RF TEST REPORT

For

Ningbo Yinzhou Longteng Tool Factory
Product Name: wireless transmitter
Test Model(s).: WLL001-WT-A, WLL001-WT

Report Reference No.	:	**POCE231218001RF001**
FCC ID	:	**2BD9U-WLL001**
Applicant's Name	:	Ningbo Yinzhou Longteng Tool Factory
Address	:	Maoshan Industrial Zone, Jiangshan Town, Yinzhou District, Ningbo City, Zhejiang Province
Testing Laboratory	:	Shenzhen POCE Testing Technology Co., Ltd.
Address	:	101-102, H5 Building & floor 1, Building H, Hongfa Science and Technology Park, Tangtou, Shiyan, Bao'An District, Shenzhen, China
Test Specification Standard	:	**47 CFR Part 15.231**
Date of Receipt	:	December 18, 2023
Date of Test	:	December 18, 2023 to December 26, 2023
Data of Issue	:	December 26, 2023
Result	:	**Pass**

Note: This report shall not be reproduced except in full, without the written approval of Shenzhen POCE Technology Co., Ltd. This document may be altered or revised by Shenzhen POCE Technology Co., Ltd. personnel only, and shall be noted in the revision section of the document. The test results in the report only apply to the tested sample.

Revision History Of Report

Version	Description	REPORT No.	Issue Date
V1.0	Original	POCE231218001RF001	December 26, 2023

NOTE1:
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.

Compiled by:	Supervised by:	Approved by:
Keren Huang	Stone Yin	Tom Chen
Keren Huang / Test Engineer	Stone Yin / Project Engineer	Tom Chen / Manager

CONTENTS

1 TEST SUMMARY 4
1.1 TEST STANDARDS 4
1.2 SUMMARY OF TEST RESULT 4
2 GENERAL INFORMATION 5
2.1 CLIENT INFORMATION 5
2.2 DESCRIPTION OF DEVICE (EUT) 5
2.3 DESCRIPTION OF TEST MODES 5
2.4 DESCRIPTION OF SUPPORT UNITS 6
2.5 EQUIPMENTS USED DURING THE TEST 6
2.6 STATEMENT OF THE MEASUREMENT UNCERTAINTY 7
2.7 IDENTIFICATION OF TESTING LABORATORY 7
2.8 ANNOUNCEMENT 8
3 EVALUATION RESULTS (EVALUATION) 9
3.1 ANTENNA REQUIREMENT 9
3.1.1 Conclusion: 9
4 RADIO SPECTRUM MATTER TEST RESULTS (RF) 10
4.1 20DB BANDWIDTH 10
4.1.1 E.U.T. Operation: 10
4.1.2 Test Setup Diagram: 11
4.1.3 Test Data: 11
4.2 DWELL TIME 12
4.2.1 E.U.T. Operation: 12
4.2.2 Test Setup Diagram: 12
4.2.3 Test Data: 13
4.3 AVERAGE FACTOR 14
4.3.1 E.U.T. Operation: 14
4.3.2 Test Setup Diagram: 14
4.3.3 Test Data: 15
4.4 FIELD STRENGTH OF THE FUNDAMENTAL SIGNAL 17
4.4.1 E.U.T. Operation: 18
4.4.2 Test Data: 19
4.5 RADIATED EMISSION (BELOW 1GHZ) 20
4.5.1 E.U.T. Operation: 20
4.5.2 Test Setup Diagram: 21
4.5.3 Test Data: 21
4.6 RADIATED EMISSION (ABOVE 1GHZ) 23
4.6.1 E.U.T. Operation: 24
4.6.2 Test Setup Diagram: 24
4.6.3 Test Data: 24
5 TEST SETUP PHOTOS 26
6 PHOTOS OF THE EUT 27

1 TEST SUMMARY

1.1 Test Standards

The tests were performed according to following standards:

47 CFR Part 15.231: Periodic operation in the band 40.66-40.70 MHz and above 70 MHz

1.2 Summary of Test Result

Item	Method	Requirement	Result
Antenna requirement	/	47 CFR 15.203	Pass
20dB Bandwidth	ANSI C63.10-2013, section 6.9.2	47 CFR 15.231(c)	Pass
Dwell Time	ANSI C63.10-2013, Section 7.4	47 CFR 15.231(a)(1) & (a)(2)	Pass
Field Strength of The Fundamental Signal	ANSI C63.10-2013, Section 6.5	47 CFR 15.231(b)	Pass
Radiated Emission (below 1GHz)	ANSI C63.10-2013, Section 6.5	47 CFR 15.231	Pass
Radiated Emission (above 1GHz)	ANSI C63.10-2013, Section 6.6	47 CFR 15.231	Pass

Note: 1.N/A -this device(EUT) is not applicable to this testing item
2. RF-conducted test results including cable loss.

2 GENERAL INFORMATION

2.1 Client Information

Applicant's Name : Ningbo Yinzhou Longteng Tool Factory
Address : Maoshan Industrial Zone, Jiangshan Town, Yinzhou District, Ningbo City, Zhejiang Province

Manufacturer : Ningbo Yinzhou Longteng Tool Factory
Address : Maoshan Industrial Zone, Jiangshan Town, Yinzhou District, Ningbo City, Zhejiang Province

2.2 Description of Device (EUT)

Product Name:	wireless transmitter
Sample No.:	Q231218013-2
Model/Type reference:	WLL001-WT-A
Series Model:	WLL001-WT
Model Difference:	Only the model name is different, everything else is the same
Trade Mark:	N/A
Operation Frequency:	433.92MHz
Number of Channels:	1
Modulation Type:	FSK
Antenna Type:	Spring Antenna
Antenna Gain:	2.0dBi
Hardware Version:	YFT287968
Software Version:	V1.0

Operation Frequency each of channel
Channel Frequency
433.92 MHz

Note:
In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Test channel	**Frequency (MHz)**
Test channel	433.92 MHz

2.3 Description of Test Modes

No	**Title**	**Description**
TM1	TX working	Keep the EUT works in continuously transmitting mode with FSK modulation.

Title	**Description**
TM1	Keep the EUT works in continuously transmitting mode with FSK modulation.
	☐Special software is used. ☐Through engineering command into the engineering mode. engineering command: *#*#3646633#*#* ☒Other method: Continuous transmission of TX-433.92MHz signal after

	power supply
	Special software:

2.4 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Description	Manufacturer	Model No.	Remark	Certification
1	Battery	Camel	/	Provide by lab	SDOC

2.5 Equipments Used During The Test

20dB Bandwidth
Dwell Time
Duty Cycle

Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
RF Test Software	TACHOY	RTS-01	V2.0.0.0	/	/
High Pass filter	ZHINAN	OQHPF1-M1.5-18G-224	6210075	/	/
Power divider	MIDEWEST	PWD-2533	SMA-79	2023-05-11	2026-05-10
DC power	HP	66311B	38444359	/	/
RF Sensor Unit	Tachoy	TR1029-2	000001	/	/
Wideband radio communication tester	R&S	CMW500	113410	2023-06-13	2024-06-12
Vector signal generator	Keysight	N5181A	MY48180415	2023-11-09	2024-11-08
Signal generator	Keysight	N5182A	MY50143455	2023-11-09	2024-11-08
Spectrum Analyzer	Keysight	N9020A	MY53420323	2023-11-09	2024-11-08

Field Strength of The Fundamental Signal Radiated Emission (below 1GHz) Radiated Emission (above 1GHz)					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EMI Test software	Farad	EZ -EMC	V1.1.42	/	/
Positioning Controller	/	MF-7802	/	/	/
High Pass filter	ZHINAN	OQHPF1-M1.5-18G-224	6210075	/	/
Amplifier(18-40G)	COM-POWER	AH-1840	10100008-1	2022-04-05	2025-04-04
Horn antenna	COM-POWER	AH-1840 (18-40G)	10100008	2023-04-05	2025-04-04
Loop antenna	ZHINAN	ZN30900C	ZN30900C	2021-07-05	2024-07-04
Cable(LF)#2	Schwarzbeck	/	/	2023-02-27	2024-02-26
Cable(LF)#1	Schwarzbeck	/	/	2023-02-27	2024-02-26
Cable(HF)#2	Schwarzbeck	AK9515E	96250	2023-02-28	2024-02-27
Cable(HF)#1	Schwarzbeck	SYV-50-3-1	/	2023-02-27	2024-02-26
Power amplifier(LF)	Schwarzbeck	BBV9743	9743-151	2023-06-13	2024-06-12
Power amplifier(HF)	Schwarzbeck	BBV9718	9718-282	2023-06-13	2024-06-12
Wideband radio communication tester	R&S	CMW500	113410	2023-06-13	2024-06-12
Spectrum Analyzer	R&S	FSP30	1321.3008K40-101729-jR	2023-06-14	2024-06-13
Horn Antenna	Sunol Sciences	DRH-118	A091114	2023-05-13	2025-05-12
Broadband Antenna	Sunol Sciences	JB6 Antenna	A090414	2023-05-21	2025-05-20
Test Receiver	R&S	ESCI	102109	2023-06-13	2024-06-12

2.6 Statement Of The Measurement Uncertainty

Test Item	**Measurement Uncertainty**
Occupied Bandwidth	±3.63%
Duty cycle	±3.1%
Radiated Emission (Below 1GHz)	±5.79dB
Radiated Emission (Above 1GHz)	±5.46dB
Note: (1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.	

