Testing Tomorrow's Technology

Application

For

Title 47 USC Part 2, Subpart J, Paragraph 2.907, 2.1043 Equipment Authorization of Certification for an Intentional Radiator per Part 15, Subpart C, Paragraphs 15.207, 15.209 and 15.249

And

Innovation, Science, and Economic Development Canada Certification per RSS-210 Issue 10: License-Exempt Radio Apparatus: Category I Equipment and RSS-Gen Issue 5: General Requirements for Compliance of Radio Apparatus

For

Cognosos, Inc
Model: PCB-10032
FCC ID: 2AKFQ10032
IC: 22165-10032

UST Project: 22-0291
Issue Date: October 27, 2022

Total Pages in This Report: 32

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I certify that I am authorized to sign for the Test Agency and that all of the statements in this report and in the Exhibits attached hereto are true and correct to the best of my knowledge and belief:

US TECH (Agent Responsible For Test):

By: Alan Ghasiani

Name: 

Title: Consulting Engineer – President

Date: October 27, 2022

NVLAP LAB CODE 200162-0

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MEASUREMENT TECHNICAL REPORT

Company Name:	Cognosos, Inc
Address:	1100 Spring St NW #300A Atlanta, GA 30309
Model:	PCB-10032
FCC ID:	2AKFQ10032
IC ID:	22165-10032
Date:	October 27, 2022

This report concerns (check one): ☒ Original ☐ Class II Permissive Change

Equipment type: 2.4 GHz ISM Radio Transceiver

Technical Information:

Radio Technology:	Bluetooth 5
Frequency of Operation (MHz):	2402-2480
Output Power (dBm):	+14.0 (rated)
Type of Modulation:	GFSK
Data/Bit Rate (M)bps:	1 Mbps (max)
Antenna Gain (dBi):	+4.7
Software used to program EUT:	Cognosos Telluride
EUT firmware:	vaha0.4.0
Power setting:	default (+14.0 dBm)

Report prepared by:

US Tech

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Table of Contents

Paragraph Title **Page**

1 General Information 7

1.1 Purpose of this Report 7
1.2 Characterization of Test Sample 7
1.3 Product Description 7
1.4 Configuration of Tested System 7
1.5 Test Facility 8

2 Tests and Measurements 10

2.1 Test Equipment 10
2.2 Modifications to EUT Hardware 11
2.3 Number of Measurements for Intentional Radiators (15.31(m)) 11
2.4 Frequency Range of Radiated Measurements (Part 15.33) 11
2.4.1 Intentional Radiator 11
2.4.2 Unintentional Radiator 12
2.5 Measurement Detector Function and Bandwidth (CFR 15.35) 12
2.5.1 Detector Function and Associated Bandwidth 12
2.5.2 Corresponding Peak and Average Requirements 12
2.5.3 Pulsed Transmitter Averaging 12
2.6 Transmitter Duty Cycle (CFR 15.35 (c)) 13
2.7 EUT Antenna Requirements (CFR 15.203) 13
2.8 Restricted Bands of Operation (CFR 15.205) 13
2.9 Intentional Radiator, Radiated Emissions (CFR 15.209, 15.249(a)(c)) (IC RSS 210, A2.9 (a)) 14
2.10 Band Edge Measurements – (CFR 15.249 (d)) 17
2.11 Occupied Bandwidth (CFR 2.1049) 26
2.12 Powerline Emissions (CFR 15.207) 30
2.13 Intentional Radiator, Radiated Emissions (CFR 15.209) 31
2.14 Measurement Uncertainty 34
2.14.1 Conducted Emissions Measurement Uncertainty 34
2.14.2 Radiated Emissions Measurement Uncertainty 34

List of Figures

Figures **Title** **Page**

Figure 1. Block Diagram of Test Configuration 9
Figure 2. Band Edge Compliance, Low Channel PHY1 Delta – Peak..... 18
Figure 3. Band Edge Compliance, Low Channel PHY2 Delta – Peak..... 19
Figure 4. Radiated Restricted Band 2310 MHz to 2390 MHz PHY1, Peak..... 20
Figure 5. Radiated Restricted Band 2310 MHz to 2390 MHz PHY2, Peak..... 21
Figure 6. Band Edge Compliance, High Channel PHY1 Delta, Peak..... 22
Figure 7. Band Edge Compliance, High Channel PHY2 Delta, Peak..... 23
Figure 8. Radiated Restricted Band 2483.5 MHz to 2500 MHz PHY1, Peak..... 24
Figure 9. Radiated Restricted Band 2483.5 MHz to 2500 MHz PHY2, Peak..... 25
Figure 10. 99% Occupied Bandwidth Low Channel PHY1..... 27
Figure 11. 99% Occupied Bandwidth Mid Channel PHY1 27
Figure 12. 99% Occupied Bandwidth High Channel PHY1..... 28
Figure 13. 99% Occupied Bandwidth Low Channel PHY2..... 28
Figure 14. 99% Occupied Bandwidth Mid Channel PHY2 29
Figure 15. 99% Occupied Bandwidth High Channel PHY2..... 29
Figure 16. Unintentional Radiated Emissions, 30 MHz – 1000 MHz (Horizontal) ..... **Error! Bookmark not defined.**
Figure 17. Unintentional Radiated Emissions, 30 MHz – 1000 MHz (Vertical) .. **Error! Bookmark not defined.**
Figure 18. Unintentional Radiated Emissions, 1000 MHz – 18000 MHz (Horizontal) ..... **Error! Bookmark not defined.**
Figure 19. Unintentional Radiated Emissions, 1000 MHz – 18000 MHz (Vertical) ..... **Error! Bookmark not defined.**

List of Tables

Table **Title** **Page**

Table 1. EUT and Peripherals 8
Table 2. Test Instruments 10
Table 3. Number of Test Frequencies for Intentional Radiators 11
Table 4. Allowed Antenna(s) 13
Table 5. Intentional Radiated Emissions Peak Measurements 15
Table 6. Average Radiated Fundamental & Harmonic Emissions 16
Table 7. Radiated Restricted Band 2310 MHz to 2390 MHz, Peak 20
Table 8. Radiated Restricted Band 2310 MHz to 2390 MHz, Peak 21
Table 9. Radiated Restricted Band 2483.5 MHz to 2500 MHz, Peak 24
Table 10. Radiated Restricted Band 2483.5 MHz to 2500 MHz, Peak 25
Table 11. Occupied Bandwidth PHY1 26
Table 12. Occupied Bandwidth PHY2 26
Table 13. Transmitter Power Line Conducted Emissions Test Data, Part 15.107 30
Table 14. Radiated Emissions, 9 kHz - 30 MHz 32
Table 15. Radiated Emissions other than Fundamental & Harmonics Below 1GHz 32
Table 16. Radiated Emissions other than Fundamental & Harmonics Above 1GHz 33

List of Attachments

IC Agency Agreement
FCC Agency Agreement
Application Forms
Canadian Representative Letter
IC Cover Letter
IC RSS to 15.249 Cross Reference
Confidentiality Request Letter
Test Configuration Photographs
External Photographs
Internal Photographs
Confidential Schematics
Confidential Theory of Operation
Confidential Block Diagram
User Manual
Sample Label

1 General Information

1.1 Purpose of this Report

This report is prepared as a means of conveying test results and information concerning the suitability of this exact product for public distribution according to the FCC Rules and Regulations Part 15, Section 249.

1.2 Characterization of Test Sample

The sample used for testing was received by US Tech on October 10, 2022in good operating condition.

1.3 Product Description

The Equipment under Test (EUT) is the Cognosos, Inc. Model PCB-10032. The EUT is a small battery powered GPS tracking device mounted on the sun visor or rearview mirror of the vehicle being tracked. When the EUT senses motion, then senses a stop, the location of the vehicle is obtained through the GPS receiver. The location and serial number are transmitted to one of the Cognosos gateway towers, over a 915 MHz radio, in tracking mode.

The maximum rated output power for this device is 14.0 dBm
Type of modulation: GFSK
Data Rate: Bluetooth Specification 5.0
Packet Type: Bluetooth Specification 5.0

1.4 Configuration of Tested System

The Test Sample was tested per *ANSI C63.4:2014 and ANSI C63.4:2013, Methods of Measurement of Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz* for FCC subpart A Digital equipment Verification requirements and per *ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices* for FCC subpart C Intentional Radiators.

