

Davis Instruments

REVISED TEST REPORT TO 105181-16

EnviroMonitor Gateway
Model: 6803

Tested to The Following Standards:

FCC Part 15 Subpart C Section(s)

15.247
(FHSS 902-928MHz)

Report No.: 105181-16A

Date of issue: June 18, 2021



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.

TABLE OF CONTENTS

Administrative Information	3
Test Report Information	3
Revision History	3
Report Authorization	3
Test Facility Information	4
Software Versions	4
Site Registration & Accreditation Information	4
Summary of Results	5
Modifications During Testing	5
Conditions During Testing	5
Equipment Under Test	6
General Product Information	6
FCC Part 15 Subpart C	12
15.247(b)(2) Output Power	12
15.247(d) Radiated Emissions & Band Edge	15
Supplemental Information	32
Measurement Uncertainty	32
Emissions Test Details	32

ADMINISTRATIVE INFORMATION

Test Report Information

REPORT PREPARED FOR:

Davis Instruments
3465 Diablo Avenue
Hayward, CA 94545

Representative: Jeremiah Jeffress
Customer Reference Number: 94238

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

Terri Rayle
CKC Laboratories, Inc.
5046 Sierra Pines Drive
Mariposa, CA 95338

Project Number: 105181

April 21, 2021

April 21 and 26, 2021


Revision History

Original: Testing of the EnviroMonitor Gateway Model: 6803 to FCC Part 15 Subpart C Section(s) 15.247 (FHSS 902-928MHz).

Revision A: To replace the block diagram and replace Band Edge data in section 15.247(d).

Report Authorization

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

A handwritten signature in black ink that reads "Steve Behm".

Steve Behm
Director of Quality Assurance & Engineering Services
CKC Laboratories, Inc.

Test Facility Information



Our laboratories are configured to effectively test a wide variety of product types. CKC utilizes first class test equipment, anechoic chambers, data acquisition and information services to create accurate, repeatable and affordable test results.

TEST LOCATION(S):
CKC Laboratories, Inc.
5046 Sierra Pines Drive
Mariposa, CA 95338

Software Versions

CKC Laboratories Proprietary Software	Version
EMITest Emissions	5.03.19

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	NA1

NA = Not Applicable

NA1 = NA1 = Not applicable, the manufacturer declares the EUT is battery operated.

NP = CKC Laboratories was not contracted to perform test.

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
Cellular Gateway	Davis Instruments	6803	809139

Support Equipment:

Device	Manufacturer	Model #	S/N
Laptop	Dell	E5470	33719389346

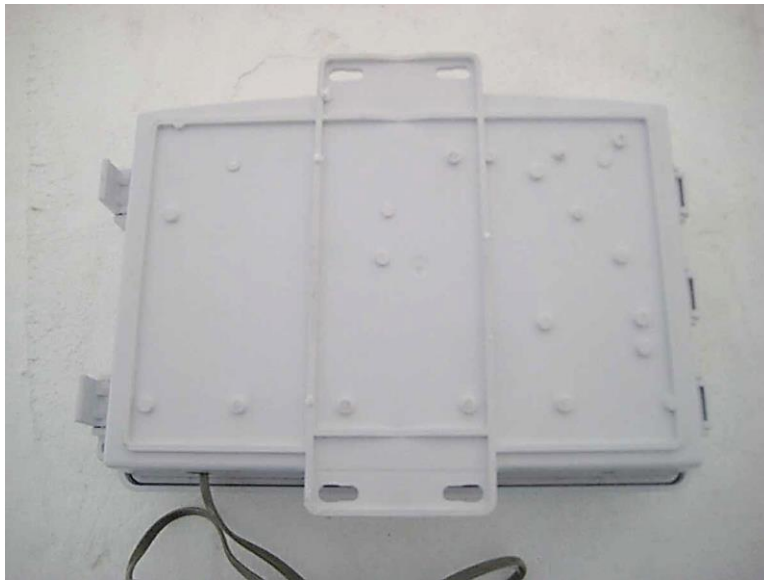
General Product Information:

Product Information	Manufacturer-Provided Details
Equipment Type:	Stand-Alone Equipment
Type of Wideband System:	FHSS
Operating Frequency Range:	902.5-927MHz
Number of Hopping Channels:	See report 97540-13
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):	GFSK
Maximum Duty Cycle:	98%
Number of TX Chains:	1
Antenna Type(s) and Gain:	2dBi Dipole, 5dBi Omni, 8dBi Omni
Beamforming Type:	NA
Antenna Connection Type:	Integral (External connector provided to facilitate testing)
Nominal Input Voltage:	6V Battery
Firmware / Software used for Test:	TeraTerm 4.105

EUT and Accessory Photo(s)



