



For Hopping Band edge

GFSK

	RF 50 Ω	AC .	SENSE: II	TI	ALIGN AUTO		07:26:12 PMDec 04
enter F	req 2.35150	PN	0: Fast 😱 Trig ain:Low #At	g: Free Run ten: 30 dB	Avg Type: I	-	TRACE 1 2 3 TYPE M WAA DET P P P
dB/div	Ref Offset 0.9 Ref 16.05					Mkr	1 2.401 970 G 6.051 dl
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95							
1.0							-13.9
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l.0							
1.0							
							Stop 2.40300 (
)000 GHz 100 kHz		#VBW 30	0 kHz		Sweep	9.87 ms (1001
Res BW R MODE H N 1 N 1 N 1 N 1 N 1	100 kHz RC SCL f f	X 2.401 970 GHz 2.390 022 GHz 2.400 013 GHz	#VBW 30 6.051 dBm -57.589 dBm -44.943 dBm		FUNCTION WIDTH		
tes BW N 1 N 1 N 1 N 1 N 1	100 kHz RC SCL f f	2.401 970 GHz 2.390 022 GHz	6.051 dBm -57.589 dBm		FUNCTION WIDTH		9.87 ms (1001
tes BW N 1000 11 N 1 N 1 N 1 N 1 N 1 N 1 N 1	100 kHz RC SCL f f	2.401 970 GHz 2.390 022 GHz	6.051 dBm -57.589 dBm		FUNCTION WIDTH		9.87 ms (1001
R MODE 11 N 1 N 1 N 1 N 1 N 1	100 kHz RC SCL f f	2.401 970 GHz 2.390 022 GHz	6.051 dBm -57.589 dBm		FUNCTION WIDTH		9.87 ms (1001



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Page 40 of 76 Report No.: STS2011178W02

Temperature:	25 ℃	Relative Humidity:	50%
	π/4-DQPSK(2Mbps)– 00/39/78 CH	Test Voltage:	DC 3.7V

L		n <mark>Analyz</mark> RF	50Ω A			SENSE:INT	ALIGN AU	ITO	07:51:5	7 PMDec 04, 2
rker	12			000 GHz	PNO: Fast C	Trig: Free Ru #Atten: 30 dB	A\ n	vg Type: Log-Pwr	Т	TYPE MWWW DET P P P P
dB/div			′set0.5 dE 5.75 dBi							.477 GI 920 dB
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										-13.87
\vdash										
			$\langle \rangle^2$	3				man	-	manne
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-										
rt 30 es B		lz 00 kH	z		#V	BW 300 kHz		· ·	Stop Sweep 2.39	25.00 G s (1001 p
N N N N	1 1 1 1	f f f f		× 2.477 GHz 3.176 GHz 5.873 GHz 24.750 GHz	z -56.09 z -58.27	FUNCTIO 0 dBm 6 dBm 3 dBm 3 dBm	IN FUNCTION W	DTH	FUNCTION VALUE	
				24 30 0112						

00 CH

30	CH
23	OL

	RF	50 Ω AC			SENSE:INT		ALIGN AUTO		06:12:4	4 PMDec 04,
nter	Freq 12	2.5150000	Р	NO: Fast 🕞	Trig: Free #Atten: 30	Run dB	Аvg Тур	e: Log-Pwr		TYPE MWWW DET P P P
IB/div		offset 0.5 dB 14.28 dBm							Mkr1 2 4.	.452 G 891 di
		1								
-										
										-14.23
				•						
	thempson and a second			No. and the second second	and a second second	Anna Marine Andrews	manner	Lol Month	mand	
-	Burger and the second	- Contraction		and the first of the second						
⊢										
) MHz W 100 ki	H7		#VB	W 300 kH;	,		s	Stop weep 2.39 s	25.00 G
_	TRC SCL		X				INCTION WIDTH		FUNCTION VALUE	
	1 f 1 f		2.452 GHz 3.151 GHz 7.471 GHz	4.891 -55.378 -56.011 -48.305	dBm dBm					
	1 f 1 f		24.451 GHz	-48.305	авт					
N N	1 f		24.451 GHz	-48.305	aBm					
NN	1 f		24.451 GHz	-48.305	abm					



78 CH

	50 Ω AC	SENSE:INT	ALI	GNAUTO			17 PMDec 04, 2
enter Freq 12.5	15000000 GHz P IFC	NO: Fast 🖵 Trig: Fi Gain:Low #Atten:	ree Run 30 dB	Avg Type:	Log-Pwr		RACE 1 2 3 4 TYPE M WAAAAA DET P P P P
Ref Offse dB/div Ref 15.						Mkr1 2 5.	.477 GI 657 dB
9 1							
34							-13.96
.3							
3							
.3	2 _3						(
3 were when the strange	manage and an and	Why have not any man	a marken was a south	and the second second	an the second second	and the second s	and the second
.3							
						0 4	05.00.0
art 30 MHz es BW 100 kHz		#VBW 300 k	Hz		Sw	eep 2.39	25.00 G s (1001 p
R MODE TRC SCL	×		FUNCTION FUNCTI	ON WIDTH	FL	NCTION VALUE	
N 1 f N 1 f	2.477 GHz 3.051 GHz	5.657 dBm -55.920 dBm					
N 1 f	5.648 GHz 24.426 GHz	-55.871 dBm -48.485 dBm					
5 5							
1							
(

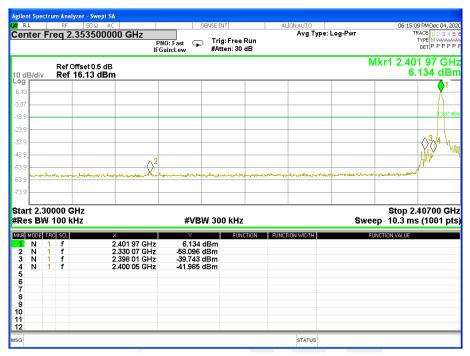


Shenzhen STS Test Services Co., Ltd.





