

Nalloy, LLC

REVISED TEST REPORT TO 102802-4

Model: PFAY0H

Tested to The Following Standards:

FCC Part 15 Subpart C Section(s)

15.207 & 15.247
(FHSS 2400-2483.5 MHz)

Report No.: 102802-4A

Date of issue: March 21, 2022



Test Certificate # 803.01

This test report bears the accreditation symbol indicating that the testing performed herein meets the test and reporting requirements of ISO/IEC 17025 under the applicable scope of testing for CKC Laboratories, Inc.

We strive to create long-term, trust based relationships by providing sound, adaptive, customer first testing services. We embrace each of our customers' unique EMC challenges, not as an interruption to set processes, but rather as the reason we are in business.

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ADMINISTRATIVE INFORMATION

Test Report Information

REPORT PREPARED FOR:

Nalloy, LLC
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Seattle, WA 98108

REPORT PREPARED BY:

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Representative: Naga Suryadevara
Customer Reference Number: 2D-03187704

Project Number: 102802

DATE OF EQUIPMENT RECEIPT:

March 26, 2020

DATE(S) OF TESTING:

March 26 -27, 2020

April 1 and 7, 2020

Revision History

Original: Testing of the Model: PFAY0H to FCC Part 15 Subpart C Section(s) 15.207 & 15.247 (FHSS 2400-2483.5 MHz).

Revision A: To replace 15.207 AC Conducted Emissions data.

Report Authorization

The test data contained in this report documents the observed testing parameters pertaining to and are relevant for only the equipment provided by the client, tested in the agreed upon operational mode(s) and configuration(s) as identified herein. Compliance assessment remains the client's responsibility. This report may not be used to claim product endorsement by A2LA or any government agencies. This test report has been authorized for release under quality control from CKC Laboratories, Inc.

A handwritten signature in black ink that reads "Steve Behm".

Steve Behm
Director of Quality Assurance & Engineering Services
CKC Laboratories, Inc.

Test Facility Information



Our laboratories are configured to effectively test a wide variety of product types. CKC utilizes first class test equipment, anechoic chambers, data acquisition and information services to create accurate, repeatable and affordable test results.

TEST LOCATION(S):
CKC Laboratories, Inc.
Canyon Park
22116 23rd Drive S.E., Suite A
Bothell, WA 98021

Software Versions

CKC Laboratories Proprietary Software	Version
EMITest Emissions	5.03.12

Site Registration & Accreditation Information

Location	*NIST CB #	FCC	Japan
Canyon Park, Bothell, WA	US0081	US1022	A-0136
Brea, CA	US0060	US1025	A-0136
Fremont, CA	US0082	US1023	A-0136
Mariposa, CA	US0103	US1024	A-0136

*CKC's list of NIST designated countries can be found at: <https://standards.gov/cabs/designations.html>

SUMMARY OF RESULTS

Standard / Specification: FCC Part 15 Subpart C - 15.247 (FHSS)

Test Procedure	Description	Modifications	Results
15.247(a)(1)	Occupied Bandwidth	NA	Pass
15.247(a)(1)	Carrier Separation	NA	Pass
15.247(a)(1)(iii)	Number of Hopping Channels	NA	Pass
15.247(a)(1)(iii)	Average Time of Occupancy	NA	Pass
15.247(b)(1)	Output Power	NA	Pass
15.247(d)	RF Conducted Emissions & Band Edge	NA	Pass
15.247(d)	Radiated Emissions & Band Edge	NA	Pass
15.207	AC Conducted Emissions	NA	Pass

NA = Not Applicable

ISO/IEC 17025 Decision Rule

The declaration of pass or fail herein is based upon assessment to the specification(s) listed above, including where applicable, assessment of measurement uncertainties. For performance related tests, equipment was monitored for specified criteria identified in that section of testing.

Modifications During Testing

This list is a summary of the modifications made to the equipment during testing.

Summary of Conditions

No modifications were made during testing.

Modifications listed above must be incorporated into all production units.

Conditions During Testing

This list is a summary of the conditions noted to the equipment during testing.

Summary of Conditions

None

EQUIPMENT UNDER TEST (EUT)

During testing, numerous configurations may have been utilized. The configurations listed below support compliance to the standard(s) listed in the Summary of Results section.

Configuration 1

Equipment Tested:

Device	Manufacturer	Model #	S/N
NA	Nalloy, LLC.	PFAY0H	9906679780

Support Equipment:

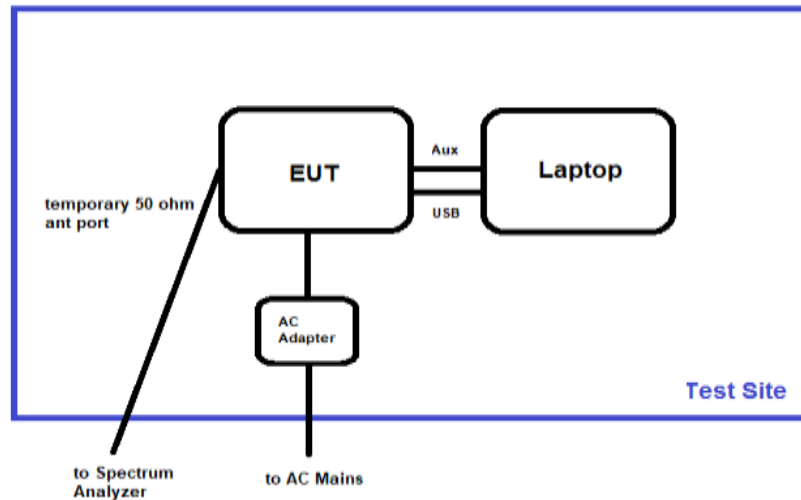
Device	Manufacturer	Model #	S/N
PC	Lenovo	81KT	YD07YGLG
PC PSU	Lenovo	ADL45WCC	NA
EUT PSU	Delta Electronics	MDS-030AAC15	24QW96P00CS

General Product Information:

Product Information	Manufacturer-Provided Details
Equipment Type:	Stand-Alone Equipment
Type of Wideband System:	FHSS (Bluetooth)
Operating Frequency Range:	2402-2480 MHz
Number of Hopping Channels:	80
Receiver Bandwidth and Synchronization:	The manufacturer declares the receiver input bandwidth matches the transmit channel bandwidth and shifts frequencies in synchronization with the transmitter.
Modulation Type(s):	GFSK, $\pi/4$ DQPSK, 8DPSK
Maximum Duty Cycle:	100% Modulated (tested worst-case)
Number of TX Chains:	1
Antenna Type(s) and Gain:	Linear Polarized / 3.7dBi
Beamforming Type:	NA
Antenna Connection Type:	Integral (External connector provided to facilitate testing)
Nominal Input Voltage:	120VAC
Firmware / Software used for Test:	ro.build.id=PKQ1.180819.001

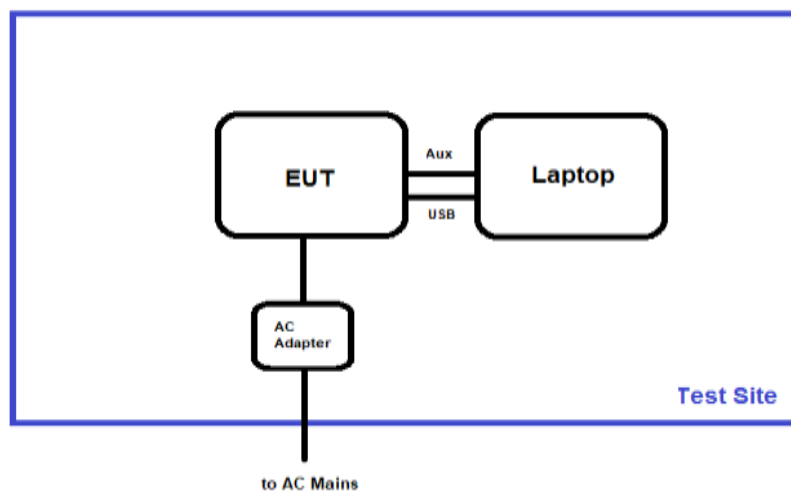
Block Diagram (s)

Test Setup Block Diagram



Tx Cond Ant Port

Test Setup Block Diagram



Tx with Antenna

FCC Part 15 Subpart C

15.247(a) Transmitter Characteristics

Test Setup/Conditions			
Test Location:	Bothell Lab Bench	Test Engineer:	M. Harrison
Test Method:	ANSI C63.10 (2013)	Test Date(s):	3/26/2020
Configuration:	1		
Test Setup:	Duty Cycle: 100% (Test Mode) Test Mode: Continuously transmitting Test Setup: EUT is transmitting through the antenna port connector and is attached to the spectrum analyzer.		

Environmental Conditions			
Temperature (°C)	22	Relative Humidity (%):	33

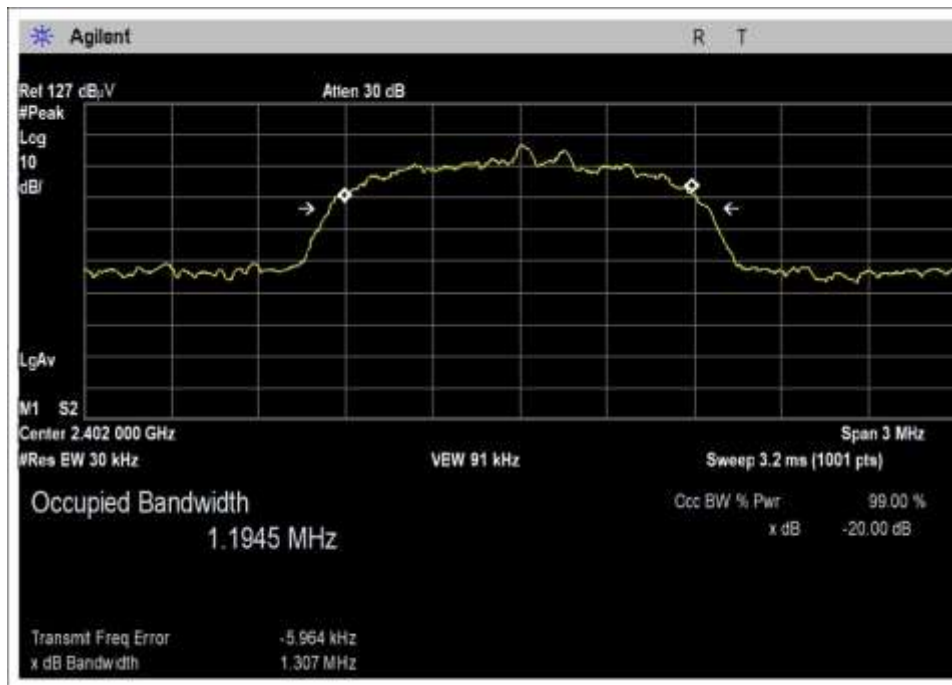
Test Equipment					
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
02673	Spectrum Analyzer	Agilent	E4446A	2/22/2019	2/22/2021

15.247(a)(1) 20 dB Bandwidth

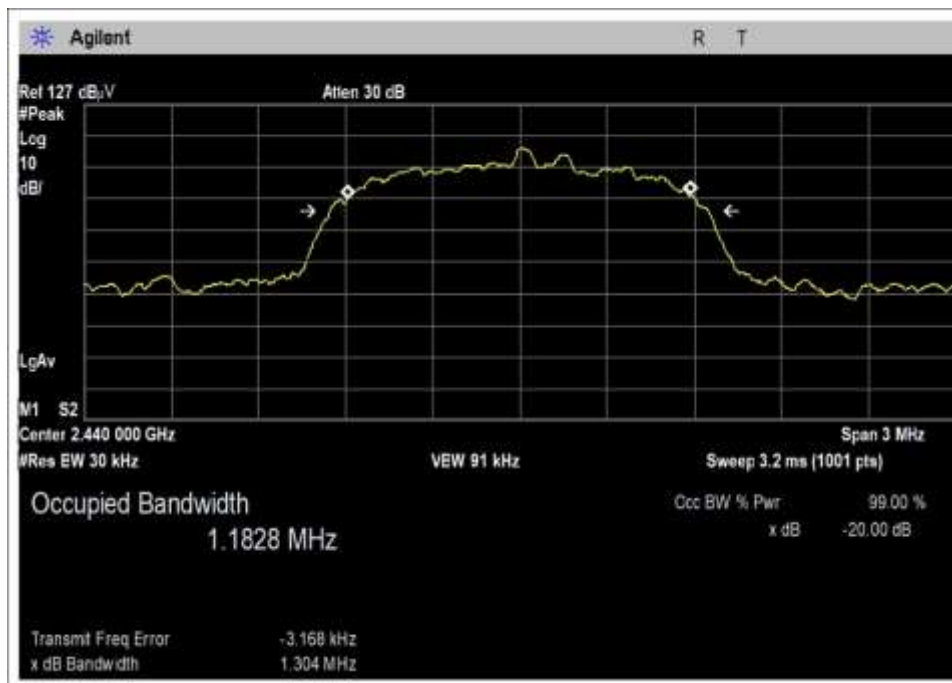
Test Data Summary					
Frequency (MHz)	Antenna Port	Modulation	Measured (kHz)	Limit (kHz)	Results
2402	0	GFSK	946.4	None	NA
2440	0	GFSK	942.9		
2480	0	GFSK	943.3		
2402	0	$\pi/4$ DQPSK	1291	None	NA
2440	0	$\pi/4$ DQPSK	1289		
2480	0	$\pi/4$ DQPSK	1290		
2402	0	8DPSK	1307	None	NA
2440	0	8DPSK	1304		
2480	0	8DPSK	1308		

NA = Not applicable

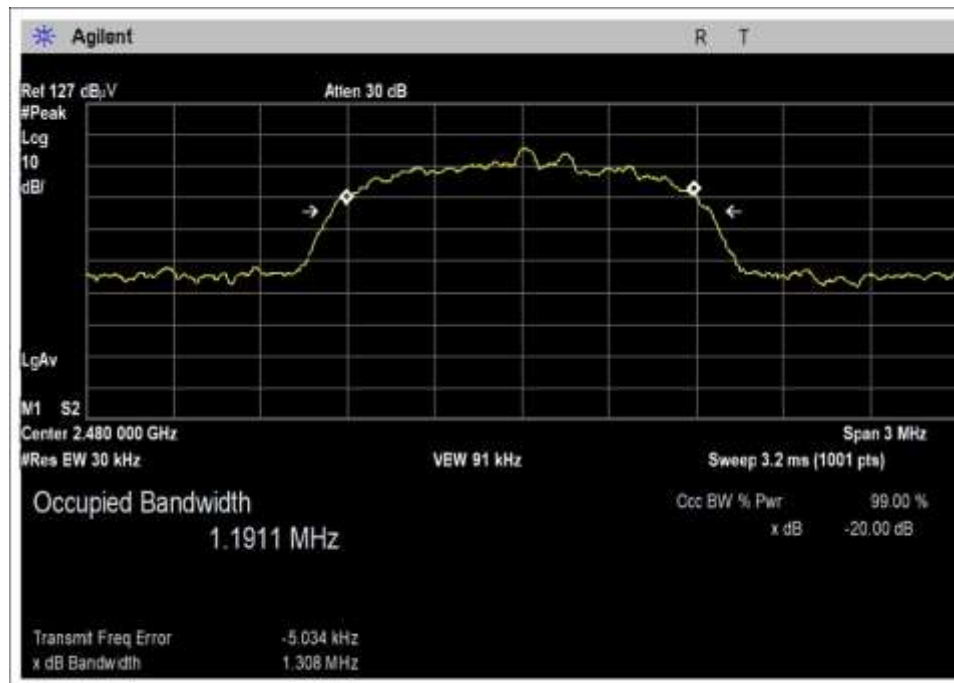
8DPSK Plot(s)



Low Channel

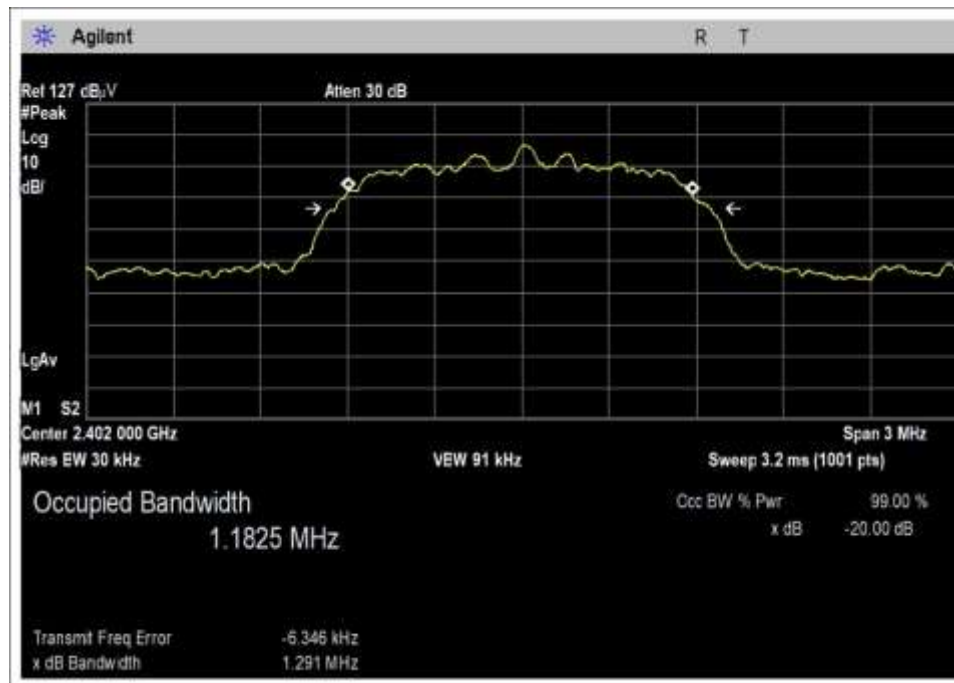


Middle Channel

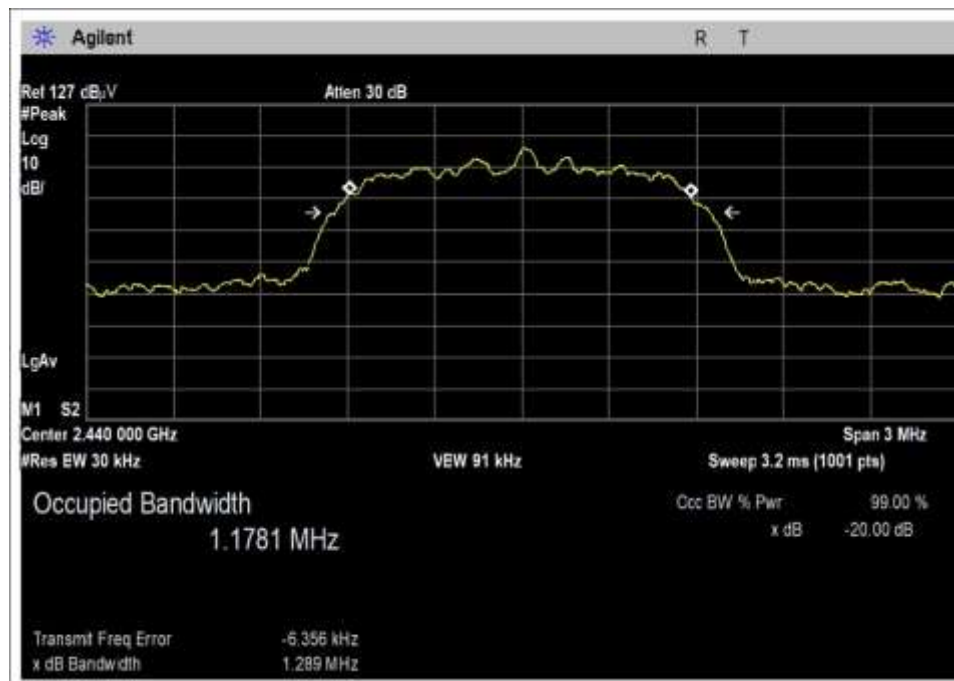


High Channel

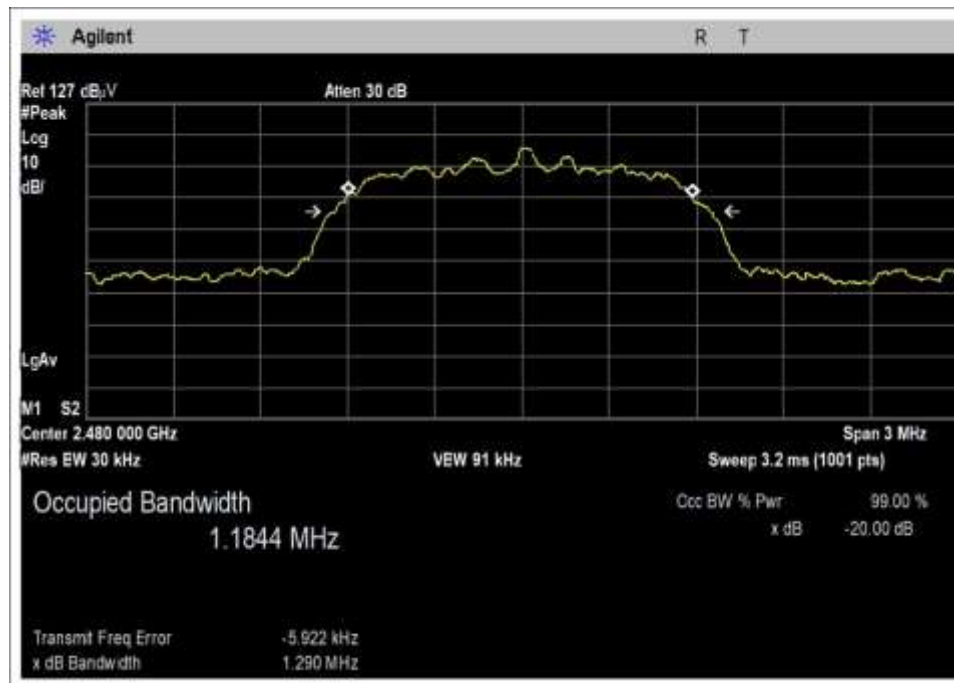
DQPSK Plot(s)



