

APPLICATION CERTIFICATION
On Behalf of
Fine Offset Electronics Co., Ltd.

Air Quality Sensor

Model No.: WH41

FCC ID: WA5WH41

Prepared for : Fine Offset Electronics Co., Ltd.
Address : 2/F., Building no.3, Ping Shan Minqi Industrial Park, Xili
Town, Nanshan District, Shenzhen City, China.

Prepared by : Shenzhen Accurate Technology Co., Ltd.
Address : 1/F., Building A, Changyuan New Material Port, Science
& Industry Park, Nanshan District, Shenzhen, Guangdong,
P.R. China

Tel: (0755) 26503290
Fax: (0755) 26503396

Report Number : ATE20180207
Date of Test : Mar. 24--Mar. 31, 2018
Date of Report : Mar. 31, 2018

TABLE OF CONTENTS

Description	Page
Test Report Certification	
1. GENERAL INFORMATION	5
1.1. Description of Device (EUT).....	5
1.2. Accessory and Auxiliary Equipment	5
1.3. Description of Test Facility	6
1.4. Measurement Uncertainty	6
2. MEASURING DEVICE AND TEST EQUIPMENT	7
3. SUMMARY OF TEST RESULTS.....	8
4. POWER LINE CONDUCTED MEASUREMENT	9
4.1. Block Diagram of Test Setup.....	9
4.2. Power Line Conducted Emission Measurement Limits.....	9
4.3. Configuration of EUT on Measurement	9
4.4. Operating Condition of EUT	9
4.5. DATA SAMPLE	10
4.6. Measurement Uncertainty	10
4.7. Test Procedure	10
4.8. Power Line Conducted Emission Measurement Results	11
5. THE FIELD STRENGTH OF RADIATION EMISSION	14
5.1. Block Diagram of Test Setup.....	14
5.2. The Field Strength of Radiation Emission Measurement Limits.....	15
5.3. Configuration of EUT on Measurement	16
5.4. Operating Condition of EUT	16
5.5. Test Procedure	16
5.6. The Field Strength of Radiation Emission Measurement Results	17
6. 20DB OCCUPIED BANDWIDTH	18
6.1. Block Diagram of Test Setup.....	18
6.2. The Bandwidth of Emission Limit According To FCC Part 15 Section 15.231(c)	18
6.3. EUT Configuration on Measurement	18
6.4. Operating Condition of EUT	18
6.5. Test Procedure	18
6.6. Measurement Result	19
7. RELEASE TIME MEASUREMENT.....	20
7.1. Block Diagram of Test Setup.....	20
7.2. Release Time Measurement According To FCC Part 15 Section 15.231(e)	20
7.3. EUT Configuration on Measurement	20
7.4. Operating Condition of EUT	20
7.5. Test Procedure	20
7.6. Measurement Result	21
8. AVERAGE FACTOR MEASUREMENT	22
8.1. Block Diagram of Test Setup.....	22
8.2. Average factor Measurement according to ANSI C63.10-2013.....	22
8.3. EUT Configuration on Measurement	22
8.4. Operating Condition of EUT	22
8.5. Test Procedure	23

8.6. Measurement Result	23
9. ANTENNA REQUIREMENT	24
9.1. The Requirement	24
9.2. Antenna Construction	24

Test Report Certification

Applicant& address : Fine Offset Electronics Co., Ltd
2/F., Building no.3, Ping Shan Minqi Industrial Park, Xili Town, Nanshan District, Shenzhen City, China.

Manufacturer& address : Fine Offset Electronics Co., Ltd
2/F., Building no.3, Ping Shan Minqi Industrial Park, Xili Town, Nanshan District, Shenzhen City, China.

Product : Air Quality Sensor

Model No. : WH41

Trade name : n.a

Measurement Procedure Used:

**FCC Rules and Regulations Part 15 Subpart C Section 15.231(e)
ANSI C63.10: 2013**

The device described above is tested by SHENZHEN ACCURATE TECHNOLOGY CO., LTD to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 15 Subpart C Section 15.231(e). The measurement results are contained in this test report and SHENZHEN ACCURATE TECHNOLOGY CO., LTD is assumed full responsibility for the accuracy and completeness of these measurements. Also, this report shows that the Equipment Under Test (EUT) is to be technically compliant with the FCC requirements.

This report applies to above tested sample only. This report shall not be reproduced in part without written approval of SHENZHEN ACCURATE TECHNOLOGY CO., LTD.

Date of Test :

Mar. 24, 2018-Mar. 31, 2018

Date of Report:

Mar. 31, 2018

Prepared by :

Approved &
Authorized Signer :

(Sean Liu, Manager)

1. GENERAL INFORMATION

1.1. Description of Device (EUT)

EUT : Air Quality Sensor
Model Number : WH41
Power Supply : DC 3V (Powered by battery)
Or DC 5V(Powered by charge port)
Modulation: : FSK
Operation Frequency : 433.92MHz
Antenna type : Integral Antenna
Antenna gain(max) : 2.15dBi
Applicant : Fine Offset Electronics Co., Ltd.
Address : 2/F., Building no.3, Ping Shan Minqi Industrial Park, Xili
Town, Nanshan District, Shenzhen City, China.
Manufacturer : Fine Offset Electronics Co., Ltd
Address : 2/F., Building no.3, Ping Shan Minqi Industrial Park, Xili
Town, Nanshan District, Shenzhen City, China.
Date of sample received : Mar. 24, 2018-Mar. 31, 2018
Date of Test : Mar. 31, 2018

1.2. Accessory and Auxiliary Equipment

AC/DC Power Adapter: Model: MX12X6-0502000VU
(provided by laboratory) INPUT: 100-240V~50/60Hz 0.35A
OUTPUT: 5V/1A

1.3. Description of Test Facility

EMC Lab	: Recognition of accreditation by Federal Communications Commission (FCC) The Designation Number is CN1189 The Registration Number is 708358
	Listed by Innovation, Science and Economic Development Canada (ISED) The Registration Number is 5077A-2
	Accredited by China National Accreditation Service for Conformity Assessment (CNAS) The Registration Number is CNAS L3193
	Accredited by American Association for Laboratory Accreditation (A2LA) The Certificate Number is 4297.01
Name of Firm	: Shenzhen Accurate Technology Co., Ltd.
Site Location	: 1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. China

1.4. Measurement Uncertainty

Conducted Emission Expanded Uncertainty	=	2.23dB, k=2
Radiated emission expanded uncertainty (9kHz-30MHz)	=	3.08dB, k=2
Radiated emission expanded uncertainty (30MHz-1000MHz)	=	4.42dB, k=2
Radiated emission expanded uncertainty (Above 1GHz)	=	4.06dB, k=2

2. MEASURING DEVICE AND TEST EQUIPMENT

Table 1: List of Test and Measurement Equipment

Kind of equipment	Manufacturer	Type	S/N	Calibrated dates	Calibrated until
EMI Test Receiver	Rohde&Schwarz	ESCS30	100307	Jan. 06, 2018	Jan. 05, 2019
EMI Test Receiver	Rohde&Schwarz	ESPI3	101526/003	Jan. 06, 2018	Jan. 05, 2019
Spectrum Analyzer	Rohde&Schwarz	FSV-40	101495	Jan. 06, 2018	Jan. 05, 2019
Spectrum Analyzer	Agilent	E7405A	MY45115511	Jan. 06, 2018	Jan. 05, 2019
Pre-Amplifier	Rohde&Schwarz	CBLU118354 0-01	3791	Jan. 06, 2018	Jan. 05, 2019
Loop Antenna	Schwarzbeck	FMZB1516	1516131	Jan. 06, 2018	Jan. 05, 2019
Bilog Antenna	Schwarzbeck	VULB9163	9163-323	Jan. 06, 2018	Jan. 05, 2019
Horn Antenna	Schwarzbeck	BBHA9120D	9120D-655	Jan. 06, 2018	Jan. 05, 2019
Horn Antenna	Schwarzbeck	BBHA9170	9170-359	Jan. 06, 2018	Jan. 05, 2019
Open Switch and Control Unit	Rohde&Schwarz	OSP120 + OSP-B157	101244 + 100866	Jan. 06, 2018	Jan. 05, 2019
LISN	Rohde&Schwarz	ESH3-Z5	100305	Jan. 06, 2018	Jan. 05, 2019
LISN	Schwarzbeck	NSLK8126	8126431	Jan. 06, 2018	Jan. 05, 2019
Highpass Filter	Wainwright Instruments	WHKX3.6/18 G-10SS	N/A	Jan. 06, 2018	Jan. 05, 2019
Band Reject Filter	Wainwright Instruments	WRCG2400/2 485-2375/2510 -60/11SS	N/A	Jan. 06, 2018	Jan. 05, 2019

