

TEST REPORT

Report No.:	BCTC2206557108-1E
Applicant:	Shenzhen Kingwear Intelligent Technology Co., Ltd
Product Name:	Smart Watch
Model/Type Ref.:	BSW042
Tested Date:	2022-06-13 to 2022-06-15
Issued Date:	2022-06-15
She	enzhen BCTC TESting Co., Ltd. APPROVED



FCC ID: 2AKQQ-BSW042

Product Name:	Smart Watch
Trademark:	N/A
Model/Type Ref.:	BSW042 BSW040, BSW041, KW102, KW102PRO, KW103, KW103PRO, KW107, KW107S, KW105, KW106
Prepared For:	Shenzhen Kingwear Intelligent Technology Co.,Ltd
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Manufacturer:	Shenzhen Kingwear Technology Development Co., Ltd. Longhua Branch
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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, Tangwei, Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, China
Sample Received Date:	2022-06-13
Sample tested Date:	2022-06-13 to 2022-06-15
Issue Date:	2022-06-15
Report No.:	BCTC2206557108-1E
Test Standards:	FCC Part15.247 ANSI C63.10-2013
Test Results:	PASS
Remark:	This is Bluetooth Classic radio test report.
Tested	by: Approved by:

Lei Chen

Lei Chen/Project Handler

Zero Zhou/Reviewer

Edition

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

Report No.	Issue Date	Description	Approved
BCTC2206557108-1E	2022-06-15	Original	Valid

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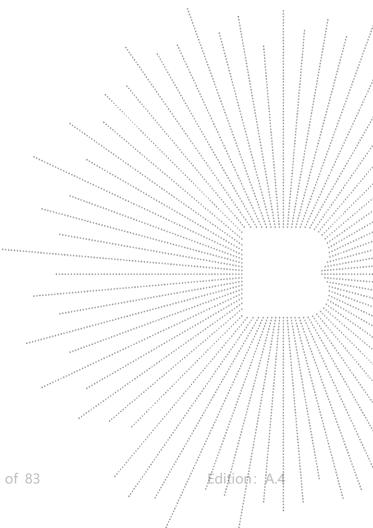
No.: BCTC/RF-EMC-005



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	Number of hopping frequencies	§15.247(a)(1)(iii)	PASS
5	Dwell Time	§15.247(a)(1)(iii)	PASS
6	Spurious RF conducted emissions	§15.247(d)	PASS
7	Band edge	§15.247(d)	PASS
8	Spurious radiated emissions for transmitter	§15.247(d) & §15.209 & §15.205	PASS
9	Antenna Requirement	15.203	PASS





Edition:

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(9kHz-30MHz)	U=3.7dB
2	3m chamber Radiated spurious emission(30MHz-1GHz)	U=4.3dB
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



4. Product Information And Test Setup

4.1 Product Information

Model/Type Ref.:	BSW042 BSW040, BSW041, KW102, KW102PRO, KW103, KW103PRO, KW107, KW107S, KW105, KW106
Model differences:	All the model are the same circuit and RF module, except model names.
Bluetooth Version:	BT3.0
Operation Frequency:	2402-2480MHz
Type of Modulation:	GFSK, π/4DQPSK, 8DPSK
Number Of Channel	79CH
Antenna installation:	Internal antenna
Antenna Gain:	0 dBi
Ratings:	USB: DC 5V, Battery: DC 3.7V

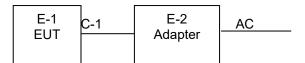
4.2 Test Setup Configuration

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

Conducted Emission:



Radiated Spurious Emission



4.3 Support Equipment

No.	Device Type	Brand	Model Series No. Note
E-1	Smart Watch	N/A	BSW042 N/A EUT
E-2	Adapter	N/A	BCTC001 N/A Auxiliary

ltem	Shielded Type	Ferrite Core	Length
C-1	NO	NO	0.5M 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	/

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.

<u>eening</u> anaaren ma			· · · · · · · · · · · · · · · · · · ·	
Test Mode	Test mode	Low channel	Middle channel	High channel
1	Transmitting(GFSK)	2402MHz	2441MHz	2480MHz
2	Transmitting(π/4DQPSK)	2402MHz	2441MHz	2480MHz
3	Transmitting(8DPSK)	2402MHz	2441MHz	2480MHz
4	Transmitting (Co	onducted emissior	n & Radiated emission	1)

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 // ØĘF/ // \\



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, Tangwei, 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 IC Registered No.: 23583

5.2 Test Instrument Used

Conducted emissions Test							
Equipment	Manufacturer	Model#	Serial#	Last Cal.	Next Cal.		
Receiver	R&S	ESR3	102075	May 24, 2022	May 23, 2023		
LISN	R&S	ENV216	101375	May 24, 2022	May 23, 2023		
Software	Frad	EZ-EMC	EMC-CON 3A1	/	1		
Attenuator	1	10dB DC-6GHz	1650	May 24, 2022	May 23, 2023		

RF Conducted Test							
Equipment	Manufacturer	Model#	Serial#	Last Cal.	Next Cal.		
Power Metter	Keysight	E4419	/	May 24, 2022	May 23, 2023		
Power Sensor (AV)	Keysight	E9300A	1	May 24, 2022	May 23, 2023		
Signal Analyzer20kH z-26.5GHz	Keysight	N9020A	MY49100060	May 24, 2022	May 23, 2023		
Spectrum Analyzer9kHz- 40GHz	R&S	FSP40	<i>L</i>	May 24, 2022	May 23, 2023		

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Equipment	Manufacturer	Model#	Serial#	Last Cal.	Next Cal.
966 chamber	ChengYu	966 Room 966		Jun. 06. 2020	Jun. 05, 2023
Receiver	R&S	ESR3	102075	May 24, 2022	May 23, 2023
Receiver	R&S	ESRP	101154	May 24, 2022	May 23, 2023
Amplifier	SKET	LAPA_01G18 G-45dB	١	May 24, 2022	May 23, 2023
Amplifier	Schwarzbeck	BBV9744	9744-0037	May 24, 2022	May 23, 2023
TRILOG Broadband Antenna	Schwarzbeck	VULB9163	942	May 26, 2022	May 25, 2023
Horn Antenna	Schwarzbeck	BBHA9120D	1541	May 24, 2022	May 23, 2023
Horn Antenn(18GHz -40GHz)	Schwarzbeck	BBHA9170	00822	Jun. 15, 2021	Jun. 14, 2022
Amplifier(18G Hz-40GHz)	MITEQ	TTA1840-35- HG	2034381	May 24, 2022	May 23, 2023
Loop Antenna(9KHz -30MHz)	Schwarzbeck	FMZB1519B	00014	May 26, 2022	May 25, 2023
RF cables1(9kHz- 30MHz)	Huber+Suhnar	9kHz-30MHz	B1702988-00 08	May 26, 2022	May 25, 2023
RF cables2(30MH z-1GHz)	Huber+Suhnar	30MHz-1GH z	1486150	May 26, 2022	May 25, 2023
RF cables3(1GHz- 40GHz)	Huber+Suhnar	1GHz-40GHz	1607106	May 24, 2022	May 23, 2023
Power Metter	Keysight	E4419	/ ····	May 26, 2022	May 25, 2023
Power Sensor (AV)	Keysight	E9300A	····	May 26, 2022	May 25, 2023
Signal Analyzer20kHz -26.5GHz	Keysight	N9020A	MY49100060	May 26, 2022	May 25, 2023
Spectrum Analyzer9kHz- 40GHz	R&S	FSP40	Γ	May 26, 2022	May 25, 2023
Software	Frad	EZ-EMC	FA-03A2 RE		

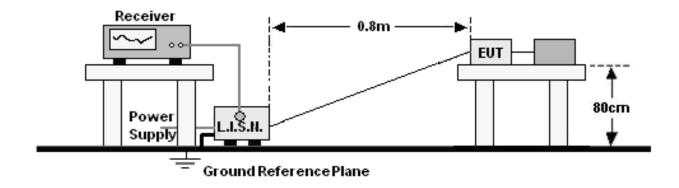
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6. Conducted Emissions

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.	$\langle \cdot \rangle$		

Decreasing inearly with logarithm of nequency.
 The lower limit shall apply at the transition frequencies.

6.3 Test Procedure

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0:15 MHż
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.

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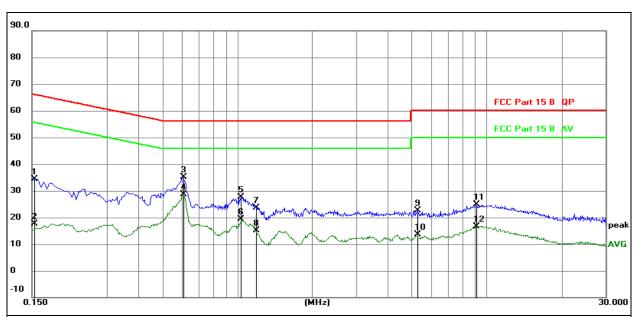
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6.5 Test Result

Temperature:	26 ℃	Relative Humidity:	54%
Pressure:	101kPa	Phase :	Line
Test Voltage :	AC 120V/60Hz	Test Mode:	Mode 4



Remark:

1. All readings are Quasi-Peak and Average values.

2. Factor = Insertion Loss + Cable Loss.

3. Measurement=Reading Level+ Correct Factor

4. Over=Measurement-Limit

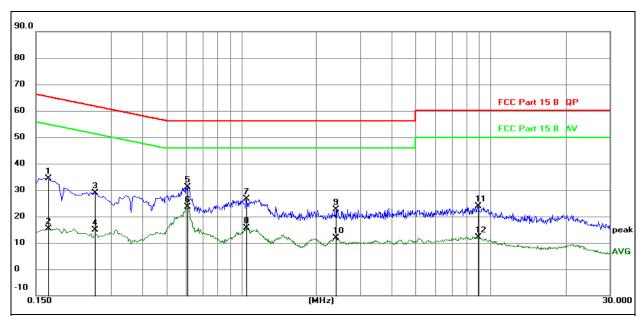
5	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
2 3 4 ' 5 6		MHz		dB	dBuV	dBuV	dB	Detector
3 4 ' 5 6		0.1539	14.86	19.60	34.46	65.79	-31.33	QP
4 * 5 6		0.1539	-1.92	19.60	17.68	55.79	-38.11	AVG
5		0.6075	15.40	19.61	35.01	56.00	-20.99	QP
6	*	0.6075	8.95	19.61	28.56	46.00	-17.44	AVG
		1.0320	7.91	19.62	27.53	56.00	-28.47	QP
-		1.0320	-0.19	19.62	19.43	46.00	-26.57	AVG
7		1.1844	3.97	19.62	23.59	56.00	-32.41	QP
8		1.1844	-4.48	19.62	15.14	46.00	-30.86	AVG
9		5.2770	3.02	19.70	22.72	60.00	-37.28	QP
10		5.2770	-6.07	19.70	13.63	50.00	-36.37	AVG
11		9.0592	5.12	19.77	24.89	60.00	-35.11	QP
12		9.0592	-3.20	19.77	16.57	50.00	-33.43	AVG

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Temperature:	26 ℃	Relative Humidity:	54%
Pressure:	101kPa	Phase :	Neutral
Test Voltage :	AC 120V/60Hz	Test Mode:	Mode 4



Remark:

All readings are Quasi-Peak and Average values.
 Factor = Insertion Loss + Cable Loss.

