Shenzhen CTL Testing Technology Co., Ltd.
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TEST REPORT

FCC PART 15 SUBPART C 15.249

Report Reference No. ..... : **CTL2307182022-WF**

Compiled by: (position+printed name+signature)	Happy Guo (File administrators)	Happy Guo
Tested by: (position+printed name+signature)	Jack Wang (Test Engineer)	Jack Wang
Approved by: (position+printed name+signature)	Ivan Xie (Manager)	Ivan Xie

Product Name ..... :	Warehouse Electronic Shelf Label 23
Model/Type reference ..... :	CK_Label_V23
List Model(s)..... :	Please see page 2
Trade Mark..... :	N/A
FCC ID..... :	**2BCKG-LABEL23**
Applicant's name ..... :	**Picksmart Technology Co., Limited**
Address of applicant ..... :	Room 406, Deguanting Business Center, Xin'an 3rd Road, Bao'an 28th District, Shenzhen City, China. 518109
Test Firm..... :	**Shenzhen CTL Testing Technology Co., Ltd.**
Address of Test Firm ..... :	Floor 1-A, Baisha Technology Park, No.3011, Shahexi Road, Nanshan District, Shenzhen, China 518055
Test specification..... :	
Standard ..... :	**FCC Part 15.249:**Operation within the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5850 MHz and 24.0 - 24.25 GHz.
TRF Originator ..... :	Shenzhen CTL Testing Technology Co., Ltd.
Master TRF..... :	Dated 2011-01
Date of receipt of test item ..... :	Jul 25, 2023
Date of Test Date..... :	Jul 25, 2023 –Aug 02, 2023
Date of Issue ..... :	Aug 03, 2023
Result..... :	**Pass**

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TEST REPORT

Test Report No. :	CTL2307182022-WF	Aug 03, 2023 Date of issue

Equipment under Test	:	Warehouse Electronic Shelf Label 23
Sample No.		CTL2307182022
Model /Type	:	CK_Label_V23
Listed Models	:	CK_Label_V23,CK_Label_1,CK_Label_2,CK_Label_3, CK_Label_4,CK_Label_5,CK_Label_6,CK_Label_7, CK_Label_8,CK_Label_9,CK_Label_9_BAT,CK_Label_10, CK_Label_11,CK_Label_12,CK_Label_13,CK_Label_14, CK_Label_15,CK_Label_16,CK_Label_20,CK_Label_21, CK_Label_24,CK_Label_75，CK_Label_X
Applicant	:	**Picksmart Technology Co., Limited**
Address	:	Room 406, Deguanting Business Center, Xin’an 3rd Road, Bao’an 28th District, Shenzhen City, China. 518109
Manufacturer	:	**Picksmart Technology Co., Limited**
Address	:	Room 406, Deguanting Business Center, Xin’an 3rd Road, Bao’an 28th District, Shenzhen City, China. 518109

Test result	**Pass ***

* In the configuration tested, the EUT complied with the standards specified page 5.

The test results presented in this report relate only to the object tested.
This report shall not be reproduced, except in full, without the written approval of the issuing testing laboratory.

** Modified History **

Revisions	Description	Issued Data	Report No.	Remark
Version 1.0	Initial Test Report Release	2023-08-03	CTL2307182022-WF	Tracy Qi

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1. SUMMARY

1.1. TEST STANDARDS

The tests were performed according to following standards:
FCC Rules Part 15.249: Operation within the bands 902 - 928 MHz, 2400 - 2483.5 MHz, 5725 - 5875 MHz, and 24.0 -24.25 GHz.

ANSI C63.10:2013: American National Standard for Testing Unlicensed Wireless Devices.

1.2. Test Description

FCC PART 15.249		
FCC Part 15.249(a)	Field Strength of Fundamental	PASS
FCC Part 15.209	Spurious Emission	PASS
FCC Part 15.215(c)	20dB bandwidth	PASS
FCC Part 15.207	Conducted Emission	N/A
FCC Part 15.203	Antenna Requirement	PASS

1.3. Test Facility

1.3.1 Address of the test laboratory

Shenzhen CTL Testing Technology Co., Ltd.
Floor 1-A, Baisha Technology Park, No. 3011, Shahexi Road, Nanshan, Shenzhen 518055 China

There is one 3m semi-anechoic chamber and two line conducted labs for final test. The Test Sites meet the requirements in documents ANSI C63.10 and CISPR 32/EN 55032 requirements.

1.3.2 Laboratory accreditation

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

CNAS-Lab Code: L7497

Shenzhen CTL Testing Technology Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 2017 General Requirements) for the Competence of Testing and Calibration Laboratories.

A2LA-Lab Cert. No. 4343.01

Shenzhen CTL Testing Technology Co., Ltd, EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2017 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

IC Registration No.: 9618B

CAB identifier: CN0041

The 3m alternate test site of Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements with Registration No.: 9618B on Jan. 22, 2019.

FCC-Registration No.: 399832

Designation No.: CN1216

Shenzhen CTL Testing Technology Co., Ltd. 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. Registration 399832, December 08, 2017.

1.4. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 “Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the Shenzhen CTL Testing Technology Co., Ltd. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for CTL laboratory is reported:

Test	Measurement Uncertainty	Notes
Transmitter power conducted	±0.57 dB	(1)
Transmitter power Radiated	±2.20 dB	(1)
Conducted spurious emission 9KHz-40 GHz	±2.20 dB	(1)
Occupied Bandwidth	±0.01ppm	(1)

Radiated Emission 30~1000MHz	±4.10dB	(1)
Radiated Emission Above 1GHz	±4.32dB	(1)
Conducted Disturbance0.15~30MHz	±3.20dB	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

2. GENERAL INFORMATION

2.1. Environmental conditions

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

Normal Temperature:	25°C
Relative Humidity:	55 %
Air Pressure:	101 kPa

2.2. General Description of EUT

Product Name:	Warehouse Electronic Shelf Label 23
Model/Type reference:	CK_Label_V23
Power supply:	DC 3 V from battery or DC-DC power supply 24V to 3.3V
Hardware version:	V1.0
Software version:	V1.0
SRD:	
Operation frequency:	915 MHz
Modulation:	FM
Channel number:	1
Channel separation:	250KHz
Antenna type:	PCB Antenna
Antenna gain:	-6.3dBi

Note1: For more details, please refer to the user's manual of the EUT.

