

# **TEST REPORT**

Report No.:	BCTC2305982727E
Applicant:	SOUND AROUND INC.
Product Name:	SPEAKER BOX
Model/Type Reference:	PPHP1569UT
Tested Date:	2023-05-18 to 2023-06-02
Issued Date:	2023-07-07
She	nzhen BCTC Testing Co., Ltd.
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# FCC ID: 2A6FX-PPHP1569UT

Product Name:	SPEAKER BOX
Trademark:	PyleUSA.com
Model/Type Reference:	PPHP1569UT, PPHP1269UT, PPHP1515AB, PPHP6235B, PCS1025B, PS1224ACT, PSTG1050, PS12X2ACT, PPHP1537UB, PPHP1237UB, PPHP1037UB, PPHP837UB, PPHP159WMU, PPHP129WMU, PPHP109WMU, PPHP1299WMU.5, PPHP849KT.5, PPHP1049KT.5
Prepared For:	SOUND AROUND INC.
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Manufacturer:	Ningbo Polinata Electronics Co., Ltd
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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:	2023-05-18
Sample Tested Date:	2023-05-18 to 2023-06-02
Report No.:	BCTC2305982727E
Test Standards	FCC Part15.247 ANSI C63.10-2013
Test Results	PASS
Remark:	This is Bluetooth Classic radio test report.
Tested	by: Approved by:

Chen

Lei Chen/Project Handler

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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Edition:



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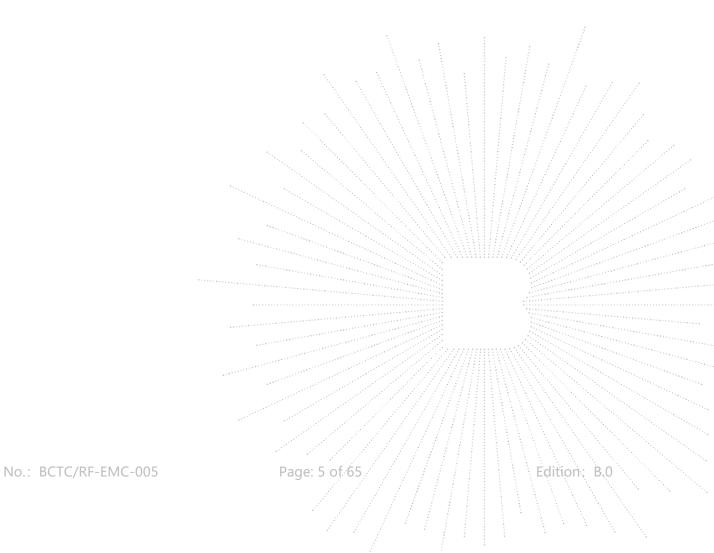
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# 1. Version

Report No.	Issue Date	Description	Approved
BCTC2305982727E	2023-07-07	Original	Valid





#### **Test Summary** 2.

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

NOTE1: N/A (Not Applicable) NOTE2: According to FCC OET KDB 558074, the report use radiated measurements in the restricted frequency bands. In addition, the radiated test is also performed to ensure the emissions emanating from the device cabinet also comply with the applicable limits.

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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	<b>U=0.59</b> °C



# 4. Product Information and Test Setup

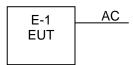
#### 4.1 Product Information

Model/Type reference:	PPHP1569UT, PPHP1269UT, PPHP1515AB, PPHP6235B, PCS1025B, PS1224ACT, PSTG1050, PS12X2ACT, PPHP1537UB, PPHP1237UB, PPHP1037UB, PPHP837UB, PPHP159WMU, PPHP129WMU, PPHP109WMU, PPHP1299WMU.5, PPHP849KT.5, PPHP1049KT.5
Model differences:	Our production units bearing the following model numbers are identical in circuitry and electrical, mechanical and physical construction; The difference is only in model names.
Bluetooth Version:	Bluetooth V5.3
Hardware Version:	N/A
Software Version:	N/A
Operation Frequency:	Bluetooth: 2402-2480MHz
Type of Modulation:	Bluetooth: GFSK, π/ 4 DQPSK
Number Of Channel	79CH
Antenna installation:	Internal antenna
Antenna Gain:	-0.58 dBi
Ratings:	AC 120V/60Hz

# 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	SPEAKER BOX	<b>PYLE</b> <sup>*</sup> PyleUSA.com	PPHP1569UT	N/A	EUT

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.

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.

#### 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 1.0.1.2			
Frequency	2402 MHz	2441 MHz	2480 MHz	
Parameters	DEF	DEF	DEF	



#### 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 C o., Ltd. Address:1-2/F., Building B, Pengzhou Industrial Park, No.158, Fuyuan 1st Road, Zhancheng, Fuha i Subdistrict, Bao'an District, Shenzhen, Guangdong, China. The site and apparatus are constructed in con formance 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	/	\	
Attenuator	/	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		May 15, 2023	May 14, 2024	
Power Sensor (AV)	Keysight	E9300A		May 15, 2023	May 14, 2024	
Signal Analyzer 20kHz-26.5G Hz	Keysight	N9020A	MY49100060	May 15, 2023	May 14, 2024	
Spectrum Analyzer 9kHz-40GHz	R&S	FSP 40		May 15, 2023	May 14, 2024	

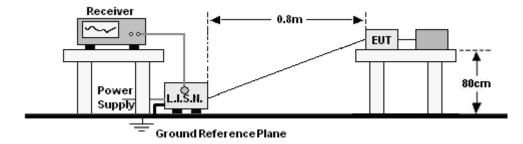


Radiated Emissions Test (966 Chamber)					
Equipment	Manufacturer	Model#	Serial#	Last Cal.	Next Cal.
966 chamber	ChengYu	966 Room	966	Nov. 02. 2021	Nov. 01.2024
Receiver	R&S	ESR3	102075	May 15, 2023	May 14, 2024
Receiver	R&S	ESRP	101154	Nov. 08. 2022	Nov. 07.2023
Amplifier	SKET	LAPA_01G18 G-45dB	١	Nov. 08. 2022	Nov. 07.2023
Amplifier	Schwarzbeck	BBV9744	9744-0037	May 15, 2023	May 14, 2024
TRILOG Broadband Antenna	Schwarzbeck	VULB9163	942	May 15, 2023	May 14, 2024
Horn Antenna	Schwarzbeck	BBHA9120D	1541	May 15, 2023	May 14, 2024
Horn Antenn (18GHz-40GH z)	Schwarzbeck	BBHA9170	00822	Jun. 06, 2022	Jun. 05, 2023
Amplifier (18GHz-40GH z)	MITEQ	TTA1840-35- HG	2034381	May 15, 2023	May 14, 2024
Loop Antenna (9KHz-30MHz )	Schwarzbeck	FMZB1519B	00014	May 15, 2023	May 14, 2024
RF cables1 (9kHz-30MHz)	Huber+Suhnar	9kHz-30MHz	B1702988-000 8	May 15, 2023	May 14, 2024
RF cables2 (30MHz-1GHz )	Huber+Suhnar	30MHz-1GHz	1486150	Nov. 02. 2021	Nov. 01.2024
RF cables3 (1GHz-40GHz )	Huber+Suhnar	1GHz-40GHz	1607106	May 15, 2023	May 14, 2024
Power Metter	Keysight	E4419		Nov. 08. 2022	Nov. 07.2023
Power Sensor (AV)	Keysight	E9300A	$\sum_{i=1}^{n} \sum_{j=1}^{n} \sum_{i=1}^{n} \sum_{j=1}^{n} \sum_{j=1}^{n} \sum_{i=1}^{n} \sum_{j=1}^{n} \sum_{j=1}^{n} \sum_{i=1}^{n} \sum_{j=1}^{n} \sum_{i=1}^{n} \sum_{j=1}^{n} \sum_{i=1}^{n} \sum_{j=1}^{n} \sum_{i=1}^{n} \sum_{j=1}^{n} \sum_{i=1}^{n} \sum_{j=1}^{n} \sum_{j=1}^{n} \sum_{j=1}^{n} \sum_{i=1}^{n} \sum_{j=1}^{n} \sum_{i=1}^{n} \sum_{j=1}^{n} \sum_{i=1}^{n} \sum_{j=1}^{n} \sum_{j$	Nov. 08. 2022	Nov. 07.2023
Signal Analyzer 20kHz-26.5G Hz	Keysight	N9020A	MY49100060	May 15, 2023	May 14, 2024
Spectrum Analyzer 9kHz-40GHz	R&S	FSP 40		May 15, 2023	May 14, 2024
Software	Frad	EZ-EMC	FA-03A2 RE	λ	Y



#### 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		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.

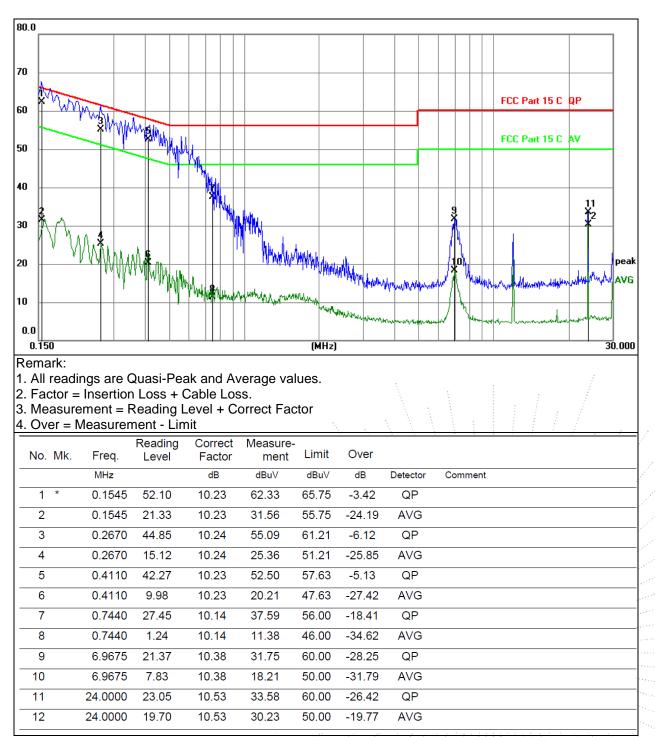
#### 6.4 EUT operating Conditions

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.



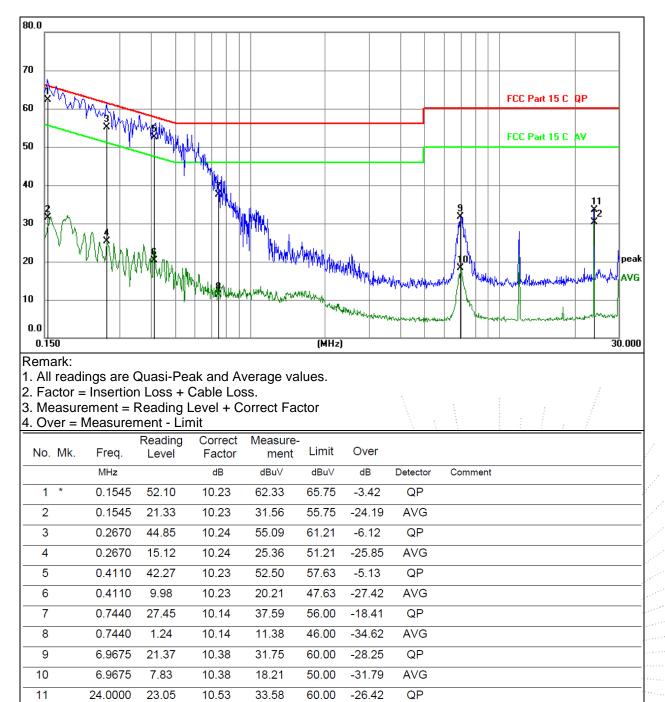
#### 6.5 Test Result

Temperature:	<b>26</b> ℃	Relative Humidity:	54%
Pressure:	101KPa	Phase :	L
Test Mode:	Mode 3	Test Voltage :	AC 120V/60Hz





Temperature:	<b>26</b> ℃	Relative Humidity:	54%
Pressure:	101KPa	Phase :	Ν
Test Mode:	Mode 3	Test Voltage :	AC 120V/60Hz



