Appendix B

RF Test Data for BT V4.2(BT LE) (Conducted Measurement)

Product Name: OVMS (Open Vehicle Monitoring System)

Trade Mark: Open Vehicles

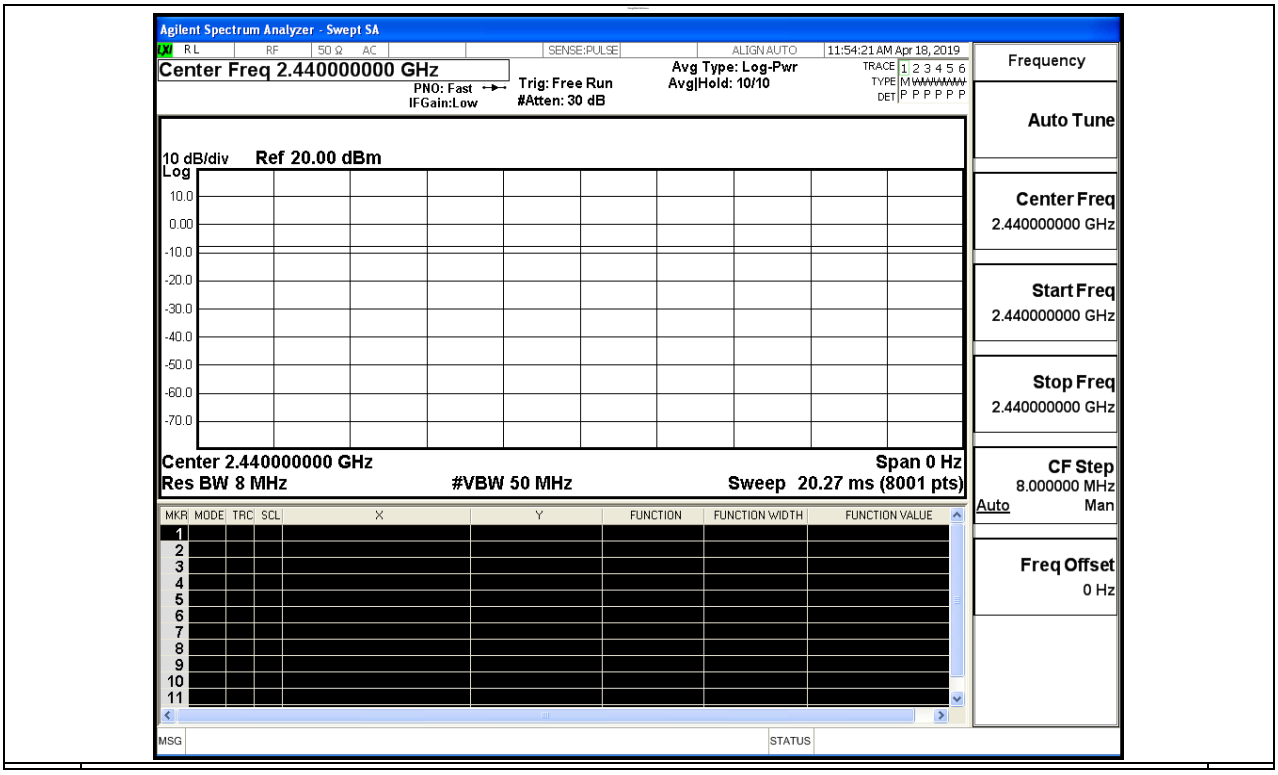
Test Model: OVMS-31-5360A

Environmental Conditions

Temperature:	24.1 ° C
Relative Humidity:	52.7%
ATM Pressure:	100.0 kPa
Test Engineer:	Wang Chuang
Supervised by:	Tom Liu

