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TEST REPORT

Application No.:	CQASZ20210801403E
Applicant:	Dongguan Hele Electronics Co., Ltd
Address of Applicant:	Dalingya Industrial Zone,Daojiao Town,Dongguan City,Guangdong,China
Manufacturer:	Dongguan Hele Electronics Co., Ltd
Address of Manufacturer:	Dalingya Industrial Zone,Daojiao Town,Dongguan City,Guangdong,China
Factory:	Dongguan Hele Electronics Co., Ltd
Address of Factory:	Dalingya Industrial Zone,Daojiao Town,Dongguan City,Guangdong,China
Equipment Under Test (EUT):	
Product:	TWS Bluetooth headset
Model No.:	BH21Q17A
Brand Name:	N/A
Standards:	Item 19 of Article 2 Paragraph 1
Date of Receipt:	2021-08-19
Date of Test:	2021-08-19 to 2021-08-30
Date of Issue:	2021-09-13
Test Result:	**PASS**

Tested By: lewis zhou
(Lewis Zhou)

Reviewed By: Rock Huang
(Rock Huang)

Approved By:
(Jack ai)

1 Version

Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
01		2021-09-13		Original

2 Test Summary

Test	Test Requirement	Limit/Severity	Result
Antenna Requirement	Item 19 of Article 2-1	Notice 88 Appendix 43,B-1 (1)&(2)	PASS
Test frequency	Item 19 of Article 2-1	Notice 88 Appendix 43, A-3	PASS
Frequency Error	Item 19 of Article 2-1	±50 PPM or less	PASS
Occupied Bandwidth	Item 19 of Article 2-1	83.5 MHz or less	PASS
Spread-spectrum Bandwidth	Item 19 of Article 2-1	500 kHz or more	PASS
Antenna Power	Item 19 of Article 2-1	3 mW /MHz or less Error＋20% -80%	PASS
Spurious Emission of Tx	Item 19 of Article 2-1	(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	PASS
Dwell Time	Item 19 of Article 2-1	less than 0.4sec	PASS
Interference prevention capability	Item 19 of Article 2-1	Notice 88 Appendix 43, 44, 45	PASS
RF accessibility	Item 19 of Article 2-1	Article 49-20, paragraph 1 (a)	PASS
Spurious Emission of Rx	Item 19 of Article 2-1	(1) Below 1 GHz : 4 nW (2) 1 GHz to 13 GHz : 20 nW	PASS
Transmission Antenna Gain	Item 19 of Article 2-1	/	N/A
Transmission Radiation Angle Width	Item 19 of Article 2-1	/	N/A

Remark:

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

Tx: In this whole report Tx (or tx) means Transmitter.

Rx: In this whole report Rx (or rx) means Receiver.

RF: In this whole report RF means Radio Frequency.

N/A: This test item was not required for the output power less than 6.91dBm/MHz(E.I.R.P), So Not Applicable.

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4 General Information

4.1 General Description of E.U.T.

Product Name:	TWS Bluetooth headset
Model No:	BH21Q17A
Trade Mark:	N/A

4.2 Details of E.U.T.

Operating Frequency:	2402 MHz to 2480 MHz	
Type of Modulation:	GFSK, (π/4)DQPSK	
Number of Channels:	79 Channels	
Channel Separation:	1 MHz	
Dwell Time:	Per channel is less than 0.4s.	
Bluetooth Version:	BT5.1	
Hardware Version:	V5.1	
Software Version:	V5.1	
Antenna Type:	Internal Antenna	
Antenna Gain:	1.81 dBi	
Rated power:	0.03027 mW/MHz	
Sample Type:	Portable product	
Power Supply:	Left ear:	lithium battery: DC 3.7V, 0.16Wh, Charge by DC 3.7V
	Right ear:	lithium battery: DC 3.7V, 0.16Wh, Charge by DC 3.7V
	The earphone box:	lithium battery: DC 3.7V 380mAh, Charge by DC 5.0V

4.3 Description of Support Units

The EUT has been tested with associated equipment below.

Description	Manufacturer	Model No.	Remark
Adapter	XIAOMI	MDY-08-EF	Provide by lab

4.4 Deviation from Standards

None.

4.5 Abnormalities from Standard Conditions

None.

4.6 Other Information Requested by the Customer

None.

4.7 Test Location

All tests were performed at:

Shenzhen Huaxia Testing Technology Co., Ltd.

1F., Block A of Tongsheng Technology Building, Huahui Road, Dalang Street, Longhua District, Shenzhen, China

No tests were sub-contracted.

4.8 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

• ISED Registration No.: 22984-1

The 3m Semi-anechoic chamber of Shenzhen Huaxia Testing Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing

• A2LA (Certificate No. 4742.01)

Shenzhen Huaxia Testing Technology Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 4742.01.

5 Equipment List

Test Equipment List						
Test Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal. Date**	**Cal. Due Date**	**Remark**
Humi/ Temp Indicator	VICTOR	VC330	CQA-S070	2020/9/25	2021/9/24	-
Spectrum Analyzer	Rohde & Schwarz	FSU26	CQA-038	2020/10/25	2021/10/24	-
DC Power Supply	KEYSIGHT	E3631A	CQA-028	2020/9/26	2021/9/25	-
Multi Meter	Fluke	15B	CQA-S011	2020/9/25	2021/9/24	-
iPhone 6s	Apple	A1688	FK1QJUUSGRYD	-	-	Certificate number: [T] ADF150099003 [R]003-150132
Signal generator	ANRITSU	MG3692B	CQA-019	2020/9/25	2021/9/24	-

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.

6 Test Results

6.1 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 2-1)

Items	Technical standard
Assigned frequency or designated frequency	2402-2480MHz
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
Tolerance of occupied bandwidth	FH: 83.5MHz or less FH + DS: 83.5MHz or less FH + OFDM: 83.5MHz or less OFDM: 38MHz or less Others: 26MHz or less
Antenna power	Designated value (1) FH, FH+DS, FH+OFDM: 3mW/MHz (used in the range of 2402 - 2480MHz) (2) OFDM, DS other than (1) 10mW/MHz (3) Other than (1) & (2) 10mW (4) OFDM OBW 26 - 38MHz: 5mW/MHz Tolerance:+20%,-80%
Antenna gain	1) 0dBi or less in principle 2) In case of directional antenna (1) FH, FH+DS or FH+OFDM using 2402-2480 MHz EIRP≤ 16.91 dBm/MHz (2) OFDM or DS other than (1) EIRP≤ 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 ≤ 360/A (The A is 10 in maximum.)
Tolerance of spurious emission intensity	(1) Below 2387 MHz: 2.5μW (2) 2387 to 2400 MHz: 25μW (3) 2483.5 through 2496.5 MHz: 25μW (4) Over 2496.5 MHz: 2.5μW
Spreading bandwidth	DS,FH,FH+DS,FH+OFDM: 500kHz or more
Spreading rate of spectrum	For DS system;(Spreading bandwidth) / (Frequency corresponding to transmission rate) ≥ 5
Limit of secondary radiated	(1) Below 1 GHz: 4nW

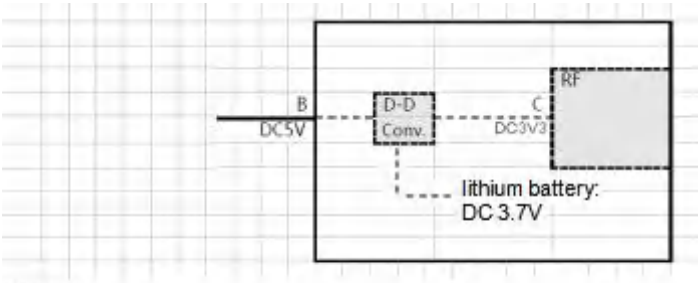
emissions	(2) 1 GHz or higher: 20nW
Interference prevention function	Shall have the function of automatic transmission and reception of identification sign.
Structure	Shall be of the structure that the RF and modulator sections excluding antenna cannot easily be opened.
Note	DS: Direct spread FH: Frequency hopping OFDM: Orthogonal frequency division multiplexing

6.2 E.U.T. Test Conditions

Power Supply: lithium battery: DC 3.7V 0.16Wh, Charge by DC 3.7V

Test voltage require: The RF unit is supplied DC with DC . The fluctuation of input voltage to the circuit of RF unit of test equipment is under ±1%, when input voltage from DC5V or DC 3.7V to the test equipment is fluctuated by ±10%, So, all measurement has been conducted by only rated voltage.

Power Supply view:



Test below:
1: The fluctuation of C point is under ±1%, when input voltage from B point to the test equipment is fluctuated by ±10%.
2:The fluctuation of C point is under ±1%, when input voltage from A point to the test equipment is fluctuated by ±10%.

Power Supply result: The RF unit is supplied DC with DC . The fluctuation of input voltage to the circuit of RF unit of test equipment is under ±1%, when input voltage from DC5V or DC3.7V to the test equipment is fluctuated by ±10%, So, all measurement has been conducted by only rated voltage.

DC Input	DC3V3	DC Input	DC3V3
5.05V	3.32V	3.74V	3.32V
5.0V	3.31V	3.7V	3.30V
4.95V	3.30V	3.66V	3.28V

Temperature: 5 -35.0 °C

Humidity: 45-85 % RH

Atmospheric Pressure: 1000 -1010 mbar

Test Frequencies: If the EUT can be set to 3 of 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.

EUT Channels and Frequencies List:

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

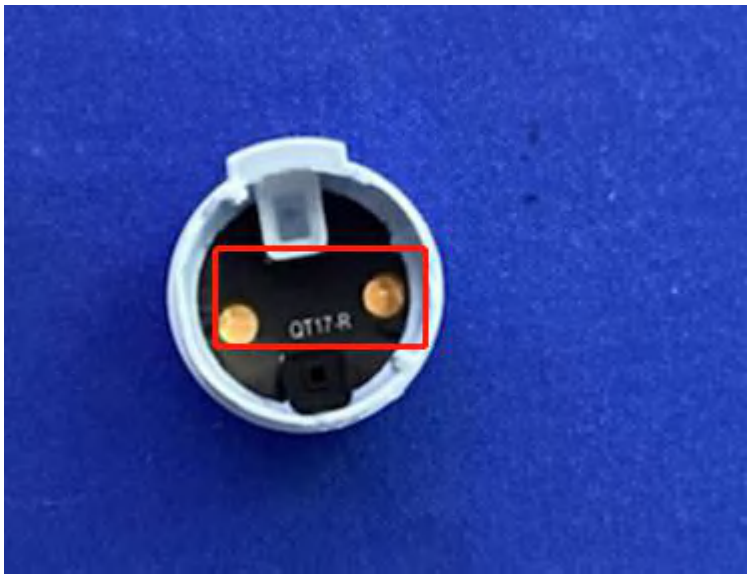
Test frequencies are the lowest channel: 0 channel (2402 MHz), middle channel: 39 channel (2441 MHz) and highest channel: 78 channel (2480 MHz).

6.3 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 EUT with PCB antenna, the best case gain of the antenna is 1.81 dBi.

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

6.4 Interference prevention function

The device consists of the the integral antenna and 2.4 GHz BT module; Component BT module also can use the protocol function to protect interference come from outside.

6.4.1 Test Equipment

iPhone 5c

6.4.2 Test Software

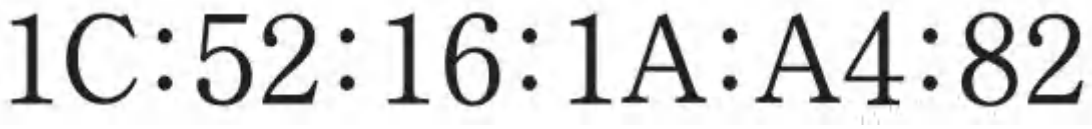
Walkie Talkie for Bluetooth

6.4.3 Test Procedure

1:Open the software

2:Search the Bluetooth device

We can use software to detect Bluetooth ID information is as follows:



Test result: The unit does meet the requirements.

PASS

6.5 Frequency Error

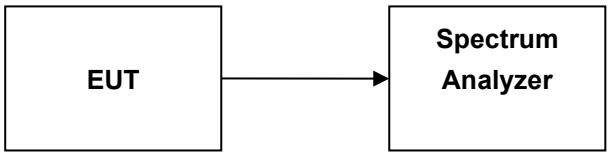
Test Requirement: Item 19 of Article 2-1

Tolerance of frequency: ±50×10^{-6}

Text Method: MIC Notice No.88 Appendix No.43

Test Status: Test the EUT in transmitting mode without modulation.

Test Configuration:



Test Procedure:

1. Test Conditions:

   Spectrum Analyzer is used for measurement.

2. EUT conditions:

   Modulation/Spread/Hopping OFF, CW Tx

3. Spectrum Analyzer conditions:

   Frequency: Test Frequency
   Span 1MHz
   RBW 10 kHz (Modulation OFF),
   VBW 10 kHz (Modulation OFF),
   Sweep Time Auto
   Detector mode Positive peak
   Indication mode Max hold

Test Result:

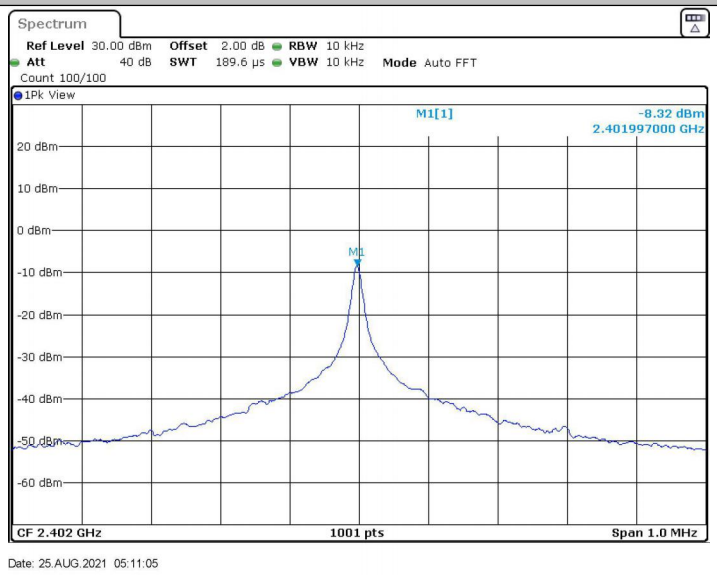
TestCondition	TestMode	Antenna	Channel	Result[ppm]	Limit[ppm]	Verdict
NTNV	CW	Ant1	2402	-1.24896	±50	PASS
			2441	-1.22900	±50	PASS
			2480	-1.20968	±50	PASS

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

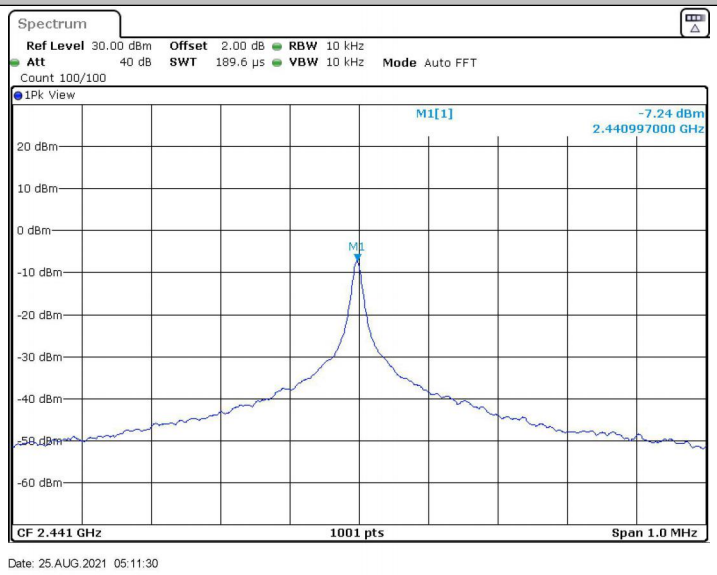
Result plot as follows:

Normal Voltage: DC3.7V

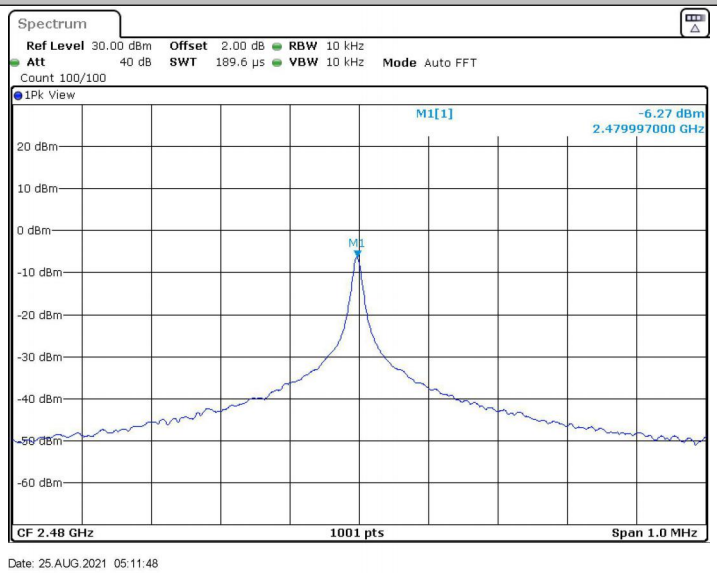
NTNV_CW_Ant1_2402



NTNV_CW_Ant1_2441



NTNV_CW_Ant1_2480

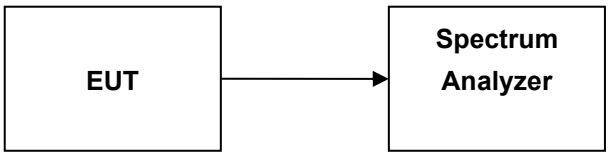


Test Result: The unit does meet the requirements.

6.6 Occupied Bandwidth (99%)

Test Requirement:	Item 19 of Article 2-1 FH: 83.5MHz or less
Text Method:	MIC Notice No.88 Appendix No.43
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:



Test Procedure:

1. Test Conditions:

   Spectrum Analyzer is used for measurement.

2. EUT conditions:

   Modulation/Spread/Hopping ON, Modulation Tx

   For equipment using diffusion code, set to the test diffusion code and modulate with standard coding test signal.

3. Spectrum Analyzer conditions:

   Frequency: Test Frequency

   Span 83.5 MHz (FHSS),

   RBW 1 MHz

   VBW 1 MHz

   Sweep Time Auto

   detector mode Positive peak

   Indication mode Max hold

   OBW 99%

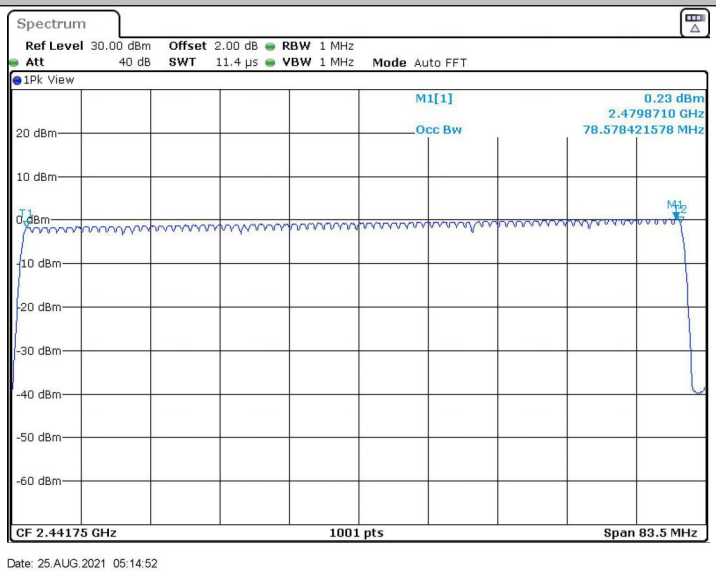
Test Result:

TestCondition	TestMode	Antenna	Channel	Result [MHz]	Limit [MHz]	Verdict
NTNV	DH5	Ant1	Hop	78.578	<=83.5	PASS
	2DH5	Ant1	Hop	78.829	<=83.5	PASS

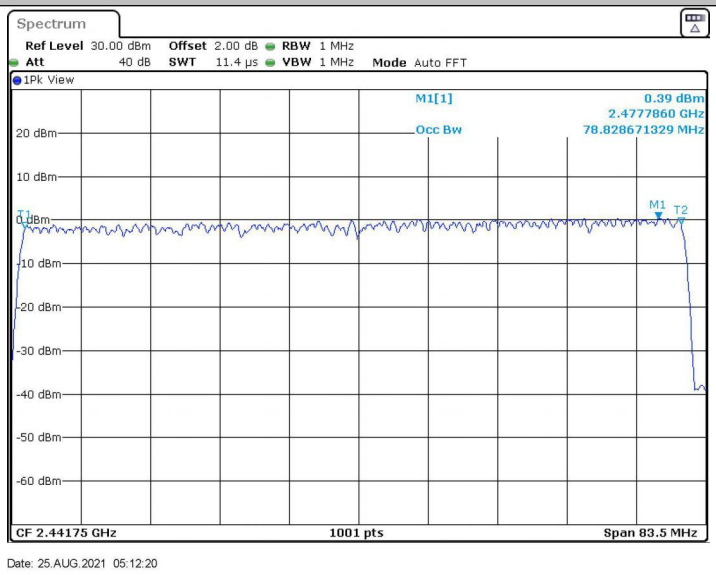
Result plot as follows:

Normal Voltage: DC3.7V

NTNV_DH5_Ant1_Hop



NTNV_2DH5_Ant1_Hop

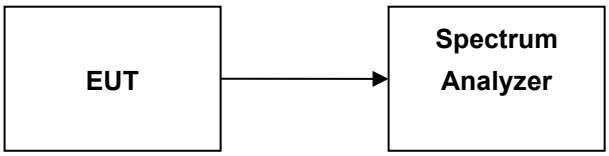


Test Result: The unit does meet the requirements.

6.7 Spread spectrum Bandwidth (90%)

Test Requirement:	Item 19 of Article 2-1 500 kHz or more
Text Method:	MIC Notice No.88 Appendix No.43
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:



Test Procedure:

1. Test Conditions:

   Spectrum Analyzer is used for measurement.

2. EUT conditions:

   Modulation/Spread/Hopping ON, Modulation Tx

   For equipment using diffusion code, set to the test diffusion code and modulate with standard coding test signal.

3. Spectrum Analyzer conditions:
   Frequency: Test Frequency
   Span 83.5MHz (FHSS),
   RBW 1 MHz
   VBW 1 MHz
   Sweep Time Auto
   detector mode Positive peak
   Indication mode Max hold

   OBW 90%

Test Result:

TestCondition	TestMode	Antenna	Channel	Result [MHz]	Limit [MHz]	Verdict
NTNV	DH5	Ant1	Hop	71.238	>=0.5	PASS
	2DH5	Ant1	Hop	71.405	>=0.5	PASS

Modulation	Test channels	Spreading factor			Limit
		Normal Voltage	High Voltage	Low Voltage	
		3.7V DC	4.07V DC	3.33V DC	
GFSK	79 channels (2402~2480)	71.238	/	/	＞5
(π/4)DQPSK	79 channels (2402~2480)	35.703	/	/	＞5

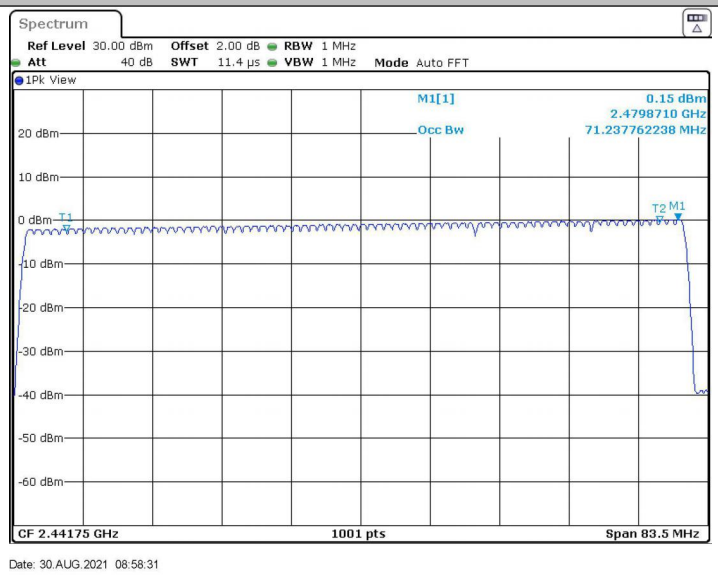
Remark: 1. Spreading factor = Spread bandwidth/ Transmission rate

2. Transmission rate of GFSK, (π/4)DQPSK are 1 Mbps, 2 Mbps

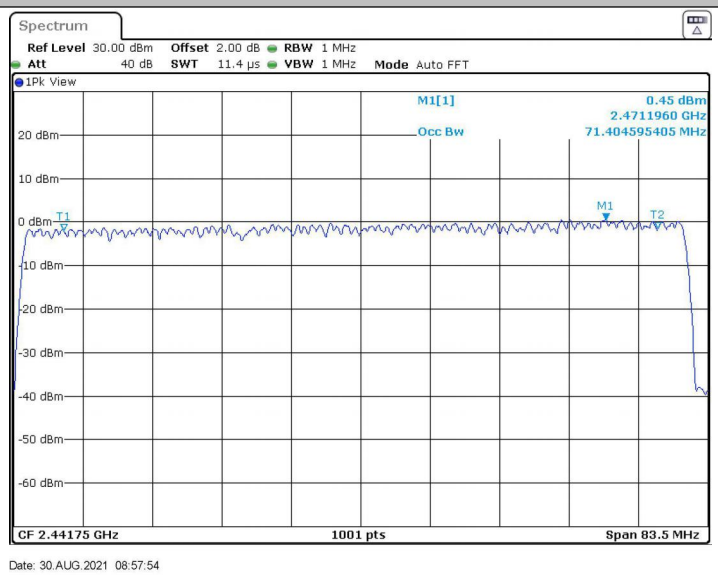
Result plot as follows:

Normal Voltage: DC3.7V

NTNV_DH5_Ant1_Hop



NTNV_2DH5_Ant1_Hop

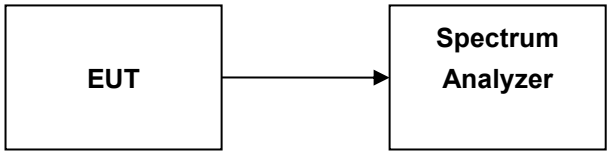


Test Result: The unit does meet the requirements.

6.8 Antenna Power

Test Requirement:	Item 19 of Article 2-1 2400-2427MHz, 2470.75-2483.5MHz: 10mW/MHz or less 2427-2470.75MHz: 3mW/MHz or less
Text Method:	MIC Notice No.88 Appendix No.43
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:



Test Procedure:

1. Test Conditions:

   Spectrum Analyzer is used for measurement.

2. EUT conditions:

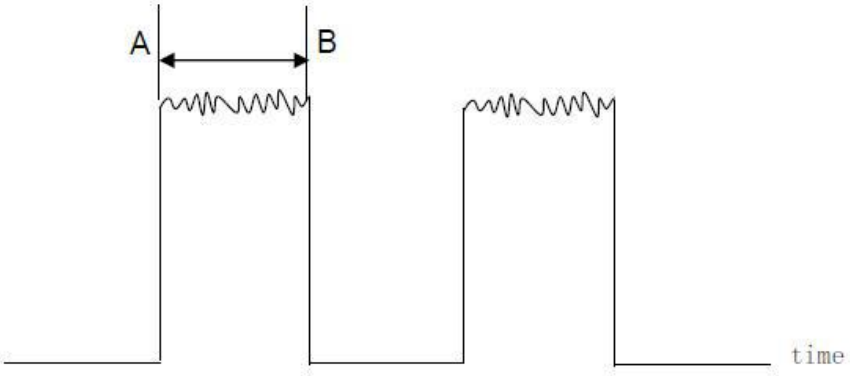
   Modulation/Spread/Hopping ON, Modulation Tx

   For equipment using diffusion code, set to the test diffusion code and modulate with standard coding test signal.

