

TEST REPORT

Report No.:	D.: BCTC2305141026E					
Applicant:	pplicant: Shenzhen Aita Technology Co., Ltd.					
Product Name:	TWS Bluetooth Headset					
Model/Type reference:	ARTWS107	CHENZHA				
Tested Date:	2023-05-25 to 2023-06-05					
Issued Date:	2023-06-05					
She	enzhen BCTC Testing Co., Lto	d.				
No.: BCTC/RF-EMC-007	Page: 1 of 64	Edition; B,0				



FCC ID:2AU75-ATS95

Product Name:	TWS Bluetooth Headset
Trademark:	N/A
Model/Type Reference:	ARTWS107 ATS-13, ATS-14, ATS-16, ATS-19, ATS-22, ATS-26, ATS-27, ATS-31, ATS-34, ATS-36, ATS-46, ATS-51, ATS-59, ATS-64, ATS-70, ATS-77, ATS-80, ATS-86, ATS-88, ATS-95, ATS-98
Prepared For:	Shenzhen Aita Technology Co., Ltd.
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Manufacturer:	Shenzhen Aita Technology Co., Ltd.
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Prepared By:	Shenzhen BCTC Testing Co., Ltd.
Address:	1-2/F., Building B, Pengzhou Industrial Park, No.158, Fuyuan 1st Road, Zhancheng, Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, China
Sample Received Date:	2023-05-25
Sample tested Date:	2023-05-25 to 2023-06-05
Issue Date:	2023-06-05
Report No.:	BCTC2305141026E
Test Standards	FCC Part15.247 ANSI C63.10-2013
Test Results	PASS
Remark:	This is Bluetooth Classic radio test report.

Tested by:

Jeff.Fu/Project Handler

Approved by:

Zero Zhou/Reviewer

The test report is effective only with both signature and specialized stamp. This result(s) shown in this report refer only to the sample(s) tested. Without written approval of Shenzhen BCTC Testing Co., Ltd, this report can't be reproduced except in full. The tested sample(s) and the sample information are provided by the client.

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(Note: N/A Means Not Applicable)



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1. Version

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BCTC2305141026E	2023-06-05	Original	Valid



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2. Test Summary

The Product has been tested according to the following specifications:

No.	Test Parameter	Clause No	Results
1	Conducted emission AC power port	§15.207	PASS
2	Conducted peak output power for FHSS	§15.247(b)(1)	PASS
3	20dB Occupied bandwidth	§15.247(a)(1)	PASS
4	Hopping channel separation	§15.247(a)(1)	PASS
5	Number of hopping frequencies	§15.247(a)(1)(iii)	PASS
6	Dwell Time	§15.247(a)(1)(iii)	PASS
7	Spurious RF conducted emissions	§15.247(d)	PASS
8	Band edge	§15.247(d)	PASS
9	Spurious radiated emissions for transmitter	§15.247(d) & §15.209 & §15.205	PASS
10	Antenna Requirement	15.203	PASS

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3. Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

No.	Item	Uncertainty
1	3m chamber Radiated spurious emission(30MHz-1GHz)	U=4.3dB
2	3m chamber Radiated spurious emission(9KHz-30MHz)	U=3.7dB
3	3m chamber Radiated spurious emission(1GHz-18GHz)	U=4.5dB
4	3m chamber Radiated spurious emission(18GHz-40GHz)	U=3.34dB
5	Conducted Emission (150kHz-30MHz)	U=3.20dB
6	Conducted Adjacent channel power	U=1.38dB
7	Conducted output power uncertainty Above 1G	U=1.576dB
8	Conducted output power uncertainty below 1G	U=1.28dB
9	humidity uncertainty	U=5.3%
10	Temperature uncertainty	U≐0.59°C



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4. Product Information And Test Setup

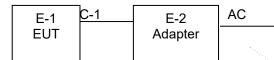
4.1 Product Information

Model/Type reference:	ARTWS107 ATS-13, ATS-14, ATS-16, ATS-19, ATS-22, ATS-26, ATS-27, ATS-31, ATS-34, ATS-36, ATS-46, ATS-51, ATS-59, ATS-64, ATS-70, ATS-77, ATS-80, ATS-86, ATS-95, ATS-88, ATS-98
Model differences:	All the model are the same circuit and RF module, except model names.
Bluetooth Version:	5.0
Hardware Version:	N/A
Software Version:	N/A
Operation Frequency:	2402-2480MHz
Type of Modulation:	GFSK, π/ 4 DQPSK
Number Of Channel	79CH
Antenna installation:	Chip antenna
Antenna Gain:	2.67 dBi
Ratings:	DC 5V From Charging case, DC3.7V From Battery

4.2 Test Setup Configuration

See test photographs attached in *EUT TEST SETUP PHOTOGRAPHS* for the actual connections between Product and support equipment.

Conducted Emission:



Radiated Spurious Emission



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4.3 Support Equipment

No.	Device Type	Brand	Model	Series No.	Note
E-1	TWS Bluetooth Headset	N/A	ARTWS107	N/A	EUT
E-2	Adapter	N/A	BCTC0001	N/A	Auxiliary

ltem	Shielded Type	Ferrite Core	Length	Note
C-1	N/A	N/A	1M	DC cable unshielded

Notes:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.

2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

4.4 Channel List

СН	Frequency (MHz)	СН	Frequency (MHz)	СН	Frequency (MHz)	СН	Frequency (MHz)
0	2402	1	2403	2	2404	3	2405
4	2406	5	2407	6	2408	7	2409
8	2410	9	2411	10	2412	11	2413
12	2414	13	2415	14	2416	15	2417
16	2418	17	2419	18	2420	19	2421
20	2422	21	2423	22	2424	23	2425
24	2426	25	2427	26	2428	27	2429
28	2430	29	2431	30	2432	31	2433
32	2434	33	2435	34	2436	35	2437
36	2438	37	2439	38	2440	39	2441
40	2442	41	2443	42	2444	43	2445
44	2446	45	2447	46	2448	47	2449
48	2450	49	2451	50	2452	51	2453
52	2454	53	2455	54	2456	55	2457
56	2458	57	2459	58	2460	59	2461
60	2462	61	2463	62	2464	63	2465
64	2466	65	2467	66	2468	67	2469
68	2470	69	2471	70	2472	71	2473
72	2474	73	2475	74	2476	75	2477
76	2478	77	2479	78	2480	79	1

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4.5 Test Mode

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Test Mode	Test mode	Low channel	Middle channel	High channel		
1	Transmitting(GFSK)	2402MHz	2441MHz	2480MHz		
2	Transmitting(π/ 4 DQPSK)	2402MHz	2441MHz	2480MHz		
3	Transmitting (Conducted emission & Radiated emission)					

Note:

(1) The measurements are performed at the highest, middle, lowest available channels.

(2) Fully-charged battery is used during the test

4.6 Table Of Parameters Of Text Software Setting

During testing channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product power parameters

Test software Version	FCC_assist_1.0.2.2				
Frequency	2402 MHz	2441 MHz	2480 MHz		
Parameters	DEF	DEF	DEF		

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5. Test Facility And Test Instrument Used

5.1 Test Facility

All measurement facilities used to collect the measurement data are located at Shenzhen BCTC Testing Co., Ltd. Address: 1-2/F., Building B, Pengzhou Industrial Park, No.158, Fuyuan 1st Road, Zhancheng, Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, China. The site and apparatus are constructed in conformance with the requirements of ANSI C63.4 and CISPR 16-1-1 other equivalent standards. FCC Test Firm Registration Number: 712850

A2LA certificate registration number is: CN1212

ISED Registered No.: 23583

ISED CAB identifier: CN0017

5.2 Test Instrument Used

Conducted Emissions Test							
Equipment	Manufacturer	Model#	Serial#	Last Cal.	Next Cal.		
Receiver	R&S	ESR3	102075	May 15, 2023	May 14, 2024		
LISN	R&S	ENV216	101375	May 15, 2023	May 14, 2024		
Software	Frad	EZ-EMC	EMC-CON 3A1	١	/		
Attenuator	١	10dB DC-6GHz	1650	May 15, 2023	May 14, 2024		

RF Conducted Test							
Equipment	Manufacturer	Model#	Serial#	Last Cal.	Next Cal.		
Power Metter	Keysight	E4419	I I	May 15, 2023	May 14, 2024		
Power Sensor (AV)	Keysight	E9300A		May 15, 2023	May 14, 2024		
Signal Analyzer20kH z-26.5GHz	Keysight	N9020A	MY49100060	May 15, 2023	May 14, 2024		
Spectrum Analyzer9kHz- 40GHz	R&S	FSP40	100363	May 15, 2023	May 14, 2024		
Radio frequency control box	MAIWEI	MW100-RFC B	$\mathcal{F}_{\mathcal{F}}$	N			
Software	MAIWEI	MTS 8310		/	I		



Radiated Emissions Test (966 Chamber01)							
Equipment	Manufacturer	Model#	Serial#	Last Cal.	Next Cal.		
966 chamber	ChengYu	966 Room	966	May 15, 2023	May 14, 2026		
Receiver	R&S	ESR3	102075	May 15, 2023	May 14, 2024		
Receiver	R&S	ESRP	101154	May 15, 2023	May 14, 2024		
Amplifier	Schwarzbeck	BBV9744	9744-0037	May 15, 2023	May 14, 2024		
TRILOG Broadband Antenna	Schwarzbeck	VULB9163	942	May 29, 2023	May 28, 2024		
Loop Antenna(9KHz -30MHz)	Schwarzbeck	FMZB1519B	00014	May 31, 2023	May 30, 2024		
Amplifier	SKET	LAPA_01G18 G-45dB	١	May 15, 2023	May 14, 2024		
Horn Antenna	Schwarzbeck	BBHA9120D	1541	May 31, 2023	May 30, 2024		
Amplifier(18G Hz-40GHz)	MITEQ	TTA1840-35- HG	2034381	May 15, 2023	May 14, 2024		
Horn Antenna(18G Hz-40GHz)	Schwarzbeck	BBHA9170	00822	May 31, 2023	May 30, 2024		
Spectrum Analyzer9kHz- 40GHz	R&S	FSP40	100363	May 15, 2023	May 14, 2024		
Software	Frad	EZ-EMC	FA-03A2 RE	١	١		

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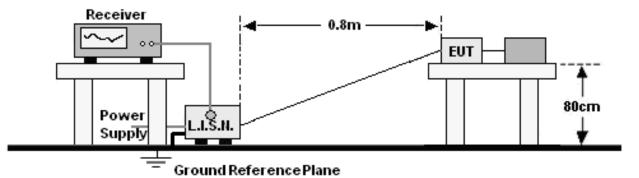
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6. Conducted Emissions

6.1 Block Diagram Of Test Setup



6.2 Limit

	Limit (dBuV)
Frequency (MHz)	Quas-peak	Average
0.15 -0.5	66 - 56 *	56 - 46 *
0.50 -5.0	56.00	46.00
5.0 -30.0	60.00	50.00
Notes:		/

1. *Decreasing linearly with logarithm of frequency.

