

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT

OF

Model No.: Delta-TG10, Theta(TG11), Alpha(G30B), TG12, TG20, T26B(ClearBuds 2), P.SONG1, TS01, TS02, TE06(Cube X), TN52(Liberbuds lipstick), TA02, TN33, TN73 (PRO), TG73 (Pro), TN39, BN04, BN05, BN20

Trademark: N/A

FCC ID: 2AZDD-DELTA-TG10

Report No.: E01A22100041F00101

Issue Date: October 19, 2022

Prepared for

Guangzhou Langston Electronic Technology Co,Ltd Room 502, Building 4, Phoenix Creative Industry Park, No. 67 North Gongye Avenue, Haizhu District, Guangzhou, China

Prepared by

Dong Guan Anci Electronic Technology Co., Ltd.

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Applicant:	Guangzhou Langston Electronic Technology Co,Ltd Room 502, Building 4, Phoenix Creative Industry Park, No. 67 North Gongye Avenue, Haizhu District, Guangzhou,China		
Manufacturer:	Dongguan Doulan Electronic Technology Co. LTD No.3, Tangzhou Road, Lijiafang, Shipai Town, Dongguan		
Product Description:	wireless earphones		
Trade Mark:	N/A		
Model Number:	Delta-TG10, Theta(TG11), Alpha(G30B), TG12, TG20, T26B(ClearBuds 2), P.SONG1, TS01, TS02, TE06(Cube X), TN52(Liberbuds lipstick), TA02, TN33, TN73 (PRO), TG73 (Pro), TN39, BN04, BN05, BN20 (All models are identical except for appearance color and model number, We choose model Delta-TG10 to do all tests.)		

VERIFICATION OF COMPLIANCE

We hereby certify that:

The above equipment was tested by Dong Guan Anci Electronic Technology Co., Ltd.The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10-2013 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.247(2021).

Date of Test :	October 09, 2022 to October 18, 2022
Prepared by :	
Reviewer & Authorized Signer :	Tiger Xu/ Supervisor

Modified Information

Version	Summary	Revision Date	Report No.
Ver.1.0	Original Report	/	E01A22100041F00101

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1. GENERAL INFORMATION

1.1 Product Description

Characteristics	Description	
Product Name	wireless earphones	
Model number	Delta-TG10	
Input rating	DC 5V, DC 3.7V	
Power Supply	DC 5V from adapter and battery 3.7V	
Kind of Device	Bluetooth Ver. 5.3	
Modulation	GFSK, π/4-DQPSK	
Operating Frequency Range	2402-2480MHz	
Number of Channels	79	
Transmit Power Max(PK)	3.86dBm(0.002432W)	
Antenna Type	Chip Antenna	
Antenna Gain	1.24dBi	
Sample Received Date	October 09, 2022	

1.2 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10-2013. Radiated testing was performed at an antenna to EUT distance 3 meters.

1.3 Test Facility

Site Description		
Name of Firm	:	Dong Guan Anci Electronic Technology Co., Ltd.
Site Location	:	1-2 Floor, Building A, No.11, Headquarters 2 Road, Songshan, Lake Hi-tech Industrial Development Zone, Dongguan City, Guangdong Pr., China.

2. System Test Configuration

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

The Transmitter was operated in the normal operating mode. The Tx frequency was fixed which was for the purpose of the measurements.

2.3 Test Procedure

2.3.1 Conducted Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.10-2013. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak and average detector mode.

2.3.2 Radiated Emissions

Below 1000MHz, The EUT was placed on a turn table which is 0.8m above ground plane. And above 1000MHz, The EUT was placed on a styrofoam table which is 1.5m above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of EUT was fixed in a particular direction according to the requirements in Section 13.1.4.1 of ANSI C63.10-2013.

2.4 Configuration of Tested System

Fig. 2-1 Configuration of Tested System

Adapter _____ EUT

Table 2-1 Equipment Used in Tested System

Item	Equipment	Trademark	Model No.	FCC ID	Note
1.	wireless earphones	N/A	L1	2AZDD-DELTA-TG10	EUT
2.	Adapter	MI	Model:MDY-08-EH Input: AC 100-240V, 50/60Hz Output: DC 5V/2.5A,DC 9/2A	N/A	Support EUT

Note:

(1) Unless otherwise denoted as EUT in [Remark] column , device(s) used in tested system is a support equipment.

3. Summary of Test Results

FCC Rules	Description Of Test	Result
§15.207	AC Power Conducted Emission	Compliant
§15.247(d),§15.209, §15.205	Radiated Emission	Compliant
§15.247(a)(1)	Channel Separation test	Compliant
§15.247(a)(1)	20dB Bandwidth	Compliant
§15.247(a)(1)(iii)	Quantity of Hopping Channel	Compliant
§15.247(a)(1)(iii)	Time of Occupancy(Dwell Time)	Compliant
§15.247(b)	Max Peak output Power test	Compliant
§15.247(d)	Band edge test	Compliant
§15.203	Antenna Requirement	Compliant

4. Description of test modes

The EUT has been tested under its typical operating condition and fully-charged battery for EUT tested alone. Pre-defined engineering program for regulatory testing used to control the EUT for staying in continuous transmitting. Only the worst case data were reported.

The EUT has been associated with peripherals pursuant to ANSI C63.10-2013 and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: radiation (9 KHz to the 10th harmonics of the highest fundamental frequency or to 40 GHz, whichever is lower).

The EUT has been tested under TX operating condition.

Pre-defined engineering program for regulatory testing used to control the EUT for staying in continuous transmitting mode is programmed. EUT is connected by com port, and transimit the control instruction via test software(JL FCC Assist V2.4.exe). The test software power value is set to the maximum.

This EUT is a FHSS system, were conducted to determine the final configuration from all possible combinations. We use software control the EUT, Let EUT hopping on and transmit with highest power, all the modes GFSK, π /4-DQPSK have been tested. 79 Channels are provided by EUT. The 3 channels of lower, medium and higher were chosen for test.

Channel	Frequency(MHz)
1	2402
40	2441
79	2480

5. TEST SYSTEM UNCERTAINTY

The following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Parameter	Uncertainty	
Radio Frequency	±1x10^-5	
Maximum Peak Output Power Test	±1.0dB	
Conducted Emissions Test(150KHz-30MHz)	±2.0dB	
Radiated Emission Test (30MHz-1000MHz)	±2.0dB	
Radiated Emission Test (1GHz-18GHz)	±2.5dB	
Radiated Emission Test (18GHz-25GHz)	±3.2dB	
Power Density	±2.0dB	
Occupied Bandwidth Test	±1.0dB	
Band Edge Test	±3dB	
All emission, radiated	±3dB	
Antenna Port Emission	±3dB	
Temperature	±0.5℃	
Humidity	±3%	

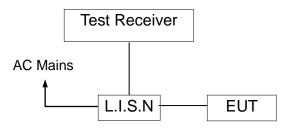
Remark: The coverage Factor (k=2), and measurement Uncertainty for a level of Confidence of 95%

6. Conducted Emissions Test

6.1 Measurement Procedure:

- 1. The EUT was placed on a table, which is 0.8m above ground plane.
- 2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 3. Repeat above procedures until all frequency measured was complete.

6.2 Test SET-UP (Block Diagram of Configuration)



6.3 Measurement Equipment Used:

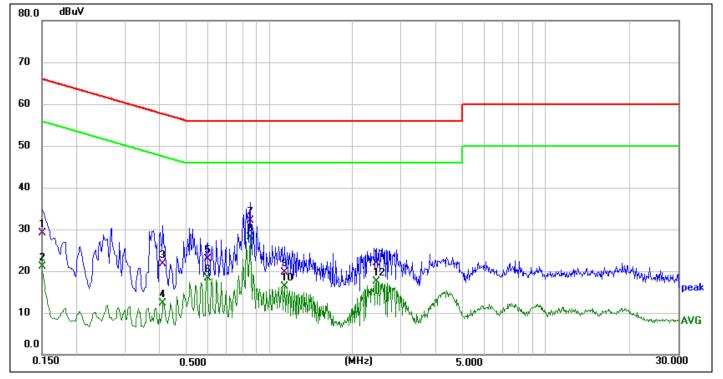
	EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	Calibrated until
6	L.I.S.N	SCHWARZBECK	NSLK 8127	8127-669	2023-05-12
	10 db attenuator	JFW	50FP-010-H4	4360846-427-1	2023-05-12
	RF Cable	N/A	N/A	2#	2023-05-12
	EMI Test Receiver	ROHDE&SCHWAR Z	ESCI	101358	2023-05-12
	4 Test Software	Farad	EZ-EMC (Ver.ANCI-3A1)	N/A	N/A

Measurement Result:

Operation Mode:	ТХ	Test Date :	October 11, 2022
Frequency Range:	0.15MHz~30MHz	Temperature :	23.5 ℃
Test Result:	PASS	Humidity :	52.6 %
Test By:	Sunshine		

All the modulation modes were tested the data of the worst mode (Pi/4-DQPSK TX 2402MHz) are recorded in the following pages and the others modulation methods do not exceed the limits.

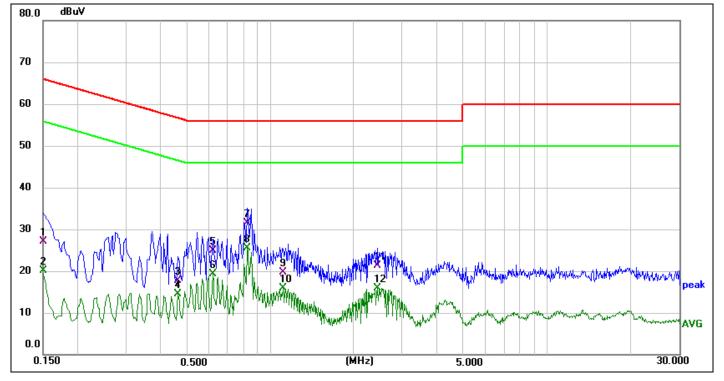
Please refer to the following data.



Site:	843	Phase:L1	Temperature(C):23.5(C)
Limit:	FCC Part 15 C Conduction(QP)		Humidity(%):52.6%
EUT:	wireless earphones	Test Time:	2022-10-11 21:01:15
M/N.:	Delta-TG10	Power Rating:	DC 5V From adapter
Mode:	TX2402	Test Engineer:	Sunshine
Note:		-	

No.	Frequency	Reading	Factor	Measure-	Limit	Margin	Detector	Comment
	(MHz)	Level(dBuV)	(dB)	ment(dBuV)	(dBuV)	(dB)		
1	0.1500	18.92	10.25	29.17	66.00	-36.83	QP	
2	0.1500	10.77	10.25	21.02	56.00	-34.98	AVG	
3	0.4100	11.81	9.84	21.65	57.65	-36.00	QP	
4	0.4100	2.48	9.84	12.32	47.65	-35.33	AVG	
5	0.5940	13.17	9.72	22.89	56.00	-33.11	QP	
6	0.5940	8.62	9.72	18.34	46.00	-27.66	AVG	
7	0.8500	22.48	9.53	32.01	56.00	-23.99	QP	
8 *	0.8500	18.67	9.53	28.20	46.00	-17.80	AVG	
9	1.1300	10.53	9.23	19.76	56.00	-36.24	QP	
10	1.1300	7.07	9.23	16.30	46.00	-29.70	AVG	
11	2.4380	11.66	10.33	21.99	56.00	-34.01	QP	
12	2.4380	7.18	10.33	17.51	46.00	-28.49	AVG	

*:Maximum data x:Over limit !:over margin



Site:	843	Phase:N	Temperature(C):23.5(C)
Limit:	FCC Part 15 C Conduction(QP)		Humidity(%):52.6%
EUT:	wireless earphones	Test Time:	2022-10-11 21:04:53
M/N.:	Delta-TG10	Power Rating:	DC 5V From adapter
Mode:	TX2402	Test Engineer:	Sunshine
Note:		_	

No.	Frequency	Reading	Factor	Measure-	Limit	Margin	Detector	Comment
	(MHz)	Level(dBuV)	(dB)	ment(dBuV)	(dBuV)	(dB)		
1	0.1500	16.77	10.26	27.03	66.00	-38.97	QP	
2	0.1500	9.82	10.26	20.08	56.00	-35.92	AVG	
3	0.4620	7.92	9.82	17.74	56.66	-38.92	QP	
4	0.4620	4.61	9.82	14.43	46.66	-32.23	AVG	
5	0.6180	15.20	9.70	24.90	56.00	-31.10	QP	
6	0.6180	9.58	9.70	19.28	46.00	-26.72	AVG	
7	0.8260	21.99	9.55	31.54	56.00	-24.46	QP	
8 *	0.8260	15.91	9.55	25.46	46.00	-20.54	AVG	
9	1.1060	10.35	9.27	19.62	56.00	-36.38	QP	
10	1.1060	6.57	9.27	15.84	46.00	-30.16	AVG	
11	2.4380	10.96	10.37	21.33	56.00	-34.67	QP	
12	2.4380	5.55	10.37	15.92	46.00	-30.08	AVG	

*:Maximum data x:Over limit !:over margin



6.5 Conducted Measurement Photos:

7. Radiated Emission Test

7.1 Measurement Procedure

- 1. The testing follows the guidelines in Spurious Radiated Emissions of ANSI C63.10-2013.
- 2. Below 1000MHz, The EUT was placed on a turn table which is 0.8m above ground plane. And above 1000MHz, The EUT was placed on a styrofoam table which is 1.5m above ground plane.
- 3. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
- 4. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (From 1m to 4m) and turntable (from 0 degree to 360 degree) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
- 5. Set to the maximum power setting and enable the EUT transmit continuously.
- 6. Final measurement (Above 1GHz): The frequency range will be divided into different sub ranges depending of the frequency range of the used horn antenna. The EMI Receiver set to peak and average mode and a resolution bandwidth of 1MHz. The measurement will be performed in horizontal and vertical polarization of the measuring antenna and while rotating the EUT in its vertical axis in the range of 0 degree to 360 degree in order to have the antenna inside the cone of radiation.
- 7. Test Procedure of measurement (For Above 1GHz):
 - 1) Monitor the frequency range at horizontal polarization and move the antenna over all sides of the EUT(if necessary move the EUT to another orthogonal axis).
 - 2) Change the antenna polarization and repeat 1) with vertical polarization.
 - 3) Make a hardcopy of the spectrum.
 - 4) Measure the frequency of the detected emissions with a lower span and resolution bandwidth to increase the accuracy and note the frequency value.
 - 5) Change the analyser mode to Clear/Write and found the cone of emission.
 - 6) Rotate and move the EUT, so that the measuring distance can be enlarged to 3m and the antenna will be still inside the cone of emission.
 - 7) Measure the level of the detected frequency with the correct resolution bandwidth, with the antenna polarization and azimuth and the peak and average detector, which causes the maximum emission.
 - 8) Repeat steps 1) to 7) for the next antenna spot if the EUT is larger than the antenna beamwidth.