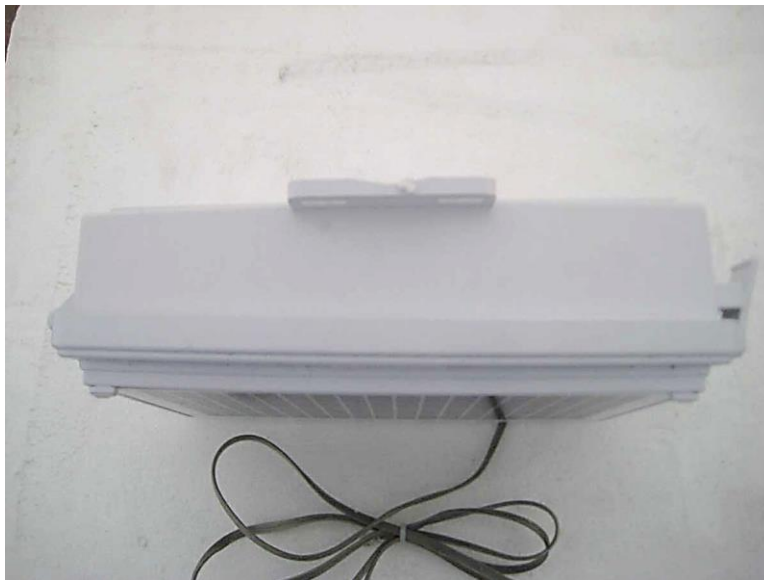
Antennas



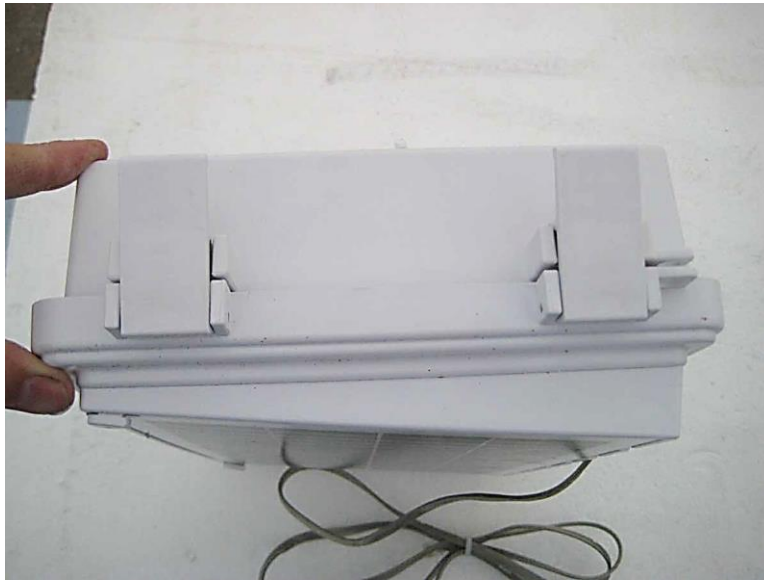
View 1



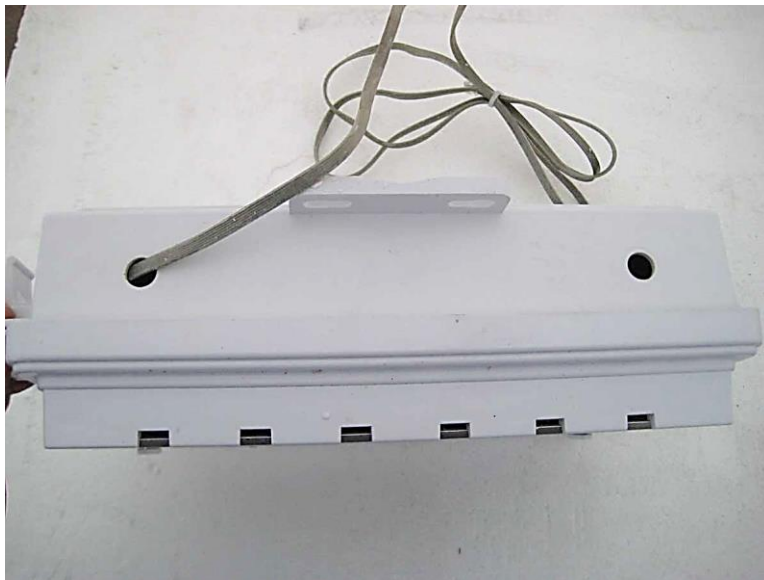
View 2



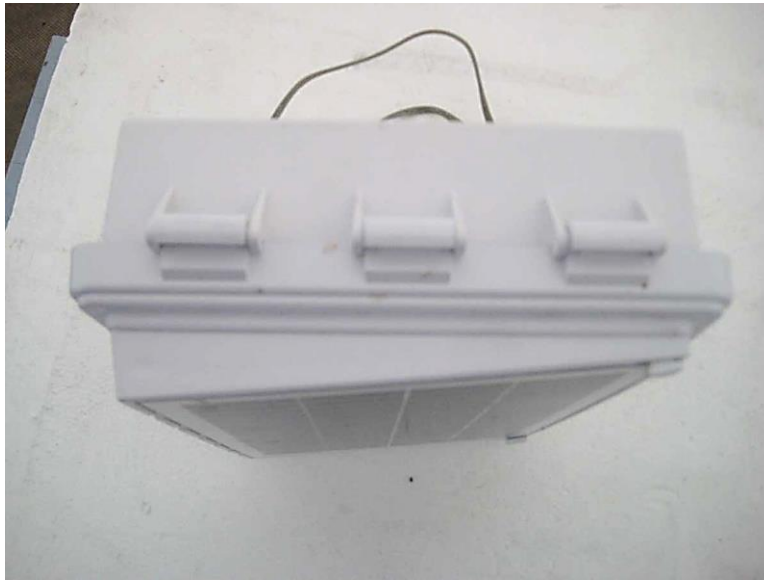
View 3



View 4



View 5



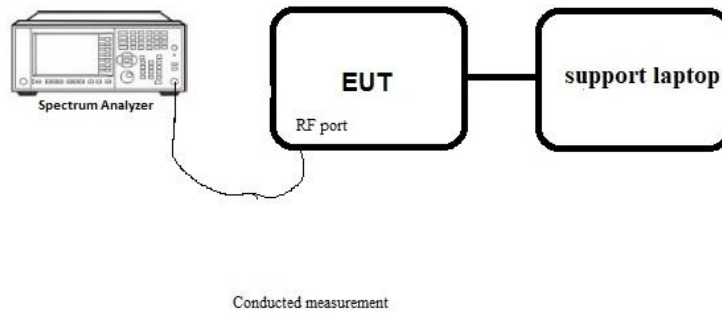
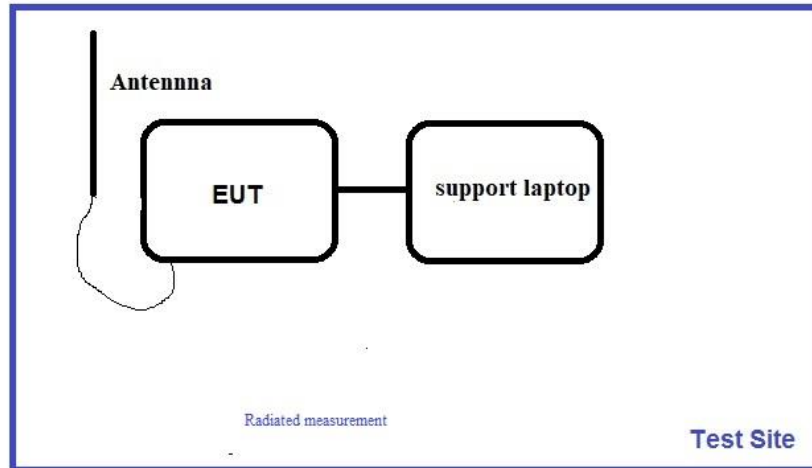
View 6

Support Equipment Photo(s)



Block Diagram of Test Setup(s)

Test Setup Block Diagram



FCC Part 15 Subpart C

15.247(b)(2) Output Power

Test Setup/Conditions			
Test Location:	Mariposa Lab A	Test Engineer:	E. Wong / J. Wharton
Test Method:	ANSI C63.10 (2013)	Test Date(s):	4/21/2021
Configuration:	1		
Test Setup:	<p>The EUT is placed on the test bench, a support laptop is connected to the EUT via USB/Serial power for configuration of test mode. The EUT is battery/solar cell operated. A support charger is connected to the battery to simulate a fully charged battery.</p> <p>Evaluation of RF parameter of the 902-928MHz radio. Antenna to be used with the device, 2dBi Dipole, 5dBi Omni, 8dBi Omni. Note: This test report evaluates the device with highest gain antenna of the same type. The 2dBi dipole was evaluated under another test report.</p>		

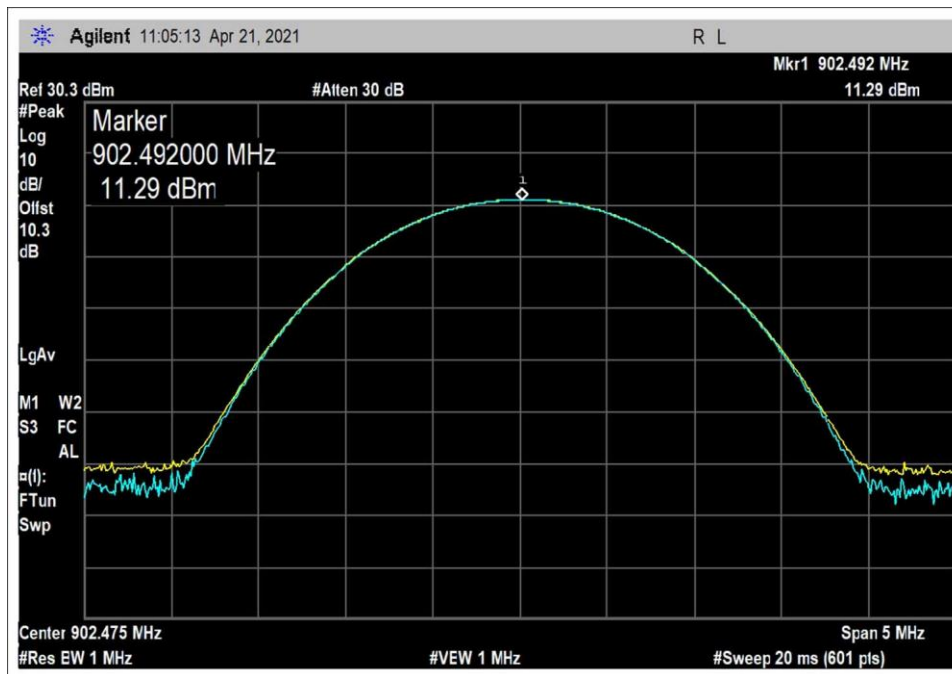
Environmental Conditions			
Temperature (°C)	46	Relative Humidity (%):	19

Test Equipment					
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
02869	Spectrum Analyzer	Agilent	E4440A	8/3/2020	8/3/2021
02138	Attenuator	Weinschel	54-10	11/12/2019	11/12/2021
033361	Cable	Astrolab	32022-2-29094-48TC	6/15/2020	6/15/2022

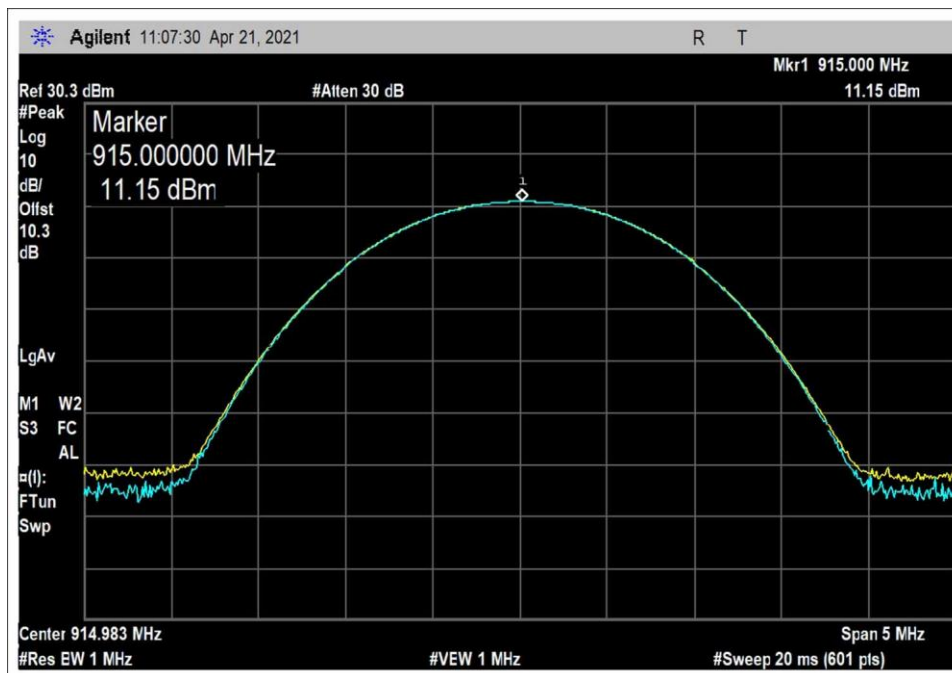
Test Data Summary - RF Conducted Measurement					
$\text{Limit} = \begin{cases} 30\text{dBm Conducted}/36\text{dBm EIRP} & \geq 50 \text{ Channels} \\ 24\text{dBm Conducted}/30\text{dBm EIRP} & < 50 \text{ Channels (min 25)} \end{cases}$					
Frequency (MHz)	Modulation	Ant. Type / Gain (dBi)	Measured (dBm)	Limit (dBm)	Results
902.5	GFSK	2/5/8	11.29	≤ 30	Pass
915.0	GFSK	2/5/8	11.15	≤ 30	Pass
927.0	GFSK	2/5/8	10.84	≤ 30	Pass

Firmware Power set= 11.5dBm.

