



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: 1792A-03788

Applied Rules and Standards:

47 CFR Part 15.247 (DTS)

RSS-247 Issue 2 (DTS) & RSS-Gen Issue 5

REPORT #: EMC_GARMI_116_23001_FCC_15_247_WLAN

DATE: 2023-09-05



A2LA Accredited

IC recognized #
3462B-1

CABID: US0187

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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 #
Garmin International, Inc.	LTE/Wi-Fi Datalink and Data Storage System	GMN-02245

Responsible for Testing Laboratory:

		Arndt Stoecker	
2023-09-05	Compliance	(Director of Regulatory Services)	
Date	Section	Name	Signature

Responsible for the Report:

		Art Thammanavarat	
2023-09-05	Compliance	(Senior 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
Fax:	+1 (408) 586 6299
EMC Lab Manager:	Arndt Stoecker
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 No:	GMN-02245
HW Version :	Ver B
SW Version :	2.30
FCC-ID:	IPH-03788
IC:	1792A-03788
HVIN:	GMN-02245
PMN:	GDL 60
Product Description:	LTE/Wi-Fi Datalink and Data Storage System
Frequency Range / number of channels:	<p><u>WiFi # 1:</u> Manufacture: Texas Instruments Module name/number: WiLink WL1807MOD FCC ID: Z64-WL18DBMOD IC: 451I-WL18DBMOD</p> <p><u>WiFi # 2:</u> Module Name: Texas Instruments Module Number: WiLink WL1837MOD FCC ID: Z64-WL18DBMOD IC: 451I-WL18DBMOD</p> <p>Nominal band: 2400 MHz – 2483.5 MHz; Center to center: 2412 MHz (ch 1) – 2462 MHz (ch 11), 11 channels</p>
Type(s) of Modulation:	BPSK, QPSK, 16-QAM, 64QAM
Modes of Operation:	802.11b/g/n, 20MHz
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:	<ul style="list-style-type: none"> ❖ <u>LTE</u> <ul style="list-style-type: none"> • Manufacture: Quectel • Module name/number: EG25-G • FCC ID: XMR201903EG25G • IC ID: 10224A-201903EG25G ❖ <u>Bluetooth, BLE</u> <ul style="list-style-type: none"> • Manufacture: Texas Instruments • Module name/number: WiLink WL1837MOD

Sample Revision:	<input type="checkbox"/> Production Unit; <input checked="" type="checkbox"/> Pre-Production
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3.2 EUT Sample details

EUT #	Serial Number	HW Version	SW Version	Notes/Comments
1	67H001401	Ver B	2.30	Radiated Emissions

3.3 Accessory Equipment (AE) details

EUT #	Model Number	Type	Manufacturer	Serial Number
1	GA-61A	LTE/Wi-Fi Antenna	Garmin International	8AP000104

3.4 Test Sample Configuration

EUT Set-up #	Combination of AE used for test set up	Comments
1	EUT#1 + AE#1	<p>Buttons on the EUT in test mode used to configure the WLAN radio to 802.11g low, mid and high channels provided by the client that will not be available to the end user.</p> <p>For radiated measurements, the external antenna was connected.</p>

3.5 Justification for Worst Case Mode of Operation

Mode of Operation	Description of Operating Mode	Note
Op. 1	WLAN	<p>During the testing process, the EUT was tested with transmitter sets with WLAN 802.11g low, mid and high channels with antenna GA 61A, The EUT was configured to the highest duty cycle and maximum output power.</p> <p>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.</p>

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.

Testing procedures are based on 558074 D01 DTS Meas Guidance v05r02 – “GUIDANCE FOR PERFORMING COMPLIANCE MEASUREMENTS ON DIGITAL TRANSMISSION SYSTEMS (DTS) OPERATING UNDER SECTION 15.247” - 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(1)	Emission Bandwidth	Nominal		<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	See Note 3
§15.247(e) RSS-247 5.2(2)	Power Spectral Density	Nominal		<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	See Note 4
§15.247(b)(1) RSS-247 5.4(4)	Maximum Conducted Output Power and EIRP	Nominal		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Complies See Note 5
§15.247(d) RSS-247 5.5	Band edge compliance Unrestricted Band Edges	Nominal		<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	See Note 6
§15.247; 15.209; 15.205 RSS-Gen 8.9; 8.10	Band edge compliance Restricted Band Edges	Nominal		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Complies See Note 6
§15.247(d); §15.209 RSS-Gen 6.13	TX Spurious emissions-Radiated	Nominal	Op. 1	<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"/>	See Note 2

Note 1: NA= Not Applicable; NP= Not Performed.

Note 2: This device does not connect to AC mains network

Note 3: Leveraged from report # FR3N2752-01C, Section 3.1 (FCC ID: Z64-WL18SBMOD)

Note 4: Leveraged from report # FR3N2752-01C, Section 3.3 (FCC ID: Z64-WL18SBMOD)

Note 5: Leveraged from report # FR3N2752-01C, Section 3.2 (FCC ID: Z64-WL18SBMOD)

Note 6: Leveraged from report # FR3N2752-01C, Section 3.4 (FCC ID: Z64-WL18SBMOD)

6 Measurements

6.1 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.

Measurement System	EMC 1	EMC 2
Conducted emissions (mains port)	1.12 dB	0.46 dB
Radiated emissions (< 30 MHz)	3.66 dB	3.88 dB
(30 MHz – 1GHz)	3.17 dB	3.34 dB
(1 GHz – 3 GHz)	5.01 dB	4.45 dB
(>3 GHz)	4.0 dB	4.79 dB

6.2 Environmental Conditions during Testing:

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

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

Deviating test conditions are indicated at individual test description where applicable.+

6.3 Date of Testing:

2023-07-26 – 2023-08-21

6.4 Decision Rule:

Cetecom advanced follows ILAC G8:2019 chapter 4.2.1 (Simple Acceptance Rule).

