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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.

0.825

0.807

Temperature:	26 ℃			Relativ	e Humidity:	54%	
Test Voltage:	DC 3.7V	The second second		Remar	k:	N/A	
			in an				
Condition	Mode	Hopping Freq1 (MHz)	Hopp Freq2 (HFS (MHz)	Limit (MHz)	Verdict
NVNT	1-DH1	2401.846	2402.	846	1	0.577	Pass
NVNT	1-DH1	2440.848	2441.	846	0.998	0.625	Pass
NVNT	1-DH1	2478.846	2479.	846	1	0.567	Pass
NVNT	2-DH1	2401.846	2402.	846	1	0.833	Pass
NVNT	2-DH1	2440.846	2441.	846	1	0.816	Pass
NVNT	2-DH1	2478.846	2479.	848	1.002	0.833	Pass
NVNT	3-DH1	2401.992	2402.	994	1.002	0.803	Pass

2441.994

2479.99

12.4 Test Result

3-DH1

3-DH1

2440.994

2478.99

NVNT

NVNT

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1

1

Edition: B.2

Pass

Pass





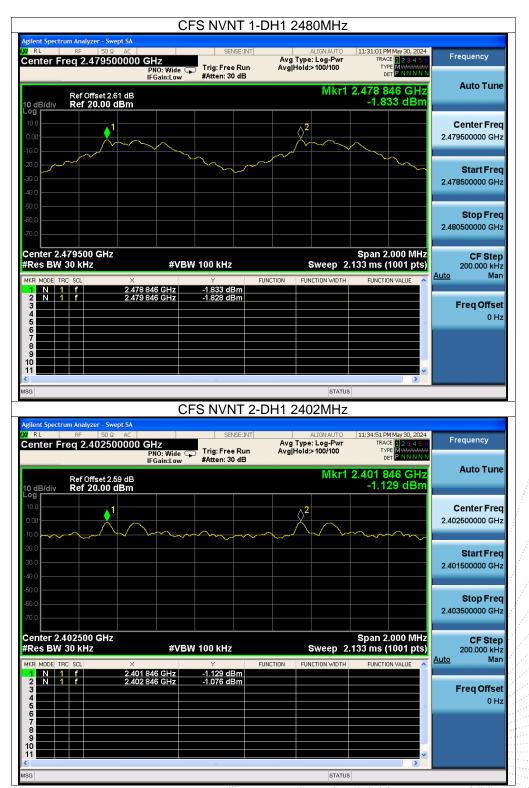
Edition: B.2

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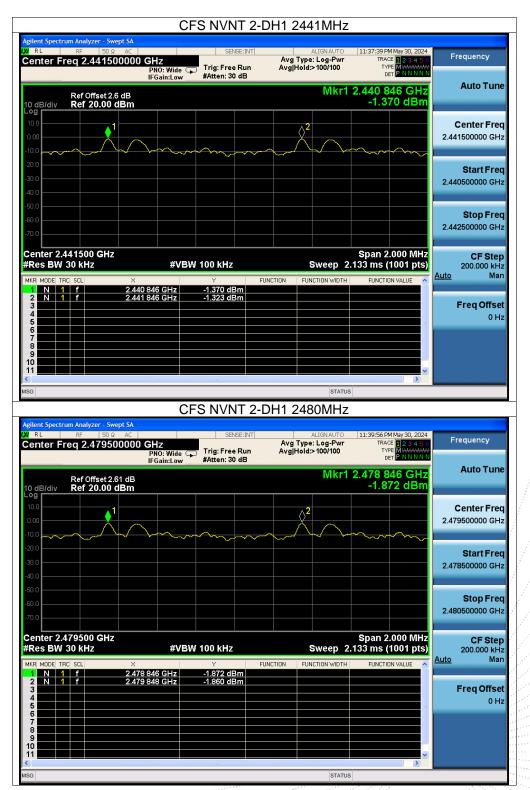
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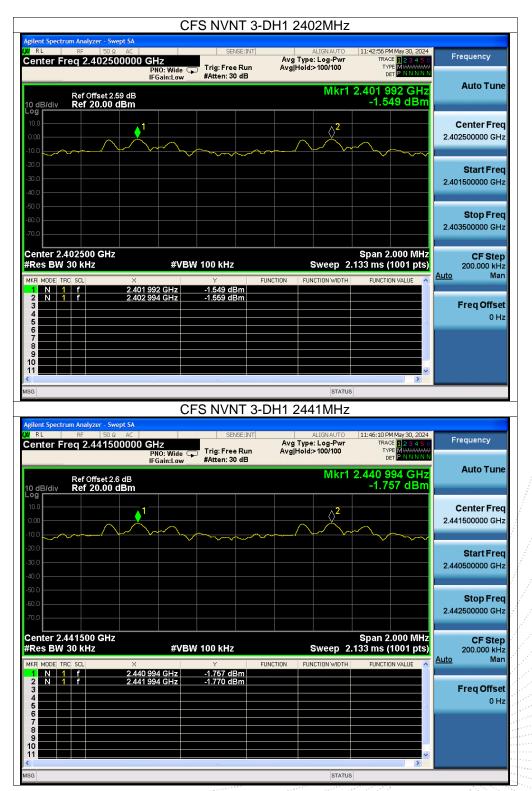




