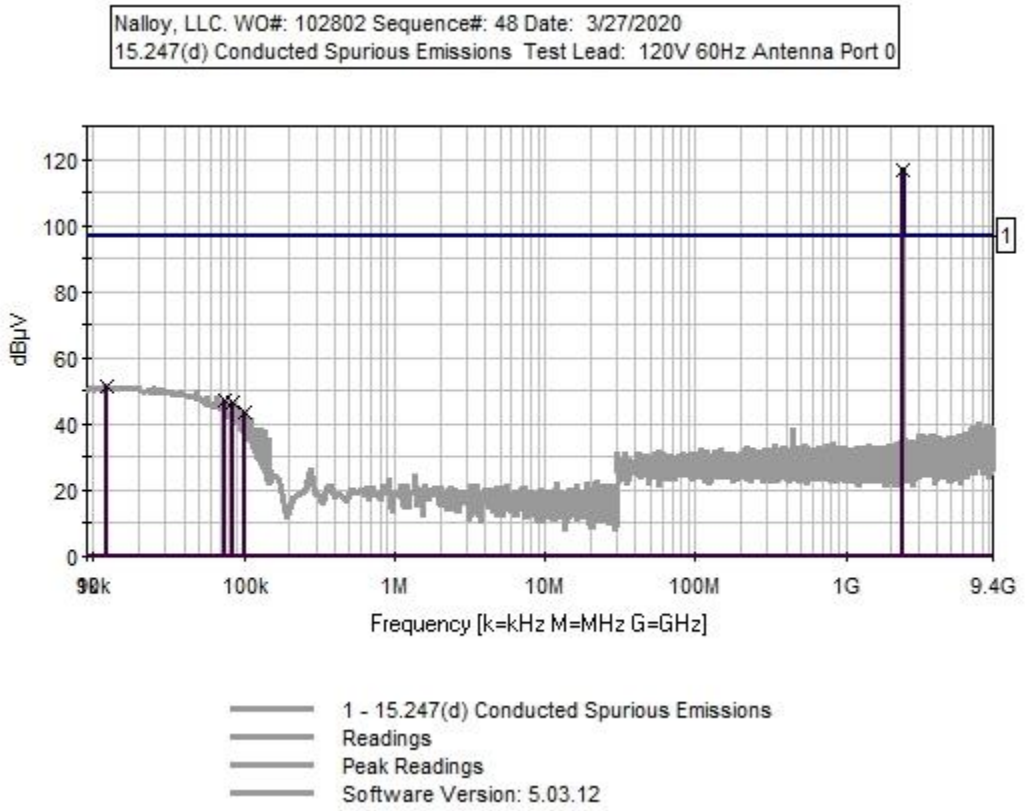


Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02673	Spectrum Analyzer	E4446A	2/22/2019	2/22/2021

Measurement Data: Reading listed by frequency. Test Lead: Antenna Port 0

#	Freq MHz	Rdng dBµV	dB	dB	dB	dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	12.102k	51.4					+0.0	51.4	97.0	-45.6	Anten
2	74.565k	47.2					+0.0	47.2	97.0	-49.8	Anten
3	83.307k	46.7					+0.0	46.7	97.0	-50.3	Anten
4	100.932k	43.3					+0.0	43.3	97.0	-53.7	Anten
5	2401.838M	116.6					+0.0	116.6	117.0	-0.4	Anten
6	9608.569M	59.5					+0.0	59.5	97.0	-37.5	Anten
7	23507.250 M	43.1					+0.0	43.1	97.0	-53.9	Anten

Test Location:	CKC Laboratories, Inc. • 22116 23rd Dr SE • Bothell, WA 98021 • 800-500-4362		
Customer:	**Nalloy, LLC.**		
Specification:	**15.247(d) Conducted Spurious Emissions**		
Work Order #:	**102802**	Date:	3/27/2020
Test Type:	**Conducted Emissions**	Time:	10:09:36
Tested By:	Matthew Harrison	Sequence#:	49
Software:	EMITest 5.03.12		120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Environmental Conditions:
Temperature: 22° C
Humidity: 28%
Pressure: 101.3 kPa

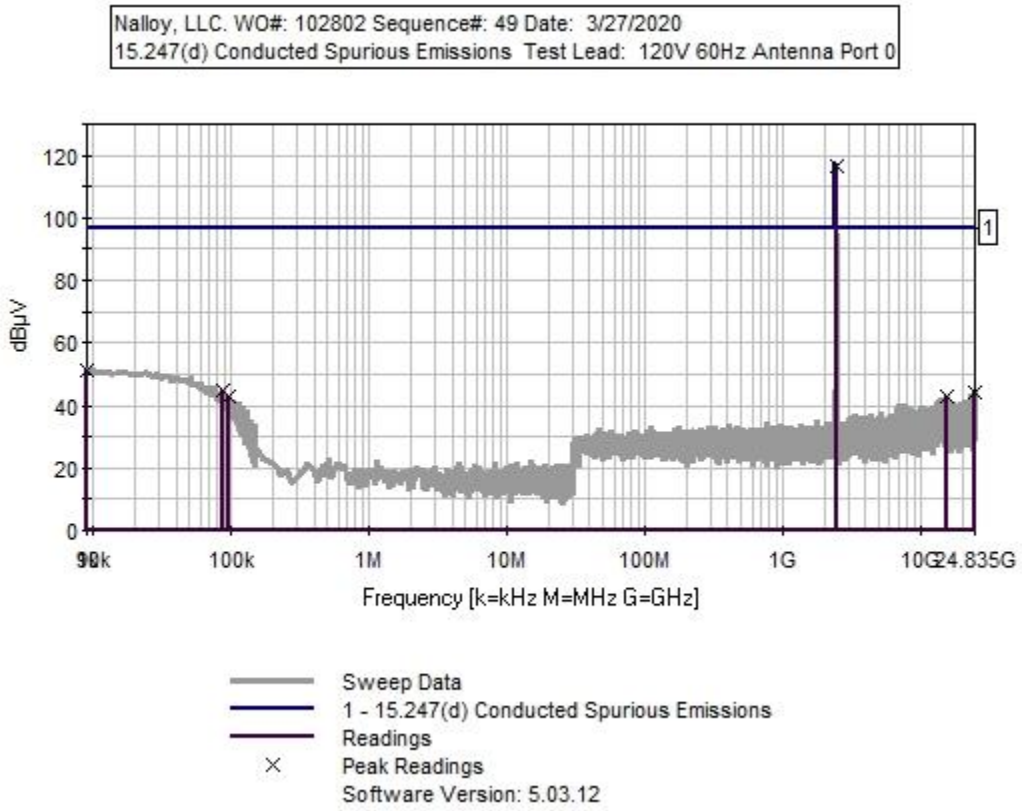
Frequency Range: 9kHz-25GHz
Frequency tested: 2440
Firmware power setting: 9
EUT Firmware:
Protocol /MCS/Modulation: BT, GFSK, DH1 (Worst-Case)

Antenna type: Linear Polarized
Antenna Gain: 3.7 dBi.

Duty Cycle: 100% Modulated

Test Method: ANSI C63.10: 2013
Test Mode: Transmitting
Test Setup: EUT is setup for conducted measurements.
Setup: EUT is connected to a Laptop via USB and Audio cable.

All data rates investigated, worst-case provided.



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02673	Spectrum Analyzer	E4446A	2/22/2019	2/22/2021

Measurement Data: Reading listed by frequency. Test Lead: Antenna Port 0

#	Freq MHz	Rdng dBµV	dB	dB	dB	dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	9.000k	51.2					+0.0	51.2	97.0	-45.8	Anten
2	86.268k	45.1					+0.0	45.1	97.0	-51.9	Anten
3	95.010k	43.1					+0.0	43.1	97.0	-53.9	Anten
4	2439.836M	116.6					+0.0	116.6	117.0	-0.4	Anten
5	15323.180 M	43.0					+0.0	43.0	97.0	-54.0	Anten
6	24776.620 M	44.2					+0.0	44.2	97.0	-52.8	Anten

Test Location:	CKC Laboratories, Inc. • 22116 23rd Dr SE • Bothell, WA 98021 • 800-500-4362		
Customer:	**Nalloy, LLC.**		
Specification:	**15.247(d) Conducted Spurious Emissions**		
Work Order #:	**102802**	Date:	3/27/2020
Test Type:	**Conducted Emissions**	Time:	10:06:39
Tested By:	Matthew Harrison	Sequence#:	50
Software:	EMITest 5.03.12		120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Environmental Conditions:
Temperature: 22° C
Humidity: 28%
Pressure: 101.3 kPa

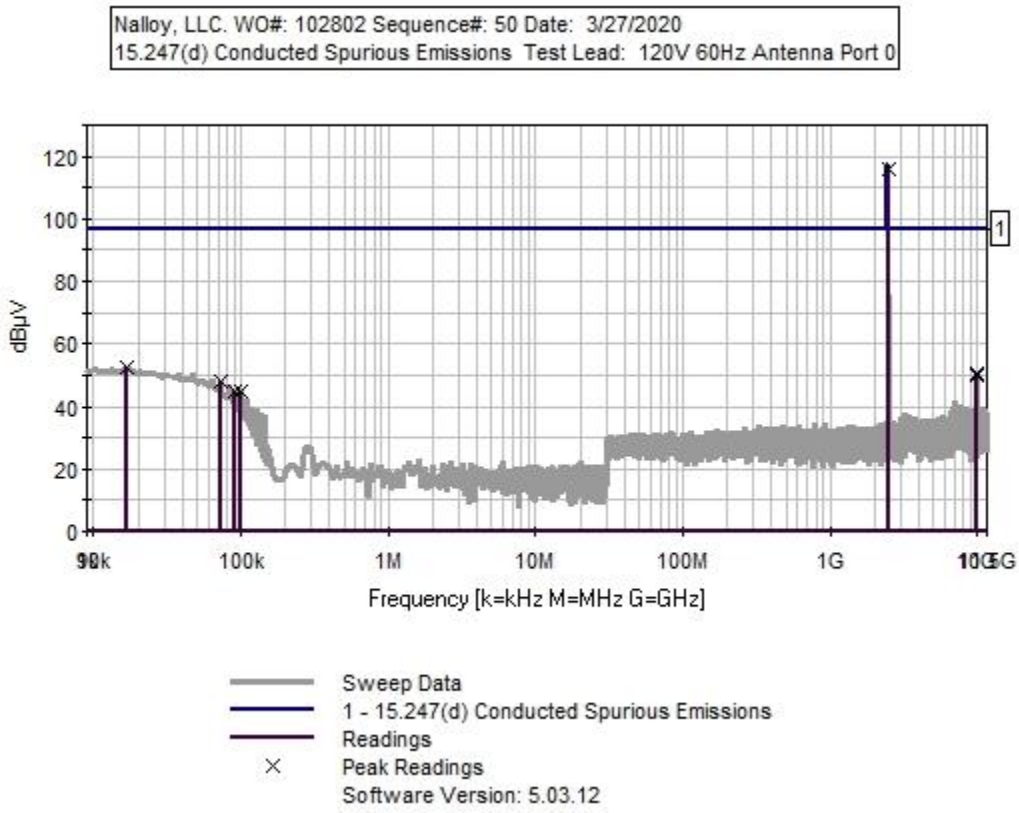
Frequency Range: 9kHz-25GHz
Frequency tested: 2480
Firmware power setting: 9
EUT Firmware:
Protocol /MCS/Modulation: BT, GFSK, DH1 (Worst-Case)

Antenna type: Linear Polarized
Antenna Gain: 3.7 dBi.

Duty Cycle: 100% Modulated

Test Method: ANSI C63.10: 2013
Test Mode: Transmitting
Test Setup: EUT is setup for conducted measurements.
Setup: EUT is connected to a Laptop via USB and Audio cable.

All data rates investigated, worst-case provided.



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02673	Spectrum Analyzer	E4446A	2/22/2019	2/22/2021

Measurement Data: Reading listed by margin. Test Lead: Antenna Port 0

#	Freq MHz	Rdng dBµV	dB	dB	dB	dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	2479.838M	116.1					+0.0	116.1	117.0	-0.9	Anten
2	17.037k	52.3					+0.0	52.3	97.0	-44.7	Anten
3	9920.480M	50.5					+0.0	50.5	97.0	-46.5	Anten
4	9919.980M	49.8					+0.0	49.8	97.0	-47.2	Anten
5	73.437k	47.9					+0.0	47.9	97.0	-49.1	Anten

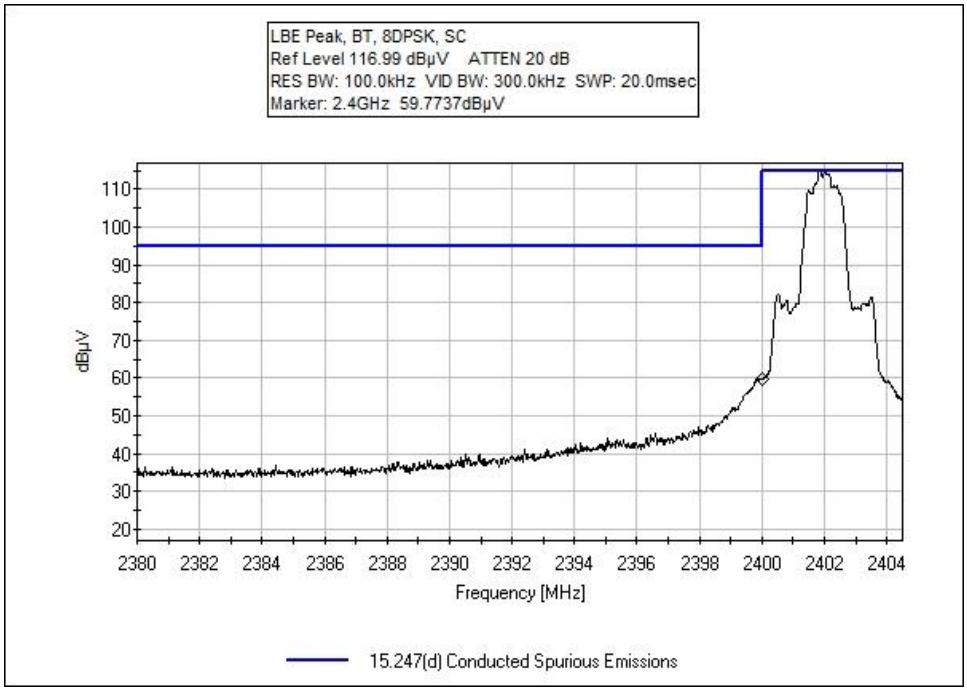
6	91.062k	44.8		+0.0	44.8	97.0	-52.2	Anten
7	99.945k	44.6		+0.0	44.6	97.0	-52.4	Anten
8	24791.000 M	44.2		+0.0	44.2	97.0	-52.8	Anten
9	23647.290 M	43.2		+0.0	43.2	97.0	-53.8	Anten

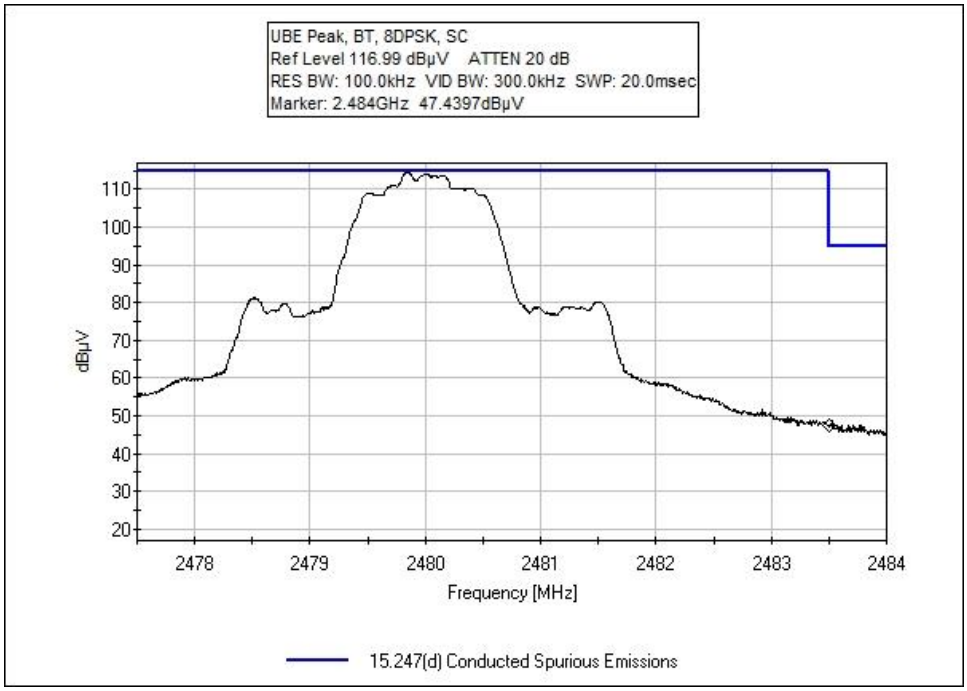
Band Edge

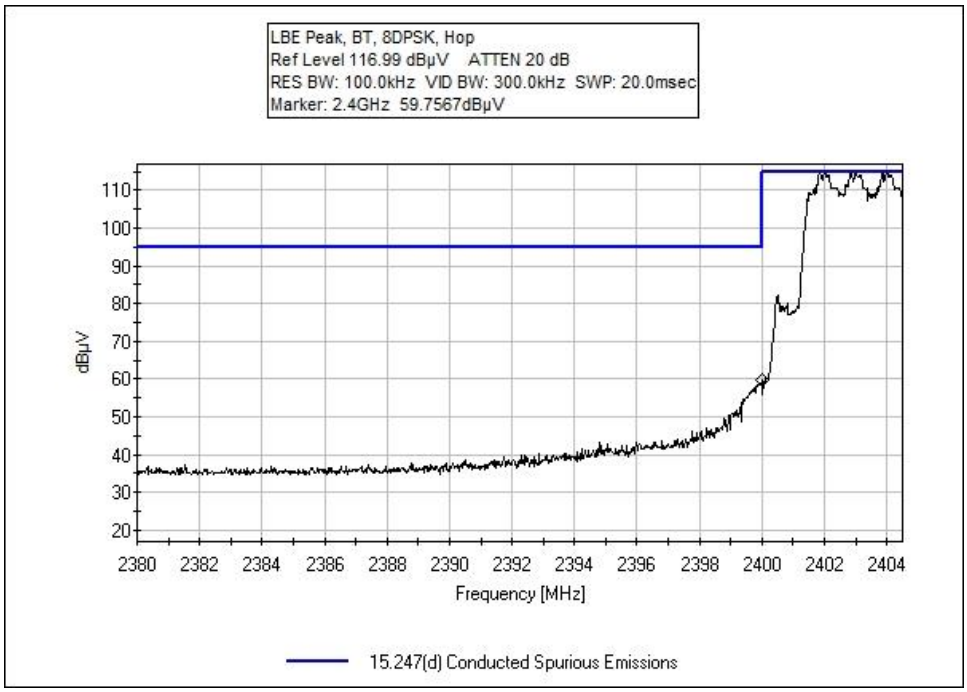
Band Edge Summary				
Limit applied: Max Power/100kHz - 20dB. Operating Mode: Single Channel (Low and High)				
Frequency (MHz)	**Modulation**	**Measured (dBm)**	**Limit (dBm)**	**Results**
2400	GFSK	62.6	<97	Pass
2483.5	GFSK	50.7	<97	Pass
2400	π/4 DQPSK	59.4	<95	Pass
2483.5	π/4 DQPSK	48.5	<95	Pass
2400	8DPSK	59.8	<95	Pass
2483.5	8DPSK	47.4	<95	Pass

