Venstar, Inc.

TEST REPORT FOR

WiFi Thermostat
Model: OnePlus

Tested to The Following Standards:

FCC Part 15 Subpart C Section(s)

15.207 & 15.247
(DTS 902-928MHz)

Report No.: 106906-7

Date of issue: June 15, 2022

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.

Test Certificate # 803.01

Testing the Future
CKC LABORATORIES, INC.

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ADMINISTRATIVE INFORMATION

Test Report Information

REPORT PREPARED FOR:

Venstar, Inc.
9250 Owensmouth Avenue
Chatsworth, CA 91311

Representative: Alex Garashin

REPORT PREPARED BY:

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

Project Number: 106906

DATE OF EQUIPMENT RECEIPT: May 13, 2022
DATE(S) OF TESTING: May 13 and 18, 2022

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.
110 North Olinda Place
Brea, CA 92823

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 - 15.247 (DTS 902-928MHz)

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	Pass
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

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
WiFi Thermostat	Venstar, Inc.	OnePlus	2111034700

Support Equipment:

Device	Manufacturer	Model #	S/N
Power Supply	Generic	MKA-412400200	NA

Configuration 2

Equipment Tested:

Device	Manufacturer	Model #	S/N
WiFi Thermostat	Venstar, Inc.	OnePlus	2111034701

Support Equipment:

Device	Manufacturer	Model #	S/N
Power Supply	Generic	MKA-412400200	NA

General Product Information:

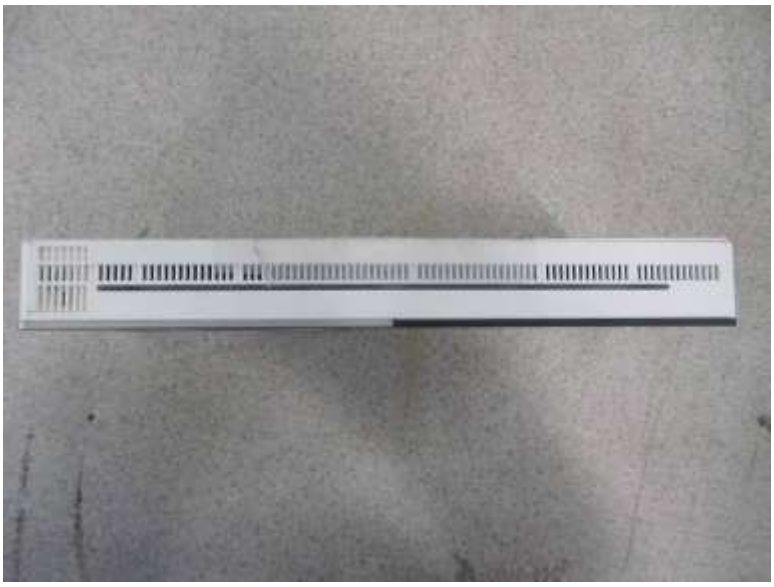
Product Information	Manufacturer-Provided Details
Equipment Type:	Stand-Alone Equipment
Type of Wideband System:	DTS
Operating Frequency Range:	Single channel 915MHz
Modulation Type(s):	2GFSK-DSSS *
Maximum Duty Cycle:	98%
Number of TX Chains:	1
Antenna Type(s) and Gain:	Integral IFA -1.58dBi
Beamforming Type:	NA
Antenna Connection Type:	Integral
Nominal Input Voltage:	24Vac
Firmware / Software used for Test:	Conducted measurement Firmware: Factory Mode, Ver 2.9.1 Radiated measurement Firmware: Factory Mode, Ver 2.9.2
The validity of results is dependent on the stated product details, the accuracy of which the manufacturer assumes full responsibility.	

* In the test sample configuration menu GFSK was selected, however in the firmware Ver 2.9.1, Ver 2.9.2 GFSK was coded as 2GFSK-DSSS

EUT and Accessory Photo(s)

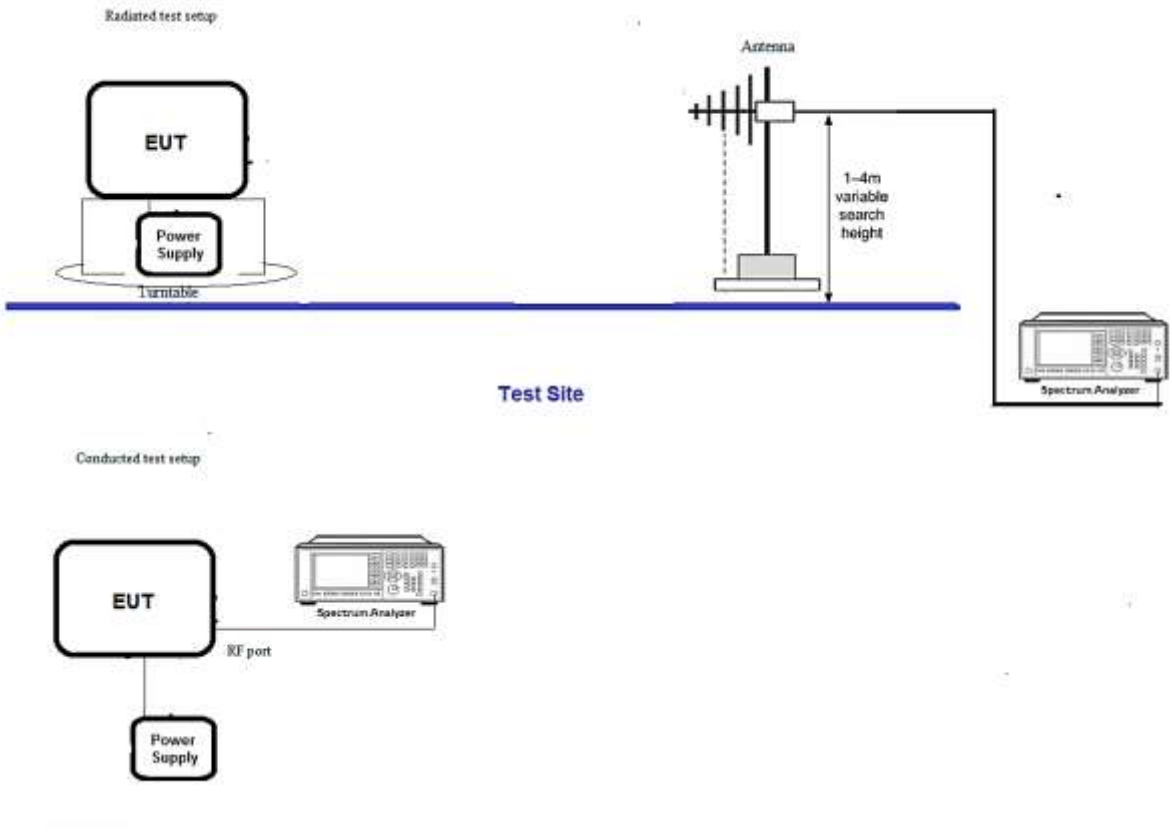
Conducted Unit

Radiated Unit



Support Equipment Photo(s)

Block Diagram of Test Setup(s)



FCC Part 15 Subpart C

15.247(a)(2) 6dB Bandwidth

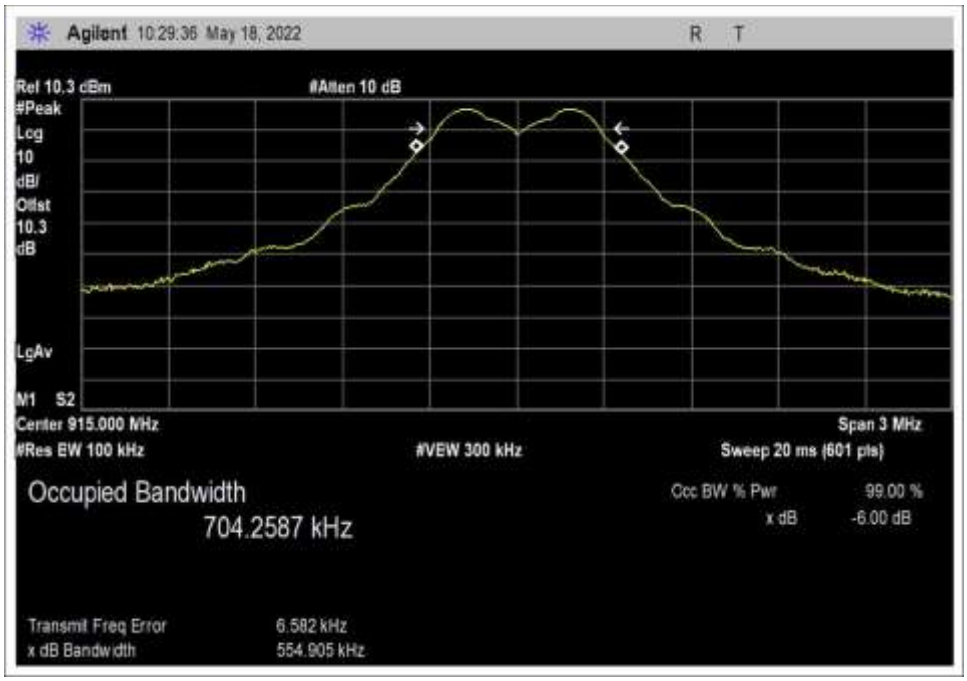
Test Setup/Conditions			
Test Location:	Brea Lab A	Test Engineer:	E. Wong
Test Method:	ANSI C63.10 (2013), KDB 558074	Test Date(s):	5/18/2022
Configuration:	1		
Test Setup:	The EUT is placed on test bench; all data and Aux port are connected to section of unterminated cable. Frequency Range: 902-928MHz TX Frequency: 915MHz 2GFSK-DSSS (setup menu: GFSK selected, however coded as 2GSK-DSSS) , Power setting =8		