Use the following spectrum analyzer settings:

When spectrum scanned from 30MHz to 1GHz setting resolution bandwidth 120KHz

and video bandwidth 300KHz:

EMI Test Receiver	Setting
Attenuation	Auto
RB	120KHz
VB	300KHz
Detector	QP
Trace	Max hold

When spectrum scanned above 1GHz setting resolution bandwidth 1MHz, video bandwidth 3MHz:

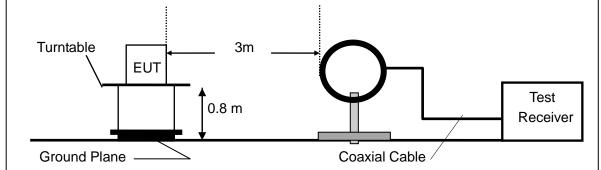
EMI Test Receiver	Setting
Attenuation	Auto
RB	1MHz
VB	3MHz
Detector	Peak
Trace	Max hold

When spectrum scanned above 1GHz setting resolution bandwidth 1MHz, video bandwidth 10Hz:

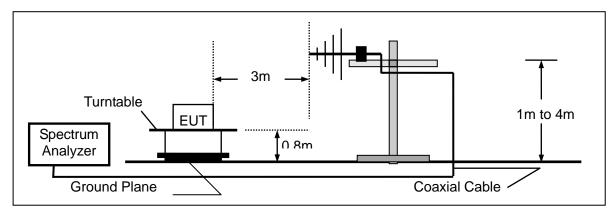
EMI Test Receiver	Setting
Attenuation	Auto
RB	1MHz
VB	10Hz
Detector	Average
Trace	Max hold

7.2 Test SET-UP (Block Diagram of Configuration)

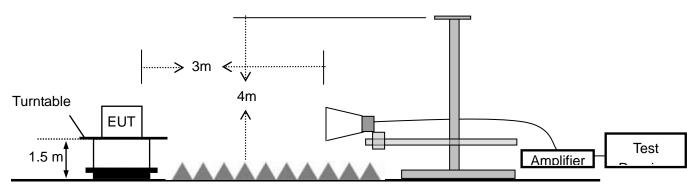




(B) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(C) Radiated Emission Test Set-Up, Frequency above 1000MHz



7.3 Measurement Equipment Used:

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Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until	Calibration interval
1.	EMI Test Receiver	Rohde & Schwarz	ESPI	100502	2022-11-12	1 year
2.	Pre-Amplifier	HP	8447D	2727A06172	2023-05-13	1 year
3.	Bilog Antenna	Schwarzbeck	VULB9163	VULB9163-588	2023-05-13	1 year
4.	Loop Antenna	Schwarzbeck	FMZB 1516	1516-141	2022-11-12	1 year
5.	Spectrum Analyzer	Rohde & Schwarz	FSV40	US40240623	2022-11-12	1 year
6.	Low noise Amplifiers	A-INFO	LA1018N4009	J101313052400 1	2023-05-13	1 year
7.	Horn antenna	A-INFO	LB-10180-SF	J203109061212 3	2023-05-13	1 year
8.	Broadband RF Power Amplifier	AEROFLEX	AEROFLEX10 0KHz-40GHz	J101313052400 1	2022-11-12	1 year
9.	DRG Horm Antenna	A.H.SYSTEMS	SAS-574	J203109061212 3	2022-11-12	1 year
10.	RF Cable	Gigalink Microwave	ZT40-2.92J-2. 92J-2m	N/A	2022-11-12	1 year
11.	RF Cable	Gigalink Microwave	ZT40-2.92J-2. 92J-0.3m	N/A	2022-11-12	1 year
12.	RF Cable	N/A	N/A	6#	2023-05-13	1 year
13.	RF Cable	N/A	N/A	1-1#	2023-05-13	1 year
14.	RF Cable	N/A	N/A	1-2#	2023-05-13	1 year
15.	RF Cable	N/A	N/A	7#	2023-05-13	1 year
16.	3m Semi-anechoic Chamber	chengyu	9m*6m*6m	N/A	2023-05-13	3 year
17.	Test Software	Farad	EZ-EMC Ver:ANCI-3A1	N/A	N/A	N/A

7..4 Radiated Emission Limit

The emissions from an intentional radiator shall not exceed the field strength levels specified in the following table 15.209(a):

Frequencies	Field Strength	Measurement Distance
(MHz)	(micorvolts/meter)	(meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

15.205 Restricted bands of operation

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	(²)

Remark 1. Emission level in dBuV/m=20 log (uV/m)

2. Measurement was performed at an antenna to the closed point of EUT distance of meters.

3. Only spurious frequency is permitted to locate within the Restricted Bands specified in provision of ξ 15.205, and the emissions located in restricted bands also comply with 15.209 limit.

2

7.5 Measurement Result

Operation Mode:	ТХ	Test Date :	October 11, 2022
Test By:	Sunshine	Temperature :	26 ℃
Test Result:	PASS	Humidity :	54 %
Measured Distance:	3m		

Below 30MHz:

Freq.	Ant.Pol.	Emission	Limit 3m	Over
		Level		
(MHz)	H/V	(dBuV/m)	(dBuV/m)	(dB)

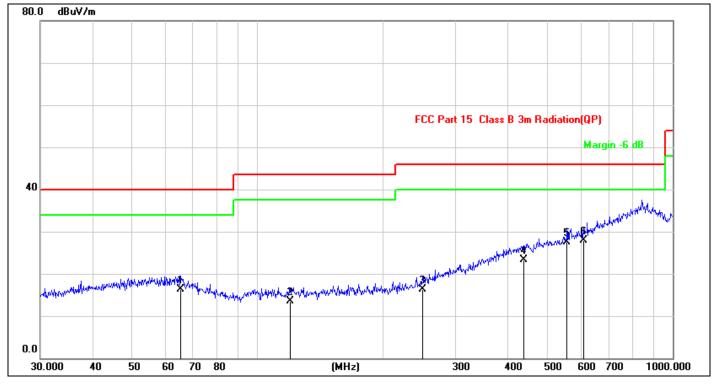
Note: The low frequency, which started from 9KHz-30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

Below 1000MHz:

Pass.

All the modulation modes were tested the data of the worst mode ((Pi/4-DQPSK TX 2402MHz)) are recorded in the following pages and the others modulation methods do not exceed the limits.

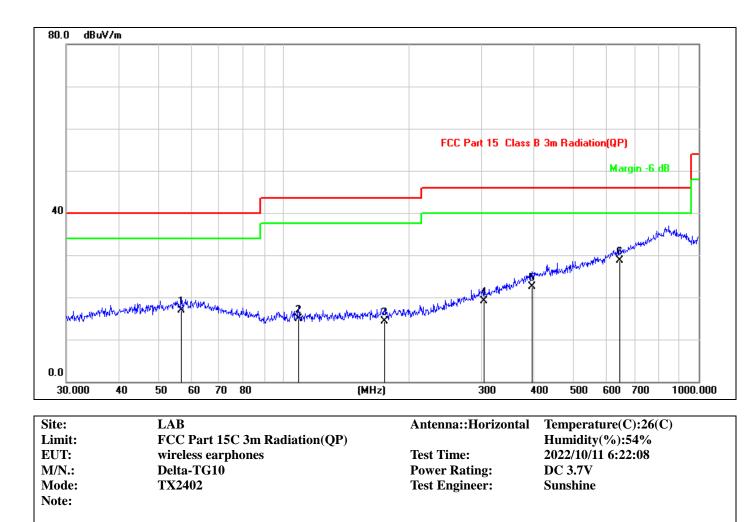
Please refer to the following data.



Site:	LAB	Antenna::Vertical	Temperature(C):26(C)
Limit:	FCC Part 15 C 3m Radiation(QP)		Humidity(%):54%
EUT:	wireless earphones	Test Time:	2022/10/11 6:23:20
M/N.:	Delta-TG10	Power Rating:	DC 3.7V
Mode:	TX2402	Test Engineer:	Sunshine
Note:		2	

No.	Frequency	Reading	Factor	Level	Limit	Margin	Det.	Height	Azimuth	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)		(cm)	(deg)	
1	65.3431	25.66	-9.41	16.25	40.00	-23.75	QP			
2	119.8555	25.15	-11.66	13.49	43.50	-30.01	QP			
3	249.4250	25.51	-9.26	16.25	46.00	-29.75	QP			
4	438.6553	25.48	-2.13	23.35	46.00	-22.65	QP			
5	556.7744	27.30	0.18	27.48	46.00	-18.52	QP			
6 *	609.9215	26.44	1.45	27.89	46.00	-18.11	QP			

*:Maximum data x:Over limit !:over margin



No.	Frequency	Reading	Factor	Level	Limit	Margin	Det.	Height	Azimuth	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)		(cm)	(deg)	
1	56.7916	25.98	-9.14	16.84	40.00	-23.16	QP			
2	108.6470	26.50	-11.63	14.87	43.50	-28.63	QP			
3	175.0367	25.64	-11.24	14.40	43.50	-29.10	QP			
4	304.6099	25.83	-6.68	19.15	46.00	-26.85	QP			
5	394.8544	25.68	-3.15	22.53	46.00	-23.47	QP			
6 *	645.1195	26.41	2.22	28.63	46.00	-17.37	QP			

*:Maximum data x:Over limit !:over margin

Above 1000MHz~10th Harmonics:

Please refer to the following data.

Operation Mode:

GFSK (CH1: 2402MHz)

July 02, 2022 Test Date :

Freq.	Ant. Pol.	Reading Level(dBuV/m)		Correct Factor	Emis Level(d	sion BuV/m)	لاللہ 3m(dB		Margin(dB)		
(MHz)	H/V	PK	AV	dB	PK	AV	PK	AV	PK	AV	
4804	V	96.25	75.14	-32.3	63.95	42.84	74	54	-10.05	-11.16	
7206	V	94.36	76.69	-37.25	57.11	39.44	74	54	-16.89	-14.56	
9608	V	97.58	78.17	-39.8	57.78	38.37	74	54	-16.22	-15.63	
12010	V	95.74	77.64	-40.5	55.24	37.14	74	54	-18.76	-16.86	
14412	V	97.24	77.65	-41.7	55.54	35.95	74	54	-18.46	-18.05	
16814	V	95.13	76.14	-40	55.13	36.14	74	54	-18.87	-17.86	
4804	Н	95.66	74.87	-31.4	64.26	43.47	74	54	-9.74	-10.53	
7206	H	95.81	76.38	-35.5	60.31	40.88	74	54	-13.69	-13.12	
9608	Н	96.14	77.25	-38.3	57.84	38.95	74	54	-16.16	-15.05	
12010	Н	94.67	75.66	-39	55.67	36.66	74	54	-18.33	-17.34	
14412	Н	97.36	77.68	-42	55.36	35.68	74	54	-18.64	-18.32	
16814	Н	94.37	75.65	-39.3	55.07	36.35	74	54	-18.93	-17.65	

Operation Mode:

GFSK (CH40: 2441MHz) Test Date : July 02, 2022

(MHz)	H/V	PK	AV	dB	PK	AV	PK	AV	PK	AV
4882	V	96.58	75.36	-32.3	64.28	43.06	74	54	-9.72	-10.94
7323	V	98.24	78.24	-37.2	61.04	41.04	74	54	-12.96	-12.96
9764	V	97.865	77.27	-39.6	58.26	37.67	74	54	-15.74	-16.33
12205	V	96.387	77.53	-40.5	55.88	37.03	74	54	-18.12	-16.97
14646	V	96.57	78.04	-41	55.57	37.04	74	54	-18.43	-16.96
17087	V	96.24	77.25	-41.1	55.14	36.15	74	54	-18.86	-17.85
4882	Н	95.37	72.67	-31.6	63.77	41.07	74	54	-10.23	-12.93
7323	H	97.04	78.07	-35.7	61.34	42.37	74	54	-12.66	-11.63
9764	H	97.28	77.09	-38.3	58.98	38.79	74	54	-15.02	-15.21
12205	Н	96.31	76.07	-39	57.31	37.07	74	54	-16.69	-16.93
14646	H	98.36	79.14	-42	56.36	37.14	74	54	-17.64	-16.86
17087	H	96.69	77.34	-41.5	55.19	35.84	74	54	-18.81	-18.16

Operation Mode:

GFSK (CH79: 2480MHz) Test Date :

te: July 02, 2022

Freq.	Ant.	Rea	ding	Correct	Emis	sion	Liı	nit	Marg	in(dB)
	Pol.	Level(d	BuV/m)	Factor	Level(d	BuV/m)	3m(dBuV/m)			
(MHz)	H/V	PK	AV	dB	PK	AV	PK	AV	PK	AV
4960	V	96.28	75.236	-32.3	63.98	42.936	74	54	-10.02	-11.06
7440	V	98.35	78.22	-37.2	61.15	41.02	74	54	-12.85	-12.98
9920	V	97.04	77.27	-39.6	57.44	37.67	74	54	-16.56	-16.33
12400	V	96.58	77.87	-40.7	55.88	37.17	74	54	-18.12	-16.83
14880	V	96.51	78.57	-41	55.51	37.57	74	54	-18.49	-16.43
17360	V	96.05	77.24	-41.1	54.95	36.14	74	54	-19.05	-17.86
4960	Н	95.14	72.74	-31.6	63.54	41.14	74	54	-10.46	-12.86
7440	Н	97.27	77.08	-35.7	61.57	41.38	74	54	-12.43	-12.62
9920	Н	97.41	77.17	-38.1	59.31	39.07	74	54	-14.69	-14.93
12400	Н	96.27	75.37	-39	57.27	36.37	74	54	-16.73	-17.63
14880	Н	98.35	78.28	-42	56.35	36.28	74	54	-17.65	-17.72
17360	Н	96.15	76.02	-41.5	54.65	34.52	74	54	-19.35	-19.48

