

Nalloy, LLC

TEST REPORT FOR

U1U0B8

Tested to The Following Standards:

FCC Part 15 Subpart C Section(s)

**15.207 & 15.225
(13.110-14.010MHz)**

Report No.: 107941-67

Date of issue: April 25, 2023



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:

Nallloy, LLC
2301 5th Avenue
Seattle, WA 98108

Representative: Naga Suryadevara
Customer Reference Number: 2D-10266822

DATE OF EQUIPMENT RECEIPT:**DATE(S) OF TESTING:****REPORT PREPARED BY:**

Lisa Bevington
CKC Laboratories, Inc.
5046 Sierra Pines Drive
Mariposa, CA 95338

Project Number: 107941

March 24, 2023

March 24, 27, 30-31, 2023

April 3, 2023

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	5.03.20

Site Registration & Accreditation Information

Location	*NIST CB #	FCC	Canada	Japan
Canyon Park, Bothell, WA	US0103	US1024	3082C	A-0136
Brea, CA	US0103	US1024	3082D	A-0136
Fremont, CA	US0103	US1024	3082B	A-0136
Mariposa, CA	US0103	US1024	3082A	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 - 15.225

Test Procedure	Description	Modifications	Results
15.215(c)	Occupied Bandwidth	NA	Pass
15.225(a)-(c)	Field Strength of Fundamental	NA	Pass
15.225(d)	Field Strength of Spurious Emissions	NA	Pass
15.225(e)	Frequency Stability	NA	Pass
15.207	AC Conducted Emissions	NA	Pass

NA = Not Applicable

ISO/IEC 17025 Decision Rule
The equipment sample utilized for testing is selected by the manufacturer. The declaration of pass or fail herein is a binary statement for simple acceptance rule (ILAC G8) based upon assessment to the specification(s) listed above, without consideration 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 Under Test:

Device	Manufacturer	Model #	S/N
None	Nalloy, LLC	U1U0B8	NA

Support Equipment:

Device	Manufacturer	Model #	S/N
None	Nalloy, LLC	Note: 2nd unit as support	NA
Laptop	ASUS	E210M	NA
None	Nalloy, LLC	A2D0US	NA
AC Adapter	Delta Electronics, Inc.	MDS-030AAC15	NA
Headphones	Poly	C5220T	NA
USB to Ethernet Adapter	Amazon	Gigabit Ethernet Adapter	NA

General Product Information:

Product Information	Manufacturer-Provided Details
Equipment Type:	Stand-Alone Equipment
Modulation Type(s):	NFC A, NFC B, NFC F (ASK) (NFC A tested as worst case per manufacturer)
Maximum Duty Cycle:	Assume 100% as worst case
Antenna Type(s) and Gain:	Rectangular Loop, 64 x 18 x 0.44mm. 0.9uH inductance @ 13.56MHz.
Antenna Connection Type:	Integral
Nominal Input Voltage:	120VAC, 60Hz
Firmware / Software used for Test:	MfgTest.1.0.661.0.bin
The validity of results is dependent on the stated product details, the accuracy of which the manufacturer assumes full responsibility.	

EUT Photo(s)

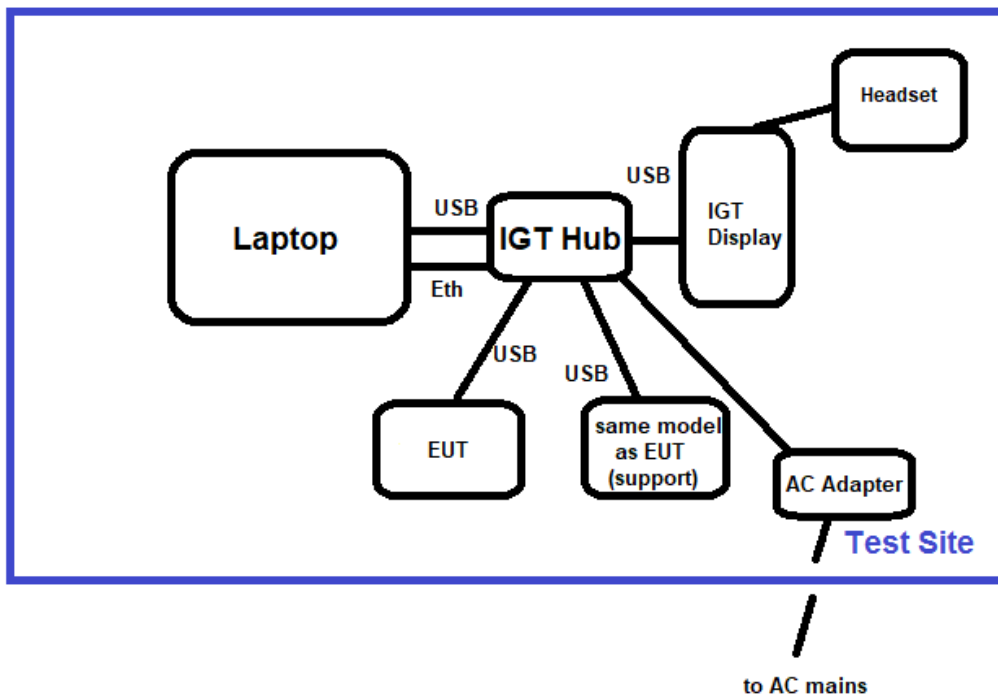


Support Equipment Photo(s)



Block Diagram of Test Setup(s)

Test Setup Block Diagram



FCC Part 15 Subpart C

15.215(c) Occupied Bandwidth (20dB BW)

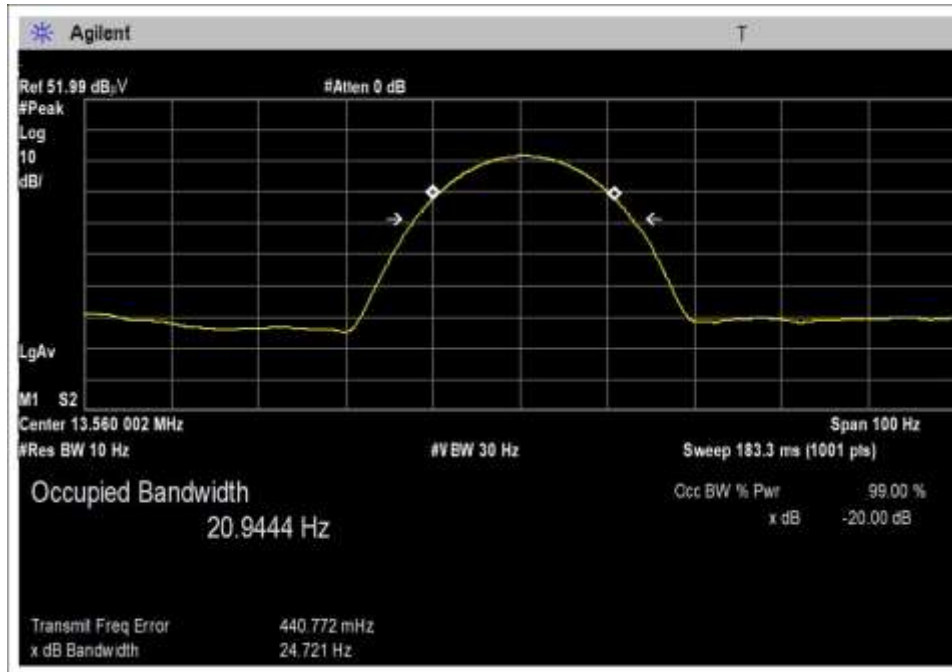
Test Setup/Conditions			
Test Location:	Bothell Lab Bench	Test Engineer:	M. Atkinson
Test Method:	ANSI C63.10 (2013)	Test Date(s):	3/27/2023
Configuration:	1		
Test Setup:	EUT is continuously transmitting, a loop antenna connected to a spectrum analyzer is used for measurement. RBW could not meet the RBW/OBW ratio as defined in ANSI C63.10 (2013) due to the nature of signal profile.		

