

6. AVERAGE TIME OF OCCUPANCY

6.1 LIMIT

FCC Part 15.247,Subpart C							
Section	Test Item	Limit	FrequencyRange (MHz)	Result			
15.247 (a)(1)(iii)	Average Time of Occupancy	0.4sec	2400-2483.5	PASS			

6.2 TEST PROCEDURE

- a. The transmitter output (antenna port) was connected to the spectrum analyzer.
- b. Set RBW =1MHz/VBW =3MHz.
- c. Use a video trigger with the trigger level set to enable triggering only on full pulses.
- d. Sweep Time is more than once pulse time.
- Set the center frequency on any frequency would be measure and set the frequency span to e. zero span.
- f. Measure the maximum time duration of one single pulse.
- g. Set the EUT for DH5, DH3 and DH1 packet transmitting.
- h. Measure the maximum time duration of one single pulse.
- i. DH5 Packet permit maximum 1600/ 79 / 6 = 3.37 hops per second in each channel (5 time slots RX, 1 time slot TX). So the number of pulses in the observation period of 31.6 seconds is $3.37 \times 31.6 = 106.6$.
- j. DH3 Packet permit maximum 1600 / 79 / 4 = 5.06 hops per second in each channel (3 time slots RX, 1 time slot TX). So the number of pulses in the observation period of 31.6 seconds is $5.06 \times 31.6 = 160$.
- k. DH1 Packet permit maximum 1600 / 79 / 2 = 10.12 hops per second in each channel (1 time slot RX, 1 time slot TX). So the number of pulses in the observation period of 31.6 seconds is 10.12 x 31.6 = 320.

6.3 TEST SETUP



6.4 EUT OPERATION CONDITIONS

Please refer to section 3.1.4 of this report.



6.5 TEST RESULTS

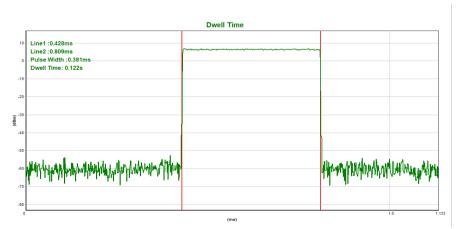
Temperature:	25℃	Relative Humidity:	50%
Test Mode:	GFSK/ π/4-DQPSK/ 8DPSK	Test Voltage:	DC 3.85V

Modulation	Pocket Type	Frequency (MHz)	Single Pulse Time (ms)	Dwell Time (s)	Limit (s)	Result
	DH1	2441	0.381	0.122	0.4	Pass
GFSK	DH3	2441	1.636	0.262	0.4	Pass
	DH5	2441	2.886	0.308	0.4	Pass
	2DH1	2441	0.390	0.125	0.4	Pass
π/4DQPSK	2DH3	2441	1.646	0.263	0.4	Pass
	2DH5	2441	2.888	0.308	0.4	Pass
	3DH1	2441	0.391	0.125	0.4	Pass
8DPSK	3DH3	2441	1.640	0.262	0.4	Pass
	3DH5	2441	2.896	0.309	0.4	Pass

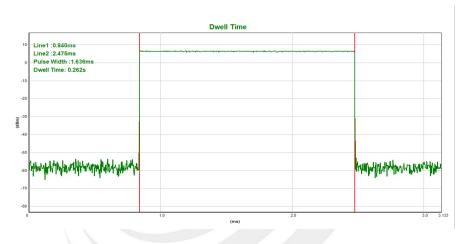
Shenzhen STS Test Services Co., Ltd.