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50.00

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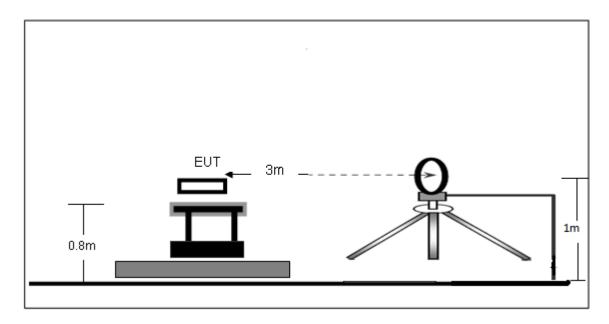
AVG



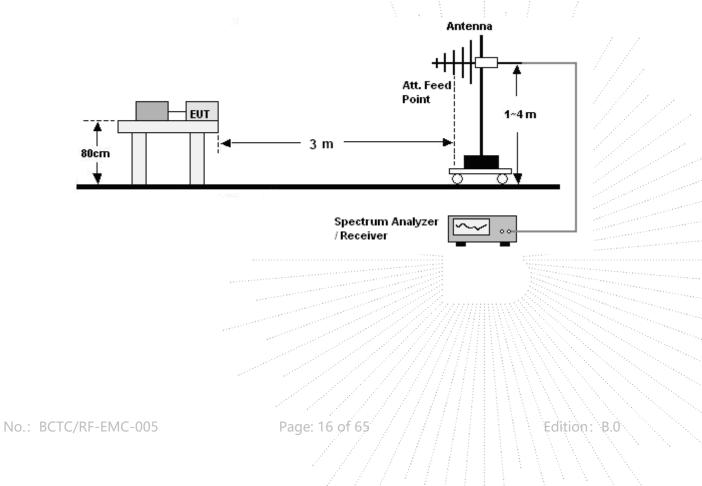
#### 7. Radiated emissions

# 7.1 Block Diagram Of Test Setup

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

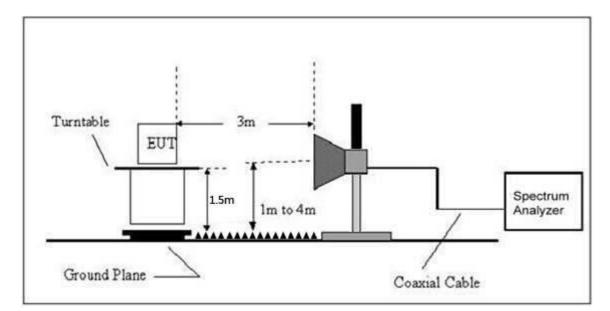


(B) Radiated Emission Test-Up Frequency 30MHz~1GHz





(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 <sup>(2400/F(kHz))</sup> + 80	
0.490 ~ 1.705	24000/F(kHz)	30	100 * 24000/F(kHz)	20log <sup>(24000/F(kHz))</sup> + 40	
1.705 ~ 30	30	30	100 * 30	20log <sup>(30)</sup> + 40	
30 ~ 88	100	3	100	20log <sup>(100)</sup>	
88 ~ 216	150	3	150	20log <sup>(150)</sup>	
216 ~ 960	200	3	200	20log <sup>(200)</sup>	
Above 960	500	3	500	20log <sup>(500)</sup>	

	Limits Of Radiated Emission Measurement	(Above	1000MHz)
--	---	--------	----------

[		Limit (dBuV/m)	(at 3M)
	Frequency (MHz)	Peak	Average
Ī	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:	<b>26</b> ℃	Relative Humidity:	54%
Pressure:	101KPa	Tost Voltago :	AC 120V/60Hz
Test Mode:	Mode 3	Test Voltage :	

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.

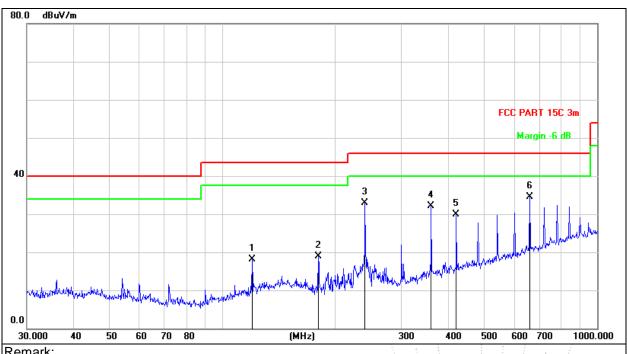
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#### Between 30MHz – 1GHz

Temperature:	<b>26</b> ℃	Relative Humidity:	54%
Pressure:	101KPa	Phase :	Horizontal
Test Mode:	Mode 3	Test Voltage:	AC 120V/60Hz



Remark:

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

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

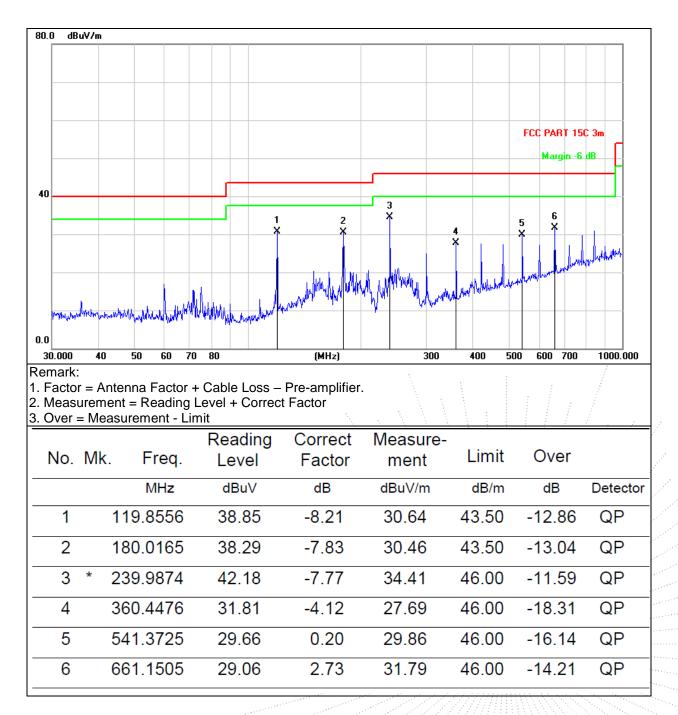
-								
No.	Mk	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		119.8556	26.27	-8.21	18.06	43.50	-25.44	QP
2		180.0165	26.69	-7.83	18.86	43.50	-24.64	QP
3		239.9874	40.67	-7.77	32.90	46.00	-13.10	QP
4		360.4476	36.32	-4.12	32.20	46.00	-13.80	QP
5		420.5803	32.18	-2.29	29.89	46.00	-16.11	QP
6	*	661.1505	31.84	2.73	34.57	46.00	-11.43	QP

No.: BCTC/RF-EMC-005

Edition: •B (



Temperature:	<b>26</b> ℃	Relative Humidity:	54%
Pressure:	101KPa	Phase :	Vertical
Test Mode:	Mode 3	Test Voltage:	AC 120V/60Hz





Between 1GHz - 25GHz

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	60.75	-0.43	60.32	74.00	-13.68	PK
V	4804.00	38.29	-0.43	37.86	54.00	-16.14	AV
V	7206.00	59.03	8.31	67.34	74.00	-6.66	PK
V	7206.00	39.93	8.31	48.24	54.00	-5.76	AV
Н	4804.00	61.87	-0.43	61.44	74.00	-12.56	PK
Н	4804.00	40.23	-0.43	39.8	54.00	-14.2	AV
Н	7206.00	61.76	8.31	70.07	74.00	-3.93	PK
Н	7206.00	41.96	8.31	50.27	54.00	-3.73	AV
		G	FSK Middle c	hannel	•		•
V	4882.00	61.9	-0.38	61.52	74.00	-12.48	PK
V	4882.00	41.8	-0.38	41.42	54.00	-12.58	AV
V	7323.00	61.33	8.83	70.16	74.00	-3.84	PK
V	7323.00	38.19	8.83	47.02	54.00	-6.98	AV
Н	4882.00	61.8	-0.38	61.42	74.00	-12.58	PK
Н	4882.00	41.96	-0.38	41.58	54.00	-12.42	AV
Н	7323.00	59.86	8.83	68.69	74.00	-5.31	PK
Н	7323.00	41.84	8.83	50.67	54.00	-3.33	AV
		(	GFSK High ch	annel			
V	4960.00	58.03	-0.32	57.71	74.00	-16.29	PK
V	4960.00	38.43	-0.32	38.11	54.00	-15.89	AV
V	7440.00	58.12	9.35	67,47	74.00	-6.53	PK
V	7440.00	39.96	9.35	49.31	54.00	-4.69	AV
Н	4960.00	58.98	-0.32	58.66	74.00	-15.34	PK
Н	4960.00	40.76	-0.32	40.44	54.00	-13.56	AV
Н	7440.00	58.71	9.35	68.06	74.00	-5.94	PK
Н	7440.00	38.04	9.35	47.39	54.00	-6.61	AV

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.

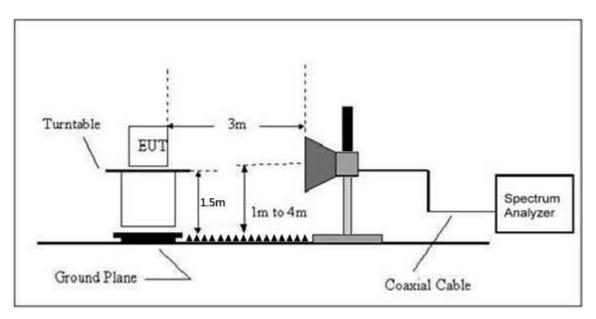
5.All the Modulation are test, the worst mode is GFSK, the data recording in the report.



#### 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
<sup>1</sup> 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	( <sup>2</sup> )
13.36-13.41			



Limits Of Radiated Emission Measurement (Above 1000MHz)

Frequency (MHz)	Limit (dBuV/m) (at 3M)				
Frequency (MIRZ)	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 / 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	Correct Factor	Measure- ment (dBuV/m)		nits V/m)	Result
	(1	(11112)	(dBuV/m)	dBuV/m) (dB) PK Low Channel 2402MHz		PK	AV	
			Low	/ Channel 2	402MHz			
	Н	2390.00	52.51	-6.70	45.81	74.00	54.00	PASS
	Н	2400.00	60.07	-6.71	53.36	74.00	54.00	PASS
	V	2390.00	54.34	-6.70	47.64	74.00	54.00	PASS
GFSK	V	2400.00	58.67	-6.71	51.96	74.00	54.00	PASS
GFSK			Higl	n Channel 2	480MHz			
	Н	2483.50	58.78	-6.79	51.99	74.00	54.00	PASS
	Н	2500.00	55.68	-6.81	48.87	74.00	54.00	PASS
	V	2483.50	58.68	-6.79	51.89	74.00	54.00	PASS
	V	2500.00	52.90	-6.81	46.09	74.00	54.00	PASS
			Low	/ Channel 2	402MHz			
	Н	2390.00	51.49	-6.70	44.79	74.00	54.00	PASS
	Н	2400.00	57.07	-6.71	50.36	74.00	54.00	PASS
	V	2390.00	53.73	-6.70	47.03	74.00	54.00	PASS
π/4DQPSK	V	2400.00	58.43	-6.71	51.72	74.00	54.00	PASS
II/4DQF3K			Higl	n Channel 2	480MHz			
	Н	2483.50	59.46	-6.79	52.67	74.00	54.00	PASS
	Н	2500.00	56.03	-6.81	49.22	74.00	54.00	PASS
	V	2483.50	57.31	-6.79	50.52	74.00	54.00	PASS
	V	2500.00	56.11	-6.81	49.30	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

