

March 10, 2023

Roku, Inc.
1155 Coleman Ave
San Jose
CA 95110 USA

Dear Thien,

Enclosed is the EMC Wireless test report for compliance testing of the Roku, Inc., WiFi Remote Control as tested to the requirements of Title 47 of the CFR, Part 15 Subpart E/ RSS-247 Issue 2 (2017-02) for Intentional Radiators.

Thank you for using the services of Eurofins Electrical and Electronic Testing NA, Inc. If you have any questions regarding these results or if Eurofins Electrical and Electronic Testing NA, Inc. can be of further service to you, please feel free to contact me.

Gary Chou

Documentation Department
Eurofins Electrical and Electronic Testing NA, Inc.

Reference: WIR121851-ROKU_FCC-WLAN_5GHz_Rev 1.0



IC Test Site(s) Reg. #: 2043C

Certificates and reports shall not be reproduced except in full, without the written permission of Eurofins Electrical and Electronic Testing NA, Inc. While use of the A2LA logo in this report reflects Eurofins Electrical and Electronic Testing NA, Inc. accreditation under these programs, the report must not be used by the client to claim product certification, approval, or endorsement by A2LA, or any agency of the Federal Government. This letter of transmittal is not a part of the attached report.

Eurofins Electrical and Electronic Testing NA, Inc. is part of the Eurofins Electrical & Electronics (E&E) global compliance network.

FCC/ ISED Test Report

Applicant name: Roku, Inc.

Product: WiFi Remote Control

Report: WIR121851-ROKU_FCC-WLAN_5GHz_Rev 1.0

Applicant Address:

1155 Coleman Ave., San Jose, CA 95110 USA

Manufacturer Address:

1155 Coleman Ave., San Jose, CA 95110 USA

Prepared By:
Eurofins Electrical and Electronic Testing NA, Inc.
3162 Belick St.
Santa Clara CA, 95054

FCC/ ISED Test Report

Applicant name: Roku, Inc.

Product: WiFi Remote Control

Standard
47 CFR FCC Part 15, Subpart E (Section 15.407)
RSS-247 Issue 2 (2017-02)
RSS-Gen Issue 5 (2019-03)
789033 D02 General UNII Test Procedures New Rules v02r01
ANSI C63.10:2013

Christopher Martin
Christopher Martin Test Engineer, Wireless Laboratory

Engineering Statement: The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements FCC Rules under normal use and maintenance.

Gary Chou
Gary Chou
Wireless Engineering Manager, Wireless Laboratory

Table of Contents

Release Control Record	6
1 Summary of Test Results	7
1.1 Measurement Uncertainty	7
1.2 Modification Record	7
2 General Information	8
2.1 General Description of EUT	8
2.2 Description of Operation Modes	9
2.3 General Description of Applied Standard	11
3 Test Types and Results	12
3.1 Antenna Requirement	12
3.2 Radiated Emission and Bandedge Measurement	13
3.2.1 Limits of Radiated Emission Measurement	13
3.2.2 Test Instruments	14
3.2.3 Test Procedure	15
3.2.4 Deviation from Test Standard	16
3.2.5 Test Setup	17
3.2.6 EUT Operating Condition	17
3.2.7 Test Results	18
3.3 Conducted Emission Measurement	76
3.3.1 Limits of Conducted Emission Measurement	76
3.3.2 Test Instruments	76
3.3.3 Test Procedure	77
3.3.4 Deviation from Test Standard	77
3.3.5 Test Setup	77
3.3.6 EUT Operating Condition	77
3.3.7 Test Results	78
3.4 Transmit Power Measurement	78
3.4.1 Limits of Transmit Power Measurement	78
3.4.2 Test Setup	79
3.4.3 Test Instruments	79
3.4.4 Test Procedure	79
3.4.5 Deviation from Test Standard	80
3.4.6 EUT Operating Condition	80
3.4.7 Test Results	81
3.5 26dB Bandwidth & 6dB Bandwidth Measurement	82
3.5.1 Limits of 6 dB Bandwidth Measurement	82
3.5.2 Test Setup	82
3.5.3 Test Instruments	82
3.5.4 Test Procedure	82
3.5.5 Test Results	83
3.6 Peak Power Spectral Density Measurement	90
3.6.1 Limits of Peak Power Spectral Density Measurement	90
3.6.2 Test Setup	90
3.6.3 Test Instruments	90
3.6.4 Test Procedure	90
3.6.5 Deviation from Test Standard	90
3.6.6 EUT Operating Condition	91
3.6.7 Test Results	91
3.7 Frequency Stability Measurement	99
3.7.1 Limits of Frequency Stability Measurement	99
3.7.2 Test Setup	99
3.7.3 Test Instruments	99

3.7.4	Test Procedure.....	99
3.7.5	Deviation from Test Standard.....	99
3.7.6	EUT Operating Condition.....	99
3.7.7	Test Results	100
4	Pictures of Test Arrangements.....	101

Release Control Record

Issue No.	Description	Date Issued
WIR121851-ROKU_FCC_ISED_WLAN_5GHz	Original release	01/ 20/2023
WIR121851-ROKU_FCC_ISED_WLAN_5GHz_Rev 1.0	Add EUT information	03/ 10/2023

1 Summary of Test Results

47 CFR FCC Part 15, Subpart E (Section 15.407)				
Standard Section		Test Item	Result	Remarks
FCC	ISED			
15.203	-	Antenna Requirement	Pass	Meet the requirement of limit.
15.407 (b)(6)	RSS-Gen 8.8	AC Power Conducted Emissions	Pass	Meet the requirement of limit.
15.407 (b)(1/2/3/4(i/ii)/6)	RSS-247	Radiated Emissions & Band Edge Measurement	Pass	Meet the requirement of limit.
15.407 (a)(1/2/3)	RSS-247	Max Average Transmit Power	Pass	Meet the requirement of limit.
-	RSS-Gen 6.6	Occupied Bandwidth	Pass	Meet the requirement of limit.
15.407 (e)	RSS-247	6 dB Emission Bandwidth	Pass	Meet the requirement of limit. (U-NII-3 only)
15.407 (a)(1/2/3)	RSS-247	Peak Power Spectral Density	Pass	Meet the requirement of limit.
15.407(g)	-	Frequency Stability	Pass	Meet the requirement of limit.

Note:

1.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Test Method	Typical Expanded Uncertainty	K	Confidence Level
RF Frequencies	±4.52 Hz	2	95%
RF Power Conducted Emissions	±2.32 dB	2	95%
RF Power Conducted Spurious Emissions	±2.25 dB	2	95%
RF Power Radiated Emissions	±3.01 dB	2	95%

1.2 Modification Record

There were no modifications required for compliance.

2 General Information

2.1 General Description of EUT

Product:	WiFi Remote Control		
Brand:	Roku		
Model(s) Tested:	RC-FA1		
Series Model:	RC-FA5		
Sample Status:	Original		
Series Number:	2000000224_04		
EUT Specifications:	Primary Power:		3Vdc powered by battery
	Voltage Frequency:		N/A
	Technology / Type of Modulations:		256QAM, 64QAM, 16QAM, QPSK, BPSK for OFDM
	Operating Frequency :		5180 MHz~5240MHz, 5260 MHz~5320 MHz 5500 MHz~5725 MHz 5745 MHz~5825MHz
	FCC ID:		TC2-R1041
	ISED ID:		5959A-R1038
	Antenna Type:	PCB Trace Antenna	5GHz: 5 dBi
	Maximum EIRP		11.33 dBm
	Antenna connector:		N/A
Analysis:	The results obtained relate only to the item(s) tested.		
Environmental Test Conditions:	Temperature: 20.3° C		
	Relative Humidity: 47.5%		
	Barometric Pressure: 860-1060 mbar		
Evaluated by:	Christopher Martin		
Issue Date(s):	March 10, 2023		

NOTE: The following modules can be chosen to be configured in the EUT.

	Model No.	FCC ID	Note
-	-	-	-
-	-	-	-

FCC/IC/ CE RF Testing Units Setting

Model	Hardware (HW) Rev.	Firmware (FW) Rev.	FW operation verification and Instruction
RC-FA1, RC-FA5	1.0	mfg.0126	Verify by Spectrum Analyzer  AmebaD Mptool Userguide (2.0).pdf

2.2 Description of Operation Modes

1TX 1RX

FOR 5180 ~ 5240MHz

4 channels are provided for 802.11a, 802.11n (20MHz):

Channel	Frequency	Channel	Frequency
36	5180 MHz	44	5220 MHz
40	5200 MHz	48	5240 MHz

FOR 5260 ~ 5320MHz

4 channels are provided for 802.11a, 802.11n (HT20):

Channel	Frequency	Channel	Frequency
52	5260 MHz	60	5300 MHz
56	5280 MHz	64	5320 MHz

FOR 5500 ~ 5700MHz

3 channels are provided for 802.11a, 802.11n (HT20):

Channel	Frequency	Channel	Frequency
100	5500 MHz	140	5700 MHz
116	5580 MHz		

FOR 5745 ~ 5825MHz:

5 channels are provided for 802.11a, 802.11n (20MHz):

Channel	Frequency	Channel	Frequency
149	5745MHz	161	5805MHz
153	5765MHz	165	5825MHz
157	5785MHz		

Power setting is as below:

802.11a		802.11n, ac(20MHz)	
Channel	Power Setting	Channel	Power Setting
36	-	36	-
40	-	40	-
48	-	48	-
52	84	52	83
56	83	56	84
64	84	64	87
100	87	100	89
116	87	116	88
140	88	140	89
149	-	149	-
157	-	157	-
165	-	165	-
802.11n, ac(40MHz)		802.11ac(80MHz)	
Channel	Power Setting	Channel	Power Setting
38	-	38	-
46	-	155	-
151	-	48	-
159	-	-	-

1. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.

2.3 General Description of Applied Standard

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

47 CFR FCC Part 15, Subpart E (Section 15.407)

Canada RSS-247 Issue 2 (2017-02)

Canada RSS-Gen Issue 5 (2019-03)

789033 D02 General UNII Test Procedures New Rules v02r01

ANSI C63.10:2013

All test items have been performed and recorded as per the above standards.

3 Test Types and Results

3.1 Antenna Requirement

Spec	Requirement	Applicable
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. Antenna requirement must meet at least one of the following: a) Antenna must be permanently attached to the device. b) The antenna must use a unique type of connector to attach to the device. c) Device must be professionally installed. The installer shall be responsible for ensuring that the correct antenna is employed by the device.	☒
Remark	The EUT uses PCB trace antenna to permanently attach to the device.	
Result	☒ PASS ☐ FAIL	

3.2 Radiated Emission and Bandedge Measurement

3.2.1 Limits of Radiated Emission Measurement

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table.

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

NOTE:

- The lower limit shall apply at the transition frequencies.
- Emission level (dBuV/m) = 20 log Emission level (uV/m).
- For frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

Limits of unwanted emission out of the restricted bands

Applicable To			Limit	
789033 D02 General UNII Test Procedure New Rules v02r01			Field Strength at 3m	
			PK:74 (dBμV/m)	AV:54 (dBμV/m)
Frequency Band	Applicable To		EIRP Limit	Equivalent Field Strength at 3m
5150~5250 MHz	15.407(b)(1)		PK:-27 (dBm/MHz)	PK:68.2(dBμV/m)
5250~5350 MHz	15.407(b)(2)			
5470~5725 MHz	15.407(b)(3)			
5725~5850 MHz	☒	15.407(b)(4)(i)	PK:-27 (dBm/MHz) *1 PK:10 (dBm/MHz) *2 PK:15.6 (dBm/MHz) *3 PK:27 (dBm/MHz) *4	PK: 68.2(dBμV/m) *1 PK:105.2 (dBμV/m) *2 PK: 110.8(dBμV/m) *3 PK:122.2 (dBμV/m) *4
	☐	15.407(b)(4)(ii)	Emission limits in section 15.247(d)	
*1 beyond 75 MHz or more above of the band edge.			*2 below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above.	
*3 below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above.			*4 from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.	

Note:

The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength:

$$E = \frac{1000000\sqrt{30P}}{3} \text{ } \mu\text{V/m, where P is the eirp (Watts).}$$

3.2.2 Test Instruments

Asset #	Equipment	Manufacturer	Model	Last Cal Date	Cal Due Date
1S2003	EMI Test Receiver	Keysight	N9030B	11/01/2022	11/01/2023
1S2399	Turntable Controller	SUNOL SCIENCE	SC99V	Not Required	Not Required
1S2486	5 Meter Chamber Control Room	Panashield	5 Meter Control Room	Not Required	Not Required
1S2435	Horn Antenna	ETS-LINDGREN	3117	03/03/2021	03/09/2023
1S4802	Preamplifier	EMC Instrument	EMC118A45SE	Note 1	Note 1
1S2668	Preamplifier	Sonoma Instrument	310N	Note 1	Note 1
1S2600	Antenna	TESEQ GmbH	D-12623	05/ 11/ 2021	05/ 11/ 2023
1S3983	Loop Antenna	ETS-LINDGREN	6512	10/ 14 /2021	10/ 14 /2023

Note 1: Verified by calibrated instrumentation at the time of testing

3.2.3 Test Procedure

For Radiated emission below 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

For Radiated emission above 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. The test-receiver system was set to peak and average detects function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is $\geq 1/T$ (Duty cycle $< 98\%$) or 10Hz (Duty cycle $\geq 98\%$) for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.