2. The lower limit shall apply at the transition frequencies.

6.3 Test procedure

Receiver Parameters	S	Setting
Attenuation		10 dB
Start Frequency		0.15 MHz
Stop Frequency		30 MHz
IF Bandwidth		9 kHz

a. The Product was placed on a nonconductive table 0.8 m above the horizontal ground reference plane, and 0.4 m from the vertical ground reference plane, and connected to the main through Line Impedance Stability Network (L.I.S.N).

b. The RBW of the receiver was set at 9 kHz in 150 kHz ~ 30MHz with Peak and AVG detector in Max Hold mode. Run the receiver's pre-scan to record the maximum disturbance generated from Product in all power lines in the full band.

c. For each frequency whose maximum record was higher or close to limit, measure its QP and AVG values and record.

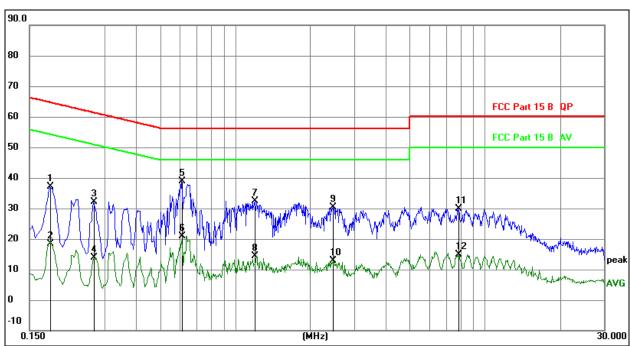
6.4 EUT operating Conditions

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.



6.5 Test Result

Temperature:	26 ℃	Relative Humidity:	54%
Pressure:	101KPa	Phase :	L
Test Mode:	Mode 3	Test Voltage :	AC120V/60Hz



Remark:

All readings are Quasi-Peak and Average values.
 Factor = Insertion Loss + Cable Loss.
 Measurement = Reading Level + Correct Factor
 Over = Measurement - Limit

No. Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
	MHz		dB	dBuV	dBuV	dB	Detector
1	0.1806	17.31	19.75	37.06	64.46	-27.40	QP
2	0.1806	-1.33	19.75	18.42	54.46	-36.04	AVG
3	0.2701	12.35	19.78	32.13	61.11	-28.98	QP
4	0.2701	-5.90	19.78	13.88	51.11	-37.23	AVG
5 *	0.6108	19.21	19.73	38.94	56.00	-17.06	QP
6	0.6108	1.27	19.73	21.00	46.00	-25.00	AVG
7	1.1970	12.58	19.78	32.36	56.00	-23.64	QP
8	1.1970	-5.51	19.78	14.27	46.00	-31.73	AVG
9	2.4606	10.56	19.93	30.49	56.00	-25.51	QP
10	2.4606	-7.01	19.93	12.92	46.00	-33.08	AVG
11	7.8516	9.77	20.21	29.98	60.00	-30.02	QP
12	7.8516	-5.39	20.21	14.82	50.00	-35.18	AVG

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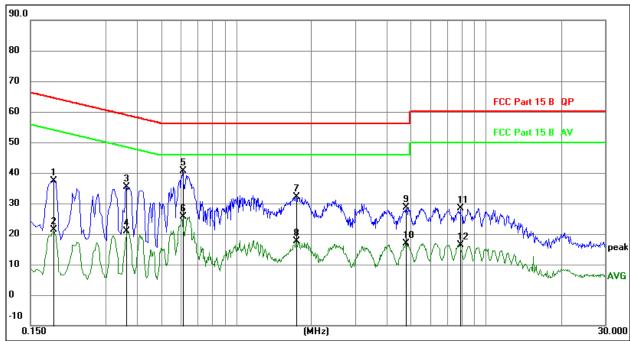
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Temperature:	26 ℃	Relative Humidity:	54%
Pressure:	101KPa	Phase :	Ν
Test Mode:	Mode 3	Test Voltage :	AC120V/60Hz



Remark:

All readings are Quasi-Peak and Average values.
 Factor = Insertion Loss + Cable Loss.
 Measurement = Reading Level + Correct Factor
 Over = Measurement - Limit

No.: BCTC/RF-EMC-007

No. Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
	MHz		dB	dBuV	dBuV	dB	Detector
1	0.1860	17.50	19.76	37.26	64.21	-26.95	QP
2	0.1860	1.60	19.76	21.36	54.21	-32.85	AVG
3	0.3615	15.51	19.76	35.27	58.69	-23.42	QP
4	0.3615	1.06	19.76	20.82	48.69	-27.87	AVG
5 *	0.6134	20.84	19.73	40.57	56.00	-15.43	QP
6	0.6134	5.98	19.73	25.71	46.00	-20.29	AVG
7	1.7430	12.27	19.85	32.12	56.00	-23.88	QP
8	1.7430	-2.26	19.85	17.59	46.00	-28.41	AVG
9	4.7895	8.60	20.12	28.72	56.00	-27.28	QP
10	4.7895	-3.25	20.12	16.87	46.00	-29.13	AVG
11	7.8630	8.06	20.21	28.27	60.00	-31.73	QP
12	7.8630	-3.71	20.21	16.50	50.00	-33.50	AVG

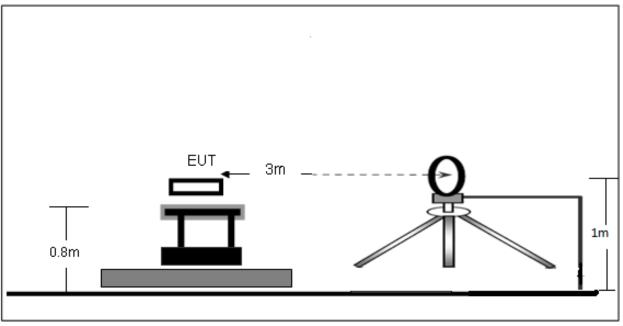
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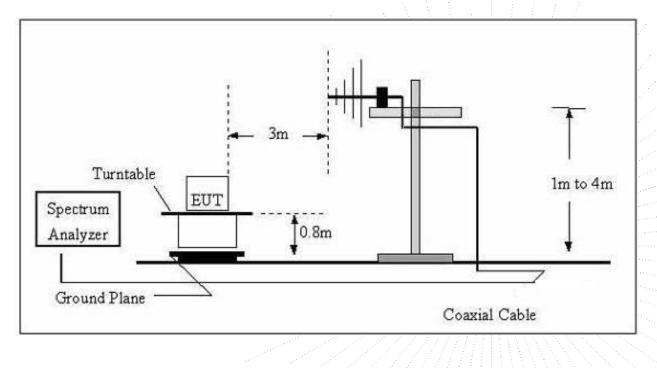
7. Radiated emissions

7.1 Block Diagram Of Test Setup

(A) Radiated Emission Test-Up Frequency Below 30MHz







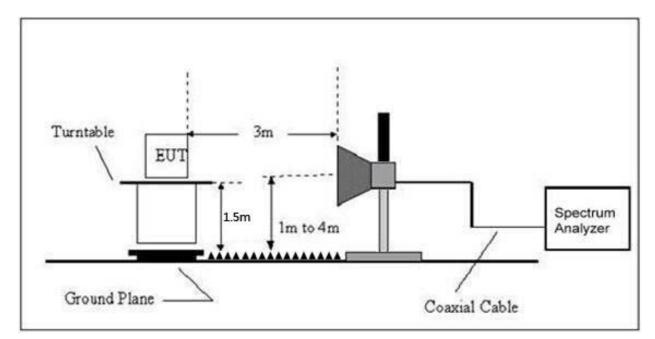
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(C) Radiated Emission Test-Up Frequency Above 1GHz



7.2 Limit

20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequency	Field Strength	Distance	Field Strength Limit at 3m Distance		
(MHz)	uV/m	(m)	uV/m	dBuV/m	
0.009 ~ 0.490	2400/F(kHz)	300	10000 * 2400/F(kHz)	20log ^{(2400/F(kHz))} + 80	
0.490 ~ 1.705	24000/F(kHz)	30	100 * 24000/F(kHz)	20log ^{(24000/F(kHz))} + 40	
1.705 ~ 30	30	30	100 * 30	20log ⁽³⁰⁾ + 40	
30 ~ 88	100	3	100	20log ⁽¹⁰⁰⁾	
88 ~ 216	150	····. 3 ····.	150	20log ⁽¹⁵⁰⁾	
216 ~ 960	200	3	200	20log ⁽²⁰⁰⁾	
Above 960	500	3	500	20log ⁽⁵⁰⁰⁾	

Limits Of Radiated Emission Measurement (Above 1000MHz)

	Limit (dBuV/m) (at 3M)	
Frequency (MHz)	Peak	Average
Above 1000	74	54

Notes:

(1)The limit for radiated test was performed according to FCC PART 15C

(2)The tighter limit applies at the band edges.

