

Appendix A

RF Test Data for BT V5.0 (BDR/EDR) (Conducted Measurement)

Product Name: Car Wireless FM Transmitter

Trade Mark: UNBREAKcable

Test Model: UBCH174

Environmental Conditions

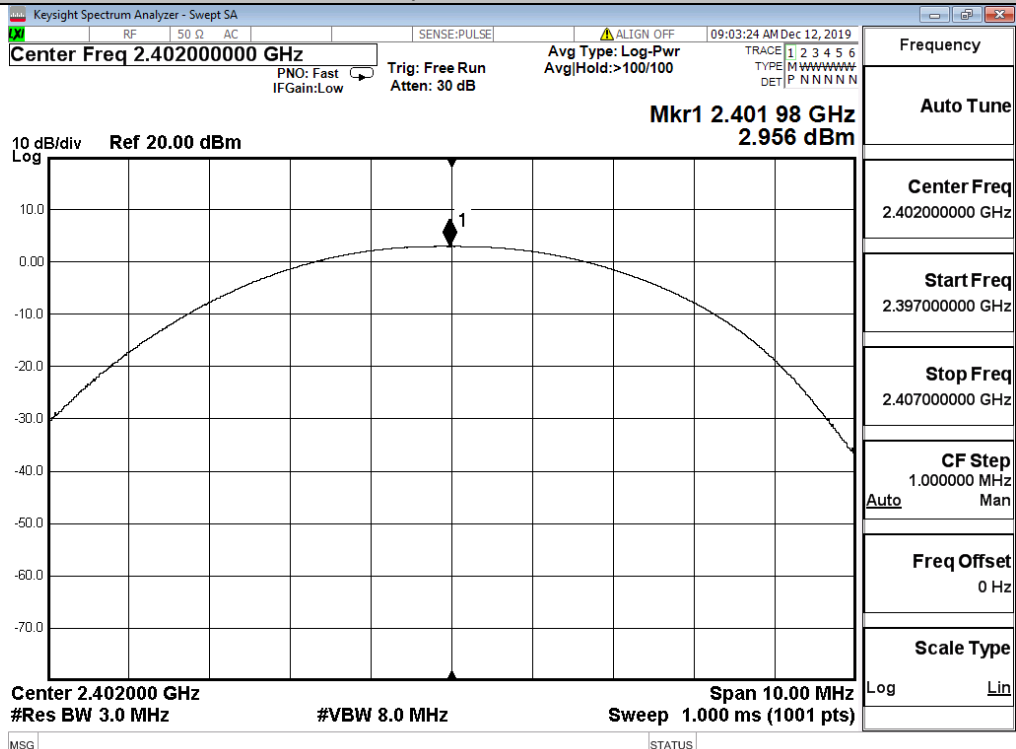
Temperature:	23.5 °C
Relative Humidity:	55%
ATM Pressure:	100.0 kPa
Test Engineer:	Kay Hu
Supervised by:	Jayden.Zhuo

A.1 Maximum Conducted Peak Output Power

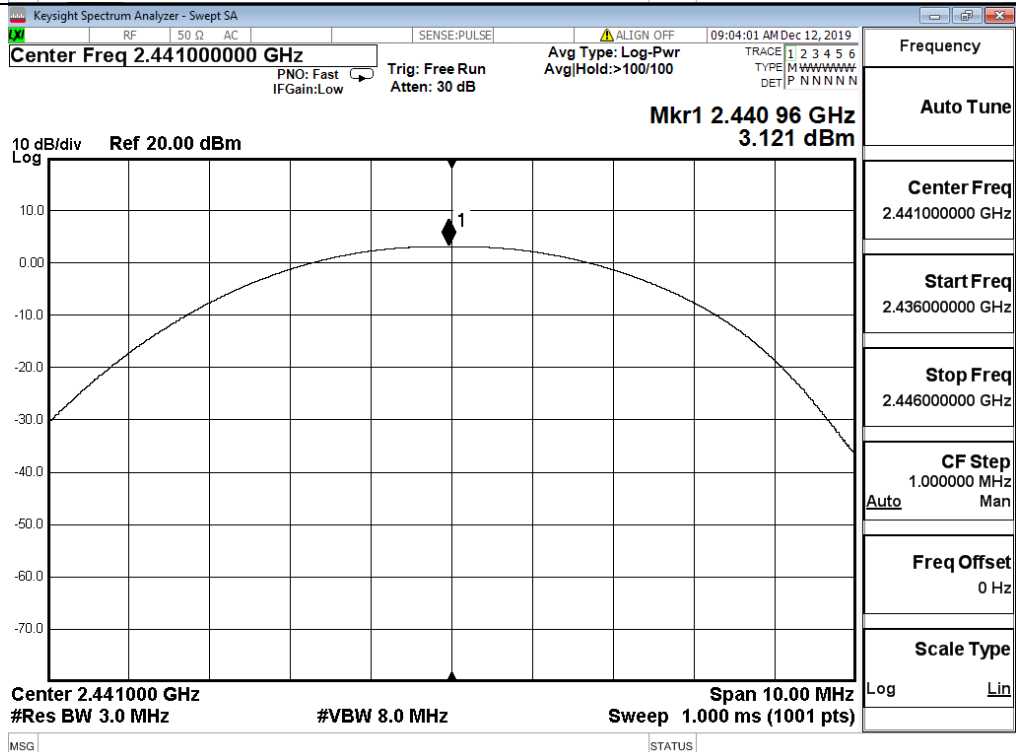
Mode	Channel.	Maximum Peak Output Power [dBm]	Limit [dBm]	Verdict
GFSK	LCH	2.956	21	PASS
	MCH	3.121	21	PASS
	HCH	3.024	21	PASS
$\pi/4$ DQPSK	LCH	1.949	21	PASS
	MCH	2.229	21	PASS
	HCH	2.127	21	PASS