For Band edge(it's also the reference level for conducted spurious emission)



00 CH

39 CH



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78 CH

		Analyze RF	50 Ω A	C	SE	NSE:INT		ALIGN AUTO		06:04	:47 PMDec 04, 2
nter	Fre	q 2.48	375000		PNO: Fast 😱 Gain:Low	Trig: Free #Atten: 30	Run dB	Avg Type	: Log-Pwr		TRACE 1 2 3 4 TYPE M WWWW DET P P P P
dB/div			et 0.5 dB .04 dBr						N	1kr1 2.47 6	9 850 GI 6.040 dB
				1							
6			س								
											-13.96
			~								
	۸A	~~~~	1	La la							
Nº 1					V WWW						
					Y	mon	www.www.ww	mannen	www.	montimum	Munna
		00 GHz 00 kHz			#VBW	/ 300 kHz			Sw	Stop 2 eep 2.40 m	2.50000 GI 1s (1001 p
	TRC			×	Y		CTION FUN	CTION WIDTH		FUNCTION VALUE	
N	1	f		.479 850 GHz .483 500 GHz	6.040 d -48.134 d						
N	1	f	2	.484 000 GHz	-44.397 d	Bm					
Ν	1	f	2	.495 600 GHz	-57.982 d	Bm					



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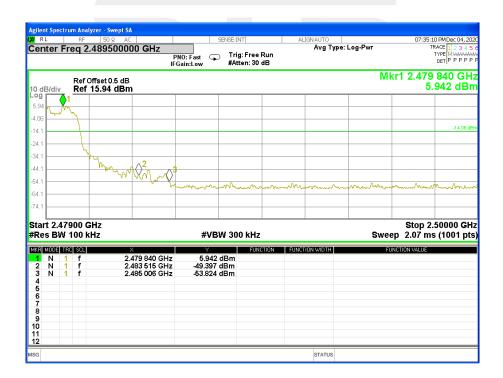




For Hopping Band edge

$\pi/4$ -DQPSK

Agilent Spectr	um Ana RF	alyzer - Swept S/							07.00.5	D110 04 000
		2.3515000	00 GHz	PNO: Fast Gain:Low	SENSE:INT Trig: Free #Atten: 30	Run	ALIGNAUTO Avg Type	_	TR 1	ACE 1 2 3 4 5 YPE M WAAWAA DET P P P P P
10 dB/div		Offset 0.5 dB 15.86 dBn						M	kr1 2.403 5.	000 GH: 856 dBn
5.86										1
4.14										-14.14 dB
24.1 34.1										
44.1 54.1										NMX
54.1		man man ha	Page-American and an internet	mohnumber	month would	monthean	ndumentation	and and the anti-	Marles Mar	whit
74.1		0.1-							Ot ers 0	
Res BW				#VB	W 300 kHz			Swe	ep 9.87 ms	10300 GH (1001 pt
KE MODE TH 1 N 1 2 N 1 3 N 1 4	f	2.	× 403 000 GHz 390 022 GHz 400 013 GHz	5.856 -57.099 -41.913	dBm dBm	CTION FUN	CTION WIDTH	F	FUNCTION VALUE	
4 5 6 7 8										
9 0 1 2										
ŝG							STATUS			



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Page 45 of 76 Report No.: STS2011178W02

Temperature:	25 ℃	Relative Humidity:	50%
Test Mode:	8DPSK(3Mbps) -00/39/78 CH	Test Voltage:	DC 3.7V

00 CH

ilent Spectrum Analyzer RL RF	- Swept SA 50 Ω AC	SENSE:INT	ALIGN AUTO		06:30:39 PMDec 04
enter Freq 12.5	15000000 GHz	PNO: Fast Trig: Fr Gain:Low #Atten:	Avg T ee Run	ype: Log-Pwr	TRACE 1 2 3 TYPE M WW DET P P P
	et 0.5 dB 42 dBm				Mkr1 2.402 G 1.424 dl
.42 1					
.58					-13.9
8.6					
3.6					
B.6	2 ^3			-	
B.6 - Martine Mart	Marrow and	Law man	water and when a marked your	www.werell.come.usernes	- and and the and
8.6					
8.6					
tart 30 MHz Res BW 100 kHz		#VBW 300 kl	łz	S	Stop 25.00 C weep 2.39 s (1001
KR MODE TRC SCL	×		UNCTION FUNCTION WIDTH		UNCTION VALUE
1 N 1 f 2 N 1 f 3 N 1 f 4 N 1 f 5	2.402 GHz 3.151 GHz 6.972 GHz 24.351 GHz	1.424 dBm -55.335 dBm -56.329 dBm -47.714 dBm			
5 5 7 3					
0 1 2					

