Automation Inc. dba RADAR

TEST REPORT FOR

RFID sensor operating in the UHF band
Model: RS510

Tested to The Following Standards:

FCC Part 15 Subpart C Section(s)

15.247
(FHSS 902-928MHz)

Report No.: 108867-4

Date of issue: September 18, 2023

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:

Automation Inc. dba RADAR
15150 Avenue of Science, Ste. 200
San Diego, CA 92121

Representative: Mark Easton
Customer Reference Number: 1962-SJ1-Test

REPORT PREPARED BY:

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

Project Number: 108867

DATE OF EQUIPMENT RECEIPT: September 5, 2023
DATE(S) OF TESTING: September 5, 2023

Report Authorization

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

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 (FHSS 902-928MHz)

Test Procedure	Description	Modifications	Results
15.247(a)(1)(i)	Occupied Bandwidth	NA	NP
15.247(a)(1)	Carrier Separation	NA	NP
15.247(a)(1)(i)	Number of Hopping Channels	NA	NP
15.247(a)(1)(i)	Average Time of Occupancy	NA	NP
15.247(b)(2)	Output Power	NA	Pass
15.247(d)	RF Conducted Emissions & Band Edge	NA	NP
15.247(d)	Radiated Emissions & Band Edge	NA	Pass
15.207	AC Conducted Emissions	NA	NP

NA = Not Applicable
NP = CKC Laboratories was not contracted to perform test.

Evaluation for Permissive Change II to accommodate different antenna.

ISO/IEC 17025 Decision Rule
The equipment sample utilized for testing is selected by the manufacturer. The declaration of pass or fail herein is a binary statement for simple acceptance rule (ILAC G8) based upon assessment to the specification(s) listed above, without consideration of measurement uncertainties. For performance related tests, equipment was monitored for specified criteria identified in that section of testing.

Modifications During Testing

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

Summary of Conditions
No modifications were made during testing.

Modifications listed above must be incorporated into all production units.

Conditions During Testing

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

Summary of Conditions
None

EQUIPMENT UNDER TEST (EUT)

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

Configuration 1

Equipment Tested:

Device	Manufacturer	Model #	S/N
RFID sensor operating in the UHF band	Automaton Inc dba RADAR	RS510	508

Support Equipment:

Device	Manufacturer	Model #	S/N
Gigabit POE	Trendent	TPE-117G1A	E18H7G2000147
Keyboard	Perixx	Perboard 505 Plus	1906000719
Mouse	DPI	TM176G	20220523000709
Minicomputer	Intel	NUC8HN	BTHN009003HV

Configuration 2

Equipment Tested:

Device	Manufacturer	Model #	S/N
RFID sensor operating in the UHF band	Automaton Inc dba RADAR	RS510	507

Support Equipment:

Device	Manufacturer	Model #	S/N
Gigabit POE	Trendent	TPE-117G1A	E18H7G2000147
Keyboard	Perixx	Perboard 505 Plus	1906000719
Mouse	DPI	TM176G	20220523000709
Minicomputer	Intel	NUC8HN	BTHN009003HV

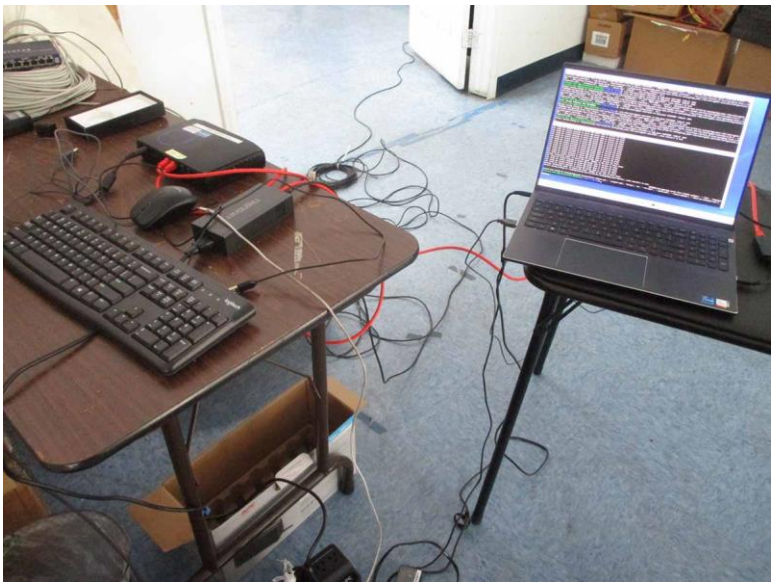
General Product Information:

Equipment Type:	Stand-Alone Equipment
Type of Wideband System:	FHSS
Operating Frequency Range:	902.75-927.25MHz
Number of Hopping Channels:	50
Receiver Bandwidth and Synchronization:	The manufacturer declares the receiver input bandwidth matches the transmit channel bandwidth and shifts frequencies in synchronization with the transmitter.
Modulation Type(s):	PR-ASK *
Maximum Duty Cycle:	98% or better
Number of TX Chains:	4
Antenna Type(s) and Gain:	Patch Array 7.04 – 8.62dBi (Measured ant gain + beamforming gain as provided by the manufacturer)
Beamforming Type:	Digital
Antenna Connection Type:	Integral (External connector provided to facilitate testing)
Nominal Input Voltage:	48VDC from POE
Firmware / Software used for Test:	Test mode firmware version: 0.85.11
The validity of results is dependent on the stated product details, the accuracy of which the manufacturer assumes full responsibility.	

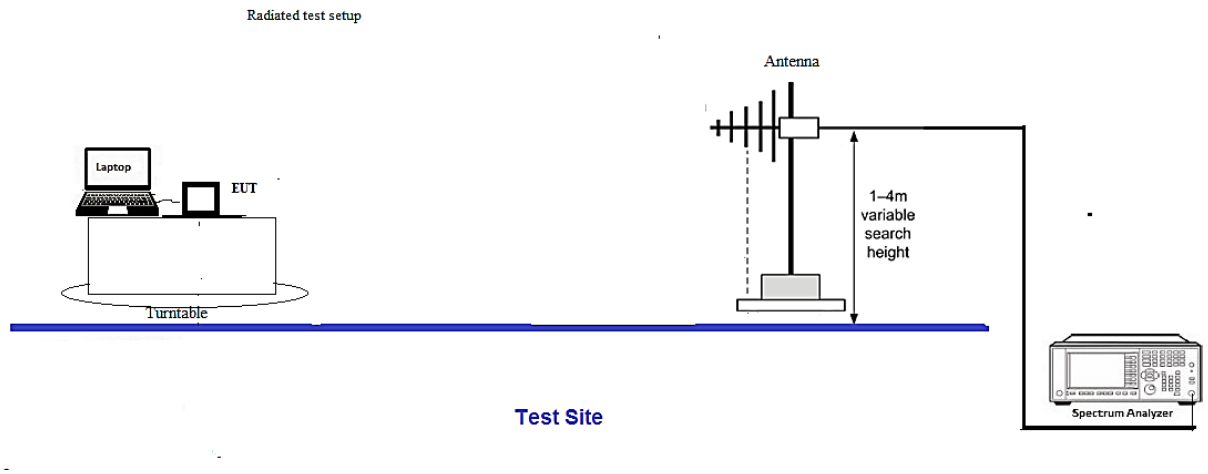
EUT Photo(s)


FCC SENSOR 507

Support Equipment Photo(s)



Block Diagram of Test Setup(s)



FCC Part 15 Subpart C

15.247(b)(2) Output Power

Test Setup/Conditions			
Test Location:	Brea Lab A	Test Engineer:	E. Wong
Test Method:	ANSI C63.10 (2013)	Test Date(s):	9/5/2023
Configuration:	1		
Test Setup:	The equipment under test (EUT) is set on a test bench. The EUT is powered via a cat 6 network cable (nominal voltage 48Vdc), which is connected to a remotely located POE Injector. Connected to the POE Injector via cat 6 cable is a remotely located computer. The computer is used to set frequency channel, frequency hopping, and modulation of the EUT. Frequency Range of EUT: 902.75MHz-927.25MHz TX 902.75MHz, 914.75MHz, 927.25MHz TARI = 6.25us as intended. Worst case Antenna Pattern and associated power level evaluated. Lowest antenna gain sector 180.0, highest power setting. L= 22.5dBm, M= 23.5dBm, H= 20.3dBm		

Environmental Conditions			
Temperature (ºC)	23	Relative Humidity (%):	61

Test Equipment					
Asset#	**Description**	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
02869	Spectrum Analyzer	Agilent	E4440A	12/13/2022	12/13/2023
03430	Attenuator	Aeroflex/Weinschel	75A-10-12	1/14/2022	1/14/2024
07658	Cable	Astrolab, Inc.	32022-29094K-29094K-24TC	6/22/2022	6/22/2024

Test Data Summary - Voltage Variations

Note: Voltage variation is NOT evaluated for Permissive change, the hardware meets voltage variation requirement during original evaluation.