A list of EUT and Peripherals is found in Table 1. A block diagram of the tested system is shown in Figure 1. Test configuration photographs are provided in separate Appendices.

1.5 Test Facility

Testing was performed at US Tech's measurement facility at 3505 Francis Circle, Alpharetta, GA 30004. This site has been fully described and registered with the FCC. Its designation number is US5301. Additionally this site has also been fully described and submitted to Industry Canada (ISED), and has been approved under file number 9900A-1.

1.6 Related Submittals

The EUT is subject to the following FCC authorizations:

a) Certification under section 15.207 and 15.209 as a transmitter.
b) SDoC under 15.101 as a digital device.

The SDoC requirement shares many common report elements with the Certification report. Therefore, though this report is mostly intended to provide data for the Certification process, the SDoC authorization report (Parts 15.107 and 15.109) for the EUT is included herein.

Table 1. EUT and Peripherals

PERIPHERAL MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	FCC ID	CABLES P/D
Tracker/ Cognosos, Inc. (EUT)	PCB-10032	Engineering Sample	Pending: FCC ID: 2AKFQ10032 IC: 22165-10032	P

U= Unshielded S= Shielded P= Power D= Data

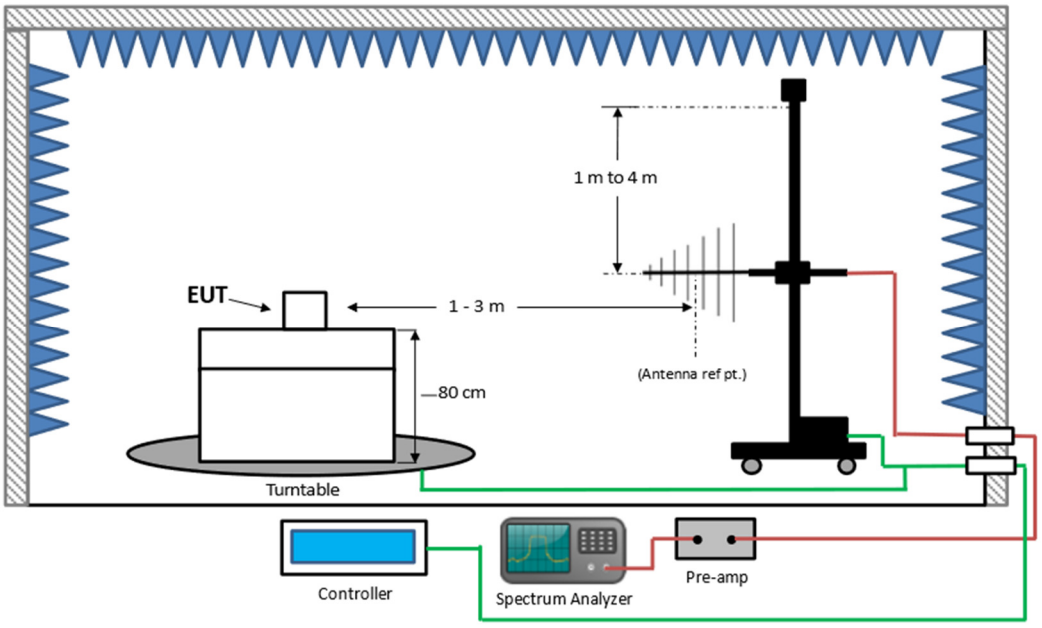


Figure 1. Block Diagram of Test Configuration

2 Tests and Measurements

2.1 Test Equipment

The table below lists test equipment used to evaluate this product. Model numbers, serial numbers and their calibration status are indicated.

Table 2. Test Instruments

TEST INSTRUMENT	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	CALIBRATION DUE DATE
Spectrum Analyzer	Hewlett-Packard	8593E	3205A00124	2/28/2024 2 yr.
Loop Antenna	ETS Lindgren	6502	9810-3246	Calibrated Before Use
Biconical Antenna	EMCO	3110B	9306-1708	8/17/2023 2 yr.
Log Periodic Antenna	EMCO	3146	9110-3236	12/13/2023 2 yr.
Horn Antenna	Ah Systems	SAS-571	605	4/28/2024 2 yr.
Preamp 100 kHz To 1.3 GHz	Hewlett-Packard	8447D	1937A02980	6/9/2023
Preamp 1.0 GHz To 26.0 GHz	Hewlett-Packard	8449B	3008A00914	2/11/2023
High Pass Filter	Microwave Circuits	H3R020G2	001DC9528	8/1/2023

Note: The calibration interval of the above test instruments are 12 months unless stated otherwise and all calibrations are traceable to NIST/USA.

2.2 Modifications to EUT Hardware

No physical modifications were made by US Tech in order to bring the EUT into compliance with FCC Part 15, Subpart C Intentional Radiator Limits for the transmitter portion of the EUT or the Subpart B Unintentional Radiator Limits (Receiver and Digital Device) Requirements.

2.3 Number of Measurements for Intentional Radiators (15.31(m))

Measurements of intentional radiators or receivers shall be performed and reported for each band in which the device can be operated with the device operating at the number of frequencies in each band specified in Table 3 below.

Table 3. Number of Test Frequencies for Intentional Radiators

Frequency Range over which the device operates	Number of Frequencies	Location in the Range of operation
1 MHz or less	1	Middle
1 to 10 MHz	2	1 near the top 1 near the bottom
Greater than 10 MHz	3	1 near top 1 near middle 1 near bottom

Because the EUT operates at 2402 MHz to 2480 MHz, 3 test frequencies were used.

2.4 Frequency Range of Radiated Measurements (Part 15.33)

2.4.1 Intentional Radiator

The spectrum shall be investigated for the intentional radiator from the lowest RF signal generated in the EUT, without going below 9 kHz to the 10^{th} harmonic of the highest fundamental frequency generated or 40 GHz, whichever is the lowest.

2.4.2 Unintentional Radiator

For the digital device, an unintentional radiator, the frequency range shall be 30 MHz to 1000 MHz, or to 5 times the highest internal clock frequency.

2.5 Measurement Detector Function and Bandwidth (CFR 15.35)

The radiated and conducted emissions limits shown herein are based on the parameters outlined following.

2.5.1 Detector Function and Associated Bandwidth

On frequencies below 1000 MHz, the limits herein are based upon measurement equipment employing a CISPR Quasi-peak detector function and related measurement bandwidths (i.e. 9 kHz from 150 kHz to 30 MHz and 120 kHz from 30 MHz to 1000 MHz). Alternatively, measurements may be made with equipment employing a peak detector function as long as the same bandwidths specified for the quasi-peak device are used.

2.5.2 Corresponding Peak and Average Requirements

Above 1000 MHz, radiated limits are based on measuring instrumentation employing an average detector function. When average radiated emissions are specified there is also a corresponding Peak requirement, as measured using a peak detector, of 20 dB greater than the average limit. For all measurements above 1000 MHz the Resolution Bandwidth shall be at least 1 MHz .

2.5.3 Pulsed Transmitter Averaging

When the radiated emissions limit is expressed as an average value, and the transmitter is pulsed, the measured field strength shall be determined by applying a Duty Cycle Correction Factor based upon dividing the total ON time during the first 100 ms period by 100 ms (or by the period if less than 100 ms). The duty cycle may be expressed logarithmically in dB.

NOTE: If the transmitter was programmed to transmit at >98% duty cycle, then, wherever applicable (where the detection mode was AVG), the duty cycle factor calculated will be applied.

2.6 Transmitter Duty Cycle (CFR 15.35 (c))

When the radiated emissions limits are expressed in terms of AVERAGE values and pulse operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals as long as the pulse train does not exceed 0.1 seconds. In cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.

In this case the Duty Cycle was calculated to be:
4.8% or 20*log (0.048) = -26.4 dB or -20 dB.

The calculation for the Duty Cycle factor is included in the Theory of Operation exhibit.

2.7 EUT Antenna Requirements (CFR 15.203)

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. Only the antenna(s) listed in Table 4 will be used with this module.

Table 4. Allowed Antenna(s)

REPORT REFERENCE	MANUFACTURER	TYPE OF ANTENNA	MODEL	GAIN dB_i	TYPE OF CONNECTOR
None	Cognosos, Inc.	PCB trace antenna	2.4GHz Inverted F	4.68	trace

2.8 Restricted Bands of Operation (CFR 15.205)

Only spurious emissions can fall in the frequency bands of CFR 15.205. The field strength of these spurious emissions cannot exceed the limits of 15.209. Radiated Harmonics and other Spurious Emissions are examined for this requirement; see paragraph 2.1.

