Appendix B

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

Product Name: True Wireless Earbuds

Trade Mark: Energizer

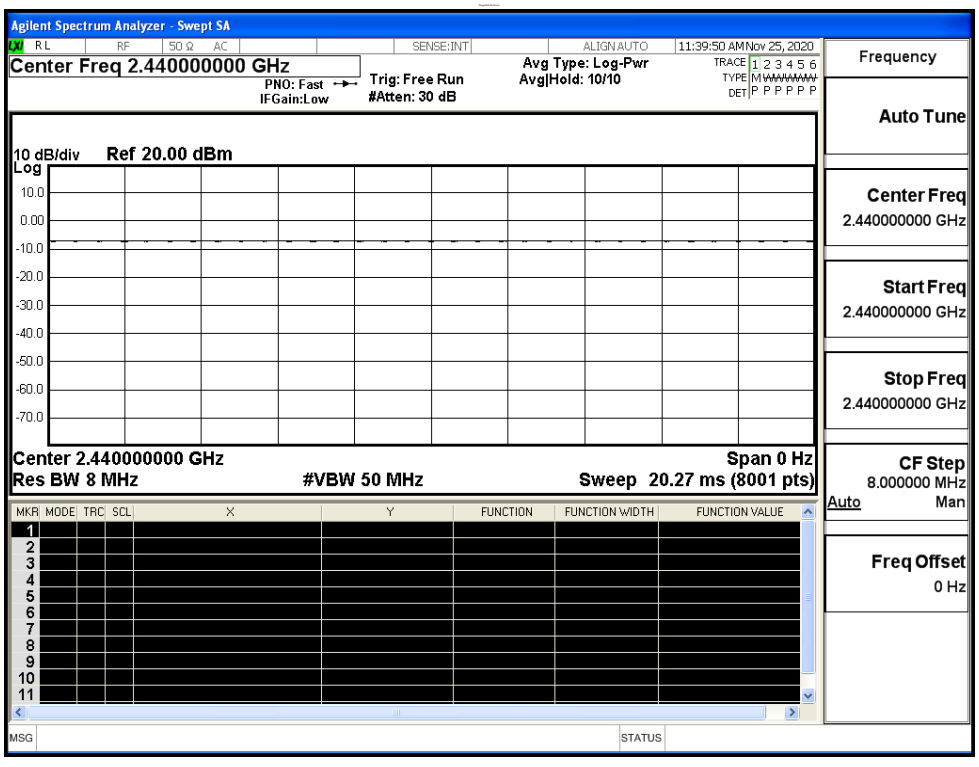
Test Model: UB2605

Environmental Conditions

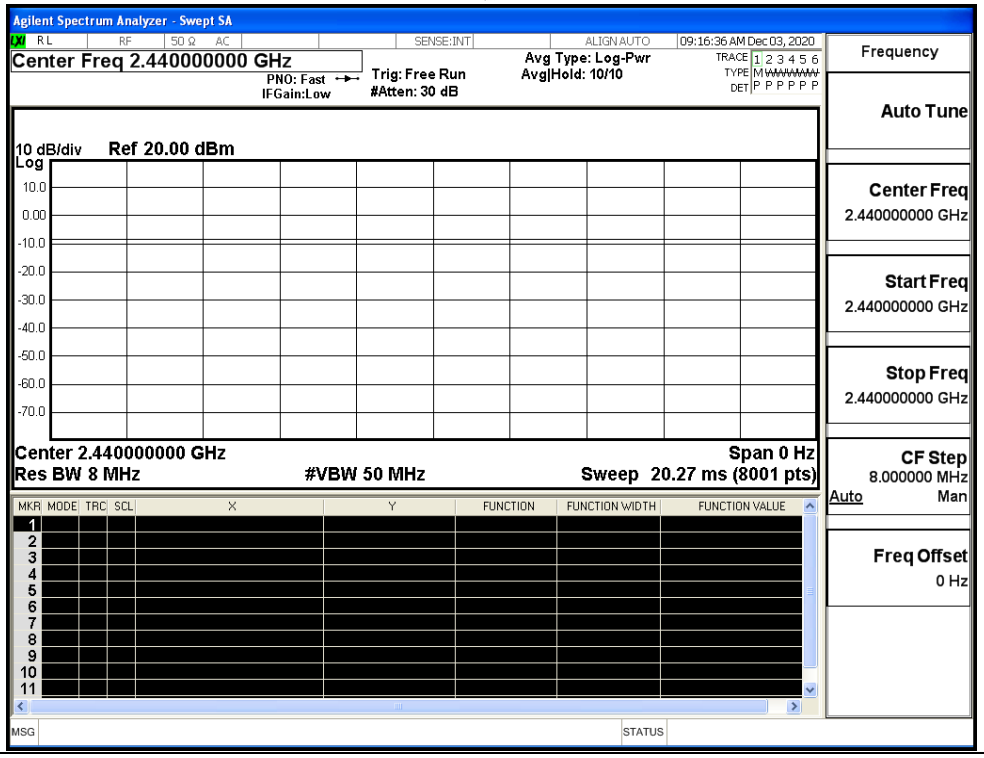
Temperature:	22.5° C
Relative Humidity:	53.1%
ATM Pressure:	100.0 kPa
Test Engineer:	Kay Hu
Supervised by:	Li Huan

B.1 Duty Cycle

Test Mode	Test Channel	Ant	Duty Cycle[%]	Verdict
BT LE	2440	Ant1	100	PASS

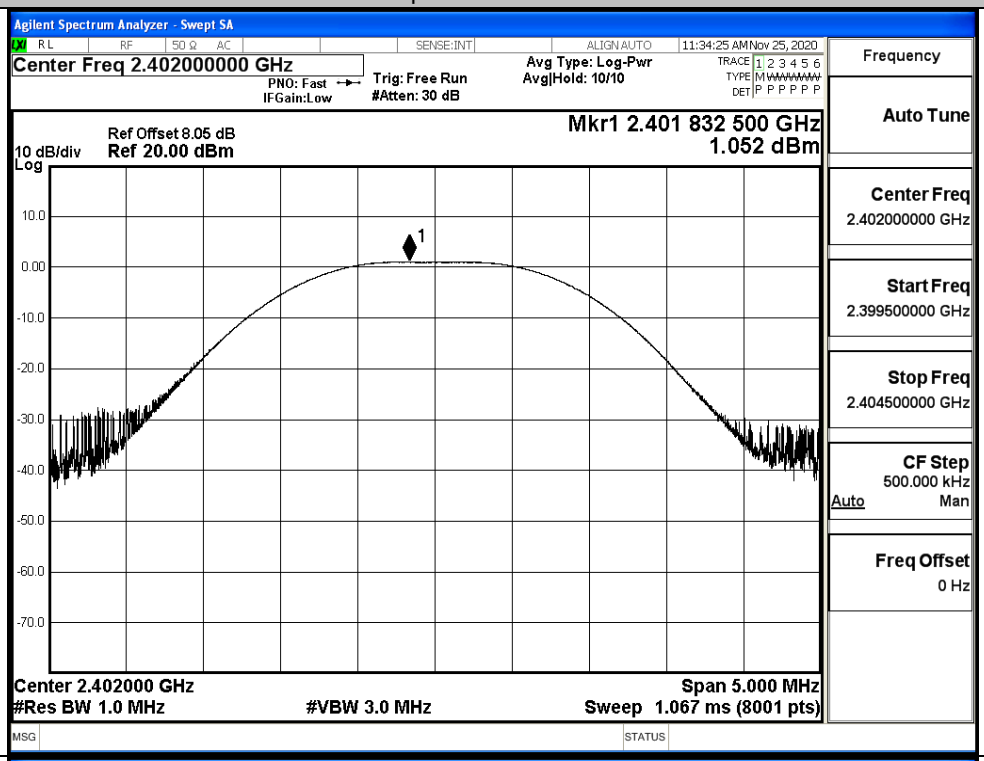
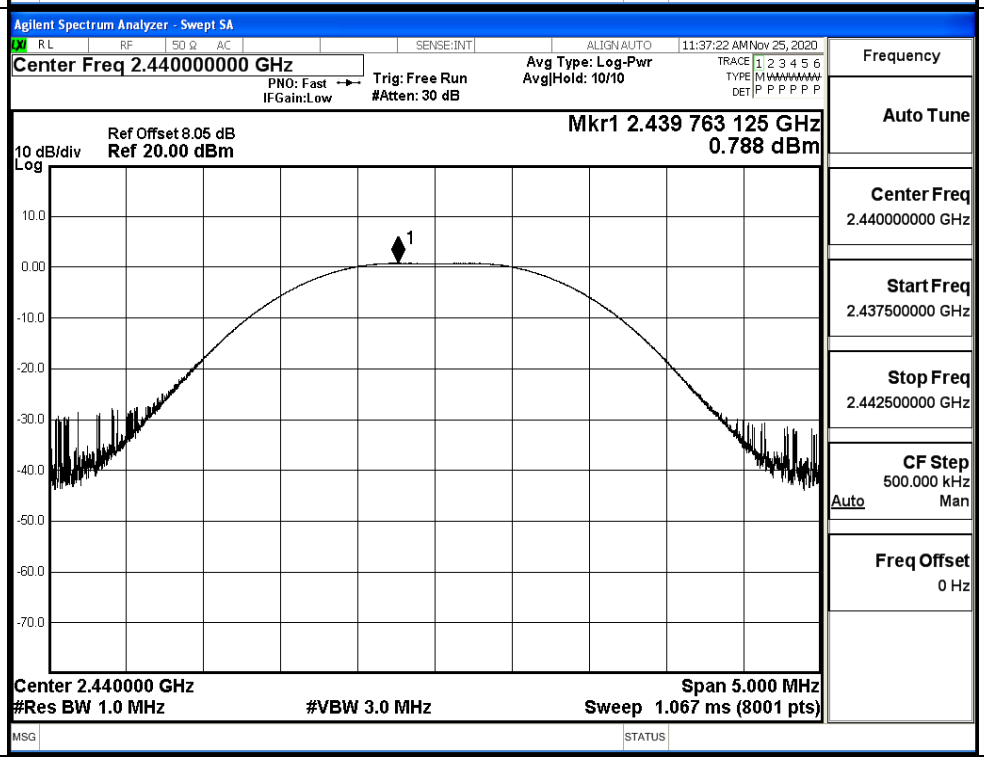


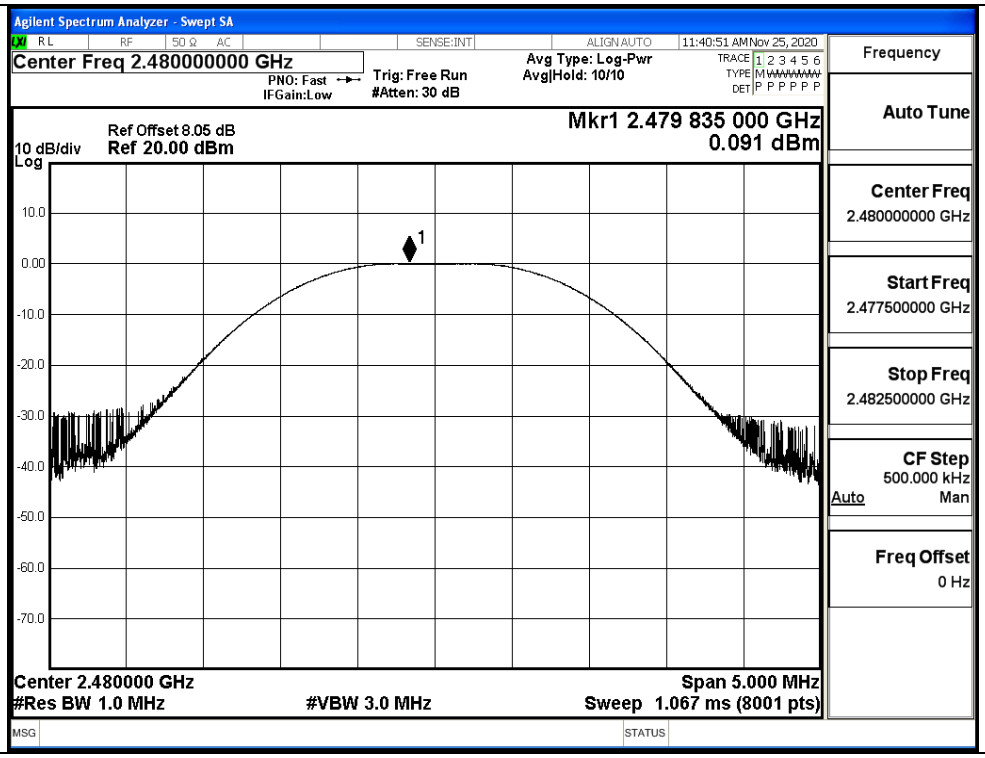
Test Mode	Test Channel	Ant	Duty Cycle[%]	Verdict
BT 2LE	2440	Ant1	100	PASS