39 CH

Ref Offset 0.5 dB Mkr 0 dB/div Ref 15.51 dBm Mkr 245 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49 4.49	:33:32 PMDec 04,
OBJGU Ref 15.51 dBm 9 1 45 1 45 1 45 1 45 1 45 1 45 1 45 1 45 1 45 1 45 1 45 1 45 1 45 1 45 1 45 1 45 1 45 1 45 1 45 1 45 1 45 1 45 1 45 1 45 1 45 1 46 1 47 1 48 1 49 1 40 1 50 1 50 1 51 1 51 1 51 1 51 1 51 1 51 1 51 1 51 1 51 1 51 1 <tr< th=""><th>TRACE 1 2 3 4 TYPE M WWW DET P P P F</th></tr<>	TRACE 1 2 3 4 TYPE M WWW DET P P P F
61 1 1 1 1 43 1 1 1 1 44 1 1 1 1 45 1 1 1 1 46 1 1 1 1 47 1 1 1 1 48 1 1 1 1 49 1 1 1 1 49 1 1 1 1 40 1 1 1 1 40 1 1 1 1 40 1 1 1 1 40 1 1 1 1 40 1 1 1 1 40 1 1 1 1 40 1 1 1 1 41 1 1 1 1 42 1 1 1 1 43 1 1 1 1 44 1 1 1 1 45 1 1 1 1 48 1 1 1 50 1 1	1 2.452 G 5.514 dE
5 1 1 1 1 1 6 1 1 1 1 1 6 1 1 1 1 1 6 1 1 1 1 1 6 1 1 1 1 1 6 1 1 1 1 1 6 1 1 1 1 1 6 1 1 1 1 1 7 1 1 1 1 1 8 1 1 1 1 1 7 24.675 GHz 48.018 dBm 1 1	
5 5 5 5 5 5 5 5 5 5 5 5 5 5	-14.34
Image: Science of the scienc	
5 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	
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art 30 MHz es BW 100 kHz #VBW 300 kHz Sweep 2 M008 T60 SCL X Y FUNCTION	
es BW 100 kHz #VBW 300 kHz Sweep 2. N 1 f 2.452 GHz 5.514 dBm N 1 f 3.401 GHz 5.5986 dBm N 1 f 6.372 GHz 56.637 dBm N 1 f 2.4.675 GHz 48.018 dBm	
N 1 f 2.452 GHz 5.514 dBm N 1 f 3.401 GHz -55.986 dBm N 1 f 6.372 GHz -56.637 dBm N 1 f 24.675 GHz -48.018 dBm	top 25.00 G 39 s (1001 p
	UE
status	



78 CH

	RF 50 Ω		SENSE	EINT	ALIGN AUTO			3 PM Dec 04, 2
arker 1 2.	477060000	PN	0: Fast 🖵 T ain:Low #	rig: Free Run Atten: 30 dB	Avg Ty	pe: Log-Pwr		ACE 1 2 3 4 TYPE M WWWW DET P P P P
dB/div	tef Offset 0.5 d Ref_15.00 dE						Mkr1 2. 5.	477 GI 259 dB
9	1							
0								-14.12
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0								
.0	2	3					4 4	مربع ما ا
0	and and have	www.l.	manshame	monorman	monenter	Marthan probability	and a sec	ann an an ann an an an an an an an an an
.0								
art 30 MH: tes BW 10			#VBW 3	00 kHz		s	Stop weep 2.39 s	25.00 GI (1001 p
R MODE TRC 8		X	Y 5 of a life	FUNCTION	FUNCTION WIDTH		FUNCTION VALUE	
N 1	f f f	2.477 GHz 3.301 GHz 5.973 GHz 21.604 GHz	5.259 dBn -55.777 dBn -56.415 dBn -49.270 dBn	1 1				
I I I I I I I I								
2								



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For Band edge(it's also the reference level for conducted spurious emission)



00 CH

39 CH



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78 CH

RL RF	50 Ω AC	SENSE:INT	ALIGN AL			MDec 04, 2
nter Freq 2.	487500000 GHz	PNO: Fast 🖵 Trig: F IFGain:Low #Atten	ree Run	vg Type: Log-Pwr	Τì	CE 1 2 3 4 PE M WAAA ET P P P P
B/div Ref	offset 0.5 dB 15.88 dBm			Μ	kr1 2.479 8 5.8	350 GI 75 dB
8	1					
2	Y					
						-14.12
and	~ ~					
www.		WWW mann			↓ ⁴	
			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	and a fail of a shall a faith a faith	Maria Manana	الماسالياتين
rt 2.47500 G s BW 100 k		#VBW 300 k	Hz	Swe	Stop 2.5 ep 2.40 ms	0000 G (1001 p
MODE TRC SCL	×		FUNCTION FUNCTION W		UNCTION VALUE	
N 1 f	2.479 850 GH 2.483 500 GH	z -47.692 dBm				
N 1 f	2.484 000 GH					
	2.495 000 GH					
N 1 f N 1 f	2.495 000 GH					
N 1 f N 1 f	2.495 000 GH					
N 1 f N 1 f	2.495 000 GH					
N 1 f N 1 f	2.496 000 GH					



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## For Hopping Band edge

8DPSK

	RF 50	DQ AC	SEI	NSE:INT	ALIGN AUTO		07:41:06	PMDec 04, 2
nter l	Freq 2.351	500000 GHz	PNO: Fast 😱 FGain:Low	Trig: Free Run #Atten: 30 dB	Avg Typ	e: Log-Pwr	T	ACE 1 2 3 4 YPE M WAAW DET P P P P
dB/div	Ref Offset Ref 16.04					M	kr1 2.401 ( 6.0	970 GI )38 dB
g								
96								
.0								-13.96
.0								
.0								
.0								- MN
.0			and a second second second	allen and a starter of	man way and a second	and a second second	² ²	
.0	and the second	-house and the second	And a state of a second se	Ale and a second se	No. March 1000 per			
.0								
art 2.3	30000 GHz					-	Stop 2.4	
			#\/D\M	200 643				
les BV	V 100 kHz	×		300 kHz	FUNCTION WIDTH		ep 9.87ms	(1001 þ
es BV		× 2.401 970 GHz 2.390 022 GHz 2.400 013 GHz	6.038 df	FUNCTION Bm 3m	FUNCTION WIDTH		eep 9.87 ms	(1001 þ
es BV N N N N	V 100 kHz 160 sci 1 f 1 f	2.401 970 GHz 2.390 022 GHz	6.038 df	FUNCTION Bm 3m	FUNCTION WIDTH			(1001 þ
es BV	V 100 kHz 160 sci 1 f 1 f	2.401 970 GHz 2.390 022 GHz	6.038 df	FUNCTION Bm 3m	FUNCTION WIDTH			(1001 þ
tes BV	V 100 kHz 160 sci 1 f 1 f	2.401 970 GHz 2.390 022 GHz	6.038 df	FUNCTION Bm 3m	FUNCTION WIDTH			(1001 p
N N N N	V 100 kHz 160 sci 1 f 1 f	2.401 970 GHz 2.390 022 GHz	6.038 df	FUNCTION Bm 3m	FUNCTION WIDTH			(1001 p
es BV	V 100 kHz 160 sci 1 f 1 f	2.401 970 GHz 2.390 022 GHz	6.038 df	FUNCTION Bm 3m	FUNCTION WIDTH			