Environmental Conditions			
Temperature (°C)	21	Relative Humidity (%):	34

Test Equipment					
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
02673	Spectrum Analyzer	Agilent	E4446A	3/2/2023	3/2/2025
P06011	Cable	Andrew	HeliAx	5/20/2022	5/20/2024
P06515	Cable	Andrews	HeliAx	5/23/2022	5/23/2024
00052	Loop Antenna	EMCO	6502	5/11/2022	5/11/2024

Test Data Summary					
Frequency (MHz)	Antenna Port	Modulation	Measured (kHz)	Limit (kHz)	Results
13.56	1	NFC A	24.721	None	N/A

Plot(s)



Test Setup Photo(s)



15.225(a)-(c) Field Strength of Fundamental

Test Data Summary - Voltage Variations

Frequency (MHz)	Modulation / Ant Port	V _{Minimum} (dBuV/m@30m)	V _{Nominal} (dBuV/m@30m)	V _{Maximum} (dBuV/m@30m)	Max Deviation from V _{Nominal} (dB)
13.56	NFC A	15.9	15.9	15.9	0.0

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

Parameter Definitions:

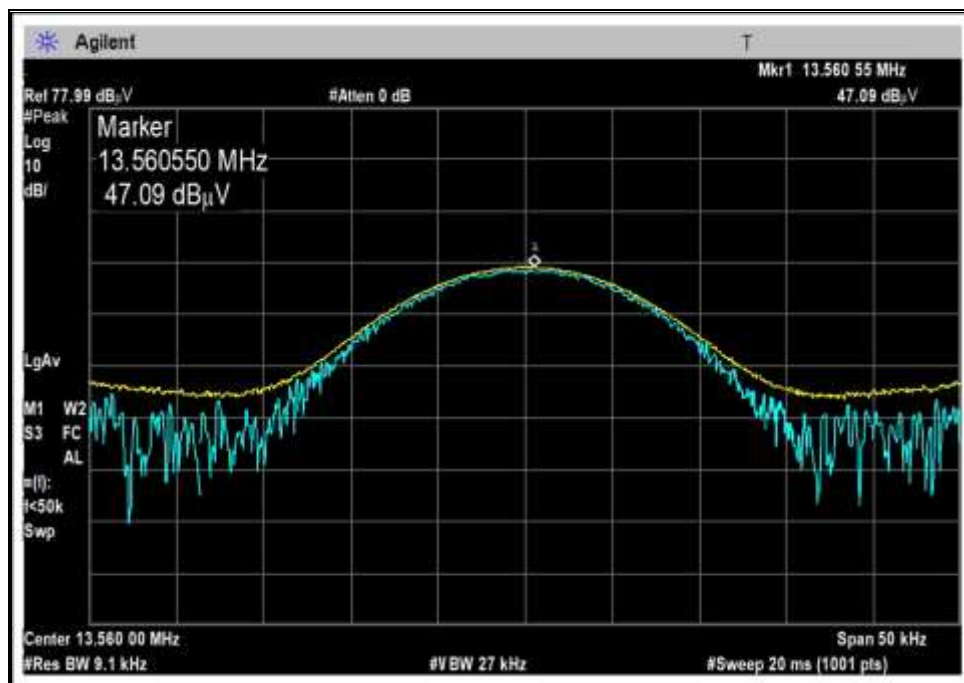
Measurements performed at input voltage V_{Nominal} ± 15%.

Parameter	Value
V _{Nominal} :	120 VAC
V _{Minimum} :	102.00 VAC
V _{Maximum} :	138.00 VAC

Test Data Summary – Radiated Field Strength Measurement

Frequency (MHz)	Modulation	Ant. Type	Measured (dBuV/m @ 30m)	Limit (dBuV/m @ 30m)	Results
13.56	NFC A	Loop	15.9	≤84	Pass

Plot



Test Setup / Conditions / Data

Test Location: CKC Laboratories, Inc. • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)
 Customer: **Nalloy, LLC**
 Specification: **15.225 Carrier and Spurious Emissions (13.110-14.010 MHz Transmitter)**
 Work Order #: **107941** Date: 3/27/2023
 Test Type: **Maximized Emissions** Time: 14:51:40
 Tested By: Michael Atkinson Sequence#: 7
 Software: EMITest 5.03.20

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

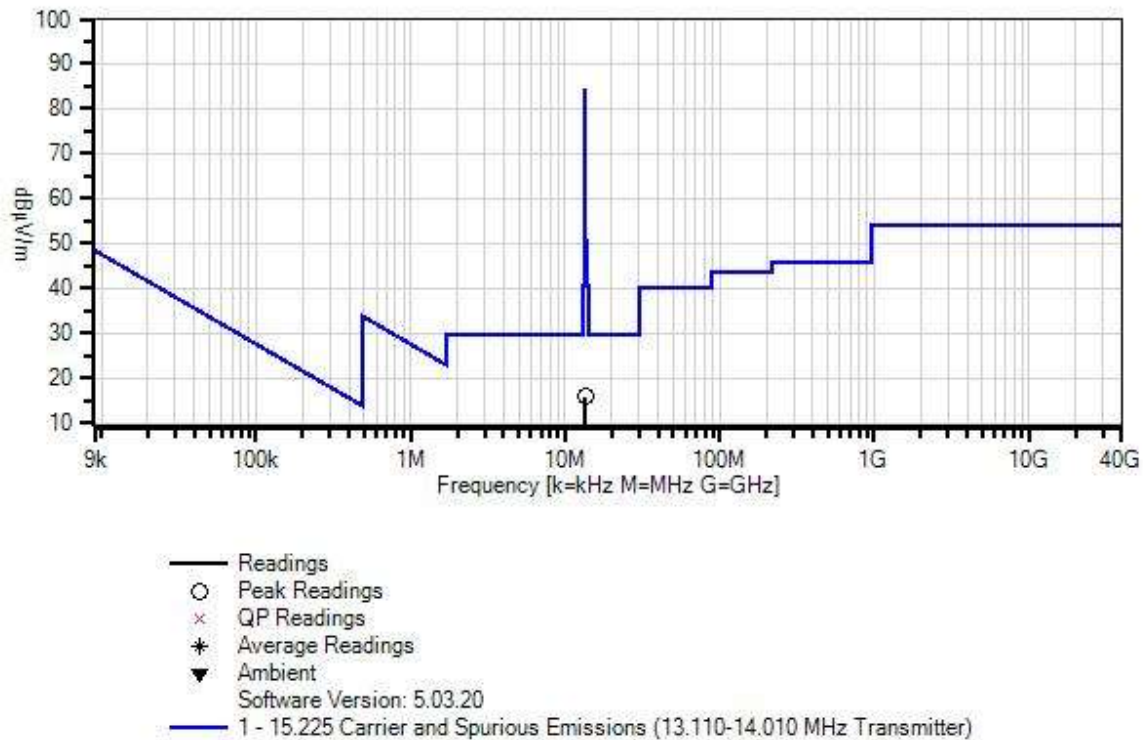
Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Environmental Conditions: Temperature: 21°C Humidity: 34% Pressure: 101.7kPa Method: ANSI C63.10: 2013 Frequency range: Fundamental Setup: Empire units, NFC transmitting at 13.56MHz. XYZ EUT axes investigated, 3 x orthogonal measurement antenna axes investigated, worst case reported. NFC A mode tested as worst case per historical investigation by manufacturer.

Nalloy, LLC WO#: 107941 Sequence#: 7 Date: 3/27/2023
15.225 Carrier and Spurious Emissions (13.110-14.010 MHz Transmitter) Test Distance: 3 Meters Para



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02673	Spectrum Analyzer	E4446A	3/2/2023	3/2/2025
T1	ANP06011	Cable	Heliac	5/20/2022	5/20/2024
T2	AN00052	Loop Antenna	6502	5/11/2022	5/11/2024
T3	ANP06515	Cable	Heliac	5/23/2022	5/23/2024

Measurement Data:

Reading listed by margin.

