China

FCC - TEST REPORT

Report Number	:	60.790.22.017.01R01	Date of Issue	:	May 24, 2022
Model	:	AOLD-2065A			
Product Type	:	RC Weather Station with Colorful Display (Transmitter Unit)			
Applicant	:	AOK ELECTRONIC LIMITED			
Address	:	Tianxin Industrial District, Dahou Village, Xiegang Town, Dongguan City, Guangdong Province, China			
Production Facility	:	AOLD ELECTRONIC LIMITED			
Address	:	Tianxin Industrial District, Dahou Village, Xiegang Town 523599 Dongguan City, Guangdong Province PEOPLE'S REPUBLIC OF CHINA			
Test Result	:	n Positive	o Negative		
Total pages including Appendices	:	24			

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1 Table of Contents

2 Description of Equipment Under Test

Description of the Equipment Under Test

Product:	RC Weather Station with Colorful Display (Transmitter Unit)
Model no.:	AOLD-2065A
FCC ID:	2AJOATX2065A
Rating:	3 VDC (2 x 1.5V AAA battery)
Frequency:	433.920MHz
Antenna gain:	0 dBi
Number of operated channel:	1
Modulation:	ASK

Auxiliary Equipment Used during Test:

DESCRIPTION	MANUFACTURER	MODEL NO.(SHIELD)	S/N(LENGTH)
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3 Summary of Test Standards

Test Standards
FCC Part 15 Subpart C 10-1-20 Edition Federal Communications Commission, PART 15 — Radio Frequency Devices, Subpart C — Unintentional Radiators

4 Details about the Test Laboratory

Site 1

Company name: TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch
Building 12&13 Zhiheng Wisdomland Business Park,
Nantou Checkpoint Road 2,
Shenzhen 518052, P.R.China
FCC Registration Number: 514049

Emission Tests	
Test Item	Test Site
FCC Part 15 Subpart C	
FCC Title 47 Part 15.205, 15.209 & 15.231(e) Radiated Emission	Site1
FCC Title 47 Part 15.207 Conduct Emission	NIL
FCC Title 47 Part 15.231(c) 20dB Bandwidth	Site 1
FCC Title 47 Part 15.231(e) Transmission Time	Site 1

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4.1 Test Equipment Site List

Radiated emission Test – Site 1

DESCRIPTION	MANUFACTURER	MODEL NO.	EQUIPMENT ID	SERIAL NO.	CAL. DUE DATE
EMI Test Receiver	Rohde & Schwarz	ESR 26	68-4-74-14-002	101269	2022-6-4
Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9162	68-4-80-19-003	284	2023-2-2
Wave Guide Antenna	ETS	3117	68-4-80-19-001	00218954	2023-5-24
Pre-amplifier	Rohde & Schwarz	SCU 18F	68-4-29-19-001	100745	2022-10-25
Pre-amplifier	Rohde & Schwarz	SCU 08F2	68-4-29-19-004	08400018	2022-10-25
Sideband Horn Antenna	Q-PAR	QWH-SL-18-40-K-SG	68-4-80-14-008	12827	2022-8-5
Pre-amplifier	Rohde & Schwarz	SCU 40A	68-4-29-14-002	100432	2022-7-30
3m Semi-anechoic chamber	TDK	9X6X6	68-4-90-19-006	----	2022-12-29
Test software	Rohde & Schwarz	EMC32	68-4-90-19-006-A01	Version10.35.02	N/A

Conducted Emission Test – Site 1

DESCRIPTION	MANUFACTURER	MODEL NO.	EQUIPMENT ID	SERIAL NO.	CAL. DUE DATE
EMI Test Receiver	Rohde & Schwarz	ESR 3	68-4-74-14-001	101782	2022-6-4
LISN	Rohde & Schwarz	ENV4200	68-4-87-14-001	100249	2022-6-5
LISN	Rohde & Schwarz	ENV432	68-4-87-16-001	101318	2022-6-5
LISN	Rohde & Schwarz	ENV216	68-4-87-14-002	100326	2022-6-5
ISN	Rohde & Schwarz	ENY81	68-4-87-14-003	100177	2022-6-5
ISN	Rohde & Schwarz	ENY81-CA6	68-4-87-14-004	101664	2022-6-5
High Voltage Probe	Schwarzbeck	TK9420(VT9420)	68-4-27-14-001	9420-584	2022-6-5
RF Current Probe	Rohde & Schwarz	EZ-17	68-4-27-14-002	100816	2022-6-5
Attenuator	Shanghai Huaxiang	TS2-26-3	68-4-81-16-003	080928189	2022-6-3
Test software	Rohde & Schwarz	EMC32	68-4-90-14-003-A10	Version9.15.00	N/A
Shielding Room	TDK	CSR #1	68-4-90-19-004	----	2022-11-07