Test Graphs

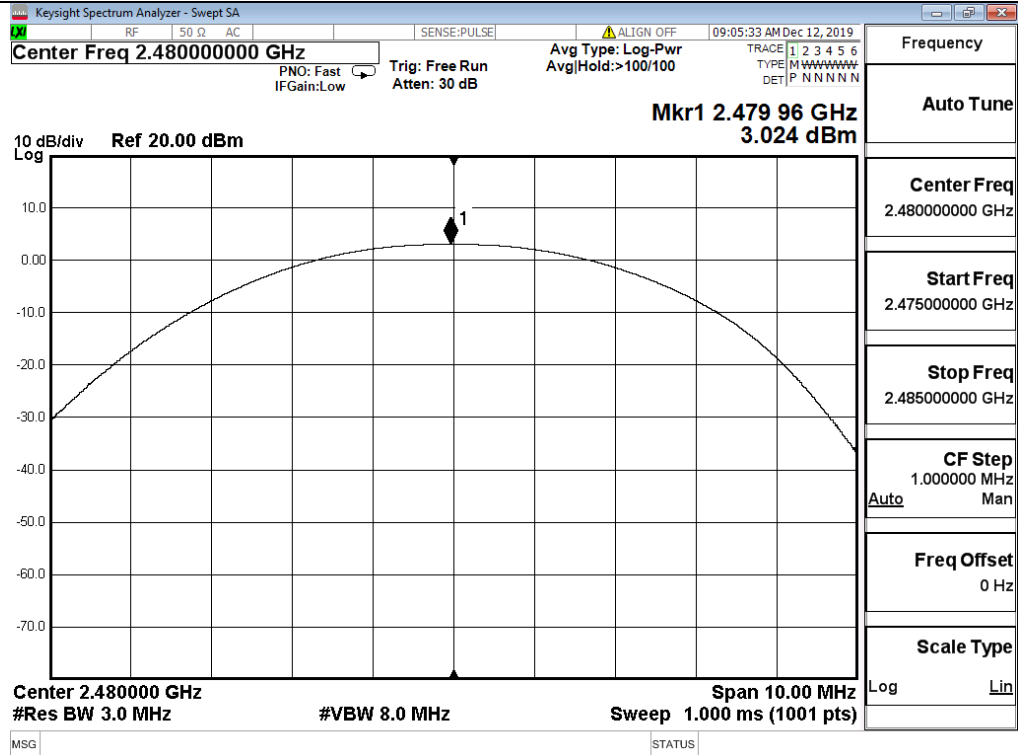
GFSK/LCH



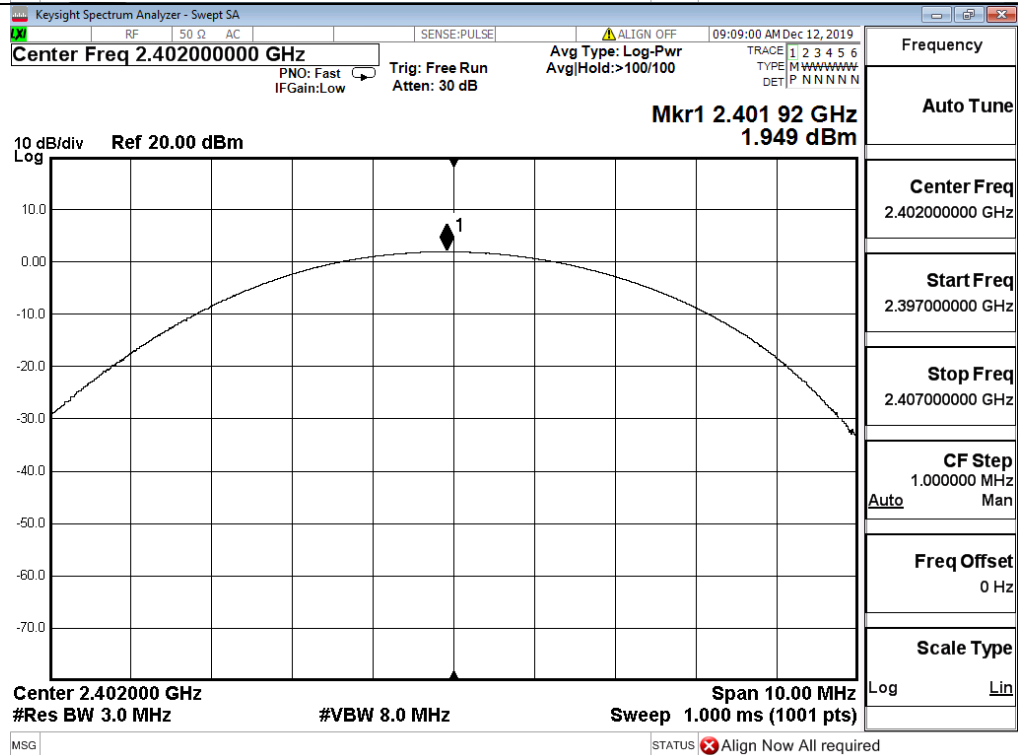
GFSK/MCH



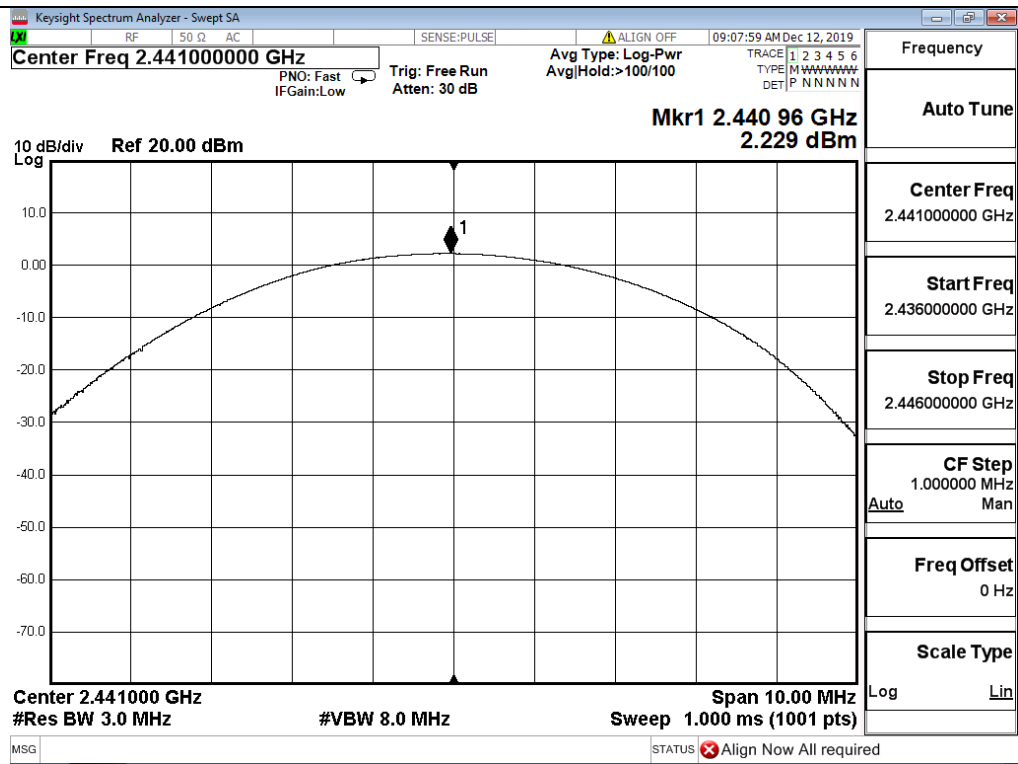
GFSK/HCH



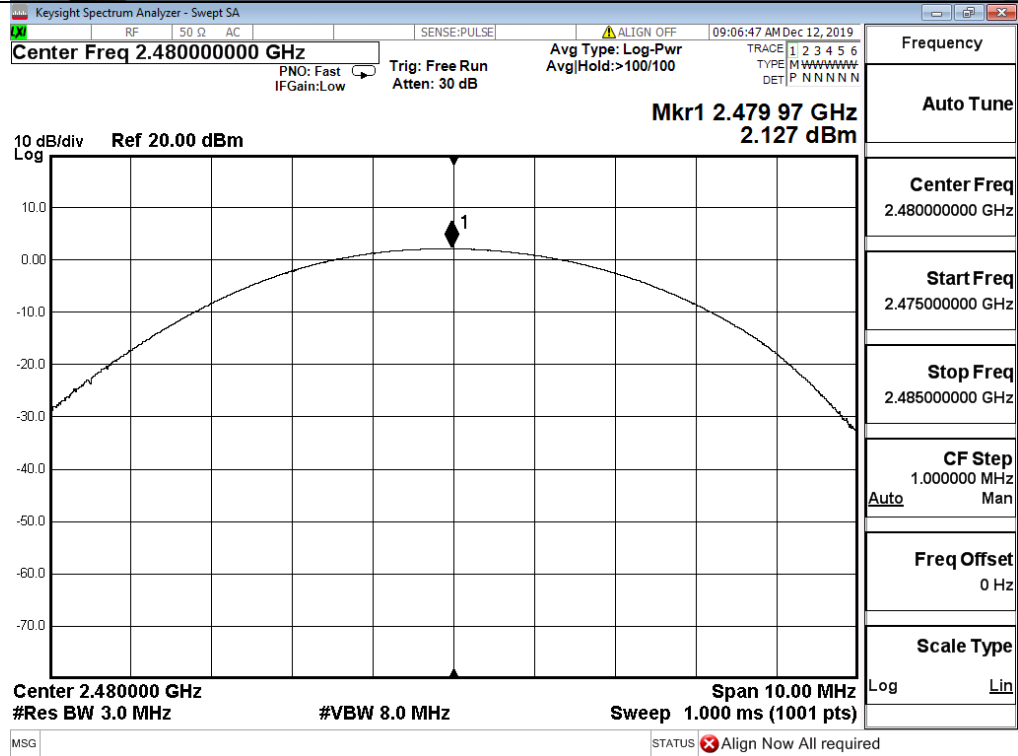
$\pi/4$ DQPSK/LCH



$\pi/4$ DQPSK/MCH

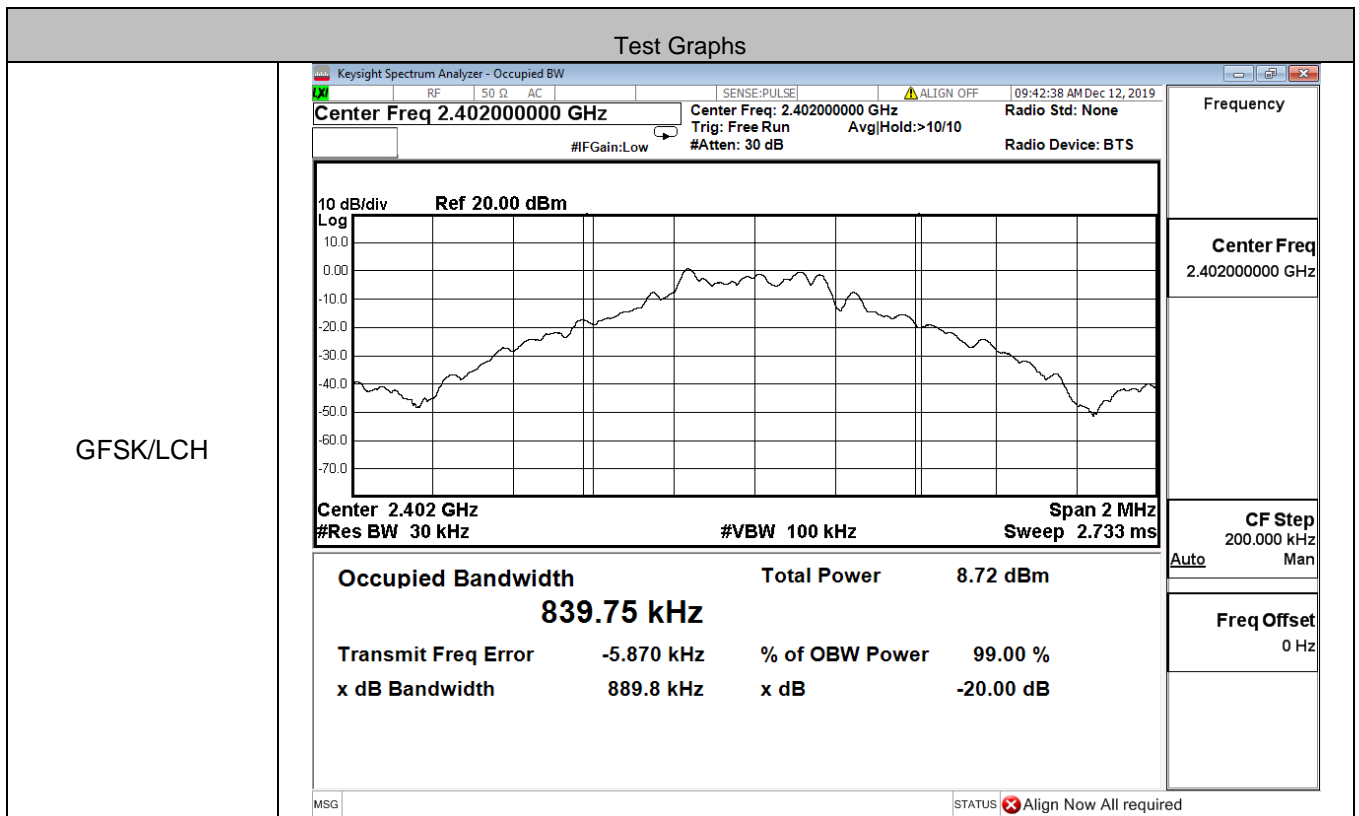


$\pi/4$ DQPSK/HCH

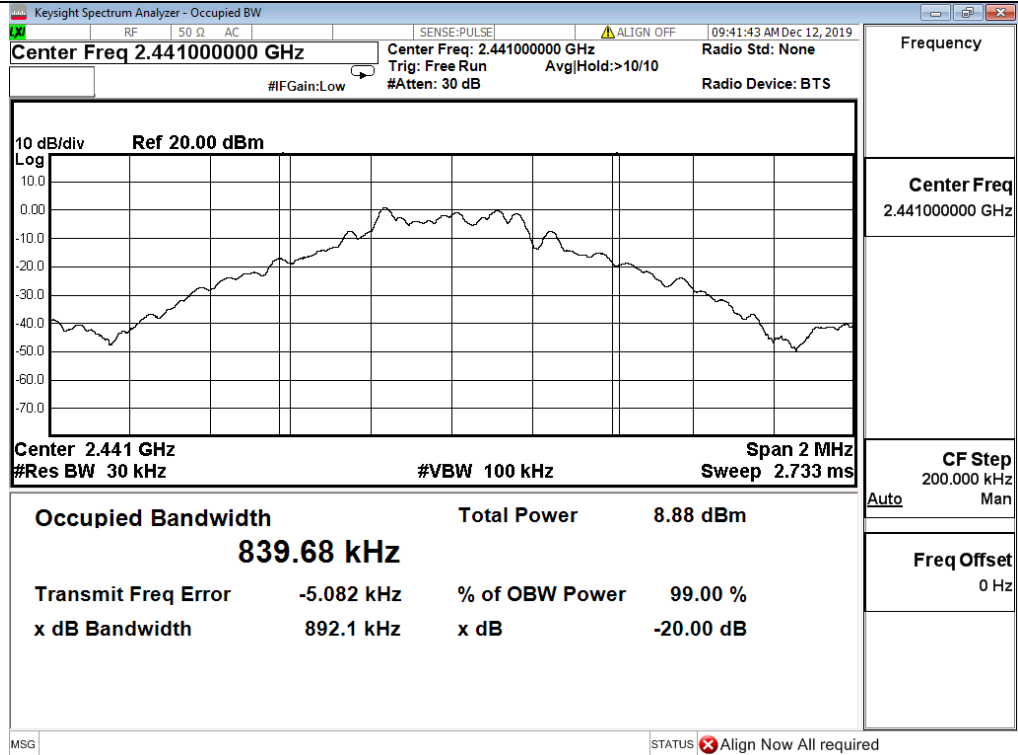


A.2 99% and 20dB Bandwidth

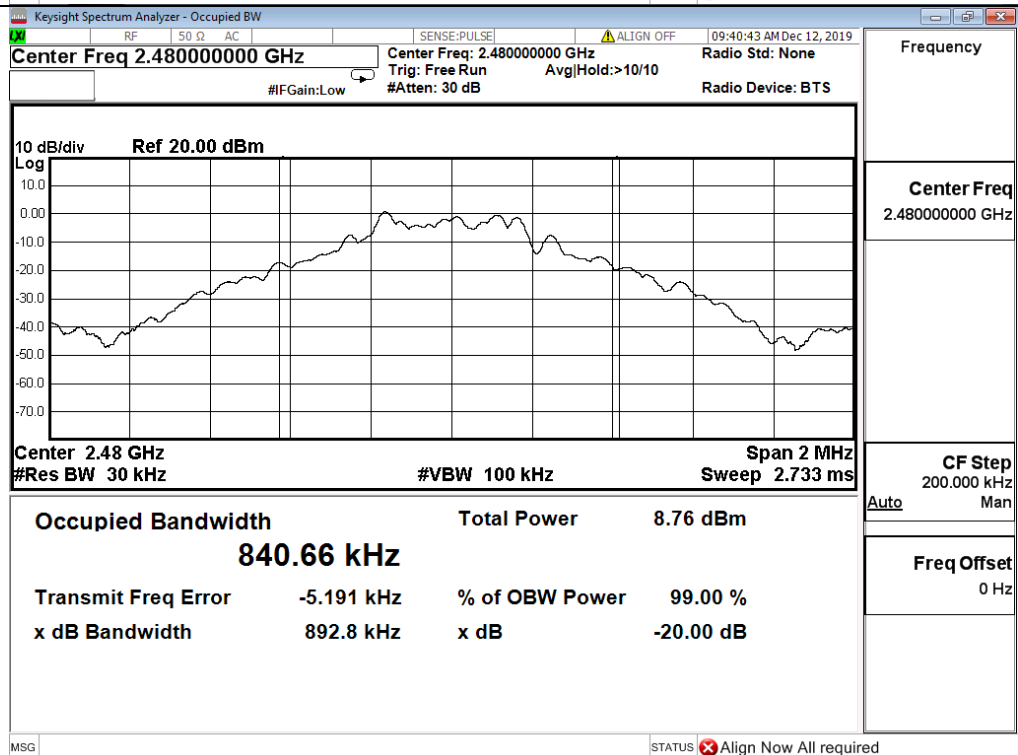
Mode	Channel.	99% Bandwidth [MHz]	20dB Bandwidth [MHz]	Limit [MHz]	Verdict
GFSK	LCH	0.83975	0.8898	Not Specified	PASS
	MCH	0.83968	0.8921	Not Specified	PASS
	HCH	0.84066	0.8928	Not Specified	PASS
π/4DQPSK	LCH	1.1648	1.287	Not Specified	PASS
	MCH	1.1737	1.288	Not Specified	PASS
	HCH	1.1759	1.288	Not Specified	PASS