2.7 Identification of Testing Laboratory

Company Name:	Shenzhen POCE Technology Co., Ltd.
Address:	101-102 Building H5 & 1/F., Building H, Hongfa Science & Technology Park, Tangtou, Shiyan, Bao'an District, Shenzhen, Guangdong, China
Phone Number:	+86-13267178997
Fax Number:	86-755-29113252

Identification of the Responsible Testing Location

Company Name:	Shenzhen POCE Technology Co., Ltd.
Address:	101-102 Building H5 & 1/F., Building H, Hongfa Science & Technology Park, Tangtou, Shiyan, Bao'an District, Shenzhen, Guangdong, China
Phone Number:	+86-13267178997
Fax Number:	86-755-29113252

FCC Registration Number:	0032847402
Designation Number:	CN1342
Test Firm Registration No.:	778666
A2LA Certificate Number:	6270.01

2.8 Announcement

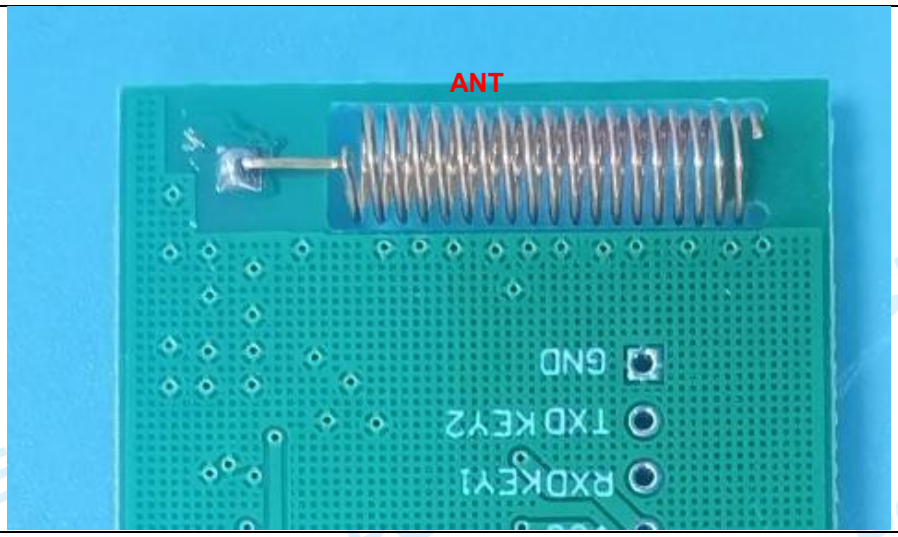
(1) The test report reference to the report template version v0.
(2) The test report is invalid if not marked with the signatures of the persons responsible for preparing, reviewing and approving the test report.
(3) The test report is invalid if there is any evidence and/or falsification.
(4) This document may not be altered or revised in any way unless done so by POCE and all revisions are duly noted in the revisions section.
(5) Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without prior written approval from the laboratory.
(6) We hereby declare that the laboratory is only responsible for the data released by the laboratory, except for the part provided by the applicant. the laboratory is not responsible for the accuracy of the information provided by the client. When the information provided by the customer may affect the effectiveness of the results, the responsibility lies with the customer, and the laboratory does not assume any responsibility.

3 Evaluation Results (Evaluation)

3.1 Antenna requirement

Test Requirement:	Refer to 47 CFR Part 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.

3.1.1 Conclusion:



4 Radio Spectrum Matter Test Results (RF)

4.1 20dB Bandwidth

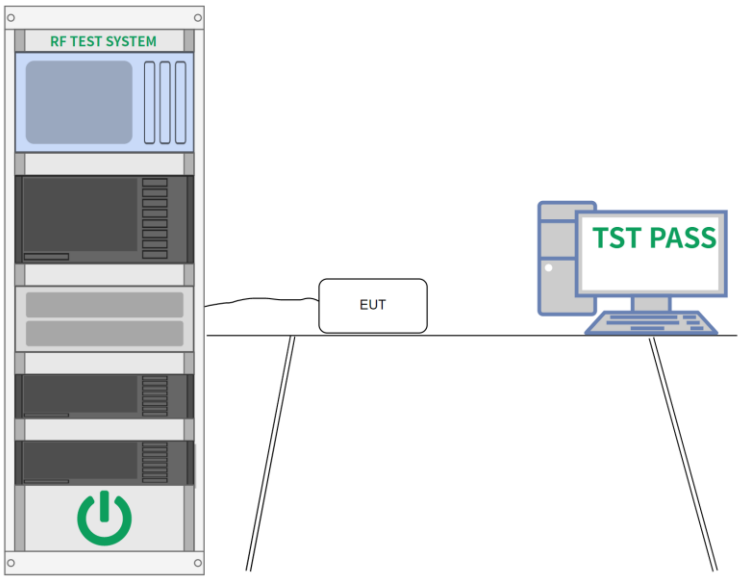
Test Requirement:	47 CFR 15.231(c)
Test Limit:	The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.
Test Method:	ANSI C63.10-2013, section 6.9.2
Procedure:	a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the EMI receiver or spectrum analyzer shall be between two times and five times the OBW. b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW and video bandwidth (VBW) shall be approximately three times RBW, unless otherwise specified by the applicable requirement. c) Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than [10 log (OBW/RBW)] below the reference level. Specific guidance is given in 4.1.5.2. d) Steps a) through c) might require iteration to adjust within the specified tolerances. e) The dynamic range of the instrument at the selected RBW shall be more than 10 dB below the target “-xx dB down” requirement; that is, if the requirement calls for measuring the -20 Db OBW, the instrument noise floor at the selected RBW shall be at least 30 dB below the reference value. f) Set detection mode to peak and trace mode to max hold. g) Determine the reference value: Set the EUT to transmit an unmodulated carrier or modulated signal, as applicable. Allow the trace to stabilize. Set the spectrum analyzer marker to the highest level of the displayed trace (this is the reference value). h) Determine the “-xx dB down amplitude” using [(reference value) - xx]. Alternatively, this calculation may be made by using the marker-delta function of the instrument. i) If the reference value is determined by an unmodulated carrier, then turn the EUT modulation ON, and either clear the existing trace or start a new trace on the spectrum analyzer and allow the new trace to stabilize. Otherwise, the trace from step g) shall be used for step j). j) Place 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 “íxx dB down amplitude” determined in step h). If a marker is below this “-xx dB down amplitude” value, then it shall be as close as possible to this value. The occupied bandwidth is the frequency difference between the two markers. Alternatively, set a marker at the lowest frequency of the envelope of the spectral display, such that the marker is at or slightly below the “íxx dB down amplitude” determined in step h). Reset the marker-delta function and move the marker to the other side of the emission until the delta marker amplitude is at the same level as the reference marker amplitude. The marker-delta frequency reading at this point is the specified emission bandwidth. k) The occupied bandwidth shall be reported by providing plot(s) of the measuring instrument display; the plot axes and the scale units per division shall be clearly labeled. Tabular data may be reported in addition to the plot(s).

