Namatad, Inc.

REVISED TEST REPORT TO 105828-9

FIREFLY Device
Model: N1

Tested to The Following Standards:

FCC Part 15 Subpart F Section(s)

15.519

Report No.: 105828-9A

Date of issue: May 17, 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:

Namatad, Inc.
1705 Dock St., Unit 106
Tacoma, WA 98402

Representatives: Namatad, Inc. - Matthew Tolentino
F-Squared Laboratories – Karen Whipkey
Customer Reference Number: 5415

REPORT PREPARED BY:

Darcy Thompson
CKC Laboratories, Inc.
5046 Sierra Pines Drive
Mariposa, CA 95338

Project Number: 105828

DATE OF EQUIPMENT RECEIPT: **J** January 10, 2022
DATE(S) OF TESTING: January 10 - February 2, 2022

Revision History

Original: Testing of the FIREFLY Device, Model: N1 to FCC Part 15 Subpart F Section(s) 15.519.
Revision A: To update Representative for F-Squared Laboratories to Karen Whipkey.
15.519 (b): Update report to include Fl and Fh measurements using procedures of ANSI C63.10 and actual 10dB BW for each channel.
15.519 (e): Correct average limit units from dBm/8MHz to dBm/MHz in Average EIRP Fundamental Summary table.

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.

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.
1120 Fulton Place
Fremont, CA 94539

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 F - 15.519 (Technical requirement for hand-held UWB systems)

Test Procedure	Description	Modifications	Results
15.519 (b)	UWB Bandwidth	NA	Pass
15.519 (c)	Radiated Emissions & Band Edge	NA	Pass
15.519 (d)	Radiated Emissions in GPS bands	NA	Pass
15.519 (e)	Peak EIRP fundamental with limit of 0dBm / 50MHz	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
FIREFLY Device	Namatad, Inc.	N1	NA

Support Equipment:

Device	Manufacturer	Model #	S/N
iPhone	Apple	iPhone 8	C6KVQZDQJC6D

General Product Information:

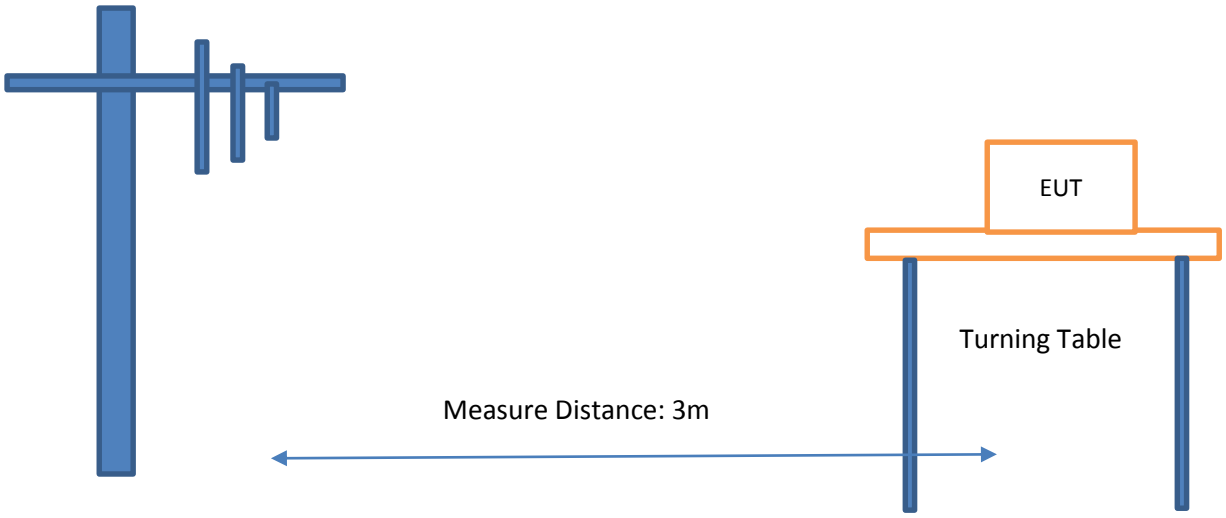
Product Information	Manufacturer-Provided Details
Equipment Type:	Stand-Alone Equipment
Type of Wideband System:	Ultra-Wideband
Operating Frequency Range:	3.5 GHz - 6.5 GHz
Modulation Type(s):	BPM & BPSK
Maximum Duty Cycle:	98%
Number of TX Chains:	2
Antenna Type(s) and Gain:	PCB
Beamforming Type:	NA
Antenna Connection Type:	Integrated PCB
Nominal Input Voltage:	3.3V
Firmware / Software used for Test:	FIREFLY FW2022-1.200
The validity of results is dependent on the stated product details, the accuracy of which the manufacturer assumes full responsibility.	

EUT and Accessory Photo(s)

Support Equipment Photo(s)

Block Diagram of Test Setup(s)

Radiated Method Setup



FCC Part 15 Subpart F

15.519 (b) UWB Bandwidth

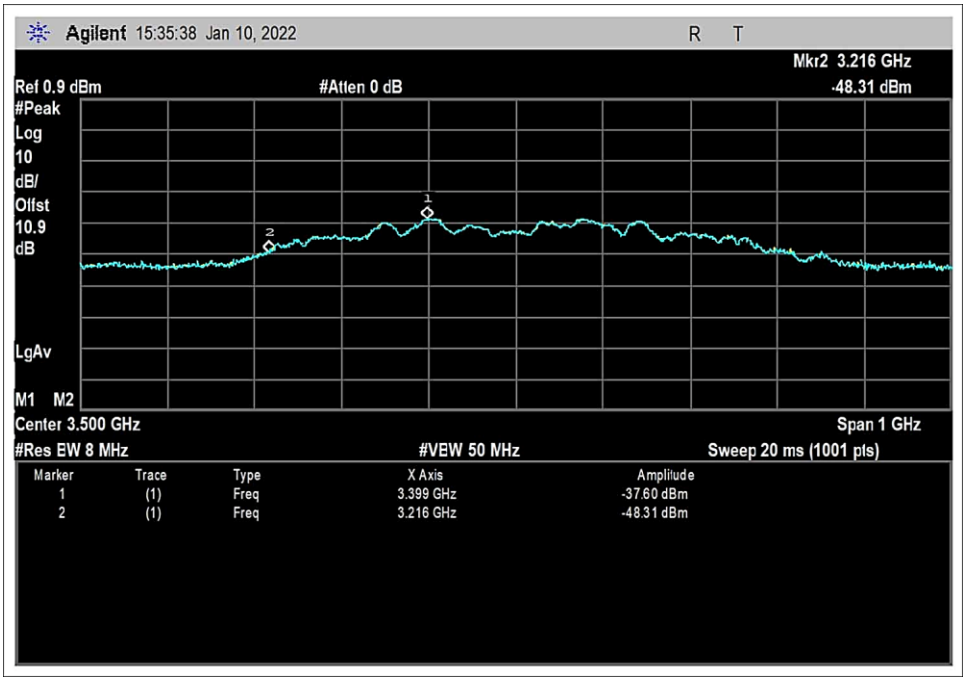
Test Setup/Conditions			
Test Location:	Fremont Lab C3	Test Engineer:	Hoang Cao
Test Method:	ANSI C63.10 (2013), KDB 393764	Test Date(s):	1/10/2022
Configuration:	1		
Test Setup:	The EUT is placed on non-conducted table. It is operated as intended.		

Environmental Conditions			
Temperature (ºC)	21.8	Relative Humidity (%):	37

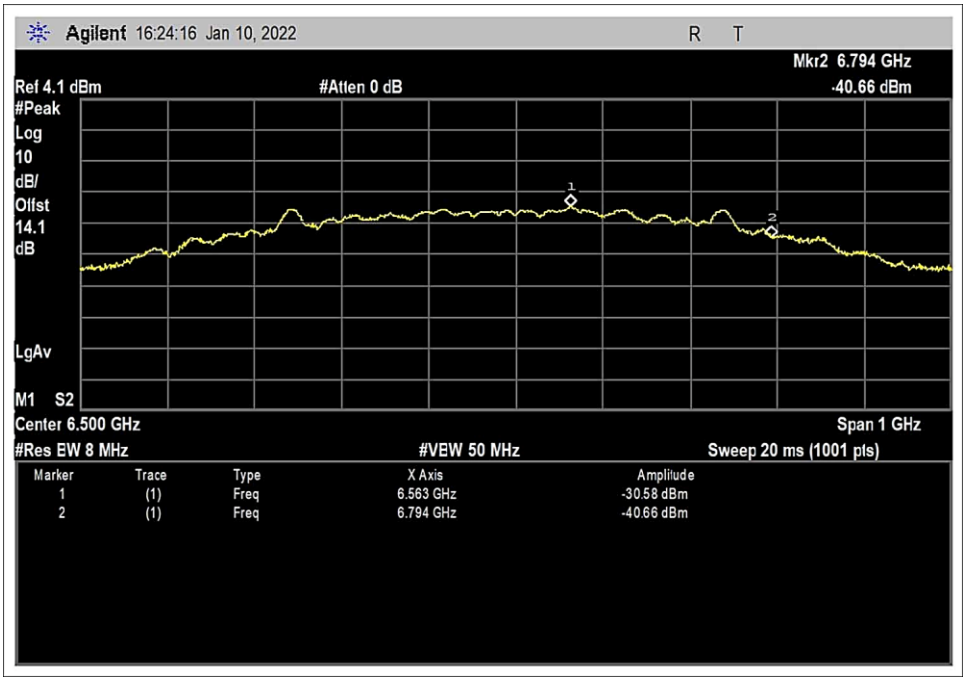
Test Equipment					
Asset#	**Description**	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
02113	Horn Antenna	EMC Test Systems	3115	3/11/2021	3/11/2023
P01210	Cable	Andrews	FSJ1P-50A-4A	11/2/2020	11/2/2022
P06902	Cable	Astrolab	32022-29094K-29094K-36TC	8/13/2020	8/13/2022
P07696	Cable	Huber+Suhner	32022-29094K-29094K-72TC	10/5/2020	10/5/2022
02810	Preamp	HP	83051A	4/2/2021	4/2/2023
02660	Spectrum Analyzer	Agilent	E4446A	12/4/2020	12/4/2022

Channel	Center Frequency (MHz)	10dB Bandwidth Frequency (MHz)	Limit (MHz)	Results
Low	3500	3216	>3100	Pass
High	6500	8794	<10600	Pass

Plot(s)



Low Channel



High Channel

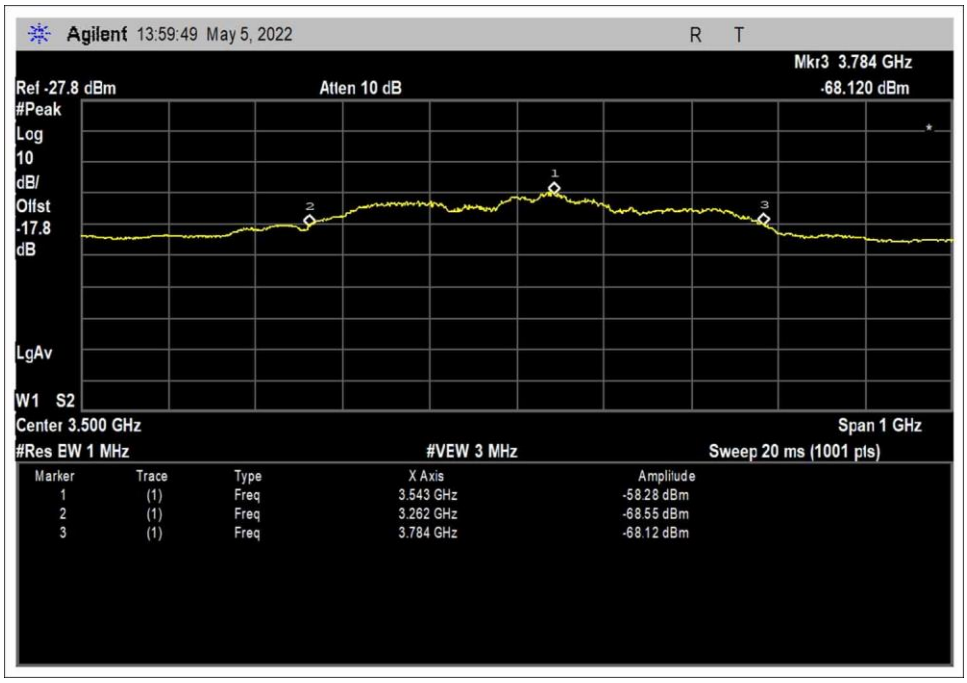
Test Setup/Conditions			
Test Location:	Fremont Lab C3	Test Engineer:	Hoang Cao
Test Method:	ANSI C63.10 (2013), KDB 393764	Test Date(s):	5/5/2022
Configuration:	1		
Test Setup:	The EUT is placed on non-conducted table. It is operated as intended.		

Environmental Conditions			
Temperature (ºC)	22.8	Relative Humidity (%):	38

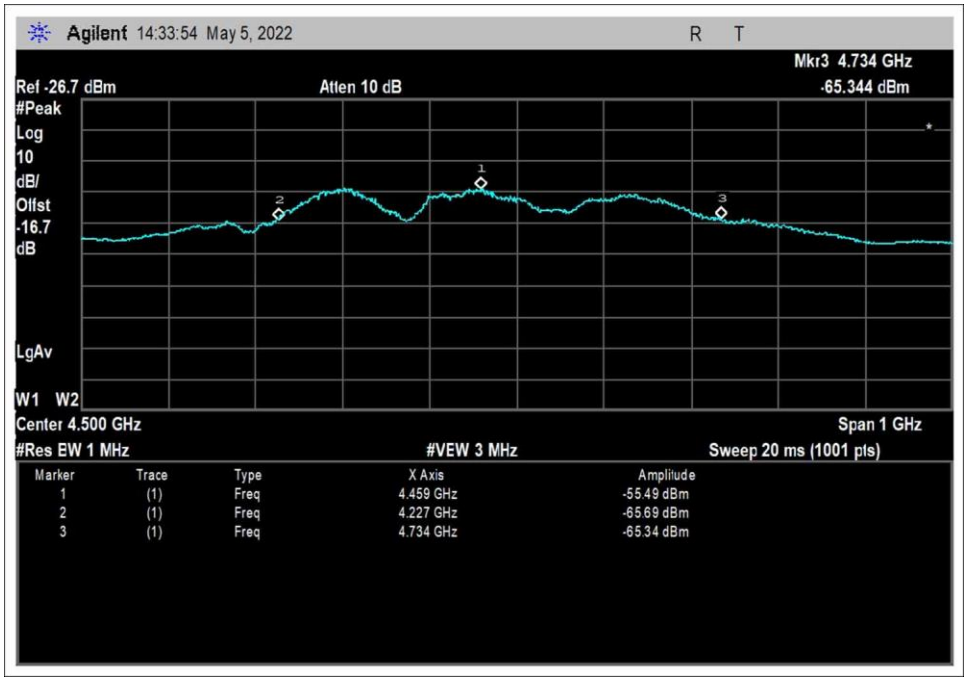
Test Equipment					
Asset#	**Description**	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
02113	Horn Antenna	EMC Test Systems	3115	3/11/2021	3/11/2023
P01210	Cable	Andrews	FSJ1P-50A-4A	11/2/2020	11/2/2022
P06902	Cable	Astrolab	32022-29094K-29094K-36TC	8/13/2020	8/13/2022
03302	Cable	Astrolab	32026-29094K-29094K-72TC	1/10/2022	1/10/2024
03738	Preamp	B&Z Technologies	BZRYE-00101800-221055-202323	2/4/2022	2/4/2024
02660	Spectrum Analyzer	Agilent	E4446A	12/4/2020	12/4/2022

Test Data Summary – Occupied Bandwidth							
Frequency (MHz)	**Fl (MHz)**	**Fh (MHz)**	**-10dB BW (MHz)**	**Fl Limit (MHz)**	**Fh Limit (MHz)**	**BW Limit (MHz)**	**Results**
3500	3262	3784	522	3100	10600	500	Pass
4500	4227	4734	507	3100	10600	500	Pass
6500	6207	6786	579	3100	10600	500	Pass

