Signetik

TEST REPORT FOR

Bluetooth to Cellular Hub / At-home patient monitoring
Model: M1-B1-USB-SIG-CSTM

Tested to The Following Standards:

FCC Part 15 Subpart C Section(s)

15.207 & 15.247
(DTS 2400-2483.5 MHz)

Report No.: 107284-4

Date of issue: August 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

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Testing the Future
CKC LABORATORIES, INC.

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ADMINISTRATIVE INFORMATION

Test Report Information

REPORT PREPARED FOR:

Signetik
3833 S 14th St
Lincoln, NE 68502

Representative: Steve Poulsen
Customer Reference Number: 188

REPORT PREPARED BY:

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

Project Number: 107284

DATE OF EQUIPMENT RECEIPT: August 2, 2022
DATE(S) OF TESTING: August 2, 3, and 10, 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 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)

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

NA = Not Applicable
NA1 = Not applicable because the EUT has an integral antenna and no antenna port/connector.

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
Bluetooth to Cellular Hub / At-home patient monitoring	Signetik	M1-B1-USB-SIG-CSTM	356726101284297

Support Equipment:

Device	Manufacturer	Model #	S/N
Laptop AC Adapter	Lenovo	ADP-450W B	8SSA10M42785D1SG81F0JBL
Laptop Computer	Lenovo	Ideapad 130-15AST	MP1EVRCJ

Configuration 2

Equipment Tested:

Device	Manufacturer	Model #	S/N
Bluetooth to Cellular Hub / At-home patient monitoring	Signetik	M1-B1-USB-SIG-CSTM	356726101284297

Support Equipment:

Device	Manufacturer	Model #	S/N
AC to USB Power Adapter	GlobTek, Inc.	GT-83083-0505-USB-W2	None

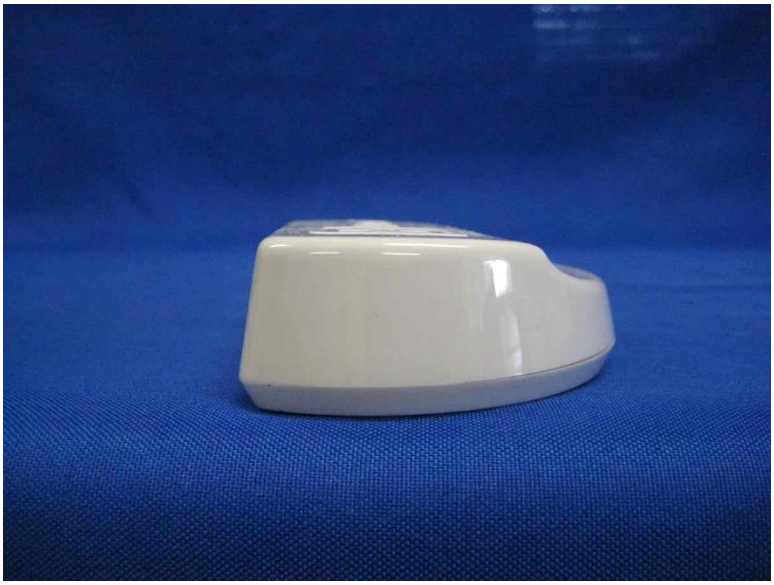
General Product Information:

Product Information	Manufacturer-Provided Details
Equipment Type:	Stand-Alone Equipment
Type of Wideband System:	DTS
Operating Frequency Range:	2402MHz to 2480MHz
Modulation Type(s):	GFSK
Maximum Duty Cycle:	50%
Number of TX Chains:	1
Antenna Type and Gain:	Surface Mount 3.2dBi (See Appendix B)
Beamforming Type:	N/A
Antenna Connection Type:	Integral
Nominal Input Voltage:	5.0Vdc
Firmware used for Test:	nRF “Radio Test” version 1.5.0
The validity of results is dependent on the stated product details, the accuracy of which the manufacturer assumes full responsibility.	

EUT Photo(s)

Front View

Back View



Left View

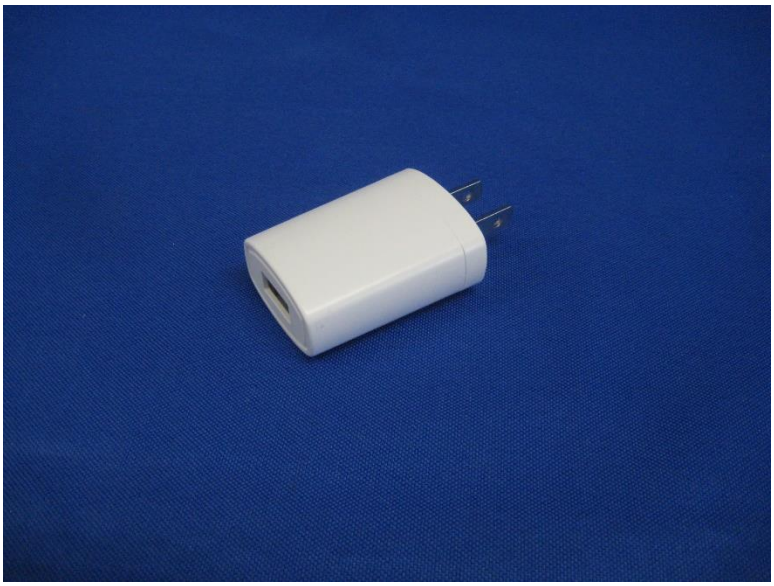
Right View

Top View

Bottom View

Support Equipment Photo(s)

Laptop Computer

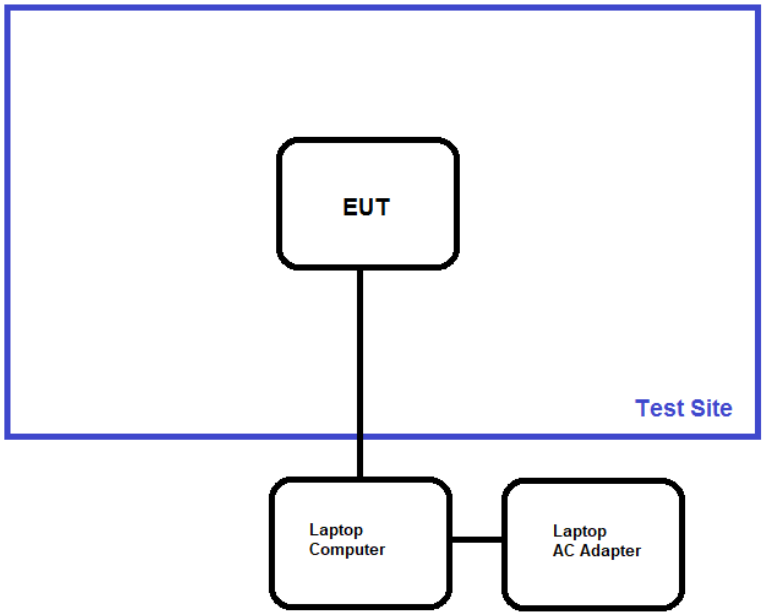


AC to USB Power Adapter

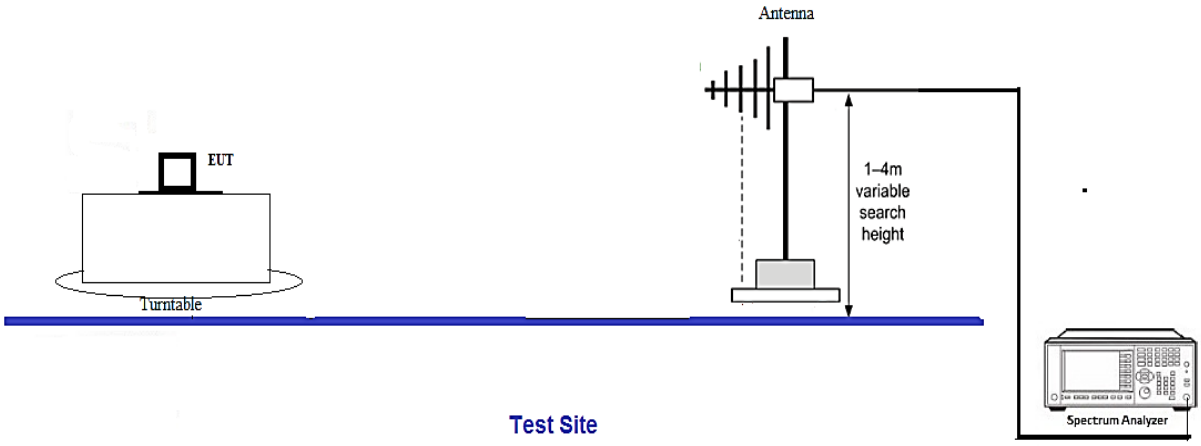
USB Cable

Block Diagram of Test Setup(s)