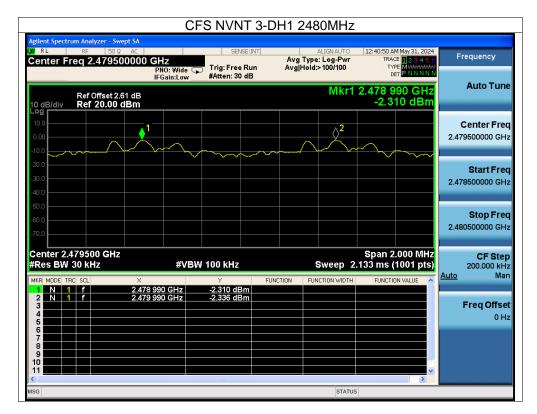
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13. Number Of Hopping Frequency

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;

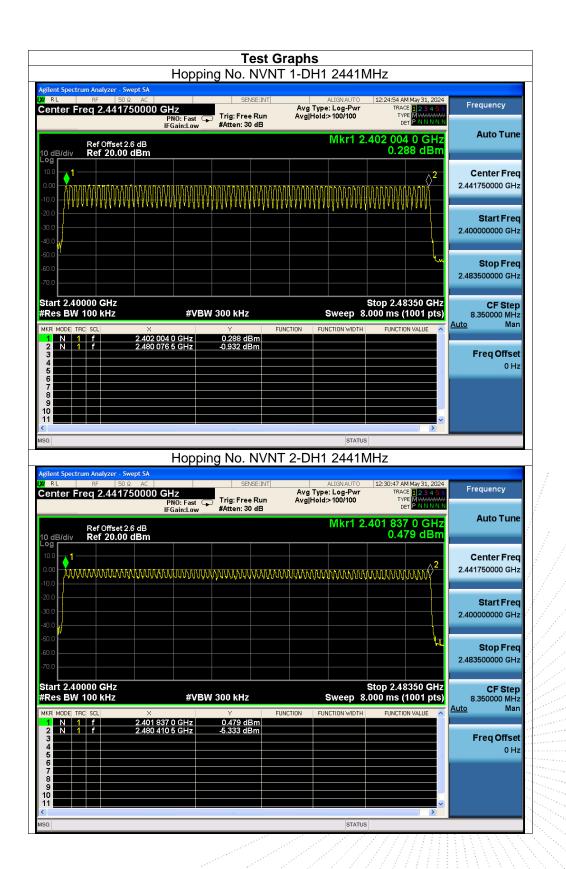
13.4 Test Result

Temperature:	26 ℃		Relative Humidity:	54%						,
Test Voltage:	DC 3.7V	**.,	Remark:	N/A						
					1	1	1	1	1 1	_

Condition	Mode	Hopping Number	Limit	Verdict
NVNT	1-DH1	79	15	Pass
NVNT	2-DH1	79	15	Pass
NVNT	3-DH1	79	15	Pass