4.1.1 E.U.T. Operation:

Operating Environment:					
Temperature:	22.3 °C	Humidity:	51.7 %	Atmospheric Pressure:	102 kPa
Pre test mode:	TM1				

Final test mode:	TM1

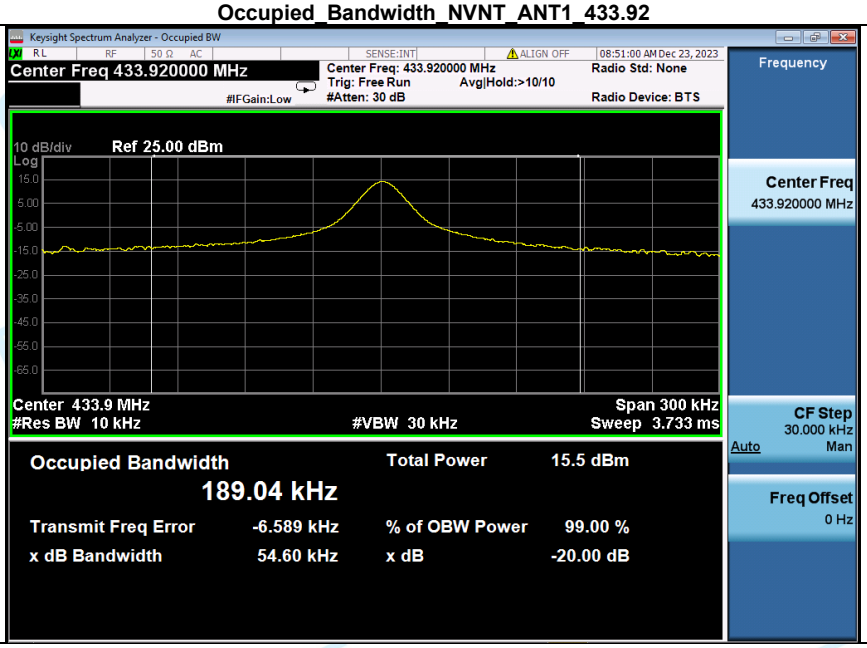
4.1.2 Test Setup Diagram:



4.1.3 Test Data:

Condition	Antenna	Frequency (MHz)	20dB BW(kHz)	limit(MHz)	Result
NVNT	ANT1	433.92	54.60	1.0848	Pass

Occupied_Bandwidth_NVNT_ANT1_433.92



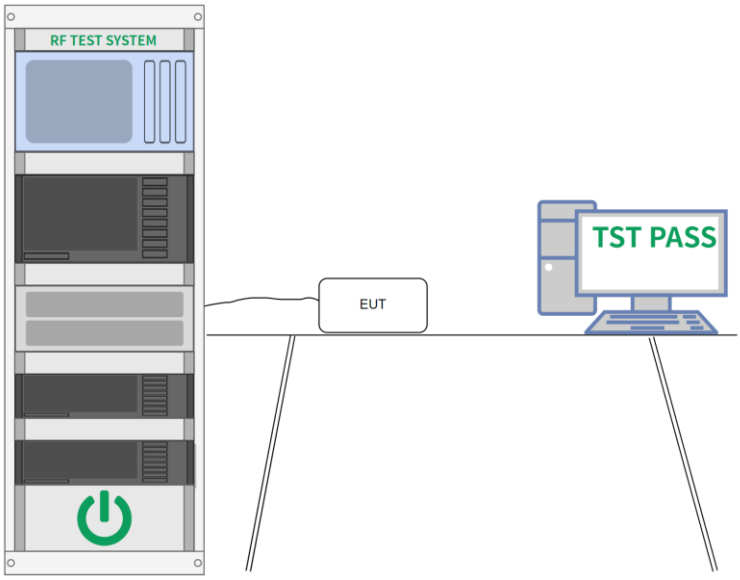
4.2 Dwell Time

Test Requirement:	47 CFR 15.231(a)(1) & (a)(2)
Test Limit:	(1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released. (2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.
Test Method:	ANSI C63.10-2013, Section 7.4
Procedure:	For evaluation of periodic operation characteristics, the following procedure may be used: a) Trigger the spectrum analyzer sweep on the RF waveform of the unlicensed wireless device. b) Set the spectrum analyzer sweep time greater than the specified time for periodic operation. c) Manually activate and deactivate the unlicensed wireless device and confirm that it ceases transmission within the specified time of deactivation. d) Document the test results. e) Verify and document that periodic transmissions at regular predetermined intervals do not exist, except where regulatory requirements allow polling or supervision transmissions, including data, to determine system integrity. Compliance is addressed by an attestation supported by the equipment theory of operation.

4.2.1 E.U.T. Operation:

Operating Environment:					
Temperature:	22.3 °C	Humidity:	51.7 %	Atmospheric Pressure:	102 kPa
Pre test mode:	TM1				
Final test mode:	TM1				

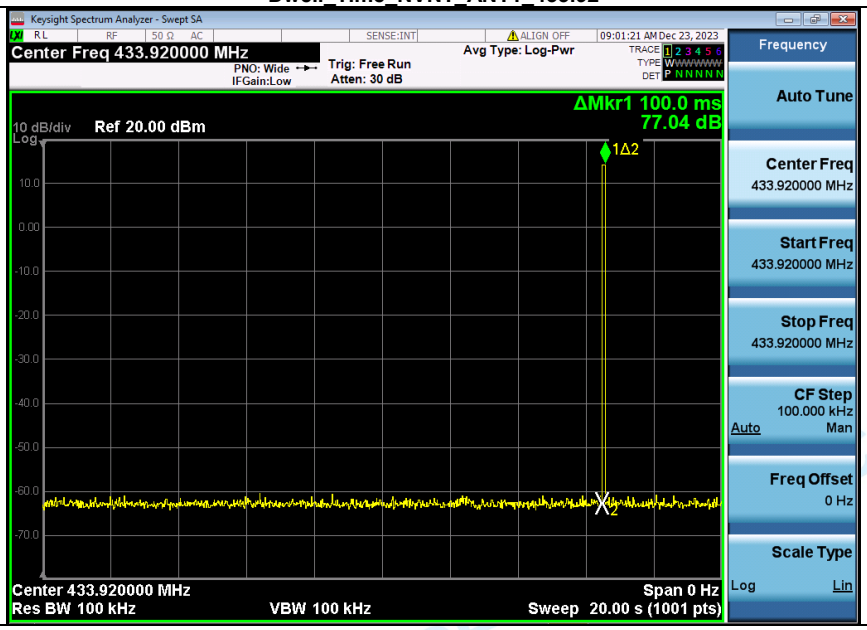
4.2.2 Test Setup Diagram:



4.2.3 Test Data:

Condition	Antenna	Frequency (MHz)	Dwell time(s)	limit(s)	Result
NVNT	ANT1	433.92	0.1s	5s	Pass

Dwell_Time_NVNT_ANT1_433.92



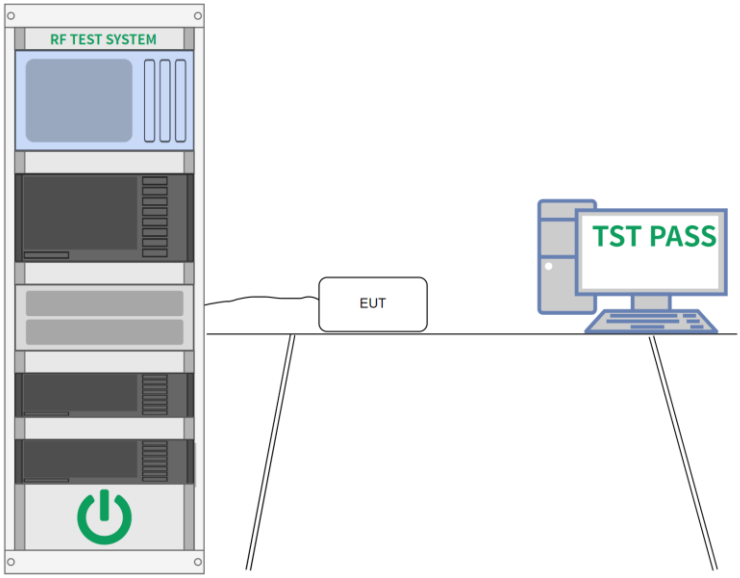
4.3 Average Factor

Procedure:	The output field strengths of specification in accordance with the FCC rules specify measurements with an average detector. During the test, a spectrum analyzer incorporating a peak detector was used. Therefore, a reduction factor can be applied to the resultant peak signal level and compared to the limit for measurement instrumentation incorporating an average detector. The duty cycle is measured in 100 ms or the repetition cycle period, whichever is a shorter time frame. The duty cycle is measured by placing the spectrum analyzer to set zero span at 100kHz resolution bandwidth.
Factor:	Averaging factor in dB =20log (duty cycle) The duration of one cycle =37.7ms The duty cycle is simply the on-time divided the duration of one cycle Duty Cycle =(0.936+0.474*5+0.171*29)/37.7=8.265/37.7=0.219231 Therefore, the averaging factor is found by 20*log(0.219231) =-13.18dB Test plot as follows: Note: During the 100ms, the amount of pulse and on-time of pulse are the same for every pulse train.

