Environmental Conditions

Temperature:	22.9 ° C
Relative Humidity:	52.3%
ATM Pressure:	100.0 kPa
Test Engineer:	Mina.xu
Supervised by:	Tom.Liu

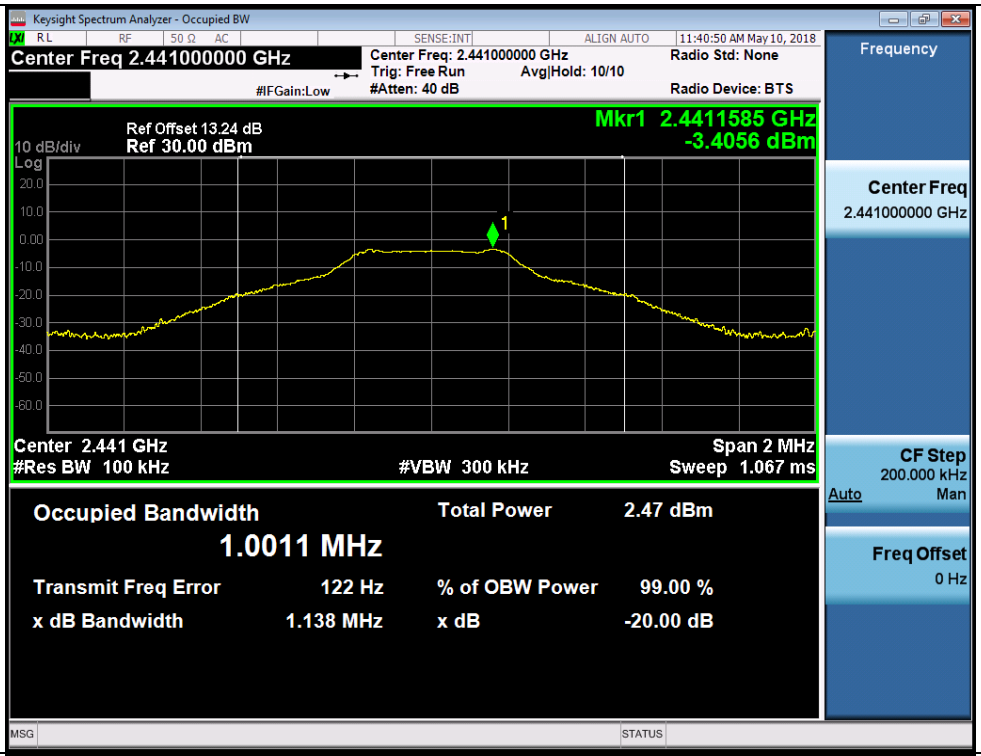
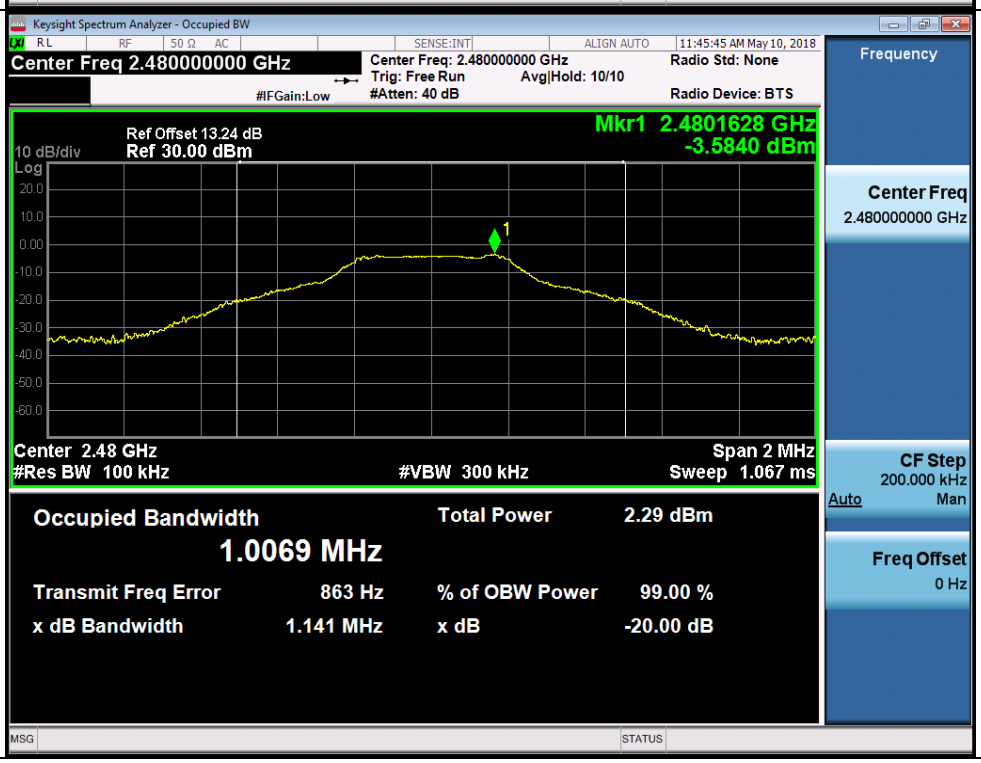
Appendix A): 20dB Bandwidth

Test Result

Mode	Channel.	20dB Bandwidth [MHz]	Limit [MHz]	Verdict
GFSK	LCH	1.154	Not Specified	PASS
	MCH	1.138	Not Specified	PASS
	HCH	1.141	Not Specified	PASS

Test Graph

Graphs	
GFSK/LCH	

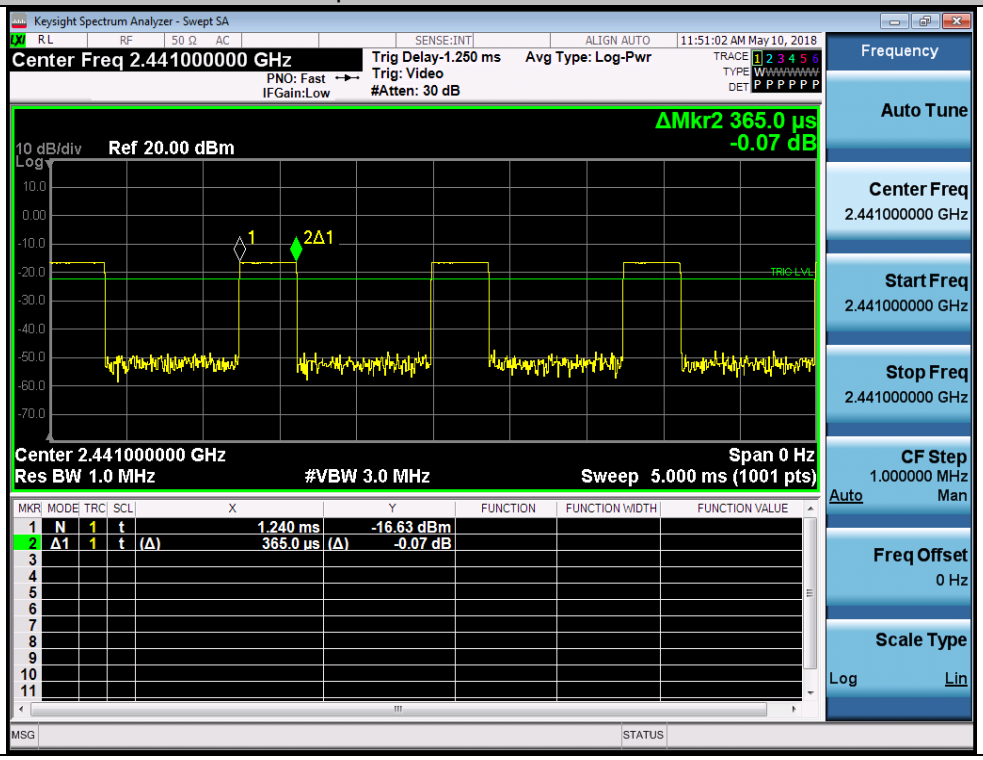
GFSK/MCH		
GFSK/HCH		

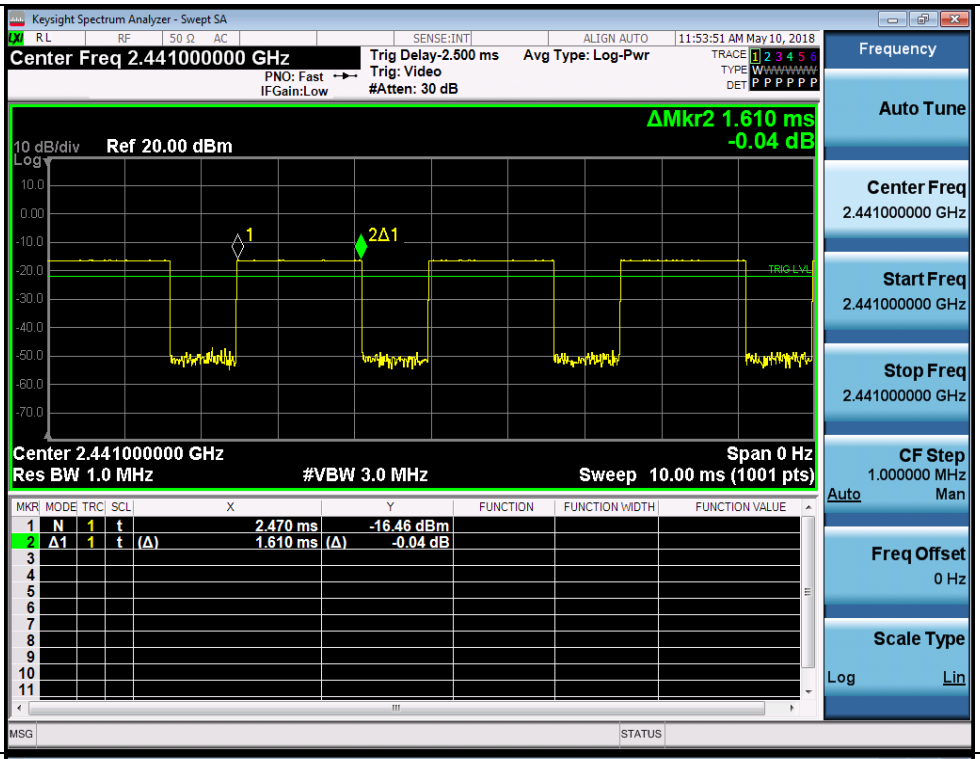
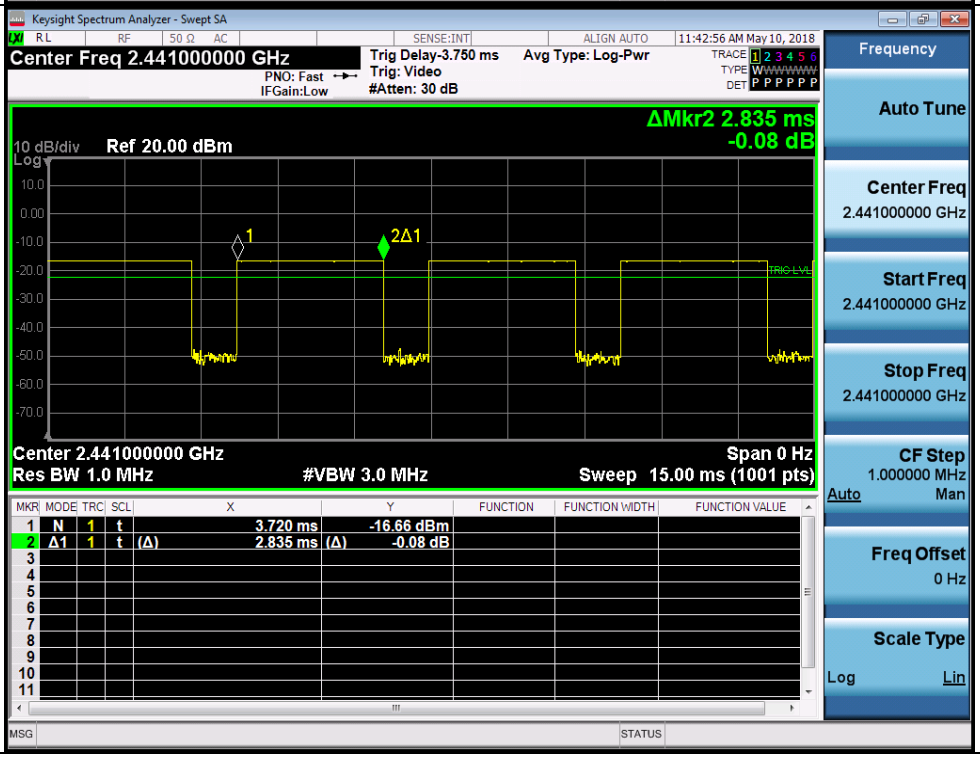
Appendix B): Dwell Time

