TEST REPORT

Report Reference No.:	**CTA23070402201**
FCC ID. :	**2ANTI-T20**
Compiled by (position+printed name+signature)..:	File administrators Zoey Cao
Supervised by (position+printed name+signature)..:	Project Engineer Amy Wen
Approved by (position+printed name+signature)..:	RF Manager Eric Wang
Date of issue:	Jul. 10, 2023

Testing Laboratory Name :	**Shenzhen CTA Testing Technology Co., Ltd.**
Address:	Room 106, Building 1, Yibaolai Industrial Park, Qiaotou Community, Fuhai Street, Bao'an District, Shenzhen, China
Applicant's name:	**Changzhou Smoothies Electronics Co., Ltd.**
Address :	6 Floor, Buliding 2, ZhiGu Tech Park, 2259#LongCheng RD, ZhongLou District, ChangZhou, China
Test specification :	
Standard:	FCC Part 15.247 ANSI C63.10: 2013

Test item description :	**Remote control**
Trade Mark :	Jumper-RC
Manufacturer :	Changzhou Smoothies Electronics Co., Ltd.
Model/Type reference:	T20
Listed Models :	T20S, T20-SE, T20-PLUS, T20-RV, T20-CAPTAIN, T20 PRO, T20 LITE
Modulation Type :	GFSK
Operation Frequency:	From 2404MHz to 2473MHz
Rating :	DC 7.4V From battery
Result:	**PASS**

TEST REPORT

Equipment under Test	:	Remote control
Model /Type	:	T20
Listed Models	:	T20S, T20-SE, T20-PLUS, T20-RV, T20-CAPTAIN, T20 PRO, T20 LITE
Applicant	:	**Changzhou Smoothies Electronics Co., Ltd.**
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Manufacturer	:	**Changzhou Smoothies Electronics Co., Ltd.**
Address	:	6 Floor, Buliding 2, ZhiGu Tech Park, 2259#LongCheng RD, ZhongLou District, ChangZhou, China

Test Result:	**PASS**

The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

Contents

1. TEST STANDARDS

The tests were performed according to following standards:

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

ANSI C63.4: 2014: –American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40GHz
Range of 9 kHz to 40GHz

FCC Rules Part 15.247: Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.
KDB558074 D01 v05r02: Guidance for Compliance Measurements on Digital Transmission Systems (DTS) ,Frequency Hopping Spread Spectrum System(HFSS), and Hybrid System Devices Operating Under §15.247 of The FCC rules.

2. SUMMARY

2.1. General Remarks

Date of receipt of test sample	:	Jul. 03, 2023
Testing commenced on	:	Jul. 03, 2023
Testing concluded on	:	Jul. 10, 2023

2.2. Product Description

Product Name:	Remote control
Model/Type reference:	T20
Power supply:	DC 7.4V From battery
Sample ID:	CTA230704022-1#(Engineer sample) CTA230704022-2#(Normal sample)
Hardware version:	V1.0
Software version:	V1.0
2.4G	
Modulation:	GFSK
Operation frequency:	2404MHz~2473MHz
Channel number:	70
Channel separation:	1MHz
Antenna type:	External antenna
Antenna gain:	2.0 dBi(Max)

2.3. Equipment Under Test

Power supply system utilised

Power supply voltage	:	○	230V / 50 Hz	○	120V / 60Hz
		○	12 V DC	○	24 V DC
		●	Other (specified in blank below)		

DC 7.4V From battery

2.4. Short description of the Equipment under Test (EUT)

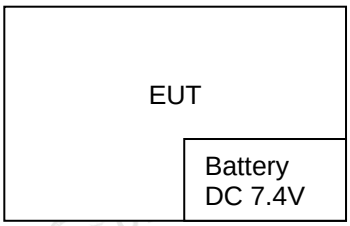
This is a Remote control. For more details, refer to the user's manual of the EUT.

2.5. EUT operation mode

The Applicant burned the software into the EUT,and can to control the switch of EUT for staying in continuous transmitting (Duty Cycle more than 98%) and receiving mode for testing .There are 70 channels provided to the EUT. Channel 01/35/70 was selected to test.

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2404	36	2439
2	2405	37	
…	…	…	…
34	2437	69	2472
35	2438	70	2473

2.6. Block Diagram of Test Setup



2.7. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

2.8. EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

○ - supplied by the manufacturer

● - Supplied by the lab

○	ADAPTER	M/N:	
		Manufacturer:	

2.9. Modifications

No modifications were implemented to meet testing criteria.

3. TEST ENVIRONMENT

3.1. Address of the test laboratory

Shenzhen CTA Testing Technology Co., Ltd.
Room 106, Building 1, Yibaolai Industrial Park, Qiaotou Community, Fuhai Street, Bao'an District, Shenzhen, China

3.2. Test Facility

The test facility is recognized, certified, or accredited by the following organizations:
FCC-Registration No.: 517856 Designation Number: CN1318

Shenzhen CTA Testing Technology Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

Industry Canada Registration Number. Is: 27890 CAB identifier: CN0127
The Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing.

A2LA-Lab Cert. No.: 6534.01

Shenzhen CTA Testing Technology Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.10 and CISPR 16-1-4:2010.

3.3. Environmental conditions

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

Temperature:	25 ° C
Humidity:	45 %
Atmospheric pressure:	950-1050mbar

Conducted testing：

Temperature:	25 ° C
Humidity:	44 %
Atmospheric pressure:	950-1050mbar

3.4. Test Description

FCC Requirements		
FCC Part 15.207	AC Power Conducted Emission	NA
FCC Part 15.247(a)(2)	6dB Bandwidth & 99% Bandwidth	PASS
FCC Part 15.247(d)	Spurious RF Conducted Emission	PASS
FCC Part 15.247(b)	Maximum Conducted Output Power	PASS
FCC Part 15.247(e)	Power Spectral Density	PASS
FCC Part 15.109/ 15.205/ 15.209	Radiated Emissions	PASS
FCC Part 15.247(d)	Band Edge	PASS
FCC Part 15.203/15.247 (b)	Antenna gain	PASS

Remark:
1. The measurement uncertainty is not included in the test result.
2. NA = Not Applicable; NP = Not Performed

3.5. 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 TR-100028-01" Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 2 " and is documented in the Shenzhen CTA 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 Shenzhen CTA Testing Technology Co., Ltd.

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	30~1000MHz	4.06 dB	(1)
Radiated Emission	1~18GHz	5.14 dB	(1)
Radiated Emission	18-40GHz	5.38 dB	(1)
Conducted Disturbance	0.15~30MHz	2.14 dB	(1)

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

3.6. Equipments Used during the Test

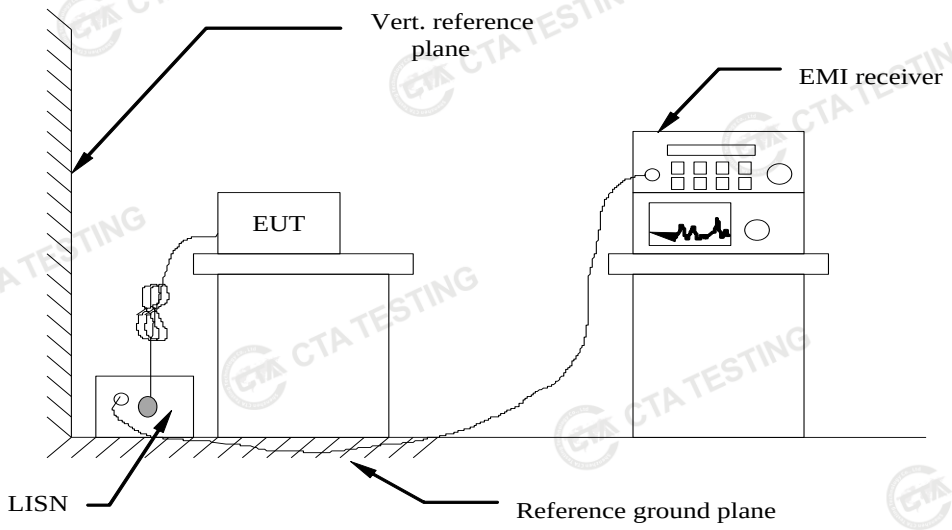
Test Equipment	Manufacturer	Model No.	Equipment No.	Calibration Date	Calibration Due Date
LISN	R&S	ENV216	CTA-308	2022/08/03	2023/08/02
LISN	R&S	ENV216	CTA-314	2022/08/03	2023/08/02
EMI Test Receiver	R&S	ESPI	CTA-307	2022/08/03	2023/08/02
EMI Test Receiver	R&S	ESCI	CTA-306	2022/08/03	2023/08/02
Spectrum Analyzer	Agilent	N9020A	CTA-301	2022/08/03	2023/08/02
Spectrum Analyzer	R&S	FSP	CTA-337	2022/08/03	2023/08/02
Vector Signal generator	Agilent	N5182A	CTA-305	2022/08/03	2023/08/02
Analog Signal Generator	R&S	SML03	CTA-304	2022/08/03	2023/08/02
Universal Radio Communication	CMW500	R&S	CTA-302	2022/08/03	2023/08/02
Temperature and humidity meter	Chigo	ZG-7020	CTA-326	2022/08/03	2023/08/02
Ultra-Broadband Antenna	Schwarzbeck	VULB9163	CTA-310	2021/08/07	2024/08/06
Horn Antenna	Schwarzbeck	BBHA 9120D	CTA-309	2021/08/07	2024/08/06
Loop Antenna	Zhinan	ZN30900C	CTA-311	2021/08/07	2024/08/06
Horn Antenna	Beijing Hangwei Dayang	OBH100400	CTA-336	2021/08/07	2024/08/06
Amplifier	Schwarzbeck	BBV 9745	CTA-312	2022/08/03	2023/08/02
Amplifier	Taiwan chengyi	EMC051845B	CTA-313	2022/08/03	2023/08/02
Directional coupler	NARDA	4226-10	CTA-303	2022/08/03	2023/08/02
High-Pass Filter	XingBo	XBLBQ-GTA18	CTA-402	2022/08/03	2023/08/02
High-Pass Filter	XingBo	XBLBQ-GTA27	CTA-403	2022/08/03	2023/08/02
Automated filter bank	Tonscend	JS0806-F	CTA-404	2022/08/03	2023/08/02
Power Sensor	Agilent	U2021XA	CTA-405	2022/08/03	2023/08/02
Amplifier	Schwarzbeck	BBV9719	CTA-406	2022/08/03	2023/08/02

Note: 1. The Cal.Interval was one year.

4. TEST CONDITIONS AND RESULTS

4.1. AC Power Conducted Emission

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 The EUT received DC5V power, the 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.

AC Power Conducted Emission Limit

For unintentional device, according to RSS Gen 8.8 and § 15.207(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
* Decreases with the logarithm of the frequency.		