Low Channel

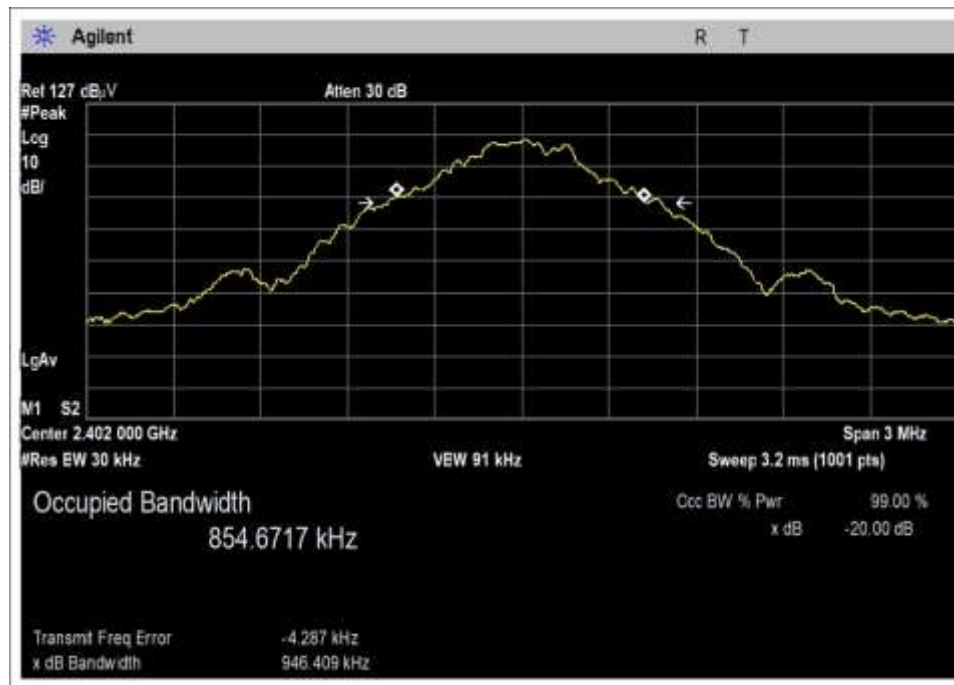


Middle Channel

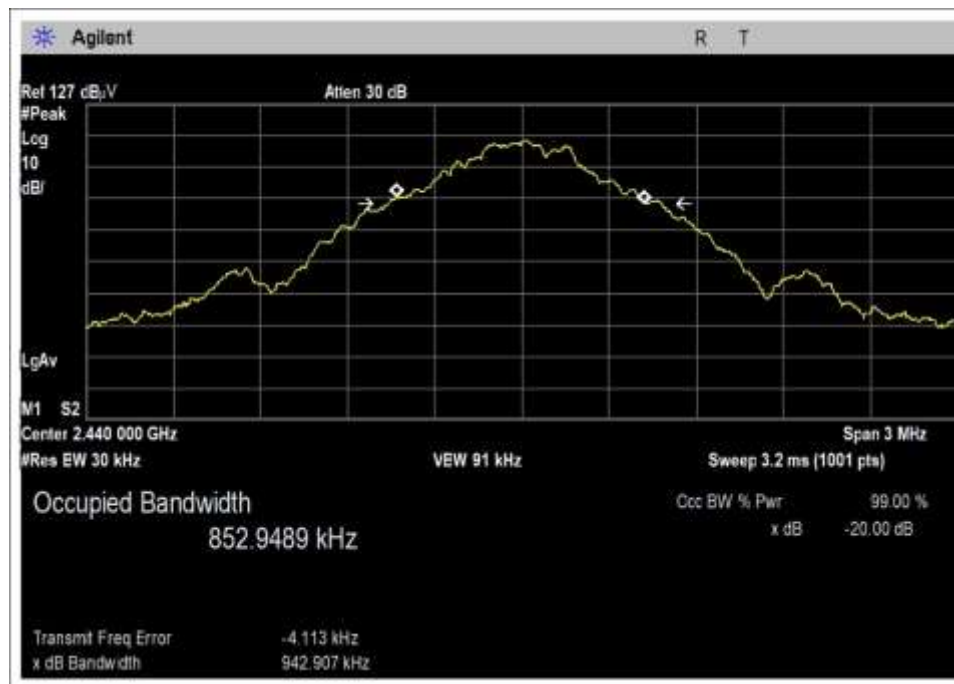


High Channel

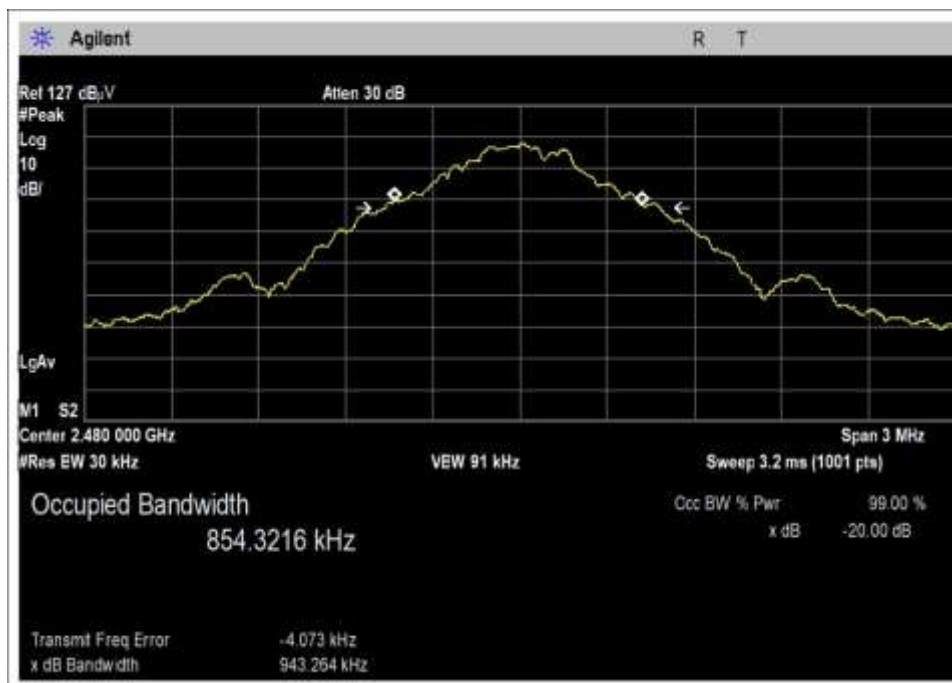
GFSK Plot(s)



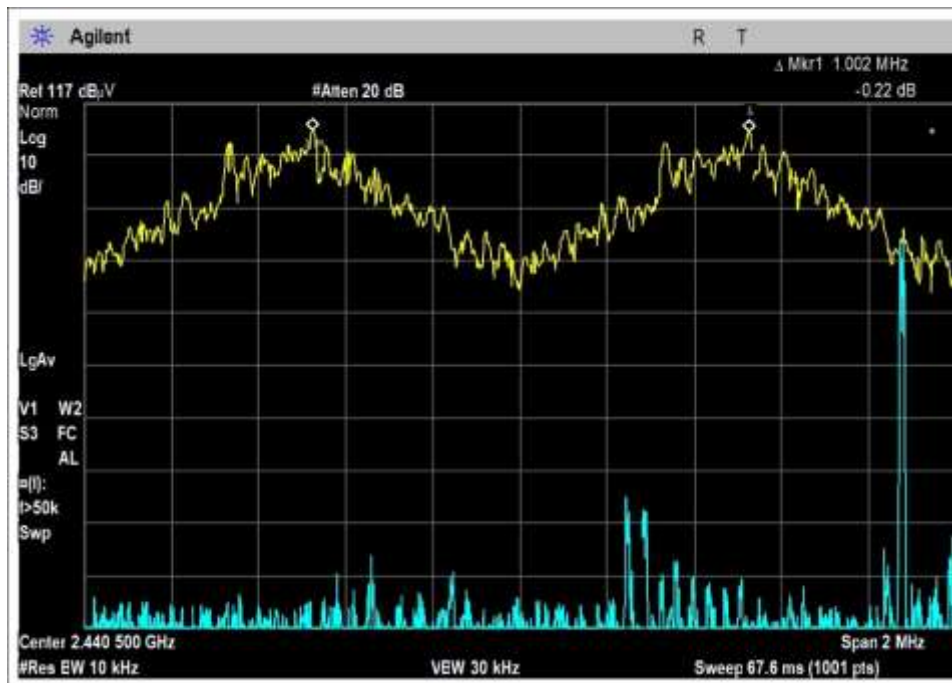
Low Channel



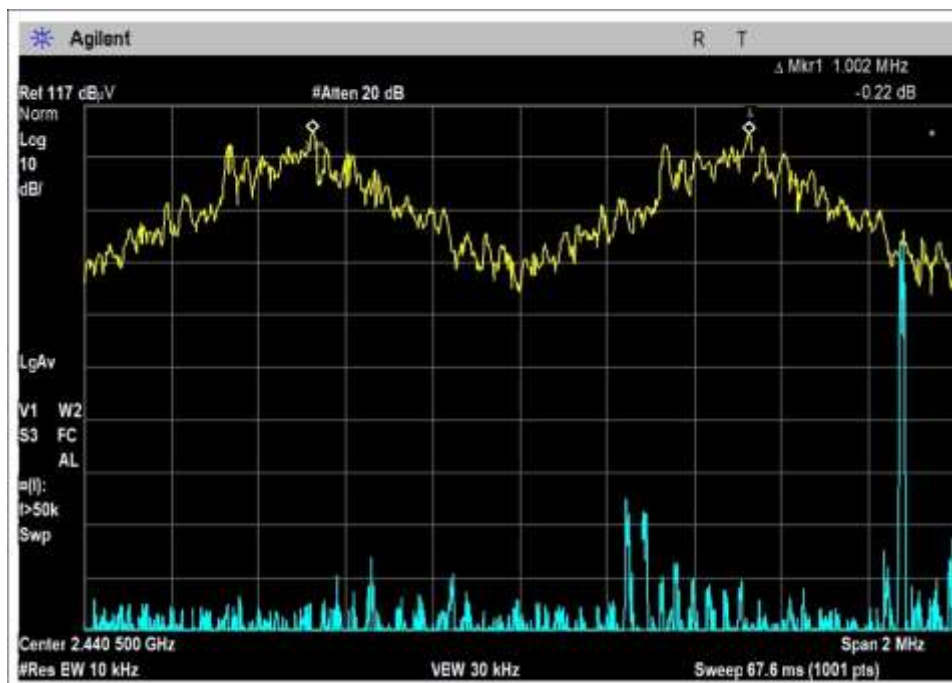
Middle Channel



High Channel



DQPSK

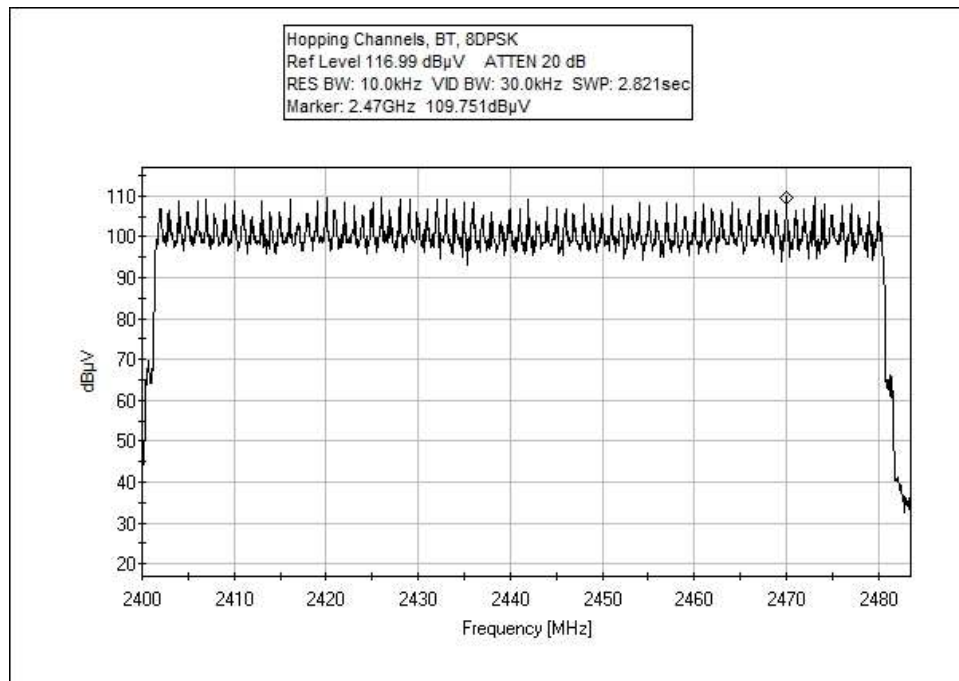


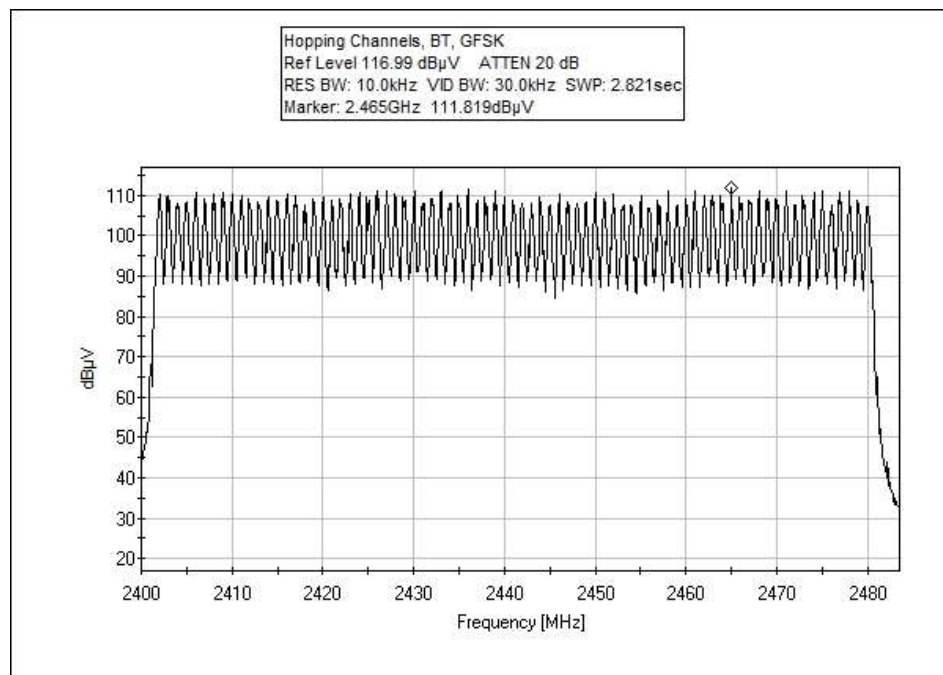
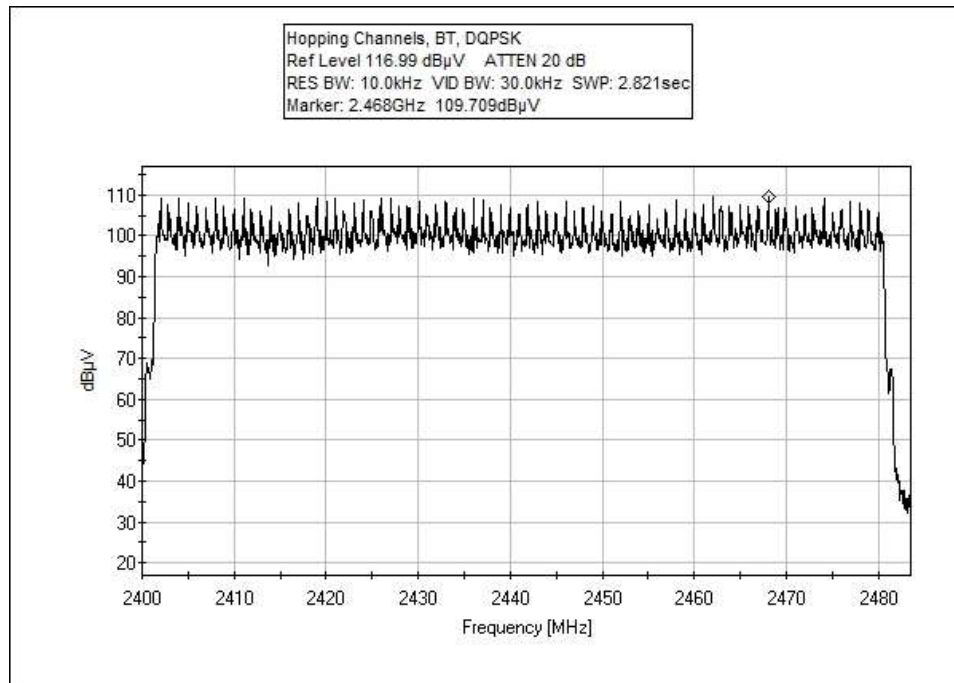
GFSK

15.247(a)(1)(iii) Number of Channels

Test Data Summary				
Limit applied: 15; for equipment with power output < 125 mW..				
Antenna Port	Operational Mode	Measured (Channels)	Limit (Channels)	Results
0	GFSK	79	≥15	Pass
0	$\pi/4$ DQPSK	79	≥15	Pass
0	8DPSK	79	≥15	Pass

Plot(s)





15.247(a)(1)(iii) Time of Occupancy

Test Data Summary				
Observation Period, P_{obs} is derived from the following: $P_{obs} = 0.4 \times \text{max number of hopping channels}$				
Antenna Port	Operational Mode	Measured (ms)	Limit (ms/ P_{obs})	Results
0	GFSK	0.84	≤ 400	Pass
0	$\pi/4$ DQPSK	0.85	≤ 400	Pass
0	8DPSK	0.85	≤ 400	Pass

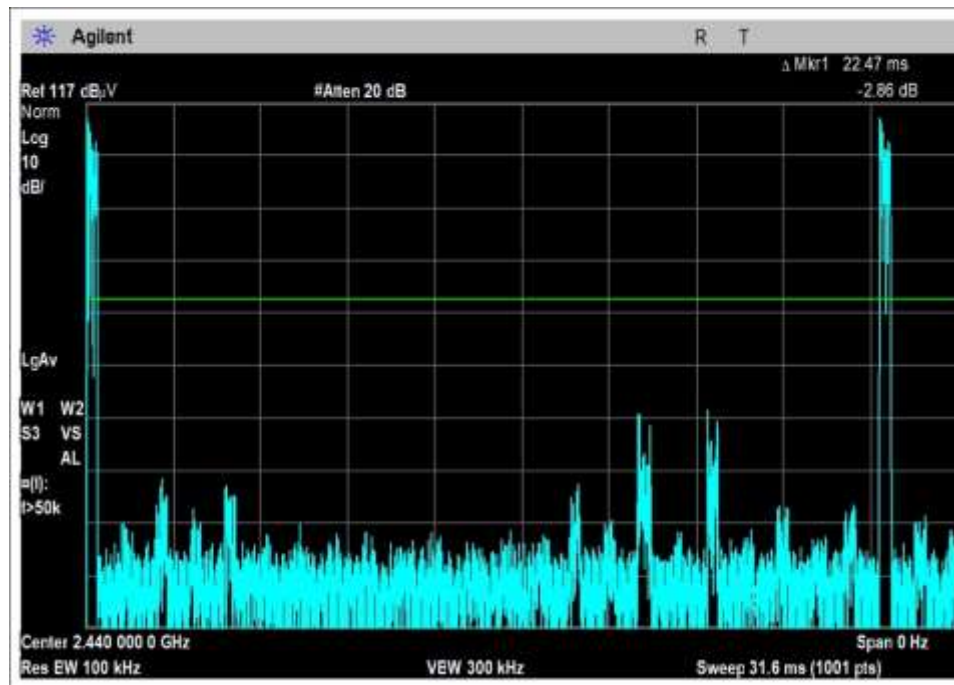
Measured results are calculated as follows:

$$Dwell\ time = \left(\sum_{Bursts} RF\ Burst\ On\ Time + \sum_{Control} Control\ Signal\ On\ time \right) \Big|_{P_{obs}}$$

Actual Calculated Values:

Parameter	Value (GFSK)	Value ($\pi/4$ DQPSK)	Value (8DPSK)
Observation Period (P_{obs}):	31.6	31.6	31.6
Number of RF Bursts / P_{obs} :	2	2	2
On time of RF Burst:	420 μ s	426 μ s	426.6 μ s
Number of Control or other signals / P_{obs} :	0	0	0
On time of Control or other Signals:	0	0	0
Total Measured On Time:	0.84ms	0.85ms	0.85ms

8DPSK Plot(s)

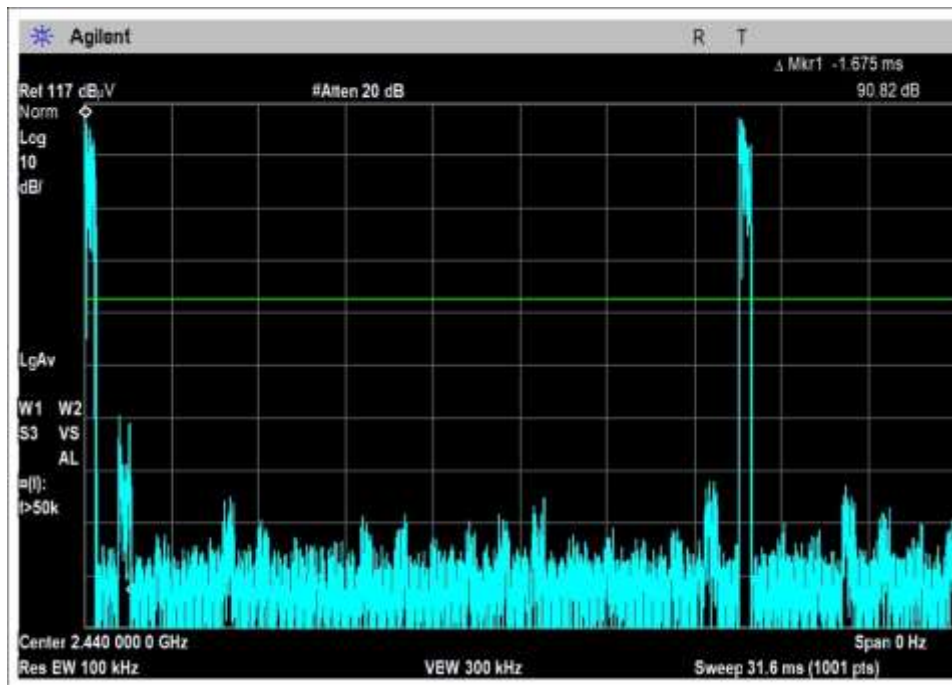


TOO 8DPSK, 1



TOO 8DPSK, 2

DQPSK Plot(s)

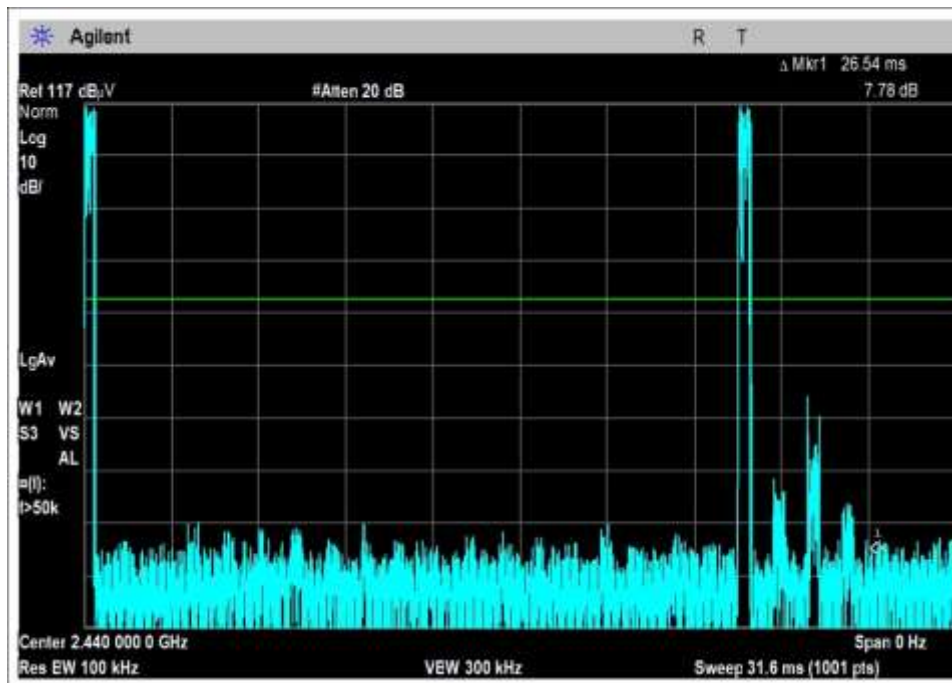


TOO DQPSK, 1

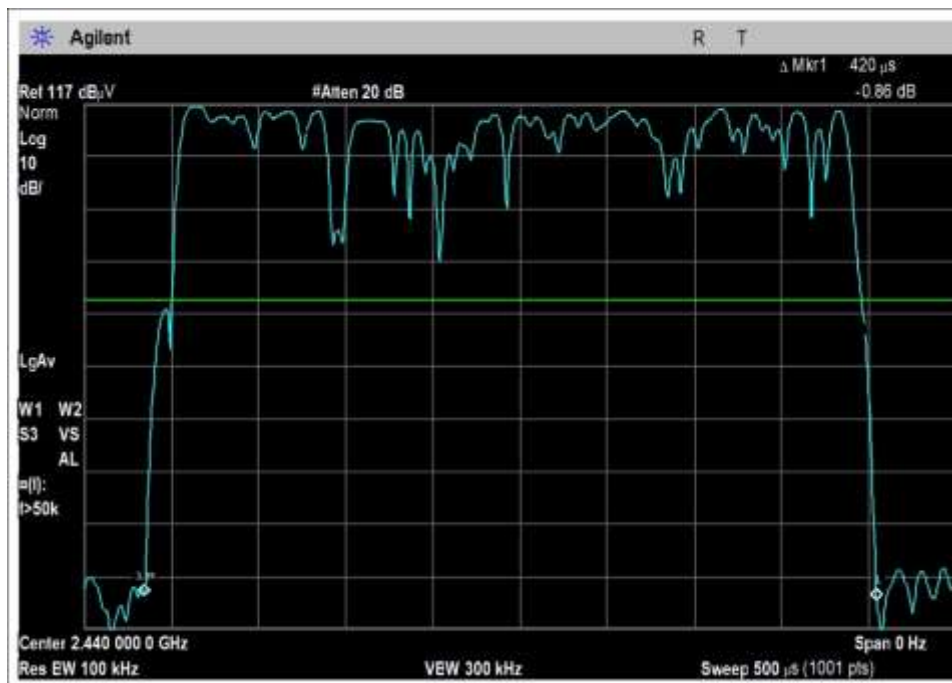


TOO DQPSK, 2

GFSK Plot(s)



TOO GFSK, 1



TOO GFSK, 2

Test Setup Photo(s)



15.247(b)(1) Output Power

Test Setup / Conditions			
Test Location:	Bothell Lab Bench	Test Engineer:	M. Harrison
Test Method:	ANSI C63.10 (2013)	Test Date(s):	3/26/2020
Configuration:	1		
Test Setup:	Duty Cycle: 100% (Test Mode) Test Mode: Continuously transmitting Test Setup: The EUT is transmitting through the antenna port connector and is attached to the spectrum analyzer.		

