FCC PART 15.231

TEST REPORT

For

Chengdu Finsiot Technology Co., Ltd

No. 1366, F1 6, Middle Section of Tianfu Avenue,
Hi-tech Zone, Chengdu, Sichuan, China

FCC ID: 2AZJA-MS100F

Report Type:	**Product Name:**
Original Report	Intelligent Temperature and Humidity Sensor

Report Number:	RSC210421001-0C
Date of Report Issue:	2021-05-08
Reviewed By:	Sula Huang
Test Laboratory:	Bay Area Compliance Laboratories Corp. (Chengdu) No.5040, Huilongwan Plaza, No.1, Shawan Road, Jinniu District, Chengdu, Sichuan, China Tel: 028-65525123 Fax: 028-65525125 www.baclcorp.com

Note: BACL is not responsible for the authenticity of any test data or information provided by the applicant. Test data or information included from the applicant that may affect test results are marked with an asterisk '*'. Do not include customer model name, addresses, names and trademarks.
This report cannot be reproduced except in full, without prior written approval of the company.
This report may contain data that are not covered by the accreditation scope and shall be marked with an asterisk "★".
This report is valid only with a valid digital signature. The digital signature may be available only under the Adobe software above version 7.0.

TABLE OF CONTENTS

GENERAL INFORMATION **3**
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT) 3
OBJECTIVE 3
RELATED SUBMITTAL(S)/GRANT(S) 3
MEASUREMENT UNCERTAINTY 3
TEST METHODOLOGY 4
TEST FACILITY 4
SYSTEM TEST CONFIGURATION **5**
JUSTIFICATION 5
EUT EXERCISE SOFTWARE 5
SUPPORT EQUIPMENT LIST AND DETAILS 5
EXTERNAL I/O CABLE 5
BLOCK DIAGRAM OF TEST SETUP 6
SUMMARY OF TEST RESULTS **8**
TEST EQUIPMENTS LIST **9**
FCC§15.203 - ANTENNA REQUIREMENT **10**
APPLICABLE STANDARD 10
ANTENNA INFORMATION* 10
FCC §15.205, §15.209, §15.231 (E) - RADIATED EMISSIONS **11**
APPLICABLE STANDARD 11
EUT SETUP 12
EMI TEST RECEIVER SETUP 13
TEST PROCEDURE 13
CORRECTED AMPLITUDE & MARGIN CALCULATION 13
TEST RESULTS SUMMARY 13
TEST DATA 14
FCC §15.231(C) - 20DB EMISSION BANDWIDTH TESTING **19**
APPLICABLE STANDARD 19
TEST PROCEDURE 19
TEST DATA 19
FCC §15.231(E) - DEACTIVATION TESTING **21**
APPLICABLE STANDARD 21
TEST PROCEDURE 21
TEST DATA 21

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Applicant	Chengdu Finsiot Technology Co., Ltd
Product	Intelligent Temperature and Humidity Sensor
Tested Model	MS100F
Multiple Model	MS100FH
FCC ID	2AZJA-MS100F
Frequency*	434 MHz
Modulation	2FSK
Voltage	DC 3V LITHUM CELL Battery (CR2477)
Measure approximately	ϕ56*H16.4mm
Sample serial number	210421004/04 (assigned by the BACL, Chengdu)
Sample/EUT Status	The test sample was in good condition and received: 2021-04-21

Note: The EUT conformed to test requirements and all measurement and test data in this report was gathered from final production sample. It may have deviation from any other sample.

Objective

This test report is prepared on behalf of Chengdu Finsiot Technology Co., Ltd, all the test measurements were performed according to the measurement procedure described in ANSI C63.10-2013.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, section 15.203, 15.205, 15.209, 15.35(c) and 15.231 rules.

Related Submittal(s)/Grant(s)

None

Measurement Uncertainty

Item			Measurement Uncertainty
Radiated Emission	30MHz-200MHz	H	4.31 dB
		V	4.57 dB
	200MHz-1GHz	H	4.68 dB
		V	5.78 dB
	1GHz-6GHz		4.56 dB
Occupied Bandwidth			±5%
Humidity			±5%
Temperature			±1℃
Voltage(DC)			±0.4%
Time			±1%

Note: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the corresponding inclusion factor K when the inclusion probability is about 95%.

Test Methodology

All measurements contained in this report were conducted with ANSIC63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

All emissions measurement was performed and Bay Area Compliance Laboratories Corp. (Chengdu). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Test Facility

The test site used by Bay Area Compliance Laboratories Corp. (Chengdu) to collect test data is located No.5040, Huilongwan Plaza, No. 1, Shawan Road, Jinniu District, Chengdu, Sichuan, China.

Bay Area Compliance Laboratories Corp. (Chengdu) lab is accredited to ISO/IEC 17025 by A2LA (Lab code: 4324.01) and the FCC designation No. CN1186 under the FCC KDB 974614 D01. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2014.

