



FCC / ISED Test Report

For:
Garmin International, Inc.

Model Name:
GMN-02245

Product Description:
LTE/Wi-Fi Datalink and Data Storage System

FCC ID: IPH-03788
IC ID: 1792A-03788

Applied Rules and Standards:
47 CFR Part 15.247 (DTS)
RSS-247 Issue 2 (DTSS) & RSS-Gen Issue 5

REPORT #: EMC_GARMI-086-20001_15.247_WLAN

DATE: 2021-11-16



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3462B-1

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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	Description	Model Name
Garmin International, Inc	LTE/Wi-Fi Datalink and Data Storage System	GMN-02245

Responsible for Testing Laboratory:

2021-11-16	Compliance	Kevin Wang (EMC Lab Manager)	
Date	Section	Name	Signature

Responsible for the Report:

2021-11-16	Compliance	Yuchan Lu (EMC Engineer)	
Date	Section	Name	Signature

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
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EMC Lab Manager:	Kevin Wang
Responsible Project Leader:	Sangeetha Sivaraman

2.2 Identification of the Client

Client's Name:	Garmin International, Inc.
Street Address:	1200 East 151st Street
City/Zip Code	Olathe, KS / 66062
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 Name:	GMN-02245
Marketing Name:	GDL 60
HW Version :	Ver 6
SW Version :	1.32-004
FCC-ID :	IPH-03788
IC-ID:	1792A-03788
FWIN:	1.32-004
HVIN:	GMN-02245
PMN:	GDL 60
Product Description:	LTE/Wi-Fi Datalink and Data Storage System
Frequency Range / number of channels:	Nominal band: 2400 MHz – 2483.5 MHz; Center to center: 2412 MHz (ch 1) – 2462 MHz (ch 11), 11 channels
Radio Information:	<u>2 x WLAN (WiFi):</u> <ul style="list-style-type: none"> • Module Name: Texas Instruments • Module Number: WiLink WL1807MOD • Modes of Operation: 802.11a,b,g,n • FCC ID: Z64-WL18DBMOD • IC ID: 4511-WL18DBMOD
Antenna Information as declared:	<u>WiFi Antenna:</u> <ul style="list-style-type: none"> • P/N: HG2400RDR90-RSP • Location: External • Maximum Gain: 5 dBi Frequency Range: 2400 – 2500 MHz
Max. Conducted Output Power:	Peak measurement: 23.86 dBm
Power Supply/ Rated Operating Voltage Range:	Vmin: 9 VDC/ Vnom: 24 VDC / Vmax: 32 VDC
Operating Temperature Range	-40°C to 70 °C
Other Radios included in the device:	Cellular
Sample Revision	<input type="checkbox"/> Prototype Unit; <input type="checkbox"/> Production Unit; <input checked="" type="checkbox"/> Pre-Production

3.2 EUT Sample details

EUT #	Serial Number	HW Version	SW Version	Notes/Comments
1	67H00230	Ver 6	1.32-004	Radiated

3.3 Accessory Equipment (AE) details

N/A

3.4 Test Sample Configuration

EUT Set-up #	Combination of AE used for test set up	Comments
1	EUT#1	<p>The WiFi Module #1 and Module #2 radio of the EUT was configured to a fixed channel transmission with highest possible duty cycle using software that is not available to the end user.</p> <p>LTE Band 4 mid Channel (1732.5 MHz) is co-transmitting simultaneously using command window to configure provided by client that is not available to the end user.</p> <p>The external antenna was connected.</p>

3.5 Justification for Worst Case 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 show the worst case between horizontal and vertical antenna polarizations and for all orientations of the EUT.

The channels and modulation schemes of the EUT were set with highest Duty Cycle possible using diagnostic software (not available to the end user).

4 Subject of Investigation

The objective of the measurements done by CETECOM Inc. was to assess the performance of the EUT according to the relevant requirements specified in FCC rules Part 15.247 of Title 47 of the Code of Federal Regulations and Radio Standard Specification RSS-247 of ISED Canada.

This test report is to support a request for new equipment authorization under
 FCC ID: IPH-03788
 IC ID: 1792A-03788

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.

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	-	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Note1
§15.247(e) RSS-247 5.2(b)	Power Spectral Density	Nominal	-	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Note1
§15.247(b)(1) RSS-247 5.4(d)	Maximum Conducted Output Power and EIRP	Nominal	-	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Note1
§15.247(d) RSS-247 5.5	Band edge compliance Unrestricted Band Edges	Nominal	-	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Note1
§15.247; 15.209; 15.205 RSS-Gen 8.9; 8.10	Band edge compliance Restricted Band Edges	Nominal	-	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Note1
§15.247(d); §15.209 RSS-Gen 6.13	TX Spurious emissions- Radiated	Nominal	802.11g	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Complies
§15.207(a) RSS Gen 8.8	AC Conducted Emissions	Nominal	-	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Note1

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

Note1: Leveraged from module certification Texas Instruments WiLink WL1807MOD (FCC ID: Z64-WL18DBMOD, IC ID: 4511-WL18DBMOD)

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 $k=1$.

Radiated measurement

9 kHz to 30 MHz	± 2.5 dB (Magnetic Loop Antenna)
30 MHz to 1000 MHz	± 2.0 dB (Biconilog Antenna)
1 GHz to 40 GHz	± 2.3 dB (Horn Antenna)

Conducted measurement

150 kHz to 30 MHz	± 0.7 dB (LISN)
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RF conducted measurement	± 0.5 dB
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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 3 dB 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:

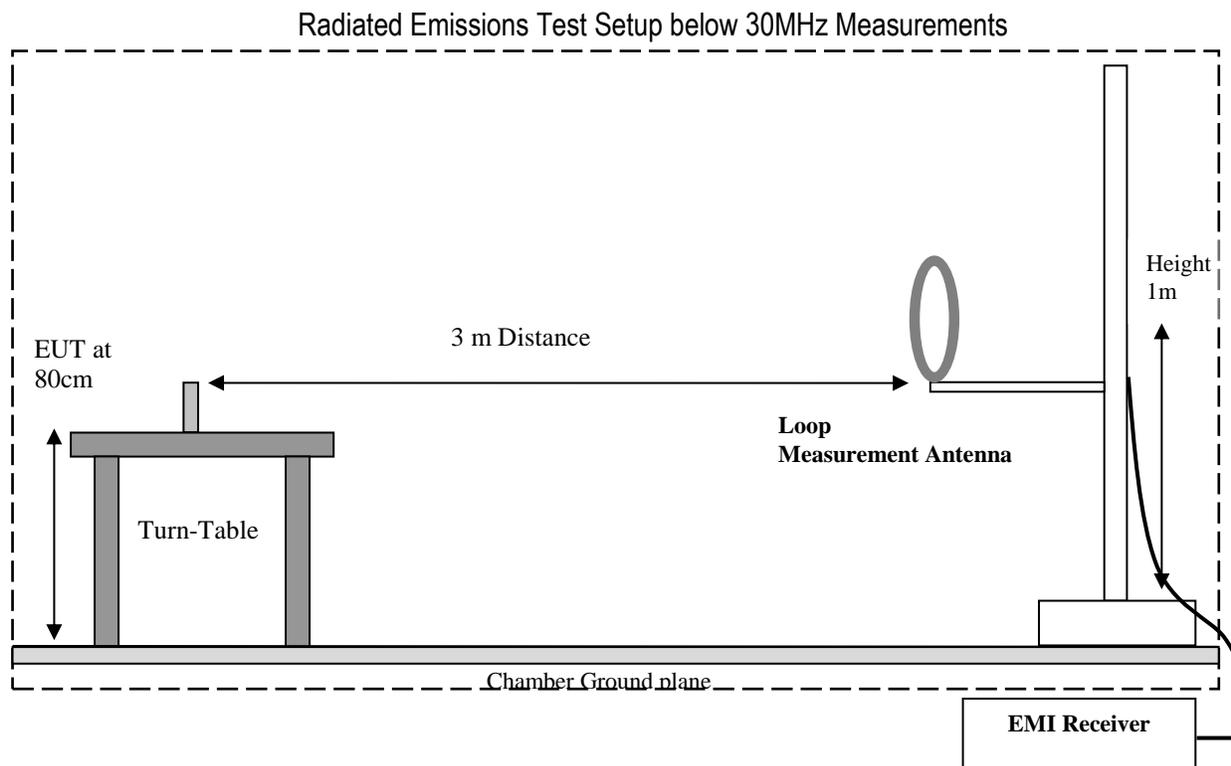
12/28/2020 – 12/30/2020

7 Measurement Procedures

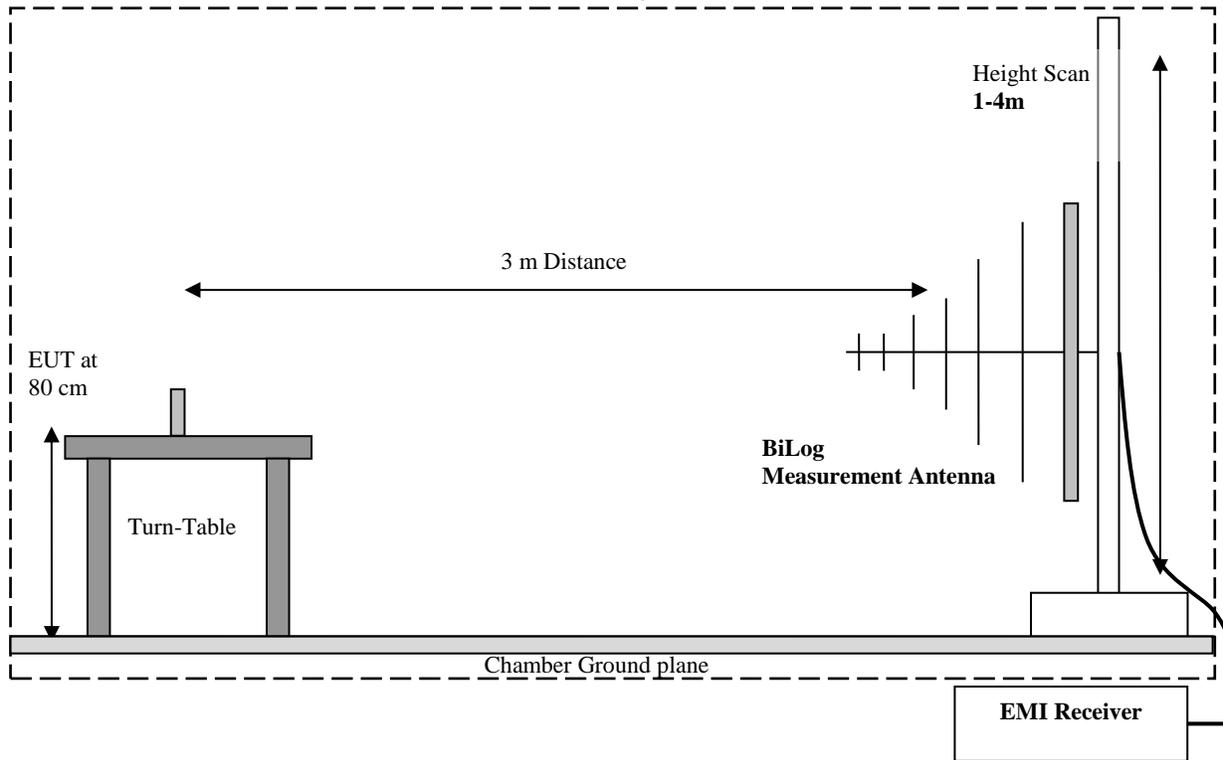
7.1 Radiated Measurement

The radiated measurement is performed according to ANSI C63.10 (2013)

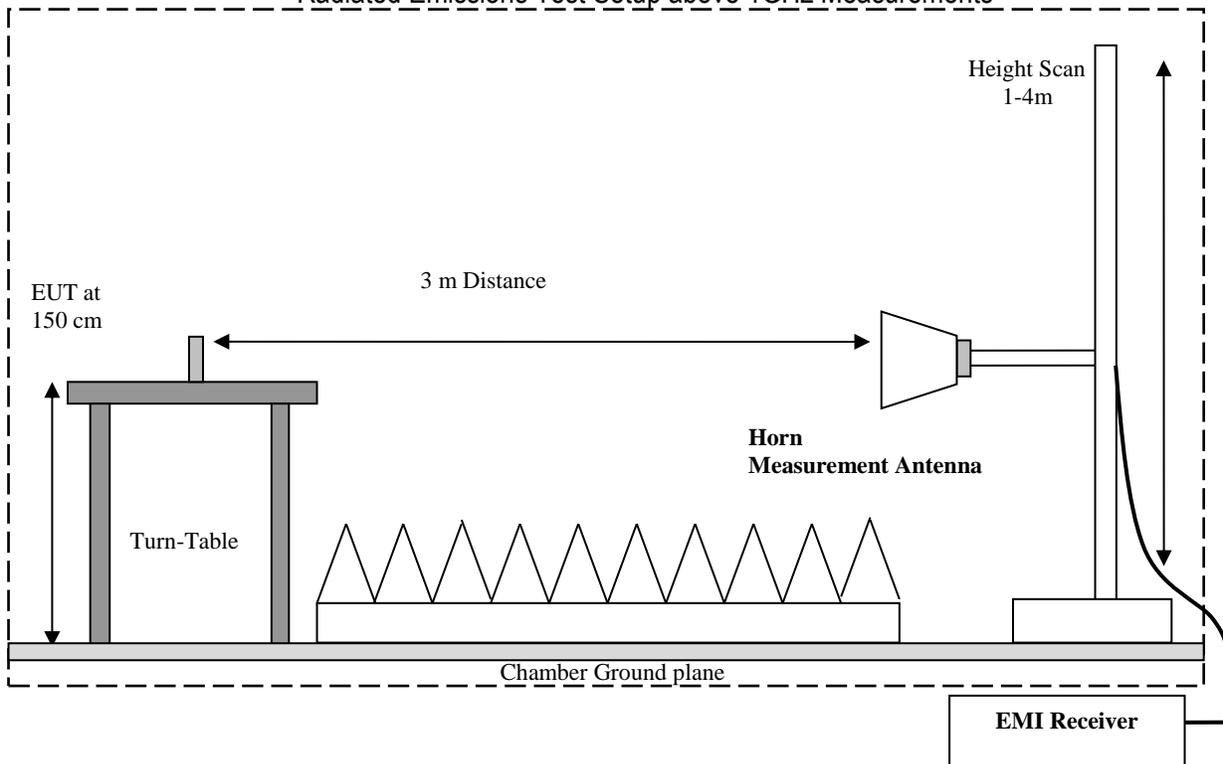
- The exploratory measurement is accomplished by running a matrix of 16 sweeps over the required frequency range with R&S Test-SW EMC32 for 4 positions of the turntable, two orthogonal positions of the EUT and both antenna polarizations. This procedure exceeds the requirement of the above standards to cover the 3 orthogonal axis of the EUT. A max peak detector is utilized during the exploratory measurement. The Test-SW creates an overall maximum trace for all 12 sweeps and saves the settings for each point of this trace. The maximum trace is part of the test report.
- The 10 highest emissions 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.
- The maxima are then put through the final measurement and again maximized in a 90deg range of the turntable, fine search in frequency domain and height scan between 1m and 4m.
- The above procedure is repeated for all possible ways of power supply to EUT and for all supported modulations.
- In case there are no emissions above noise floor level only the maximum trace is reported as described above.
- The results are split up into up to 4 frequency ranges due to antenna bandwidth restrictions. A magnetic loop is used from 9 kHz to 30 MHz, a Biconilog antenna is used from 30 MHz to 1 GHz, and two different horn antennas are used to cover frequencies up to 40 GHz.