Test Setup Block Diagram



Radiated test setup



FCC Part 15 Subpart C

15.247(a)(2) 6dB Bandwidth

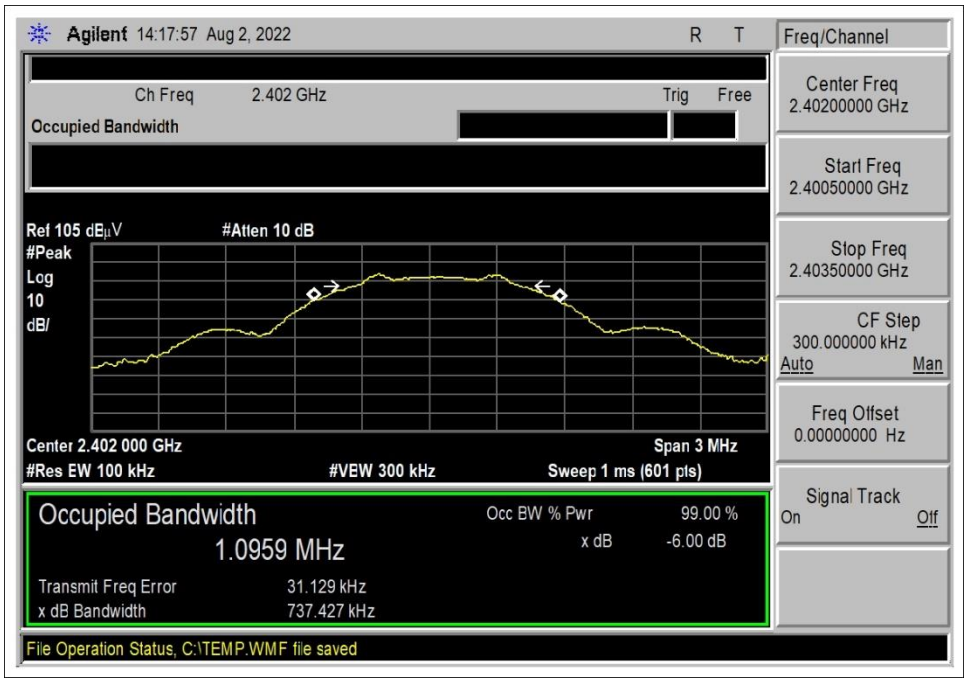
Test Setup/Conditions			
Test Location:	Brea Lab D	Test Engineer:	S. Yamamoto
Test Method:	ANSI C63.10 (2013), KDB 558074	Test Date(s):	8/2/2022
Configuration:	1		
Test Setup:	The equipment under test (EUT) is stand alone on the Styrofoam tabletop. The EUT is connected to a laptop computer via USB cable. The laptop is running the PUTTY application, which is being used to command the EUT to transmit. The EUT is powered from the laptop USB port. Low channel 2402MHz, Mid channel 2442MHz, High channel 2480MHz. The EUT is set at the output power level of +8dBm.		

Environmental Conditions43			
Temperature (ºC)	27	Relative Humidity (%):	43

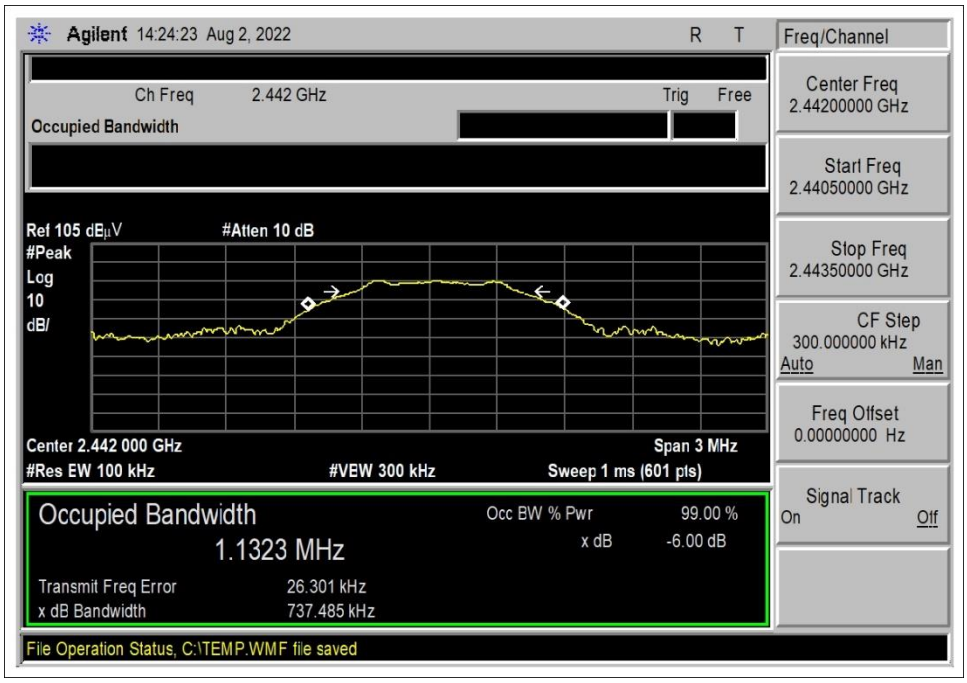
Test Equipment					
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
02672	Spectrum Analyzer	Agilent	E4446A	5/9/2022	5/9/2024
P04382	Cable	Andrew	LDF-50	5/18/2022	5/18/2024
P07138	Andrew	Andrew	ANDL1-PNMNM-60	3/30/2021	3/30/2023
00787	Preamp	HP	83017A	6/23/2021	6/23/2023
P07657	Cable	Astrolab, Inc.	32022-29094K-29094K-24TC	6/22/2022	6/22/2024
01646	Antenna	Emco	3115	3/21/2022	3/21/2024

Test Data Summary					
Frequency (MHz)	Antenna Port	Modulation	Measured (kHz)	Limit (kHz)	Results
2402	Integral Antenna	GFSK	737.427	≥500	Pass
2442	Integral Antenna	GFSK	737.485	≥500	Pass
2480	Integral Antenna	GFSK	737.489	≥500	Pass

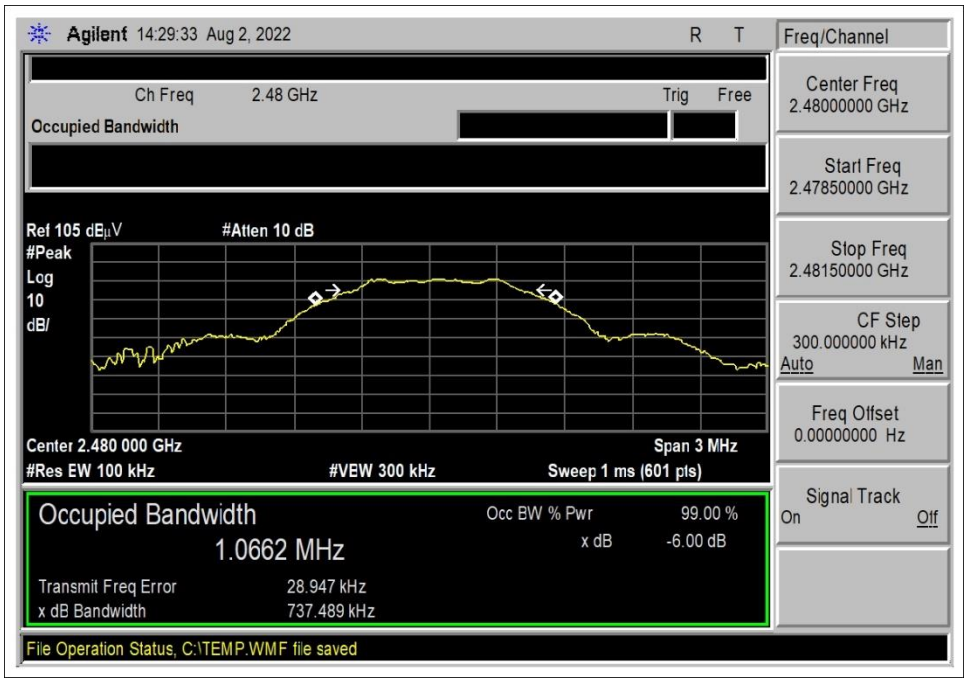
Plot(s)



Low Channel



Middle Channel



High Channel

Test Setup Photo(s)

Test Setup

15.247(b)(3) Output Power

Test Setup/Conditions			
Test Location:	Brea Lab D	Test Engineer:	S. Yamamoto
Test Method:	ANSI C63.10 (2013), KDB 558074	Test Date(s):	8/2/2022
Configuration:	1		
Test Setup:	The equipment under test (EUT) is stand alone on the Styrofoam tabletop. The EUT is connected to a laptop computer via USB cable. The laptop is running the PUTTY application, which is being used to command the EUT to transmit. The EUT is powered from the laptop USB port. Low channel 2402MHz, Mid channel 2442MHz, High channel 2480MHz. The EUT is set at the output power level of +8dBm.		