Operation Mode:

Pi/4-DQPSK (CH1: 2402MHz)

Test Date : July 02, 2022

Freq.	Ant. Pol.	Reading Level(dBuV/m)		Correct Factor	Emis Level(d			mit BuV/m)	Over(dB)	
(MHz)	H/V	PK	AV	dB	PK	AV	PK	AV	PK	AV
4804	V	95.31	74.65	-32.3	63.01	42.35	74	54	-10.99	-11.65
7206	V	97.65	76.24	-37.2	60.45	39.04	74	54	-13.55	-14.96
9608	V	97.05	77.85	-39.8	57.25	38.05	74	54	-16.75	-15.95
12010	V	96.25	75.61	-40.5	55.75	35.11	74	54	-18.25	-18.89
14412	V	97.31	76.31	-41.7	55.61	34.61	74	54	-18.39	-19.39
16814	V	94.68	74.28	-40	54.68	34.28	74	54	-19.32	-19.72
4804	H	96.27	73.57	-31.6	64.67	41.97	74	54	-9.33	-12.03
7206	Н	96.39	77.01	-35.5	60.89	41.51	74	54	-13.11	-12.49
9608	Н	97.36	76.98	-38.3	59.06	38.68	74	54	-14.94	-15.32
12010	Н	97.33	76.34	-39.4	57.93	36.94	74	54	-16.07	-17.06
14412	Н	98.24	75.64	-42	56.24	33.64	74	54	-17.76	-20.36
16814	Н	96.37	74.92	-39.3	57.07	35.62	74	54	-16.93	-18.38

Freq.	Ant. Pol.	Reading Level(dBuV/m)		Correct Factor	Emis Level(dl			niit BuV/m	Over(dB)	
(MHz)	H/V	PK	AV	dB	PK	AV	PK	AV	PK	AV
4882	V	96.21	75.36	-32.3	63.91	43.06	74	54	-10.09	-10.94
7323	V	98.67	77.64	-37.2	61.47	40.44	74	54	-12.53	-13.56
9764	V	97.36	78.54	-39.8	57.56	38.74	74	54	-16.44	-15.26
12205	V	97.12	76.38	-40.5	56.62	35.88	74	54	-17.38	-18.12
14646	V	98.38	77.82	-41	57.38	36.82	74	54	-16.62	-17.18
17087	V	95.78	75.24	-41.1	54.68	34.14	74	54	-19.32	-19.86
4882	Н	96.34	74.68	-31.6	64.74	43.08	74	54	-9.26	-10.92
7323	Н	96.27	77.24	-35.5	60.77	41.74	74	54	-13.23	-12.26
9764	Н	97.04	77.61	-38.3	58.74	39.31	74	54	-15.26	-14.69
12205	Н	98.37	77.02	-39	59.37	38.02	74	54	-14.63	-15.98
14646	Н	97.39	76.34	-42	55.39	34.34	74	54	-18.61	-19.66
17087	Н	98.12	74.68	-41.4	56.72	33.28	74	54	-17.28	-20.72

Operation Mode: Pi/4-DQPSK (CH40: 2441MHz) Test Date : July 02, 2022

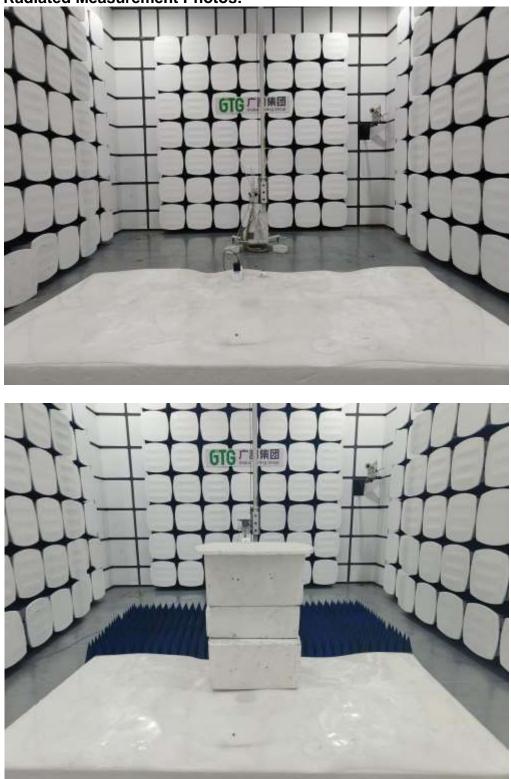
Pi/4-DQPSK (CH79: 2480MHz) Test Date : July 02, 2022

Operation Mode:

Freq.	Ant. Pol.	Reading Level(dBuV/m)		Correct Factor	Emis Level(dl			nit SuV/m)	Over(dB)	
(MHz)	H/V	PK	AV	dB	PK	AV	PK	AV	PK	AV
4960	V	96.58	76.59	-32.3	64.28	44.29	74	54	-9.72	-9.71
7440	V	97.25	76.69	-37.2	60.05	39.49	74	54	-13.95	-14.51
9920	V	98.02	79.21	-39.8	58.22	39.41	74	54	-15.78	-14.59
12400	V	98.14	77.36	-40.5	57.64	36.86	74	54	-16.36	-17.14
14880	V	96.37	78.31	-41	55.37	37.31	74	54	-18.63	-16.69
17360	V	95.68	76.54	-41.1	54.58	35.44	74	54	-19.42	-18.56
4960	H	96.57	74.61	-31.6	64.97	43.01	74	54	-9.03	-10.99
7440	H	96.27	77.68	-35.5	60.77	42.18	74	54	-13.23	-11.82
9920	H	97.24	77.98	-38.3	58.94	39.68	74	54	-15.06	-14.32
12400	H	98.25	77.28	-39	59.25	38.28	74	54	-14.75	-15.72
14880	Н	98.36	77.32	-42	56.36	35.32	74	54	-17.64	-18.68
17360	H	98.39	75.34	-41.5	56.89	33.84	74	54	-17.11	-20.16

Other harmonics emissions are lower than 20dB below the allowable limit.

- **Note:** (1) All Readings are Peak Value and AV.
 - (2) Emission Level= Reading Level+ Probe Factor +Cable Loss.
 - (3) The average measurement was not performed when the peak measured data under the limit of average detection.
 - (4) Measuring frequencies from 1GHz to 25GHz.



7.5 Radiated Measurement Photos:

8. Channel Separation test

8.1 Measurement Procedure

The EUT was operating in hopping mode or could be controlled its channel. Printed out the test result from the spectrum by hard copy function.

8.2 Test SET-UP (Block Diagram of Configuration)

EUT	Spectrum Analyzer
-----	-------------------

8.3 Measurement Equipment Used:

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	CALIBRATED UNTIL	Calibration interval
Spectrum Analyzer	Rohde & Schwarz	FSV40	US40240623	2022-11-12	1 year
Coaxial Cable	Gigalink Microwave	ZT40	19022092	2022-11-12	1 year
Antenna Connector	ARTHUR-YANG	2244-N1TG1	N/A	2022-11-12	1 year

Remark: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

8.4 Measurement Results:

Refer to attached data chart.

Spectrum Detector:	PK	Test Date :	October 11, 2022
Test By:	Jack	Temperature :	24℃
Test Result: Modulation:	PASS GFSK	Humidity :	53 %

Channel number	Channel frequency (MHz)	Separation Read Value (kHz)	Separation Limit 2/3 20dB Down BW(kHz)
1	2402	1001	>630.13
40	2441	1001	>630.66
79	2480	1001	>632.67

				Braphs		
			FS NVNT I-DF	I5 2402MHz Ant1		
RL	req 2.402500	000 GHz	Trig: Free Run	Avg Type: Log-Pwr Avg/Hold.>100/100	11:04:04 AM Oct 11, 2022 TRACE 7 3 4 5 6	Frequency
5	Ref Offset 6.68		#Atten: 30 dB	Mkr1	2.401 990 GHz 1.343 dBm	Auto Tuni
10 dB/div 10 ll	Ref 20.00 dB			and and	1.343 000	Center Free 2.402500000 GH
-10.0			~~~	100.0	m	Start Fre 2.401500000 GH
50.0 10.0 70.0						Stop Fre 2.403500000 GH
Res BW		#VBV	v 100 kHz	and the second se	Span 2.000 MHz .133 ms (1001 pts)	CF Ste 200.000 kH Auto Ma
1 N 2 N 3 4 5	f	2.401 990 GHz 2.402 986 GHz	1.343 dBm 1.081 dBm	ACTION FUNCTION MOTH	FUNKEDOW WAAR	Freq Offse 0 H
6 7 8 9 10 11						Scale Typ
190			ñ	STATU		

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Spectrum Detector:	PK	Test Date :	October 11, 2022
Test By:	Jack	Temperature :	24℃
Test Result: Modulation:	PASS Π/4-DQPSK	Humidity :	53 %

Channel number	Channel frequency (MHz)	Separation Read Value (kHz)	Separation Limit 2/3 20dB Down BW(kHz)
1	2402	1001	>872.67
40	2441	1001	>873.33
79	2480	1001	>876.00

Layzagitt Spectrum Analyzer - Swept SA	1 SYNAMORY	<i>1</i> 0		0 4
nter Freq 2.402500000 GHz PNO: WI	de 😱 Trig: Free Run	Avg Type: Log-Pwr Avg Hold:>100/100	11:29:05 AN Oct 11, 2022 TRACE 1, 2, 3, 4, 5, 6 TYPE N WWWWWWW	Frequency
Ref Offset 6.68 dB dBidiv Ref 20.00 dBm	ow #Atten: 30 dB	Mkr1 2		Auto Tune
	man	milion	hora	Center Freq 2.402500000 GHz
0				Start Free 2.401500000 GH
0				Stop Free 2.403500000 GH
	VBW 100 kHz	Sweep 2.1	Span 2.000 MHz 33 ms (1001 pts)	CF Step 200.000 kH: uto Mar
N 1 2.401 992 GH: N 1 2.401 992 GH: N 1 2.402 986 GH:	z 1.428 dBm	KCTION FUNCTION WIDTH	EUNICTION WATE	Freq Offse 0 H
				Scale Type
			- 4	og <u>Lir</u>

	CI	FS NVNT 2-I	DH5 2441MHz Ant1		
Keysight Spectrum Analyzer - Swept SA	A. 202		90:	Notest and the second	0 2 4
Center Freq 2.44150000		Trig: Free Run	Avg Type: Log-Pwr Avg/Hold:>100/100	11:48:14 AM Oct 11, 2022 TRACE 1 2 3 4 5 6 1 VPE IN WWWWWWWW DET P N N N N N	Frequency
Ref Offset 6.72 dE	IFGain:Low	#Atten: 30 dB	Mkr1	2.440 992 GHz	Auto Tune
10 dBldiv Ref 20.00 dBm				0,121 dBm	
	im	· · · ·	man	2	Center Freq 2.441500000 GHz
-210					Start Freq 2.440500000 GHz
50.0 40.0 -70.0					Stop Freq 2.442500000 GHz
Center 2.441500 GHz #Res BW 30 kHz	#VBW	100 kHz	Sweep 2	Span 2.000 MHz .133 ms (1001 pts)	200.000 kHz
MOR MODE THE SCI.	Simmer and Discovered Street		FUNCTION FUNCTION MOTH	FUNCTION WATE	<u>Auto</u> Man
	440 992 GHz 442 100 GHz	0.121 dBm -1.768 dBm			Freq Offset 0 Hz
7 8 9 10 11					Scale Type
1		n.		, · ·	
NI90			STATU	6	

CFS NVNT 2-DH5 2480MHz Ant1

Kayseght Spectrum Analyzer - Swept SA	W (2007)	10	Websteiner (* 1996)	
Center Freq 2.479500000	PNO: Wide Trig: Free Run	Avg Type: Log-Pwr Avg Hold:>100/100	11:54:25 AM Oct 11, 2022 TRACE 3 3 4 5 6 TYPE REWARDSHIP	Frequency
Ref Offset 6.78 dB 10 dBidiv Ref 20.00 dBm	IFGeIn:Low #Atten: 30 dB	Mkr1		Auto Tune
	him	2 An	vi,	Center Free 2.479500000 GH
210 20 20				Start Fre 2.478500000 GH
50.0 40.0 70.0				Stop Fre 2.480500000 GH
Center 2.479500 GHz #Res BW 30 kHz	#VBW 100 kHz	Sweep 2.	Span 2.000 MHz 133 ms (1001 pts)	CF Step 200.000 kH Auto Ma
1 N f 2.47	9 012 GHz -3.005 dBm 0 004 GHz -3.010 dBm		z	Freq Offse 0 H
6 7 8 9 10 11				Scale Type
* (, 000	n	STATUS		

9. 20dB Bandwidth test

9.1 Measurement Procedure

The EUT was operating in hopping mode or could be controlled its channel. Printed out the test result from the spectrum by hard copy function.

