

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 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: WIR123580-ROKU_FCC-WLAN_5GHz_Rev 1.0



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

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FCC Test Report

Applicant name: Roku, Inc.

Product: WiFi Remote Control

Report: WIR123580-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 Test Report

Applicant name: Roku, Inc.

Product: WiFi Remote Control

Standard
47 CFR FCC Part 15, Subpart E (Section 15.407)
789033 D02 General UNII Test Procedures New Rules v02r01
ANSI C63.10:2013

Christmas 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

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Release Control Record

Issue No.	Description	Date Issued
WIR123580-ROKU_FCC-WLAN_5GHz	Original release	01/ 20/2023
WIR123580-ROKU_FCC-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
15.203	Antenna Requirement	Pass	Meet the requirement of limit.
15.407 (b)(6)	AC Power Conducted Emissions	Pass	Meet the requirement of limit.
15.407 (b)(1/2/3/4(i/ii)/6)	Radiated Emissions & Band Edge Measurement	Pass	Meet the requirement of limit.
15.407 (a)(1/2/3)	Max Average Transmit Power	Pass	Meet the requirement of limit.
-	Occupied Bandwidth	Pass	Meet the requirement of limit.
15.407 (e)	6 dB Emission Bandwidth	Pass	Meet the requirement of limit. (U-NII-3 only)
15.407 (a)(1/2/3)	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-MC1	
Series Model:	RC-MC5	
Sample Status:	Original	
EUT Specifications:	Primary Power:	5Vdc powered by Adaptor/ 3.8Vdc powered by battery
	Voltage Frequency:	N/A
	Technology / Type of Modulations:	256QAM, 64QAM, 16QAM, QPSK, BPSK for OFDM
	Operating Frequency :	5260 MHz~5320 MHz 5500 MHz~5725 MHz
	FCC ID:	TC2-R1039
Antenna Type:	Chip Antenna	5150-5250 MHz: 2.9 dBi 5260-5700 MHz: 4.3 dBi 5745-5825 MHz: 3.9 dBi
	Maximum EIRP	11.17 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):	January 20, 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-MC1/ RC-MC5	1.0	1.0	Verify by Spectrum Analyzer  ArnebaD 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	85	52	86
56	86	56	86
64	87	64	86
100	82	100	83
116	91	116	91
140	102	140	102
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)

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	<p>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.</p> <p>Antenna requirement must meet at least one of the following:</p> <p>a) Antenna must be permanently attached to the device.</p> <p>b) The antenna must use a unique type of connector to attach to the device.</p> <p>c) Device must be professionally installed. The installer shall be responsible for ensuring that the correct antenna is employed by the device.</p>	<input checked="" type="checkbox"/>
Remark	The EUT uses a Chip Antenna antenna to permanently attach to the device.	
Result	<input checked="" type="checkbox"/> PASS <input type="checkbox"/> 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	<input checked="" type="checkbox"/> 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}
	<input type="checkbox"/> 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:

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

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:

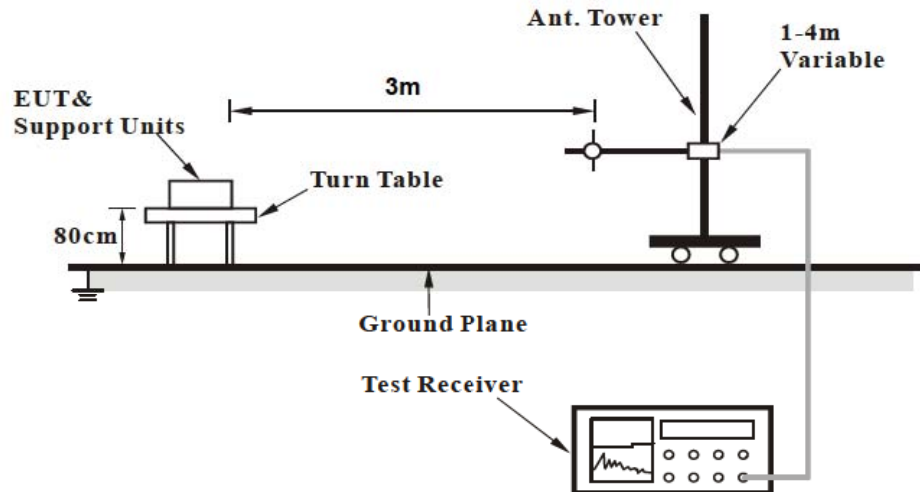
2. Set RBW=100 kHz
3. Set VBW=300 kHz
4. Perform a band-power integration across the 1 MHz bandwidth in which the band-edge emission level is to be measured.

3.2.4 Deviation from Test Standard

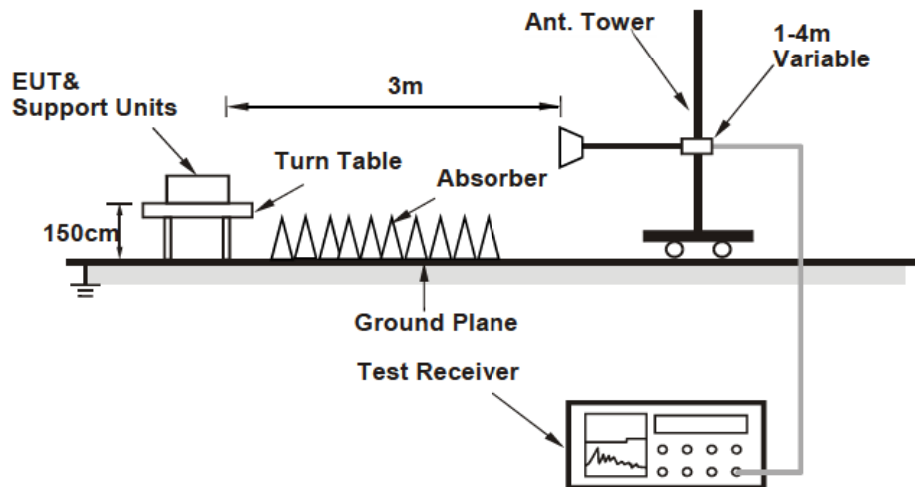
No deviation.

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).

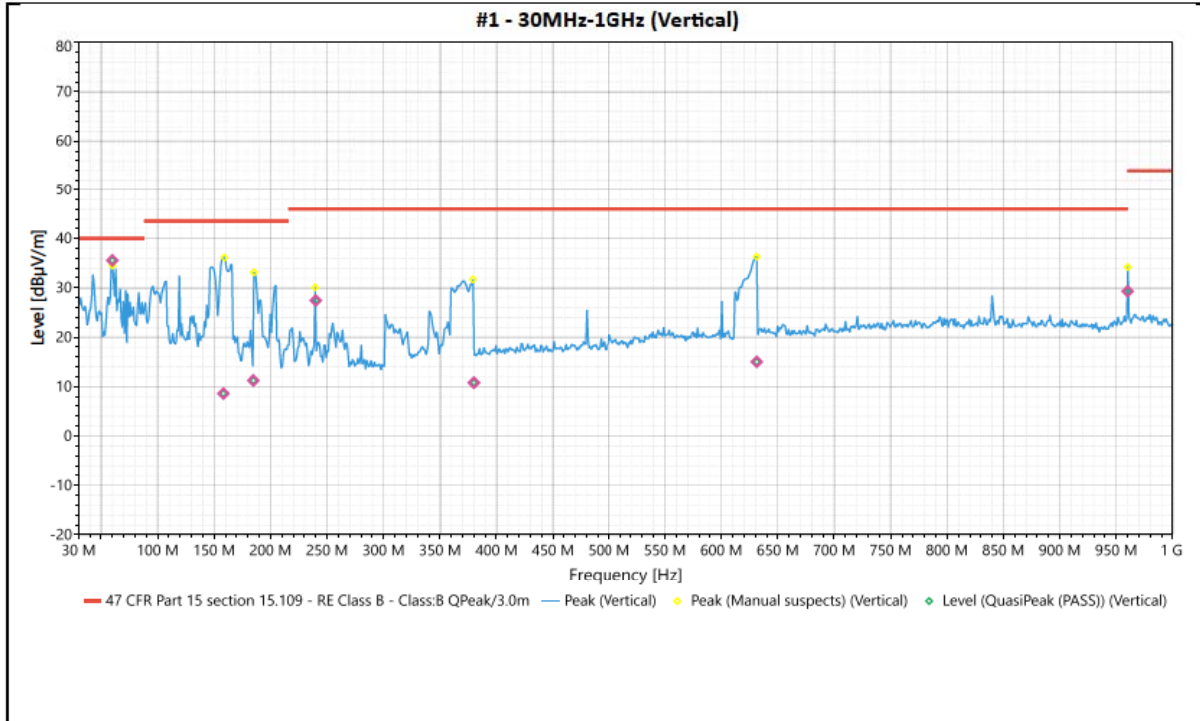
3.2.6 EUT Operating Condition

- a. Placed the EUT on the testing table.
- b. Prepared notebooks to act as communication partner and placed it outside of testing area.
- c. 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.
- d. The necessary accessories enable the system in full functions.

3.2.7 Test Results

Below 1GHz Worst-Case Data:

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



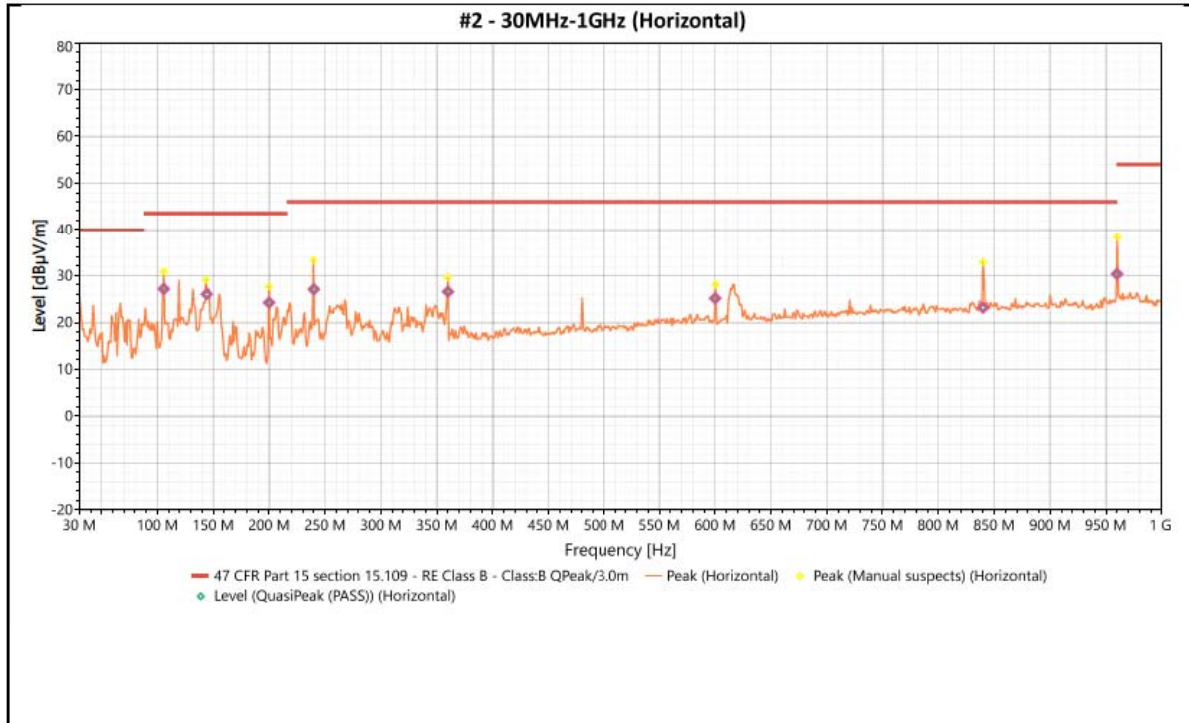
Antenna Polarity & Test Distance: Vertical at 3m									
No.	Frequency (MHz)	Polarization	Level Peak[dB(uV/m)]	Limit Peak dB(uV/m)	Margin Peak [dB]	Height (m)	Angle (Deg)	Factor [dB(1/m)]	Pass/Fail
1	59.998	Vertical	35.558	40	-4.442	1.32	113	-19.69	Pass
2	158.17	Vertical	8.619	43.5	-34.881	3.17	251	-14.8	Pass
3	184.732	Vertical	11.248	43.5	-32.252	1	138	-15.69	Pass
4	240.036	Vertical	27.442	46	-18.558	1	0	-13.59	Pass
5	379.992	Vertical	10.802	46	-35.198	3.39	208	-9.76	Pass
6	631.4	Vertical	15.044	46	-30.956	1.8	244	-5.35	Pass
7	960.074	Vertical	29.306	54	-24.694	1.27	309	-1.59	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 52	DETECTOR FUNCTION	Quasi Peak
FREQUENCY RANGE	30MHz – 1GHz		


Antenna Polarity & Test Distance: Vertical at 3m

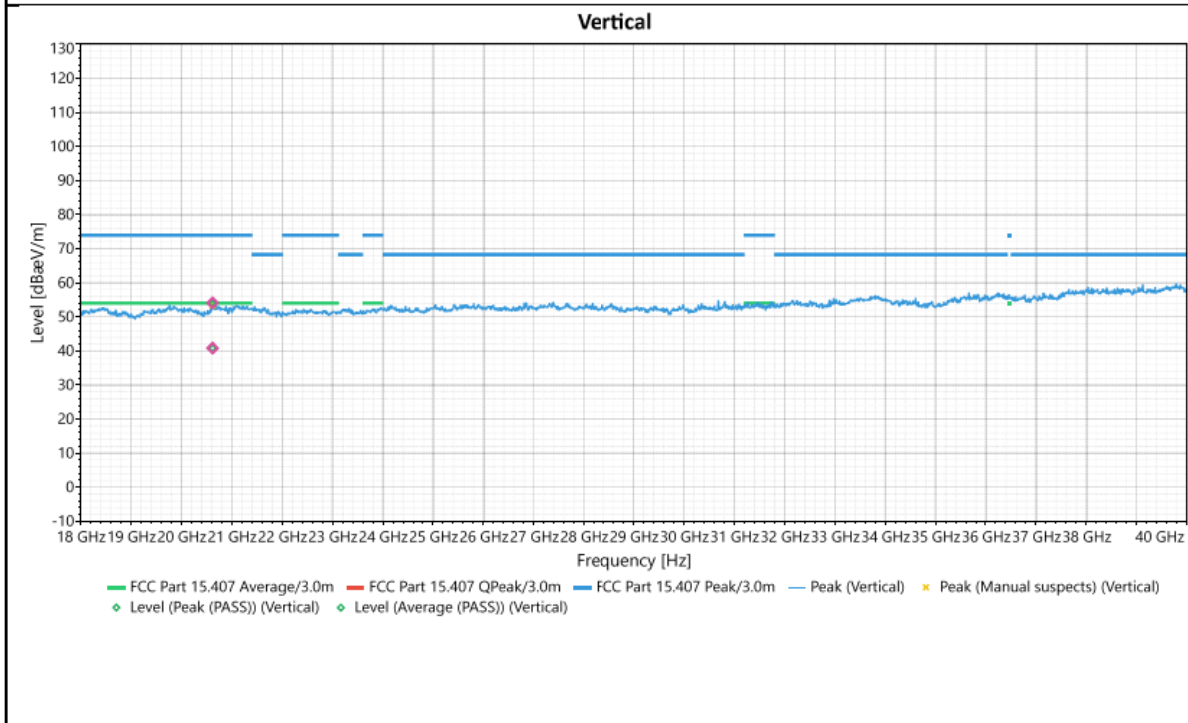
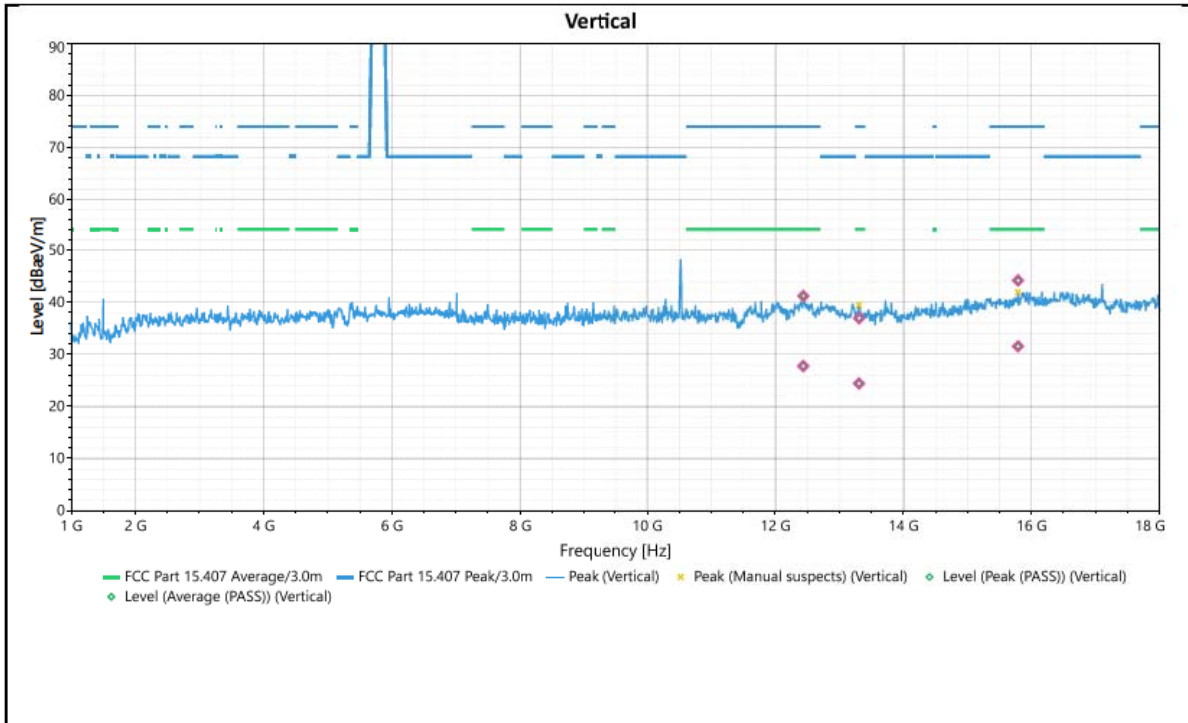
No.	Frequency (MHz)	Polarization	Level Peak[dB(uV/m)]	Limit Peak dB(uV/m)	Margin Peak [dB]	Height (m)	Angle (Deg)	Factor [dB(1/m)]	Pass/Fail
1	105.672	Horizontal	27.18	43.5	-16.32	2.01	133	-13.89	Pass
2	144.09	Horizontal	26.057	43.5	-17.443	1.09	92	-14.38	Pass
3	199.99	Horizontal	24.186	43.5	-19.314	2.64	226	-15.58	Pass
4	240	Horizontal	27.072	46	-18.928	1.89	231	-13.49	Pass
5	360.028	Horizontal	26.57	46	-19.43	1.02	16	-9.78	Pass
6	600.06	Horizontal	25.135	46	-20.865	1.72	57	-5.8	Pass
7	840.082	Horizontal	23.154	46	-22.846	1.86	128	-2.7	Pass
8	960.074	Horizontal	30.316	54	-23.684	1.89	29	-0.19	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)

Above 1GHz Test Data:

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

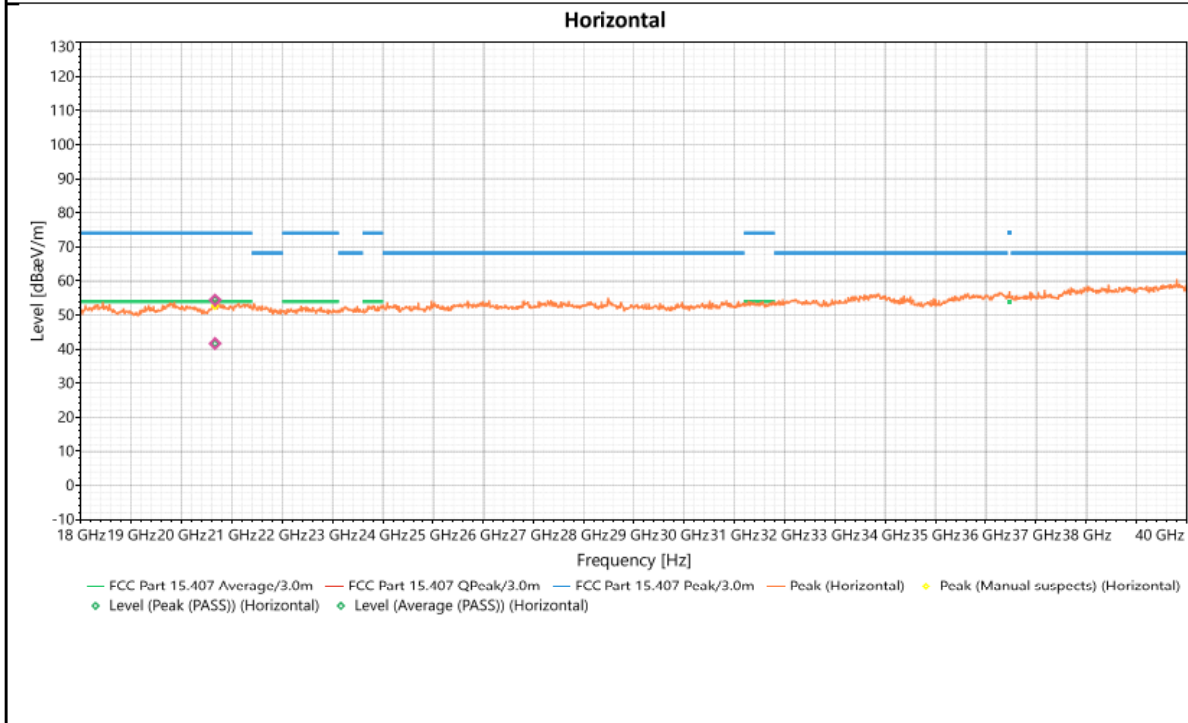
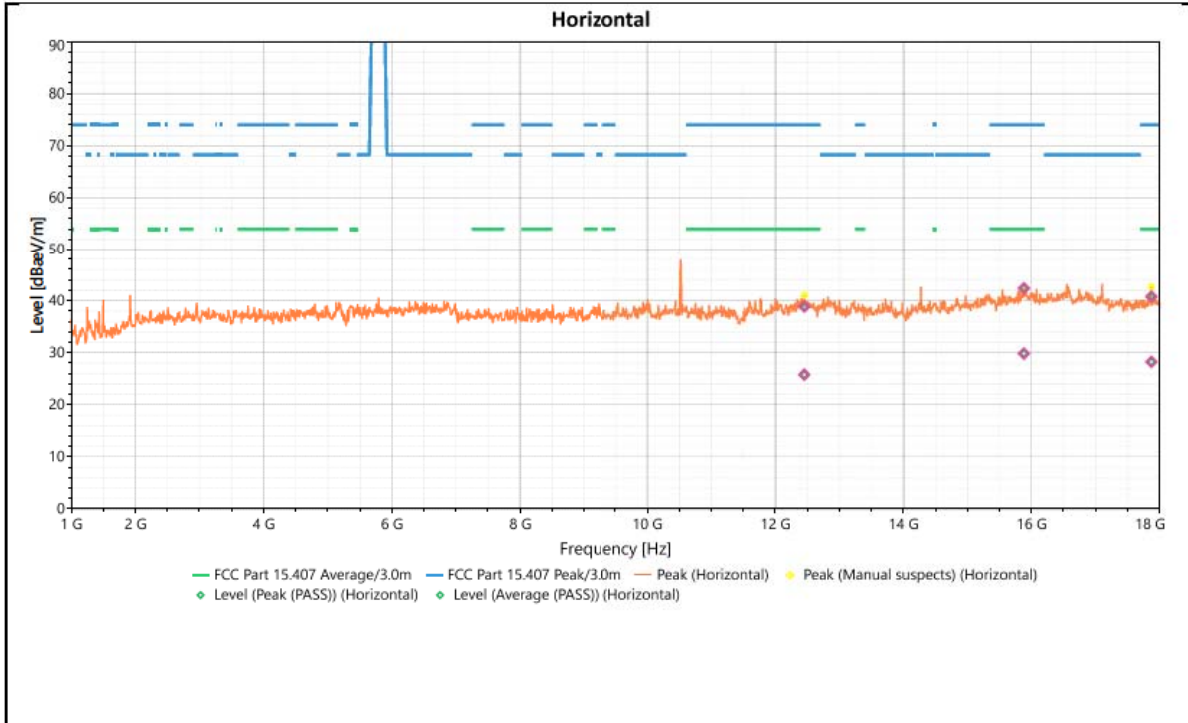


Antenna Polarity & Test Distance: Vertical at 3m									
No.	Frequency (MHz)	Polarization	Level [dB(uV/m)]	Limit dB(uV/m)	Margin [dB]	Height (m)	Angle (Deg)	Factor [dB(1/m)]	Measure Type/ Result
1	12435.92	Vertical	41.189	74	-32.811	1	41.189	3.72	Peak (PASS)
2	12435.92	Vertical	27.737	54	-26.263	1	27.737	3.72	Average (PASS)
3	13306.32	Vertical	36.951	74	-37.049	1.46	36.951	3.27	Peak (PASS)
4	13306.32	Vertical	24.391	54	-29.609	1.46	24.391	3.27	Average (PASS)
5	15788.32	Vertical	44.172	74	-29.828	3.5	44.172	4.9	Peak (PASS)
6	15788.32	Vertical	31.531	54	-22.469	3.5	31.531	4.9	Average (PASS)
7	20618.05	Vertical	54.072	74	-19.928	1.14	160	8.4	Peak (PASS)
8	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		

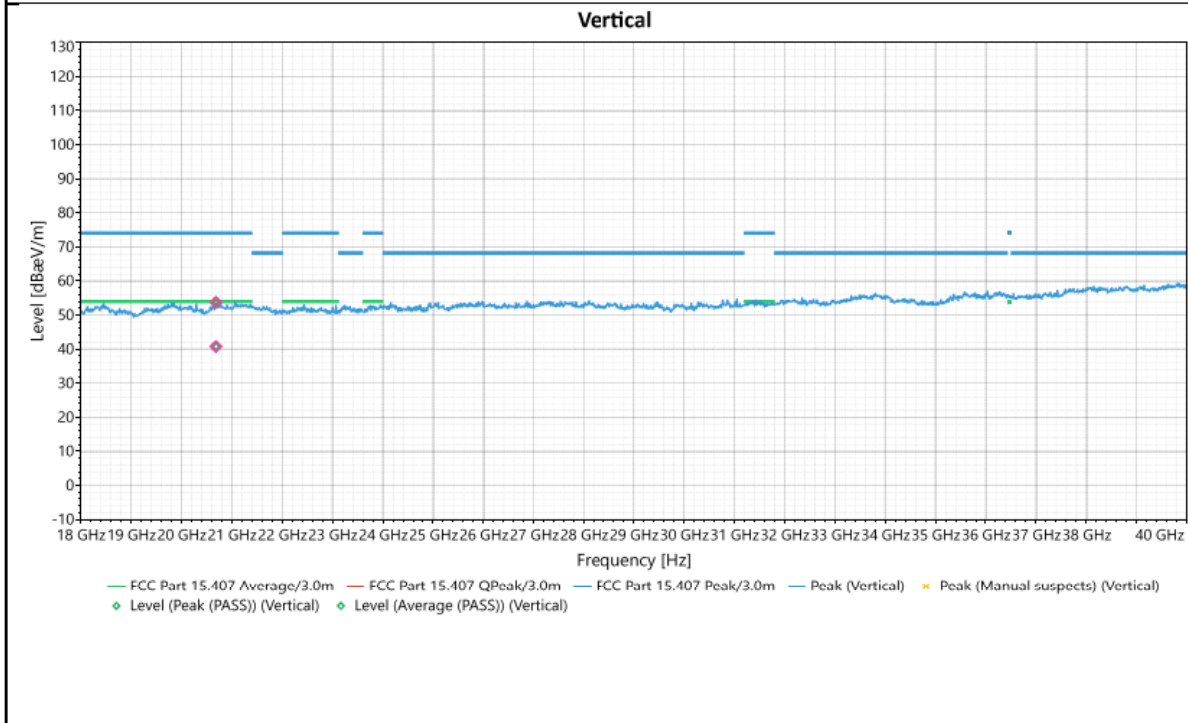
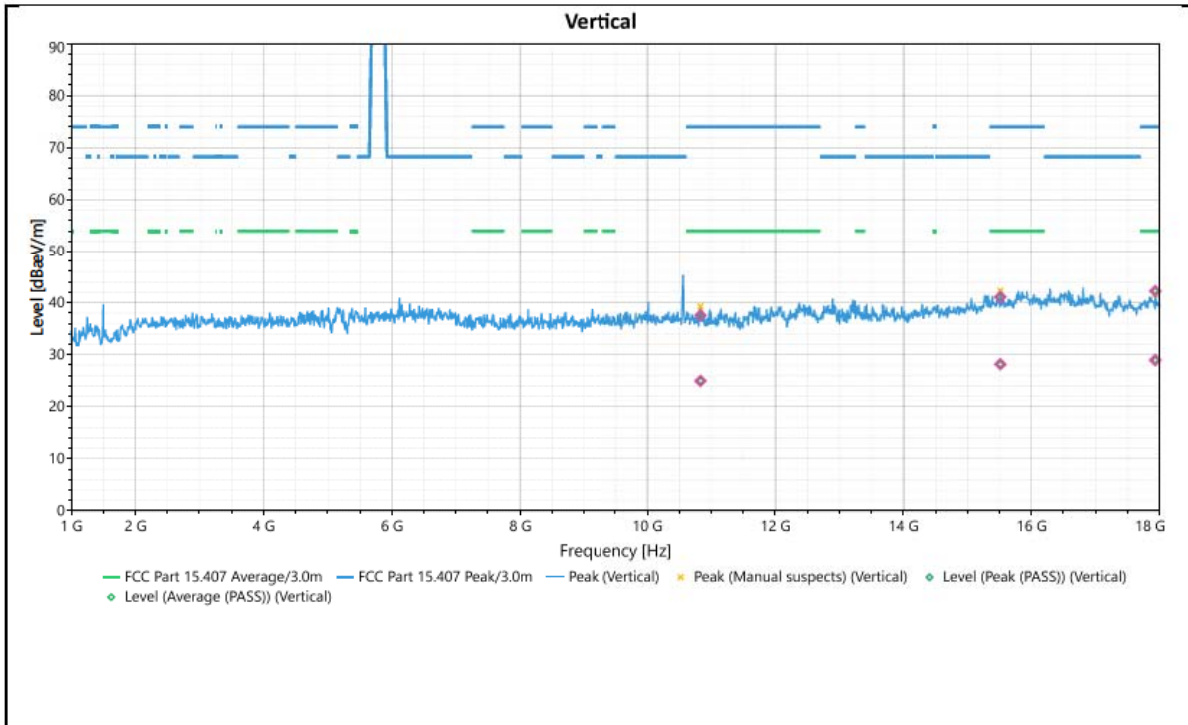