Test Data Summary - RF Conducted Measurement

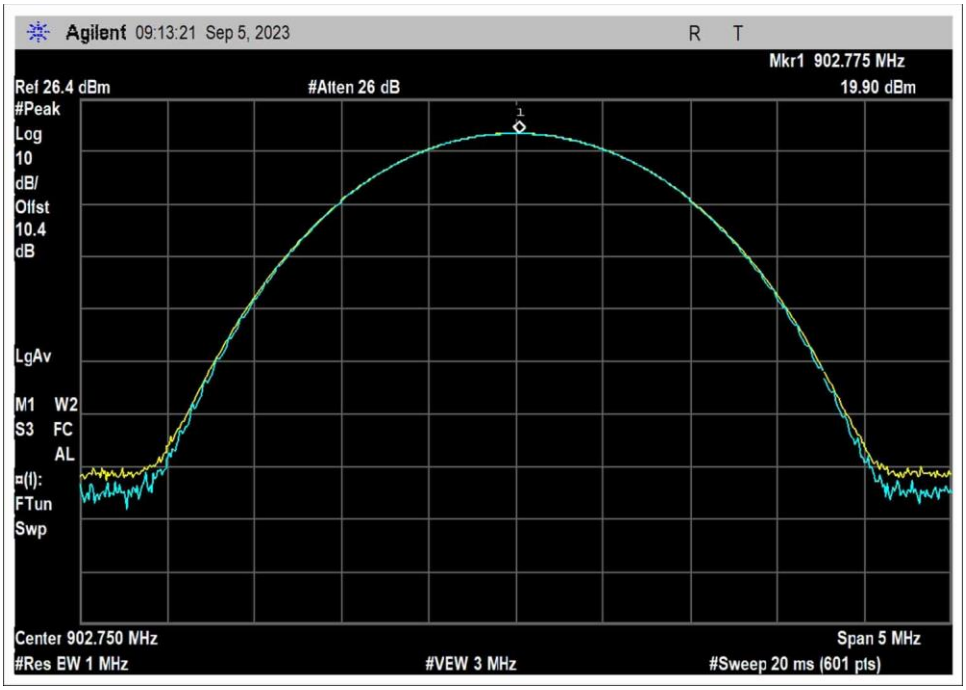
$$Limit = \begin{cases} 30dBm\ Conducted/36dBm\ EIRP \mid \geq 50\ Channels \\ 24dBm\ Conducted/30dBm\ EIRP \mid < 50\ Channels\ (\min 25) \end{cases}$$

Ant Port	0		1		2		3		Linear sum		Ant gain Beamform-ing gain	Total EIRP
Freq	dBm	Watts	dBm	Watts	dBm	Watts	dBm	Watts	watt	dBm	dBi	dBm
902.75	19.90	0.0977	22.47	0.1766	21.42	0.1387	21.68	0.1472	0.5602	27.5	7.04	34.5
914.75	21.25	0.1334	23.61	0.2296	22.73	0.1875	23.45	0.2213	0.7718	28.9	7.04	35.9
927.25	17.41	0.0551	20.36	0.1086	19.18	0.0828	20.31	0.1074	0.3539	25.5	7.04	32.5

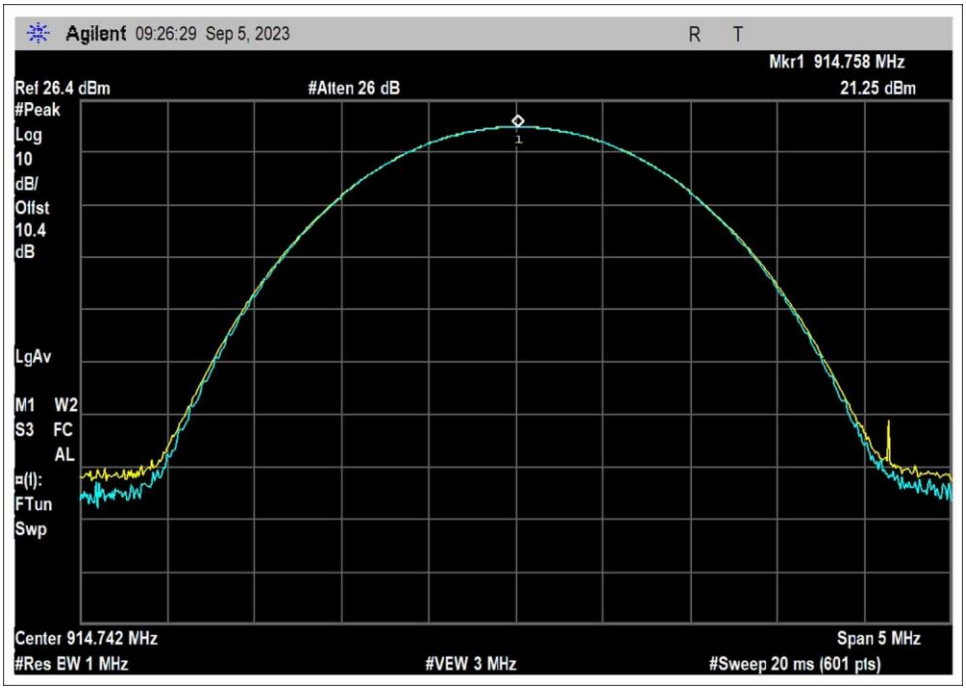
Frequency (MHz)	Modulation	Ant. Type / Gain (dBi)	Measured Total EIRP (dBm)	EIRP Limit (dBm)	Results
Lowest antenna gain sector 180,0, highest power setting. L= 22.5dBm, M= 23.5dBm, H= 20.3dBm					
902.75 (L)	PR-ASK	Patch Array	34.5	≤ 36	Pass
914.75 (M)	PR-ASK	Patch Array	35.9	≤ 36	Pass
927.25 (H)	PR-ASK	Patch Array	32.5	≤ 36	Pass