(3) Emission level (dBuV/m)=20log Emission level (uV/m).



Frequency Range Of Radiated Measurement

(a) For an intentional radiator the spectrum shall be investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to at least the frequency shown in this paragraph:

(1) If the intentional radiator operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

(2) If the intentional radiator operates at or above 10 GHz and below 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 100 GHz, whichever is lower.

(3) If the intentional radiator operates at or above 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 200 GHz, whichever is lower, unless specified otherwise elsewhere in the rules.

(4) If the intentional radiator operates at or above 95 GHz: To the third harmonic of the highest fundamental frequency or to 750 GHz, whichever is lower, unless specified otherwise elsewhere in the rules.

(5) If the intentional radiator contains a digital device, regardless of whether this digital device controls the functions of the intentional radiator or the digital device is used for additional control or function purposes other than to enable the operation of the intentional radiator, the frequency range shall be investigated up to the range specified in paragraphs (a) (1)through (4) of this section or the range applicable to the digital device, as shown in paragraph (b)(1) of this section, whichever is the higher frequency range of investigation.

7.3 Test procedure

Receiver Parameter	Setting
Attenuation	Auto
9kHz~150kHz	RBW 200Hz for QP
150kHz~30MHz	RBW 9kHz for QP
30MHz~1000MHz	RBW 120kHz for QP

Spectrum Parameter	Setting
1-25GHz	RBW 1 MHz /VBW 1 MHz for Peak, RBW 1 MHz / VBW 10Hz for Average

Below 1GHz test procedure as below:

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.



Above 1GHz test procedure as below:

a.The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.

b.The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c.The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d.For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.

e.The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

g. Test the EUT in the lowest channel, the middlest channel, the Highest channel. Note:

Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported.

7.4 EUT operating Conditions

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

7.5 Test Result

Below 30MHz

Temperature:	26 ℃	Relative Humidity:	54%
Pressure:	101KPa	Test Voltage :	DC 3.7V
Test Mode:	Mode 3	Polarization :	$\mathbf{H} = \left[\frac{1}{2} \right] \left[\frac{1}{2} \left[\frac{1}{2} \right] \left[\frac{1}{2} \right] \left[\frac{1}{2} \left[\frac{1}{2} \right] \left[\frac{1}{2} \left[\frac{1}{2} \right] \left[\frac{1}{2} \left[$

Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F
				PASS
				PASS

Note:

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Distance extrapolation factor =40 log (specific distance/test distance)(dB);

Limit line = specific limits(dBuv) + distance extrapolation factor.



Between 30MHz – 1GHz Temperature: 26 °C Relative Humidity: 54%				
Pressure:	101KPa	Phase :	Horizontal	
Test Mode:	Mode 3	Test Voltage :	DC 3.7V	





Remark:

1. Factor = Antenna Factor + Cable Loss – Pre-amplifier.

2. Measurement = Reading Level + Correct Factor

3. Over = Measurement - Limit

No.	Mk	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		125.8864	33.56	-19.46	14.10	43.50	-29.40	QP
2		199.9856	33.48	-17.37	16.11	43.50	-27.39	QP
3		322.1886	36.68	-13.79	22.89	46.00	-23.11	QP
4		489.0269	29.80	-10.52	19.28	46.00	-26.72	QP
5		668.1423	29.57	-7.51	22.06	46.00	-23.94	QP
6	*	851.0353	29.36	-5.14	24.22	46.00	-21.78	QP

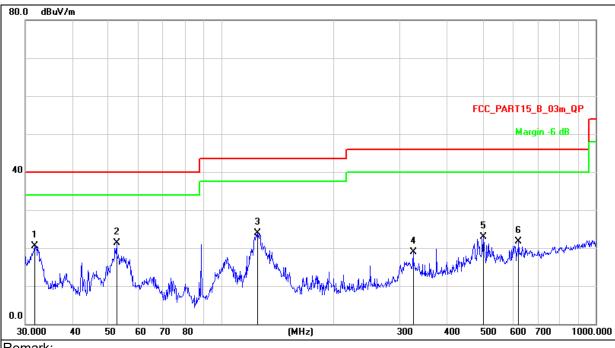
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E



Temperature:	26 ℃	Relative Humidity:	54%
Pressure:	101KPa	Phase :	Vertical
Test Mode:	Mode 3	Test Voltage :	DC 3.7V



Remark:

1. Factor = Antenna Factor + Cable Loss – Pre-amplifier.

2. Measurement = Reading Level + Correct Factor 3. Over = Measurement - Limit

0101	moue					1 1		
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		31.7313	38.56	-18.09	20.47	40.00	-19.53	QP
2	*	52.5753	37.29	-15.98	21.31	40.00	-18.69	QP
3	1	25.0066	43.27	-19.41	23.86	43.50	-19.64	QP
4	3	325.5958	32.57	-13.66	18.91	46.00	-27.09	QP
5	5	501.1790	33.20	-10.23	22.97	46.00	-23.03	QP
6	6	622.8900	29.88	-8.08	21.80	46.00	-24.20	QP



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Polar	Frequency	Reading Level	Correct Factor	Measure- ment	Limits	Over	Detector
(H/V)	(MHz)	(dBuV/m)	(dB)	(dBuV/m)	(dBuV/ m)	(dB)	Туре
			GFSK Low ch	annel			
V	4804.00	53.46	-0.43	53.03	74.00	-20.97	PK
V	4804.00	43.55	-0.43	43.12	54.00	-10.88	AV
V	7206.00	42.89	8.31	51.20	74.00	-22.80	PK
V	7206.00	32.87	8.31	41.18	54.00	-12.82	AV
Н	4804.00	51.35	-0.43	50.92	74.00	-23.08	PK
Н	4804.00	41.83	-0.43	41.40	54.00	-12.60	AV
Н	7206.00	40.85	8.31	49.16	74.00	-24.84	PK
Н	7206.00	32.43	8.31	40.74	54.00	-13.26	AV
		G	GFSK Middle c	hannel			
V	4882.00	49.69	-0.38	49.31	74.00	-24.69	PK
V	4882.00	41.58	-0.38	41.20	54.00	-12.80	AV
V	7323.00	42.38	8.83	51.21	74.00	-22.79	PK
V	7323.00	33.48	8.83	42.31	54.00	-11.69	AV
Н	4882.00	45.85	-0.38	45.47	74.00	-28.53	PK
Н	4882.00	36.48	-0.38	36.10	54.00	-17.90	AV
Н	7323.00	40.64	8.83	49.47	74.00	-24.53	PK
Н	7323.00	32.61	8.83	41.44	54.00	-12.56	AV
			GFSK High ch	annel			
V	4960.00	51.13	-0.32	50.81	74.00	-23.19	PK
V	4960.00	40.23	-0.32	39.91	54.00	-14.09	AV
V	7440.00	42.32	9.35	51.67	74.00	-22.33	PK
V	7440.00	31.34	9.35	40.69	54.00	-13.31	AV
Н	4960.00	49.84	-0.32	49.52	74.00	-24.48	PK
Н	4960.00	40.23	-0.32	39.91	54.00	-14.09	AV
Н	7440.00	39.60	9.35	48.95	74.00	-25.05	PK
Н	7440.00	31.83	9.35	41.18	54.00	-12.82	AV

Between 1GHz – 25GHz

Remark:

1.Emission Level = Meter Reading + Factor, Factor = Antenna Factor + Cable Loss – Pre-amplifier. Over= Emission Level - Limit

2.If peak below the average limit, the average emission was no test.

3. In restricted bands of operation, The spurious emissions below the permissible value more than 20dB 4. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

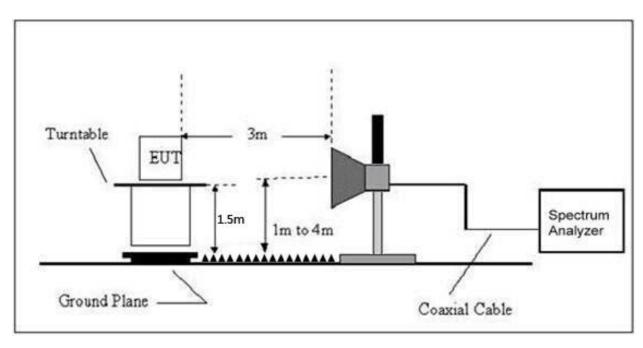
5.All the Modulation are test, the worst mode is GFSK, the data recording in the report.



8. Radiated Band Emission Measurement And Restricted Bands Of Operation

8.1 Block Diagram Of Test Setup

Radiated Emission Test-Up Frequency Above 1GHz



8.2 Limit

FCC Part15 C Section 15.209 and 15.205

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

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)
13.36-13.41			



Limits Of Radiated Emission Measurement (Above 1000MHz)

Frequency (MHz)	Limit (dBuV/m) (at 3M) Peak Average			
Frequency (MHz)				
Above 1000	74	54		

Notes:

(1)The limit for radiated test was performed according to FCC PART 15C.

(2)The tighter limit applies at the band edges.

(3)Emission level (dBuV/m)=20log Emission level (uV/m).

8.3 Test procedure

Receiver Parameter	Setting
Attenuation	Auto
Start Frequency	2300MHz
Stop Frequency	2520
RB / VB (Emission In Restricted Band)	1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average

Above 1GHz test procedure as below:

a. The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.

b.The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c.The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d.For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.

e.The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

g. Test the EUT in the lowest channel, the middlest channel, the Highest channel.

Note:

Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported.

8.4 EUT operating Conditions

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.