Environmental Conditions			
Temperature (ºC)	22	Relative Humidity (%):	25

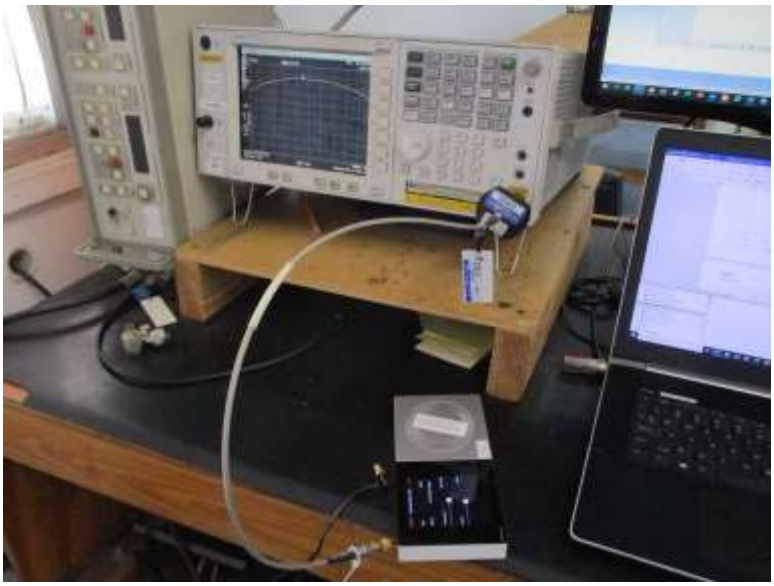
Test Equipment					
Asset#	**Description**	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
02869	Spectrum Analyzer	Agilent	E4440A	8/16/2021	8/16/2022
03430	Attenuator	Aeroflex/Weinschel	75A-10-12	1/14/2022	1/14/2024
07658	Cable	Astrolab, Inc.	32022-29094K-29094K-24TC	7/30/2020	7/30/2022

Test Data Summary					
Frequency (MHz)	**Antenna Port**	**Modulation**	**Measured (kHz)**	**Limit (kHz)**	**Results**
915.0	1	2GFSK-DSSS	554.9	≥500	Pass

Plot(s)



Test Setup Photo(s)



15.247(b)(3) Output Power

Test Setup/Conditions			
Test Location:	Brea Lab A	Test Engineer:	E. Wong, S. Yamamoto
Test Method:	ANSI C63.10 (2013), KDB 558074	Test Date(s):	5/18/2022
Configuration:	1		
Test Setup:	The EUT is placed on test bench; all data and Aux port are connected to section of unterminated cable. Frequency Range: 902-928MHz TX Frequency: 915.0MHz 2GFSK-DSSS (setup menu: GFSK selected, however coded as 2GSK-DSSS) , Power setting =8		

Environmental Conditions			
Temperature (ºC)	22	Relative Humidity (%):	25

Test Equipment					
Asset#	**Description**	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
02869	Spectrum Analyzer	Agilent	E4440A	8/16/2021	8/16/2022
03430	Attenuator	Aeroflex/Weinschel	75A-10-12	1/14/2022	1/14/2024
07658	Cable	Astrolab, Inc.	32022-29094K-29094K-24TC	7/30/2020	7/30/2022
07164	Multimeter	Fluke	8845A/G	8/13/2021	8/13/2023
03759	AC Power Supply	GoHz	HZ-60-1005	8/5/2021	8/5/2022

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)**
915.0	2GFSK-DSSS / 1	7.8	7.8	7.8	0

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

Parameter Definitions:

Measurements performed at input voltage Vnominal ± 15%.

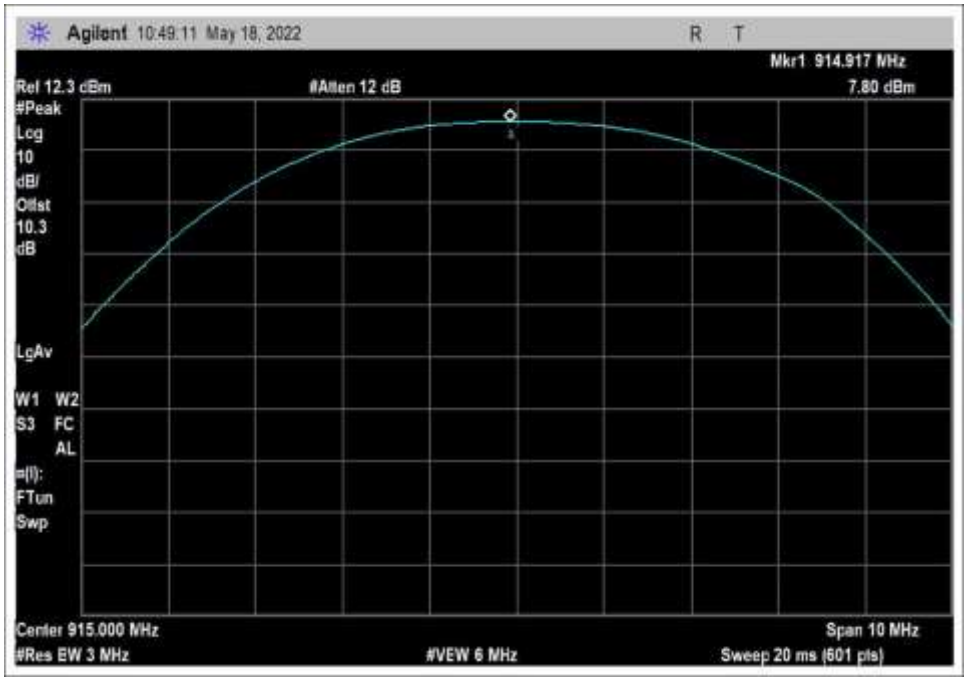
Parameter	Value
$V_{Nominal}$:	24.0
$V_{Minimum}$:	20.4
$V_{Maximum}$:	27.6

Test Data Summary - RF Conducted Measurement

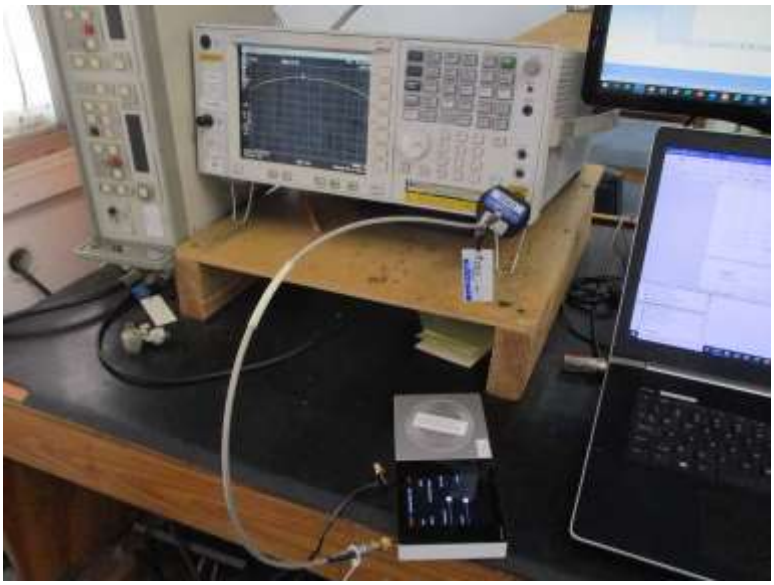
Measurement Option: RBW > DTS Bandwidth

Frequency (MHz)	Modulation	Ant. Type / Gain (dBi)	Measured (dBm)	Limit (dBm)	Results
915.0	2GFSK-DSSS	Integral IFA / -1.58	7.8	≤ 30	Pass

Plot(s)



Test Setup Photo(s)



RF Conducted Measurement

Voltage Variation

15.247(d) RF Conducted Emissions & Band Edge

Test Setup / Conditions / Data

Test Location:	CKC Laboratories, Inc • 110 N. Olinda Place • Brea, CA 92823 • (714) 993-6112		
Customer:	**Venstar, Inc.**		
Specification:	**15.247(d) Conducted Spurious Emissions**		
Work Order #:	**106906**	Date:	5/18/2022
Test Type:	**Conducted Emissions**	Time:	11:28:18
Tested By:	E. Wong	Sequence#:	4
Software:	EMITest 5.03.20		24Vac

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

The EUT is placed on test bench.

Frequency Range: 902 - 928MHz
TX Frequency: 915.0MHz

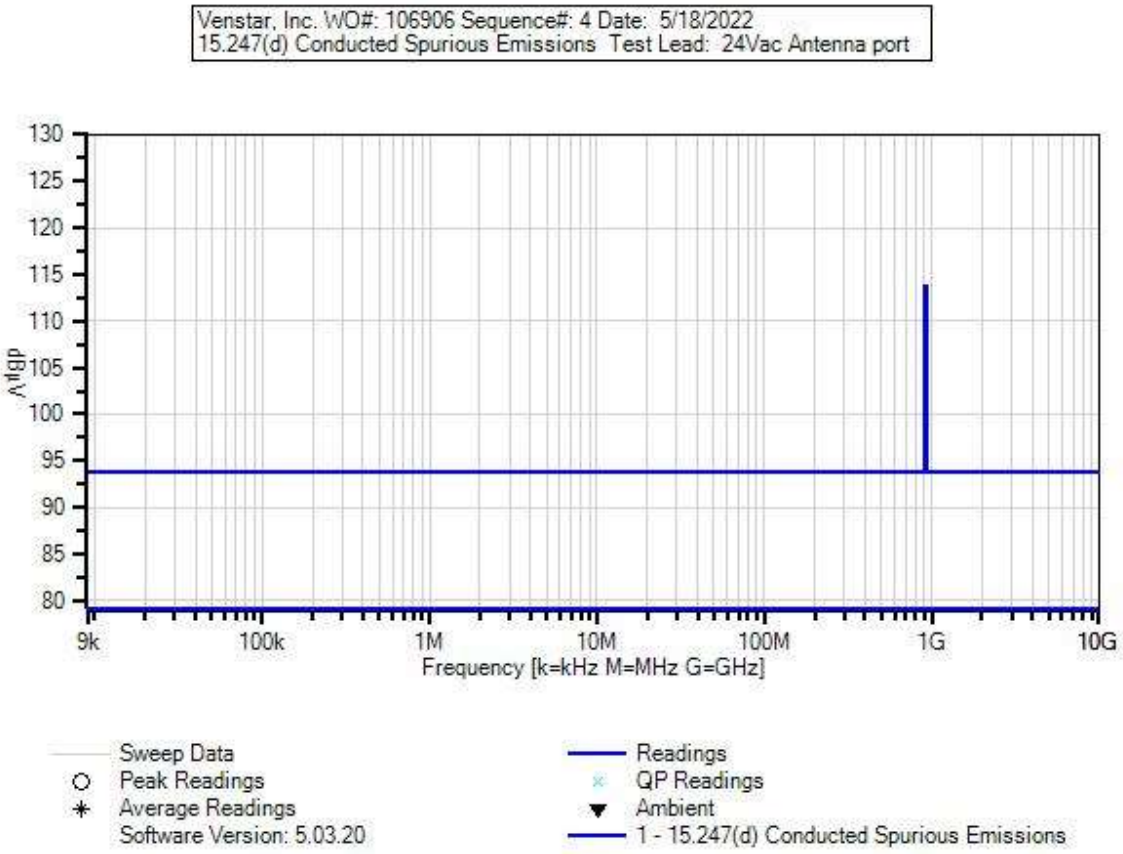
2GFSK-DSSS (setup menu, GFSK selected, however coded as 2GSK-DSSS)
Power Setting = 8dBm

Frequency Range of Measurement = 9kHz - 10GHz.
RBW = 100kHz, VBW = 3000kHz.