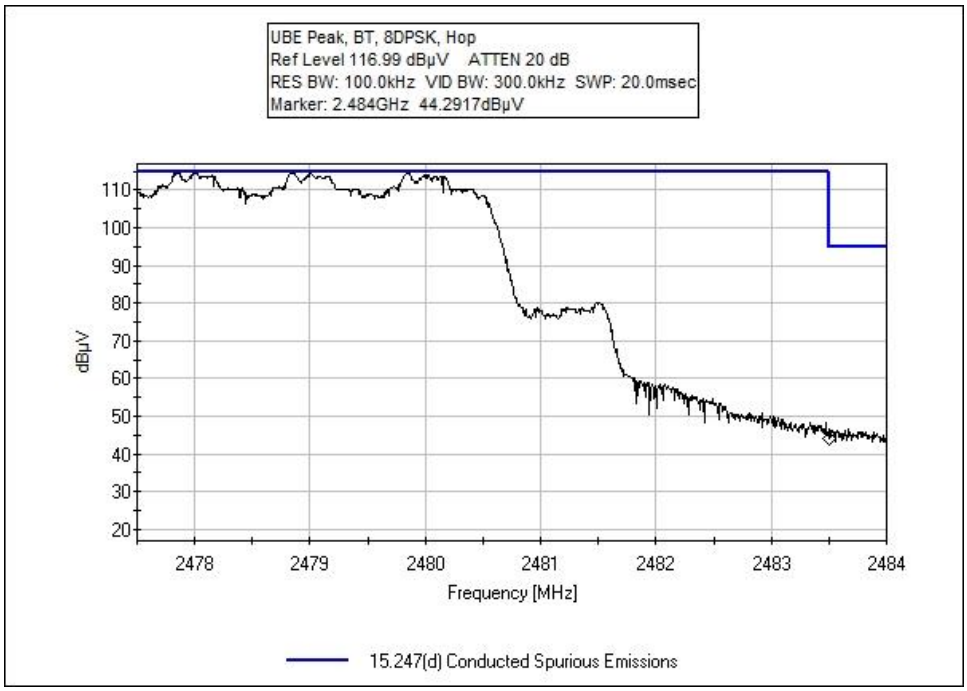
Band Edge Summary				
Limit applied: Max Power/100kHz - 20dB. Operating Mode: Hopping				
Frequency (MHz)	**Modulation**	**Measured (dBm)**	**Limit (dBm)**	**Results**
2400	GFSK	62.2	<97	Pass
2483.5	GFSK	47.2	<97	Pass
2400	π/4 DQPSK	58.5	<95	Pass
2483.5	π/4 DQPSK	45.5	<95	Pass
2400	8DPSK	59.8	<95	Pass
2483.5	8DPSK	44.3	<95	Pass

8DPSK Band Edge Plots

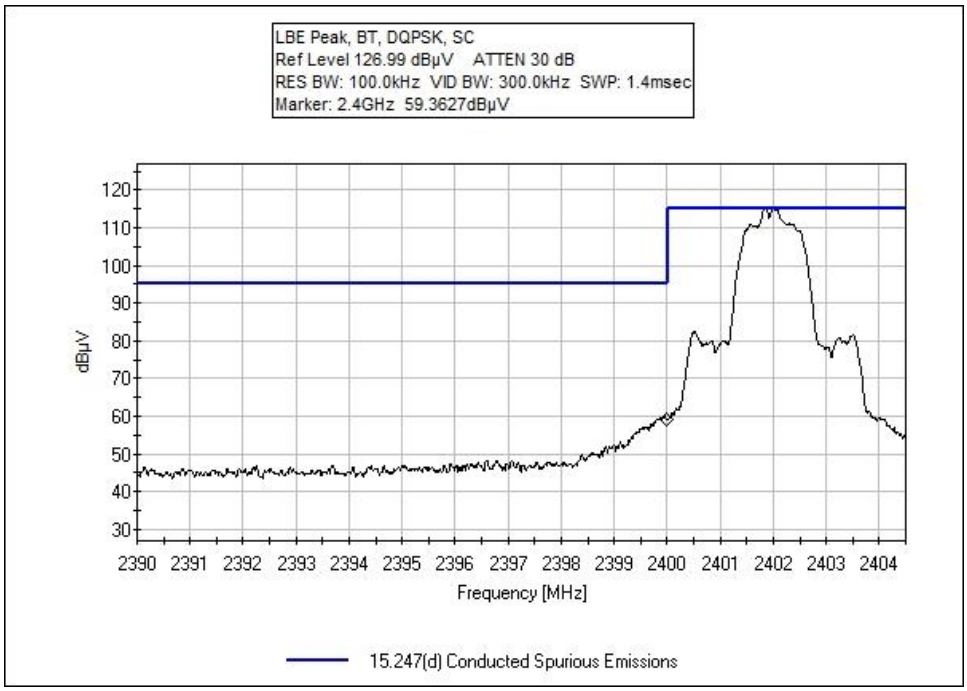


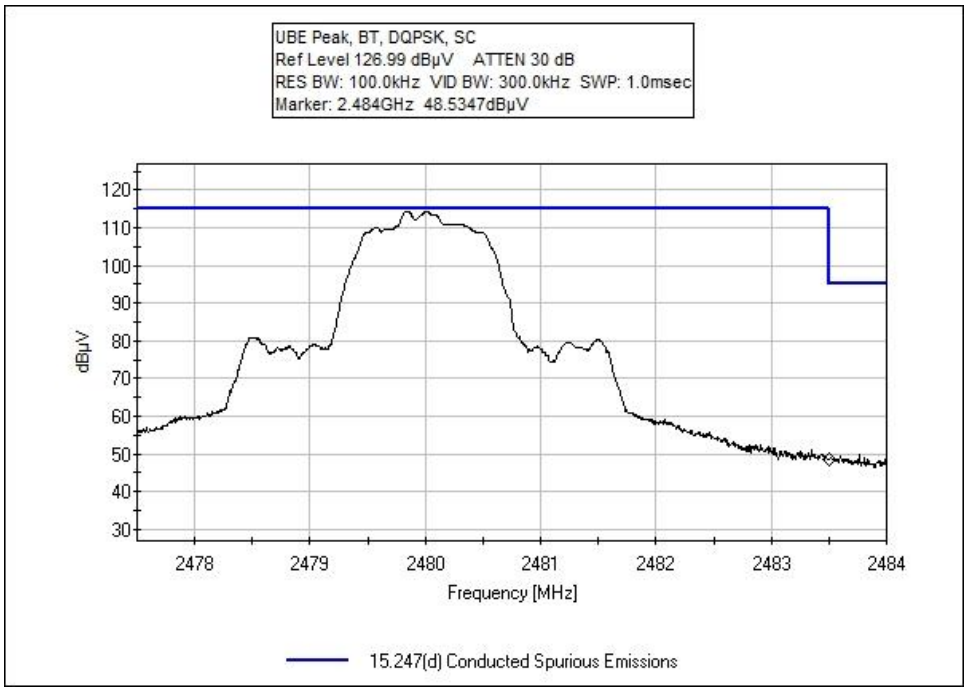


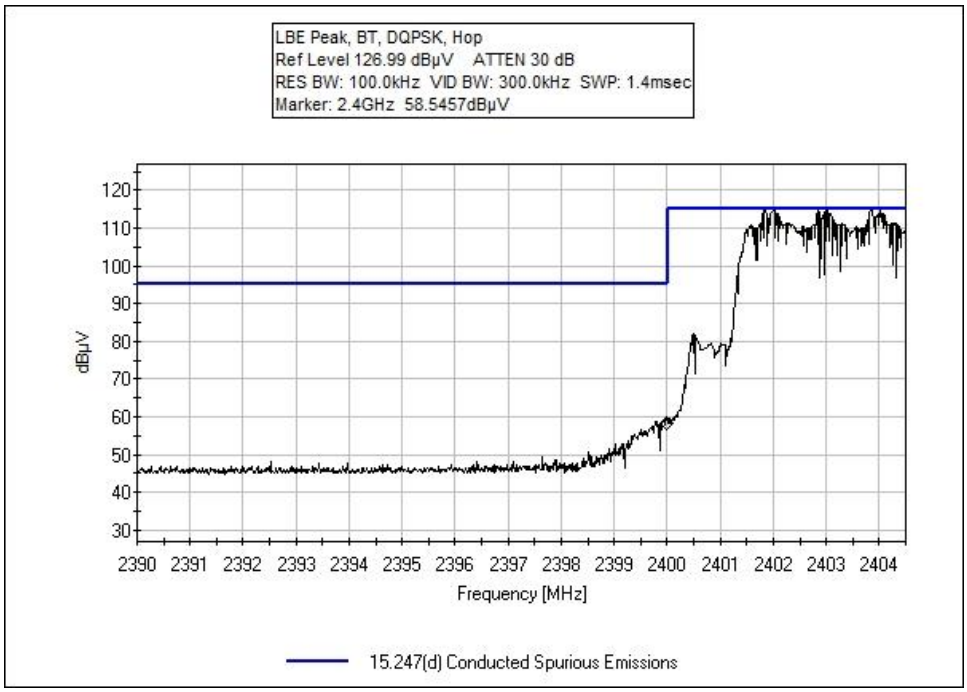

LBE Peak, BT, 8DPSK, Hop
Ref Level 116.99 dBµV ATTEN 20 dB
RES BW: 100.0kHz VID BW: 300.0kHz SWP: 20.0msec
Marker: 2.4GHz 59.7567dBµV
dBµV
110
100
90
80
70
60
50
40
30
20
2380 2382 2384 2386 2388 2390 2392 2394 2396 2398 2400 2402 2404
Frequency [MHz]
15.247(d) Conducted Spurious Emissions

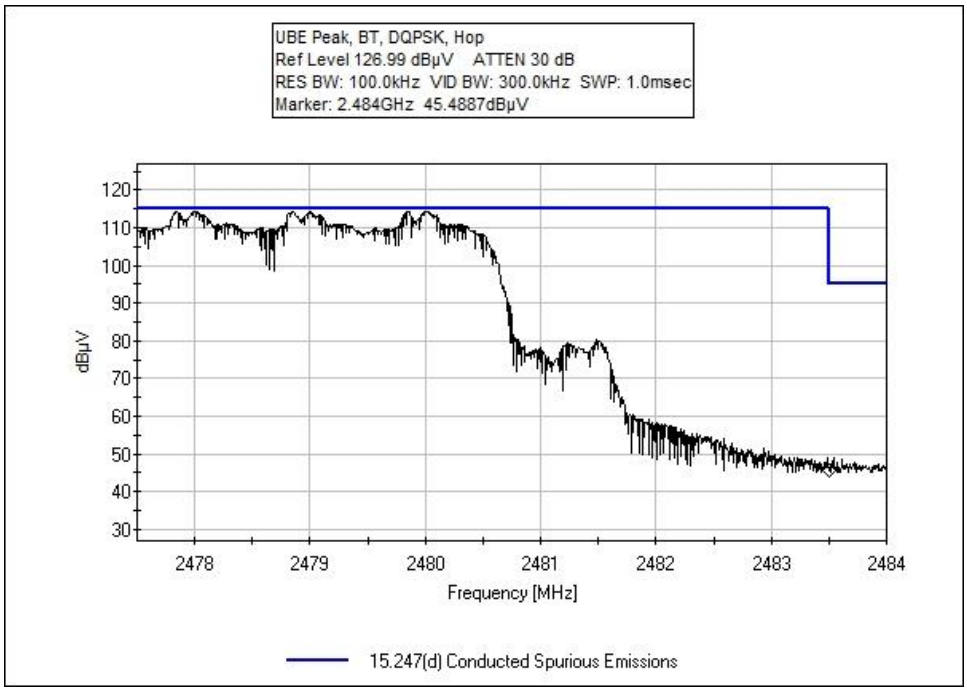

UBE Peak, BT, 8DPSK, Hop
Ref Level 116.99 dBµV ATTEN 20 dB
RES BW: 100.0kHz VID BW: 300.0kHz SWP: 20.0msec
Marker: 2.484GHz 44.2917dBµV
dBµV
110
100
90
80
70
60
50
40
30
20
2478 2479 2480 2481 2482 2483 2484
Frequency [MHz]
15.247(d) Conducted Spurious Emissions

DQPSK Band Edge Plots

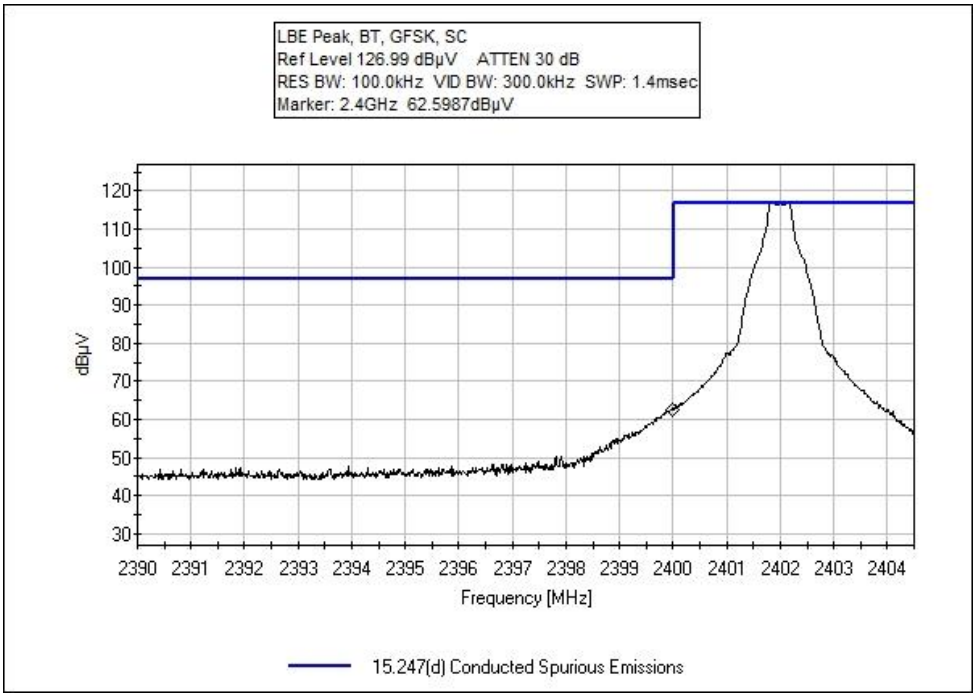


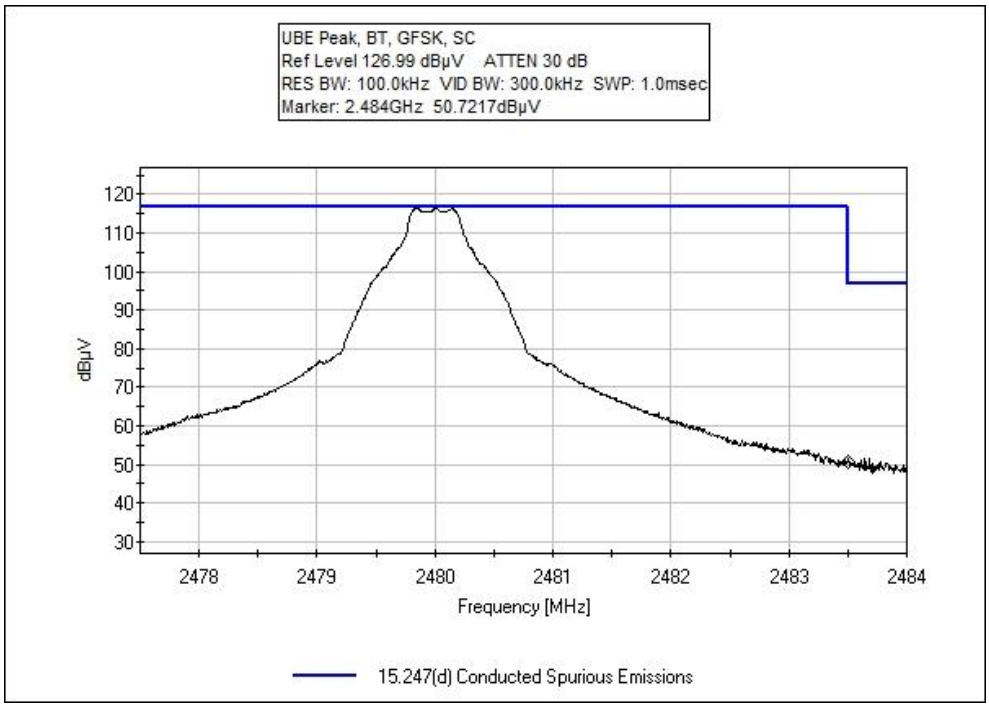


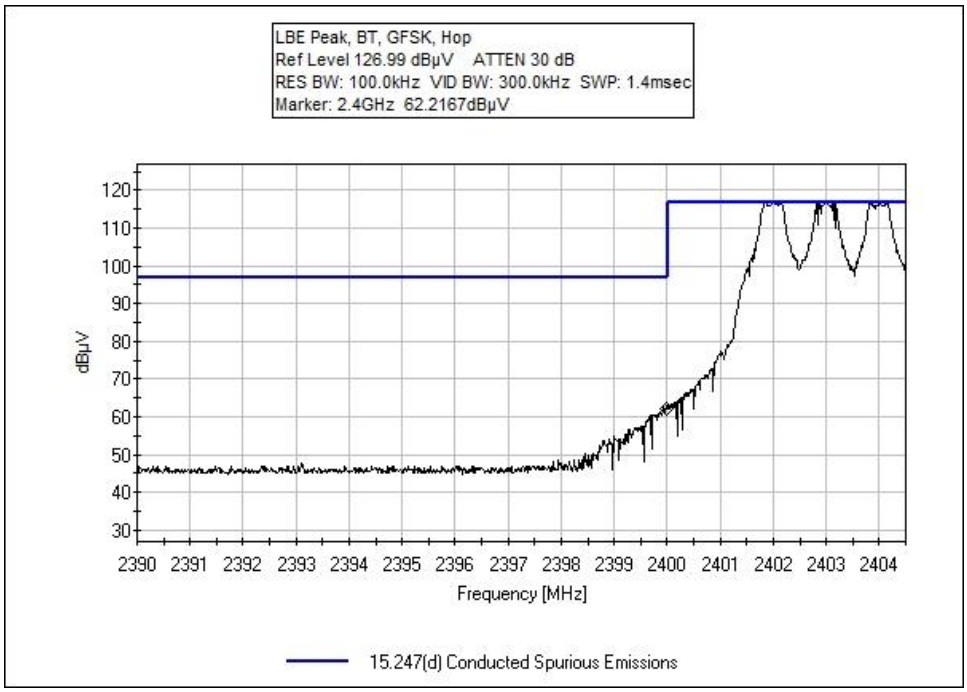

LBE Peak, BT, DQPSK, Hop
Ref Level 126.99 dBµV ATTEN 30 dB
RES BW: 100.0kHz VID BW: 300.0kHz SWP: 1.4msec
Marker: 2.4GHz 58.5457dBµV
dBµV
120
110
100
90
80
70
60
50
40
30
2390 2391 2392 2393 2394 2395 2396 2397 2398 2399 2400 2401 2402 2403 2404
Frequency [MHz]
15.247(d) Conducted Spurious Emissions

