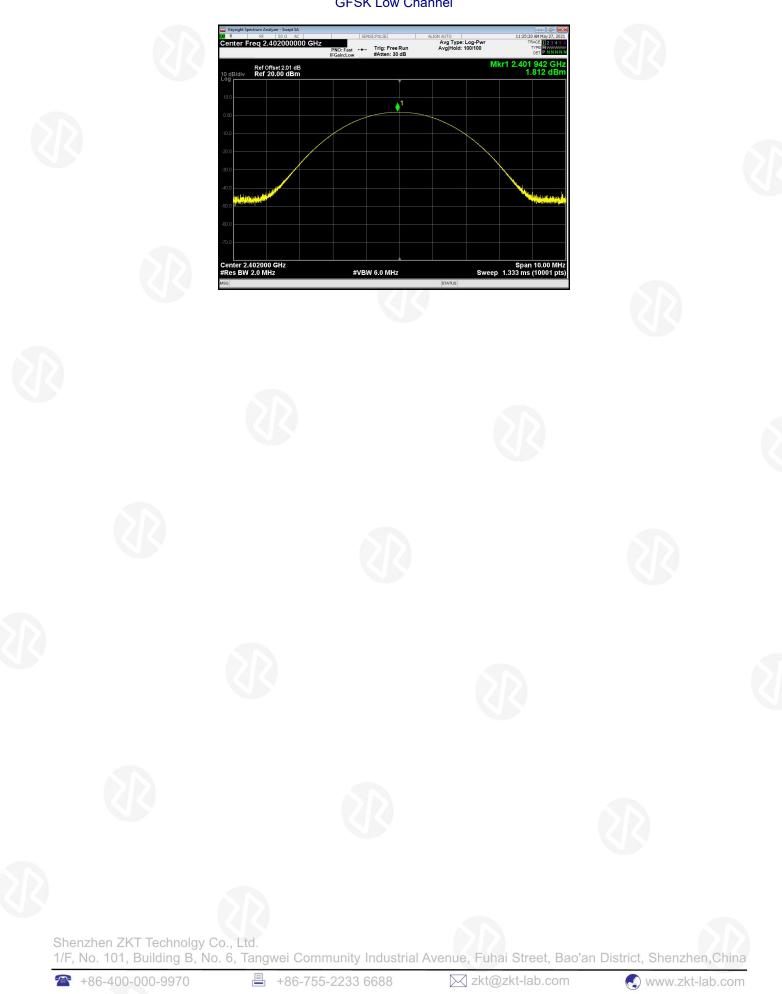


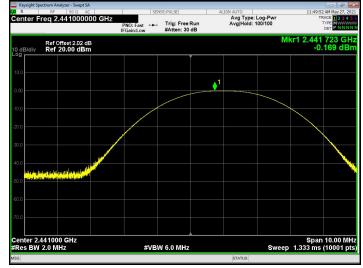
# Project No.: ZKT-2106152630E Page 51 of 73

#### Test plots GFSK Low Channel





#### **GFSK Middle Channel**





**GFSK High Channel** 

X R	RF 50 Ω AC			SEN	SE:PULSE	AL	LIGN AUTO			PM May 27, 2
Center Fi	req 2.4800000	00 GHz	PNO: Fast IFGain:Low	-•-	Trig: Free Run #Atten: 30 dB		Avg Type: Avg Hold:	100/100		ACE 1 2 3 4 TYPE MWWW DET PNNN
0 dB/div	Ref Offset 2.04 di Ref 20.00 dBn	3						M	kr1 2.480 -0.	190 GI 163 dE
-og	20100 4201				Ţ				7085	
5.000										
10.0										
0.00					•	1				
0.00							-			
10.0										
		/						The		
20.0										
30.0									1	
40.0									· 🔨	
40.0 Nordersla	the set of the set of								The second	hada the
50.0 <b>1001/90</b>	- Colorian								<sup>U</sup> N <sub>44</sub>	and the second states
50.0										
70.0										
	80000 GHz								Span	10.00 M
Res BW	2.0 MHz		#	VBV	6.0 MHz			Sweep	1.333 ms	(10001 p
ISG							STATUS			