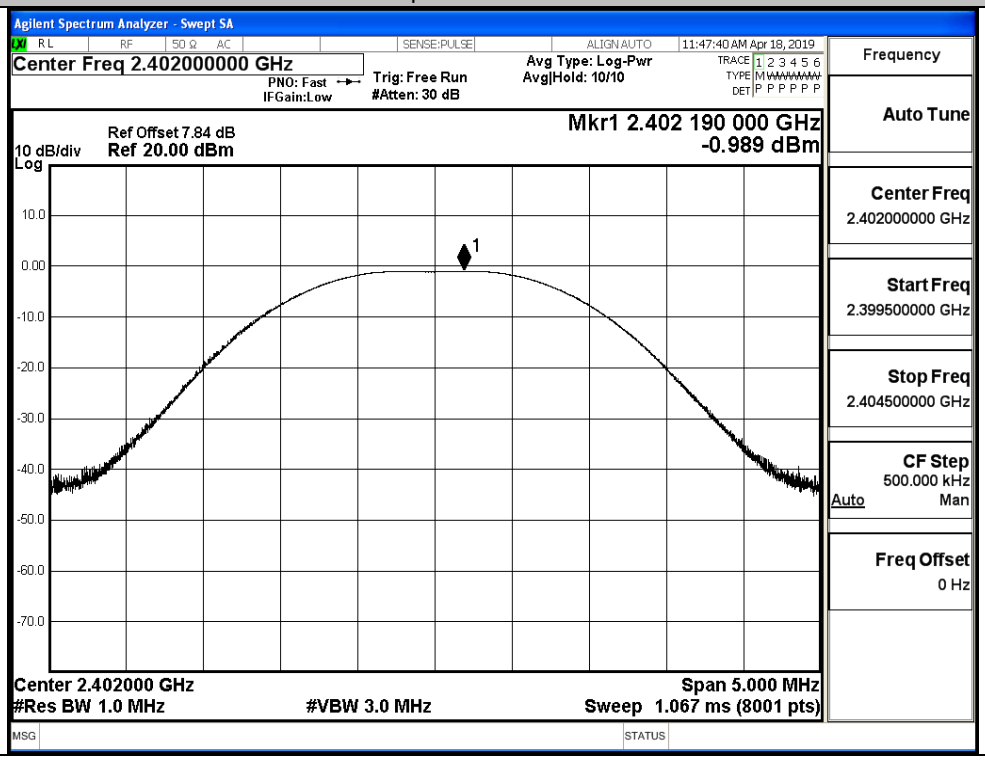
B.1 Duty Cycle

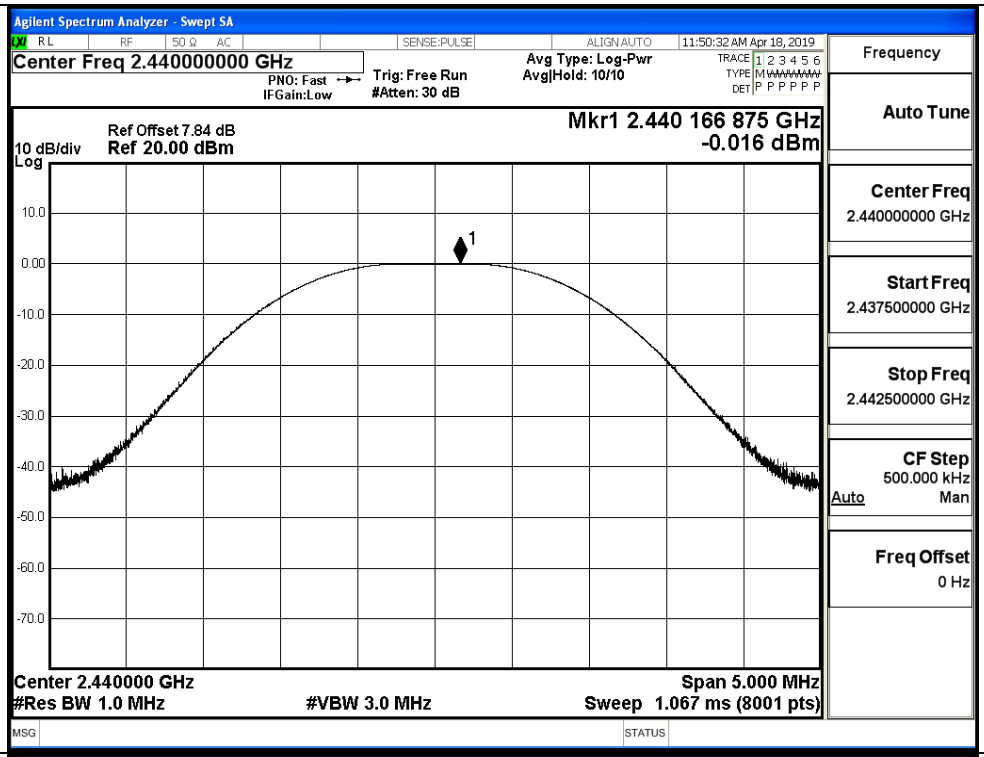
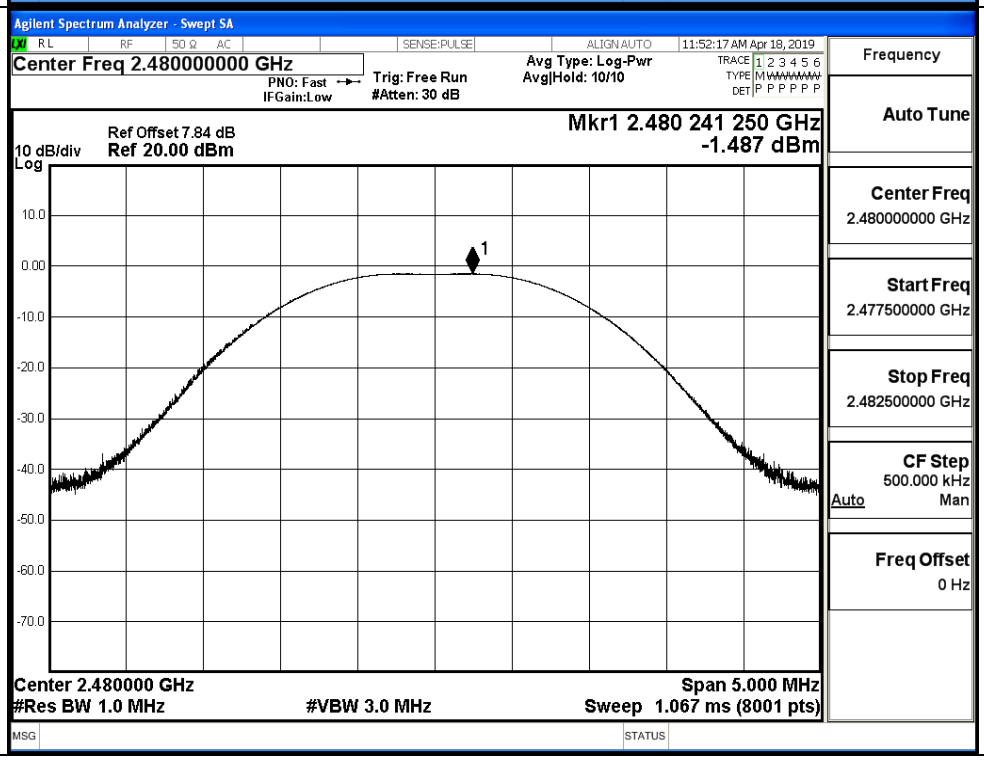
Test Mode	Test Channel	Ant	Duty Cycle[%]	Verdict
BT LE	2440	Ant1	100	PASS



B.2 Maximum Conducted Peak Output Power

Mode	Channel	Conduct Peak Power[dBm]	Conduct Average Power[dBm]	Limit [dBm]	Verdict
BT LE	LCH	-0.989	-1.115	30	PASS
BT LE	MCH	-0.016	-0.147	30	PASS
BT LE	HCH	-1.487	-1.639	30	PASS

Test Graphs		
LCH		

MCH		
HCH		

Agilent Spectrum Analyzer - Swept SA
Center Freq 2.440000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 10/10
11:50:32 AM Apr 18, 2019
Ref Offset 7.84 dB
10 dB/div
Log
Ref 20.00 dBm
Mkr1 2.440 166 875 GHz
-0.016 dBm
Center 2.440000 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz
Span 5.000 MHz
Sweep 1.067 ms (8001 pts)
Frequency
Auto Tune
Center Freq
2.440000000 GHz
Start Freq
2.437500000 GHz
Stop Freq
2.442500000 GHz
CF Step
500.000 kHz
Auto
Man
Freq Offset
0 Hz
MSG
STATUS

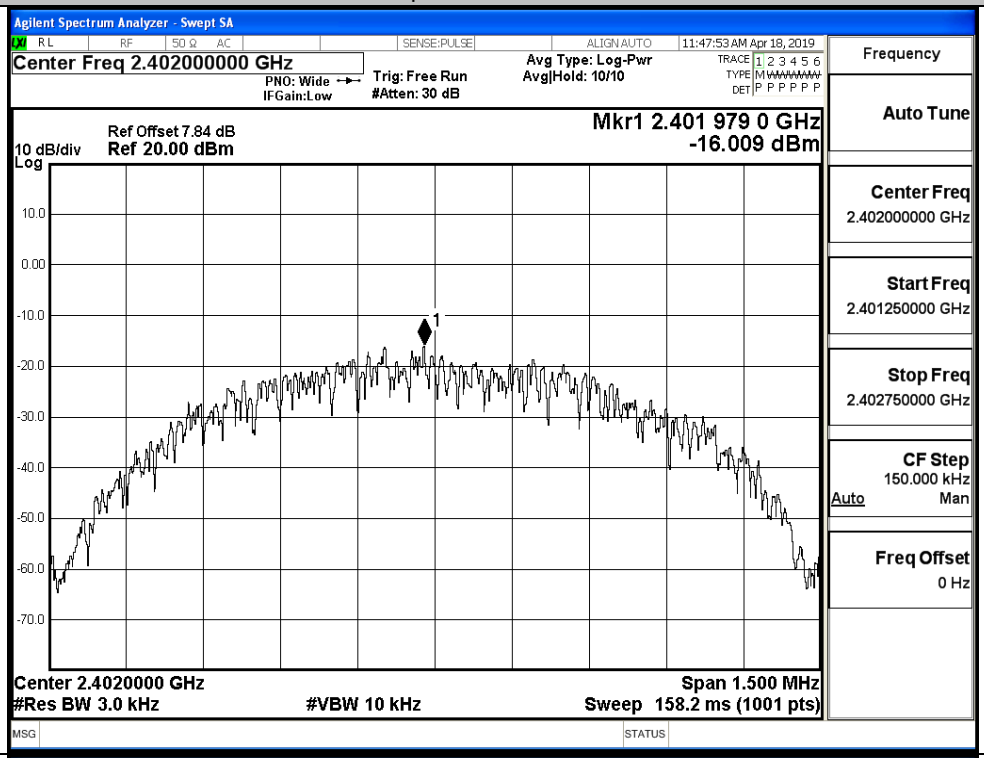
Agilent Spectrum Analyzer - Swept SA
Center Freq 2.480000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 10/10
11:52:17 AM Apr 18, 2019
Ref Offset 7.84 dB
10 dB/div
Log
Ref 20.00 dBm
Mkr1 2.480 241 250 GHz
-1.487 dBm
Center 2.480000 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz
Span 5.000 MHz
Sweep 1.067 ms (8001 pts)
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
MSG
STATUS