SYSTEM TEST CONFIGURATION

Justification

Channel List:

Channel	Frequency (MHz)
1	434

EUT Exercise Software

N/A

Support Equipment List and Details

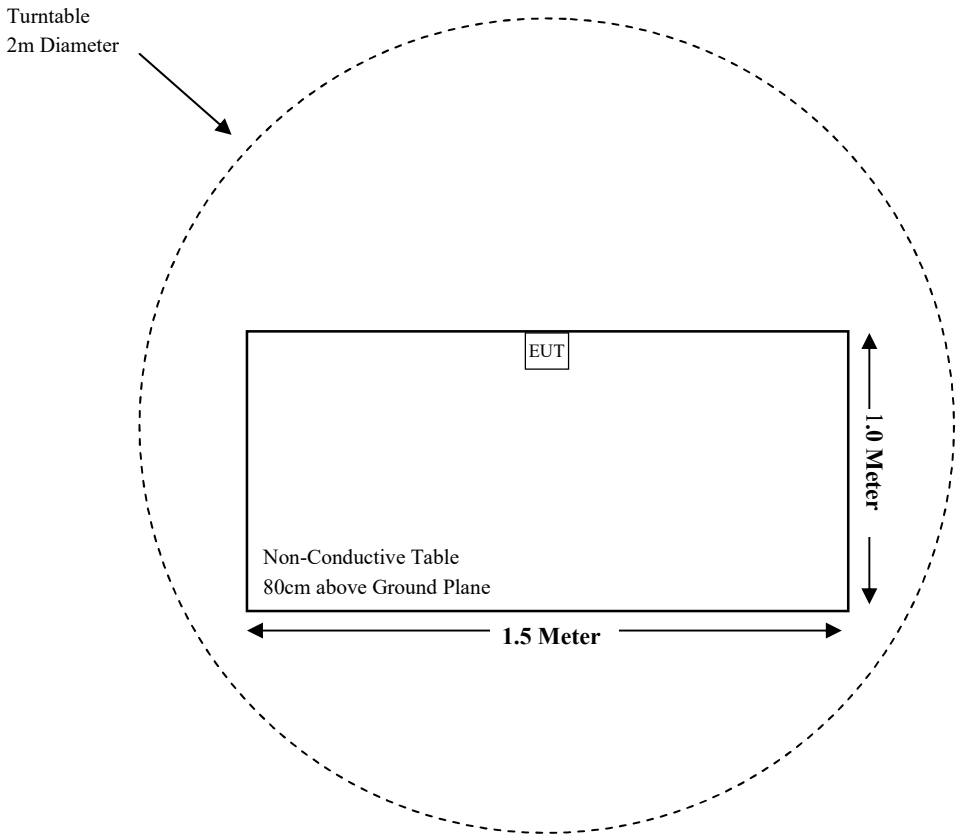
Manufacturer	Description	Model	Serial Number
-	-	-	-

External I/O Cable

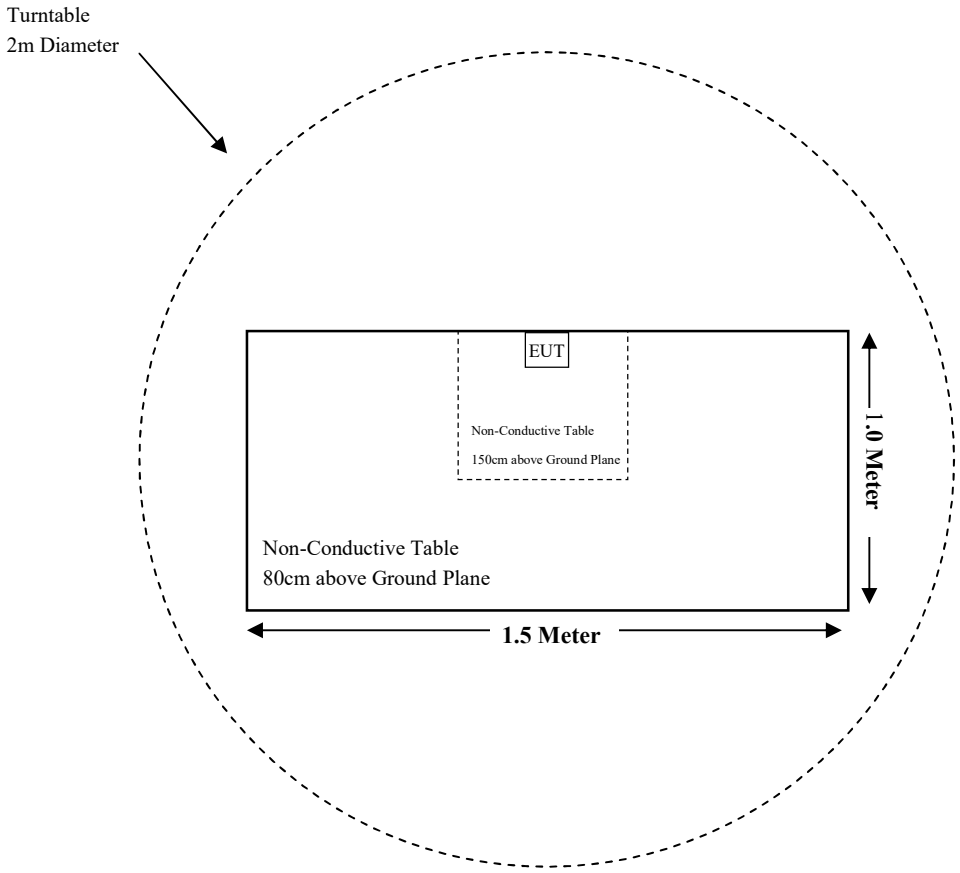
Cable Description	Length (m)	From	To
-	-	-	-

Block Diagram of Test Setup

For Radiated Emissions (Below 1GHz):



For Radiated Emissions (Above 1GHz):



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliant
§15.207(a)	Conducted Emissions	Not Applicable
§15.205, §15.209, §15.231(e)	Radiated Emissions	Compliant
§15.231(c)	20dB Emission Bandwidth	Compliant
§15.231(e)	Deactivation	Compliant

Not Applicable: The device is battery operated equipment.