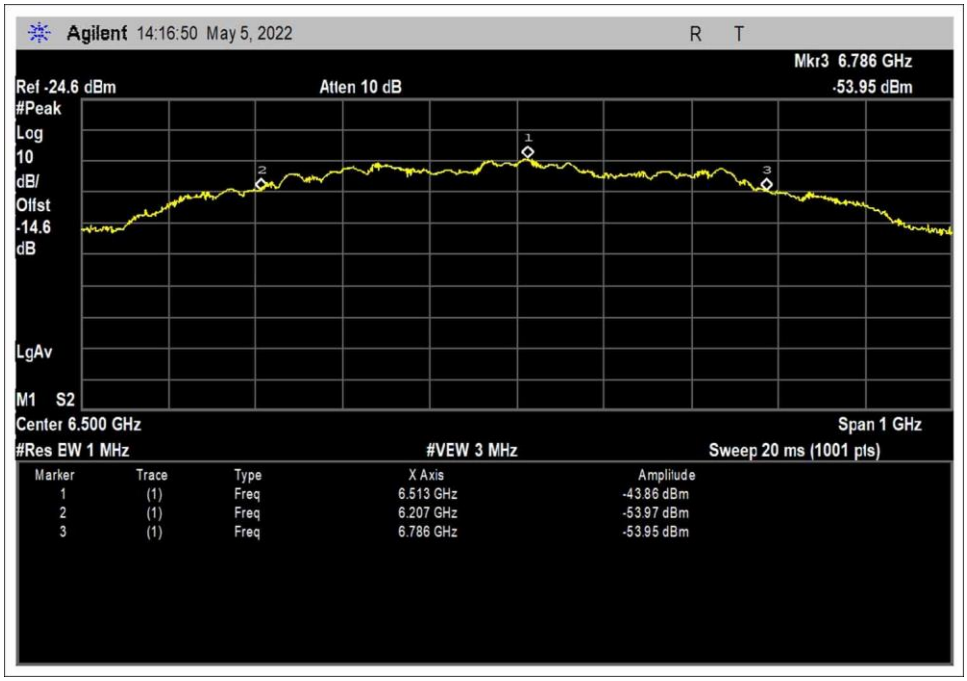
Plot(s)



Low Channel

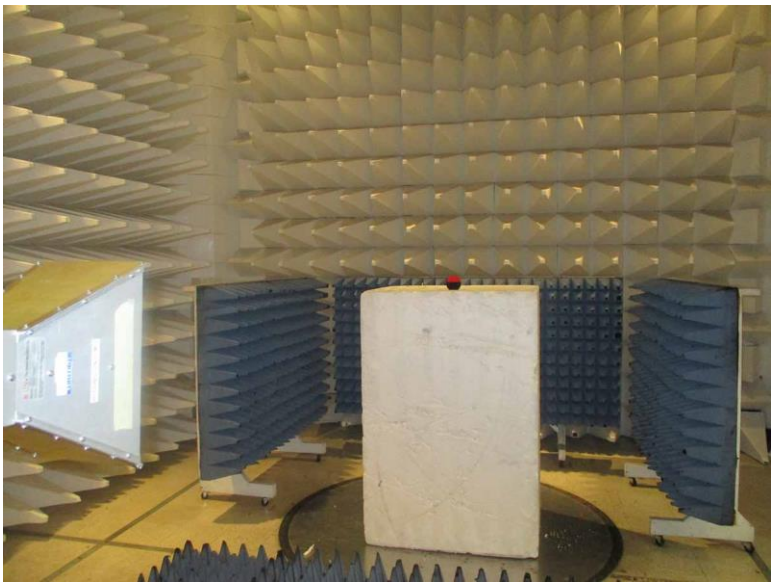


Middle Channel



High Channel

Test Setup Photo(s)



Front View

Back View

15.519 (c) Radiated Emissions and Band Edge

Test Setup / Conditions / Data

Test Location:	CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170		
Customer:	**Namatad, Inc.**		
Specification:	**15.209/15.519 Radiated Emissions**		
Work Order #:	**105828**	Date:	2/2/2022
Test Type:	**Radiated Scan**	Time:	13:50:47
Tested By:	Hoang Cao	Sequence#:	77
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:

Radiated Emissions
Frequency Range: 9kHz to 1GHz

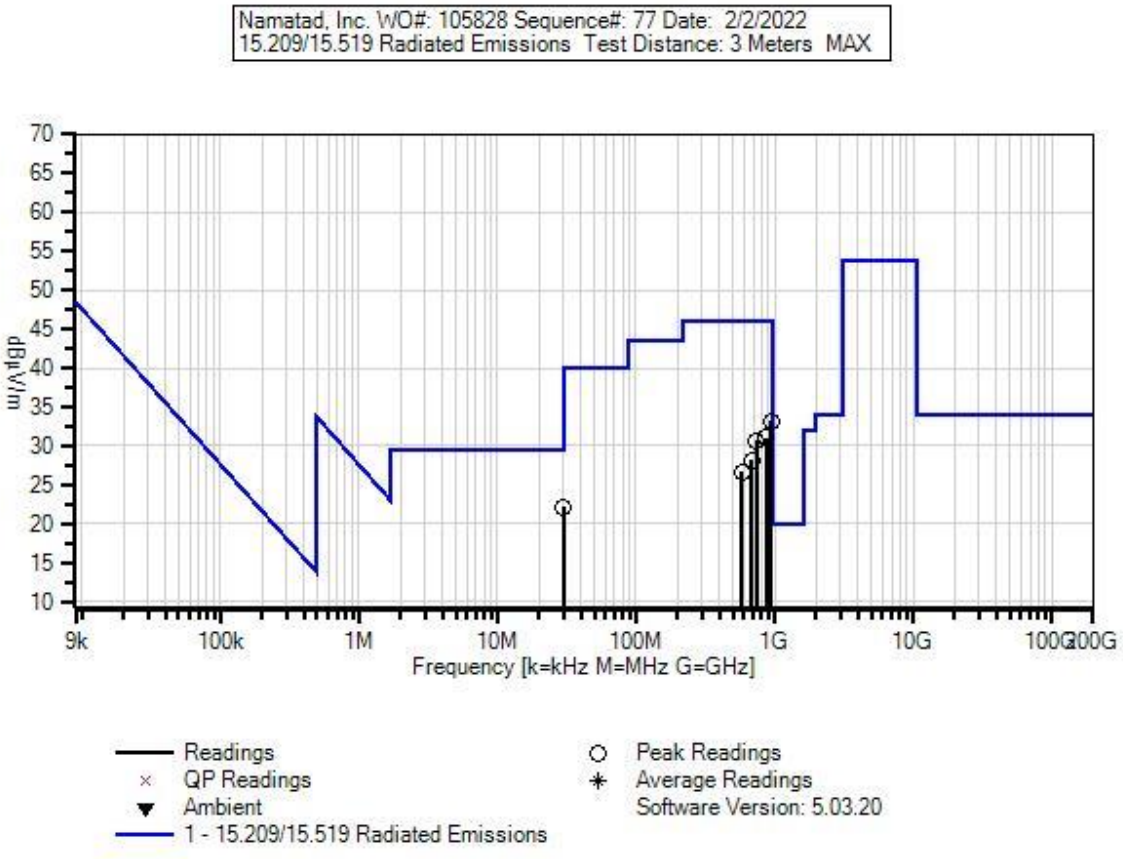
Environmental Conditions:
Temperature: 20.8°C
Humidity: 37%
Atmospheric Pressure: 102.2kPa

The EUT is set up as intended.

Low Channel

Note:
Y-axis is the worst case.

No emissions have been found from 9kHz to 30MHz within 20dB below limit.



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP07508	Preamp	310N	7/9/2020	7/9/2022
T2	AN00852	Biconilog Antenna	CBL 6111C	4/14/2020	4/14/2022
T3	ANP06049	Attenuator	PE7002-6	5/11/2020	5/11/2022
T4	ANP01187	Cable	CNT-195	7/6/2020	7/6/2022
T5	ANP06691	Cable	PE3062-180	3/25/2020	3/25/2022
T6	ANP06694	Cable	PE3062-480	3/25/2020	3/25/2022
	AN02660	Spectrum Analyzer	E4446A	12/4/2020	12/4/2022
	AN00432	Loop Antenna	6502	7/19/2021	7/19/2023

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	940.057M	29.2	-31.0 +1.3	+23.7 +3.3	+5.9	+0.7	+0.0	33.1	46.0	-12.9	Vert
2	868.261M	28.6	-31.6 +1.2	+23.0 +3.2	+5.9	+0.7	+0.0	31.0	46.0	-15.0	Vert
3	744.612M	30.5	-32.0 +1.1	+21.7 +2.8	+6.0	+0.6	+0.0	30.7	46.0	-15.3	Horiz
4	686.009M	29.1	-32.0 +1.0	+20.8 +2.7	+6.0	+0.6	+0.0	28.2	46.0	-17.8	Vert
5	30.056M	29.0	-32.1 +0.2	+18.7 +0.4	+5.9	+0.0	+0.0	22.1	40.0	-17.9	Vert
6	578.026M	29.4	-32.0 +0.9	+19.3 +2.5	+5.9	+0.6	+0.0	26.6	46.0	-19.4	Vert

Test Location:	CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170		
Customer:	**Namatad, Inc.**		
Specification:	**15.209/15.519 Radiated Emissions**		
Work Order #:	**105828**	Date:	2/2/2022
Test Type:	**Radiated Scan**	Time:	14:16:58
Tested By:	Hoang Cao	Sequence#:	80
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:

Radiated Emissions
Frequency Range: 9kHz to 1GHz

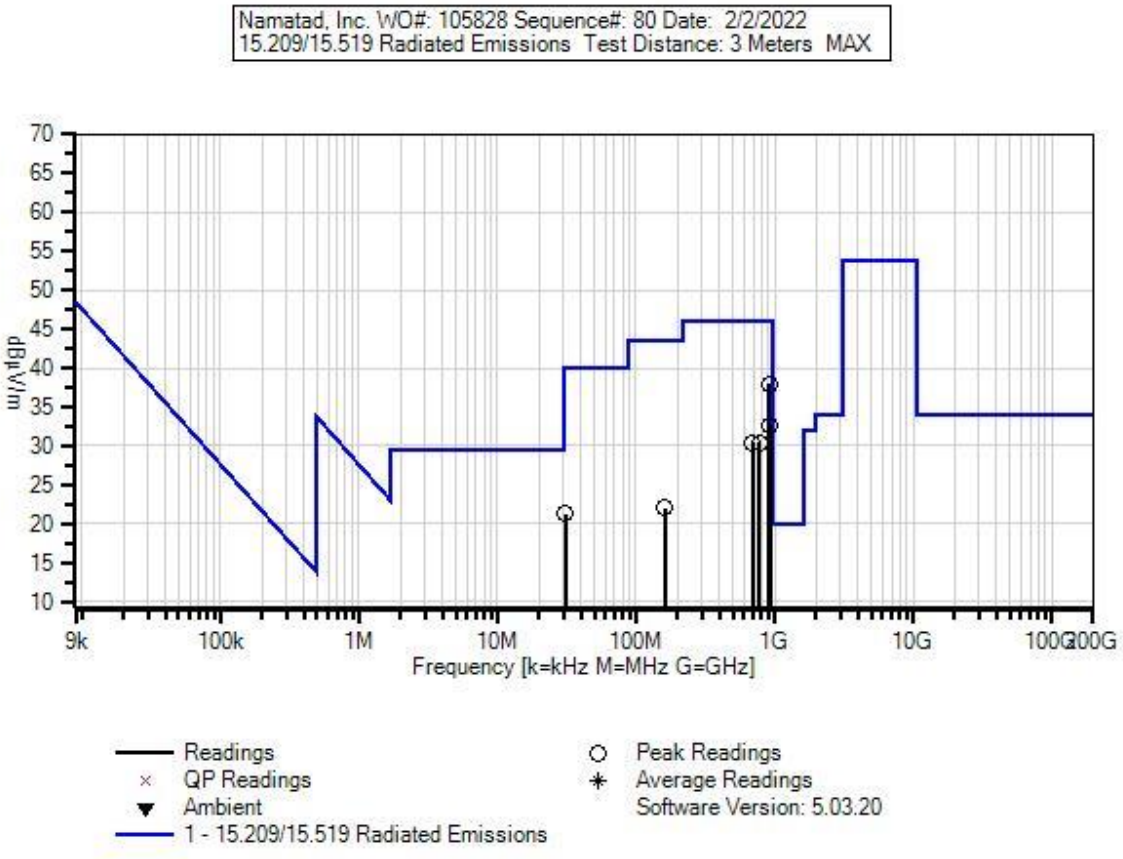
Environmental Conditions:
Temperature: 20.8°C
Humidity: 37%
Atmospheric Pressure: 102.2kPa

The EUT is set up as intended.

Middle Channel

Note:
Y-axis is the worst case.

No emissions have been found from 9kHz to 30MHz within 20dB below limit.



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP07508	Preamp	310N	7/9/2020	7/9/2022
T2	AN00852	Biconilog Antenna	CBL 6111C	4/14/2020	4/14/2022
T3	ANP06049	Attenuator	PE7002-6	5/11/2020	5/11/2022
T4	ANP01187	Cable	CNT-195	7/6/2020	7/6/2022
T5	ANP06691	Cable	PE3062-180	3/25/2020	3/25/2022
T6	ANP06694	Cable	PE3062-480	3/25/2020	3/25/2022
	AN02660	Spectrum Analyzer	E4446A	12/4/2020	12/4/2022
	AN00432	Loop Antenna	6502	7/19/2021	7/19/2023

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	907.534M	34.9	-31.3 +1.2	+23.3 +3.2	+5.9	+0.7	+0.0	37.9	46.0	-8.1	Horiz
2	924.409M	29.0	-31.1 +1.3	+23.5 +3.3	+5.9	+0.7	+0.0	32.6	46.0	-13.4	Horiz
3	699.816M	30.9	-32.0 +1.1	+21.0 +2.8	+6.0	+0.6	+0.0	30.4	46.0	-15.6	Horiz
4	782.658M	29.4	-31.9 +1.1	+22.3 +2.9	+6.0	+0.6	+0.0	30.4	46.0	-15.6	Vert
5	31.001M	28.5	-32.1 +0.2	+18.3 +0.4	+5.9	+0.0	+0.0	21.2	40.0	-18.8	Vert
6	160.762M	35.7	-32.0 +0.4	+10.6 +1.1	+6.0	+0.2	+0.0	22.0	43.5	-21.5	Vert

Test Location:	CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170		
Customer:	**Namatad, Inc.**		
Specification:	**15.209/15.519 Radiated Emissions**		
Work Order #:	**105828**	Date:	2/2/2022
Test Type:	**Radiated Scan**	Time:	14:48:19
Tested By:	Hoang Cao	Sequence#:	83
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:

Radiated Emissions
Frequency Range: 9kHz to 1GHz

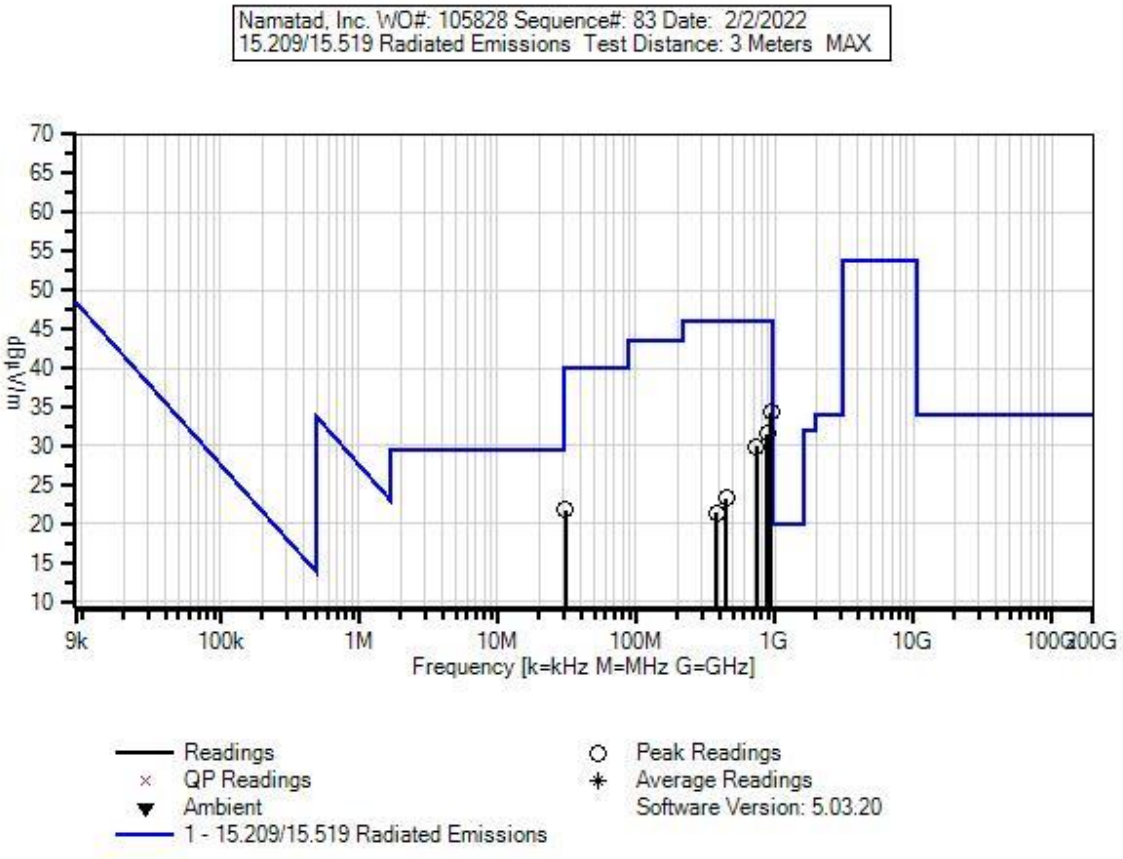
Environmental Conditions:
Temperature: 20.8°C
Humidity: 37%
Atmospheric Pressure: 102.2kPa

The EUT is set up as intended.

High Channel

Note:
Y-axis is the worst case.

No emissions have been found from 9kHz to 30MHz within 20dB below limit.