2.9 Intentional Radiator, Radiated Emissions (CFR 15.209, 15.249(a)(c)) (IC RSS 210, A2.9 (a))

Radiated Radio measurements: the EUT was placed into a continuous transmit mode of operation and a preliminary scan was performed on the EUT to find signal frequencies that were caused by the transmitter part of the product. To obtain the worst case results, the EUT was placed on a table top of a non-conductive table, 80 cm above the ground floor. The EUT was positioned 3 meters away from the receiving antenna during testing (1 meter at frequencies above 6 GHz and if the emissions were less than 6 dB from the noise floor). The EUT was tested in X, Y and Z axes or the position of normal operation to determine the worst case orientation. Radiated measurements below 30 MHz were tested with a RBW = 9 kHz; emissions below 1 GHz were tested with a RBW = 120 kHz and radiated measurements above 1 GHz were measured using a RBW =1 MHz . VBW was set to three times the RBW value.

Table 5. Intentional Radiated Emissions Peak Measurements

Test: Part 15C, Para 15.249							
Frequency (MHz)	**Test Data (dBuV)**	**AF+CL-PA (dB/m)**	**Corrected Results (dBuV/m)**	**PK Limits (dBuV/m)**	**Distance / Polarization**	**Margin (dB)**	**Detection Method**
CH0							
2402.00	71.50	32.19	103.69	114.0	3.0m./VERT	10.3	**PK**
*4802.00	49.26	1.48	50.74	74.0	3.0m./VERT	23.3	**PK**
~*7201.00	43.31	6.77	50.08	74.0	1.0m./VERT	23.9	**PK**
~9607.00	44.27	6.46	50.73	74.0	1.0m./VERT	23.3	**PK**
CH20							
2442.00	73.54	32.18	105.72	114.0	3.0m./VERT	8.3	**PK**
*4886.00	48.76	1.46	50.22	74.0	3.0m./VERT	23.8	**PK**
~*7325.00	43.36	7.85	51.21	74.0	1.0m./VERT	22.8	**PK**
~9768.00	45.06	6.34	51.40	74.0	1.0m./VERT	22.6	**PK**
CH39							
2480.00	72.93	32.36	105.29	114.0	3.0m./VERT	8.7	**PK**
*4963.00	48.77	2.06	50.83	74.0	3.0m./VERT	23.2	**PK**
~*7473.00	52.97	6.83	59.80	74.0	1.0m./VERT	14.2	**PK**
~9919.00	53.76	6.81	60.57	74.0	1.0m./VERT	13.4	**PK**
No other emissions found less than 20 dB from the applicable limit.							

1. (*) Falls within the restricted bands of CFR 15.205.
2. No other signals detected within 20 dB of specification limit. Harmonics investigated up to the 10th harmonic
3. (~) Measurements taken at 1 meter were extrapolated to 3 meter using a factor of (-9.5 dB).

Sample Calculation at 2402 MHz:

Magnitude of Measured Frequency	71.50	dBuV
+Antenna Factor + Cable Loss+ Amplifier Gain	32.19	dB/m
Corrected Result	103.69	dBuV/m

Test Date: October 12, 2022
Tested By

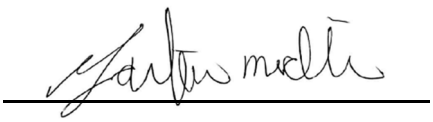
Signature:  Name: Gabriel Medina

Table 6. Average Radiated Fundamental & Harmonic Emissions

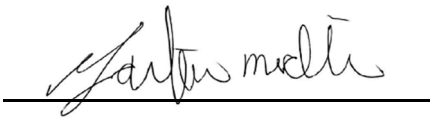
Test: Part 15C, Para 15.249							
Frequency (MHz)	**Test Data (dBuV)**	**AF+CL-PA+DC (dB/m)**	**Corrected Results (dBuV/m)**	**PK Limits (dBuV/m)**	**Distance / Polarization**	**Margin (dB)**	**Detection Method**
CH0							
2402.00	71.50	12.19	83.69	94.0	3.0m./VERT	10.3	**AVG**
*4802.00	49.26	-18.52	30.74	54.0	3.0m./VERT	23.3	**AVG**
~*7201.00	43.31	-13.23	30.08	54.0	1.0m./VERT	23.9	**AVG**
~9607.00	44.27	-13.54	30.73	54.0	1.0m./VERT	23.3	**AVG**
CH19							
2442.00	73.54	12.18	85.72	94.0	3.0m./VERT	8.3	**AVG**
*4886.00	48.76	-18.54	30.22	54.0	3.0m./VERT	23.8	**AVG**
~*7325.00	43.39	-12.15	31.24	54.0	1.0m./VERT	22.8	**AVG**
~9768.00	45.06	-13.66	31.40	54.0	1.0m./VERT	22.6	**AVG**
CH39							
2480.00	72.93	12.36	85.29	94.0	3.0m./VERT	8.7	**AVG**
*4963.00	48.77	-17.94	30.83	54.0	3.0m./VERT	23.2	**AVG**
~*7437.00	43.47	-13.17	30.30	54.0	1.0m./VERT	23.7	**AVG**
~9919.00	44.26	-13.19	31.07	54.0	1.0m./VERT	22.9	**AVG**
No other emissions found less than 20 dB from the applicable limit.							

1. (*) Falls within the restricted bands of CFR 15.205.
2. No other signals detected within 20 dB of specification limit. Harmonics investigated up to the 10th harmonic
3. (~) Measurements taken at 1 meter were extrapolated to 3 meter using a factor of (-9.5 dB).
4. DC correction factor of -20.00 applied

Sample Calculation at 2402 MHz:

Magnitude of Measured Frequency	76.89	dBuV
+Antenna Factor + Cable Loss+ Amplifier Gain	0.39	dB/m
Corrected Result	77.28	dBuV/m

Test Date: October 12, 2022
Tested By

Signature:  Name: Gabriel Medina

2.10 Band Edge Measurements – (CFR 15.249 (d))

Band Edge measurements are made following the guidelines in FCC KDB Publication No. 558074 with the EUT initially operating on the Lowest Channel and then operating on the Highest Channel within its band of operation. Radiated measurements are performed to demonstrate compliance with the requirement of 15.249(d) that all emissions outside of the band edges be attenuated by at least 50 dB or 15.209 limits, when compared to its highest in-band value (contained in a 100 kHz band).

To capture the band edge, set the Spectrum Analyzer frequency span set to 2 MHz to capture the peak level of the emission operating on the channel closest to the band edge as well as any modulation products falling outside of the authorized band of operation. See figure and calculations following for more detail.

The EUT has different PHY modes of operation for programming purposes:

PHY1	1Mbps	1 MHz BW
PHY2	2Mbps	2 MHz BW
PHY3	125kbps	1 MHz BW
PHY4	500kbps	1MHz BW

Exploratory testing was conducted and it was determined that for field strength measurements the PHY1 mode of operation can be used as the representative mode of operation for all PHY modes. For restricted band, band edge and bandwidth measurements, two PHY modes were used to represent the EUT. PHY1 and PHY2. PHY2 yields a wider bandwidth, PHY1 is used to represent PHY1, 3 & 4. The test results are present herein.