20dB Bandwidth, Transmission Time – Site 1

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
Signal Analyzer	Rohde & Schwarz	FSV40	101030	2022-6-3

4.2 Measurement System Uncertainty

Measurement System Uncertainty Emissions

System Measurement Uncertainty	
Items	**Extended Uncertainty**
Uncertainty for Radiated Emission in 3m chamber 9kHz-30MHz	4.76dB
Uncertainty for Radiated Emission in 3m chamber 30MHz-1000MHz	Horizontal: 4.63dB; Vertical: 4.61dB;
Uncertainty for Radiated Emission in 3m chamber 1000MHz-25000MHz	Horizontal: 4.65dB; Vertical: 4.64dB;
Uncertainty for Conducted Emission 150kHz-30MHz	3.21dB
Uncertainty for Conducted RF test	2.13dB
Uncertainty for Frequency RF test	0.6×10-7

Measurement Uncertainty Decision Rule

Determination of conformity with the specification limits is based on the decision rule according to IEC Guide 115: 2007, clause 4.4.3 and 4.5.1.

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5 Summary of Test Results

Emission Tests				
FCC Part 15 Subpart C				
Test Condition	Pages	Test Result		
		Pass	Fail	N/A
FCC Title 47 Part 15.205, 15.209 & 15.231(e) Radiated Emission	12-15	☒	☐	☐
FCC Title 47 Part 15.207 Conduct Emission (1)	NIL	☐	☐	☒
FCC Title 47 Part 15.231(c) 20dB Bandwidth	16	☒	☐	☐
FCC Title 47 Part 15.231(e) Transmission Time	17-18	☒	☐	☐

Remark:
1) Conducted Emission testing is not applicable for battery operated device.

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6 General Remarks

Remarks

This submittal(s) (test report) is intended for **FCC ID: 2AJOATX2065A**, complies with Section 15.205, 15.207, 15.209, 15.231 of the FCC Part 15, Subpart C rules.

The TX frequency is 433.92MHz.

SUMMARY:

- All tests according to the regulations cited on page 8 were

n - Performed

o - **Not** Performed

- The Equipment Under Test

n - **Fulfills** the general approval requirements.

o - **Does not** fulfill the general approval requirements.

Sample Received Date:	April 26, 2022
Testing Start Date:	April 26, 2022
Testing End Date:	May 20, 2022

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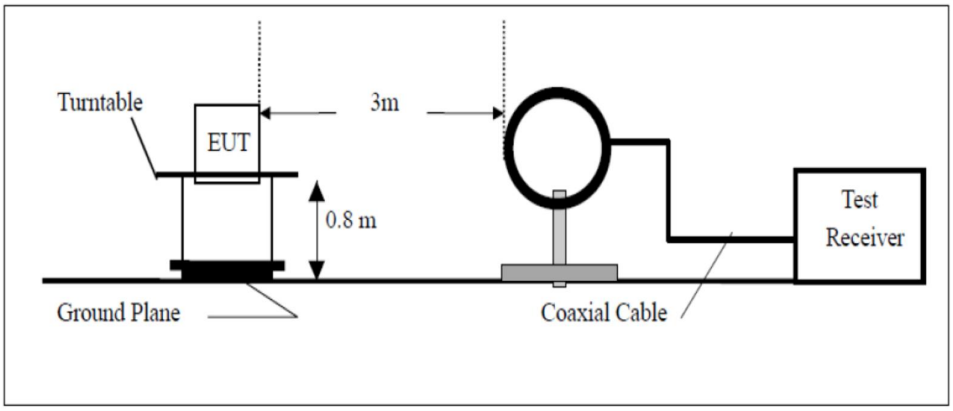
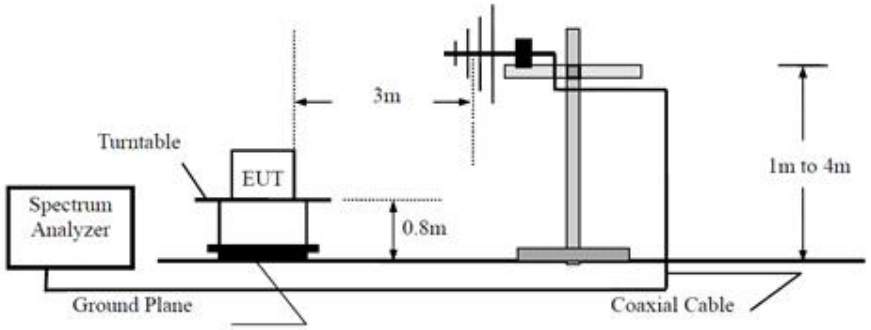
Reviewed by:	Prepared by:	Tested by:
Eric LI	Hosea CHAN	Louise Liu
EMC Project Manager	EMC Project Engineer	EMC Test Engineer

