Appendix A

RF Test Data for BT V4.1(BDR/EDR) (Conducted Measurement)

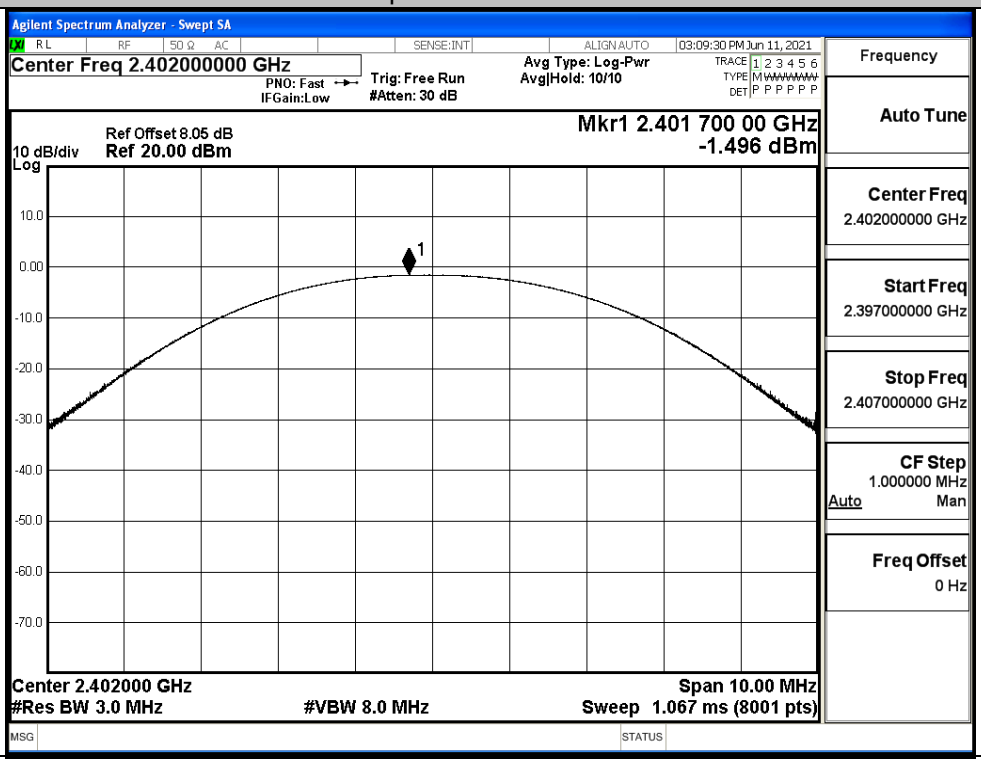
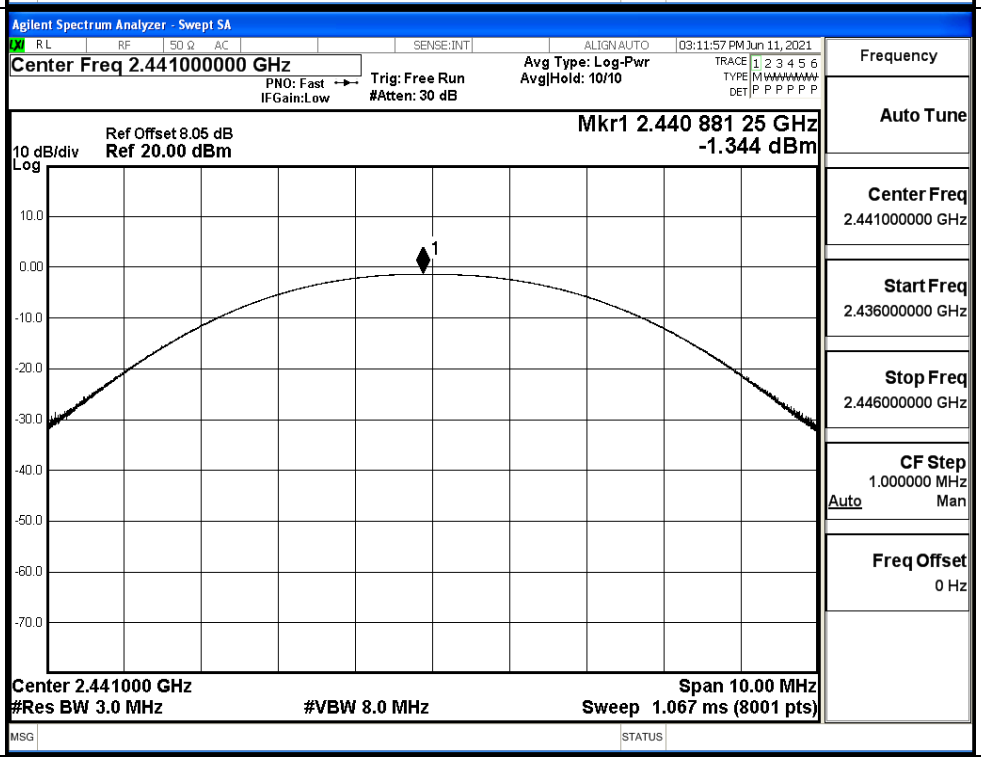
Product Name: TWS Earbuds with Charging Case
Trade Mark: CJ TECH
Test Model: 53858-DI

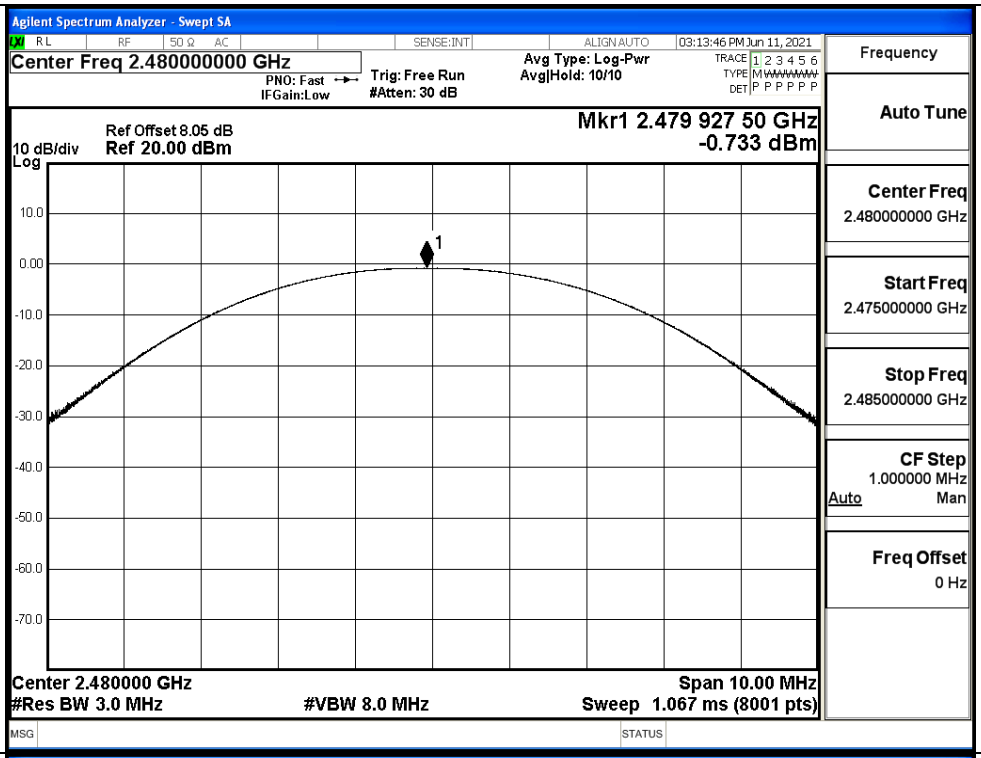
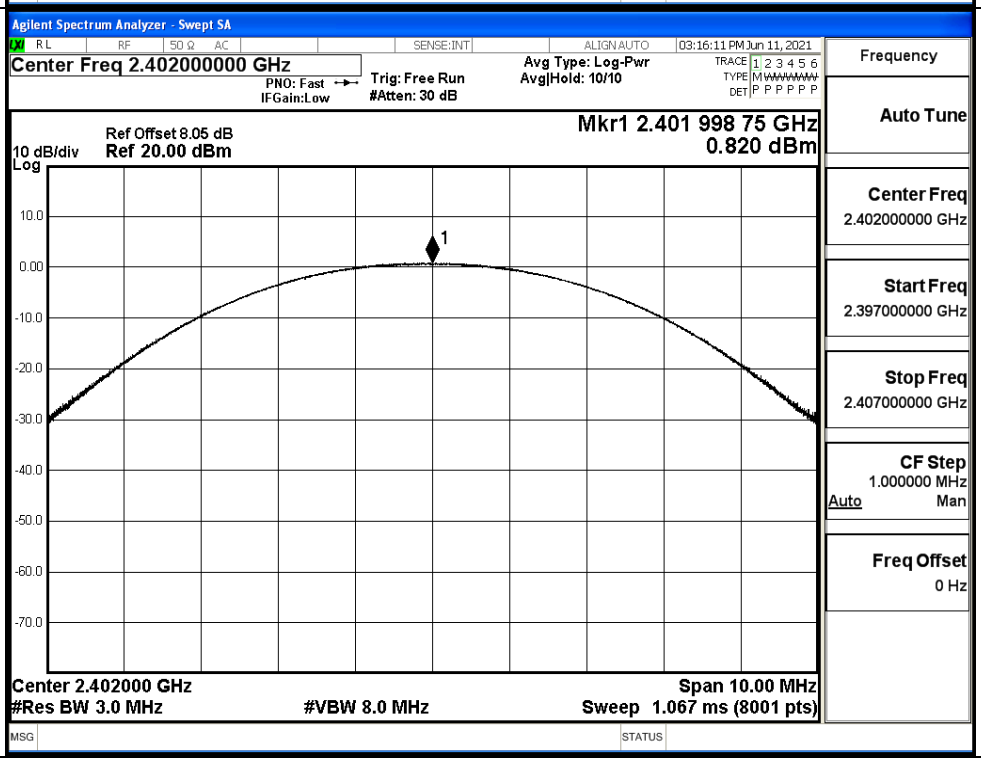
Environmental Conditions

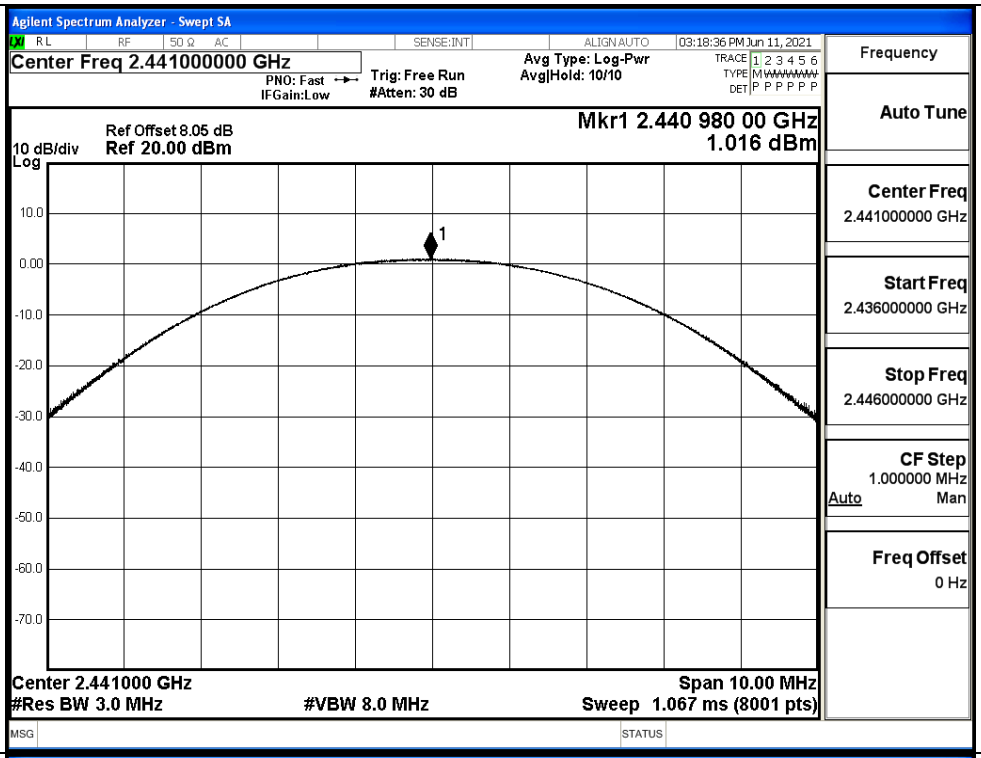
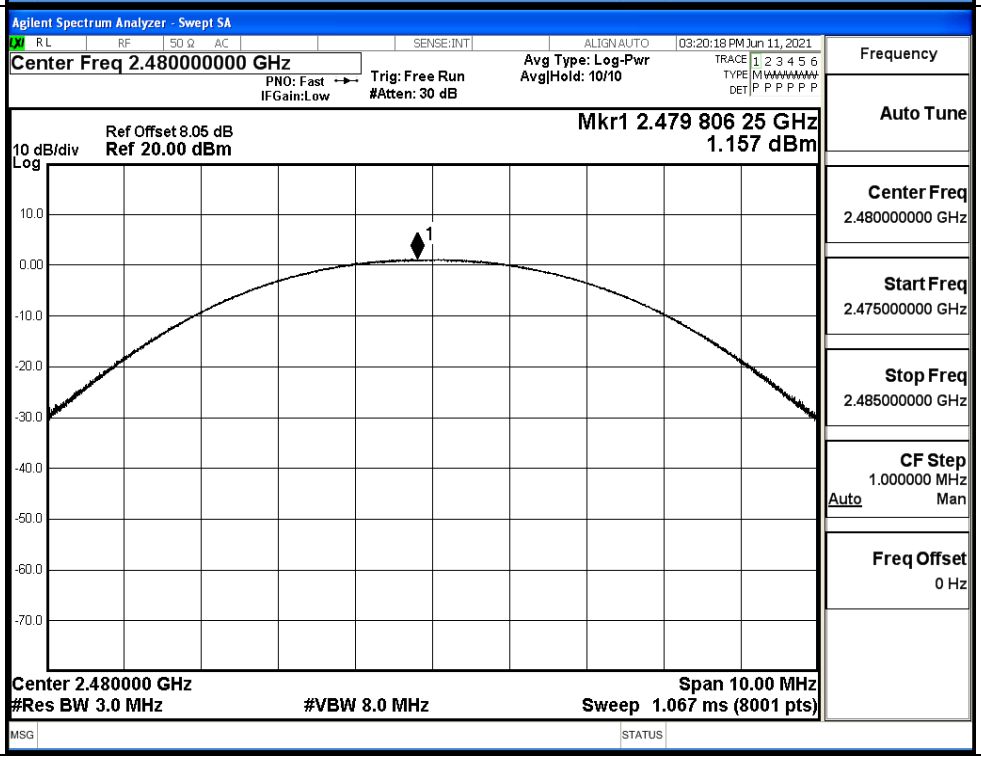
Temperature:	22.1° C
Relative Humidity:	53.2%
ATM Pressure:	100.0 kPa
Test Engineer:	Carl Fu
Supervised by:	Li Huan

A.1 Maxmum Conducted Peak Output Power

Mode	Channel.	Maximum Peak Output Power [dBm]	Limit [dBm]	Verdict
GFSK	LCH	-1.496	21	PASS
	MCH	-1.344	21	PASS
	HCH	-0.733	21	PASS
π/4DQPSK	LCH	0.820	21	PASS
	MCH	1.016	21	PASS
	HCH	1.157	21	PASS