Environmental Conditions			
Temperature (ºC)	27	Relative Humidity (%):	43

Test Equipment					
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
02672	Spectrum Analyzer	Agilent	E4446A	5/9/2022	5/9/2024
P04382	Cable	Andrew	LDF-50	5/18/2022	5/18/2024
P07138	Andrew	Andrew	ANDL1-PNMNM-60	3/30/2021	3/30/2023
00787	Preamp	HP	83017A	6/23/2021	6/23/2023
P07657	Cable	Astrolab, Inc.	32022-29094K-29094K-24TC	6/22/2022	6/22/2024
01646	Antenna	Emco	3115	3/21/2022	3/21/2024
07567	Power Supply	Leader	LPS 152	8/4/2021	8/4/2023
P07164	Multimeter	Fluke	8845A/G	8/13/2021	8/13/2023

Test Data Summary - Radiated Measurement						
Measurement Option: RBW > DTS Bandwidth						
Frequency (MHz)	Modulation	Ant. Type / Gain (dBi)	Field Strength (dBuV/m @3m)	Calculated (dBm)	Limit (dBm)	Results
2402	GFSK	Surface Mount / 3.2	98.6	0.17	≤ 30	Pass
2442	GFSK	Surface Mount / 3.2	99.6	1.17	≤ 30	Pass
2480	GFSK	Surface Mount / 3.2	99.1	0.67	≤ 30	Pass

Test Data Summary - Voltage Variations					
Frequency (MHz)	Modulation / Ant Port	$V_{Minimum}$ (dBm)	$V_{Nominal}$ (dBm)	$V_{Maximum}$ (dBm)	Max Deviation from $V_{Nominal}$ (dB)
2402	GFSK / Integral Antenna	0.17	0.17	0.17	0.0
2442	GFSK / Integral Antenna	1.17	1.17	1.17	0.0
2480	GFSK / Integral Antenna	0.67	0.67	0.67	0.0

Parameter Definitions:

Measurements performed at input voltage Vnominal ± 15%.

Parameter	Value
$V_{Nominal}$:	5.0Vdc
$V_{Minimum}$:	5.75Vdc
$V_{Maximum}$:	4.25Vdc

Test Setup / Conditions / Data

Test Location:	CKC Laboratories, Inc. • 110 N. Olinda Place • Brea, CA 92823 • (714) 993-6112		
Customer:	**Signetik**		
Specification:	**15.247(b) Power Output (2400-2483.5 MHz DTS)**		
Work Order #:	**107284**	Date:	8/2/2022
Test Type:	**Maximized Emissions**	Time:	16:01:05
Tested By:	S. Yamamoto	Sequence#:	1
Software:	EMITest 5.03.20		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

The equipment under test (EUT) is stand alone on the Styrofoam tabletop. The EUT is connected to a laptop computer via USB cable. The laptop is running the PUTTY application, which is being used to set the transmitter parameters. The EUT is powered from the USB port.
Low channel 2402MHz, Mid channel 2442MHz, High channel 2480MHz. The EUT is set at the output power level of +8dBm.

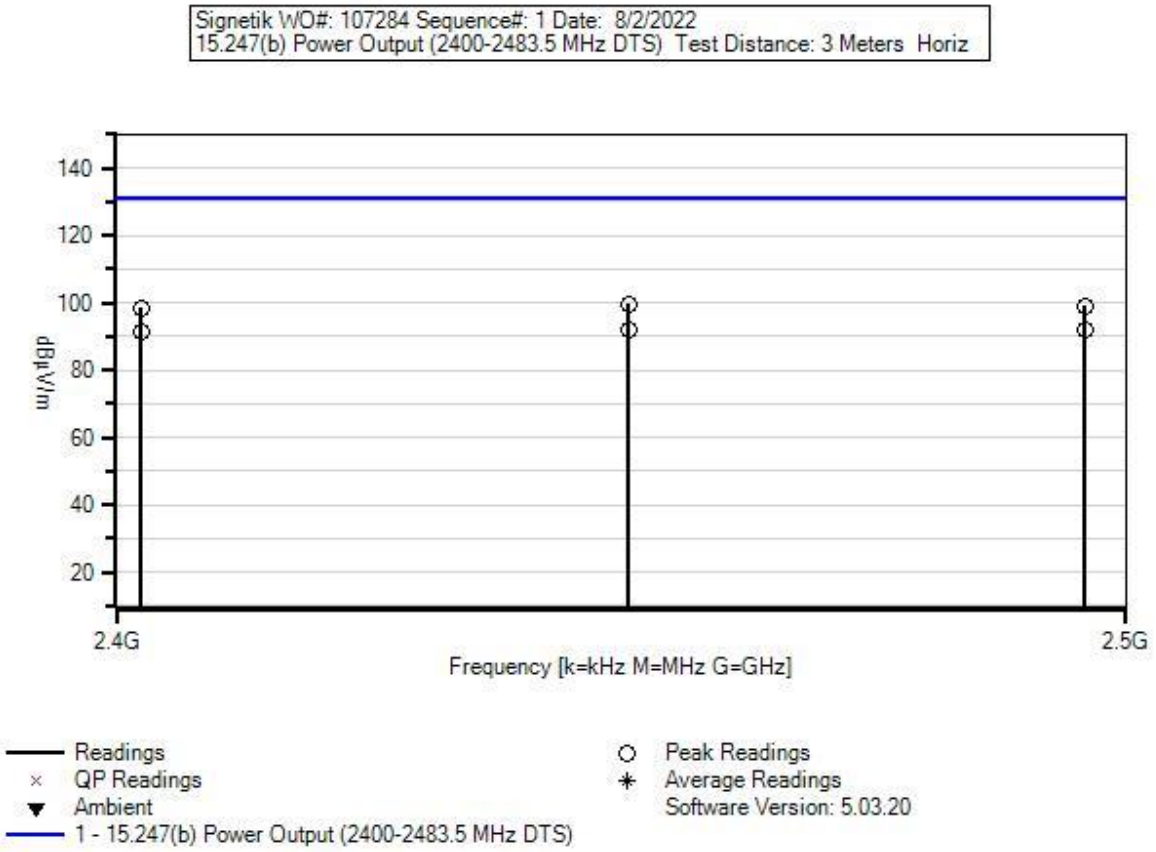
Frequency range of data sheet 2402MHz to 2480MHz.
RBW=1MHz
VBW=3MHz

Measurement of Fundamental Output Power

Test Environment Conditions:
Temperature: 27°C
Humidity: 43%
Pressure: 100kPa

Site D

Test method ANSI C63.10 (2013)



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02672	Spectrum Analyzer	E4446A	5/9/2022	5/9/2024
T1	ANP04382	Cable	LDF-50	5/18/2022	5/18/2024
T2	ANP07138	Cable	ANDL1-PNMNM-60	3/30/2021	3/30/2023
T3	AN00787	Preamp	83017A	6/23/2021	6/23/2023
T4	AN01646	Horn Antenna	3115	3/21/2022	3/21/2024
T5	ANP07657	Cable	32022-29094K-29094K-24TC	6/22/2022	6/22/2024

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

#	Freq MHz	Rdng dBµV	T1 T5 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBµV/m	Spec dBµV/m	Margin dB	Polar Ant
1	2442.000M	100.3	+5.6 +0.4	+4.1	-39.2	+28.4	+0.0	99.6	131.2	-31.6	Horiz
2	2480.000M	99.6	+5.7 +0.4	+4.2	-39.2	+28.4	+0.0	99.1	131.2	-32.1	Horiz
3	2402.000M	99.3	+5.6 +0.4	+4.0	-39.2	+28.5	+0.0	98.6	131.2	-32.6	Horiz
4	2442.000M	92.7	+5.6 +0.4	+4.1	-39.2	+28.4	+0.0	92.0	131.2	-39.2	Vert
5	2480.000M	92.2	+5.7 +0.4	+4.2	-39.2	+28.4	+0.0	91.7	131.2	-39.5	Vert
6	2402.000M	91.9	+5.6 +0.4	+4.0	-39.2	+28.5	+0.0	91.2	131.2	-40.0	Vert

Test Setup Photo(s)

15.247(e) Power Spectral Density

Test Setup/Conditions			
Test Location:	Brea Lab D	Test Engineer:	S. Yamamoto
Test Method:	ANSI C63.10 (2013), KDB 558074	Test Date(s):	8/2/2022
Configuration:	1		
Test Setup:	The equipment under test (EUT) is stand alone on the Styrofoam tabletop. The EUT is connected to a laptop computer via USB cable. The laptop is running the PUTTY application, which is being used to command the EUT to transmit. The EUT is powered from the laptop USB port. Low channel 2402MHz, Mid channel 2442MHz, High channel 2480MHz. The EUT is set at the output power level of +8dBm.		

Environmental Conditions			
Temperature (ºC)	27	Relative Humidity (%):	43

Test Data Summary - Radiated Measurement						
Measurement Method: PKPSD						
Frequency (MHz)	**Modulation**	**Ant. Type / Gain (dBi)**	**Field Strength (dBuV/m @3m)**	**Calculated (dBm/3kHz)**	**Limit (dBm/3kHz)**	**Results**
2402	GFSK	Surface Mount / 3.2	85.9	-12.5	≤ 8	Pass
2442	GFSK	Surface Mount / 3.2	87.0	-11.4	≤ 8	Pass
2480	GFSK	Surface Mount / 3.2	87.2	-11.2	≤ 8	Pass

Test Data

Test Location:	CKC Laboratories, Inc. • 110 N. Olinda Place • Brea, CA 92823 • (714) 993-6112		
Customer:	**Signetik**		
Specification:	**15.247(e) Peak Power Spectral Density (2400-2483.5 MHz DTS)**		
Work Order #:	**107284**	Date:	8/2/2022
Test Type:	**Maximized Emissions**	Time:	16:30:47
Tested By:	S. Yamamoto	Sequence#:	2
Software:	EMITest 5.03.20		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

The equipment under test (EUT) is stand alone on the Styrofoam tabletop. The EUT is connected to a laptop computer via USB cable. The laptop is running the PUTTY application, which is being used to set the transmitter parameters. The EUT is powered from the USB port.
Low channel 2402MHz, Mid channel 2442MHz, High channel 2480MHz. The EUT is set at the output power level of +8dBm.