For Band edge Measurement

789033 D02 General U-NII Test Procedures New Rules v02r01, II.F. Method SA-1

1. For average emissions measurements, follow the procedures described in section II.G.6., "Procedures

for Average Unwanted Emissions Measurements above 1000 MHz", except for the following changes:

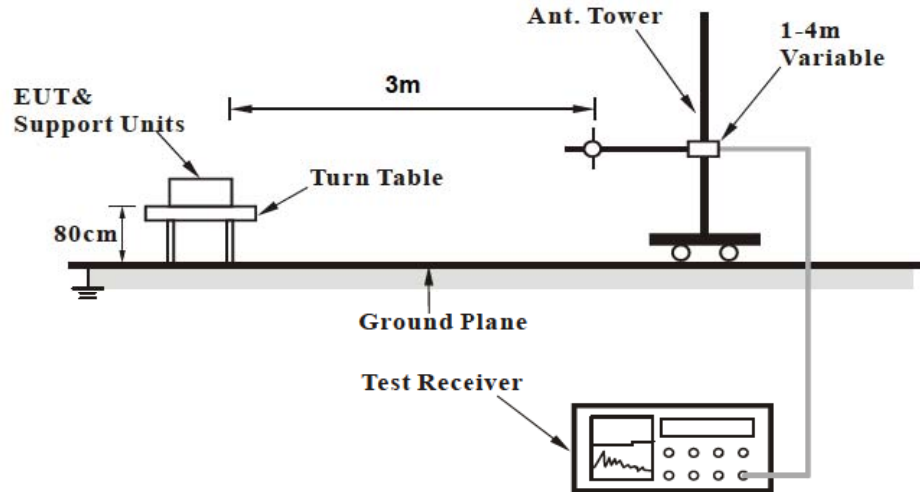
2. Set RBW=100 kHz
3. Set VBW=300 kHz
4. Perform a band-power integration across the 1 MHz bandwidth in which the band-edge emission level is to be measured.

3.2.4 Deviation from Test Standard

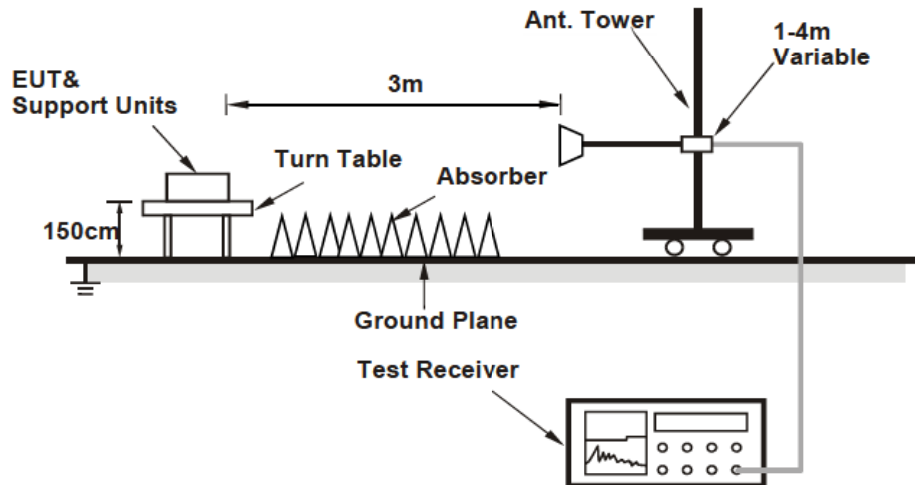
No deviation.

3.2.5 Test Setup

For Radiated emission 30MHz to 1GHz



For Radiated emission above 1GHz



For the actual test configuration, please refer to the attached file (Test Setup Photo).

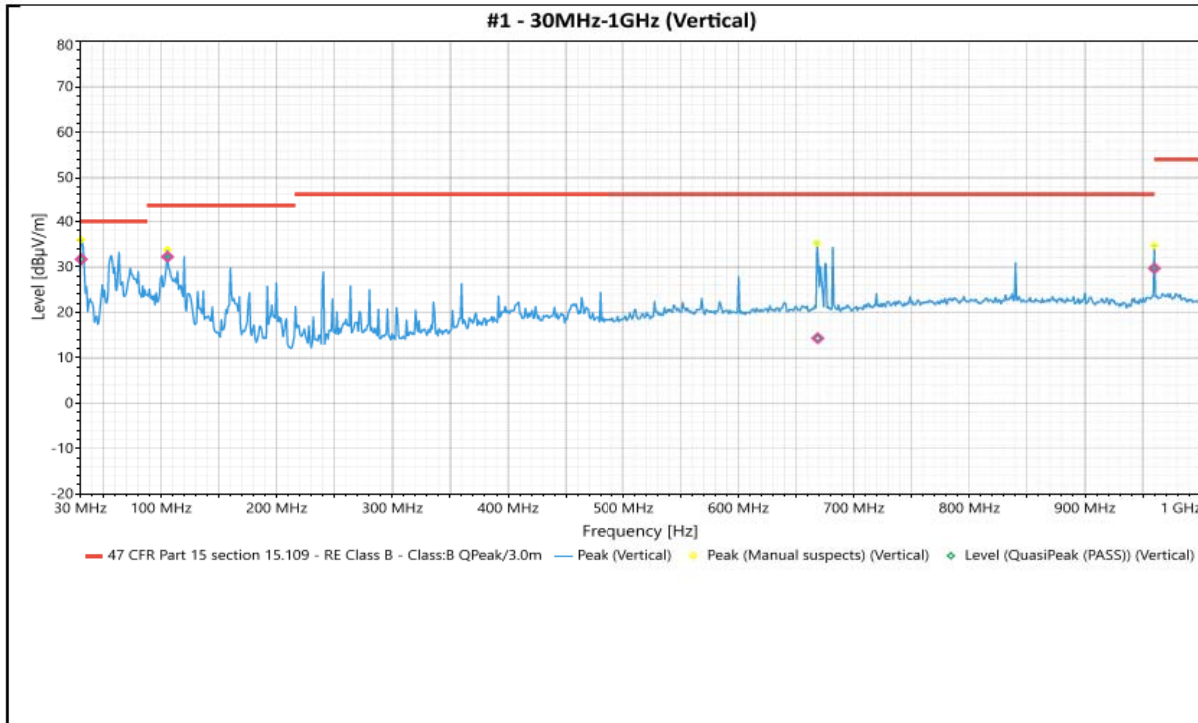
3.2.6 EUT Operating Condition

- Placed the EUT on the testing table.
- Prepared notebooks to act as communication partner and placed it outside of testing area.
- The communication partner connected with EUT via a USB cable and ran a test program (provided by manufacturer) to enable EUT under transmission condition continuously at specific channel frequency.
- The necessary accessories enable the system in full functions.

3.2.7 Test Results

Below 1GHz Worst-Case Data:

CHANNEL	802.11a Channel 52	DETECTOR FUNCTION	Quasi Peak
FREQUENCY RANGE	30MHz – 1GHz		



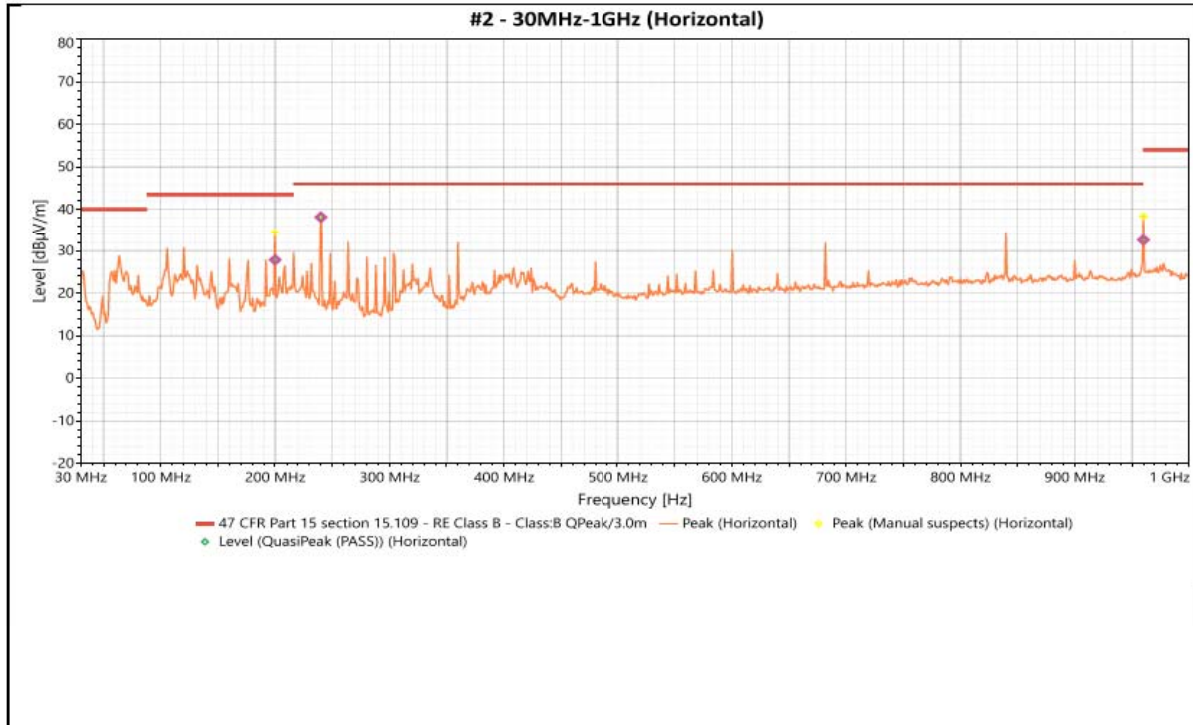
Antenna Polarity & Test Distance: Vertical at 3m									
No.	Frequency (MHz)	Polarization	Level Peak[dB(uV/m)]	Limit Peak dB(uV/m)	Margin Peak [dB]	Height (m)	Angle (Deg)	Factor [dB(1/m)]	Pass/Fail
1	199.99	Vertical	31.702	40	-8.298	1	224	-9.07	Pass
2	349.872	Vertical	32.234	43.5	-11.266	1	218	-12.56	Pass
3	665.254	Vertical	14.287	46	-31.713	1.2	337	-5.11	Pass
4	31.133	Vertical	29.684	54	-24.316	1.82	2	-1.57	Pass
5	105.71	Vertical	31.702	40	-8.298	1	224	-9.07	Pass
6	668.8	Vertical	32.234	43.5	-11.266	1	218	-12.56	Pass

REMARKS:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Cable Loss (dB) + AF (dB)
2. AF (dB/m) = Antenna Factor (dB/m) – Pre-amplifier Gain (dB).
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)

Below 1GHz Worst-Case Data:

CHANNEL	802.11n Channel 40	DETECTOR FUNCTION	Quasi Peak
FREQUENCY RANGE	30MHz – 1GHz		