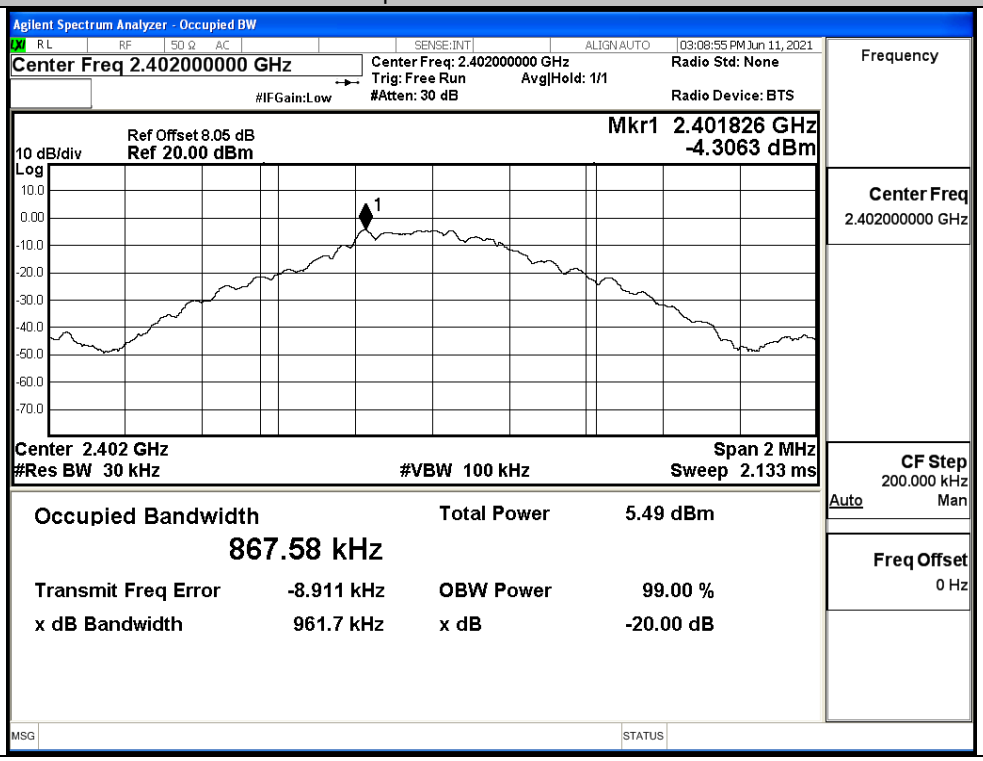
Test Graphs		
GFSK/LCH		
GFSK/MCH		

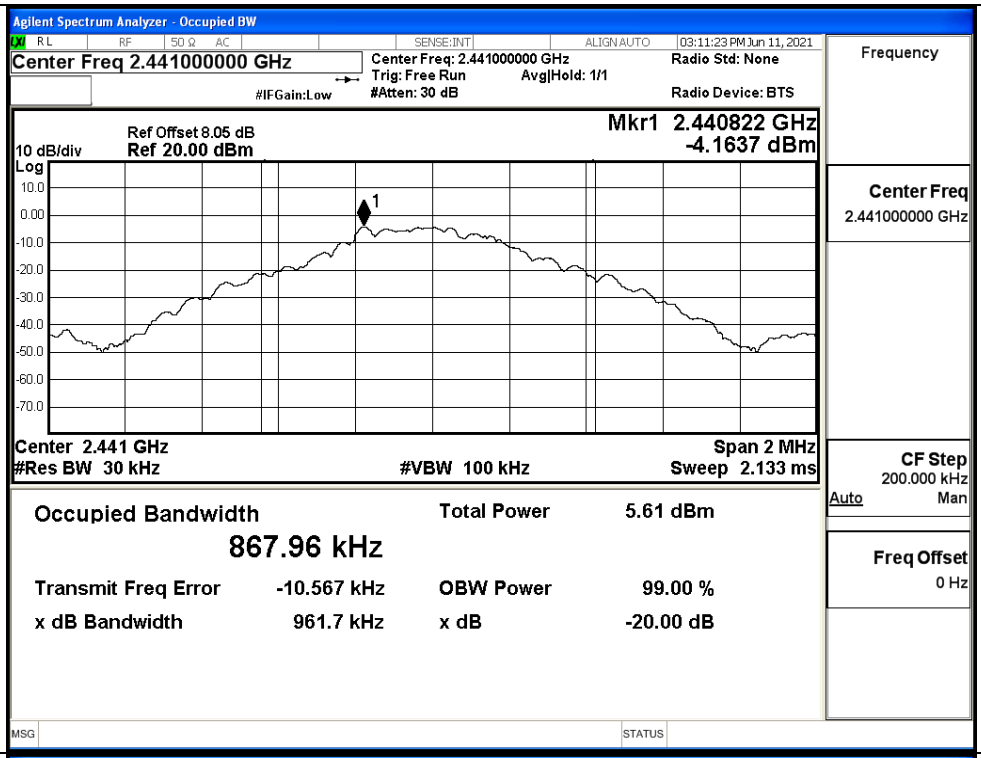
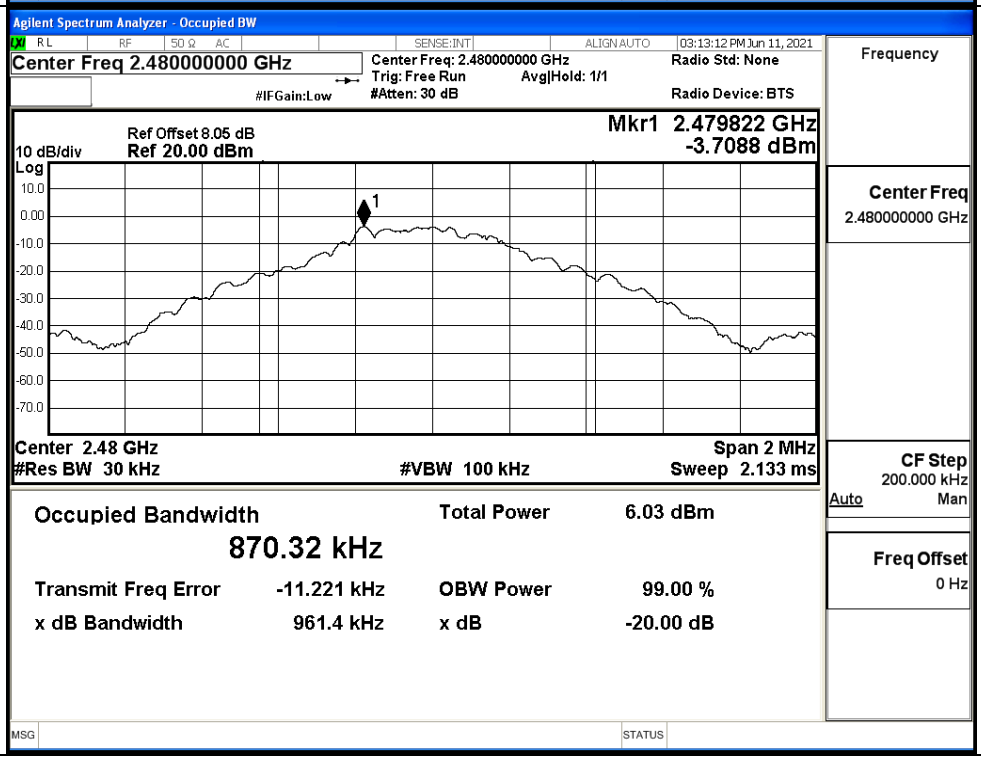
GFSK/HCH	
π/4DQPSK/LCH	

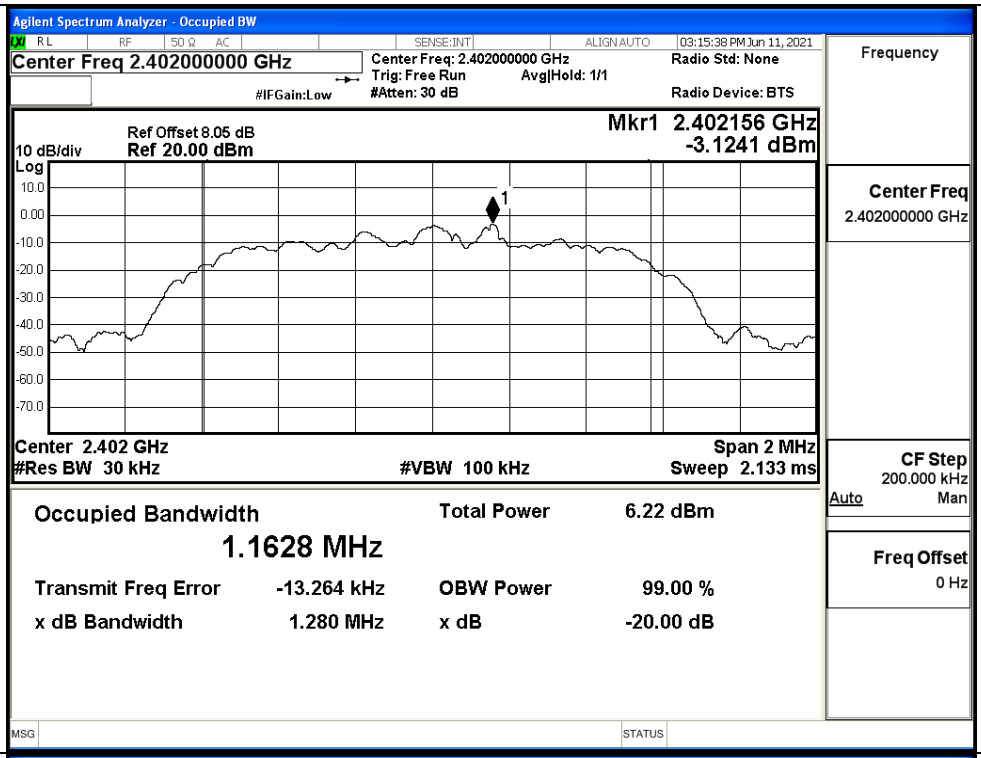
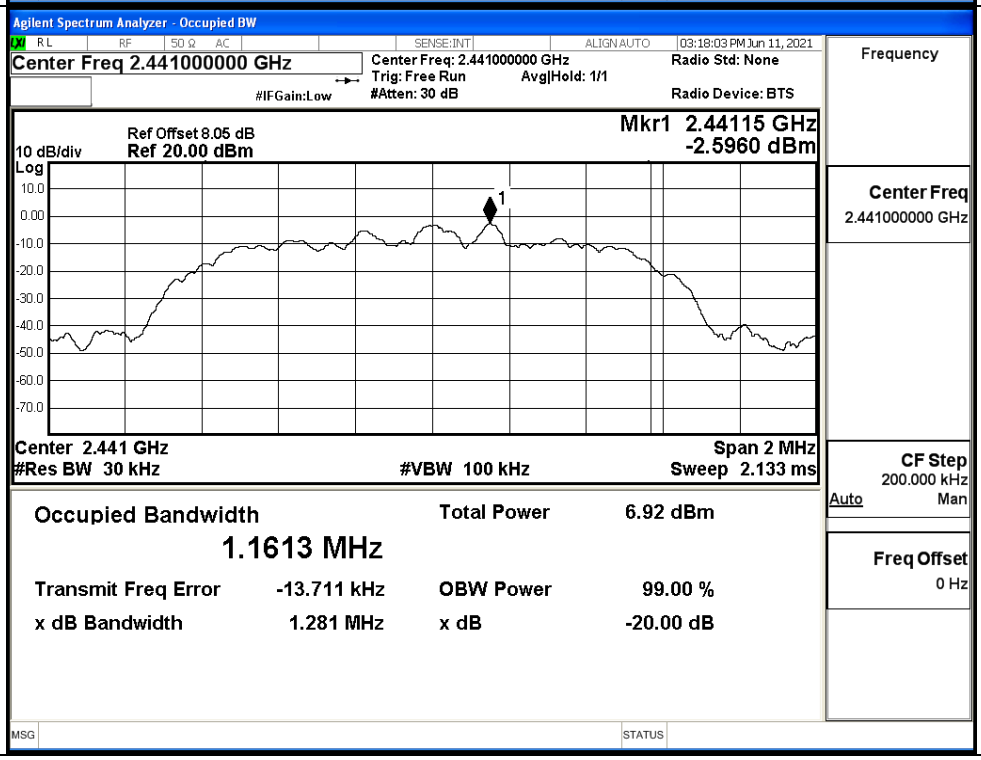
π/4DQPSK/MCH	
π/4DQPSK/HCH	

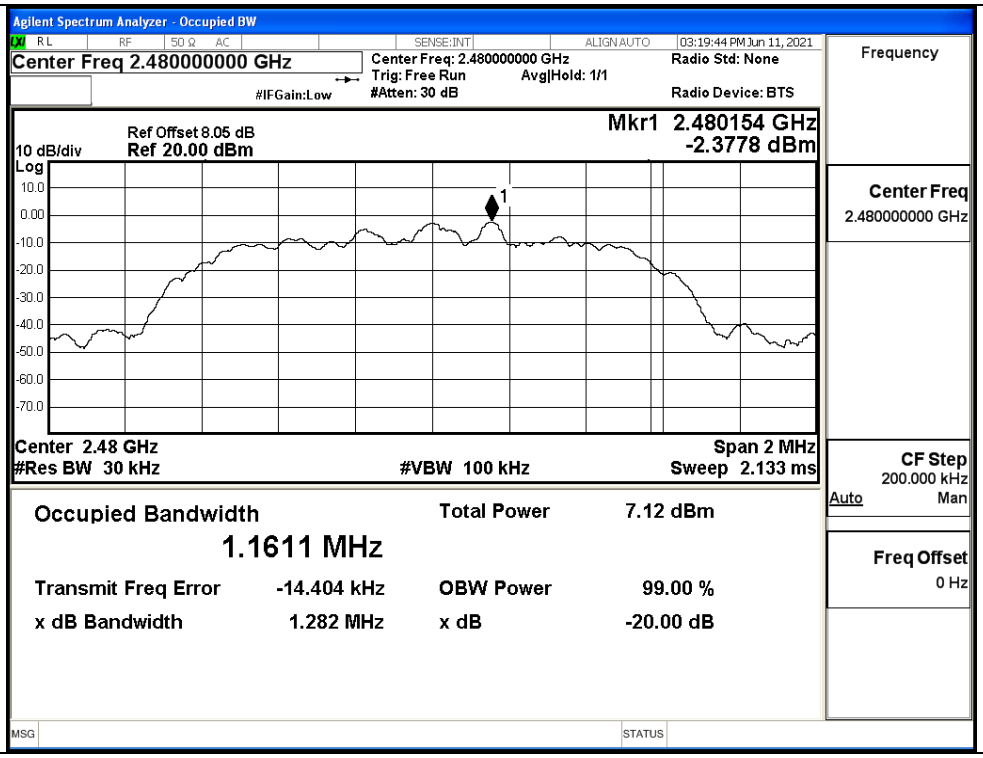
A.2 20dB Bandwidth

Mode	Channel.	20dB Bandwidth [MHz]	Limit [MHz]	Verdict
GFSK	LCH	0.9617	Not Specified	PASS
	MCH	0.9617	Not Specified	PASS
	HCH	0.9614	Not Specified	PASS
π/4DQPSK	LCH	1.280	Not Specified	PASS
	MCH	1.281	Not Specified	PASS
	HCH	1.282	Not Specified	PASS