3. SUMMARY OF TEST RESULTS

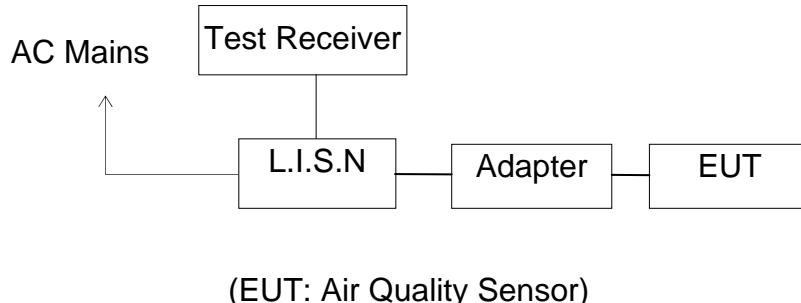
FCC Rules	Description of Test	Result
Section 15.207	Conducted Emission	Compliant
Section 15.231(e)	Radiated Emission	Compliant
Section 15.231(c)	20dB Bandwidth	Compliant
Section 15.231(e)	Release Time Measurement	Compliant
Section 15.203	Antenna Requirement	Compliant

The product is a automatic operated Air Quality Sensor.

All normal using modes of the normal function were tested but only the worst test data of the worst mode is recorded by this report.

4. POWER LINE CONDUCTED MEASUREMENT

4.1. Block Diagram of Test Setup



(EUT: Air Quality Sensor)

4.2. Power Line Conducted Emission Measurement Limits

Frequency (MHz)	Limit dB(μ V)	
	Quasi-peak Level	Average Level
0.15 - 0.50	66.0 – 56.0 *	56.0 – 46.0 *
0.50 - 5.00	56.0	46.0
5.00 - 30.00	60.0	50.0

NOTE1: The lower limit shall apply at the transition frequencies.
NOTE2: The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.50MHz.

4.3. Configuration of EUT on Measurement

The following equipments are installed on Power Line Conducted Emission Measurement to meet the commission requirement and operating regulations in a manner, which tends to maximize its emission characteristics in a normal application.

4.4. Operating Condition of EUT

4.4.1. Setup the EUT and simulator as shown as Section 4.1.

4.4.2. Turn on the power of all equipment.

4.4.3. Let the EUT work in test mode and measure it.

4.5.DATA SAMPLE

Frequency (MHz)	Quasi Peak Level (dB μ V)	Average Level (dB μ V)	Transducer value (dB)	QuasiPeak Result (dB μ V)	Average Result (dB μ V)	Quasi Peak Limit (dB μ V)	Average Limit (dB μ V)	QuasiPeak Margin (dB)	Average Margin (dB)	Remark (Pass/Fail)
X.XX	29.4	18.3	11.1	40.5	29.4	56.0	56.0	15.5	16.6	Pass

Transducer value = Insertion loss of LISN + Cable Loss

Result = Quasi-peak Level/Average Level + Transducer value

Limit = Limit stated in standard

Calculation Formula:

Margin = Limit – Reading level value – Transducer value

4.6.Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, and LISN.

The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement at ATC is +2.23dB.

4.7.Test Procedure

The EUT is put on the plane 0.8m high above the ground by insulating support and is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC lines are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to ANSI C63.4: 2014 on Conducted Emission Measurement.

The bandwidth of test receiver (R & S ESCS30) is set at 9kHz.

The frequency range from 150kHz to 30MHz is checked.

4.8.Power Line Conducted Emission Measurement Results

PASS.

The frequency range from 150kHz to 30MHz is checked.

Test Mode: Charging(120V/60Hz)							
MEASUREMENT RESULT: "F0207-1_fin"							
2018-3-28 11:17							
Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.356000	22.60	10.9	59	36.2	QP	N	GND
0.448000	24.10	11.0	57	32.8	QP	N	GND
1.704000	22.60	11.2	56	33.4	QP	N	GND
4.645000	19.80	11.4	56	36.2	QP	N	GND
5.230000	20.10	11.4	60	39.9	QP	N	GND
18.510000	22.90	11.7	60	37.1	QP	N	GND
MEASUREMENT RESULT: "F0207-1_fin2"							
2018-3-28 11:17							
Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.150000	25.90	10.8	56	30.1	AV	N	GND
0.774000	19.80	11.1	46	26.2	AV	N	GND
1.800000	19.10	11.2	46	26.9	AV	N	GND
2.140000	14.40	11.3	46	31.6	AV	N	GND
5.230000	9.10	11.4	50	40.9	AV	N	GND
18.510000	8.80	11.7	50	41.2	AV	N	GND
MEASUREMENT RESULT: "F0207-2_fin"							
2018-3-28 11:19							
Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.358000	23.10	10.9	59	35.7	QP	L1	GND
0.452000	25.20	11.0	57	31.6	QP	L1	GND
1.550000	23.40	11.2	56	32.6	QP	L1	GND
4.660000	19.20	11.4	56	36.8	QP	L1	GND
8.350000	20.50	11.5	60	39.5	QP	L1	GND
17.945000	20.10	11.7	60	39.9	QP	L1	GND
MEASUREMENT RESULT: "F0207-2_fin2"							
2018-3-28 11:19							
Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.356000	16.20	10.9	49	32.6	AV	L1	GND
0.776000	20.90	11.1	46	25.1	AV	L1	GND
1.800000	19.10	11.2	46	26.9	AV	L1	GND
2.185000	14.20	11.3	46	31.8	AV	L1	GND
8.335000	11.90	11.5	50	38.1	AV	L1	GND
17.960000	9.20	11.7	50	40.8	AV	L1	GND

Emissions attenuated more than 20 dB below the permissible value are not reported. We tested high and low voltage and recorded the worst mode data.

The spectral diagrams are attached as below.

