

World Standardization Certification & Testing Group (Shenzhen) Co., ltd.

W5C1



Report No.: WSCT-ANAB-R&E250100003A-BT

### Carrier Frequencies Separation 6.5.

6.5.1.	<b>Test S</b>	pecification 5

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X	Test Requirement:	FCC Part15 C Section 15.247 (a)(1)	
WS ET	Test Method:	ANSI C63.10:2014 W5 ET W5 ET	
	Limit:	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.	WS ET®
WSCT	Test Setup:	Spectrum Analyzer EUT W5_C7°	
	Test Mode:	Hopping mode	
WS CT	Test Procedure:	<ol> <li>The testing follows ANSI C63.10:2014 Measurement Guidelines.</li> <li>The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.</li> <li>Set to the maximum power setting and enable the EUT transmit continuously.</li> <li>Enable the EUT hopping function.</li> <li>Use the following spectrum analyzer settings: Span = wide enough to capture the peaks of two adjacent channels; RBW is set to approximately 30% of the channel spacing, adjust as necessary to best identify the center of each individual channel; VBW≥RBW; Sweep = auto; Detector function = peak; Trace = max hold.</li> <li>Use the marker-delta function to determine the separation between the peaks of the adjacent channels. Record the value in report.</li> </ol>	W5 ET
	Test Result:	PASS	

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## 6.5.2. Test data

	WEET	MARCE TO MARCH MAR	CE CT <sup>®</sup>				
7	GFSK mode						
	Test channel	Carrier Frequencies Separation (MHz)	Limit ((2/3*20dB BW MHz))	Result			
57°]	Lowest	0.996	0.636	PASS			
	Middle	1	0.636	PASS			
	Highest	0.994	0.628	PASS			
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SET

Pi/4 DQPSK mode						
	Test channel	Carrier Frequencies Separation (MHz)	Limit ((2/3*20dB BW MHz))	Result		
_	Lowest	1.01	0.909	PASS		
	Middle	1.006	0.889	PASS		
	Highest	W5 [7 1.002 N	5 <i>[</i> 7 0.892 W	SET PASS		

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8DPSK mode						
Test channel	Carrier Frequencies Separation (MHz)	Limit ((2/3*20dB BW MHz))	Result			
Lowest 1.002		0.857	PASS			
Middle	1.01	0.869	PASS			
Highest	1.002	0.919	PASS			

Test plots as follows:

W5 CI W5 CI W5C W5 C1

W5C1 W5 C7 W5C7 W5C7

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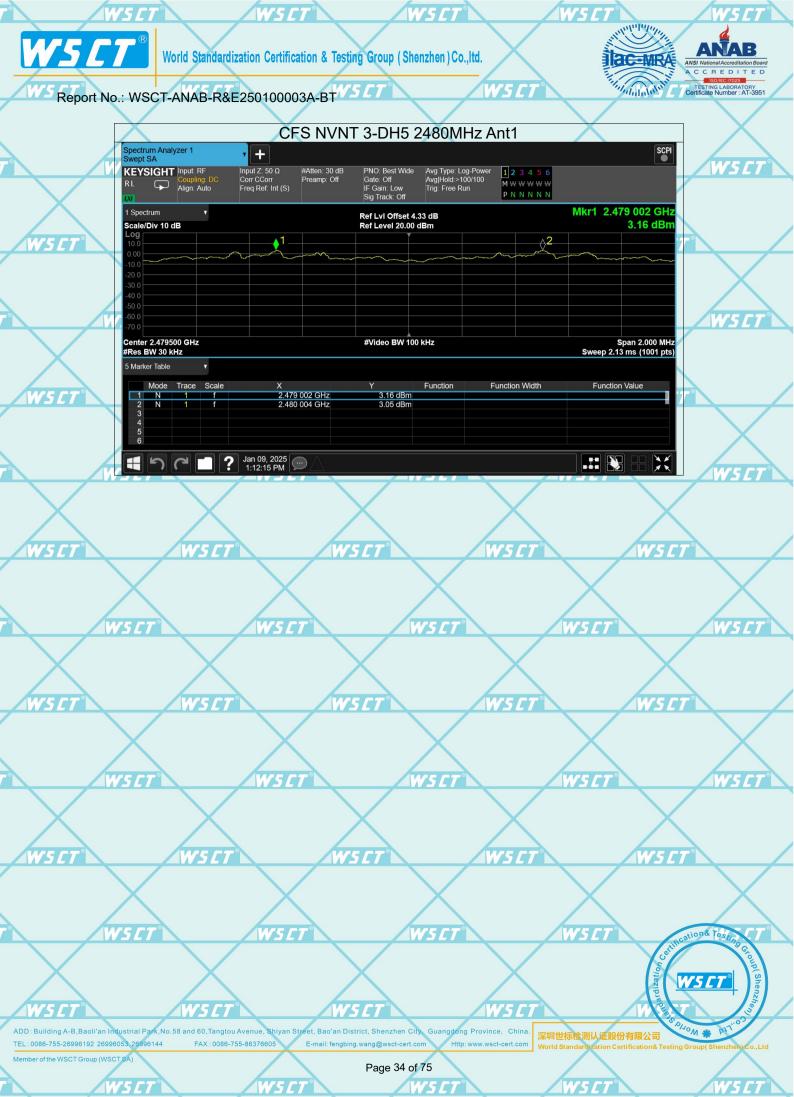
W5 CT