B.3 Maximum Power Spectral Density

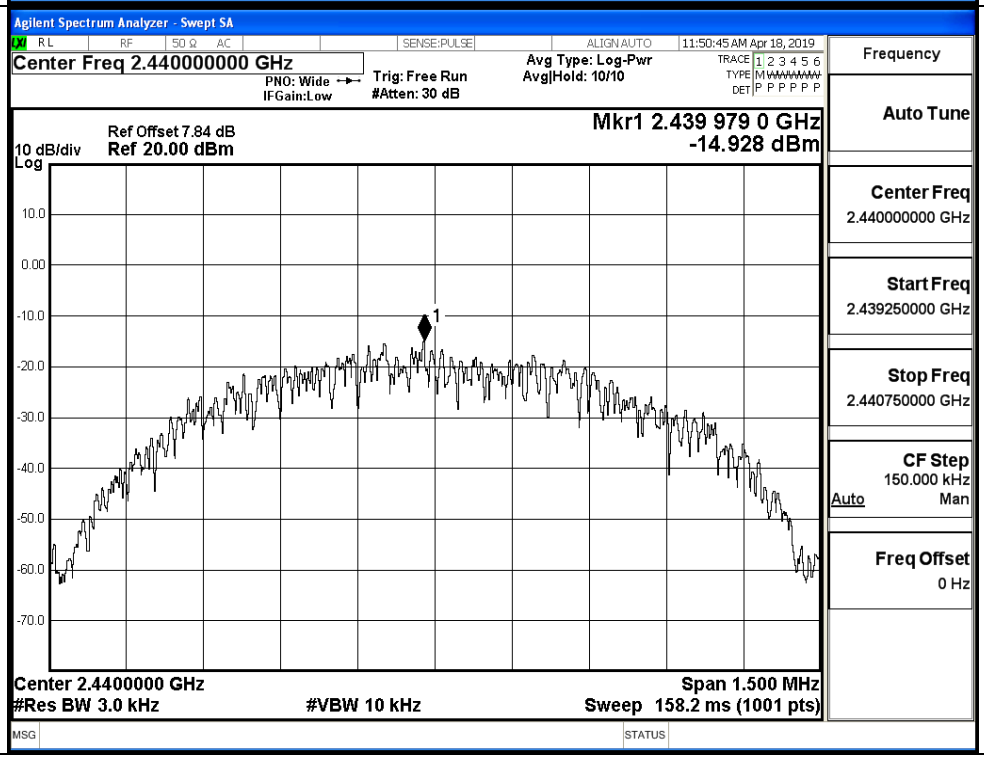
Mode	Channel	PSD [dBm/3KHz]	Limit [dBm/3KHz]	Verdict
BT LE	LCH	-16.009	8	PASS
BT LE	MCH	-14.928	8	PASS
BT LE	HCH	-16.760	8	PASS