Plots

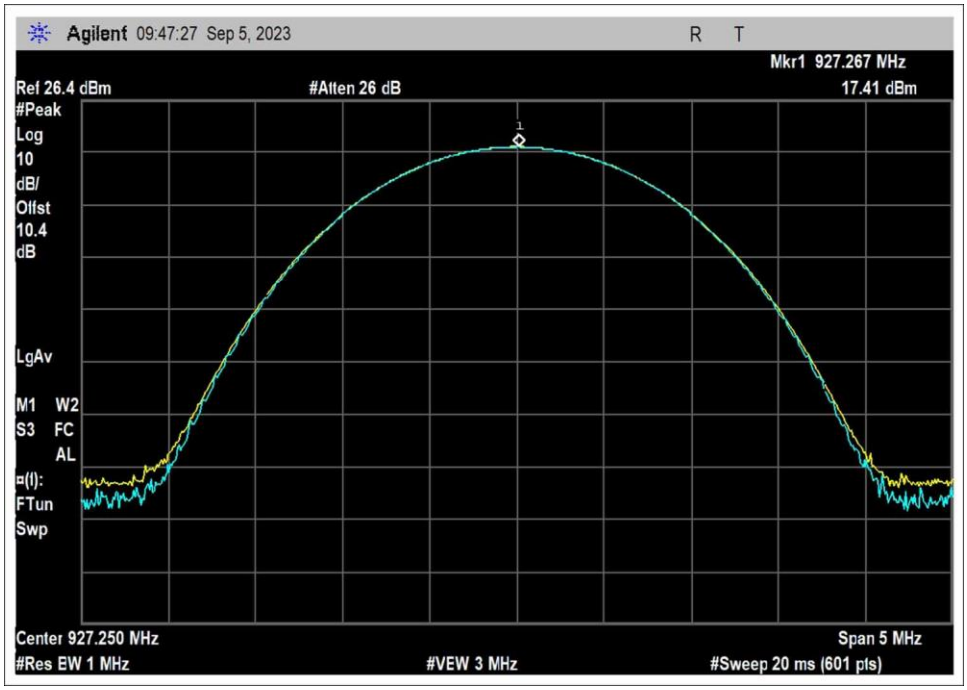
Antenna 0



Low Channel

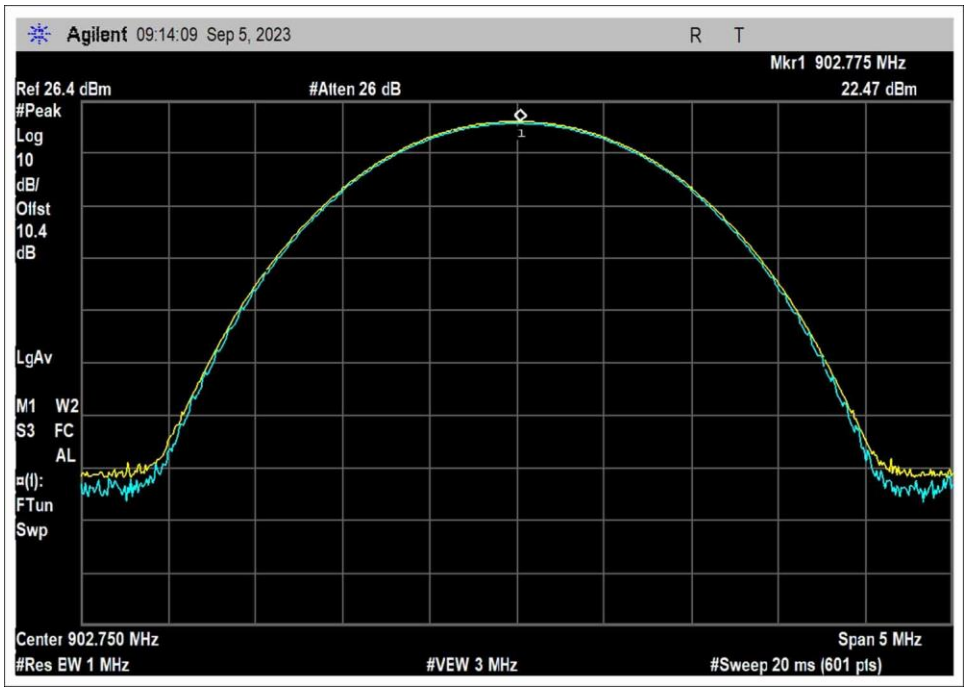


Middle Channel



High Channel

Antenna 1



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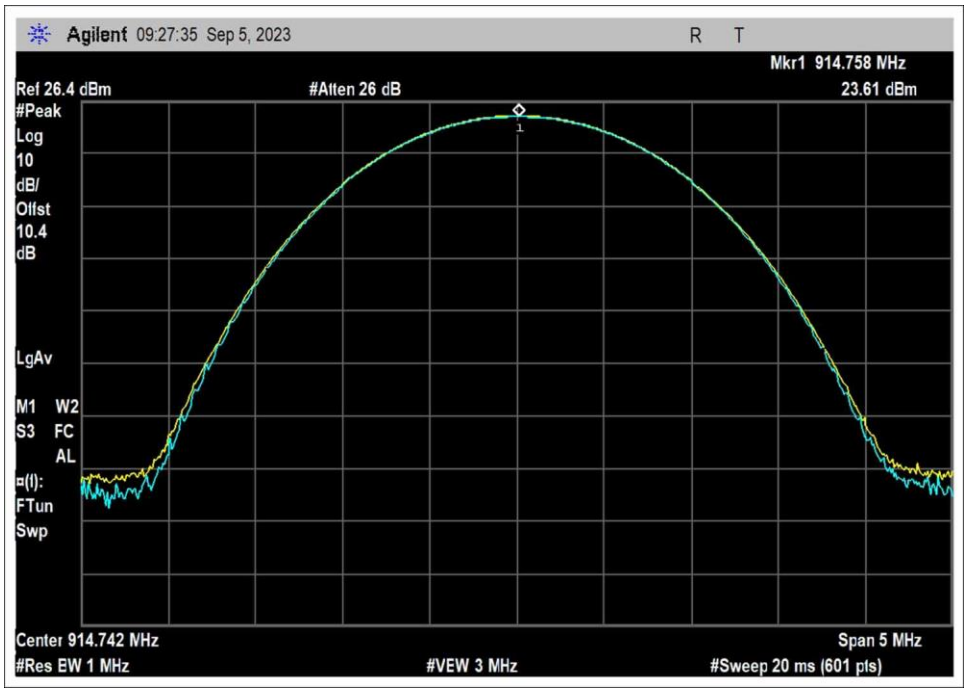
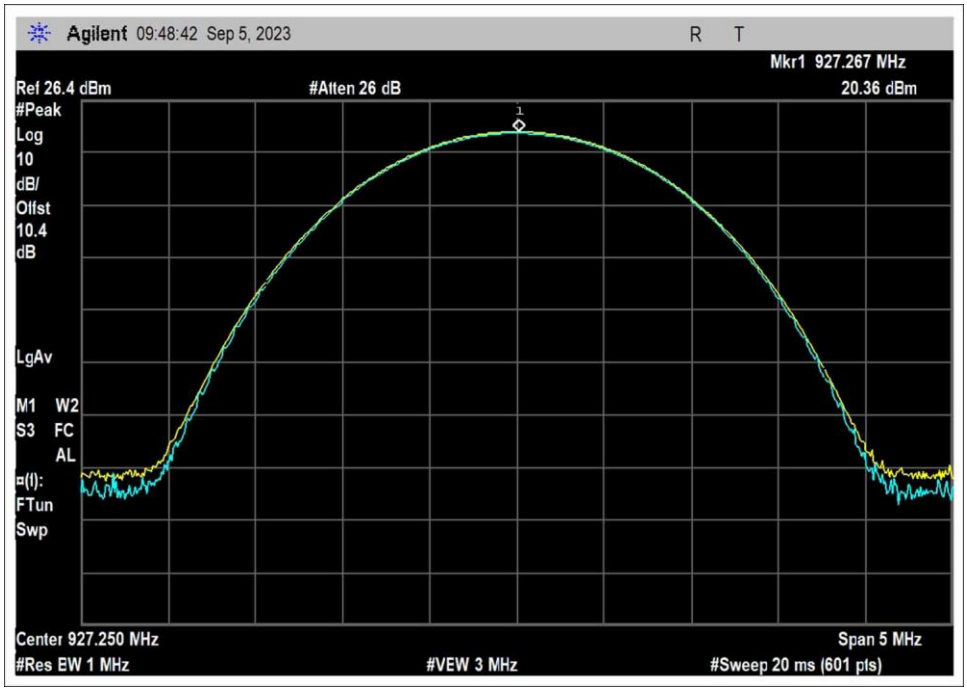
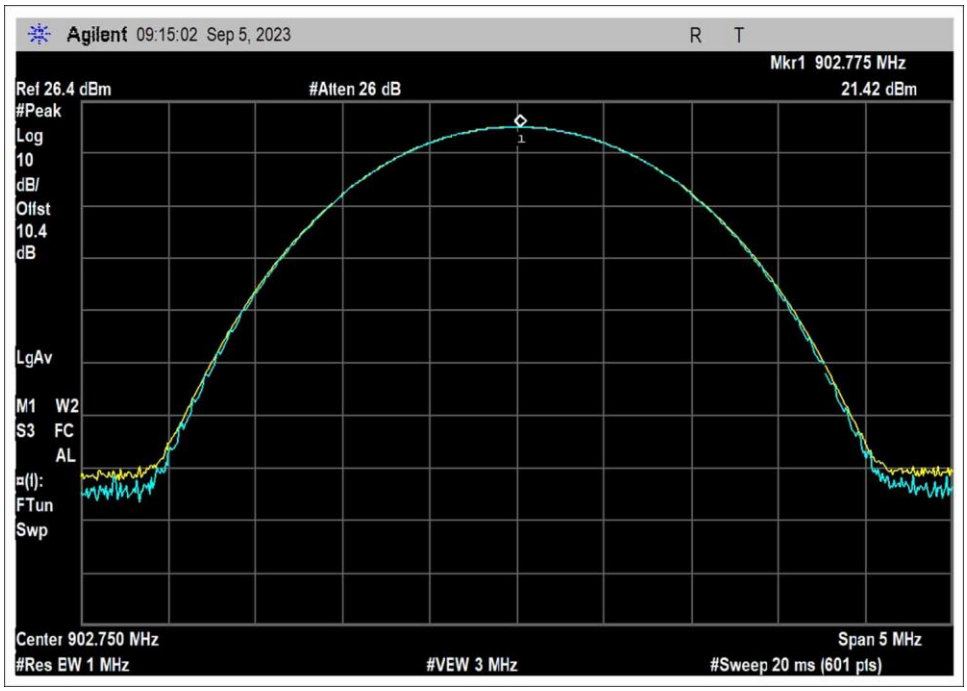