JC JC PPR

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		Норрі	ng No. N	VNT 3-D	H1 2441	MHz	
gilent Spectr	rum Analyzer - Swept SA						
RL	RF 50 Ω AC		SENSE:		ALIGN AUTO	12:36:42 AM May 31, 2	
Center F	req 2.441750000	GHZ PNO: Fast G IFGain:Low	Trig: Free Ru #Atten: 30 dE	ın Avg	Type: Log-Pwr Hold:>100/100	TRACE 1234 TYPE MWWW DET PNNN	www
	Ref Offset 2.6 dB				Mkr1 2	.401 837 0 GI 0.425 dB	
0 dB/div	Ref 20.00 dBm					0.420 ab	
10.0 - 1 -							Center Fre
o.oo 🔽	****						2 2.441750000 GH
	MAMMANAMANAM	ANANAANAA	ANNAAAAAAAA	wwwwww	IAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA	AUMAANANANY	2.441700000 01
20.0							Start Fre
30.0							2.400000000 GH
40.0							
50.0							
							Stop Fre
50.0							2.483500000 GH
70.0							
						Ot 0 40050 0	
	0000 GHz 100 kHz	#VB\	V 300 kHz		Sweep 8	Stop 2.48350 G .000 ms (1001 p	ts) 8.350000 MH
IKR MODE TH	RC SCL X		Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	<u>Auto</u> Ma
1 N 1		37 0 GHz	0.425 dBm				
2 N 1	f 2.480 4	10 5 GHz	-4.693 dBm				Freq Offs
4							0+
5							
7							
8							
9							
1							✓
ļ			100			1	
G					STATUS	5	



Edition: B.2

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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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Temperature:	26°C	Relative Humidity:	54%
Test Voltage:	DC 3.7V	Remark:	N/A

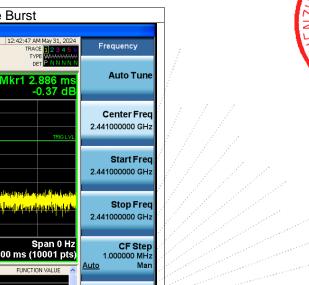
Condition	Mode	Frequency (MHz)	Pulse Time (ms)	Total Dwell Time (s)	Limit (s)	Verdict
NVNT	1-DH1	2441	0.383	0.123	0.4	Pass
NVNT	1-DH3	2441	1.639	0.262	0.4	Pass
NVNT	1-DH5	2441	2.886	0.308	0.4	Pass
NVNT	2-DH1	2441	0.392	0.125	0.4	Pass
NVNT	2-DH3	2441	1.643	0.263	0.4	Pass
NVNT	2-DH5	2441	2.891	0.308	0.4	Pass
NVNT	3-DH1	2441	0.391	0.125	0.4	Pass
NVNT	3-DH3	2441	1.643	0.263	0.4	Pass
NVNT	3-DH5	2441	2.893	0.309	0.4	Pass

D	Tes well NVNT 1-DH	t Graphs 1 2441MHz Or	e Burst	
Agilent Spectrum Analyzer - Swept SA	SENSE:I	NT ALIGNAUTO 10.0 µs Avg Type: Log-Pwr	12:24:59 AM May 31, 2024	Frequency
Ref Offset 2.6 dB 10 dB/div Ref 20.00 dBm			∆Mkr1 383.0 µs -3.47 dB	Auto Tune
100 0.00 X2 1Δ2			TRIG LVL	Center Freq 2.441000000 GHz
-20 0				Start Freq 2.441000000 GHz
	a a far itali da far far afar a far a f An far itali da far far far a far	and the second		Stop Freq 2.441000000 GHz
Center 2.441000000 GHz Res BW 1.0 MHz	#VBW 3.0 MHz	Sweep 1	Span 0 Hz 0.00 ms (10001 pts)	CF Step 1.000000 MHz
	383.0 μs (Δ) -3.47 dB 498.0 μs -1.88 dBm	FUNCTION FUNCTION WIDT	H FUNCTION VALUE	<u>Auto</u> Man Freq Offset 0 Hz
6 7 7 8 9 9 10 11				
< /second		STAT	JS	

