



FCC / ISED Test Report

For:
Life360, Inc.

Model Number:
TP401

Market Name:
Life360 PET GPS

Product Description:
Life360 PET GPS

Applied Rules and Standards:
47 CFR Part 15.247 (DTS)
RSS-247 Issue 3 (DTS) & RSS-Gen Issue 5

FCC ID: 2AKLITP401
IC: 11858A-TP401

REPORT #: EMC_JIOBI_013_25001_FCC_15_247_WLAN

DATE: 2025-06-17



A2LA Accredited

IC recognized #
3462B

CETECOM Inc.

411 Dixon Landing Road ♦ Milpitas, CA 95035 ♦ U.S.A.

Phone: + 1 (408) 586 6200 ♦ Fax: + 1 (408) 586 6299 ♦ E-mail: contact@cetecom.com ♦ <http://www.cetecom.com>

CETECOM Inc. is a Delaware Corporation with Corporation number: 2905571

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1 Assessment

The following device was evaluated against the applicable criteria specified in FCC rules Parts 15.247 of Title 47 of the Code of Federal Regulations and the relevant ISED Canada standard RSS-247.

No deviations were ascertained.

Company Name	Product Description	Model No.
Life360, Inc.	Life360 PET GPS	TP401

Report Reviewer:

Alvin, Ilarina

2025-06-17

Compliance

(Senior Manager Regulatory Services)

Date	Section	Name	Signature
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Responsible for the Report:

Cheng Song

2025-06-17

Compliance

(EMC Engineer)

Date	Section	Name	Signature
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The test results of this test report relate exclusively to the test item specified in Section 3.

CETECOM Inc. USA does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of CETECOM Inc. USA.

2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the EMC Test Report

Company Name:	CETECOM Inc.
Department:	Compliance
Street Address:	411 Dixon Landing Road
City/Zip Code	Milpitas, CA 95035
Country	USA
Telephone:	+1 (408) 586 6200
Fax:	+1 (408) 586 6299
Senior Manager Regulatory Services:	Alvin, Ilarina
Responsible Project Leader:	Ruby, Hall

2.2 Identification of the Client

Applicant's Name:	Life360, Inc.
Street Address:	1900 S NORFOLK ST Suite 310
City/Zip Code	San Mateo CA 94403
Country	USA

2.3 Identification of the Manufacturer

Manufacturer's Name:	Same as client
Manufacturers Address:	
City/Zip Code	
Country	

3 Equipment Under Test (EUT)

3.1 EUT Specifications

Model No	TP401
Marketing Name	Life360 PET GPS
HW Version	TP401
SW Version	BT 64.22.51.7 Rftest MCU FW, 01-006 Wifi FW, 51441 Cell Modem FW
FCC ID	2AKLITP401
IC	11858A-TP401
Product Description	Life360 PET GPS
Radio Information as declared	<u>Cellular Modules</u> • Model: LBAD0ZZ2GD • FCC ID: HSW-TY2GD • IC: 4492A-TY2GD <u>Bluetooth</u> • Model: nRF5340 • Bluetooth Low Energy v5.4 <u>WLAN</u> • Model: DA16200MOD-AAC4WA32 • 802.11b/g/n
Antenna Information as declared	2.4 GHz Antenna (Bluetooth/BLE/802.11b/g/n); Model: 410-10152-00 Cellular Antenna
Power Supply/ Rated Operating Voltage Range	Nominal 3.8 VDC
Operating Temperature Range	-10 °C to +60 °C
Sample Revision	☐ Prototype ☐ Production ☒ Pre-Production
EUT Dimensions	50.2mm x 35.7mm x 16.7mm
Weight	<1.0 lb
Note: Details about the Equipment Under Test (EUT) are provided by the client or applicant.	

3.2 EUT Sample details

EUT #	Serial Number	HW Version	SW Version	Notes/Comments
1	0002	TP401	BT 64.22.51.7 Rftest MCU FW, 01-006 Wifi FW, 51441 Cell Modem FW	Radiated and AC Conducted Emissions
2	0005	TP401	BT 64.22.51.7 Rftest MCU FW, 01-006 Wifi FW, 51441 Cell Modem FW	Conducted RF

3.3 Accessory Equipment (AE) details

AE #	Type	Model	Manufacturer	Serial Number
1	20W Wall Charger	A2348	Anker	ATC95L0F11403953

3.4 Test Sample Configuration

EUT Set-up #	Combination of AE used for test set up	Comments
1	EUT#1 + AE#1	External antennas were connected to the EUT during testing.
2	EUT#2 + AE#1	The measurement equipment was connected to the 50-ohm RF port of the EUT for conducted measurements.

3.5 Mode of Operation details

Mode of Operation	Description of Operating modes	Additional Information
Op. 1	WLAN (2.4G)	The EUT was configured to operate in continuous transmission mode using test software that is not accessible to the end user. During testing, measurements were performed with the WLAN radio set to operate in 802.11b, 802.11g, and 802.11n modes.

3.6 Justification for Mode of Operation

During the testing process, the EUT was tested with transmitter sets on low, mid and high channels, and highest possible duty cycle. For radiated measurements, all data in this report shows the worst case between horizontal and vertical antenna polarizations and for all orientations of the EUT.

4 Subject of Investigation

The objective of the measurements done by CETECOM Inc. was to evaluate the compliance of the EUT against the relevant requirements specified in section 1.

5 Measurement Results Summary

Test Specification	Test Case	Temperature and Voltage Conditions	Mode	Pass	NA	NP	Result
§15.247(a)(1) RSS-247 5.2(a)	Emission Bandwidth	Nominal	Op. 1	■	□	□	Complies
§15.247(e) RSS-247 5.2(b)	Power Spectral Density	Nominal	Op. 1	■	□	□	Complies
§15.247(b)(1) RSS-247 5.4(d)	Maximum Conducted Output Power and EIRP	Nominal	Op. 1	■	□	□	Complies
§15.247(d) RSS-247 5.5	Band edge compliance Unrestricted Band Edges	Nominal	Op. 1	■	□	□	Complies
§15.247; 15.209; 15.205 RSS-Gen 8.9; 8.10	Band edge compliance Restricted Band Edges	Nominal	Op. 1	■	□	□	Complies
§15.247(d); §15.209 RSS-Gen 6.13	TX Radiated Spurious Emissions	Nominal	Op. 1	■	□	□	Complies
§15.207(a) RSS Gen 8.8	AC Conducted Emissions	Nominal	Op. 1	■	□	□	Complies

Note: NA= Not Applicable; NP= Not Performed.

6 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus, with 95% confidence interval (in dB delta to result), based on a coverage factor $k=2$.

Radiated measurement

Measurement System		EMC 1	EMC 2
Conducted emissions (mains port)	150 kHz – 30 MHz	2.47 dB	N/A
Radiated emissions	9 kHz – 30 MHz	2.68 dB	2.53 dB
	30 – 100 MHz	4.39 dB	3.85 dB
	100 MHz – 1 GHz	5.65 dB	5.24 dB
	1 – 6 GHz	5.0 dB	4.88 dB
	6 – 18 GHz	4.76 dB	4.58 dB
	18 – 40 GHz	4.65 dB	4.61 dB

RF conducted measurement ± 0.5 dB

According to TR 102 273 a multiplicative propagation of error is assumed for RF measurement systems. For this reason the RMS method is applied to dB values and not to linear values as appropriate for additive propagation of error. Also used: <http://physics.nist.gov/cuu/Uncertainty/typeb.html>. The above calculated uncertainties apply to direct application of the Substitution method. The Substitution method is always used when the EUT comes closer than 3dB to the limit.

6.1 Environmental Conditions During Testing:

The following environmental conditions were maintained during the course of testing:

- Ambient Temperature: 20-25°C
- Relative humidity: 40-60%

6.2 Dates of Testing:

2025-05-23 – 2025-06-03

6.3 Decision Rule:

Cetecom Inc. follows ILAC G8:09/2019 chapter 4.2.1 (Simple Acceptance Rule).

Only the measured values related to their corresponding limits will be used to decide whether the equipment under test meets the requirements of the test standards listed in chapter 3. The measurement uncertainty is mentioned in this test report, See chapter 9, but is not taken into account – neither to the limits nor to the measurement results. Measurement results with a smaller margin to the corresponding limits than the measurement uncertainty have a potential risk of more than 5% that the decision might be wrong.

7 Measurement Procedures

7.1 Radiated Measurement

Testing is performed according to the guidelines provided in ANSI C63.4-2014 American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz. The results are split up into up to 3 frequency ranges due to antenna bandwidth restrictions and according to ANSI C63.4 chap. 4.5. A loop antenna is used for 9 kHz – 30 MHz, a Biconilog antenna is used from 30 MHz to 1 GHz, and Horn antennas are used to cover frequencies above 1 GHz.

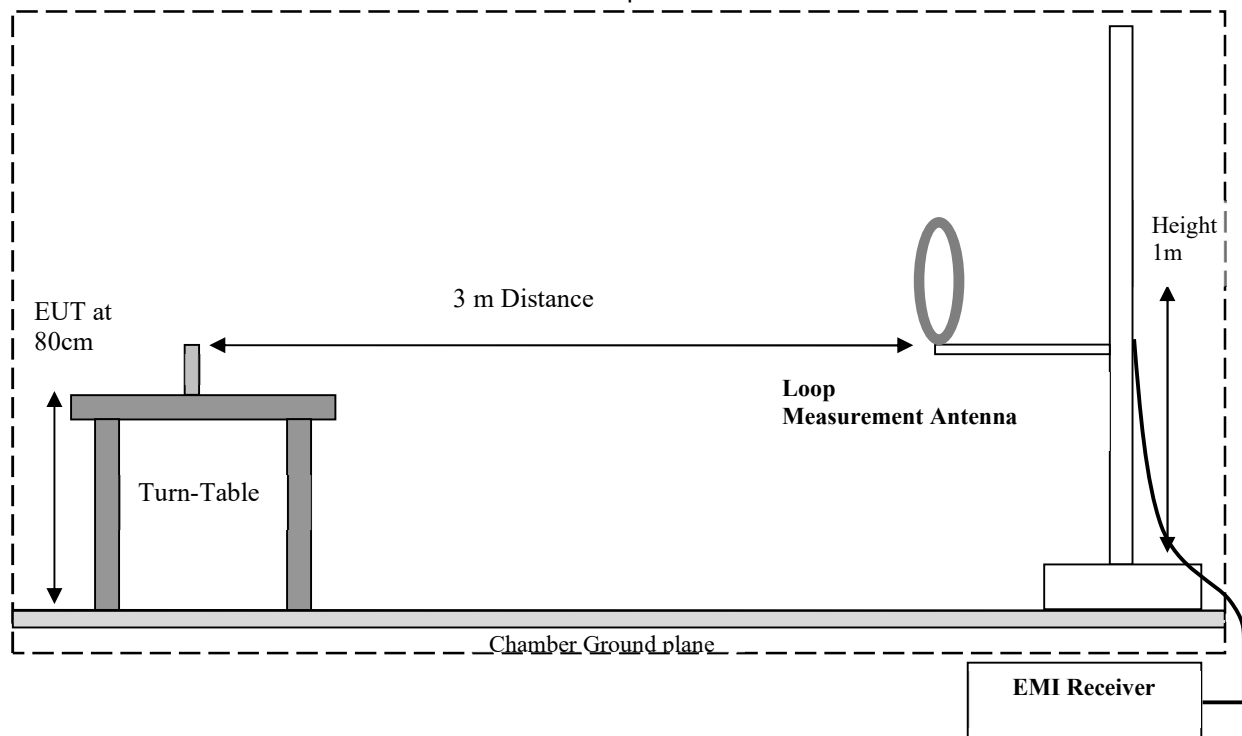
Step 1:

- The exploratory measurement is accomplished by running a matrix of sweeps over the required frequency range with R&S Test-SW EMC32 and continuous turntable movements during Preview (360°), two orthogonal positions of the EUT, and both antenna polarizations (Horizontal/Vertical) at three antenna heights (1, 1.5, 2 meters). This procedure exceeds the requirement of the above standards to cover the 3 orthogonal axes of the EUT. A max peak detector is utilized during the exploratory measurement. Test-SW creates an overall maximum trace for all sweeps and saves the settings for each point of this trace. The maximum trace is part of the test report.
- In case there are no emissions above noise floor level only the maximum trace is reported as described above and step 2 is not being performed.