Test Environment Conditions:
Temperature:22°C
Humidity:25%
Pressure: 99kPa

Method: ANSI C63.10-2013
Site A

Note: v2.9.1.



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02869	Spectrum Analyzer	E4440A	8/16/2021	8/16/2022
T1	ANP07658	Cable	32022-29094K-29094K-24TC	7/30/2020	7/30/2022
T2	AN03430	Attenuator	75A-10-12	1/14/2022	1/14/2024

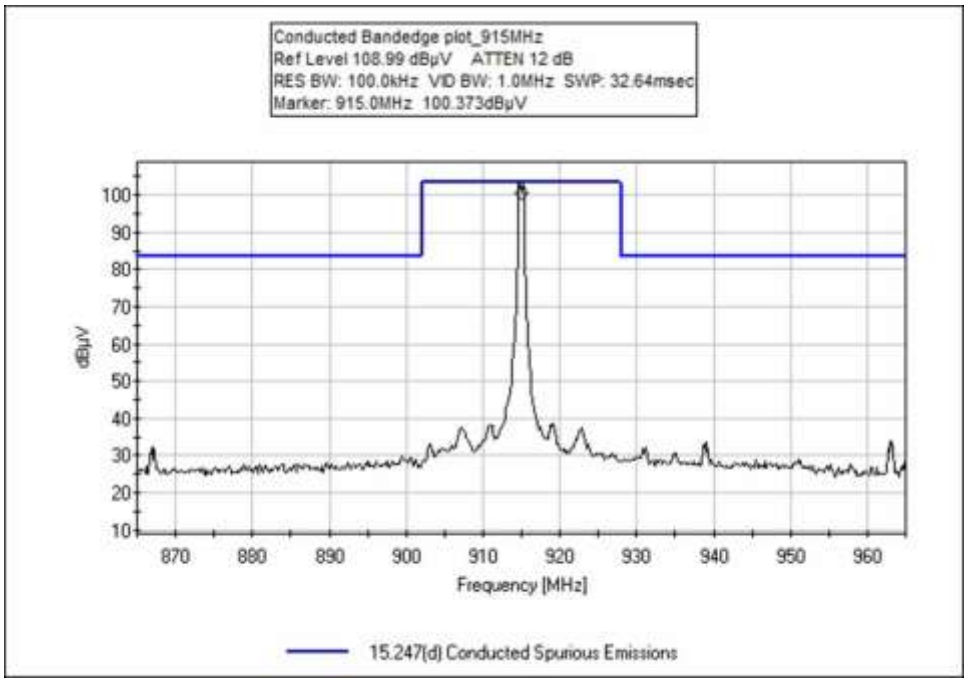
Measurement Data: Reading listed by margin. Test Lead: Antenna port

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	dB	dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	2745.400M	56.1	+0.4	+10.1			+0.0	66.6	93.8	-27.2	Anten
2	3658.800M	52.5	+0.5	+10.1			+0.0	63.1	93.9	-30.8	Anten
3	457.400M	45.5	+0.2	+10.0			+0.0	55.7	93.8	-38.1	Anten
4	1830.400M	43.5	+0.4	+10.1			+0.0	54.0	93.8	-39.8	Anten
5	4573.800M	37.5	+0.6	+10.2			+0.0	48.3	93.9	-45.6	Anten

Band Edge

Band Edge Summary				
Limit applied: Max Power/100kHz - 20dB.				
Frequency (MHz)	**Modulation**	**Measured (dBm)**	**Limit (dBm)**	**Results**
902	2GFSK-DSSS	-70.3	< -13.2	Pass
928	2GFSK-DSSS	-70.3	< -13.2	Pass

Band Edge Plots



Test Setup / Conditions / Data

Test Location:	CKC Laboratories, Inc. • 110 N. Olinda Place • Brea, CA 92823 • (714) 993-6112		
Customer:	**Venstar, Inc.**		
Specification:	**15.247(d) Conducted Spurious Emissions**		
Work Order #:	**106906**	Date:	5/18/2022
Test Type:	**Conducted Emissions**	Time:	11:28:18
Tested By:	E. Wong	Sequence#:	4
Software:	EMITest 5.03.20		24Vac

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

The EUT is placed on test bench.

Frequency Range: 902 - 928MHz
TX Frequency: 915.0MHz

2GFSK-DSSS (setup menu, GFSK selected, however coded as 2GSK-DSSS)
Power Setting = 8dBm

Frequency Range of Measurement = 9kHz - 10GHz.
RBW = 100kHz, VBW = 3000kHz.

Test Environment Conditions:
Temperature: 22°C
Humidity: 25%
Pressure: 99kPa

Method: ANSI C63.10-2013
Site A

Note: v2.9.1.

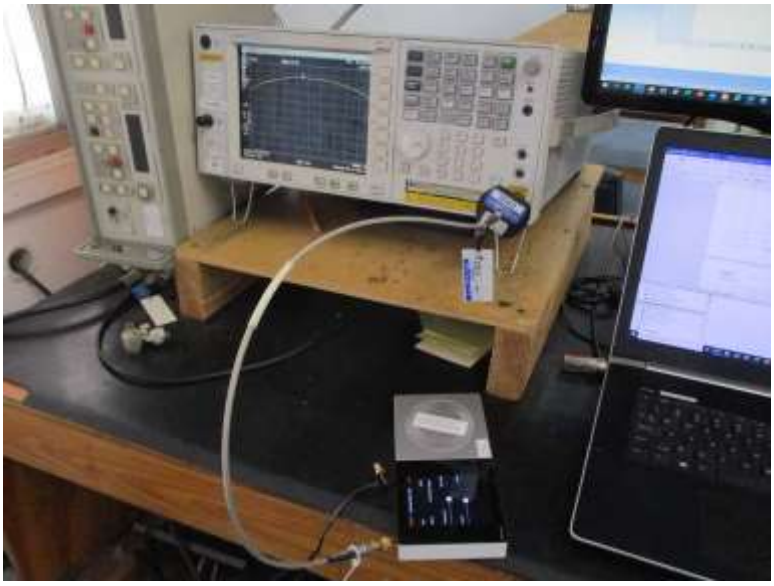
Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02869	Spectrum Analyzer	E4440A	8/16/2021	8/16/2022
T2	ANP07658	Cable	32022-29094K-29094K-24TC	7/30/2020	7/30/2022
T3	AN03430	Attenuator	75A-10-12	1/14/2022	1/14/2024

Measurement Data: Reading listed by margin. Test Lead: Antenna port

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	914.817M	103.5	+0.0	+0.2	+10.1		+0.0	113.8	113.8 Fundamental	+0.0	Anten
2	902.000M	26.4	+0.0	+0.2	+10.1		+0.0	36.7	93.8 bandedge_H	-57.1	Anten
3	928.000M	26.4	+0.0	+0.2	+10.1		+0.0	36.7	93.8 bandedge_L	-57.1	Anten

Test Setup Photo(s)



15.247(d) Radiated Emissions & Band Edge

Test Setup / Conditions / Data

Test Location:	CKC Laboratories, Inc. • 110 N. Olinda Place • Brea, CA 92823 • (714) 993-6112		
Customer:	**Venstar, Inc.**		
Specification:	**15.247(d) / 15.209 Radiated Spurious Emissions**		
Work Order #:	**106906**	Date:	5/18/2022
Test Type:	**Radiated Scan**	Time:	09:03:54
Tested By:	E. Wong	Sequence#:	3
Software:	EMITest 5.03.20		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

Test Conditions / Notes:

The EUT is placed on Styrofoam block, orientated per intended installation; all data and Aux port are connected to section of unterminated cable.

Frequency Range: 902 - 928MHz
TX Frequency: 915.0MHz

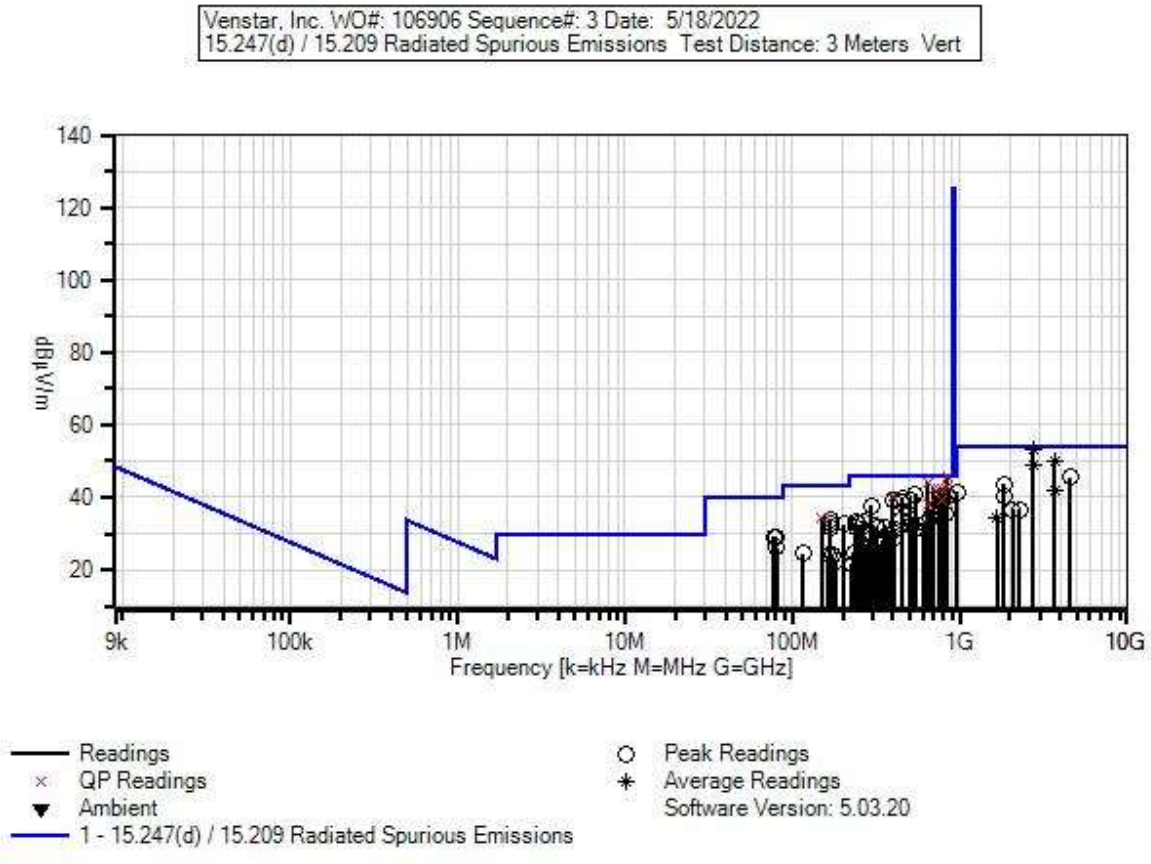
2GFSK-DSSS (setup menu, GFSK selected, however coded as 2GSK-DSSS)
Power Setting = 8dBm