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP07508	Preamp	310N	7/9/2020	7/9/2022
T2	AN00852	Biconilog Antenna	CBL 6111C	4/14/2020	4/14/2022
T3	ANP06049	Attenuator	PE7002-6	5/11/2020	5/11/2022
T4	ANP01187	Cable	CNT-195	7/6/2020	7/6/2022
T5	ANP06691	Cable	PE3062-180	3/25/2020	3/25/2022
T6	ANP06694	Cable	PE3062-480	3/25/2020	3/25/2022
	AN02660	Spectrum Analyzer	E4446A	12/4/2020	12/4/2022
	AN00432	Loop Antenna	6502	7/19/2021	7/19/2023

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	940.057M	30.4	-31.0 +1.3	+23.7 +3.3	+5.9	+0.7	+0.0	34.3	46.0	-11.7	Horiz
2	880.533M	28.9	-31.5 +1.2	+23.1 +3.2	+5.9	+0.7	+0.0	31.5	46.0	-14.5	Horiz
3	740.009M	29.8	-32.0 +1.1	+21.6 +2.8	+6.0	+0.6	+0.0	29.9	46.0	-16.1	Horiz
4	30.930M	29.1	-32.1 +0.2	+18.3 +0.4	+5.9	+0.0	+0.0	21.8	40.0	-18.2	Vert
5	447.342M	28.9	-31.9 +0.8	+17.0 +2.1	+5.9	+0.5	+0.0	23.3	46.0	-22.7	Vert
6	381.923M	29.0	-31.9 +0.7	+15.3 +1.9	+6.0	+0.4	+0.0	21.4	46.0	-24.6	Vert

Test Location:	CKC Laboratories, Inc • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170		
Customer:	**Namatad, Inc.**		
Specification:	**15.209/15.519 Radiated Emissions**		
Work Order #:	**105828**	Date:	1/31/2022
Test Type:	**Radiated Scan**	Time:	12:08:06
Tested By:	Hoang Cao	Sequence#:	33
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:

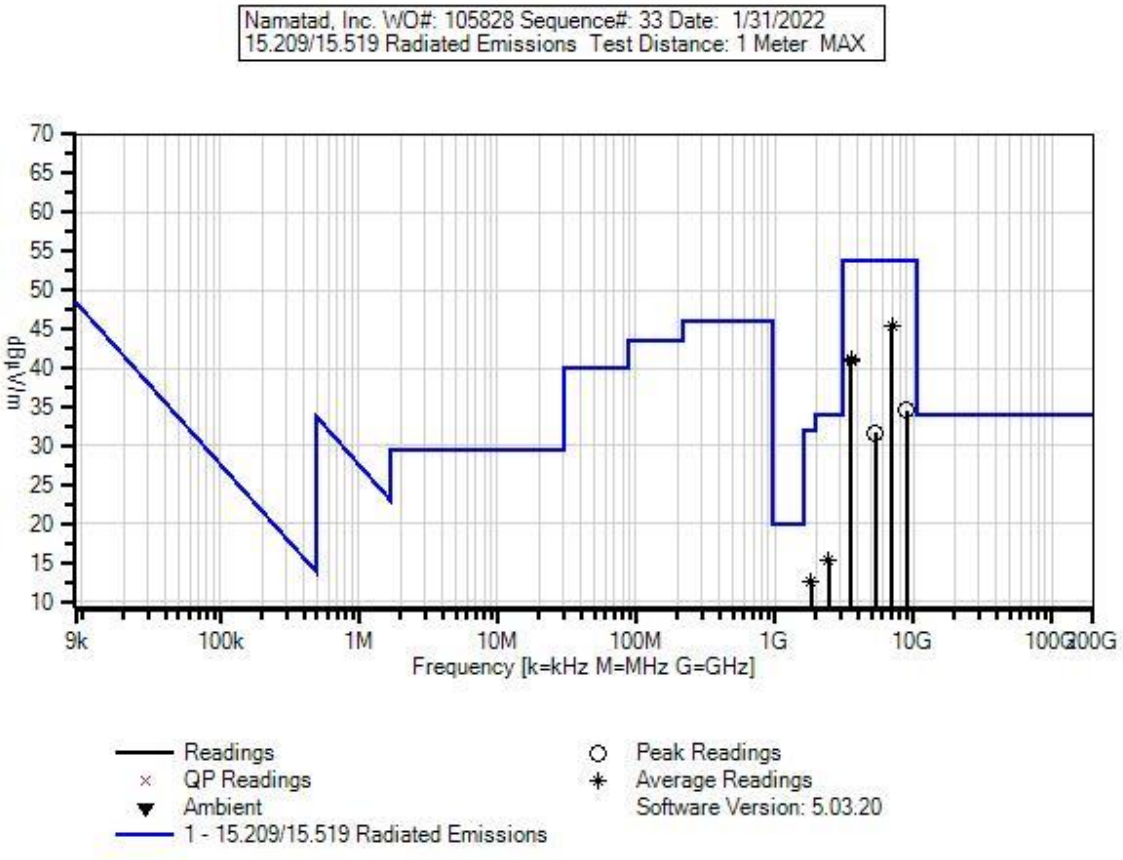
Radiated Emissions
Frequency Range: 1GHz to 40GHz

Test Environment Conditions:
Temperature: 20.8°C
Humidity: 37%
Atmospheric Pressure: 102.2kPa

The EUT is set up as intended. It is set up on the table height 150cm.

Low Channel

Note:
Y-axis is the worst case



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP01210	Cable	FSJ1P-50A-4A	11/2/2020	11/2/2022
T2	AN02113	Horn Antenna-ANSI C63.5	3115	3/11/2021	3/11/2023
T3	ANP06902	Cable	32022-29094K-29094K-36TC	8/13/2020	8/13/2022
T4	AN03302	Cable	32026-29094K-29094K-72TC	1/10/2022	1/10/2024
	AN02660	Spectrum Analyzer	E4446A	12/4/2020	12/4/2022
T5	AN03713	Preamp	01001800-221055-202525	5/24/2021	5/24/2023
	AN02810	Preamp	83051A	4/2/2021	4/2/2023
	AN02693	Active Horn Antenna	AMFW-5F-12001800-20-10P	10/26/2021	10/26/2023
	AN02694	Horn Antenna	AMFW-5F-18002650-20-10P	10/26/2021	10/26/2023
	AN02695	Active Horn Antenna	AMFW-5F-260400-33-8P	10/26/2021	10/26/2023
	AN03619	Cable	OKOCQoCQ177.2	9/17/2021	9/17/2023
	ANP00928	Cable	various	1/12/2022	1/12/2024
	ANP00929	Cable	various	1/12/2022	1/12/2024
	ANP00930	Cable	various	1/12/2022	1/12/2024
	ANP07697	Cable	32022-29094K-29094K-72TC	10/5/2020	10/5/2022

Measurement Data: Reading listed by margin. Test Distance: 1 Meter

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	6988.800M Ave	69.3	+4.4 -56.9	+34.1	+1.5	+2.4	-9.5	45.3	53.9	-8.6	Vert
^	6988.800M	75.2	+4.4 -56.9	+34.1	+1.5	+2.4	-9.5	51.2	53.9	-2.7	Vert
3	3553.551M Ave	69.5	+3.2 -56.1	+31.3	+1.0	+1.7	-9.5	41.1	53.9	-12.8	Horiz
^	3553.551M	79.2	+3.2 -56.1	+31.3	+1.0	+1.7	-9.5	50.8	53.9	-3.1	Horiz
5	3542.540M Ave	69.3	+3.2 -56.1	+31.2	+1.0	+1.7	-9.5	40.8	53.9	-13.1	Vert
^	3542.540M	81.5	+3.2 -56.1	+31.2	+1.0	+1.7	-9.5	53.0	53.9	-0.9	Vert
7	2440.000M Ave	47.8	+2.6 -55.9	+28.1	+0.8	+1.4	-9.5	15.3	33.9	-18.6	Vert
^	2440.000M	68.2	+2.6 -55.9	+28.1	+0.8	+1.4	-9.5	35.7	33.9	+1.8	Vert
9	9023.015M	55.8	+5.1 -57.2	+36.0	+1.6	+2.8	-9.5	34.6	53.9	-19.3	Horiz
10	1822.000M Ave	46.5	+2.2 -55.5	+26.8	+0.7	+1.2	-9.5	12.4	31.9	-19.5	Vert
^	1822.000M	60.0	+2.2 -55.5	+26.8	+0.7	+1.2	-9.5	25.9	31.9	-6.0	Vert
12	5362.358M	57.0	+3.9 -56.2	+33.1	+1.2	+2.1	-9.5	31.6	53.9	-22.3	Horiz

Test Location:	CKC Laboratories, Inc • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170		
Customer:	**Namatad, Inc.**		
Specification:	**15.209/15.519 Radiated Emissions**		
Work Order #:	**105828**	Date:	1/31/2022
Test Type:	**Radiated Scan**	Time:	14:05:09
Tested By:	Hoang Cao	Sequence#:	38
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:

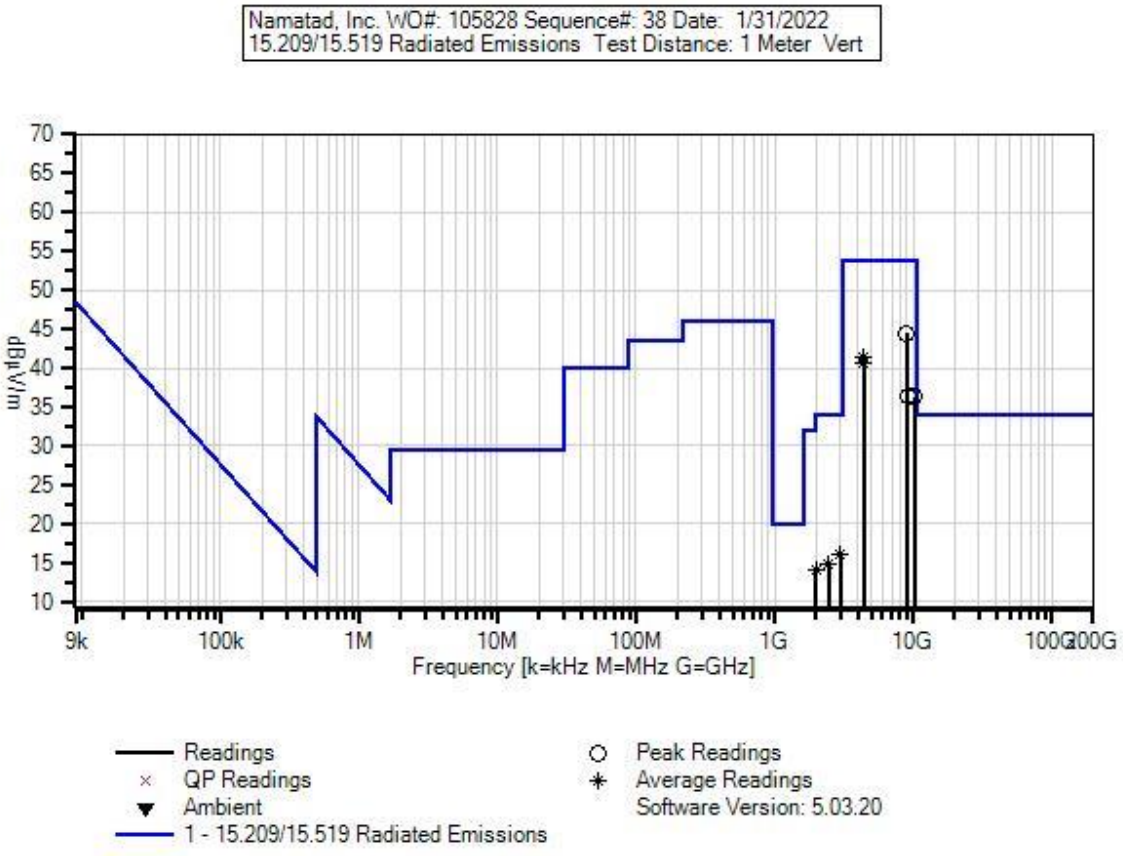
Radiated Emissions
Frequency Range: 1GHz to 40GHz

Test Environment Conditions:
Temperature: 20.8°C
Humidity: 37%
Atmospheric Pressure: 102.2kPa

The EUT is set up as intended. It is set up on the table height 150cm.

Middle Channel

Note:
Y-axis is the worst case



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP01210	Cable	FSJ1P-50A-4A	11/2/2020	11/2/2022
T2	AN02113	Horn Antenna-ANSI C63.5	3115	3/11/2021	3/11/2023
T3	ANP06902	Cable	32022-29094K-29094K-36TC	8/13/2020	8/13/2022
T4	AN03302	Cable	32026-29094K-29094K-72TC	1/10/2022	1/10/2024
	AN02660	Spectrum Analyzer	E4446A	12/4/2020	12/4/2022
T5	AN03713	Preamp	01001800-221055-202525	5/24/2021	5/24/2023
	AN02810	Preamp	83051A	4/2/2021	4/2/2023
	AN02693	Active Horn Antenna	AMFW-5F-12001800-20-10P	10/26/2021	10/26/2023
	AN02694	Horn Antenna	AMFW-5F-18002650-20-10P	10/26/2021	10/26/2023
	AN02695	Active Horn Antenna	AMFW-5F-260400-33-8P	10/26/2021	10/26/2023
	AN03619	Cable	OKOCQoCQ177.2	9/17/2021	9/17/2023
	ANP00928	Cable	various	1/12/2022	1/12/2024
	ANP00929	Cable	various	1/12/2022	1/12/2024
	ANP00930	Cable	various	1/12/2022	1/12/2024
	ANP07697	Cable	32022-29094K-29094K-72TC	10/5/2020	10/5/2022

Measurement Data: Reading listed by margin. Test Distance: 1 Meter

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	8985.000M	65.7	+5.1 -57.2	+36.0	+1.6	+2.8	-9.5	44.5	53.9	-9.4	Vert
2	4408.000M Ave	69.1	+3.5 -56.1	+31.5	+1.1	+1.9	-9.5	41.5	53.9	-12.4	Vert
^	4408.000M	82.0	+3.5 -56.1	+31.5	+1.1	+1.9	-9.5	54.4	53.9	+0.5	Vert
4	4403.400M Ave	68.2	+3.5 -56.1	+31.5	+1.1	+1.9	-9.5	40.6	53.9	-13.3	Horiz
^	4403.400M	80.8	+3.5 -56.1	+31.5	+1.1	+1.9	-9.5	53.2	53.9	-0.7	Horiz
6	10277.268 M	55.1	+5.5 -56.5	+37.0	+1.7	+3.0	-9.5	36.3	53.9	-17.6	Horiz
7	9142.134M	57.3	+5.2 -57.2	+36.1	+1.6	+2.8	-9.5	36.3	53.9	-17.6	Horiz
8	2993.539M Ave	46.4	+2.9 -55.9	+29.7	+0.9	+1.5	-9.5	16.0	33.9	-17.9	Vert
^	2993.539M	59.2	+2.9 -55.9	+29.7	+0.9	+1.5	-9.5	28.8	33.9	-5.1	Vert
10	1979.500M Ave	47.6	+2.3 -55.7	+27.3	+0.7	+1.3	-9.5	14.0	31.9	-17.9	Vert
^	1979.500M	60.7	+2.3 -55.7	+27.3	+0.7	+1.3	-9.5	27.1	31.9	-4.8	Vert
12	2441.500M Ave	47.2	+2.6 -55.9	+28.1	+0.8	+1.4	-9.5	14.7	33.9	-19.2	Vert
^	2441.500M	64.7	+2.6 -55.9	+28.1	+0.8	+1.4	-9.5	32.2	33.9	-1.7	Vert

Test Location:	CKC Laboratories, Inc • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170		
Customer:	**Namatad, Inc.**		
Specification:	**15.209/15.519 Radiated Emissions**		
Work Order #:	**105828**	Date:	1/31/2022
Test Type:	**Radiated Scan**	Time:	14:46:42
Tested By:	Hoang Cao	Sequence#:	41
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:

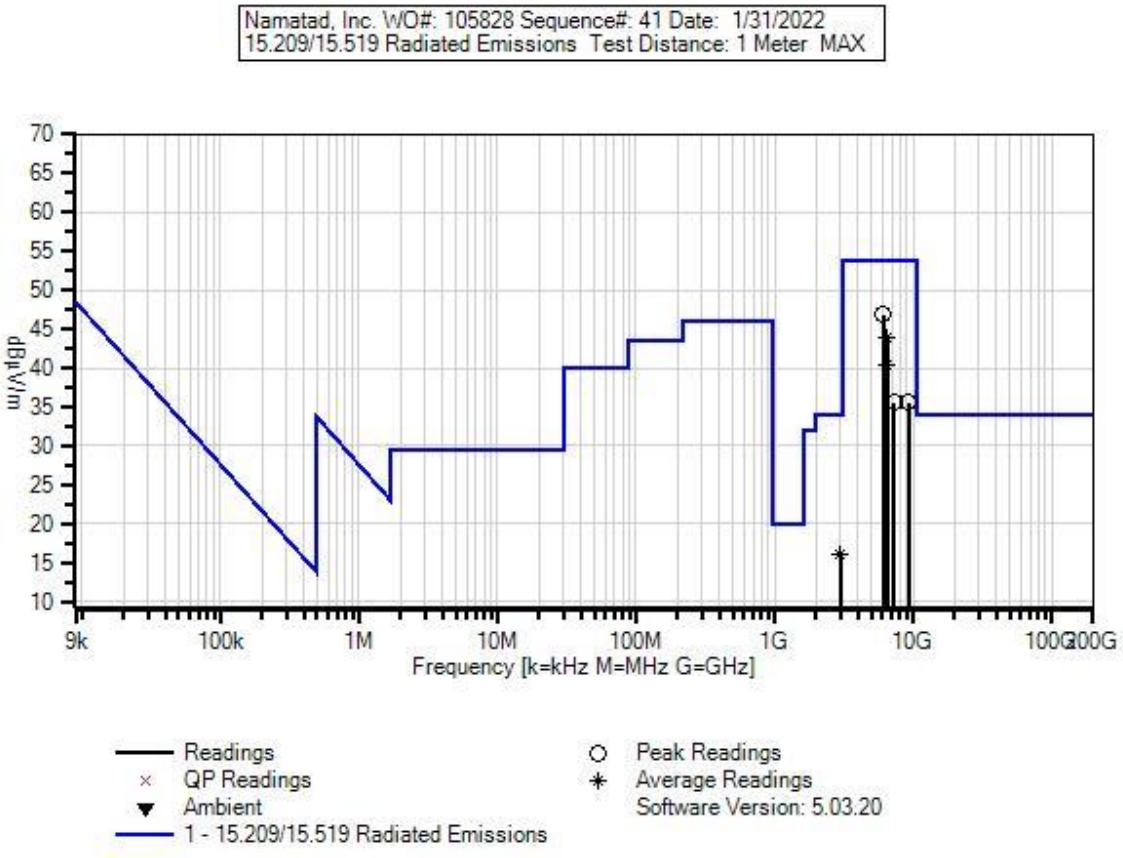
Radiated Emissions
Frequency Range: 1GHz to 40GHz

Test Environment Conditions:
Temperature: 20.8°C
Humidity: 37%
Atmospheric Pressure: 102.2kPa

The EUT is set up as intended. It is set up on the table height 150cm.

