MIC TEST REPORT

On Behalf of

ShenZhenShi NewStone Technology co., Ltd

2.4G remote controller

Model No.: P2X(X=0~9), P1X(X=0~9), P3X(X=0~9), P4X(X=0~9), P5X(X=0~9), P6X(X=0~9), P7X(X=0~9), P8X(X=0~9), P9X(X=0~9), P21-SVC, P31-P, A82, A82-S

Prepared for	:	ShenZhenShi NewStone Technology co., Ltd
Address	:	B2 blvd, YuHong Industrial Park, No.20, XingYe West Road, ShaJing Town, ShenZhen, China

Prepared By	:	Shenzhen Alpha Product Testing Co., Ltd.
Address	:	Building i, No.2, Lixin Road, Fuyong Street, Bao'an District, 518103, Shenzhen, Guangdong, China

Report Number	:	A2210206G1-C01-R01
Date of Receipt	:	November 2, 2022
Date of Test	:	November 2, 2022-November 14, 2022
Date of Report	:	October 23, 2023
Version Number	:	V0

Contents

TEST REPORT DECLARATION

Applicant	:	ShenZhenShi NewStone Technology co., Ltd
Address	:	B2 blvd, YuHong Industrial Park, No.20, XingYe West Road, ShaJing Town, ShenZhen, China
Manufacturer	:	ShenZhenShi NewStone Technology co., Ltd
Address	:	B2 blvd, YuHong Industrial Park, No.20, XingYe West Road, ShaJing Town, ShenZhen, China
EUT Description	:	2.4G remote controller

(A)	Model No.	:	P2X(X=0~9), P1X(X=0~9), P3X(X=0~9), P4X(X=0~9), P5X(X=0~9), P6X(X=0~9), P7X(X=0~9), P8X(X=0~9), P9X(X=0~9), P21-SVC, P31-P, A82, A82-S
(B)	Trademark	:	N/A

Measurement Standard Used:

MIC public notice 88:2004, annex 43 and annex 1

The device described above is tested by Shenzhen Alpha Product Testing Co., Ltd. to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the MIC public notice 88:2004, annex 43 and annex 1 limits both conducted and radiated emissions. The test results are contained in this test report and Shenzhen Alpha Product Testing Co., Ltd. is assumed of full responsibility for the accuracy and completeness of these tests.
After the test, our opinion is that EUT compliance with the requirement of the above standards.

This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Shenzhen Alpha Product Testing Co., Ltd.

Tested by (name + signature)............:	Yannis Wen Project Engineer	
Approved by (name + signature).…....:	Reak Yang Project Manager	

Date of issue…… …………………..:   October 23, 2023

Revision History

Revision	Issue Date	Revisions	Revised By
V0	October 23, 2023	Initial released Issue	Yannis Wen

1. General Information

1.1. Description of Device (EUT)

EUT	:	2.4G remote controller
Model No.	:	P2X(X=0~9), P1X(X=0~9), P3X(X=0~9), P4X(X=0~9), P5X(X=0~9), P6X(X=0~9), P7X(X=0~9), P8X(X=0~9), P9X(X=0~9), P21-SVC, P31-P, A82, A82-S
DIFF	:	There is no difference except the name of the model. All tests are made with the P21 model.
Trade Name	:	N/A
Power supply	:	DC 6V from battery

2.4G

Operation frequency	:	2405MHz -2478MHz
Channel No.	:	74 channels
Modulation	:	GFSK
Antenna Type	:	Dipole Antenna, max gain 3.57dBi.
Rated power	:	0.1.mW/MHz
Hardware version	:	P21 V1.0
Software version	:	V1.0

Remark: This Co-license is based on report A2210206-C01-R03 , the new models P7X(X=0~9), P8X(X=0~9), P9X(X=0~9) in Co-license are the same as original models P21 mentioned in test report A2210206-C01-R03 respectively, no further test need.

1.2. Accessories of Device (EUT)

Accessories1 : N/A

Manufacturer : N/A

Model : N/A

Ratings : N/A

1.3. Ancillary Equipment Details

| No.	Description	Manufacturer	Model	Serial Number	Certification or SDOC
/	/	/	/	/	/

1.4. Test Lab Information

Shenzhen Alpha Product Testing Co., Ltd

Building i, No.2, Lixin Road, Fuyong Street, Bao'an District, 518103, Shenzhen, Guangdong, China

2. Summary of test

2.1. Summary of test result

CLAUSE (ARIB STD-T66)	TEST PARAMETER	RESULTS
Transmitter Parameters		
3.2 (2)	Antenna Power	**PASS**
3.2 (3)	Tolerances for Antenna Power	**PASS**
3.2 (4)	Frequency Tolerance	**PASS**
3.2 (5)	Transmission Rate	**PASS**
3.2 (7)	Occupied Frequency Bandwidth	**PASS**
3.2 (8)	Spread Bandwidth	**PASS**
3.2 (9)	Process Gain	**PASS**
3.2 (10)	Number of Carriers	**PASS**
3.2 (11)	Dwell Time	**PASS**
3.2 (6)	Spurious Emissions	**PASS**
/	Interference prevention function	**PASS**
/	Carrier Sensing function	**N/A**
/	Equivalent Isotropic Radiated Power	**PASS**
/	3dB Beam Bandwidth	**N/A**
Receiver Parameters		
3.3 (1)	Secondary Radiated Emissions	**N/A**
N/A is an abbreviation for Not Applicable.		

2.2. Block Diagram

EUT
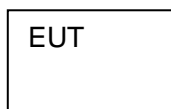
2.3. Test mode

For All Channels:

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2405MHz	20	2424MHz	39	2443MHz	58	2462MHz
2	2406MHz	21	2425MHz	40	2444MHz	59	2463MHz
3	2407MHz	22	2426MHz	41	2445MHz	60	2464MHz
4	2408MHz	23	2427MHz	42	2446MHz	61	2465MHz
5	2409MHz	24	2428MHz	43	2447MHz	62	2466MHz
6	2410MHz	25	2429MHz	44	2448MHz	63	2467MHz
7	2411MHz	26	2430MHz	45	2449MHz	64	2468MHz
8	2412MHz	27	2431MHz	46	2450MHz	65	2469MHz
9	2413MHz	28	2432MHz	47	2451MHz	66	2470MHz
10	2414MHz	29	2433MHz	48	2452MHz	67	2471MHz
11	2415MHz	30	2434MHz	49	2453MHz	68	2472MHz
12	2416MHz	31	2435MHz	50	2454MHz	69	2473MHz
13	2417MHz	32	2436MHz	51	2455MHz	70	2474MHz
14	2418MHz	33	2437MHz	52	2456MHz	71	2475MHz
15	2419MHz	34	2438MHz	53	2457MHz	72	2476MHz
16	2420MHz	35	2439MHz	54	2458MHz	73	2477MHz
717	2421MHz	36	2440MHz	55	2459MHz	74	2478MHz
18	2422MHz	37	2441MHz	56	2460MHz		
19	2423MHz	38	2442MHz	57	2461MHz		

The test specific software was used to control EUT work in Continuous TX mode, and select test channel, wireless mode

Tested mode, channel, and data rate information		
Mode	Channel	Frequency (MHz)
Carrier Tx Mode	CH1	2405
	CH37	2441
	CH74	2478
GFSK hopping on Tx Mode	CH1 to CH74	2405 to 2478
GFSK hopping off Tx Mode	CH1	2405
	CH37	2441
	CH74	2478
Tested mode, channel, and data rate information		

2.4. Test Conditions

Temperature range	15-35℃
Humidity range	45-85%
Pressure range	86-106kPa

2.5. Measurement Uncertainty (95% confidence levels, k=2)

Item	MU	Remark
Bandwidth	±0.2ppm	/
Antenna Power	±0.33dB	/
Frequency Tolerance	±0.5ppm	/
Conducted spurious emission	±0.13dB	/

2.6. Test Voltage

Voltage mode	Input Voltage	Radio Unit Voltage
Charger	DC 6V	DC 3.3V
	DC 6V	DC 3.3V
	DC 6V	DC 3.3V
Note: 1 The radio unit Voltage with the IC regulator. 2 The radio unit less than 1%, so the test only rated voltage (Normal voltage DC 3.3V) with the battery.		