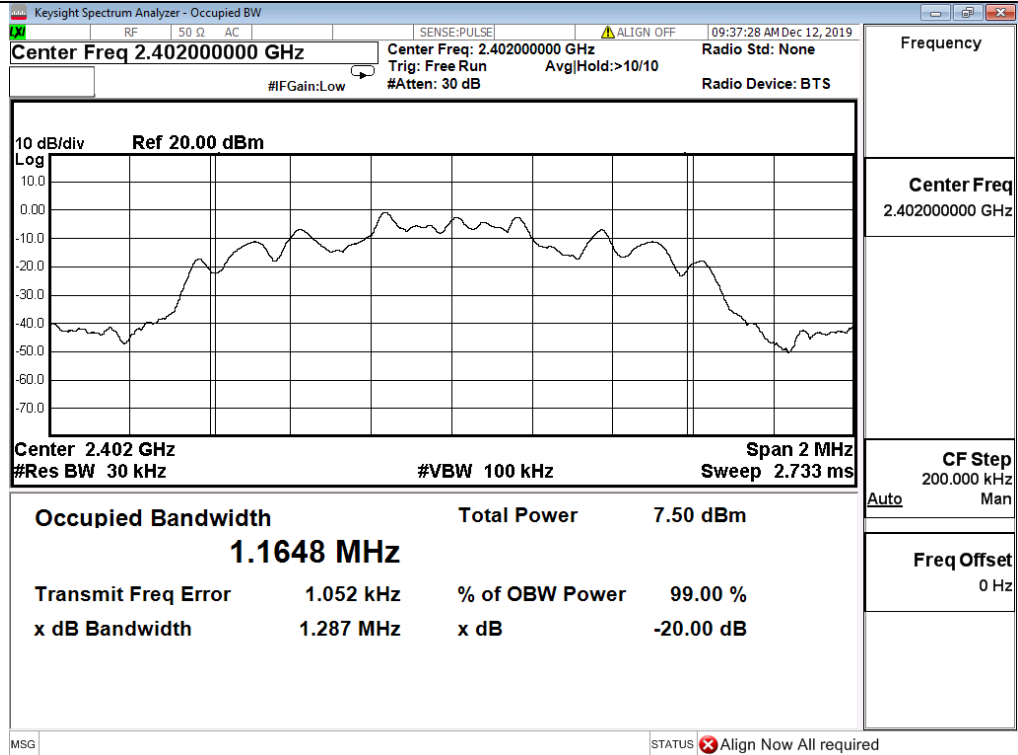
GFSK/MCH



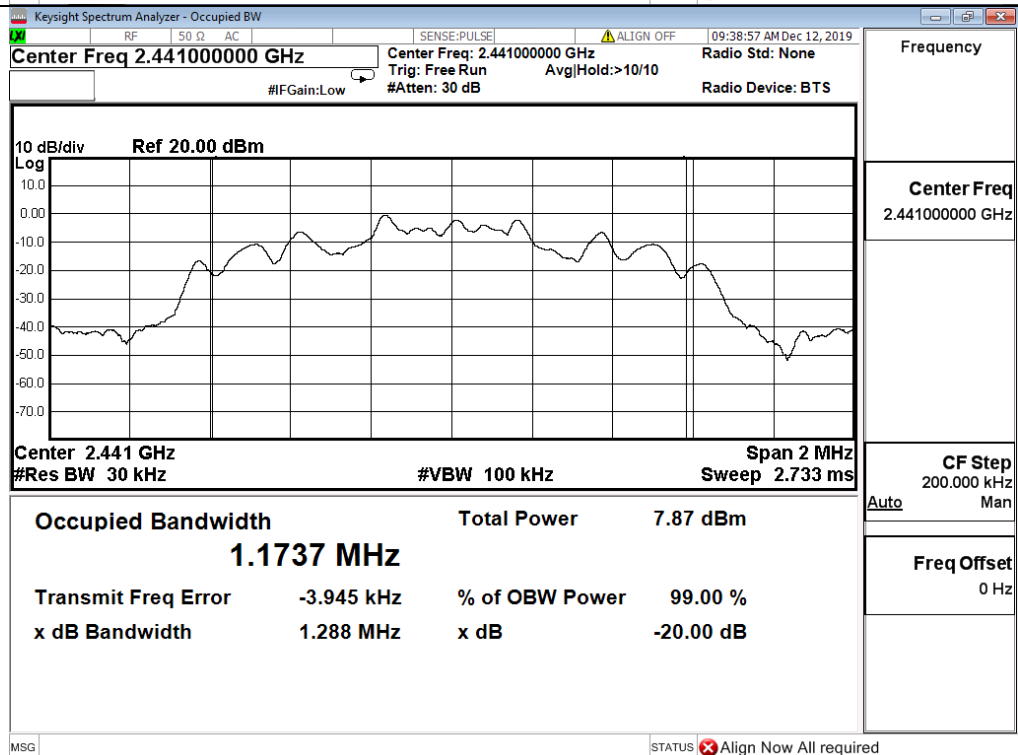
GFSK/HCH



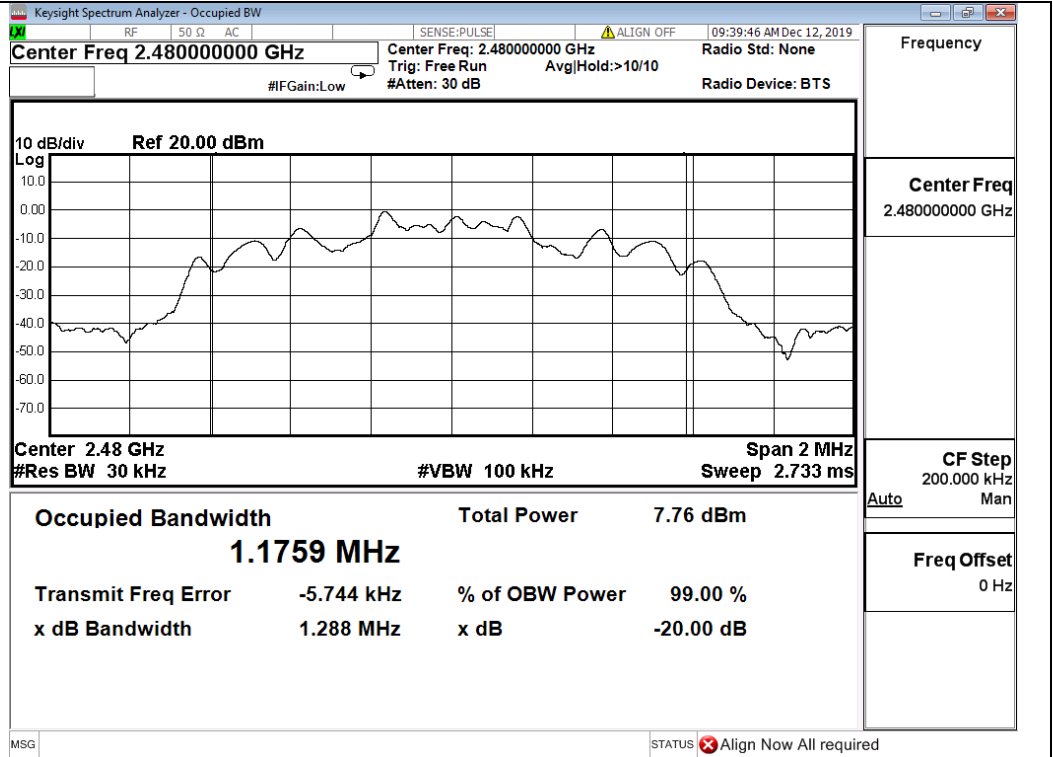
$\pi/4$ DQPSK/LCH



$\pi/4$ DQPSK/MCH

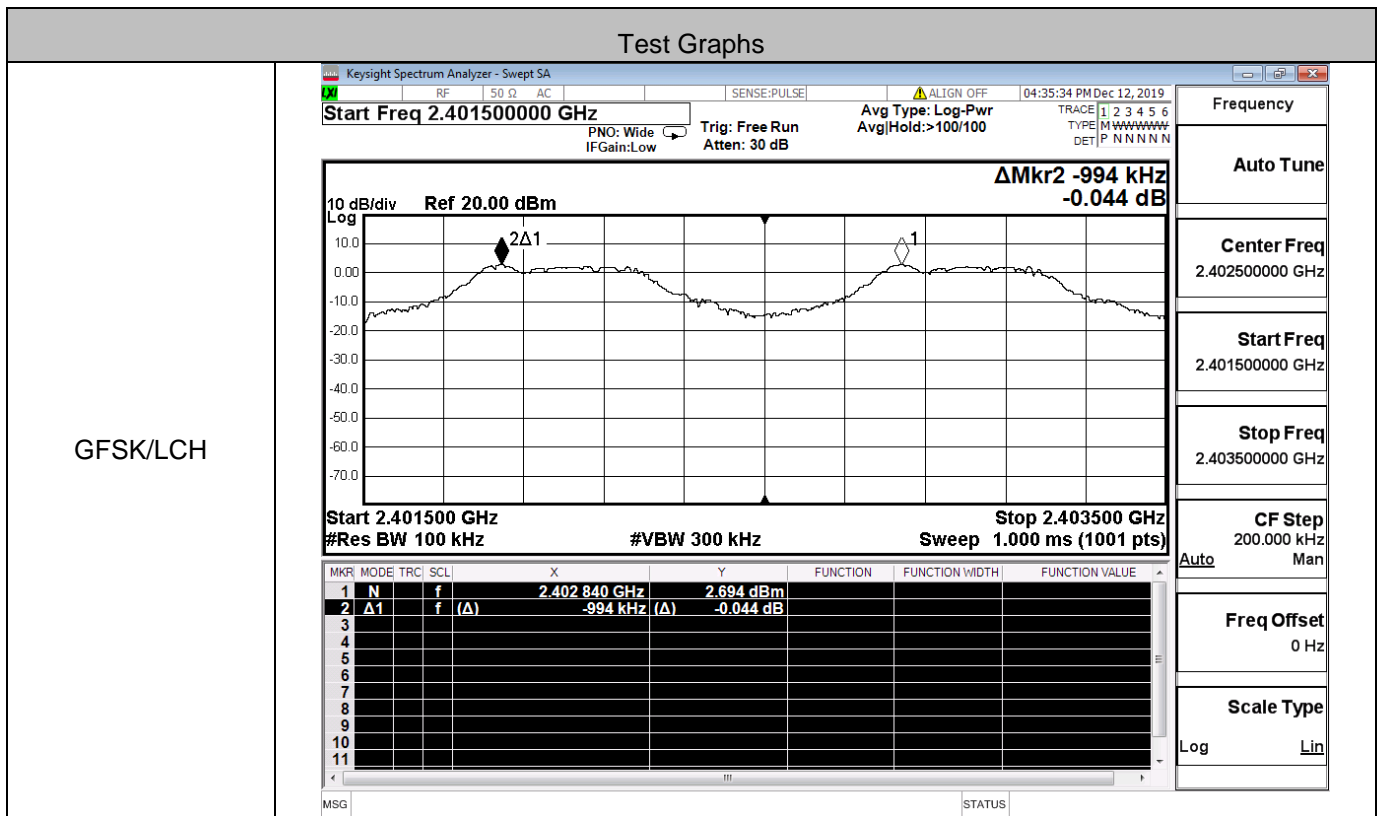


$\pi/4$ DQPSK/HCH

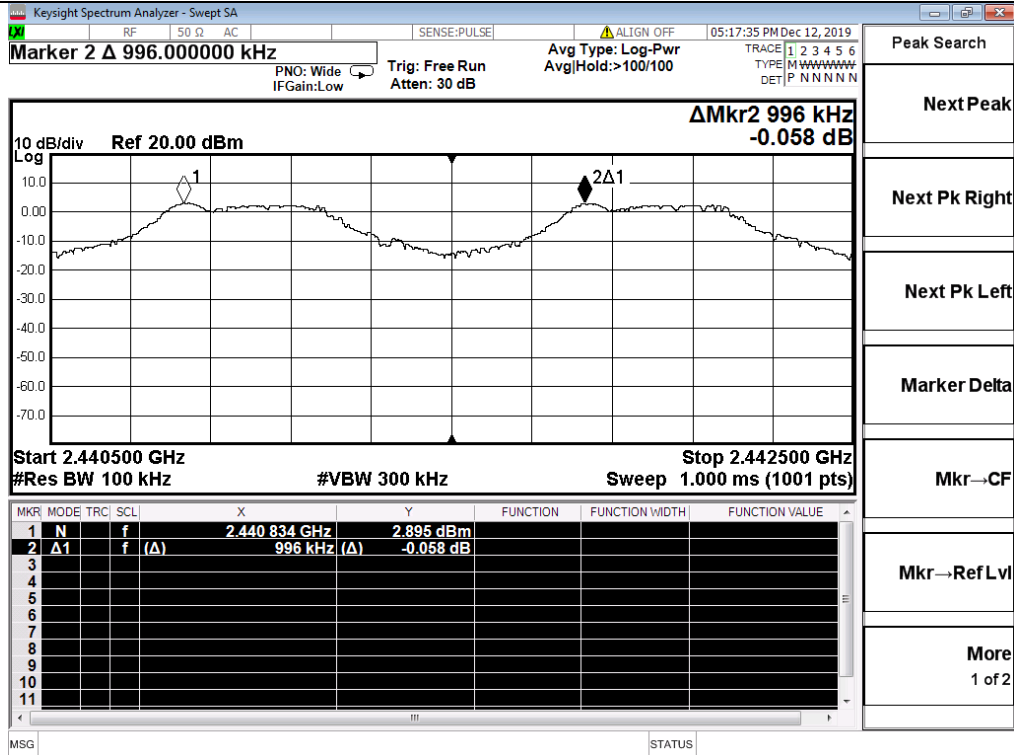


A.3 Carrier Frequency Separation

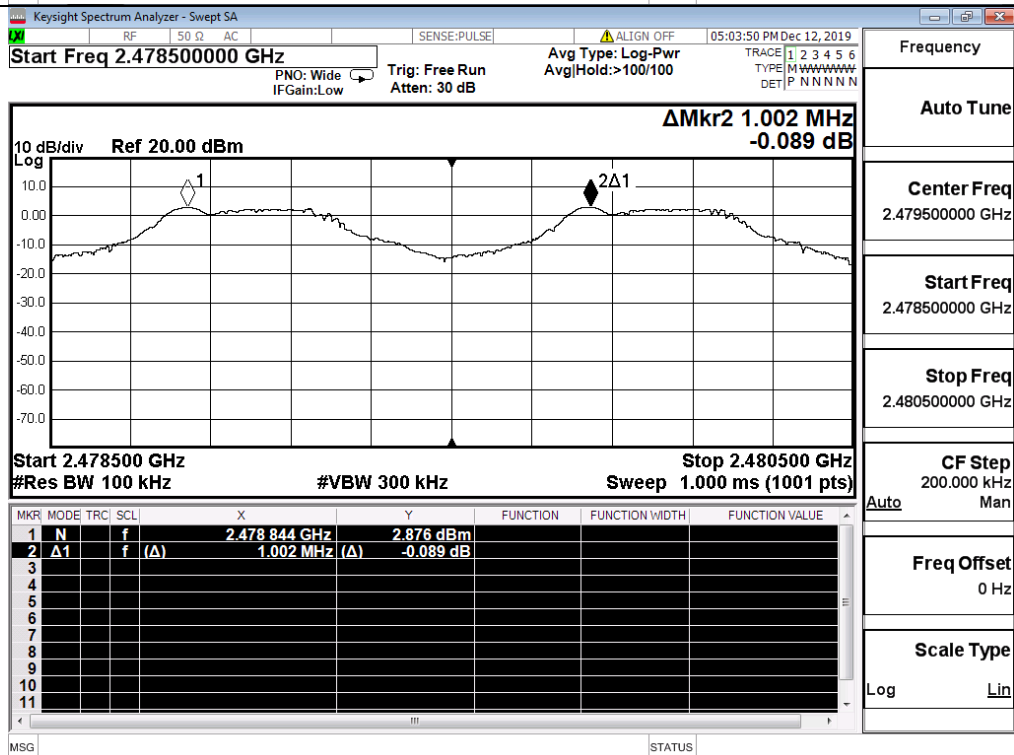
Mode	Channel.	Carrier Frequency Separation [MHz]	Limit [MHz]	Verdict
GFSK	LCH	0.994	0.59	PASS
	MCH	0.996	0.59	PASS
	HCH	1.002	0.60	PASS
π/4DQPSK	LCH	1.000	0.86	PASS
	MCH	0.994	0.86	PASS
	HCH	1.004	0.86	PASS



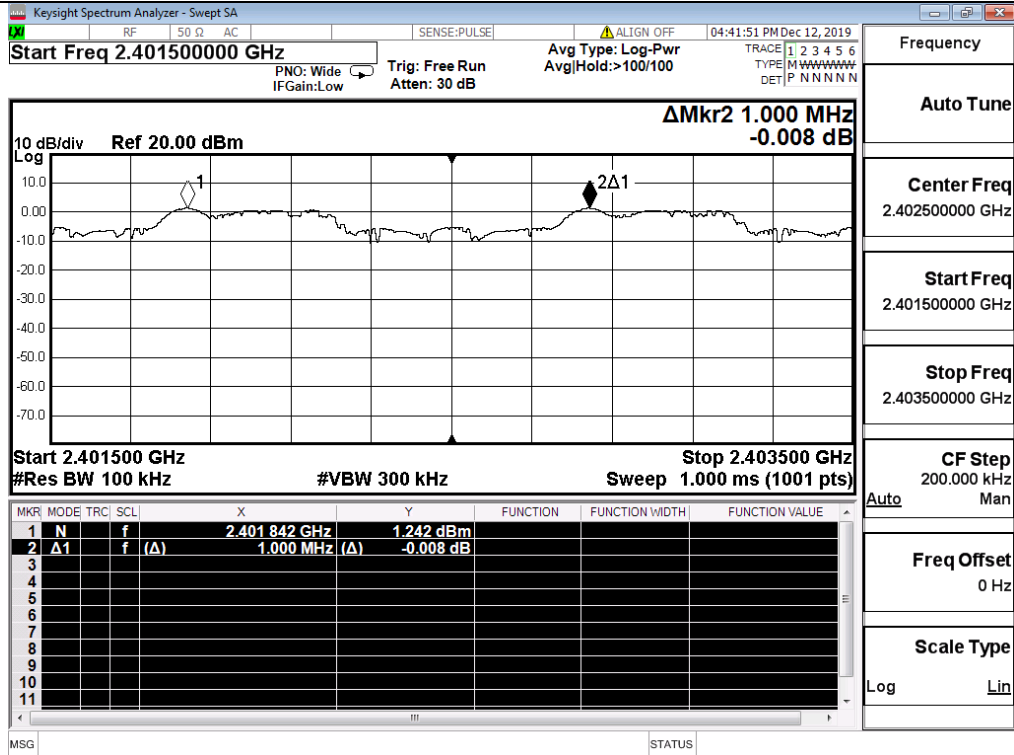
GFSK/MCH



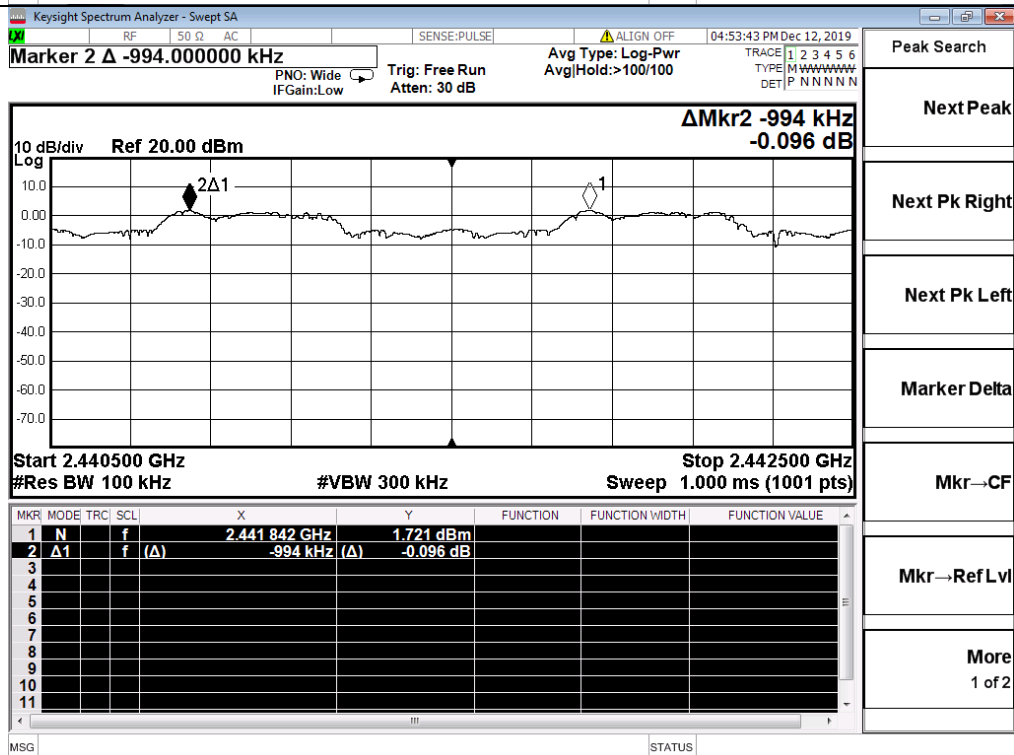
GFSK/HCH



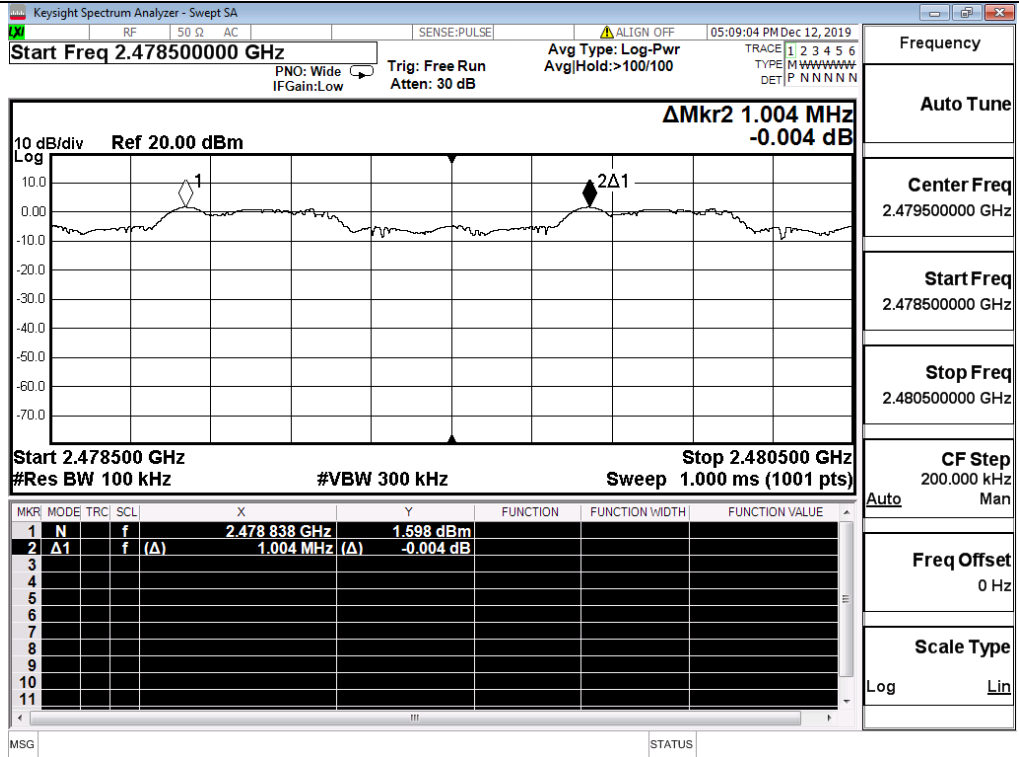
$\pi/4$ DQPSK/LCH



$\pi/4$ DQPSK/MCH



π/4DQPSK/HCH



A.4 Hopping Channel Number

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

Test Graphs

GFSK/Hop

Marker 2 Δ 78.1560000 MHz
 #Avg Type: RMS
 Avg|Hold:>100/100
 PNO: Fast IFGain:Low
 Trig: Free Run Atten: 30 dB
 01:54:46 PM Dec 12, 2019
 TRACE 1 2 3 4 5 6
 TYPE M W W W W W W W
 DET A N N N N N N

10 dB/div Ref 20.00 dBm
 Log
 Δ Mkr2 78.156 0 MHz
 0.152 dB

Start 2.40000 GHz Stop 2.48350 GHz
 #Res BW 100 kHz #VBW 300 kHz* Sweep 10.33 ms (1001 pts)

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N			f	2.401 837 0 GHz			1.138 dBm
2	Δ 1			f (Δ)	78.156 0 MHz (Δ)			0.152 dB

$\pi/4$ DQPSK/Hop

Start Freq 2.40000000 GHz
 #Avg Type: RMS
 Avg|Hold:>100/100
 PNO: Fast IFGain:Low
 Trig: Free Run Atten: 30 dB
 01:50:10 PM Dec 12, 2019
 TRACE 1 2 3 4 5 6
 TYPE M W W W W W W W
 DET A N N N N N N

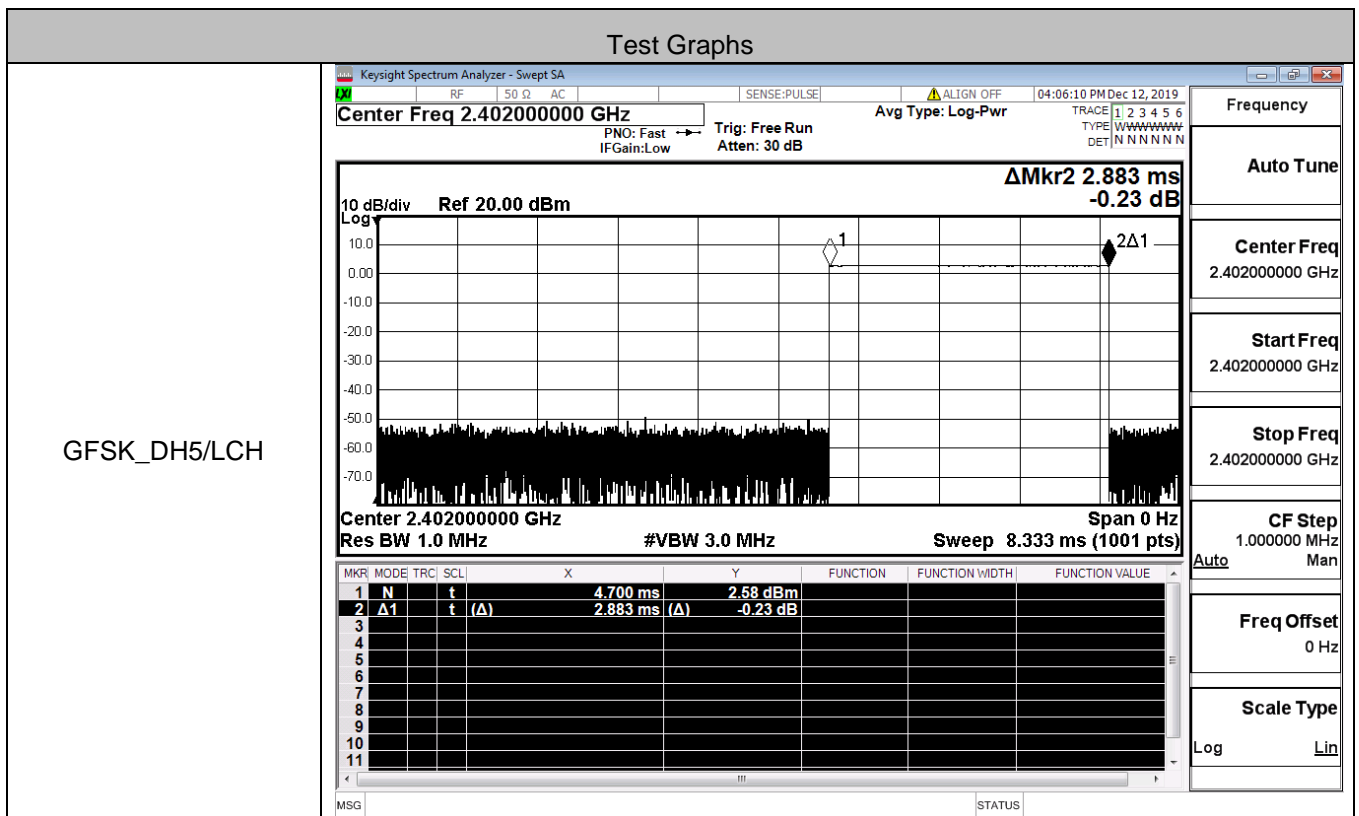
10 dB/div Ref 20.00 dBm
 Log
 Δ Mkr2 78.156 0 MHz
 0.727 dB