Test Graphs	
GFSK/LCH	

GFSK/MCH	
GFSK/HCH	

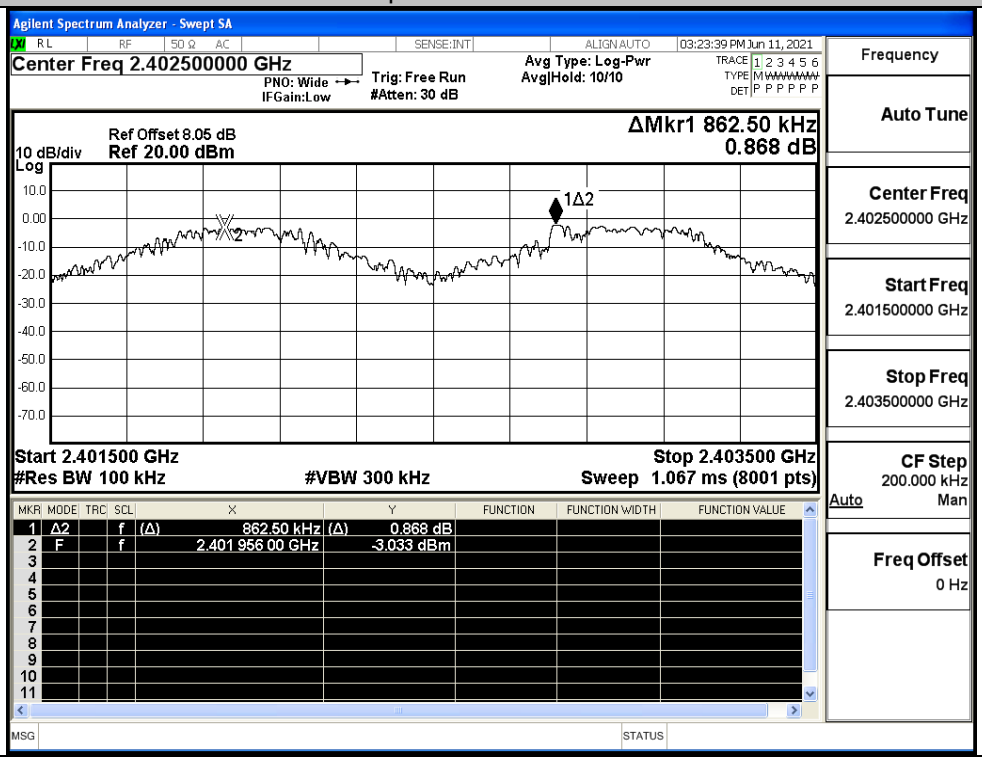
π/4DQPSK/LCH	
π/4DQPSK/MCH	

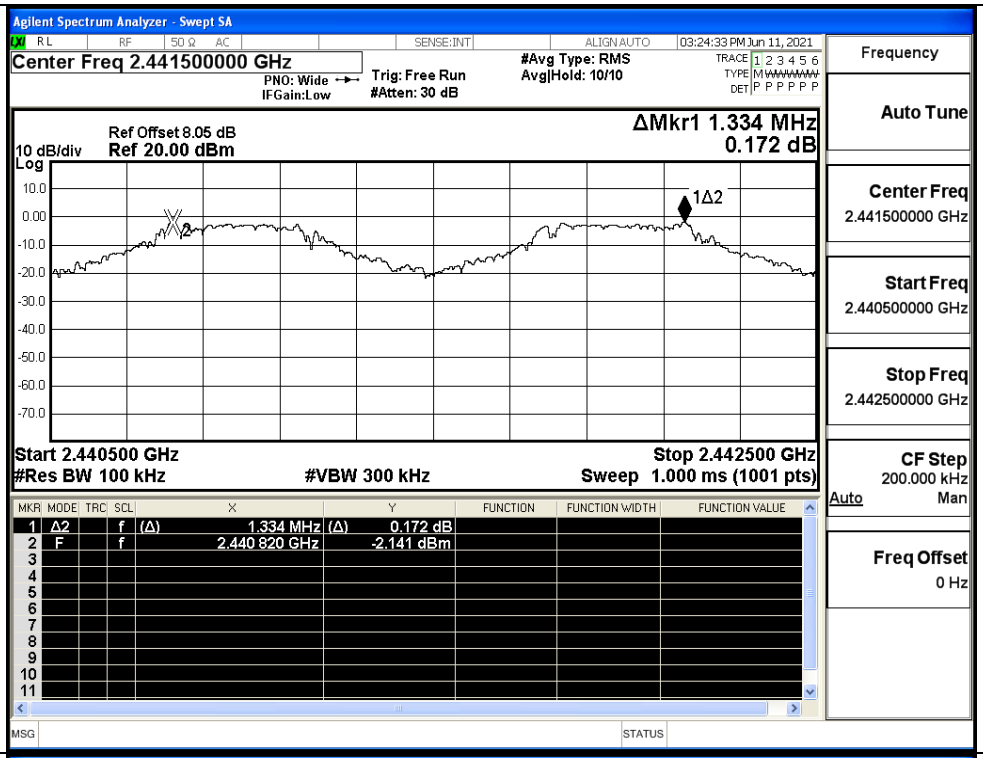
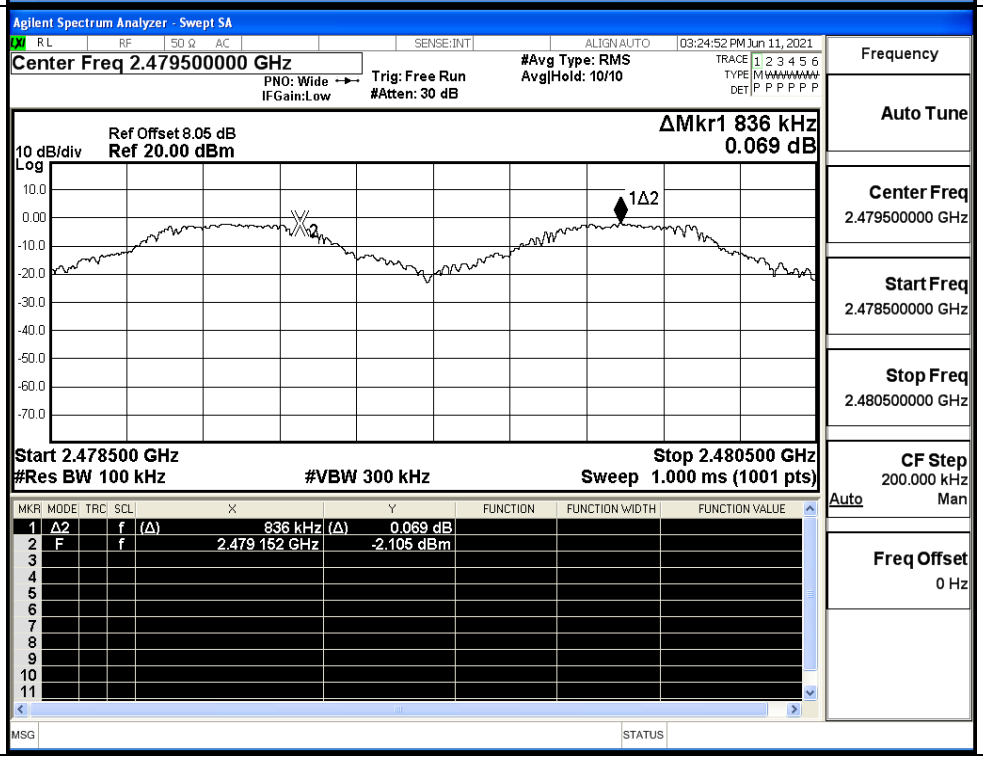
π/4DQPSK/HCH	

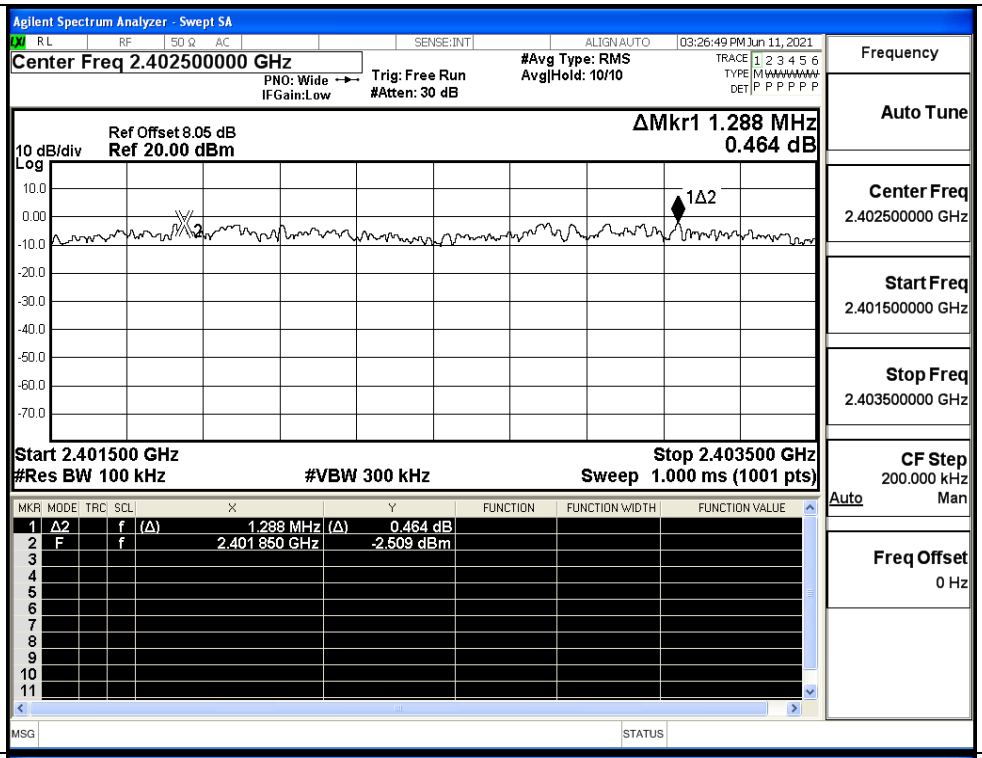
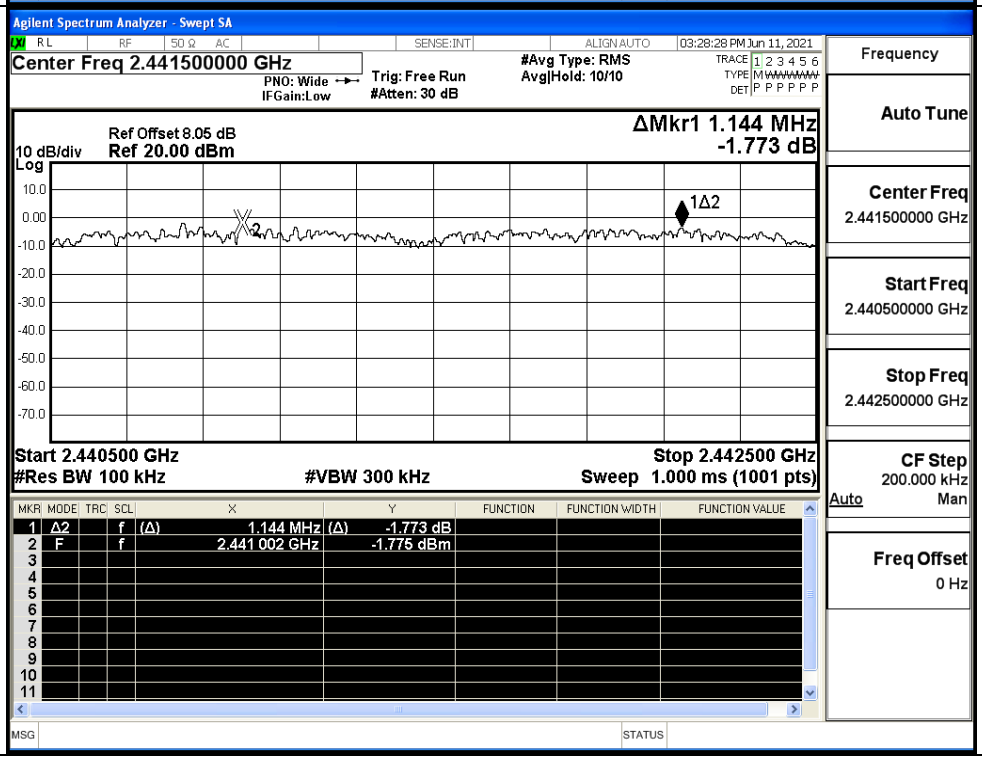
Agilent Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
03:19:44 PM Jun 11, 2021
Center Freq 2.480000000 GHz
Center Freq: 2.480000000 GHz
Trig: Free Run
Avg|Hold: 1/1
#IFGain:Low
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
Frequency
Ref Offset 8.05 dB
10 dB/div
Ref 20.00 dBm
Mkr1 2.480154 GHz
-2.3778 dBm
Log
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
1
Center Freq
2.480000000 GHz
Center 2.48 GHz
#Res BW 30 kHz
#VBW 100 kHz
Span 2 MHz
Sweep 2.133 ms
CF Step
200.000 kHz
Auto
Man
Occupied Bandwidth
1.1611 MHz
Total Power
7.12 dBm
Freq Offset
0 Hz
Transmit Freq Error
-14.404 kHz
OBW Power
99.00 %
x dB Bandwidth
1.282 MHz
x dB
-20.00 dB
MSG
STATUS

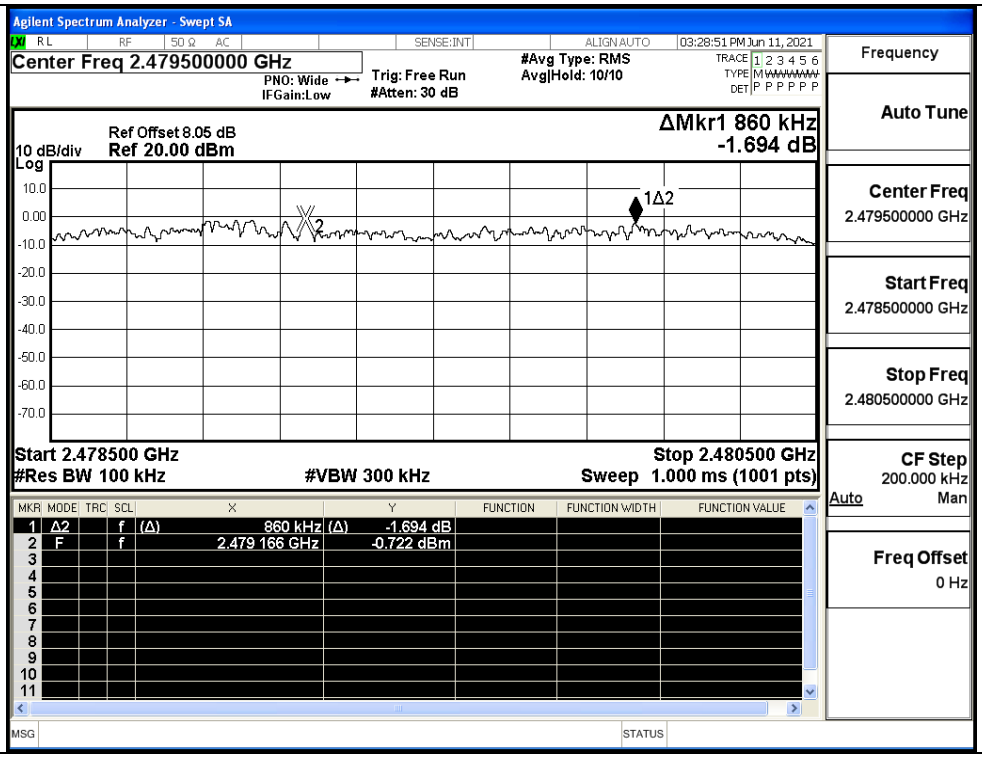
A.3 Carrier Frequency Separation

Mode	Channel.	Carrier Frequency Separation [MHz]	Limit [MHz]	Verdict
GFSK	LCH	0.862	0.641	PASS
	MCH	1.334	0.641	PASS
	HCH	0.836	0.641	PASS
π/4DQPSK	LCH	1.288	0.855	PASS
	MCH	1.144	0.855	PASS
	HCH	0.860	0.855	PASS

Test Graphs	
GFSK/LCH	

GFSK/MCH	
GFSK/HCH	

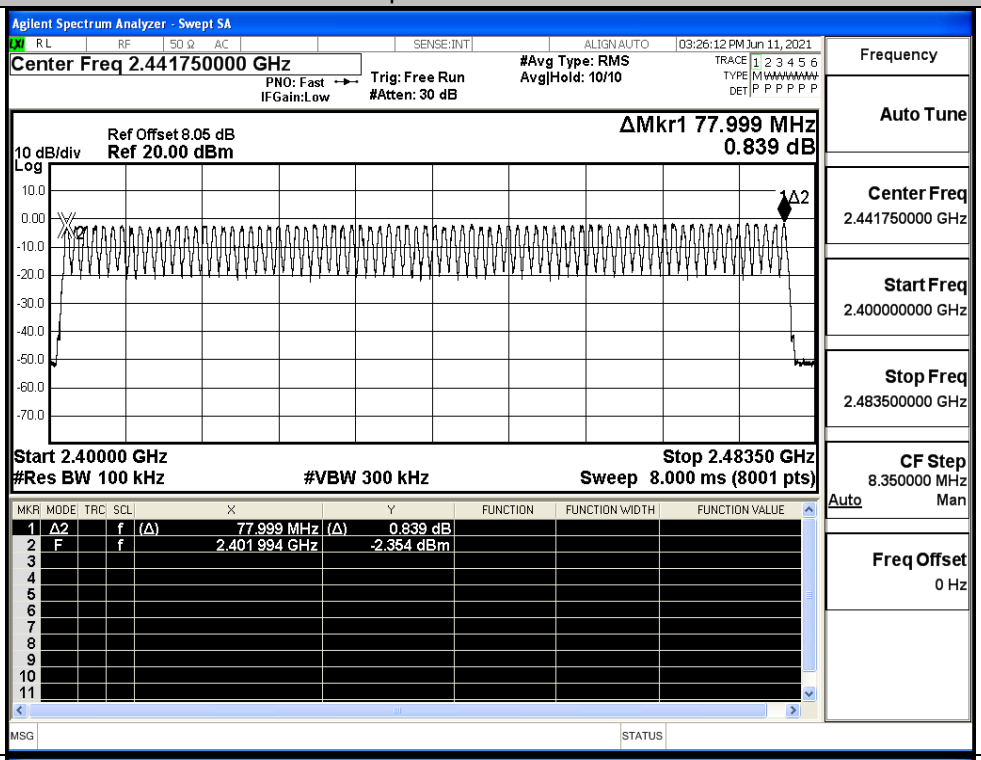
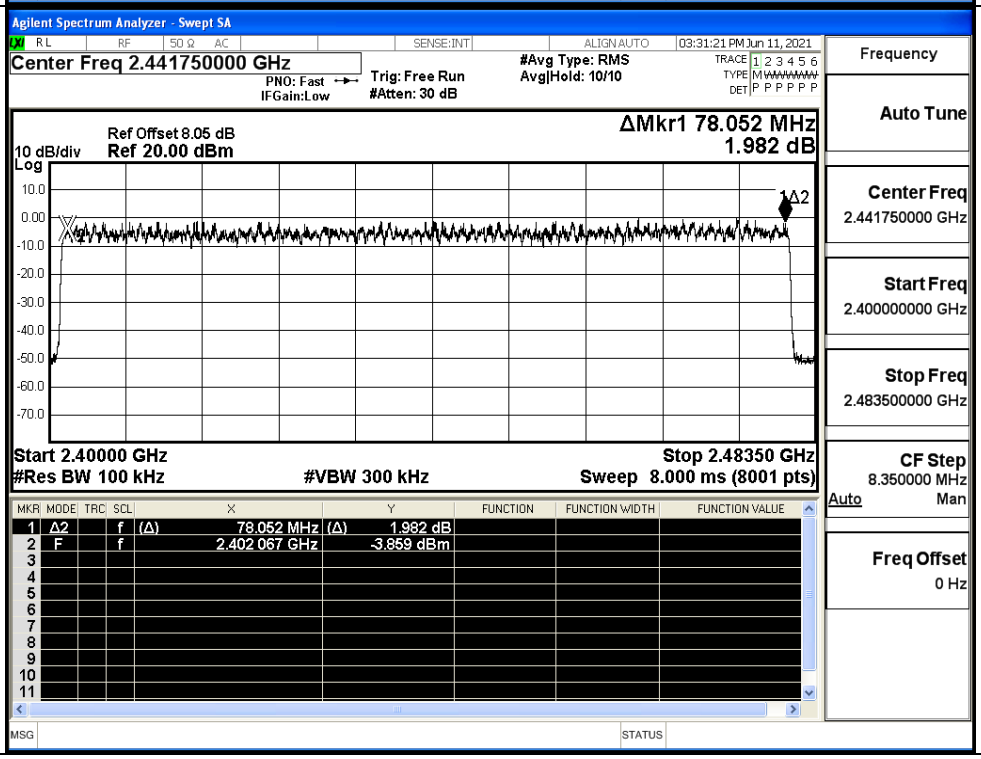
π/4DQPSK/LCH	
π/4DQPSK/MCH	