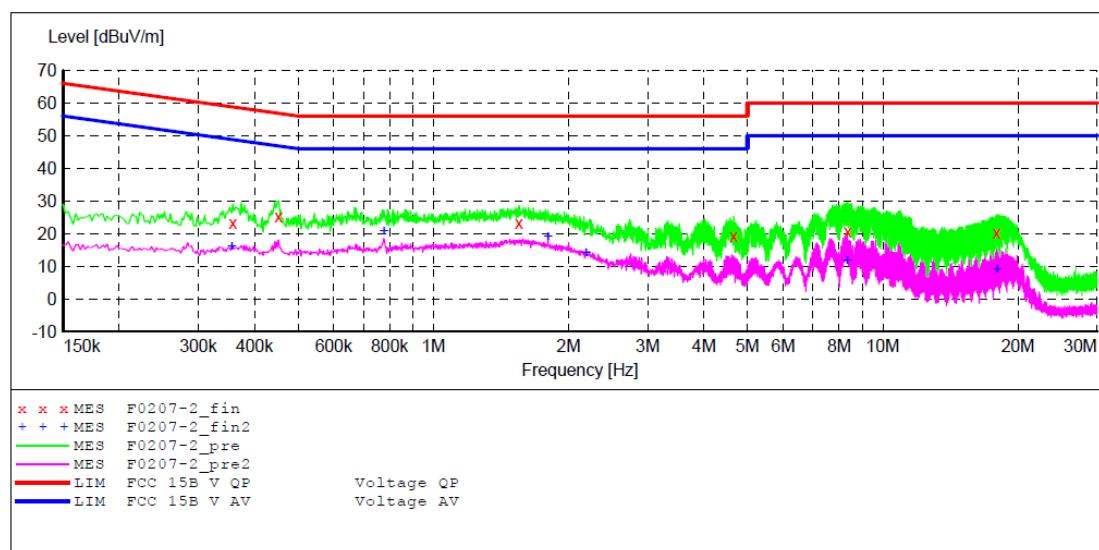
ACCURATE TECHNOLOGY CO., LTD

CONDUCTED EMISSION STANDARD FCC PART 15B

EUT: Air Quality Sensor M/N:WH41
 Manufacturer: Fine Offset Electronics Co.,Ltd
 Operating Condition: CHARGING
 Test Site: 1#Shielding Room
 Operator: Frank
 Test Specification: L 120V/60Hz
 Comment: Report NO.:ATE20180207
 Start of Test: 2018-3-28 / 11:17:54

SCAN TABLE: "V 150K-30MHz fin"

Short Description: SUB STD VTERM2 1.70
 Start Stop Step Detector Meas. IF Transducer
 Frequency Frequency Width Time Bandw.
 150.0 kHz 30.0 MHz 4.5 kHz QuasiPeak 1.0 s 9 kHz NSLK8126 2008
 Average



MEASUREMENT RESULT: "F0207-2_fin"

2018-3-28 11:19

Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.358000	23.10	10.9	59	35.7	QP	L1	GND
0.452000	25.20	11.0	57	31.6	QP	L1	GND
1.550000	23.40	11.2	56	32.6	QP	L1	GND
4.660000	19.20	11.4	56	36.8	QP	L1	GND
8.350000	20.50	11.5	60	39.5	QP	L1	GND
17.945000	20.10	11.7	60	39.9	QP	L1	GND

MEASUREMENT RESULT: "F0207-2_fin2"

2018-3-28 11:19

Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.356000	16.20	10.9	49	32.6	AV	L1	GND
0.776000	20.90	11.1	46	25.1	AV	L1	GND
1.800000	19.10	11.2	46	26.9	AV	L1	GND
2.185000	14.20	11.3	46	31.8	AV	L1	GND
8.335000	11.90	11.5	50	38.1	AV	L1	GND
17.960000	9.20	11.7	50	40.8	AV	L1	GND

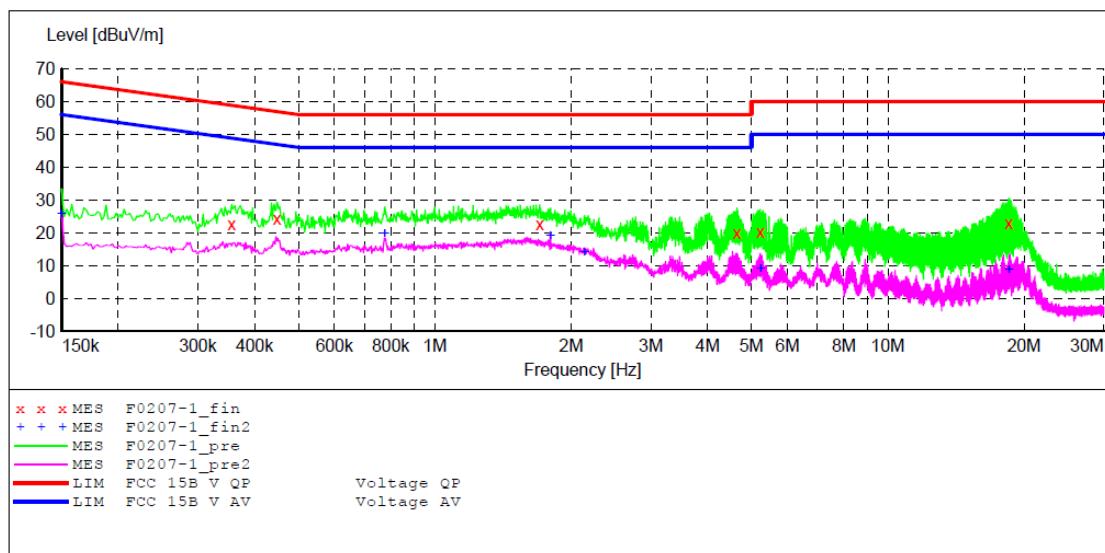
ACCURATE TECHNOLOGY CO., LTD

CONDUCTED EMISSION STANDARD FCC PART 15B

EUT: Air Quality Sensor M/N:WH41
 Manufacturer: Fine Offset Electronics Co.,Ltd
 Operating Condition: CHARGING
 Test Site: 1#Shielding Room
 Operator: Frank
 Test Specification: N 120V/60Hz
 Comment: Report NO.:ATE20180207
 Start of Test: 2018-3-28 / 11:15:51

SCAN TABLE: "V 150K-30MHz fin"

Short Description: SUB STD VTERM2 1.70
 Start Stop Step Detector Meas. IF Transducer
 Frequency Frequency Width Time Bandw.
 150.0 kHz 30.0 MHz 4.5 kHz QuasiPeak 1.0 s 9 kHz NSLK8126 2008
 Average



MEASUREMENT RESULT: "F0207-1_fin"

2018-3-28 11:17

Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.356000	22.60	10.9	59	36.2	QP	N	GND
0.448000	24.10	11.0	57	32.8	QP	N	GND
1.704000	22.60	11.2	56	33.4	QP	N	GND
4.645000	19.80	11.4	56	36.2	QP	N	GND
5.230000	20.10	11.4	60	39.9	QP	N	GND
18.510000	22.90	11.7	60	37.1	QP	N	GND

MEASUREMENT RESULT: "F0207-1_fin2"

2018-3-28 11:17

Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.150000	25.90	10.8	56	30.1	AV	N	GND
0.774000	19.80	11.1	46	26.2	AV	N	GND
1.800000	19.10	11.2	46	26.9	AV	N	GND
2.140000	14.40	11.3	46	31.6	AV	N	GND
5.230000	9.10	11.4	50	40.9	AV	N	GND
18.510000	8.80	11.7	50	41.2	AV	N	GND

5. THE FIELD STRENGTH OF RADIATION EMISSION

5.1. Block Diagram of Test Setup

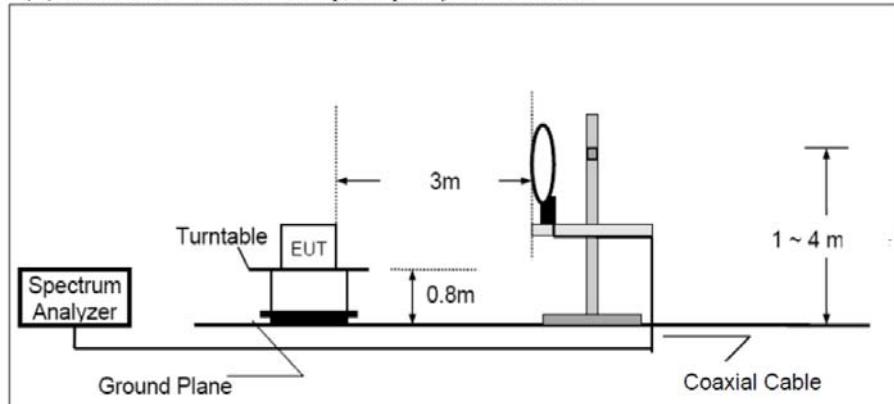
5.1.1. Block diagram of connection between the EUT and simulators