Start 2.40000 GHz Stop 2.48350 GHz
 #Res BW 100 kHz #VBW 300 kHz* Sweep 10.33 ms (1001 pts)

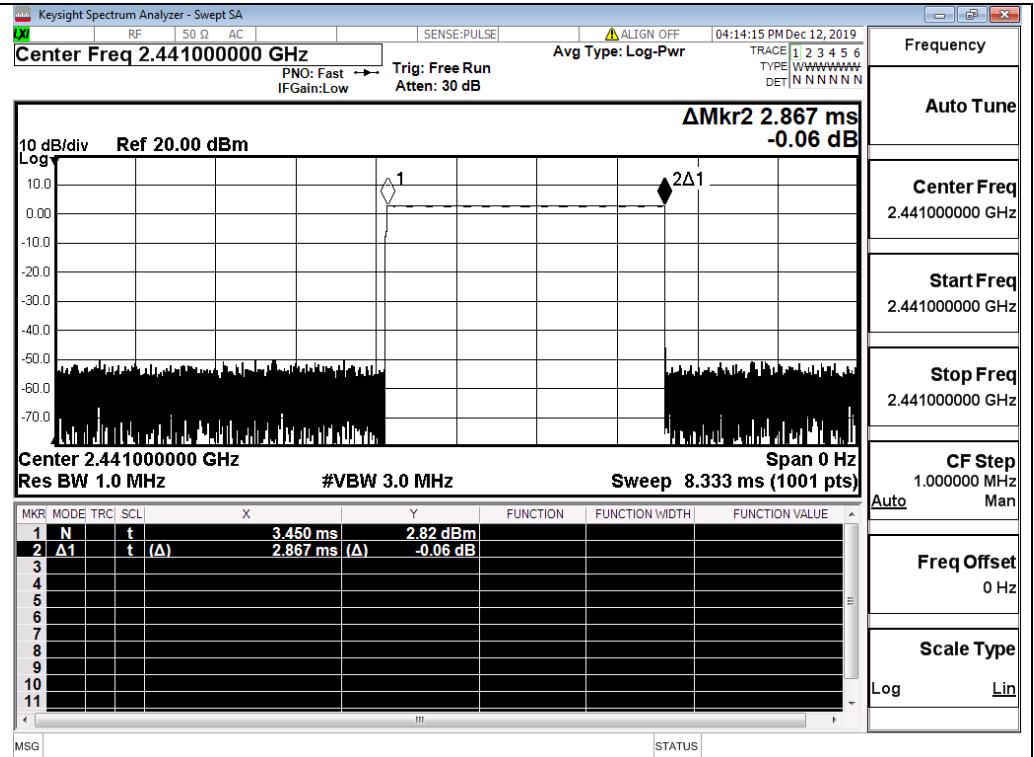
MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N			f	2.401 837 0 GHz			0.114 dBm
2	Δ 1			f (Δ)	78.156 0 MHz (Δ)			0.727 dB

A.5 Dwell Time

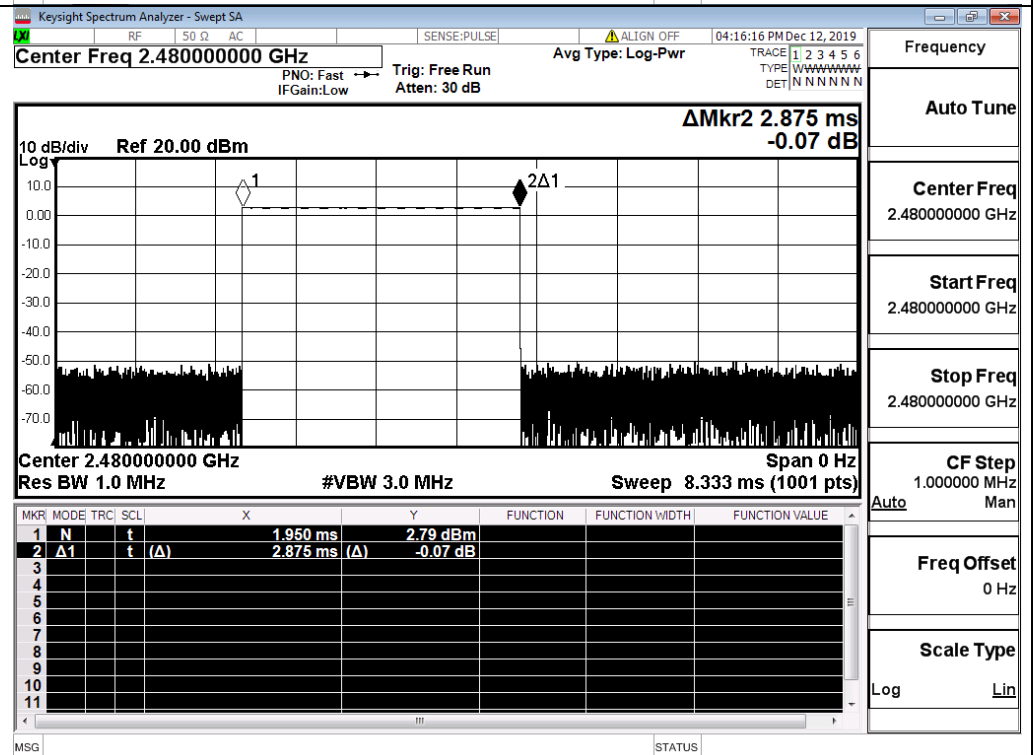
Mode	Packet	Channel	Burst Width [ms/hop/ch]	Total Hops[hop*ch]	Dwell Time[s]	Limit [s]	Verdict
GFSK	DH5	LCH	2.883	106.7	0.31	0.4	PASS
	DH5	MCH	2.867	106.7	0.31	0.4	PASS
	DH5	HCH	2.875	106.7	0.31	0.4	PASS
π/4DQPSK	2DH5	LCH	2.867	106.7	0.31	0.4	PASS
	2DH5	MCH	2.867	106.7	0.31	0.4	PASS
	2DH5	HCH	2.883	106.7	0.31	0.4	PASS