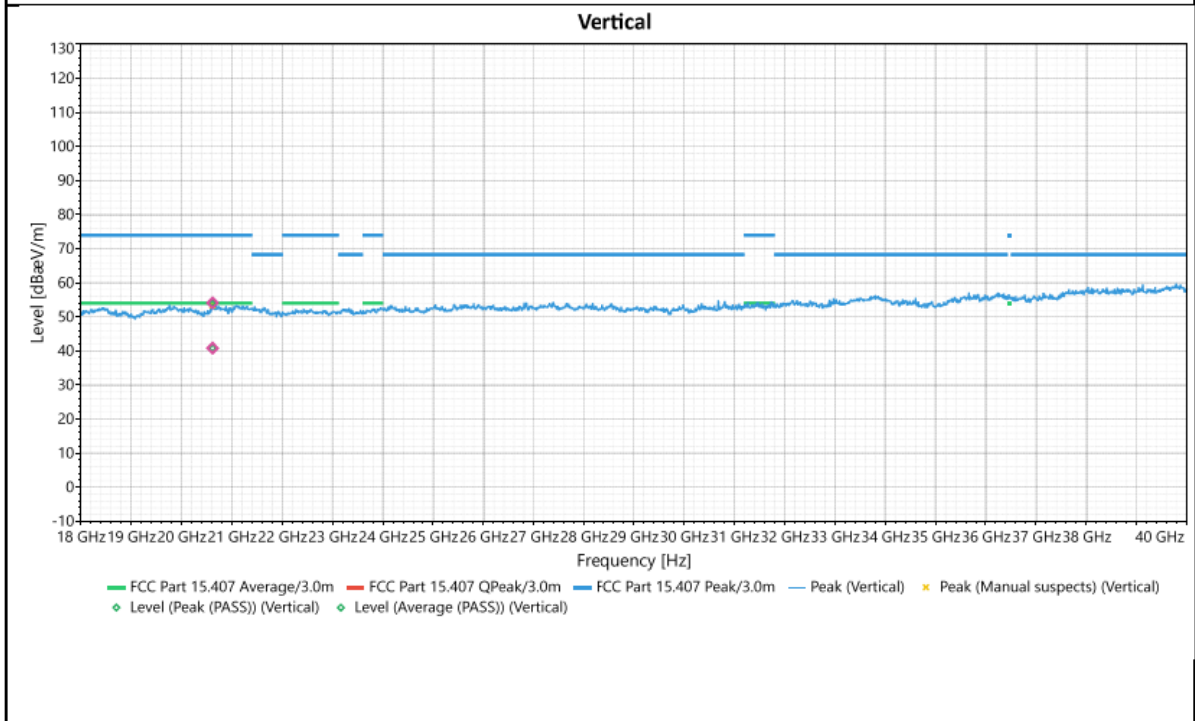
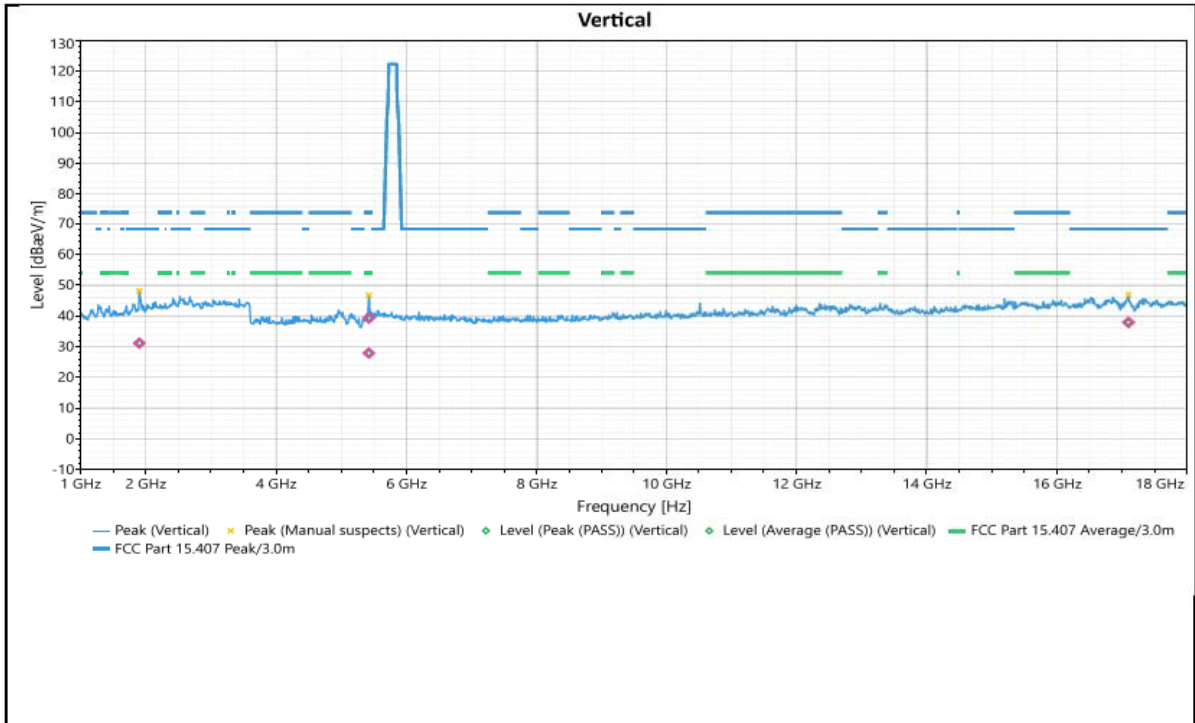
Antenna Polarity & Test Distance: Vertical at 3m									
No.	Frequency (MHz)	Polarization	Level Peak[dB(uV/m)]	Limit Peak dB(uV/m)	Margin Peak [dB]	Height (m)	Angle (Deg)	Factor [dB(1/m)]	Pass/Fail
1	200.02	Horizontal	27.839	43.5	-15.661	1.01	255	-15.58	Pass
2	240	Horizontal	38.167	46	-7.833	1.24	133	-13.49	Pass
3	960.09	Horizontal	32.563	54	-21.437	1.87	53	-0.18	Pass

REMARKS:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Cable Loss (dB) + AF (dB)
2. AF (dB/m) = Antenna Factor (dB/m) – Preamplifier Gain (dB).
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)

Above 1GHz Test Data:

CHANNEL	802.11a 5260 MHz	DETECTOR FUNCTION	Prak/Average
FREQUENCY RANGE	1GHz-40GHz		

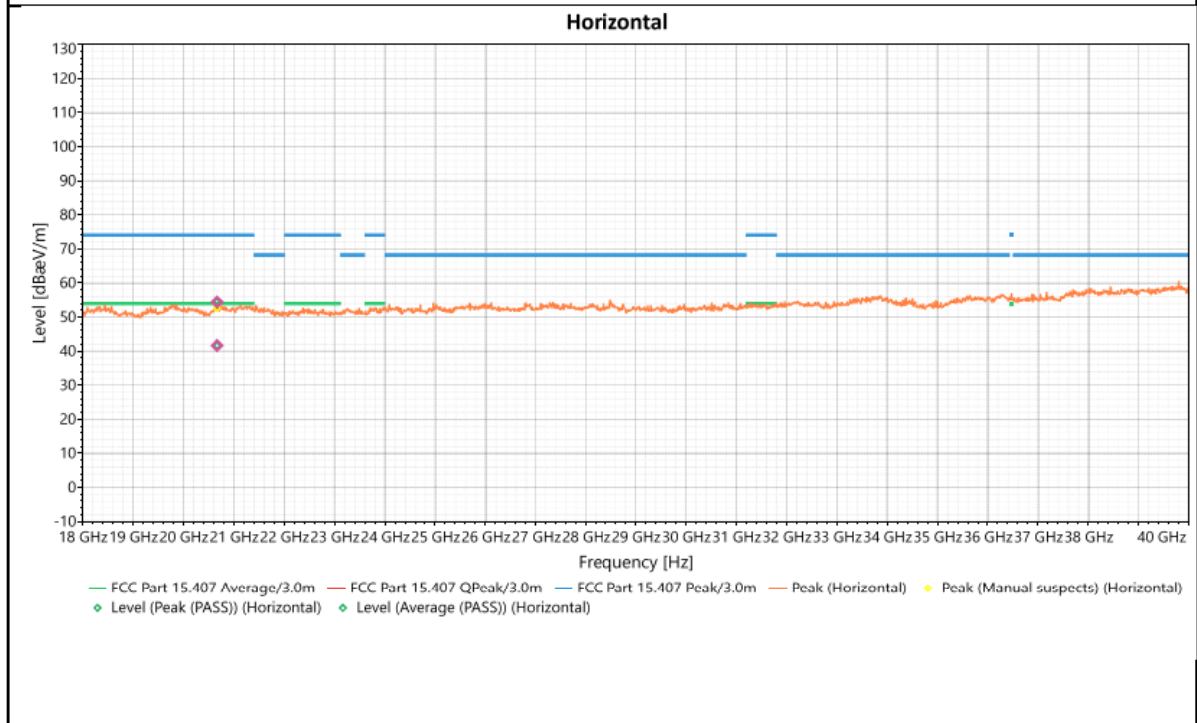
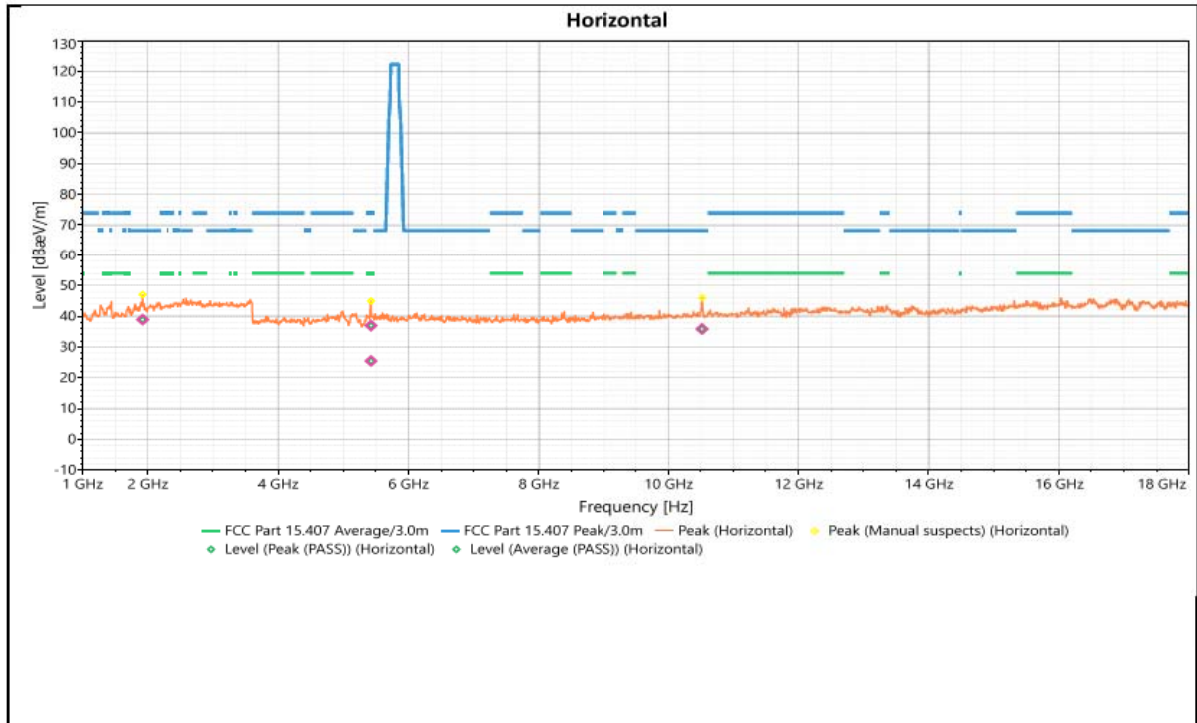


Antenna Polarity & Test Distance: Vertical at 3m									
No.	Frequency (MHz)	Polarization	Level [dB(uV/m)]	Limit dB(uV/m)	Margin [dB]	Height (m)	Angle (Deg)	Factor [dB(1/m)]	Measure Type/ Result
1	1899.3	Vertical	31.109	68.23	-37.121	2.4	195	-2.37	Peak (PASS)
2	5421.7	Vertical	39.252	74	-34.748	1	356	1.05	Average (PASS)
3	5421.7	Vertical	27.876	54	-26.124	1	356	1.05	Peak (PASS)
4	17102	Vertical	37.883	68.23	-30.347	3.33	249	3.44	Average (PASS)
5	20618.05	Vertical	54.072	74	-19.928	1.14	160	8.4	Peak (PASS)
6	20618.05	Vertical	40.807	54	-13.193	1.14	160	8.4	Average (PASS)

REMARKS:

1. Level (dBuV) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB) +Preamplifier
3. Margin value = Emission level – Limit value.
4. The emission levels of other frequencies were less than 20dB margin agains

Frequency	802.11a 5260 MHz	DETECTOR FUNCTION	Prak/Average
FREQUENCY RANGE	1GHz-40GHz		