Middle Channel



High Channel

Antenna 2



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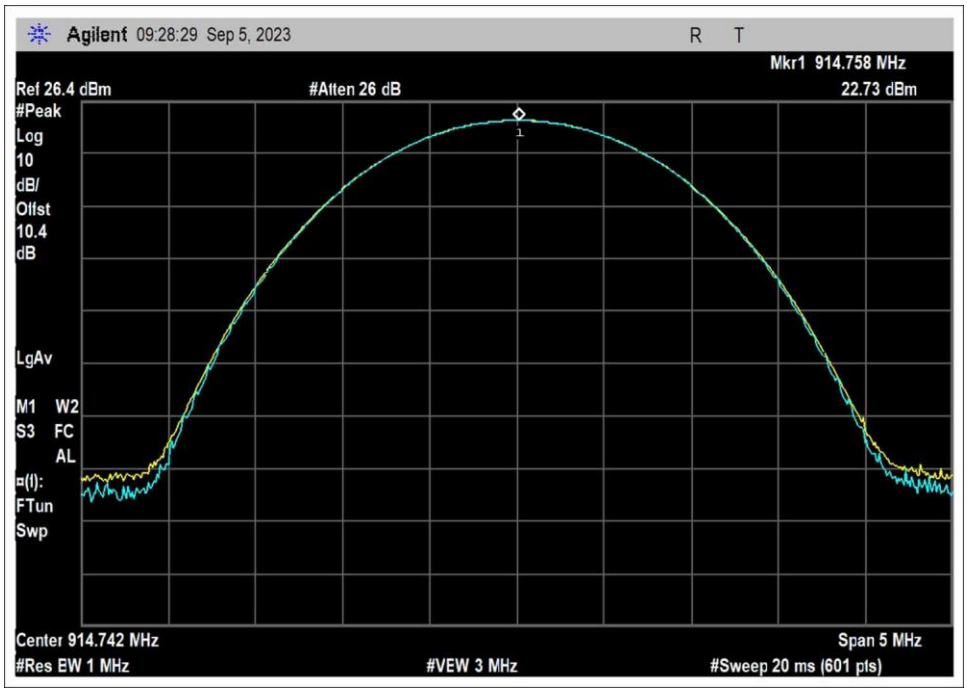
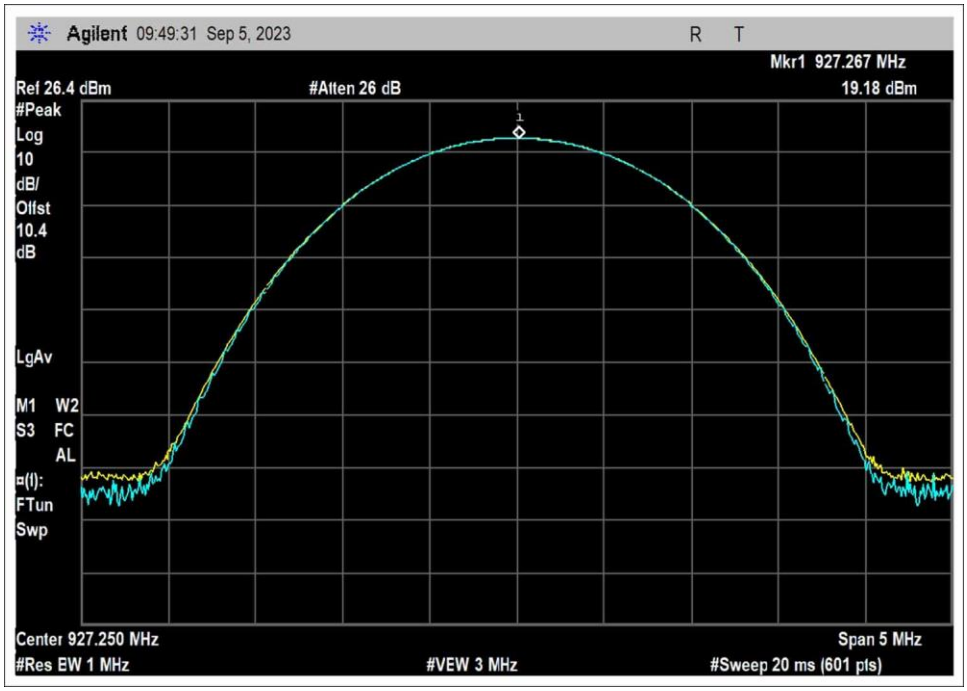
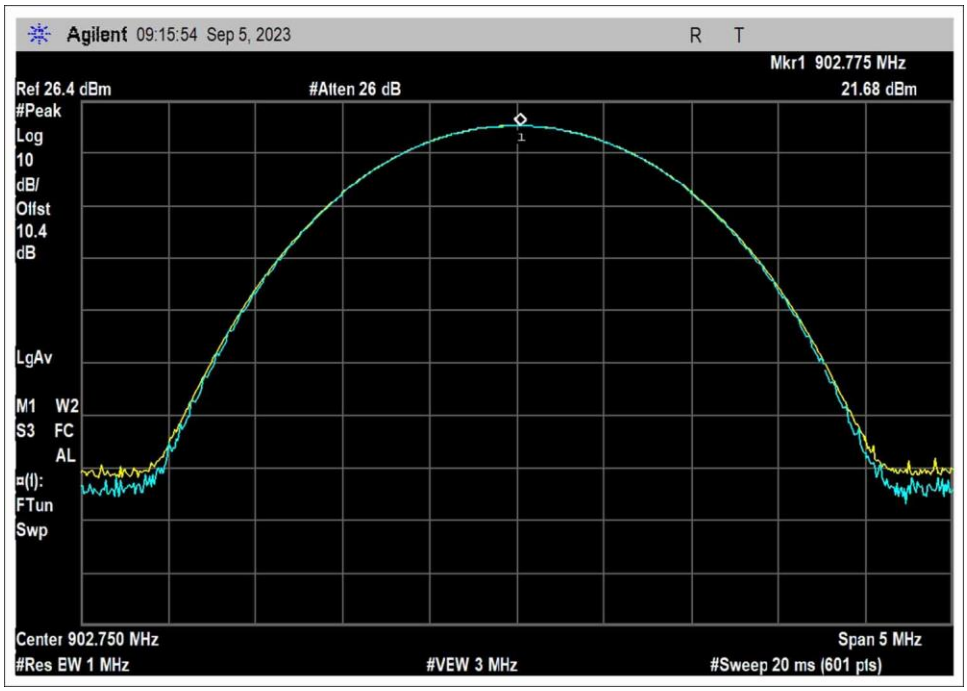


Middle Channel

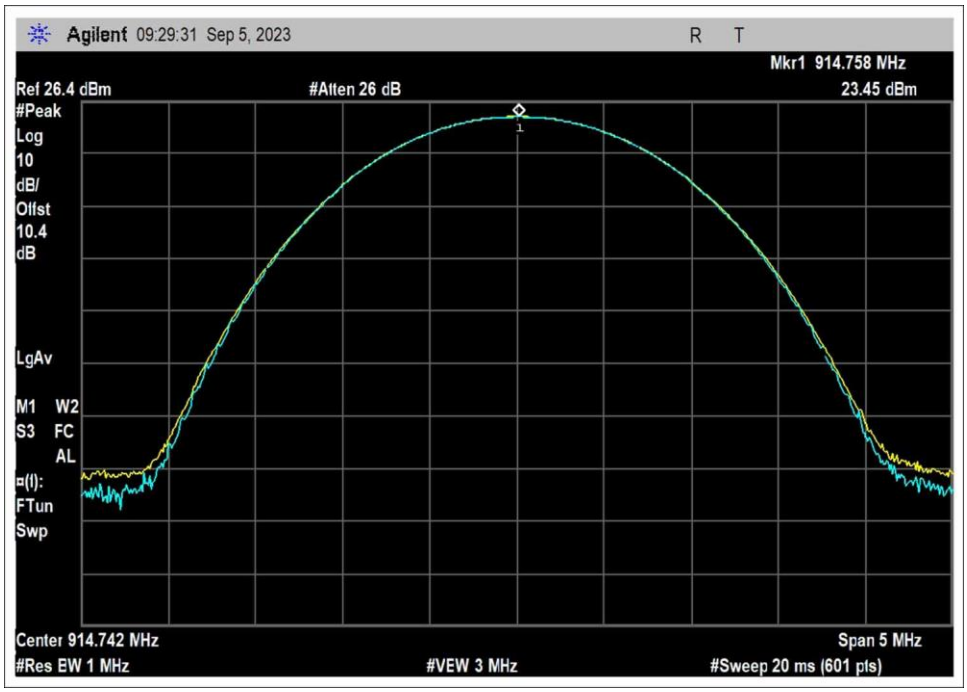


High Channel

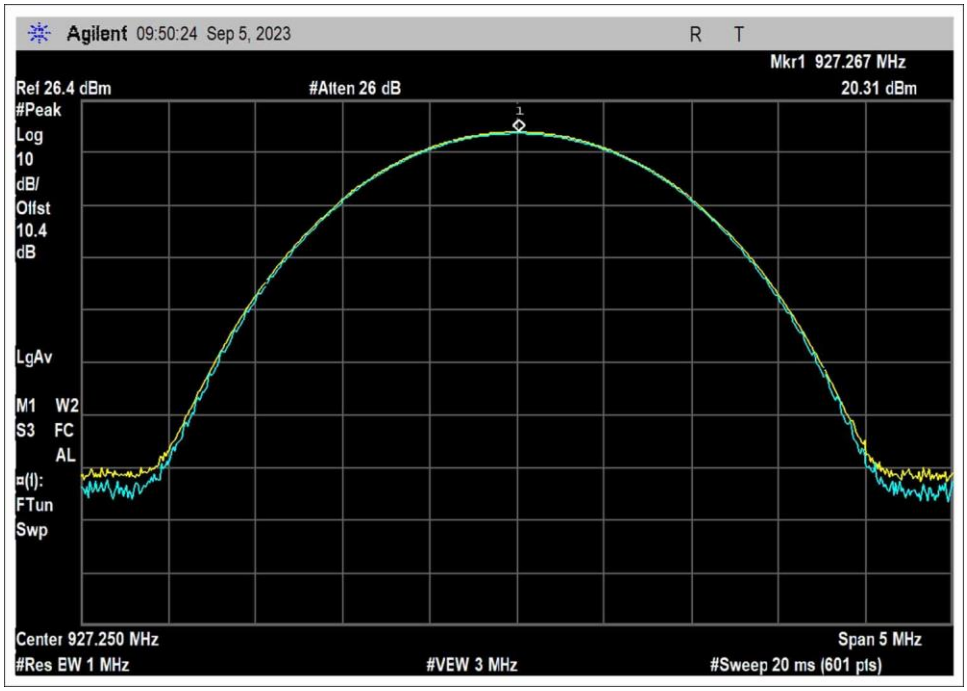
Antenna 3



Low Channel



Middle Channel



High Channel

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 • (714) 993-6112
Customer: **Automation Inc dba RADAR**
Specification: **15.247(d) / 15.209/ 15.205.. Radiated Spurious Emissions**
Work Order #: **108867** Date: 9/5/2023
Test Type: **Maximized Emissions** Time: 13:35:00
Tested By: E. Wong Sequence#: 2
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 equipment under test (EUT) is set on a Styrofoam tabletop in the maximized emission orientation.