8.5 Test Result

Test mode	Polar (H/V)	Frequency (MHz)	Reading Level (dBuV/m)	Correct Factor (dB)	Measure- ment (dBuV/m)	Limits (dBuV/m)		Result
					РК	□PK	AV	
	Low Channel 2402MHz							
GFSK	Н	2390.00	53.04	-6.70	46.34	74.00	54.00	PASS
	Н	2400.00	57.82	-6.71	51.11	74.00	54.00	PASS
	V	2390.00	52.77	-6.70	46.07	74.00	54.00	PASS
	V	2400.00	56.12	-6.71	49.41	74.00	54.00	PASS
	High Channel 2480MHz							
	Н	2483.50	57.51	-6.79	50.72	74.00	54.00	PASS
	Н	2500.00	51.94	-6.81	45.13	74.00	54.00	PASS
	V	2483.50	56.82	-6.79	50.03	74.00	54.00	PASS
	V	2500.00	52.31	-6.81	45.50	74.00	54.00	PASS
π/4DQPSK	Low Channel 2402MHz							
	Н	2390.00	53.72	-6.70	47.02	74.00	54.00	PASS
	Н	2400.00	57.94	-6.71	51.23	74.00	54.00	PASS
	V	2390.00	52.91	-6.70	46.21	74.00	54.00	PASS
	V	2400.00	56.99	-6.71	50.28	74.00	54.00	PASS
	High Channel 2480MHz							
	Н	2483.50	57.31	-6.79	50.52	74.00	54.00	PASS
	Н	2500.00	52.72	-6.81	45.91	74.00	54.00	PASS
	V	2483.50	55.85	-6.79	49.06	74.00	54.00	PASS
	V	2500.00	52.59	-6.81	45.78	74.00	54.00	PASS

Remark:

1. Emission Level = Meter Reading + Factor, Factor = Antenna Factor + Cable Loss – Pre-amplifier. Over= Emission Level – Limit

2. If the PK measured levels comply with average limit, then the average level were deemed to comply with average limit.

3 In restricted bands of operation, The spurious emissions below the permissible value more than 20dB 4. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.



9. Spurious RF Conducted Emissions

9.1 Block Diagram Of Test Setup



9.2 Limit

Regulation 15.247 (d),In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.205(c))

9.3 Test procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;

2. Set the spectrum analyzer: Below 30MHz: RBW = 100kHz, VBW = 300kHz, Sweep = auto Detector function = peak, Trace = max hold Above 30MHz: RBW = 100KHz, VBW = 300KHz, Sweep = auto Detector function = peak, Trace = max hold

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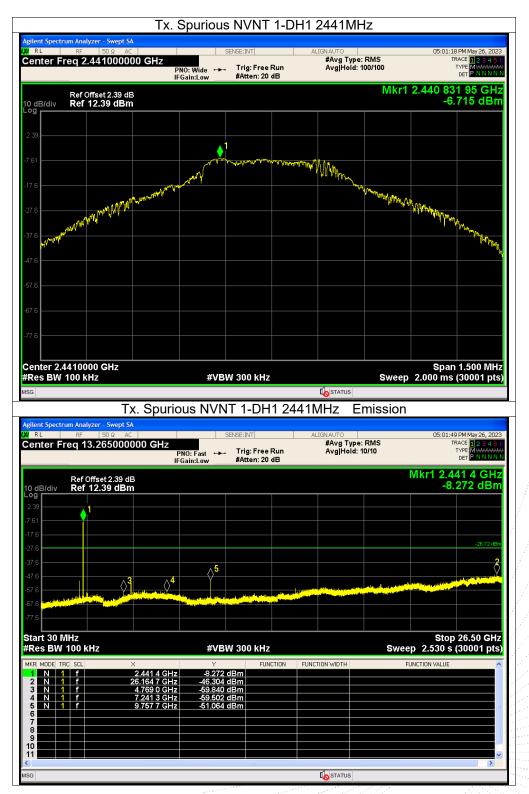
9.4 Test Result







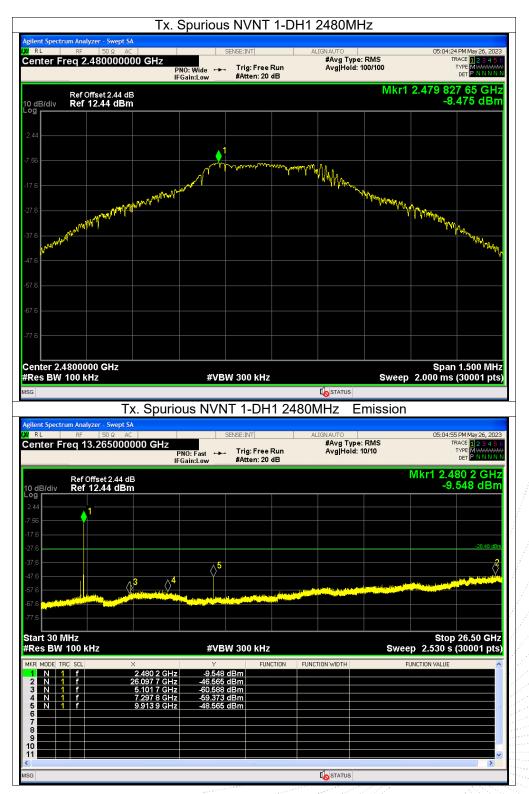




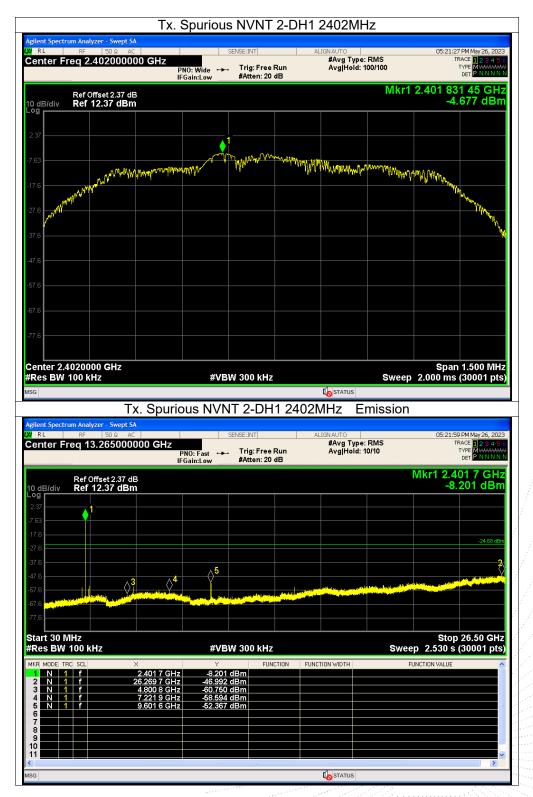


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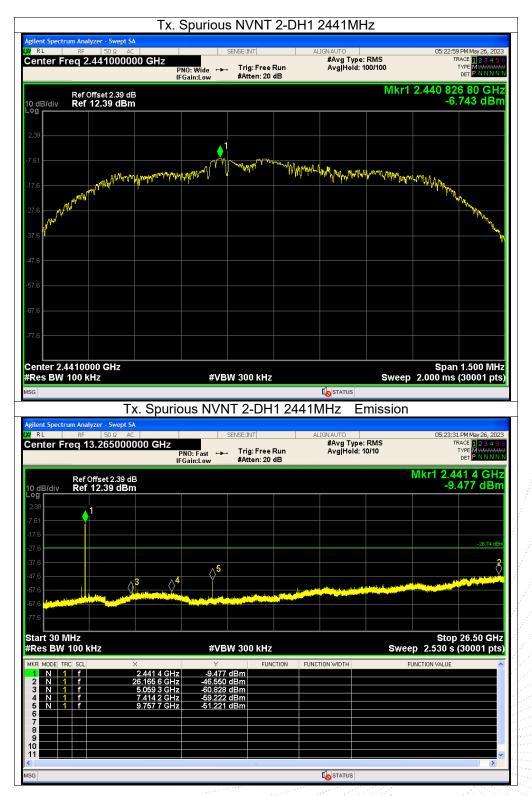