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## **Hopping Channel Number** 6.6.

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# 6.6.1. Test Specification

WEET	Test Requirement:	FCC Part15 C Section 15.247 (a)(1)	
<u> </u>	Test Method:	ANSI C63.10:2014	
	Limit:	Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.	$\triangle$
WSET	Test Setup:	Spectrum Analyzer EUT	<b>W5</b>
-WJE/	Test Mode:	Hopping mode	
WSET		<ol> <li>The testing follows ANSI C63.10:2014 Measurement Guidelines.</li> <li>The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.</li> <li>Set to the maximum power setting and enable the</li> </ol>	WSET
WSET	Test Procedure:	<ul> <li>EUT transmit continuously.</li> <li>4. Enable the EUT hopping function.</li> <li>5. Use the following spectrum analyzer settings: Span = the frequency band of operation; set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller; VBW≥RBW; Sweep = auto; Detector function = peak; Trace = max hold.</li> <li>6. The number of hopping frequency used is defined as the number of total channel.</li> <li>7. Record the measurement data in report.</li> </ul>	
	Test Result:	PASS W31	WS ET

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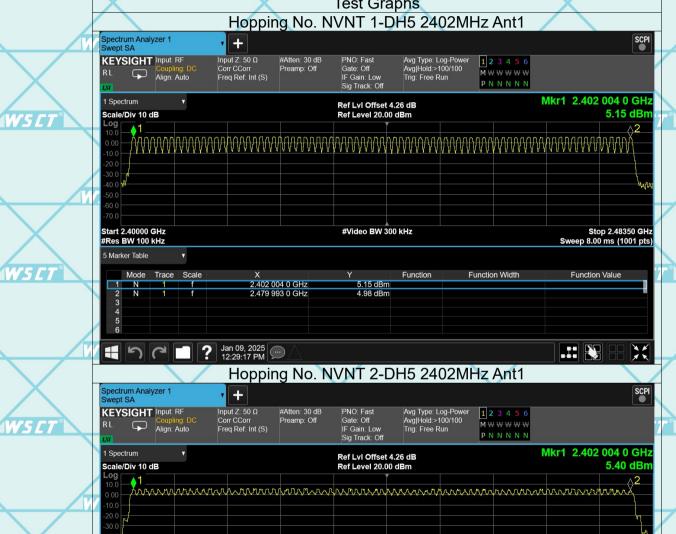




