

Finalmouse

REVISED EMC TEST REPORT TO 109390-4

Wireless Gaming Mouse
Model: ULXS (Finalmouse Ultralight X – Cheetah)

Tested to The Following Standards:

FCC Part 15 Subpart C Section(s)

15.207 & 15.247
(DTS 2400-2483.5MHz)

Report No.: 109390-4A

Date of issue: May 8, 2024



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:

Finalmouse
505 San Juan Ave 4
Venice, CA 90291

Representative: Maxime Vincent
Customer Reference Number: CKC2

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

Viviana Prado
CKC Laboratories, Inc.
5046 Sierra Pines Drive
Mariposa, CA 95338

Project Number: 109390

March 14, 2024

March 16-18 & March 22, 2024

Revision History

Original: Testing of the Wireless Gaming Mouse, Model: ULXS (Finalmouse Ultralight X – Cheetah) to FCC Part 15 Subpart C Section(s) 15.207 & 15.247 (DTS 2400-2483.5MHz).

Revision A: To update radiated emissions test notes.

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.
22116 23rd Drive SE, 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 – 15.207 & 15.247 (DTS)

Test Procedure	Description	Modifications	Results
15.247(a)(2)	6dB Bandwidth	NA	Pass
15.247(b)(3)	Output Power	NA	Pass
15.247(d)	RF Conducted Emissions & Band Edge	NA	NA1
15.247(d)	Radiated Emissions & Band Edge	NA	Pass
15.247(e)	Power Spectral Density	NA	Pass
15.207	AC Conducted Emissions	NA	Pass

NA = Not Applicable

NA1= Not applicable because EUT has integral antenna.

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 Tested:

Device	Manufacturer	Model #	S/N
Wireless Gaming Mouse	Finalmouse	ULXS (Finalmouse Ultralight X – Cheetah)	NA

Support Equipment:

Device	Manufacturer	Model #	S/N
Laptop	HP	ProtectSmart	CKCAN3512
Laptop PSU	HP	PPP009A	WFTLK0FGM961LE

General Product Information:

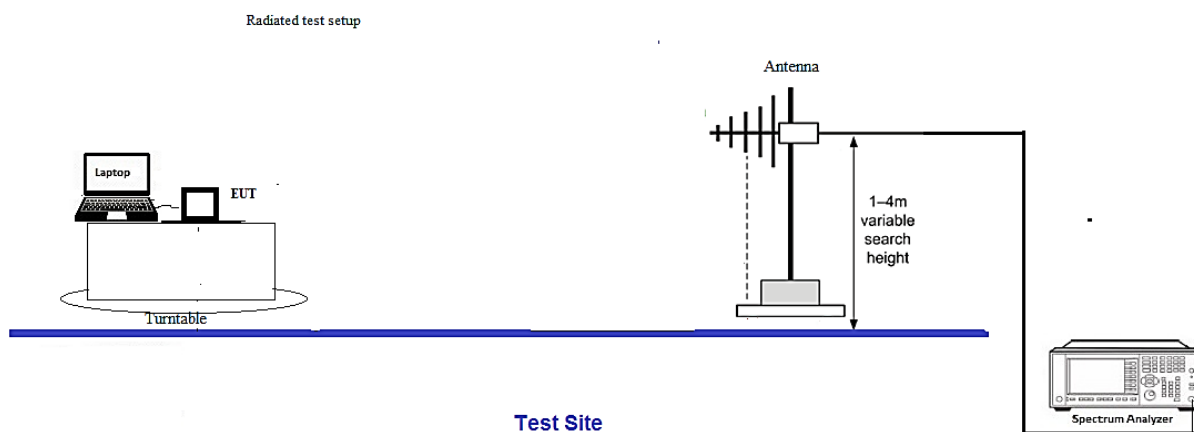
Description of EUT	
Wireless Gaming Mouse	

Product Information	Manufacturer-Provided Details
Operating Frequencies Tested:	2402-2480 MHz
Equipment Type:	Stand-Alone Equipment
Type of Wideband System:	DTS
Maximum Duty Cycle:	100% (Tested worst-case)
Modulation Type(s):	GFSK
Number of TX Chains:	1
Beamforming Type:	NA
Antenna Type(s) and Gain:	inverted F PCB trace antenna Average Gain: -8.52 dBi Max Gain: 1.56 dBi
Antenna Connection Type:	Integral
Nominal Input Voltage:	120VAC (Host) EUT 5VDC
Firmware / Software Version(s):	v2.1.0
Firmware / Software Description:	Production release software
Firmware / Software Setting(s):	Default or Radio Test mode, depending on tests
Tune-up or Adjustment(s):	None

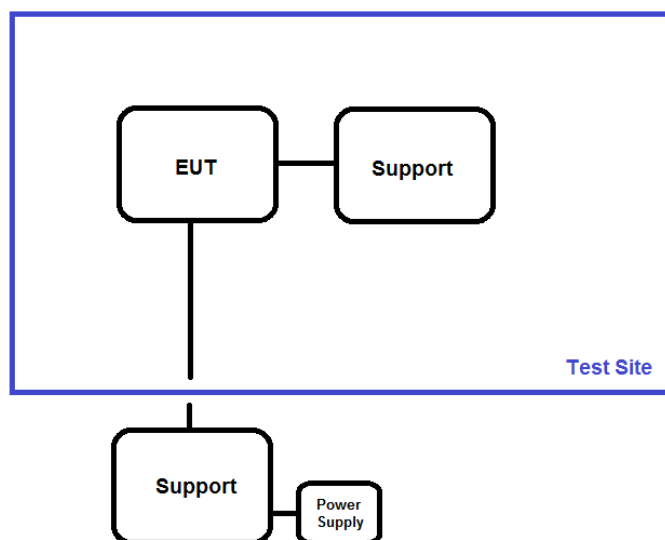
The validity of results is dependent on the stated product details, the accuracy of which the manufacturer assumes full responsibility.

Block Diagram of Test Setup(s)

Config#	Setup Description of Block Diagram
1	EUT is setup in a tabletop configuration. It is connected to a Laptop via USB cable. Laptop is sitting on turntable. X, Y, and Z axis were investigated and worst-case data provided.



Test Setup Block Diagram



FCC Part 15 Subpart C

15.247(a)(2) 6dB Bandwidth

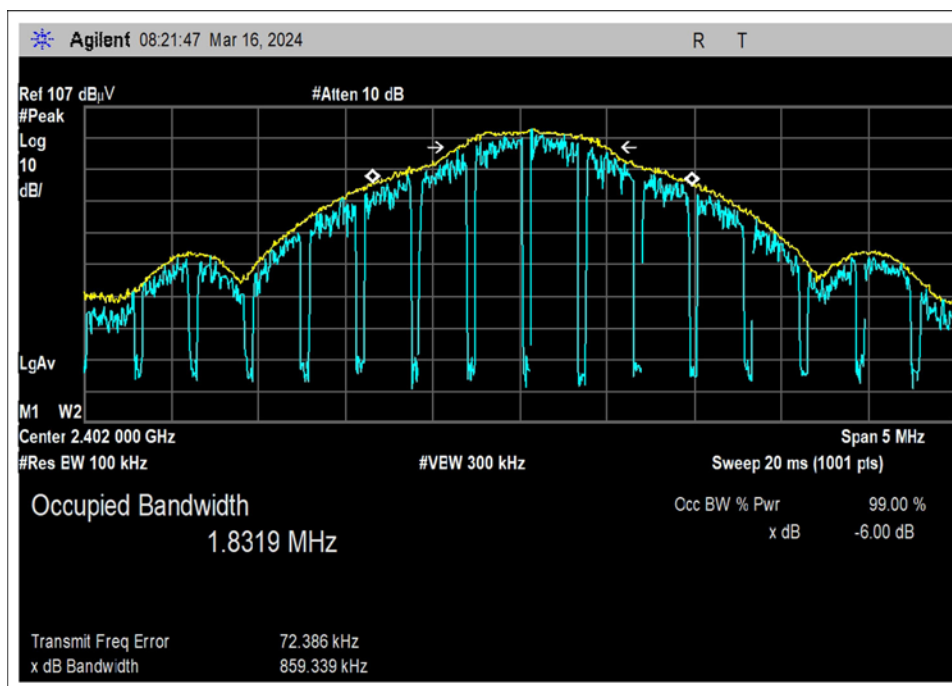
Test Setup/Conditions			
Test Location:	Bothell Lab C3	Test Engineer:	M. Harrison
Test Method:	ANSI C63.10 (2020), KDB 558074	Test Date(s):	3/17/2024
Configuration:	1		
Test Setup:	EUT is setup in a Tabletop configuration. It is 150cm high on a Styrofoam table. It is connected to a support laptop via USB Cable. Laptop is sitting 20cm above ground plane. Horizontal and Vertical Polarities along with X, Y, and Z axis investigated, worst-case data provided.		

Environmental Conditions			
Temperature (°C)	21	Relative Humidity (%):	40

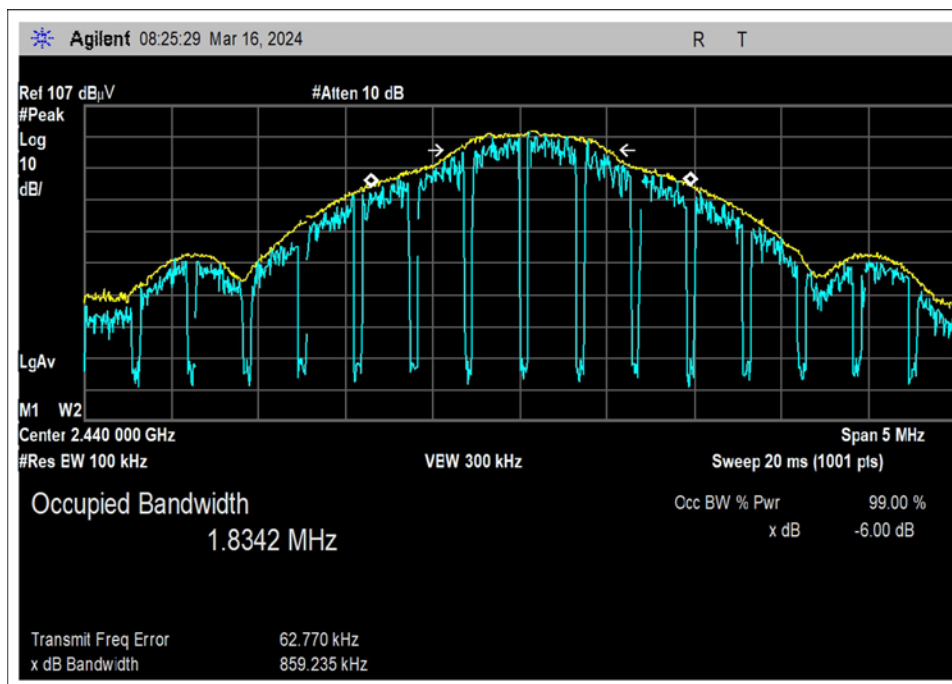
Test Equipment					
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
03834	Spectrum Analyzer	Agilent	E4448A	11/08/2023	11/08/2025
02374ANSI	Horn Antenna	Electrometrics	RGA-60	5/26/2023	5/26/2025
03540	Preamp	HP	83017A	3/24/2023	3/24/2025
P06011	Cable	Andrew	Heliac	11/16/2023	11/16/2025
P06515	Cable	Andrews	Heliac	2/28/2024	2/28/2026
P07504	Cable	TMS	CLU40-KMKM-02.00F	8/1/2023	8/1/2025

Test Data Summary					
Frequency (MHz)	Antenna Port	Modulation	Measured (kHz)	Limit (kHz)	Results
2402	1	GFSK	859.3	≥500	Pass
2440	1	GFSK	859.2	≥500	Pass
2480	1	GFSK	860.5	≥500	Pass

