

FCC RADIO TEST REPORT

FCC ID: 2AYIQ-TX100

Product: Wireless Thermometer

Trade Name: N/A

Model Name: TX100

Serial Model: TX100H, CLTX001, CLTX100H, DSTX001,
DSTX100H

Report No.: UNIA20122314ER-01

Prepared for

CENTRE WAY COMPANY LIMITED

Unit 607, 6/F., Shing Chuen Industrial Centre, 25-27 Shing Wan Road, Tai Wai, NT.,
Hong Kong

Prepared by

Shenzhen United Testing Technology Co., Ltd.

2F, Annex Bldg, Jiahuangyuan Tech Park, #365 Baotian 1 Rd, Tiegang
Community, Xixiang Str, Bao'an District, Shenzhen, China

TEST RESULT CERTIFICATION

Applicant's name.....: **CENTRE WAY COMPANY LIMITED**

Address.....: Unit 607, 6/F., Shing Chuen Industrial Centre, 25-27 Shing Wan Road, Tai Wai, NT., Hong Kong

Manufacture's Name.....: **CENTRE WAY COMPANY LIMITED**

Address.....: Unit 607, 6/F., Shing Chuen Industrial Centre, 25-27 Shing Wan Road, Tai Wai, NT., Hong Kong

Product description

Product name.....: Wireless Thermometer

Trade Mark.....: N/A

Model and/or type reference .: TX100H, CLTX001, CLTX100H, DSTX001, DSTX100H

Standards.....: FCC Part 15 Subpart C 15.231

ANSI C63.10: 2013

This device described above has been tested by Shenzhen United Testing Technology Co., Ltd., and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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Date of Test.....: December. 21, 2020

Date (s) of performance of tests.....: December. 21, 2020 -- December. 25, 2020

Date of Issue.....: December. 25, 2020

Test Result.....: Pass

Prepared by:

Bob Liao

Bob liao/Editor

Reviewer:

Kahn Yang

Kahn yang/Supervisor

Approved & Authorized Signer:

Liuze

Liuze/Manager

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1 TEST SUMMARY

TEST PROCEDURES AND RESULTS

FCC and IC Requirements		
FCC Part 15.207	Conducted Emission	N/A
FCC Part 15.231(e)	Radiated Emission	Compliant
FCC Part 15.231(c)	20dB Bandwidth	Compliant
FCC Part 15.231(e)	Release Time Measurement	Compliant
FCC Part 15.203	Antenna Requirement	Compliant
The product is a activated automatically transmitter.		

TEST FACILITY

Test Firm : Shenzhen United Testing Technology Co., Ltd.

Address : 2F, Annex Bldg, Jiahuangyuan Tech Park, #365 Baotian 1 Rd, Tiegang Community, Xixiang Str, Bao'an District, Shenzhen, China

The testing quality ability of our laboratory meet with "Quality Law of People's Republic of China" Clause 19. The testing quality system of our laboratory meets with ISO/IEC-17025 requirements, which is approved by CNAS. This approval result is accepted by MRA of APLAC.

Our test facility is recognized, certified, or accredited by the following organizations:

CNAS-LAB Code: L6494

The EMC Laboratory has been assessed and in compliance with CNAS-CL01 accreditation criteria for testing Laboratories (identical to ISO/IEC 17025:2017 General Requirements) for the Competence of testing Laboratories.

Designation Number: CN1227

Test Firm Registration Number: 674885

The EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications commission. The acceptance letter from the FCC is maintained in our files.

MEASUREMENT UNCERTAINTY

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 GENERAL INFORMATION

2.1 ENVIRONMENTAL CONDITIONS

During the measurement the environmental conditions were within the listed ranges:

Temperature	Normal Temperature:	26°C
Voltage	Normal Voltage	3.0V
Other	Relative Humidity	54 %
	Air Pressure	101 kPa

2.2 GENERAL DESCRIPTION OF EUT

Equipment	Wireless Thermometer
Trade Mark	N/A
Model Name	TX100
Serial No.	N/A
Model Difference	TX100H, CLTX001, CLTX100H, DSTX001, DSTX100H
FCC ID	2AYIQ-TX100
Antenna Type	Spring Antenna
Antenna Gain	0dbi
Frequency Range	433.92MHz
Number of Channels	1
Modulation Type	ASK
Battery	N/A
Power Source	DC 3V (2 x 1.5V battery)
Adapter Model	N/A

2.3 CARRIER FREQUENCY OF CHANNELS

Channel	Frequency (MHz)
1	433.92

2.4 OPERATION OF EUT DURING TESTING

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Operating Mode

The mode is used: Transmitting mode

2.5 DESCRIPTION OF TEST SETUP

During test, Keep EUT is in continuous transmission mode, Both open button and close button have test, The two keys were tested to assess and only record the worst case in the report.

Note: New battery is used during all test.



3.1 MEASUREMENT INSTRUMENTS LIST

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
Conduction Emissions Measurement					
1	Conducted Emission Test Software	EZ-EMC	Ver.CCS-3A1-CE	N/A	N/A
2	AMN	Schwarzbeck	NNLK8121	8121370	2021.10.15
3	AMN	ETS	3810/2	00020199	2021.10.15
4	AAN	TESEQ	T8-Cat6	38888	2021.10.15
5	Pulse Limiter	CYBRTEK	EM5010	E115010056	2021.05.26
6	EMI Test Receiver	Rohde&Schwarz	ESCI	101210	2021.10.15
Radiated Emissions Measurement					
1	Radiated Emission Test Software	EZ-EMC	Ver.CCS-03A1	N/A	N/A
2	Horn Antenna	Sunol	DRH-118	A101415	2021.10.18
3	Broadband Hybrid Antenna	Sunol	JB1	A090215	2021.11.15
4	PREAMP	HP	8449B	3008A00160	2021.10.21
5	PREAMP	HP	8447D	2944A07999	2021.05.26
6	EMI Test Receiver	Rohde&Schwarz	ESR3	101891	2021.10.15
7	MXA Signal Analyzer	Keysight	N9020A	MY51110104	2021.10.15
8	Active Loop Antenna	Com-Power	AL-310R	10160009	2021.05.28
9	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-1680	2021.05.28
10	Horn Antenna	A-INFOMW	LB-180400-KF	J211060660	2021.10.23
11	Loop Antenna	Beijing daze Technology	ZN30401	13015	2021.10.15
12	EM Clamp	Schwarzbeck	MDS21	03350	2021.10.20

3 TEST CONDITIONS AND RESULTS

3.2 CONDUCTED EMISSIONS TEST

Limit

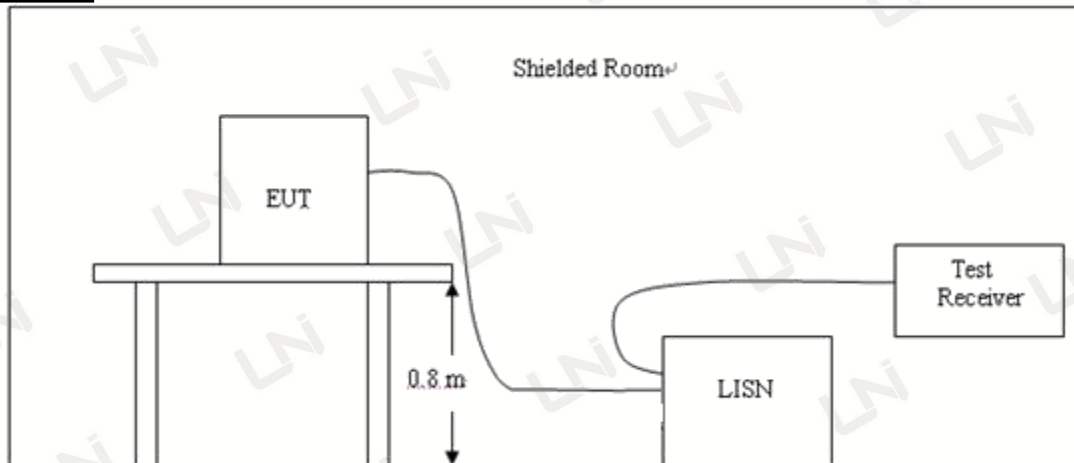
For unintentional device, according to § 15.107(a) Line Conducted Emission Limits is as following

Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreasing linearly with the logarithm of the frequency

For intentional device, according to §15.207(a) Line Conducted Emission Limit is same as above table.