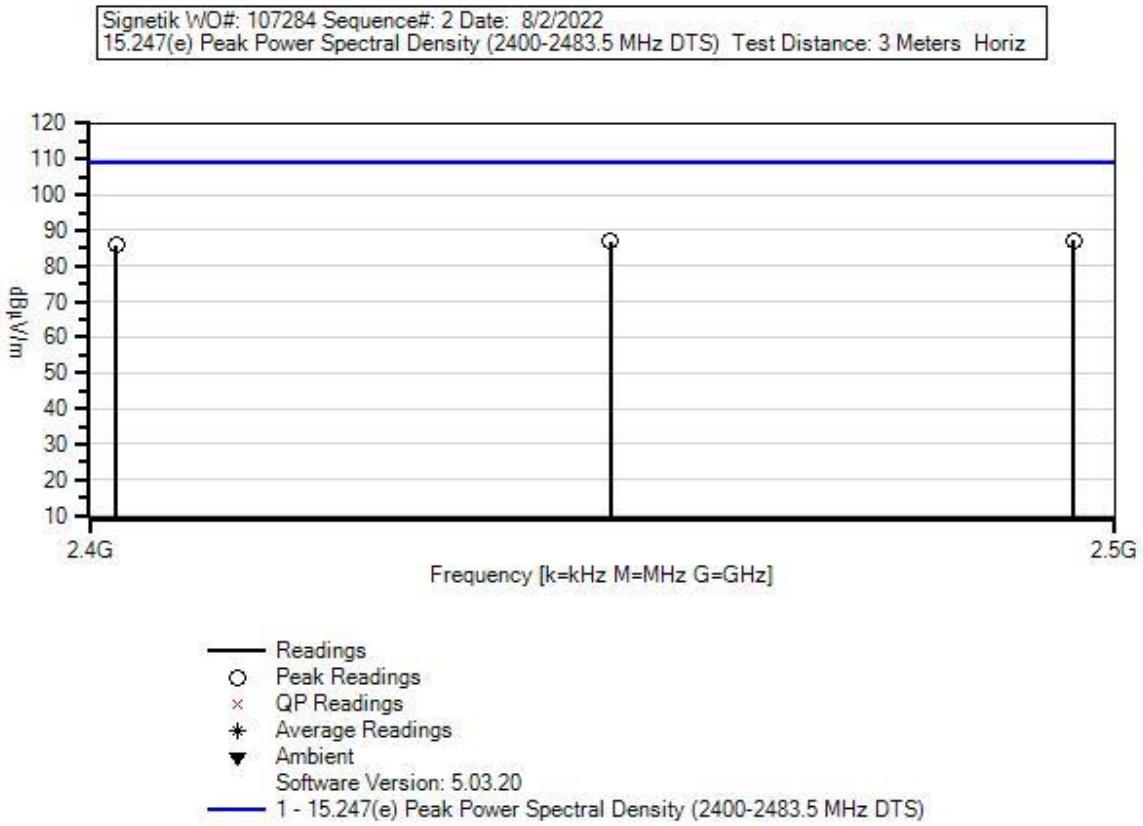
Frequency range of data sheet 2402MHz to 2480MHz.
RBW=3kHz
VBW=10kHz

Measurement of Power Spectral Density

Test Environment Conditions:
Temperature: 27°C
Humidity: 43%
Pressure: 100kPa

Site D

Test method ANSI C63.10 (2013)



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02672	Spectrum Analyzer	E4446A	5/9/2022	5/9/2024
T1	ANP04382	Cable	LDF-50	5/18/2022	5/18/2024
T2	ANP07138	Cable	ANDL1-PNMNM-60	3/30/2021	3/30/2023
T3	AN00787	Preamp	83017A	6/23/2021	6/23/2023
T4	AN01646	Horn Antenna	3115	3/21/2022	3/21/2024
T5	ANP07657	Cable	32022-29094K-29094K-24TC	6/22/2022	6/22/2024

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

#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
			T5								
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	2480.091M	87.7	+5.7 +0.4	+4.2	-39.2	+28.4	+0.0	87.2	109.2	-22.0	Horiz
2	2442.106M	87.7	+5.6 +0.4	+4.1	-39.2	+28.4	+0.0	87.0	109.2	-22.2	Horiz
3	2402.120M	86.6	+5.6 +0.4	+4.0	-39.2	+28.5	+0.0	85.9	109.2	-23.3	Horiz

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:	**Signetik**		
Specification:	**15.247(d) / 15.209 Radiated Spurious Emissions**		
Work Order #:	**107284**	Date:	8/3/2022
Test Type:	**Maximized Emissions**	Time:	10:40:29
Tested By:	S. Yamamoto	Sequence#:	4
Software:	EMITest 5.03.20		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

The equipment under test (EUT) is stand alone on the Styrofoam tabletop. The EUT is connected to a laptop computer via USB cable. The laptop is running the PUTTY application, which is being used to set the transmitter parameters. The EUT is powered from the USB port.
Low channel 2402MHz, Mid channel 2442MHz, High channel 2480MHz. The EUT is set at the output power level of +8dBm.

Frequency range of data sheet 9kHz to 25GHz.

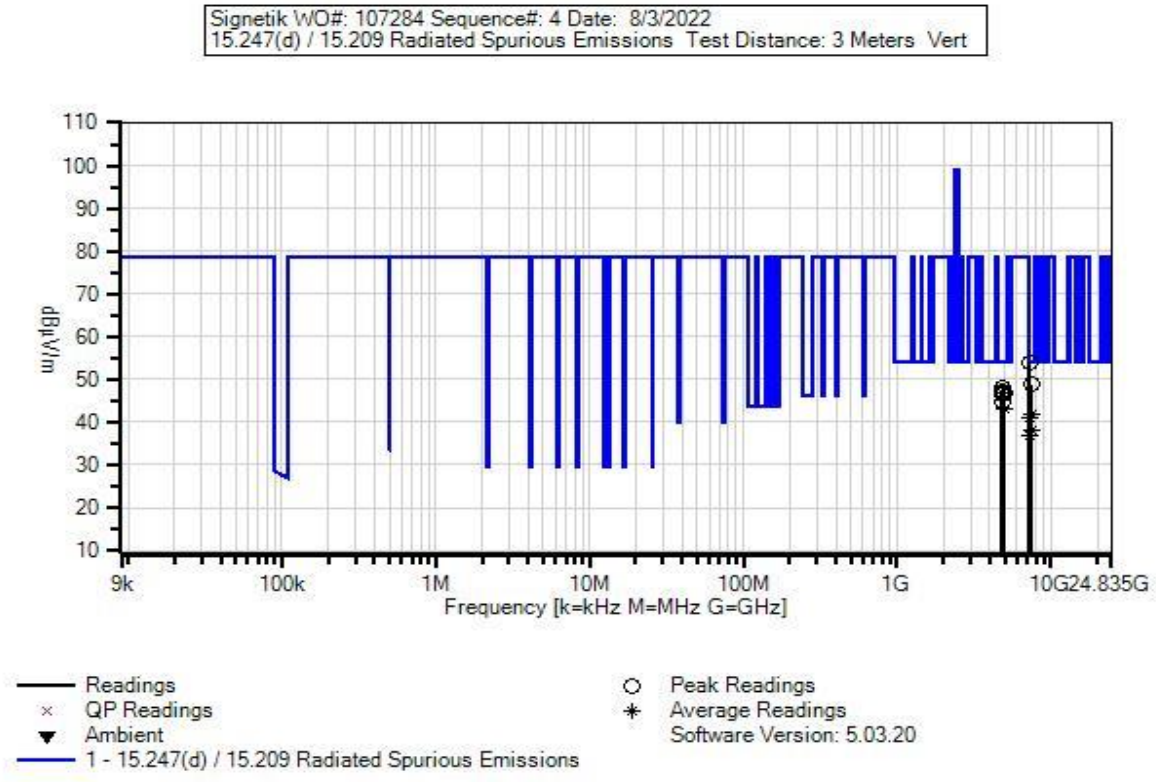
1GHz to 25GHz, RBW=1MHz, VBW=3MHz

Measurement of Radiated Spurious Emissions

Test Environment Conditions:
Temperature: 27°C
Humidity: 50%
Pressure: 100kPa

Site D

Test method ANSI C63.10 (2013)



