



Report No. : BLA-RF-201908-A15

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TEST REPORT

Product Name
Trade mark
Mode No.
Serial Number

: Bluetooth Headset
: SOUNDPEATS
: Truengine SE
: SP1016A 、 SP1016B
SP1016C 、 SP1016D
SP1016E 、 SP1016F
SP1016G、 SP1016H、 SP1016I
: BLA-RF-201908-A15
: August. 08, 2019
: Item 19 of Article 2 Paragraph 1
: PASS

Report Number
Date of Issue
Test standard
Test result

Prepared for:
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Room 1308-1309, Building B,Huihai Square,Chuangye Road, Longhua
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Prepared by:
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Compiled by:

Review by:

Approved by:

Date: August. 08, 2019



2 Version

Version No.	Date	Description
00	August. 08, 2019	Original

3 Test Summary

Test	Test Requirement	Limit/Severity	Result
Antenna Requirement	Item 19 of Article 2 Paragraph 1	Notice 88 Appendix 43.B-1 (1)&(2)	PASS
Test frequency	Item 19 of Article 2 Paragraph 1	Notice 88 Appendix 43, A-3	PASS
Frequency Error	Item 19 of Article 2 Paragraph 1	±50 PPM or less	PASS
Occupied Bandwidth	Item 19 of Article 2 Paragraph 1	83.5 MHz or less	PASS
Spread-spectrum Bandwidth	Item 19 of Article 2 Paragraph 1	500 kHz or more	PASS
Antenna Power	Item 19 of Article 2 Paragraph 1	Designated value: (1) FH, FH+DS, FH+OFDM 3mW/MHz (Used in the range of 427-2470.75MHz) (2) OFDM, DS other than (1) : 10mW/MHz (3) Other than (1) & (2) : 10mW Tolerance: +20%-80%	PASS
Spurious Emission of Tx	Item 19 of Article 2 Paragraph 1	(1) Below 2387 MHz : -26dBm (2) 2387 to 2400 MHz : -16dBm (3) 2483.5 through 2496.5 MHz : -16dBm (4) Over 2496.5 MHz : -26dBm	PASS
Dwell Time	Item 19 of Article 2 Paragraph 1	less than 0.4sec	PASS
Pseudorandom Frequency Hopping Sequence	Item 19 of Article 2 Paragraph 1	Notice 88 Appendix 43, 44, 45	PASS
Interference prevention capability	Item 19 of Article 2 Paragraph 1	Notice 88 Appendix 43, 44, 45	PASS
RF accessibility	Item 19 of Article 2 Paragraph 1	Notice 88 Appendix 43, 44, 45	PASS
Spurious Emission of Rx	Item 19 of Article 2 Paragraph 1	(1) Below 1 GHz: -54dBm (2) 1GHz or higher: -47dBm	PASS

Remark:

Model No.: Truengine SE(left and right), SP1016A(left and right), SP1016B(left and right), SP1016C(left and right), SP1016D(left and right), SP1016E(left and right), SP1016F(left and right), SP1016G(left and right), SP1016H(left and right), SP1016I(left and right)

Only the model Truengine SE(left) was tested, since the electrical circuit design, layout, components used and internal wiring were identical for the above models, with difference being model name.

Only the left was tested, since the electrical circuit design, layout, components used and internal wiring were identical for the left earphone and right earphone.

EUT: In this whole report EUT means Equipment Under Test.

Rx: In this whole report Rx (or tx) means the product in transmitting status.

RF: In this whole report RF means Radiated Frequency.

NTNV:

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5 General Information

5.1 Client Information

Applicant:	Shenzhen Soundsoul Information Technology Co.,Ltd
Address of Applicant:	Room 1308-1309, Building B,Huihai Square,Chuangye Road, Longhua District,Shenzhen,Guangdong,China
Manufacturer:	Shenzhen Soundsoul Information Technology Co.,Ltd
Address of Manufacturer:	Room 1308-1309, Building B,Huihai Square,Chuangye Road, Longhua District,Shenzhen,Guangdong,China
Factory:	Shenzhen iFree Electronic Technology Co., Ltd
Address of Factory:	7B A9 Building, Tianrui Industrial Zone, No.35 Fuyuan 1st Road ,Xinhe Community, Fuhai Street, Bao'an District, Shenzhen

5.2 General Description of EUT

Product Name:	Bluetooth Headset
Trade Mark:	SOUNDPEATS
Model No.:	Truengine SE
Serial Number:	SP1016A 、 SP1016B 、 SP1016C 、 SP1016D 、 SP1016E 、 SP1016F 、 SP1016G、 SP1016H、 SP1016I
Operating Frequency:	2402 MHz to 2480 MHz
Conducted rated power:	F1D: 1.45mW/MHz G1D: 1.45mW/MHz
Number of Channels:	79 Channels
Type of Modulation:	GFSK, (π/4)DQPSK, 8DPSK
Channel Separation:	1 MHz
Dwell time	Per channel is less than 0.4s.
Antenna Type:	Integral antenna
Antenna gain:	4.97dBi from 2402-2480MHz
Sample Type:	Portable production
Power Supply:	3.7V
Sample Received Date:	August. 05, 2019
Sample tested Date:	August. 05, 2019 to August. 07, 2019

5.3 Description of Support Units

The EUT has been tested stand-alone..

5.4 Test Location

All tests were performed at:

BlueAsia of Technical Services(Shenzhen) Co.,Ltd.

IOT Test Centre of BlueAsia No. 448 Bulong Road, Banlian Street, Longgang District, Shenzhen

Telephone: TEL: +86-755-2305 9481

FAX: +86-755-2305 9481

No tests were sub-contracted.

6 Equipment List

Equipment	Manufacturer	Model	Serial No.	Due Date	Calibration body	Classification
Signal Generator	Agilent	E8257D	MY44320250	2020.5.06	GRGT	(c)
Communication test set test set	Anritsu	MT8852B	0814003	2020.5.06	GRGT	(c)
Spectrum Analyzer	Keysight	N9030A	MY52350152	2020.5.06	GRGT	(c)
Signal Generator	Agilent	E4438C	MY45092582	2020.5.06	GRGT	(c)

Remark:

(a) Calibration conducted by the National Institute of Information and Communications Technology (NICT) in

Japan (hereinafter referred to as "NICT") or a designated calibration agency under Article 102-18

paragraph (1) in JRL

(b) Correction conducted pursuant to the provisions of Article 135 or Article 144 of the Measurement Act (Act No. 51 of 1992) .

(c) Calibration conducted in countries except Japan, which shall be equivalent to the calibration conducted by the NICT or a designated calibration agency under Article 102-18 paragraph (1).

(d) Calibration, etc. conducted by using measuring instruments and other equipment listed in the right column of appended table No. 3, which shall have been given any type of calibration, etc. listed above from (a) to (C)

From JRL Article 24-2, paragraph 4, Item 2

Notice: Calibration duration for above equipments is 1 year.

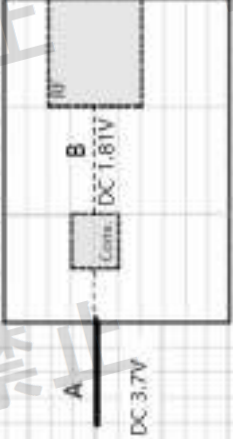
7 Radio Technical Requirements Specification

Table 1: Radio Technical Requirements Specification for 2.4 GHz band wide-band low-power data communication system (Item 19 of Article 2 Paragraph 1)

Items	Technical standard
Assigned frequency or designated frequency	2400-2483.5MHz
Communication method	One-way communication, simplex, semi-duplex, or duplex operation of digital signal transmission including spread spectrum
Tolerance of frequency ($\times 10^{-6}$)	± 50 PPM
Tolerance of occupied bandwidth	FH: 83.5MHz or less FH + OFDM: 83.5MHz or less Others: 26MHz or less
Antenna power	Designated value (1) FH, FH+DS, FH+OFDM: 3mW/MHz (used in the range of 2427 - 2470.75 MHz) (2) OFDM, DS other than (1): 10mW/MHz (3) Other than (1) & (2): 10mW Tolerance : +20%, -80%
Antenna gain	1) 12.14 dBi or less in principle 2) In case of directional antenna (1) FH, FH+DS or FH+OFDM using 2427-2470.75 MHz EIRP $\leq$ 16.91 dBm/MHz (2) OFDM or DS other than (1) EIRP $\leq$ 22.14 dBm/MHz (3) Other than (1) and (2): 22.14 dBm or less (4) OFDM OBW 26 - 38MHz: 19.14dBm/MHz (5) Half-power angle of directional antenna (e) in case of the item 2): $e \leq 360^\circ/A$ (The A is 10 in maximum.) (1) Below 2387 MHz: 2.5 μ W (2) 2387 to 2400 MHz: 25 μ W (3) 2483.5 through 2496.5 MHz: 25 μ W (4) Over 2496.5 MHz: 2.5 μ W 500KHz or more
Tolerance of spurious emission intensity	(1) Below 1 GHz: 4nW (2) 1 GHz or higher: 20nW
Spreading bandwidth	Shall have the function of automatic transmission and reception of identification sign.
Limit of secondary radiated emissions	Shall be of the structure that the RF and modulator sections excluding antenna cannot easily be opened.
Interference prevention function	DS: Direct spread FH: Frequency hopping
Structure	OFDM: Orthogonal frequency division multiplexing
Note	Note: The Technical Standards described here do not cover all of the regulated items.

7.1 Transmitter Requirements

7.1.1 EUT test voltage and Frequency

7.1.1.1 EUT test voltage									
Power Supply:	DC 3.7V								
Test voltage require:	The power supply is by DC 3.7V port charging. The supply voltage of RF part is varied within $\pm 1\%$, so the DC 3.7V is choosed in the test report.								
Power Supply view:	 								
Power Supply result:	The measurement result of the voltage fluctuation at RF circuit when 3.7V $\pm 10\%$. <table border="1"> <thead> <tr> <th>DC INPUT</th> <th>DC1.81V</th> </tr> </thead> <tbody> <tr> <td>4.07V</td> <td>1.81V</td> </tr> <tr> <td>3.70V</td> <td>1.81V</td> </tr> <tr> <td>3.33V</td> <td>1.81V</td> </tr> </tbody> </table>	DC INPUT	DC1.81V	4.07V	1.81V	3.70V	1.81V	3.33V	1.81V
DC INPUT	DC1.81V								
4.07V	1.81V								
3.70V	1.81V								
3.33V	1.81V								
Test condition	Ambient								
NTNV	Temperature(°C)								
NTLV	26								
NTHV	N/A								
	Voltage(V)								
	3.7								
	N/A								
	N/A								

7.1.1.2 Test frequency

Test frequencies:	If the EUT can be set to 3 or more different (carrier) frequencies in 1 allocated band, testing shall be performed using the Lowest, Middle and the Highest frequency (L, M and H). If there are 2 or fewer frequencies, testing shall be performed with the available frequencies.		
	Frequency range over which device operates	Number of frequencies	Location in the range of operation
	1 MHz or less	1	Middle
	1 to 10 MHz	2	1 near top and 1 near bottom
	More than 10 MHz	3	1 near top, 1 near middle and 1 near bottom

EUT channels and frequencies list:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	20	2422	40	2442	60	2462
1	2403	21	2423	41	2443	61	2463
2	2404	22	2424	42	2444	62	2464
3	2405	23	2425	43	2445	63	2465
4	2406	24	2426	44	2446	64	2466
5	2407	25	2427	45	2447	65	2467
6	2408	26	2428	46	2448	66	2468
7	2409	27	2429	47	2449	67	2469
8	2410	28	2430	48	2450	68	2470
9	2411	29	2431	49	2451	69	2471
10	2412	30	2432	50	2452	70	2472
11	2413	31	2433	51	2453	71	2473
12	2414	32	2434	52	2454	72	2474
13	2415	33	2435	53	2455	73	2475
14	2416	34	2436	54	2456	74	2476
15	2417	35	2437	55	2457	75	2477
16	2418	36	2438	56	2458	76	2478
17	2419	37	2439	57	2459	77	2479
18	2420	38	2440	58	2460	78	2480
19	2421	39	2441	59	2461	N/A	N/A

Test frequencies are the lowest channel: 0 channel (2402 MHz), Middle channel, 39 channel (2441 MHz) and highest channel: 78 channel (2480 MHz).

