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Report No.: SZEM170300160301
Page: 1 of 26

TEST REPORT

Application No.: SZEM1703001603CR
Applicant: AOK Electronic Ltmited
Address of Applicant: Tianxin Industrial District, Dahou Village, Xiegang Town, Dongguan City, Guangdong Province, China
Manufacturer: AOK Electronic Ltmited
Address of Manufacturer: Tianxin Industrial District, Dahou Village, Xiegang Town, Dongguan City, Guangdong Province, China
Factory: AOK Electronic Ltmited
Address of Factory: Tianxin Industrial District, Dahou Village, Xiegang Town, Dongguan City, Guangdong Province, China

Equipment Under Test (EUT):
EUT Name: Weather Station
Model No.: AOK-202
FCC ID: 2AJOA-RSTATION
Standards: 47 CFR Part 15, Subpart C 15.231
Date of Receipt: 2017-03-09
Date of Test: 2017-04-06 to 2017-04-11
Date of Issue: 2017-04-18

Test Result :	Pass*
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* In the configuration tested, the EUT complied with the standards specified above.



Jack Zhang
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		2017-04-18		Original

Authorized for issue by:			
Tested By		<i>Bill Chen</i>	2017-04-18
		_____ Bill Chen /Project Engineer	_____ Date
Checked By		<i>Eric Fu</i>	2017-04-18
		_____ Eric Fu /Reviewer	_____ Date



2 Test Summary

Radio Spectrum Technical Requirement				
Item	Standard	Method	Requirement	Result
Antenna Requirement	47 CFR Part 15, Subpart C 15.231	N/A	47 CFR Part 15, Subpart C 15.203	Pass

Radio Spectrum Matter Part				
Item	Standard	Method	Requirement	Result
Field Strength of the Fundamental Signal(15.231(e))	47 CFR Part 15, Subpart C 15.231	ANSI C63.10 (2013) Section 6.5	47 CFR Part 15, Subpart C 15.231(e)	Pass
Radiated Emissions	47 CFR Part 15, Subpart C 15.231	ANSI C63.10 (2013) Section 6.4&6.5&6.6	47 CFR Part 15, Subpart C 15.231(e)	Pass
Transmit Time and Silent Period	47 CFR Part 15, Subpart C 15.231	ANSI C63.10 (2013) Section 7.8.4	47 CFR Part 15, Subpart C 15.231(e)	Pass
20dB Bandwidth	47 CFR Part 15, Subpart C 15.231	ANSI C63.10 (2013) Section 6.9	47 CFR Part 15, Subpart C 15.231(c)	Pass



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4 General Information

4.1 Details of E.U.T.

Operation Frequency:	433.92MHz
Channel Numbers:	1
Modulation Type:	ASK
Sample Type:	Portable production
Antenna Type:	Integral
Antenna Gain:	0dBi
Power supply:	3.0V DC (1.5V x 2 "AA" Size Batteries) for Tx

4.2 Description of Support Units

The EUT has been tested as an independent unit.

4.3 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	7.25 x 10 ⁻⁸
2	Timeout	2s
3	Duty cycle	0.37%
4	Occupied Bandwidth	3%
5	RF conducted power	0.75dB
6	RF power density	2.84dB
7	Conducted Spurious emissions	0.75dB
8	RF Radiated power	4.5dB (below 1GHz)
		4.8dB (above 1GHz)
9	Radiated Spurious emission test	4.5dB (30MHz-1GHz)
		4.8dB (1GHz-18GHz)
10	Temperature test	1 °C
11	Humidity test	3%
12	Supply voltages	1.5%
13	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 10m Semi-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.: G-823, R-4188, T-1153 and C-2383 respectively.

- **FCC – Registration No.: 556682**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration No.: 556682.

- **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

Field Strength of the Fundamental Signal(15.231(e))					
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	2016-09-15	2017-09-15
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

Radiated Emissions					
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. Date (yyyy-mm-dd)	Cal. Due date (yyyy-mm-dd)
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
Pre-amplifier (0.1-1300MHz)	Agilent Technologies	8447D	SEM005-01	2016-04-25	2017-04-25
Band filter	Amindeon	Asi 3314	SEM023-01	N/A	N/A
DC Power Supply	Zhao Xin	RXN-305D	SEM011-02	2016-10-09	2017-10-09
Loop Antenna	Beijing Daze	ZN30401	SEM003-09	2015-05-13	2018-05-13