Radiated Emissions Test Setup 30MHz-1GHz Measurements



Radiated Emissions Test Setup above 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 dBμV
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:

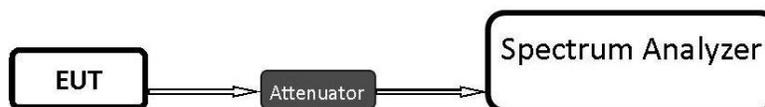
Frequency (MHz)	Measured SA (dBμV)	Cable Loss (dB)	Antenna Factor Correction (dB)	Field Strength Result (dBμV/m)
1000	80.5	3.5	14	98.0

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 Radiated Transmitter Spurious Emissions and Restricted Bands

8.1.1 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.

8.1.2 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

8.1.3 Test conditions and setup:

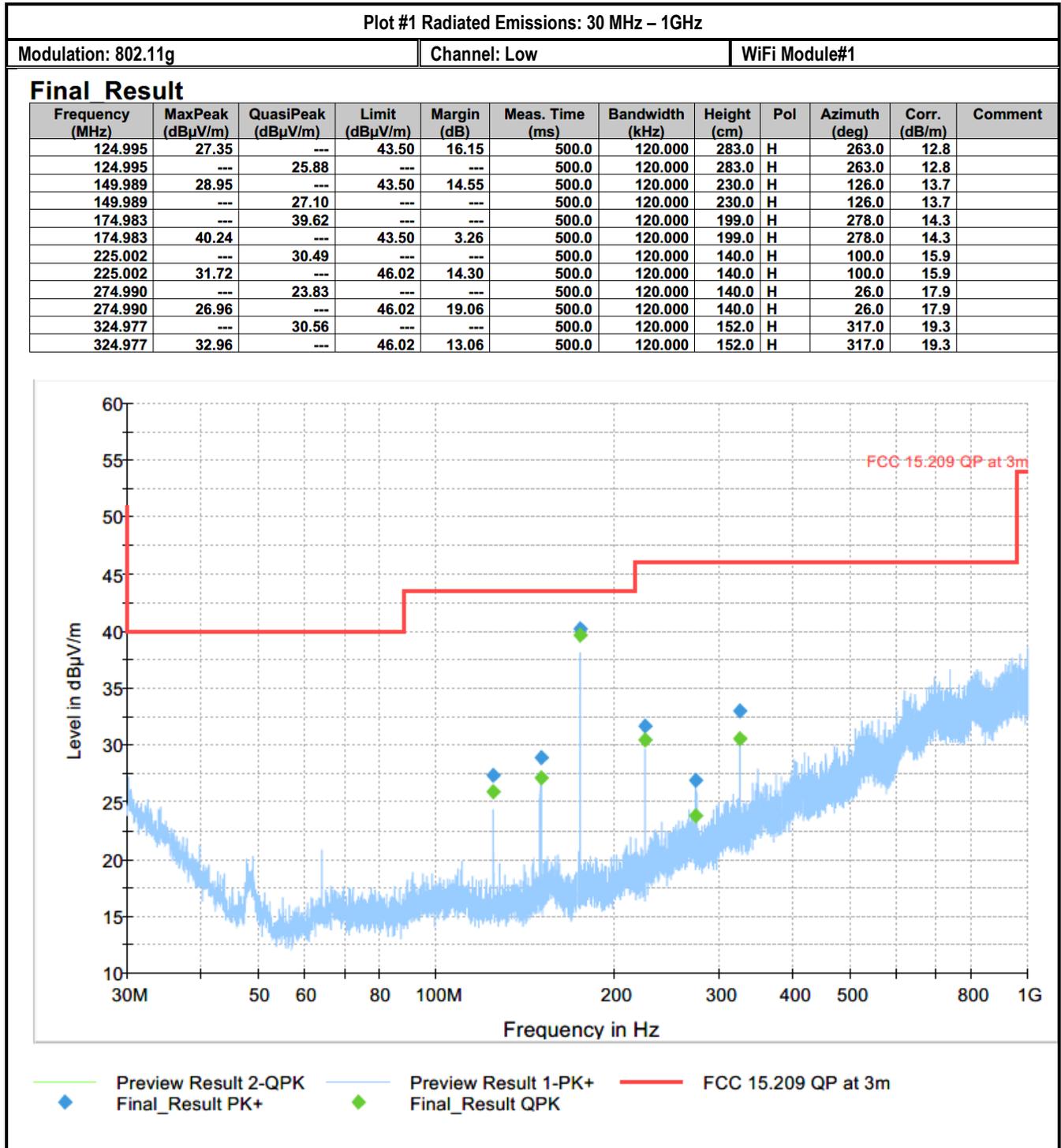
Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input
22.0° C	1	802.11g	14 VDC

8.1.4 Measurement result:

Plot #	Channel #	WiFi Module#	Scan Frequency	Limit	Result
1-3	Low	#1	30 MHz – 18 GHz	See section 8.6.2	Pass
4-8	Mid	#1	9 kHz – 26 GHz	See section 8.6.2	Pass
9-11	High	#1	30 MHz – 18 GHz	See section 8.6.2	Pass
12-14	Low	#2	30 MHz – 18 GHz	See section 8.6.2	Pass
15-19	Mid	#2	9 kHz – 26 GHz	See section 8.6.2	Pass
20-22	High	#2	30 MHz – 18 GHz	See section 8.6.2	Pass

Note: Tested with LTE B2 Co-Transmission

8.1.5 Measurement Plots:



Plot #2 Radiated Emissions: 1-3 GHz

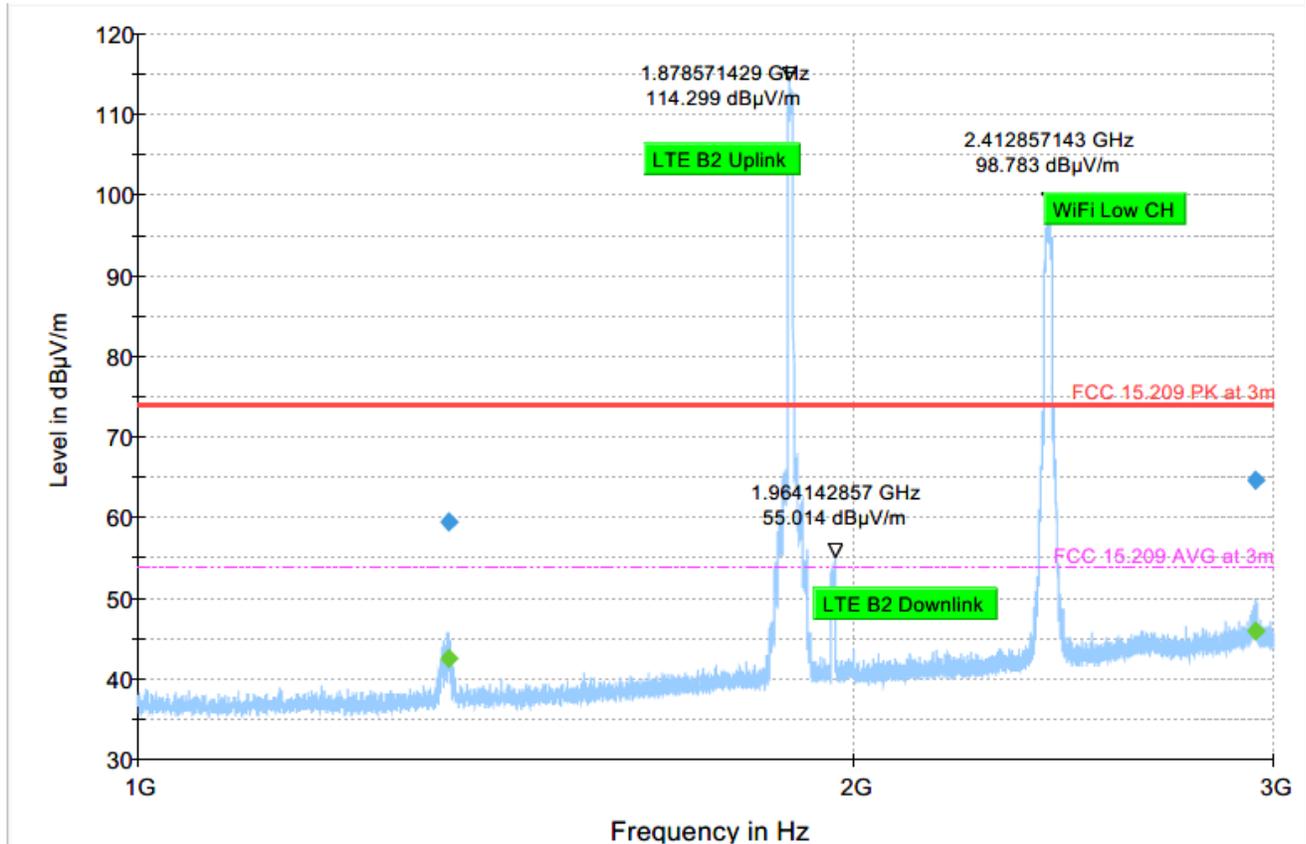
Modulation: 802.11g

Channel: Low

WiFi Module#1

Final Result

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)	Comment
1350.429	59.38	---	73.98	14.60	500.0	1000.000	140.0	H	303.0	5.1	
1350.429	---	42.63	53.98	11.35	500.0	1000.000	140.0	H	303.0	5.1	
2947.571	64.72	---	73.98	9.26	500.0	1000.000	240.0	H	299.0	11.6	
2947.571	---	45.89	53.98	8.09	500.0	1000.000	240.0	H	299.0	11.6	



— Preview Result 2-QPK
 — Preview Result 1-PK+
 — FCC 15.209 PK at 3m
- - - FCC 15.209 AVG at 3m
 ◆ Final_Result PK+
 ◆ Final_Result CAV

Plot #3 Radiated Emissions: 3-18 GHz

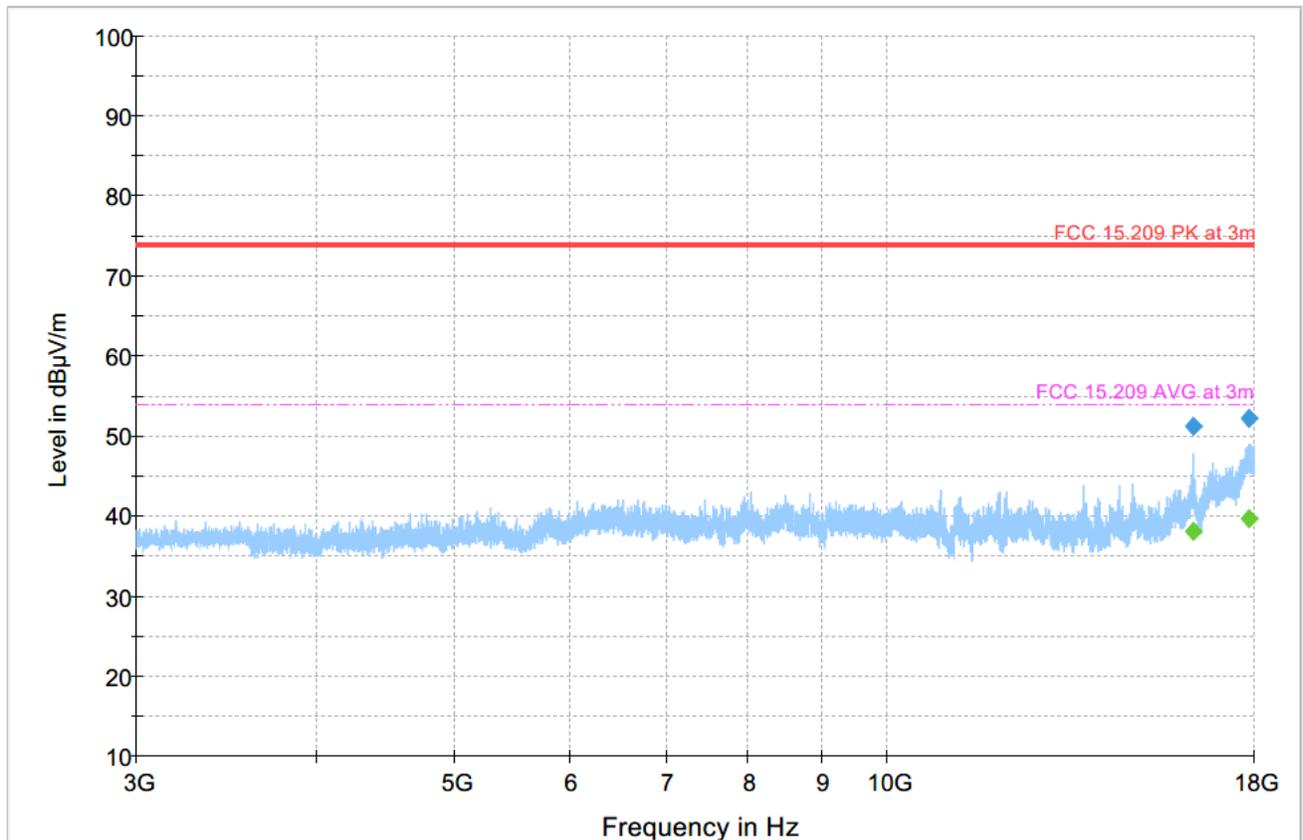
Modulation: 802.11g

Channel: Low

WiFi Module#1

Final Result

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)	Comment
16336.000	---	38.17	53.98	15.81	500.0	1000.000	218.0	V	72.0	10.5	
16336.000	51.14	---	73.98	22.84	500.0	1000.000	218.0	V	72.0	10.5	
17843.000	---	39.58	53.98	14.40	500.0	1000.000	252.0	V	69.0	16.6	
17843.000	52.19	---	73.98	21.79	500.0	1000.000	252.0	V	69.0	16.6	