B.2 Maximum Conducted Peak Output Power

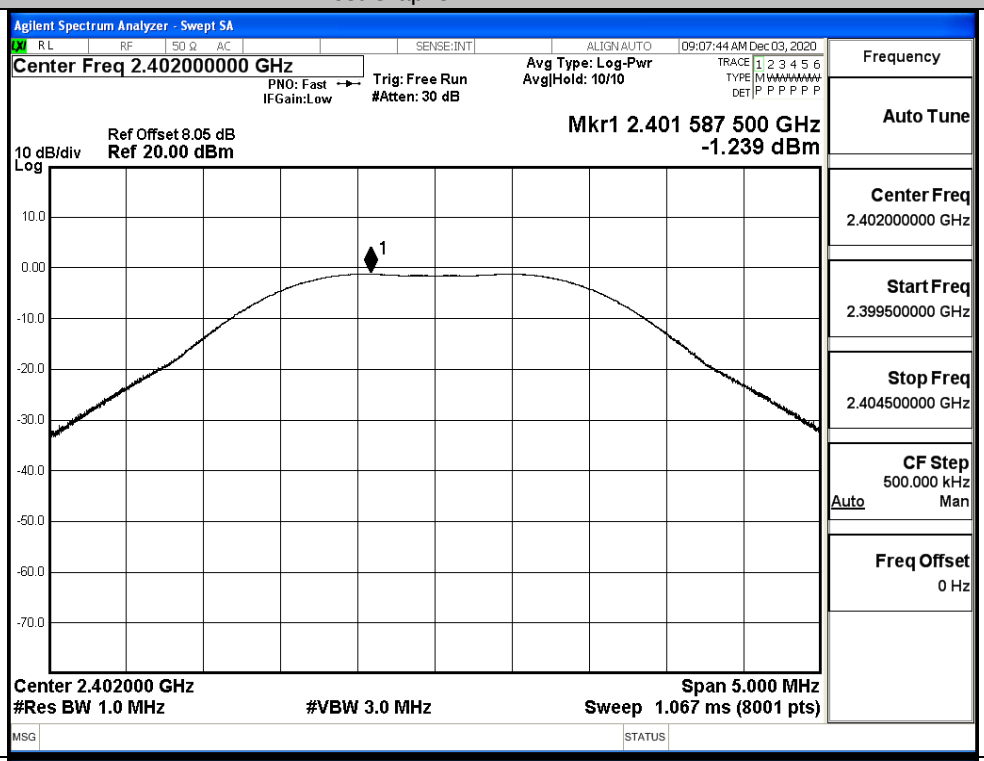
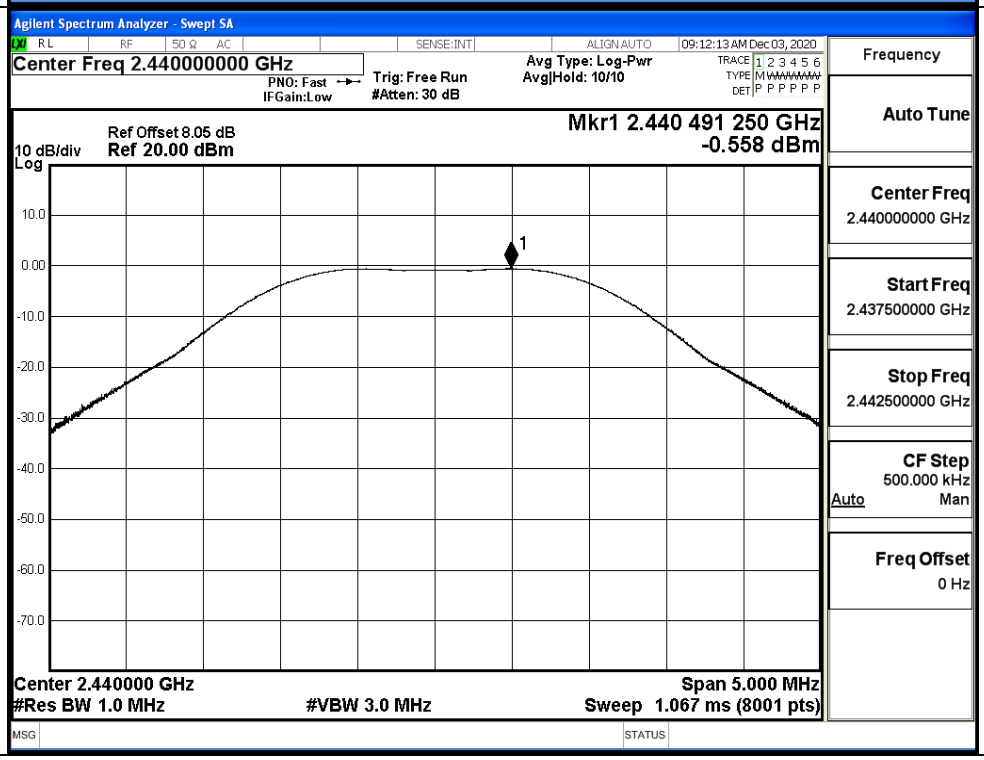
Mode	Channel	Conduct Peak Power[dBm]	Limit [dBm]	Verdict
BT LE	LCH	1.052	30	PASS
BT LE	MCH	0.788	30	PASS
BT LE	HCH	0.091	30	PASS

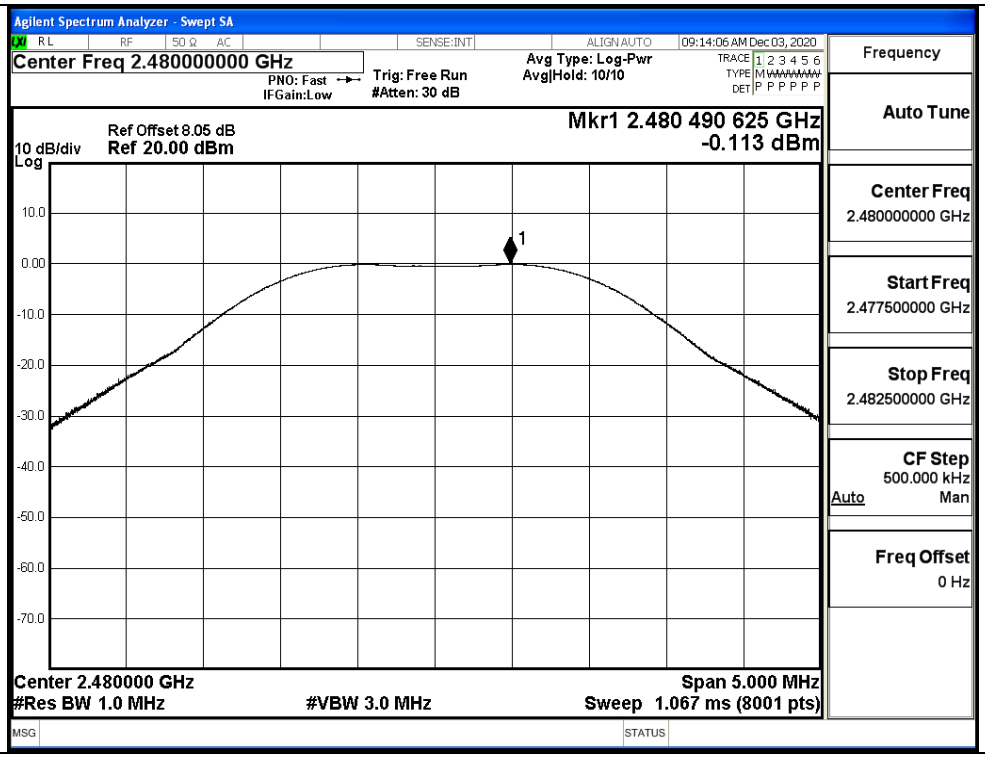
Test Graphs		
LCH		
MCH		

HCH		

Agilent Spectrum Analyzer - Swept SA
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
11:40:51 AM Nov 25, 2020
Center Freq 2.480000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 10/10
TRACE 1 2 3 4 5 6
TYPE M WWWWW
DET P P P P P
Ref Offset 8.05 dB
10 dB/div
Log
Ref 20.00 dBm
Mkr1 2.479 835 000 GHz
0.091 dBm
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 2.480000 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz
Span 5.000 MHz
Sweep 1.067 ms (8001 pts)
MSG
STATUS
Frequency
Auto Tune
Center Freq
2.480000000 GHz
Start Freq
2.477500000 GHz
Stop Freq
2.482500000 GHz
CF Step
500.000 kHz
Auto
Man
Freq Offset
0 Hz

Mode	Channel	Conduct Peak Power[dBm]	Limit [dBm]	Verdict
BT 2LE	LCH	-1.239	30	PASS
BT 2LE	MCH	-0.558	30	PASS
BT 2LE	HCH	-0.113	30	PASS

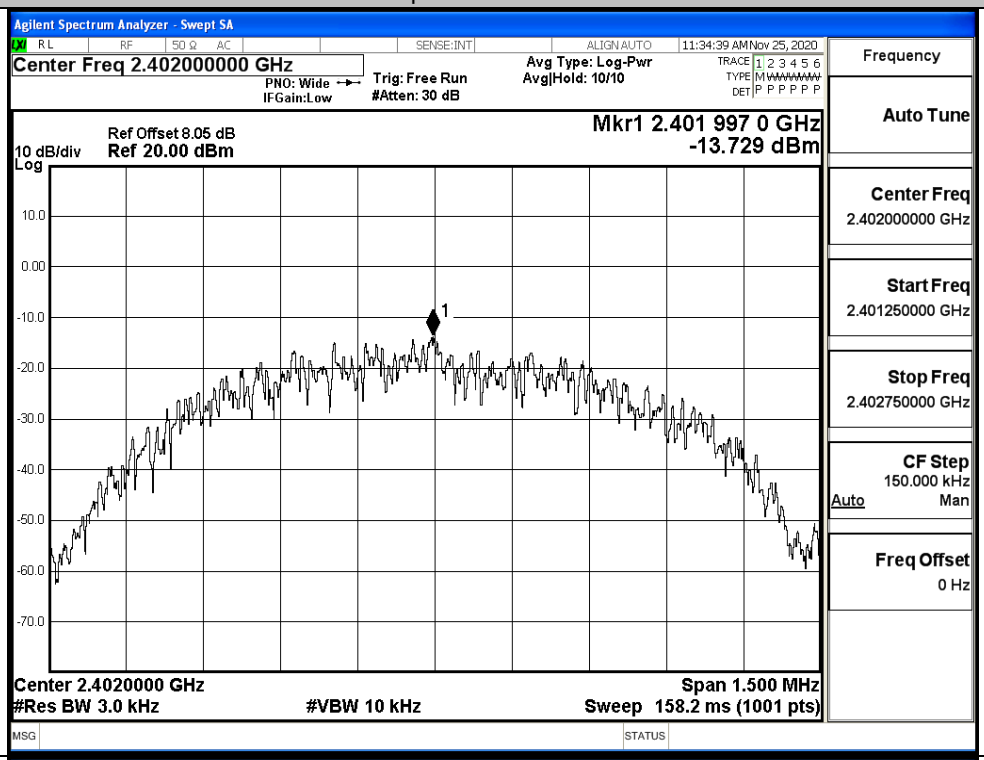
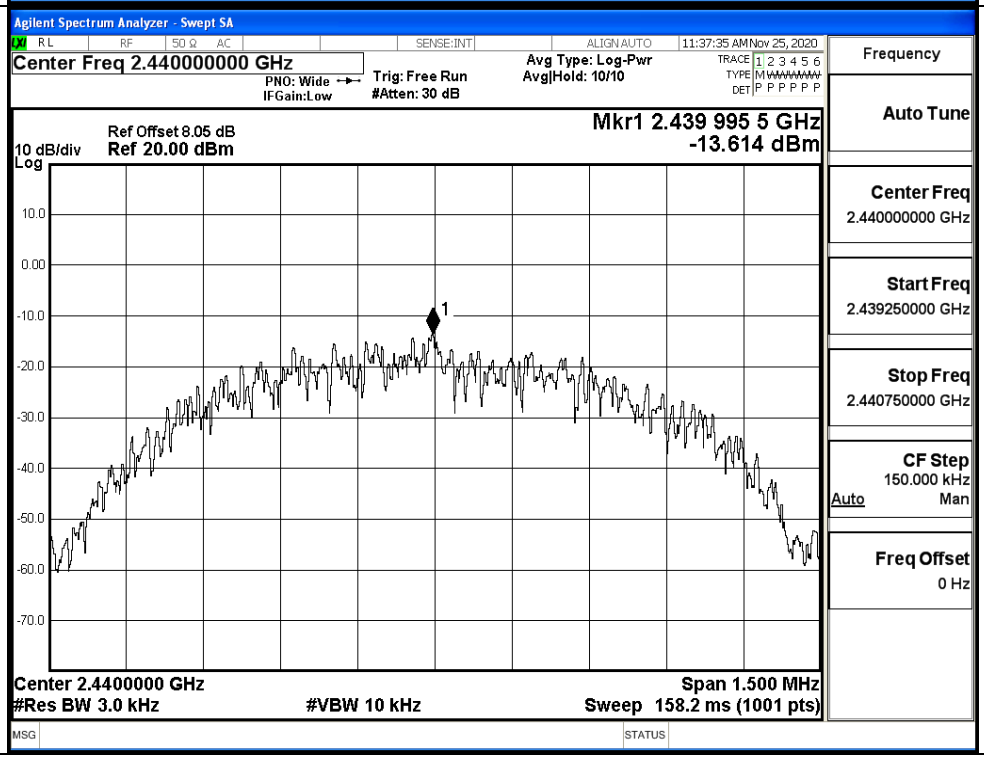
Test Graphs		
LCH		
MCH		

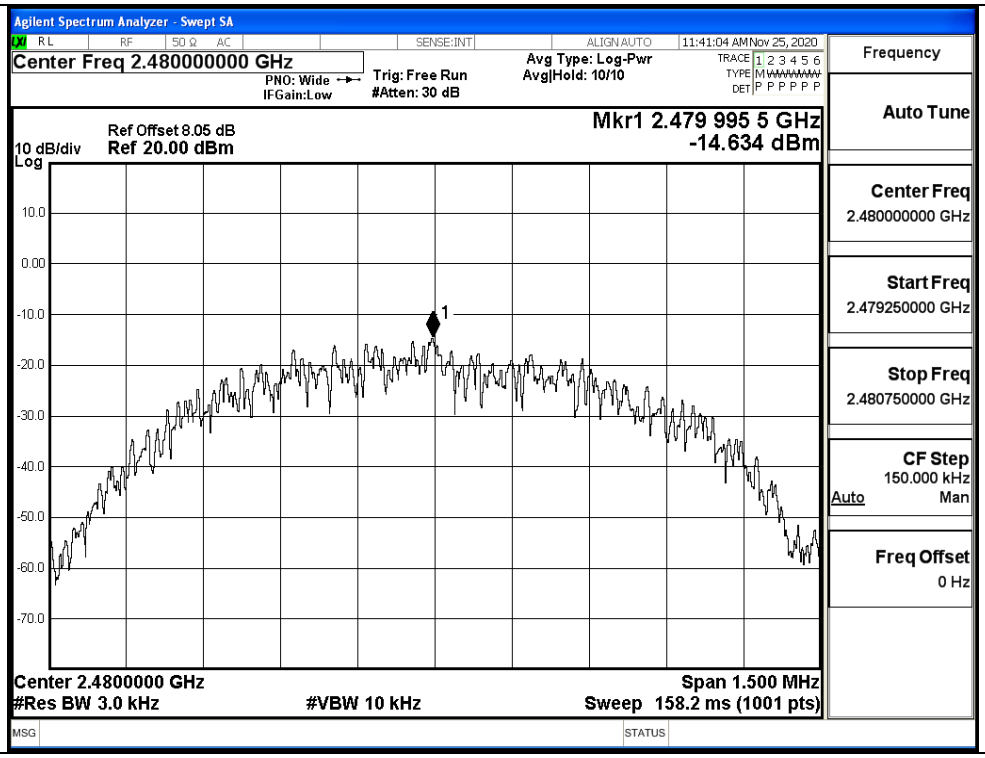
HCH		

Agilent Spectrum Analyzer - Swept SA
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
09:14:06 AM Dec 03, 2020
Center Freq 2.480000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 10/10
TRACE 1 2 3 4 5 6
TYPE M WWWWW
DET P P P P P
Ref Offset 8.05 dB
10 dB/div
Log
Ref 20.00 dBm
Mkr1 2.480 490 625 GHz
-0.113 dBm
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
1
Center 2.480000 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz
Span 5.000 MHz
Sweep 1.067 ms (8001 pts)
MSG
STATUS
Frequency
Auto Tune
Center Freq
2.480000000 GHz
Start Freq
2.477500000 GHz
Stop Freq
2.482500000 GHz
CF Step
500.000 kHz
Auto
Man
Freq Offset
0 Hz