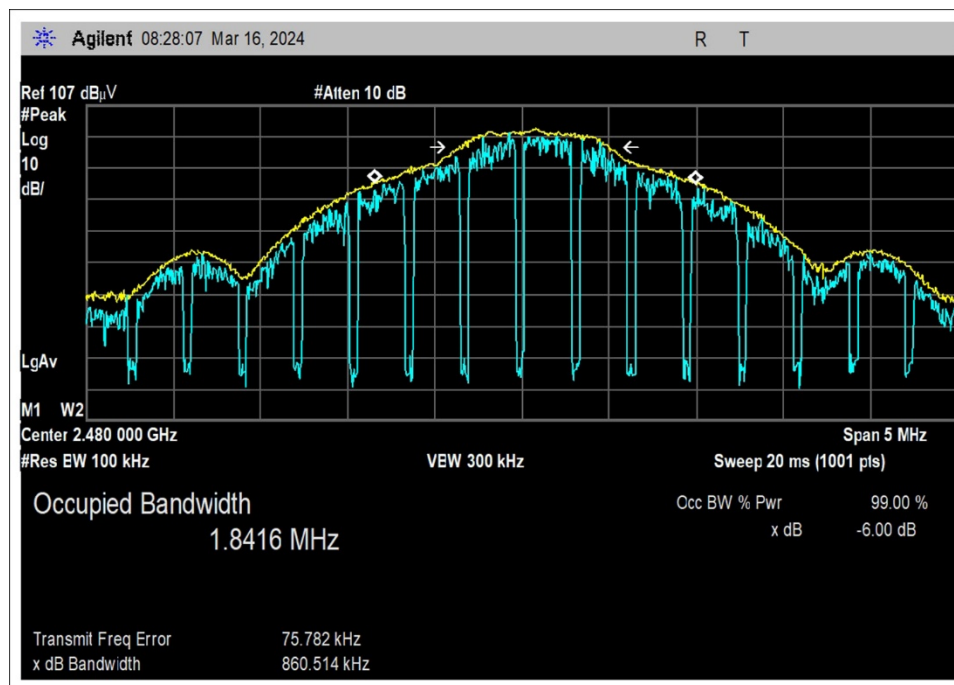
Plot(s)



Low Channel Frequency



Middle Channel Frequency

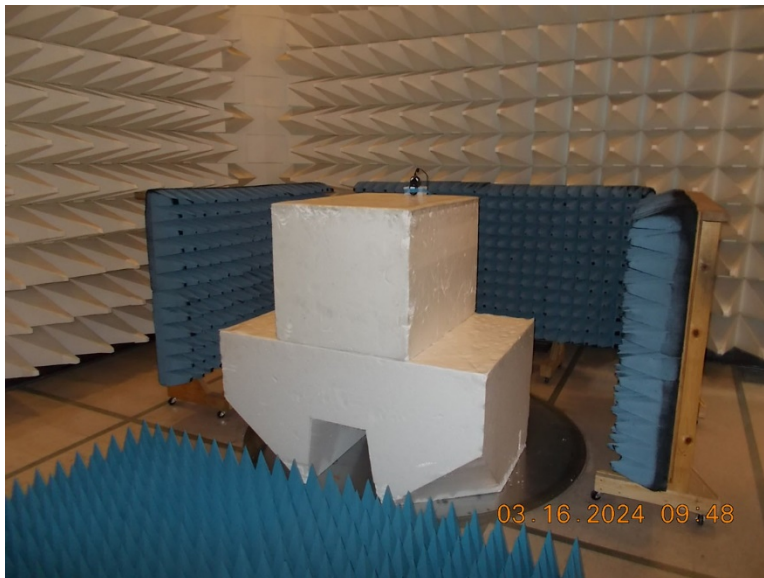


High Channel Frequency

Test Setup Photo(s)



Above 1GHz, View 1



Above 1GHz, View 2

15.247(b)(3) Output Power

Test Setup/Conditions

Test Location:	Bothell Lab C3	Test Engineer:	M. Harrison
Test Method:	ANSI C63.10 (2020), KDB 558074	Test Date(s):	3/22/2024
Configuration:	1		

Test Data Summary - Voltage Variations

Frequency (MHz)	Modulation / Ant Port	V _{Minimum} (dBm)	V _{Nominal} (dBm)	V _{Maximum} (dBm)	Max Deviation from V _{Nominal} (dB)
2402	GFSK / 1	8.9	8.9	8.9	0.0
2440	GFSK / 1	7.9	7.9	7.9	0.0
2480	GFSK / 1	8.6	8.6	8.6	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} :	115
V _{Minimum} :	98
V _{Maximum} :	132

Test Data Summary - Radiated Measurement							
Measurement Option: RBW > DTS Bandwidth							
Frequency (MHz)	Modulation	Ant. Type / Gain (dBi)	RF Conducted (dBm)		EIRP (dBm)		Results
			Calculated	Limit	Calculated	Limit	
2402	GFSK	Inverted F / 1.56	7.34	≤30	8.9	≤36	Pass
2440	GFSK	Inverted F / 1.56	6.34	≤30	7.9	≤36	Pass
2480	GFSK	Inverted F / 1.56	7.04	≤30	8.6	≤36	Pass

EIRP is calculated as RF conducted power (dBm) + antenna gain (dBi)

For fixed point-to-point antennas, the limit is calculated in accordance with 15.247(c)(1): $Limit = 30 - Roundup\left(\frac{G-6}{3}\right)$

For all other antennas, the RF conducted power limit is calculated according to a maximum of 1W (30 dBm) conducted power with a maximum of 6dBi gain antenna in accordance with 15.247(b)
 $Limit = 30 - Roundup(G - 6)$

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

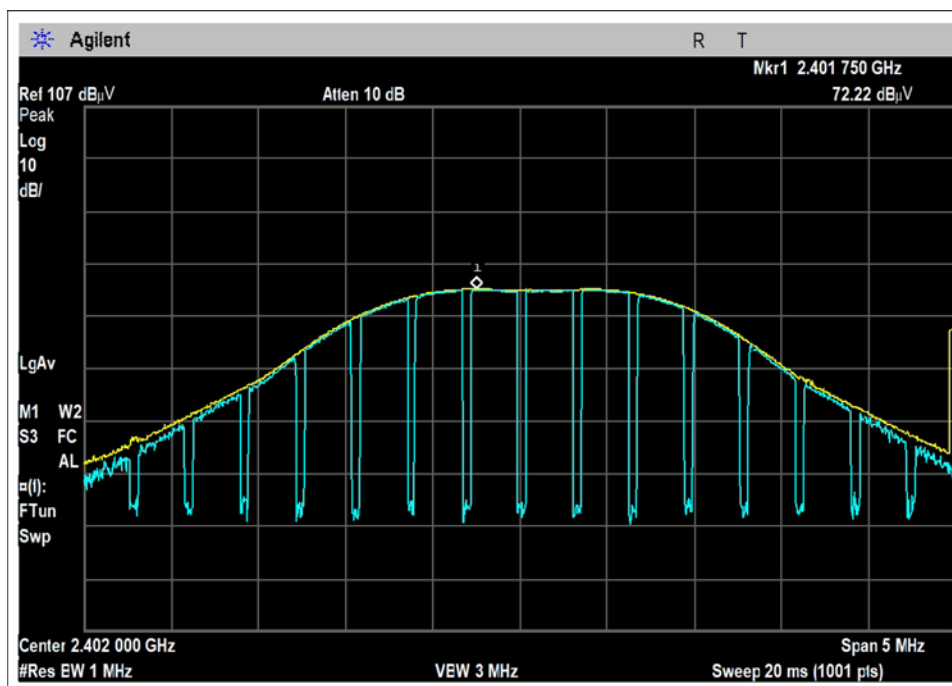
Conducted RF output power calculated in accordance with ANSI C63.10.

$$P(W) = \frac{(E \cdot d)^2}{30 G}$$

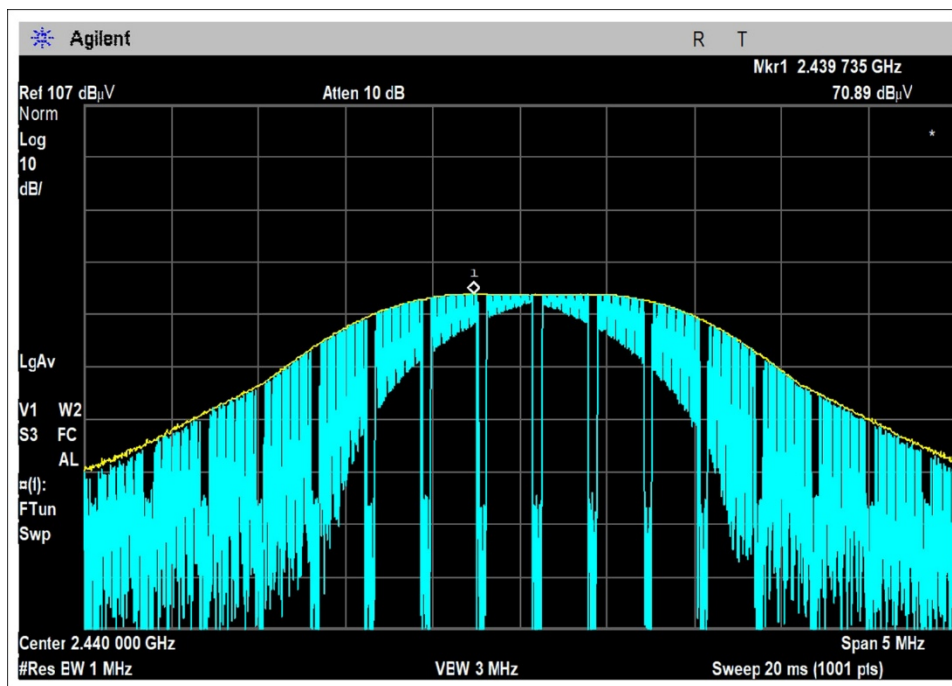
Or equivalently, in logarithmic form:

$$P(dBm) = E(dBuV/m) + 20LOG(d) - G - 104.77$$

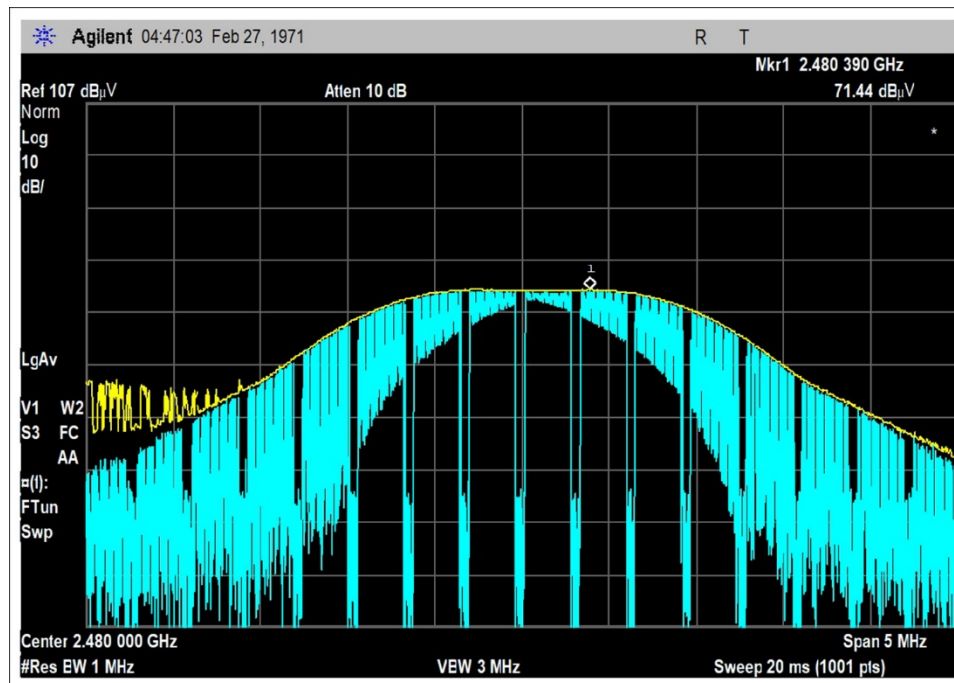
Plot(s)



Low Channel Frequency



Middle Channel Frequency



High Channel Frequency

Test Setup / Conditions / Data

Test Location: CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)
 Customer: **Finalmouse**
 Specification: **15.247(b) Power Output (2400-2483.5 MHz DTS)**
 Work Order #: **109545** Date: 3/22/2024
 Test Type: **Radiated Scan** Time: 07:54:32
 Tested By: Matt Harrison Sequence#: 1
 Software: EMITest 5.03.21

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Setup: EUT is setup in a Tabletop configuration. It is 150cm high on a Styrofoam table. It is connected to a support laptop via USB Cable. Laptop is sitting 20cm above ground plane. Horizontal and Vertical Polarities along with X, Y, and Z axis investigated, worst-case data provided.