C 00.,LT



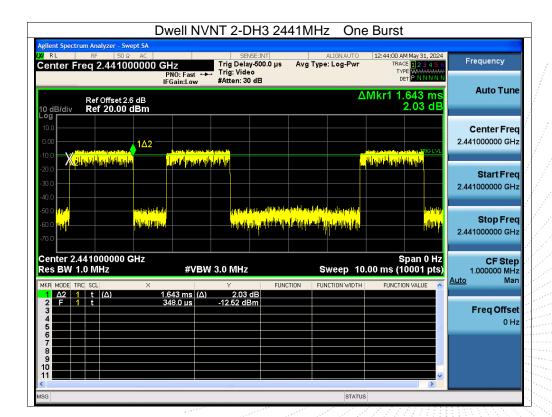
	Dwell NVNT 1-E	DH3 2441MHz	One Burst		
Agilent Spectrum Analyzer - Swept S		NSE:INT A	ALIGNAUTO 12:41:36 AF	4 May 31, 2024	
Center Freq 2.4410000	00 GHz Trig Dela PN0: East ↔ Trig: Vid	ay-500.0 μs Avg Type: eo	Log-Pwr TRAC	E 1 2 3 4 5 6 E WWWWWW T P N N N N N	Frequency
	IFGain:Low #Atten: 3	0 dB	ΔMkr1 1.		Auto Tune
Ref Offset 2.6 dE 10 dB/div Ref 20.00 dBr Log				4.33 dB	
10.0	1Δ2				Center Freq 41000000 GHz
-10.0 2 -20.0					Start Freq
-40.0 -50.0 taugh -60.0 <mark>http://</mark>	alaster for gradet so for so de san de san de san de san de san de se	ny ara daaraa midaha adala adala daala daala 4 m oo o	la de la secona de la contra di tra la Ma Alta de la contra di tra la Ma	an de ser plante An de ser a	Stop Freq
-70.0					141000000 GHZ
Center 2.441000000 GHz Res BW 1.0 MHz	2 #VBW 3.0 MHz	Sv	S weep 10.00 ms (1	• • •	CF Step 1.000000 MHz Man
MKR MODE TRC SCL Δ2 1 t (Δ)	× Υ 1.639 ms (Δ) 4.33	dB	CTION WIDTH FUNCTIO	N VALUE	Wan
2 F 1 t 3 4 5 5 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	498.0 μs -6.14 d	Bm			Freq Offset 0 Hz
6 7 8 9					
10 11 <				→	
MSG			STATUS		



Dwell NVNT 1-DH5 2441MHz One Burst RL Center Freq 2.441000000 GHz IFGain:Low Trig Video #Atten: 30 dB Avg Type: Log-Pwr ΔMkr1 2.886 ms -0.37 dB Ref Offset 2.6 dB Ref 20.00 dBm B/div ▲1∆2 X l aling an ang balansan na tang dipaninasi kasa. ينى يىلى يارتالى يريز الجرار الأربي الجرير (الجريز الجريز (الجريز) و مريد الحاط الجرير . Center 2.441000000 GHz Res BW 1.0 MHz Span 0 Hz Sweep 10.00 ms (10001 pts) #VBW 3.0 MHz 2.886 ms (Δ) 498.0 μs -0.37 dB -0.39 dBm 1 t 1 t Freq Offset 0 Hz STATUS