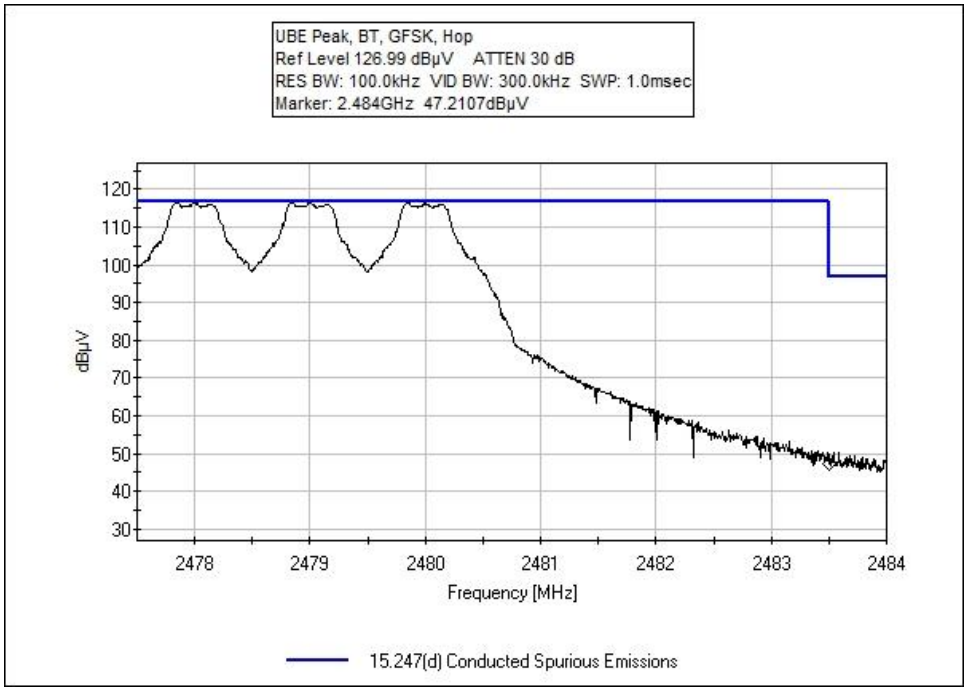

UBE Peak, BT, DQPSK, Hop
Ref Level 126.99 dBµV ATTEN 30 dB
RES BW: 100.0kHz VID BW: 300.0kHz SWP: 1.0msec
Marker: 2.484GHz 45.4887dBµV
dBµV
120
110
100
90
80
70
60
50
40
30
2478 2479 2480 2481 2482 2483 2484
Frequency [MHz]
15.247(d) Conducted Spurious Emissions

GFSK Band Edge Plots






LBE Peak, BT, GFSK, Hop
Ref Level 126.99 dBµV ATTEN 30 dB
RES BW: 100.0kHz VID BW: 300.0kHz SWP: 1.4msec
Marker: 2.4GHz 62.2167dBµV
dBµV
120
110
100
90
80
70
60
50
40
30
2390 2391 2392 2393 2394 2395 2396 2397 2398 2399 2400 2401 2402 2403 2404
Frequency [MHz]
15.247(d) Conducted Spurious Emissions


UBE Peak, BT, GFSK, Hop
Ref Level 126.99 dBµV ATTEN 30 dB
RES BW: 100.0kHz VID BW: 300.0kHz SWP: 1.0msec
Marker: 2.484GHz 47.2107dBµV
dBµV
120
110
100
90
80
70
60
50
40
30
2478 2479 2480 2481 2482 2483 2484
Frequency [MHz]
15.247(d) Conducted Spurious Emissions

Test Setup / Conditions / Data

Test Location:	CKC Laboratories, Inc. • 22116 23rd Dr SE • Bothell, WA 98021 • 800-500-4362		
Customer:	**Nalloy, LLC.**		
Specification:	**15.247(d) Conducted Spurious Emissions**		
Work Order #:	**102802**	Date:	3/27/2020
Test Type:	**Conducted Emissions**	Time:	06:57:17
Tested By:	Matthew Harrison	Sequence#:	48
Software:	EMITest 5.03.12		120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Environmental Conditions:
Temperature: 22° C
Humidity: 28%
Pressure: 101.3 kPa

Frequency Range: 2.4-2.4835GHz
Frequency tested: 2402, 2480
Firmware power setting: 9
EUT Firmware:
Protocol /MCS/Modulation: BT, 8DPSK, 3DH1 (Worst-Case)

Antenna type: Linear Polarized
Antenna Gain: 3.7 dBi.

Duty Cycle: 100% Modulated

Test Method: ANSI C63.10: 2013
Test Mode: Transmitting
Test Setup: EUT is setup for conducted measurements.
Setup: EUT is connected to a Laptop via USB and Audio cable.

All data rates investigated, worst-case provided.

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02673	Spectrum Analyzer	E4446A	2/22/2019	2/22/2021

Measurement Data: Reading listed by margin. Test Lead: Antenna Port 0

#	Freq MHz	Rdng dBµV	T1 dB	dB	dB	dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	2401.830M	115.0	+0.0				+0.0	115.0	115.0 SC	+0.0	Anten
2	2400.000M	59.8	+0.0				+0.0	59.8	95.0 SC	-35.2	Anten
3	2400.000M	59.8	+0.0				+0.0	59.8	95.0 Hop	-35.2	Anten
4	2483.500M	47.4	+0.0				+0.0	47.4	95.0 SC	-47.6	Anten
5	2483.500M	44.3	+0.0				+0.0	44.3	95.0 Hop	-50.7	Anten

Test Location:	CKC Laboratories, Inc. • 22116 23rd Dr SE • Bothell, WA 98021 • 800-500-4362		
Customer:	**Nalloy, LLC.**		
Specification:	**15.247(d) Conducted Spurious Emissions**		
Work Order #:	**102802**	Date:	3/26/2020
Test Type:	**Conducted Emissions**	Time:	16:47:44
Tested By:	Matthew Harrison	Sequence#:	47
Software:	EMITest 5.03.12		120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Environmental Conditions:
Temperature: 22° C
Humidity: 28%
Pressure: 101.3 kPa

Frequency Range: 2.4-2.4835GHz
Frequency tested: 2402, 2480
Firmware power setting: 9
EUT Firmware:
Protocol /MCS/Modulation: BT, DQPSK, 2DH1 (Worst-Case)

Antenna type: Linear Polarized
Antenna Gain: 3.7 dBi.

Duty Cycle: 100% Modulated

Test Method: ANSI C63.10: 2013
Test Mode: Transmitting
Test Setup: EUT is setup for conducted measurements.
Setup: EUT is connected to a Laptop via USB and Audio cable.

All data rates investigated, worst-case provided.

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02673	Spectrum Analyzer	E4446A	2/22/2019	2/22/2021

Measurement Data: Reading listed by margin. Test Lead: Antenna Port 0

#	Freq MHz	Rdng dBµV	T1 dB	dB	dB	dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	2401.830M	115.0	+0.0				+0.0	115.0	115.0 SC	+0.0	Anten
2	2400.000M	59.4	+0.0				+0.0	59.4	95.0 SC	-35.6	Anten
3	2400.000M	58.5	+0.0				+0.0	58.5	95.0 Hop	-36.5	Anten
4	2483.500M	48.5	+0.0				+0.0	48.5	95.0 SC	-46.5	Anten
5	2483.500M	45.5	+0.0				+0.0	45.5	95.0 Hop	-49.5	Anten

Test Location:	CKC Laboratories, Inc. • 22116 23rd Dr SE • Bothell, WA 98021 • 800-500-4362		
Customer:	**Nalloy, LLC.**		
Specification:	**15.247(d) Conducted Spurious Emissions**		
Work Order #:	**102802**	Date:	3/26/2020
Test Type:	**Conducted Emissions**	Time:	16:26:40
Tested By:	Matthew Harrison	Sequence#:	46
Software:	EMITest 5.03.12		120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Environmental Conditions:
Temperature: 22° C
Humidity: 28%
Pressure: 101.3 kPa

Frequency Range: 2.4-2.4835GHz
Frequency tested: 2402, 2440, 2480
Firmware power setting: 9
EUT Firmware:
Protocol /MCS/Modulation: BT, GFSK, DH1 (Worst-Case)

Antenna type: Linear Polarized
Antenna Gain: 3.7 dBi.

Duty Cycle: 100% Modulated

Test Method: ANSI C63.10: 2013
Test Mode: Transmitting
Test Setup: EUT is setup for conducted measurements.
Setup: EUT is connected to a Laptop via USB and Audio cable.

All data rates investigated, worst-case provided.

Test Equipment:

ID	Asset #/Serial #	Description	Model	Calibration Date	Cal Due Date
T1	AN02673	Spectrum Analyzer	E4446A	2/22/2019	2/22/2021

Measurement Data: Reading listed by margin. Test Lead: Antenna Port 0

#	Freq MHz	Rdng dBµV	T1 dB	dB	dB	dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	2402.137M	117.0	+0.0				+0.0	117.0	117.0 SC	+0.0	Anten
2	2400.000M	62.6	+0.0				+0.0	62.6	97.0 SC	-34.4	Anten
3	2400.000M	62.2	+0.0				+0.0	62.2	97.0 Hop	-34.8	Anten
4	2483.500M	50.7	+0.0				+0.0	50.7	97.0 SC	-46.3	Anten
5	2483.500M	47.2	+0.0				+0.0	47.2	97.0	-49.8	Anten

Test Setup Photo(s)

15.247(d) Radiated Emissions & Band Edge

Test Setup / Conditions / Data

Test Location:	CKC Laboratories, Inc. • 22116 23rd Dr SE • Bothell, WA 98021 • 800-500-4362		
Customer:	**Nalloy, LLC.**		
Specification:	**15.247(d) / 15.209 Radiated Spurious Emissions**		
Work Order #:	**102802**	Date:	4/7/2020
Test Type:	**Maximized Emissions**	Time:	10:12:27
Tested By:	Matthew Harrison	Sequence#:	83
Software:	EMITest 5.03.12		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Environmental Conditions:
Temperature: 21° C
Humidity: 33%
Pressure: 101.3 kPa

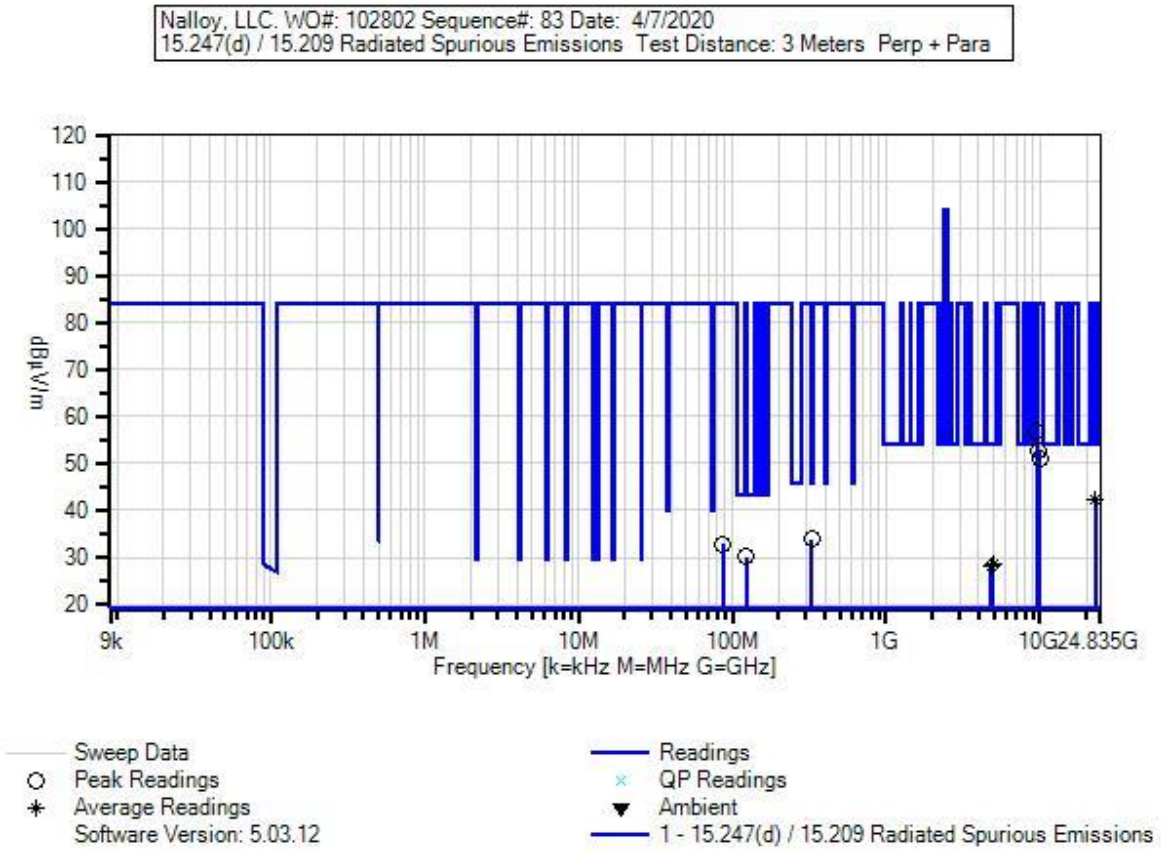
Frequency Range: 9kHz-25GHz
Frequency tested: 2402, 2440, 2480
Firmware power setting: 9
EUT Firmware:
Protocol /MCS/Modulation: BT, 8DPSK, 3DH1 (Worst-Case)

Antenna type: Linear Polarized
Antenna Gain: 3.7 dBi.

Duty Cycle: 100% Modulated

Test Method: ANSI C63.10: 2013
Test Mode: Transmitting
Test Setup: EUT is setup 1.5m high on a Styrofoam table.
Setup: EUT is connected to a Laptop via USB and Audio cable.

All data rates and Low, Mid, High channels investigated, worst-case provided.


Nalloy, LLC. WO#: 102802 Sequence#: 83 Date: 4/7/2020
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Perp + Para
120
110
100
90
80
70
60
50
40
30
20
dBµV/m
9k
100k
1M
10M
100M
1G
10G24.835G
Frequency [k=kHz M=MHz G=GHz]
Sweep Data
Peak Readings
Average Readings
Software Version: 5.03.12
Readings
QP Readings
Ambient
1 - 15.247(d) / 15.209 Radiated Spurious Emissions

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN01467	Horn Antenna-ANSI C63.5 Calibration	3115	7/5/2019	7/5/2021
T2	ANP06515	Cable	Heliax	6/29/2018	6/29/2020
T3	ANP06540	Cable	Heliax	8/23/2019	8/23/2021
T4	AN02872	Spectrum Analyzer	E4440A	11/18/2019	11/18/2021
T5	AN03540	Preamp	83017A	5/13/2019	5/13/2021
T6	ANP07504	Cable	CLU40-KMKM-02.00F	1/17/2019	1/17/2021
T7	AN03116	High Pass Filter	11SH10-00313	1/22/2019	1/22/2021
T8	AN02763-69	Waveguide	Multiple	4/23/2018	4/23/2020
T9	ANP06678	Cable	32026-29801-29801-144	2/20/2020	2/20/2022
T10	ANP07211	Cable	32026-29801-29801-18	8/7/2019	8/7/2021
T11	ANP07212	Cable	32026-29801-29801-18	8/7/2019	8/7/2021
T12	AN02742	Active Horn Antenna	AMFW-5F-18002650-20-10P	10/16/2018	10/16/2020
T13	AN02307	Preamp	8447D	1/10/2020	1/10/2022
T14	AN03628	Biconilog Antenna	3142E	6/11/2019	6/11/2021
T15	ANP06123	Attenuator	18N-6	4/5/2019	4/5/2021
T16	ANP05305	Cable	ETSI-50T	9/6/2019	9/6/2021
T17	ANP05360	Cable	RG214	2/3/2020	2/3/2022
T18	AN00052	Loop Antenna	6502	5/7/2018	5/7/2020

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq	Rdng	T1 T5 T9 T13 T17	T2 T6 T10 T14 T18	T3 T7 T11 T15	T4 T8 T12 T16	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	22979.840 M Ave	44.9	+0.0 +0.0 +9.5 +0.0 +0.0	+0.0 +0.0 +0.8 +0.0 +0.0	+0.0 +0.0 +1.3 +0.0	+0.0 +1.7 -15.8 +0.0	+0.0	42.4	54.0	-11.6	Vert
^	22979.840 M	50.5	+0.0 +0.0 +9.5 +0.0 +0.0	+0.0 +0.0 +0.8 +0.0 +0.0	+0.0 +0.0 +1.3 +0.0	+0.0 +1.7 -15.8 +0.0	+0.0	48.0	54.0	-6.0	Vert

3	328.800M	38.4	+0.0	+0.0	+0.2	+0.0	+0.0	33.9	46.0	-12.1	Vert
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			-27.1	+14.5	+5.8	+0.9					
			+1.2	+0.0							
4	123.100M	42.7	+0.0	+0.0	+0.1	+0.0	+0.0	30.1	43.5	-13.4	Vert
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			-27.6	+7.9	+5.8	+0.5					
			+0.7	+0.0							
5	4960.000M	23.7	+32.6	+4.2	+0.9	+0.0	+0.0	28.7	54.0	-25.3	Vert
	Ave		-33.6	+0.4	+0.5	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0							
^	4960.000M	38.4	+32.6	+4.2	+0.9	+0.0	+0.0	43.4	54.0	-10.6	Vert
			-33.6	+0.4	+0.5	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0							
7	4804.000M	23.3	+32.4	+4.1	+0.9	+0.0	+0.0	28.3	54.0	-25.7	Vert
	Ave		-33.6	+0.6	+0.6	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0							
^	4804.000M	36.5	+32.4	+4.1	+0.9	+0.0	+0.0	41.5	54.0	-12.5	Vert
			-33.6	+0.6	+0.6	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0							
9	4880.000M	23.1	+32.5	+4.2	+0.9	+0.0	+0.0	28.1	54.0	-25.9	Vert
	Ave		-33.6	+0.5	+0.5	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0							
^	4880.000M	36.7	+32.5	+4.2	+0.9	+0.0	+0.0	41.7	54.0	-12.3	Vert
			-33.6	+0.5	+0.5	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0							
11	9607.945M	43.9	+37.6	+6.2	+1.4	+0.0	+0.0	56.7	84.1	-27.4	Vert
			-33.9	+0.5	+1.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0							
12	9759.730M	40.4	+37.5	+6.3	+1.3	+0.0	+0.0	52.7	84.1	-31.4	Vert
			-33.9	+0.4	+0.7	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0							

13	9919.195M	38.6	+37.5	+6.3	+1.3	+0.0	+0.0	51.1	84.1	-33.0	Vert
			-33.9	+0.5	+0.8	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0							
14	87.200M	46.8	+0.0	+0.0	+0.1	+0.0	+0.0	32.8	84.1	-51.3	Vert
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			-27.8	+7.0	+5.8	+0.4					
			+0.5	+0.0							
15	25.373M	20.7	+0.0	+0.3	+0.1	+0.0	-40.0	-12.0	84.1	-96.1	Perp
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+6.9							
16	27.343M	20.3	+0.0	+0.3	+0.1	+0.0	-40.0	-13.0	84.1	-97.1	Perp
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+6.3							
17	74.988k	39.3	+0.0	+0.0	+0.0	+0.0	-80.0	-31.0	84.1	-115.1	Perp
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+9.7							

Test Location:	CKC Laboratories, Inc. • 22116 23rd Dr SE • Bothell, WA 98021 • 800-500-4362		
Customer:	**Nalloy, LLC.**		
Specification:	**15.247(d) / 15.209 Radiated Spurious Emissions**		
Work Order #:	**102802**	Date:	4/7/2020
Test Type:	**Maximized Emissions**	Time:	10:23:24
Tested By:	Matthew Harrison	Sequence#:	82
Software:	EMITest 5.03.12		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Environmental Conditions:
Temperature: 21° C
Humidity: 33%
Pressure: 101.3 kPa

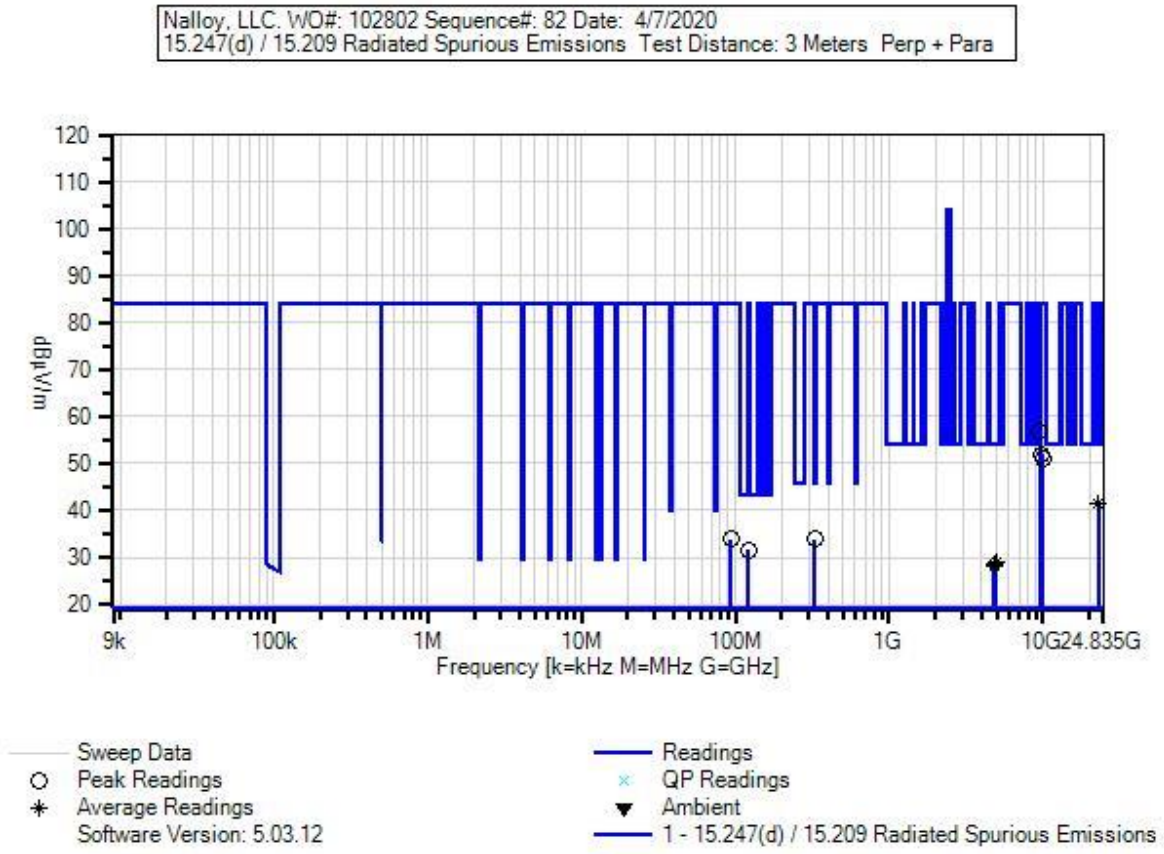
Frequency Range: 9kHz-25GHz
Frequency tested: 2402, 2440, 2480
Firmware power setting: 9
EUT Firmware:
Protocol /MCS/Modulation: BT, DQPSK, 2DH1 (Worst-Case)

Antenna type: Linear Polarized
Antenna Gain: 3.7 dBi.