3. Measurement=Reading Level+ Correct Factor

4. Over=Measurement-Limit

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz		dB	dBuV	dBuV	dB	Detector
1		0.1680	14.66	19.60	34.26	65.06	-30.80	QP
2		0.1680	-4.21	19.60	15.39	55.06	-39.67	AVG
3		0.2587	9.31	19.61	28.92	61.47	-32.55	QP
4		0.2587	-4.65	19.61	14.96	51.47	-36.51	AVG
5		0.6089	11.53	19.61	31.14	56.00	-24.86	QP
6	*	0.6089	4.09	19.61	23.70	46.00	-22.30	AVG
7		1.0454	7.12	19.62	26.74	56.00	-29.26	QP
8		1.0454	-4.00	19.62	15.62	46.00	-30.38	AVG
9		2.3954	3.12	19.63	22.75	56.00	-33.25	QP
10		2.3954	-7.76	19.63	11.87	46.00	-34.13	AVG
11		8.8845	4.03	19.77	23.80	60.00	-36.20	QP
12		8.8845	-7.63	19.77	12.14	50.00	-37.86	AVG

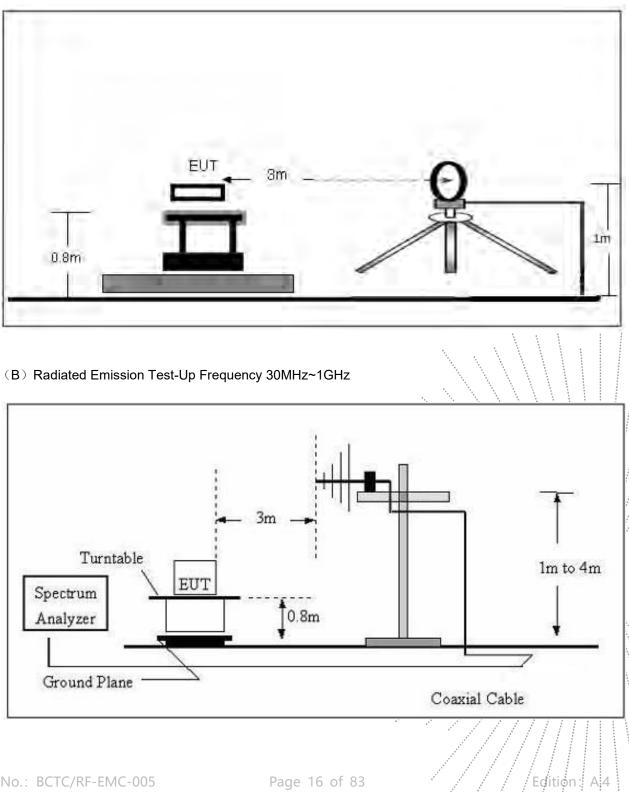


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7. Radiated Emissions

Block Diagram Of Test Setup 7.1

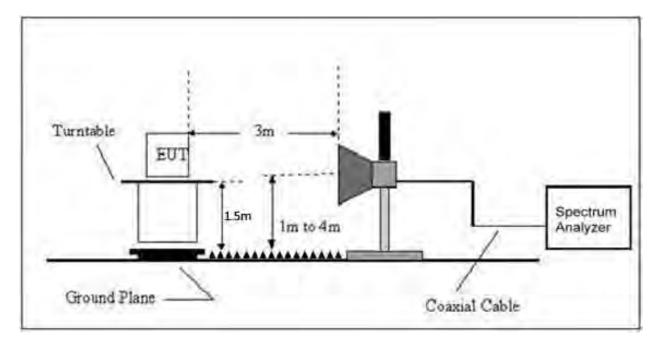
(A) Radiated Emission Test-Up Frequency Below 30MHz



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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	

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LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

FREQUENCY	Limit (dBuV/m) (at 3M)		
(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).

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 chamber. 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:

g. Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.8 metre to 1.5 metre(Above 18GHz the distance is 1 meter and table is 1.5 metre).

h. Test the EUT in the lowest channel, the middle 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.



Edition

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 chamber. 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 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: 24%
Pressure:	101 kPa	Test Voltage : AC120V/60Hz
Test Mode :	Mode 4	Polarization :

Freq.	Reading	Limit	Margin
(MHz)	(dBuV/m)	(dBuV/m) .	(dB)
			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.

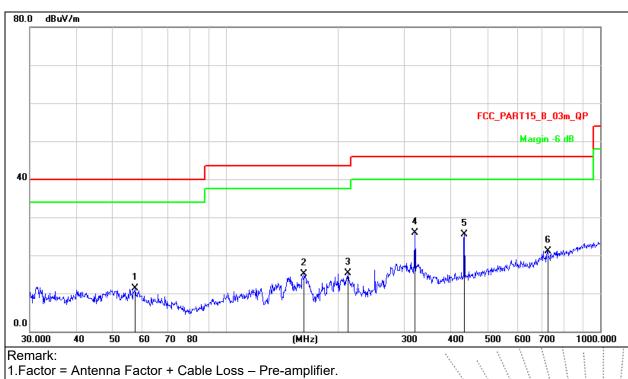
Distance extrapolation factor =40 log (specific distance/test distance)(dB);

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



Between 30MHz – 1GHz

Temperature:	26 ℃	Relative Humidity:	54%
Pressure:	101KPa	Phase :	Horizontal
Test Mode:	Mode 4	Remark:	N/A



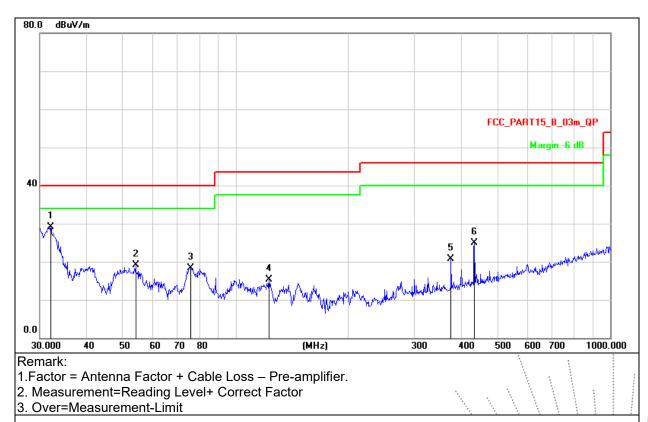
2. Measurement=Reading Level+ Correct Factor

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	ţ	57.3923	26.89	-15.63	11.26	40.00	-28.74	QP
2	16	62.0414	33.76	-18.73	15.03	43.50	-28.47	QP
3	2'	12.2695	31.32	-16.02	15.30	43.50	-28.20	QP
4	* 31	19.9370	38.98	-13.05	25.93	46.00	-20.07	QP
5	43	34.0651	35.90	-10.33	25.57	46.00	-20.43	QP
6	72	24.2611	25.92	-4.75	21.17	46.00	-24.83	QP



Temperature:	26 ℃	Relative Humidity:	54%
Pressure:	101KPa	Phase :	Vertical
Test Mode:	Mode 4	Remark:	N/A



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1	*	32.0667	45.93	-16.89	29.04	40.00	-10.96	QP
2		54.0711	34.29	-15.28	19.01	40.00	-20.99	QP
3		75.7114	37.79	-19.46	18.33	40.00	-21.67	QP
4		122.8340	33.08	-17.75	15.33	43.50	-28.17	QP
5		375.9385	32.25	-11.64	20.61	46.00	-25.39	QP
6		434.0651	35.31	-10.33	24.98	46.00	-21.02	QP



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 channel						
V	4804.00	52.79	-0.43	52.36	74.00	-21.64	PK
V	4804.00	44.43	-0.43	44.00	54.00	-10.00	AV
V	7206.00	44.04	8.31	52.35	74.00	-21.65	PK
V	7206.00	34.70	8.31	43.01	54.00	-10.99	AV
Н	4804.00	48.10	-0.43	47.67	74.00	-26.33	PK
Н	4804.00	38.75	-0.43	38.32	54.00	-15.68	AV
Н	7206.00	42.84	8.31	51.15	74.00	-22.85	PK
Н	7206.00	34.37	8.31	42.68	54.00	-11.32	AV
		G	FSK Middle c	hannel			
V	4882.00	51.02	-0.38	50.64	74.00	-23.36	PK
V	4882.00	43.55	-0.38	43.17	54.00	-10.83	AV
V	7323.00	40.73	8.83	49.56	74.00	-24.44	PK
V	7323.00	31.91	8.83	40.74	54.00	-13.26	AV
Н	4882.00	48.64	-0.38	48.26	74.00	-25.74	PK
Н	4882.00	38.56	-0.38	38.18	54.00	-15.82	AV
Н	7323.00	38.98	8.83	47.81	74.00	-26.19	PK
Н	7323.00	30.73	8.83	39.56	54.00	-14.44	AV
			GFSK High ch	annel	<u> </u>		
V	4960.00	53.64	-0.32	53.32	74.00	-20.68	PK
V	4960.00	44.96	-0.32	44.64	54.00	-9.36	AV
V	7440.00	46.48	9.35	55.83	74.00	-18.17	PK
V	7440.00	37.12	9.35	46.47	54.00	-7.53	AV
Н	4960.00	51.70	-0.32	51.38	74.00	-22.62	РК
Н	4960.00	41.48	-0.32	41.16	54.00	-12.84	AV
Н	7440.00	43.50	9.35	52.85	74.00	-21.15	PK
Н	7440.00	35.50	9.35	44.85	54.00	-9.15	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.

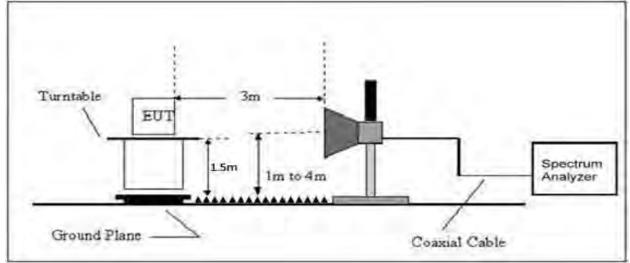
5.All the Modulation are test, the worst mode is GFSK, the data recording in the report.



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			

Edition



Edition:

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

FREQUENCY	Limit (dBuV/	m) (at 3M)
(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).

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 / 1/T Hz 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 chamber. 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 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

	Polar (H/V)	Frequency (MHz)	Reading Level	Correct Factor	Measure- ment (dBuV/m)	Limits (dBuV/m)		Result		
	(п/•)	(11172)	(dBuV/m)	(dB)	РК	РК	AV			
		Low Channel 2402MHz								
	Н	2390.00	53.29	-6.70	46.59	74.00	54.00	PASS		
GFSK	Н	2400.00	57.39	-6.71	50.68	74.00	54.00	PASS		
	V	2390.00	53.06	-6.70	46.36	74.00	54.00	PASS		
	V	2400.00	57.80	-6.71	51.09	74.00	54.00	PASS		
	High Channel 2480MHz									
	Н	2483.50	56.20	-6.79	49.41	74.00	54.00	PASS		
	Н	2500.00	52.04	-6.81	45.23	74.00	54.00	PASS		
	V	2483.50	56.97	-6.79	50.18	74.00	54.00	PASS		
	V	2500.00	53.81	-6.81	47.00	74.00	54.00	PASS		
π/4DQPSK	Low Channel 2402MHz									
	Н	2390.00	54.54	-6.70	47.84	74.00	54.00	PASS		
	Н	2400.00	57.78	-6.71	51.07	74.00	54.00	PASS		
	V	2390.00	53.70	-6.70	47.00	74.00	54.00	PASS		
	V	2400.00	58.47	-6.71	51.76	74.00	54.00	PASS		
	High Channel 2480MHz									
	Н	2483.50	57.34	-6.79	50.55	74.00	54.00	PASS		
	Н	2500.00	51.61	-6.81	44.80.	74.00	54.00	PASS		
	V	2483.50	56.90	-6.79	50.11	74.00	54.00	PASS		
	V	2500.00	52.75	-6.81	45.94	74.00	54.00	PASS		
	Low Channel 2402MHz									
8DPSK	Н	2390.00	54.62	-6.70	47.92	74.00	54.00	PASS		
	Н	2400.00	57.75	-6.71	51.04	74.00	54.00	PASS		
	V	2390.00	54.68	-6.70	47.98	74.00	54.00	PASS		
	V	2400.00	57.93	-6.71	51.22	74.00	54.00	PASS		
	High Channel 2480MHz									
	Н	2483.50	58.37	-6.79	51.58	74.00	54.00	PASS		
	Н	2500.00	53.07	-6.81	46.26	74.00	54.00	PASS		
	V	2483.50	58.33	-6.79	51.54	74.00	54.00	PASS		
	V	2500.00	54.58	-6.81	47.77	74.00	54.00	PASS		

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. Conducted Emission

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;