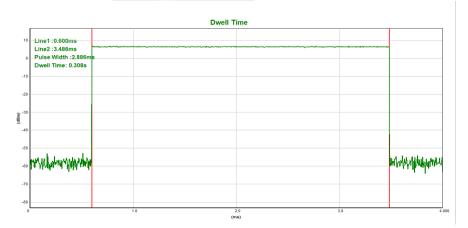
CH39-DH1



CH39-DH3



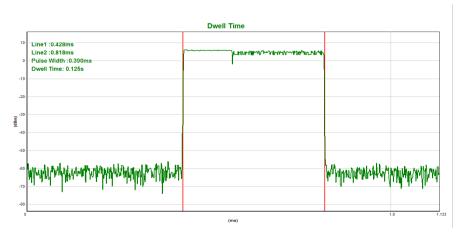




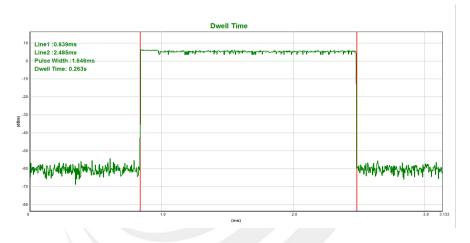
Shenzhen STS Test Services Co., Ltd.



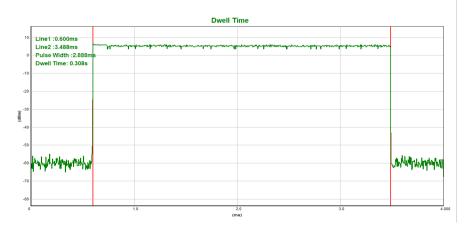
CH39-2DH1



CH39-2DH3



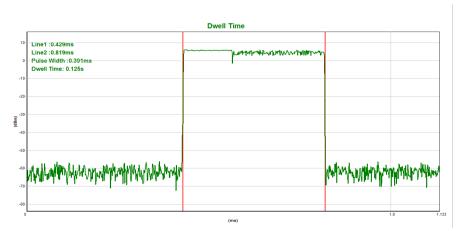
CH39-2DH5



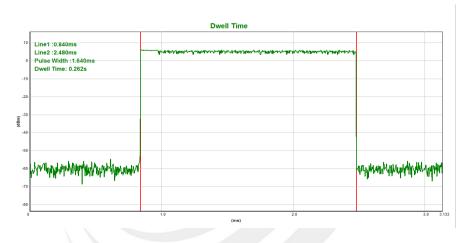
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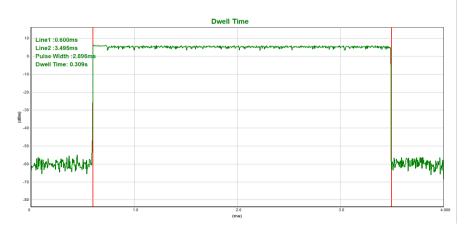
CH39-3DH1



CH39-3DH3



CH39-3DH5



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7. HOPPING CHANNEL SEPARATION MEASUREMEN

7.1 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 125 mW.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	> 20 dB Bandwidth or Channel Separation
RB	30 kHz (20dB Bandwidth) / 30 kHz (Channel Separation)
VB	100 kHz (20dB Bandwidth) / 100 kHz (Channel Separation)
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

7.2 TEST PROCEDURE

- a. The transmitter output (antenna port) was connected to the spectrum analyser in peak hold mode.
- b. The resolution bandwidth of 30 kHz and the video bandwidth of 100 kHz were utilised for 20 dB bandwidth measurement.
- c. The resolution bandwidth of 30 kHz and the video bandwidth of 100 kHz were utilised for channel separation measurement.

7.3 TEST SETUP



7.4 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.



7.5 TEST RESULTS

Temperature:	25°C	Relative Humidity:	50%
Test Mode:	GFSK/π/4-DQPSK/8DPSK	Test Voltage:	DC 3.85V

Modulation	Frequency (MHz)	Mark1 Frequency (MHz)	Mark2 Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)	Result
	2402	2402.167	2403.169	1.002	0.703	Pass
GFSK	2441	2441.023	2442.019	0.996	0.703	Pass
	2480	2479.023	2480.019	0.996	0.692	Pass
	2402	2401.834	2403.166	1.332	0.879	Pass
π/4DQPSK	2441	2441.014	2442.019	1.005	0.877	Pass
	2480	2479.023	2480.166	1.143	0.870	Pass
	2402	2402.173	2403.163	0.990	0.869	Pass
8DPSK	2441	2441.170	2442.172	1.002	0.866	Pass
	2480	2479.164	2480.160	0.996	0.862	Pass