No.: BCTC/RF-EMC-005

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#### 9.4 Test Result



No.: BCTC/RF-EMC-005



Keysight Spectrum Analyzer - Swept SA        R L      RF      50 Ω      AC		SENS	E:PULSE			07:23:31 PM Jun 02, 20
enter Freq 2.44100000	00 GHz	NO: Wide ↔→ Gain:Low	Trig: Free Run #Atten: 20 dB	#Avg Type Avg Hold:	: RMS 100/100	TRACE 1 2 3 4 TYPE MWWW DET P N N N
Ref Offset 3.36 dB	3	Jameon			Mkr	2.440 823 0 G
dB/div Ref 13.36 dBm			Ť			-0.573 dB
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enter 2.4410000 GHz Res BW 100 kHz		#VBW	300 kHz		Sweep	Span 1.500 M 1.000 ms (1001 p
G						
Keysight Spectrum Analyzer - Swept SA		us NVNT	1-DH1 24	141MHz E	mission	
RL RF 50 Ω AC		SENS	E:PULSE			07:24:02 PM lun 02 20
enter Freq 13.2650000				#Avg Type		
enter Freq 13.2650000	Р	NO: Fast ↔ Gain:Low	Trig: Free Run #Atten: 20 dB	#Avg Type Avg Hold: ·	10/10	TRACE 1 2 3 4 TYPE MWWW DET PNNN
Ref Offset 3.36 dE	P IF <sup>(</sup>				10/10	kr2 13.265 0 GH -67.444 dB
Ref Offset 3.36 dE 0 dB/div Ref 13.36 dBm	P IF <sup>(</sup>				10/10	kr2 13.265 0 GH
Ref Offset 3.36 dE 0 dB/div Ref 13.36 dBm 99 36 64	P IF <sup>(</sup>				10/10	kr2 13.265 0 GH
Ref Offset 3.36 dE 0 dB/div Ref 13.36 dBm 99 136 64 6 6	P IF <sup>(</sup>				10/10	kr2 13.265 0 GH
Ref Offset 3.36 dE dB/div Ref 13.36 dBm 9 9 136 6 6 6 6 6 6 6 6 6 6 6 6 6	P IF <sup>(</sup>				10/10	kr2 13.265 0 GF -67.444 dB
0 dB/div Ref 13.36 dBm 99 60 60 60 60 60 60 60 60 60 60	P IF <sup>(</sup>	Gain:Low			10/10	kr2 13.265 0 GF -67.444 dB
Ref Offset 3.36 dE dB/div Ref 13.36 dEm 9 9 9 9 9 9 9 9 9 9 9 9 9	P IF <sup>(</sup>				10/10	kr2 13.265 0 GF -67.444 dB
Ref Offset 3.36 dB dB/div Ref 13.36 dBm 9 9 9 9 9 9 9 9 9 9 9 9 9	P IF <sup>(</sup>	Gain:Low			10/10	kr2 13.265 0 GF -67.444 dB
Ref Offset 3.36 dE Ref 13.36 dE ref 14.36 dE	P IF <sup>(</sup>	Gain:Low				kr2 13.265 0 GF -67.444 dB
Ref Offset 3.36 dE Ref 13.36 dE ref 14.36 dE		Gain:Low	#Atten: 20 dB		IO/10 M	CET 213.265 0 GH -67.444 dB
Ref Offset 3.36 dB    Ref 13.36 dBm    Og    1    64    65    66    67    68    69    69    60    61    62    63    64    65    66    67    68    69    60    61    62    63    64    65    66    67    68    69    60    61    62    63    64    65    66    67    68    69    60    61    62    63    64    65    66    67    68    69    61    61    62    63    64    65    65    66    67    68    69    60    61    70 <td></td> <td>Gain:Low</td> <td>#Atten: 20 dB</td> <td></td> <td>IO/10 M</td> <td>LET-2057 Stop 26.50 GH 2.530 s (30001 p</td>		Gain:Low	#Atten: 20 dB		IO/10 M	LET-2057 Stop 26.50 GH 2.530 s (30001 p
Ref Offset 3.36 dE Ref 13.36 dE Ref 13.36 dE ref 13.36 dE 1 1 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 7 7 7 7	P IFI	2	#Atten: 20 dB		IO/10 M	LET-2057 Stop 26.50 GH 2.530 s (30001 p
Ref Offset 3.36 dB        Od B/div      Ref 13.36 dBm        Og      1        Og      2        N      1      2        N      1      2        3      3      3        5      3      3      3        6      3      3      3        1      1      2      3        3      3      3      3	P IFI	2	#Atten: 20 dB		IO/10 M	LET-2057 Stop 26.50 GH 2.530 s (30001 p
Ref Offset 3.36 dE      Pg    Ref 13.36 dBm      Pg    1      64    1      65    6      66    6      66    6      66    6      66    6      67    1      7    1      67    1      68    1      69    1      60    1      60    1      7    1      6    2      7    1      6    1      7    1	P IFI	2	#Atten: 20 dB		IO/10 M	LET-2057 Stop 26.50 GH 2.530 s (30001 p



Keysight Spectrum Analyzer - Swept SA R L RF 50 Ω AC			- ¢
RL RF 50 Ω AC enter Freq 2.480000000 GH	SENSE:PULSE 12 PNO: Wide ↔ Trig: Free Run	#Avg Type: RMS Avg Hold: 100/100	07:24:41 PM Jun 02, 202 TRACE 1 2 3 4 5 TYPE MWWW
	IFGain:Low #Atten: 20 dB		TYPE MWWW DET PNNN
Ref Offset 3.36 dB		Mkr1	2.479 838 0 GH -0.792 dBi
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enter 2.4800000 GHz Res BW 100 kHz	#VBW 300 kHz	Sweep	Span 1.500 MH 1.000 ms (1001 pt
3		STATUS	
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Keysight Spectrum Analyzer - Swept SA RL RF 50 Ω AC	SENSE:PULSE		07:25:12 PM Jun 02, 202
enter Freq 13.265000000 G	Hz PNO: Fast →→→ Trig: Free Run	#Avg Type: RMS Avg Hold: 10/10	TRACE 1 2 3 4 TYPE MWWW DET P NNN
	IFGain:Low #Atten: 20 dB		kr4 7.433 7 GH
Ref Offset 3.36 dB dB/div Ref 13.36 dBm			-50.530 dBr
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			UC1 -20 /9 68
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64 66 66 66 66 66 66 66 67 7 80 80 80 80 80 80 80 80 80 80	#VBW 300 kHz 2 GHz -2.602 dBm		Stop 26.50 GH 2.530 s (30001 pt
64 66 66 66 66 67 68 68 68 68 69 69 60 60 60 60 60 60 60 60 60 60	#VBW 300 kHz 2 GHz -2.602 dBm		Stop 26.50 GH 2.530 s (30001 pt
1      N      1      f      2.440.97        2      N      1      f      2.441.89        3	#VBW 300 kHz 2 GHz -2.602 dBm		Stop 26.50 GH 2.530 s (30001 pt
64 66 66 66 66 66 66 66 67 8 8 6 6 6 6 6 6 7 8 8 6 6 6 6 6 7 8 8 6 7 8 8 8 7 8 8 8 7 8 8 8 8 8 8 8 8 8 8 8 8 8	#VBW 300 kHz 2 GHz -2.602 dBm		Stop 26.50 GH 2.530 s (30001 pt



Keysight Spectrum Analyzer - Swept SA        R L      RF      50 Ω      AC	SENSE:PULSE		07:34:08 PM Jun 02, 20
enter Freq 2.402000000 GH		#Avg Type: RMS Avg Hold: 100/100	TRACE 1 2 3 4 TYPE MWWW DET P N N N
Ref Offset 3.36 dB dB/div Ref 13.36 dBm		Mkr1	2.401 806 5 GH -1.147 dB
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	purious NVNT 2-DH1 2	<b></b>	
Keysight Spectrum Analyzer - Swept SA        R L      RF      50 Ω      AC	SENSE:PULSE		07:34:39 PM Jun 02, 20
enter Freq 13.265000000	PNO: Fast +++ Trig: Free Run	#Avg Type: RMS Avg Hold: 10/10	TRACE 1234 TYPE MWWW DET PNNN
	IFGain:Low #Atten: 20 dB	Mi	r5 13.265 0 GH
Ref Offset 3.36 dB dB/div Ref 13.36 dBm			-68.309 dB
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6 0 tart 30 MHz Res BW 100 kHz rr Mode TRC SCL X 1 N 1 f 2.401 920	Y FUNCTION 5 GHz -4.284 dBm		Stop 26.50 GH 2.530 s (30001 pt CTION VALUE
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60      x        tart 30 MHz      x        Res BW 100 kHz      x        I      1      f        2      N      1        1      1      f        2.401 920      327        4      5        6      5	Y FUNCTION 5 GHz -4.284 dBm		2.530 s (30001 pt
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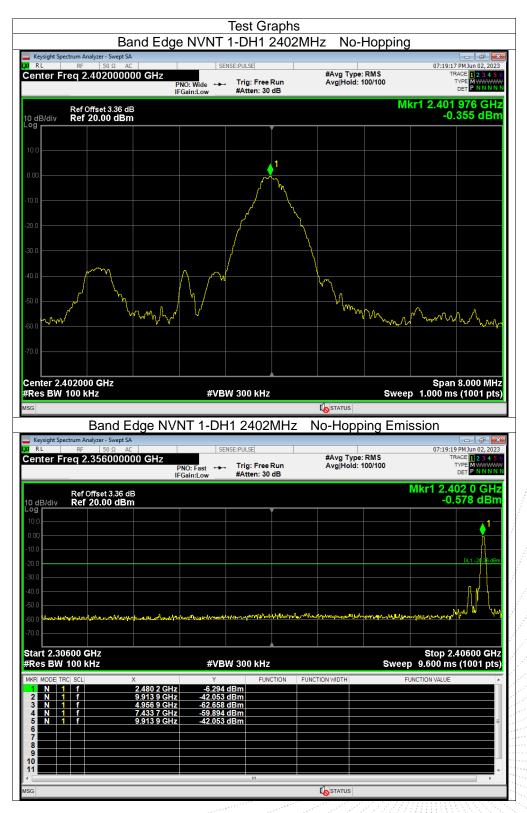


Keysight Spectrum Analyzer - Swept SA	Tx. Spurious NVNT 2-		
RL RF 50 Ω AC enter Freg 2.441000000 GH	SENSE:PULSE	#Avg Type: RMS	07:38:11 PM Jun 02, 20 TRACE 1 2 3 4
enter Freq 2.44 1000000 GH.	PNO: Wide Trig: Free Run IFGain:Low #Atten: 20 dB	Avg/Hold: 100/100	
Pof Offect 2.26 dP		Mkr1	2.440 850 0 GH
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RL RF 50 Ω AC enter Freq 13.265000000 G	SENSE:PULSE	#Avg Type: RMS	07:38:41 PM Jun 02, 20 TRACE 1 2 3 4
	PNO: Fast +++ Trig: Free Run IFGain:Low #Atten: 20 dB	Avg Hold: 10/10	DET PNNN
Ref Offset 3.36 dB		М	kr1 2.440 9 GI
dB/div Ref 13.36 dBm			-2.046 dB
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i.6			DL1 -20.60 d
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5.6			
26			Stop 26.50 GF
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5.6 5.6 5.6 5.6 5.7 5.7 5.7 5.7 5.7 5.7 5.7 5.7	Y FUNCTION GHz -2.834 dBm		Stop 26.50 GF 2.530 s (30001 pt TION VALUE
36  36    36  36    36  36    37  30    38  1    4  N    1  1    7  2.440    38  1	Y FUNCTION GHz -2.834 dBm		2.530 s (30001 pt
3.6	Y FUNCTION GHz -2.834 dBm		2.530 s (30001 pt
16  1    16  1    16  1    16  1    17  1    1  1    1  1    1  1    1  1    1  1	Y FUNCTION GHz -2.834 dBm		2.530 s (30001 p
3.6	Y FUNCTION GHz -2.834 dBm		2.530 s (30001 pt
36	Y FUNCTION GHz -2.834 dBm		2.530 s (30001 pt