- Preview Result 2-QPK
- Preview Result 1-PK+
- FCC 15.209 PK at 3m
- - - FCC 15.209 AVG at 3m
- ◆ Final_Result PK+
- ◆ Final_Result CAV

Plot #4 Radiated Emissions: 9 KHz – 30 MHz

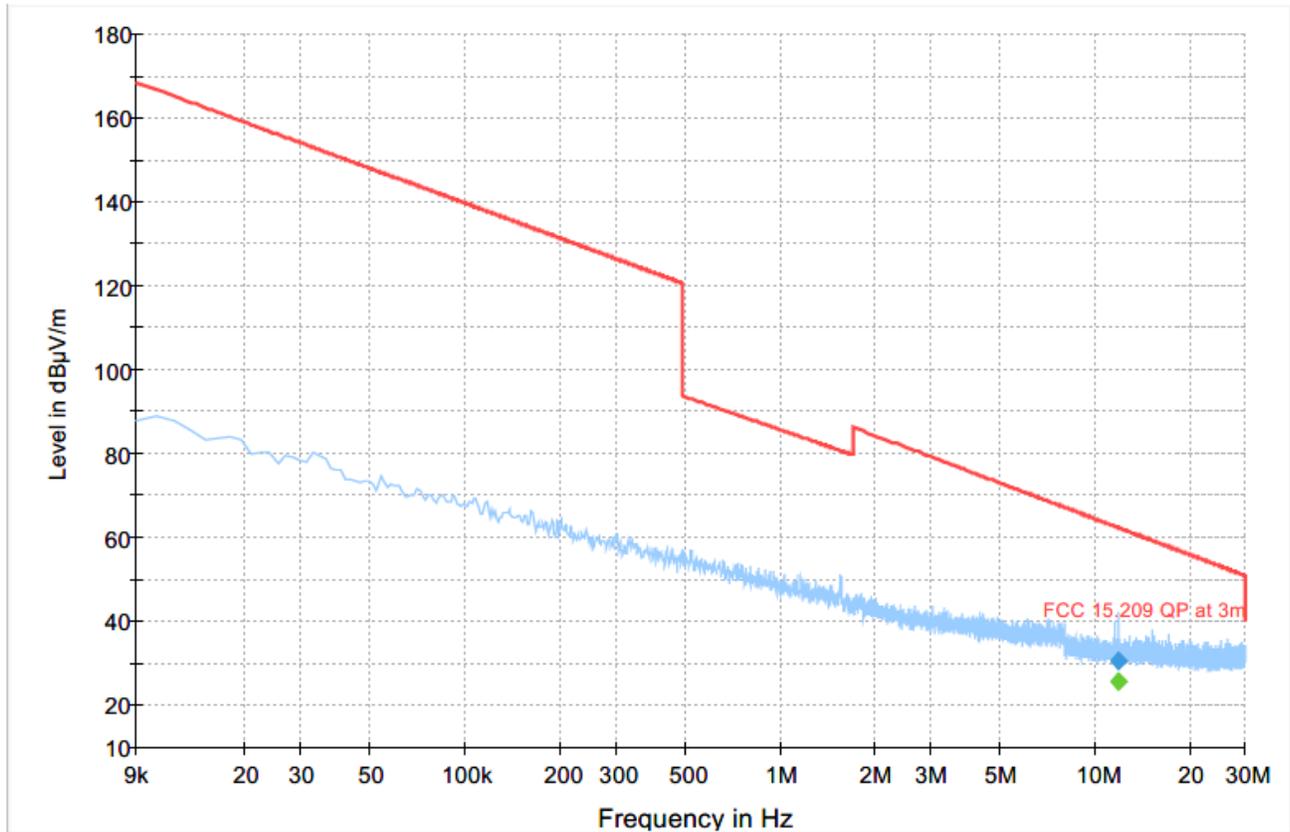
Modulation: 802.11g

Channel: Mid

WiFi Module#1

Final Result

Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
11.906	---	25.85	62.42	36.57	500.0	9.000	248.0	V	224.0	17.4	
11.906	30.86	---	62.42	31.56	500.0	9.000	248.0	V	224.0	17.4	



- Preview Result 2-QPK
- Preview Result 1-PK+
- FCC 15.209 QP at 3m
- ◆ Final_Result PK+
- ◆ Final_Result QPK

Plot #5 Radiated Emissions: 30 MHz – 1GHz

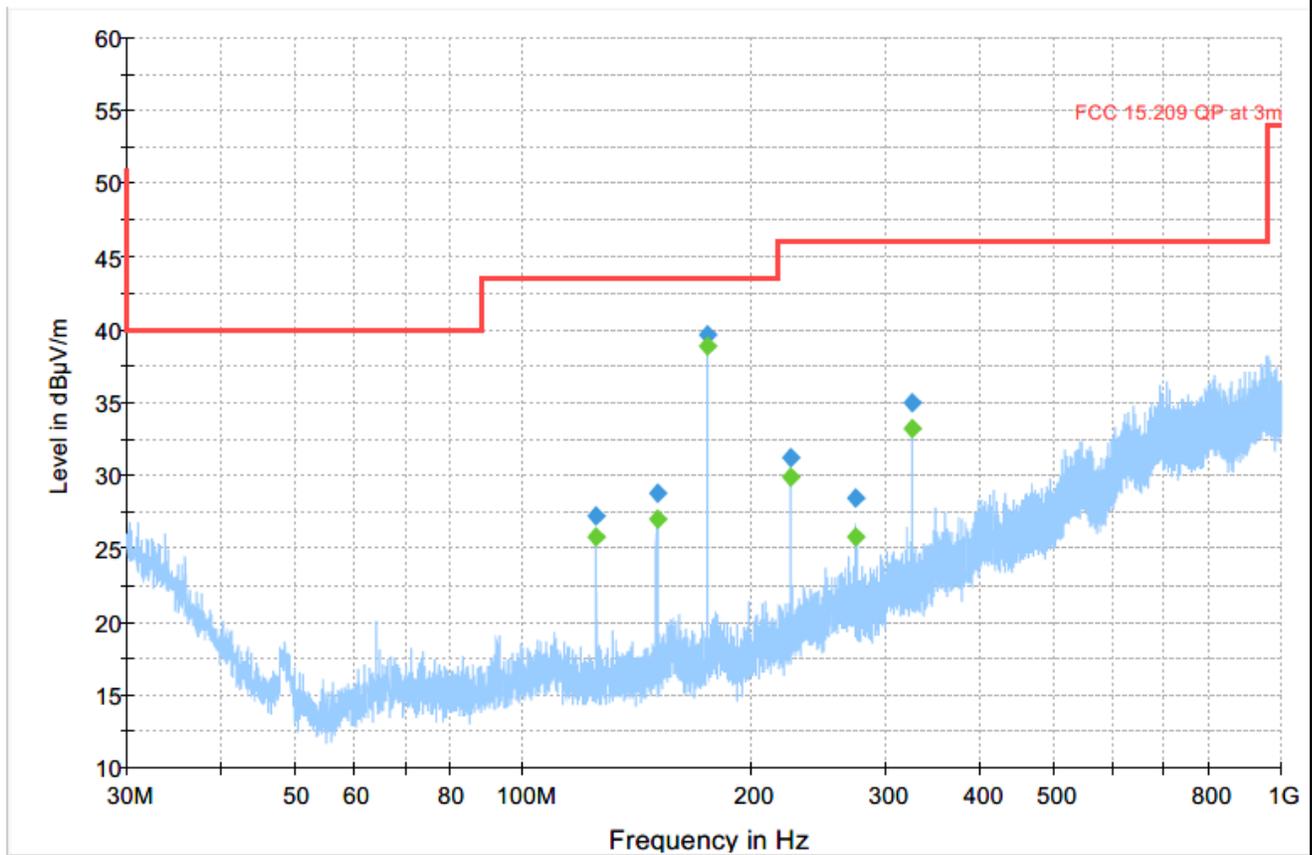
Modulation: 802.11g

Channel: Mid

WiFi Module#1

Final Result

Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
124.995	27.25	---	43.50	16.25	500.0	120.000	272.0	H	265.0	12.8	
124.995	---	25.82	---	---	500.0	120.000	272.0	H	265.0	12.8	
149.989	---	26.99	---	---	500.0	120.000	186.0	H	121.0	13.7	
149.989	28.81	---	43.50	14.69	500.0	120.000	186.0	H	121.0	13.7	
174.983	39.70	---	43.50	3.80	500.0	120.000	186.0	H	282.0	14.3	
174.983	---	38.91	---	---	500.0	120.000	186.0	H	282.0	14.3	
225.002	---	29.92	---	---	500.0	120.000	140.0	H	95.0	15.9	
225.002	31.29	---	46.02	14.73	500.0	120.000	140.0	H	95.0	15.9	
274.990	---	25.78	---	---	500.0	120.000	196.0	H	276.0	17.9	
274.990	28.46	---	46.02	17.56	500.0	120.000	196.0	H	276.0	17.9	
325.009	---	33.24	---	---	500.0	120.000	140.0	H	335.0	19.3	
325.009	35.04	---	46.02	10.98	500.0	120.000	140.0	H	335.0	19.3	



- ◆ Preview Result 2-QPK
- ◆ Final_Result PK+
- ◆ Preview Result 1-PK+
- ◆ Final_Result QPK
- FCC 15.209 QP at 3m

Plot #6 Radiated Emissions: 1-3 GHz

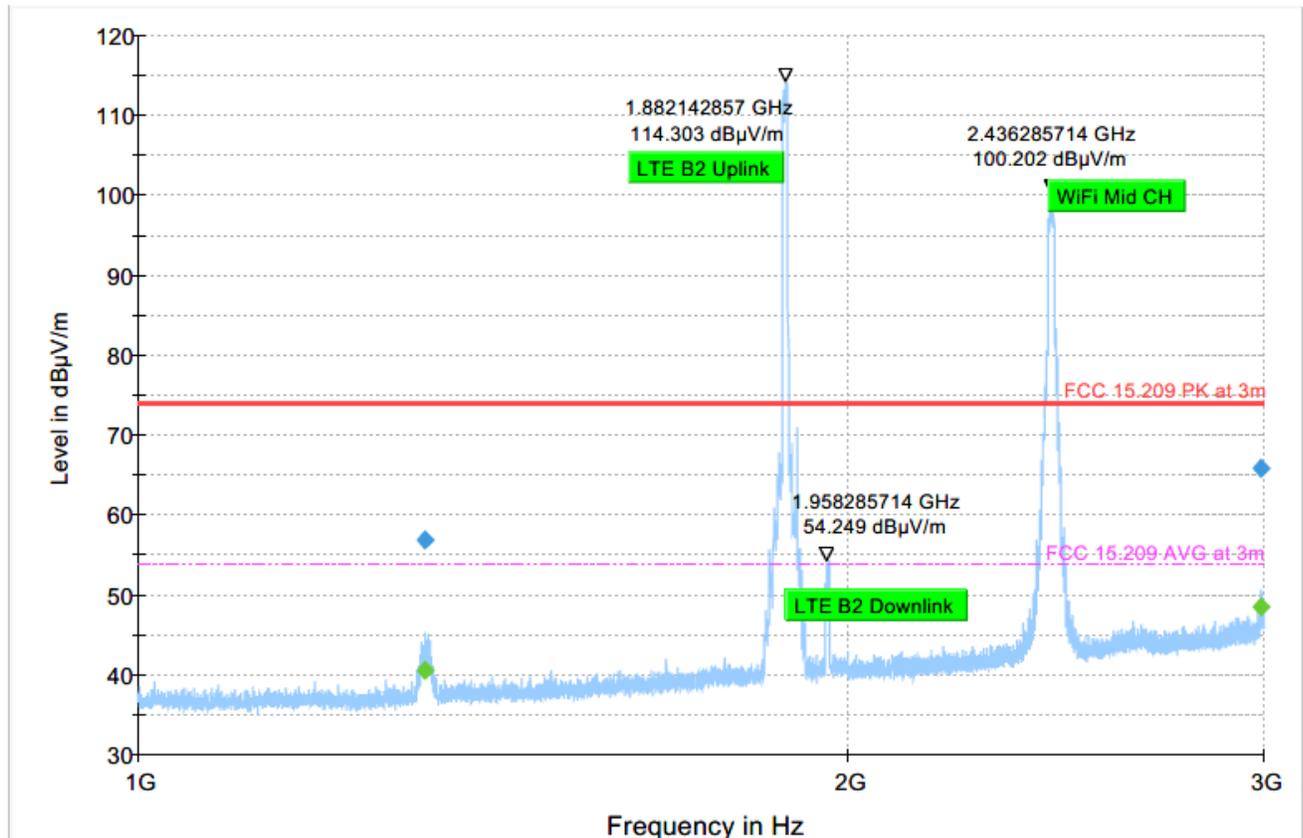
Modulation: 802.11g

Channel: Mid

WiFi Module#1

Final Result

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)	Comment
1323.143	56.82	---	73.98	17.16	500.0	1000.000	176.0	H	299.0	5.1	
1323.143	---	40.65	53.98	13.33	500.0	1000.000	176.0	H	299.0	5.1	
2992.571	65.90	---	73.98	8.08	500.0	1000.000	174.0	H	290.0	11.9	
2992.571	---	48.52	53.98	5.46	500.0	1000.000	174.0	H	290.0	11.9	



- Preview Result 2-QPK
- Preview Result 1-PK+
- FCC 15.209 PK at 3m
- - - FCC 15.209 AVG at 3m
- ◆ Final_Result PK+
- ◆ Final_Result CAV