Environmental Conditions			
Temperature (°C)	20	Relative Humidity (%):	35

Test Equipment					
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
02673	Spectrum Analyzer	Agilent	E4446A	2/22/2019	2/22/2021
01318	Multimeter	Fluke	Fluke 85	7/22/2019	7/22/2021
P07527	Variac	Simpson	NA	11/21/2018	11/21/2020

Test Data Summary - Voltage Variations					
Frequency (MHz)	Modulation / Ant Port	Conducted Power at V _{Minimum} (dBm)	Conducted Power at V _{Nominal} (dBm)	Conducted Power at V _{Maximum} (dBm)	Conducted Power Max Deviation During Voltage Variations (dB)
2402	GFSK / 0	10	10	10	0
2440	GFSK / 0	9.9	9.9	9.9	0
2480	GFSK / 0	9.4	9.4	9.4	0
2402	$\pi/4$ DQPSK / 0	9.5	9.5	9.5	0
2440	$\pi/4$ DQPSK / 0	9.2	9.2	9.2	0
2480	$\pi/4$ DQPSK / 0	8.8	8.8	8.8	0
2402	8DPSK / 0	9.8	9.8	9.8	0
2440	8DPSK / 0	9.5	9.5	9.5	0
2480	8DPSK / 0	9.1	9.1	9.1	0

Test performed using operational mode with the highest output power, representing worst case.

Parameter Definitions:

Measurements performed at input voltage V_{Nominal} $\pm$ 15%.

Parameter	Value
V _{Nominal} :	120
V _{Minimum} :	102
V _{Maximum} :	138

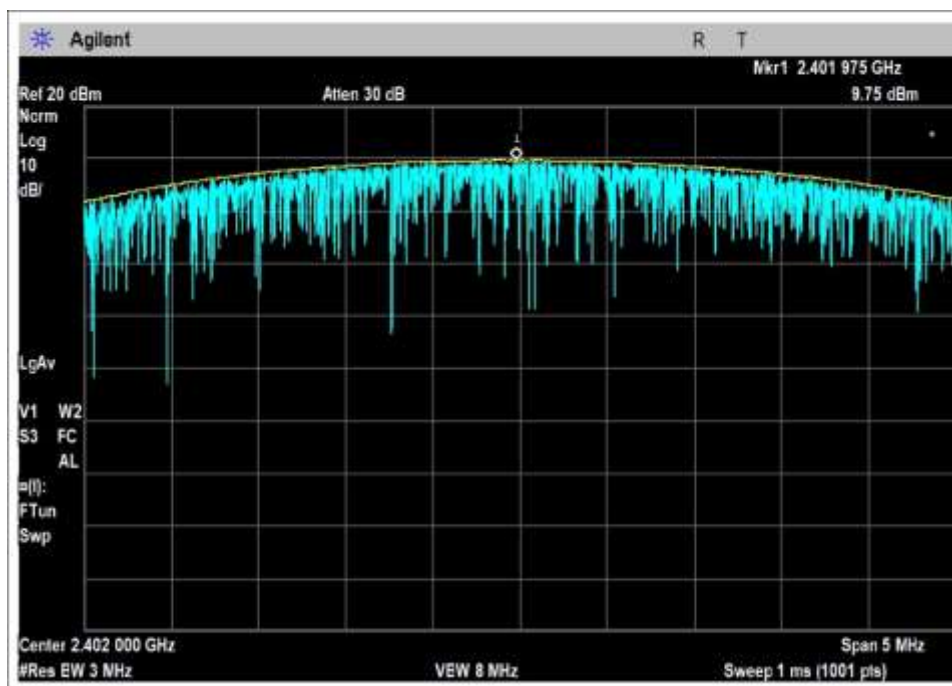
Test Data Summary - RF Conducted Measurement					
$\text{Limit} = \begin{cases} 30\text{dBm Conducted}/36\text{dBm EIRP} & \geq 75 \text{ Channels} \\ 21\text{dBm Conducted}/27\text{dBm EIRP} & < 75 \text{ Channels (min 15)} \end{cases}$					
Frequency (MHz)	Modulation	Ant. Type / Gain (dBi)	Measured (dBm)	Limit (dBm)	Results
2402	GFSK	Linear Polarized / 3.7dBi	10	≤ 30	Pass
2440	GFSK	Linear Polarized / 3.7dBi	9.9	≤ 30	Pass
2480	GFSK	Linear Polarized / 3.7dBi	9.4	≤ 30	Pass
2402	$\pi/4$ DQPSK	Linear Polarized / 3.7dBi	9.5	≤ 30	Pass
2440	$\pi/4$ DQPSK	Linear Polarized / 3.7dBi	9.2	≤ 30	Pass
2480	$\pi/4$ DQPSK	Linear Polarized / 3.7dBi	8.8	≤ 30	Pass
2402	8DPSK	Linear Polarized / 3.7dBi	9.8	≤ 30	Pass
2440	8DPSK	Linear Polarized / 3.7dBi	9.5	≤ 30	Pass
2480	8DPSK	Linear Polarized / 3.7dBi	9.1	≤ 30	Pass

For fixed point-to-point antennas, the limit is calculated in accordance with 15.247(c)(1):

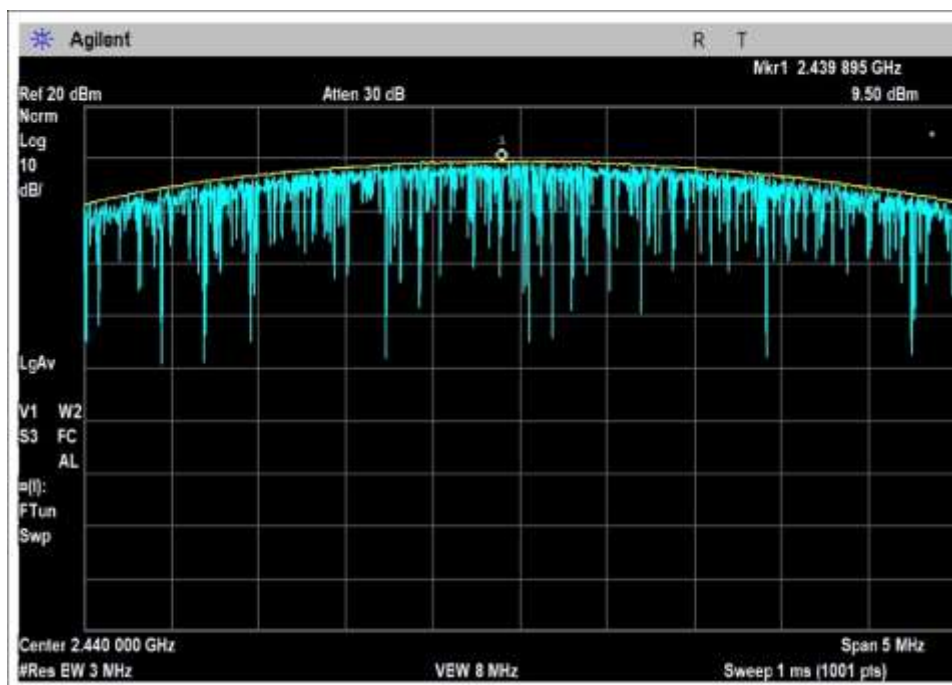
$$\text{Limit} = 30 - \text{Roundup}\left(\frac{G-6}{3}\right)$$

For directional beamforming antennas, the limit is calculated in accordance with 15.247(c)(2) and KDB 662911.

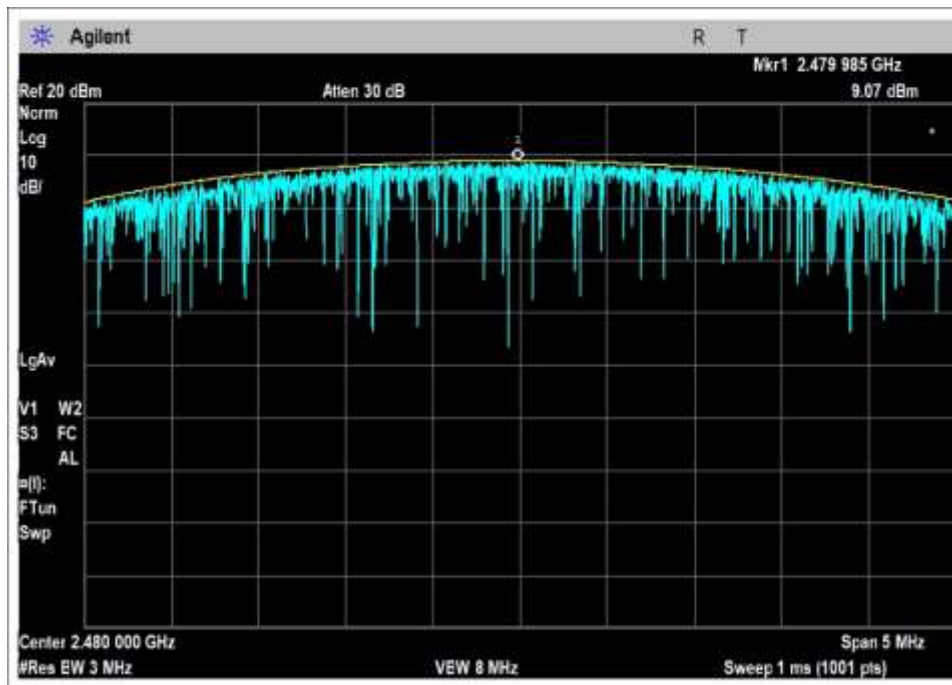
8DPSK Plot(s)



Low Channel

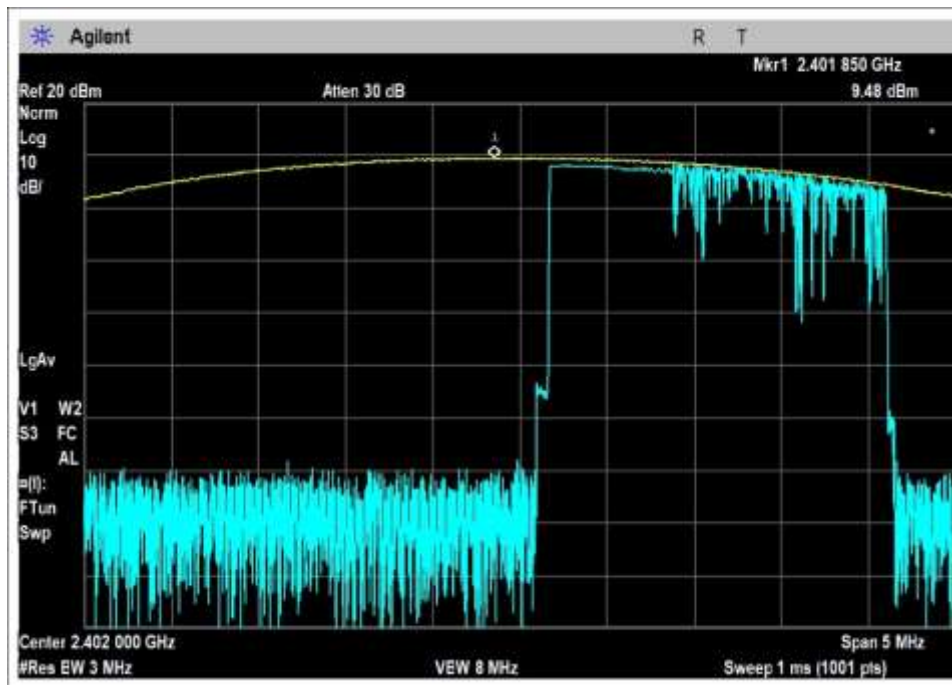


Middle Channel

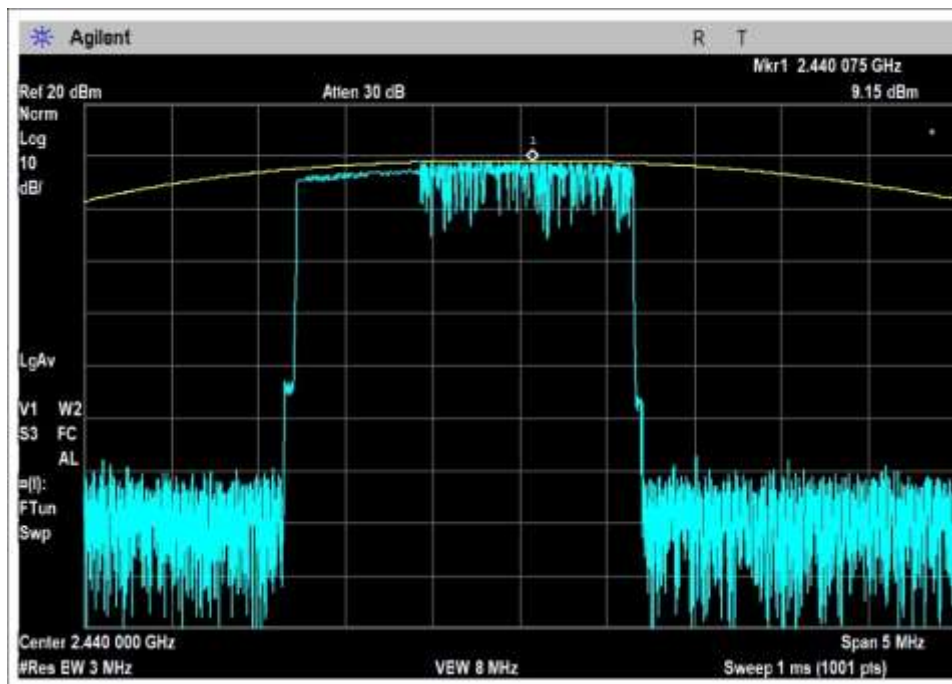


High Channel

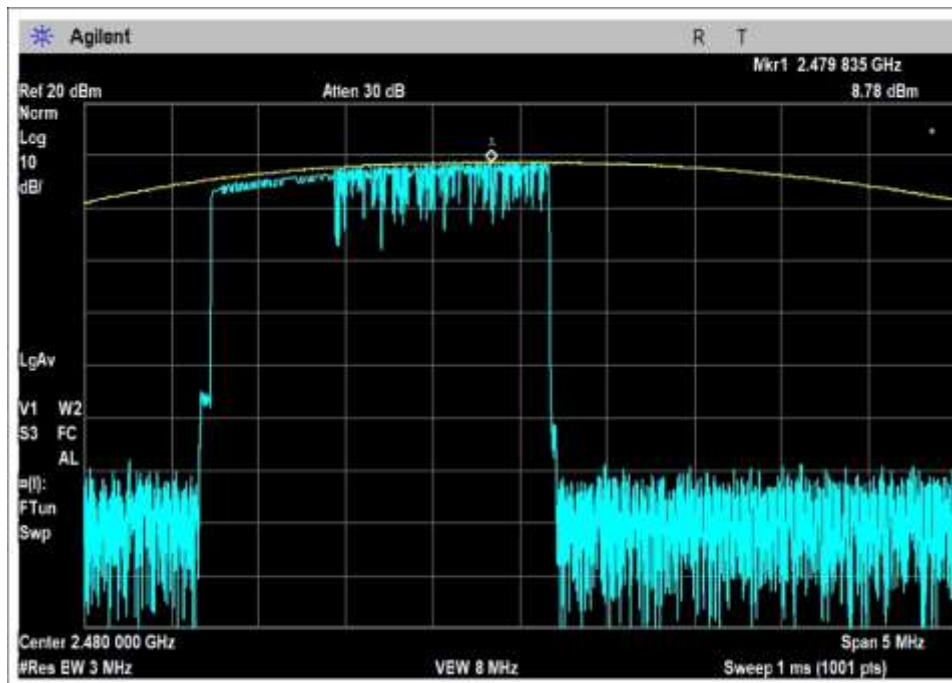
DQPSK Plot(s)



Low Channel

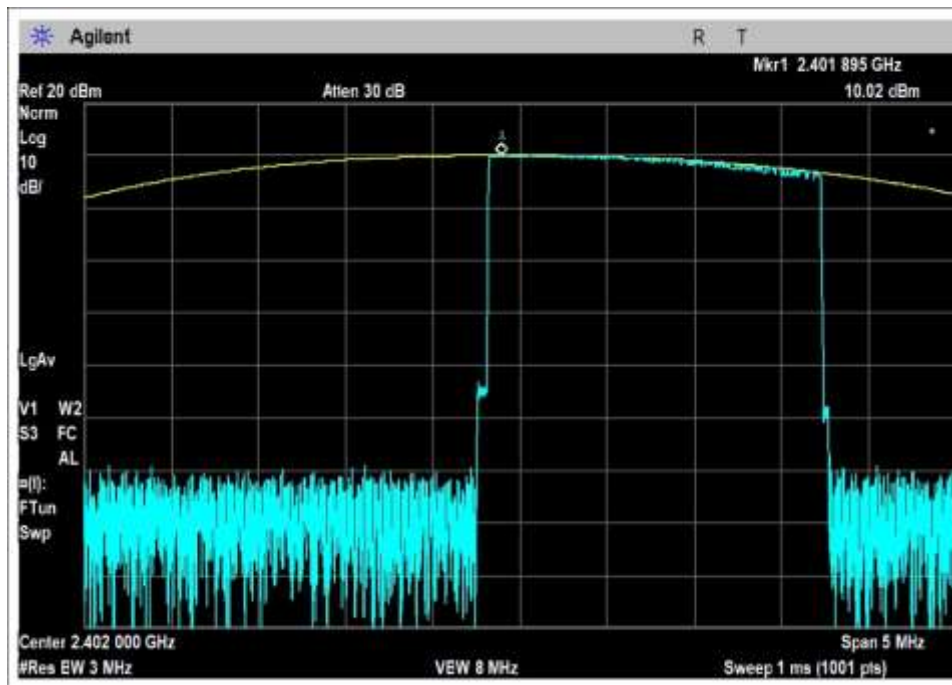


Middle Channel

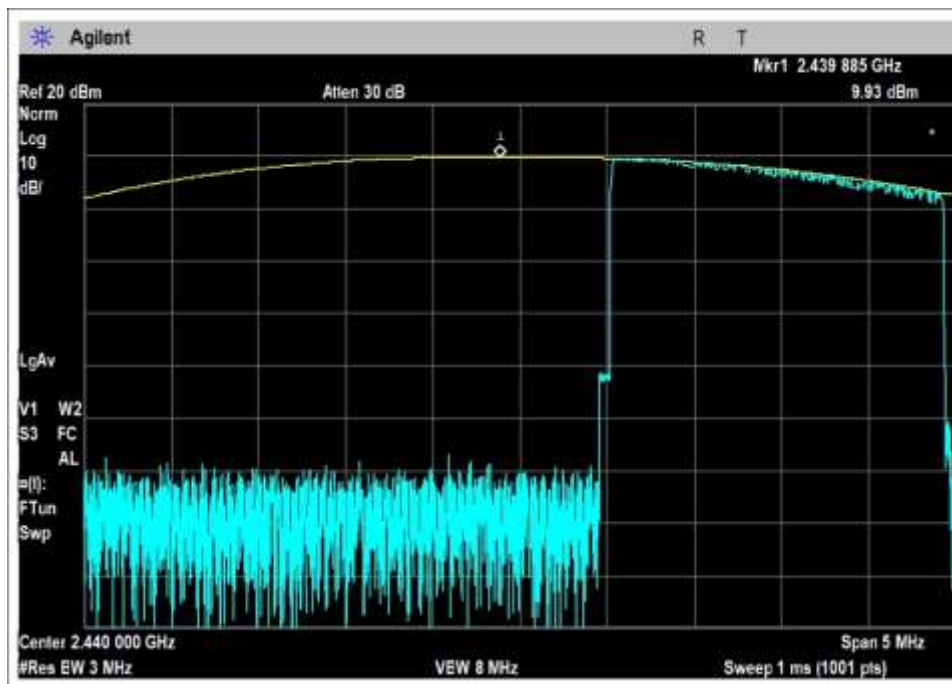


High Channel

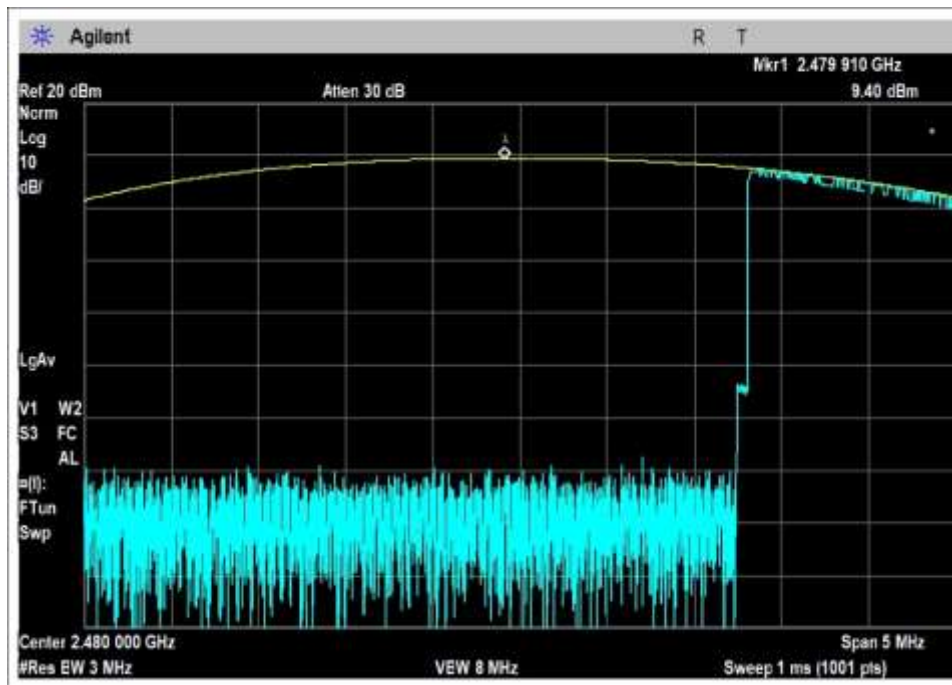
GFSK Plot(s)



Low Channel



Middle Channel



High Channel

Test Setup Photo(s)



15.247(d) RF Conducted Emissions & Band Edge

Test Setup / Conditions / Data

8DPSK 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: 10:58:12
 Tested By: Matthew Harrison Sequence#: 54
 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: 2402
 Firmware power setting: 9
 EUT Firmware:
 Protocol /MCS/Modulation: BT, 8DPSK, 3DH1 (Worst-Case)

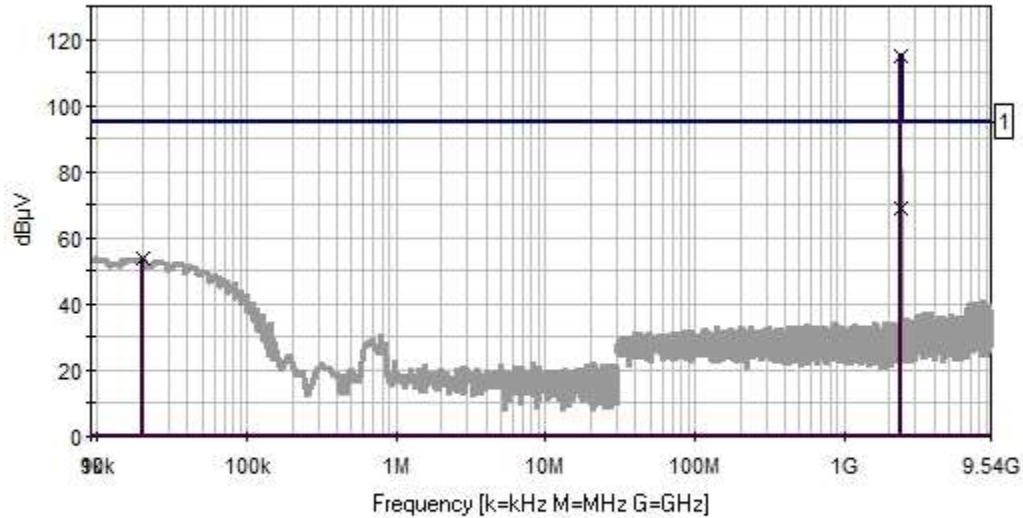
 Antenna type: Linear Polarized
 Antenna Gain: 3.7 dBi.