Note: Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

TEST EQUIPMENTS LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Emission Test					
EMCT	Semi-Anechoic Chamber	966	001	2020-07-24	2025-07-23
SONOMA INSTRUMENT	Amplifier	310 N	186684	2020-08-10	2021-08-09
INMET	Attenuator	18N-6dB	N/A	2019-12-10	2022-12-09
SUNOL SCIENCES	Broadband Antenna	JB3	A121808	2019-12-10	2022-12-09
Rohde & Schwarz	EMI Test Receiver	ESR3	102456	2021-04-12	2022-04-11
Unknown	RF Cable (Below 1GHz)	L-E-005	000005	2020-09-04	2021-09-03
Unknown	RF Cable (Below 1GHz)	T-E128	000128	2020-10-16	2021-10-15
UTIFLEX	RF Cable (Below 1GHz)	T-E237	233522-001	2020-07-17	2021-07-16
Rohde & Schwarz	Spectrum Analyzer	FSU26	200835	2021-04-12	2022-04-11
EMCO	Horn Antenna	3115	2192	2019-09-25	2021-09-24
Mini-circuits	Amplifier	ZVA-183-S+	771001215	2020-09-20	2021-09-19
SUHNER+HUBER	RF Cable (Above 1GHz)	SUCOFLEX 104PE	93533/4PE	2020-05-18	2021-05-17
IW-MICROWAVE	RF Cable (Above 1GHz)	SPS-2301	111503	2020-08-31	2021-08-30
Rohde & Schwarz	EMC32	EMC32	V9.10.00	NCR	NCR
RF Conducted Test					
Rohde & Schwarz	Spectrum Analyzer	FSU26	200835	2021-04-12	2022-04-11
Mini-circuits	6dB Attenuator	BW-S6W5+	00433	2020-09-10	2021-09-09
Unknown	RF Coaxial Cable	SMA-IPEX	Unknown	Each Time	

FCC§15.203 - ANTENNA REQUIREMENT

Applicable Standard

According to § 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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

a. Antenna must be permanently attached to the unit.
b. Antenna must use a unique type of connector to attach to the EUT.

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

Antenna Information*

The EUT has one internal FPC antenna which was permanently attached and the antenna gain is 2.50 dBi; fulfill the requirement of this section. Please refer to EUT photos.

Result: Compliant.

FCC §15.205, §15.209, §15.231 (e) - RADIATED EMISSIONS

Applicable Standard

FCC §15.205, §15.209, §15.231 (e)

According to §15.231 (e), the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

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 *	50 to 150 *
174-260	1,500	150
260-470	1,500 to 5,000 *	150 to 500*
Above 470	5,000	500

*Linear interpolations.

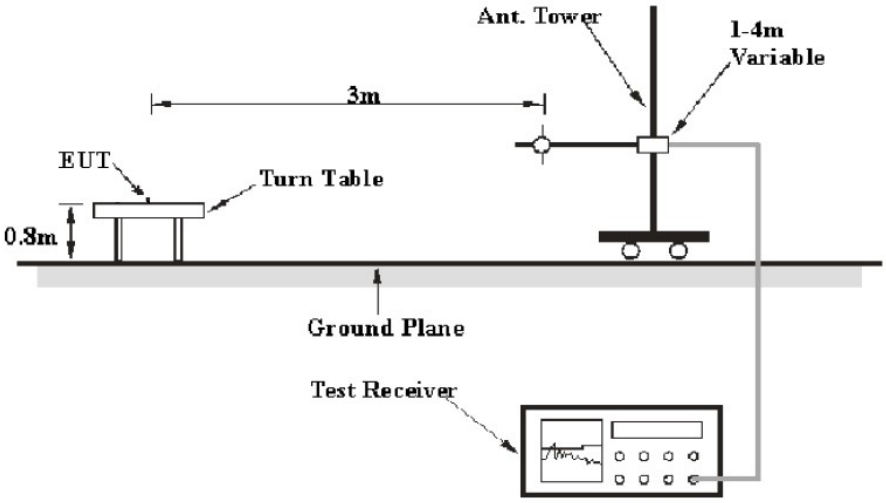
(1) The above field strength limits are specified at a distance of 3 meters. The tighter limits apply at the band edges.