Test Environment Conditions:

Temperature: 21°C

Humidity: 35%

Pressure: 103.0kPa

Frequency Range: 2402-2480 MHz

Test Method: ANSI C63.10

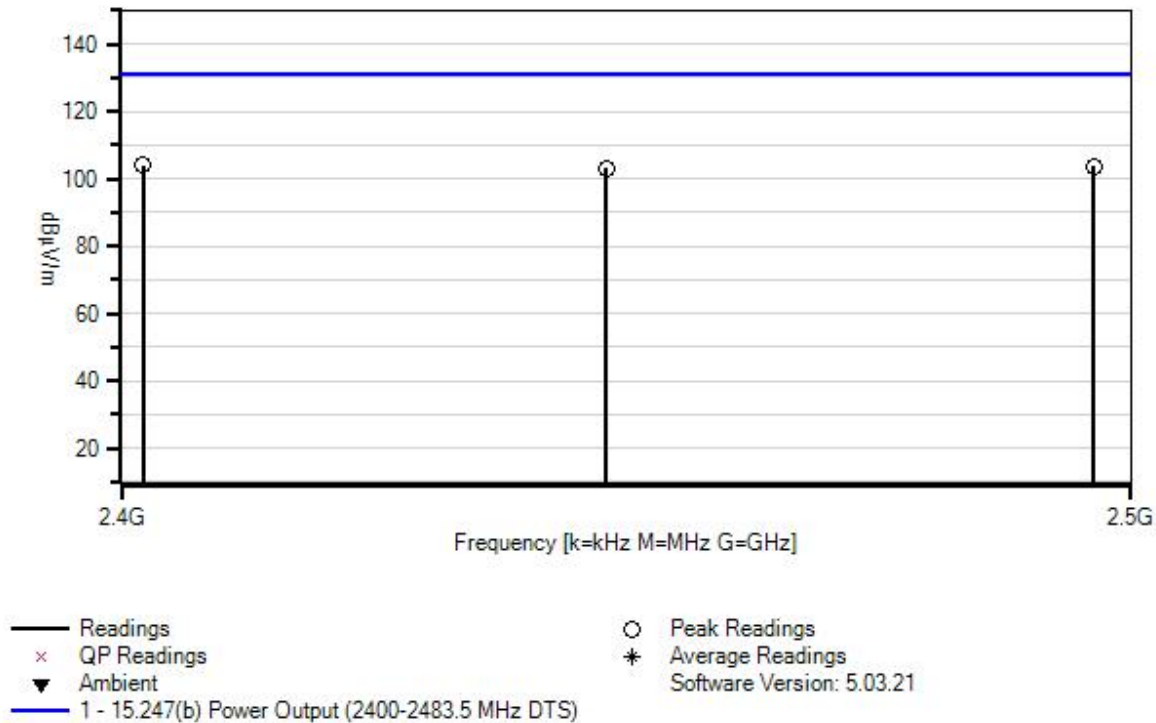
Notes:

Small Mouse

Channels: 2402, 2440, 2480

Output Power: 8dBm

Finalmouse WD#: 109545 Sequence#: 1 Date: 3/22/2024
15.247(b) Power Output (2400-2483.5 MHz DTS) Test Distance: 3 Meters Horiz



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02374ANSI	Horn Antenna	RGA-60	5/26/2023	5/26/2025
T2	ANP06011	Cable	Heliac	11/16/2023	11/16/2025
T3	ANP06515	Cable	Heliac	2/28/2024	2/28/2026
T4	AN03803	Spectrum Analyzer	E4440A	2/12/2024	2/12/2026
	ANP05503	Attenuator	766-10	4/28/2023	4/28/2025

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dBμV	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar Ant
1	2401.750M	72.2	+28.6	+0.7	+2.6	+0.0	+0.0 342	104.1	131.2	-27.1	Horiz 100
2	2480.385M	71.4	+29.0	+0.7	+2.7	+0.0	+0.0 345	103.8	131.2	-27.4	Horiz 111
3	2439.735M	70.9	+28.8	+0.7	+2.7	+0.0	+0.0 342	103.1	131.2	-28.1	Horiz 100

Test Setup Photo(s)



X- Axis



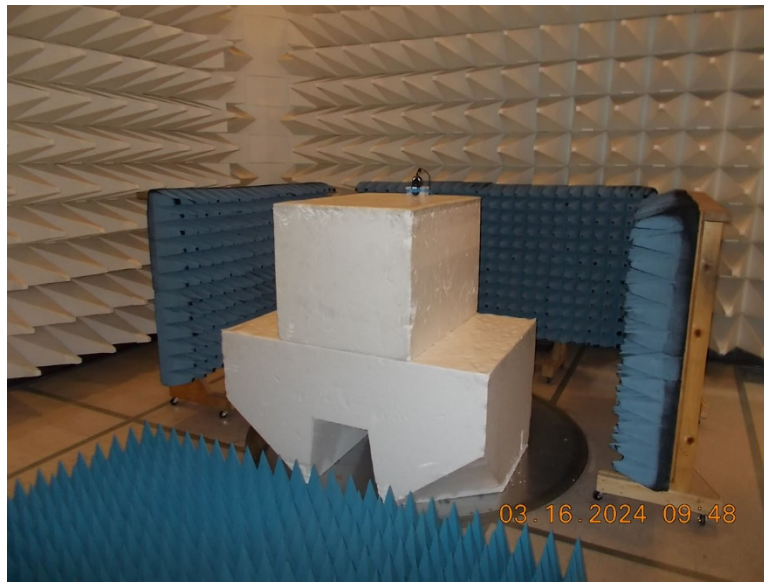
Y-Axis



Z- Axis



Above 1GHz, View 1



Above 1GHz, View 2

15.247(d) Radiated Emissions & Band Edge

Test Setup/Conditions

Test Location:	Bothell Lab C3	Test Engineer:	M. Harrison
Test Method:	ANSI C63.10 (2020), KDB 558074	Test Date(s):	3/16/2024
Configuration:	1		

Test Data

Test Location: CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)
 Customer: **Finalmouse**
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**
 Work Order #: **109545** Date: 3/16/2024
 Test Type: **Radiated Scan** Time: 12:55:48
 Tested By: Matt Harrison Sequence#: 4
 Software: EMITest 5.03.21

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Setup: EUT is setup in a Tabletop configuration. It is 150cm high above 1GHz and 0.8m high below 1GHz on a Styrofoam table. It is connected to a support laptop via USB Cable. Laptop is sitting 20cm above ground plane. Horizontal and Vertical Polarities along with X, Y, and Z axis investigated, worst-case data provided.

Test Environment Conditions:

Temperature: 21°C

Humidity: 35%

Pressure: 103.0kPa

Frequency Range: 9k-25GHz

Test Method: ANSI C63.10

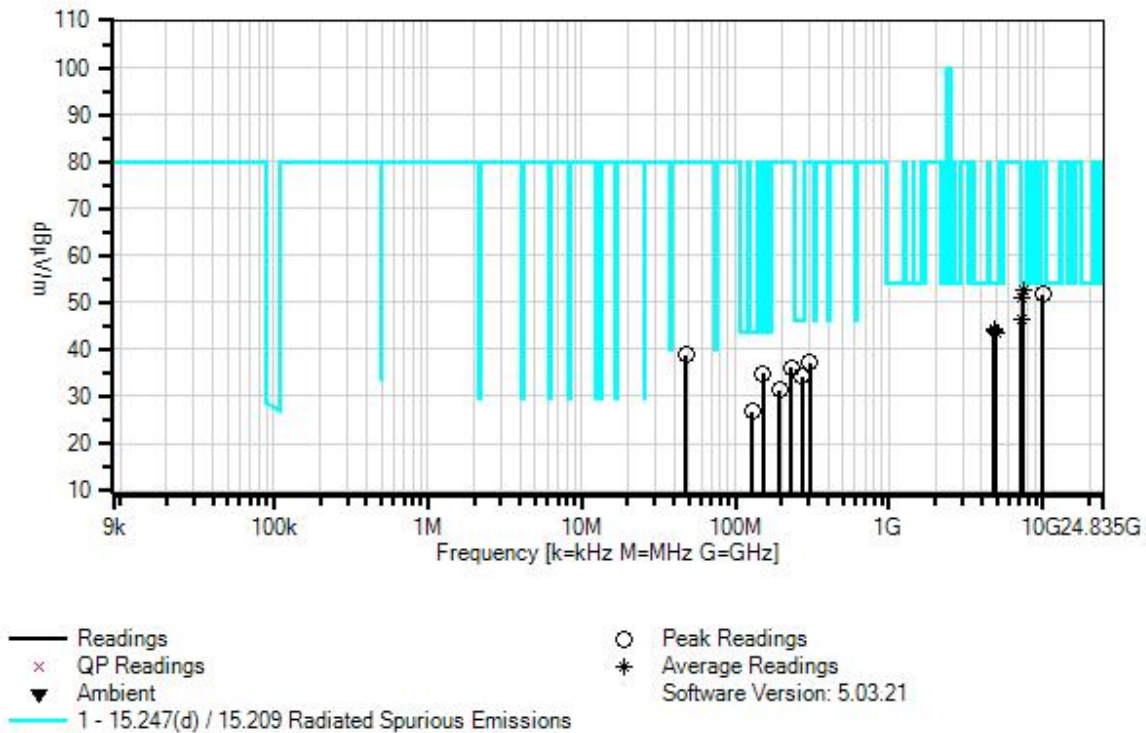
Notes:

Transmitting on 2402, 2440, 2480MHz

Output Power: 8dBm

No EUT Emissions found within 20dB of the limit above 10GHz or below 30MHz

Finalmouse WD#: 109545 Sequence#: 4 Date: 3/16/2024
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Horiz



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02374ANSI	Horn Antenna	RGA-60	5/26/2023	5/26/2025
T2	ANP07504	Cable	CLU40-KMKM-02.00F	1/24/2023	1/24/2025
T3	ANP06011	Cable	Heliac	11/16/2023	11/16/2025
T4	ANP06515	Cable	Heliac	2/28/2024	2/28/2026
T5	AN03834	Spectrum Analyzer	E4448A	11/8/2023	11/8/2025
T6	AN03540	Preamp	83017A	3/24/2023	3/24/2025
	AN02741	Active Horn Antenna	AMFW-5F-12001800-20-10P	5/26/2023	5/26/2025
	AN02742	Active Horn Antenna	AMFW-5F-18002650-20-10P	11/18/2022	11/18/2024
	AN02763-69	Waveguide	Multiple	1/9/2024	1/9/2026
T7	AN02307	Preamp	8447D	8/9/2023	8/9/2025
T8	AN03824	Biconilog Antenna	3142E	5/9/2023	5/9/2025
T9	ANP05333	Cable	Heliac	8/8/2023	8/8/2025
T10	ANP05360	Cable	RG214	8/8/2023	8/8/2025
	AN00052	Loop Antenna	6502	5/11/2022	5/11/2024