Frequency Range of Measurement = 9kHz - 10GHz.
9kH -150kHz; RBW = 200Hz, VBW = 200Hz; 150kHz - 30MHz; RBW =9kHz, VBW = 9kHz; 30MHz - 1000MHz; RBW = 120kHz, VBW = 120kHz, 1000MHz - 10000 MHz; RBW = 1MHz, VBW = 1MHz

Test Environment Conditions:
Temperature: 21°C
Humidity: 25%
Pressure: 99kPa

Method: ANSI C63.10-2013
Site A

Note: v2.9.2.



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02869	Spectrum Analyzer	E4440A	8/16/2021	8/16/2022
T2	AN01646	Horn Antenna	3115	3/21/2022	3/21/2024
T3	ANP07656	Cable	32022-29094K-29094K-24TC	7/30/2020	7/30/2022
T4	AN00787	Preamp	83017A	6/23/2021	6/23/2023
T5	ANP06360	Cable	L1-PNMNM-48	9/30/2021	9/30/2023
T6	AN02749	High Pass Filter	9SH10-1000/T10000-O/O	7/12/2021	7/12/2023
T7	AN00851	Biconilog Antenna	CBL6111C	4/21/2022	4/21/2024
T8	AN00309	Preamp	8447D	12/13/2021	12/13/2023
T9	ANP05050	Cable	RG223/U	12/24/2020	12/24/2022
T10	ANP05198	Cable-Amplitude +15C to +45C (dB)	8268	12/21/2020	12/21/2022
	AN00314	Loop Antenna	6502	3/29/2022	3/29/2024

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	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	841.495M QP	37.3	+0.0 +0.0 +0.4	+0.0 +0.0 +5.6	+0.0 +29.6	+0.0 -27.2	+0.0	45.7	46.0	-0.3	Horiz
^	841.495M	38.4	+0.0 +0.0 +0.4	+0.0 +0.0 +5.6	+0.0 +29.6	+0.0 -27.2	+0.0	46.8	46.0	+0.8	Horiz
3	2745.550M Ave	58.6	+0.0 +3.4 +0.0	+29.3 +0.6 +0.0	+0.5 +0.0	-39.3 +0.0	+0.0	53.1	54.0	-0.9	Horiz
^	2745.550M	65.1	+0.0 +3.4 +0.0	+29.3 +0.6 +0.0	+0.5 +0.0	-39.3 +0.0	+0.0	59.6	54.0	+5.6	Horiz
5	647.989M QP	39.5	+0.0 +0.0 +0.3	+0.0 +0.0 +4.7	+0.0 +27.1	+0.0 -27.3	+0.0	44.3	46.0	-1.7	Horiz
^	647.989M	40.2	+0.0 +0.0 +0.3	+0.0 +0.0 +4.7	+0.0 +27.1	+0.0 -27.3	+0.0	45.0	46.0	-1.0	Horiz
7	841.500M QP	34.4	+0.0 +0.0 +0.4	+0.0 +0.0 +5.6	+0.0 +29.7	+0.0 -27.2	+0.0	42.9	46.0	-3.1	Vert
^	841.500M	35.2	+0.0 +0.0 +0.4	+0.0 +0.0 +5.6	+0.0 +29.7	+0.0 -27.2	+0.0	43.7	46.0	-2.3	Vert
9	839.978M QP	34.2	+0.0 +0.0 +0.4	+0.0 +0.0 +5.6	+0.0 +29.7	+0.0 -27.2	+0.0	42.7	46.0	-3.3	Horiz
^	839.978M	35.3	+0.0 +0.0 +0.4	+0.0 +0.0 +5.6	+0.0 +29.7	+0.0 -27.2	+0.0	43.8	46.0	-2.2	Horiz
11	695.985M QP	37.6	+0.0 +0.0 +0.3	+0.0 +0.0 +4.9	+0.0 +27.0	+0.0 -27.2	+0.0	42.6	46.0	-3.4	Horiz
^	695.985M	38.4	+0.0 +0.0 +0.3	+0.0 +0.0 +4.9	+0.0 +27.0	+0.0 -27.2	+0.0	43.4	46.0	-2.6	Horiz
13	743.985M QP	35.5	+0.0 +0.0 +0.4	+0.0 +0.0 +5.1	+0.0 +28.6	+0.0 -27.2	+0.0	42.4	46.0	-3.6	Horiz
^	743.985M	36.1	+0.0 +0.0 +0.4	+0.0 +0.0 +5.1	+0.0 +28.6	+0.0 -27.2	+0.0	43.0	46.0	-3.0	Horiz
15	791.985M QP	35.1	+0.0 +0.0 +0.4	+0.0 +0.0 +5.4	+0.0 +28.5	+0.0 -27.2	+0.0	42.2	46.0	-3.8	Horiz

16	3659.250M Ave	53.0	+0.0 +4.0 +0.0	+31.5 +0.4 +0.0	+0.5 +0.0	-39.4 +0.0	+0.0	50.0	54.0	-4.0	Horiz
^	3659.250M	60.3	+0.0 +4.0 +0.0	+31.5 +0.4 +0.0	+0.5 +0.0	-39.4 +0.0	+0.0	57.3	54.0	+3.3	Horiz
18	2744.533M Ave	54.6	+0.0 +3.4 +0.0	+29.3 +0.6 +0.0	+0.5 +0.0	-39.3 +0.0	+0.0	49.1	54.0	-4.9	Vert
^	2744.533M	61.5	+0.0 +3.4 +0.0	+29.3 +0.6 +0.0	+0.5 +0.0	-39.3 +0.0	+0.0	56.0	54.0	+2.0	Vert
20	544.487M	38.9	+0.0 +0.0 +0.3	+0.0 +0.0 +4.4	+0.0 +25.0	+0.0 -27.7	+0.0	40.9	46.0	-5.1	Horiz
21	396.000M QP	42.8	+0.0 +0.0 +0.2	+0.0 +0.0 +3.6	+0.0 +21.8	+0.0 -27.9	+0.0	40.5	46.0	-5.5	Vert
^	396.000M	44.1	+0.0 +0.0 +0.2	+0.0 +0.0 +3.6	+0.0 +21.8	+0.0 -27.9	+0.0	41.8	46.0	-4.2	Vert
23	839.978M	31.6	+0.0 +0.0 +0.4	+0.0 +0.0 +5.6	+0.0 +29.7	+0.0 -27.2	+0.0	40.1	46.0	-5.9	Vert
24	839.978M	31.6	+0.0 +0.0 +0.4	+0.0 +0.0 +5.6	+0.0 +29.7	+0.0 -27.2	+0.0	40.1	46.0	-5.9	Vert
25	791.980M	32.9	+0.0 +0.0 +0.4	+0.0 +0.0 +5.4	+0.0 +28.5	+0.0 -27.2	+0.0	40.0	46.0	-6.0	Vert
26	455.985M	40.1	+0.0 +0.0 +0.3	+0.0 +0.0 +3.9	+0.0 +23.2	+0.0 -27.9	+0.0	39.6	46.0	-6.4	Horiz
27	791.975M QP	32.3	+0.0 +0.0 +0.4	+0.0 +0.0 +5.4	+0.0 +28.5	+0.0 -27.2	+0.0	39.4	46.0	-6.6	Horiz
^	791.985M	38.8	+0.0 +0.0 +0.4	+0.0 +0.0 +5.4	+0.0 +28.5	+0.0 -27.2	+0.0	45.9	46.0	-0.1	Horiz
^	791.975M	34.3	+0.0 +0.0 +0.4	+0.0 +0.0 +5.4	+0.0 +28.5	+0.0 -27.2	+0.0	41.4	46.0	-4.6	Horiz
30	503.985M	38.5	+0.0 +0.0 +0.3	+0.0 +0.0 +4.1	+0.0 +24.2	+0.0 -27.8	+0.0	39.3	46.0	-6.7	Horiz
31	396.005M	41.4	+0.0 +0.0 +0.2	+0.0 +0.0 +3.6	+0.0 +21.8	+0.0 -27.9	+0.0	39.1	46.0	-6.9	Horiz
32	445.505M	39.5	+0.0 +0.0 +0.3	+0.0 +0.0 +3.9	+0.0 +23.0	+0.0 -27.9	+0.0	38.8	46.0	-7.2	Horiz