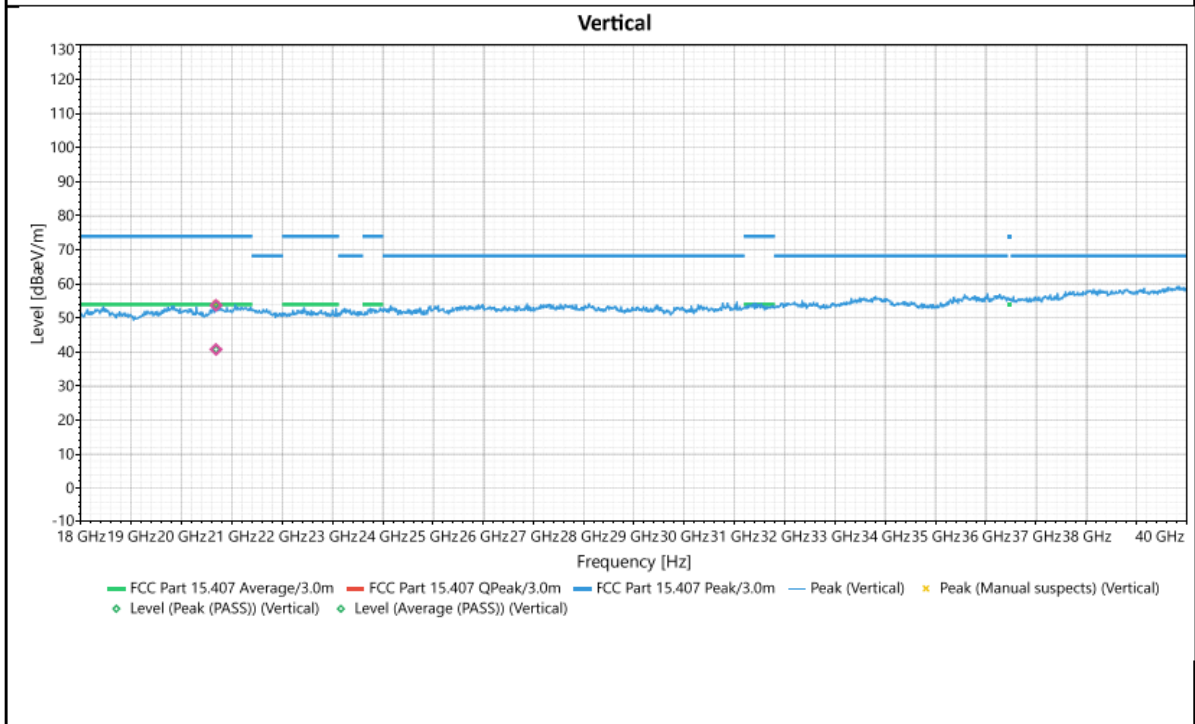
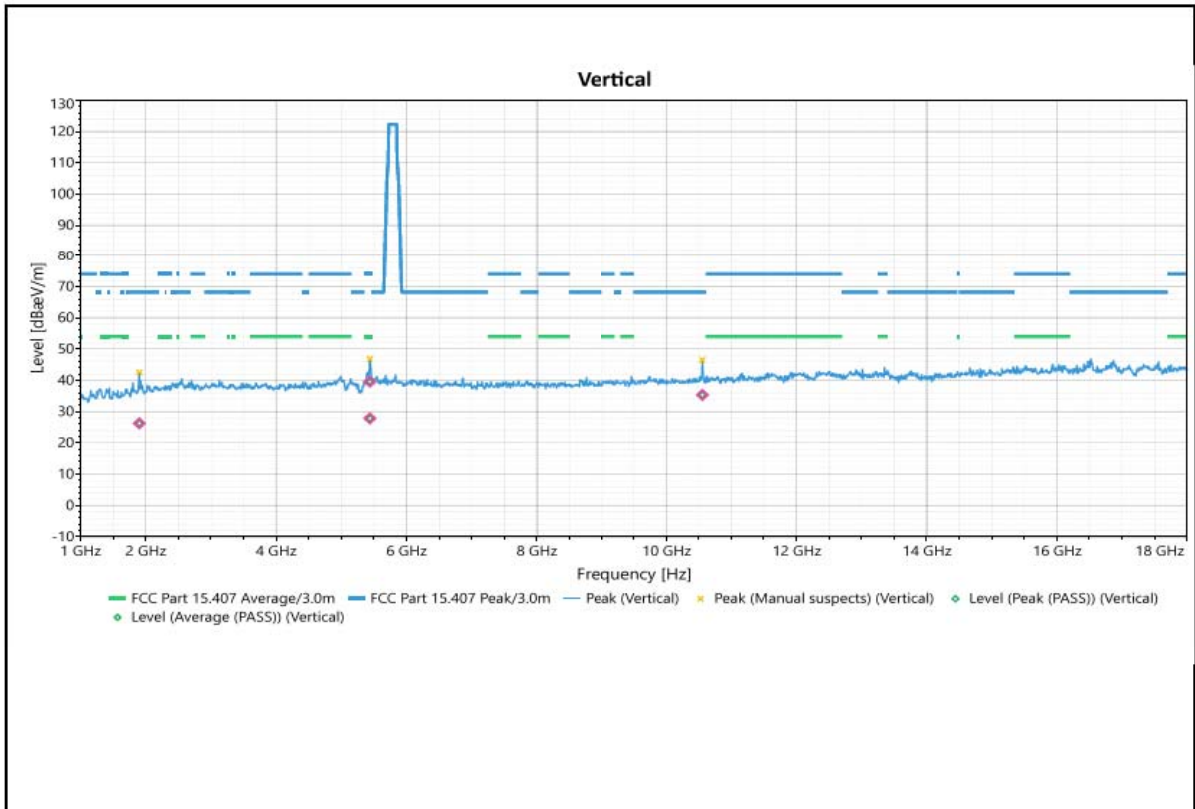


Antenna Polarity & Test Distance: Vertical at 3m									
No.	Frequency (MHz)	Polarization	Level [dB(uV/m)]	Limit dB(uV/m)	Margin [dB]	Height (m)	Angle (Deg)	Factor [dB(1/m)]	Measure Type/ Result
1	1919.7	Horizontal	38.856	68.23	-29.374	1.41	211	-2.15	Peak (PASS)
2	5423.4	Horizontal	36.919	74	-37.081	3.22	116	0.96	Average (PASS)
3	5423.4	Horizontal	25.43	54	-28.57	3.22	116	0.96	Peak (PASS)
4	10520	Horizontal	35.821	68.23	-32.409	2.69	50	2.8	Average (PASS)
5	20668.5	Horizontal	54.423	74	-19.577	1.89	50	8.33	Peak (PASS)
6	20668.5	Horizontal	41.655	54	-12.345	1.89	50	8.33	Average (PASS)

REMARKS:

1. Level (dBuV) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB) +Preamplifier
3. Margin value = Emission level – Limit value.
4. The emission levels of other frequencies were less than 20dB margin agains

CHANNEL	802.11a 5280 MHz	DETECTOR FUNCTION	Prak/Average
FREQUENCY RANGE	1GHz-40GHz		

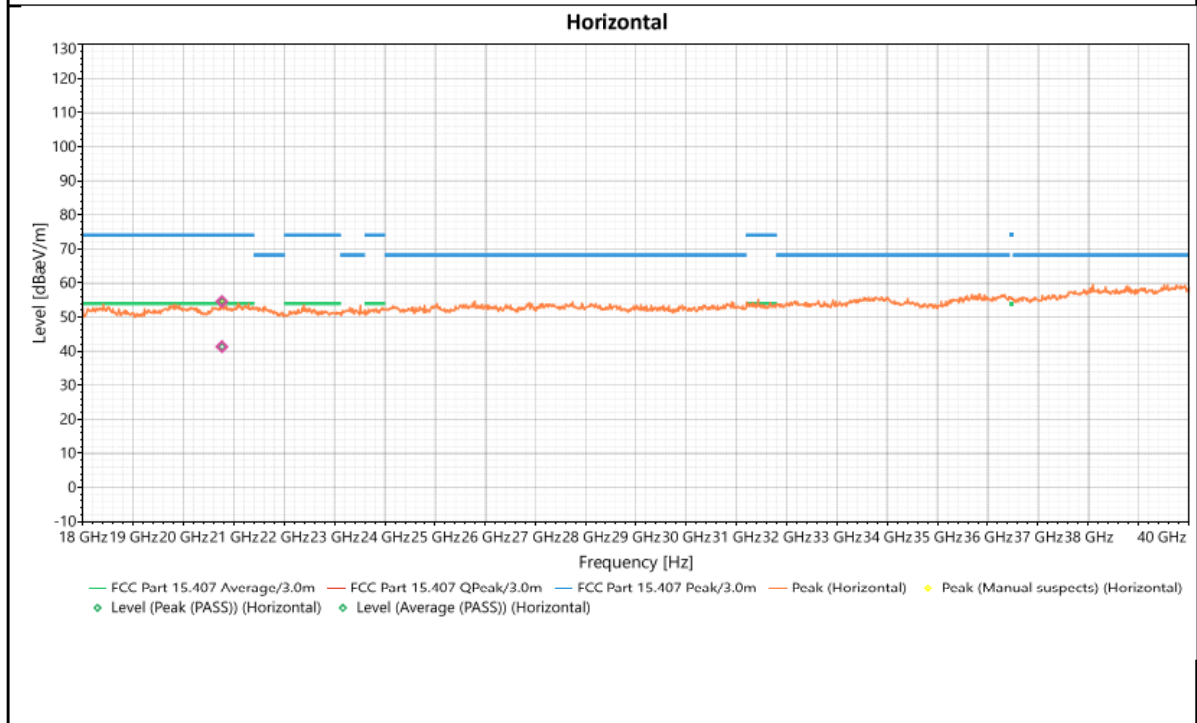
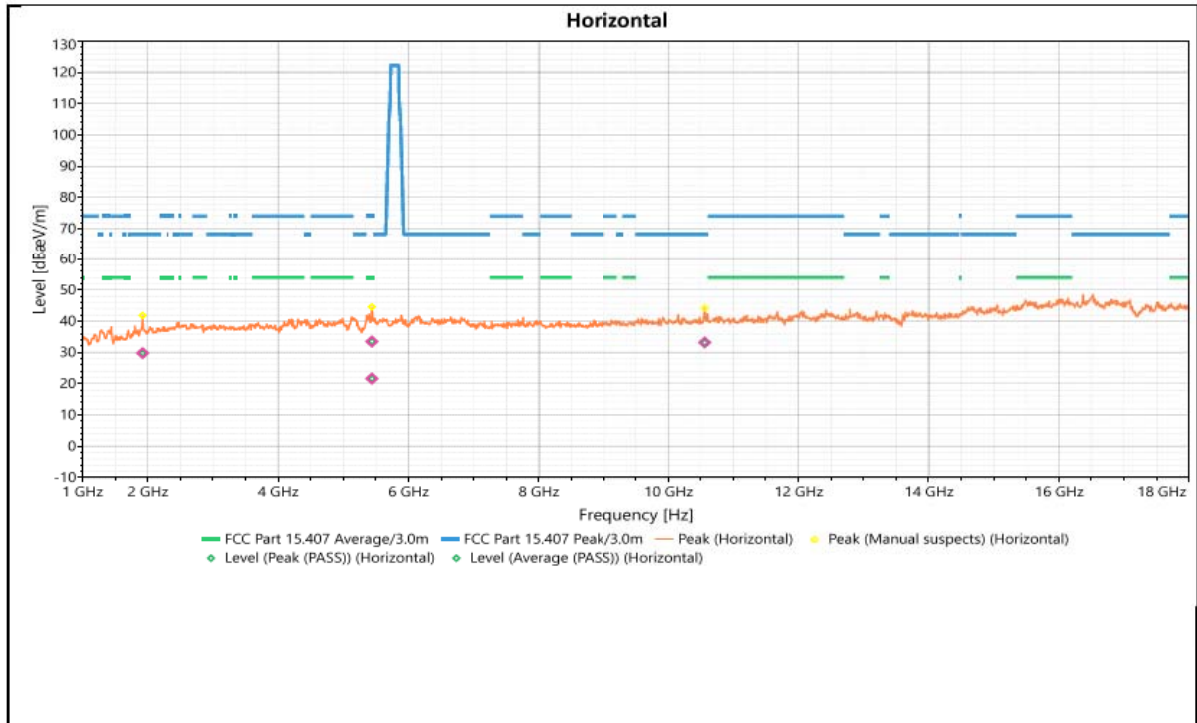


Antenna Polarity & Test Distance: Vertical at 3m									
No.	Frequency (MHz)	Polarization	Level [dB(uV/m)]	Limit dB(uV/m)	Margin [dB]	Height (m)	Angle (Deg)	Factor [dB(1/m)]	Measure Type/ Result
1	1899.3	Vertical	44.837	74	-29.163	3.9	51	2.13	Peak (PASS)
2	5437	Vertical	31.972	54	-22.028	3.9	51	2.13	Average (PASS)
3	5437	Vertical	48.987	74	-25.013	1	220	3.84	Peak (PASS)
4	10556	Vertical	36.368	54	-17.632	1	220	3.84	Average (PASS)
5	20686.24	Vertical	53.707	74	-20.293	1.49	314	8.45	Peak (PASS)
6	20686.24	Vertical	40.773	54	-13.227	1.49	314	8.45	Average (PASS)

REMARKS:

1. Level (dBuV) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB) +Preamplifier
3. Margin value = Emission level – Limit value.
4. The emission levels of other frequencies were less than 20dB margin agains

Frequency	802.11a 5280 MHz	DETECTOR FUNCTION	Prak/Average
FREQUENCY RANGE	1GHz-40GHz		

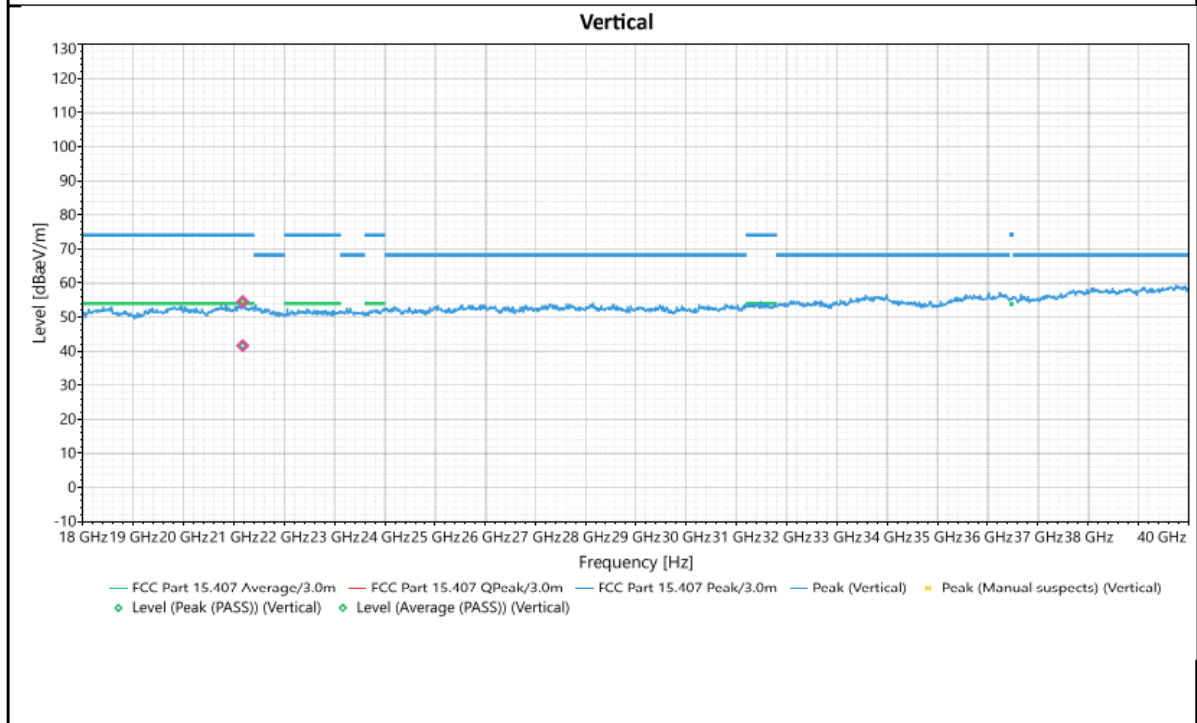
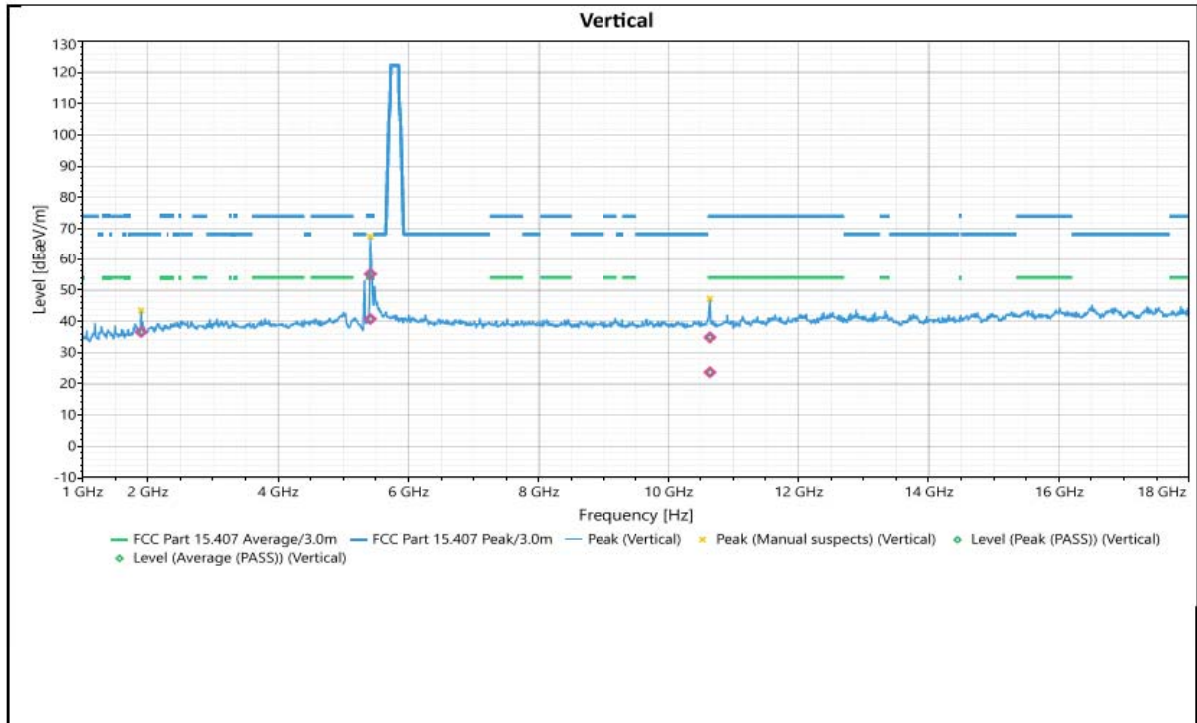


Antenna Polarity & Test Distance: Vertical at 3m									
No.	Frequency (MHz)	Polarization	Level [dB(uV/m)]	Limit dB(uV/m)	Margin [dB]	Height (m)	Angle (Deg)	Factor [dB(1/m)]	Measure Type/ Result
1	1919.7	Horizontal	48.7	74	-25.3	2.05	316	1.33	Peak (PASS)
2	5437	Horizontal	31.705	54	-22.295	2.05	316	1.33	Average (PASS)
3	5437	Horizontal	48.733	74	-25.267	3.73	268	3.9	Peak (PASS)
4	10561	Horizontal	35.953	54	-18.047	3.73	268	3.9	Average (PASS)
5	20765.3	Horizontal	54.571	74	-19.429	1.55	262	8.44	Peak (PASS)
6	20765.3	Horizontal	41.306	54	-12.694	1.55	262	8.44	Average (PASS)

REMARKS:

1. Level (dBuV) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB) +Preamplifier
3. Margin value = Emission level – Limit value.
4. The emission levels of other frequencies were less than 20dB margin agains

CHANNEL	802.11a 5320 MHz	DETECTOR FUNCTION	Prak/Average
FREQUENCY RANGE	1GHz-40GHz		

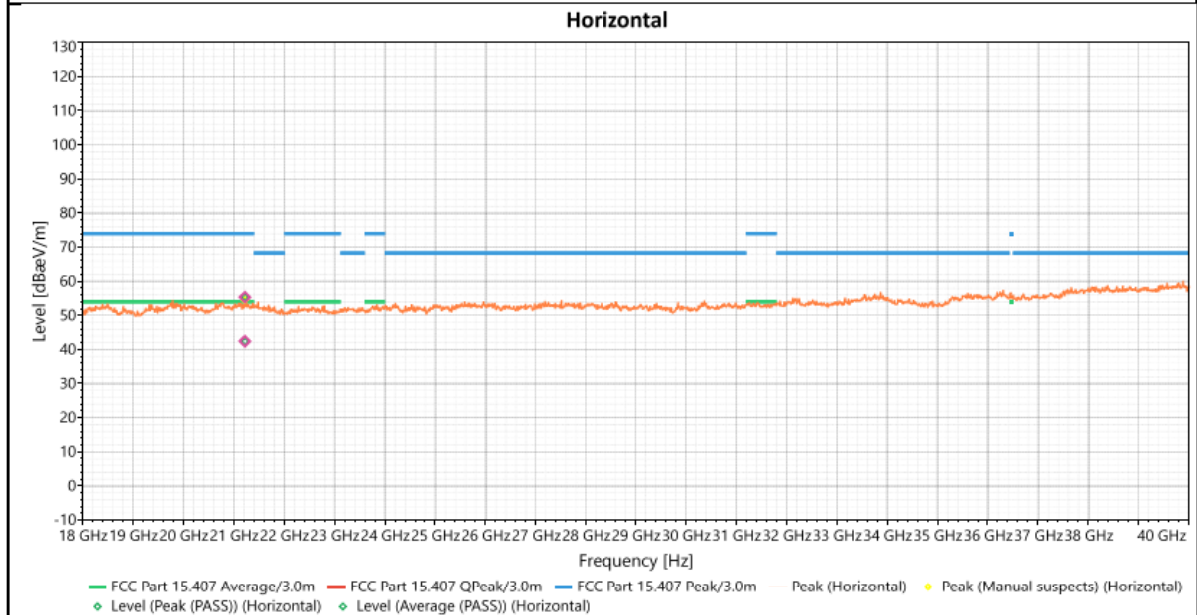
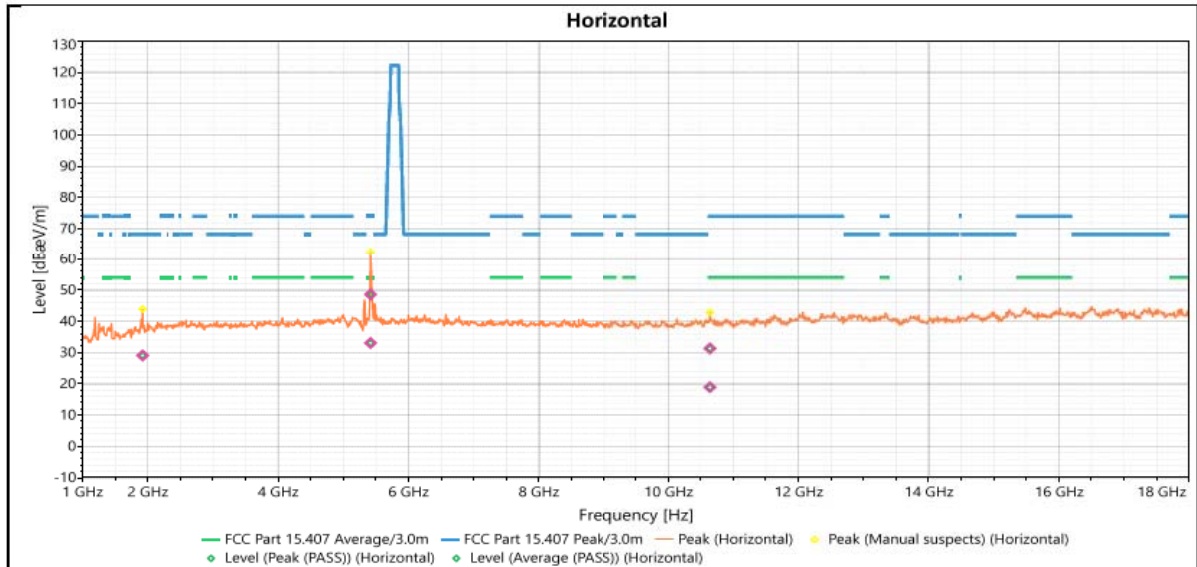


Antenna Polarity & Test Distance: Vertical at 3m									
No.	Frequency (MHz)	Polarization	Level [dB(uV/m)]	Limit dB(uV/m)	Margin [dB]	Height (m)	Angle (Deg)	Factor [dB(1/m)]	Measure Type/ Result
1	5414.9	Vertical	55.096	74	-18.904	1.35	341	1.02	Peak (PASS)
2	5414.9	Vertical	40.698	54	-13.302	1.35	341	1.02	Average (PASS)
3	10641	Vertical	34.835	74	-39.165	1.16	305	2.74	Peak (PASS)
4	10641	Vertical	23.681	54	-30.319	1.16	305	2.74	Average (PASS)
5	21176.78	Vertical	54.549	74	-19.451	2	74	8.5	Peak (PASS)
6	21176.78	Vertical	41.622	54	-12.378	2	74	8.5	Average (PASS)

REMARKS:

1. Level (dBuV) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB) +Preamplifier
3. Margin value = Emission level – Limit value.
4. The emission levels of other frequencies were less than 20dB margin agains

Frequency	802.11a 5320 MHz	DETECTOR FUNCTION	Prak/Average
FREQUENCY RANGE	1GHz-40GHz		