7.1.2 Antenna Requirement

Standard requirement
Applicable for equipment with an antenna terminal, including testing terminals) If an antenna connector is available, all relevant tests will be carried out conducted. If not, tests will be carried out in an anechoic room or with a suitable test-fixture.
EUT Antenna
The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 4.97dBi.

Result: An antenna connector is available; all relevant tests will be carried out conducted.

7.1.3 Frequency Error

Test Requirement:	Item 19 of Article 2 Paragraph 1			
Test Method:	MIC Notice No.88 Appendix No.43			
EUT Operation:				
Ambient:	Temp.: 24°C	Humid.: 55%	Press.: 1010 mbar	
Test Status:	Test the EUT in transmitting mode without modulation. Test in Channel lowest (2402MHz), middle (2441MHz) and highest (2480MHz), keep in continuously transmitting status.			
Test Configuration:	EUT ↑ Spectrum Analyzer			
Test Conditions:	Frequency Counter or Spectrum Analyzer is used for measurement.			
EUT conditions:	Modulation/Spread/Hopping off, CW Tx If EUT does not accept "Modulation OFF" mode in the measurement, you may use "Modulation ON" mode. In that case you can use the Max power Frequency as the measuring results.			
Spectrum Analyzer conditions:	Frequency: Test Frequency Span 1MHz RBW 10KHz (Modulation ON), VBW 10KHz (Modulation ON), Sweep Time Auto Detector mode Positive peak Indication mode Max hold			
Technical standard:	Tolerance of frequency: $\pm 50 \times 10^{-6}$			
Test result:	PASS			

Measurement Record:

Uncertainty: $\pm 10\text{Hz}$

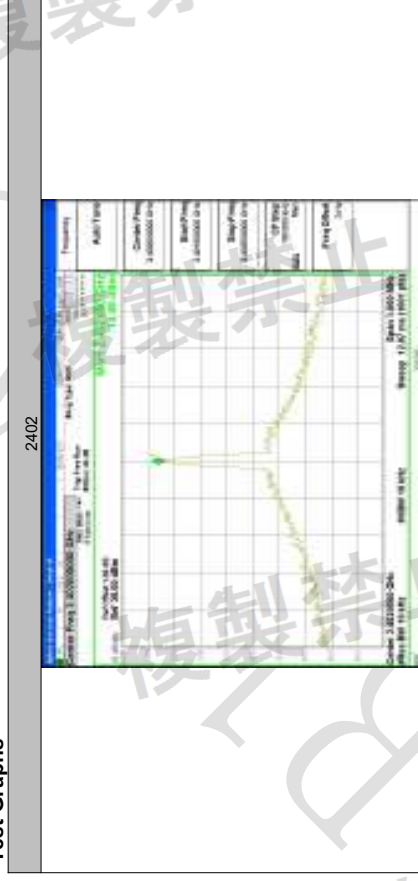
Test Result

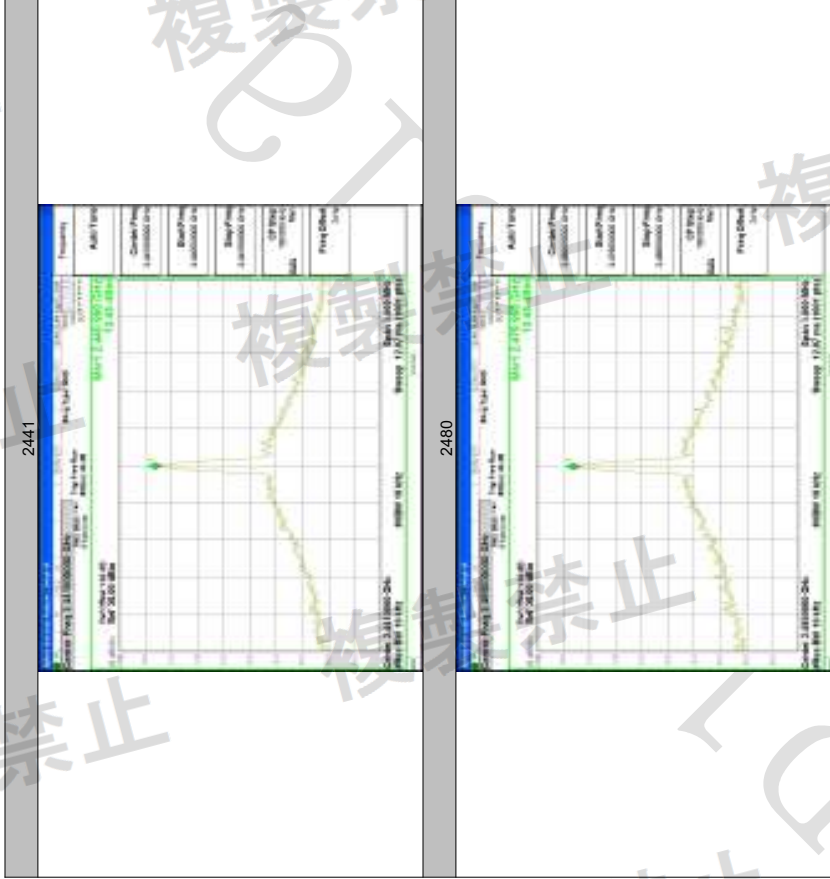
Test channel	Test Frequency (MHz)	Result[ppm]	Limit[ppm]	Verdict
Lowest	2402	0.00000	± 50	PASS
Middle	2441	-0.40967	± 50	PASS
Highest	2480	-0.80645	± 50	PASS

Note: The nominal frequency shall be confirmed by the applicant and test lab.

Result plot as follows:

Test Graphs





7.1.4 Occupied Bandwidth (99%)

Test Requirement:	Item 19 of Article 2 Paragraph 1
Test Method:	MIC Notice No.88 Appendix No.43
EUT Operation:	
Ambient:	Temp.: 24.0°C Humid.: 55% Press.: 1010 mbar
Test Status:	Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture). Following channel(s) was (were) selected for the final test as listed below.
Test Configuration:	EUT ↑ Spectrum Analyzer
EUT conditions:	Modulation/Spread/Hopping on, PN9 Modulation Tx For equipment using diffusion code, set to the test diffusion code and modulate with standard coding test signal.
Spectrum Analyzer conditions:	Frequency: Test Frequency Span 120MHz (FHSS), RBW 1MHz Sweep Time Auto detector mode Positive peak Indication mode Max hold OBW 99%
Technical standard:	FH : 83.5MHz
Test result:	PASS

Measurement Record:

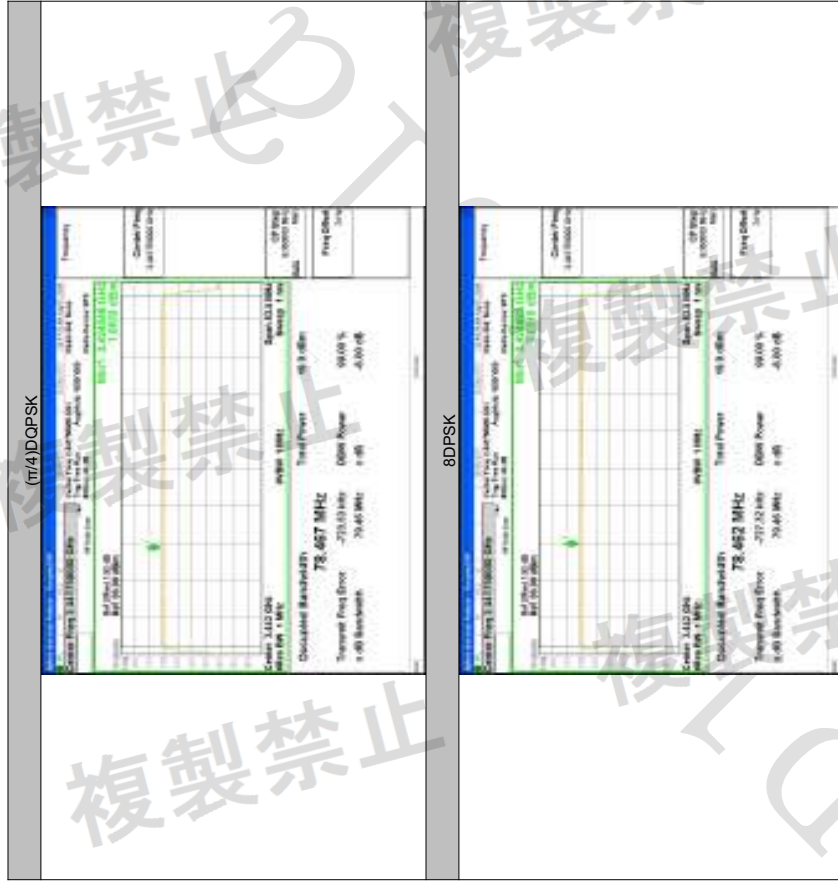
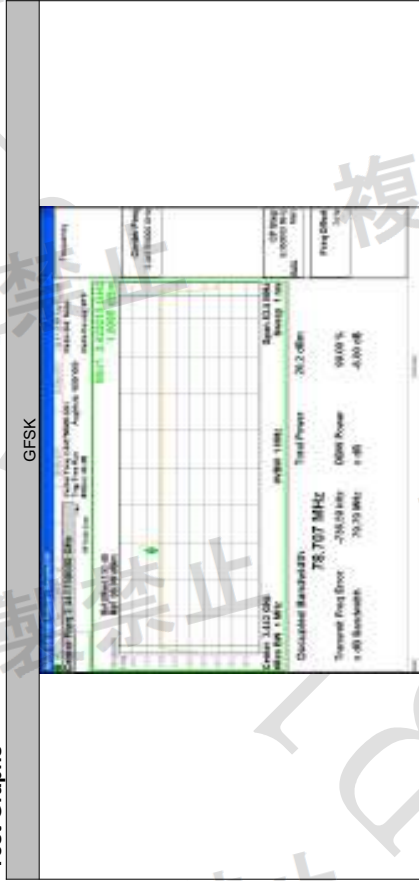
Uncertainty: $\pm 10\text{KHz}$

Test Result

TestCondition	TestMode	Channel	Result [MHz]	Limit [MHz]	Verdict
NTNV	GFSK	Hop	78.707	≤ 83.5	PASS
	($\pi/4$)DQPSK	Hop	78.467	≤ 83.5	PASS
	8DPSK	Hop	78.462	≤ 83.5	PASS

Result plot as follows:

Test Graphs



7.1.5 Spread spectrum Bandwidth (90%)

Test Requirement:	Item 19 of Article 2 Paragraph 1			
Test Method:	MIC Notice No.88 Appendix No.43			
EUT Operation:				
Ambient:	Temp.: 24.0°C	Humid.: 55%	Press.: 1010 mbar	
Test Status:	Pre-Scan has been conducted to determine the worst-case mode formal possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).Following channel(s) was (were) selected for the final test as listed below.			
Test Configuration:	EUT ↑ Spectrum Analyzer			
EUT conditions:	Modulation/Spread/Hopping on, PN9 Modulation Tx For equipment using diffusion code, set to the test diffusion code and modulate with standard coding test signal.			
Spectrum Analyzer conditions:	Frequency: Test Frequency Span 120MHz (FHSS), RBW 1MHz VBW 1MHz Sweep Time Auto detector mode Positive peak Indication mode Max hold OBW 90%			
Technical standard:	500kHz or more			
Test result:	PASS			

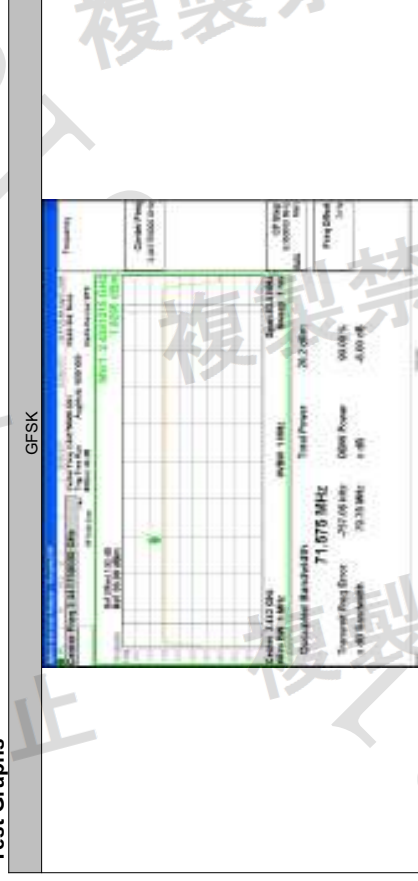
Measurement Record:

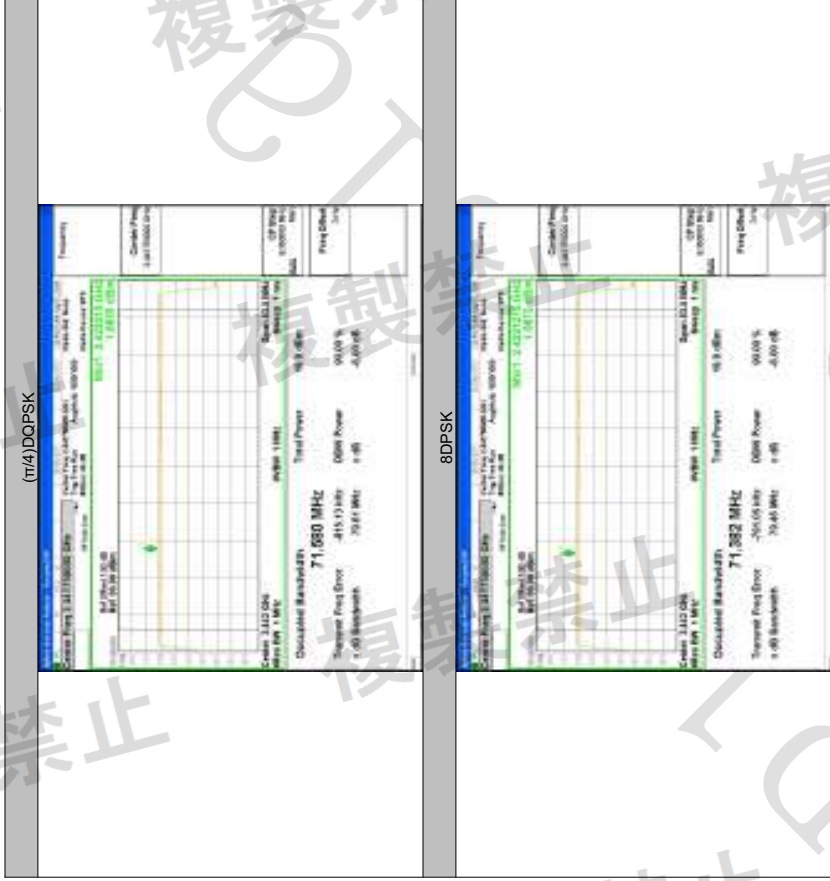
Uncertainty: $\pm 10\text{KHz}$

Test Result

TestCondition	TestMode	Channel	Result [MHz]	Limit [MHz]	Verdict
NTNV	GFSK	Hop	71.575	≥ 0.5	PASS
	($\pi/4$)DQPSK	Hop	71.580	≥ 0.5	PASS
	8DPSK	Hop	71.382	≥ 0.5	PASS

Result plot as follows:
Test Graphs





7.1.6 Antenna Power

Test Requirement:	Item 19 of Article 2 Paragraph 1		
Test Method:	MIC Notice No.88 Appendix No.43		
EUT Operation:			
Ambient:	Temp.: 24°C	Humid.: 55%	Press.: 1010mbar
Test Status:	Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture). Following channel(s) was (were) selected for the final test as listed below.		
Test Configuration:	EUT → Spectrum Analyzer		
EUT conditions:	Modulation/Spread/Hopping on, PN9 Modulation Tx For equipment using diffusion code, set to the test diffusion code and modulate with standard coding test signal.		
Spectrum Analyzer conditions(FHSS):	Frequency: Test Frequency Span 120MHz RBW 1MHz VBW 1MHz Sweep Time Auto Detector mode Positive peak Indication mode Max hold		
Technical standard:	Antenna Power (1) FH, FH+DS, FH+OFDM 3mW/MHz or less (used in the range of 2427-2470.75 MHz) (2) OFDM, DS other than (1) 10mW/MHz or less (3) Other than (1) & (2) 10mW or less Tolerance: + 20% -80%		
Test result:	PASS		



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Measurement Record:

Uncertainty: $\pm 10 \text{ kHz} / \pm 1 \text{ dB}$

Test Result

Antenna Power				
TestCondition	TestMode	Antenna	Channel	Verdict
NTNV	GFSK	Ant1	2402	PASS
			2441	PASS
			2480	PASS
	(m4)DQPSK	Ant1	2402	PASS
			2441	PASS
			2480	PASS
	8DPSK	Ant1	2402	PASS
			2441	PASS
			2480	PASS

Tolerance					
Test Condition	Test Mode	Antenna	Channel	Power (mW/MHz)	Verdict
NTNV	GFSK	Ant1	2402	1.296	PASS
			2441	1.368	PASS
			2480	1.324	PASS
	(m4)DQPSK	Ant1	2402	1.421	PASS
			2441	1.370	PASS
			2480	1.330	PASS
	8DPSK	Ant1	2402	1.420	PASS
			2441	1.350	PASS
			2480	1.525	PASS

Remark:

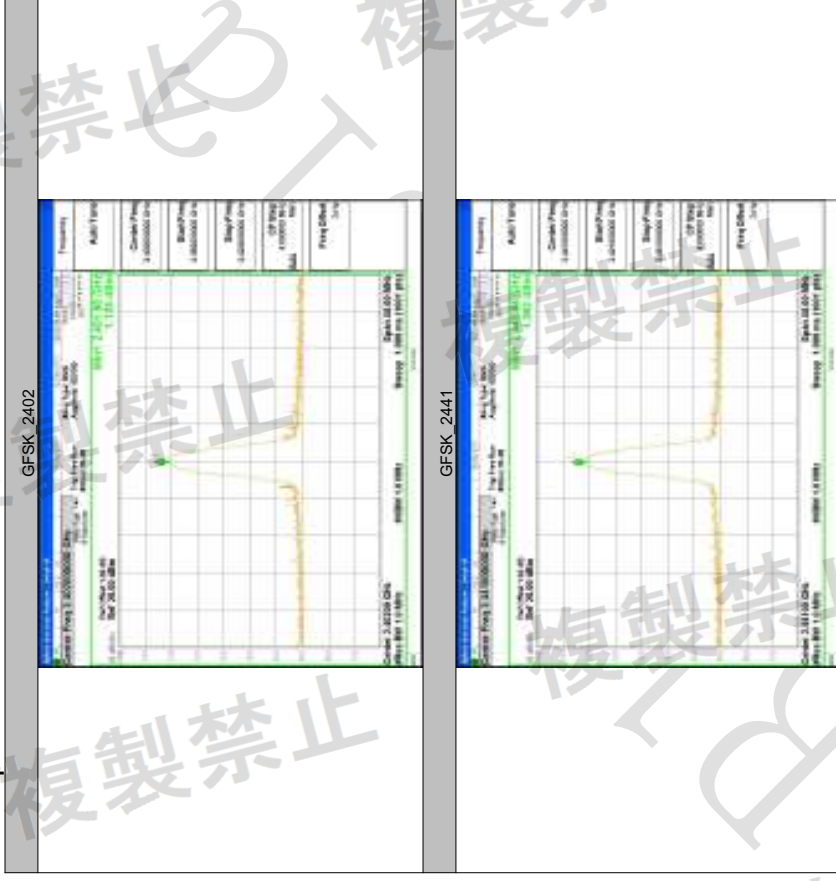
Conducted rated power: 1.45mW/MHz
Tolerance (%) : [(test value- rate power)/rater power]*100

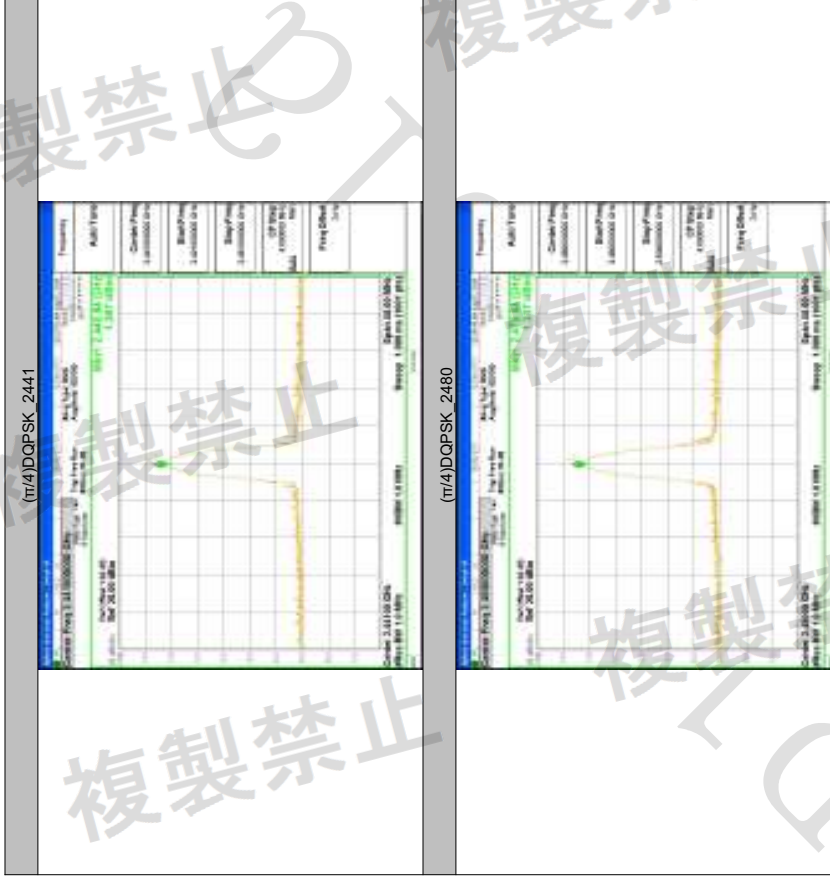
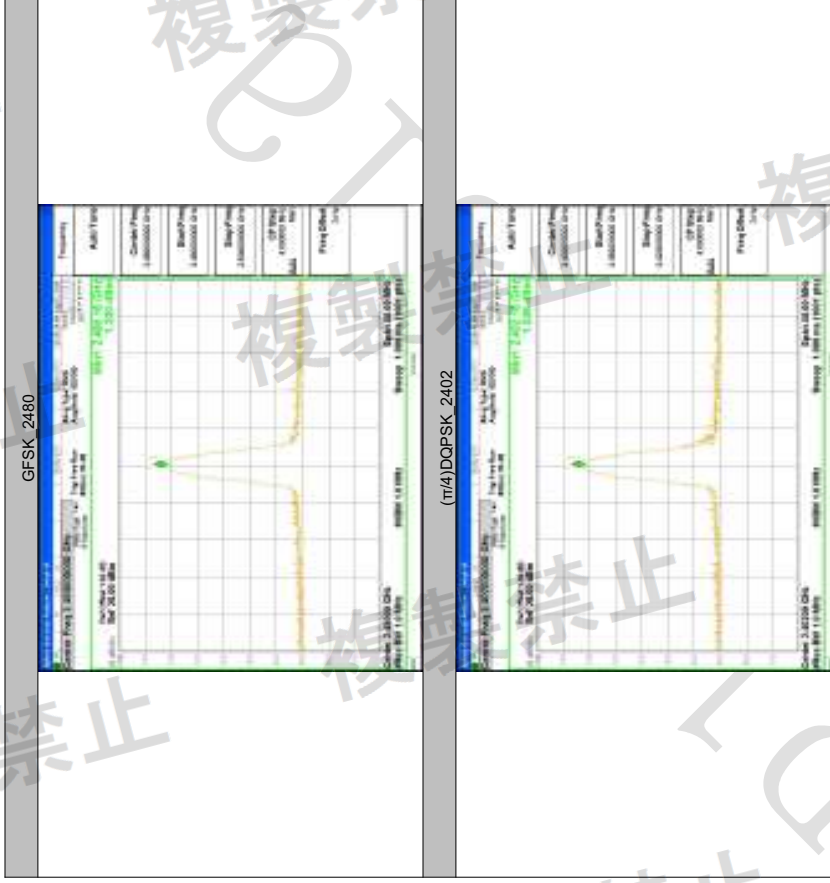


