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Shenzhen, Guangdong, China 518057

Telephone: +86 (0) 755 2601 2053 Report No.: SZEM180200104402

Fax: +86 (0) 755 2671 0594 Page: 1 of 28 Email: ee.shenzhen@sgs.com

### TEST REPORT

**Application No.:** SZEM1802001044CR **Applicant:** AOK Electronic Limited

Address of Applicant: Tianxin Industrial District, Dahou Village, Xiegang Town, Dongguan City,

Guangdong, China

Manufacturer: AOK Electronic Limited

Address of Manufacturer: Tianxin Industrial District, Dahou Village, Xiegang Town, Dongguan City,

Guangdong, China

Factory: AOK Electronic Limited

Address of Factory: Tianxin Industrial District, Dahou Village, Xiegang Town, Dongguan City,

Guangdong, China

**Equipment Under Test (EUT):** 

**EUT Name:** Weather Station **Model No.:** TX:AOK-2039B **FCC ID:** 2AJOA-HSTATION

Standard(s): 47 CFR Part 15, Subpart C 15.231

**Date of Receipt:** 2018-02-06

**Date of Test:** 2018-02-11 to 2018-02-23

**Date of Issue:** 2018-02-26

Test Result: Pass\*



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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<sup>\*</sup> In the configuration tested, the EUT complied with the standards specified above.



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	Revision Record				
Version	Chapter	Date	Modifier	Remark	
01		2018-02-26		Original	

Authorized for issue by:		
	Bim chen	
	Bill Chen /Project Engineer	_
	EvicFu	
	Eric Fu /Reviewer	



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### 2 Test Summary

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

N/A: Not applicable

Radio Spectrum Matter Part				
Item	Standard	Method	Requirement	Result
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
Dwell Time (15.231(e))	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
Field Strength of the Fundamental Signal (15.231(e))	47 CFR Part 15, Subpart C 15.231	ANSI C63.10 (2013) Section 6.5	N/A	Pass
Radiated Emissions	47 CFR Part 15, Subpart C 15.231	ANSI C63.10 (2013) Section 6.4&6.5&6.6	N/A	Pass

N/A: Not applicable



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### 4 General Information

#### 4.1 Details of E.U.T.

Power supply:	remote: DC 3V by 2x1.5V "AAA" batteries
Operation Frequency	433.92MHz
Channel Numbers:	1
Antenna Type	Straight antenna
Sample Type:	Portable production
Modulation Type	ASK
Antenna Gain	0dBi

### 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 <sup>-8</sup>
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	DE Dadieted newer	4.5dB (below 1GHz)
/	RF Radiated power	4.8dB (above 1GHz)
0	Dadiated Courieus amission test	4.5dB (Below 1GHz)
8	Radiated Spurious emission test	4.8dB (Above 1GHz)
9	Temperature test	1℃
10	Humidity test	3%
11	Supply voltages	1.5%
12	Time	3%



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#### 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



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### 5 Equipment List

RF Conducted					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
DC Power Supply	ZhaoXin	RXN-305D	SEM011-02	2017-09-27	2018-09-26
Spectrum Analyzer	Rohde & Schwarz	FSU43	SEM004-08	2017-04-14	2018-04-13
Measurement Software	JS Tonscend	JS1120-2 BT/WIFI V2.	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM031-01	2017-07-13	2018-07-12
Attenuator	Weinschel Associates	WA41	SEM021-09	N/A	N/A
Signal Generator	KEYSIGHT	N5173B	SEM006-05	2017-09-27	2018-09-26
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2017-09-27	2018-09-26

	RE in Chamber					
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. Date (yyyy-mm-dd)	Cal. Due date (yyyy-mm-dd)
1	3m Semi-Anechoic Chamber	ETS-LINDGREN	N/A	SEM001-01	2017-08-05	2020-08-04
2	MXE EMI Receiver (20Hz-8.4GHz)	Agilent Technologies	N9038A	SEM004-05	2017-09-27	2018-09-26
3	BiConiLog Antenna (26-3000MHz)	ETS-LINDGREN	3142C	SEM003-01	2017-06-27	2020-06-26
4	Pre-amplifier (0.1-1300MHz)	Agilent Technologies	8447D	SEM005-01	2017-04-14	2018-04-13
5	Measurement Software	AUDIX	e3 V8.2014-6- 27	N/A	N/A	N/A
6	Coaxial Cable	SGS	N/A	SEM025-01	2017-07-13	2018-07-12
7	Cable	SGS	RE		2017-10-09	2018-10-09