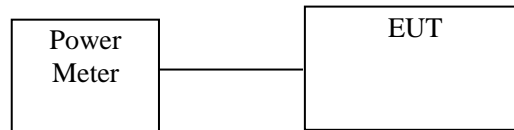## 3. Antenna Power

3.1. Test Equipment

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	Power meter	Agilent	E4419B	GB40202122	2022.08.22	1 Year
Note: The test equipment is calibrated by CCIC Southern Testing Co., Ltd.						

3.2. Limit

Type	Limit
Antenna Power	10 mW
Tolerance	+20%,-80%

3.3. Block diagram of test setup

Power Meter		EUT

3.4. Test Procedure

(1) Configure EUT and assistant system according clause 2.3 and 3.3

(2) Set EUT work in test mode as described in clause 2.4

(3) Connected the EUT's antenna port to the Power Meter by suitable attenuator.

 (4)When the trace is complete, find the peak value of the power envelope and record.

3.5. Test result

Mode	Condition	CH	Test Result (dBm)	Antenna (dBi)	Result (mW/MHz)	Limit (mW/MHz)
GFSK	DC 6V	CH1	7.56	2	0.087	3
		CH37	7.37	2	0.083	3
		CH74	7.31	2	0.082	3
Conclusion: PASS						

Mode	CH	Stated power (mW/MHz)	Result (mW/MHz)	Tolerance /	Limit /
GFSK	CH1	0.1	0.087	-13.00%	+20%,-80%
	CH37	0.1	0.083	-17.00%	+20%,-80%
	CH74	0.1	0.082	-18.00%	+20%,-80%
Conclusion: PASS					

4. Frequency Tolerance

4.1. Test Equipment

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	Spectrum analyzer	Agilent	E4407B	MY49510055	2022.08.22	1 Year
Note: The test equipment is calibrated by CCIC Southern Testing Co., Ltd..						

4.2. Limit

+/- 50x 10^{-6} or less(50ppm)

4.3. Block diagram of test setup
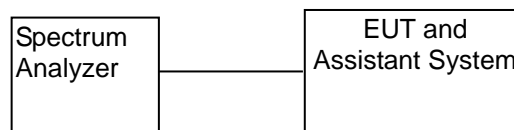
4.4. Test Procedure

(1) Configure EUT and assistant system according clause 2.3 and 4.3

(2) Set EUT work in carrier Tx mode as described in clause 2.4

(3) Connected the EUT's antenna port to the Spectrum Analyzer by suitable attenuator, set the
Spectrum Analyzer as below:

> Centre Frequency: The centre frequency of the channel under test.
>
> Resolution BW: 10 KHz.
>
> Video BW: 30 KHz.
>
> Span: 1MHz.
>
> Detector: Peak.
>
> Trace Mode: Max Hold.

(4)When the trace is complete, find the peak value of the power envelope and record the
frequency.

4.5. Test result

| Mode	CH	Measured	Tolerance	Result	Limit
		MHz	MHz	ppm	ppm
Test Voltage: DC 6V by battery					
Carrier Tx Mode	CH1:2405MHz	2405.09	0.09	37.106	±50
	CH37:2441MHz	2441.05	0.05	21.630	±50
	CH74:2478MHz	2477.90	-0.10	-39.642	±50
Conclusion: PASS					

5. Occupied Frequency Bandwidth

5.1. Test Equipment

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	Spectrum analyzer	Agilent	E4407B	MY49510055	2022.08.22	1 Year
Note: The test equipment is calibrated by CCIC Southern Testing Co., Ltd..						

5.2. Limit

Permissible value for occupied bandwidth using the FH system, a hybrid system combining DS and FH systems, or a hybrid system combining FH and OFDM systems shall be 83.5 MHz or less, The OFDM systems shall be 38 MHz or less, while necessary bandwidth (minimum occupied bandwidth sufficient to ensure information transmission of required quality at a required transmission rate for the system used under specified conditions for a given emission type) using a system other than any of the above shall be 26 MHz or less.

5.3. Block diagram of test setup

```
┌──────────┐        ┌──────────┐
│Spectrum  │        │ EUT and  │
│Analyzer  │────────│Assistant │
│          │        │ System   │
└──────────┘        └──────────┘
```
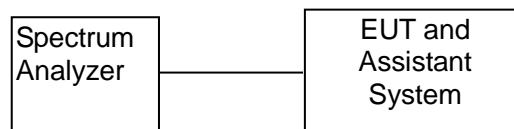
5.4. Test Procedure

(1) Configure EUT and assistant system according clause 2.3 and 5.3

(2) Set EUT work in test mode as described in clause 2.4

(3) Connected the EUT's antenna port to the Spectrum Analyzer by suitable attenuator, set the Spectrum Analyzer as below:

    Centre Frequency: The centre frequency of the channel under test.

    Resolution BW: 300 KHz

    Video BW: 300 KHz

   Span: Wide enough to cover the complete power envelope of the signal of the EUT.

    Detector: Peak.

    Trace Mode: Max Hold.

(4) When the trace is complete, measure the occupied bandwidth (99% bandwidth) with spectrum analyzer's bandwidth measure function.
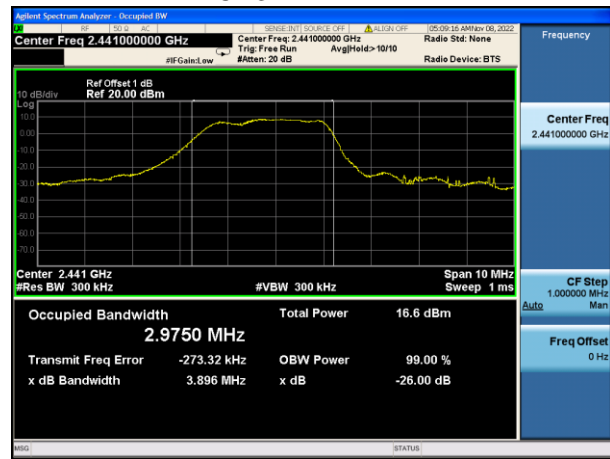
5.5. Test result

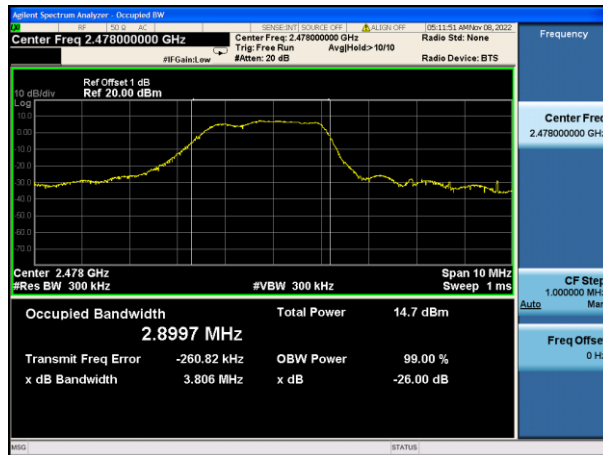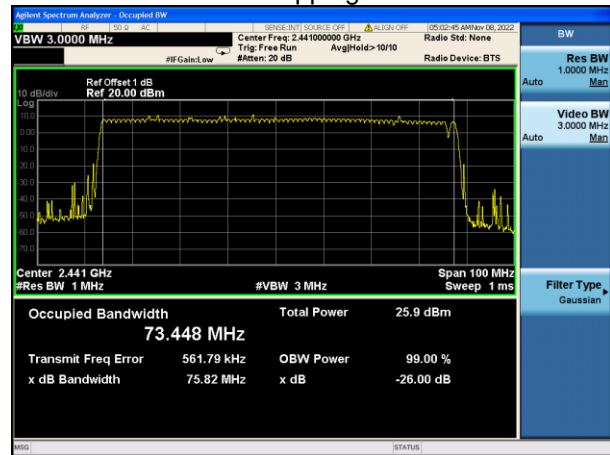| Mode	Condition	CH	Result (MHz)	Limit (MHz)
GFSK	DC 6V	CH1	3.0815	83.5
		CH37	2.9750	83.5
		CH74	2.8997	83.5
GFSK Tx Mode Hopping on	Normal	/	73.448	83.5
Conclusion: PASS				