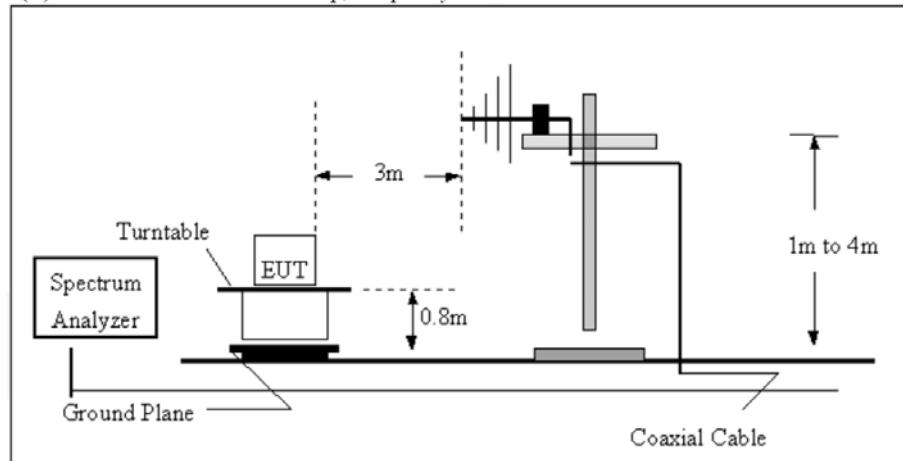
(EUT: Air Quality Sensor)

5.1.2. Semi-Anechoic Chamber Test Setup Diagram

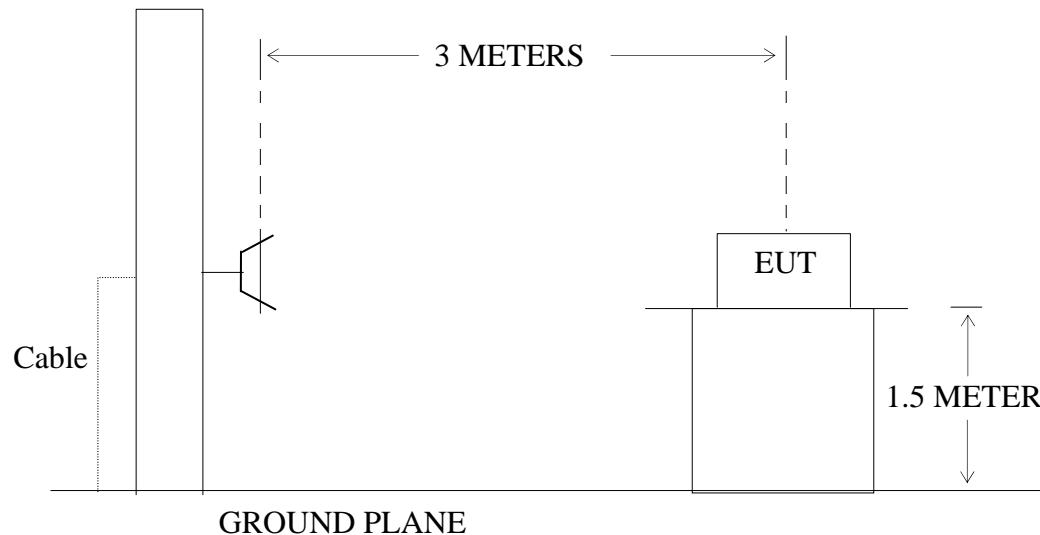
(A) Radiated Emission Test Set-Up, Frequency below 30MHz



(B) Radiated Emission Test Set-Up, Frequency 30-1000MHz



(C) Radiated Emission Test Set-Up, Frequency above 1GHz



(EUT: Air Quality Sensor)

5.2. The Field Strength of Radiation Emission Measurement Limits

5.2.1. Radiation Emission Measurement Limits According to FCC Part 15 Section 15.231(e)

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emission (microvolts/meter)
40.66–40.70.	1,000	100
70–130	500	50
130–174	500 to 1,500 ¹	50 to 150 ¹
174–260	1,500	150
260–470	1,500 to 5,000 ¹	150 to 500 ¹
Above 470	5,000	500

¹ Linear interpolations.

5.2.2. Restricted Band Radiation Emission Measurement Limits According to FCC part 15 Section 15.205 and Section15.209.

5.3. Configuration of EUT on Measurement

The following equipment is installed on Radiated Emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

5.4. Operating Condition of EUT

5.4.1. Setup the EUT and simulator as shown as Section 5.1.

5.4.2. Turn on the power of all equipment.

5.4.3. Let the EUT work in TX mode measure it.

5.5. Test Procedure

The EUT and its simulators are placed on a turntable, which is 0.8 meter high above ground(Below 1GHz). The EUT and its simulators are placed on a turntable, which is 1.5 meter high above ground(Above 1GHz). The turntable can rotate 360 degrees to determine the position of the maximum emission level. EUT is set 3.0 meters away from the receiving antenna, which is mounted on an antenna tower. The antenna can be moved up and down between 1.0 meter and 4 meters to find out the maximum emission level. Broadband antenna (calibrated bi-log antenna) is used as receiving antenna. Both horizontal and vertical polarizations of the antenna are set on measurement. In order to find the maximum emission levels, all of the EUT location must be manipulated according to ANSI C63.10:2013 on radiated emission measurement. The EUT was tested in 3 orthogonal planes.

The bandwidth of test receiver is set at 120 kHz in 30-1000 MHz, and 1 MHz in 1000-5000 MHz.

The frequency range from 9 kHz to 5000 MHz is checked.

The test frequency is from 9KHz to 5000 MHz, The radiation emission from 9KHz-30MHz is not reported, because the levels are too low against the limit.

5.6.The Field Strength of Radiation Emission Measurement Results
PASS.

Date of Test:	Mar. 24-31, 2018	Temperature:	25°C
EUT:	Air Quality Sensor	Humidity:	50%
Model No.:	WH41	Power Supply:	DC 3V
Test Mode:	TX	Test Engineer:	Frank

Frequency (MHz)	Reading (dB μ V/m)	Factor Corr.	Average Factor	Result(dB μ V/m)		Limit(dB μ V/m)		Margin(dB)		Polarization
				PEAK	(dB)	AV	PEAK	AV	PEAK	
433.92	95.38	-13.51	-26.52	55.35	81.87	72.87	92.87	17.52	11.00	Horizontal
867.85	45.50	-5.01	-26.52	/	40.49	52.87	72.87	/	32.38	
3037.45	52.23	-6.12	-26.52	/	46.11	52.87	72.87	/	26.76	
433.92	105.12	-13.51	-26.52	65.09	91.61	72.87	92.87	7.78	1.26	Vertical
867.85	45.53	-5.01	-26.52	/	40.52	52.87	72.87	/	37.61	
3037.45	51.80	-6.12	-26.52	/	45.68	52.87	72.87	/	27.19	

Note:

1. Emissions attenuated more than 20 dB below the permissible value are not reported.
2. “/” indicates that this value is less than the limit, and does not have to be recorded.
3. The field strength is calculated by adding the antenna factor, high pass filter loss(if used) and cable loss, and subtracting the amplifier gain(if any)from the measured reading. The basic equation calculation is as follows:

Result = Reading + Corrected Factor

Where Corrected Factor = Antenna Factor + Cable Loss + High Pass Filter Loss – Amplifier Gain