 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.

Nalloy, LLC. WO#: 102802 Sequence#: 54 Date: 3/27/2020
15.247(d) Conducted Spurious Emissions Test Lead: 120V 60Hz Antenna Port 0



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	2401.846M	114.8					+0.0	114.8	115.0	-0.2	Anten
2	20.138k	53.8					+0.0	53.8	95.0	-41.2	Anten
3	2403.171M	69.0					+0.0	69.0	115.0	-46.0	Anten
4	9608.569M	46.4					+0.0	46.4	95.0	-48.6	Anten
5	9608.970M	45.5					+0.0	45.5	95.0	-49.5	Anten
6	24821.270 M	44.3					+0.0	44.3	95.0	-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: 3/27/2020
 Test Type: **Conducted Emissions** Time: 11:09:37
 Tested By: Matthew Harrison Sequence#: 55
 Software: EMITest 5.03.12 120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

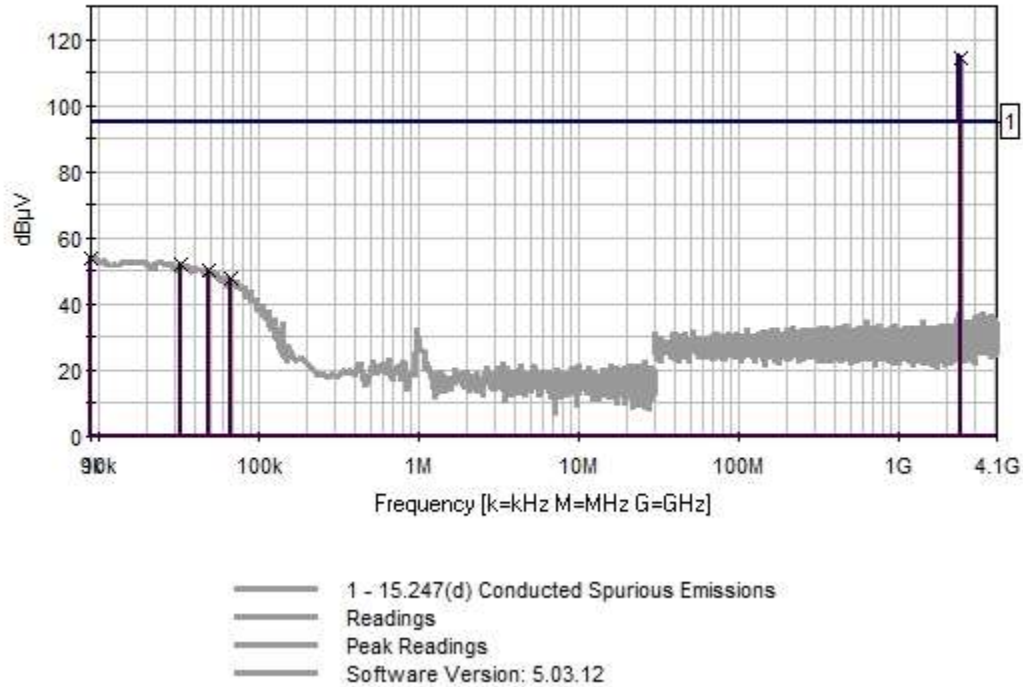
Support Equipment:

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, 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.
--

Nalloy, LLC. WO#: 102802 Sequence#: 55 Date: 3/27/2020
15.247(d) Conducted Spurious Emissions Test Lead: 120V 60Hz Antenna Port 0



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	2439.836M	114.2					+0.0	114.2	115.0	-0.8	Anten
2	9.000k	53.8					+0.0	53.8	95.0	-41.2	Anten
3	32.829k	52.1					+0.0	52.1	95.0	-42.9	Anten
4	49.749k	50.2					+0.0	50.2	95.0	-44.8	Anten
5	9759.920M	47.8					+0.0	47.8	95.0	-47.2	Anten
6	67.092k	47.5					+0.0	47.5	95.0	-47.5	Anten
7	24829.620 M	43.9					+0.0	43.9	95.0	-51.1	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: 11:20:19
 Tested By: Matthew Harrison Sequence#: 56
 Software: EMITest 5.03.12 120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

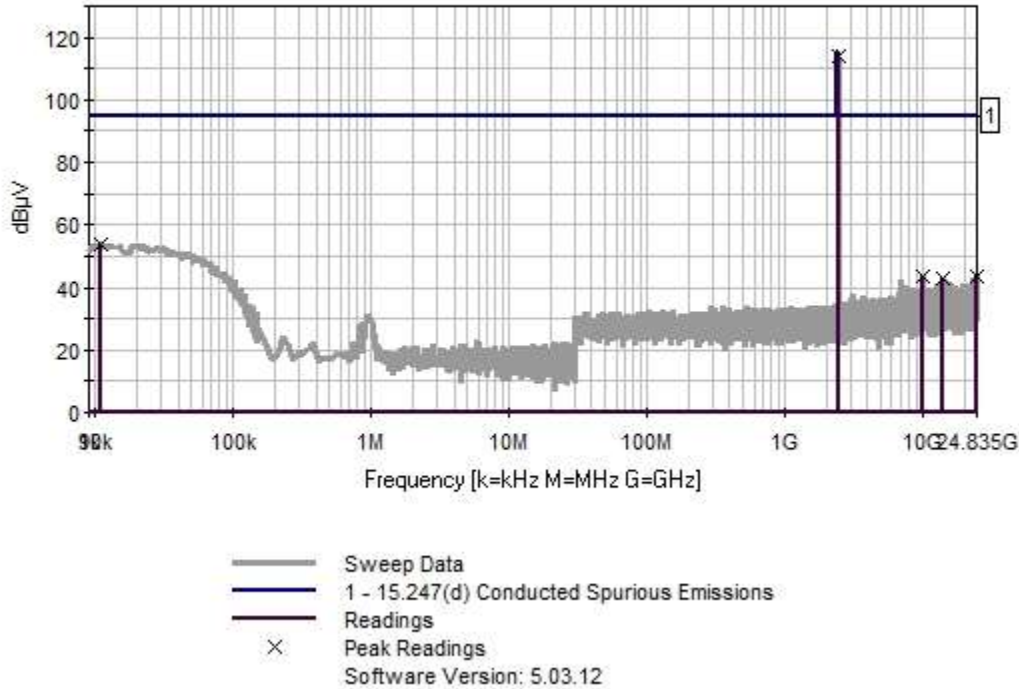
Support Equipment:

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, 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.
--

Nalloy, LLC. WO#: 102802 Sequence#: 56 Date: 3/27/2020
15.247(d) Conducted Spurious Emissions Test Lead: 120V 60Hz Antenna Port 0



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	2479.843M	114.2					+0.0	114.2	115.0	-0.8	Anten
2	11.115k	53.6					+0.0	53.6	95.0	-41.4	Anten
3	9920.581M	43.6					+0.0	43.6	95.0	-51.4	Anten
4	24803.920 M	43.4					+0.0	43.4	95.0	-51.6	Anten
5	14198.450 M	42.6					+0.0	42.6	95.0	-52.4	Anten

DQPSK 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: 10:46:19
 Tested By: Matthew Harrison Sequence#: 53
 Software: EMITest 5.03.12 120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

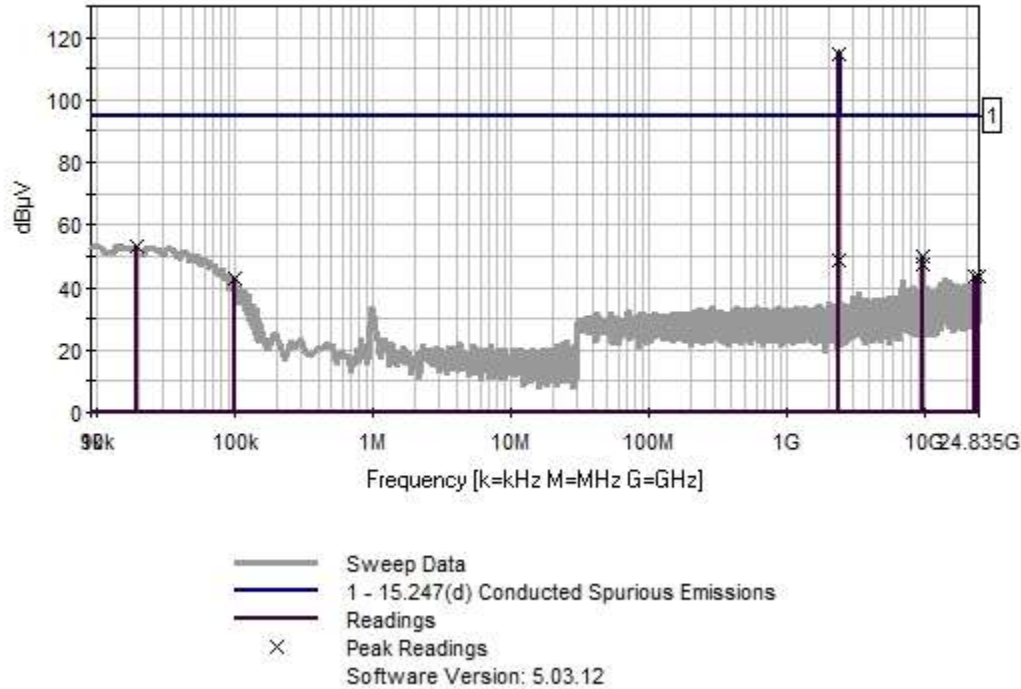
Support Equipment:

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: 2402 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.
--

Nalloy, LLC. WO#: 102802 Sequence#: 53 Date: 3/27/2020
15.247(d) Conducted Spurious Emissions Test Lead: 120V 60Hz Antenna Port 0



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	2401.839M	114.8					+0.0	114.8	115.0	-0.2	Anten
2	19.575k	53.4					+0.0	53.4	95.0	-41.6	Anten
3	9608.469M	50.2					+0.0	50.2	95.0	-44.8	Anten
4	2399.367M	48.9					+0.0	48.9	95.0	-46.1	Anten
5	9607.969M	47.3					+0.0	47.3	95.0	-47.7	Anten
6	23298.350 M	43.7					+0.0	43.7	95.0	-51.3	Anten
7	24717.960 M	43.7					+0.0	43.7	95.0	-51.3	Anten
8	98.958k	42.8					+0.0	42.8	95.0	-52.2	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: 10:34:28
 Tested By: Matthew Harrison Sequence#: 52
 Software: EMITest 5.03.12 120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

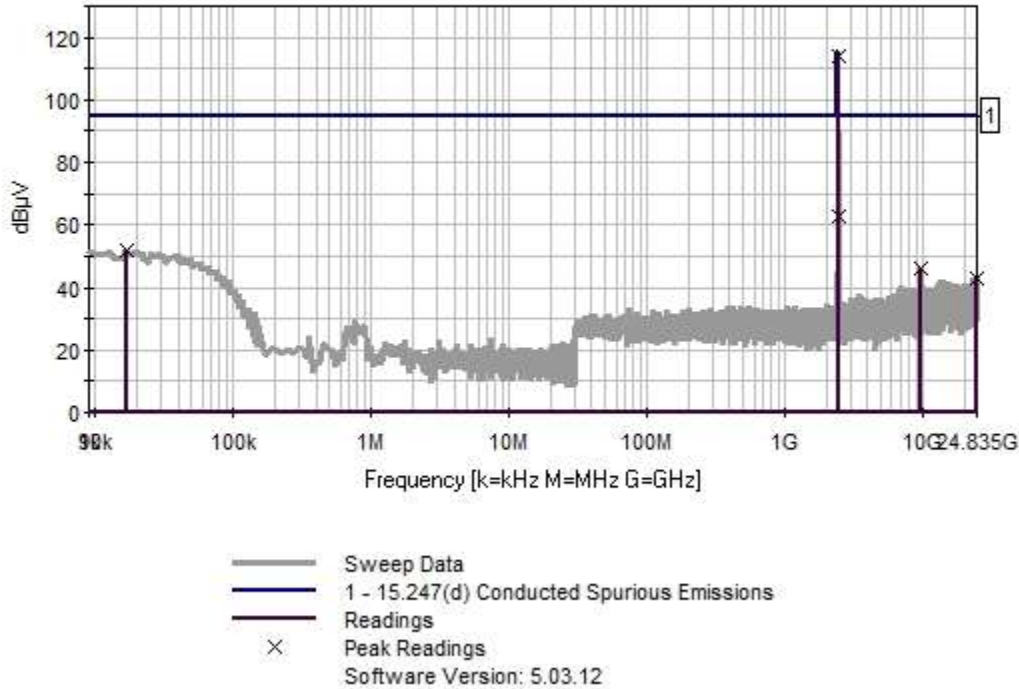
Support Equipment:

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, 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.
--

Nalloy, LLC. WO#: 102802 Sequence#: 52 Date: 3/27/2020
15.247(d) Conducted Spurious Emissions Test Lead: 120V 60Hz Antenna Port 0



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	2439.839M	114.2					+0.0	114.2	115.0	-0.8	Anten
2	16.755k	51.6					+0.0	51.6	95.0	-43.4	Anten
3	9760.421M	46.1					+0.0	46.1	95.0	-48.9	Anten
4	24790.590 M	43.0					+0.0	43.0	95.0	-52.0	Anten
5	24791.160 M	43.0					+0.0	43.0	95.0	-52.0	Anten
6	2438.306M	62.9					+0.0	62.9	115.0	-52.1	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: 10:19:07
 Tested By: Matthew Harrison Sequence#: 51
 Software: EMITest 5.03.12 120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

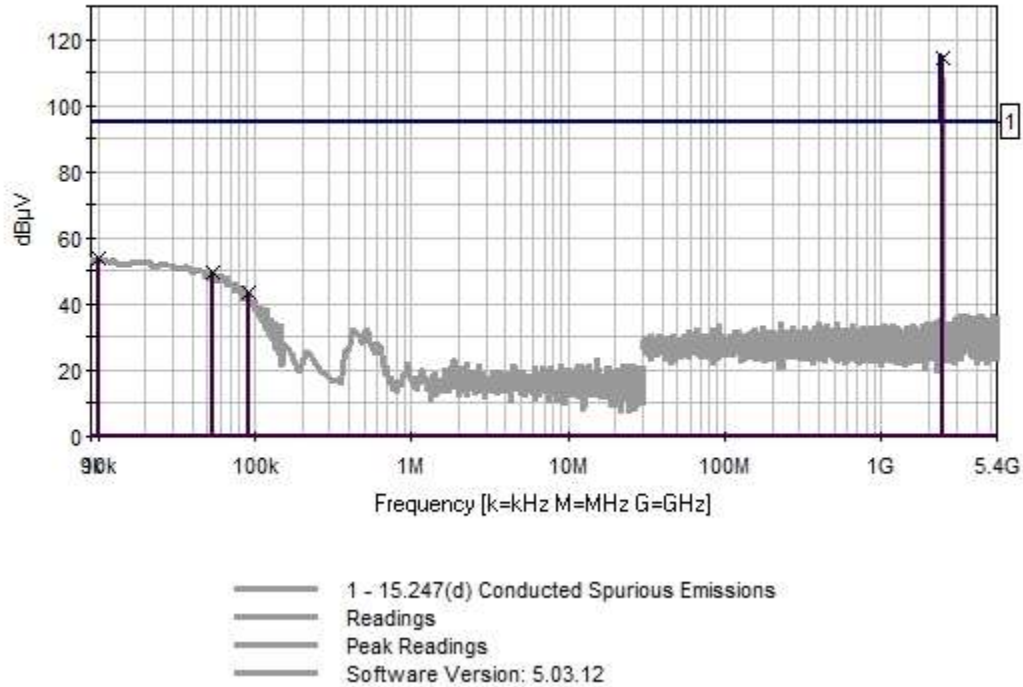
Support Equipment:

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, 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.
--

Nalloy, LLC. WO#: 102802 Sequence#: 51 Date: 3/27/2020
15.247(d) Conducted Spurious Emissions Test Lead: 120V 60Hz Antenna Port 0



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	2479.844M	114.1					+0.0	114.1	115.0	-0.9	Anten
2	9.987k	53.6					+0.0	53.6	95.0	-41.4	Anten
3	54.684k	49.6					+0.0	49.6	95.0	-45.4	Anten
4	92.049k	43.5					+0.0	43.5	95.0	-51.5	Anten
5	24672.020 M	43.3					+0.0	43.3	95.0	-51.7	Anten
6	24745.290 M	43.2					+0.0	43.2	95.0	-51.8	Anten

GFSK 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: 10:11:08
 Tested By: Matthew Harrison Sequence#: 48
 Software: EMITest 5.03.12 120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

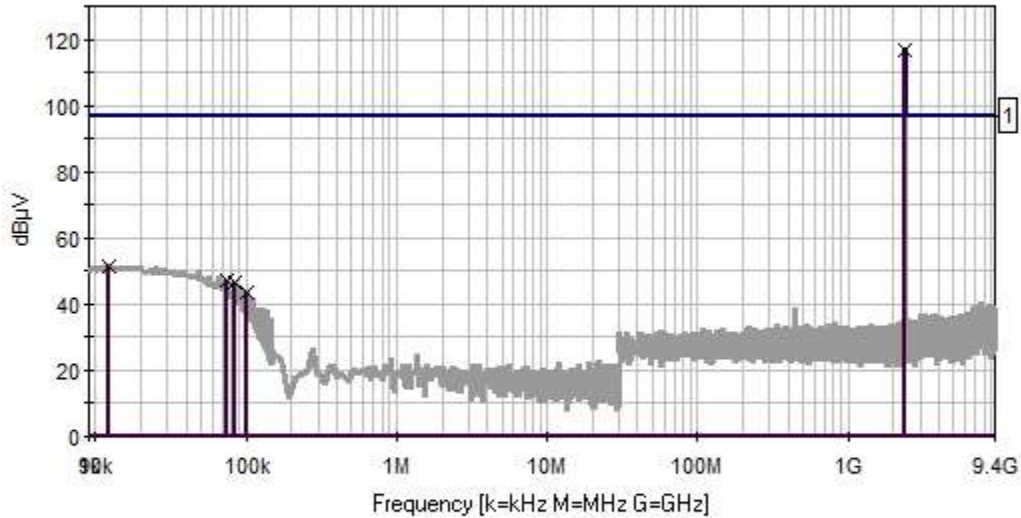
Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Environmental Conditions: Temperature: 22° C Humidity: 28% Pressure: 101.3 kPa Frequency Range: 9kHz-25GHz Frequency tested: 2402 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.

