

TEST REPORT

Report number: DRTTEC1810-0164

Issue Date: Oct 02, 2018

Applicant	: Bluebird Inc. (Dogok-dong, SEI Tower 13,14)39, Eonjuro30-gil, Seoul, South Korea
Equipment under test	: Enterprise Full Touch Handheld Computer
Model Name	: EF401
Date of Test	: 2018-08-06 ~ 2018-08-22
Test Place	: DT&C Co., Ltd. 42, Yurim-ro, 154beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea 449-935
Test Results	: PASS (Refer to attachment)

The results in this reports are applicable only to the samples tested.
This report shall not be re-produced except in full without the written approval of
DT&C Co., Ltd.

Tested Engineer;

MyungHoon Lee

Approval Person;

Geunki Son

1. Summary of Test

1. Purpose of test
Ordinance on Technical Standards Conformity Certification of Specified Radio Equipment
2.4GHz Band wide band low power data communication System

2. Standards
Certification Ordinance Article 2 Clause 1 Item19

1) Test Methods
Ministry of Internal Affairs and Communications Notification Article 88 Appendix 43

2) Deviation from standards
None

3. List of applied test to the EUT

Article 88 Appendix 43	Classification of EUT	Condition	Result
1	Voltage fluctuation	Conducted	PASS
3	Frequency Tolerance	Conducted	PASS
4	Occupied Bandwidth	Conducted	PASS
4	Spread Bandwidth	Conducted	PASS
5	Unwanted (Spurious) Emission Strength	Conducted	PASS
6	RF Output Power Tolerance	Conducted	PASS
7	Secondary Emitted Radio Wave Strength	Conducted	PASS
8	Carrier Sensing Function (1)	Conducted	N/A
9	Carrier Sensing Function (2)	Conducted	N/A
10	Absolute Gain of Transmission Antenna	Conducted	N/A
11	Angle Width of Principal Radiation from Transmission Antenna	Conducted	N/A
12	Interference Prevention Function	Conducted	PASS
13	Hopping frequency dwell time	Conducted	PASS

1) Test set up
Table-Top

2) Modification to the EUT by laboratory
None

2. Test Information

1. Applicant

Bluebird Inc.

2. Equipment under test

Enterprise Full Touch Handheld Computer

3. Model number

EF401

4. Serial number

Identical prototype

5. Size

(W) 68 x (D) 15.9 x (H) 136.3 mm

6. Terminal limitation

- 10 °C ~ + 50 °C

7. RF Specification Frequency range

2402-2421MHz

8. Number of RF Channels

20 Channels

9. Modulation method

Method of GFSK, $\pi/4$ -DQPSK, 8DPSK, FHSS

(Frequency equal to the transmission rate of the modulation signal: 1MHz)

10. Data rate

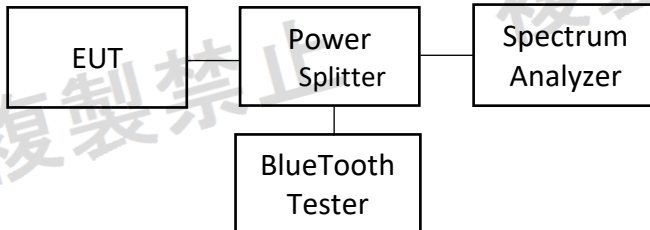
1Mbps(GFSK), 2Mbps($\pi/4$ -DQPSK), 3Mbps(8DPSK)

10. Variation of the family model(s)

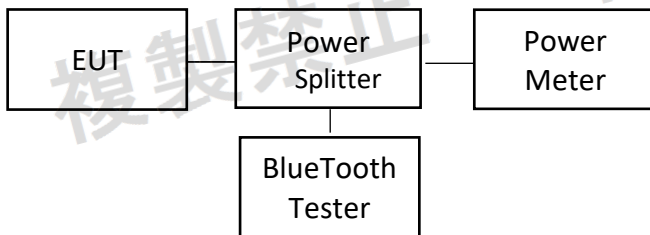
NA

3. Configuration of equipment

1. Frequency tolerance, Spread bandwidth, Occupied and Spread bandwidth, Unwanted(Spurious) emission strength, Secondary emitted radio wave strength



2. RF output power tolerance



4. Test Results

Environment of Test Room	Test Date	2018-08-06 ~ 2018-08-22
	Temperature	20 ~ 25 °C
	Humidity	45 ~ 48 %

Peak Antenna Gain	0.823	dBi
Declaration Output Power	0.277	mW/MHz
Declaration Output Power	-5.5752	dBm/MHz
E.I.R.P.	-4.7522	dBm/ MHz
Input Power Voltage	3.80	VDC

Tested Circit Insertion Loss		0	dB
Frequency equal to the Transmission rate		1	MHz
Transmission Time	ON TIME	2.880	ms
	OFF TIME	0.870	ms
	Ratio	77%	
Packet Type (Mode)		3-DH5	mode
Transmit Speed		1	MHz

Note: The insertion loss was corrected during the test.