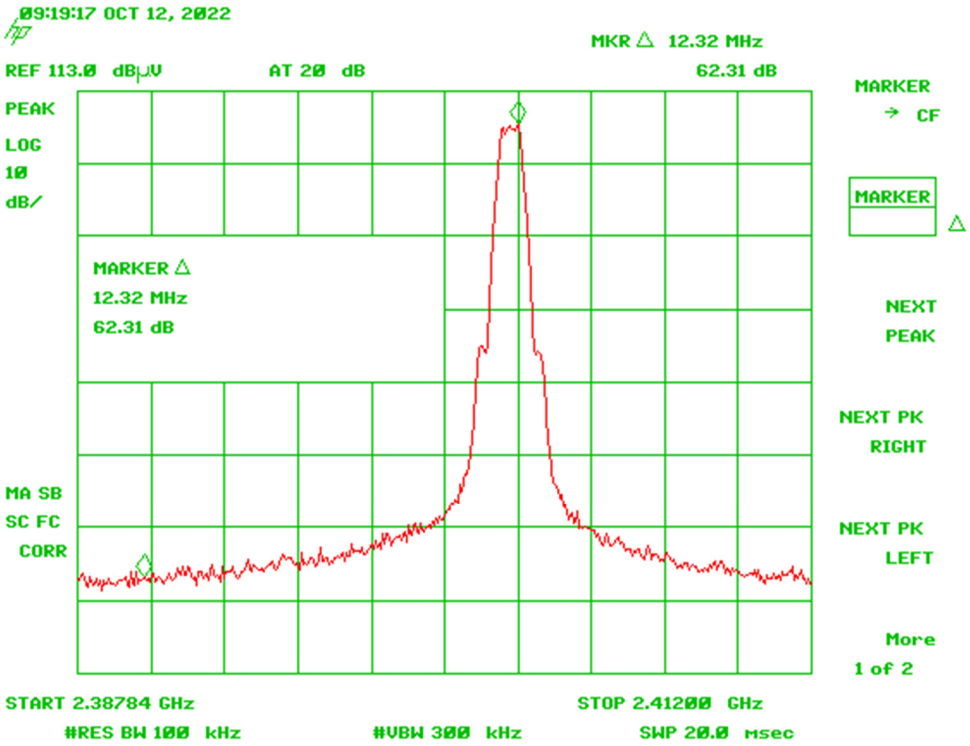


Figure 2. Band Edge Compliance, Low Channel PHY1 Delta – Peak

Low Channel Corrected Measured Value from Table 5	103.69	dBuV
Low Channel Band Edge Delta from Figure 2	-62.31	dB
Calculated Result (PEAK)	41.38	dBuV/m
Band Edge Limit (PEAK)	74.00	dBuV/m
Calculated Result (PEAK)	-41.38	dBuV/m
Band Edge Margin	32.62	dBuV/m
Low Channel Corrected Measured Value from Table 6	83.69	dBuV
Low Channel Band Edge Delta from Figure 2	-62.31	dB
Calculated Result (AVG)	21.38	dBuV/m
Band Edge Limit (AVG)	54.00	dBuV/m
Calculated Result (AVG)	-21.38	dBuV/m
Band Edge Margin	32.62	dBuV/m

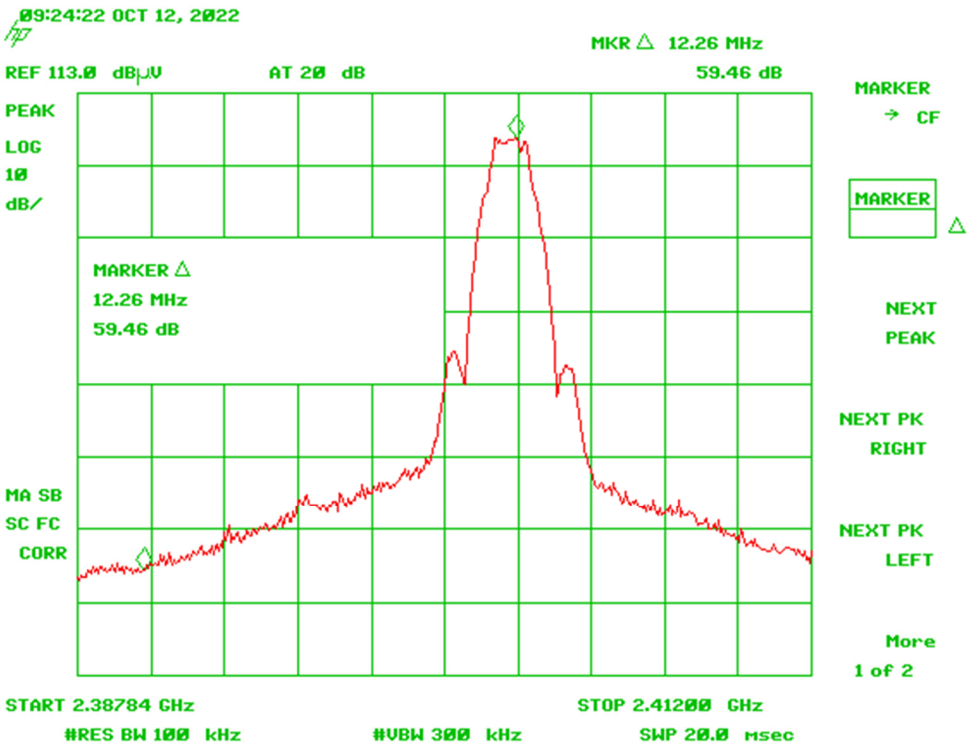


Figure 3. Band Edge Compliance, Low Channel PHY2 Delta – Peak

Low Channel Corrected Measured Value from Table 5	103.69	dBuV
Low Channel Band Edge Delta from Figure 3	-59.46	dB
Calculated Result (PEAK)	44.23	dBuV/m
Band Edge Limit (PEAK)	74.00	dBuV/m
Calculated Result (PEAK)	-44.23	dBuV/m
Band Edge Margin	29.77	dBuV/m
Low Channel Corrected Measured Value from Table 6	83.69	dBuV
Low Channel Band Edge Delta from Figure 3	-59.46	dB
Calculated Result (AVG)	24.23	dBuV/m
Band Edge Limit (AVG)	54.00	dBuV/m
Calculated Result (AVG)	-24.23	dBuV/m
Band Edge Margin	29.77	dBuV/m

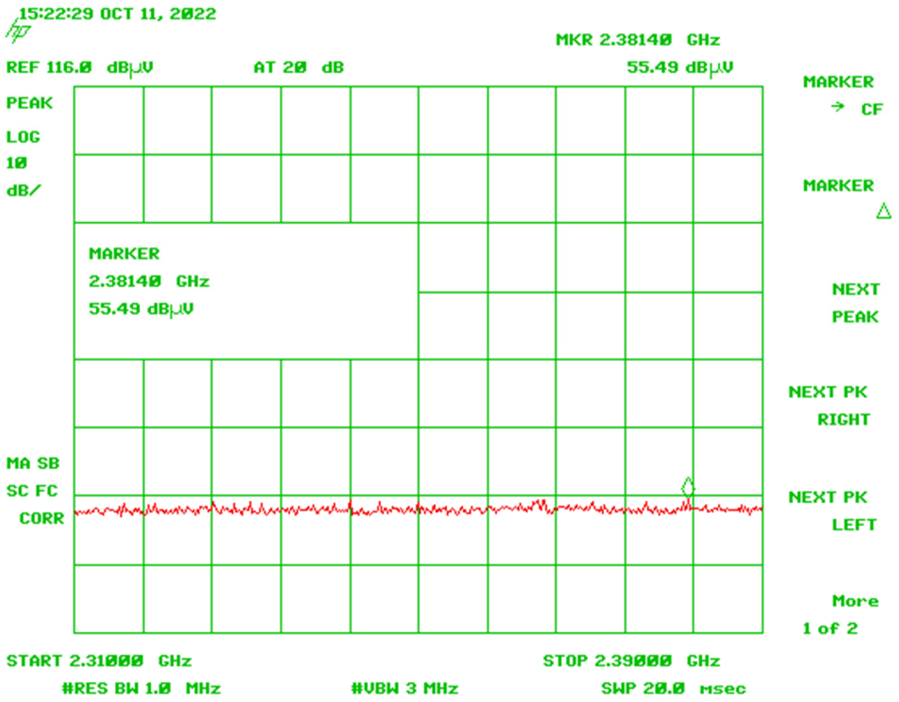


Figure 4. Radiated Restricted Band 2310 MHz to 2390 MHz PHY1, Peak

Table 7. Radiated Restricted Band 2310 MHz to 2390 MHz, Peak

Restricted Band Peak Measurements							
Frequency (MHz)	**Test Data (dBuv)**	**AF+CA-AMP (dB/m)**	**Results (dBuV/m)**	**Limits (dBuV/m)**	**Antenna Distance/ Polarization**	**Margin (dB)**	**Detector PK, or AVG**
2381.00	55.49	-6.64	48.85	54.0	3.0m./HORZ	5.1	PK