33	791.978M	31.5	+0.0 +0.0 +0.4	+0.0 +0.0 +5.4	+0.0 +28.5	+0.0 -27.2	+0.0	38.6	46.0	-7.4	Vert
34	647.989M QP	33.4	+0.0 +0.0 +0.3	+0.0 +0.0 +4.7	+0.0 +27.1	+0.0 -27.3	+0.0	38.2	46.0	-7.8	Vert
^	647.989M	38.6	+0.0 +0.0 +0.3	+0.0 +0.0 +4.7	+0.0 +27.1	+0.0 -27.3	+0.0	43.4	46.0	-2.6	Vert
36	297.013M	42.9	+0.0 +0.0 +0.2	+0.0 +0.0 +3.1	+0.0 +19.3	+0.0 -27.9	+0.0	37.6	46.0	-8.4	Horiz
37	4574.250M	47.3	+0.0 +4.6 +0.0	+32.3 +0.0 +0.0	+0.6 +0.0	-39.3 +0.0	+0.0	45.5	54.0 non intentional	-8.5	Horiz
38	148.481M QP	42.9	+0.0 +0.0 +0.1	+0.0 +0.0 +2.1	+0.0 +17.3	+0.0 -28.0	+0.0	34.4	43.5	-9.1	Horiz
^	148.481M	46.5	+0.0 +0.0 +0.1	+0.0 +0.0 +2.1	+0.0 +17.3	+0.0 -28.0	+0.0	38.0	43.5	-5.5	Horiz
40	695.980M	31.5	+0.0 +0.0 +0.3	+0.0 +0.0 +4.9	+0.0 +27.0	+0.0 -27.2	+0.0	36.5	46.0	-9.5	Vert
41	167.996M	43.4	+0.0 +0.0 +0.2	+0.0 +0.0 +2.3	+0.0 +15.9	+0.0 -28.0	+0.0	33.8	43.5	-9.7	Horiz
42	743.980M	29.3	+0.0 +0.0 +0.4	+0.0 +0.0 +5.1	+0.0 +28.6	+0.0 -27.2	+0.0	36.2	46.0	-9.8	Vert
43	1829.533M	52.1	+0.0 +2.7 +0.0	+27.1 +0.4 +0.0	+0.4 +0.0	-39.1 +0.0	+0.0	43.6	54.0	-10.4	Vert
44	816.730M	28.2	+0.0 +0.0 +0.4	+0.0 +0.0 +5.5	+0.0 +28.6	+0.0 -27.2	+0.0	35.5	46.0	-10.5	Horiz
45	167.980M	42.4	+0.0 +0.0 +0.2	+0.0 +0.0 +2.3	+0.0 +15.9	+0.0 -28.0	+0.0	32.8	43.5	-10.7	Horiz
46	204.221M	42.8	+0.0 +0.0 +0.2	+0.0 +0.0 +2.5	+0.0 +15.1	+0.0 -28.0	+0.0	32.6	43.5	-10.9	Horiz
47	79.000M	42.2	+0.0 +0.0 +0.1	+0.0 +0.0 +1.5	+0.0 +13.4	+0.0 -28.1	+0.0	29.1	40.0	-10.9	Horiz
48	77.470M	42.3	+0.0 +0.0 +0.1	+0.0 +0.0 +1.5	+0.0 +13.2	+0.0 -28.1	+0.0	29.0	40.0	-11.0	Horiz
49	660.000M	29.8	+0.0 +0.0 +0.3	+0.0 +0.0 +4.7	+0.0 +26.9	+0.0 -27.3	+0.0	34.4	46.0	-11.6	Vert

50	167.980M	41.4	+0.0 +0.0 +0.2	+0.0 +0.0 +2.3	+0.0 +15.9	+0.0 -28.0	+0.0	31.8	43.5	-11.7	Vert
51	3660.900M Ave	45.1	+0.0 +4.0 +0.0	+31.5 +0.4 +0.0	+0.5 +0.0	-39.4 +0.0	+0.0	42.1	54.0	-11.9	Vert
^	3660.900M	53.7	+0.0 +4.0 +0.0	+31.5 +0.4 +0.0	+0.5 +0.0	-39.4 +0.0	+0.0	50.7	54.0	-3.3	Vert
53	512.020M	33.0	+0.0 +0.0 +0.3	+0.0 +0.0 +4.2	+0.0 +24.2	+0.0 -27.8	+0.0	33.9	46.0	-12.1	Horiz
54	445.425M	34.3	+0.0 +0.0 +0.3	+0.0 +0.0 +3.9	+0.0 +23.0	+0.0 -27.9	+0.0	33.6	46.0	-12.4	Vert
55	960.020M	30.8	+0.0 +0.0 +0.5	+0.0 +0.0 +6.0	+0.0 +31.4	+0.0 -27.3	+0.0	41.4	54.0	-12.6	Horiz
56	239.956M	40.7	+0.0 +0.0 +0.2	+0.0 +0.0 +2.7	+0.0 +17.5	+0.0 -27.9	+0.0	33.2	46.0	-12.8	Horiz
57	263.988M	37.8	+0.0 +0.0 +0.2	+0.0 +0.0 +2.9	+0.0 +20.0	+0.0 -27.9	+0.0	33.0	46.0	-13.0	Horiz
58	611.400M	29.4	+0.0 +0.0 +0.3	+0.0 +0.0 +4.5	+0.0 +26.2	+0.0 -27.5	+0.0	32.9	46.0	-13.1	Horiz
59	247.501M	39.1	+0.0 +0.0 +0.2	+0.0 +0.0 +2.8	+0.0 +18.4	+0.0 -27.9	+0.0	32.6	46.0	-13.4	Horiz
60	503.988M	31.6	+0.0 +0.0 +0.3	+0.0 +0.0 +4.1	+0.0 +24.2	+0.0 -27.8	+0.0	32.4	46.0	-13.6	Vert
61	1829.850M	48.8	+0.0 +2.7 +0.0	+27.1 +0.4 +0.0	+0.4 +0.0	-39.1 +0.0	+0.0	40.3	54.0	-13.7	Horiz
62	80.550M	39.0	+0.0 +0.0 +0.1	+0.0 +0.0 +1.5	+0.0 +13.7	+0.0 -28.1	+0.0	26.2	40.0	-13.8	Vert
63	311.980M	37.1	+0.0 +0.0 +0.2	+0.0 +0.0 +3.2	+0.0 +19.5	+0.0 -27.9	+0.0	32.1	46.0	-13.9	Horiz
64	239.984M	39.2	+0.0 +0.0 +0.2	+0.0 +0.0 +2.7	+0.0 +17.5	+0.0 -27.9	+0.0	31.7	46.0	-14.3	Vert
65	360.020M	35.0	+0.0 +0.0 +0.2	+0.0 +0.0 +3.4	+0.0 +20.9	+0.0 -27.9	+0.0	31.6	46.0	-14.4	Horiz
66	320.013M	36.3	+0.0 +0.0 +0.2	+0.0 +0.0 +3.2	+0.0 +19.7	+0.0 -27.9	+0.0	31.5	46.0	-14.5	Horiz

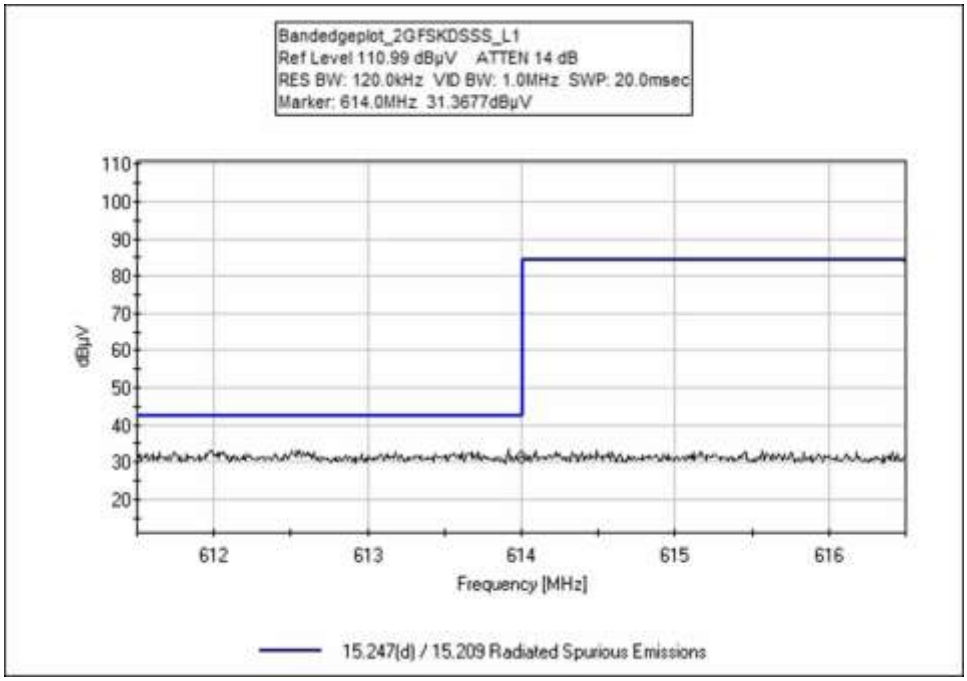
67	408.000M	32.8	+0.0 +0.0 +0.2	+0.0 +0.0 +3.7	+0.0 +22.4	+0.0 -27.9	+0.0	31.2	46.0	-14.8	Vert
68	544.490M	28.9	+0.0 +0.0 +0.3	+0.0 +0.0 +4.4	+0.0 +25.0	+0.0 -27.7	+0.0	30.9	46.0	-15.1	Vert
69	297.020M	35.5	+0.0 +0.0 +0.2	+0.0 +0.0 +3.1	+0.0 +19.3	+0.0 -27.9	+0.0	30.2	46.0	-15.8	Vert
70	383.970M	32.3	+0.0 +0.0 +0.2	+0.0 +0.0 +3.5	+0.0 +21.3	+0.0 -27.9	+0.0	29.4	46.0	-16.6	Horiz
71	407.972M	30.7	+0.0 +0.0 +0.2	+0.0 +0.0 +3.7	+0.0 +22.4	+0.0 -27.9	+0.0	29.1	46.0	-16.9	Horiz
72	2257.300M	44.6	+0.0 +3.1 +0.0	+27.8 +0.0 +0.0	+0.4 +0.0	-39.3 +0.0	+0.0	36.6	54.0 non intentional	-17.4	Horiz
73	2077.300M	44.4	+0.0 +2.9 +0.0	+27.8 +0.2 +0.0	+0.4 +0.0	-39.2 +0.0	+0.0	36.5	54.0	-17.5	Horiz
74	346.463M	32.2	+0.0 +0.0 +0.2	+0.0 +0.0 +3.4	+0.0 +20.5	+0.0 -27.9	+0.0	28.4	46.0	-17.6	Horiz
75	288.003M	33.8	+0.0 +0.0 +0.2	+0.0 +0.0 +3.0	+0.0 +19.1	+0.0 -27.9	+0.0	28.2	46.0	-17.8	Horiz
76	320.000M	32.9	+0.0 +0.0 +0.2	+0.0 +0.0 +3.2	+0.0 +19.7	+0.0 -27.9	+0.0	28.1	46.0	-17.9	Vert
77	115.683M	32.9	+0.0 +0.0 +0.1	+0.0 +0.0 +1.9	+0.0 +17.6	+0.0 -28.0	+0.0	24.5	43.5	-19.0	Horiz
78	270.363M	32.6	+0.0 +0.0 +0.2	+0.0 +0.0 +2.9	+0.0 +18.9	+0.0 -27.9	+0.0	26.7	46.0	-19.3	Horiz
79	336.013M	30.9	+0.0 +0.0 +0.2	+0.0 +0.0 +3.3	+0.0 +20.1	+0.0 -27.9	+0.0	26.6	46.0	-19.4	Horiz
80	163.798M	33.4	+0.0 +0.0 +0.2	+0.0 +0.0 +2.2	+0.0 +16.2	+0.0 -28.0	+0.0	24.0	43.5	-19.5	Horiz
81	172.471M	34.0	+0.0 +0.0 +0.2	+0.0 +0.0 +2.3	+0.0 +15.5	+0.0 -28.0	+0.0	24.0	43.5	-19.5	Horiz
82	260.746M	30.8	+0.0 +0.0 +0.2	+0.0 +0.0 +2.9	+0.0 +20.3	+0.0 -27.9	+0.0	26.3	46.0	-19.7	Horiz