# **Test data**

Mode	Hopping channel numbers	Limit	Result
GFSK, P/4-DQPSK, 8DPSK	79	15	PASS

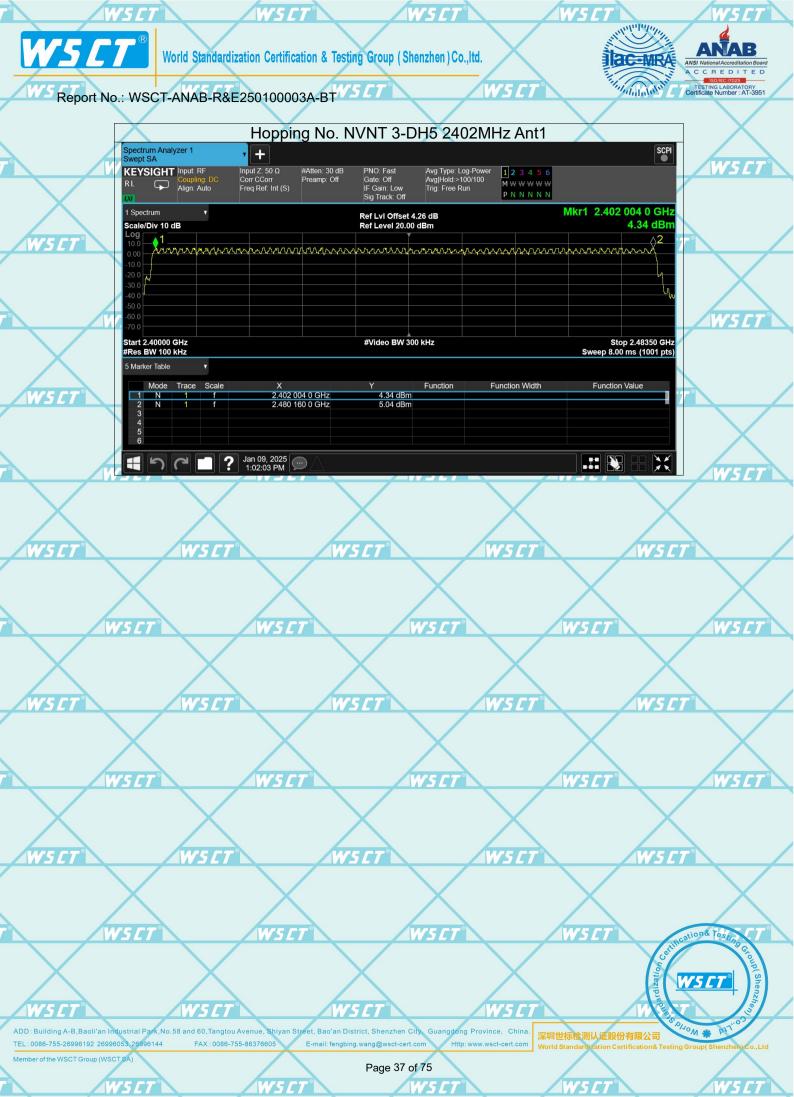
NS CT Test plots as follows: Test Graphs Hopping No. NVNT 1-DH5 2402MHz Ant1 Spectrum Analyzer 1 Swept SA SCPI + KEYSIGHT Input: RF



Stop 2.48350 GHz Sweep 8.00 ms (1001 pts) Start 2.40000 GHz #Video BW 300 kHz #Res BW 100 kHz Function Value **Function Width** 2.402 004 0 GHz 2.479 993 0 GHz 5.40 dBm 4.10 dBm tion& Testin 

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#### 6.7. **Dwell Time**

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6.7.1. Test 5	pecification

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X	Test Requirement:	FCC Part15 C Section 15.247 (a)(1)	
W5 ET	Test Method:	ANSI C63.10:2014 W5 C7 W5 C7	
	Limit:	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.	W5 Ci
X	Test Setup:	Spectrum Analyzer EUT	
W5 CT	Test Mode:	Hopping mode WSET WSET	
WSCT	Test Procedure:	<ol> <li>The testing follows ANSI C63.10:2014 Measurement Guidelines.</li> <li>The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.</li> <li>Set to the maximum power setting and enable the EUT transmit continuously.</li> <li>Enable the EUT hopping function.</li> <li>Use the following spectrum analyzer settings: Span = zero span, centered on a hopping channel; RBW shall be ≤ channel spacing and where possible RBW should be set &gt;&gt; 1 / T, where T is the expected dwell time per channel; VBW≥RBW; Sweep = as necessary to capture the entire dwell time per hopping channel; Detector function = peak; Trace = max hold.</li> <li>Measure and record the results in the test report.</li> </ol>	WSCI
	Test Result:	PASS	
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## 6.7.2. Test Data

