Project 22760-15

Advanced TeleSensors, Inc
ATX2410

Wireless Certification Report (Class II Permissive Change)

Prepared for:

Advanced TeleSensors, Inc.
5114 Balcones Woods Dr.
Suite 307-472
Austin, TX 78759

By

Professional Testing (EMI), Inc.
1601 North A.W. Grimes Blvd., Suite B
Round Rock, Texas 78665

11 Apr 2022

Written by

Larry Finn
Chief Technical Officer

Revision History

Revision Number	Description	Date
Final01	Initial release to agency	11 Apr 2022

Errata: None

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Certificate of Compliance

FCC MRA Designation Number: US5270
NVLAP Accreditation Number: 200062-0

Applicant	Device & Test Identification	
Advanced TeleSensors, Inc. 5114 Balcones Woods Dr. Suite 307-472 Austin, TX 78759 Certificate Date: 11 Apr 2022	FCC ID: Model(s): Laboratory Project ID:	2AXL8-ATX2410V4P1 ATX2410, ATX2410-EQ, ATX2410-GW 22760-15

The EUT(s) listed above were tested utilizing the following documents and found to be in compliance with the required criteria.

Standard	Reference	Detail
FCC 47 CFR Part 15 C	15.249(a), 15.209, 15.205, 15.212(a)(1), 15.207	Radiated Power Bandwidth Spurious Emissions Mains Conducted Emissions

I, Larry Finn, for Professional Testing (EMI), Inc., being familiar with the above requirements and test procedures have reviewed the test setup, measured data, and this report. I believe them to be true and accurate.

TESTING
NVLAP LAB CODE 200062-0

Larry Finn
Chief Technical Officer

This report has been reviewed and accepted by the Applicant**.** The undersigned is responsible for ensuring that this device will continue to comply with the requirements listed above.

_____
Representative of Applicant

1.0 Introduction

1.1 Scope

This report describes the extent to which the equipment under test (EUT) conformed to the intentional radiator requirements of the United States.

Professional Testing (EMI), Inc., (PTI) follows the guidelines of National Institute of Standards and Technology (NIST) for all uncertainty calculations, estimates, and expressions thereof for electromagnetic compatibility testing.

This report is intended to support a Class II Permissive Change for the ATX2410 (Hardware revision of the ATX-2410 device). The changes made from the previously approved device are:

1) PCB antenna traces moved slightly on PCB
2) HTS, ACCL, IR Sens, and DAC components depopulated from PCB

Spurious emissions and fundamental field strength were measured. All other parameters were not degraded as a result of these changes. Original bandwidth and conducted emissions test data included for completeness.

1.2 EUT Description

Table 1.2.1: EUT Essential Information	
Manufacturer & Model	**Description**
Advanced TeleSensors, Inc ATX2410	Non-contact vital signs monitor.

This device also contains a pre-certified WiFi module (FCC ID: O7P-362), which has been considered for RF Exposure.

1.3 EUT Operation

The EUT was exercised in a manner consistent with normal operations.

1.4 Modifications to Equipment

No modifications were made to the EUT during the performance of the test program.

1.5 Test Site

Measurements were made at the PTI semi-anechoic facility designated Site 45 (FCC 776781, IC 3036B-1) in Austin, Texas. The site is registered with the FCC under Section 2.948 and Industry Canada per RSS-GEN, and is subsequently confirmed by laboratory accreditation (NVLAP). The test site is located at 11400 Burnet Road, Austin, Texas 78758, while the main office is located at 1601 North A.W. Grimes Boulevard, Suite B, Round Rock, Texas, 78665. CAB Identifier: US 0123.

1.6 Measurement Correction Methods

Table 1.6 1 Measurement Corrections	
Parameter	**From Sums Of**
Radiated Field Strength	Raw Measured Level + Antenna Factor + Cable Losses – Amplifier Gain
Conducted Antenna Port	Raw Measured Level + Attenuator Factor + Cable Losses
Conducted Mains Port	Raw Measured Level + LISN Factor + Cable/Filter/Limiter Losses
Additionally, measurement distance extrapolation factors (such as 1/d above 30 MHz) are applied and documented where used.	

1.7 Applicable Documents

Table 1.7.1: Applicable Documents	
Document	**Title**
47 CFR	Part 15 – Radio Frequency Devices Subpart C -Intentional Radiators
ANSI C63.10 2013	ANSI C63.10-2013 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
ANSI C63.4 2014	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low Voltage Electrical and Electronic Equipment

2.0 Fundamental Power, Clause: 15.249(a)

2.1 Test Procedure

Power is measured using radiated means and without modulation. Measurements made on Apr 8, 2022.

2.2 Test Criteria

Parameter

Average Detection

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

24 GHz Fundamental Power Limit Restated as dBµV/m:
108 dBµV/m at 3 meters

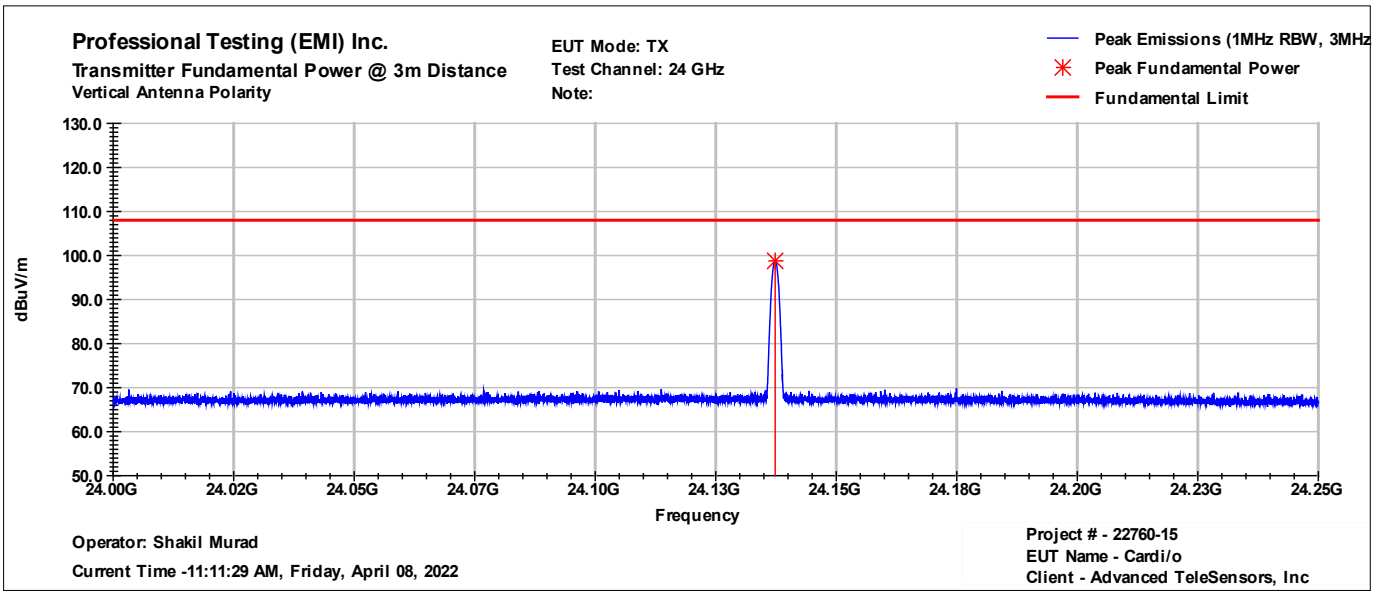
2.3 Test Results

Table 2.3.1: Field Strength of Fundamental; 1 Meter Measurement Distance Corrected to 3 meters