	50Ω AC		SENSE:INT	ALIGN AUTO		07:43:20 PM Dec 04
iter Freq 2.	489500000 GHz	PNO: Fast C IFGain:Low	<ul> <li>Trig: Free Run</li> <li>#Atten: 30 dB</li> </ul>	Avg Type	: Log-Pwr	TRACE 1 2 3 TYPE MWW DET P P P
B/div Ref	offset 0.5 dB 15.87 dBm				M	kr1 2.480 008 G 5.865 dl
We have have						
						-14.1
- N						
	manden	A () ³				
		Verman	when man	mmmm	an markon	wown ho have how how how
	47					Stop 2.50000 0
		#V	BW 300 kHz		Swe	ep 2.07 ms (1001
es BW 100 ki Mode tec scl	Hz	Y	FUNCTION	FUNCTION WIDTH		
N 1 F N 1 F	Hz 2.480 008 0 2.483 515 0	GHz 5.86 GHz -48.80	FUNCTION 55 dBm 3 dBm	FUNCTION WIDTH		ep 2.07 ms (1001
N 1 F	Hz 2.480 008 0	GHz 5.86 GHz -48.80	FUNCTION 55 dBm	FUNCTION WIDTH		ep 2.07 ms (1001
N 1 F N 1 F	Hz 2.480 008 0 2.483 515 0	GHz 5.86 GHz -48.80	FUNCTION 55 dBm 3 dBm	FUNCTION WIDTH		ep 2.07 ms (1001
N 1 f N 1 f	Hz 2.480 008 0 2.483 515 0	GHz 5.86 GHz -48.80	FUNCTION 55 dBm 3 dBm	FUNCTION WIDTH		ep 2.07 ms (1001
ESBW 100 K	Hz 2.480 008 0 2.483 515 0	GHz 5.86 GHz -48.80	FUNCTION 55 dBm 3 dBm	FUNCTION WIDTH		ep 2.07 ms (1001
SBW 100 k N 1 f N 1 f	Hz 2.480 008 0 2.483 515 0	GHz 5.86 GHz -48.80	FUNCTION 55 dBm 3 dBm	FUNCTION WIDTH		ep 2.07 ms (1001

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## 5. NUMBER OF HOPPING CHANNEL

5.1 LIMIT

FCC Part 15.247,Subpart C							
Section	Test Item	Limit	FrequencyRange (MHz)	Result			
15.247 (a)(1)(iii)	Number of Hopping Channel	≥15	2400-2483.5	PASS			

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	> Operating FrequencyRange
RB	300KHz
VB	300KHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

### 5.2 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= 300KHz, VBW=300KHz, Sweep time = Auto.
- 5.3 TEST SETUP



## 5.4 EUT OPERATION CONDITIONS

Please refer to section 3.1.4 of this report.



### 5.5 TEST RESULTS

Temperature:	<b>25</b> ℃	Relative Humidity:	60%
Test Mode:	Hopping Mode -GFSK Mode	Test Voltage:	DC 3.7V

# Number of Hopping Channel

79

# Hopping channel

		RF 5	OΩ AC			SENSE:	NT	A	LIGN AUTO		07:23:5	57 PMDec 04, 2
ente	er Fre	q 2.441	75000		PNO: Fast IFGain:Low		g: Free R ten: 30 di	un 3	Avg Type:	Log-Pwr		RACE 1 2 3 4 TYPE MWWA DET P P P P
0 dB/		Ref Offset Ref 16.4								Mkr	2 2.479 9	09 5 GI 6.10 dB
^{og} Γ	<>1		<u> </u>									2
3.43 - 3.57 -	MW	WWW	WW	WWW	mm	MMM	mm	mm	www	mmm	mmm	MMM
13.6		· · · · ·							1			
3.6												
13.6 13.6												
3.6												
3.6												
3.6												
3.6												
3.6												
Res	BW 30					#VBW 30					ep 1.13 m	.48350 G s (1001 p
1 N	IDE TRC J 1 J 1	f		2 171 0 GHz		6.29 dBm	FUNCT	ON FUNC	CTION WIDTH	F	UNCTION VALUE	
	4 1	f	2.47	9 909 5 GHz	·	6.10 dBm						
2 N 3												
2 N 3 4												
2 N 3 4 5												
2 N 3 4 5 6 7 8												
2 N 3 4 5 6 7 8 9												
2 N 3 4 5 6 7 8												

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# 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:	<b>25</b> ℃	Relative Humidity:	50%
Test Mode:	GFSK(1Mbps)-DH1/DH3/DH5	Test Voltage:	DC 3.7V