Keysight Spectrum Analyzer - Swept SA        RL      RF      50 Ω      AC	•		2480MHz	
RL RF 50 Ω AC enter Freq 2.480000000 GH	Z SENSE:PUL		#Avg Type: RMS	07:40:59 PM Jun 02, 20 TRACE 1 2 3 4
	PNO: Wide ++++ Tric	j: Free Run ten: 20 dB	Avg Hold: 100/100	
Ref Offset 3.36 dB dB/div Ref 13.36 dBm			Mk	1 2.479 982 0 GH -0.807 dB
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enter 2.4800000 GHz				Span 1.500 Mł
Res BW 100 kHz	#VBW 30		Swee	ep 1.000 ms (1001 pt
	ourious NVNT 2	-DH1 2480		
Keysight Spectrum Analyzer - Swept SA				
RL RF 50 Ω AC enter Freq 13.265000000 G	HZ PNO: Fast +++ Trig	se g: Free Run	#Avg Type: RMS Avg Hold: 10/10	07:41:29 PM Jun 02, 20 TRACE 1 2 3 4 TYPE MWWW DET P N N N
		ten: 20 dB	-	DET PNNN
				Mkr4 7 422 7 CH
Ref Offset 3.36 dB dB/div Ref 13.36 dBm				Mkr4 7.433 7 GH -54.469 dBi
0 dB/div Ref 13.36 dBm				Mkr4 7.433 7 GH -54.469 dBi
OdB/div Ref 13.36 dBm				Mkr4 7.433 7 GH -54.469 dBi
0 dB/div Ref 13.36 dBm 99 1				-54.469 dBi
dB/div Ref 13.36 dBm				-54.469 dBi
d dB/div Ref 13.36 dBm	. 4			-54.469 dBi
dB/div      Ref 13.36 dBm        9      1        64      1        65      1        66      1        67      1        68      1        69      1        60      1        61      1        62      1        63      1        64      1        65      1        66      1        67      1        68      1        69      1        60      1        60      1        60      1        60      1        60      1        60      1        60      1        60      1        60      1        61      1        62      1        63      1        64      1        65      1        66      1        67      1        68      1	. 4			-54.469 dBi
dB/div      Ref 13.36 dBm        99      1        64      1        64      1        66      3        66      3        66      3        66      3        66      4        66      4        66      4        66      4        66      4        66      4        66      4        66      4        66      4        67      4        68      4        69      4        60      4        61      4        62      4        63      4        64      4        65      4        66      4        67      4        7      4        7      4        7      4        8      4        8      4        8      4          8      4<	. 4		Swe	-54.469 dBi
dB/div      Ref 13.36 dBm        9      1        64      1        65      3        66      3        66      3        66      3        66      3        66      3        66      3        66      3        66      3        66      3        67      3        68      3        69      3        60      3        61      3        62      3        63      3        64      3        65      3        66      3        67      3        68      3        69      3        60      3        61      3        62      3        63      3        64      3        65      3        66      3        7      3        7      3	4 #VBW 300			-54,469 dBi
All    Ref 13.36 dBm      99    1      64    1      64    1      65    3      66    3      66    3      67    3      68    3      69    3      60    3      61    3      62    3      7    1      7    1      1    1	4 #VBW 30 4 GHz -2.834 dBm			-54,469 dBi
All of the second se	4 #VBW 30 4 GHz -2.834 dBm			-54,469 dBi
Beldiv      Ref 13.36 dBm        29      1        64      1        65      1        66      1        66      1        66      1        66      1        66      1        67      1        68      1        69      1        60      1        61      1        62      1        7      1        8      1	4 #VBW 30 4 GHz -2.834 dBm			-54,469 dBi
dB/div    Ref 13.36 dBm      29    1      64    1      66    3      66    3      66    3      66    3      66    3      66    3      66    3      66    3      67    1      7    1      68    2      7    1      7    1	4 #VBW 30 4 GHz -2.834 dBm			-54,469 dBi





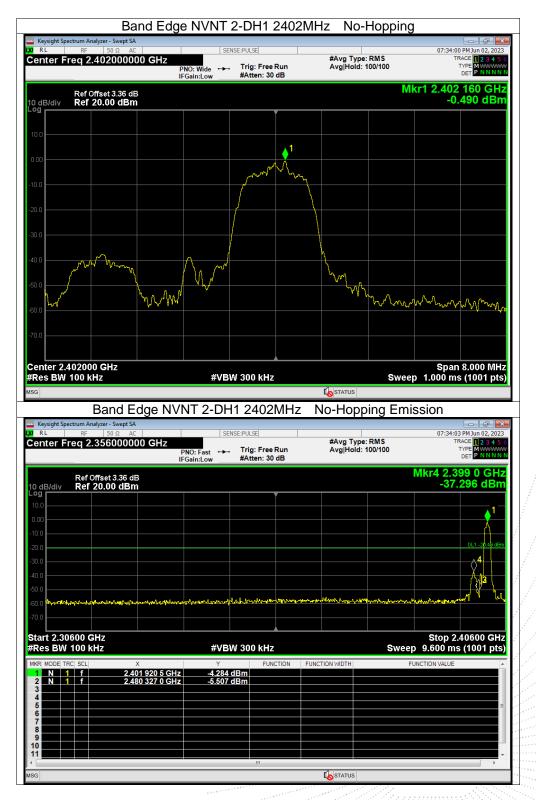
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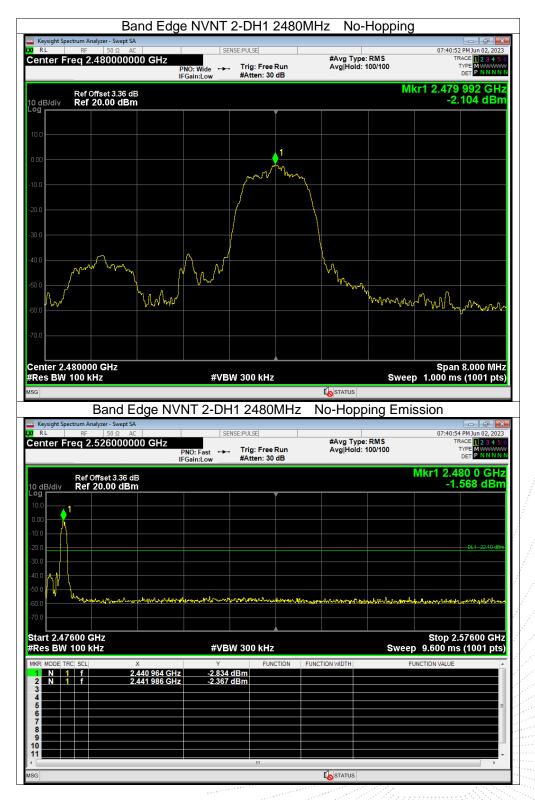






















Keysight Spectrum Analyzer - Swept SA RL RF 50 Ω AC	ge(Hopping) NVNT 2-	DH1 2402MHz Hop	07:32:42 PM Jun 02, 20
RL   RF   50 Ω AC   enter Freq 2.402000000 GI	HZ PNO: Wide IFGain:Low HZ HZ HZ HZ HZ HZ HZ HZ HZ HZ HZ HZ HZ		07:32:42 PMJun 02, 20 TRACE 1 2 3 4 TYPE MWWW DET P N N N
Ref Offset 3.36 dB dB/div Ref 20.00 dBm		Ν	lkr1 2.404 864 GF -1.329 dB
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enter 2.402000 GHz Res BW 100 kHz	#VBW 300 kHz	Swe	Span 8.000 MH ep 1.000 ms (1001 pt
3		STATUS	
	opping) NVNT 2-DH1	2402MHz Hopping	Emission
Keysight Spectrum Analyzer - Swept SA			
RL RF 50 Ω AC	HZ	#Avg Type: RMS n AvaiHold: 2000/2000	07:33:12 PM Jun 02, 202
RL   RF   50 Ω AC   enter Freq 2.356000000 GI	SENSE:PULSE HZ PNO: Fast IFGain:Low #Atten: 30 dB	n Avg Hold: 2000/2000	07:33:12 PM Jun 02, 20 TRACE 1 2 3 4 TYPE MWWW DET P N N N
RL RF 50 Ω AC enter Freq 2.356000000 G Ref Offset 3.36 dB αB/div Ref 20.00 dBm	PNO: Fast +++ Trig: Free Ru	n Avg Hold: 2000/2000	07:33:12 PM Jun 02, 202
enter Freq 2.356000000 GI Ref Offset 3.36 dB	PNO: Fast +++ Trig: Free Ru	n Avg Hold: 2000/2000	07:33:12 PM Jun 02, 20: TRACE 1 2 3 4 TYPE MWWW DET P NNN Mkr2 2.356 0 GH
RL      RF      50 Ω      AC        enter Freq 2.356000000 GI        Ref Offset 3.36 dB        0 dB/div      Ref 20.00 dBm        00        00        00	PNO: Fast +++ Trig: Free Ru	n Avg Hold: 2000/2000	07:33:12 PM Jun 02, 20: TRACE 1 2 3 4 TYPE MWWW DET P NNN Mkr2 2.356 0 GH
RL      RF      50 Ω      AC        enter Freq 2.356000000 GI        Ref Offset 3.36 dB        dB/div      Ref 20.00 dBm        0        0        0        0        0        0        0        0        0        0        0	PNO: Fast +++ Trig: Free Ru	n Avg Hold: 2000/2000	07:33:12 PM Jun 02, 20: TRACE 12 3 4 TYPE WINN DET P NNNI Mkr2 2.356 0 GH -57.592 dB1
RL      RF      50 Ω      AC        enter Freq 2.356000000 Gl      Ref Offset 3.36 dB      Ref Offset 3.36 dB        0 dB/div      Ref 20.00 dBm      Ref 20.00 dBm	PNO: Fast +++ Trig: Free Ru	n Avg Hold: 2000/2000	07:33:12 PM Jun 02, 20: TRACE 12 3 4 TYPE WINN DET P NNNI Mkr2 2.356 0 GH -57.592 dB1
RL      RF      50 Ω      AC        enter Freq 2.356000000 Gl	PNO: Fast +++ Trig: Free Ru	n Avg Hold: 2000/2000	07:33:12 PM Jun 02, 20: TRACE 12 3 4 TYPE WINN DET P NNNI Mkr2 2.356 0 GH -57.592 dB1
RL      RF      50 Ω      AC        enter Freq 2.356000000 GI      Ref Offset 3.36 dB      Ref 20.00 dBm      Ref 20.00 dBm        0 dB/div      Ref 20.00 dBm      Ref 20.00 dBm      Ref 20.00 dBm      Ref 20.00 dBm        0 0      Ref 20.00 dBm      Ref 20.00 dBm      Ref 20.00 dBm      Ref 20.00 dBm        0 0      Ref 20.00 dBm      Ref 20.00 dBm      Ref 20.00 dBm      Ref 20.00 dBm        0 0      Ref 20.00 dBm      Ref 20.00 dBm      Ref 20.00 dBm      Ref 20.00 dBm        0 0      Ref 20.00 dBm        0 0      Ref 20.00 dBm      Ref 20.00 dBm <td>PNO: Fast +++ Trig: Free Ru</td> <td>n Avg Hold: 2000/2000</td> <td>07:33:12 PM Jun 02, 20: TRACE [] 2 3 4: DET P NNNN Mkr2 2.356 0 GH -57.592 dB 01.1-2, 33 df 01.1-2, 34 df</td>	PNO: Fast +++ Trig: Free Ru	n Avg Hold: 2000/2000	07:33:12 PM Jun 02, 20: TRACE [] 2 3 4: DET P NNNN Mkr2 2.356 0 GH -57.592 dB 01.1-2, 33 df 01.1-2, 34 df
RL      RF      50 Ω      AC        enter Freq 2.356000000 GI	Hz PNO: Fast IFGain:Low #Atten: 30 dB #Atten: 30 dB #Atten: 40 dB #Atten: 4	n Avg Hold: 2000/2000	07:33:12 PM Jun 02, 20: TRACE    2, 3, 4 TYPE    WWWW DET  P NNNI Mkr2 2.356 0 GH -57.592 dB 0,1-2 33 df 0,1-2 33 df 0,1-2 33 df
Ref      50 Ω      AC        enter      Freq      2.356000000 GI        odB/div      Ref      000 dBm        00      0      0	Hz PNO: Fast IFGain:Low #Atten: 30 dB #VBW 300 kHz Y FUNCTIC 5 GHz -4.284 dBm	n Avg Hold: 2000/2000	07:33:12 PM Jun 02, 20: TRACE    2.3 4: TYPE    4:44 DET    NNNI Mkr2 2.356 0 GH -57.592 dB 0:1-2 3: dl 0:1-2 3: d
RL      RF      50 Ω      AC        enter Freq 2.356000000 GI	Hz PNO: Fast IFGain:Low #Atten: 30 dB #VBW 300 kHz Y FUNCTIC 5 GHz -4.284 dBm	n Avg Hold: 2000/2000	07:33:12 PM Jun 02, 20: TRACE    2.3 4: TYPE    4:44 DET    NNNI Mkr2 2.356 0 GH -57.592 dB 0:1-2 3: dl 0:1-2 3: d
RL      RF      50 Ω      AC        enter Freq 2.356000000 Gl      Ref Offset 3.36 dB      Ref 20.00 dBm        dB/div      Ref 20.00 dBm      Ref 20.00 dBm        00      Image: State Stat	Hz PNO: Fast IFGain:Low #Atten: 30 dB #VBW 300 kHz Y FUNCTIC 5 GHz -4.284 dBm	n Avg Hold: 2000/2000	07:33:12 PM Jun 02, 20: TRACE    2.3 4: TYPE    4:44 DET    NNNI Mkr2 2.356 0 GH -57.592 dB 0:1-2 3: dl 0:1-2 3: d