Test Setup



Test Procedure

- 1, The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. A wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10.
- 2, Support equipment, if needed, was placed as per ANSI C63.10.
- 3, All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.
- 4, If a EUT received DC power from the USB Port of Notebook PC, the PC's adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
- 5, All support equipments received AC power from a second LISN, if any.
- 6, The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
- 7, Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.

Test Result

Note: EUT is only power by battery, So it is not applicable for this test.

3.3 RADIATED EMISSION TEST

Radiation Limit

For unintentional device, according to § 15.109(a), except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency (MHz)	Distance (Meters)	Radiated (dBμV/m)	Radiated (μV/m)
30-88	3	40	100
88-216	3	43.5	150
216-960	3	46	200
Above 960	3	54	500

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the above table.

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

Funda-mental fre-quency (MHz)	Field strength of fun-damental (microvolts/ meter)	Field strength of spu-rious 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

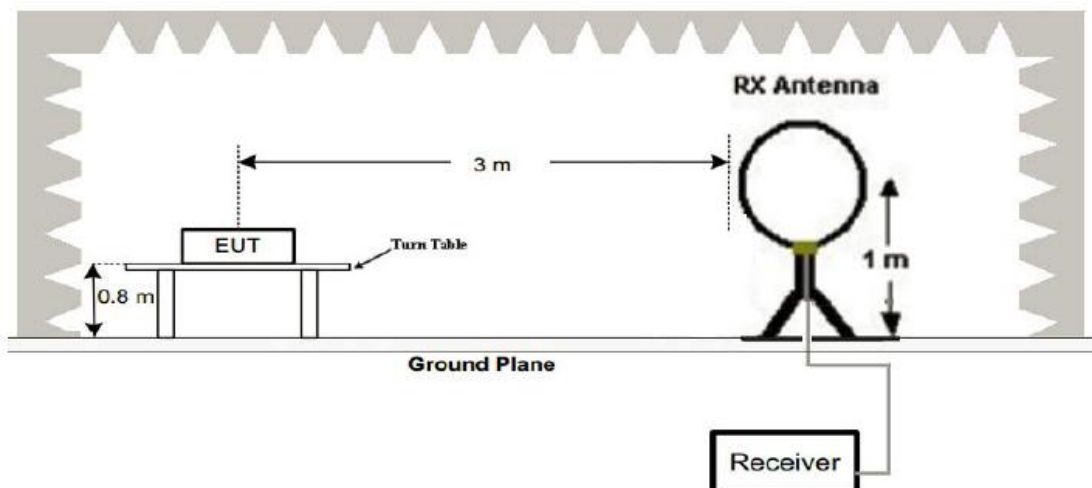
¹ Linear interpolations.

Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174 MHz, $\mu\text{V/m}$ at 3 meters = $22.73(F) - 2454.55$; for the band 260-470 MHz, $\mu\text{V/m}$ at 3 meters = $16.67(F) - 2833.33$. The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.

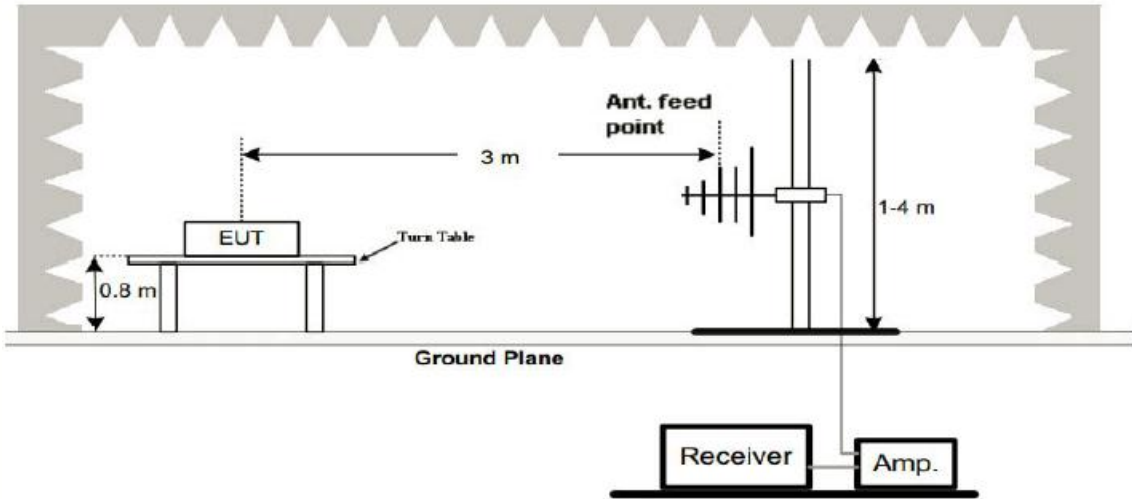
Test Setup

The 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.

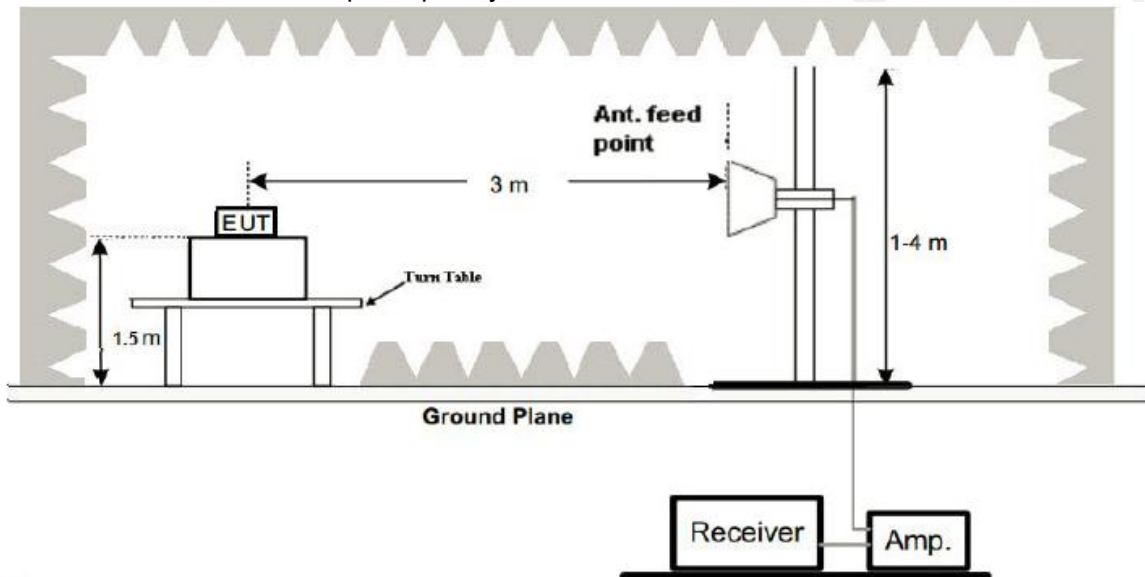
1. Radiated Emission Test-Up Frequency Below 30MHz



2. Radiated Emission Test-Up Frequency 30MHz~1GHz



3. Radiated Emission Test-Up Frequency Above 1GHz



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. This EUT was tested in 3 orthogonal positions and the worst case position data was reported.

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

Note:

For battery operated equipment, the equipment tests shall be performed using a new battery.



Test Result

---PASS---

Remark:

1. All the test modes completed for test. The worst case of Radiated Emission is Middle channel, the test data of this mode was reported.
2. By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that "Z axis" position was the worst, and test data recorded in this report.
3. The frequency range from 9 kHz to 6000 MHz is checked.
4. Below 30MHz, the emissions are lower than 20dB below the allowable limit. Therefore, 9kHz-30MHz data were not recorded.