B.3 Maximum Power Spectral Density

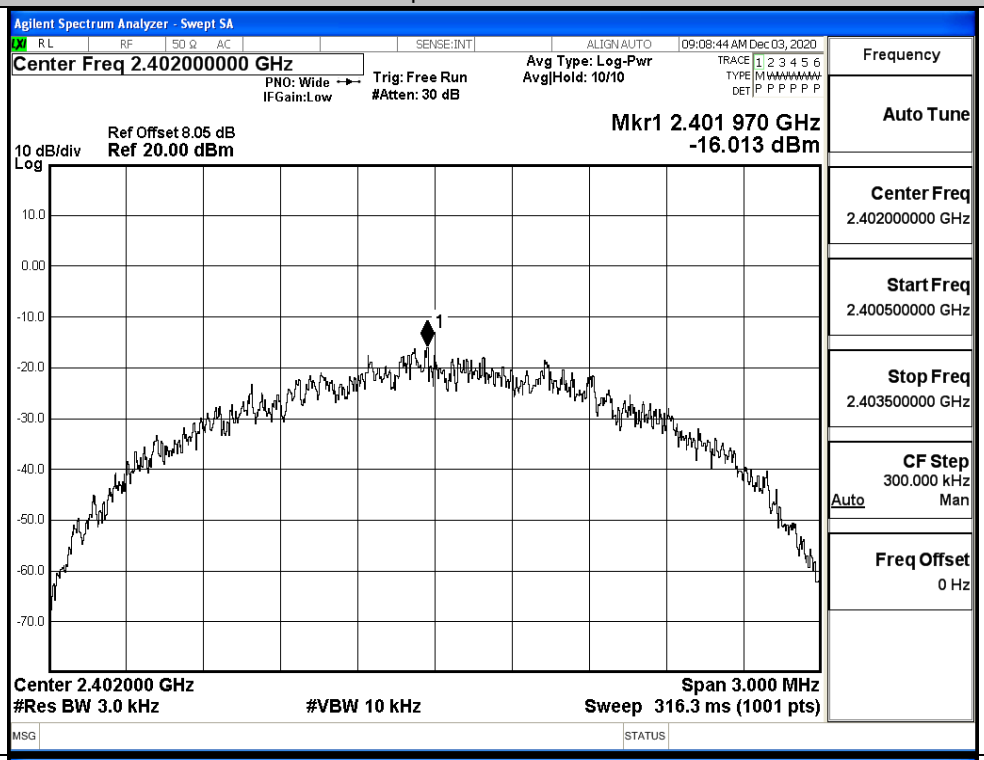
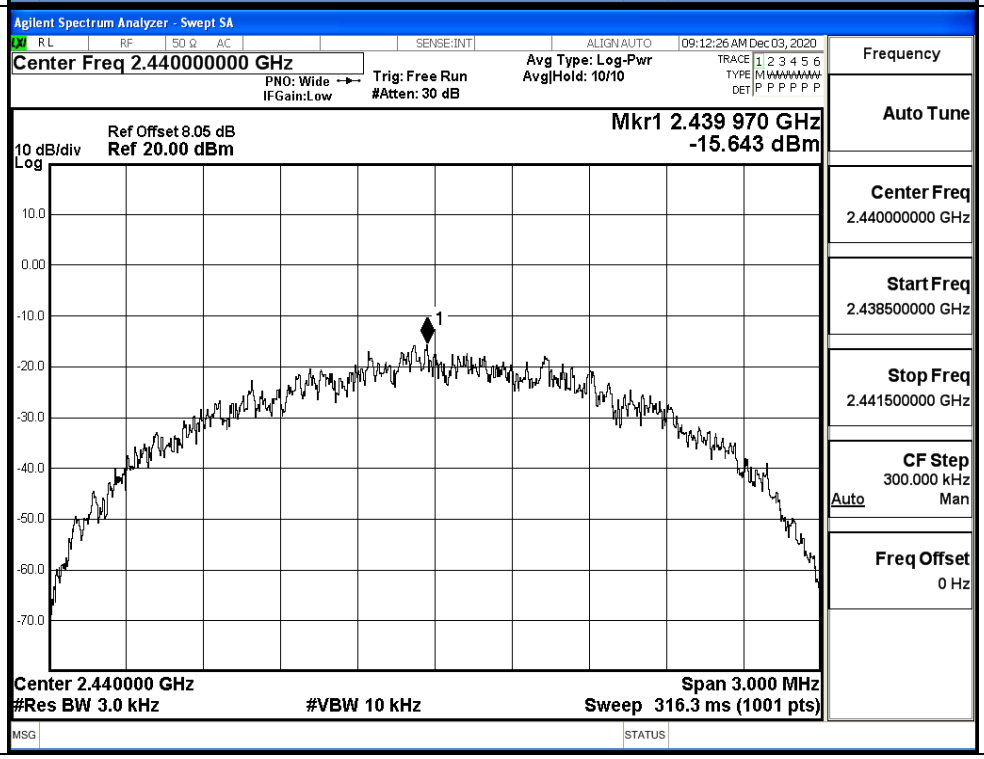
Mode	Channel	PSD [dBm/3KHz]	Limit [dBm/3KHz]	Verdict
BT LE	LCH	-13.729	8	PASS
BT LE	MCH	-13.614	8	PASS
BT LE	HCH	-14.634	8	PASS

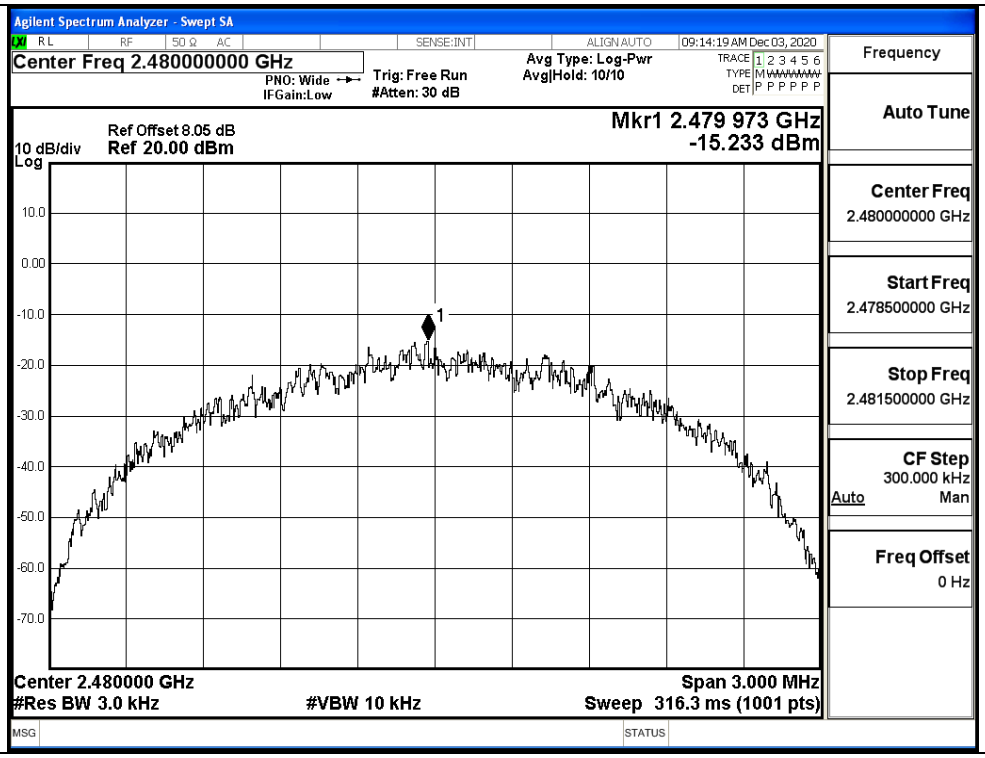
Test Graphs		
LCH		
MCH		

HCH		

Agilent Spectrum Analyzer - Swept SA
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
11:41:04 AM Nov 25, 2020
Center Freq 2.480000000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 10/10
TRACE 1 2 3 4 5 6
TYPE M WWWWW
DET P P P P P
Ref Offset 8.05 dB
10 dB/div
Log
Ref 20.00 dBm
Mkr1 2.479 995 5 GHz
-14.634 dBm
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
1
Center 2.4800000 GHz
#Res BW 3.0 kHz
#VBW 10 kHz
Span 1.500 MHz
Sweep 158.2 ms (1001 pts)
MSG
STATUS
Frequency
Auto Tune
Center Freq
2.480000000 GHz
Start Freq
2.479250000 GHz
Stop Freq
2.480750000 GHz
CF Step
150.000 kHz
Auto
Man
Freq Offset
0 Hz

Mode	Channel	PSD [dBm/3KHz]	Limit [dBm/3KHz]	Verdict
BT 2LE	LCH	-16.013	8	PASS
BT 2LE	MCH	-15.643	8	PASS
BT 2LE	HCH	-15.233	8	PASS

Test Graphs		
LCH		
MCH		

HCH		

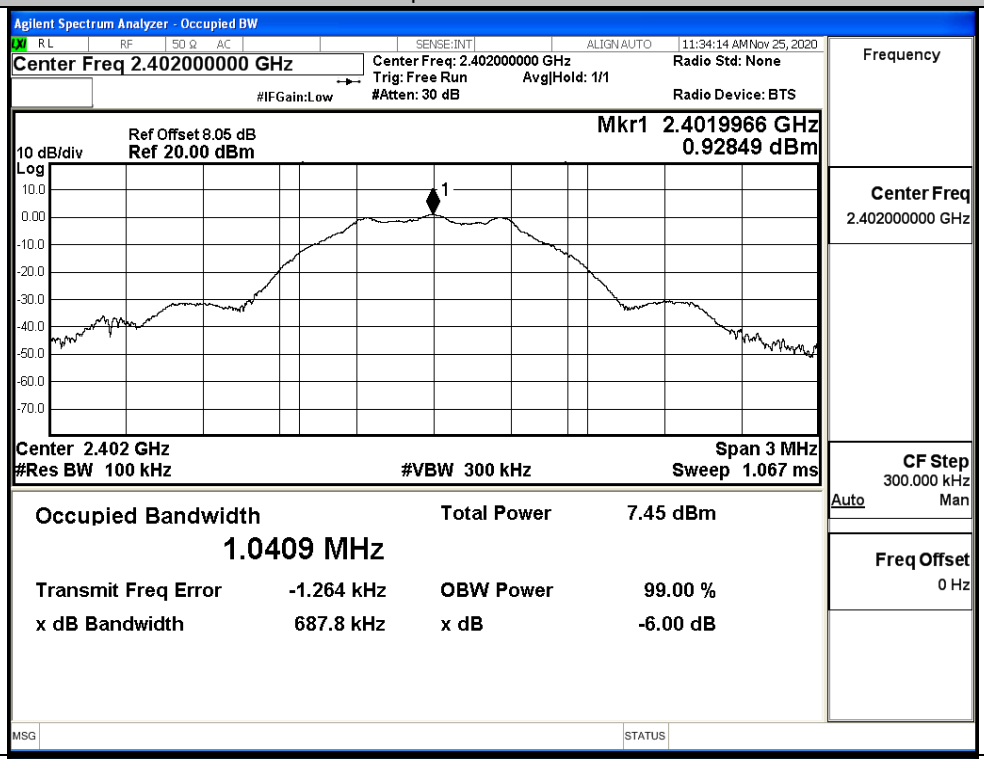
Agilent Spectrum Analyzer - Swept SA
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
09:14:19 AM Dec 03, 2020
Center Freq 2.480000000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 10/10
TRACE 1 2 3 4 5 6
TYPE M WWWWW
DET P P P P P
Ref Offset 8.05 dB
10 dB/div
Log
Ref 20.00 dBm
Mkr1 2.479 973 GHz
-15.233 dBm
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
1
Center 2.480000 GHz
#Res BW 3.0 kHz
#VBW 10 kHz
Span 3.000 MHz
Sweep 316.3 ms (1001 pts)
MSG
STATUS
Frequency
Auto Tune
Center Freq
2.480000000 GHz
Start Freq
2.478500000 GHz
Stop Freq
2.481500000 GHz
CF Step
300.000 kHz
Auto
Man
Freq Offset
0 Hz

B.4 6dB Bandwidth

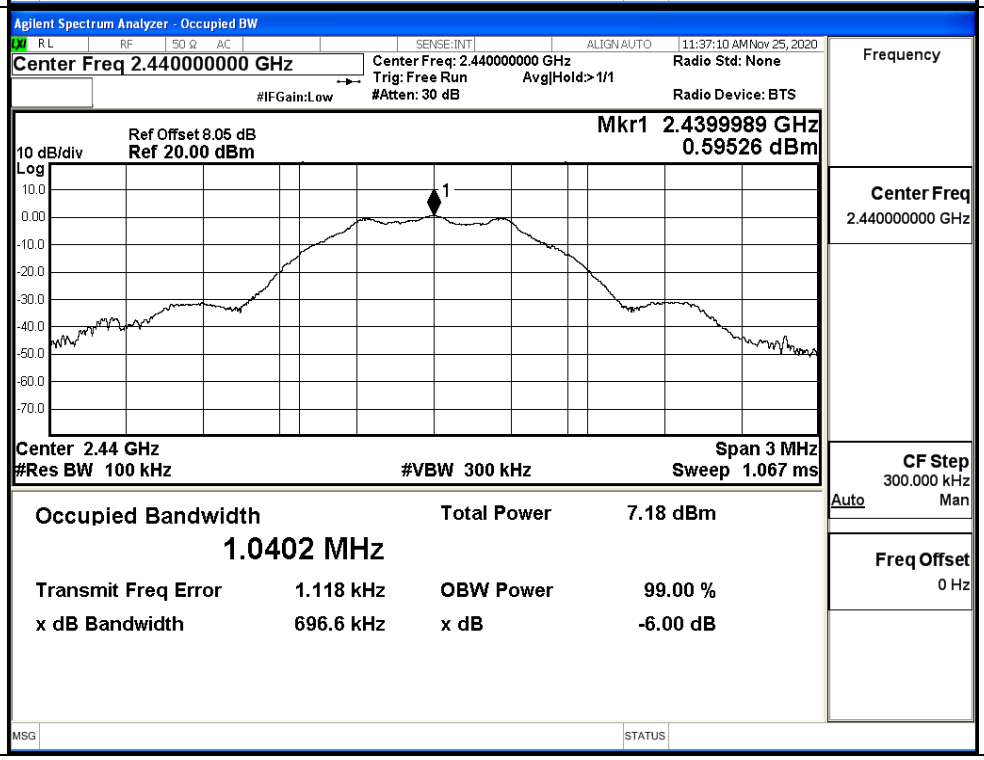
Mode	Channel	6dB Bandwidth [MHz]	Limit [MHz]	Verdict
BT LE	LCH	0.6878	⩾0.5	PASS
BT LE	MCH	0.6966	⩾0.5	PASS
BT LE	HCH	0.6992	⩾0.5	PASS