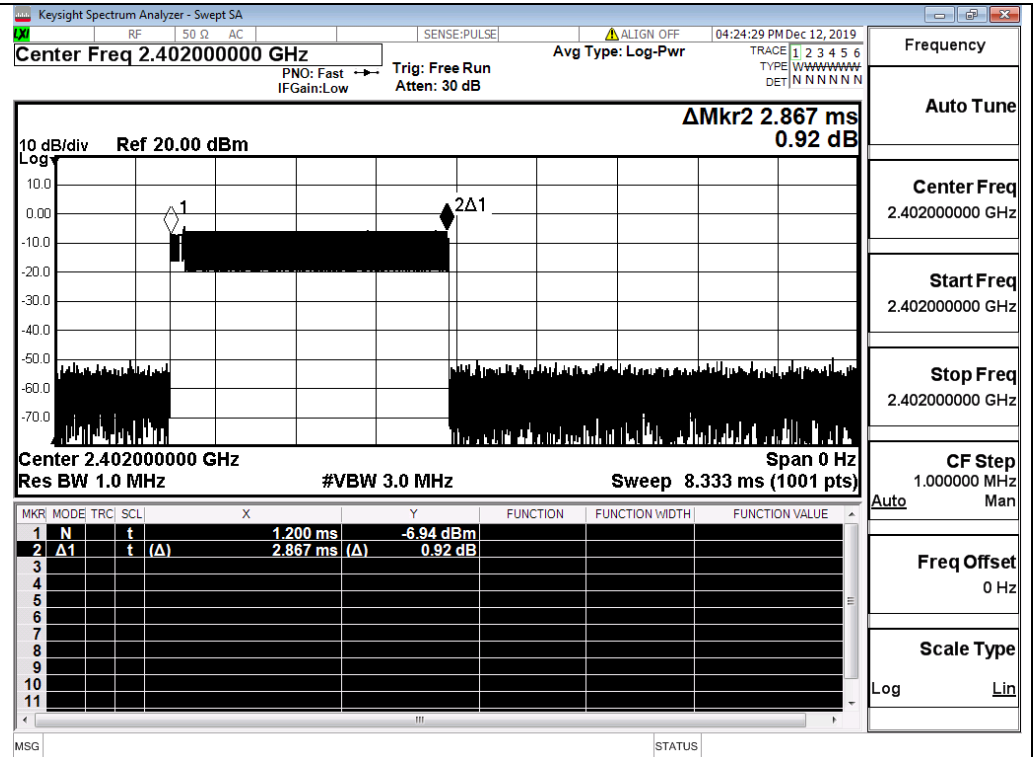
GFSK_DH5/MCH



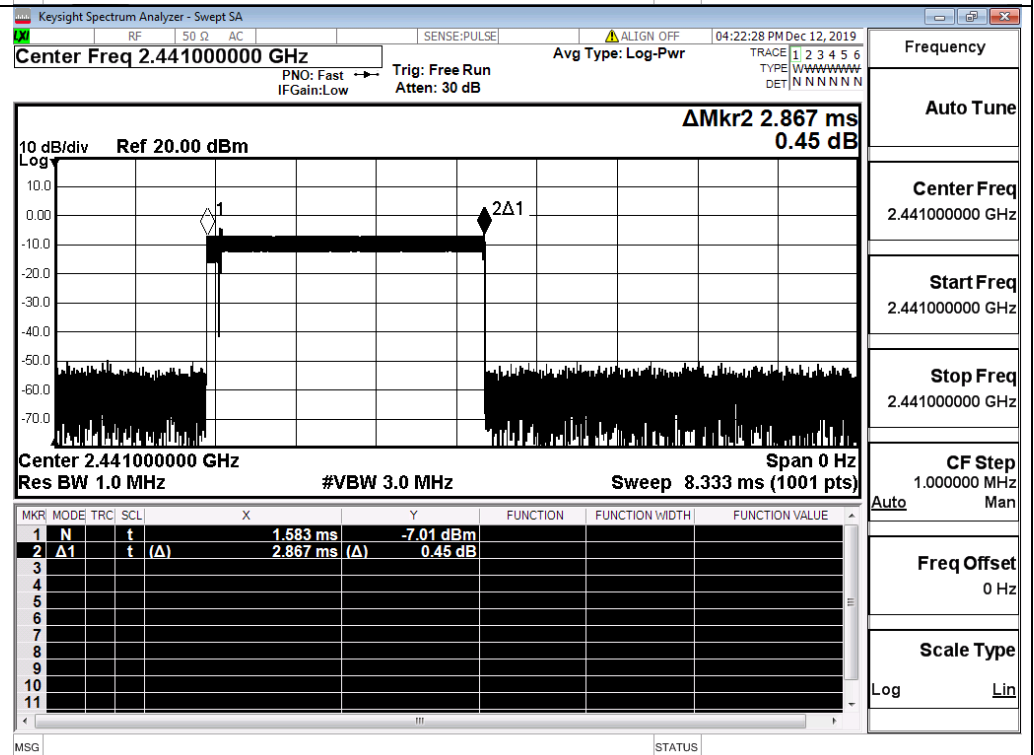
GFSK_DH5/HCH



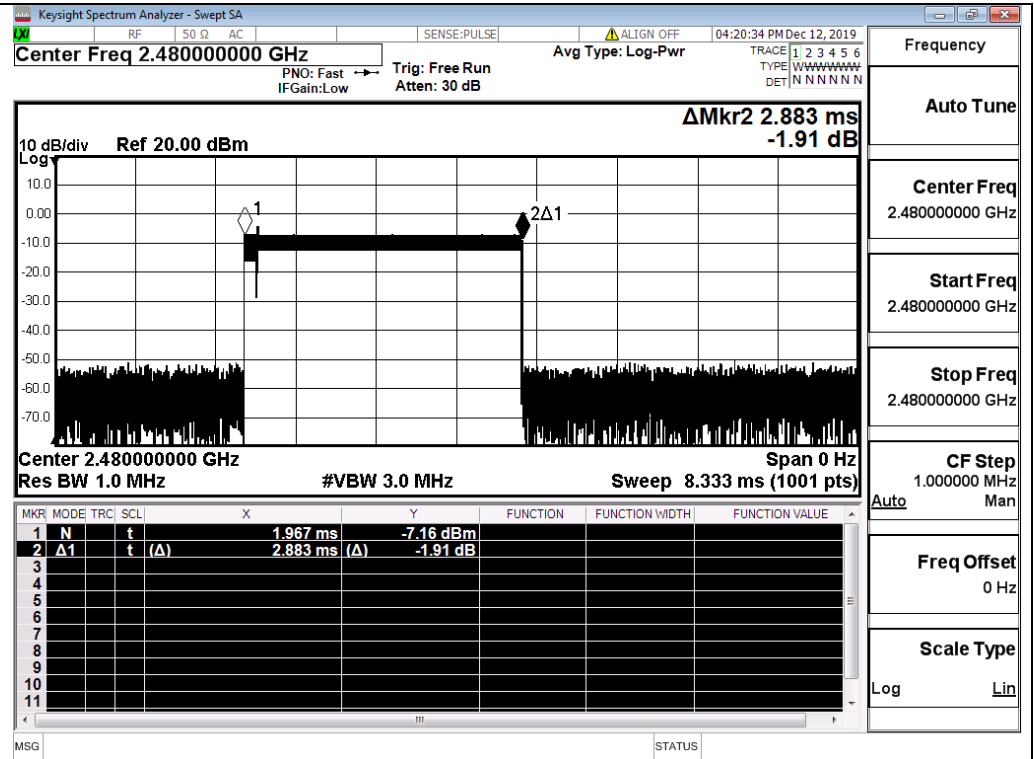
$\pi/4$ DQPSK
_2DH5/LCH



$\pi/4$ DQPSK
_2DH5/MCH



$\pi/4$ DQPSK
_2DH5/HCH

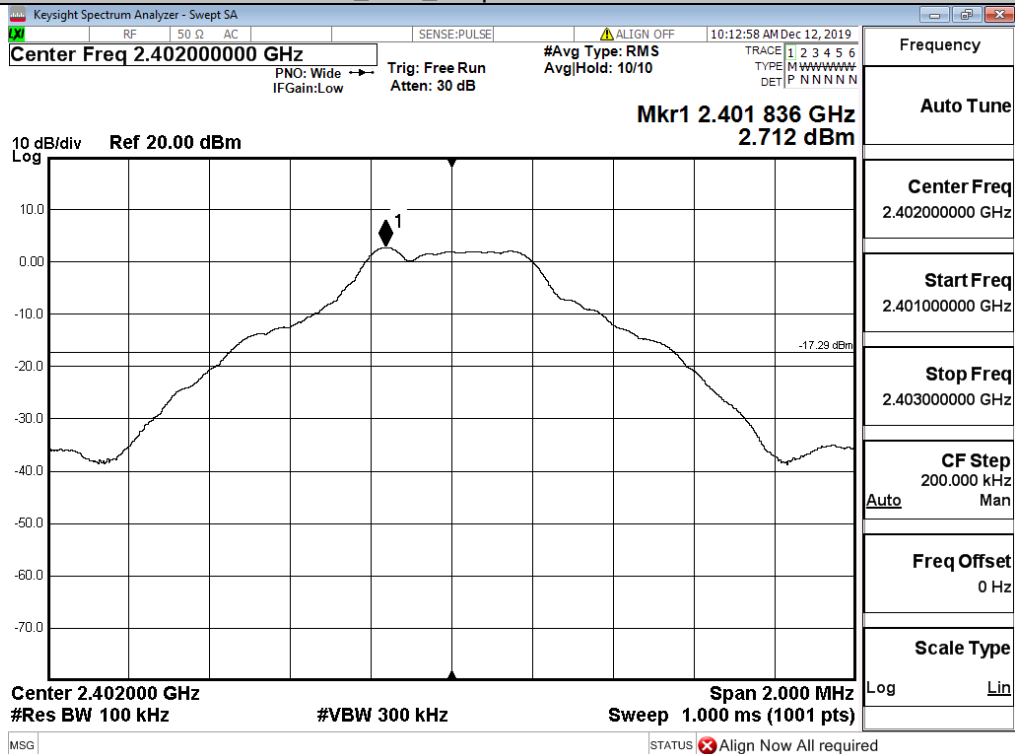


A.6 RF Conducted Spurious Emissions

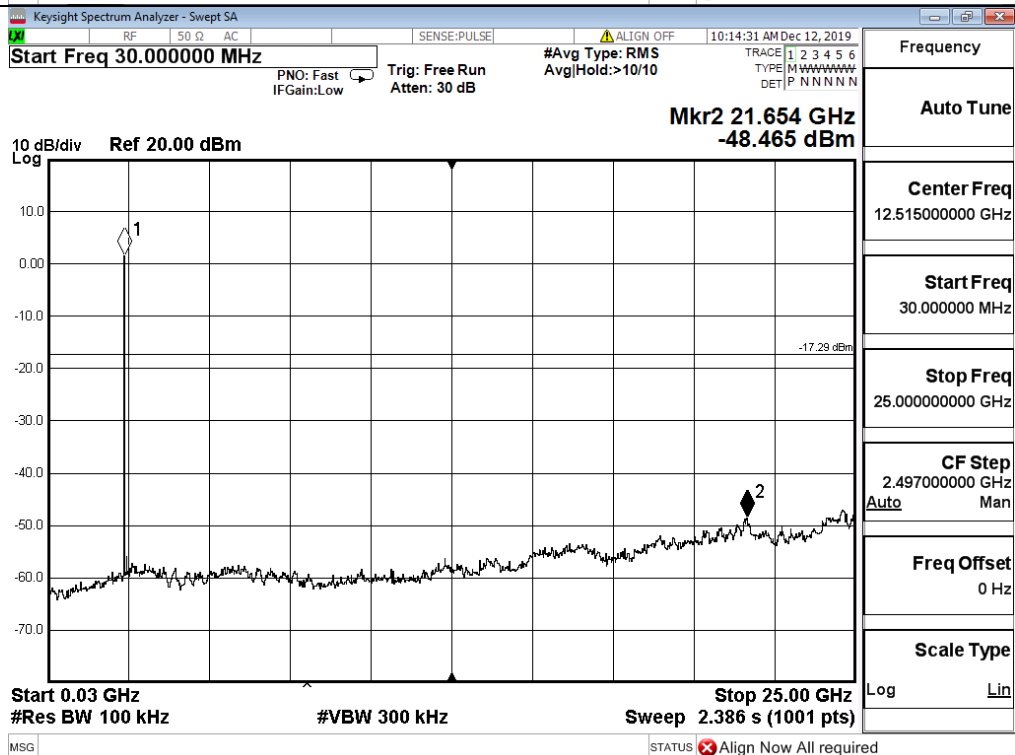
Mode	Channel	Pref [dBm]	Max. Level [dBm]	Limit [dBm]	Verdict
GFSK	LCH	2.712	-48.465	-17.29	PASS
	MCH	2.973	-34.147	-17.07	PASS
	HCH	2.852	-48.041	-17.15	PASS
$\pi/4$ DQPSK	LCH	1.401	-49.586	-18.60	PASS
	MCH	1.774	-46.579	-18.23	PASS
	HCH	1.598	-47.222	-18.40	PASS