Plot #7 Radiated Emissions: 3-18 GHz

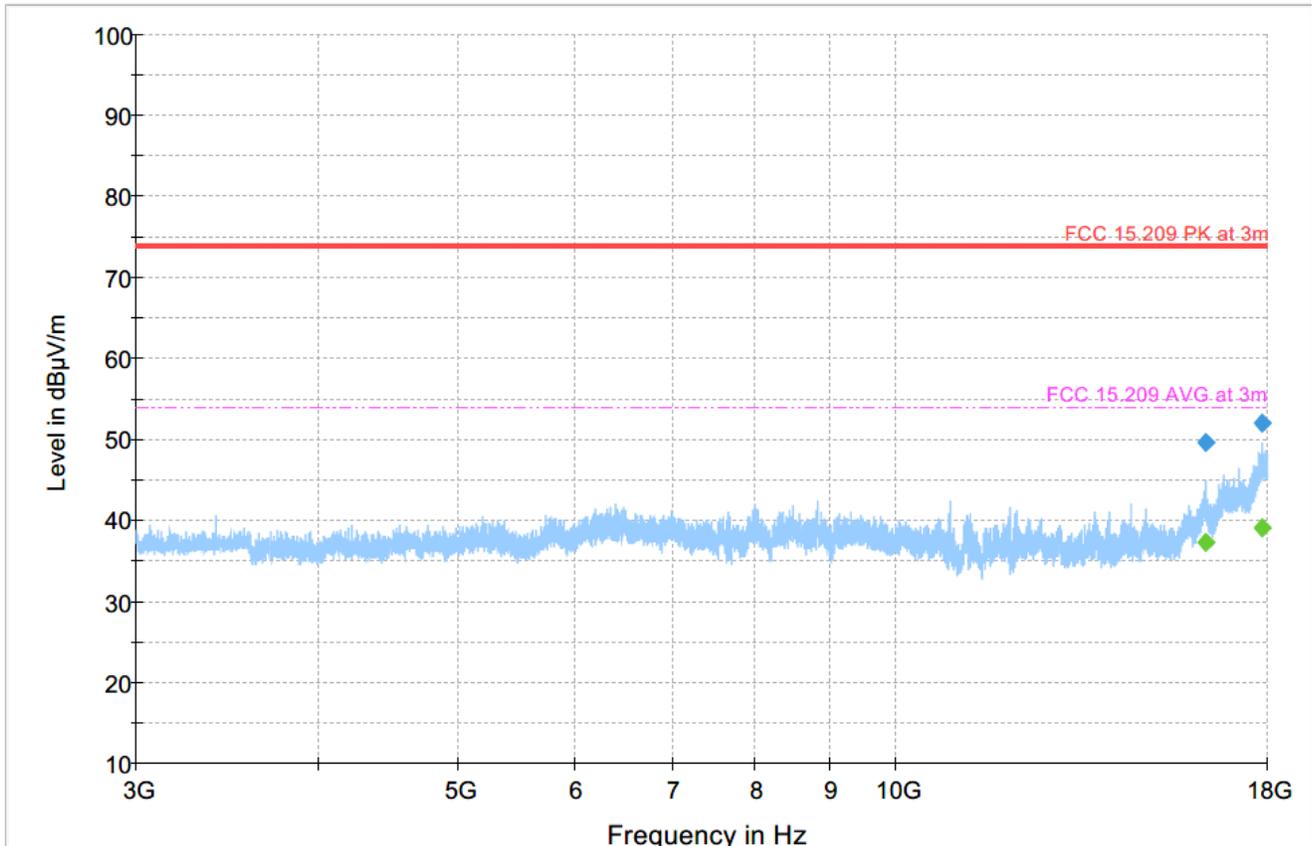
Modulation: 802.11g

Channel: Mid

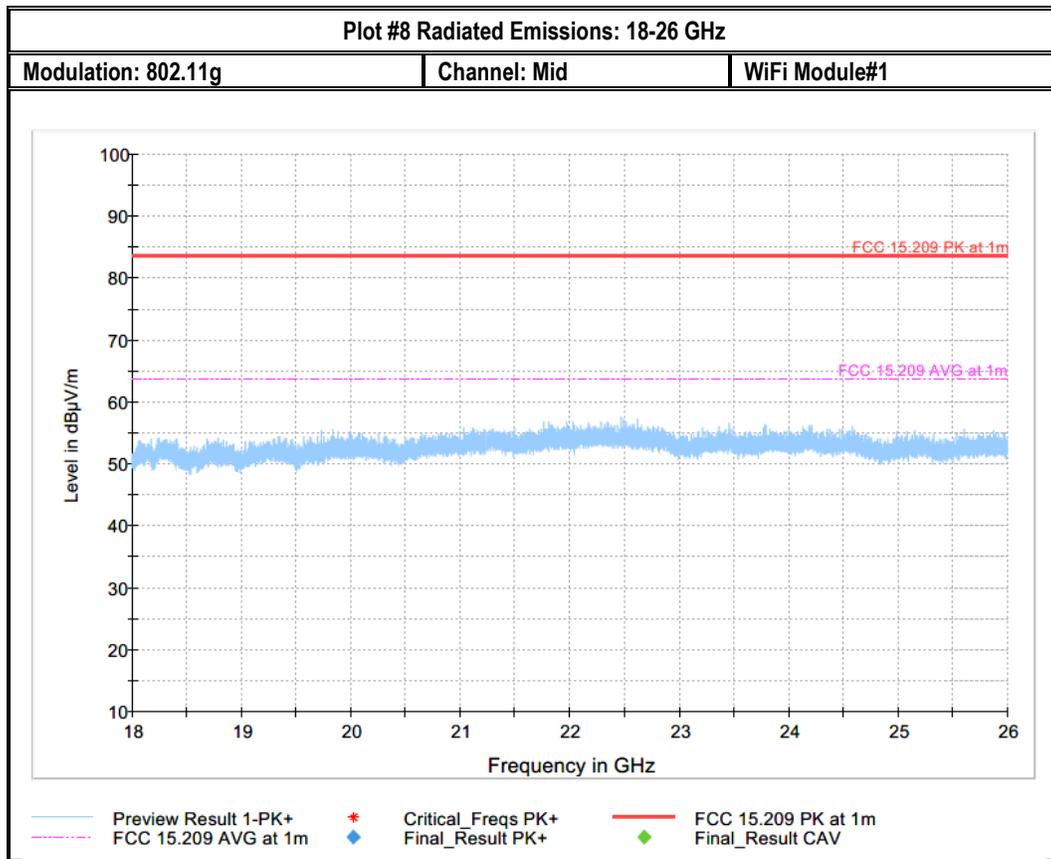
WiFi Module#1

Final Result

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)	Comment
16346.000	---	37.28	53.98	16.70	500.0	1000.000	293.0	H	178.0	10.4	
16346.000	49.64	---	73.98	24.34	500.0	1000.000	293.0	H	178.0	10.4	
17872.500	---	39.15	53.98	14.83	500.0	1000.000	287.0	V	27.0	16.7	
17872.500	52.11	---	73.98	21.87	500.0	1000.000	287.0	V	27.0	16.7	



- Preview Result 2-QPK
- Preview Result 1-PK+
- FCC 15.209 PK at 3m
- - - FCC 15.209 AVG at 3m
- ◆ Final_Result PK+
- ◆ Final_Result CAV



Plot #9 Radiated Emissions: 30 MHz – 1GHz

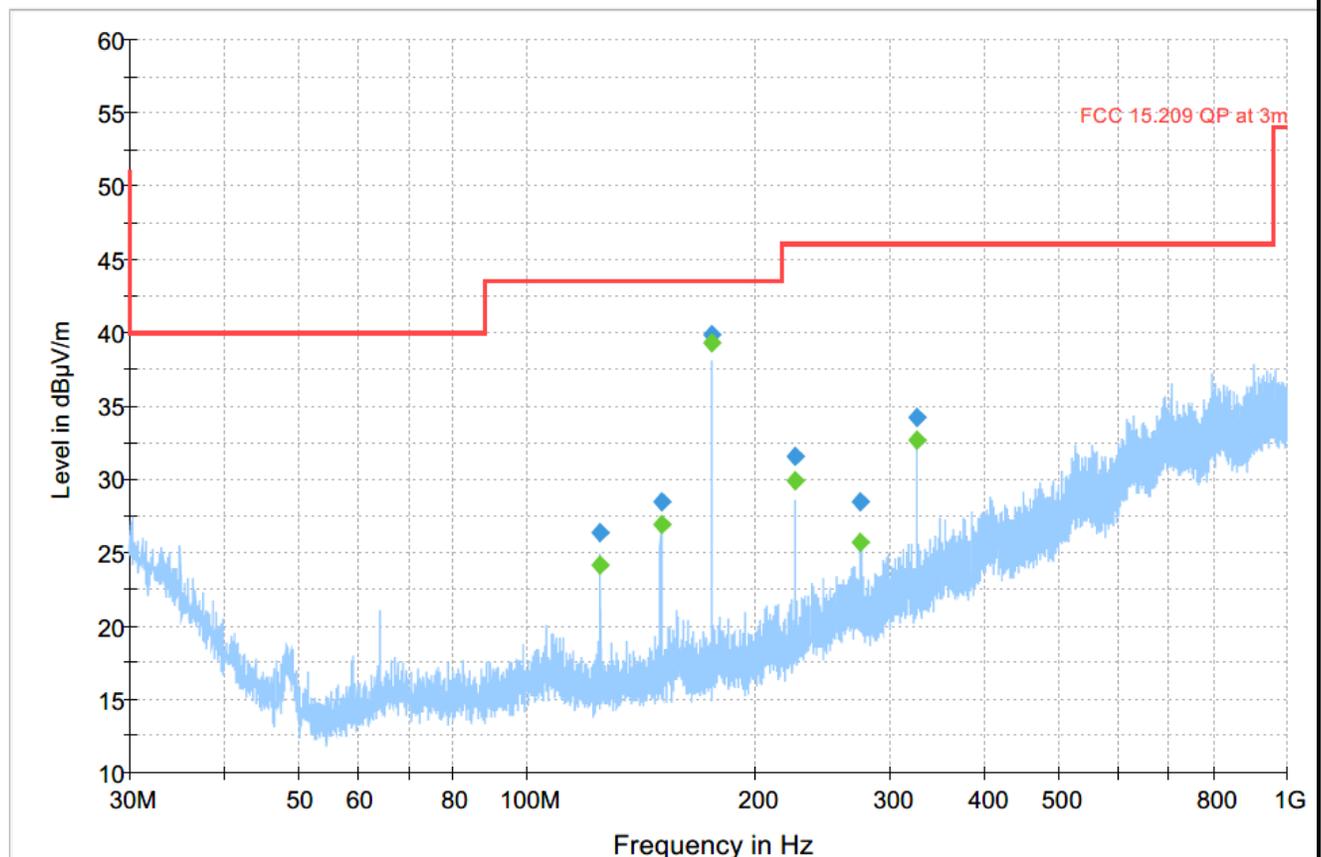
Modulation: 802.11g

Channel: High

WiFi Module#1

Final Result

Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
124.995	---	24.11	---	---	500.0	120.000	315.0	H	98.0	12.8	
124.995	26.41	---	43.50	17.09	500.0	120.000	315.0	H	98.0	12.8	
149.989	28.48	---	43.50	15.02	500.0	120.000	229.0	H	115.0	13.7	
149.989	---	26.96	---	---	500.0	120.000	229.0	H	115.0	13.7	
174.983	---	39.30	---	---	500.0	120.000	208.0	H	285.0	14.3	
174.983	39.92	---	43.50	3.58	500.0	120.000	208.0	H	285.0	14.3	
225.002	---	29.94	---	---	500.0	120.000	151.0	H	92.0	15.9	
225.002	31.54	---	46.02	14.48	500.0	120.000	151.0	H	92.0	15.9	
274.990	28.50	---	46.02	17.52	500.0	120.000	228.0	H	274.0	17.9	
274.990	---	25.65	---	---	500.0	120.000	228.0	H	274.0	17.9	
325.009	---	32.63	---	---	500.0	120.000	140.0	H	344.0	19.3	
325.009	34.28	---	46.02	11.74	500.0	120.000	140.0	H	344.0	19.3	



- ◆ Preview Result 2-QPK
- Preview Result 1-PK+
- FCC 15.209 QP at 3m
- ◆ Final_Result PK+
- ◆ Final_Result QPK

Plot #10 Radiated Emissions: 1-3 GHz

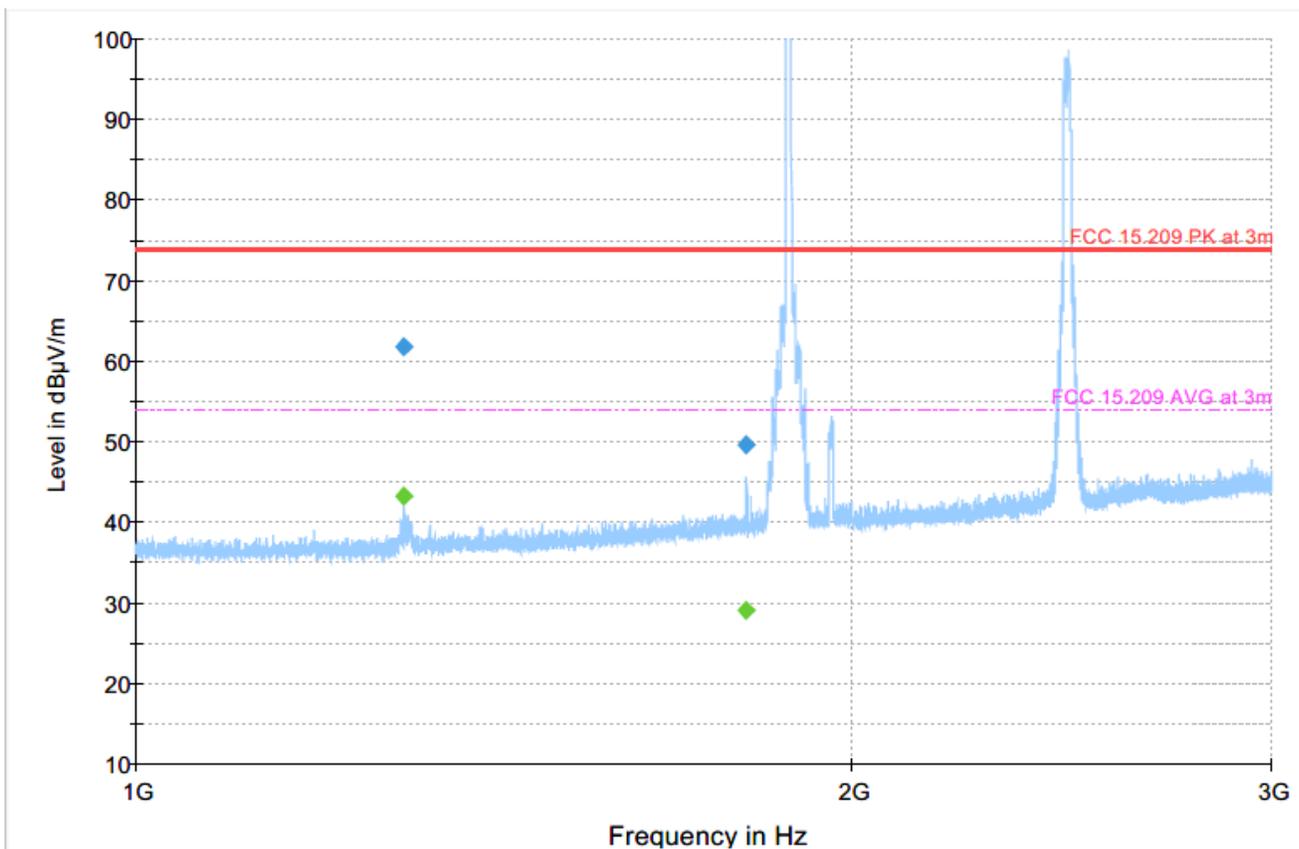
Modulation: 802.11g

Channel: High

WiFi Module#1

Final Result

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)	Comment
1296.714	---	43.16	53.98	10.82	500.0	1000.000	175.0	H	224.0	4.7	
1296.714	61.81	---	73.98	12.17	500.0	1000.000	175.0	H	224.0	4.7	
1805.571	---	29.08	53.98	24.90	500.0	1000.000	315.0	V	33.0	6.8	
1805.571	49.55	---	73.98	24.43	500.0	1000.000	315.0	V	33.0	6.8	