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DI DE LEGE			ICE-DUILCE			07-44-57 DN http://doi.org
RL RF 50 Ω enter Freq 2.480000	F	PNO: Wide	Trig: Free Run #Atten: 30 dB	#Avg Type Avg Hold:	: RMS 2000/2000	07:44:57 PM Jun 02, 20 TRACE 1 2 3 4 TYPE MWWW DET P N N N
Def offer tage		roain:Low	written: ov ub		Mk	(r1 2.478 848 GI
Ref Offset 3.36 dB/div Ref 20.00 dB						-0.693 dB
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enter 2.480000 GHz						Span 8.000 M
tes BW 100 kHz		#VB\	N 300 kHz		Sweep	o 1.000 ms (1001 p
Band Edg Keysight Spectrum Analyzer - Swept		ng) NVN	T 2-DH1 24	480MHz H	opping E	mission
	SA					
RL RF 50 Ω	AC	SEN	NSE:PULSE			07:45:29 PM Jun 02, 20 TRACE 12.3.4
RL RF 50 Ω	AC 000 GHz	PNO: Fast 🛶	Trig: Free Run #Atten: 30 dB	#Avg Type Avg Hold:	e: RMS	
RL RF 50 Ω enter Freq 2.526000	ac 000 GHz I		Trig: Free Run	#Avg Type	e: RMS 2000/2000	07:45:29 PM Jun 02, 20 TRACE 1 2 3 4 TYPE MWWW DET P NNN
RL RF 50 Ω enter Freq 2.526000 Ref Offset 3.36 dB/div Ref 20.00 dE	ас 000 GHz dB	PNO: Fast 🛶	Trig: Free Run	#Avg Type	e: RMS 2000/2000	07:45:29 PM Jun 02, 20 TRACE 1 2 3 4 TYPE MWWW DET P N N N
RL RF 50 Ω enter Freq 2.526000 Ref Offset 3.36 dB/div Ref 20.00 dE	ас 000 GHz dB	PNO: Fast 🛶	Trig: Free Run	#Avg Type	e: RMS 2000/2000	07:45:29 PM Jun 02, 20 TRACE 1 2 3 4 TYPE MWWW DET P NNN
RL RF 50 Ω enter Freq 2.526000 Ref Offset 3.36 dB/div Ref 20.00 dE	ас 000 GHz dB	PNO: Fast 🛶	Trig: Free Run	#Avg Type	e: RMS 2000/2000	07:45:29 PM Jun 02, 20 TRACE 1 2 3 4 TYPE MWWW DET P NNN
RL RF 50 Ω enter Freq 2.526000 Ref Offset 3.36 dB/div Ref 20.00 dE	ас 000 GHz dB	PNO: Fast 🛶	Trig: Free Run	#Avg Type	e: RMS 2000/2000	07:45:29 PM Jun 02, 20 TRACE 1 2 3 4 TYPE MWWW DET P NNN
RL RF 50 Ω enter Freq 2.526000 Ref Offset 3.36 dB/div Ref 20.00 dE	ас 000 GHz dB	PNO: Fast 🛶	Trig: Free Run	#Avg Type	e: RMS 2000/2000	07:45:29 PM Jun 02, 20 TYPE MANN 0FT PMANN 0FT PMANNN 0FT PMANNNN 0FT PMANNNNN 0FT PMANNNNN 0FT PMANNNNN 0FT PMANNNNN 0FT PMANNNNNNNNNNNNNN 0FT PMANNNNNNNNNNNNNNNNNNNN
RL RF 50 2 enter Freq 2.526000 Ref Offset 3.36 Ref 20.00 dE	AC 000 GHz 1	PNO: Fast 🛶	Trig: Free Run	#Avg Type	e: RMS 2000/2000	07:45:29 PM Jun 02, 20 TYPE MANN 0FT PMANN 0FT PMANNN 0FT PMANNNN 0FT PMANNNNN
RL RF 50 2 enter Freq 2.526000 Ref Offset 3.36 Ref 20.00 dE	ас 000 GHz dB	PNO: Fast 🛶	Trig: Free Run	#Avg Type	2000/2000	07:45:29 PM Jun 02, 20 TYPE MANN 0FT PMANN 0FT PMANNN 0FT PMANNNN 0FT PMANNNNN
RL RF 50 2 enter Freq 2.526000 Ref Offset 3.36 Ref 20.00 dE	AC 000 GHz 1	PNO: Fast ↔ FGain:Low	Trig: Free Run	#Avg Type	e: RMS 2000/2000	07:45:29 PM Jun 02, 20 TYPE MANN 0FT PMANN 0FT PMANNN 0FT PMANNNN 0FT PMANNNNN
RL RF 500 enter Freq 2.526000	AC 000 GHz 1	PNO: Fast ↔ FGain:Low	Trig: Free Run	#Avg Type	2000/2000	07:45:29 PM Jun 02, 20 TRACE [] 3 4 TYPE MWWW DET P NNN Mkr4 2.489 4 GH -54.059 dB
RL RF 50 2 enter Freq 2.526000 B/div Ref 0ffset 3.36 gg gg gg gg gg gg gg gg gg gg gg gg gg	AC 000 GHz 1	PNO: Fast $\rightarrow$	Trig: Free Run #Atten: 30 dB	#Avg Type	2000/2000	CL1-2068 Stop 2.57600 G
RL RF 50 Ω enter Freq 2.526000 Ref Offset 3.36 Ref 20.00 dE 9 9 1 1 1 1 1 1 1 1 1 1 1 1 1	AC 000 GHz 1	PNO: Fast FGain:Low	Trig: Free Run #Atten: 30 dB	#Avg Type	ERMS 2000/2000	07:45:29 PM Jun 02, 20 TRACE [] 3 4 TYPE MWWW DET P NNN Mkr4 2.489 4 GH -54.059 dB
RL      RF      50 p.        Enter Freq 2.526000      Ref Offset 3.36      Ref 20.00 dE        ABJdiv      Ref 20.00 dE      Ref 20.00 dE        ABJdiv      ABJdiv      ABJdiv        ABJdiv      ABJdiv      ABJdiv        ABJdiv      ABJdiv      ABJdiv      ABJdiv        ABJdiv      ABJdiv      ABJdiv      ABJdiv        ABJdiv      ABJdiv      ABJdiv      ABJdiv        ABJdiv      ABJdiv      ABJdiv      ABJdiv        ABJdiv      ABJdiv      ABJdiv      ABJdi	AC 000 GHz 1	PNO: Fast →→ FGain:Low	AT 300 kHz	#Avg Type Avg Hold:	ERMS 2000/2000	07:45:29 PM Jun 02, 20 TRACE [] 3 4 TYPE MWW DET P NNN Mkr4 2.489 4 GH -54.059 dB 011-2059
RL      RF      50 p.        enter Freq 2.526000      Ref Offset 3.36      Ref 20.00 dE        gradiu      Ref 20.00 dE      Re	AC 000 GHz 000 GHz 0 000 G	PNO: Fast →→ FGain:Low	AT 300 kHz	#Avg Type Avg Hold:	ERMS 2000/2000	07:45:29 PM Jun 02, 20 TRACE [] 3 4 TYPE MWW DET P NNN Mkr4 2.489 4 GH -54.059 dB 011-2059
RL      RF      50 p        enter Freq 2.526000      Ref Offset 3.36      Ref 20.00 dE        dB/div      Ref 20.00 dE      Ref 20.00 dE        1      1      1        10      1      1        10      1      1        10      1      1        10      1      1        10      1      1        10      1      1        10      1      1        10      1      1        11      1      1        12      1      1        13      1      1	AC 000 GHz 000 GHz 0 000 G	PNO: Fast →→ FGain:Low	AT 300 kHz	#Avg Type Avg Hold:	ERMS 2000/2000	07:45:29 PM Jun 02, 20 TRACE [] 3 4 TYPE MWW DET P NNN Mkr4 2.489 4 GH -54.059 dB 011-2059
RE Offset 3.36 Ref Offset 3.36 Ref Offset 3.36 Ref 20.00 dE	AC 000 GHz 000 GHz 0 000 G	PNO: Fast →→ FGain:Low	AT 300 kHz	#Avg Type Avg Hold:	ERMS 2000/2000	07:45:29 PM Jun 02, 20 TRACE [] 3 4 TYPE MWW DET P NNN Mkr4 2.489 4 GH -54.059 dB 011-2059
RL RF 50 0 enter Freq 2.526000 B/div Ref 0ffset 3.36 Ref 0ffset 3.36 Ref 20.00 dE 9 9 1 0 0 0 0 0 0 0 0 0 0 0 0 0	AC 000 GHz 000 GHz 0 000 G	PNO: Fast →→ FGain:Low	AT 300 kHz	#Avg Type Avg Hold:	ERMS 2000/2000	07:45:29 PM Jun 02, 20 TRACE [] 3 4 TYPE MWW DET P NNN Mkr4 2.489 4 GH -54.059 dB 011-2059

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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.