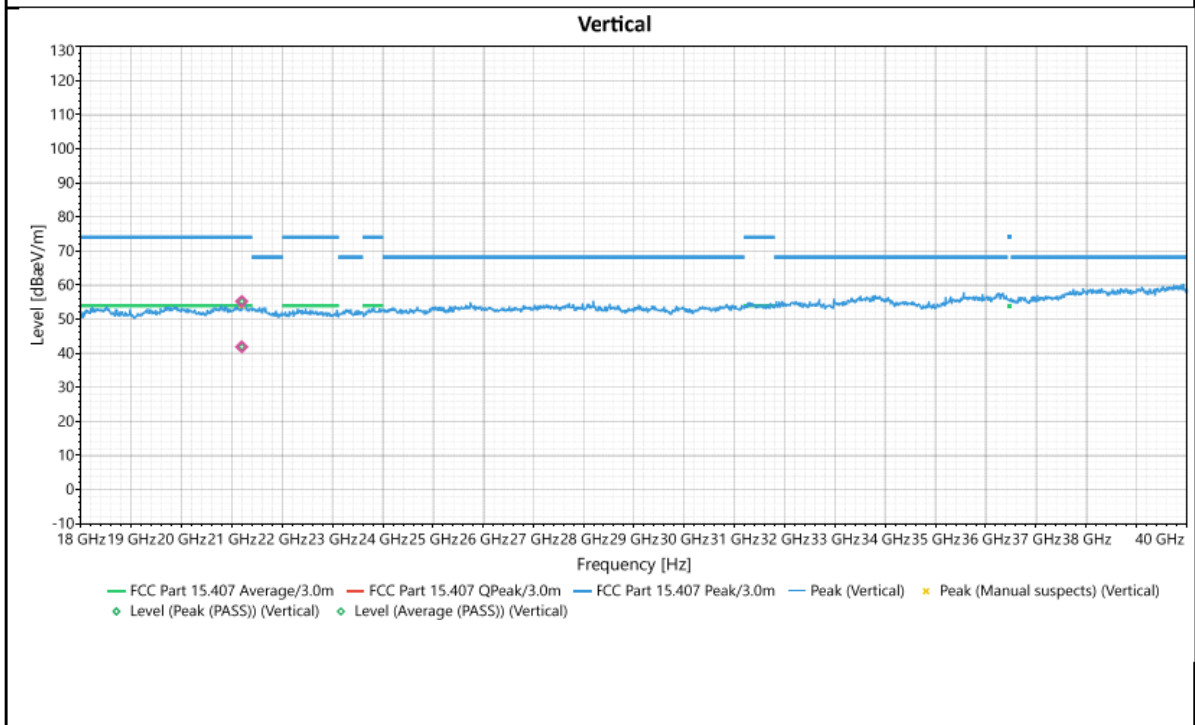
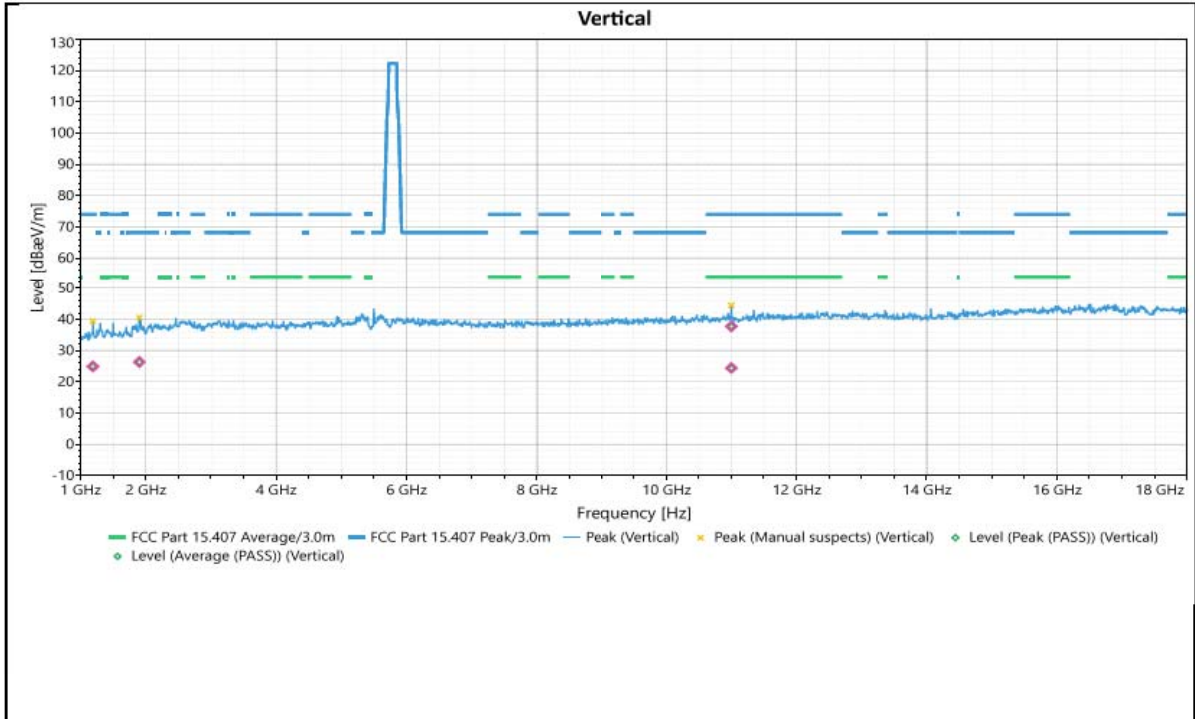


Antenna Polarity & Test Distance: Vertical at 3m									
No.	Frequency (MHz)	Polarization	Level [dB(uV/m)]	Limit dB(uV/m)	Margin [dB]	Height (m)	Angle (Deg)	Factor [dB(1/m)]	Measure Type/ Result
1	4993.257	Horizontal	48.553	74	-25.447	1.49	248	0.96	Peak (PASS)
2	5416.6	Horizontal	33.053	54	-20.947	1.49	248	0.96	Average (PASS)
3	5416.6	Horizontal	31.3	74	-42.7	2.13	176	2.87	Peak (PASS)
4	10641	Horizontal	18.907	54	-35.093	2.13	176	2.87	Average (PASS)
5	21220.7	Horizontal	55.297	74	-18.703	1	119	8.34	Peak (PASS)
6	21220.7	Horizontal	42.416	54	-11.584	1	119	8.34	Average (PASS)

REMARKS:

1. Level (dBuV) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB) +Preamplifier
3. Margin value = Emission level – Limit value.
4. The emission levels of other frequencies were less than 20dB margin agains

CHANNEL	802.11a 5500 MHz	DETECTOR FUNCTION	Prak/Average
FREQUENCY RANGE	1GHz-40GHz		

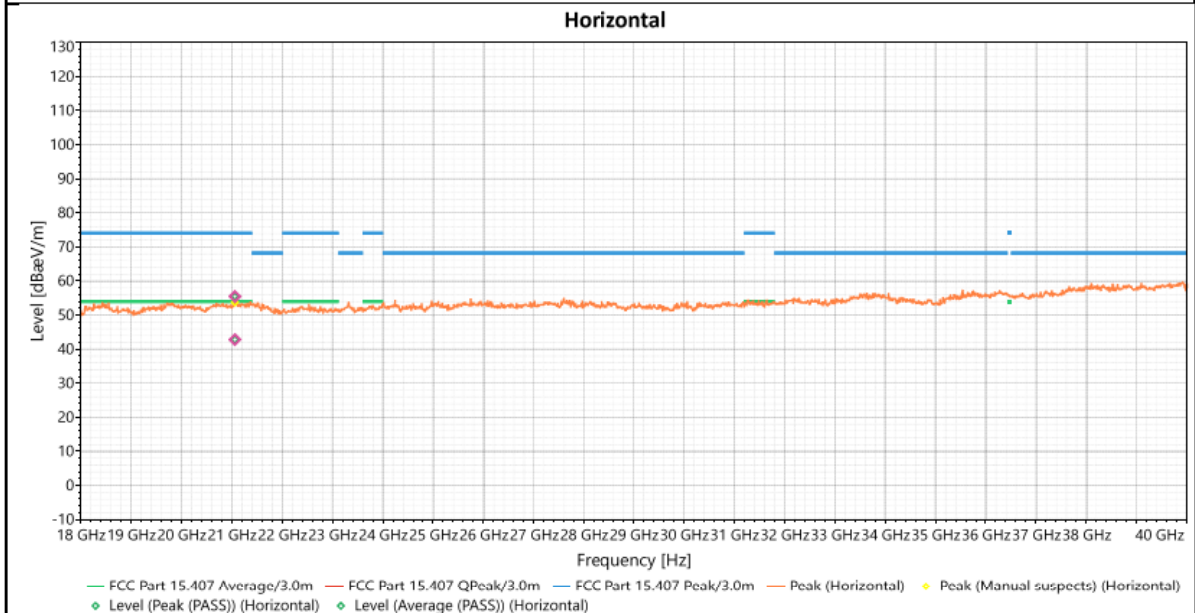
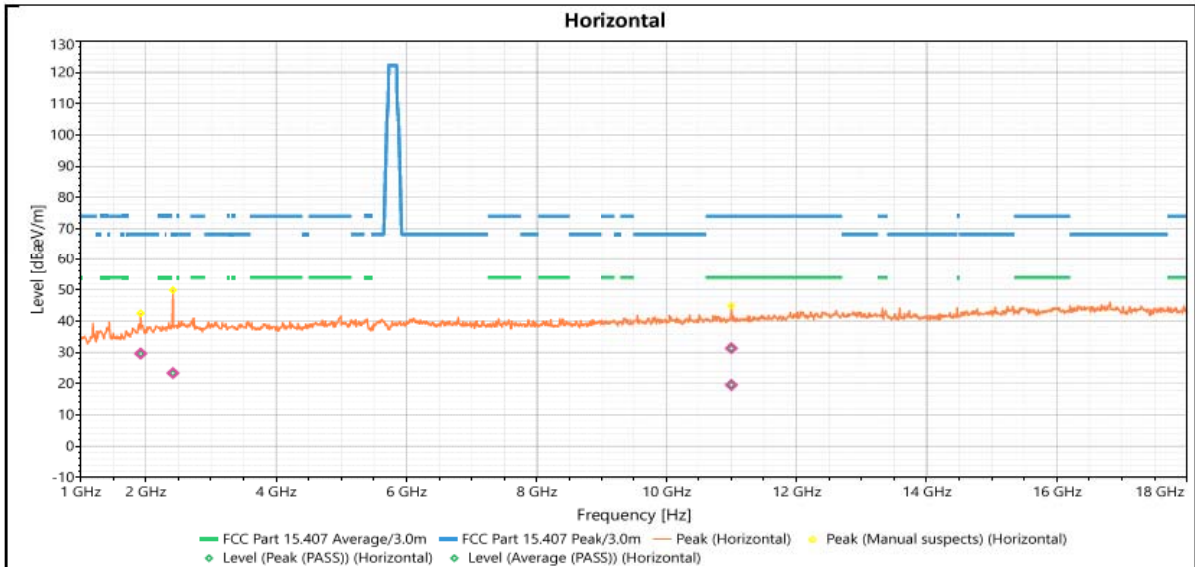


Antenna Polarity & Test Distance: Vertical at 3m									
No.	Frequency (MHz)	Polarization	Level [dB(uV/m)]	Limit dB(uV/m)	Margin [dB]	Height (m)	Angle (Deg)	Factor [dB(1/m)]	Measure Type/ Result
1	11001	Vertical	37.706	74	-36.294	3	119	2.81	Peak (PASS)
2	11001	Vertical	24.402	54	-29.598	3	119	2.81	Average (PASS)
3	21198.8	Vertical	55.204	74	-18.796	1.64	188	8.46	Peak (PASS)
4	21198.8	Vertical	41.871	54	-12.129	1.64	188	8.46	Average (PASS)

REMARKS:

1. Level (dBuV) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB) +Preamplifier
3. Margin value = Emission level – Limit value.
4. The emission levels of other frequencies were less than 20dB margin agains

Frequency	802.11a 5500 MHz	DETECTOR FUNCTION	Prak/Average
FREQUENCY RANGE	1GHz-40GHz		