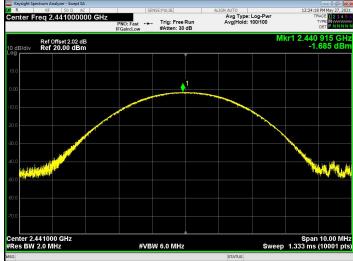




#### π/4-DQPSK Low Channel



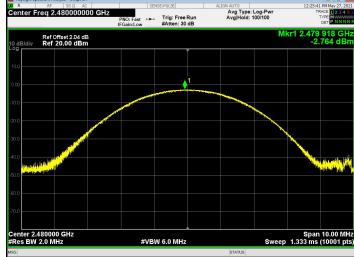
π/4-DQPSK Middle Channel

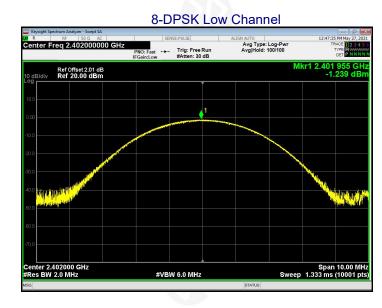






# π/4-DQPSK High Channel



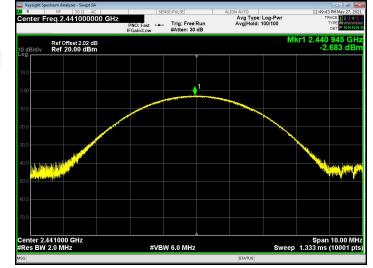




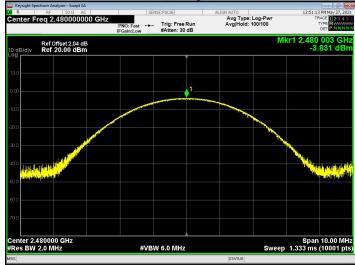




#### 8-DPSK Middle Channel



# 8-DPSK High Channel







#### 9. HOPPING CHANNEL SEPARATION

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=100KHz, VBW=300KHz, detector=Peak
Limit:	GFSK: 20dB bandwidth $\pi/4$ -DQPSK & 8DSK: 0.025MHz or 2/3 of the 20dB bandwidth (whichever is greater)

#### 9.1 Test Setup

UT	SPECTRUM
10/002	ANALYZER

#### 9.2 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 , Span = 3.0MHz. 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.

# 9.3 DEVIATION FROM STANDARD

No deviation.

#### 9.4 Test Result

Modulation	Test Channel	Separation (MHz)	Limit(MHz)	Result
GFSK	Low	0.998	0.703	PASS
GFSK	Middle	1.002	0.701	PASS
GFSK	High	1.002	0.699	PASS
π/4-DQPSK	Low	1.002	0.916	PASS
π/4-DQPSK	Middle	1.000	0.917	PASS
π/4-DQPSK	High	1.002	0.913	PASS
8-DPSK	Low	1.000	0.896	PASS
8-DPSK	Middle	0.998	0.891	PASS
8-DPSK	High	1.002	0.883	PASS