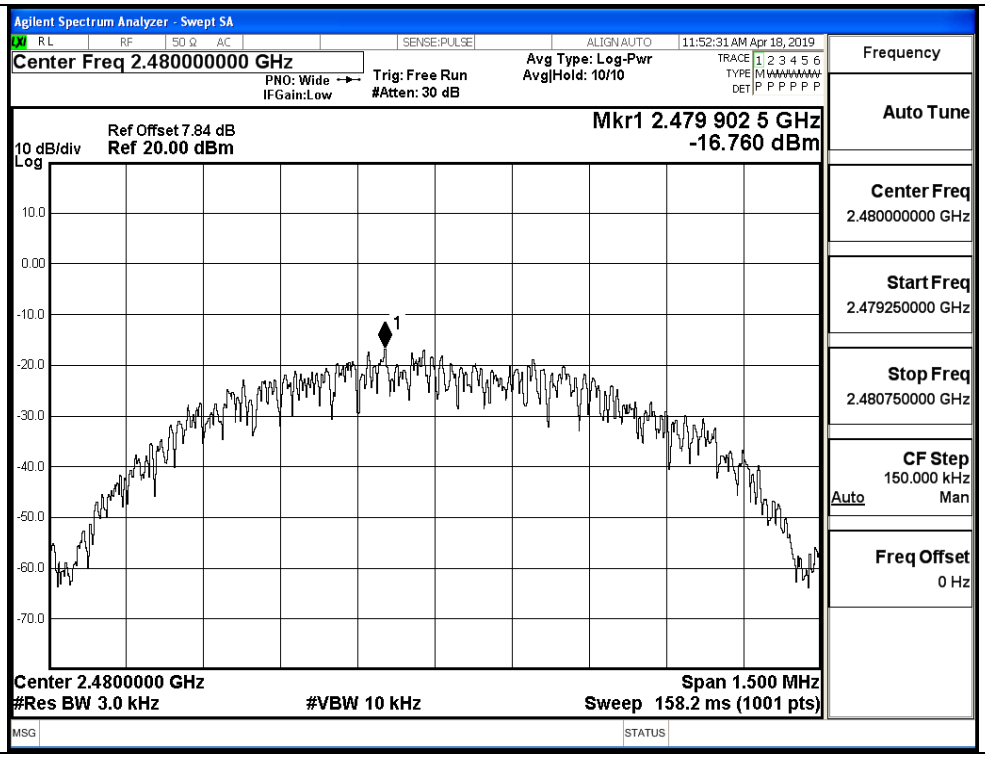
Test Graphs

LCH



MCH



HCH		

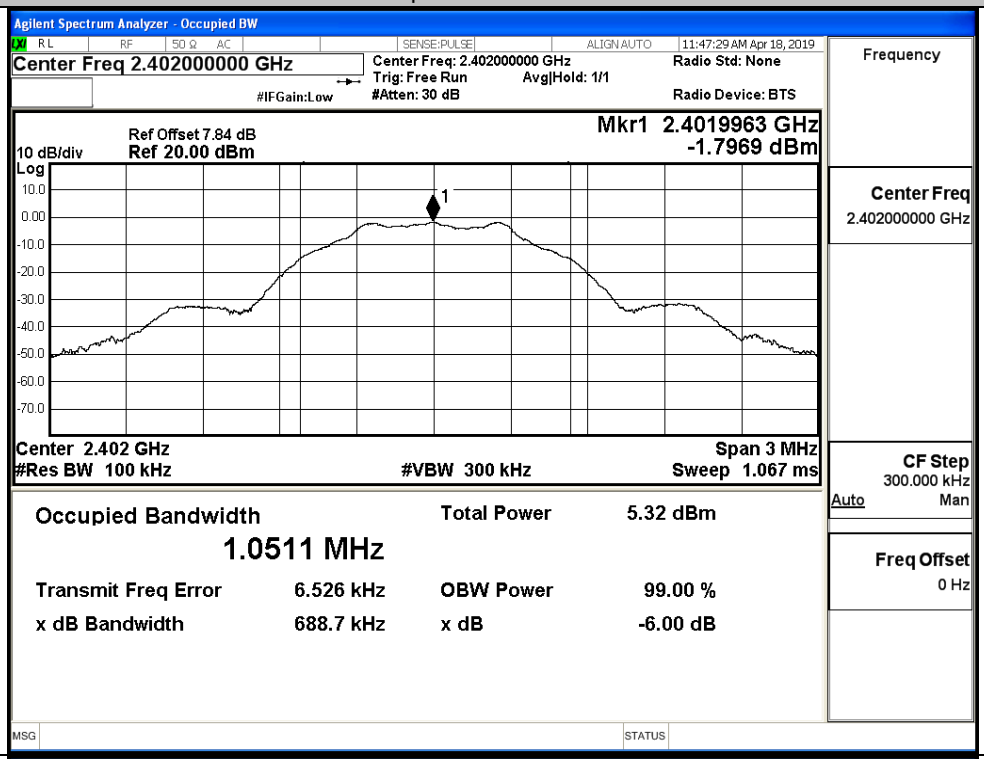
Agilent Spectrum Analyzer - Swept SA
RL
RF
50 Ω AC
SENSE:PULSE
ALIGN AUTO
11:52:31 AM Apr 18, 2019
Center Freq 2.480000000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 10/10
TRACE 1 2 3 4 5 6
TYPE M WWWWW
DET P P P P P
Ref Offset 7.84 dB
10 dB/div
Log
Ref 20.00 dBm
Mkr1 2.479 902 5 GHz
-16.760 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

B.4 6dB Bandwidth

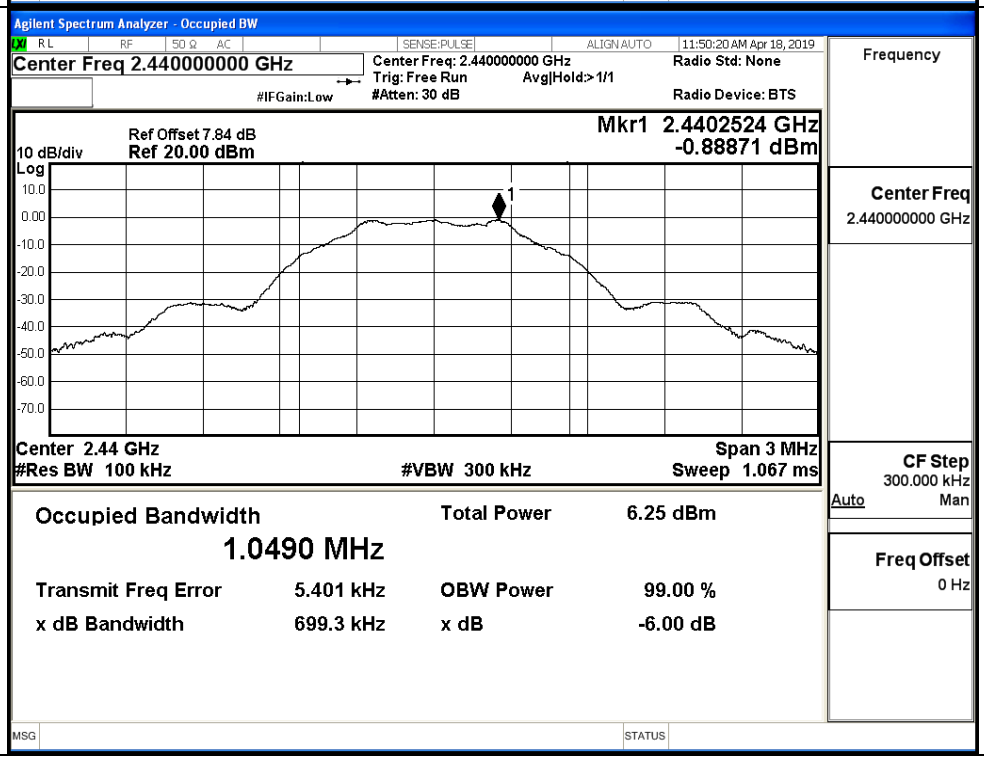
Mode	Channel	6dB Bandwidth [MHz]	Limit [MHz]	Verdict
BT LE	LCH	0.6887	⩾0.5	PASS
BT LE	MCH	0.6993	⩾0.5	PASS
BT LE	HCH	0.6960	⩾0.5	PASS