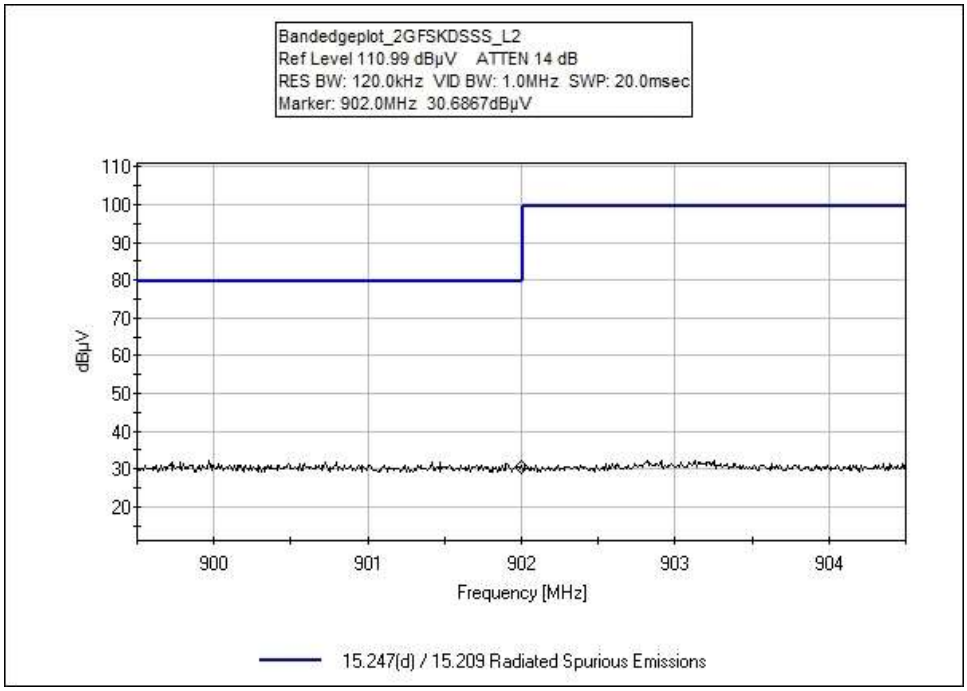
83	1663.433M	44.6	+0.0	+25.7	+0.4	-39.2	+0.0	34.2	54.0	-19.8	Vert
	Ave		+2.7	+0.0	+0.0	+0.0			non intetntional		
			+0.0	+0.0							
^	1663.433M	62.8	+0.0	+25.7	+0.4	-39.2	+0.0	52.4	54.0	-1.6	Vert
			+2.7	+0.0	+0.0	+0.0			non intetntional		
			+0.0	+0.0							
85	183.621M	32.8	+0.0	+0.0	+0.0	+0.0	+0.0	22.3	43.5	-21.2	Horiz
			+0.0	+0.0	+15.0	-28.0					
			+0.2	+2.3							
86	233.696M	33.1	+0.0	+0.0	+0.0	+0.0	+0.0	24.7	46.0	-21.3	Horiz
			+0.0	+0.0	+16.7	-28.0					
			+0.2	+2.7							
87	226.050M	30.7	+0.0	+0.0	+0.0	+0.0	+0.0	21.5	46.0	-24.5	Vert
			+0.0	+0.0	+15.9	-28.0					
			+0.2	+2.7							

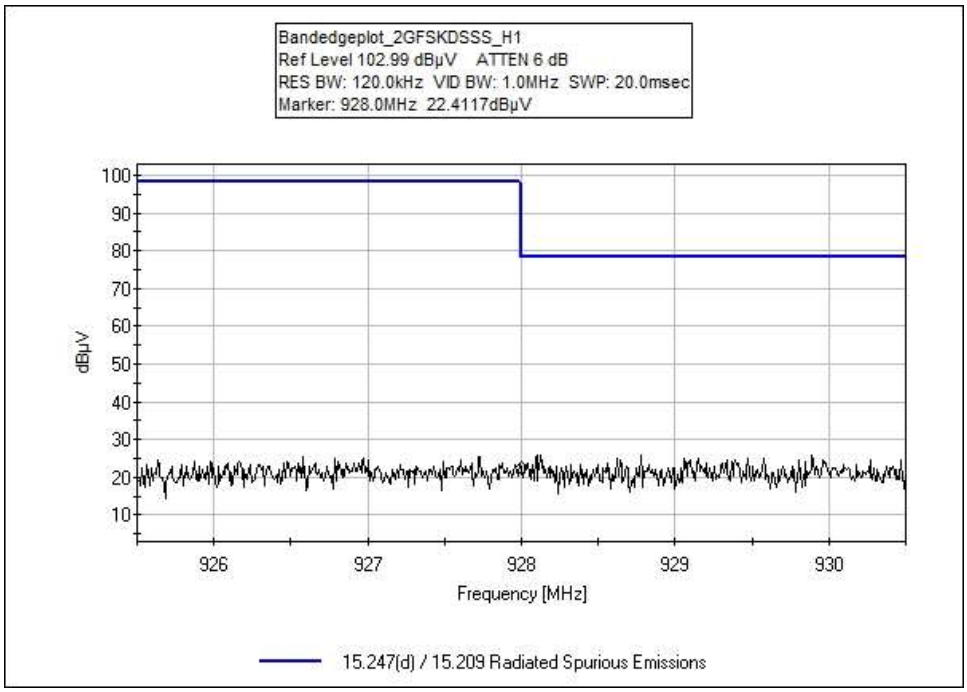
Band Edge

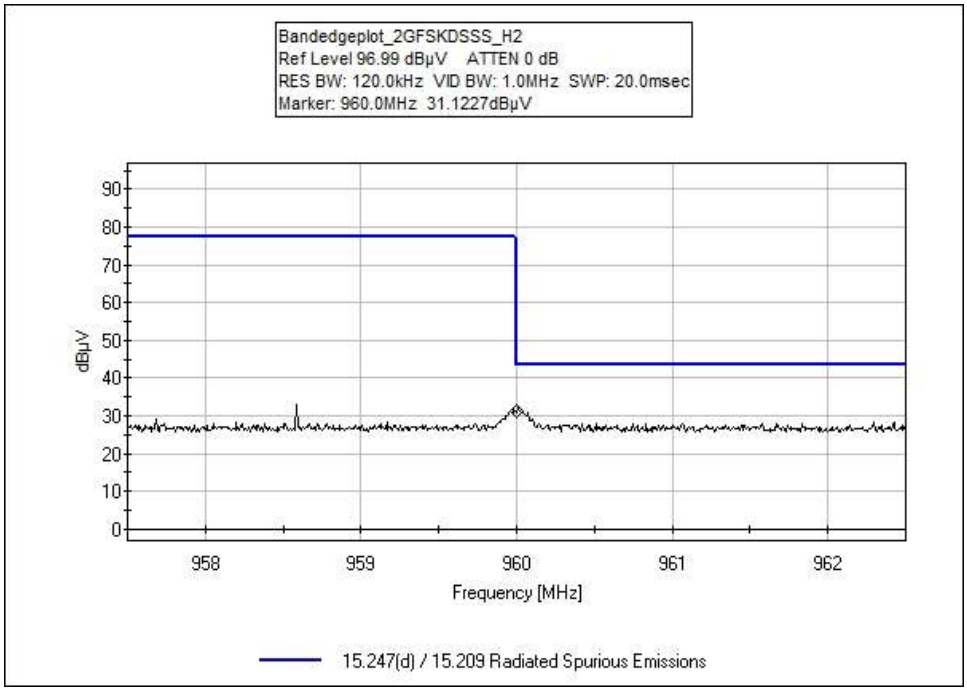
Band Edge Summary					
Frequency (MHz)	**Modulation**	**Ant. Type**	**Field Strength (dBuV/m @3m)**	**Limit (dBuV/m @3m)**	**Results**
614	2GFSK-DSSS	Integral IFA / -1.58	35.2	<46	Pass
902	2GFSK-DSSS	Integral IFA / -1.58	59.1	< 88	Pass
928	2GFSK-DSSS	Integral IFA / -1.58	36.1	< 88	Pass
960	2GFSK-DSSS	Integral IFA / -1.58	41.7	<54	Pass

Band Edge Plots






Bandedgeplot_2GFSKDSSS_H1
Ref Level 102.99 dBµV ATTEN 6 dB
RES BW: 120.0kHz VID BW: 1.0MHz SWP: 20.0msec
Marker: 928.0MHz 22.4117dBµV
dBµV
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions


Bandedgeplot_2GFSKDSSS_H2
Ref Level 96.99 dBµV ATTEN 0 dB
RES BW: 120.0kHz VID BW: 1.0MHz SWP: 20.0msec
Marker: 960.0MHz 31.1227dBµV
dBµV
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

Test Setup / Conditions / Data

Test Location:	CKC Laboratories, Inc • 110 N. Olinda Place • Brea, CA 92823 • (714) 993-6112		
Customer:	**Venstar, Inc.**		
Specification:	**15.247(d) / 15.209 Radiated Spurious Emissions**		
Work Order #:	**106906**	Date:	5/18/2022
Test Type:	**Radiated Scan**	Time:	09:03:54
Tested By:	E. Wong	Sequence#:	3
Software:	EMITest 5.03.20		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

Test Conditions / Notes:

The EUT is placed on Styrofoam block, orientated per intended installation; all data and Aux port are connected to section of unterminated cable.