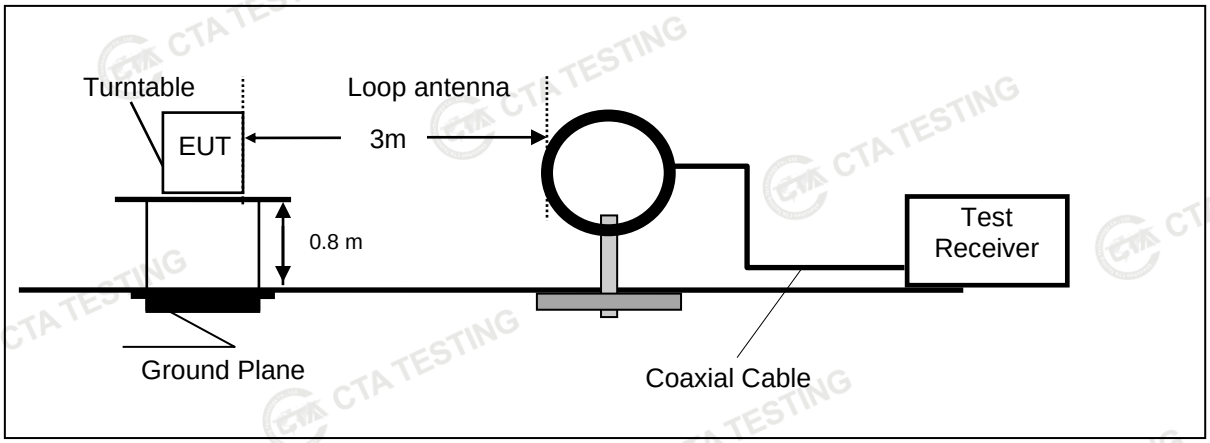
TEST RESULTS

The EUT is Powered by Battery, so this test item is not applicable for the EUT

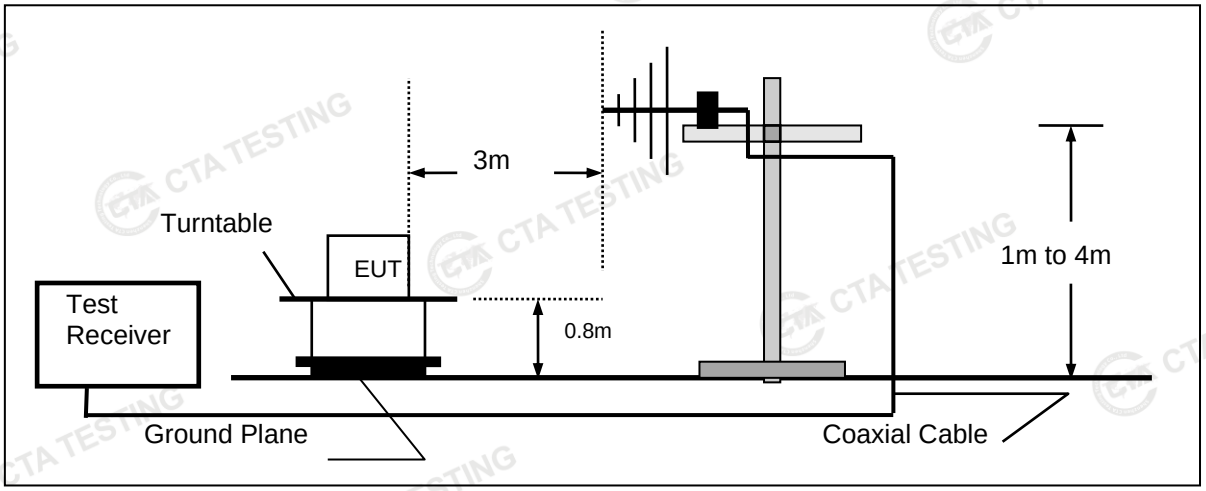
4.2. Radiated Emission

TEST CONFIGURATION

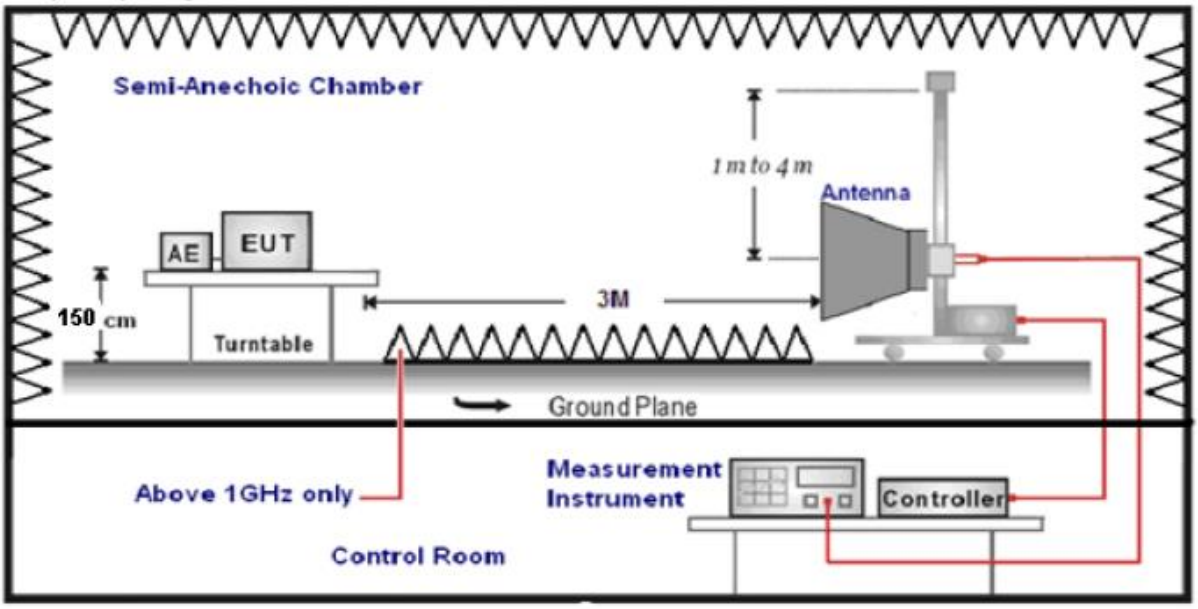
Frequency range 9 KHz – 30MHz



Frequency range 30MHz – 1000MHz



Frequency range above 1GHz-25GHz



TEST PROCEDURE

1. The EUT was placed on a turn table which is 0.8m above ground plane when testing frequency range 9 KHz –1GHz;the EUT was placed on a turn table which is 1.5m above ground plane when testing frequency range 1GHz – 25GHz.
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. The EUT minimum operation frequency was 32.768KHz and maximum operation frequency was 2480MHz.so radiated emission test frequency band from 9KHz to 25GHz.
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	Ultra-Broadband Antenna	3
1GHz-18GHz	Double Ridged Horn Antenna	3
18GHz-25GHz	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

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor(if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL - AG

Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

Transd=AF +CL-AG

RADIATION LIMIT

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emission out of authorized band shall not exceed the following table at a 3 meters measurement distance.

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)

Except when the requirements applicable to a given device state otherwise, emissions from licence-exempt transmitters shall comply with the field strength limits shown in table below. Additionally, the level of any transmitter emission shall not exceed the level of the transmitter's fundamental emission

Unwanted emissions that fall into restricted bands shall comply with the limits specified in RSS-Gen; and Unwanted emissions that do not fall within the restricted frequency bands shall comply either with the limits specified in the applicable RSS or with those specified in this RSS-Gen.

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

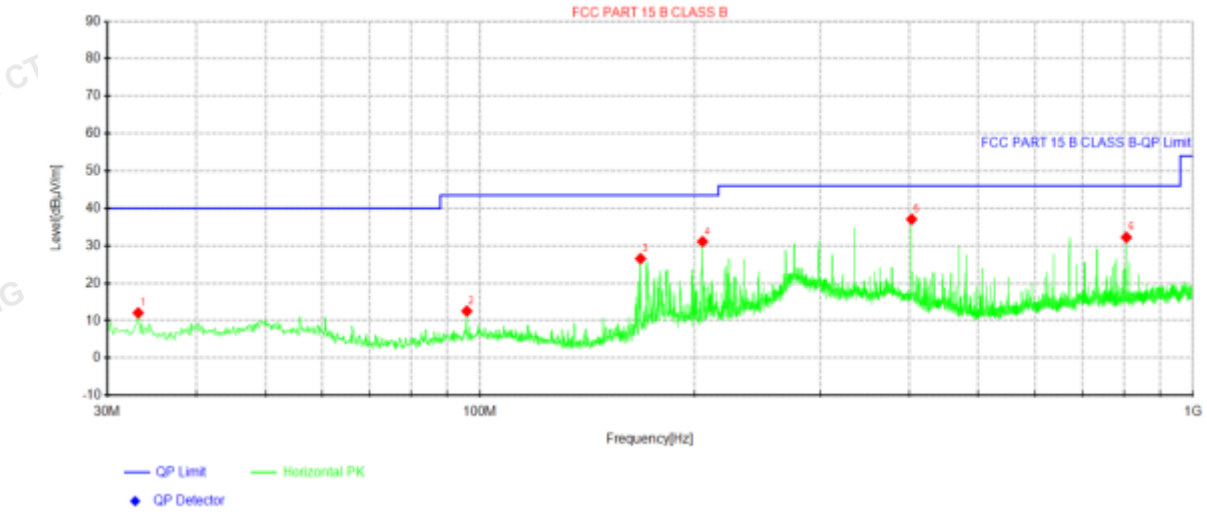
TEST RESULTS

Remark:

1. We measured Radiated Emission at GFSK mode from 9 KHz to 25GHz and recorded worst case at GFSK mode.
2. For below 1GHz testing recorded worst at GFSK middle channel.
3. Radiated emission test from 9 KHz to 10th harmonic of fundamental was verified, and no emission found except system noise floor in 9 KHz to 30MHz and not recorded in this report.
4. Remark: Result=Reading value+Factor,and Margin=Limit- Result

For 30MHz-1GHz

Horizontal

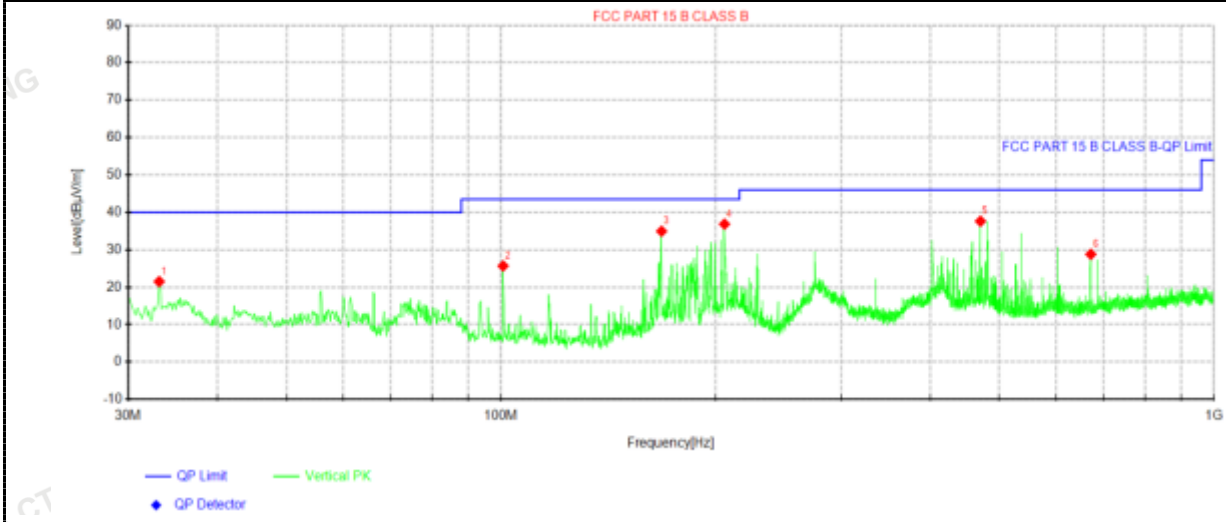


Suspected Data List

NO.	Freq. [MHz]	Reading [dBµV]	Level [dBµV/m]	Factor [dB/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	33.1525	30.24	12.06	-18.18	40.00	27.94	100	5	Horizontal
2	95.8388	31.55	12.53	-19.02	43.50	30.97	100	0	Horizontal
3	167.982	47.71	26.55	-21.16	43.50	16.95	100	119	Horizontal
4	205.206	50.30	31.11	-19.19	43.50	12.39	100	51	Horizontal
5	403.086	52.60	37.10	-15.50	46.00	8.90	100	170	Horizontal
6	806.606	42.76	32.24	-10.52	46.00	13.76	100	51	Horizontal

Note:1).Level (dBµV/m)= Reading (dBµV)+ Factor (dB/m)
2). Factor(dB/m)=Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB)
3). Margin(dB) = Limit (dBµV/m) - Level (dBµV/m)

Vertical



Suspected Data List

NO.	Freq. [MHz]	Reading [dBµV]	Level [dBµV/m]	Factor [dB/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	33.1525	39.68	21.50	-18.18	40.00	18.50	100	89	Vertical
2	100.688	44.07	25.67	-18.40	43.50	17.83	100	141	Vertical
3	167.982	56.12	34.96	-21.16	43.50	8.54	100	89	Vertical
4	205.812	56.03	36.85	-19.18	43.50	6.65	100	123	Vertical
5	470.501	52.40	37.63	-14.77	46.00	8.37	100	302	Vertical
6	672.018	40.75	28.80	-11.95	46.00	17.20	100	342	Vertical

Note:1).Level (dBµV/m)= Reading (dBµV)+ Factor (dB/m)
2). Factor(dB/m)=Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB)
3). Margin(dB) = Limit (dBµV/m) - Level (dBµV/m)