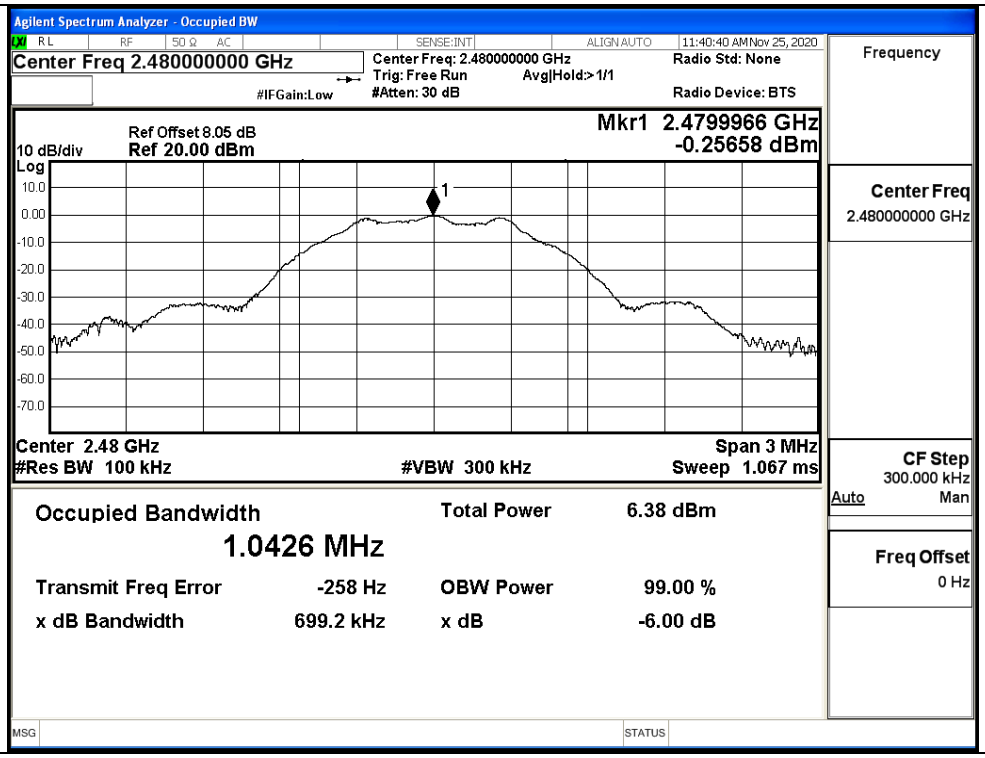
Test Graphs

LCH



MCH



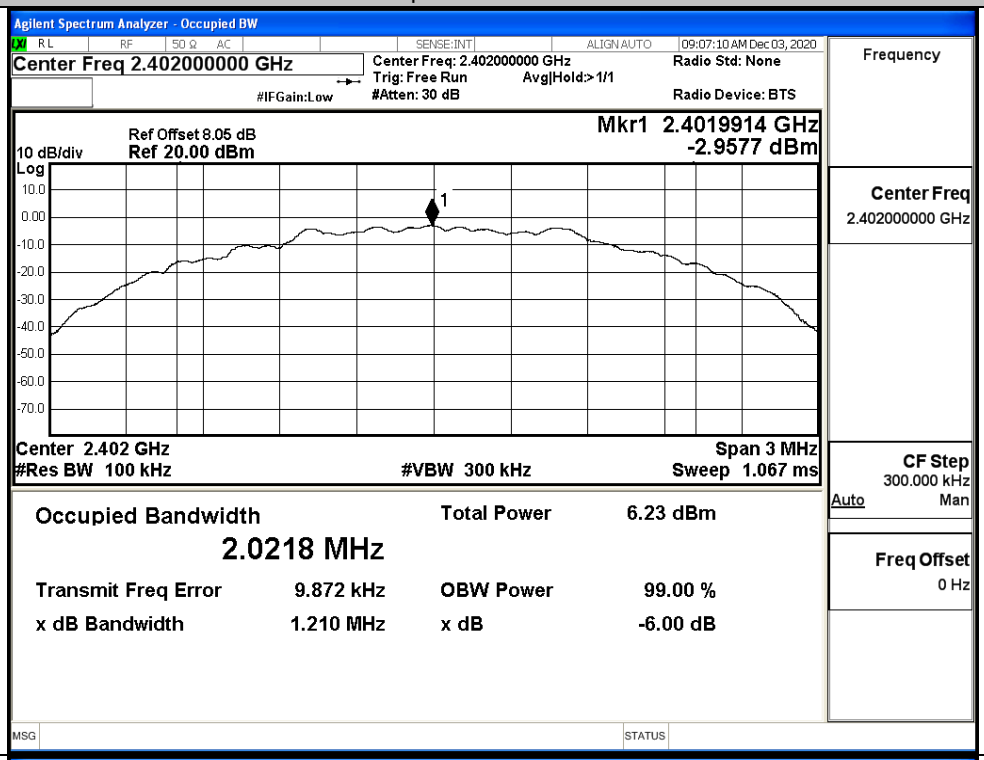
HCH		

Agilent Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
11:40:40 AM Nov 25, 2020
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
Log
Mkr1 2.4799966 GHz
-0.25658 dBm
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 100 kHz
#VBW 300 kHz
Span 3 MHz
Sweep 1.067 ms
CF Step
300.000 kHz
Auto
Man
Occupied Bandwidth
1.0426 MHz
Total Power 6.38 dBm
Transmit Freq Error -258 Hz
OBW Power 99.00 %
x dB Bandwidth 699.2 kHz
x dB -6.00 dB
Freq Offset
0 Hz
MSG
STATUS

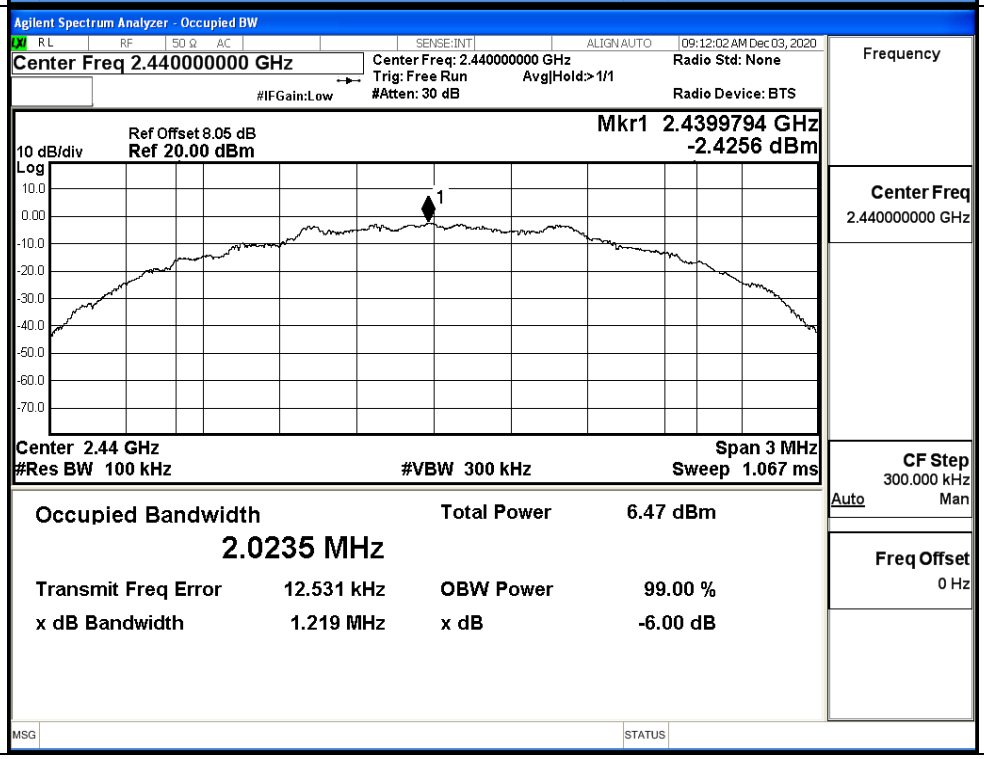
Mode	Channel	6dB Bandwidth [MHz]	Limit [MHz]	Verdict
BT 2LE	LCH	1.210	⩾0.5	PASS
BT 2LE	MCH	1.219	⩾0.5	PASS
BT 2LE	HCH	1.216	⩾0.5	PASS

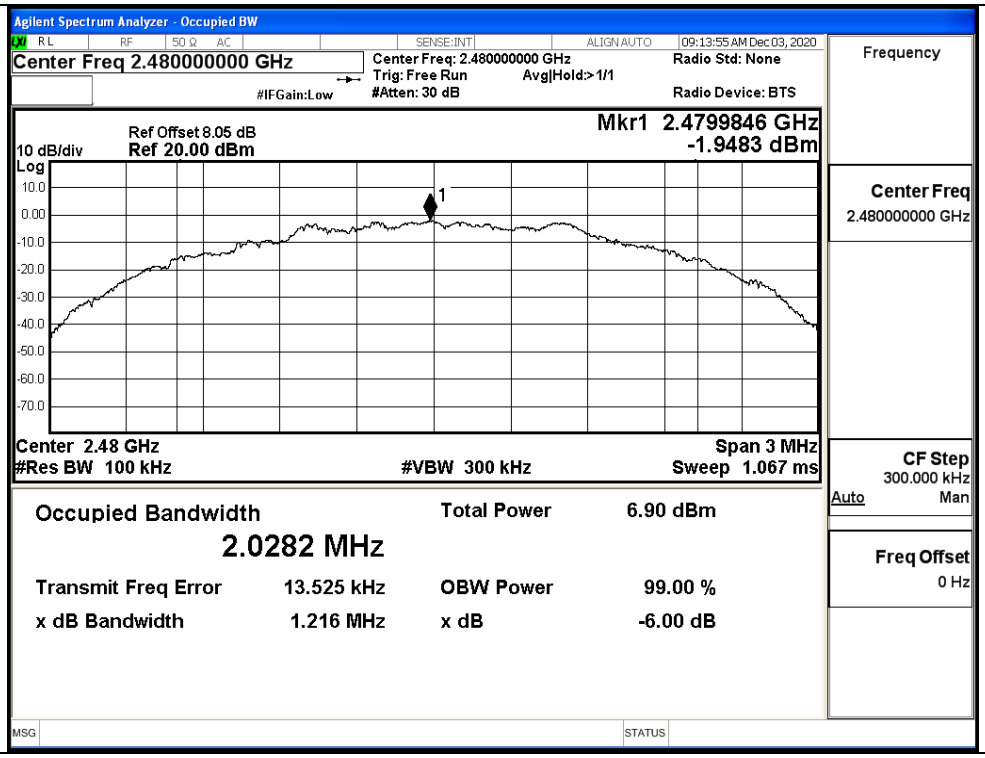
Test Graphs

LCH



MCH

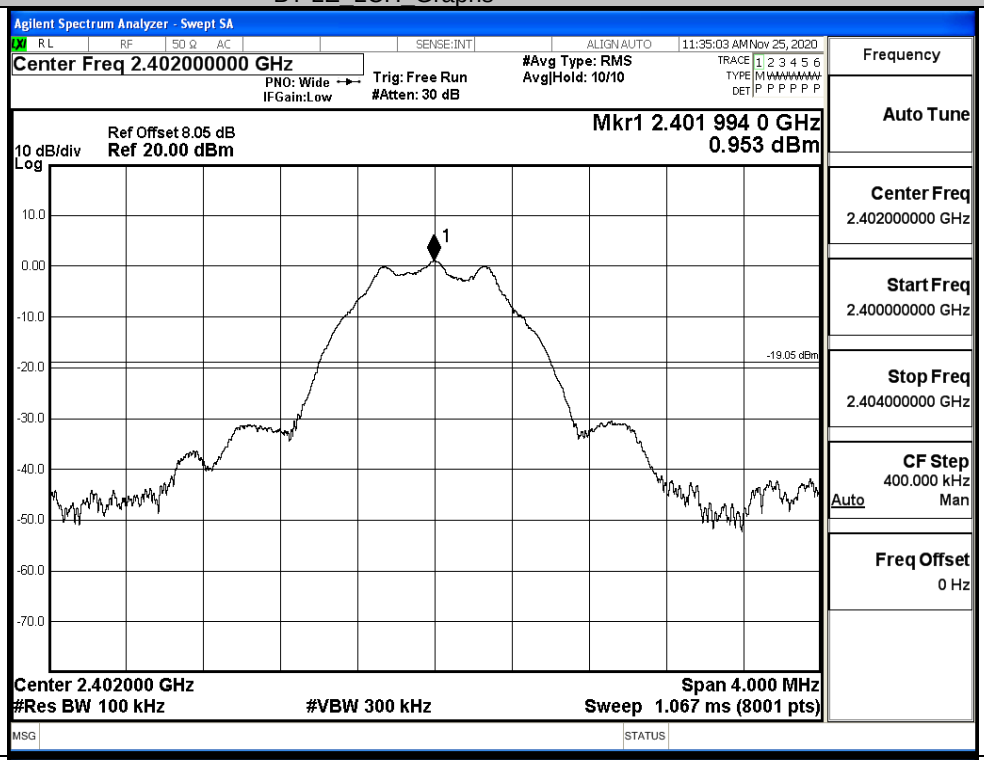
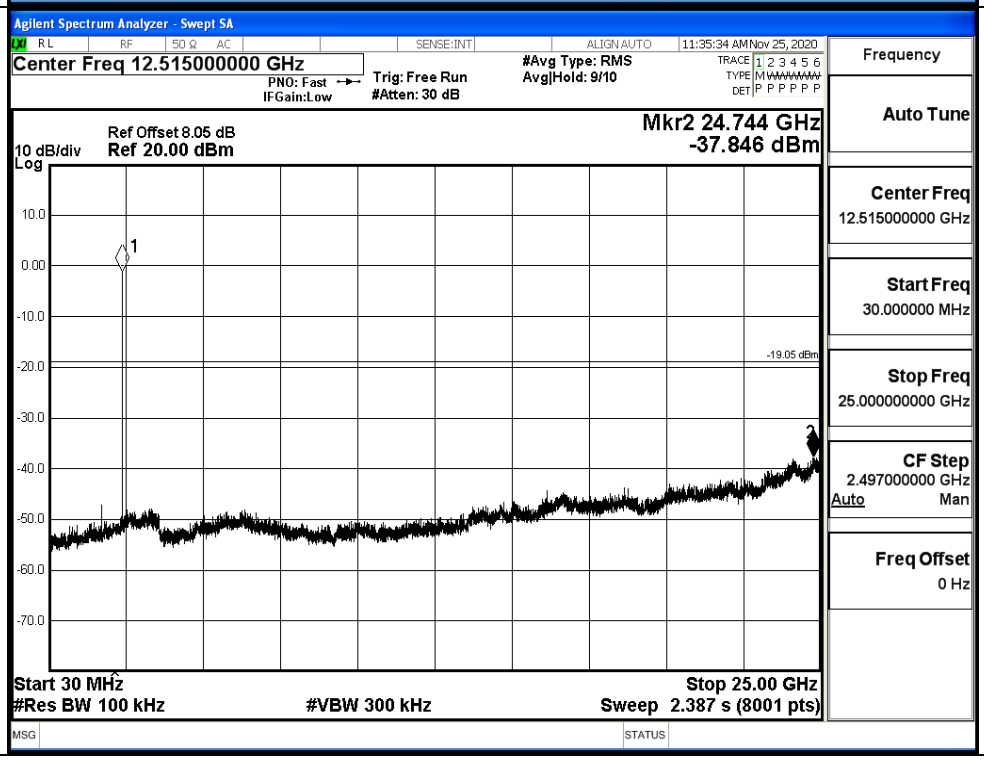