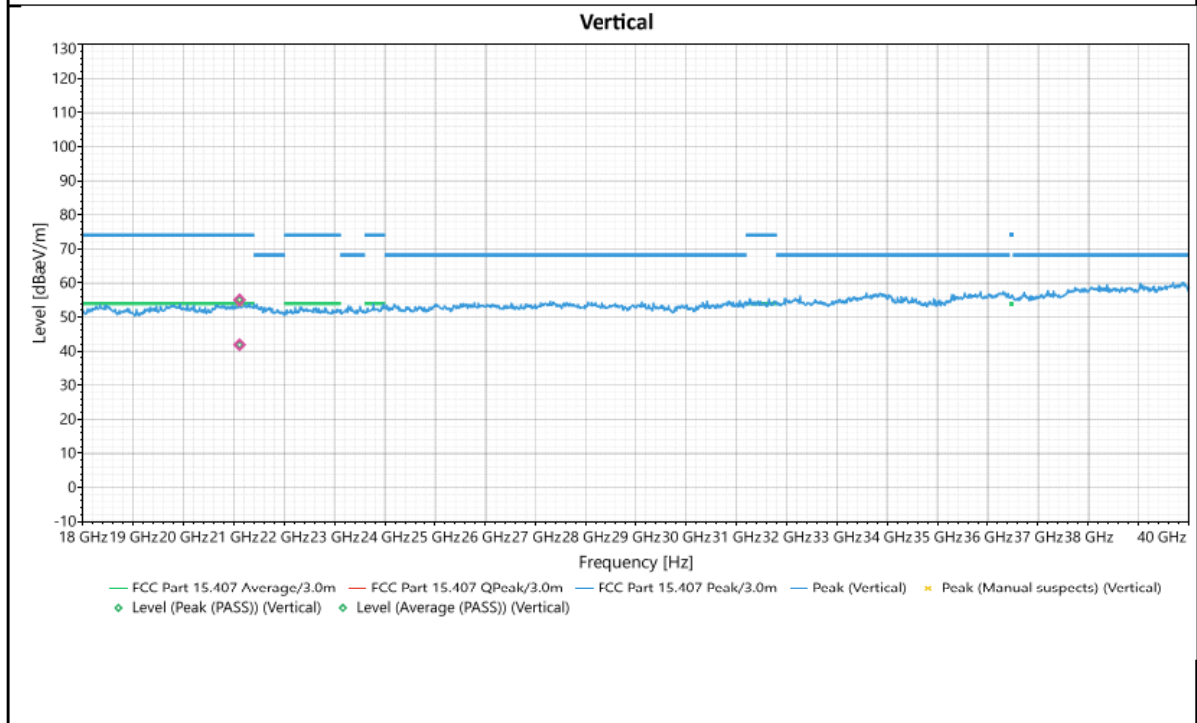
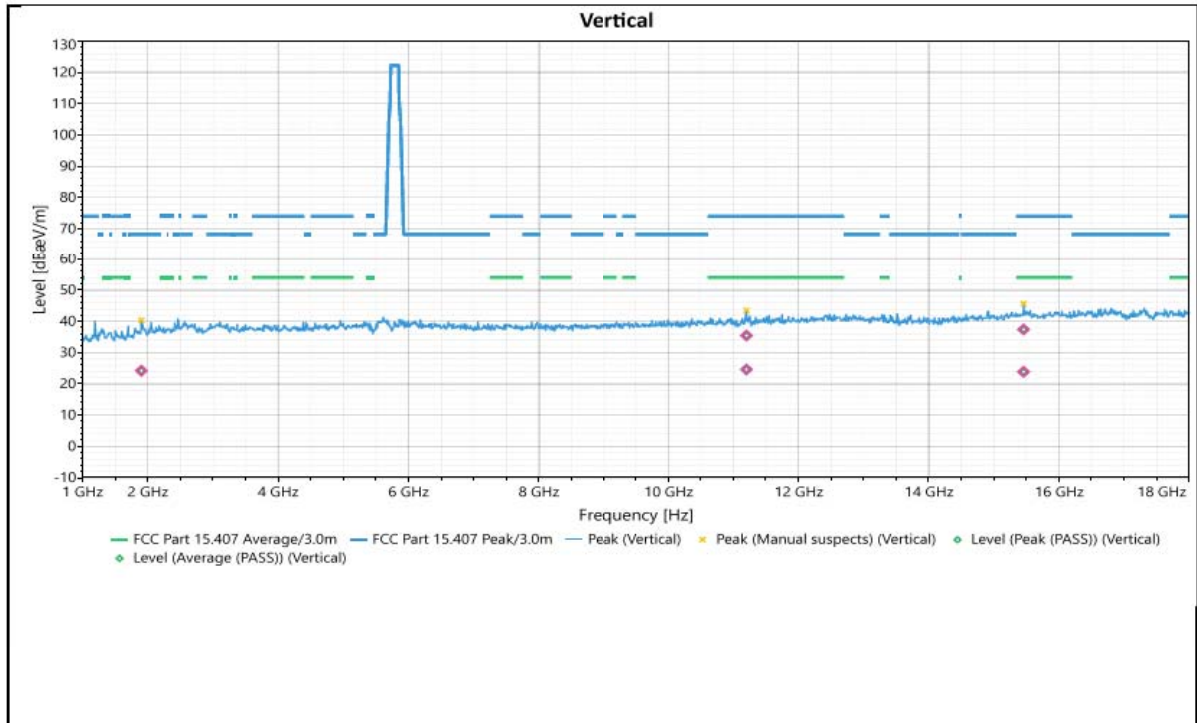


Antenna Polarity & Test Distance: Vertical at 3m									
No.	Frequency (MHz)	Polarization	Level [dB(uV/m)]	Limit dB(uV/m)	Margin [dB]	Height (m)	Angle (Deg)	Factor [dB(1/m)]	Measure Type/ Result
1	11001	Horizontal	31.34	74	-42.66	1.96	357	2.82	Peak (PASS)
2	11001	Horizontal	19.584	54	-34.416	1.96	357	2.82	Average (PASS)
3	21062.3	Horizontal	55.454	74	-18.546	1.14	247	8.5	Peak (PASS)
4	21062.3	Horizontal	42.81	54	-11.19	1.14	247	8.5	Average (PASS)

REMARKS:

1. Level (dBuV) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB) +Preamplifier
3. Margin value = Emission level – Limit value.
4. The emission levels of other frequencies were less than 20dB margin agains

CHANNEL	802.11a 5600 MHz	DETECTOR FUNCTION	Prak/Average
FREQUENCY RANGE	1GHz-40GHz		

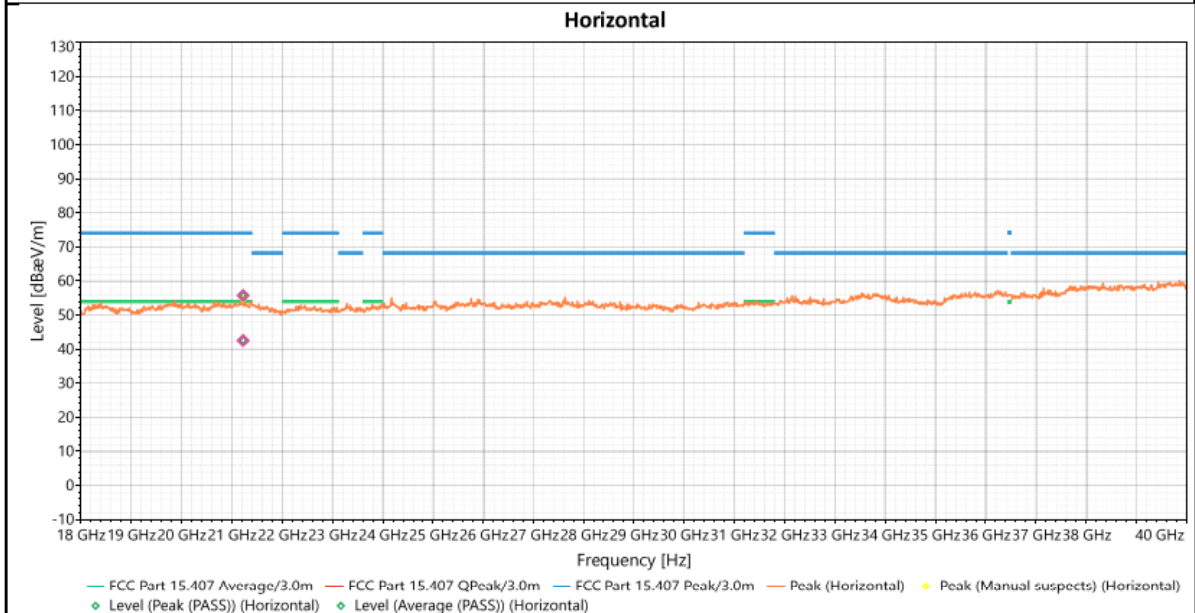
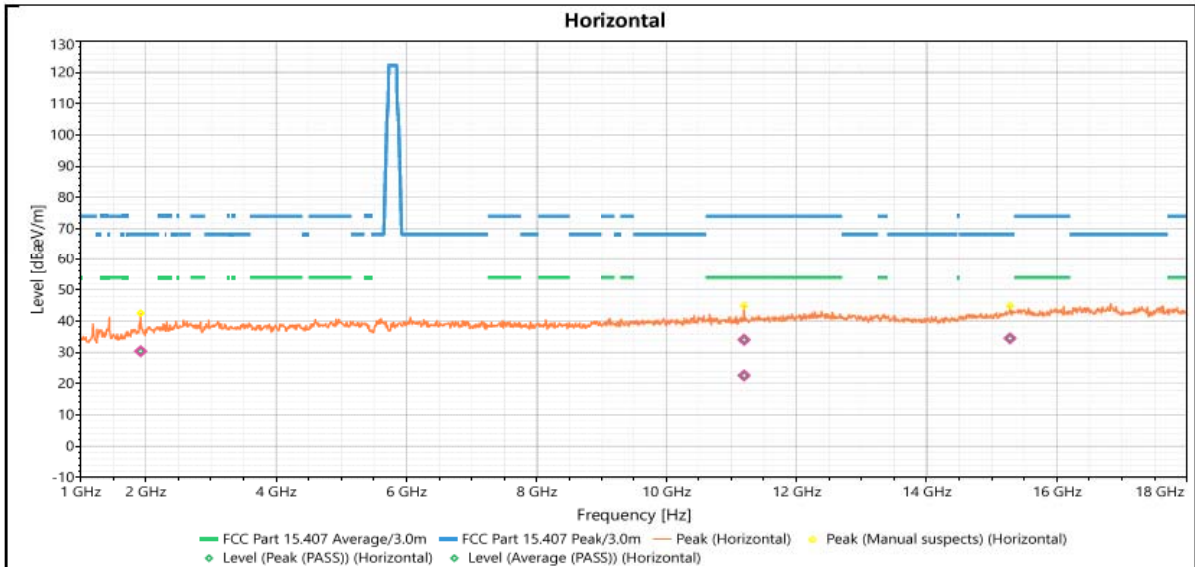


Antenna Polarity & Test Distance: Vertical at 3m									
No.	Frequency (MHz)	Polarization	Level [dB(uV/m)]	Limit dB(uV/m)	Margin [dB]	Height (m)	Angle (Deg)	Factor [dB(1/m)]	Measure Type/ Result
1	11202	Vertical	35.409	74	-38.591	2.13	297	2.9	Peak (PASS)
2	11202	Vertical	24.56	54	-29.44	2.13	297	2.9	Average (PASS)
3	15459	Vertical	37.358	74	-36.642	2.96	280	4.35	Peak (PASS)
4	15459	Vertical	23.829	54	-30.171	2.96	280	4.35	Average (PASS)
5	21115.2	Vertical	55.021	74	-18.979	1.73	0	8.6	Peak (PASS)
6	21115.2	Vertical	41.857	54	-12.143	1.73	0	8.6	Average (PASS)

REMARKS:

1. Level (dBuV) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB) +Preamplifier
3. Margin value = Emission level – Limit value.
4. The emission levels of other frequencies were less than 20dB margin agains

Frequency	802.11a 5600 MHz	DETECTOR FUNCTION	Prak/Average
FREQUENCY RANGE	1GHz-40GHz		