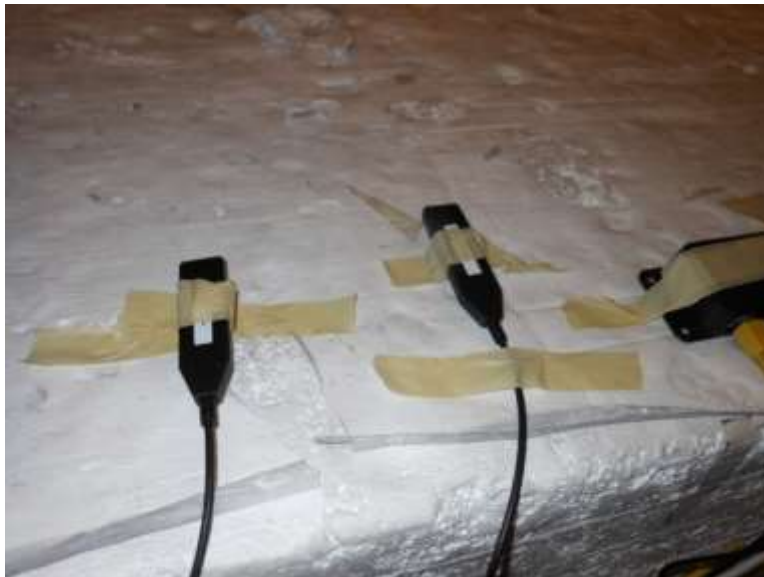
Test Distance: 3 Meters

#	Freq MHz	Rdng dBμV	T1 dB	T2 dB	T3 dB	Dist dB	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar Ant
1	13.561M	47.0	+0.1	+8.6	+0.2	-40.0	15.9	84.0	-68.1	Para

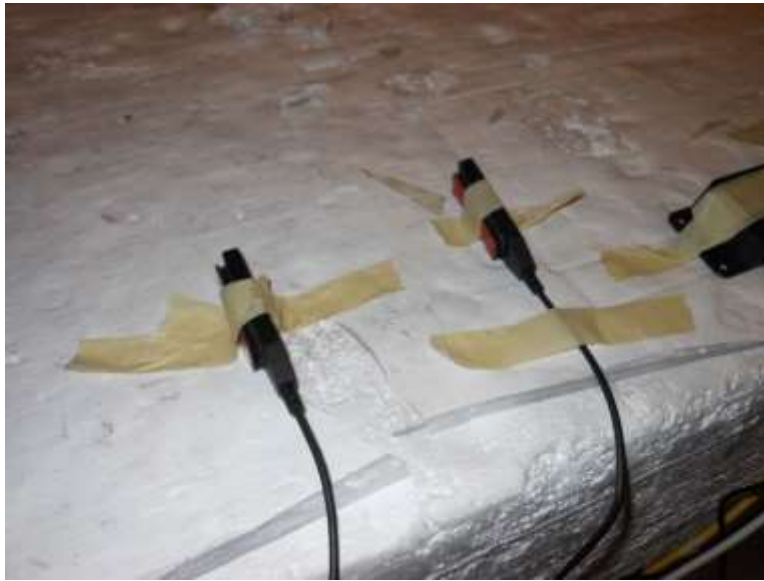
Test Setup Photo(s)



Below 1GHz



X Axis



Y Axis



Z Axis

15.225(d) Radiated Emissions & Band Edge

Test Setup / Conditions/ Data

Test Location: CKC Laboratories, Inc. • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)
 Customer: **Nalloy, LLC**
 Specification: **15.225 Carrier and Spurious Emissions (13.110-14.010 MHz Transmitter)**
 Work Order #: **106571** Date: 3/27/2023
 Test Type: **Radiated Scan** Time: 15:39:15
 Tested By: Michael Atkinson Sequence#: 9
 Software: EMITest 5.03.20

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

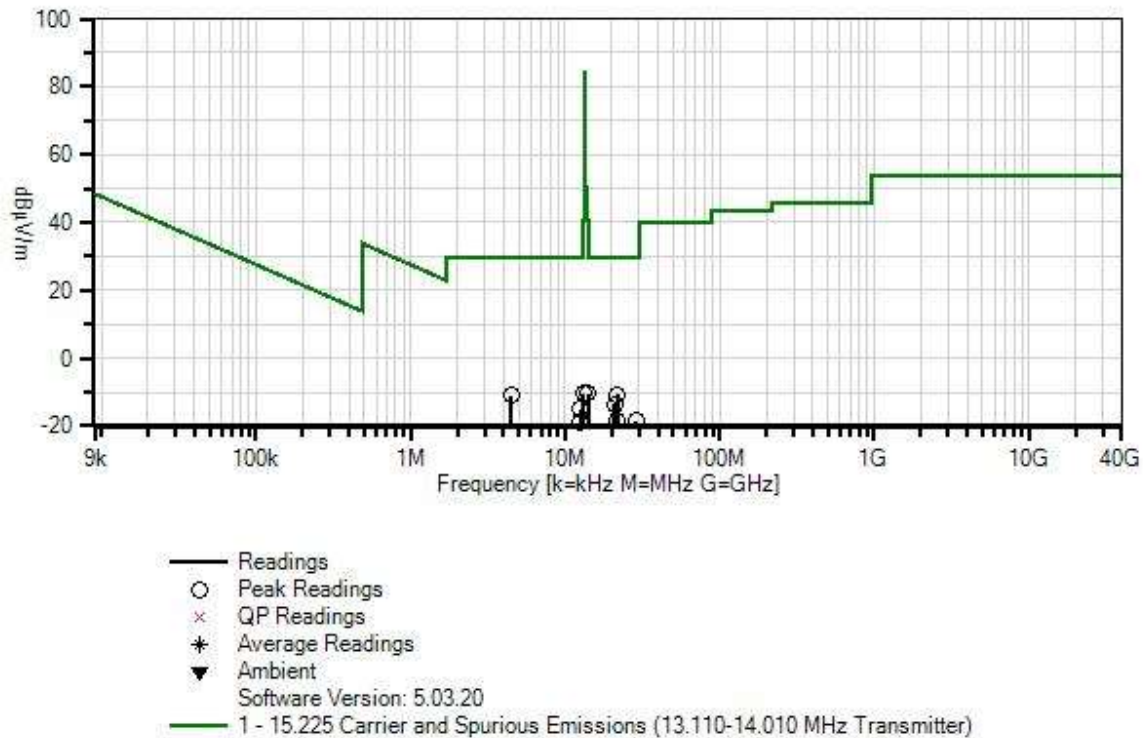
Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Environmental Conditions: Temperature: 21°C Humidity: 34% Pressure: 101.7kPa Method: ANSI C63.10 (2013) Frequency range: 9k-30MHz Setup: Empire units, NFC transmitting at 13.56MHz. XYZ EUT axes investigated, 3 x orthogonal measurement antenna axes investigated, worst case reported. NFC A mode tested as worst case per historical investigation by manufacturer. ort laptop.

Nalloy, LLC WO#: 106571 Sequence#: 9 Date: 3/27/2023
15.225 Carrier and Spurious Emissions (13.110-14.010 MHz Transmitter) Test Distance: 3 Meters Various



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02673	Spectrum Analyzer	E4446A	3/2/2023	3/2/2025
T1	ANP06011	Cable	Heliac	5/20/2022	5/20/2024
T2	ANP06515	Cable	Heliac	5/23/2022	5/23/2024
T3	AN00052	Loop Antenna	6502	5/11/2022	5/11/2024

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dB μ V	T1 dB	T2 dB	T3 dB		Dist Table	Corr dB μ V/m	Spec dB μ V/m	Margin dB	Polar Ant
1	14.189M	20.8	+0.1	+0.2	+8.6		-40.0	-10.3	29.5	-39.8	Para
2	13.031M	20.7	+0.1	+0.2	+8.7		-40.0	-10.3	29.5	-39.8	Para
3	21.658M	22.9	+0.1	+0.2	+6.2		-40.0	-10.6	29.5	-40.1	Groun
4	4.463M	20.1	+0.0	+0.1	+8.9		-40.0	-10.9	29.5	-40.4	Para
5	20.863M	19.9	+0.1	+0.2	+6.2		-40.0	-13.6	29.5	-43.1	Para
6	12.599M	16.0	+0.1	+0.2	+8.7		-40.0	-15.0	29.5	-44.5	Para
7	21.658M	15.1	+0.1	+0.2	+6.2		-40.0	-18.4	29.5	-47.9	Perp
8	28.681M	17.0	+0.1	+0.3	+4.2		-40.0	-18.4	29.5	-47.9	Para
9	12.599M	12.0	+0.1	+0.2	+8.7		-40.0	-19.0	29.5	-48.5	Groun
10	27.160M	14.1	+0.1	+0.3	+4.9		-40.0	-20.6	29.5	-50.1	Perp