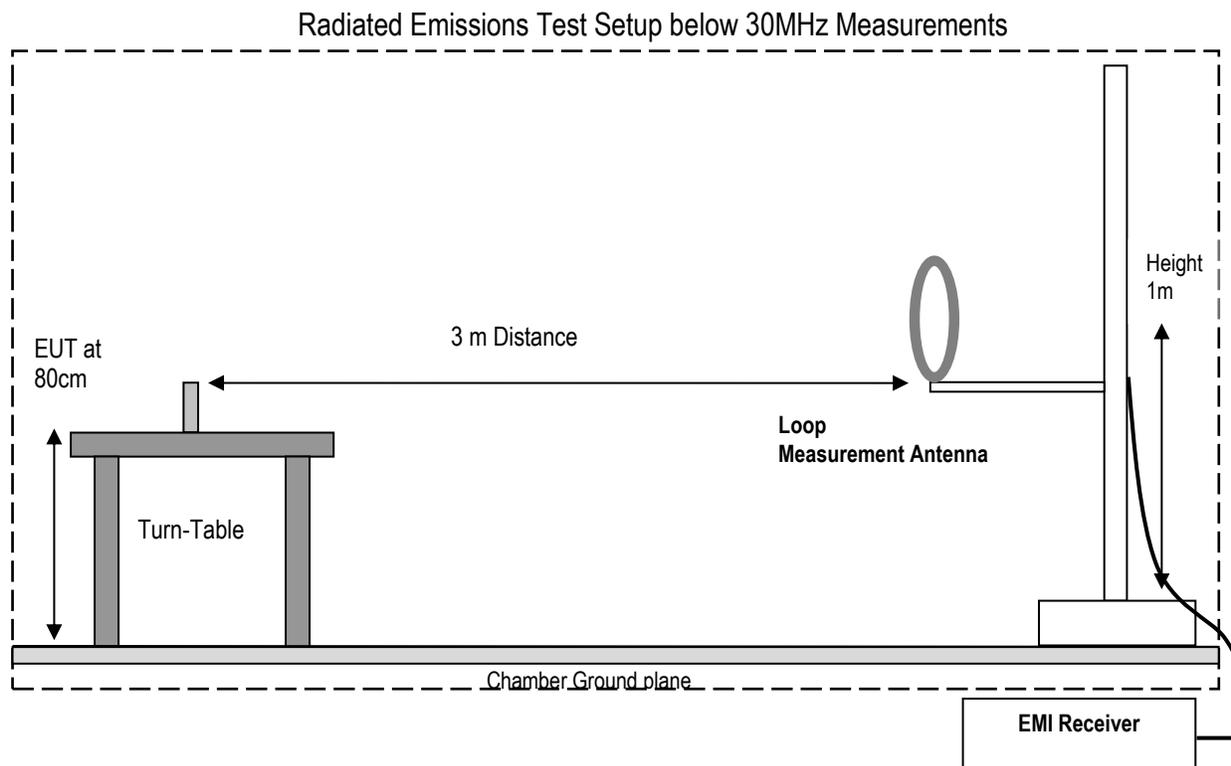
Only the measured values related to their corresponding limits will be used to decide whether the equipment under test meets the requirements of the test standards listed in chapter 3. The measurement uncertainty is mentioned in this test report, See chapter 9, but is not taken into account – neither 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