4. FCC Limit for Average Measurement = $16.67 * (433.92) - 2833.33 = 4400.1164 \mu\text{V/m} = 72.87 \text{ dB}\mu\text{V/m}$
5. The spectral diagrams in appendix I display the measurement of peak values.
6. Average value= PK value + Average Factor (duty factor)
7. If the peak-detected amplitude can be shown to comply with the average limit, then it is not necessary to perform a separate average measurement.
8. The EUT is tested radiation emission in three axes(X,Y,Z). The worst emissions are reported in three axes.
9. Pulse Desensitization Correction Factor

Pulse Width (PW) = 4.7ms;

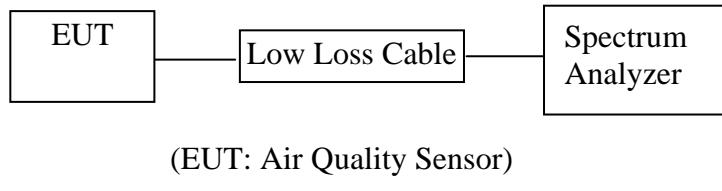
$2/\text{PW} = 2/4.7\text{ms} = 0.4\text{kHz}$;

RBW (100 kHz) > 2/PW (0.4 kHz),

Therefore PDCF is not needed

6. 20DB OCCUPIED BANDWIDTH

6.1. Block Diagram of Test Setup



6.2. The Bandwidth of Emission Limit According To FCC Part 15 Section

15.231(c)

The bandwidth of emission shall be no wider than 0.25% of the center frequency. Therefore, the bandwidth of the emission limit is $433.92 \text{ MHz} \times 0.25\% = 1084.8 \text{ kHz}$. Bandwidth is determined at the two points 20 dB down from the top of modulated carrier.

6.3. EUT Configuration on Measurement

The following equipment are installed on the bandwidth of emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

6.4. Operating Condition of EUT

6.4.1. Setup the EUT and simulator as shown as Section 6.1.

6.4.2. Turn on the power of all equipment.

6.4.3. Let the EUT work in TX mode measure it.

6.5. Test Procedure

6.5.1. Set SPA Center Frequency = Fundamental frequency, RBW = 10 kHz, VBW = 30 kHz, Span = 1MHz.

6.5.2. Set SPA Max hold, Mark peak, -20 dB.

6.6.Measurement Result

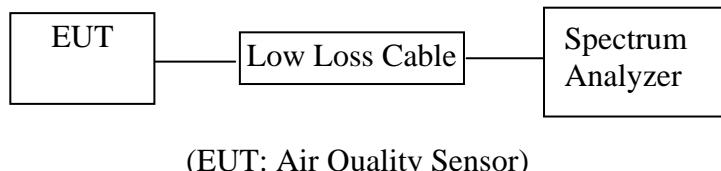
The EUT does meet the FCC requirement.

-20 dB bandwidth = 118 kHz < 433.92MHz * 0.25% = 1084.8KHz.

The spectral diagrams in appendix I.

7. RELEASE TIME MEASUREMENT

7.1. Block Diagram of Test Setup



(EUT: Air Quality Sensor)

7.2. Release Time Measurement According To FCC Part 15 Section 15.231(e)

Section 15.231(e) devices operated under the provisions of this paragraph shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.

7.3. EUT Configuration on Measurement

The following equipment are installed on Release Time Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

7.4. Operating Condition of EUT

- 7.4.1. Setup the EUT and simulator as shown as Section 7.1.
- 7.4.2. Turn on the power of all equipment.
- 7.4.3. Let the EUT work in TX mode measure it.

7.5. Test Procedure

- 7.5.1. Set SPA Center Frequency = Fundamental frequency, RBW = 100 kHz, VBW = 300 kHz, Span = 0 Hz.
- 7.5.2. Set EUT as normal operation.
- 7.5.3. Set SPA View. Delta Mark time.

7.6. Measurement Result

Test result: pass

Period Time = 60.12s

Duration time = 0.0047s

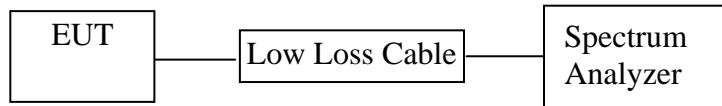
Silent time = $60.12 - 0.0047s = 60.1 > 10s$

Silent time = $60.1s > 30 * 0.0047s = 0.141s$

The spectral diagrams in appendix I.

8. AVERAGE FACTOR MEASUREMENT

8.1. Block Diagram of Test Setup



(EUT: Air Quality Sensor)

8.2. Average factor Measurement according to ANSI C63.10-2013

ANSI C63.10-2013 Section 7.5 Unless otherwise specified, when the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 s (100 ms). In cases where the pulse train exceeds 0.1 s, the measured field strength shall be determined during a 0.1 s interval.⁶⁴ The following procedure is an example of how the average value may be determined. The average field strength may be found by measuring the peak pulse amplitude (in log equivalent units) and determining the duty cycle correction factor (in dB) associated with the pulse modulation as shown in Equation (10):

$$\text{Average factor in dB} = 20 \log (\text{duty cycle})$$

8.3. EUT Configuration on Measurement

The following equipment are installed on average factor Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

8.4. Operating Condition of EUT

8.4.1. Setup the EUT and simulator as shown as Section 8.1.

8.4.2. Turn on the power of all equipment.

8.4.3. Let the EUT work in TX mode measure it.

8.5. Test Procedure

8.5.1. The time period over which the duty cycle is measured is 100 milliseconds, or the repetition cycle, whichever is a shorter time frame. The worst case (highest percentage on) duty cycle is used for the calculation.

8.5.2. Set SPA Center Frequency = Fundamental frequency, RBW = 100 kHz, VBW = 300 kHz, Span = 0 Hz.

8.5.3. Set EUT as normal operation.

8.5.4. Set SPA View. Delta Mark time.

8.6. Measurement Result

The duty cycle is simply the on time divided by the period:

Effective period of the cycle = 4.719 ms

DC = $4.719\text{ms}/100\text{ms} = 0.04719\%$

Therefore, the average factor is found by $20\log 0.04719 = -26.52\text{dB}$

The spectral diagrams in appendix I.

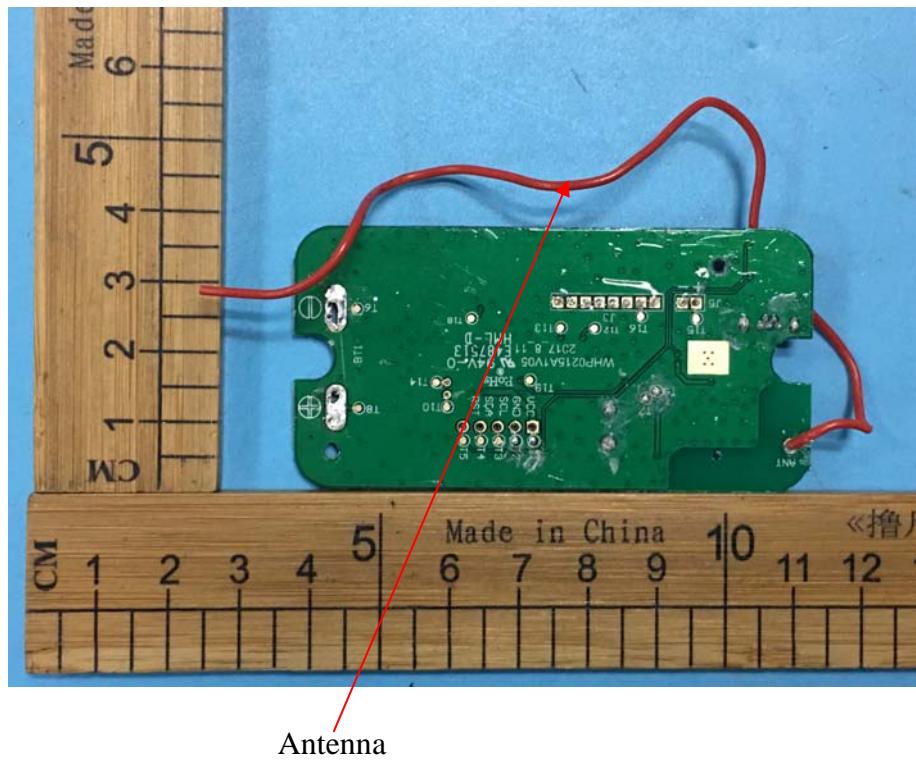
9. ANTENNA REQUIREMENT

9.1. The Requirement

According to Section 15.203, 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.