2.3. Description of Test Modes and Test Frequency

The Applicant provides communication tools software to control the EUT for staying in continuous transmitting (Duty Cycle more than 98%) and receiving mode for testing.

2.4. Equipments Used during the Test

Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
LISN	R&S	ESH2-Z5	860014/010	2023/05/04	2024/05/03
Double cone logarithmic antenna	Schwarzbeck	VULB 9168	824	2023/02/13	2026/02/12
Horn Antenna	Ocean Microwave	OBH100400	26999002	2021/12/22	2024/12/21
EMI Test Receiver	R&S	ESCI	1166.5950.03	2023/05/04	2024/05/03
Spectrum Analyzer	Agilent	E4407B	MY41440676	2023/05/05	2024/05/04
Spectrum Analyzer	Agilent	N9020A	US46220290	2023/05/05	2024/05/04
Spectrum Analyzer	Keysight	N9020A	MY53420874	2023/05/05	2024/05/04
Horn Antenna	Sunol Sciences Corp.	DRH-118	A062013	2021/12/23	2024/12/22
Active Loop Antenna	Da Ze	ZN30900A	/	2021/05/13	2024/05/12

Amplifier	Agilent	8449B	3008A02306	2023/05/04	2024/05/03
Amplifier	MRT Technology(Suzhou)Co., Ltd	MRT-AP01M06	S-001	2023/05/04	2024/05/03
Amplifier	Brief&Smart	LNA-4018	2104197	2023/05/05	2024/05/04
Temperature/Humidity Meter	Ji Yu	MC501	/	2023/05/09	2024/05/08
Power Sensor	Agilent	U2021XA	MY53340004	2023/05/05	2024/05/04
Power Sensor	Agilent	U2021XA	MY54080012	2023/05/05	2024/05/04
Power Sensor	Agilent	U2021XA	MY54510008	2023/05/05	2024/05/04
Power Sensor	Agilent	U2021XA	MY55060003	2023/05/05	2024/05/04
Spectrum Analyzer	RS	FSP	1164.4391.38	2023/05/05	2024/05/04

Test Software

Name of Software	Version
TST-PASS	V1.1.0
EZ_EMC(Below 1GHz)	V1.1.4.2
EZ_EMC((Above 1GHz)	V1.1.4.2

The calibration interval was one year

2.5. Modifications

No modifications were implemented to meet testing criteria.

3. TEST CONDITIONS AND RESULTS

3.1. Conducted Emissions Test

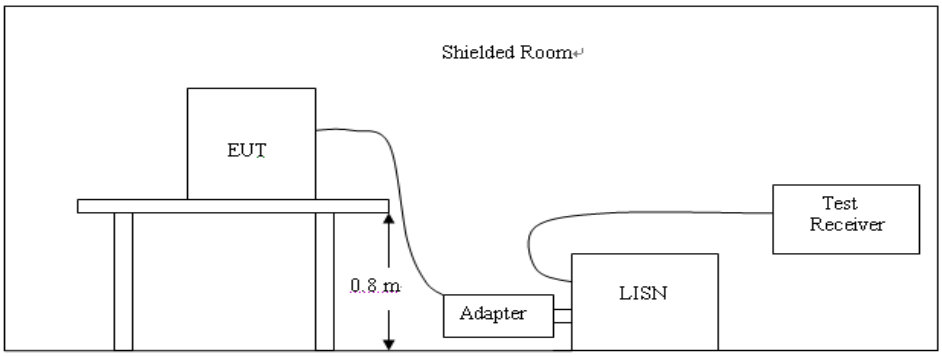
LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.207

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

* Decreases with the logarithm of the frequency.

TEST CONFIGURATION



TEST PROCEDURE

1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system; a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10:2013.
2. Support equipment, if needed, was placed as per ANSI C63.10:2013.
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10:2013.
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.
8. During the above scans, the emissions were maximized by cable manipulation.

TEST RESULTS

Remark: This device is not used for this project

3.2. Radiated Emissions

Limit

According 15.249, the field strength of emissions from intentional radiators operated within 5725-5875 MHz shall not exceed 94dBμV/m (50mV/m):

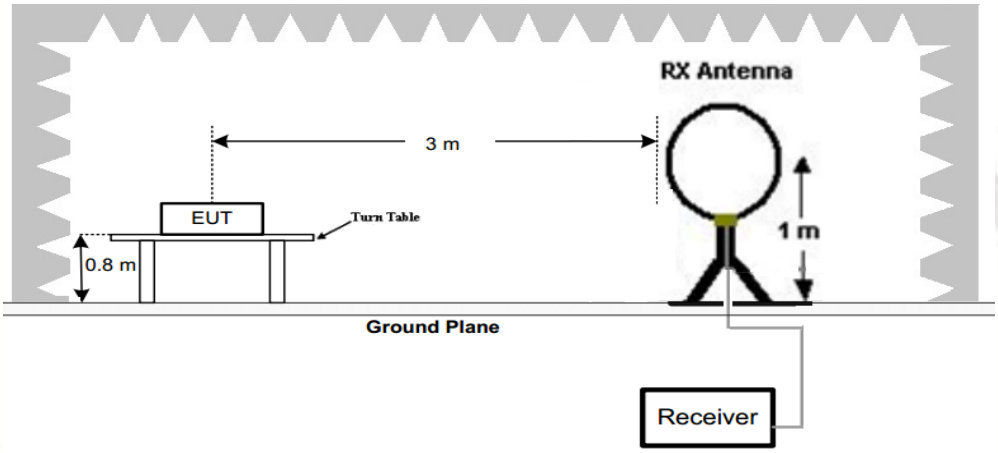
FCC PART 15.249(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.
In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a)