Dwell Time(15.231(a))					
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

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

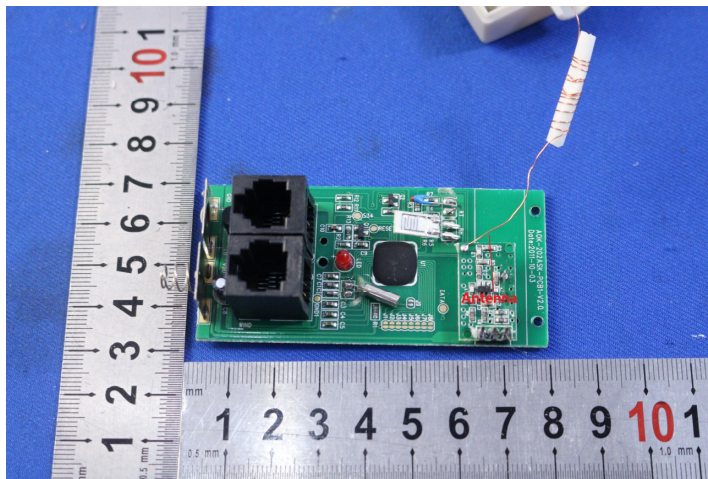
6.1.1 Test Requirement:

47 CFR Part 15, Subpart C 15.231

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 Field Strength of the Fundamental Signal(15.231(e))

Test Requirement 47 CFR Part 15, Subpart C 15.231(e)
Test Method: ANSI C63.10 (2013) Section 6.5
Measurement Distance: 3m
Limit:

Fundamental frequency(MHz)	Field strength of fundamental(microvolts/meter)	Field strength of spurious emissions(microvolts/meter)
40.66-40.70	1000	100
70-130	500	50
130-174	500 to 1500	50 to 150
174-260	1500	150
260-470	1500 to 5000	150 to 500
Above 470	5000	500

Remark: the emission limit is based on measurement instrumentation employing an average detector at a distance of 3 meters. The frequencies above 1000MHz 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.