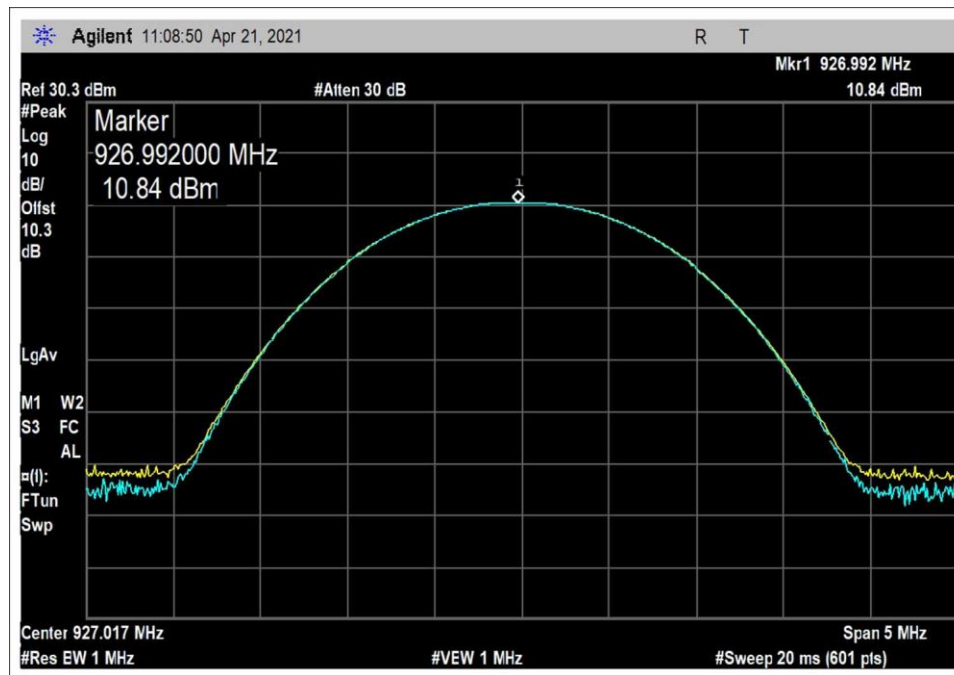
Plots



Low Channel

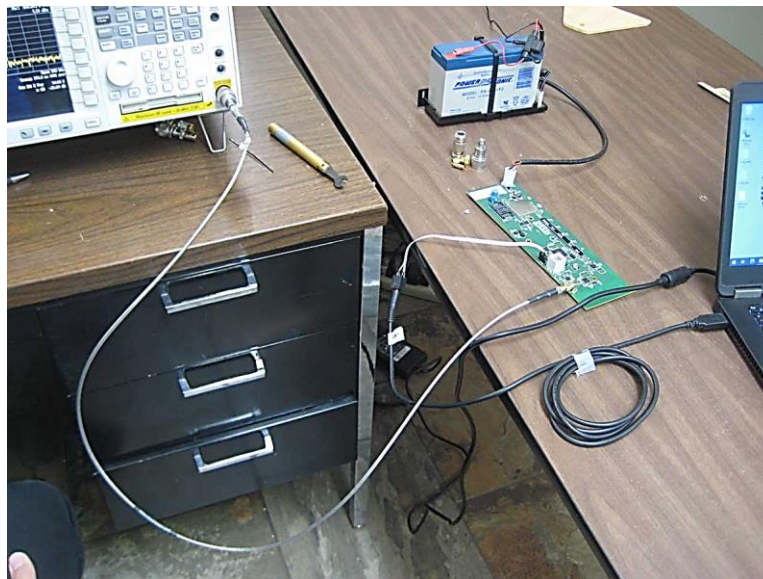


Middle Channel



High Channel

Test Setup Photo(s)



15.247(d) Radiated Emissions & Band Edge

Test Setup / Conditions / Data

Test Location: CKC Laboratories, Inc. • 5046 Sierra Pines Drive • Mariposa, CA 95338 • (209)-299-5240
 Customer: **Davis Instruments**
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**
 Work Order #: **105181** Date: 4/26/2021
 Test Type: **Radiated Scan** Time: 16:43:10
 Tested By: E. Wong / Jonathan Wharton Sequence#: 3
 Software: EMITest 5.03.19

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

The PCB of the EUT is placed on the Styrofoam block, orientated as the exact position to be installed in a non-conductive enclosure., a support laptop is connected to the EUT via USB/Serial power for configuration of test mode. a section of cable is connected to the RS485 serial port. EUT is battery operated, a support DC power supply is connected to the battery to ensure full battery power.

Freq range 902-928MHz

TX frequency: 902.46MHz, 914.98MHz, 926.98MHz

Power set = 11.5

antenna: 5dBi Omni, 8dBi Omni. Data set is for worst case antenna, highest gain of the same type. 8dBi

Frequency Range of Measurement = 9KHz- 10GHz.

9kHz-150kHz; RBW=200Hz, VBW=200Hz; 150kHz-30MHz; RBW=9kHz, VBW=9kHz; 30MHz-1000 MHz; RBW=120kHz, VBW=360kHz, 1000MHz; RBW=1MHz, VBW=3MHz.

Test Environment Conditions:

Temperature: 21°C

Relative Humidity 45%

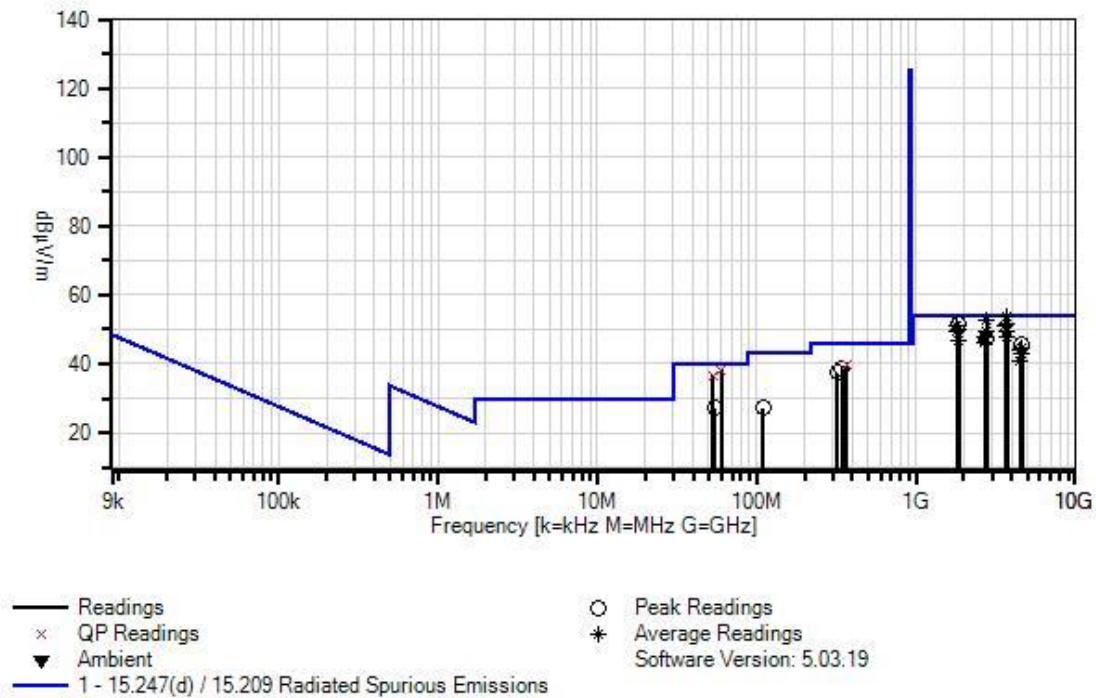
Pressure: 100kPa

Site: Mariposa A

Test Method: ANSI C63.10-2013

For measurement above 1GHz, the PCB is installed in enclosure, with no charger. Battery is fully charged.