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq	Rdng	T1 T5 T9	T2 T6 T10	T3 T7	T4 T8	Dist	Corr	Spec	Margin	Polar
	MHz	dB μ V	dB	dB	dB	dB	Table	dB μ V/m	dB μ V/m	dB	Ant
1	7439.395M	42.5	+37.4 +0.0 +0.0	+1.2 -35.1 +0.0	+1.5 +0.0	+5.1 +0.0	+0.0	52.6	54.0	-1.4	Horiz
^	7439.395M	52.4	+37.4 +0.0 +0.0	+1.2 -35.1 +0.0	+1.5 +0.0	+5.1 +0.0	+0.0	62.5	54.0	+8.5	Horiz
3	7319.295M	40.9	+37.2 +0.0 +0.0	+1.4 -35.1 +0.0	+1.5 +0.0	+5.0 +0.0	+0.0	50.9	54.0	-3.1	Horiz
^	7319.295M	51.1	+37.2 +0.0 +0.0	+1.4 -35.1 +0.0	+1.5 +0.0	+5.0 +0.0	+0.0	61.1	54.0	+7.1	Horiz
5	4880.850M	38.3	+33.4 +0.0 +0.0	+1.3 -33.8 +0.0	+1.2 +0.0	+3.9 +0.0	+0.0	44.3	54.0	-9.7	Horiz
^	4880.850M	49.5	+33.4 +0.0 +0.0	+1.3 -33.8 +0.0	+1.2 +0.0	+3.9 +0.0	+0.0	55.5	54.0	+1.5	Horiz
7	4803.385M	37.9	+33.1 +0.0 +0.0	+1.5 -33.8 +0.0	+1.3 +0.0	+4.0 +0.0	+0.0	44.0	54.0	-10.0	Horiz
^	4803.385M	49.2	+33.1 +0.0 +0.0	+1.5 -33.8 +0.0	+1.3 +0.0	+4.0 +0.0	+0.0	55.3	54.0	+1.3	Horiz
9	4959.450M	37.7	+33.6 +0.0 +0.0	+1.2 -33.8 +0.0	+1.1 +0.0	+3.9 +0.0	+0.0	43.7	54.0	-10.3	Horiz
^	4959.450M	49.1	+33.6 +0.0 +0.0	+1.2 -33.8 +0.0	+1.1 +0.0	+3.9 +0.0	+0.0	55.1	54.0	+1.1	Horiz
11	269.230M	39.5	+0.0 +0.0 +0.8	+0.0 +0.0 +1.2	+0.2 -26.8	+0.0 +19.3	+0.0	34.2	46.0	-11.8	Horiz
12	129.640M	39.0	+0.0 +0.0 +0.5	+0.0 +0.0 +0.8	+0.1 -27.4	+0.0 +13.7	+0.0	26.7	43.5	-16.8	Horiz

13	9922.105M	39.7	+38.2 +0.0 +0.0	+1.0 -34.4 +0.0	+1.4 +0.0	+5.8 +0.0	+0.0	51.7	80.0	-28.3	Vert
14	7207.250M Ave	36.9	+36.7 +0.0 +0.0	+1.3 -35.0 +0.0	+1.4 +0.0	+4.9 +0.0	+0.0	46.2	80.0	-33.8	Horiz
^	7207.250M	48.5	+36.7 +0.0 +0.0	+1.3 -35.0 +0.0	+1.4 +0.0	+4.9 +0.0	+0.0	57.8	80.0	-22.2	Horiz
16	47.860M	52.7	+0.0 +0.0 +0.3	+0.0 +0.0 +0.5	+0.1 -27.7	+0.0 +13.0	+0.0	38.9	80.0	-41.1	Horiz
17	303.540M	42.5	+0.0 +0.0 +0.9	+0.0 +0.0 +1.3	+0.2 -26.9	+0.0 +19.1	+0.0	37.1	80.0	-42.9	Horiz
18	230.220M	43.8	+0.0 +0.0 +0.7	+0.0 +0.0 +1.1	+0.2 -26.9	+0.0 +17.2	+0.0	36.1	80.0	-43.9	Horiz
19	151.730M	44.9	+0.0 +0.0 +0.6	+0.0 +0.0 +0.9	+0.1 -27.3	+0.0 +15.7	+0.0	34.9	80.0	-45.1	Horiz
20	192.620M	41.1	+0.0 +0.0 +0.7	+0.0 +0.0 +1.0	+0.2 -27.1	+0.0 +15.4	+0.0	31.3	80.0	-48.7	Horiz

Band Edge

Band Edge Summary

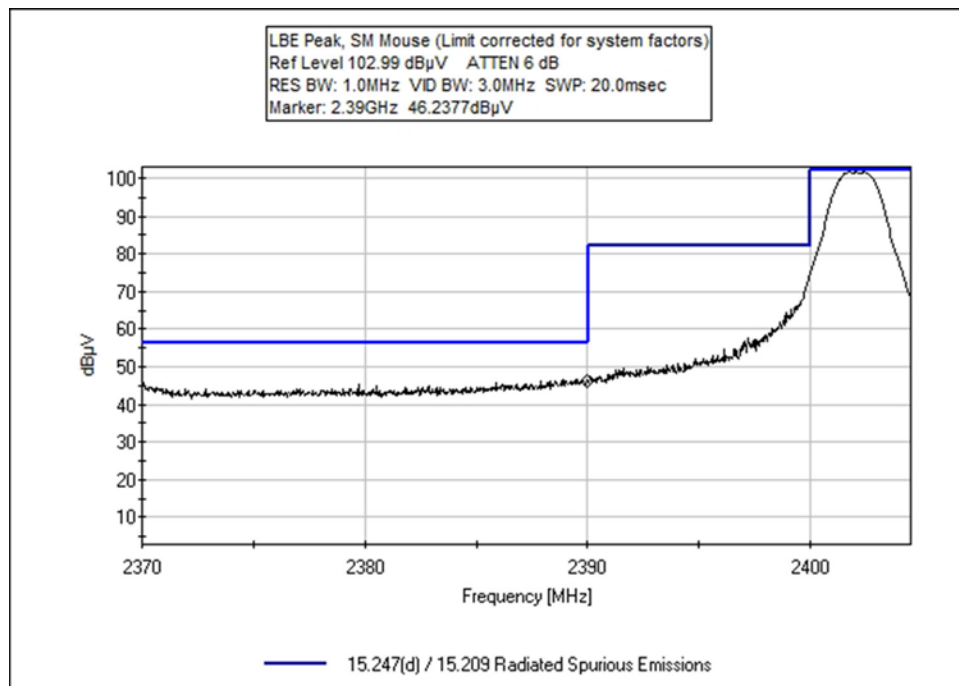
Limit applied at restricted bands: 15.209

Limit applied for other than restricted bands: Max Power/100kHz - 20dB.

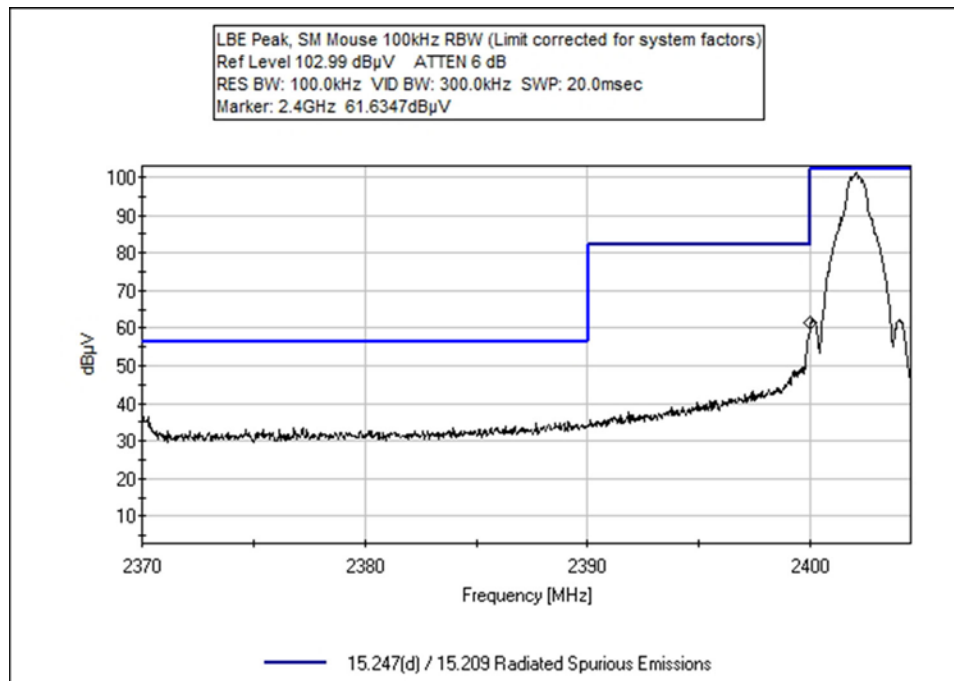
Frequency (MHz)	Modulation	Ant. Type / Gain (dBi)	Average (dBuV/m @3m)		Peak (dBuV/m @3m)		Results
			Measured	Limit	Measured	Limit	
2390.0	GFSK	Inverted F / 1.56	43.9	≤54	NA1	≤74	Pass
2400.0	GFSK	Inverted F / 1.56	NA1	NA1	59.4	≤80.0	Pass
2483.5	GFSK	Inverted F / 1.56	39.3	≤54	58.0	≤74	Pass

NA1= Average limit not applicable when applying 20dBc limit.