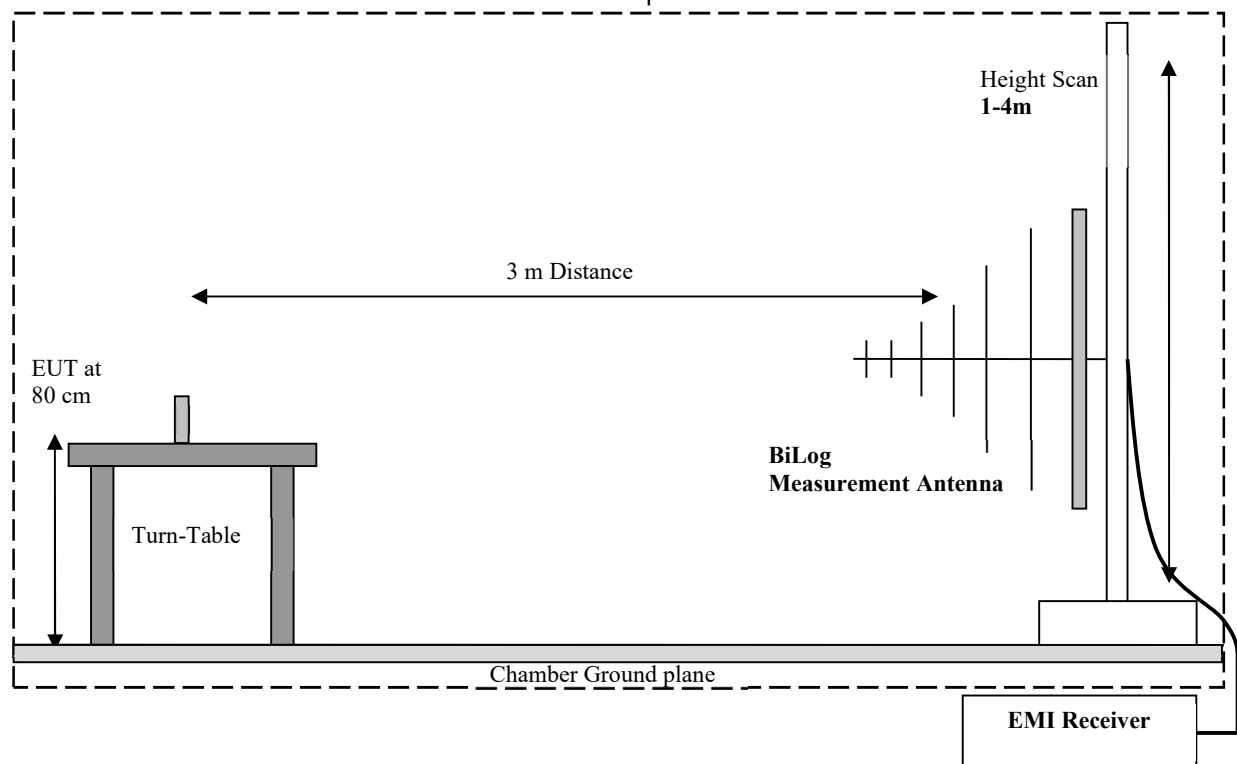
Step 2:

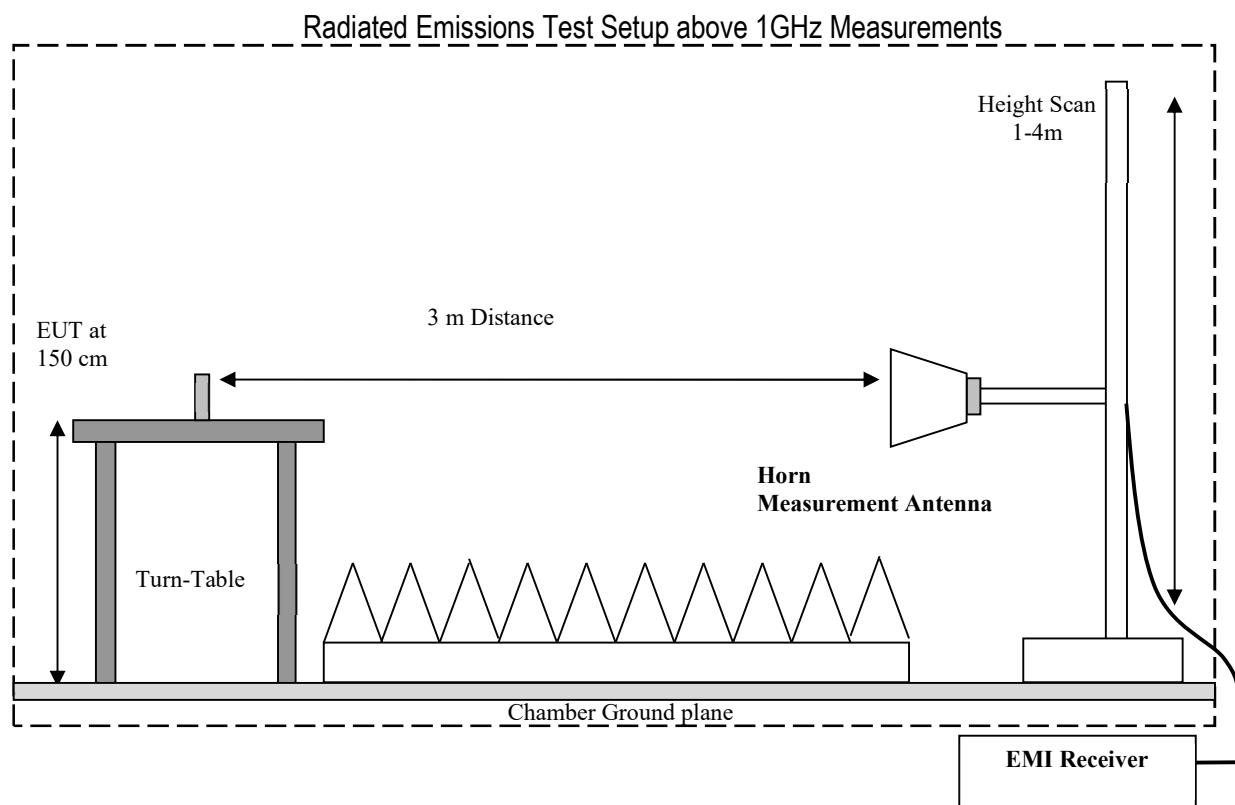
- The 6 highest emissions (emission level 6 dB higher than the noise floor and margin to the limit < 20 dB) are selected with an automatic algorithm of EMC32 searching for peaks in the noise floor and ensuring that broadband signals are not selected multiple times.
- Add a marker to the highest emissions that does not exceed the margin threshold for final measurement.
- The maxima are then put through the final measurement and again maximized in a 90-degree range of the turntable, fine search in the frequency domain, and height scan between 1m and 4m
- In case there are no emissions above noise floor level only the maximum trace is reported as described above.

Radiated Emissions Test Setup below 30MHz Measurements



Radiated Emissions Test Setup 30MHz-1GHz Measurements





7.1.1 Sample Calculations for Field Strength Measurements

Field Strength is calculated from the Spectrum Analyzer/ Receiver readings, taking into account the following parameters:

1. Measured reading in dB μ V
2. Cable Loss between the receiving antenna and SA in dB and
3. Antenna Factor in dB/m

All radiated measurement plots in this report are taken from a test SW that calculates the Field Strength based on the following equation:

$$FS \text{ (dB}\mu\text{V/m)} = \text{Measured Value on SA (dB}\mu\text{V)} + \text{Cable Loss (dB)} + \text{Antenna Factor (dB/m)}$$

Example:

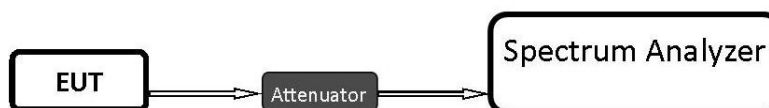
Frequency (MHz)	Measured SA (dB μ V)	Cable Loss (dB)	Antenna Factor Correction (dB)	Field Strength Result (dB μ V/m)
1000	80.5	3.5	14	98.0

7.2 Power Line Conducted Measurement Procedure

AC Power Line conducted emissions measurements performed according to: ANSI C63.4 (2014)

7.3 RF Conducted Measurement Procedure

Testing procedures are based on 558074 D01 15.247 Meas Guidance v05r02 – “GUIDANCE FOR COMPLIANCE MEASUREMENTS ON DIGITAL TRANSMISSION SYSTEM, FREQUENCY HOPPING SPREAD SPECTRUM SYSTEM, AND HYBRID SYSTEM DEVICES OPERATING UNDER SECTION 15.247 OF THE FCC RULES” - April 2, 2019, by the Federal Communications Commission, Office of Engineering and Technology, Laboratory Division.



- Connect the equipment as shown in the above diagram.
- Adjust the settings of the SA (Rohde-Schwarz Spectrum Analyzer) to connect the EUT at the required mode of test.
- Measurements are to be performed with the EUT set to the low, middle and high channels and for worst case modulation schemes.

8 Test Result Data

8.1 Maximum Conducted (Average) Output Power

8.1.1 Measurement according to FCC 558074 D01 15.247 Meas Guidance v05r02, and ANSI C63.10 Clause 11.

Spectrum Analyzer settings:

- RBW = 1% to 5% of the OBW, not to exceed 1 MHz
- VBW $\geq 3 \times$ RBW
- Span = at least 1.5 times the OBW
- Sweep = Auto couple
- Detector function = RMS
- Trace = Average (at least 100 traces in power averaging (rms) mode)
- Compute power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function with band limits set equal to the OBW band edges
- Add $[10 \log (1 / D)]$, where D is the duty cycle, to the measured power to compute the average power during the actual transmission times

8.1.2 Limits:

Maximum Output Power:

- FCC §15.247 (b): 1 W
- IC RSS-247: 1 W

8.1.3 Test conditions and setup:

Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input	Antenna Gain
22° C	2	Op. 1	120 VAC	1.63 dBi

8.1.4 Measurement result:

Test #	WLAN Mode	Frequency (MHz)	Output Power (dBm)	EIRP (dBm)	Limit (dBm)	Result
1	802.11b	2412	15.9	17.53	30 (Pk) / 36 (EIRP)	Pass
2	802.11b	2437	15.7	17.33	30 (Pk) / 36 (EIRP)	Pass
3	802.11b	2462	15.7	17.33	30 (Pk) / 36 (EIRP)	Pass
4	802.11g	2412	11.8	13.43	30 (Pk) / 36 (EIRP)	Pass
5	802.11g	2437	11.6	13.23	30 (Pk) / 36 (EIRP)	Pass
6	802.11g	2462	11.7	13.33	30 (Pk) / 36 (EIRP)	Pass
7	802.11n	2412	11.3	12.93	30 (Pk) / 36 (EIRP)	Pass
8	802.11n	2437	11.1	12.73	30 (Pk) / 36 (EIRP)	Pass
9	802.11n	2462	11.2	12.83	30 (Pk) / 36 (EIRP)	Pass

Note 1: For certain test cases where the measurement plots were determined to be similar, only the plot corresponding to the worst-case configuration is presented in the following section.

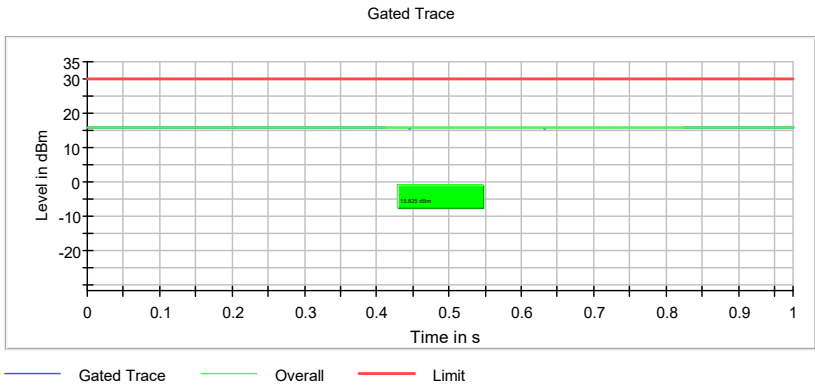
Note 2: The output power values listed in the table above have been adjusted using a duty cycle correction factor derived from the duty cycle measured by the system. $F_{\text{duty}} = 10\log_{10}(1/D)$

8.1.5 Measurement Plots:

RF output power (2412 MHz; 30 dBm; 20 MHz)

Result

DUT Frequency (MHz)	Gated RMS (dBm)	Limit Max (dBm)	Gated EIRP (dBm)	DutyCycle (%)	Result
2412.000000	15.8	30.0	16.8	97.740	PASS



8.2 Power Spectral Density

8.2.1 Measurement according to FCC 558074 D01 15.247 Meas Guidance v05r02, and ANSI C63.10 Clause 11.

Spectrum Analyzer settings for AVGPST-1 PSD method:

- Set analyzer center frequency to DTS channel center frequency
- Set the span to $> 1.5 \times$ DTS bandwidth
- Set RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$
- Set the VBW $\geq (3 \times \text{RBW})$
- Detector = RMS
- Sweep time = Auto couple
- Trace mode = Employ trace averaging (RMS)
- Allow trace to fully stabilize
- Use the peak marker function to determine the maximum amplitude level within the RBW
- If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat

8.2.2 Limits:

FCC§15.247(e) & RSS-247 5.2(b)

- For digitally modulated systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

8.2.3 Test conditions and setup:

Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input	Antenna Gain
22° C	2	Op. 1	120 VAC	1.63 dBi

8.2.4 Measurement result:

Test #	WLAN Mode	Frequency (MHz)	Maximum Power Spectral Density (dBm/3 kHz)	Limit (dBm / 3 kHz)	Result
1	802.11b	2412	-1.674	8	Pass
2	802.11b	2437	-1.545	8	Pass
3	802.11b	2462	-1.649	8	Pass
4	802.11g	2412	-8.592	8	Pass
5	802.11g	2437	-8.589	8	Pass
6	802.11g	2462	-8.746	8	Pass
7	802.11n	2412	-8.571	8	Pass
8	802.11n	2437	-8.714	8	Pass
9	802.11n	2462	-8.599	8	Pass

Note: For certain test cases where the measurement plots were determined to be similar, only the plot corresponding to the worst-case configuration is presented in the following section.