High Channel

Note:
Y-axis is the worst case



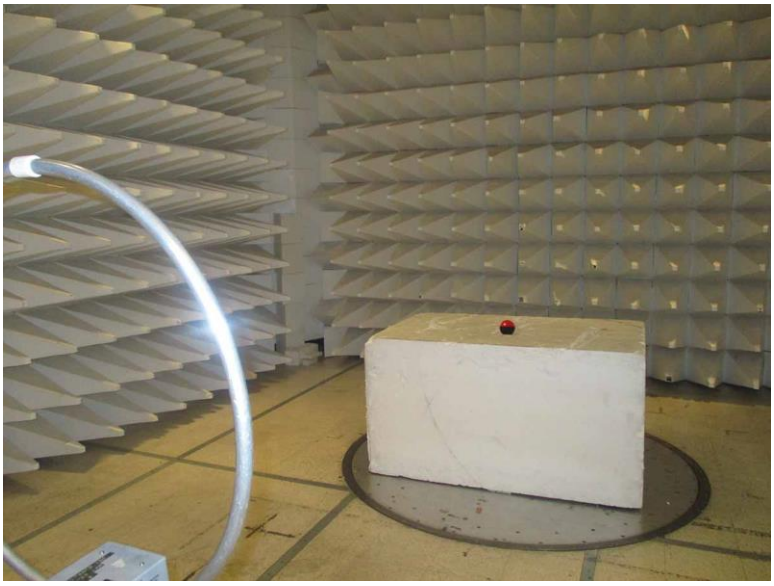
Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP01210	Cable	FSJ1P-50A-4A	11/2/2020	11/2/2022
T2	AN02113	Horn Antenna-ANSI C63.5	3115	3/11/2021	3/11/2023
T3	ANP06902	Cable	32022-29094K-29094K-36TC	8/13/2020	8/13/2022
T4	AN03302	Cable	32026-29094K-29094K-72TC	1/10/2022	1/10/2024
	AN02660	Spectrum Analyzer	E4446A	12/4/2020	12/4/2022
T5	AN03713	Preamp	01001800-221055-202525	5/24/2021	5/24/2023
	AN02810	Preamp	83051A	4/2/2021	4/2/2023
	AN02693	Active Horn Antenna	AMFW-5F-12001800-20-10P	10/26/2021	10/26/2023
	AN02694	Horn Antenna	AMFW-5F-18002650-20-10P	10/26/2021	10/26/2023
	AN02695	Active Horn Antenna	AMFW-5F-260400-33-8P	10/26/2021	10/26/2023
	AN03619	Cable	OKOCQoCQ177.2	9/17/2021	9/17/2023
	ANP00928	Cable	various	1/12/2022	1/12/2024
	ANP00929	Cable	various	1/12/2022	1/12/2024
	ANP00930	Cable	various	1/12/2022	1/12/2024
	ANP07697	Cable	32022-29094K-29094K-72TC	10/5/2020	10/5/2022

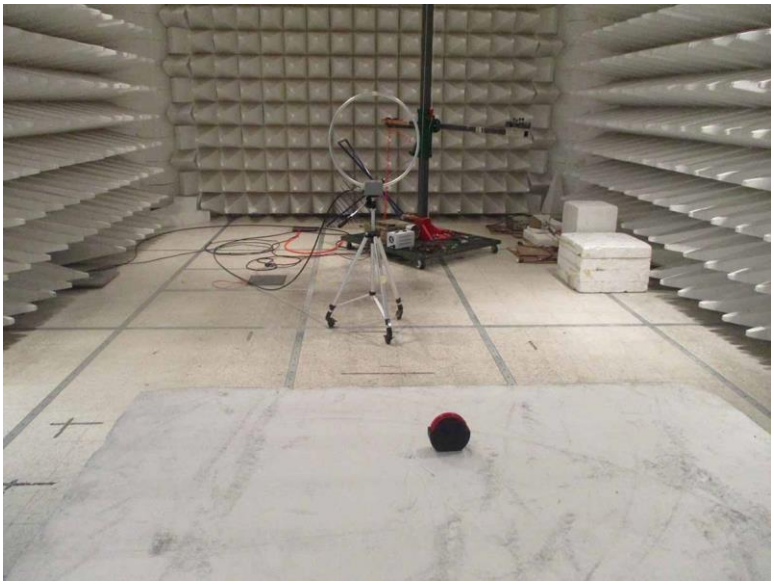
Measurement Data: Reading listed by margin. Test Distance: 1 Meter

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	6134.129M	72.2	+4.1 -56.4	+32.8	+1.4	+2.2	-9.5	46.8	53.9	-7.1	Vert
2	6468.472M Ave	69.7	+4.2 -56.6	+32.4	+1.4	+2.3	-9.5	43.9	53.9	-10.0	Vert
^	6468.472M	84.2	+4.2 -56.6	+32.4	+1.4	+2.3	-9.5	58.4	53.9	+4.5	Vert
4	6468.463M Ave	66.2	+4.2 -56.6	+32.4	+1.4	+2.3	-9.5	40.4	53.9	-13.5	Horiz
^	6468.463M	82.9	+4.2 -56.6	+32.4	+1.4	+2.3	-9.5	57.1	53.9	+3.2	Horiz
6	3005.584M Ave	46.5	+2.9 -55.9	+29.7	+0.9	+1.5	-9.5	16.1	33.9	-17.8	Horiz
^	3005.584M	59.6	+2.9 -55.9	+29.7	+0.9	+1.5	-9.5	29.2	33.9	-4.7	Horiz
8	9271.263M	56.3	+5.3 -57.2	+36.2	+1.6	+2.8	-9.5	35.5	53.9	-18.4	Horiz
9	7235.229M	58.9	+4.5 -57.1	+34.7	+1.5	+2.5	-9.5	35.5	53.9	-18.4	Horiz

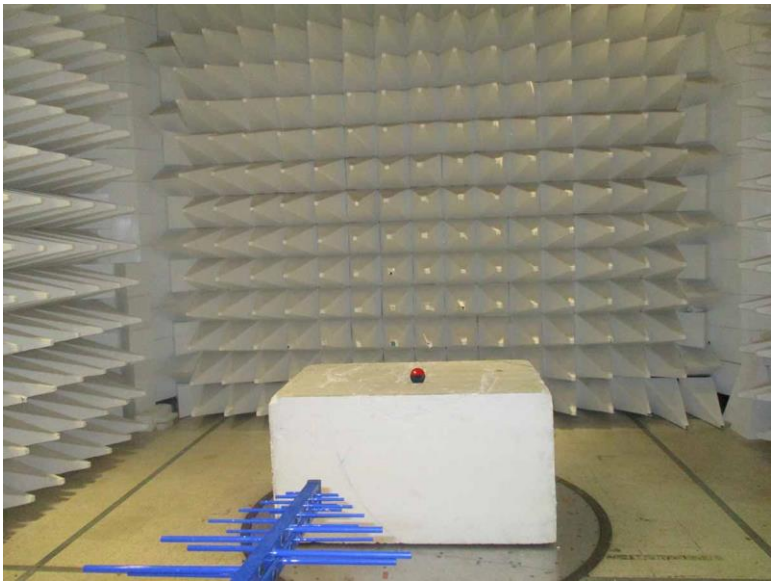
Test Setup Photo(s)