Evaluation for Permissive Change II, worse case frequency point based on original evaluation.

The EUT is powered via a cat 6 network cable (nominal voltage 48Vdc), which is connected to a remotely located POE Injector. Connected to the POE Injector via cat 6 cable is a remotely located computer.
The computer is used to set frequency channel, frequency hopping, and modulation of the EUT.

Frequency Range of EUT: 902.75MHz-927.25MHz

TX 902.75MHz, 914.75MHz, 927.25MHz

TARI = 6.25us as intended.

Firmware version: 0.85.11

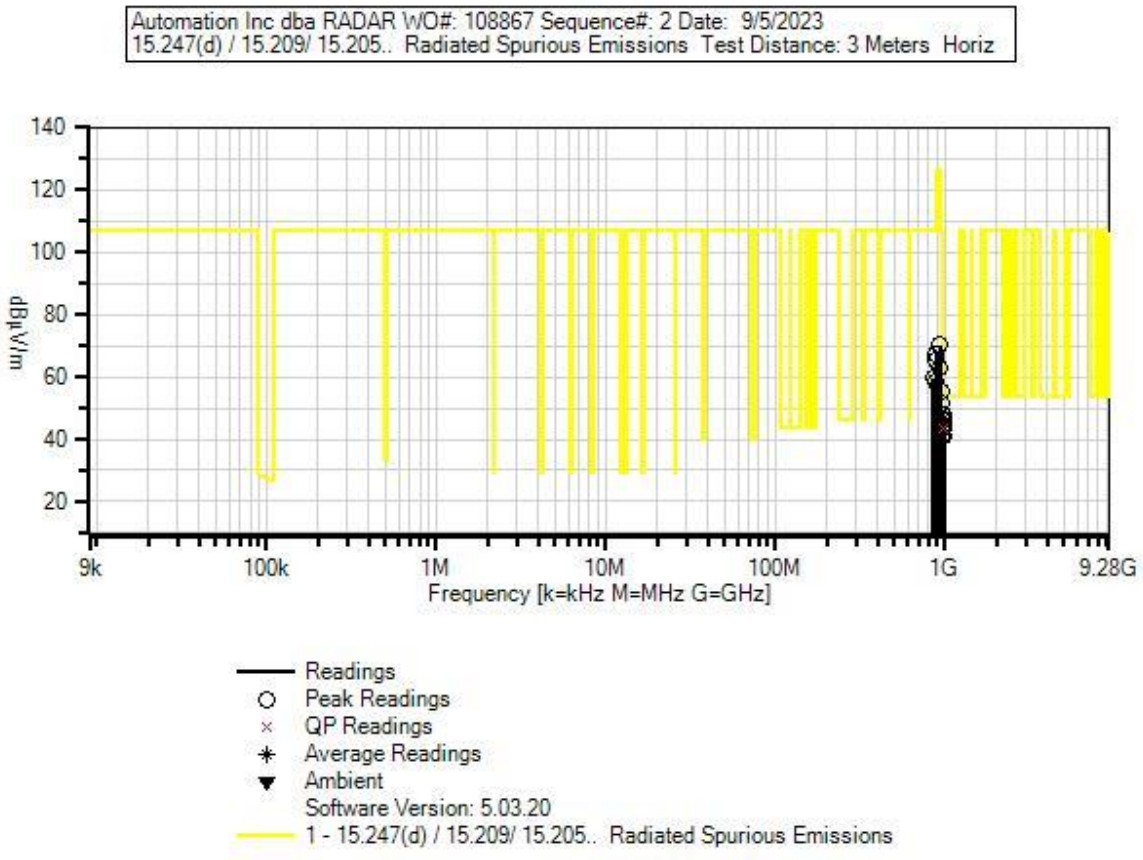
Frequency Range of Measurement: 30MHz-1000MHz
RBW=VBW=100kHz
RBW=120kHz, VBW=360kHz restricted band

Lowest antenna gain sector 180.0, highest power setting. L= 22.5dBm, M= 23.5dBm, H= 20.3dBm

Site A
Test Method: ANSI C63.10 (2013)

Test Environment Conditions:
Temperature: 23°C
Relative Humidity: 61%
Pressure: 98.8kPa

Additional evaluation performed with the EUT lay flat on the Styrofoam. worst case emission presented.



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02869	Spectrum Analyzer	E4440A	12/13/2022	12/13/2023
T2	AN00851	Biconilog Antenna	CBL6111C	4/21/2022	4/21/2024
T3	ANP05198	Cable-Amplitude +15C to +45C (dB)	8268	12/31/2022	12/31/2024
T4	AN00309	Preamp	8447D	12/13/2021	12/13/2023
T5	ANP05050	Cable	RG223/U	12/31/2022	12/31/2024
T6	AN02749	High Pass Filter	9SH10-1000/T10000-O/O	8/29/2023	8/29/2025

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	976.267M	34.9	+0.0 +0.5	+31.4 +2.4	+6.2	-27.4	+0.0	48.0	54.0 H	-6.0	Horiz
2	987.733M	35.5	+0.0 +0.5	+31.1 +1.7	+6.2	-27.4	+0.0	47.6	54.0 L	-6.4	Vert
3	966.860M	35.6	+0.0 +0.5	+31.5 +0.0	+6.1	-27.3	+0.0	46.4	54.0 M	-7.6	Vert
4	976.220M	33.0	+0.0 +0.5	+31.4 +2.4	+6.2	-27.4	+0.0	46.1	54.0 H_Layflat	-7.9	Horiz
5	977.770M	31.6	+0.0 +0.5	+31.3 +2.3	+6.2	-27.4	+0.0	44.5	54.0 L	-9.5	Horiz
6	977.870M	31.3	+0.0 +0.5	+31.3 +2.3	+6.2	-27.4	+0.0	44.2	54.0 L	-9.8	Horiz
7	982.770M	31.6	+0.0 +0.5	+31.2 +1.9	+6.2	-27.4	+0.0	44.0	54.0 L	-10.0	Horiz
8 QP	987.740M	31.3	+0.0 +0.5	+31.1 +1.7	+6.2	-27.4	+0.0	43.4	54.0 L	-10.6	Horiz
^	987.700M	36.6	+0.0 +0.5	+31.1 +1.7	+6.2	-27.4	+0.0	48.7	54.0 L	-5.3	Horiz
^	987.733M	30.4	+0.0 +0.5	+31.1 +1.7	+6.2	-27.4	+0.0	42.5	54.0 L_Layflat	-11.5	Horiz
11	976.260M	30.1	+0.0 +0.5	+31.4 +2.4	+6.2	-27.4	+0.0	43.2	54.0 H_Layflat	-10.8	Vert
12	960.024M	30.5	+0.0 +0.5	+31.4 +0.0	+6.1	-27.3	+0.0	41.2	54.0 M	-12.8	Horiz
13	987.733M	28.7	+0.0 +0.5	+31.1 +1.7	+6.2	-27.4	+0.0	40.8	54.0 L_Layflat	-13.2	Vert
14	939.470M	60.4	+0.0 +0.5	+30.8 +0.0	+6.0	-27.3	+0.0	70.4	106.8 H	-36.4	Horiz
15	890.460M	58.9	+0.0 +0.5	+29.4 +0.0	+5.8	-27.3	+0.0	67.3	106.8 L	-39.5	Horiz
16	890.450M	57.1	+0.0 +0.5	+29.4 +0.0	+5.8	-27.3	+0.0	65.5	106.8 L	-41.3	Horiz
17	853.790M	51.1	+0.0 +0.4	+29.7 +0.0	+5.6	-27.2	+0.0	59.6	106.8 L	-47.2	Horiz
18	878.210M	50.1	+0.0 +0.5	+29.5 +0.0	+5.7	-27.3	+0.0	58.5	106.8 L	-48.3	Horiz
19	951.790M	45.3	+0.0 +0.5	+31.1 +0.0	+6.0	-27.3	+0.0	55.6	106.8 L	-51.2	Horiz
20	939.700M	41.5	+0.0 +0.5	+30.9 +0.0	+6.0	-27.3	+0.0	51.6	106.8 L	-55.2	Horiz
21	927.240M	53.3	+0.0 +0.5	+30.4 +0.0	+5.9	-27.3	+0.0	62.8	126.8 L	-64.0	Vert

Test Location:	CKC Laboratories, Inc • 110 N. Olinda Place • Brea, CA • (714) 993-6112		
Customer:	**Automation Inc dba RADAR**		
Specification:	**15.247(d) / 15.209/ 15.205.. Radiated Spurious Emissions**		
Work Order #:	**108867**	Date:	9/5/2023
Test Type:	**Maximized Emissions**	Time:	15:27:23
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 equipment under test (EUT) is set on a Styrofoam tabletop in the maximized emission orientation.