π/4DQPSK/HCH	

Agilent Spectrum Analyzer - Swept SA
Center Freq 2.479500000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
#Avg Type: RMS
Avg|Hold: 10/10
03:28:51 PM Jun 11, 2021
Ref Offset 8.05 dB
10 dB/div
Log
Ref 20.00 dBm
ΔMkr1 860 kHz
-1.694 dB
Start 2.478500 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.480500 GHz
Sweep 1.000 ms (1001 pts)
1 Δ2 (Δ) 860 kHz (Δ) -1.694 dB
2 F f 2.479 166 GHz -0.722 dBm
Frequency
Auto Tune
Center Freq
2.479500000 GHz
Start Freq
2.478500000 GHz
Stop Freq
2.480500000 GHz
CF Step
200.000 kHz
Auto
Man
Freq Offset
0 Hz

A.4 Hopping Channel Number

Mode	Channel.	Number of Hopping Channel [N]	Limit [N]	Verdict
GFSK	Hop	79	>=15	PASS
π/4DQPSK	Hop	79	>=15	PASS

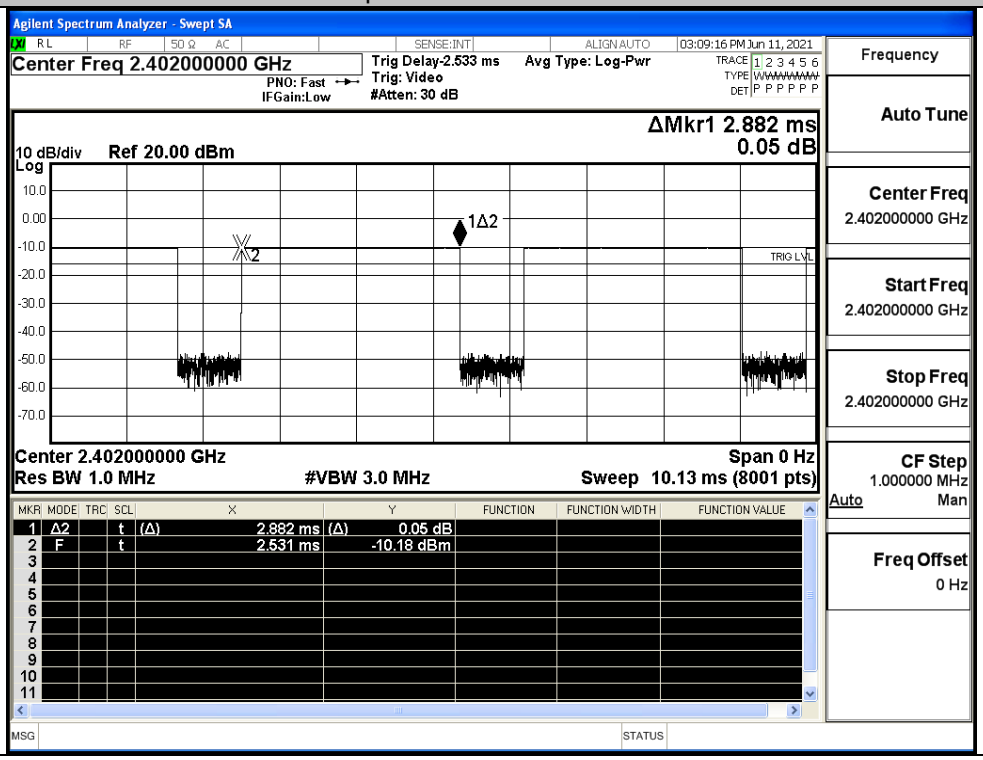
Test Graphs		
GFSK/Hop		
π/4DQPSK/Hop		

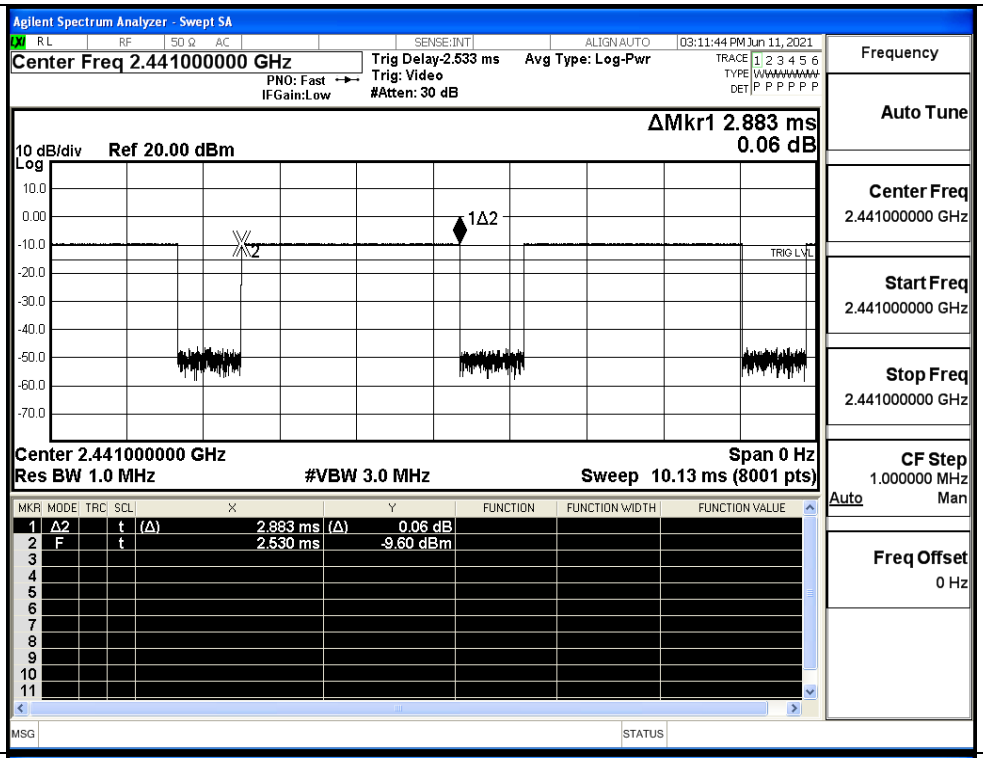
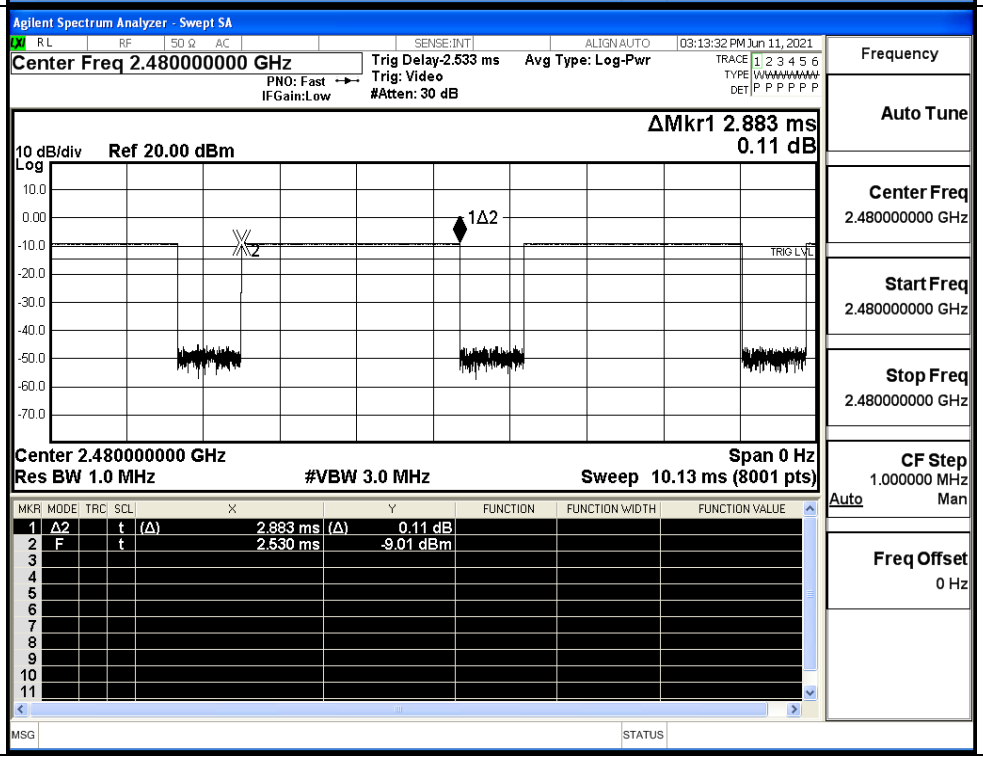
A.5 Dwell Time

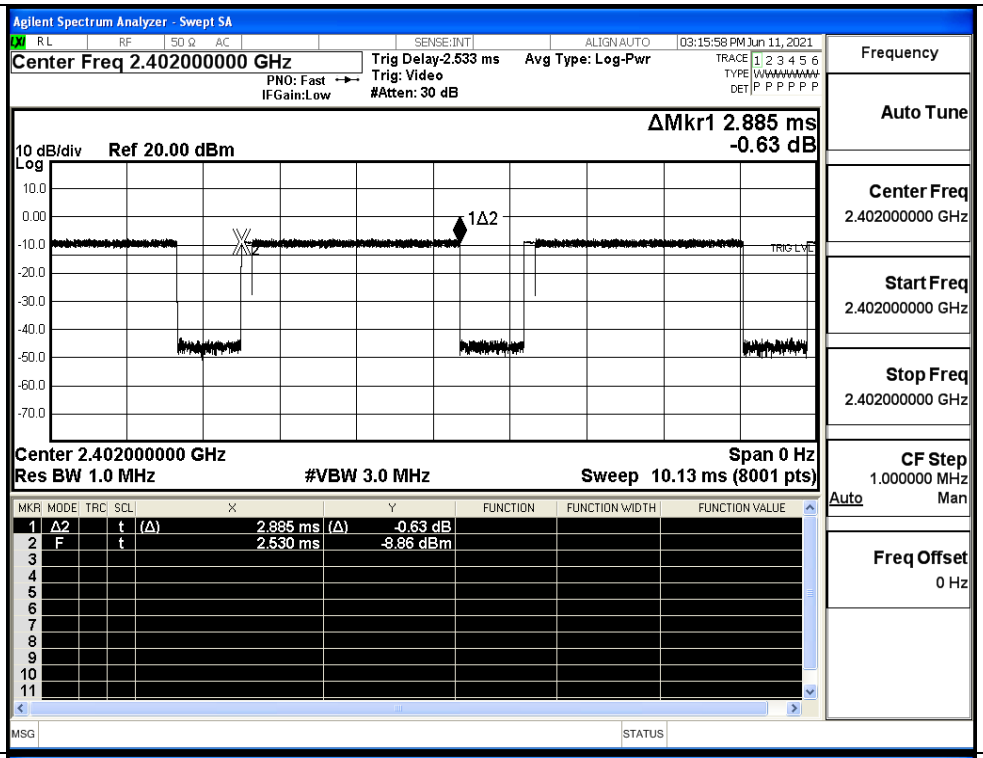
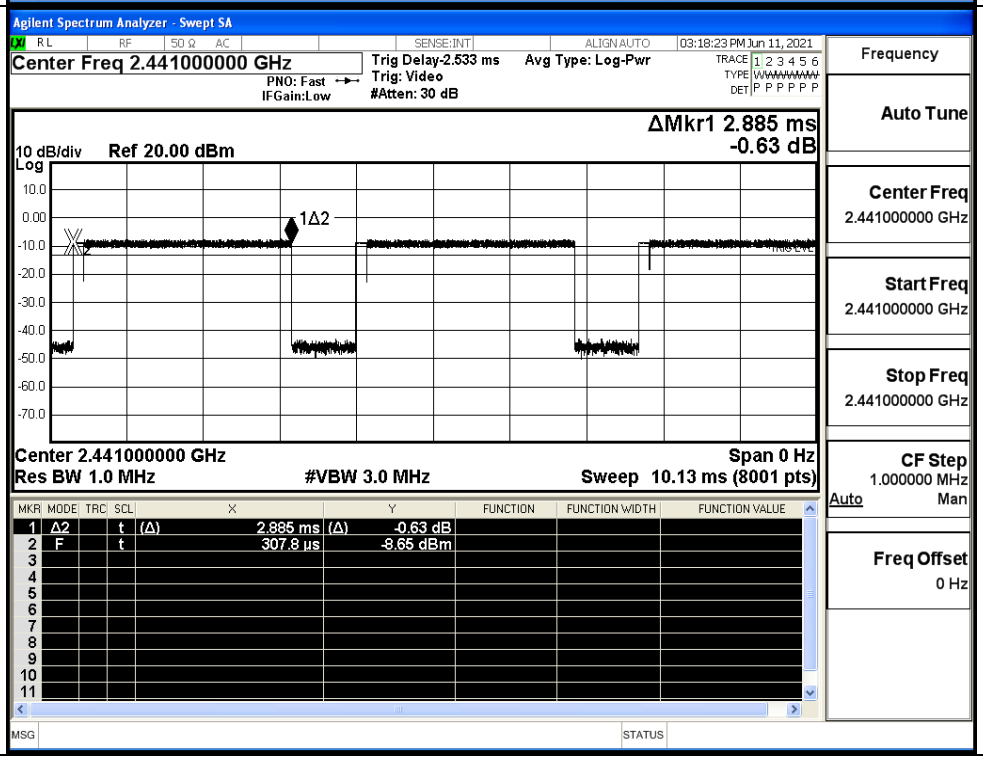
Mode	Packet	Channel	Burst Width [ms/hop/ch]	Total Hops[hop*ch]	Dwell Time[s]	Limit [s]	Verdict
GFSK	DH5	LCH	2.88	106.7	0.307	0.4	PASS
	DH5	MCH	2.88	106.7	0.307	0.4	PASS
	DH5	HCH	2.88	106.7	0.307	0.4	PASS
π/4DQPSK	2DH5	LCH	2.88	106.7	0.308	0.4	PASS
	2DH5	MCH	2.88	106.7	0.308	0.4	PASS
	2DH5	HCH	2.88	106.7	0.308	0.4	PASS

