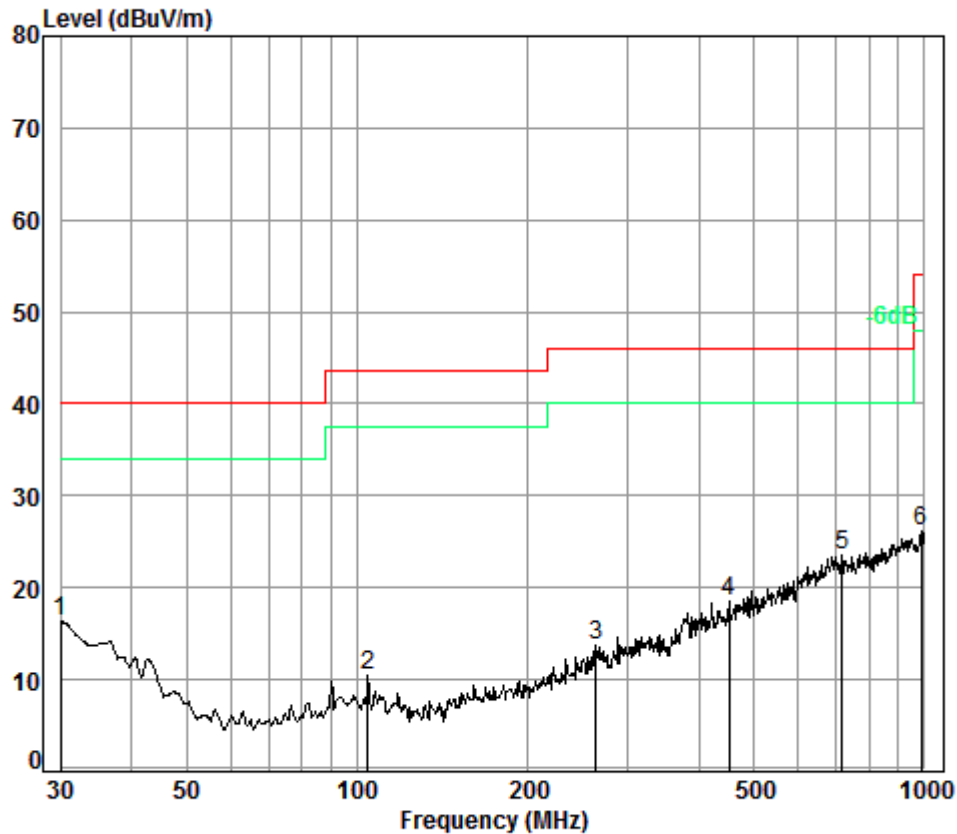


7.2.3 Measurement Data

- 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.