7 Test Setups

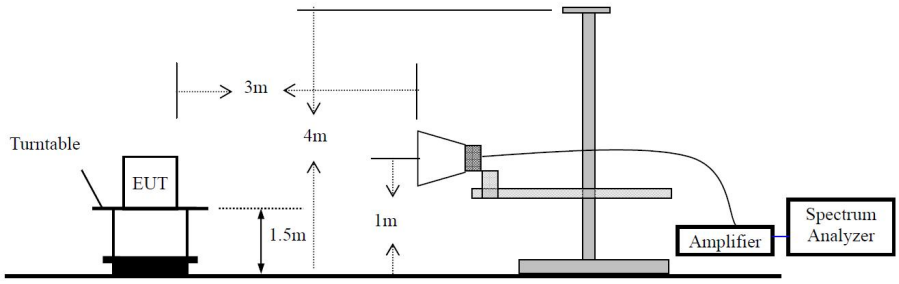
7.1 Radiated test setups 9kHz-30MHz



7.2 Radiated test setups Below 1GHz



7.3 Radiated test setups Above 1GHz



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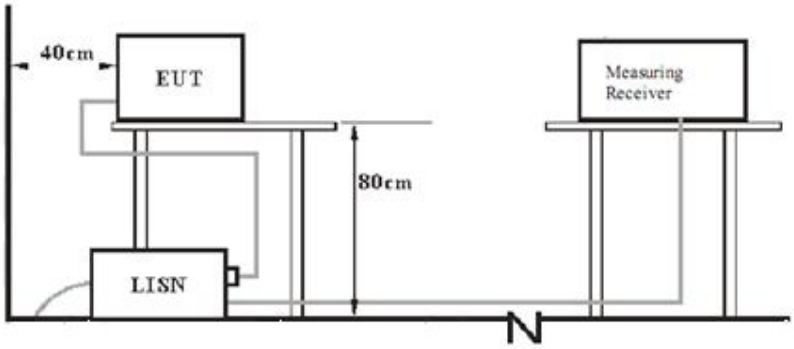
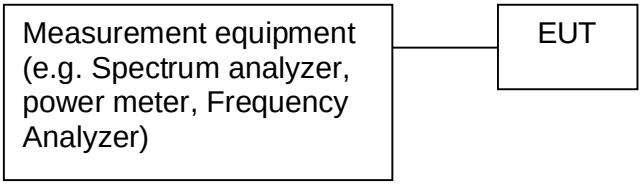
7.4 AC Power Line Conducted Emission test setups



7.5 Conducted RF test setups



8 Emission Test Results

8.1 Spurious Radiated Emission

EUT: AOLD-2065A
Op Condition: Operated, TX Mode (433.92MHz)
Test Specification: FCC15.205, 15.209 & 15.231(e) Antenna: Horizontal
Comment: 3 VDC
Remark: 9kHz to 5GHz