Original test data :

CH1:2405MHz
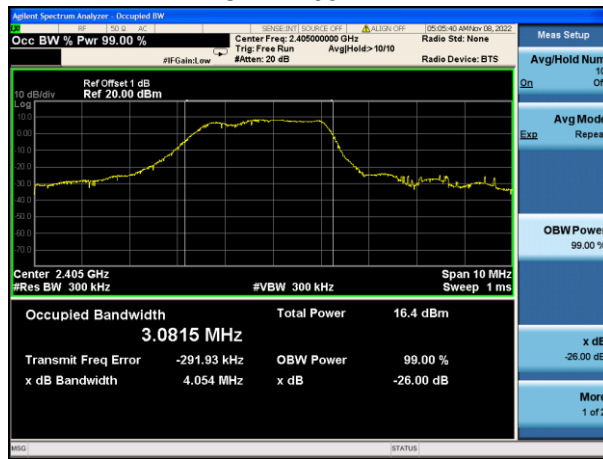
CH37:2441MHz

CH74:2478MHz

Hopping

6. Spread Bandwidth

6.1. Test Equipment

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	Spectrum analyzer	Agilent	E4407B	MY49510055	2022.08.22	1 Year
Note: The test equipment is calibrated by CCIC Southern Testing Co., Ltd..						

6.2. Limit

In spread spectrum systems, spread bandwidth (which refers to a frequency bandwidth with an upper limit and lower limit such that each of the mean powers radiated above the upper frequency limit and below the lower frequency limit is equal to 5 % of the total mean power radiated; this also applies hereafter) shall be 500 kHz or more.

6.3. Block diagram of test setup

```
┌──────────┐         ┌──────────┐         ┌────────────────┐
│ Spectrum │         │          │         │ EUT and Assistant│
│ Analyzer │─────────│ Attenuator│────────│     System      │
└──────────┘         └──────────┘         └────────────────┘
```
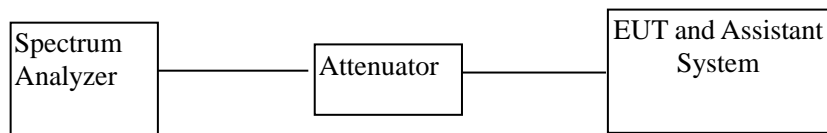
6.4. Test Procedure

(1) Configure EUT and assistant system according clause 2.3 and 6.3

(2) Set EUT work in test mode as described in clause 2.4

(3) Connected the EUT's antenna port to the Spectrum Analyzer by suitable attenuator, set the Spectrum Analyzer as below:

> Centre Frequency: The centre frequency of the channel under test.
> Resolution BW: 300 KHz.
> Video BW: 300 KHz.
> Span: Wide enough to cover the complete power envelope of the signal of the EUT.
> Detector: Peak.
> Trace Mode: Max Hold.

(4) When the trace is complete, measure the spread bandwidth (90% bandwidth) with spectrum analyzer's bandwidth measure function.
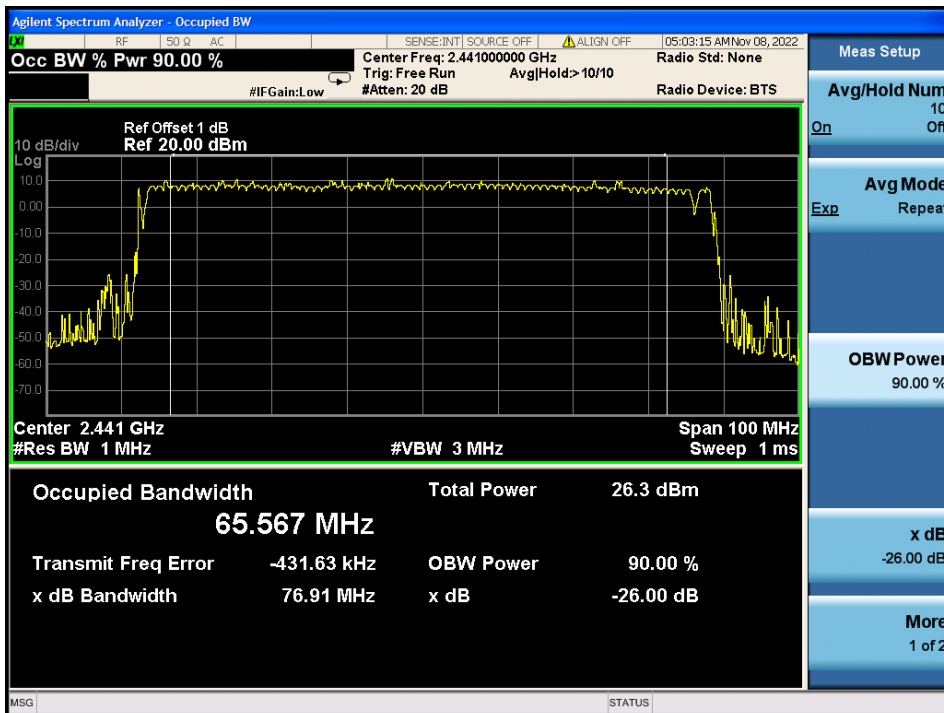
6.5. Test result

Mode	Condition	CH	Result	Limit
			MHz	KHz
GFSK Tx Mode Hopping on	Normal	/	65.567	500
Conclusion: PASS				

6.6. Original test data :

GFSK

7. Dwell time

7.1. Test Equipment

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	Spectrum analyzer	Agilent	N9020A	MY499100060	2022.08.22	1 Year
Note: The test equipment is calibrated by CCIC Southern Testing Co., Ltd.						

7.2. Limit

Frequency dwell time (time during which radio waves continue to be emitted at a specified frequency) of a transmitting equipment using the FH system shall be 0.4 seconds or less.

7.3. Block diagram of test setup

```
┌───────────┐        ┌────────────┐        ┌──────────────┐
│Spectrum   │        │            │        │ EUT and      │
│Analyzer   │────────│ Attenuator │────────│ Assistant System │
└───────────┘        └────────────┘        └──────────────┘
```
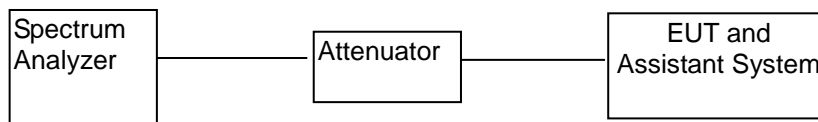
7.4. Test Procedure

(1) Configure EUT and assistant system according clause 2.4 and 7.3

(2) Set EUT work in test mode as described in clause 2.4

(3) Connected the EUT's antenna port to the Spectrum Analyzer by suitable attenuator, set the Spectrum Analyzer as below:

> Centre Frequency: The centre frequency of the middle hopping channel.
> Resolution BW: 1MHz.
> Video BW: 1MHz.
> Span: Zero span.
> Detector: Peak.
> Trace Mode: Max Hold.
> Sweep: Video Trigger

(4) When the trace is complete, measure the sending time of 1 burst and the duty cycle of 1 Burst cycle.