8.2.5 Measurement Plots:

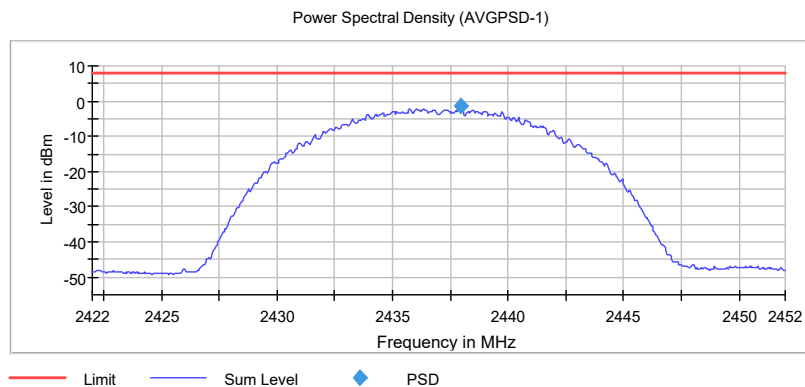
Power Spectral Density (AVGPSD-1) (2437 MHz; 30 dBm; 20 MHz)

Result

DUT Frequency (MHz)	Frequency (MHz)	PSD (dBm)	Limit Max (dBm)	Result
2437.000000	2437.950000	-1.545	8.0	PASS

Ports

Port	State
1	used



8.3 Band Edge Compliance

8.3.1 Measurement according to FCC 558074 D01 15.247 Meas Guidance v05r02, and ANSI C63.10 Clause 11.

Spectrum Analyzer settings for band edge:

- Set the center frequency and span to encompass frequency range to be measured
- RBW = 100 kHz
- VBW $\geq 3 \times$ RBW
- Sweep Time: Auto couple
- Detector = Peak
- Trace = Max hold
- Allow trace to fully stabilize
- Use the peak marker function to determine the maximum amplitude level
- Set the marker on the emission at the band edge, or on the highest modulation product outside of the band, if this level is greater than that at the band edge

8.3.2 Limits non restricted band:

FCC§15.247 (d)

- In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

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- In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30dB instead of 20dB.

Spectrum Analyzer settings for restricted band:

- Peak measurements are made using a peak detector and RBW=1 MHz

8.3.3 Limits restricted band §15.247/15.209/15.205 and RSS-Gen 8.9/8.10

- *PEAK LIMIT= 74 dB μ V/m @3m =-21.23 dBm
- *AVG. LIMIT= 54 dB μ V/m @3m =-41.23 dBm
- Start frequency & stop frequency according to frequency range specified in the restricted band table in FCC section 15.205 & RSS-Gen 8.10
- Measurements with a peak detector were used to show compliance to average limits, thus showing compliance to both peak and average limits.

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
10.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	Above 38.6
13.36-13.41			

8.3.4 Test conditions and setup:

Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input	Antenna Gain
22° C	2	Op. 1	120 VAC	1.63 dBi

8.3.5 Measurement result:

Test #	EUT operating mode	WLAN Mode	Band Edge	Level (dBm)	Margin (dB)	Limit (dBm)	Result
1	Op. 1	802.11b	Lower, Non-restricted (conducted)	-35.8	23.8	-12.0	Pass
2	Op. 1	802.11g	Lower, Non-restricted (conducted)	-34.8	14.9	-19.8	Pass
3	Op. 1	802.11n	Lower, Non-restricted (conducted)	-39.1	18.8	-20.3	Pass

Note: For certain test cases where the measurement plots were determined to be similar, only the plot corresponding to the worst-case configuration is presented in the following section.

8.3.6 Measurement Plots:

Band Edge low (2412 MHz; 30 dBm; 20 MHz)

Result

DUT Frequency (MHz)	Result
2412.000000	PASS

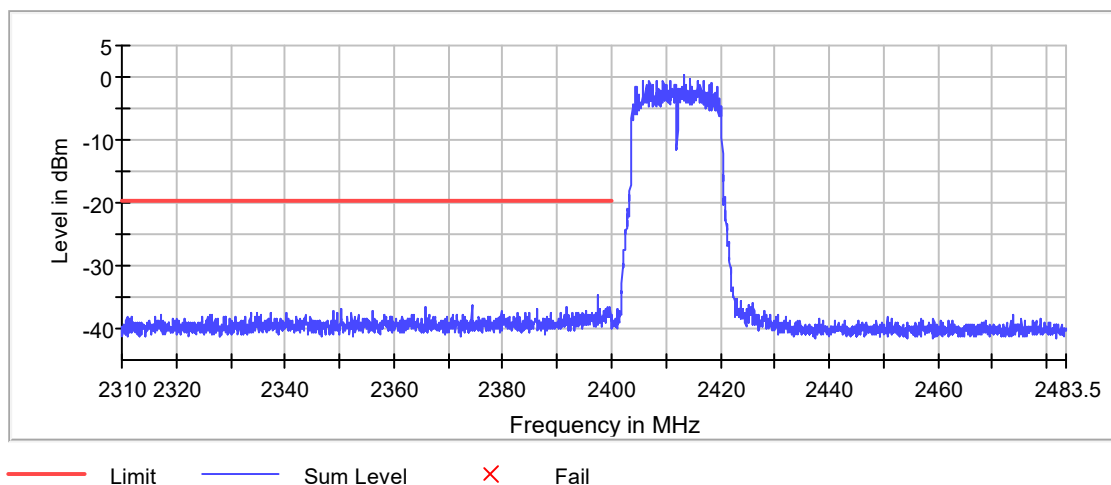
Inband Peak

Frequency (MHz)	Level (dBm)
2413.261765	0.2

Measurements

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2397.350000	-34.8	14.9	-19.8	PASS
2374.300000	-36.3	16.4	-19.8	PASS
2374.350000	-36.3	16.5	-19.8	PASS
2391.800000	-36.5	16.6	-19.8	PASS
2399.800000	-36.6	16.7	-19.8	PASS
2399.100000	-36.6	16.7	-19.8	PASS
2365.850000	-36.7	16.9	-19.8	PASS
2399.750000	-36.8	17.0	-19.8	PASS
2397.900000	-36.9	17.0	-19.8	PASS
2397.950000	-36.9	17.0	-19.8	PASS
2398.950000	-37.0	17.1	-19.8	PASS
2391.750000	-37.0	17.1	-19.8	PASS
2386.250000	-37.0	17.2	-19.8	PASS
2350.350000	-37.0	17.2	-19.8	PASS
2379.700000	-37.1	17.3	-19.8	PASS

Band Edge



8.4 Emission Bandwidth 6dB and 99% Occupied Bandwidth

8.4.1 Measurement according to FCC 558074 D01 15.247 Meas Guidance v05r02, and ANSI C63.10 Clause 11.

Spectrum Analyzer settings:

6dB (DTS) Bandwidth:

- Set RBW = 100 kHz
- Set the video bandwidth (VBW) $\geq 3 \times$ RBW
- Detector = Peak
- Trace mode = Max hold
- Sweep = Auto couple
- Allow the trace to stabilize
- Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

99% Occupied Bandwidth:

- Set frequency = nominal EUT channel center frequency
- Set Span = 1.5 x to 5.0 x OBW
- Set RBW = 1% to 5% of OBW
- Set the video bandwidth (VBW) $\approx 3 \times$ RBW
- Detector = Peak
- Trace mode = Max hold
- Sweep = Auto couple
- Allow the trace to stabilize
- Use the 99% power bandwidth function of the instrument (if available) and report the measured bandwidth
- If the instrument does not have a 99% power bandwidth function, then the trace data points are recovered and directly summed in linear power terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5% of the total is reached; that frequency is recorded as the upper frequency. The 99% power bandwidth is the difference between these two frequencies.

8.4.2 Limits:

FCC §15.247(a)(2) and RSS-247 5.2(a)

- Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

8.4.3 Test conditions and setup:

Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input
22° C	2	Op. 1	120 VAC

8.4.4 Measurement result:

Test #	Frequency (MHz)	WLAN Mode	6dB Emissions Bandwidth (MHz)	Limit (MHz)	Result
1	2412	802.11b	9.100000	> 0.5	Pass
2	2437	802.11b	9.100000	> 0.5	Pass
3	2462	802.11b	9.100000	> 0.5	Pass
4	2412	802.11g	16.500000	> 0.5	Pass
5	2437	802.11g	16.550000	> 0.5	Pass
6	2462	802.11g	16.500000	> 0.5	Pass
7	2412	802.11n	17.750000	> 0.5	Pass
8	2437	802.11n	17.750000	> 0.5	Pass
9	2462	802.11n	17.700000	> 0.5	Pass

Note: For certain test cases where the measurement plots were determined to be similar, only the plot corresponding to the worst-case configuration is presented in the following section.

Test #	Frequency (MHz)	WLAN Mode	99% Occupied Bandwidth (MHz)	Limit (MHz)	Result
10	2412	802.11b	13.400000	N/A	Pass
11	2437	802.11b	13.400000	N/A	Pass
12	2462	802.11b	13.400000	N/A	Pass
13	2412	802.11g	16.600000	N/A	Pass
14	2437	802.11g	16.500000	N/A	Pass
15	2462	802.11g	16.500000	N/A	Pass
16	2412	802.11n	17.600000	N/A	Pass
17	2437	802.11n	17.600000	N/A	Pass
18	2462	802.11n	17.600000	N/A	Pass

Note: For certain test cases where the measurement plots were determined to be similar, only the plot corresponding to the worst-case configuration is presented in the following section.

8.4.5 Measurement Plots:

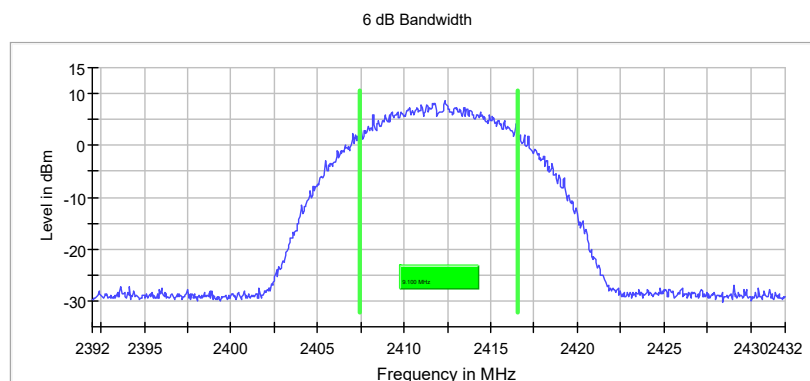
Minimum Emission Bandwidth 6 dB (2412 MHz; 30 dBm; 20 MHz)

6 dB Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
2412.000000	9.100000	0.500000	---	2407.450000	2416.550000

(continuation of the "6 dB Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Max Level (dBm)	Result
2412.000000	8.7	PASS



Occupied Channel Bandwidth 99% (2412 MHz; 30 dBm; 20 MHz)

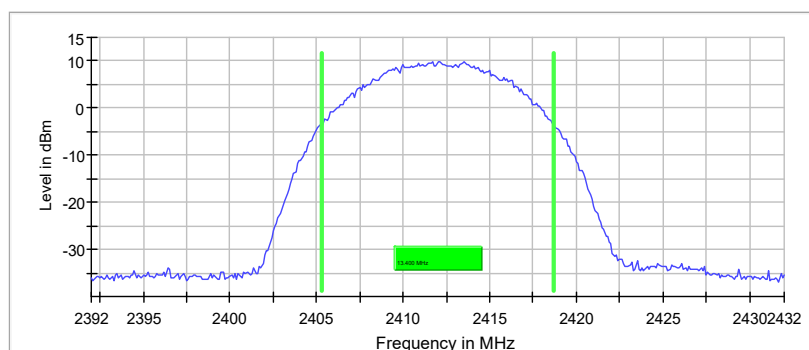
99 % Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
2412.000000	13.400000	---	---	2405.300000	2418.700000

(continuation of the "99 % Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Result
2412.000000	PASS

99 % Bandwidth



8.5 Radiated Transmitter Spurious Emissions and Restricted Bands

8.5.1 Measurement according to ANSI C63.10 (2013)

Spectrum Analyzer Settings:

- Frequency = 9 KHz – 30 MHz
- RBW = 9 KHz
- Detector: Peak

- Frequency = 30 MHz – 1 GHz
- Detector = Peak / Quasi-Peak
- RBW= 120 KHz (<1GHz)

- Frequency > 1 GHz
- Detector = Peak / Average
- RBW = 1 MHz

- Radiated spurious emissions shall be measured for the transmit frequencies, transmit power, and data rate for the lowest, middle and highest channel in each frequency band of operation and for the highest gain antenna for each antenna type, and using the appropriate parameters and test requirements.
- The highest (or worst-case) data rate shall be recorded for each measurement.
- For testing frequencies below 30 MHz at distance other than the specified in the standard, the limit conversion is calculated by using the FCC materials for the ANSI 63 committee issued on January, 27 1991.