9.2 Test SET-UP (Block Diagram of Configuration)

EUT -	Spectrum Analyzer	

9.3 Measurement Equipment Used:

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	CALIBRATED UNTIL	Calibration interval
Spectrum Analyzer	Rohde & Schwarz	FSV40	US40240623	2022-11-12	1 year
Coaxial Cable	Gigalink Microwave	ZT40	19022092	2022-11-12	1 year
Antenna Connector	ARTHUR-YANG	2244-N1TG1	N/A	2022-11-12	1 year

Remark: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

9.4 Measurement Results:

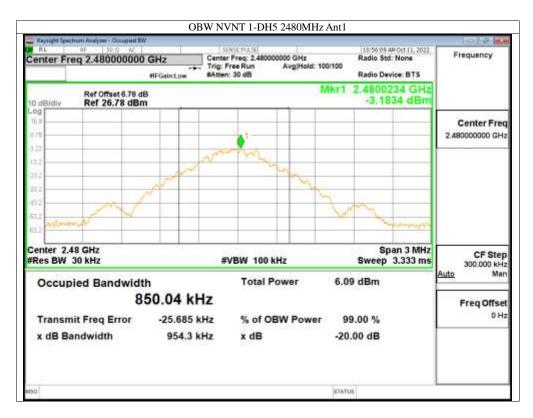
Refer to attached data chart.

Spectrum Detector:	PK	Test Date :	October 11, 2022
Test By:	Jack	Temperature :	24 °C
Test Result:	PASS	Humidity :	53 %
Modulation:	GFSK		

Channel number	Channel frequency (MHz)	20dB Down BW(MHz)
1	2402	0.9437
40	2441	0.9461
79	2480	0.9543



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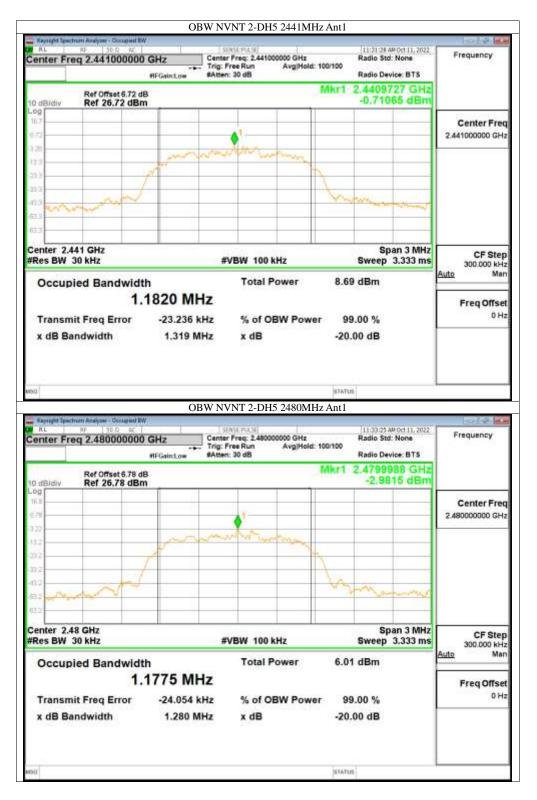


Spectrum Detector:	PK	Test Date :	(
Test By:	Jack	Temperature :	
Test Result:	PASS	Humidity :	ļ
Modulation:	П/4-DQPSK	-	

October 11, 2022 24℃ 53 %

Cha	nnel numb	er	Channel f (MH:		су		dB Dov W(MH:		
	1		24	02			1.311		
			2441 1.319						
	79		24				1.280		
		OB	W NVNT 2-DH		Ant1				
CH RL	eq 2.402000000	GHz	SENSE PUCH Center Freq: 2.4020 Trig: Free Run #Atten: 30 dB	00000 GHz Avg Hold: 1	00100	Radio Sto Radio Der	vice: BTS		Jency
10 dBidiy	Ref Offset 6.68 dl Ref 26.68 dBn			2	Mkrt 3		057 GHz 16 dBm		
Log 167 6-58			1						nter Fre 0000 GH
-113	- ~	d and		and t	In				
Center 2.4	(02 CH2					Pa	an 3 MHz		
#Res BW			#VB₩ 100	kHz	3		3.333 ms	Contraction of the second	CF Step 0.000 kH
Transm	ied Bandwidt 1. hit Freq Error andwidth	h 1 763 MH -21.291 kH 1.311 MH	Z łz % of O	Power DBW Power	99.	dBm .00 %)0 dB		Fre	Mar eq Offse 0 H
0 60					STATUS				





10. Quantity of Hopping Channel Test

10.1 Measurement Procedure

The EUT was operating in hopping mode or could be controlled its channel. Printed out the test result from the spectrum by hard copy function.

10.2Test SET-UP (Block Diagram of Configuration)

EUT		Spectrum Analyzer
-----	--	-------------------

10.3Measurement Equipment Used:

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	CALIBRATED UNTIL	Calibration interval
Spectrum Analyzer	Rohde & Schwarz	FSV40	US40240623	2022-11-12	1 year
Coaxial Cable	Gigalink Microwave	ZT40	19022092	2022-11-12	1 year
Antenna Connector	ARTHUR-YANG	2244-N1TG1	N/A	2022-11-12	1 year

Remark: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

10.4 Measurement Results:

Refer to attached	data chart.		
Worst Test Mode	GFSK	Test Date :	October 11, 2022
Test By:	Jack	Temperature :	24 °C
Test Result:	PASS	Humidity :	53 %

lopping Channel requency Range	Quantity of Chanr		•	y of Hopping hannel
2402-2480	79			>15
Kayunghi Spectrum Analyzer - Swept SA N.L. RF ST-D &C	SNG PU S	()	11:07:35 AM Oct 11, 2022	012
enter Freq 2.441750000 GHz		Avg Type: Log-Pw Avg/Hold >100/100	TRACE 23456	Frequency
	in:Low #Atten: 30 dB	A Date of the second second	DET P NINNA A	Auto Tune
Ref Offset 6.68 dB		Mkr1	2.402 004 0 GHz 3.107 dBm	Auto rune
	· · · ·			
n Althanamin			0-	2 441750000 GHz
0		VIEW FRANK MINUT		
0		mannana	upper contraction of the second se	Start Freq
0				2.400000000 GHz
0			1	
0			-	Stop Freq
0				2.483500000 GHz
art 2.40000 GHz			Stop 2.48350 GHz	CF Step
es BW 100 kHz	#VBW 300 kHz	Sweep	8.000 ms (1001 pts)	8.350000 MHz
N f 2,402 004 0		UNCTION FUNCTION WOT	FUNCTION WALLE	Auto Man
N f 2.402 004 0 N f 2.479 993 0				Freq Offset
				0 Hz
			-	
				Scale Type
				Log Lin
	n			
		STAT	US	

11. Time of Occupancy (Dwell Time) test

11.1 Test Description

The Equipment Under Test (EUT) was set up to perform the dwell time measurements. The EUT was connected to the spectrum analyzer via a short coax cable. The dwell time is calculated by:

Dwell time = time slot length * hop rate / number of hopping channels * 31.6s

with:

- hop rate = $1600 \times 1/s$ for DH1 packets = 1600 s^{-1}

- hop rate = $1600/3 \times 1/s$ for DH3 packets = 533.33 s^{-1}

- number of hopping channels = 79

- 31.6 s = 0.4 seconds multiplied by the number of hopping channels = 0.4 s * 79

The highest value of the dwell time is reported.

11.2 Test SET-UP (Block Diagram of Configuration)

EUT	Spectrum Analyzer
-----	-------------------

11.3 Measurement Equipment Used:

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	CALIBRATED UNTIL	Calibration interval
Spectrum Analyzer	Rohde & Schwarz	FSV40	US40240623	2022-11-12	1 year
Coaxial Cable	Gigalink Microwave	ZT40	19022092	2022-11-12	1 year
Antenna Connector	ARTHUR-YANG	2244-N1TG1	N/A	2022-11-12	1 year

Remark: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

11.4 Test Requirements / Limits

FCC Part 15, Subpart C, §15.247 (a) (1) (iii)

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Since the Bluetooth technology uses 79 channels this period is calculated to be 31.6seconds. Refer to attached data chart.

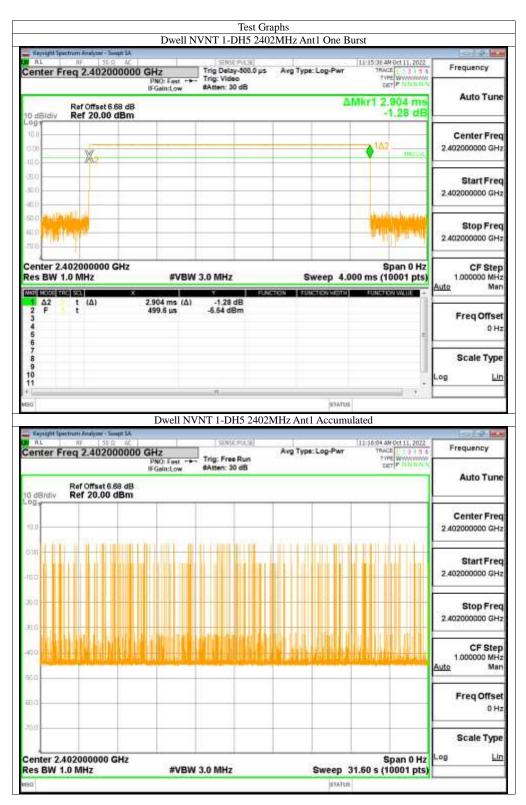
Modulation:	GFSK	Test Date :	October 11, 2022
Test By:	Jack	Temperature :	24 °C
Test Result:	PASS	Humidity :	53 %

11.5 Test result

Remark: The results of worst cased was recorded.

Condition	Mode	Frequency	Antenna	Pulse Time	Total Dwell Time	Burst	Period Time	Limit	Verdict
		(MHz)		(ms)	(ms)	Count	(ms)	(ms)	
NVNT	1-DH5	2402	Ant1	2.904	325.248	112	31600	400	Pass
NVNT	1-DH5	2441	Ant1	2.9	292.9	101	31600	400	Pass
NVNT	1-DH5	2480	Ant1	2.9	304.5	105	31600	400	Pass
NVNT	2-DH5	2402	Ant1	2.891	323.792	112	31600	400	Pass
NVNT	2-DH5	2441	Ant1	2.891	283.318	98	31600	400	Pass
NVNT	2-DH5	2480	Ant1	2.906	296.412	102	31600	400	Pass

Dwell Time



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12. MAXIMUM PEAK OUTPUT POWER TEST

12.1 Measurement Procedure

a. Check the calibration of the measuring instrument(SA) using either an internal calibrator or a known signal from an external generator.

b. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.

c. The center frequency of the spectrum analyzer is set to the fundamental frequency and using proper RBW and VBW setting.

- d. Measure the captured power within the band and recording the plot.
- e. Repeat above procedures until all frequencies required were complete.

12.2 Test SET-UP (Block Diagram of Configuration)

EUT	Spectrum Analyzer
-----	-------------------

12.3 Measurement Equipment Used:

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	CALIBRATED UNTIL	Calibration interval
Spectrum Analyzer	Rohde & Schwarz	FSV40	US40240623	2022-11-12	1 year
Coaxial Cable	Gigalink Microwave	ZT40	19022092	2022-11-12	1 year
Antenna Connector	ARTHUR-YANG	2244-N1TG1	N/A	2022-11-12	1 year

Remark: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

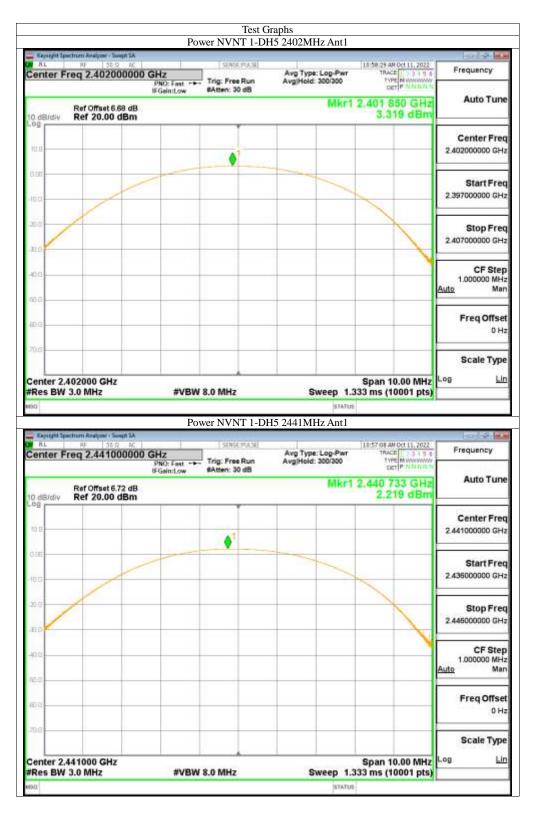
12.4Measurement Results:

Refer to attached data chart.

Spectrum Detector:	PK	Test Date :	October 11, 2022
Test By:	Jack	Temperature :	24 °C
Test Result:	PASS	Humidity :	53 %

Condition	Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	Duty Factor (dB)	Total Power (dBm)	Limit (dBm)	Verdict
NVNT	1-DH5	2402	Ant1	3.32	0	3.32	21	Pass
NVNT	1-DH5	2441	Ant1	2.22	0	2.22	21	Pass
NVNT	1-DH5	2480	Ant1	-0.25	0	-0.25	21	Pass
NVNT	2-DH5	2402	Ant1	2.69	0	2.69	21	Pass
NVNT	2-DH5	2441	Ant1	3.86	0	3.86	21	Pass
NVNT	2-DH5	2480	Ant1	1.19	0	1.19	21	Pass





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13. Band EDGE test

13.1 Measurement Procedure

For Conducted Test

- 1. The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100KHz. The video bandwidth is set to 300KHz.
- 2. The spectrum from 30MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

EMI Test Receiver	Setting
Attenuation	Auto
RBW	100KHz
VBW	300KHz
Detector	Peak
Trace	Max hold

For Radiated emission Test

The EUT was placed on a styrofoam table which is 1.5m above ground plane.

The measurement procedure at the ban edges was simplified by performing the measurement in just one plot. Both, the in-band-emission and the unwanted emission were be encompassed by the span. After trace stabilization, the maximum peak was be determined by a peak detector and the value was marked by an appropriate limit line. The second limit line, which is 20dB below the first, marks the limit for the emissions in the unrestricted band. A maximum-peak-detector marks the highest emission in the unrestricted band next to the band edge.