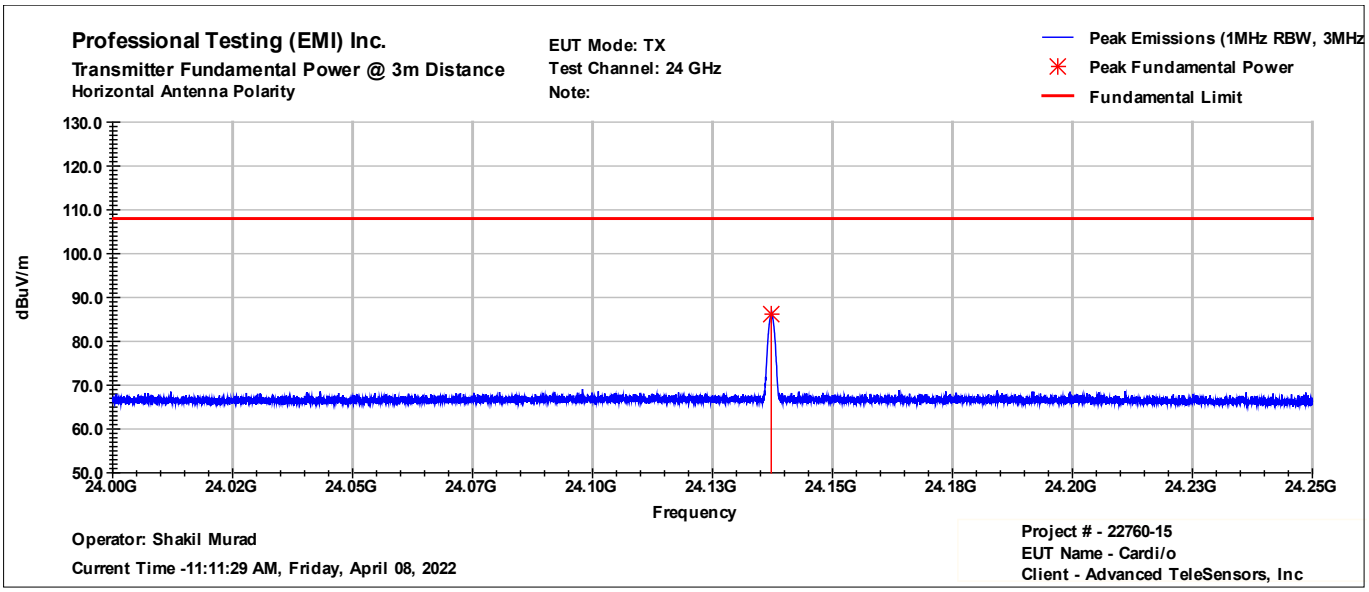
Frequency GHz	Antenna Polarity	Corrected Level* (Measured Peak Level) dBµV/m	Duty Cycle Averaging Factor dB	Calculated Average Level dBµV/m	Margin dB
24.13	V	98.77	0	98.77	-9.23
24.13	H	86.19	0	94.7	-21.81

*Resolution bandwidth 1 MHz, video bandwidth 3 MHz, using peak detection.

The EUT satisfies the criteria.



Power, Vertical Polarity



Power, Horizontal Polarity

3.0 Occupied Bandwidth, Clause: 2.1049

3.1 Test Procedure

Bandwidth is measured by relative radiated means. Bandwidth measurements taken on 9/16/2020 (for original submission).

3.2 Test Criteria

Parameter
Bandwidth, 99%

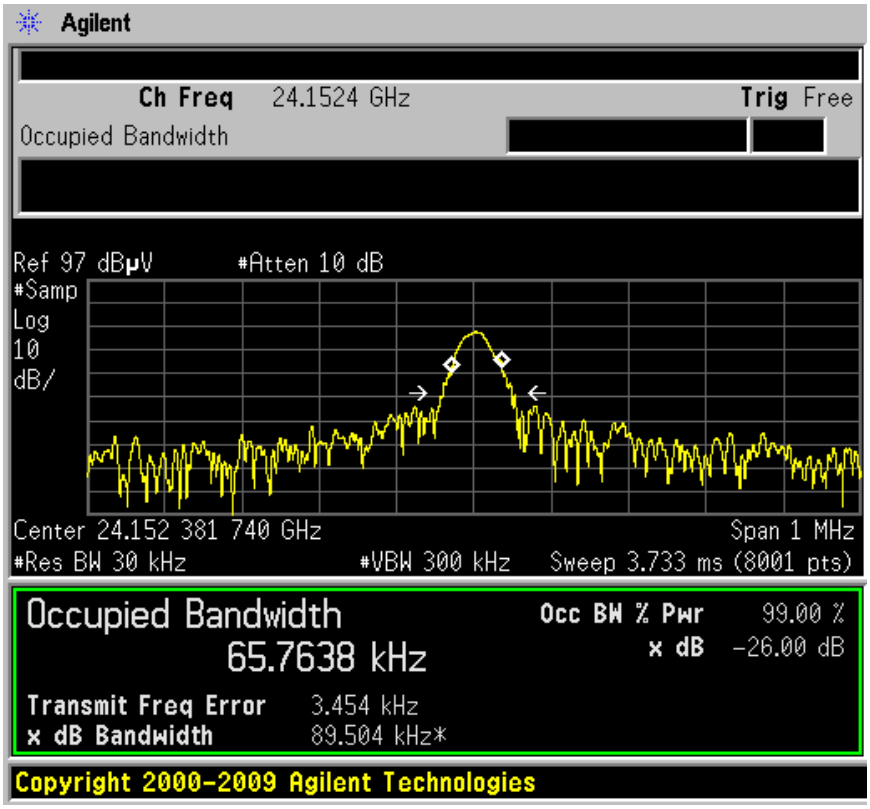
3.3 Test Results

The bandwidth measurement is used for general reporting for agency application and serves to confirm the emission is confined to the designated band.

The EUT satisfied the requirements.

Note that this is an unmodulated Doppler device. Apparent bandwidth is largely due to the resolution bandwidth of the measuring instrument.

Table 3.3.1 Bandwidth 99%, Measure and Report
Measured BW (kHz)
65.8



4.0 Radiated Spurious Emissions, Transmit Mode, Clause: 15.249(a)

4.1 Test Procedure

The EUT was placed on a non-conductive table above a ground plane. The EUT was centered on a rotating turntable. Measurements below 1 GHz were taken at a test distance of 10 meters from the measurement antenna and a height of 80cm above the ground plane. Above 1 GHz the measurement distance was 3 meters or less as needed to overcome path loss and inherent equipment noise and a height of 1.5m above the ground plane.

Spurious emissions below 1 GHz were measured with quasi-peak detection with a resolution bandwidth of 120 kHz. Above 1 GHz peak measurements were taken and average measured where appropriate and 1 MHz resolution bandwidth. Testing conducted on 9/17/2021, 9/19/2021, and 3/23/2022.

4.2 Test Criteria

Parameter

Average or Peak Detection, Limits for 15.249(a) and RSS-210 B.10:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

Non-harmonic emission limits: -50 dBc or general emission limits.

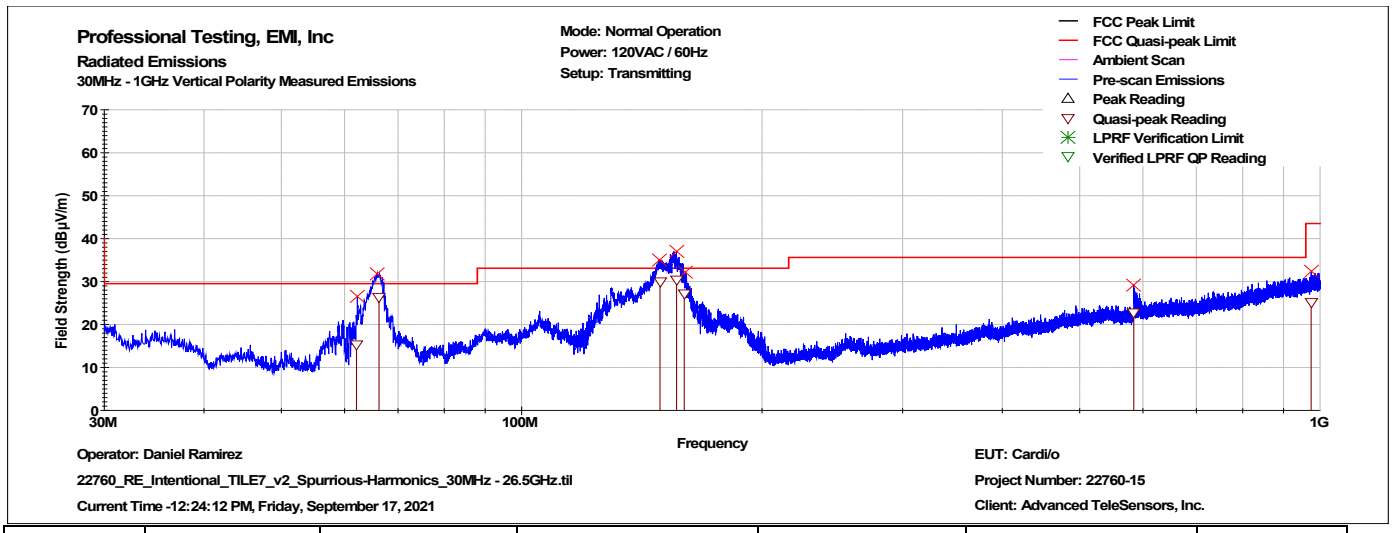
4.3 Test Results

The EUT is a Doppler device, it must transmit to be able to receive. The EUT satisfied the criteria.

Above 26.5 GHz, external harmonic mixers are used. The factors for the mixers are included in the analyzer measurement. The horn is directly attached wave-guide to the harmonic mixer to eliminate any additional loss. The final measurement requires addition of the standard gain octave horn antenna factor (AF).