Antenna Polarity & Test Distance: Vertical at 3m									
No.	Frequency (MHz)	Polarization	Level [dB(uV/m)]	Limit dB(uV/m)	Margin [dB]	Height (m)	Angle (Deg)	Factor [dB(1/m)]	Measure Type/ Result
1	12451.15	Horizontal	38.827	74	-35.173	1	221	3.75	Peak (PASS)
2	12451.15	Horizontal	25.759	54	-28.241	1	221	3.75	Average (PASS)
3	15880.06	Horizontal	42.337	74	-31.663	2.34	268	4.8	Peak (PASS)
4	15880.06	Horizontal	29.809	54	-24.191	2.34	268	4.8	Average (PASS)
5	17870.76	Horizontal	40.751	74	-33.249	1.68	203	2.62	Peak (PASS)
6	17870.76	Horizontal	28.213	54	-25.787	1.68	203	2.62	Average (PASS)
7	20668.5	Horizontal	54.423	74	-19.577	1.89	50	8.33	Peak (PASS)
8	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		

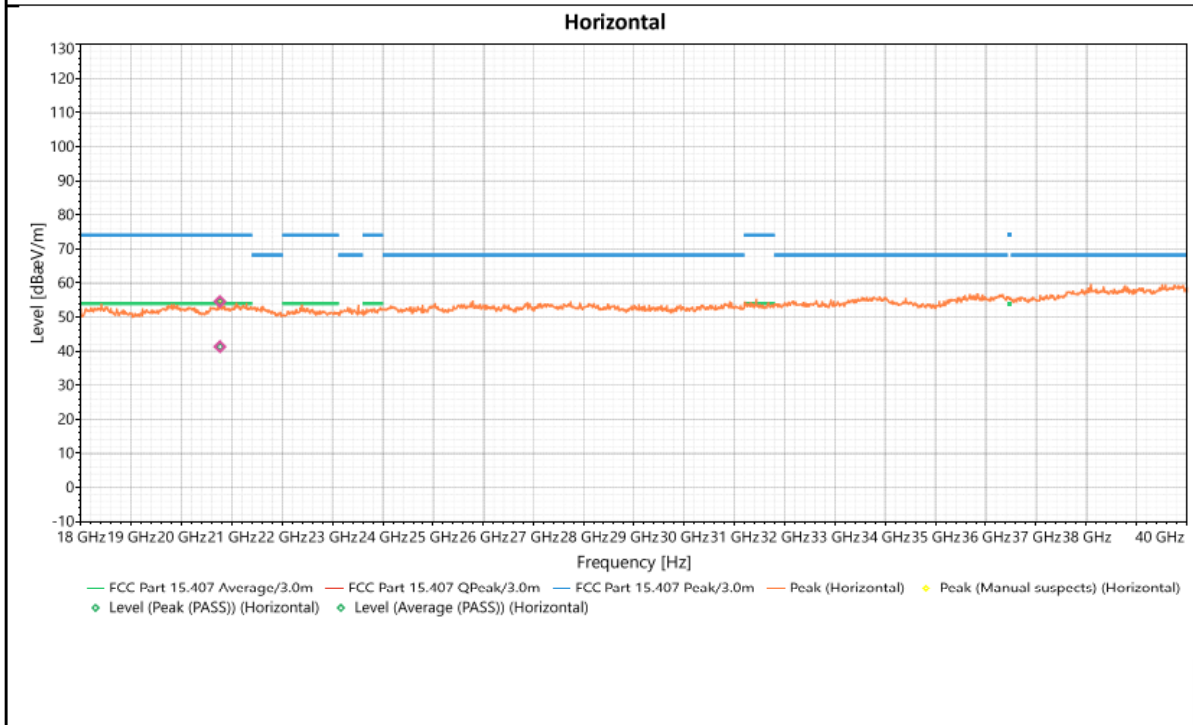
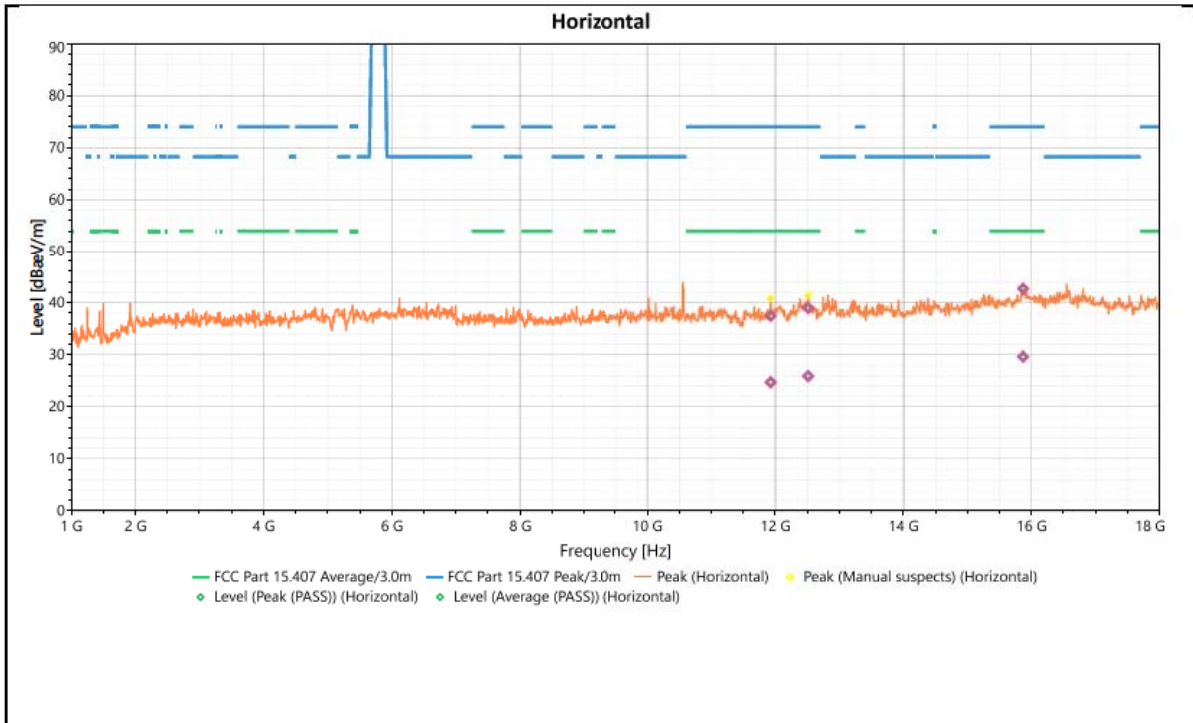


Antenna Polarity & Test Distance: Vertical at 3m									
No.	Frequency (MHz)	Polarization	Level [dB(uV/m)]	Limit dB(uV/m)	Margin [dB]	Height (m)	Angle (Deg)	Factor [dB(1/m)]	Measure Type/ Result
1	10831.03	Vertical	37.514	74	-36.486	1	77	2.79	Peak (PASS)
2	10831.03	Vertical	24.95	54	-29.05	1	77	2.79	Average (PASS)
3	15512.86	Vertical	41.061	74	-32.939	1.49	360	4.28	Peak (PASS)
4	15512.86	Vertical	28.138	54	-25.862	1.49	360	4.28	Average (PASS)
5	17932	Vertical	42.207	74	-31.793	1.21	269	3.1	Peak (PASS)
6	17932	Vertical	28.94	54	-25.06	1.21	269	3.1	Average (PASS)
7	20686.24	Vertical	53.707	74	-20.293	1.49	314	8.45	Peak (PASS)
8	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		

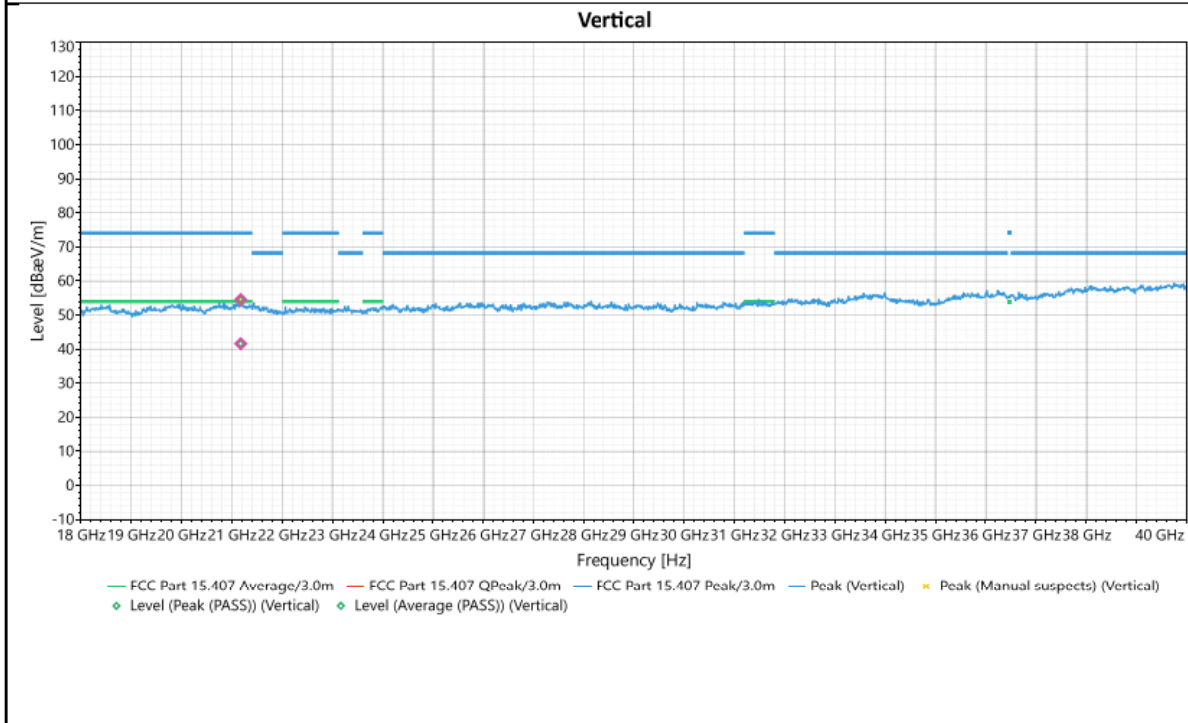
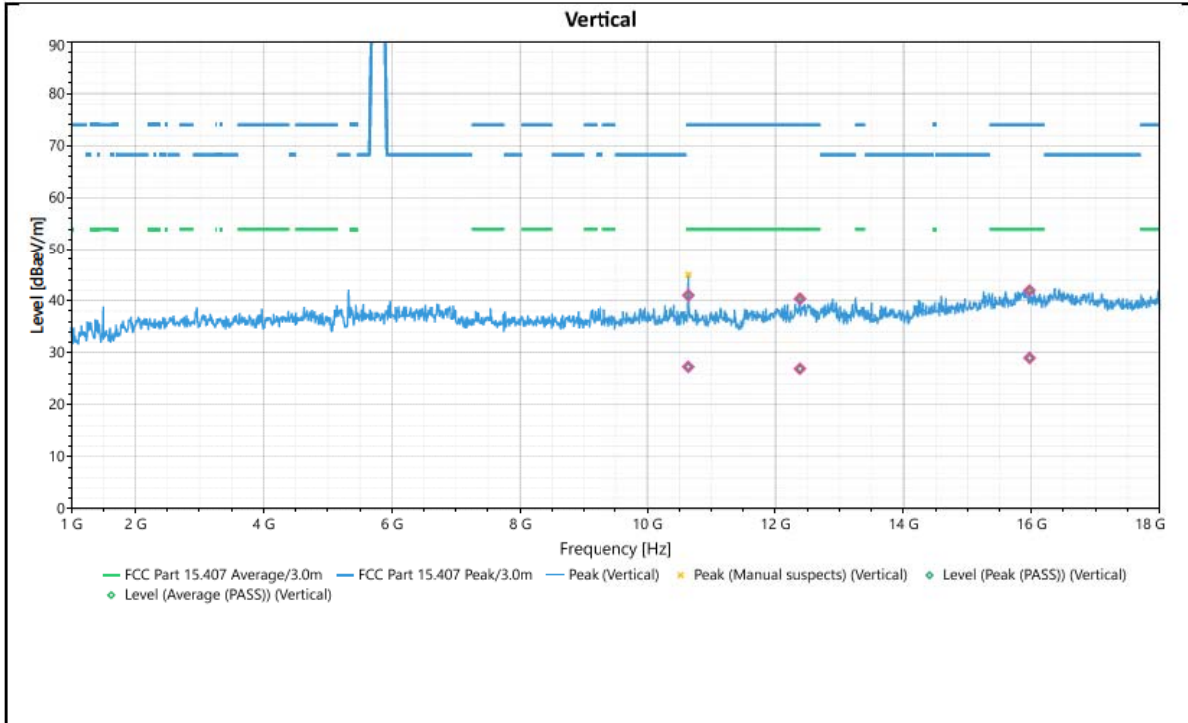