For 1GHz to 25GHz

GFSK (above 1GHz)

Frequency(MHz):			2404		Polarity:		HORIZONTAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
4808.00	49.97	PK	74.00	24.03	54.22	32.35	5.12	41.72	-4.25
4808.00	39.31	AV	54.00	14.69	43.56	32.35	5.12	41.72	-4.25
7212.00	50.39	PK	74.00	23.61	50.91	36.59	6.5	43.61	-0.52
7212.00	37.28	AV	54.00	16.72	37.80	36.59	6.5	43.61	-0.52

Frequency(MHz):			2404		Polarity:		VERTICAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
4808.00	47.71	PK	74.00	26.29	51.96	32.35	5.12	41.72	-4.25
4808.00	38.43	AV	54.00	15.57	42.68	32.35	5.12	41.72	-4.25
7212.00	48.19	PK	74.00	25.81	48.71	36.59	6.5	43.61	-0.52
7212.00	34.99	AV	54.00	19.01	35.51	36.59	6.5	43.61	-0.52

Frequency(MHz):			2438		Polarity:		HORIZONTAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
4876.00	50.96	PK	74.00	23.04	54.87	32.58	5.33	41.82	-3.91
4876.00	47.12	AV	54.00	6.88	51.03	32.58	5.33	41.82	-3.91
7314.00	50.21	PK	74.00	23.79	50.15	36.97	6.8	43.71	0.06
7314.00	35.67	AV	54.00	18.33	35.61	36.97	6.8	43.71	0.06

Frequency(MHz):			2438		Polarity:		VERTICAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
4876.00	48.59	PK	74.00	25.41	52.50	32.58	5.33	41.82	-3.91
4876.00	43.64	AV	54.00	10.36	47.55	32.58	5.33	41.82	-3.91
7314.00	49.72	PK	74.00	24.28	49.66	36.97	6.8	43.71	0.06
7314.00	38.57	AV	54.00	15.43	38.51	36.97	6.8	43.71	0.06

Frequency(MHz):			2473		Polarity:		HORIZONTAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
4946.00	51.68	PK	74.00	22.32	54.58	32.8	5.65	41.35	-2.9
4946.00	47.10	AV	54.00	6.90	50.00	32.8	5.65	41.35	-2.9
7419.00	50.94	PK	74.00	23.06	50.59	36.93	7.24	43.82	0.35
7419.00	41.06	AV	54.00	12.94	40.71	36.93	7.24	43.82	0.35

Frequency(MHz):			2473		Polarity:		VERTICAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
4946.00	50.43	PK	74.00	23.57	53.33	32.8	5.65	41.35	-2.9
4946.00	43.96	AV	54.00	10.04	46.86	32.8	5.65	41.35	-2.9
7419.00	48.90	PK	74.00	25.10	48.55	36.93	7.24	43.82	0.35
7419.00	37.31	AV	54.00	16.69	36.96	36.93	7.24	43.82	0.35

REMARKS:

1. Emission level (dBuV/m) =Raw Value (dBuV)+Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)- Pre-amplifier
3. Margin value = Limit value- Emission level.
4. -- Mean the PK detector measured value is below average limit.
5. The other emission levels were very low against the limit.

4.3. Maximum Peak Output Power

TEST CONFIGURATION

TEST PROCEDURE

According to KDB558074 D01 DTS Measurement Guidance Section 9.1 Maximum peak conducted output power,9.1.2.
The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector.

LIMIT

The Maximum Peak Output Power Measurement is 30dBm.

TEST RESULTS

Type	Channel	Output power (dBm)	Limit (dBm)	Result
GFSK	01	0.89	30.00	Pass
	35	0.74		
	70	0.46		

Note: 1.The test results including the cable lose.

4.4. Power Spectral Density

TEST CONFIGURATION

TEST PROCEDURE

1.Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
2.Set the RBW =3 kHz.
3.Set the VBW =10 KHz.
4.Set the span to 1.5 times the DTS channel bandwidth.
5.Detector = peak.
6.Sweep time = auto couple.
7.Trace mode = max hold.
8.Allow trace to fully stabilize.
9.Use the peak marker function to determine the maximum power level.
10.If measured value exceeds limit,reduce RBW(no less than 3 kHz)and repeat.
11.The resulting peak PSD level must be 8 dBm.

LIMIT

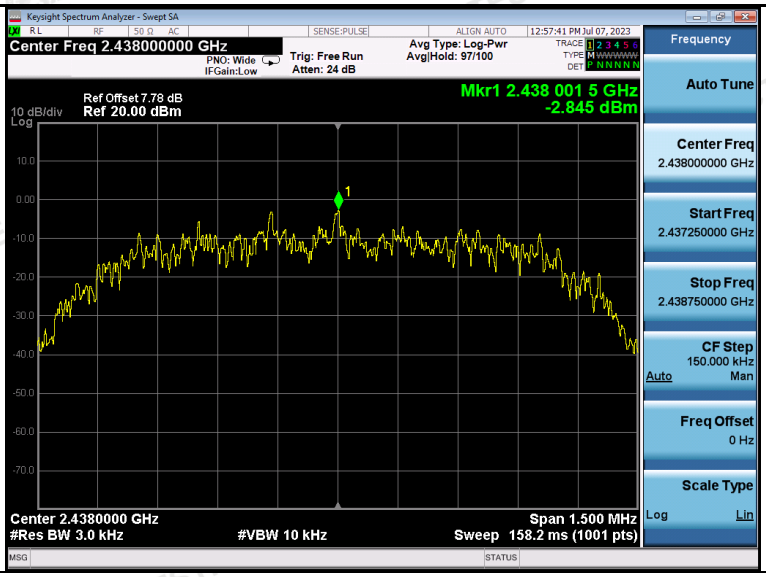
For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

TEST RESULTS

Type	Channel	Power Spectral Density (dBm/3KHz)	Limit (dBm/3KHz)	Result
GFSK	01	-3.091	8.00	Pass
	35	-2.845		
	70	-2.602		

Test plot as follows:

GFSK

CH01

CH35

CH70

4.5. 6dB Bandwidth

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 RBW=100 KHz and VBW=300KHz.
The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB.
According to KDB558074 D01 V03 for one of the following procedures may be used to determine the modulated DTS device signal bandwidth.
1. Set RBW = 100 kHz.
2. Set the video bandwidth (VBW) ≥ 3 RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

LIMIT

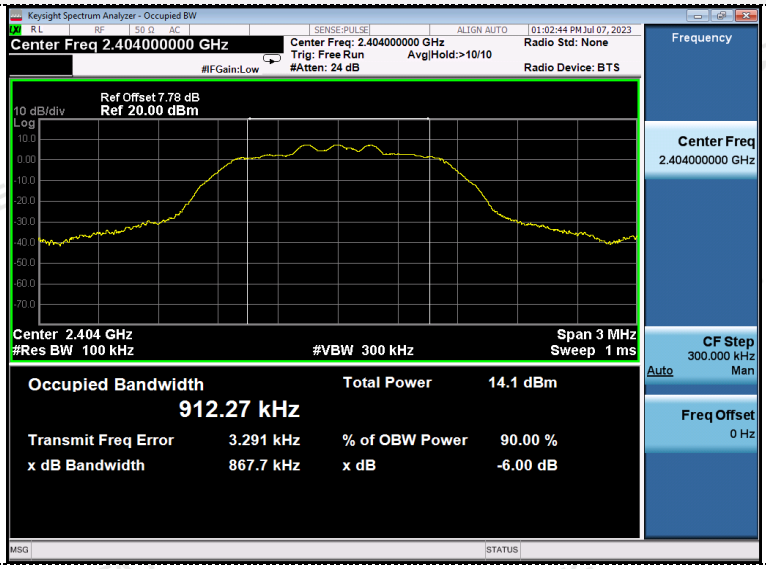
For digital modulation systems, the minimum 6 dB bandwidth shall be at least 500 kHz

TEST RESULTS

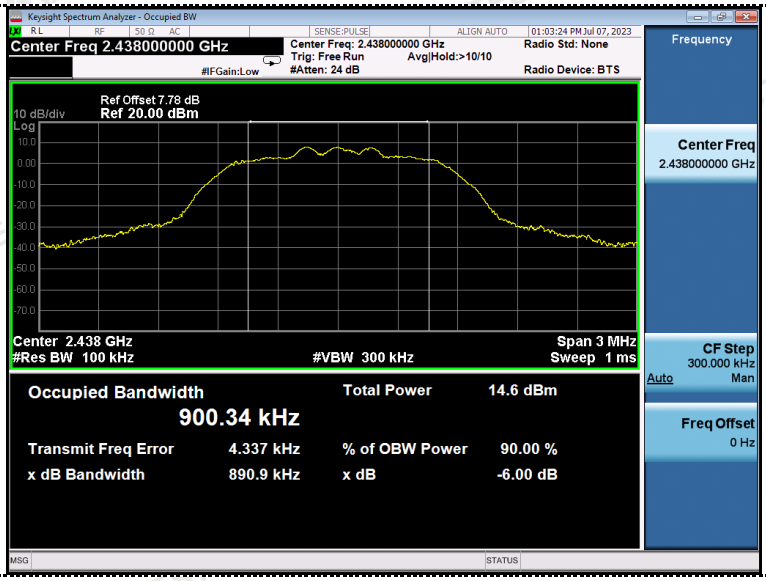
Type	Channel	6dB Bandwidth (MHz)	Limit (KHz)	Result
GFSK	01	0.8677	≥500	Pass
	35	0.8909		
	70	0.9048		

Test plot as follows:

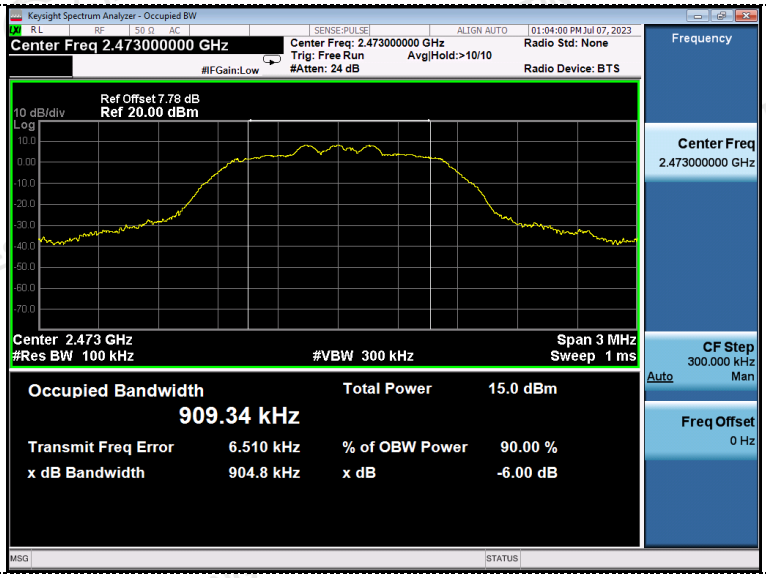
GFSK



CH01



CH35



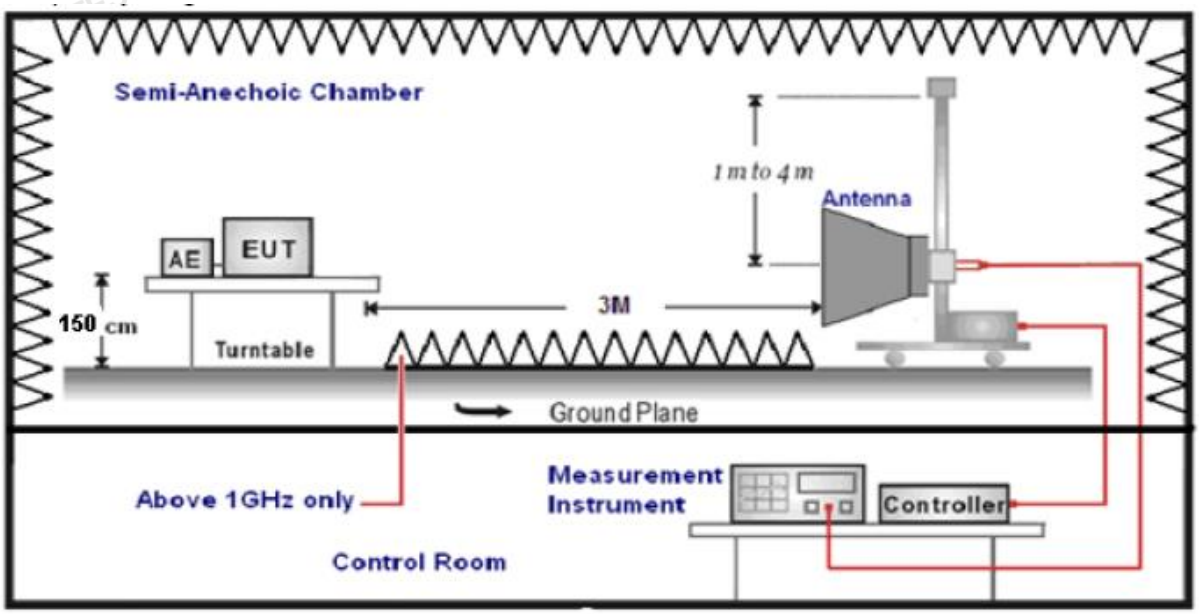
CH70

4.6. Band Edge Compliance of RF Emission

TEST REQUIREMENT

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. 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) (see §15.205(c)).