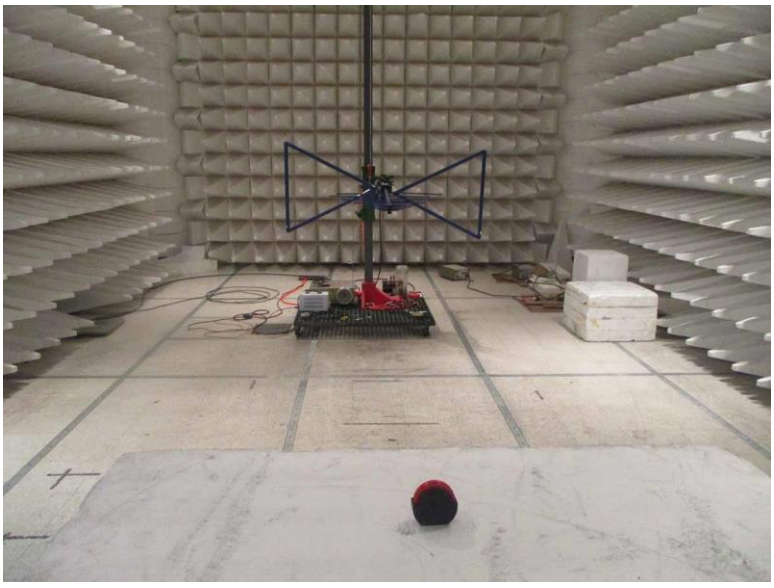
9kHz to 30MH, Front View



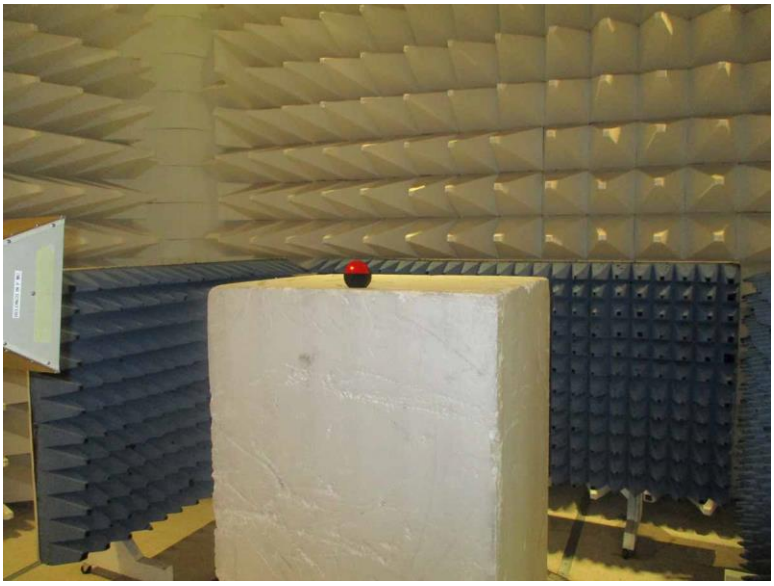
9kHz to 30MH, Back View



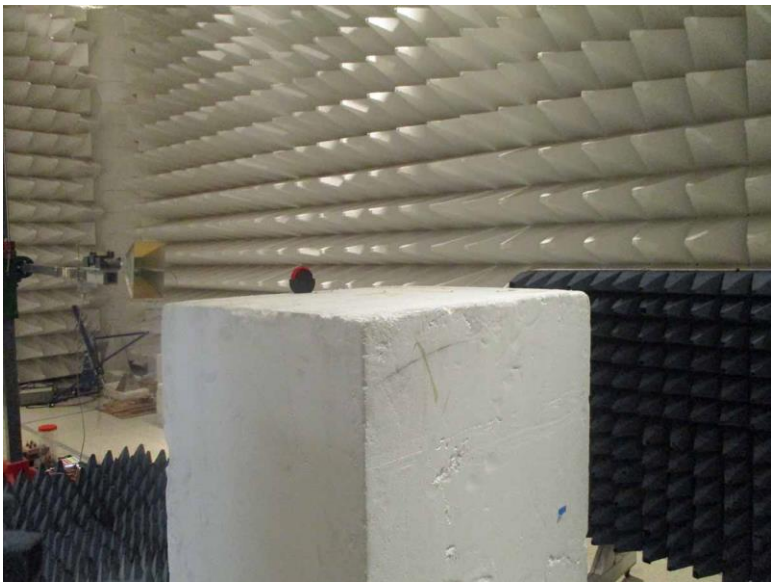
30MHz – 1GHz, Front View



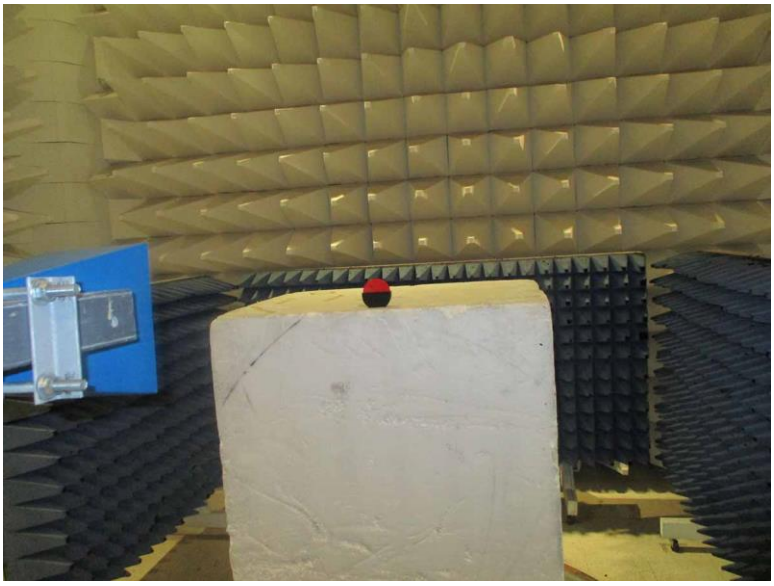
30MHz – 1GHz, Back View



1GHz – 12GHz, Front View

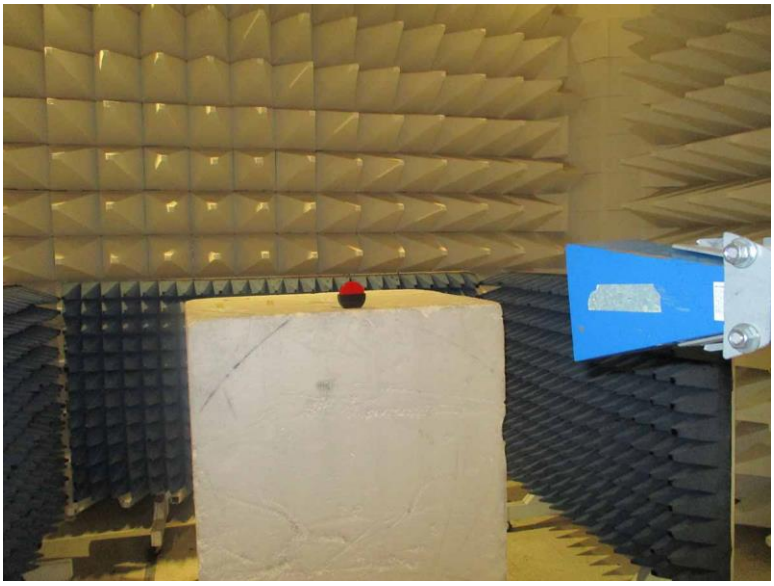


1GHz – 12GHz, Back View

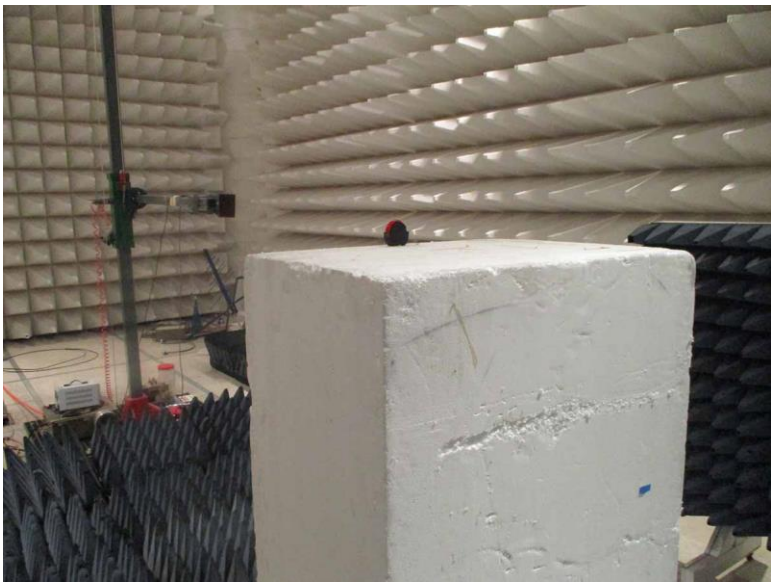


12GHz – 18GHz, Front View

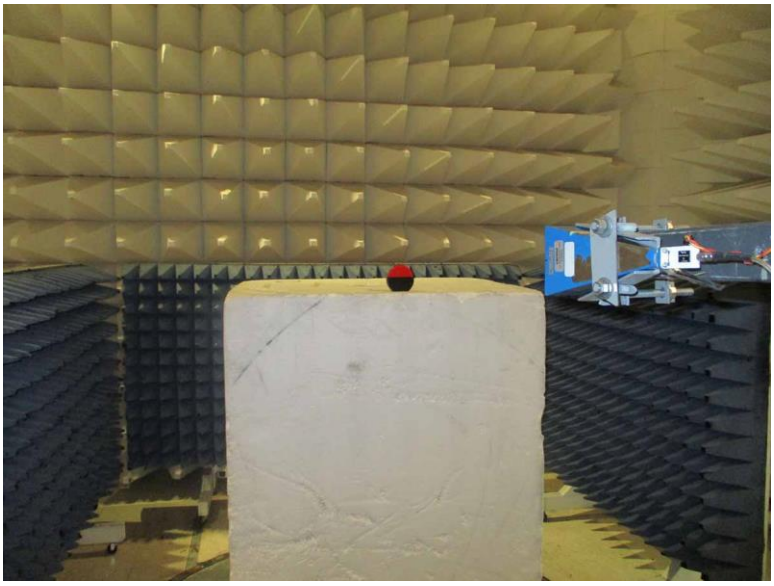
12GHz – 18GHz, Back View



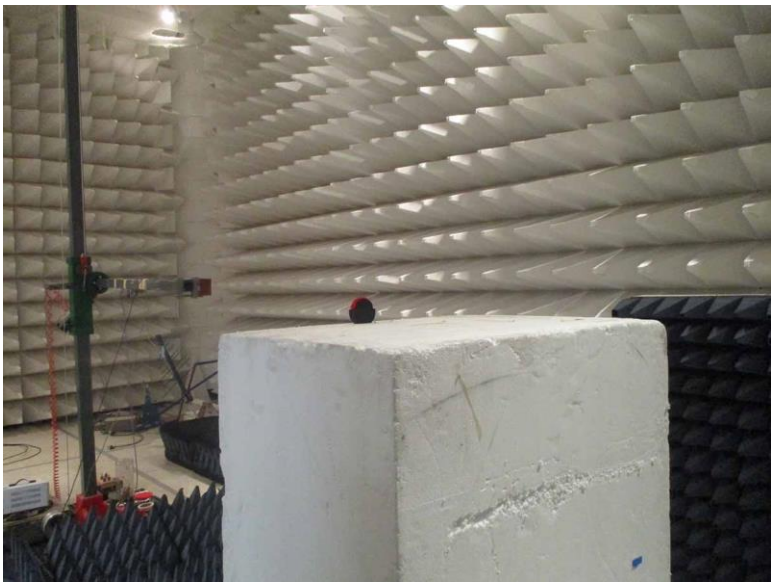
18GHz to 26.5GHz, Front View



18GHz to 26.5GHz, Back View



26.5GHz to 40GHz, Front View



26.5GHz to 40GHz, Back View

Band Edge

Test Setup/Conditions			
Test Location:	Fremont Lab C3	Test Engineer:	Hoang Cao
Test Method:	ANSI C63.10 (2013), KDB 393764	Test Date(s):	1/27/2022
Configuration:	1		
Test Setup (for Band Edge):	The EUT is placed on non-conducted table. It is operated as intended. The test distance of Radiated Emissions (above 1GHz) is 1m.		

Environmental Conditions			
Temperature (ºC)	23.6	Relative Humidity (%):	35

Test Equipment

Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
02113	Horn Antenna	EMC Test Systems	3115	3/11/2021	3/11/2023
P01210	Cable	Andrews	FSJ1P-50A-4A	11/2/2020	11/2/2022
P06902	Cable	Astrolab	32022-29094K-29094K-36TC	8/13/2020	8/13/2022
03302	Cable	Astrolab	32026-29094K-29094K-72TC	1/10/2022	1/10/2024
03713	Preamp	B & Z	01001800-221055-202525	5/24/2021	5/24/2023
02660	Spectrum Analyzer	Agilent	E4446A	12/4/2020	12/4/2022

Band Edge Summary

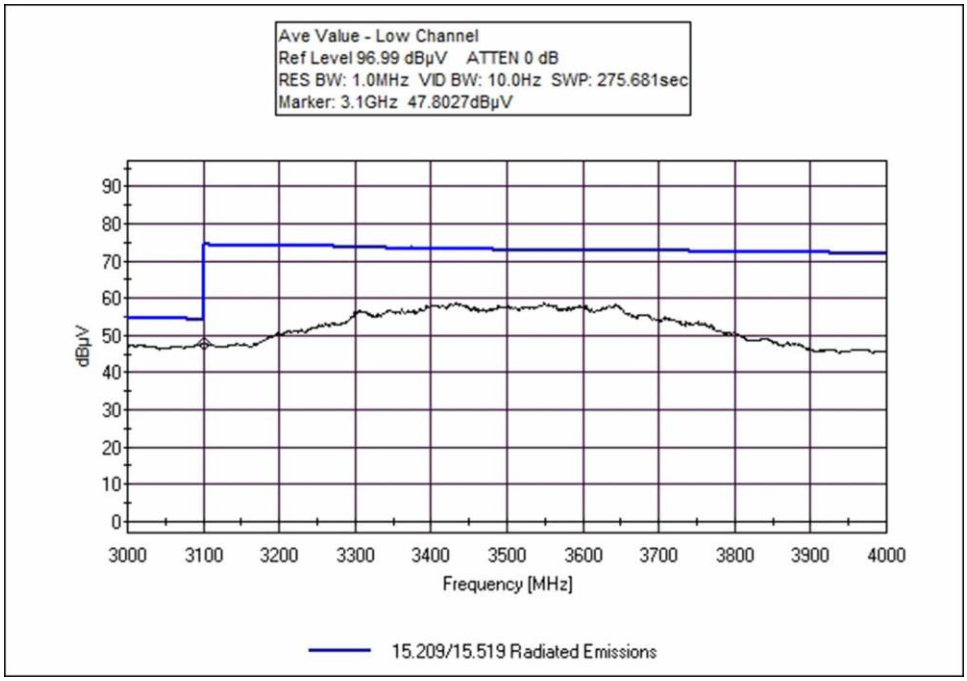
Frequency (MHz)	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
3100	Integral	27.3	<33.9	Pass
10600	integral	31.5	<33.9	Pass

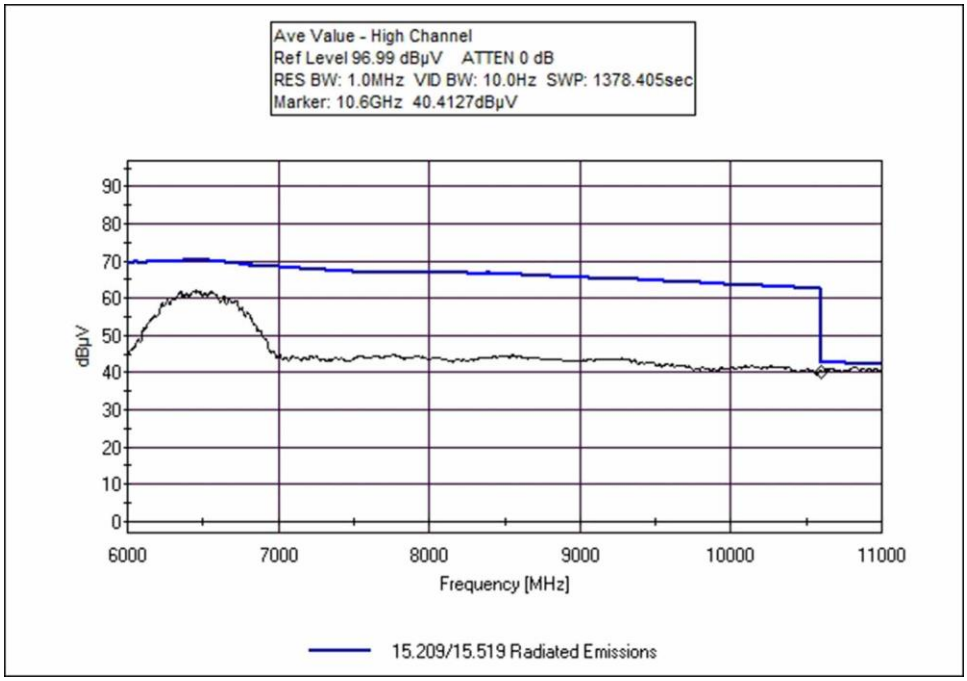
Test Limit

Frequency (MHz)	EIRP (dBm)	Field Strength (dBuV/m @3m)	RBW (MHz)	Distance (m)
Below 960	NA	NA	NA	NA
960 to 1610	-75.3	19.9	1*	3
1610 to 1990	-63.3	31.9	1*	3
1990 to 3100	-61.3	33.9	1*	3
3100 to 10600	-41.3	53.9	1*	3
Above 10600	-61.3	33.9	1*	3

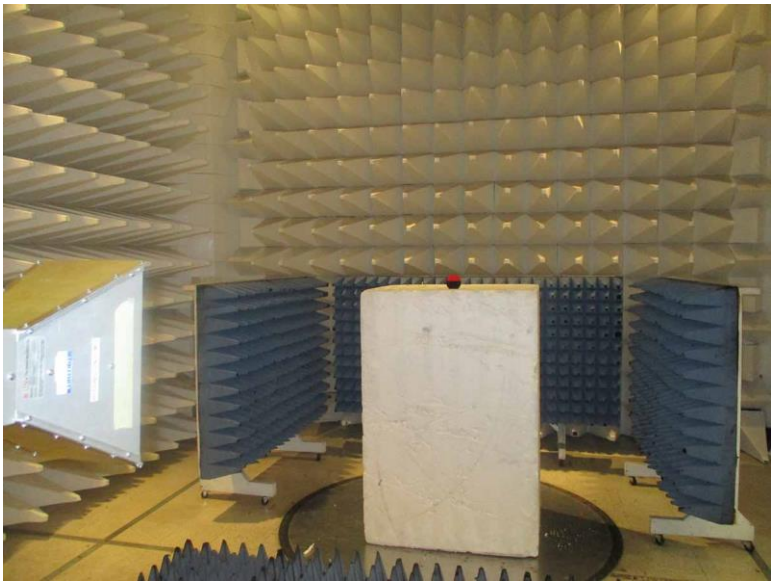
Note:
*VBW > 3x RBW
NA = Follow 15.209 Limit
As FCC 47 CFR Part 15 subpart F: 15.503 k at 3 meters distance:
E (dBuV/m) = EIRP (dBm) + 95.2

Band Edge Plots

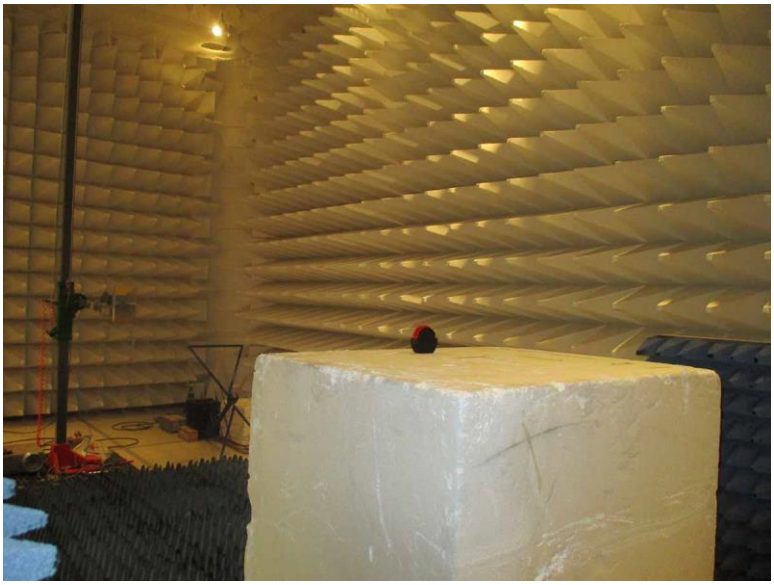




Test Setup Photo(s)



Front View



Back View

15.519 (d) Radiated Emissions in GPS Bands

Test Limit				
Frequency (MHz)	EIRP (dBm)	Field Strength (dBuV/m @3m)	RBW (kHz)	Distance (m)
1164-1240	-85	9.9*	1*	3
1559-1610	-85	9.9*	1*	3

Note:
*VBW > 3x RBW
As FCC 47 CFR Part 15 subpart F: 15.503 k at 3 meters distance:
E (dBuV/m) = EIRP (dBm) + 95.2

Test Setup / Conditions / Data

Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170
Customer: **Namatad, Inc**
Specification: **15.209/15.519 Radiated Emissions**
Work Order #: **105828** Date: 1/24/2022
Test Type: **Radiated Scan** Time: 15:46:46
Tested By: Hoang Cao 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:

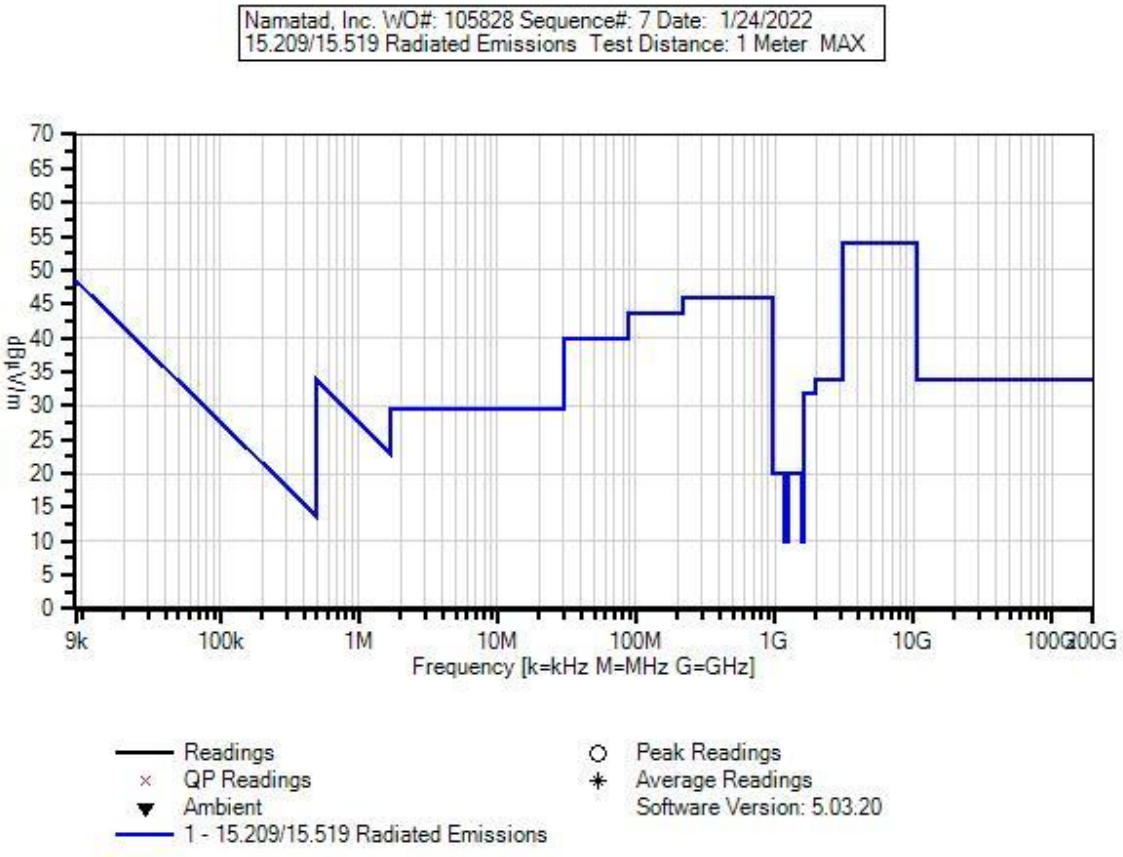
Radiated Emissions - GPS Band
Frequency Range: 1164MHz to 1240MHz

Environmental Conditions:
Temperature: 20.7°C
Humidity: 37%
Atmospheric Pressure: 101.8kPa

The EUT is set up as intended.
It is set up on the table height 150cm.