Nalloy, LLC. WO#: 102802 Sequence#: 48 Date: 3/27/2020
15.247(d) Conducted Spurious Emissions Test Lead: 120V 60Hz Antenna Port 0



1 - 15.247(d) Conducted Spurious Emissions
Readings
Peak Readings
Software Version: 5.03.12

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			

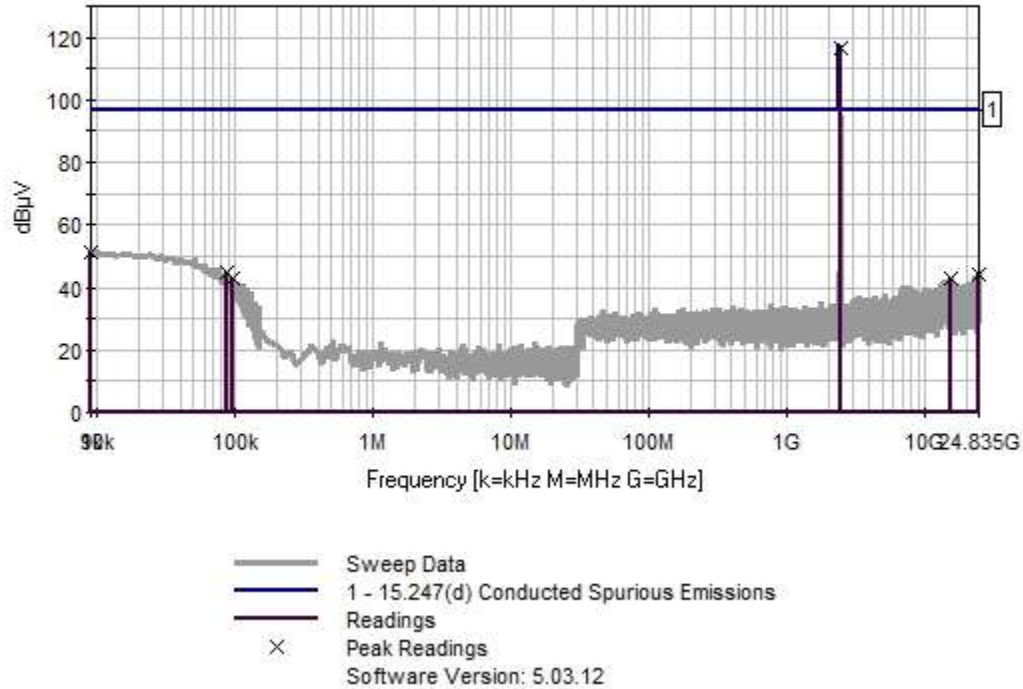
Support Equipment:

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.
--

Nalloy, LLC. WO#: 102802 Sequence#: 49 Date: 3/27/2020
15.247(d) Conducted Spurious Emissions Test Lead: 120V 60Hz Antenna Port 0



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					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			

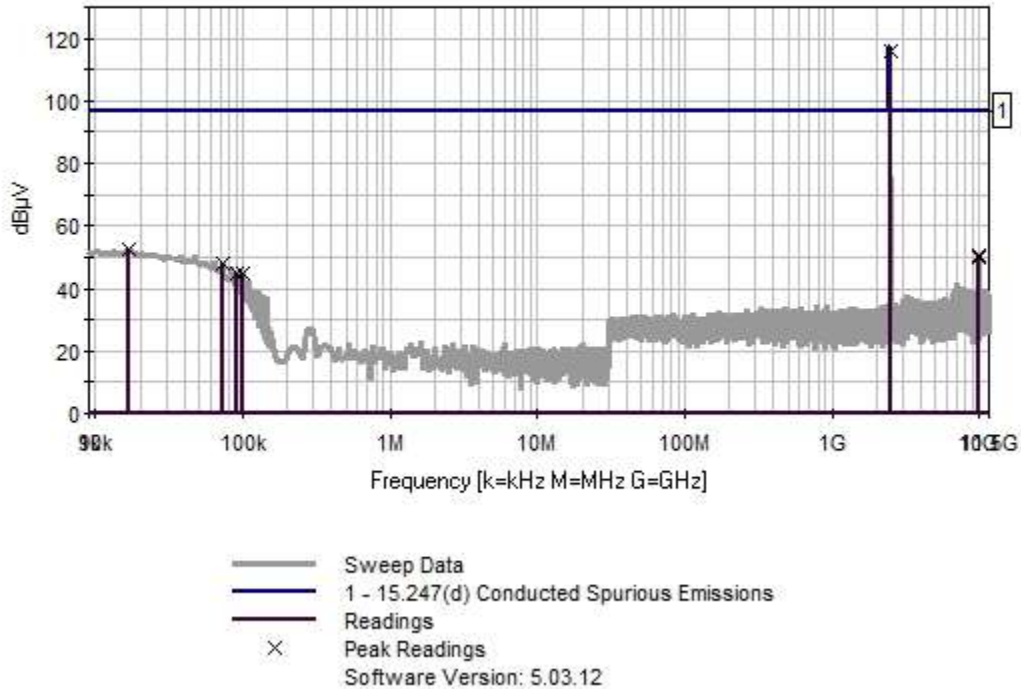
Support Equipment:

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.
--

Nalloy, LLC. WO#: 102802 Sequence#: 50 Date: 3/27/2020
15.247(d) Conducted Spurious Emissions Test Lead: 120V 60Hz Antenna Port 0



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	$\pi/4$ DQPSK	59.4	<95	Pass
2483.5	$\pi/4$ DQPSK	48.5	<95	Pass
2400	8DPSK	59.8	<95	Pass
2483.5	8DPSK	47.4	<95	Pass

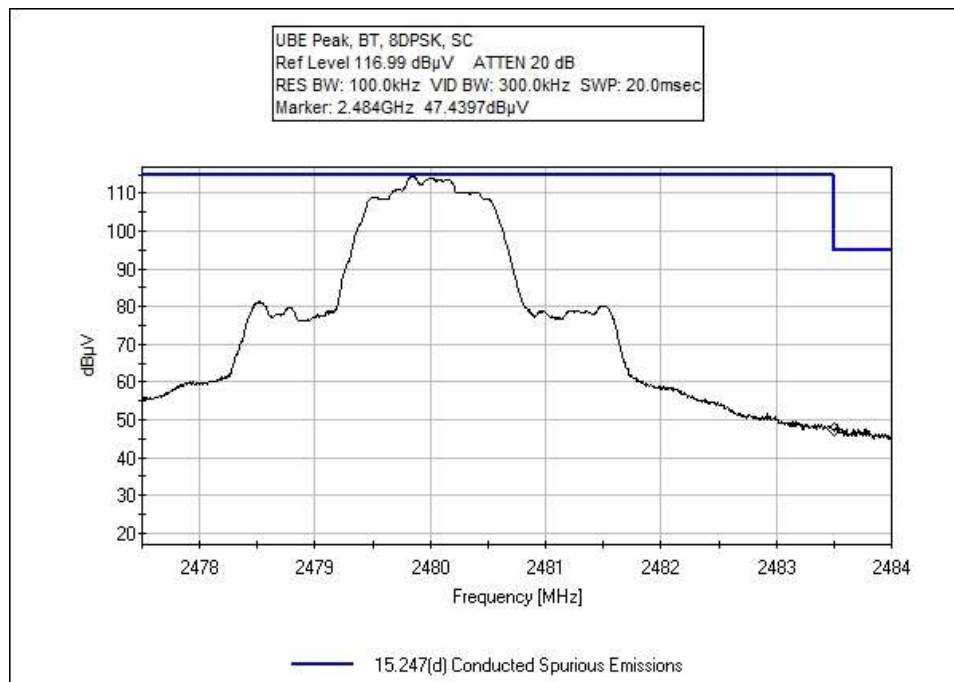
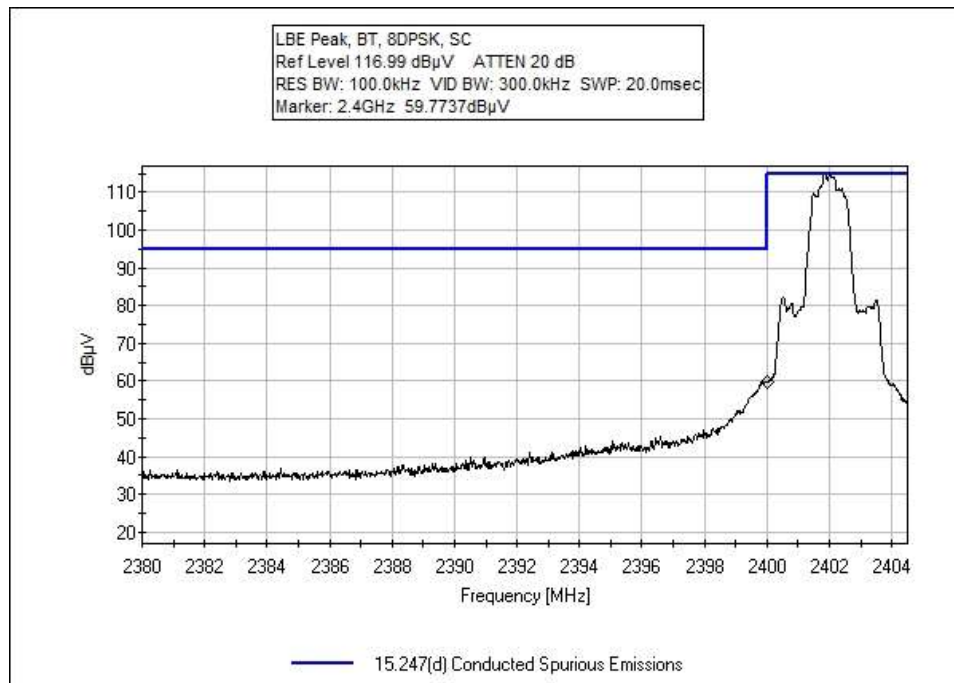
Band Edge Summary

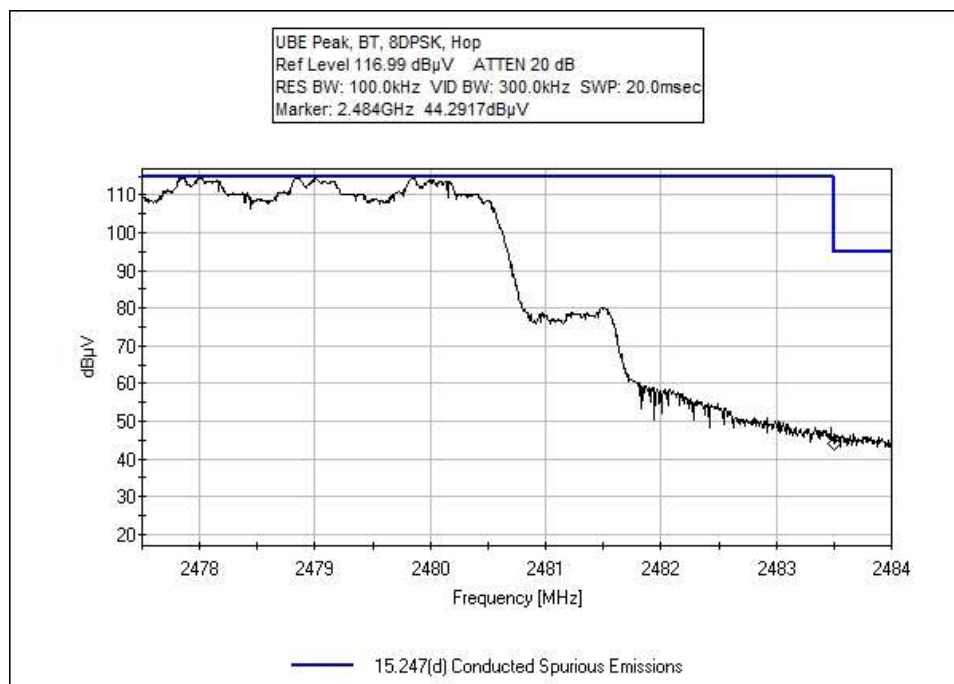
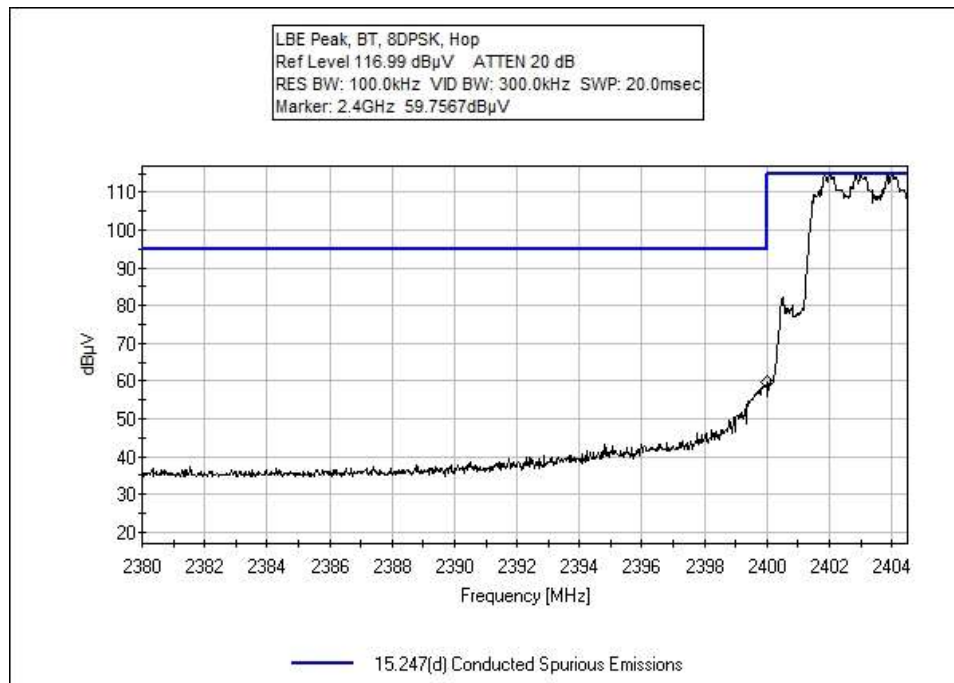
Limit applied: Max Power/100kHz - 20dB.

Operating Mode: Hopping

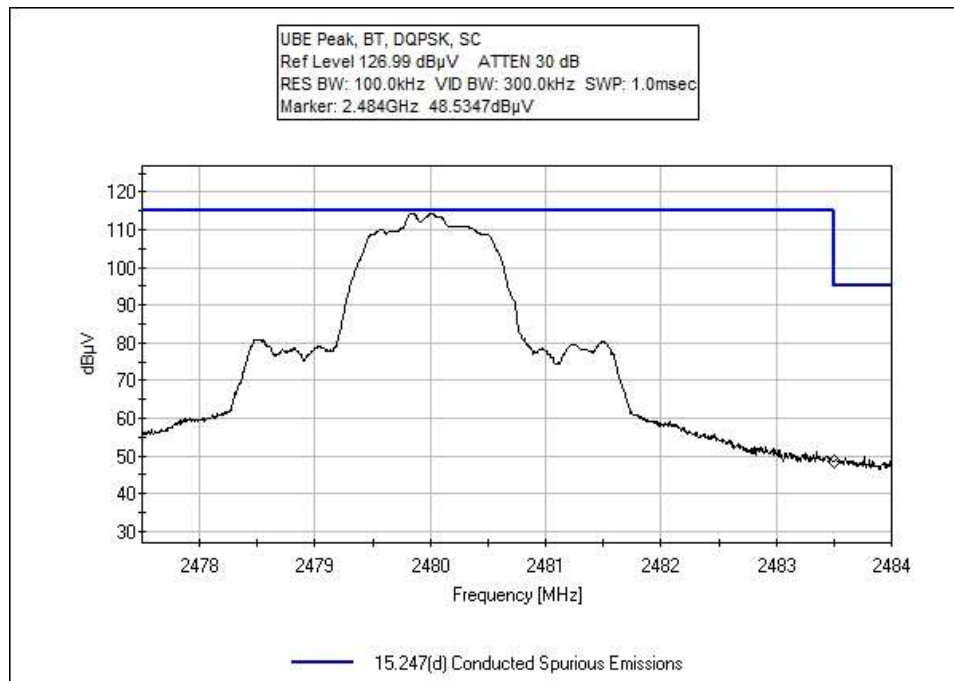
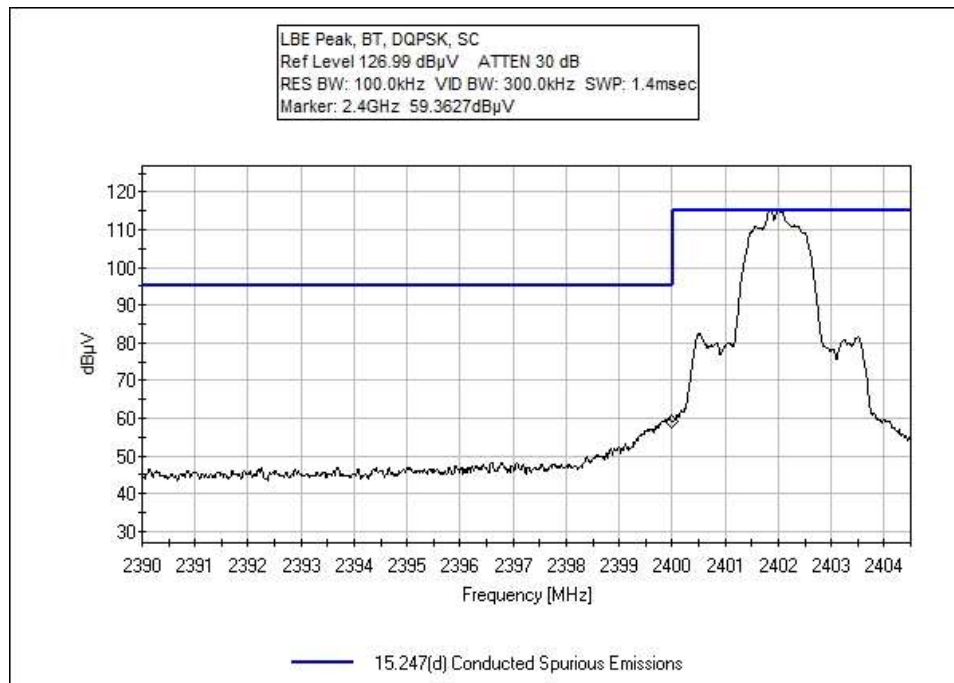
Frequency (MHz)	Modulation	Measured (dBm)	Limit (dBm)	Results
2400	GFSK	62.2	<97	Pass
2483.5	GFSK	47.2	<97	Pass
2400	$\pi/4$ DQPSK	58.5	<95	Pass
2483.5	$\pi/4$ DQPSK	45.5	<95	Pass
2400	8DPSK	59.8	<95	Pass
2483.5	8DPSK	44.3	<95	Pass

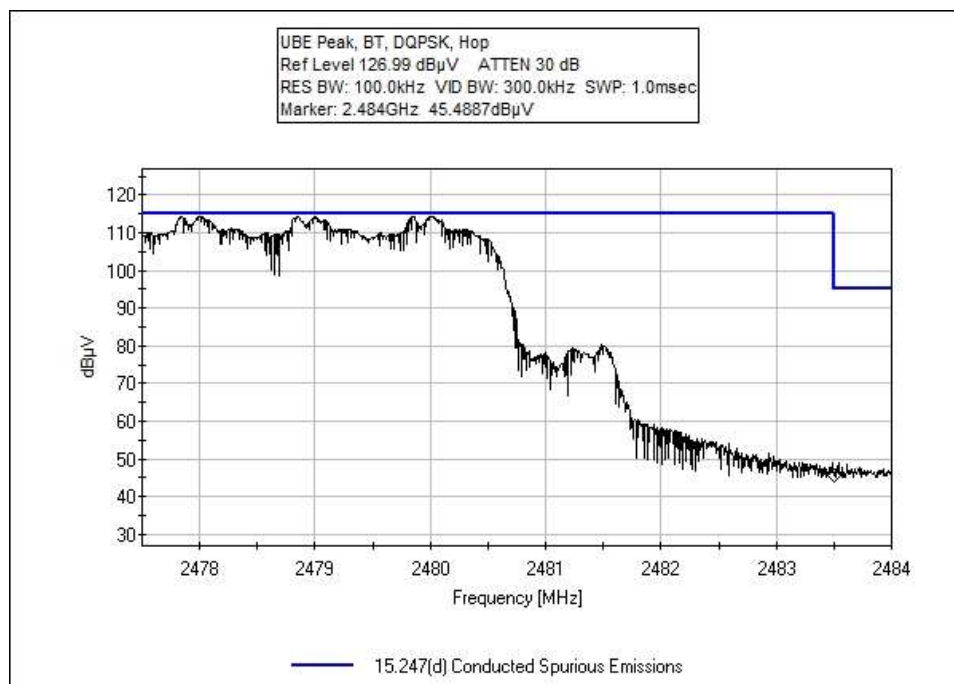
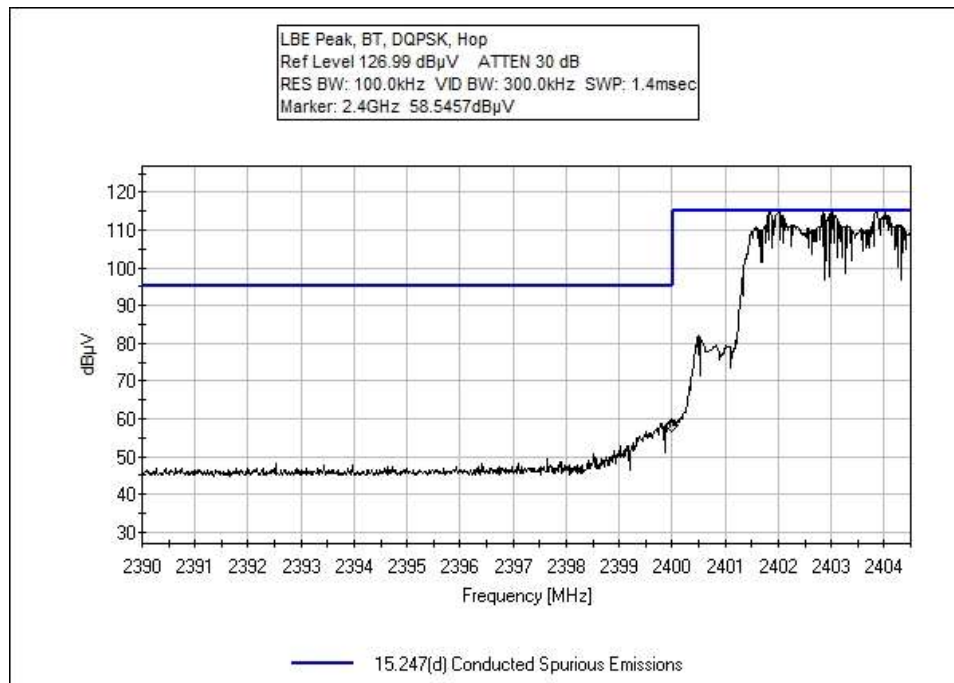
8DPSK Band Edge Plots



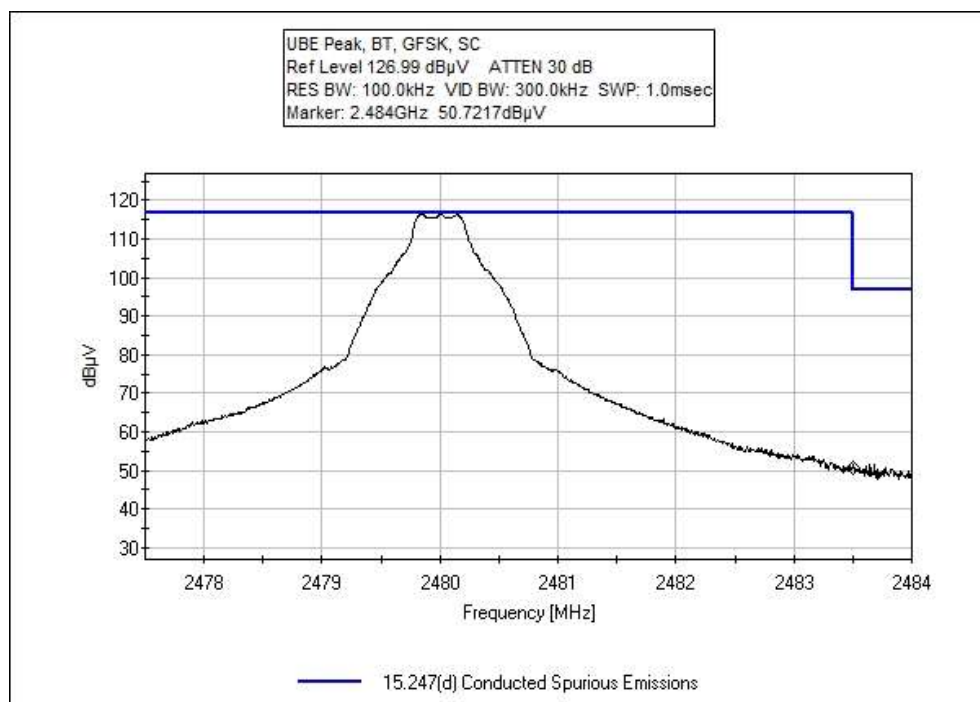
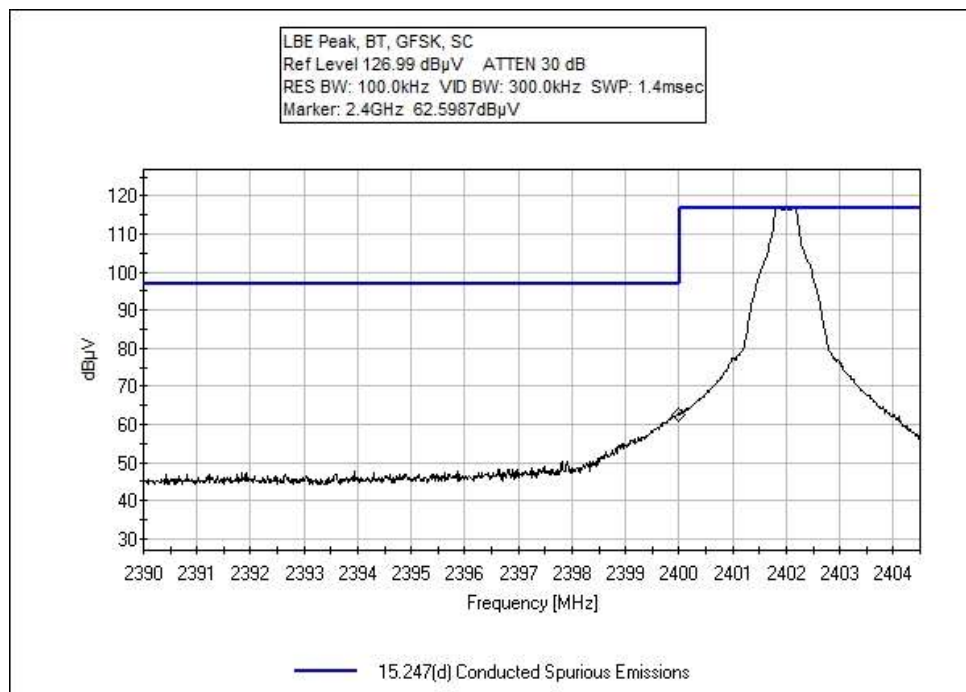