30MHz~1GHz (QP)		
Test mode:	Transmitting	Vertical



Condition: 3m VERTICAL

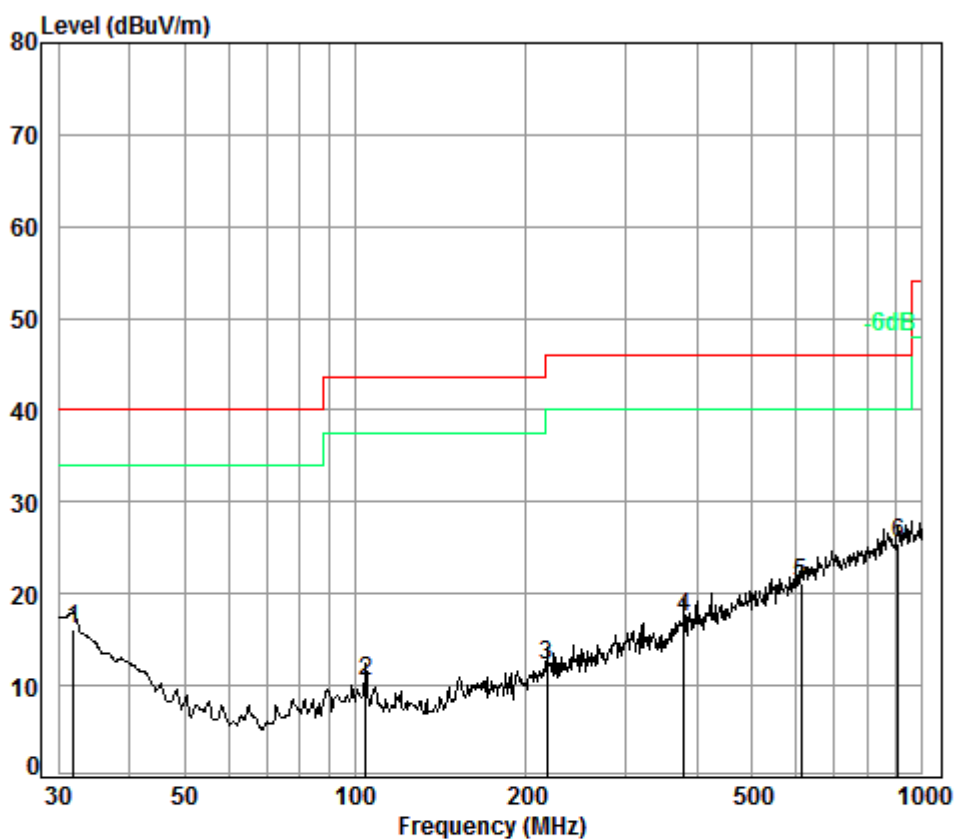
Job No. : 0802CR

Test mode: TX mode

	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	30.00	0.60	18.70	27.36	24.50	16.44	40.00	-23.56
2	104.54	1.21	8.87	27.17	27.47	10.38	43.50	-33.12
3	263.82	1.74	12.58	26.50	25.99	13.81	46.00	-32.19
4	452.72	2.42	17.00	27.46	26.65	18.61	46.00	-27.39
5 pp	716.68	2.96	21.60	27.39	26.27	23.44	46.00	-22.56
6	986.07	3.69	23.74	26.37	25.05	26.11	54.00	-27.89



Test mode:	Transmitting	Horizontal
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Condition: 3m HORIZONTAL

Job No. : 0802CR

Test mode: TX mode

	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	31.95	0.60	17.61	27.35	25.24	16.10	40.00	-23.90
2	104.54	1.21	8.87	27.17	27.60	10.51	43.50	-32.99
3	218.31	1.51	11.15	26.63	26.09	12.12	46.00	-33.88
4	379.91	2.15	16.06	27.01	26.23	17.43	46.00	-28.57
5	612.06	2.73	20.14	27.53	25.76	21.10	46.00	-24.90
6 pp	906.48	3.61	23.23	26.75	25.37	25.46	46.00	-20.54