- Preview Result 2-QPK
- Preview Result 1-PK+
- FCC 15.209 PK at 3m
- - - FCC 15.209 AVG at 3m
- ◆ Final_Result PK+
- ◆ Final_Result CAV

Plot #11 Radiated Emissions: 3-18 GHz

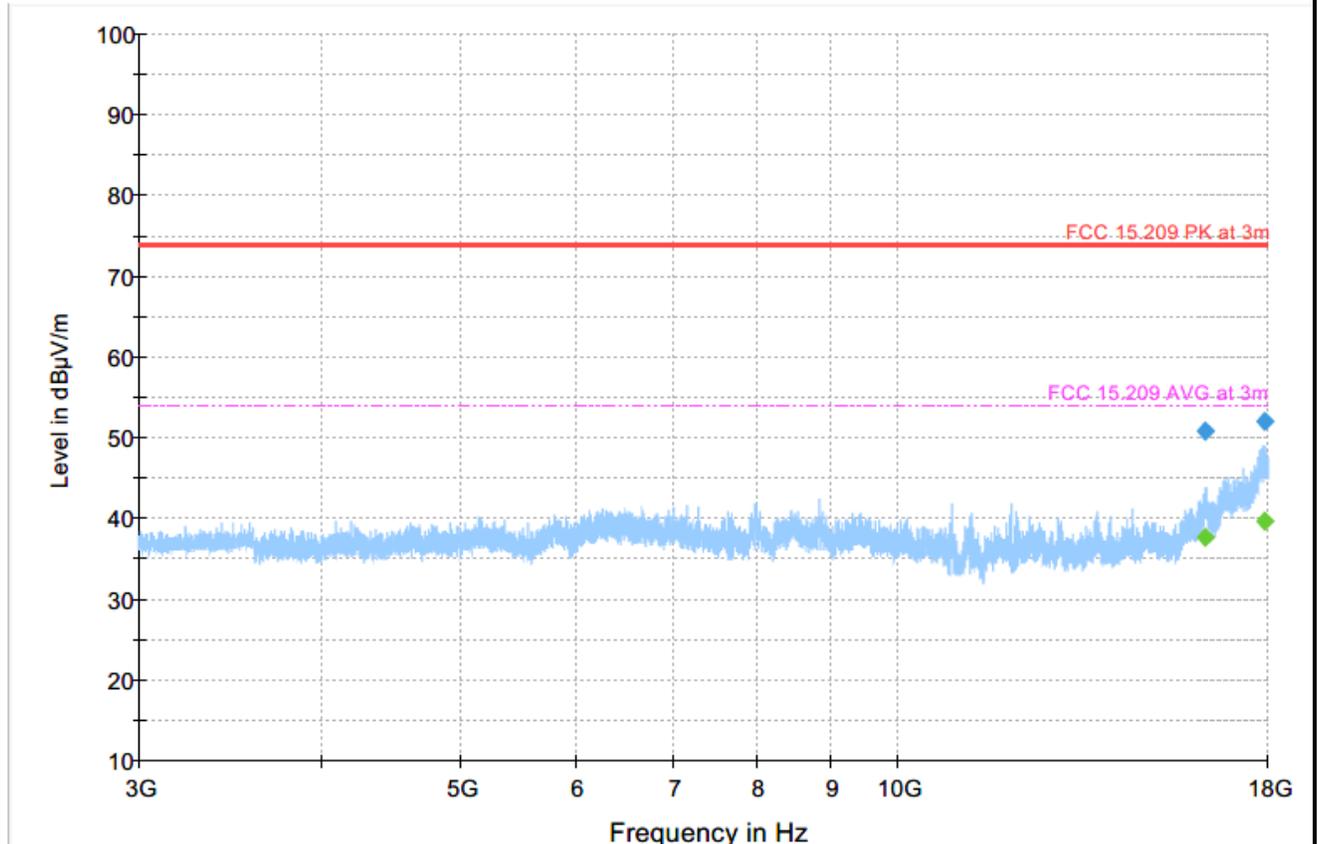
Modulation: 802.11g

Channel: High

WiFi Module#1

Final Result

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)	Comment
16270.000	---	37.67	53.98	16.31	500.0	1000.000	315.0	V	285.0	10.4	
16270.000	50.81	---	73.98	23.17	500.0	1000.000	315.0	V	285.0	10.4	
17885.500	---	39.65	53.98	14.33	500.0	1000.000	174.0	V	264.0	16.8	
17885.500	52.05	---	73.98	21.93	500.0	1000.000	174.0	V	264.0	16.8	



— Preview Result 2-QPK
 — Preview Result 1-PK+
 — FCC 15.209 PK at 3m
- - - FCC 15.209 AVG at 3m
 ◆ Final_Result PK+
 ◆ Final_Result CAV

Plot #12 Radiated Emissions: 30 MHz – 1GHz

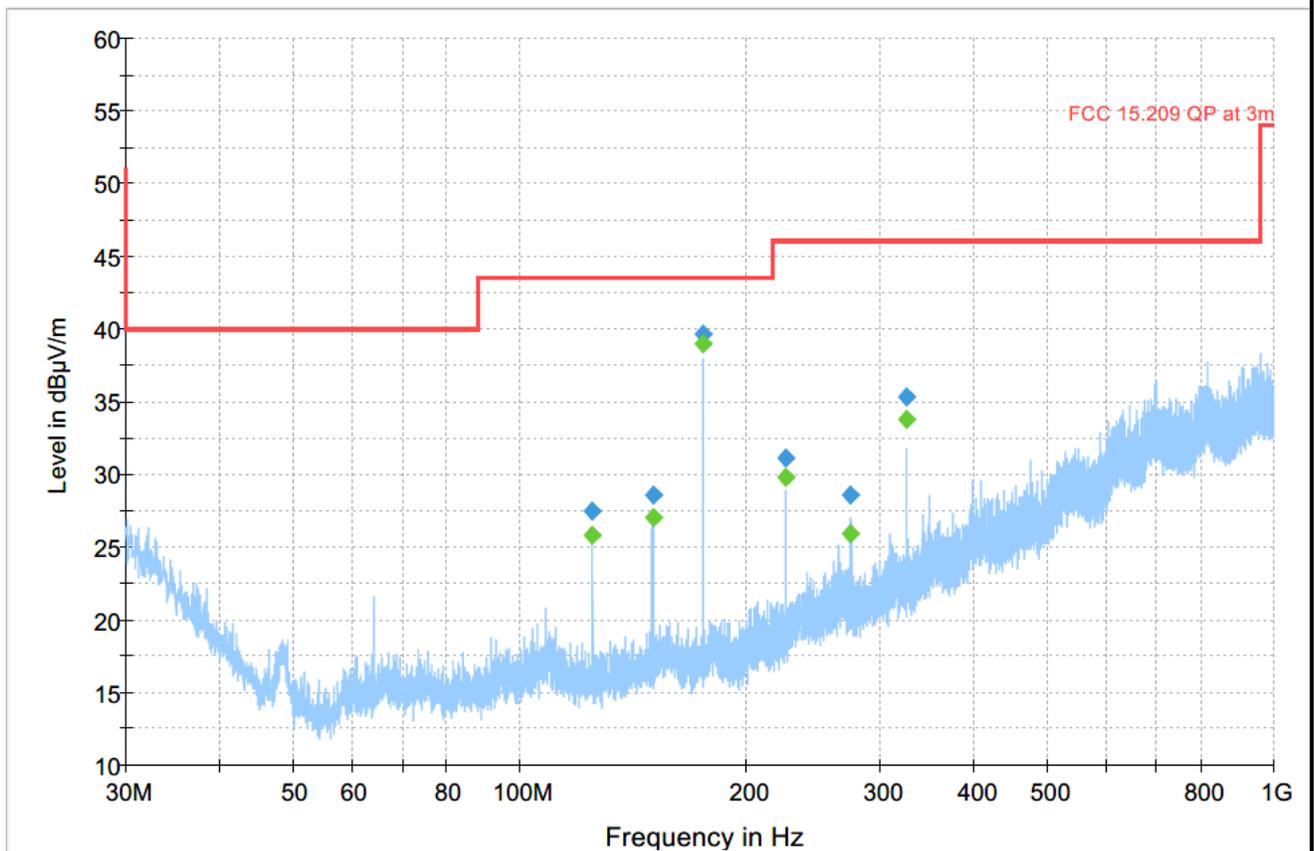
Modulation: 802.11g

Channel: Low

WiFi Module#2

Final Result

Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Poi	Azimuth (deg)	Corr. (dB/m)	Comment
124.995	27.53	---	43.50	15.97	500.0	120.000	274.0	H	265.0	12.8	
124.995	---	25.86	---	---	500.0	120.000	274.0	H	265.0	12.8	
149.989	---	27.02	---	---	500.0	120.000	196.0	H	116.0	13.7	
149.989	28.63	---	43.50	14.87	500.0	120.000	196.0	H	116.0	13.7	
174.983	---	38.97	---	---	500.0	120.000	198.0	H	288.0	14.3	
174.983	39.59	---	43.50	3.91	500.0	120.000	198.0	H	288.0	14.3	
225.002	---	29.75	---	---	500.0	120.000	151.0	H	94.0	15.9	
225.002	31.16	---	46.02	14.86	500.0	120.000	151.0	H	94.0	15.9	
274.990	28.54	---	46.02	17.48	500.0	120.000	208.0	H	276.0	17.9	
274.990	---	25.91	---	---	500.0	120.000	208.0	H	276.0	17.9	
325.009	---	33.78	---	---	500.0	120.000	140.0	H	330.0	19.3	
325.009	35.34	---	46.02	10.69	500.0	120.000	140.0	H	330.0	19.3	



◆ Preview Result 2-QPK Final_Result PK+
 ◆ Preview Result 1-PK+ Final_Result QPK
 — FCC 15.209 QP at 3m

Plot #13 Radiated Emissions: 1-3 GHz

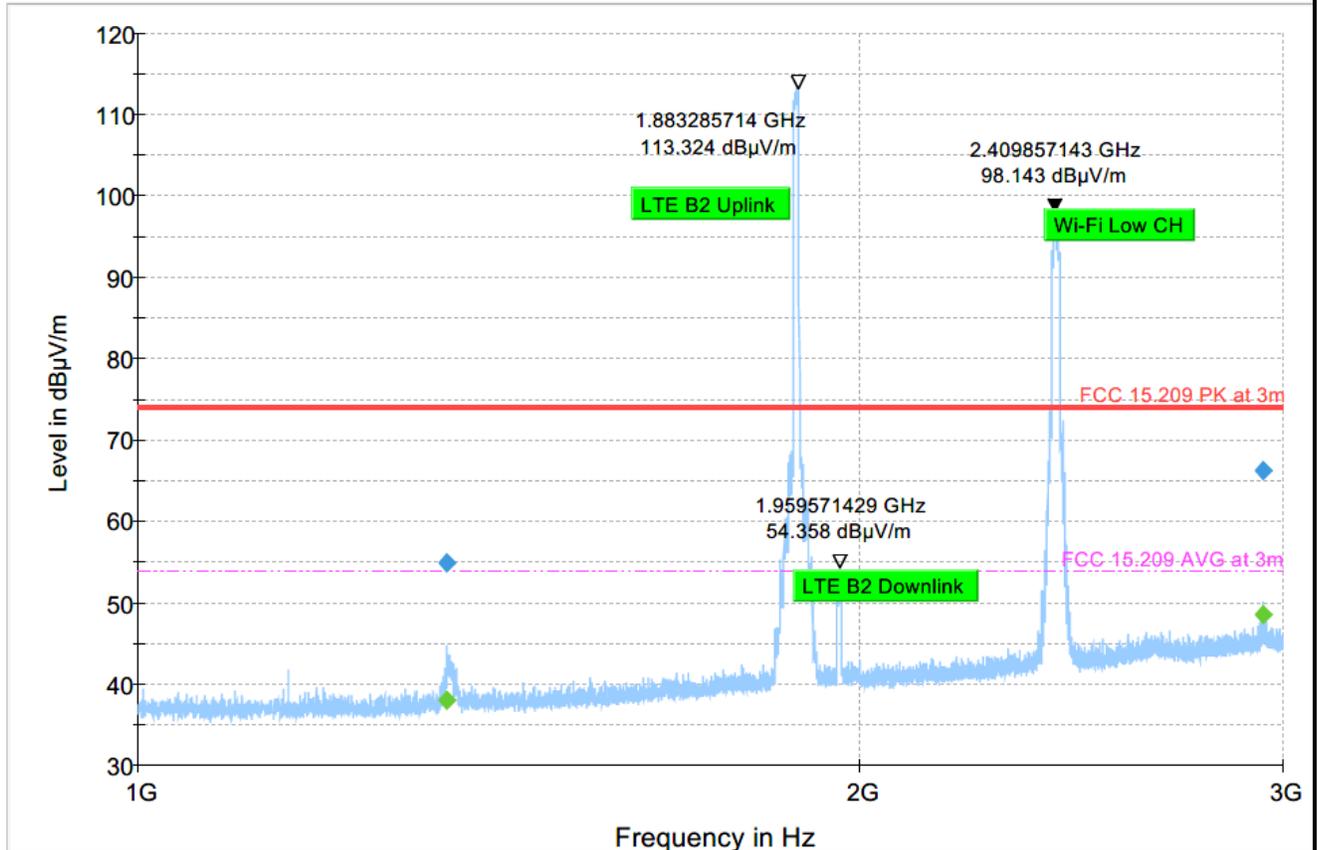
Modulation: 802.11g

Channel: Low

WiFi Module#2

Final Result

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)	Comment
1343.714	54.88	---	73.98	19.10	500.0	1000.000	207.0	H	304.0	5.1	
1343.714	---	38.00	53.98	15.98	500.0	1000.000	207.0	H	304.0	5.1	
2942.857	66.17	---	73.98	7.81	500.0	1000.000	140.0	H	288.0	11.6	
2942.857	---	48.50	53.98	5.48	500.0	1000.000	140.0	H	288.0	11.6	