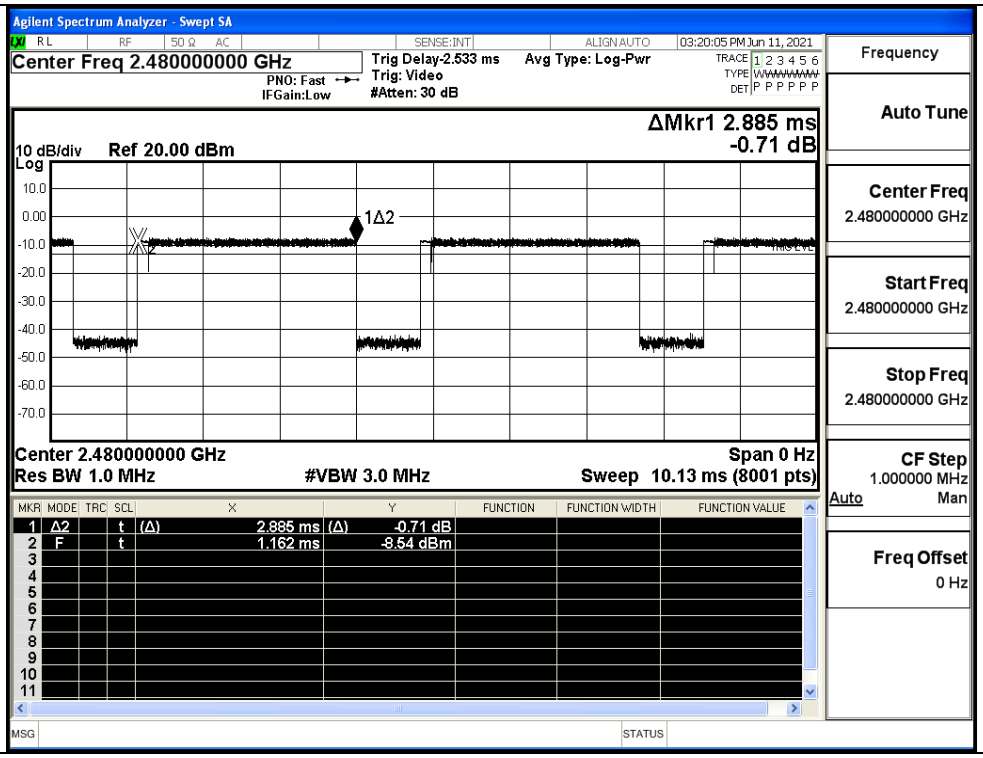
Test Graphs

GFSK_DH5/LCH



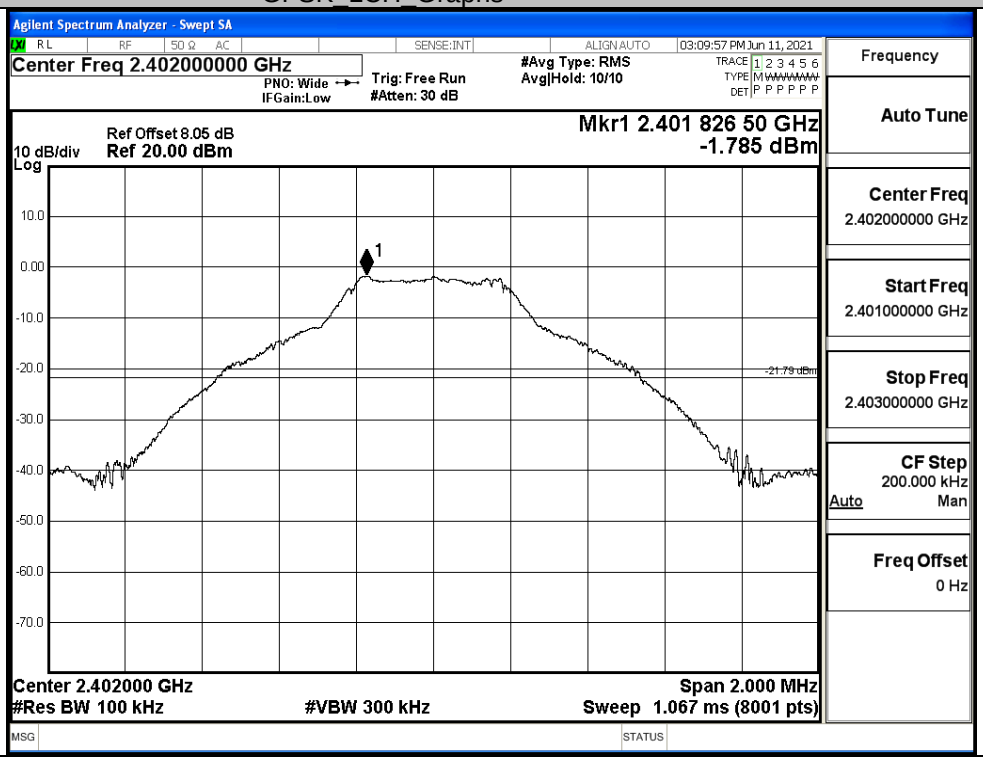
GFSK_DH5/MCH	
GFSK_DH5/HCH	

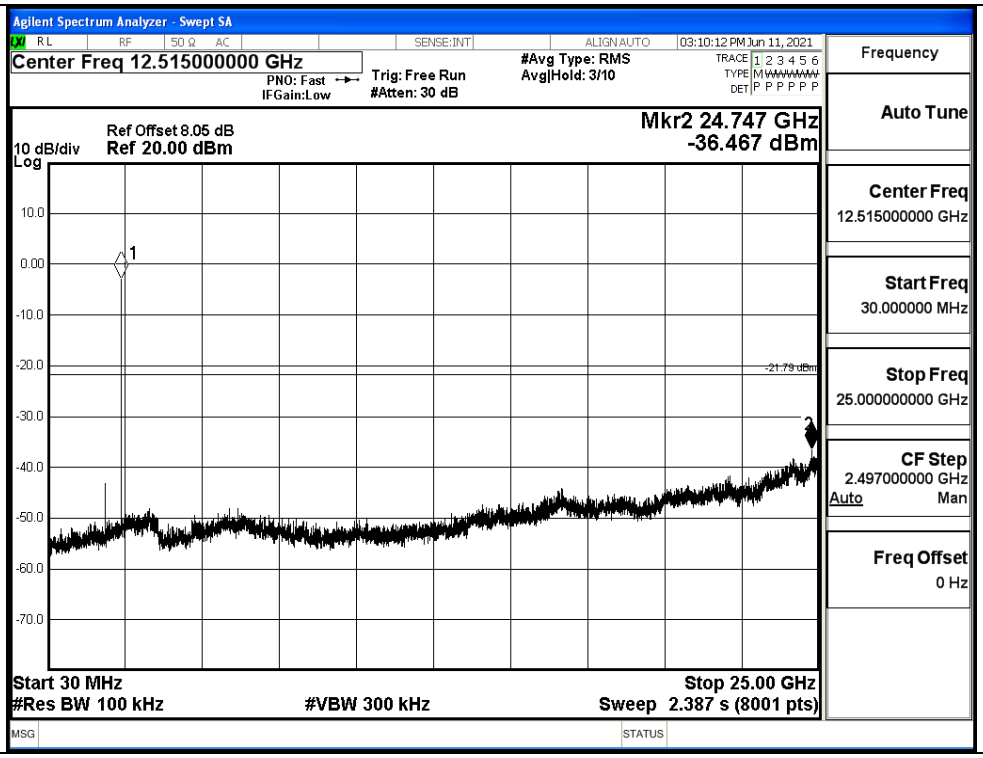
π/4DQPSK _2DH5/LCH	
π/4DQPSK _2DH5/MCH	

π/4DQPSK _2DH5/HCH	

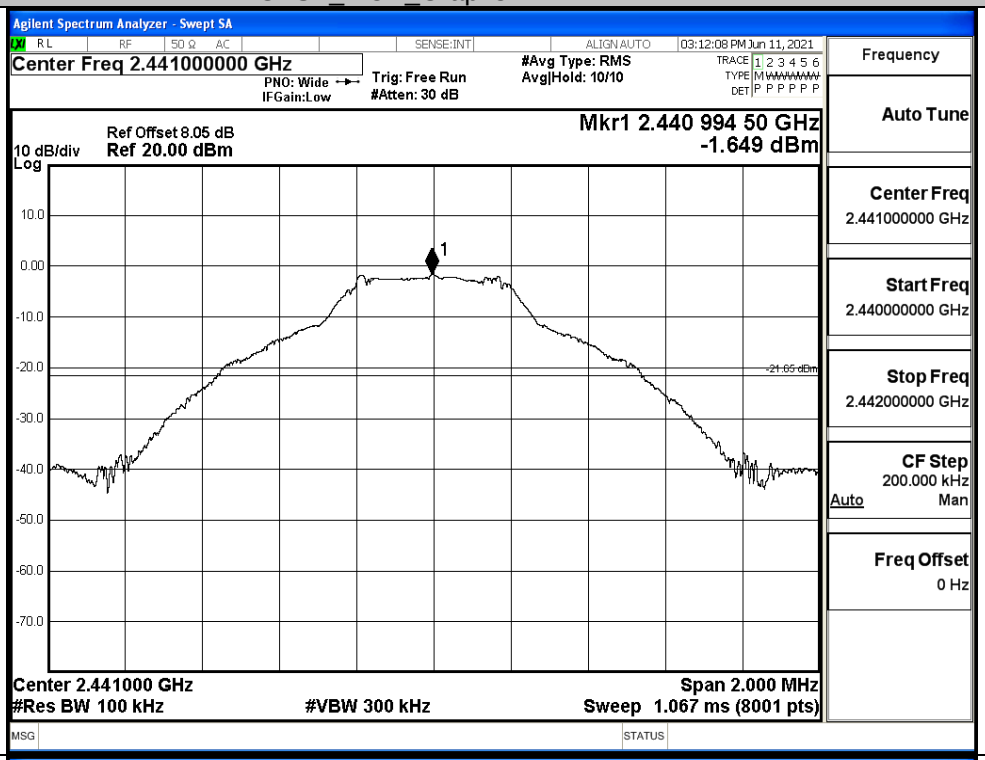
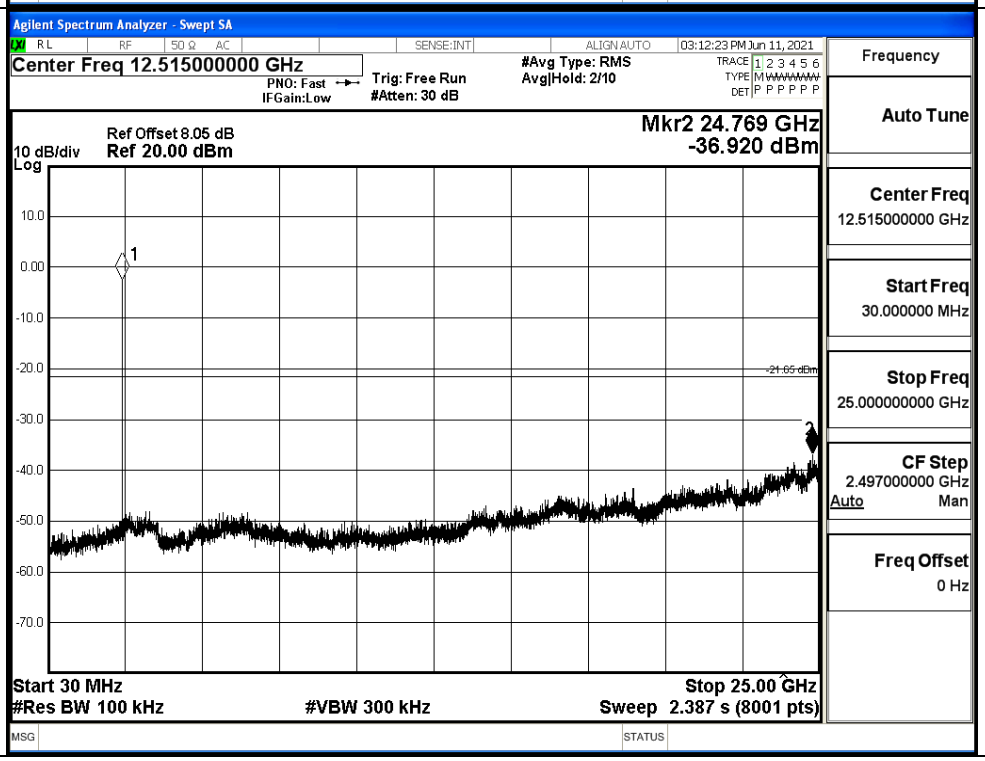
A.6 RF Conducted Spurious Emissions

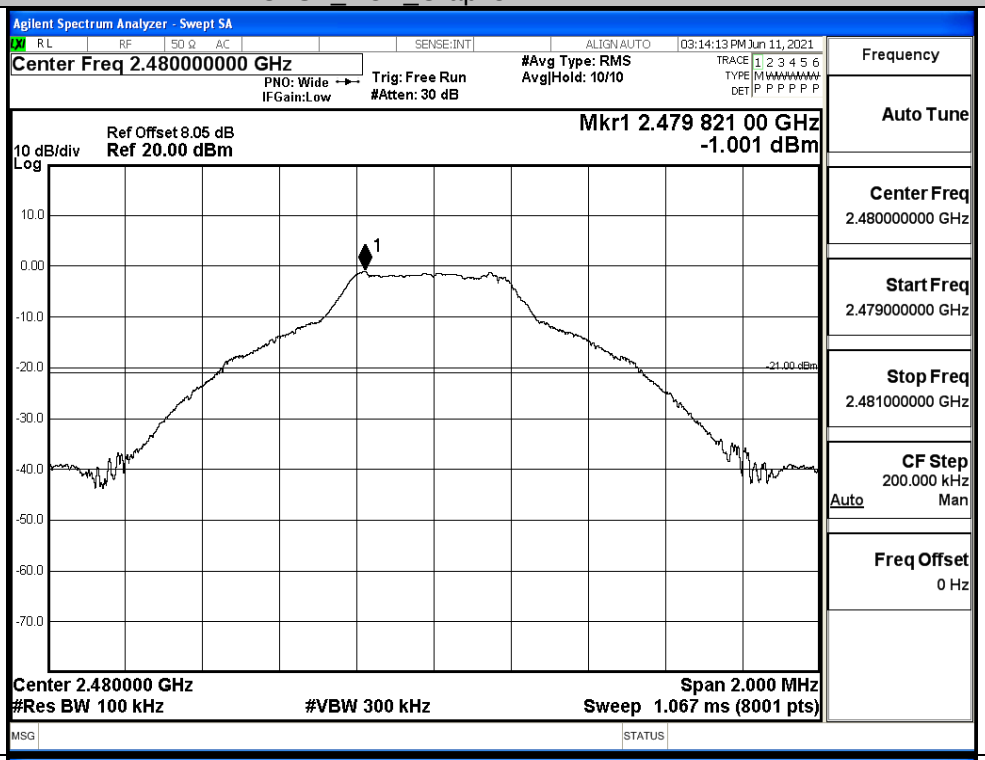
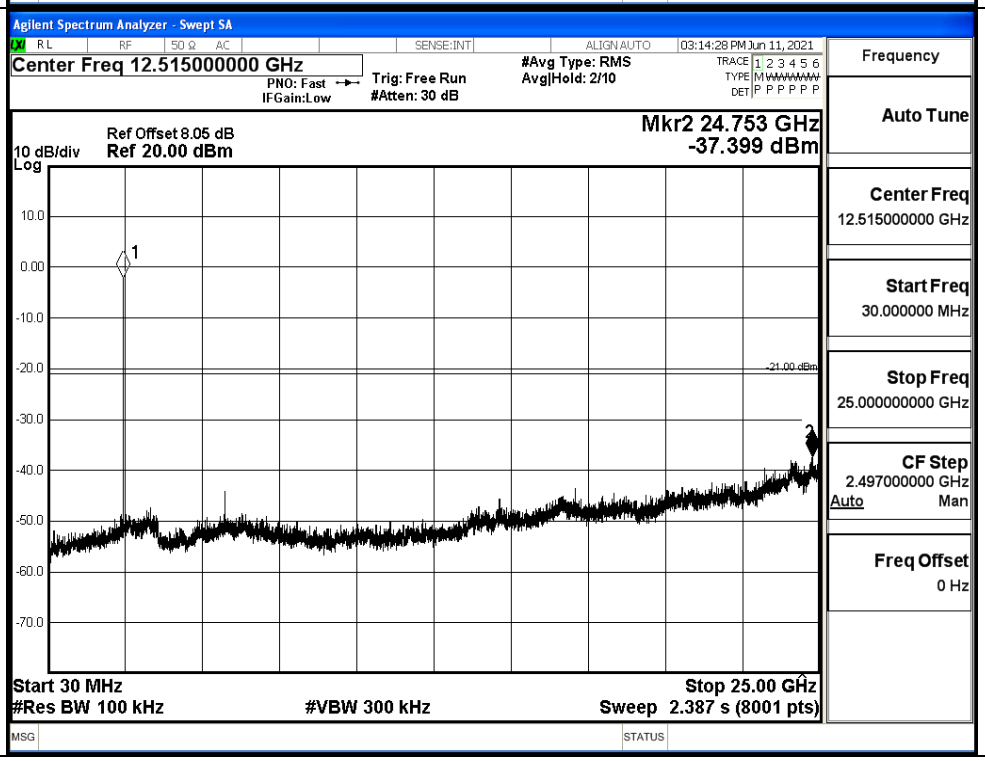
Mode	Channel	Pref [dBm]	Max. Level [dBm]	Limit [dBm]	Verdict
GFSK	LCH	-1.785	-36.467	-21.785	PASS
	MCH	-1.649	-36.920	-21.649	PASS
	HCH	-1.001	-37.399	-21.001	PASS
π/4DQPSK	LCH	-1.037	-36.539	-21.037	PASS
	MCH	-0.704	-36.482	-20.704	PASS
	HCH	-0.555	-37.340	-20.555	PASS

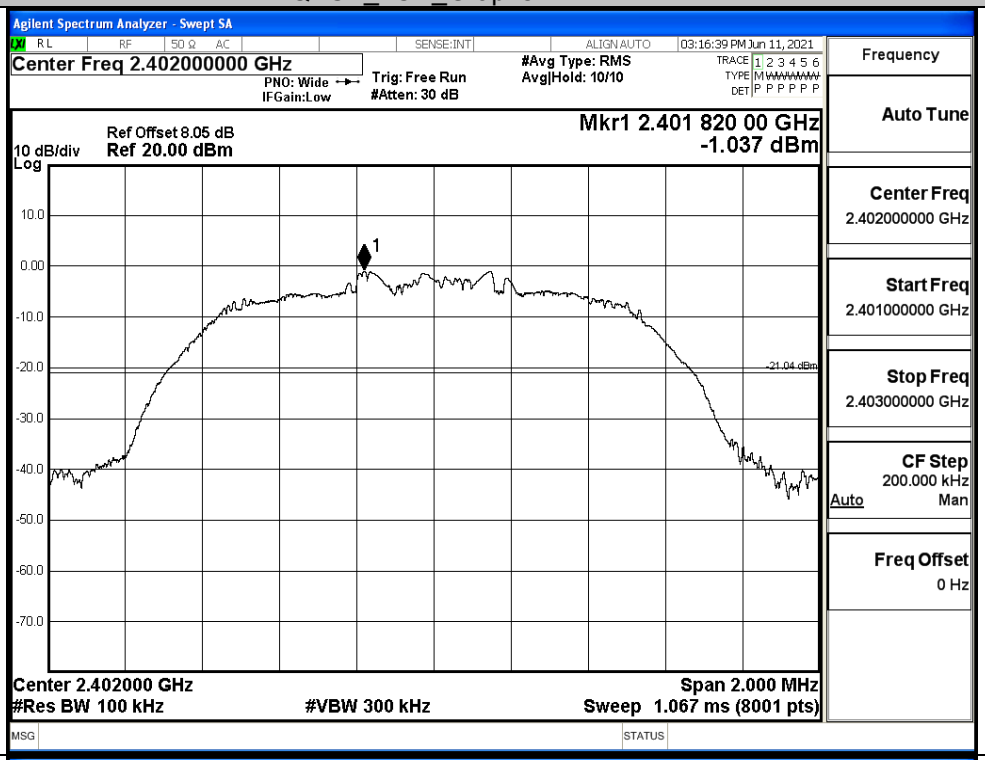
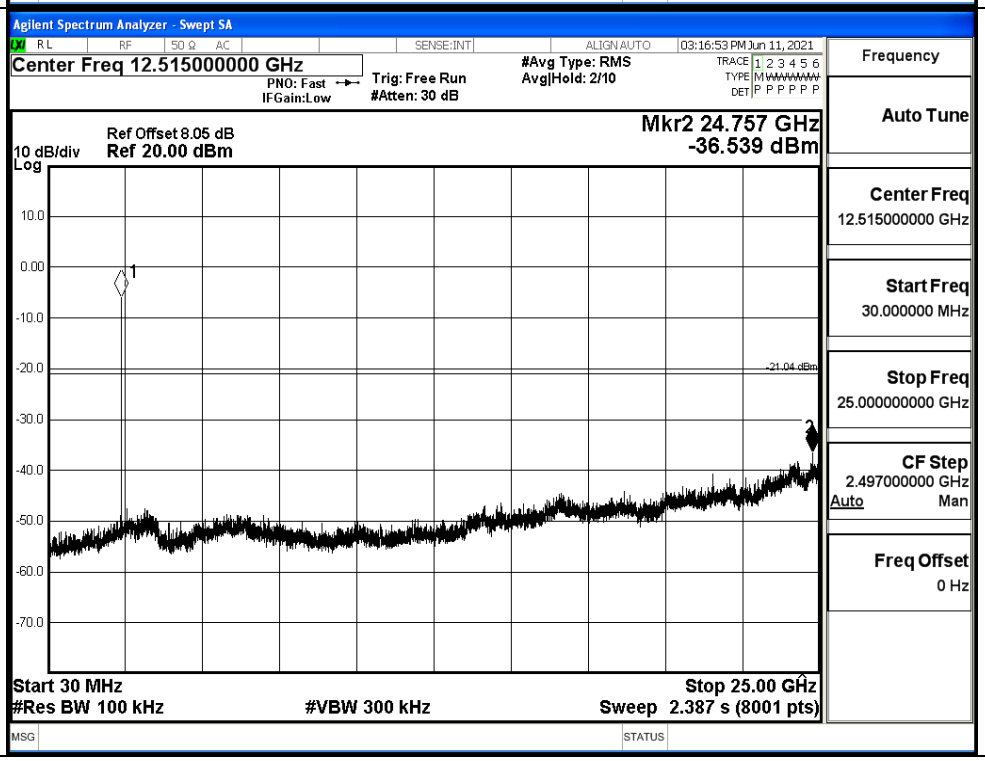
GFSK_LCH_Graphs	
Pref	