Duty Cycle: 100% Modulated

Test Method: ANSI C63.10: 2013
Test Mode: Transmitting
Test Setup: EUT is setup 1.5m high on a Styrofoam table.
Setup: EUT is connected to a Laptop via USB and Audio cable.

All data rates and Low, Mid, High channels investigated, worst-case provided.


Nalloy, LLC. WO#: 102802 Sequence#: 82 Date: 4/7/2020
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Perp + Para
120
110
100
90
80
70
60
50
40
30
20
dBµV/m
9k
100k
1M
10M
100M
1G
10G24.835G
Frequency [k=kHz M=MHz G=GHz]
Sweep Data
Peak Readings
Average Readings
Software Version: 5.03.12
Readings
QP Readings
Ambient
1 - 15.247(d) / 15.209 Radiated Spurious Emissions

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN01467	Horn Antenna-ANSI C63.5 Calibration	3115	7/5/2019	7/5/2021
T2	ANP06515	Cable	Heliax	6/29/2018	6/29/2020
T3	ANP06540	Cable	Heliax	8/23/2019	8/23/2021
	AN02872	Spectrum Analyzer	E4440A	11/18/2019	11/18/2021
T4	AN03540	Preamp	83017A	5/13/2019	5/13/2021
T5	ANP07504	Cable	CLU40-KMKM-02.00F	1/17/2019	1/17/2021
T6	AN03116	High Pass Filter	11SH10-00313	1/22/2019	1/22/2021
T7	AN02742	Active Horn Antenna	AMFW-5F-18002650-20-10P	10/16/2018	10/16/2020
T8	AN02763-69	Waveguide	Multiple	4/23/2018	4/23/2020
T9	ANP06678	Cable	32026-29801-29801-144	2/20/2020	2/20/2022
T10	ANP07211	Cable	32026-29801-29801-18	8/7/2019	8/7/2021
T11	ANP07212	Cable	32026-29801-29801-18	8/7/2019	8/7/2021
T12	AN02307	Preamp	8447D	1/10/2020	1/10/2022
T13	AN03628	Biconilog Antenna	3142E	6/11/2019	6/11/2021
T14	ANP06123	Attenuator	18N-6	4/5/2019	4/5/2021
T15	ANP05305	Cable	ETSI-50T	9/6/2019	9/6/2021
T16	ANP05360	Cable	RG214	2/3/2020	2/3/2022
T17	AN00052	Loop Antenna	6502	5/7/2018	5/7/2020

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq	Rdng	T1 T5 T9 T13 T17	T2 T6 T10 T14	T3 T7 T11 T15	T4 T8 T12 T16	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	328.800M	38.3	+0.0 +0.0 +0.0 +14.5 +0.0	+0.0 +0.0 +0.0 +5.8	+0.2 +0.0 +0.0 +0.9	+0.0 +0.0 -27.1 +1.2	+0.0	33.8	46.0	-12.2	Vert

2	22979.910 M Ave	43.9	+0.0 +0.0 +9.5 +0.0 +0.0	+0.0 +0.0 +0.8 +0.0	+0.0 -15.8 +1.3 +0.0	+0.0 +1.7 +0.0 +0.0	+0.0	41.4	54.0	-12.6	Vert
^	22979.910 M	50.2	+0.0 +0.0 +9.5 +0.0 +0.0	+0.0 +0.0 +0.8 +0.0	+0.0 -15.8 +1.3 +0.0	+0.0 +1.7 +0.0 +0.0	+0.0	47.7	54.0	-6.3	Vert
4	4960.000M Ave	23.8	+32.6 +0.4 +0.0 +0.0 +0.0	+4.2 +0.5 +0.0 +0.0	+0.9 +0.0 +0.0 +0.0	-33.6 +0.0 +0.0 +0.0	+0.0	28.8	54.0	-25.2	Vert
^	4960.000M	39.7	+32.6 +0.4 +0.0 +0.0 +0.0	+4.2 +0.5 +0.0 +0.0	+0.9 +0.0 +0.0 +0.0	-33.6 +0.0 +0.0 +0.0	+0.0	44.7	54.0	-9.3	Vert
6	4804.000M Ave	23.4	+32.4 +0.6 +0.0 +0.0 +0.0	+4.1 +0.6 +0.0 +0.0	+0.9 +0.0 +0.0 +0.0	-33.6 +0.0 +0.0 +0.0	+0.0	28.4	54.0	-25.6	Vert
^	4804.000M	38.3	+32.4 +0.6 +0.0 +0.0 +0.0	+4.1 +0.6 +0.0 +0.0	+0.9 +0.0 +0.0 +0.0	-33.6 +0.0 +0.0 +0.0	+0.0	43.3	54.0	-10.7	Vert
8	4880.000M Ave	23.1	+32.5 +0.5 +0.0 +0.0 +0.0	+4.2 +0.5 +0.0 +0.0	+0.9 +0.0 +0.0 +0.0	-33.6 +0.0 +0.0 +0.0	+0.0	28.1	54.0	-25.9	Vert
^	4880.000M	38.2	+32.5 +0.5 +0.0 +0.0 +0.0	+4.2 +0.5 +0.0 +0.0	+0.9 +0.0 +0.0 +0.0	-33.6 +0.0 +0.0 +0.0	+0.0	43.2	54.0	-10.8	Vert
10	9608.390M	43.9	+37.6 +0.5 +0.0 +0.0 +0.0	+6.2 +1.0 +0.0 +0.0	+1.4 +0.0 +0.0 +0.0	-33.9 +0.0 +0.0 +0.0	+0.0	56.7	84.0	-27.3	Vert
11	9760.905M	39.6	+37.5 +0.4 +0.0 +0.0 +0.0	+6.3 +0.7 +0.0 +0.0	+1.3 +0.0 +0.0 +0.0	-33.9 +0.0 +0.0 +0.0	+0.0	51.9	84.0	-32.1	Vert

12	9920.540M	38.5	+37.5 +0.5 +0.0 +0.0 +0.0	+6.3 +0.8 +0.0 +0.0	+1.3 +0.0 +0.0 +0.0	-33.9 +0.0 +0.0 +0.0	+0.0	51.0	84.0	-33.0	Vert
13	93.000M	47.1	+0.0 +0.0 +0.0 +7.4 +0.0	+0.0 +0.0 +0.0 +5.8	+0.1 +0.0 +0.0 +0.5	+0.0 +0.0 -27.7 +0.6	+0.0	33.8	84.0	-50.2	Vert
14	122.200M	44.1	+0.0 +0.0 +0.0 +7.9 +0.0	+0.0 +0.0 +0.0 +5.8	+0.1 +0.0 +0.0 +0.5	+0.0 +0.0 -27.6 +0.7	+0.0	31.5	84.0	-52.5	Vert
15	26.478M	22.0	+0.0 +0.0 +0.0 +0.0 +6.6	+0.3 +0.0 +0.0 +0.0	+0.1 +0.0 +0.0 +0.0	+0.0 +0.0 +0.0 +0.0	-40.0	-11.0	84.0	-95.0	Perp
16	83.025k	38.0	+0.0 +0.0 +0.0 +0.0 +9.7	+0.0 +0.0 +0.0 +0.0	+0.0 +0.0 +0.0 +0.0	+0.0 +0.0 +0.0 +0.0	-80.0	-32.3	84.0	-116.3	Perp

Test Location:	CKC Laboratories, Inc. • 22116 23rd Dr SE • Bothell, WA 98021 • 800-500-4362		
Customer:	**Nalloy, LLC.**		
Specification:	**15.247(d) / 15.209 Radiated Spurious Emissions**		
Work Order #:	**102802**	Date:	4/7/2020
Test Type:	**Maximized Emissions**	Time:	10:37:45
Tested By:	Matthew Harrison	Sequence#:	81
Software:	EMITest 5.03.12		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Environmental Conditions:
Temperature: 21° C
Humidity: 33%
Pressure: 101.3 kPa

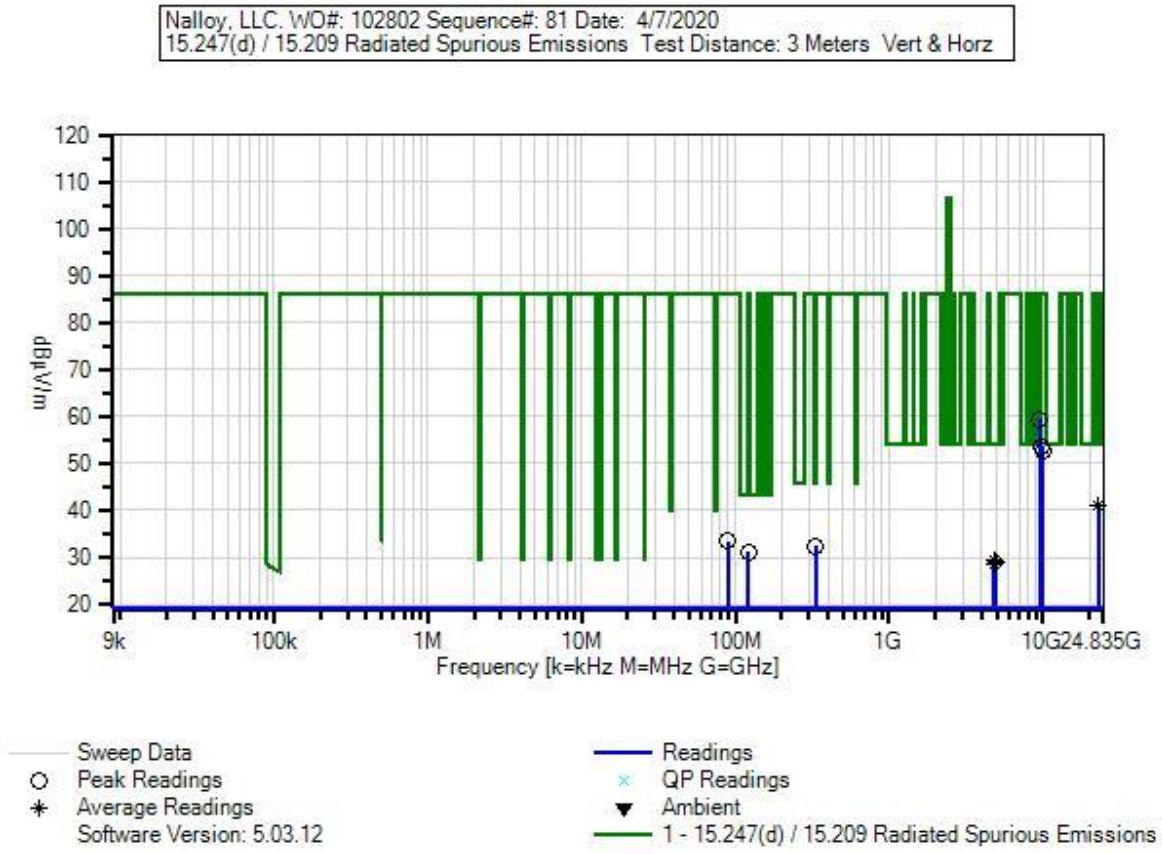
Frequency Range: 9kHz-25GHz
Frequency tested: 2402, 2440, 2480
Firmware power setting: 9
EUT Firmware:
Protocol /MCS/Modulation: BT, GFSK, DH1 (Worst-Case)

Antenna type: Linear Polarized
Antenna Gain: 3.7 dBi.

Duty Cycle: 100% Modulated

Test Method: ANSI C63.10: 2013
Test Mode: Transmitting
Test Setup: EUT is setup 1.5m high on a Styrofoam table for above 1GHz and 0.8m high below 1GHz.
Setup: EUT is connected to a Laptop via USB and Audio cable.

All data rates and Low, Mid, High channels investigated, worst-case provided.


Nalloy, LLC. WO#: 102802 Sequence#: 81 Date: 4/7/2020
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Vert & Horz
120
110
100
90
80
70
60
50
40
30
20
dBµV/m
9k
100k
1M
10M
100M
1G
10G24.835G
Frequency [k=kHz M=MHz G=GHz]
Sweep Data
Peak Readings
Average Readings
Software Version: 5.03.12
Readings
QP Readings
Ambient
1 - 15.247(d) / 15.209 Radiated Spurious Emissions

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN01467	Horn Antenna-ANSI C63.5 Calibration	3115	7/5/2019	7/5/2021
T2	ANP06515	Cable	Heliax	6/29/2018	6/29/2020
T3	ANP06540	Cable	Heliax	8/23/2019	8/23/2021
	AN02872	Spectrum Analyzer	E4440A	11/18/2019	11/18/2021
T4	AN03540	Preamp	83017A	5/13/2019	5/13/2021
T5	ANP07504	Cable	CLU40-KMKM-02.00F	1/17/2019	1/17/2021
T6	AN03116	High Pass Filter	11SH10-00313	1/22/2019	1/22/2021
T7	AN02742	Active Horn Antenna	AMFW-5F-18002650-20-10P	10/16/2018	10/16/2020
T8	AN02763-69	Waveguide	Multiple	4/23/2018	4/23/2020
T9	ANP06678	Cable	32026-29801-29801-144	2/20/2020	2/20/2022
T10	ANP07211	Cable	32026-29801-29801-18	8/7/2019	8/7/2021
T11	ANP07212	Cable	32026-29801-29801-18	8/7/2019	8/7/2021
T12	AN02307	Preamp	8447D	1/10/2020	1/10/2022
T13	AN03628	Biconilog Antenna	3142E	6/11/2019	6/11/2021
T14	ANP06123	Attenuator	18N-6	4/5/2019	4/5/2021
T15	ANP05305	Cable	ETSI-50T	9/6/2019	9/6/2021
T16	ANP05360	Cable	RG214	2/3/2020	2/3/2022

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq	Rdng	T1 T5 T9 T13	T2 T6 T10 T14	T3 T7 T11 T15	T4 T8 T12 T16	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	121.200M	43.7	+0.0 +0.0 +0.0 +8.0	+0.0 +0.0 +0.0 +5.8	+0.1 +0.0 +0.0 +0.5	+0.0 +0.0 -27.6 +0.7	+0.0	31.2	43.5	-12.3	Vert
2	22979.880 M Ave	43.4	+0.0 +0.0 +9.5 +0.0	+0.0 +0.0 +0.8 +0.0	+0.0 -15.8 +1.3 +0.0	+0.0 +1.7 +0.0 +0.0	+0.0	40.9	54.0	-13.1	Vert
^	22979.880 M	49.7	+0.0 +0.0 +9.5 +0.0	+0.0 +0.0 +0.8 +0.0	+0.0 -15.8 +1.3 +0.0	+0.0 +1.7 +0.0 +0.0	+0.0	47.2	54.0	-6.8	Vert
4	330.700M	36.9	+0.0 +0.0 +0.0 +14.6	+0.0 +0.0 +0.0 +5.8	+0.2 +0.0 +0.0 +0.9	+0.0 +0.0 -27.1 +1.2	+0.0	32.5	46.0	-13.5	Vert

5	4804.000M	24.5	+32.4	+4.1	+0.9	-33.6	+0.0	29.5	54.0	-24.5	Vert
	Ave		+0.6	+0.6	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
^	4804.000M	39.9	+32.4	+4.1	+0.9	-33.6	+0.0	44.9	54.0	-9.1	Vert
			+0.6	+0.6	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
7	4960.000M	24.1	+32.6	+4.2	+0.9	-33.6	+0.0	29.1	54.0	-24.9	Vert
	Ave		+0.4	+0.5	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
^	4960.000M	39.6	+32.6	+4.2	+0.9	-33.6	+0.0	44.6	54.0	-9.4	Vert
			+0.4	+0.5	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
9	4880.000M	23.5	+32.5	+4.2	+0.9	-33.6	+0.0	28.5	54.0	-25.5	Vert
	Ave		+0.5	+0.5	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
^	4880.000M	39.4	+32.5	+4.2	+0.9	-33.6	+0.0	44.4	54.0	-9.6	Vert
			+0.5	+0.5	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
11	9608.585M	46.7	+37.6	+6.2	+1.4	-33.9	+0.0	59.5	86.3	-26.8	Vert
			+0.5	+1.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
12	9760.205M	41.3	+37.5	+6.3	+1.3	-33.9	+0.0	53.6	86.3	-32.7	Vert
			+0.4	+0.7	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
13	9919.765M	40.0	+37.5	+6.3	+1.3	-33.9	+0.0	52.5	86.3	-33.8	Vert
			+0.5	+0.8	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
14	89.200M	47.4	+0.0	+0.0	+0.1	+0.0	+0.0	33.5	86.3	-52.8	Vert
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	-27.8					
			+7.1	+5.8	+0.4	+0.5					
15	25.911M	19.7	+0.0	+0.0	+0.1	+0.0	-40.0	-22.4	86.3	-108.7	Vert
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	-27.9					
			+19.3	+5.8	+0.3	+0.3					
16	37.482k	44.0	+0.0	+0.0	+0.0	+0.0	-80.0	-30.2	86.3	-116.5	Vert
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+5.8	+0.0	+0.0					