Note: Peak meets avg limits

Test Date: October 12, 2022
Tested By

Signature: _____ Name: Gabriel Medina

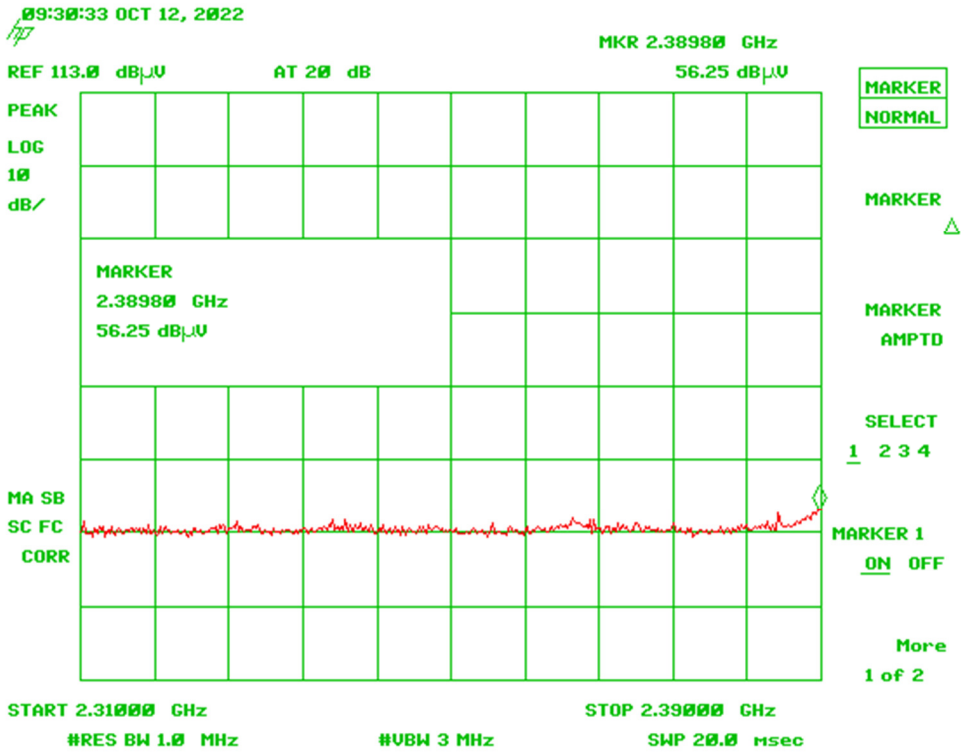


Figure 5. Radiated Restricted Band 2310 MHz to 2390 MHz PHY2, Peak

Table 8. Radiated Restricted Band 2310 MHz to 2390 MHz, Peak

Restricted Band Peak Measurements							
Frequency (MHz)	**Test Data (dBuv)**	**AF+CA-AMP (dB/m)**	**Results (dBuV/m)**	**Limits (dBuV/m)**	**Antenna Distance/ Polarization**	**Margin (dB)**	**Detector PK, or AVG**
2389.00	56.25	-6.60	49.65	54.0	3.0m./HORZ	4.4	**PK**

Note: Peak meets avg limits

Test Date: October 12, 2022
Tested By

Signature: _____ Name: Gabriel Medina

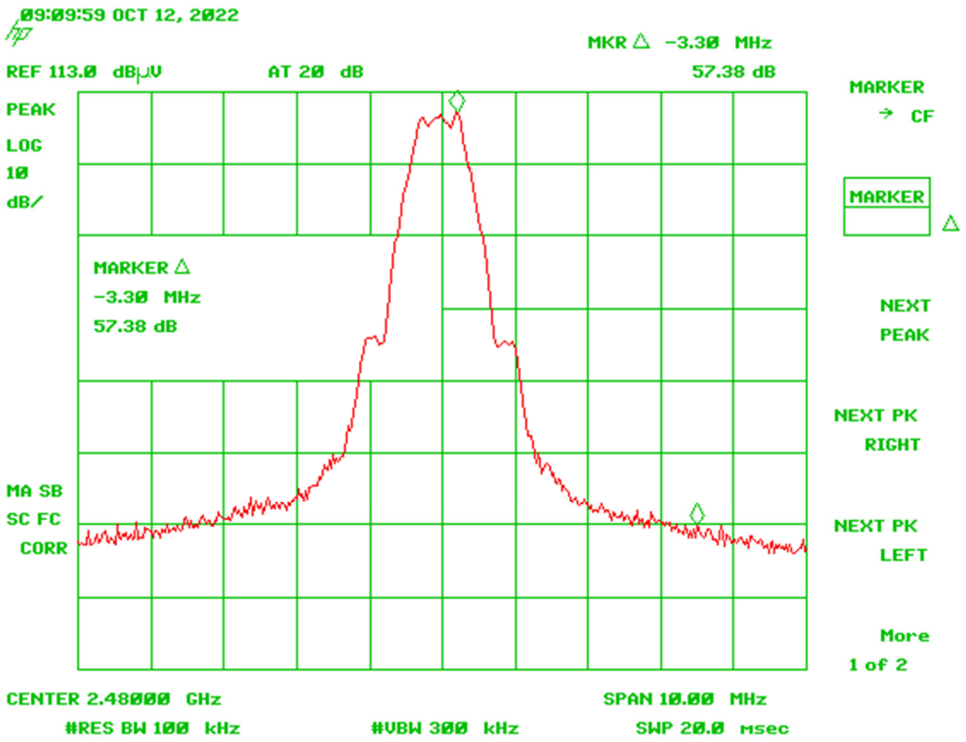


Figure 6. Band Edge Compliance, High Channel PHY1 Delta, Peak

Low Channel Corrected Measured Value from Table 5	105.29	dBuV
Low Channel Band Edge Delta from Figure 6	-57.38	dB
Calculated Result (PEAK)	47.91	dBuV/m
Band Edge Limit (PEAK)	74.00	dBuV/m
Calculated Result (PEAK)	-47.91	dBuV/m
Band Edge Margin	26.09	dBuV/m
Low Channel Corrected Measured Value from Table 6	85.29	dBuV
Low Channel Band Edge Delta from Figure 6	-57.38	dB
Calculated Result (AVG)	27.91	dBuV/m
Band Edge Limit (AVG)	54.00	dBuV/m
Calculated Result (AVG)	-27.91	dBuV/m
Band Edge Margin	26.09	dBuV/m

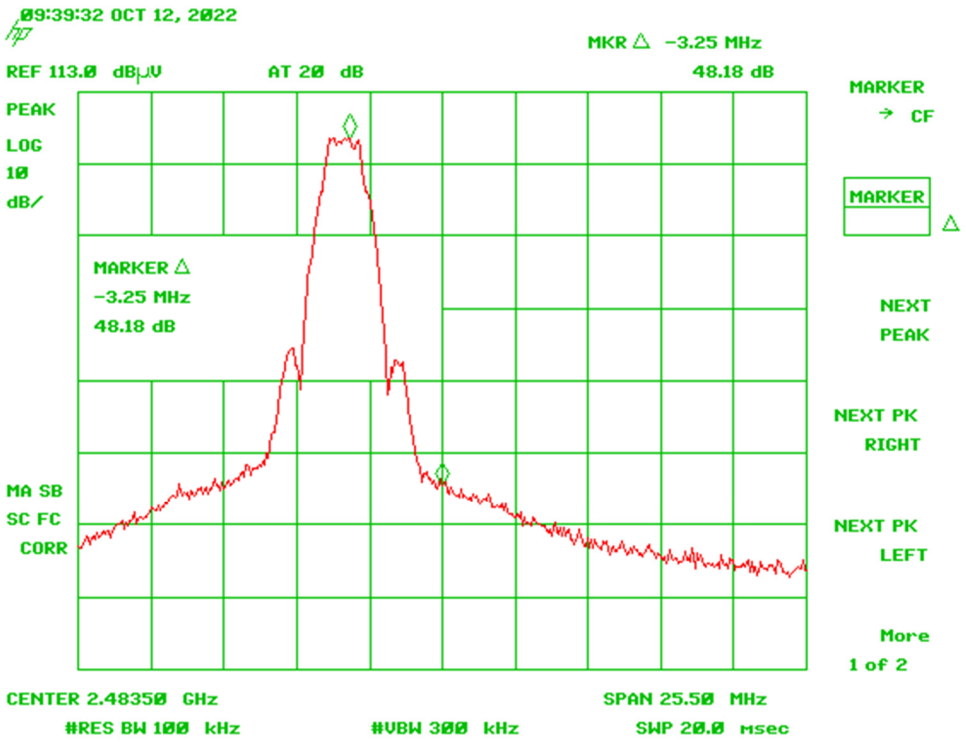


Figure 7. Band Edge Compliance, High Channel PHY2 Delta, Peak

Low Channel Corrected Measured Value from Table 5	105.29	dBuV
Low Channel Band Edge Delta from Figure 7	-48.18	dB
Calculated Result (PEAK)	57.11	dBuV/m
Band Edge Limit (PEAK)	74.00	dBuV/m
Calculated Result (PEAK)	-57.11	dBuV/m
Band Edge Margin	16.89	dBuV/m
Low Channel Corrected Measured Value from Table 6	85.29	dBuV
Low Channel Band Edge Delta from Figure 7	-48.18	dB
Calculated Result (AVG)	37.11	dBuV/m
Band Edge Limit (AVG)	54.00	dBuV/m
Calculated Result (AVG)	-37.11	dBuV/m
Band Edge Margin	16.89	dBuV/m