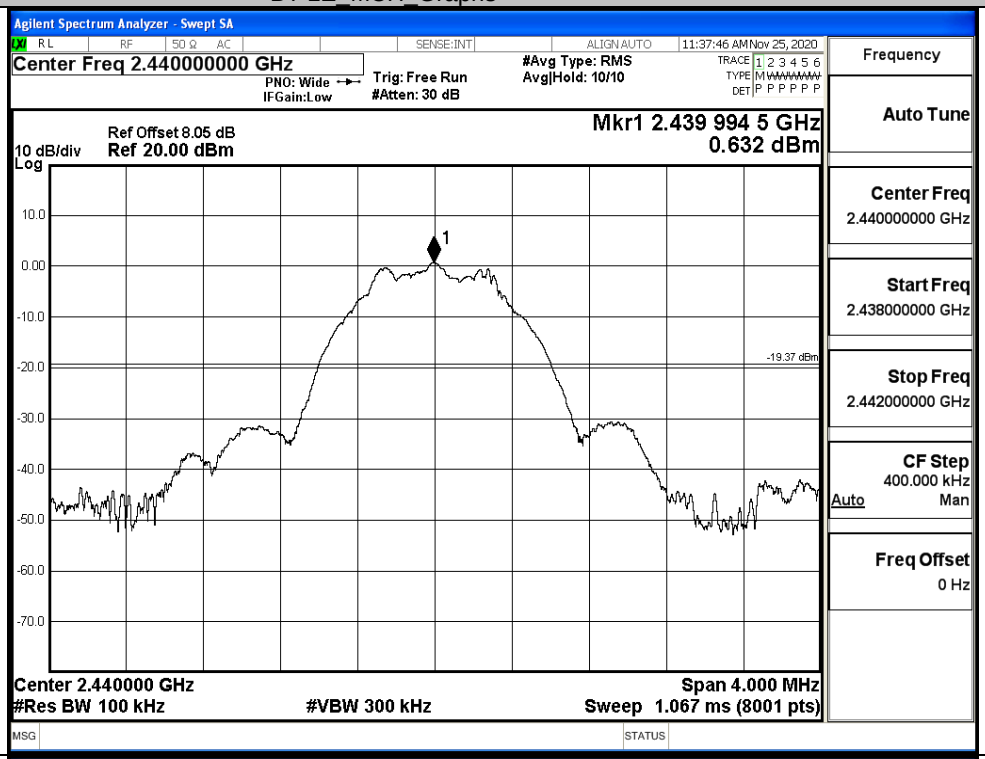
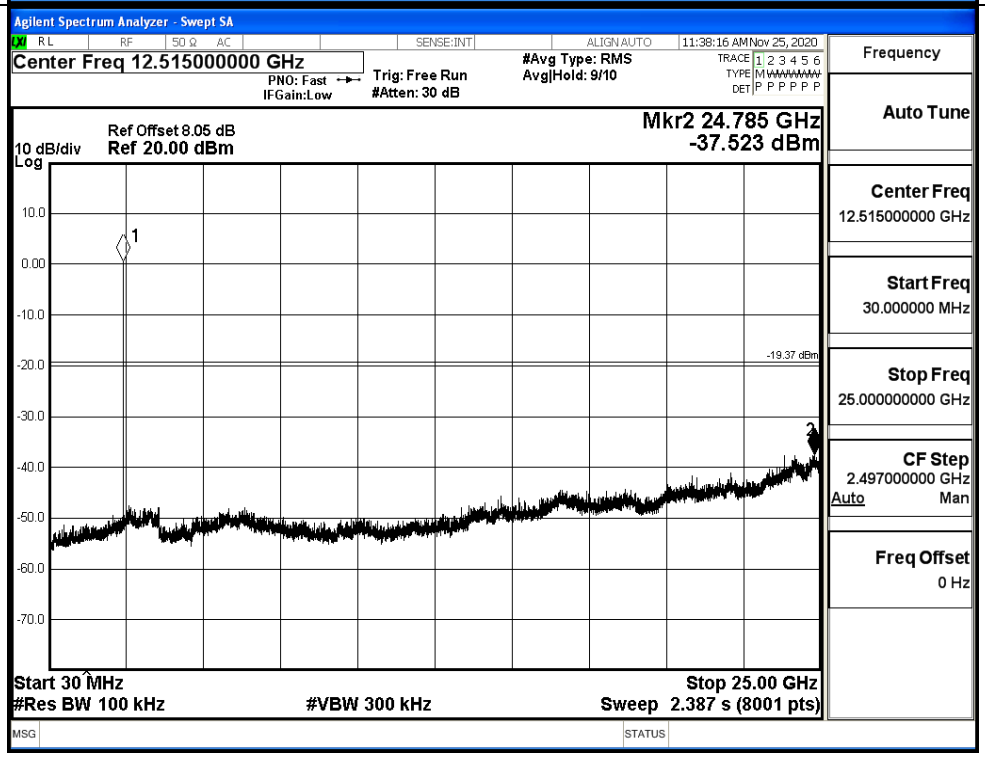
HCH		

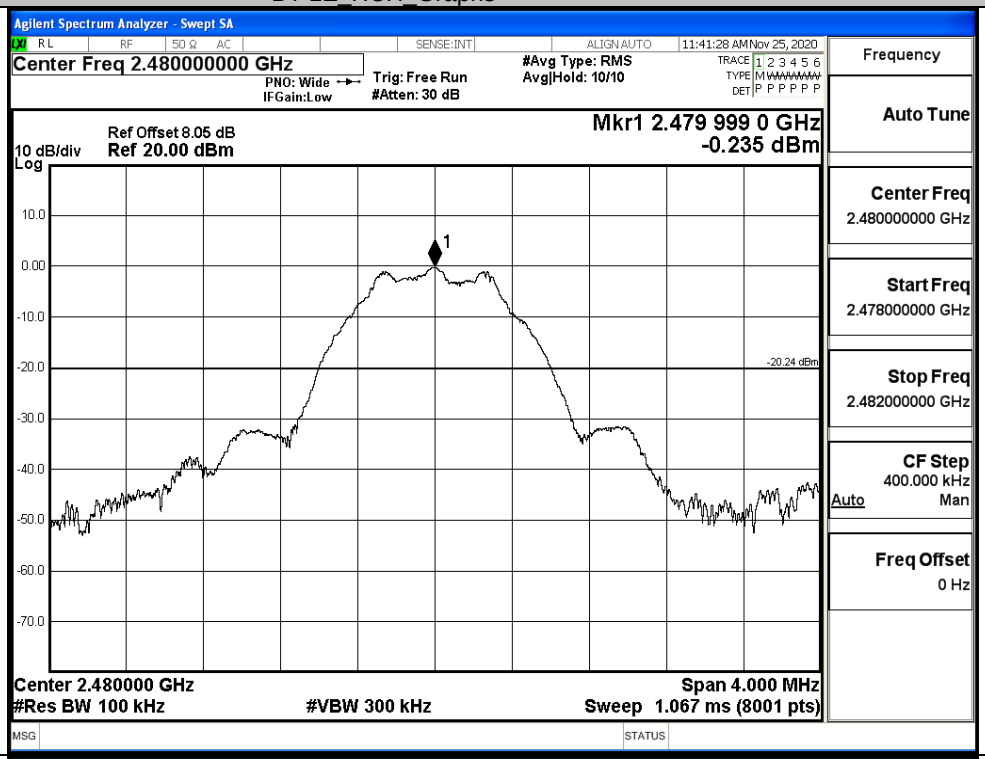
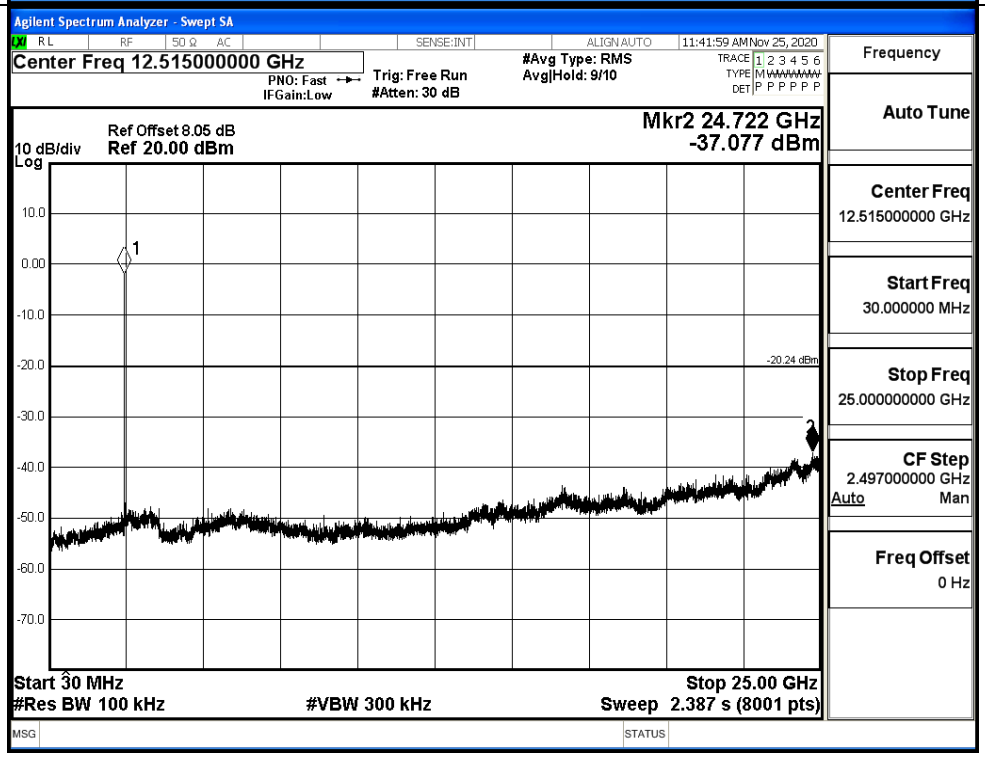
Agilent Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
09:13:55 AM Dec 03, 2020
Center Freq 2.480000000 GHz
Center Freq: 2.480000000 GHz
Trig: Free Run
Avg|Hold:>1/1
#IFGain:Low
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
Frequency
Ref Offset 8.05 dB
10 dB/div
Ref 20.00 dBm
Log
Mkr1 2.4799846 GHz
-1.9483 dBm
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center Freq
2.480000000 GHz
Center 2.48 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 3 MHz
Sweep 1.067 ms
CF Step
300.000 kHz
Auto
Man
Occupied Bandwidth
2.0282 MHz
Total Power 6.90 dBm
Transmit Freq Error 13.525 kHz
OBW Power 99.00 %
x dB Bandwidth 1.216 MHz
x dB -6.00 dB
Freq Offset
0 Hz
MSG
STATUS