Radiated emission limits

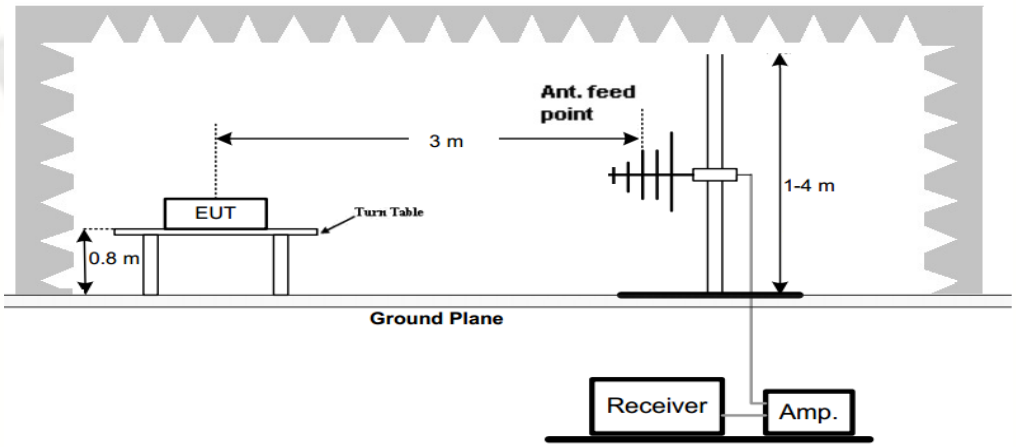
Frequency (MHz)	Distance (Meters)	Radiated (dBμV/m)	Radiated (μV/m)
0.009-0.49	3	20log(2400/F(KHz))+40log(300/3)	2400/F(KHz)
0.49-1.705	3	20log(24000/F(KHz))+ 40log(30/3)	24000/F(KHz)
1.705-30	3	20log(30)+ 40log(30/3)	30
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

TEST CONFIGURATION

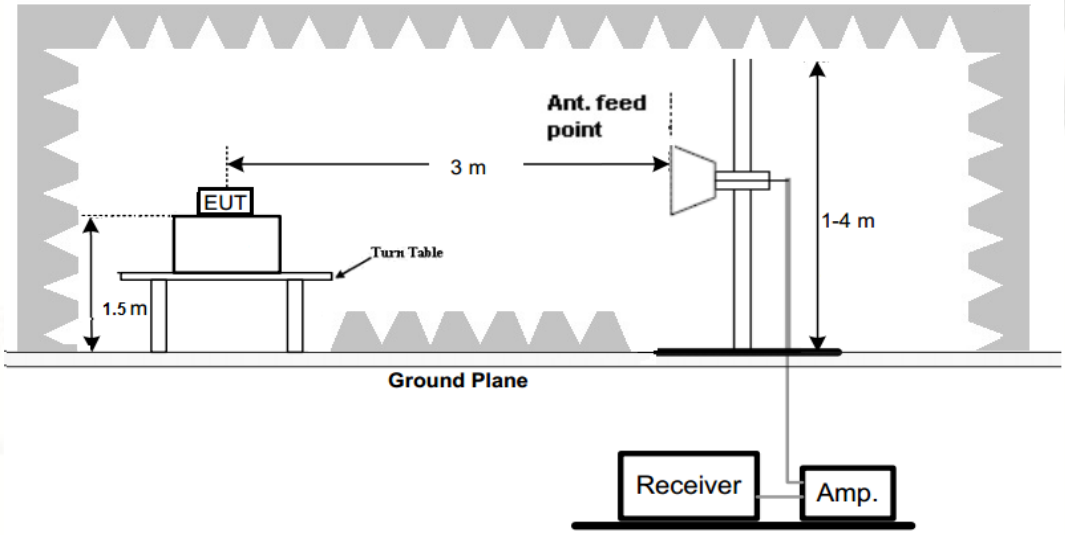
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



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



(C) Radiated Emission Test Set-Up, Frequency above 1000MHz



Test Procedure

1. Below 1GHz measurement the EUT is placed on a turntable which is 0.8m above ground plane, and above 1GHz measurement EUT was placed on a low permittivity and low loss tangent turn table which is 1.5m above ground plane.
2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0℃ to 360℃ to acquire the highest emissions from EUT
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measurements have been completed.
5. Radiated emission test frequency band from 9KHz to 10GHz.
6. The distance between test antenna and EUT as following table states:

Test Frequency range	Test Antenna Type	Test Distance
9KHz-30MHz	Active Loop Antenna	3
30MHz-1GHz	Bilog Antenna	3
1GHz-18GHz	Horn Antenna	3
18GHz-40GHz	Horn Anternna	1

7. Setting test receiver/spectrum as following table states:

Test Frequency range	Test Receiver/Spectrum Setting	Detector
9KHz-150KHz	RBW=200Hz/VBW=3KHz,Sweep time=Auto	QP
150KHz-30MHz	RBW=9KHz/VBW=100KHz,Sweep time=Auto	QP

30MHz-1GHz	RBW=120KHz/VBW=1000KHz,Sweep time=Auto	QP
1GHz-40GHz	Peak Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto Average Value: RBW=1MHz/VBW=10Hz, Sweep time=Auto	Peak

TEST RESULTS

Field Strength of Fundamental:

Remark: This test was performed with EUT in X, Y, Z position and the worst case was found when EUT in X position.