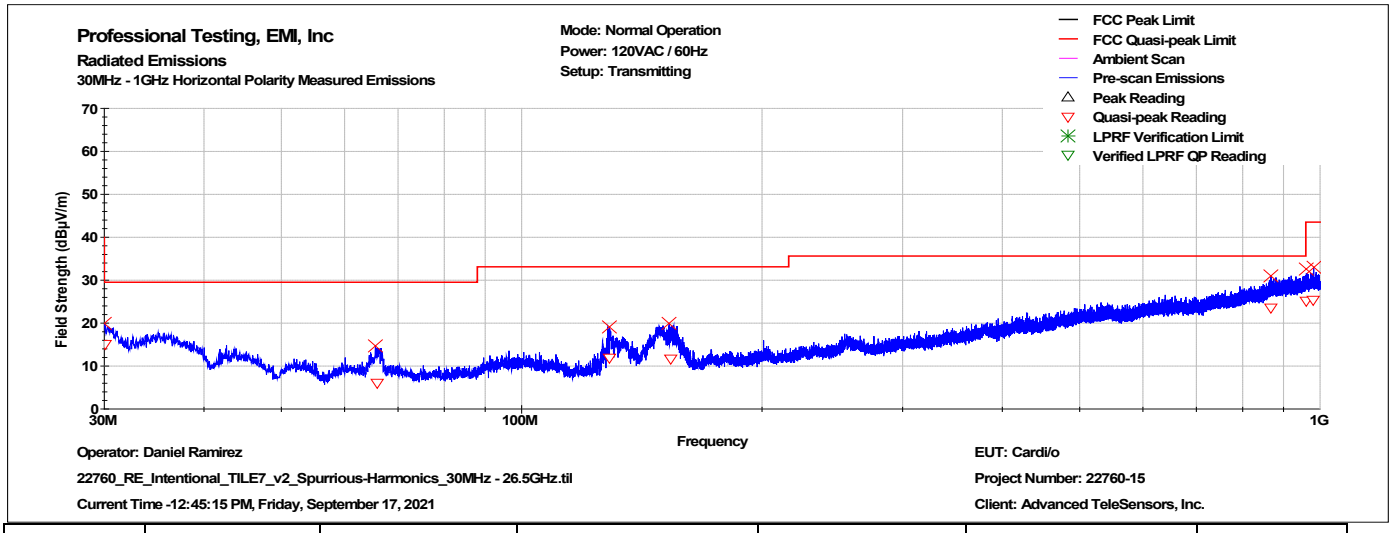
4.3.1 Up to 1 GHz

Vertical Polarization



Frequency (MHz)	EUT Direction (Degrees)	Antenna Height (cm)	Quasi-peak Reading (dBµV)	Quasi-peak Limit (dBµV)	Quasi-peak Margin (dB)	Quasi-peak Results
62.097	345.000	276.000	15.381	29.500	-14.119	PASS
66.275	319.000	157.000	26.289	29.500	-3.211	PASS
149.045	130.000	127.000	30.064	33.100	-3.036	PASS
156.327	166.000	126.000	30.358	33.100	-2.742	PASS
159.817	129.000	126.000	27.090	33.100	-6.010	PASS
584.321	3.000	126.000	22.681	35.600	-12.919	PASS
974.658	193.000	392.000	25.134	43.500	-18.366	PASS

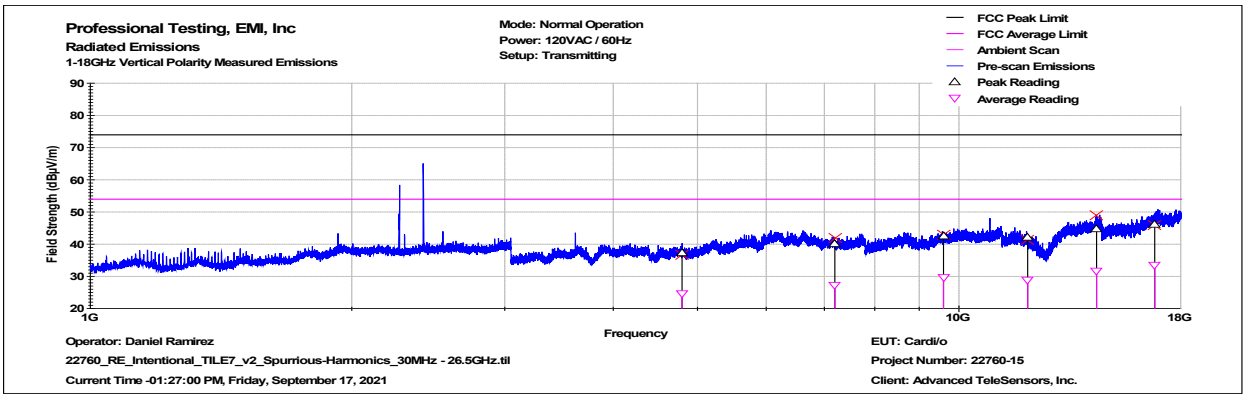
Horizontal Polarization



Frequency (MHz)	EUT Direction (Degrees)	Antenna Height (cm)	Quasi-peak Reading (dBµV)	Quasi-peak Limit (dBµV)	Quasi-peak Margin (dB)	Quasi-peak Results
30.062	332.000	279.000	15.030	29.500	-14.470	PASS
65.833	341.000	126.000	6.068	29.500	-23.432	PASS
128.761	17.000	378.000	11.910	33.100	-21.190	PASS
153.855	2.000	380.000	11.688	33.100	-21.412	PASS
868.692	336.000	291.000	23.479	35.600	-12.121	PASS
960.155	16.000	231.000	25.093	43.500	-18.407	PASS
981.450	327.000	126.000	25.396	43.500	-18.104	PASS

4.3.2 Up to 18 GHz

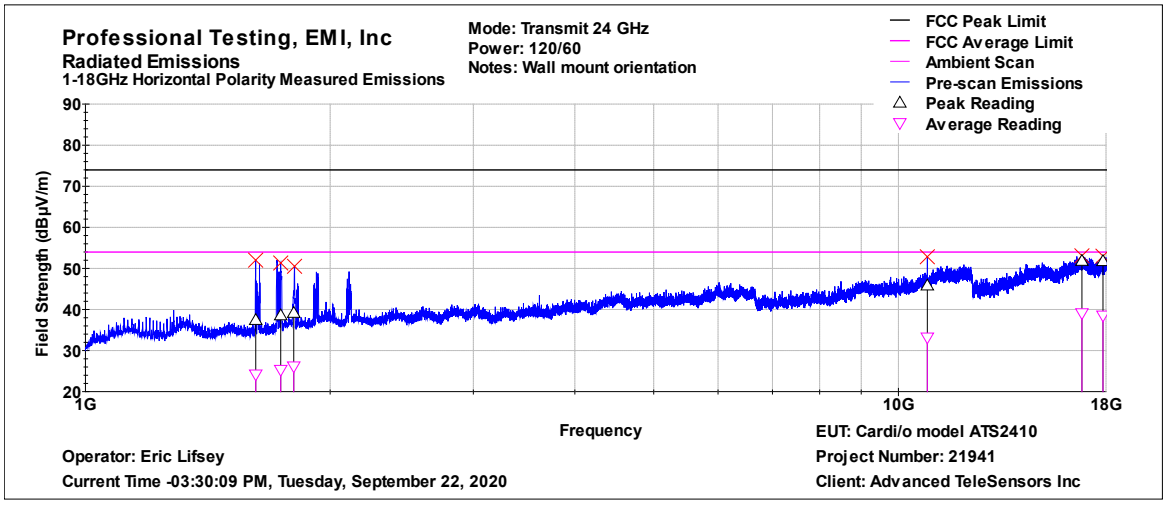
Vertical Polarization



*Peaks between 2-3GHz were fundamental signals from WLAN radio module

Frequency (MHz)	EUT Direction (Degrees)	Antenna Height (cm)	Peak Reading (dBµV)	Peak Limit (dBµV)	Peak Margin (dB)	Peak Results	Average Reading (dBµV)	Average Limit (dBµV)	Average Margin (dB)	Average Results
4800.27	2	324	37.238	73.958	-36.720	PASS	24.561	53.958	-29.397	PASS
7195.94	28	375	40.146	73.958	-33.812	PASS	27.275	53.958	-26.683	PASS
9599.47	2	195	42.461	73.958	-31.497	PASS	29.552	53.958	-24.406	PASS
11998.90	177	126	42.176	73.958	-31.782	PASS	28.790	53.958	-25.168	PASS
14403.00	186	149	44.816	73.958	-29.142	PASS	31.680	53.958	-22.278	PASS
16804.21	134	222	46.210	73.958	-27.748	PASS	33.402	53.958	-20.556	PASS