B.5 RF Conducted Spurious Emissions

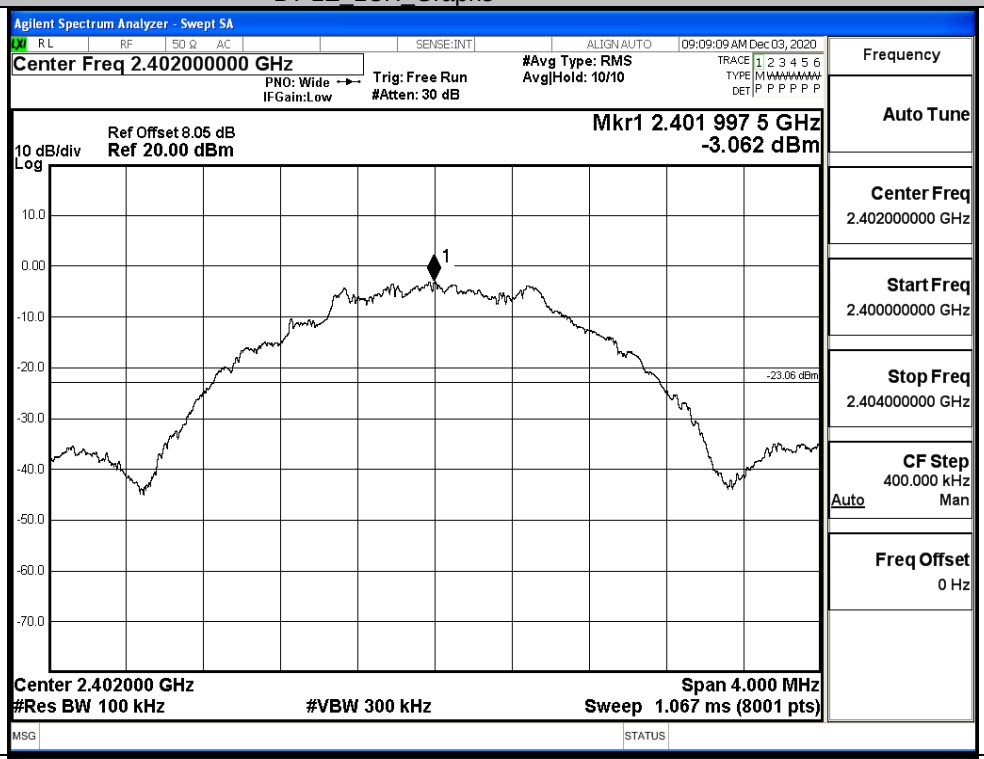
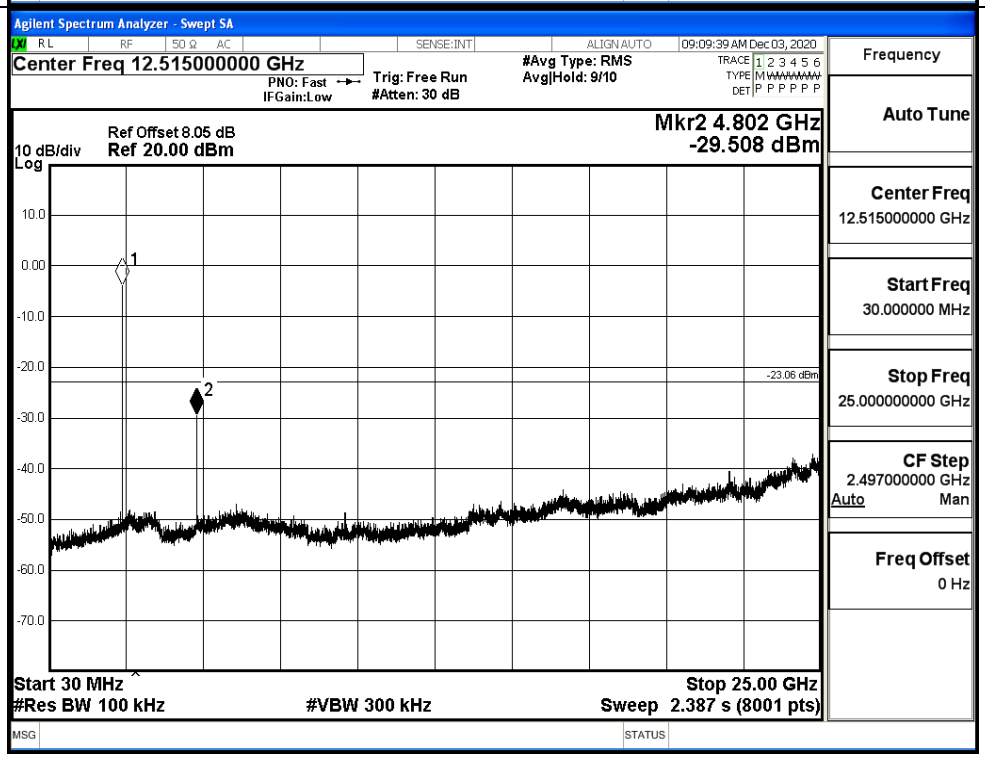
Mode	Channel	Pref [dBm]	Max. Level [dBm]	Limit [dBm]	Verdict
BT LE	LCH	0.953	-37.846	-19.047	PASS
BT LE	MCH	0.632	-37.523	-19.368	PASS
BT LE	HCH	-0.235	-37.077	-20.235	PASS

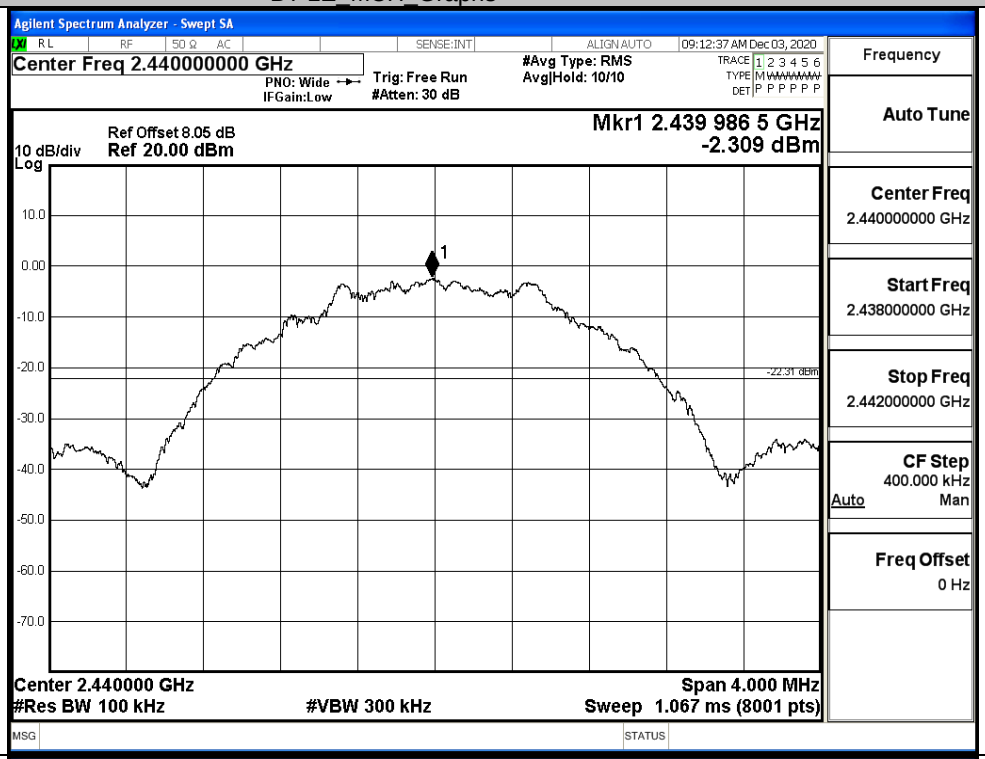
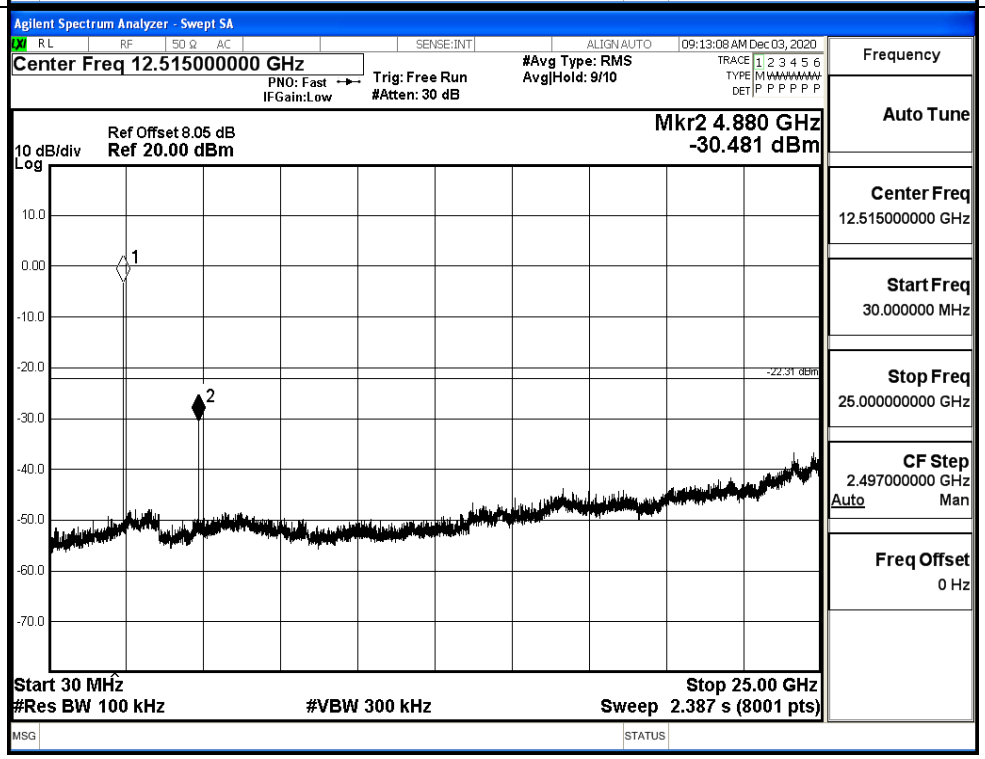
BT LE_LCH_Graphs		
Pref/BT LE/LCH		
Puw/BT LE/LCH		

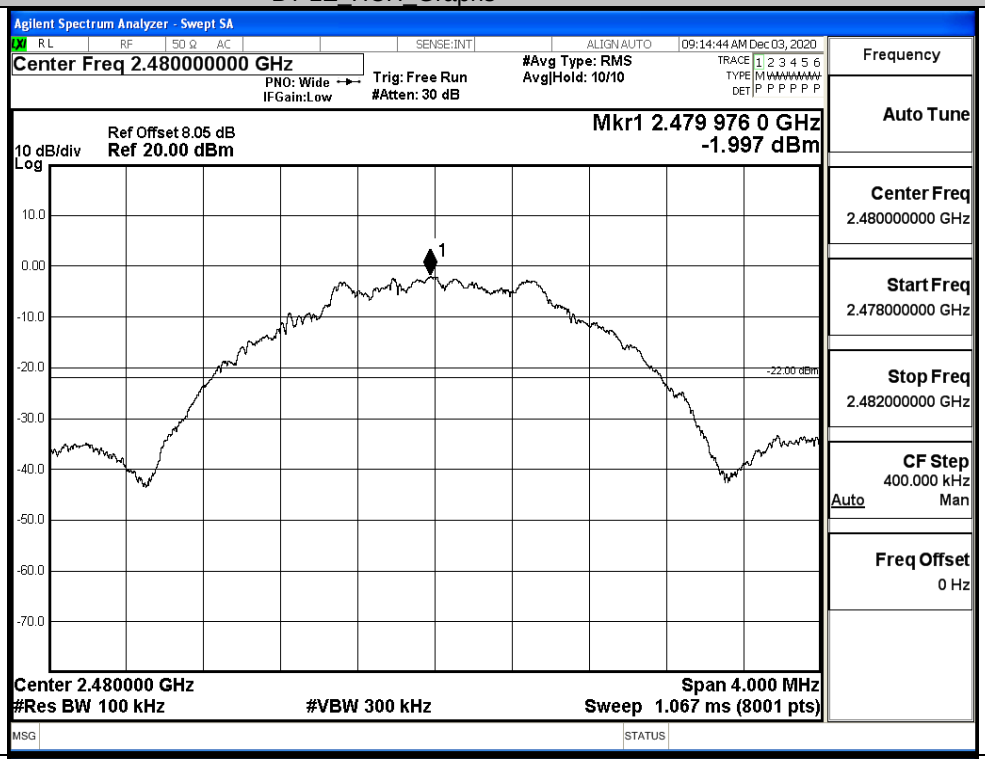
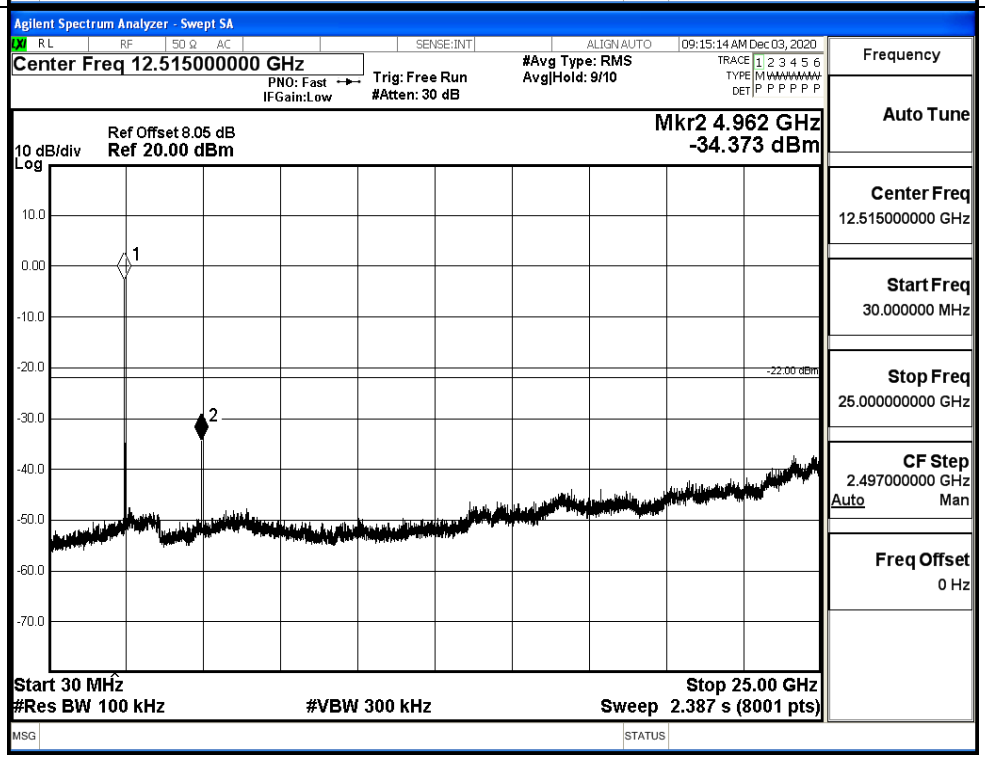
BT LE_MCH_Graphs	
Pref/BT LE/MCH	
Puw/BT LE/MCH	

BT LE_HCH_Graphs	
Pref/BT LE/HCH	
Puw/BT LE/HCH	

Mode	Channel	Pref [dBm]	Max. Level [dBm]	Limit [dBm]	Verdict
BT 2LE	LCH	-3.062	-29.508	-23.062	PASS
BT 2LE	MCH	-2.309	-30.481	-22.309	PASS
BT 2LE	HCH	-1.997	-34.373	-21.997	PASS