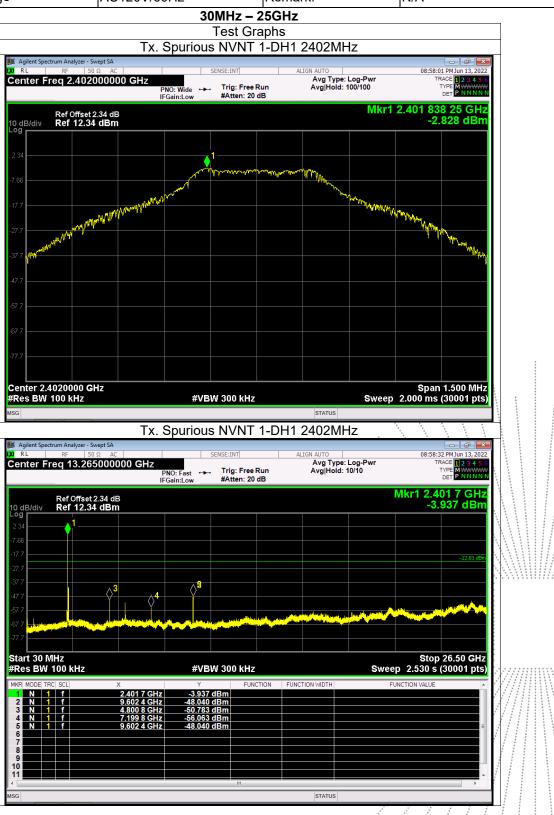
2. Set the spectrum analyzer: Below 1GHz: RBW = 100kHz, VBW = 300kHz, Sweep = auto Detector function = peak, Trace = max hold Above 1GHz: RBW = 100kHz, VBW = 300kHz, Sweep = auto Detector function = peak, Trace = max hold



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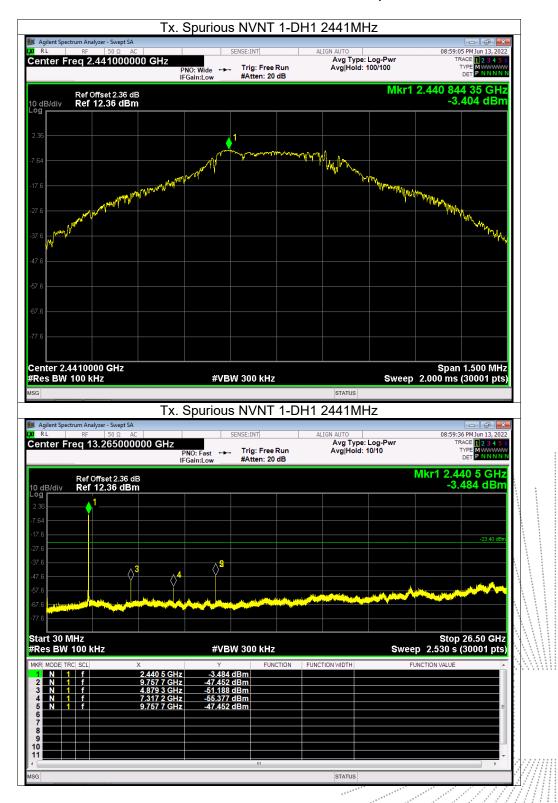
9.4 Test Result

Temperature :	26 ℃	Relative Humidity:	54%
Test Voltage :	AC120V/60Hz	Remark:	N/A

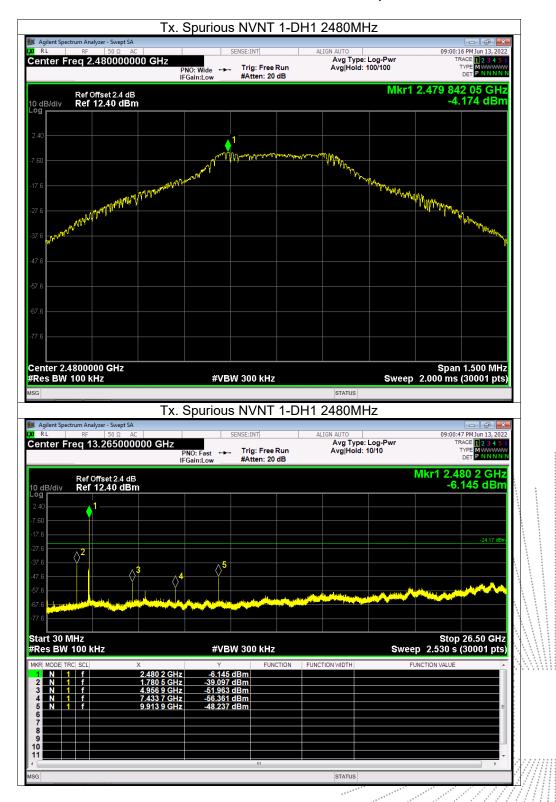


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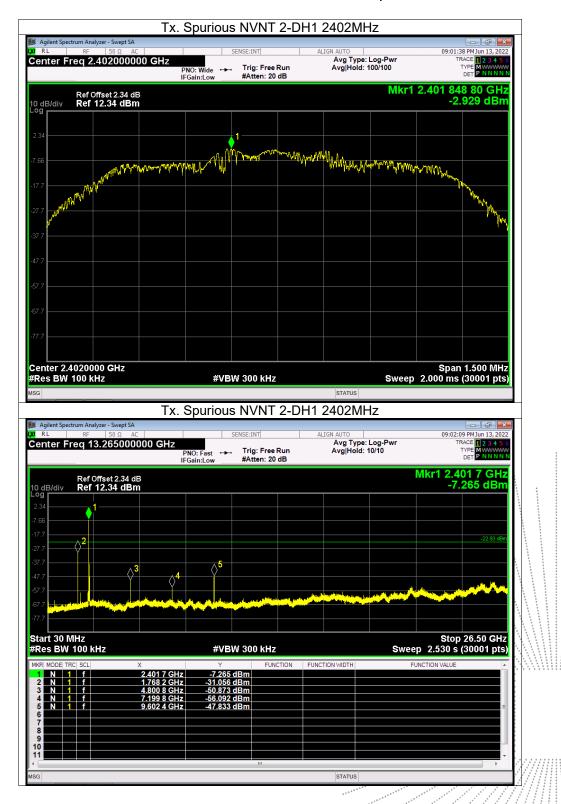




