

## **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	<sup>:</sup> ShenZhenShi NewStone Technology co., Ltd
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## **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.

> ALPHA HA PRODUCT TESTI

Tested by (name + signature):	Yannis Wen Project Engineer	Vannis
Approved by (name + signature):	Reak Yang Project Manager	R.4
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 De	vice	e (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 2.4G	:	DC 6V from battery
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		
V/A is an abbreviation for Not Applicable.				

## 2.2. Block Diagram



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		

## 2.3. Test mode

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

lested mode, channel, and data rate information						
Mode	Channel	Frequency (MHz)				
	CH1	2405				
Carrier Tx Mode	CH37	2441				
	CH74	2478				
GFSK hopping on Tx Mode	CH1 to CH74	2405 to 2478				
OFSK	CH1	2405				
GFSK honning off Ty Mode	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			
	DC 6V	DC 3.3V			
Charger	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	Туре	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval		
1	Power meter	Agilent	E4419B	GB40202122	2022.08.22	1 Year		
Note:	Note: The test equipment is calibrated by CCIC Southern Testing Co., Ltd.							

### 3.2. Limit

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

## 3.3. Block diagram of test setup



## 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	СН	Test Result	Antenna	Result	Limit
		011	(dBm)	(dBi)	(mW/MHz )	(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	СН	Stated power	Result	Tolerance	Limit			
WIDGE	OIT	(mW/MHz)	(mW/MHz )	/	/			
	CH1	0.1	0.087	-13.00%	+20%,-80%			
GFSK	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	Туре	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval	
1	Spectrum analyzer	Agilent	E4407B	MY49510055	2022.08.22	1 Year	
Note:	Note: The test equipment is calibrated by CCIC Southern Testing Co., Ltd						

### 4.2. Limit

+/- 50x 10<sup>-6</sup> 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	СН	Measured	Tolerance	Result	Limit		
	011	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	Туре	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 C	CIC Southern	Testing Co., Ltd	ł	

## 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



## 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	СН	Result	Limit	
	Condition	On	(MHz)	(MHz)	
		CH1	3.0815	83.5	
GFSK	DC 6V	CH37	2.9750	83.5	
		CH74	2.8997	83.5	
GFSK Tx Mode Hopping on	Normal	/	73.448	83.5	
Conclusion: PA	SS				

Original test data :



## 6. Spread Bandwidth

### 6.1. Test Equipment

Item	Туре	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 C	CIC Southern	Testing Co., Lto		

### 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



### 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	СН	Result	Limit	
Wiede	Condition	On	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	Туре	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 C	CIC Southern	Testing Co., Ltd	ł.	

## 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



## 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 = $(0.4(s) \times spreading rate \times sending time of 1 burst(s))/(Burst cycle(s) \times No. of hopping channel)$ 

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

## 7.5. Test result

Mode	T <sub>on</sub>	Burst cycle	Result	Limit
Packet type	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

Agilen	it Spectr	um Ana	lyzer - Sv	vept SA													
L <mark>XI</mark>		RF	50 \$	2 AC				SENSE	EINT SOU	RCE OFF	🛕 ALIG	IN OFF	05:29	:31 AMI	Nov 08, 20	22	Marker
Mar	ker 3	Δ 12	.6000	ms	PNO IFGai	:Fast ← in:Low	► Trig: Atter	Video n:30 di	8	Avg	туре: со	g-r-wr		TYPE	1 2 3 4 1 Winning P N N N 1	N N	Select Marker
10 dl	B/div	Ref Ref	Offset 1 20.00	dB dBm								Δ	Mkra	3 12. -0	.60 m .24 d	S B	3
Log 10.0 0.00 -10.0					X2	1∆2											Normal
-20.0 -30.0 -40.0									3/	¥					THIGL	7E	Delta
-50.0 -60.0 -70.0	leventer.	<b>16.</b> 149800	\ <del>\</del> #*** <b>\</b> *	hanne ann an 1	<mark>₩                                    </mark>	teru per ter	ระป <sub>ร้<sup>า</sup>ะระ<sub>จากสม</sub></sub>	ndrag Ab	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	hirlebolator	YH <b>LU</b> UMMAN	han maar wa	ng kungi	nular	<b>⋗</b> ৻৻৵৸৸	~	Fixed⊳
Cen Res	BW 1	4410 .0 MI	00000 Hz	GHz		#VB	W 1.0 IV	IHz	FUI	NCTION	SWG	ep 5	0.00 n FU	Sp ns (1 NCTION	an 0 H 001 pt	lz s)	Off
1 2 3 4 5 6	Δ2 1 F 1 Δ4 1 F 1	t t t	(Δ) (Δ)		1.150 14.00 12.60 15.20	ims (Δ ims ims (Δ ims	) 0 8.3 ) -0 -51.6	1.62 dE 5 dBn 1.24 dE 4 dBn	3 n 3 1							-	Properties►
8 9 10 11 <																•	More 1 of 2
MSG												STATUS	6				