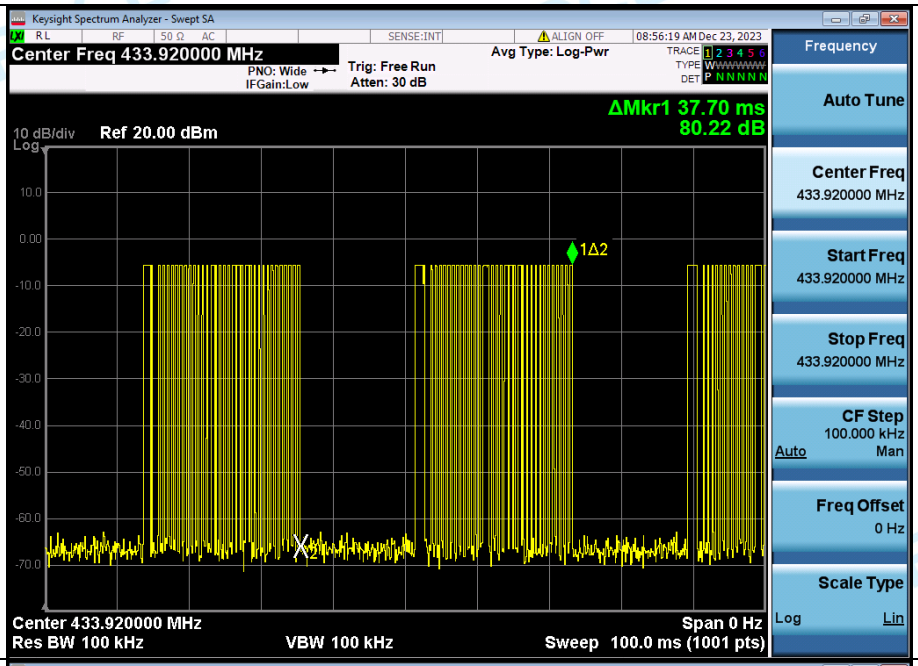
4.3.1 E.U.T. Operation:

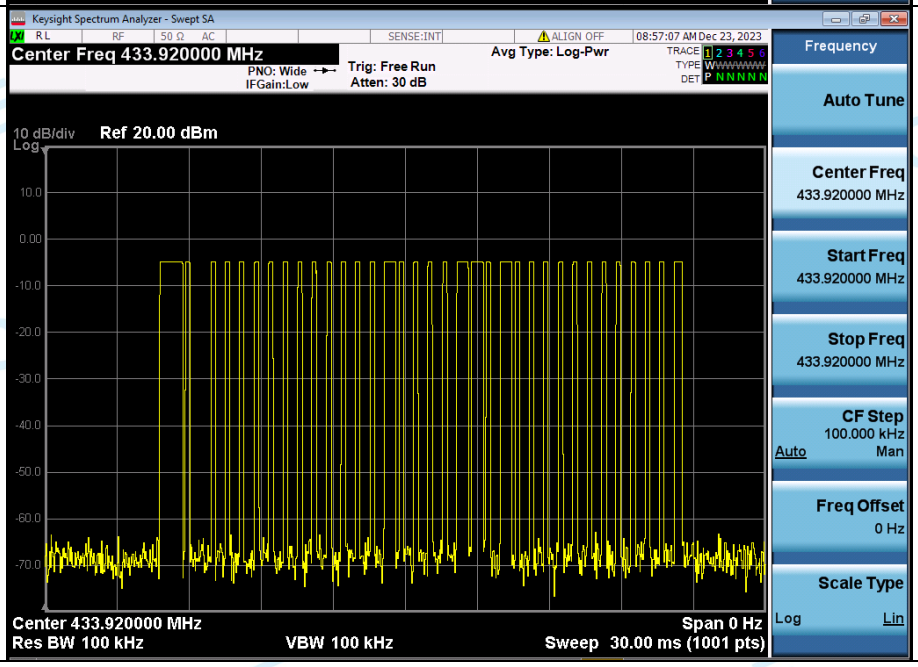
Operating Environment:					
Temperature:	22.3 °C	Humidity:	51.7 %	Atmospheric Pressure:	102 kPa
Pre test mode:	TM1				
Final test mode:	TM1				

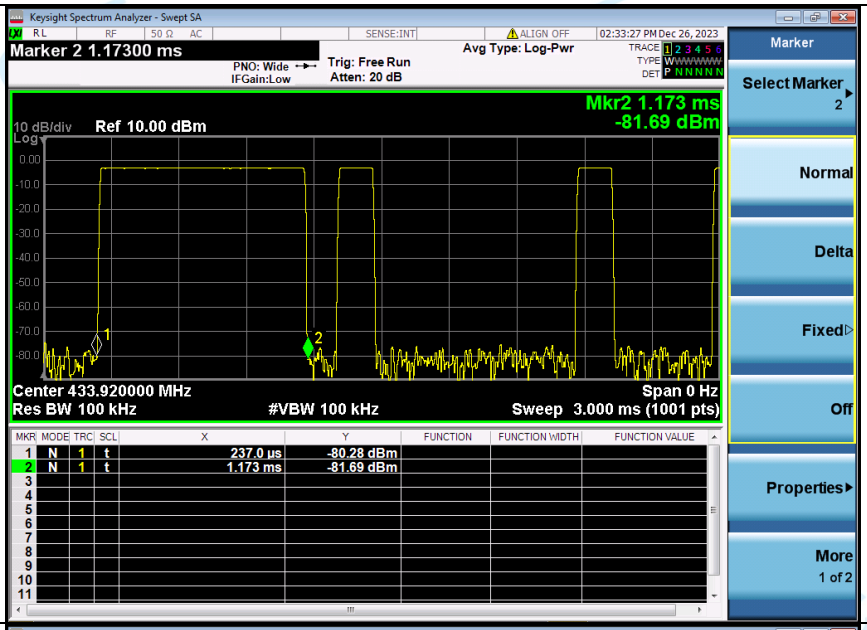
4.3.2 Test Setup Diagram:

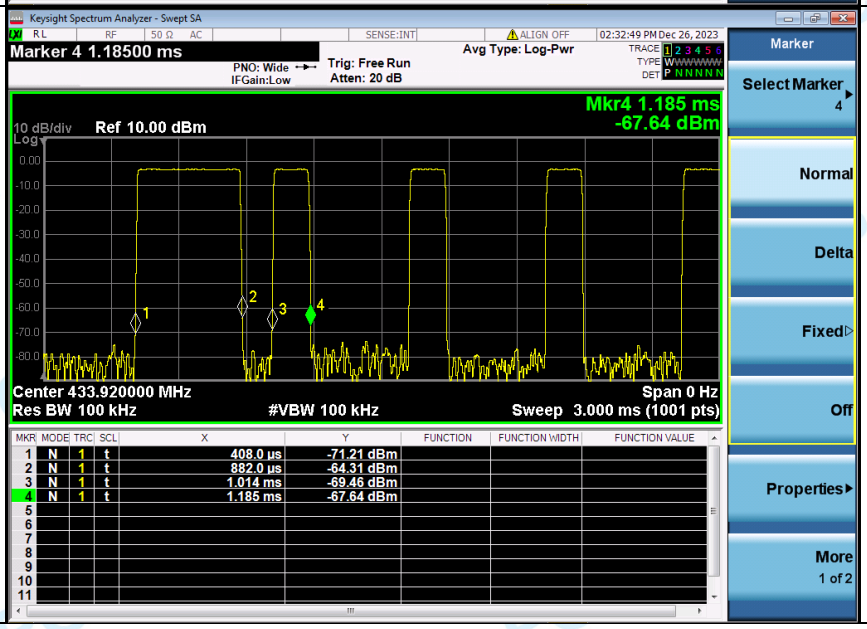


4.3.3 Test Data:






Keysight Spectrum Analyzer - Swept SA
Marker 2 1.17300 ms
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
02:33:27 PM Dec 26, 2023
Mkr2 1.173 ms
-81.69 dBm
10 dB/div
Ref 10.00 dBm
Center 433.920000 MHz
Span 0 Hz
Res BW 100 kHz
#VBW 100 kHz
Sweep 3.000 ms (1001 pts)
1 N 1 t 237.0 µs -80.28 dBm
2 N 1 t 1.173 ms -81.69 dBm
Marker
Select Marker 2
Normal
Delta
Fixed
Off
Properties
More 1 of 2