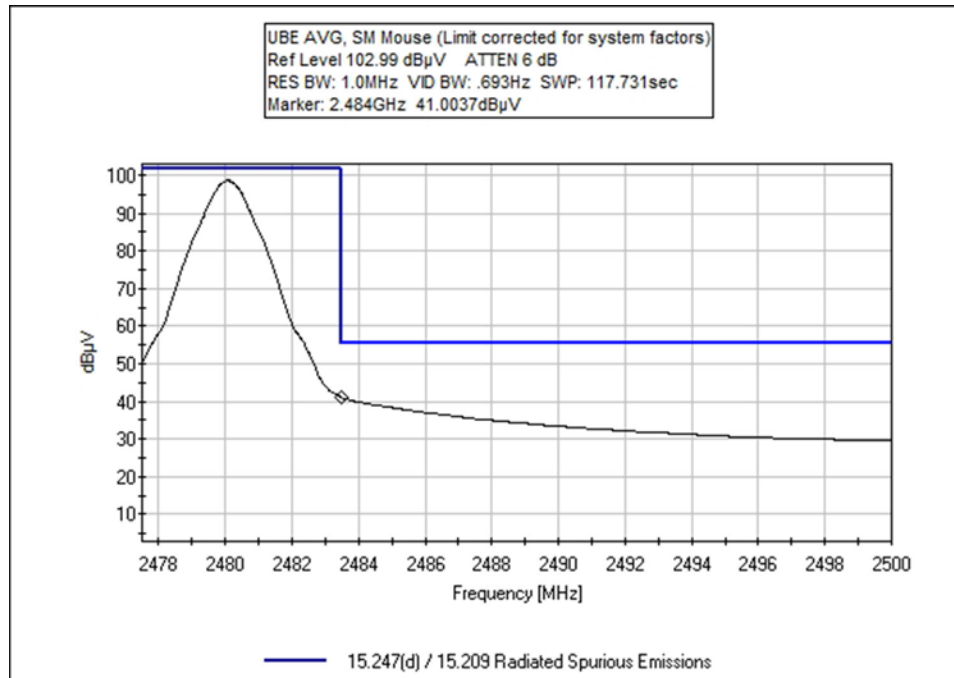
Band Edge Plots



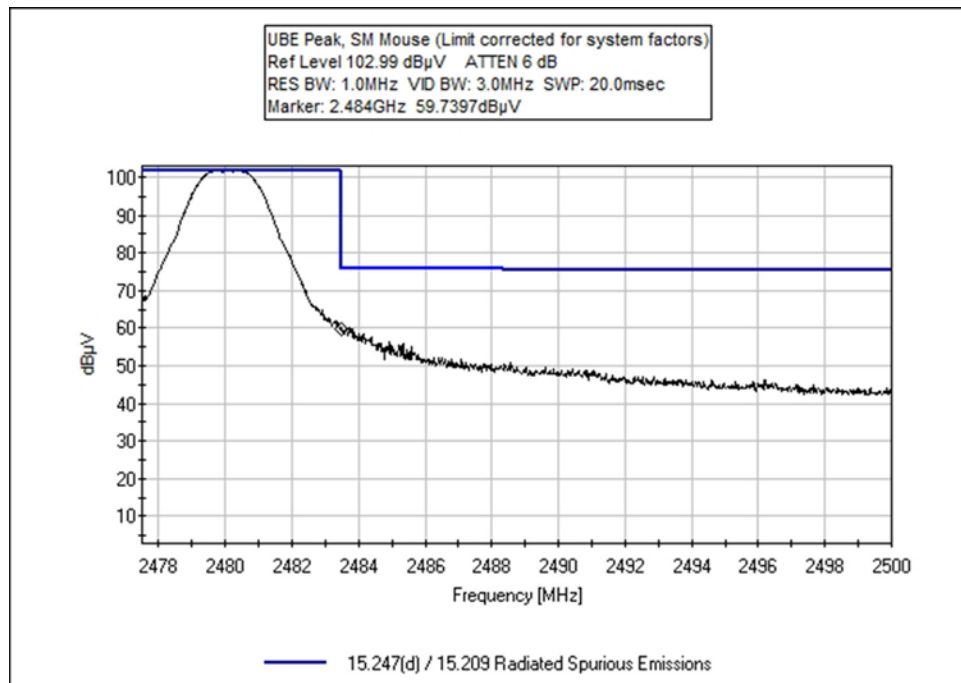
Low Channel Frequency



Middle Channel Frequency



High Channel Frequency, Plot 1



High Channel Frequency, Plot 2

Test Setup / Conditions / Data

Test Location: CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)
 Customer: **Finalmouse**
 Specification: **RSS-247 5.5 / RSS-GEN 8.9 Radiated Spurious Emissions**
 Work Order #: **109545** Date: 3/16/2024
 Test Type: **Radiated Scan** Time: 07:19:16
 Tested By: Matt Harrison Sequence#: 3
 Software: EMITest 5.03.21

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Setup: EUT is setup in a Tabletop configuration. It is 150cm high on a styrofoam table. It is connected to a support laptop via USB Cable. Laptop is sitting 20cm above ground plane. Horizontal and Vertical Polarities along with X, Y, and Z axis investigated, worst-case data provided.

Test Environment Conditions:

Temperature: 21°C
 Humidity: 35%
 Pressure: 103.0kPa

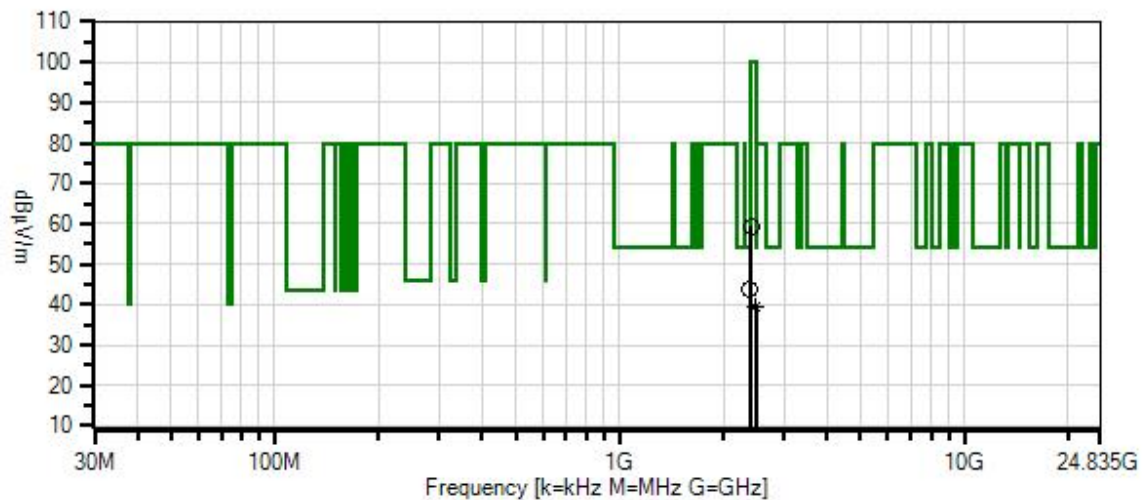
Frequency Range: 2390-2483.5 MHz

Test Method: ANSI C63.10

Notes:

Small Mouse
 Channels: 2402, 2480
 Output Power: 8dBm

Finalmouse WO#: 109545 Sequence#: 3 Date: 3/16/2024
RSS-247 5.5 / RSS-GEN 8.9 Radiated Spurious Emissions Test Distance: 3 Meters Horiz



— Readings
○ Peak Readings
× QP Readings
* Average Readings
▼ Ambient
Software Version: 5.03.21
— 1 - RSS-247 5.5 / RSS-GEN 8.9 Radiated Spurious Emissions

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02374ANSI	Horn Antenna	RGA-60	5/26/2023	5/26/2025
T2	ANP07504	Cable	CLU40-KMKM-02.00F	1/24/2023	1/24/2025
T3	ANP06011	Cable	Heliac	11/16/2023	11/16/2025
T4	ANP06515	Cable	Heliac	2/28/2024	2/28/2026
T5	AN03834	Spectrum Analyzer	E4448A	11/8/2023	11/8/2025
T6	AN03540	Preamplifier	83017A	3/24/2023	3/24/2025

Measurement Data:		Reading listed by margin.					Test Distance: 3 Meters				
#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dB μ V	T5 dB	T6 dB	dB	dB	Table	dB μ V/m	dB μ V/m	dB	Ant
1	2390.000M	46.2	+28.5 +0.0	+0.5 -34.6	+0.7	+2.6	+0.0	43.9	54.0 1MHz RBW	-10.1	Horiz
2	2400.000M	61.6	+28.6 +0.0	+0.5 -34.6	+0.7	+2.6	+0.0	59.4	80.0 100kHz RBW	-20.6	Horiz
3	2483.500M	41.0	+29.0 +0.0	+0.5 -34.6	+0.7	+2.7	+0.0	39.3	74.0	-34.7	Horiz
^	2483.500M	59.7	+29.0 +0.0	+0.5 -34.6	+0.7	+2.7	+0.0	58.0	74.0 1MHz RBW	-16.0	Horiz

Test Setup Photo(s)



X-Axis



Y-Axis



Z-Axis



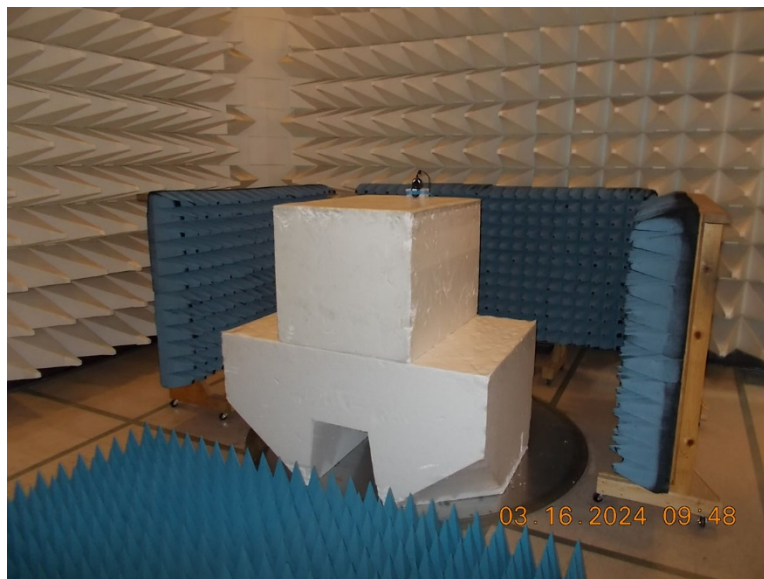
Below 1GHz, View 1



Below 1GHz, View 2



Above 1GHz, View 1



Above 1GHz, View 2

15.247(e) Power Spectral Density

Test Setup/Conditions

Test Location:	Bothell Lab C3	Test Engineer:	M. Harrison
Test Method:	ANSI C63.10 (2020), KDB 558074	Test Date(s):	3/16/2024
Configuration:	1		

Test Data Summary - Radiated Measurement

Measurement Method: PKPSD						
Frequency (MHz)	Modulation	Ant. Type / Gain (dBi)	Field Strength (dBuV/m @3m)	Calculated (dBm/3kHz)	Limit (dBm/3kHz)	Results
2402	GFSK	Inverted F / 1.56	84.5	-12.3	≤8	Pass
2440	GFSK	Inverted F / 1.56	85.1	-11.7	≤8	Pass
2480	GFSK	Inverted F / 1.56	87.6	-9.2	≤8	Pass

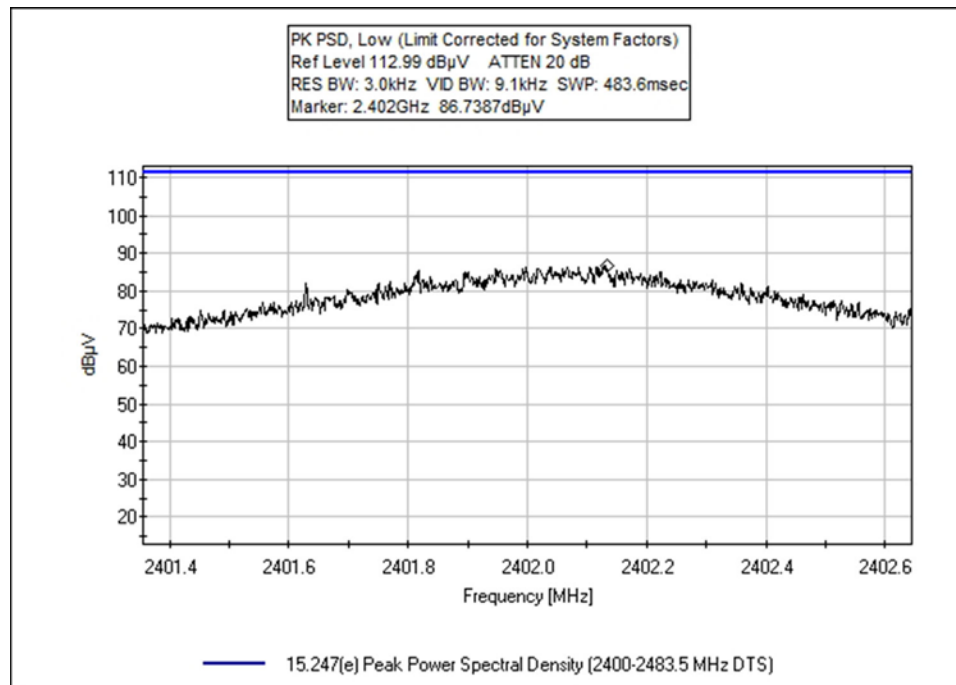
Conducted RF output power calculated in accordance with ANSI C63.10.