Antenna Polarity & Test Distance: Vertical at 3m									
No.	Frequency (MHz)	Polarization	Level [dB(uV/m)]	Limit dB(uV/m)	Margin [dB]	Height (m)	Angle (Deg)	Factor [dB(1/m)]	Measure Type/ Result
1	11925.84	Horizontal	37.427	74	-36.573	1.02	222	3.45	Peak (PASS)
2	11925.84	Horizontal	24.681	54	-29.319	1.02	222	3.45	Average (PASS)
3	12512.4	Horizontal	38.971	74	-35.029	1	359	3.8	Peak (PASS)
4	12512.4	Horizontal	25.871	54	-28.129	1	359	3.8	Average (PASS)
5	15868.15	Horizontal	42.657	74	-31.343	1.49	29	4.79	Peak (PASS)
6	15868.15	Horizontal	29.568	54	-24.432	1.49	29	4.79	Average (PASS)
7	20765.3	Horizontal	54.571	74	-19.429	1.55	262	8.44	Peak (PASS)
8	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		

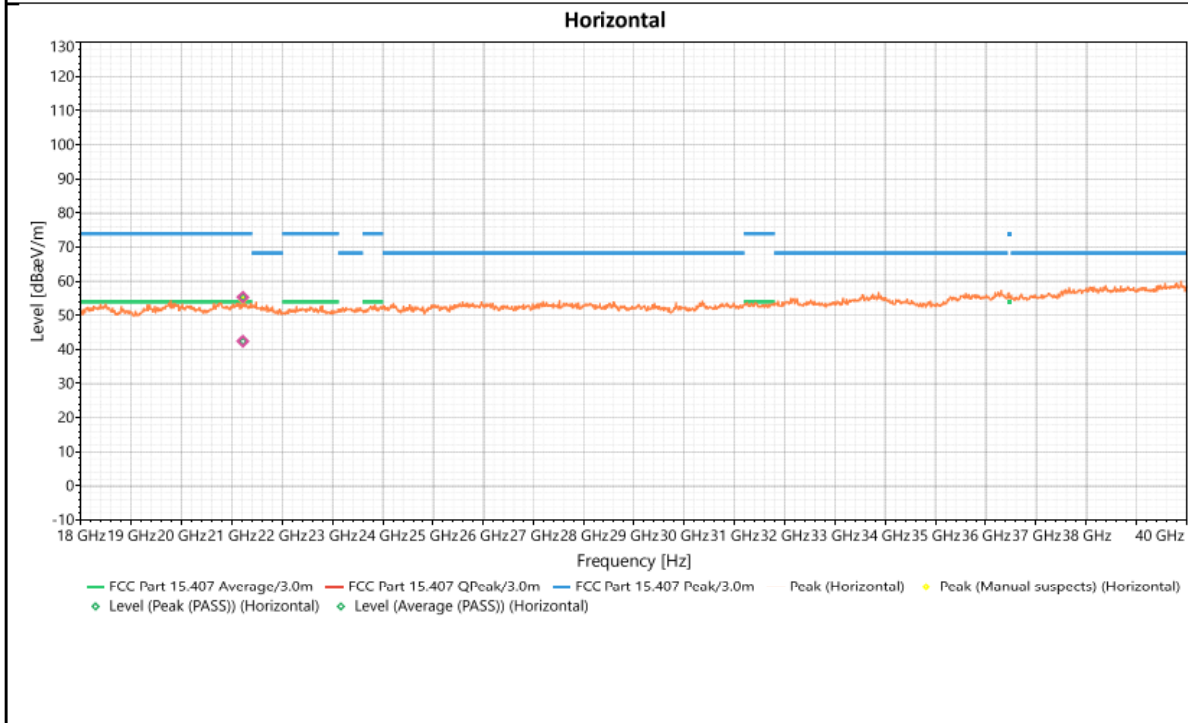
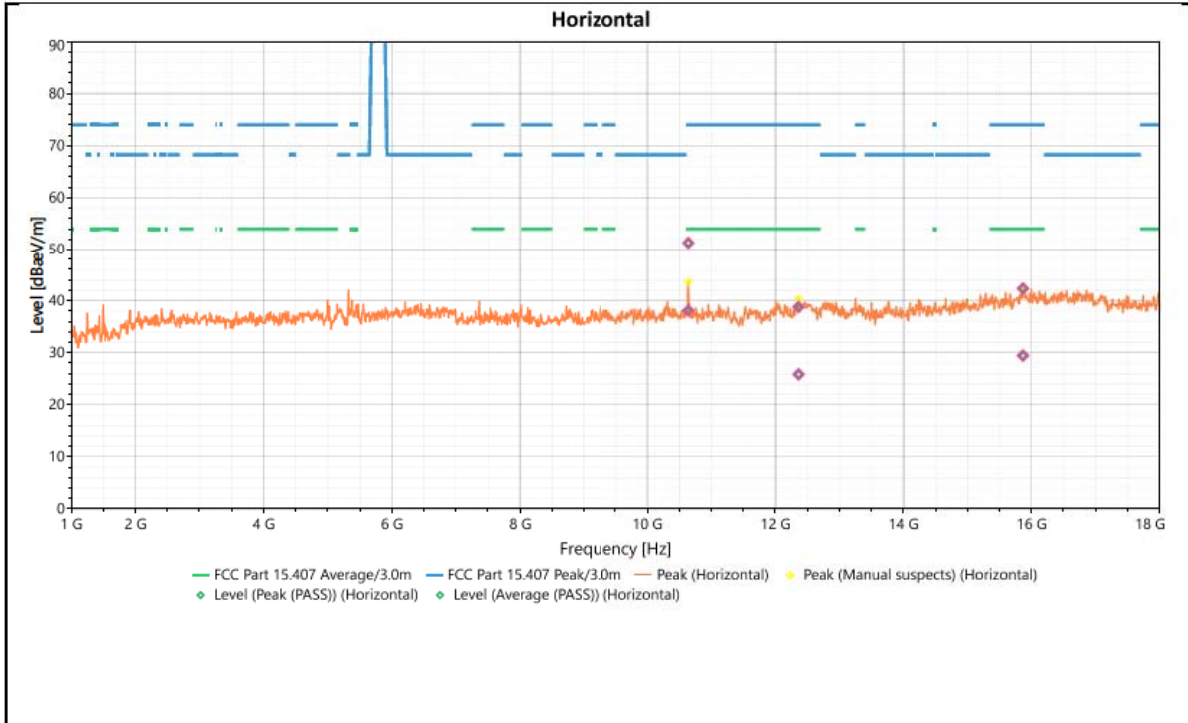


Antenna Polarity & Test Distance: Vertical at 3m									
No.	Frequency (MHz)	Polarization	Level [dB(uV/m)]	Limit dB(uV/m)	Margin [dB]	Height (m)	Angle (Deg)	Factor [dB(1/m)]	Measure Type/ Result
1	10640.7	Vertical	40.991	74	-33.009	1	326	2.7	Peak (PASS)
2	10640.7	Vertical	27.249	54	-26.751	1	326	2.7	Average (PASS)
3	12384.95	Vertical	40.299	74	-33.701	1	357	3.63	Peak (PASS)
4	12384.95	Vertical	26.897	54	-27.103	1	357	3.63	Average (PASS)
5	15968.5	Vertical	41.904	74	-32.096	1.49	221	4.96	Peak (PASS)
6	15968.5	Vertical	28.968	54	-25.032	1.49	221	4.96	Average (PASS)
7	21176.78	Vertical	54.549	74	-19.451	2	74	8.5	Peak (PASS)
8	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		