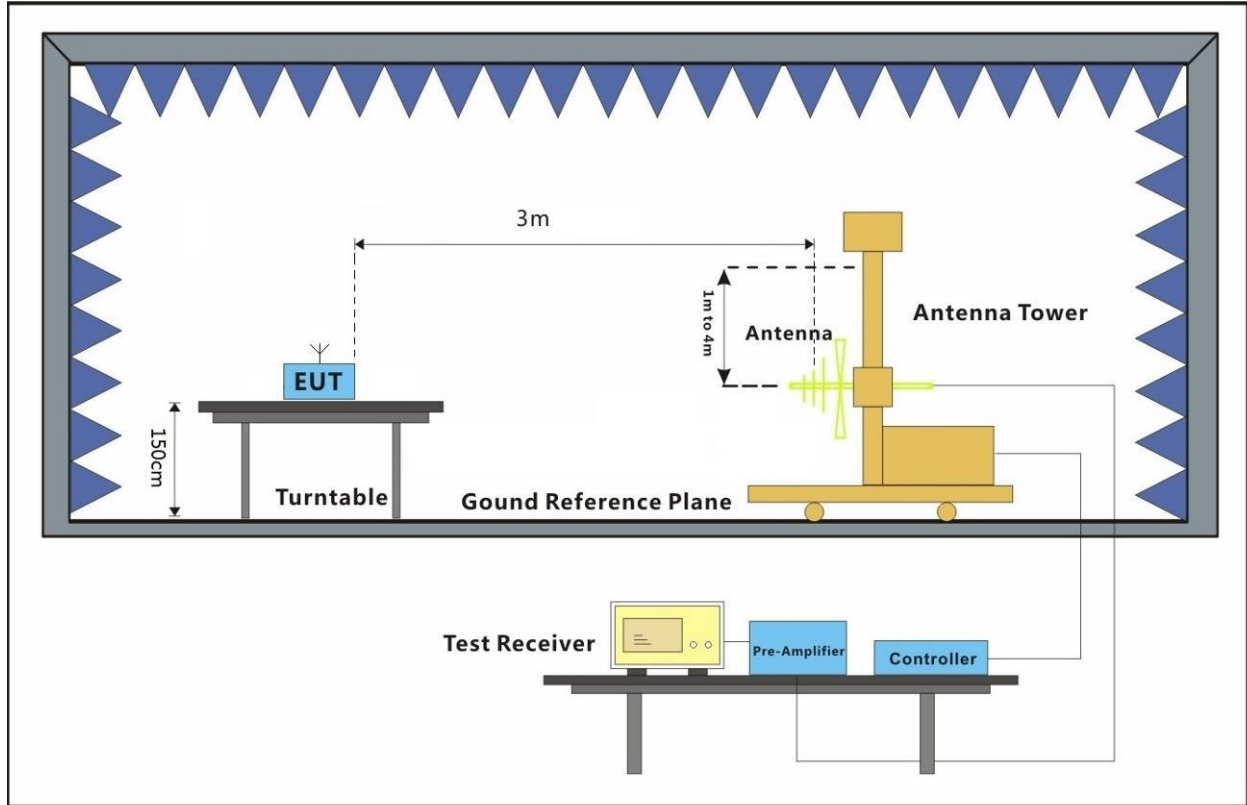
7.1.1 E.U.T. Operation

Operating Environment:

Temperature: 25.0 °C Humidity: 55 % RH Atmospheric Pressure: 1015 mbar

Test mode a:TX mode_Keep the EUT in transmitting mode

7.1.2 Test Setup Diagram





7.1.3 Measurement 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.



Mode:a; Peak value:

Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Factor (dB)	Read Level (dBuV)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
433.92	2.35	16.58	27.35	80.91	72.49	92.86	-20.37	Horizontal
433.92	2.35	16.58	27.35	68.45	60.03	92.86	-40.79	Vertical



7.2 Radiated Emissions

Test Requirement 47 CFR Part 15, Subpart C 15.231(e)
Test Method: ANSI C63.10 (2013) Section 6.4&6.5&6.6
Measurement Distance: 3m
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

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 and 110-490kHz. Radiated emission limits in these two bands are based on measurements employing an average detector.

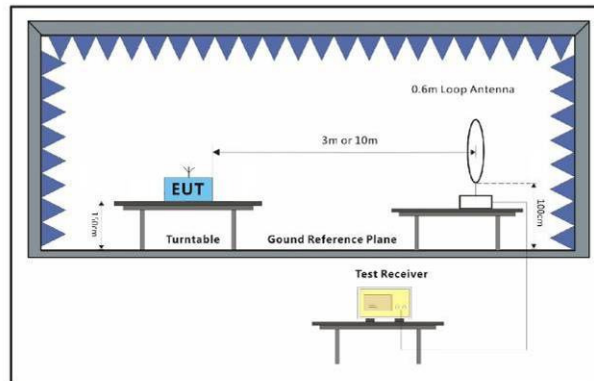
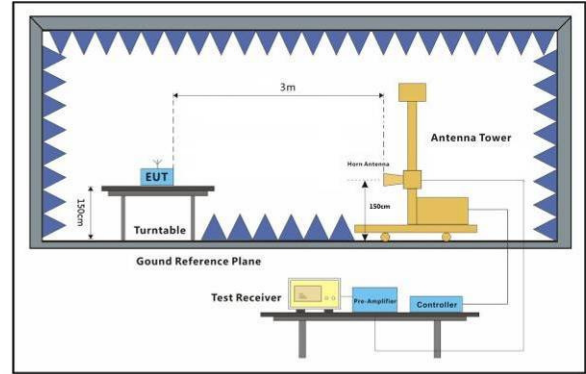
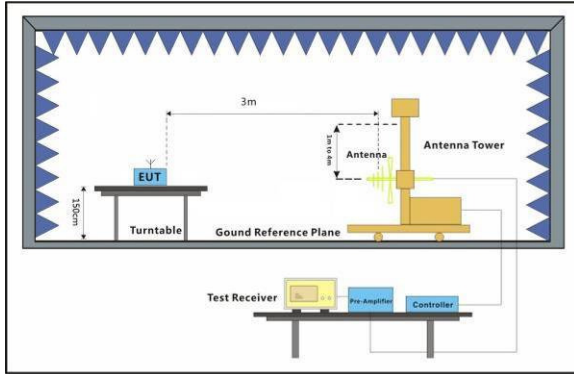
7.2.1 E.U.T. Operation

Operating Environment:

Temperature: 23.0 °C Humidity: 54 % RH Atmospheric Pressure: 1015 mbar

Test mode a:TX mode_Keep the EUT in transmitting mode

7.2.2 Test Setup Diagram



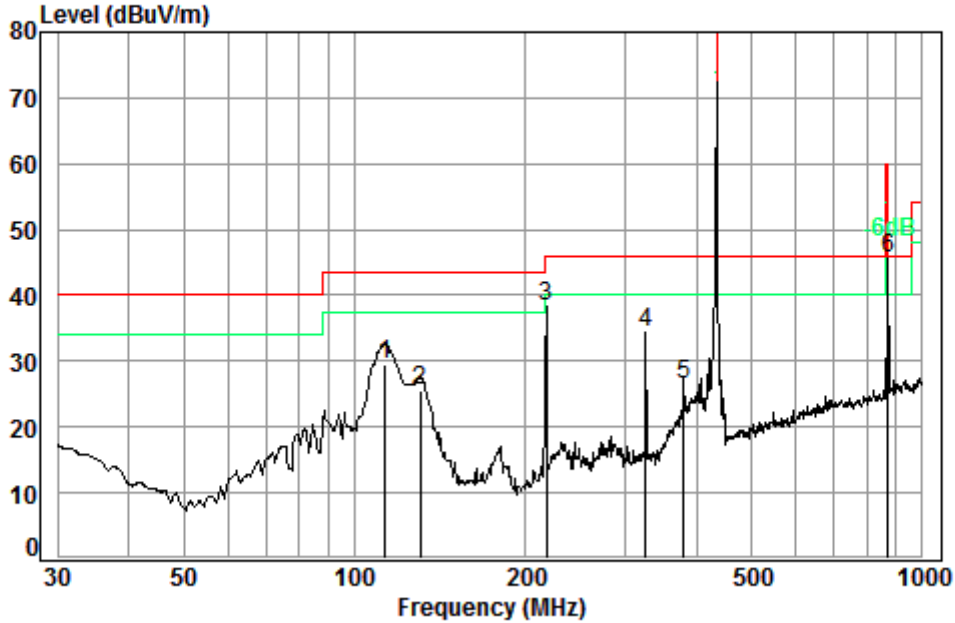
7.2.3 Measurement Data

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.



Below 1GHz

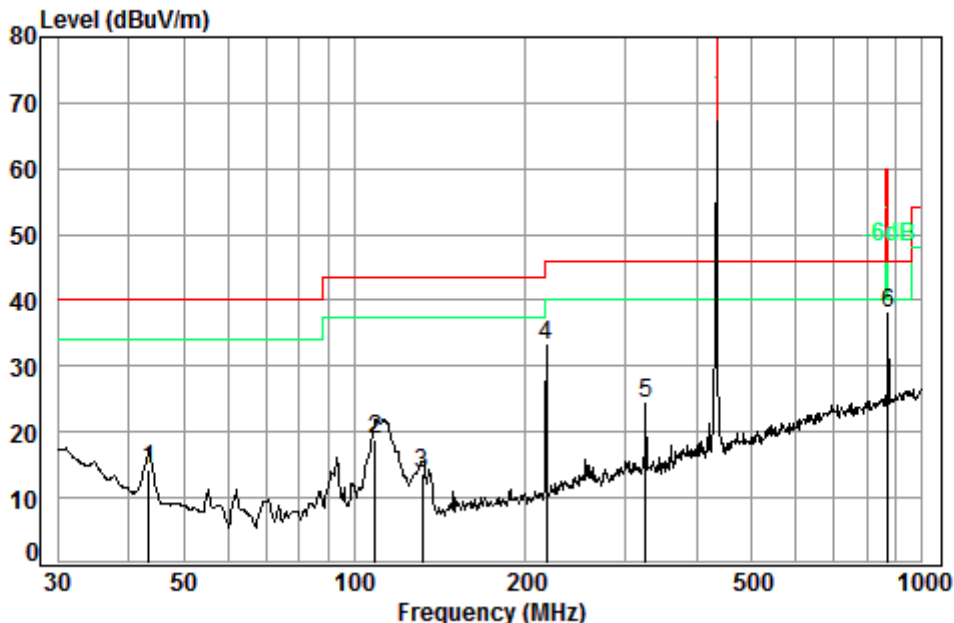
Mode:a; Polarization:Horizontal



Condition: 3m Horizontal
Job No. : 01603CR
Test mode: a

	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	113.32	1.24	8.37	27.11	47.12	29.62	43.50	-13.88
2	130.84	1.28	7.73	27.01	43.56	25.56	43.50	-17.94
3	217.54	1.50	11.11	26.63	52.25	38.23	46.00	-7.77
4	325.60	1.98	14.78	26.60	44.19	34.35	46.00	-11.65
5	379.91	2.15	16.06	27.01	35.19	26.39	46.00	-19.61
6 pp	869.13	3.48	22.86	26.92	46.10	45.52	46.00	-0.48