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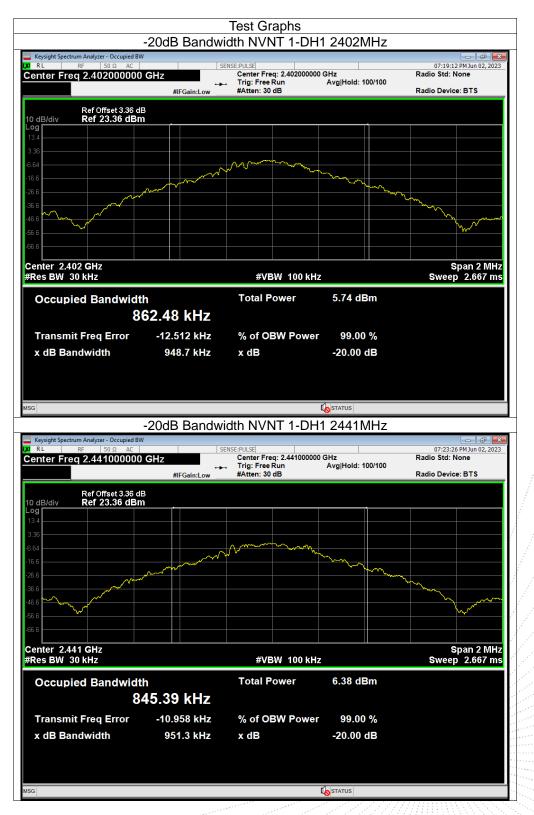
# 10.4 Test Result

Condition	Mode	Frequency (MHz)	-20 dB Bandwidth (MHz)	Verdict
NVNT	1-DH1	2402	0.949	Pass
NVNT	1-DH1	2441	0.951	Pass
NVNT	1-DH1	2480	0.936	Pass
NVNT	2-DH1	2402	1.294	Pass
NVNT	2-DH1	2441	1.301	Pass
NVNT	2-DH1	2480	1.283	Pass

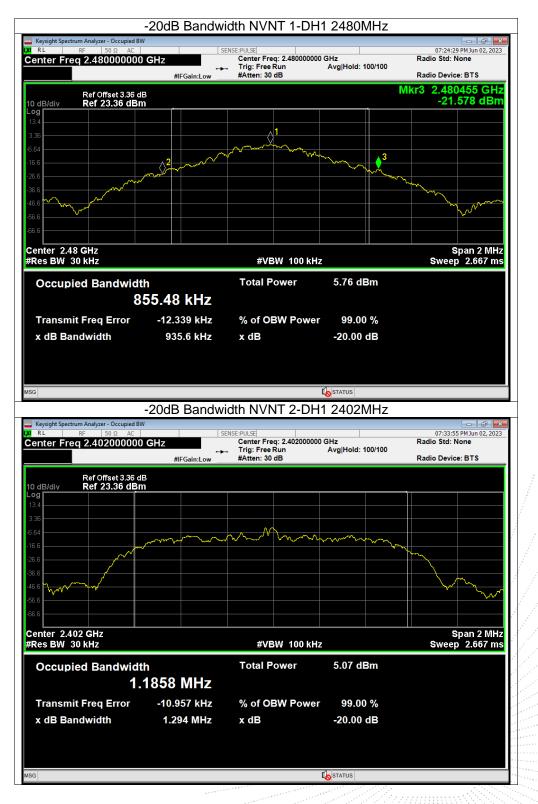


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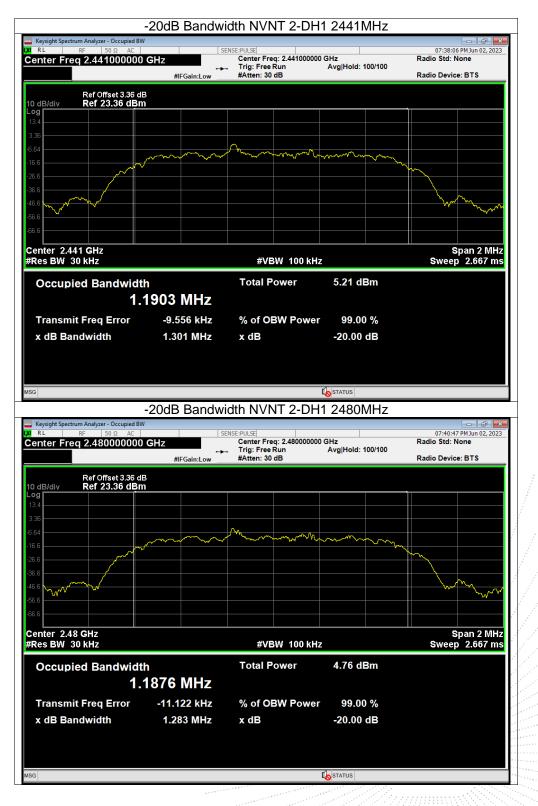














### 11. Maximum Peak Output Power

### 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.

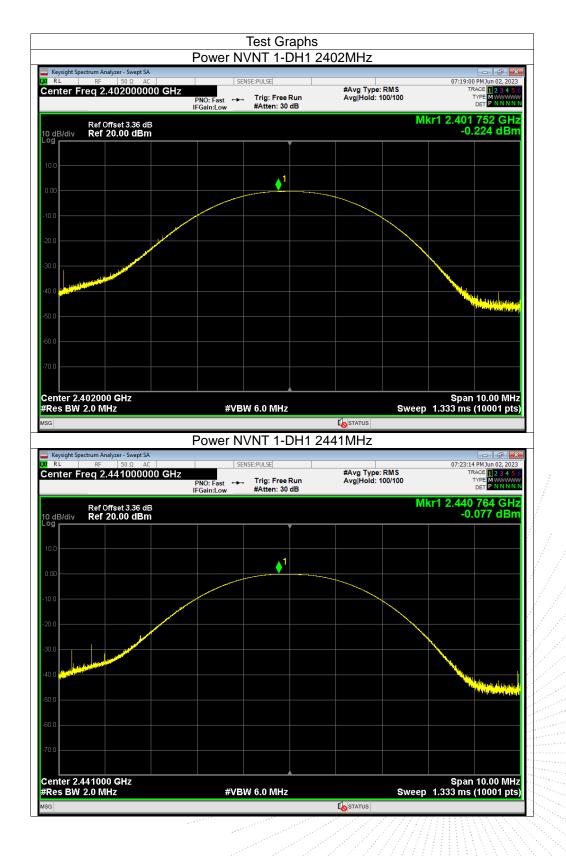
### 11.4 Test Result

Condition	Mode	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Verdict
NVNT	1-DH1	2402	-0.22	21	Pass
NVNT	1-DH1	2441	-0.08	21	Pass
NVNT	1-DH1	2480	-0.50	21	Pass
NVNT	2-DH1	2402	0.70	21	Pass
NVNT	2-DH1	2441	0.86	21	Pass
NVNT	2-DH1	2480	0.39	21	Pass

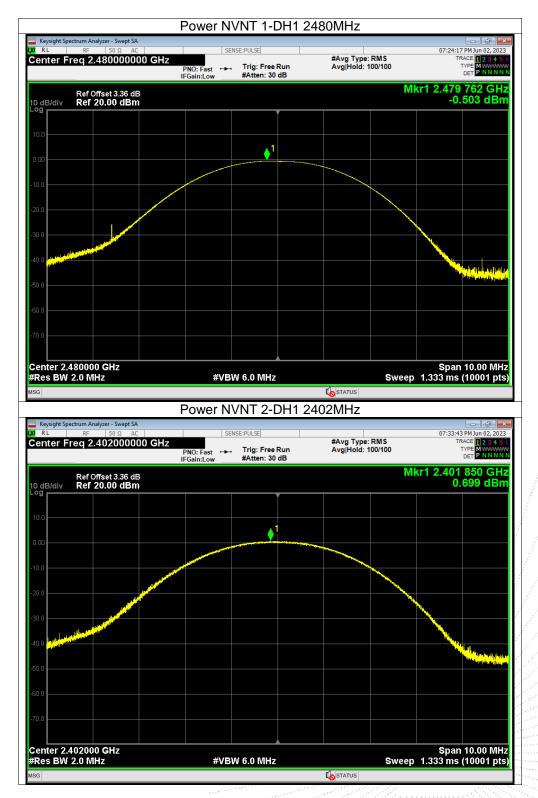
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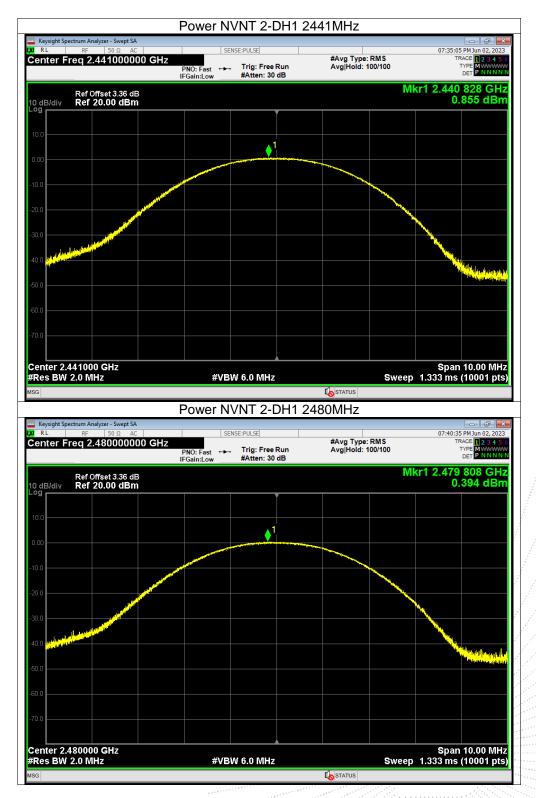














## 12. Hopping Channel Separation

### 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	Mode Hopping Freq1 Hopp (MHz)		HFS (MHz)	Limit (MHz)	Verdict
NVNT	1-DH1	2401.89	2402.97	1.08	0.720	Pass
NVNT	1-DH1	2440.972	2441.896	0.924	0.616	Pass
NVNT	1-DH1	2478.976	2480.004	1.028	0.685	Pass
NVNT	2-DH1	2401.83	2402.828	0.998	0.665	Pass
NVNT	2-DH1	2440.964	2441.986	1.022	0.681	Pass
NVNT	2-DH1	2478.988	2479.968	0.98	0.653	Pass