Test Location: CKC Laboratories, Inc. • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)
 Customer: **Nalloy, LLC**
 Specification: **15.225 Carrier and Spurious Emissions (13.110-14.010 MHz Transmitter)**
 Work Order #: **107941** Date: 3/27/2023
 Test Type: **Radiated Scan** Time: 13:14:21
 Tested By: Michael Atkinson Sequence#: 3
 Software: EMITest 5.03.20

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

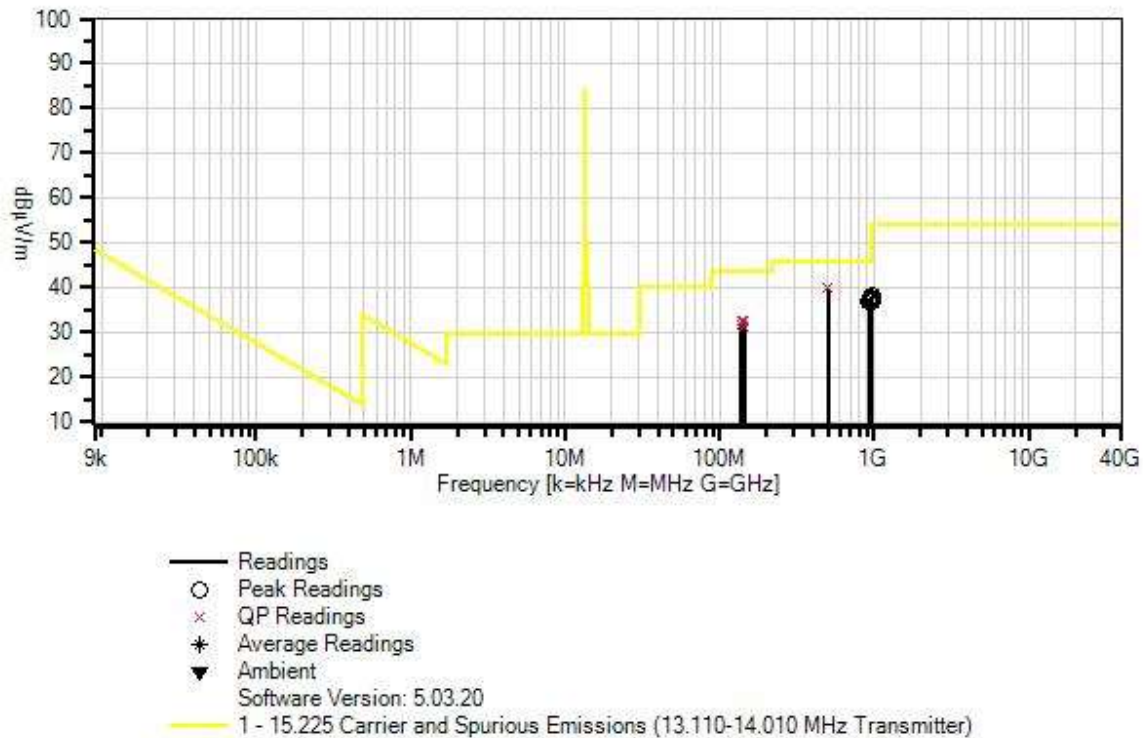
Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Environmental Conditions: Temperature: 21°C Humidity: 34% Pressure: 101.7kPa Method: ANSI C63.10 (2013) Frequency range: 30-1000MHz Setup: Empire units, NFC transmitting at 13.56MHz. XYZ EUT axes investigated, worst case reported. NFC A mode tested as worst case per historical investigation by manufacturer. ort laptop. Also investigated fully exercised I2C commands, worst case reported.
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Nalloy, LLC WO#: 107941 Sequence#: 3 Date: 3/27/2023
15.225 Carrier and Spurious Emissions (13.110-14.010 MHz Transmitter) Test Distance: 3 Meters Vert



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02673	Spectrum Analyzer	E4446A	3/2/2023	3/2/2025
T2	ANP06011	Cable	Heliac	5/20/2022	5/20/2024
T3	ANP05333	Cable	Heliac	3/14/2022	3/14/2024
T4	ANP05360	Cable	RG214	2/4/2022	2/4/2024
T5	AN02307	Preamp	8447D	1/6/2022	1/6/2024
T6	AN03628	Biconilog Antenna	3142E	6/3/2021	6/3/2023

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dBμV	T1 T5 dB	T2 T6 dB	T3 dB	T4 dB	Dist Table	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar Ant
1	500.011M QP	40.6	+0.0 -28.1	+0.3 +24.2	+1.2	+1.6	+0.0	39.8	46.0	-6.2	Vert
^	500.032M	40.5	+0.0 -28.1	+0.3 +24.2	+1.2	+1.6	+0.0	39.7	46.0	-6.3	Vert
3	958.238M	30.0	+0.0 -27.2	+0.4 +30.8	+1.6	+2.4	+0.0	38.0	46.0	-8.0	Vert
4	934.506M	29.6	+0.0 -27.3	+0.4 +31.0	+1.6	+2.4	+0.0	37.7	46.0	-8.3	Vert
5	939.330M	29.1	+0.0 -27.3	+0.4 +31.1	+1.6	+2.4	+0.0	37.3	46.0	-8.7	Vert
6	958.865M	29.1	+0.0 -27.2	+0.4 +30.8	+1.6	+2.4	+0.0	37.1	46.0	-8.9	Vert
7	944.714M	28.7	+0.0 -27.2	+0.4 +31.2	+1.6	+2.4	+0.0	37.1	46.0	-8.9	Vert
8	929.341M	29.3	+0.0 -27.3	+0.4 +30.6	+1.6	+2.4	+0.0	37.0	46.0	-9.0	Vert
9	932.584M	28.9	+0.0 -27.3	+0.4 +30.9	+1.6	+2.4	+0.0	36.9	46.0	-9.1	Vert
10	945.027M	28.4	+0.0 -27.2	+0.4 +31.2	+1.6	+2.4	+0.0	36.8	46.0	-9.2	Vert
11	948.283M	28.4	+0.0 -27.2	+0.4 +31.2	+1.6	+2.4	+0.0	36.8	46.0	-9.2	Vert
12	959.992M	28.9	+0.0 -27.2	+0.4 +30.7	+1.6	+2.4	+0.0	36.8	46.0	-9.2	Vert
13	139.192M QP	44.7	+0.0 -27.6	+0.1 +14.0	+0.7	+0.8	+0.0	32.7	43.5	-10.8	Vert
^	139.192M	48.1	+0.0 -27.6	+0.1 +14.0	+0.7	+0.8	+0.0	36.1	43.5	-7.4	Vert
15	143.276M QP	44.5	+0.0 -27.6	+0.1 +13.9	+0.7	+0.8	+0.0	32.4	43.5	-11.1	Vert
^	143.276M	47.3	+0.0 -27.6	+0.1 +13.9	+0.7	+0.8	+0.0	35.2	43.5	-8.3	Vert
17	138.471M QP	43.8	+0.0 -27.6	+0.1 +14.0	+0.7	+0.8	+0.0	31.8	43.5	-11.7	Vert
^	138.471M	47.2	+0.0 -27.6	+0.1 +14.0	+0.7	+0.8	+0.0	35.2	43.5	-8.3	Vert
19	141.203M QP	43.2	+0.0 -27.6	+0.1 +13.9	+0.7	+0.8	+0.0	31.1	43.5	-12.4	Vert
^	141.234M	47.8	+0.0 -27.6	+0.1 +13.9	+0.7	+0.8	+0.0	35.7	43.5	-7.8	Vert



Test Location: CKC Laboratories, Inc. • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)
Customer: **Nalloy, LLC**
Specification: **15.225 Carrier and Spurious Emissions (13.110-14.010 MHz Transmitter)**
Work Order #: **107941** Date: 3/27/2023
Test Type: **Radiated Scan** Time: 14:10:40
Tested By: Michael Atkinson Sequence#: 6
Software: EMITest 5.03.20