Test Category :	2.4GHz Band Wideband Low-Power Data Communication System Bluetooth_GFSK
The reason why the tests are performed only at rated voltage :	When the input voltage to receiver RF circuit varies below $\pm 1\%$ as the input voltage from the external power supply to the receiver varies $\pm 10\%$ (excluding power supply).

Measurement Frequency		MHz	2402	2411	2421	Result	Limit	Note
Channel Number		Ch.	1	10	20	---	---	
Reading Frequency		MHz	2402.011025	2411.004575	2421.012300	---		
Frequency Tolerance		ppm	4.589925062	1.897552883	5.080545229	PASS	±50×10 ⁻⁶ (50ppm)	
Occupied Bandwidth		MHz	19.991			PASS	83.5MHz or below	
Spread Bandwidth		MHz	18.331			PASS	500kHz or more	
RF Output Power		mW/MHz	0.209630	0.184269	0.199275	PASS	3mW/MHz or below	
RF Output Power Tolerance		%	-24.321441	-33.476843	-28.059599	PASS	+20 to -80%	
Tx Spurious Emission Strength	30 to 2387MHz	uW/MHz	0.012776			PASS	2.5uW/MHz or below	
		MHz	2339.9			----		
	2387 to 2400MHz	uW/MHz	2.322737			PASS	25uW/MHz or below	
		MHz	2399.987			----		
	2483.5 to 2496.5MHz	uW/MHz	0.008362			PASS	25uW/MHz or below	
		MHz	2484.488			----		
	2496.5 to 12500MHz	uW/MHz	0.020903			PASS	2.5uW/MHz or below	
		MHz	12430			----		
Rx Spurious Emission Strength	10 to 1000MHz	nW	0.024451			PASS	4nW or below	
		MHz	784.18			----		
	1000 to 5000MHz	nW	0.436817			PASS	20nW or below	
		MHz	3168			----		
	5000 to 12500MHz	nW	0.735699			PASS	20nW or below	
		MHz	11202.5			----		
Time of occupancy hopping frequency		sec	0.002880			PASS	0.4sec or below	
		sec	0.29664			PASS	0.4sec or below	0.4sec×Spread rate
Spreading Factor		---	18.331000			PASS	5 or more	
Interference Prevention Function		----	Good	Good	Good	PASS		

5. List of Measuring Instruments

[illegible]

Note1: "X" は使用した測定機器です。
"X" used equipment.

Note2: 較正期限は、較正を行った日の翌月から起算して1年以内です。
The validity of measurement equipment is one year from the first day of the following month of the calibration date.

Note3: 較正方法 ... 4) 国立研究開発法人情報通信研究機構（NICT）（以下「機構」という。）又は第百二条の十八第一項の指定較正機関
Cal.Method ... （TELEC、インターテックジャパン、キーサイト）が行う較正

a): Calibration conducted by the National Institute of Information and Communications Technology~NICT~ or a designated calibration agency under Article 102-18 paragraph (1)~ Telecom Engineering Center, Intertek Japan K.K., Keysight Technologies, Inc~.

ロ: 計量法（平成四年法律第五十一号）第百三十五条 又は第百四十四条 の規定に基づく 校正（JCSS校正）

b): Correction conducted pursuant to the provisions of Article 135 or Article 144 of the Measurement Law (Law No. 51 of 1992) ~Japan Calibration Service System~

ハ) 外国において行う較正であつて、機構又は第百二条の十八第一項の指定較正機関（TELEC、インターテックジャパン、キーサイト）が行う較正に相当するもの

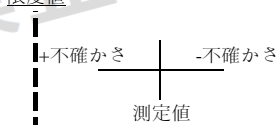
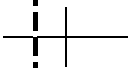
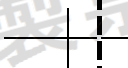
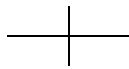
c): Calibration conducted in foreign countries, which shall be equivalent to the calibration conducted by the NICT or a designated calibration agency under Article 102-18 paragraph (1)~ Telecom Engineering Center, Intertek Japan K.K., Keysight Technologies, Inc.~.