Test Result
☒ Passed
☐ Not Passed

Frequency MHz	Result dBµV/m	Limit dBµV/m	Margin dB	Detector PK/QP/AV	Corr. (dB)	RSE. or Fund.
51.555556	23.62	40.00	16.38	Peak	20.79	RSE
101.456667	20.54	43.50	22.96	Peak	18.58	RSE
278.643333	23.53	46.00	22.47	Peak	20.33	RSE
433.9200	**75.09**	**92.86**	**17.77**	**Peak**	**24.14**	**Fund**
598.851111	32.51	46.00	13.49	Peak	27.48	RSE
867.864444	47.85	72.86	25.01	Peak	31.26	RSE
1302.000000	37.00	72.86	35.86	Peak	-11.51	RSE
1736.000000	42.68	72.86	30.18	Peak	-8.80	RSE
2170.000000	44.83	72.86	28.03	Peak	-6.34	RSE
2603.500000	46.57	72.86	26.29	Peak	-3.94	RSE

Frequency MHz	PK Result @3m dBµV/m	Duty Cycle Factor dB	AV Result @3m dBµV/m	Limit dBµV/m	Margin dB
433.9200	**75.09**	**-11.15**	**63.94**	**74.86**	**10.92**

Remarks:
According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in above table if the peak value complies with average limit.

Average value = Peak value + Duty cycle factor

Spurious Radiated Emission

EUT: AOLD-2065A
Op Condition: Operated, TX Mode (433.92MHz)
Test Specification: FCC15.205, 15.209 & 15.231(e) Antenna: Vertical
Comment: 3 VDC
Remark: 9kHz to 5GHz

Test Result
☒ Passed
☐ Not Passed

Frequency MHz	Result dBµV/m	Limit dBµV/m	Margin dB	Detector PK/QP/AV	Corr. (dB)	RSE. or Fund.
105.356875	18.95	43.50	24.55	Peak	19.20	RSE
196.173125	19.18	43.50	24.32	Peak	19.36	RSE
433.9200	**66.10**	**92.86**	**17.77**	**Peak**	**24.14**	**Fund**
867.864444	37.85	72.86	35.01	Peak	31.26	RSE
1302.000000	54.29	72.86	18.57	Peak	-11.51	RSE
1735.500000	46.85	72.86	26.01	Peak	-8.79	RSE
2170.000000	46.14	72.86	26.72	Peak	-6.34	RSE
2603.500000	54.27	72.86	18.59	Peak	-3.94	RSE
4773.500000	49.47	72.86	23.39	Peak	3.67	RSE

Frequency MHz	PK Result @3m dBµV/m	Duty Cycle Factor dB	AV Result @3m dBµV/m	Limit dBµV/m	Margin dB
433.9200	**66.10**	**-11.15**	**54.95**	**72.86**	**18.01**
1302.000000	54.29	-11.15	43.14	52.86	9.72
2603.500000	54.27	-11.15	42.12	52.86	9.74

Remarks:

According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in above table if the peak value complies with average limit.

Average value = Peak value + Duty cycle factor

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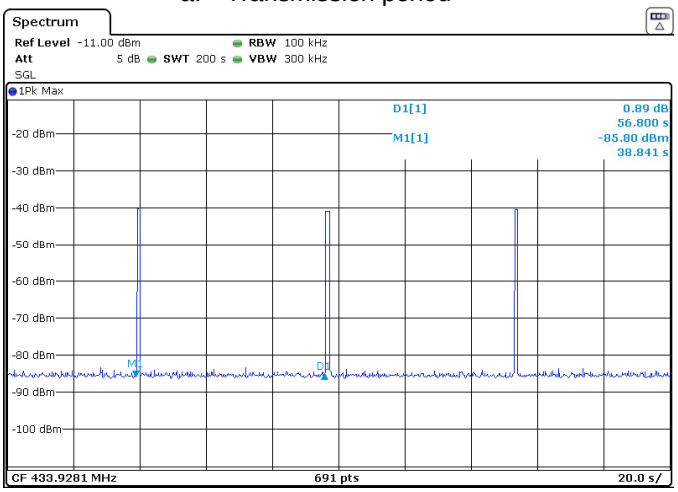
Duty Cycle Factor Calculation

EUT:	AOLD-2065A
Op Condition:	Operated, TX Mode (433.92MHz)
Test Specification:	FCC15.205, 15.209 & 15.231(e)
Comment:	3 VDC
Remark:	Duct Cycle Factor Calculation