Horizontal

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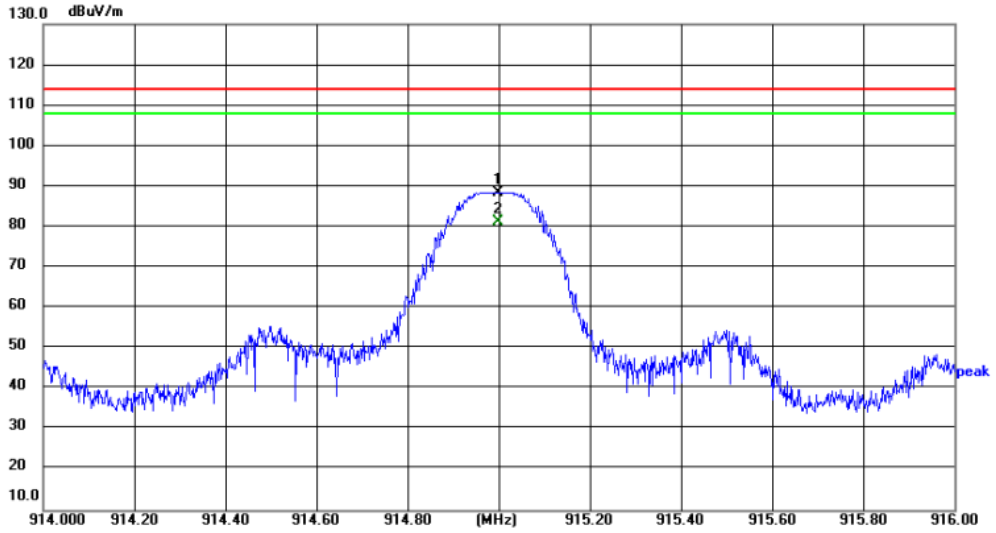
Radiated Emission Measurement

File :RF-RSE 3 Data :#6994 Date: 2023/07/31 Time: 22:38:20



Site LAB Chamber 2
Limit: FCC Part 15.249
EUT:
M/N: CK_Label_V23
Mode: 915MHz TX
Note: Picksmart Technology Co., Limited

Polarization: *Horizontal*
Power:
Distance: 3m

Temperature: 25(C)
Humidity: 50 %

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	914.9997	62.78	25.66	88.44	114.00	25.56	peak	150	360	P	
2	914.9997	55.60	25.66	81.26	114.00	32.74	AVG	150	0	P	

Vertical

Shenzhen CTL Testing Technology Co., Ltd
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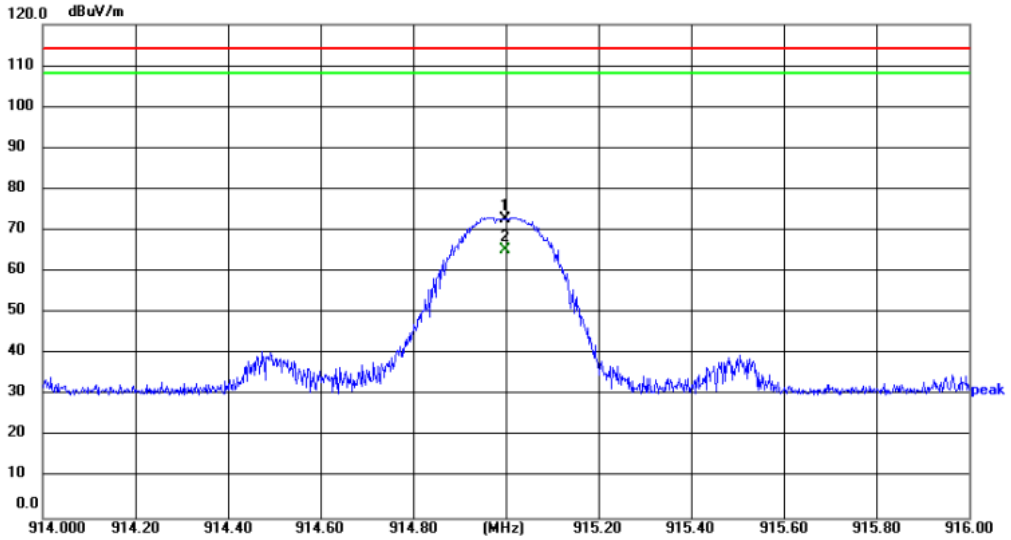
Floor 1-A, Baisha Technology Park, No.3011, Shahexi Road, Nanshan District, She

Radiated Emission Measurement

File :RF-RSE 3 Data :#6995 Date: 2023/07/31 Time: 22:40:16



Site LAB Chamber 2
Limit: FCC Part 15.249
EUT:
M/N: CK_Label_V23
Mode: 915MHz TX
Note: Picksmart Technology Co., Limited

Polarization: *Vertical*
Power:
Distance: 3m

Temperature: 25(C)
Humidity: 50 %

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	914.9995	47.07	25.66	72.73	114.00	41.27	peak	150	360	P	
2	914.9995	39.68	25.66	65.34	114.00	48.66	AVG	150	0	P	

REMARKS:

1. Emission level (dBuV/m) = Reading (dBuV)+ Factor (dB/m)
2. Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
3. Margin value = Limit value- Emission level.

Emissions radiated outside of the specified frequency bands:

Remark:

1. This test was performed with EUT in X, Y, Z position and the worst case was found when EUT in Z position.
2. For below 1GHz testing recorded worst at low channel.
3. Radiated emission test from 9 KHz to 10th harmonic of fundamental was verified, and the emission levels from 9kHz to 30MHz are attenuated 20dB below the limit and not recorded in report.