EUT :		Wireless Thermometer								
Model No. :		TX100				Power Supply :		DC 3V		
Test Mode :		TX				Test Engineer :		PEI		
Frequency (MHz)	Reading	Factor	Average	Result(dBμV/m)		Limit(dBμV/m)		Margin(dB)		Polarization
	(dBμV/m)	Corr.	Factor							
	PEAK	(dB)	(dB)	AV	PEAK	AV	PEAK	AV	PEAK	
433.92	52.36	17.65	-2.555	67.46	70.01	72.87	92.87	-5.41	-22.86	Horizontal
867.8385	12.04	23.65	-2.555	33.14	35.69	52.87	72.87	-19.73	-37.18	
1301.749	40.55	-1.54	-2.555	36.46	39.01	52.87	72.87	-16.41	-33.86	
1735.658	39.74	0.02	-2.555	37.21	39.76	52.87	72.87	-15.66	-33.11	
433.92	53.03	17.65	-2.555	68.13	70.68	72.87	92.87	-4.74	-22.19	Vertical
867.8376	13.39	23.65	-2.555	34.49	37.04	52.87	72.87	-18.38	-35.83	
1301.755	41.09	-1.54	-2.555	37.00	39.55	52.87	72.87	-15.87	-33.32	
1735.668	38.51	0.02	-2.555	35.98	38.53	52.87	72.87	-16.89	-28.24	

Note:

1. Emissions attenuated more than 20 dB below the permissible value are not reported.
2. 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:

$$\text{Result} = \text{Reading} + \text{Corrected Factor}$$

$$\text{Where Corrected Factor} = \text{Antenna Factor} + \text{Cable Loss} + \text{High Pass Filter Loss} - \text{Amplifier Gain}$$

3. FCC Limit for Average Measurement = $16.67(433.92) - 2833.33 = 4400.1164 \mu\text{V/m} = 72.87 \text{ dB}\mu\text{V/m}$
4. The spectral diagrams in appendix I display the measurement of peak values.
5. Average value= PK value + Average Factor (duty factor)

6. If the peak-detected amplitude can be shown to comply with the average limit, then it is not necessary to perform

7. The EUT is tested radiation emission in three axes(X,Y,Z). The worst emissions are reported in three axes.

8. Pulse Desensitization Correction Factor

Pulse Width (PW) = 0.611ms

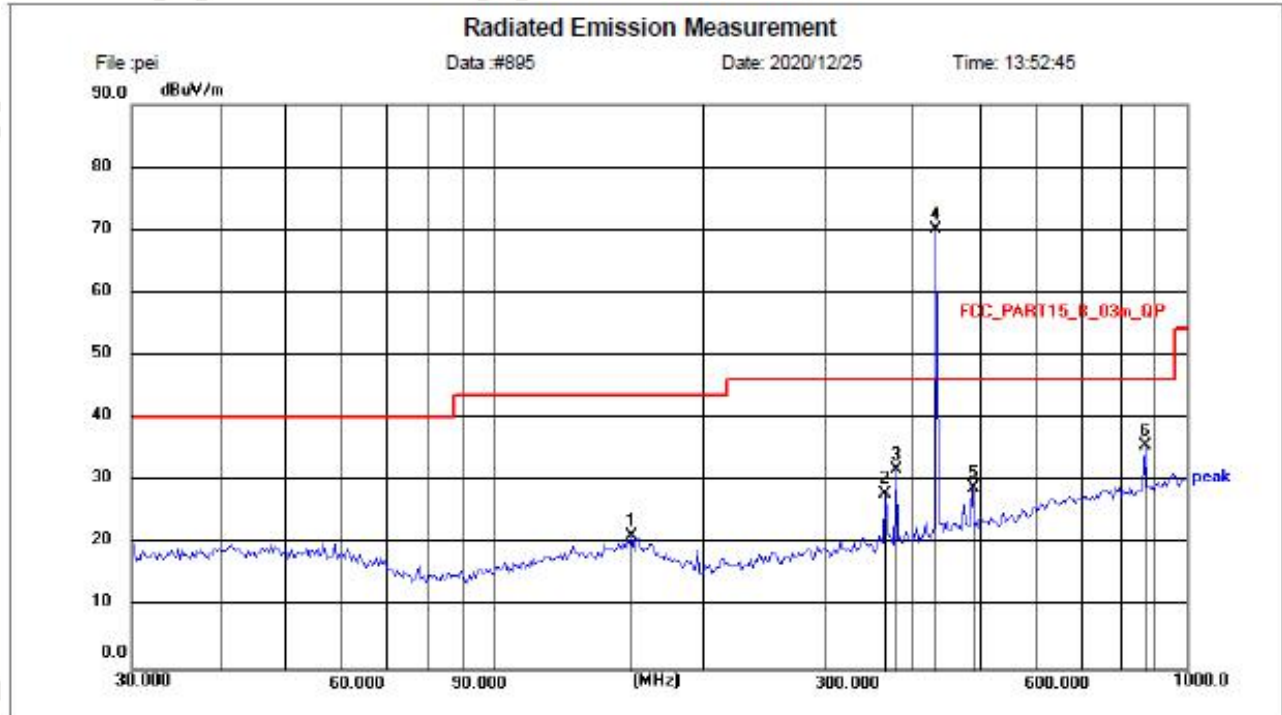
$2/PW = 2/0.350 = 5.7143\text{kHz}$

RBW (100kHz) > 2/PW

Therefore PDCF is not needed.

Below 1GHz Test Results:

Temperature:	26°C	Relative Humidity:	54%
Test Date:	December 25,2020	Pressure:	1010hPa
Test Voltage:	DC 3V	Polarization:	Horizontal
Test Mode:	TX		



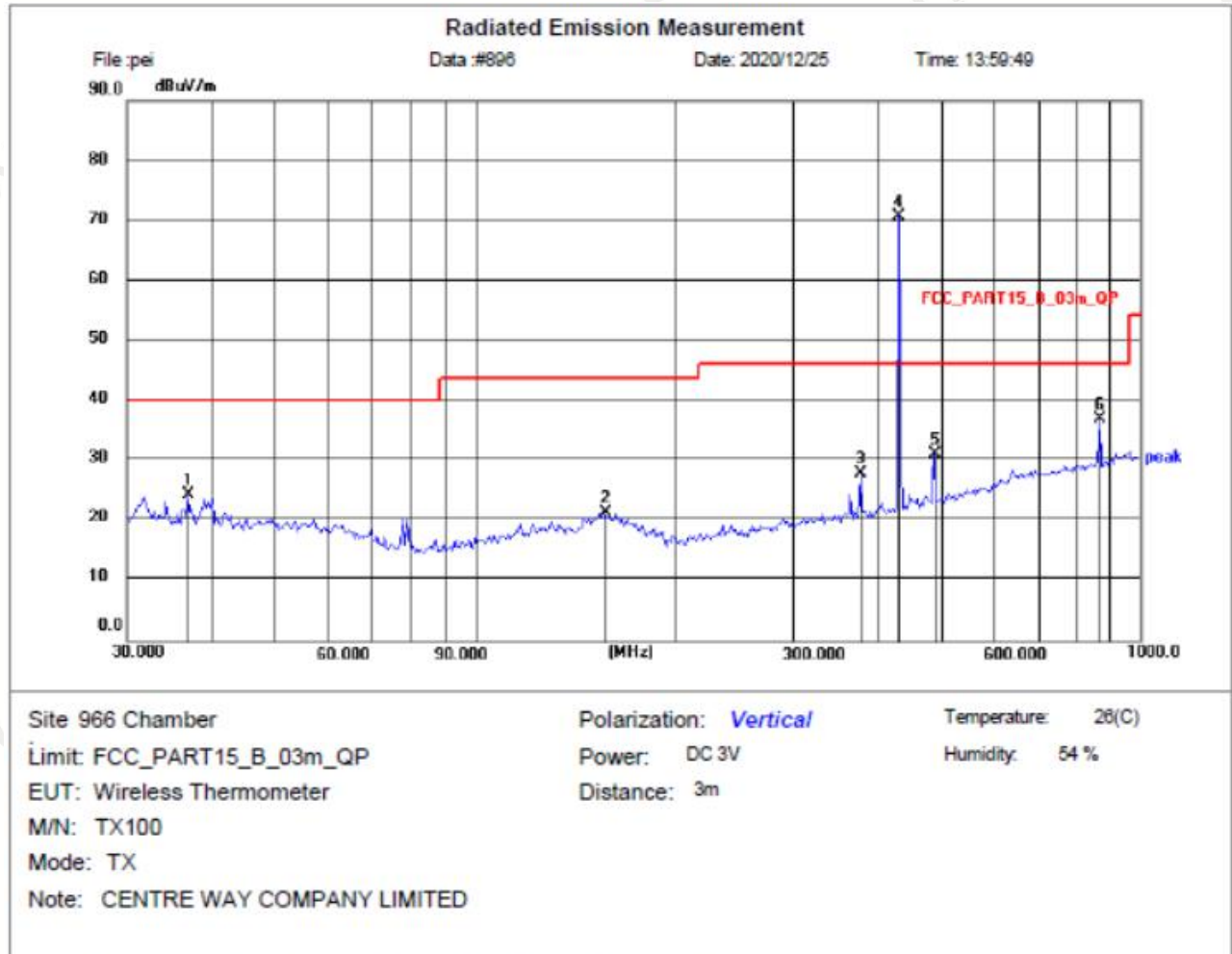
Site 966 Chamber
Limit: FCC_PART15_B_03m_QP
EUT: Wireless Thermometer
M/N: TX100
Mode: TX
Note: CENTRE WAY COMPANY LIMITED