Keysight Spectrum Analyzer - Swept SA
Marker 4 1.18500 ms
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
02:32:49 PM Dec 26, 2023
Mkr4 1.185 ms
-67.64 dBm
10 dB/div
Ref 10.00 dBm
Center 433.920000 MHz
Span 0 Hz
Res BW 100 kHz
#VBW 100 kHz
Sweep 3.000 ms (1001 pts)
1 N 1 t 408.0 µs -71.21 dBm
2 N 1 t 882.0 µs -64.31 dBm
3 N 1 t 1.014 ms -69.46 dBm
4 N 1 t 1.185 ms -67.64 dBm
Marker
Select Marker 4
Normal
Delta
Fixed
Off
Properties
More 1 of 2

4.4 Field Strength of The Fundamental Signal

<table>
<tr><td>Test Requirement:</td><td>47 CFR 15.231(b)</td></tr>
<tr><td>Test Limit:</td><td>
<table>
<tr><th>Fundamental frequency (MHz)</th><th>Field strength of fundamental (microvolts/meter)</th><th>Field strength of spurious emissions (microvolts/meter)</th></tr>
<tr><td>40.66-40.70</td><td>2,250</td><td>225</td></tr>
<tr><td>70-130</td><td>1,250</td><td>125</td></tr>
<tr><td>130-174</td><td>[1]1,250 to 3,750</td><td>[1]125 to 375</td></tr>
<tr><td>174-260</td><td>3,750</td><td>375</td></tr>
<tr><td>260-470</td><td>[1]3,750 to 12,500</td><td>[1]375 to 1,250</td></tr>
<tr><td>Above 470</td><td>12,500</td><td>1,250</td></tr>
</table>
[1]Linear interpolations.

(1) The above field strength limits are specified at a distance of 3 meters. The tighter limits apply at the band edges.</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.10-2013, Section 6.5</td></tr>
<tr><td>Procedure:</td><td>Below 1GHz:
a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
b. 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.
c. 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.
d. 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.
e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
f. 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 quasi-peak method as specified and then reported in a data sheet.
g. Test the EUT in the lowest channel, the middle channel, the Highest channel.
h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
i. Repeat above procedures until all frequencies measured was complete.
Remark:
1. Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor
2. Scan from 9kHz to 30MHz, the disturbance below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points 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. The disturbance below 1GHz was very low and the harmonics were the highest point could be found when testing, so only the above harmonics had been displayed.

Above 1GHz:
a. 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.
b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.</td></tr>
</table>

	c. 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. d. 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. e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. f. 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 or average method as specified and then reported in a data sheet. g. Test the EUT in the lowest channel, the middle channel, the Highest channel. h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case. i. Repeat above procedures until all frequencies measured was complete. Remark: 1. Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor 2. Scan from 18GHz to 40GHz, the disturbance above 18GHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points 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. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report. 4. The disturbance above 18GHz were very low and the harmonics were the highest point could be found when testing, so only the above harmonics had been displayed.

4.4.1 E.U.T. Operation:

Operating Environment:					
Temperature:	22.3 °C	Humidity:	51.7 %	Atmospheric Pressure:	102 kPa
Pre test mode:	TM1				
Final test mode:	TM1				

4.4.2 Test Data:

Frequency (MHz)	Level (dBuV/m)	Duty cycle Factor	Level dBuV/m	Limit (PK/AV)	Margin (dB)	Polarization	
433.92	84.40	/	84.40	100.8	-16.40	Horizontal	QP
433.92	84.40	-13.18	71.22	80.8	-9.58	Horizontal	AV
867.84	53.50	/	53.50	80.8	-27.30	Horizontal	QP
867.84	53.50	-13.18	40.32	60.8	-20.48	Horizontal	AV
433.92	85.30	/	85.30	100.8	-15.50	Vertical	QP
433.92	85.30	-13.18	72.12	80.8	-8.68	Vertical	AV
867.84	64.90	/	64.90	80.8	-15.90	Vertical	QP
867.84	64.90	-13.18	51.72	60.8	-9.08	Vertical	AV

4.5 Radiated Emission (below 1GHz)

Test Requirement:	47 CFR 15.231
Test 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

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§ 15.231 and 15.241.
In the emission table above, the tighter limit applies at the band edges.
The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

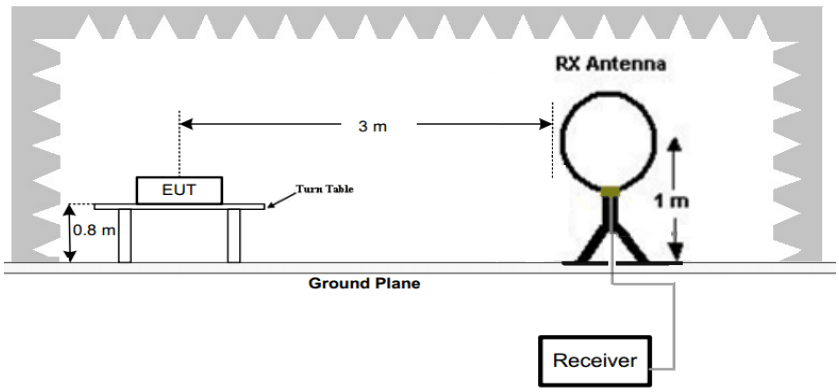
Test Method:	ANSI C63.10-2013, Section 6.5
Procedure:	a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation. b. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. c. 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. d. 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. e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. f. 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 quasi-peak method as specified and then reported in a data sheet. g. Test the EUT in the lowest channel, the middle channel, the Highest channel. h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case. i. Repeat above procedures until all frequencies measured was complete. Remark: 1. Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor 2. Scan from 9kHz to 30MHz, the disturbance below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points 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. The disturbance below 1GHz was very low and the harmonics were the highest point could be found when testing, so only the above harmonics had been displayed.

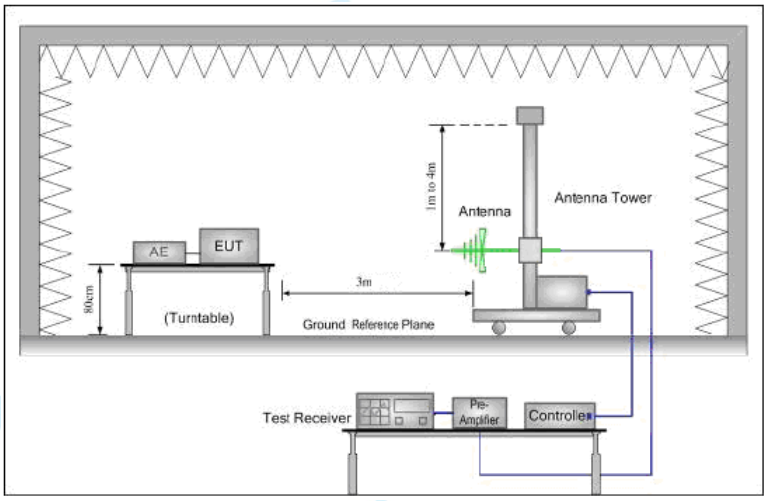
4.5.1 E.U.T. Operation:

Operating Environment:

Temperature:	22.3 °C	Humidity:	51.7 %	Atmospheric Pressure:	102 kPa
Pre test mode:	TM1				
Final test mode:	TM1				

4.5.2 Test Setup Diagram:



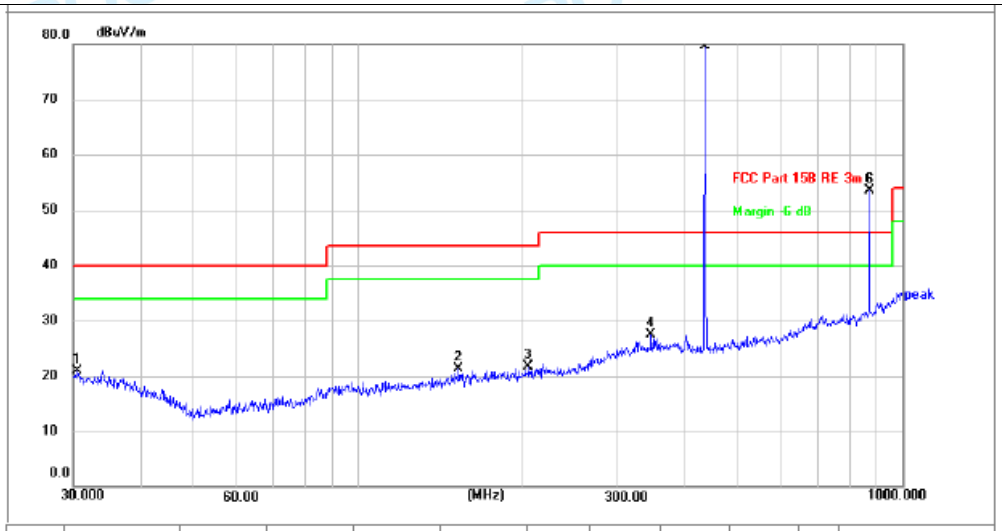


4.5.3 Test Data:

Between 9KHz – 30MHz
The emission from 9 kHz to 30MHz was pre-tested and found the result was 20dB lower than the limit, and according to 15.31(o) & RSS-Gen 6.13, the test result no need to reported.