Frequency Range: 902 - 928MHz
TX Frequency: 915.0MHz

2GFSK-DSSS (setup menu, GFSK selected, however coded as 2GSK-DSSS)
Power Setting = 8dBm

Frequency range of measurement = 9kHz - 10GHz.
9kH - 150kHz; RBW = 200Hz, VBW = 200Hz; 150kHz - 30MHz; RBW = 9kHz, VBW = 9kHz; 30MHz - 1000MHz; RBW = 120kHz, VBW = 120kHz, 1000MHz - 10000MHz; RBW = 1MHz, VBW =1MHz

Test Environment Conditions:
Temperature: 21°C
Humidity: 25%
Pressure: 99kPa.

Method: ANSI C63.10-2013
Site A

Note: v2.9.2.

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02869	Spectrum Analyzer	E4440A	8/16/2021	8/16/2022
	AN01646	Horn Antenna	3115	3/21/2022	3/21/2024
	ANP07656	Cable	32022-29094K-29094K-24TC	7/30/2020	7/30/2022
	AN00787	Preamp	83017A	6/23/2021	6/23/2023
	ANP06360	Cable	L1-PNMNM-48	9/30/2021	9/30/2023
	AN02749	High Pass Filter	9SH10-1000/T10000-O/O	7/12/2021	7/12/2023
T2	AN00851	Biconilog Antenna	CBL6111C	4/21/2022	4/21/2024
T3	AN00309	Preamp	8447D	12/13/2021	12/13/2023
T4	ANP05050	Cable	RG223/U	12/24/2020	12/24/2022
T5	ANP05198	Cable-Amplitude +15C to +45C (dB)	8268	12/21/2020	12/21/2022
	AN00314	Loop Antenna	6502	3/29/2022	3/29/2024

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

#	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	614.000M	31.4	+0.0 +4.6	+26.3	-27.4	+0.3	+0.0	35.2	46.0 bandedge_L	-10.8	Horiz
2	960.000M	31.1	+0.0 +6.0	+31.4	-27.3	+0.5	+0.0	41.7	54.0 bandedge_H	-12.3	Horiz
3	902.000M	30.6	+0.0 +5.8	+29.5	-27.3	+0.5	+0.0	39.1	88.0 bandedge_L	-48.9	Horiz
4	928.000M	26.5	+0.0 +5.9	+30.5	-27.3	+0.5	+0.0	36.1	88.0 bandedge_H	-51.9	Horiz

Test Setup Photo(s)

Below 1GHz; View 1

Below 1GHz; View 2

Above 1GHz; View 1

Above 1GHz; View 2

Above 1GHz' View 3

Above 1GHz; View 4

15.247(e) Power Spectral Density

Test Setup/Conditions			
Test Location:	Brea Lab A	Test Engineer:	E. Wong
Test Method:	ANSI C63.10 (2013), KDB 558074	Test Date(s):	5/13/2022
Configuration:	1		
Test Setup:	The EUT is placed on test bench; all data and Aux port are connected to section of unterminated cable. Frequency range: 902-928MHz TX Frequency: 915.0MHz 2GFSK-DSSS (setup menu: GFSK selected, however coded as 2GSK-DSSS) , Power setting =8		

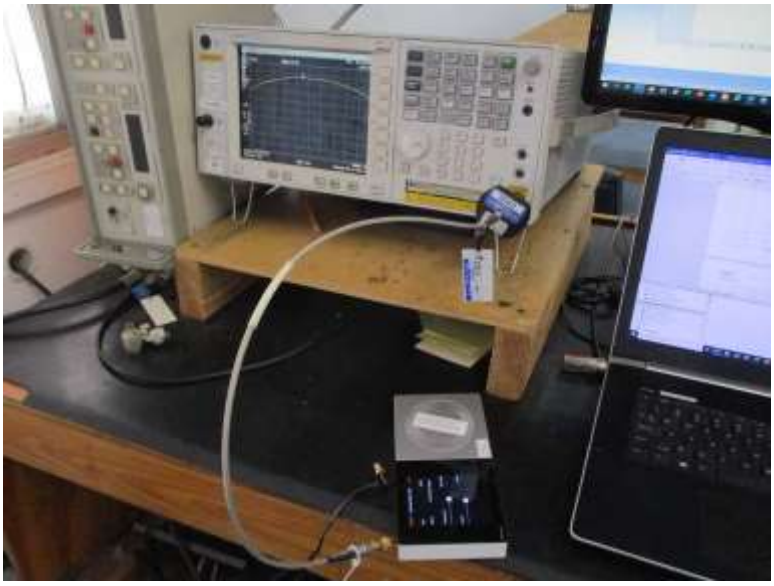
Environmental Conditions			
Temperature (ºC)	22	Relative Humidity (%):	25

Test Equipment					
Asset#	**Description**	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
02869	Spectrum Analyzer	Agilent	E4440A	8/16/2021	8/16/2022
03430	Attenuator	Aeroflex/Weinschel	75A-10-12	1/14/2022	1/14/2024
07658	Cable	Astrolab, Inc.	32022-29094K-29094K-24TC	7/30/2020	7/30/2022

Test Data Summary - RF Conducted Measurement				
Measurement Method: PKPSD				
Frequency (MHz)	**Modulation**	**Measured (dBm/3kHz)**	**Limit (dBm/3kHz)**	**Results**
915.0	2GFSK-DSSS	-1.9	≤8	Pass

Plot(s)

Test Setup Photo(s)



15.207 AC Conducted Emissions

Test Setup / Conditions / Data

Test Location:	CKC Laboratories, Inc. • 110 N. Olinda Place • Brea, CA 92823 • (714) 993-6112		
Customer:	**Venstar, Inc.**		
Specification:	**15.207 AC Mains - Average**		
Work Order #:	**106906**	Date:	5/18/2022
Test Type:	**Conducted Emissions**	Time:	2:09:40 PM
Tested By:	E. Wong	Sequence#:	4
Software:	EMITest 5.03.20		120/60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

Test Conditions / Notes:

The EUT is placed on test bench, orientated per intended installation; all data and Aux port are connected to section of unterminated cable.

Frequency Range: 902 - 928MHz
TX Frequency: 915.0MHz

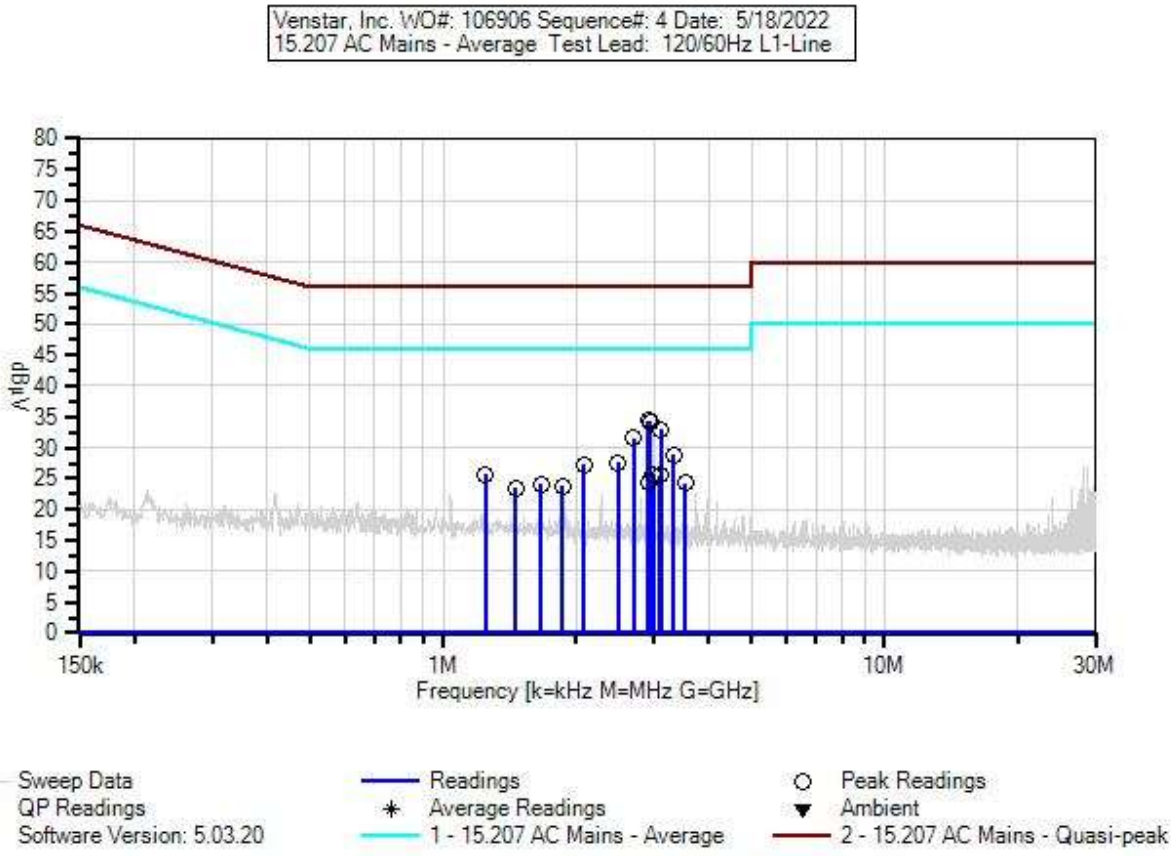
2GFSK-DSSS (setup menu, GFSK selected, however coded as 2GSK-DSSS)
Power Setting = 8dBm

Frequency Range of Measurement = 150kHz - 30MHz.
150kHz - 30MHz; RBW = 9kHz, VBW = 30kHz

Test Environment Conditions:
Temperature: 21°C
Humidity: 25%
Pressure: 99kPa.