Polarization: **Horizontal**
Power: DC 3V
Distance: 3m

Temperature: 26(C)
Humidity: 54 %

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	158.1123	5.23	15.99	21.22	43.50	22.28	QP	100	257	P	
2	366.8231	11.78	16.17	27.95	46.00	18.05	QP	100	352	P	
3	379.9141	15.45	16.42	31.87	46.00	14.13	QP	105	39	P	
4 *	433.9200	52.36	17.65	70.01	/	/	peak	110	254	P	
5	489.0269	10.38	18.47	28.85	46.00	17.15	QP	100	105	P	
6	867.8385	12.04	23.65	35.69	/	/	peak	100	184	P	

Temperature:	26°C	Relative Humidity:	54%
Test Date:	December 25,2020	Pressure:	1010hPa
Test Voltage:	DC 3V	Polarization:	Vertical
Test Mode:	TX		

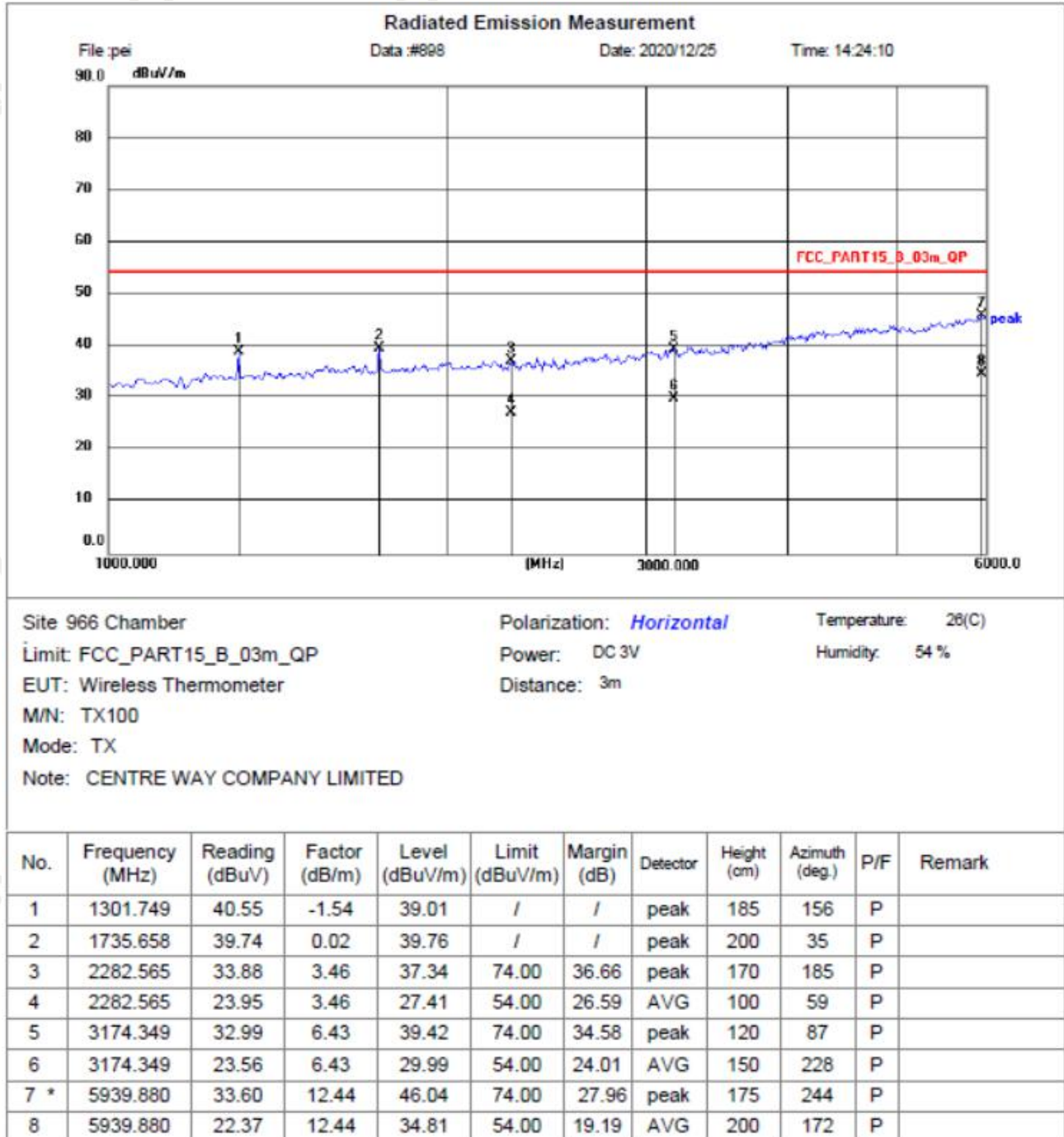


No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	37.0248	9.47	14.91	24.38	40.00	15.62	QP	185	38	P	
2	155.9101	5.60	15.99	21.59	43.50	21.91	QP	185	45	P	
3	379.9141	11.63	16.42	28.05	46.00	17.95	QP	150	169	P	
4 *	433.9200	53.03	17.65	70.68	/	/	peak	100	256	P	
5	489.0268	12.69	18.47	31.16	46.00	14.84	QP	175	36	P	
6	867.8376	13.39	23.65	37.04	/	/	peak	105	150	P	