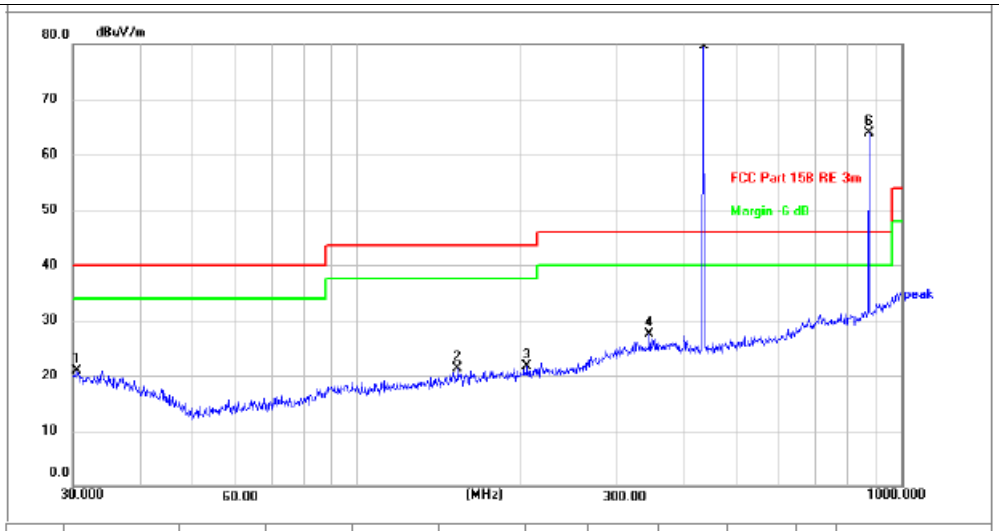
Between 30MHz –1000MHz :

TM1 / Polarization: Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	30.5306	23.85	-3.00	20.85	40.00	-19.15	QP	100		P	
2	153.2004	25.03	-3.67	21.36	43.50	-22.14	QP	100		P	
3	205.6751	24.49	-2.85	21.64	43.50	-21.86	QP	100		P	
4	345.5952	25.85	1.67	27.52	46.00	-18.48	QP	100		P	
5 *	434.0651	83.19	1.21	84.40	100.80	-16.40	QP	100		P	Fundamental
6	869.1302	46.30	7.20	53.50	80.80	-27.30	QP	100		P	

TM1 / Polarization: Vertical



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	30.2111	24.01	-2.92	21.09	40.00	-18.91	QP	100		P	
2	86.5029	25.58	-6.57	19.01	40.00	-20.99	QP	100		P	
3	196.5098	25.21	-2.98	22.23	43.50	-21.27	QP	100		P	
4	305.6800	26.31	-0.02	26.29	46.00	-19.71	QP	100		P	
5 *	434.0651	84.09	1.21	85.30	100.80	-15.50	QP	100		P	Fundamental
6	869.1302	58.09	6.81	64.90	80.80	-15.90	QP	100		P	

Remark: Over= Measurement Level - Limit
Measurement Level=Test receiver reading + correction factor
Correction Factor= Antenna Factor + Cable loss – Pre-amplifier

4.6 Radiated Emission (above 1GHz)

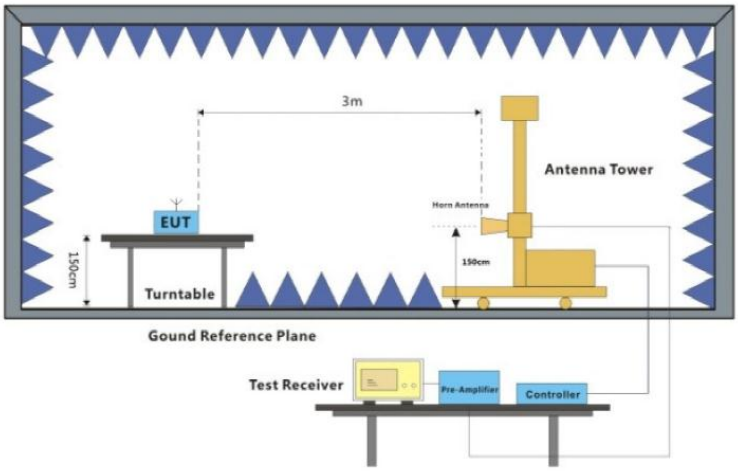
Test Requirement:	47 CFR 15.231
Test Limit:	<table><tr><th>Frequency (MHz)</th><th>Field strength (microvolts/meter)</th><th>Measurement distance (meters)</th></tr><tr><td>0.009-0.490</td><td>2400/F(kHz)</td><td>300</td></tr><tr><td>0.490-1.705</td><td>24000/F(kHz)</td><td>30</td></tr><tr><td>1.705-30.0</td><td>30</td><td>30</td></tr><tr><td>30-88</td><td>100 **</td><td>3</td></tr><tr><td>88-216</td><td>150 **</td><td>3</td></tr><tr><td>216-960</td><td>200 **</td><td>3</td></tr><tr><td>Above 960</td><td>500</td><td>3</td></tr></table> ** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§ 15.231 and 15.241. In the emission table above, the tighter limit applies at the band edges. The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.
Test Method:	ANSI C63.10-2013, Section 6.6
Procedure:	a. 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. b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. c. 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. d. 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. e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. f. 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 or average method as specified and then reported in a data sheet. g. Test the EUT in the lowest channel, the middle channel, the Highest channel. h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case. i. Repeat above procedures until all frequencies measured was complete. Remark: 1. Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor 2. Scan from 18GHz to 40GHz, the disturbance above 18GHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points 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. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report. 4. The disturbance above 18GHz were very low and the harmonics were the

	highest point could be found when testing, so only the above harmonics had been displayed.

4.6.1 E.U.T. Operation:

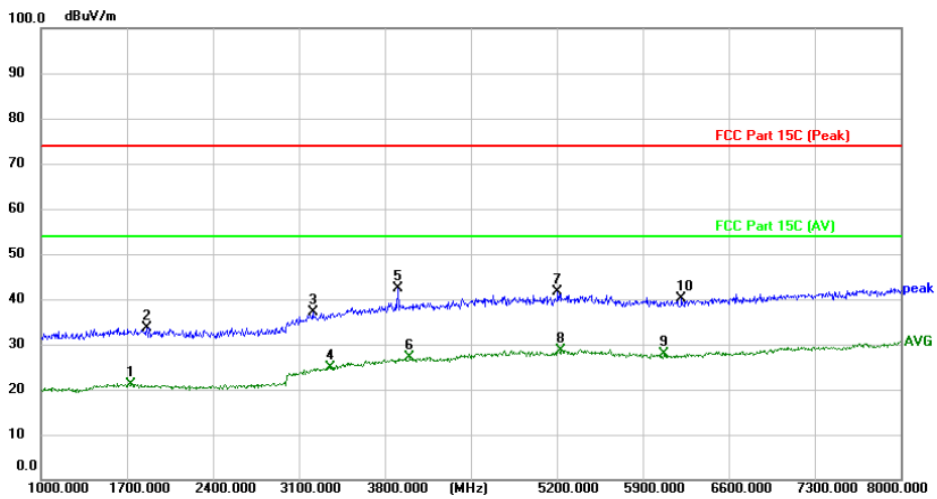
Operating Environment:					
Temperature:	22.3 °C	Humidity:	51.7 %	Atmospheric Pressure:	102 kPa
Pre test mode:	TM1				
Final test mode:	TM1				