BT LE_LCH_Graphs	
Pref/BT LE/LCH	
Puw/BT LE/LCH	

BT LE_MCH_Graphs	
Pref/BT LE/MCH	
Puw/BT LE/MCH	

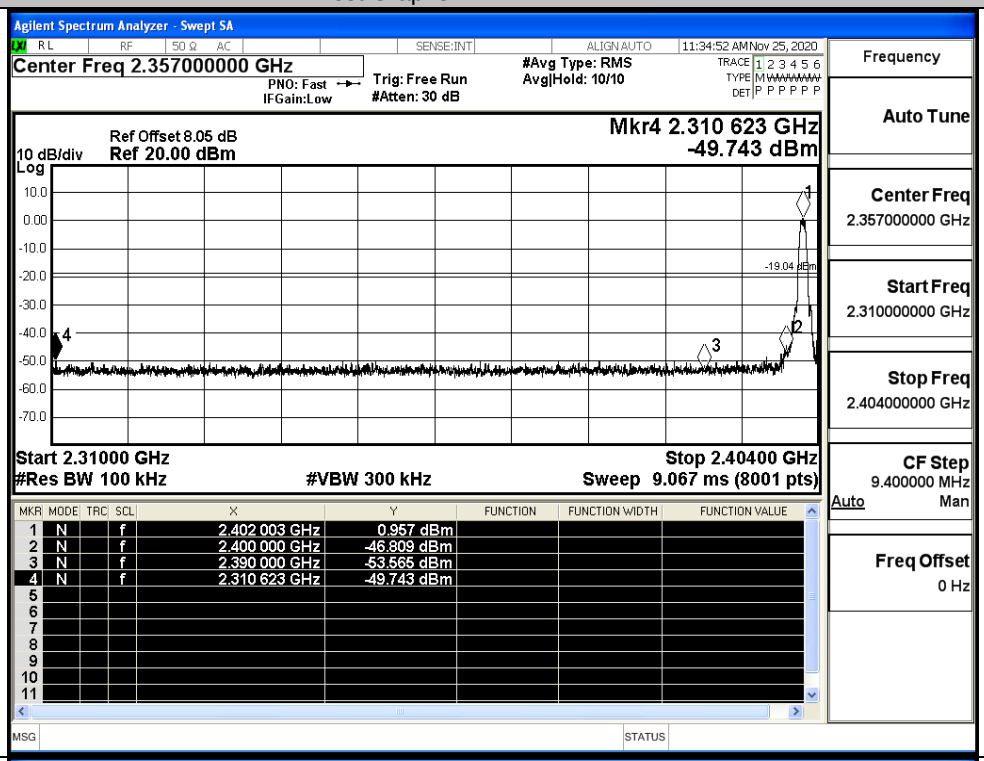
BT LE_HCH_Graphs	
Pref/BT LE/HCH	
Puw/BT LE/HCH	

B.6 Band-edge for RF Conducted Emissions

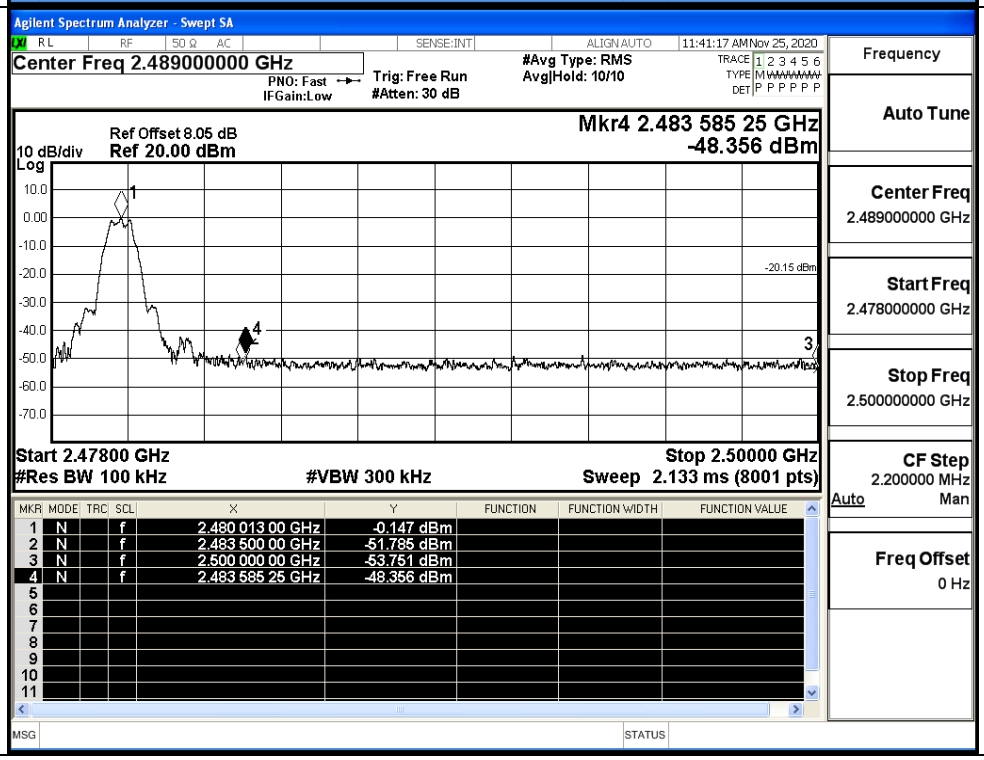
Mode	Channel	Carrier Power[dBm]	Max.Spurious Level [dBm]	Limit [dBm]	Verdict
BT LE	LCH	0.957	-49.743	-19.04	PASS
BT LE	HCH	-0.147	-48.356	-20.15	PASS

Test Graphs

LCH



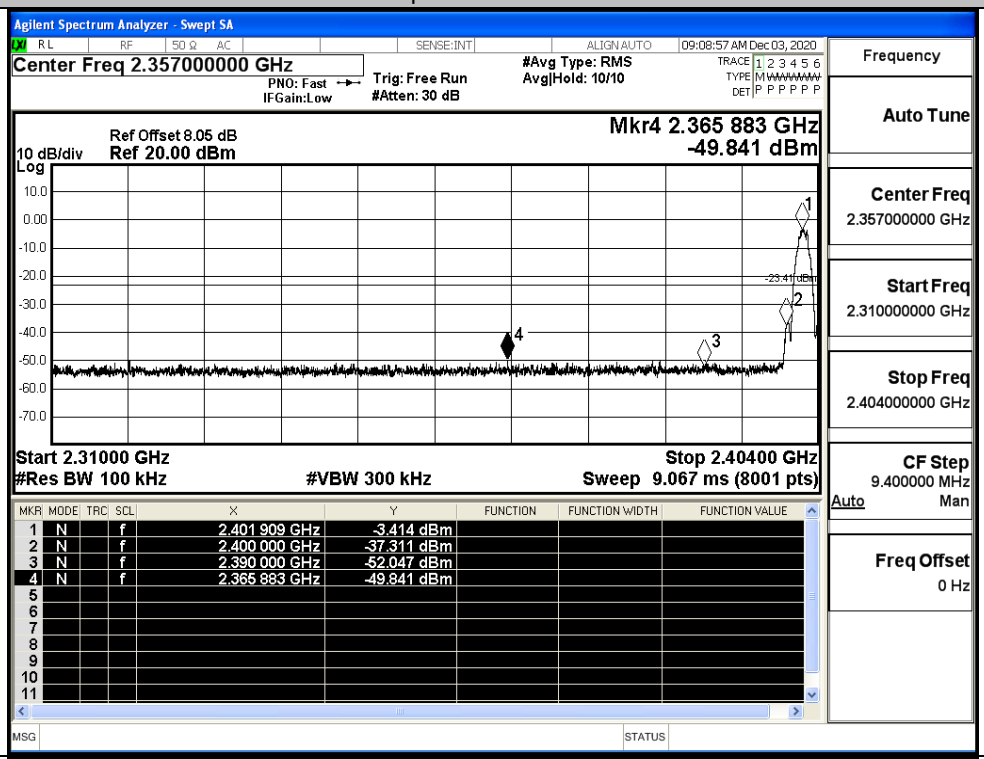
HCH



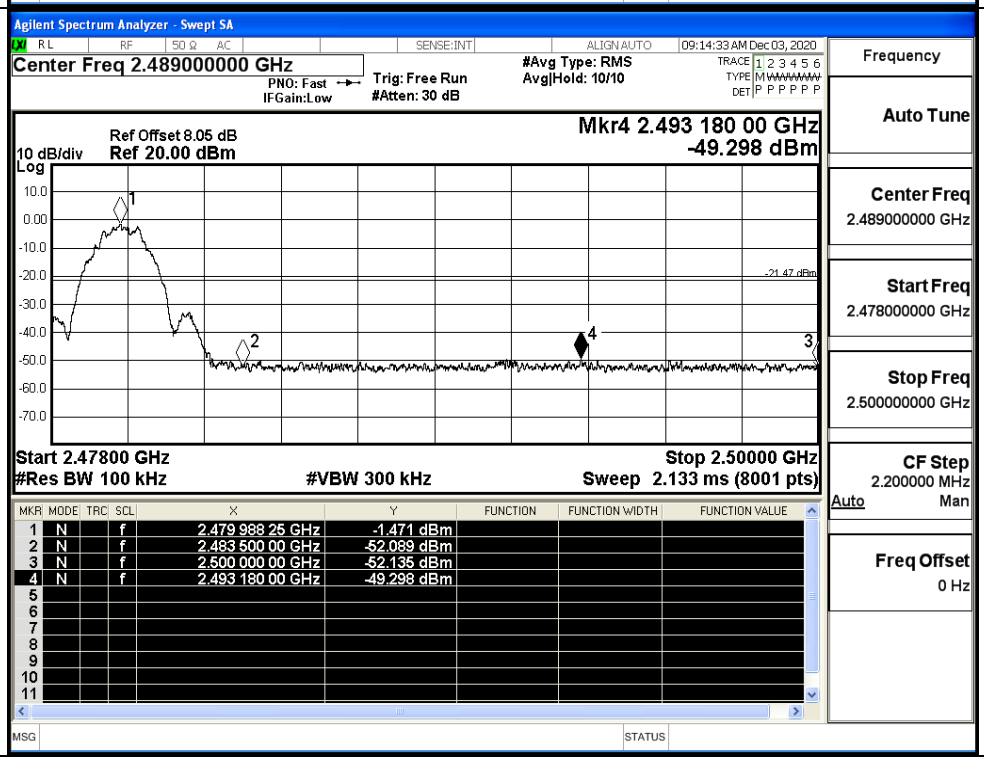
Mode	Channel	Carrier Power[dBm]	Max.Spurious Level [dBm]	Limit [dBm]	Verdict
BT 2LE	LCH	-3.414	-49.841	-23.41	PASS
BT 2LE	HCH	-1.471	-49.298	-21.47	PASS

Test Graphs

LCH



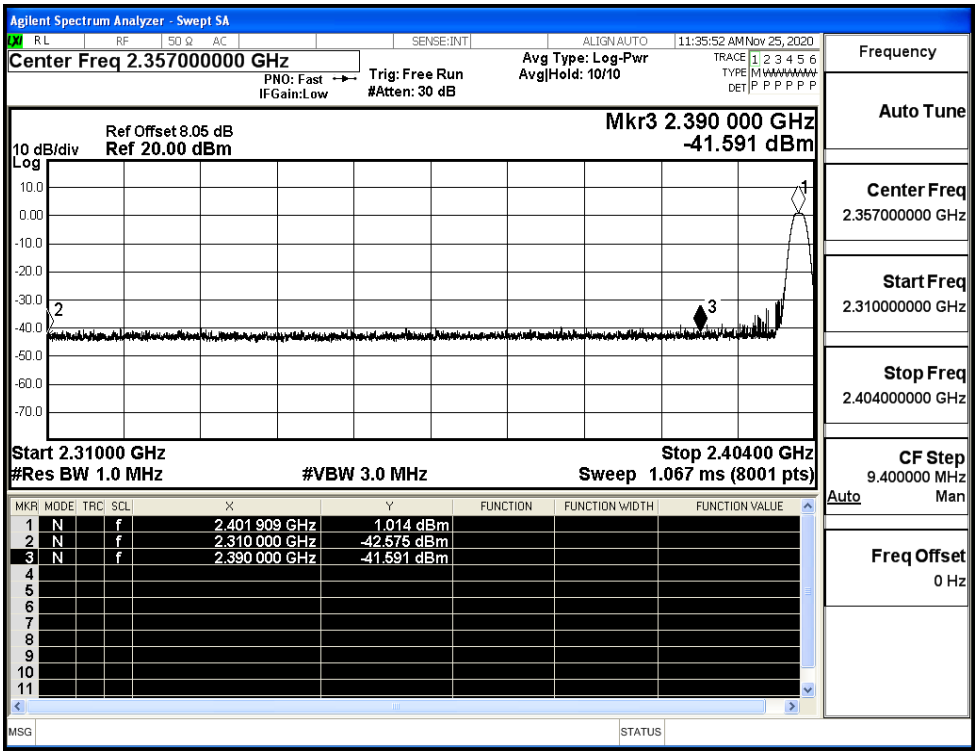
HCH



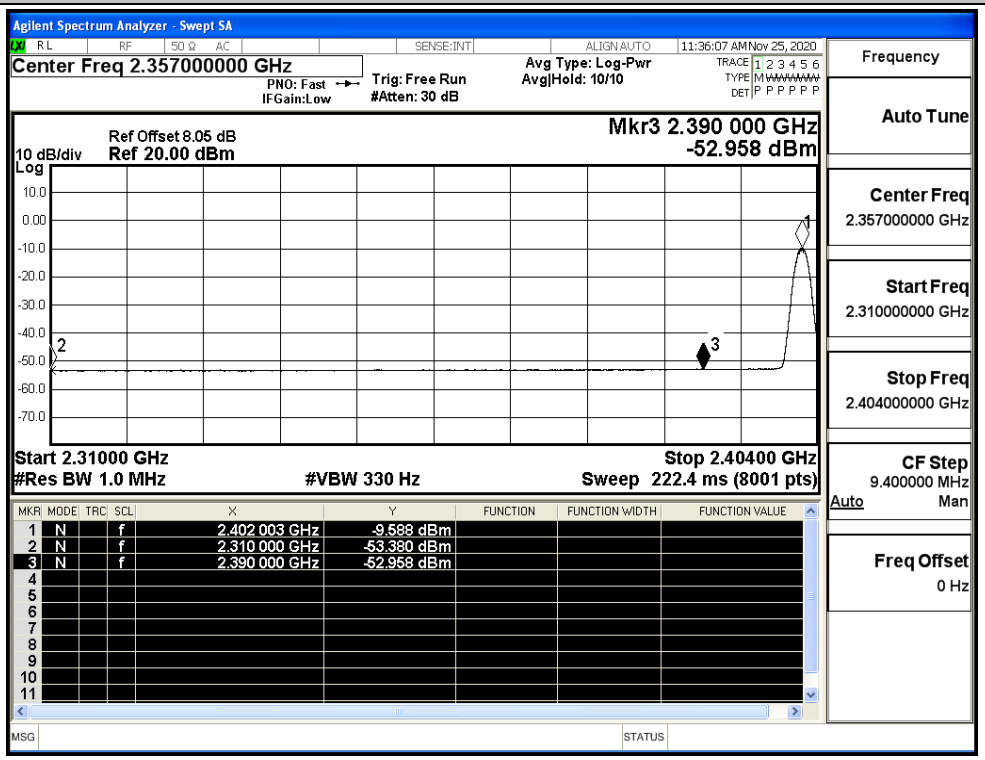
B.7 Restrict-band band-edge measurements