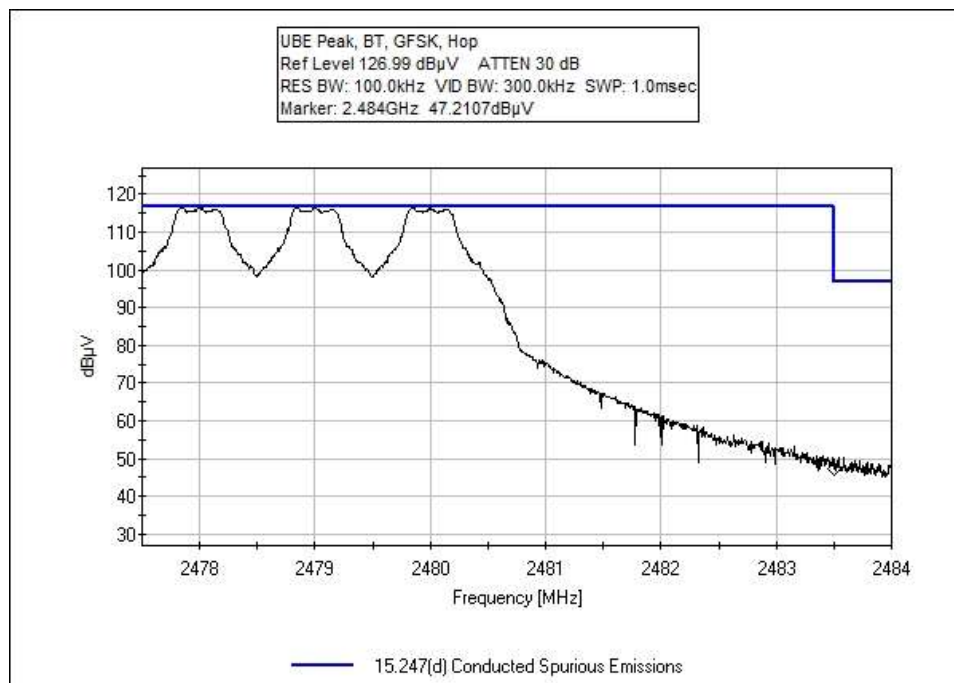
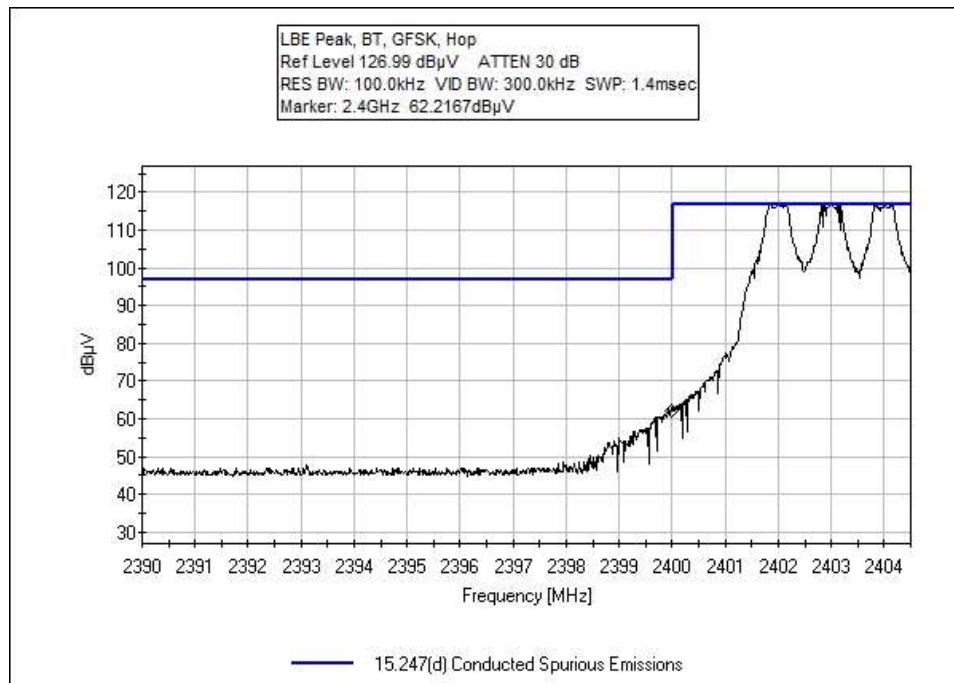
DQPSK Band Edge Plots





GFSK Band Edge Plots





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



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



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				Dist Table	Corr dBμV	Spec dBμV	Margin dB	Polar Ant
1	2402.137M	117.0	+0.0				+0.0	117.0	117.0	+0.0	Anten
									SC		
2	2400.000M	62.6	+0.0				+0.0	62.6	97.0	-34.4	Anten
									SC		
3	2400.000M	62.2	+0.0				+0.0	62.2	97.0	-34.8	Anten
									Hop		
4	2483.500M	50.7	+0.0				+0.0	50.7	97.0	-46.3	Anten
									SC		
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			

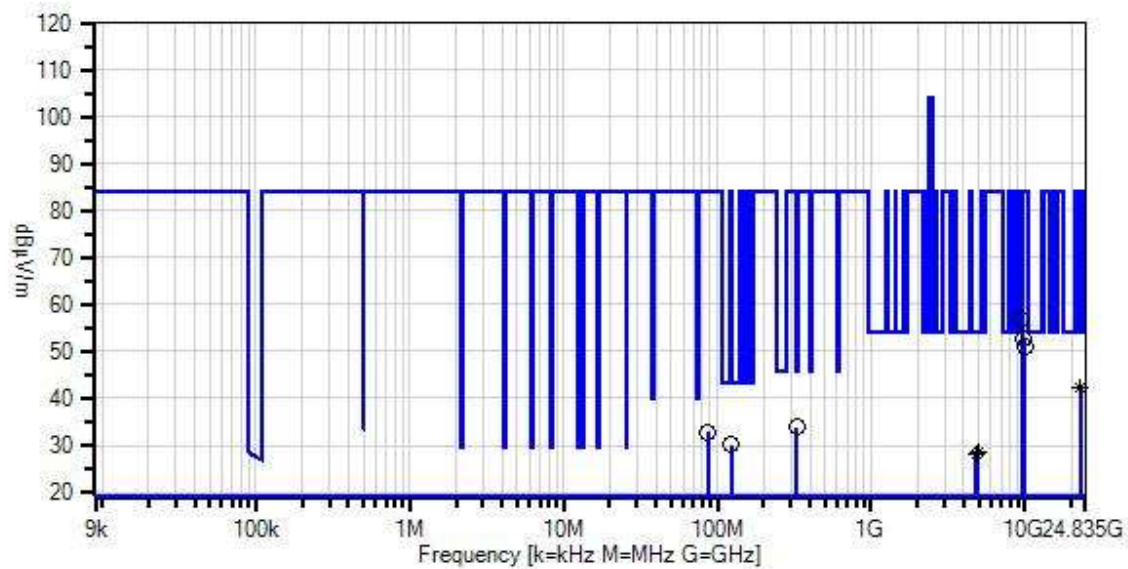
Support Equipment:

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.
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Nalloy, LLC. WO#: 102802 Sequence#: 83 Date: 4/7/2020
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Perp + Para



— Sweep Data
○ Peak Readings
* Average Readings
— Readings
× QP Readings
▼ Ambient
— 1 - 15.247(d) / 15.209 Radiated Spurious Emissions

Software Version: 5.03.12

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	Heliac	6/29/2018	6/29/2020
T3	ANP06540	Cable	Heliac	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	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
			T5	T6	T7	T8					
			T9	T10	T11	T12					
			T13	T14	T15	T16					
			T17	T18							
	MHz	dBμV	dB	dB	dB	dB	Table	dBμV/m	dBμV/m	dB	Ant
1	22979.840	44.9	+0.0	+0.0	+0.0	+0.0	+0.0	42.4	54.0	-11.6	Vert
	M		+0.0	+0.0	+0.0	+1.7					
	Ave		+9.5	+0.8	+1.3	-15.8					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0							
^	22979.840	50.5	+0.0	+0.0	+0.0	+0.0	+0.0	48.0	54.0	-6.0	Vert
	M		+0.0	+0.0	+0.0	+1.7					
			+9.5	+0.8	+1.3	-15.8					
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0							

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 Ave	23.7	+32.6	+4.2	+0.9	+0.0	+0.0	28.7	54.0	-25.3	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							
^	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 Ave	23.3	+32.4	+4.1	+0.9	+0.0	+0.0	28.3	54.0	-25.7	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							
^	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 Ave	23.1	+32.5	+4.2	+0.9	+0.0	+0.0	28.1	54.0	-25.9	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							
^	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			

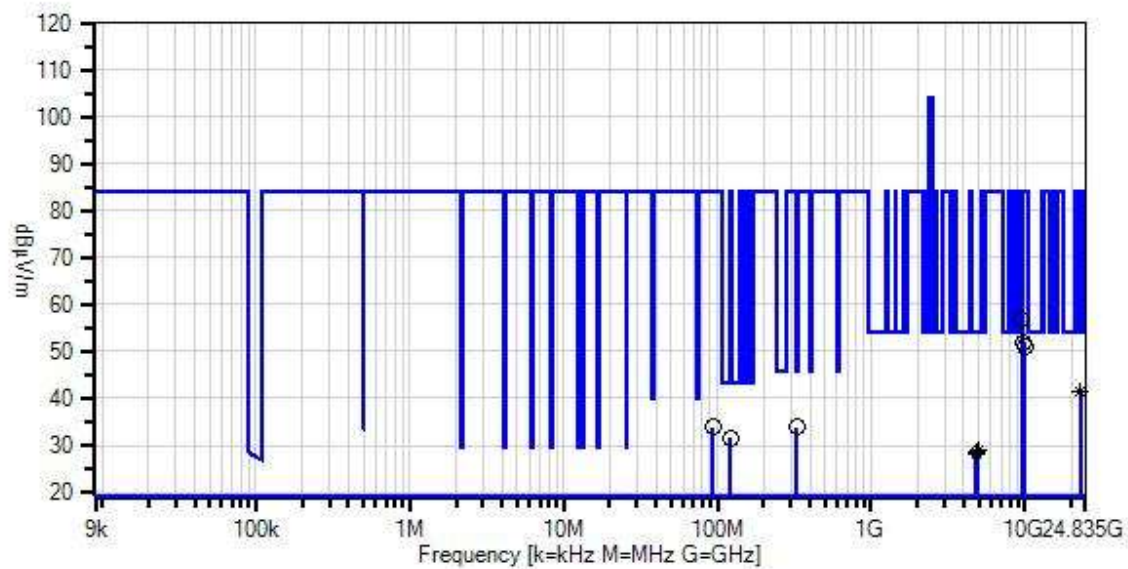
Support Equipment:

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.
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Nalloy, LLC. WO#: 102802 Sequence#: 82 Date: 4/7/2020
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Perp + Para



— 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	Heliac	6/29/2018	6/29/2020
T3	ANP06540	Cable	Heliac	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	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
			T5	T6	T7	T8					
			T9	T10	T11	T12					
			T13	T14	T15	T16					
			T17								
	MHz	dBμV	dB	dB	dB	dB	Table	dBμV/m	dBμV/m	dB	Ant
1	328.800M	38.3	+0.0	+0.0	+0.2	+0.0	+0.0	33.8	46.0	-12.2	Vert
			+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								

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	+0.0 -15.8 +1.3 +0.0 +0.0	+0.0 +1.7 +0.0 +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	+0.0 -15.8 +1.3 +0.0 +0.0	+0.0 +1.7 +0.0 +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 +0.0	+0.9 +0.0 +0.0 +0.0 +0.0	-33.6 +0.0 +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 +0.0	+0.9 +0.0 +0.0 +0.0 +0.0	-33.6 +0.0 +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 +0.0	+0.9 +0.0 +0.0 +0.0 +0.0	-33.6 +0.0 +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 +0.0	+0.9 +0.0 +0.0 +0.0 +0.0	-33.6 +0.0 +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 +0.0	+0.9 +0.0 +0.0 +0.0 +0.0	-33.6 +0.0 +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 +0.0	+0.9 +0.0 +0.0 +0.0 +0.0	-33.6 +0.0 +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 +0.0	+1.4 +0.0 +0.0 +0.0 +0.0	-33.9 +0.0 +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 +0.0	+1.3 +0.0 +0.0 +0.0 +0.0	-33.9 +0.0 +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 +0.0	+1.3 +0.0 +0.0 +0.0 +0.0	-33.9 +0.0 +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 +0.0	+0.1 +0.0 +0.0 +0.5 +0.6	+0.0 +0.0 -27.7 +0.6 +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 +0.5	+0.1 +0.0 +0.0 +0.5 +0.7	+0.0 +0.0 -27.6 +0.7 +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 +0.0	+0.1 +0.0 +0.0 +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 +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			

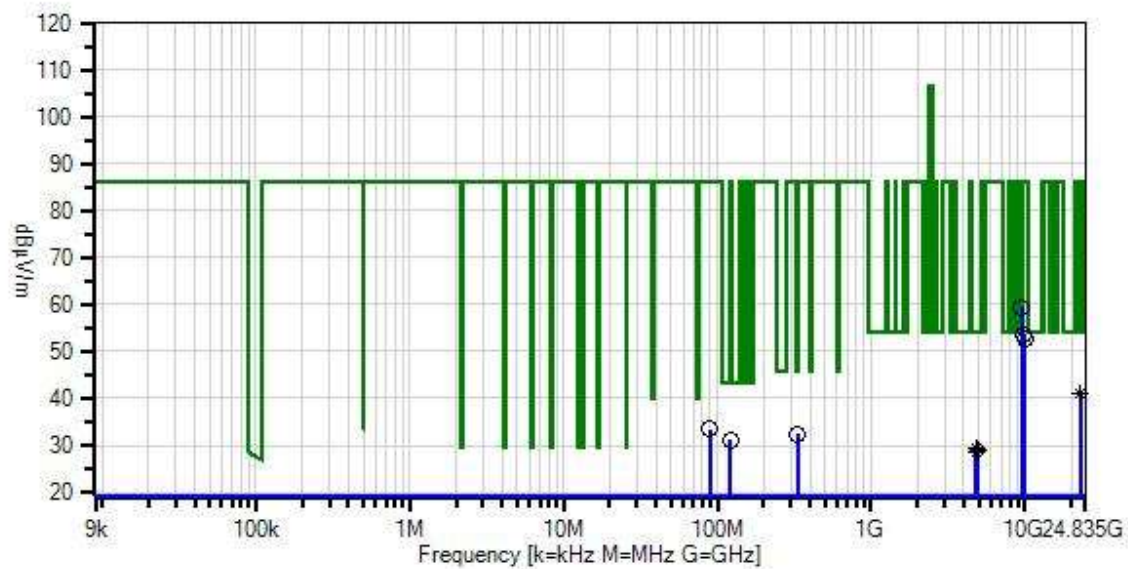
Support Equipment:

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.
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Nalloy, LLC. WO#: 102802 Sequence#: 81 Date: 4/7/2020
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Vert & Horz



— 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	Heliac	6/29/2018	6/29/2020
T3	ANP06540	Cable	Heliac	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	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
			T5	T6	T7	T8					
			T9	T10	T11	T12					
			T13	T14	T15	T16					
	MHz	dBμV	dB	dB	dB	dB	Table	dBμV/m	dBμV/m	dB	Ant
1	121.200M	43.7	+0.0	+0.0	+0.1	+0.0	+0.0	31.2	43.5	-12.3	Vert
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	-27.6					
			+8.0	+5.8	+0.5	+0.7					
2	22979.880 M	43.4	+0.0	+0.0	+0.0	+0.0	+0.0	40.9	54.0	-13.1	Vert
	Ave		+0.0	+0.0	-15.8	+1.7					
			+9.5	+0.8	+1.3	+0.0					
			+0.0	+0.0	+0.0	+0.0					
^	22979.880 M	49.7	+0.0	+0.0	+0.0	+0.0	+0.0	47.2	54.0	-6.8	Vert
			+0.0	+0.0	-15.8	+1.7					
			+9.5	+0.8	+1.3	+0.0					
			+0.0	+0.0	+0.0	+0.0					
4	330.700M	36.9	+0.0	+0.0	+0.2	+0.0	+0.0	32.5	46.0	-13.5	Vert
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	-27.1					
			+14.6	+5.8	+0.9	+1.2					

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

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	$\pi/4$ DQPSK	Linear Polarized	38.9	<54	Pass
2400.0	$\pi/4$ DQPSK	Linear Polarized	77.4	<83	Pass
2483.5	$\pi/4$ 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

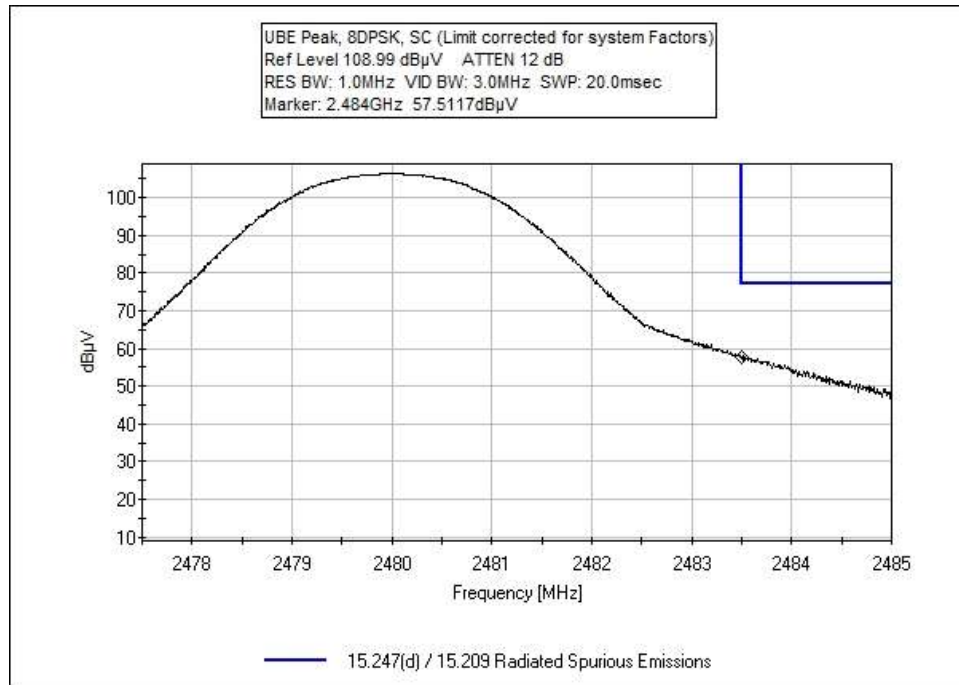
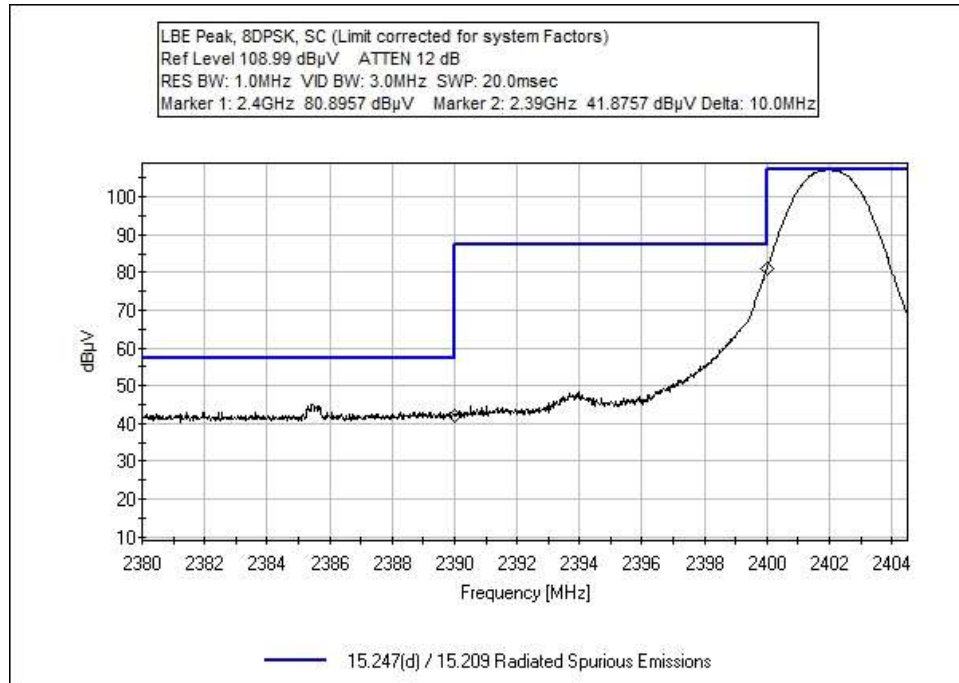
Band Edge Summary

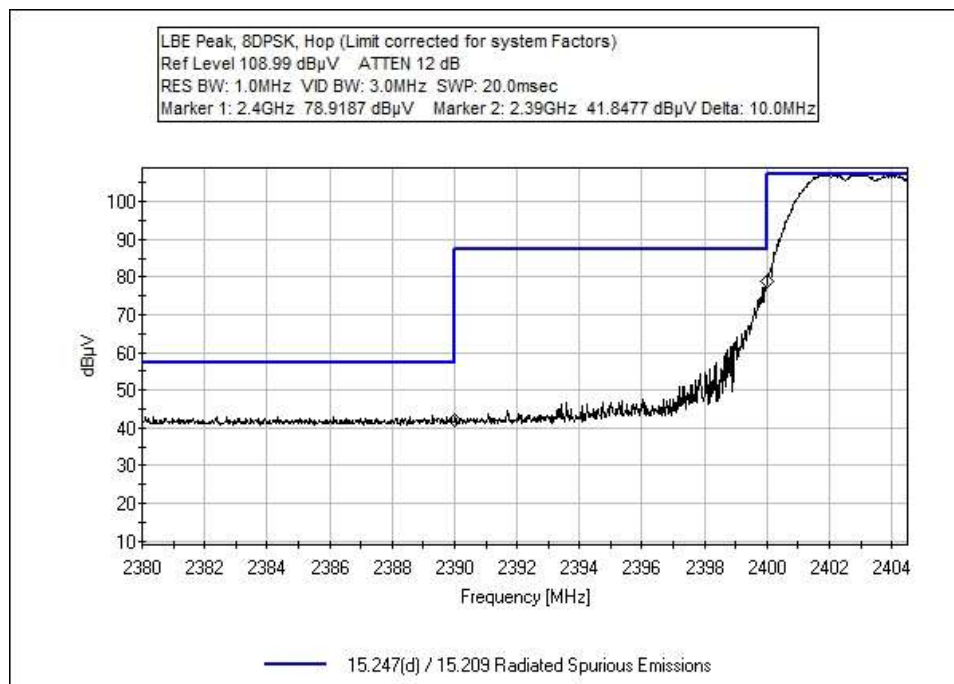
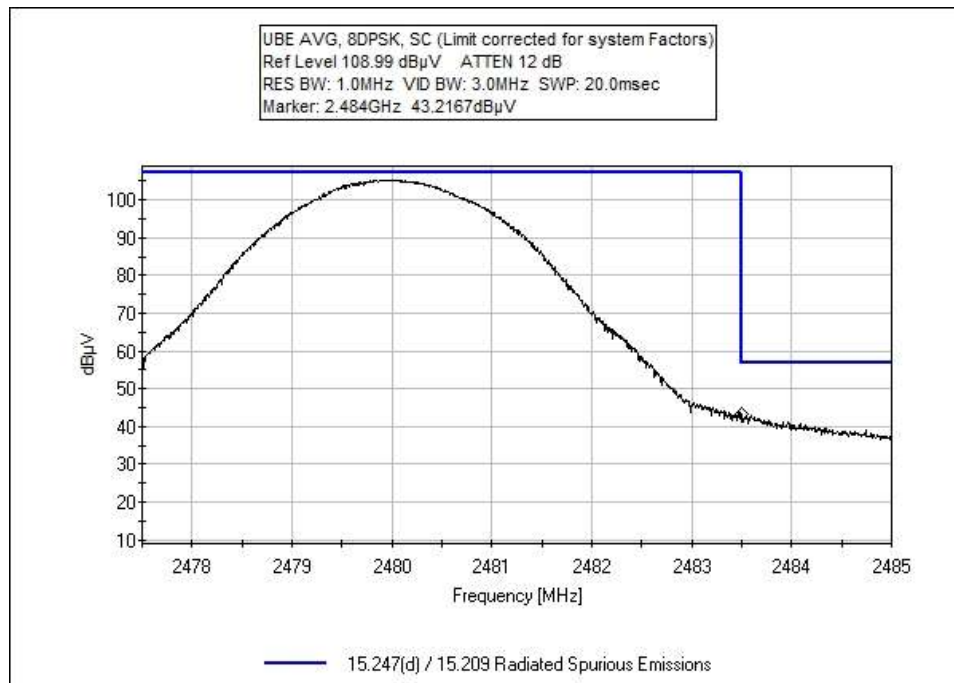
Operating Mode: Hopping