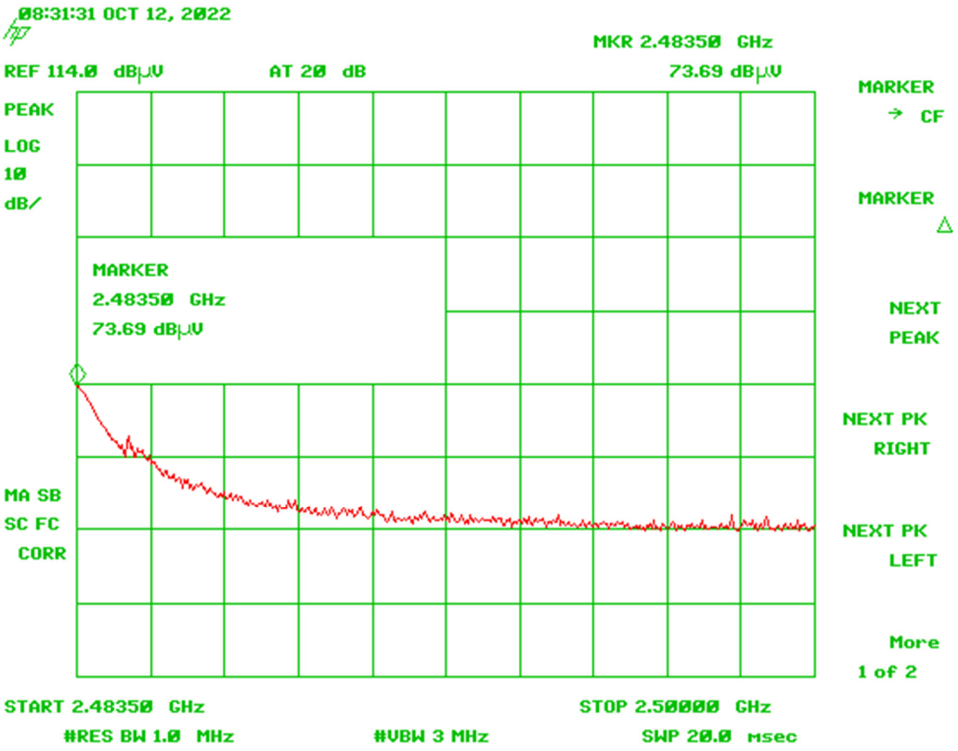


Figure 8. Radiated Restricted Band 2483.5 MHz to 2500 MHz PHY1, Peak

Table 9. Radiated Restricted Band 2483.5 MHz to 2500 MHz, Peak

Restricted Band Peak Measurements							
Test: Radiated Emissions				**Client:** Cognosos			
Project: 22-0414				**Model:** PCB-10032			
Frequency (MHz)	**Test Data (dBuv)**	**AF+CA-AMP + DC (dB/m)**	**Results (dBuV/m)**	**Limits (dBuV/m)**	**Antenna Distance/ Polarization**	**Margin (dB)**	**Detector PK, or AVG**
2483	73.69	-5.94	67.75	74.0	3.0m./HORZ	6.3	**PK**
2483	73.69	-25.94*	47.75	54.0	3.0m./HORZ	6.3	**AVG**

(*)= -20 dB duty cycle correction factor added for AVG detection correction.

Test Date: October 12, 2022
Tested By

Signature: _____ Name: Gabriel Medina

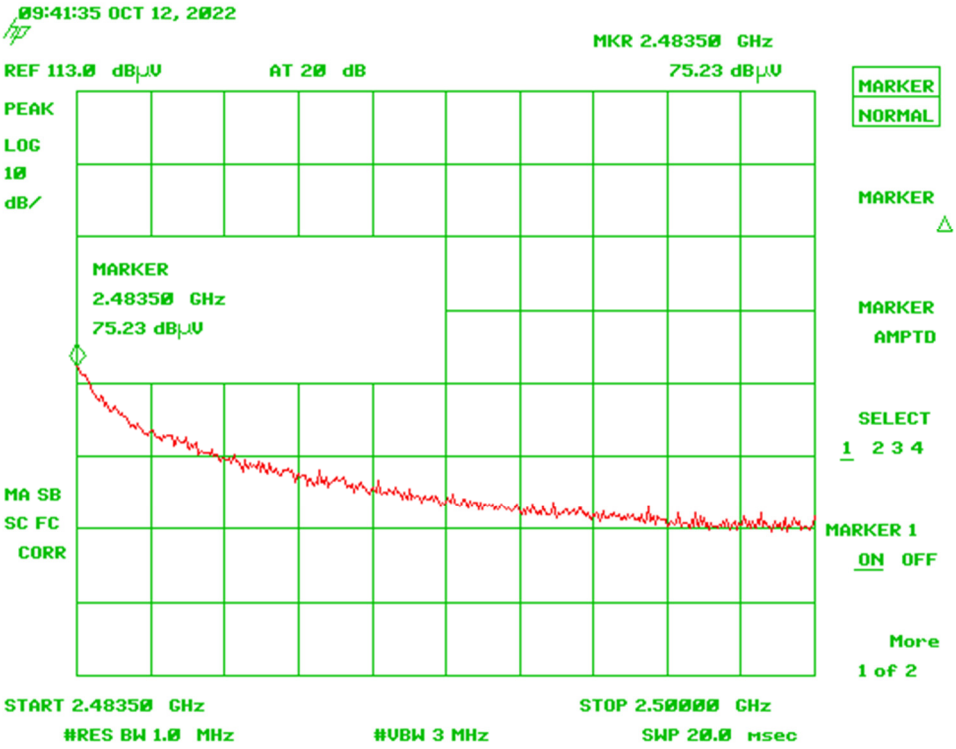


Figure 9. Radiated Restricted Band 2483.5 MHz to 2500 MHz PHY2, Peak

Table 10. Radiated Restricted Band 2483.5 MHz to 2500 MHz, Peak

Restricted Band Peak Measurements							
Test: Radiated Emissions				**Client:** Cognosos			
Project: 21-414				**Model:** PCB-10032			
Frequency (MHz)	**Test Data (dBuv)**	**AF+CA-AMP (dB/m)**	**Results (dBuV/m)**	**Limits (dBuV/m)**	**Antenna Distance/ Polarization**	**Margin (dB)**	**Detector PK, or AVG**
2483	75.23	-5.94	69.29	74.0	3.0m./HORZ	4.7	**PK**
2483	75.23	-25.94*	49.29	54.0	3.0m./HORZ	4.7	**AVG**

(*)= -20 dB duty cycle correction factor added for AVG detection correction.

Test Date: October 12, 2022
Tested By

Signature: _____ Name: Gabriel Medina

2.11 Occupied Bandwidth (CFR 2.1049)

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured.