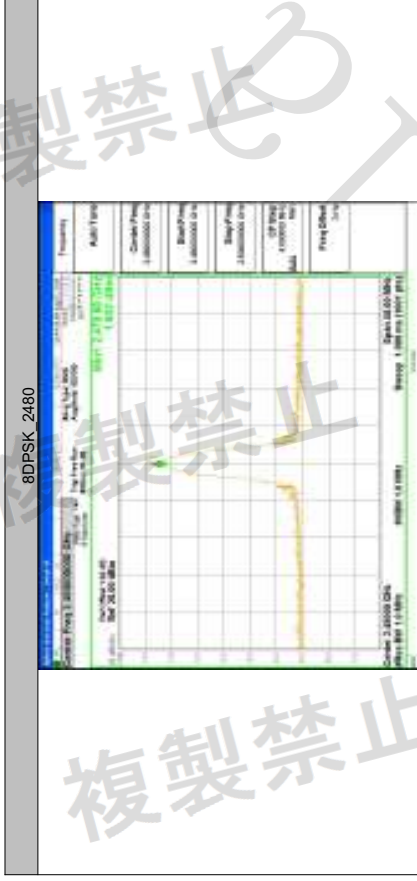
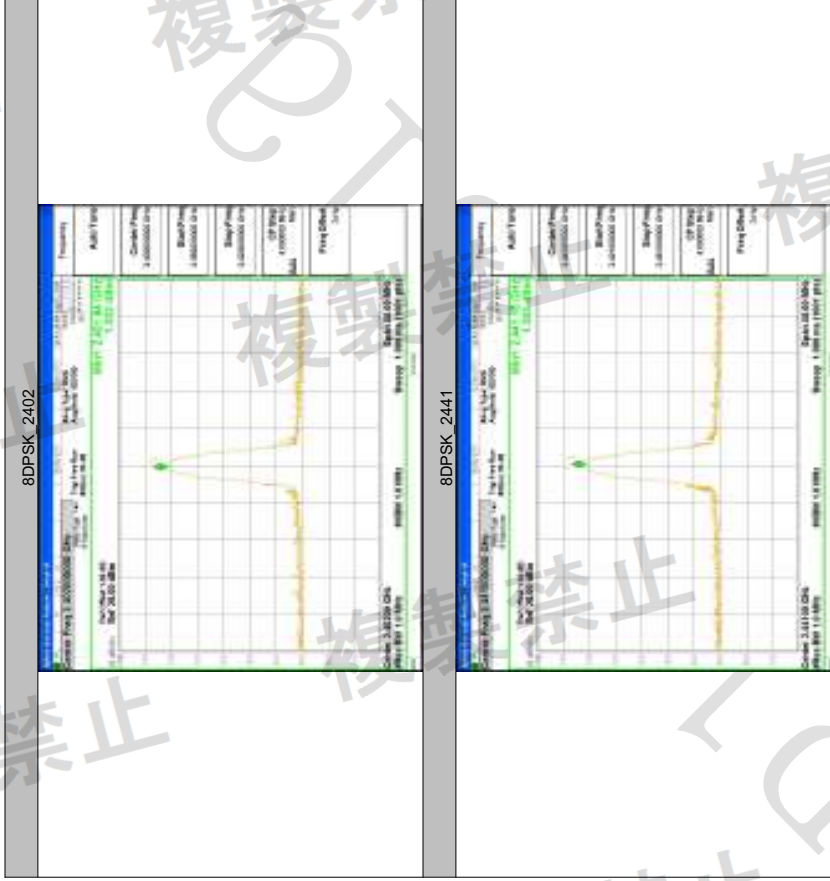
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Test Graphs







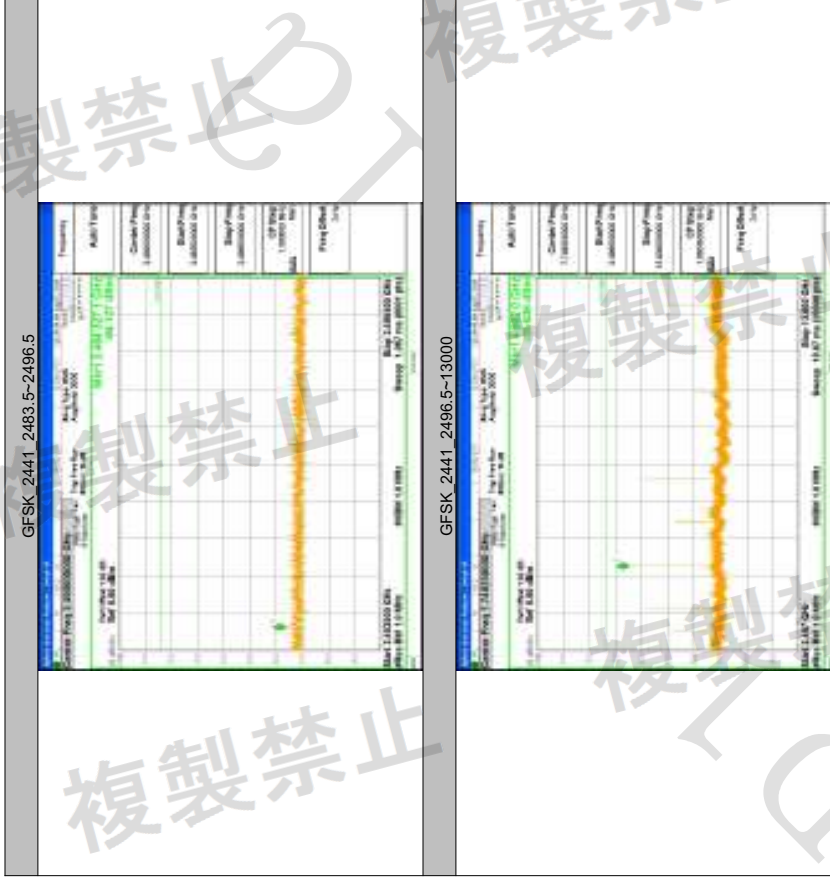
7.1.7 Spurious Emissions of Tx

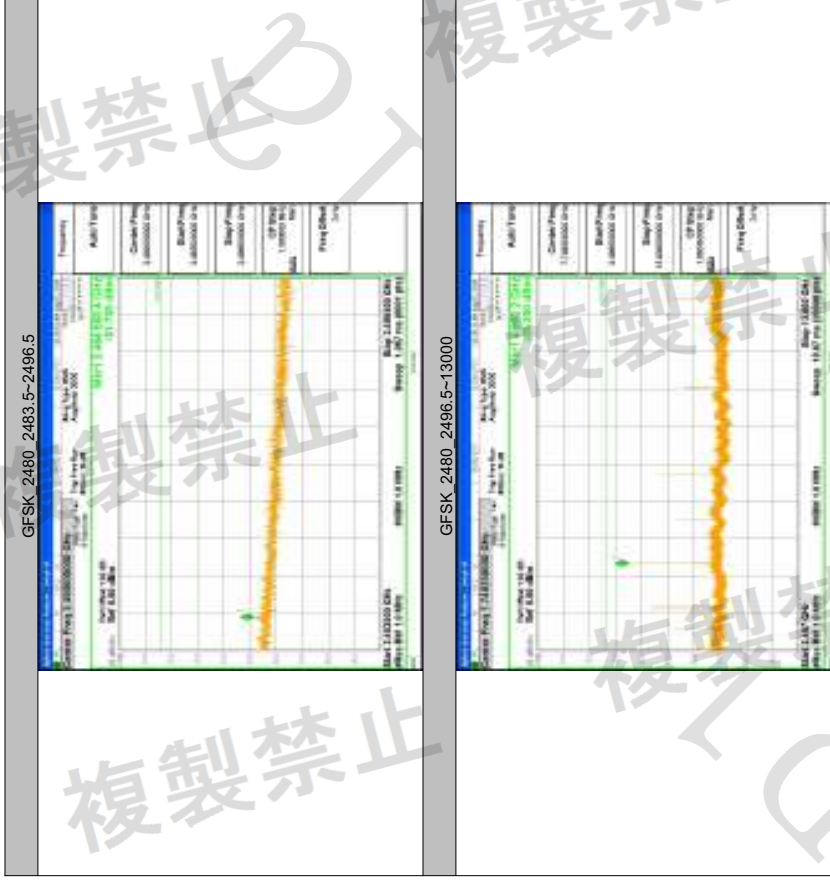
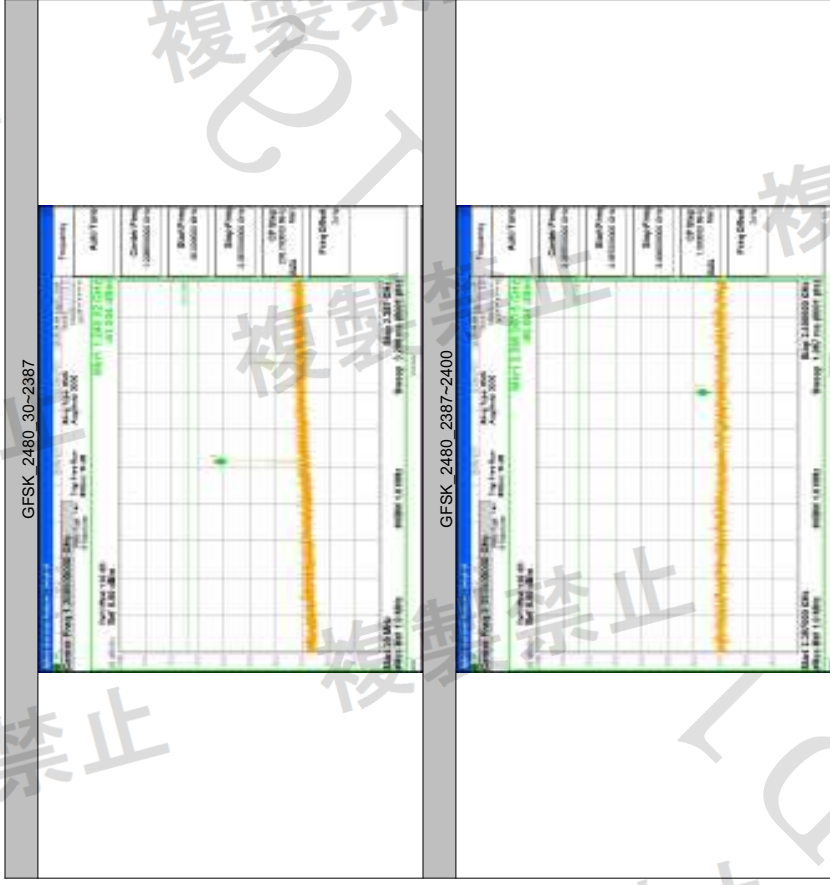
Test Requirement:	Item 19 of Article 2 Paragraph 1			
Test Method:	MIC Notice No.88 Appendix No.43			
EUT Operation:				
Ambient:	Temp.: 24°C	Humid.: 55%	Press.: 1010 mbar	
Test Status:	Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture). Following channel(s) was (were) selected for the final test as listed below.			
Test Configuration:	EUT Spectrum Analyzer			
EUT conditions:	Modulation/Spread/Hopping on, PN9 Modulation Tx For equipment using diffusion code, set to the test diffusion code and modulate with standard coding test signal.			
Measurement Procedure:	Step1 All spurious are measured from 30MHz to 13GHz by peak mode. Step2 If the value measured by Step1 is 2dB or less, measure in average mode.			
Spectrum Analyzer conditions(Step 1):	Frequency: 30MHz – 2400MHz, 2483.5MHz –13GHz RBW 1000kHz (30 – 1GHz), 1000KHz (over 1GHz) VBW 1000kHz (30 – 1GHz), 1000KHz (over 1GHz) Sweep Time Auto detector mode Positive peak Indication mode Max hold			
Spectrum Analyzer conditions(Step 2):	Frequency: Spurious Frequency Span 0Hz RBW 1MHz VBW 1MHz Sweep Time Auto Detector mode Sample Indication mode Max hold			
Technical standard:	(1) Below 2387 MHz : 2.5µW/MHz (2) 2387 to 2400 MHz : 25µW/MHz (3) 2483.5 through 2496.5 MHz : 25µW/MHz (4) Over 2496.5 MHz : 2.5µW/MHz			
Test result:	PASS			