$$P(W) = \frac{(E \cdot d)^2}{30 G}$$

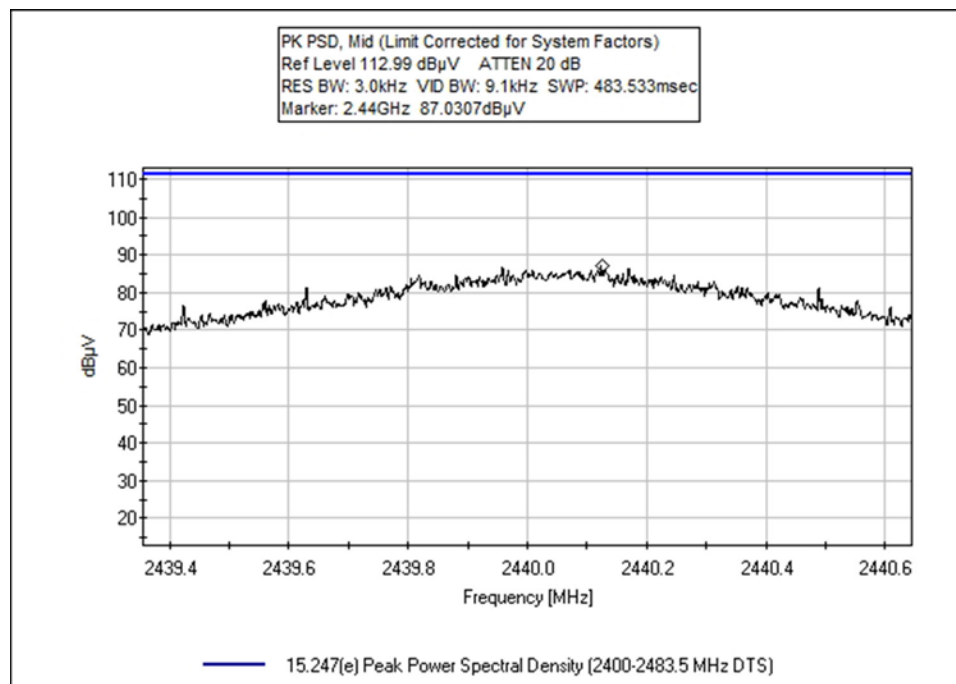
Or equivalently, in logarithmic form:

$$P(dBm) = E(dBuV/m) + 20LOG(d) - G - 104.77$$

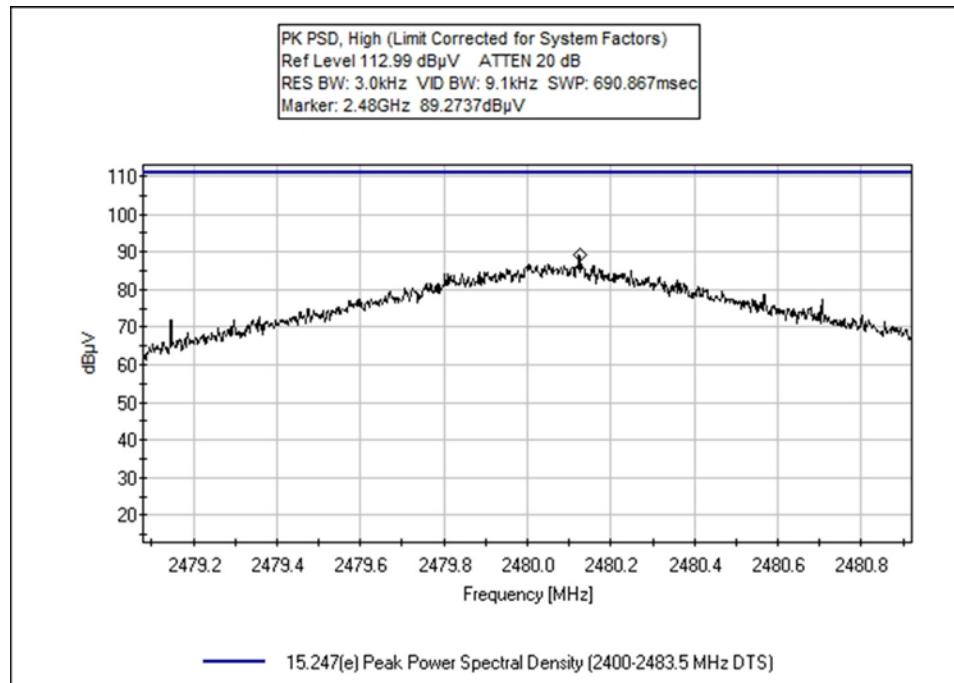
Plot(s)



Low Channel Frequency



Middle Channel Frequency



High Channel Frequency

Test Setup / Conditions / Data

Test Location: CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)
 Customer: **Finalmouse**
 Specification: **RSS-247 5.2 Peak Power Spectral Density (2400-2483.5 MHz DTS)**
 Work Order #: **109545** Date: 3/16/2024
 Test Type: **Radiated Scan** Time: 10:23:39
 Tested By: Matt Harrison Sequence#: 7
 Software: EMITest 5.03.21

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Setup: EUT is setup in a Tabletop configuration. It is 150cm high above 1GHz and 0.8m high below 1GHz on a Styrofoam table. It is connected to a support laptop via USB Cable. Laptop is sitting 20cm above ground plane. Horizontal and Vertical Polarities along with X, Y, and Z axis investigated, worst-case data provided.

Test Environment Conditions:

Temperature: 21°C

Humidity: 35%

Pressure: 103.0kPa

Frequency Range: 2402-2480

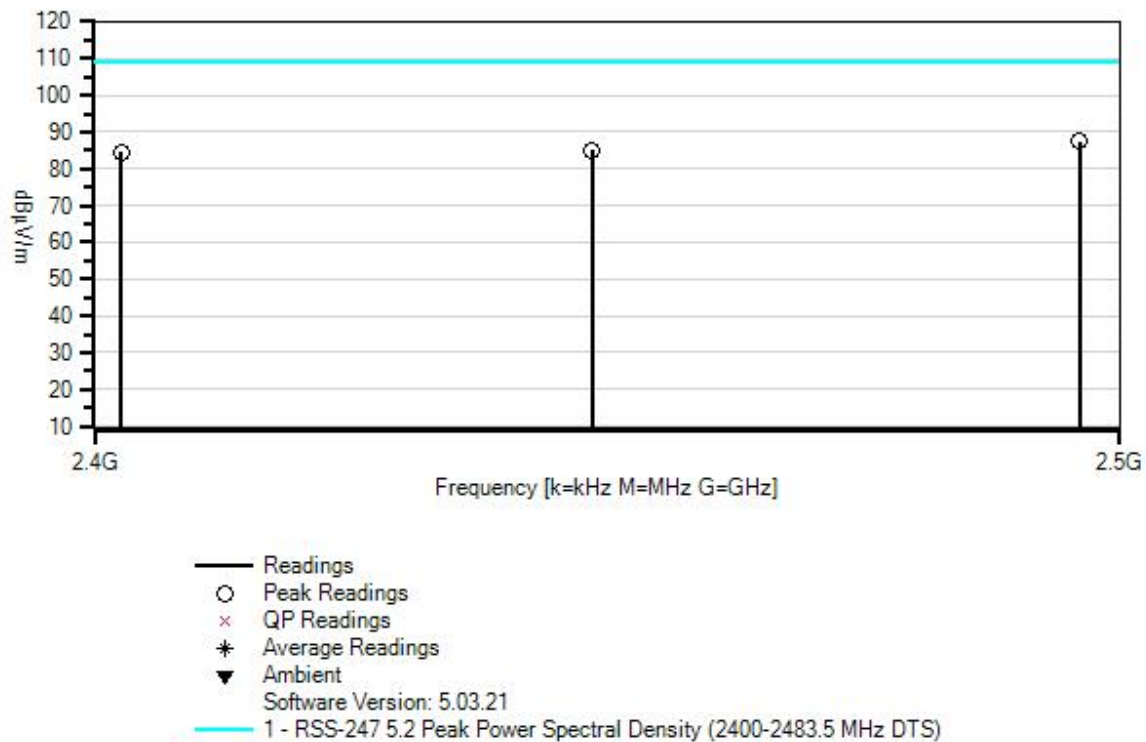
Test Method: ANSI C63.10

Notes:

Transmitting on 2402 & 2480MHz

Output Power: 8dBm

Finalmouse W/O#: 109545 Sequence#: 7 Date: 3/16/2024
RSS-247 5.2 Peak Power Spectral Density (2400-2483.5 MHz DTS) Test Distance: 3 Meters Horiz



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02374ANSI	Horn Antenna	RGA-60	5/26/2023	5/26/2025
T2	ANP07504	Cable	CLU40-KMKM-02.00F	1/24/2023	1/24/2025
T3	ANP06011	Cable	Heliac	11/16/2023	11/16/2025
T4	ANP06515	Cable	Heliac	2/28/2024	2/28/2026
T5	AN03834	Spectrum Analyzer	E4448A	11/8/2023	11/8/2025
T6	AN03540	Preamp	83017A	3/24/2023	3/24/2025
	AN02741	Active Horn Antenna	AMFW-5F-12001800-20-10P	5/26/2023	5/26/2025
	AN02742	Active Horn Antenna	AMFW-5F-18002650-20-10P	11/18/2022	11/18/2024
	AN02763-69	Waveguide	Multiple	1/9/2024	1/9/2026
	AN02307	Preamp	8447D	8/9/2023	8/9/2025
	AN03824	Biconilog Antenna	3142E	5/9/2023	5/9/2025
	ANP05333	Cable	Heliac	8/8/2023	8/8/2025
	ANP05360	Cable	RG214	8/8/2023	8/8/2025
	AN00052	Loop Antenna	6502	5/11/2022	5/11/2024

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq	Rdng	T1 T5	T2 T6	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dB μ V	dB	dB	dB	dB	Table	dB μ V/m	dB μ V/m	dB	Ant
1	2480.126M	89.3	+29.0 +0.0	+0.5 -34.6	+0.7	+2.7	+0.0	87.6	109.2	-21.6	Horiz
2	2440.126M	87.0	+28.8 +0.0	+0.5 -34.6	+0.7	+2.7	+0.0	85.1	109.2	-24.1	Horiz
3	2402.133M	86.7	+28.6 +0.0	+0.5 -34.6	+0.7	+2.6	+0.0	84.5	109.2	-24.7	Horiz

Test Setup Photo(s)



X- Axis



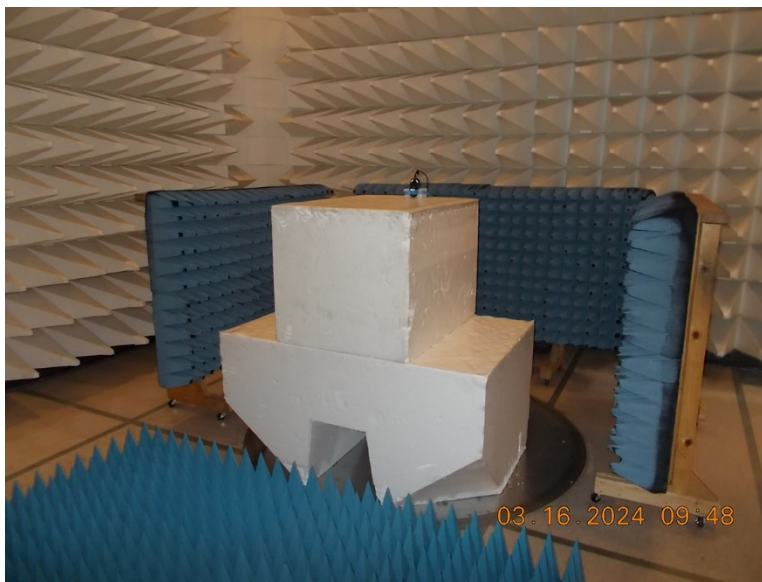
Y-Axis



Z- Axis



Above 1GHz, View 1



Above 1GHz, View 2

15.207 AC Conducted Emissions

Test Setup / Conditions / Data

Test Location: CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)
 Customer: **Finalmouse**
 Specification: **15.207 AC Mains - Average**
 Work Order #: **109390** Date: 3/18/2024
 Test Type: **Conducted Emissions** Time: 09:18:26
 Tested By: Matt Harrison Sequence#: 13
 Software: EMITest 5.03.21 120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