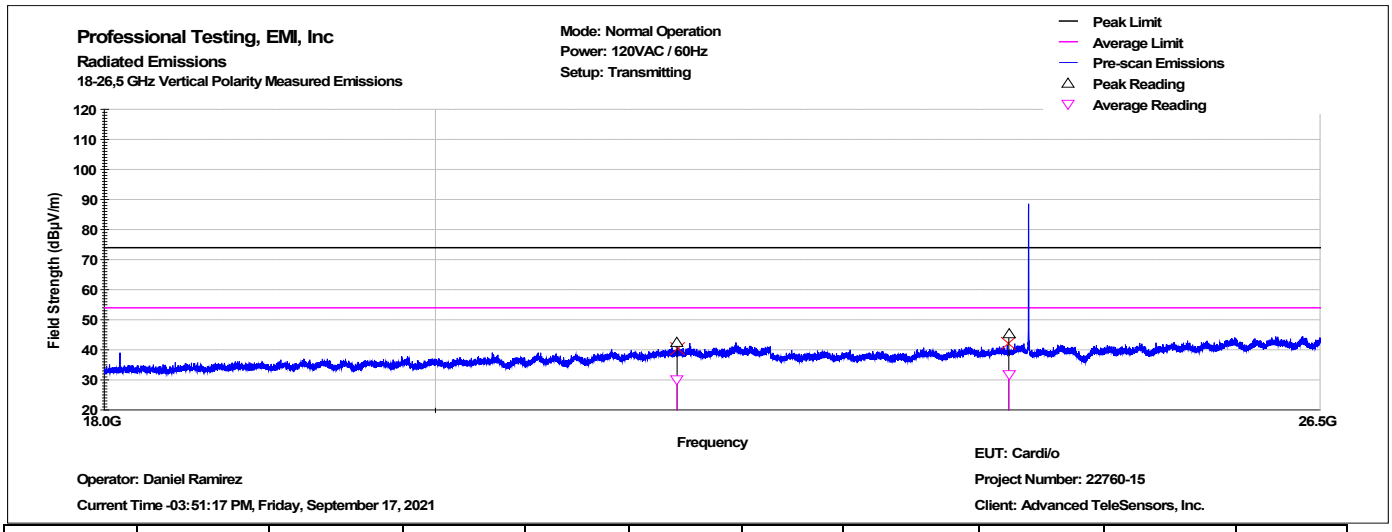
Horizontal Polarization



Frequency	Azimuth	Height	Peak	Peak Limit	Peak Margin	Peak Results	Avg	Avg Limit	Avg Margin	Avg Results
(MHz)	(deg)	(cm)	(dBuV)	(dBuV)	(dB)	(P/F)	(dBuV)	(dBuV)	(dB)	(P/F)
1619.98	151	326	37.453	73.958	-36.505	PASS	24.147	53.958	-29.811	PASS
1738.84	2	321	38.575	73.958	-35.383	PASS	25.262	53.958	-28.696	PASS
1804.28	66	329	39.173	73.958	-34.785	PASS	26.108	53.958	-27.850	PASS
10852.35	2	378	45.856	73.958	-28.102	PASS	33.151	53.958	-20.807	PASS
16816.12	22	102	51.841	73.958	-22.117	PASS	39.061	53.958	-14.897	PASS
17849.95	144	366	51.774	73.958	-22.184	PASS	38.484	53.958	-15.474	PASS

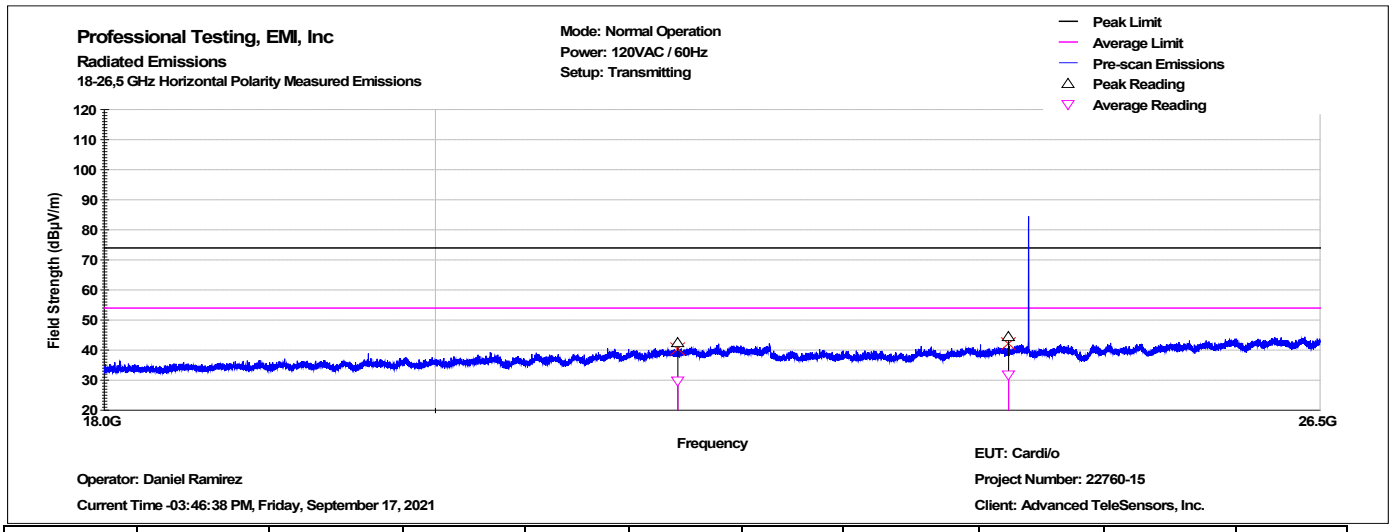
4.3.3 Up to 26.5 GHz

Vertical Polarization



Frequency (MHz)	EUT Direction (Degrees)	Antenna Height (cm)	Peak Reading (dBµV)	Peak Limit (dBµV)	Peak Margin (dB)	Peak Results	Average Reading (dBµV)	Average Limit (dBµV)	Average Margin (dB)	Average Results
21598.67	2	100.000	42.416	73.958	-31.542	PASS	29.999	53.958	-23.959	PASS
24002.13	255	100.000	45.193	73.958	-28.765	PASS	31.746	53.958	-22.212	PASS

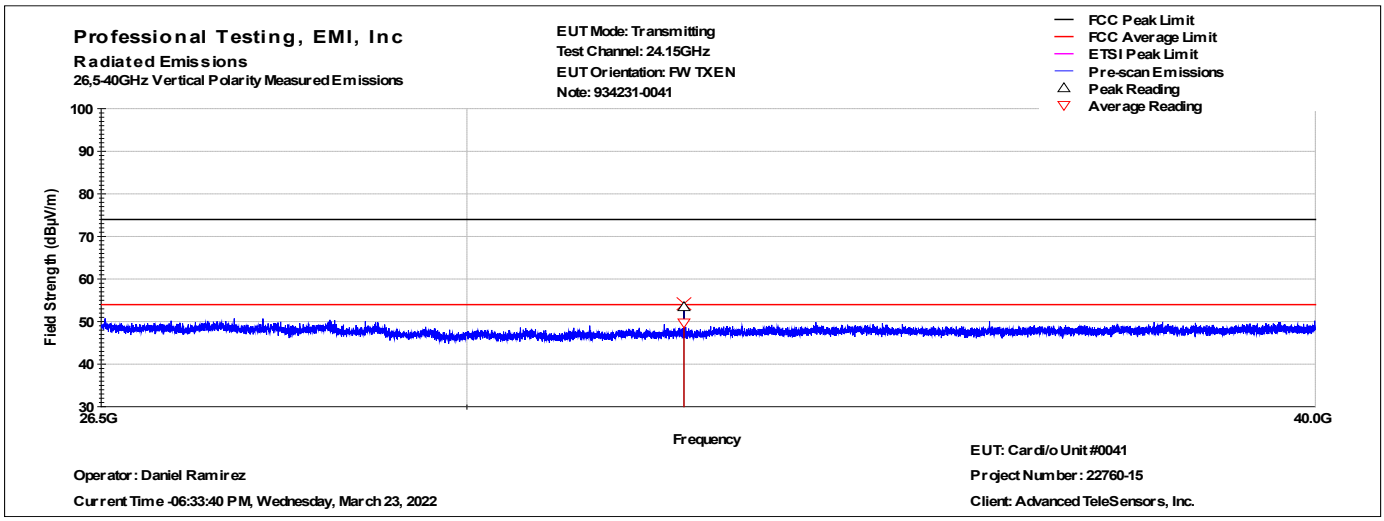
Horizontal Polarization



Frequency (MHz)	EUT Direction (Degrees)	Antenna Height (cm)	Peak Reading (dBµV)	Peak Limit (dBµV)	Peak Margin (dB)	Peak Results	Average Reading (dBµV)	Average Limit (dBµV)	Average Margin (dB)	Average Results
21603.24	267	150.000	42.523	73.958	-31.435	PASS	29.677	53.958	-24.281	PASS
24000.54	146	150.000	44.403	73.958	-29.555	PASS	31.654	53.958	-22.304	PASS