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	RE in Chamber					
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. Date (yyyy-mm-dd)	Cal. Due date (yyyy-mm-dd)
1	3m Semi-Anechoic Chamber	AUDIX	N/A	SEM001-02	2017-05-10	2018-05-09
2	EXA Signal Analyzer (10Hz-26.5GHz)	Agilent Technologies Inc	N9010A	SEM004-09	2017-06-05	2018-06-04
3	BiConiLog Antenna (26-3000MHz)	ETS-Lindgren	3142C	SEM003-01	2017-06-27	2020-06-26
4	Horn Antenna (800MHz-18GHz)	Rohde & Schwarz	HF907	SEM003-07	2015-06-14	2018-06-13
5	Amplifier (0.1-1300MHz)	HP	8447D	SEM005-02	2017-09-27	2018-09-26
6	Low Noise Amplifier (100MHz-18GHz)	Black Diamond Series	BDLNA-0118- 352810	SEM005-05	2017-09-27	2018-09-26
7	Band filter	N/A	N/A	N/A	N/A	N/A
8	Measurement Software	AUDIX	e3 V8.2014-6- 27	N/A	N/A	N/A
9	Coaxial Cable	SGS	N/A	SEM026-01	2017-07-13	2018-07-12
10	Cable	SGS	RE		2017-10-09	2018-10-09

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	2017-09-29	2018-09-28
Humidity/ Temperature Indicator	Shanghai Meteorological Industry Factory	ZJ1-2B	SEM002-04	2017-09-29	2018-09-28
Humidity/ Temperature Indicator	Mingle	N/A	SEM002-08	2017-09-29	2018-09-28
Barometer	Changchun Meteorological Industry Factory	DYM3	SEM002-01	2017-04-18	2018-04-17



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### 6 Radio Spectrum Technical Requirement

#### 6.1 Antenna Requirement

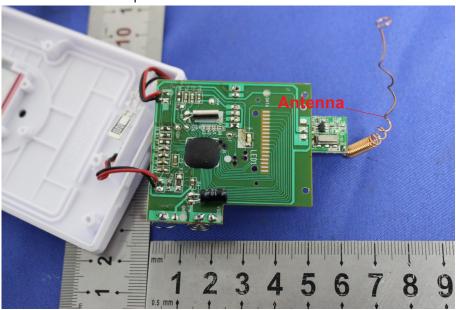
#### 6.1.1 Test Requirement:

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 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.



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### 7 Radio Spectrum Matter Test Results

#### 7.1 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

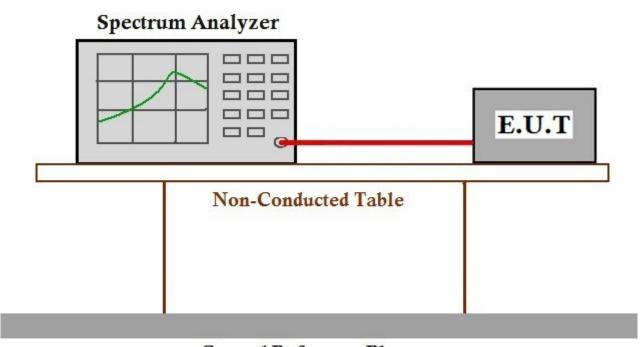
### 7.1.1 E.U.T. Operation

Operating Environment:

Temperature: 21.1 °C Humidity: 55.1 % RH Atmospheric Pressure: 1015 mbar

Test mode a:TX mode\_Keep the EUT in transmitting with modulation mode.