The measurements were performed at the lower end of the 2.4GHz band. Use the following spectrum analyzer settings:

For Restricted Band, When spectrum scanned above 1GHz setting resolution bandwidth 1MHz, video bandwidth 3MHz:

EMI Test Receiver	Setting
Attenuation	Auto
RBW	1MHz
VBW	3MHz
Detector	Peak
Trace	Max hold

For Non-Restricted Band, When spectrum scanned above 1GHz setting resolution bandwidth 100KHz, video bandwidth 300KHz:

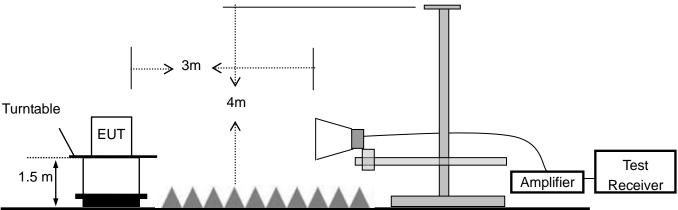
EMI Test Receiver	Setting
Attenuation	Auto
RBW	100KHz
VBW	300KHz
Detector	Peak
Trace	Max hold

13.2 Test SET-UP (Block Diagram of Configuration)

For Conducted Test



For Radiated emission Test



13.3 Measurement Equipment Used: For Conducted Test

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	CALIBRATED UNTIL	Calibration interval		
Spectrum Analyzer	Rohde & Schwarz	FSV40	US40240623	2022-11-12	1 year		
Coaxial Cable	Gigalink Microwave	ZT40	19022092	2022-11-12	1 year		
Antenna Connector	ARTHUR-YANG	2244-N1TG1	N/A	2022-11-12	1 year		

Remark: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

For Radiated emission Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated Until	Calibratio n interval
1	Signal Analyzer	Rohde & Schwarz	FSV40	US40240623	2022-11-12	1 year
2	Broadband RF Power Amplifier	AEROFLEX	AEROFLEX100KHz-40G Hz	J1013130524 001	2022-11-12	1 year
3	DRG Horm Antenna	A.H.SYSTEMS	SAS-574	J2031090612 123	2022-11-12	1 year
4	RF Cable	Gigalink Microwave	ZT40-2.92J-2.92J-2m	N/A	2022-11-12	1 year
5	RF Cable	Gigalink Microwave	ZT40-2.92J-2.92J-0.3m	N/A	2022-11-12	1 year

13.4 Measurement Results:

Refer to attached data chart.

Spectrum Detector:	PK	Test Date :	October 11, 2022
Test By:	Jack	Temperature :	24 °C
Test Result:	PASS	Humidity :	53 %

1. Conducted Test

For Hopping Mode:

Condition	Mode	Frequency (MHz)	Antenna	Hopping Mode	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	1-DH5	2402	Ant1	Hopping	-50.52	-20	Pass
NVNT	1-DH5	2480	Ant1	Hopping	-51.43	-20	Pass
NVNT	2-DH5	2402	Ant1	Hopping	-46.51	-20	Pass
NVNT	2-DH5	2480	Ant1	Hopping	-52.21	-20	Pass







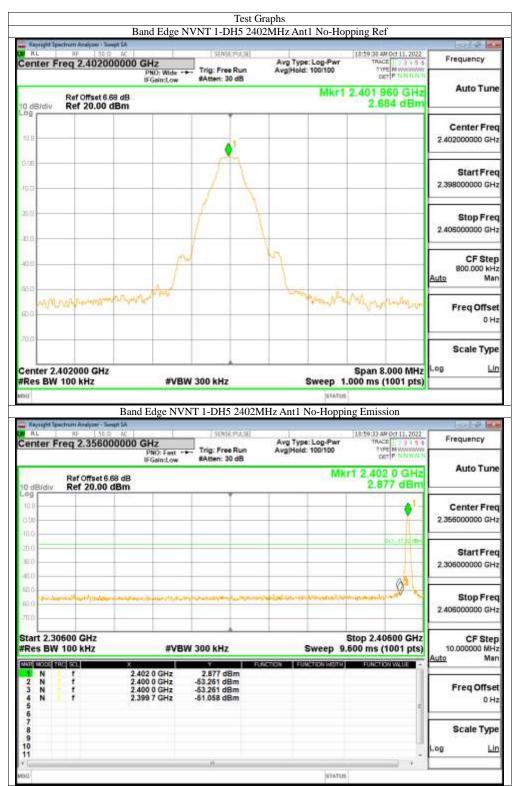








Condition	Mode	Frequency (MHz)	Antenna	Hopping Mode	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	1-DH5	2402	Ant1	No-Hopping	-53.73	-20	Pass
NVNT	1-DH5	2480	Ant1	No-Hopping	-52.38	-20	Pass
NVNT	2-DH5	2402	Ant1	No-Hopping	-49.28	-20	Pass
NVNT	2-DH5	2480	Ant1	No-Hopping	-52.39	-20	Pass



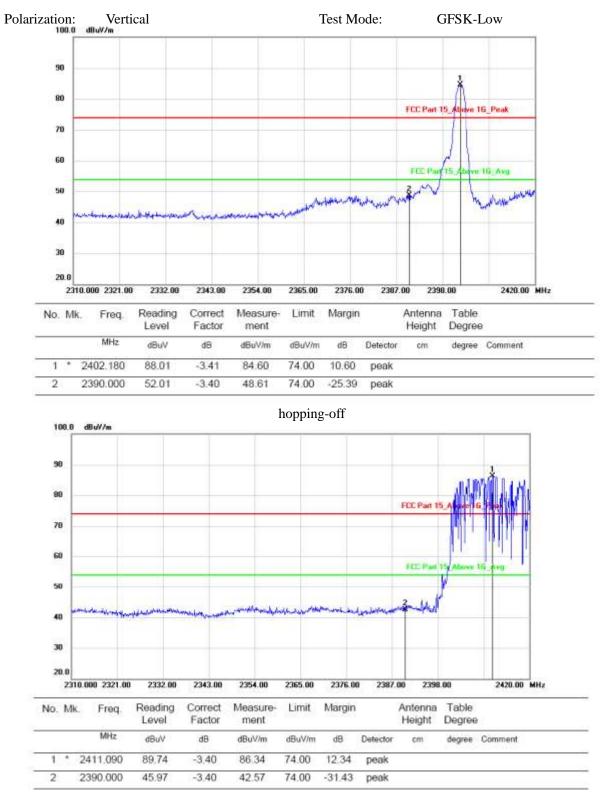
	R 46	SENSE PLASE	Avg Type: Log-Pwr	18:56:25 AM Oct 11, 2022	Frequency
enter Freq 2.4800	PND: Wid FGain:Lo	Trig: Free Run #Atten: 30 dB	Avg Hold: 100/100	TYPE NWWWWWW	
Ref Offset 6	5.78 dB		Mkr1	2.479 992 GHz -0.688 dBm	Auto Tun
9 <u>0</u>					Center Fre 2.48000000 GH
00		Â			Start Fre 2.475000000 GH
0.0		$\langle \rangle$			Stop Fre 2.484000000 GH
00		N	h		CF Ste 800.000 kF Auto Ma
na nationality	A management		Manual Annual	and a hard a start and a start and a start a st	Freq Offs 0 F
	#\ Band Edge N	VBW 300 kHz NVNT 1-DH5 2480N	инz Ant1 No-Hopp	ing Emission	
Res BW 100 kHz	Band Edge N Boont M 0000000 GHz File Geint.or 5.78 dB	NVNT 1-DH5 2480N	Avg Type: Log-Pwr Avg Type: Log-Pwr Avg Hold: 100/100	1.000 ms (1001 pts) ing Emission Truct 11, 2022 Truct 13, 5, 6 Truct 12, 480 0 GHz	Log L
Res BW 100 kHz a Recent Section Analyse - n. P 150 enter Freq 2.5260 Ref Offset 1 0 dB/d/v Ref 20.00	Band Edge N Boont M 0000000 GHz File Geint.or 5.78 dB	NVNT 1-DH5 2480N	Avg Type: Log-Pwr Avg Type: Log-Pwr Avg Hold: 100/100	1000 ms (1001 pts) ing Emission 18:36:28 AP Oct 11, 2022 TRACE 1 3 5 6 trace per Processor	Log L Frequency Auto Tur Center Fre
Res BW 100 kHz	Band Edge N Boont M 0000000 GHz File Geint.or 5.78 dB	NVNT 1-DH5 2480N	Avg Type: Log-Pwr Avg Type: Log-Pwr Avg Hold: 100/100	1.000 ms (1001 pts) ing Emission Truct 11, 2022 Truct 13, 5, 6 Truct 12, 480 0 GHz	Log L Frequency Auto Tur 2.525000000 GF Start Fre
Res BW 100 kHz	Band Edge N Boont M 0000000 GHz File Geint.or 5.78 dB	NVNT 1-DH5 2480N	Avg Type: Log-Pwr Avg Type: Log-Pwr Avg Hold: 100/100	1.000 ms (1001 pts) ing Emission Truct 11, 2022 Truct 13, 5, 6 Truct 12, 480 0 GHz	019
Res BW 100 kHz	Band Edge N Band Edge N 9 40 9 40 9 40 9 40 9 40 9 40 9 40 9 40	VVNT 1-DH5 2480N	Avg Type: Log-Pwr Avg Type: Log-Pwr AvgHold: 100/100 MB	.000 ms (1001 pts) ing Emission III: 50:28 AM Oct II, 2022 TAR OCT III, 2022 TAR OCT IIIII TAR OCT IIIII TAR OCT IIII TAR OCT IIIII TA	Log L Frequency Auto Tur 2.525000000 GP 2.476000000 GP 2.575000000 GP 2.575000000 GP
Res BW 100 kHz	Band Edge N Band Edge N 9 40 9 40 9 40 9 40 9 40 9 40 9 40 9 40	VNT 1-DH5 2480N	Avg Type: Log-Pwr Avg Type: Log-Pwr Avg Hold: 100/100	.000 ms (1001 pts) ing Emission III: 50:28 AM Oct II, 2022 TAR OCT III, 2022 TAR OCT IIIII TAR OCT IIIII TAR OCT IIII TAR OCT IIIII TA	Log L Frequency Auto Tur 2.525000000 GP 2.476000000 GP 2.576000000 GP 2.576000000 GP
Res BW 100 kHz	#\ Band Edge N Ban	VNT 1-DH5 2480N	Avg Type: Log-Pwr Avg Type: Log-Pwr AvgHold: 100/100 MB	.000 ms (1001 pts) ing Emission III: 50:28 AM Oct II, 2022 TAR OCT III, 2022 TAR OCT IIIII TAR OCT IIIII TAR OCT IIII TAR OCT IIIII TA	Log L Frequency Auto Tur Center Frr 2.525000000 GH Start Frr 2.476000000 GH Stop Frr 2.576000000 GH CF Ste 10.00000 MH Auto MH