9.2. Antenna Construction

Device is equipped with permanent attached antenna, which isn't displaced by other antenna. The Max Antenna gain of EUT is 2.15dBi. Therefore, the equipment complies with the antenna requirement of Section 15.203.



APPENDIX I

(Test Curves)



ACCURATE TECHNOLOGY CO., LTD.

F1,Bldg,A,Changyuan New Material Port Keyuan Rd,
Science & Industry Park,Nanshan Shenzhen,P.R.China

Site: 1# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

Job No.: frank2018 #292

Polarization: Horizontal

Standard: FCC 15.231(e) 3M Radiated

Power Source: DC 3V

Test item: Radiation Test

Date: 18/03/30/

Temp.(C)/Hum.(%) 25 C / 55 %

Time: 10/02/03

EUT: Air Quality Sensor

Engineer Signature:

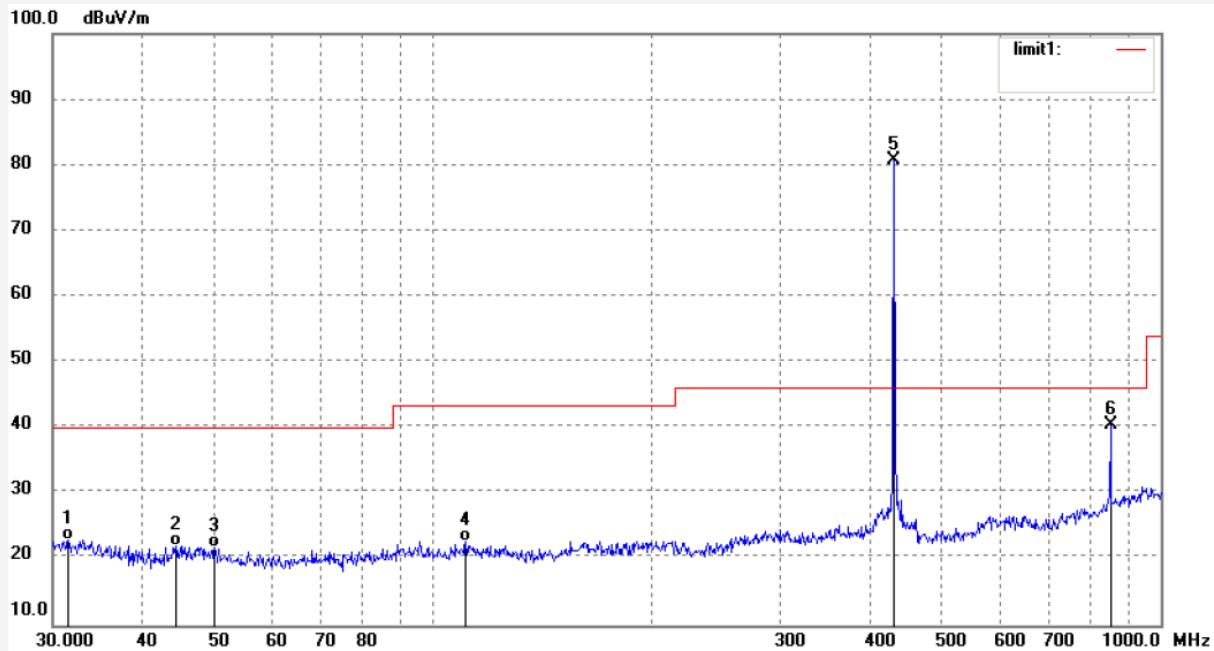
Mode: 433.92MHz TX

Distance: 3m

Model: WH41

Manufacturer: Fine Offset Electronics Co.,Ltd

Note: Report NO.:ATE20180207



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	31.5125	40.01	-17.01	23.00	40.00	-17.00	QP	200	132	
2	44.3098	41.42	-19.35	22.07	40.00	-17.93	QP	200	96	
3	50.1079	42.54	-20.73	21.81	40.00	-18.19	QP	200	165	
4	110.8580	43.90	-21.08	22.82	43.50	-20.68	QP	200	102	
5	433.9252	95.38	-13.51	81.87			peak	200	119	
6	867.8545	45.50	-5.01	40.49			peak	200	321	



ACCURATE TECHNOLOGY CO., LTD.

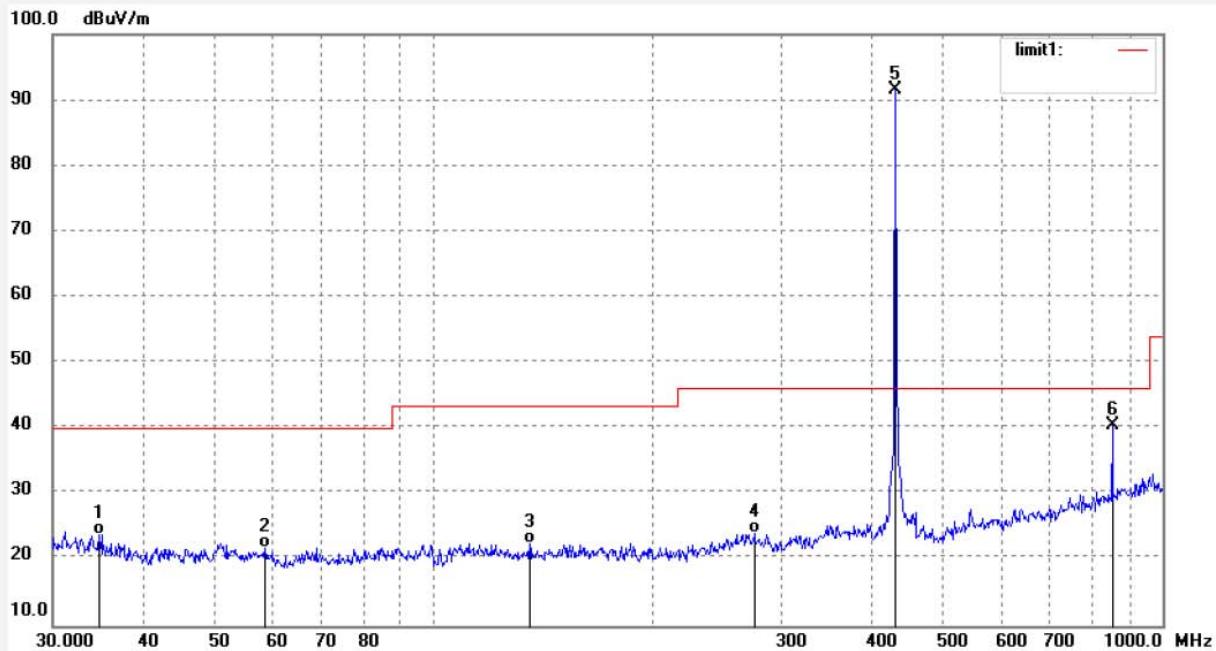
F1,Bldg,A,Changyuan New Material Port Keyuan Rd,
Science & Industry Park,Nanshan Shenzhen,P.R.China

Site: 1# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

Job No.: frank2018 #291
Standard: FCC 15.231(e) 3M Radiated
Test item: Radiation Test
Temp. (C)/Hum.(%) 25 C / 55 %
EUT: Air Quality Sensor
Mode: 433.92MHz TX
Model: WH41
Manufacturer: Fine Offset Electronics Co.,Ltd

Polarization: Vertical
Power Source: DC 3V
Date: 18/03/30/
Time: 10/01/40
Engineer Signature:
Distance: 3m

Note: Report NO.:ATE20180207



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	34.7704	41.42	-17.47	23.95	40.00	-16.05	QP	100	102	
2	58.6912	44.43	-22.55	21.88	40.00	-18.12	QP	100	268	
3	135.4395	44.47	-21.94	22.53	43.50	-20.97	QP	100	218	
4	275.4123	40.97	-16.96	24.01	46.00	-21.99	QP	100	132	
5	433.9252	105.12	-13.51	91.61			peak	100	121	
6	867.8545	45.53	-5.01	40.52			peak	100	318	



ACCURATE TECHNOLOGY CO., LTD.