3. Spectrum Analyzer conditions:

   Center Frequency: Test Frequency
   Span: 2 times of occupied bandwidth
   RBW: 1 MHz
   VBW: 3 MHz
   Sweep Time: Auto
   detector mode: Positive peak
   Indication mode: Max hold

4. Spectrum Analyzer conditions(Measure of Antenna Power):
   Center Frequency: Frequency of Peak Power (Search Frequency by 3)
   Span: 0Hz
   RBW: 1 MHz
   VBW: 1 MHz
   Sweep Time: Auto
   detector mode: Positive peak
   Indication mode: Sample Average



Measures the Average Burst power （A to B)

Test Result:

GFSK:

Modulation	Test channels	Test Result			Item	Limit
		Normal Voltage	High Voltage	Low Voltage		
		3.7V DC	4.07V DC	3.33V DC		
GFSK	79 channels (2402~2480)	-1.62	/	/	Average Burst Power(dB)	/
		0.00966	/	/	Antenna power(mW/MHz)	≤3 mW /MHz
		-68.08	/	/	Antenna power Tolerance (%)	＋20% -80%
		-1.75	/	/	Antenna power(dBm/MHz)	/
		0.06	/	/	EIRP(dBm/MHz)	≤6.91dBm/MHz

(π/4)DQPSK:

Modulation	Test channels	Test Result			Item	Limit
		Normal Voltage	High Voltage	Low Voltage		
		3.7V DC	4.07V DC	3.33V DC		
(π/4)DQPSK	79 channels (2402~2480)	0.34	/	/	Average Burst Power(dB)	/
		0.03029	/	/	Antenna power(mW/MHz)	≤3 mW /MHz
		0	/	/	Antenna power Tolerance (%)	＋20% -80%
		-1.83	/	/	Antenna power(dBm/MHz)	/
		-0.02	/	/	EIRP(dBm/MHz)	≤6.91dBm/MHz

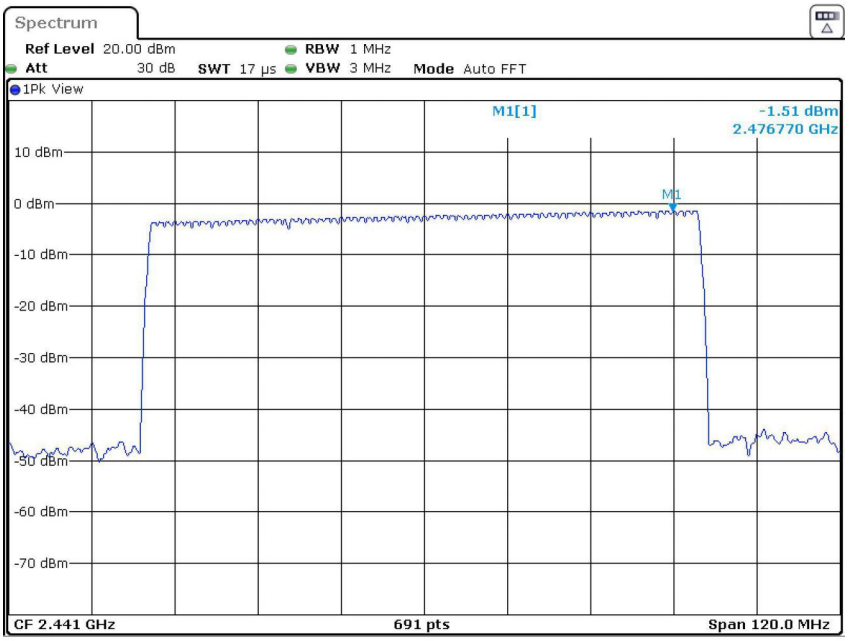
Remark:

1. Antenna power(mW/MHz)=Average Burst Power / Spread Band width
2. The “Spread Band width” please refer to section 7.6.
3. Tolerance (%) :[(test value- rate power)/rater power]*100
4. EIRP= Antenna power + Antenna Gain
5. Antenna Gain is 1.81 dBi
6. Rated power: 0.03029MW/MHz

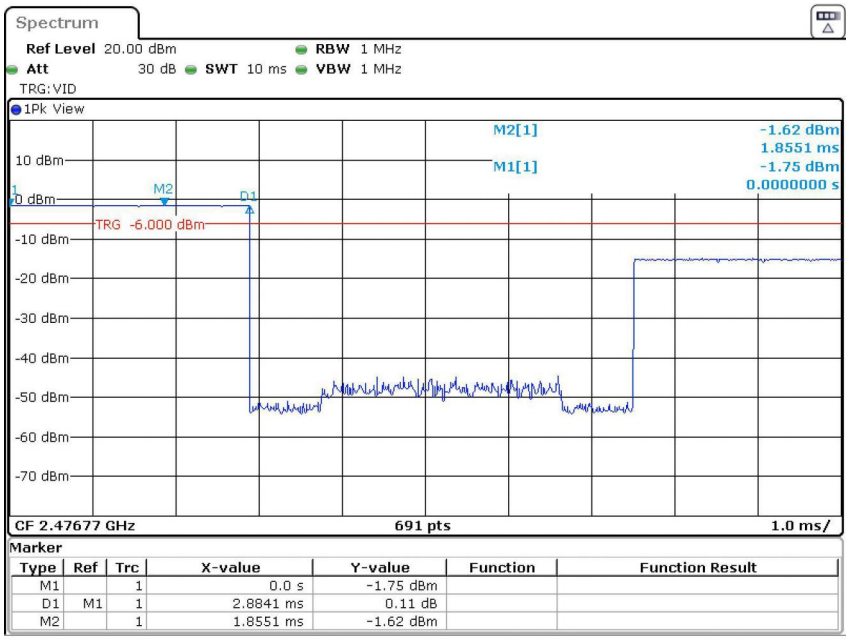
Result plot as follows:

Normal Voltage: DC3.7V

GFSK

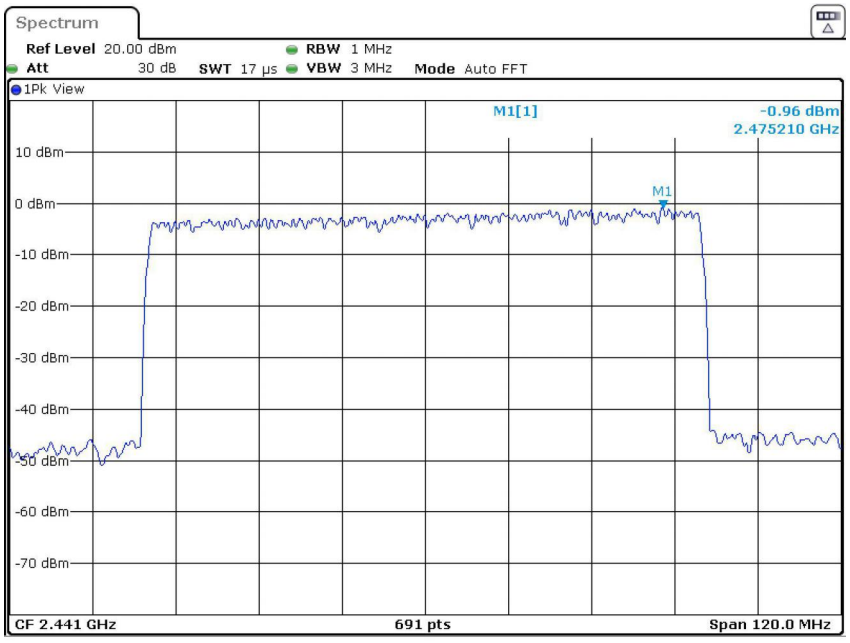


Date: 31.AUG.2021 13:44:29

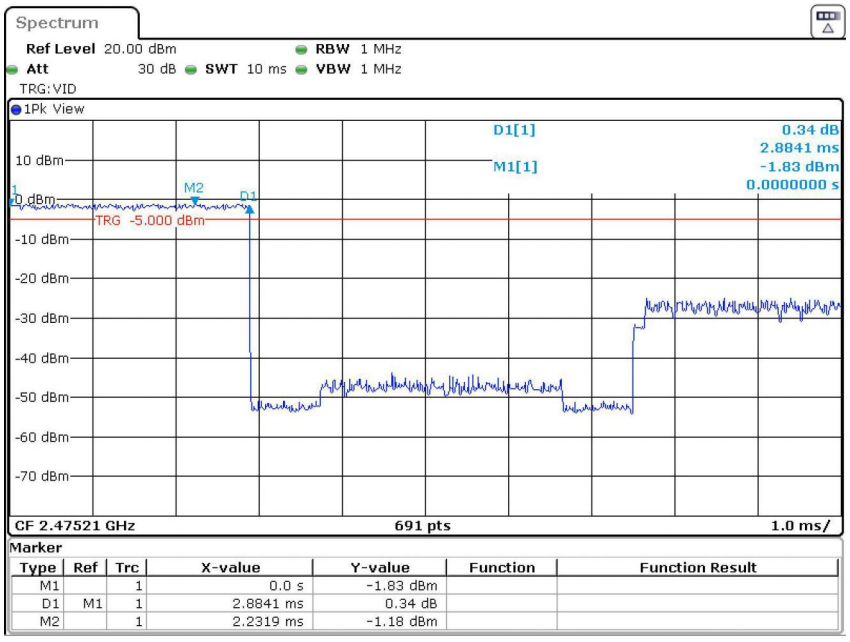


Date: 31.AUG.2021 13:45:55

(π/4)DQPSK



Date: 31.AUG.2021 13:41:14



Date: 31.AUG.2021 13:42:42

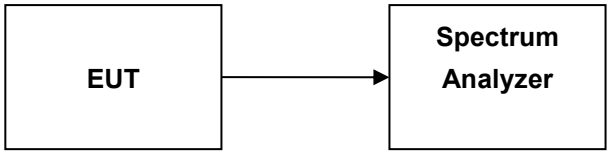
Remark: The “Spread Band width” please refer to section 7.6.

Test result: The unit does meet the requirements.

6.9 Spurious Emissions of Tx

Test Requirement:	Item 19 of Article 2-1
Text Method:	MIC Notice No.88 Appendix No.43
	(1) Below 2387 MHz: 2.5μW/MHz(-26dBm/MHz) (2) 2387 to 2400 MHz: 25μW/MHz(-16dBm/MHz) (3) 2483.5 through 2496.5 MHz: 25μW/MHz(-16dBm/MHz) (4) Over 2496.5 MHz: 2.5μW/MHz(-26dBm/MHz)
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:



Test Procedure:

1. Test Conditions:

   Spectrum Analyzer is used for measurement.

2. EUT conditions:

   Modulation/Spread/Hopping ON, , Modulation Tx

   For equipment using diffusion code, set to the test diffusion code and modulate with standard coding test signal.

3. Spectrum Analyzer conditions:

   Step 1
   All spurious are measured from 30 MHz to 13 GHz by peak mode.
   Step 2
   IF the value measured by Step1 is 2 dB or less, measure in average mode.
   Test setup for Step 1:
   Frequency: 30 MHz – 1000 MHz
   RBW 100 KHz
   VBW 100 KHz
   Sweep Time Auto
   detector mode Positive peak
   Indication mode Max hold

   Frequency: 1000 MHz – 2400 MHz , 2483.5 MHz –13 GHz
   RBW 1 MHz
   VBW 1 MHz
   Sweep Time Auto
   detector mode Positive peak
   Indication mode Max hold

Test setup for Step 2:
Frequency: Spurious Frequency
RBW 1 MHz
VBW 1 MHz
Sweep Time Auto
detector mode Sample
Indication mode Max hold

Test Result:

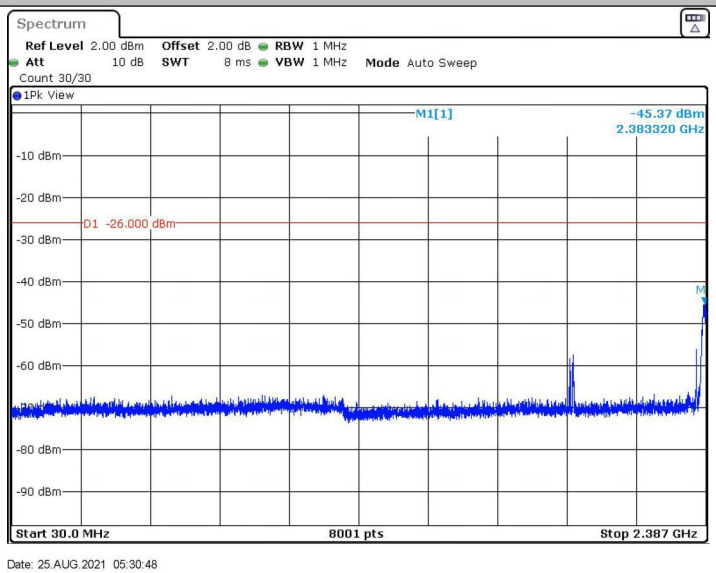
TestCondition	TestMode	Antenna	Channel	Freq.Range [MHz]	Result [dBm]	Limit [dBm]	Verdict
NTNV	DH5	Ant1	2402	30~2387	-45.37	<=-26	PASS
				2387~2400	-39.16	<=-16	PASS
				2483.5~2496.5	-65.46	<=-16	PASS
				2496.5~13000	-40.81	<=-26	PASS
			2441	30~2387	-51.15	<=-26	PASS
				2387~2400	-54.43	<=-16	PASS
				2483.5~2496.5	-54.33	<=-16	PASS
				2496.5~13000	-40.75	<=-26	PASS
			2480	30~2387	-57.15	<=-26	PASS
				2387~2400	-65.89	<=-16	PASS
				2483.5~2496.5	-43.29	<=-16	PASS
				2496.5~13000	-41.29	<=-26	PASS
	2DH5	Ant1	2402	30~2387	-46.39	<=-26	PASS
				2387~2400	-34.99	<=-16	PASS
				2483.5~2496.5	-65.81	<=-16	PASS
				2496.5~13000	-40.76	<=-26	PASS
			2441	30~2387	-55.55	<=-26	PASS
				2387~2400	-54.31	<=-16	PASS
				2483.5~2496.5	-54.48	<=-16	PASS
				2496.5~13000	-40.85	<=-26	PASS
			2480	30~2387	-51.54	<=-26	PASS
				2387~2400	-65.57	<=-16	PASS
				2483.5~2496.5	-43.33	<=-16	PASS
				2496.5~13000	-41.34	<=-26	PASS

Test Result:

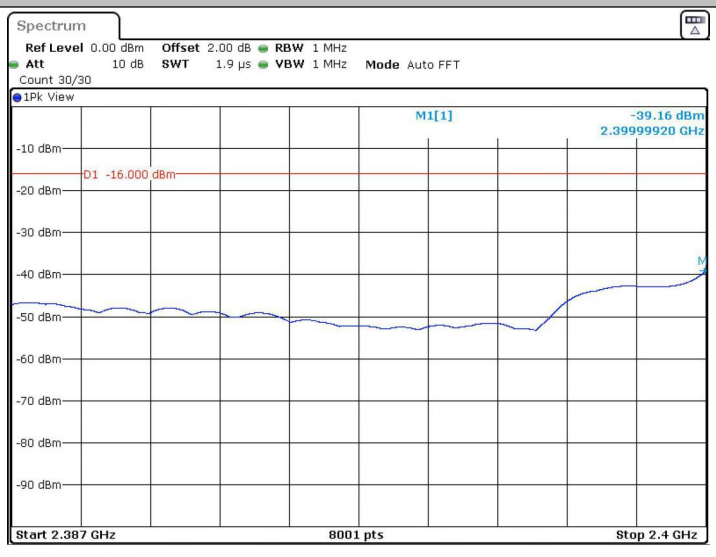
Result plot as follows:

Normal Voltage DC3.7V

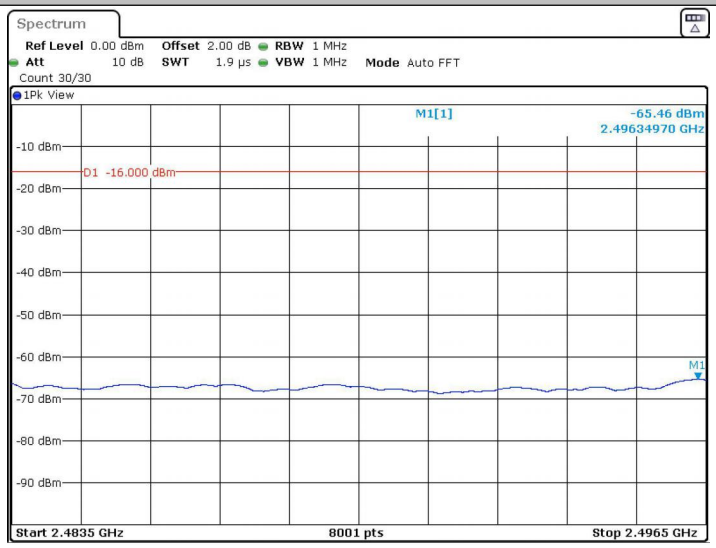
NTNV_DH5_Ant1_2402_30~2387



NTNV_DH5_Ant1_2402_2387~2400

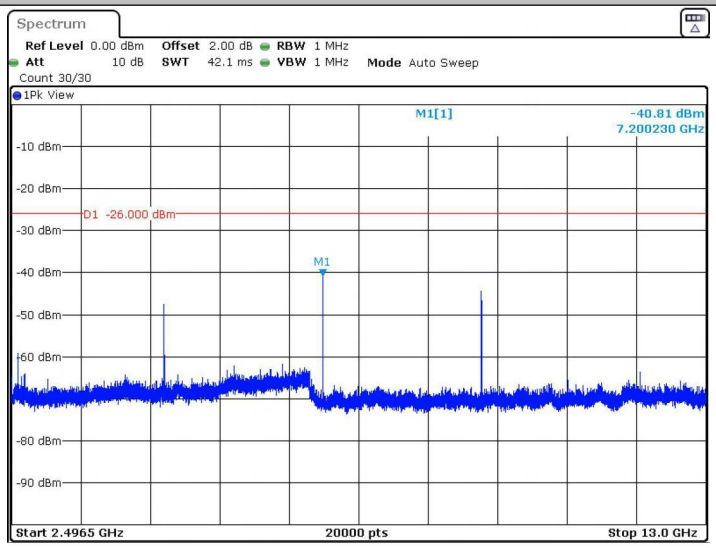


NTNV_DH5_Ant1_2402_2483.5~2496.5



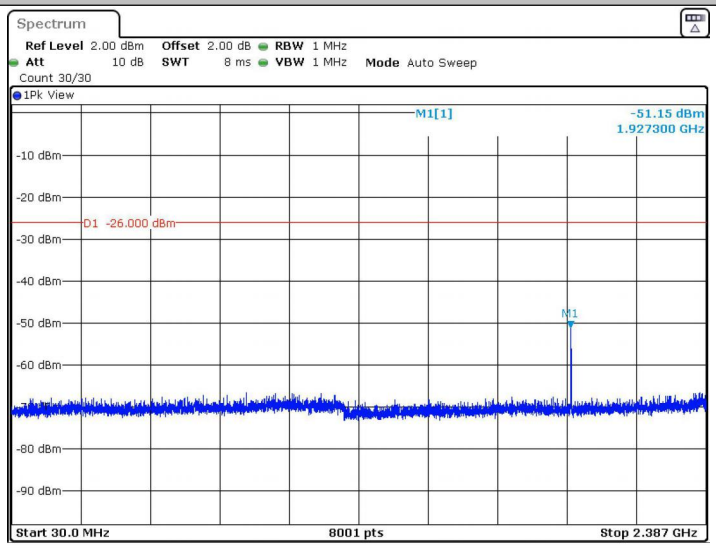
Date: 25.AUG.2021 05:31:03

NTNV_DH5_Ant1_2402_2496.5~13000



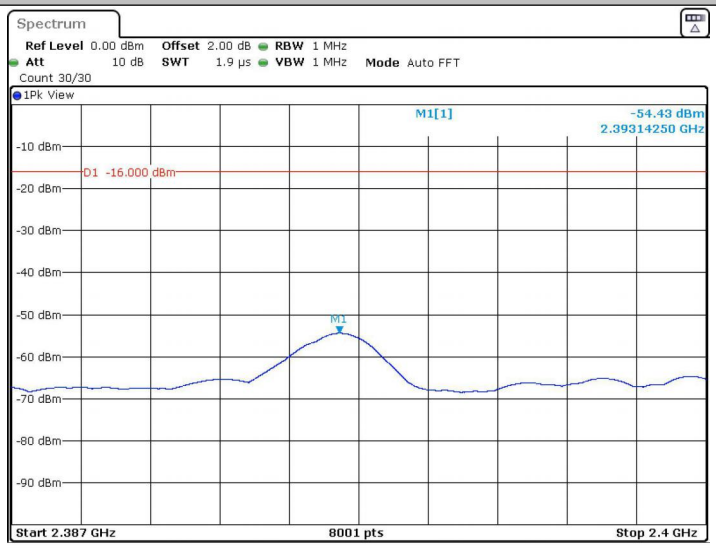
Date: 25.AUG.2021 05:31:12

NTNV_DH5_Ant1_2441_30~2387



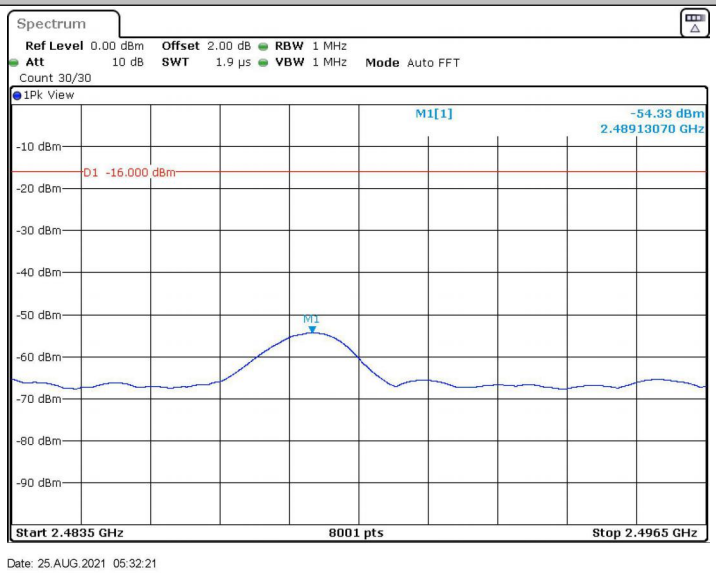
Date: 25.AUG.2021 05:32:06

NTNV_DH5_Ant1_2441_2387~2400



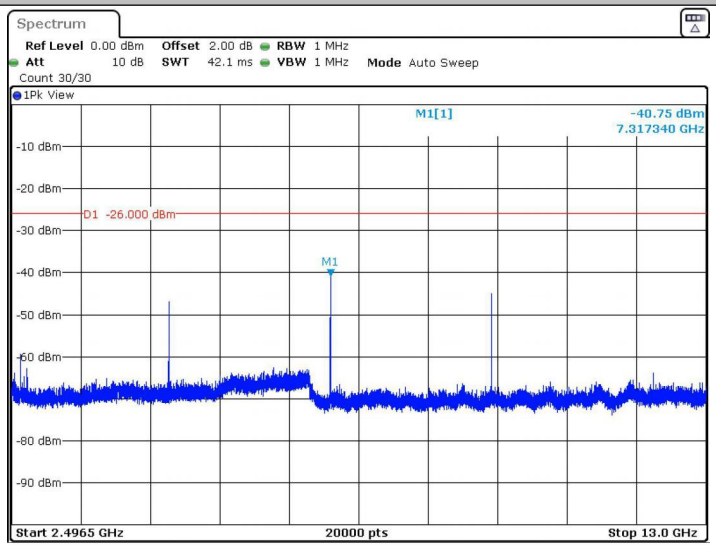
Date: 25.AUG.2021 05:32:14

NTNV_DH5_Ant1_2441_2483.5~2496.5



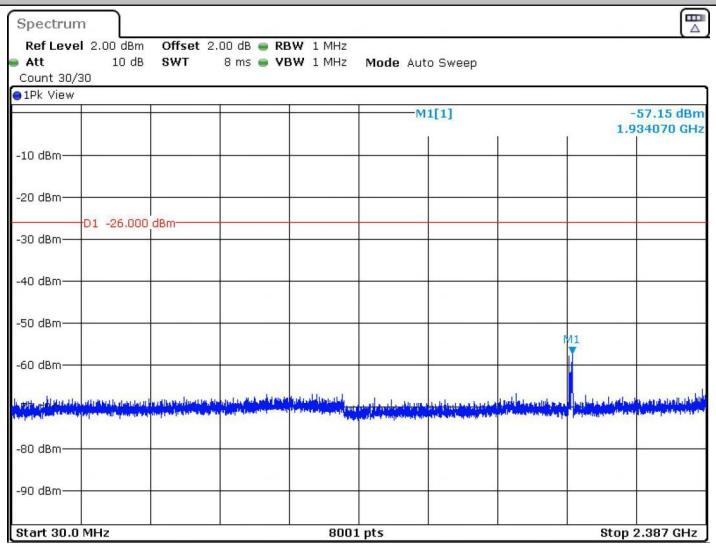
Date: 25.AUG.2021 05:32:21

NTNV_DH5_Ant1_2441_2496.5~13000



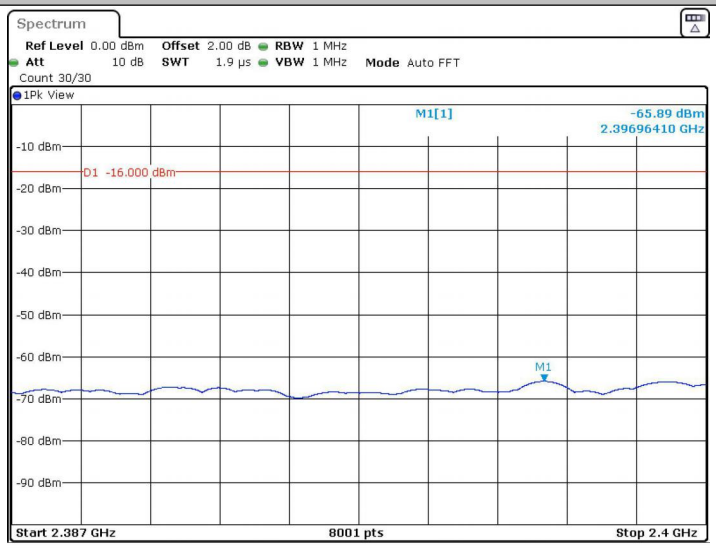
Date: 25.AUG.2021 05:32:30

NTNV_DH5_Ant1_2480_30~2387



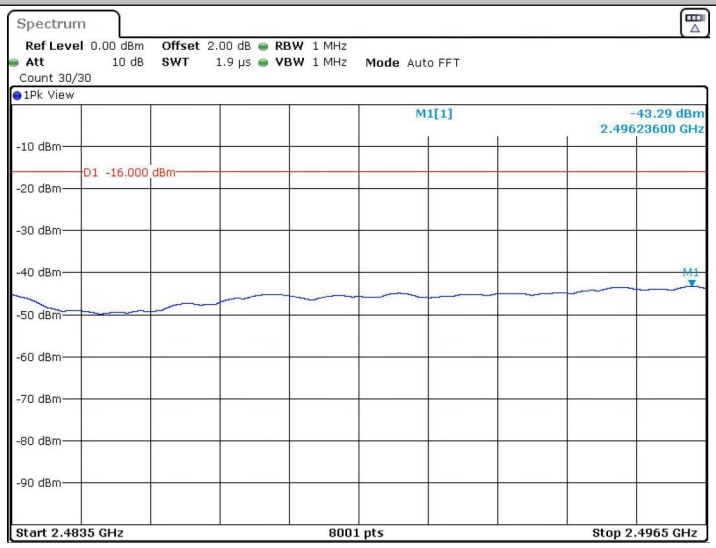
Date: 25.AUG.2021 05:33:05

NTNV_DH5_Ant1_2480_2387~2400



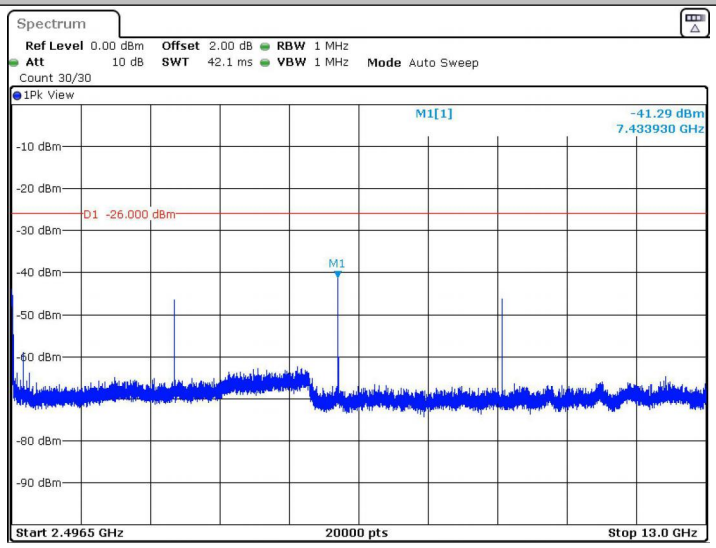
Date: 25.AUG.2021 05:33:12

NTNV_DH5_Ant1_2480_2483.5~2496.5



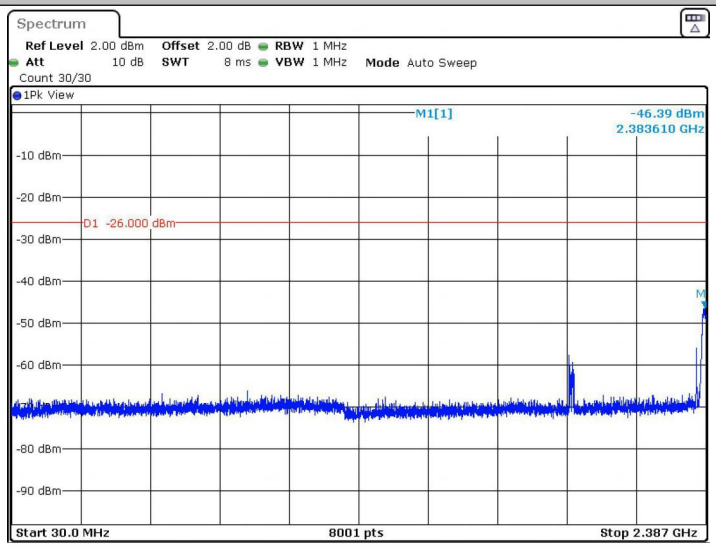
Date: 25.AUG.2021 05:33:19

NTNV_DH5_Ant1_2480_2496.5~13000



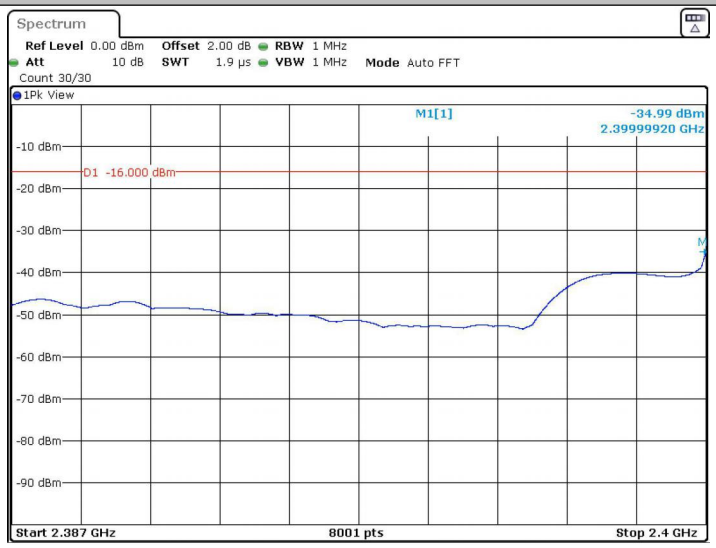
Date: 25.AUG.2021 05:33:28

NTNV_2DH5_Ant1_2402_30~2387



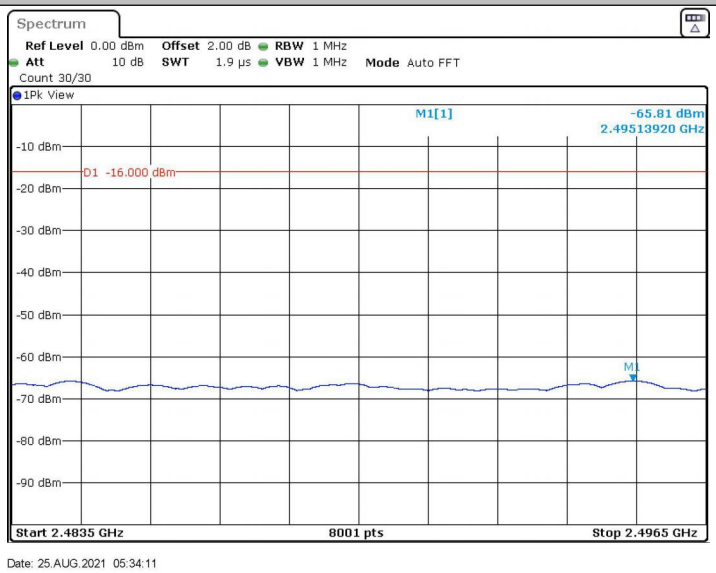
Date: 25.AUG.2021 05:33:56

NTNV_2DH5_Ant1_2402_2387~2400



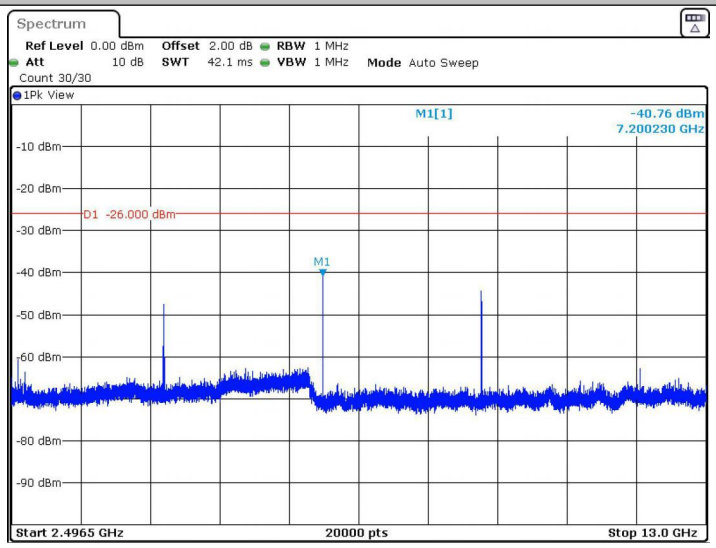
Date: 25.AUG.2021 05:34:04