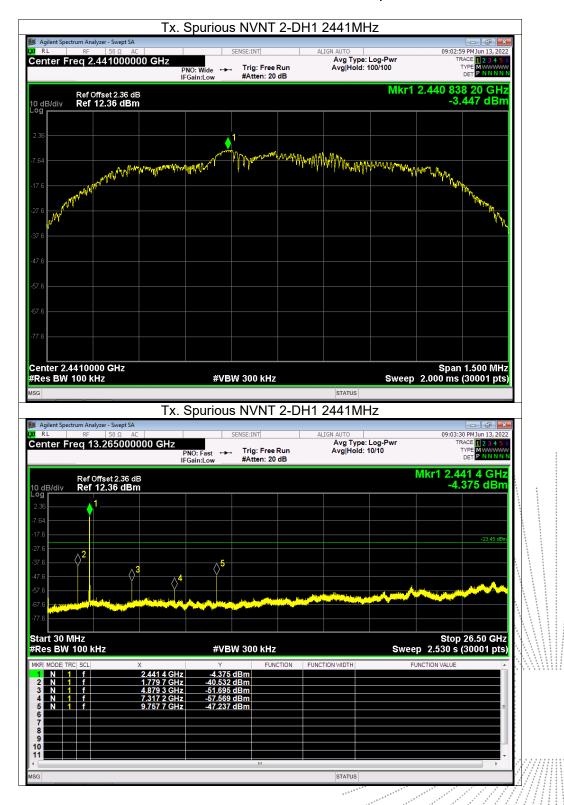




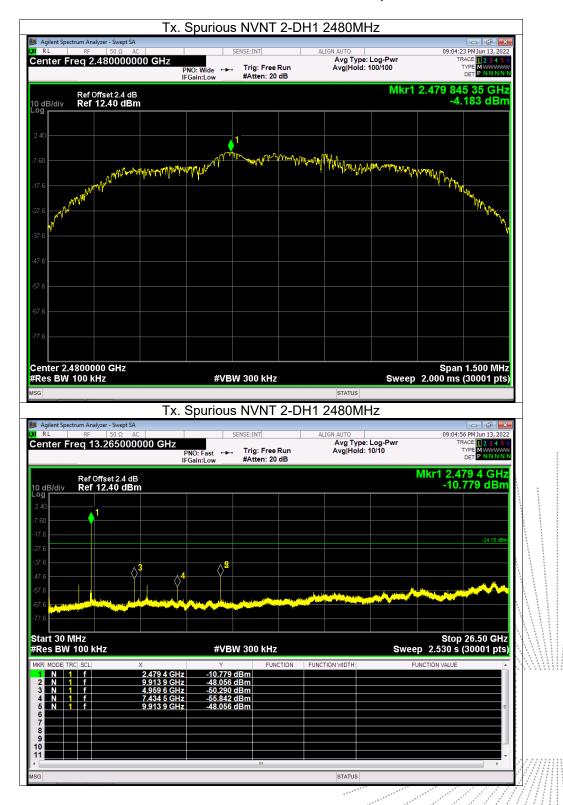




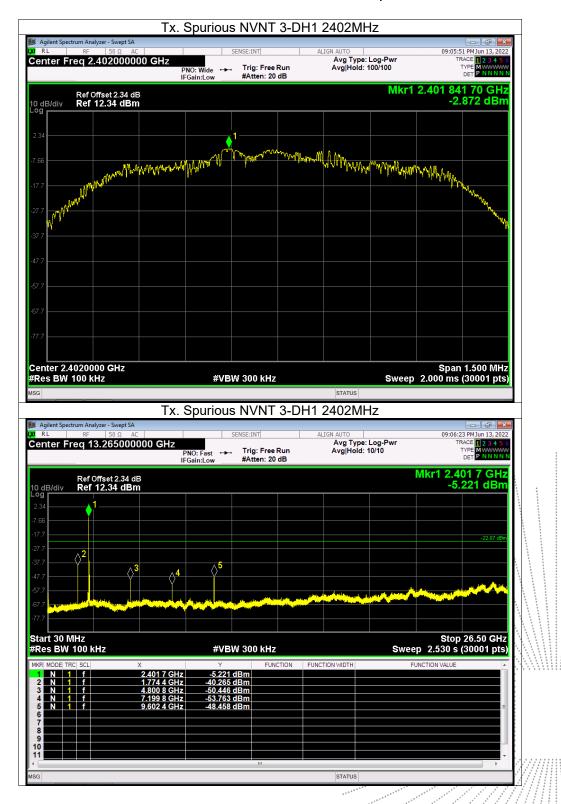




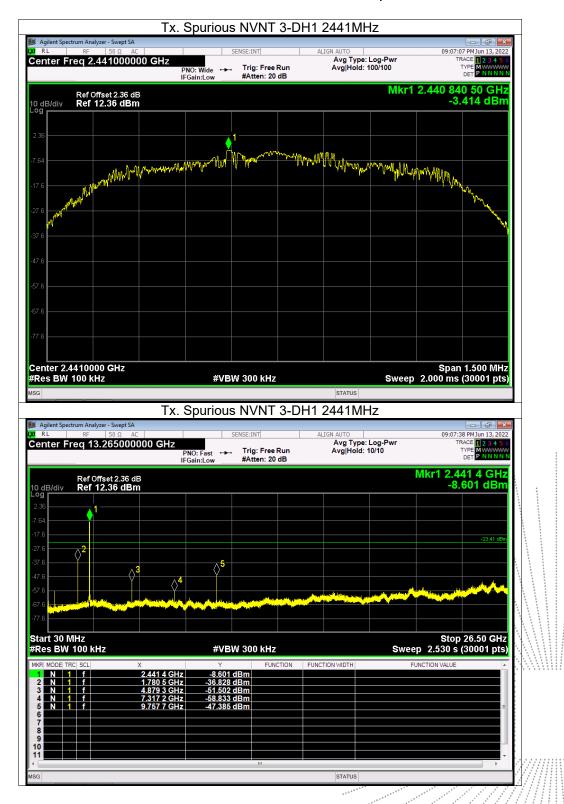




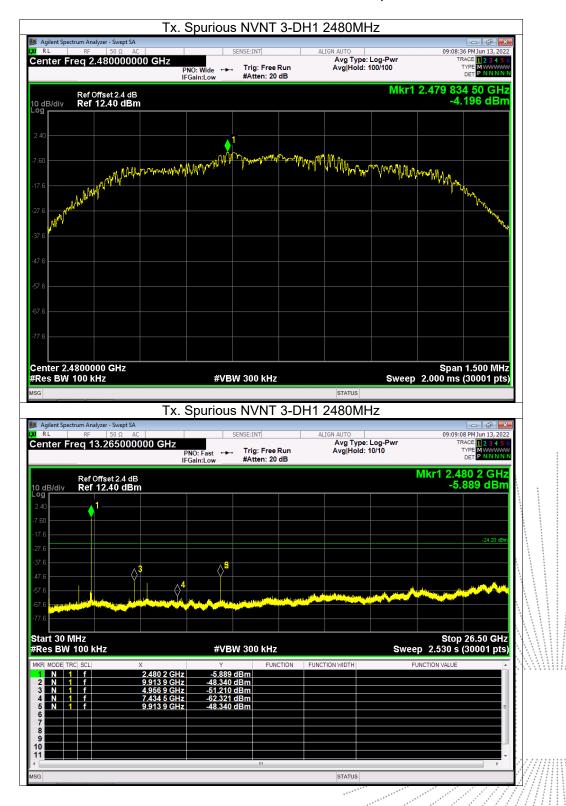




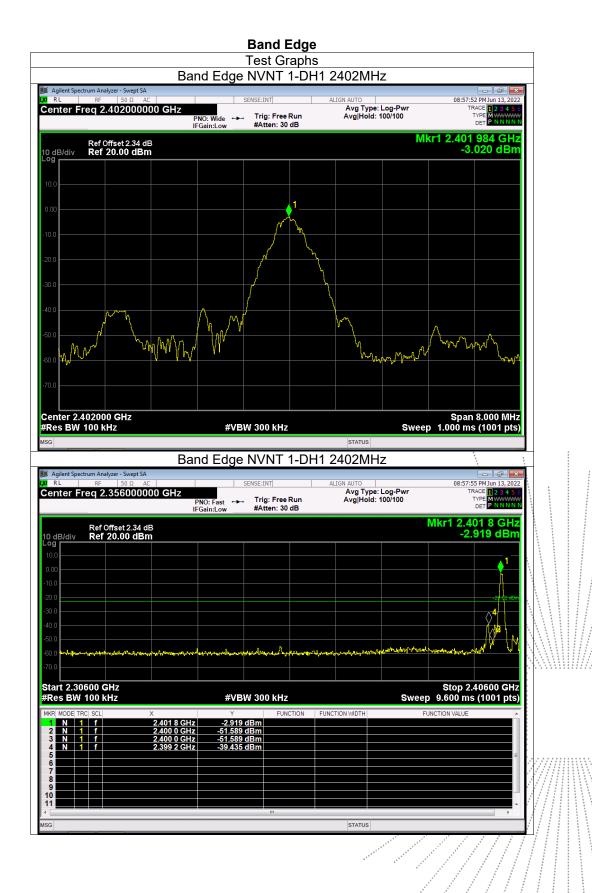




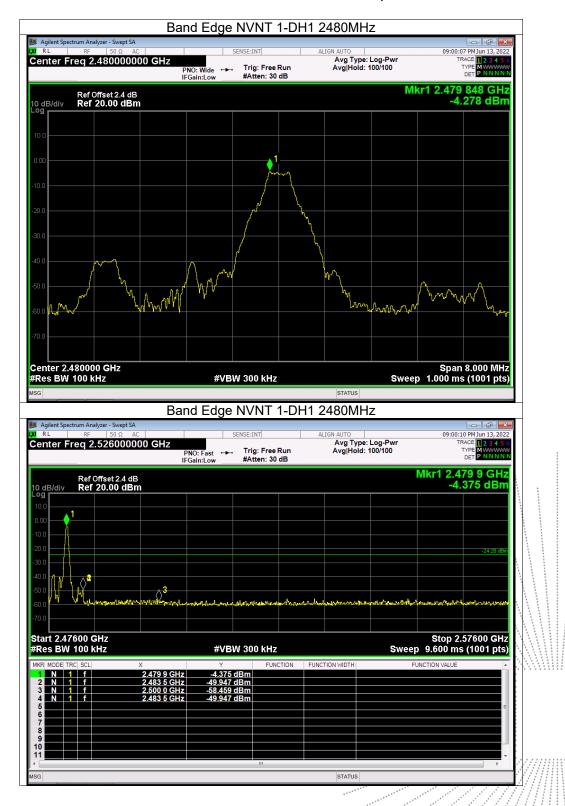




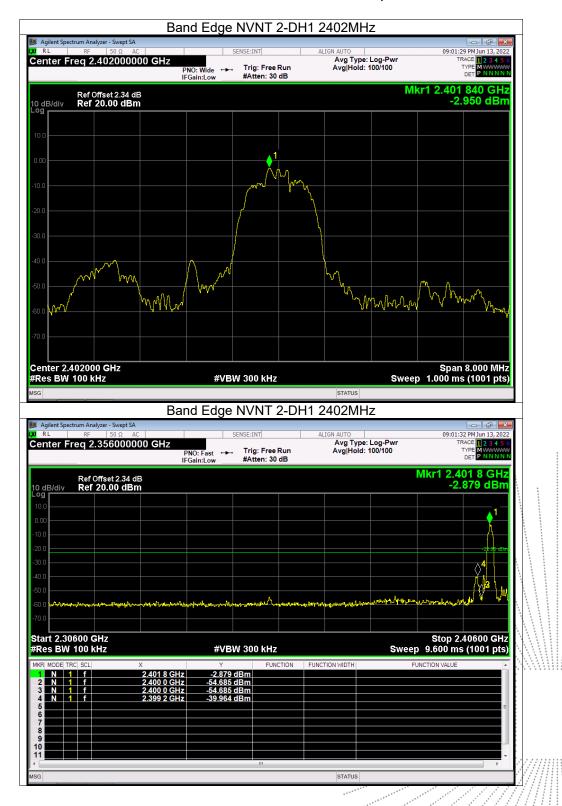




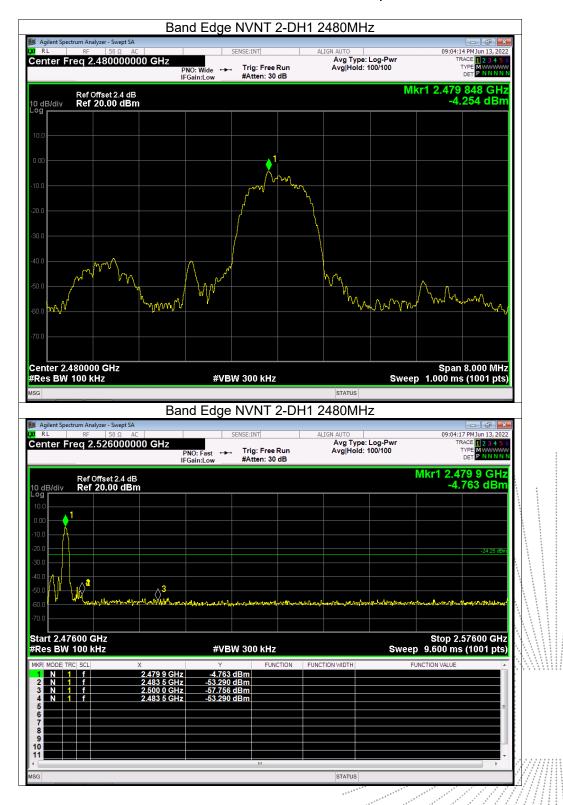




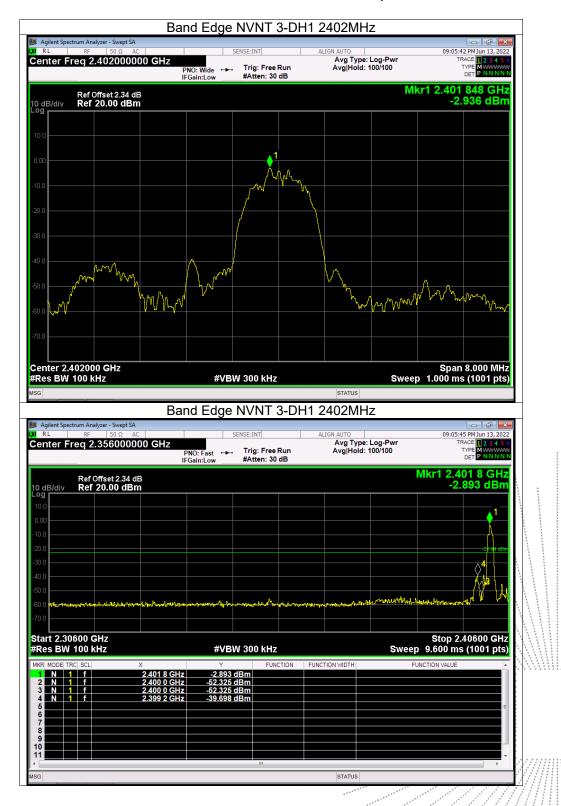




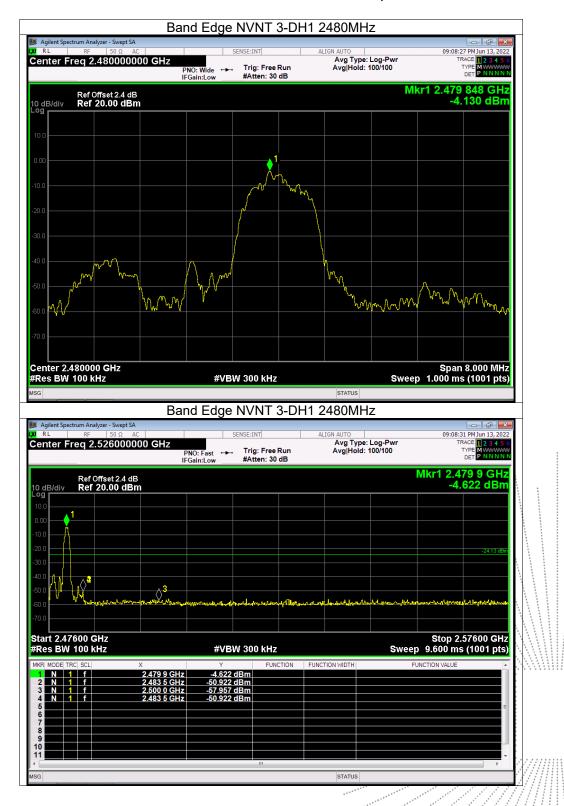






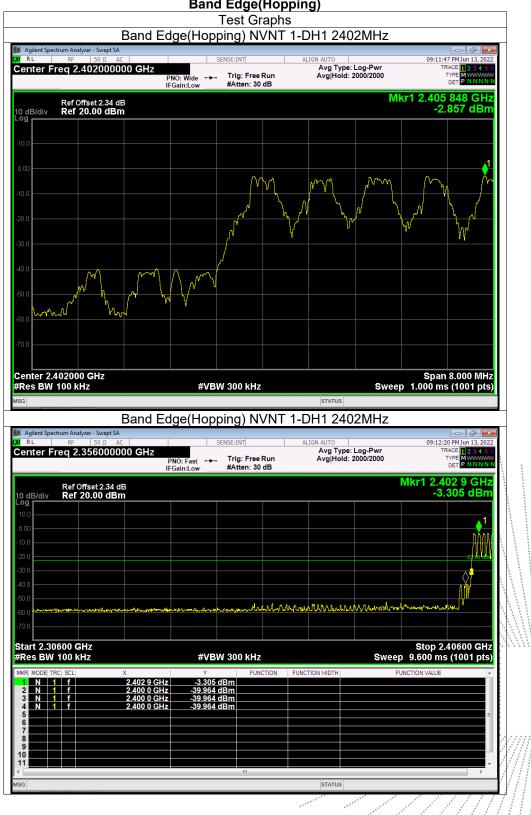






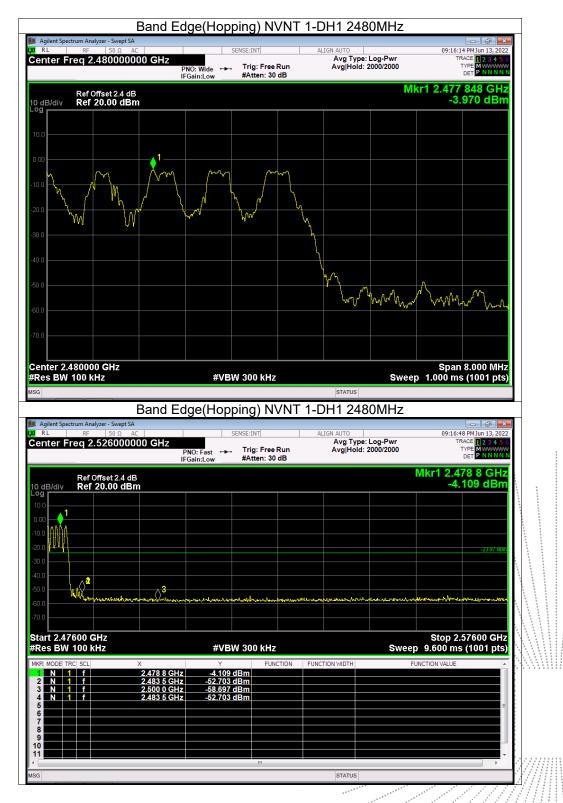


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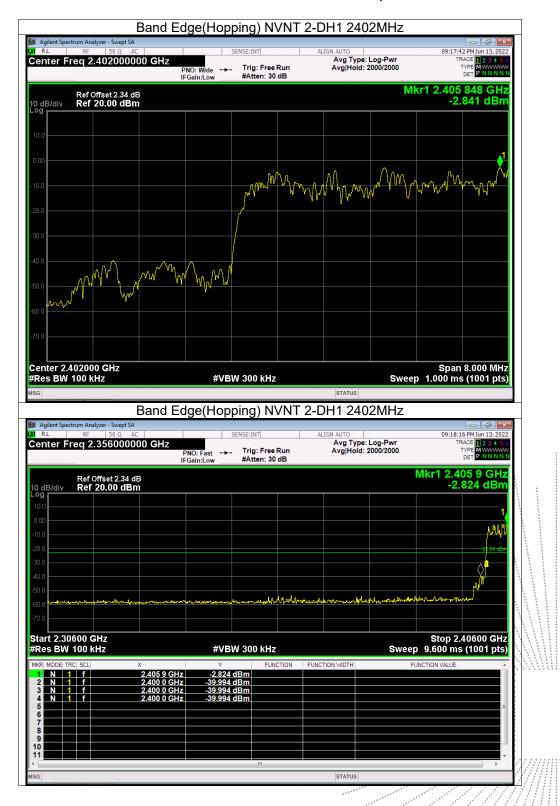


Band Edge(Hopping)

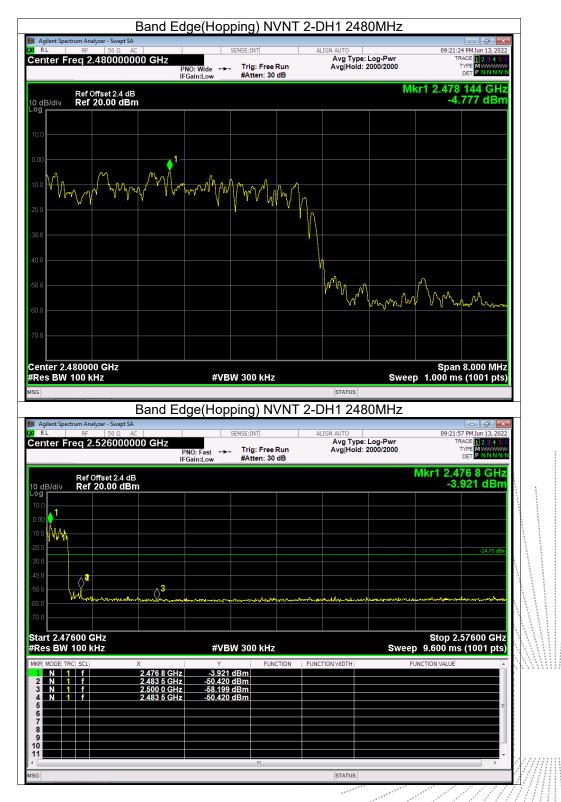




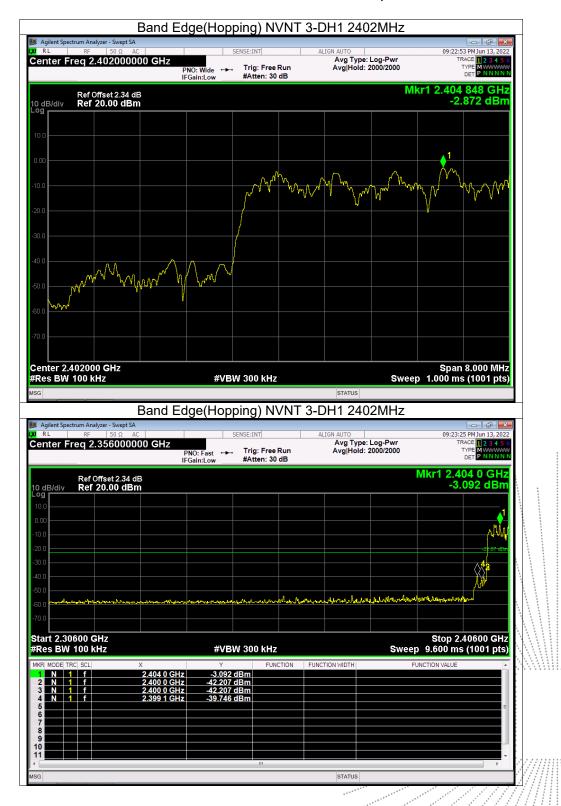




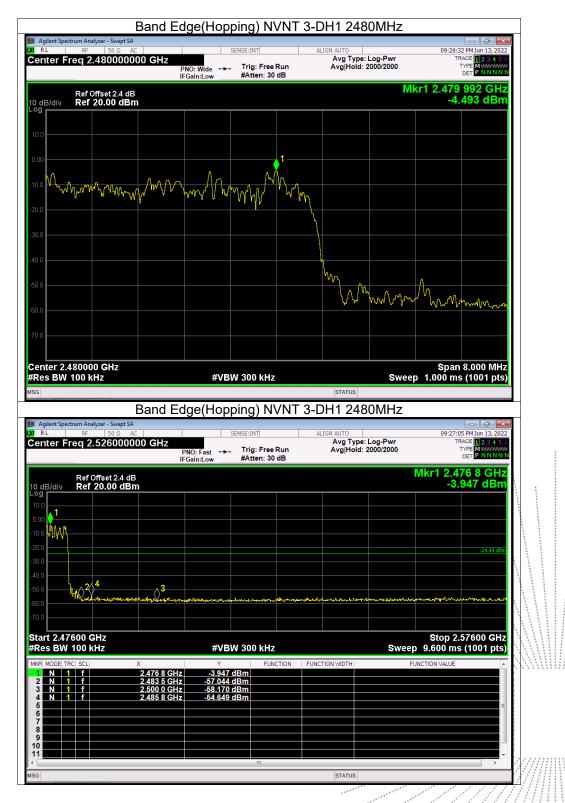














10. 20 DB Bandwidth