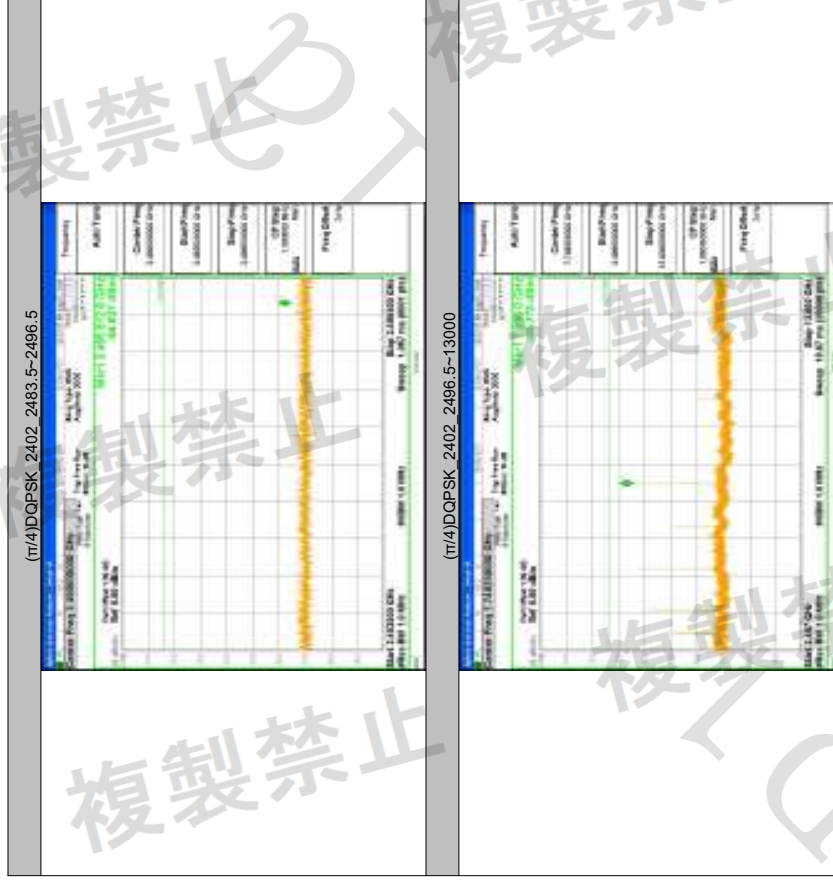
Measurement Record:**Test Result**

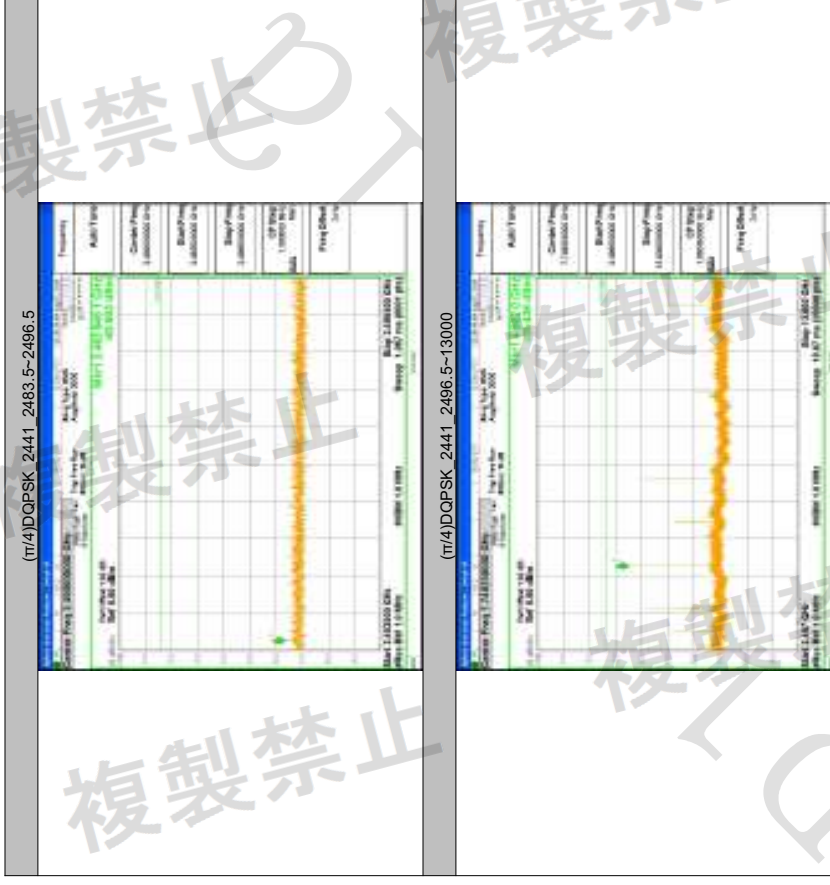
Uncertainty: ±1dB

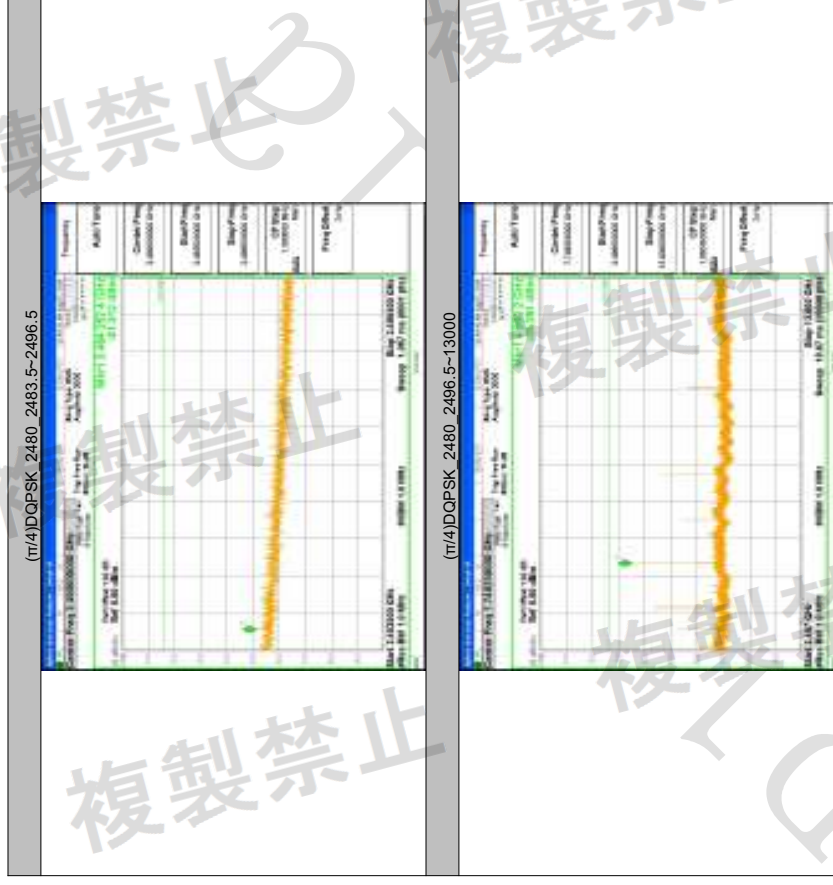
TestCondition	TestMode	Channel	Freq.Range [MHz]	Result [dBm]	Limit [dBm]	Verdict
NTNV	GFSK	2402	30~2387	-42.140	<=-26	PASS
			2387~2400	-38.428	<=-16	PASS
			2483.5~2496.5	-64.266	<=-16	PASS
			2496.5~13000	-36.042	<=-26	PASS
		2441	30~2387	-41.829	<=-26	PASS
			2387~2400	-63.513	<=-16	PASS
			2483.5~2496.5	-64.127	<=-16	PASS
			2496.5~13000	-35.636	<=-26	PASS
	2480		30~2387	-41.534	<=-26	PASS
			2387~2400	-65.897	<=-16	PASS
			2483.5~2496.5	-51.705	<=-16	PASS
			2496.5~13000	-35.250	<=-26	PASS
		2402	30~2387	-41.447	<=-26	PASS
			2387~2400	-44.365	<=-16	PASS
			2483.5~2496.5	-64.827	<=-16	PASS
			2496.5~13000	-35.775	<=-26	PASS
(π/4)DQPSK	K	2441	30~2387	-41.601	<=-26	PASS
			2387~2400	-63.511	<=-16	PASS
			2483.5~2496.5	-63.803	<=-16	PASS
			2496.5~13000	-35.438	<=-26	PASS
		2480	30~2387	-41.783	<=-26	PASS
			2387~2400	-64.580	<=-16	PASS
			2483.5~2496.5	-51.312	<=-16	PASS
			2496.5~13000	-35.281	<=-26	PASS
	8DPSK	2402	30~2387	-41.335	<=-26	PASS
			2387~2400	-44.513	<=-16	PASS
			2483.5~2496.5	-64.310	<=-16	PASS
			2496.5~13000	-35.717	<=-26	PASS
		2441	30~2387	-41.643	<=-26	PASS
			2387~2400	-63.574	<=-16	PASS
			2483.5~2496.5	-63.358	<=-16	PASS
			2496.5~13000	-35.358	<=-26	PASS

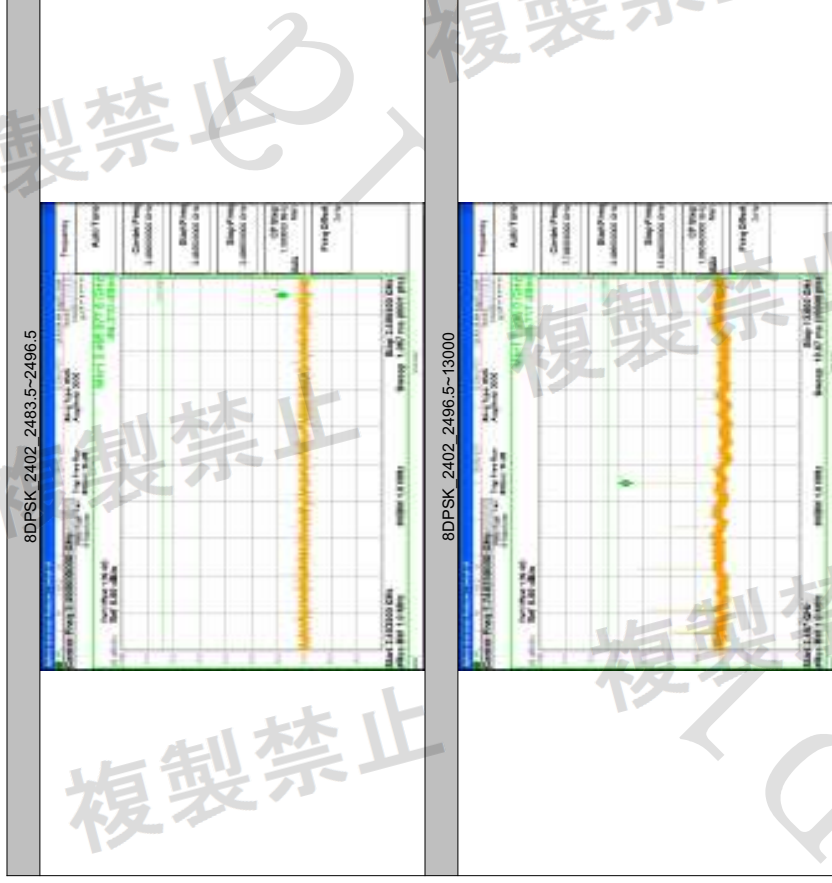
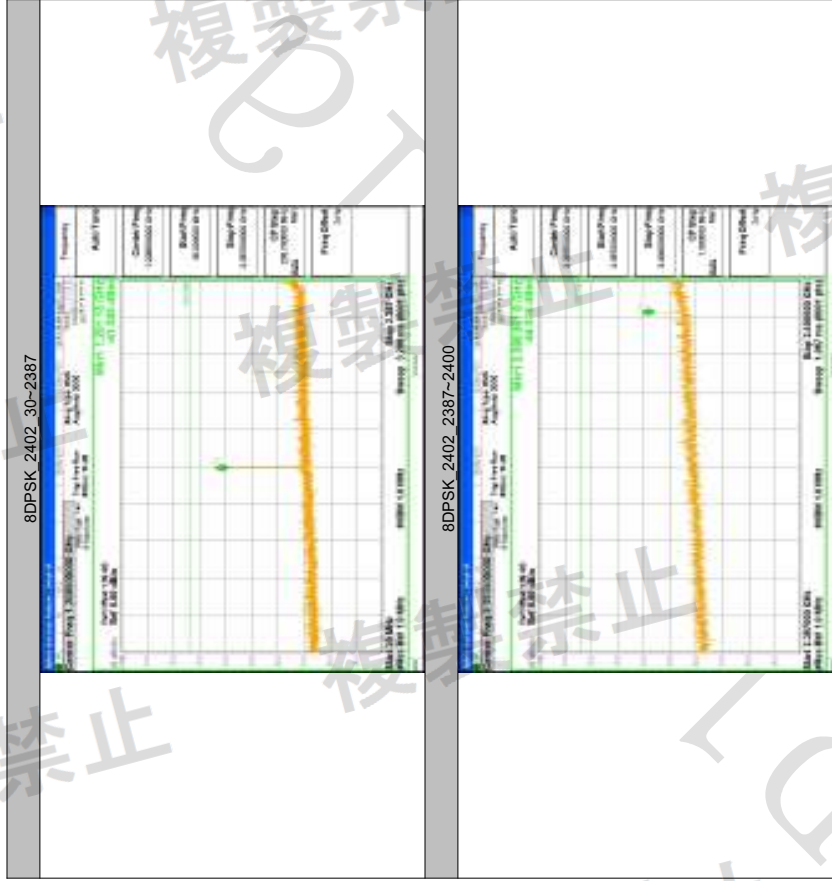