NTNV_2DH5_Ant1_2402_2483.5~2496.5



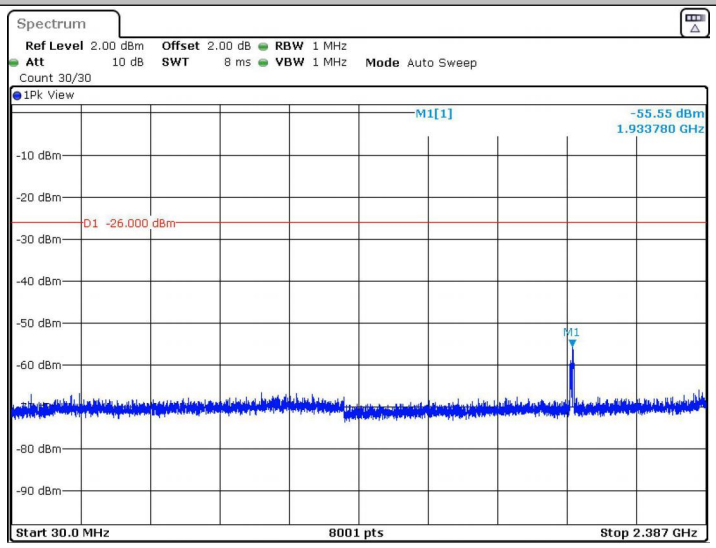
Date: 25.AUG.2021 05:34:11

NTNV_2DH5_Ant1_2402_2496.5~13000



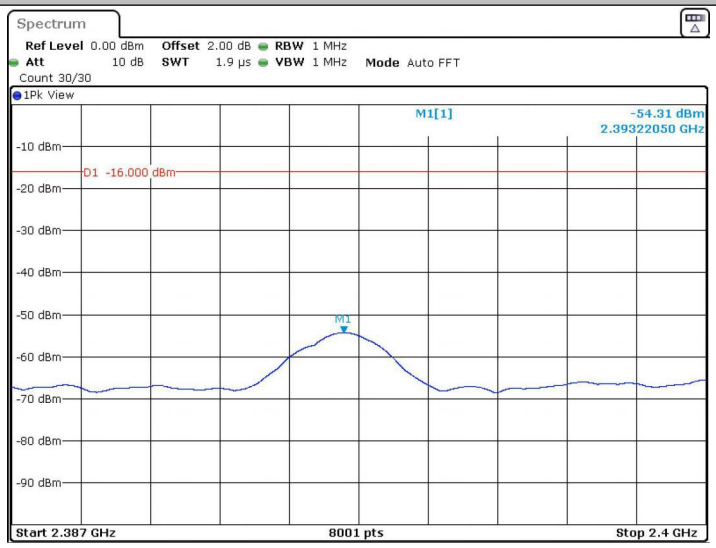
Date: 25.AUG.2021 05:34:20

NTNV_2DH5_Ant1_2441_30~2387



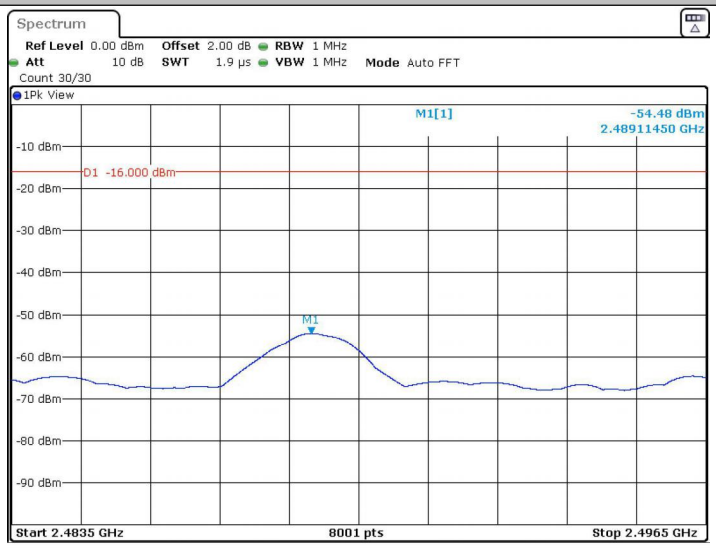
Date: 25.AUG.2021 05:35:01

NTNV_2DH5_Ant1_2441_2387~2400



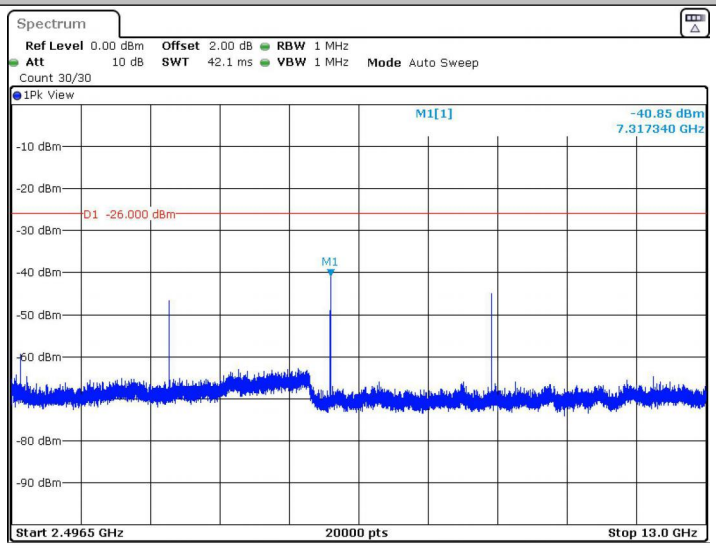
Date: 25.AUG.2021 05:35:08

NTNV_2DH5_Ant1_2441_2483.5~2496.5



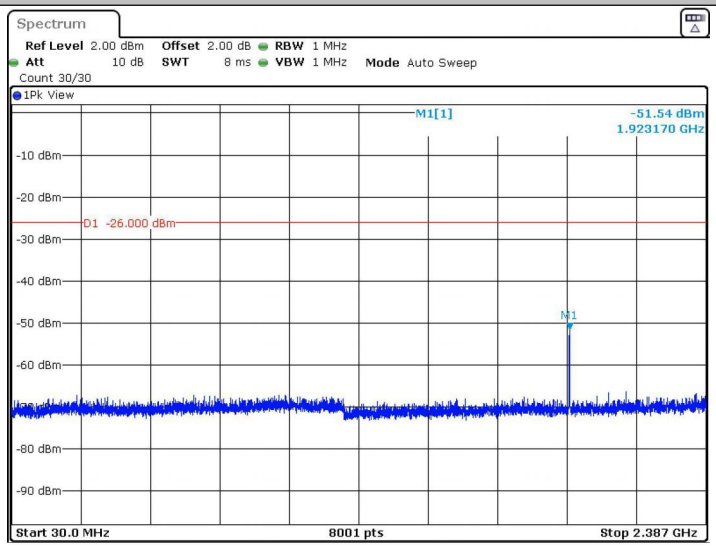
Date: 25.AUG.2021 05:35:16

NTNV_2DH5_Ant1_2441_2496.5~13000



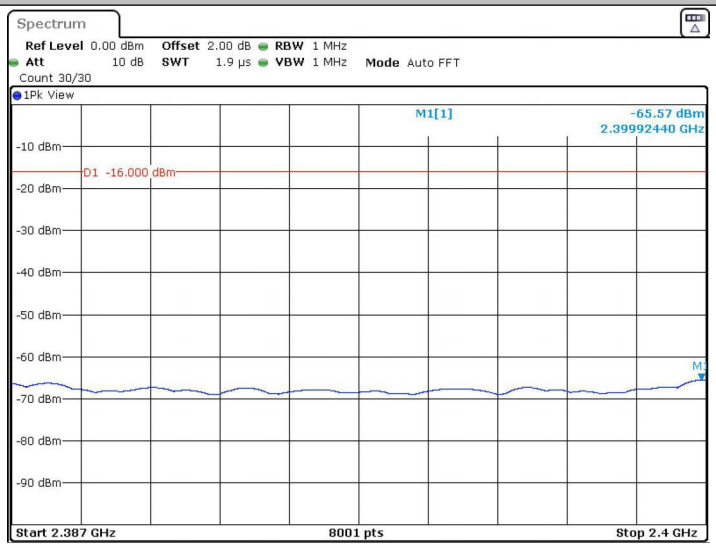
Date: 25.AUG.2021 05:35:25

NTNV_2DH5_Ant1_2480_30~2387



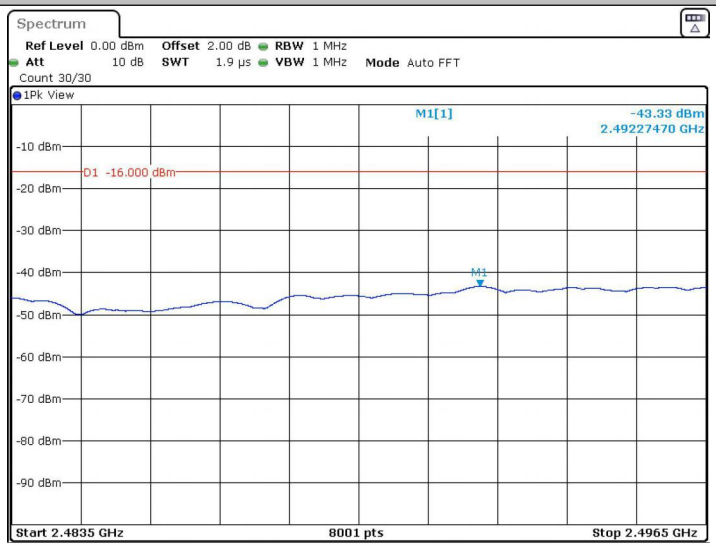
Date: 25.AUG.2021 05:36:00

NTNV_2DH5_Ant1_2480_2387~2400



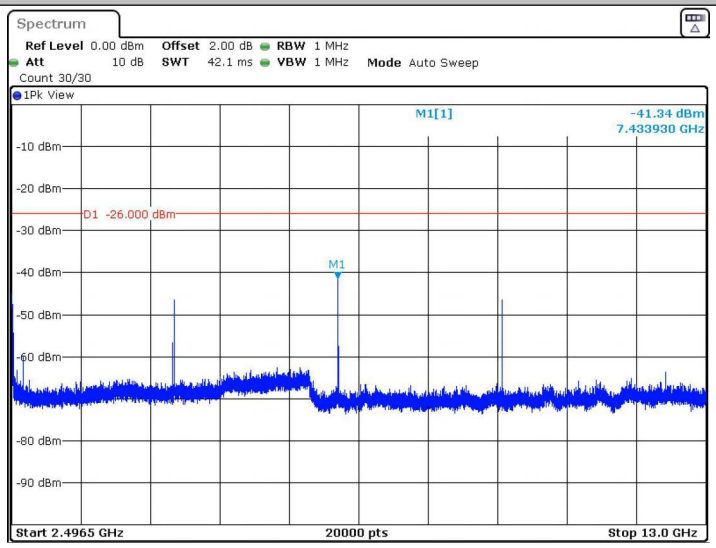
Date: 25.AUG.2021 05:36:07

NTNV_2DH5_Ant1_2480_2483.5~2496.5



Date: 25.AUG.2021 05:36:15

NTNV_2DH5_Ant1_2480_2496.5~13000



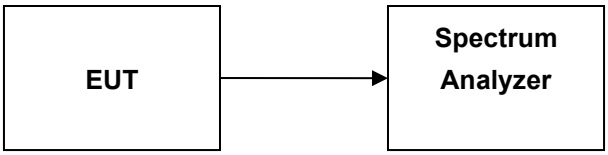
Date: 25.AUG.2021 05:36:24

Test Result: The unit does meet the requirements.

6.10 Dwell Time

Test Requirement:	Item 19 of Article 2-1 less than 0.4sec
Text Method:	MIC Notice No.88 Appendix No.43
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:



Test Procedure:

1. Test Conditions:

   Spectrum Analyzer is used for measurement.

2. 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.