Result Table

Mode	Packet	Channel	Burst Width [ms/hop/ch]	Total Hops[hop*ch]	Dwell Time[s]	Limit [s]	Verdict
GFSK	DH1	MCH	0.37	320	0.118	0.4	PASS
GFSK	DH3	MCH	1.61	160	0.258	0.4	PASS
GFSK	DH5	MCH	2.84	106.7	0.303	0.4	PASS

Test Graph

Graphs	
GFSK_DH1/MCH	

GFSK_DH3/MCH	
GFSK_DH5/MCH	

Appendix C): Carrier Frequency Separation

Result Table

Mode	Channel.	Carrier Frequency Separation [MHz]	Limit [MHz] 2/3*20dB Bandwidth	Verdict
GFSK	LCH	0.958	0.648	PASS
	MCH	1.079	0.678	PASS
	HCH	0.954	0.687	PASS

Test Graph

Graphs	
GFSK/LCH	

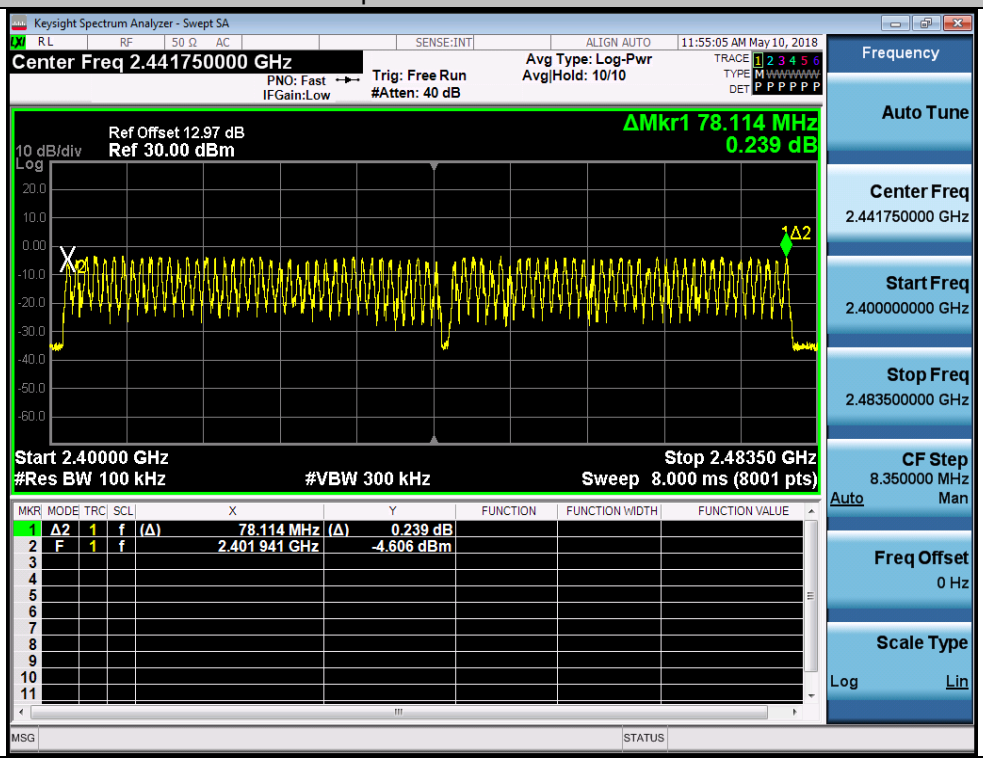
GFSK/MCH		
GFSK/HCH		

Appendix D): Hopping Channel Number

Result Table

Mode	Channel.	Number of Hopping Channel	Verdict
GFSK	Hop	79	PASS

Test Graph

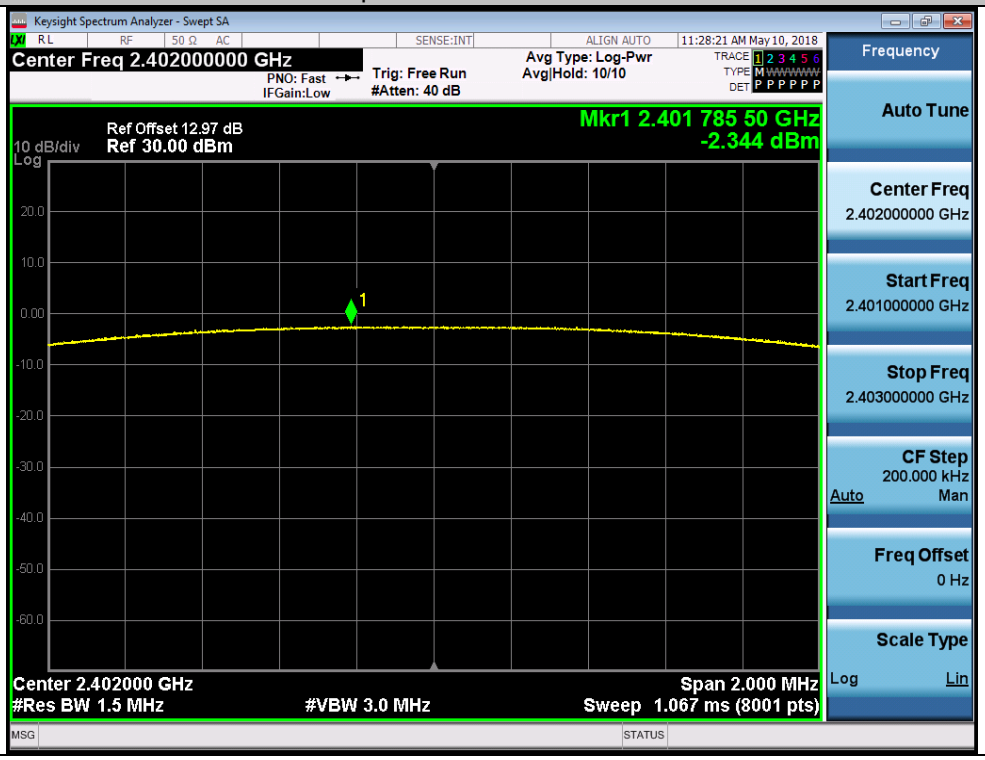
Graphs	
GFSK/Hop	

Appendix E): Conducted Peak Output Power

Result Table

Mode	Channel.	Maximum Peak Output Power [dBm]	Limit [dBm]	Verdict
GFSK	LCH	-2.344	21	PASS
	MCH	-2.500	21	PASS
	HCH	-2.555	21	PASS