(2) Intentional radiators operating under the provisions of this section shall demonstrate compliance with the limits on the field strength of emissions, as shown in the above table, based on the average value of the measured emissions. As an alternative, compliance with the limits in the above table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector. The specific method of measurement employed shall be specified in the application for equipment authorization. If average emission measurements are employed, the provisions in §15.35 for averaging pulsed emissions and for limiting peak emissions apply. Further, compliance with the provisions of §15.205 shall be demonstrated using the measurement instrumentation specified in that section.

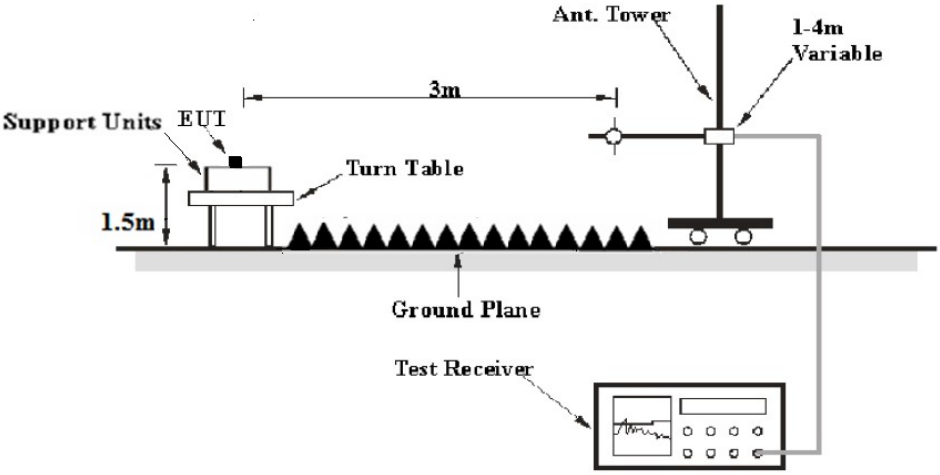
(3) The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in §15.209, whichever limit permits a higher field strength.

EUT Setup

Below 1GHz:



Above 1 GHz:



The radiated emission tests were performed in the 3 meters test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15 § 15.209, 15.205 and 15.231(e).

EMI Test Receiver Setup

The system was investigated from 30 MHz to 6 GHz.

During the radiated emission test, the EMI test Receiver was set with the following configurations:

Frequency Range	RBW	Video B/W	Detector
30 MHz – 1000MHz	100 kHz	300 kHz	QP
1 GHz –6 GHz	1MHz	3MHz	PK

If the spurious emission maximized peak measured value complies with the QP/average limit, it is unnecessary to perform a QP/Average measurement.

Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Loss and Cable Loss, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corrected Amplitude = Meter Reading + Antenna factor+ Cable Loss - Amplifier Gain

or

Corrected Amplitude = Meter Reading + Antenna factor+ Cable Loss

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the maximum limit. The equation for margin calculation is as follows:

Margin = Limit - Corrected Amplitude

Test Results Summary

According to the data in the following table, the EUT complied with the FCC §15.205, §15.209, §15.231(e).

Test Data

Environmental Conditions

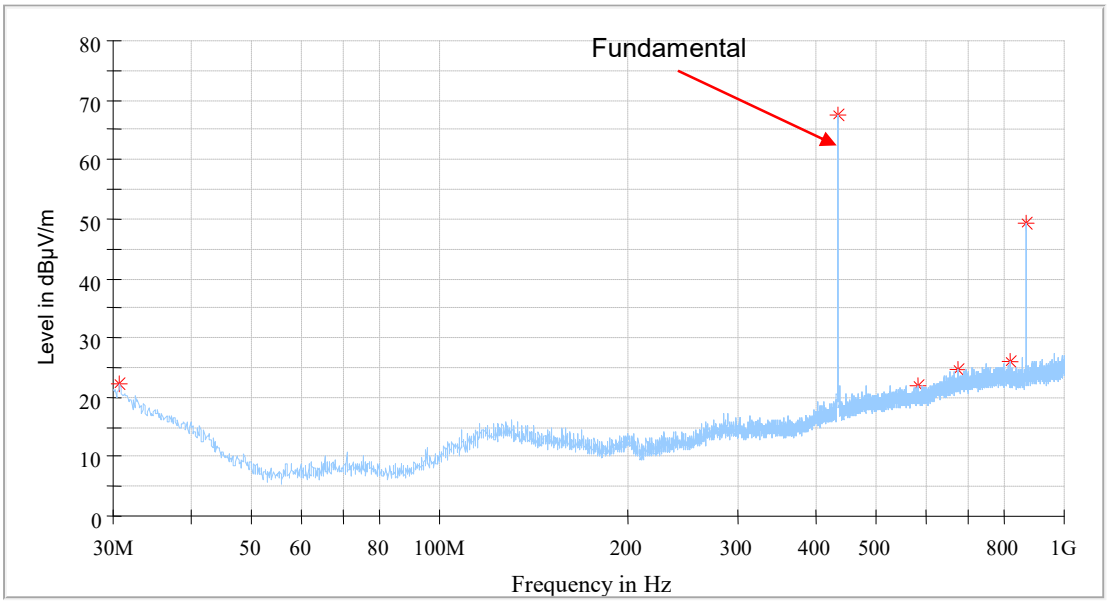
Temperature:	25 °C
Relative Humidity:	52 %
ATM Pressure:	96.5 kPa

The testing was performed by Winfred Wang on 2021-05-01.