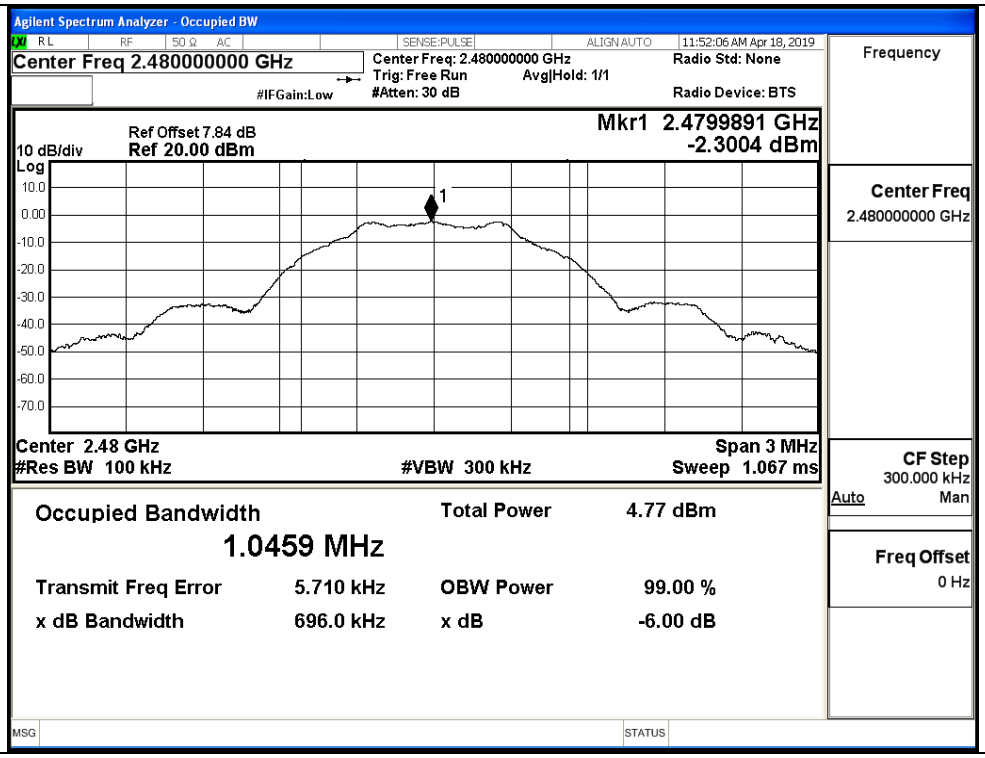
Test Graphs

LCH



MCH



HCH		

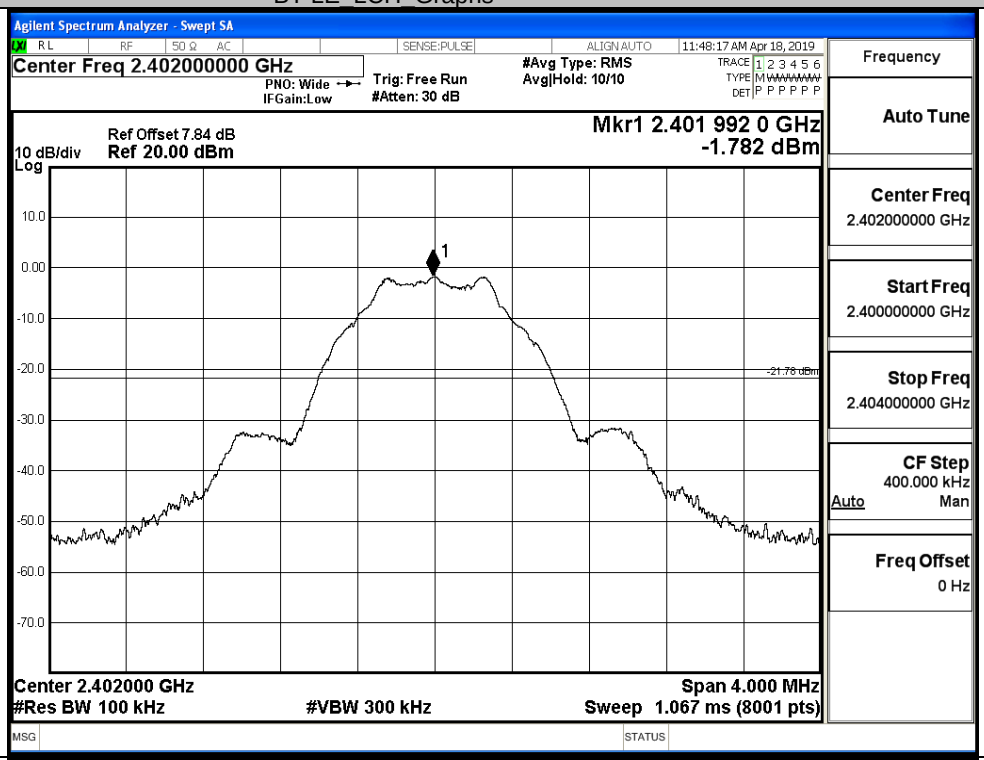
Agilent Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:PULSE
ALIGN AUTO
11:52:06 AM Apr 18, 2019
Center Freq 2.480000000 GHz
Center Freq: 2.480000000 GHz
Trig: Free Run
Avg|Hold: 1/1
#IFGain:Low
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
Frequency
Ref Offset 7.84 dB
10 dB/div
Ref 20.00 dBm
Log
Mkr1 2.4799891 GHz
-2.3004 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
1.0459 MHz
Total Power
4.77 dBm
Transmit Freq Error
5.710 kHz
OBW Power
99.00 %
x dB Bandwidth
696.0 kHz
x dB
-6.00 dB
Freq Offset
0 Hz
MSG
STATUS

B.5 RF Conducted Spurious Emissions

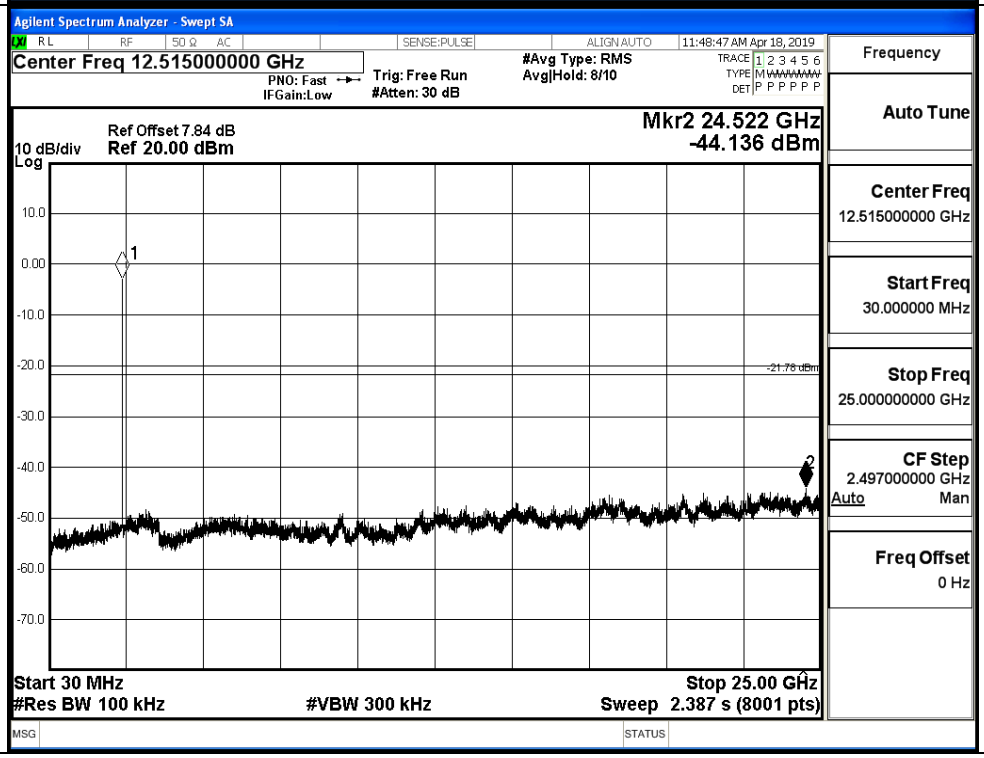
Mode	Channel	Pref [dBm]	Max. Level [dBm]	Limit [dBm]	Verdict
BT LE	LCH	-1.782	-44.136	-21.782	PASS
BT LE	MCH	-0.788	-44.463	-20.788	PASS
BT LE	HCH	-2.219	-43.882	-22.219	PASS