Test Graph

Graphs		
GFSK/LCH		

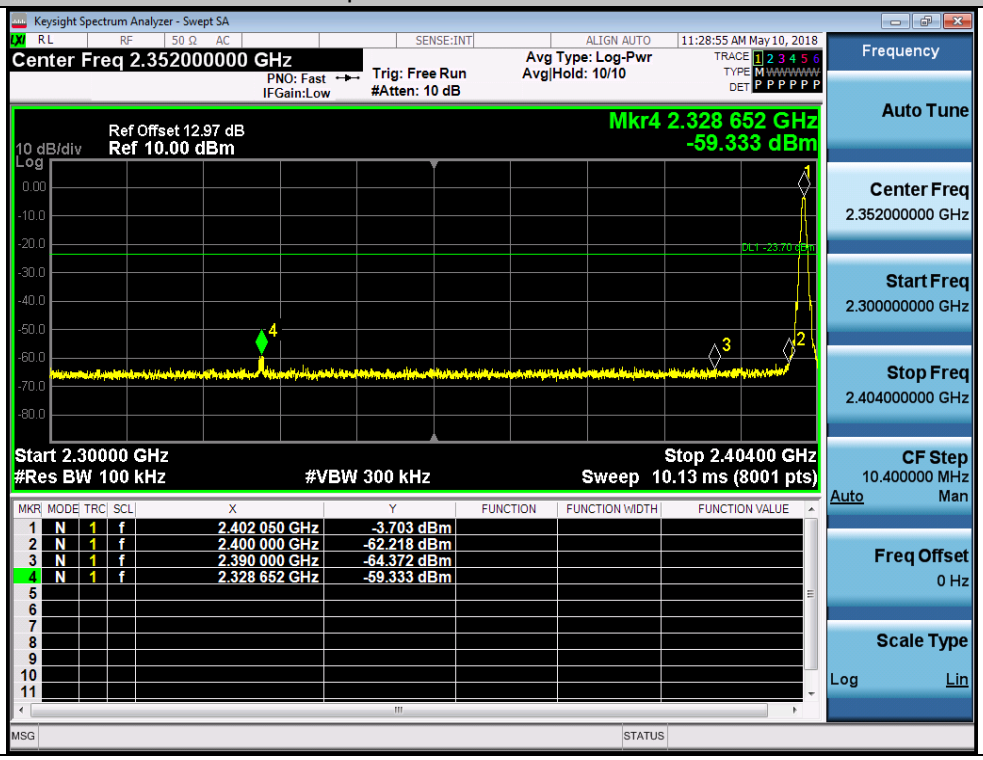
GFSK/MCH		
GFSK/HCH		

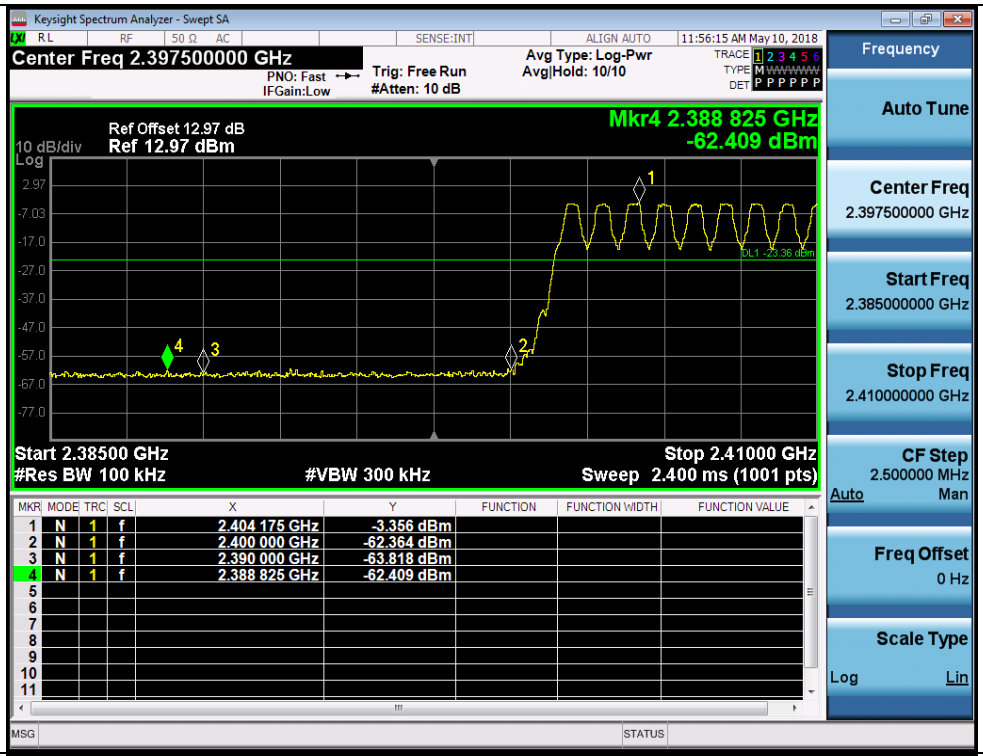
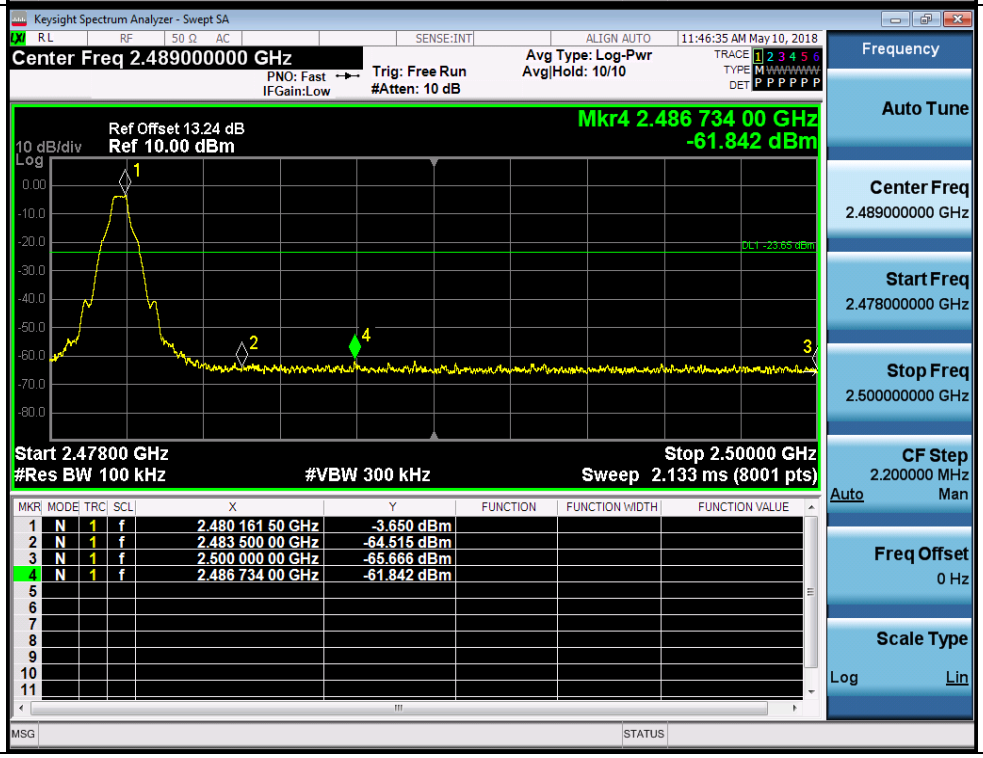
Appendix F): Band-edge for RF Conducted Emissions

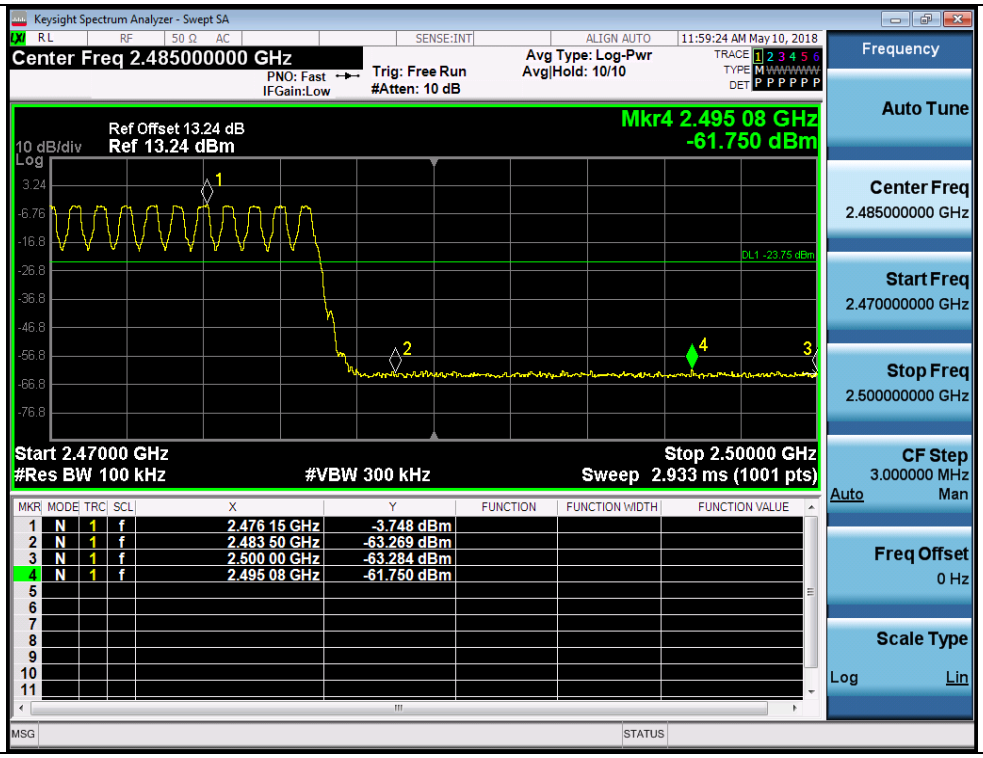
Result Table

Mode	Channel	Carrier Frequency [MHz]	Carrier Power [dBm]	Frequency Hopping	Max Spurious Level [dBm]	Limit [dBm]	Verdict
GFSK	LCH	2402	-3.703	Off	-59.333	-23.7	PASS
			-3.356	On	-62.364	-23.36	PASS
GFSK	HCH	2480	-3.650	Off	-61.842	-23.65	PASS
			-3.748	On	-61.750	-23.75	PASS

Test Graph

Graphs	
GFSK/LCH/No Hop	

GFSK/LCH/Hop	
GFSK/HCH/No Hop	

GFSK/HCH/Hop		

Keysight Spectrum Analyzer - Swept SA
Center Freq 2.485000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 10 dB
Avg Type: Log-Pwr
Avg|Hold: 10/10
11:59:24 AM May 10, 2018
Ref Offset 13.24 dB
10 dB/div
Ref 13.24 dBm
Mkr4 2.495 08 GHz
-61.750 dBm
DL1 -23.75 dBm
Start 2.47000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.50000 GHz
Sweep 2.933 ms (1001 pts)
1 N 1 f 2.476 15 GHz -3.748 dBm
2 N 1 f 2.483 50 GHz -63.269 dBm
3 N 1 f 2.500 00 GHz -63.284 dBm
4 N 1 f 2.495 08 GHz -61.750 dBm
Frequency
Auto Tune
Center Freq
2.485000000 GHz
Start Freq
2.470000000 GHz
Stop Freq
2.500000000 GHz
CF Step
3.000000 MHz
Auto
Man
Freq Offset
0 Hz
Scale Type
Log
Lin