Mode:a; Polarization:Vertical



Condition: 3m Vertical

Job No. : 01603CR

Test mode: a

	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	43.51	0.68	11.56	27.31	29.49	14.42	40.00	-25.58
2	108.65	1.22	8.67	27.14	36.19	18.94	43.50	-24.56
3	131.76	1.28	7.77	27.00	31.52	13.57	43.50	-29.93
4	217.54	1.50	11.11	26.63	47.30	33.28	46.00	-12.72
5	325.60	1.98	14.78	26.60	34.05	24.21	46.00	-21.79
6 pp	899.13	3.48	22.86	26.92	38.50	37.92	46.00	-8.08



Above 1GHz

Mode: a; Peak value:

Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Read Level (dBuV)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
1303.147	24.52	4.22	38.07	55.52	46.19	74	-27.81	Vertical
1736.280	26.55	4.74	38.03	55.80	49.06	74	-24.94	Vertical
1905.276	27.56	4.92	38.01	58.81	53.28	74	-20.72	Vertical
2170.459	28.04	5.16	37.98	49.36	44.58	74	-29.42	Vertical
2421.666	28.70	5.36	37.96	52.74	48.84	74	-25.16	Vertical
3138.336	31.47	6.04	37.91	43.94	43.54	74	-30.46	Vertical
1080.725	24.14	3.90	38.09	43.40	33.35	74	-40.65	Horizontal
1303.147	24.52	4.22	38.07	55.23	45.90	74	-28.10	Horizontal
1736.280	26.55	4.74	38.03	55.68	48.94	74	-25.06	Horizontal
2170.459	28.04	5.16	37.98	52.89	48.11	74	-25.89	Horizontal
2462.289	28.89	5.39	37.95	50.55	46.88	74	-27.12	Horizontal
3160.165	31.59	6.05	37.92	44.67	44.39	74	-29.61	Horizontal

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:

$$\text{Final Test Level} = \text{Receiver Reading} + \text{Antenna Factor} + \text{Cable Factor} - \text{Preamplifier Factor}$$

2) Scan from 9kHz to 5GHz, the disturbance above 13GHz and below 30MHz was very low, and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

3) As shown in this section, 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. So, only the peak measurements were shown in the report.



7.3 Transmit Time and Silent Period

Test Requirement	47 CFR Part 15C Section 15.231 (e)
Test Method:	ANSI C63.10:2013
Limit:	The duration of each transmission shall not be greater than one second The silent period shall be at least 30 times the transmit time but in no case less than 10 seconds.