Davis Instruments WO#: 105181 Sequence#: 3 Date: 4/26/2021
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Vert



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02869	Spectrum Analyzer	E4440A	8/3/2020	8/3/2021
T2	AN01996	Biconilog Antenna	CBL6111C	6/11/2019	6/11/2021
T3	ANP05656	Attenuator	PE7004-6	2/17/2020	2/17/2022
T4	ANP06229	Cable-Insertion Loss (dB) (+15degC to 0degC)	CXTA04A-50	7/9/2020	7/9/2022
T5	ANP06231	Cable	CXTA04A-70	3/10/2020	3/10/2022
T6	ANP07055	Cable	CNT-195-FR-3	8/28/2019	8/28/2021
T7	AN00449	Preamp-Upper Ports (dB)	8447F	1/13/2020	1/13/2022
T8	ANP06847	Cable	LMR195-FR-6	8/16/2019	8/16/2021
T9	AN00327	Horn Antenna	3115	11/24/2020	11/24/2022
T10	AN03011	Cable	32022-2-2909K- 24TC	6/15/2020	6/15/2022
T11	AN02115	Preamp	83051A	4/2/2021	4/2/2023
T12	ANP07585	Cable	32026-2- 29094K-360TC	8/26/2019	8/26/2021
T13	AN01415	High Pass Filter	84300-80037	3/26/2020	3/26/2022
	AN00226	Loop Antenna	6502	3/11/2021	3/11/2023

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq	Rdng	T1 T5 T9 T13	T2 T6 T10	T3 T7 T11	T4 T8 T12	Dist	Corr	Spec	Margin	Polar
	MHz	dBμV	dB	dB	dB	dB	Table	dBμV/m	dBμV/m	dB	Ant
1	3708.050M Ave	47.5	+0.0 +0.0 +31.5 +0.3	+0.0 +0.0 +0.5	+0.0 +0.0 -33.5	+0.0 +0.0 +7.6	+0.0	53.9	54.0 8dBi-Pset_11.5_H	-0.1	Vert
^	3708.050M	49.9	+0.0 +0.0 +31.5 +0.3	+0.0 +0.0 +0.5	+0.0 +0.0 -33.5	+0.0 +0.0 +7.6	+0.0	56.3	54.0 8dBi-Pset_11.5_H	+2.3	Vert
3	2780.950M Ave	49.1	+0.0 +0.0 +29.3 +0.3	+0.0 +0.0 +0.4	+0.0 +0.0 -33.5	+0.0 +0.0 +6.8	+0.0	52.4	54.0 8dBi_Pset_11.5_H	-1.6	Horiz
^	2780.950M	50.7	+0.0 +0.0 +29.3 +0.3	+0.0 +0.0 +0.4	+0.0 +0.0 -33.5	+0.0 +0.0 +6.8	+0.0	54.0	54.0 8dBi_Pset_11.5_H	+0.0	Horiz
5	60.300M QP	41.6	+0.0 +1.1 +0.0 +0.0	+4.9 +0.1 +0.0	+6.0 -27.0 +0.0	+0.8 +0.2 +0.0	+10.5	38.2	40.0	-1.8	Vert
^	60.300M	47.6	+0.0 +1.1 +0.0 +0.0	+4.9 +0.1 +0.0	+6.0 -27.0 +0.0	+0.8 +0.2 +0.0	+10.5	44.2	40.0	+4.2	Vert
7	1854.000M	52.8	+0.0 +0.0 +26.7 +0.7	+0.0 +0.0 +0.2	+0.0 +0.0 -34.4	+0.0 +0.0 +5.5	+0.0	51.5	54.0 8dBi-Pset_11.5_H	-2.5	Vert
8	3707.900M Ave	45.1	+0.0 +0.0 +31.5 +0.3	+0.0 +0.0 +0.5	+0.0 +0.0 -33.5	+0.0 +0.0 +7.6	+0.0	51.5	54.0 8dBi_Pset_11.5_H	-2.5	Horiz
^	3707.900M	47.3	+0.0 +0.0 +31.5 +0.3	+0.0 +0.0 +0.5	+0.0 +0.0 -33.5	+0.0 +0.0 +7.6	+0.0	53.7	54.0 8dBi_Pset_11.5_H	-0.3	Horiz
10	3609.950M Ave	44.8	+0.0 +0.0 +31.5 +0.3	+0.0 +0.0 +0.5	+0.0 +0.0 -33.6	+0.0 +0.0 +7.7	+0.0	51.2	54.0 8dBi_Pset_11.5_L	-2.8	Horiz
^	3609.950M	47.5	+0.0 +0.0 +31.5 +0.3	+0.0 +0.0 +0.5	+0.0 +0.0 -33.6	+0.0 +0.0 +7.7	+0.0	53.9	54.0 8dBi_Pset_11.5_L	-0.1	Horiz

12	3609.950M Ave	44.5	+0.0 +0.0 +31.5 +0.3	+0.0 +0.0 +0.5	+0.0 +0.0 -33.6	+0.0 +0.0 +7.7	+0.0	50.9	54.0 8dBi_Pset_11.5_L	-3.1	Vert
^	3609.950M	47.5	+0.0 +0.0 +31.5 +0.3	+0.0 +0.0 +0.5	+0.0 +0.0 -33.6	+0.0 +0.0 +7.7	+0.0	53.9	54.0 8dBi_Pset_11.5_L	-0.1	Vert
14	1804.950M Ave	52.7	+0.0 +0.0 +26.5 +0.7	+0.0 +0.0 +0.2	+0.0 +0.0 -34.6	+0.0 +0.0 +5.4	+0.0	50.9	54.0 8dBi_Pset_11.5_L	-3.1	Horiz
^	1804.950M	53.8	+0.0 +0.0 +26.5 +0.7	+0.0 +0.0 +0.2	+0.0 +0.0 -34.6	+0.0 +0.0 +5.4	+0.0	52.0	54.0 8dBi_Pset_11.5_L	-2.0	Horiz
16	53.350M QP	37.9	+0.0 +1.1 +0.0 +0.0	+7.2 +0.1 +0.0	+6.0 -27.1 +0.0	+0.7 +0.2 +0.0	+10.5	36.6	40.0	-3.4	Vert
^	53.350M	41.8	+0.0 +1.1 +0.0 +0.0	+7.2 +0.1 +0.0	+6.0 -27.1 +0.0	+0.7 +0.2 +0.0	+10.5	40.5	40.0	+0.5	Vert
18	1830.000M Ave	51.7	+0.0 +0.0 +26.6 +0.7	+0.0 +0.0 +0.2	+0.0 +0.0 -34.5	+0.0 +0.0 +5.4	+0.0	50.1	54.0 8dBi_Pset_11.5_M	-3.9	Horiz
^	1830.000M	53.3	+0.0 +0.0 +26.6 +0.7	+0.0 +0.0 +0.2	+0.0 +0.0 -34.5	+0.0 +0.0 +5.4	+0.0	51.7	54.0 8dBi_Pset_11.5_M	-2.3	Horiz
20	1830.000M Ave	51.4	+0.0 +0.0 +26.6 +0.7	+0.0 +0.0 +0.2	+0.0 +0.0 -34.5	+0.0 +0.0 +5.4	+0.0	49.8	54.0 8dBi_Pset_11.5_M	-4.2	Vert
^	1830.000M	52.7	+0.0 +0.0 +26.6 +0.7	+0.0 +0.0 +0.2	+0.0 +0.0 -34.5	+0.0 +0.0 +5.4	+0.0	51.1	54.0 8dBi_Pset_11.5_M	-2.9	Vert
22	2745.000M Ave	46.4	+0.0 +0.0 +29.2 +0.3	+0.0 +0.0 +0.4	+0.0 +0.0 -33.4	+0.0 +0.0 +6.8	+0.0	49.7	54.0 8dBi_Pset_11.5_M	-4.3	Horiz
^	2745.000M	48.3	+0.0 +0.0 +29.2 +0.3	+0.0 +0.0 +0.4	+0.0 +0.0 -33.4	+0.0 +0.0 +6.8	+0.0	51.6	54.0 8dBi_Pset_11.5_M	-2.4	Horiz