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02672	Spectrum Analyzer	E4446A	5/9/2022	5/9/2024
T1	ANP04382	Cable	LDF-50	5/18/2022	5/18/2024
T2	ANP07138	Cable	ANDL1-PNMNM-60	3/30/2021	3/30/2023
T3	AN00787	Preamp	83017A	6/23/2021	6/23/2023
T4	AN01646	Horn Antenna	3115	3/21/2022	3/21/2024
T5	AN03385	High Pass Filter	11SH10-3000/T10000-O/O	5/17/2021	5/17/2023
	AN03367	Horn Antenna	62-GH-62-25.	8/3/2021	8/3/2023
	AN01413	Horn Antenna	84125-80008	10/19/2020	10/19/2022
	AN02746	Low Pass Filter	11SL10-2000/U6000-O/O	8/4/2021	8/4/2023
	AN00314	Loop Antenna	6502	3/29/2022	3/29/2024
	AN00010	Preamp	8447D	1/3/2022	1/3/2024
	AN00851	Biconilog Antenna	CBL6111C	4/21/2022	4/21/2024
	ANP05569	Cable-Amplitude +15C to +45C (dB)	RG-214/U	12/14/2020	12/14/2022
T6	ANP07657	Cable	32022-29094K-29094K-24TC	6/22/2022	6/22/2024

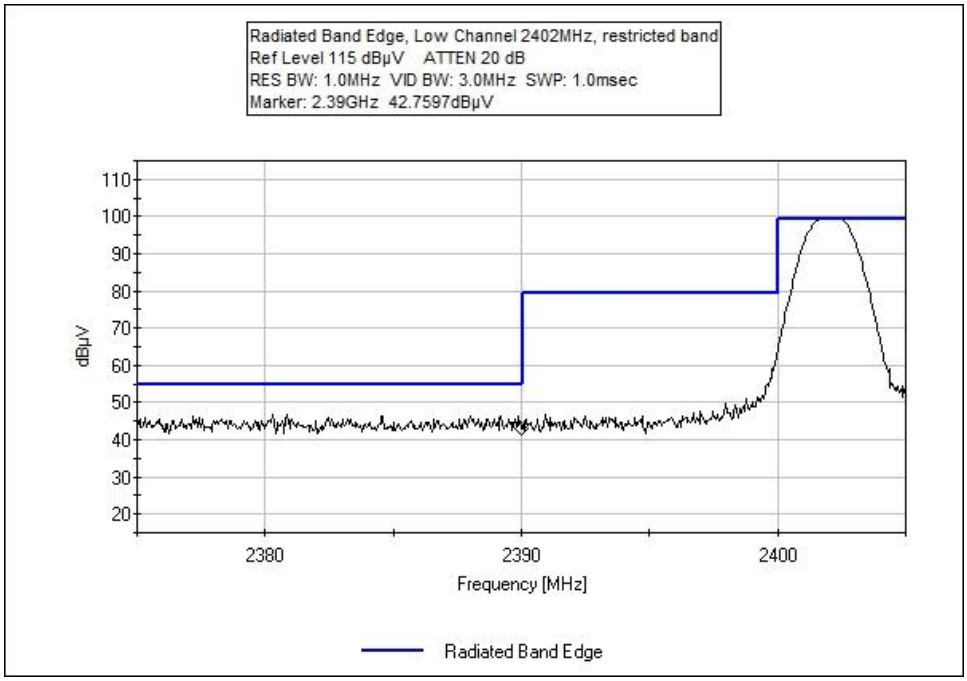
Measurement Data: Reading listed by margin. Test Distance: 3 Meters

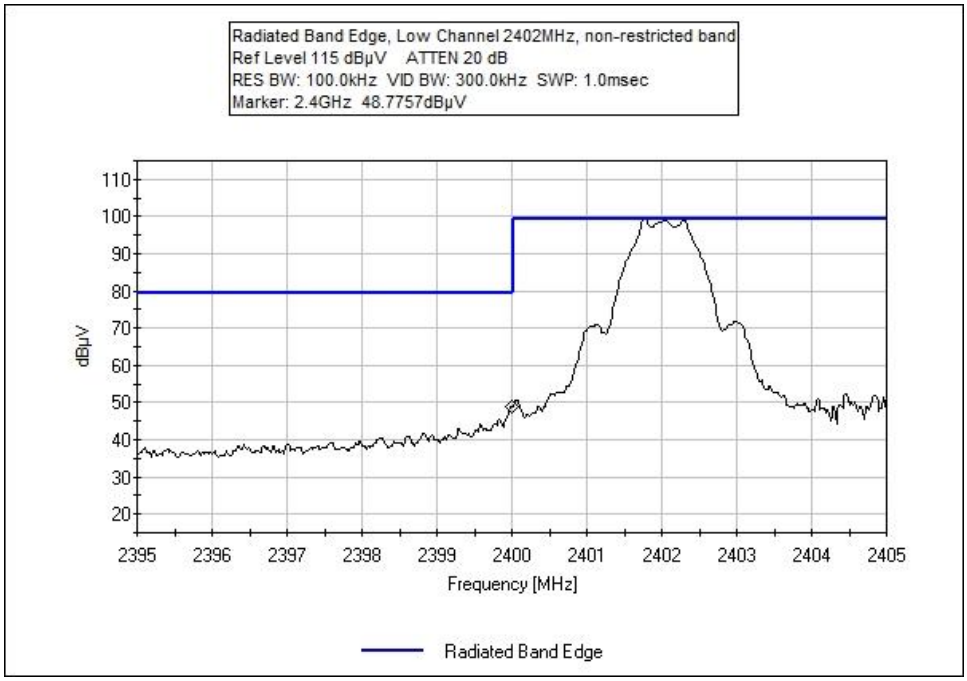
#	Freq MHz	Rdng dBµV	T1 T5 dB	T2 T6 dB	T3 dB	T4 dB	Dist Table	Corr dBµV/m	Spec dBµV/m	Margin dB	Polar Ant
1	7440.833M	31.9	+11.2 +0.2	+7.0 +1.0	-38.9	+36.5	+0.0	48.9	54.0	-5.1	Horiz
2	4884.533M	38.3	+8.4 +0.3	+5.8 +1.2	-39.1	+33.2	+0.0	48.1	54.0	-5.9	Horiz
3	4804.033M	38.2	+8.3 +0.3	+5.7 +1.0	-39.2	+33.0	+0.0	47.3	54.0	-6.7	Horiz
4	4804.033M	37.8	+8.3 +0.3	+5.7 +1.0	-39.2	+33.0	+0.0	46.9	54.0	-7.1	Horiz
5	4959.560M	37.0	+8.5 +0.3	+5.9 +1.1	-39.1	+33.2	+0.0	46.9	54.0	-7.1	Vert
6	4884.458M	36.4	+8.4 +0.3	+5.8 +1.2	-39.1	+33.2	+0.0	46.2	54.0	-7.8	Vert
7	4804.075M	35.7	+8.3 +0.3	+5.7 +1.0	-39.2	+33.0	+0.0	44.8	54.0	-9.2	Vert
8	4960.600M Ave	33.2	+8.5 +0.3	+5.9 +1.1	-39.1	+33.2	+0.0	43.1	54.0	-10.9	Horiz
^	4960.600M	41.4	+8.5 +0.3	+5.9 +1.1	-39.1	+33.2	+0.0	51.3	54.0	-2.7	Horiz
10	7440.883M Ave	24.7	+11.2 +0.2	+7.0 +1.0	-38.9	+36.5	+0.0	41.7	54.0	-12.3	Vert
^	7440.883M	35.1	+11.2 +0.2	+7.0 +1.0	-38.9	+36.5	+0.0	52.1	54.0	-1.9	Vert
12	7325.533M Ave	24.4	+11.1 +0.2	+6.9 +0.9	-39.0	+36.4	+0.0	40.9	54.0	-13.1	Vert
^	7325.533M	34.6	+11.1 +0.2	+6.9 +0.9	-39.0	+36.4	+0.0	51.1	54.0	-2.9	Vert
14	7440.417M Ave	21.1	+11.2 +0.2	+7.0 +1.0	-38.9	+36.5	+0.0	38.1	54.0	-15.9	Horiz
15	7326.608M Ave	20.4	+11.1 +0.2	+6.9 +0.9	-39.0	+36.4	+0.0	36.9	54.0	-17.1	Horiz
^	7326.608M	33.0	+11.1 +0.2	+6.9 +0.9	-39.0	+36.4	+0.0	49.5	54.0	-4.5	Horiz
17	7205.275M	38.2	+11.0 +0.2	+6.8 +0.8	-39.0	+35.9	+0.0	53.9	78.8	-24.9	Vert