Test mode: Transmitting

1）Radiated Emissions (30 MHz ~1 GHz):

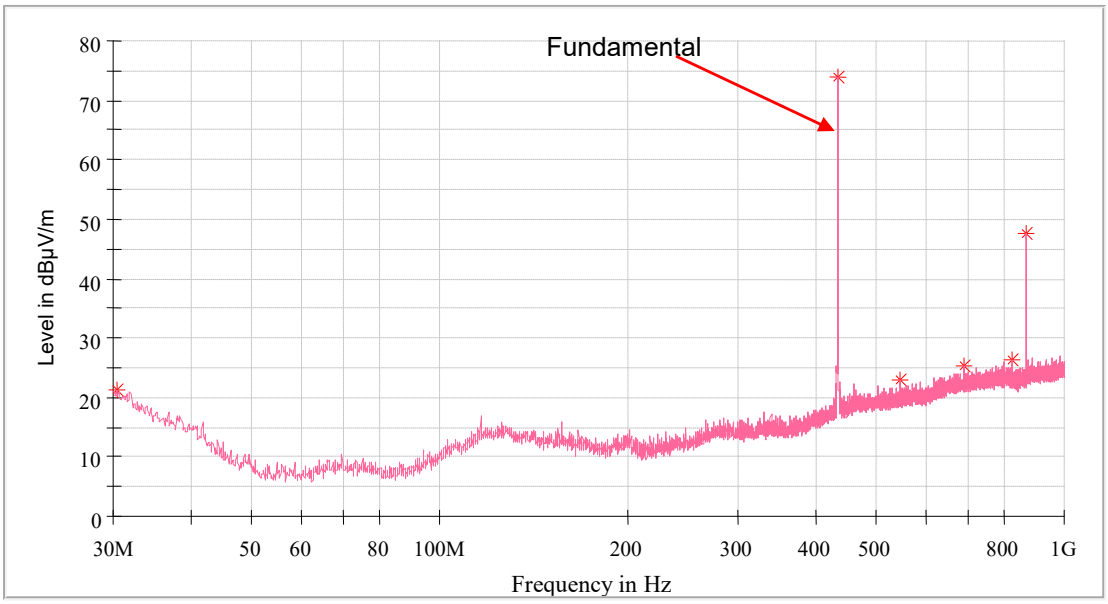
Horizontal



Frequency (MHz)	Max Peak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
30.727500	22.29	52.86	30.57	150.0	H	293.0	-5.1	Spurious
434.005000	67.39	72.86	5.47	100.0	H	68.0	-7.8	Fundamental
584.112500	22.09	52.86	30.77	100.0	H	132.0	-5.9	Spurious
678.323750	24.73	52.86	28.13	150.0	H	253.0	-3.9	Spurious
817.882500	25.83	52.86	27.03	150.0	H	0.0	-2.4	Spurious
868.080000	49.43	52.86	3.43	100.0	H	222.0	-2.1	Spurious

If the spurious emission maximized peak measured value complies with the QP/average limit, it is unnecessary to perform a QP/Average measurement.

Vertical



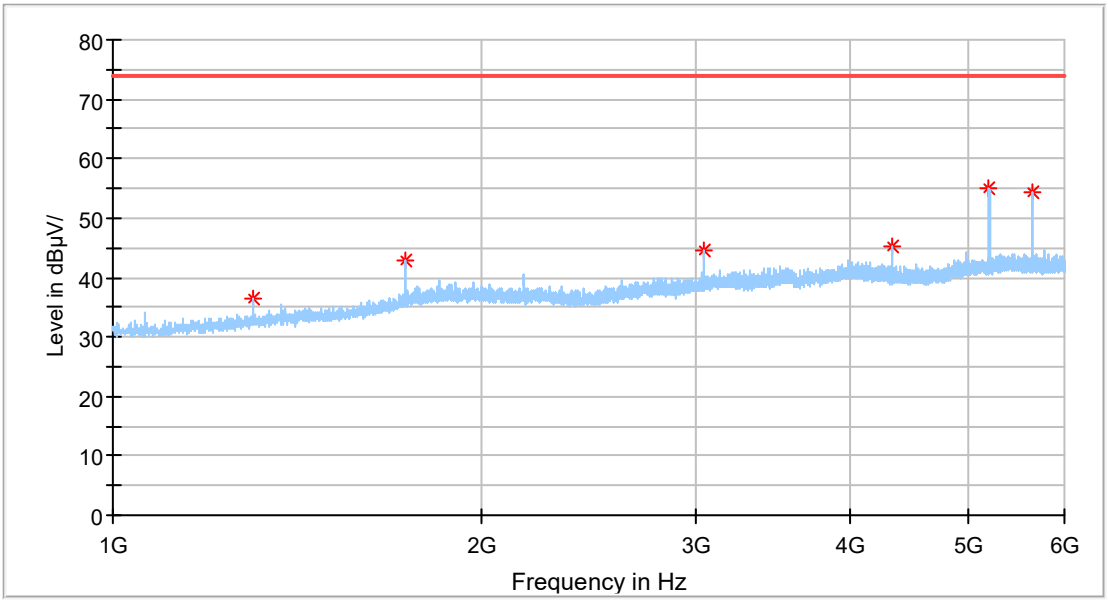
Frequency (MHz)	Max Peak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
30.363750	21.15	52.86	31.71	150.0	V	217.0	-4.8	Spurious
434.005000	74.01	92.86	18.85	150.0	V	51.0	-7.8	Fundamental
546.767500	22.82	52.86	30.04	100.0	V	106.0	-6.1	Spurious
690.570000	25.27	52.86	27.59	100.0	V	12.0	-3.7	Spurious
824.915000	26.17	52.86	26.69	150.0	V	193.0	-2.5	Spurious
868.080000	47.48	52.86	5.38	150.0	V	281.0	-2.1	Spurious