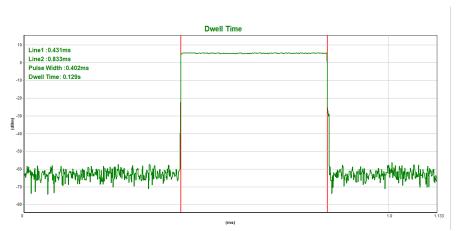
Data Packet	Channel	pulse time(ms)	Dwell Time(s)	Limits(s)
DH1	middle	0.402	0.129	0.4
DH3	middle	1.663	0.266	0.4
DH5	middle	2.908	0.310	0.4



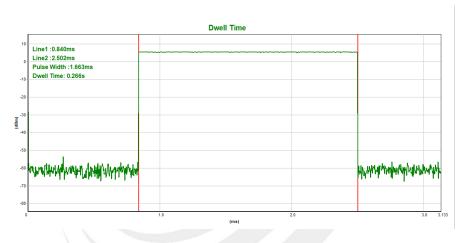
П



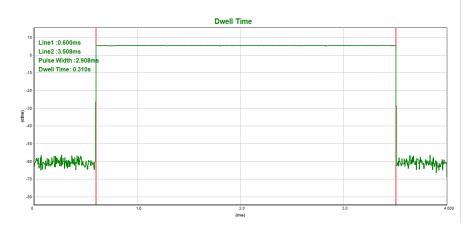
### CH39-DH1



### CH39-DH3







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Page 55 of 76 Report No.: STS2011178W02

Temperature:	<b>25</b> ℃	Relative Humidity:	50%
	π/4-DQPSK(2Mbps)– 2DH1/2DH3/2DH5	Test Voltage:	DC 3.7V

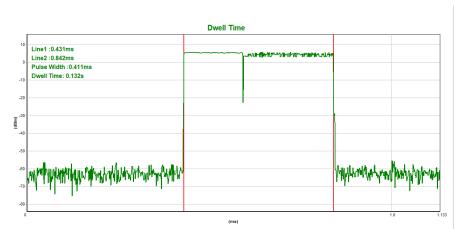
Data Packet	Channel	pulse time(ms)	Dwell Time(s)	Limits(s)
2DH1	middle	0.411	0.132	0.4
2DH3	middle	1.664	0.266	0.4
2DH5	middle	2.914	0.311	0.4



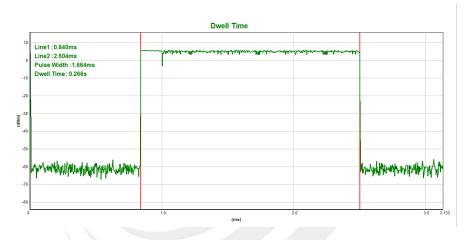
Shenzhen STS Test Services Co., Ltd.



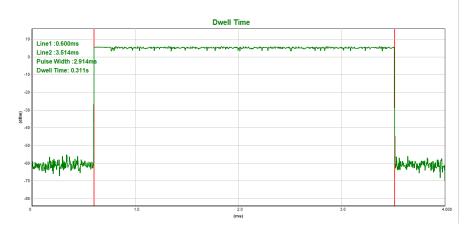
#### CH39-2DH1











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Page 57 of 76 Report No.: STS2011178W02

Temperature:	<b>25</b> ℃	Relative Humidity:	50%
	8DPSK(3Mbps)– 3DH1/3DH3/3DH5	Test Voltage:	DC 3.7V

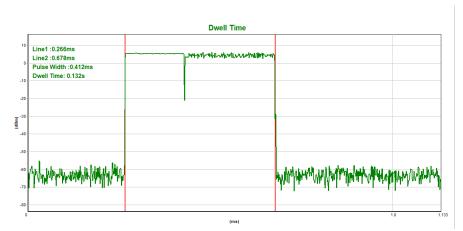
Data Packet	Channel	pulse time(ms)	Dwell Time(s)	Limits(s)
3DH1	middle	0.412	0.132	0.4
3DH3	middle	1.665	0.266	0.4
3DH5	middle	2.916	0.311	0.4



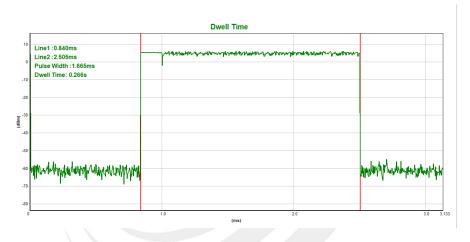
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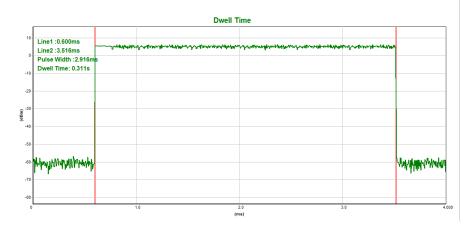
### CH39-3DH1



### CH39-3DH3



#### CH39-3DH5



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## 7. HOPPING CHANNEL SEPARATION MEASUREMEN

7.1 LIMIT

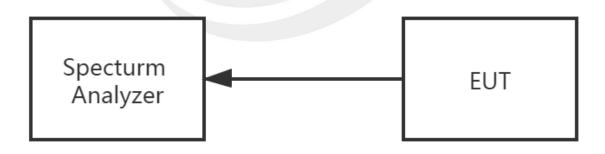
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that 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℃	Relative Humidity:	50%
	CH00 / CH39 / CH78 (GFSK(1Mbps) Mode)	Test Voltage:	DC 3.7V