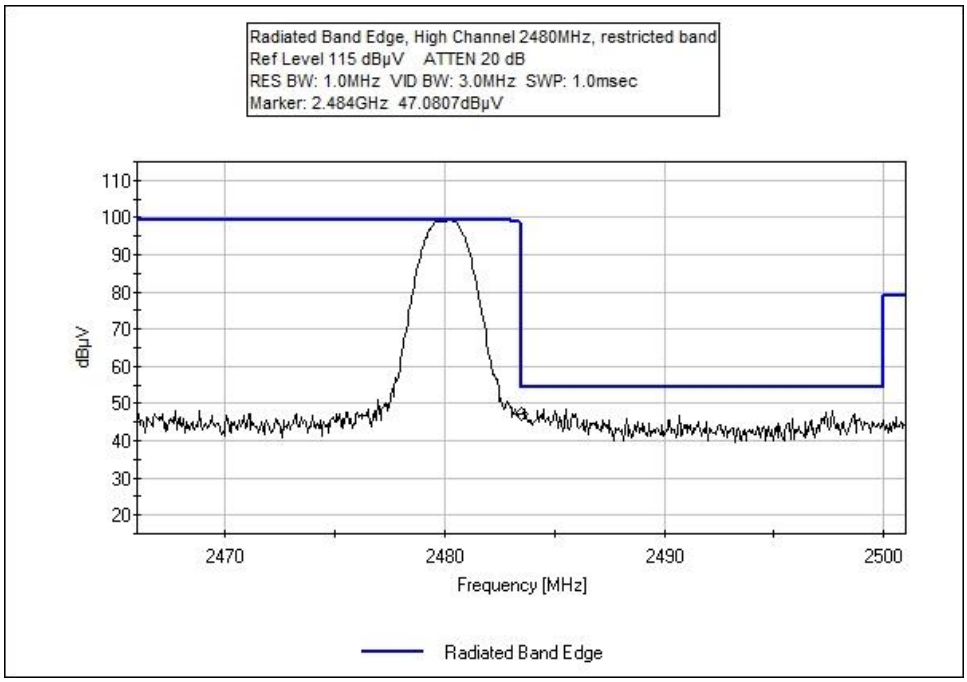
Band Edge

Band Edge Summary					
Frequency (MHz)	**Modulation**	**Ant. Type**	**Field Strength (dBuV/m @3m)**	**Limit (dBuV/m @3m)**	**Results**
2390.0	GFSK	Surface Mount	41.7	< 54	Pass
2400.0	GFSK	Surface Mount	47.7	< 78.8	Pass
2483.5	GFSK	Surface Mount	46.7	< 54	Pass

Band Edge Plots




Radiated Band Edge, Low Channel 2402MHz, non-restricted band
Ref Level 115 dBµV ATTEN 20 dB
RES BW: 100.0kHz VID BW: 300.0kHz SWP: 1.0msec
Marker: 2.4GHz 48.7757dBµV
dBµV
110
100
90
80
70
60
50
40
30
20
2395
2396
2397
2398
2399
2400
2401
2402
2403
2404
2405
Frequency [MHz]
Radiated Band Edge


Radiated Band Edge, High Channel 2480MHz, restricted band
Ref Level 115 dBµV ATTEN 20 dB
RES BW: 1.0MHz VID BW: 3.0MHz SWP: 1.0msec
Marker: 2.484GHz 47.0807dBµV
dBµV
110
100
90
80
70
60
50
40
30
20
2470
2480
2490
2500
Frequency [MHz]
Radiated Band Edge

Test Setup / Conditions / Data

Test Location:	CKC Laboratories, Inc. • 110 N. Olinda Place • Brea, CA 92823 • (714) 993-6112		
Customer:	**Signetik**		
Specification:	**Radiated Band Edge**		
Work Order #:	**107284**	Date:	8/2/2022
Test Type:	**Maximized Emissions**	Time:	17:13:29
Tested By:	S. Yamamoto	Sequence#:	3
Software:	EMITest 5.03.20		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

The equipment under test (EUT) is stand alone on the Styrofoam tabletop. The EUT is connected to a laptop computer via USB cable. The laptop is running the PUTTY application, which is being used to set the transmitter parameters. The EUT is powered from the USB port.
Low channel 2402MHz, Mid channel 2442MHz, High channel 2480MHz. The EUT is set at the output power level of +8dBm.

Frequency range of data sheet 2390MHz to 2483.5MHz.
Restricted band RBW=1MHz, VBW=3MHz
Non restricted band RBW=100kHz, VBW=300kHz

Measurement of Band Edge Emissions

Test Environment Conditions:
Temperature: 27°C
Humidity: 43%
Pressure: 100kPa

Site D

Test method ANSI C63.10 (2013)

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02672	Spectrum Analyzer	E4446A	5/9/2022	5/9/2024
T1	ANP04382	Cable	LDF-50	5/18/2022	5/18/2024
T2	ANP07138	Cable	ANDL1-PNMNM-60	3/30/2021	3/30/2023
T3	AN00787	Preamp	83017A	6/23/2021	6/23/2023
T4	AN01646	Horn Antenna	3115	3/21/2022	3/21/2024
T5	ANP07657	Cable	32022-29094K-29094K-24TC	6/22/2022	6/22/2024

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	2483.500M	47.5	+5.7 +0.4	+4.3	-39.2	+28.4	+0.0	47.1	54.0	-6.9	Horiz
2	2390.000M	42.8	+5.6 +0.4	+4.0	-39.2	+28.5	+0.0	42.1	54.0	-11.9	Horiz
3	2400.000M	48.8	+5.6 +0.4	+4.0	-39.2	+28.5	+0.0	48.1	78.8	-30.7	Horiz

Test Setup Photo(s)

Front View

Back View

Above 1GHz

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:	**Signetik**		
Specification:	**15.207 AC Mains - Average**		
Work Order #:	**107284**	Date:	8/10/2022
Test Type:	**Conducted Emissions**	Time:	3:18:16 PM
Tested By:	S. Yamamoto	Sequence#:	7
Software:	EMITest 5.03.20		120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

Test Conditions / Notes:

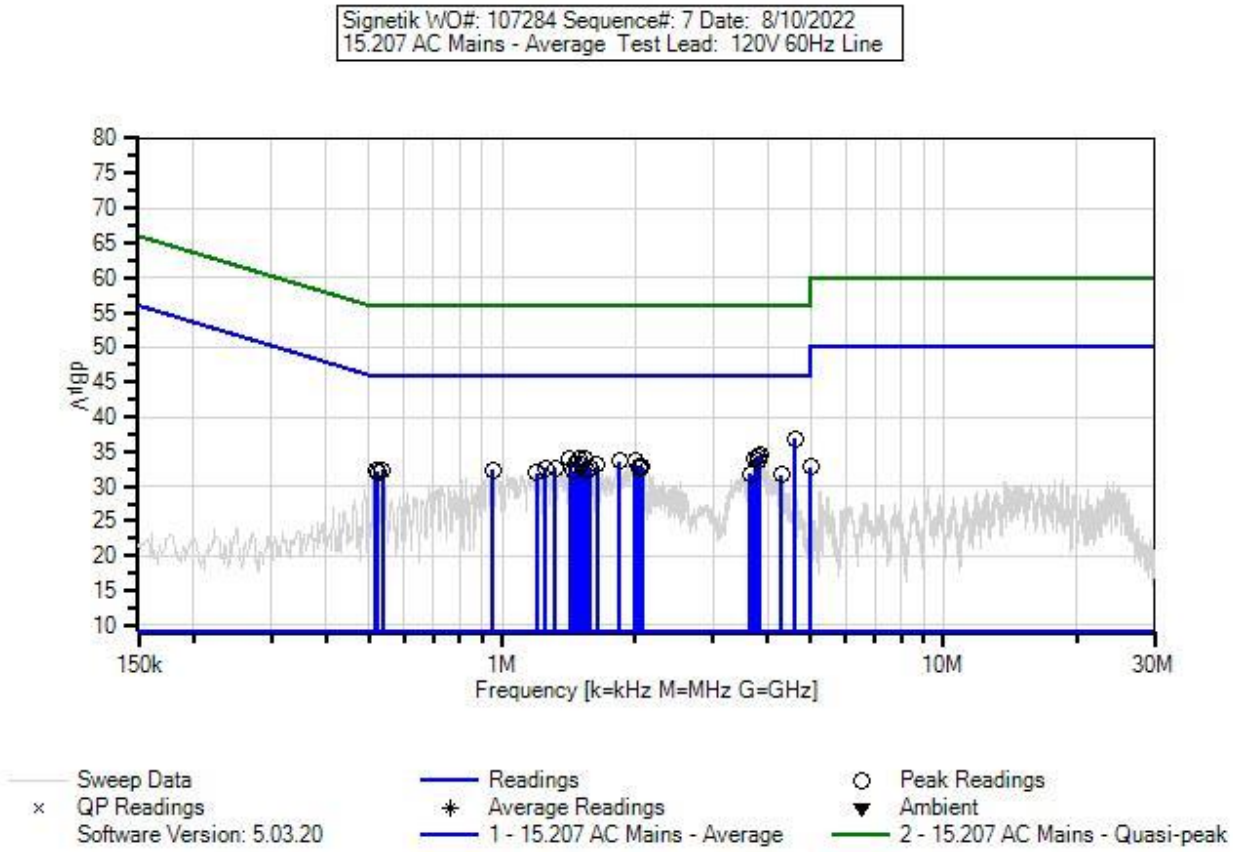
The equipment under test (EUT) is stand alone on the tabletop. The EUT is connected to an AC to USB power adapter via USB cable.
The EUT has been configured to transmit continuously at the output power level of +8dBm.
Low channel 2402MHz, Mid channel 2442MHz, High channel 2480MHz.