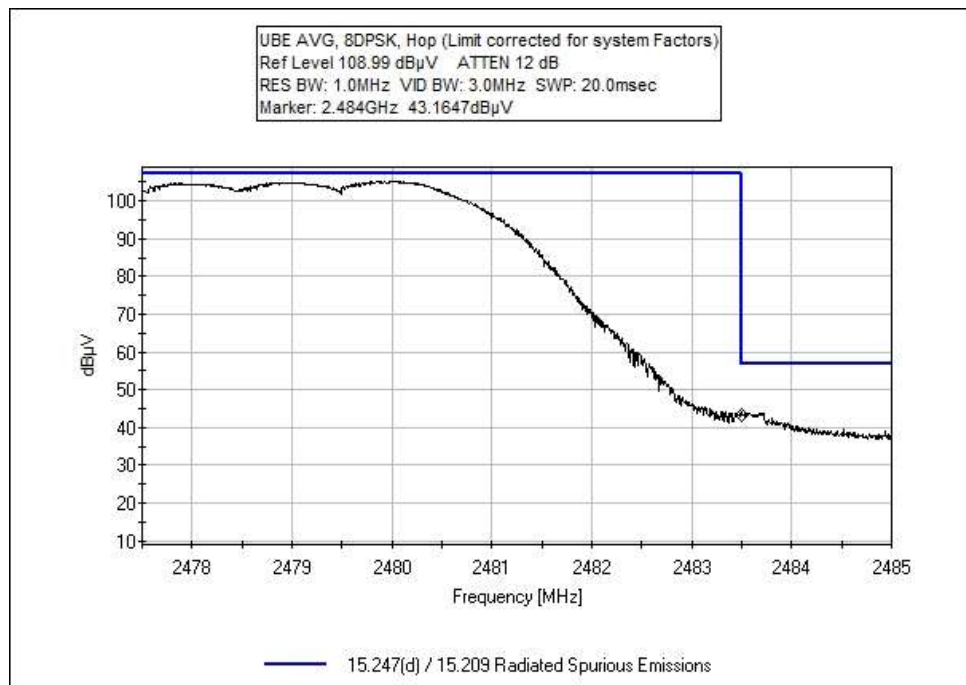
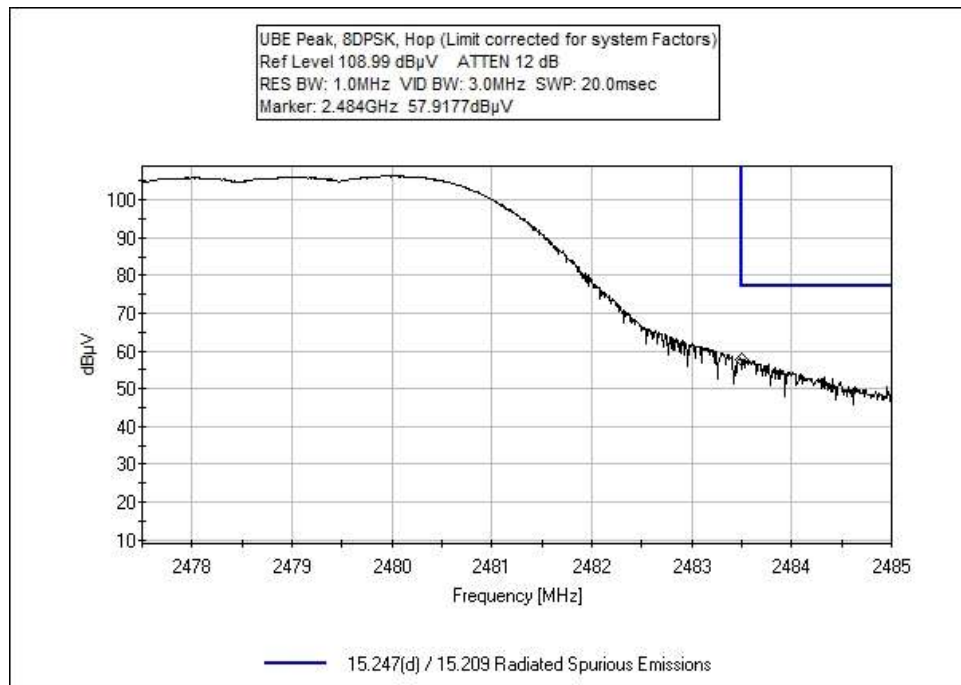
Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
2390.0	GFSK	Linear Polarized	40.3	<54	Pass
2400.0	GFSK	Linear Polarized	75	<86.3	Pass
2483.5	GFSK	Linear Polarized	42.7	<54	Pass
2390.0	$\pi/4$ DQPSK	Linear Polarized	39	<54	Pass
2400.0	$\pi/4$ DQPSK	Linear Polarized	77.2	<83	Pass
2483.5	$\pi/4$ 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.

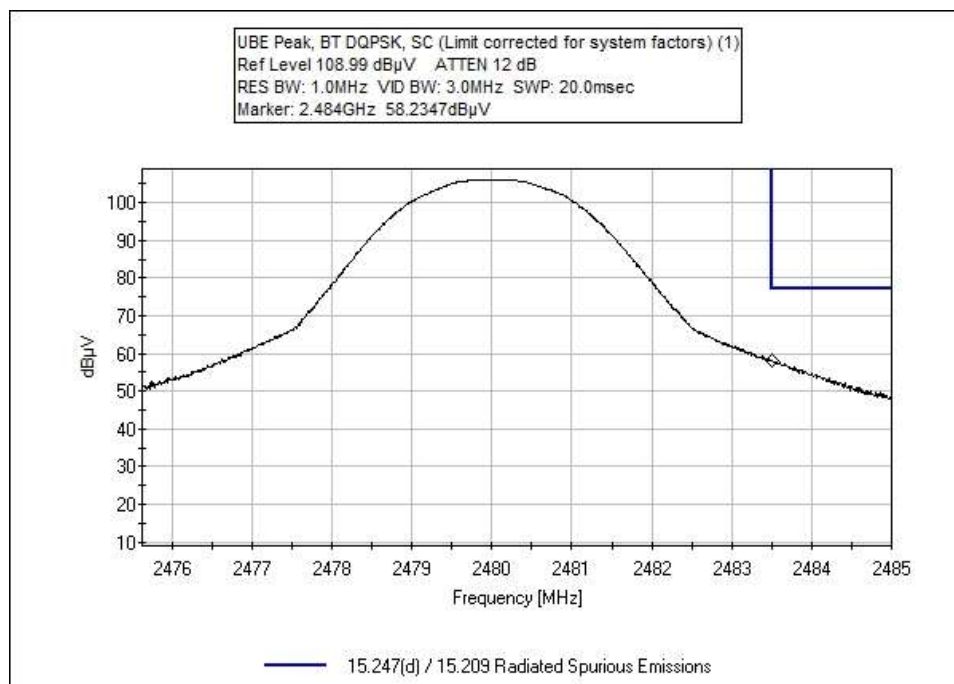
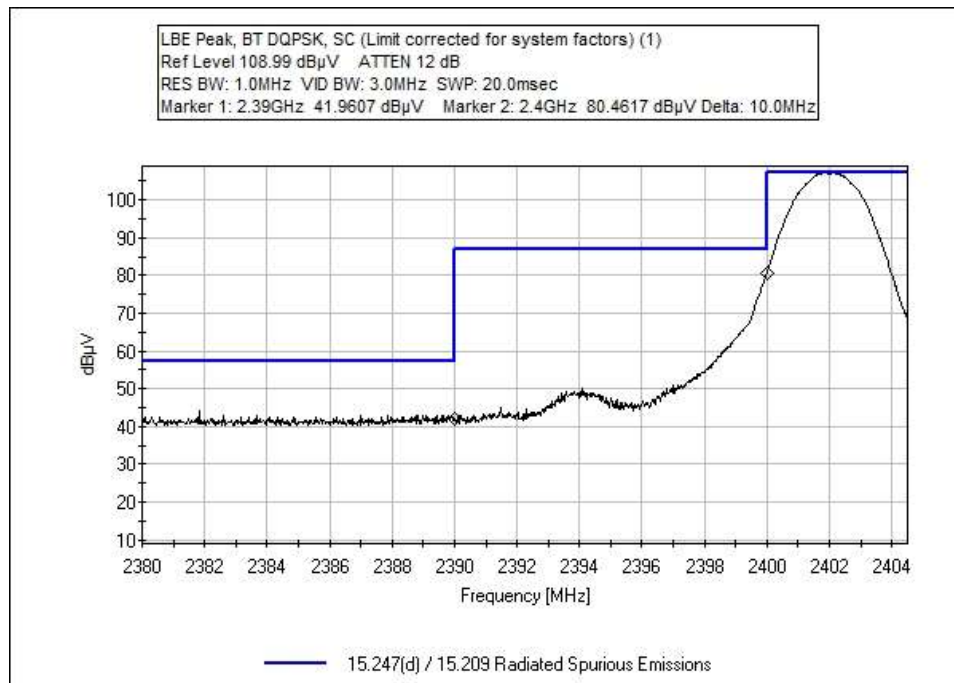
8DPSK Band Edge Plots

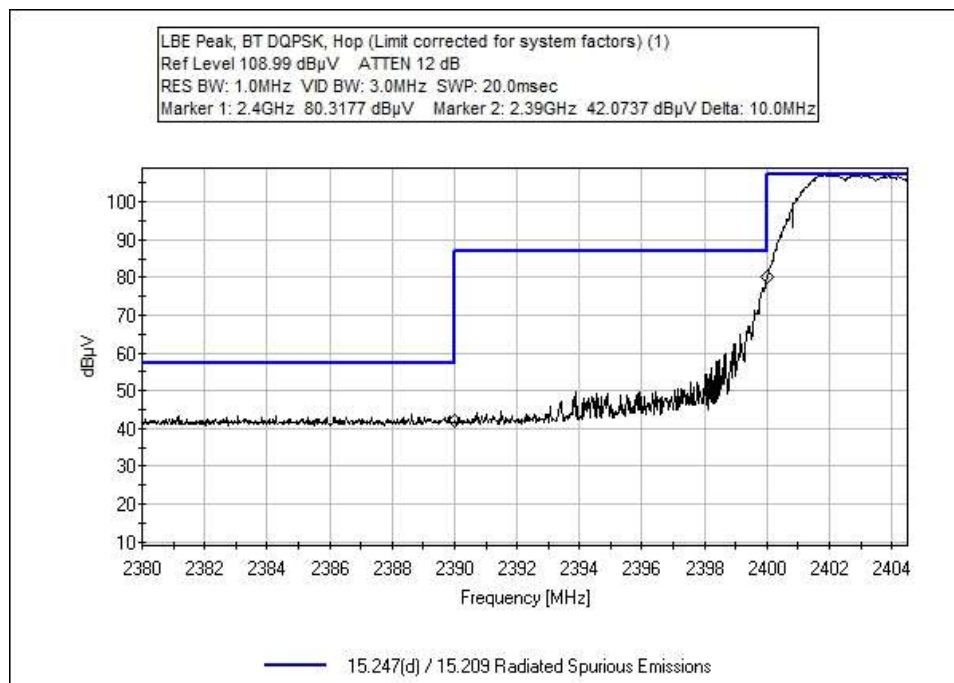
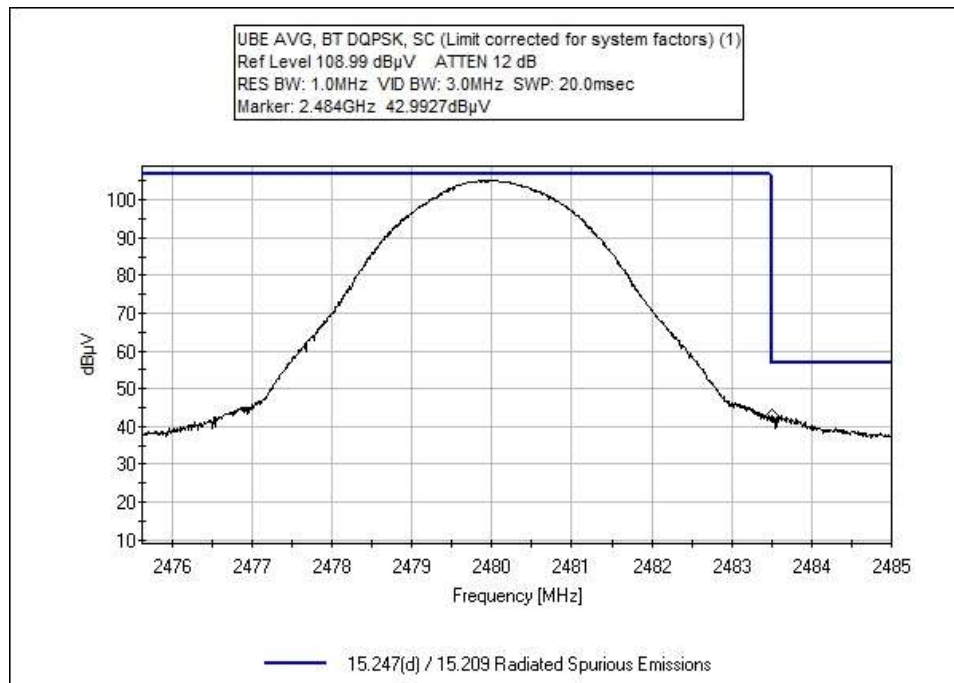


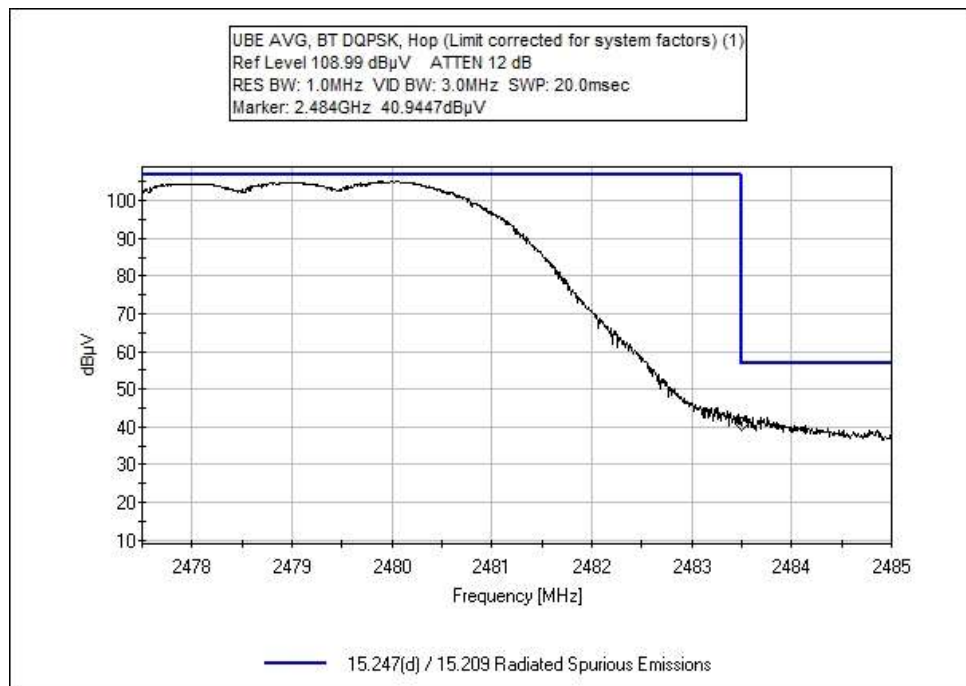
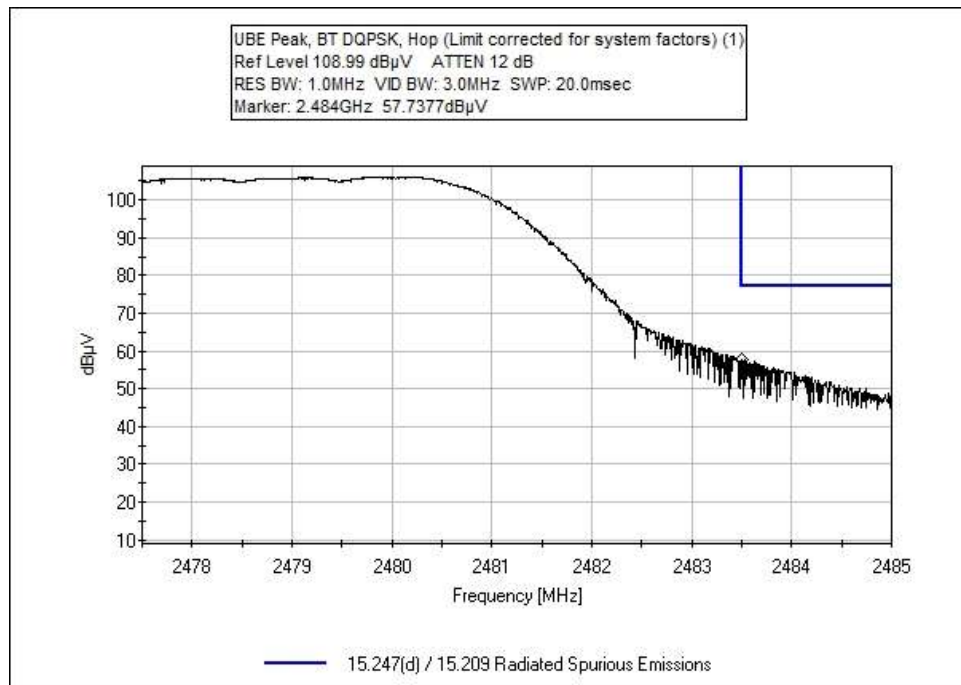




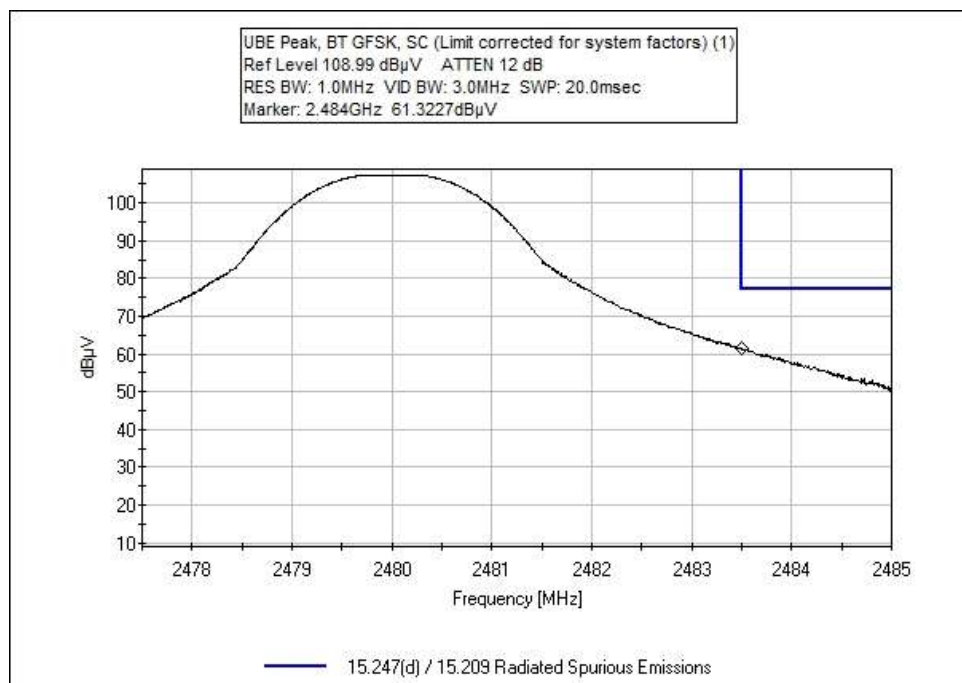
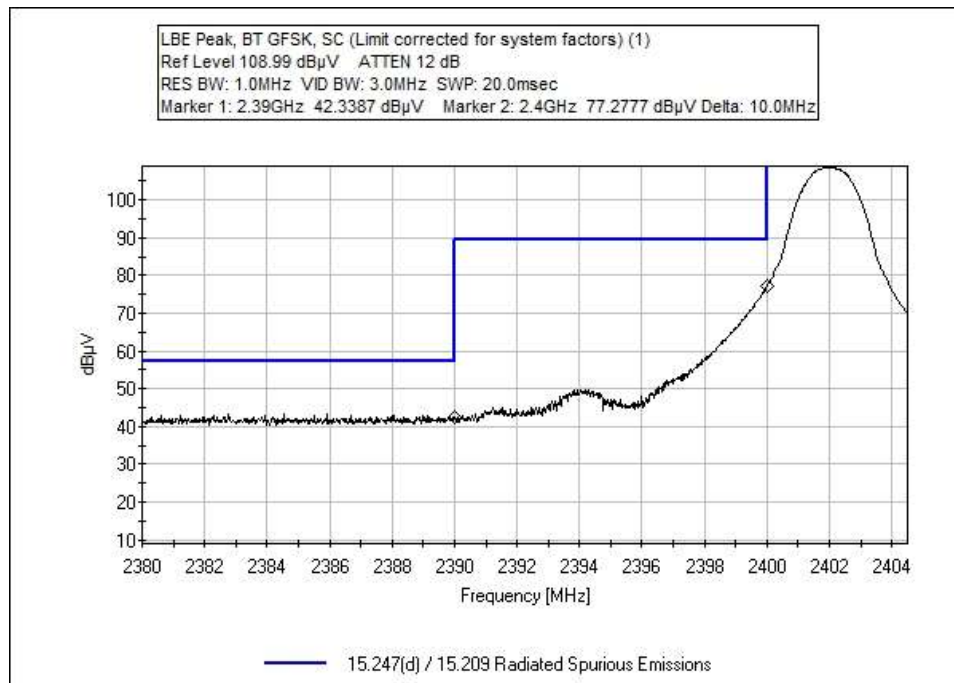
DQPSK Band Edge Plots