# Project No.: ZKT-2106152630E Page 57 of 73

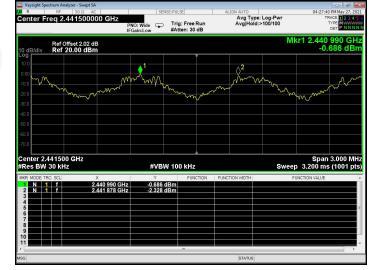
# Test plots







#### GFSK Middle Channel





**GFSK High Channel** 









#### π/4-DQPSK Low Channel



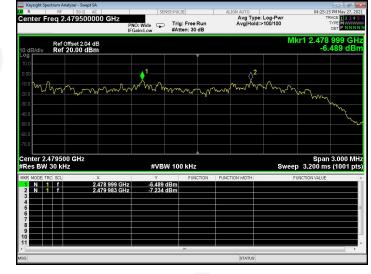
π/4-DQPSK Middle Channel

	41500000 GHz	SENSE:PUI	g: Free Run	Avg Ty Avg Hol	d:>100/100	04:25:57 PM May 27, TRACE 1 2 3 TYPE N MM
		FGain:Low #A	tten: 30 dB			DET PNN
	set 2.02 dB				Mk	r1 2.441 158 G
dB/div Ref 20	0.00 dBm		•			-7.479 dl
1.0						
00		1			<mark>∕2</mark>	
mon	A-	mmm	\	and how	mymm	non m
.0	Mar and 1.	No	· Mullin	Conc me et	A MAA nut	mond of
.0						
.0						
.0						
enter 2.441500	011-					0
siller 2.44 1000	GHZ	#VBW 10	0 kHz		Sweep	Span 3.000 M 3.200 ms (1001
es BW 30 kHz						
	X	Y	FUNCTION	FUNCTION WIDTH	FU	NCTION VALUE
R MODE TRC SCL	2.441 158 GHz	-7.479 dBm	FUNCTION	FUNCTION WIDTH	FU	NCTION VALUE
R MODE TRC SCL N 1 f N 1 f		-7.479 dBm	FUNCTION	FUNCTION WIDTH	FU	NCTION VALUE
R MODE TRC SCL	2.441 158 GHz	-7.479 dBm	FUNCTION	FUNCTION WIDTH	FU	NCTION VALUE
R MODE TRC SCL	2.441 158 GHz	-7.479 dBm	FUNCTION	FUNCTION WIDTH	FU	NCTION VALUE
R MODE TRC SCL N 1 f N 1 f	2.441 158 GHz	-7.479 dBm	FUNCTION	FUNCTION WIDTH	FU	NCTION VALUE
R MODE TRC SCL N 1 F 2 N 1 F 5 S 5 S 8 S	2.441 158 GHz	-7.479 dBm	FUNCTION	FUNCTION WIDTH	FU	NCTION VALUE
	2.441 158 GHz	-7.479 dBm	FUNCTION	FUNCTION WIDTH	FU	NCTION VALUE





## π/4-DQPSK High Channel



8-DPSK Low Channel

R	trum Analyzer - Swep RF 50 Ω eq 2.402500	AC 0000 GHz PNC	SENSE:PUI	SE g: Free Run tten: 30 dB	ALIGN AUTO Avg Tyj Avg Hol	be: Log-Pwr d:>100/100	04:31:36 PM May 27, 2 TRACE 2 3 4 TYPE MWWW DET P N N N
10 dB/div	Ref Offset 2.0 Ref 20.00 d	dB				M	(r1 2.402 005 GI -5.418 dB
10.0	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	, mm Mn M	Mum Mum M	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	m	m 2	mmm
-30.0	~						
70.0 Center 2.4 Res BW 3	02500 GHz 30 kHz		#VBW 10	0 kHz		Sweep	Span 3.000 M 5 3.200 ms (1001 p
		× 2.402 005 GHz	Y -5.418 dBm	FUNCTION	FUNCTION WIDTH	FI	UNCTION VALUE
2 N 1 3	f	2.403 145 GHz	-7.076 dBm				
5							
7 8							
9							
				ш			
					STATUS		

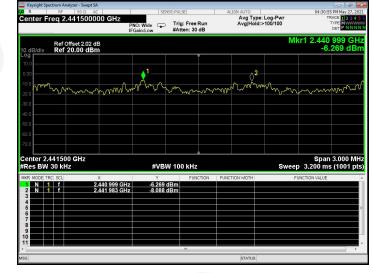








# 8-DPSK Middle Channel





8-DPSK High Channel

	eq 2.479500	PI		g: Free Run tten: 30 dB	Avg Type: Log- Avg Hold:>100/1	OV TRACE 2 3 00 TYPE MWW DET P NN
I0 dB/div	Ref Offset 2.04 Ref 20.00 dB	dB 3m		,		Mkr1 2.479 002 G -8.317 dE
		10	1		2	
20.0 20.0 30.0 40.0	wann	~~~~\/i`\/	in all a free	mm	mmm	how we have
50.0 50.0 70.0						
enter 2.4	79500 GHz		#VBW 10	0 kHz		Span 3.000 N Sweep 3.200 ms (1001
Res BW 3	30 kHz					Gweep 3.200 ms (1001
Res BW 3	SCL	X 2.479 002 GHz 2.479 998 GHz	Y -8.317 dBm -9.979 dBm	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
Res BW 3	SCL	2.479 002 GHz	۲ -8.317 dBm		FUNCTION WIDTH	