8.5.2 Limits:

FCC §15.247

- In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

FCC §15.209 & RSS-Gen 8.9

- Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency of emission (MHz)	Field strength (μV/m)	Measurement Distance (m)	Field strength @ 3m (dBμV/m)
0.009–0.490	2400/F(kHz) / -----	300	-
0.490–1.705	24000/F(kHz) / -----	30	-
1.705–30.0	30 / (29.5)	30	-
30–88	100	3	40 dBμV/m
88–216	150	3	43.5 dBμV/m
216–960	200	3	46 dBμV/m
Above 960	500	3	54 dBμV/m

FCC §15.205 & RSS-Gen 8.10

- Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
10.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	Above 38.6
13.36-13.41			

- Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

*PEAK LIMIT= 74 dBμV/m

*AVG. LIMIT= 54 dBμV/m

8.5.3 Test conditions and setup:

Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input
22° C	1	Op. 1	120 VAC

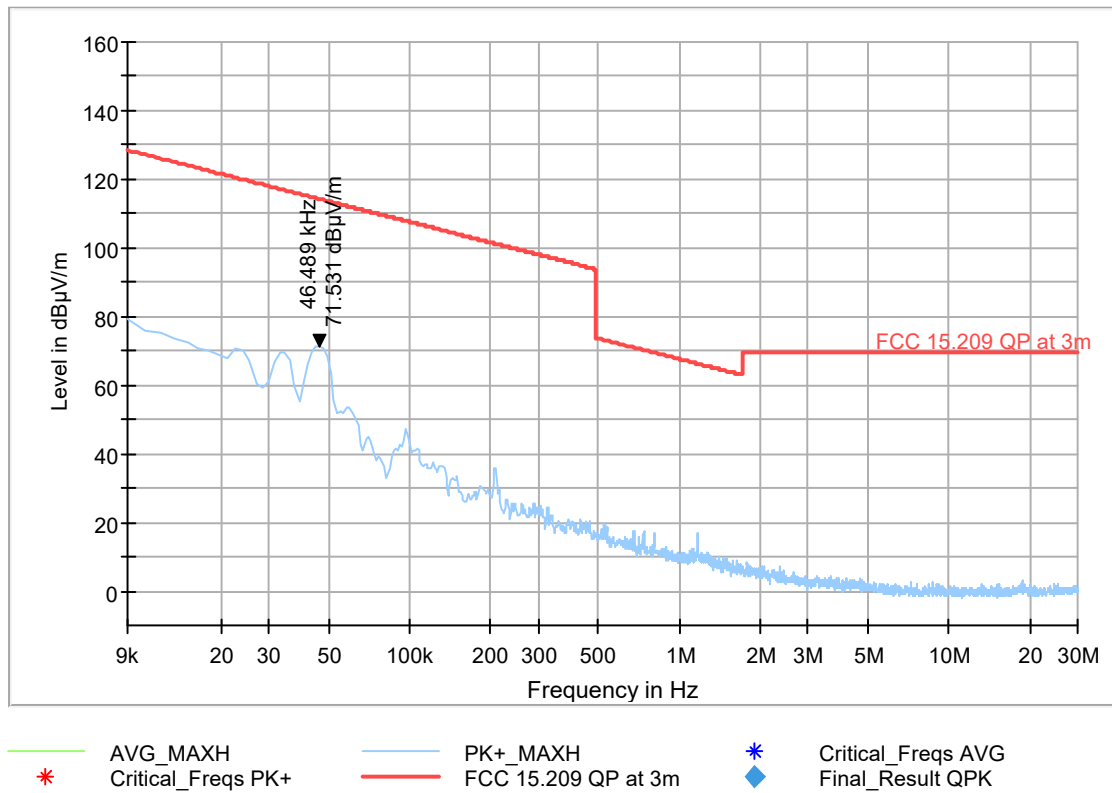
8.5.4 Measurement result:

Plot #	Channel #	WLAN Mode	Scan Frequency	Limit	Result
1-5	Low	802.11b	9 kHz – 26 GHz	See section 8.5.2	Pass
6-10	Mid	802.11b	9 kHz – 26 GHz	See section 8.5.2	Pass
11-15	High	802.11b	9 kHz – 26 GHz	See section 8.5.2	Pass
16	High	802.11b	Upper Restricted Band Edge	See section 8.5.2	Pass

Note: Based on the duty-cycle-corrected average conducted output power measurements, 802.11b exhibits the highest fundamental level compared to 802.11g and 802.11n modes; therefore, all Radiated Transmitter Spurious Emissions testing were performed in 802.11b mode to ensure worst-case coverage.

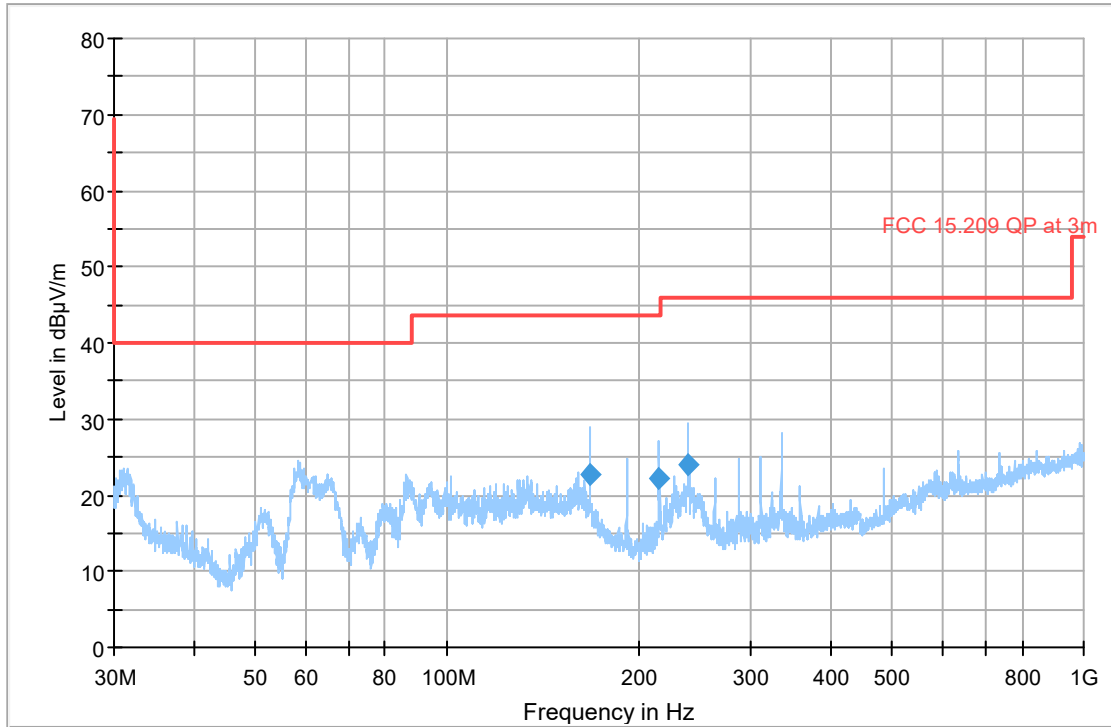
8.5.5 Measurement Plots:

Plot # 1



Plot # 2

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Sig Path (dB)	Preamp (dB)	Trd Corr. (dB/m)	Raw Rec (dBμV)
167.595	22.698	43.50	20.80	500.0	120.0	142.0	H	290.0	-12.0	-34.3	0.0	22.4	34.7
215.387	22.202	43.50	21.30	500.0	120.0	156.0	H	291.0	-16.6	-34.1	0.0	17.5	38.8
239.356	24.043	46.02	21.98	500.0	120.0	100.0	H	263.0	-14.7	-34.0	0.0	19.3	38.7



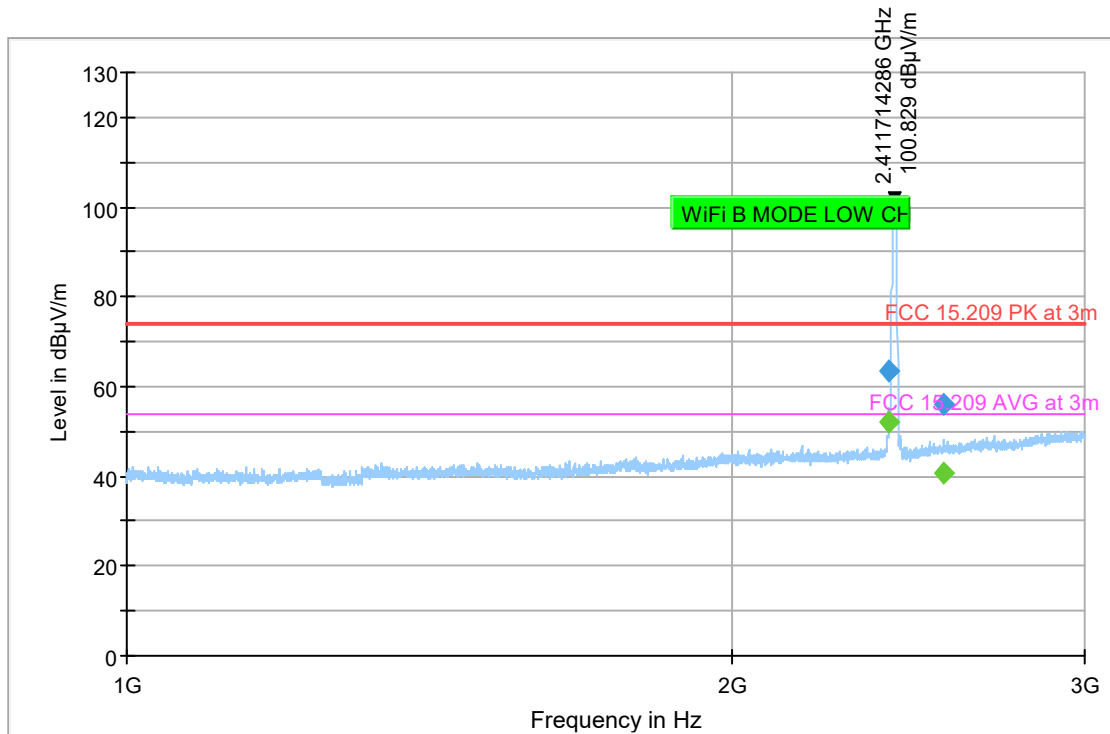
— AVG_MAXH — PK+_MAXH — FCC 15.209 QP at 3m ◆ Final_Result QPK

Plot # 3

Frequency (MHz)	MaxPeak (dBμV/m)	CAverage (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Sig Path (dB)	Preamp (dB)	Trd Corr. (dB/m)
2397.404	---	51.949	53.98	2.03	500.0	1000.0	118.0	H	4.0	33.3	5.3	0.0	28.1
2397.404	63.499	---	73.98	10.48	500.0	1000.0	118.0	H	4.0	33.3	5.3	0.0	28.1
2551.023	---	40.750	53.98	13.23	500.0	1000.0	339.0	V	23.0	34.1	5.6	0.0	28.6
2551.023	55.946	---	73.98	18.03	500.0	1000.0	339.0	V	23.0	34.1	5.6	0.0	28.6

(continuation of the "Final_Result" table from column 19 ...)