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 20 dB relative to the maximum level measured in the fundamental emission.

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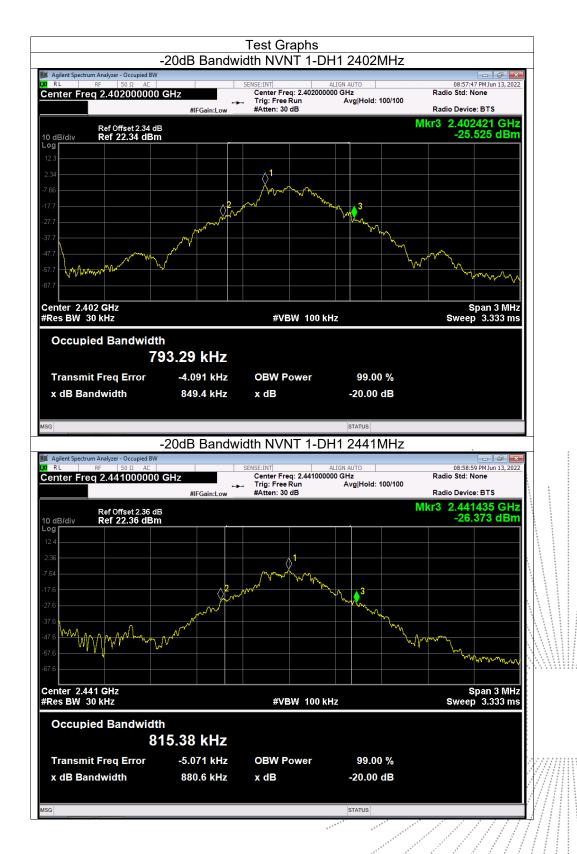


10.4 Test Result

Temperature :	ure ∶ 26℃		Relative Humidity	y∶ 54%
Test Voltage :	Test Voltage : AC120		Remark	N/A
[
Modulation		Test Channel		Bandwidth(MHz)
GFSK		Low		0.849
GFSK		Middl	Middle 0.881	
GFSK		High	I	0.867
π/4DQPSK		Low		1.23
π/4DQPSK		Middl	e	1.252
π/4DQPSK		High	I	1.234
8DPSK		Low		1.243
8DPSK		Middl	e	1.223
8DPSK		High		1.208

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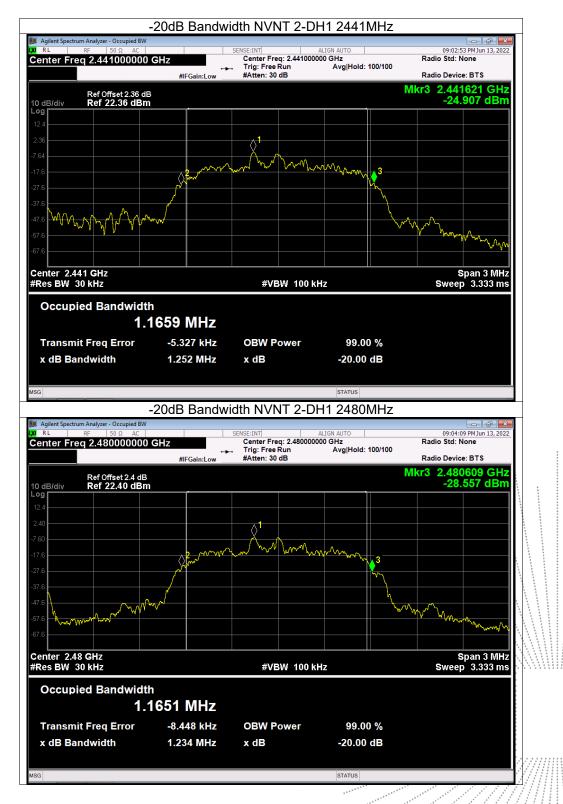




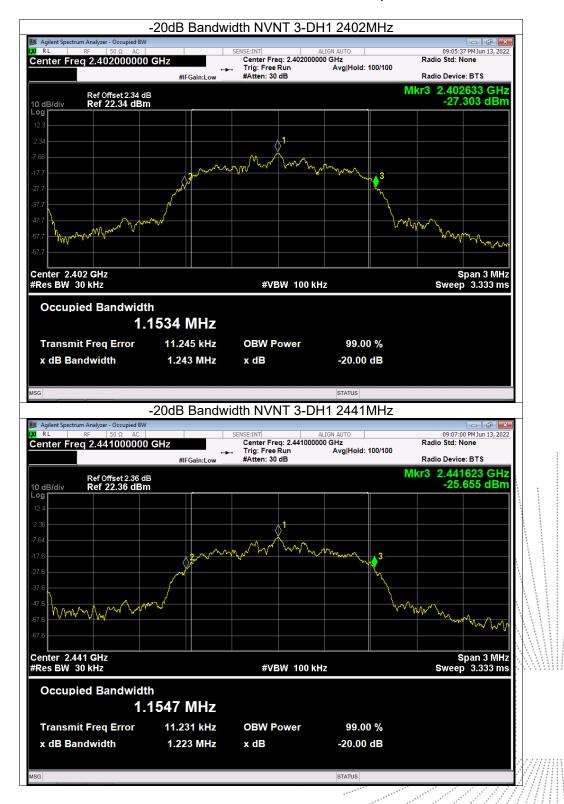




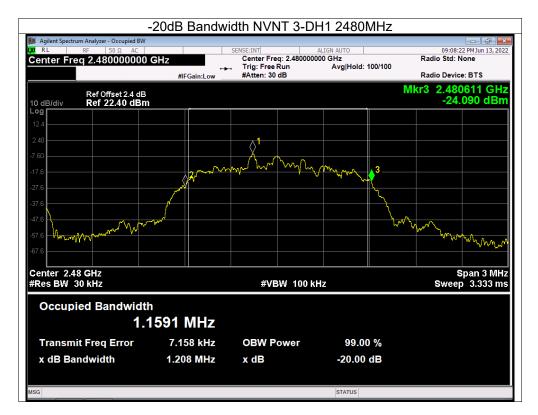


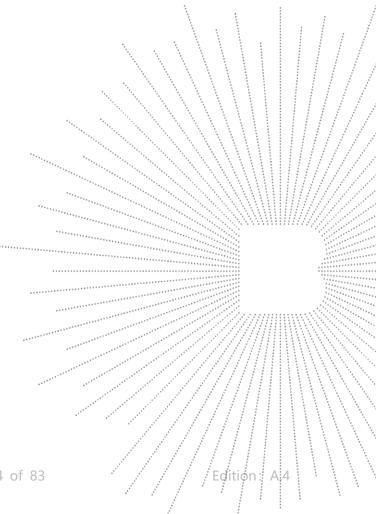














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11. Maximum Peak Output Power

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.