3. 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)

4. Calculation procedure :

   Dwell time = (0.4(s) x [spreading rate] x [Transmission time of 1 burst(s)]) / ([burst cycle(s)] x [No. of hopping channel])
   Note:
   * Spreading rate = [Spread bandwidth (actual measurement value)] / [Transmission rate]

Test Result:

TestCondition	TestMode	Antenna	Channel	BurstWidth [ms]	Period [ms]	Result [s]	Limit [s]	Verdict
NTNV	DH5	Ant1	2402	2.87	3.73	0.31	<0.4	PASS
			2441	2.87	3.73	0.31	<0.4	PASS
			2480	2.87	3.73	0.31	<0.4	PASS
	2DH5	Ant1	2402	2.87	3.73	0.31	<0.4	PASS
			2441	2.87	3.73	0.31	<0.4	PASS
			2480	2.87	3.73	0.31	<0.4	PASS

Remark: Calculated method: Dwell time = (0.4(s) x [spreading rate] x [Transmission time of 1 burst(s)])/ ([burst cycle(s)] x [No. of hopping channel])

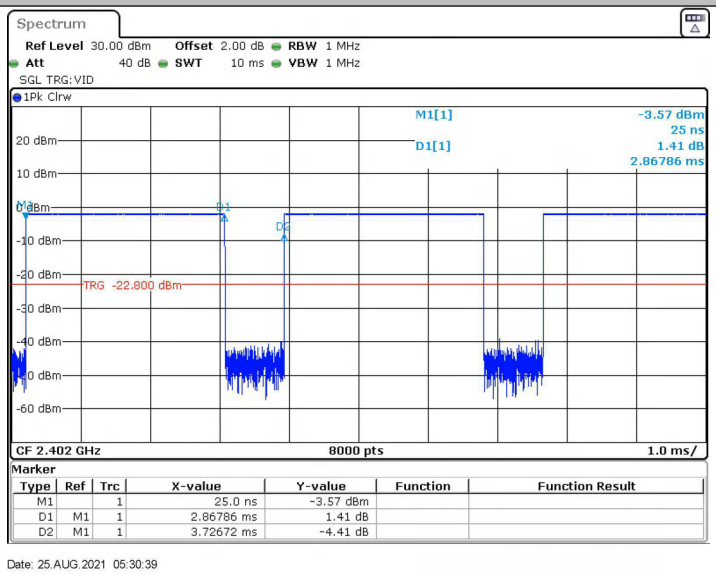
Note: Spreading rate = [Spread bandwidth (actual measurement value)]/[Transmission rate]

Transmission rate is GFSK:1.0 Mbps,(π/4)DQPSK:2.0 Mbps

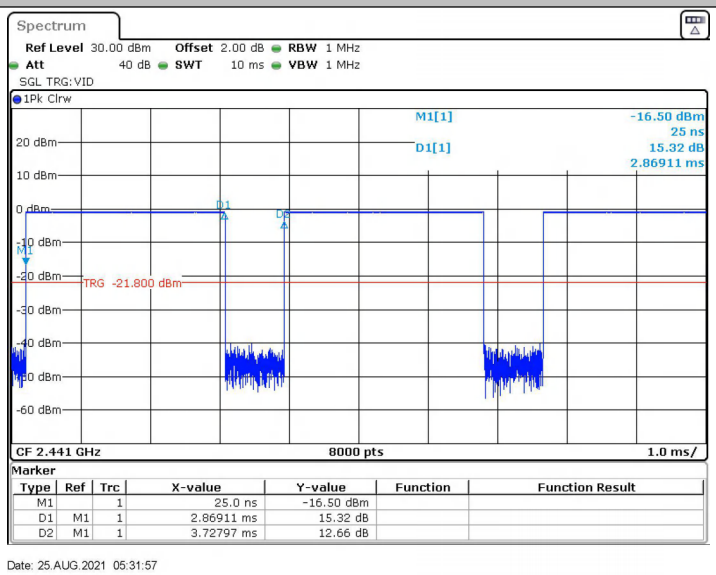
Result plot as follows:

Normal Voltage: DC3.7V

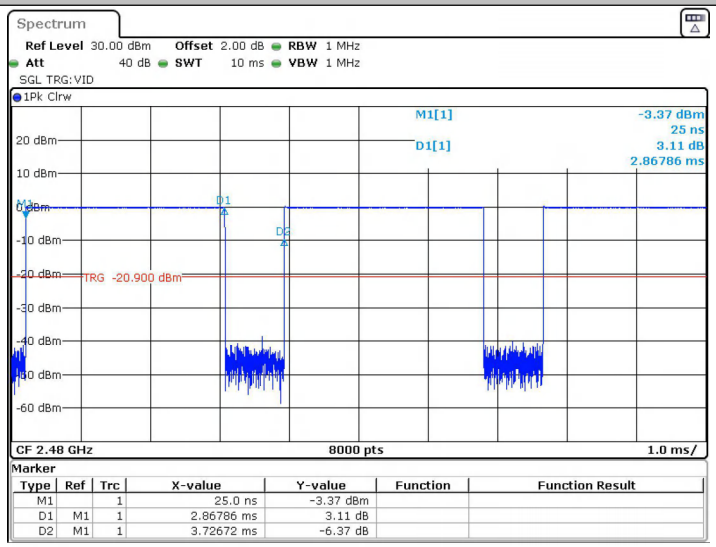
NTNV_DH5_Ant1_2402



NTNV_DH5_Ant1_2441

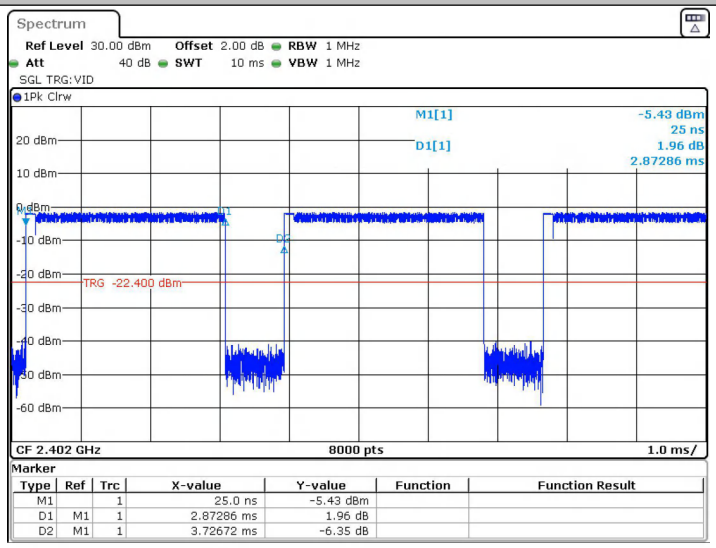


NTNV_DH5_Ant1_2480



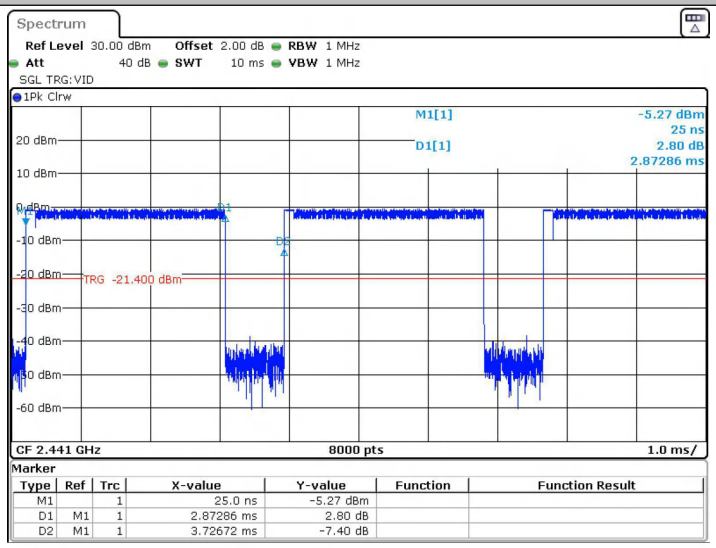
Date: 25.AUG.2021 05:32:56

NTNV_2DH5_Ant1_2402

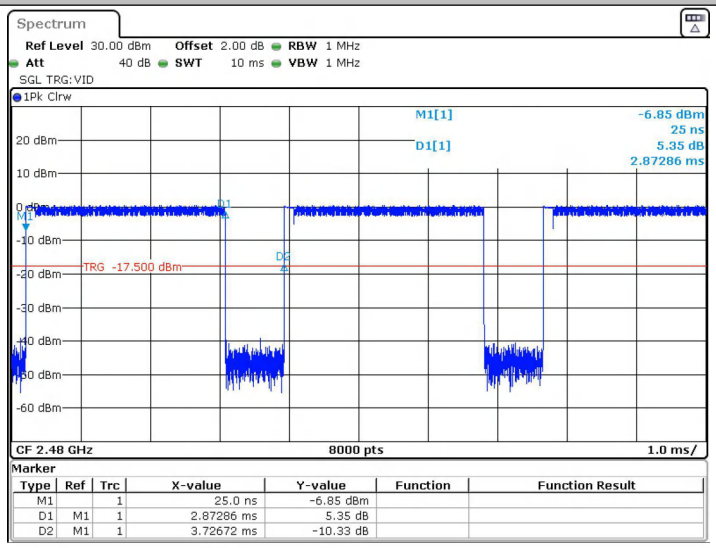


Date: 25.AUG.2021 05:34:33

NTNV_2DH5_Ant1_2441



NTNV_2DH5_Ant1_2480



Test Result: The unit does meet the requirements.

6.11 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.

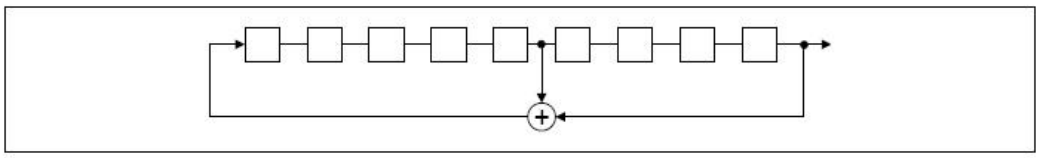
EUT Pseudorandom Frequency Hopping Sequence

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

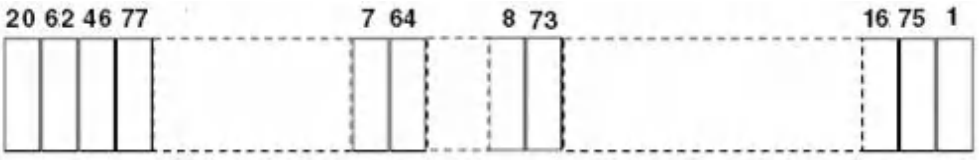
• Length of pseudo-random sequence: 2^9 -1 = 511 bits

• 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.

6.12 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.

Tamper proof Declaration:

☐ 1. Sealed with special screws.

☐ 2. Plastic chassis is being welded using ultrasonic waves.

☐ 3. Chassis is glued using a special adhesive.

☐ 4. Metal covers are spot-fused.

☐ 5. Cover is specially interlocked.

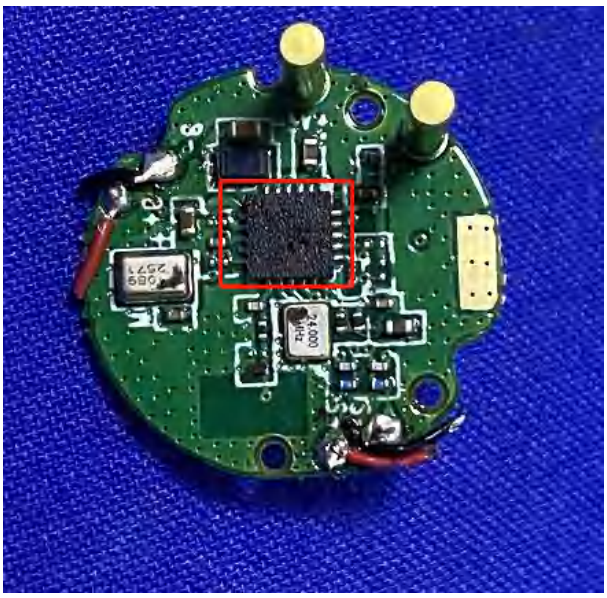
☐ 6. RF and Modulation components are covered with shielding case and this shielding case is soldered.

☐ 7. Shield case is welded at RF and modulation parts, and ID-ROM is welded using the BGA Method.

☐ 8. Shield case is welded at RF and modulation parts, and ID-ROM is glued at its lead with a special adhesive.

☐ 9. Shield case is welded at RF and modulation parts, and ID-ROM is glued with a non-transparent laminating agent.

☒ 10. RF and Modulation parts are mounted on PCB with surface mount technology, and there is no any adjustable parts on PCB or adjustable parts are not exposed.

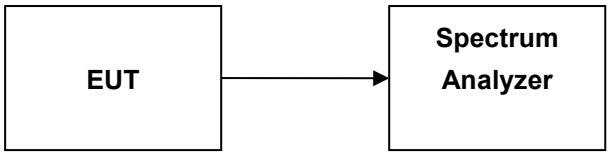


Result: Method used to meet "can not open easily requirement" is welded using ultrasonic waves, Any attempt to modify the RF chip will void the normal operation of this device.

6.13 Spurious Emissions of Rx

Test Requirement:	Item 19 of Article 2-1
Text Method:	MIC Notice No.88 Appendix No.43
	(1) Below 1 GHz : 4 nW(-54dBm) or less (2) 1 GHz and over : 20 nW(-47dBm) or less
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:



Test Procedure:

1. Test Conditions:
   Spectrum Analyzer is used for measurement.
2. EUT conditions:
   Modulation/Spread/Hopping ON
   For equipment using diffusion code, set to the test diffusion code and modulate with standard coding test signal.
3. Spectrum Analyzer conditions:
   Step 1
   All spurious are measured from 30 MHz to 13 GHz by peak mode.
   Step 2
   IF the value measured by Step1 is 2 dB or less, measure in average mode.
   Test setup for Step 1:
   Frequency: 30 MHz – 2400 MHz , 2483.5 MHz –13 GHz
   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
   Test setup for 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

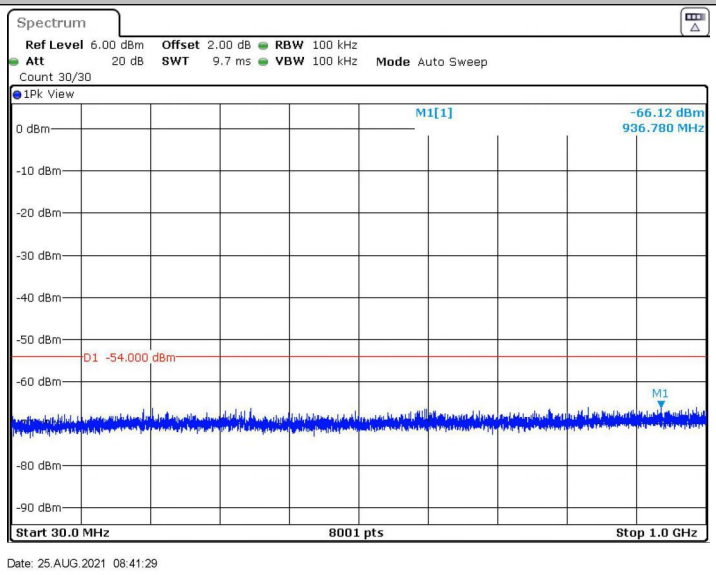
Test Result:

TestCondition	TestMode	Antenna	Channel	Freq.Range [MHz]	Result [dBm]	Limit [dBm]	Verdict
NTNV	DH5	Ant1	2480	30~1000	-65.99	<=-54	PASS
				1000~13000	-53.05	<=-47	PASS
	2DH5	Ant1	2441	30~1000	-66.04	<=-54	PASS
				1000~13000	-53.15	<=-47	PASS