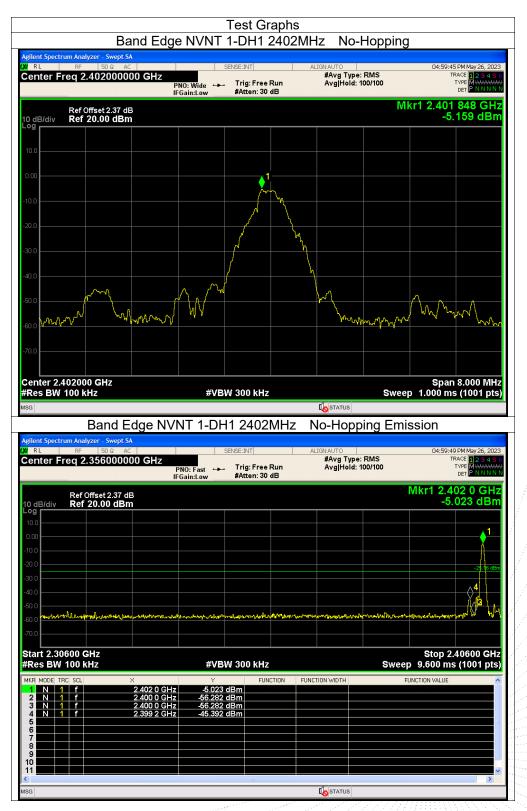








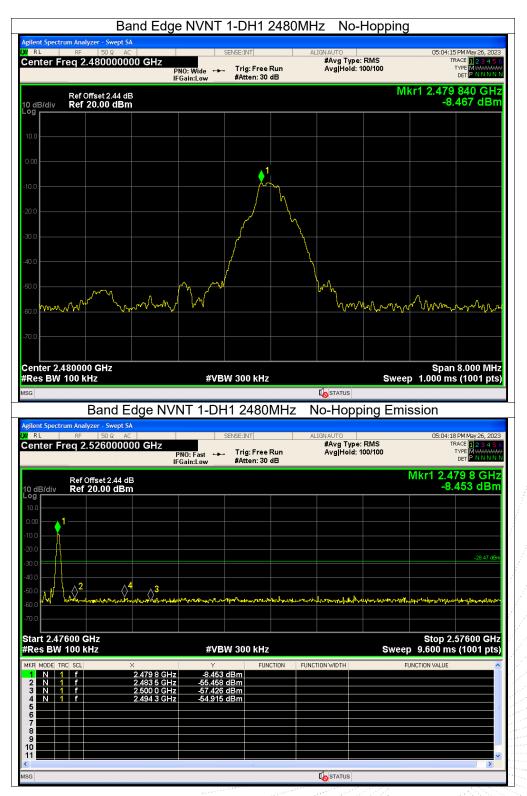










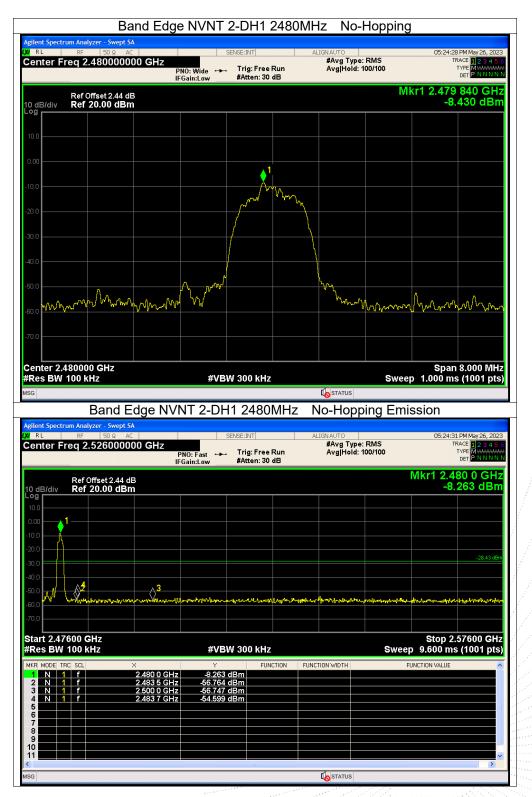








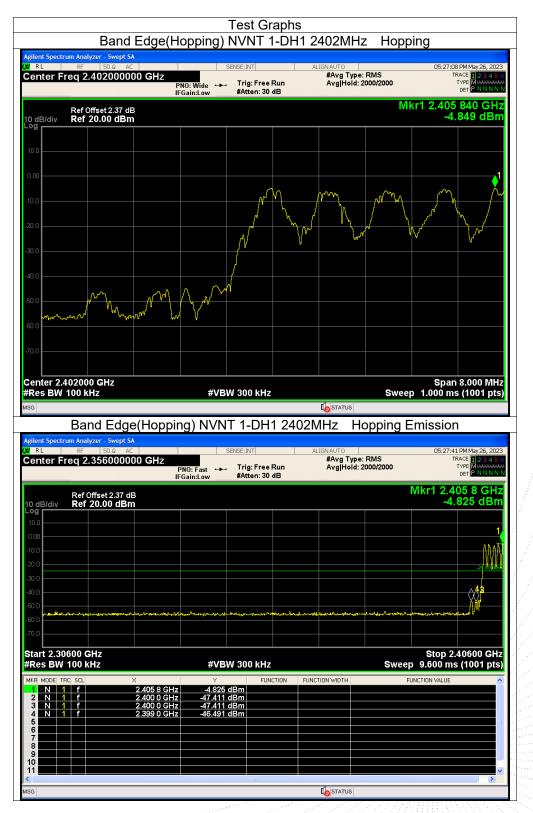




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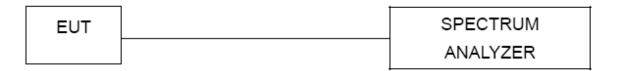






10. 20 dB Bandwidth

10.1 Block Diagram Of Test Setup



10.2 Limit

N/A

10.3 Test procedure

- 1. Set RBW = 30kHz.
- 2. Set the video bandwidth (VBW) \ge 3 x RBW.
- 3. Detector = Peak.
- 4. Trace mode = max hold.
- 5. Sweep = auto couple.
- 6. Allow the trace to stabilize.

7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

10.4 Test Result

Condition	Mode	Frequency (MHz)	-20 dB Bandwidth (MHz)	Verdict
NVNT	1-DH1	2402	0.861	Pass
NVNT	1-DH1	2441	0.851	Pass
NVNT	1-DH1	2480	0.876	Pass
NVNT	2-DH1	2402	1.246	Pass
NVNT	2-DH1	2441	1.222	Pass
NVNT	2-DH1	2480	1 24	Pass









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11. Maximum Peak Output Power

11.1 Block Diagram Of Test Setup



11.2 Limit

FCC Part15 (15.247) , Subpart C						
Section	Test Item	Limit	Frequency Range (MHz)	Result		
15.247(b)(1)	Peak Output Power	0.125 watt or 21dBm	2400-2483.5	PASS		

11.3 Test procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.

2. Set the spectrum analyzer: RBW = 2MHz. VBW = 6MHz. Sweep = auto; Detector Function = Peak.

3. Keep the EUT in transmitting at lowest, medium and highest channel individually. Record the max value.

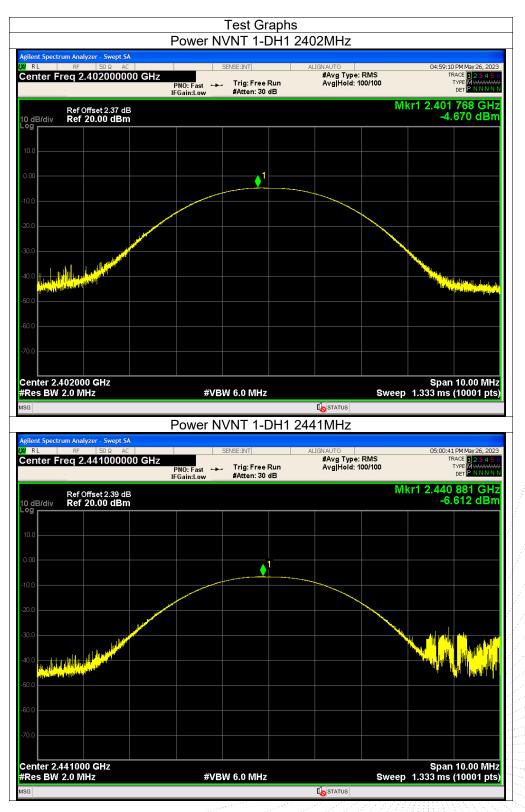
11.4 Test Result

Condition	Mode	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Verdict
NVNT	1-DH1	2402	-4.67	21	Pass
NVNT	1-DH1	2441	-6.61	21	Pass
NVNT	1-DH1	2480	-8.30	21	Pass
NVNT	2-DH1	2402	-3.80	21	Pass
NVNT	2-DH1	2441	-5.74	21	Pass
NVNT	2-DH1	2480	-7.37	21	Pass





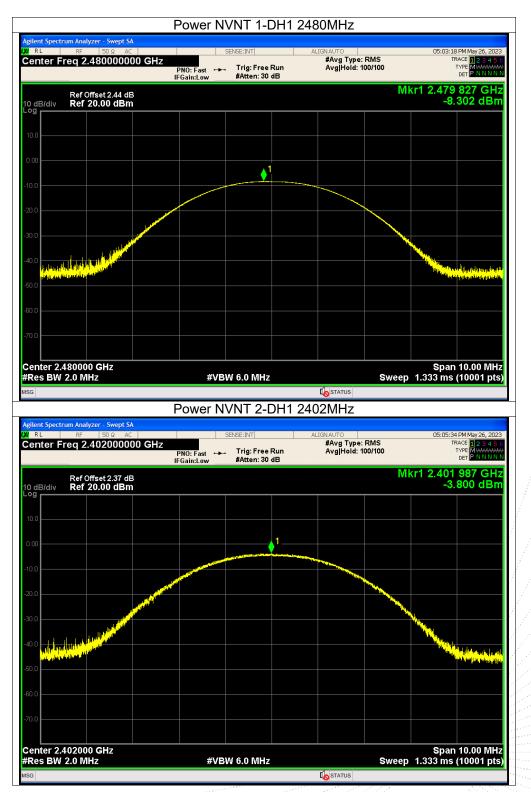






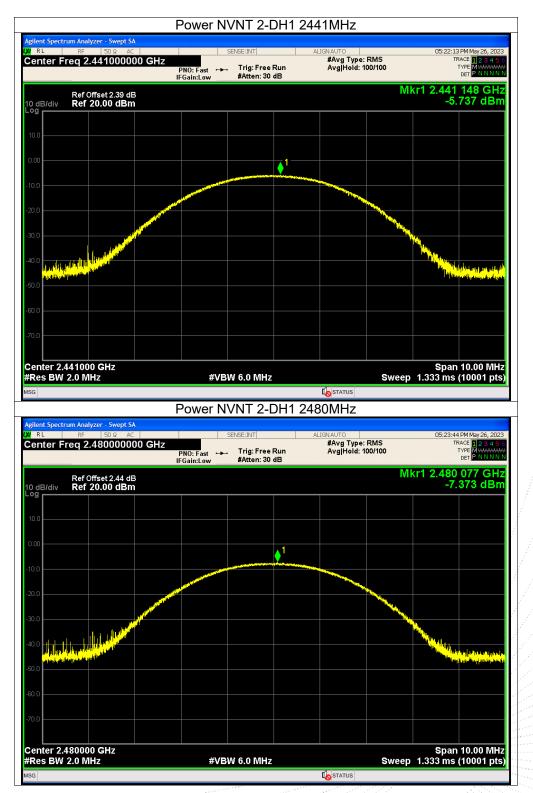














12. Hopping Channel Separation

12.1 Block Diagram Of Test Setup



12.2 Limit

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 0.125W.

12.3 Test procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.

2. Set the spectrum analyzer: RBW = 30kHz. VBW = 100kHz , Span = 2.0MHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.

3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section Submit this plot.