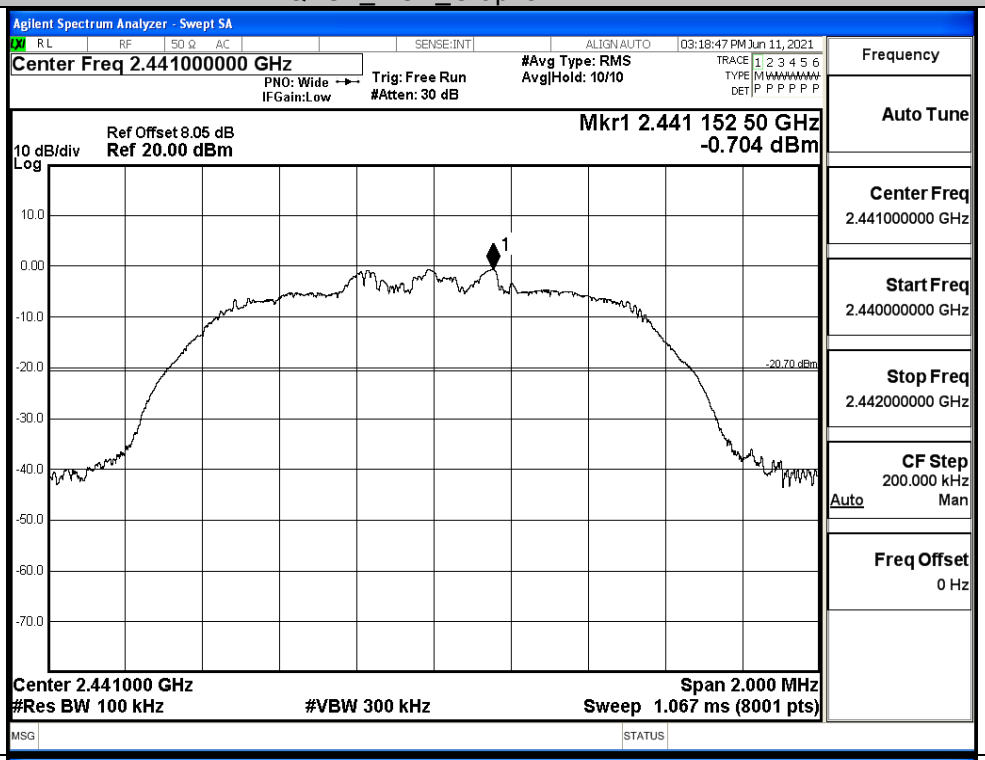
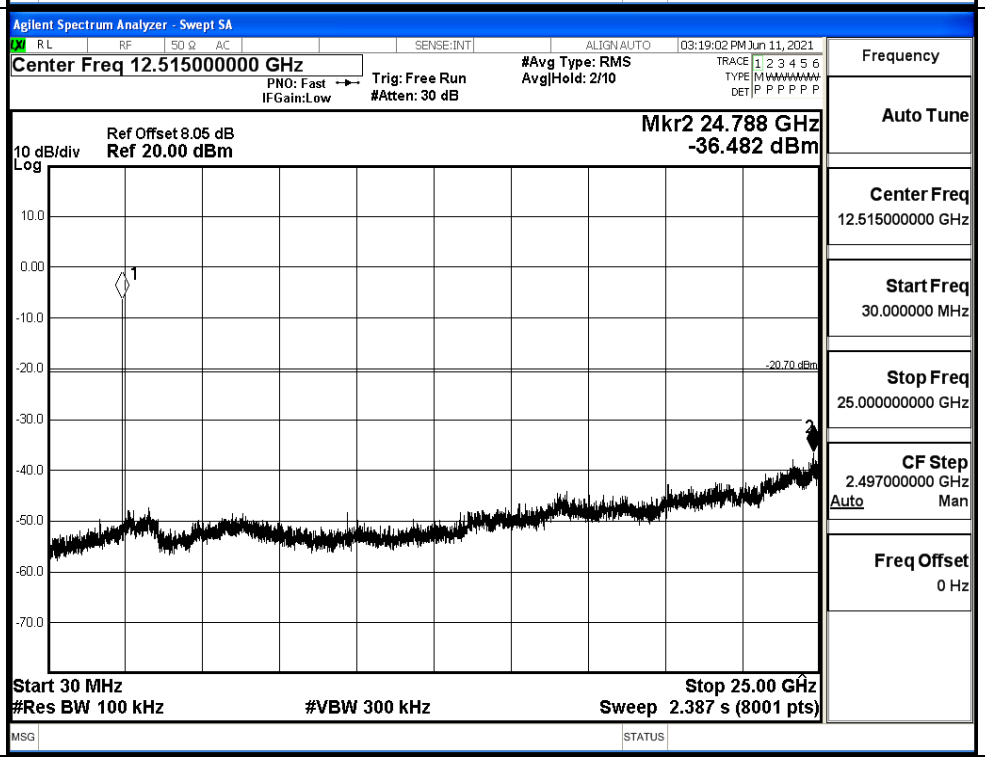
Puw		

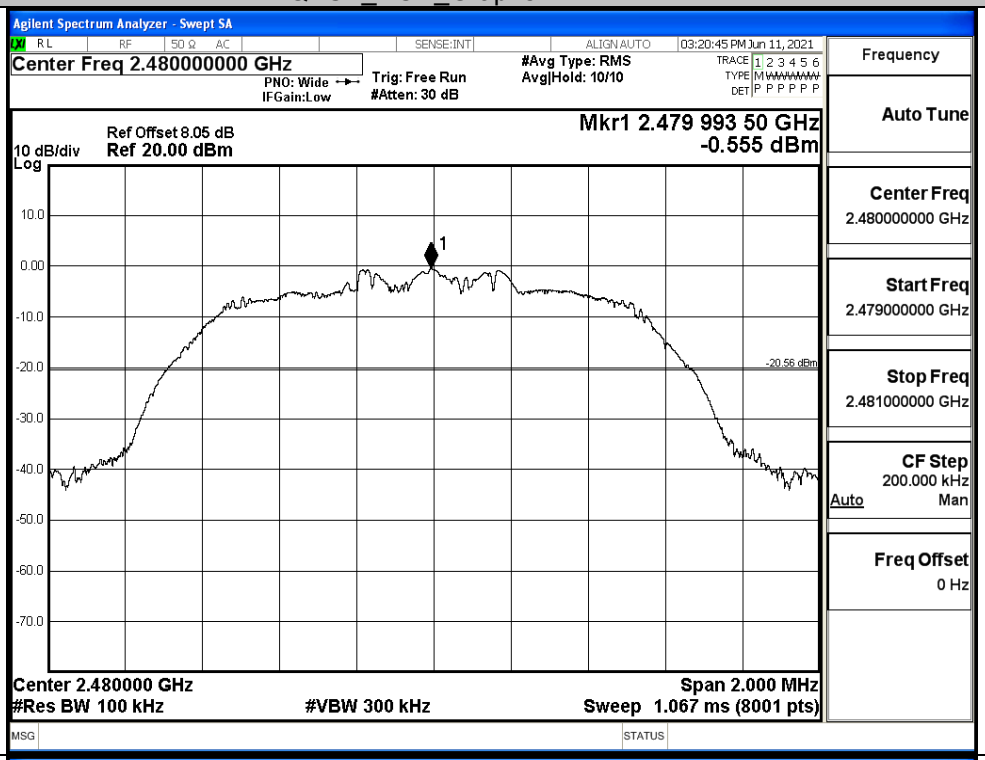
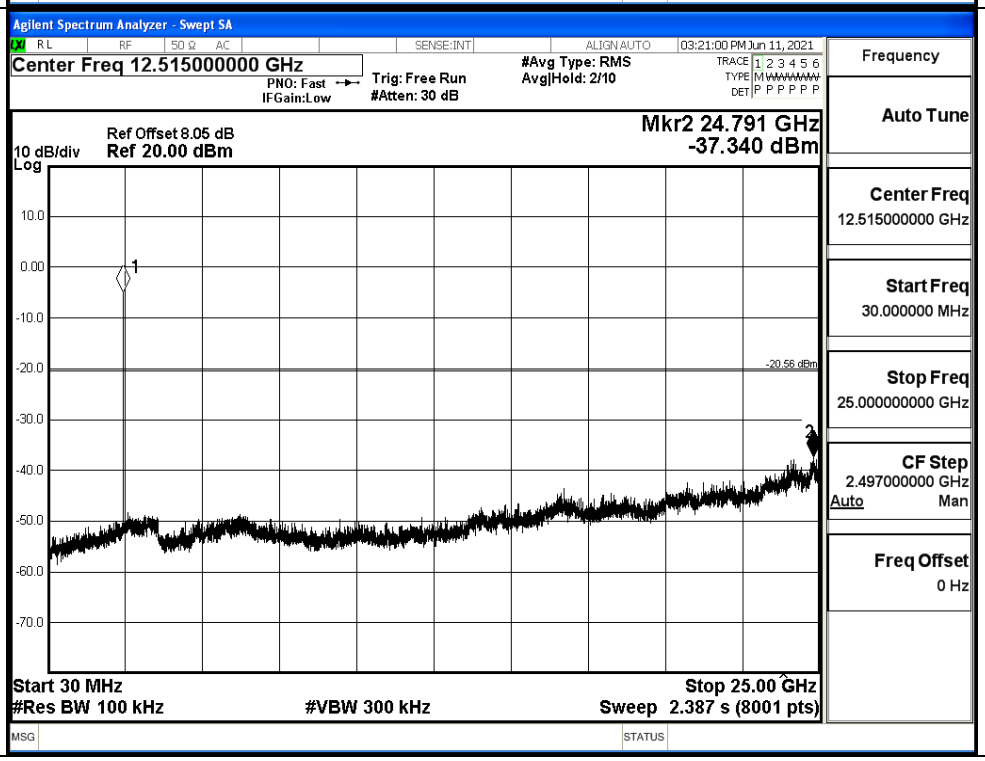
Agilent Spectrum Analyzer - Swept SA
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
03:10:12 PM Jun 11, 2021
Center Freq 12.515000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
#Avg Type: RMS
Avg|Hold: 3/10
TRACE 1 2 3 4 5 6
TYPE M
DET P P P P P
Ref Offset 8.05 dB
10 dB/div
Log
Ref 20.00 dBm
Mkr2 24.747 GHz
-36.467 dBm
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-21.79 dBm
Start 30 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.00 GHz
Sweep 2.387 s (8001 pts)
MSG
STATUS
Frequency
Auto Tune
Center Freq
12.515000000 GHz
Start Freq
30.000000 MHz
Stop Freq
25.000000000 GHz
CF Step
2.497000000 GHz
Auto
Man
Freq Offset
0 Hz

GFSK_MCH_Graphs			
Pref			
Puw			

GFSK_HCH_Graphs			
Pref			
Puw			

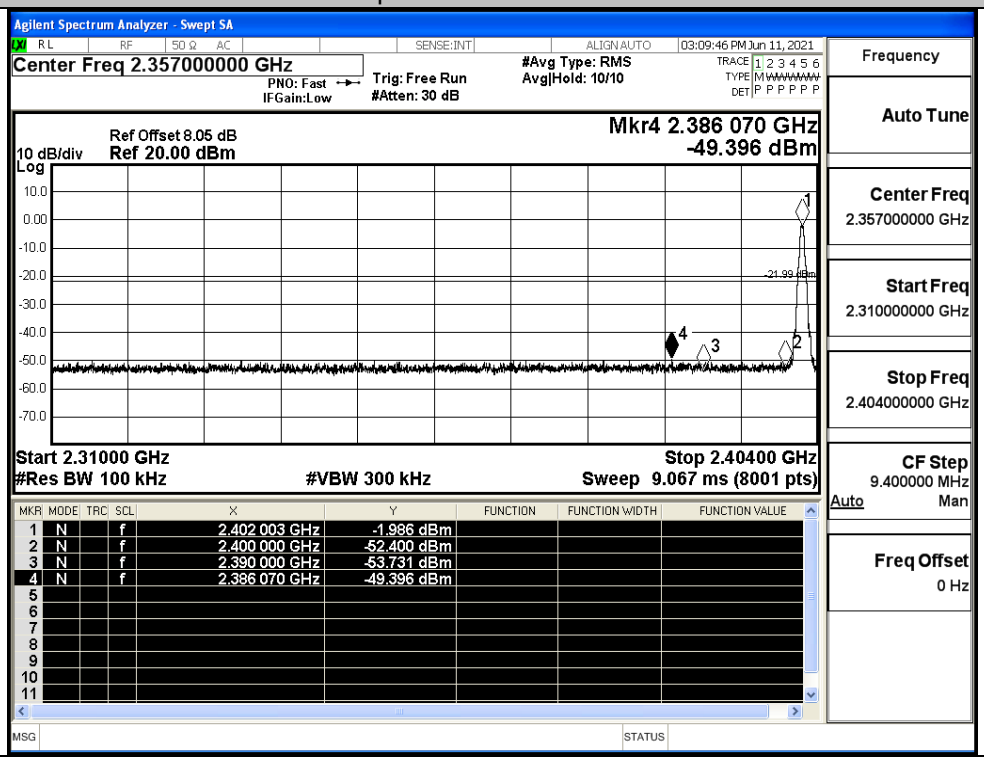
π/4DQPSK_LCH_Graphs		
Pref		
Puw		

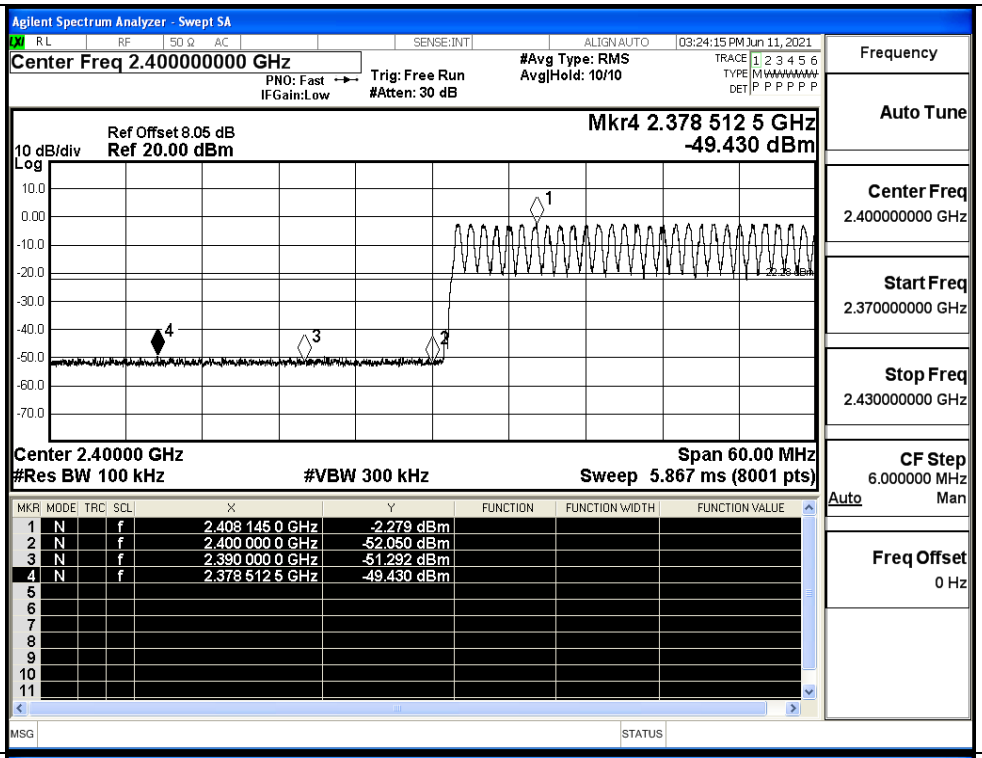
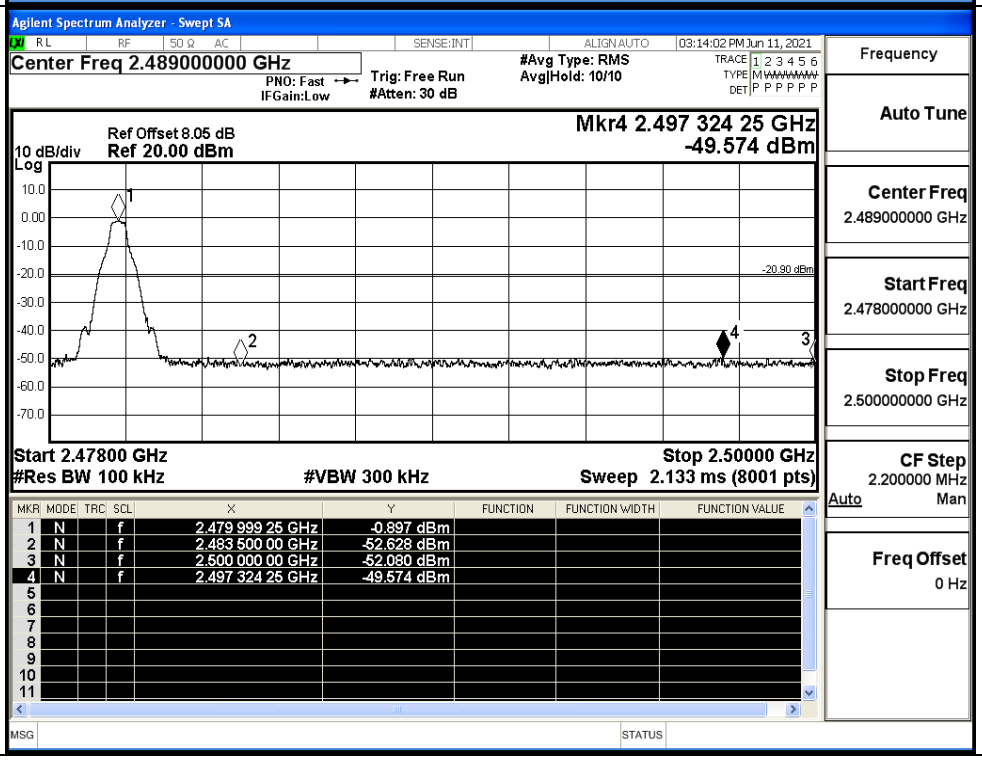
π/4DQPSK_MCH_Graphs			
Pref			
Puw			