Table 11. Occupied Bandwidth PHY1

Frequency (MHz)	Occupied Bandwidth (MHz)
2402	1.065
2442	1.035
2480	1.005

Test Date: October 13, 2022
Tested By

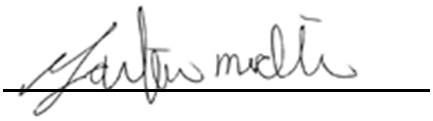
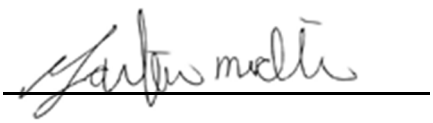
Signature:  Name: Gabriel Medina

Table 12. Occupied Bandwidth PHY2

Frequency (MHz)	Occupied Bandwidth (MHz)
2402	2.063
2442	2.063
2480	2.055

Test Date: October 13, 2022
Tested By

Signature:  Name: Gabriel Medina

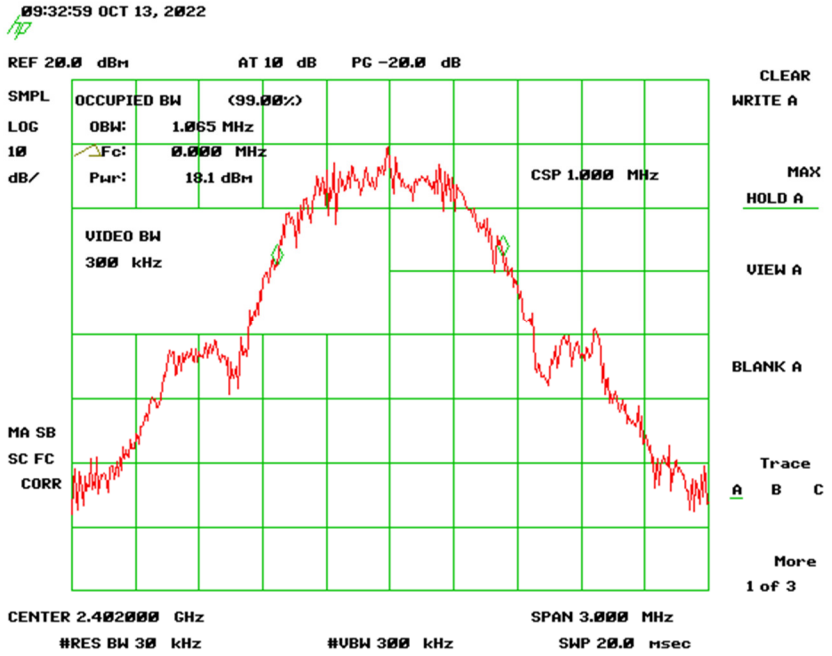


Figure 10. 99% Occupied Bandwidth Low Channel PHY1

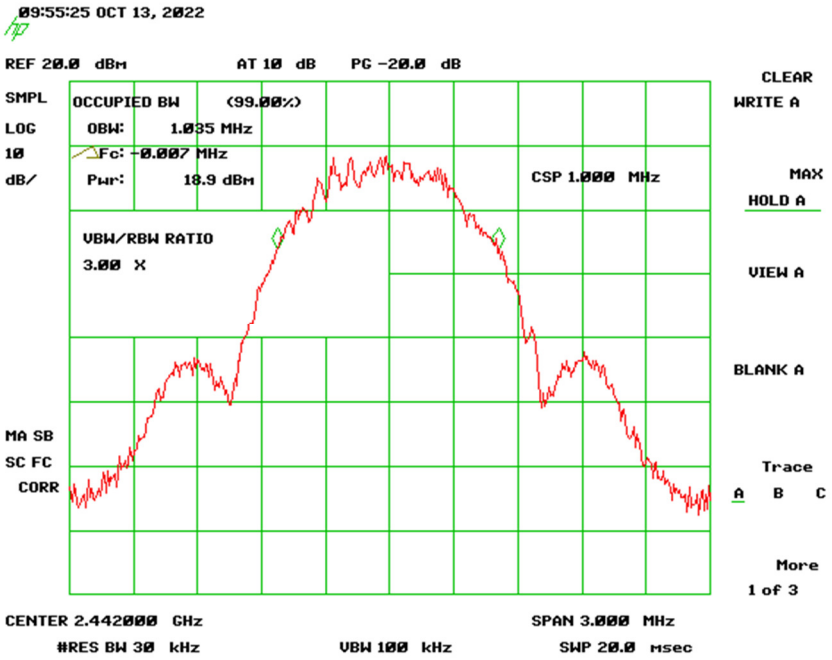


Figure 11. 99% Occupied Bandwidth Mid Channel PHY1

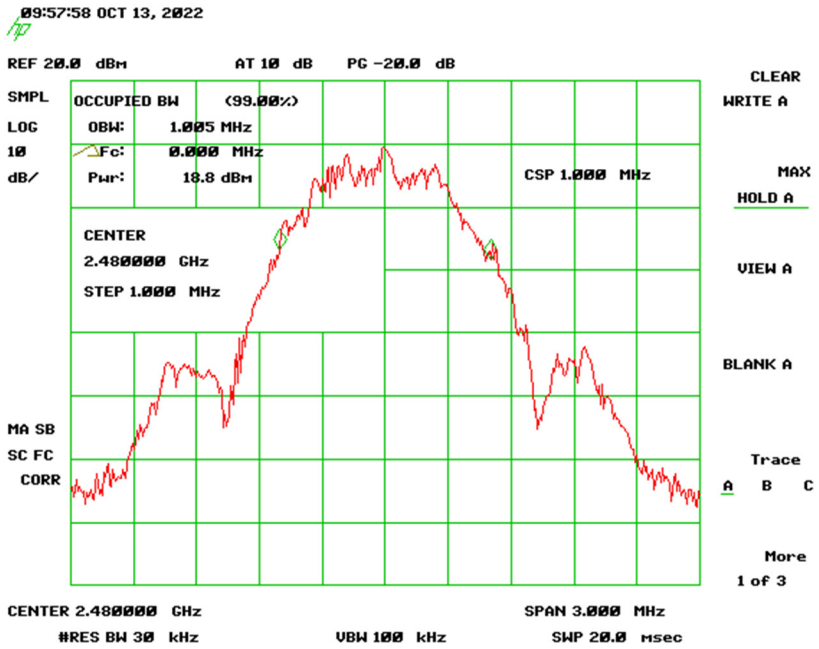


Figure 12. 99% Occupied Bandwidth High Channel PHY1

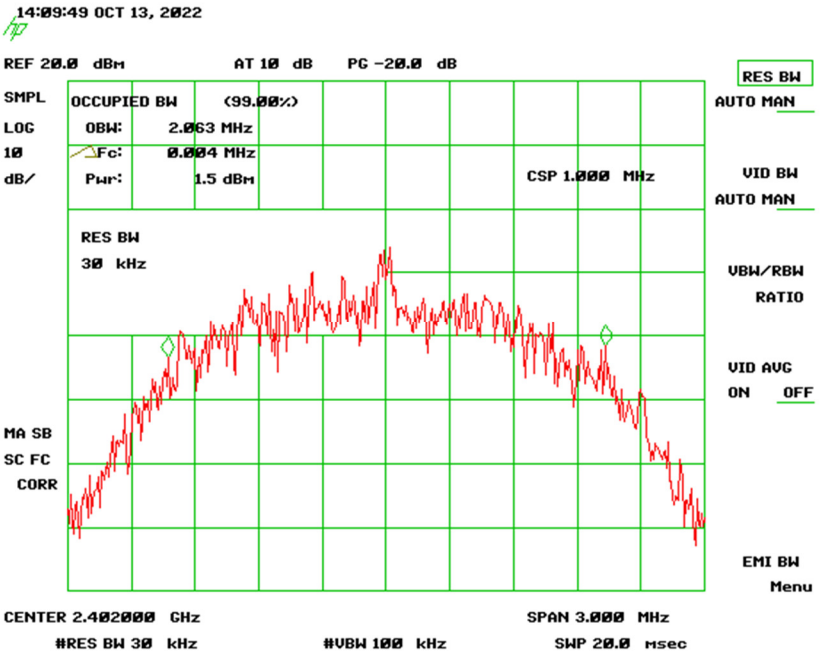


Figure 13. 99% Occupied Bandwidth Low Channel PHY2

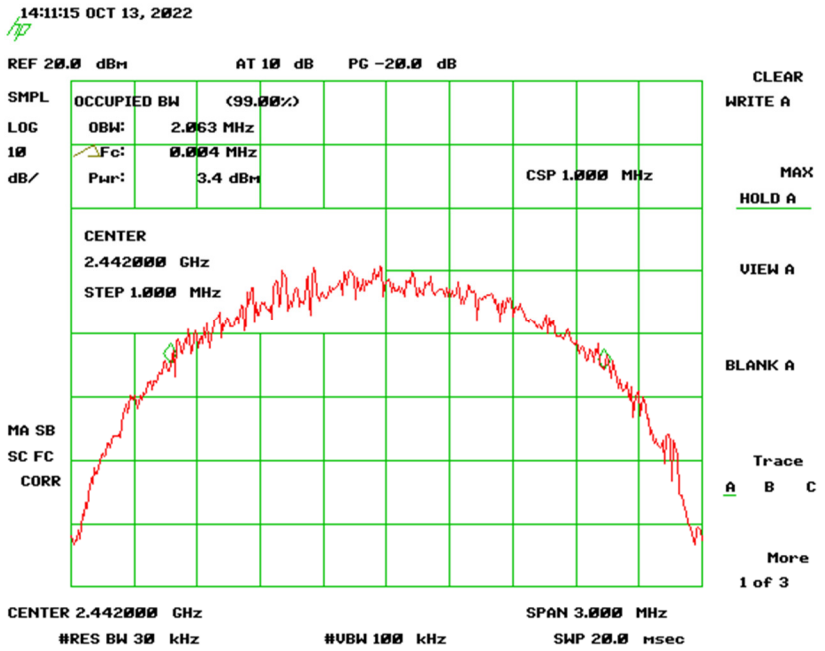


Figure 14. 99% Occupied Bandwidth Mid Channel PHY2

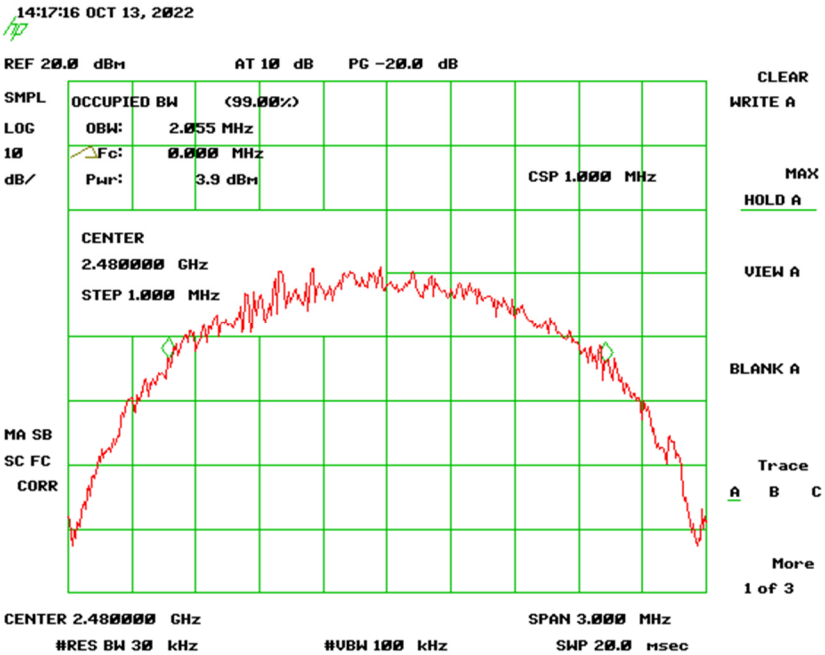


Figure 15. 99% Occupied Bandwidth High Channel PHY2

2.12 Powerline Emissions (CFR 15.207)

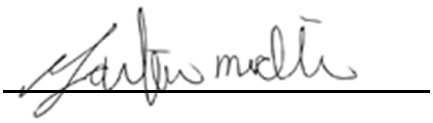
The power line conducted voltage emission measurements have been carried out in accordance with CFR 15.207, per ANSI C63.4:2014, Paragraph 7, with a spectrum analyzer connected to a LISN and the EUT placed into a continuous mode of transmission.

Table 13. Transmitter Power Line Conducted Emissions Test Data, Part 15.107

9kHz to 30 MHz with Class B Limits						
Test: Radiated Emissions				**Client:** Cognosos		
Project: 22-0414				**Model:** PCB-10032		
Frequency (MHz)	**Test Data (dBuv)**	**LISN+CL-PA (dB)**	**Results (dBuV)**	**AVG Limits (dBuV)**	**Margin (dB)**	**Detector PK, QP, or AVG**
EUT is battery operated, therefore this test is not applicable						

Sample Calculation: N/A

Test Date: October 13, 2022
Tested By

Signature:  Name: Gabriel Medina

2.13 Intentional Radiator, Radiated Emissions (CFR 15.209)

Radiated emissions disturbance Measurements were performed with an instrument having both peak and quasi-peak detectors over the frequency range of 9 KHz to 14 GHz. Measurements of the radiated emissions were made with the receiver antenna at a distance of 3 m from the boundary of the test unit.

The test antenna was varied from 1 m to 4 m in height while watching the analyzers' display for the maximum magnitude of the signal at the test frequency. The antenna polarization (horizontal or vertical) and test sample azimuth were varied during the measurements to find the maximum field strength readings to record.

Table 14. Radiated Emissions, 9 kHz - 30 MHz

9 kHz to 30 MHz, 15.209 limits							