7.3 20dB Bandwidth

Test Requirement 47 CFR Part 15, Subpart C 15.215

Test Method: ANSI C63.10 (2013) Section 6.9.2

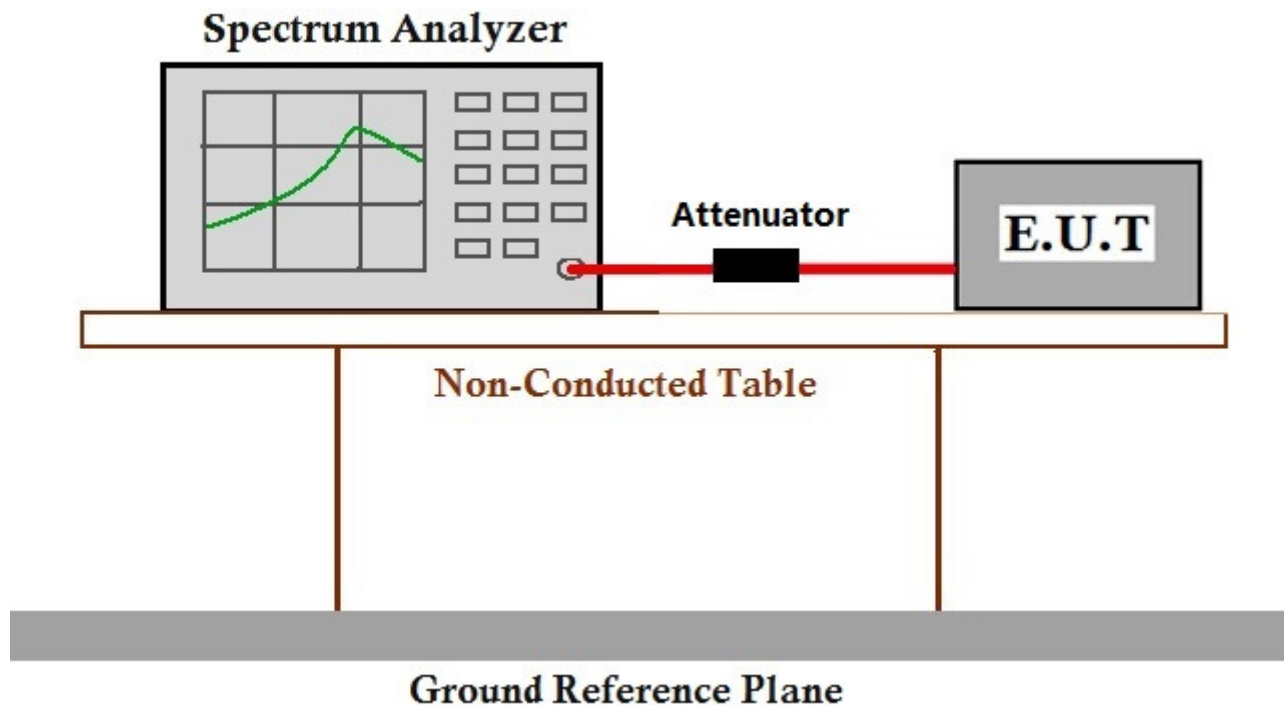
7.3.1 E.U.T. Operation

Operating Environment:

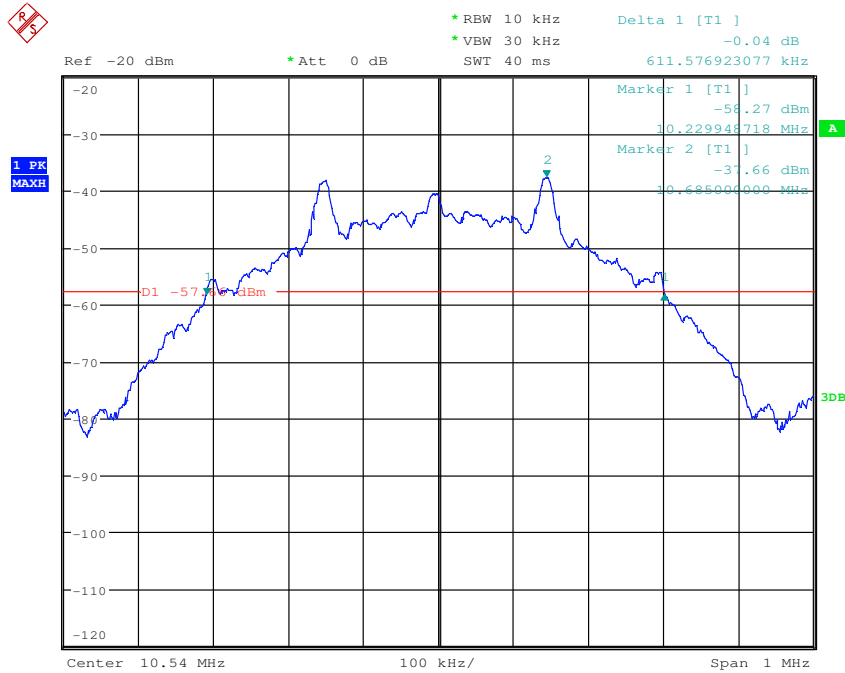
Temperature: 24 °C Humidity: 52 % RH Atmospheric Pressure: 1015 mbar

Test mode Keep the EUT in transmitting mode.