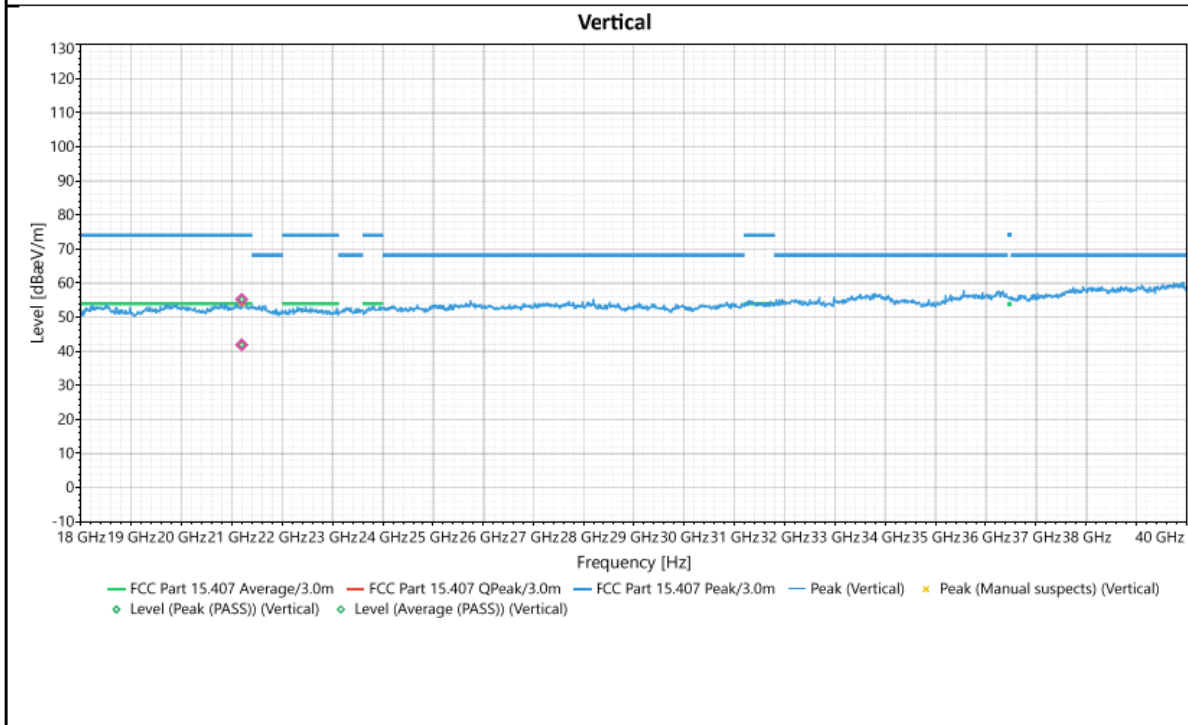
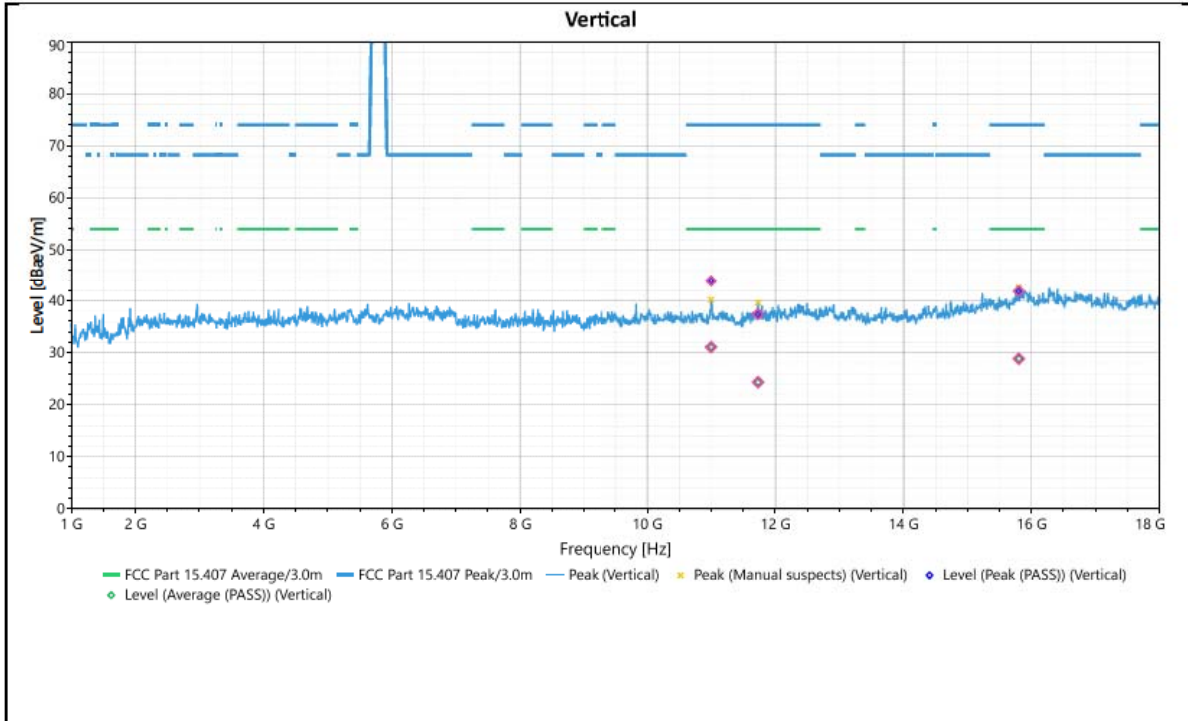


Antenna Polarity & Test Distance: Vertical at 3m									
No.	Frequency (MHz)	Polarization	Level [dB(uV/m)]	Limit dB(uV/m)	Margin [dB]	Height (m)	Angle (Deg)	Factor [dB(1/m)]	Measure Type/ Result
1	10640.71	Horizontal	51.291	74	-22.709	2.05	317	2.82	Peak (PASS)
2	10640.71	Horizontal	38.112	54	-15.888	2.05	317	2.82	Average (PASS)
3	12362.75	Horizontal	38.741	74	-35.259	1	357	3.62	Peak (PASS)
4	12362.75	Horizontal	25.81	54	-28.19	1	357	3.62	Average (PASS)
5	15866.52	Horizontal	42.296	74	-31.704	1.49	0	4.79	Peak (PASS)
6	15866.52	Horizontal	29.415	54	-24.585	1.49	0	4.79	Average (PASS)
7	21220.7	Horizontal	55.297	74	-18.703	1	119	8.34	Peak (PASS)
8	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		

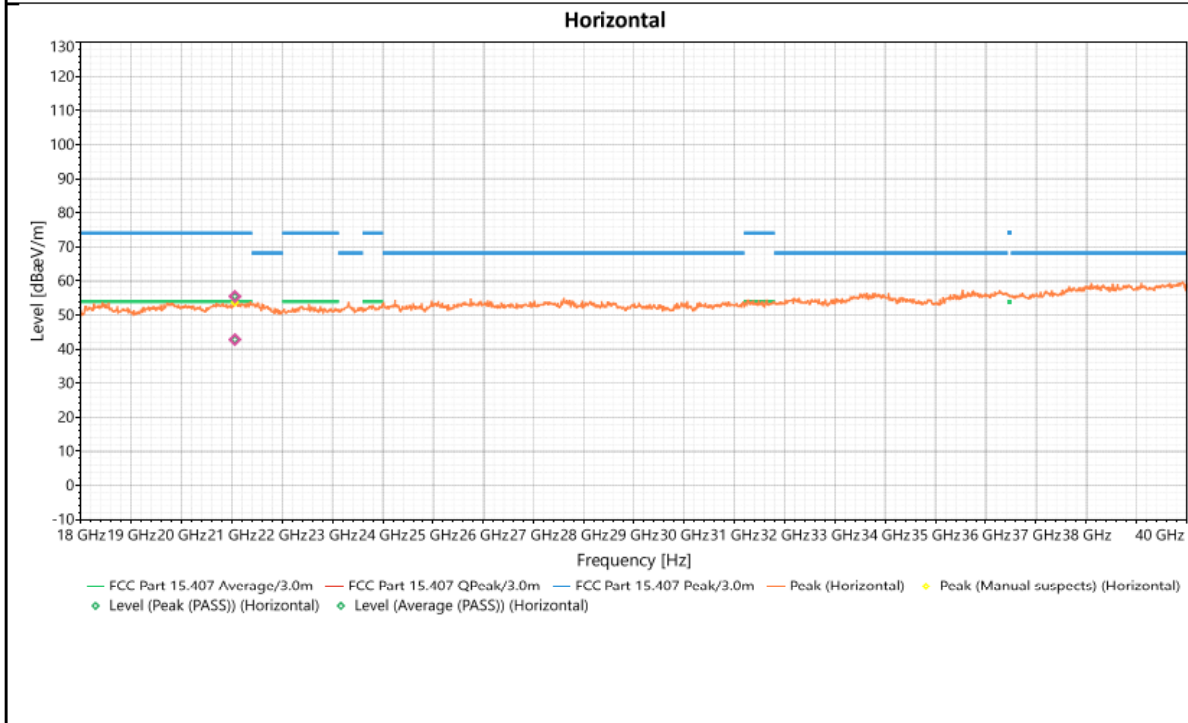
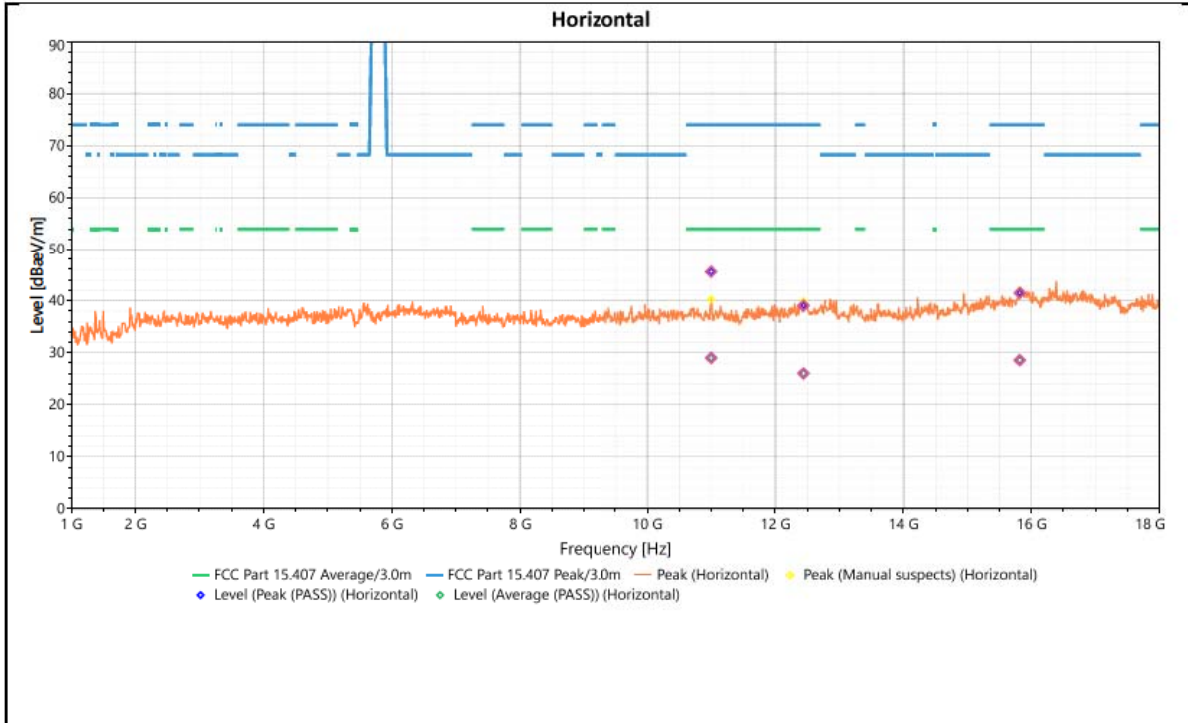