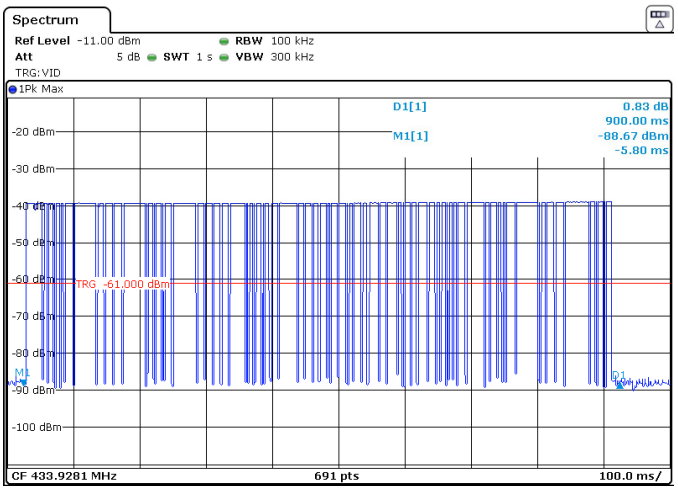
Test Result
☒ Passed
☐ Not Passed

Duct Cycle Factor Calculation

a. Transmission period



b. Duration of each transmission

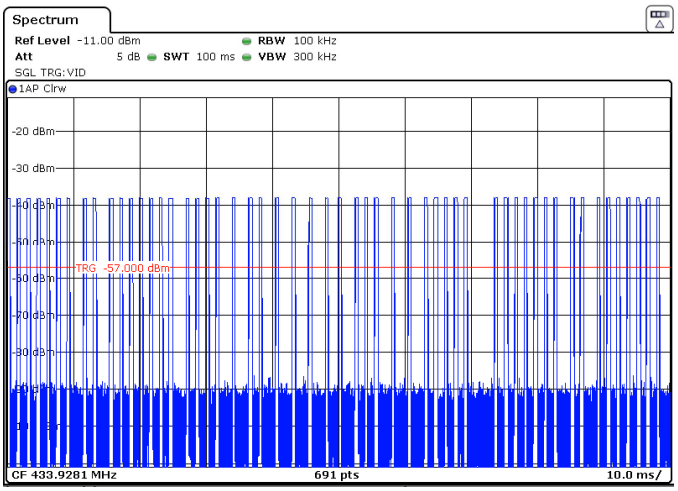


Spurious Radiated Emission

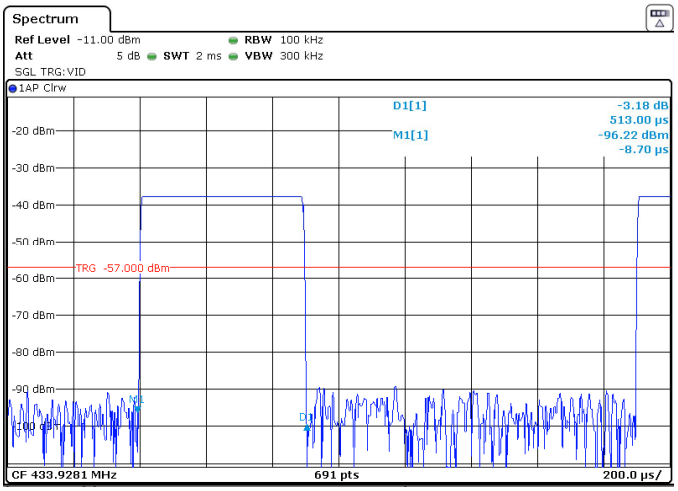
EUT:	AOLD-2065A
Op Condition:	Operated, TX Mode (433.92MHz)
Test Specification:	FCC15.205, 15.209 & 15.231(e)
Comment:	3 VDC
Remark:	Duct Cycle Factor Calculation