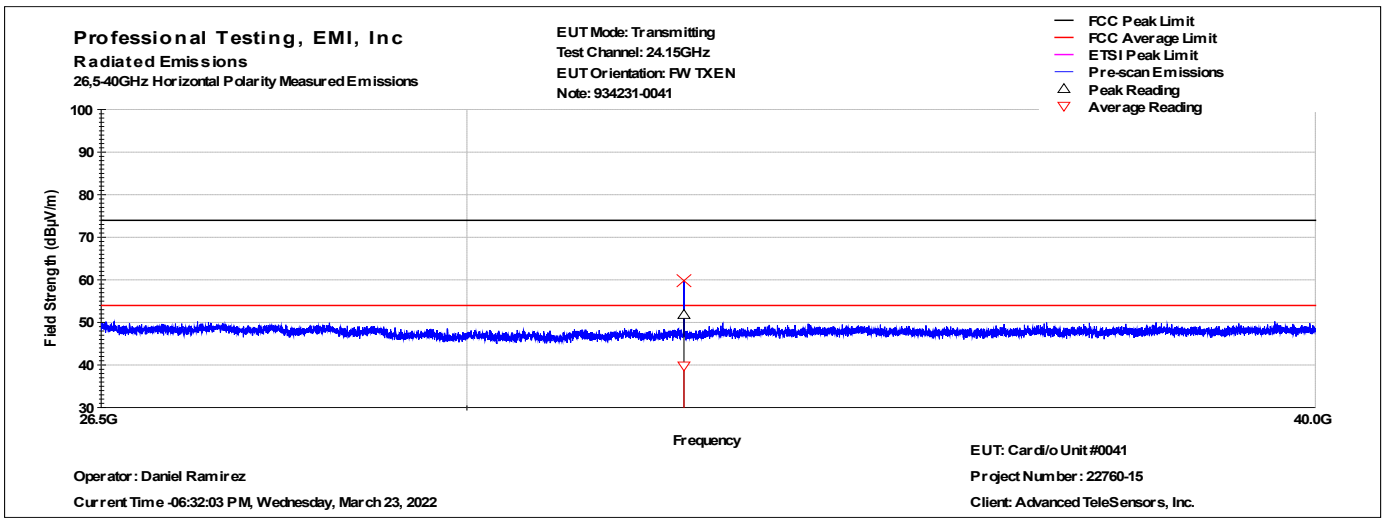
4.3.4 Up to 40 GHz

Vertical Polarization



Frequency (MHz)	EUT Direction (Degrees)	Antenna Height (cm)	Peak Reading (dBµV)	Peak Limit (dBµV)	Peak Margin (dB)	Peak Results	Average Reading (dBµV)	Average Limit (dBµV)	Average Margin (dB)	Average Results
32291	2	150.000	53.424	73.958	20.534	PASS	49.728	53.958	-4.23	PASS

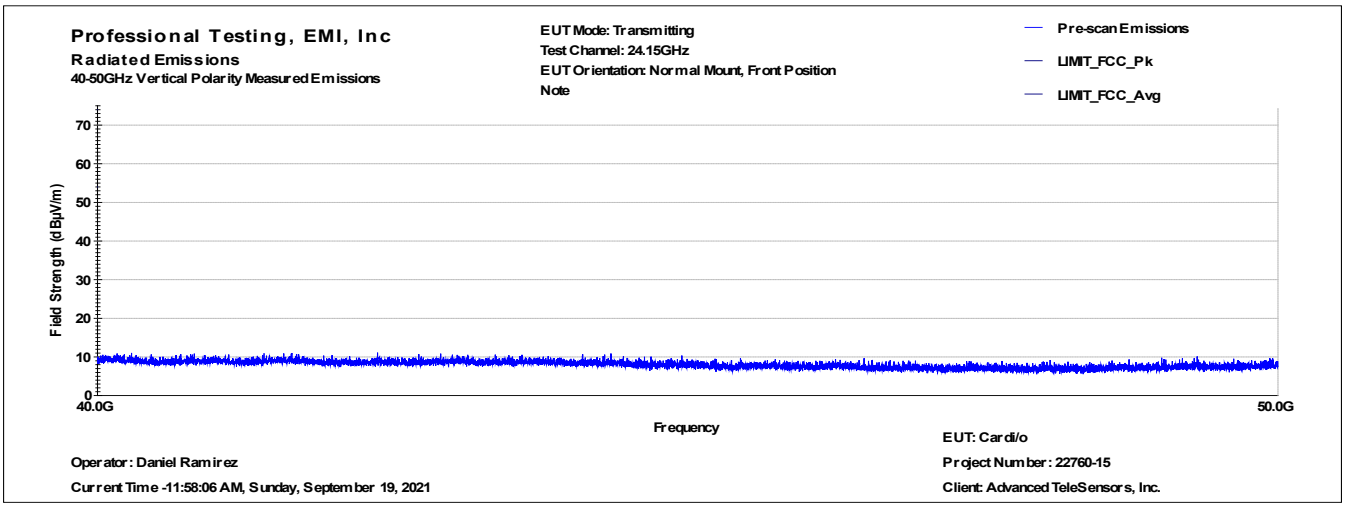
Horizontal Polarization



Frequency (MHz)	EUT Direction (Degrees)	Antenna Height (cm)	Peak Reading (dBµV)	Peak Limit (dBµV)	Peak Margin (dB)	Peak Results	Average Reading (dBµV)	Average Limit (dBµV)	Average Margin (dB)	Average Results
32291.35	336	150.000	51.801	73.958	-22.157	PASS	39.824	53.958	-14.134	PASS

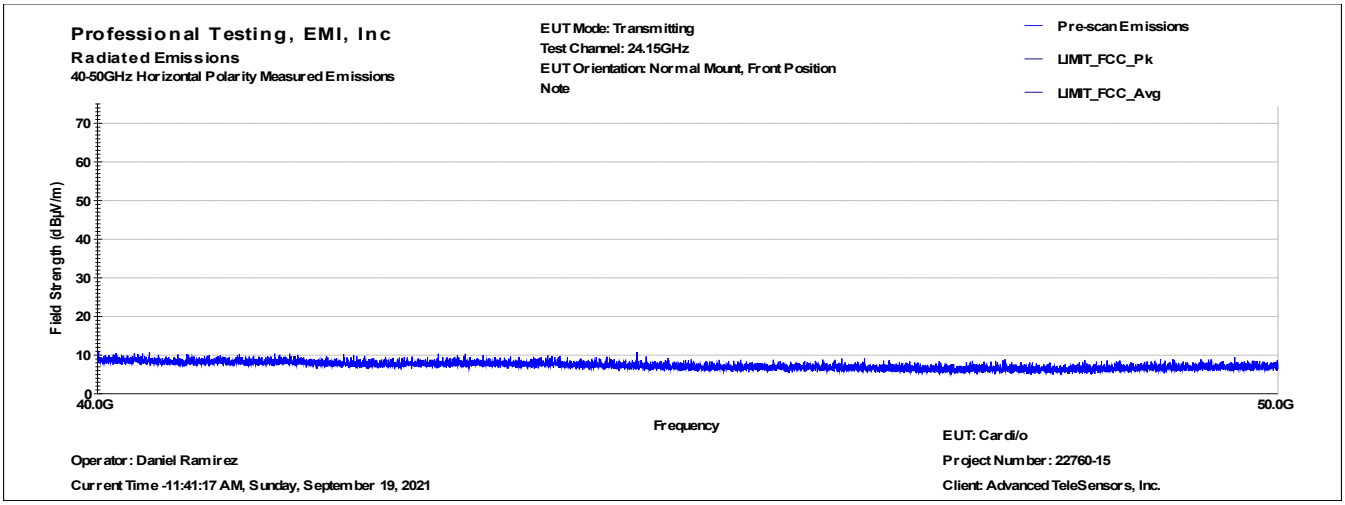
4.3.5 Up to 50 GHz

Vertical Polarization



No measurable signals observed between 40-50GHz.