# **10.NUMBER OF HOPPING FREQUENCY**

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)(iii)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=100kHz, VBW=300kHz, Frequency range=2400MHz-2483.5MHz, Detector=Peak
Limit:	15 channels

#### 10.1 Test Setup

EUT	SPECTRUM
	ANALYZER

#### 10.2 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;

#### 10.3 DEVIATION FROM STANDARD

No deviation.







# Project No.: ZKT-2106152630E Page 64 of 73

#### π/4-DQPSK

		Trig: Free Run #Atten: 30 dB	Avg Hold: 2000/2000	TYPE M DET P
Ref Offset 2.01 dE			Mk	r1 2.401 503 0 -8.008
		Ť		
10.0 $MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM$	warmwarphary	hand warder	Mannanna	Margangang
-20.0				
-30.0				
-40.0				
-50.0				
-60.0				
Start 2.40000 GHz #Res BW 100 kHz	#VBW 3	300 kHz	Swe	Stop 2.4835 p 8.000 ms (10
	X Y			FUNCTION VALUE
MKR MODE TRC SCL				
1 N 1 f 2.40	01 503 0 GHz -8.008 dB			
1 N 1 f 2.40	01 503 0 GHz -8.008 dB 30 243 5 GHz -6.994 dB			
1 N 1 f 2.40 2 N 1 f 2.48 3 4 5 5				
1 N 1 f 2.40   2 N 1 f 2.48   3 - - - -   4 - - - -   5 - - - -   6 - - - -   7 - - - - -				
1 N 1 f 2.40 2 N 1 f 2.48 3 4 5 6				

#### 8-DPSK

Keysight Spectrum Analyzer - Swept SA R RF 50 Ω AC Center Freq 2.441750000 GHz		LSE g: Free Run tten: 30 dB	ALIGN AUTO Avg Type: L Avg Hold: 20	.og-Pwr 000/2000	12:40:59 PM May 27, 2021 TRACE 1 2 3 4 5 TYPE M
Ref Offset 2.01 dB 10 dB/div Ref 20.00 dBm		Ť		Mkr1	2.401 419 5 GHz -10.631 dBm
100 000 100 000 000 00	en an	ᡃ᠋ᢩᠮᡅᡧᢊᠰᡧ	ᡪᡟ᠋ᡰᢦᢧ᠇ᠰᡧ᠕ᡀᠺᢩᡁ	vuliterite og	MAAMAAMAA
40.0 60.0 70.0					ht
Start 2.40000 GHz #Res BW 100 kHz	#VBW 30	0 kHz		Sweep	Stop 2.48350 GHz 8.000 ms (1001 pts)
MRR MODEL TRC SCL X 1 N 1 f 2.401 419 5 GH 2 N 1 f 2.480 327 0 GH 3		FUNCTION	FUNCTION WIDTH	FUI	NCTION VALUE
6 7 8 9					
10			STATUS		,



#### 11. DWELL TIME

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)(iii)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=1MHz, VBW=3MHz, Span=0Hz, Detector=Peak
Limit:	0.4 Second

#### 11.1 Test Setup

UT	SPECTRUM
	ANALYZER

#### 11.2 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 = 0Hz;

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).

**11.3 DEVIATION FROM STANDARD** 

No deviation.