Test Result
☒ Passed
☐ Not Passed

c. Pulse number in 100ms



d. Pulse width



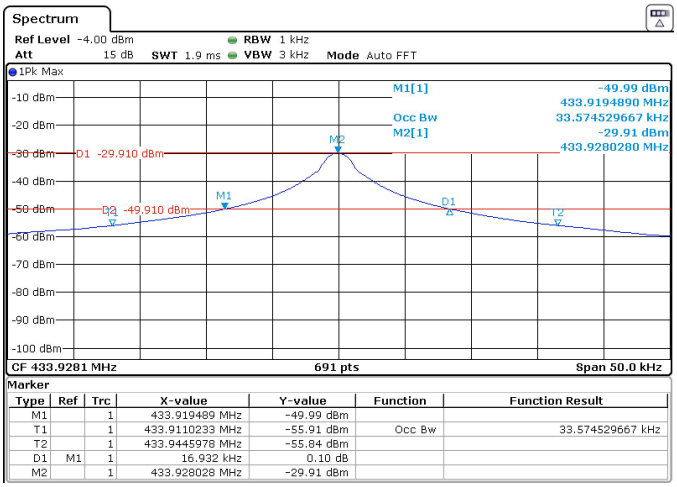
Calculation:

Tp = 100ms (Max. allowed Tp for calculation)
Number of pulse in Tp = 54,
Pulse width = 0.513ms
Ton= Pulse width* Number of pulses in Tp
= 27.702 ms
Duty cycle factor= 20*log(Ton/Tp)=-11.15 dB

8.2 20dB Bandwidth

EUT: AOLD-2065A
Op Condition: Operated, TX Mode (433.92MHz)
Test Specification: FCC15.231(c) 20dB Bandwidth
Comment: 3 VDC

Test Result
☒ Passed
☐ Not Passed



Bandwidth	Measured Value	Limit
20dB bandwidth	16.932 kHz	<= 1084.7 kHz
Limit=0.25%*Center Frequency=0.25%*433.92MHz=1084.7kHz		

8.3 Transmission Time

EUT: AOLD-2065A
Op Condition: Operated, TX Mode (433.92MHz)
Test Specification: FCC15.231(e)
Comment: 3 VDC

Test Result
☒ Passed
☐ Not Passed

Frequency	Duration of each transmission	Limit	Silent period	Limit
433.92MHz	900ms	< 1s	55.9s	≥ 27s

Silent period should be at least 30 times the duration of the transmission but in no case less than 10 Seconds

Silent period = Transmission period - Duration of each transmission
=56.80 - 0.9s
=55.9s

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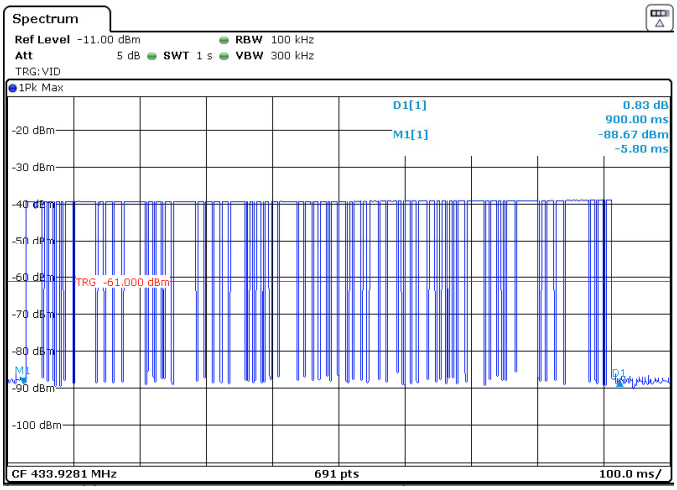
Transmission Time

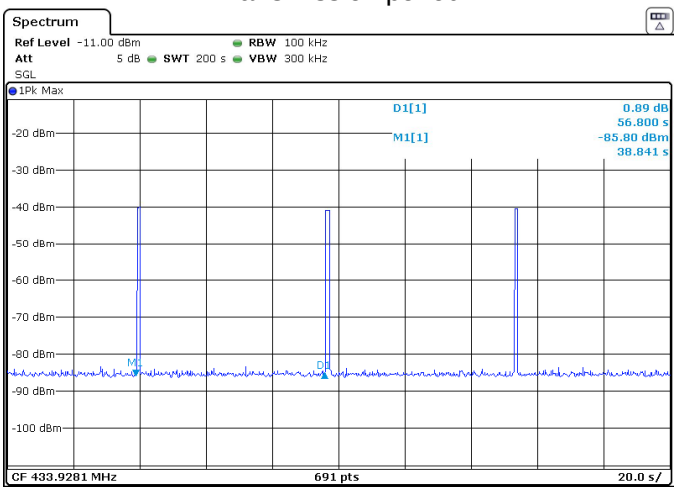
EUT:	AOLD-2065A
Op Condition:	Operated, TX Mode (433.92MHz)
Test Specification:	FCC15.231(e)
Comment:	3 VDC