GFSK_LCH_Graphs

Pref

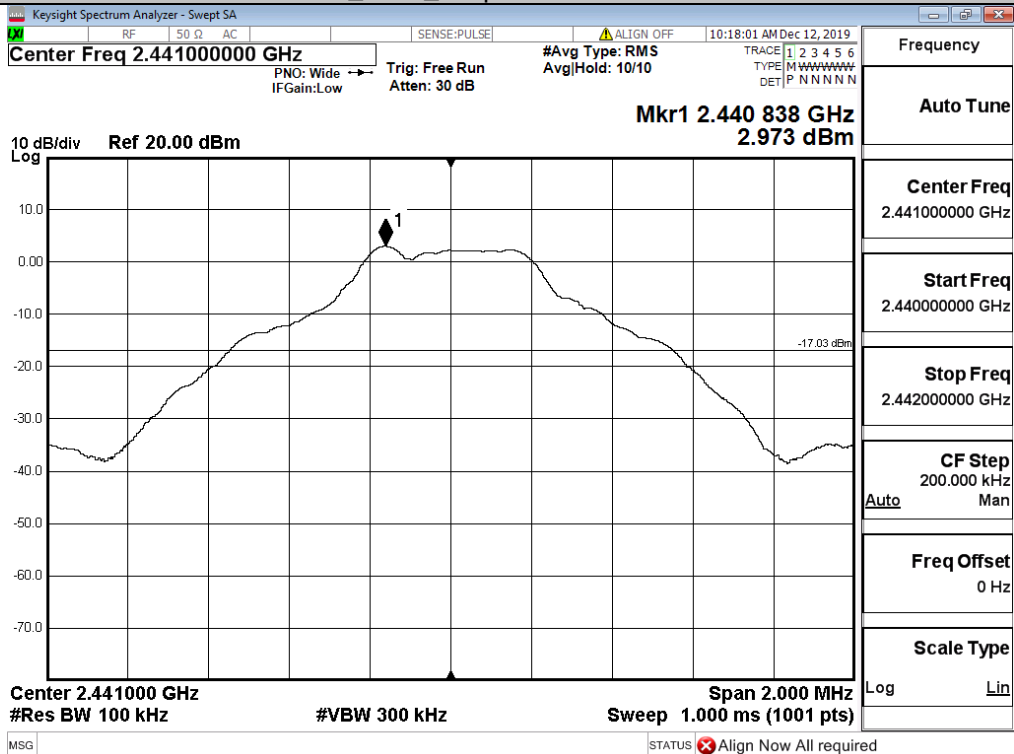


Puw

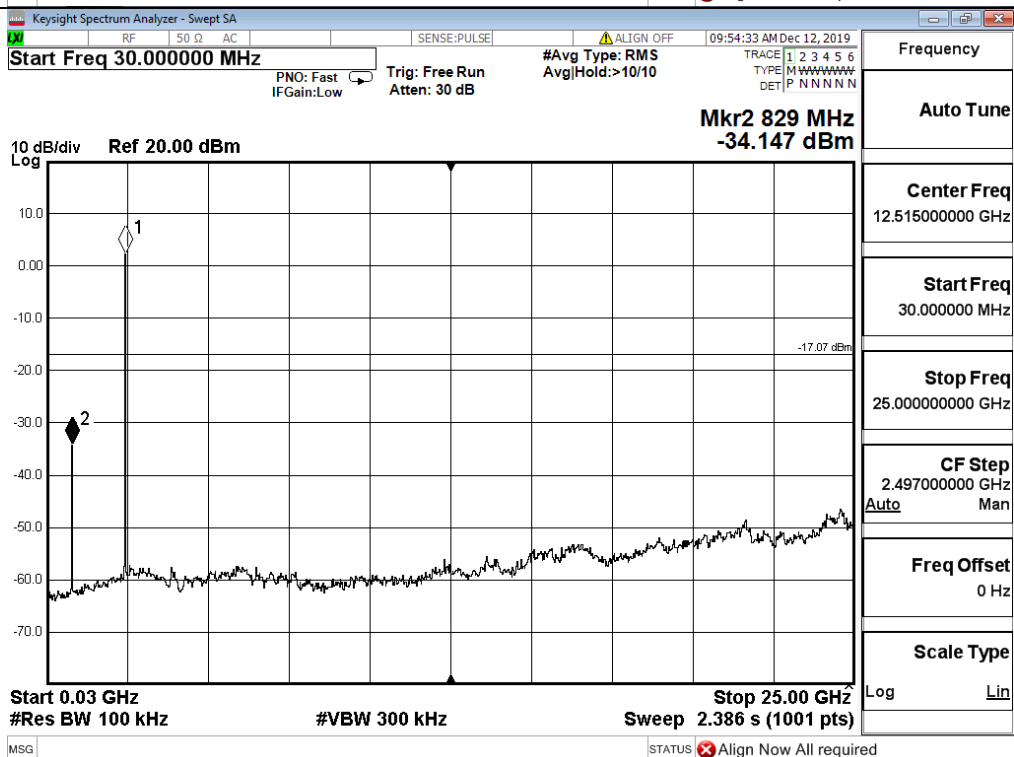


GFSK_MCH_Graphs

Pref

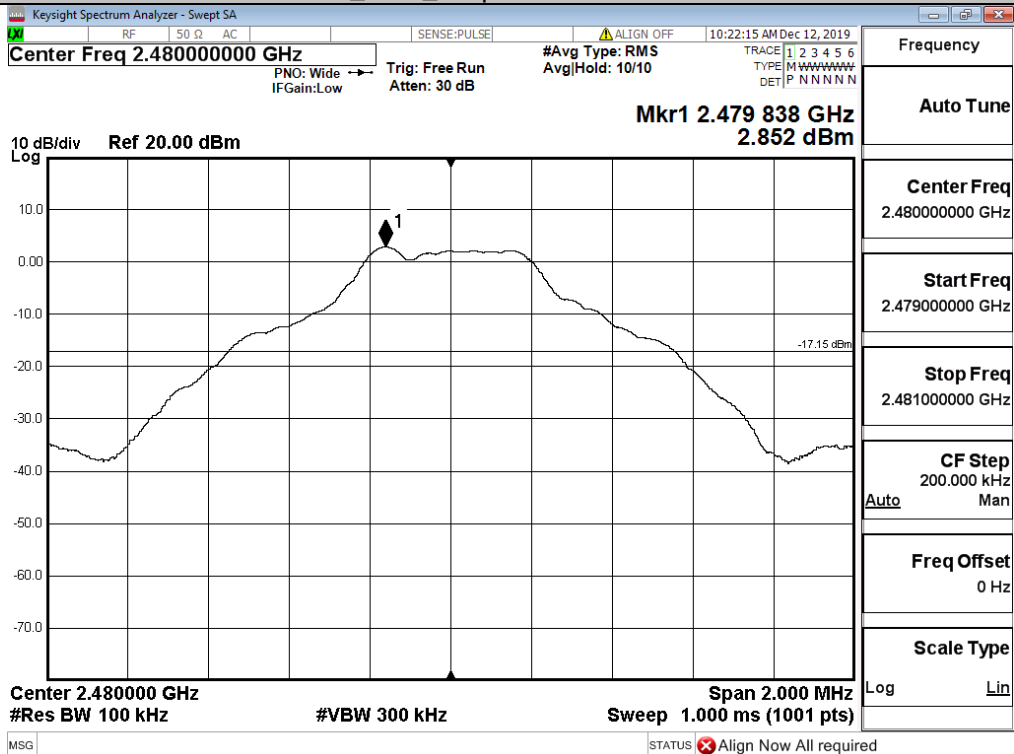


Puw

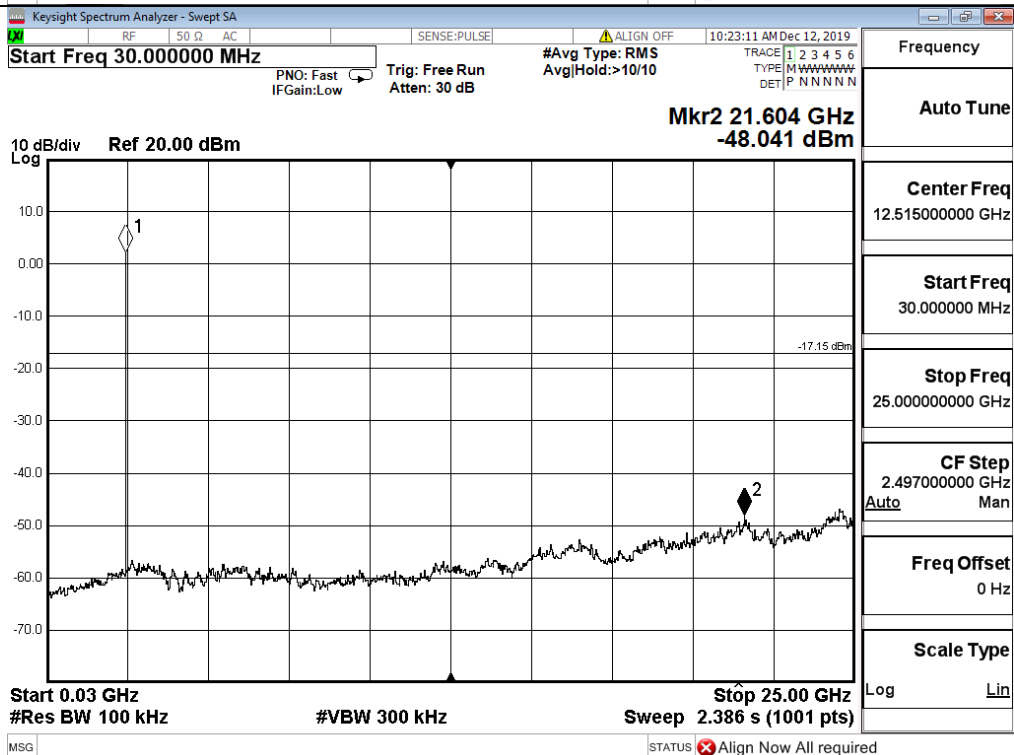


GFSK_HCH_Graphs

Pref

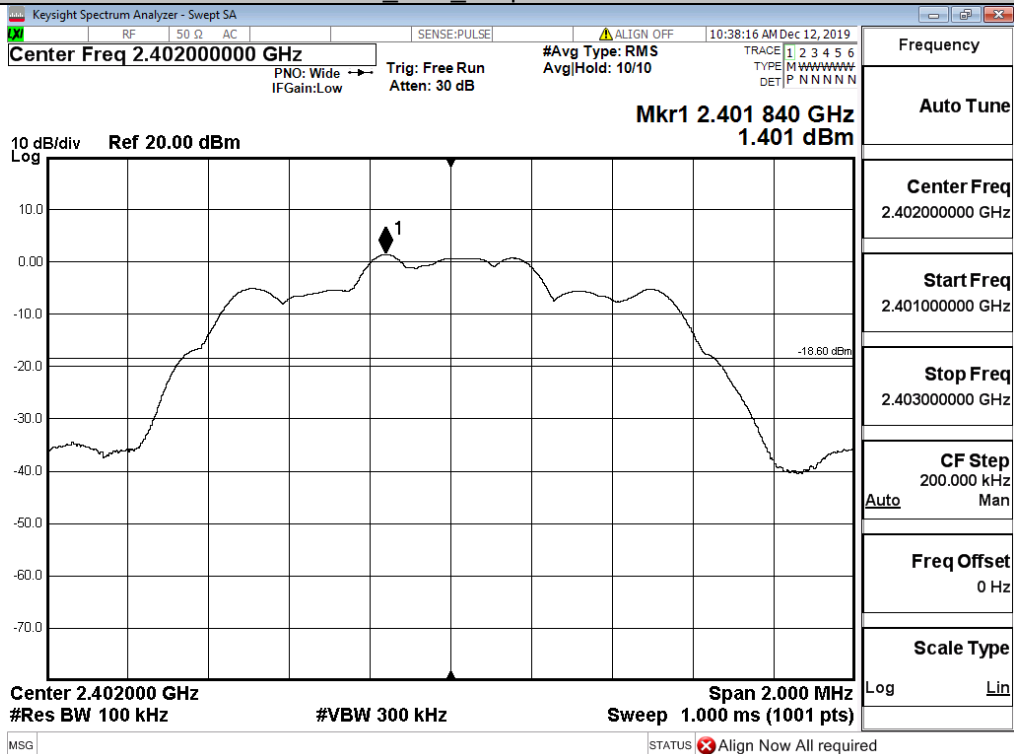


Puw

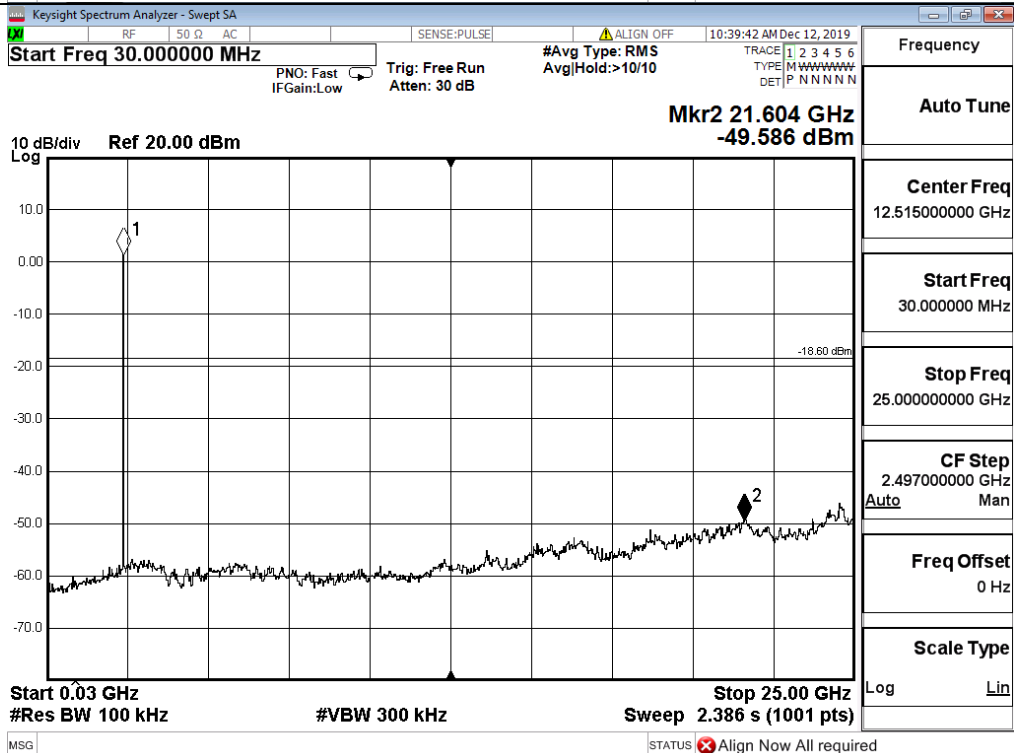


$\pi/4$ DQPSK_LCH_Graphs

Pref

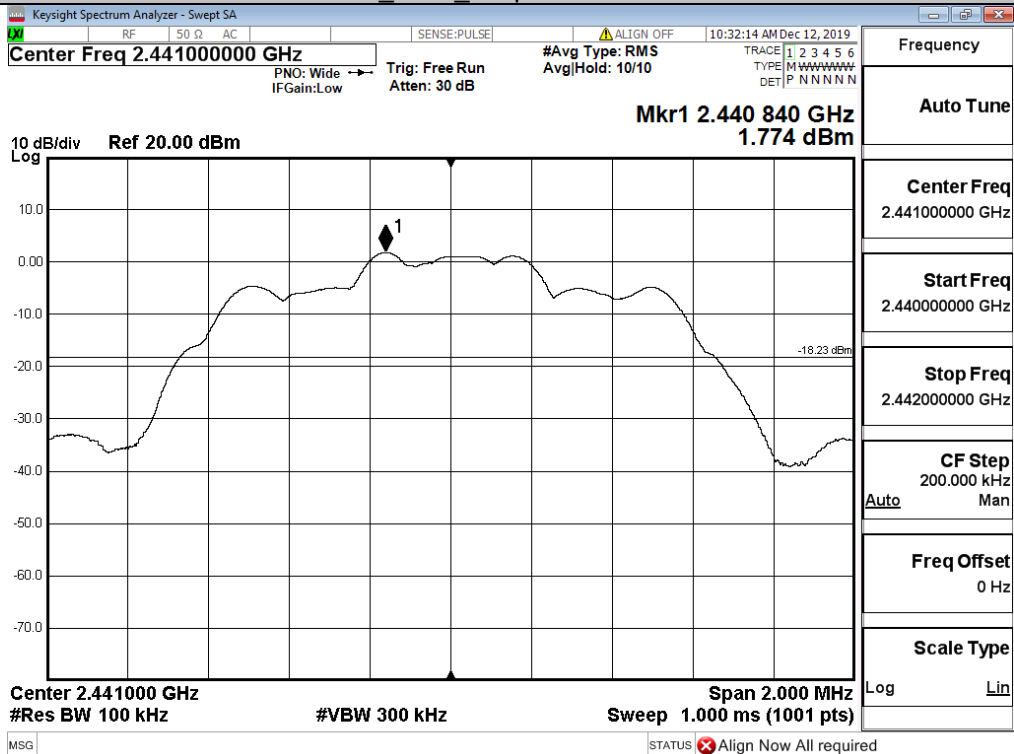


Puw

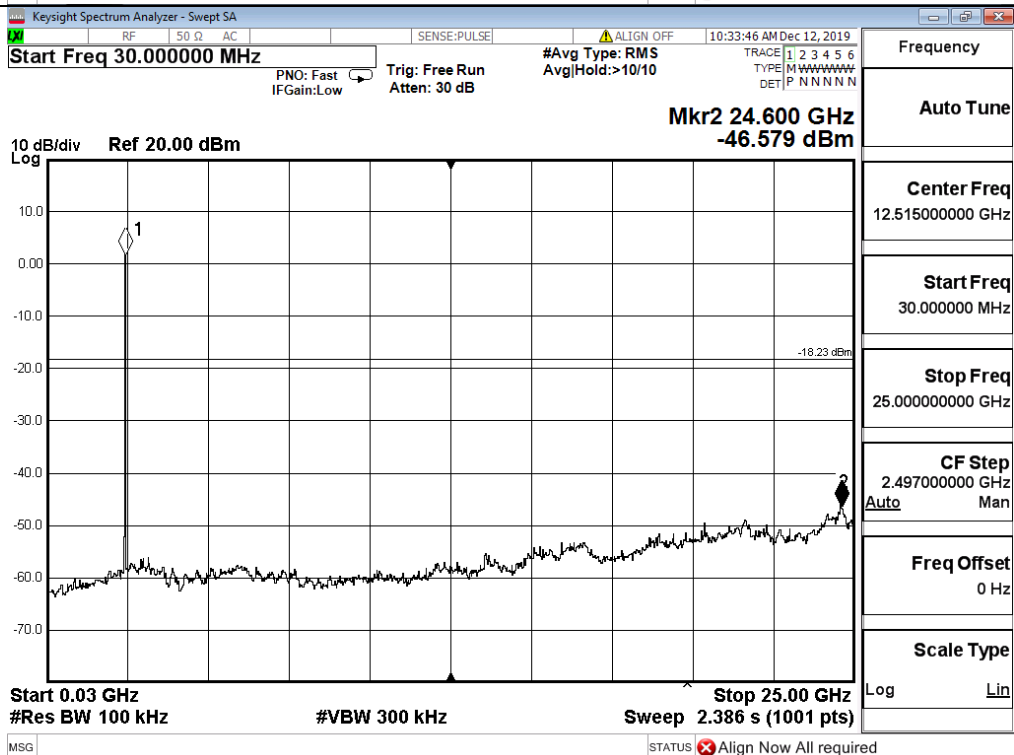


$\pi/4$ DQPSK_MCH_Graphs

Pref

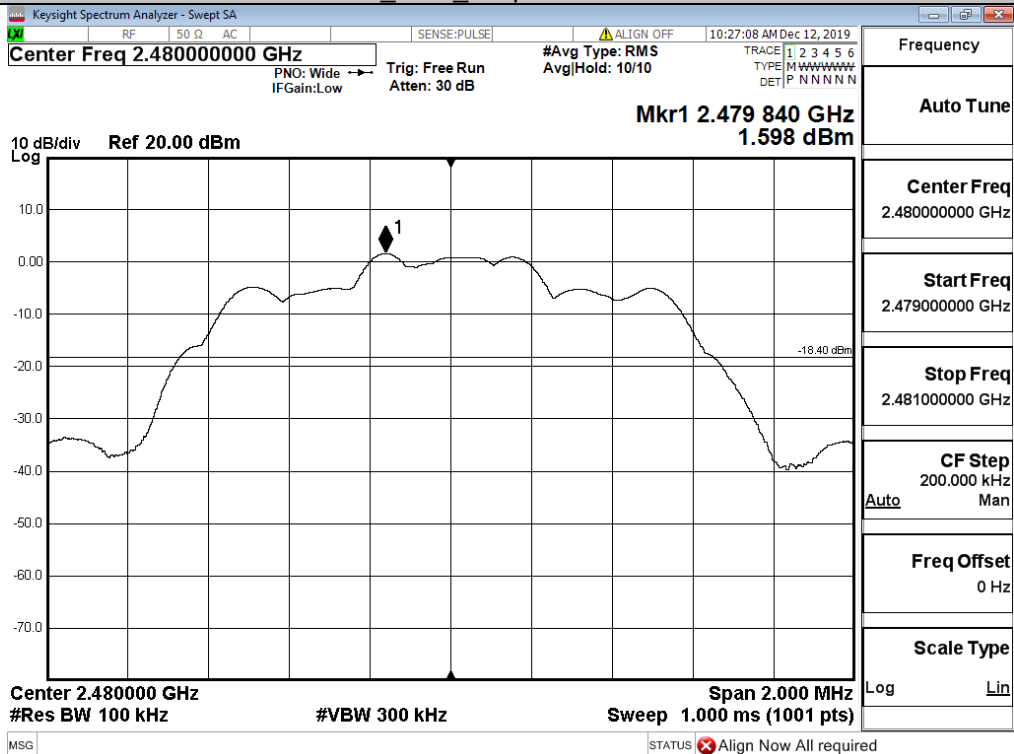


Puw

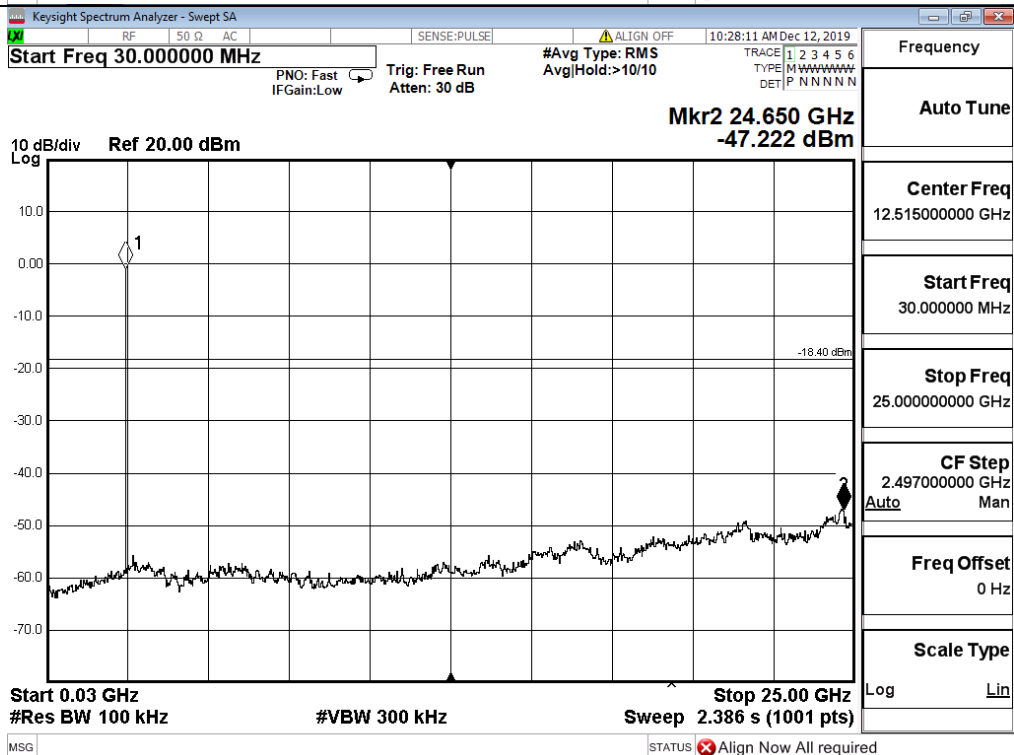


$\pi/4$ DQPSK_HCH_Graphs

Pref



Puw

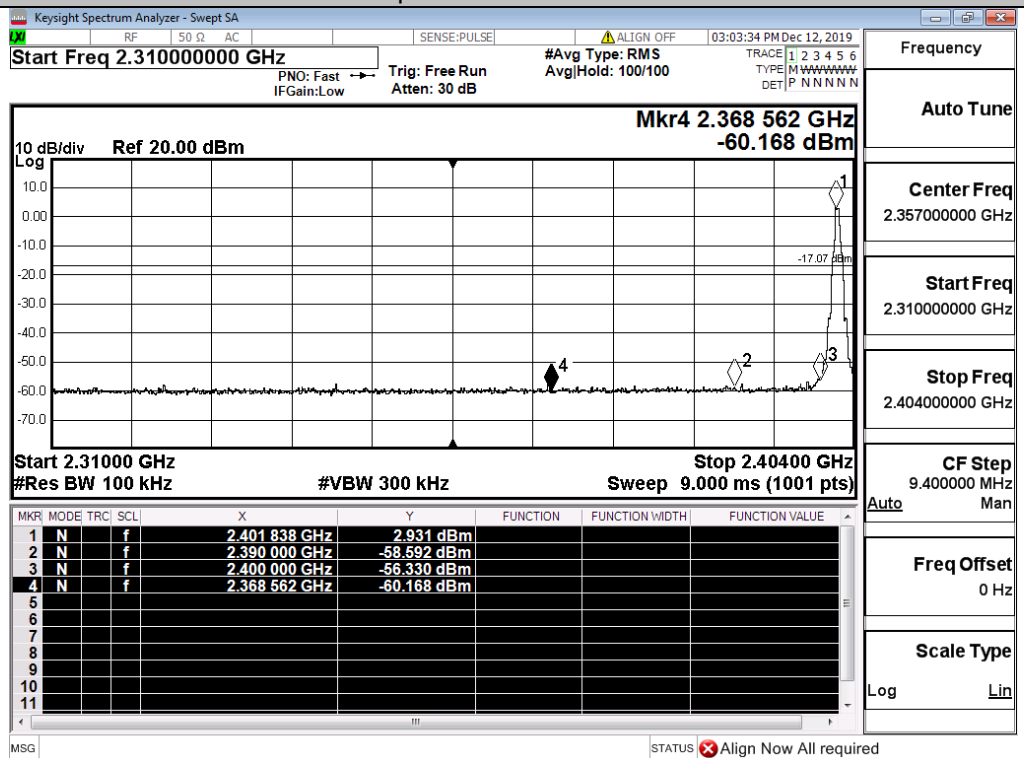


A.7 Band-edge for RF Conducted Emissions

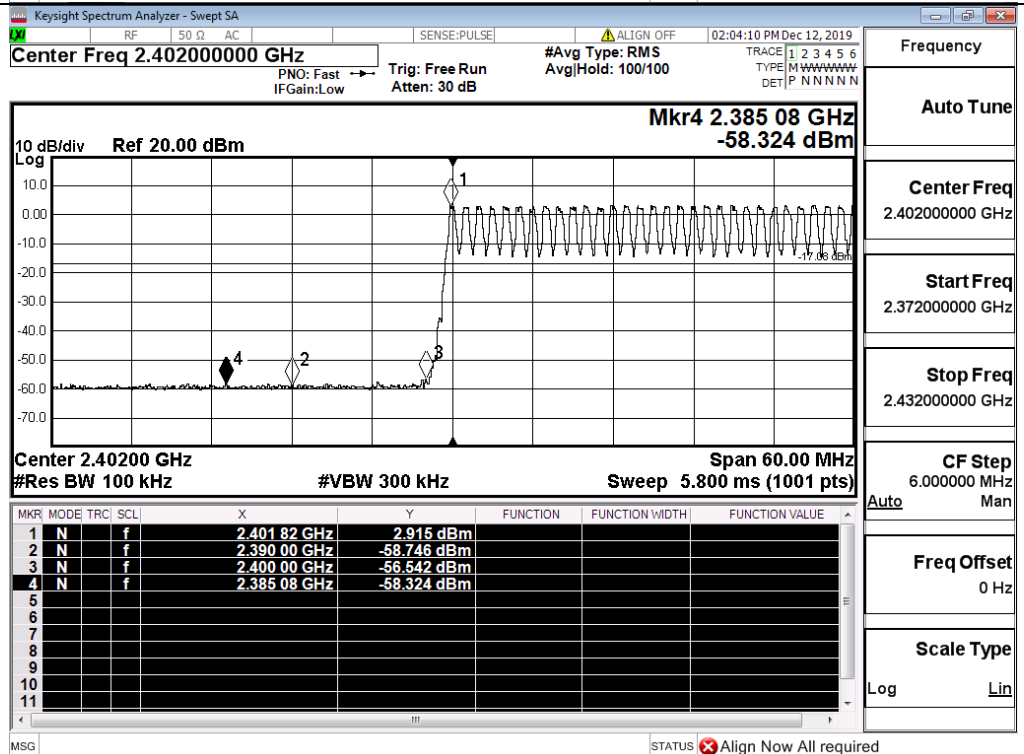
Mode	Channel	Carrier Frequency [MHz]	Carrier Power [dBm]	Frequency Hopping	Max Spurious Level [dBm]	Limit [dBm]	Verdict
GFSK	LCH	2402	2.931	Off	-60.168	-17.07	PASS
			2.915	On	-58.324	-17.08	PASS
	HCH	2480	3.003	Off	-58.084	-16.90	PASS
			2.950	On	-59.056	-17.05	PASS
$\pi/4$ DQPSK	LCH	2402	1.443	Off	-58.707	-18.56	PASS
			1.464	On	-58.817	-18.53	PASS
	HCH	2480	1.763	Off	-58.038	-18.25	PASS
			1.729	On	-58.844	-18.27	PASS