7.3.2 Test Setup Diagram

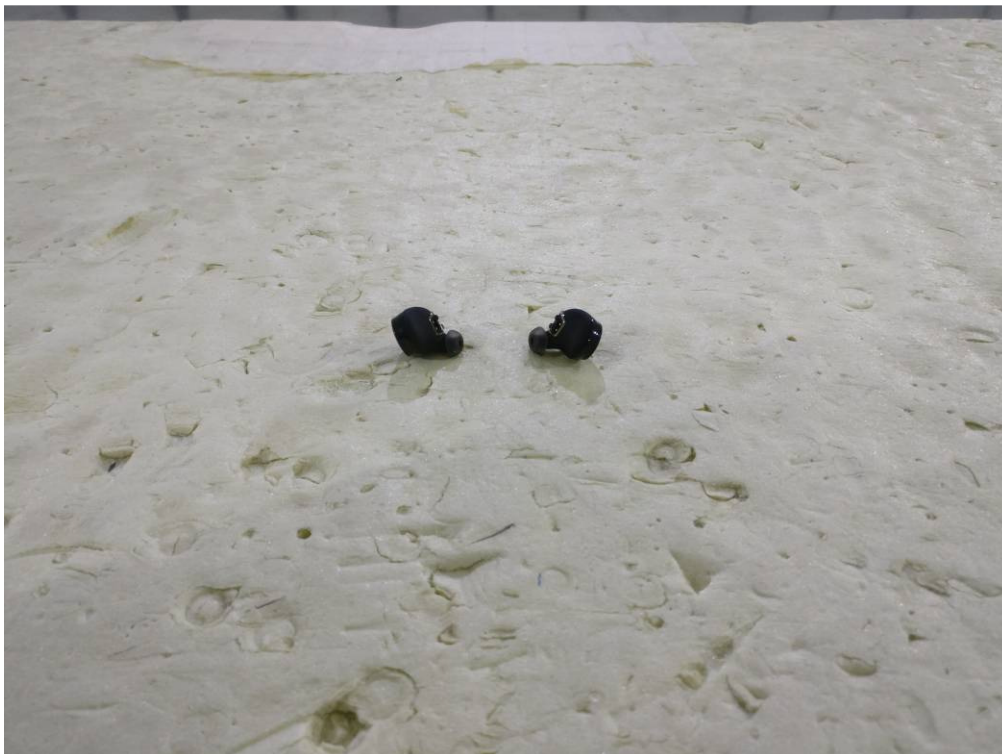
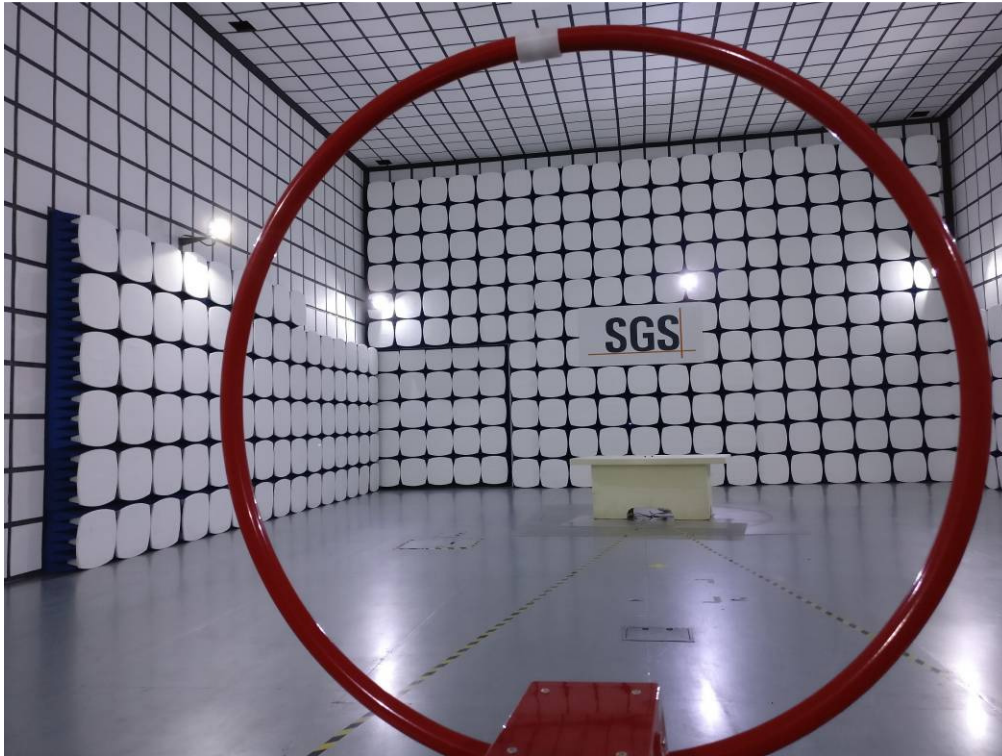