TEST CONFIGURATION



TEST PROCEDURE

1. The EUT was placed on a 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. The distance between test antenna and EUT was 3 meter:
6. Setting test receiver/spectrum as following table states:

Test Frequency range	Test Receiver/Spectrum Setting	Detector
1GHz-40GHz	Peak Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto Average Value: RBW=1MHz/VBW=10Hz, Sweep time=Auto	Peak

LIMIT

Below -20dB of the highest emission level in operating band.
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)

TEST RESULTS

Results of Band Edges Test (Radiated)

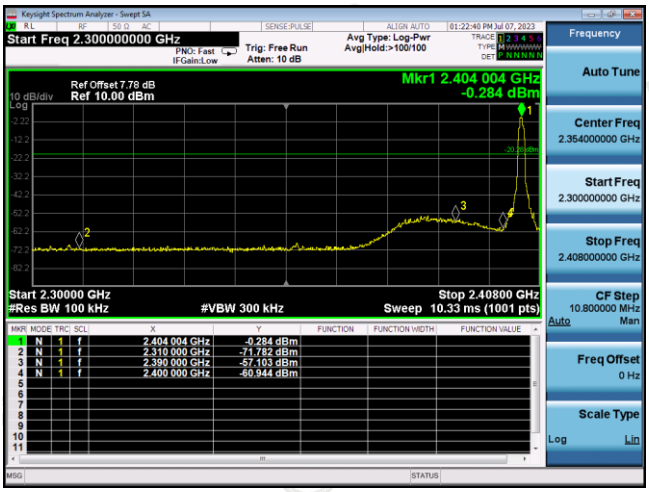
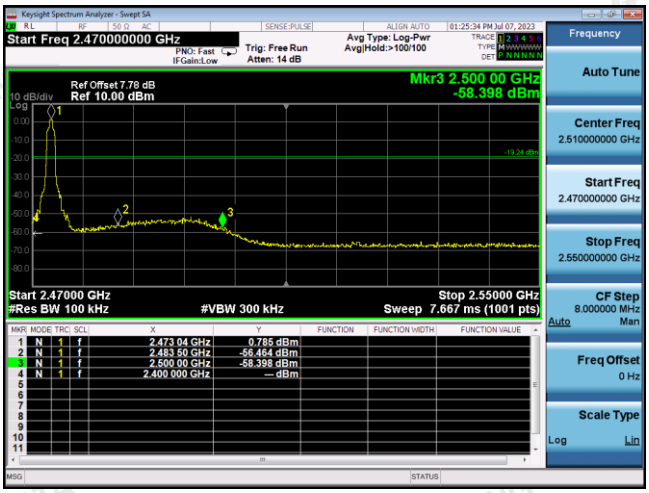
GFSK

Frequency(MHz):			2404		Polarity:		HORIZONTAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
2390.00	60.07	PK	74	13.93	70.49	27.42	4.31	42.15	-10.42
2390.00	43.21	AV	54	10.79	53.63	27.42	4.31	42.15	-10.42
Frequency(MHz):			**2404**		**Polarity:**		**VERTICAL**		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
2390.00	58.65	PK	74	15.35	69.07	27.42	4.31	42.15	-10.42
2390.00	40.64	AV	54	13.36	51.06	27.42	4.31	42.15	-10.42
Frequency(MHz):			**2473**		**P olarity:**		**HORIZONTAL**		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
2483.50	60.36	PK	74	13.64	70.47	27.7	4.47	42.28	-10.11
2483.50	42.87	AV	54	11.13	52.98	27.7	4.47	42.28	-10.11
Frequency(MHz):			**2473**		**Polarity:**		**VERTICAL**		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
2483.50	59.46	PK	74	14.54	69.57	27.7	4.47	42.28	-10.11
2483.50	42.24	AV	54	11.76	52.35	27.7	4.47	42.28	-10.11

REMARKS:

1. Emission level (dBuV/m) =Raw Value (dBuV)+Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)- Pre-amplifier
3. Margin value = Limit value- Emission level.
4. -- Mean the PK detector measured value is below average limit.

4.6.2 For Conducted Bandedge Measurement

GFSK	
	
Left bandedge	Right bandedge

4.7. Spurious RF Conducted Emission

TEST CONFIGURATION

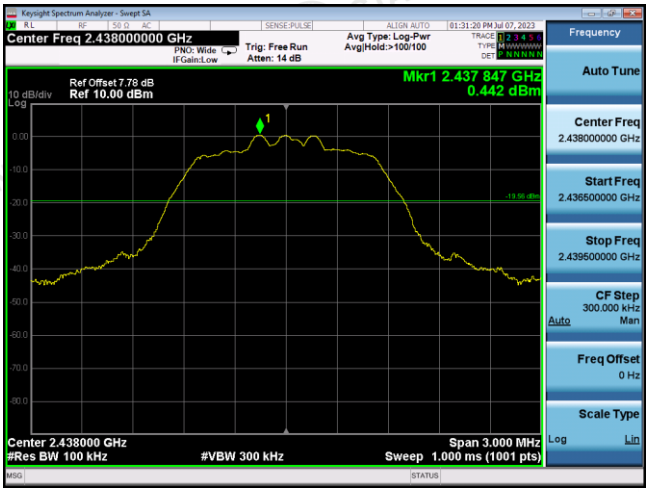
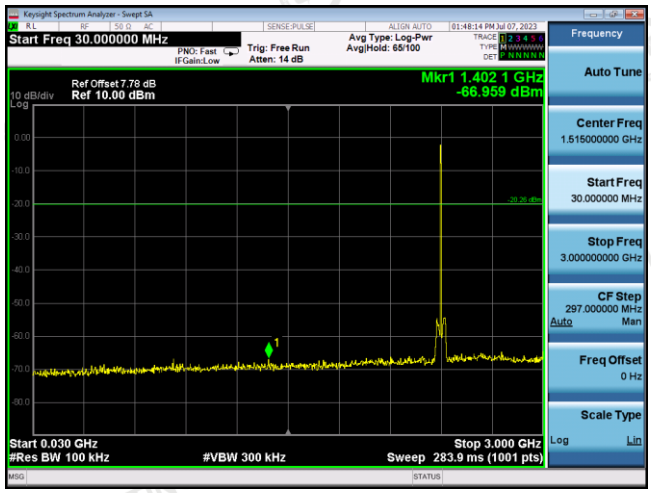
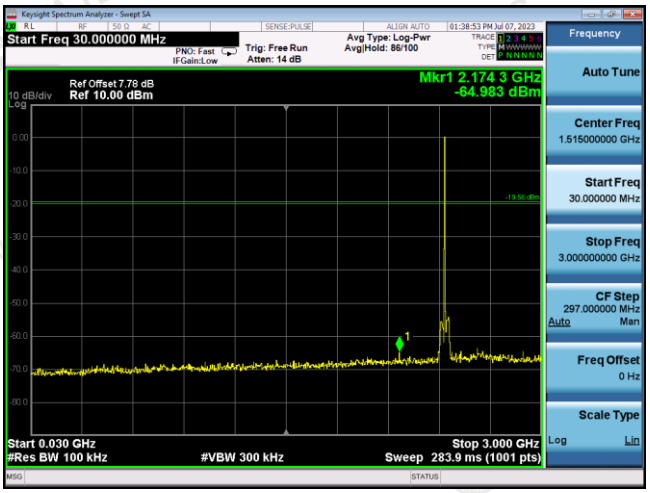
TEST PROCEDURE

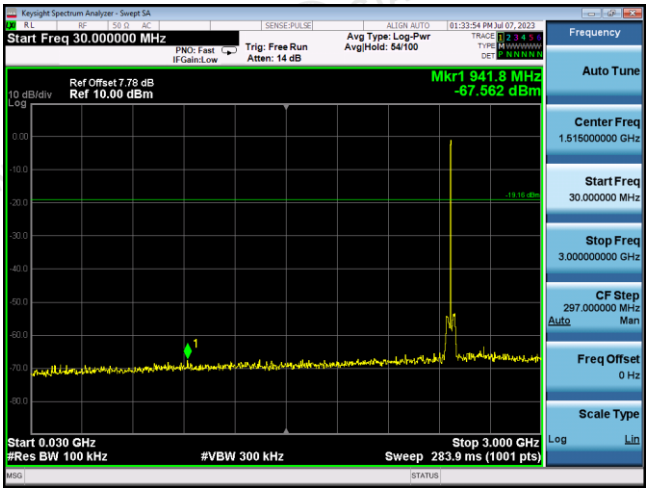
The Spurious RF conducted emissions compliance of RF radiated emission should be measured by following the guidance in ANSI C63.10-2013 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization etc. Set RBW=100kHz and VBW= 300KHz to measure the peak field strength , and mwasure frequeny range from 9KHz to 25GHz.

LIMIT

1. Below -20dB of the highest emission level in operating band.
2. Fall in the restricted bands listed in section 15.205. The maximum permitted average field strength is listed in section 15.209.

TEST RESULTS

CH01	*CH35*
	
Reference	Reference
	
30MHz-3GHz	30MHz-3GHz
	
3GHz-25GHz	3GHz-25GHz

CH70	
	
Reference	30MHz-3GHz
	
3GHz-25GHz	

4.8. Antenna Requirement

Gain of the antenna exceeds 6dBi.

Refer to statement below for compliance

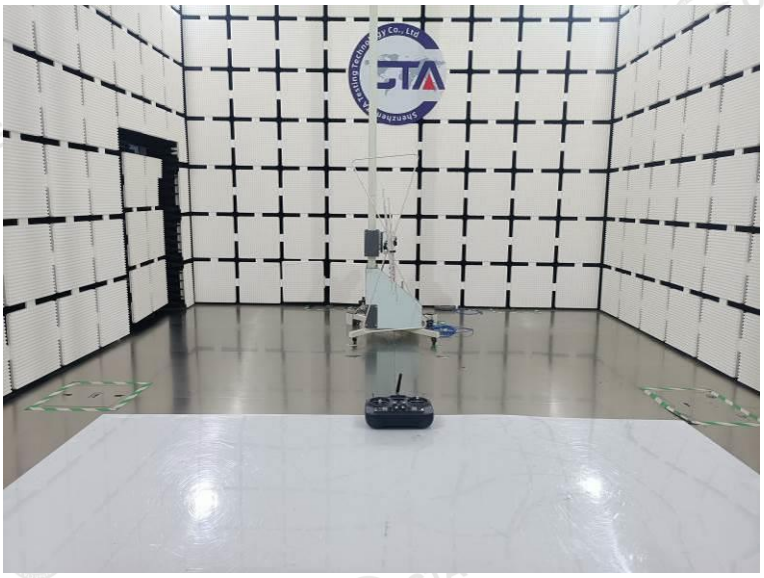
The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

Antenna Connected Construction

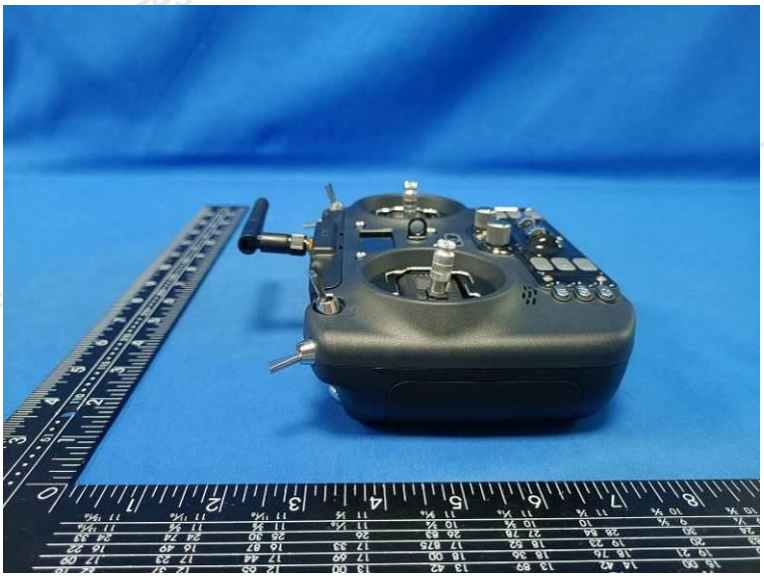
The maximum gain of antenna was 2.00 dBi.