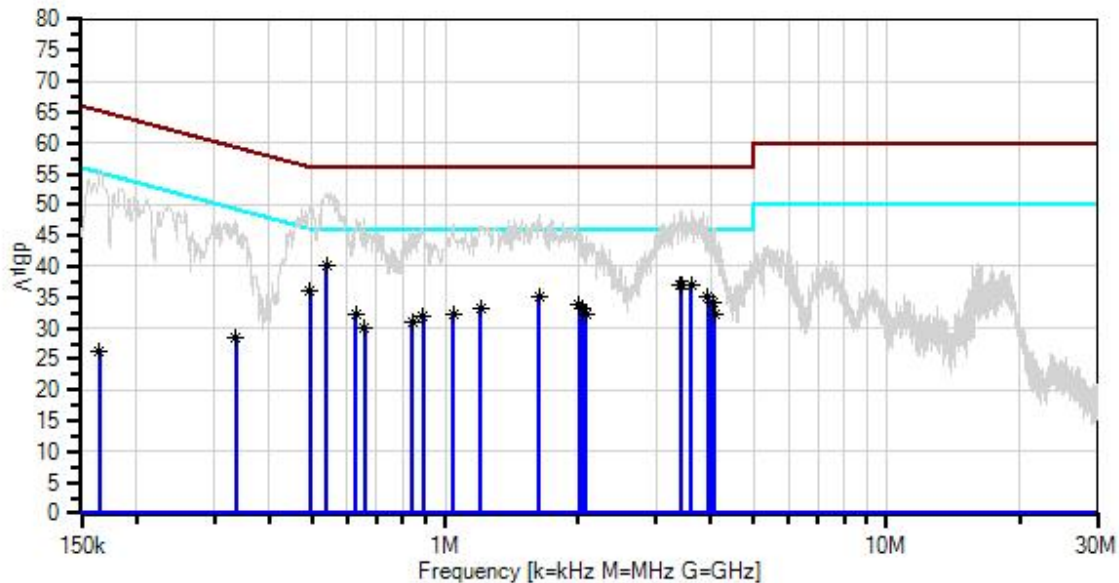
Setup: EUT is setup in a Tabletop configuration. It is 80cm high on a Styrofoam table. It is connected to a support laptop via USB Cable.

 Test Environment Conditions:
 Temperature: 21°C
 Humidity: 35%
 Pressure: 103.0kPa

 Frequency Range: 150k-30MHz

 Test Method: ANSI C63.10

Finalmouse W/O#: 109390 Sequence#: 13 Date: 3/18/2024
15.207 AC Mains - Average Test Lead: 120V 60Hz Line



— Sweep Data
× QP Readings
Software Version: 5.03.21
— Readings
* Average Readings
○ Peak Readings
▼ Ambient
— 1 - 15.207 AC Mains - Average
— 2 - 15.207 AC Mains - Quasi-peak

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP06219	Attenuator	768-10	3/23/2022	3/23/2024
T2	ANP06011	Cable	Heliac	11/16/2023	11/16/2025
T3	ANP06515	Cable	Heliac	2/28/2024	2/28/2026
T4	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
T5	AN02611	High Pass Filter	HE9615-150K-50-720B	11/27/2023	11/27/2025

Measurement Data:			Reading listed by margin.				Test Lead: Line				
#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dB μ V	dB	dB	dB	dB	Table	dB μ V	dB μ V	dB	Ant
1	539.782k	30.6	+9.1	+0.0	+0.1	+0.1	+0.0	40.1	46.0	-5.9	Line
	Ave		+0.2								
^	539.782k	42.5	+9.1	+0.0	+0.1	+0.1	+0.0	52.0	46.0	+6.0	Line
			+0.2								
3	3.437M	27.7	+9.1	+0.0	+0.1	+0.2	+0.0	37.1	46.0	-8.9	Line
	Ave		+0.0								
^	3.437M	39.6	+9.1	+0.0	+0.1	+0.2	+0.0	49.0	46.0	+3.0	Line
			+0.0								
5	3.408M	27.6	+9.1	+0.0	+0.1	+0.2	+0.0	37.0	46.0	-9.0	Line
	Ave		+0.0								
^	3.408M	39.5	+9.1	+0.0	+0.1	+0.2	+0.0	48.9	46.0	+2.9	Line
			+0.0								
7	3.603M	27.6	+9.1	+0.0	+0.1	+0.2	+0.0	37.0	46.0	-9.0	Line
	Ave		+0.0								
^	3.603M	39.8	+9.1	+0.0	+0.1	+0.2	+0.0	49.2	46.0	+3.2	Line
			+0.0								
9	493.241k	26.8	+9.1	+0.0	+0.1	+0.1	+0.0	36.2	46.1	-9.9	Line
	Ave		+0.1								
^	493.241k	40.7	+9.1	+0.0	+0.1	+0.1	+0.0	50.1	46.1	+4.0	Line
			+0.1								
11	1.634M	25.6	+9.1	+0.0	+0.1	+0.2	+0.0	35.1	46.0	-10.9	Line
	Ave		+0.1								
^	1.634M	39.0	+9.1	+0.0	+0.1	+0.2	+0.0	48.5	46.0	+2.5	Line
			+0.1								
13	3.931M	25.6	+9.1	+0.0	+0.1	+0.2	+0.0	35.0	46.0	-11.0	Line
	Ave		+0.0								
^	3.931M	38.7	+9.1	+0.0	+0.1	+0.2	+0.0	48.1	46.0	+2.1	Line
			+0.0								
15	4.037M	24.7	+9.1	+0.0	+0.1	+0.2	+0.0	34.1	46.0	-11.9	Line
	Ave		+0.0								
^	4.037M	36.8	+9.1	+0.0	+0.1	+0.2	+0.0	46.2	46.0	+0.2	Line
			+0.0								
17	2.013M	24.5	+9.1	+0.0	+0.1	+0.2	+0.0	34.0	46.0	-12.0	Line
	Ave		+0.1								
^	2.013M	36.3	+9.1	+0.0	+0.1	+0.2	+0.0	45.8	46.0	-0.2	Line
			+0.1								
19	1.200M	23.7	+9.1	+0.0	+0.1	+0.1	+0.0	33.1	46.0	-12.9	Line
	Ave		+0.1								
^	1.200M	37.3	+9.1	+0.0	+0.1	+0.1	+0.0	46.7	46.0	+0.7	Line
			+0.1								
21	2.051M	23.6	+9.1	+0.0	+0.1	+0.2	+0.0	33.1	46.0	-12.9	Line
	Ave		+0.1								
^	2.051M	35.6	+9.1	+0.0	+0.1	+0.2	+0.0	45.1	46.0	-0.9	Line
			+0.1								

23	1.043M	23.0	+9.1 +0.1	+0.0	+0.1	+0.1	+0.0	32.4	46.0	-13.6	Line
^	1.043M	37.6	+9.1 +0.1	+0.0	+0.1	+0.1	+0.0	47.0	46.0	+1.0	Line
25	2.085M	22.8	+9.1 +0.1	+0.0	+0.1	+0.2	+0.0	32.3	46.0	-13.7	Line
^	2.085M	35.4	+9.1 +0.1	+0.0	+0.1	+0.2	+0.0	44.9	46.0	-1.1	Line
27	4.075M	22.8	+9.1 +0.0	+0.0	+0.1	+0.2	+0.0	32.2	46.0	-13.8	Line
^	4.075M	36.8	+9.1 +0.0	+0.0	+0.1	+0.2	+0.0	46.2	46.0	+0.2	Line
29	627.774k	22.7	+9.1 +0.1	+0.0	+0.1	+0.1	+0.0	32.1	46.0	-13.9	Line
^	627.774k	38.5	+9.1 +0.1	+0.0	+0.1	+0.1	+0.0	47.9	46.0	+1.9	Line
31	889.963k	22.4	+9.1 +0.1	+0.0	+0.1	+0.1	+0.0	31.8	46.0	-14.2	Line
^	889.963k	36.9	+9.1 +0.1	+0.0	+0.1	+0.1	+0.0	46.3	46.0	+0.3	Line
33	843.755k	21.5	+9.1 +0.1	+0.0	+0.1	+0.1	+0.0	30.9	46.0	-15.1	Line
^	843.754k	36.4	+9.1 +0.1	+0.0	+0.1	+0.1	+0.0	45.8	46.0	-0.2	Line
35	656.863k	20.6	+9.1 +0.1	+0.0	+0.1	+0.1	+0.0	30.0	46.0	-16.0	Line
^	656.862k	38.5	+9.1 +0.1	+0.0	+0.1	+0.1	+0.0	47.9	46.0	+1.9	Line
37	335.438k	19.2	+9.1 +0.0	+0.0	+0.1	+0.1	+0.0	28.5	49.3	-20.8	Line
^	335.437k	38.3	+9.1 +0.0	+0.0	+0.1	+0.1	+0.0	47.6	49.3	-1.7	Line
39	164.544k	16.4	+9.1 +0.5	+0.0	+0.0	+0.1	+0.0	26.1	55.2	-29.1	Line
^	164.544k	46.0	+9.1 +0.5	+0.0	+0.0	+0.1	+0.0	55.7	55.2	+0.5	Line

Test Location: CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)
 Customer: **Finalmouse**
 Specification: **15.207 AC Mains - Average**
 Work Order #: **109390** Date: 3/18/2024
 Test Type: **Conducted Emissions** Time: 09:06:12
 Tested By: Matt Harrison Sequence#: 14
 Software: EMITest 5.03.21 120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

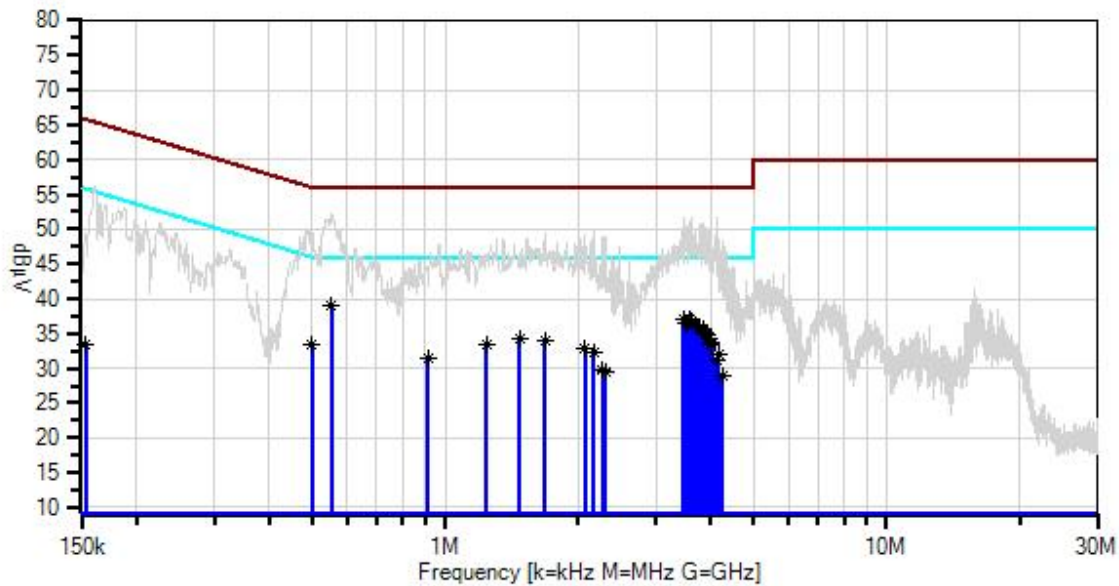
Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Setup: EUT is setup in a Tabletop configuration. It is 80cm high on a Styrofoam table. It is connected to a support laptop via USB Cable. Test Environment Conditions: Temperature: 21°C Humidity: 35% Pressure: 103.0kPa Frequency Range: 150k-30MHz Test Method: ANSI C63.10
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Finalmouse W/O#: 109390 Sequence#: 14 Date: 3/18/2024
15.207 AC Mains - Average Test Lead: 120V 60Hz Neutral



— Sweep Data
× QP Readings
Software Version: 5.03.21
— 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
T1	ANP06219	Attenuator	768-10	3/23/2022	3/23/2024
T2	ANP06011	Cable	Heliac	11/16/2023	11/16/2025
T3	ANP06515	Cable	Heliac	2/28/2024	2/28/2026
T4	AN01492	50uH LISN-Line (L1)	3816/2NM	3/18/2022	3/18/2024
		50uH LISN-Neutral (L2)	3816/2NM	3/18/2022	3/18/2024
T5	AN02611	High Pass Filter	HE9615-150K-50-720B	11/27/2023	11/27/2025

Measurement Data:

Reading listed by margin.