(5) Calculate dwell time follow below formula:

Dwell time =(0.4(s) x spreading rate x sending time of 1 burst(s))/(Burst cycle(s) x No. of hopping channel)

Spreading rate = Spread bandwidth (actual measurement value)/Transmission rate.
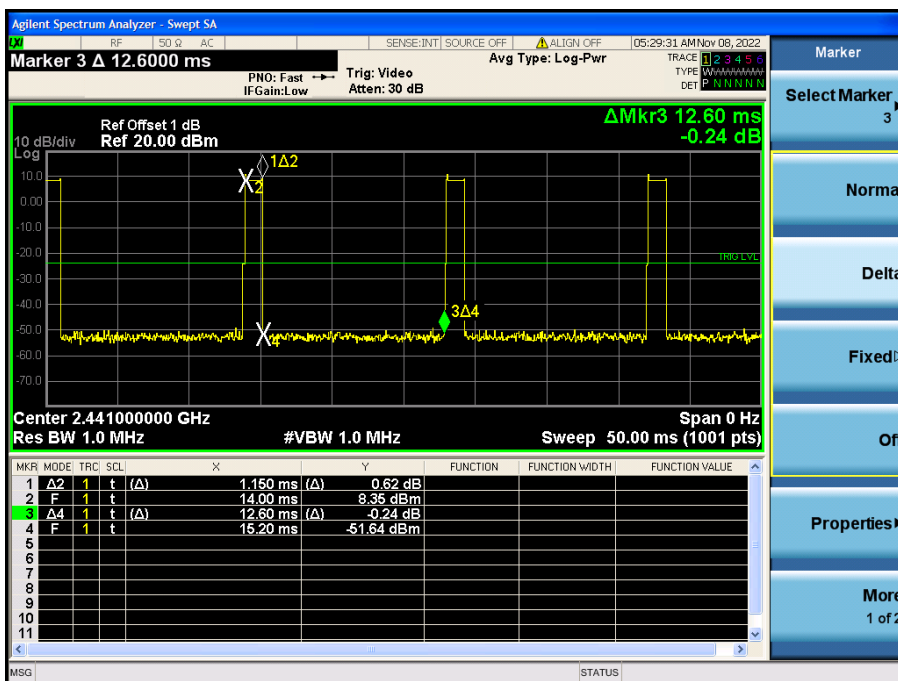
7.5. Test result

Mode Packet type	T_{on}	Burst cycle	Result	Limit
	ms	ms	s	s
GFSK Tx Mode Hopping on	1.15	13.75	0.030	0.4
GFSK mode Spreading rate= Spread bandwidth (actual measurement value)/Transmission rate=65.567MHz/1Mbps=65.567				
Conclusion: PASS				

7.6. Original test data

GFSK

Note : T_{on}=1.15ms

Burst cycle=1.15+12.6=13.75ms

8. Transmitter Spurious Emissions (conducted)

8.1. Test Equipment

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	Spectrum analyzer	Agilent	E4407B	MY49510055	2022.08.22	1 Year
Note: The test equipment is calibrated by CCIC Southern Testing Co., Ltd..						

8.2. Limit

Permissible mean power of spurious emission of each frequency supplied to a feeder, that is, mean power of spurious emission in the 1 MHz bandwidth at frequency f other than frequency band used shall be as follows:

a. 2,387MHz ≤ f ≤ 2,400MHz and 2,483.5MHz < f ≤ 2,496.5MHz   25 µW or less

b. 2,387MHz > f and 2,496.5MHz < f   2.5 µW or less

8.3. Block diagram of test setup

```
┌─────────────┐        ┌─────────────┐
│ Spectrum    │        │ EUT and     │
│ Analyzer    │────────│ Assistant   │
│             │        │ System      │
└─────────────┘        └─────────────┘
```
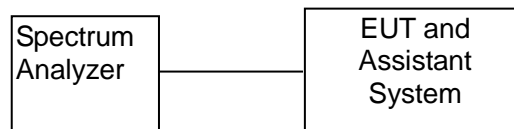
8.4. Test Procedure

(1) Configure EUT and assistant system according clause 2.3 and 7.3

(2) Set EUT work in test mode as described in clause 2.4

(3) Connected the EUT's antenna port to the Spectrum Analyzer by suitable attenuator, set the Spectrum Analyzer as below:

Below 1GHz: Resolution BW: 100KHz.

Video BW: 100KHz.

Detector: Peak.

Trace Mode: Max Hold.

Above 1GHz: Resolution BW: 1MHz.

Video BW: 1MHz.

Detector: Peak.

Trace Mode: Max Hold.

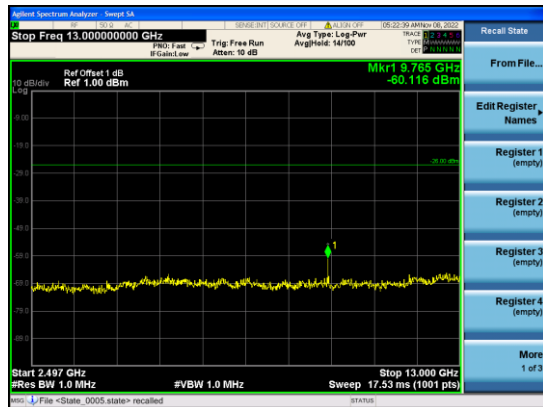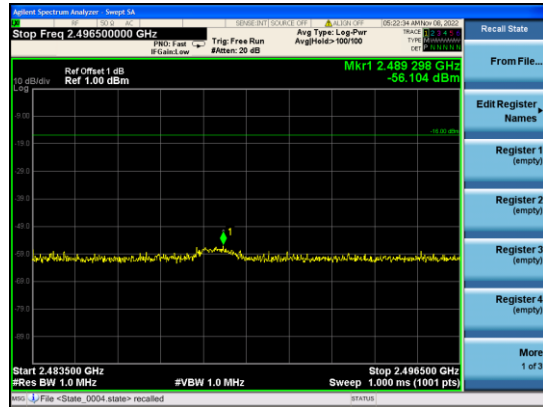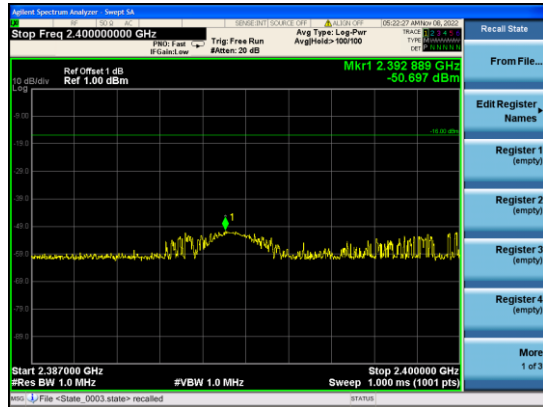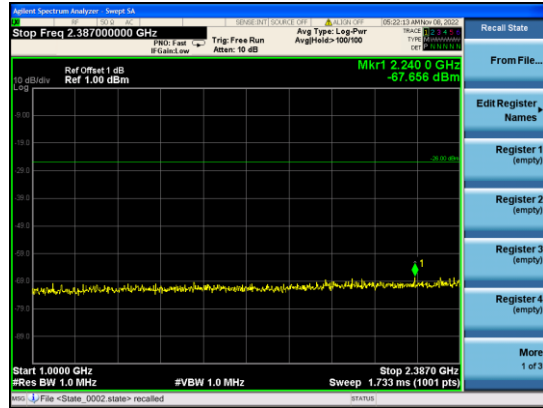(4)All the emissions from 30MHz to 13GHz were measured and record.