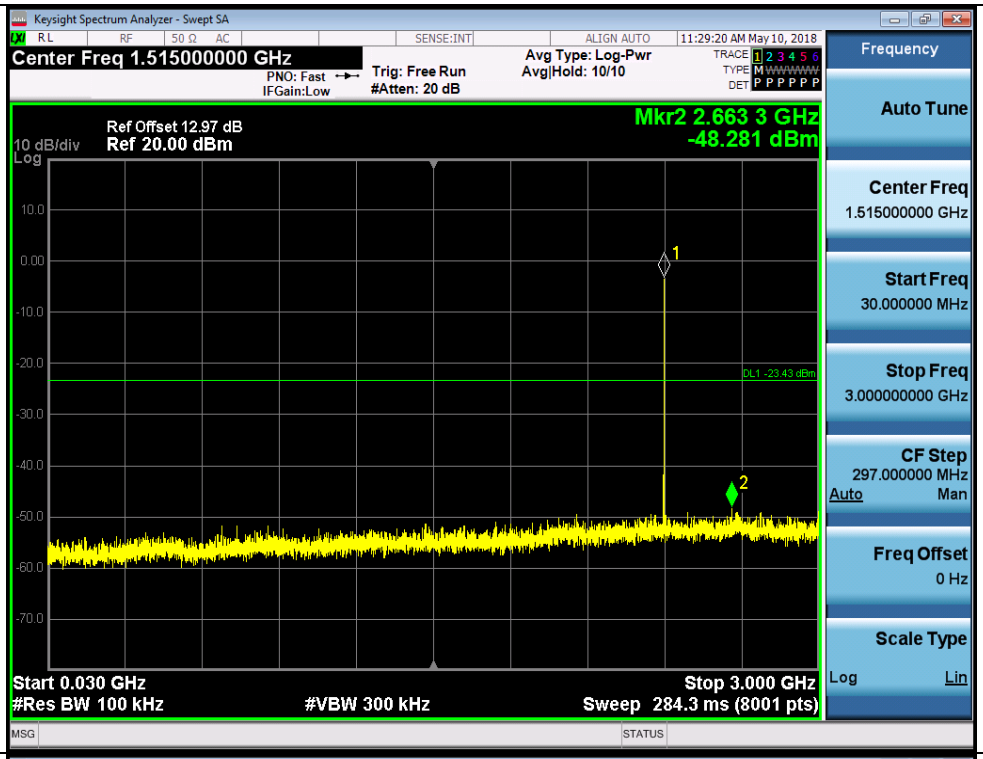
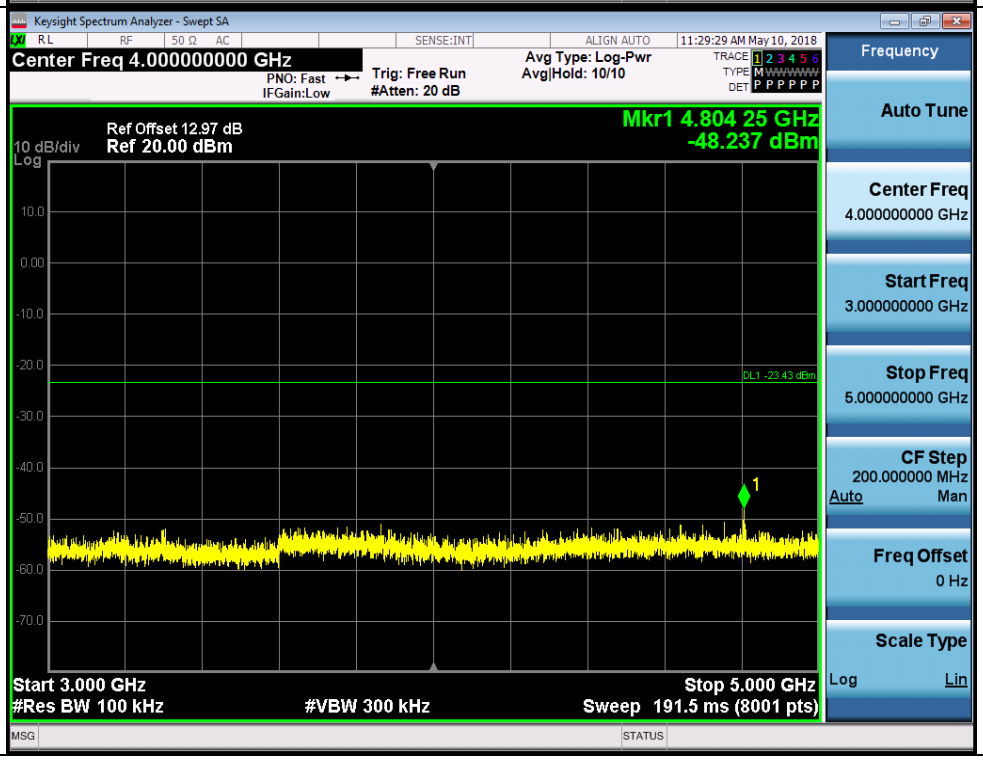
Appendix G): RF Conducted Spurious Emissions

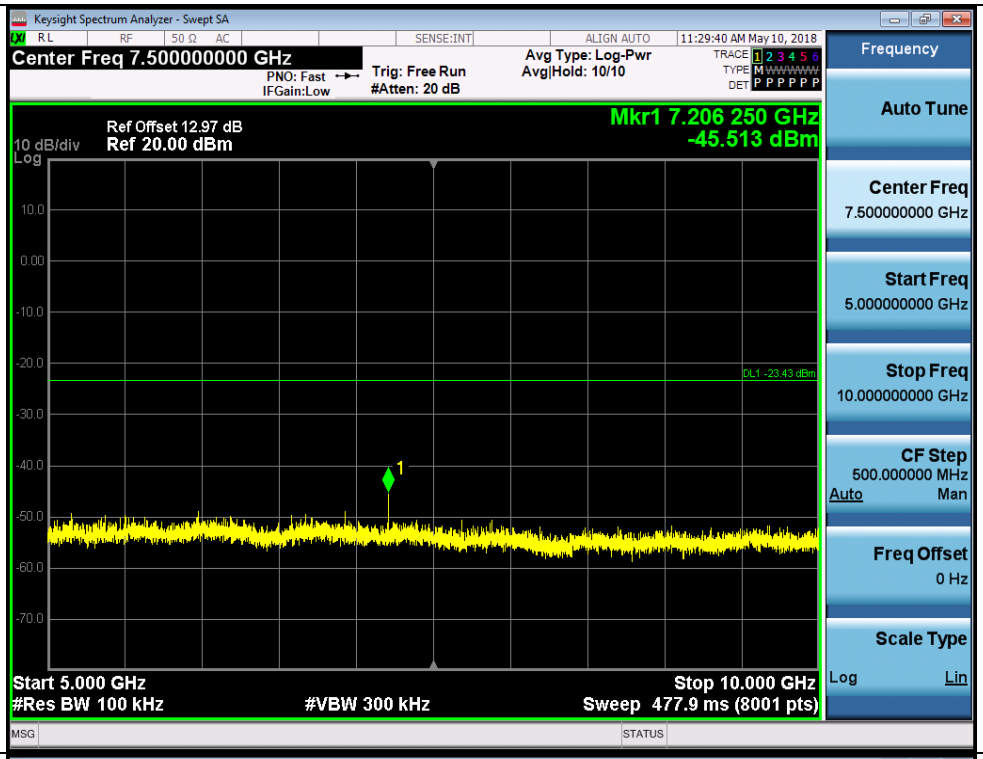
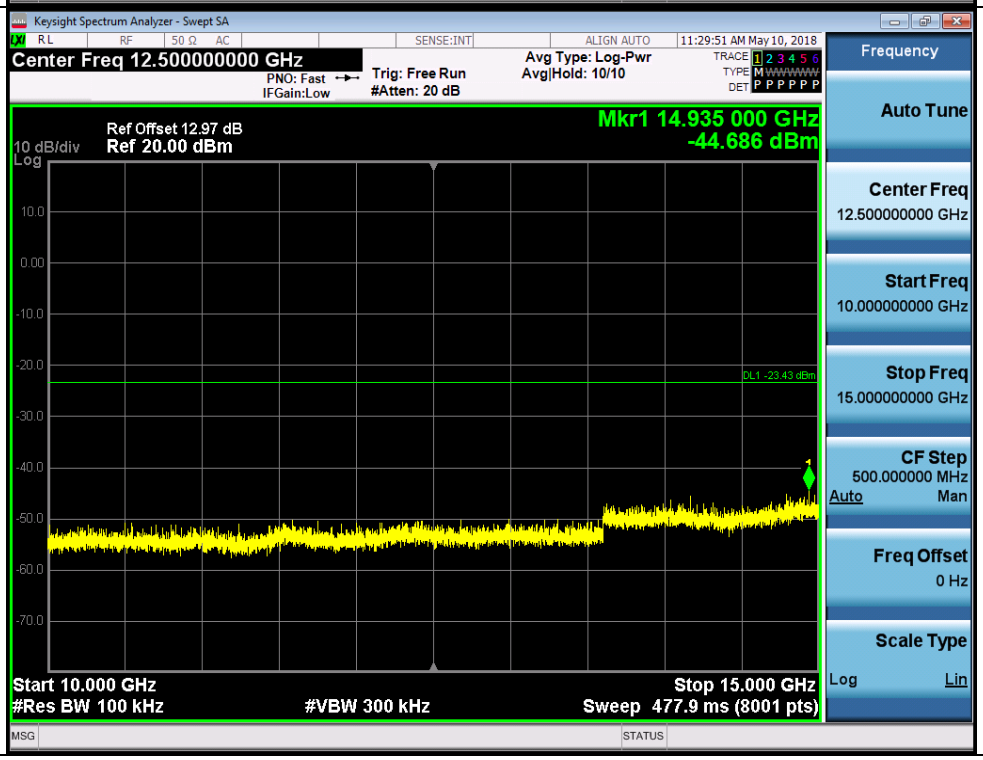
Result Table

Mode	Channel	Pref [dBm]	Puw[dBm]	Verdict
GFSK	LCH	-3.431	<Limit	PASS
GFSK	MCH	-3.694	<Limit	PASS
GFSK	HCH	-3.703	<Limit	PASS