1	Mode	Frequency	Pulse Time	Total Dwell Time	Burst	Period Time	Limit	Verdict
-		(MHz)	(ms)	(ms)	Count	(ms)	(ms)	
	1-DH1	2402	0.384	122.112	318	31600	400	Pass
	1-DH1	2441	0.384	122.496	319	31600	400	Pass
	1-DH1	2480	0.382	121.476	318	31600	400	Pass
	1-DH3	2402	1.638	265.356	162	31600	400	Pass
	1-DH3	2441 "	1.638	255.528	156	31600	400	Pass
	1-DH3	2480	1.639	257.323	157	31600	400	Pass
	1-DH5	2402	2.888	352.336	122	31600	400	Pass
	1-DH5	2441	2.887	256.943	89	31600	400	Pass
	1-DH5	2480	2.888	294.576	102	31600	400	Pass

Note: 1. In normal mode, hopping rate is 1600 hops/s with 6 slots in 79 hopping channels.

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For DH1, With channel hopping rate (1600 / 2 / 79) in Occupancy Time Limit (0.4 x 79) (s), Hops Over Occupancy Time comes to  $(1600 / 2 / 79) \times (0.4 \times 79) = 320 \text{ hops}$ 

For DH3, With channel hopping rate (1600 / 4 / 79) in Occupancy Time Limit (0.4 x 79) (s), Hops Over Occupancy Time comes to  $(1600 / 4 / 79) \times (0.4 \times 79) = 160 \text{ hops } \sqrt{5} \text{ C}$ 

For DH5, With channel hopping rate (1600 / 6 / 79) in Occupancy Time Limit (0.4 x 79) (s), Hops Over Occupancy Time comes to  $(1600 / 6 / 79) \times (0.4 \times 79) = 106.67$  hops

2. Dwell Time(s) = Hops Over Occupancy Time (hops) x Package Transfer Time

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## Test plots as follows:

Ws	ET W	YS CT"	WSCT	WSET	WSCT
WSCT	WSET	WSET	WS ET*	WS ET"	
Ws	ET W	SET	WSCT	WSCT	WSCT
WSCT	WSET	WSET	W5 CT	WSET®	

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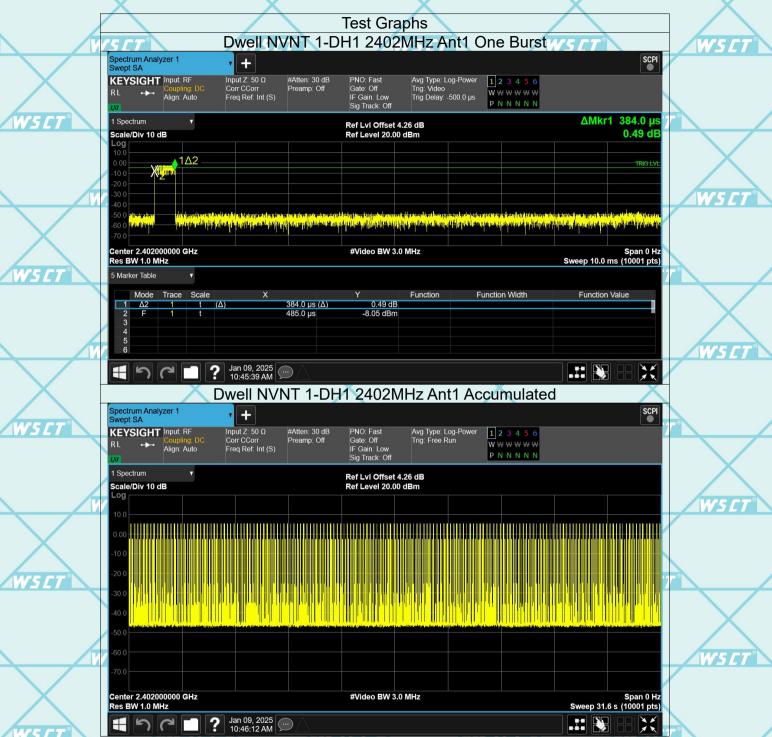
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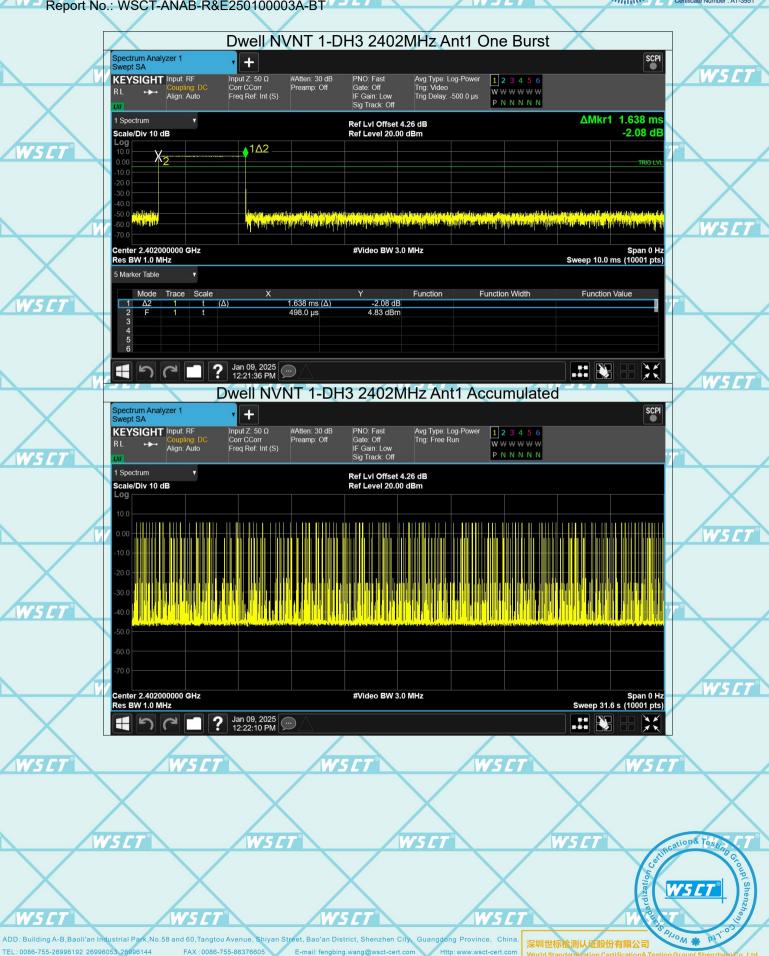








W5CT" **W5**CT<sup>®</sup> International States World Standardization Certification & Testing Group (Shenzhen) Co., ltd. **ac-MRA** WS CI Report No.: WSCT-ANAB-R&E250100003A-BT Dwell NVNT 1-DH3 2402MHz Ant1 One Burst Spectrum Analyzer 1 Swept SA SCPI + Input Z: 50 Ω Corr CCorr Freq Ref: Int (S) PNO: Fast Gate: Off IF Gain: Low Sig Track: Off Avg Type: Log-Power Trig: Video Trig Delay: -500.0 μs KEYSIGHT Input: RF 1 2 3 4 5 6 **w** ₩ ₩ ₩ ₩ Alian: Auto PNNNNN