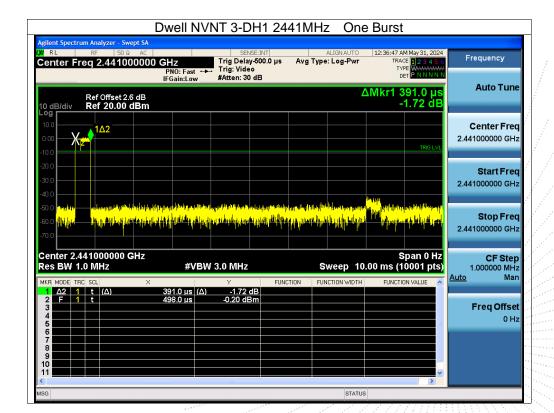


C	well NVNT 2-DH1 24	41MHz One	Burst	
Agilent Spectrum Analyzer - Swept SA M RF 50 Ω AC Center Freq 2.441000000 C		ALIGN AUTO Avg Type: Log-Pwr	12:30:52 AM May 31, 2024 TRACE 1 2 3 4 5 6 TYPE WWWWWW	Frequency
Ref Offset 2.6 dB	PN0: Fast ↔ Trig: Video IFGain:Low #Atten: 30 dB	Δ	Mkr1 392.0 µs 0.50 dB	Auto Tune
10 dB/div Ref 20.00 dBm				Center Freq 2.441000000 GHz
-10.0				Start Freq 2.441000000 GHz
-40.0 -50.0 Power	an bhlian ha Bhrachtan a tha na tha tha dha an bhlian bhailtean A a g a g angla a fac an fac an tarainn an tarainn an tarainn a tha tha tarainn a	eletter, une entre printe se terret generative l'electric protection	ultersets and the content of the set a lice puts of the player of the set of the set	Stop Freq 2.441000000 GHz
Center 2.441000000 GHz Res BW 1.0 MHz	#VBW 3.0 MHz	Sweep 10.	Span 0 Hz 00 ms (10001 pts)	CF Step 1.000000 MHz
MKR MODE TRC SCL Χ 1 Δ2 1 t (Δ) 2 F 1 t	Υ FUNC 392.0 μs (Δ) 0.50 dB 498.0 μs -4.51 dBm	TION FUNCTION WIDTH	FUNCTION VALUE	<u>Auto</u> Man
3 4 5 6			=========	Freq Offset 0 Hz
7 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9				
			×	





Dw	ell NVNT 2-DH5 2	441MHz One	e Burst	
Agilent Spectrum Analyzer - Swept SA				
RL RF 50 Ω AC Center Freq 2.441000000 GH	SENSE:INT	ALIGNAUTO s Avg Type: Log-Pwr	12:44:56 AM May 31, 2024 TRACE 1 2 3 4 5 6	Frequency
PI	NO: Fast 🛶 Trig: Video		TYPE WWWWWWWWW DET P N N N N N	
	Gain:Low #Atten: 30 dB		Mkr1 2.891 ms	Auto Tune
Ref Offset 2.6 dB 10 dB/div Ref 20.00 dBm			1.71 dB	
10.0				Center Freq
0.00	162			2.441000000 GHz
			TRIG LVL	
-20.0 Alither and the strength of the strength				Start Freq
-30.0				2.441000000 GHz
-40.0	الترابيقا فرافته براريف وبالعراد والقرر	at total a constants di da		
-50.0 <mark>w//</mark>	dividing a filter shall be a first site of the state of the	the second se	<mark>n disarta patris di kana tanaka n</mark>	Stop Freq
-60.0 <mark>/ #//</mark>			<mark>a i Museli e jun ji Musel e jun ju a li jun</mark>	2.441000000 GHz
-70.0				
Center 2.441000000 GHz			Span 0 Hz	CF Step
Res BW 1.0 MHz	#VBW 3.0 MHz	Sweep 10	.00 ms (10001 pts)	1.000000 MHz
MKR MODE TRC SCL X		UNCTION FUNCTION WIDTH	FUNCTION VALUE	<u>Auto</u> Man
2 F 1 t 34	91 ms (Δ) 1.71 dB 8.0 μs -12.23 dBm			
3				Freq Offset 0 Hz
5				0112
7 8				
9				
11			×	
MSG		STATU		
mou		STATU	3	





Dw	ell NVNT 3-DH3 24	41MHz One	e Burst	
Agilent Spectrum Analyzer - Swept SA	SENSE:INT	ALIGN AUTO	12:46:05 AM May 31, 2024 TRACE 1 2 3 4 5 6	Frequency
	NO: Fast +++ Sain:Low #Atten: 30 dB	Avg Type. Log-Pwr	TYPE WWWWWWW DET PNNNNN	
Ref Offset 2.6 dB 10 dB/div Ref 20.00 dBm		Δ	Mkr1 1.643 ms 0.67 dB	Auto Tune
Log 10.0 -10.			TRIO LVL	Center Freq 2.441000000 GHz
-100 X 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1				Start Freq 2.441000000 GHz
-50.0 <mark>1001 - 0777401000 -60.0 10101 - 117874 10214</mark> -70.0 -	eli el secuel el se cherefore de la sobjeta de la della se Na de la della desentación della política de la sobjeta de la della della della della della della della della d Na della d	1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	al berdi dan dan sejan di si berdi dan di karap na tila kad di na da tila plan hada kati haga tila n	Stop Freq 2.441000000 GHz
Center 2.441000000 GHz Res BW 1.0 MHz	#VBW 3.0 MHz	Sweep 10	Span 0 Hz .00 ms (10001 pts)	CF Step 1.000000 MHz
	Υ FUN 43 ms (Δ) 0.67 dB 7.0 μs -15.24 dBm	CTION FUNCTION WIDTH	FUNCTION VALUE	<u>Auto</u> Man
				Freq Offset 0 Hz
6 7 8				
9 10 11			~	
MSG		STATUS		