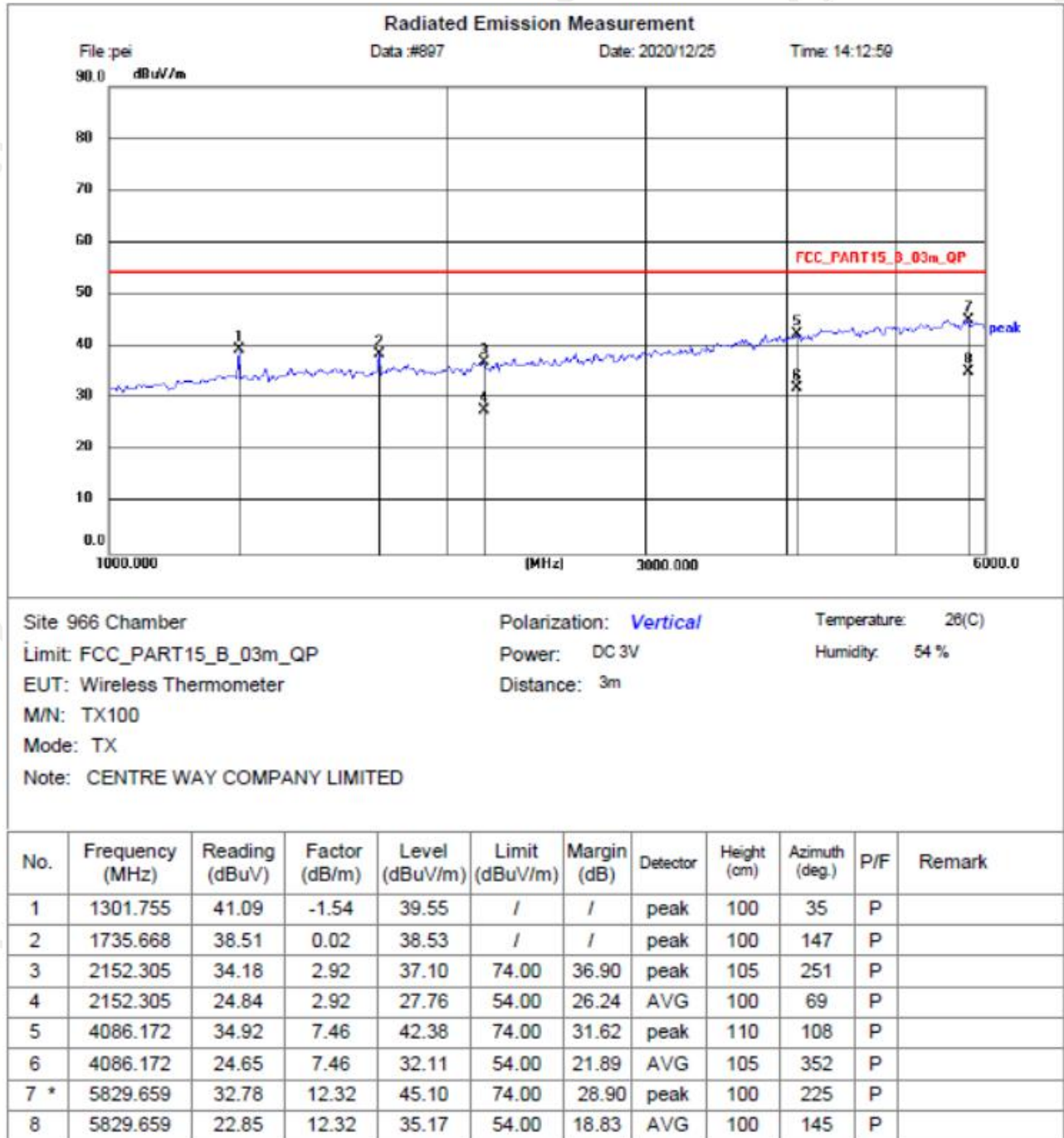


Above 1GHz Test Results:

Temperature:	26°C	Relative Humidity:	54%
Test Date:	December 25,2020	Pressure:	1010hPa
Test Voltage:	DC 3V	Polarization:	Horizontal
Test Mode:	TX		



Temperature:	26°C	Relative Humidity:	54%
Test Date:	December 25, 2020	Pressure:	1010hPa
Test Voltage:	DC 3V	Polarization:	Vertical
Test Mode:	TX		



3.4 -20db OCCUPIED BANDWIDTH

Limit

According to 47 CFR 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.

Test Procedure

1. Set SPA Center Frequency = Fundamental frequency, RBW = 10 kHz, VBW = 30 kHz, Span = 1MHz.
2. Set SPA Max hold, Mark peak, -20 dB.

Test Configuration

The 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.

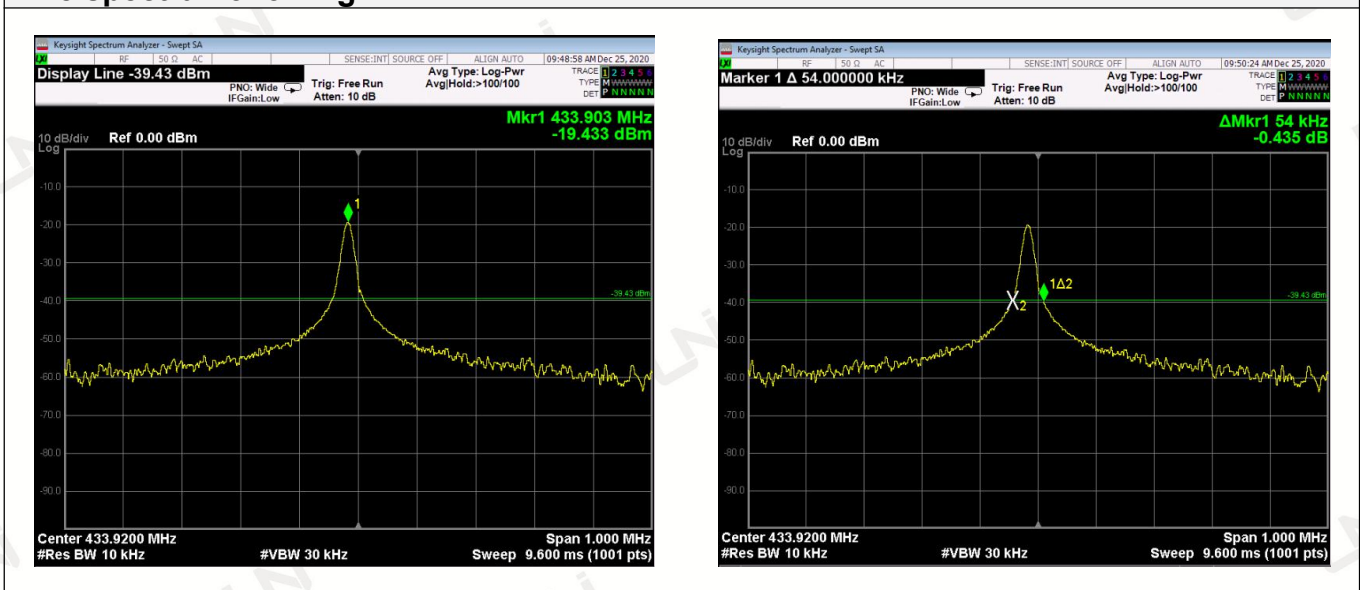


Test Result

---PASS---

Channel Frequency	Measurement		
	20dB bandwidth (kHz)	Limit (kHz)	Result
433.92MHz	54	$0.25\% \times 433.92 = 1084.8$	Pass

The spectral following:



3.5 Release time measurement

LIMIT

According to FCC §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.

TEST PROCEDURE

1. Set SPA Center Frequency = Fundamental frequency, RBW = 100 kHz, VBW = 300 kHz, Span = 0 Hz.
2. Set EUT as normal operation and press Transmitter button.
3. Set SPA View. Delta Mark time.

Test Configuration

The 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.