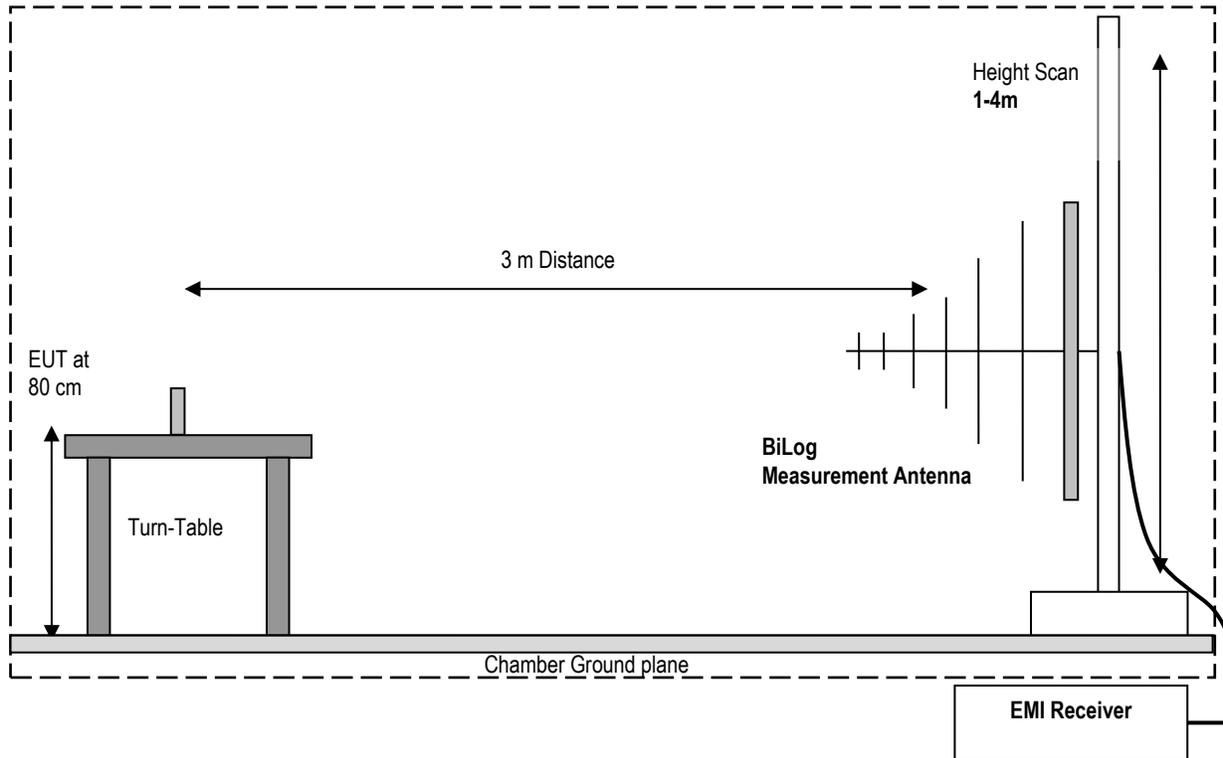
7.1 Radiated Measurement

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

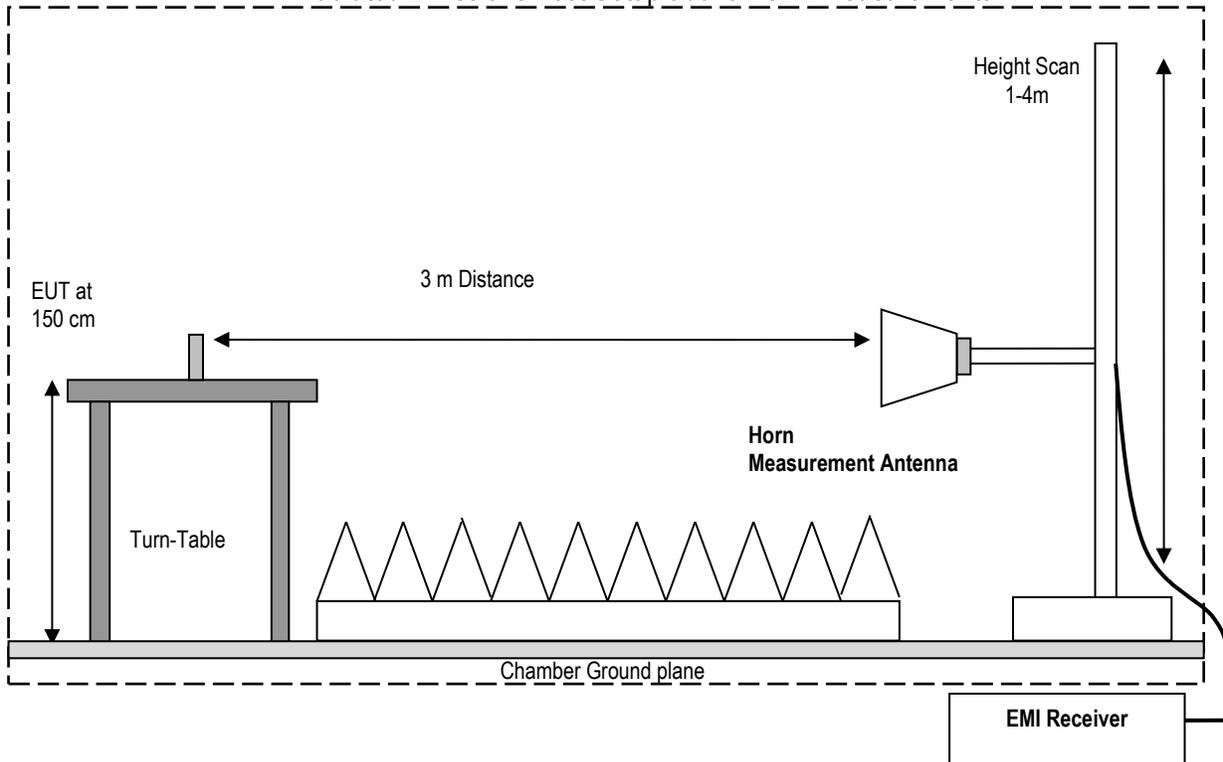
- The exploratory measurement is accomplished by running a matrix of 16 sweeps over the required frequency range with R&S Test-SW EMC32 for 4 positions of the turntable, two orthogonal positions of the EUT and both antenna polarizations. This procedure exceeds the requirement of the above standards to 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:

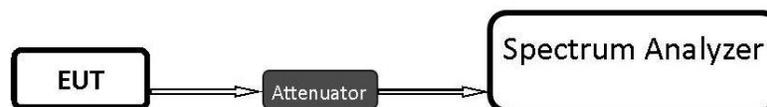
Frequency (MHz)	Measured SA (dBμV)	Cable Loss (dB)	Antenna Factor Correction (dB)	Field Strength Result (dBμV/m)
1000	80.5	3.5	14	98.0

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 Output Power Verification Measurement according to ANSI C63.10-2013

Spectrum Analyzer settings:

- RBW ≥ DTS bandwidth.
- VBW ≥ 3 x RBW
- Span ≥ [3 x RBW]
- Sweep = Auto couple
- Detector function = Peak
- Trace = Max-hold
- Use peak marker function to determine the peak amplitude level.

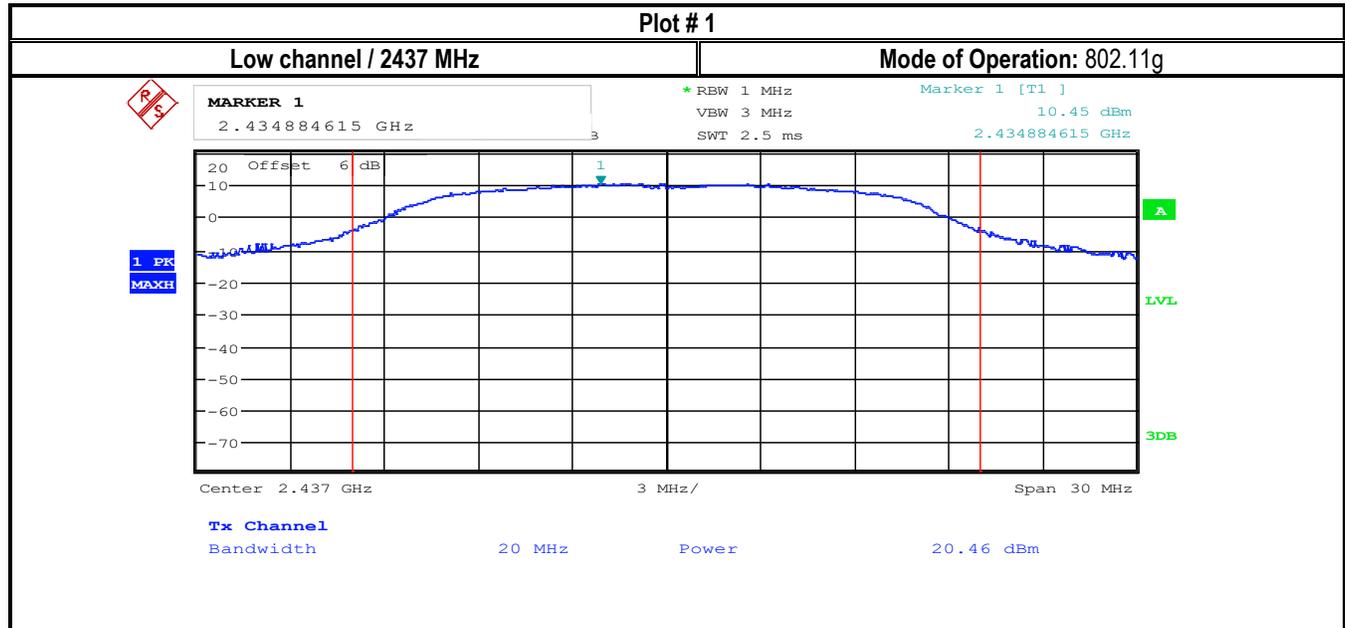
8.1.1 Test conditions and setup:

Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input	Antenna Gain
23.8°C	1	802.11g	12 VDC	3.05

8.1.2 Measurement result:

Plot #	Frequency (MHz)	EUT Operating Mode	Max Peak Output Power (dBm)	EIRP (dBm)	Limit (dBm)	Result
1	2437	802.11g	20.46	23.51	30 (Avg) / 36 (EIRP)	Pass

8.1.3 Measurement Plot(s):



8.2 Band Edge Compliance Verification.

8.2.1 Measurement according to FCC 558074 D01 15.247 Meas Guidance v05r02

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

8.2.2 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

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

- *PEAK LIMIT= 74 dBµV/m @3m =-21.23 dBm
- *AVG. LIMIT= 54 dBµV/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			