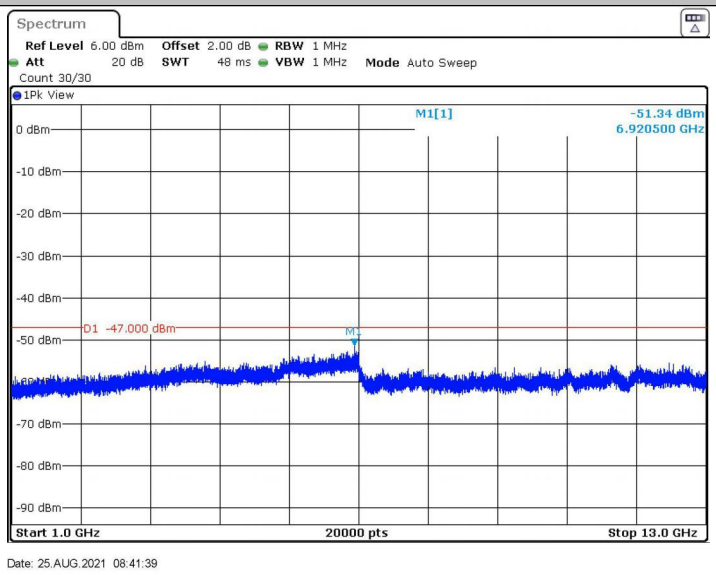
Result plot as follows:

Normal Voltage DC3.7V

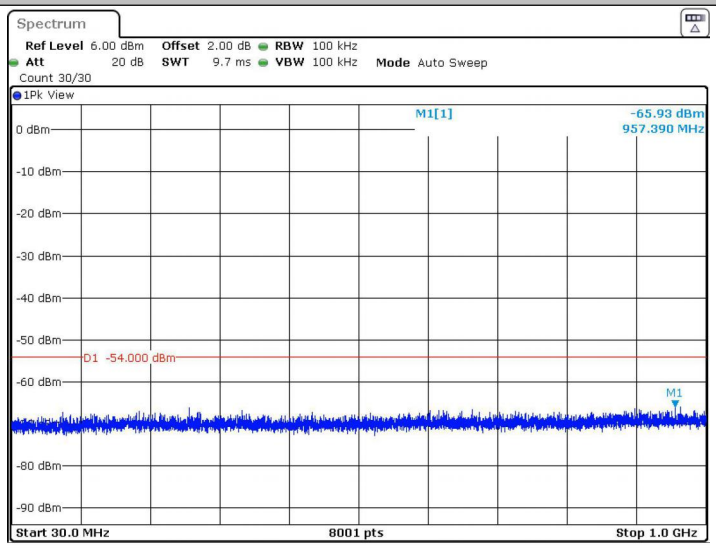
NTNV_DH5_Ant1_2480_30~1000



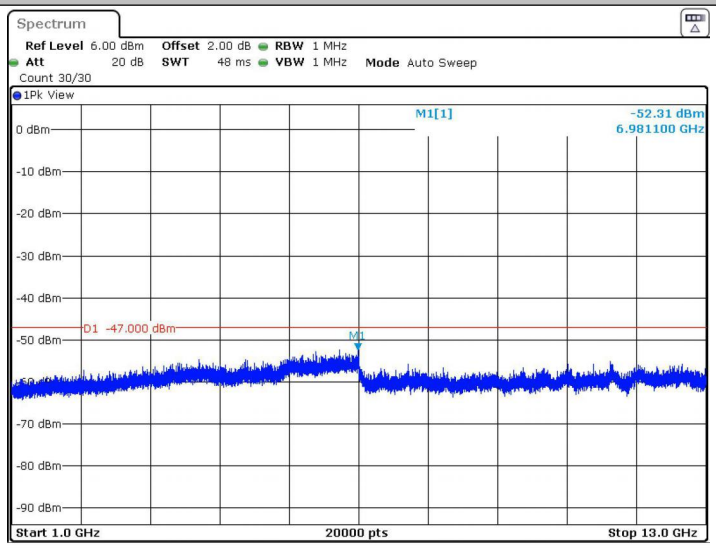
NTNV_DH5_Ant1_2480_1000~13000



NTNV_2DH5_Ant1_2441_30~1000

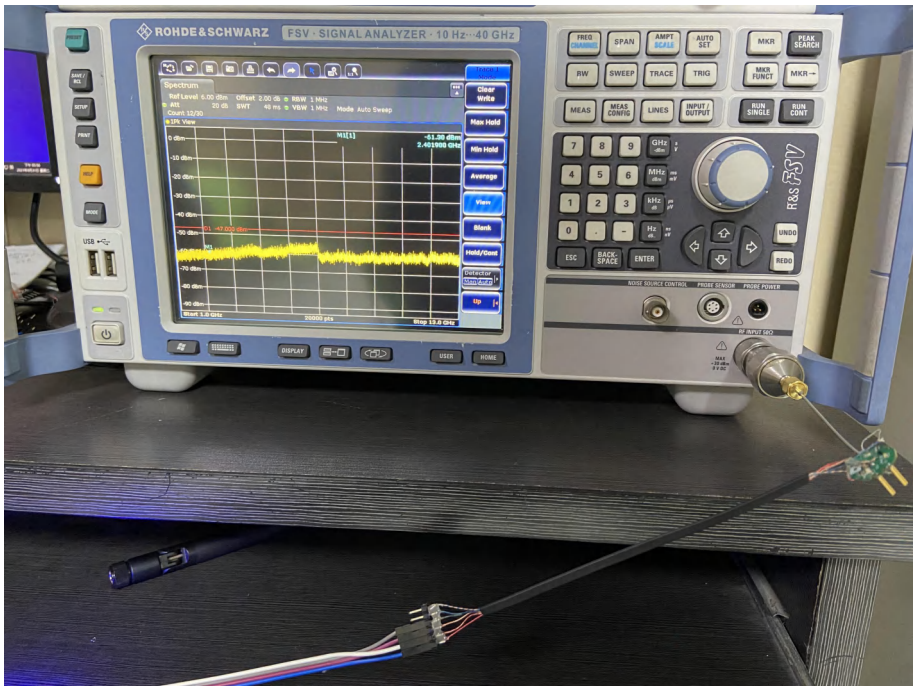


NTNV_2DH5_Ant1_2441_1000~13000

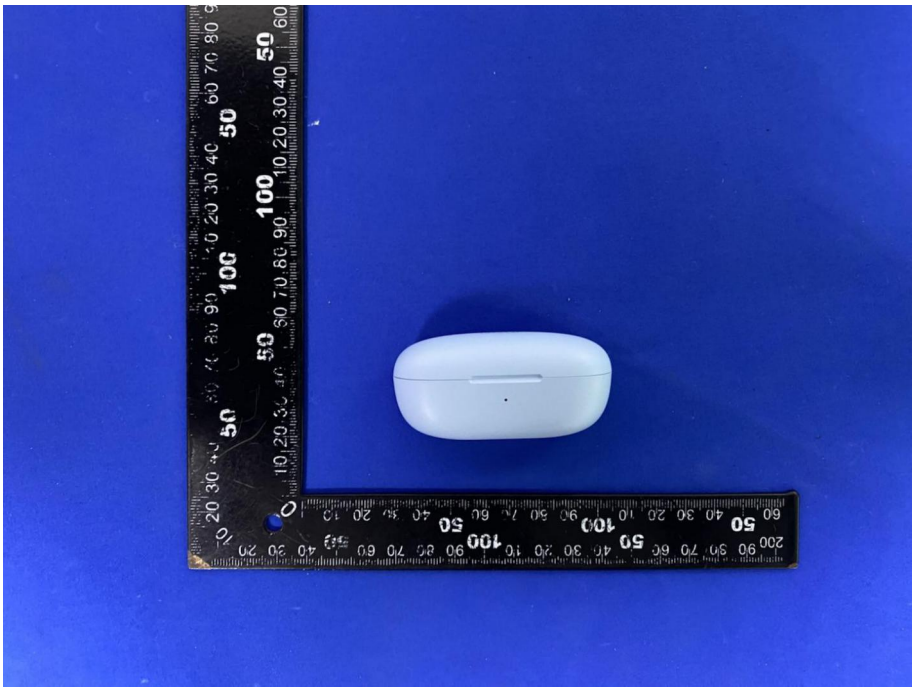


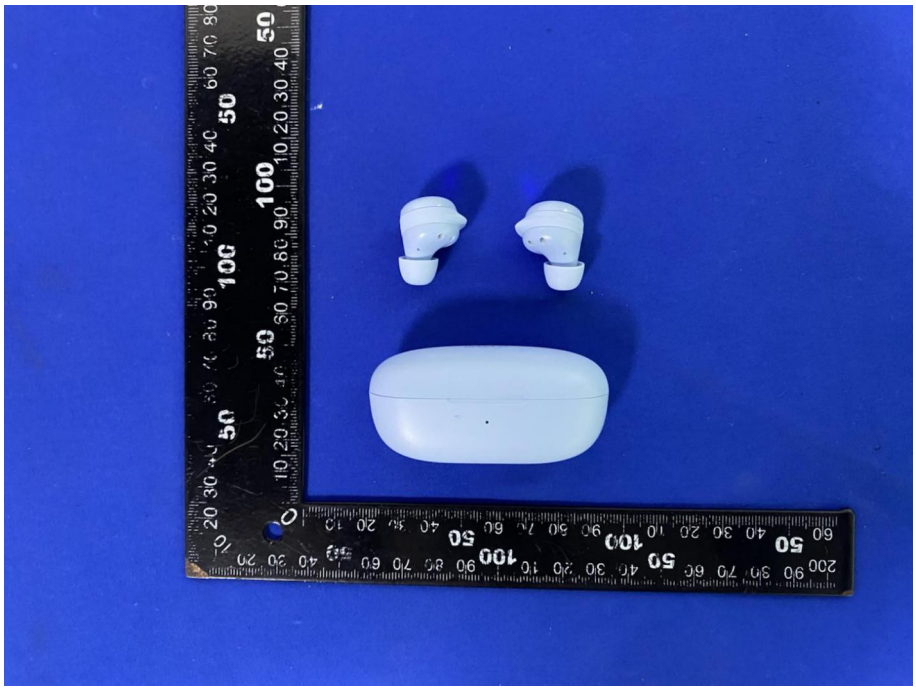
7 Photographs

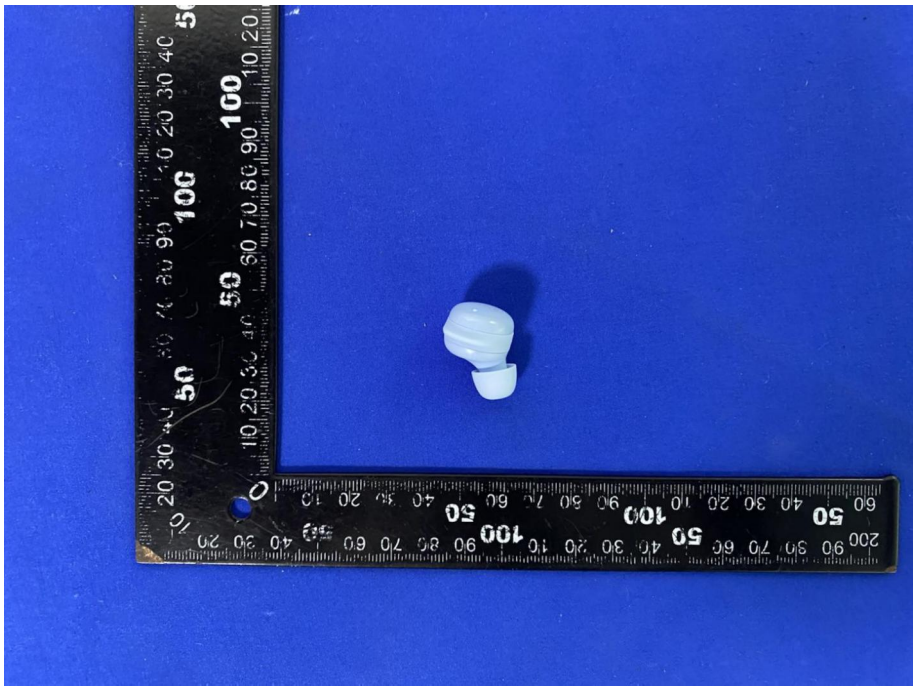
7.1 Test Setup

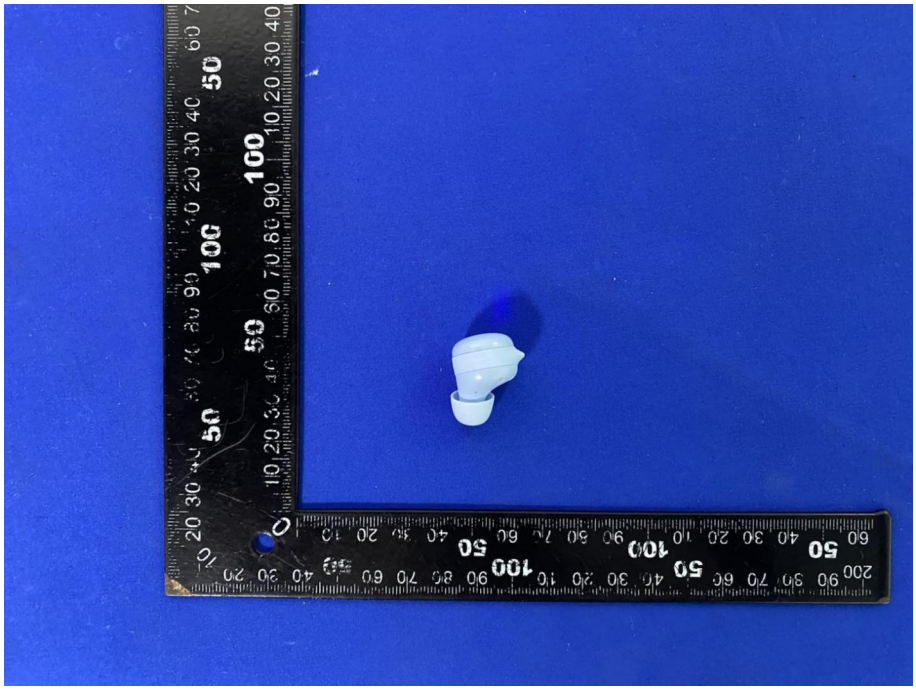


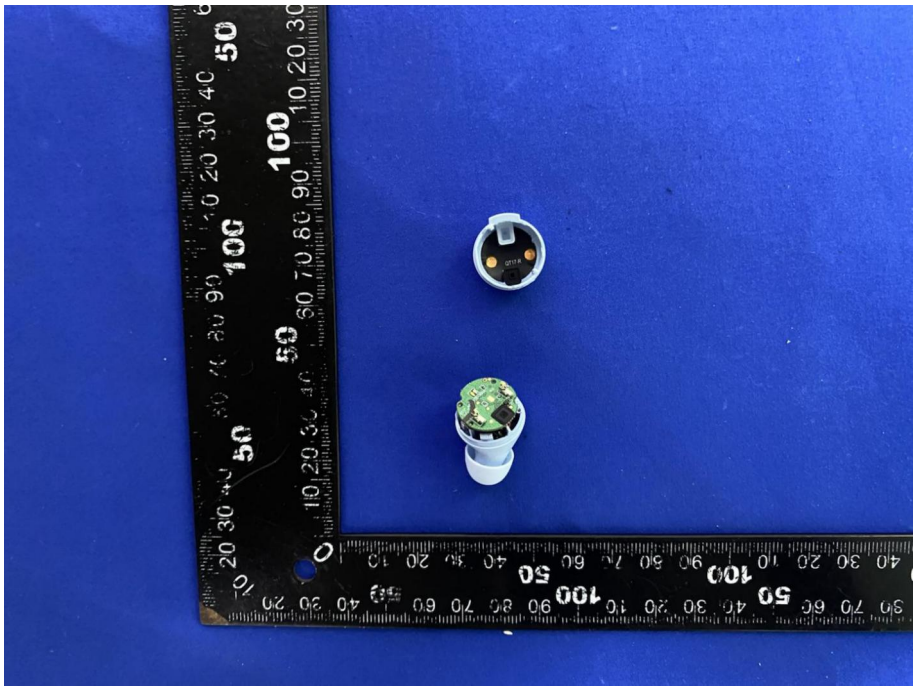
Test model No.: BH21Q17A

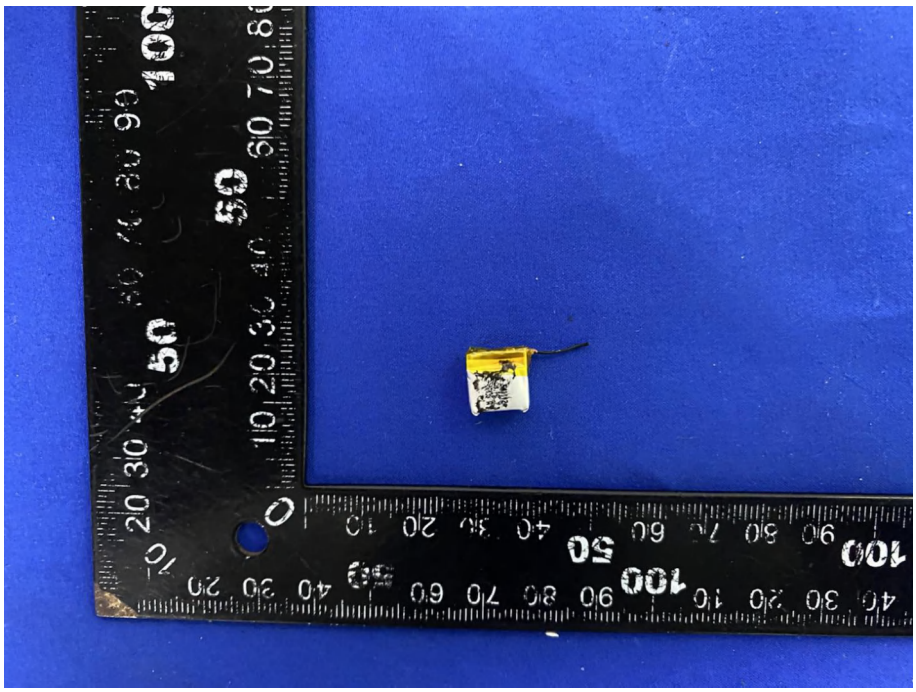


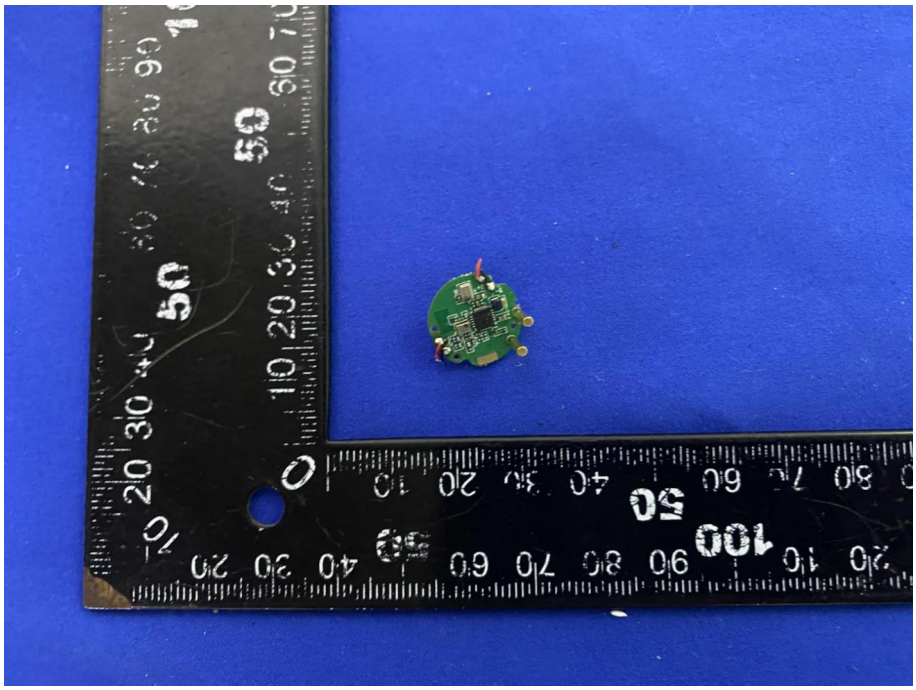


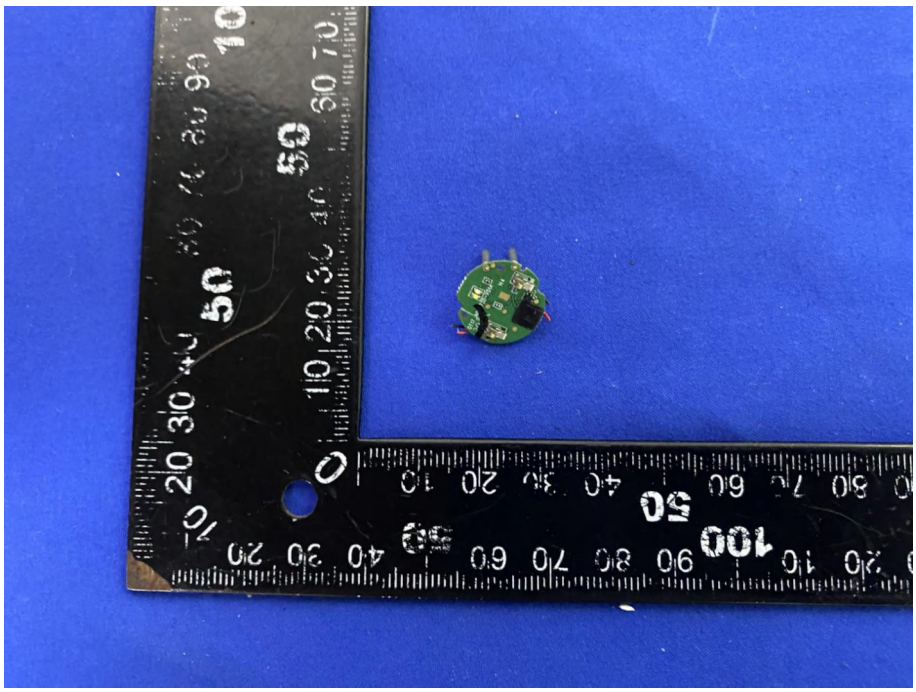


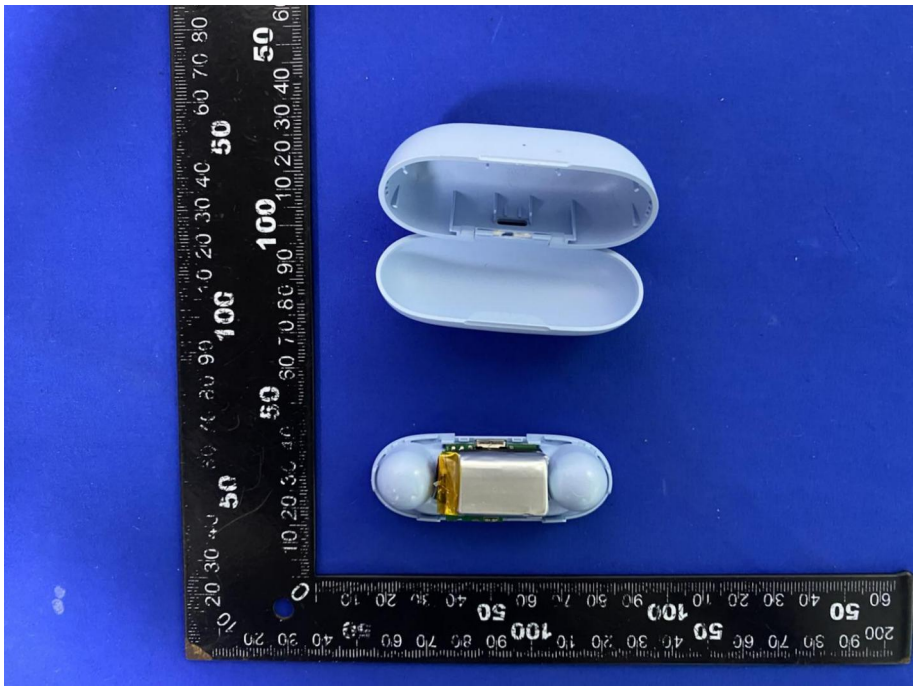


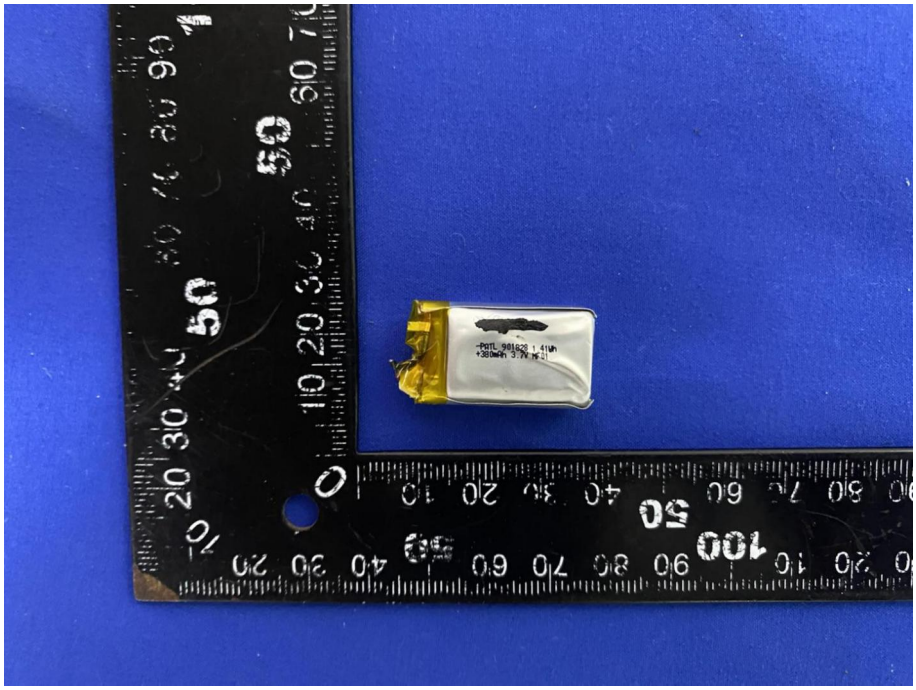


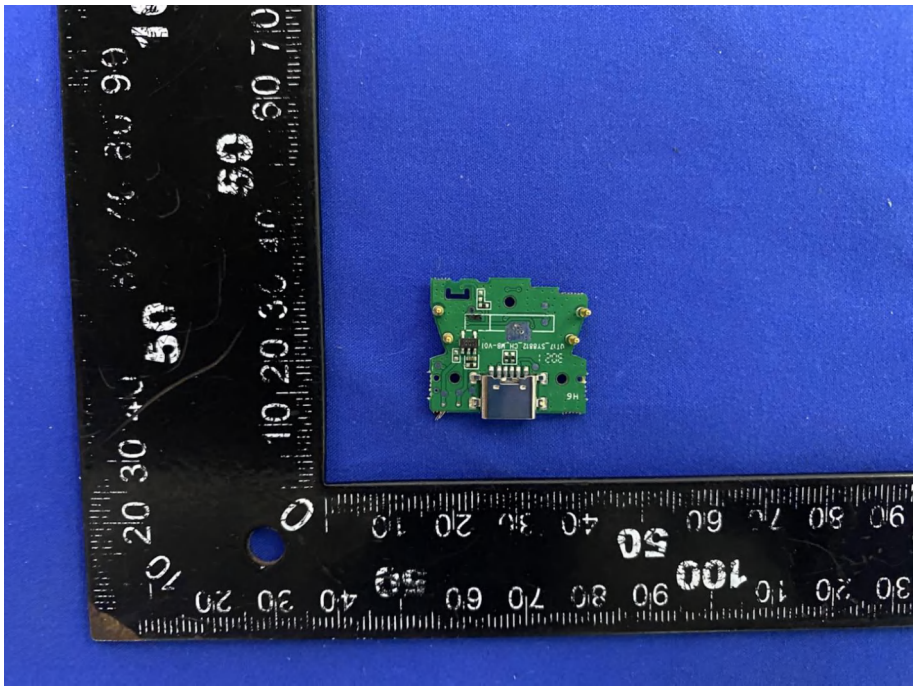


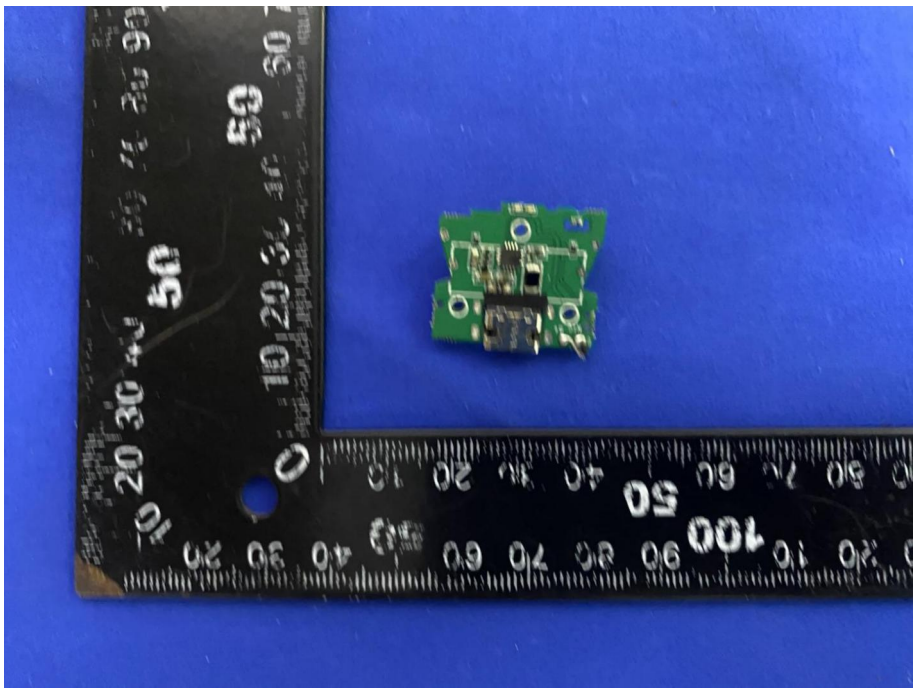












The End