7.3.3 Measurement Data

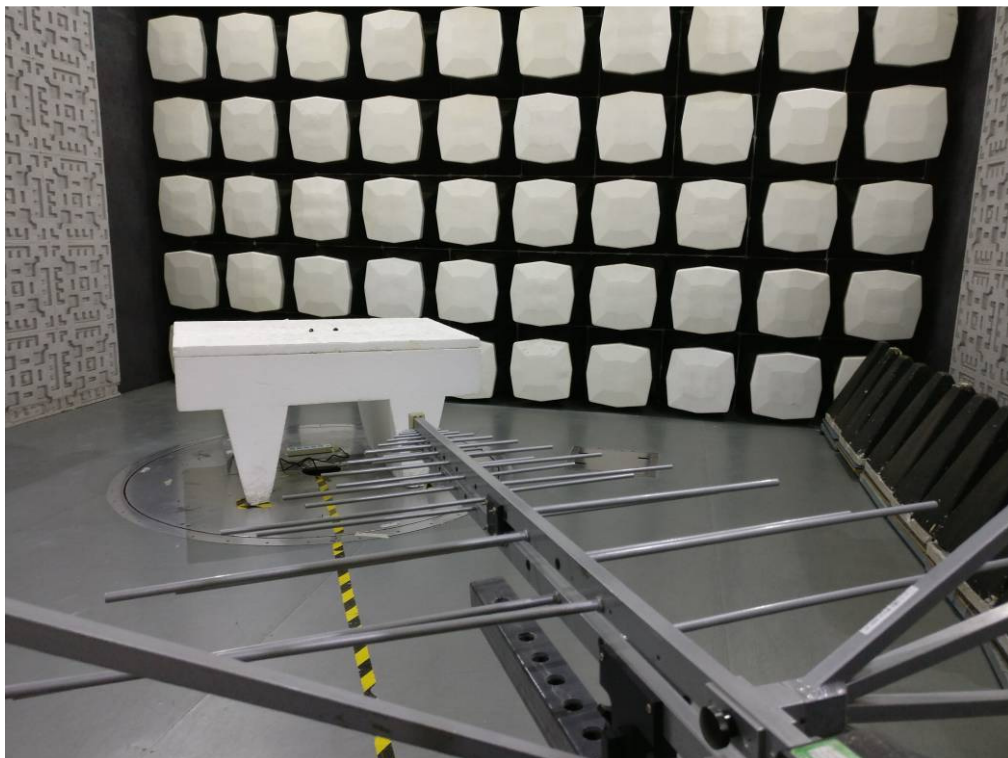


8 Photographs

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.