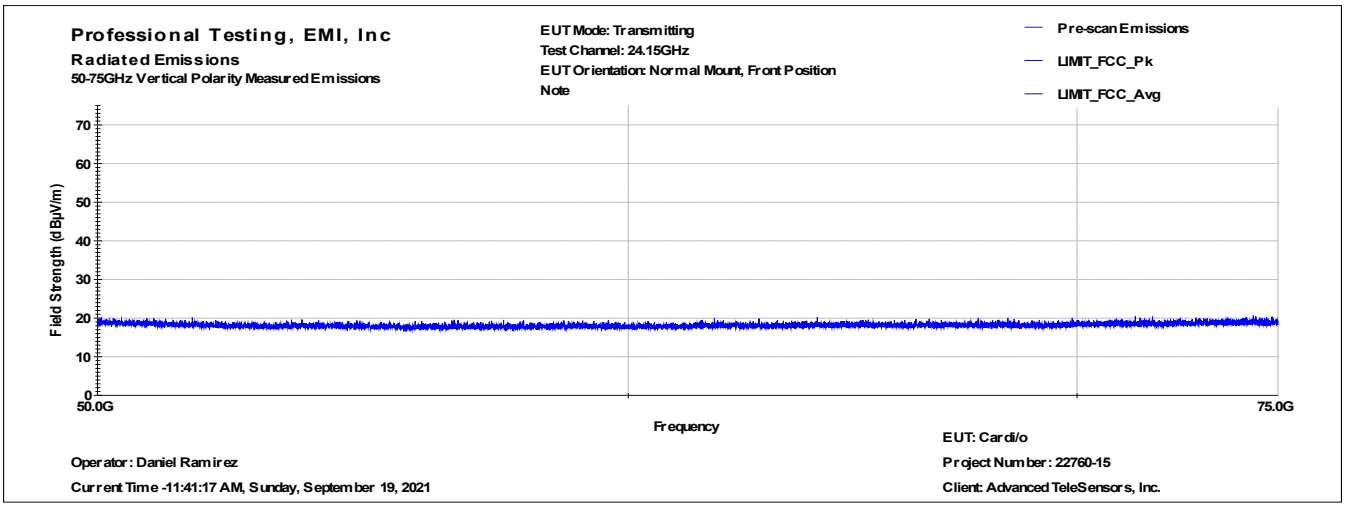
Horizontal Polarization



No measurable signals observed between 40-50GHz.

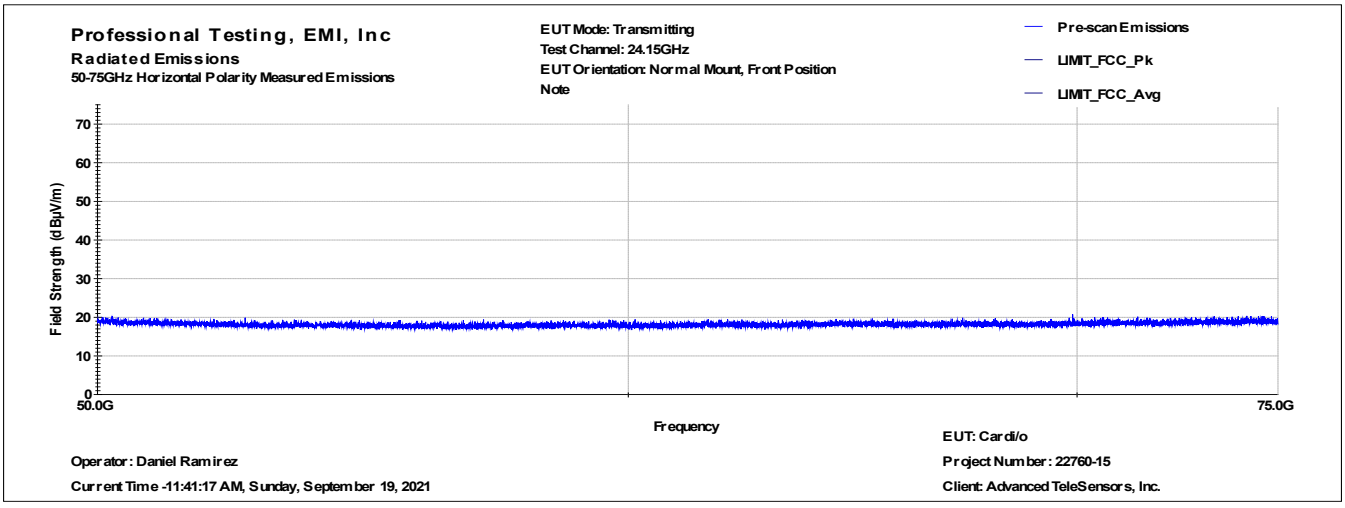
4.3.6 Up to 75 GHz

Vertical Polarization



No measurable signals observed between 50-75GHz.

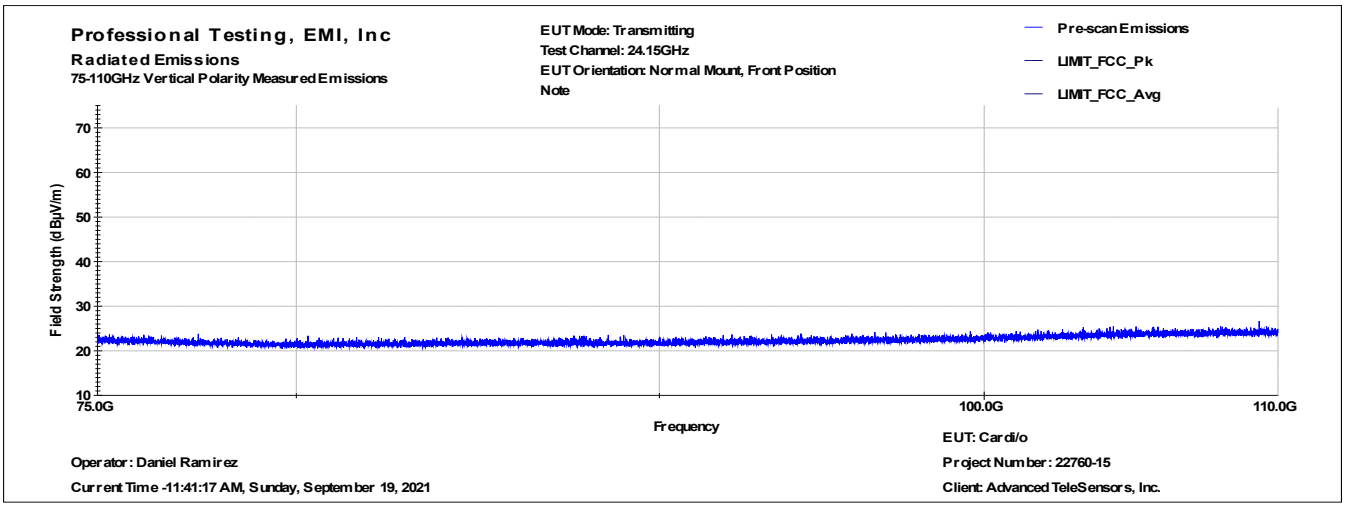
Horizontal Polarization



No measurable signals observed between 50-75GHz.

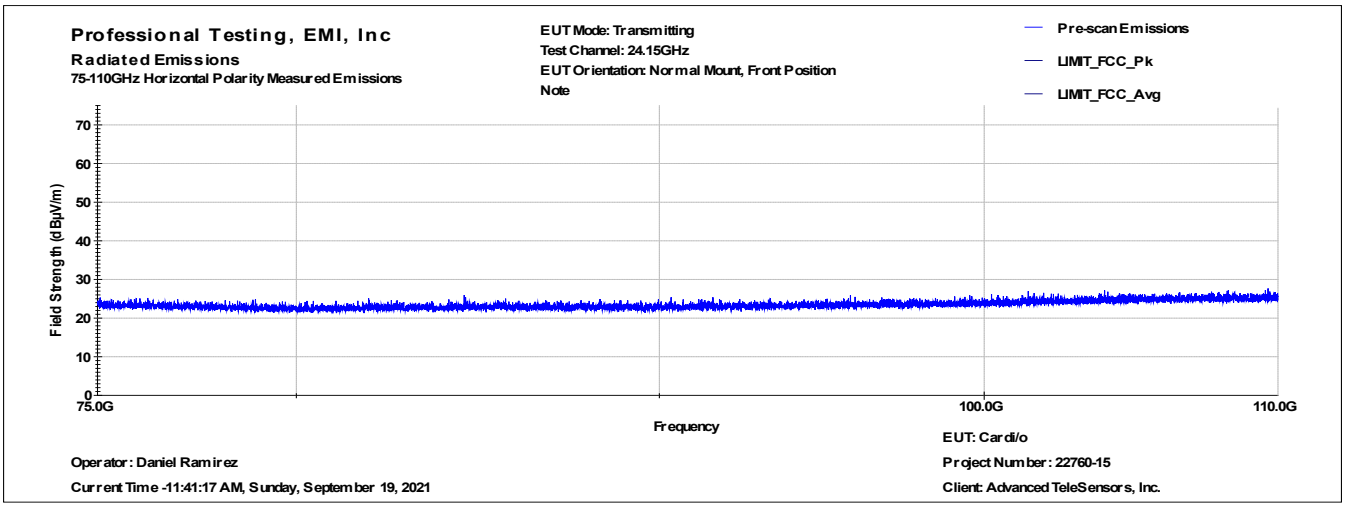
4.3.7 Up to 110 GHz

Vertical Polarization



No measurable signals observed between 75-110GHz.

Horizontal Polarization



No measurable signals observed between 75-110GHz.

5.0 Antenna Construction Requirements, Clause: 15.203

5.1 Procedure

A direct examination of the antenna construction is performed and compared to rule criteria that prevent wireless device antennas from being modified by end users.