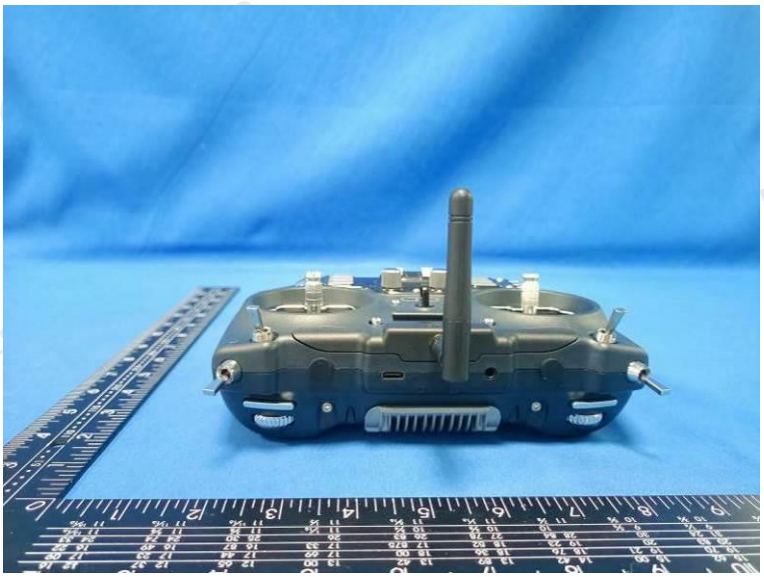
Remark:The antenna gain is provided by the customer , if the data provided by the customer is not accurate, Shenzhen CTA Testing Technology Co., Ltd. does not assume any responsibility.

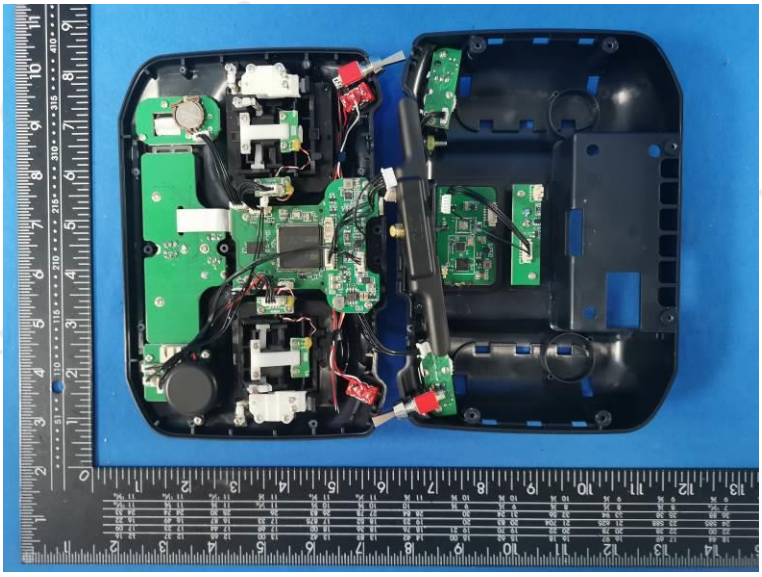
5. Test Setup Photos of the EUT

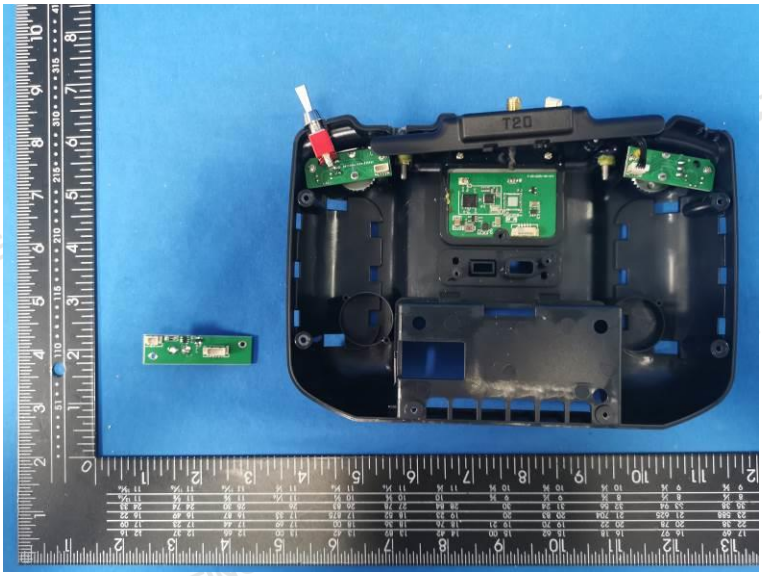


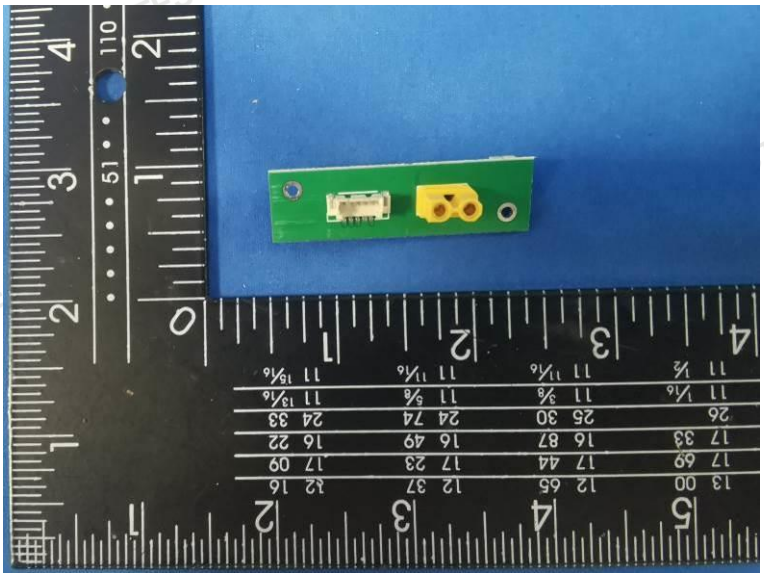
6. External and Internal Photos of the EUT