Test Result
☒ Passed
☐ Not Passed

Duration of each transmission



Transmission period



9 Test setup procedure

9.1 Field strength of emissions and Restricted bands

Test Method

1: The EUT was place on a turn table which is 1.5m above ground plane for above 1GHz and 0.8m above ground for below 1GHz at 3-meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
2: The EUT was set 3 meters away from the interference – receiving antenna, which was mounted on the top of a variable – height antenna tower.
3: The height of antenna 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.
4: 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 and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
5: Use the following spectrum analyzer settings According to C63.10:

For Above 1GHz

Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 1MHz, VBW≥3RBW, Sweep = auto, Detector function = peak and average,
Trace = max hold.

For Below 1GHz

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 120KHz, VBW≥3RBW, Sweep = auto, Detector function = QP,
Trace = max hold.

Field strength of emissions and Restricted bands

Limits

According to §15.231 (e), Intentional radiators may operate at a periodic rate exceeding that specified in paragraph (a) of this section and may be employed for any type of operation, including operation prohibited in paragraph (a) of this section, provided the intentional radiator complies with the provisions of paragraphs (b) through (d) of this section, except the field strength table in paragraph (b) of this section is replaced by the following::

Fundamental frequency (MHz)	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
40.66-40.70	1,000	100
70-130	500	50
130-174	500 to 1,5001	50 to 1501
174-260	1,500	150
260-470	1,500 to 5,0001	150 to 5001
Above 470	5,000	500

9.2 Conducted Emission at AC Power line

Test Method

1. The EUT was placed on a table, which is 0.8m above ground plane
2. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.).
3. Maximum procedure was performed to ensure EUT compliance
4. A EMI test receiver is used to test the emissions from both sides of AC line

Limit

Frequency MHz	QP Limit dBµV	AV Limit dBµV
0.150-0.500	66-56*	56-46*
0.500-5	56	46
5-30	60	50

*Decreasing linearly with logarithm of the frequency.

9.3 20dB & 99% Bandwidth

Test Method

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to spectrum analyser. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20dB from the reference level. Record the frequency difference as the emission bandwidth.

Limits:

According to 15.215 (c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

10 Appendix A - General Product Information

Radiofrequency radiation exposure evaluation

This exposure evaluation is intended for **FCC ID: 2AJOATX2065A**

According to FCC CFR 47 part1 1.1310, As specified in Table 1B of 47 CFR 1.1310 – Limits for Maximum Permissible Exposure (MPE), Limits for General Population/Uncontrolled Exposure

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*100	30
1.34-30	824/f	2.19/f	$*180/f^2$	30
30-300	27.5	0.073	0.2	30
300-1,500			f/1500	30
1,500-100,000			1.0	30

MPE calculation method:
Pd = (P*G) / (4*Pi* R^2), where
Pd = power density in mW/cm^2
P = output power to antenna in mW
G = gain of antenna in linear scale
Pi = 3.1416
R= calculation distance in cm

>> The limit of Power density 433.92MHz is 433.92 /1500=0.29mW/cm^2

>> The antenna gain is 0dBi (=1 in linear scale).
Manufacturer specified the separation distance is: 20cm
The max. power (calculated power + tune up tolerance) of EUT at 433.92MHz is: 0.0098mW

>> The Pd calculated of 433.92MHz is 0.000002mW/cm^2

Which is smaller than the threshold of the limit.
Therefore, the device is exempt from stand-alone SAR test requirements.

Power calculation (According to C63.10 chapter 9.5)

	433.920	MHz
Field Strength Measured (E)	75.09	dBµV/m
Measurement Distance (D)	3	m
Equivalent Isotropically Radiated Power (E.I.R.P in dBm)	-20.07	dBm
Equivalent Isotropically Radiated Power (E.I.R.P in mW)	0.0098	mW

Remark: EIRP = E + 20log(D) −104.7

(EIRP is in dBm, E is in dBµV/m, D is in metres)

Reviewed by:

Eric LI
EMC Project Manager

Prepared by:

Hosea CHAN
EMC Project Engineer