Note : Ton=1.15ms

Burst cycle=1.15+12.6=13.75ms

## 8. Transmitter Spurious Emissions (conducted)

## 8.1. Test Equipment

Item	Туре	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 C	CIC Southern	Testing Co., Lto	d	

## 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  $\leq$  f  $\leq$  2,400MHz and 2,483.5MHz  $\leq$  f  $\leq$  2,496.5MHz 25  $\mu$ W or less

b. 2,387MHz > f and 2,496.5MHz < f  $\,$  2.5  $\mu W$  or less

## 8.3. Block diagram of test setup



### 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	СН	Result
		CH1	PASS
GFSK Tx Mode	Normal	CH37	PASS
		CH74	PASS
Conclusion: PASS			

## Original test data

p Freg 1.000000000 GHz	SBNS	E:INT SOURCE OFF ALIGN OFF Avg Type: Log-Pwr	05:16:04 AMNov 08, 2022 TRACE 2 2 4 5 0	Recall State
F	NO: Fast Trig: Free F Gain:Low Atten: 10 d	Run Avg Heid: 21/100 B	TYPE DET	
Ref Offset 1 dB B/div Ref 1.00 dBm		Ν	1kr1 709.97 MHz -79.370 dBm	From File.
				Edit Register Names
				Register (empt
			-38.00 68%	Register (empt
				Register (empl
klauligitligidelliyakinder-yreiditlatiyatiya		1 1	Maderhan,	Register (empt
				Mo

Agilent Spectro	um Analyzer - Swept SA								
Stop Free	q 2.387000000 G	Hz	SEVS	EBNT[SOURCE	Avg Type	Log-Pwr	05:16:09 AP	1Nov 08, 2022 £	Recall State
	Ref Offset 1 dB	PNO: Fast	Atten: 10 d	Run 18	Avg Hold	>100/100 M	kr1 2.38	2 8 GHz	From File
10 dB/div Log	Ref 1.00 dBm						-02.5	55 UBIII	
-9.00									Edit Register Names
-19.0								-26.00 dBn	Register 1 (empty)
-29.0									
.39.0									Register 2 (empty)
-59.0									Register 3
-69.0 	Augunan Arabana	Annas Costrates	*****	eletrynese	ander	e serve and the	Langia Managar		
-79.0									Register 4 (empty)
-89.0									More
Start 1.00 #Res BW	00 GHz 1.0 MHz	#VBW	1.0 MHz			Sweep	Stop 2.3	870 GHz	1 of 3
MSG 📣 File <	<state_0002.state> rec</state_0002.state>	alled				STATL	15		

iroain:tow pricen: to db			
	Mkr	1 2.399 935 GHz -21.233 dBm	From File
		16.00 -	Edit Register Names
	Lowing		Register (empty
			Register (empty
			Register (empty
			Register (empt)
		Stop 2.400000 GHz	Mon 1 of
	BYBW 1.0 MHz	FVEW 1.0 MHz Sweep	100 ms (100 ms