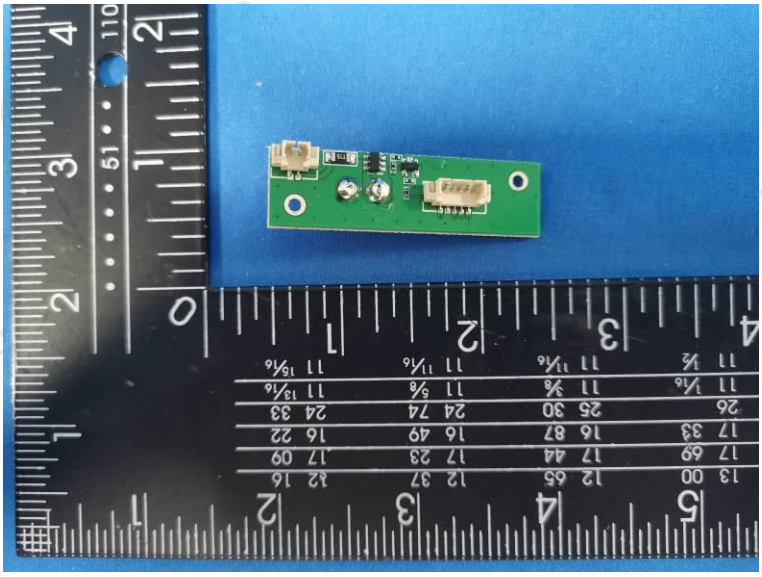


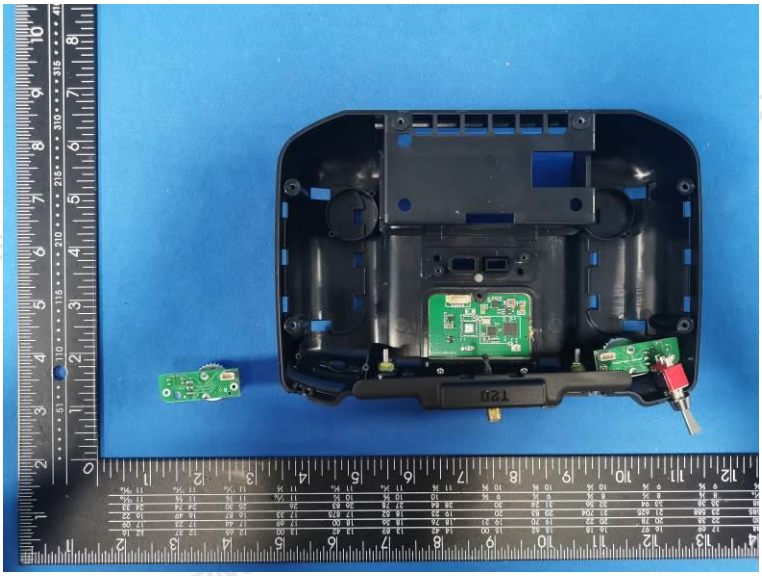


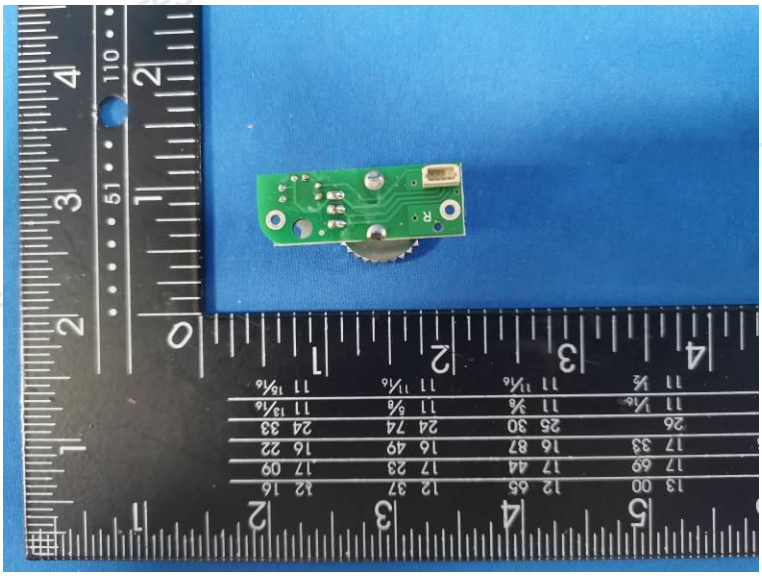


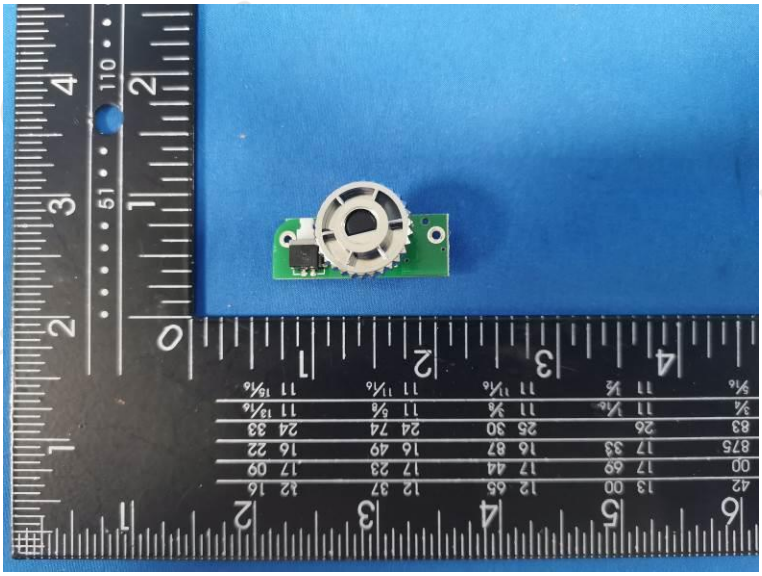


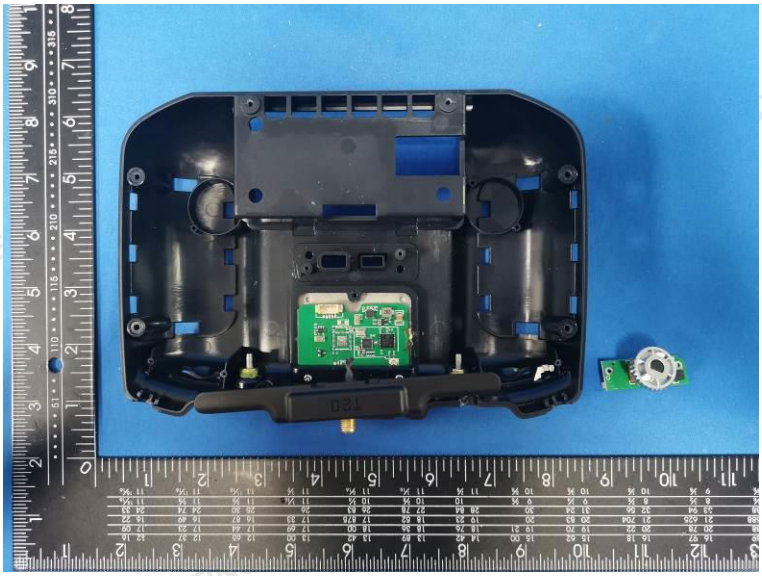


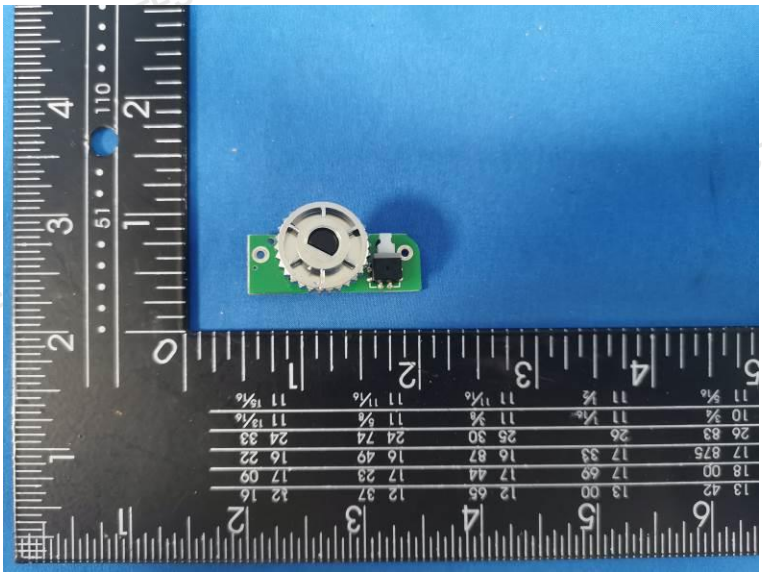


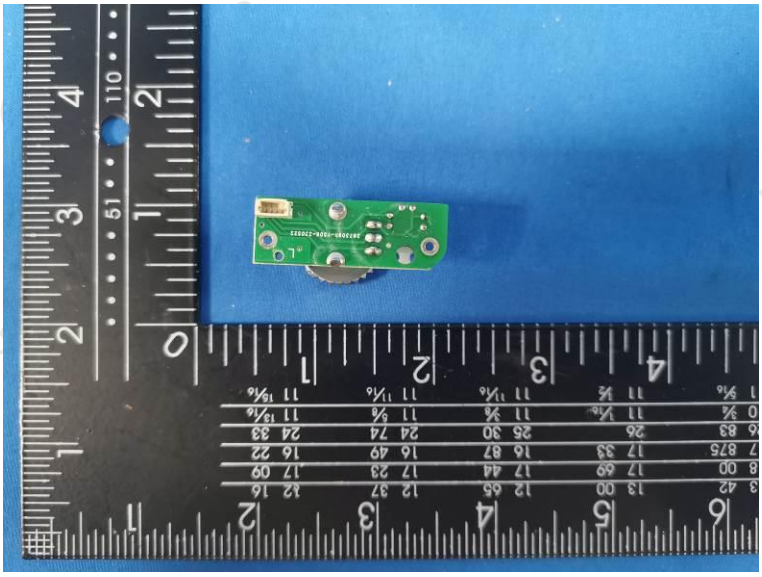


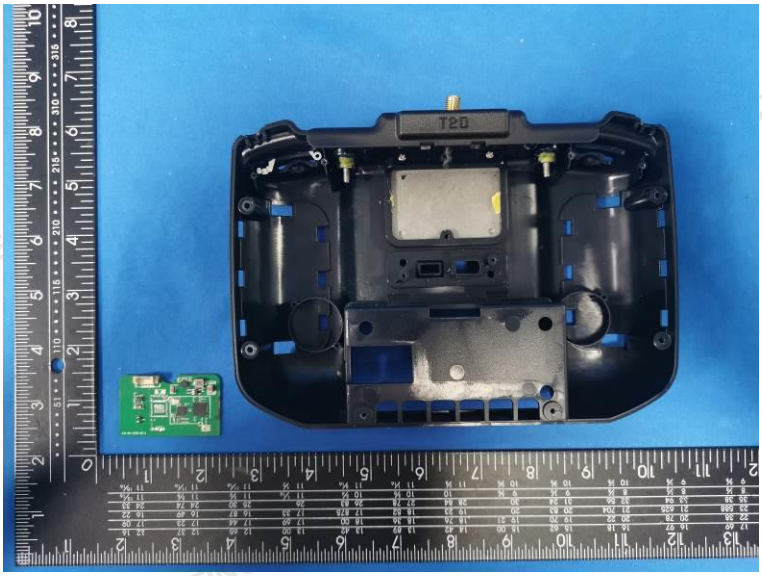


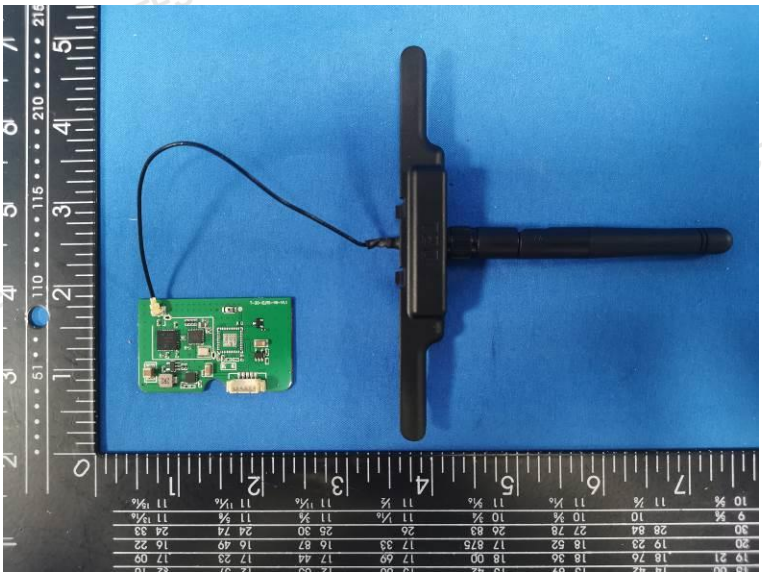


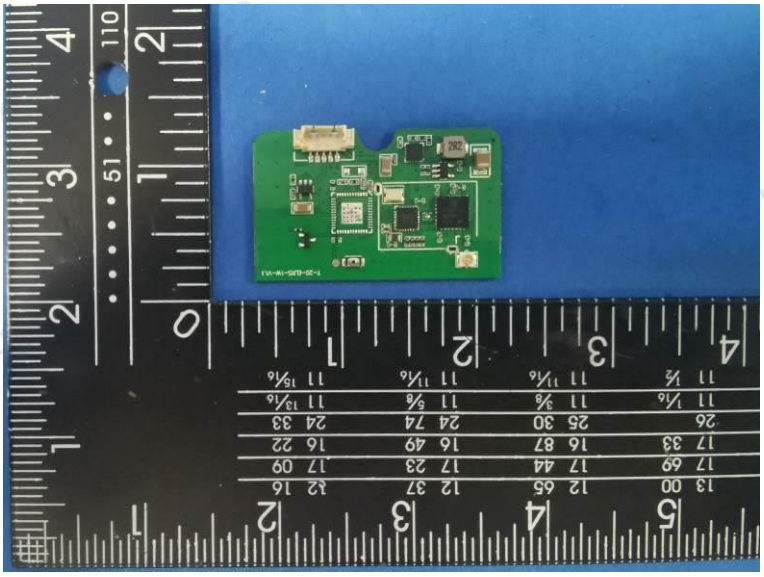