Evaluation for Permissive Change II, worse case frequency point based on original evaluation.

The EUT is powered via a cat 6 network cable (nominal voltage 48Vdc), which is connected to a remotely located POE Injector. Connected to the POE Injector via cat 6 cable is a remotely located computer.
The computer is used to set frequency channel, frequency hopping, and modulation of the EUT.

Frequency Range of EUT: 902.75MHz-927.25MHz

TX 902.75MHz, 914.75MHz, 927.25MHz

TARI = 6.25us as intended.

Firmware version: 0.85.11

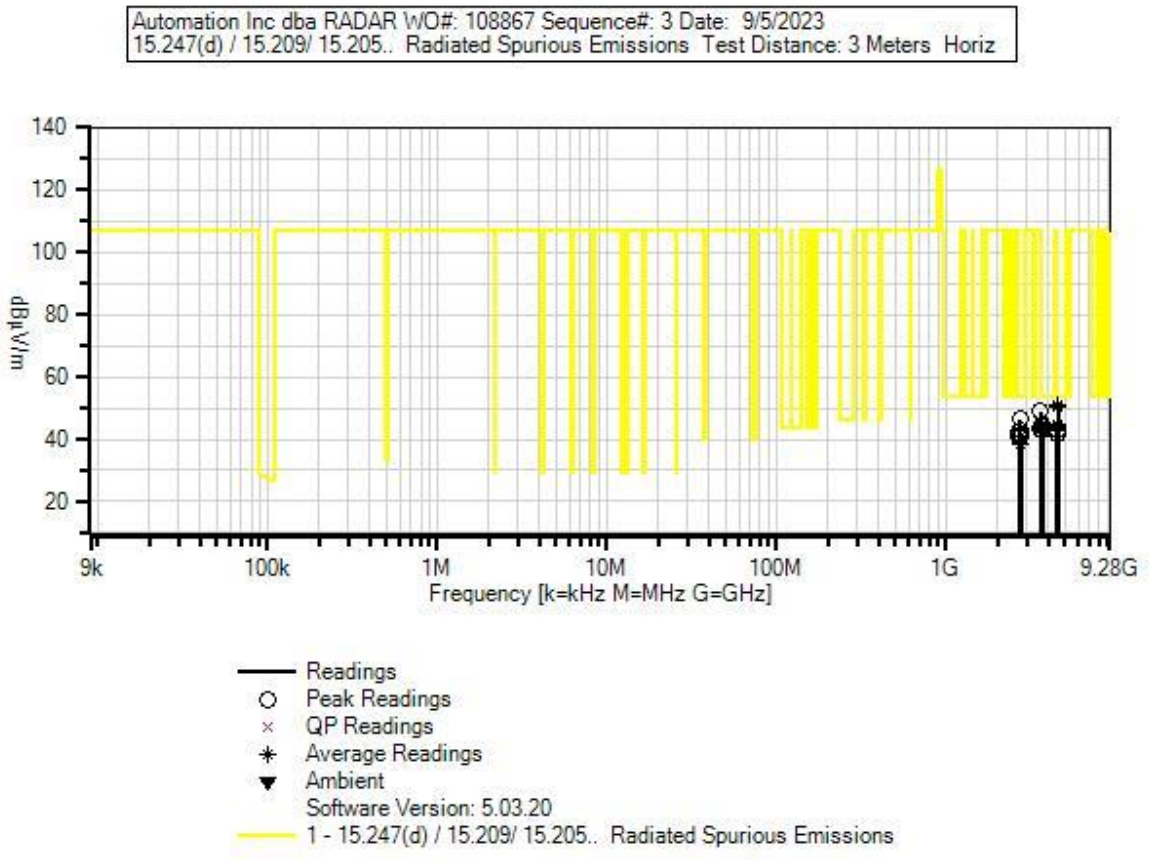
Frequency Range of Measurement: 1-10GHz
RBW=VBW=1MHz
RBW=100kHz, VBW=300kHz restricted band

Lowest antenna gain sector 180.0, highest power setting. L= 22.5dBm, M= 23.5dBm, H= 20.3dBm

Site A
Test Method: ANSI C63.10 (2013)

Test Environment Conditions:
Temperature: 23°C
Relative Humidity: 61%
Pressure: 98.8kPa

Additional evaluation performed with the EUT lay flat on the Styrofoam. worst case emission presented.



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02869	Spectrum Analyzer	E4440A	12/13/2022	12/13/2023
T2	AN00849	Horn Antenna	3115	3/21/2022	3/21/2024
T3	ANP07658	Cable	32022-29094K-29094K-24TC	6/22/2022	6/22/2024
T4	AN00786	Preamp	83017A	5/23/2022	5/23/2024
T5	ANP06360	Cable	L1-PNMNM-48	9/30/2021	9/30/2023
T6	AN03169	High Pass Filter	HM1155-11SS	5/15/2023	5/15/2025

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	4575.017M Ave	50.5	+0.0 +4.6	+32.3 +0.4	+0.7	-37.4	+0.0	51.1	54.0 Layflat_H_Harmonics of LO	-2.9	Vert
^	4575.017M	53.2	+0.0 +4.6	+32.3 +0.4	+0.7	-37.4	+0.0	53.8	54.0 Layflat_H_Harmonics of LO	-0.2	Vert
^	4575.000M	46.2	+0.0 +4.6	+32.3 +0.4	+0.7	-37.4	+0.0	46.8	54.0 H_Harmonics of LO	-7.2	Vert
^	4575.000M	45.8	+0.0 +4.6	+32.3 +0.4	+0.7	-37.4	+0.0	46.4	54.0 L_Harmonics of LO	-7.6	Vert
^	4575.040M	44.8	+0.0 +4.6	+32.3 +0.4	+0.7	-37.4	+0.0	45.4	54.0 M+Harmonics of LO	-8.6	Vert
6	4574.883M Ave	50.2	+0.0 +4.6	+32.3 +0.4	+0.7	-37.4	+0.0	50.8	54.0 Layflat_L_Harmonics of LO	-3.2	Vert
7	4574.883M Ave	50.0	+0.0 +4.6	+32.3 +0.4	+0.7	-37.4	+0.0	50.6	54.0 Layflat_M+Harmonics of LO	-3.4	Vert
^	4574.883M	53.8	+0.0 +4.6	+32.3 +0.4	+0.7	-37.4	+0.0	54.4	54.0 Layflat_M+Harmonics of LO	+0.4	Vert
^	4574.883M	53.1	+0.0 +4.6	+32.3 +0.4	+0.7	-37.4	+0.0	53.7	54.0 Layflat_L_Harmonics of LO	-0.3	Vert
10	3611.040M	50.8	+0.0 +3.9	+31.4 +0.3	+0.6	-38.1	+0.0	48.9	54.0 L	-5.1	Horiz
11	2744.920M	51.3	+0.0 +3.4	+29.3 +0.4	+0.5	-38.4	+0.0	46.5	54.0 M+Harmonics of LO	-7.5	Horiz
12	3658.917M Ave	46.5	+0.0 +4.0	+31.5 +0.3	+0.6	-37.9	+0.0	45.0	54.0 Layflat_M+Harmonics of LO	-9.0	Vert
^	3658.917M	52.7	+0.0 +4.0	+31.5 +0.3	+0.6	-37.9	+0.0	51.2	54.0 Layflat_M+Harmonics of LO	-2.8	Vert
14	3709.100M	45.5	+0.0 +4.1	+32.0 +0.4	+0.6	-37.8	+0.0	44.8	54.0 Layflat_H	-9.2	Vert
15	4575.000M Ave	44.2	+0.0 +4.6	+32.3 +0.4	+0.7	-37.4	+0.0	44.8	54.0 H_Harmonics of LO	-9.2	Horiz