8.5. Test result

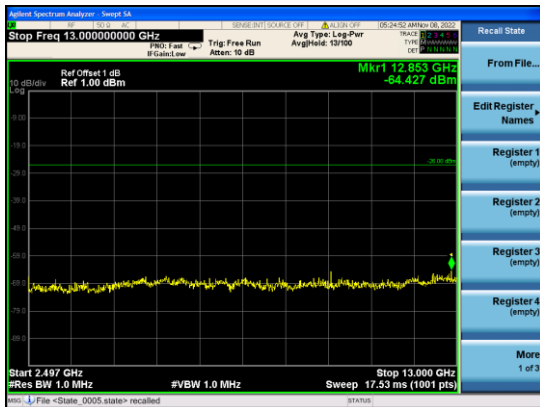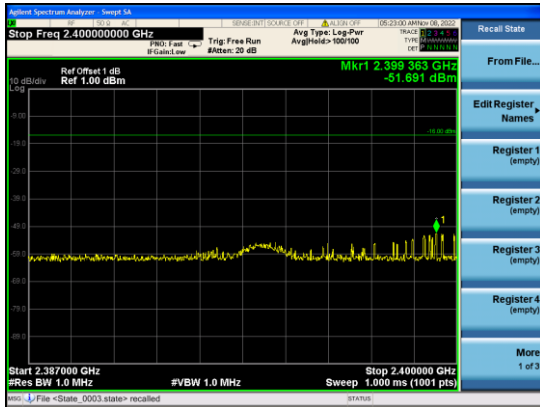| Mode	Condition	CH	Result
GFSK Tx Mode	Normal	CH1	PASS
		CH37	PASS
		CH74	PASS
Conclusion: PASS			

Original test data

CH1: 2405MHz:
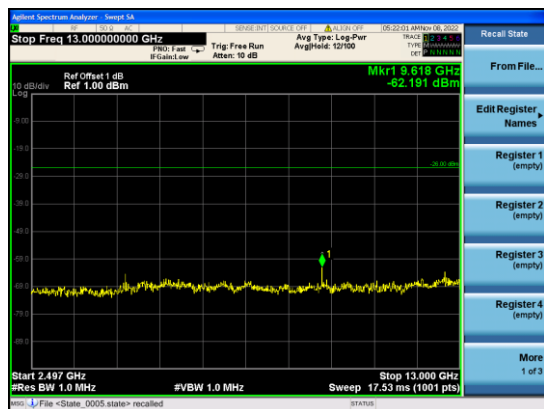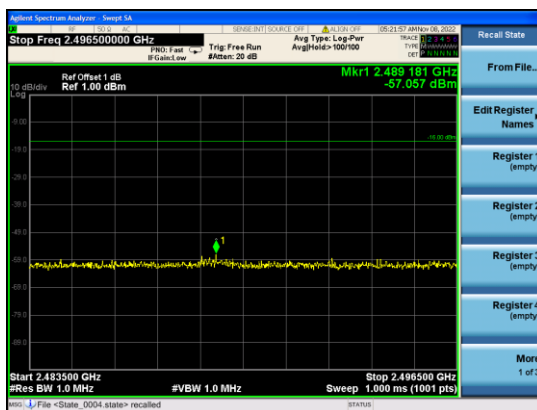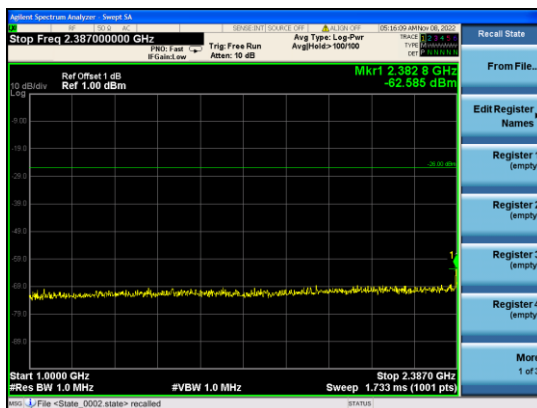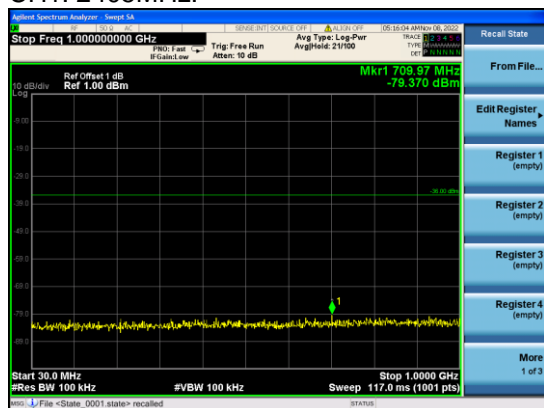
CH37: 2441MHz:
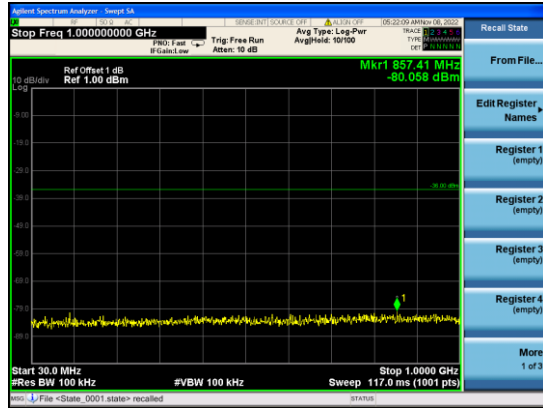
CH74: 2478MHz:
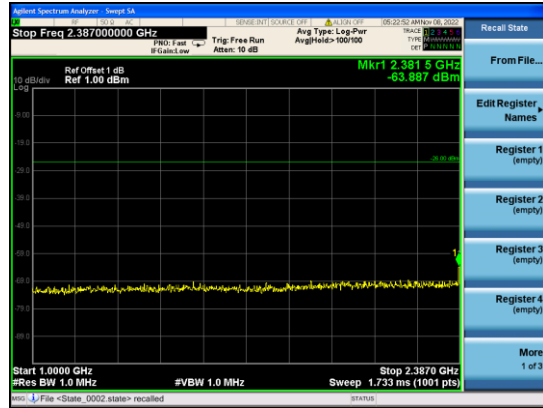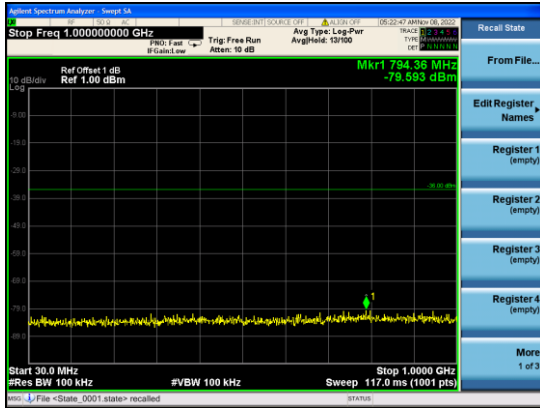
9. Interference prevention function

9.1. Limit

Item	Limits
Identification	≥48 bits

9.2. Measuring ID Code Software

Item	Limits
MAC IP List	MAC Scan

9.3. Block diagram of test setup

PC with Net tool software(Get EUT's MAC)	Peripheral	EUT and Assistant System
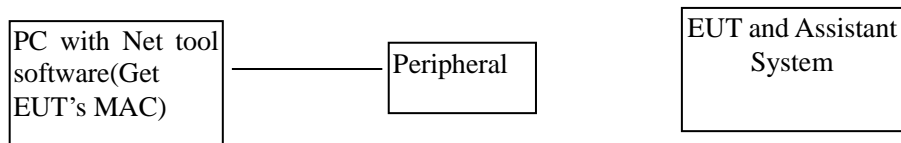
9.4. Test Procedure

1. In the case that the EUT has the function of automatically transmitting the identification code: a. Transmit the predetermined identification codes form EUT. b. Check the transmitted identification codes with the demodulator.
2. In the case of receiving the identification ocde: a. Transmit the predetermined identification codes form the counterpart. b . Check if communication is normal. c. Transmit the signals other than predetermined ID codes form the counterpart. d. check if the EUT stops the transmission, or if it displays that idnetification codes are different from the predetermined ones.
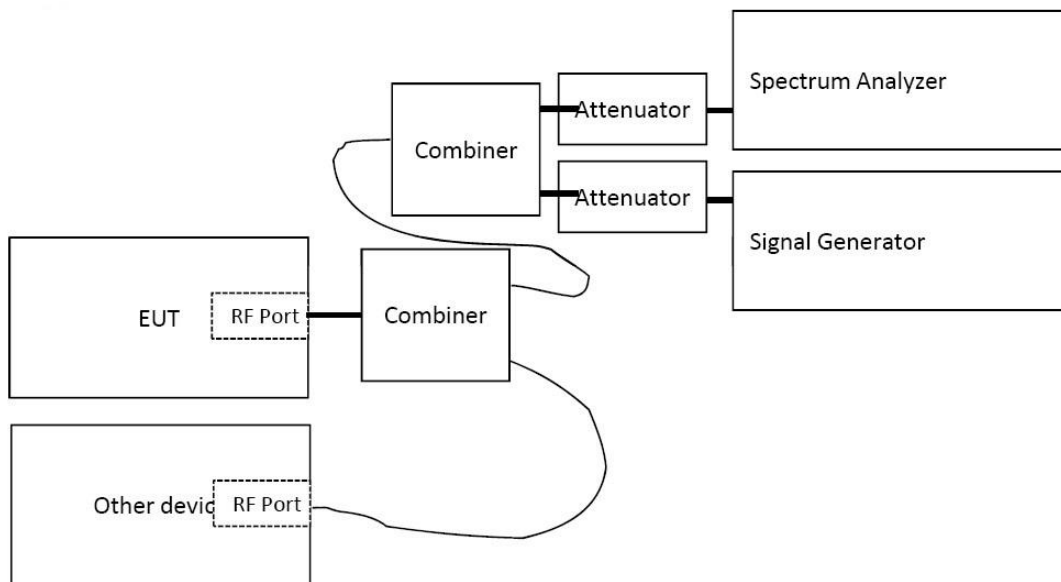
9.5. Test result