Frequency	Mark1 Frequency (MHz)	Mark2 Frequency (MHz)	Ch. Separation (MHz)	Limit (MHz)	Result
2402 MHz	2402.002	2403.001	0.999	0.827	Complies
2441 MHz	2441.002	2442.001	0.999	0.832	Complies
2480 MHz	2479.002	2480.001	0.999	0.828	Complies

For GFSK: Ch. Separation Limits: > 20dB bandwidth

### CH00 -1Mbps

L	RF 50	Ω AC	SENSE:If	TI	ALIGNAUTO		05:52:46 PMDec 04
nter F	req 2.402			j: Free Run ten: 30 dB	Avg Type: Log	-Pwr	TRACE 1 2 3 TYPE MWAA DET P P P
IB/div	Ref Offset Ref 16.04					Mkr2	2.403 001 0 6.060 d
			$\sqrt{1}$		2		
		$\sim$	~~		$\sim\sim$	~	
			2	~~~~	~	$\mathcal{N}$	
		~		~		`	m
	M						Mar North
$\sim$	~~~~						
s BW	402500 GH 30 kHz	z	#VBW 10			-	Span 3.000   3.20 ms (1001
NODE T		× 2.402 002 GHz	۲ 6.06 dBm	FUNCTION FU	NCTION WIDTH	FUNCT	ION VALUE
N 1		2.402 002 GHz					

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#### CH39 -1Mbps



#### CH78 -1Mbps



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Page 62 of 76 Report No.: STS2011178W02

Temperature:	25℃	Relative Humidity:	50%
	CH00 / CH39 / CH78 (π/4-DQPSK(2Mbps) Mode)	Test Voltage:	DC 3.7V

Frequency	Mark1 Frequency (MHz)	Mark2 Frequency (MHz)	Ch. Separation (MHz)	Limit (MHz)	Result
2402 MHz	2402.002	2403.001	0.999	0.811	Complies
2441 MHz	2441.002	2442.001	0.999	0.810	Complies
2480 MHz	2479.005	2480.001	0.996	0.811	Complies

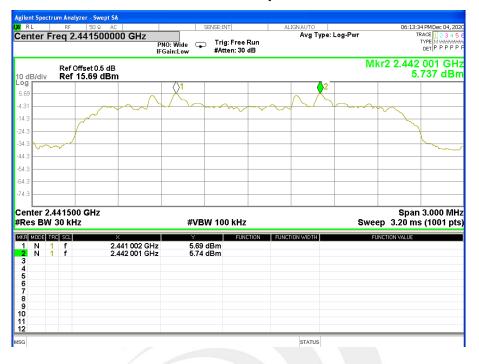
## For $\pi$ /4-DQPSK(2Mbps): Ch. Separation Limits: > two-thirds 20dB bandwidth

RL	RF 50 9		SENSE:IN	T	ALIGNAUTO			PMDec 04,2
enter F	req 2.4025			j: Free Run ten: 30 dB	Avg Type:	Log-Pwr	TRA T` I	CE 1 2 3 4 PE MWWW DET P P P P
dB/div	Ref Offset 0 Ref 16.04					Mk	r2 2.403 ( 6.1	001 GI 40 dB
04			<b>⊘</b> 1		2			
96			$\Delta$		$\Lambda_{\circ}$			
	~			m	~~~~~		$\sim$	
	6						~	
1.0							Ì	
	mont							- Am
.0					_			
L0								
1.0								
1.0								
	402500 GHz 30 kHz		#VBW 10	) kHz		Swee	Span 3 p 3.20 ms	3.000 M (1001 p
R MODE T		×	Y	FUNCTION	JNCTION WIDTH	FUN	ICTION VALUE	
	1 f 1 f	2.402 002 GHz 2.403 001 GHz	6.04 dBm 6.14 dBm					
3		2.100 001 0112						
l 5								
5 7								
3								
3								
)								

#### CH00 -2Mbps



#### CH39 -2Mbps



#### CH78 -2Mbps



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Page 64 of 76 Report No.: STS2011178W02

Temperature:	25℃	Relative Humidity:	50%
	CH00 / CH39 / CH78 (8DPSK(3Mbps)Mode)	Test Voltage:	DC 3.7V

Frequency	Mark1 Frequency (MHz)	Mark2 Frequency (MHz)	Ch. Separation (MHz)	Limit (MHz)	Result
2402 MHz	2401.999	2403.001	1.002	0.793	Complies
2441 MHz	2441.002	2442.001	0.999	0.803	Complies
2480 MHz	2479.002	2480.001	0.999	0.805	Complies