コ: イからハまでのいずれかに掲げる較正等を受けたものを用いて行う較正等

d): Calibration conducted by using other equipment that listed above from a) to c)

6. Uncertainty

Parameter	Uncertainty
Total RF power conducted	0.70 dB
Spurious emissions conducted	0.92 dB
Temperature	0.4 C
Humidity	2%

判定	測定データにおける不確かさの判断とその範囲	
適合	例 A  <p>測定結果と不確かさは与えられた限度値内に入っています。 これを『適合』と呼びます。</p>	
	例 B  <p>完全には、限度値内でも限度値外でもありません。 この場合の適合性については、確実な結論を出すことは出来ません。</p>	
不適合	例 C  <p>完全には、限度値内でも限度値外でもありません。 この場合の適合性については、確実な結論を出すことは出来ません。</p>	
	例 D  <p>測定結果も不確かさも与えられた限度値内に入っていない。 これは『不適合』と呼びます。</p>	

7. Configuration Photographs

Conducted Measurement Photo(1)



Conducted Measurement Photo(2)



8. Trece Data

8.1 Frequency Tolerance

Ch.1: 2402MHz



Ch.10: 2411MHz

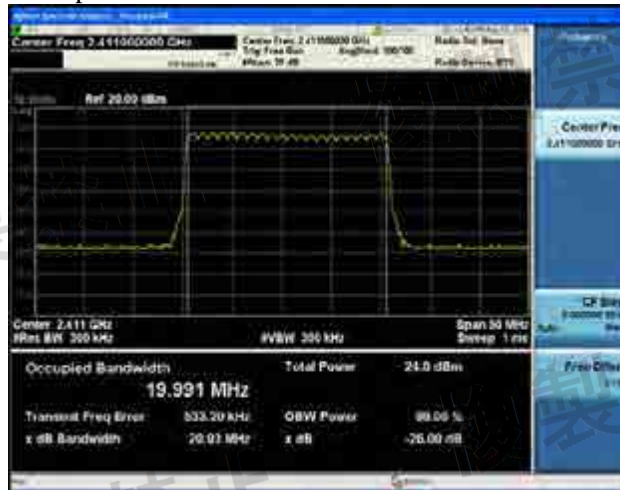


Ch.20: 2421MHz

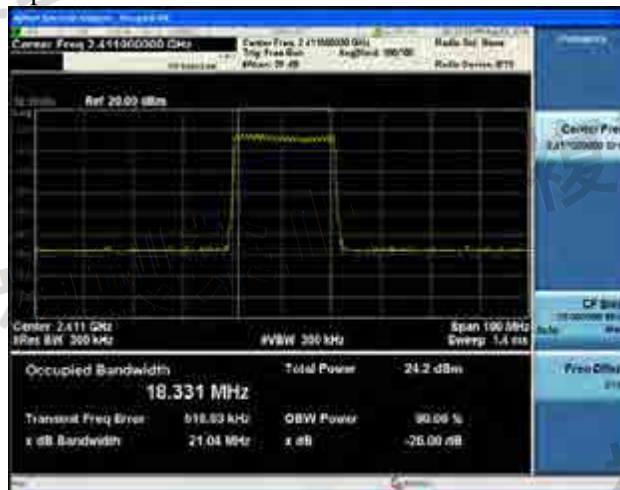


8.2 Occupied and Spread Bandwidth

Occupied Bandwidth



Spread Bandwidth



8.3 Tx Spurious Emission Strength

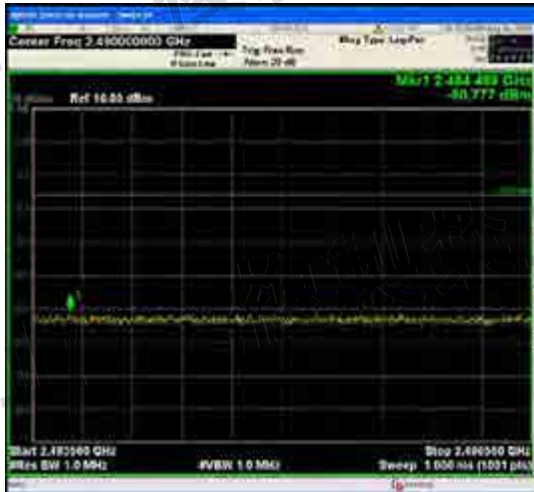