4.6.2 Test Setup Diagram:



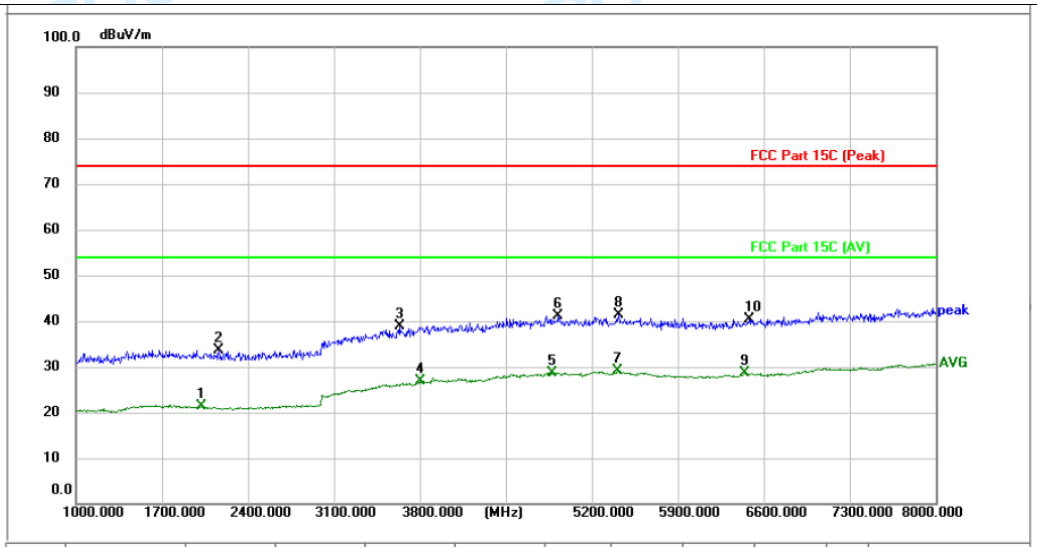
4.6.3 Test Data:

TM1 / Polarization: Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	1735.000	29.77	-8.55	21.22	54.00	-32.78	AVG			P	
2	1861.000	41.78	-8.18	33.60	74.00	-40.40	peak			P	
3	3212.000	42.11	-4.88	37.23	74.00	-36.77	peak			P	
4	3359.000	29.23	-4.37	24.86	54.00	-29.14	AVG			P	
5	3905.000	45.43	-3.05	42.38	74.00	-31.62	peak			P	
6	4003.000	30.08	-2.86	27.22	54.00	-26.78	AVG			P	
7	5207.000	41.48	0.17	41.65	74.00	-32.35	peak			P	
8 *	5235.000	28.45	0.22	28.67	54.00	-25.33	AVG			P	
9	6075.000	26.55	1.45	28.00	54.00	-26.00	AVG			P	
10	6215.000	38.38	1.76	40.14	74.00	-33.86	peak			P	

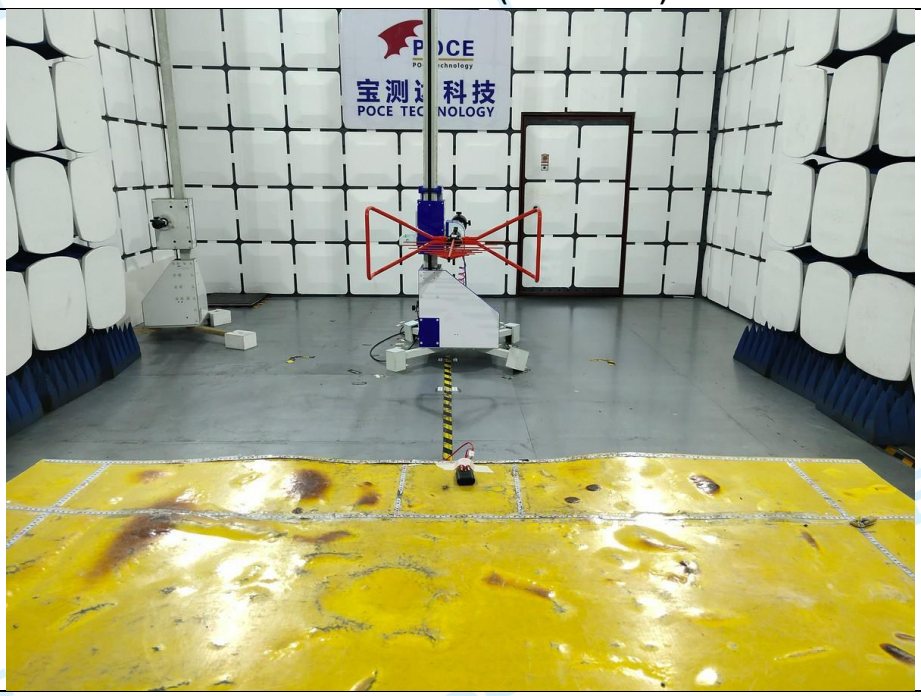
TM1 / Polarization: Vertical



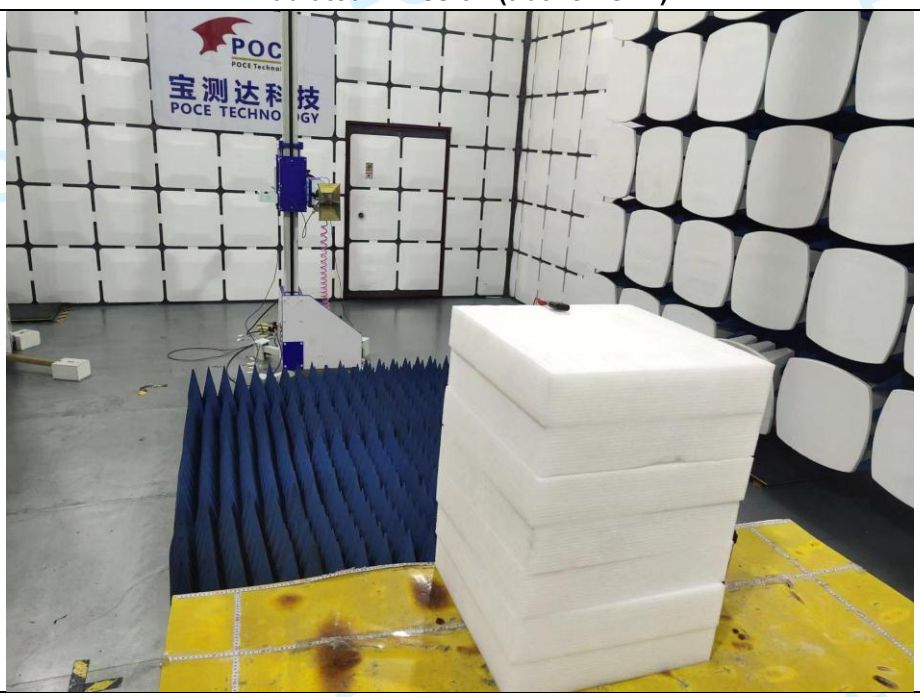
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	2022.000	30.63	-9.36	21.27	54.00	-32.73	AVG	150		P	
2	2162.000	42.42	-8.81	33.61	74.00	-40.39	peak	150		P	
3	3632.000	42.90	-3.91	38.99	74.00	-35.01	peak	150		P	
4	3800.000	30.30	-3.47	26.83	54.00	-27.17	AVG	150		P	
5	4878.000	28.79	-0.04	28.75	54.00	-25.25	AVG	150		P	
6	4927.000	41.00	0.13	41.13	74.00	-32.87	peak	150		P	
7 *	5410.000	28.44	0.63	29.07	54.00	-24.93	AVG	150		P	
8	5417.000	40.81	0.63	41.44	74.00	-32.56	peak	150		P	
9	6446.000	26.43	2.15	28.58	54.00	-25.42	AVG	150		P	
10	6481.000	38.26	2.24	40.50	74.00	-33.50	peak	150		P	