24	1804.950M Ave	51.4	+0.0 +0.0 +26.5 +0.7	+0.0 +0.0 +0.2	+0.0 +0.0 -34.6	+0.0 +0.0 +5.4	+0.0 +0.0 +0.0	49.6	54.0 8dBi_Pset_11.5_L	-4.4	Vert
^	1804.950M	52.7	+0.0 +0.0 +26.5 +0.7	+0.0 +0.0 +0.2	+0.0 +0.0 -34.6	+0.0 +0.0 +5.4	+0.0 +0.0 +0.0	50.9	54.0 8dBi_Pset_11.5_L	-3.1	Vert
26	2745.000M Ave	46.1	+0.0 +0.0 +29.2 +0.3	+0.0 +0.0 +0.4	+0.0 +0.0 -33.4	+0.0 +0.0 +6.8	+0.0 +0.0 +0.0	49.4	54.0 8dBi_Pset_11.5_M	-4.6	Vert
^	2745.000M	48.1	+0.0 +0.0 +29.2 +0.3	+0.0 +0.0 +0.4	+0.0 +0.0 -33.4	+0.0 +0.0 +6.8	+0.0 +0.0 +0.0	51.4	54.0 8dBi_Pset_11.5_M	-2.6	Vert
28	3660.000M Ave	42.8	+0.0 +0.0 +31.5 +0.3	+0.0 +0.0 +0.5	+0.0 +0.0 -33.5	+0.0 +0.0 +7.6	+0.0 +0.0 +0.0	49.2	54.0 8dBi_Pset_11.5_M	-4.8	Vert
^	3660.000M	46.0	+0.0 +0.0 +31.5 +0.3	+0.0 +0.0 +0.5	+0.0 +0.0 -33.5	+0.0 +0.0 +7.6	+0.0 +0.0 +0.0	52.4	54.0 8dBi_Pset_11.5_M	-1.6	Vert
30	3660.000M Ave	41.6	+0.0 +0.0 +31.5 +0.3	+0.0 +0.0 +0.5	+0.0 +0.0 -33.5	+0.0 +0.0 +7.6	+0.0 +0.0 +0.0	48.0	54.0 8dBi_Pset_11.5_M	-6.0	Horiz
^	3660.000M	45.4	+0.0 +0.0 +31.5 +0.3	+0.0 +0.0 +0.5	+0.0 +0.0 -33.5	+0.0 +0.0 +7.6	+0.0 +0.0 +0.0	51.8	54.0 8dBi_Pset_11.5_M	-2.2	Horiz
32	2707.450M Ave	44.9	+0.0 +0.0 +29.1 +0.3	+0.0 +0.0 +0.4	+0.0 +0.0 -33.5	+0.0 +0.0 +6.8	+0.0 +0.0 +0.0	48.0	54.0 8dBi_Pset_11.5_L	-6.0	Vert
^	2707.450M	47.2	+0.0 +0.0 +29.1 +0.3	+0.0 +0.0 +0.4	+0.0 +0.0 -33.5	+0.0 +0.0 +6.8	+0.0 +0.0 +0.0	50.3	54.0 8dBi_Pset_11.5_L	-3.7	Vert
34	2780.950M	44.0	+0.0 +0.0 +29.3 +0.3	+0.0 +0.0 +0.4	+0.0 +0.0 -33.5	+0.0 +0.0 +6.8	+0.0 +0.0 +0.0	47.3	54.0 8dBi_Pset_11.5_H	-6.7	Vert
35	1854.000M Ave	47.9	+0.0 +0.0 +26.7 +0.7	+0.0 +0.0 +0.2	+0.0 +0.0 -34.4	+0.0 +0.0 +5.5	+0.0 +0.0 +0.0	46.6	54.0 8dBi_Pset_11.5_H	-7.4	Horiz
^	1854.000M	51.1	+0.0 +0.0 +26.7 +0.7	+0.0 +0.0 +0.2	+0.0 +0.0 -34.4	+0.0 +0.0 +5.5	+0.0 +0.0 +0.0	49.8	54.0 8dBi_Pset_11.5_H	-4.2	Horiz

37	2707.450M	43.2	+0.0	+0.0	+0.0	+0.0	+0.0	46.3	54.0	-7.7	Horiz
	Ave		+0.0	+0.0	+0.0	+0.0			8dBi_Pset_11.5_L		
			+29.1	+0.4	-33.5	+6.8					
			+0.3								
^	2707.450M	46.0	+0.0	+0.0	+0.0	+0.0	+0.0	49.1	54.0	-4.9	Horiz
			+0.0	+0.0	+0.0	+0.0			8dBi_Pset_11.5_L		
			+29.1	+0.4	-33.5	+6.8					
			+0.3								
39	4635.000M	36.9	+0.0	+0.0	+0.0	+0.0	+0.0	45.6	54.0	-8.4	Vert
			+0.0	+0.0	+0.0	+0.0			8dBi-Pset_11.5_H		
			+31.7	+0.6	-33.1	+9.2					
			+0.3								
40	4575.000M	36.3	+0.0	+0.0	+0.0	+0.0	+0.0	44.8	54.0	-9.2	Horiz
	Ave		+0.0	+0.0	+0.0	+0.0			8dBi_Pset_11.5_M		
			+31.6	+0.6	-33.1	+9.1					
			+0.3								
^	4575.000M	41.4	+0.0	+0.0	+0.0	+0.0	+0.0	49.9	54.0	-4.1	Horiz
			+0.0	+0.0	+0.0	+0.0			8dBi_Pset_11.5_M		
			+31.6	+0.6	-33.1	+9.1					
			+0.3								
42	4634.850M	36.0	+0.0	+0.0	+0.0	+0.0	+0.0	44.7	54.0	-9.3	Horiz
	Ave		+0.0	+0.0	+0.0	+0.0			8dBi_Pset_11.5_H		
			+31.7	+0.6	-33.1	+9.2					
			+0.3								
^	4634.850M	41.4	+0.0	+0.0	+0.0	+0.0	+0.0	50.1	54.0	-3.9	Horiz
			+0.0	+0.0	+0.0	+0.0			8dBi_Pset_11.5_H		
			+31.7	+0.6	-33.1	+9.2					
			+0.3								
44	4512.450M	35.9	+0.0	+0.0	+0.0	+0.0	+0.0	43.9	54.0	-10.1	Horiz
	Ave		+0.0	+0.0	+0.0	+0.0			8dBi_Pset_11.5_L		
			+31.4	+0.6	-33.2	+8.9					
			+0.3								
^	4512.450M	41.3	+0.0	+0.0	+0.0	+0.0	+0.0	49.3	54.0	-4.7	Horiz
			+0.0	+0.0	+0.0	+0.0			8dBi_Pset_11.5_L		
			+31.4	+0.6	-33.2	+8.9					
			+0.3								
46	4575.000M	34.2	+0.0	+0.0	+0.0	+0.0	+0.0	42.7	54.0	-11.3	Vert
	Ave		+0.0	+0.0	+0.0	+0.0			8dBi_Pset_11.5_M		
			+31.6	+0.6	-33.1	+9.1					
			+0.3								
^	4575.000M	40.1	+0.0	+0.0	+0.0	+0.0	+0.0	48.6	54.0	-5.4	Vert
			+0.0	+0.0	+0.0	+0.0			8dBi_Pset_11.5_M		
			+31.6	+0.6	-33.1	+9.1					
			+0.3								
48	54.417M	28.7	+0.0	+6.8	+6.0	+0.8	+10.5	27.1	40.0	-12.9	Horiz
			+1.1	+0.1	-27.1	+0.2					
			+0.0	+0.0	+0.0	+0.0					
			+0.0								

49	4512.450M Ave	32.8	+0.0 +0.0 +31.4 +0.3	+0.0 +0.0 +0.6	+0.0 +0.0 -33.2	+0.0 +0.0 +8.9	+0.0	40.8	54.0 8dBi_Pset_11.5_L	-13.2	Vert
^	4512.450M	39.1	+0.0 +0.0 +31.4 +0.3	+0.0 +0.0 +0.6	+0.0 +0.0 -33.2	+0.0 +0.0 +8.9	+0.0	47.1	54.0 8dBi_Pset_11.5_L	-6.9	Vert
51	109.725M	23.8	+0.0 +1.6 +0.0 +0.0	+10.5 +0.2 +0.0	+6.0 -27.0 +0.0	+1.2 +0.3 +0.0	+10.5	27.1	43.5	-16.4	Vert
52	364.825M QP	28.6	+0.0 +3.0 +0.0 +0.0	+15.3 +0.3 +0.0	+6.0 -26.8 +0.0	+2.2 +0.5 +0.0	+10.5	39.6	94.0	-54.4	Vert
^	364.825M	33.1	+0.0 +3.0 +0.0 +0.0	+15.3 +0.3 +0.0	+6.0 -26.8 +0.0	+2.2 +0.5 +0.0	+10.5	44.1	94.0	-49.9	Vert
54	342.683M	28.4	+0.0 +2.9 +0.0 +0.0	+14.7 +0.3 +0.0	+6.0 -26.6 +0.0	+2.1 +0.5 +0.0	+10.5	38.8	94.0	-55.2	Vert
55	320.633M	27.8	+0.0 +2.8 +0.0 +0.0	+14.1 +0.3 +0.0	+6.0 -26.4 +0.0	+2.0 +0.5 +0.0	+10.5	37.6	94.0	-56.4	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	GFSK	Omni	42.3	<46	Pass
902	GFSK	Omni	65.8	<94	Pass
928	GFSK	Omni	54.9	< 94	Pass
960	GFSK	Omni	48.6	<54	Pass

Worse case 8dBi antenna.