Frequency range of data sheet 150kHz to 30MHz.
RBW=9kHz
VBW=30kHz

Test Environment Conditions:
Temperature: 23°C
Humidity: 40%
Pressure: 99kPa

Site D

Test method ANSI C63.10 (2013)



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02869	Spectrum Analyzer	E4440A	8/16/2021	8/16/2022
T1	AN02610	High Pass Filter	HE9615-150K-50-720B	9/8/2021	9/8/2023
T2	ANP07338	Cable	2249-Y-240	1/3/2022	1/3/2024
T3	ANP07545	Attenuator	SA18N10W-06	1/4/2021	1/4/2023
T4	ANP07738	Cable-Line L1(dB)	90cm-extcord	12/9/2020	12/9/2022
	ANP07738	Cable-Neutral L2(dB)	90cm-extcord	12/9/2020	12/9/2022
T5	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: Line

#	Freq MHz	Rdng dBµV	T1 T5 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	4.615M	30.6	+0.1 +0.0	+0.2	+5.7	+0.2	+0.0	36.8	46.0	-9.2	Line
2	3.841M	28.4	+0.1 +0.0	+0.1	+5.7	+0.2	+0.0	34.5	46.0	-11.5	Line
3	3.790M	28.2	+0.1 +0.0	+0.1	+5.7	+0.2	+0.0	34.3	46.0	-11.7	Line
4	3.744M	28.0	+0.1 +0.0	+0.1	+5.7	+0.2	+0.0	34.1	46.0	-11.9	Line
5	1.490M	27.9	+0.2 +0.0	+0.1	+5.7	+0.1	+0.0	34.0	46.0	-12.0	Line
6	1.422M	27.8	+0.2 +0.0	+0.1	+5.7	+0.1	+0.0	33.9	46.0	-12.1	Line
7	1.541M	27.8	+0.2 +0.0	+0.1	+5.7	+0.1	+0.0	33.9	46.0	-12.1	Line
8	3.812M	27.6	+0.1 +0.0	+0.1	+5.7	+0.2	+0.0	33.7	46.0	-12.3	Line
9	1.843M	27.5	+0.2 +0.0	+0.1	+5.7	+0.1	+0.0	33.6	46.0	-12.4	Line
10	2.004M	27.6	+0.1 +0.0	+0.1	+5.7	+0.1	+0.0	33.6	46.0	-12.4	Line
11	1.468M	27.1	+0.2 +0.0	+0.1	+5.7	+0.1	+0.0	33.2	46.0	-12.8	Line
12	1.515M	26.9	+0.2 +0.0	+0.1	+5.7	+0.1	+0.0	33.0	46.0	-13.0	Line
13	1.638M	26.9	+0.2 +0.0	+0.1	+5.7	+0.1	+0.0	33.0	46.0	-13.0	Line
14	2.038M	26.9	+0.1 +0.0	+0.1	+5.7	+0.1	+0.0	32.9	46.0	-13.1	Line
15	4.994M	26.6	+0.1 +0.0	+0.2	+5.7	+0.2	+0.0	32.8	46.0	-13.2	Line
16	2.076M	26.8	+0.1 +0.0	+0.1	+5.7	+0.1	+0.0	32.8	46.0	-13.2	Line
17	1.251M	26.5	+0.2 +0.0	+0.1	+5.7	+0.1	+0.0	32.6	46.0	-13.4	Line
18	1.319M	26.5	+0.2 +0.0	+0.1	+5.7	+0.1	+0.0	32.6	46.0	-13.4	Line
19	1.587M	26.5	+0.2 +0.0	+0.1	+5.7	+0.1	+0.0	32.6	46.0	-13.4	Line
20	2.051M	26.5	+0.1 +0.0	+0.1	+5.7	+0.1	+0.0	32.5	46.0	-13.5	Line
21	953.754k	26.3	+0.2 +0.0	+0.1	+5.7	+0.1	+0.0	32.4	46.0	-13.6	Line
22	536.146k	26.2	+0.3 +0.0	+0.0	+5.7	+0.1	+0.0	32.3	46.0	-13.7	Line
23	1.562M	26.2	+0.2 +0.0	+0.1	+5.7	+0.1	+0.0	32.3	46.0	-13.7	Line

24	516.511k	26.1	+0.3 +0.0	+0.0	+5.7	+0.1	+0.0	32.2	46.0	-13.8	Line
25	1.443M	26.1	+0.2 +0.0	+0.1	+5.7	+0.1	+0.0	32.2	46.0	-13.8	Line
26	522.329k	26.0	+0.3 +0.0	+0.0	+5.7	+0.1	+0.0	32.1	46.0	-13.9	Line
27	1.196M	25.8	+0.2 +0.0	+0.1	+5.7	+0.1	+0.0	31.9	46.0	-14.1	Line
28	3.646M	25.7	+0.1 +0.0	+0.1	+5.7	+0.2	+0.0	31.8	46.0	-14.2	Line
29	3.671M	25.6	+0.1 +0.0	+0.1	+5.7	+0.2	+0.0	31.7	46.0	-14.3	Line
30	4.279M	25.5	+0.1 +0.0	+0.2	+5.7	+0.2	+0.0	31.7	46.0	-14.3	Line

Test Location:	CKC Laboratories, Inc. • 110 N. Olinda Place • Brea, CA 92823 • (714)-993-6112		
Customer:	**Signetik**		
Specification:	**15.207 AC Mains - Average**		
Work Order #:	**107284**	Date:	8/10/2022
Test Type:	**Conducted Emissions**	Time:	3:23:01 PM
Tested By:	S. Yamamoto	Sequence#:	8
Software:	EMITest 5.03.20		120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

Test Conditions / Notes:

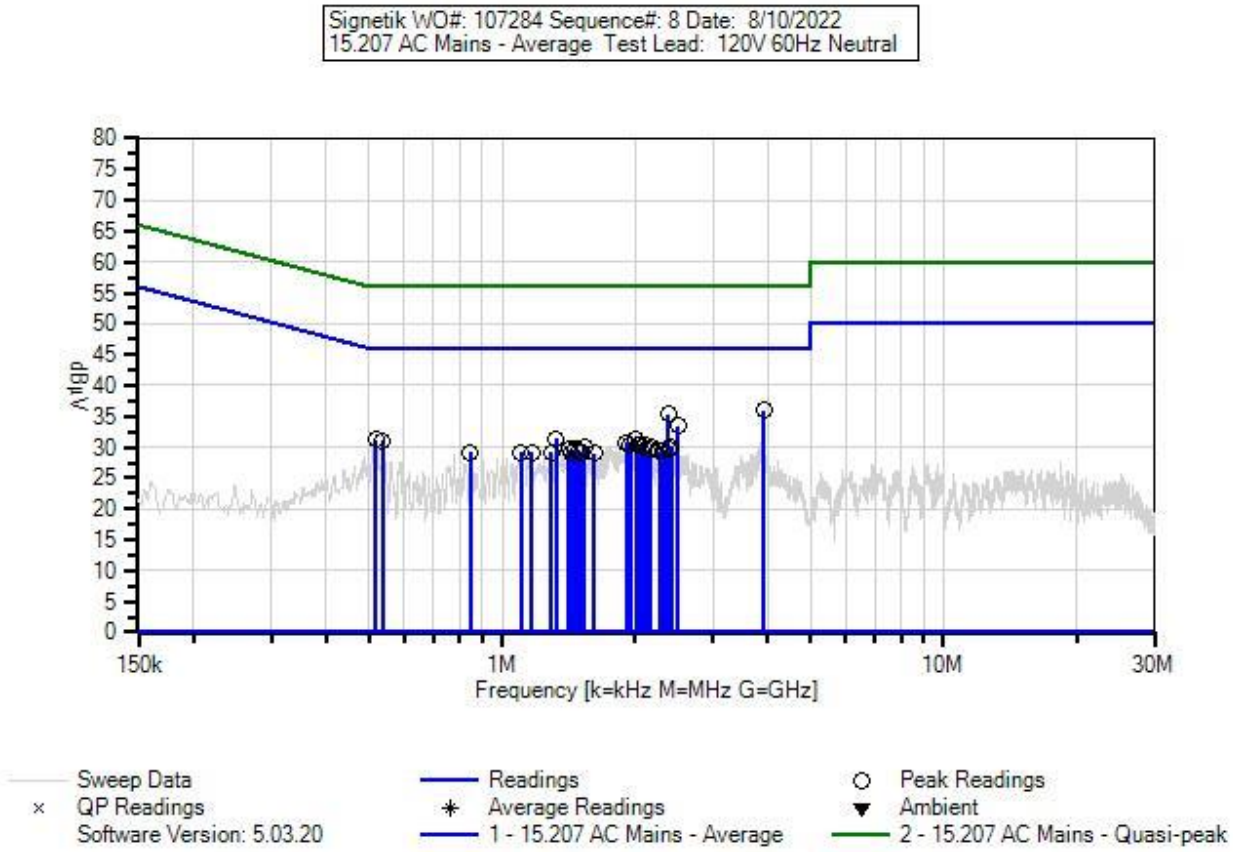
The equipment under test (EUT) is stand alone on the tabletop. The EUT is connected to an AC to USB power adapter via USB cable.
The EUT has been configured to transmit continuously at the output power level of +8dBm.
Low channel 2402MHz, Mid channel 2442MHz, High channel 2480MHz.