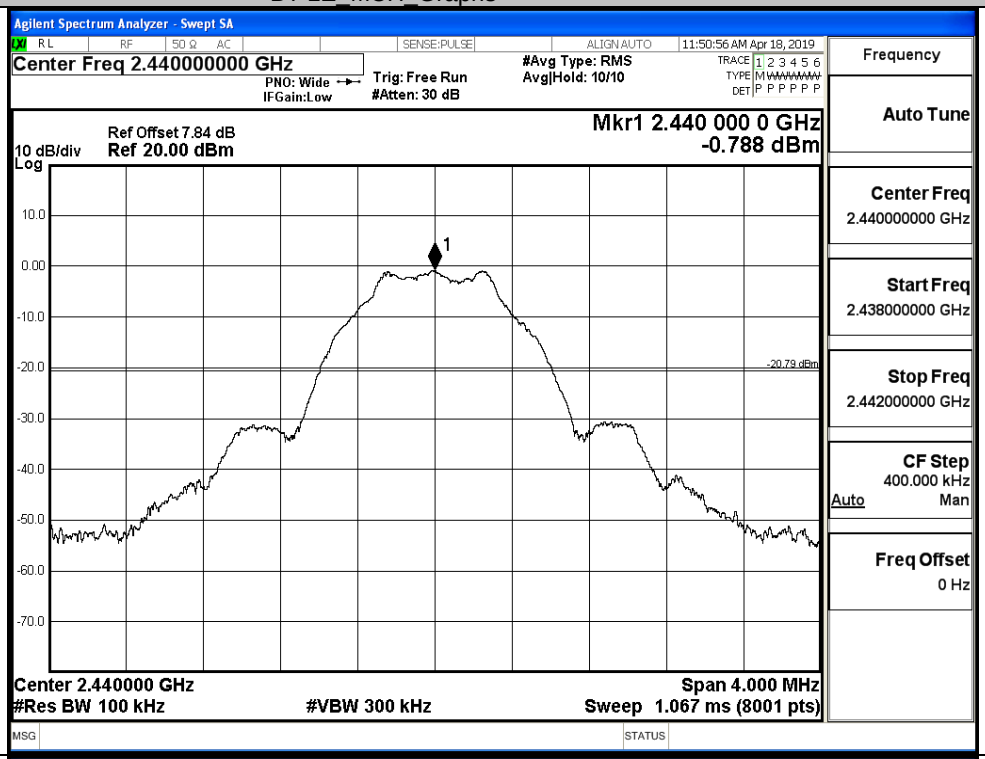
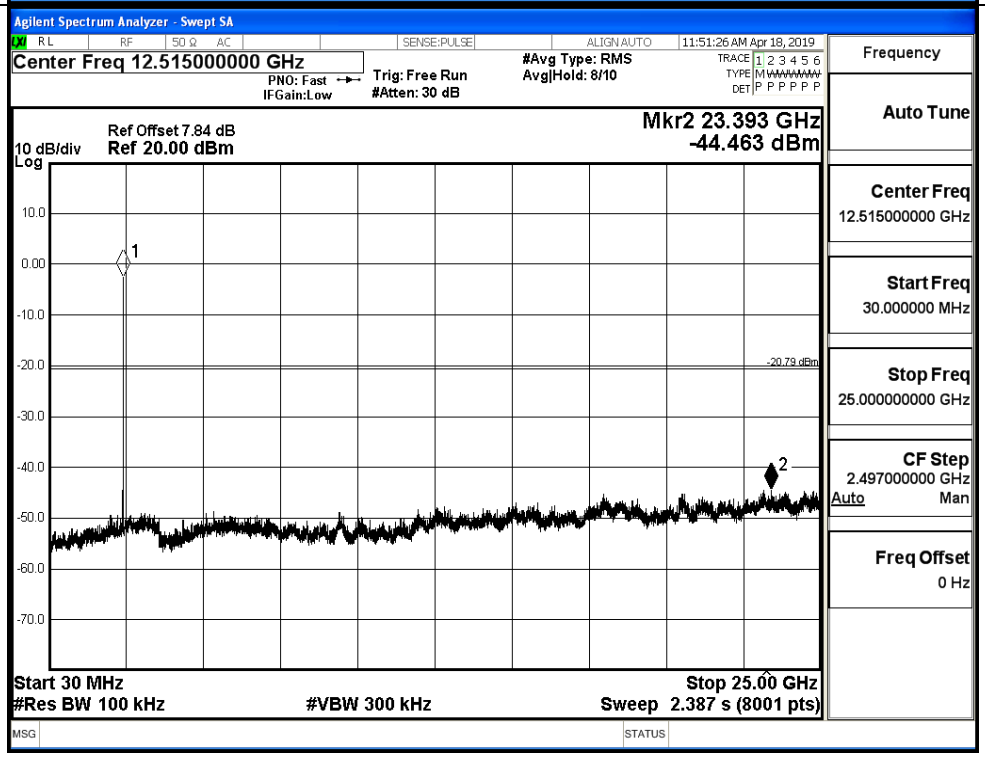
BT LE_LCH_Graphs

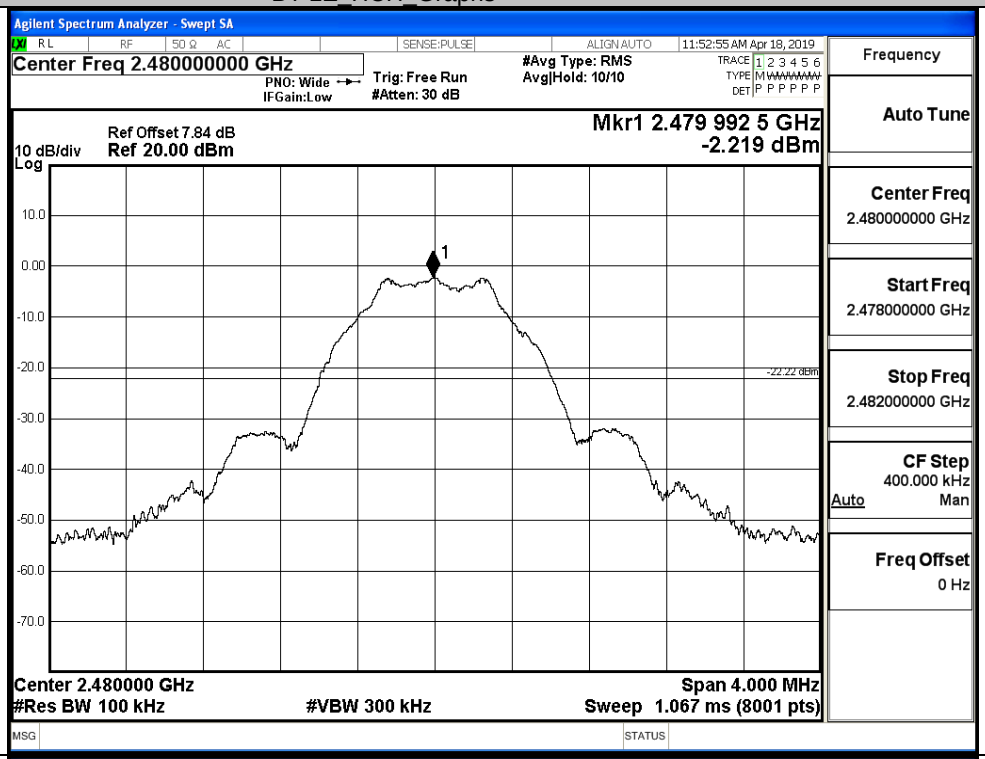
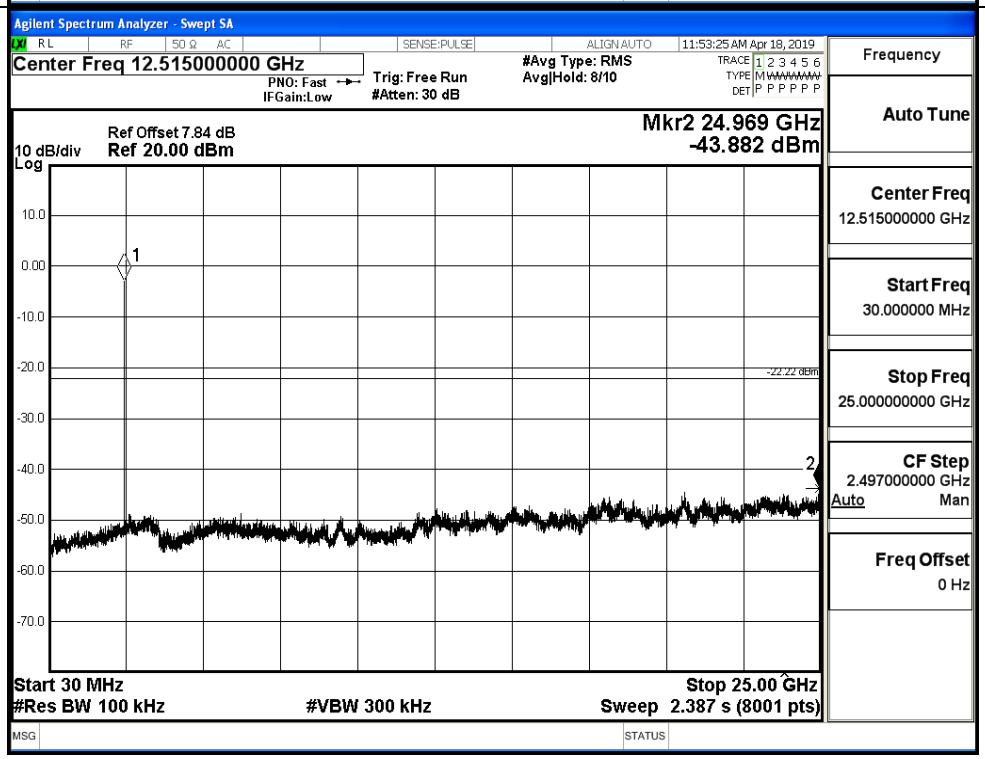
Pref/BT LE/LCH