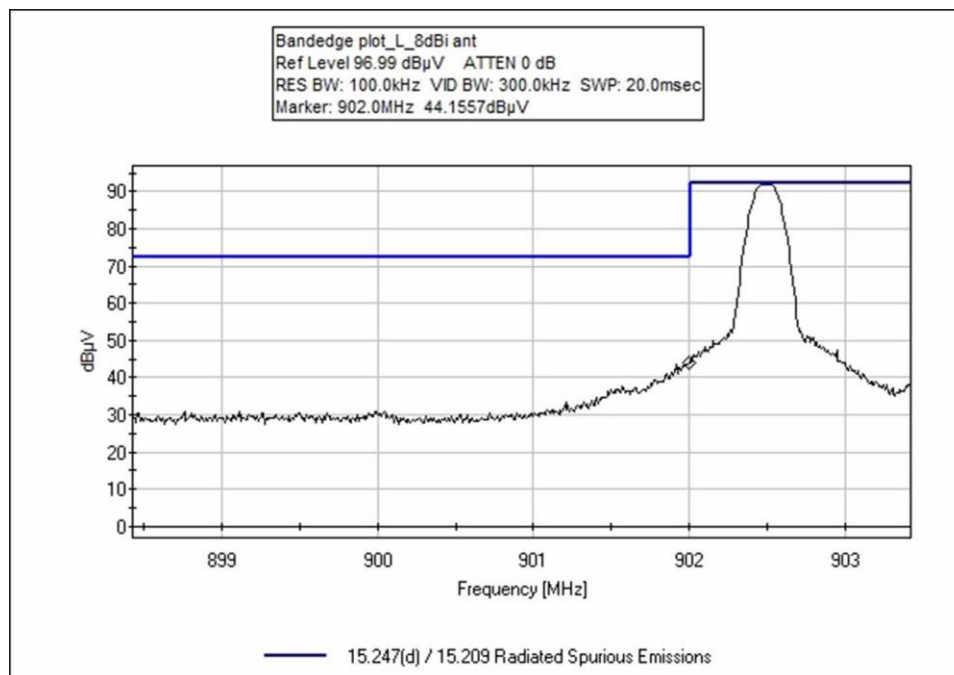
Band Edge Summary

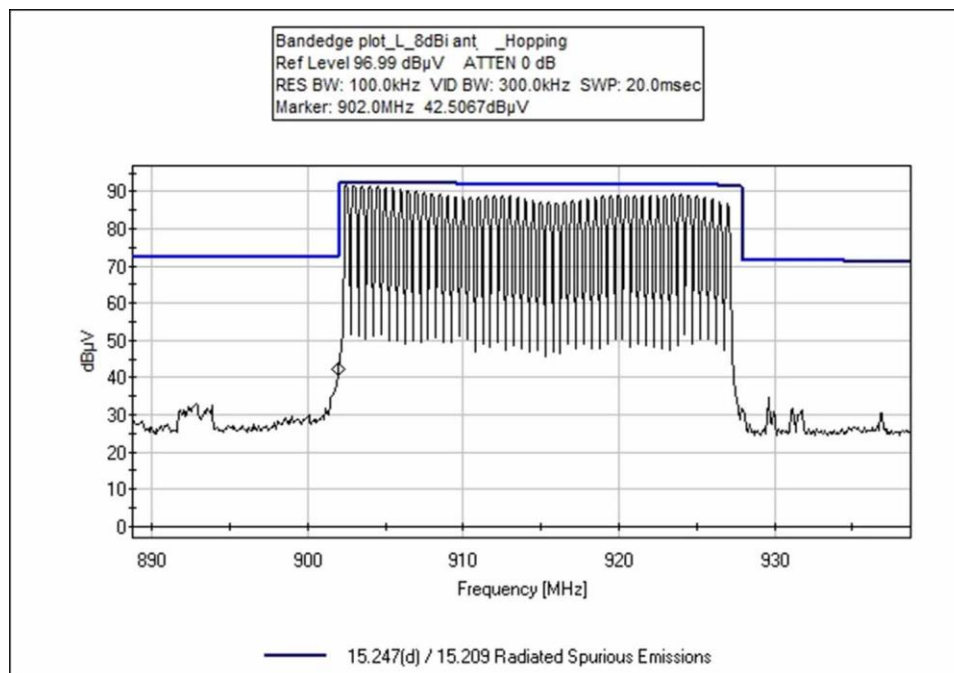
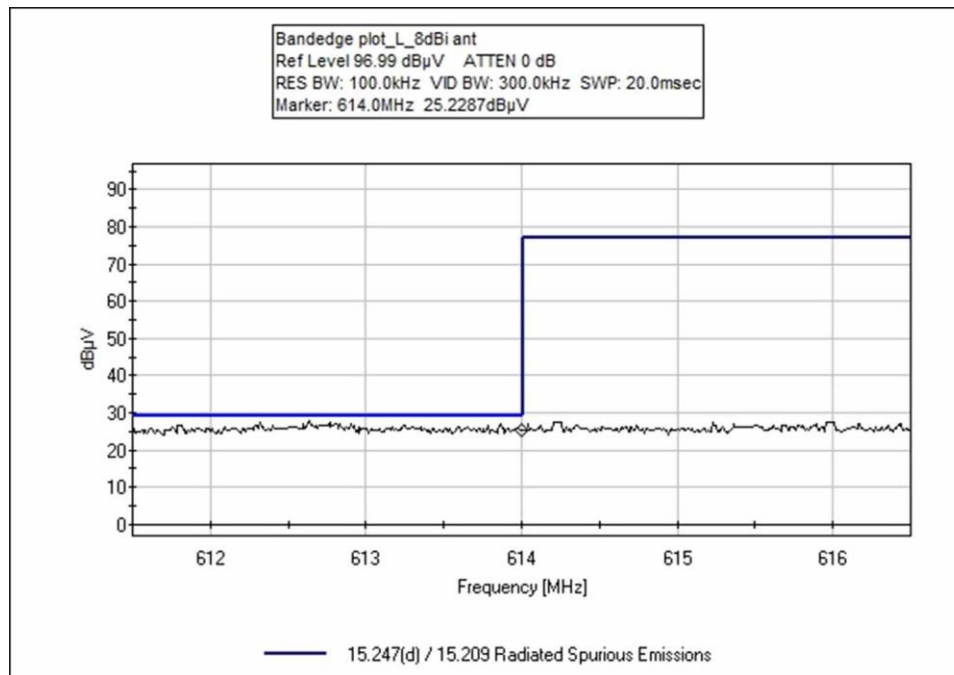
Operating Mode: Hopping

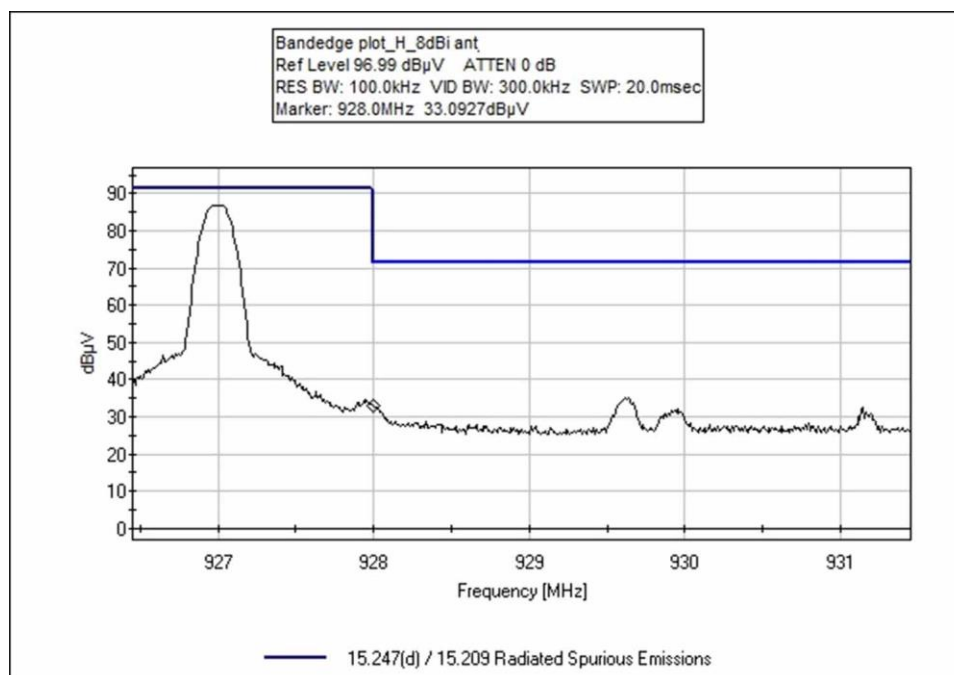
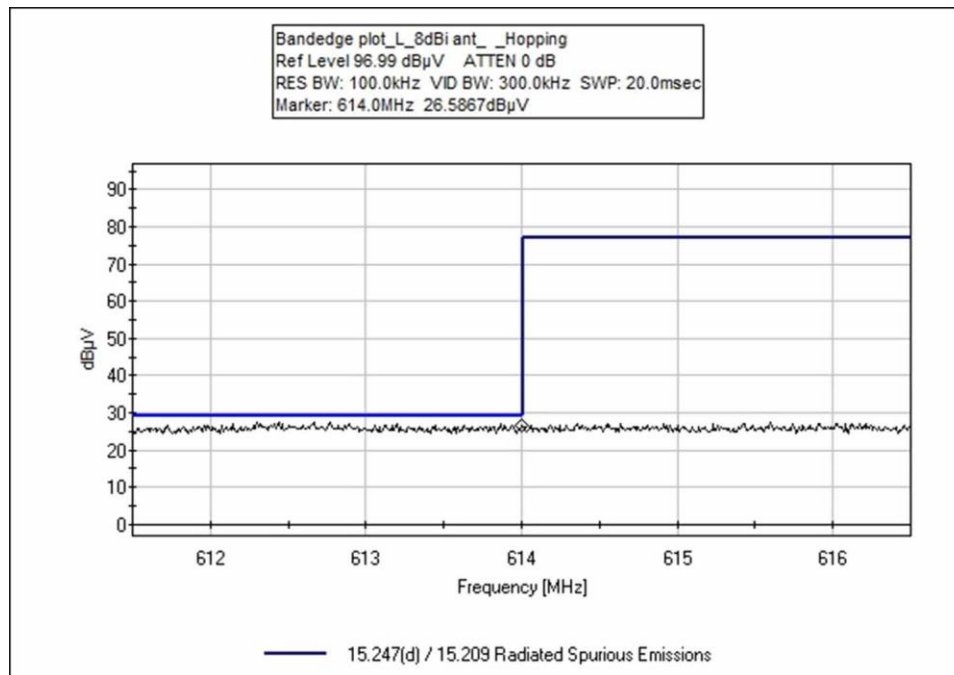
Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
614	GFSK	Omni	43.5	<46	Pass
902	GFSK	Omni	64	<94	Pass
928	GFSK	Omni	54.2	< 94	Pass
960	GFSK	Omni	49.9	<54	Pass