For 30MHz-1GHz

Horizontal

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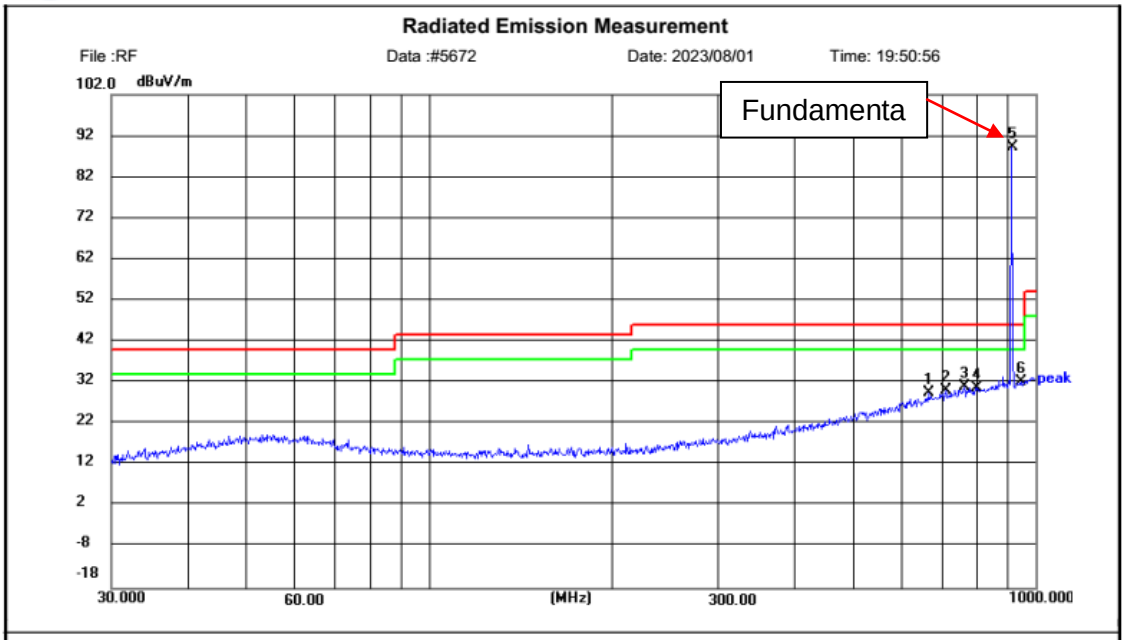
Floor 1-A, Baisha Technology Park, No.3011, Shahexi Road, Nanshan District, She



Site LAB Chamber 2
Limit: FCC Part15C
EUT: /
M/N: CK_Label_V23
Mode: 915MHz
Note: Picksmart Technology Co., Limited

Polarization: *Horizontal*
Power:
Distance: 3m

Temperature: 25(C)
Humidity: 50 %

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	665.8034	8.06	21.53	29.59	46.00	16.41	peak	100	121	P	
2	711.6734	7.91	22.14	30.05	46.00	15.95	peak	100	167	P	
3	763.3757	7.50	23.50	31.00	46.00	15.00	peak	100	353	P	
4	798.9797	6.24	24.43	30.67	46.00	15.33	peak	100	7	P	
5	915.4500	63.69	25.64	89.33	46.00	-43.33	peak	100	360	F	
6	945.4400	6.27	26.03	32.30	46.00	13.70	peak	100	246	P	

Vertical

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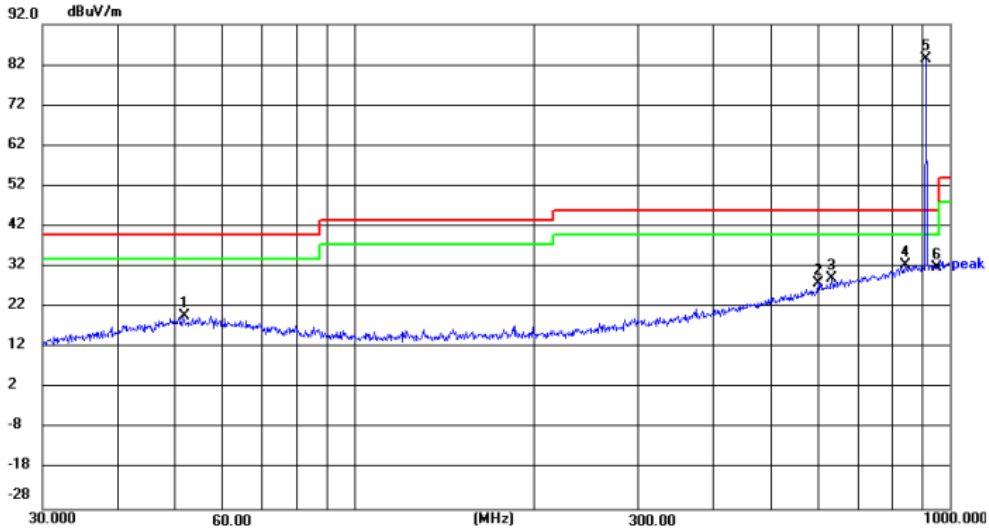
Tel: +86-755-89486194
Floor 1-A, Baisha Technology Park, No.3011, Shahexi Road, Nanshan District, She

Radiated Emission Measurement

File :RF Data :#5673 Date: 2023/08/01 Time: 19:52:13



Site LAB Chamber 2
Limit: FCC Part15C
EUT: /
M/N: CK_Label_V23
Mode: 915MHz
Note: Picksmart Technology Co., Limited

Polarization: *Vertical*
Power:
Distance: 3m

Temperature: 25(C)
Humidity: 50 %

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	51.6616	6.20	13.66	19.86	40.00	20.14	peak	100	345	P	
2	601.4265	7.05	20.93	27.98	46.00	18.02	peak	100	212	P	
3	633.9073	7.98	21.23	29.21	46.00	16.79	peak	100	68	P	
4	842.1296	7.46	24.89	32.35	46.00	13.65	peak	100	326	P	
5	915.0610	57.85	25.64	83.49	46.00	-37.49	peak	100	81	F	
6	948.7610	5.88	26.08	31.96	46.00	14.04	peak	100	121	P	

Remark: Level(dBuV/m)=Reading(dBuV)+Factor(dB/m)
Margin= Level(dBuV/m)-Limit(dBuV/m)