EUT:	2.4G remote controller	Test Date:	2022.11.14
Temperature:	24°C	Tested by:	Yannis Wen
Humidity:	56%RH	IC codes:	702fd80n24d30DT5
Test result:	CONFORM		

10. Carrier sensing function

10.1. Limit

The device shall not transmit radio wave when receiving 100mv/m

10.2. Block diagram of test setup

10.3. Test Procedure

The device is configured to communicate with another device as shown below. Once the communications link is established the signal generator is configured to produce a CW signal at the center frequency of the operating channel. The level of the signal generator is increased from a level approximately 30dB lower then the required carrier sense detection threshold (calculated based on the **lowest** antenna gain to be used with the device) until the device stops transmitting. This level is recorded as the carrier sense detection threshold.
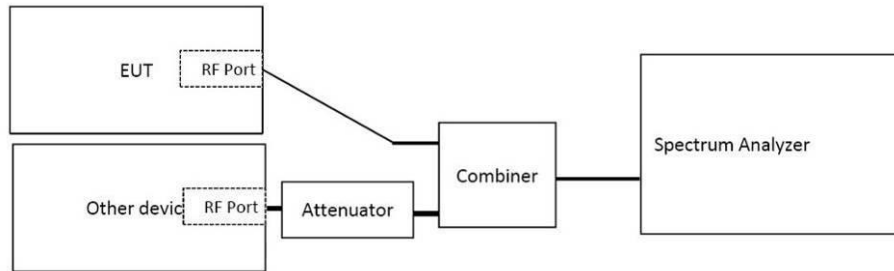
10.4. Test result

EUT:	2.4G remote controller	Test Date:	/
Temperature:	/	Tested by:	/
Humidity:	/		
Test result:	Not Apply to EUT with OBW less than 26MHz		

11. Transmission rate

11.1. Limit

The maximum transmission burst length is limited to 4ms.

11.2. Block diagram of test setup

11.3. Test Precedure

The device was configured to transmit maximum length packets at the fastest and slowest data rate (3MB/s and 1Mb/s).
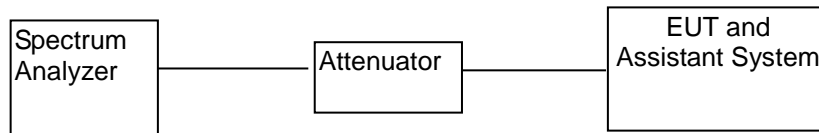
11.4. Test result

EUT:	2.4G remote controller	Model:	P21
Temperature:	24℃	Humidity:	56%RH
Test result:	CONFORM		

12. Process gain

12.1. Limit

Process gain (value obtained by dividing the spread bandwidth by a frequency equal to the transmission rate of the modulation signal; this also applies hereafter) in the spread spectrum system shall be 5 or more.

12.2. Block diagram of test setup

12.3. Test Precedure

(1) Configure EUT and assistant system according clause 2.3 and 11.2

(2) Set EUT work in test mode as described in clause 2.4

12.4. Test result

EUT:	2.4G remote controller	Model:	P21
Temperature:	24℃	Humidity:	56%RH

Modulation	Spread Bandwidth (MHz)	Value	Result	Limit
GFSK	65.567	1	65.567	5

13. Secondary Radiated Emissions

13.1. Test Equipment

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	Spectrum analyzer	Agilent	E4407B	MY49510055	2022.08.22	1 Year
Note: The test equipment is calibrated by CCIC Southern Testing Co., Ltd..						

13.2. Limit

The limit on secondary emissions radiated from the receiving equipment within which the function of other radio equipment will not be impaired shall be, in terms of the power of a dummy antenna circuit that has the same electrical constant as the receiving antenna, 4 nW or less at a frequency below 1 GHz and 20 nW or less at a frequency of 1 GHz or higher as measured using the circuit.

13.3. Block diagram of test setup

```
┌──────────────┐        ┌──────────────┐
│ Spectrum     │        │ EUT and      │
│ Analyzer     │────────│ Assistant    │
│              │        │ System       │
└──────────────┘        └──────────────┘
```
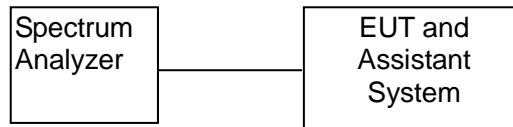
13.4. Test Procedure

(1) Configure EUT and assistant system according clause 2.3 and 8.3

(2) Set EUT work in test mode as described in clause 2.4

(3) Connected the EUT's antenna port to the Spectrum Analyzer by suitable attenuator, set the Spectrum Analyzer as below:

Resolution BW: 100 KHz for frequency below 1GHz and 1MHz for frequency above 1GHz

Video BW: 100 KHz for frequency below 1GHz and 1MHz for frequency above 1GHz

Detector: Peak.

Trace Mode: Max Hold.

(4) All the emissions from 30MHz to 13GHz were measured and record.

13.5. Test result

Not Applicable.
The EUT only has transmitter function.

## 14. Equivalent Isotropic Radiated Power

14.1. Test Equipment

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	Spectrum analyzer	ROHDE&SCHWARZ	ESR	1316.3003K03-102082-Wa	2022.08.22	1 Year
2	Horn Antenna	Schwarzbeck	BBHA 9120 D	BBHA 9120 D(1201)	2021.08.30	2 Year
Note: The test equipment is calibrated by CCIC Southern Testing Co., Ltd..						

14.2. Limit

Modulation system	Frequency band used	Antenna power(max.)	EIRP	
			Omnidirectional case	Directional case
DS	2400~2483.5MHz	10mW	12.14dBm	22.14dBm

14.3. Block diagram of test setup
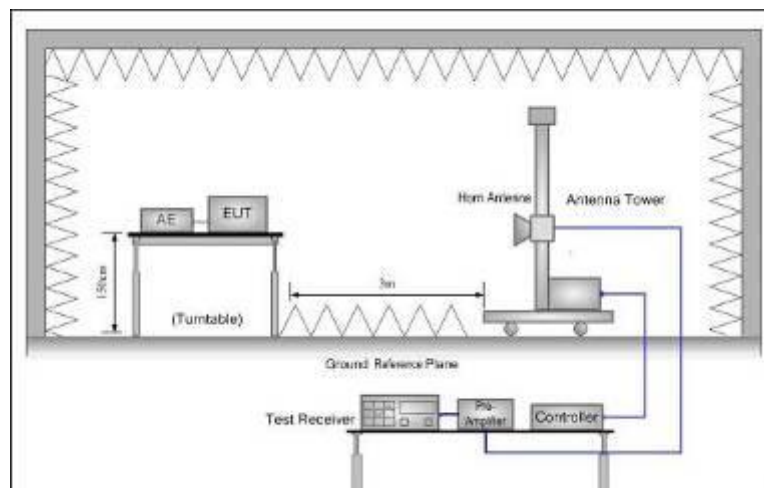
14.4. Test Procedure

Step 1

Set the test equipment at test frequency, and in continuous transmitting mode or intermittent burst mode (constant frequency and constant burst time). Stop the spread.