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

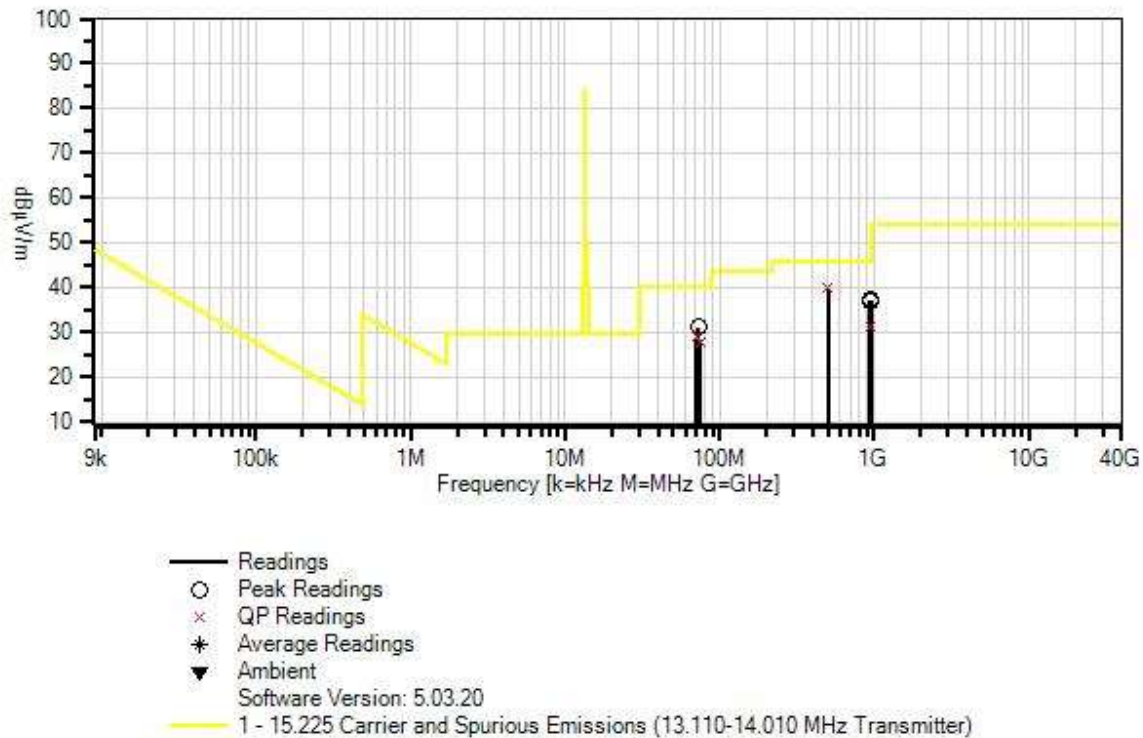
Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Environmental Conditions: Temperature: 21°C Humidity: 34% Pressure: 101.7kPa Method: ANSI C63.10 (2013) Frequency range: 30-1000MHz Setup: Empire units, NFC transmitting at 13.56MHz. XYZ EUT axes investigated, worst case reported. NFC A mode tested as worst case per historical investigation by manufacturer .ort laptop. Also investigated fully exercised I2C commands, worst case reported.
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Nalloy, LLC WO#: 107941 Sequence#: 6 Date: 3/27/2023
15.225 Carrier and Spurious Emissions (13.110-14.010 MHz Transmitter) Test Distance: 3 Meters Horiz



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02673	Spectrum Analyzer	E4446A	3/2/2023	3/2/2025
T1	ANP06011	Cable	Heliac	5/20/2022	5/20/2024
T2	ANP05333	Cable	Heliac	3/14/2022	3/14/2024
T3	ANP05360	Cable	RG214	2/4/2022	2/4/2024
T4	AN02307	Preamp	8447D	1/6/2022	1/6/2024
T5	AN03628	Biconilog Antenna	3142E	6/3/2021	6/3/2023

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

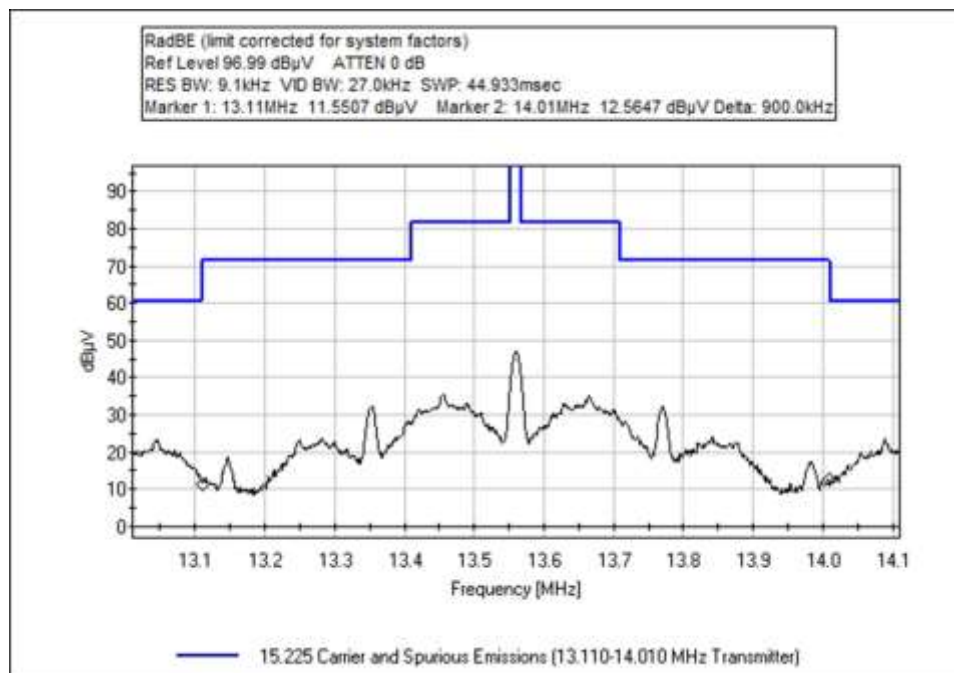
#	Freq MHz	Rdng dBμV	T1 T5 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar Ant
1	500.007M QP	40.5	+0.3 +24.2	+1.2	+1.6	-28.1	+0.0	39.7	46.0	-6.3	Horiz
^	500.032M	41.1	+0.3 +24.2	+1.2	+1.6	-28.1	+0.0	40.3	46.0	-5.7	Horiz
3	72.392M	44.9	+0.1 +12.9	+0.5	+0.5	-27.8	+0.0	31.1	40.0	-8.9	Horiz
4	941.772M	28.8	+0.4 +31.2	+1.6	+2.4	-27.3	+0.0	37.1	46.0	-8.9	Horiz
5	946.781M	28.6	+0.4 +31.3	+1.6	+2.4	-27.2	+0.0	37.1	46.0	-8.9	Horiz
6	955.734M	28.7	+0.4 +31.0	+1.6	+2.4	-27.2	+0.0	36.9	46.0	-9.1	Horiz
7	936.068M	28.7	+0.4 +31.0	+1.6	+2.4	-27.3	+0.0	36.8	46.0	-9.2	Horiz
8	949.598M	28.4	+0.4 +31.2	+1.6	+2.4	-27.2	+0.0	36.8	46.0	-9.2	Horiz
9	71.127M QP	42.7	+0.1 +12.9	+0.5	+0.5	-27.8	+0.0	28.9	40.0	-11.1	Horiz
^	71.127M	47.7	+0.1 +12.9	+0.5	+0.5	-27.8	+0.0	33.9	40.0	-6.1	Horiz
11	74.521M QP	41.8	+0.1 +12.8	+0.5	+0.5	-27.8	+0.0	27.9	40.0	-12.1	Horiz
^	74.521M	47.3	+0.1 +12.8	+0.5	+0.5	-27.8	+0.0	33.4	40.0	-6.6	Horiz
13	950.600M QP	22.9	+0.4 +31.1	+1.6	+2.4	-27.2	+0.0	31.2	46.0	-14.8	Horiz
^	950.600M	29.9	+0.4 +31.1	+1.6	+2.4	-27.2	+0.0	38.2	46.0	-7.8	Horiz

Band Edge

Band Edge Summary

Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @30m)	Limit (dBuV/m @30m)	Results
13.110	NFC A	Loop	-18.3	≤29.5	Pass
14.010	NFC A	Loop	-18.5	≤29.5	Pass

Band Edge Plots



Test Setup / Conditions / Data

Test Location: CKC Laboratories, Inc. • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)
 Customer: **Nalloy, LLC**
 Specification: **15.225 Carrier and Spurious Emissions (13.110-14.010 MHz Transmitter)**
 Work Order #: **106571** Date: 3/27/2023
 Test Type: **Maximized Emissions** Time: 15:14:05
 Tested By: Michael Atkinson Sequence#: 8
 Software: EMITest 5.03.20

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: 34% Pressure: 101.7kPa Method: ANSI C63.10: 2013 Frequency range: Band Edge Setup: Empire units, NFC transmitting at 13.56MHz. XYZ EUT axes investigated, 3 x orthogonal measurement antenna axes investigated, worst case reported. NFC A mode tested as worst case per historical investigation by manufacturer.