F1,Bldg,A,Changyuan New Material Port Keyuan Rd,
Science & Industry Park,Nanshan,Shenzhen,P.R.China

Site: 1# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

Job No.: frank2018 #365

Polarization: Horizontal

Standard: FCC PK

Power Source: DC 3V

Test item: Radiation Test

Date: 18/03/30/

Temp. (C)/Hum.(%) 25 C / 55 %

Time: 9/50/58

EUT: Air Quality Sensor

Engineer Signature:

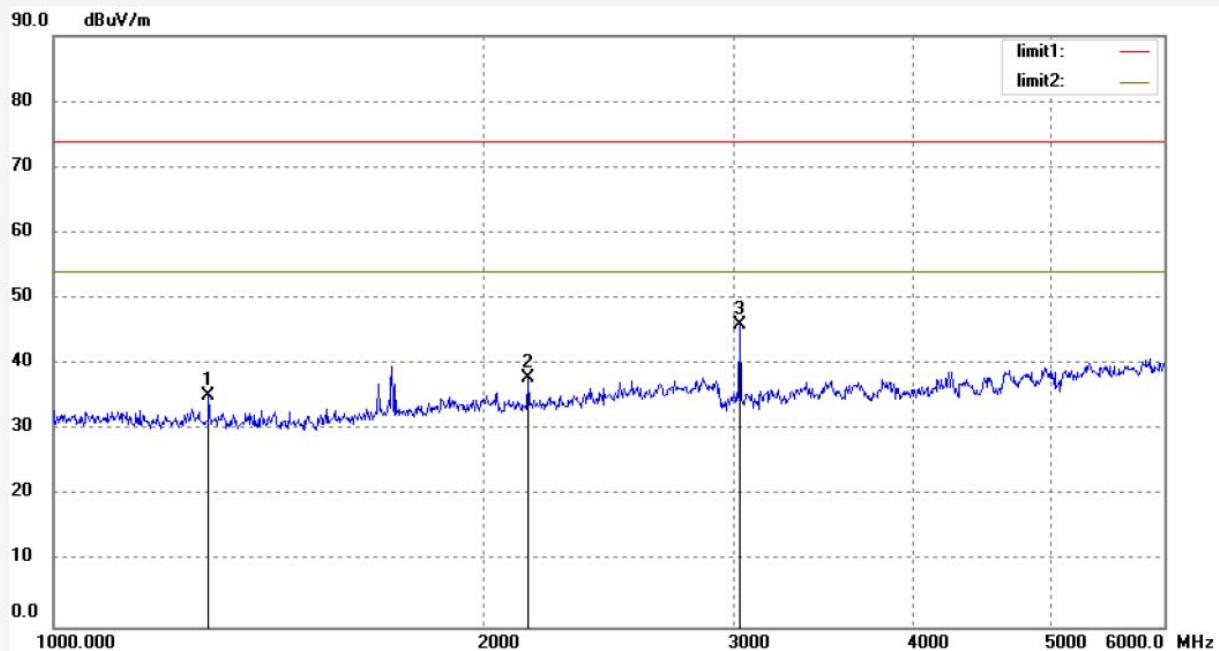
Mode: 433.92MHz TX

Distance: 3m

Model: WH41

Manufacturer: Fine Offset Electronics Co.,Ltd

Note: Report NO.:ATE20180207



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	1301.762	47.17	-11.93	35.24	72.87	-37.63	peak	150	287	
2	2169.647	46.65	-8.63	38.02	72.87	-34.85	peak	150	225	
3	3037.446	52.23	-6.12	46.11	72.87	-26.76	peak	150	292	



ACCURATE TECHNOLOGY CO., LTD.

F1,Bldg,A,Changyuan New Material Port Keyuan Rd,
Science & Industry Park,Nanshan Shenzhen,P.R.China

Site: 1# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

Job No.: frank2018 #364

Polarization: Vertical

Standard: FCC PK

Power Source: DC 3V

Test item: Radiation Test

Date: 18/03/30/

Temp.(C)/Hum.(%) 25 C / 55 %

Time: 9/46/15

EUT: Air Quality Sensor

Engineer Signature:

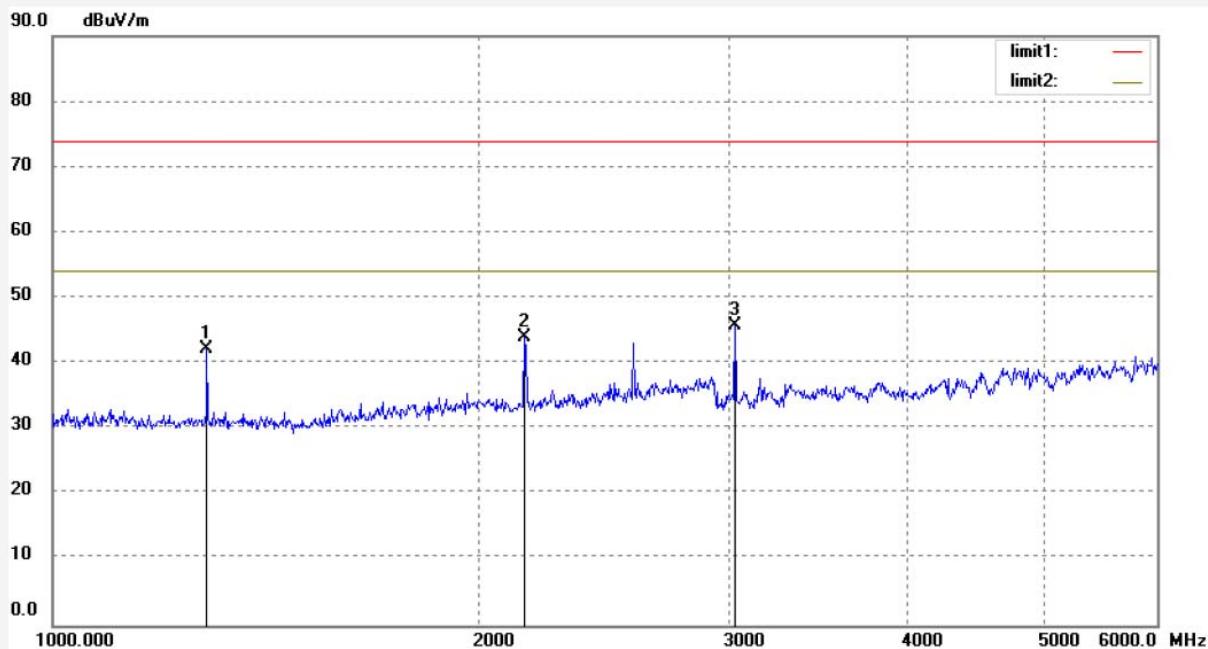
Mode: 433.92MHz TX

Distance: 3m

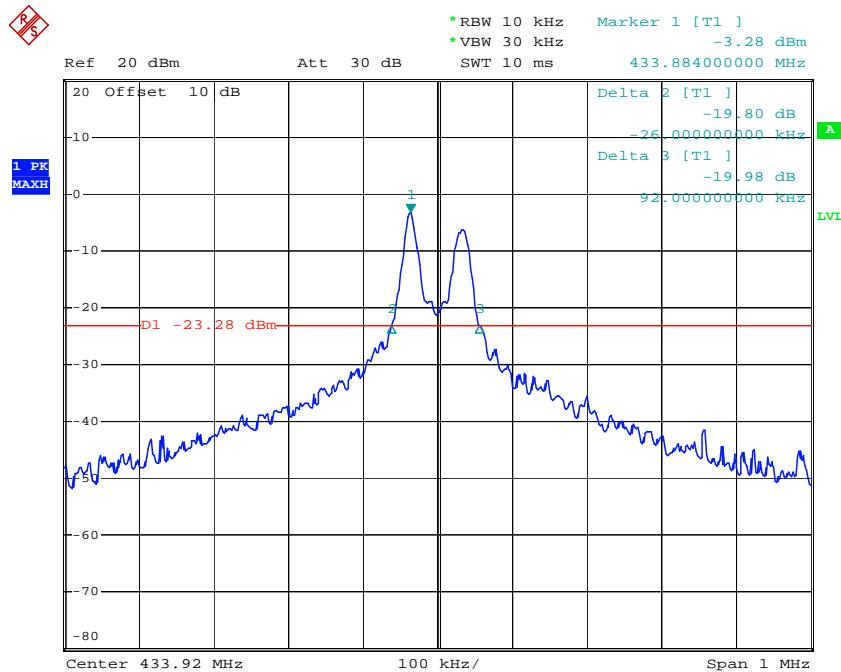
Model: WH41

Manufacturer: Fine Offset Electronics Co.,Ltd

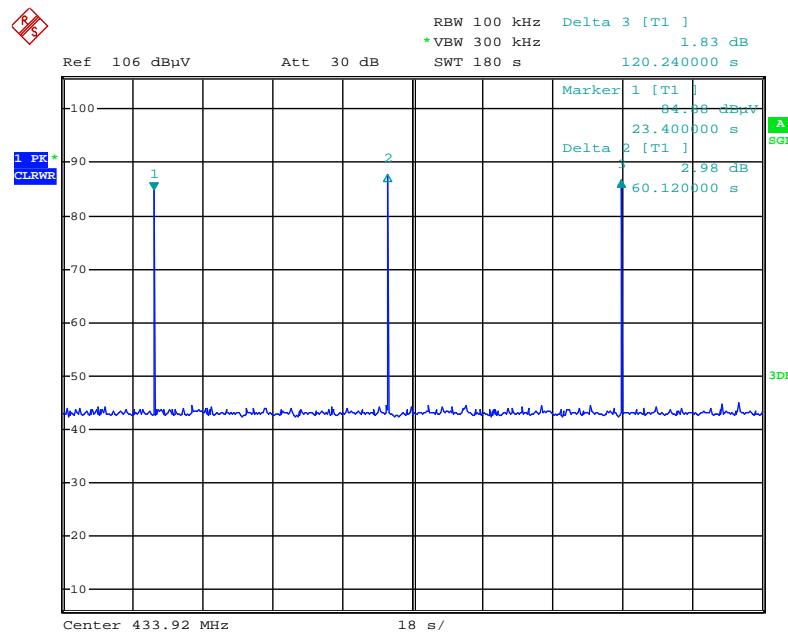
Note: Report NO.:ATE20180207



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	1301.762	54.08	-11.93	42.15	72.87	-30.72	peak	150	118	
2	2169.647	52.51	-8.63	43.88	72.87	-28.99	peak	150	321	
3	3037.446	51.80	-6.12	45.68	72.87	-27.19	peak	150	212	

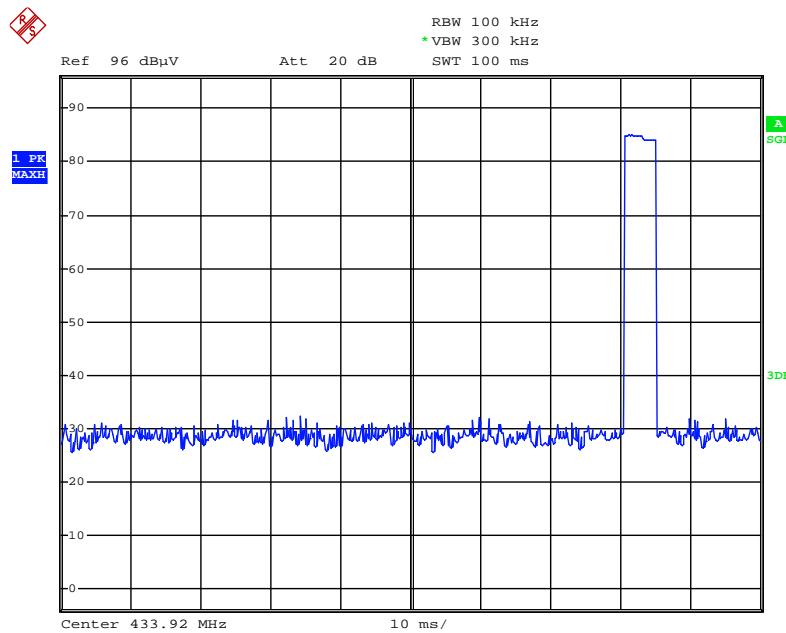


Comment A:
Date: 27.MAR.2018 18:29:43

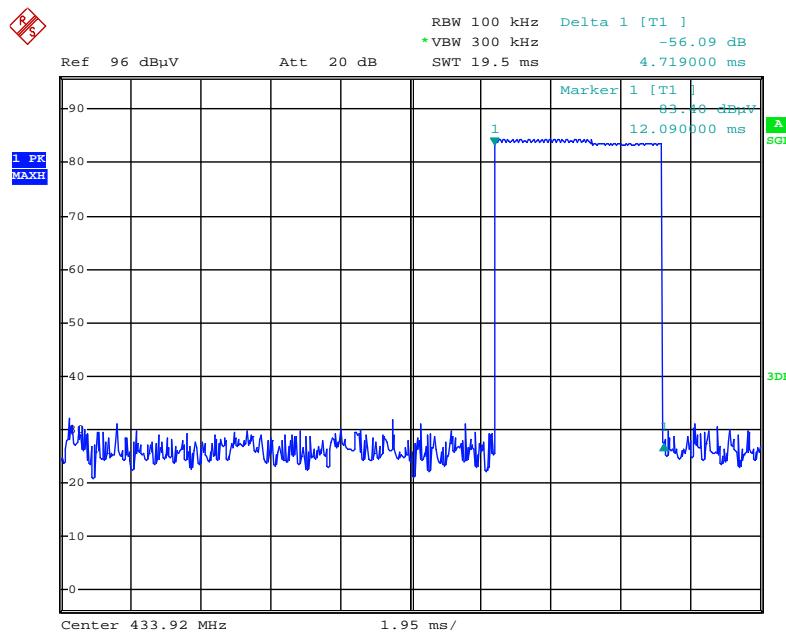


Date: 31.MAR.2018 09:59:29

The period between transmissions =60.12s



Date: 27.MAR.2018 15:43:41



Date: 27.MAR.2018 15:43:11

The graph shows the duration of 'on' signal. From marker 1 to Delta 1, duration is 4.719ms.