Frequency (MHz)	Raw Rec (dBμV)
2397.404	18.6
2397.404	30.2
2551.023	6.6
2551.023	21.8



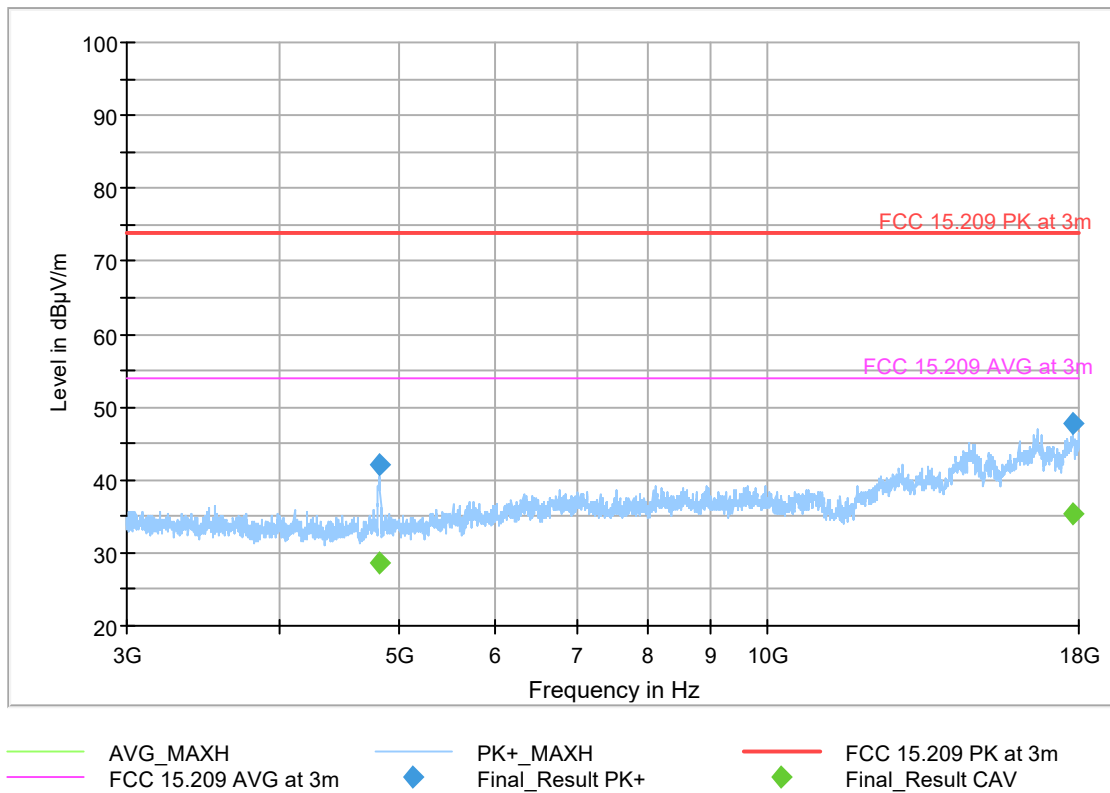
AVG_MAXH PK+_MAXH FCC 15.209 PK at 3m
FCC 15.209 AVG at 3m Final_Result PK+ Final_Result CAV

Plot # 4

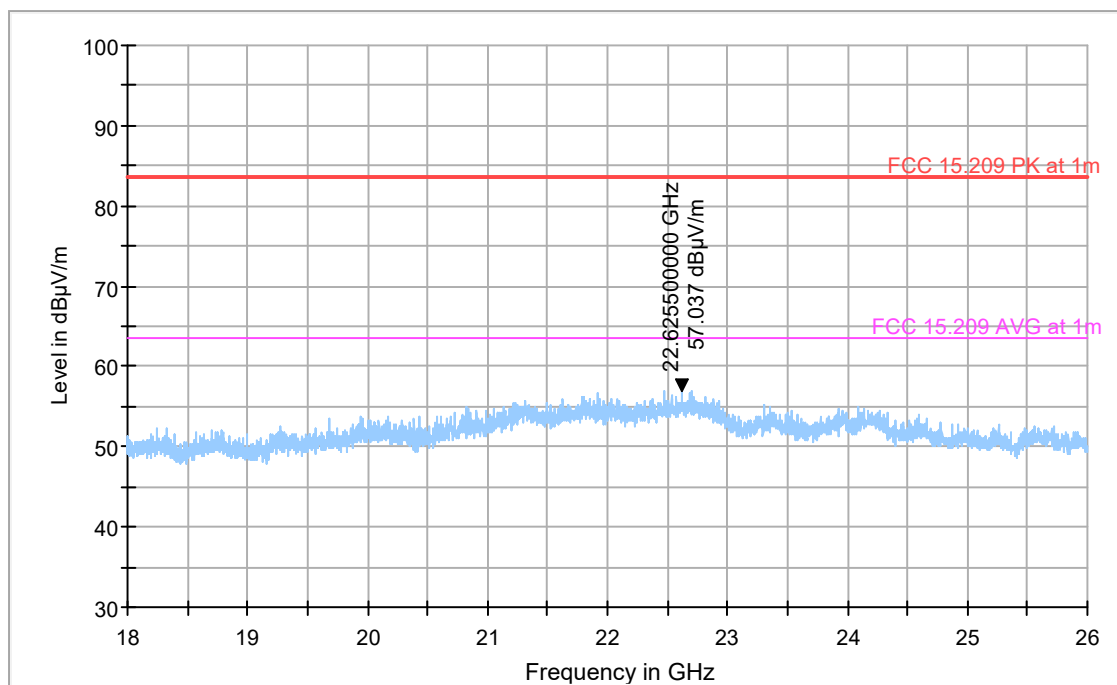
Frequency (MHz)	MaxPeak (dBμV/m)	CAverage (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Sig Path (dB)	Preamp (dB)	Trd Corr. (dB/m)
4830.500	42.121	---	73.98	31.86	500.0	1000.0	294.0	H	166.0	-4.8	6.8	-45.7	34.1
4830.500	---	28.546	53.98	25.43	500.0	1000.0	294.0	H	166.0	-4.8	6.8	-45.7	34.1
17808.821	47.815	---	73.98	26.16	500.0	1000.0	287.0	H	5.0	14.5	15.5	-42.6	41.5
17808.821	---	35.413	53.98	18.57	500.0	1000.0	287.0	H	5.0	14.5	15.5	-42.6	41.5

(continuation of the "Final_Result" table from column 19 ...)

Frequency (MHz)	Raw Rec (dBμV)
4830.500	46.9
4830.500	33.3
17808.821	33.3
17808.821	20.9



Plot # 5

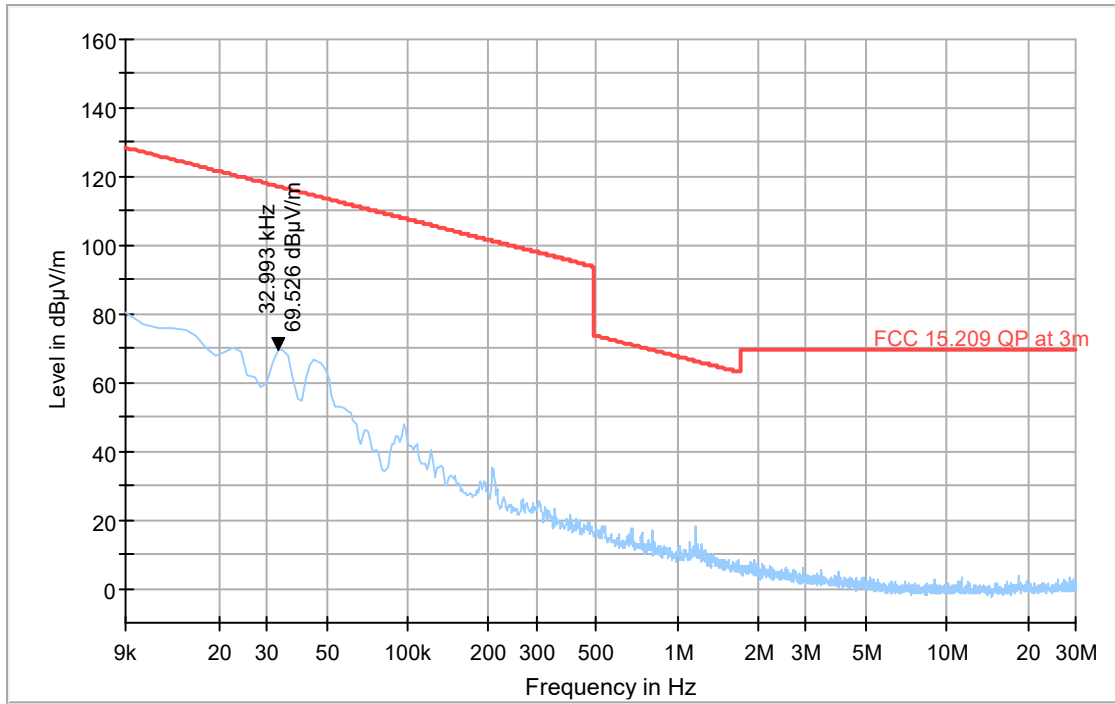


AVG_MAXH
Critical_Freqs PK+
Final_Result PK+

PK+_MAXH
FCC 15.209 PK at 1m
Final_Result CAV

* Critical_Freqs AVG
FCC 15.209 AVG at 1m

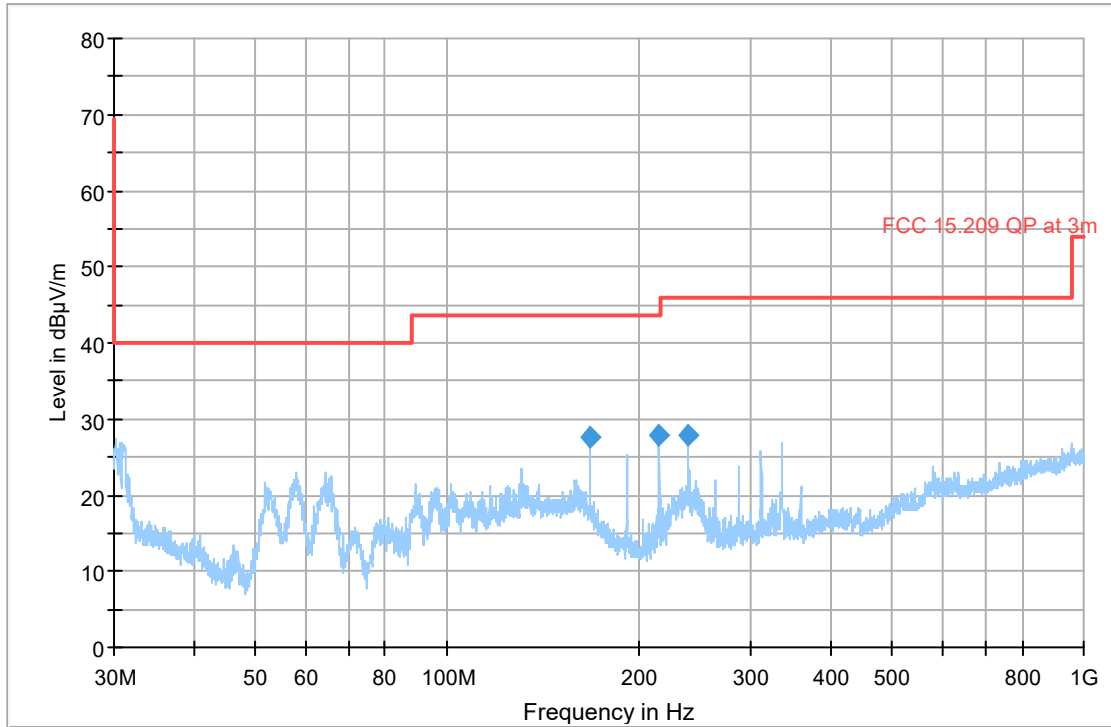
Plot # 6



AVG_MAXH
Critical_Freqs PK+
PK+_MAXH
FCC 15.209 QP at 3m
Critical_Freqs AVG
Final_Result QPK

Plot # 7

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Sig Path (dB)	Preamp (dB)	Trd Corr. (dB/m)	Raw Rec (dBμV)
167.764	27.615	43.50	15.89	500.0	120.0	177.0	H	306.0	-12.0	-34.3	0.0	22.3	39.6
215.633	27.831	43.50	15.67	500.0	120.0	143.0	H	283.0	-16.6	-34.1	0.0	17.5	44.4
239.642	27.755	46.02	18.27	500.0	120.0	209.0	V	14.0	-14.8	-34.0	0.0	19.2	42.6