8.2.4 Test conditions and setup:

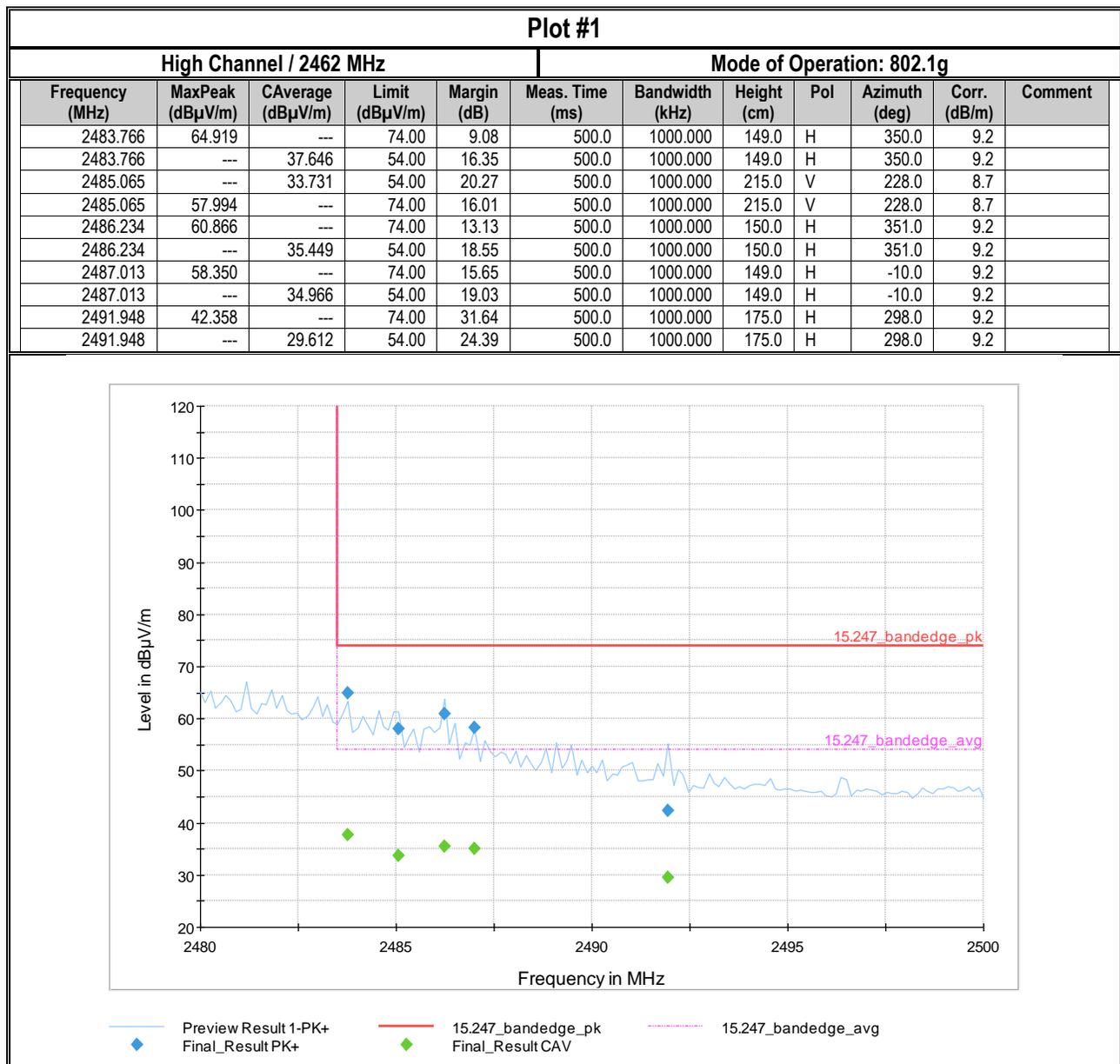
Restricted Band:

Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input	Antenna Gain
23.8°C	1	802.11g	12 VDC	3.05 dBi

8.2.5 Measurement result:

Plot #	EUT operating mode	Band Edge	Measured Peak Value (dBµV/m)	Measured Average Value (dBµV/m)	Limit (dBµV/m)	Result
1	802.11g	Upper Restricted Peak and Average	64.92	37.65	See section 8.2.3	Pass

8.2.6 Measurement Plots:



8.3 Radiated Transmitter Spurious Emissions and Restricted Bands

8.3.1 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 at distance other than the specified in the standard, the limit conversion is calculated by using 40 dB/decade extrapolation factor as follow: Conversion factor (CF) = $40 \log (D/d) = 40 \log (300m / 3m) = 80dB$

8.3.2 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

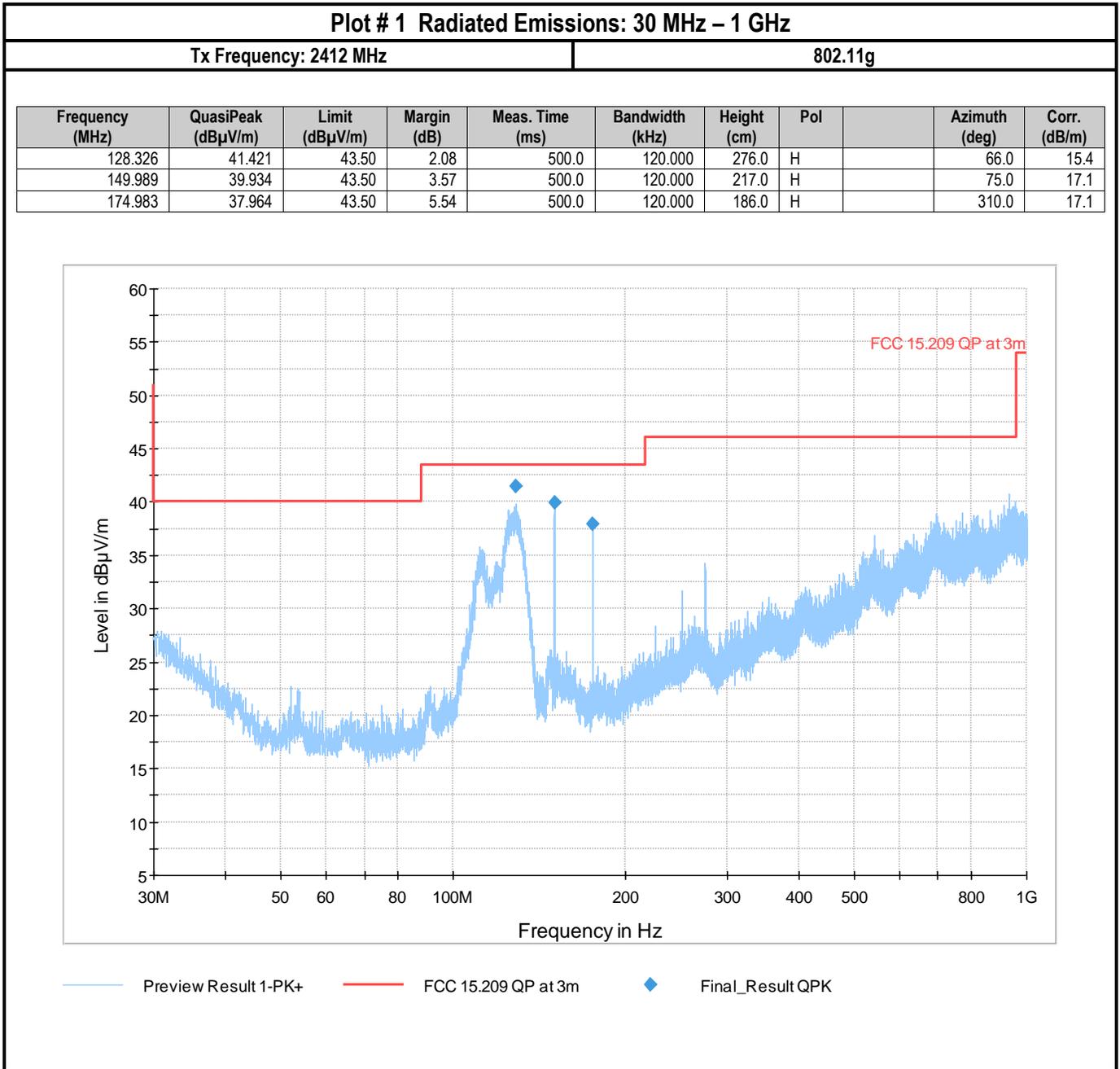
8.3.3 Test conditions and setup:

Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input
23° C	1	802.11g	12 VDC

8.3.4 Measurement result:

Plot #	Mode operating	Channel #	Scan Frequency	Limit	Result
1-3	802.11g	Low	30 MHz – 18 GHz	See section 8.2.2	Pass
4-8	802.11g	Mid	9 kHz – 26 GHz	See section 8.2.2	Pass
9-11	802.11g	High	30 MHz – 18 GHz	See section 8.2.2	Pass

8.3.5 Measurement Plots:

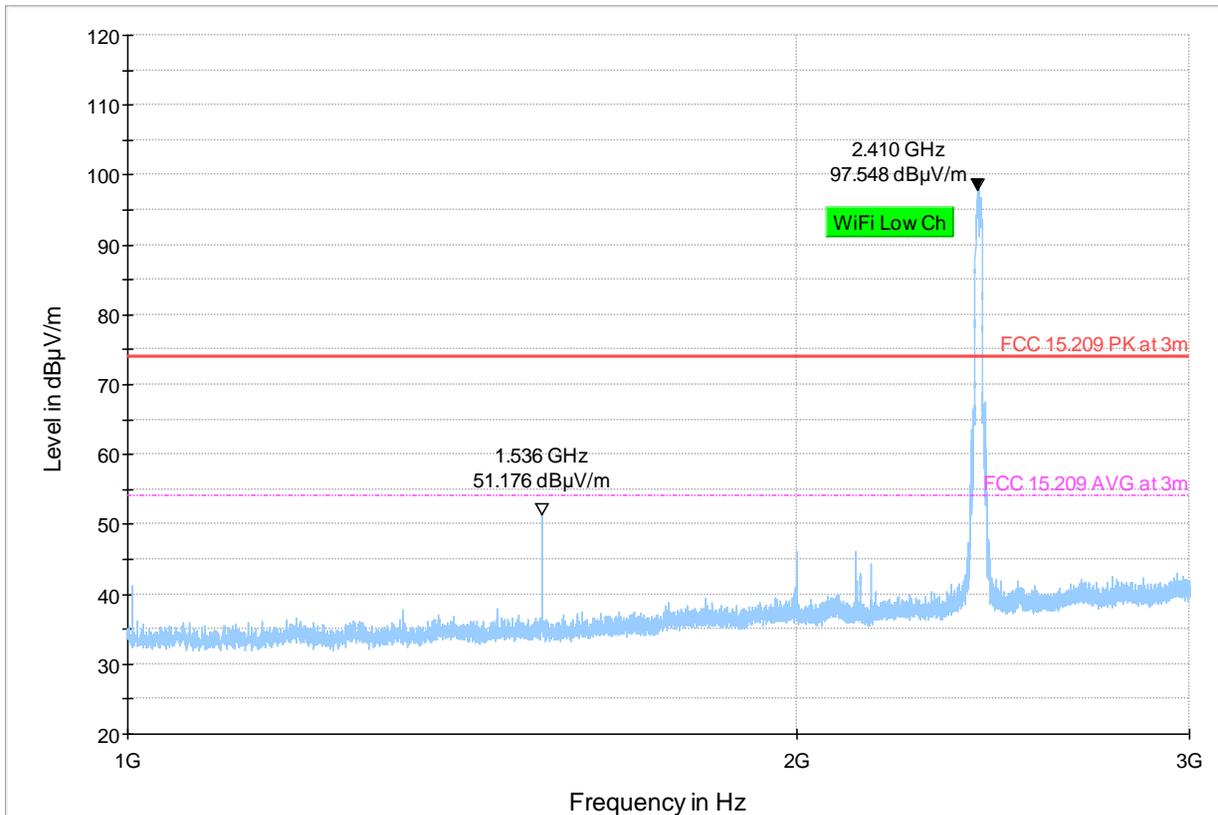


Plot # 2 Radiated Emissions: 1 – 3 GHz

Tx Frequency: 2412 MHz

802.11g