Test: Radiated Emissions				**Client:** Cognosos Inc.			
Project: 21-0414				**Model:** PCB-10032			
Frequency (MHz)	**Test Data (dBuv)**	**AF+CA-AMP (dB/m)**	**Results (dBuV/m)**	**QP Limits (dBuV/m)**	**Antenna Distance/ Polarization**	**Margin (dB)**	**Detector PK, or AVG**
All emissions were greater than 20 dB below the limit							

Sample Calculation: N/A

Test Date: October 12, 2022
Tested By

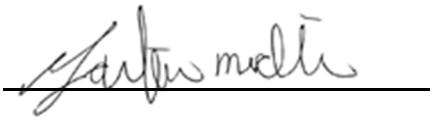
Signature:  Name: Gabriel Medina

Table 15. Radiated Emissions other than Fundamental & Harmonics Below 1GHz

>30 MHz 15.209 Limits							
Frequency (MHz)	**Test Data (dBuv)**	**AF+CA-AMP (dB/m)**	**Results (dBuV/m)**	**QP Limits (dBuV/m)**	**Antenna Distance/ Polarization**	**Margin (dB)**	**Detector PK, or AVG**
All Emissions less than 6 dB above the noise floor							

Sample Calculation:

Test Date: October 12, 2022
Tested By

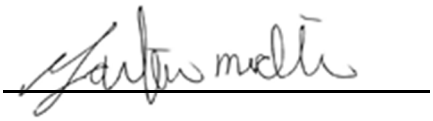
Signature:  Name: Gabriel Medina

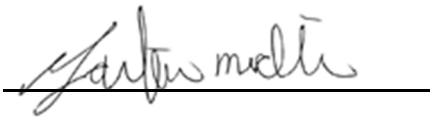
Table 16. Radiated Emissions other than Fundamental & Harmonics Above 1GHz

>1 GHz 15 2.09 Limits							
Test: Radiated Emissions				**Client:** Cognosos Inc.			
Project: 21-0414				**Model:** PCB-10032			
Frequency (MHz)	**Test Data (dBuv)**	**AF+CA-AMP (dB/m)**	**Results (dBuV/m)**	**QP Limits (dBuV/m)**	**Antenna Distance/ Polarization**	**Margin (dB)**	**Detector PK, or AVG**
All emissions were greater than 20 dB below the limit other than fundamental and harmonics							

Tested from 1 GHz to 14 GHz

Sample Calculation: N/A

Test Date: October 12, 2022
Tested By

Signature:  Name: Gabriel Medina

2.14 Measurement Uncertainty

The measurement uncertainties given were calculated using the method detailed in CISPR 16-4-2: 2011. A coverage factor of k=2 was used to give a level of confidence of approximately 95%.

2.14.1 Conducted Emissions Measurement Uncertainty

Measurement Uncertainty (within a 95% confidence level) for this test is ± 2.85 dB.

2.14.2 Radiated Emissions Measurement Uncertainty

For a measurement distance of 3 m the measurement uncertainty (with a 95% confidence level) for this test using a Biconical Antenna (30 MHz to 200 MHz) is ± 5.40 dB. This value includes all elements of measurement.

The measurement uncertainty (with a 95% confidence level) for this test using a Log Periodic Antenna (200 MHz to 1000 MHz) is ± 5.19 dB.

The measurement uncertainty (with a 95% confidence level) for this test using a Horn Antenna is ± 5.08 dB.

The data listed in this test report does have sufficient margin to negate the effects of uncertainty. Therefore, the EUT unconditionally meets this requirement.

END REPORT