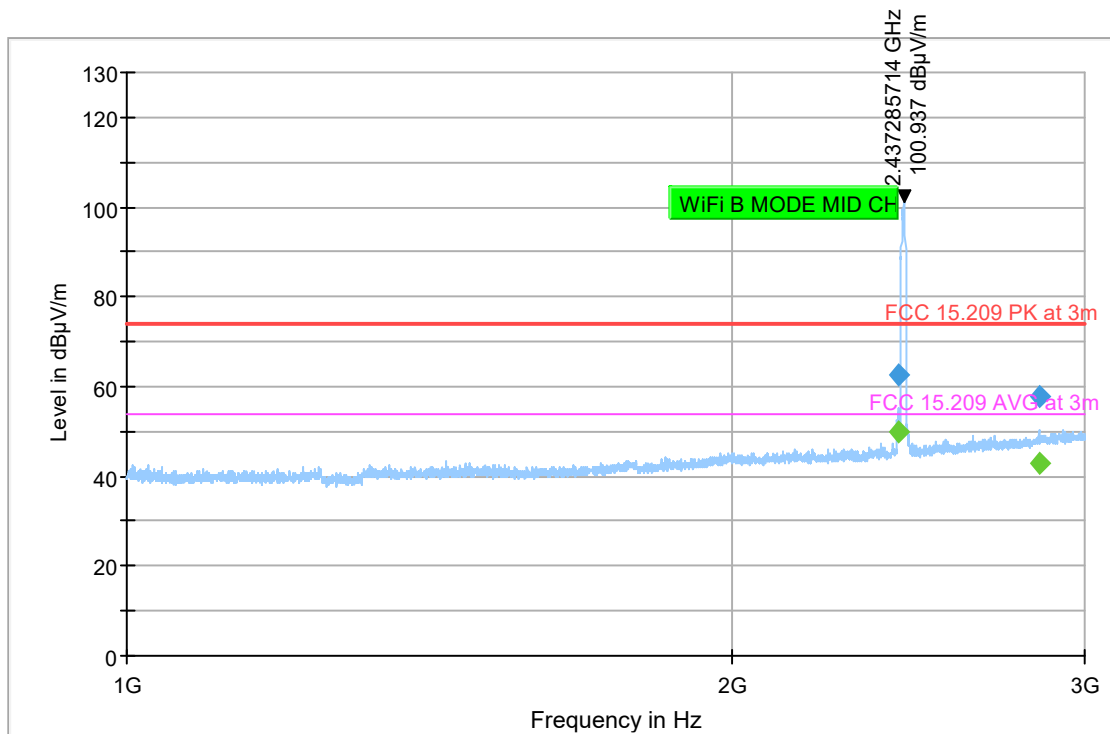
— AVG_MAXH — PK+_MAXH — FCC 15.209 QP at 3m ◆ Final_Result QPK

Plot # 8

Frequency (MHz)	MaxPeak (dBμV/m)	CAverage (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Sig Path (dB)	Preamp (dB)	Trd Corr. (dB/m)
2421.394	---	50.089	53.98	3.89	500.0	1000.0	134.0	H	17.0	33.5	5.4	0.0	28.1
2421.394	62.641	---	73.98	11.34	500.0	1000.0	134.0	H	17.0	33.5	5.4	0.0	28.1
2845.907	---	42.887	53.98	11.09	500.0	1000.0	297.0	V	341.0	35.0	5.9	0.0	29.1
2845.907	57.974	---	73.98	16.01	500.0	1000.0	297.0	V	341.0	35.0	5.9	0.0	29.1

(continuation of the "Final_Result" table from column 19 ...)

Frequency (MHz)	Raw Rec (dBμV)
2421.394	16.6
2421.394	29.1
2845.907	7.9
2845.907	23.0



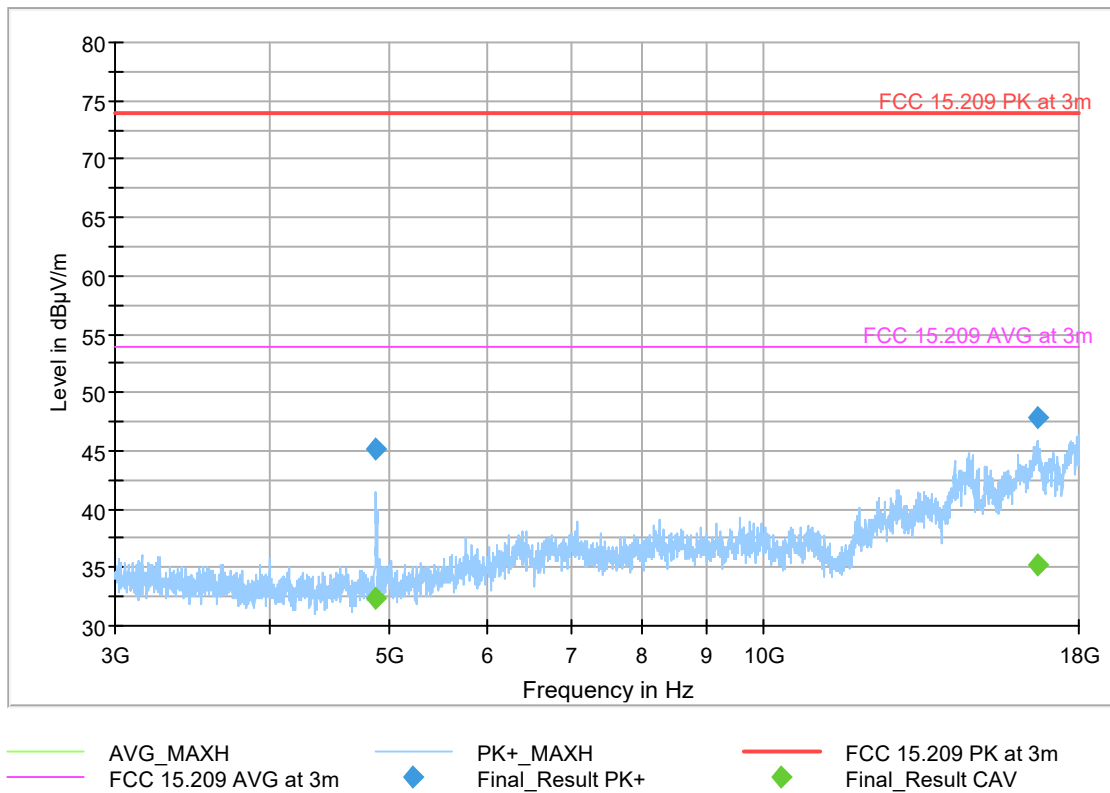
AVG_MAXH PK+_MAXH FCC 15.209 PK at 3m
FCC 15.209 AVG at 3m Final_Result PK+ Final_Result CAV

Plot # 9

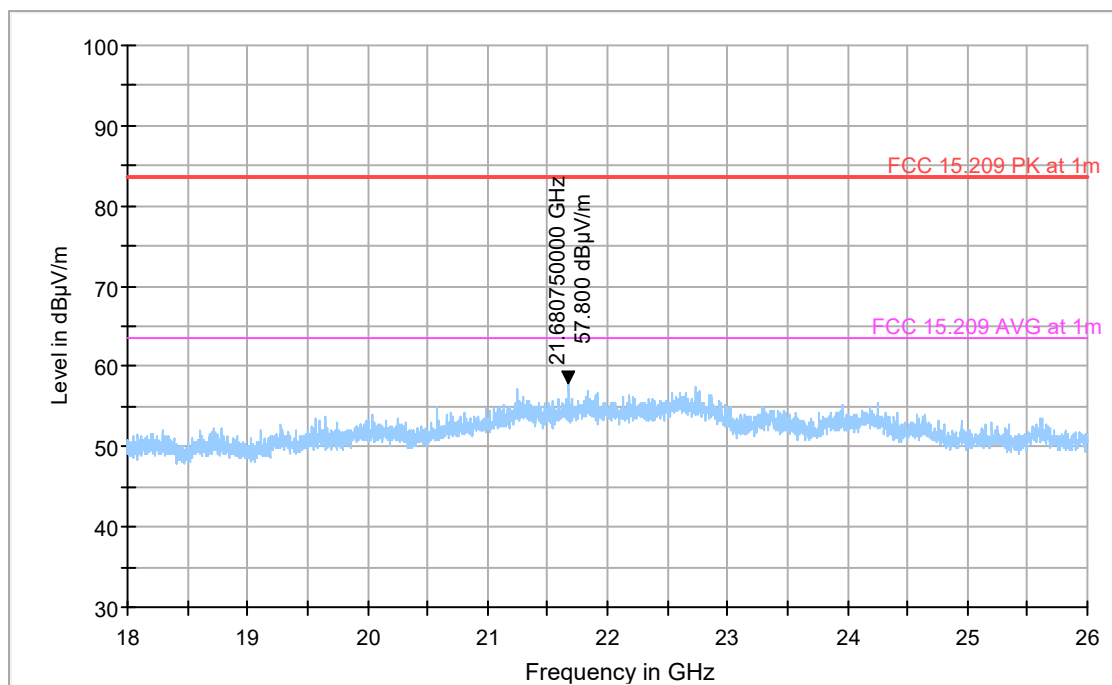
Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Sig Path (dB)	Preamp (dB)	Trd Corr. (dB/m)
4872.479	---	32.344	53.98	21.64	500.0	1000.0	259.0	H	150.0	-4.8	7.0	-45.9	34.1
4872.479	45.147	---	73.98	28.83	500.0	1000.0	259.0	H	150.0	-4.8	7.0	-45.9	34.1
16657.334	---	35.135	53.98	18.84	500.0	1000.0	117.0	V	180.0	14.0	15.2	-42.4	41.2
16657.334	47.776	---	73.98	26.20	500.0	1000.0	117.0	V	180.0	14.0	15.2	-42.4	41.2

(continuation of the "Final_Result" table from column 19 ...)

Frequency (MHz)	Raw Rec (dBµV)
4872.479	37.1
4872.479	49.9
16657.334	21.1
16657.334	33.8