Antenna Polarity & Test Distance: Vertical at 3m									
No.	Frequency (MHz)	Polarization	Level [dB(uV/m)]	Limit dB(uV/m)	Margin [dB]	Height (m)	Angle (Deg)	Factor [dB(1/m)]	Measure Type/ Result
1	10997.71	Vertical	43.898	74	-30.102	1.85	310	2.74	Peak (PASS)
2	10997.71	Vertical	31.056	54	-22.944	1.85	310	2.74	Average (PASS)
3	11730.41	Vertical	37.403	74	-36.597	1	317	3.3	Peak (PASS)
4	11730.41	Vertical	24.326	54	-29.674	1	317	3.3	Average (PASS)
5	15801.88	Vertical	41.821	74	-32.179	1	173	4.92	Peak (PASS)
6	15801.88	Vertical	28.822	54	-25.178	1	173	4.92	Average (PASS)
7	21198.8	Vertical	55.204	74	-18.796	1.64	188	8.46	Peak (PASS)
8	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		

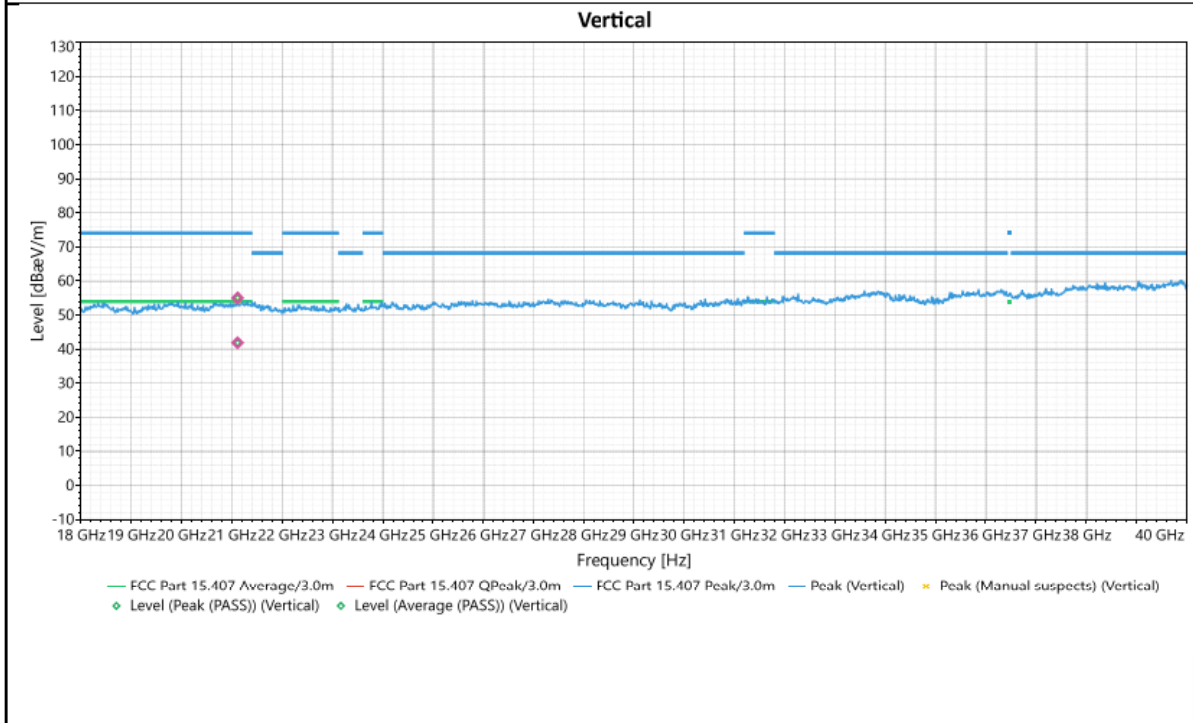
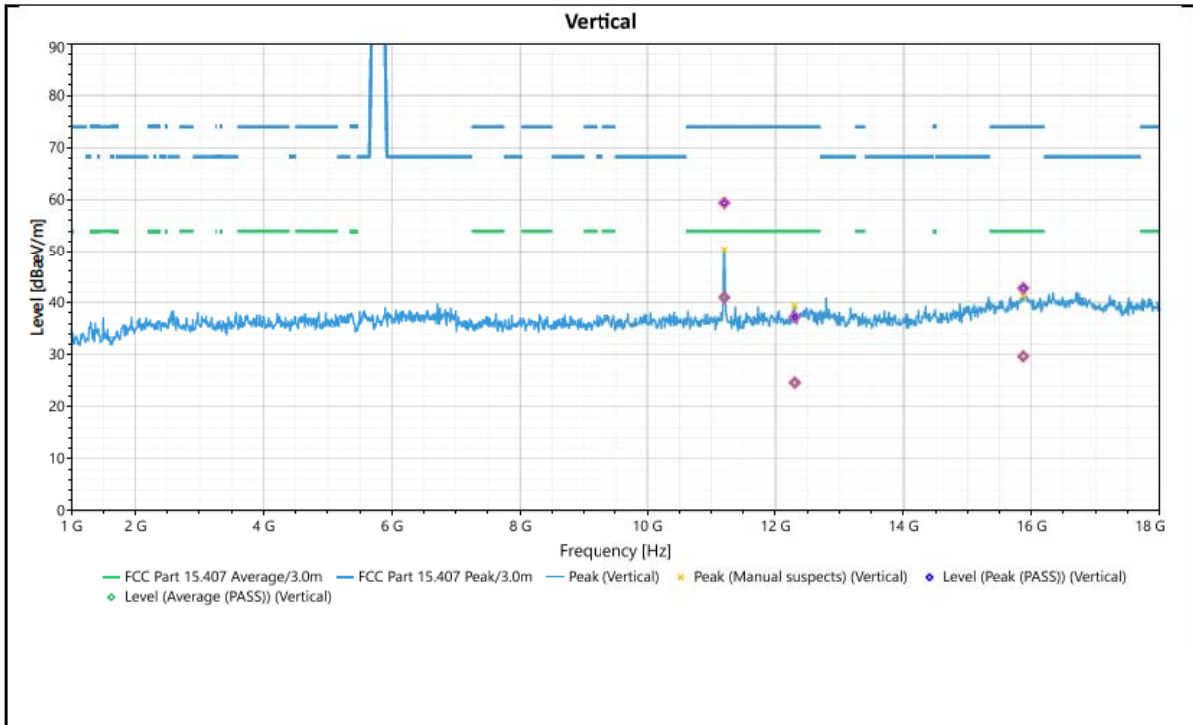


Antenna Polarity & Test Distance: Vertical at 3m									
No.	Frequency (MHz)	Polarization	Level [dB(uV/m)]	Limit dB(uV/m)	Margin [dB]	Height (m)	Angle (Deg)	Factor [dB(1/m)]	Measure Type/ Result
1	10997.69	Horizontal	45.563	74	-28.437	2.05	221	2.81	Peak (PASS)
2	10997.69	Horizontal	28.983	54	-25.017	2.05	221	2.81	Average (PASS)
3	12439.22	Horizontal	39.012	74	-34.988	1.77	221	3.73	Peak (PASS)
4	12439.22	Horizontal	25.992	54	-28.008	1.77	221	3.73	Average (PASS)
5	15817.13	Horizontal	41.462	74	-32.538	1.49	359	4.74	Peak (PASS)
6	15817.13	Horizontal	28.537	54	-25.463	1.49	359	4.74	Average (PASS)
7	21062.3	Horizontal	55.454	74	-18.546	1.14	247	8.5	Peak (PASS)
8	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		

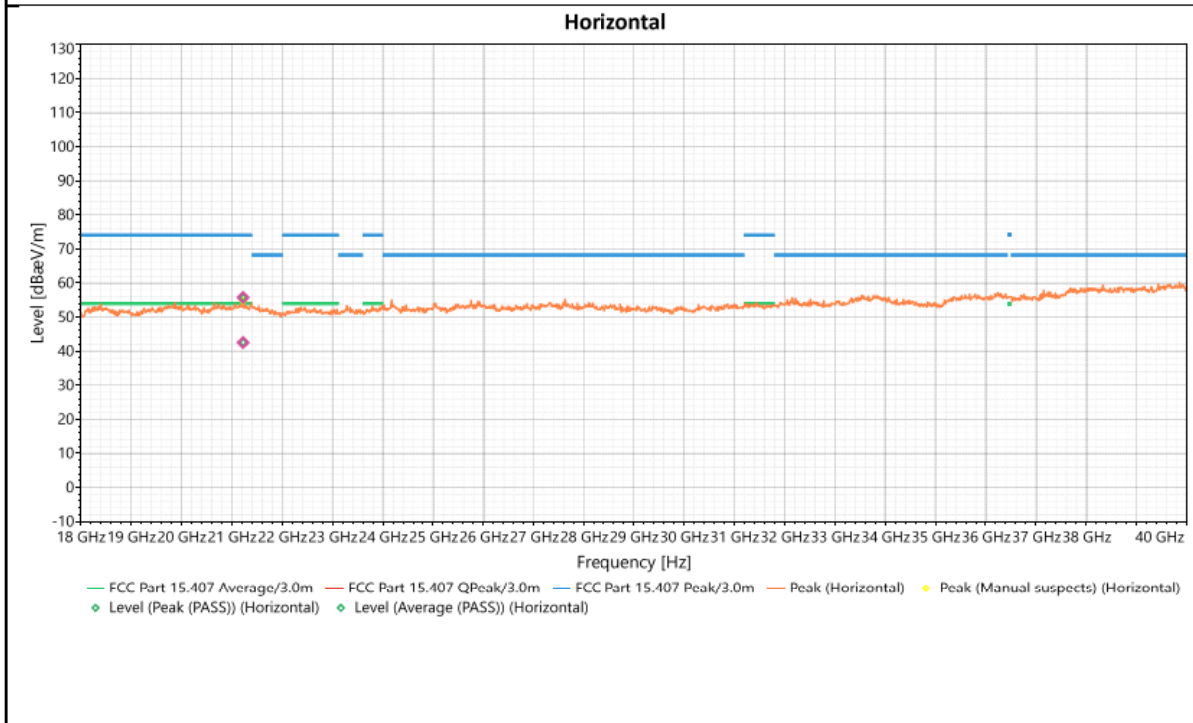
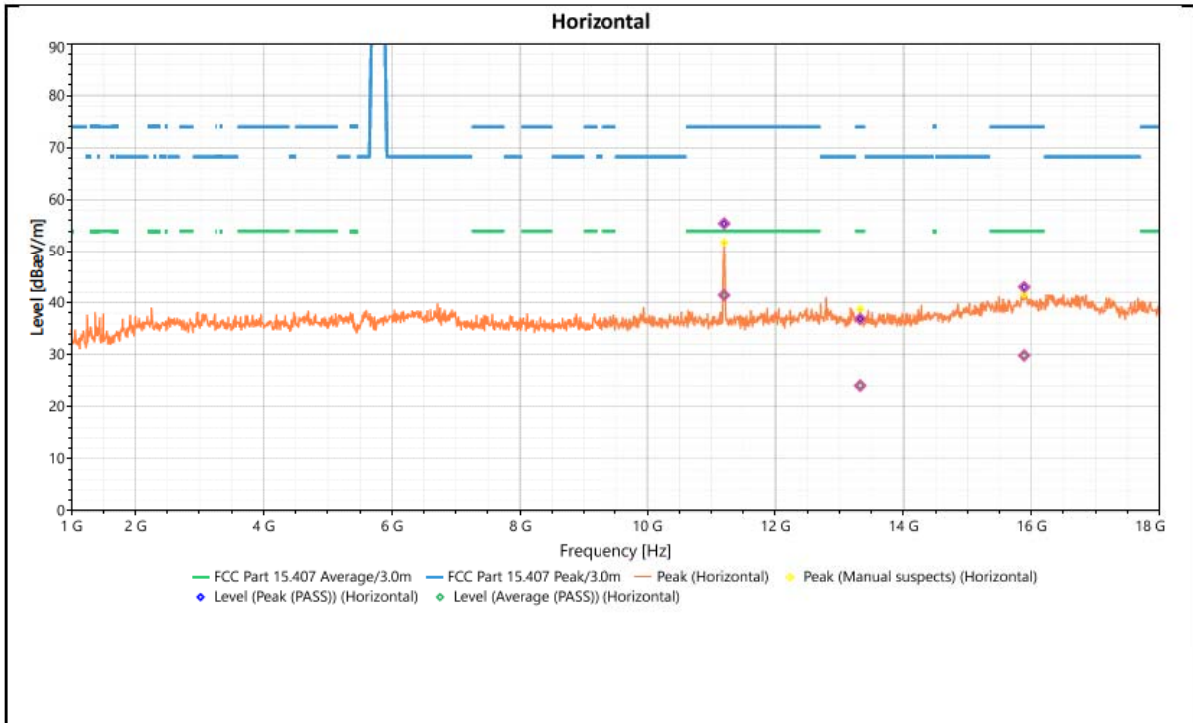