CH00 -1Mbps



CH39 -1Mbps



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CH78 -1Mbps



CH00 -2Mbps

		lyzer - Swept SA	5							
K RL	RF	50 Q AC		SENSE	PULSE	A	LIGN AUTO AVg Type:	Log-Pwr		3 PM Jan 08, 2022 RACE 1 2 3 4 5 6
Cerner	FIEQ 2	.40230000	PN		Trig: Free Ru #Atten: 30 dB					DET P P P P F
	Ref (Offset 0.5 dB						M		166 GHz
10 dB/div Log		9.14 dBm							4.	063 dBm
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-70.9										
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Center : #Res Bi				#VBW	100 kHz			Swee	Span 9 3.200 m	3.000 MHz 6 (1001 pts)
MKR MODE	TRC SCL	>	<	Y	FUNCT	ION FUNC	TION WIDTH	÷	UNCTION VALUE	^
1 N 2 N	1 f		401 834 GHz 403 166 GHz	2.36 dB 4.06 dB						
3		2.•	400 100 0112	4.00 08						
4 5										
6 7										
8										
9 10										
11										~
MSG							STATUS			
							SIAIDS			

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CH39 -2Mbps

	50 Ω AC	SE	ENSE:PULSE	ALIGN AUTO	02	:45:09 PM Jan 08, 20
ter Freq 2.44	41500000 GHz	PNO: Wide IFGain:Low		Avg Type: Lo		TRACE 1234 TYPE MWWW DET P P P P
	set 0.5 dB .81 dBm				Mkr2 2.4	42 019 GH 2.051 dB
		1		2		
mm	mm	mon Tron	man	man	mmm	mm
ter 2.441500 (GH7					pan 3.000 MI
s BW 30 kHz	0112	#VB	W 100 kHz		Sweep 3.200	
	×	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VA	LUE
MODE TRC SCL	2.441 014 G		dBm dBm			
N 1 f						
MODE TRC SCL N 1 f N 1 f	2.442 019 G	112 2.00				
N 1 f	2.442 019 G					
N 1 f	2.442 019 G					
N 1 f	2.442 019 G					
N 1 f	2.442 019 G					
N 1 f	2.442 019 G					

CH78 -2Mbps



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CH00 -3Mbps

Agilent Spectrum A									
Center Freq		PI	NO: Wide 🖵 Gain:Low	Trig: Free #Atten: 30	Run	IGNAUTO Avg Type:	_	TF	PM Jan 08, 2022 RACE 1 2 3 4 5 6 TYPE M WWWWWW DET P P P P P F
10 dB/div R	ef Offset 0.5 dB ef 14.60 dBm	I					MI	(r2 2.403 4.	163 GHz 604 dBm
4.60 -5.40			m	~~~~-		mm	2		~~~~
-15.4								·····	
-35.4	~								
-45.4 -65.4									
-75.4									
Center 2.402 #Res BW 30			#VBV	/ 100 kHz			Sweej	Span 3.200 ms	3.000 MHz (1001 pts
MKB MODE TRC 50 1 N 1 f 2 N 1 f 3 4	2.	402 173 GHz 403 163 GHz	4.29 c 4.60 c	lBm	CTION FUNC	TION WIDTH	F	UNCTION VALUE	<u>^</u>
5 6 7 8									
9 10 11									
MSG						STATUS			

CH39 -3Mbps

R L RF						
	50 Ω AC	SENSE:PULS	E	ALIGNAUTO Avg Type: Lo		03:16:47 PM Jan 08, 20
enter Freq 2.44	Р	NO: Wide 😱 Trig Gain:Low #Atte	Free Run en: 30 dB	Avg Type: Lo	·g-Pwr	TRACE 1 2 3 4 TYPE M WAAAAA DET P P P P
Ref Offse dB/div Ref 11.	et 0.5 dB 89 dBm				Mkr2 :	2.442 172 GF 3.081 dB
89 mm		m			2	
11		a a compact	m		man	
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8.1						
enter 2.441500 G Res BW 30 kHz	θHz	#VBW 100	kHz		Sweep 3.2	Span 3.000 M 200 ms (1001 p
r mode tro scl N 1 f	× 2.441 170 GHz	۲ 3.31 dBm	FUNCTION FUN	ICTION WIDTH	FUNCTIO	N VALUE
2 N 1 f	2.442 172 GHz	3.08 dBm				
3						
1						
						>