Plot # 10

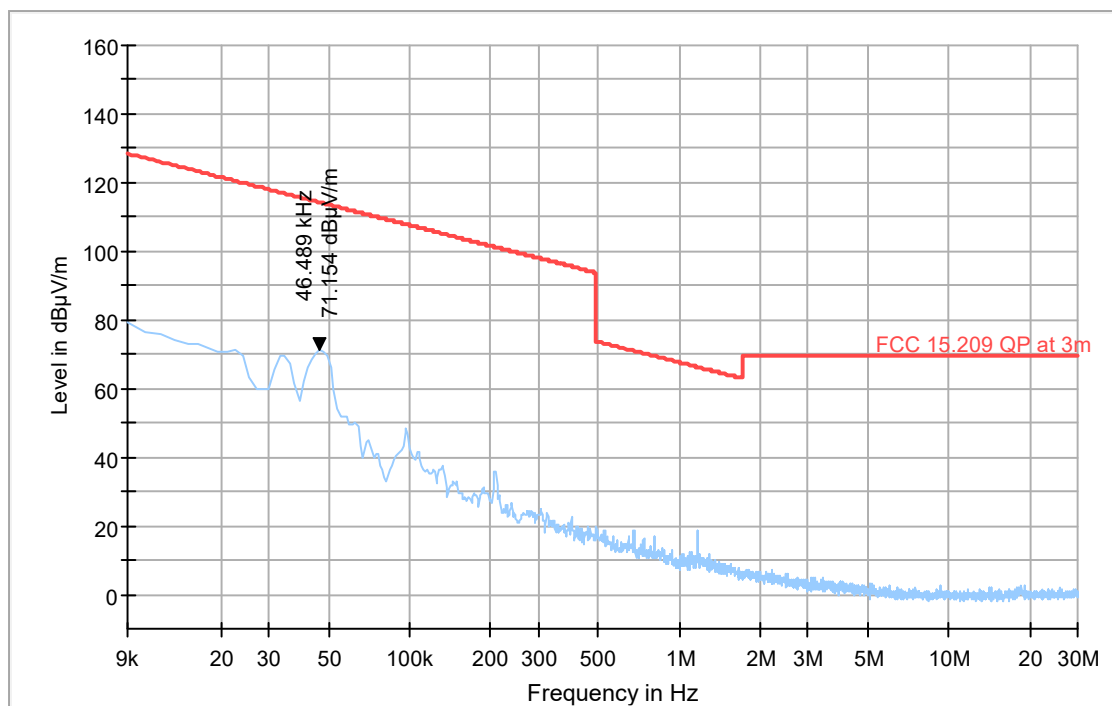


— AVG_MAXH
* Critical_Freqs PK+
◆ Final_Result PK+

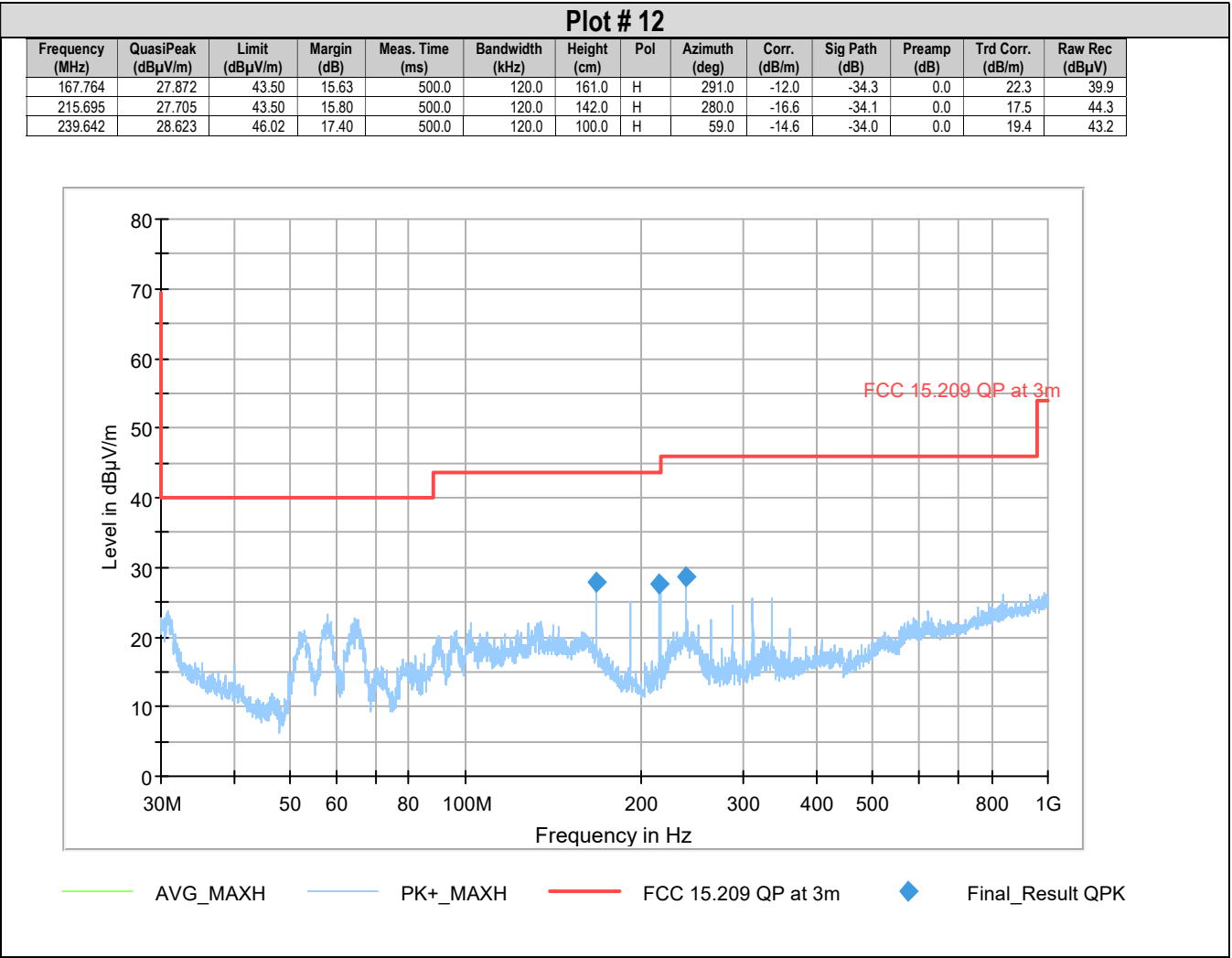
— PK+_MAXH
— FCC 15.209 PK at 1m
◆ Final_Result CAV

* Critical_Freqs AVG
— FCC 15.209 AVG at 1m

Plot # 11



AVG_MAXH
Critical_Freqs PK+
PK+_MAXH
FCC 15.209 QP at 3m
Critical_Freqs AVG
Final_Result QPK

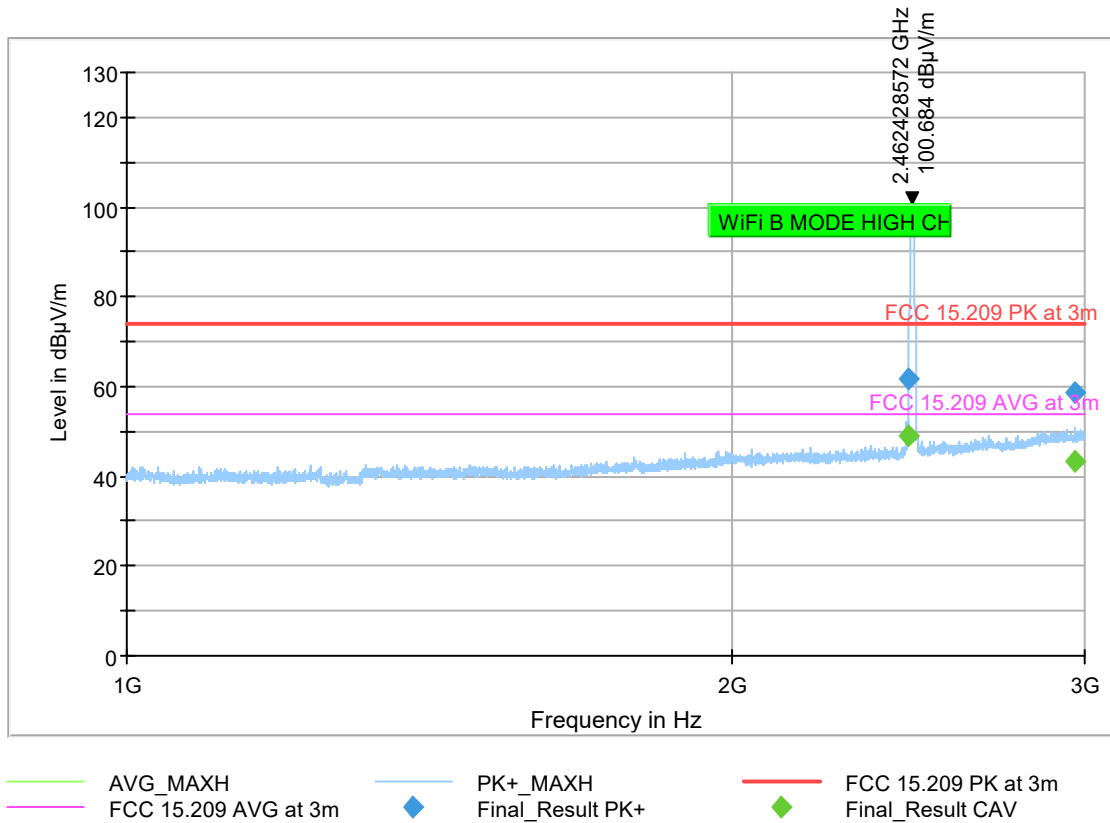


Plot # 13

Frequency (MHz)	MaxPeak (dBμV/m)	CAverage (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Sig Path (dB)	Preamp (dB)	Trd Corr. (dB/m)
2448.522	61.575	---	73.98	12.40	500.0	1000.0	117.0	H	8.0	33.7	5.5	0.0	28.2
2448.522	---	49.119	53.98	4.86	500.0	1000.0	117.0	H	8.0	33.7	5.5	0.0	28.2
2967.907	58.707	---	73.98	15.27	500.0	1000.0	287.0	V	293.0	35.6	5.9	0.0	29.7
2967.907	---	43.370	53.98	10.61	500.0	1000.0	287.0	V	293.0	35.6	5.9	0.0	29.7

(continuation of the "Final_Result" table from column 19 ...)

Frequency (MHz)	Raw Rec (dBμV)
2448.522	27.9
2448.522	15.4
2967.907	23.1
2967.907	7.8

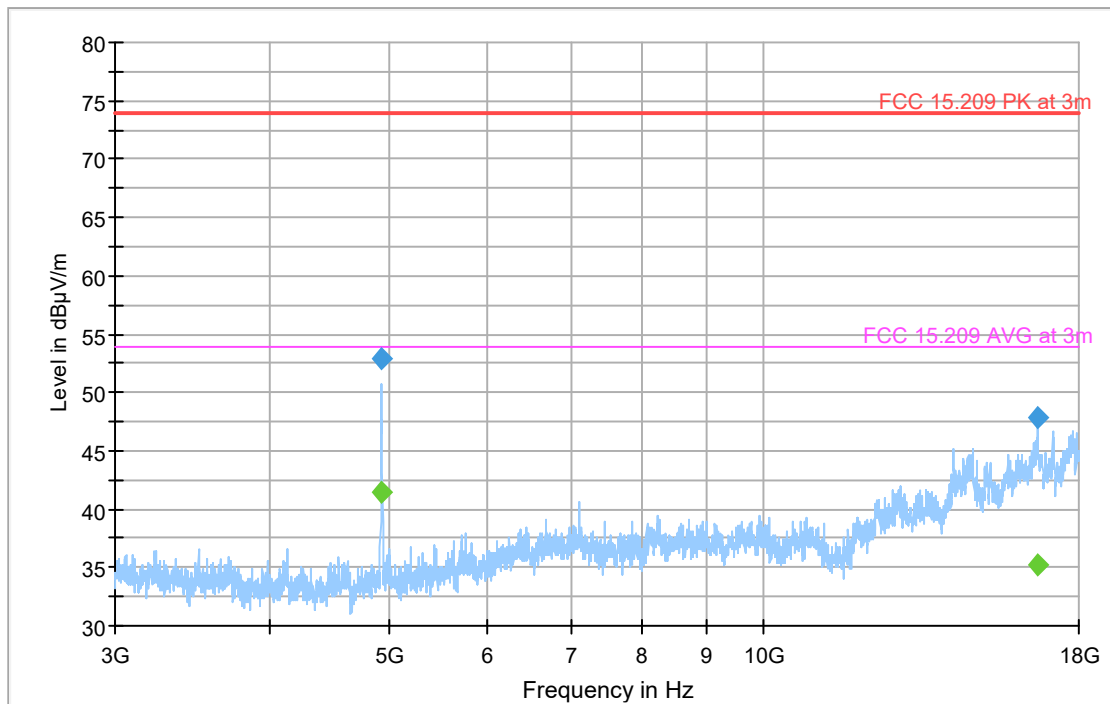


Plot # 14

Frequency (MHz)	MaxPeak (dBμV/m)	CAverage (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Sig Path (dB)	Preamp (dB)	Trd Corr. (dB/m)
4923.899	52.881	---	73.98	21.10	500.0	1000.0	100.0	H	158.0	-4.6	7.1	-45.8	34.1
4923.899	---	41.441	53.98	12.54	500.0	1000.0	100.0	H	158.0	-4.6	7.1	-45.8	34.1
16677.500	47.816	---	73.98	26.16	500.0	1000.0	400.0	H	128.0	14.1	15.1	-42.2	41.3
16677.500	---	35.178	53.98	18.80	500.0	1000.0	400.0	H	128.0	14.1	15.1	-42.2	41.3

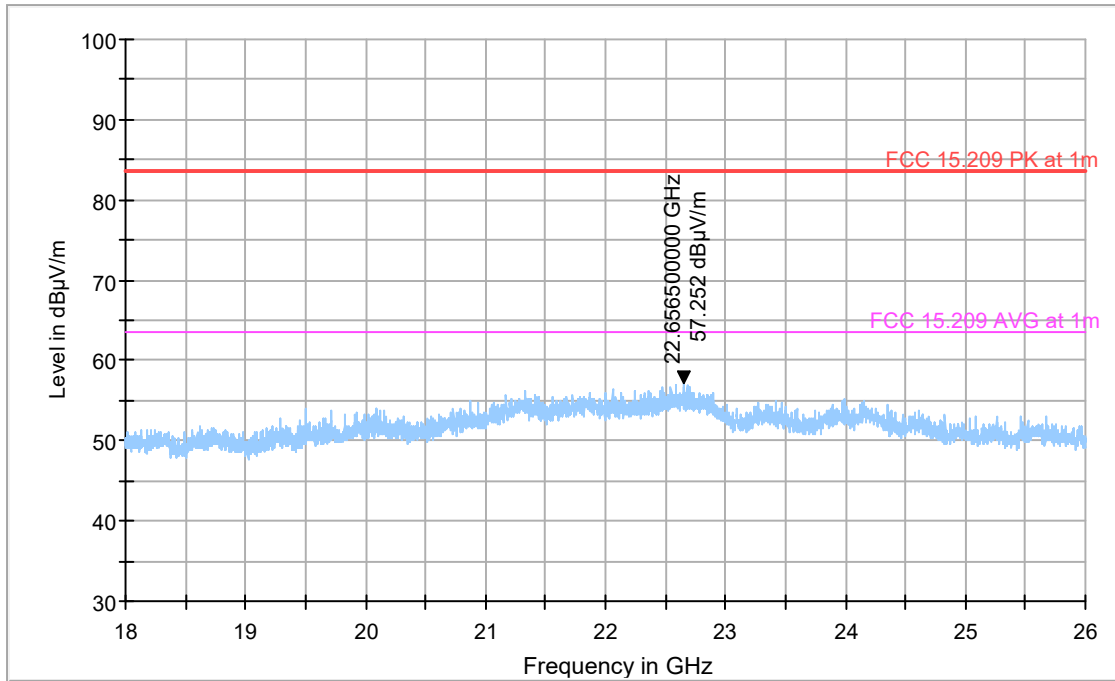
(continuation of the "Final_Result" table from column 19 ...)