16	4575.000M Ave	43.8	+0.0 +4.6	+32.3 +0.4	+0.7	-37.4	+0.0	44.4	54.0	-9.6	Horiz
^	4575.000M	49.5	+0.0 +4.6	+32.3 +0.4	+0.7	-37.4	+0.0	50.1	54.0	-3.9	Horiz
^	4575.050M	49.3	+0.0 +4.6	+32.3 +0.4	+0.7	-37.4	+0.0	49.9	54.0	-4.1	Horiz
^	4575.000M	48.5	+0.0 +4.6	+32.3 +0.4	+0.7	-37.4	+0.0	49.1	54.0	-4.9	Horiz
^	4575.000M	45.7	+0.0 +4.6	+32.3 +0.4	+0.7	-37.4	+0.0	46.3	54.0	-7.7	Horiz
^	4575.000M	45.5	+0.0 +4.6	+32.3 +0.4	+0.7	-37.4	+0.0	46.1	54.0	-7.9	Horiz
^	4574.917M	45.0	+0.0 +4.6	+32.3 +0.4	+0.7	-37.4	+0.0	45.6	54.0	-8.4	Horiz
23	3658.920M Ave	45.5	+0.0 +4.0	+31.5 +0.3	+0.6	-37.9	+0.0	44.0	54.0	-10.0	Horiz
^	3658.950M	51.1	+0.0 +4.0	+31.5 +0.3	+0.6	-37.9	+0.0	49.6	54.0	-4.4	Horiz
25	3659.083M	45.4	+0.0 +4.0	+31.5 +0.3	+0.6	-37.9	+0.0	43.9	54.0	-10.1	Horiz
26	3611.000M Ave	45.7	+0.0 +3.9	+31.4 +0.3	+0.6	-38.1	+0.0	43.8	54.0	-10.2	Vert
^	3611.000M	51.5	+0.0 +3.9	+31.4 +0.3	+0.6	-38.1	+0.0	49.6	54.0	-4.4	Vert
^	3611.040M	47.4	+0.0 +3.9	+31.4 +0.3	+0.6	-38.1	+0.0	45.5	54.0	-8.5	Vert
29	3611.000M	45.5	+0.0 +3.9	+31.4 +0.3	+0.6	-38.1	+0.0	43.6	54.0	-10.4	Horiz
30	3708.867M	43.8	+0.0 +4.1	+32.0 +0.4	+0.6	-37.8	+0.0	43.1	54.0	-10.9	Horiz
31	4513.750M	42.5	+0.0 +4.5	+32.2 +0.4	+0.7	-37.4	+0.0	42.9	54.0	-11.1	Vert
32	2744.760M	47.4	+0.0 +3.4	+29.3 +0.4	+0.5	-38.4	+0.0	42.6	54.0	-11.4	Vert
33	2708.250M	47.4	+0.0 +3.4	+29.2 +0.4	+0.5	-38.4	+0.0	42.5	54.0	-11.5	Vert
34	2708.280M	47.3	+0.0 +3.4	+29.2 +0.4	+0.5	-38.4	+0.0	42.4	54.0	-11.6	Horiz
35	2744.883M	46.6	+0.0 +3.4	+29.3 +0.4	+0.5	-38.4	+0.0	41.8	54.0	-12.2	Horiz
36	2781.650M	46.1	+0.0 +3.5	+29.5 +0.4	+0.5	-38.4	+0.0	41.6	54.0	-12.4	Horiz

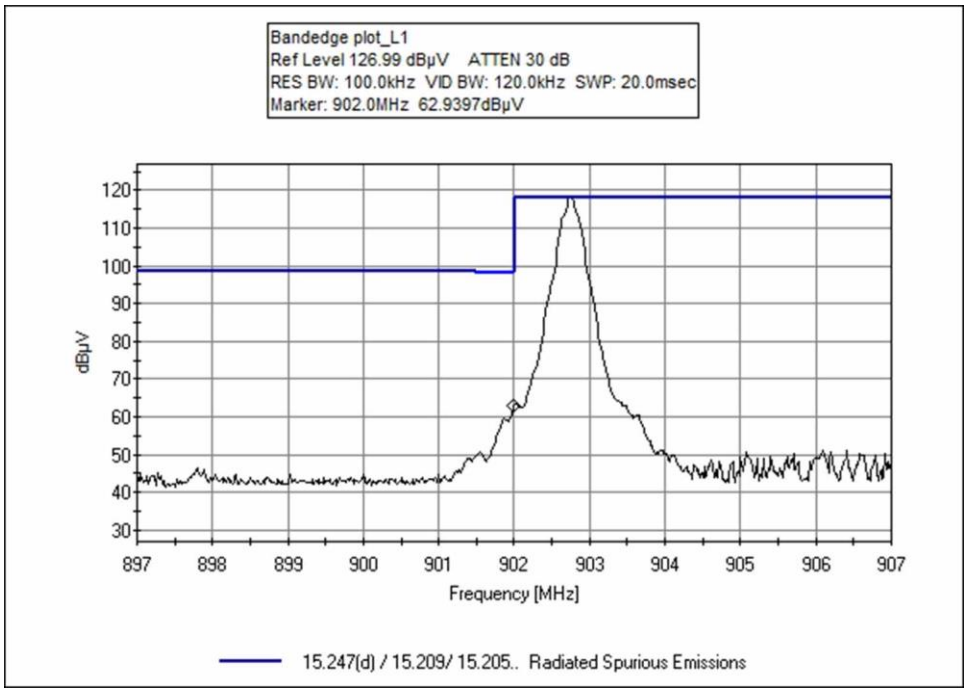
16	Ave L_Harmonics of LO
^	H_Harmonics of LO
^	M+Harmonics of LO
^	L_Harmonics of LO
^	Layflat_L_Harmonics of LO
^	Layflat_H_Harmonis of LO
^	Layflat_M+Harmonics of LO
23	Ave M+Harmonics of LO
^	M+Harmonics of LO
25	Layflat_M+Harmonics of LO
26	Ave Layflat_L
^	Layflat_L
^	L
29	Layflat_L
30	H
31	Layflat_L
32	M+Harmonics of LO
33	Layflat_L
34	L
35	Layflat_M+Harmonics of LO
36	H

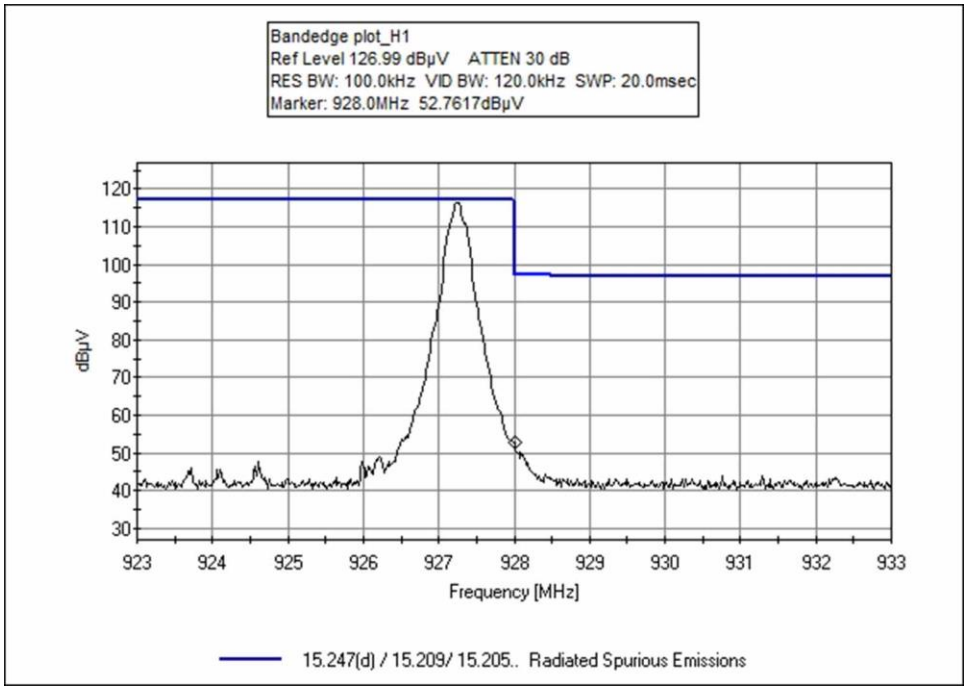
37	2781.900M	46.0	+0.0 +3.5	+29.5 +0.4	+0.5	-38.4	+0.0	41.5	54.0 H	-12.5	Vert
38	2781.750M	45.9	+0.0 +3.5	+29.5 +0.4	+0.5	-38.4	+0.0	41.4	54.0 Layflat_H	-12.6	Horiz
39	4513.800M	40.9	+0.0 +4.5	+32.2 +0.4	+0.7	-37.4	+0.0	41.3	54.0 L	-12.7	Vert
40	2781.825M	45.7	+0.0 +3.5	+29.5 +0.4	+0.5	-38.4	+0.0	41.2	54.0 Layflat_H	-12.8	Vert
41	2708.280M	45.8	+0.0 +3.4	+29.2 +0.4	+0.5	-38.4	+0.0	40.9	54.0 L	-13.1	Vert
42	2745.067M Ave	43.4	+0.0 +3.4	+29.3 +0.4	+0.5	-38.4	+0.0	38.6	54.0 Layflat_M+Harmonics of LO	-15.4	Vert
^	2745.067M	52.0	+0.0 +3.4	+29.3 +0.4	+0.5	-38.4	+0.0	47.2	54.0 Layflat_M+Harmonics of LO	-6.8	Vert