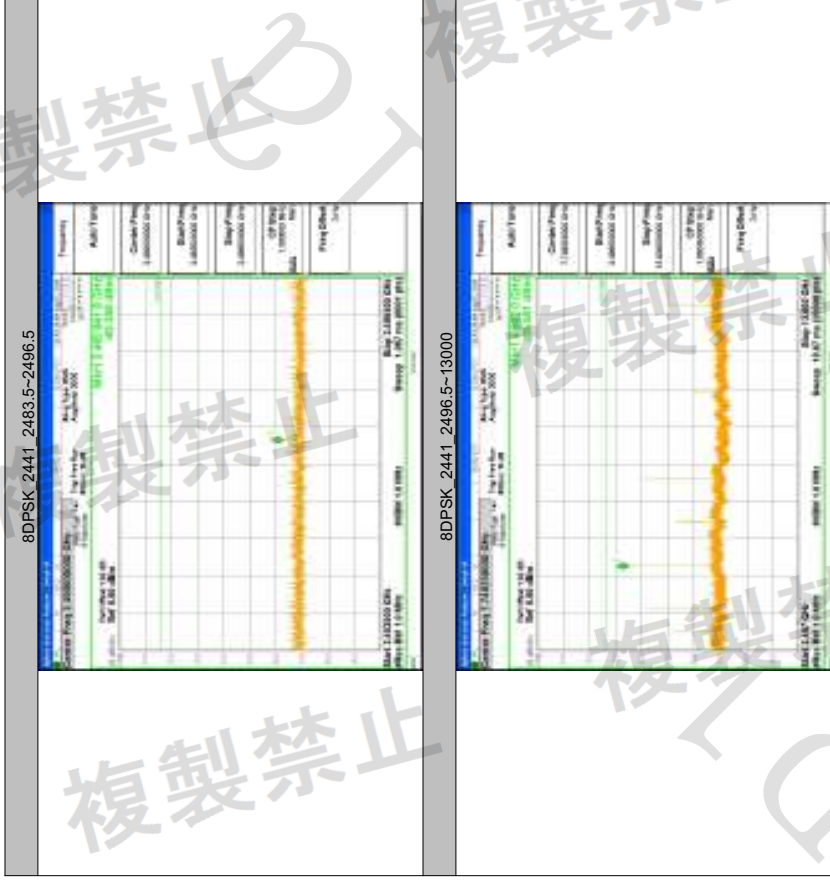


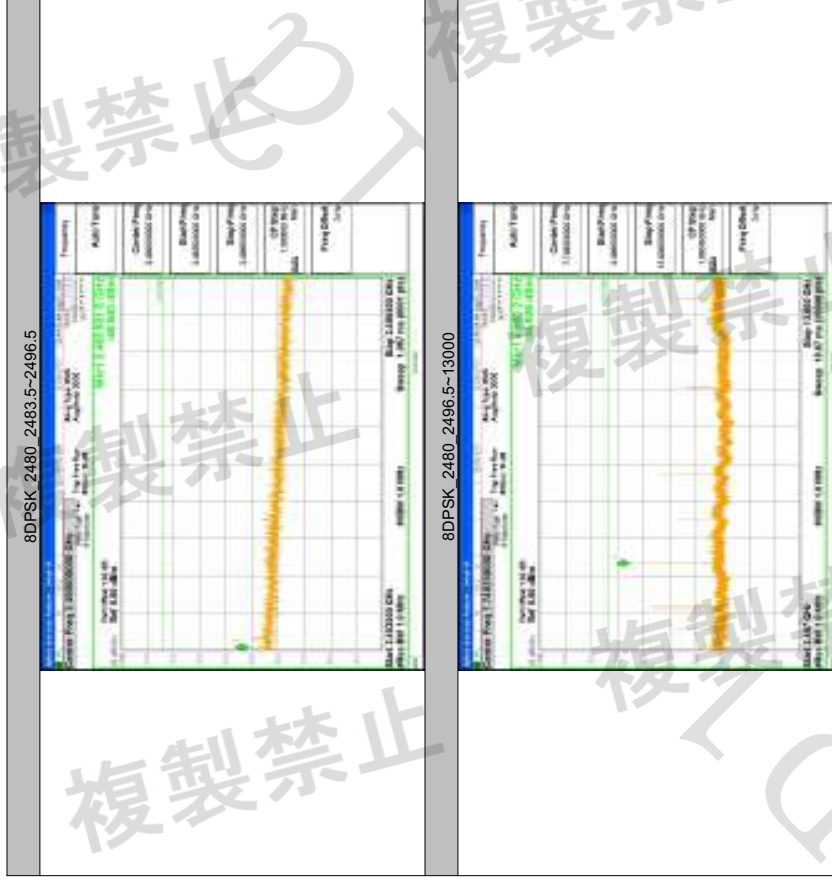
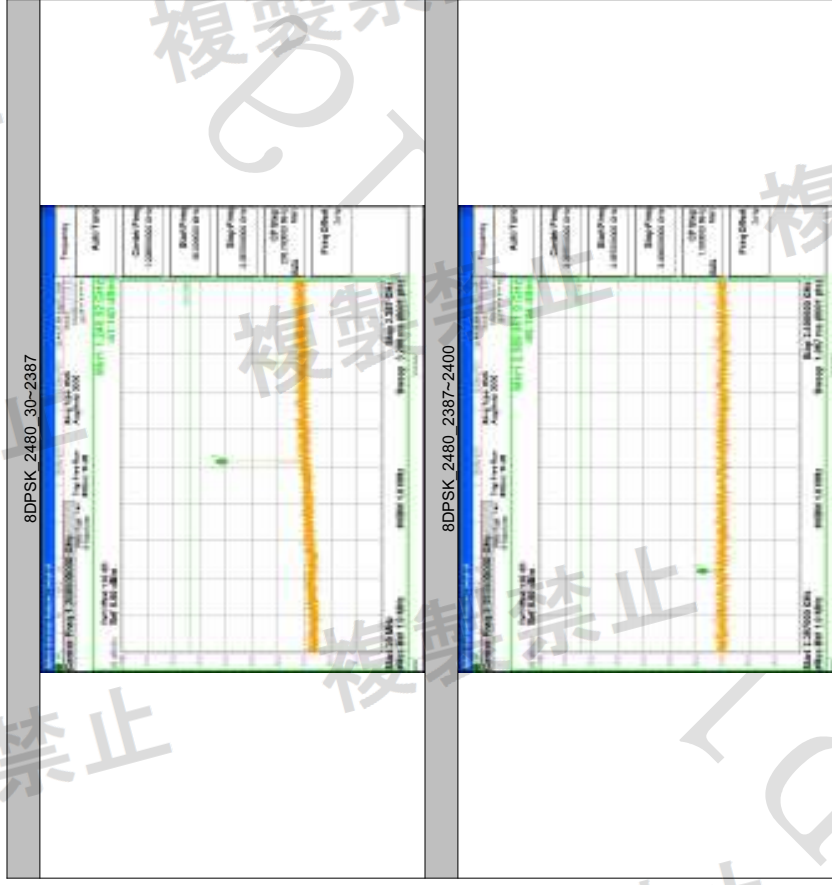






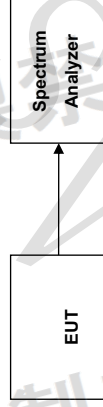






7.1.8 Dwell Time

Test Requirement:	Item 19 of Article 2 Paragraph 1		
Test Method:	MIC Notice No.88 Appendix No.43		
EUT Operation:			
Ambient:	Temp.: 24°C	Humid.: 55%	Press.: 1010 mbar
Test Status:	Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture). Following channel(s) was (were) selected for the final test as listed below. Modulation/Spread/Hopping ON. Hopping frequency is fixed, Bluetooth equipment is setting DH5 mode		
Test Configuration:			



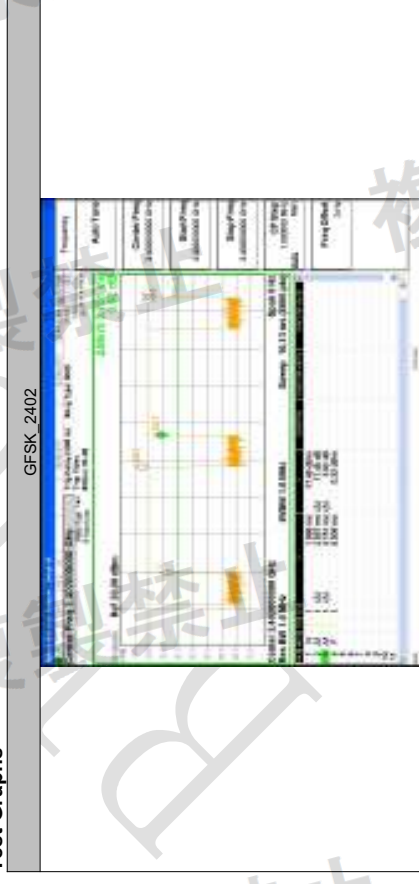
EUT conditions:	Modulation/Spread/Hopping ON. Hopping frequency is fixed, Bluetooth equipment is setting DH5 mode For equipment using diffusion code, set to the test diffusion code and modulate with standard coding test signal.
Spectrum Analyzer conditions:	Frequency: Test Frequency (fixed hopping frequency) Span 0 Hz RBW 1 MHz VBW 1 MHz Sweep Time EUT condition Trigger Video Trigger Measures the Transmission time of 1 burst (sec) Measures the Burst cycle (sec)
Calculation procedure:	Dwell time = $(0.4(s) \times [\text{spreading rate}] \times [\text{Transmission time of 1 burst}(s)]) / (\text{burst cycle}(s)) \times [\text{No. of hopping channel}]$ Note: * Spreading rate = $[\text{Spread bandwidth (actual measurement value)}] / [\text{Transmission rate}]$
Technical standard:	Less than 0.4 sec
Test result:	PASS