Test Graphs

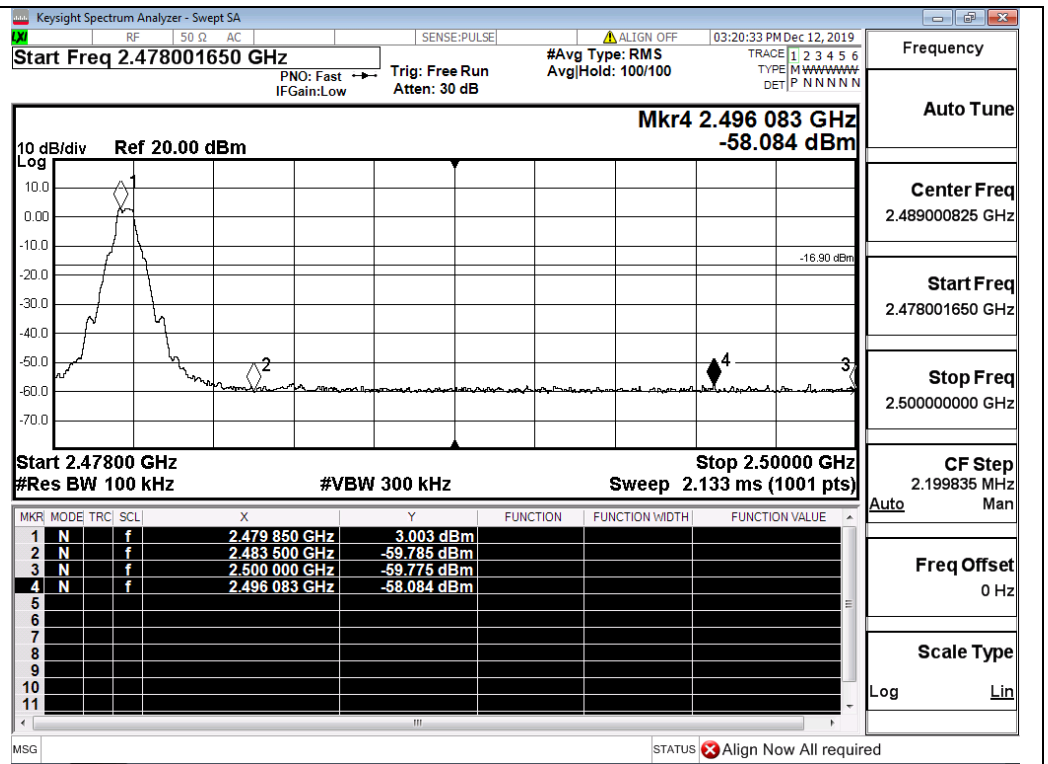
GFSK/LCH/No Hop



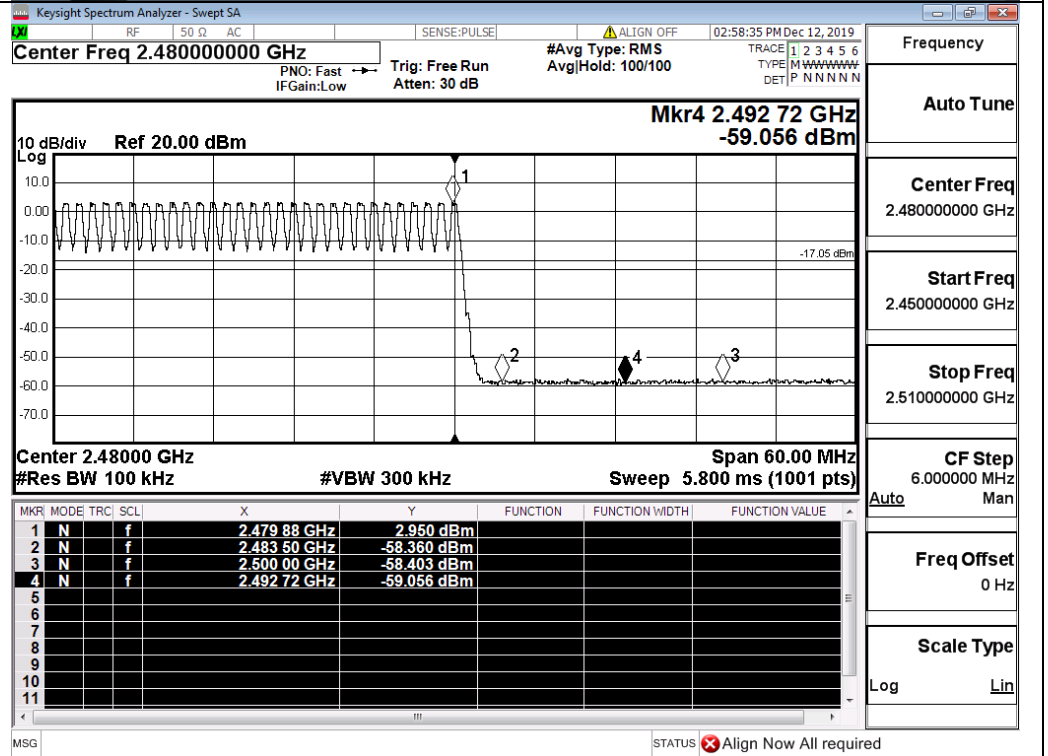
GFSK/LCH/Hop



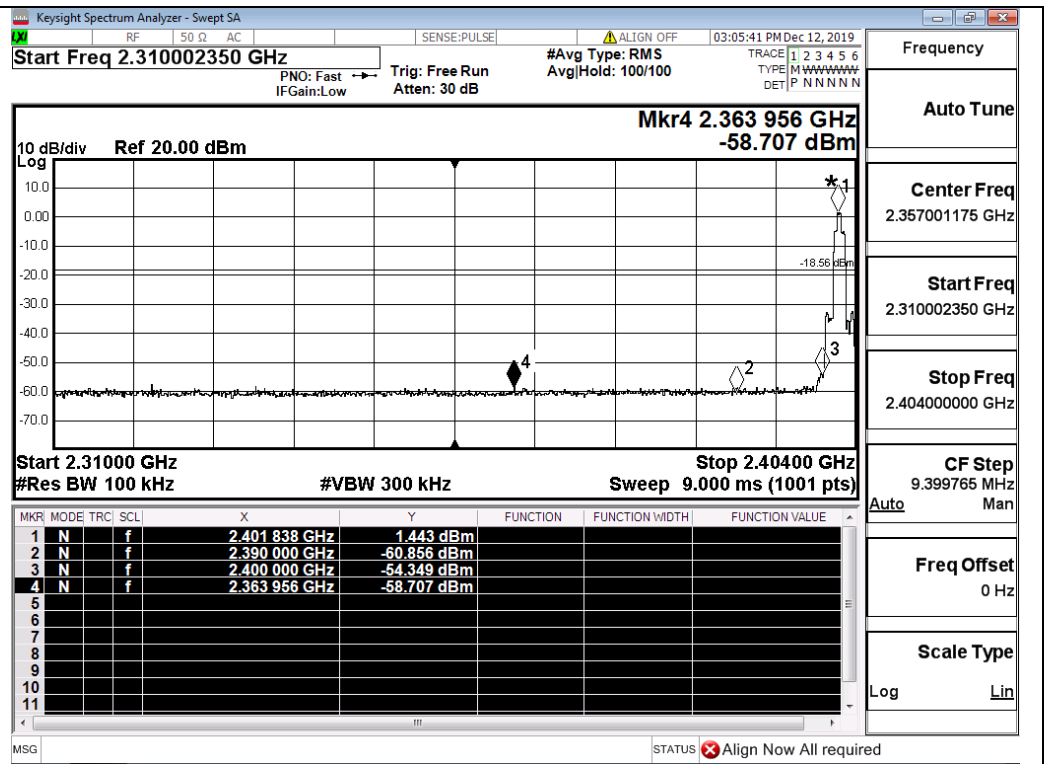
GFSK/HCH/No Hop



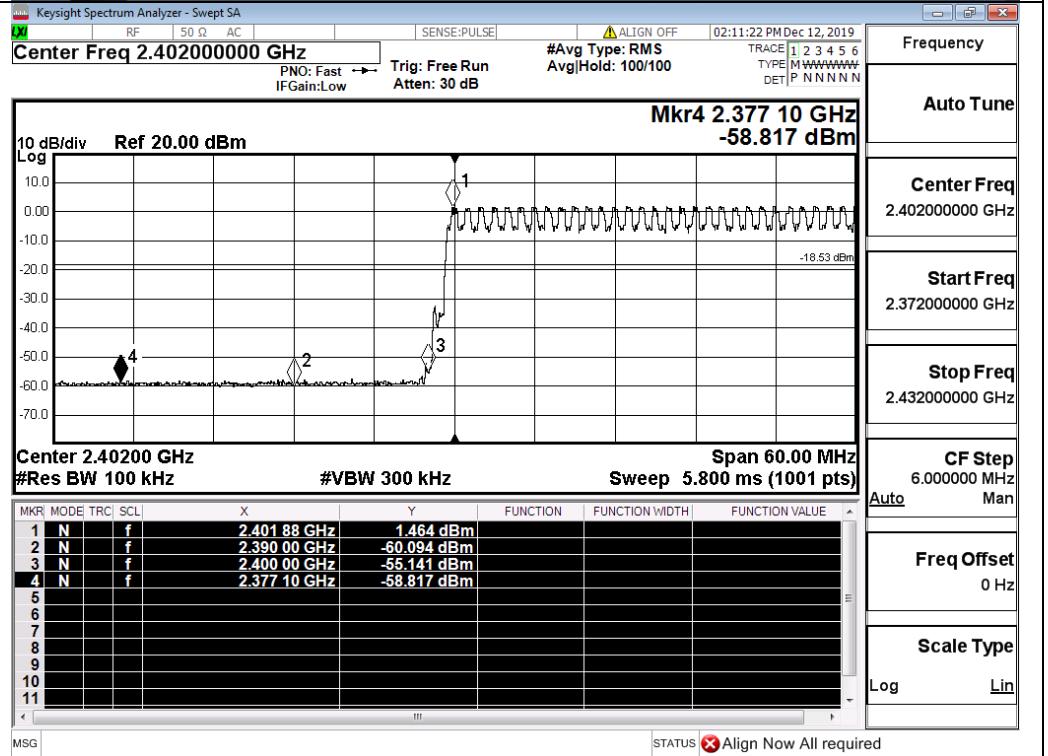
GFSK/HCH/Hop



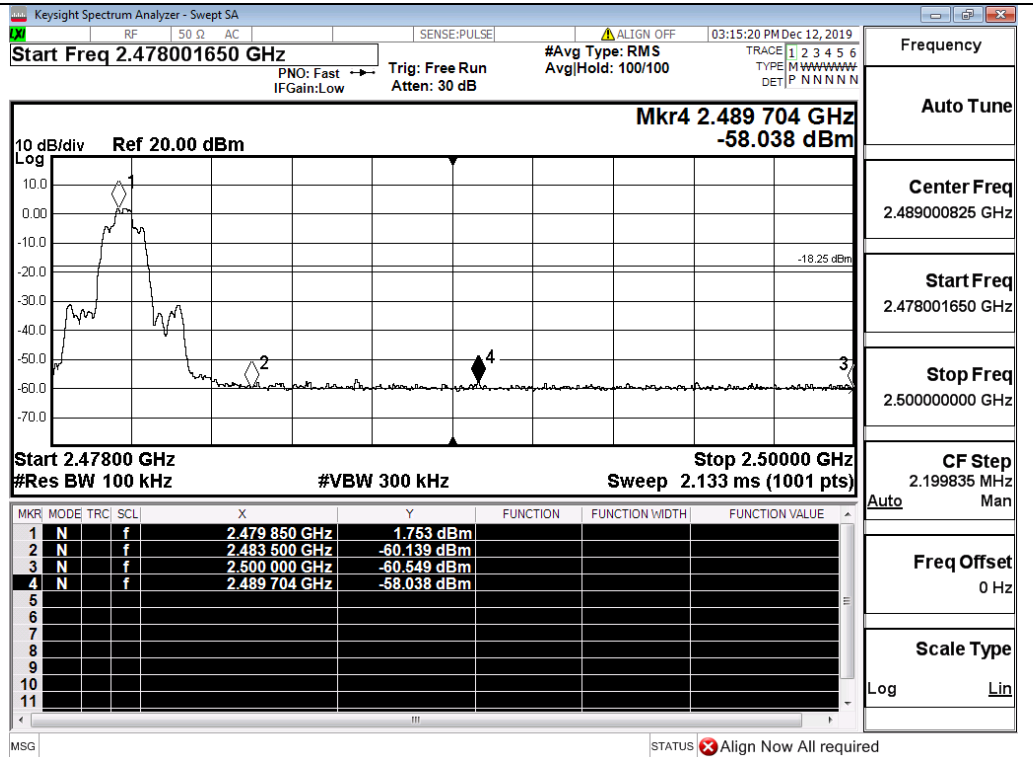
$\pi/4$ DQPSK/LCH/No Hop



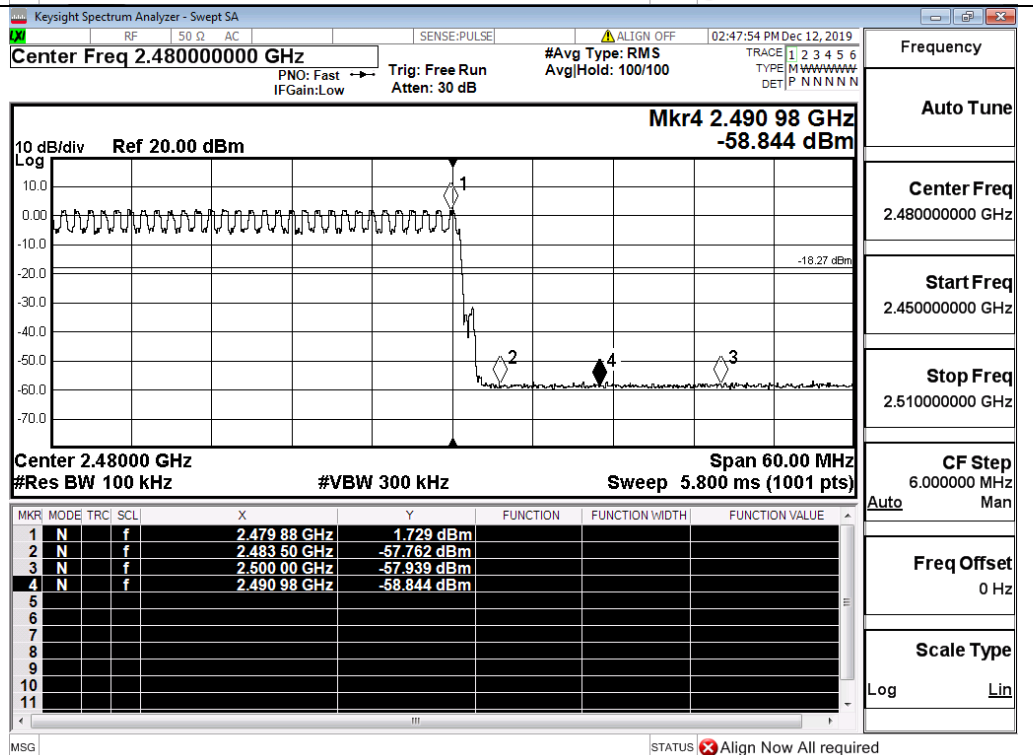
$\pi/4$ DQPSK/LCH/Hop



$\pi/4$ DQPSK/HCH/No Hop



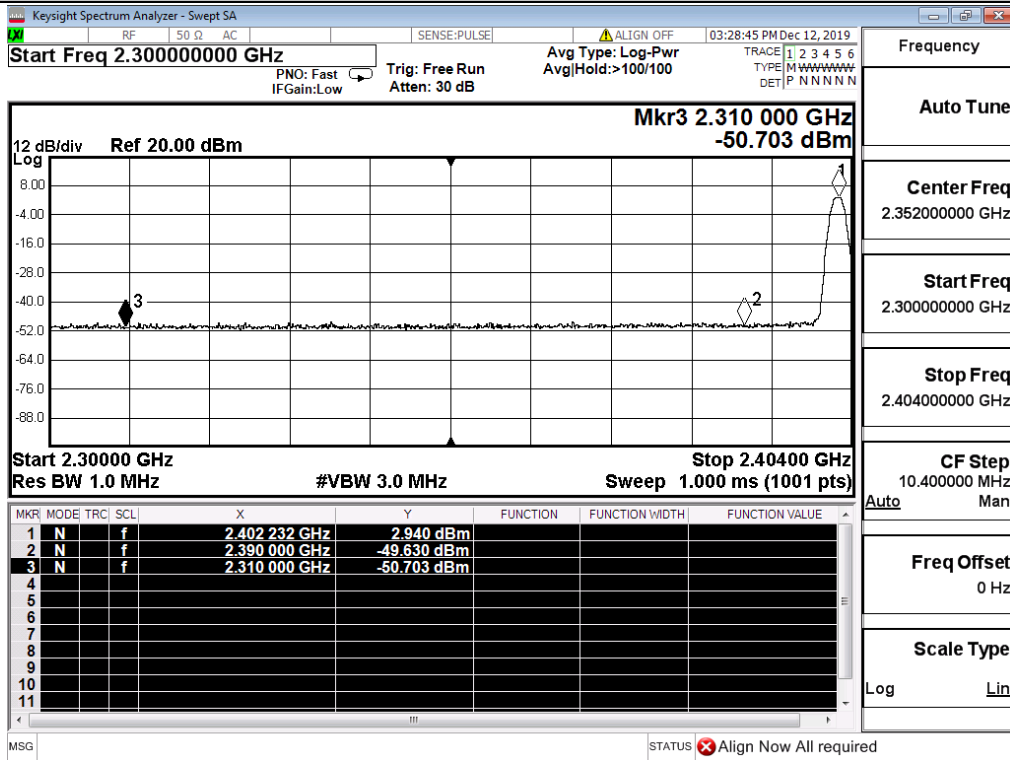
$\pi/4$ DQPSK/HCH/Hop



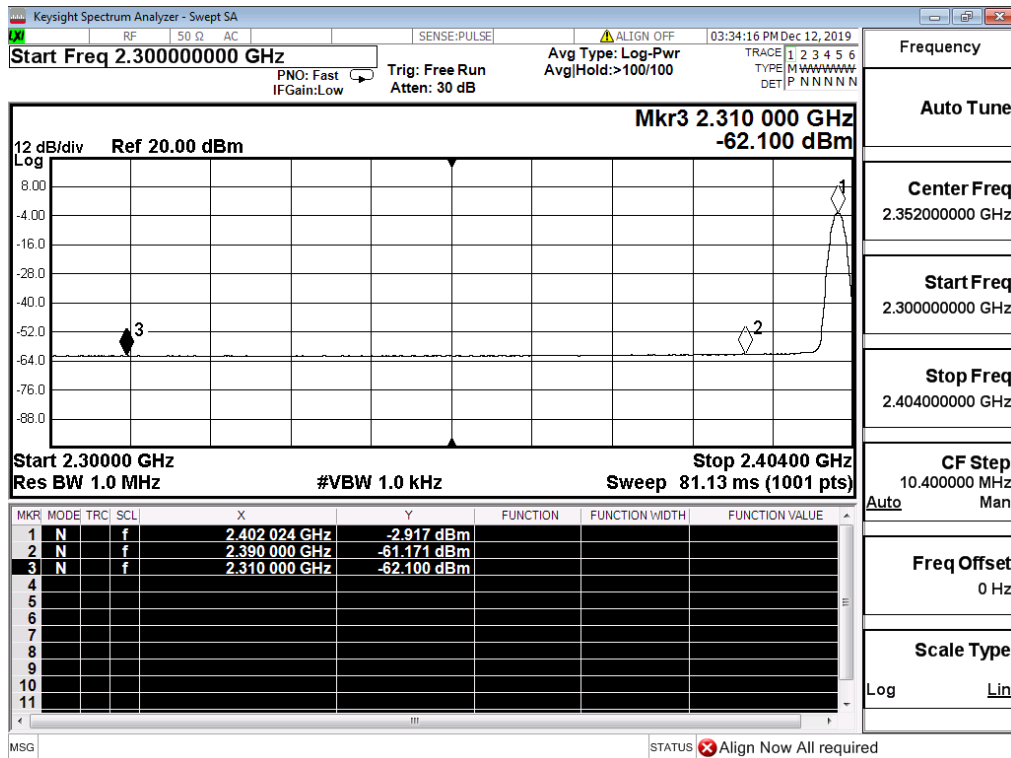
A.8 Restrict-band band-edge measurements