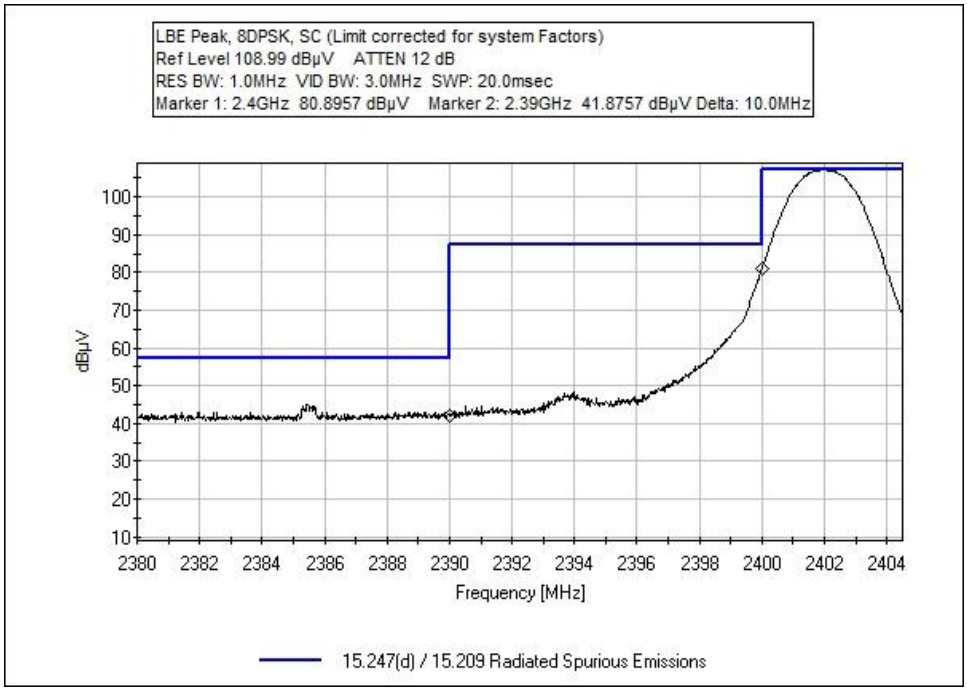
Band Edge

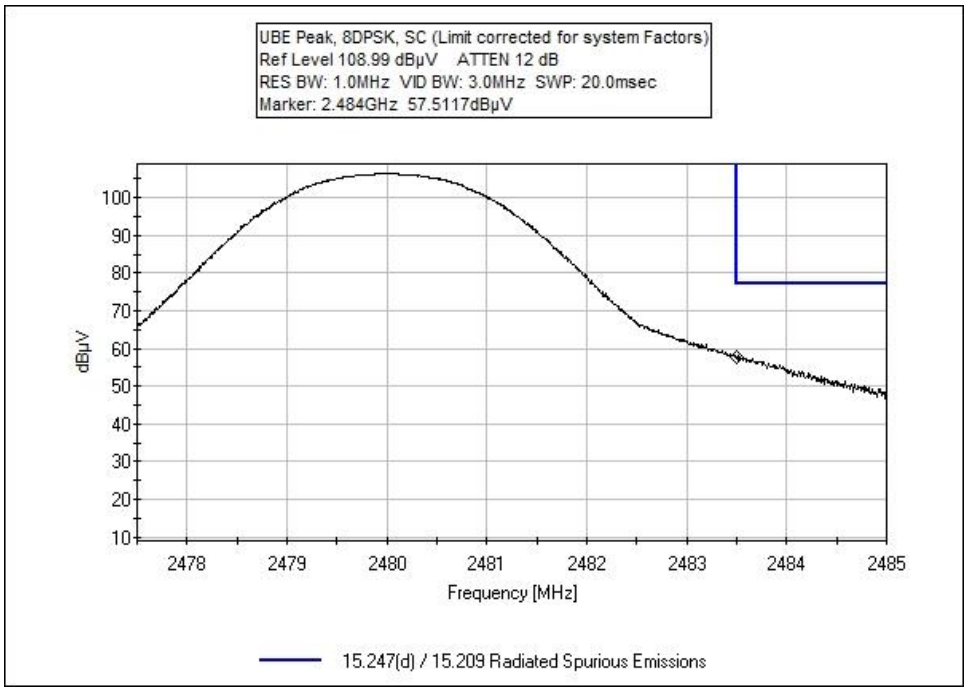
Band Edge Summary					
Operating Mode: Single Channel (Low and High)					
Frequency (MHz)	**Modulation**	**Ant. Type**	**Field Strength (dBuV/m @3m)**	**Limit (dBuV/m @3m)**	**Results**
2390.0	GFSK	Linear Polarized	39.2	<54	Pass
2400.0	GFSK	Linear Polarized	74.2	<86.3	Pass
2483.5	GFSK	Linear Polarized	30.8	<54	Pass
2390.0	π/4 DQPSK	Linear Polarized	38.9	<54	Pass
2400.0	π/4 DQPSK	Linear Polarized	77.4	<83	Pass
2483.5	π/4 DQPSK	Linear Polarized	40	<54	Pass
2390.0	8DPSK	Linear Polarized	38.8	<54	Pass
2400.0	8DPSK	Linear Polarized	77.8	<84.1	Pass
2483.5	8DPSK	Linear Polarized	40.2	<54	Pass

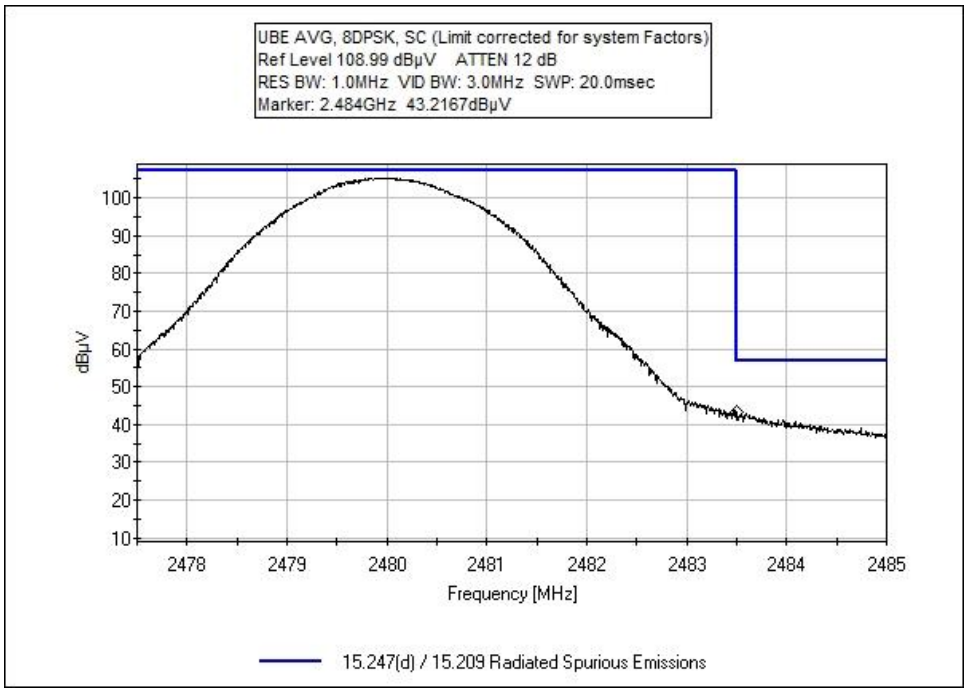
Band Edge Summary					
Operating Mode: Hopping					
Frequency (MHz)	**Modulation**	**Ant. Type**	**Field Strength (dBuV/m @3m)**	**Limit (dBuV/m @3m)**	**Results**
2390.0	GFSK	Linear Polarized	40.3	<54	Pass
2400.0	GFSK	Linear Polarized	75	<86.3	Pass
2483.5	GFSK	Linear Polarized	42.7	<54	Pass
2390.0	π/4 DQPSK	Linear Polarized	39	<54	Pass
2400.0	π/4 DQPSK	Linear Polarized	77.2	<83	Pass
2483.5	π/4 DQPSK	Linear Polarized	37.9	<54	Pass
2390.0	8DPSK	Linear Polarized	38.7	<54	Pass
2400.0	8DPSK	Linear Polarized	75.8	<84.1	Pass
2483.5	8DPSK	Linear Polarized	40.2	<54	Pass

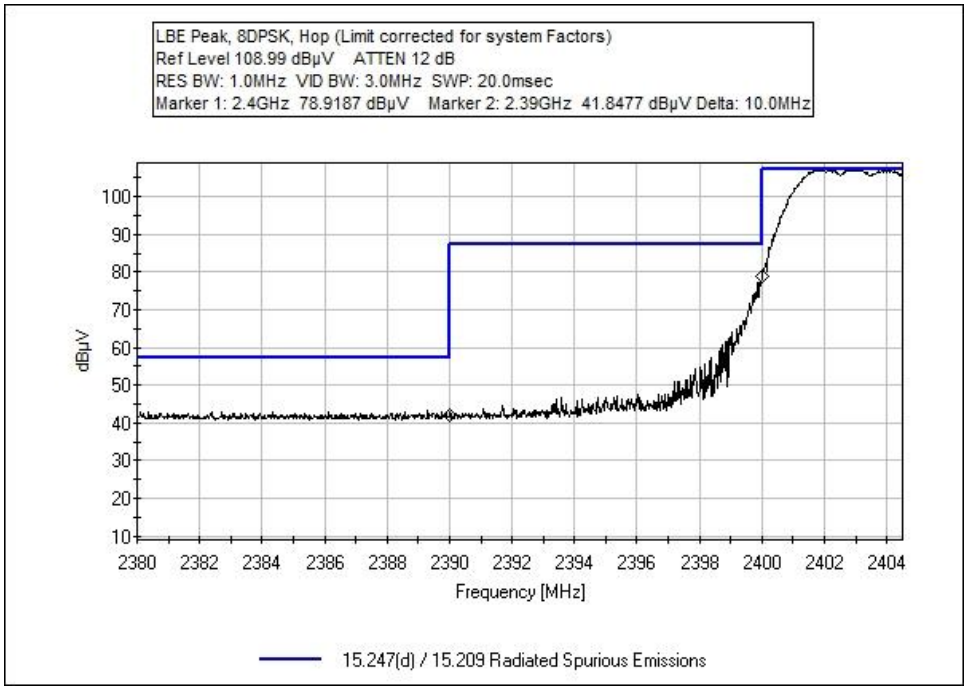
*Note: In order to avoid averaging blanking intervals, an RMS average detector was used.

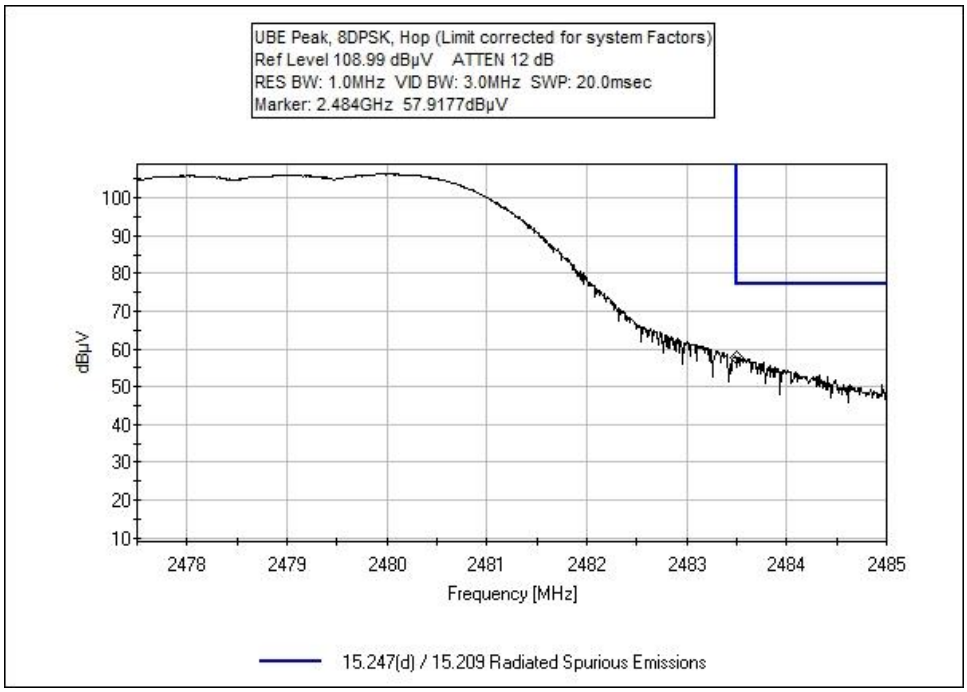
8DPSK Band Edge Plots

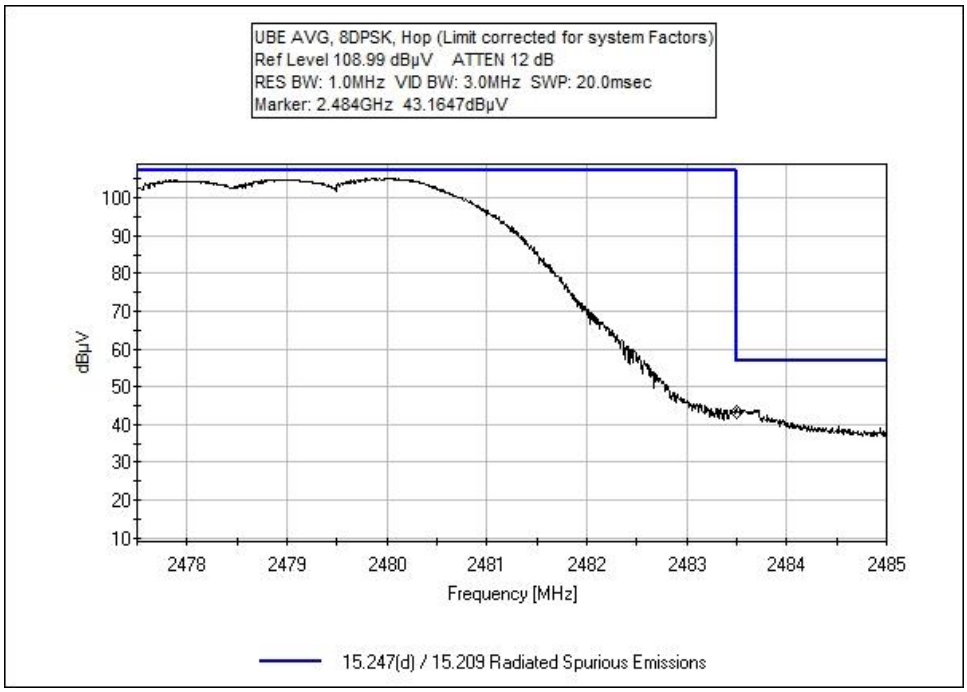




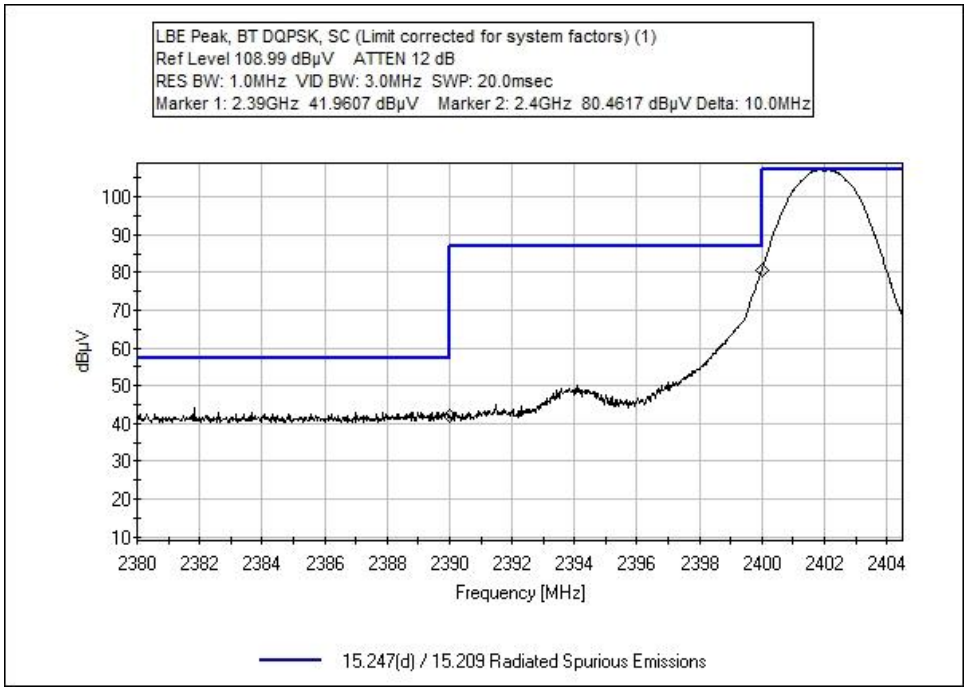

UBE AVG, 8DPSK, SC (Limit corrected for system Factors)
Ref Level 108.99 dBµV ATTEN 12 dB
RES BW: 1.0MHz VID BW: 3.0MHz SWP: 20.0msec
Marker: 2.484GHz 43.2167dBµV
dBµV
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

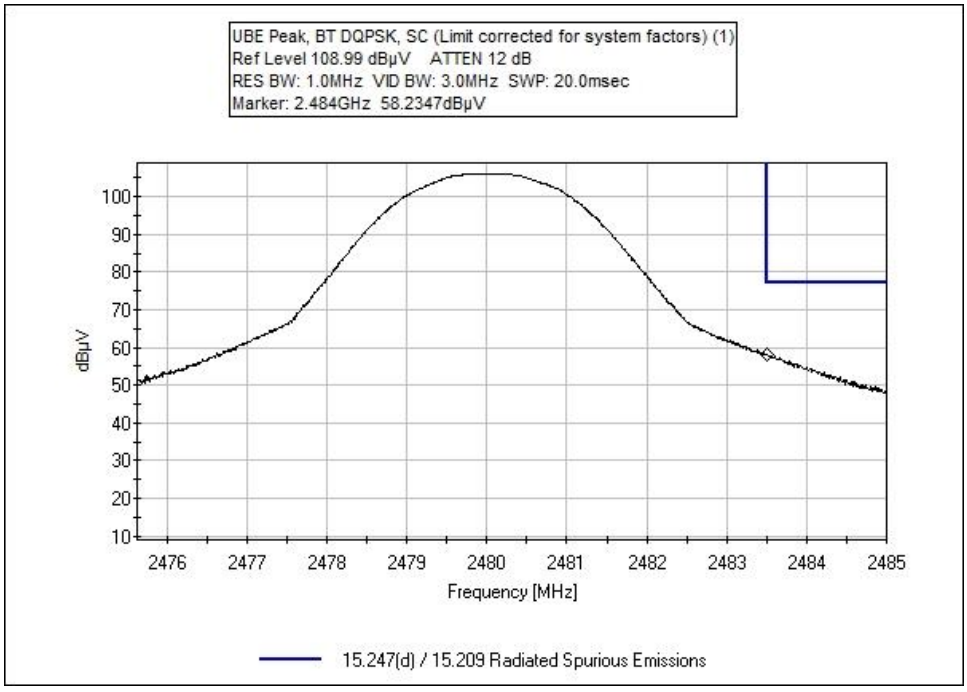

LBE Peak, 8DPSK, Hop (Limit corrected for system Factors)
Ref Level 108.99 dBµV ATTEN 12 dB
RES BW: 1.0MHz VID BW: 3.0MHz SWP: 20.0msec
Marker 1: 2.4GHz 78.9187 dBµV Marker 2: 2.39GHz 41.8477 dBµV Delta: 10.0MHz
dBµV
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