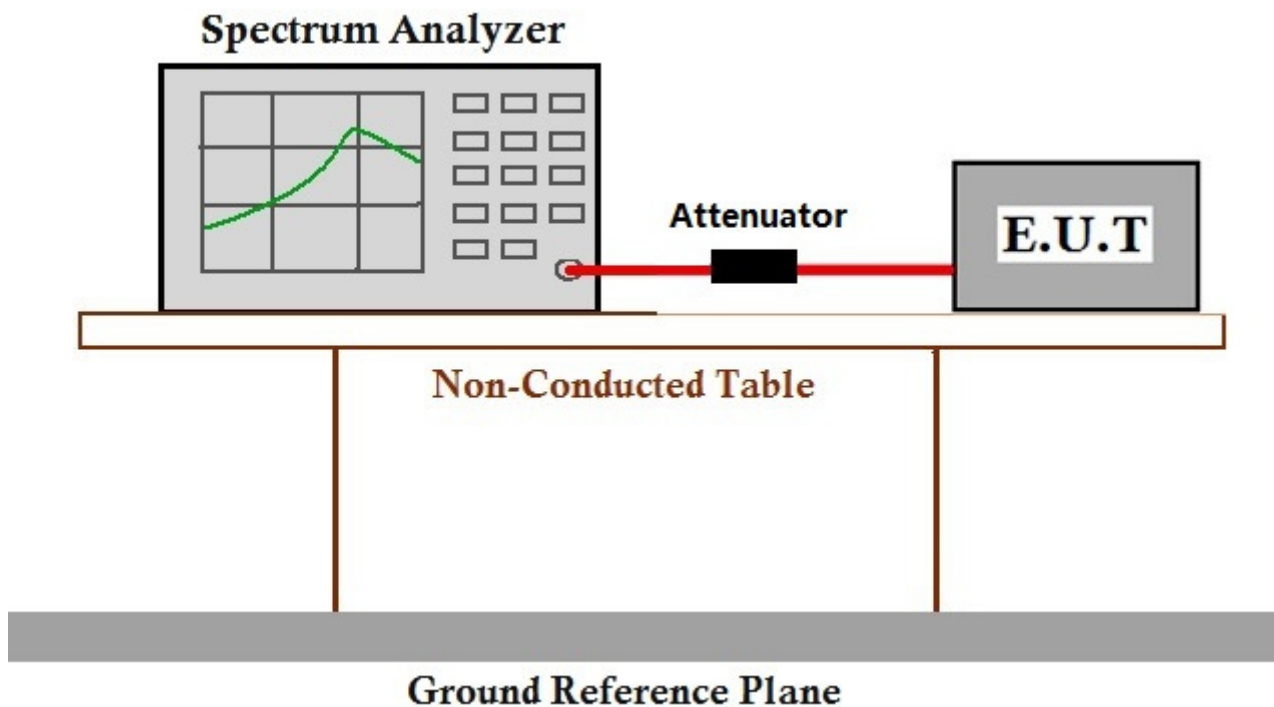
7.3.1 E.U.T. Operation

Operating Environment:

Temperature: 23.0 °C Humidity: 56 % RH Atmospheric Pressure: 1015 mbar

Test mode a:TX mode_Keep the EUT in transmitting mode

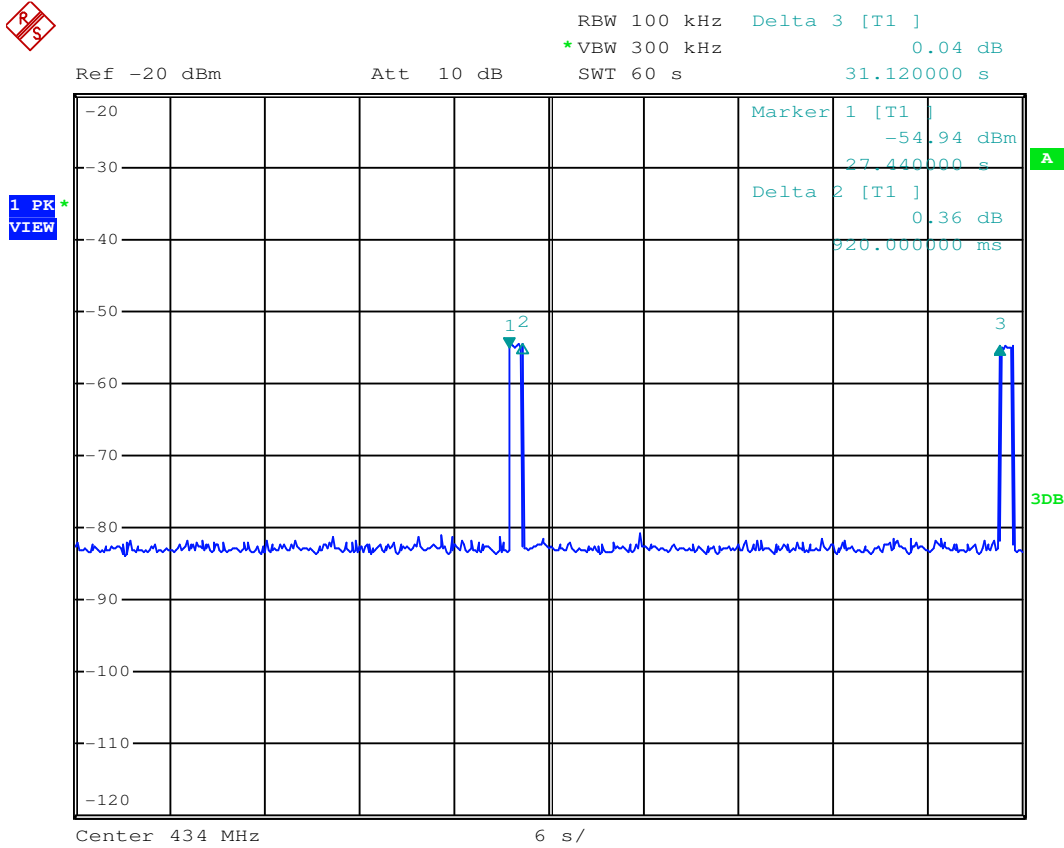
7.3.2 Test Setup Diagram



7.3.3 Measurement Data

Test item	Test data	Limit
Transmitting time	0.92s	<1(second)
Silent Period	30.2s	>30 times the transmit time(27.6s) and >=10 seconds.