Low Channel

Note:
Y-axis is the worst case.



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP01210	Cable	FSJ1P-50A-4A	11/2/2020	11/2/2022
T2	AN02113	Horn Antenna-ANSI C63.5	3115	3/11/2021	3/11/2023
T3	ANP06902	Cable	32022-29094K-29094K-36TC	8/13/2020	8/13/2022
T4	AN03302	Cable	32026-29094K-29094K-72TC	1/10/2022	1/10/2024
	AN02660	Spectrum Analyzer	E4446A	12/4/2020	12/4/2022
T5	AN03713	Preamp	01001800-221055-202525	5/24/2021	5/24/2023

Measurement Data: Reading listed by margin. Test Distance: 1 Meter

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	1225.078M	33.4	+1.8 -55.3	+25.0	+0.6	+1.0	-9.5	-3.0	9.9	-12.9	Vert
2	1179.985M	33.4	+1.8 -55.2	+24.8	+0.6	+1.0	-9.5	-3.1	9.9	-13.0	Horiz
3	1217.891M	32.6	+1.8 -55.3	+24.9	+0.6	+1.0	-9.5	-3.9	9.9	-13.8	Horiz
4	1195.061M	32.4	+1.8 -55.3	+24.9	+0.6	+1.0	-9.5	-4.1	9.9	-14.0	Horiz
5	1230.556M	32.1	+1.8 -55.3	+25.0	+0.6	+1.0	-9.5	-4.3	9.9	-14.2	Vert
6	1237.089M	32.1	+1.8 -55.3	+25.0	+0.6	+1.0	-9.5	-4.3	9.9	-14.2	Vert
7	1235.906M	32.0	+1.8 -55.3	+25.0	+0.6	+1.0	-9.5	-4.4	9.9	-14.3	Horiz

Test Location:	CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170		
Customer:	**Namatad, Inc.**		
Specification:	**15.209/15.519 Radiated Emissions**		
Work Order #:	**105828**	Date:	1/24/2022
Test Type:	**Radiated Scan**	Time:	16:21:19
Tested By:	Hoang Cao	Sequence#:	10
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:

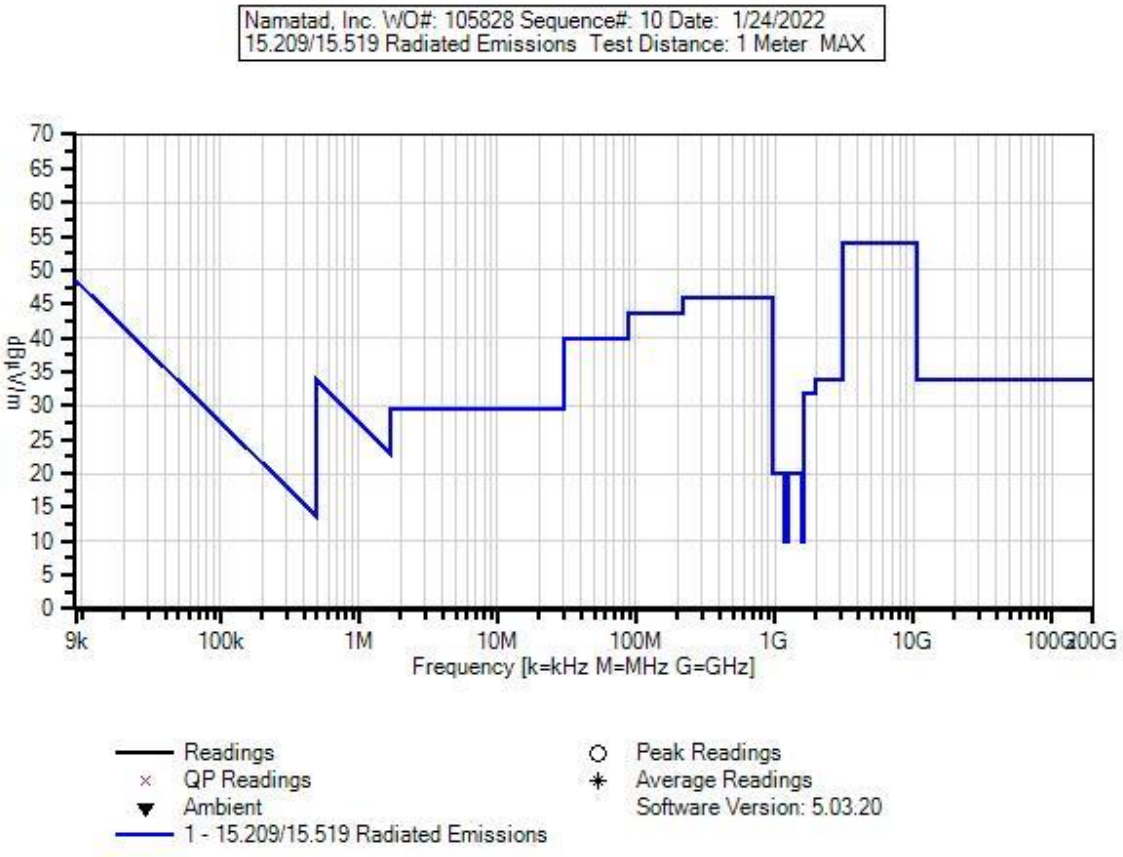
Radiated Emissions - GPS Band
Frequency Range: 1164MHz to 1240MHz

Environmental Conditions:
Temperature: 20.7°C
Humidity: 37%
Atmospheric Pressure: 101.8kPa

The EUT is set up as intended.
It is set up on the table height 150cm.

Middle Channel

Note:
Y-axis is the worst case.



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP01210	Cable	FSJ1P-50A-4A	11/2/2020	11/2/2022
T2	AN02113	Horn Antenna-ANSI C63.5	3115	3/11/2021	3/11/2023
T3	ANP06902	Cable	32022-29094K-29094K-36TC	8/13/2020	8/13/2022
T4	AN03302	Cable	32026-29094K-29094K-72TC	1/10/2022	1/10/2024
	AN02660	Spectrum Analyzer	E4446A	12/4/2020	12/4/2022
T5	AN03713	Preamp	01001800-221055-202525	5/24/2021	5/24/2023

Measurement Data: Reading listed by margin. Test Distance: 1 Meter

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	1180.008M	34.4	+1.8 -55.2	+24.8	+0.6	+1.0	-9.5	-2.1	9.9	-12.0	Horiz
2	1220.005M	34.1	+1.8 -55.3	+24.9	+0.6	+1.0	-9.5	-2.4	9.9	-12.3	Horiz
3	1180.026M	33.8	+1.8 -55.2	+24.8	+0.6	+1.0	-9.5	-2.7	9.9	-12.6	Horiz
4	1203.978M	33.1	+1.8 -55.3	+24.9	+0.6	+1.0	-9.5	-3.4	9.9	-13.3	Horiz
5	1239.120M	32.6	+1.8 -55.3	+25.0	+0.6	+1.0	-9.5	-3.8	9.9	-13.7	Horiz
6	1198.486M	32.6	+1.8 -55.3	+24.9	+0.6	+1.0	-9.5	-3.9	9.9	-13.8	Vert
7	1234.424M	32.0	+1.8 -55.3	+25.0	+0.6	+1.0	-9.5	-4.4	9.9	-14.3	Vert

Test Location:	CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170		
Customer:	**Namatad, Inc.**		
Specification:	**15.209/15.519 Radiated Emissions**		
Work Order #:	**105828**	Date:	1/24/2022
Test Type:	**Radiated Scan**	Time:	16:48:30
Tested By:	Hoang Cao	Sequence#:	13
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:

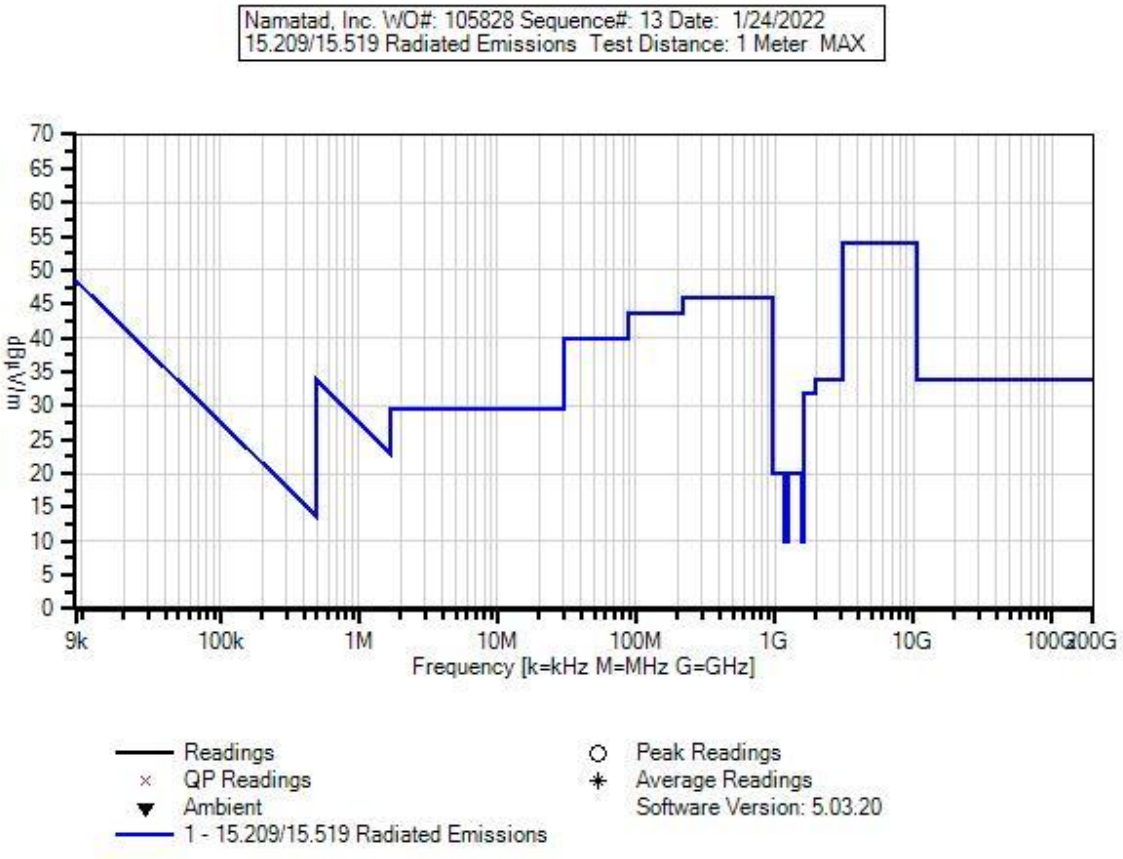
Radiated Emissions - GPS Band
Frequency Range: 1164MHz to 1240MHz

Environmental Conditions:
Temperature: 20.7°C
Humidity: 37%
Atmospheric Pressure: 101.8kPa

The EUT is set up as intended.
It is set up on the table height 150cm.

High Channel

Note:
Y-axis is the worst case.



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP01210	Cable	FSJ1P-50A-4A	11/2/2020	11/2/2022
T2	AN02113	Horn Antenna-ANSI C63.5	3115	3/11/2021	3/11/2023
T3	ANP06902	Cable	32022-29094K-29094K-36TC	8/13/2020	8/13/2022
T4	AN03302	Cable	32026-29094K-29094K-72TC	1/10/2022	1/10/2024
	AN02660	Spectrum Analyzer	E4446A	12/4/2020	12/4/2022
T5	AN03713	Preamp	01001800-221055-202525	5/24/2021	5/24/2023

Measurement Data: Reading listed by margin. Test Distance: 1 Meter

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	1180.052M	34.4	+1.8 -55.2	+24.8	+0.6	+1.0	-9.5	-2.1	9.9	-12.0	Horiz
2	1229.806M	34.1	+1.8 -55.3	+25.0	+0.6	+1.0	-9.5	-2.3	9.9	-12.2	Horiz
3	1219.959M	34.1	+1.8 -55.3	+24.9	+0.6	+1.0	-9.5	-2.4	9.9	-12.3	Horiz
4	1231.057M	33.2	+1.8 -55.3	+25.0	+0.6	+1.0	-9.5	-3.2	9.9	-13.1	Vert
5	1220.007M	33.2	+1.8 -55.3	+24.9	+0.6	+1.0	-9.5	-3.3	9.9	-13.2	Horiz
6	1239.025M	32.9	+1.8 -55.3	+25.0	+0.6	+1.0	-9.5	-3.5	9.9	-13.4	Vert
7	1205.561M	32.9	+1.8 -55.3	+24.9	+0.6	+1.0	-9.5	-3.6	9.9	-13.5	Horiz

Test Location:	CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170		
Customer:	**Namatad, Inc.**		
Specification:	**15.209/15.519 Radiated Emissions**		
Work Order #:	**105828**	Date:	1/31/2022
Test Type:	**Radiated Scan**	Time:	09:04:50
Tested By:	Hoang Cao	Sequence#:	22
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:

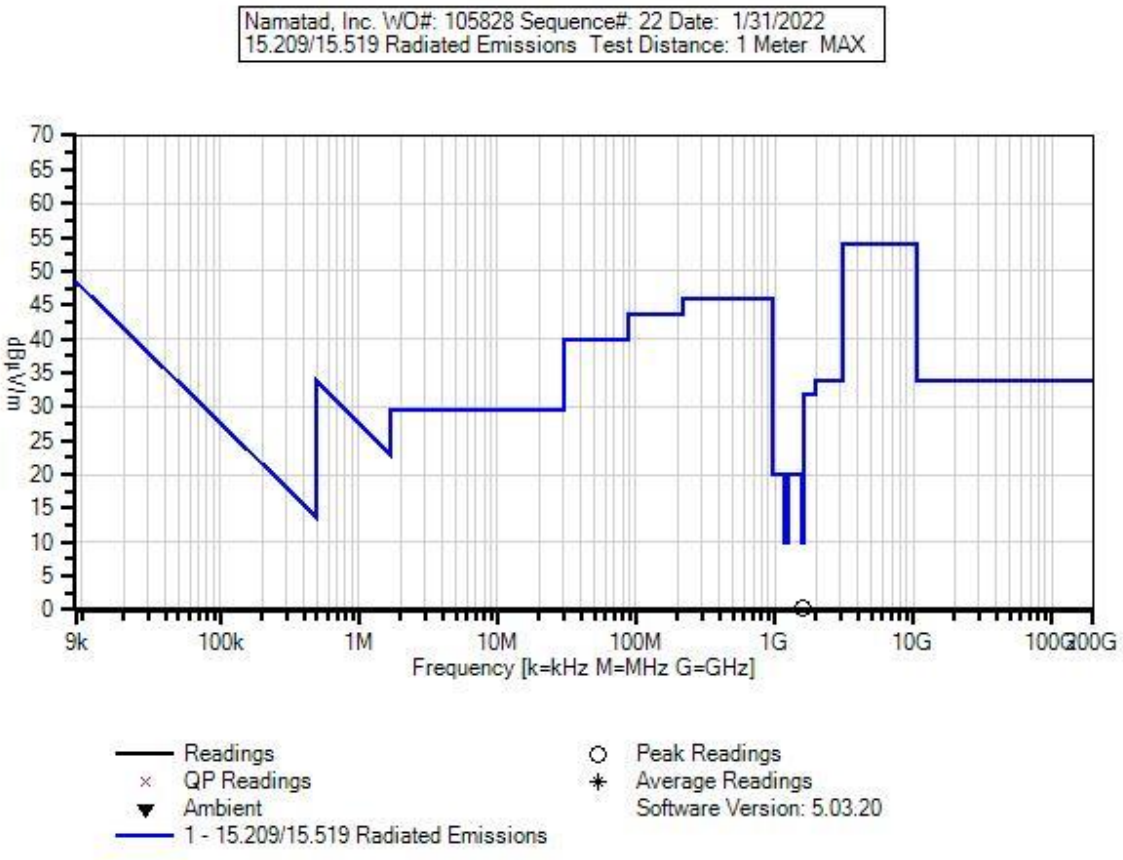
Radiated Emissions - GPS Band
Frequency Range: 1559MHz to 1610MHz

Environmental Conditions:
Temperature: 20.8°C
Humidity: 37%
Atmospheric Pressure: 102.2kPa

The EUT is set up as intended.
It is set up on the table height 150cm.

Low Channel

Note:
Y-axis is the worst case.