For 8DPSK(3Mbps):Ch. Separation Limits: > two-thirds 20dB bandwidth

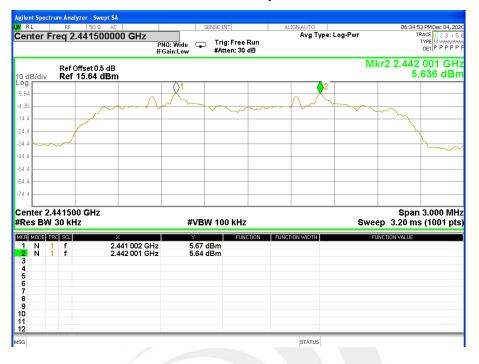
CH00 -3Mbps

	50 Ω AC	SENSE:INT	ALIGN AUTO	06:31:42 PMDec 04, 20
Center Frea 2	.402500000 GHz		Avg Type: Log-Pw	
		PNO:Wide 🕞 Trig:Freel		DET P P P F
	I	FGain:Low #Atten: 30	dB	DETIPPPP
				Mkr2 2.403 001 GH
	Offset 0.5 dB			6.061 dB
0 dB/div Ref	16.08 dBm			0.001 0.01
6.08		$\nabla^{1}$	<b>2</b>	
	$\land$			
3.92	- marine 1			
13.9				
23.9				
13.9				Ν.
man				U.C.
3.9				
53.9				
39				
73.9				
				O
		#1/DW 400 LUL		Span 3.000 MI
		#VBW 100 kHz		Span 3.000 MI Sweep 3.20 ms (1001 pt
Res BW 30 kH			CTION FUNCTION WIDTH	Span 3.000 MI Sweep 3.20 ms (1001 pt FUNCTION VALUE
Res BW 30 kH KR MODE TRO SOL 1 N 1 f	1z × 2.401 999 GHz	Y FUNG		Sweep 3.20 ms (1001 pt
Res BW 30 kH KR MODE TRO SCL 1 N 1 f 2 N 1 f	1z ×	Y FUNG		Sweep 3.20 ms (1001 pt
Res BW 30 kH KR 1000 TRO SCL 1 N 1 f 2 N 1 f 3	1z × 2.401 999 GHz	Y FUNG		Sweep 3.20 ms (1001 pt
Res BW 30 kH KR MOOSING SCU 1 N 1 f 2 N 1 f 3 4	1z × 2.401 999 GHz	Y FUNG		Sweep 3.20 ms (1001 pt
Res BW 30 kH KR MOOS TRO SCU 1 N 1 f 2 N 1 f 3 4 5 6	1z × 2.401 999 GHz	Y FUNG		Sweep 3.20 ms (1001 pt
Res         BW         30 kl           1         N         1         f           2         N         1         f           3         4         5         6           7         7         7         7	1z × 2.401 999 GHz	Y FUNG		Sweep 3.20 ms (1001 pt
2 N 1 f 3 4 5 5 6 7 8	1z × 2.401 999 GHz	Y FUNG		Span 3.000 Mi Sweep 3.20 ms (1001 pi Function value
Res         BW         30 kH           1         N         1         f           2         N         1         f           3         4         5         6           7         7         7         7	1z × 2.401 999 GHz	Y FUNG		Sweep 3.20 ms (1001 pt
Res         BW         30 kl           1         N         1         f           2         N         1         f           3         -         -         f           4         -         -         -           5         -         -         -           6         -         -         -           7         -         -         -           9         -         -         -           1         -         -         -         -	1z × 2.401 999 GHz	Y FUNG		Sweep 3.20 ms (1001 pt
Res         BW         30 kl           1         N         1         f           2         N         1         f           3         -         -         -           4         -         -         -           5         -         -         -           6         -         -         -           7         -         -         -           8         -         -         -           9         0         -         -	1z × 2.401 999 GHz	Y FUNG		Sweep 3.20 ms (1001 pt

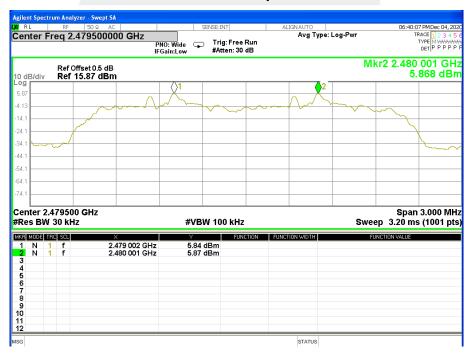
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#### CH39 -3Mbps



#### CH78 -3Mbps



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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°C	Relative Humidity:	50%
	GFSK(1Mbps) CH00 / CH39 / C78	Test Voltage:	DC 3.7V

Frequency	20dB Bandwidth (MHz)	Result
2402 MHz	0.8274	PASS
2441 MHz	0.8316	PASS
2480 MHz	0.8282	PASS

#### CH00 -1Mbps

gilent Spectrum Analyzer - Occupied BV RL RF 50 Ω AC		SENSE:INT	ALIGNAUTO	05:51:01 PMDec 04, 20
enter Freg 2.402000000	GHz	Center Freq: 2.402000	000 GHz	Radio Std: None
2.10200000		🕞 Trig: Free Run	Avg Hold:>10/10	
	#IFGain:Low	#Atten: 30 dB		Radio Device: BTS
Ref Offset 0.5 dB				
dB/div Ref 20.00 dBm				
og				
D.D				
00		$\sim$		
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.0				
m n				
0				
.0				
.0				
0				
enter 2.402 GHz				Span 2 M
Res BW 30 kHz		#VBW 100 k	Hz	Sweep 2.733 r
Occupied Bandwidth	ו	Total Power	12.9 dBm	
84	40.15 kHz			
Transmit Freq Error	6.071 kHz	OBW Power	99.00 %	
x dB Bandwidth	827.4 kHz	x dB	-20.00 dB	
	027.4 KHZ	X UD	-20.00 UB	
i			STATUS	

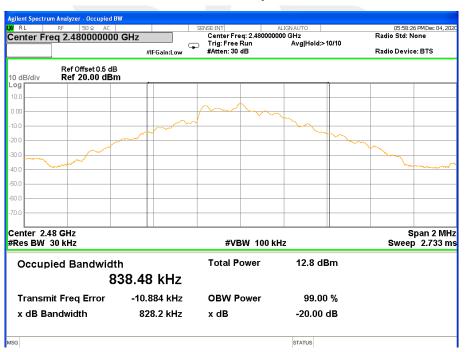
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#### CH39 -1Mbps



#### CH78 -1Mbps



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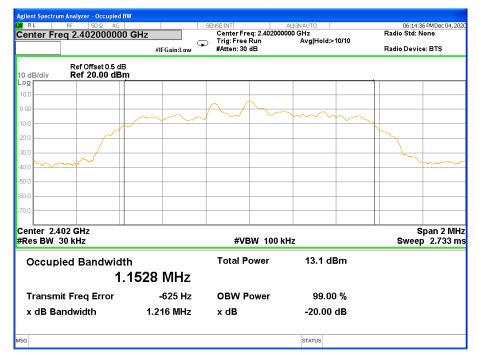