Antenna Polarity & Test Distance: Vertical at 3m									
No.	Frequency (MHz)	Polarization	Level [dB(uV/m)]	Limit dB(uV/m)	Margin [dB]	Height (m)	Angle (Deg)	Factor [dB(1/m)]	Measure Type/ Result
1	11203.36	Vertical	59.387	74	-14.613	1.9	174	2.65	Peak (PASS)
2	11203.36	Vertical	40.958	54	-13.042	1.9	174	2.65	Average (PASS)
3	12301.64	Vertical	37.179	74	-36.821	1	317	3.66	Peak (PASS)
4	12301.64	Vertical	24.621	54	-29.379	1	317	3.66	Average (PASS)
5	15871.58	Vertical	42.741	74	-31.259	1.21	221	4.97	Peak (PASS)
6	15871.58	Vertical	29.66	54	-24.34	1.21	221	4.97	Average (PASS)
7	21115.2	Vertical	55.021	74	-18.979	1.73	0	8.6	Peak (PASS)
8	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		

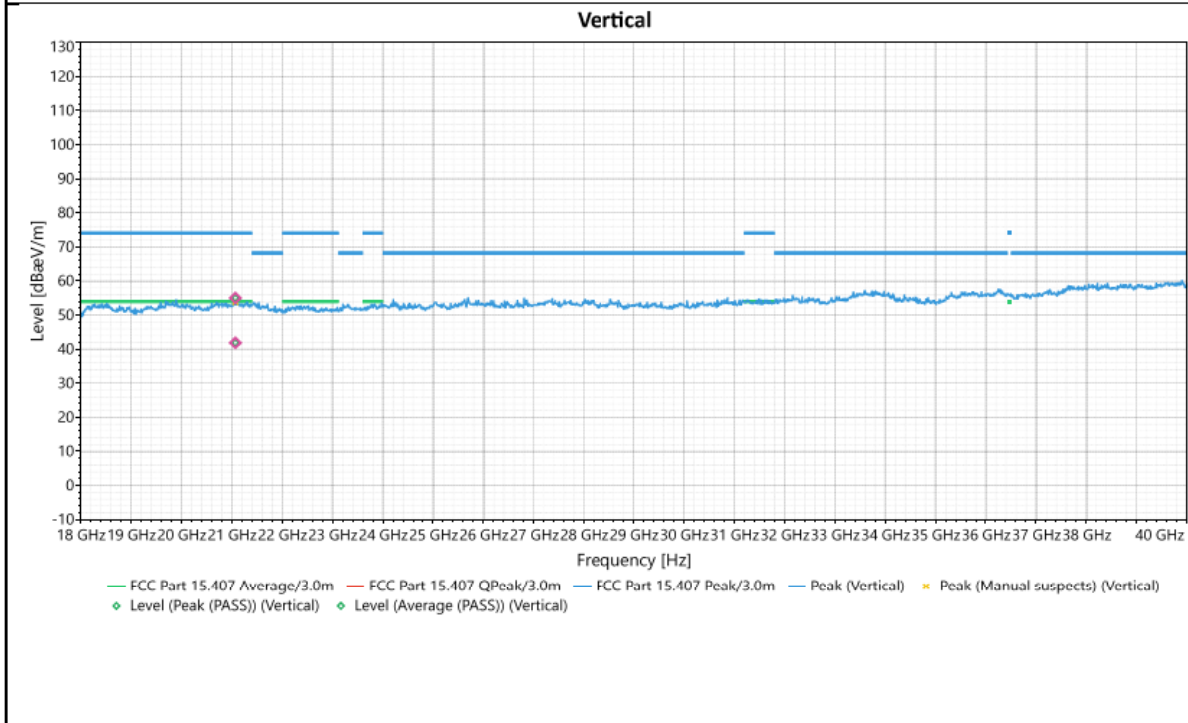
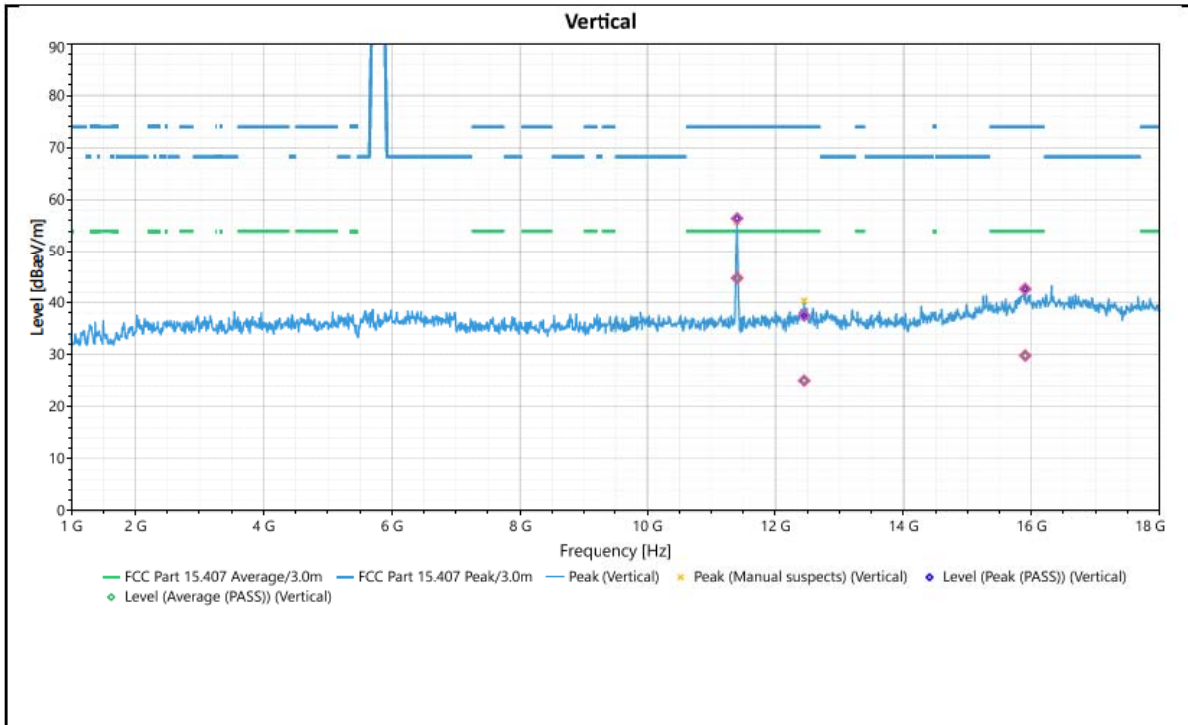


Antenna Polarity & Test Distance: Vertical at 3m									
No.	Frequency (MHz)	Polarization	Level [dB(uV/m)]	Limit dB(uV/m)	Margin [dB]	Height (m)	Angle (Deg)	Factor [dB(1/m)]	Measure Type/ Result
1	11200.09	Horizontal	55.439	74	-18.561	2.05	221	2.64	Peak (PASS)
2	11200.09	Horizontal	41.431	54	-12.569	2.05	221	2.64	Average (PASS)
3	13324.94	Horizontal	36.838	74	-37.162	1.21	173	3.24	Peak (PASS)
4	13324.94	Horizontal	24.026	54	-29.974	1.21	173	3.24	Average (PASS)
5	15885.21	Horizontal	42.946	74	-31.054	1.77	125	4.8	Peak (PASS)
6	15885.21	Horizontal	29.826	54	-24.174	1.77	125	4.8	Average (PASS)
7	21225.1	Horizontal	55.738	74	-18.262	1.73	306	8.34	Peak (PASS)
8	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 agains

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	11402.32	Vertical	56.428	74	-17.572	1.39	220	2.71	Peak (PASS)
2	11402.32	Vertical	44.698	54	-9.302	1.39	220	2.71	Average (PASS)
3	12449.44	Vertical	37.485	74	-36.515	1	269	3.75	Peak (PASS)
4	12449.44	Vertical	24.995	54	-29.005	1	269	3.75	Average (PASS)
5	15900.56	Vertical	42.591	74	-31.409	1	173	4.95	Peak (PASS)
6	15900.56	Vertical	29.789	54	-24.211	1	173	4.95	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		