Test Graph

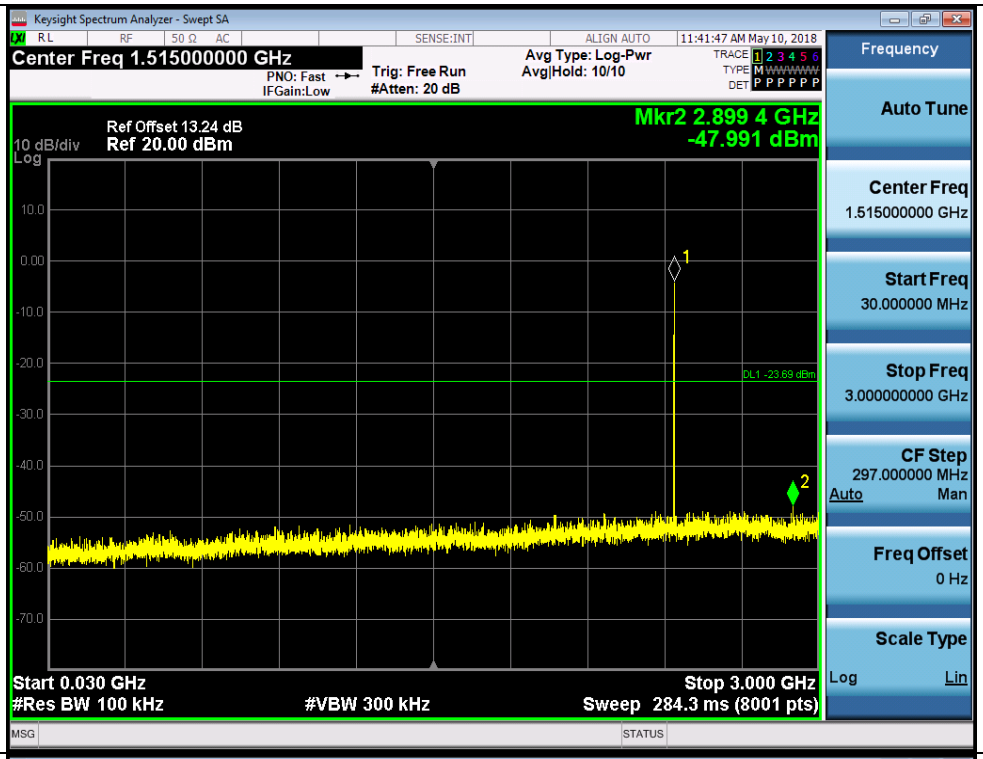
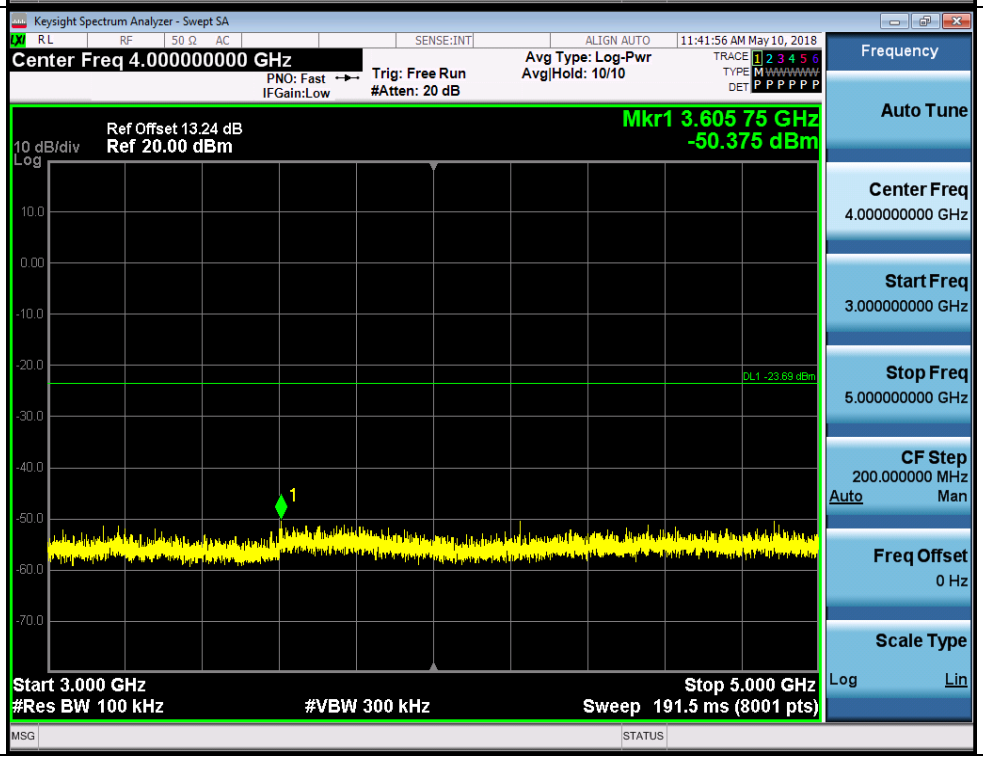
GFSK_LCH_Graphs		
Pref		

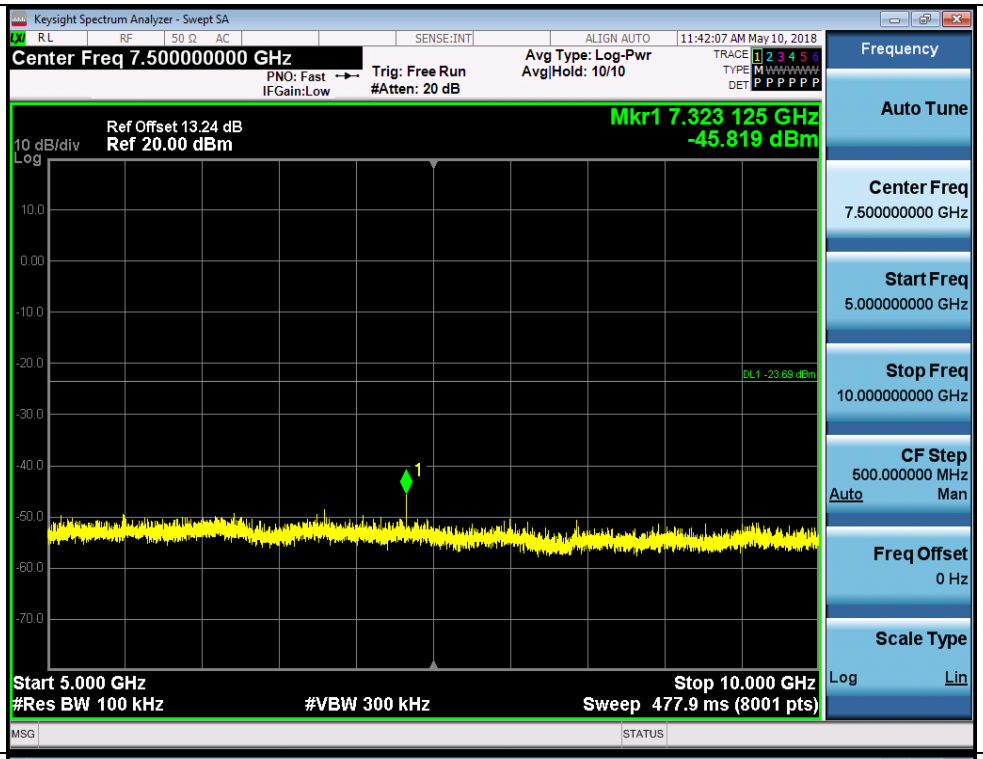
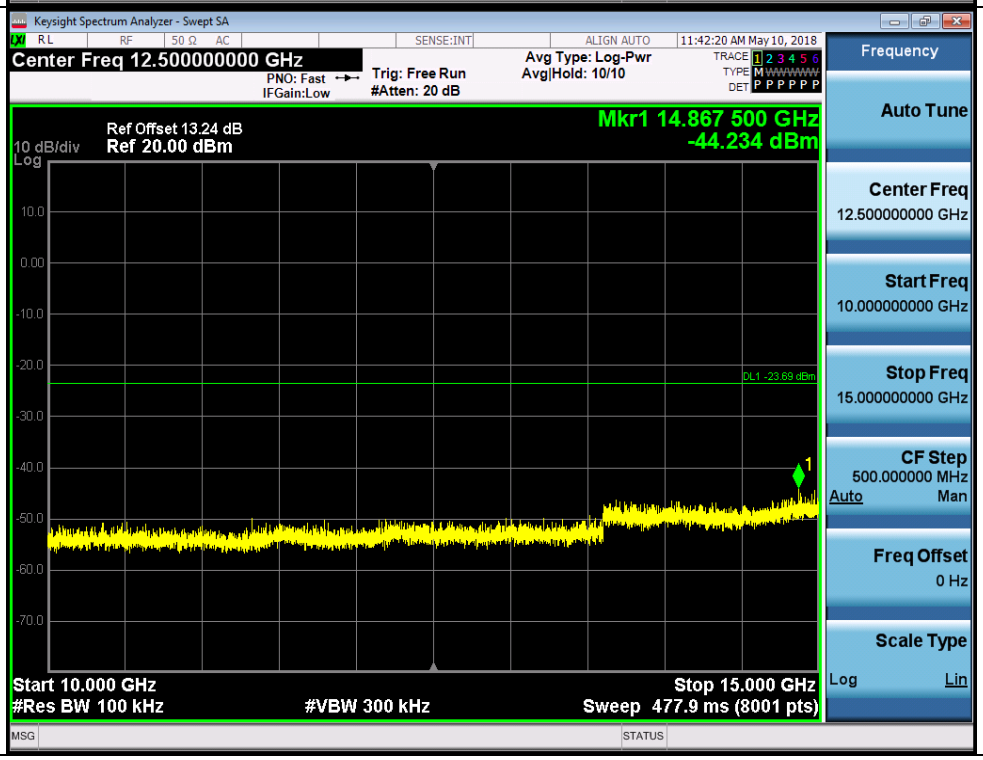
Puw		 Keysight Spectrum Analyzer - Swept SA Center Freq 1.515000000 GHz PNO: Fast IFGain:Low Trig: Free Run #Atten: 20 dB Avg Type: Log-Pwr Avg|Hold: 10/10 11:29:20 AM May 10, 2018 Ref Offset 12.97 dB 10 dB/div Ref 20.00 dBm Mkr2 2.663 3 GHz -48.281 dBm DL1 -23.43 dBm Start 0.030 GHz #Res BW 100 kHz #VBW 300 kHz Stop 3.000 GHz Sweep 284.3 ms (8001 pts) Frequency Auto Tune Center Freq 1.515000000 GHz Start Freq 30.000000 MHz Stop Freq 3.000000000 GHz CF Step 297.000000 MHz Auto Man Freq Offset 0 Hz Scale Type Log Lin	
Puw		 Keysight Spectrum Analyzer - Swept SA Center Freq 4.000000000 GHz PNO: Fast IFGain:Low Trig: Free Run #Atten: 20 dB Avg Type: Log-Pwr Avg|Hold: 10/10 11:29:29 AM May 10, 2018 Ref Offset 12.97 dB 10 dB/div Ref 20.00 dBm Mkr1 4.804 25 GHz -48.237 dBm DL1 -23.43 dBm Start 3.000 GHz #Res BW 100 kHz #VBW 300 kHz Stop 5.000 GHz Sweep 191.5 ms (8001 pts) Frequency Auto Tune Center Freq 4.000000000 GHz Start Freq 3.000000000 GHz Stop Freq 5.000000000 GHz CF Step 200.000000 MHz Auto Man Freq Offset 0 Hz Scale Type Log Lin	