#### 11.4 Test Result

#### GFSK mode:

Frequency	Packet	Dwell time(ms)	Limit(ms)	Result
2441MHz	DH1	124.48	400	Pass
2441MHz	DH3	263.04	400	Pass
2441MHz	DH5	308.48	400	Pass

#### Remarks:

The test period: T= 0.4 Second/Channel x 79 Channel = 31.6 s Test channel: 2441MHz as blow

DH1 time slot=0.389(ms)\*(1600/ (2\*79))\*31.6=124.48ms DH3 time slot=1.644(ms)\*(1600/ (4\*79))\*31.6=263.04ms

DH5 time slot=2.892(ms)\*(1600/ (6\*79))\*31.6=308.48ms

#### π/4-DQPSK mode:

Frequency	Packet	Dwell time(ms)	Limit(ms)	Result
2441MHz	2DH1	127.68	400	Pass
2441MHz	2DH3	263.84	400	Pass
2441MHz	2DH5	308.80	400	Pass

#### Remarks:

The test period: T= 0.4 Second/Channel x 79 Channel = 31.6 s Test channel: 2441MHz as blow DH1 time slot=0.399(ms)\*(1600/ (2\*79))\*31.6=127.68ms DH3 time slot=1.649(ms)\*(1600/ (4\*79))\*31.6=263.84ms DH5 time slot=2.895(ms)\*(1600/ (6\*79))\*31.6=308.80ms

#### 8-DPSK mode:

Frequency	Packet	Dwell time(ms)	Limit(ms)	Result
2441MHz	3DH1	127.36	400	Pass
2441MHz	3DH3	263.20	400	Pass
2441MHz	3DH5	309.33	400	Pass

#### Remarks:

The test period: T= 0.4 Second/Channel x 79 Channel = 31.6 s Test channel: 2441MHz as blow DH1 time slot=0.398(ms)\*(1600/ (2\*79))\*31.6=127.36ms DH3 time slot=1.645(ms)\*(1600/ (4\*79))\*31.6=263.20ms DH5 time slot=2.900(ms)\*(1600/ (6\*79))\*31.6=309.33ms



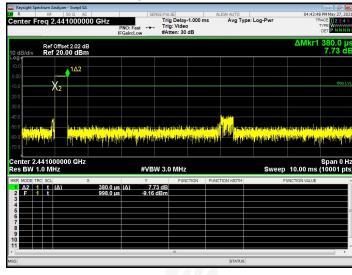






Test Plots

# GFSK DH1



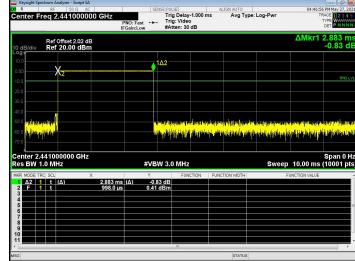
# GFSK DH3

X R						1		
			PNO: Fast Tr	rig Delay-1.000 n rig: Video Atten: 30 dB	ALIGN AUTO ns Avg Typ	be: Log-Pwr	TR. T	PM May 27, ACE 1 2 3 TYPE WWW DET PNN
I0 dB/div	Ref Offse Ref 20.0	et 2.02 dB 00 dBm					ΔMkr1 ′	1.636 -0.09
10.0		<u></u> 1Δ	2					
0.00	X2							TR
20.0								
30.0								
40.0 50.0 <b>Webstern</b>	and the second				and be and other with other	ha da a ti sa aka shara	ilidhaansi darahdada	Hilling
50.0 <mark>1741 17</mark>				Low Marker	de la la compañía de	and didicitations and he	dil sika di sua dasa i	i di di sa da
70.0			<i>v</i> ,		In a second to	and a the	41	Faile de
enter 2.	.44100000 1.0 MHz	00 GHz	#VBW 3.			Sweep	o 10.00 ms (	Span ( (10001
Center 2. Res BW	1.0 MHz	x	Y	0 MHz	FUNCTION WIDTH		0 10.00 ms (	Span ( 10001
enter 2. es BW 1	1.0 MHz		Υ (Δ) -0.09 dB	0 MHz			o 10.00 ms (	Span ( 10001
Center 2. Res BW 1 1 A2 2 F 3 4 5 6	1.0 MHz RC SCL 1 t (Δ)	× 1.636 ms	Υ (Δ) -0.09 dE	0 MHz			o 10.00 ms (	Span ( 10001
Center 2. Res BW	1.0 MHz RC SCL 1 t (Δ)	× 1.636 ms	Υ (Δ) -0.09 dE	0 MHz			o 10.00 ms (	Span ( 10001
Res BW /	1.0 MHz RC SCL 1 t (Δ)	× 1.636 ms	Υ (Δ) -0.09 dE	0 MHz			o 10.00 ms (	Span ( (10001