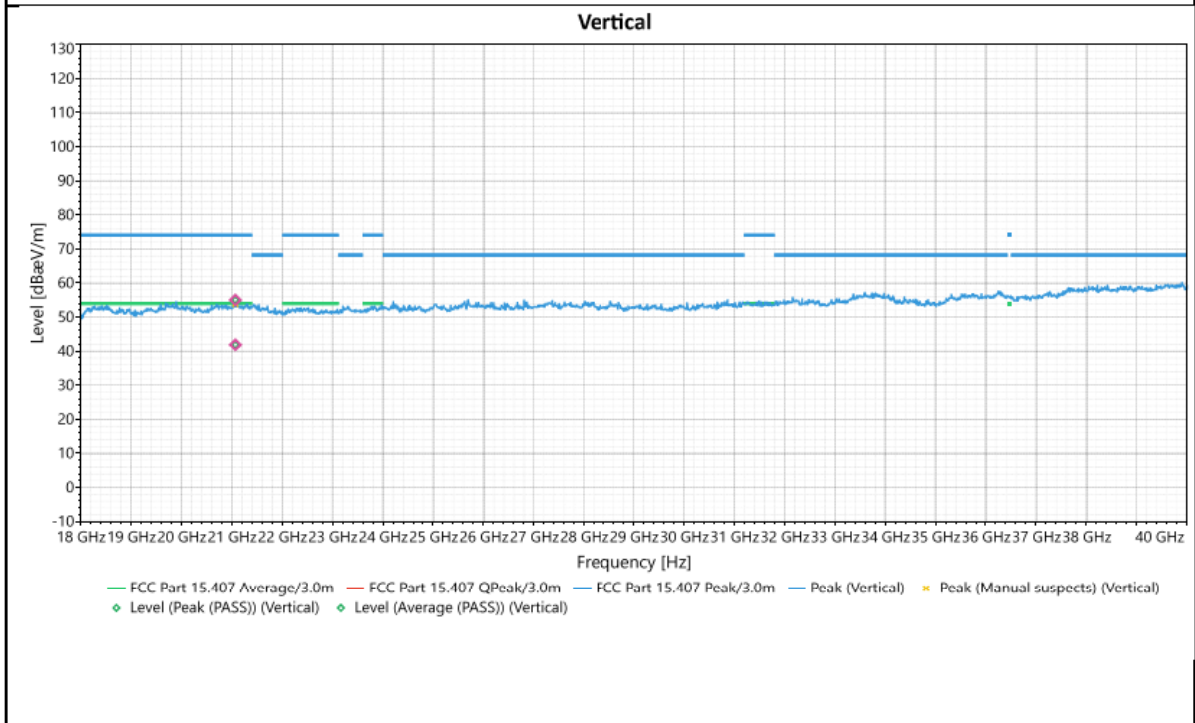
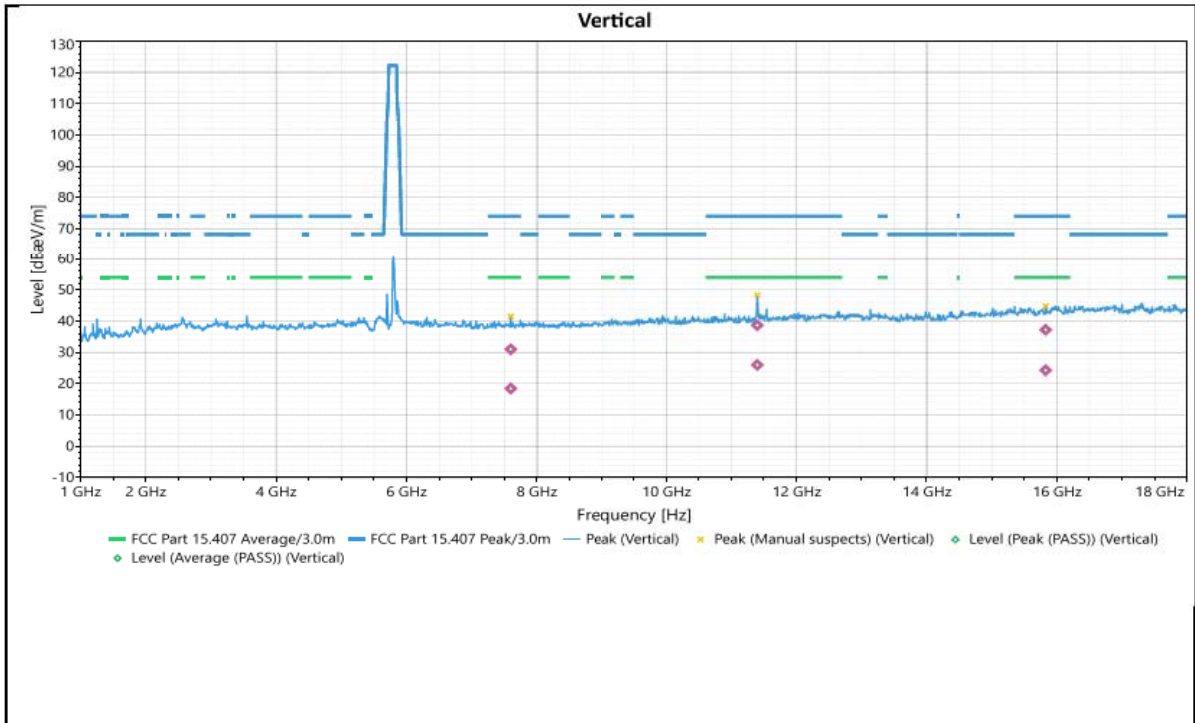


Antenna Polarity & Test Distance: Vertical at 3m									
No.	Frequency (MHz)	Polarization	Level [dB(uV/m)]	Limit dB(uV/m)	Margin [dB]	Height (m)	Angle (Deg)	Factor [dB(1/m)]	Measure Type/ Result
1	11197	Horizontal	34.034	74	-39.966	2.3	354	2.87	Peak (PASS)
2	11197	Horizontal	22.596	54	-31.404	2.3	354	2.87	Average (PASS)
3	21225.1	Horizontal	55.738	74	-18.262	1.73	306	8.34	Peak (PASS)
4	21225.1	Horizontal	42.522	54	-11.478	1.73	306	8.34	Average (PASS)

REMARKS:

1. Level (dBuV) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB) +Preamplifier
3. Margin value = Emission level – Limit value.
4. The emission levels of other frequencies were less than 20dB margin against

CHANNEL	802.11a 5700 MHz	DETECTOR FUNCTION	Prak/Average
FREQUENCY RANGE	1GHz-40GHz		

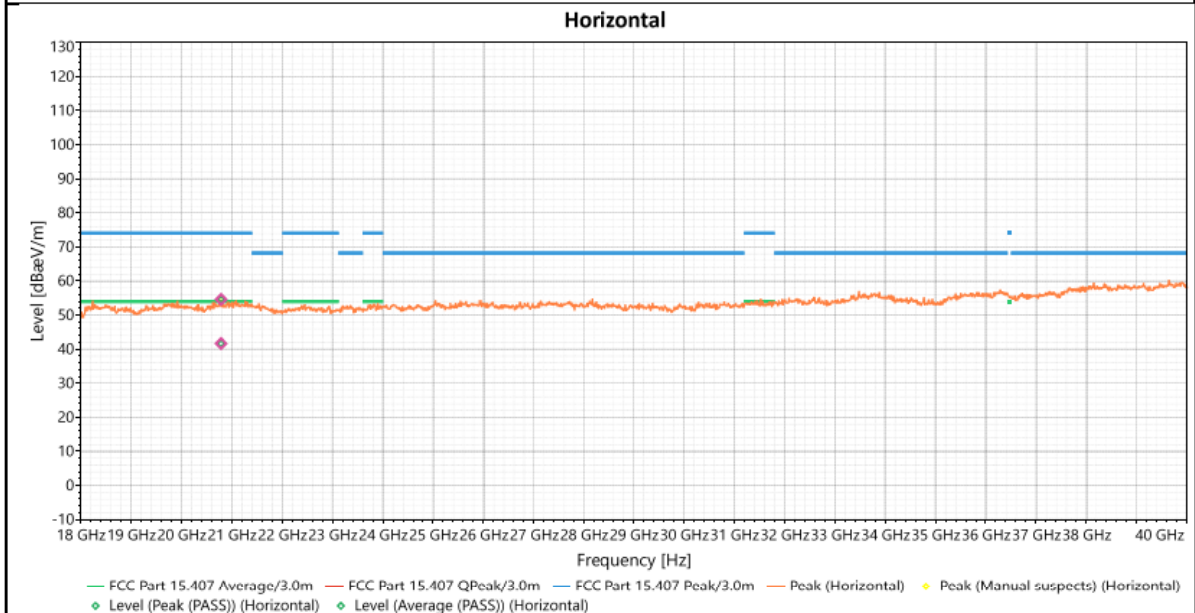
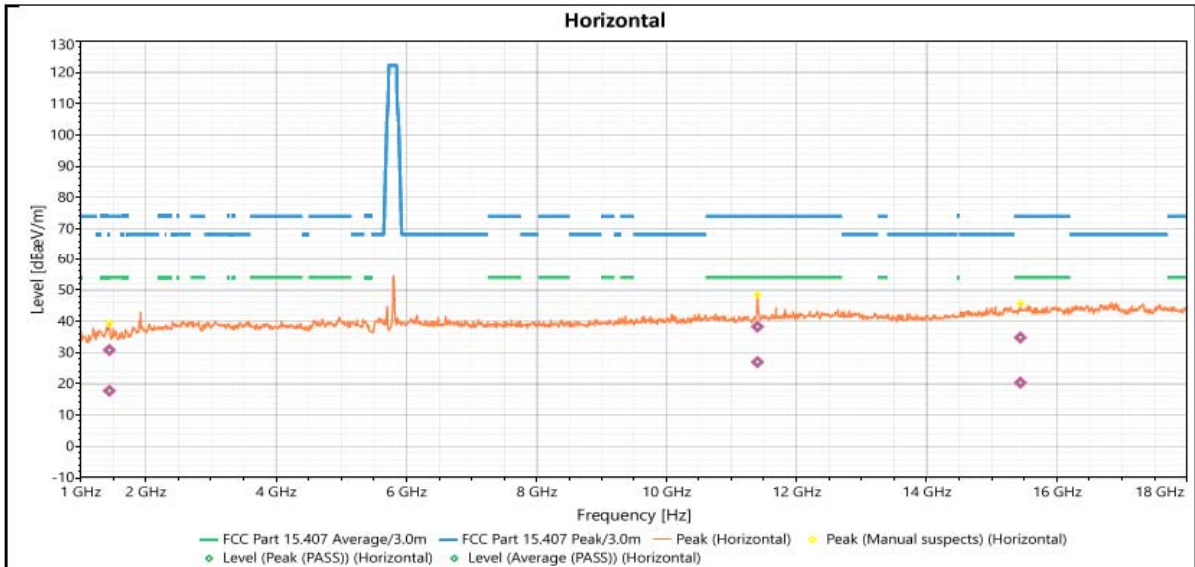


Antenna Polarity & Test Distance: Vertical at 3m									
No.	Frequency (MHz)	Polarization	Level [dB(uV/m)]	Limit dB(uV/m)	Margin [dB]	Height (m)	Angle (Deg)	Factor [dB(1/m)]	Measure Type/ Result
1	7599.4	Vertical	30.988	74	-43.012	2.02	52	2.13	Peak (PASS)
2	7599.4	Vertical	18.451	54	-35.549	2.02	52	2.13	Average (PASS)
3	11399	Vertical	38.679	74	-35.321	1	76	3.13	Peak (PASS)
4	11399	Vertical	26.008	54	-27.992	1	76	3.13	Average (PASS)
5	15829	Vertical	37.241	74	-36.759	2.96	327	4.38	Peak (PASS)
6	15829	Vertical	24.314	54	-29.686	2.96	327	4.38	Average (PASS)
7	21071.21	Vertical	55.013	74	-18.987	1.14	322	8.64	Peak (PASS)
8	21071.21	Vertical	41.869	54	-12.131	1.14	322	8.64	Average (PASS)

REMARKS:

1. Level (dBuV) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB) +Preamplifier
3. Margin value = Emission level – Limit value.
4. The emission levels of other frequencies were less than 20dB margin agains

Frequency	802.11a 5700 MHz	DETECTOR FUNCTION	Prak/Average
FREQUENCY RANGE	1GHz-40GHz		



Antenna Polarity & Test Distance: Vertical at 3m

No.	Frequency (MHz)	Polarization	Level [dB(uV/m)]	Limit dB(uV/m)	Margin [dB]	Height (m)	Angle (Deg)	Factor [dB(1/m)]	Measure Type/ Result
1	1440.3	Horizontal	30.793	74	-43.207	1	207	-4.1	Peak (PASS)
2	1440.3	Horizontal	17.744	54	-36.256	1	207	-4.1	Average (PASS)
3	11402	Horizontal	38.241	74	-35.759	2.18	348	3.24	Peak (PASS)
4	11402	Horizontal	26.948	54	-27.052	2.18	348	3.24	Average (PASS)
5	15441	Horizontal	34.772	74	-39.228	1.2	313	4.57	Peak (PASS)
6	15441	Horizontal	20.36	54	-33.64	1.2	313	4.57	Average (PASS)
7	20787.3	Horizontal	54.598	74	-19.402	1.02	232	8.46	Peak (PASS)
8	20787.3	Horizontal	41.651	54	-12.349	1.02	232	8.46	Average (PASS)

REMARKS:

1. Level (dBuV) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB) +Preamplifier
3. Margin value = Emission level – Limit value.
4. The emission levels of other frequencies were less than 20dB margin agains