#### 7.1.2 Test Setup Diagram



### Ground Reference Plane

#### 7.1.3 Measurement Procedure and Data

20dB bandwidth (MHz)	Limit (MHz)	Results		
0.0133	1.085	Pass		

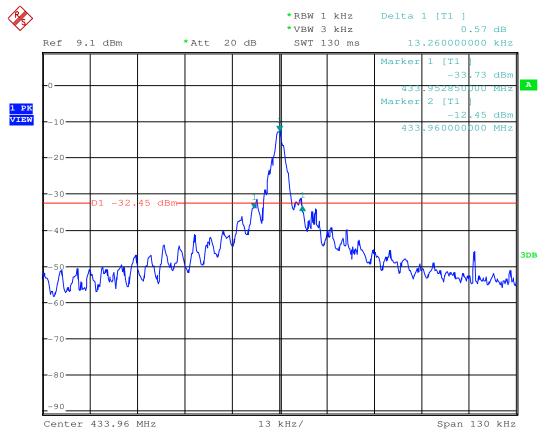
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#### Mode a:





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### 7.2 Dwell Time (15.231(e))

Test Requirement 47 CFR Part 15, Subpart C 15.231(e)
Test Method: ANSI C63.10 (2013) Section 7.8.4

Limit:

Device type	Limit
Intentional radiators may operate at a periodic rate	The duration of each transmission ≤1S
exceeding that specified in paragraph (a) 15.231 and may be employed for any type of operation, including operation prohibited in paragraph (a) 15.231	Silent period >30 times the duration of the transmission and ≥10S

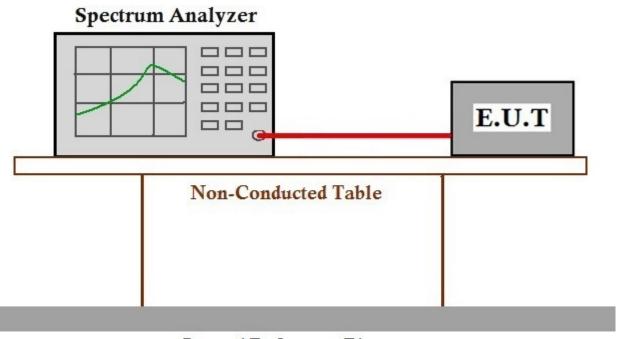
#### 7.2.1 E.U.T. Operation

Operating Environment:

Temperature: 21.2 °C Humidity: 55.1 % RH Atmospheric Pressure: 1015 mbar

Test mode a:TX mode Keep the EUT in transmitting with modulation mode.

#### 7.2.2 Test Setup Diagram



### Ground Reference Plane

#### 7.2.3 Measurement Procedure and Data

Test item	Test data	Limit
Transmitting time	0.962s	<1(second)
Silent Period	32.451s	>30 times the transmit time(32.451s) and >=10 seconds.

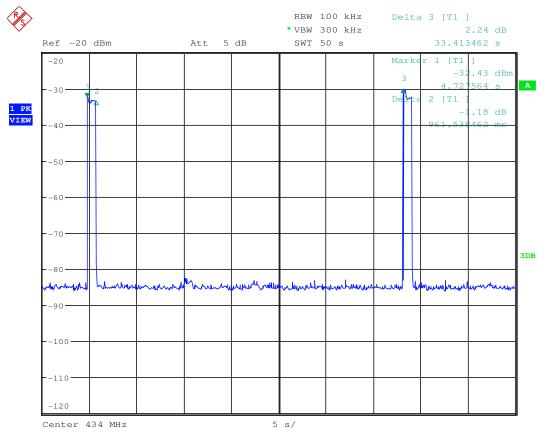
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#### Mode a:

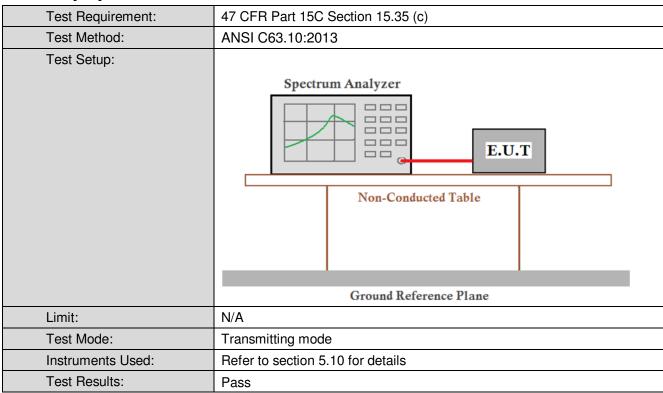




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### 7.3 Duty Cycle



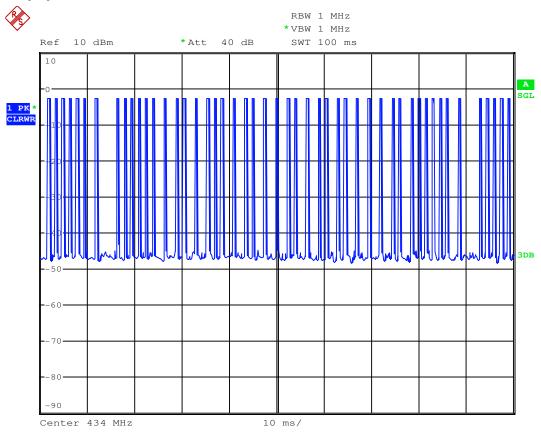


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#### Test plot as follows:

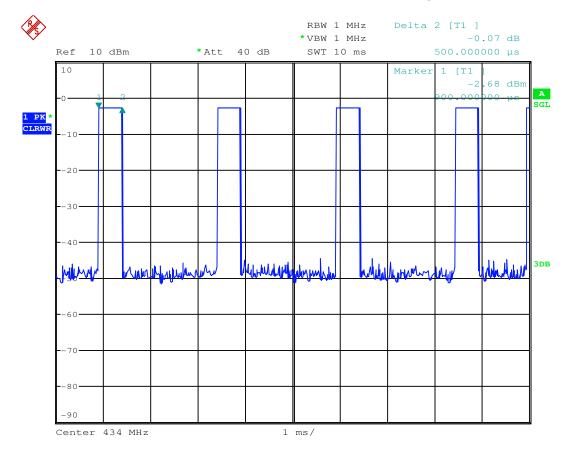
#### **Duty cycle numbers**





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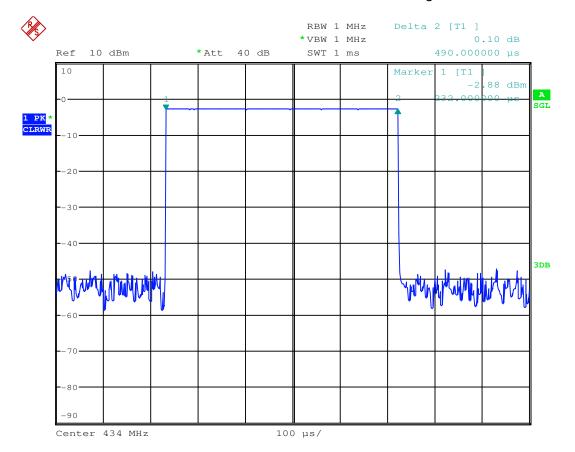
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### 7.4 Field Strength of the Fundamental Signal (15.231(e))

Test Requirement N/A

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.



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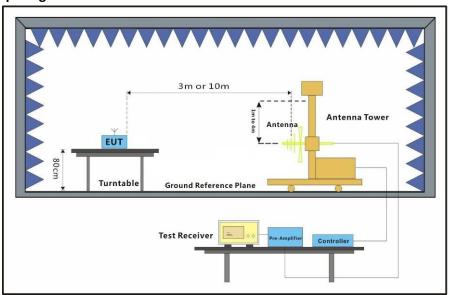
#### 7.4.1 E.U.T. Operation

Operating Environment:

Temperature: 20 °C Humidity: 40.5 % RH Atmospheric Pressure: 1015 mbar

Test mode a:TX mode\_Keep the EUT in transmitting with modulation mode.

#### 7.4.2 Test Setup Diagram



#### 7.4.3 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 or 10 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: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor



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#### **Measurement Data**

Average value:							
	Average value=Peak value + PDCF						
Calculate Formula:	PDCF=20 log(Duty cycle)						
	Duty cycle= T on time / T period						
	Ton time =24.01ms						
Test data:	T period =100ms						
	Average value= -12.39dB						

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	23.21	27.79	81.61	79.38	92.86	-13.48	Horizontal			
433.92	2.35	23.21	27.79	81.28	79.05	92.86	-13.81	Vertical			

Average value:

Frequency (MHz)	PDCF	Peak Level (dBuV/m)	Average Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
433.92	10.00	79.38	66.99	72.86	-5.87	Horizontal
433.92	-12.39	79.05	66.66	72.86	-6.20	Vertical



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#### 7.5 Radiated Emissions

Test Requirement N/A

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
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.