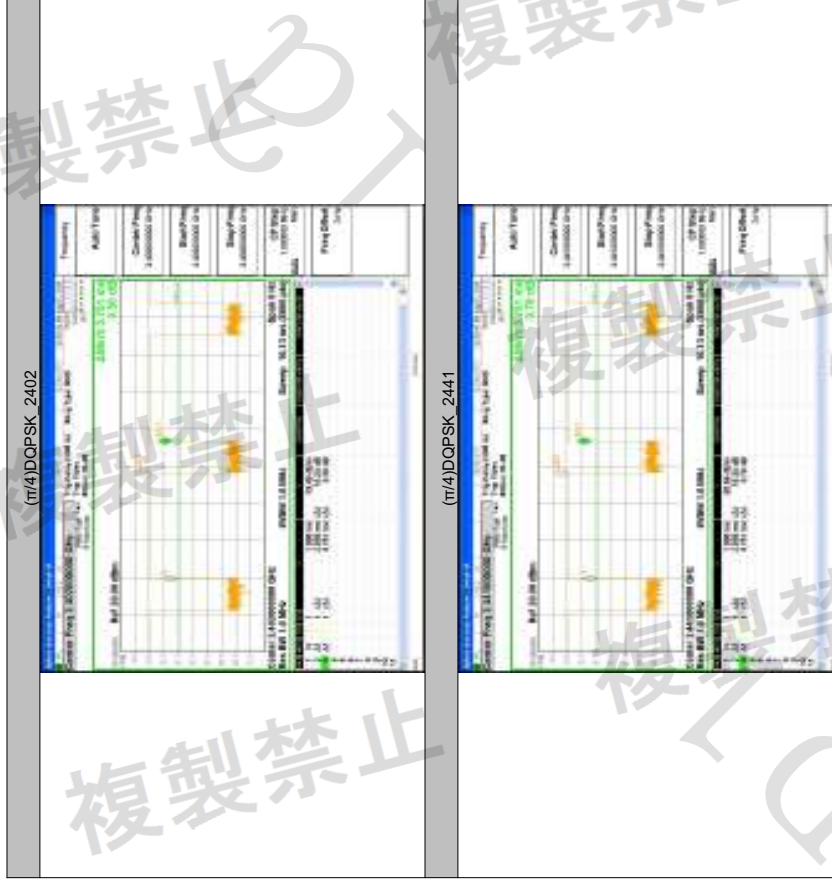
Test Result

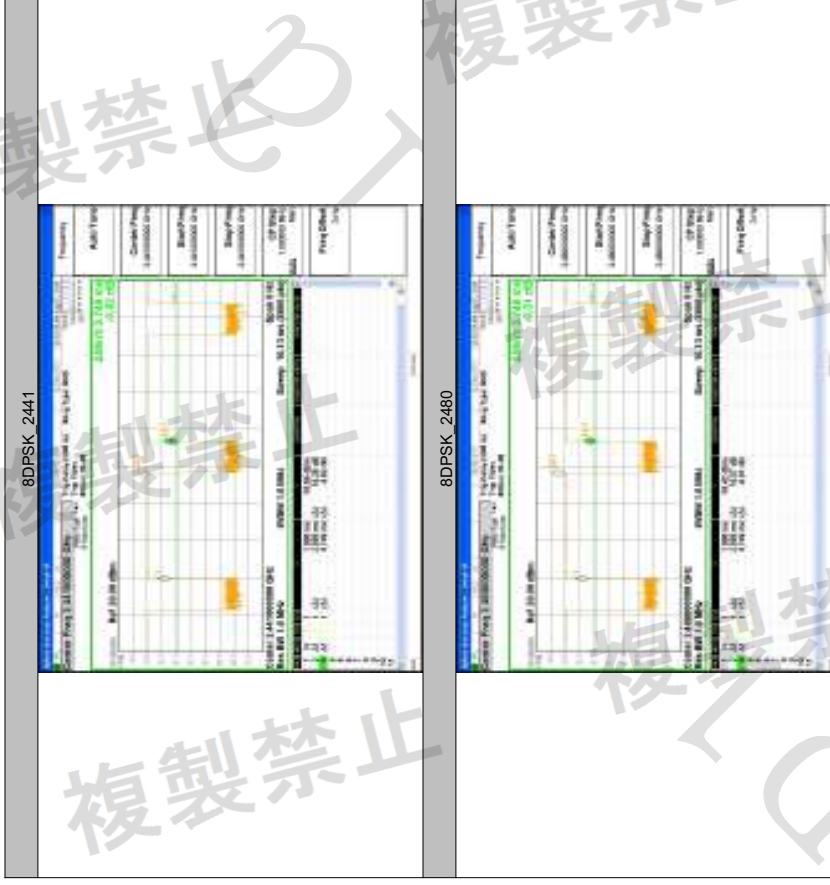
TestCondition	TestMode	Channel	Spread bandwidth	Result [s]	Limit [s]	Verdict
NTNV	GFSK	2402	71.575	0.279	<0.4	PASS
		2441	71.575	0.279	<0.4	PASS
		2480	71.575	0.279	<0.4	PASS
	(m/4)DQPSK	2402	71.580	0.279	<0.4	PASS
		2441	71.580	0.279	<0.4	PASS
		2480	71.580	0.279	<0.4	PASS
	8DPSK	2402	71.382	0.278	<0.4	PASS
		2441	71.382	0.278	<0.4	PASS
		2480	71.382	0.278	<0.4	PASS

Remark: Calculated method: Dwell time = $(0.4(s) \times [\text{spreading rate}] \times [\text{Transmission time of 1 burst}(s)]) / (\text{burst cycle}(s)) \times [\text{No. of hopping channel}]$
Note: Spreading rate = $[\text{Spread bandwidth (actual measurement value)}] / [\text{Transmission rate}]$
 Transmission rate is 1.0 Mbps.

Test Graphs







7.1.9 Pseudorandom Frequency Hopping Sequence

Standard requirement

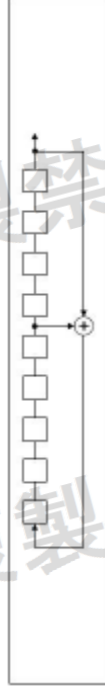
Article 2, Item (19) Notice 88 Appendix 43, 44, 45 requirement:

The EUT shall have the capability to transmit or to receive the MAC identification automatically, so that sender and receiver shall exclude other equipment.

EUT Pseudorandom Frequency Hopping Sequence

The pseudorandom sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage, and the result is fed back to the input of the first stage. The sequence begins with the first ONE of 9 consecutive ONEs; i.e. the shift register is initialized with nine ones.

- Number of shift register stages: 9
- Length of pseudo-random sequence: $2^9 - 1 = 511$ bits
- Longest sequence of zeros: 8 (non-inverted signal)



Linear Feedback Shift Register for Generation of the PRBS sequence

An example of Pseudorandom Frequency Hopping Sequence as follow:



Each frequency used equally on the average by each transmitter.

The system receivers have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shift frequencies in synchronization with the transmitted signals.

7.1.10 Interference prevention function

1) Measurement system diagram



2) Condition of measuring instrument

- (1) Demodulator must be able to demodulate the transmitting signal emitted by test equipment and to indicate the identification code.

3) Condition of test equipment The mode of normal use.

4) Measuring operation procedure

- (1) When test equipment has the function to transmit identification code automatically:

A) Transmit the predetermined identification code from test equipment.

B) Confirm the transmitted identification code by demodulator.



5) Test result: The unit does meet the requirements (Good).

Test result: PASS

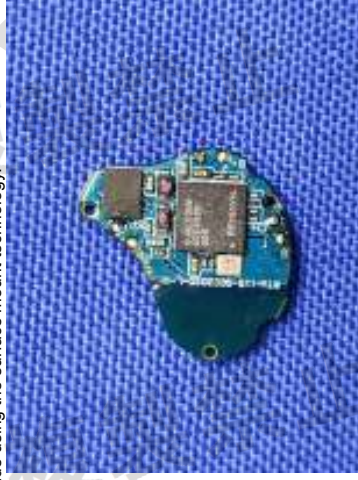
7.1.11 RF accessibility

Standard requirement

Article 49-20, paragraph 1 (a)

The EUT shall be constructed in such a way that sensitive RF parts, (like modulation and oscillator parts) cannot be reached easily by the user. These parts shall be covered by soldered metal caps or glue or by other mechanical covers. If the covers are fixed with screws, these shall be not the common type(s) like a Phillips, but special versions like Torx, so that the user cannot open the device with common tools.

PCB board is made using the surface mount technology.



7.2 Receiver Requirements

7.2.1 Spurious Emissions of Rx

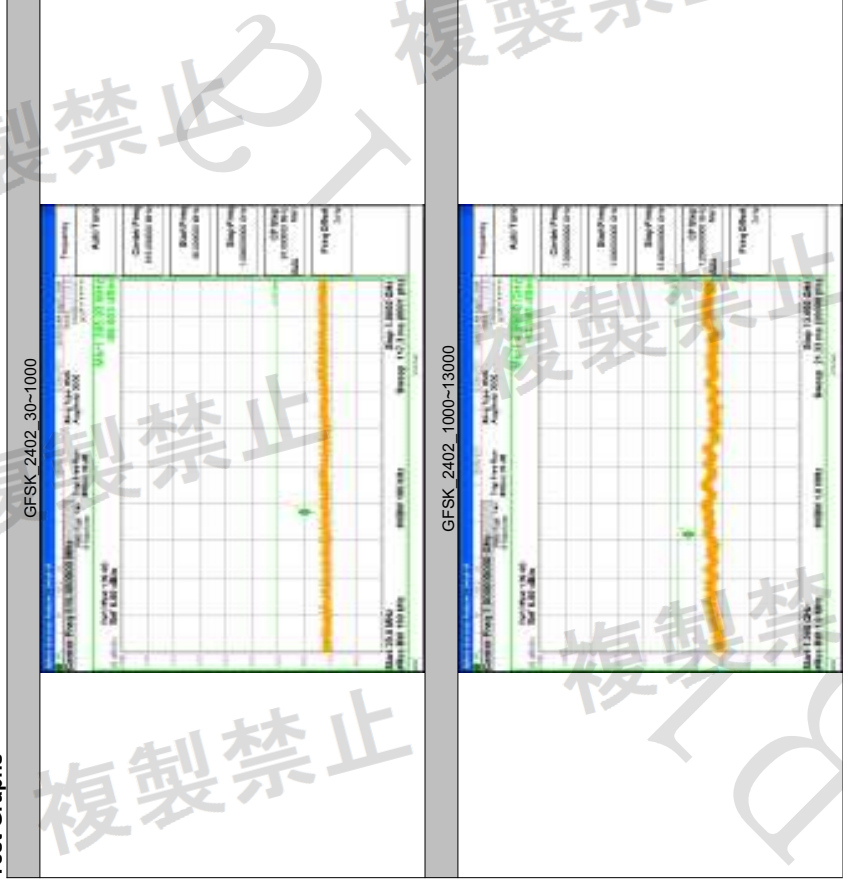
Test Requirement:	Item 19 of Article 2 Paragraph 1		
Test Method:	MIC Notice No.88 Appendix No.43		
EUT Operation:			
Ambient:	Temp.: 24°C	Humid.: 55%	Press.: 1010 mbar
Test Status:	Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture). Following channel(s) was (were) selected for the final test as listed below.		
Test Configuration:	EUT Spectrum Analyzer		
EUT conditions:	Rx		
Measurement Procedure:	Step1 All spurious are measured from 30MHz to 13 GHz by peak mode. Step2 IF the value measured by Step1 is 2dB or less, measure in average mode.		
Spectrum Analyzer conditions(Step 1):	Frequency: 30MHz – 2400MHz , 2483.5MHz –13GHz RBW 100 kHz (30 – 1GHz) , 1 MHz (over 1GHz) VBW 100 kHz (30 – 1GHz) , 1 MHz (over 1GHz) Sweep Time Auto detector mode Positive peak Indication mode Max hold		
Spectrum Analyzer Conditions(Step 2):	Frequency: Spurious Frequency Span 0 Hz RBW 100 kHz (30 – 1GHz) , 1 MHz (over 1GHz) VBW 100 kHz (30 – 1GHz) , 1 MHz (over 1GHz) Sweep Time Auto detector mode Sample Indication mode Max hold		
Technical standard:	(1) Below 1 GHz : 4 nW or less (2) 1 GHz and over : 20 nW or less		
Test result:	PASS		