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02673	Spectrum Analyzer	E4446A	3/2/2023	3/2/2025
T1	ANP06011	Cable	Heliac	5/20/2022	5/20/2024
T2	AN00052	Loop Antenna	6502	5/11/2022	5/11/2024
T3	ANP06515	Cable	Heliac	5/23/2022	5/23/2024

Measurement Data:

Reading listed by margin.

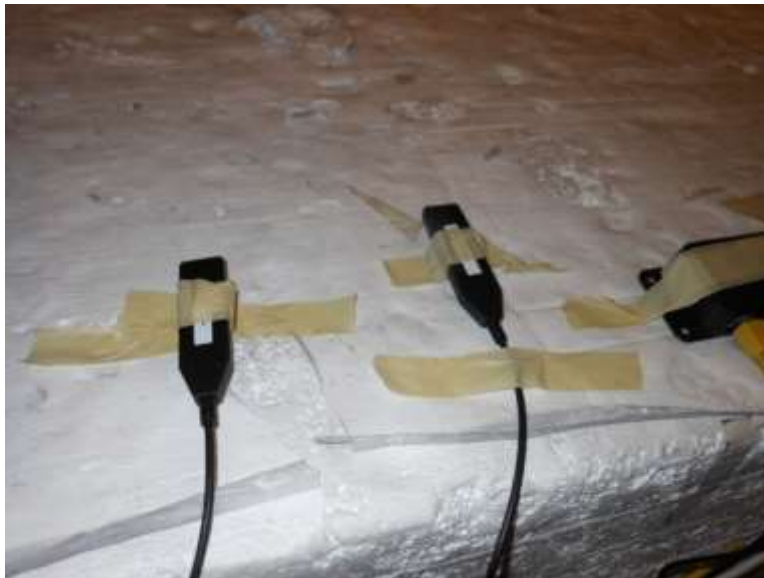
Test Distance: 3 Meters

#	Freq MHz	Rdng dBμV	T1 dB	T2 dB	T3 dB	dB	Dist Table	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar Ant
1	13.110M	12.7	+0.1	+8.7	+0.2		-40.0	-18.3	29.5	-47.8	Para
2	14.010M	12.6	+0.1	+8.6	+0.2		-40.0	-18.5	29.5	-48.0	Para

Test Setup Photo(s)



Below 1GHz



X Axis



Y Axis



Z Axis

15.225(e) Frequency Stability

Test Setup/Conditions			
Test Location:	Bothell Lab Bench	Test Engineer:	M. Atkinson
Test Method:	ANSI C63.10 (2013)	Test Date(s):	3/31/2023
Configuration:	1		
Test Setup:	EUT is continuously transmitting inside of a temperature chamber, a near field probe connected to a spectrum analyzer is used for measurement. NFC A tested as worst case.		

Environmental Conditions			
Temperature (°C)	21	Relative Humidity (%):	36

Test Equipment					
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
02872	Spectrum Analyzer	Agilent	E4440A	11/29/2021	11/29/2023
02757	Temperature Chamber	Bemco	F100/350-8	12/8/2022	12/8/2024
PE0316	Hydra Data Logger	Fluke	2625A	5/24/2021	5/24/2023
PE0331	Thermocouple	Omega	SA3-T-SRTC	10/3/2022	10/3/2024
PE0329	Thermocouple	Omega	SA3-T-SRTC	10/3/2022	10/3/2024

Test Data Summary					
Temperature (°C)	Voltage	Frequency (MHz)	Deviation (%)	Limit (%)	Results
-20	V _{Nominal}	13.56010	0.00074	±0.01	Pass
-10	V _{Nominal}	13.56040	0.00295	±0.01	
0	V _{Nominal}	13.56030	0.00221	±0.01	
10	V _{Nominal}	13.56002	0.00015	±0.01	
20	V _{Minimum}	13.56000	0.00000	±0.01	
20	V _{Nominal}	13.56000	0.00000	±0.01	
20	V _{Maximum}	13.55999	0.00007	±0.01	
30	V _{Nominal}	13.55999	0.00007	±0.01	
40	V _{Nominal}	13.56010	0.00074	±0.01	
50	V _{Nominal}	13.56040	0.00295	±0.01	
Nominal Frequency:		13.560000			

Parameter Definitions:

Measurements performed at input voltage according to manufacturer specification.

Parameter	Value
V _{Nominal} :	120 VAC
V _{Minimum} :	100 VAC
V _{Maximum} :	264 VAC

Test Setup Photo(s)



15.207 AC Conducted Emissions

Test Setup / Conditions / Data

Test Location: CKC Laboratories, Inc. • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)
 Customer: **Nalloy, LLC**
 Specification: **15.207 AC Mains - Average**
 Work Order #: **106571** Date: 3/27/2023
 Test Type: **Conducted Emissions** Time: 16:25:22
 Tested By: Michael Atkinson Sequence#: 10
 Software: EMITest 5.03.20 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: 21°C
 Humidity: 34%
 Pressure: 101.7kPa

 Method: ANSI C63.10 (2013)

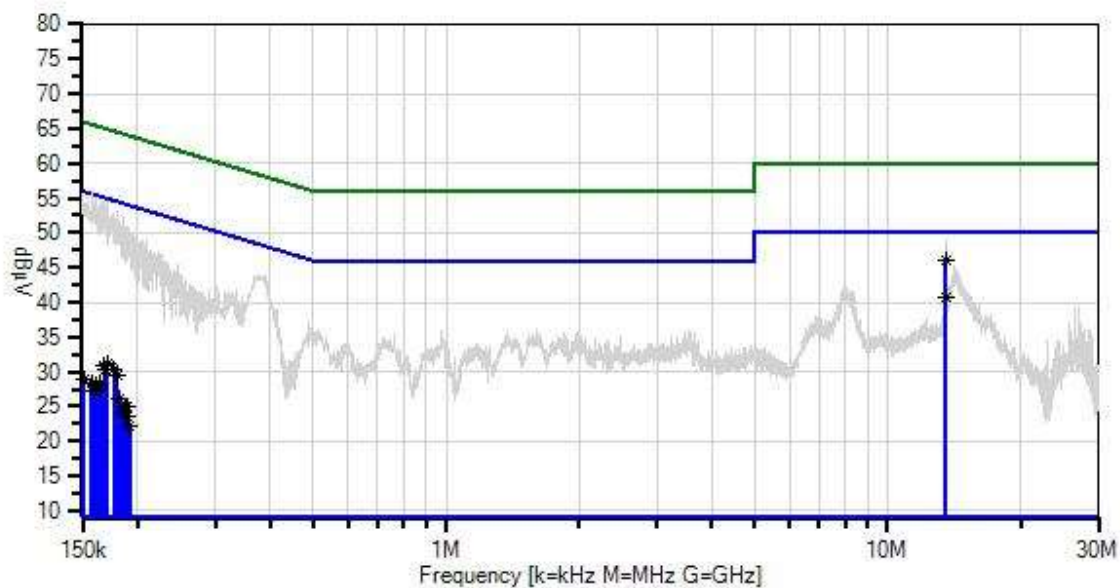
 Frequency range: 0.15-30MHz

 Setup:

 Empire units, NFC transmitting at 13.56MHz.