Method: ANSI C63.10-2013
Site A

Note: v2.9.2.



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02869	Spectrum Analyzer	E4440A	8/16/2021	8/16/2022
T1	ANP07545	Attenuator	SA18N10W-06	1/4/2021	1/4/2023
T2	ANP07338	Cable	2249-Y-240	1/3/2022	1/3/2024
T3	AN02610	High Pass Filter	HE9615-150K-50-720B	9/8/2021	9/8/2023
T4	AN00847.1	50uH LISN-(L) Line 1	3816/2NM	3/18/2022	3/18/2023
	AN00847.1	50uH LISN-(N) Line 2	3816/2NM	3/18/2022	3/18/2023

Measurement Data: Reading listed by margin. Test Lead: L1-Line

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	2.910M	28.5	+5.7	+0.1	+0.1	+0.0	+0.0	34.4	46.0	-11.6	L1-Li
2	2.948M	28.4	+5.7	+0.1	+0.1	+0.0	+0.0	34.3	46.0	-11.7	L1-Li
3	3.118M	27.0	+5.7	+0.1	+0.1	+0.0	+0.0	32.9	46.0	-13.1	L1-Li
4	2.702M	25.7	+5.7	+0.1	+0.1	+0.0	+0.0	31.6	46.0	-14.4	L1-Li
5	3.327M	23.0	+5.7	+0.1	+0.1	+0.0	+0.0	28.9	46.0	-17.1	L1-Li
6	2.493M	21.7	+5.7	+0.1	+0.1	+0.0	+0.0	27.6	46.0	-18.4	L1-Li
7	2.081M	21.3	+5.7	+0.1	+0.1	+0.0	+0.0	27.2	46.0	-18.8	L1-Li
8	2.995M	19.8	+5.7	+0.1	+0.1	+0.0	+0.0	25.7	46.0	-20.3	L1-Li
9	1.247M	19.7	+5.7	+0.1	+0.2	+0.0	+0.0	25.7	46.0	-20.3	L1-Li
10	3.101M	19.6	+5.7	+0.1	+0.1	+0.0	+0.0	25.5	46.0	-20.5	L1-Li
11	2.927M	18.6	+5.7	+0.1	+0.1	+0.0	+0.0	24.5	46.0	-21.5	L1-Li
12	3.535M	18.3	+5.7	+0.1	+0.1	+0.0	+0.0	24.2	46.0	-21.8	L1-Li
13	1.664M	18.1	+5.7	+0.1	+0.2	+0.0	+0.0	24.1	46.0	-21.9	L1-Li
14	1.868M	17.9	+5.7	+0.1	+0.1	+0.0	+0.0	23.8	46.0	-22.2	L1-Li
15	1.460M	17.5	+5.7	+0.1	+0.2	+0.0	+0.0	23.5	46.0	-22.5	L1-Li

Test Location:	CKC Laboratories, Inc. • 110 N. Olinda Place • Brea, CA 92823 • (714) 993-6112		
Customer:	**Venstar, Inc.**		
Specification:	**15.207 AC Mains - Average**		
Work Order #:	**106906**	Date:	5/18/2022
Test Type:	**Conducted Emissions**	Time:	2:14:27 PM
Tested By:	E. Wong	Sequence#:	5
Software:	EMITest 5.03.20		120/60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

Test Conditions / Notes:

The EUT is placed on test bench, orientated per intended installation; all data and Aux port are connected to section of unterminated cable.

Frequency Range: 902 - 928MHz
TX Frequency: 915.0MHz

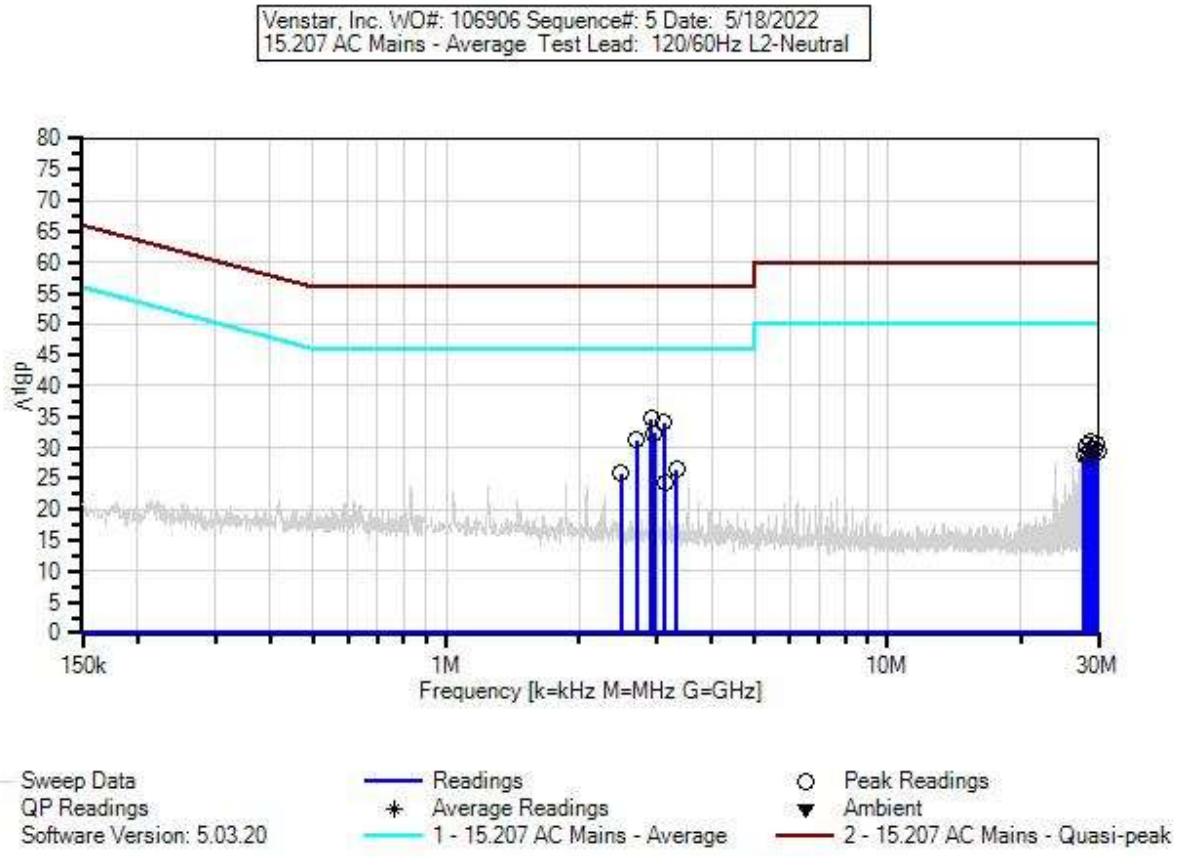
2GFSK-DSSS (setup menu, GFSK selected, however coded as 2GSK-DSSS)
Power Setting = 8dBm

Frequency Range of Measurement = 150kHz - 30MHz.
150kHz - 30MHz; RBW = 9kHz, VBW = 30kHz

Test Environment Conditions:
Temperature: 21°C
Humidity: 25%
Pressure: 99kPa.

Method: ANSI C63.10-2013
Site A

Note: v2.9.2.



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
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T1	ANP07545	Attenuator	SA18N10W-06	1/4/2021	1/4/2023
T2	ANP07338	Cable	2249-Y-240	1/3/2022	1/3/2024
T3	AN02610	High Pass Filter	HE9615-150K-50-720B	9/8/2021	9/8/2023
	AN00847.1	50uH LISN-(L) Line 1	3816/2NM	3/18/2022	3/18/2023
T4	AN00847.1	50uH LISN-(N) Line 2	3816/2NM	3/18/2022	3/18/2023

Measurement Data: Reading listed by margin. Test Lead: L2-Neutral

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	2.910M	28.8	+5.7	+0.1	+0.1	+0.0	+0.0	34.7	46.0	-11.3	L2-Ne
2	3.118M	28.1	+5.7	+0.1	+0.1	+0.0	+0.0	34.0	46.0	-12.0	L2-Ne
3	2.953M	26.5	+5.7	+0.1	+0.1	+0.0	+0.0	32.4	46.0	-13.6	L2-Ne
4	2.702M	25.3	+5.7	+0.1	+0.1	+0.0	+0.0	31.2	46.0	-14.8	L2-Ne
5	28.691M	24.5	+5.8	+0.4	+0.2	+0.2	+0.0	31.1	50.0	-18.9	L2-Ne
6	29.733M	24.0	+5.8	+0.4	+0.2	+0.2	+0.0	30.6	50.0	-19.4	L2-Ne
7	3.323M	20.6	+5.7	+0.1	+0.1	+0.0	+0.0	26.5	46.0	-19.5	L2-Ne
8	28.266M	23.8	+5.8	+0.4	+0.2	+0.2	+0.0	30.4	50.0	-19.6	L2-Ne
9	2.493M	19.9	+5.7	+0.1	+0.1	+0.0	+0.0	25.8	46.0	-20.2	L2-Ne
10	29.315M	23.2	+5.8	+0.4	+0.2	+0.2	+0.0	29.8	50.0	-20.2	L2-Ne
11	28.883M	23.0	+5.8	+0.4	+0.2	+0.2	+0.0	29.6	50.0	-20.4	L2-Ne
12	29.931M	22.9	+5.8	+0.4	+0.2	+0.2	+0.0	29.5	50.0	-20.5	L2-Ne
13	27.842M	22.1	+5.8	+0.4	+0.2	+0.2	+0.0	28.7	50.0	-21.3	L2-Ne
14	28.479M	21.9	+5.8	+0.4	+0.2	+0.2	+0.0	28.5	50.0	-21.5	L2-Ne
15	3.131M	18.5	+5.7	+0.1	+0.1	+0.0	+0.0	24.4	46.0	-21.6	L2-Ne

Test Setup Photo(s)

SUPPLEMENTAL INFORMATION

Measurement Uncertainty

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

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

Emissions Test Details

TESTING PARAMETERS

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

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

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

CORRECTION FACTORS

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

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

TEST INSTRUMENTATION AND ANALYZER SETTINGS

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

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

SPECTRUM ANALYZER/RECEIVER DETECTOR FUNCTIONS

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

Peak

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

Quasi-Peak

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

Average

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