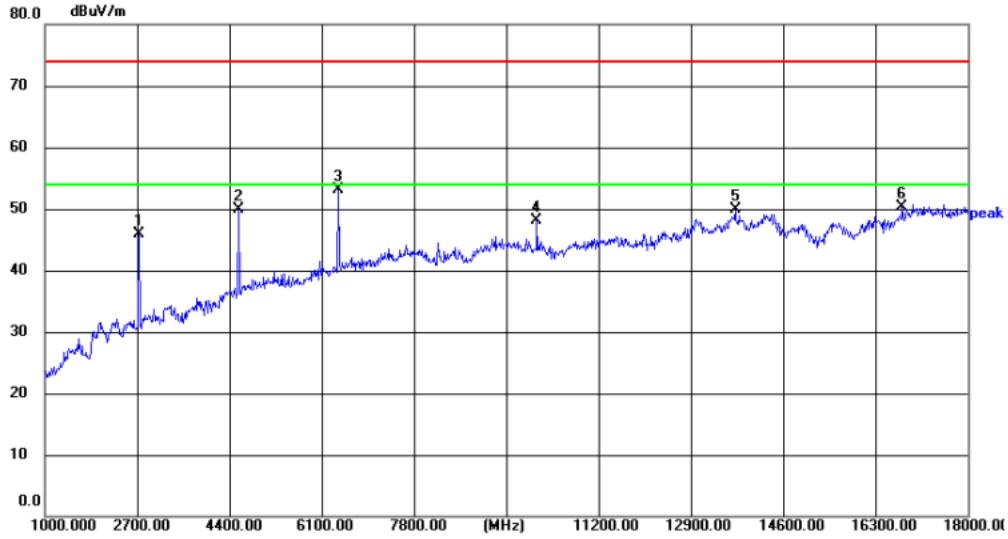
For 1GHz to 10GHz

Horizontal

Shenzhen CTL Testing Technology Co., Ltd
Tel: +86-755-89486194
Floor 1-A, Baisha Technology Park, No.3011, Shahexi Road, Nanshan District, She

Radiated Emission Measurement

File :RF-RSE 3 Data :#6980 Date: 2023/07/31 Time: 18:59:30



Site LAB Chamber 2
Limit: 74db
EUT:
M/N: CK_Label_V23
Mode: 915MHz TX
Note: Picksmart Technology Co., Limited

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

Temperature: 25(C)
Humidity: 50 %

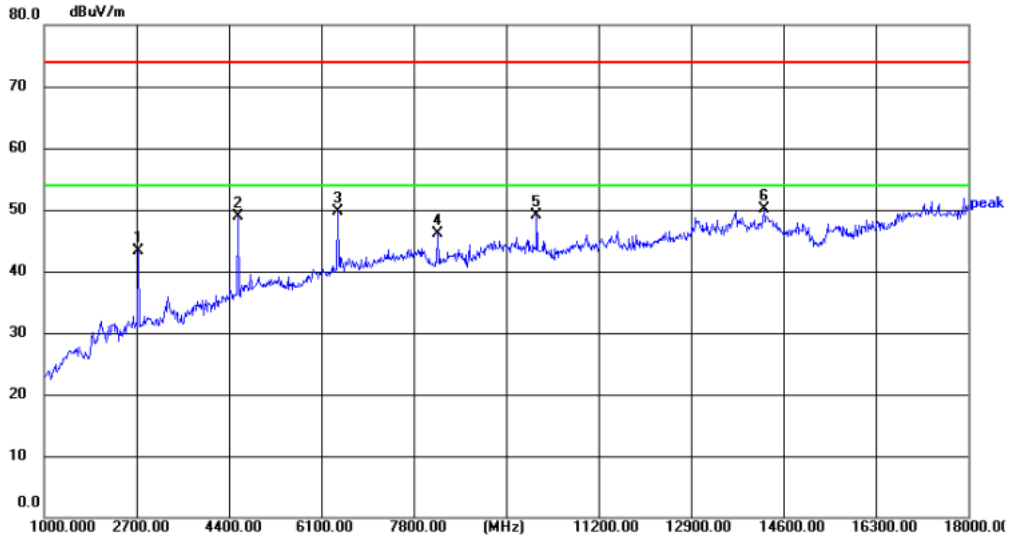
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	2734.000	66.23	-20.30	45.93	74.00	28.07	peak	150	360	P	
2	4570.000	63.13	-13.17	49.96	74.00	24.04	peak	150	360	P	
3	6406.000	61.80	-8.68	53.12	74.00	20.88	peak	150	360	P	
4	10061.000	52.62	-4.52	48.10	74.00	25.90	peak	150	360	P	
5	13716.000	50.91	-1.02	49.89	74.00	24.11	peak	150	360	P	
6	16793.000	49.29	0.93	50.22	74.00	23.78	peak	150	360	P	

Vertical

Shenzhen CTL Testing Technology Co., Ltd
Tel: +86-755-89486194
Floor 1-A, Baisha Technology Park, No.3011, Shahexi Road, Nanshan District, She

Radiated Emission Measurement

File :RF-RSE 3 Data :#6981 Date: 2023/07/31 Time: 19:01:02



Site LAB Chamber 2
Limit: 74db
EUT:
M/N: CK_Label_V23
Mode: 915MHz TX
Note: Picksmart Technology Co., Limited

Polarization: *Vertical*
Power:
Distance: 3m

Temperature: 25(C)
Humidity: 50 %

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	2734.000	63.55	-20.30	43.25	74.00	30.75	peak	150	0	P	
2	4570.000	62.07	-13.17	48.90	74.00	25.10	peak	150	0	P	
3	6406.000	58.41	-8.68	49.73	74.00	24.27	peak	150	0	P	
4	8242.000	52.21	-6.04	46.17	74.00	27.83	peak	150	0	P	
5	10061.000	53.68	-4.52	49.16	74.00	24.84	peak	150	0	P	
6	14243.000	51.39	-1.30	50.09	74.00	23.91	peak	150	0	P	

REMARKS:

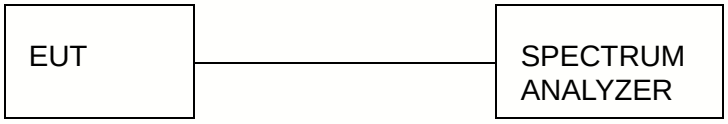
1. Emission level (dBuV/m) = Reading (dBuV)+ Factor (dB/m)
2. Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
3. Margin value = Limit value- Emission level.
4. -- Mean the PK detector measured value is below average limit.
5. The other emission levels lower -6dB than the limit was not reported.
6. RBW1MHz VBW3MHz Peak detector is for PK value; RBW 1MHz VBW10Hz Peak detector is for AV value.