 NFC A mode tested as worst case per historical investigation by manufacturer. ort laptop, as well as fully exercised I2C scripts, worst case reported.

Nalloy, LLC W/O#: 106571 Sequence#: 10 Date: 3/27/2023
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
	AN02673	Spectrum Analyzer	E4446A	3/2/2023	3/2/2025
T1	AN02611	High Pass Filter	HE9615-150K-50-720B	1/5/2022	1/5/2024
T2	ANP06011	Cable	Heliac	5/20/2022	5/20/2024
T3	ANP06515	Cable	Heliac	5/23/2022	5/23/2024
T4	ANP06219	Attenuator	768-10	3/23/2022	3/23/2024
T5	AN01492	50uH LISN-Line (L1)	3816/2NM	3/18/2022	3/18/2024
	AN01492	50uH LISN-Neutral (L2)	3816/2NM	3/18/2022	3/18/2024

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	13.560M Ave	36.3	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	46.1	50.0	-3.9	Line
2	13.564M Ave	30.8	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	40.6	50.0	-9.4	Line
^	13.564M	39.2	+0.0 +0.4	+0.1	+0.2	+9.1	+0.0	49.0	50.0	-1.0	Line
4	170.855k Ave	21.8	+0.3 +0.1	+0.0	+0.0	+9.1	+0.0	31.3	54.9	-23.6	Line
5	168.340k Ave	21.3	+0.3 +0.1	+0.0	+0.0	+9.1	+0.0	30.8	55.0	-24.2	Line
6	176.723k Ave	20.8	+0.3 +0.1	+0.0	+0.0	+9.1	+0.0	30.3	54.6	-24.3	Line
7	169.702k Ave	20.9	+0.3 +0.1	+0.0	+0.0	+9.1	+0.0	30.4	55.0	-24.6	Line
^	170.854k	44.9	+0.3 +0.1	+0.0	+0.0	+9.1	+0.0	54.4	54.9	-0.5	Line
^	169.702k	44.6	+0.3 +0.1	+0.0	+0.0	+9.1	+0.0	54.1	55.0	-0.9	Line
10	179.867k Ave	19.9	+0.3 +0.1	+0.0	+0.0	+9.1	+0.0	29.4	54.5	-25.1	Line
^	176.723k	43.2	+0.3 +0.1	+0.0	+0.0	+9.1	+0.0	52.7	54.6	-1.9	Line
12	164.462k Ave	18.8	+0.4 +0.1	+0.0	+0.0	+9.1	+0.0	28.4	55.2	-26.8	Line
13	151.040k Ave	18.3	+1.5 +0.1	+0.0	+0.0	+9.1	+0.0	29.0	55.9	-26.9	Line
^	151.040k	44.4	+1.5 +0.1	+0.0	+0.0	+9.1	+0.0	55.1	55.9	-0.8	Line
15	157.231k Ave	18.7	+0.6 +0.1	+0.0	+0.0	+9.1	+0.0	28.5	55.6	-27.1	Line
16	160.860k Ave	18.5	+0.5 +0.1	+0.0	+0.0	+9.1	+0.0	28.2	55.4	-27.2	Line
17	163.624k Ave	18.1	+0.4 +0.1	+0.0	+0.0	+9.1	+0.0	27.7	55.3	-27.6	Line
^	168.339k	45.0	+0.3 +0.1	+0.0	+0.0	+9.1	+0.0	54.5	55.0	-0.5	Line

19	159.570k Ave	17.6	+0.5 +0.1	+0.0	+0.0	+9.1	+0.0	27.3	55.5	-28.2	Line
^	160.860k	46.6	+0.5 +0.1	+0.0	+0.0	+9.1	+0.0	56.3	55.4	+0.9	Line
^	159.570k	46.4	+0.5 +0.1	+0.0	+0.0	+9.1	+0.0	56.1	55.5	+0.6	Line
^	157.231k	46.1	+0.6 +0.1	+0.0	+0.0	+9.1	+0.0	55.9	55.6	+0.3	Line
^	164.462k	44.4	+0.4 +0.1	+0.0	+0.0	+9.1	+0.0	54.0	55.2	-1.2	Line
^	163.623k	44.3	+0.4 +0.1	+0.0	+0.0	+9.1	+0.0	53.9	55.3	-1.4	Line
25	182.697k Ave	16.7	+0.2 +0.1	+0.0	+0.0	+9.1	+0.0	26.1	54.4	-28.3	Line
^	179.867k	43.6	+0.3 +0.1	+0.0	+0.0	+9.1	+0.0	53.1	54.5	-1.4	Line
27	187.518k Ave	15.7	+0.1 +0.1	+0.0	+0.0	+9.1	+0.0	25.0	54.1	-29.1	Line
28	188.985k Ave	15.6	+0.1 +0.1	+0.0	+0.0	+9.1	+0.0	24.9	54.1	-29.2	Line
29	185.422k Ave	14.8	+0.2 +0.1	+0.0	+0.0	+9.1	+0.0	24.2	54.2	-30.0	Line
^	182.696k	42.5	+0.2 +0.1	+0.0	+0.0	+9.1	+0.0	51.9	54.4	-2.5	Line
31	189.928k Ave	14.4	+0.1 +0.1	+0.0	+0.0	+9.1	+0.0	23.7	54.0	-30.3	Line
^	185.421k	42.8	+0.2 +0.1	+0.0	+0.0	+9.1	+0.0	52.2	54.2	-2.0	Line
33	192.024k Ave	13.0	+0.1 +0.1	+0.0	+0.0	+9.1	+0.0	22.3	53.9	-31.6	Line
^	189.928k	41.7	+0.1 +0.1	+0.0	+0.0	+9.1	+0.0	51.0	54.0	-3.0	Line
^	188.984k	41.5	+0.1 +0.1	+0.0	+0.0	+9.1	+0.0	50.8	54.1	-3.3	Line
^	187.517k	41.5	+0.1 +0.1	+0.0	+0.0	+9.1	+0.0	50.8	54.1	-3.3	Line
^	192.023k	41.2	+0.1 +0.1	+0.0	+0.0	+9.1	+0.0	50.5	53.9	-3.4	Line



Test Location: CKC Laboratories, Inc. • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)
Customer: **Nalloy, LLC**
Specification: **15.207 AC Mains - Average**
Work Order #: **106571** Date: 3/27/2023
Test Type: **Conducted Emissions** Time: 16:45:04
Tested By: Michael Atkinson Sequence#: 11
Software: EMITest 5.03.20 120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

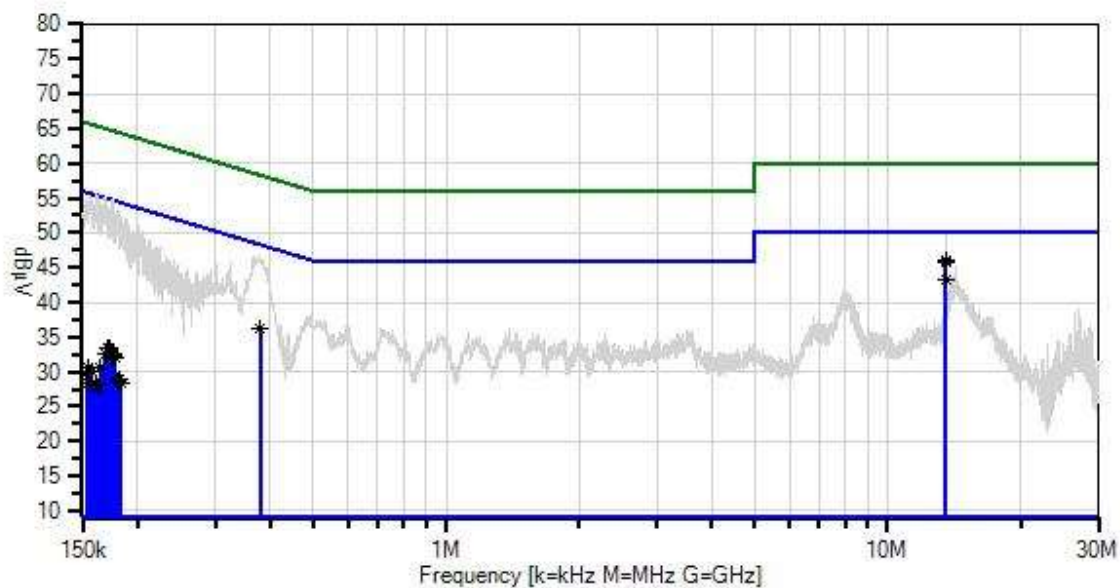
Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Environmental Conditions: Temperature: 21°C Humidity: 34% Pressure: 101.7kPa Method: ANSI C63.10 (2013) Frequency range: 0.15-30MHz Setup: Empire units, NFC transmitting at 13.56MHz. NFC A mode tested as worst case per historical investigation by manufacturer. ort laptop, as well as fully exercised I2C scripts, worst case reported.