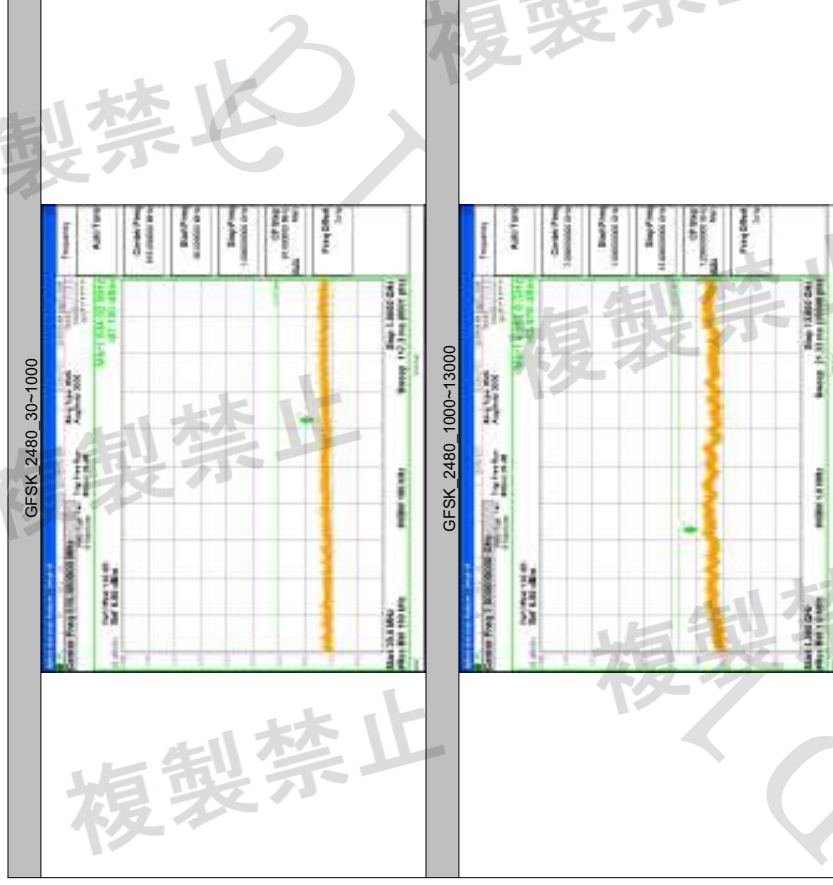


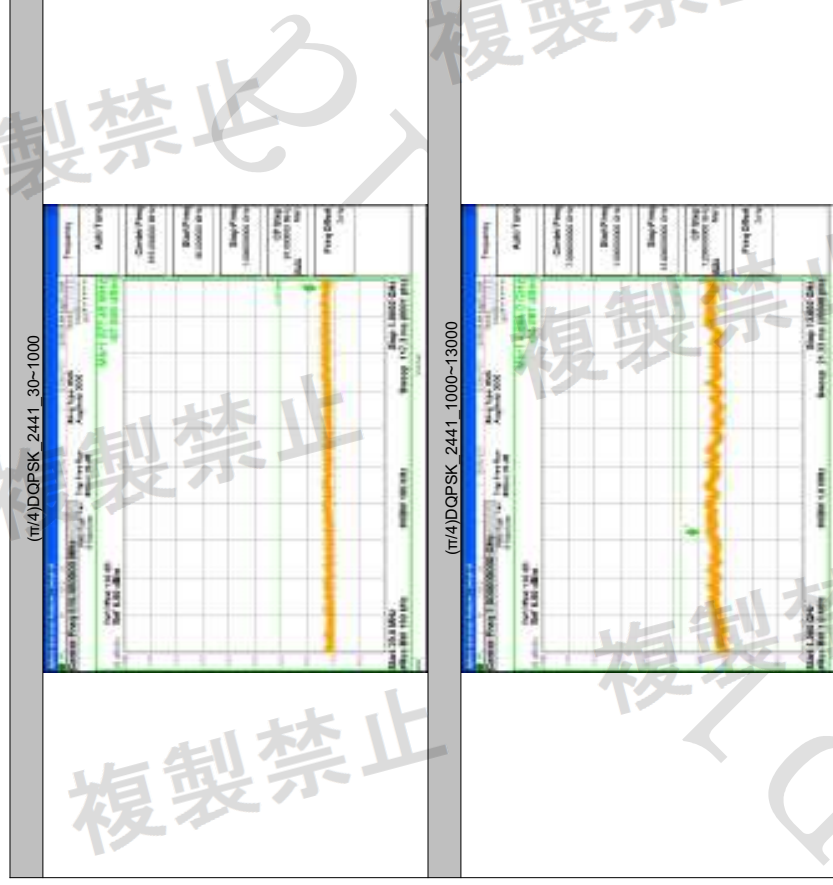
Test Result

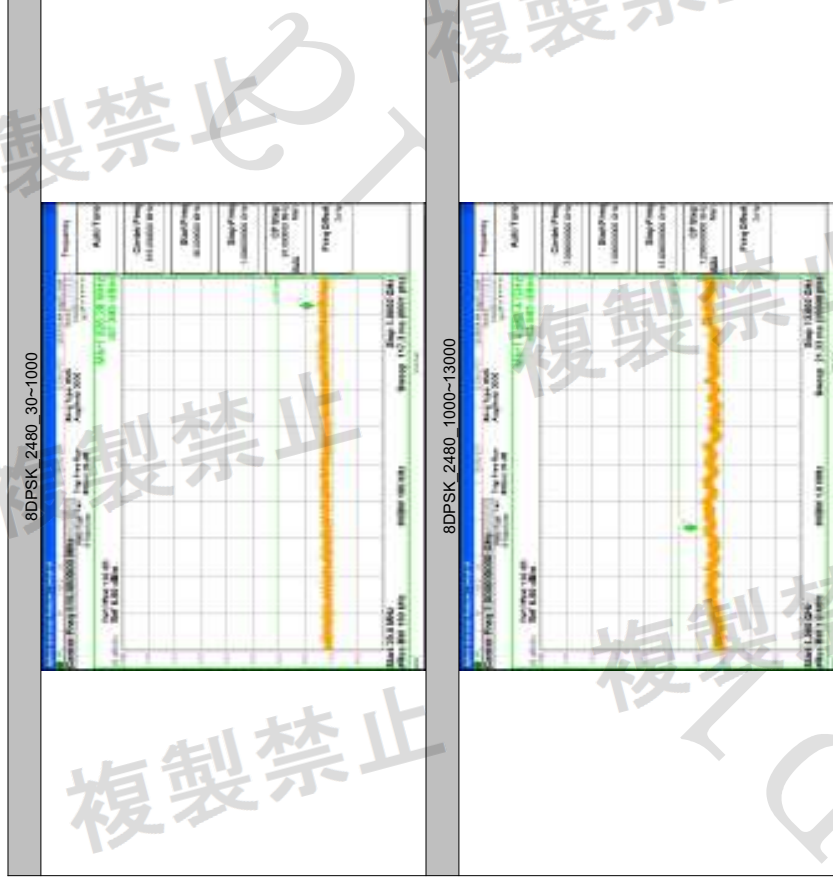
TestCondition	TestMode	Channel	Freq.Range [MHz]	Result [dBm]	Limit [dBm]	Verdict
NTNV	GFSK	2402	30~1000	-66.803	<=-54	PASS
			1000~13000	-53.595	<=-47	PASS
		2441	30~1000	-67.594	<=-54	PASS
			1000~13000	-53.348	<=-47	PASS
		2480	30~1000	-67.13	<=-54	PASS
			1000~13000	-53.976	<=-47	PASS
	(π/4)DQPSK	2402	30~1000	-67.831	<=-54	PASS
			1000~13000	-53.871	<=-47	PASS
		2441	30~1000	-67.509	<=-54	PASS
			1000~13000	-54.087	<=-47	PASS
		2480	30~1000	-67.372	<=-54	PASS
			1000~13000	-53.996	<=-47	PASS
	8DPSK	2402	30~1000	-67.669	<=-54	PASS
			1000~13000	-51.974	<=-47	PASS
		2441	30~1000	-67.45	<=-54	PASS
			1000~13000	-53.92	<=-47	PASS
		2480	30~1000	-67.395	<=-54	PASS
			1000~13000	-53.995	<=-47	PASS

Test Graphs









8 Photographs

8.1 EUT Constructional Details



View of Product-1



View of Product-2



View of Product-3



View of Product-4



View of Product-7



View of Product-8



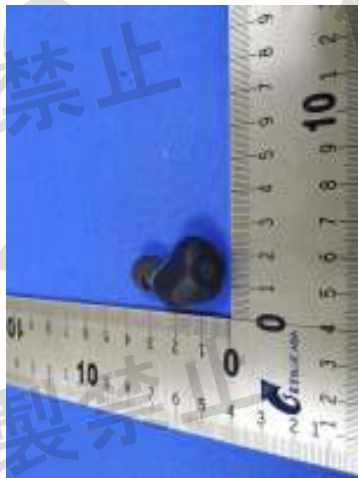
View of Product-5



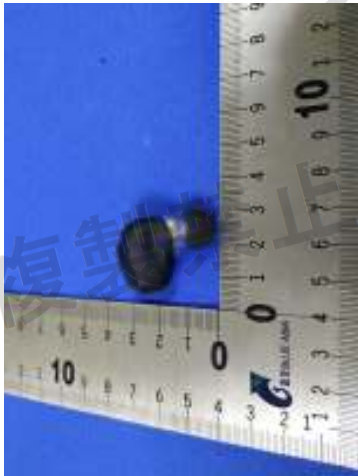
View of Product-6



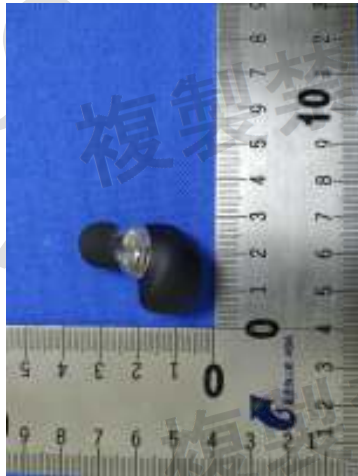
View of Product-9



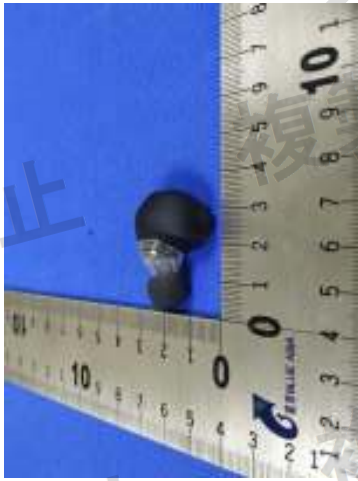
View of Product-10



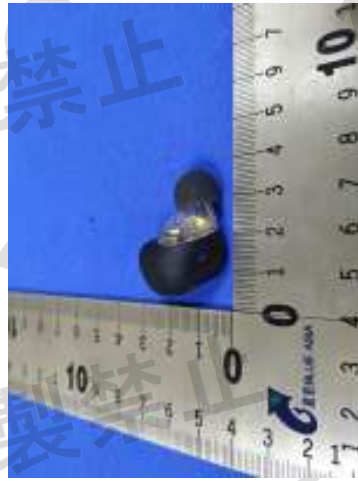
View of Product-11



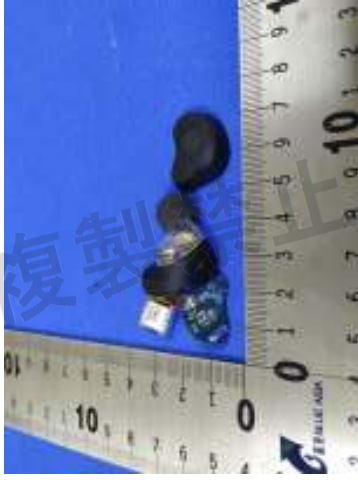
View of Product-12



View of Product-13



View of Product-14



View of Product-15



View of Product-16



View of Product-19



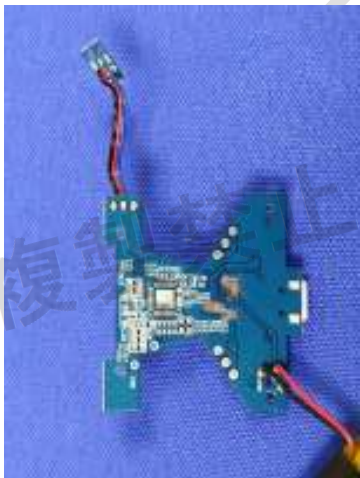
View of Product-20



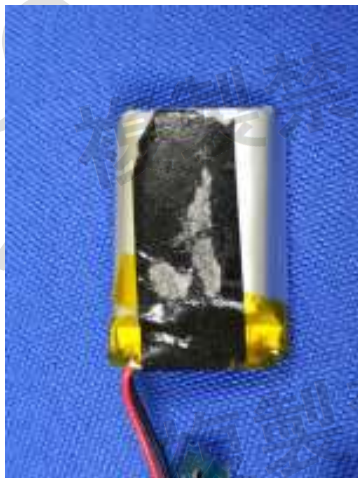
View of Product-17



View of Product-18



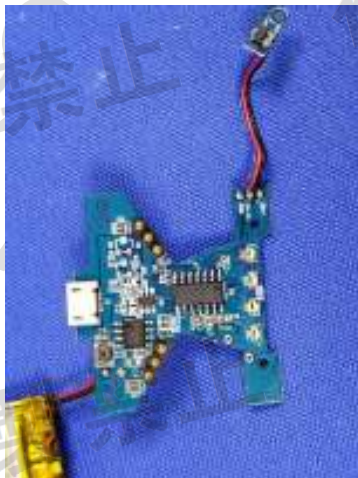
View of Product-23



View of Product-24



View of Product-21



View of Product-22



View of Product-25

*** End of Report ***

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