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP01210	Cable	FSJ1P-50A-4A	11/2/2020	11/2/2022
T2	AN02113	Horn Antenna-ANSI C63.5	3115	3/11/2021	3/11/2023
T3	ANP06902	Cable	32022-29094K-29094K-36TC	8/13/2020	8/13/2022
T4	AN03302	Cable	32026-29094K-29094K-72TC	1/10/2022	1/10/2024
	AN02660	Spectrum Analyzer	E4446A	12/4/2020	12/4/2022
T5	AN03713	Preamp	01001800-221055-202525	5/24/2021	5/24/2023

Measurement Data: Reading listed by margin. Test Distance: 1 Meter

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	1599.995M	35.4	+2.1 -55.3	+25.9	+0.7	+1.1	-9.5	0.4	9.9	-9.5	Horiz
2	1593.588M	33.1	+2.1 -55.3	+25.9	+0.7	+1.1	-9.5	-1.9	9.9	-11.8	Horiz
3	1569.228M	32.1	+2.0 -55.3	+25.8	+0.7	+1.1	-9.5	-3.1	9.9	-13.0	Horiz
4	1609.070M	31.8	+2.1 -55.3	+26.0	+0.7	+1.1	-9.5	-3.1	9.9	-13.0	Horiz
5	1559.233M	32.0	+2.0 -55.3	+25.8	+0.7	+1.1	-9.5	-3.2	9.9	-13.1	Vert
6	1576.368M	31.9	+2.0 -55.3	+25.8	+0.7	+1.1	-9.5	-3.3	9.9	-13.2	Vert
7	1560.122M	31.8	+2.0 -55.3	+25.8	+0.7	+1.1	-9.5	-3.4	9.9	-13.3	Vert

Test Location:	CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170		
Customer:	**Namatad, Inc.**		
Specification:	**15.209/15.519 Radiated Emissions**		
Work Order #:	**105828**	Date:	1/31/2022
Test Type:	**Radiated Scan**	Time:	09:30:04
Tested By:	Hoang Cao	Sequence#:	25
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:

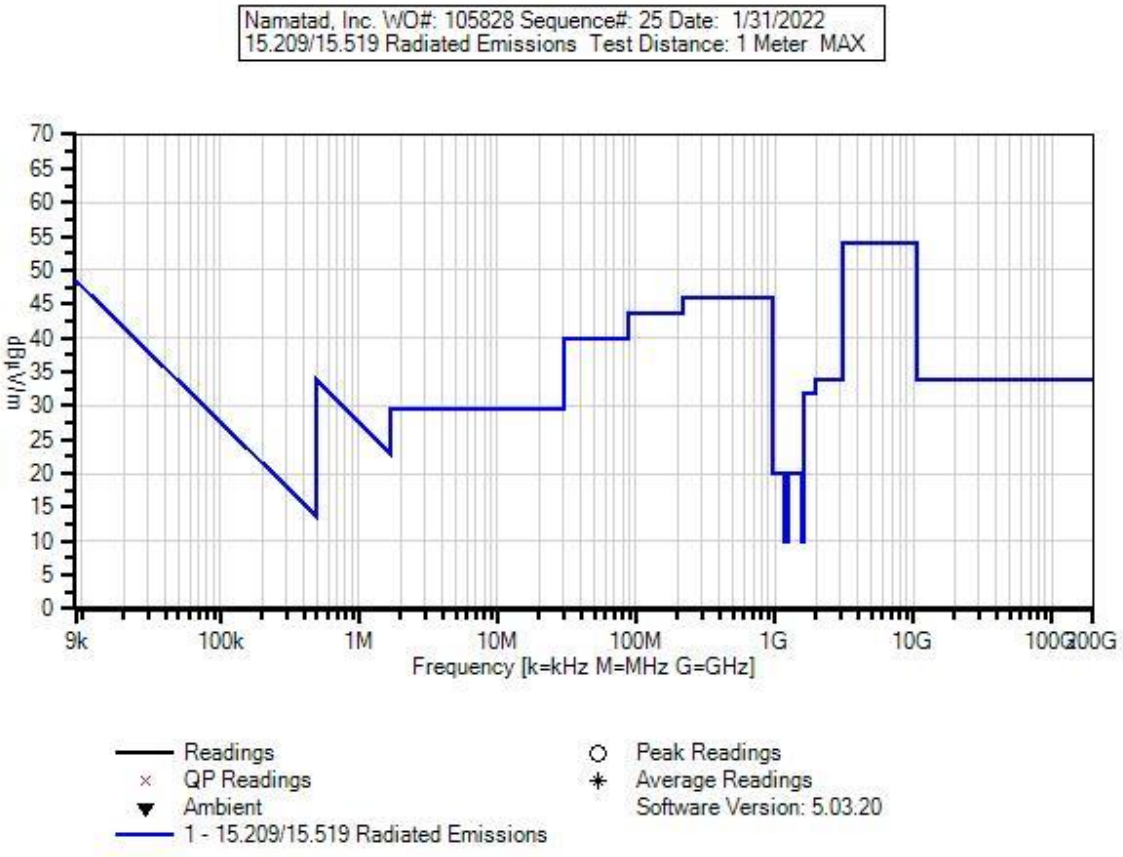
Radiated Emissions - GPS Band
Frequency Range: 1559MHz to 1610MHz

Environmental Conditions:
Temperature: 20.8°C
Humidity: 37%
Atmospheric Pressure: 102.2kPa

The EUT is set up as intended.
It is set up on the table height 150cm.

Middle Channel

Note:
Y-axis is the worst case.



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP01210	Cable	FSJ1P-50A-4A	11/2/2020	11/2/2022
T2	AN02113	Horn Antenna-ANSI C63.5	3115	3/11/2021	3/11/2023
T3	ANP06902	Cable	32022-29094K-29094K-36TC	8/13/2020	8/13/2022
T4	AN03302	Cable	32026-29094K-29094K-72TC	1/10/2022	1/10/2024
	AN02660	Spectrum Analyzer	E4446A	12/4/2020	12/4/2022
T5	AN03713	Preamp	01001800-221055-202525	5/24/2021	5/24/2023

Measurement Data: Reading listed by margin. Test Distance: 1 Meter

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	1574.385M	35.0	+2.0 -55.3	+25.8	+0.7	+1.1	-9.5	-0.2	9.9	-10.1	Horiz
2	1599.993M	33.8	+2.1 -55.3	+25.9	+0.7	+1.1	-9.5	-1.2	9.9	-11.1	Horiz
3	1559.701M	32.6	+2.0 -55.3	+25.8	+0.7	+1.1	-9.5	-2.6	9.9	-12.5	Vert
4	1564.772M	32.6	+2.0 -55.3	+25.8	+0.7	+1.1	-9.5	-2.6	9.9	-12.5	Vert
5	1609.696M	32.2	+2.1 -55.3	+26.0	+0.7	+1.1	-9.5	-2.7	9.9	-12.6	Horiz
6	1591.729M	32.1	+2.1 -55.3	+25.9	+0.7	+1.1	-9.5	-2.9	9.9	-12.8	Horiz
7	1601.025M	32.0	+2.1 -55.3	+25.9	+0.7	+1.1	-9.5	-3.0	9.9	-12.9	Vert

Test Location:	CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170		
Customer:	**Namatad, Inc.**		
Specification:	**15.209/15.519 Radiated Emissions**		
Work Order #:	**105828**	Date:	1/31/2022
Test Type:	**Radiated Scan**	Time:	10:15:51
Tested By:	Hoang Cao	Sequence#:	28
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:

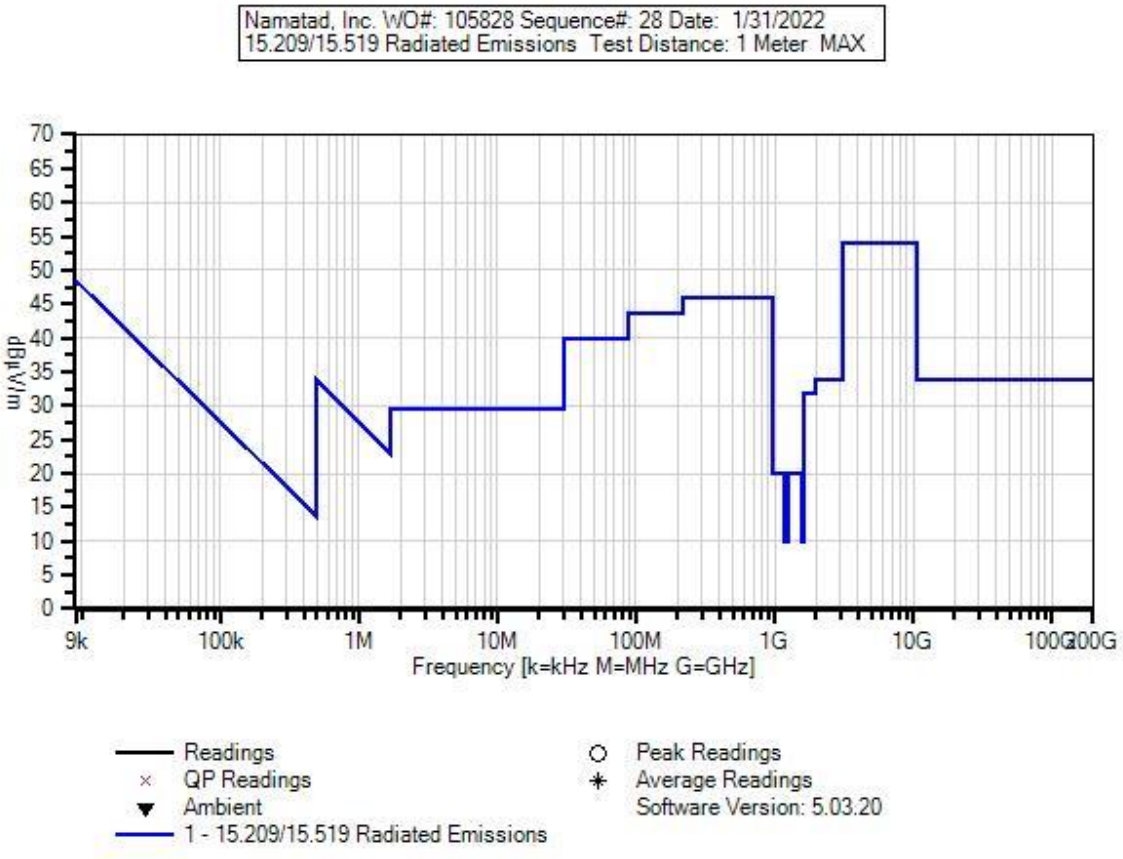
Radiated Emissions - GPS Band
Frequency Range: 1559MHz to 1610MHz

Environmental Conditions:
Temperature: 20.8°C
Humidity: 37%
Atmospheric Pressure: 102.2kPa

The EUT is set up as intended.
It is set up on the table height 150cm.

High Channel

Note:
Y-axis is the worst case.



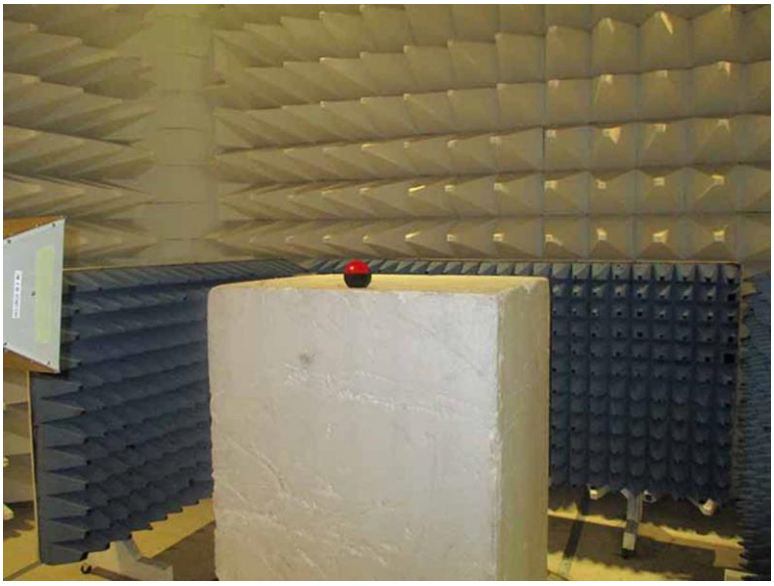
Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP01210	Cable	FSJ1P-50A-4A	11/2/2020	11/2/2022
T2	AN02113	Horn Antenna-ANSI C63.5	3115	3/11/2021	3/11/2023
T3	ANP06902	Cable	32022-29094K-29094K-36TC	8/13/2020	8/13/2022
T4	AN03302	Cable	32026-29094K-29094K-72TC	1/10/2022	1/10/2024
	AN02660	Spectrum Analyzer	E4446A	12/4/2020	12/4/2022
T5	AN03713	Preamp	01001800-221055-202525	5/24/2021	5/24/2023

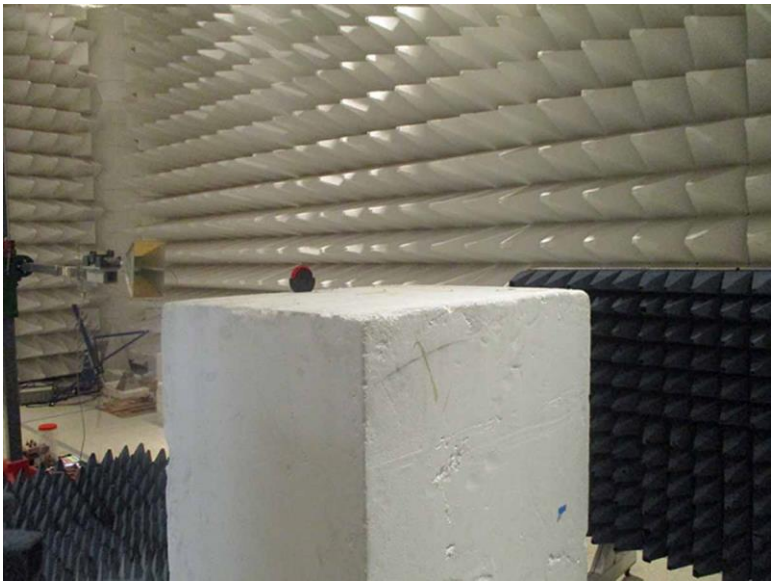
Measurement Data: Reading listed by margin. Test Distance: 1 Meter

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	1599.994M	33.7	+2.1 -55.3	+25.9	+0.7	+1.1	-9.5	-1.3	9.9	-11.2	Horiz
2	1565.318M	33.2	+2.0 -55.3	+25.8	+0.7	+1.1	-9.5	-2.0	9.9	-11.9	Horiz
3	1573.973M	32.2	+2.0 -55.3	+25.8	+0.7	+1.1	-9.5	-3.0	9.9	-12.9	Horiz
4	1609.202M	31.5	+2.1 -55.3	+26.0	+0.7	+1.1	-9.5	-3.4	9.9	-13.3	Vert
5	1600.134M	31.6	+2.1 -55.3	+25.9	+0.7	+1.1	-9.5	-3.4	9.9	-13.3	Vert
6	1602.786M	31.5	+2.1 -55.3	+25.9	+0.7	+1.1	-9.5	-3.5	9.9	-13.4	Vert

Test Setup Photo(s)



Front View



Back View

15.519 (e) Peak EIRP Fundamental

Test Setup/Conditions			
Test Location:	Fremont Lab C3	Test Engineer:	Hoang Cao
Test Method:	ANSI C63.10 (2013), KDB 393764	Test Date(s):	1/10/2022
Configuration:	1		
Test Setup:	The EUT is placed on non-conducted table. It is operated as intended RBW = 8MHz VBW = 50MHz		

Environmental Conditions			
Temperature (ºC)	21.8	Relative Humidity (%):	37

Test Equipment

Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
02113	Horn Antenna	EMC Test Systems	3115	3/11/2021	3/11/2023
P01210	Cable	Andrews	FSJ1P-50A-4A	11/2/2020	11/2/2022
P06902	Cable	Astrolab	32022-29094K-29094K-36TC	8/13/2020	8/13/2022
P07696	Cable	Huber+Suhner	32022-29094K-29094K-72TC	10/5/2020	10/5/2022
02810	Preamp	HP	83051A	4/2/2021	4/2/2023
02660	Spectrum Analyzer	Agilent	E4446A	12/4/2020	12/4/2022

Test Limit

Frequency (MHz)	EIRP (dBm/50MHz)	EIRP (dBm/8MHz)	Field Strength (dBuV/m/8MHz @3m)	RBW (MHz) / VBW (MHz)	Distance (m)
3500	0	-16	79.2	8 / 50	3
4500	0	-16	79.2	8 / 50	3
6500	0	-16	79.2	8 / 50	3

Peak EIRP Fundamental Summary						
Frequency (MHz)	**Polarity**	**Field Strength (dBuV/m/8MHz @3m)****	**Calculated* EIRP (dBm/8MHz)**	**Limit (dBm/8MHz)**	**Margin**	**Results**
3500	Horizontal	70.28	-24.92	< -16	-8.92	Pass
	Vertical	70.11	-25.09	< -16	-9.09	Pass
4500	Horizontal	73.89	-21.31	< -16	-5.31	Pass
	Vertical	76.81	-18.39	< -16	-2.39	Pass
6500	Horizontal	75.11	-20.09	< -16	-4.09	Pass
	Vertical	76.37	-18.83	< -16	-2.83	Pass

*In accordance with FCC 47 CFR Part 15 subpart F: 15.503 k at 3 meters distance:
EIRP (dBm) = E (dBuV/m) - 95.2

**Plots were collected using the dBm display unit on the spectrum analyzer. Correction of 107 was added for proper units of dBuV/m/8MHz @ 3m.