3.3. Occupied Bandwidth Measurement

Limit

N/A

Test Configuration



Test Procedure

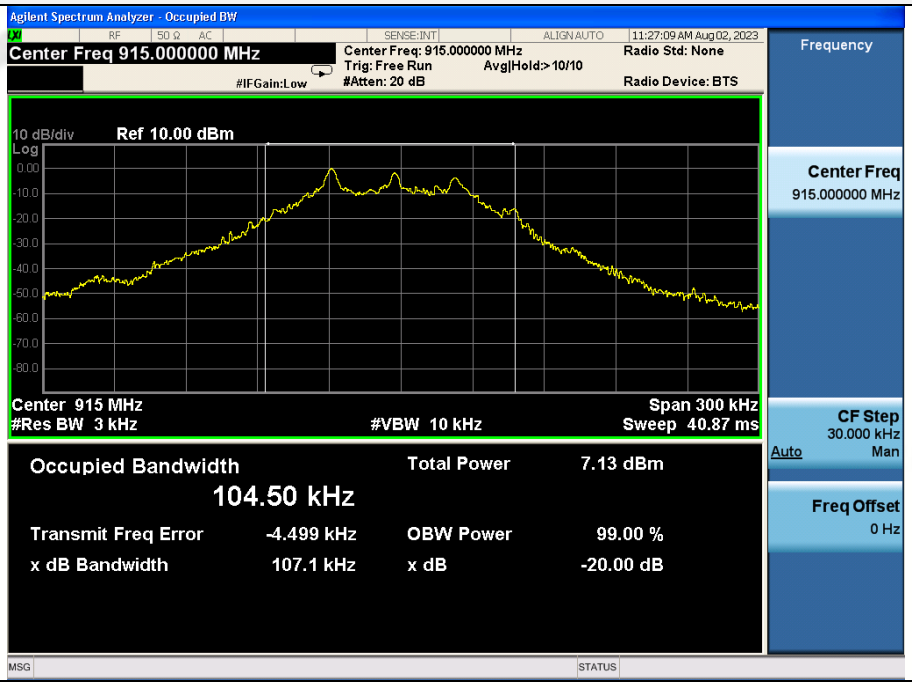
The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 3KHz RBW and 10KHz VBW.

The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

Test Results

Modulation	Test Frequency (MHz)	99% OBW (kHz)	20dB bandwidth (kHz)	Result
FM	915.00	104.5	107.1	Pass

Test plot as follows:

FM Modulation

915.00MHz

3.4. 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.

Refer to statement below for compliance.
The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

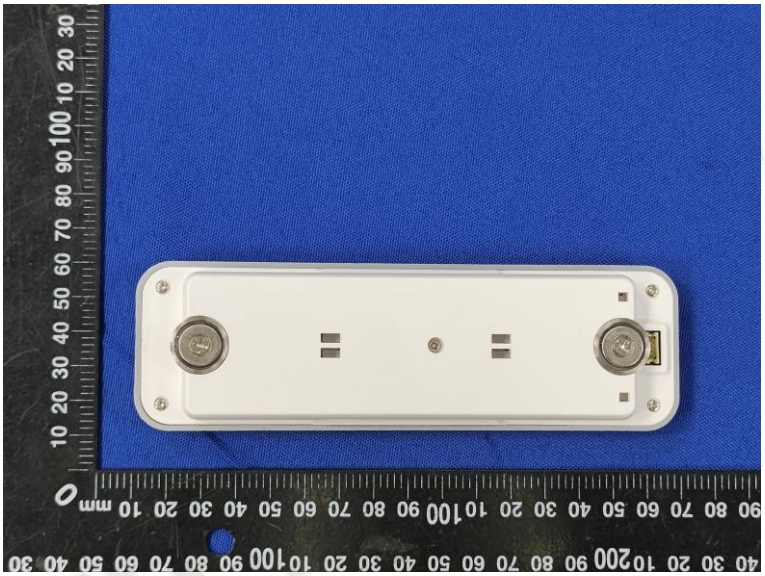
Antenna Connected Construction

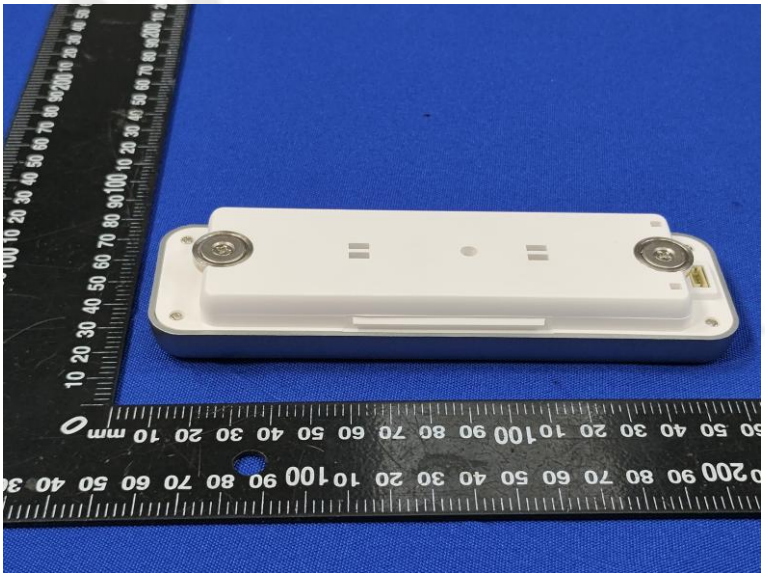
The antenna used in this product is an integral antenna, The directional gains of antenna used for transmitting is -6.30dBi.