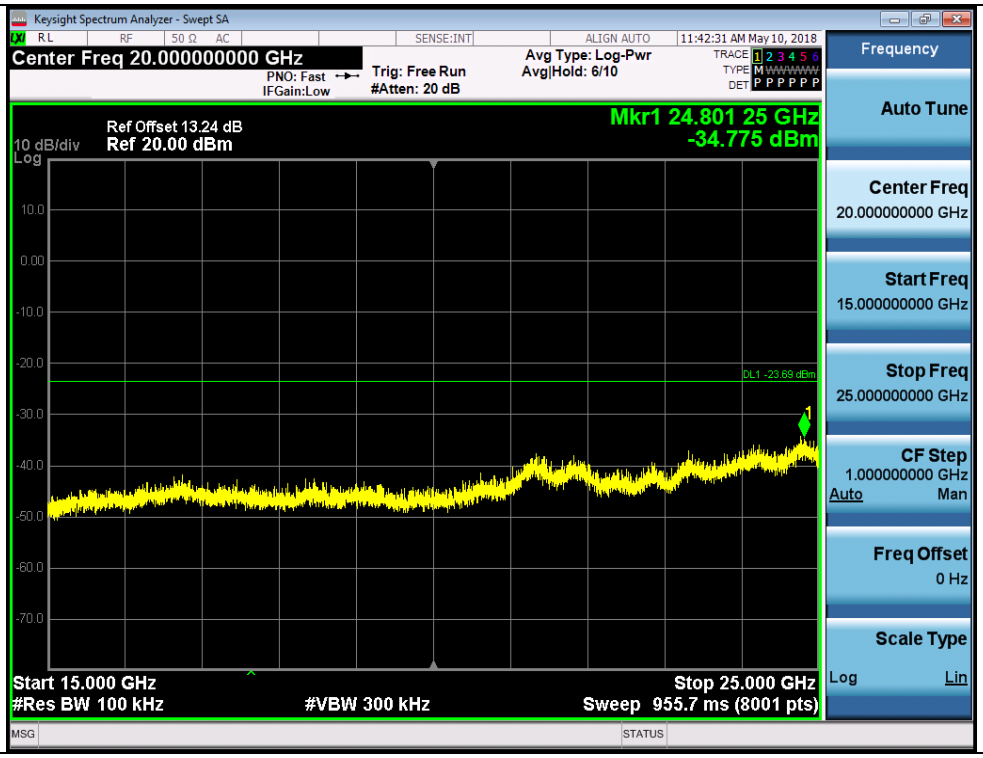
Puw		 Keysight Spectrum Analyzer - Swept SA Center Freq 7.500000000 GHz PNO: Fast IFGain:Low Trig: Free Run #Atten: 20 dB Avg Type: Log-Pwr Avg|Hold: 10/10 11:29:40 AM May 10, 2018 Ref Offset 12.97 dB 10 dB/div Ref 20.00 dBm Mkr1 7.206 250 GHz -45.513 dBm DL1 -23.43 dBm Start 5.000 GHz #Res BW 100 kHz #VBW 300 kHz Stop 10.000 GHz Sweep 477.9 ms (8001 pts) Frequency Auto Tune Center Freq 7.500000000 GHz Start Freq 5.000000000 GHz Stop Freq 10.000000000 GHz CF Step 500.000000 MHz Auto Man Freq Offset 0 Hz Scale Type Log Lin MSG STATUS	
Puw		 Keysight Spectrum Analyzer - Swept SA Center Freq 12.500000000 GHz PNO: Fast IFGain:Low Trig: Free Run #Atten: 20 dB Avg Type: Log-Pwr Avg|Hold: 10/10 11:29:51 AM May 10, 2018 Ref Offset 12.97 dB 10 dB/div Ref 20.00 dBm Mkr1 14.935 000 GHz -44.686 dBm DL1 -23.43 dBm Start 10.000 GHz #Res BW 100 kHz #VBW 300 kHz Stop 15.000 GHz Sweep 477.9 ms (8001 pts) Frequency Auto Tune Center Freq 12.500000000 GHz Start Freq 10.000000000 GHz Stop Freq 15.000000000 GHz CF Step 500.000000 MHz Auto Man Freq Offset 0 Hz Scale Type Log Lin MSG STATUS	

Puw		

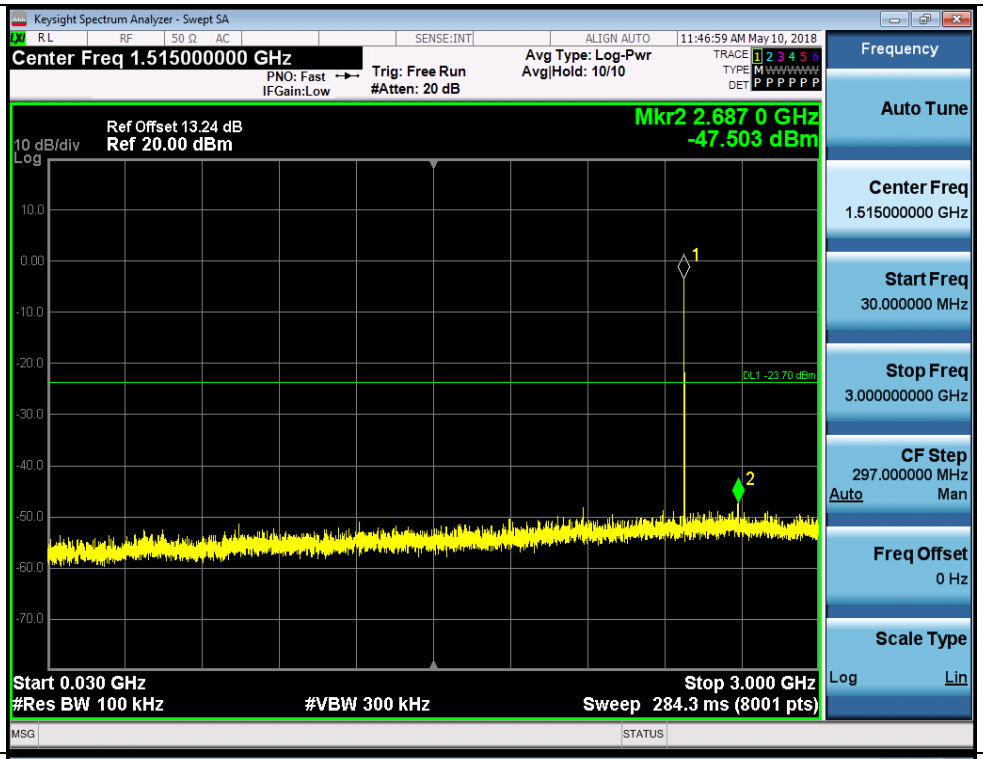
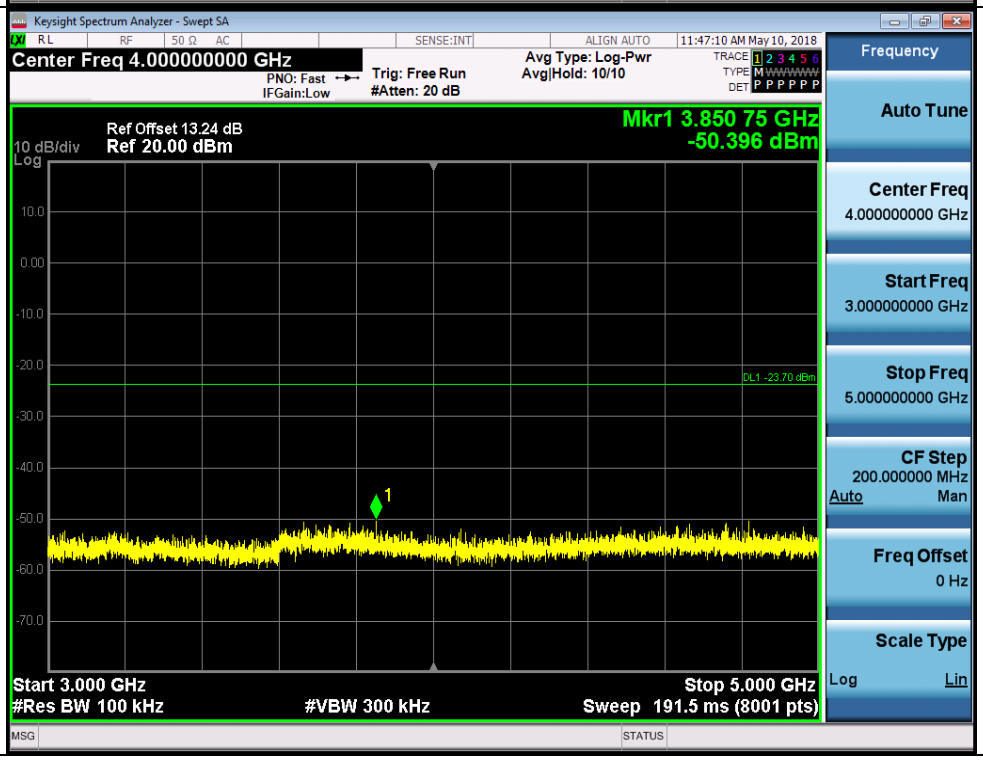
GFSK_MCH_Graphs		
Pref		