TEST RESULTS

---PASS---

Period Time = 30.63s+276.0ms=30.906s

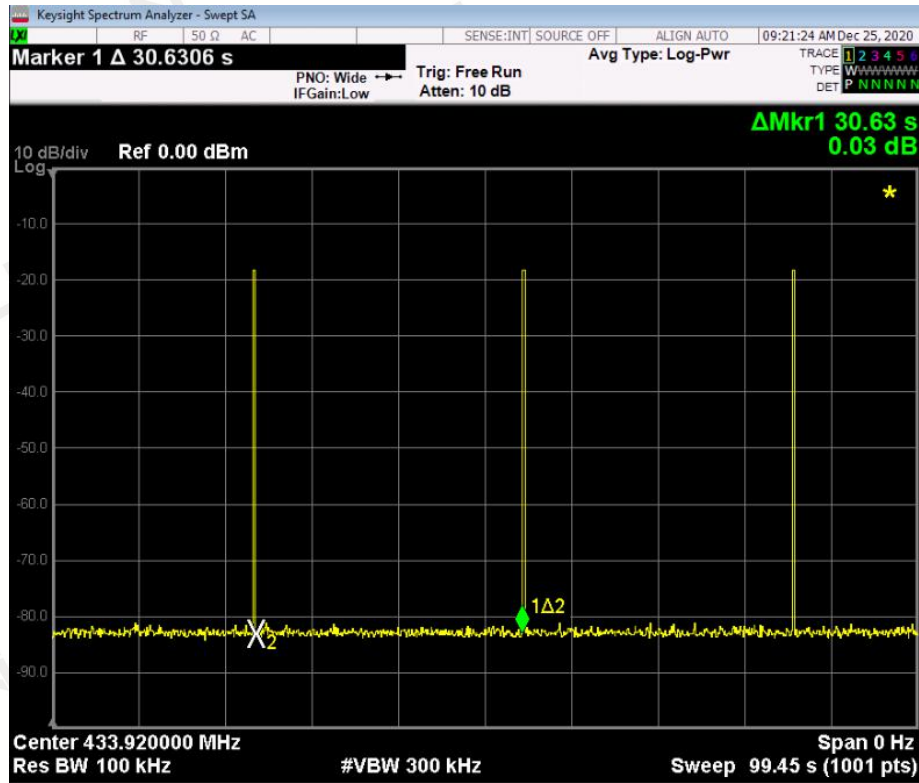
Duration time = 276.0ms < 1s

Silent time = 30.63s > 10s

Silent time = 30.63s > 30*276.0ms=8.28s



the duration of a transmission Time = 276.0ms



the silent period between transmissions =30.63s

3.6 Average factor measurement

LIMIT

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):

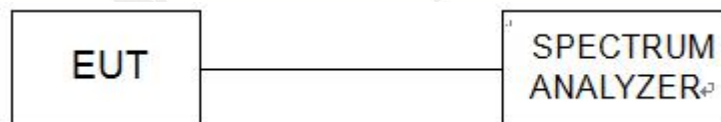
Average factor in dB = 20 log (duty cycle)

TEST PROCEDURE

1. Set SPA Center Frequency = Fundamental frequency, RBW = 100 kHz, VBW = 300 kHz, Span = 0 Hz.
2. Set EUT as normal operation and press Transmitter button.
3. Set SPA View. Delta Mark time.
4. 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

Test Configuration

The 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.



TEST RESULTS

---PASS---

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

The duration of one cycle = 43.95 ms

Effective period of the cycle = (2.75×2)ms + (1.25×5)ms + (0.65×21)ms + (0.35×21)ms =30.65 ms

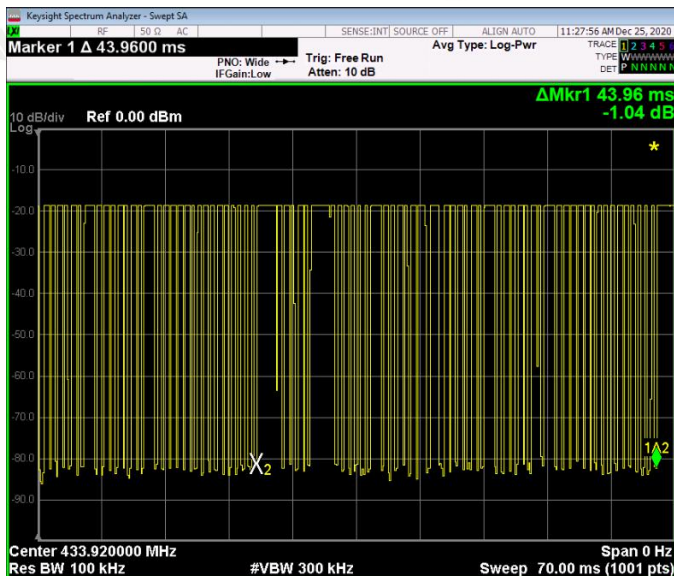
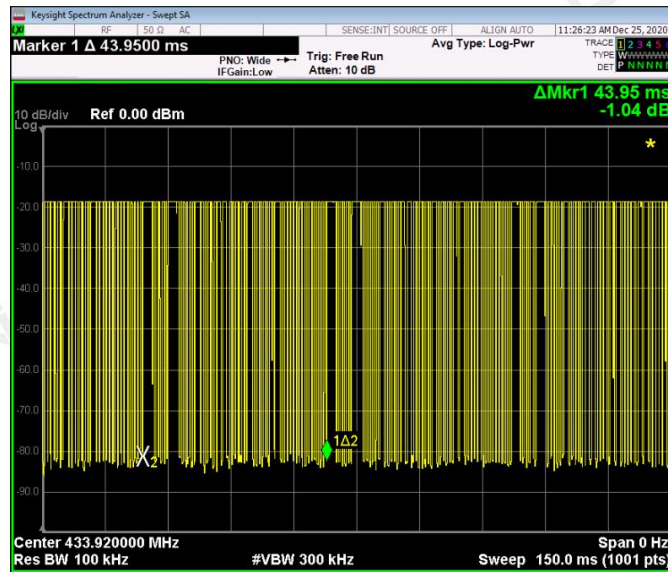
DC = 32.75 ms / 43.95 ms =0.7452

Therefore, the average factor is found by 20log0.7452= -2.555dB

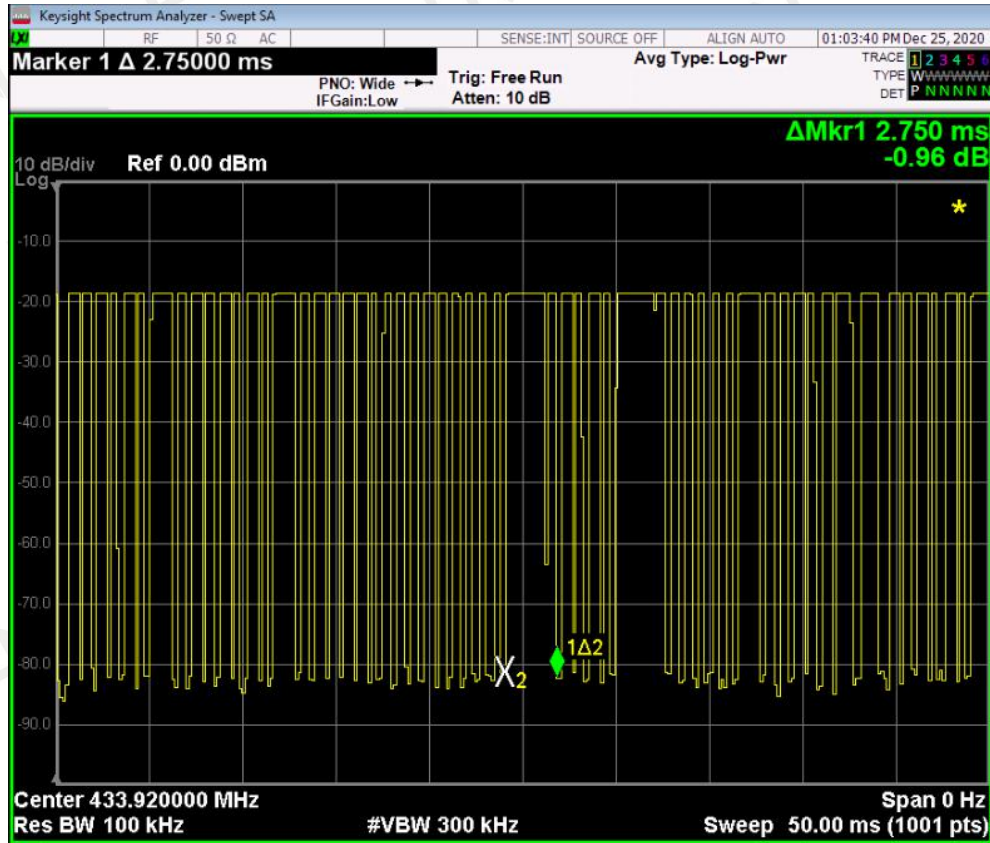
The spectral following.