Puw/BT LE/LCH



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

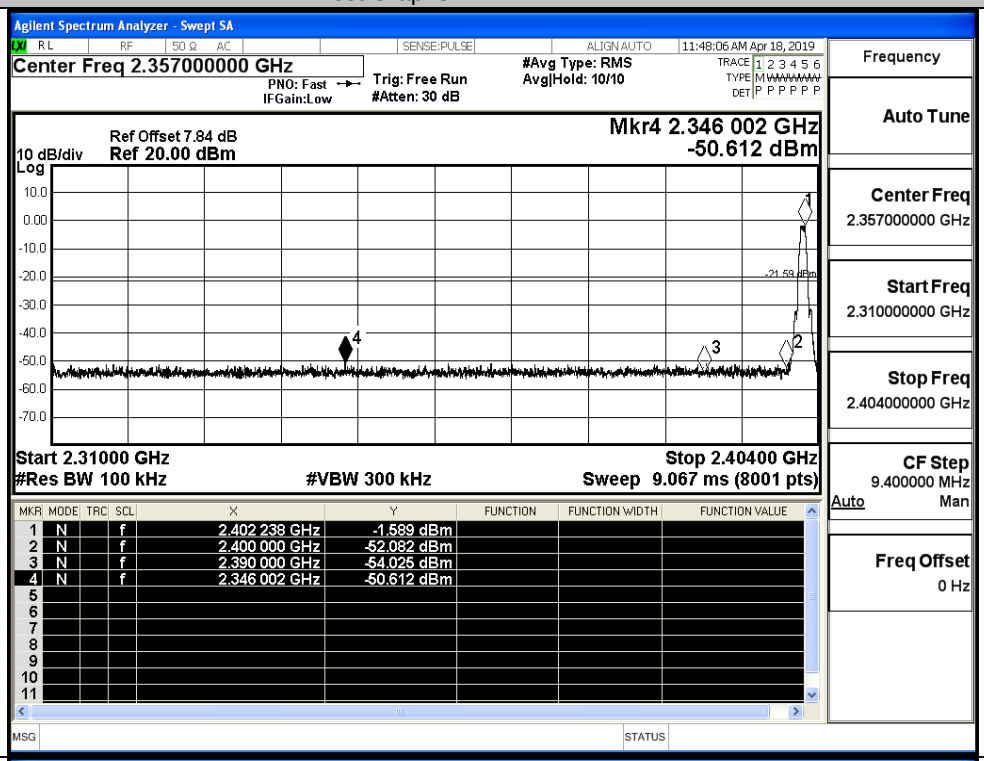
BT LE_HCH_Graphs	
Pref/BT LE/HCH	
Puw/BT LE/HCH	

B.6 Band-edge for RF Conducted Emissions

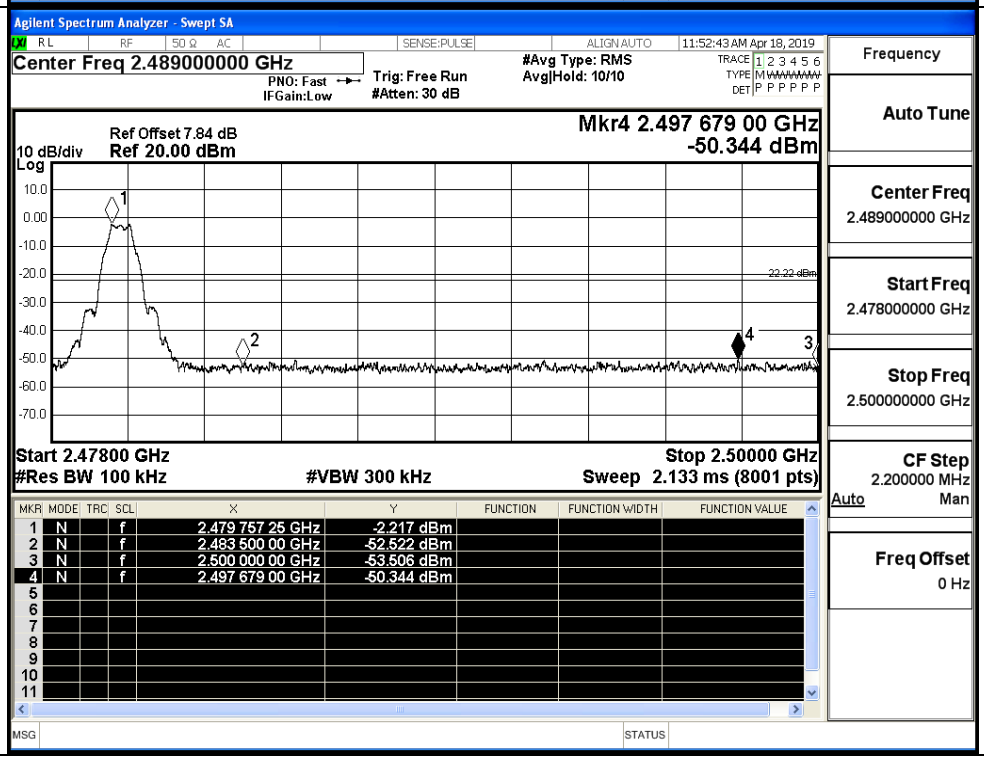
Mode	Channel	Carrier Power[dBm]	Max.Spurious Level [dBm]	Limit [dBm]	Verdict
BT LE	LCH	-1.589	-50.612	-21.59	PASS
BT LE	HCH	-2.217	-50.344	-22.22	PASS