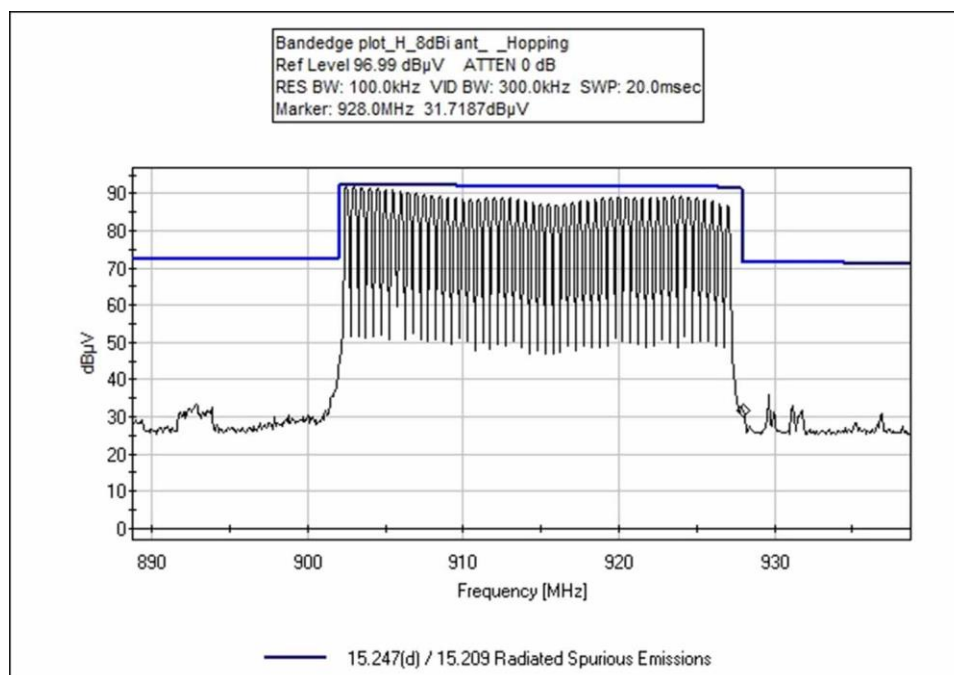
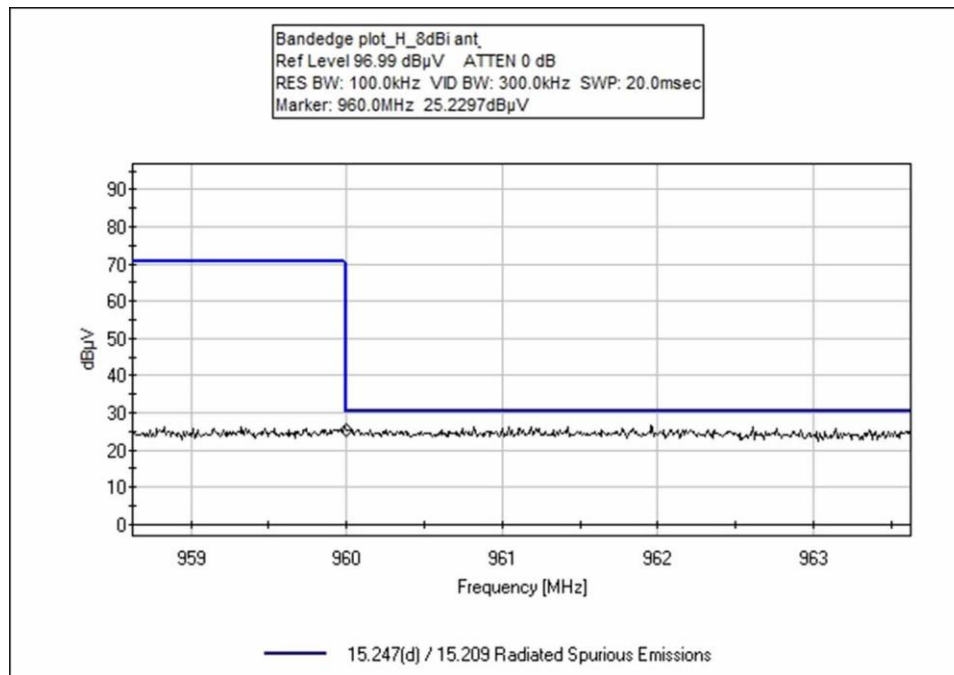
Worse case 8dBi antenna

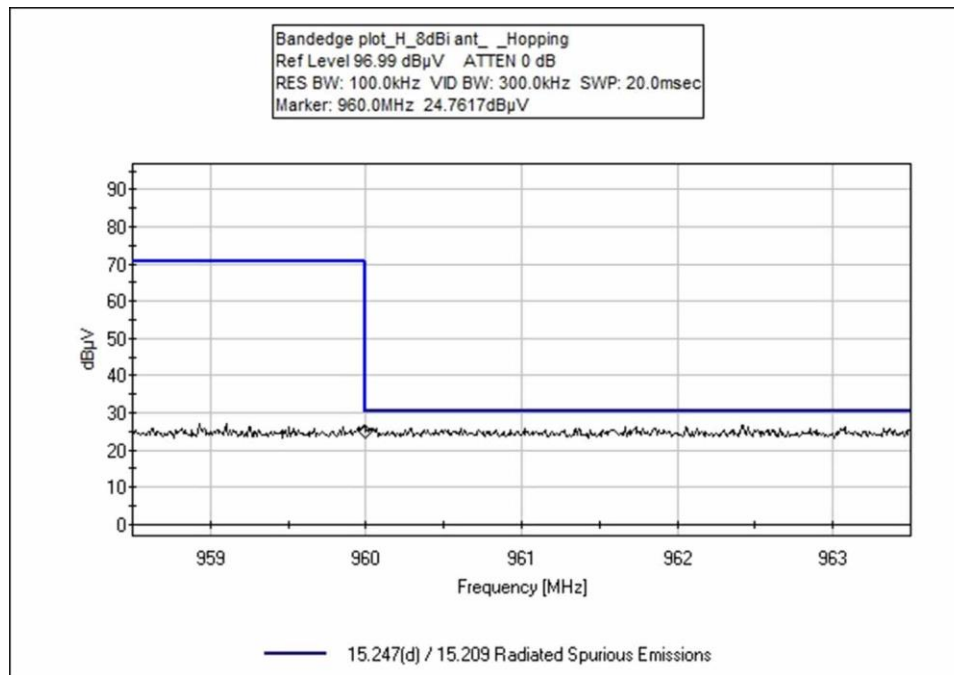
Band Edge Plots











Test Setup / Conditions / Data

Test Location: CKC Laboratories, Inc. • 5046 Sierra Pines Drive • Mariposa, CA 95338 • (209)-299-5240
 Customer: **Davis Instruments**
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**
 Work Order #: **105181** Date: 4/26/2021
 Test Type: **Radiated Scan** Time: 16:43:10
 Tested By: E. Wong / Jonathan Wharton Sequence#: 3
 Software: EMITest 5.03.19

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

The PCB of the EUT is place on the Styrofoam block, orientated as the exact position to be installed in a non-conductive enclosure, a support laptop is connected to the EUT via USB/Serial power for configuration of test mode. a section of cable is connected to the RS485 serial port. EUT is battery operated, a support DC power supply is connected to the battery to ensure full battery power.