5.2 Criteria

Parameter
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. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §§ 15.211, 15.213, 15.217, 15.219, 15.221, or § 15.236. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with § 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

5.3 Results

Table 5.3.1: Construction Results		
Criteria	**Evaluation**	**Pass/Fail**
Antenna must not be easily substituted by user.	The antenna is a permanent integral antenna (a printed circuit patch array).	Pass
Antenna must use a unique type of connector to attach to the EUT.	There is no antenna connector.	Pass

The EUT and antenna satisfied the requirements.

6.0 Mains Conducted Emissions, Clause: 15.207

6.1 Procedure

A direct examination of the antenna construction is performed and compared to rule criteria that prevent wireless device antennas from being modified by end users. Conducted emission measurements made on 9/25/2020 for the original submission.

6.2 Criteria

Parameter

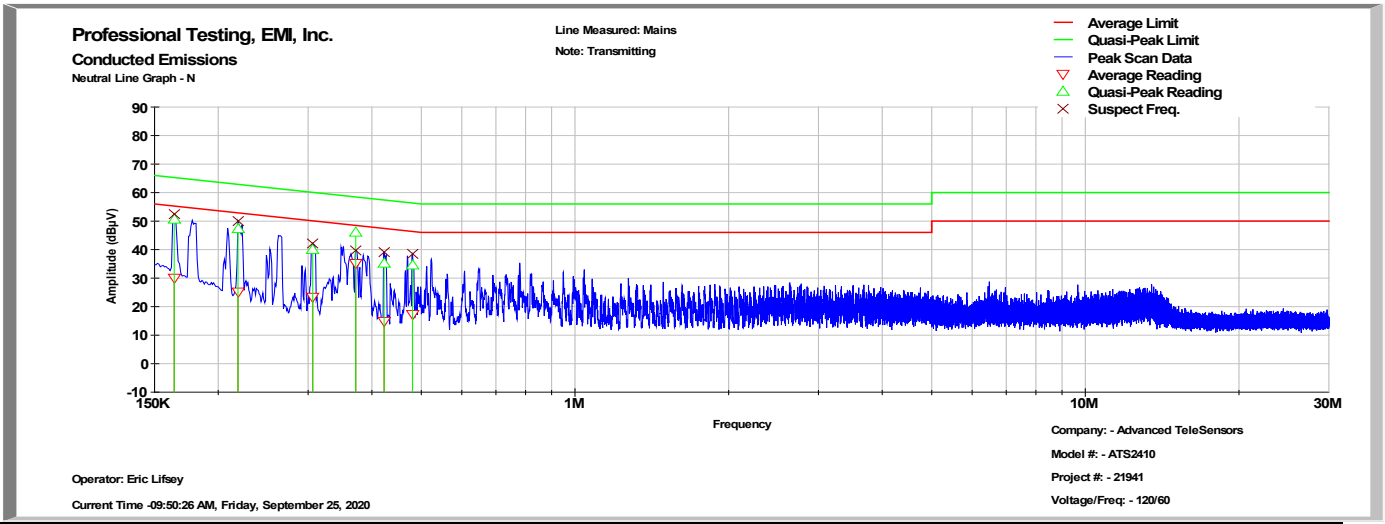
Frequency of emission (MHz)	Conducted limit (dBµV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

6.3 Results

The EUT satisfied the requirements.

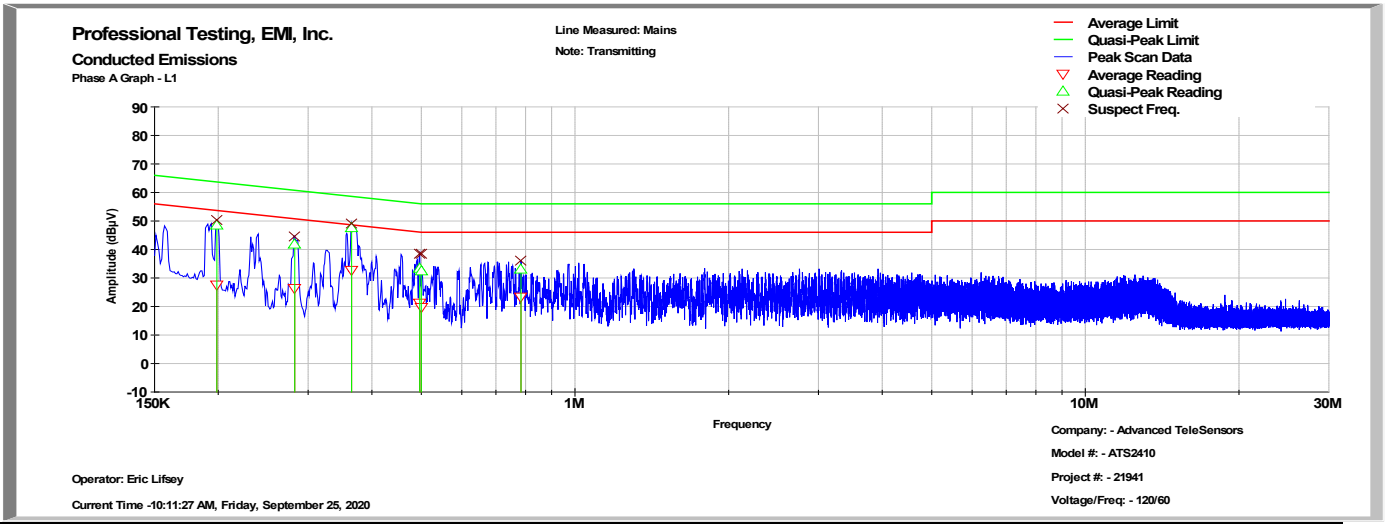
EUT Name	Cardi/o		Model or Serial #	ATX2410 S/N 8	
EUT Line Voltage	120	VAC	Frequency	60	Hz
Emissions Limit Level	B		EUT Test Mode or Configuration	Transmitting	
Frequency Range			Line Tested	Test Results	
150kHz to 30MHz			Neutral Line	Pass	
			Phase A (Line 1)	Pass	
Notes:					

Neutral Line Emissions Data



Frequency (MHz)	Quasi-peak Reading (dBµV)	Quasi-peak Limit (dBµV)	Quasi-peak Margin (dB)	Quasi-peak Results	Average Reading (dBµV)	Average Limit (dBµV)	Average Margin (dB)	Average Results	Peak Reading (dBµV)
(MHz)	(dBµV)	(dBµV)	(dB)	(Pass/Fail)	(dBµV)	(dBµV)	(dB)	(Pass/Fail)	(dBµV)
0.164	50.6	65.3	-14.6	PASS	29.9	55.3	-25.4	PASS	58.7
0.219	47.2	62.9	-15.6	PASS	25.3	52.9	-27.6	PASS	53.1
0.306	39.9	60.1	-20.2	PASS	23.3	50.1	-26.8	PASS	48.3
0.372	46.2	58.5	-12.2	PASS	35.2	48.5	-13.3	PASS	49.9
0.423	35.2	57.4	-22.2	PASS	14.8	47.4	-32.6	PASS	42.3
0.480	34.6	56.3	-21.7	PASS	17.4	46.3	-29.0	PASS	41.0

Line 1 Emissions Data



Frequency (MHz)	Quasi-peak Reading (dBµV)	Quasi-peak Limit (dBµV)	Quasi-peak Margin (dB)	Quasi-peak Results	Average Reading (dBµV)	Average Limit (dBµV)	Average Margin (dB)	Average Results	Peak Reading (dBµV)
(MHz)	(dBµV)	(dBµV)	(dB)	(Pass/Fail)	(dBµV)	(dBµV)	(dB)	(Pass/Fail)	(dBµV)
0.199	48.5	63.7	-15.1	PASS	27.7	53.7	-26.0	PASS	54.9
0.282	41.7	60.7	-19.0	PASS	26.3	50.7	-24.5	PASS	46.1
0.365	47.5	58.6	-11.1	PASS	32.6	48.6	-16.0	PASS	50.6
0.496	33.2	56.1	-22.9	PASS	21.2	46.1	-24.8	PASS	37.9
0.500	32.5	56.0	-23.5	PASS	19.8	46.0	-26.2	PASS	38.1
0.784	32.9	56.0	-23.1	PASS	23.3	46.0	-22.7	PASS	36.9