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W5CT" WSCT" Thinline I'm World Standardization Certification & Testing Group (Shenzhen) Co., ltd. **ac-MRA** WS CI Report No.: WSCT-ANAB-R&E250100003A-BT Dwell NVNT 1-DH3 2441MHz Ant1 One Burst Spectrum Analyzer 1 Swept SA SCPI + Input Z: 50 Ω Corr CCorr Freq Ref: Int (S) PNO: Fast Gate: Off IF Gain: Low Sig Track: Off Avg Type: Log-Power Trig: Video Trig Delay: -500.0 μs KEYSIGHT Input: RF 1 2 3 4 5 6 **w** ₩ ₩ ₩ ₩ Alian: Auto PNNNNN ΔMkr1 1.638 ms Ref LvI Offset 4.28 dB Ref Level 20.00 dBm -5.88 dB Scale/Div 10 dB 15 CT 1Δ2 The state of the s Center 2.441000000 GHz Res BW 1.0 MHz #Video BW 3.0 MHz Span 0 Hz Sweep 10.0 ms (10001 pts) Function Function Value **Function Width** 1.638 ms (Δ) 496.0 us 5 \*\* Dwell NVNT 1-DH3 2441MHz Ant1 Accumulated Spectrum Analyzer 1 Swept SA SCPI **v** + Input Z: 50 Ω Corr CCorr Freq Ref: Int (S) KEYSIGHT Input: RF #Atten: 30 dB Preamp: Off Avg Type: Log-Power Trig: Free Run 1 2 3 4 5 6 W + W + W + WAlign: Auto PNNNNN 1 Spectrum Ref Lvi Offset 4.28 dB Ref Level 20.00 dBm Scale/Div 10 dB Span 0 Hz Sweep 31.6 s (10001 pts) Center 2.441000000 GHz #Video BW 3.0 MHz Res BW 1.0 MHz ? Jan 09, 2025 .... 12:22:48 PM tion& Testin WS C WS CI WS C ADD: Building A-B,Baoli'an Industrial Park,No.58 and 60,Tangtou Avenue, Shiyan Street, Bao'an District, Shenzhen City, Guangdong Province, China 深圳世标检测认证股份有限公司 FAX: 0086-755-8637660

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W5CT<sup>®</sup> WSCT" International States World Standardization Certification & Testing Group (Shenzhen) Co., ltd. **ac-MRA** "Infalalalata W5C1 Report No.: WSCT-ANAB-R&E250100003A-BT Dwell NVNT 1-DH3 2480MHz Ant1 One Burst Spectrum Analyzer 1 Swept SA SCPI + Input Z: 50 Ω Corr CCorr Freq Ref: Int (S) PNO: Fast Gate: Off IF Gain: Low Sig Track: Off Avg Type: Log-Power Trig: Video Trig Delay: -500.0 μs KEYSIGHT Input: RF 1 2 3 4 5 6 **w** ₩ ₩ ₩ ₩ Alian: Auto PNNNNN ΔMkr1 1.639 ms Ref Lvl Offset 4.33 dB Ref Level 20.00 dBm 0.85 dB Scale/Div 10 dB 15 CT 102 Center 2.480000000 GHz Res BW 1.0 MHz #Video BW 3.0 MHz Span 0 Hz Sweep 10.0 ms (10001 pts) 5 Marker Table Function Function Value **Function Width** 1.639 ms (Δ) 484.0 μs 4 5 6 ? Jan 09, 2025 .... 12:22:54 PM \*\* Dwell NVNT 1-DH3 2480MHz Ant1 Accumulated Spectrum Analyzer 1 Swept SA SCPI **v** + Input Z: 50 Ω Corr CCorr Freq Ref: Int (S) KEYSIGHT Input: RF #Atten: 30 dB Preamp: Off Avg Type: Log-Power Trig: Free Run 1 2 3 4 5 6 W + W + W + WAlign: Auto PNNNNN 1 Spectrum Ref Lvi Offset 4.33 dB Ref Level 20.00 dBm Scale/Div 10 dB Span 0 Hz Sweep 31.6 s (10001 pts) Center 2.480000000 GHz #Video BW 3.0 MHz Res BW 1.0 MHz tion& Testin WSC WS C ADD: Building A-B,Baoli'an Industrial Park,No.58 and 60,Tangtou Avenue, 深圳世标检测认证股份有限公司 FAX: 0086-755-8637660

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