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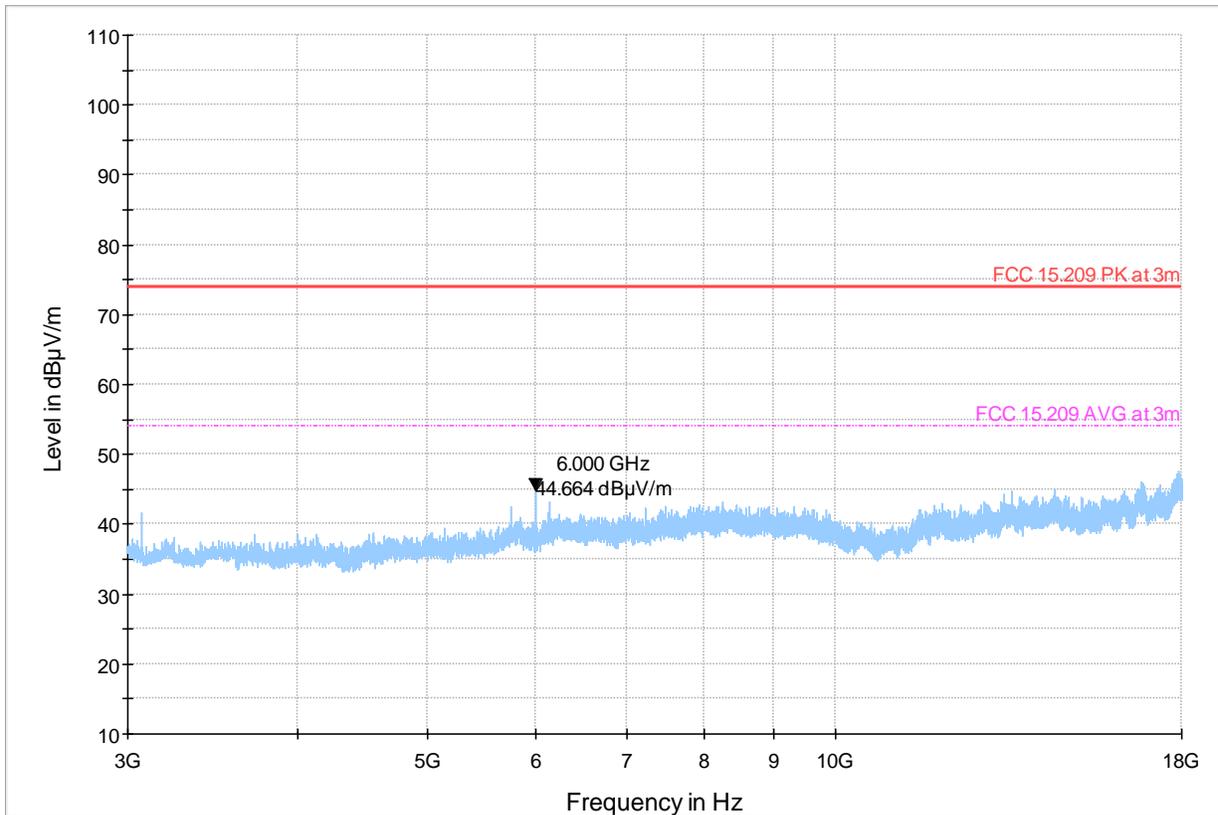
- ◆ Preview Result 1-PK+
Final_Result PK+
- ◆ FCC 15.209 PK at 3m
Final_Result CAV
- ◆ FCC 15.209 AVG at 3m

Plot # 3 Radiated Emissions: 3 – 18 GHz

Tx Frequency: 2412 MHz

802.11g

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)
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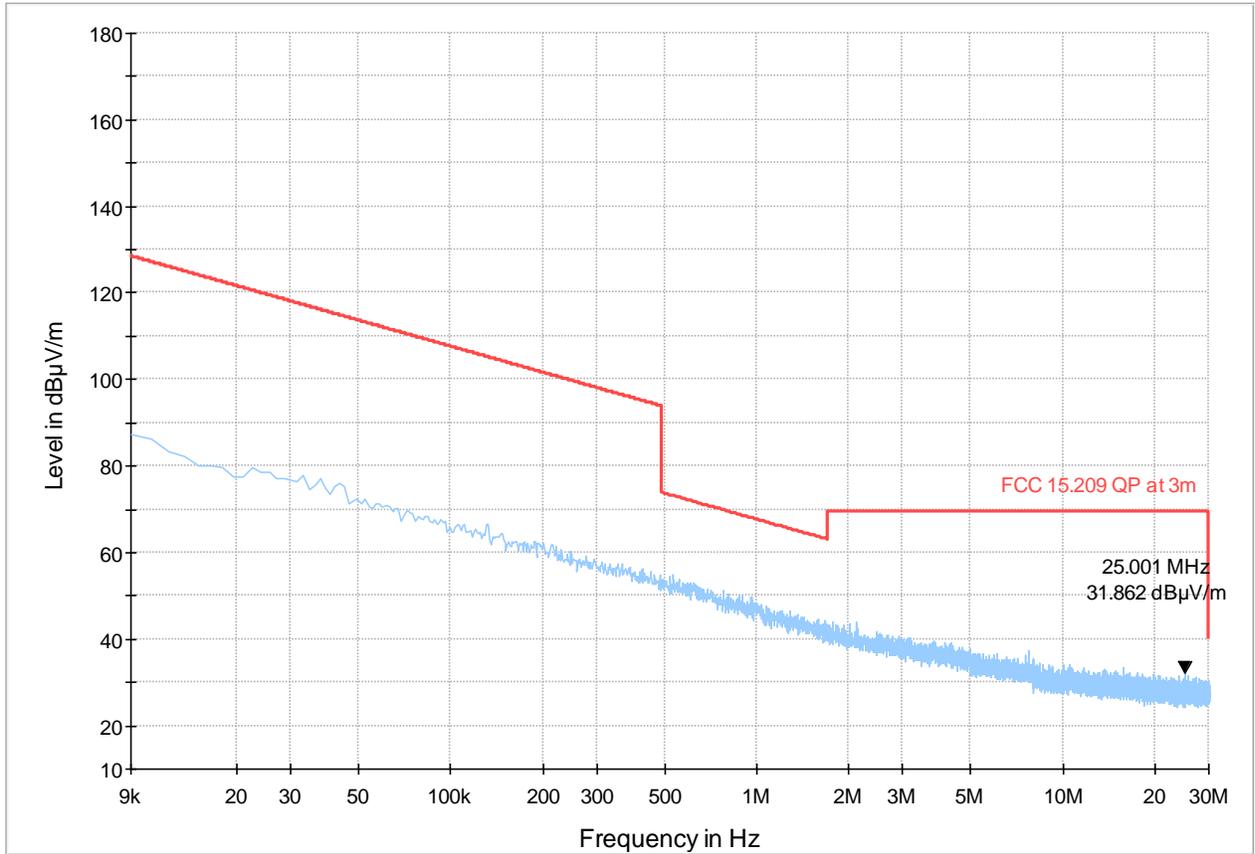


- ◆ Preview Result 1-PK+
Final_Result PK+
- ◆ FCC 15.209 PK at 3m
Final_Result CAV
- - - FCC 15.209 AVG at 3m