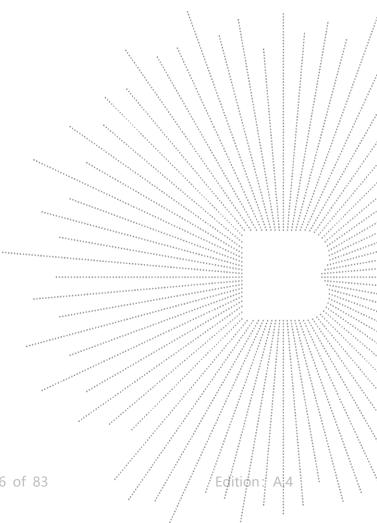
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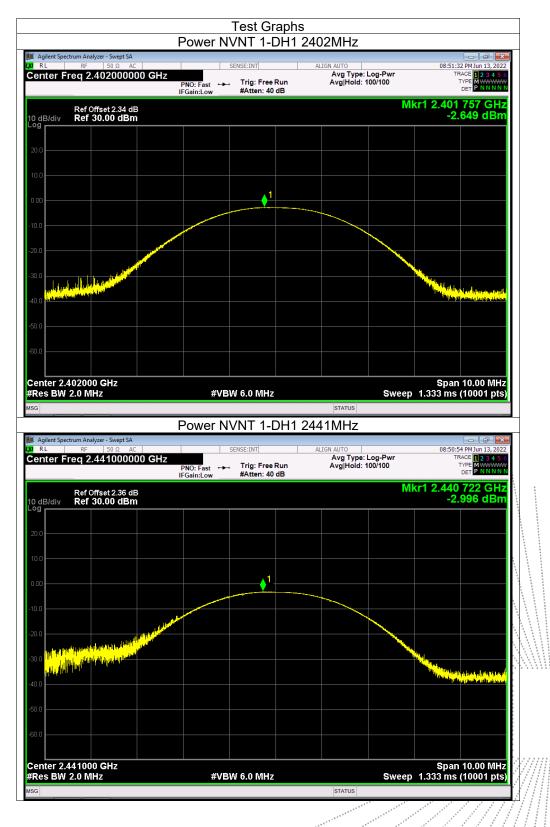


11.4 Test Result

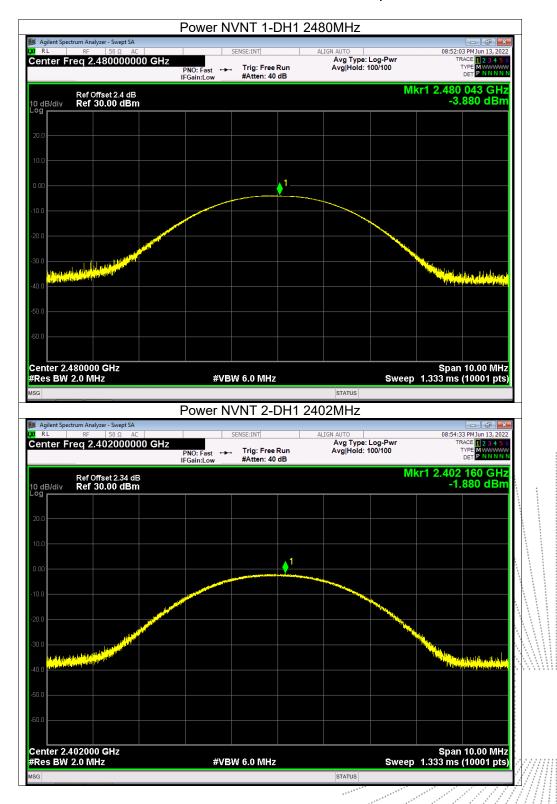
Temperature :	26 ℃	Relative Humidity :	54%	
Test Voltage :	AC120V/60Hz	Remark:	N/A	
Modulation	Test Channel	Output Dower (dDm)		Limit (dDm)
wodulation	Test Channel	Output Power (dBm))	Limit (dBm)
GFSK	Low	-2.65		21
GFSK	Middle	-3		21
GFSK	High	-3.88		21
π/4DQPSK	Low	-1.88		21
π/4DQPSK	Middle	-2.4		21
π/4DQPSK	High	-3.26		21
8DPSK	Low	-1.35		21
8DPSK	Middle	-1.76		21
8DPSK	High	-2.52		21



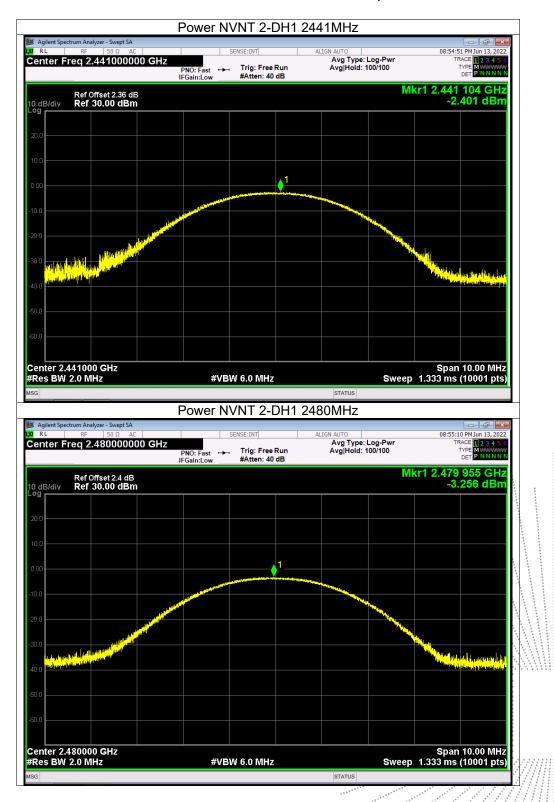




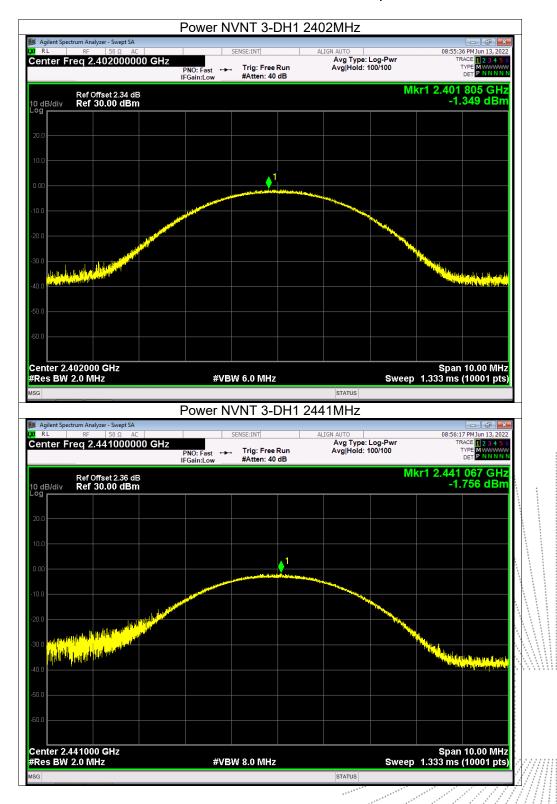




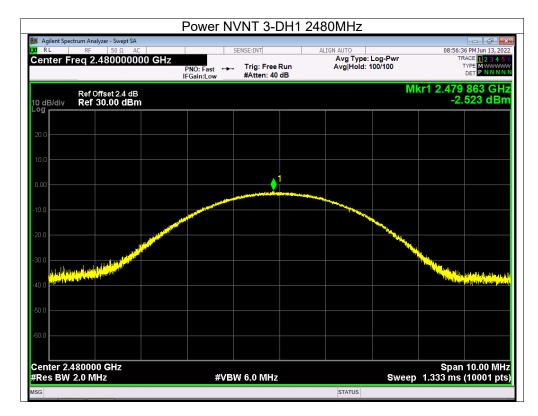


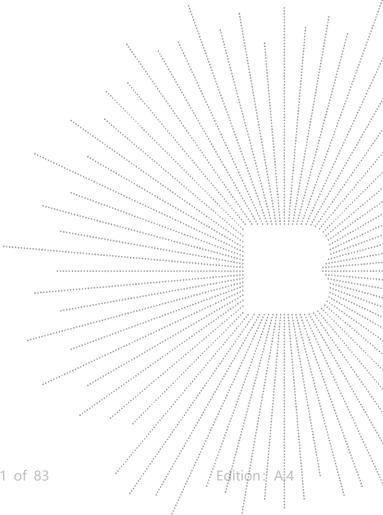














12. Hopping Channel Separation

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.

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12.4 Test Result

Modulation	Test Channel	Separation (MHz)	Limit(MHz)	Result
GFSK	Low	1	0.849	PASS
GFSK	Middle	1	0.881	PASS
GFSK	High	1.002	0.867	PASS
π/4DQPSK	Low	0.998	0.820	PASS
π/4DQPSK	Middle	1	0.835	PASS
π/4DQPSK	High	1	0.823	PASS
8DPSK	Low	1.01	0.829	PASS
8DPSK	Middle	1.002	0.815	PASS
8DPSK	High	1.002	0.805	PASS

.....