Test plot as follows:



7.4 20dB Bandwidth

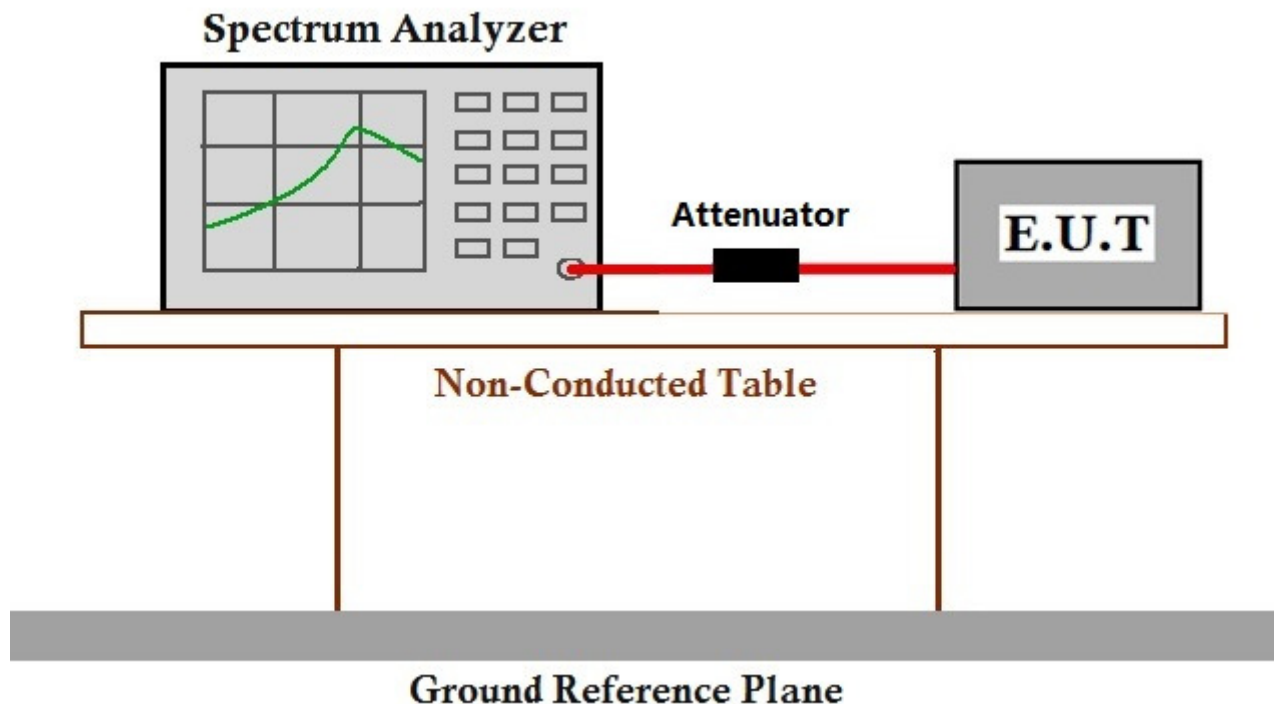
Test Requirement 47 CFR Part 15, Subpart C 15.231(c)
 Test Method: ANSI C63.10 (2013) Section 6.9
 Limit:

Frequency range(MHz)	Limit
70-900	No wider than 0.25% of the center frequency
Above 900	No wider than 0.5% of the center frequency

7.4.1 E.U.T. Operation

Operating Environment:
 Temperature: 23.0 °C Humidity: 56 % RH Atmospheric Pressure: 1015 mbar
 Test mode a:TX mode_Keep the EUT in transmitting mode