- Preview Result 2-QPK
- Preview Result 1-PK+
- FCC 15.209 PK at 3m
- - - FCC 15.209 AVG at 3m
- ◆ Final_Result PK+
- ◆ Final_Result CAV

Plot #14 Radiated Emissions: 3-18 GHz

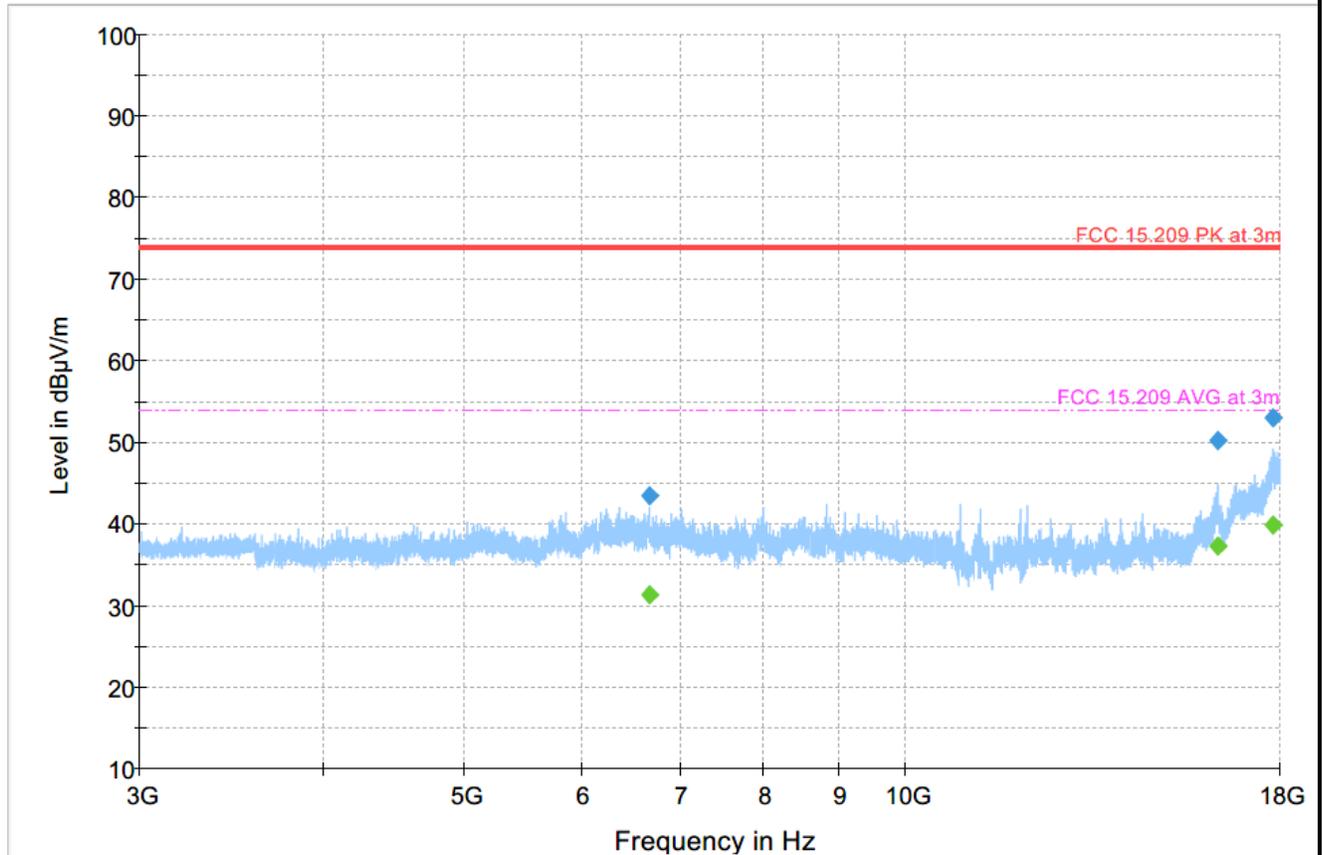
Modulation: 802.11g

Channel: Low

WiFi Module#2

Final Result

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)	Comment
6680.000	43.38	---	73.98	30.60	500.0	1000.000	275.0	H	19.0	-0.2	
6680.000	---	31.39	53.98	22.58	500.0	1000.000	275.0	H	19.0	-0.2	
16334.500	50.20	---	73.98	23.78	500.0	1000.000	268.0	H	5.0	10.5	
16334.500	---	37.34	53.98	16.64	500.0	1000.000	268.0	H	5.0	10.5	
17817.000	---	39.96	53.98	14.02	500.0	1000.000	152.0	H	242.0	16.4	
17817.000	53.09	---	73.98	20.89	500.0	1000.000	152.0	H	242.0	16.4	



— Preview Result 2-QPK
 — Preview Result 1-PK+
 — FCC 15.209 PK at 3m
- - - FCC 15.209 AVG at 3m
 ◆ Final_Result PK+
 ◆ Final_Result CAV

Plot #15 Radiated Emissions: 9 KHz – 30 MHz

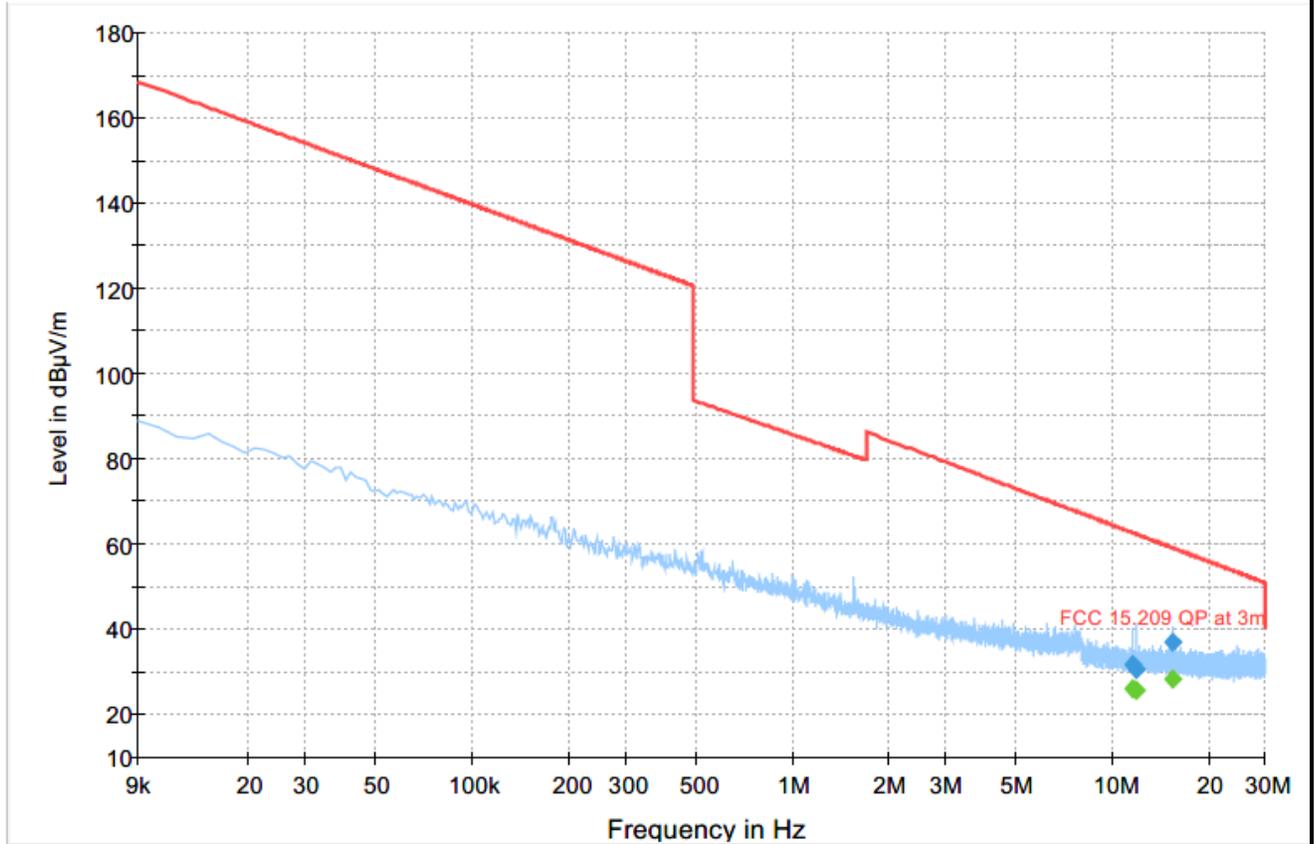
Modulation: 802.11g

Channel: Mid

WiFi Module#2

Final Result

Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
11.635	31.74	---	62.70	30.96	500.0	9.000	208.0	H	312.0	17.4	
11.635	---	26.04	62.70	36.66	500.0	9.000	208.0	H	312.0	17.4	
11.906	30.84	---	62.42	31.58	500.0	9.000	140.0	H	34.0	17.4	
11.906	---	25.78	62.42	36.64	500.0	9.000	140.0	H	34.0	17.4	
15.366	---	28.57	59.28	30.71	500.0	9.000	195.0	V	192.0	17.1	
15.366	37.24	---	59.28	22.04	500.0	9.000	195.0	V	192.0	17.1	



◆ Preview Result 2-QPK
◆ Final Result PK+
 — Preview Result 1-PK+
 — FCC 15.209 QP at 3m
 ◆ Final Result QPK

Plot #16 Radiated Emissions: 30 MHz – 1GHz

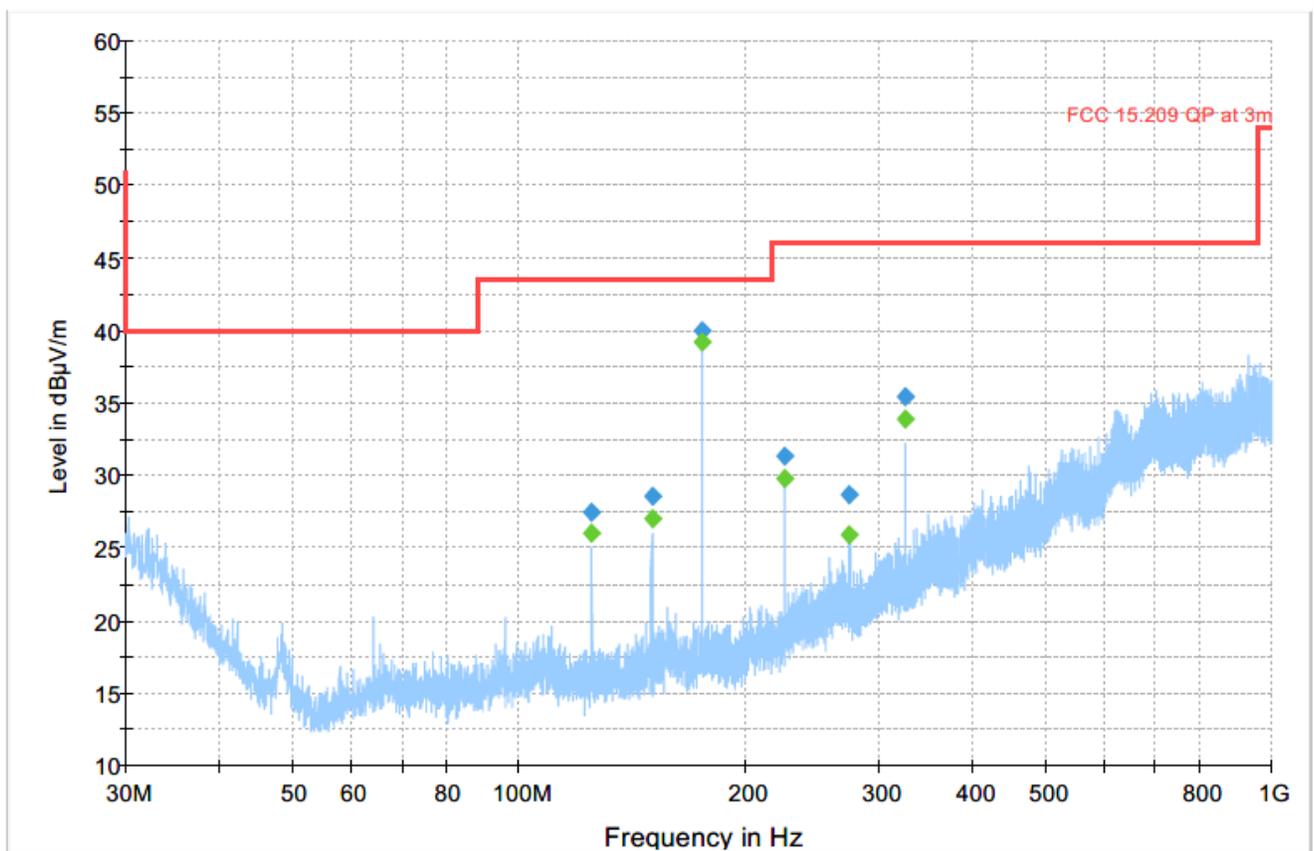
Modulation: 802.11g

Channel: Mid

WiFi Module#2

Final Result

Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
124.995	27.48	---	43.50	16.02	500.0	120.000	287.0	H	260.0	12.8	
124.995	---	26.00	---	---	500.0	120.000	287.0	H	260.0	12.8	
149.989	---	27.01	---	---	500.0	120.000	208.0	H	128.0	13.7	
149.989	28.62	---	43.50	14.88	500.0	120.000	208.0	H	128.0	13.7	
175.015	39.96	---	43.50	3.54	500.0	120.000	198.0	H	277.0	14.3	
175.015	---	39.26	---	---	500.0	120.000	198.0	H	277.0	14.3	
225.002	---	29.81	---	---	500.0	120.000	140.0	H	92.0	15.9	
225.002	31.30	---	46.02	14.73	500.0	120.000	140.0	H	92.0	15.9	
274.990	---	25.93	---	---	500.0	120.000	208.0	H	278.0	17.9	
274.990	28.71	---	46.02	17.31	500.0	120.000	208.0	H	278.0	17.9	
325.009	---	33.86	---	---	500.0	120.000	140.0	H	331.0	19.3	
325.009	35.40	---	46.02	10.62	500.0	120.000	140.0	H	331.0	19.3	