Condition	Mode	Hopping Freq1 (MHz)	Hopping Freq2 (MHz)	HFS (MHz)	Limit (MHz)	Verdict
NVNT	1-DH1	2401.832	2402.83	0.998	0.861	Pass
NVNT	1-DH1	2440.832	2441.832	1	0.851	Pass
NVNT	1-DH1	2478.832	2479.832	1	0.876	Pass
NVNT	2-DH1	2401.832	2402.832	1	0.831	Pass
NVNT	2-DH1	2440.83	2441.832	1.002	0.815	Pass
NVNT	2-DH1	2478.828	2479.832	1.004	0.827	Pass

12.4 Test Result



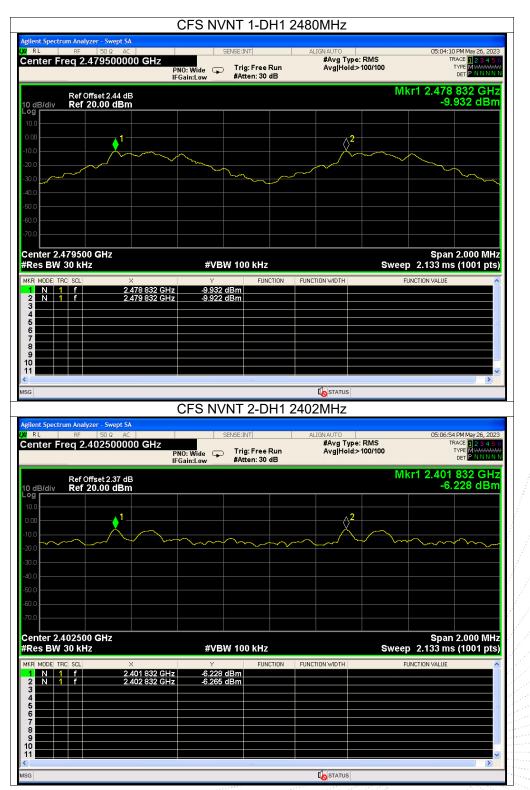
ilent Spectrum Analyz		CFS NVNT		-	24	E0: 41 DM May 26, 2023
	02500000 GHz	IO: Wide 🏳 Tri Sain:Low #A	ig: Free Run tten: 30 dB	ALIGNAUTO #Avg Type: RI Avg Hold:>100	VIS	59:41 PM May 26, 2023 TRACE 1 2 3 4 5 TYPE MWWWW DET P N N N N
0 dB/div Ref 2	⁻ set 2.37 dB 0.00 dBm				Mkr1 2.4	01 832 GHz -6.297 dBm
og 10.0						
0.00				2	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	
20.0	· ` کـر		<u> </u>			
30.0 40.0 						
50.0						
70.0						
enter 2.402500 Res BW 30 kHz		#VBW 10	0 kHz		Sp Sweep 2.133	oan 2.000 MHz ms (1001 pts)
IKR MODE TRC SCL	×	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VAL	
1 N 1 f 2 N 1 f 3	2.401 832 GHz 2.402 830 GHz	-6.297 dBm -6.288 dBm				
4 5						3
6 7 8						
9						
			Ш			~
SG				STATUS		
		CFS NVNT	1-DH1	2441MHz		
RL RF	er - Swept SA 50 Ω AC	CFS NVNT		ALIGNAUTO		01:12 PM May 26, 2023
RL RF	er - Swept SA 50 Ω AC 41500000 GHz PN	SENSE::	INT		VIS	01:12 PM May 26, 2023 TRACE 1 2 3 4 5 6 TYPE MWWWWW DET P N N N N
RL RF center Freq 2.4 Ref Off	er - Swept SA 50 Q AC 415000000 GHz PP IF0 5set 2.39 dB	SENSE:	INT	ALIGNAUTO #Avg Type: R!	MS 0/100 Mkr1 2.4	
Center Freq 2.4	er - Swept SA 50 Ω AC 41500000 GHz PN	SENSE:	INT	ALIGNAUTO #Avg Type: R!	MS 0/100 Mkr1 2.4	TRACE 1 2 3 4 5 6 TYPE MWWWW DET P N N N N N
RL RF Center Freq 2.4 Ref Off 0 dB/div Ref 21	er - Swept SA 50 Ω AC 41500000 GHz Ph IF4 Fset 2.39 dB 0.00 dBm	SENSE:	INT	ALIGNAUTO #Avg Type: RI Avg Hold>100	MS 9/100 Mkr1 2.4	
RL RF Center Freq 2.4 Ref Off 0 dB/div Ref Off 0 dB/div Ref Off 0 0.00 0.00	er - Swept SA 50 Q AC 415000000 GHz PP IF0 5set 2.39 dB	SENSE:	INT	ALIGNAUTO #Avg Type: R!	MS 9/100 Mkr1 2.4	
RL RF Center Freq 2.4 Ref Off 0 dB/div Ref Off 0 dD/div Ref 2 0 00 000 0.00 000 0.00 000 0.00 000	er - Swept SA 50 Ω AC 41500000 GHz Ph IF4 Fset 2.39 dB 0.00 dBm	SENSE:	INT	ALIGNAUTO #Avg Type: RI Avg Hold>100	MS 9/100 Mkr1 2.4	
RL Ref Off 0 dB/div Ref 2 0 0 0.00 0.00 0.00 0.00 0.00 0.00 0.0	er - Swept SA 50 Ω AC 41500000 GHz Ph IF4 Fset 2.39 dB 0.00 dBm	SENSE:	INT	ALIGNAUTO #Avg Type: RI Avg Hold>100	MS 9/100 Mkr1 2.4	
RL RE Center Freq 2.4 Ref Off 0 dB/div Ref 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	er - Swept SA 50 Ω AC 41500000 GHz Ph IF4 Fset 2.39 dB 0.00 dBm	SENSE:	INT	ALIGNAUTO #Avg Type: RI Avg Hold>100	MS 9/100 Mkr1 2.4	
RL RE Center Freq 2.4 Ref Off 0 dB/div Ref 2/ 0 000 0.00 0.00 0.00 0.00 0.00 0.00 0.	er - Swept SA 50 Ω AC 41500000 GHz Ph IF4 Fset 2.39 dB 0.00 dBm	SENSE:	INT	ALIGNAUTO #Avg Type: RI Avg Hold>100	MS 9/100 Mkr1 2.4	
Rt Ref Off C dB/div Ref 2/ 0 000 2000 2000 2000 2000 2000 2000	er - Swept SA 50 Ω AC 4 1500000 GHz P For For For For For For For For	SENSE:	INT	ALIGNAUTO #Avg Type: RI Avg Hold>100	MKr1 2.4	1742 0 23 4 5 6 1746 0 23 4 5 6 1747 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Rt Ref Off Center Freq 2.4 Ref Off 0 dB/div Ref 2/ 0 000 0.00 0.00 0.00 0.00 0.00 0.00 0.	er - Swept SA 50 Ω AC 41500000 GHz P F F F F F F F F F F F F F	SENSE:	int ig: Free Run tten: 30 dB	ALIGNAUTO #Avg Type: RI Avg Hold>10(MKr1 2.4	40 832 GHz -8.171 dBm
RL RE Ref Off 0 dB/div Ref 2/ 0 00 0 0	er - Swept SA 50 Ω AC 41500000 GHZ P F F F F F F F F F F F F F	SENSE: O: Wide Gain:Low Tri #A	INT Ig: Free Run tten: 30 dB	ALIGNAUTO #Avg Type: RI Avg Hold>10(MKr1 2.4	40 832 GHz -8.171 dBm
RL Ref Center Freq 2.4 Ref off 0 dB/div Ref off 0 dD data 0 dD data 0 dD data 0 dD data 1 df f	er - Swept SA 50 Ω AC 4 1500000 GHz P F F F F F F F F F F F F F	IO: Wilde Tri Sain:Low #A	INT Ig: Free Run tten: 30 dB	ALIGNAUTO #Avg Type: RI Avg Hold>100	Mkr1 2.4	40 832 GHz -8.171 dBm
RL RE- Ref Off 0 dB/div Ref 2/ 0 000 0 0	er - Swept SA 50 9 AC 41500000 GHz P P P P P P P P P P P P P	IO: Wide Tri Sain:Low Tri #A	INT Ig: Free Run tten: 30 dB	ALIGNAUTO #Avg Type: RI Avg Hold>100	Mkr1 2.4	40 832 GHz -8.171 dBm
RL RE- Center Freq 2.4 Ref Off 0 dB/div Ref 2i 0 00 0 00	er - Swept SA 50 9 AC 41500000 GHz P P P P P P P P P P P P P	IO: Wide Tri Sain:Low Tri #A	INT Ig: Free Run tten: 30 dB	ALIGNAUTO #Avg Type: RI Avg Hold>100	Mkr1 2.4	40 832 GHz -8.171 dBm
Ref Off Ref Off 10 dB/div Ref Off 10 dB/div Ref 2 0 g	er - Swept SA 50 9 AC 41500000 GHz P P P P P P P P P P P P P	IO: Wide Tri Sain:Low Tri #A	INT Ig: Free Run tten: 30 dB	ALIGNAUTO #Avg Type: RI Avg Hold>100	Mkr1 2.4	40 832 GHz -8.171 dBm
Ref Off Center Freq 2.4 Ref Off 0 dB/div Ref 21 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	er - Swept SA 50 9 AC 41500000 GHz P P P P P P P P P P P P P	IO: Wide Tri Sain:Low Tri #A	INT Ig: Free Run tten: 30 dB	ALIGNAUTO #Avg Type: RI Avg Hold>100	Mkr1 2.4	40 832 GHz -8.171 dBm