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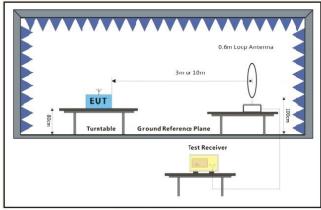
#### 7.5.1 E.U.T. Operation

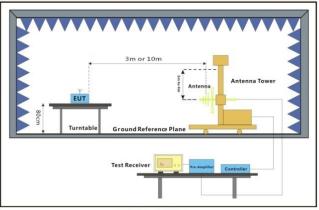
Operating Environment:

Temperature: 21.1 °C Humidity: 51.9 % RH Atmospheric Pressure: 1015 mbar

Test mode a:TX mode\_Keep the EUT in transmitting with modulation mode.

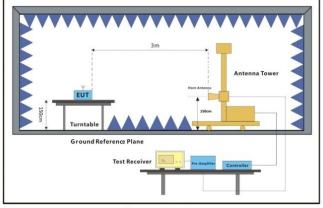
#### 7.5.2 Test Setup Diagram





Below 30MHz

30MHz-1GHz



Above 1GHz

#### 7.5.3 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.

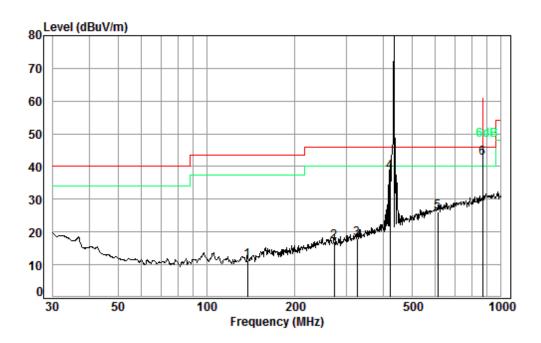


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Below 1G Detection:QP

Mode:a; Polarization:Horizontal



Condition: 3m HORIZONTAL

Job No. : 01044CR

Test mode: b

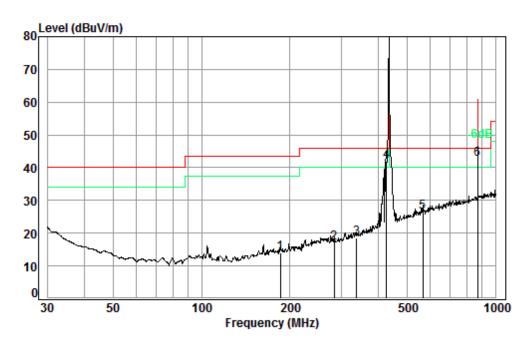
	Freq			Preamp Factor				Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	137.90	1.29	13.64	27.52	23.99	11.40	43.50	-32.10
2	271.32	1.77	18.93	27.54	23.92	17.08	46.00	-28.92
3	324.46	1.98	20.36	27.59	23.17	17.92	46.00	-28.08
4	420.58	2.29	22.89	27.76	40.78	38.20	46.00	-7.80
5	609.92	2.72	26.74	27.69	24.45	26.22	46.00	-19.78
6 pp	869.13	3.48	29.41	27.18	37.00	42.71	46.00	-3.29



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Mode:a; Polarization:Vertical



Condition: 3m VERTICAL Job No. : 01044CR

Test mode: b

		Cable	Ant	Preamp	Read		Limit	0ver
	Freq	Loss	Factor	Factor	Level	Level	Line	Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	185.14	1.38	16.06	27.53	24.07	13.98	43.50	-29.52
2	282.99	1.83	18.92	27.54	23.79	17.00	46.00	-29.00
3	336.04	2.02	20.70	27.62	23.38	18.48	46.00	-27.52
4	425.03	2.31	23.00	27.77	44.54	42.08	46.00	-3.92
5	564.64	2.67	25.93	27.76	25.74	26.58	46.00	-19.42
6 pp	869.13	3.48	29.41	27.18	36.73	42.44	46.00	-3.56