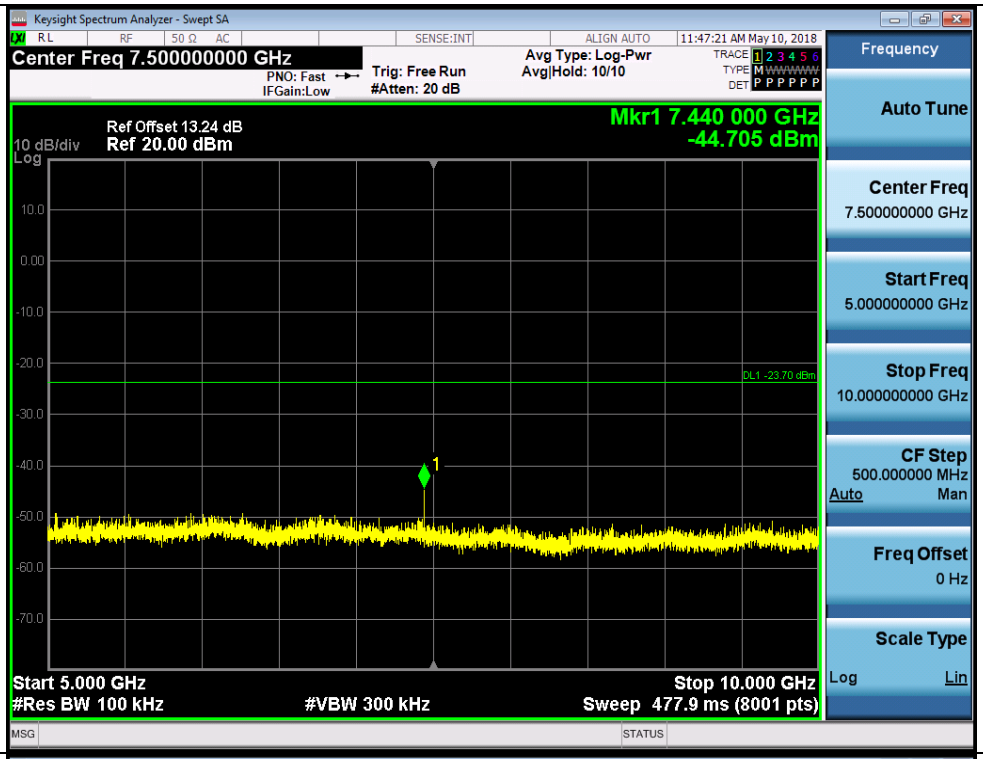
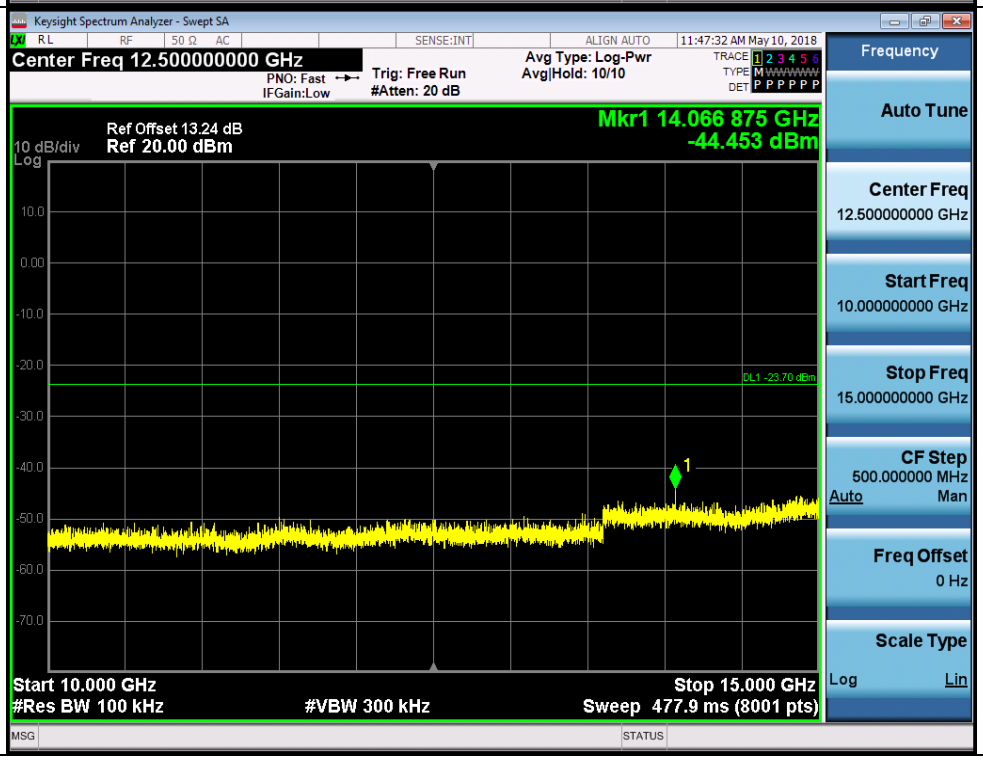
Puw		 Keysight Spectrum Analyzer - Swept SA Center Freq 1.515000000 GHz PNO: Fast IFGain:Low Trig: Free Run #Atten: 20 dB Avg Type: Log-Pwr Avg|Hold: 10/10 11:41:47 AM May 10, 2018 Ref Offset 13.24 dB 10 dB/div Ref 20.00 dBm Mkr2 2.899 4 GHz -47.991 dBm DL1 -23.69 dBm Start 0.030 GHz #Res BW 100 kHz #VBW 300 kHz Stop 3.000 GHz Sweep 284.3 ms (8001 pts) Frequency Auto Tune Center Freq 1.515000000 GHz Start Freq 30.000000 MHz Stop Freq 3.000000000 GHz CF Step 297.000000 MHz Auto Man Freq Offset 0 Hz Scale Type Log Lin	
Puw		 Keysight Spectrum Analyzer - Swept SA Center Freq 4.000000000 GHz PNO: Fast IFGain:Low Trig: Free Run #Atten: 20 dB Avg Type: Log-Pwr Avg|Hold: 10/10 11:41:56 AM May 10, 2018 Ref Offset 13.24 dB 10 dB/div Ref 20.00 dBm Mkr1 3.605 75 GHz -50.375 dBm DL1 -23.69 dBm Start 3.000 GHz #Res BW 100 kHz #VBW 300 kHz Stop 5.000 GHz Sweep 191.5 ms (8001 pts) Frequency Auto Tune Center Freq 4.000000000 GHz Start Freq 3.000000000 GHz Stop Freq 5.000000000 GHz CF Step 200.000000 MHz Auto Man Freq Offset 0 Hz Scale Type Log Lin	

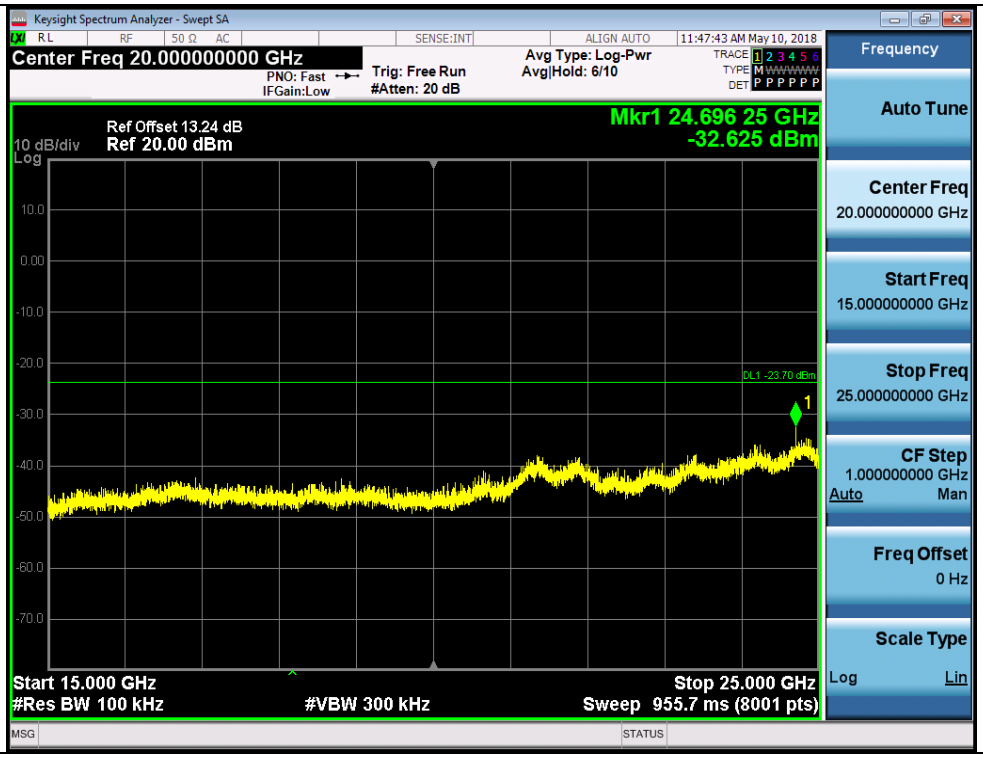
Puw		 Keysight Spectrum Analyzer - Swept SA Center Freq 7.500000000 GHz PNO: Fast IFGain:Low Trig: Free Run #Atten: 20 dB Avg Type: Log-Pwr Avg|Hold: 10/10 11:42:07 AM May 10, 2018 Ref Offset 13.24 dB 10 dB/div Ref 20.00 dBm Mkr1 7.323 125 GHz -45.819 dBm DL1 -23.69 dBm Start 5.000 GHz #Res BW 100 kHz #VBW 300 kHz Stop 10.000 GHz Sweep 477.9 ms (8001 pts) Frequency Auto Tune Center Freq 7.500000000 GHz Start Freq 5.000000000 GHz Stop Freq 10.000000000 GHz CF Step 500.000000 MHz Auto Man Freq Offset 0 Hz Scale Type Log Lin MSG STATUS	
Puw		 Keysight Spectrum Analyzer - Swept SA Center Freq 12.500000000 GHz PNO: Fast IFGain:Low Trig: Free Run #Atten: 20 dB Avg Type: Log-Pwr Avg|Hold: 10/10 11:42:20 AM May 10, 2018 Ref Offset 13.24 dB 10 dB/div Ref 20.00 dBm Mkr1 14.867 500 GHz -44.234 dBm DL1 -23.69 dBm Start 10.000 GHz #Res BW 100 kHz #VBW 300 kHz Stop 15.000 GHz Sweep 477.9 ms (8001 pts) Frequency Auto Tune Center Freq 12.500000000 GHz Start Freq 10.000000000 GHz Stop Freq 15.000000000 GHz CF Step 500.000000 MHz Auto Man Freq Offset 0 Hz Scale Type Log Lin MSG STATUS	

Puw	

GFSK_HCH_Graphs	
Pref	

Puw		 Keysight Spectrum Analyzer - Swept SA Center Freq 1.515000000 GHz PNO: Fast IFGain:Low Trig: Free Run #Atten: 20 dB Avg Type: Log-Pwr Avg|Hold: 10/10 11:46:59 AM May 10, 2018 Ref Offset 13.24 dB 10 dB/div Ref 20.00 dBm Mkr2 2.687 0 GHz -47.503 dBm DL1 -23.70 dBm Start 0.030 GHz #Res BW 100 kHz #VBW 300 kHz Stop 3.000 GHz Sweep 284.3 ms (8001 pts) Frequency Auto Tune Center Freq 1.515000000 GHz Start Freq 30.000000 MHz Stop Freq 3.000000000 GHz CF Step 297.000000 MHz Auto Man Freq Offset 0 Hz Scale Type Log Lin	
Puw		 Keysight Spectrum Analyzer - Swept SA Center Freq 4.000000000 GHz PNO: Fast IFGain:Low Trig: Free Run #Atten: 20 dB Avg Type: Log-Pwr Avg|Hold: 10/10 11:47:10 AM May 10, 2018 Ref Offset 13.24 dB 10 dB/div Ref 20.00 dBm Mkr1 3.850 75 GHz -50.396 dBm DL1 -23.70 dBm Start 3.000 GHz #Res BW 100 kHz #VBW 300 kHz Stop 5.000 GHz Sweep 191.5 ms (8001 pts) Frequency Auto Tune Center Freq 4.000000000 GHz Start Freq 3.000000000 GHz Stop Freq 5.000000000 GHz CF Step 200.000000 MHz Auto Man Freq Offset 0 Hz Scale Type Log Lin	

Puw		 Keysight Spectrum Analyzer - Swept SA Center Freq 7.500000000 GHz PNO: Fast IFGain:Low Trig: Free Run #Atten: 20 dB Avg Type: Log-Pwr Avg|Hold: 10/10 11:47:21 AM May 10, 2018 Ref Offset 13.24 dB 10 dB/div Ref 20.00 dBm Mkr1 7.440 000 GHz -44.705 dBm DL1 -23.70 dBm Start 5.000 GHz #Res BW 100 kHz #VBW 300 kHz Stop 10.000 GHz Sweep 477.9 ms (8001 pts) Frequency Auto Tune Center Freq 7.500000000 GHz Start Freq 5.000000000 GHz Stop Freq 10.000000000 GHz CF Step 500.000000 MHz Auto Man Freq Offset 0 Hz Scale Type Log Lin MSG STATUS	
Puw		 Keysight Spectrum Analyzer - Swept SA Center Freq 12.500000000 GHz PNO: Fast IFGain:Low Trig: Free Run #Atten: 20 dB Avg Type: Log-Pwr Avg|Hold: 10/10 11:47:32 AM May 10, 2018 Ref Offset 13.24 dB 10 dB/div Ref 20.00 dBm Mkr1 14.066 875 GHz -44.453 dBm DL1 -23.70 dBm Start 10.000 GHz #Res BW 100 kHz #VBW 300 kHz Stop 15.000 GHz Sweep 477.9 ms (8001 pts) Frequency Auto Tune Center Freq 12.500000000 GHz Start Freq 10.000000000 GHz Stop Freq 15.000000000 GHz CF Step 500.000000 MHz Auto Man Freq Offset 0 Hz Scale Type Log Lin MSG STATUS	