Agilent Spectrum Analyzer - Swep RL RF 50 Ω	ot SA	SENSE		ALIGN AUTO		09:10:20 PM Jun 13, 2022
enter Freq 2.40250	00000 GHz		rig: Free Run Atten: 30 dB	Avg Type: Avg Hold:>	Log-Pwr	TRACE 1 2 3 4 5 6 TYPE M WWWW DET P N N N N N
Ref Offset 2.3 dB/div Ref 20.00 c	34 dB d B m				Mkr1 2.	401 838 GHz -4.588 dBm
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.0						
enter 2.402500 GHz						Span 2.000 MHz
Res BW 30 kHz	X	#VBW 10	00 KHZ	FUNCTION WIDTH		33 ms (1001 pts)
N 1 f N 1 f	2.401 838 GHz 2.402 838 GHz	-4.588 dBm -4.640 dBm		FONCTION WIDTH	PONCTION	VALUE
						E
						-
				STATUS		
Agilent Spectrum Analyzer - Swep	ot SA	CFS NVNT	⁻ 1-DH1 2			
Agilent Spectrum Analyzer - Swep RL RF 50 Ω	AC A	SENSE:	:INT		Log-Pwr 100/100	09:14:00 PM Jun 13, 2022 TRACE 1 2 3 4 5 6 TYPE M MAAAAAAAA
Agilent Spectrum Analyzer - Swep RL RF 50 Ω enter Freq 2.44150 Ref Offset 2.3	AC A	SENSE:	INT	2441MHz Align Auto Avg Type: I	100/100	09:14:00 PMJun 13, 2022 TRACE 1 2 3 4 5 6 TYPE MWWWWW DET P NNNNN
Agilent Spectrum Analyzer - Swep RL RF 50 Ω enter Freq 2.44150 Ref Offset 2.3 dB/div Ref 20.00 c	AC A	SENSE:	:INT	2441MHz	100/100	09:14:00 PM Jun 13, 2022 TRACE 1 2 3 4 5 6 TYPE MWWWWW DET PNNNNN
Agilent Spectrum Analyzer - Swep RL RF 50 Q enter Freq 2.44150 Ref Offset 2.3 dB/div Ref 20.00 c	AC A	SENSE:	:INT	2441MHz Align Auto Avg Type: I	100/100	09:14:00 PMJun 13, 2022 TRACE 1 2 3 4 5 6 TYPE MWWWW DET P NNNN 440 838 GHZ
Agilent Spectrum Analyzer - Swep RL RF 50 Ω enter Freq 2.44150 Ref Offset 2.3 dB/div Ref 20.00 c	AC PNC PNC PNC PNC PNC PNC IFG 36 dB 36 dB 36 m	SENSE:	:INT	2441MHz	100/100	09:14:00 PMJun 13, 2022 TRACE 1 2 3 4 5 6 TYPE MWWWW DET P NNNN 440 838 GHZ
Agilent Spectrum Analyzer - Swep RL RF 50 Ω enter Freq 2.44150 Ref Offset 2.3 dB/div Ref 20.00 c 9 0 0 0 0 0 0 0 0 0 0 0 0 0	AC PNC PNC PNC PNC PNC PNC IFG 36 dB 36 dB 36 m	SENSE:	:INT	2441MHz	100/100	09:14:00 PMJun 13, 2022 TRACE 1 2 3 4 5 6 TYPE MWWWW DET P NNNN 440 838 GHZ
Agilent Spectrum Analyzer - Swep RL RF 50 Ω enter Freq 2.44150 Ref Offset 2.3 dB/div Ref 20.00 c 9 0 0 0 0 0 0 0 0 0 0 0 0 0	AC PNC PNC PNC PNC PNC PNC IFG 36 dB 36 dB 36 m	SENSE:	:INT	2441MHz	100/100	09:14:00 PMJun 13, 2022 TRACE 1 2 3 4 5 6 TYPE MWWWW DET P NNNN 440 838 GHZ
Agilent Spectrum Analyzer - Swep RL RF 50 Ω enter Freq 2.44150 Ref Offset 2.3 dB/div Ref 20.00 c 9 0 0 0 0 0 0 0 0 0 0 0 0 0	AC PNC PNC PNC PNC PNC PNC IFG 36 dB 36 dB 36 m	SENSE:	:INT	2441MHz	100/100 Mkr1 2.	09:14:00 PM Jun 13, 2022 TRACE 23 4 5 0 TYPE WINNEN DET PNINNN 440 838 GHz -5.159 dBm
Agilent Spectrum Analyzer - Swep RL RF 50 Ω Penter Freq 2.44150 Bl/div Ref 20.00 c Ref Offset 2.3 dB/div Ref 20.00 c g g g g g g g g g g g g g	AC PNC PNC PNC PNC PNC PNC IFG 36 dB 36 dB 36 m	SENSE:	INT	2441MHz	Mkr1 2.	09:14:00 PM Jun 13, 2022 TRACE 12 3 4 5 0 TYPE MUSER SALES DET PNINNN 440 838 GHz -5.159 dBm 5pan 2.000 MHz 3 ms (1001 pts)
Agilent Spectrum Analyzer - Swep RL RF 50 Q enter Freq 2.44150 Ref Offset 2.3 dB/div Ref 20.00 c g dB/div Ref 20.00 c dB/div Ref	AC PNU FG	SENSE D: Wide Tr ain:Low #A	INT	2441MHz	100/100 Mkr1 2.	09:14:00 PM Jun 13, 2022 TRACE 12 3 4 5 0 TYPE MUSER SALES DET PNINNN 440 838 GHz -5.159 dBm 5pan 2.000 MHz 3 ms (1001 pts)
Agilent Spectrum Analyzer - Swep RL RF 50 Q enter Freq 2.44150	AC PNO PNO IFG	SENSE D: Wide Tr ain:Low Tr #A	INT	2441MHz	Mkr1 2.	09:14:00 PM Jun 13, 2022 TRACE 12 3 4 5 0 TYPE MUSER SALES DET PNINNN 440 838 GHz -5.159 dBm 5pan 2.000 MHz 3 ms (1001 pts)
enter Freq 2.44150 Ref Offset 2.3	AC PNU FG	SENSE D: Wide Tr ain:Low Tr #A	INT	2441MHz	Mkr1 2.	09:14:00 PM Jun 13, 2022 TRACE 12 3 4 5 0 TYPE MUSER SALES DET PNINNN 440 838 GHz -5.159 dBm 5pan 2.000 MHz 3 ms (1001 pts)



<figure></figure>	Agilent Spectrum Analyzer - Swept SA	CFS NVNT 1-DH1 2		00:15:50 DM Jup 12, 2022	Γ
During and the second secon	enter Freq 2.479500000 GHz		ALIGN AUTO Avg Type: Log-Pwr Avg Hold:>100/100	09:15:58 PM Jun 13, 2022 TRACE 1 2 3 4 5 6 TYPE M WWWWW	
Ref 20.00 dBm 	Ref Offset 2.4 dB	jain:Low #Atten: 30 dB	Mk	r1 2.478 838 GHz	
Image: product rest rest rest rest rest rest rest res	dB/div Ref 20.00 dBm			-5.818 dBm	
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span 2.000 MHz Span 2.000 MHz Sweep 2.133 ms (1001 ps)					
tes BW 30 kHz BV 100 kHz Sweep 2.133 ms (1001 pts) Process ms (c) 2.473 838 cHz - 338 dBm Process ms (1001 pts) Process ms (c) 2.473 838 cHz - 338 dBm Process ms (1001 pts) make book of the second make book of the secon					
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All of the state o	R MODE TRC SCL X	Y FUNCTION			
	2 N 1 f 2.479 840 GHz	-5.818 dBm -5.866 dBm			
CFS NVNT 2-DH1 2402MHz					
Addet Spectrum Addyzer-Seet 3A Rt. See 30 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0					
Rt Pic Vide Street Price Allow	Agilent Spectrum Analyzer - Swept SA	JES NVNT 2-DH1 2			
Ref offset 23 d B GERAV Ref 20.00 d B	enter Freq 2.402500000 GHz		Avg Type: Log-Pwr	TRACE TO DATE 6	
Addition Ref 20.00 dBm 44.578 dBm Addition Addition Addition <	IF0				
The set of	dB/div Ref 20.00 dBm			-4.578 dBm	
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enter 24.02500 GHz Res EW 30 kHz	0				
Res BW 30 kHz #VBW 100 kHz Sweep 2.133 ms (1001 pts) N 1 f 2.401 840 GHz -4.578 dBm N 1 f 2.402 838 GHz -4.562 dBm N 1 f Status -	.0				
1 1 f 2.401 840 GHz -4.578 dBm 2 N 1 f 2.402 838 GHz -4.562 dBm 3 - - - - - 4 - - - - - 5 - - - - - - 6 - <td>enter 2.402500 GHz</td> <td></td> <td></td> <td>Span 2.000 MHz</td> <td></td>	enter 2.402500 GHz			Span 2.000 MHz	
	enter 2.402500 GHz tes BW 30 kHz			2.133 ms (1001 pts)	
	Image: 10 minipage Image: 10 minipage Image: 10 minipage <td>Y FUNCTION</td> <td></td> <td>2.133 ms (1001 pts)</td> <td></td>	Y FUNCTION		2.133 ms (1001 pts)	
status	0 0 enter 2.402500 GHz tes BW 30 kHz R MODE TRC SCL X N 1 f 2.401 840 GHz 2 N 1 f 2 N 1 f 2 N 1 f	Y FUNCTION		2.133 ms (1001 pts)	
s status	Image: constraint of the second sec	Y FUNCTION		2.133 ms (1001 pts)	
	0	Y FUNCTION		2.133 ms (1001 pts)	
	0 0 enter 2.402500 GHz Res BW 30 kHz R MODE TRC SCL N 1 1 7 2.401 840 GHz N 1 1 7 2.402 838 GHz 1 1	Y FUNCTION -4.578 dBm -4.562 dBm	FUNCTION WIDTH FUN	2.133 ms (1001 pts) ICTION VALUE	
RF-EMC-005 Page 65 of 83 Edition :	0 0 enter 2.402500 GHz Res BW 30 kHz R MODE TRC SCL N 1 1 7 2.401 840 GHz N 1 1 7 2.402 838 GHz 1 1	Y FUNCTION -4.578 dBm -4.562 dBm	FUNCTION WIDTH FUN	2.133 ms (1001 pts) ICTION VALUE	
RF-EMC-005 Page 65 of 83 / Edition:	0 0 enter 2.402500 GHz Res BW 30 kHz R MODE TRC SCL N 1 1 7 2.401 840 GHz N 1 1 7 2.402 838 GHz 1 1	Y FUNCTION -4.578 dBm -4.562 dBm	FUNCTION WIDTH FUN	2.133 ms (1001 pts) ICTION VALUE	
RF-EMC-005 Page 65 of 83 / / Edition:	0 0 enter 2.402500 GHz Res BW 30 kHz R MODE TRC SCL N 1 1 7 2.401 840 GHz N 1 1 7 2.402 838 GHz 1 1	Y FUNCTION -4.578 dBm -4.562 dBm	FUNCTION WIDTH FUN	2.133 ms (1001 pts) ICTION VALUE	
RF-EMC-005 Page 65 of 83 / / / Edition:	0 0 enter 2.402500 GHz Res BW 30 kHz R MODE TRC SCL N 1 1 7 2.401 840 GHz N 1 1 7 2.402 838 GHz 1 1	Y FUNCTION -4.578 dBm -4.562 dBm	FUNCTION WIDTH FUN	2.133 ms (1001 pts) ICTION VALUE	
~ / / / / / / / / / / / / / / / / / / /	10 10 10 10 10 10 10 10 10 10	Y FUNCTION 44.578 dBm -4.562 dBm -1000 -1100 -	FUNCTION WIDTH FUN	2.133 ms (1001 pts) ICTION VALUE	



	50 Ω AC	SENSE:INT	ALIGN AUTO	09:19:01 PM Jun 13, 2022	
nter Freq 2.44	PNO:	Wide Trig: Free Run in:Low #Atten: 30 dB	Avg Type: Log-Pwr Avg Hold:>100/100	TRACE 123456 TYPE MWWWW DET PNNNNN	
Ref Offse B/div Ref 20.	t 2.36 dB 00 dBm		M	r1 2.440 838 GHz -5.216 dBm	
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			\wedge^2		
				· · · · · · · · · · · · · · · · · · ·	
nter 2.441500 G es BW 30 kHz	Hz	#VBW 100 kHz	Sweep	Span 2.000 MHz 2.133 ms (1001 pts)	
MODE TRC SCL N 1 f N 1 f	× 2.440 838 GHz 2.441 838 GHz	Y FUNCTION -5.216 dBm -5.228 dBm	FUNCTION WIDTH FU	INCTION VALUE	
	2.441 000 0112	-0.220 dBiii			
		m	STATUS		
		FS NVNT 2-DH1	2480MHz		
gilent Spectrum Analyzer	50 Ω AC	SENSE:INT	ALIGN AUTO Avg Type: Log-Pwr	09:21:07 PM Jun 13, 2022 TRACE 1 2 3 4 5 6	
	PNO:	Wide Trig: Free Run in:Low #Atten: 30 dB	Avg Hold:>100/100	DET PNNNN	
Ref Offse B/div Ref 20.	t2.4 dB 00 dBm			r1 2.478 838 GHz -5.861 dBm	
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				~~~~~~	
nter 2.479500 G	Hz			Span 2.000 MHz	
MODE TRC SCL	X	#VBW 100 kHz		0 2.133 ms (1001 pts)	
N 1 f N 1 f	2.478 838 GHz 2.479 838 GHz	-5.861 dBm -5.910 dBm			
				=	
			STATUS		
					1.1