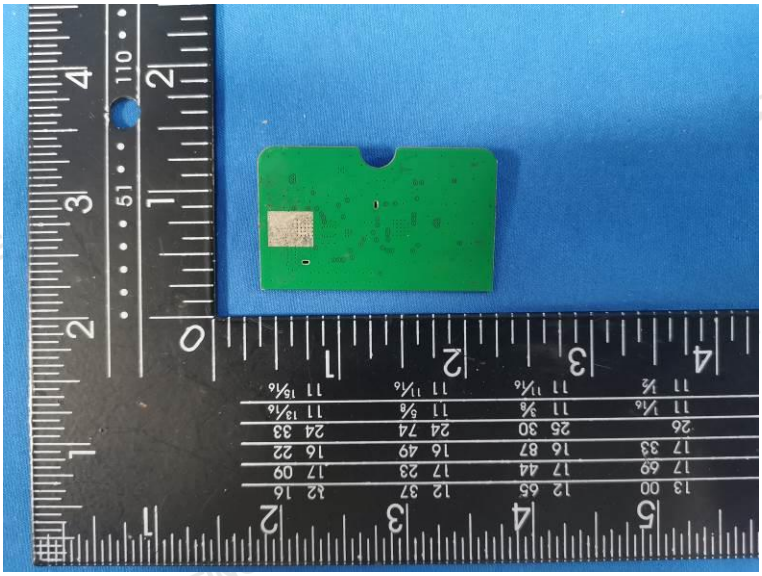


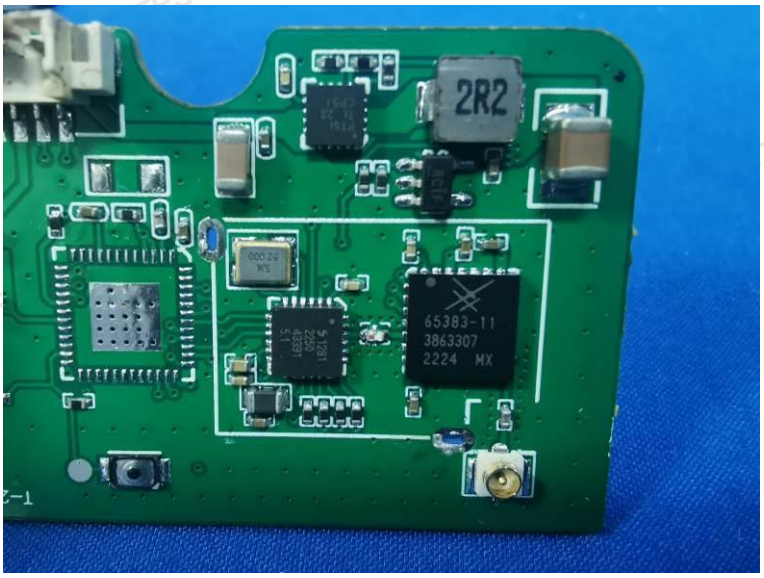


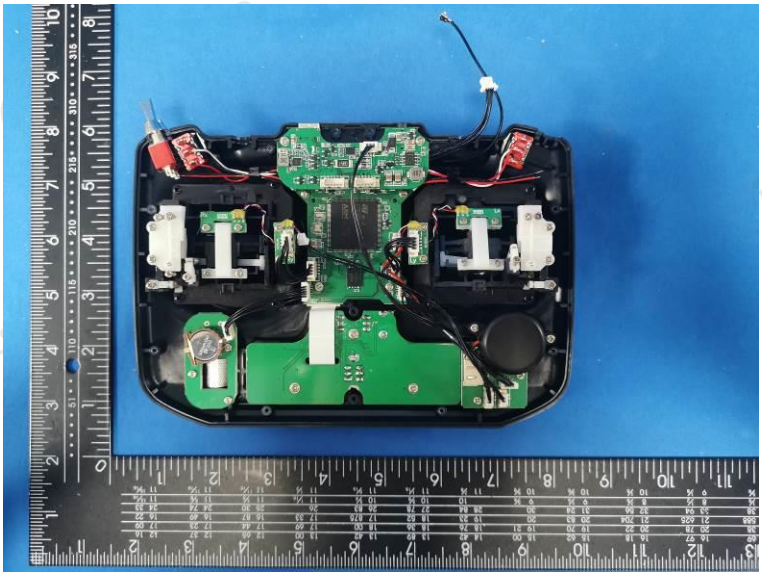


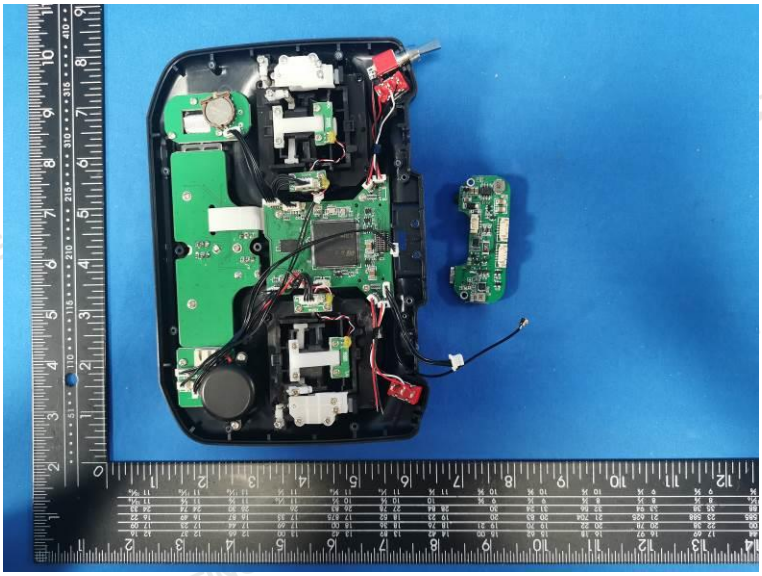


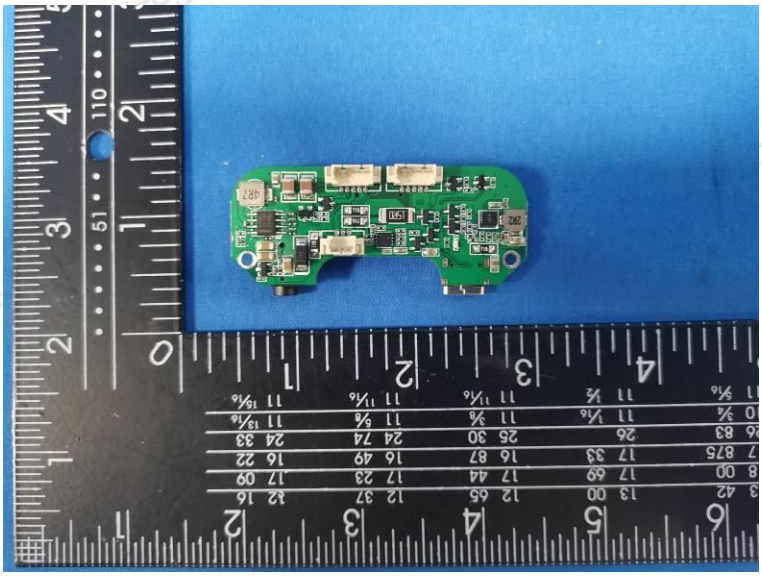


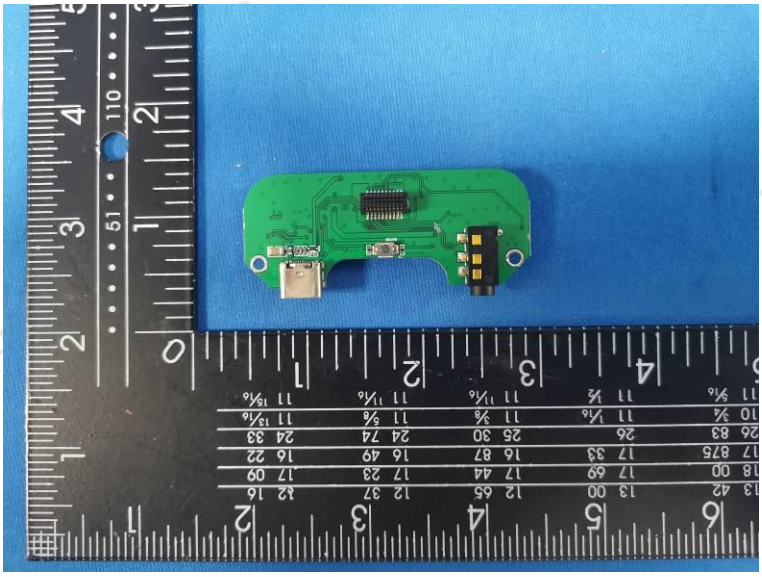


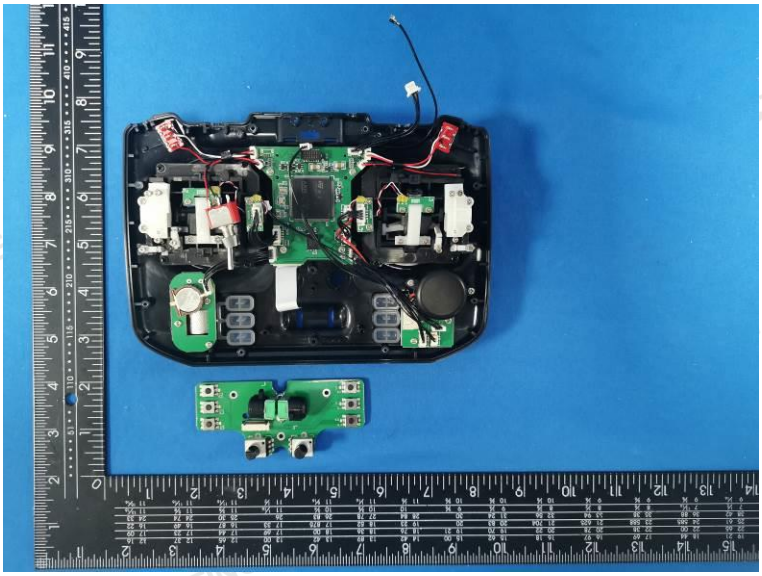

2R2
65383-11
3863307
2224 MX

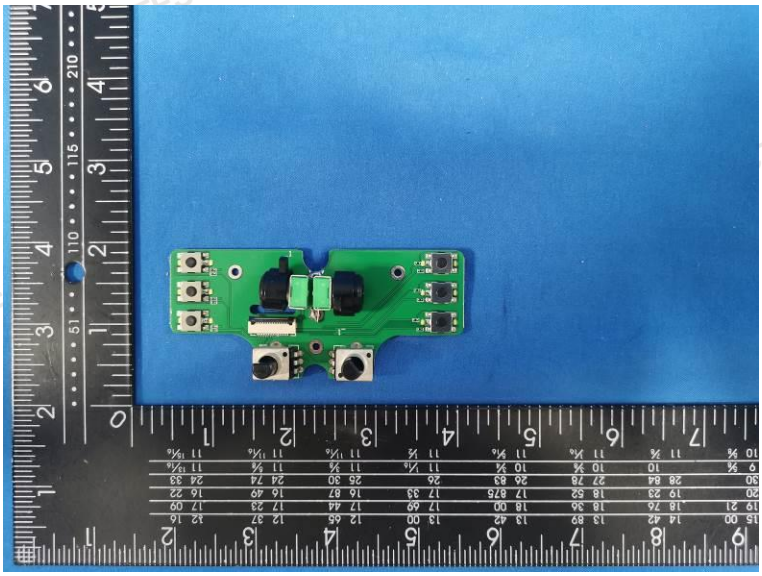


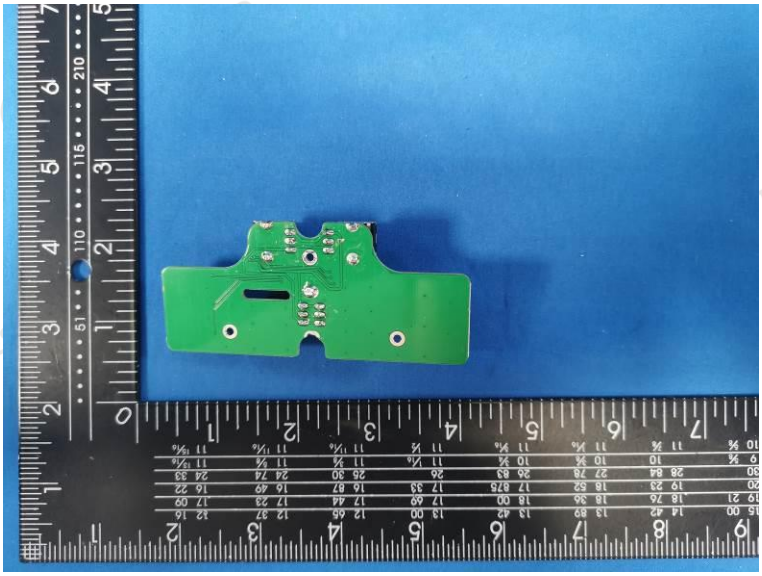


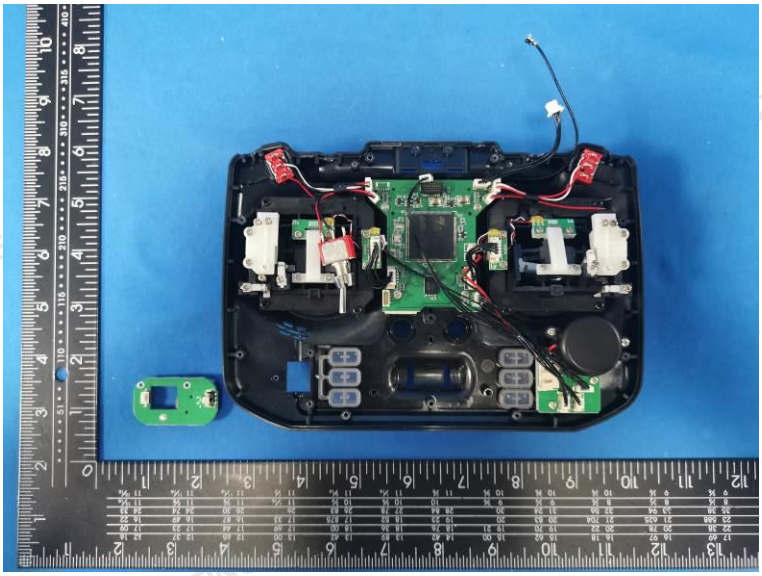