◆ Preview Result 2-QPK — Preview Result 1-PK+ — FCC 15.209 QP at 3m
◆ Final_Result PK+ ◆ Final_Result QPK

Plot #17 Radiated Emissions: 1-3 GHz

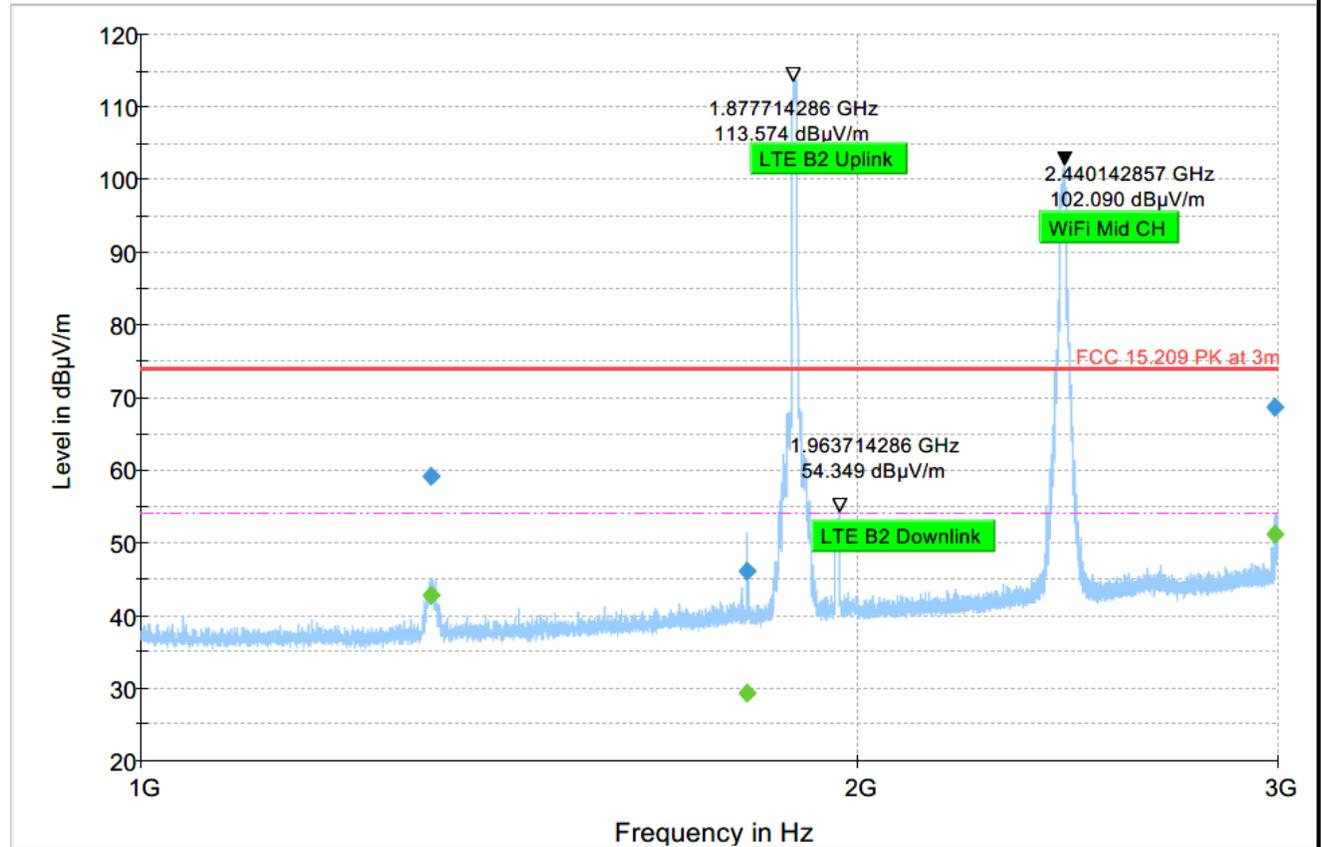
Modulation: 802.11g

Channel: Mid

WiFi Module#2

Final Result

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)	Comment
1323.286	59.26	---	73.98	14.72	500.0	1000.000	140.0	H	292.0	5.1	
1323.286	---	42.78	53.98	11.20	500.0	1000.000	140.0	H	292.0	5.1	
1796.571	46.19	---	73.98	27.79	500.0	1000.000	288.0	V	269.0	6.8	
1796.571	---	29.27	53.98	24.71	500.0	1000.000	288.0	V	269.0	6.8	
2989.000	---	51.14	53.98	2.84	500.0	1000.000	140.0	H	285.0	11.9	
2989.000	68.76	---	73.98	5.22	500.0	1000.000	140.0	H	285.0	11.9	



— Preview Result 2-QPK
 — Preview Result 1-PK+
 — FCC 15.209 PK at 3m
- - - FCC 15.209 AVG at 3m
 ◆ Final_Result PK+
 ◆ Final_Result CAV

Plot #18 Radiated Emissions: 3-18 GHz

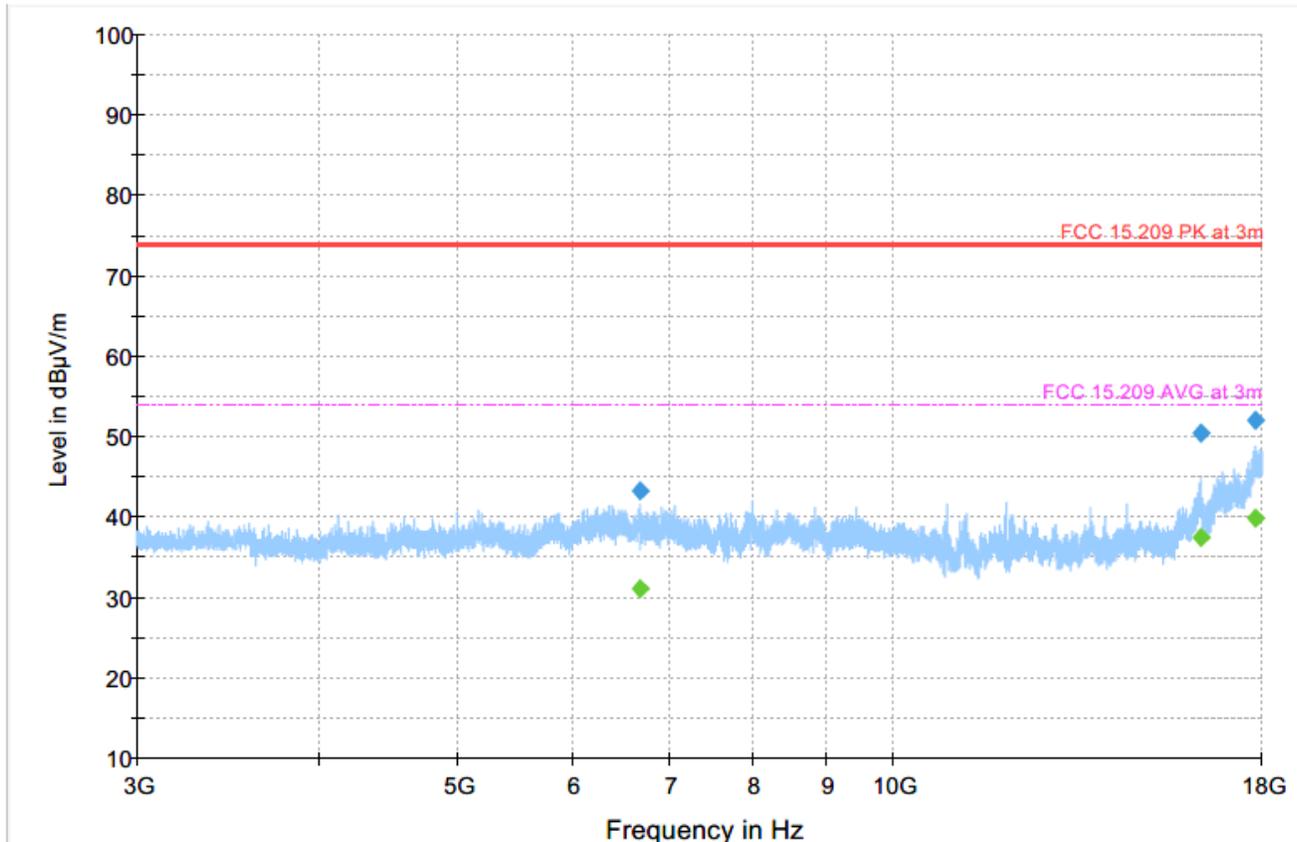
Modulation: 802.11g

Channel: Mid

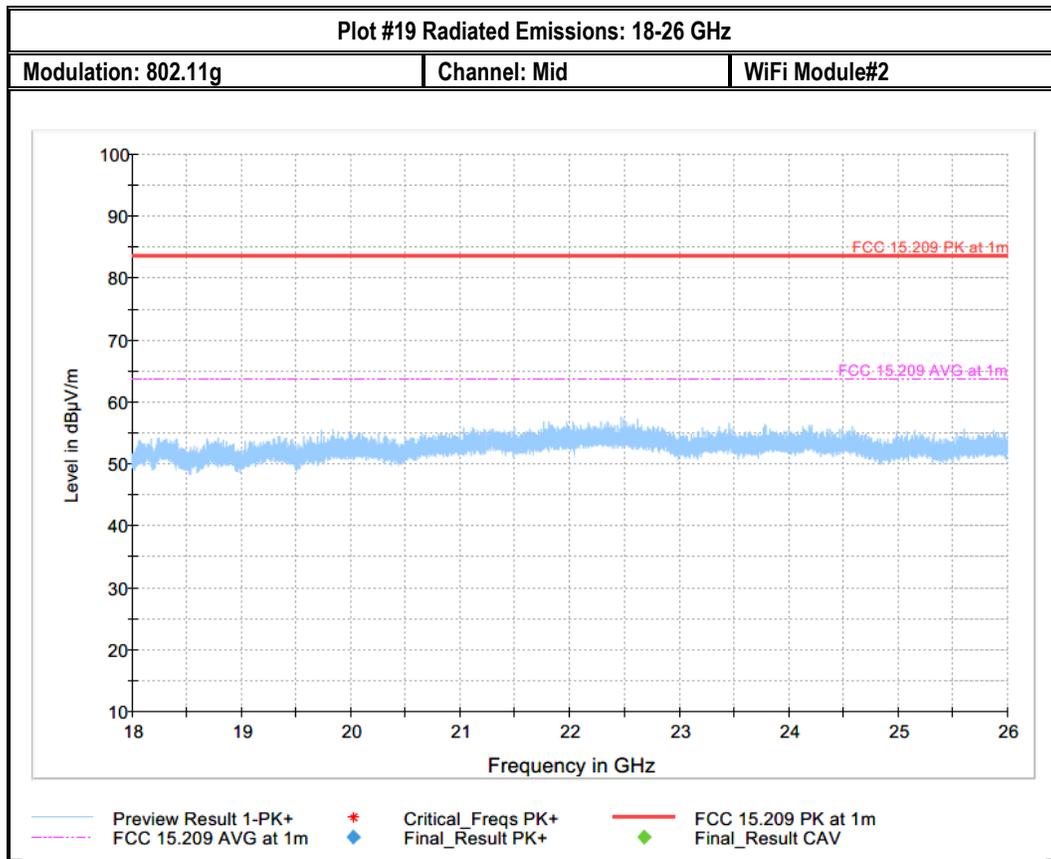
WiFi Module#2

Final Result

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)	Comment
6678.000	43.18	---	73.98	30.80	500.0	1000.000	140.0	V	12.0	-0.2	
6678.000	---	31.03	53.98	22.95	500.0	1000.000	140.0	V	12.0	-0.2	
16339.500	50.47	---	73.98	23.51	500.0	1000.000	217.0	V	59.0	10.5	
16339.500	---	37.55	53.98	16.43	500.0	1000.000	217.0	V	59.0	10.5	
17794.000	---	39.82	53.98	14.16	500.0	1000.000	164.0	V	309.0	16.2	
17794.000	52.05	---	73.98	21.93	500.0	1000.000	164.0	V	309.0	16.2	



- Preview Result 2-QPK
- Preview Result 1-PK+
- FCC 15.209 PK at 3m
- - - FCC 15.209 AVG at 3m
- ◆ Final_Result PK+
- ◆ Final_Result CAV