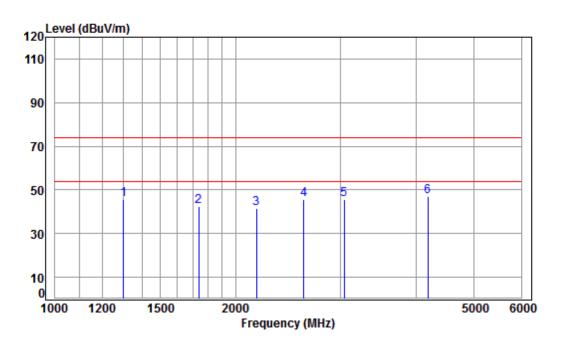


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Above 1G

Mode:a; Polarization:Horizontal



Condition: 3m HORIZONTAL

Job No : 01044CR Mode : 433 TX RSE

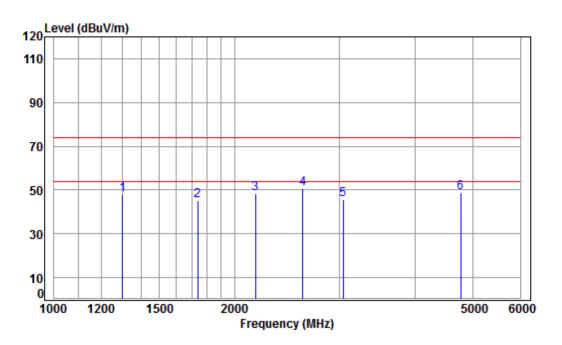
ouc		174 113	_						
		Cable	Ant	Preamp	Read		Limit	0ver	
	Freq	Loss	Factor	Factor	Level	Level	Line	Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1301.332	4.80	24.96	41.26	56.93	45.43	74.00	-28.57	Peak
2	1736.483	5.18	26.82	41.55	51.83	42.28	74.00	-31.72	Peak
3	2168.510	5.16	28.38	41.78	49.81	41.57	74.00	-32.43	Peak
4	2603.351	5.70	29.82	41.96	51.86	45.42	74.00	-28.58	Peak
5	3037.063	6.02	31.37	42.11	50.27	45.55	74.00	-28.45	Peak
6	pp 4192.963	7.21	33.60	42.36	48.43	46.88	74.00	-27.12	Peak



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Mode:a; Polarization:Vertical



Condition: 3m VERTICAL Job No : 01044CR Mode : 433 TX RSE

ouc	_	. 400	17/ 1/2								
			Cable	Ant	Preamp	Read		Limit	0ver		
		Freq	Loss	Factor	Factor	Level	Level	Line	Limit	Remark	
											_
		MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB		
1		1301.332	4.80	24.96	41.26	59.19	47.69	74.00	-26.31	Peak	
2		1736.483	5.18	26.82	41.55	54.89	45.34	74.00	-28.66	Peak	
3		2168.510	5.16	28.38	41.78	56.42	48.18	74.00	-25.82	Peak	
4	pp	2603.351	5.70	29.82	41.96	56.92	50.48	74.00	-23.52	Peak	
5		3037.063	6.02	31.37	42.11	50.16	45.44	74.00	-28.56	Peak	
6		4770.324	7.85	34.10	42.46	49.12	48.61	74.00	-25.39	Peak	

#### 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

- 2) Scan from 9kHz to 25GHz, 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.

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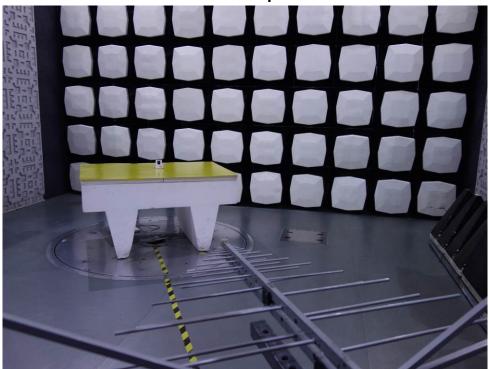


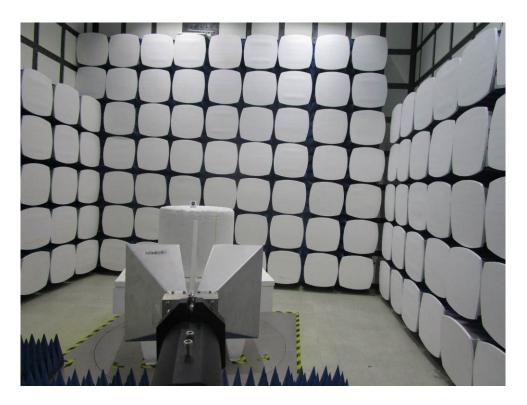
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### 8 Photographs

### 8.1 Radiated Emissions Test Setup





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### 8.2 EUT Constructional Details (EUT Photos)

Refer to EUT external and internal photos.

- End of the Report -