Spectrum Analyzer - Swept SA RF 50 Ω AC	CFS NVNT 3-DH1 2	ALIGN AUTO	09:22:35 PM Jun 13, 2022
Freq 2.402500000 GH	Z PNO: Wide Trig: Free Run IFGain:Low #Atten: 30 dB	Avg Type: Log-Pwr Avg Hold:>100/100	TRACE 123456 TYPE MWWWWW DET PNNNNN
Ref Offset 2.34 dB v <b>Ref 20.00 dBm</b>		Mkr	1 2.401 834 GHz -4.887 dBm
	hundra har - A	2 ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	$\wedge$
here and the second sec	mar handwaller		
2.402500 GHz			Span 2.000 MHz
W 30 kHz	#VBW 100 kHz		2.133 ms (1001 pts)
E TRC SCL X 1 f 2.401 834 1 f 2.402 844	Y         FUNCTION           GHz         -4.887 dBm           GHz         -5.165 dBm	FUNCTION WIDTH FUNC	TION VALUE
			E
		STATUS	
Spectrum Analyzer - Swept SA	CFS NVNT 3-DH1 2	441MHz	
RF 50 Ω AC Freq 2.441500000 GH	PNO: Wide C Irig: Free Run	ALIGN AUTO Avg Type: Log-Pwr Avg Hold:>100/100	09:23:58 PM Jun 13, 2022 TRACE 1 2 3 4 5 6 TYPE MWWWWW DET P N N N N N
Ref Offset 2.36 dB	IFGain:Low #Atten: 30 dB	Mkr	1 2.440 838 GHz
v Ref 20.00 dBm			-5.267 dBm
		2 2	
2.441500 GHz W 30 kHz	#VBW 100 kHz	Sweep	Span 2.000 MHz 2.133 ms (1001 pts)
E TRC SCL X 1 f 2.440 838 1 f 2.441 840	Y         FUNCTION           GHz         -5.267 dBm           GHz         -5.248 dBm	FUNCTION WIDTH FUNC	TION VALUE
	, m	STATUS	۴
		and the second secon	

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			CFS NV	NT 3-DH1	2480MHz		
🗴 Agilent Spectr	um Analyzer - Swept S	A					
U RL		AC	S	ENSE:INT	ALIGN AUTO		09:26:14 PM Jun 13, 202
Center Fre	eq 2.479500	P	NO:Wide 🖵 Gain:Low	Trig: Free Run #Atten: 30 dB	Avg Type: Avg Hold:>	Log-Pwr 100/100	TRACE 1 2 3 4 5 TYPE MWWWW DET P N N N N
	Ref Offset 2.4 c					Mkr1 2.	478 838 GHz
I0 dB/div -og r	Ref 20.00 dE	3m					-5.897 dBm
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	79500 GHz						Span 2.000 MH
#Res BW 3	30 KHZ		#VBV	V 100 kHz		Sweep 2.13	3 ms (1001 pts
MKR MODE TRO		х	Y	FUNCTION	FUNCTION WIDTH	FUNCTION	VALUE 4
1 N 1 2 N 1	f	2.478 838 GHz 2.479 840 GHz	<u>-5.897 c</u> -6.008 c	iBm IDm			
3		2.4/9 640 GHZ	-0.006 (	юш			
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6 7							
6 7 8							
6 7 8 9							
6 7 8 9 10							
6 7 8							

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### **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.

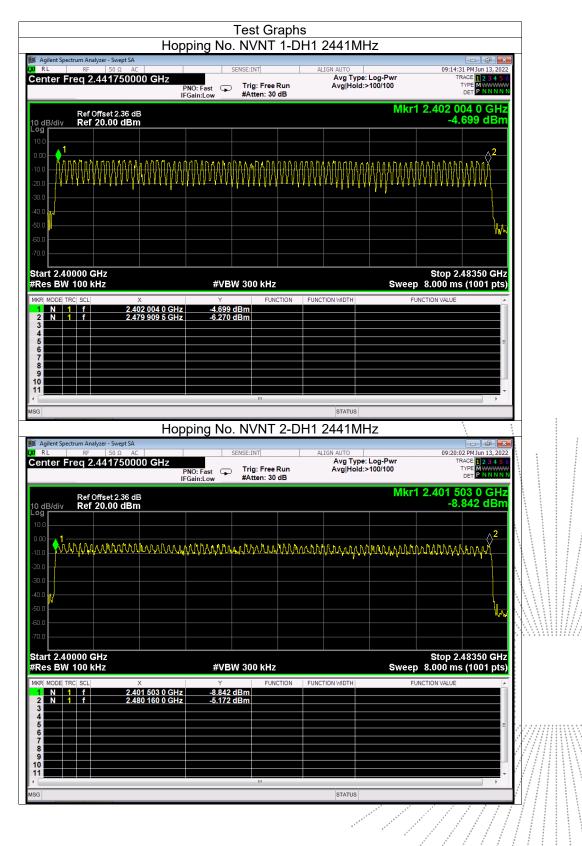
Allow the trace to stabilize. It may prove necessary to break the span up to sections. in order to clearly show all of the hopping frequencies. The limit is specified in one of the subparagraphs of this Section.
 Set the spectrum analyzer: Start Frequency = 2.4GHz, Stop Frequency = 2.4835GHz. Sweep=auto;

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/ / Edition: /



### 13.4 Test Result





	trum Analyzer - Swept SA								
RL		AC	SI	ENSE:INT	AL	IGN AUTO Avg Type			3 PM Jun 13, 2 ACE 1 2 3 4
enter Fr	req 2.441750		NO: Fast	Trig: Free R	tun	Avg Type Avg Hold:		1	YPE NWW
			Gain:Low	#Atten: 30 d					DET PNNN
	B 608 1000						Mkr	1 2.401 8	37 0 GH
) dB/div	Ref Offset 2.36 ( Ref 20.00 dB								278 dB
^{og}									
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3.00 <b>  -   -  </b>									∂ ²
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		× 401 837 0 GHz	-3.278 d	FUNC	TION FUNC	FION WIDTH	F	JNCTION VALUE	
			-5.494 d						
1 N 1		480 160 0 GHz							
1 N 1 2 N 1 3		480 160 0 GHZ							
1 N 1 2 N 1		480 160 0 GHZ							
2 N 1 3 4 5 6		480 160 0 GHZ							
1 N 1 2 N 1 3 4 4 5 6 7 9		480 160 0 GHZ							
1 N 1 2 N 1 3 4 5 6		480 160 0 GHZ							
1 N 1 2 N 1 3 4 5 5 6 7 8		480 160 0 GHZ							

Edition: A4

No.: BCTC/RF-EMC-005



### 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).

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### 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:

DH5:1600/79/6*0.4*79*(MkrDelta)/1000 DH3:1600/79/4*0.4*79*(MkrDelta)/1000 DH1:1600/79/2*0.4*79*(MkrDelta)/1000 Remark: Mkr Delta is once pulse time.

Modulation	Channel Data	Packet	pulse time(ms)	Dwell Time(ms)	Limits(ms)
		DH1	0.376	120.32	400
GFSK	Middle	DH3	1.633	261.28	400
		DH5	2.88	307.20	400
		2DH1	0.386	123.52	400
π/4DQPSK	Middle	2DH3	1.638	262.08	400
		2DH5	2.885	307.73	400
		3DH1	0.387	123.84	400
8DPSK	Middle	3DH3	1.637	261.92	400
		3DH5	2.887	307.95	400



Agilent Spectrum Analyzer - Swept RL RF 50 Ω	SA	CENCE INT		
RL RF 50 Ω nter Freq 2.44100		SENSE:INT Trig Delay-500.0 μs	ALIGN AUTO Avg Type: Log-Pwr	09:14:37 PM Jun 13, 2022 TRACE 1 2 3 4 5 6
	PNO: Fast IFGain:Low	Trig: Video #Atten: 30 dB		TYPE WWWWWW DET P N N N N N
Ref Offset 2.3				ΔMkr1 376.0 μs
dB/div Ref 20.00 d	Bm			-5.77 dB
				TRIG I VI
0				
	abilitatili a di su su su di s	n millithe		
	en an	ang sa kang sa Kang sa kang sa	ana <mark>la ka</mark> ana magaa ka ka na galaga ka na dala mala ka alama ka malan ka sa ana ka k Ana ka	ne maren in program (herris) billion (herrison) navah di tani padahan da di shikita di basar sa
	and the second	ala a serie a serie de la s	and the second	
nter 2.441000000 G	Hz			Span 0 Hz
s BW 1.0 MHz		VBW 3.0 MHz	-	0.00 ms (10001 pts)
MODE TRC SCL	376.0 μs (Δ)	-5.77 dB	UNCTION WIDTH FUNC	CTION VALUE
F 1 t	491.0 µs -15	5.86 dBm		
				E
				-
			STATUS	F
	Dwell NVN	T 1-DH3 2441M	Hz One Burst	
gilent Spectrum Analyzer - Swept	t SA			
RL RF 50 Ω nter Freq 2.44100		SENSE:INT Trig Delay-500.0 µs	ALIGN AUTO Avg Type: Log-Pwr	09:27:19 PM Jun 13, 2022 TRACE 1 2 3 4 5 6
	PNO: Fast IFGain:Low	Trig: Video #Atten: 30 dB		
Ref Offset 2.3				ΔMkr1 1.633 ms -2.59 dB
dB/div Ref 20.00 d	Bm			-2.59 UB
	162			TRISTV
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o <mark>berelepi</mark> o <mark>berelepi</mark>	e a caller procession and a statement of the	ani na a the transference managemeers for the International Action for the second statement of the	in an	n in stand with the formation of the standard of t
	table of the second second second second			
nter 2.441000000 G	<u> </u>			Span 0 Hz
s BW 1.0 MHz		VBW 3.0 MHz	Sweep 1	0.00 ms (10001 pts)
MODE TRC SCL			UNCTION WIDTH FUNC	CTION VALUE
	<u>1.633 ms (Δ)</u> 492.0 μs -17	-2.59 dB 7.14 dBm		
Δ2 1 t (Δ) F 1 t				
Δ2 1 t (Δ)				
Δ2 1 t (Δ)				
Δ2 1 t (Δ)				
Δ2 1 t (Δ)				



nter Freq 2.441000		SENSE:INT Trig Delay-500.0 Trig: Video #Atten: 30 dB	ALIGN AUTO µs Avg Type: Log-F	09:28:07 PM Jun 1: Wr TRACE 1 2 3 TYPE WWW DET P N	4 5 6
Ref Offset 2.36	dB			ΔMkr1 2.880	
dB/div Ref 20.00 dB	im			-4.16	
0					
		12		TR	<del>IG LVL</del>
0					
O valation		alaana ahaa ahaa ahaa ahaa ahaa ahaa aha	<mark>den her her ander den her ander a</mark>	and a start of the s	la anna
	<u> </u>	Over the back with a sec		about a state of the	
nter 2.441000000 GH	Z			Span	0 Hz
S BW 1.0 MHZ	X	#VBW 3.0 MHz	FUNCTION WIDTH	Sweep 10.00 ms (10001	pts)
$\begin{array}{c c} \hline \Delta 2 & 1 & t & (\Delta) \\ \hline F & 1 & t \\ \end{array}$	2.880 ms (Δ)	-4.16 dB 16.34 dBm	FUNCTION WIDTH	FUNCTION VALUE	
					•
Agilent Spectrum Analyzer - Swept S		1 Z-DH1 Z441	MHz One Burs		
nter Freq 2.441000	AC 000 GHz PNO: Fast	SENSE:INT Trig Delay-500.0	ALIGN AUTO μs Avg Type: Log-F	09:20:08 PM Jun 1: WI TRACE 1 2 3 TYPE WWW DET P NI	4 5 6
	IFGain:Low			ΔMkr1 386.0	
Ref Offset 2.36 dB/div Ref 20.00 dB	dB Sm			1.84	
0 102					
				TR	<del>IO EVE</del>
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nter 2.441000000 GH				Span (	
S BW 1.0 MHZ	X	Y FUNCTION	FUNCTION WIDTH	Sweep 10.00 ms (10001	) DE
<u>Δ2 1 t (Δ)</u> F 1 t	386.0 μs (Δ)	1.84 dB -7.27 dBm			
					=



Dwell	NVNT 2-DH3 2441	MHz One Burst		
J Agilent Spectrum Analyzer - Swept SA	SENSE:INT	ALIGN AUTO	09:29:10 PM Jun 13, 2022	
Center Freq 2.441000000 GHz	Trig Delay-500.0 µ PNO: Fast ↔→ Trig: Video Gain:Low #Atten: 30 dB		TRACE 1 2 3 4 5 6 TYPE WWWWWW DET PNNNNN	
Ref Offset 2.36 dB 10 dB/div Ref 20.00 dBm Log			∆Mkr1 1.638 ms -1.26 dB	
10.0				
0.00 X2 ^{1Δ2}			TRIOLINE	
-20.0				
30.0				
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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 Internal antenna, fulfill the requirement of this section.

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### 16. EUT Photographs

#### EUT Photo 1







Edition

### 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 stamp of laboratory.

4. The test report is invalid without signature of person(s) testing and authorizing.

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

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

7.If there is any objection to 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, Tangwei, 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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