Test Mode	Test Channel	Ant	Freq.	Power [dBm]	Gain	Ground Factor	E [dBuV/m]	Detector	Limit [dBuV/m]	Verdi
BT LE	2402	Ant1	2310.0	-42.58	2.5	0	55.18	PEAK	74	PASS
		Ant1	2310.0	-53.38	2.5	0	44.38	AV	54	PASS
		Ant1	2390.0	-41.59	2.5	0	56.17	PEAK	74	PASS
		Ant1	2390.0	-52.96	2.5	0	44.80	AV	54	PASS
	2480	Ant1	2483.5	-34.82	2.5	0	62.94	PEAK	74	PASS
		Ant1	2483.5	-52.37	2.5	0	45.39	AV	54	PASS
		Ant1	2500.0	-41.57	2.5	0	56.19	PEAK	74	PASS
		Ant1	2500.0	-52.37	2.5	0	45.39	AV	54	PASS

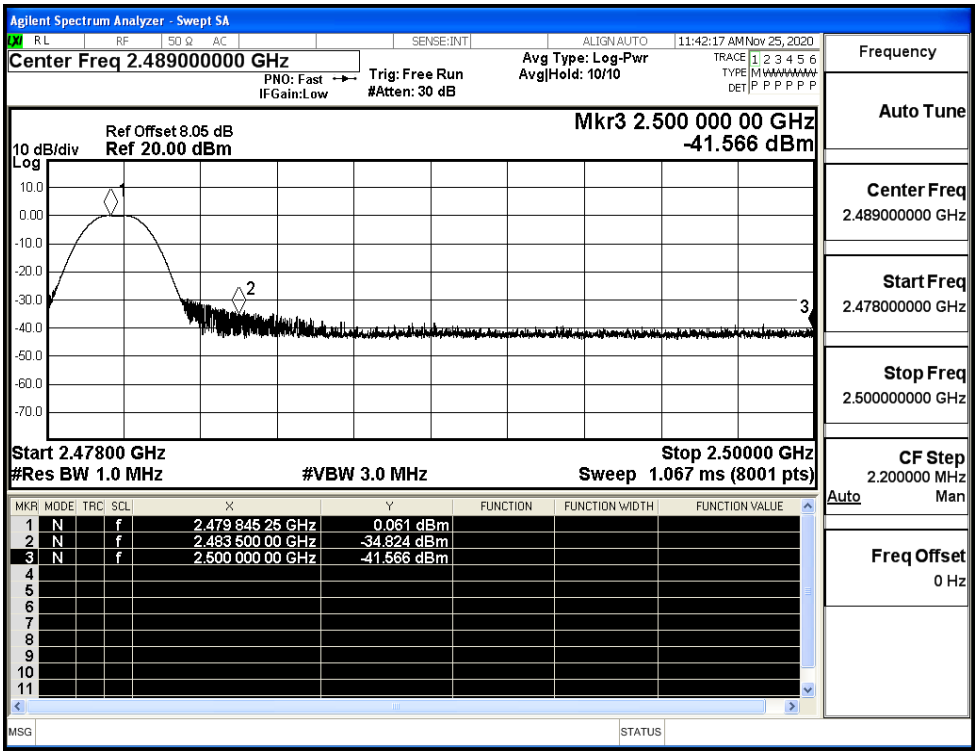
Restrict-band band-edge measurements_BT LE_2402_Ant1_PEAK



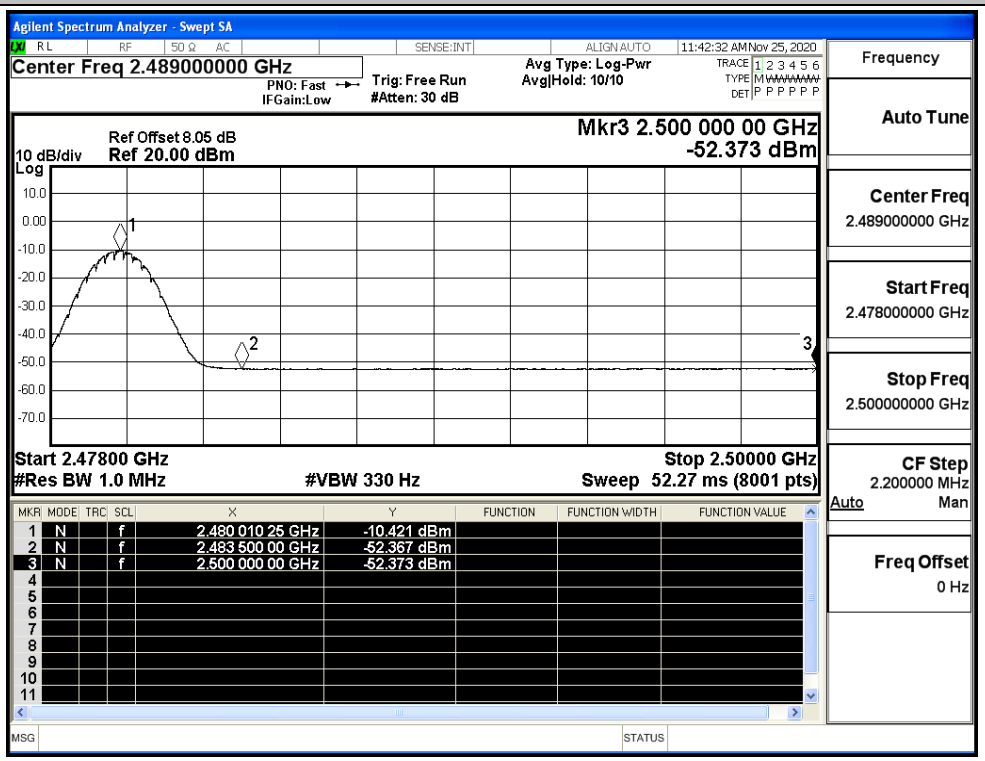
Restrict-band band-edge measurements_BT LE_2402_Ant1_AV



Restrict-band band-edge measurements_BT LE_2480_Ant1_PEAK

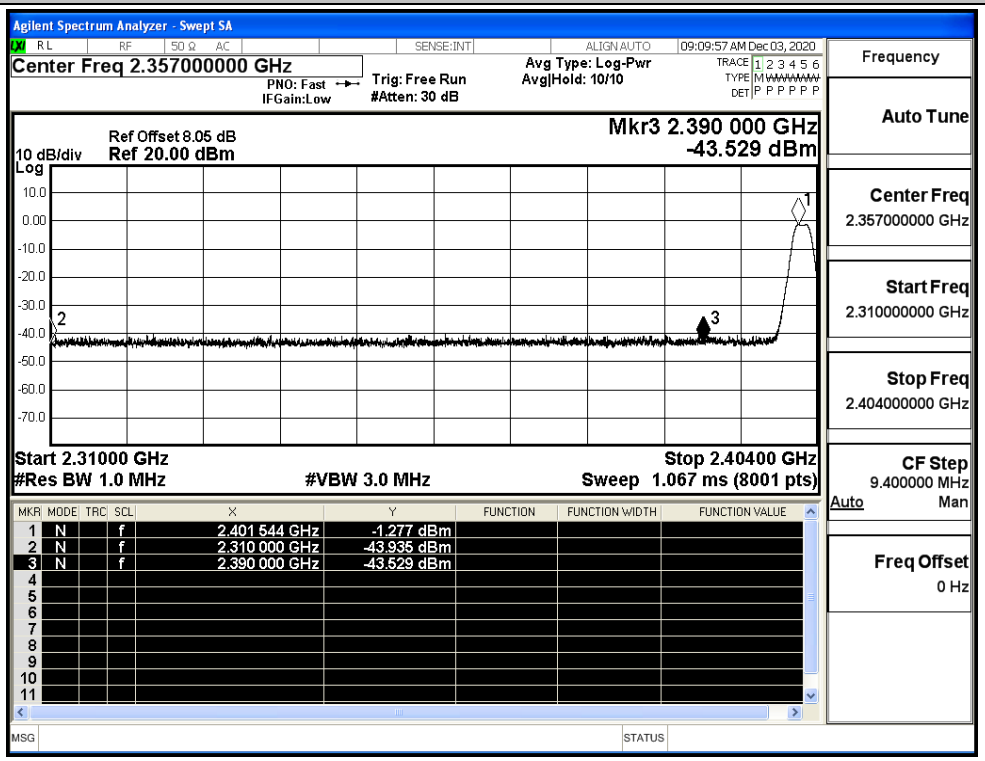


Restrict-band band-edge measurements_BT LE_2480_Ant1_AV

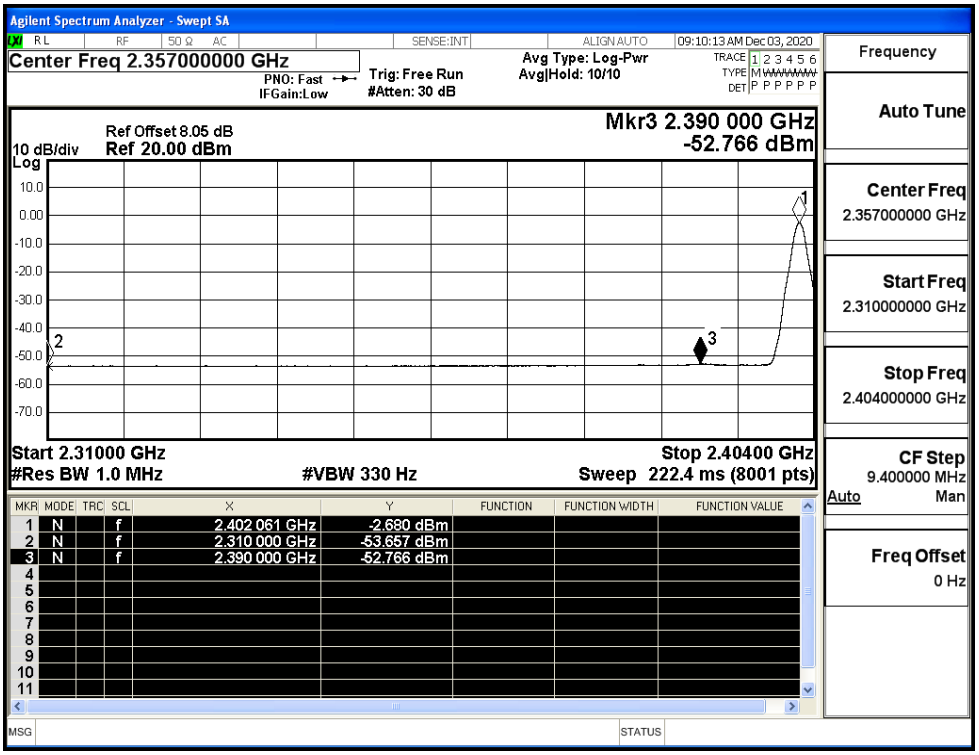


Test Mode	Test Channel	Ant	Freq.	Power [dBm]	Gain	Ground Factor	E [dBuV/m]	Detector	Limit [dBuV/m]	Verdi
BT 2LE	2402	Ant1	2310.0	-43.94	2.0	0	51.32	PEAK	74	PASS
		Ant1	2310.0	-53.66	2.0	0	41.60	AV	54	PASS
		Ant1	2390.0	-43.53	2.0	0	51.73	PEAK	74	PASS
		Ant1	2390.0	-52.77	2.0	0	42.49	AV	54	PASS
	2480	Ant1	2483.5	-41.01	2.0	0	54.25	PEAK	74	PASS
		Ant1	2483.5	-51.43	2.0	0	43.83	AV	54	PASS
		Ant1	2500.0	-41.49	2.0	0	53.77	PEAK	74	PASS
		Ant1	2500.0	-52.46	2.0	0	42.80	AV	54	PASS

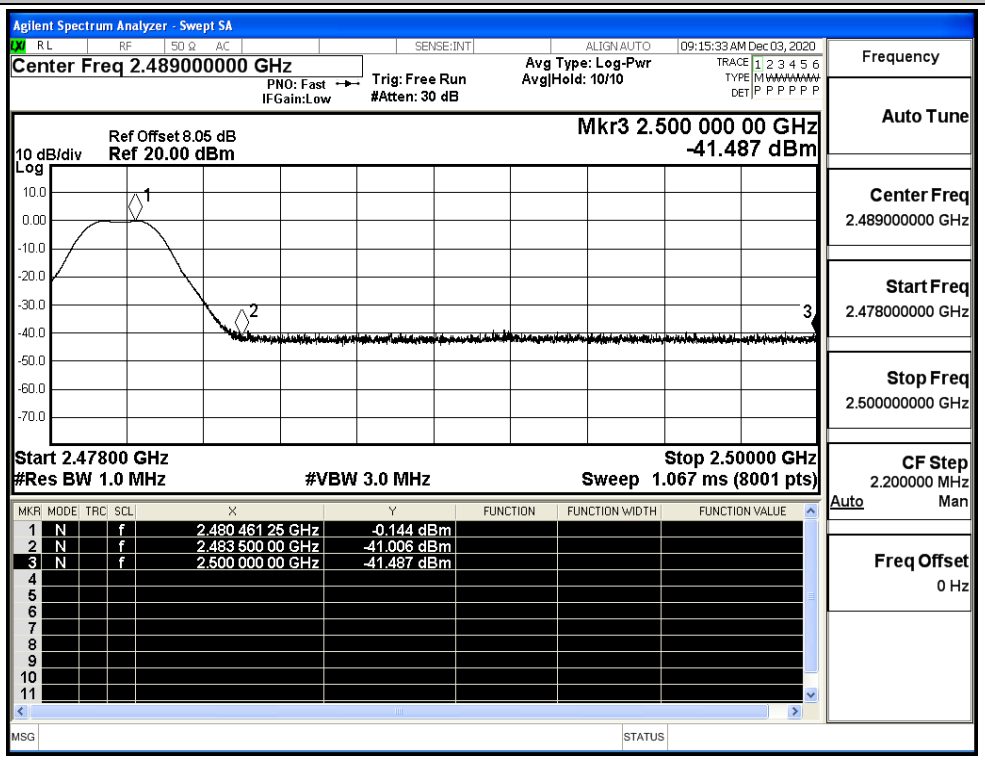
Restrict-band band-edge measurements_BT LE_2402_Ant1_PEAK



Restrict-band band-edge measurements_BT LE_2402_Ant1_AV



Restrict-band band-edge measurements_BT LE_2480_Ant1_PEAK



Restrict-band band-edge measurements_BT LE_2480_Ant1_AV