The graph shows the pattern of coding during the signal transmission.

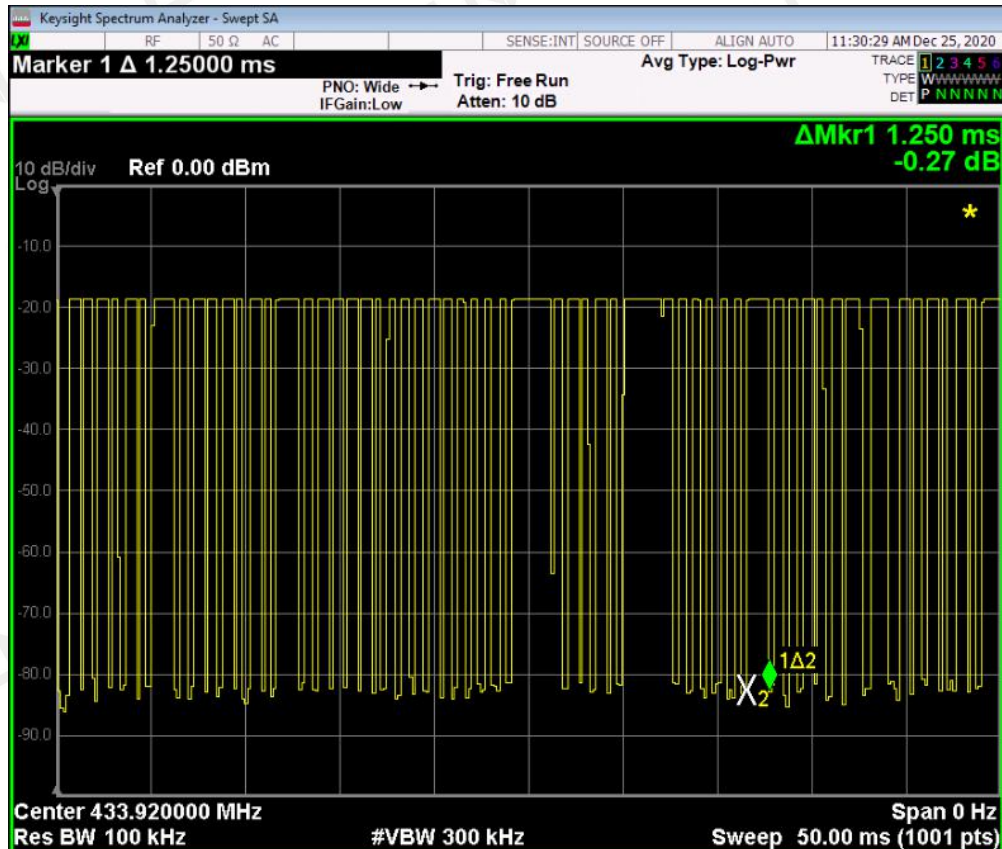
The duration of one cycle = 43.95 ms.



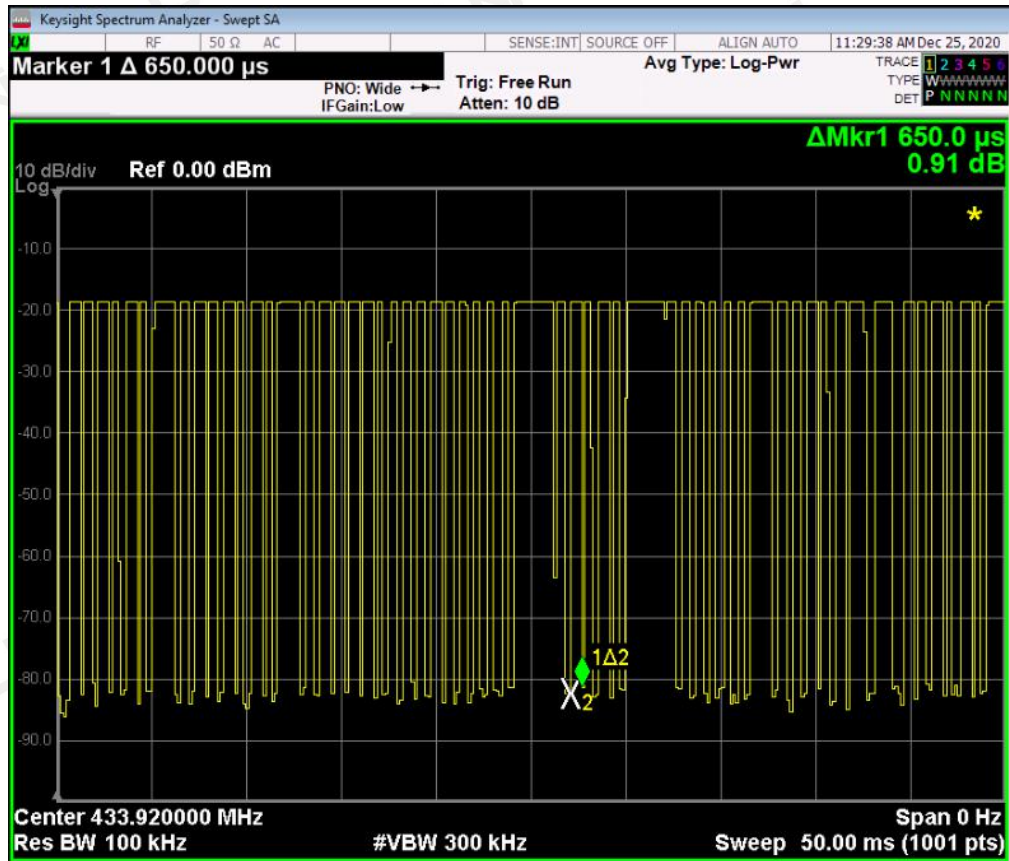
The graph shows the duration of 'on' signal. From marker 1 to marker 2, duration is 2.75 ms.



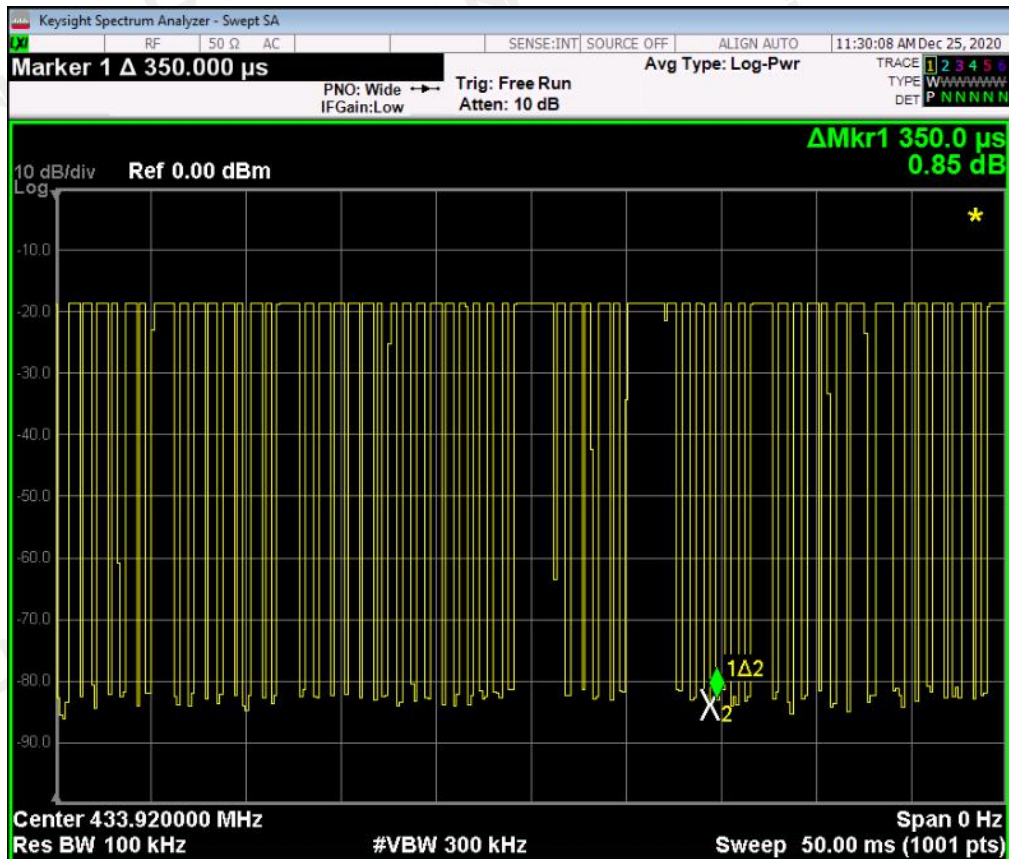
The graph shows the duration of 'on' signal. From marker 1 to marker 2, duration is 1.250 ms.