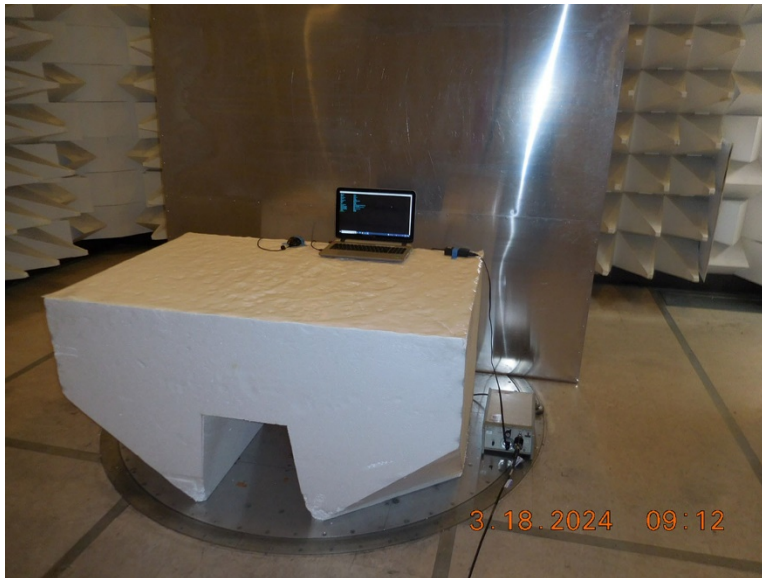
Test Lead: Neutral

#	Freq MHz	Rdng dB μ V	T1 T5 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dB μ V	Spec dB μ V	Margin dB	Polar Ant
1	552.871k	29.5	+9.1 +0.2	+0.0	+0.1	+0.0	+0.0	38.9	46.0	-7.1	Neutr
^	552.871k	42.8	+9.1 +0.2	+0.0	+0.1	+0.0	+0.0	52.2	46.0	+6.2	Neutr
3	3.595M	27.9	+9.1 +0.0	+0.0	+0.1	+0.0	+0.0	37.1	46.0	-8.9	Neutr
^	3.595M	42.0	+9.1 +0.0	+0.0	+0.1	+0.0	+0.0	51.2	46.0	+5.2	Neutr
5	3.459M	27.8	+9.1 +0.0	+0.0	+0.1	+0.0	+0.0	37.0	46.0	-9.0	Neutr
^	3.459M	42.6	+9.1 +0.0	+0.0	+0.1	+0.0	+0.0	51.8	46.0	+5.8	Neutr
7	3.620M	27.7	+9.1 +0.0	+0.0	+0.1	+0.0	+0.0	36.9	46.0	-9.1	Neutr
^	3.620M	42.6	+9.1 +0.0	+0.0	+0.1	+0.0	+0.0	51.8	46.0	+5.8	Neutr
9	3.505M	27.3	+9.1 +0.0	+0.0	+0.1	+0.0	+0.0	36.5	46.0	-9.5	Neutr
^	3.505M	41.3	+9.1 +0.0	+0.0	+0.1	+0.0	+0.0	50.5	46.0	+4.5	Neutr
11	3.539M	27.2	+9.1 +0.0	+0.0	+0.1	+0.0	+0.0	36.4	46.0	-9.6	Neutr
^	3.539M	41.1	+9.1 +0.0	+0.0	+0.1	+0.0	+0.0	50.3	46.0	+4.3	Neutr
13	3.701M	27.1	+9.1 +0.0	+0.0	+0.1	+0.0	+0.0	36.3	46.0	-9.7	Neutr
^	3.701M	40.9	+9.1 +0.0	+0.0	+0.1	+0.0	+0.0	50.1	46.0	+4.1	Neutr
15	3.756M	26.6	+9.1 +0.0	+0.0	+0.1	+0.0	+0.0	35.8	46.0	-10.2	Neutr
^	3.756M	41.5	+9.1 +0.0	+0.0	+0.1	+0.0	+0.0	50.7	46.0	+4.7	Neutr
17	3.829M	26.4	+9.1 +0.0	+0.0	+0.1	+0.0	+0.0	35.6	46.0	-10.4	Neutr
^	3.829M	41.8	+9.1 +0.0	+0.0	+0.1	+0.0	+0.0	51.0	46.0	+5.0	Neutr
19	3.850M	26.1	+9.1 +0.0	+0.0	+0.1	+0.0	+0.0	35.3	46.0	-10.7	Neutr
^	3.850M	40.1	+9.1 +0.0	+0.0	+0.1	+0.0	+0.0	49.3	46.0	+3.3	Neutr
21	3.884M	26.0	+9.1 +0.0	+0.0	+0.1	+0.0	+0.0	35.2	46.0	-10.8	Neutr
^	3.884M	41.0	+9.1 +0.0	+0.0	+0.1	+0.0	+0.0	50.2	46.0	+4.2	Neutr
23	3.897M	26.0	+9.1 +0.0	+0.0	+0.1	+0.0	+0.0	35.2	46.0	-10.8	Neutr
Ave											

24	3.905M	25.7	+9.1	+0.0	+0.1	+0.0	+0.0	34.9	46.0	-11.1	Neutr
Ave			+0.0								
^	3.905M	40.8	+9.1	+0.0	+0.1	+0.0	+0.0	50.0	46.0	+4.0	Neutr
			+0.0								
^	3.897M	40.2	+9.1	+0.0	+0.1	+0.0	+0.0	49.4	46.0	+3.4	Neutr
			+0.0								
27	1.477M	25.1	+9.1	+0.0	+0.1	+0.0	+0.0	34.4	46.0	-11.6	Neutr
Ave			+0.1								
^	1.477M	38.9	+9.1	+0.0	+0.1	+0.0	+0.0	48.2	46.0	+2.2	Neutr
			+0.1								
29	3.952M	25.0	+9.1	+0.0	+0.1	+0.0	+0.0	34.2	46.0	-11.8	Neutr
Ave			+0.0								
^	3.952M	40.8	+9.1	+0.0	+0.1	+0.0	+0.0	50.0	46.0	+4.0	Neutr
			+0.0								
31	1.685M	24.7	+9.1	+0.0	+0.1	+0.0	+0.0	34.0	46.0	-12.0	Neutr
Ave			+0.1								
^	1.685M	40.3	+9.1	+0.0	+0.1	+0.0	+0.0	49.6	46.0	+3.6	Neutr
			+0.1								
33	3.990M	24.5	+9.1	+0.0	+0.1	+0.0	+0.0	33.7	46.0	-12.3	Neutr
Ave			+0.0								
^	3.990M	40.4	+9.1	+0.0	+0.1	+0.0	+0.0	49.6	46.0	+3.6	Neutr
			+0.0								
35	4.020M	24.3	+9.1	+0.0	+0.1	+0.0	+0.0	33.5	46.0	-12.5	Neutr
Ave			+0.0								
^	4.020M	43.5	+9.1	+0.0	+0.1	+0.0	+0.0	52.7	46.0	+6.7	Neutr
			+0.0								
37	499.785k	24.2	+9.1	+0.0	+0.1	+0.0	+0.0	33.5	46.0	-12.5	Neutr
Ave			+0.1								
^	499.785k	40.6	+9.1	+0.0	+0.1	+0.0	+0.0	49.9	46.0	+3.9	Neutr
			+0.1								
39	1.239M	24.1	+9.1	+0.0	+0.1	+0.0	+0.0	33.4	46.0	-12.6	Neutr
Ave			+0.1								
^	1.239M	39.6	+9.1	+0.0	+0.1	+0.0	+0.0	48.9	46.0	+2.9	Neutr
			+0.1								
41	2.076M	23.6	+9.1	+0.0	+0.1	+0.0	+0.0	32.9	46.0	-13.1	Neutr
Ave			+0.1								
^	2.076M	40.0	+9.1	+0.0	+0.1	+0.0	+0.0	49.3	46.0	+3.3	Neutr
			+0.1								
43	2.166M	23.0	+9.1	+0.0	+0.1	+0.0	+0.0	32.2	46.0	-13.8	Neutr
Ave			+0.0								
^	2.166M	40.5	+9.1	+0.0	+0.1	+0.0	+0.0	49.7	46.0	+3.7	Neutr
			+0.0								
45	4.152M	22.9	+9.1	+0.0	+0.1	+0.0	+0.0	32.1	46.0	-13.9	Neutr
Ave			+0.0								
^	4.152M	39.4	+9.1	+0.0	+0.1	+0.0	+0.0	48.6	46.0	+2.6	Neutr
			+0.0								
47	915.300k	22.3	+9.1	+0.0	+0.1	+0.0	+0.0	31.6	46.0	-14.4	Neutr
Ave			+0.1								
^	915.300k	37.2	+9.1	+0.0	+0.1	+0.0	+0.0	46.5	46.0	+0.5	Neutr
			+0.1								

49	4.118M	21.9	+9.1	+0.0	+0.1	+0.0	+0.0	31.1	46.0	-14.9	Neutr
	Ave		+0.0								
^	4.118M	42.5	+9.1	+0.0	+0.1	+0.0	+0.0	51.7	46.0	+5.7	Neutr
			+0.0								
51	2.276M	20.7	+9.1	+0.0	+0.1	+0.0	+0.0	29.9	46.0	-16.1	Neutr
	Ave		+0.0								
^	2.276M	39.9	+9.1	+0.0	+0.1	+0.0	+0.0	49.1	46.0	+3.1	Neutr
			+0.0								
53	2.302M	20.1	+9.1	+0.0	+0.1	+0.0	+0.0	29.3	46.0	-16.7	Neutr
	Ave		+0.0								
^	2.302M	39.9	+9.1	+0.0	+0.1	+0.0	+0.0	49.1	46.0	+3.1	Neutr
			+0.0								
55	4.245M	19.8	+9.1	+0.0	+0.1	+0.0	+0.0	29.0	46.0	-17.0	Neutr
	Ave		+0.0								
^	4.245M	39.3	+9.1	+0.0	+0.1	+0.0	+0.0	48.5	46.0	+2.5	Neutr
			+0.0								
57	153.320k	23.4	+9.1	+0.0	+0.0	+0.0	+0.0	33.3	55.8	-22.5	Neutr
	Ave		+0.8								
^	153.320k	46.3	+9.1	+0.0	+0.0	+0.0	+0.0	56.2	55.8	+0.4	Neutr
			+0.8								

Test Setup Photo(s)



Supplemental Information

Measurement Uncertainty

Uncertainty Value	Parameter
5.77 dB	Radiated Emissions
0.673 dB	RF Conducted Measurements
5.77×10^{-10}	Frequency Deviation
0.00005 s	Time Deviation
3.18 dB	Mains Conducted Emissions

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.

End of Report