Nalloy, LLC WO#: 106571 Sequence#: 11 Date: 3/27/2023
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
	AN02673	Spectrum Analyzer	E4446A	3/2/2023	3/2/2025
T1	AN02611	High Pass Filter	HE9615-150K-50-720B	1/5/2022	1/5/2024
T2	ANP06011	Cable	Heliac	5/20/2022	5/20/2024
T3	ANP06515	Cable	Heliac	5/23/2022	5/23/2024
T4	ANP06219	Attenuator	768-10	3/23/2022	3/23/2024
	AN01492	50uH LISN-Line (L1)	3816/2NM	3/18/2022	3/18/2024
T5	AN01492	50uH LISN-Neutral (L2)	3816/2NM	3/18/2022	3/18/2024

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	13.560M	36.4	+0.0	+0.1	+0.2	+9.1	+0.0	46.0	50.0	-4.0	Neutr
	Ave		+0.2								
2	13.561M	36.1	+0.0	+0.1	+0.2	+9.1	+0.0	45.7	50.0	-4.3	Neutr
	Ave		+0.2								
3	13.557M	33.6	+0.0	+0.1	+0.2	+9.1	+0.0	43.2	50.0	-6.8	Neutr
	Ave		+0.2								
^	13.560M	40.0	+0.0	+0.1	+0.2	+9.1	+0.0	49.6	50.0	-0.4	Neutr
			+0.2								
^	13.557M	40.0	+0.0	+0.1	+0.2	+9.1	+0.0	49.6	50.0	-0.4	Neutr
			+0.2								
^	13.561M	38.8	+0.0	+0.1	+0.2	+9.1	+0.0	48.4	50.0	-1.6	Neutr
			+0.2								
7	379.229k	27.0	+0.1	+0.0	+0.0	+9.1	+0.0	36.2	48.3	-12.1	Neutr
	Ave		+0.0								
^	379.228k	37.5	+0.1	+0.0	+0.0	+9.1	+0.0	46.7	48.3	-1.6	Neutr
			+0.0								
9	172.532k	23.9	+0.3	+0.0	+0.0	+9.1	+0.0	33.3	54.8	-21.5	Neutr
	Ave		+0.0								
10	171.274k	23.9	+0.3	+0.0	+0.0	+9.1	+0.0	33.3	54.9	-21.6	Neutr
	Ave		+0.0								
11	175.780k	23.1	+0.3	+0.0	+0.0	+9.1	+0.0	32.5	54.7	-22.2	Neutr
	Ave		+0.0								
12	176.514k	22.9	+0.3	+0.0	+0.0	+9.1	+0.0	32.3	54.6	-22.3	Neutr
	Ave		+0.0								
13	169.388k	23.1	+0.3	+0.0	+0.0	+9.1	+0.0	32.5	55.0	-22.5	Neutr
	Ave		+0.0								
14	177.771k	22.6	+0.3	+0.0	+0.0	+9.1	+0.0	32.0	54.6	-22.6	Neutr
	Ave		+0.0								
15	174.732k	22.7	+0.3	+0.0	+0.0	+9.1	+0.0	32.1	54.7	-22.6	Neutr
	Ave		+0.0								
^	175.780k	45.6	+0.3	+0.0	+0.0	+9.1	+0.0	55.0	54.7	+0.3	Neutr
			+0.0								
^	171.273k	44.4	+0.3	+0.0	+0.0	+9.1	+0.0	53.8	54.9	-1.1	Neutr
			+0.0								
^	174.732k	44.0	+0.3	+0.0	+0.0	+9.1	+0.0	53.4	54.7	-1.3	Neutr
			+0.0								
^	172.531k	44.0	+0.3	+0.0	+0.0	+9.1	+0.0	53.4	54.8	-1.4	Neutr
			+0.0								
20	164.881k	21.2	+0.4	+0.0	+0.0	+9.1	+0.0	30.7	55.2	-24.5	Neutr
	Ave		+0.0								
^	169.387k	45.7	+0.3	+0.0	+0.0	+9.1	+0.0	55.1	55.0	+0.1	Neutr
			+0.0								
22	154.710k	20.9	+0.7	+0.0	+0.0	+9.1	+0.0	30.7	55.7	-25.0	Neutr
	Ave		+0.0								
23	182.697k	19.7	+0.2	+0.0	+0.0	+9.1	+0.0	29.0	54.4	-25.4	Neutr
	Ave		+0.0								

24	157.110k Ave	20.4	+0.6 +0.0	+0.0	+0.0	+9.1	+0.0	30.1	55.6	-25.5	Neutr
25	181.020k Ave	19.2	+0.3 +0.0	+0.0	+0.0	+9.1	+0.0	28.6	54.4	-25.8	Neutr
^	176.513k	43.9	+0.3 +0.0	+0.0	+0.0	+9.1	+0.0	53.3	54.6	-1.3	Neutr
^	177.771k	43.4	+0.3 +0.0	+0.0	+0.0	+9.1	+0.0	52.8	54.6	-1.8	Neutr
28	183.431k Ave	19.1	+0.2 +0.0	+0.0	+0.0	+9.1	+0.0	28.4	54.3	-25.9	Neutr
^	181.020k	44.2	+0.3 +0.0	+0.0	+0.0	+9.1	+0.0	53.6	54.4	-0.8	Neutr
^	182.696k	43.8	+0.2 +0.0	+0.0	+0.0	+9.1	+0.0	53.1	54.4	-1.3	Neutr
^	183.430k	43.1	+0.2 +0.0	+0.0	+0.0	+9.1	+0.0	52.4	54.3	-1.9	Neutr
32	153.340k Ave	19.9	+0.7 +0.0	+0.0	+0.0	+9.1	+0.0	29.7	55.8	-26.1	Neutr
33	158.430k Ave	18.8	+0.6 +0.0	+0.0	+0.0	+9.1	+0.0	28.5	55.5	-27.0	Neutr
34	160.899k Ave	18.7	+0.5 +0.0	+0.0	+0.0	+9.1	+0.0	28.3	55.4	-27.1	Neutr
35	154.910k Ave	18.6	+0.7 +0.0	+0.0	+0.0	+9.1	+0.0	28.4	55.7	-27.3	Neutr
^	157.110k	46.8	+0.6 +0.0	+0.0	+0.0	+9.1	+0.0	56.5	55.6	+0.9	Neutr
^	153.340k	46.0	+0.7 +0.0	+0.0	+0.0	+9.1	+0.0	55.8	55.8	+0.0	Neutr
^	154.910k	44.9	+0.7 +0.0	+0.0	+0.0	+9.1	+0.0	54.7	55.7	-1.0	Neutr
^	154.710k	44.2	+0.7 +0.0	+0.0	+0.0	+9.1	+0.0	54.0	55.7	-1.7	Neutr
40	163.100k Ave	18.4	+0.4 +0.0	+0.0	+0.0	+9.1	+0.0	27.9	55.3	-27.4	Neutr
^	160.898k	46.1	+0.5 +0.0	+0.0	+0.0	+9.1	+0.0	55.7	55.4	+0.3	Neutr
^	163.099k	45.9	+0.4 +0.0	+0.0	+0.0	+9.1	+0.0	55.4	55.3	+0.1	Neutr
^	158.430k	45.7	+0.6 +0.0	+0.0	+0.0	+9.1	+0.0	55.4	55.5	-0.1	Neutr
^	164.881k	45.2	+0.4 +0.0	+0.0	+0.0	+9.1	+0.0	54.7	55.2	-0.5	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 $\text{dB}\mu\text{V}/\text{m}$, 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.