Frequency (MHz)	Raw Rec (dBμV)
4923.899	57.5
4923.899	46.1
16677.500	33.7
16677.500	21.0



— AVG_MAXH ◆ PK+_MAXH
— FCC 15.209 AVG at 3m ◆ Final_Result PK+ — FCC 15.209 PK at 3m
◆ Final_Result CAV

Plot # 15



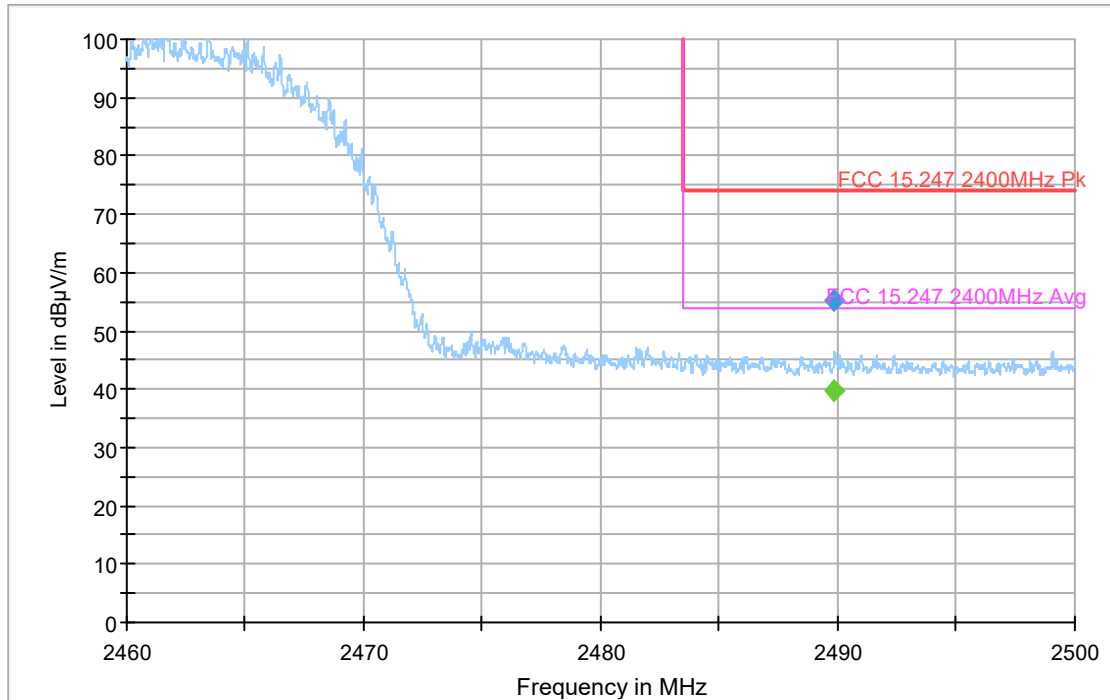
— AVG_MAXH	— PK+ _MAXH	* Critical_Freqs AVG
* Critical_Freqs PK+	— FCC 15.209 PK at 1m	* FCC 15.209 AVG at 1m
◆ Final_Result PK+	◆ Final_Result CAV	

Plot # 16

Frequency (MHz)	MaxPeak (dBμV/m)	CAverage (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Sig Path (dB)	Preamp (dB)	Trd Corr. (dB/m)
2489.851	---	39.686	54.00	14.31	500.0	1000.0	276.0	H	96.0	33.7	5.4	0.0	28.4
2489.851	55.073	---	74.00	18.93	500.0	1000.0	276.0	H	96.0	33.7	5.4	0.0	28.4

(continuation of the "Final_Result" table from column 19 ...)

Frequency (MHz)	Raw Rec (dBμV)
2489.851	6.0
2489.851	21.3



AVG_MAXH
FCC 15.247 2400MHz Avg

PK+_MAXH
Final_Result PK+

FCC 15.247 2400MHz Pk
Final_Result CAV

8.6 AC Power Line Conducted Emissions

8.6.1 Measurement according to ANSI C63.4

Analyzer Settings:

- RBW = 9 KHz (CISPR Bandwidth)
- Detector: Peak / Average for Pre-scan
- Quasi-Peak/Average for Final Measurements

8.6.2 Limits: §15.207 & RSS-Gen 8.8

FCC §15.207(a) & RSS-Gen 8.8

- Except as shown in paragraphs (b) and (c) of this section of the CFR, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table (1), as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between frequency ranges.

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

*Decreases with the logarithm of the frequency.

8.6.3 Test conditions and setup:

Ambient Temperature $^{\circ}$ C	EUT Set-Up #	EUT operating mode	Power line (L1, L2, L3, N)	Power Input
22 $^{\circ}$ C	1	Op. 1	Line & Neutral	120 VAC

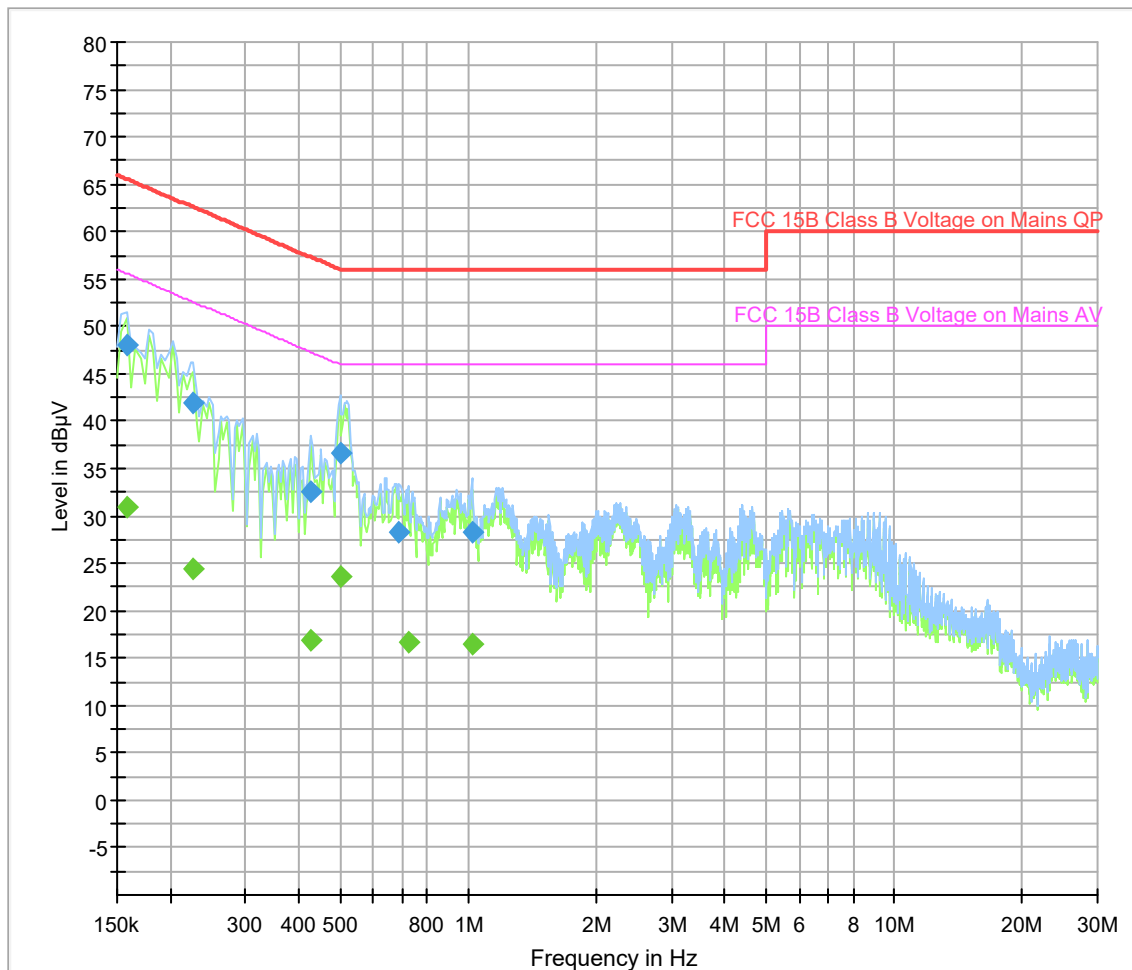
8.6.4 Measurement Result:

Plot #	Port	EUT Set-Up #:	EUT operating mode	Scan Frequency	Limit	Result
1	AC Mains	1	Op. 1	150 kHz – 30 MHz	See section 8.6.2	Pass

8.6.5 Measurement Plots:

Plot # 1

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	PE	Corr. (dB)
0.158	---	30.88	55.57	24.69	1000.0	9.0	N	GND	10.2
0.158	47.98	---	65.57	17.58	1000.0	9.0	N	GND	10.2
0.227	42.01	---	62.57	20.56	1000.0	9.0	N	GND	10.1
0.227	---	24.38	52.57	28.19	1000.0	9.0	N	GND	10.1
0.428	---	16.87	47.29	30.41	1000.0	9.0	N	GND	10.0
0.428	32.52	---	57.29	24.76	1000.0	9.0	N	GND	10.0
0.501	36.71	---	56.00	19.29	1000.0	9.0	L1	GND	9.9
0.501	---	23.55	46.00	22.45	1000.0	9.0	L1	GND	9.9
0.691	28.19	---	56.00	27.81	1000.0	9.0	L1	GND	9.9
0.723	---	16.58	46.00	29.42	1000.0	9.0	L1	GND	9.9
1.021	---	16.48	46.00	29.52	1000.0	9.0	L1	GND	9.9
1.025	28.33	---	56.00	27.67	1000.0	9.0	L1	GND	9.9



9 Test setup photos

Setup photos are included in supporting file name: "EMC_JIOBI_013_25001_FCC_15_247_Setup_Photos"

10 Test Equipment and Ancillaries Used for Testing

Equipment Type	Manufacturer	Model	Serial #	Calibration Cycle	Last Calibration Date
PASSIVE LOOP ANTENNA	ETS LINDGREN	6512	000164698	3 Years	09/06/2023
BILOG ANTENNA	A.H. SYSTEMS	BiLA2G	569	3 Years	10/30/2023
HORN ANTENNA	EMCO	3115	00035111	3 Years	10/26/2023
HORN ANTENNA	ETS LINDGREN	3117-PA	00167061	3 Years	9/25/2023
HORN ANTENNA	ETS LINDGREN	3116C-PA	00166821	3 Years	10/26/2023
ESW.EMI TEST RECEIVER	ROHDE & SCHWARZ	ESW44	101715	3 Years	10/24/2023
DIGITAL THERMOMETER	Control Company	4410,90080-03	230712972	3 Years	10/18/2023
Signal Analyzer	R&S	FSV40	101022	3 Years	09/25/2023
Multimeter	Fluke	115	56090717MV	3 Years	09/26/2023
Software	EMC32	Version 10.50.40	-	-	-
LISN	FCC	FCC-LISN-50-25-2-08	08014	2 Years	10/06/2023
TEST RECEIVER	R&S	ESW44	103143	2 Years	09/12/2024
Software	EMC32	Version 11.40.00	-	-	-

Note: Equipment used meets the measurement uncertainty requirements as required per applicable standards for 95% confidence levels.

Calibration due dates, unless defined specifically, falls on the last day of the month. Items indicated "N/A" for cal status either do not specifically require calibration or is internally characterized before use.

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11 History

Date	Report Name	Changes to report	Prepared by
2025-06-17	EMC_JIOBI_013_25001_FCC_15_247_WLAN	Initial Version	Cheng Song

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