Page 69 of 76 Report No.: STS2011178W02

Temperature:	25℃	Relative Humidity:	50%
	π/4-DQPSK(2Mbps) CH00 / CH39 / C78	Test Voltage:	DC 3.7V

Frequency	20dB Bandwidth (MHz)	Result
2402 MHz	1.216	PASS
2441 MHz	1.215	PASS
2480 MHz	1.216	PASS

#### CH00 -2Mbps

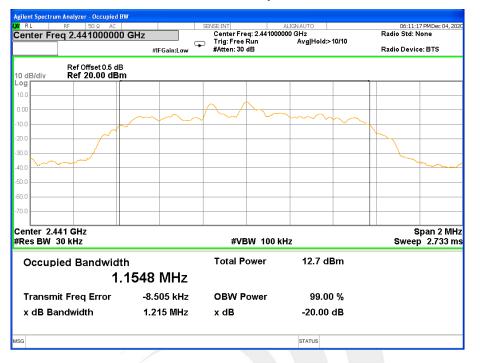


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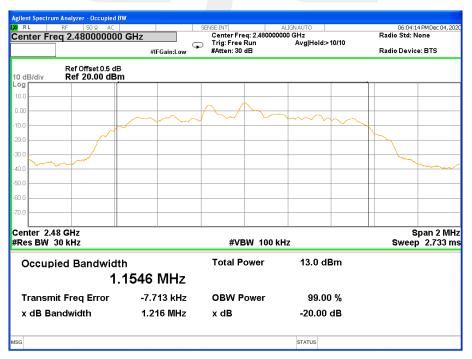
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#### CH39 -2Mbps



#### CH78 -2Mbps





Page 71 of 76 Report No.: STS2011178W02

Temperature:	25°C	Relative Humidity:	50%
	8DPSK(3Mbps) CH00 / CH39 / CH78	Test Voltage:	DC 3.7V

Frequency	20dB Bandwidth (MHz)	Result
2402 MHz	1.189	PASS
2441 MHz	1.204	PASS
2480 MHz	1.207	PASS

## CH00 -3Mbps

gilent Spectrum Analyzer - Occupied B\	N			
RL RF 50 Ω AC	GH7	SENSE:INT Center Freq: 2.402000	ALIGN AUTO	06:29:36 PMDec 04, 20 Radio Std: None
enter Freq 2.40200000	#IFGain:Low		Avg Hold:>10/10	Radio Device: BTS
	#IFGain:Low	WALLEN, SO UD		Radio Device. D15
Ref Offset 0.5 dB dB/div Ref 20.00 dBm				
0.0				
00		$\wedge$	~ ~	
.0			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	
.0				
.0				
.0				
.0				
enter 2.402 GHz Res BW 30 kHz		#VBW 100 k	H7	Span 2 Mi Sweep 2.733 r
				0wccp 2.7001
Occupied Bandwidt	h	Total Power	12.7 dBm	
1.1	1431 MHz			
Transmit Freq Error	17.333 kHz	OBW Power	99.00 %	
x dB Bandwidth	1.189 MHz	x dB	-20.00 dB	
3			STATUS	

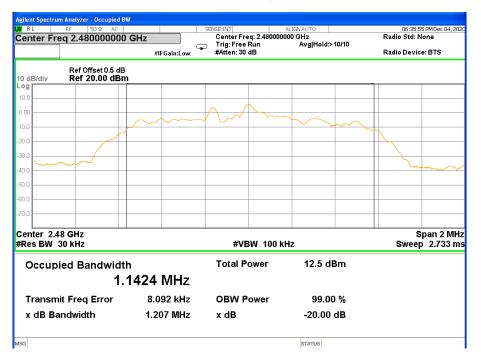
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#### CH39 -3Mbps



CH78 -3Mbps



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# 9. OUTPUT POWER TEST

### 9.1 LIMIT

FCC Part 15.247,Subpart C					
Section	Test Item	Limit	FrequencyRange (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.

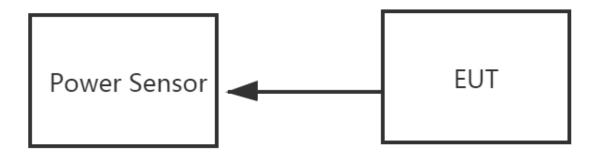
e) A plot of the test results and setup description shall be included in the test report.

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 3.7V		

Mode	Channel Number	Frequency (MHz)	Peak Power	Average Power	Limit
			(dBm)	(dBm)	(dBm)
GFSK(1M)	0	2402	6.25	4.77	30.00
	39	2441	6.13	4.65	30.00
	78	2480	6.05	4.60	30.00

Note: the channel separation >20dB bandwidth

Mode	Channel Number	Frequency (MHz)	Peak Power	Average Power	Limit
			(dBm)	(dBm)	(dBm)
π/4-DQPSK( 2M)	0	2402	7.36	3.54	20.97
	39	2441	7.24	3.44	20.97
	78	2480	7.17	3.36	20.97

Note: the channel separation >2/3 20dB bandwidth

Mode	Channel Number	Frequency (MHz)	Peak Power	Average Power	Limit
			(dBm)	(dBm)	(dBm)
8-DPSK(3M)	0	2402	7.63	3.53	20.97
	39	2441	7.48	3.46	20.97
	78	2480	7.45	3.35	20.97

Note: the channel separation >2/3 20dB bandwidth

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## 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 Chip 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.

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