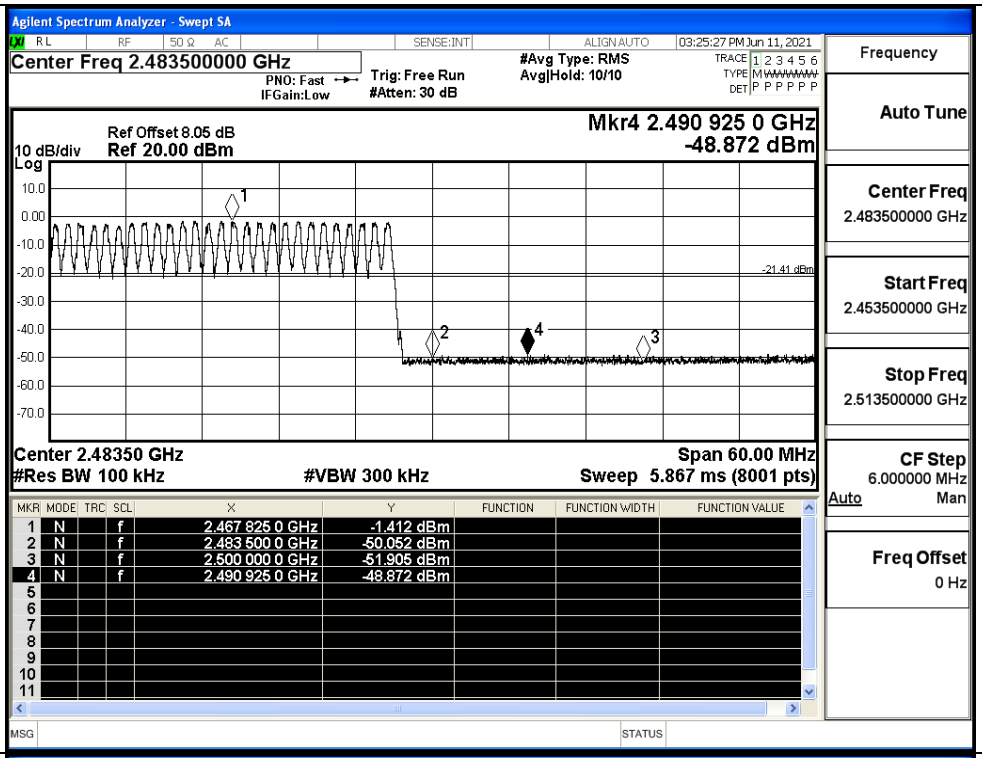
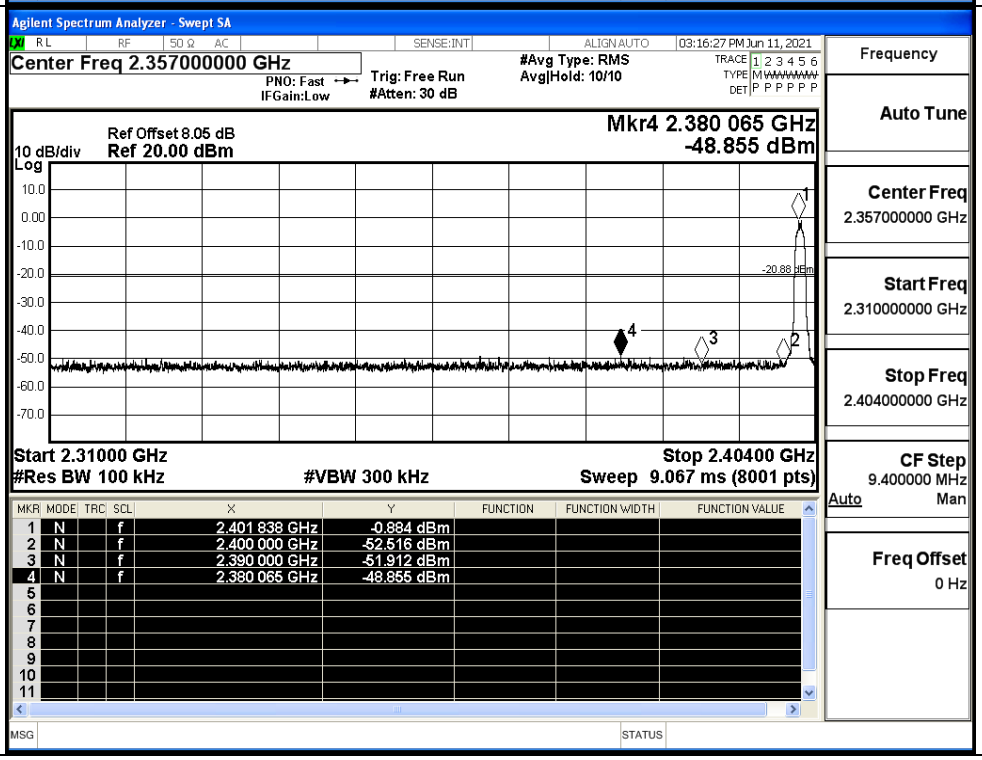
π/4DQPSK_HCH_Graphs		
Pref		
Puw		

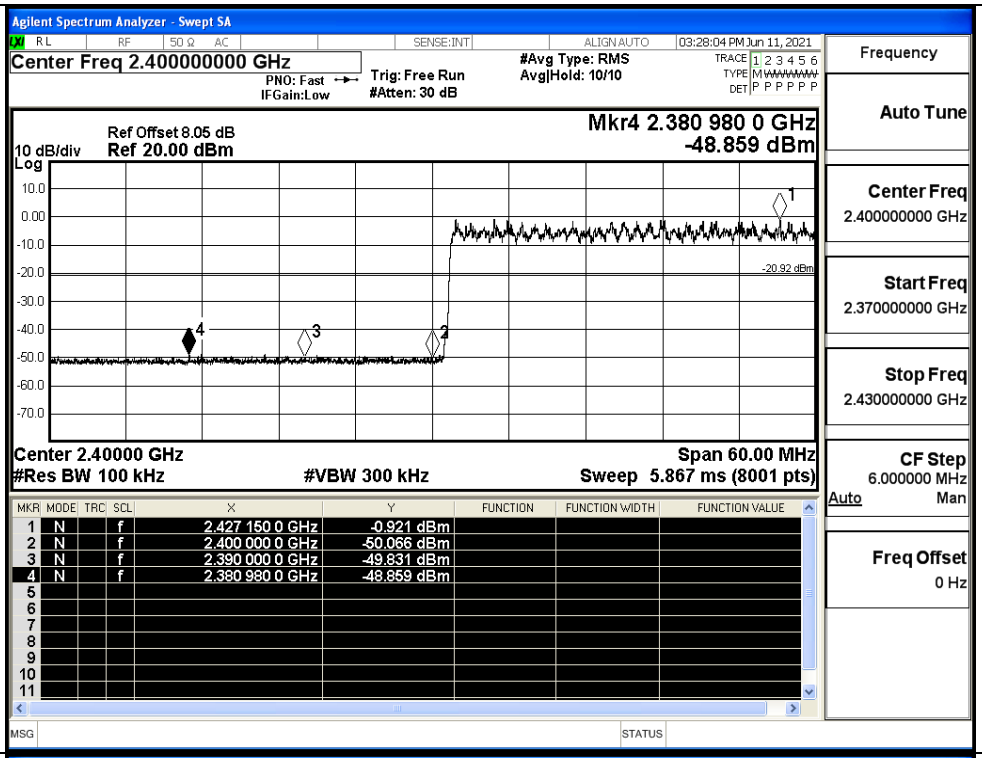
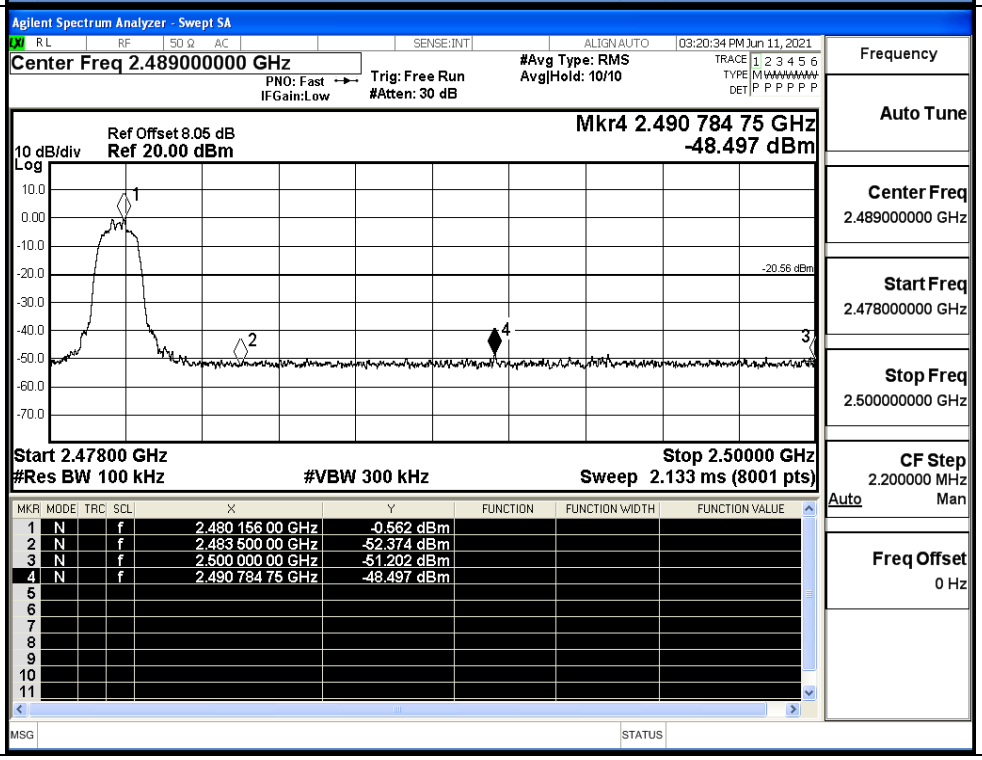
A.7 Band-edge for RF Conducted Emissions

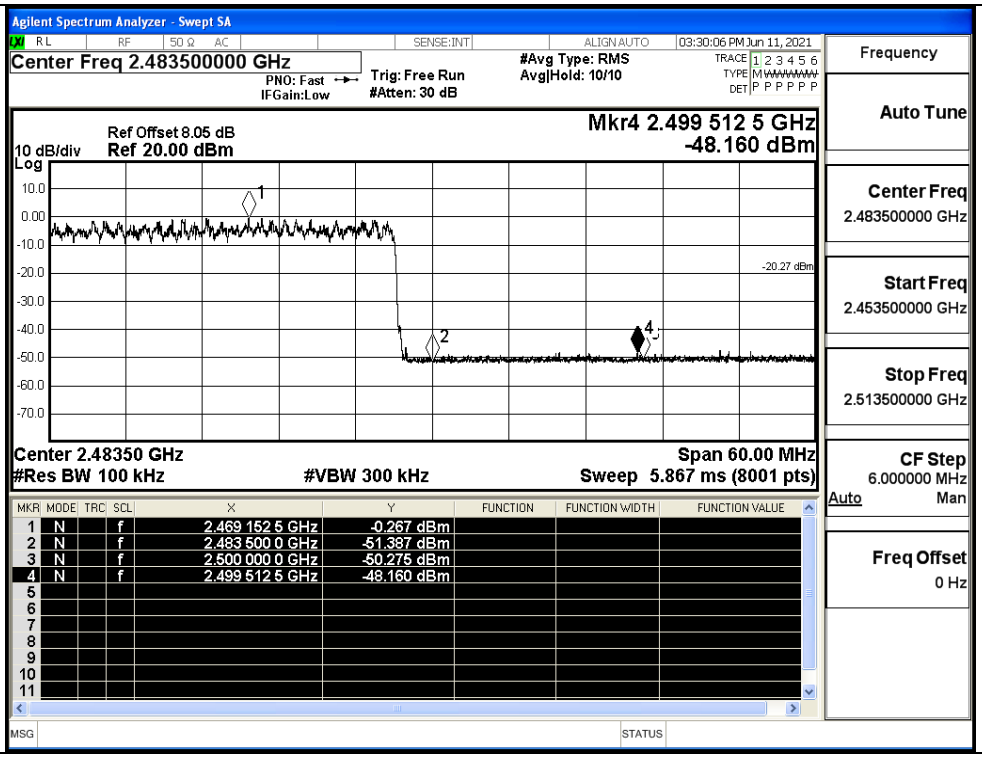
Mode	Channel	Carrier Frequency [MHz]	Carrier Power [dBm]	Frequency Hopping	Max Spurious Level [dBm]	Limit [dBm]	Verdict
GFSK	LCH	2402	-1.986	Off	-49.396	-21.99	PASS
			-2.279	On	-49.430	-22.28	PASS
	HCH	2480	-0.897	Off	-49.574	-20.9	PASS
			-1.412	On	-48.872	-21.41	PASS
π/4DQPSK	LCH	2402	-0.884	Off	-48.855	-20.88	PASS
			-0.921	On	-48.859	-20.92	PASS
	HCH	2480	-0.562	Off	-48.497	-20.56	PASS
			-0.267	On	-48.160	-20.27	PASS