7.0 Equipment

Table 7.0.1 – Radiated Emissions 30 MHz to 26.5 GHz; Fundamental field strength

Radiated Emissions Test Equipment List					
Tile! Software Version:			**Version: 7.1.2.17 (Jan 08, 2016 - 02:12:48 PM) or 4.1.A.0, April 14, 2009, 11:01:00PM**		
Test Profile:			**2020_RE_Unintentional_TILE7_v2.7.til**		
Asset #	**Manufacturer**	**Model**	**Equipment Nomenclature**	**Serial Number**	**Calibration Due Date**
1890	HP	8447F-H64	Preamp/Amp, 9kHz-1300MHz, 28/25dB	3313A05298	N/A
2295	Keysight	E4440A-AYZ	PSA Spectrum Analyzer	MY46186204	1/5/2023
1926	ETS-Lindgren	3142D	Antenna, Biconilog, 26 MHz - 6 GHz	135454	4/20/2022
C027	none	RG214	Cable Coax, N-N, 25m, 25MHz - 1GHz	None	9/14/2022
1327	EMCO	1050	Controller, Antenna Mast	none	N/A
942	EMCO	11968D	Turntable, 4ft.	9510-1835	N/A
1969	HP	11713A	Attenuator/Switch Driver	3748A04113	N/A
C030	none	none	Cable Coax, N-N, 30m, 1 - 18GHz	None	9/15/2022
1509B	Braden	TDK 10M	TDK 10M Chamber,sVSWR > 1 GHz	DAC-012915-005	4/9/2023
2004	Miteq	AFS44-00101800-2S-10P-44	Amplifier, 40dB, 100MHz-18GHz	None	1/14/2024
C030	none	none	Cable Coax, N-N, 30m, 1 - 18GHz	None	9/15/2022
1325	EMCO	1050	Controller, Antenna Mast	9003-1461	N/A
1780	ETS-Lindgren	3117	Antenna, Double Ridged Guide Horn, 1 - 18 GHz	110313	4/16/2023
1977	Agilent	87421A	Power Supply	MY44350145	N/A
1973	Agilent	83017A	Amplifier, Microwave 0.5-26.5 GHz	MY39500497	11/10/2022
1542	A.H. Systems	SAS-572	Antenna, Horn 18-26.5GHz, 20dB gain	225	N/A
1735	Pasternack	PE9850-20	Antenna, horn, WR28	N/A	N/A
2063	HP	11970A	Mixer, Harmonic, 26.5 - 40 GHz	3003A08717	N/A
2062	HP	11970Q	Mixer, Harmonic, 33 - 50 GHz	3003A03234	N/A
2064	HP	11970V	Mixer, Harmonic, 50 - 75 GHz	MY30033017	N/A
2061	HP	11970W	Mixer, Harmonic, 75 - 110 GHz	2521A00784	N/A

Table 7.0.2 – Radiated Emissions 26.5 GHz to 100 GHz				
Asset #	**Manufacturer**	**Model #**	**Description**	**Calibration Due**
2295	Agilent	E4440A	Spectrum Analyzer	5 Jan 2023
None	Agilent	5061-5458	Agilent harmonic mixer cable 1: IF/LO SN none	NCR
None	Agilent	5061-5458	Agilent harmonic mixer cable 2: IF/LO SN none	NCR
2063	Agilent	11970A	Mixer, Harmonic, 26.5 - 40 GHz SN 3003A08717	NCR
2062	Agilent	11970Q	Mixer, Harmonic, 33 - 50 GHz SN 3003A03234	NCR
2064	Agilent	11970V	Mixer, Harmonic, 50 - 75 GHz SN MY30033017	NCR
2061	Agilent	11970W	Mixer, Harmonic, 75 - 110 GHz SN 2521A00784	NCR
0730	Millitech	SGH-19	Standard Gain Horn (no mixer) SN B020598	NCR
0730	Millitech	SGH-12	Standard Gain Horn (no mixer) SN 035-8344	NCR
0730	Millitech	SGH-10	Standard Gain Horn (no mixer) SN 085-8344	NCR
0730	Millitech	SGH-08	Standard Gain Horn (no mixer) SN 012-8344	NCR

Table 7.0.3 – Mains Conducted Emissions					
Conducted Emissions Test Equipment List					
Tile! Software Version:	**Version: 7.1.2.17 (Jan 08, 2016 - 02:12:48 PM) or 4.1.A.0, April 14, 2009, 11:01:00PM**				
Test Profile:	**2020_CE_TILE7_v4**				
Asset #	**Manufacturer**	**Model**	**Equipment Nomenclature**	**Serial Number**	**Calibration Due Date**
1145	HP	8568B	Spectrum Analyzer 100Hz-1.5GHz	2517A01821	7/7/2021
2113	HP	85662A	Spec Anal Dsply for A/N 1842	2403A07470	N/A
0990	HP	85685A	RF Preselector	3010A01119	7/8/2021
1279	HP	85650A	Quasi Peak Adapter	2521A00935	7/2/2021
C192	HP	none	Cable, RF, BNC-BNC, 0.2032m, Grey	None	1/20/2022
C303	Coleman Cable	RG-58A/U	Cable, BNC-BNC, 0.914m Black	None	2/24/2022
C107	Pomona	RG-223	Cable, BNC-BNC, 2.64m, RG-223 (black)	None	8/3/2022
1185	EMCO	3825/2	LISN, 10kHz-100MHz	1235	8/10/2021
1088	PTI	PTI-ALF4	Attenuator Limiter Filter	none	2/20/2021
1173	PTI	100k HPF	Filter, High Pass, 100kHz	none	2/11/2022

8.0 Measurement Bandwidths

Radiated Emissions Spectrum Analyzer Bandwidth and Measurement Time - Peak Scan				
Frequency Band Start (MHz)	**Frequency Band Stop (MHz)**	**6 dB Bandwidth (kHz)**	**Number of Ranges Used**	**Measurement Time per Range**
0.009	0.15	0.3	2	Multiple Sweeps
0.15	30	9	6	Multiple Sweeps
30	1000	120	2	Multiple 800 mS Sweeps
1000	6000	1000	2	Multiple Sweeps
6000	18000	1000	2	Multiple Sweeps
18000	100000	1000	2	Multiple Sweeps

*Notes:
1. The settings above are specifically calculated for the E4440A series of spectrum analyzers, which have 8,000 data points per range.
2. The measurement receiver resolution bandwidth setting was 300 Hz for quasi-peak measurements from 9-150 kHz.
3. The measurement receiver resolution bandwidth setting was 9 kHz for quasi-peak measurements from 0.15-30 MHz.
4. The measurement receiver resolution bandwidth setting was 120 kHz for quasi-peak measurements from 30-1000 MHz.
5. The measurement receiver resolution bandwidth setting was 1 MHz for average measurements from 1-18 GHz.

Appendix: Policy, Rationale, and Evaluation of EMC Measurement Uncertainty

All uncertainty calculations, estimates and expressions thereof shall be in accordance with NIST policy. Since PTI operates in accordance with NIST (NVLAP) Handbook 150-11: 2007, all instrumentation having an effect on the accuracy or validity of tests shall be periodically calibrated or verified traceable to national standards by a competent calibration laboratory. The certificates of calibration or verification on this instrumentation shall include estimates of uncertainty as required by NIST Handbook 150-11.

1. Rationale and Summary of Expanded Uncertainty.

Each piece of instrumentation at PTI that is used in making measurements for determining conformance to a standard (or limit), shall be assessed to evaluate its contribution to the overall uncertainty of the measurement in which it is used. The assessment of each item will be based on either a type A evaluation or a type B evaluation. Most of the evaluations will be type B, since they will be based on the manufacturer's statements or specifications of the calibration tolerances, or uncertainty will be stated along with a brief rationale for the type of evaluation and the resulting stated uncertainties.

The individual uncertainties included in the combined standard uncertainty for a specific test result will depend on the configuration in which the item of instrumentation is used. The combination will always be based on the law of propagation of uncertainty. Any systematic effects will be accommodated by including their uncertainties, in the calculation of the combined standard uncertainty; except that if the direction and amount of the systematic effect cannot be determined and separated from its uncertainty, the whole effect will be treated as uncertainty and combined along with the other elements of the test setup.

Type A evaluations of standard uncertainty will usually be based on calculating the standard deviation of the mean of a series of independent observations, but may be based on a least-squares curve fit or the analysis of variance for unusual situations. Type B evaluations of standard uncertainty will usually be based on manufacturer's specifications, data provided in calibration reports, and experience. The type of probability distribution used (normal, rectangular, a priori, or u-shaped) will be stated for each Type B evaluation.

In the evaluation of the uncertainty of each type of measurement, the uncertainty caused by the operator will be estimated. One notable operator contribution to measurement uncertainty is the manipulation of cables to maximize the measured values of radiated emissions. The operator contribution to measurement uncertainty is evaluated by having several operators independently repeat the same test. This results in a Type A evaluation of operator-contributed measurement uncertainty.

A summary of the expanded uncertainties of PTI measurements is shown as Table 1. These are the worst-case uncertainties considering all operative influence factors.

Table 1: Summary of Measurement Uncertainties for Site 45

Type of Measurement	Frequency Range	Meas. Dist.	Expanded Uncertainty U, dB (k=2)
Mains Conducted Emissions	150 kHz to 30 MHz	N/A	2.9
Telecom Conducted Emissions	150 kHz to 30 MHz	N/A	2.8
Radiated Emissions	30 to 1,000 MHz	10 m	4.8
	1 to 18 GHz	3 m	5.7

End of Report