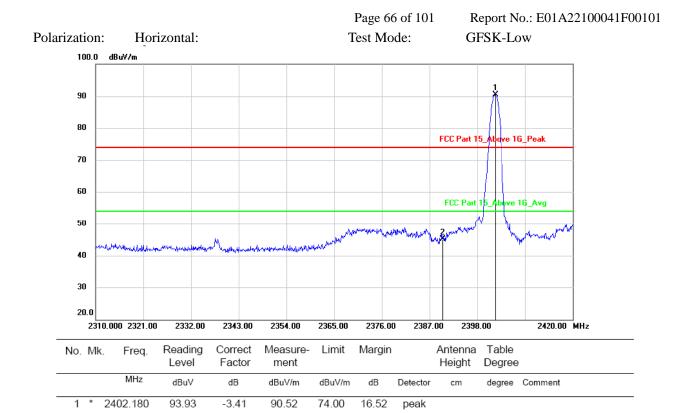


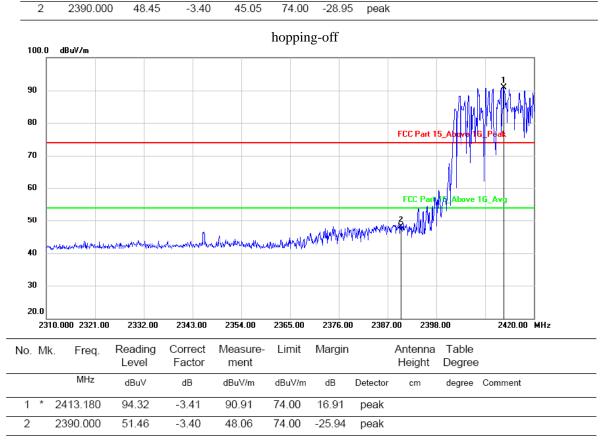


RL RF enter Freq 2.480	0000000 GHz	SENSE PULSE	Avg Type: Log-Pwr Avg Hold: 100/100	11:34:35 AM Oct 11, 2022 TRACE 11, 3, 4, 5, 6 TVPE IN WWWWWWW DET P. N.N.N.N.N.N.	Frequency
Ref Offset	iFGein:t	low #Atten: 30 dB	Mkr1	2.480 000 GHz -1.015 dBm	Auto Tun
o dB/div Ref 20.0					Center Fre 2.480000000 GH
000		m			Start Fre 2.476000000 GH
202					Stop Fre 2.484000000 GH
0.0		Jack .	hange -		CF Ste 800.000 kH Auto Ma
B. a many and plan	Andrea		Mart 10	manuman	Freq Offse 0 H
					Scale Typ
Res BW 100 kHz	Band Edge	#VBW 300 kHz NVNT 2-DH5 24800	BJATU	ng Emission	
Res BW 100 kHz Control Section Analyse AL RF enter Freq 2.526	Band Edge Semant SA (S) AC (S) AC (S) BAC (S)	NVNT 2-DH5 24801	MHz Ant1 No-Hopp: Avg Type: Log-Pwr AvgHold: 100/100	.000 ms (1001 pts) ing Emission	Frequency
Res BW 100 kHz	Band Edge South 54 15.7 AC 15.000000 GHz 15.000 GHz 15.78 dB	NVNT 2-DH5 24801	MHz Ant1 No-Hopp: Avg Type: Log-Pwr AvgHold: 100/100	.000 ms (1001 pts) ing Emission	Frequency Auto Tur Center Fre
Res BW 100 kHz	Band Edge	NVNT 2-DH5 24801	MHz Ant1 No-Hopp: Avg Type: Log-Pwr AvgHold: 100/100	.000 ms (1001 pts) ing Emission	Frequency Auto Turn Center Fre 2.52600000 GH Start Fre
RL RF I center Freq 2.52f Ref Offse Ref 20.5 0 dB/dhv Ref 20.5 Ref 20.5 0 dB/dhv 1 1 0 dB/dhv 1 1	Band Edge	NVNT 2-DH5 24801	MHz Ant1 No-Hopp: Avg Type: Log-Pwr AvgHold: 100/100	.000 ms (1001 pts) ing Emission	-14 -
Res BW 100 kHz	Band Edge	NVNT 2-DH5 24801	MHz Ant1 No-Hopp Avg Type: Log-Pwr AvgHold: 100/100	.000 ms (1001 pts) ing Emission III:9441 AMORT II, 2022 THE PERIOD III:9441 AMORT II, 2022 THE PERIOD III:9441 AMORT II, 2022 THE PERIOD III:9441 AMORT II, 2022 III:9441 AMORT III:9441 AMORT III III:9441 AMORT III:9441 AMORT III:9441 AMORT III III:9441 AMORT III:9441 AMORT III:9441 AMORT III:9441 AMORT III III:9441 AMORT III:9441 AMORT III:9441 AMORT III:9441 AMORT III III:9441 AM	Frequency Auto Tur Center Fre 2.526000000 GH Start Fre 2.476000000 GH Stop Fre 2.576000000 GH CF Ste 10.000000 MH
Res BW 100 kHz	Band Edge	NVNT 2-DH5 24800 I SINSE PUSH ast ++- Trig: Free Run #Atten: 30 dB #VBW 300 kHz Iz _0516 dBm Iz _0516 dBm Iz _0516 dBm	MHz Ant1 No-Hopp	.000 ms (1001 pts) ing Emission III:9441 AMORT II, 2022 THAN OCT III THAN OCT II, 2022 THAN OCT II, 202	Frequency Auto Tur Center Fre 2.526000000 GH Start Fre 2.476000000 GH Stop Fre 2.576000000 GH CF Ste 10.000000 MH

2. Radiated Test







TRF No.: 01-R001-3A-BT

2

2390.000

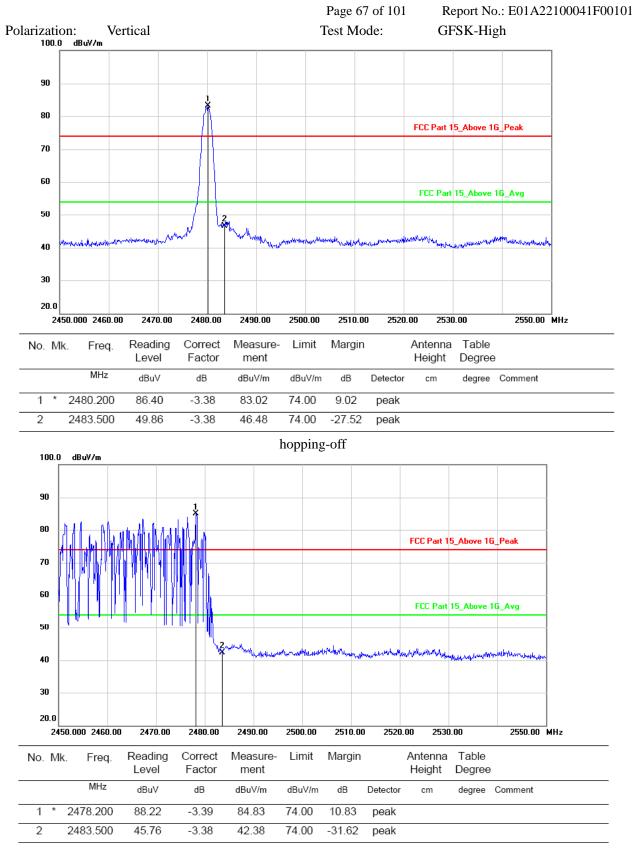
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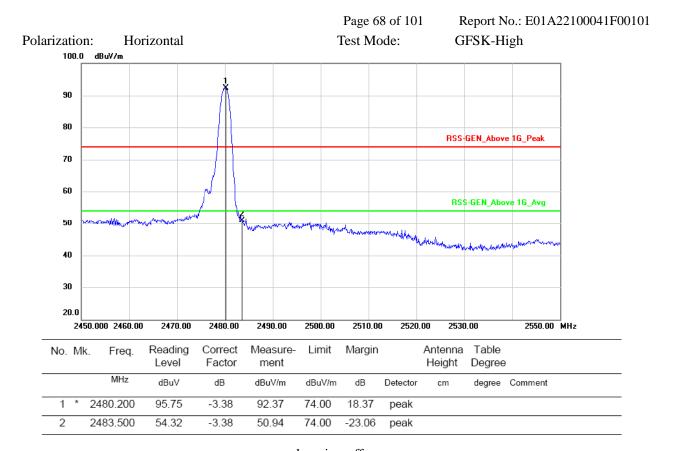
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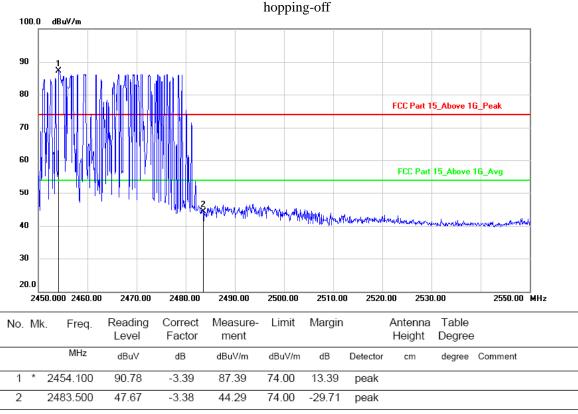
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74.00

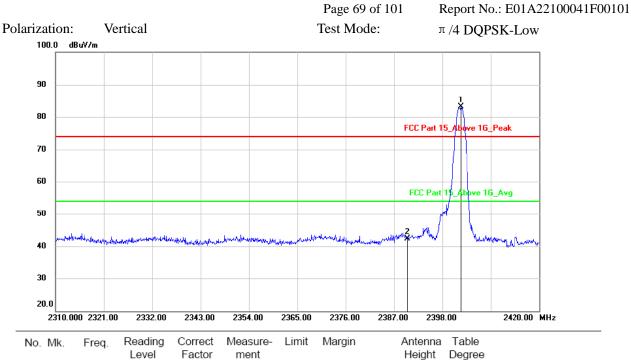
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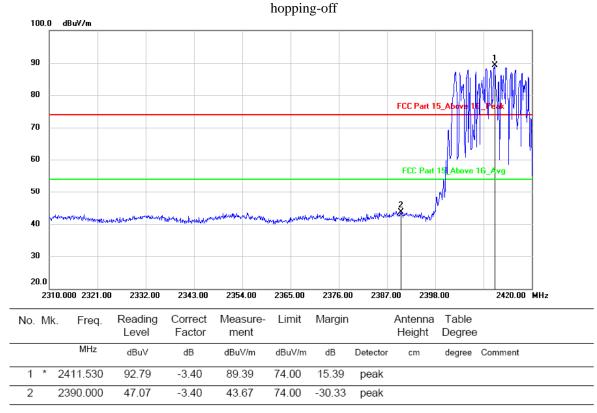




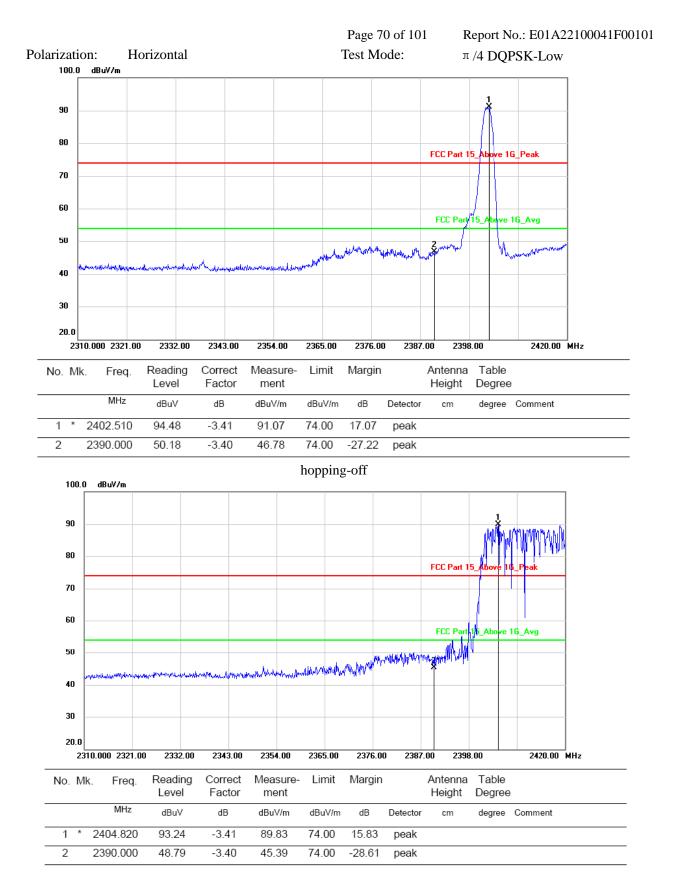
hopping-on

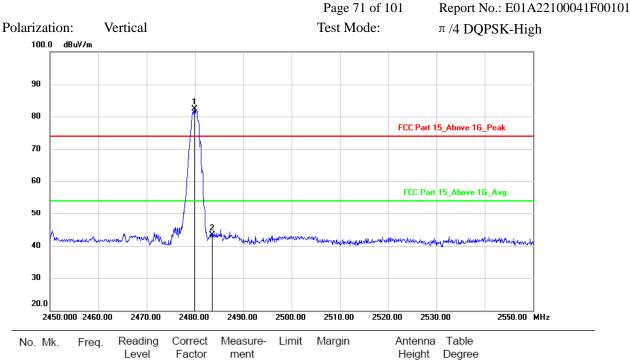


		Level	Factor	ment				Height	Degree	3
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1 *	2402.180	86.50	-3.41	83.09	74.00	9.09	peak			
2	2390.000	45.61	-3.40	42.21	74.00	-31.79	peak			

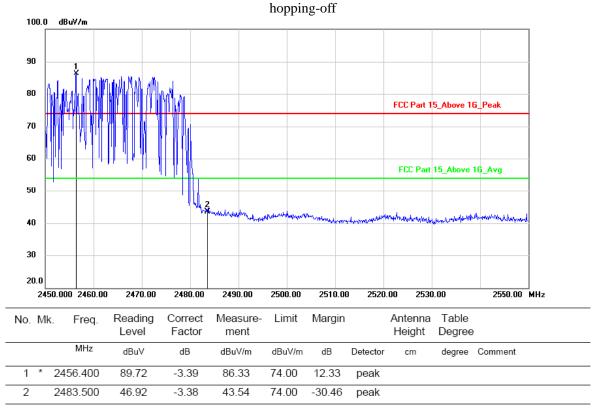


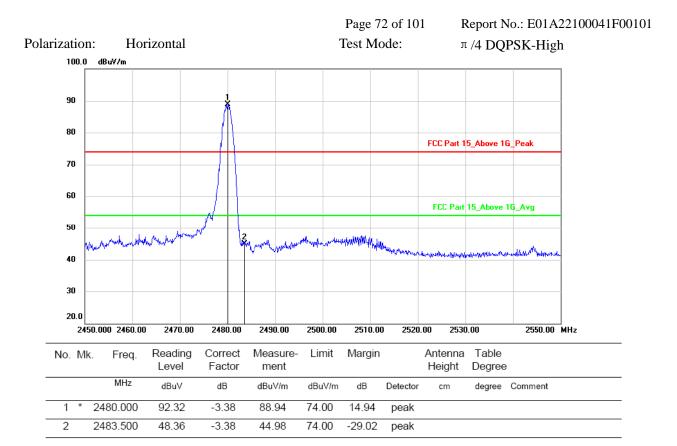
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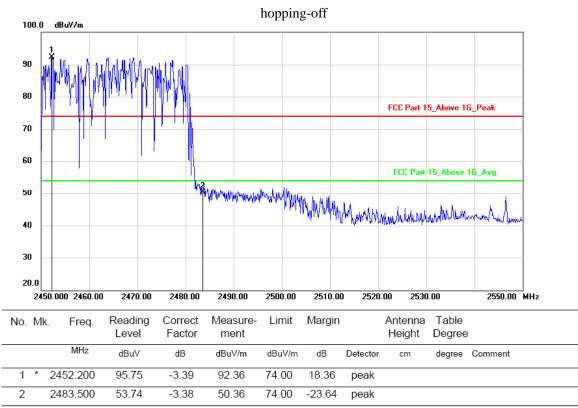




		LOVOI	1 dotor	mont				rioigin	Degree	,
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1 *	2479.900	85.69	-3.38	82.31	74.00	8.31	peak			
2	2483.500	46.71	-3.38	43.33	74.00	-30.67	peak			







14. Antenna Port Emission

	1 • • • • • • • • • • • • • • • • • • •				
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	CALIBRATED UNTIL	Calibration interval
Spectrum Analyzer	Rohde & Schwarz	FSV40	US40240623	2022-11-12	1 year
Coaxial Cable	Gigalink Microwave	ZT40	19022092	2022-11-12	1 year
Antenna Connector	ARTHUR-YANG	2244-N1TG1	N/A	2022-11-12	1 year

14.1Test Equipment

Remark: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

14.2Measuring Instruments and Setting

The following table is the setting of spectrum analyzer.