Test Graphs	
GFSK/LCH/No Hop	

GFSK/LCH/Hop	
GFSK/HCH/No Hop	

GFSK/HCH/Hop	
π/4DQPSK/LCH/No Hop	

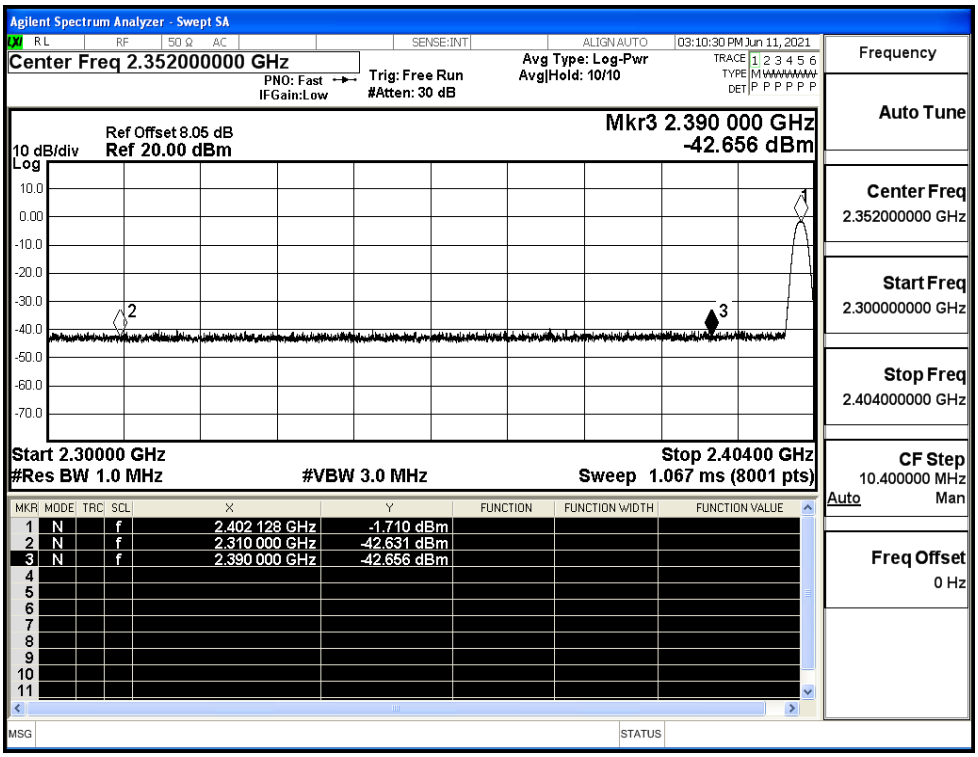
π/4DQPSK/LCH/Hop	
π/4DQPSK/HCH/No Hop	

π/4DQPSK/HCH/Hop	

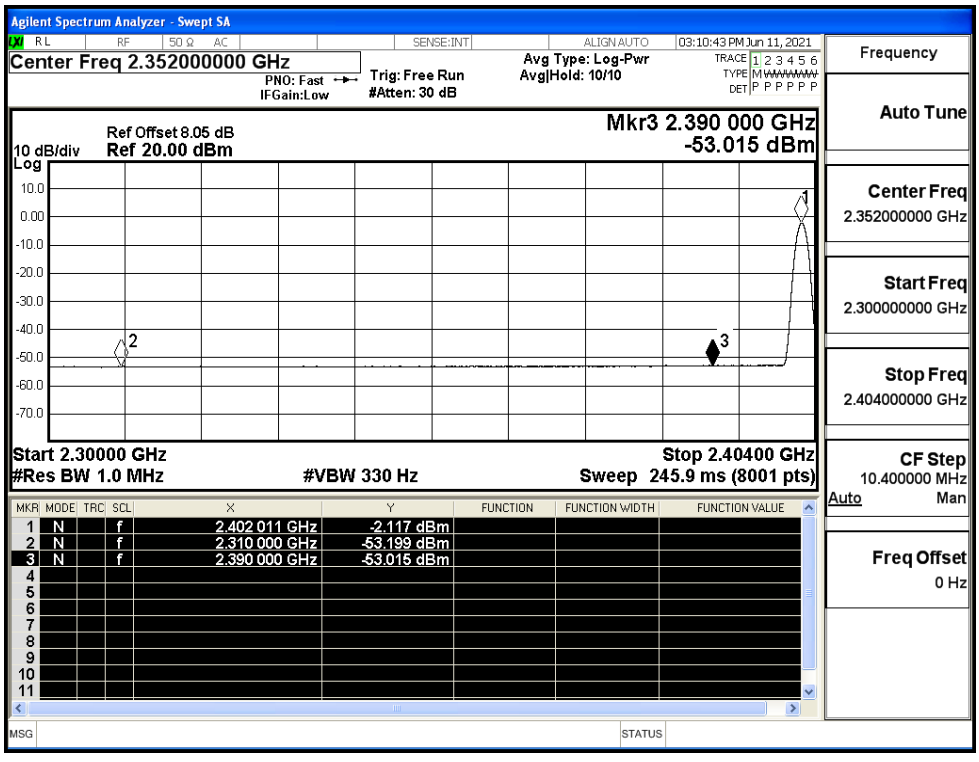
A.8 Restrict-band band-edge measurements

Test Mode	Hopping	Freq.	Power [dBm]	Gain	Ground Factor	E [dBuV/m]	Detector	Limit [dBuV/m]	Verdict
GFSK	Off	2310.0	-42.63	2.0	0	54.60	PEAK	74	PASS
	Off	2310.0	-53.20	2.0	0	44.03	AV	54	PASS
	Off	2390.0	-42.66	2.0	0	54.57	PEAK	74	PASS
	Off	2390.0	-53.02	2.0	0	44.21	AV	54	PASS
	Off	2483.5	-41.90	2.0	0	55.33	PEAK	74	PASS
	Off	2483.5	-52.52	2.0	0	44.71	AV	54	PASS
	Off	2500.0	-41.55	2.0	0	55.68	PEAK	74	PASS
	Off	2500.0	-52.33	2.0	0	44.90	AV	54	PASS
π/4DQPSK	Off	2310.0	-41.79	2.0	0	55.44	PEAK	74	PASS
	Off	2310.0	-53.33	2.0	0	43.90	AV	54	PASS
	Off	2390.0	-42.44	2.0	0	54.79	PEAK	74	PASS
	Off	2390.0	-52.91	2.0	0	44.32	AV	54	PASS
	Off	2483.5	-40.16	2.0	0	57.07	PEAK	74	PASS
	Off	2483.5	-52.37	2.0	0	44.86	AV	54	PASS
	Off	2500.0	-42.34	2.0	0	54.89	PEAK	74	PASS
	Off	2500.0	-52.30	2.0	0	44.93	AV	54	PASS

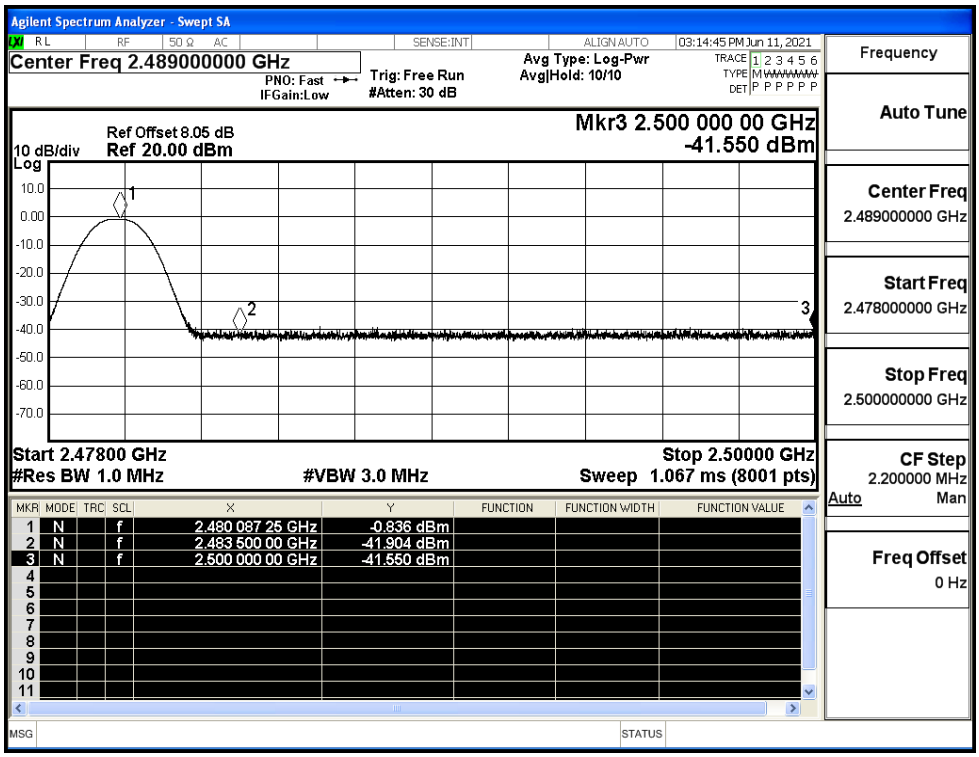
Restrict-band band-edge measurements_Hopping Off_ GFSK_PEAK (Low Channel)



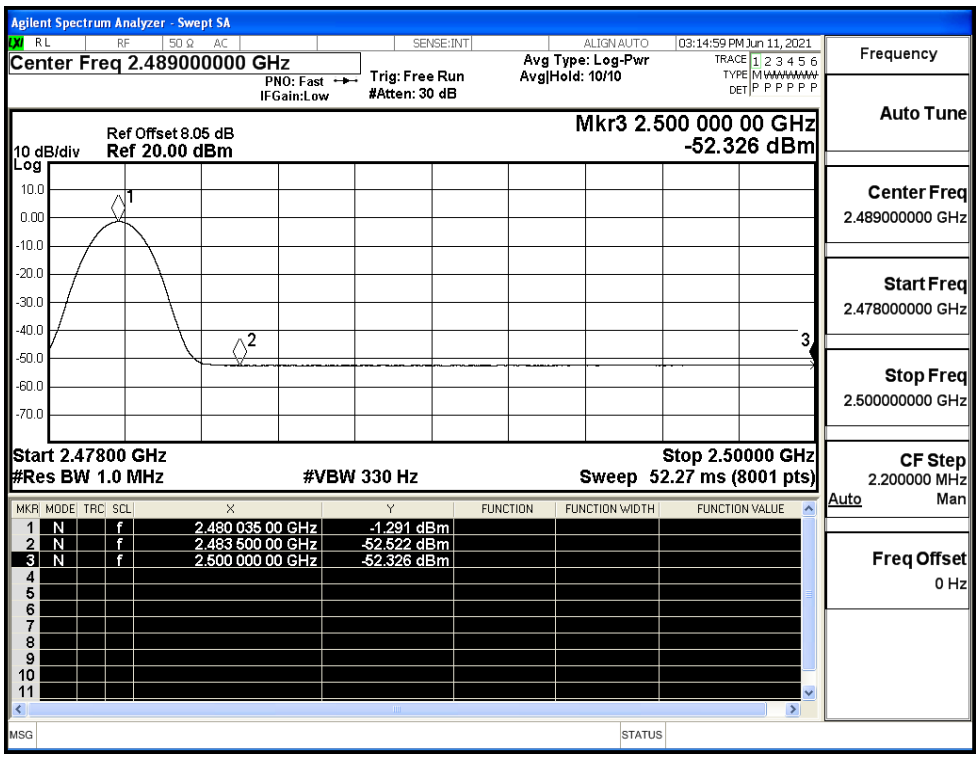
Restrict-band band-edge measurements_Hopping Off_ GFSK_Average (Low Channel)



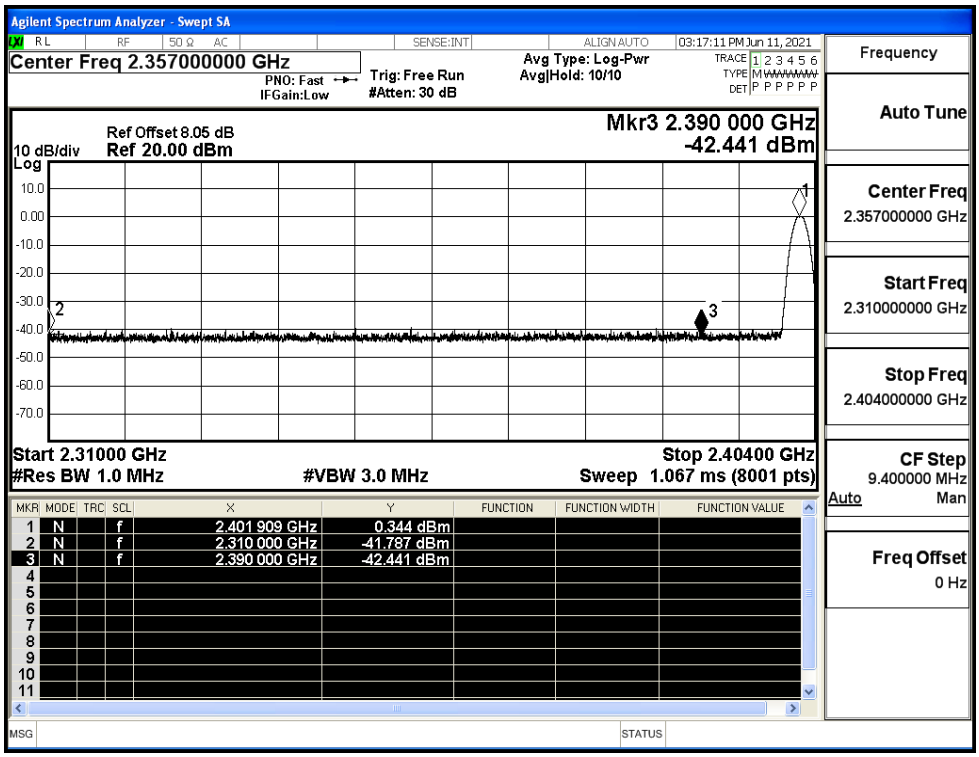
Restrict-band band-edge measurements_Hopping Off_ GFSK_PEAK (High Channel)



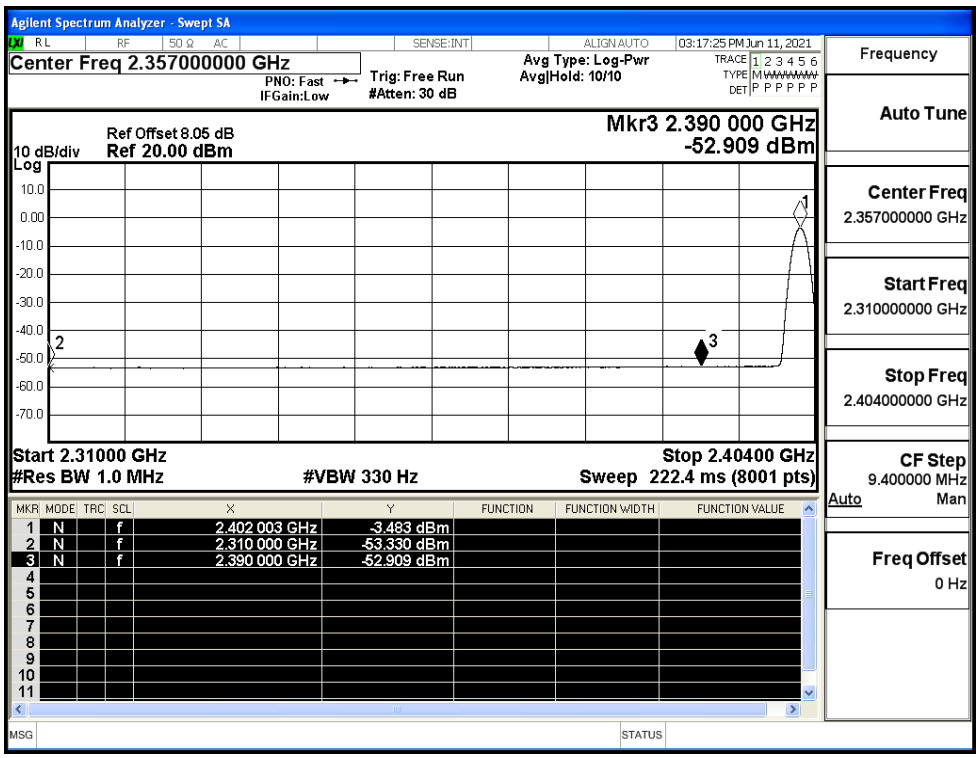
Restrict-band band-edge measurements_Hopping Off_ GFSK_Average (High Channel)



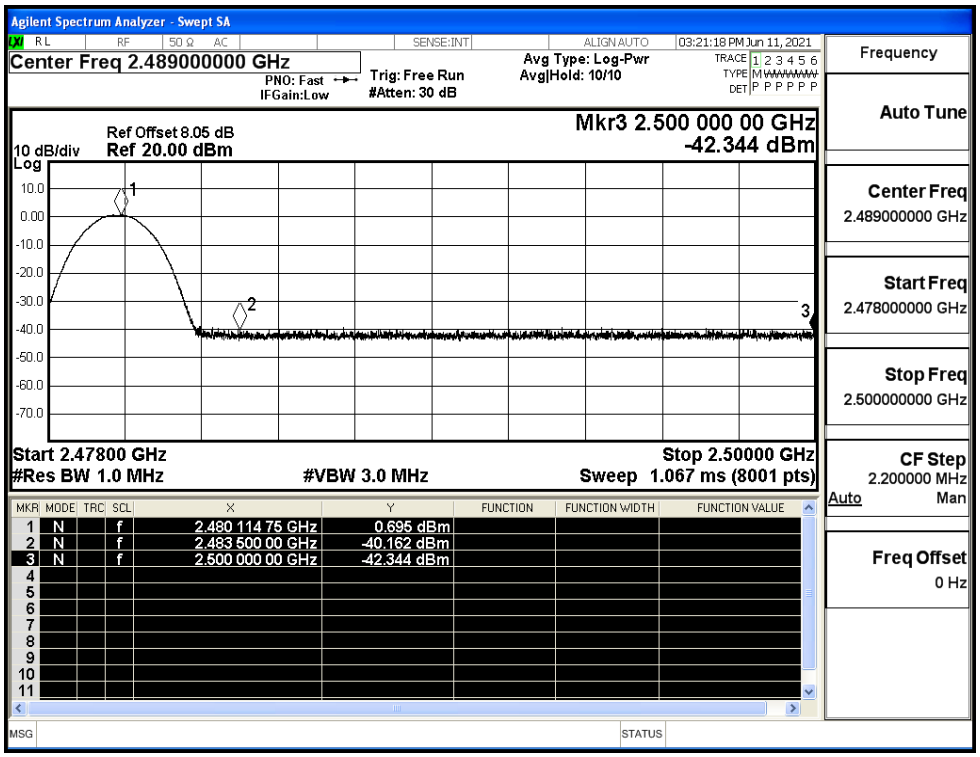
Restrict-band band-edge measurements_Hopping Off_π/4-DQPSK_PEAK (Low Channel)



Restrict-band band-edge measurements_Hopping Off_π/4-DQPSK_Average (Low Channel)



Restrict-band band-edge measurements_Hopping Off_π/4-DQPSK_PEAK (High Channel)



Restrict-band band-edge measurements_Hopping Off_π/4-DQPSK_Average (High Channel)