A 1/F, Building B, Zhuoke Science Park, No.190 Chongqing Road, HepingShequ, Fuyong Sub-District, Bao'an District, Shenzhen, Guang Dong, China Tel: +86-755 3688 6288 Fax:+86-755 3688 6277 Http://www.stsapp.com E-mail: sts@stsapp.com



CH78 -3Mbps

RL RF	50 Q AC	SEN	SE:PULSE	ALIGN AUTO		49 PM Jan 08, 202
nter Freq 2.	479500000 GHz	PNO: Wide 🖵 IFGain:Low	Trig: Free Run #Atten: 30 dB	Avg Type: Log	-Pwr	TRACE 1 2 3 4 TYPE MWWWW DET P P P P
dB/div Ref	0ffset 0.5 dB 8.82 dBm				Mkr2 2.480 1) 160 GF .282 dB
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nter 2.47950 es BW 30 kH		#VBV	/ 100 kHz		Spai Sweep 3.200 m	n 3.000 MH Is (1001 pt
MODE TRC SCL N 1 f N 1 f	× 2.479 164 G 2.480 160 G			FUNCTION WIDTH	FUNCTION VALUE	
N 1 T	2.480 160 G	HZ 1.28 C	вт			
						>



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8. BANDWIDTH TEST

8.1 LIMIT

FCC Part15 15.247,Subpart C						
Section Test Item Limit FrequencyRange (MHz) Result						
15.247 (a)(1)	Bandwidth	N/A	2400-2483.5	PASS		

Spectrum Parameter	Setting		
Attenuation	Auto		
Span Frequency	> Measurement Bandwidth or Channel Separation		
RB	30 kHz (20dB Bandwidth) / 30 kHz (Channel Separation)		
VB	100 kHz (20dB Bandwidth) / 100 kHz (Channel Separation)		
Detector	Peak		
Trace	Max Hold		
Sweep Time	Auto		

8.2 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.

b. Spectrum Setting: RBW= 30KHz, VBW=100KHz, Sweep time = Auto.

8.3 TEST SETUP



8.4 EUT OPERATION CONDITIONS

Please refer to section 3.1.4 of this report.



8.5 TEST RESULTS

Temperature:	25℃	Relative Humidity:	50%
Test Mode:	GFSK/π/4-DQPSK/8DPSK	Test Voltage:	DC 3.85V

Modulation	Frequency (MHz)	-20 dB Bandwidth (MHz)	Result
	2402	1.0550	Pass
GFSK	2441	1.0540	Pass
	2480	1.0380	Pass
	2402	1.319	Pass
π/4DQPSK	2441	1.315	Pass
	2480	1.305	Pass
8DPSK	2402	1.304	Pass
	2441	1.299	Pass
	2480	1.293	Pass