# GFSK DH5



# π/4-DQPSK DH1

	trum Analyzer - Swep RF 50 Ω	AC		SENSE:PU				IN AUTO	-		04.47.1	9 PM May 27
R enter Fre	eq 2.441000	0000 GHz	PNO: Fast • FGain:Low	Tri		1.000 ms dB			be: Log-Pwi	r		TYPE WWW DET PNN
) dB/div	Ref Offset 2.02 Ref 20.00 di	dB Bm									AMkr1	389.0 6.26
0.0												
.0	1Δ2											TRI
i.o .o	-X <u>5</u>											
1.0 1.0 <b></b>												
Internal in Station in	and in the second second	die platike in the first	States and the states	No. of Contraction	ALC: NOT BEEN IN	A DEPARTMENT	THE STREET	A DECK	ALC: NOT A REAL PROPERTY OF A REAL PROPERTY	of the second second	CONTRACTOR OF THE OWNER.	1000 1000
	the state of the s	and the second states of the s	<mark>Angged peak</mark>	a Physics	hour					10.000	whenterphin	pr <sup>at</sup> tinit'
enter 2.44	41000000 GH	4 11							KAP HATTO	i <mark>har-pit</mark>	ahaa kaliitta	Span
es BW 1.0	0 MHz	Hz	#\	/BW 3.0	0 MHz	NA (AN INI)		nuliya n	KAP HATTO	/eep	10.00 ms	Span
enter 2.44 es BW 1.0 R MODE TRC A2 1 F 1	0 MHz scl t (Δ)	4 11	#\ (A)	/BW 3.0	0 MHz	NA (AN INI)			KAP HATTO	/eep	ahaa kaliitta	Span
enter 2.44 es BW 1.0 R MODE TRC Δ2 1 F 1	0 MHz scl t (Δ)	Hz 389.0 us	#\ (A)	/BW 3.0	0 MHz	NA (AN INI)		nuliya n	KAP HATTO	/eep	10.00 ms	Span (
enter 2.44 es BW 1.0 A2 1 A2 1 F 1	0 MHz scl t (Δ)	Hz 389.0 us	#\ (A)	/BW 3.0	0 MHz	NA (AN INI)		nuliya n	KAP HATTO	/eep	10.00 ms	Span
enter 2.44 es BW 1.0 R MODE TRC A2 1 F 1	0 MHz scl t (Δ)	Hz 389.0 us	#\ (A)	/BW 3.0	0 MHz	NA (AN INI)		nuliya n	KAP HATTO	/eep	10.00 ms	Span



Shenzhen ZKT Technolgy Co., Ltd. 1/F, No. 101, Building B, No. 6, Tangwei Community Industrial Avenue, Fuhai Street, Bao'an District, Shenzhen,China