Field Strength of Average Emission

Frequency (MHz)	Max Peak measurement @3m (dBµV/m)	Duty Cycle Corrected Factor (dB)	Pol	Corrected Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Comment
434.005000	74.01	-9.67	V	64.34	72.86	8.52	Fundamental

2）Radiated Emissions (1GHz ~ 6GHz):

Horizontal

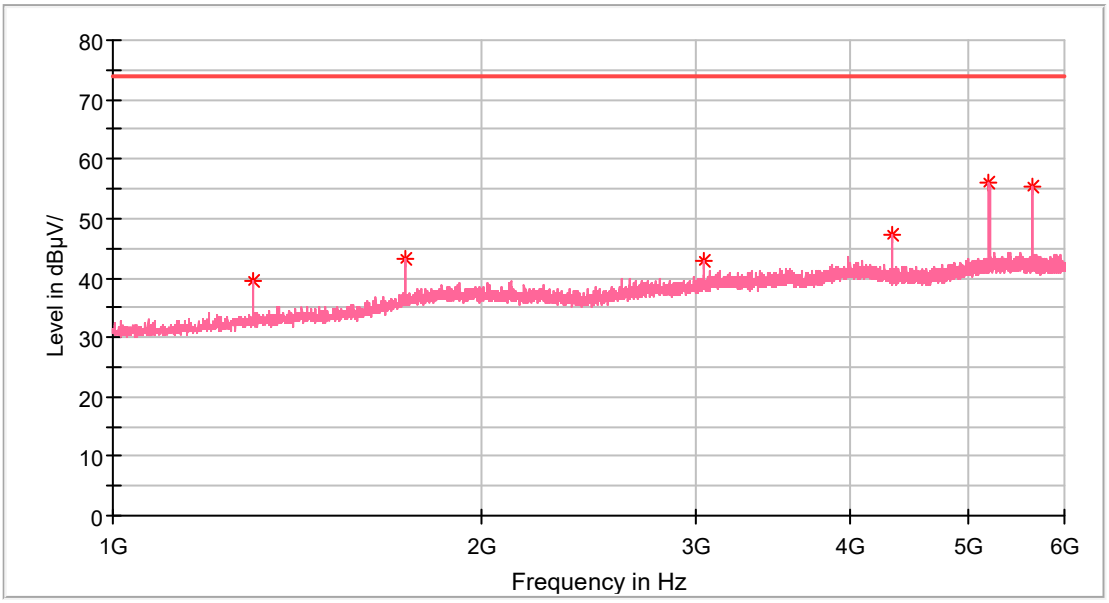


Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
1301.500000	36.37	54.00	17.63	150.0	H	166.0	0.8	Spurious
1736.000000	42.91	54.00	11.09	150.0	H	191.0	3.7	Spurious
3038.500000	44.66	54.00	9.34	200.0	H	194.0	7.3	Spurious
4340.500000	45.30	54.00	8.7	200.0	H	102.0	10.9	Spurious
5208.500000	55.07	74.00	18.93	200.0	H	186.0	12.9	Spurious
5642.500000	54.44	74.00	19.56	100.0	H	104.0	13.6	Spurious

Field Strength of Average Emission

Frequency (MHz)	Max Peak measurement @3m (dBµV/m)	Duty Cycle Corrected Factor (dB)	Pol	Corrected Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Comment
5208.500000	55.07	-9.67	V	45.40	54	8.60	Spurious
5642.500000	54.44	-9.67	V	44.77	54	9.23	Spurious