- V	
Spectrum analyzer	Setting
Attenuation	Auto
RB	100kHz
VB	300kHz
Detector	Peak
Trace	Max hold

14.3Test Procedures

The testing follows the Measurement Procedure of FCC KDB No. 558074 D01 15.247 Meas Guidance v05r02.

The conducted spurious emissions were measured conducted using a spectrum analyzer at low, Middle, and high channels, the limit was determined by attenuation 20dB of the RF peak power output.

14.4Block Diagram of Test setup



14.5Test Result

PASS.

Please refer to following pages.

Condition	Mode	Frequency (MHz)	Antenna	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	1-DH5	2402	Ant1	-30.29	-20	Pass
NVNT	1-DH5	2441	Ant1	-29.8	-20	Pass
NVNT	1-DH5	2480	Ant1	-26.03	-20	Pass
NVNT	2-DH5	2402	Ant1	-35.78	-20	Pass
NVNT	2-DH5	2441	Ant1	-30.49	-20	Pass
NVNT	2-DH5	2480	Ant1	-27.16	-20	Pass



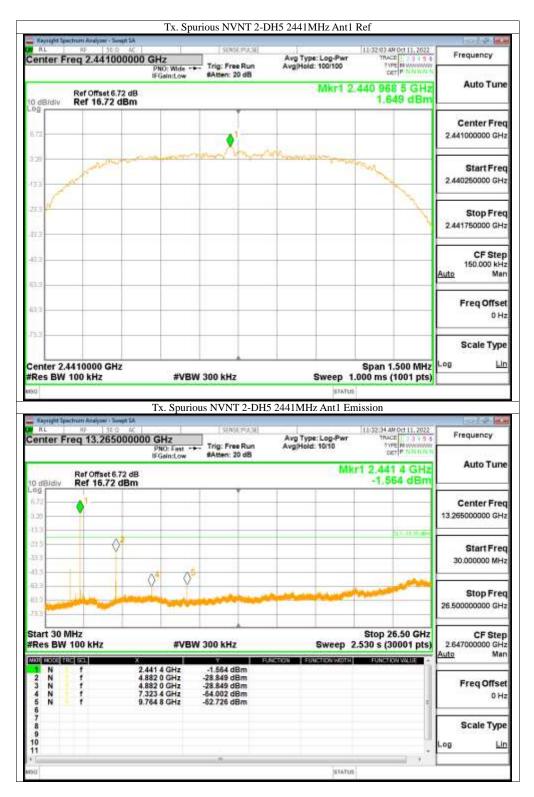




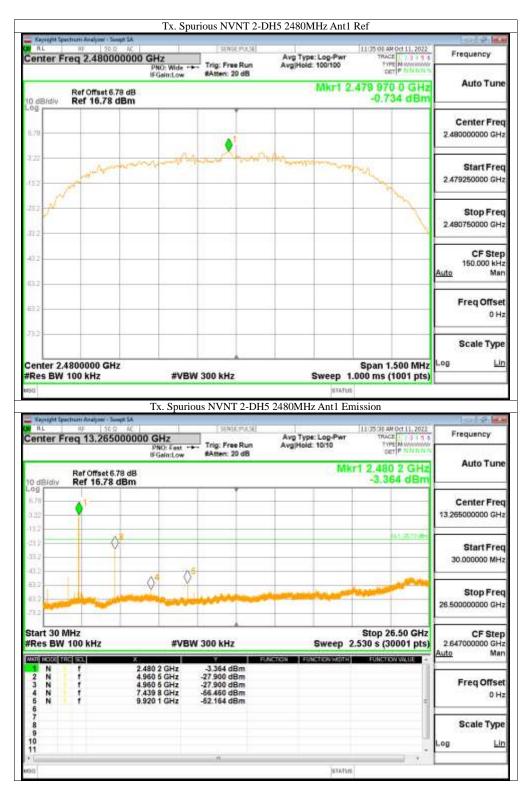
AL RF 3500 enter Freq 2.48000	0000 GHz	SENSE PULSE	Avg Type: Log-Pwr Avg Hold: 100/100	18:55:39 AM Oct 11, 2022 TRACE 2:3:1:5:5 1:02E M WWWWWWW	Frequency
Ref Offset 6.78	PNO: Wide ++ IFGain:Low	#Atten: 20 dB	19 9 80 010 0 - 01 0 - 010	479 983 5 GHz	Auto Tun
dBidiv Ref 16.78 d				-0.477 dBm	
.70.					Center Fre 2.480000000 GH
32	and when				Start Fre 2.479250000 GH
12	em		~	Min Jim	Stop Fre
12				Station.	2.480750000 GH
3.2					150.000 kF Auto Ma
3,2					Freq Offs 0 F
enter 2.4800000 GHz					Scale Typ
Res BW 100 kHz		V 300 kHz	Sweep 1	Span 1.500 MHz .000 ms (1001 pts)	
es BW 100 kHz	#VB\		STATU	.000 ms (1001 pts)	
0 Keynghi Spectrum Analyser - Sweg	#VBI Tx. Spurio	ous NVNT 1-DH:	and the second	.000 ms (1001 pts) nission	019 🖬
0	#VBV Tx. Spurio	DUS NVNT 1-DH:	STATU	.000 ms (1001 pts)	Frequency
a ht RF 552 enter Freq 13.2650 Ref Offset 6.7/ 0 dBidly Ref 16.78 d	Tx. Spurio	Dus NVNT 1-DH:	5 2480MHz Ant1 Er Avg Type: Log-Pwr Avg[Hold: 515	.000 ms (1001 pts) nission	Frequency
a Record Sector Andrew - See AL State enter Freq 13.2650 Ref Offset 6.7	Tx. Spurio	Dus NVNT 1-DH:	5 2480MHz Ant1 Er Avg Type: Log-Pwr Avg[Hold: 515	.000 ms (1001 pts) nission III:5558 AP Oct 11, 2022 TWOCE TWO TWOCE TWOCE TWO TWOCE TWOCE TWOCE TWOCE TWOCE TWO TWOCE TWO TWO TWOCE TWO TWO TWO TWO TWO TWO TWO TWO	Frequency Auto Tur Center Fre
a Reading Spectrum Andrew - See AL RF 55.9 enter Freq 13.26500 Ref Offset 6.74 0 dBidly Ref 16.78 d 90 122	Tx. Spurio	Dus NVNT 1-DH:	5 2480MHz Ant1 Er Avg Type: Log-Pwr Avg[Hold: 515	.000 ms (1001 pts) nission III:5558 AP Oct 11, 2022 TWOCE TWO TWOCE TWOCE TWO TWOCE TWOCE TWOCE TWOCE TWOCE TWO TWOCE TWO TWO TWOCE TWO TWO TWO TWO TWO TWO TWO TWO	Frequency Auto Tur Center Fre 13.26500000 GF
a Rengel Spectrum Andrew - See nL RF 552 enter Freq 13.26500 Ref Offset 6.71 0 dBidiv Ref 16.78 d 9 d 12 1 12 2 13 2 14 2 15 2	Tx. Spurio	Dus NVNT 1-DH:	5 2480MHz Ant1 Er Avg Type: Log-Pwr Avg[Hold: 515	.000 ms (1001 pts) mission III-5558-AP-Oct II, 2022 TYPE BRANCE CET P NAME III-5558-AP-Oct II, 2022 TYPE BRANCE III-5558-AP-Oct II, 2022 III-5558-AP-Oct III-505 III-5558-AP-Oct III-555 III-5558-AP-OCT III-5558-AP-OCT III-5558-AP-OCT III-555 III-5558-AP-OCT III-5558-AP-OCT III-5558-AP-OCT III-555 III-5558-AP-OCT III-5558-AP-OCT III-5558-AP-OCT III-5558-AP-OCT III-5558-AP-OCT II-5558-AP-OCT III-5558-AP-OCT III-558-AP-OCT III-5558-AP-OCT III-55	Frequency Auto Tur Center Fre 13.265000000 GF Start Fre 30.000000 MF
Accept Sector Active - See RL RP 36.2 enter Freq 13.2650 Consider Ref Offset 6.7 Consider Ref 16.78 d Consider Conside	#VBV	Dus NVNT 1-DH:	5 2480MHz Ant1 Er Avg Type: Log-Pwr AvgiHold: 515 Mk	.000 ms (1001 pts) nission III:555#APOct II. 2022 TYPE B ANDOCT II. 2023 TYPE B ANDOCT II. 2023 T	Frequency Auto Tur Center Frequency 13.265000000 GH Start Frequency 30.000000 MH Stop Frequency 26.50000000 GH CF Step 2.647000000 GH
Ref Offset 6.7 additional and the formed fo	#VBV	Dus NVNT 1-DH:	5 2480MHz Ant1 Er	.000 ms (1001 pts) nission III:555#APOct II. 2022 TWEE 3 3 5 5 TWE B ANDOR II. 2022 TWEE 3 3 5 5 TWE B ANDOR II. 2022 TWEE 3 3 5 5 TWE B ANDOR II. 2022 TWEE 3 3 5 TWE B ANDOR II. 2022 TWEE 3 3 5 TWEE 3 3 5 TWEE 3	Frequency Auto Tur Center Fre 13.265000000 GH Start Fre 30.000000 MH Stop Fre 26.50000000 GH 2.647000000 GH Auto Mil
Rengtl Spectrum Andrew - Swe RL RP 362 enter Freq 13.26500 Ref Offset 6.7 odBidly Ref 16.78 d 0 0 0 0 0 0 0 0 0 0 0 0 0	#VB/	V 300 KHz	5 2480MHz Ant1 Er Avg Type: Log-Pwr AvgiHold: 515 Mk	.000 ms (1001 pts) nission III:555#APOct II. 2022 TYPE B ANDOCT II. 2023 TYPE B ANDOCT II. 2023 T	Frequency Auto Tur Center Fre 13.26500000 GH Start Fre 30.000000 MH Stop Fre 26.50000000 GH CF Ste 2.647000000 GH











15. Antenna Application

15.1 Antenna requirement

The EUT'S antenna is met the requirement of FCC part 15C section 15.203 and 15.247.

FCC part 15C section 15.247 requirements:

Systems operating in the 2402-2480MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum peak output power of the intentional radiator is reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

15.2 Result

The EUT's antenna, permanent attached antenna, used a chip antenna and integrated on PCB, The antenna's gain is 1.24dBi and meets the requirement.

APPENDIX (Photos of EUT)

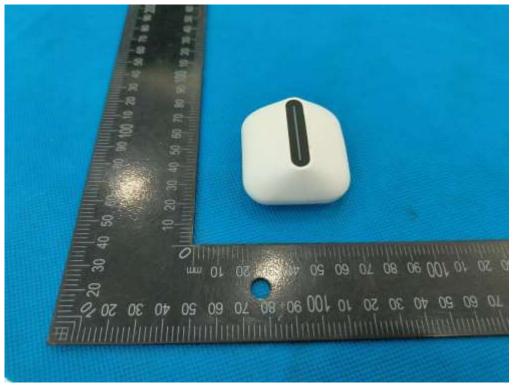


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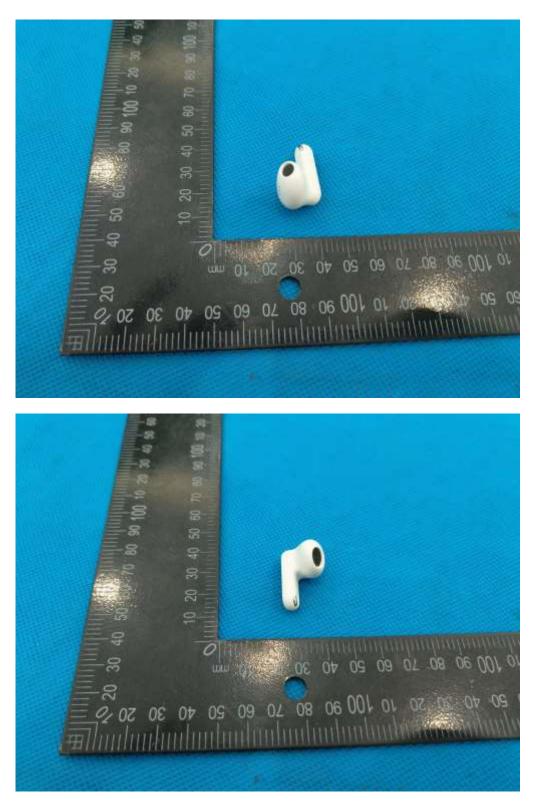
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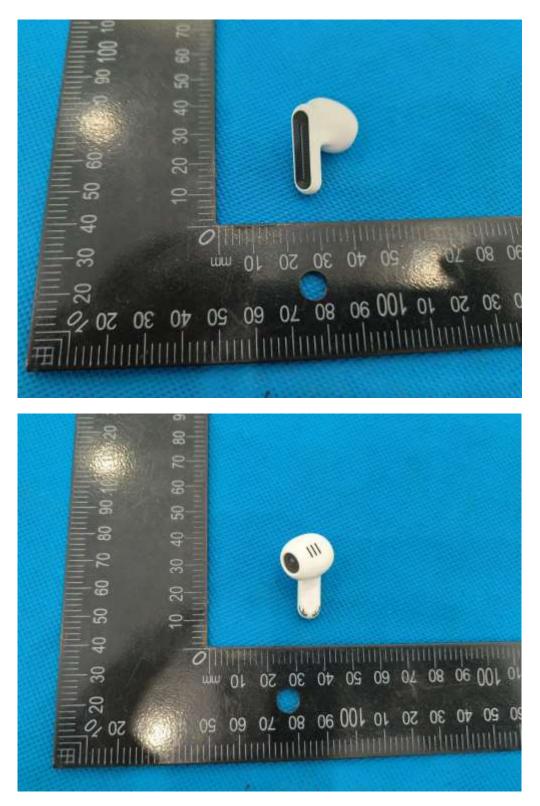