Test Graphs

LCH



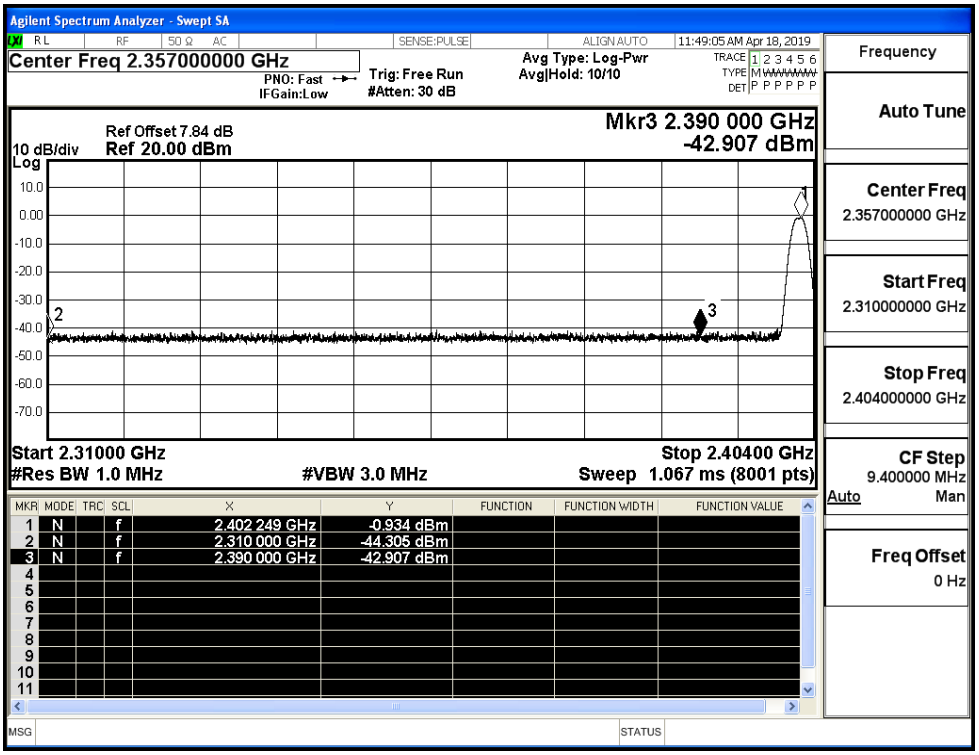
HCH



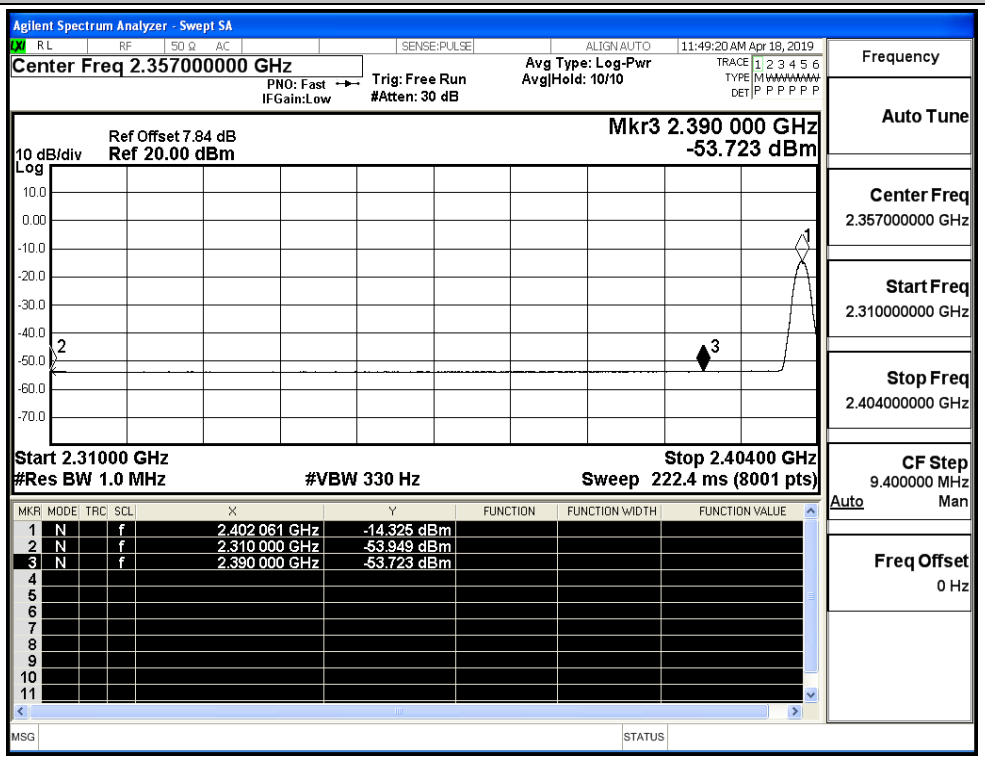
B.7 Restrict-band band-edge measurements

Test Mode	Test Channel	Ant	Freq.	Power [dBm]	Gain	Ground Factor	E [dBuV/m]	Detector	Limit [dBuV/m]	Verdict
BT LE	2402	Ant1	2310.0	-44.31	2.0	0	50.95	PEAK	74	PASS
		Ant1	2310.0	-53.95	2.0	0	41.31	AV	54	PASS
		Ant1	2390.0	-42.91	2.0	0	52.35	PEAK	74	PASS
		Ant1	2390.0	-53.72	2.0	0	41.53	AV	54	PASS
	2480	Ant1	2483.5	-43.63	2.0	0	51.63	PEAK	74	PASS
		Ant1	2483.5	-53.48	2.0	0	41.78	AV	54	PASS
		Ant1	2500.0	-43.88	2.0	0	51.37	PEAK	74	PASS
		Ant1	2500.0	-53.32	2.0	0	41.94	AV	54	PASS

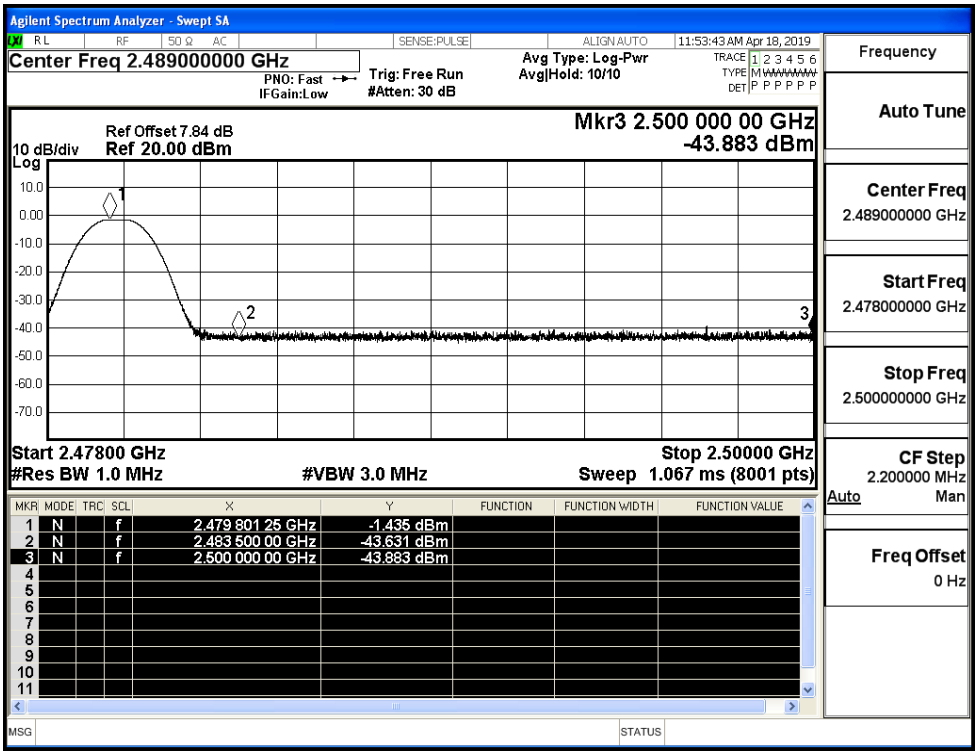
Restrict-band band-edge measurements_BT LE_2402_Ant1_PEAK



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