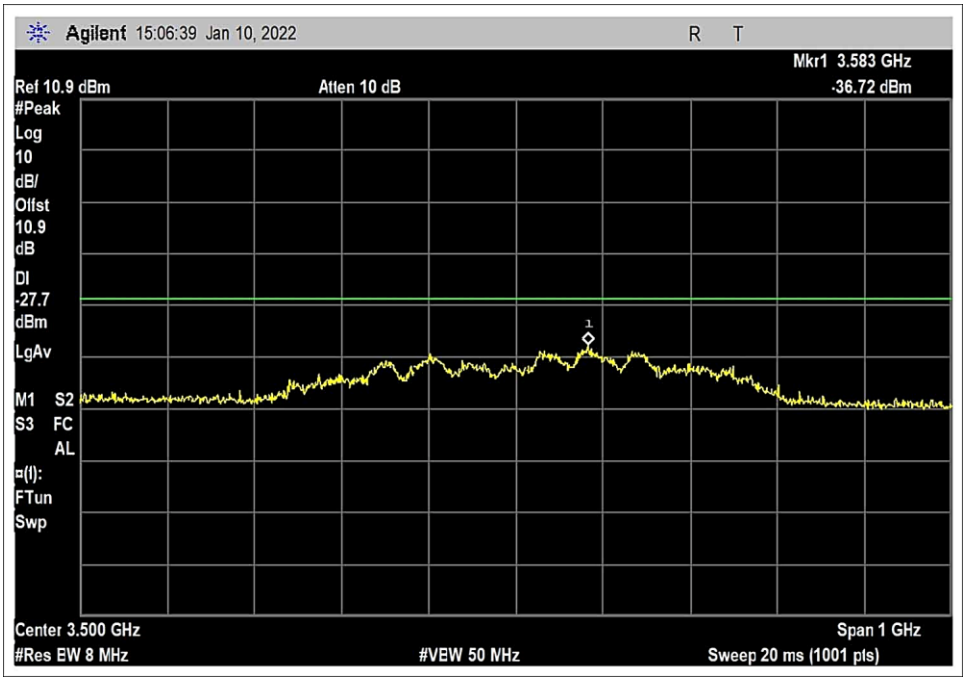
Average EIRP Fundamental Summary						
Frequency (MHz)	**Polarity**	**Measured Field Strength (dBuV/m/MHz @3m)****	**Calculated* EIRP (dBm/MHz)**	**Limit (dBm/MHz)**	**Margin**	**Results**
3500	Horizontal	41.1	-54.1	< -41.3	-12.8	Pass
	Vertical	40.8	-54.4	< -41.3	-13.1	Pass
4500	Horizontal	40.6	-54.6	< -41.3	-13.3	Pass
	Vertical	41.5	-53.7	< -41.3	-12.4	Pass
6500	Horizontal	40.4	-54.8	< -41.3	-13.5	Pass
	Vertical	43.9	-51.3	< -41.3	-10.0	Pass

*In accordance with FCC 47 CFR Part 15 subpart F: 15.503 k at 3 meters distance:
EIRP (dBm) = E (dBuV/m) - 95.2

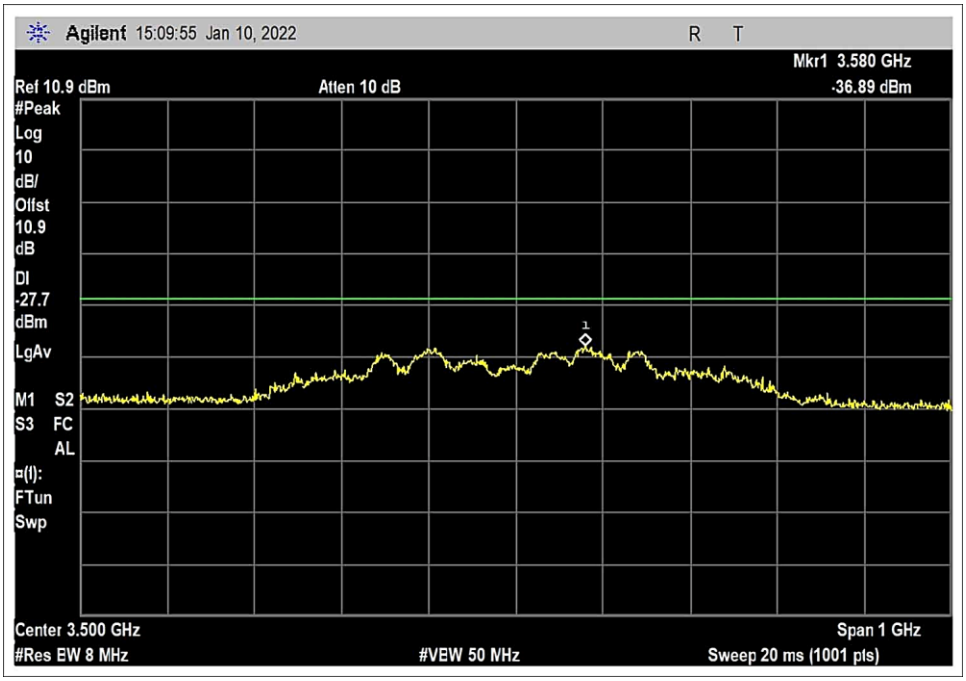
** Reported values utilize peak detector unless otherwise indicated.

Note: For the Average EIRP Fundamental data, refer to the section 15.519 (c) Radiated Emissions and Band Edge section.

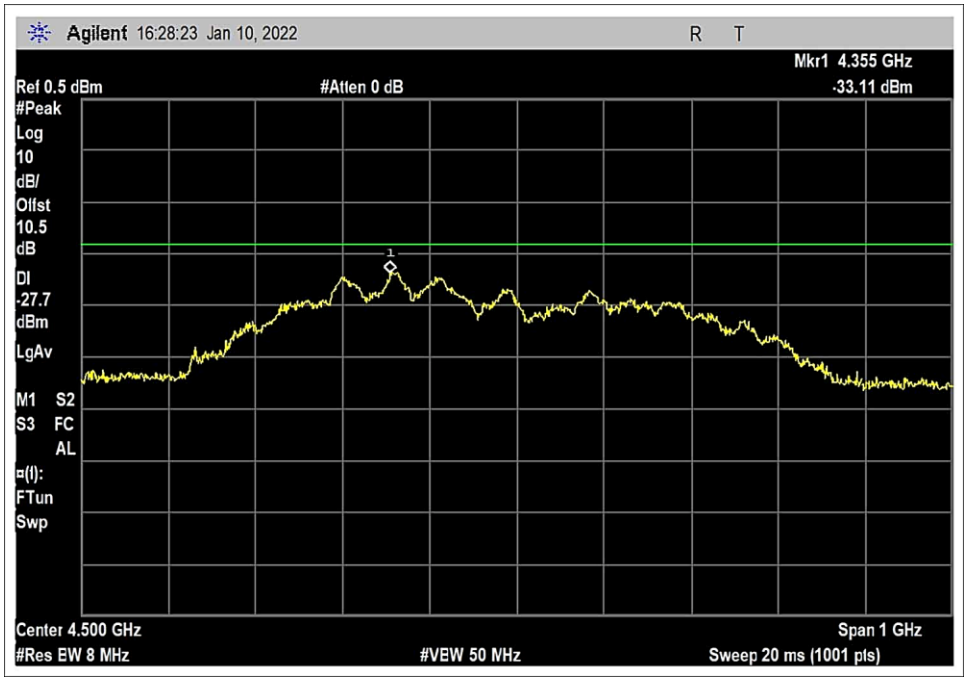
Test Plots



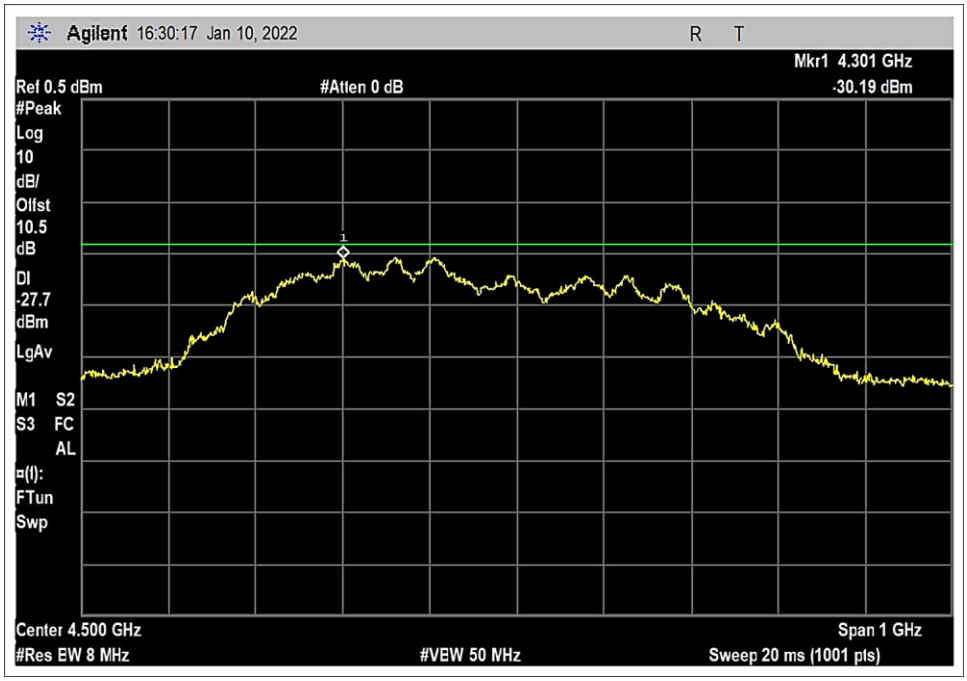
Low Channel Horizontal



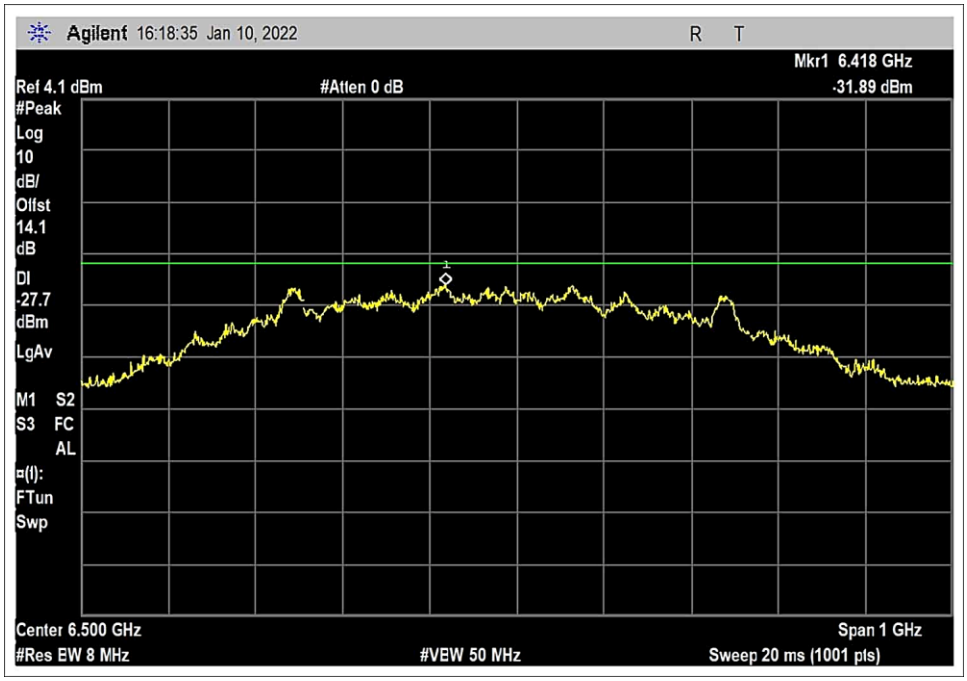
Low Channel Vertical



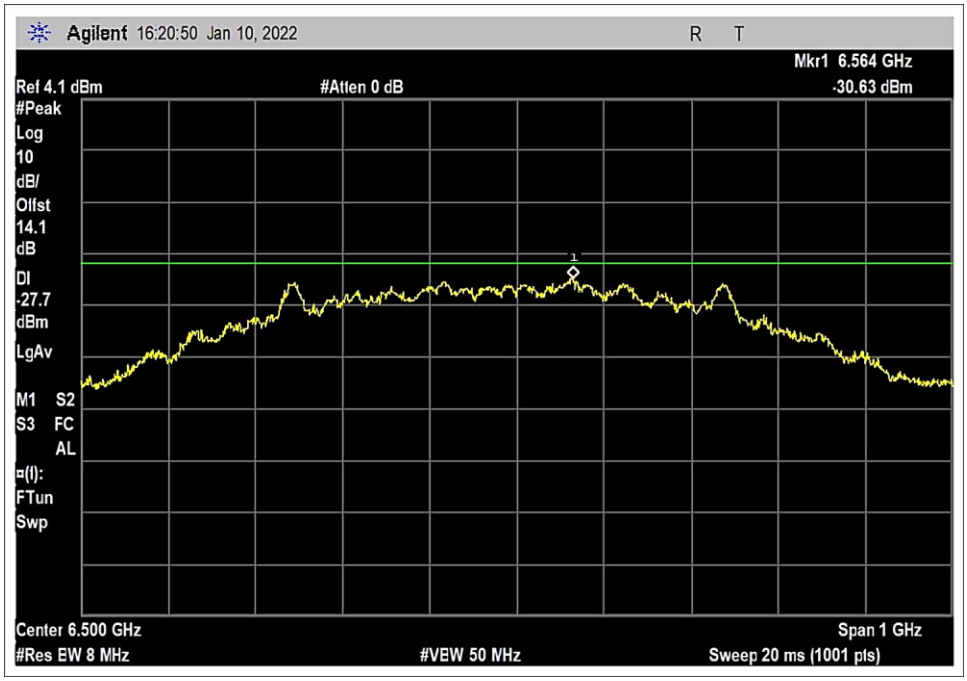
Middle Channel Horizontal



Middle Channel Vertical

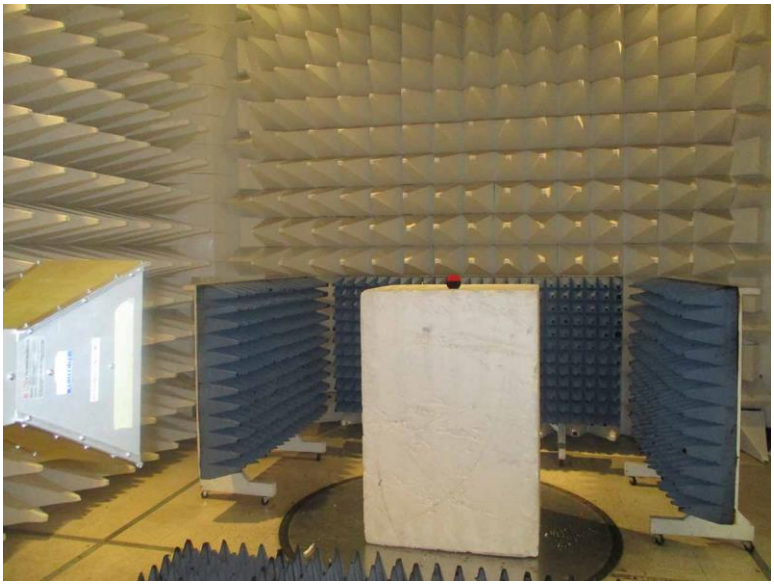


High Channel Horizontal

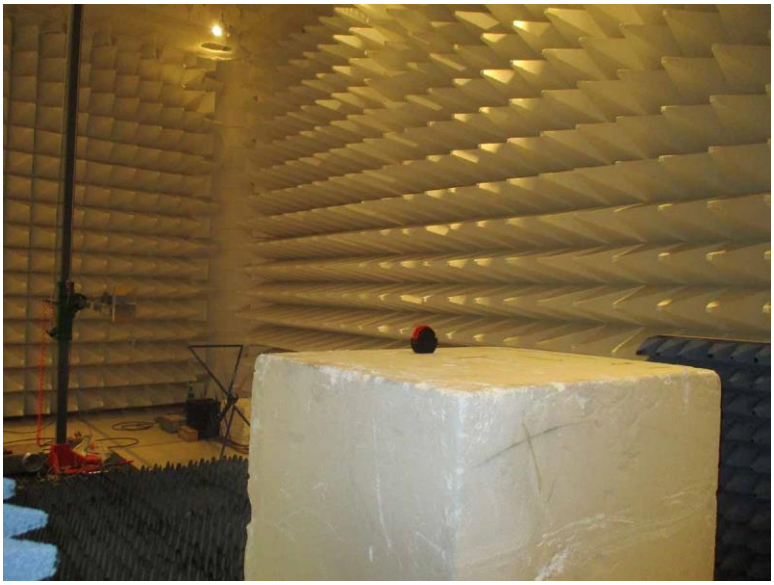


High Channel Vertical

Test Setup Photo(s)



Front View



Back View

SUPPLEMENTAL INFORMATION

Measurement Uncertainty

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

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

Emissions Test Details

TESTING PARAMETERS

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

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

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

CORRECTION FACTORS

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

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

TEST INSTRUMENTATION AND ANALYZER SETTINGS

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

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

SPECTRUM ANALYZER/RECEIVER DETECTOR FUNCTIONS

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

Peak

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

Quasi-Peak

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

Average

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