Puw		

Keysight Spectrum Analyzer - Swept SA
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
11:47:43 AM May 10, 2018
Center Freq 20.000000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold: 6/10
TRACE 1 2 3 4 5 6
TYPE M
DET P P P P P
Ref Offset 13.24 dB
10 dB/div
Log
Ref 20.00 dBm
Mkr1 24.696 25 GHz
-32.625 dBm
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
DL1 -23.70 dBm
1
Start 15.000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.000 GHz
Sweep 955.7 ms (8001 pts)
MSG
STATUS
Frequency
Auto Tune
Center Freq
20.000000000 GHz
Start Freq
15.000000000 GHz
Stop Freq
25.000000000 GHz
CF Step
1.000000000 GHz
Auto
Man
Freq Offset
0 Hz
Scale Type
Log
Lin

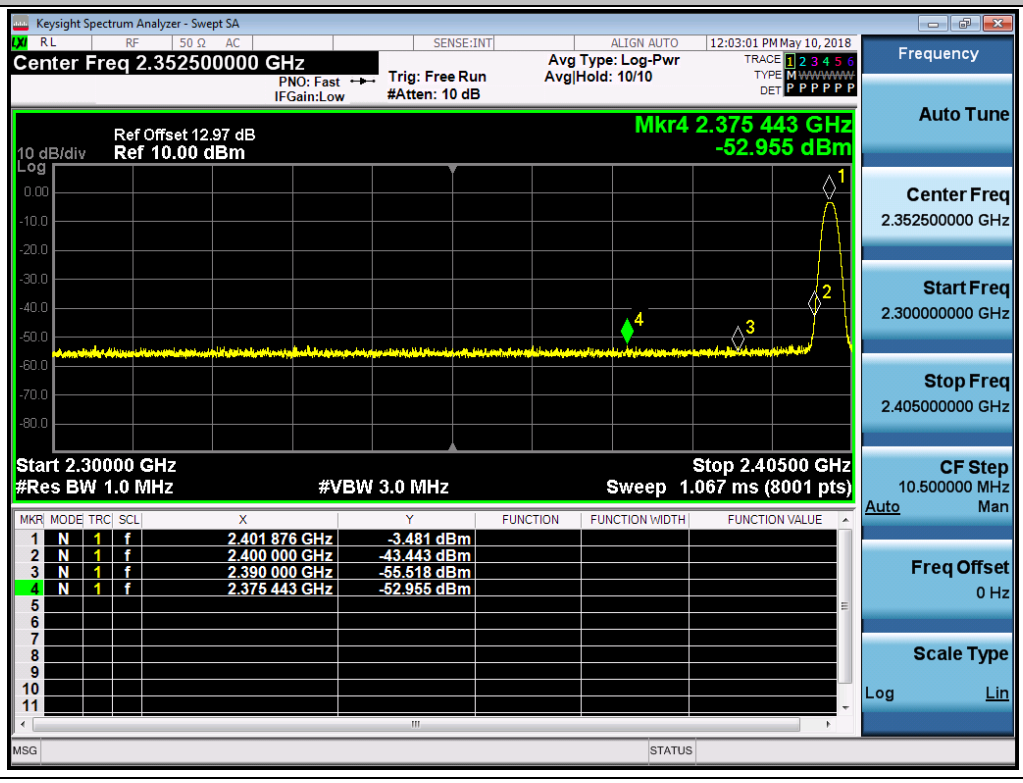
. Appendix H):Restrict-band band-edge measurements

Result Table

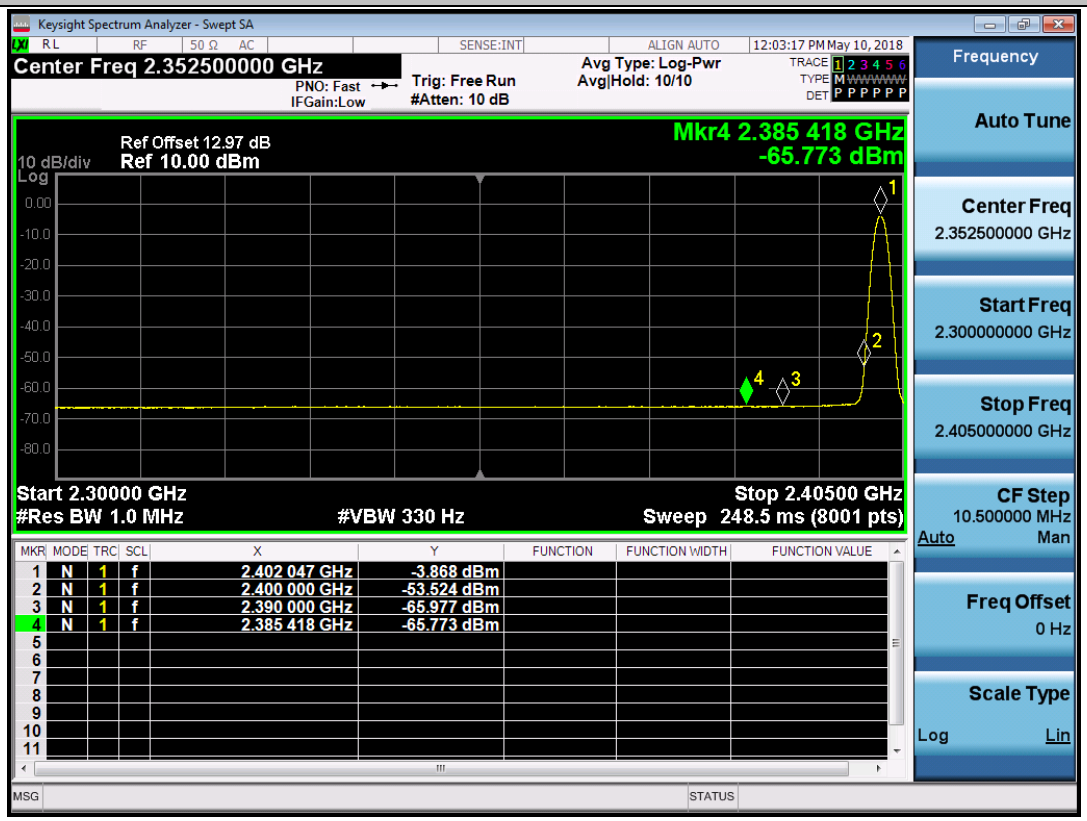
Test Mode	Hopping	Freq.	Power [dBm]	Gain	Ground Factor	E [dBuV/m]	Detector	Limit [dBuV/m]	Verdi
GFSK_DH5	On	2375.4	-52.96	1.87	0	44.11	PEAK	74	PASS
GFSK_DH5	On	2385.4	-65.77	1.87	0	31.10	AV	54	PASS
GFSK_DH5	On	2390.0	-55.52	1.87	0	41.55	PEAK	74	PASS
GFSK_DH5	On	2390.0	-65.98	1.87	0	31.09	AV	54	PASS
GFSK_DH5	On	2483.5	-54.47	1.87	0	42.60	PEAK	74	PASS
GFSK_DH5	On	2483.5	-65.03	1.87	0	32.04	AV	54	PASS
GFSK_DH5	On	2500.0	-55.94	1.87	0	41.14	PEAK	74	PASS
GFSK_DH5	On	2500.0	-65.85	1.87	0	31.22	AV	54	PASS

Test Graph

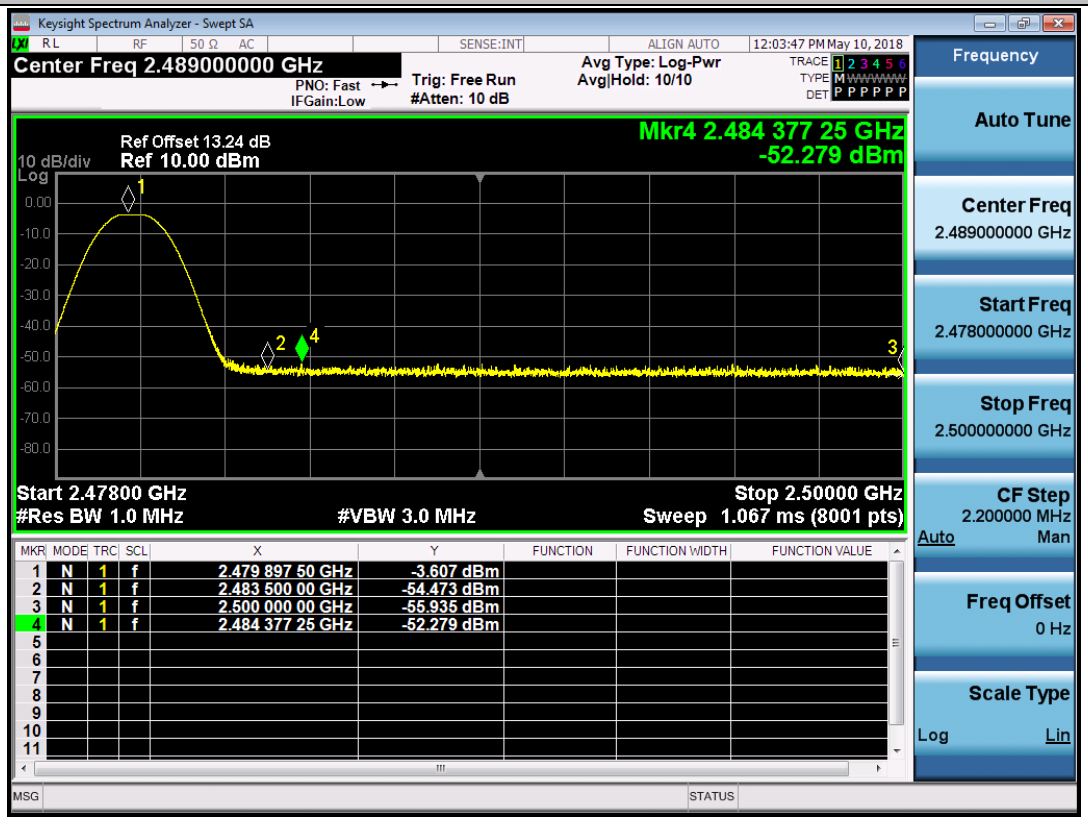
Restrict-band band-edge measurements_2402_PEAK_DH5



Restrict-band band-edge measurements_2402_AV_DH5



Restrict-band band-edge measurements_2480_PEAK_DH5



Restrict-band band-edge measurements_2480_AV_DH5