Step 2

Set the height and direction of test equipment and measurement antenna approximately facing each other.

Step 3

In the frequency derived in D), change the height of the measurement antenna from the ground by ±50cm with a central focus on the antenna of test equipment. Search the location that the power is maximum by adjusting the direction of measurement antenna. Set the indicator of spectrum analyzer at this point as "E".

Step 4

Remove the test equipment from the turntable, set the opening of substitution antenna at the same location as the opening of the test equipment, and receive by outputting radio wave of the same frequency from the standard signal generator for substitution.

Step 5

Adjust at the maximum power point, turning the substitution antenna.

Step 6

Change the height of the measurement antenna from the ground by ±50cm with a central focus on the substitution antenna, and adjust the direction of measurement antenna to the location that the received power is maximum.

Step 7

Adjust output of standard signal generator and record the power Ps that is equal to "E". Or record Ps by counting backward from the difference with "E" as the close value to "E" (within ±1dB).

Step 8

EIRP is derived from the following calculating formula:

$$EIRP = G_S - L_F + P_S$$

G_S; Absolute gain of substitution antenna (dBi).

L_F; Loss of electric supply line between standard signal generator and substitution antenna (dB).

P_S; Output of standard signal generator (dBm).

Step 9

Spectrum Analyzer as below:

Centre Frequency: The centre frequency of the channel under test.

Frequency Span: 0Hz

Resolution BW: 1MHz

Video BW: 3MHz

Detector: Peak.
Sweep mode: Continuous sweep

14.5. Test result

PASS. (See below test data)

Mode	Frequency (MHz)	Level of signal Generator (dBm)	Gain of substitution antenna (dBi)	Cable Loss (dB)	EIRP (dBm/MHz)	Limit (dBm/MHz)
GFSK	2405	-9.85	10.5	0.5	0.146	12.14
	2441	-9.86	10.5	0.5	0.143	12.14
	2478	-9.86	10.5	0.5	0.142	12.14
Note:						
EIRP = Level of signal Generator + Gain of substitution antenna – Cable loss						

15. 3dB Beam Bandwidth

15.1. Test Equipment

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	Spectrum analyzer	ROHDE&SCHWARZ	ESR	1316.3003K03-102082-Wa	2022.08.22	1 Year
. 2	Horn Antenna	Schwarzbeck	BBHA 9120 D	BBHA 9120 D(1201)	2021.08.30	2 Year
Note: The test equipment is calibrated by CCIC Southern Testing Co., Ltd..							

15.2. Block diagram of test setup
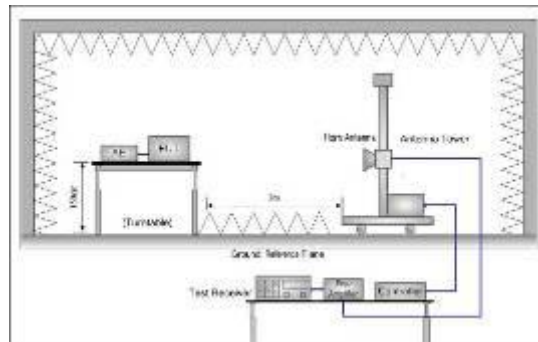
15.3. Test Procedure

Step 1

Set the test equipment at test frequency, and transmit.

Step 2

Stop the modulation, and make it "continuous transmission of unmodulated wave" in principle.
If it is impossible, make it "intermittent burst transmission of unmodulated wave"

Step 3

Polarized wave side of measurement antenna is the same using mode as test equipment.

Step 4

Set the height and direction of test equipment and measurement antenna approximately facing each other.

Step 5

Set the spectrum analyzer according to "Spectrum set" and set as reference level and receive.

Step 6

Adjust at the maximum received power point, turning the test equipment horizontally and vertically.

Step 7

Change the height of the measurement antenna from the ground by ±50cm with a central focus on the antenna of test equipment, and search the location that the power is maximum by adjusting the direction of measurement antenna. Set the indicator of spectrum analyzer at this point as "E".

Step 8

By using EIRP (P_E) that is measured at 9, calculate allowed main beam angle(θ_0) between the horizontal plane and vertical plane of the test equipment as follows.

Allowed main beam angle (θ_0) = 360/A

　　θ_0: Allowed transmitter antenna beamwidth angle in degree of test equipment

　　P_E : EIRP of test equipment (dBm)

A: A is defined as EIRP divides by the summation of antenna gain 2.14dBi transmitter antenna and average power 10mW (In case of using ODFM, or DS, or FHSS, or DS and complex with FHSS, or OFDM and complex with FHSS, 10mW/MHz. However, in FHSS or DS and complex with FHSS, or OFDM and complex with FHSS, when using the frequency from 2,427MHz to 2,470.75MHz,3mW/MHz) antenna power. In case the value is lower than 1, set A as 1.

Step 9

Turn the test equipment in horizontal direction, from main beam direction with the beam angle except main beam angle (θ_0) calculated by (step 8), over all surroundings as much as possible. Confirm that received power is decreased more than 3dB from the maximum point value of received power(E).

Step 10

Return the test equipment to position (step 6), incline the test equipment in vertical direction, from main beam direction with the beam angle except main beam angle (θ_0) calculated by (step 8), widely as much as possible (over 90 degrees. However, it is able to according to "6. other condition", too.) Confirm that received power is 3dB lower than the maximum point value of received power (E).

Step 9

Spectrum Analyzer as below:

> Centre Frequency: The centre frequency of the channel under test.
>
> Frequency Span: 0Hz
>
> Resolution BW: 1MHz
>
> Video BW: 1KHz
>
> Y-Axis: 5dB/Div
>
> Detector: Peak.
>
> Sweep mode: Continuous sweep
>
> Input level: the amplitude of transmission signal is set around max. line area of mixer.