Plot #20 Radiated Emissions: 30 MHz – 1GHz

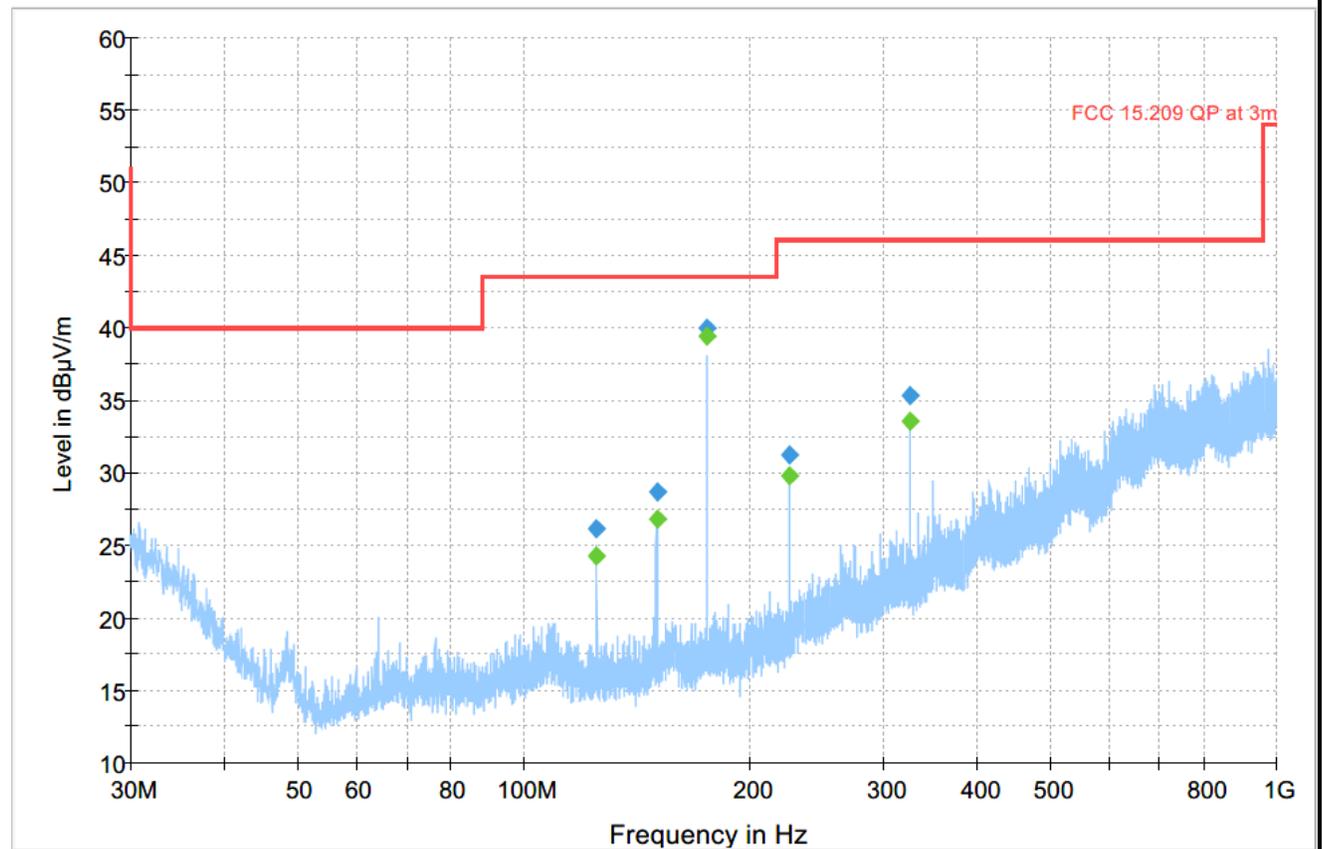
Modulation: 802.11g

Channel: High

WiFi Module#2

Final Result

Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
124.995	---	24.26	---	---	500.0	120.000	313.0	H	99.0	12.8	
124.995	26.10	---	43.50	17.40	500.0	120.000	313.0	H	99.0	12.8	
149.989	28.73	---	43.50	14.77	500.0	120.000	230.0	H	124.0	13.7	
149.989	---	26.83	---	---	500.0	120.000	230.0	H	124.0	13.7	
175.015	40.01	---	43.50	3.49	500.0	120.000	198.0	H	280.0	14.3	
175.015	---	39.40	---	---	500.0	120.000	198.0	H	280.0	14.3	
225.002	---	29.81	---	---	500.0	120.000	140.0	H	90.0	15.9	
225.002	31.22	---	46.02	14.81	500.0	120.000	140.0	H	90.0	15.9	
325.009	---	33.61	---	---	500.0	120.000	140.0	H	326.0	19.3	
325.009	35.32	---	46.02	10.70	500.0	120.000	140.0	H	326.0	19.3	



◆ Preview Result 2-QPK Final_Result PK+
 ◆ Preview Result 1-PK+ Final_Result QPK
 — FCC 15.209 QP at 3m

Plot #21 Radiated Emissions: 1-3 GHz

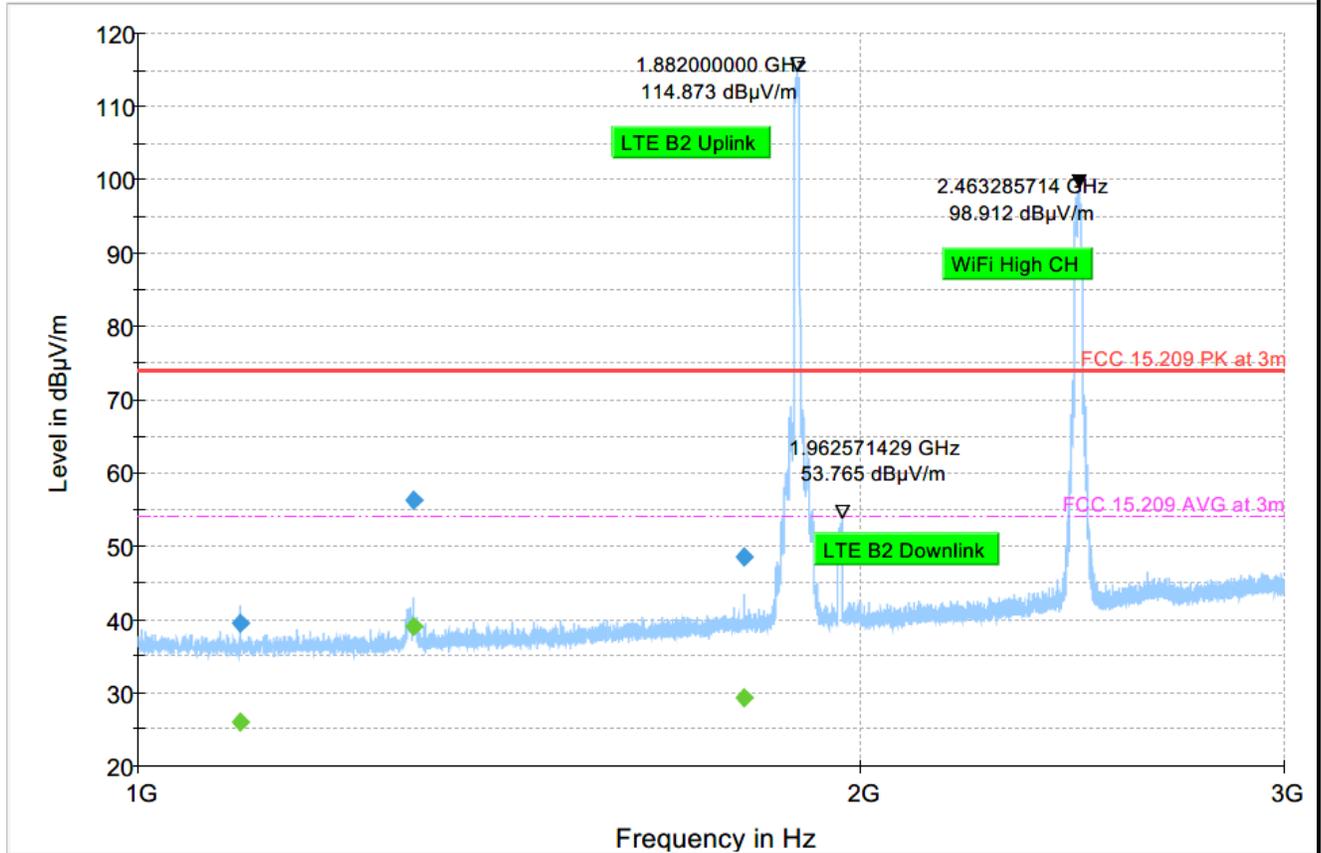
Modulation: 802.11g

Channel: High

WiFi Module#2

Final Result

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)	Comment
1103.143	39.41	---	73.98	34.57	500.0	1000.000	229.0	V	309.0	4.1	
1103.143	---	25.88	53.98	28.10	500.0	1000.000	229.0	V	309.0	4.1	
1301.429	---	39.02	53.98	14.96	500.0	1000.000	140.0	H	291.0	4.7	
1301.429	56.21	---	73.98	17.77	500.0	1000.000	140.0	H	291.0	4.7	
1787.857	48.48	---	73.98	25.50	500.0	1000.000	267.0	H	127.0	6.8	
1787.857	---	29.24	53.98	24.74	500.0	1000.000	267.0	H	127.0	6.8	



- Preview Result 2-QPK
- Preview Result 1-PK+
- FCC 15.209 PK at 3m
- FCC 15.209 AVG at 3m
- Final_Result PK+
- Final_Result CAV

Plot #22 Radiated Emissions: 3-18 GHz

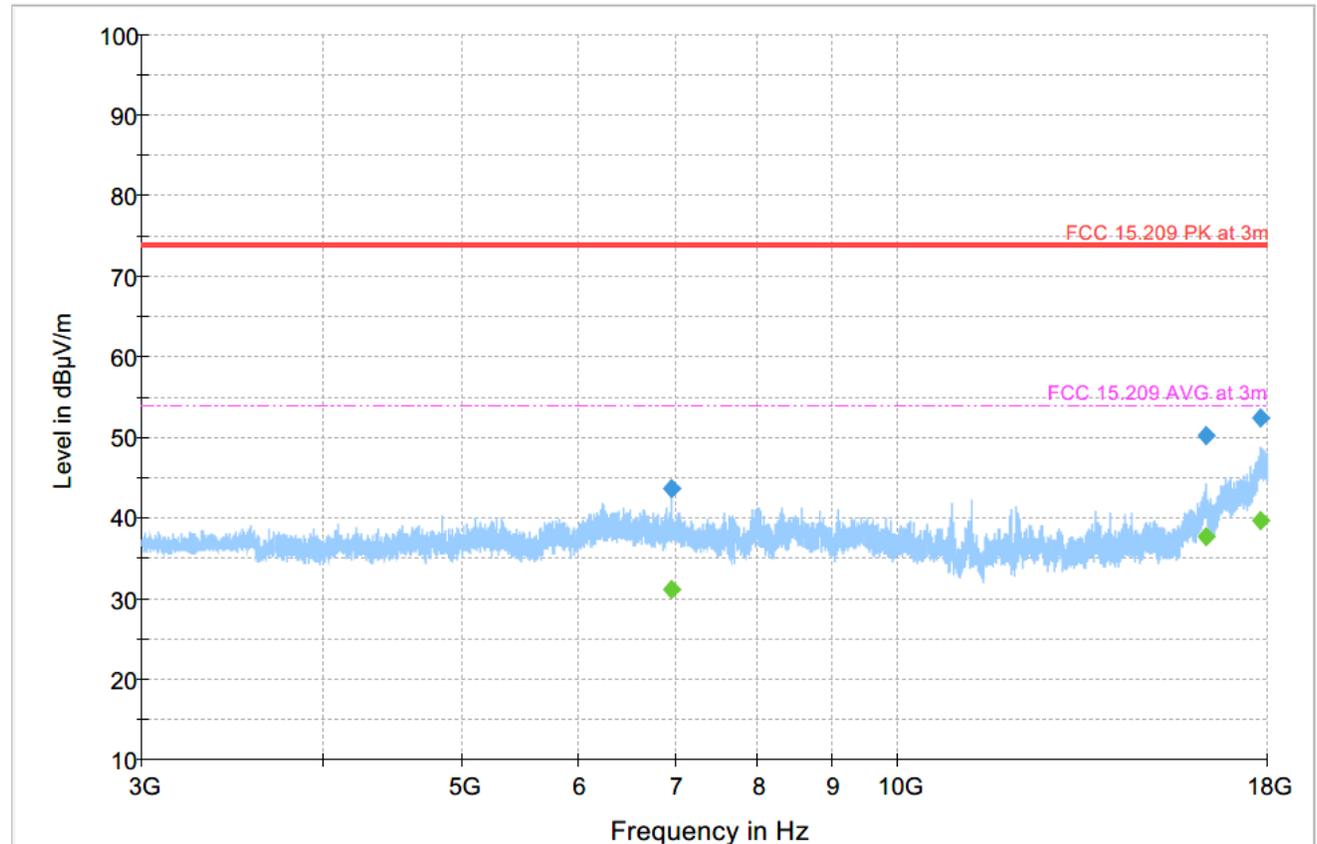
Modulation: 802.11g

Channel: High

WiFi Module#2

Final Result

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)	Comment
6964.500	43.62	---	73.98	30.36	500.0	1000.000	289.0	H	20.0	-0.3	
6964.500	---	31.19	53.98	22.79	500.0	1000.000	289.0	H	20.0	-0.3	
16330.500	50.25	---	73.98	23.73	500.0	1000.000	246.0	H	34.0	10.5	
16330.500	---	37.59	53.98	16.39	500.0	1000.000	246.0	H	34.0	10.5	
17791.000	---	39.57	53.98	14.41	500.0	1000.000	153.0	V	283.0	16.2	
17791.000	52.47	---	73.98	21.51	500.0	1000.000	153.0	V	283.0	16.2	



— Preview Result 2-QPK
 — Preview Result 1-PK+
 — FCC 15.209 PK at 3m
- - - FCC 15.209 AVG at 3m
 ◆ Final_Result PK+
 ◆ Final_Result CAV

9 Test setup photos

Setup photos are included in supporting file name: "EMC_GARMI-086-20001_FCC_Setup_Photos.pdf"

10 Test Equipment And Ancillaries Used For Testing

Equipment Type	Manufacturer	Model	Serial #	Calibration Cycle	Last Calibration Date
ACTIVE LOOP ANTENNA	ETS.LINDGREN	6507	00161344	2 YEARS	10/30/2020
BILOG ANTENNA	ETS.LINDGREN	3142E	00166067	2 YEARS	03/12/2020
HORN ANTENNA	EMCO	3115	00035114	2 YEARS	08/10/2020
HORN ANTENNA	ETS.LINDGREN	3117	00215984	2 YEARS	01/31/2021
HORN ANTENNA	ETS.LINDGREN	3116	00070497	2 YEARS	11/23/2020
TEST RECEIVER	R&S	ESU40	100251	2 YEARS	09/13/2021
COMPACT DIGITAL BAROMETER	CONTROL COMPANY	10510-922	200236891	2 YEARS	04/13/2020
DIGITAL THRMOMETER	CONTROL COMPANY	36934-164	181230565	3 YEARS	01/10/2019

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.



11 History

Date	Report Name	Changes to report	Report prepared by
2021-10-22	EMC_GARMI-086-20001_15.247_WLAN	Initial Version	Yuchan Lu

<<< The End >>>