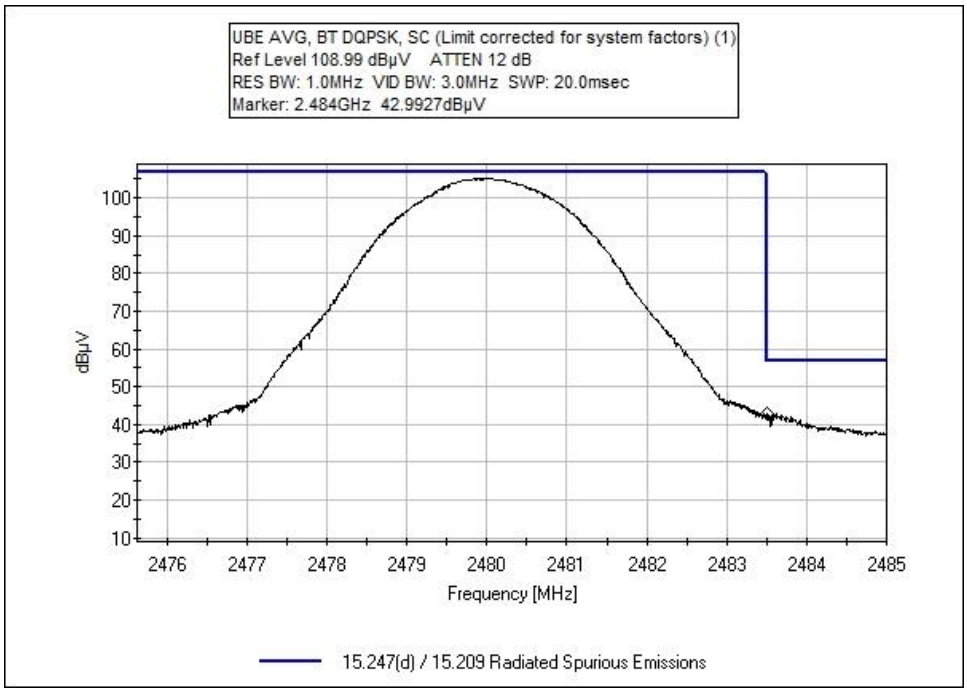

UBE Peak, 8DPSK, Hop (Limit corrected for system Factors)
Ref Level 108.99 dBµV ATTEN 12 dB
RES BW: 1.0MHz VID BW: 3.0MHz SWP: 20.0msec
Marker: 2.484GHz 57.9177dBµV
dBµV
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

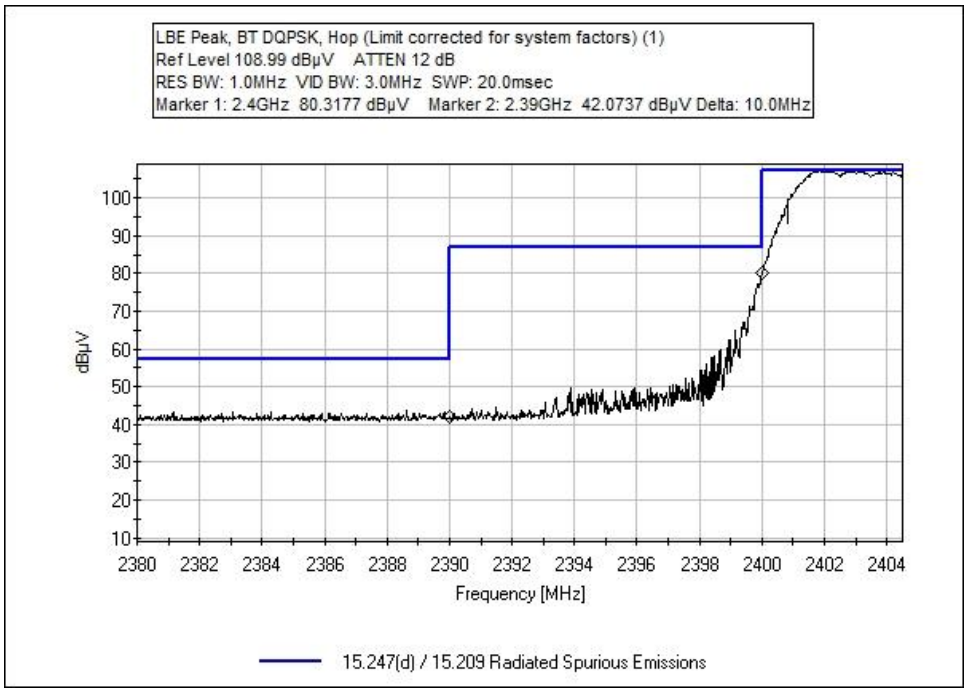

UBE AVG, 8DPSK, Hop (Limit corrected for system Factors)
Ref Level 108.99 dBµV ATTEN 12 dB
RES BW: 1.0MHz VID BW: 3.0MHz SWP: 20.0msec
Marker: 2.484GHz 43.1647dBµV
dBµV
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

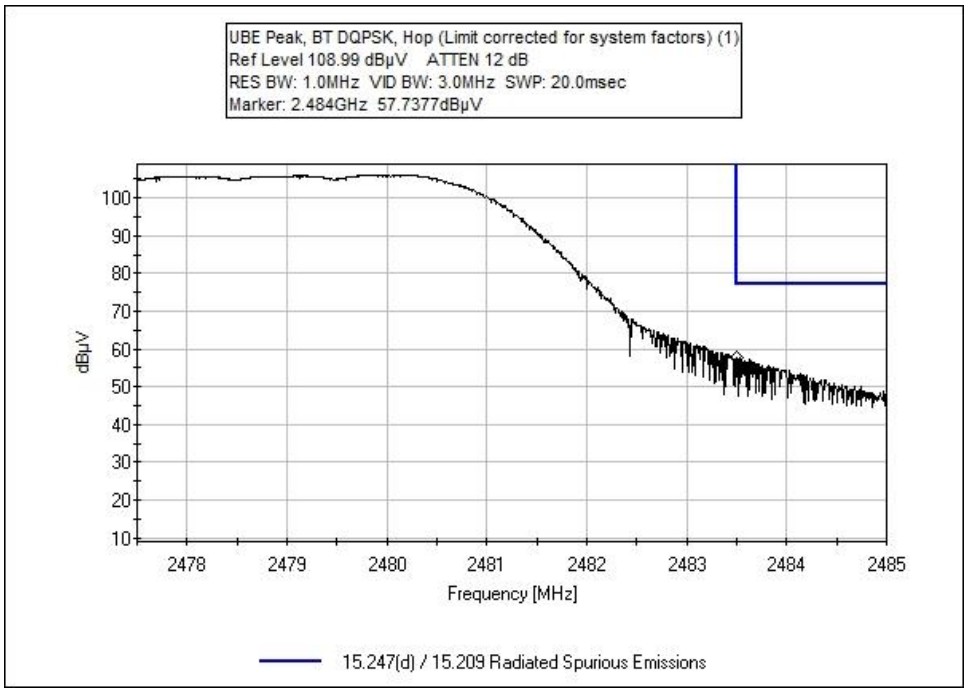
DQPSK Band Edge Plots

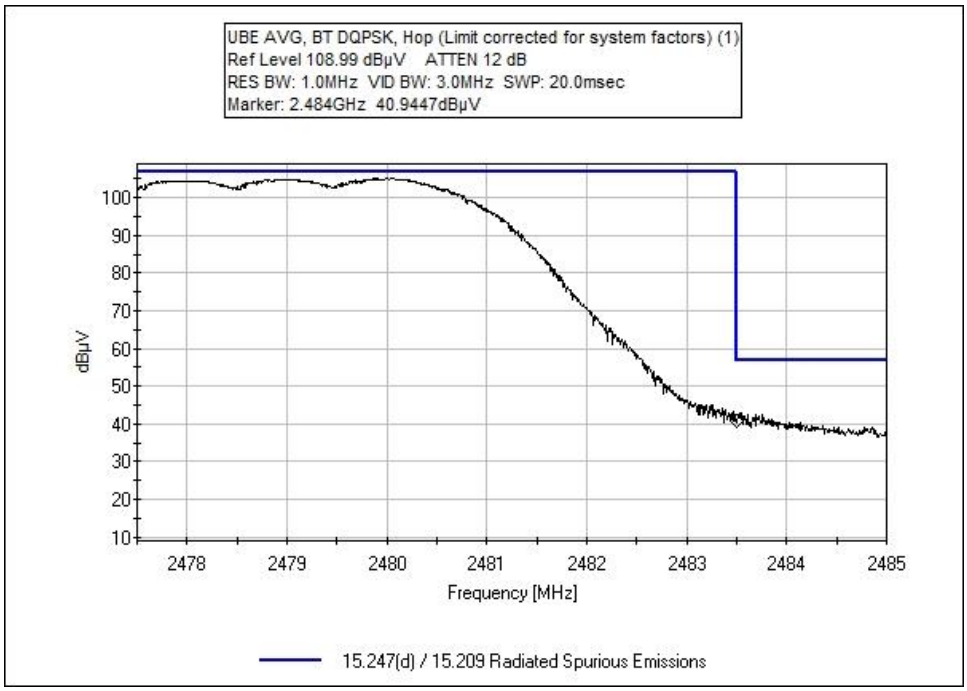




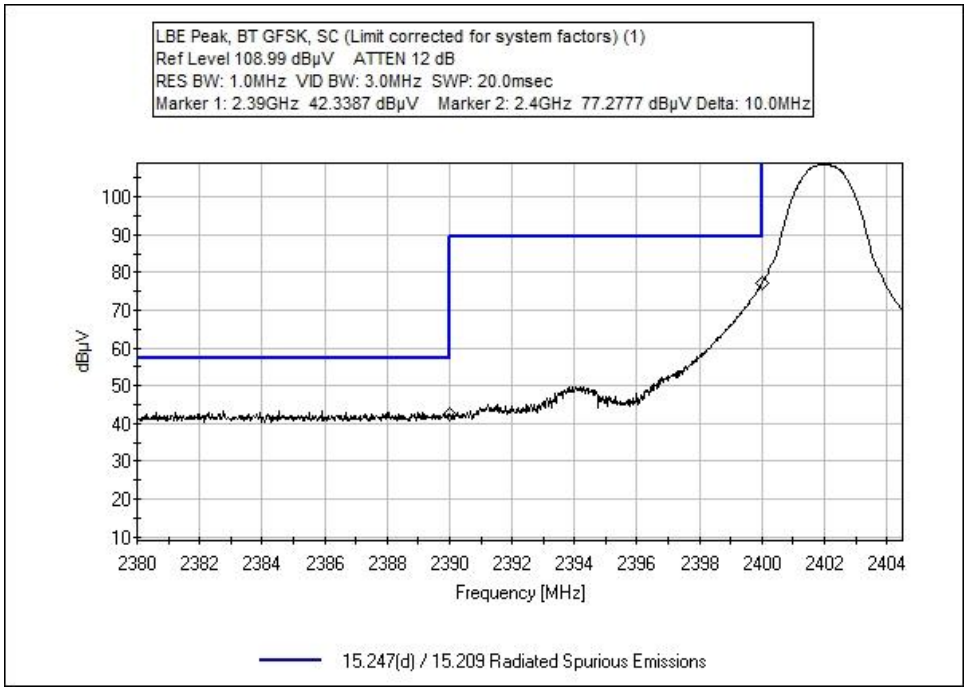

UBE AVG, BT DQPSK, SC (Limit corrected for system factors) (1)
Ref Level 108.99 dBµV ATTEN 12 dB
RES BW: 1.0MHz VID BW: 3.0MHz SWP: 20.0msec
Marker: 2.484GHz 42.9927dBµV
dBµV
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

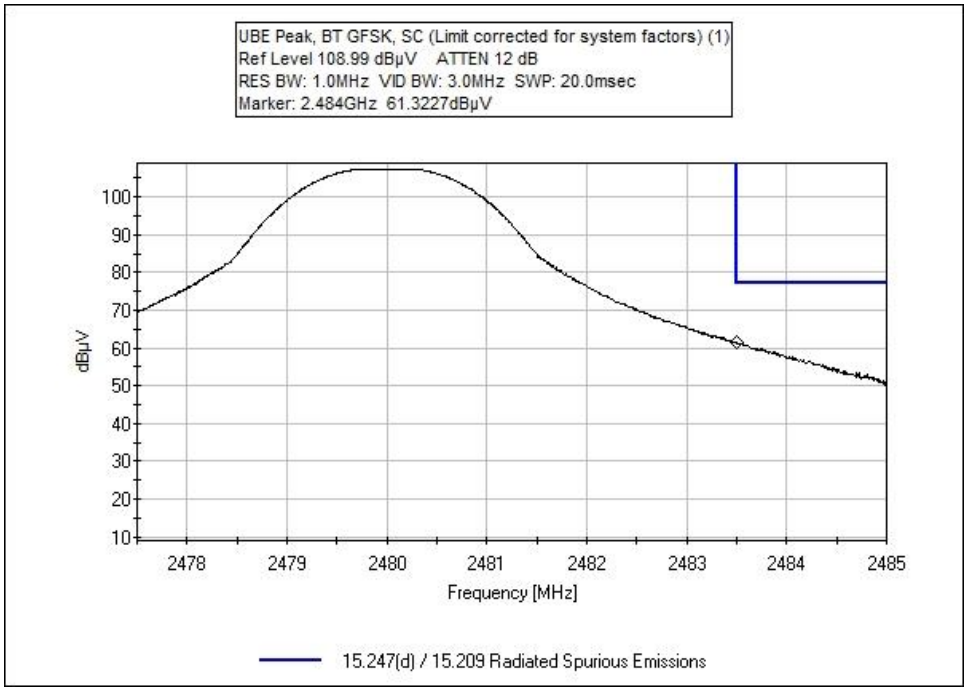

LBE Peak, BT DQPSK, Hop (Limit corrected for system factors) (1)
Ref Level 108.99 dBµV ATTEN 12 dB
RES BW: 1.0MHz VID BW: 3.0MHz SWP: 20.0msec
Marker 1: 2.4GHz 80.3177 dBµV Marker 2: 2.39GHz 42.0737 dBµV Delta: 10.0MHz
dBµV
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

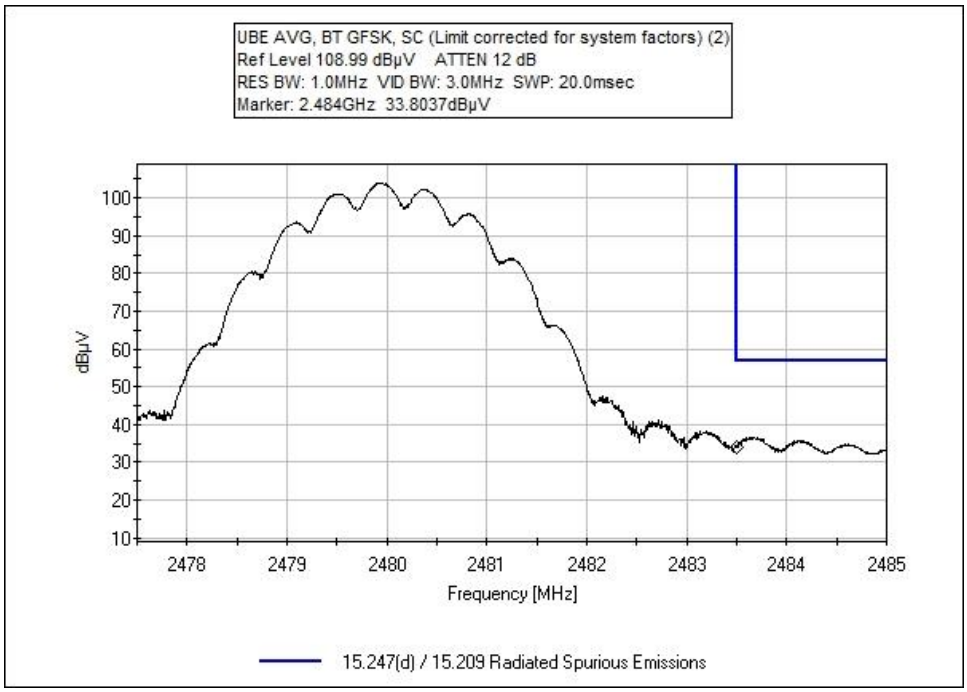

UBE Peak, BT DQPSK, Hop (Limit corrected for system factors) (1)
Ref Level 108.99 dBµV ATTEN 12 dB
RES BW: 1.0MHz VID BW: 3.0MHz SWP: 20.0msec
Marker: 2.484GHz 57.7377dBµV
dBµV
100
90
80
70
60
50
40
30
20
10
2478
2479
2480
2481
2482
2483
2484
2485
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

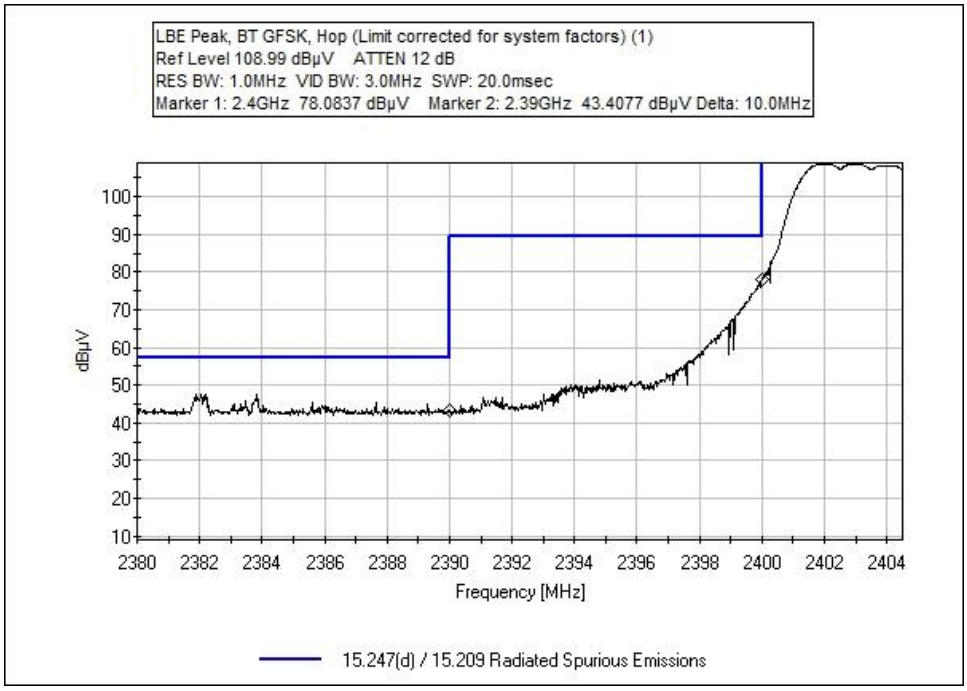

UBE AVG, BT DQPSK, Hop (Limit corrected for system factors) (1)
Ref Level 108.99 dBµV ATTEN 12 dB
RES BW: 1.0MHz VID BW: 3.0MHz SWP: 20.0msec
Marker: 2.484GHz 40.9447dBµV
dBµV
100
90
80
70
60
50
40
30
20
10
2478
2479
2480
2481
2482
2483
2484
2485
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