15.4. Test result

Not Applicable.
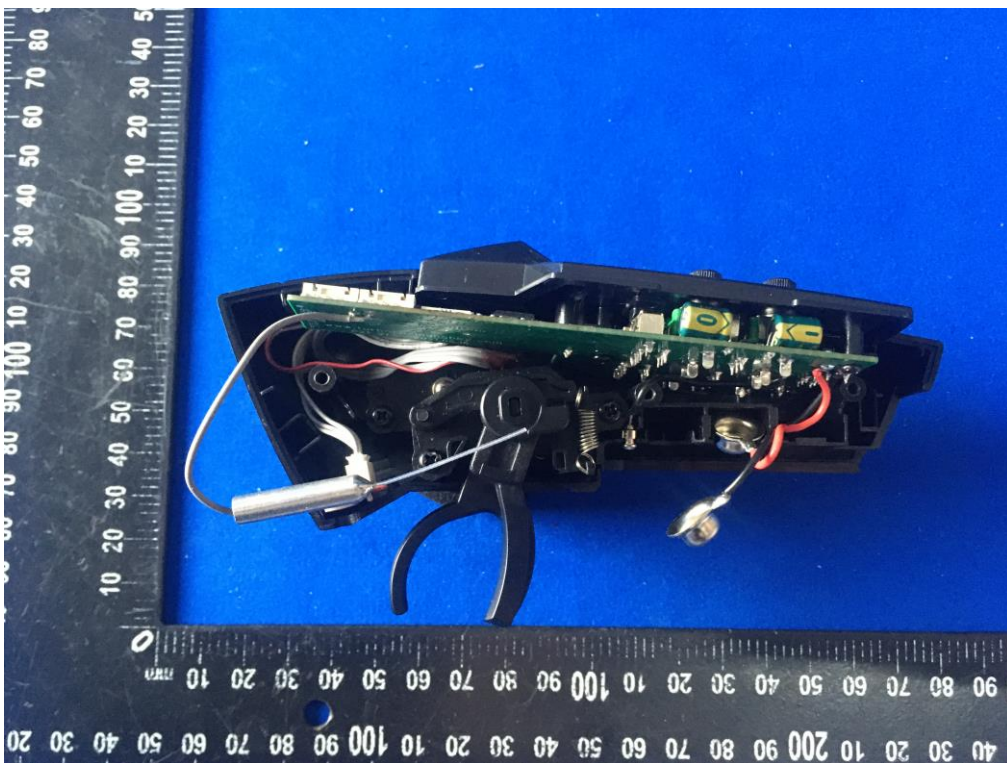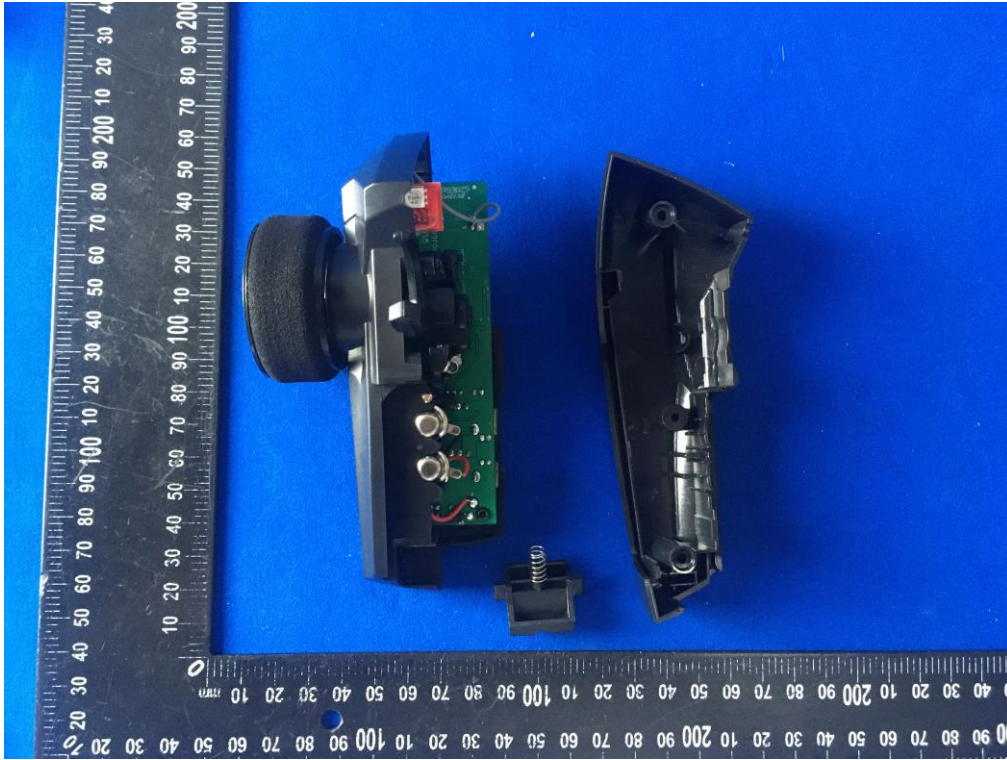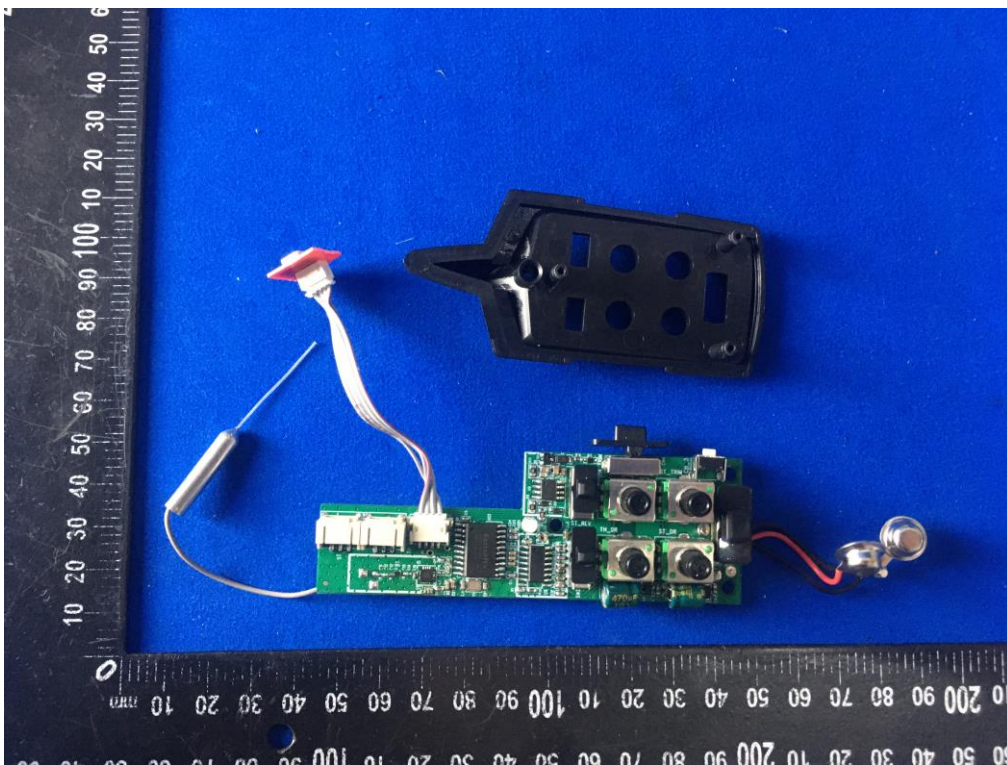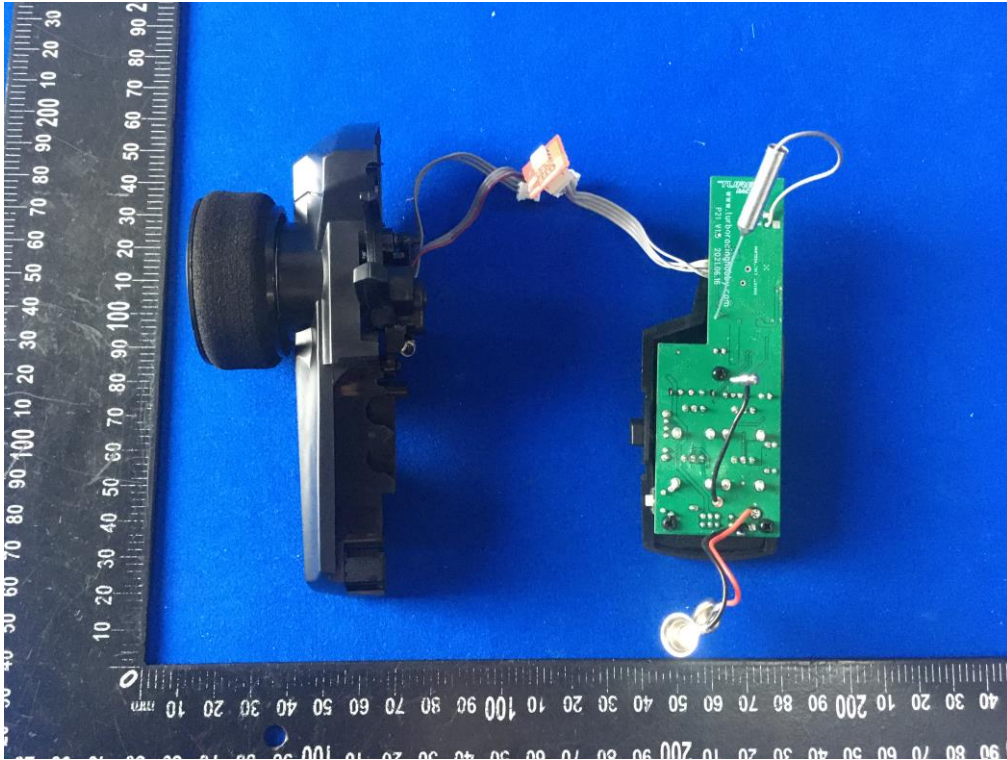The EIRP less than 12.14dBm.

16. Test setup photo

17. EUT Photo

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-------END OF REPORT----