#### 12.4 Test Result



	(	CFS NVNT	: Graphs 1-DH1 24	02MHz	
Keysight Spectrum Analyzer					
RL RF	50 Ω AC	SENSE:PULS	E	#Aug Turner DMA	07:21:50 PM Jun 02, 2023
enter Freq 2.402	PN	IO:Wide	Free Run en: 30 dB	#Avg Type: RMS Avg Hold:>100/100	TRACE 1 2 3 4 5 TYPE M WWWW DET P NNNN
Ref Offse dB/div <b>Ref 20.0</b>	et 3.36 dB 00 dBm				
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	www	m			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
).0 					
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enter 2.402500 G Res BW 30 kHz	iHz	#VBW 100	kHz	Sv	Span 2.000 MHz veep 2.133 ms (1001 pts
R MODE TRC SCL	х	Y	FUNCTION FU	INCTION WIDTH	FUNCTION VALUE
1 N 1 f 2 N 1 f 3	2.401 920 5 GHz 2.480 160 0 GHz	-0.559 dBm -0.961 dBm			
5					=
6					
8					
1					
3					•
-				STATUS	
	(				
Keysight Spectrum Applyzer		CFS NVNT	1-DH1 24		
RL RF :	r - Swept SA 50 Ω AC			41MHz	07:22:54 MJu 02, 2023
RL RF :	r - Swept SA 50 Ω AC 1500000 GHz PN	SENSE:PULS	Free Run		07:22:54 PM Jun 02, 2023 TRACE 1 2 3 4 5 TYPE M 1044444
enter Freq 2.44	r - Swept SA 50 Ω AC     15000000 GHz PN IFC	SENSE:PULS	E	41MHz #Avg Type: RMS	07:22:54 PM Jun 02, 2023 TRACE 1 2 3 4 5
RL RF enter Freq 2.44 Ref Offse	r-Swept SA 50 Ω AC <b>1500000 GHz</b> PN IFC et 3.36 dB	SENSE:PULS	Free Run	41MHz #Avg Type: RMS	07:22:54 PM Jun 02, 2023 TRACE 1 2 3 4 5 TYPE M 1044444
RL RF Treq 2.44 Panter Freq 2.44 Ref Offse D dB/div Ref 20.0	r-Swept SA 50 Ω AC <b>1500000 GHz</b> PN IFC et 3.36 dB	SENSE:PULS	Free Run	41MHz #Avg Type: RMS	07:22:54 PM Jun 02, 2023 TRACE 1 2 3 4 5 TYPE M 1044444
RL      RF      I        enter Freq 2.44'      Ref Offse        dB/div      Ref Offse        9	r-Swept SA 50 Ω AC <b>1500000 GHz</b> PN IFC et 3.36 dB	SENSE:PULS	Free Run	41MHz #Avg Type: RMS	07:22:54 PM Jun 02, 2023 TRACE 1 2 3 4 5 TYPE M 1044444
RL      RF        enter Freq 2.44'        Ref Offse        0 dB/div      Ref 20.1        29        0.0	r-Swept SA 50 Ω AC 1500000 GHz PN IFC et 3.36 dB 00 dBm	SENSE:PULS	Free Run	41MHz #Avg Type: RMS Avg Hold:>100/100	07:22:54 PM Jun 02, 2023 TRACE 1 2 3 4 5 TYPE M 1044444
Ref Offse 0 dB/div Ref 20.1	r-Swept SA 50 Ω AC <b>1500000 GHz</b> PN IFC et 3.36 dB	SENSE:PULS	Free Run	41MHz #Avg Type: RMS	07:22:54 PM Jun 02, 2023 TRACE 1 2 3 4 5 TYPE M 1044444
RL RF enter Freq 2.44' Ref Offse dB/div Ref 20.1	r-Swept SA 50 Ω AC 1500000 GHz PN IFC et 3.36 dB 00 dBm	SENSE:PULS	Free Run en: 30 dB	41MHz #Avg Type: RMS Avg Hold:>100/100	07:22:54 PMJun 02, 2023 TRACE 1 2 3 4 5 TYPE WWWW DET P NNNN
RL      RF        enter Freq 2.44'        Ref Offse        0 dB/div      Ref Offse        0 dD/div      Ref 20.1        0 0	r-Swept SA 50 Ω AC 1500000 GHz PN IFC et 3.36 dB 00 dBm	SENSE:PULS	Free Run en: 30 dB	41MHz #Avg Type: RMS Avg Hold:>100/100	07:22:54 PMJun 02, 2023 TRACE 1 2 3 4 5 TYPE WWWW DET P NNNN
RL      RF      I        enter Freq 2.44'      Ref Offse        dB/div      Ref 20.1        00	r-Swept SA 50 Ω AC 1500000 GHz PN IFC et 3.36 dB 00 dBm	SENSE:PULS	Free Run en: 30 dB	41MHz #Avg Type: RMS Avg Hold:>100/100	07:22:54 PMJun 02, 2023 TRACE 1 2 3 4 5 TYPE WWWW DET P NNNN
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RL      RF      I        enter Freq 2.44'      Ref Offse        dB/div      Ref 20.1        00	r-Swept SA 50 9 AC     1500000 GHz PP Price at 3.36 dB 00 dBm	I SENSE:PULS	Free Run en: 30 dB	41MHz #Avg Type: RMS Avg Hold:>100/100	07:22:54 PMJun 02, 2023 TRACE 12 3 4 5 TYPE NNNN DET NNNN
RL      Ref      Offse        enter      Freq      2.44'        Ref      Offse      Ref        0      GB/div      Ref        0.0      GB/div      GB/div	r-Swept SA 50 Q. AC     1500000 GHz PP Provide a state of the second sec	SENSE:PULS	Free Run en: 30 dB	41MHz #Avg Type: RMS Avg Hold:>100/100	07:22:54 РМЈш 02,2023 ТRACE 2345 тупе 2345 тупе Р NNNN рет Р NNNN Span 2.000 MHz veep 2.133 ms (1001 pts
RL      RF      I        enter Freq 2.44'      Ref Offse        dB/div      Ref 20.1        0	r-Swept SA 50 Q AC 1500000 GHz PP IFC at 3.36 dB 00 dBm	I SENSE:PULS	Free Run en: 30 dB	41MHz #Avg Type: RMS Avg Hold:>100/100	07:22:54 PMJun 02, 2023 TRACE 12 3 4 5 TYPE NNNN DET NNNN
RL      Ref      I        enter      Freq      2.44'        Ref      Offse      Ref        0      GB/div      Ref      20.1'        0      GB/div      S      1      1	r-Swept SA 50 Q. AC     1500000 GHz PP Provide a state of the second sec	IO: Wide Gain:Low Trig: Sain:Low Attack	Free Run en: 30 dB	41MHz #Avg Type: RMS Avg Hold:>100/100	07:22:54 РМЈш 02,2023 ТRACE 2345 тупе 2345 тупе Р NNNN рет Р NNNN Span 2.000 MHz veep 2.133 ms (1001 pts
RL      RF      I        enter Freq 2.44'      Ref Offse        dB/div      Ref 20.1        0	r-Swept SA 50 Q AC 1500000 GHz PP IFC at 3.36 dB 00 dBm	I SENSE:PULS	Free Run en: 30 dB	41MHz #Avg Type: RMS Avg Hold:>100/100	07:22:54 РМЈш 02,2023 ТRACE 2345 тупе 2345 тупе Р NNNN рет Р NNNN Span 2.000 MHz veep 2.133 ms (1001 pts
RL      RF      I        enter Freq 2.44'      Ref Offse        dB/div      Ref 20.1'        00	r-Swept SA 50 Q AC 1500000 GHz PP IFC at 3.36 dB 00 dBm	I SENSE:PULS	Free Run en: 30 dB	41MHz #Avg Type: RMS Avg Hold:>100/100	07:22:54 PMJun 02,2023 TRACE 23 4 5 TYPE 23 4 5 TYPE NNNN DET PNNNN Span 2.000 MHz veep 2.133 ms (1001 pts FUNCTION VALUE
RL      RF      I        enter Freq 2.44'      Ref Offse        dB/div      Ref 20.1'        0.0	r-Swept SA 50 Q AC 1500000 GHz PP IFC at 3.36 dB 00 dBm	I SENSE:PULS	Free Run en: 30 dB	41MHz #Avg Type: RMS Avg Hold:>100/100	07:22:54 PMJun 02,2023 TRACE 23 4 5 TYPE 23 4 5 TYPE NNNN DET PNNNN Span 2.000 MHz veep 2.133 ms (1001 pts FUNCTION VALUE
RL      Ref      Offse        enter      Freq 2.44'        Ref Offse      GB/div        dB/div      Ref 20.1        00	r-Swept SA 50 Q AC 1500000 GHz PP IFC at 3.36 dB 00 dBm	I SENSE:PULS	Free Run en: 30 dB	41MHz #Avg Type: RMS Avg Hold:>100/100	07:22:54 PMJun 02,2023 TRACE 23 4 5 TYPE 23 4 5 TYPE NNNN DET PNNNN Span 2.000 MHz veep 2.133 ms (1001 pts FUNCTION VALUE
RL      RF      I        enter Freq 2.44'      Ref Offse        dB/div      Ref 20.1        00	r-Swept SA 50 Q AC 1500000 GHz PP IFC at 3.36 dB 00 dBm	SENSE:PULS NO: Wide Sain:Low Trig: #Attri #VBW 1000 Y 2.95 dB -8.37 dBm	Free Run en: 30 dB	41MHz #Avg Type: RMS Avg Hold:>100/100	07:22:54 PMJun 02,2023 TRACE 23 4 5 TYPE 23 4 5 TYPE NNNN DET PNNNN Span 2.000 MHz veep 2.133 ms (1001 pts FUNCTION VALUE



Keysight Spectrum Analyzer - Sv RL RF 50 S	Vept SA	SENSE	0111.00			07:27:50 PM Jun 02, 2023
enter Freq 2.4795	00000 GHz	IO: Wide	Trig: Free Run #Atten: 30 dB	#Avg Type Avg Hold::	e: RMS >100/100	TRACE 1 2 3 4 5 0 TYPE MWWWW DET P NNNN
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enter 2.479500 GHz	2 I I I I I I I I I I I I I I I I I I I					Span 2.000 MHz
Res BW 30 kHz	X	#VBW	100 kHz	FUNCTION WIDTH	Sweep 2.7	133 ms (1001 pts)
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4						=
6 7 8						
9 0 1						
G			III			•
_	(	CFS NVN	T 2-DH1 :			
Keysight Spectrum Analyzer - Sv RL RF 50 S	wept SA Ω AC	SENSE	:PULSE			07:31:57 PM Jun 02, 2023
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		Gain:Low	#Atten: 30 dB	, traji tetali	>100/100	DET
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0 dB/div Ref 20.00	.36 dB	Gain:Low i	#Atten: 30 dB		>100/100	
0 dB/div Ref 20.00 99 0.0 0.0 0.0 0.0 0.0	.36 dB	Gain:Low				
0 dB/div Ref 20.00 9 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	.36 dB	Sain:Low	#Atten: 30 dB			
dB/div      Ref 20.00        00	.36 dB	Sain:Low	#Atten: 30 dB			
dB/div      Ref 20.00        00	.36 dB	Sain:Low				
enter 2.402500 GHz	isa dB dBm					Span 2.000 MHz
Ref 20.00	X	#VBW	100 kHz		Sweep 2.	Span 2.000 MHz
dB/div      Ref 20.00        09	isa dB dBm	#VBW	100 KHz		Sweep 2.	Span 2.000 MHz 133 ms (1001 pts)
All of the second se	2.478 976 GHz	#VBW 2.898 dB	100 KHz		Sweep 2.	Span 2.000 MHz 133 ms (1001 pts)
organization      Ref 20.00        organization	2.478 976 GHz	#VBW 2.898 dB	100 KHz		Sweep 2.	Span 2.000 MHz 133 ms (1001 pts)
dB/div      Ref 20.00        09	2.478 976 GHz	#VBW 2.898 dB	100 KHz		Sweep 2.	Span 2.000 MHz 133 ms (1001 pts)

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0.0							 
enter 2.441500 (	GH7					Snan	2.000 MHz
Res BW 30 kHz		#VBW 1				o 2.133 me	
R MODE TRC SCL 1 N 1 f 2 N 1 f	X 2.401 920 5 GHz 2.480 327 0 GHz	-4.284 dBn -5.507 dBn	FUNCTION	FUNCTION WIDTH	FI	JNCTION VALUE	
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5 6 7							
8 9 0							
1							
3							
Keysight Spectrum Apalica		CFS NVN	Г 2-DH1				
RL RF	er - Swept SA 50 Ω AC 79500000 GHz	SENSE:P	PULSE	2480MHz #Avg Typ	e: RMS	07:44:4: Tf	3 PM Jun 02, 2023
RL RF	er - Swept SA 50 Ω AC 79500000 GHz F	SENSE:P		2480MHz	e: RMS :>100/100	07:44:4: TF	3 PM Jun 02, 2023
RL RF enter Freq 2.47 Ref Offs I dB/div Ref 20.	er - Swept SA 50 Ω AC 79500000 GHz F	SENSE:P	rig: Free Run	2480MHz #Avg Typ	e: RMS :>100/100	07:44:43 TF	3 PM Jun 02, 2023
RL RF enter Freq 2.47 Ref Offs dB/div Ref 20.	er - Swept SA 50 Ω AC 79500000 GHz F II et 3.36 dB	SENSE:P	rig: Free Run	2480MHz #Avg Typ	e: RMS >100/100	07:44:42 TF	3 PM Jun 02, 2023
RL RF enter Freq 2.47 Ref Offs dB/div Ref 20	er - Swept SA 50 Ω AC 79500000 GHz F II et 3.36 dB	SENSE:P	rig: Free Run	2480MHz #Avg Typ	e: RMS >100/100	07:44:43	3 PM Jun 02, 2023
RL RF enter Freq 2.47 Ref Offs dB/div Ref 20	er - Swept SA 50 Ω AC 79500000 GHz F II et 3.36 dB	SENSE:P	rig: Free Run	2480MHz #Avg Typ	e: RMS >100/100	07:44:42 TF	3 PM Jun 02, 2023
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RL RF enter Freq 2.47 Ref Offs dB/div Ref 20. 00 00 00 00 00 00 00 00 00 00 00 00 0	er - Swept SA 50 Ω AC 79500000 GHz F II et 3.36 dB	SENSE:P	rig: Free Run	2480MHz #Avg Typ	e: RMS :>100/100	07:44:42	3 PM Jun 02, 2023
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RL      RF        enter Freq 2.47      Ref Offs        dB/div      Ref 20.9        00      0        00      0        00      0        00      0        00      0        00      0        00      0        00      0        00      0        00      0        00      0	er - Swept SA [50 Q AC ] [9500000 GHz F F set 3.36 dB .00 dBm	SENSE:P	rig: Free Run	2480MHz #Avg Typ	e: RMS :>100/100	TF	3 PMJun 02, 2023 ACCE    2, 3, 4, 5, TYPE MUMUU DET P. NNNN DET P. NNNN
RL      RF        enter Freq 2.47      Ref Offs        odB/div      Ref 20.        odB/div <t< td=""><td>er - Swept SA [50 Q AC ] [9500000 GHz F F set 3.36 dB .00 dBm</td><td>SENSE:P</td><td>vuse</td><td>2480MHz #Avg Typ</td><td>.&gt;100/100</td><td>Span</td><td>2.0000 MHz</td></t<>	er - Swept SA [50 Q AC ] [9500000 GHz F F set 3.36 dB .00 dBm	SENSE:P	vuse	2480MHz #Avg Typ	.>100/100	Span	2.0000 MHz
RL      RF        enter Freq 2.47        Ref Offs        dB/div        Ref 20.90        00        00        00        00        00        00        00        00        00        00        00        00        00        00        00        00        00        00        00        00        00        00        00        00        00        00        00        00        00        00        00        00        00        00        00        00        00        00        00        00        00        00        00        00        00        00   <	er - Swept SA 50 Ω AC 9500000 GHz F et 3.36 dB .00 dBm 	SENSE:P FGain:Low T #VBW 1	VU.SE rig: Free Run Atten: 30 dB	2480MHz #Avg Typ	:>100/100	Span	2.000 MHHz (1001 pts)
RL      RF        enter Freq 2.47      Ref Offs        dB/div      Ref 20.        00	er - Swept SA [50 Q AC ] 79500000 GHz F F set 3.36 dB .00 dBm 	SENSE:P FGain:Low T #VBW 1	VU.SE rig: Free Run Atten: 30 dB	2480MHz	:>100/100	Span 2.133 ms	2.000 MHz
RL      RF        enter Freq 2.47      Ref Offs        dB/div      Ref 20.        00	er - Swept SA 50 Ω AC 9500000 GHz F et 3.36 dB .00 dBm 	SENSE:P FGain:Low T #VBW 1	VU.SE rig: Free Run Atten: 30 dB	2480MHz	:>100/100	Span 2.133 ms	2.0000 MHz
Ref Offs dB/div Ref 20. Ref 20	er - Swept SA 50 Ω AC 9500000 GHz F et 3.36 dB .00 dBm 	SENSE:P FGain:Low T #VBW 1	VU.SE rig: Free Run Atten: 30 dB	2480MHz	:>100/100	Span 2.133 ms	2.0000 MHz
RL      RF        enter Freq 2.47      Ref Offs        dB/div      Ref 20.90        00	er - Swept SA 50 Ω AC 9500000 GHz F et 3.36 dB .00 dBm 	SENSE:P FGain:Low T #VBW 1	VU.SE rig: Free Run Atten: 30 dB	2480MHz	:>100/100	Span 2.133 ms	2.0000 MHz