Frequency range 902-928MHz

TX frequency: 902.46MHz, 926.98MHz

Power set = 11.5

antenna: 5dBi Omni, 8dBi Omni. Data set is for worst case antenna, highest gain of the same type. 8dBi

Frequency range of measurement = band edges

30MHz-1000MHz; RBW=120kHz, VBW=360kHz, 1000MHz; RBW=1MHz VBW=3MHz.

Test Environment Conditions:

Temperature: 21°C

Relative Humidity 45%

Pressure: 100kPa

Site: Mariposa A

Test Method: ANSI C63.10-2013

Test Equipment:

ID	Asset #/Serial #	Description	Model	Calibration Date	Cal Due Date
	AN02869	Spectrum Analyzer	E4440A	8/3/2020	8/3/2021
T1	AN01996	Biconilog Antenna	CBL6111C	6/11/2019	6/11/2021
T2	ANP05656	Attenuator	PE7004-6	2/17/2020	2/17/2022
T3	ANP06229	Cable-Insertion Loss (dB) (+15degC to 0degC)	CXTA04A-50	7/9/2020	7/9/2022
T4	ANP06231	Cable	CXTA04A-70	3/10/2020	3/10/2022
T5	ANP07055	Cable	CNT-195-FR-3	8/28/2019	8/28/2021
T6	AN00449	Preamp-Upper Ports (dB)	8447F	1/13/2020	1/13/2022
T7	ANP06847	Cable	LMR195-FR-6	8/16/2019	8/16/2021
	AN00327	Horn Antenna	3115	11/24/2020	11/24/2022
	AN03011	Cable	32022-2-2909K- 24TC	6/15/2020	6/15/2022
	AN02115	Preamp	83051A	4/2/2021	4/2/2023
	ANP07585	Cable	32026-2- 29094K-360TC	8/26/2019	8/26/2021
	AN01415	High Pass Filter	84300-80037	3/26/2020	3/26/2022

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dBμV	T1 T5 dB	T2 T6 dB	T3 T7 dB	T4 dB	Dist Table	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar Ant
1	614.000M	26.6	+20.2 +0.4	+6.0 -28.0	+3.0 +0.7	+4.1	+10.5	43.5	46.0 bandedge hopping	-2.5	Vert
2	614.000M	25.4	+20.2 +0.4	+6.0 -28.0	+3.0 +0.7	+4.1	+10.5	42.3	46.0 bandedge	-3.7	Vert
3	960.000M	26.5	+23.8 +0.5	+6.1 -27.4	+3.7 +0.9	+5.3	+10.5	49.9	54.0 bandedge hopping	-4.1	Vert
4	960.000M	25.2	+23.8 +0.5	+6.1 -27.4	+3.7 +0.9	+5.3	+10.5	48.6	54.0 bandedge	-5.4	Vert
5	902.000M	44.2	+22.6 +0.5	+6.1 -27.5	+3.5 +0.8	+5.1	+10.5	65.8	94.0 bandedge	-28.2	Vert
6	902.000M	42.5	+22.6 +0.5	+6.1 -27.5	+3.5 +0.8	+5.1	+10.5	64.1	94.0 bandedge hopping	-29.9	Vert
7	928.000M	32.4	+23.2 +0.5	+6.1 -27.5	+3.6 +0.9	+5.2	+10.5	54.9	94.0 bandedge	-39.1	Vert
8	928.000M	31.7	+23.2 +0.5	+6.1 -27.5	+3.6 +0.9	+5.2	+10.5	54.2	94.0 bandedge hopping	-39.8	Vert

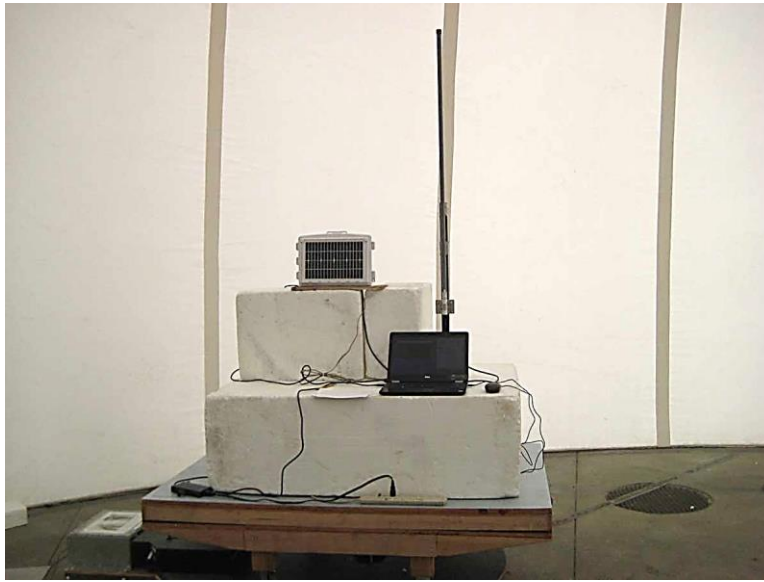
Test Setup Photo(s)



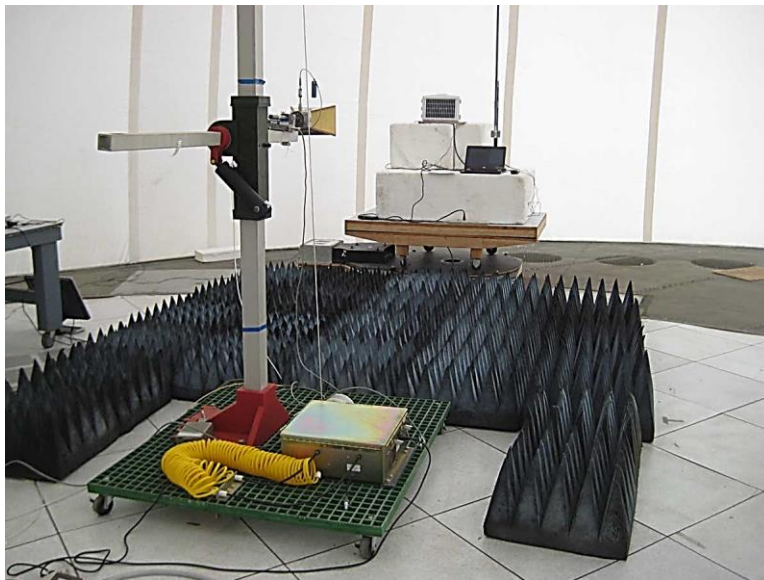
View 1



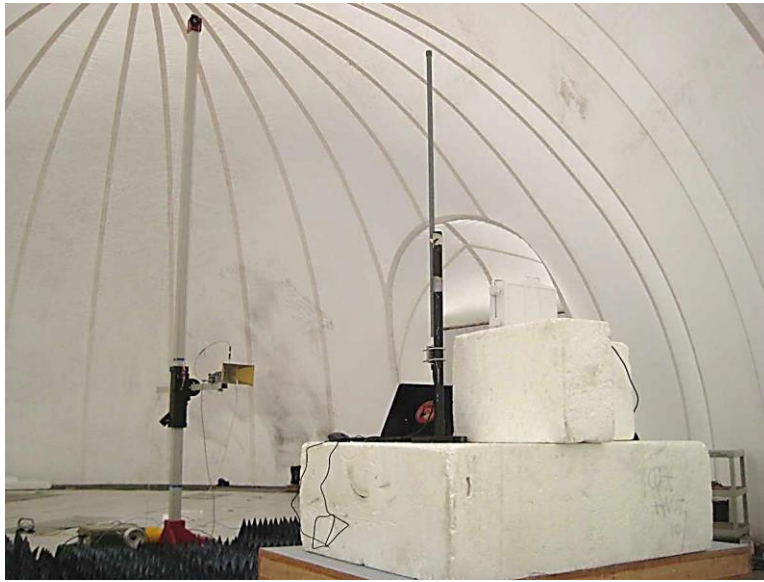
View 2



View 3



View 4



View 5

SUPPLEMENTAL INFORMATION

Measurement Uncertainty

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

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

Emissions Test Details

TESTING PARAMETERS

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

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

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

CORRECTION FACTORS

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

SAMPLE CALCULATIONS		
	Meter reading	($\text{dB}\mu\text{V}$)
+	Antenna Factor	(dB/m)
+	Cable Loss	(dB)
-	Distance Correction	(dB)
-	Preamplifier Gain	(dB)
=	Corrected Reading	($\text{dB}\mu\text{V}/\text{m}$)

TEST INSTRUMENTATION AND ANALYZER SETTINGS

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

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

SPECTRUM ANALYZER/RECEIVER DETECTOR FUNCTIONS

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

Peak

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

Quasi-Peak

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

Average

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