4. Test Setup Photos of the EUT

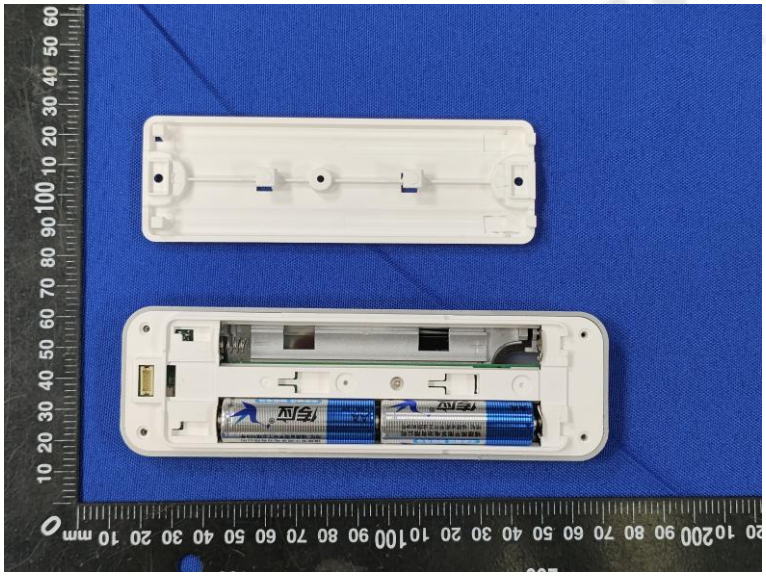
5. External and Internal Photos of the EUT

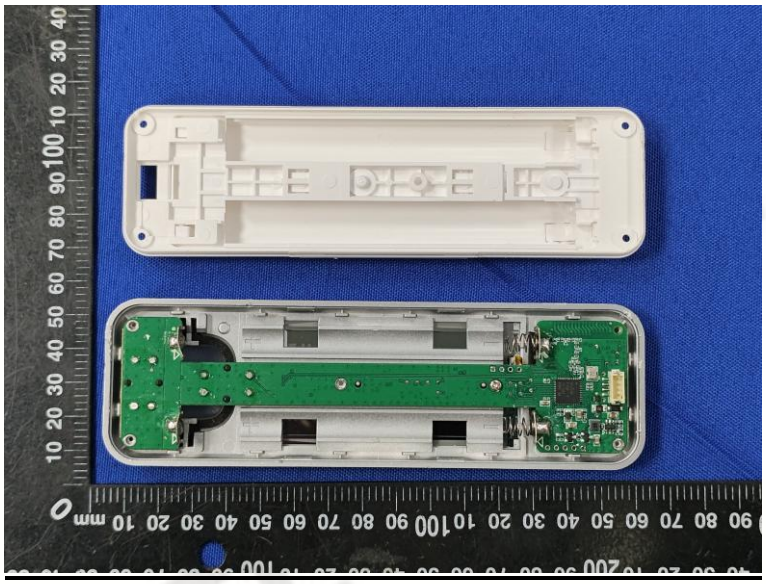
External Photos of EUT

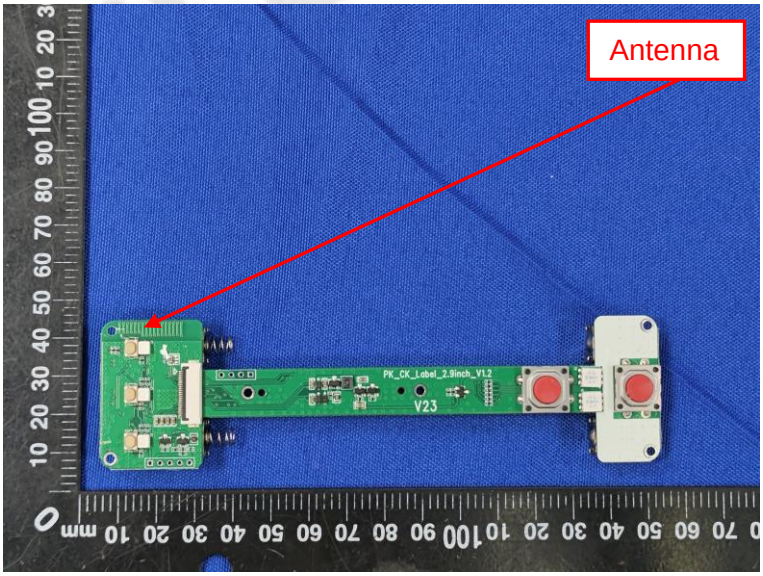


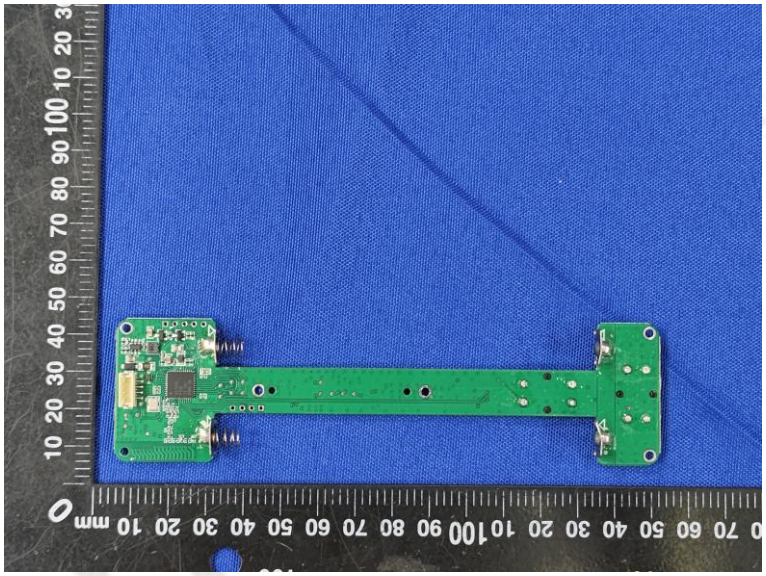


Internal Photos of EUT









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