Vertical

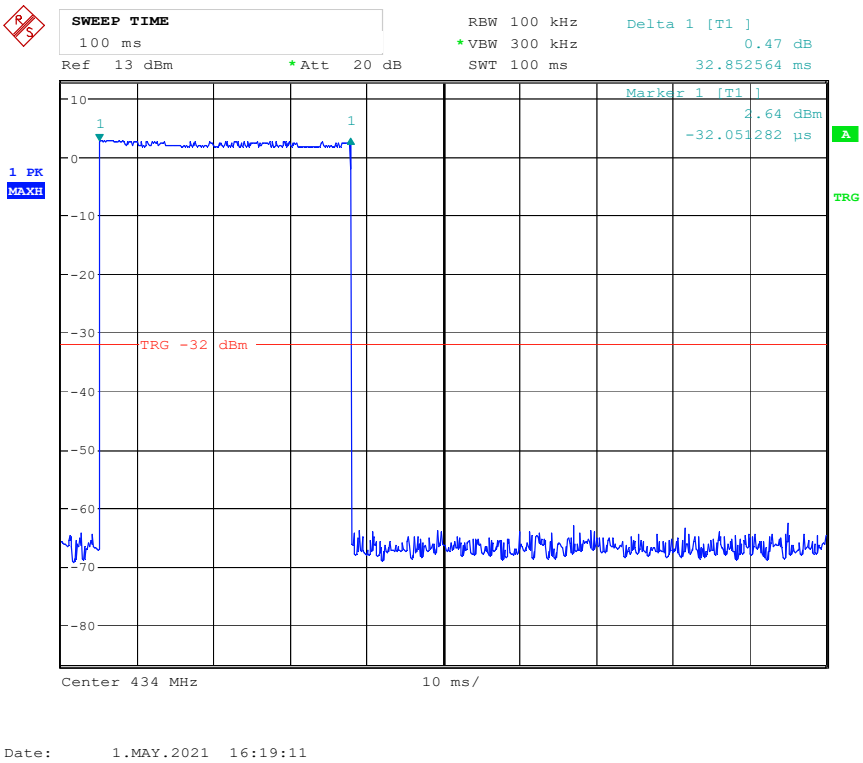


Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
1302.000000	39.59	54.00	14.41	100.0	V	272.0	0.8	Spurious
1736.000000	43.12	54.00	10.88	200.0	V	100.0	3.7	Spurious
3038.500000	42.79	54.00	11.21	100.0	V	97.0	7.3	Spurious
4340.500000	47.22	54.00	6.78	100.0	V	0.0	10.9	Spurious
5208.500000	55.88	74.00	18.12	150.0	V	174.0	12.9	Spurious
5643.000000	55.29	74.00	18.71	100.0	V	329.0	13.6	Spurious

Field Strength of Average Emission

Frequency (MHz)	Max Peak measurement @3m (dBµV/m)	Duty Cycle Corrected Factor (dB)	Pol	Corrected Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Comment
5208.500000	55.88	-9.67	V	46.21	54	7.79	Spurious
5643.000000	55.29	-9.67	V	45.62	54	8.38	Spurious

Duty Cycle



Note:
Calculate Duty Cycle Value:
T_p=100 ms
T_{on}=32.85 ms
Duty Cycle Corrected Factor =20*log(T_{on}/T_P)=20*log(32.85/100)= -9.67 dB
Average value = Peak value+ Duty Cycle Corrected Factor

FCC §15.231(c) - 20dB EMISSION BANDWIDTH TESTING

Applicable Standard

Per 15.231(c), The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. Bandwidth is determined at the points 20 dB down from the modulated carrier.

Test Procedure

The steps for the first option are as follows:
a) Set RBW = shall be in the range of 1% to 5% of the OBW.
b) Set the VBW ≥ [3 × RBW].
c) Detector = peak.
d) Trace mode = max-hold.
e) Sweep = No faster than coupled (auto) time.
f) Allow the trace to stabilize.
g) Measure the maximum width of the emission by placing two markers, one at the lowest frequency and the other at the highest frequency of the envelope of the spectral display, such that each marker is at or slightly below the "−20 dB down amplitude". If a marker is below this "−20 dB down amplitude" value, then it shall be as close as possible to this value.

Test Data

Environmental Conditions

Temperature:	24 °C
Relative Humidity:	51 %
ATM Pressure:	96.5 kPa

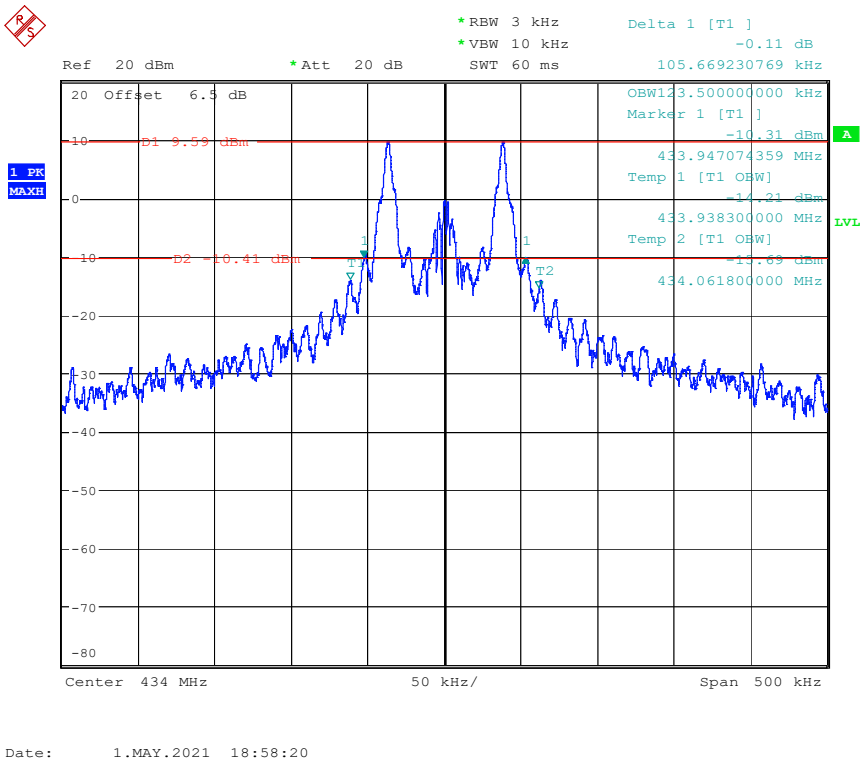
The testing was performed by Winfred Wang on 2021-05-01.