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	- Swept SA 50 Ω AC	SENSE:INT	ALIGN AUTO #Avg Type: RMS	05:22:53 PM May 26, 2023	
enter Freq 2.441	PNO:	Wide 🖵 Trig: Free Run n:Low #Atten: 30 dB	#Avg Type: RMS Avg Hold:>100/100	TRACE 12345 TYPE MWWWWW DET P N N N N	
Ref Offse dB/div Ref 20.0			Mk	r1 2.440 830 GHz -8.195 dBm	
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enter 2.441500 G Res BW 30 kHz	Hz	#\/B\\// 400 L/U-		Span 2.000 MHz	
KR MODE TRC SCL	×	#VBW 100 kHz Y FUNCTION		2.133 ms (1001 pts	
1 N 1 f 2 N 1 f 3	2.440 830 GHz 2.441 832 GHz	-8.195 dBm -8.215 dBm			
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3		III		>	
			I STATUS		
	CI	-S NVNT 2-DH1 2	_		
i <mark>lent Spectrum Analyzer</mark> - RL RF 5	- Swept SA 50 Ω AC	FS NVNT 2-DH1 2	480MHz	05:24:23 PM May 26, 2023	
i <mark>lent Spectrum Analyzer</mark> - RL RF 5	- Swept SA 50 Ω AC 9500000 GHz PNO:		480MHz	05:24:23 PM May 26, 202 TRACE 1 2 3 4 5 TYPE MWWWW DET PINNIN	
ilent Spectrum Analyzer RL RF S enter Freq 2.479 Ref Offse	- Swept SA 50 Q AC 9500000 GHz PNO: IFGain t2.44 dB	SENSE:INT	ALIGNAUTO #Avg Type: RMS Avg Hold>100/100	TRACE 12345 TYPE MWWWW DET PNNNN	
RL RF	- Swept SA 50 Q AC 9500000 GHz PNO: IFGain t2.44 dB	SENSE:INT	ALIGNAUTO #Avg Type: RMS Avg Hold>100/100	TRACE 12345 TYPE MWWWW DET PNNNN	
RL RF P enter Freq 2.479 Ref Offse dB/div Ref 20.0	- Swept SA 50 Q AC 9500000 GHz PNO: IFGain t2.44 dB	SENSE:INT	480MHz ALIGNAUTO #Avg Type: RMS Avg Hold>100/100	TRACE 12345 TYPE MWWWW DET PNNNN	
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Ref Offse 0 0 0 0 0 0	- Swept SA 50 Q AC 9500000 GHz PNO: IFGain t2.44 dB	SENSE:INT	480MHz ALIGNAUTO #Avg Type: RMS Avg Hold>100/100	TRACE 12345 TYPE MWWWW DET PNNNN	
Ref Offse RE Ref Offse 0 dB/div Ref 2.479 0 dB/div Ref 20.0 0 d 0 d 0 d 0 d 0 d 0 d 0 d 0	- Swept SA 50 Q AC PRO: PRO: IFGai t 2.44 dB D0 dBm	SENSE:INT	480MHz ALIGNAUTO #Avg Type: RMS Avg Hold>100/100	rtAcE 12 3 4 5 Type Miximum Det P NNNN r1 2.478 828 GHz -10.019 dBm	
Ref Offse Ref Offse d B/div Ref 20.0 00 00 00 00 00 00 00 00 00 00 00 00	- Swept SA 50 Q AC PRO: Pro: IFGail t 2.44 dB D0 dBm	Vide Trig: Free Run #Atten: 30 dB	ALIGNAUTO #Avg Type: RMS Avg Heid>100/100 Mk	rt 2.478 828 GHz -10.019 dBm -10.019 dBm -10.019 dBm -10.019 dBm -10.019 dBm -10.019 dBm -10.019 dBm -10.019 dBm -10.019 dBm	
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ilent Spectrum Analyzer - RL RF I enter Freq 2.479 Ref Offse 0 dB/div Ref 20.0	Swept SA 50 Q AC DEC PRO: IFGain t2.44 dB D0 dBm 1 1 1 1 1 1 1 1 1 1 1 1 1	SENSE:INT Wide n:Low Trig: Free Run #Atten: 30 dB	ALIGNAUTO #Avg Type: RMS Avg Heid>100/100 Mk	rt 2.478 828 GHz -10.019 dBm -10.019 dBm -10.019 dBm -10.019 dBm -10.019 dBm -10.019 dBm -10.019 dBm -10.019 dBm -10.019 dBm	
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Ilent Spectrum Analyzer RL RF IE enter Freq 2.475 Ref Offse Ref Offse 0 dB/div Ref 20.00 Ref 20.00 0 dB/div Ref 20.00 Ref 20.00 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	- Swept SA 50 Q AC PNO: IF Gain t 2.44 dB 00 dBm 1 1 4 4 4 4 2.478 528 GHz	Wide Trig: Free Run #Atten: 30 dB	ALIGNAUTO #Avg Type: RMS Avg Heid>100/100 Mk	rt 2.478 828 GHz -10.019 dBm -10.019 dBm -10.019 dBm -10.019 dBm -10.019 dBm -10.019 dBm -10.019 dBm -10.019 dBm -10.019 dBm	





13. Number Of Hopping Frequency

13.1 Block Diagram Of Test Setup



13.2 Limit

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

13.3 Test procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.

2. Set the spectrum analyzer: RBW = 100kHz. VBW = 300kHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.

3. Allow the trace to stabilize. It may prove necessary to break the span up to sections. in order to clearly show all of the hopping frequencies. The limit is specified in one of the subparagraphs of this Section.
4. Set the spectrum analyzer: Start Frequency = 2.4GHz, Stop Frequency = 2.4835GHz. Sweep=auto;

13.4 Test Result

Co	ndition	Mode	Hopping Number	Limit	Verdict
Ν	IVNT	1-DH1	79	15	Pass
Ν	IVNT	2-DH1	79	15	Pass

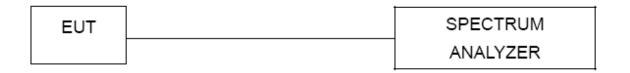


RL RF RL RF RL FRF	r - Swept SA 50 Ω AC 41750000 GHz	SENSE:IN	· · · · · · · · · · · · · · · · · · ·	ALIGN AUTO #Avg Type: F	RMS	:29:07 PM May 26, 202 TRACE 1 2 3 4 5
	PN	D: Fast 😱 Trig: ain:Low #Atte	Free Run en: 30 dB	Avg Hold:>10		DET PNNNN
	set 2.39 dB 1.00 dBm				Mkr1 2.40	1 920 5 GH: -5.387 dBn
D.0						
.00 ↓).0 	HAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA	RARABABAABA	ለበስለሰብ	477747777777	ስስቢእስከስከስከለታልታ	เกิงกุลกกุลกั้
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).0 <mark>4</mark> 44444444444444444444444444444444444						
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tart 2.40000 GH: Res BW 100 kHz		#VBW 300	kHz			p 2.48350 GH ms (1001 pts
R MODE TRC SCL	× 2.401 920 5 GHz	Y -5.387 dBm	FUNCTION	FUNCTION WIDTH	FUNCTION VA	LUE
2 N 1 f 3 4	2.480 160 0 GHz	-9.026 dBm				
5 6 7						
B B						
			Ш			
3	Honn	ing No. NV	NT 2-D	Корали и колонија Н1 2441MH:	7	
lent Spectrum Analyze		SENSE:IN		ALIGNAUTO		:33:17 PM May 26, 202
	41750000 GHz	D: Fast 🖵 Trig:	Free Run en: 30 dB	#Avg Type: F Avg Hold:>10	RMS	TRACE 12345 TYPE MWWWW DET PNNNN
Ref Offs	set 2.39 dB	ain:Low #Atte	en: 30 dB		Mkr1 2.40	1 670 0 GH
dB/div Ref 20	0.00 dBm					-9.918 dBn
	4 . 4 4 . 0 7 8 . 0 6 6 . 4 . 4					٨2
0.0 - 70 UUUUU U 0.0	ՠՠՠՠՠՠՠՠՠՠՠՠՠ		wwww	ኯ፟፟ዂዀኯጚቘቚኯኯኯ	ՠֈՠֈՠֈՠՠ	www.wp=
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tart 2.40000 GH						p 2.48350 GH
Res BW 100 kHz	X	#VBW 300	KHZ FUNCTION	FUNCTION WIDTH	Sweep 8.000) ms (1001 pts
N 1 f N 1 f	2.401 670 0 GHz 2.480 410 5 GHz	-9.918 dBm -13.717 dBm				
4						
5 6						



14. Dwell Time

14.1 Block Diagram Of Test Setup



14.2 Limit

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. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

14.3 Test procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.

2. Set spectrum analyzer span = 0. Centred on a hopping channel;

3. Set RBW = 1MHz and VBW = 3MHz.Sweep = as necessary to capture the entire dwell time per hopping channel. Set the EUT for DH5, DH3 and DH1 packet transmitting.

4. Use the marker-delta function to determine the dwell time. If this value varies with different modes of operation (e.g., data rate, modulation format, etc.), repeat this test for each variation. The limit is specified in one of the subparagraphs of this Section. Submit this plot(s).

14.4 Test Result

DH5 Packet permit maximum 1600 / 79 / 6 hops per second in each channel (5 time slots RX, 1 time slot TX).

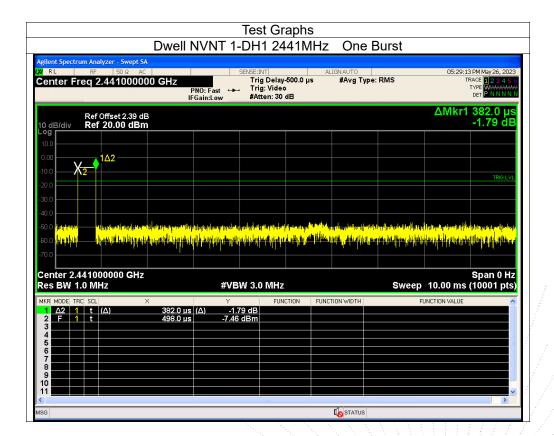
DH3 Packet permit maximum 1600 / 79 / 4 hops per second in each channel (3 time slots RX, 1 time slot TX).