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Gale	-79.0					Register 4 (empty)
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gilent Spectrum Analyzer - Swept SA		SENSE (M/T) COL		06-20-01 AMM/08-2020	-
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Res BW 1.0 MHz	#VBW	1.0 MHz	Sweep 1	7.53 ms (1001 pts)	
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rt 30.0 MHz s BW 100 kHz	#VBW	100 kHz	Sweep 1	Stop 1.0000 GHz 17.0 ms (1001 pts)	1 of

top Freq 2.387000000 G	PNO: Fast Trig: Free Run IFGaincLow Atten: 10 dB	Avg Type: Log-Pwr Avg Hold>100/100	TRACE 2345 C TYPE M DET PINNNN	Recall State
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Stop Freq 2.496500000 G	Hz	SENSE:INT SOURC	Avg Type: Log-Pwi Avg Type: Log-Pwi	05:22:34 AMNov 08, 2022 TRACE 2 3 4 5 0	Recall State
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tart 2.483500 GHz Res BW 1.0 MHz	#VBW 1.0	MHz	Sweep	Stop 2.496500 GHz 1.000 ms (1001 pts)	1 of 3

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	PNO: Fast IFGain:Low	Trig: Free Run Atten: 10 dB	AvgiHold: 14/100	DET PINNINN	From File
Ref Offset 1 dB	1		1	4 19.765 GHz -60.116 dBm	From File
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Start 2.497 GHz				Stop 13.000 GHz	More 1 of 3
Res BW 1.0 MHz	#VBW	1.0 MHz	Sweep 1	7.53 ms (1001 pts)	

#### CH74: 2478MHz:

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#Res BW	1.0 MHz	#VBW 1.0 MHz		Sweep	1.000 ms (1001 pts)	
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	RF 50.9 AC		SEN	SE:INT SOUR	CE OFF	ALIGN OFF	05:24:52 A	MNov 08, 2022	Recall State
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art 2.49	7 GHz						Stop 13	.000 GHz	Mor 1 of
Res BW	1.0 MHz	#VBW	1.0 MHz			Sweep	17.53 ms	1001 pts)	

## 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



#### 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°C	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°C	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	Туре	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



## 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

Item	Туре	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval	
1	Spectrum analyzer	ROHDE&SCH WARZ	ESR	1316.3003K0 3-102082-Wa	2022.08.22	1 Year	
2     Horn Antenna     Schwarzbeck     BBHA 9120 D     BBHA 9120 D(1201)     2021.08.30     2 Yea							
Note:	Note: The test equipment is calibrated by CCIC Southern Testing Co., Ltd						

## 14.1. Test Equipment

## 14.2. Limit

Modulation	Eroqueney band	Antonno	EIRP	
system	used	power(max.)	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  $\pm 50$ cm 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  $\pm 50$ cm 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  $\pm 1$ dB).

#### Step 8

EIRP is derived from the following calculating formula:

 $EIRP = G_S - L_F + P_S$ 

Gs; Absolute gain of substitution antenna (dBi).

 $L_{\text{F}};$  Loss of electric supply line between standard signal generator and substitution antenna (dB).

P<sub>S</sub>; 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)	
	2405	-9.85	10.5	0.5	0.146	12.14	
GFSK	2441	-9.86	10.5	0.5	0.143	12.14	
	2478	-9.86	10.5	0.5	0.142	12.14	
Note:							
EIRP = Le	vel of signal G	enerator + Gai	in of substitution	antenna -	- Cable loss		

## 15.3dB Beam Bandwidth

	15.1	I. Test	Equipm	ent
--	------	---------	--------	-----

Item	Туре	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval	
1	Spectrum analyzer	ROHDE&SCH WARZ	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 Ye							
Note:	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  $\pm$ 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( $\theta_0$ ) between the horizontal plane and vertical plane of the test equipment as follows.

Allowed main beam angle ( $\theta_0$ ) = 360/A

 $\theta_0$ : 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 ( $\theta_0$ ) 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 ( $\theta_0$ ) 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























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