Frequency range of data sheet 150kHz to 30MHz.
RBW=9kHz
VBW=30kHz

Test Environment Conditions:
Temperature: 23C
Humidity: 40%
Pressure: 99kPa

Site D

Test method ANSI C63.10 (2013)



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02869	Spectrum Analyzer	E4440A	8/16/2021	8/16/2022
T1	AN02610	High Pass Filter	HE9615-150K-50-720B	9/8/2021	9/8/2023
T2	ANP07338	Cable	2249-Y-240	1/3/2022	1/3/2024
T3	ANP07545	Attenuator	SA18N10W-06	1/4/2021	1/4/2023
	ANP07738	Cable-Line L1(dB)	90cm-extcord	12/9/2020	12/9/2022
T4	ANP07738	Cable-Neutral L2(dB)	90cm-extcord	12/9/2020	12/9/2022
	AN00847.1	50uH LISN-(L) Line 1	3816/2NM	3/18/2022	3/18/2023
T5	AN00847.1	50uH LISN-(N) Line 2	3816/2NM	3/18/2022	3/18/2023

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

#	Freq MHz	Rdng dBµV	T1 T5 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	3.905M	29.8	+0.1 +0.0	+0.2	+5.7	+0.2	+0.0	36.0	46.0	-10.0	Neutr
2	2.378M	29.4	+0.1 +0.0	+0.1	+5.7	+0.1	+0.0	35.4	46.0	-10.6	Neutr
3	2.506M	27.5	+0.1 +0.0	+0.1	+5.7	+0.1	+0.0	33.5	46.0	-12.5	Neutr
4	1.324M	25.3	+0.2 +0.0	+0.1	+5.7	+0.1	+0.0	31.4	46.0	-14.6	Neutr
5	2.008M	25.3	+0.1 +0.0	+0.1	+5.7	+0.1	+0.0	31.3	46.0	-14.7	Neutr
6	517.966k	25.1	+0.3 +0.0	+0.0	+5.7	+0.1	+0.0	31.2	46.0	-14.8	Neutr
7	536.146k	25.0	+0.3 +0.0	+0.0	+5.7	+0.1	+0.0	31.1	46.0	-14.9	Neutr
8	1.911M	24.7	+0.1 +0.0	+0.1	+5.7	+0.1	+0.0	30.7	46.0	-15.3	Neutr
9	1.953M	24.5	+0.1 +0.0	+0.1	+5.7	+0.1	+0.0	30.5	46.0	-15.5	Neutr
10	2.034M	24.5	+0.1 +0.0	+0.1	+5.7	+0.1	+0.0	30.5	46.0	-15.5	Neutr
11	2.051M	24.5	+0.1 +0.0	+0.1	+5.7	+0.1	+0.0	30.5	46.0	-15.5	Neutr
12	2.102M	24.4	+0.1 +0.0	+0.1	+5.7	+0.1	+0.0	30.4	46.0	-15.6	Neutr
13	2.081M	24.1	+0.1 +0.0	+0.1	+5.7	+0.1	+0.0	30.1	46.0	-15.9	Neutr
14	2.421M	24.1	+0.1 +0.0	+0.1	+5.7	+0.1	+0.0	30.1	46.0	-15.9	Neutr
15	1.536M	23.9	+0.2 +0.0	+0.1	+5.7	+0.1	+0.0	30.0	46.0	-16.0	Neutr
16	2.174M	23.9	+0.1 +0.0	+0.1	+5.7	+0.1	+0.0	29.9	46.0	-16.1	Neutr
17	2.391M	23.8	+0.1 +0.0	+0.1	+5.7	+0.1	+0.0	29.8	46.0	-16.2	Neutr
18	1.468M	23.6	+0.2 +0.0	+0.1	+5.7	+0.1	+0.0	29.7	46.0	-16.3	Neutr
19	1.417M	23.5	+0.2 +0.0	+0.1	+5.7	+0.1	+0.0	29.6	46.0	-16.4	Neutr
20	2.149M	23.6	+0.1 +0.0	+0.1	+5.7	+0.1	+0.0	29.6	46.0	-16.4	Neutr
21	2.319M	23.5	+0.1 +0.0	+0.1	+5.7	+0.1	+0.0	29.5	46.0	-16.5	Neutr
22	2.272M	23.4	+0.1 +0.0	+0.1	+5.7	+0.1	+0.0	29.4	46.0	-16.6	Neutr
23	1.490M	23.2	+0.2 +0.0	+0.1	+5.7	+0.1	+0.0	29.3	46.0	-16.7	Neutr

24	1.103M	23.1	+0.2 +0.0	+0.1	+5.7	+0.1	+0.0	29.2	46.0	-16.8	Neutr
25	1.439M	23.1	+0.2 +0.0	+0.1	+5.7	+0.1	+0.0	29.2	46.0	-16.8	Neutr
26	1.515M	23.1	+0.2 +0.0	+0.1	+5.7	+0.1	+0.0	29.2	46.0	-16.8	Neutr
27	848.844k	23.0	+0.3 +0.0	+0.0	+5.7	+0.1	+0.0	29.1	46.0	-16.9	Neutr
28	1.166M	23.0	+0.2 +0.0	+0.1	+5.7	+0.1	+0.0	29.1	46.0	-16.9	Neutr
29	1.294M	23.0	+0.2 +0.0	+0.1	+5.7	+0.1	+0.0	29.1	46.0	-16.9	Neutr
30	1.613M	22.9	+0.2 +0.0	+0.1	+5.7	+0.1	+0.0	29.0	46.0	-17.0	Neutr

Test Setup Photo(s)

Front View

Back View

APPENDIX B: ANTENNA SPECIFICATIONS

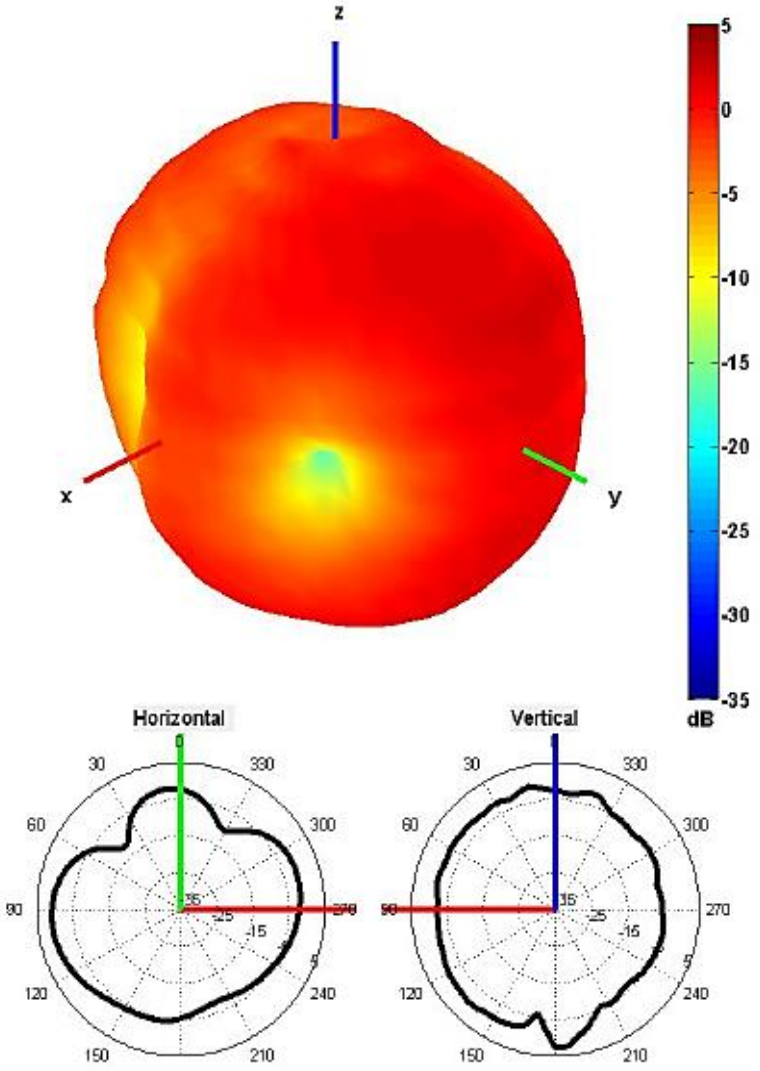
2JE07g

2.4 GHz ISM Surface Mount

antenna conceptor

1. Antenna and electrical specifications

Parameters	2.4 GHz ISM Antenna
Standards	WiFi, BT, ZigBee, ISM,
Band (MHz)	2.4 GHz
Frequency (MHz)	2410-2490
Return Loss (dB)	~-20.3
VSWR	~1.2:1
Efficiency (%)	~67
Peak Gain (dBi)	~3.2
Average Gain (dB)	~-1.8
Impendance (Ohm)	50
Polarisation	Linear
Radiation Pattern	Omni-Directional
Max. Input Power (W)	25



2450 MHz Radiation pattern

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.