DH1 Packet permit maximum 1600 / 79 /2 hops per second in each channel (1 time slot RX, 1 time slot TX). So, the Dwell Time can be calculated as follows:

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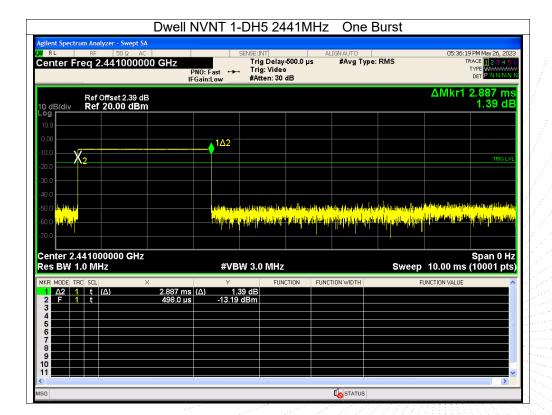


Condition	Mode	Frequency (MHz)	Pulse Time (ms)	Total Dwell Time (s)	Limit (s)	Verdict
NVNT	1-DH1	2441	0.382	0.122	0.4	Pass
NVNT	1-DH3	2441	1.637	0.262	0.4	Pass
NVNT	1-DH5	2441	2.887	0.308	0.4	Pass
NVNT	2-DH1	2441	0.391	0.125	0.4	Pass
NVNT	2-DH3	2441	1.644	0.263	0.4	Pass
NVNT	2-DH5	2441	2.885	0.308	0.4	Pass





	Dwell N	NVNT 1-DH	13 2441N	IHz One	Burst	
Agilent Spectrum Analyzer - Swep X RL RF 50 Ω Center Freq 2.441000	AC 0000 GHz	PNO:East ⊶ Tr	int ig Delay-500.0 μ ig: Video tten: 30 dB	ALIGNAUTO s #Avg Ty	pe: RMS	05:35:31 PM May 26, TRACE 12 3 TYPE WAAA DET P N N
Ref Offset 2.39 10 dB/div Ref 20.00 dB						ΔMkr1 1.637 -2.03
10.0 0.00 10.0	1Δ2					TRI
20.0 30.0 40.0		alta al-Mirodalan-Ioon				
50.0 19 10 19 11 50.0 20 14 14 14 14 70.0	and the set of the set				and part of a second second Second second	<mark>a la se de la se de Se de la se de la se Se de la se de la se</mark>
enter 2.441000000 GH es BW 1.0 MHz	lz	#VBW 3.	0 MHz		Succes	Span 0
					Sweep	10.00 ms (10001
KR MODE TRC SCL 1 Δ2 1 t (Δ) 2 F 1 t (Δ) 3 4 5 5 6 7 4 4 4 4	× 1.637 ms 498.0 µs	Y	FUNCTION	FUNCTION WIDTH		10.00 ms (10001







	Dwell NVNT 2-D	H1 2441MH	z One Burs	t	
Agilent Spectrum Analyzer - Swept S/ On RL RF 50Ω AC Center Freq 2.44100000	00 GHz PN0: East ↔►→	БЕ:INT Trig Delay-500.0 µs Trig: Video #Atten: 30 dB	ALIGNAUTO #Avg Type: RMS	TRAC	4 May 26, 2023 E 1 2 3 4 5 6 E WWWWWW FT P N N N N N
Ref Offset 2.39 df 10 dB/div Ref 20.00 dBm Log				∆Mkr1 3 -:	91.0 µs 2.30 dB
0.00 -10.0 -20.0					TRIG LVL
-30.0	a dia mandri da dia kaonina mandri da dia kaonina dia kaonina dia mandri da dia kaonina dia mandri da dia dia k	0	la k starikle i sterat tal star e st		le control de control
	a light cul, an a mhair an				<mark>di, saliti kali p</mark> ik
Center 2.441000000 GHz Res BW 1.0 MHz	#VBW	3.0 MHz	S	s weep 10.00 ms (1	pan 0 Hz 0001 pts
Δ2 1 t (Δ) 2 F 1 t 3 - - - 4 - - - 5 - - - 6 - - - 7 - - - 8 - - - 9 - - - 10 - - -	× Υ 391.0 μs (Δ) -2.30 c 498.0 μs -7.81 dB	IB	NCTION WIDTH	FUNCTION VALUE	
11 MSG			STATUS		>

Dwell NVNT 2-DH3 2441MHz One Burst ept SA nt Spectrum Analyzer <mark>d</mark> RL NSE:INT Trig Delay-500.0 μs Trig: Video #Atten: 30 dB #Avg Type: RMS Center Freq 2.441000000 GHz PNO: Fast ↔↔ IFGain:Low TYPE DET ΔMkr1 1.644 ms 4.02 dB Ref Offset 2.39 dB Ref 20.00 dBm 10 dB/div 1Δ2 X البال وربابلوا المعدامة walk, gewieds, dishila di panatang ang akana kana panang katapatik similandi nala bipan Center 2.441000000 GHz Res BW 1.0 MHz Span 0 Hz Sweep 10.00 ms (10001 pts) #VBW 3.0 MHz UNCTION Δ2 1 t (Δ) F 1 t 1.644 ms (Δ) 497.0 μs 4.02 dE -15.63 dBm **STATUS**

TE TC OVE



DWOILI	NVNT 2-DH5 244	1MHz One	e Burst	
	SENSE:INT Trig Delay-50 PNO: Fast →→ Trig: Video Gain:Low #Atten: 30 dB		/pe: RMS	05:37:50 PM May 26, 202 TRACE 12 3 4 5 TYPE WANNAN DET PINNNN
Ref Offset 2.39 dB 10 dB/div Ref 20.00 dBm Log				ΔMkr1 2.885 ms -0.71 dE
0.00 -10.0 -20.0 King and a spin of sp	1Δ2			TRIG LVI
-30.0 -40.0 -50.0 2014 -60.0 2114	dag ta gil da panjar se pina mila ga mili da sa kana da sa 1929 ka panga kana sa k	allaharan mendan kara Mulayaran periodokaran periodokaran periodokaran periodokaran periodokaran periodokaran p	kotilik, gražila bila protika bila protika dago glatko protika kaja kas gr	ing the law floor live of the state of the s
Center 2.441000000 GHz Res BW 1.0 MHz	#VBW 3.0 MHz		Sweep	Span 0 Hz 10.00 ms (10001 pts
	Y FUNCTION OF THE STATE OF THE	DN FUNCTION WIDTH		Span 0 H2 10.00 ms (10001 pts INCTION VALUE



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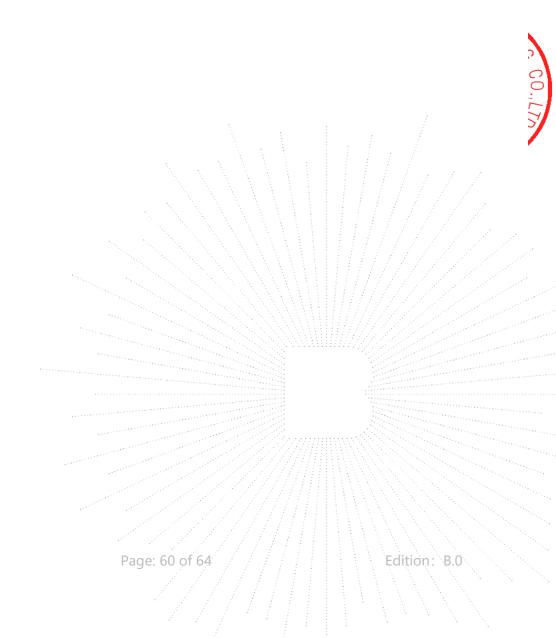
15. Antenna Requirement

15.1 Limit

15.203 requirement: For intentional device, according to 15.203: an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

15.2 Test Result

The EUT antenna is Chip antenna, The antenna gain is 2.67 dBi, fulfill the requirement of this section.



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16. EUT Photographs





EUT Photo 2

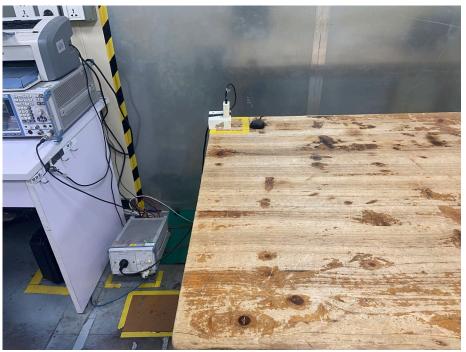




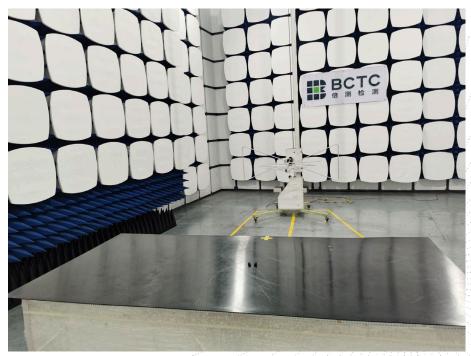


17. EUT Test Setup Photographs

Conducted Measurement Photo



Radiated Measurement Photos



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STATEMENT

1. The equipment lists are traceable to the national reference standards.

2. The test report can not be partially copied unless prior written approval is issued from our lab.

3. The test report is invalid without the "special seal for inspection and testing".

4. The test report is invalid without the signature of the approver.

5. The test process and test result is only related to the Unit Under Test.

6. Sample information is provided by the client and the laboratory is not responsible for its authenticity.

7. The quality system of our laboratory is in accordance with ISO/IEC17025.

8. If there is any objection to this test report, the client should inform issuing laboratory within 15 days from the date of receiving test report.

Address:

1-2/F., Building B, Pengzhou Industrial Park, No.158, Fuyuan 1st Road, Zhancheng, Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, China

TEL: 400-788-9558

P.C.: 518103

FAX: 0755-33229357

Website: http://www.chnbctc.com

E-Mail: bctc@bctc-lab.com.cn

***** END *****

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