Plot # 4 Radiated Emissions: 9 KHz – 30 MHz

Tx Frequency: 2437 MHz

802.11g



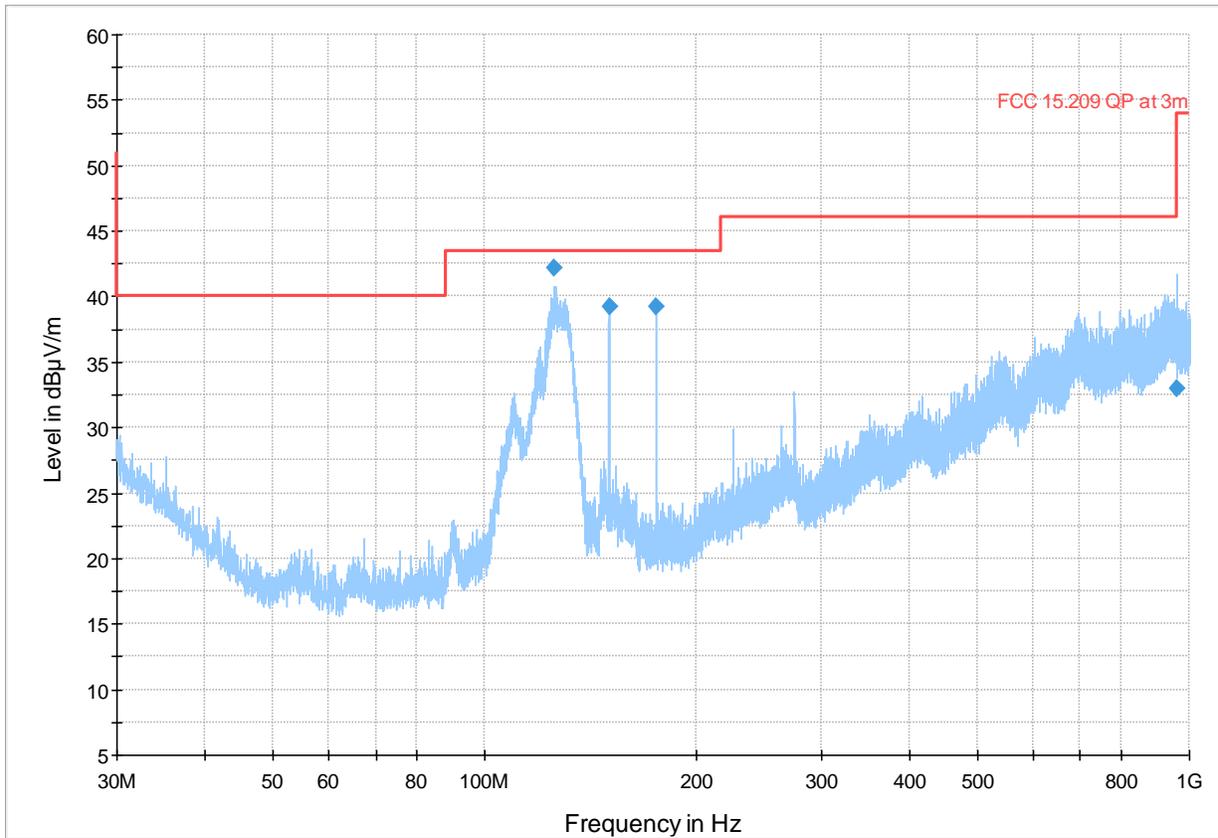
Preview Result 1-PK+ FCC 15.209 QP at 3m Final_Result QPK

Plot # 5 Radiated Emissions: 30 MHz – 1 GHz

Tx Frequency: 2437 MHz

802.11g

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
125.125	42.154	43.50	1.35	500.0	120.000	320.0	H	72.0	15.4
149.989	39.269	43.50	4.23	500.0	120.000	242.0	H	95.0	17.1
174.983	39.218	43.50	4.28	500.0	120.000	186.0	H	308.0	17.1
958.387	32.926	46.02	13.09	500.0	120.000	150.0	H	252.0	33.3



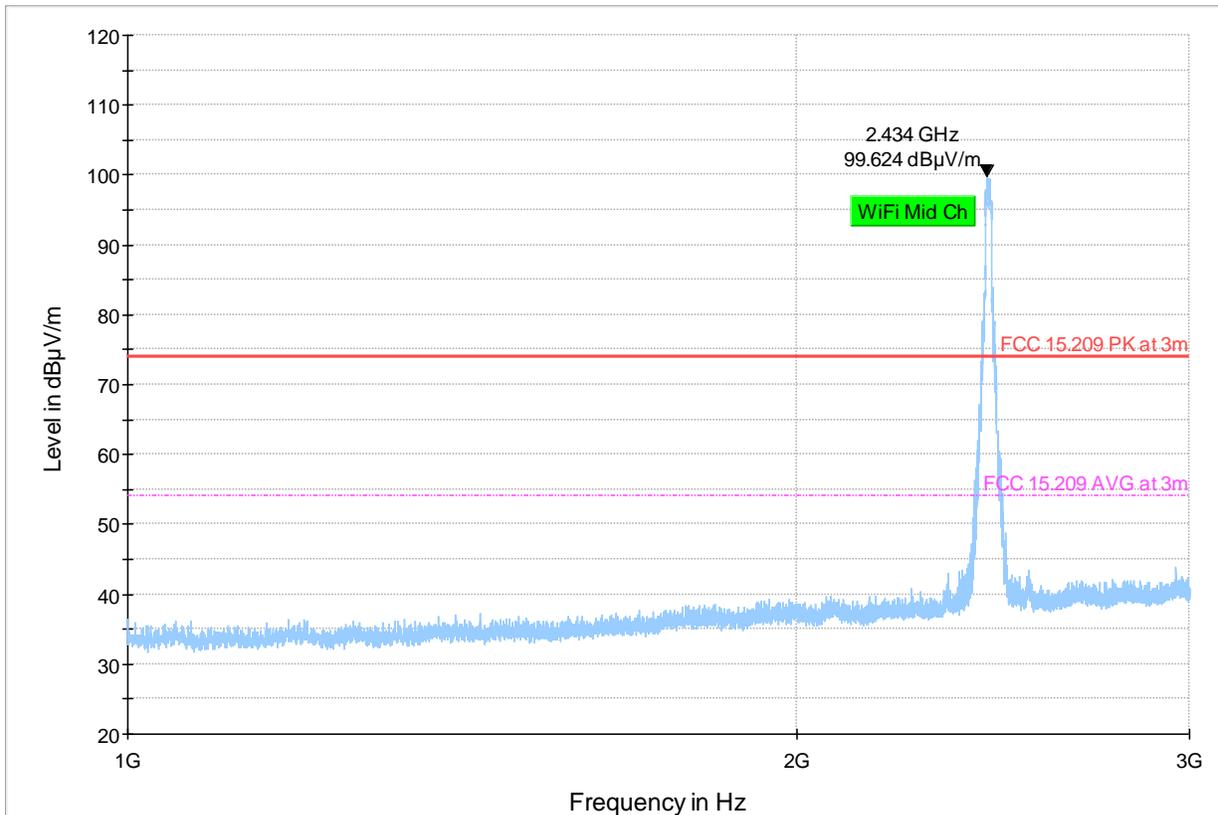
— Preview Result 1-PK+
 — FCC 15.209 QP at 3m
 ◆ Final_Result QPK