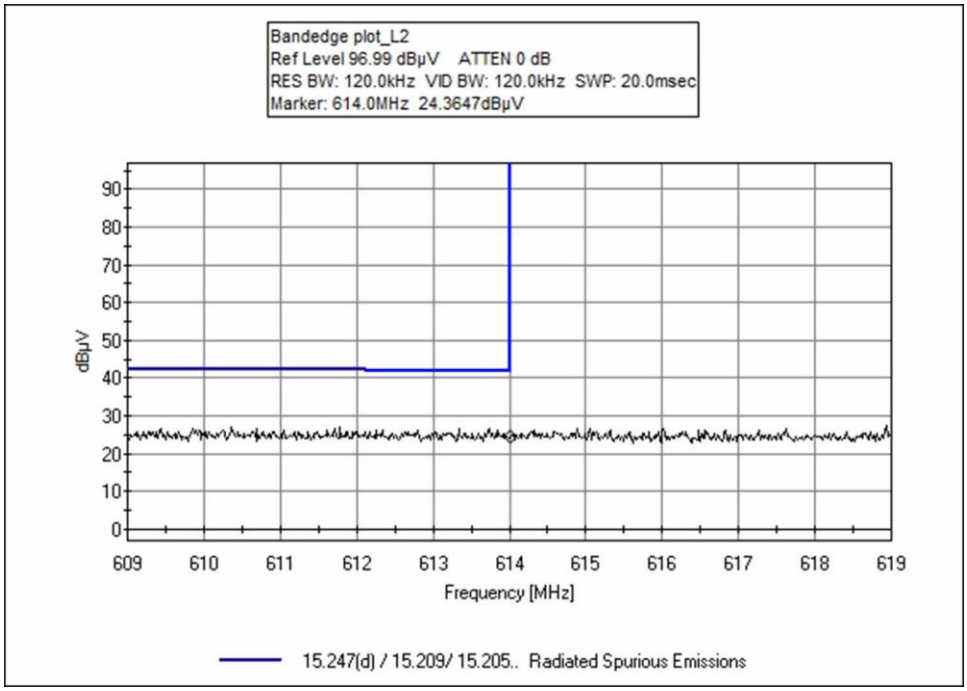
Band Edge

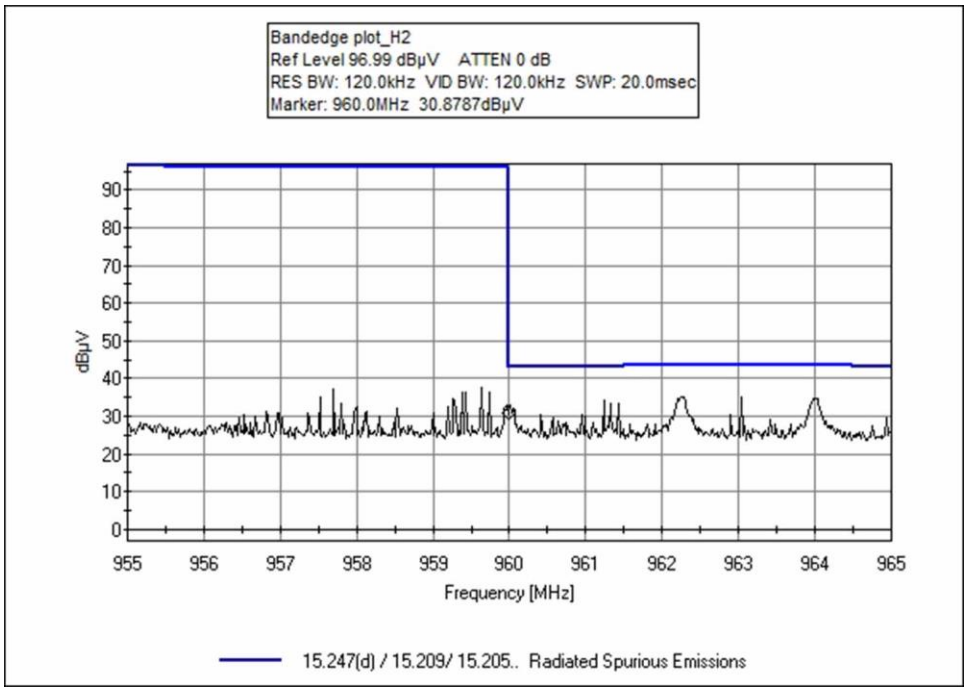
Band Edge Summary					
Operating Mode: Single Channel (Low and High)					
Frequency (MHz)	**Modulation**	**Ant. Type**	**Field Strength (dBuV/m @3m)**	**Limit (dBuV/m @3m)**	**Results**
614	PR-ASK	Patch Array	28.4	<46	Pass
902	PR-ASK	Patch Array	71.4	<106.8	Pass
928	PR-ASK	Patch Array	62.4	< 106.8	Pass
960	PR-ASK	Patch Array	45.1	<54	Pass

Band Edge Plots






Bandedge plot_L2
Ref Level 96.99 dBµV ATTEN 0 dB
RES BW: 120.0kHz VID BW: 120.0kHz SWP: 20.0msec
Marker: 614.0MHz 24.3647dBµV
dBµV
90
80
70
60
50
40
30
20
10
0
609
610
611
612
613
614
615
616
617
618
619
Frequency [MHz]
15.247(d) / 15.209/ 15.205.. Radiated Spurious Emissions


Bandedge plot_H2
Ref Level 96.99 dBµV ATTEN 0 dB
RES BW: 120.0kHz VID BW: 120.0kHz SWP: 20.0msec
Marker: 960.0MHz 30.8787dBµV
dBµV
90
80
70
60
50
40
30
20
10
0
955
956
957
958
959
960
961
962
963
964
965
Frequency [MHz]
15.247(d) / 15.209/ 15.205.. Radiated Spurious Emissions

Test Setup / Conditions / Data

Test Location:	CKC Laboratories, Inc • 110 N. Olinda Place • Brea, CA • (714) 993-6112		
Customer:	**Automation Inc dba RADAR**		
Specification:	**15.247(d) / 15.209/ 15.205.. Radiated Spurious Emissions**		
Work Order #:	**108867**	Date:	9/5/2023
Test Type:	**Maximized Emissions**	Time:	10:46:27
Tested By:	E. Wong	Sequence#:	1
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 equipment under test (EUT) is set on a Styrofoam tabletop in the maximized emission orientation.

Evaluation for Permissive Change II, worse case frequency point based on original evaluation. Hopping mode was not evaluated.

The EUT is powered via a cat 6 network cable (nominal voltage 48Vdc) which is connected to a remotely located POE Injector. Connected to the POE Injector via cat 6 cable is a remotely located computer.
The computer is used to set frequency channel, frequency hopping, and modulation of the EUT.

Frequency Range of EUT: 902.75MHz-927.25MHz

TX 902.75MHz, 927.25MHz

TARI = 6.25us as intended.

Firmware version: 0.85.11

Frequency Range of Measurement: 614MHz-960MHz
RBW=VBW=100kHz
RBW=120kHz, VBW=360kHz restricted band

Lowest antenna gain sector 180.0, highest power setting. L= 22.5dBm, M= 23.5dBm, H= 20.3dBm

Site A
Test Method: ANSI C63.10 (2013)

Test Environment Conditions:
Temperature: 23°C
Relative Humidity: 61%
Pressure: 98.8kPa

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02869	Spectrum Analyzer	E4440A	12/13/2022	12/13/2023
T2	AN00851	Biconilog Antenna	CBL6111C	4/21/2022	4/21/2024
T3	ANP05198	Cable-Amplitude +15C to +45C (dB)	8268	12/31/2022	12/31/2024
T4	AN00309	Preamp	8447D	12/13/2021	12/13/2023
T5	ANP05050	Cable	RG223/U	12/31/2022	12/31/2024

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	960.000M	34.4	+0.0 +0.5	+31.4	+6.1	-27.3	+0.0	45.1	54.0 Bandedge_H2	-8.9	Horiz
2	614.000M	24.4	+0.0 +0.4	+26.3	+4.7	-27.4	+0.0	28.4	46.0 Bandedge_L2	-17.6	Horiz
3	902.000M	62.9	+0.0 +0.5	+29.5	+5.8	-27.3	+0.0	71.4	106.8 Bandedge_L1	-35.4	Horiz
4	928.000M	52.8	+0.0 +0.5	+30.5	+5.9	-27.3	+0.0	62.4	106.8 Bandedge_H1	-44.4	Horiz

Test Setup Photo(s)

Lay flat Position

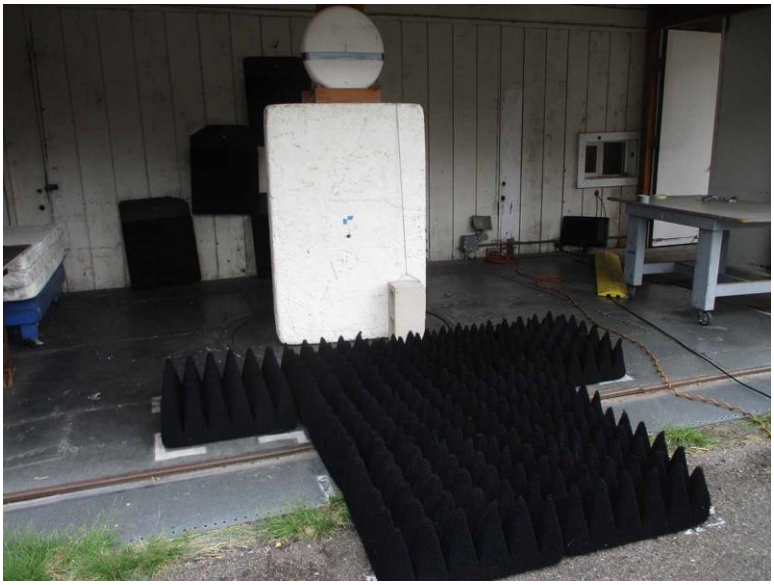
Upright Position

Below 1GHz; 0.8m, View 1

Below 1GHz; 0.8m, View 2

Below 1GHz; 1.5m, View 1

Below 1GHz; 1.5m, View 2



Above 1GHz; View 1

Above 1GHz; View 2

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.