7.4.2 Test Setup Diagram

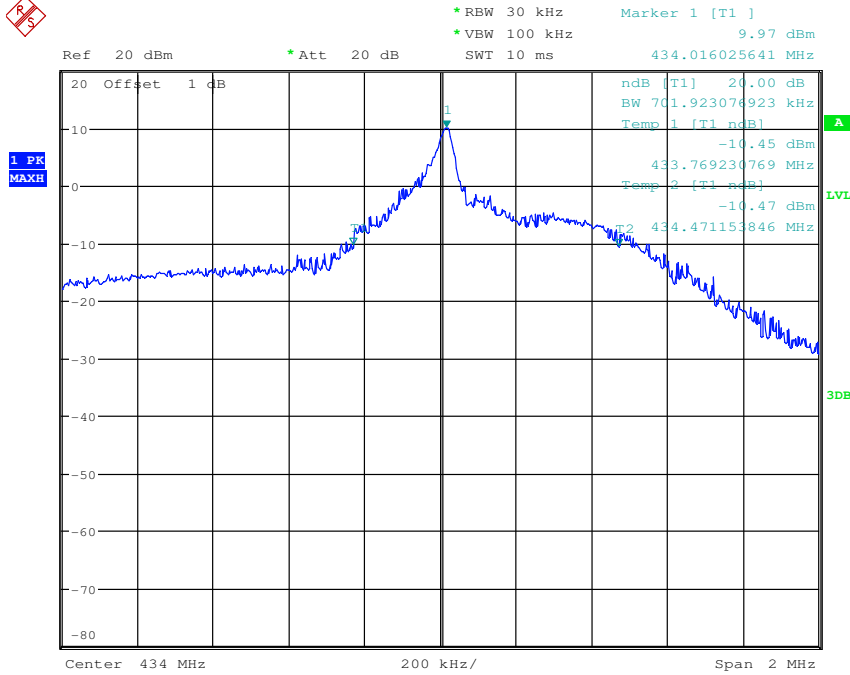


7.4.3 Measurement Data



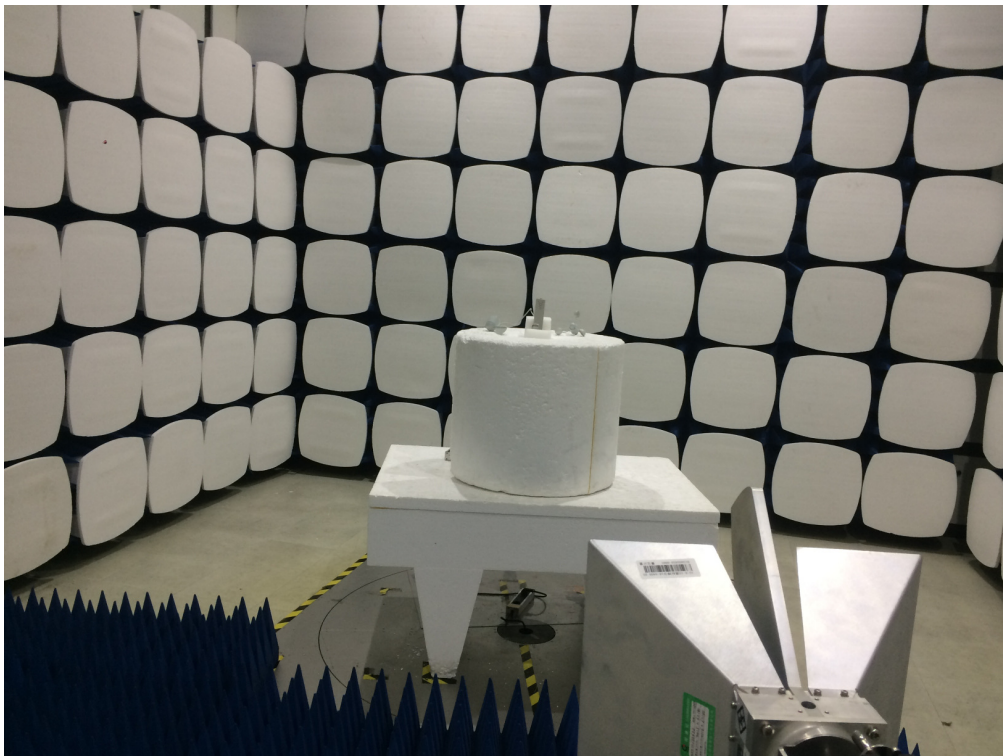
20dB bandwidth (MHz)	Limit (MHz)	Results
0.702	1.085	Pass

Test plot as follows:



8 Photographs

8.1 Radiated Emissions Test Setup





8.2 EUT Constructional Details

Refer to Appendix A - Photographs of EUT Constructional Details for SZEM1703001603CR.