CH00 -1Mbps



CH39 -1Mbps

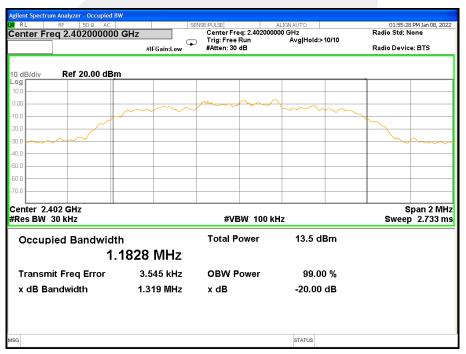




CH78 -1Mbps



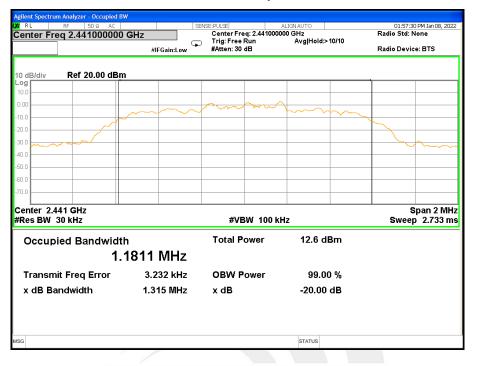
CH00 -2Mbps



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CH39 -2Mbps



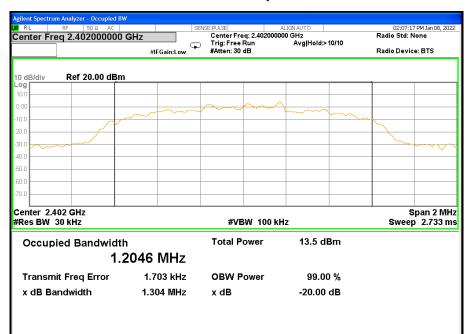
CH78 -2Mbps



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CH00 -3Mbps



CH39 -3Mbps

STATUS



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CH78 -3Mbps



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9. OUTPUT POWER TEST

9.1 LIMIT

FCC Part 15.247,Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
		1 W or 0.125W		
15.247 (a)(1)&(b)(1)	Output Power	if channel separation > 2/3 bandwidthprovided thesystems operatewith an output power no greater than125 mW(20.97dBm)	2400-2483.5	PASS

9.2 TEST PROCEDURE

This is an RF-conducted test to evaluate maximum peak output power. Use a direct connection between the antenna port of the unlicensed wireless device and the spectrum analyzer, through suitable attenuation. The hopping shall be disabled for this test:

- a) Use the following spectrum analyzer settings:
- 1) Span: Approximately five times the 20 dB bandwidth, centered on a hopping channel.
- 2) RBW > 20 dB bandwidth of the emission being measured.
- 3) VBW \geq RBW.
- 4) Sweep: Auto.
- 5) Detector function: Peak.
- 6) Trace: Max hold.
- b) Allow trace to stabilize.
- c) Use the marker-to-peak function to set the marker to the peak of the emission.

d) The indicated level is the peak output power, after any corrections for external attenuators and cables.

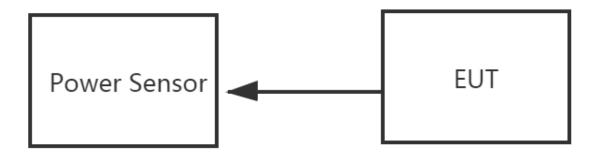
e) A plot of the test results and setup description shall be included in the test report.

NOTE—A peak responding power meter may be used, where the power meter and sensor system video bandwidth is greater than the occupied bandwidth of the unlicensed wireless device, rather than a spectrum analyzer.

PKPM1 Peak power meter method:

The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DSS bandwidth and shall use a fast-responding diode detector.

9.3 TEST SETUP



9.4 EUT OPERATION CONDITIONS

Please refer to section 3.1.4 of this report.

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9.5 TEST RESULTS

Temperature:	25°C	Relative Humidity:	60%
Test Voltage:	DC 3.85V		

Modulation	Frequency (MHz)	Peak Power (dBm)	Average Power (dBm)	Limit (dBm)
GFSK (1M)	2402	7.48	5.67	20.97
	2441	6.34	4.58	20.97
	2480	5.92	4.22	20.97
π/4-DQPSK (2M)	2402	7.25	3.93	20.97
	2441	6.13	2.73	20.97
	2480	5.67	2.13	20.97
8-DPSK (3M)	2402	7.18	3.97	20.97
	2441	6.04	2.76	20.97
	2480	5.68	2.06	20.97



10. ANTENNA REQUIREMENT

10.1 STANDARD REQUIREMENT

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.

10.2 EUT ANTENNA

The EUT antenna is PIFA Antenna. It comply with the standard requirement.



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APPENDIX-PHOTOS OF TEST SETUP

Note: See test photos in setup photo document for the actual connections between Product and support equipment.

* * * * * END OF THE REPORT * * * * *



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