30-2387MHz



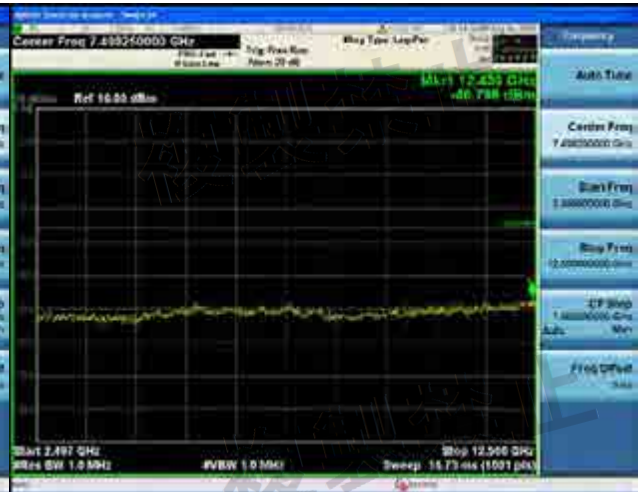
2387-2400MHz



2483.5-2496.5MHz



2496.5-12500MHz



8.4 RF Output Power

Ch.1: 2402MHz



Ch.10: 2411MHz

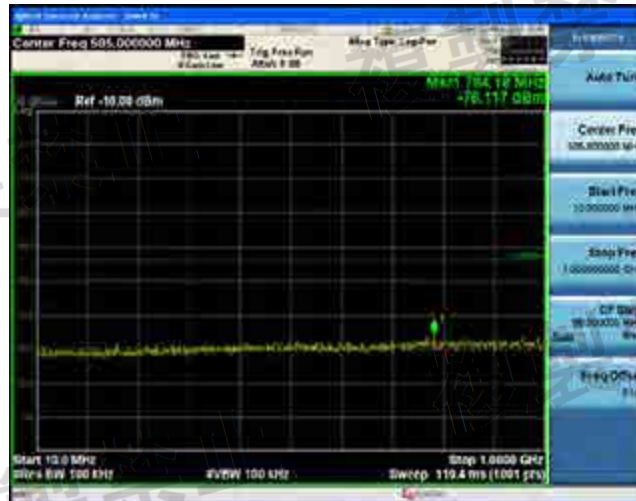


Ch.20: 2421MHz

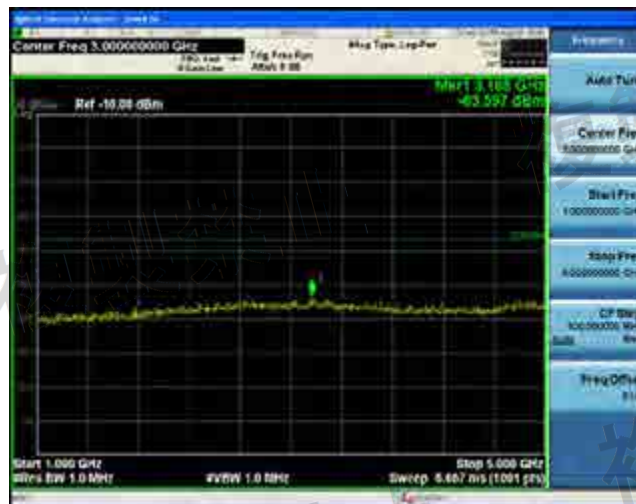


8.5 Rx Spurious Emission Strength

10MHz-1GHz



1-5GHz

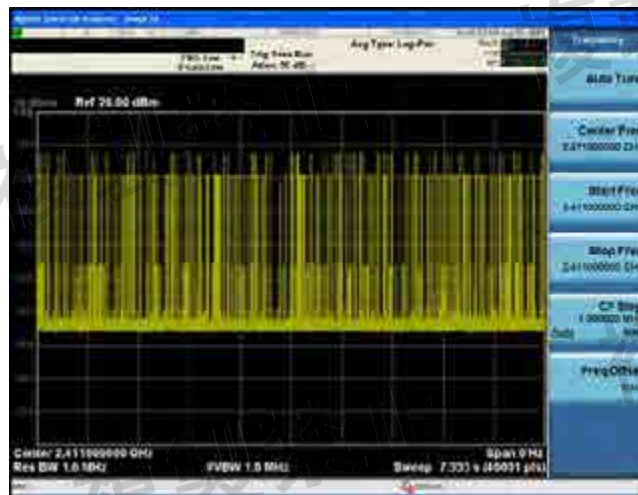


5-12.5GHz



8.6 Hopping Frequency Dwell Time

ON/OFF



9. Laboratory description

1. Location

Name: DT&C Co., Ltd.

Address: 42, Yurim-ro, 154beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea 449-935s

Fax: +81-031-321-2855

2. Accreditation and Registration

1) VLAC

Accreditation No.: N/A

2) NVLAP

LAB CODE: N/A

3) BSMI

Laboratory Code: N/A

4) Industry Canada

Site number	Facility	Expiration date
5740A-4	DT&C Co., Ltd.	2020-10-16
-	-	-
-	-	-

5) VCCI Council

Registration number	Expiration date
-	-

6) KOLAS

Registration number	Expiration date
KT393	2021-01-13