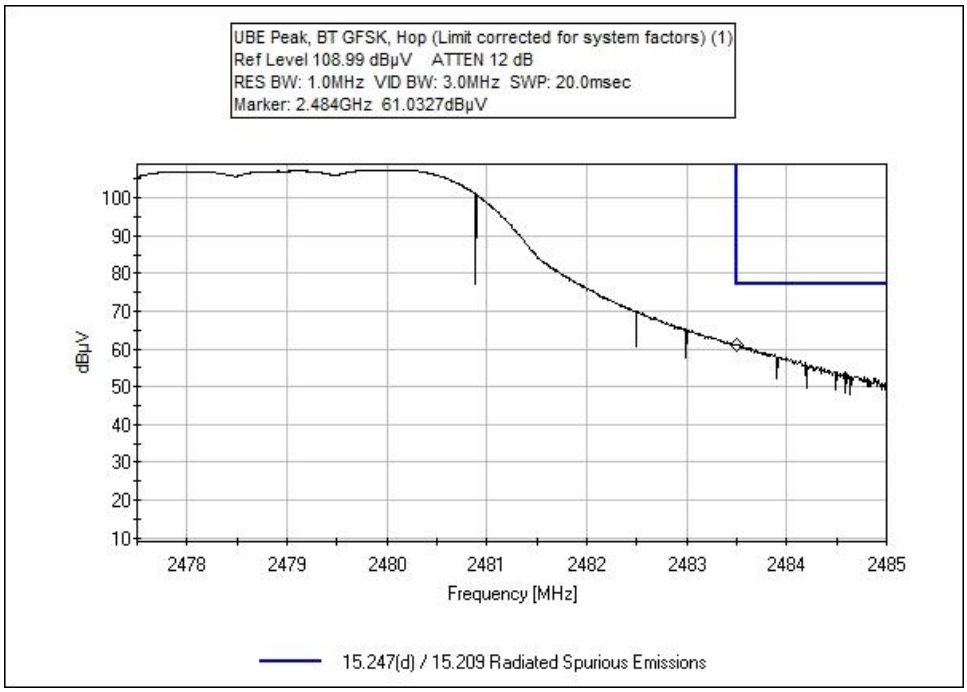
GFSK Band Edge Plots

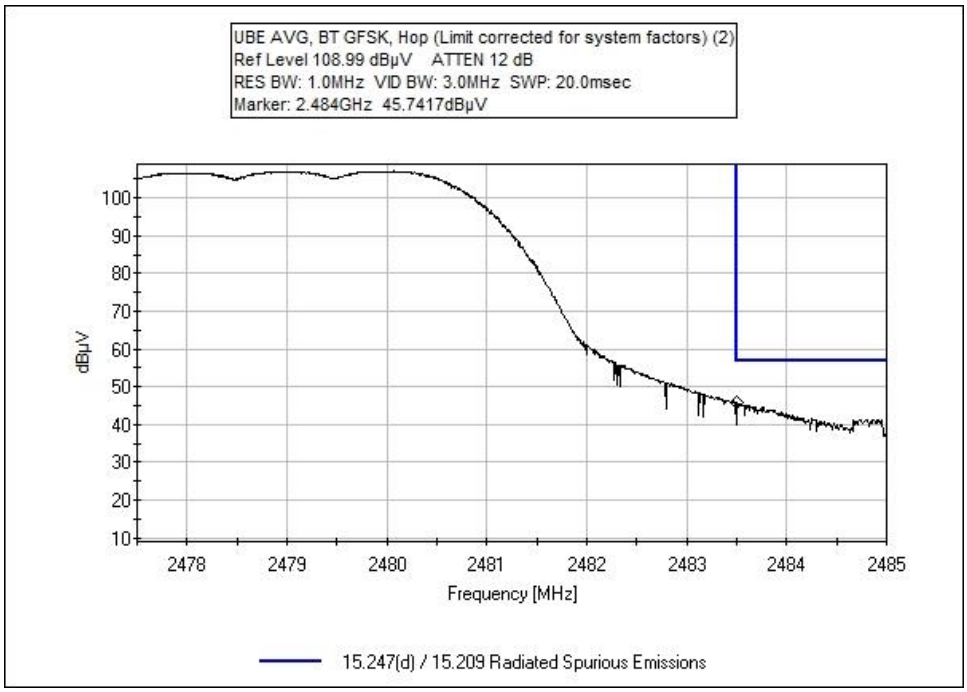





UBE AVG, BT GFSK, SC (Limit corrected for system factors) (2)
Ref Level 108.99 dBµV ATTEN 12 dB
RES BW: 1.0MHz VID BW: 3.0MHz SWP: 20.0msec
Marker: 2.484GHz 33.8037dBµV
dBµV
100
90
80
70
60
50
40
30
20
10
2478
2479
2480
2481
2482
2483
2484
2485
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions


LBE Peak, BT GFSK, Hop (Limit corrected for system factors) (1)
Ref Level 108.99 dBµV ATTEN 12 dB
RES BW: 1.0MHz VID BW: 3.0MHz SWP: 20.0msec
Marker 1: 2.4GHz 78.0837 dBµV Marker 2: 2.39GHz 43.4077 dBµV Delta: 10.0MHz
dBµV
100
90
80
70
60
50
40
30
20
10
2380
2382
2384
2386
2388
2390
2392
2394
2396
2398
2400
2402
2404
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions


UBE Peak, BT GFSK, Hop (Limit corrected for system factors) (1)
Ref Level 108.99 dBµV ATTEN 12 dB
RES BW: 1.0MHz VID BW: 3.0MHz SWP: 20.0msec
Marker: 2.484GHz 61.0327dBµV
dBµV
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions


UBE AVG, BT GFSK, Hop (Limit corrected for system factors) (2)
Ref Level 108.99 dBµV ATTEN 12 dB
RES BW: 1.0MHz VID BW: 3.0MHz SWP: 20.0msec
Marker: 2.484GHz 45.7417dBµV
dBµV
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

Test Setup / Conditions / Data

Test Location:	CKC Laboratories, Inc. • 22116 23rd Dr SE • Bothell, WA 98021 • 800-500-4362		
Customer:	**Nalloy, LLC.**		
Specification:	**15.247(d) / 15.209 Radiated Spurious Emissions**		
Work Order #:	**102802**	Date:	3/26/2020
Test Type:	**Maximized Emissions**	Time:	11:14:36
Tested By:	Matthew Harrison	Sequence#:	45
Software:	EMITest 5.03.12		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Environmental Conditions:
Temperature: 22° C
Humidity: 28%
Pressure: 101.3 kPa

Frequency Range: 2.380-2.485GHz
Frequency tested: 2402, 2480
Firmware power setting: 9
EUT Firmware:
Protocol /MCS/Modulation: BT, 8DPSK, 3DH1 (Worst-Case)

Antenna type: Linear Polarized
Antenna Gain: 3.7 dBi.

Duty Cycle: 100% Modulated

Test Method: ANSI C63.10: 2013
Test Mode: Transmitting
Test Setup: EUT is setup 1.5m high on a Styrofoam table.
Setup: EUT is connected to a Laptop via USB and Audio cable.

All data rates investigated, worst-case provided.

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN01467	Horn Antenna-ANSI C63.5 Calibration	3115	7/5/2019	7/5/2021
T2	ANP06515	Cable	Heliax	6/29/2018	6/29/2020
T3	ANP06540	Cable	Heliax	8/23/2019	8/23/2021
T4	AN02872	Spectrum Analyzer	E4440A	11/18/2019	11/18/2021
T5	AN03540	Preamp	83017A	5/13/2019	5/13/2021
T6	ANP07504	Cable	CLU40-KMKM-02.00F	1/17/2019	1/17/2021

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq	Rdng	T1 T5	T2 T6	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	2400.000M	80.9	+27.7 -34.3	+2.6 +0.3	+0.6	+0.0	+0.0	77.8	84.1 SC	-6.3	Vert
2	2400.000M	78.9	+27.7 -34.3	+2.6 +0.3	+0.6	+0.0	+0.0	75.8	84.1 Hop	-8.3	Vert
3	2483.500M Ave	43.2	+27.6 -34.2	+2.7 +0.3	+0.6	+0.0	+0.0	40.2	54.0 Hop	-13.8	Vert
4	2483.500M Ave	43.2	+27.6 -34.2	+2.7 +0.3	+0.6	+0.0	+0.0	40.2	54.0 SC	-13.8	Vert
^	2483.500M	57.9	+27.6 -34.2	+2.7 +0.3	+0.6	+0.0	+0.0	54.9	74.0 Hop	-19.1	Vert
^	2483.500M	57.5	+27.6 -34.2	+2.7 +0.3	+0.6	+0.0	+0.0	54.5	74.0 SC	-19.5	Vert
7	2390.000M	41.9	+27.7 -34.3	+2.6 +0.3	+0.6	+0.0	+0.0	38.8	54.0 SC	-15.2	Vert
8	2390.000M	41.8	+27.7 -34.3	+2.6 +0.3	+0.6	+0.0	+0.0	38.7	54.0 Hop	-15.3	Vert

Test Location:	CKC Laboratories, Inc. • 22116 23rd Dr SE • Bothell, WA 98021 • 800-500-4362		
Customer:	**Nalloy, LLC.**		
Specification:	**15.247(d) / 15.209 Radiated Spurious Emissions**		
Work Order #:	**102802**	Date:	3/26/2020
Test Type:	**Maximized Emissions**	Time:	10:28:08
Tested By:	Matthew Harrison	Sequence#:	44
Software:	EMITest 5.03.12		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Environmental Conditions:
Temperature: 22° C
Humidity: 28%
Pressure: 101.3 kPa

Frequency Range: 2.380-2.485GHz
Frequency tested: 2402, 2480
Firmware power setting: 9
EUT Firmware:
Protocol /MCS/Modulation: BT, pi/4 DQPSK, 2DH1 (Worst-Case)

Antenna type: Linear Polarized
Antenna Gain: 3.7 dBi.

Duty Cycle: 100% Modulated

Test Method: ANSI C63.10: 2013
Test Mode: Transmitting
Test Setup: EUT is setup 1.5m high on a Styrofoam table.
Setup: EUT is connected to a Laptop via USB and Audio cable.

All data rates investigated, worst-case provided.

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN01467	Horn Antenna-ANSI C63.5 Calibration	3115	7/5/2019	7/5/2021
T2	ANP06515	Cable	Heliax	6/29/2018	6/29/2020
T3	ANP06540	Cable	Heliax	8/23/2019	8/23/2021
T4	AN02872	Spectrum Analyzer	E4440A	11/18/2019	11/18/2021
T5	AN03540	Preamp	83017A	5/13/2019	5/13/2021
T6	ANP07504	Cable	CLU40-KMKM-02.00F	1/17/2019	1/17/2021

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq	Rdng	T1 T5	T2 T6	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	2400.000M	80.5	+27.7 -34.3	+2.6 +0.3	+0.6	+0.0	+0.0	77.4	84.0 SC	-6.6	Vert
2	2400.000M	80.3	+27.7 -34.3	+2.6 +0.3	+0.6	+0.0	+0.0	77.2	84.0 Hop	-6.8	Vert
3	2483.500M Ave	43.0	+27.6 -34.2	+2.7 +0.3	+0.6	+0.0	+0.0	40.0	54.0 SC	-14.0	Vert
^	2483.500M	40.9	+27.6 -34.2	+2.7 +0.3	+0.6	+0.0	+0.0	37.9	54.0 Hop	-16.1	Vert
^	2483.500M	58.2	+27.6 -34.2	+2.7 +0.3	+0.6	+0.0	+0.0	55.2	74.0 SC	-18.8	Vert
^	2483.500M	57.7	+27.6 -34.2	+2.7 +0.3	+0.6	+0.0	+0.0	54.7	74.0 Hop	-19.3	Vert
7	2390.000M	42.1	+27.7 -34.3	+2.6 +0.3	+0.6	+0.0	+0.0	39.0	54.0 Hop	-15.0	Vert
8	2390.000M	42.0	+27.7 -34.3	+2.6 +0.3	+0.6	+0.0	+0.0	38.9	54.0 SC	-15.1	Vert

Test Location:	CKC Laboratories, Inc. • 22116 23rd Dr SE • Bothell, WA 98021 • 800-500-4362		
Customer:	**Nalloy, LLC.**		
Specification:	**15.247(d) / 15.209 Radiated Spurious Emissions**		
Work Order #:	**102802**	Date:	3/26/2020
Test Type:	**Maximized Emissions**	Time:	08:33:47
Tested By:	Matthew Harrison	Sequence#:	43
Software:	EMITest 5.03.12		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Environmental Conditions:
Temperature: 22° C
Humidity: 28%
Pressure: 101.3 kPa

Frequency Range: 2.380-2.486GHz
Frequency tested: 2402, 2480
Firmware power setting: 9
EUT Firmware:
Protocol /MCS/Modulation: BT, GFSK, DH1 (Worst-Case)

Antenna type: Linear Polarized
Antenna Gain: 3.7 dBi.

Duty Cycle: 100% Modulated

Test Method: ANSI C63.10: 2013
Test Mode: Transmitting
Test Setup: EUT is setup 1.5m high on a Styrofoam table.
Setup: EUT is connected to a Laptop via USB and Audio cable.

All data rates investigated, worst-case provided.

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN01467	Horn Antenna-ANSI C63.5 Calibration	3115	7/5/2019	7/5/2021
T2	ANP06515	Cable	Heliax	6/29/2018	6/29/2020
T3	ANP06540	Cable	Heliax	8/23/2019	8/23/2021
T4	AN02872	Spectrum Analyzer	E4440A	11/18/2019	11/18/2021
T5	AN03540	Preamp	83017A	5/13/2019	5/13/2021
T6	ANP07504	Cable	CLU40-KMKM-02.00F	1/17/2019	1/17/2021

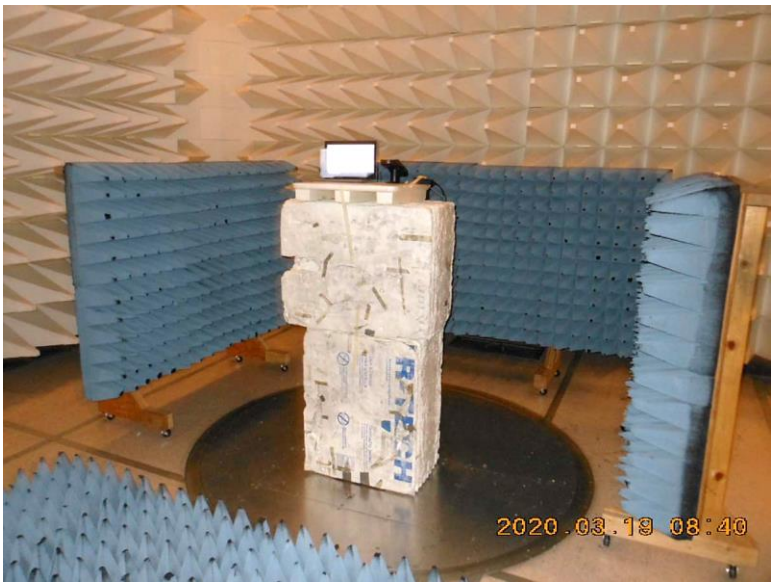
Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq	Rdng	T1 T5	T2 T6	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	2401.852M	109.4	+27.7 -34.3	+2.6 +0.3	+0.6	+0.0	+0.0	106.3	106.3 SC	+0.0	Vert
2	2401.878M	108.5	+27.7 -34.3	+2.6 +0.3	+0.6	+0.0	+0.0	105.4	106.3 Hop	-0.9	Vert
3	2480.140M	107.5	+27.6 -34.2	+2.7 +0.3	+0.6	+0.0	+0.0	104.5	106.3 SC	-1.8	Vert
4	2480.538M	104.9	+27.6 -34.2	+2.7 +0.3	+0.6	+0.0	+0.0	101.9	106.3 Hop	-4.4	Vert
5	2483.500M Ave	45.7	+27.6 -34.2	+2.7 +0.3	+0.6	+0.0	+0.0	42.7	54.0 Hop	-11.3	Vert
6	2400.000M	78.1	+27.7 -34.3	+2.6 +0.3	+0.6	+0.0	+0.0	75.0	86.3 Hop	-11.3	Vert
7	2400.000M	77.3	+27.7 -34.3	+2.6 +0.3	+0.6	+0.0	+0.0	74.2	86.3 SC	-12.1	Vert
8	2390.000M	43.4	+27.7 -34.3	+2.6 +0.3	+0.6	+0.0	+0.0	40.3	54.0 Hop	-13.7	Vert
9	2390.000M	42.3	+27.7 -34.3	+2.6 +0.3	+0.6	+0.0	+0.0	39.2	54.0 SC	-14.8	Vert
10	2483.500M Ave	33.8	+27.6 -34.2	+2.7 +0.3	+0.6	+0.0	+0.0	30.8	54.0 SC	-23.2	Vert
^	2483.500M	61.3	+27.6 -34.2	+2.7 +0.3	+0.6	+0.0	+0.0	58.3	74.0 SC	-15.7	Vert
^	2483.500M	61.0	+27.6 -34.2	+2.7 +0.3	+0.6	+0.0	+0.0	58.0	74.0 Hop	-16.0	Vert

Test Setup Photo(s)

Below 1GHz

Below 1GHz



Above 1GHz

Above 1GHz

15.207 AC Conducted Emissions

Test Setup / Conditions / Data

Test Location:	CKC Laboratories, Inc. • 22116 23rd Dr SE • Bothell, WA 98021 • 800-500-4362		
Customer:	**Nalloy, LLC.**		
Specification:	**15.207 AC Mains - Average**		
Work Order #:	**102802**	Date:	4/1/2020
Test Type:	**Conducted Emissions**	Time:	07:33:32
Tested By:	Matthew Harrison	Sequence#:	84
Software:	EMITest 5.03.12		120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Environmental Conditions:
Temperature: 22° C
Humidity: 28%
Pressure: 101.3 kPa

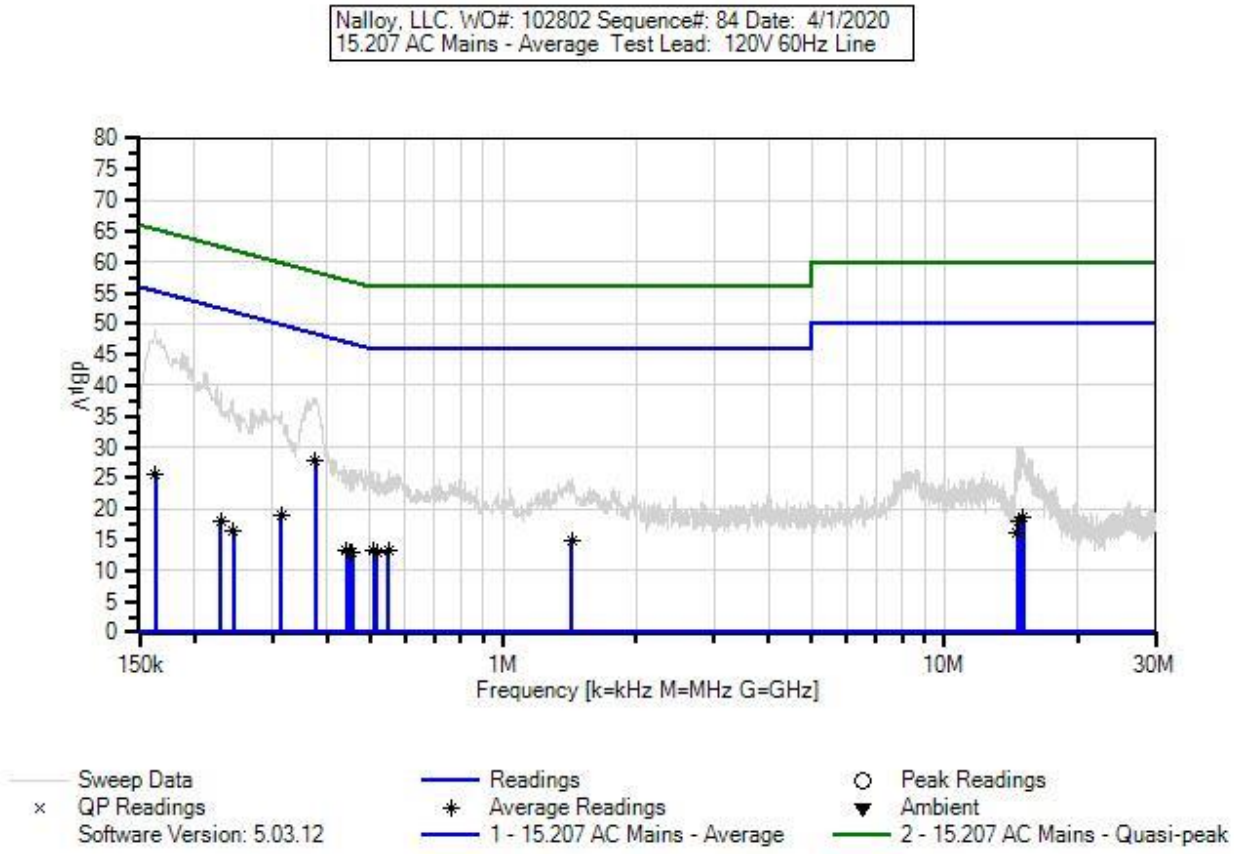
Frequency Range: 150kHz-30MHz
Frequency tested: Hopping
Firmware power setting: 9
EUT Firmware:
Protocol /MCS/Modulation: BT, GFSK, DH1 (Worst-Case)

Antenna type: Linear Polarized
Antenna Gain: 3.7 dBi.