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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.

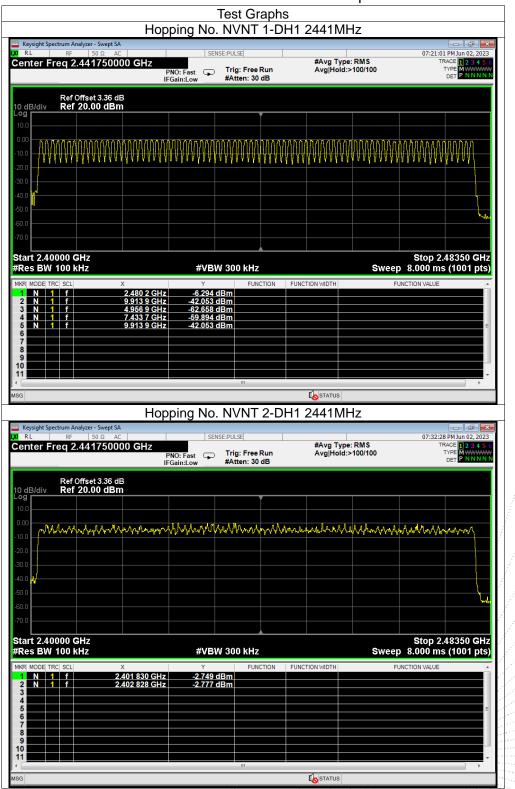
3. Allow the trace to stabilize. It may prove necessary to break the span up to sections. in order to clearly show all of the hopping frequencies. The limit is specified in one of the subparagraphs of this Section.

4. Set the spectrum analyzer: Start Frequency = 2.4GHz, Stop Frequency = 2.4835GHz. Sweep=auto;

#### 13.4 Test Result

Condition	Mode	Hopping Number	Limit	Verdict
NVNT	1-DH1	79	15	Pass
NVNT	2-DH1	79	15	Pass







# 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:

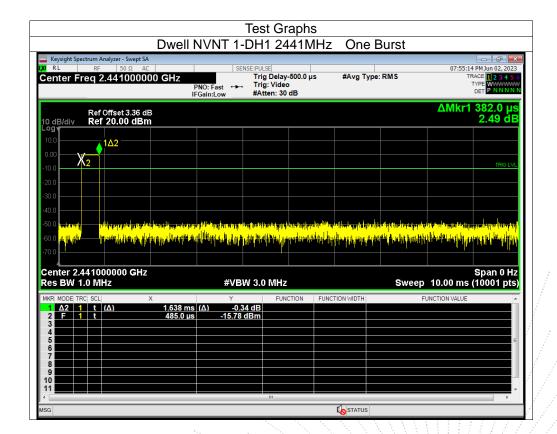
DH5:1600/79/6*0.4*79*(MkrDelta)/1000
DH3:1600/79/4*0.4*79*(MkrDelta)/1000
DH1:1600/79/2*0.4*79*(MkrDelta)/1000
Remark: Mkr Delta is once pulse time.

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Condition	Mode	Frequency (MHz)	Pulse Time (ms)	Total Dwell Time (ms)	Limit (ms)	Verdict
NVNT	1-DH1	2441	0.382	121.476	400	Pass
NVNT	1-DH3	2441	1.638	270.27	400	Pass
NVNT	1-DH5	2441	2.888	314.792	400	Pass
NVNT	2-DH1	2441	0.392	124.264	400	Pass
NVNT	2-DH3	2441	1.643	257.951	400	Pass
NVNT	2-DH5	2441	2.892	329.688	400	Pass



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	Dwell I	NVNT 1-DH	l3 2441M	IHz One	Burst		
keysight Spectrum Analyzer - Swept S/ RL RF 50 Ω A( Senter Freq 2.4410000	00 GHz	NO East +++ Tri	LSE g Delay-500.0 μ g: Video tten: 30 dB	s #Avg Typ	e: RMS	07:54:19 PM TRACE TYPE	Jun 02, 202 1 2 3 4 5 WWW P N N N
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enter 2.441000000 GHz es BW 1.0 MHz		#VBW 3.0	0 MHz		Sweep	Sı 10.00 ms (10	oan 0 H 1001 pt
	x 1.643 ms	Υ (Δ) 5.31 dB	FUNCTION	FUNCTION WIDTH	FL	JNCTION VALUE	
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4 5 6 7							
4 5 6							

			VVNT 1-D	H5 24	141MHz	One	Burst		
RL		Ω AC 000000 GHz	NO Fast ↔	:PULSE Trig Delay Trig: Video #Atten: 30	• •	#Avg Typ	be: RMS	т	6 PM Jun 02, 20 RACE 1 2 3 4 TYPE WWWW DET PNNN
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enter 2.4 es BW 1.	41000000 0 MHz	) GHz	#VBW	3.0 MHz	 :		Sweep	10.00 ms	Span 0 I (10001 p
KR MODE TRO		X	Y		CTION FUNC	TION WIDTH	F	UNCTION VALUE	
1 N 1 2 N 1	f (Δ) f	2.401 890 GHz 2.402 970 GHz	(Δ) -3.467 dB -2.807 dB						
3									
6									
8									
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	Dweii r	NVNT 2-			One E	Suisi		
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0.0      μημη      μημη μημημή        0.0      μημη μημημή      μημημή      μημημή        enter 2.441000000 GHz      es BW 1.0 MHz      μημημή        RN      MODE TRC SCI      1        1      N      1      f        2      N      1      f        3      N      1      f        4      N      1      f	× 2.479 9 GHz 2.483 5 GHz 2.500 0 GHz	#VBV (Δ) -1.314 α -56.929 α	W 3.0 MHz	ng n	n <mark>n li<sup>k</sup>n den de d<sup>e s</sup></mark>	Sweep	10.00 ms	Span 0 H

	Dwell I	NVNT 2-	-DH3 24	441MHz	One B	urst		
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enter 2.441000000 GHz es BW 1.0 MHz		#VB	W 3.0 MHz			Sweep	10.00 ms	Span 0 H (10001 pt
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3 N 1 f	2.500 0 GHz		dBm					
3 N 1 f 4 N 1 f 5 6	2.500 0 GHz 2.489 4 GHz		dBm dBm					
6 7 8 9			dBm dBm					
6 7 8			dBm dBm - dBm 					



	Dwell N	NVNT 2-	DH5 24	41MHZ	One E	Burst		
Keysight Spectrum Analyzer - Swept S RL RF 50 Ω / enter Freq 2.4410000	AC DOO GHz	SEN PNO: Fast ↔ FGain:Low	NSE:PULSE Trig Delay- Trig: Video #Atten: 30 (		#Avg Type	RMS	TF	7 PM Jun 02, 202: RACE 1 2 3 4 5 TYPE W DET P NNNN
Ref Offset 3.36 0 dB/div Ref 20.00 dB							Mkr1	286.9 m dBn
		<b>↓</b> <sup>1</sup>						
	<mark>Pellippingen den service de la companya de la comp Pellippingen de la companya de la com</mark>	Maria .						TRIG LV
30.0								
40.0								
						dition talen and an an <sup>tal</sup> ni <mark>n</mark> ing talen and an an		
50.0 <mark></mark>	2 2	i-lippikidan.				<sup>en</sup> ni <mark>s</mark> te saturi		Span 0 H
50.0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	X	#Up#Up#Up #VBV	W 3.0 MHz			Sweep		Span 0 H
50.0 senter 2.441000000 GH tes BW 1.0 MHz		#VBν (Δ) -4.284 (	W 3.0 MHz		<mark>land Megang Maja</mark>	Sweep	10.00 ms	Span 0 H
50.0      1/1 (μ)        50.0      1/1 (μ)        center 2.441000000 GH        tes BW 1.0 MHz        IRR MODE TRC: SCL        1      N        2      N        3      -        5      -        6      -        7      -	× 401 920 5 GHz	#VBV	W 3.0 MHz		<mark>land Megang Maja</mark>	Sweep	10.00 ms	Span 0 H
0.0      1      1      1      1      1      1      1      1      1      1      1      1      1      1      1      1      1      1      1      1      1      1      1      1      1      1      1      1      1      2      2      1      1      1      2      2      1      1      1      1      1      2      2      1      1      1      2      2      3      4      1      1      2      3      4      1      1      1      1      1      1      2      1      1      1      2      1      1      1      2      1      1      1      1      1      1      1      1      1      1      1      1      1      1      1      1      1      1      1      1      1      1      1      1      1      1      1      1      1      1      1      1      1      1      1      1	× 401 920 5 GHz	#VBV	W 3.0 MHz		<mark>land Megang Kupp</mark>	Sweep	10.00 ms	Span 0 H

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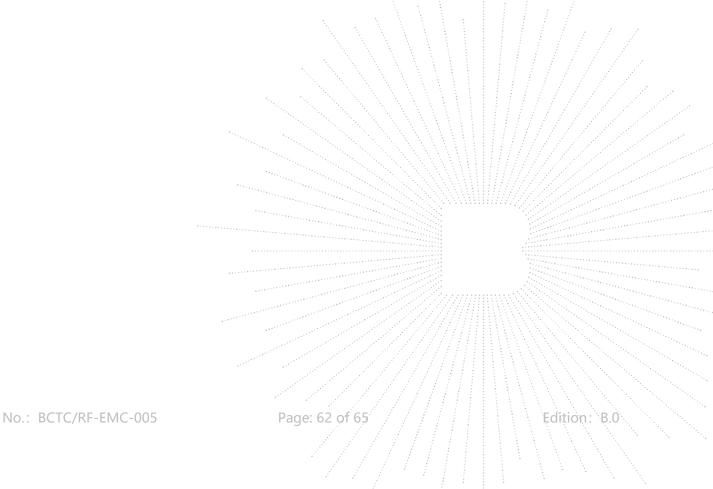
# 15. Antenna Requirement

### 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.





# 16. EUT Test Setup Photographs

#### Conducted emissions





Radiated Measurement Photos







# **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:

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\*\*\*\*\* END \*\*\*\*\*

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