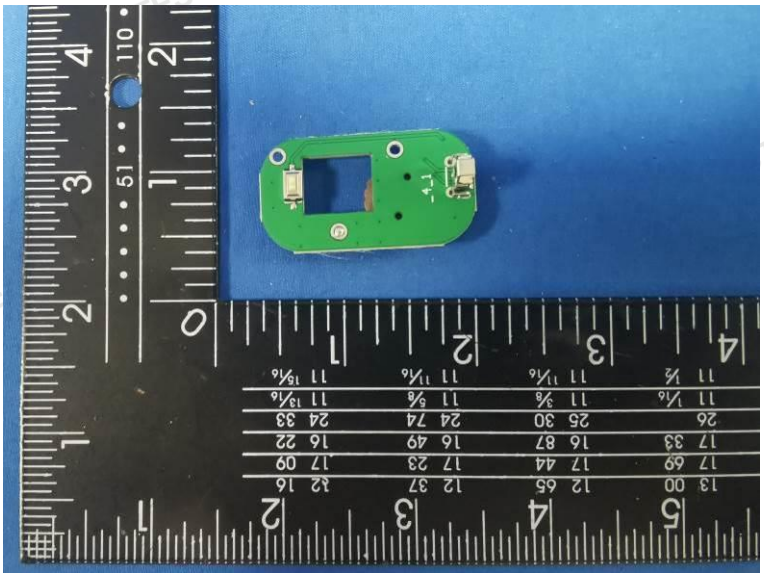


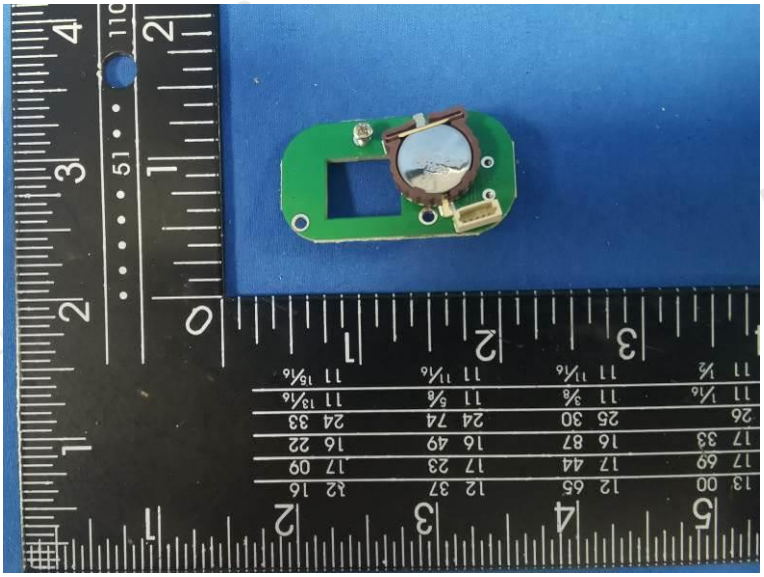


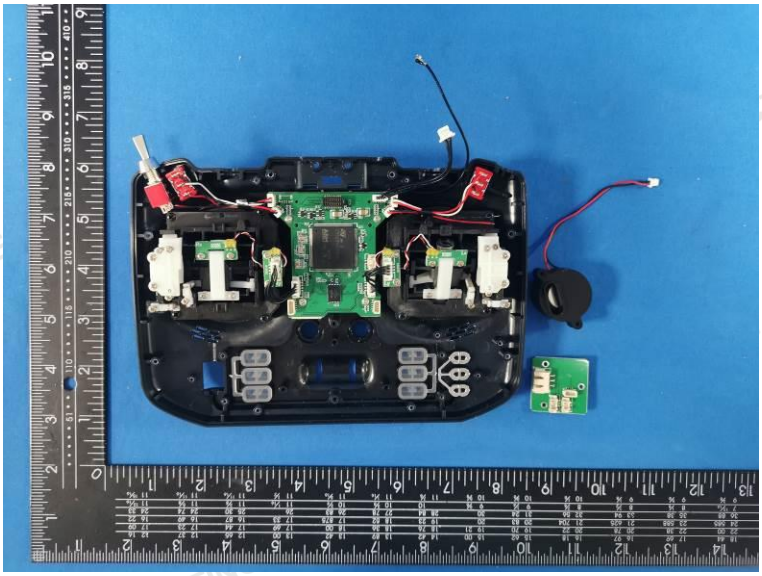


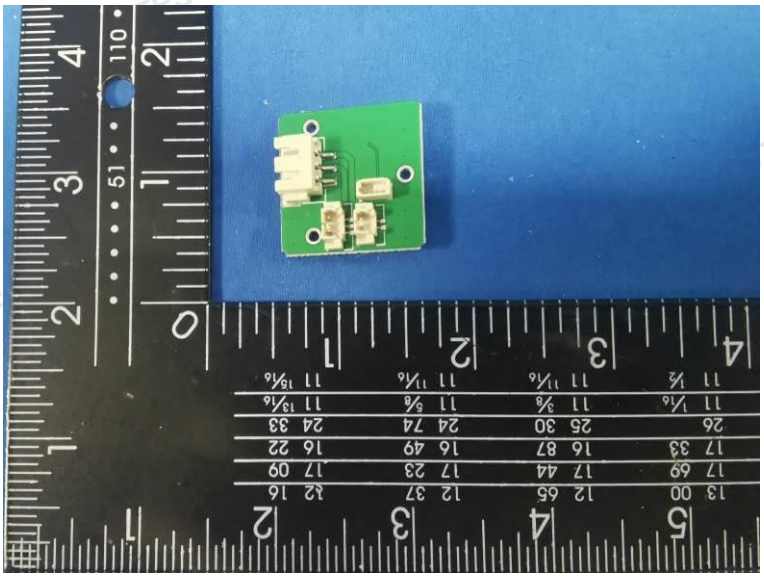


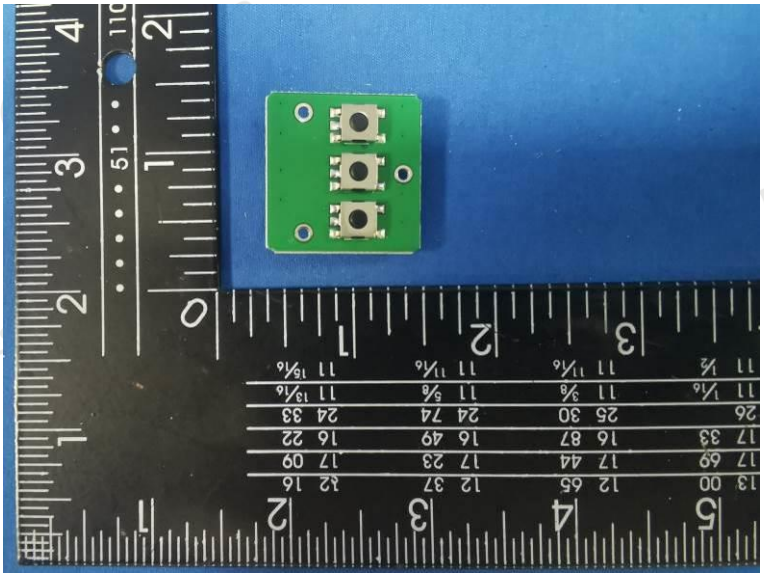


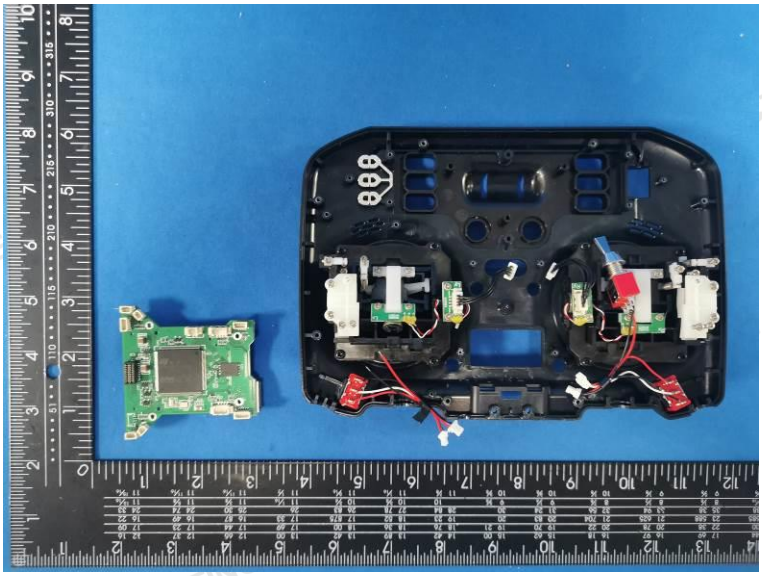


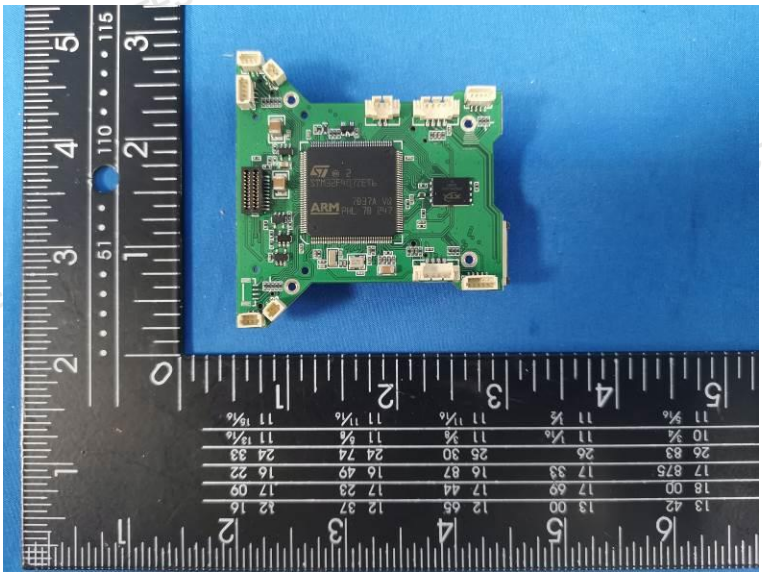


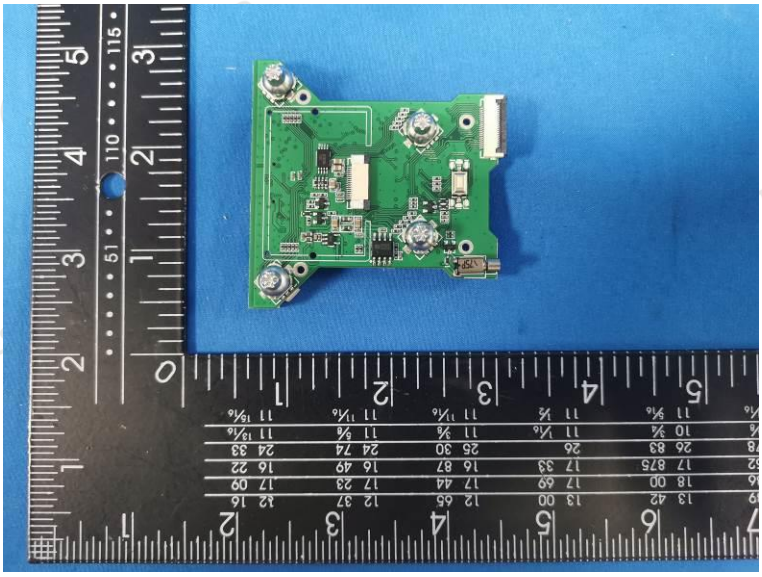


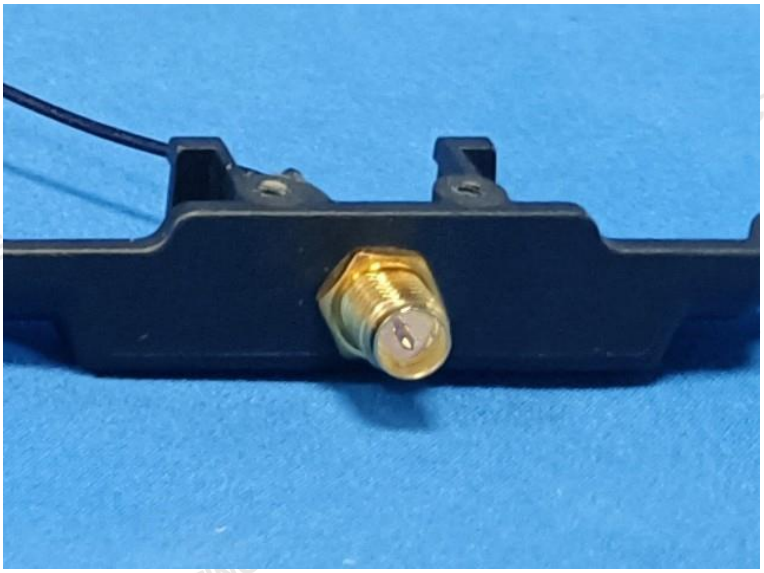












.....End of Report.....