The graph shows the duration of 'on' signal. From marker 1 to marker 2, duration is 650 μ s.



The graph shows the duration of 'on' signal. From marker 1 to marker 2, duration is 350 μ s.



3.7 ANTENNA REQUIREMENT

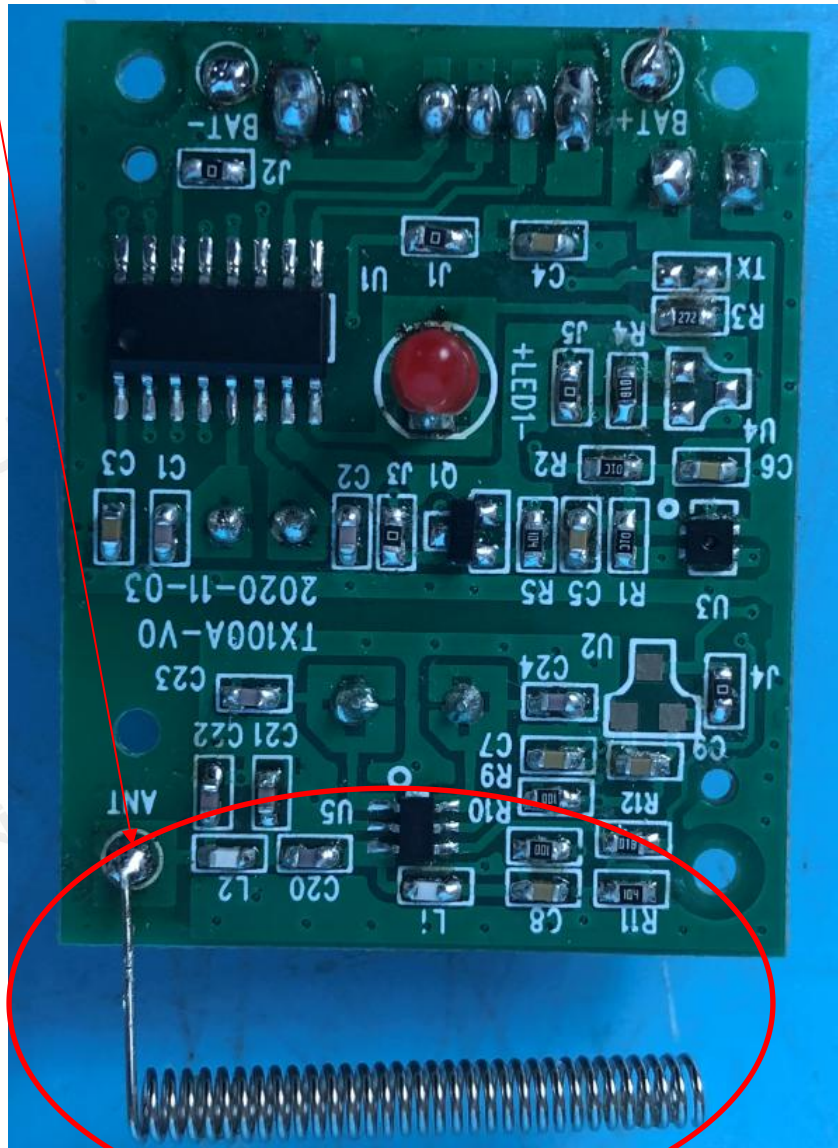
Standard Applicable:

For intentional device, according to FCC 47 CFR 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.

Antenna Construction

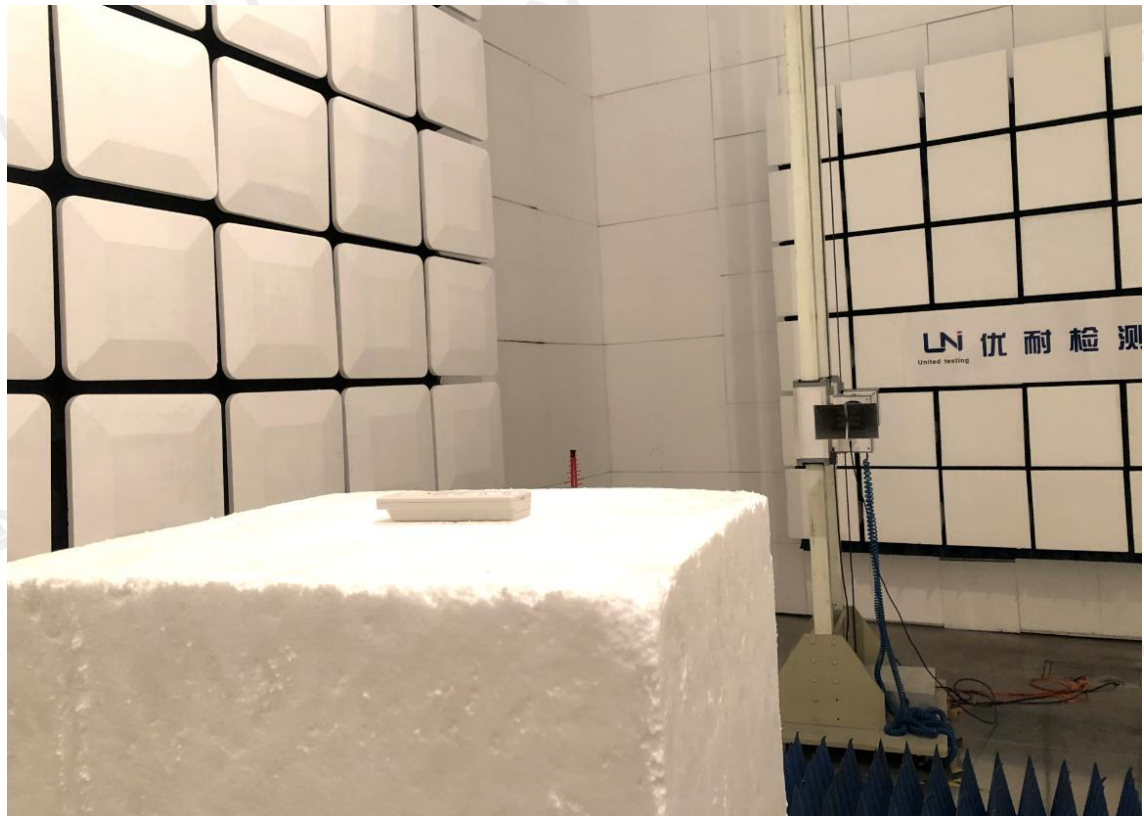
Device is equipped with permanent attached antenna, which isn't displaced by other antenna. The Antenna gain of EUT is 0dBi. Therefore, the equipment complies with the antenna requirement of Section 15.203.

ANTENNA



4 PHOTOGRAPH OF TEST

Radiated Emission



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