Test Mode: Transmitting

Fundamental Frequency (MHz)	20 dB Bandwidth (kHz)	Limit (kHz)	Result
434	105.67	1085	Pass

Note: Limit = 0.25% *the center frequency = 0.25%*434 MHz = 1085 kHz

20 dB Emission Bandwidth



FCC §15.231(e) - DEACTIVATION TESTING

Applicable Standard

Per 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.

Test Procedure

1. With the EUT's antenna attached, the waveform was received by the test antenna which was connected to the spectrum analyzer.
2. Set center frequency of spectrum analyzer=operating frequency.
3. Set the spectrum analyzer as RBW=100 kHz VBW=300 kHz Span=0Hz.
4. Repeat above procedures until all frequency measured was complete.

Test Data

Environmental Conditions

Temperature:	25 °C
Relative Humidity:	52 %
ATM Pressure:	96.5 kPa

The testing was performed by Winfred Wang on 2021-05-01.

Test Mode: Transmitting

Deactivation

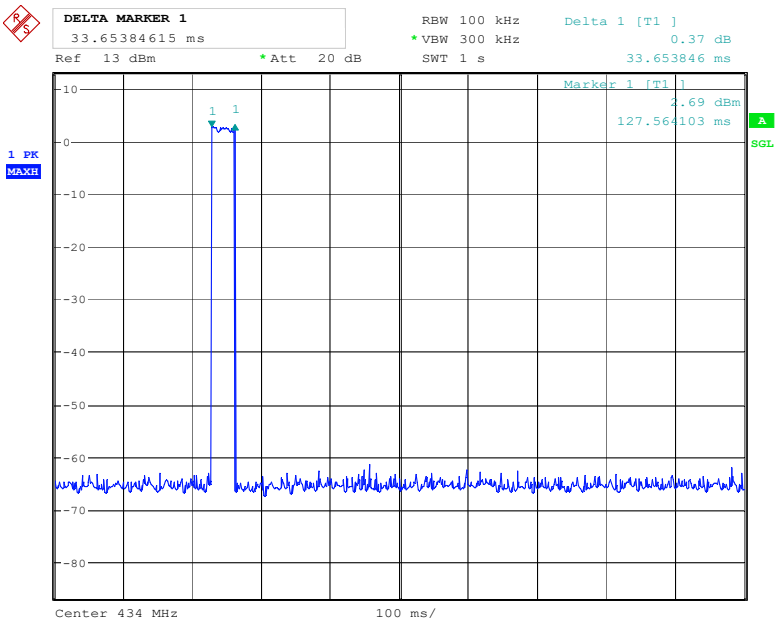
Duration Time (s)	Limit (s)	Result
0.034	< 1	Pass

Silent Period

Silent Period (s)	Limit (s)	Result
60.10	>10	Pass

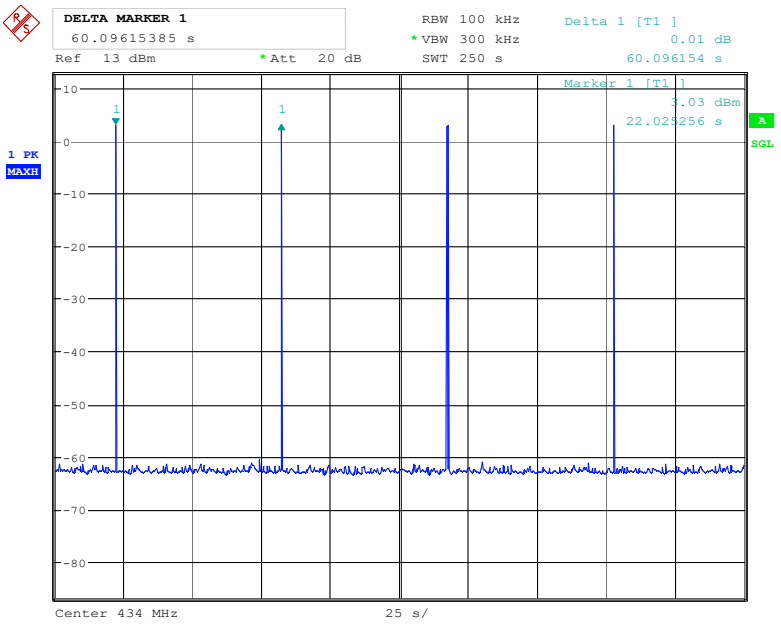
Note: The silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.
The duration time is 0.034s, 0.034×30 = 1.02s

Duration Time



Date: 1.MAY.2021 16:23:17

Silent Period



Date: 1.MAY.2021 16:36:35

END OF REPORT