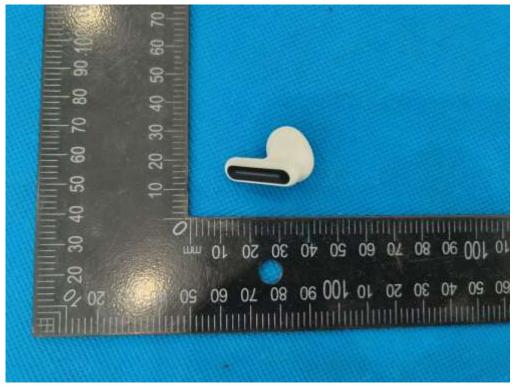


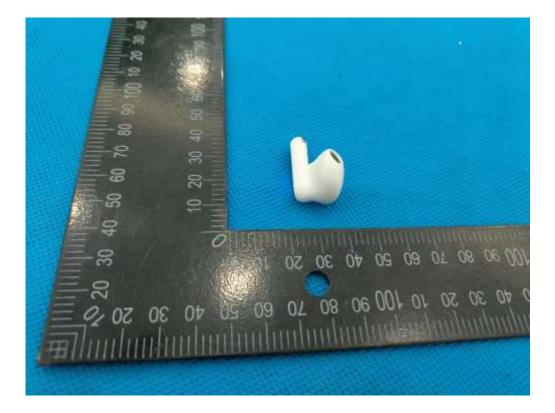


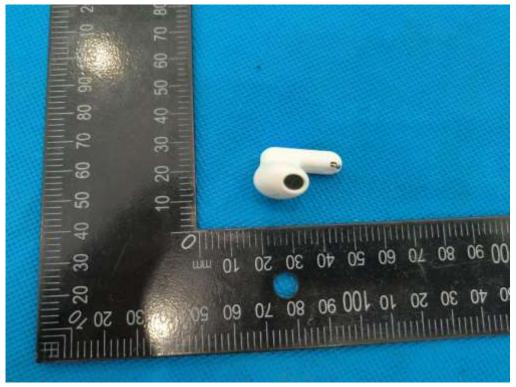










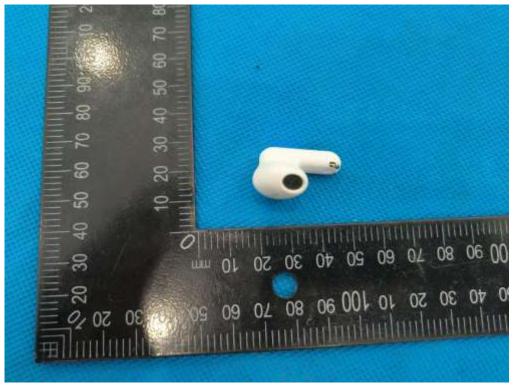




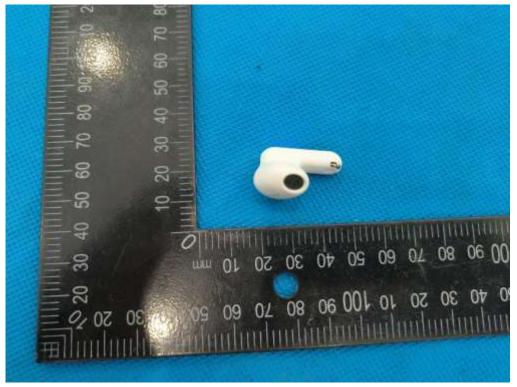
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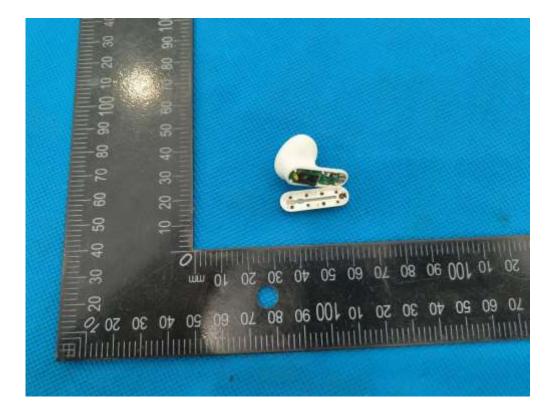




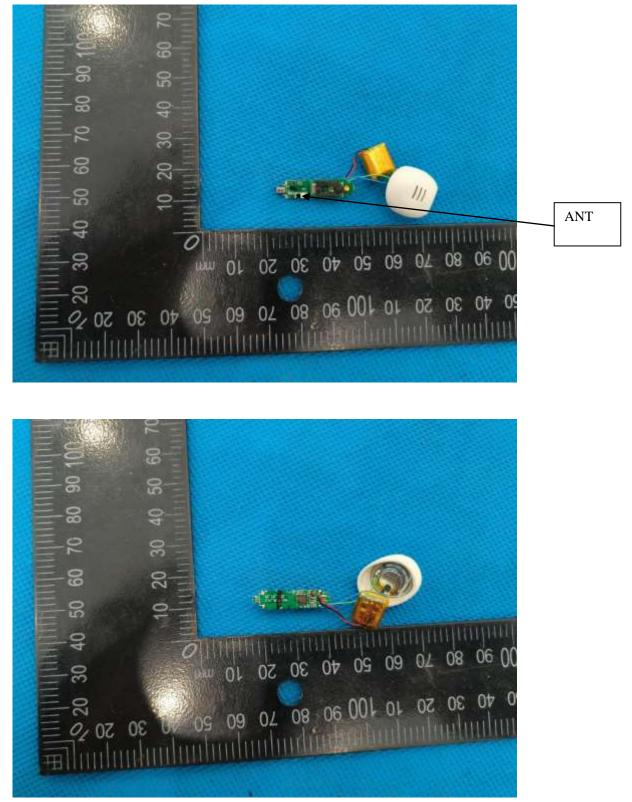




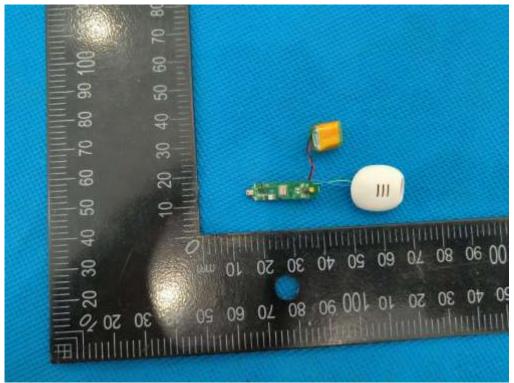


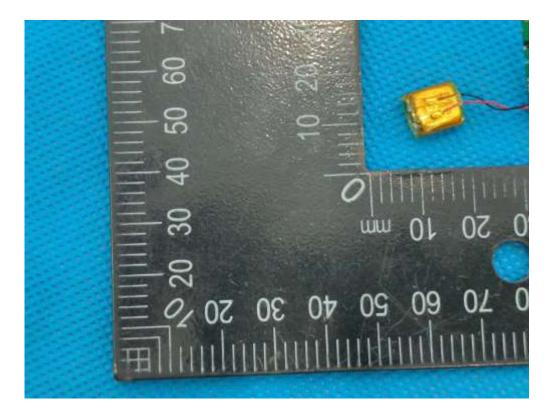


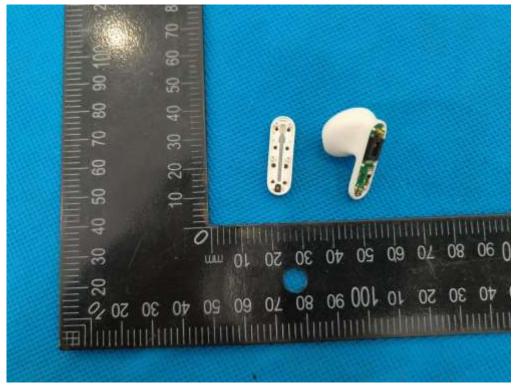
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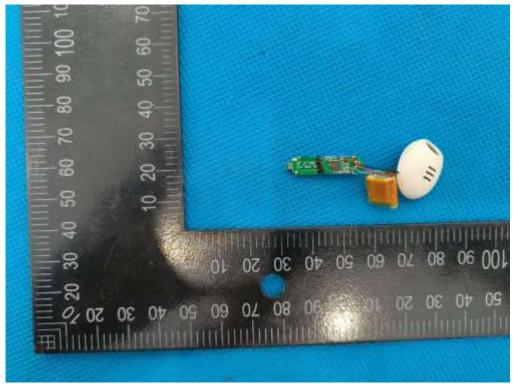
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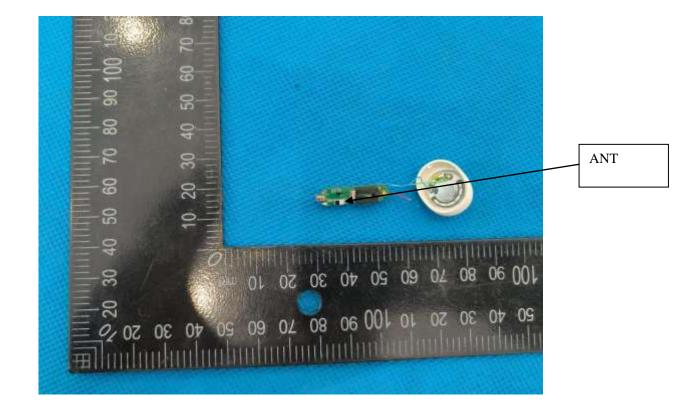


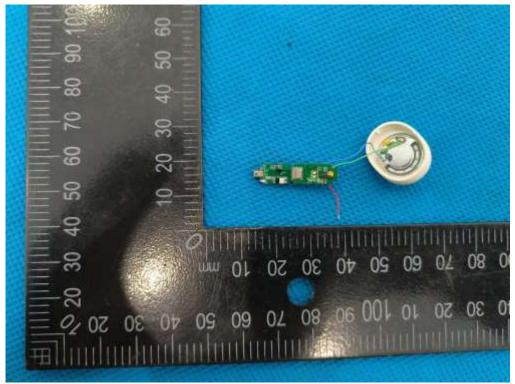


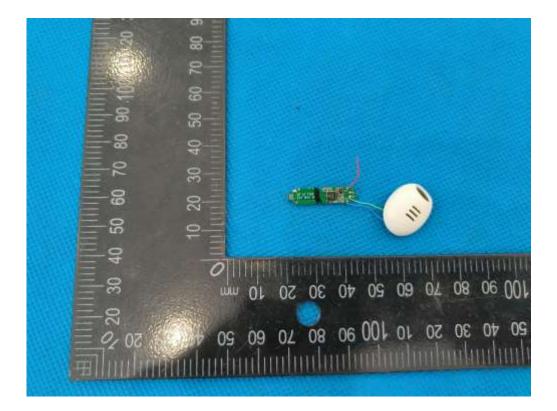










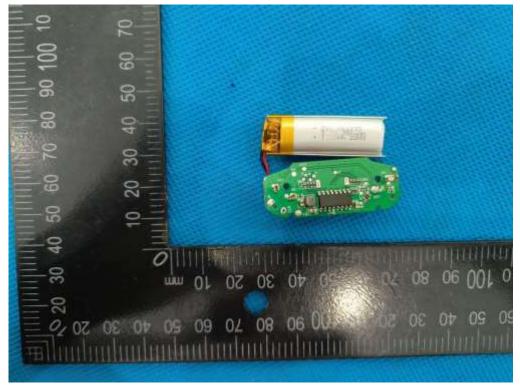


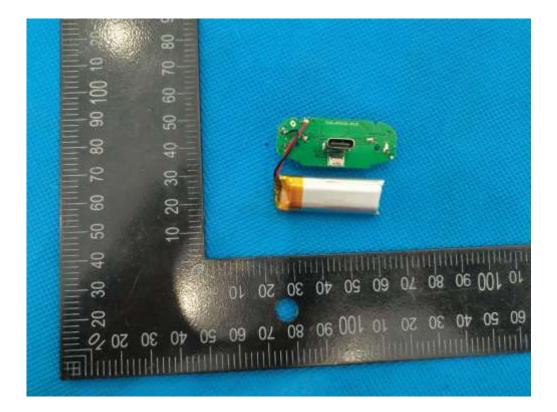
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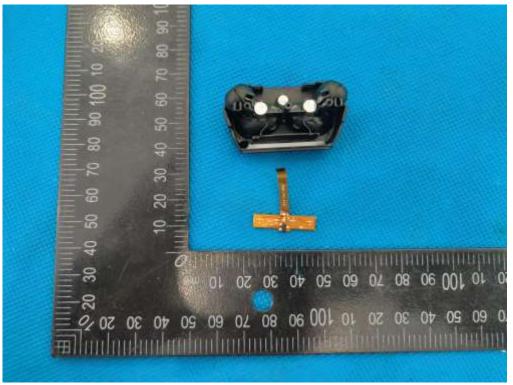


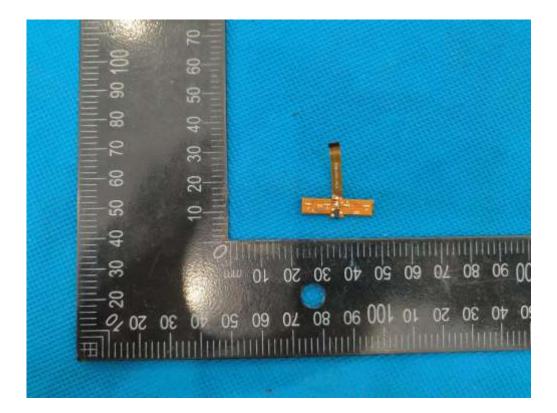
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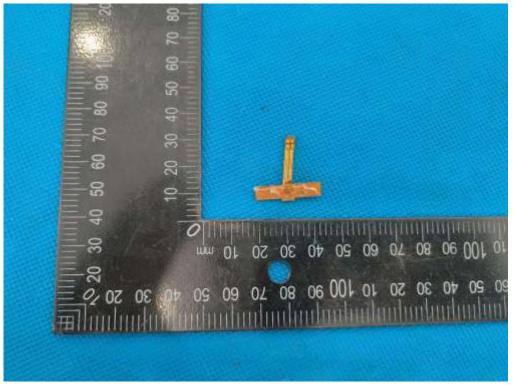


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