5 TEST SETUP PHOTOS

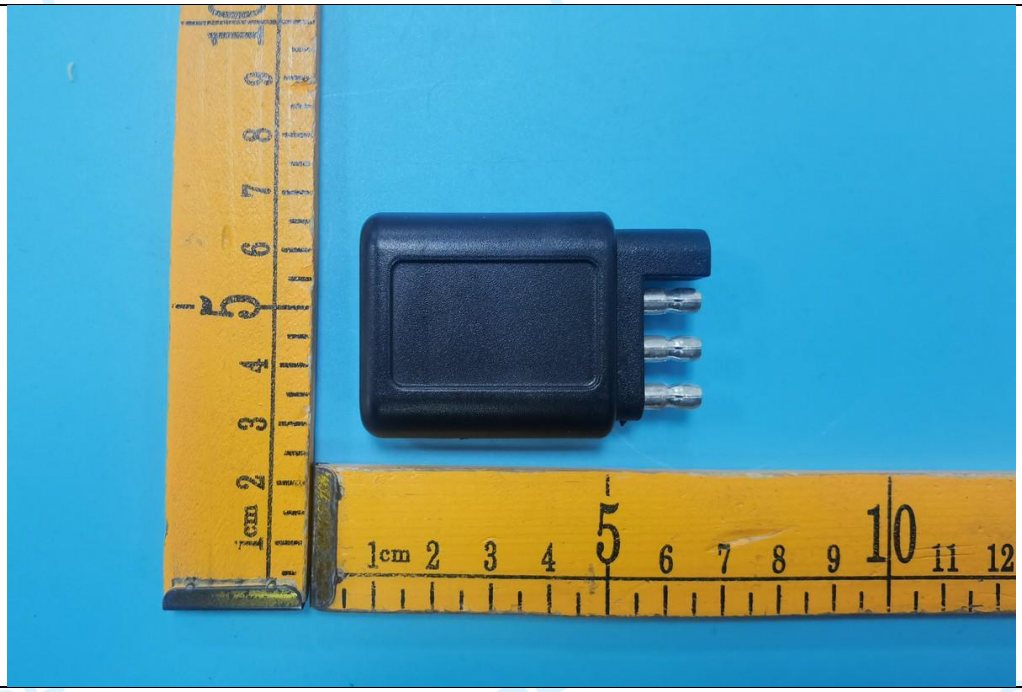
Radiated Emission (below 1GHz)



Radiated Emission (above 1GHz)



6 PHOTOS OF THE EUT

External


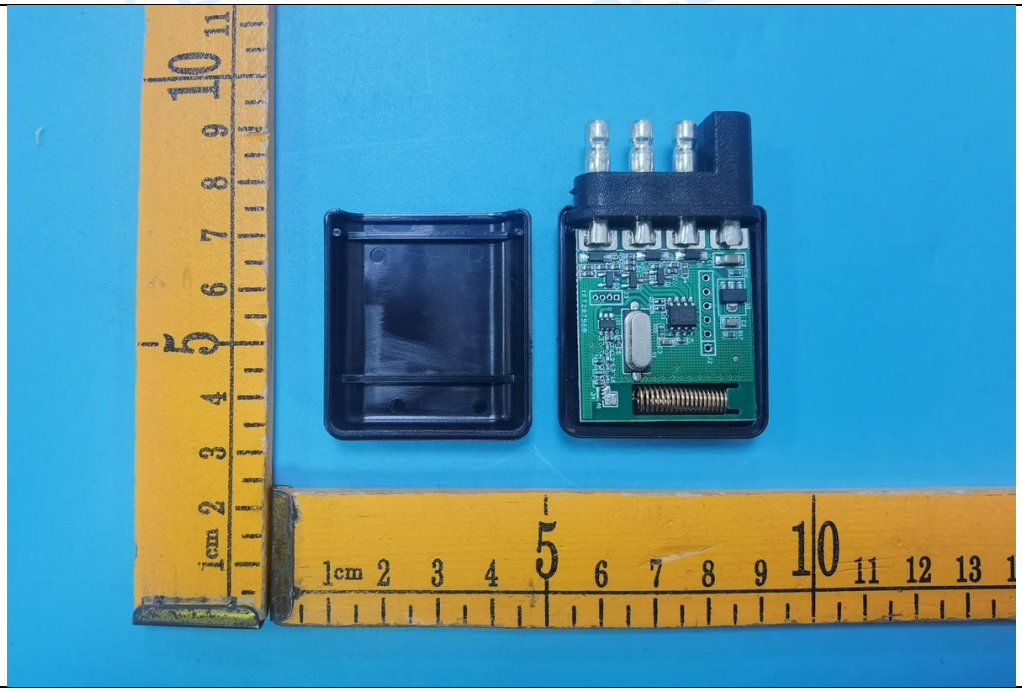
1cm 2 3 4 5 6 7 8

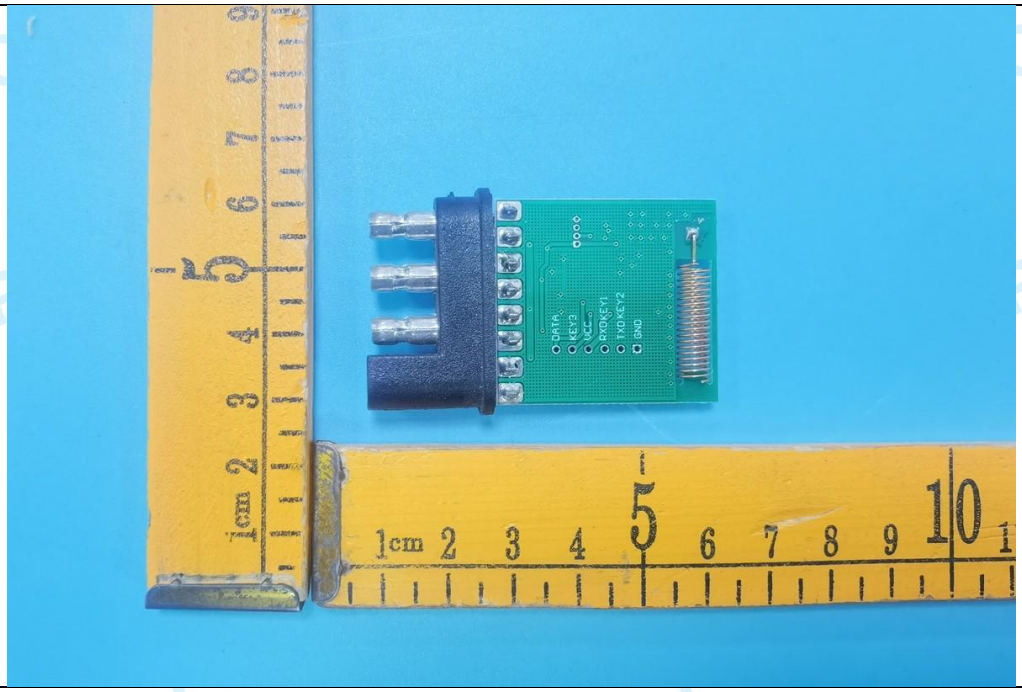
1cm 2 3 4 5 6 7 8

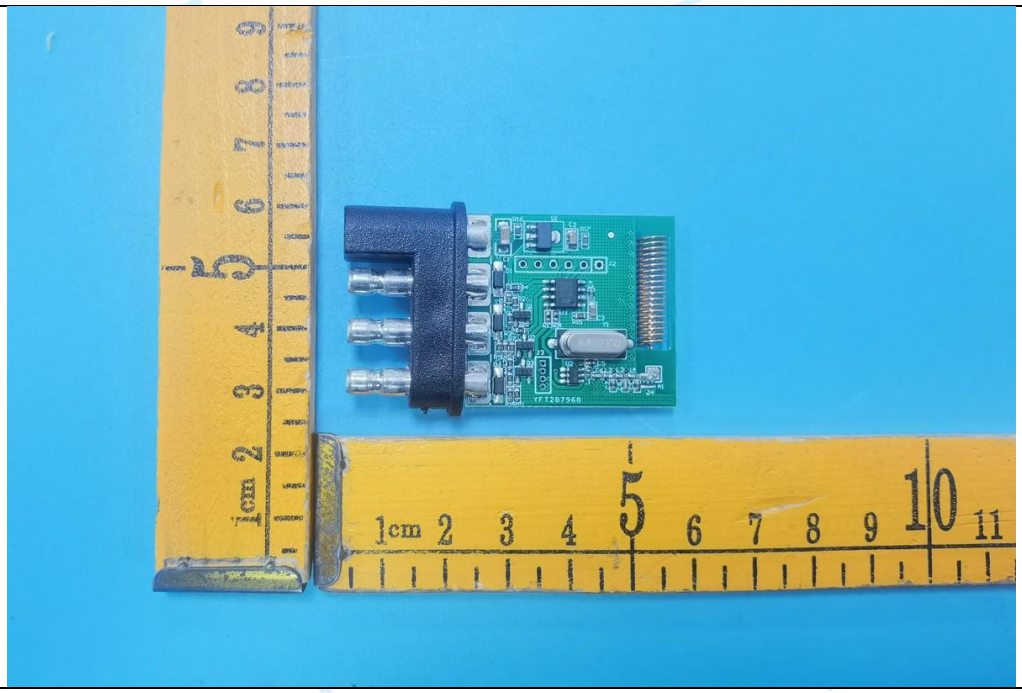
1cm 2 3 4 5 6 7 8 9

1cm 2 3 4 5 6 7 8 9

Internal







********** End of Report **********