Test Mode	Hopping	Freq.	Power [dBm]	Gain	Ground Factor	E [dBuV/m]	Detector	Limit [dBuV/m]	Verdict
GFSK	Off	2310.0	-50.703	2.0	0	46.56	PEAK	74	PASS
	Off	2310.0	-61.171	2.0	0	36.09	AV	54	PASS
	Off	2390.0	-49.630	2.0	0	47.63	PEAK	74	PASS
	Off	2390.0	-62.100	2.0	0	35.16	AV	54	PASS
	Off	2483.5	-49.932	2.0	0	47.33	PEAK	74	PASS
	Off	2483.5	-60.395	2.0	0	36.87	AV	54	PASS
	Off	2500.0	-49.493	2.0	0	47.77	PEAK	74	PASS
	Off	2500.0	-61.198	2.0	0	36.06	AV	54	PASS
$\pi/4$ DQPSK	Off	2310.0	-49.635	2.0	0	47.63	PEAK	74	PASS
	Off	2310.0	-62.032	2.0	0	35.23	AV	54	PASS
	Off	2390.0	-49.817	2.0	0	47.44	PEAK	74	PASS
	Off	2390.0	-61.256	2.0	0	36.00	AV	54	PASS
	Off	2483.5	-48.806	2.0	0	48.45	PEAK	74	PASS
	Off	2483.5	-60.596	2.0	0	36.66	AV	54	PASS
	Off	2500.0	-50.691	2.0	0	46.57	PEAK	74	PASS
	Off	2500.0	-61.155	2.0	0	36.11	AV	54	PASS

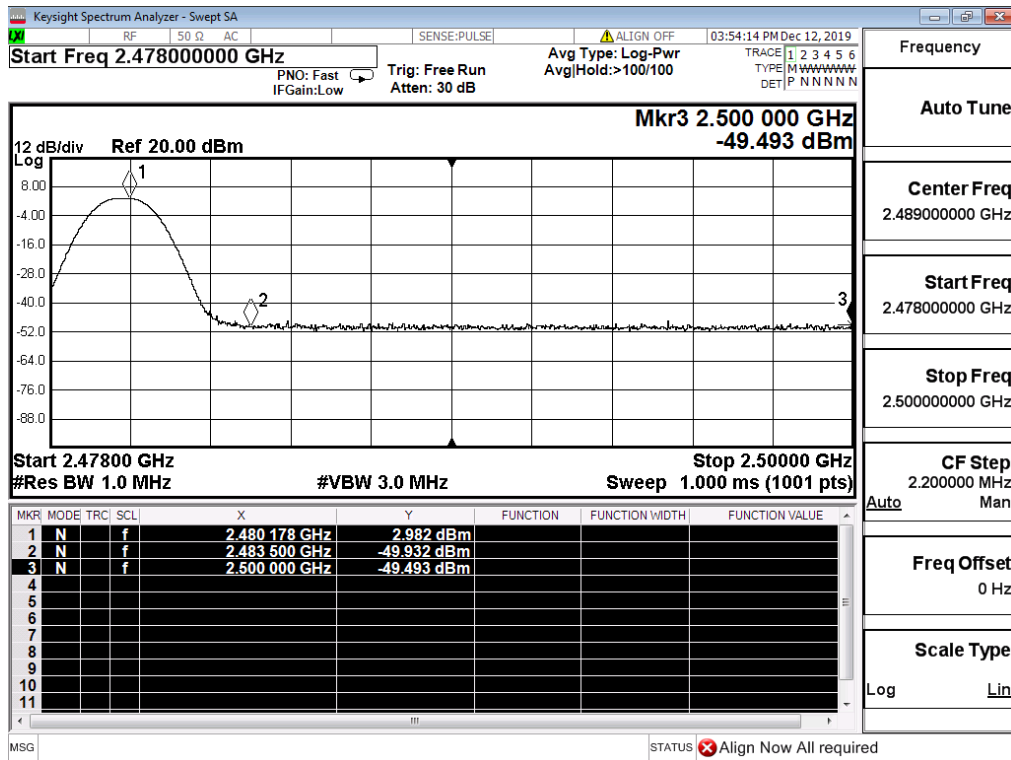
Restrict-band band-edge measurements_Hopping Off_GFSK_PEAK (Low Channel)



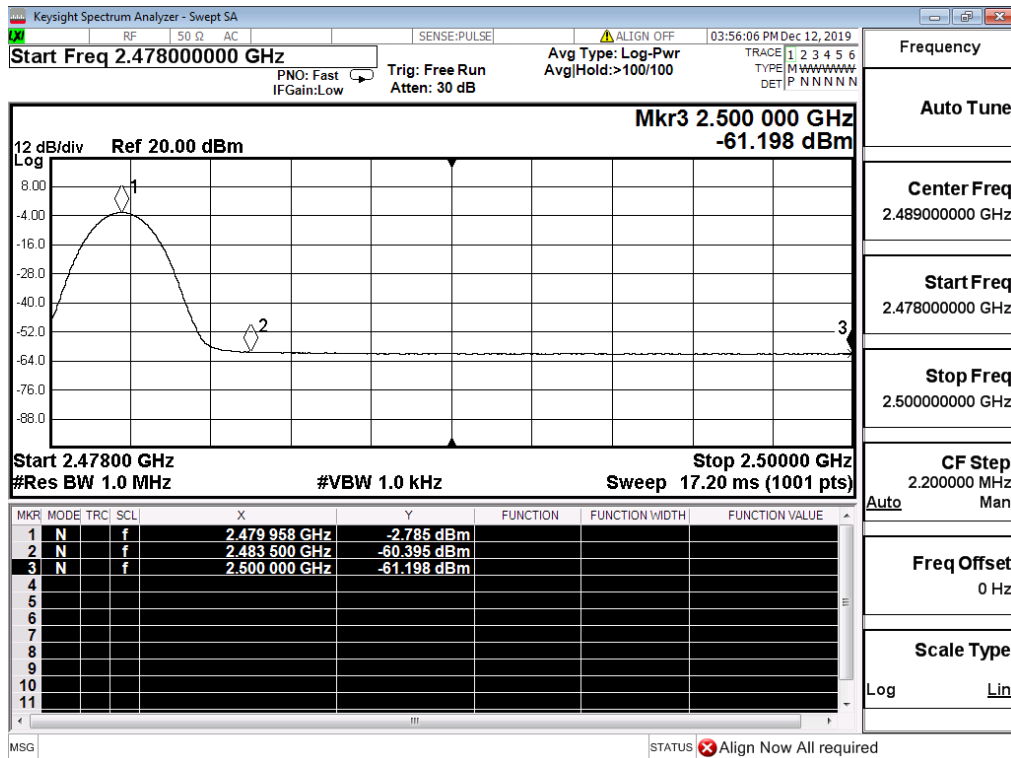
Restrict-band band-edge measurements_Hopping Off_GFSK_Average (Low Channel)



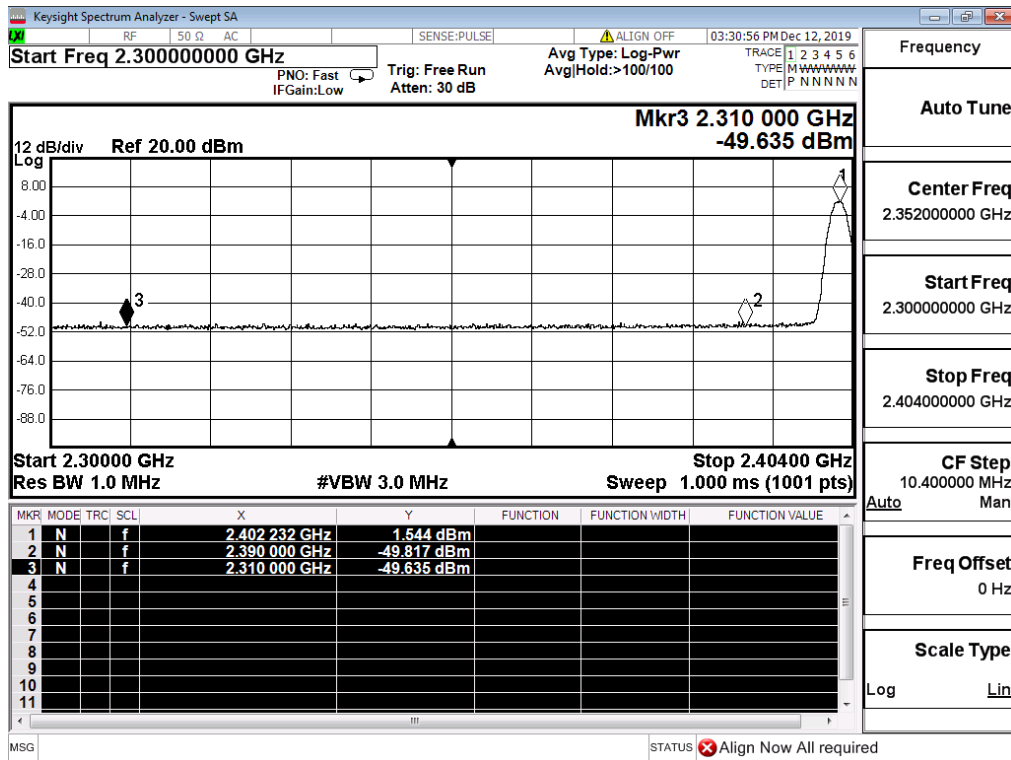
Restrict-band band-edge measurements_Hopping Off_GFSK_PEAK (High Channel)



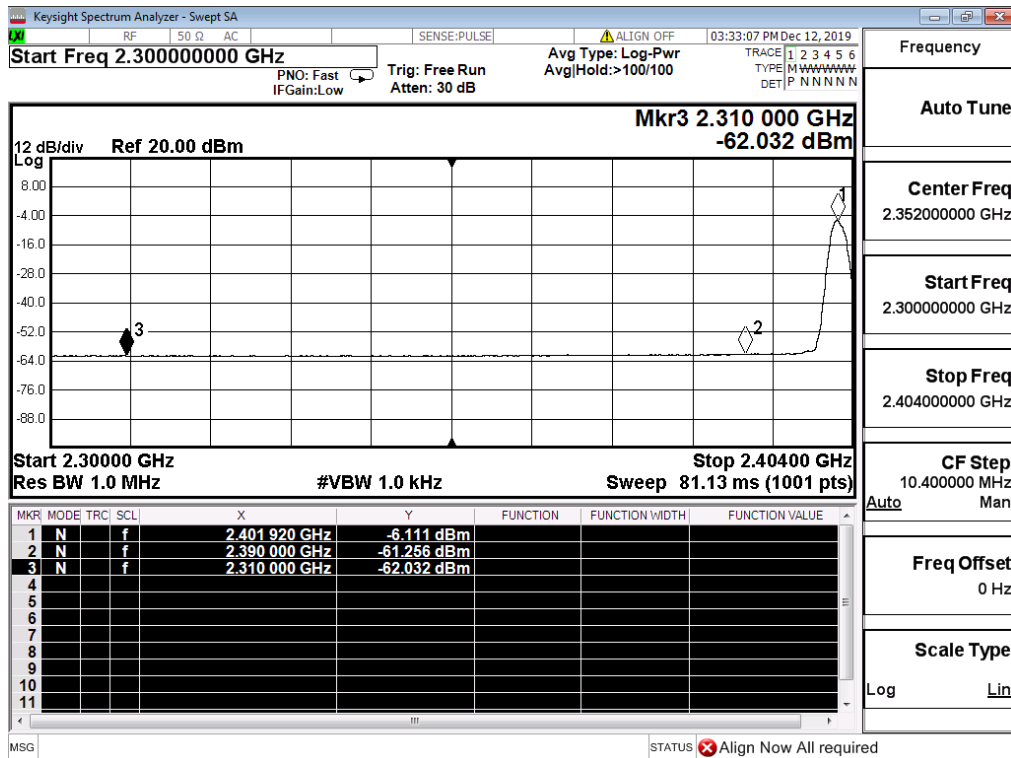
Restrict-band band-edge measurements_Hopping Off_GFSK_Average (High Channel)



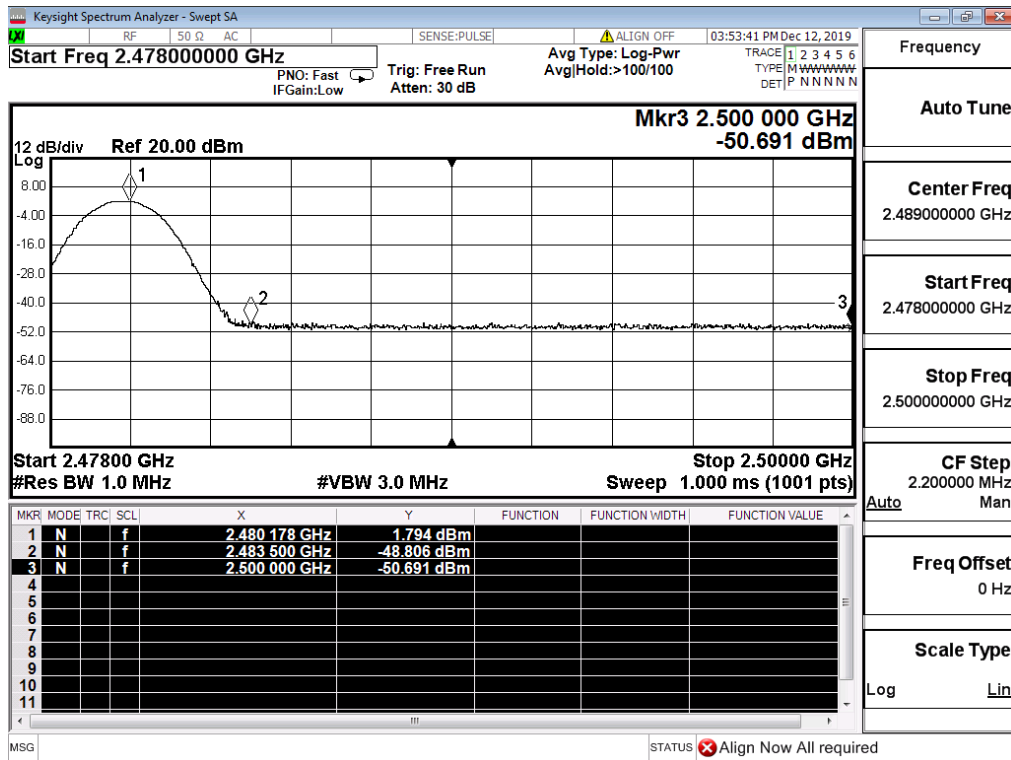
Restrict-band band-edge measurements_Hopping Off $\pi/4$ -DQPSK_PEAK (Low Channel)



Restrict-band band-edge measurements_Hopping Off $\pi/4$ -DQPSK_Average (Low Channel)



Restrict-band band-edge measurements_Hopping Off $\pi/4$ -DQPSK_PEAK (High Channel)



Restrict-band band-edge measurements_Hopping Off $\pi/4$ -DQPSK_Average (High Channel)