Dwell NVNT 3-DH5 2441MHz One Burst M May 31, 2024 Center Freq 2.441000000 GHz PN0:Fast →→ IFGain:Low Frequency Trig Delay-500.0 μs Trig: Video #Atten: 30 dB Avg Type: Log-Pwr TYPE DET Auto Tune ΔMkr1 2.893 ms 1.32 dB Ref Offset 2.6 dB Ref 20.00 dBm **Center Freq** 2.441000000 GHz <u>1∆2</u> Start Freq 2.441000000 GHz Stop Freq وفاؤاها أورواعة فتواليت الأريقية فاشر 2.441000000 GHz CF Step 1.000000 MHz Man Center 2.441000000 GHz Res BW 1.0 MHz Span 0 Hz Sweep 10.00 ms (10001 pts) #VBW 3.0 MHz Auto 2.893 ms (Δ) 347.0 μs 1.32 dE -14.40 dBm Freq Offset 0 Hz

STATUS

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RL

10 dB/div

1 t 1 t



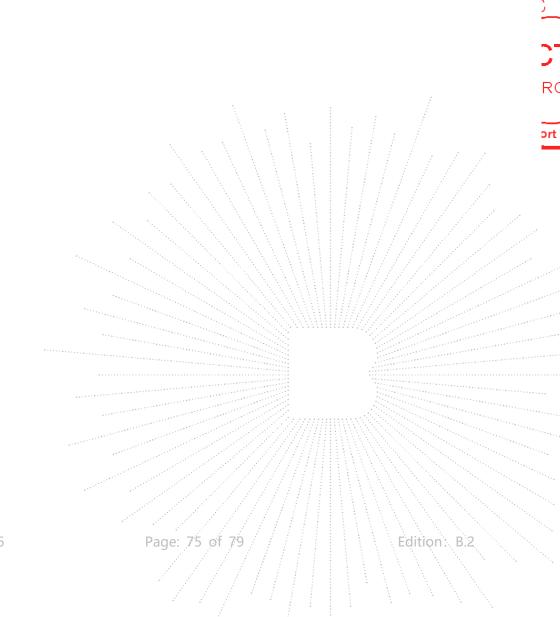
15. Antenna Requirement

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



EUT Photo 2



NOTE: Appendix-Photographs Of EUT Constructional Details.

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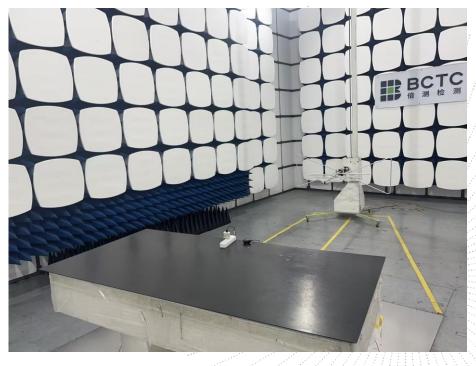


17. EUT Test Setup Photographs

Conducted Emissions Photo



Radiated Measurement Photos











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STATEMENT

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

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

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

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

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

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

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

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

Address:

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

TEL: 400-788-9558

P.C.: 518103

FAX: 0755-33229357

Website: http://www.chnbctc.com

Consultation E-mail: bctc@bctc-lab.com.cn.

Complaint/Advice E-mail: advice@bctc-lab.com.cn

***** END *****

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