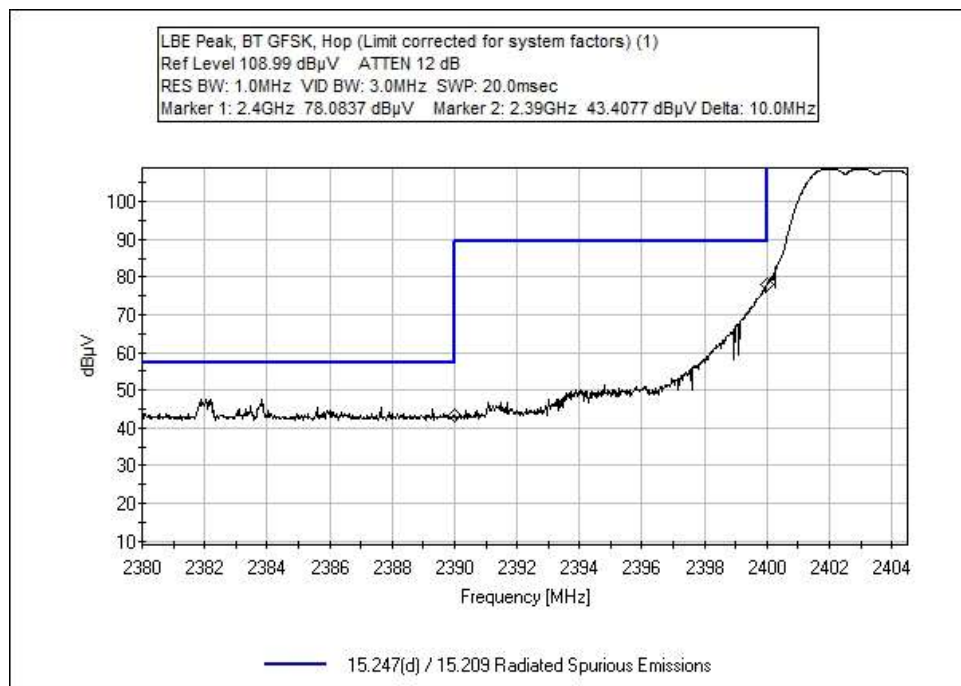
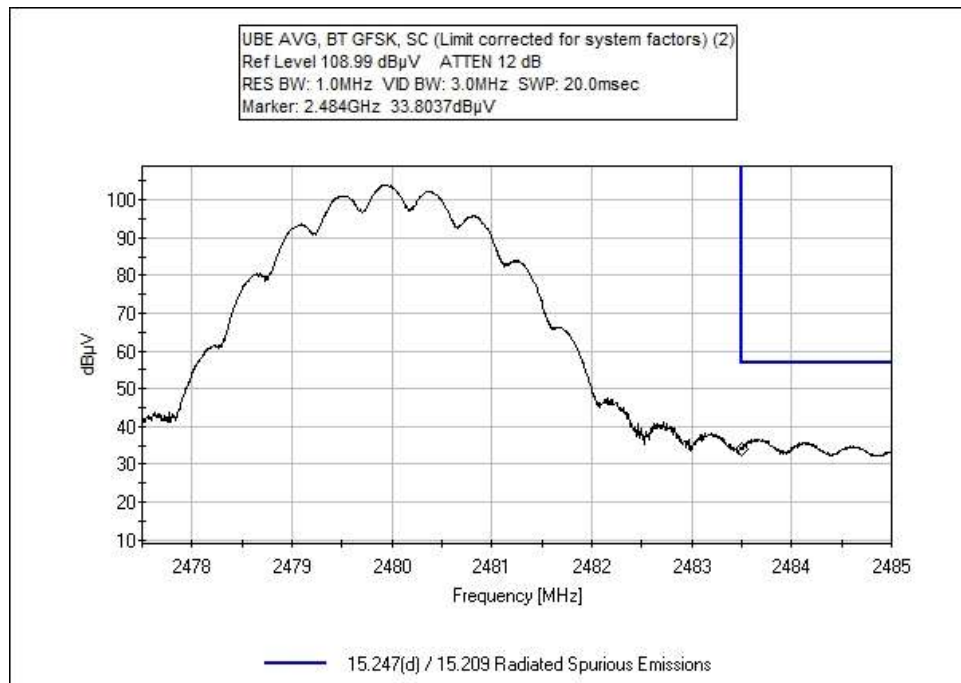


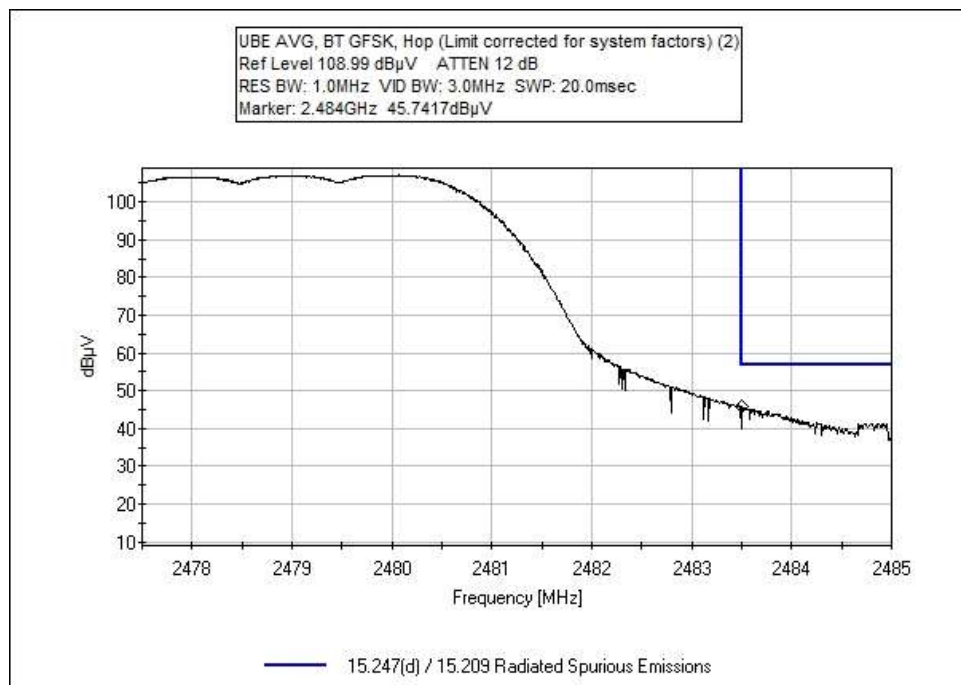
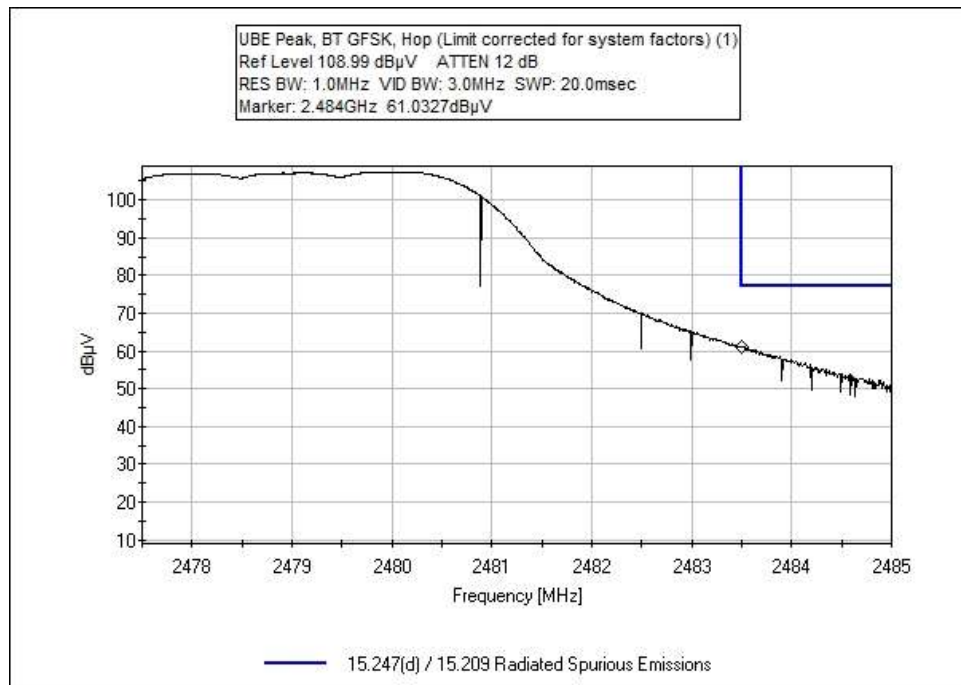




GFSK Band Edge Plots







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.
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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	Heliac	6/29/2018	6/29/2020
T3	ANP06540	Cable	Heliac	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	Heliast	6/29/2018	6/29/2020
T3	ANP06540	Cable	Heliast	8/23/2019	8/23/2021
T4	AN02872	Spectrum Analyzer	E4440A	11/18/2019	11/18/2021
T5	AN03540	Preamplifier	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.
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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	Heliac	6/29/2018	6/29/2020
T3	ANP06540	Cable	Heliac	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

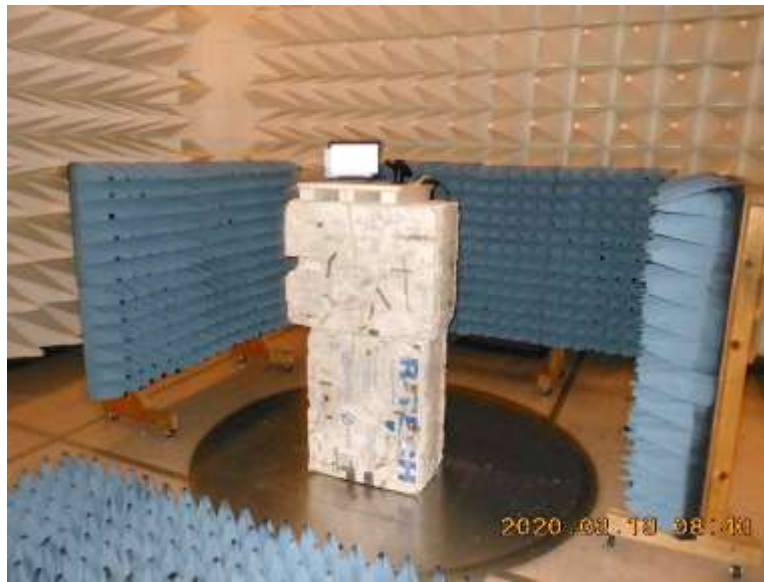
Test Setup Photo(s)



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)

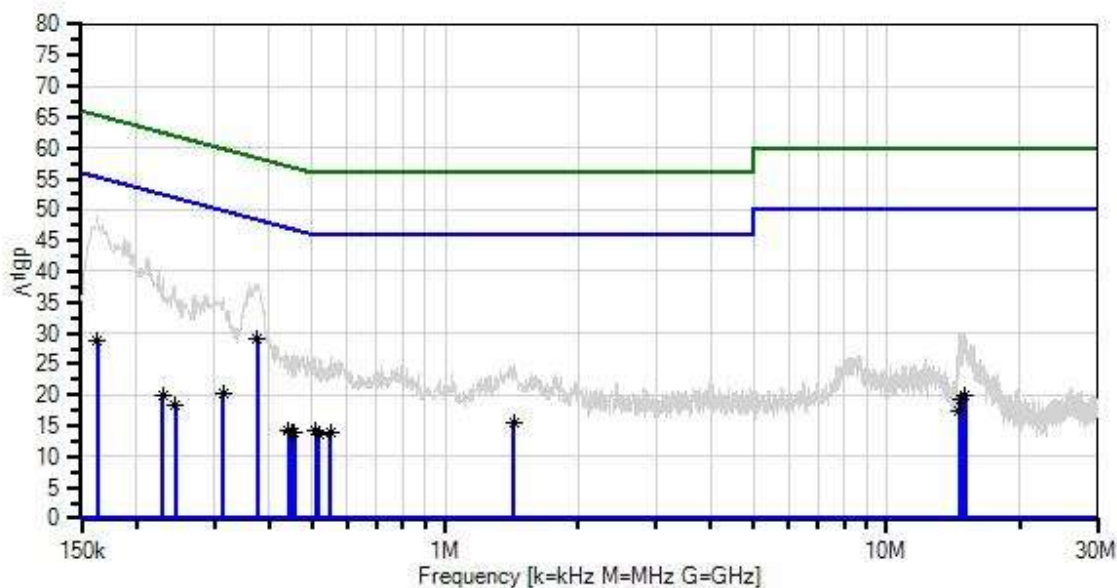
 Antenna type: Linear Polarized
 Antenna Gain: 3.7 dBi.

 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.

Nalloy, LLC. WO#: 102802 Sequence#: 84 Date: 4/1/2020
15.207 AC Mains - Average Test Lead: 120V 60Hz Line



— Sweep Data
× QP Readings
Software Version: 5.03.20
— Readings
* Average Readings
— 1 - 15.207 AC Mains - Average
○ Peak Readings
▼ Ambient
— 2 - 15.207 AC Mains - Quasi-peak

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	Heliac	6/29/2018	6/29/2020
T3	ANP06540	Cable	Heliac	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 MHz	Rdng dBμV	T1 T5 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBμV	Spec dBμV	Margin dB	Polar Ant
1	376.161k Ave	19.1	+9.1 +0.2	+0.0	+0.0	-0.6	+0.0	29.0	48.4	-19.4	Line
^	376.161k	29.5	+9.1 +0.2	+0.0	+0.0	-0.6	+0.0	39.4	48.4	-9.0	Line
3	163.090k Ave	17.7	+9.1 +0.5	+0.0	+0.0	-1.6	+0.0	28.9	55.3	-26.4	Line
^	163.089k	40.9	+9.1 +0.5	+0.0	+0.0	-1.6	+0.0	52.1	55.3	-3.2	Line
5	315.076k Ave	10.4	+9.1 +0.1	+0.0	+0.0	-0.7	+0.0	20.3	49.8	-29.5	Line
^	315.075k	27.2	+9.1 +0.1	+0.0	+0.0	-0.7	+0.0	37.1	49.8	-12.7	Line
7	15.049M Ave	9.7	+9.1 +0.2	+0.2	+0.1	-0.6	+0.0	19.9	50.0	-30.1	Line
^	15.049M	21.2	+9.1 +0.2	+0.2	+0.1	-0.6	+0.0	31.4	50.0	-18.6	Line
9	1.430M Ave	5.9	+9.1 +0.2	+0.1	+0.0	-0.3	+0.0	15.6	46.0	-30.4	Line
^	1.430M	16.1	+9.1 +0.2	+0.1	+0.0	-0.3	+0.0	25.8	46.0	-20.2	Line
11	14.797M Ave	9.1	+9.1 +0.2	+0.2	+0.1	-0.6	+0.0	19.3	50.0	-30.7	Line
^	14.797M	21.1	+9.1 +0.2	+0.2	+0.1	-0.6	+0.0	31.3	50.0	-18.7	Line
13	508.513k Ave	4.4	+9.1 +0.2	+0.0	+0.0	-0.4	+0.0	14.1	46.0	-31.9	Line
^	508.512k	17.2	+9.1 +0.2	+0.0	+0.0	-0.4	+0.0	26.9	46.0	-19.1	Line
15	550.691k Ave	4.2	+9.1 +0.3	+0.0	+0.0	-0.4	+0.0	14.0	46.0	-32.0	Line
^	550.690k	17.4	+9.1 +0.3	+0.0	+0.0	-0.4	+0.0	27.2	46.0	-18.8	Line
17	518.693k Ave	4.0	+9.1 +0.2	+0.0	+0.0	-0.4	+0.0	13.7	46.0	-32.3	Line
^	518.693k	16.9	+9.1 +0.2	+0.0	+0.0	-0.4	+0.0	26.6	46.0	-19.4	Line
19	229.265k Ave	9.5	+9.1 +0.3	+0.0	+0.0	-1.0	+0.0	19.9	52.5	-32.6	Line
^	229.265k	30.5	+9.1 +0.3	+0.0	+0.0	-1.0	+0.0	40.9	52.5	-11.6	Line
21	442.337k Ave	4.5	+9.1 +0.2	+0.1	+0.0	-0.5	+0.0	14.4	47.0	-32.6	Line
^	442.336k	17.5	+9.1 +0.2	+0.1	+0.0	-0.5	+0.0	27.4	47.0	-19.6	Line
23	14.616M Ave	7.0	+9.1 +0.2	+0.2	+0.1	-0.6	+0.0	17.2	50.0	-32.8	Line
^	14.616M	20.7	+9.1 +0.2	+0.2	+0.1	-0.6	+0.0	30.9	50.0	-19.1	Line

25	451.790k Ave	4.0	+9.1 +0.2	+0.1	+0.0	-0.5	+0.0	13.9	46.8	-32.9	Line
26	455.427k Ave	4.0	+9.1 +0.2	+0.1	+0.0	-0.5	+0.0	13.9	46.8	-32.9	Line
^	455.426k	17.5	+9.1 +0.2	+0.1	+0.0	-0.5	+0.0	27.4	46.8	-19.4	Line
^	451.790k	17.4	+9.1 +0.2	+0.1	+0.0	-0.5	+0.0	27.3	46.8	-19.5	Line
29	244.537k Ave	8.2	+9.1 +0.2	+0.0	+0.0	-0.9	+0.0	18.4	51.9	-33.5	Line
^	244.536k	29.4	+9.1 +0.2	+0.0	+0.0	-0.9	+0.0	39.6	51.9	-12.3	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			

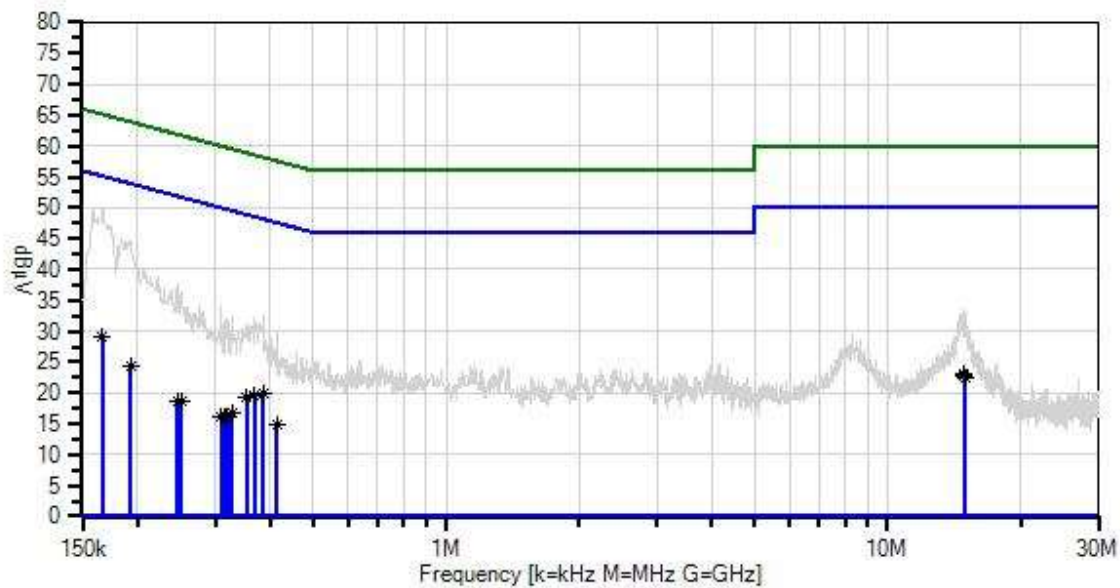
Support Equipment:

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.
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Nalloy, LLC. WO#: 102802 Sequence#: 85 Date: 4/1/2020
15.207 AC Mains - Average Test Lead: 120V 60Hz Neutral



— Sweep Data
× QP Readings
Software Version: 5.03.20
— Readings
* Average Readings
— 1 - 15.207 AC Mains - Average
○ Peak Readings
▼ Ambient
— 2 - 15.207 AC Mains - Quasi-peak

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	Heliac	6/29/2018	6/29/2020
T3	ANP06540	Cable	Heliac	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 MHz	Rdng dBμV	T1 T5 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBμV	Spec dBμV	Margin dB	Polar Ant
1	166.725k	17.8	+9.1 +0.5	+0.0	+0.0	-1.5	+0.0	28.9	55.1	-26.2	Neutr
^	166.724k	41.6	+9.1 +0.5	+0.0	+0.0	-1.5	+0.0	52.7	55.1	-2.4	Neutr
3	14.887M	12.9	+9.1 +0.2	+0.2	+0.1	-0.6	+0.0	23.1	50.0	-26.9	Neutr
^	14.887M	24.5	+9.1 +0.2	+0.2	+0.1	-0.6	+0.0	34.7	50.0	-15.3	Neutr
5	14.932M	12.5	+9.1 +0.2	+0.2	+0.1	-0.6	+0.0	22.7	50.0	-27.3	Neutr
^	14.932M	23.9	+9.1 +0.2	+0.2	+0.1	-0.6	+0.0	34.1	50.0	-15.9	Neutr
7	14.995M	12.2	+9.1 +0.2	+0.2	+0.1	-0.6	+0.0	22.4	50.0	-27.6	Neutr
^	14.995M	23.9	+9.1 +0.2	+0.2	+0.1	-0.6	+0.0	34.1	50.0	-15.9	Neutr
9	385.614k	10.0	+9.1 +0.2	+0.0	+0.0	-0.5	+0.0	19.8	48.2	-28.4	Neutr
^	385.613k	23.9	+9.1 +0.2	+0.0	+0.0	-0.5	+0.0	33.7	48.2	-14.5	Neutr
11	368.161k	9.9	+9.1 +0.1	+0.0	+0.0	-0.6	+0.0	19.7	48.5	-28.8	Neutr
^	368.160k	23.6	+9.1 +0.1	+0.0	+0.0	-0.6	+0.0	33.4	48.5	-15.1	Neutr
13	353.617k	9.6	+9.1 +0.1	+0.0	+0.0	-0.6	+0.0	19.4	48.9	-29.5	Neutr
^	353.616k	22.6	+9.1 +0.1	+0.0	+0.0	-0.6	+0.0	32.4	48.9	-16.5	Neutr
15	192.904k	13.7	+9.1 +0.3	+0.0	+0.0	-1.2	+0.0	24.3	53.9	-29.6	Neutr
^	192.904k	36.6	+9.1 +0.3	+0.0	+0.0	-1.2	+0.0	47.2	53.9	-6.7	Neutr
17	414.702k	5.1	+9.1 +0.2	+0.0	+0.0	-0.5	+0.0	14.9	47.6	-32.7	Neutr
^	414.701k	21.2	+9.1 +0.2	+0.0	+0.0	-0.5	+0.0	31.0	47.6	-16.6	Neutr
19	327.437k	6.9	+9.1 +0.1	+0.0	+0.0	-0.6	+0.0	16.7	49.5	-32.8	Neutr
^	327.437k	23.6	+9.1 +0.1	+0.0	+0.0	-0.6	+0.0	33.4	49.5	-16.1	Neutr
21	251.081k	8.4	+9.1 +0.2	+0.0	+0.0	-0.9	+0.0	18.6	51.7	-33.1	Neutr
^	251.080k	28.0	+9.1 +0.2	+0.0	+0.0	-0.9	+0.0	38.2	51.7	-13.5	Neutr
23	245.990k	8.5	+9.1 +0.2	+0.0	+0.0	-0.9	+0.0	18.7	51.9	-33.2	Neutr
^	245.990k	29.2	+9.1 +0.2	+0.0	+0.0	-0.9	+0.0	39.4	51.9	-12.5	Neutr

25	319.438k	6.3	+9.1	+0.0	+0.0	-0.7	+0.0	16.2	49.7	-33.5	Neutr
	Ave		+0.1								
26	315.075k	6.1	+9.1	+0.0	+0.0	-0.7	+0.0	16.0	49.8	-33.8	Neutr
	Ave		+0.1								
^	319.437k	23.5	+9.1	+0.0	+0.0	-0.7	+0.0	33.4	49.7	-16.3	Neutr
			+0.1								
^	315.074k	23.2	+9.1	+0.0	+0.0	-0.7	+0.0	33.1	49.8	-16.7	Neutr
			+0.1								
29	309.257k	6.3	+9.1	+0.0	+0.0	-0.7	+0.0	16.2	50.0	-33.8	Neutr
	Ave		+0.1								
^	309.257k	25.8	+9.1	+0.0	+0.0	-0.7	+0.0	35.7	50.0	-14.3	Neutr
			+0.1								

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 $\text{dB}\mu\text{V}/\text{m}$, the spectrum analyzer reading in $\text{dB}\mu\text{V}$ 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	($\text{dB}\mu\text{V}$)
+	Antenna Factor	(dB/m)
+	Cable Loss	(dB)
-	Distance Correction	(dB)
-	Preamplifier Gain	(dB)
=	Corrected Reading	($\text{dB}\mu\text{V}/\text{m}$)

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.