Duty Cycle: 100% Modulated

Test Method: ANSI C63.10: 2013
Test Mode: Transmitting
Test Setup: EUT is setup for conducted measurements.
Setup: EUT is connected to a Laptop via USB and Audio cable.

All modes, channels, and data rates investigated, worst-case provided.



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02872	Spectrum Analyzer	E4440A	11/18/2019	11/18/2021
T1	ANP06219	Attenuator	768-10	4/13/2018	4/13/2020
T2	ANP06515	Cable	Heliax	6/29/2018	6/29/2020
T3	ANP06540	Cable	Heliax	8/23/2019	8/23/2021
T4	AN01311	50uH LISN-Line1 (L)	3816/2	2/24/2020	2/24/2022
	AN01311	50uH LISN-Line2 (N)	3816/2	2/24/2020	2/24/2022
T5	AN02611	High Pass Filter	HE9615-150K-50-720B	1/10/2020	1/10/2022

Measurement Data: Reading listed by margin. Test Lead: Line

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV	dBµV	dB	Ant
1	376.161k	19.1	+9.1	+0.0	+0.0	-0.6	+0.0	27.8	48.4	-20.6	Line
	Ave		+0.2								
^	376.161k	29.5	+9.1	+0.0	+0.0	-0.6	+0.0	38.2	48.4	-10.2	Line
			+0.2								
3	163.090k	17.7	+9.1	+0.0	+0.0	-1.6	+0.0	25.7	55.3	-29.6	Line
	Ave		+0.5								
^	163.089k	40.9	+9.1	+0.0	+0.0	-1.6	+0.0	48.9	55.3	-6.4	Line
			+0.5								
5	315.076k	10.4	+9.1	+0.0	+0.0	-0.7	+0.0	18.9	49.8	-30.9	Line
	Ave		+0.1								
^	315.075k	27.2	+9.1	+0.0	+0.0	-0.7	+0.0	35.7	49.8	-14.1	Line
			+0.1								
7	1.430M	5.9	+9.1	+0.1	+0.0	-0.3	+0.0	15.0	46.0	-31.0	Line
	Ave		+0.2								
^	1.430M	16.1	+9.1	+0.1	+0.0	-0.3	+0.0	25.2	46.0	-20.8	Line
			+0.2								
9	15.049M	9.7	+9.1	+0.2	+0.1	-0.6	+0.0	18.7	50.0	-31.3	Line
	Ave		+0.2								
^	15.049M	21.2	+9.1	+0.2	+0.1	-0.6	+0.0	30.2	50.0	-19.8	Line
			+0.2								
11	14.797M	9.1	+9.1	+0.2	+0.1	-0.6	+0.0	18.1	50.0	-31.9	Line
	Ave		+0.2								
^	14.797M	21.1	+9.1	+0.2	+0.1	-0.6	+0.0	30.1	50.0	-19.9	Line
			+0.2								
13	508.513k	4.4	+9.1	+0.0	+0.0	-0.4	+0.0	13.3	46.0	-32.7	Line
	Ave		+0.2								
^	508.512k	17.2	+9.1	+0.0	+0.0	-0.4	+0.0	26.1	46.0	-19.9	Line
			+0.2								
15	550.691k	4.2	+9.1	+0.0	+0.0	-0.4	+0.0	13.2	46.0	-32.8	Line
	Ave		+0.3								
^	550.690k	17.4	+9.1	+0.0	+0.0	-0.4	+0.0	26.4	46.0	-19.6	Line
			+0.3								
17	518.693k	4.0	+9.1	+0.0	+0.0	-0.4	+0.0	12.9	46.0	-33.1	Line
	Ave		+0.2								
^	518.693k	16.9	+9.1	+0.0	+0.0	-0.4	+0.0	25.8	46.0	-20.2	Line
			+0.2								
19	442.337k	4.5	+9.1	+0.1	+0.0	-0.5	+0.0	13.4	47.0	-33.6	Line
	Ave		+0.2								
^	442.336k	17.5	+9.1	+0.1	+0.0	-0.5	+0.0	26.4	47.0	-20.6	Line
			+0.2								

21	455.427k Ave	4.0	+9.1 +0.2	+0.1	+0.0	-0.5	+0.0	12.9	46.8	-33.9	Line
22	451.790k Ave	4.0	+9.1 +0.2	+0.1	+0.0	-0.5	+0.0	12.9	46.8	-33.9	Line
^	455.426k	17.5	+9.1 +0.2	+0.1	+0.0	-0.5	+0.0	26.4	46.8	-20.4	Line
^	451.790k	17.4	+9.1 +0.2	+0.1	+0.0	-0.5	+0.0	26.3	46.8	-20.5	Line
25	14.616M Ave	7.0	+9.1 +0.2	+0.2	+0.1	-0.6	+0.0	16.0	50.0	-34.0	Line
^	14.616M	20.7	+9.1 +0.2	+0.2	+0.1	-0.6	+0.0	29.7	50.0	-20.3	Line
27	229.265k Ave	9.5	+9.1 +0.3	+0.0	+0.0	-1.0	+0.0	17.9	52.5	-34.6	Line
^	229.265k	30.5	+9.1 +0.3	+0.0	+0.0	-1.0	+0.0	38.9	52.5	-13.6	Line
29	244.537k Ave	8.2	+9.1 +0.2	+0.0	+0.0	-0.9	+0.0	16.6	51.9	-35.3	Line
^	244.536k	29.4	+9.1 +0.2	+0.0	+0.0	-0.9	+0.0	37.8	51.9	-14.1	Line

Test Location:	CKC Laboratories, Inc. • 22116 23rd Dr SE • Bothell, WA 98021 • 800-500-4362		
Customer:	**Nalloy, LLC.**		
Specification:	**15.207 AC Mains - Average**		
Work Order #:	**102802**	Date:	4/1/2020
Test Type:	**Conducted Emissions**	Time:	07:42:20
Tested By:	Matthew Harrison	Sequence#:	85
Software:	EMITest 5.03.12		120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Environmental Conditions:
Temperature: 22° C
Humidity: 28%
Pressure: 101.3 kPa

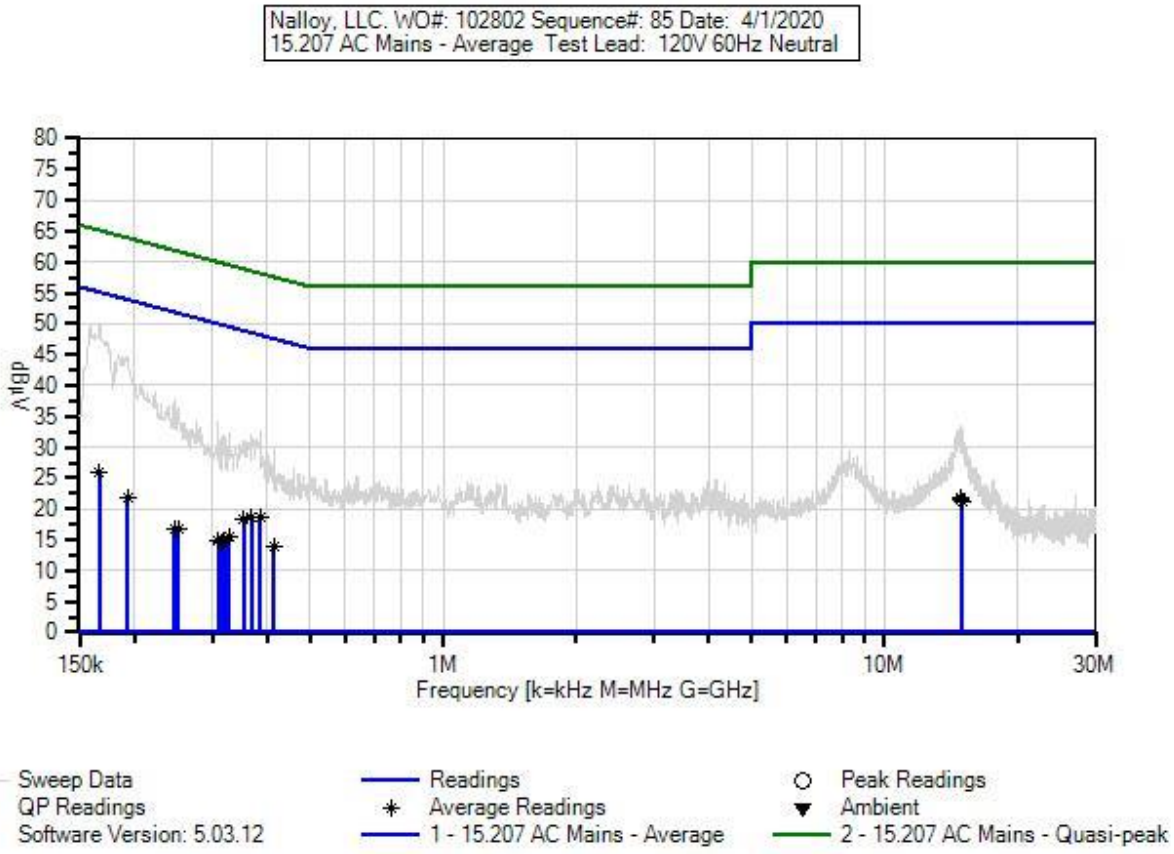
Frequency Range: 150kHz-30MHz
Frequency tested: Hopping
Firmware power setting: 9
EUT Firmware:
Protocol /MCS/Modulation: BT, GFSK, DH1 (Worst-Case)

Antenna type: Linear Polarized
Antenna Gain: 3.7 dBi.

Duty Cycle: 100% Modulated

Test Method: ANSI C63.10: 2013
Test Mode: Transmitting
Test Setup: EUT is setup for conducted measurements.
Setup: EUT is connected to a Laptop via USB and Audio cable.

All modes, channels, and data rates investigated, worst-case provided.



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02872	Spectrum Analyzer	E4440A	11/18/2019	11/18/2021
T1	ANP06219	Attenuator	768-10	4/13/2018	4/13/2020
T2	ANP06515	Cable	Heliax	6/29/2018	6/29/2020
T3	ANP06540	Cable	Heliax	8/23/2019	8/23/2021
	AN01311	50uH LISN-Line1 (L)	3816/2	2/24/2020	2/24/2022
T4	AN01311	50uH LISN-Line2 (N)	3816/2	2/24/2020	2/24/2022
T5	AN02611	High Pass Filter	HE9615-150K-50-720B	1/10/2020	1/10/2022

Measurement Data: Reading listed by margin. Test Lead: Neutral

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV	dBµV	dB	Ant
1	14.887M	12.9	+9.1	+0.2	+0.1	-0.6	+0.0	21.9	50.0	-28.1	Neutr
	Ave		+0.2								
^	14.887M	24.5	+9.1	+0.2	+0.1	-0.6	+0.0	33.5	50.0	-16.5	Neutr
			+0.2								
3	14.932M	12.5	+9.1	+0.2	+0.1	-0.6	+0.0	21.5	50.0	-28.5	Neutr
	Ave		+0.2								
^	14.932M	23.9	+9.1	+0.2	+0.1	-0.6	+0.0	32.9	50.0	-17.1	Neutr
			+0.2								
5	14.995M	12.2	+9.1	+0.2	+0.1	-0.6	+0.0	21.2	50.0	-28.8	Neutr
	Ave		+0.2								
^	14.995M	23.9	+9.1	+0.2	+0.1	-0.6	+0.0	32.9	50.0	-17.1	Neutr
			+0.2								
7	166.725k	17.8	+9.1	+0.0	+0.0	-1.5	+0.0	25.9	55.1	-29.2	Neutr
	Ave		+0.5								
^	166.724k	41.6	+9.1	+0.0	+0.0	-1.5	+0.0	49.7	55.1	-5.4	Neutr
			+0.5								
9	385.614k	10.0	+9.1	+0.0	+0.0	-0.5	+0.0	18.8	48.2	-29.4	Neutr
	Ave		+0.2								
^	385.613k	23.9	+9.1	+0.0	+0.0	-0.5	+0.0	32.7	48.2	-15.5	Neutr
			+0.2								
11	368.161k	9.9	+9.1	+0.0	+0.0	-0.6	+0.0	18.5	48.5	-30.0	Neutr
	Ave		+0.1								
^	368.160k	23.6	+9.1	+0.0	+0.0	-0.6	+0.0	32.2	48.5	-16.3	Neutr
			+0.1								
13	353.617k	9.6	+9.1	+0.0	+0.0	-0.6	+0.0	18.2	48.9	-30.7	Neutr
	Ave		+0.1								
^	353.616k	22.6	+9.1	+0.0	+0.0	-0.6	+0.0	31.2	48.9	-17.7	Neutr
			+0.1								
15	192.904k	13.7	+9.1	+0.0	+0.0	-1.2	+0.0	21.9	53.9	-32.0	Neutr
	Ave		+0.3								
^	192.904k	36.6	+9.1	+0.0	+0.0	-1.2	+0.0	44.8	53.9	-9.1	Neutr
			+0.3								
17	414.702k	5.1	+9.1	+0.0	+0.0	-0.5	+0.0	13.9	47.6	-33.7	Neutr
	Ave		+0.2								
^	414.701k	21.2	+9.1	+0.0	+0.0	-0.5	+0.0	30.0	47.6	-17.6	Neutr
			+0.2								
19	327.437k	6.9	+9.1	+0.0	+0.0	-0.6	+0.0	15.5	49.5	-34.0	Neutr
	Ave		+0.1								
^	327.437k	23.6	+9.1	+0.0	+0.0	-0.6	+0.0	32.2	49.5	-17.3	Neutr
			+0.1								

21	319.438k Ave	6.3	+9.1 +0.1	+0.0	+0.0	-0.7	+0.0	14.8	49.7	-34.9	Neutr
22	251.081k Ave	8.4	+9.1 +0.2	+0.0	+0.0	-0.9	+0.0	16.8	51.7	-34.9	Neutr
^	251.080k	28.0	+9.1 +0.2	+0.0	+0.0	-0.9	+0.0	36.4	51.7	-15.3	Neutr
24	245.990k Ave	8.5	+9.1 +0.2	+0.0	+0.0	-0.9	+0.0	16.9	51.9	-35.0	Neutr
^	245.990k	29.2	+9.1 +0.2	+0.0	+0.0	-0.9	+0.0	37.6	51.9	-14.3	Neutr
26	315.075k Ave	6.1	+9.1 +0.1	+0.0	+0.0	-0.7	+0.0	14.6	49.8	-35.2	Neutr
^	319.437k	23.5	+9.1 +0.1	+0.0	+0.0	-0.7	+0.0	32.0	49.7	-17.7	Neutr
^	315.074k	23.2	+9.1 +0.1	+0.0	+0.0	-0.7	+0.0	31.7	49.8	-18.1	Neutr
29	309.257k Ave	6.3	+9.1 +0.1	+0.0	+0.0	-0.7	+0.0	14.8	50.0	-35.2	Neutr
^	309.257k	25.8	+9.1 +0.1	+0.0	+0.0	-0.7	+0.0	34.3	50.0	-15.7	Neutr

Test Setup Photo(s)

SUPPLEMENTAL INFORMATION

Measurement Uncertainty

Uncertainty Value	Parameter
4.73 dB	Radiated Emissions
3.34 dB	Mains Conducted Emissions
3.30 dB	Disturbance Power

Uncertainties reported are worst case for all CKC Laboratories' sites and represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k=2. Compliance is deemed to occur provided measurements are below the specified limits.

Emissions Test Details

TESTING PARAMETERS

Unless otherwise indicated, the following configuration parameters are used for equipment setup: The cables were routed consistent with the typical application by varying the configuration of the test sample. Interface cables were connected to the available ports of the test unit. The effect of varying the position of the cables was investigated to find the configuration that produced maximum emissions. Cables were of the type and length specified in the individual requirements. The length of cable that produced maximum emissions was selected.

The equipment under test (EUT) was set up in a manner that represented its normal use, as shown in the setup photographs. Any special conditions required for the EUT to operate normally are identified in the comments that accompany the emissions tables.

The emissions data was taken with a spectrum analyzer or receiver. Incorporating the applicable correction factors for distance, antenna, cable loss and amplifier gain, the data was reduced as shown in the table below. The corrected data was then compared to the applicable emission limits. Preliminary and final measurements were taken in order to ensure that all emissions from the EUT were found and maximized.

CORRECTION FACTORS

The basic spectrum analyzer reading was converted using correction factors as shown in the highest emissions readings in the tables. For radiated emissions in dBµV/m, the spectrum analyzer reading in dBµV was corrected by using the following formula. This reading was then compared to the applicable specification limit. Individual measurements were compared with the displayed limit value in the margin column. The margin was calculated based on subtracting the limit value from the corrected measurement value; a positive margin represents a measurement exceeding the limit, while a negative margin represents a measurement less than the limit.

SAMPLE CALCULATIONS		
	Meter reading	(dBµV)
+	Antenna Factor	(dB/m)
+	Cable Loss	(dB)
-	Distance Correction	(dB)
-	Preamplifier Gain	(dB)
=	Corrected Reading	(dBµV/m)

TEST INSTRUMENTATION AND ANALYZER SETTINGS

The test instrumentation and equipment listed were used to collect the emissions data. A spectrum analyzer or receiver was used for all measurements. Unless otherwise specified, the following table shows the measuring equipment bandwidth settings that were used in designated frequency bands. For testing emissions, an appropriate reference level and a vertical scale size of 10 dB per division were used.

MEASURING EQUIPMENT BANDWIDTH SETTINGS PER FREQUENCY RANGE			
TEST	BEGINNING FREQUENCY	ENDING FREQUENCY	BANDWIDTH SETTING
CONDUCTED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	9 kHz	150 kHz	200 Hz
RADIATED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	30 MHz	1000 MHz	120 kHz
RADIATED EMISSIONS	1000 MHz	>1 GHz	1 MHz

SPECTRUM ANALYZER/RECEIVER DETECTOR FUNCTIONS

The notes that accompany the measurements contained in the emissions tables indicate the type of detector function used to obtain the given readings. Unless otherwise noted, all readings were made in the "positive peak" detector mode. Whenever a "quasi-peak" or "average" reading was recorded, the measurement was annotated with a "QP" or an "Ave" on the appropriate rows of the data sheets. In cases where quasi-peak or average limits were employed and data exists for multiple measurement types for the same frequency then the peak measurement was retained in the report for reference, however the numbering for the affected row was removed and an arrow or caret (“^”) was placed in the far left-hand column indicating that the row above takes precedence for comparison to the limit. The following paragraphs describe in more detail the detector functions and when they were used to obtain the emissions data.

Peak

In this mode, the spectrum analyzer or receiver recorded all emissions at their peak value as the frequency band selected was scanned. By combining this function with another feature called "peak hold," the measurement device had the ability to measure intermittent or low duty cycle transient emission peak levels. In this mode the measuring device made a slow scan across the frequency band selected and measured the peak emission value found at each frequency across the band.

Quasi-Peak

Quasi-peak measurements were taken using the quasi-peak detector when the true peak values exceeded or were within 2 dB of a quasi-peak specification limit. Additional QP measurements may have been taken at the discretion of the operator.

Average

Average measurements were taken using the average detector when the true peak values exceeded or were within 2 dB of an average specification limit. Additional average measurements may have been taken at the discretion of the operator. If the specification or test procedure requires trace averaging, then the averaging was performed using 100 samples or as required by the specification. All other average measurements are performed using video bandwidth averaging. To make these measurements, the test engineer reduces the video bandwidth on the measuring device until the modulation of the signal is filtered out. At this point, the measuring device is set into the linear mode and the scan time is reduced.