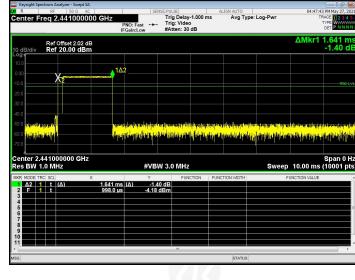
**\*** +86-400-000-9970







# π/4-DQPSK DH3



#### π/4-DQPSK DH5

Keysight Spectrum Analyzer - !							0
R RF 50		SENSE:PUI	u Delay-1.000 ms	ALIGN AUTO	Dura Dura	04:48:1	PM May 27, RACE 1 2 3
enter Freq 2.4410		NO: Fast Tri	g Delay-1.000 m g: Video tten: 30 dB	s Avglyp	e: Log-Pwr	I	
Ref Offset 2 dB/div Ref 20.00	2.02 dB ) dBm					ΔMkr1	2.889 i 4.58
0.0							
		1∆2					
	ninene, iheene helend						TRK
0.0							
0.0 0.0 octobrance.co				ten formusionaries.	and dealers at a tar	- tikeline and the	the state
			ana sanganan na sang	and the second secon			
enter 2.441000000 es BW 1.0 MHz	GHz	#VBW 3.0	0 MHz		Sweep	10.00 ms	Span 0 (10001
R MODE TRC SCL	x	Y	FUNCTION	FUNCTION WIDTH	F	UNCTION VALUE	
1 Δ2 1 t (Δ) 2 F 1 t	2.889 ms 854.0 us	(Δ) 4.58 dB -17.06 dBm					
3							
5							
7							
9							
0							
			m.				









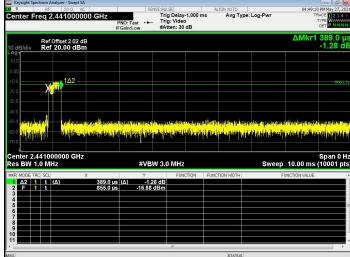








### 8-DPSK DH1



# 8-DPSK DH3

R RF 50 Ω A0								0
enter Freq 2.4410000	00 GHz	NO: Fast		/-1.000 ms o	ALIGN AUTO Avg Type	: Log-Pwr	т	0 PM May 27, RACE 1 2 3 TYPE WWW DET P N N
Ref Offset 2.02 d 0 dB/div Ref 20.00 dBr	B n						ΔMkr1	1.640 0.17
10.0	▲ 1∆3	2						
								TRX
0.0								
0.0								
		n dan kalangan kalan <mark>Producti yang kalangan</mark>				aleren palanti Nata na dat D	i dentro entrett 17. http://www.stade	an Criter an An Criter and An
0.0	րո	l da celle de el l	in ala i	delle successioner	In to other fa	a da da da se od	ada nada da	. As aller
enter 2.441000000 GHz		#VB	W 3.0 MH;			Sweep	10.00 ms	Span 0 (10001
enter 2.441000000 GHz es BW 1.0 MHz	x	Y	FUI		CTION WIDTH		10.00 ms	Span 0 (10001
enter 2.441000000 GHz es BW 1.0 MHz KR MODE TRC  SCL  1 A2 1 t (A) 2 F 1 t		γ (Δ) 0.1			CTION WIDTH			Span 0 (10001
enter 2.441000000 GHz es BW 1.0 MHz KR MODE TRC; SCL 1 A2 1 t (A) 2 F 1 t 3 4	× 1.640 ms	γ (Δ) 0.1	FUI 17 dB		CTION WIDTH			Span 0 (10001
enter 2.441000000 GHz es BW 1.0 MHz RF MODE TRCI SCL 2 F 1 t (Δ) 2 F 1 t 4 5 6	× 1.640 ms	γ (Δ) 0.1	FUI 17 dB		CTION WIDTH			Span 0 (10001
RF MODE TRC SCL 2 F 1 t (A) 2 F 1 t (A) 3 4 5 5 6 6 7 7 8 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	× 1.640 ms	γ (Δ) 0.1	FUI 17 dB		CTION WIDTH			Span 0 (10001
enter 2.441000000 GHz es BW 1.0 MHz 1 Δ2 1 t (Δ) 2 F 1 t 4 5 5 6 7	× 1.640 ms	γ (Δ) 0.1	FUI 17 dB		CTION WIDTH			Span 0 (10001
Image: Second control of the second control	× 1.640 ms	γ (Δ) 0.1	FUI 17 dB		CTION WIDTH			Span 0 (10001





















#### 12. Antenna Requirement

Standard requirement:	FCC Part15 C Section 15.203 /247(c)
4E 000 menuinement	

#### 15.203 requirement:

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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

#### 15.247(c) (1)(i) requirement:

(i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

#### EUT Antenna:

The antenna is PCB antenna, the best case gain of the antennas is 0dBi, reference to the appendix II for details





R

Reference to the **appendix I** for details.

# 14. EUT Constructional Details

Reference to the appendix II for details.

**\*\*\*\*\* END OF REPORT \*\*\*\*** 