Plot # 6 Radiated Emissions: 1 – 3 GHz

Tx Frequency: 2437 MHz

802.11g

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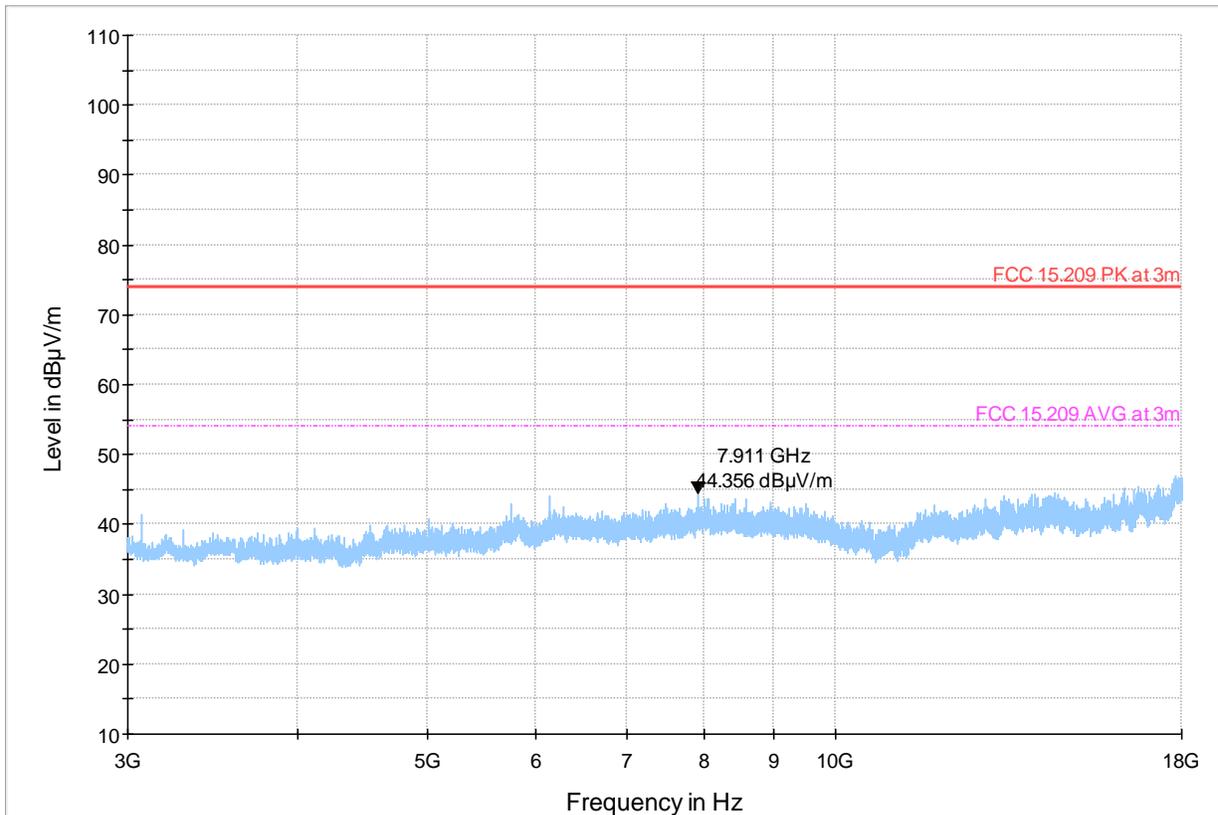
- ◆ Preview Result 1-PK+
Final_Result PK+
- ◆ FCC 15.209 PK at 3m
Final_Result CAV
- ◆ FCC 15.209 AVG at 3m

Plot # 7 Radiated Emissions: 3 – 18 GHz

Tx Frequency: 2437 MHz

802.11g

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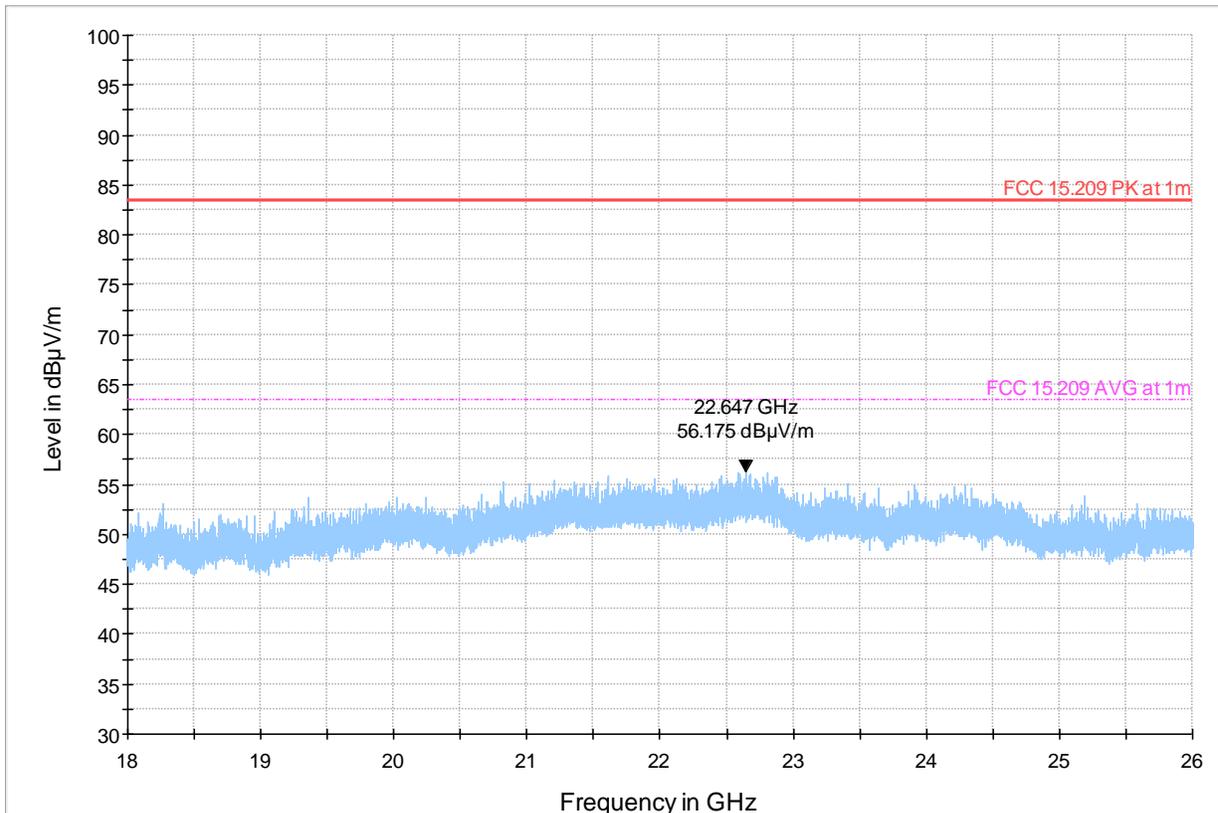
- ◆ Preview Result 1-PK+
Final_Result PK+
- ◆ FCC 15.209 PK at 3m
Final_Result CAV
- ◆ FCC 15.209 AVG at 3m

Plot # 8 Radiated Emissions: 18 – 26 GHz

Tx Frequency: 2437 MHz

802.11g

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)
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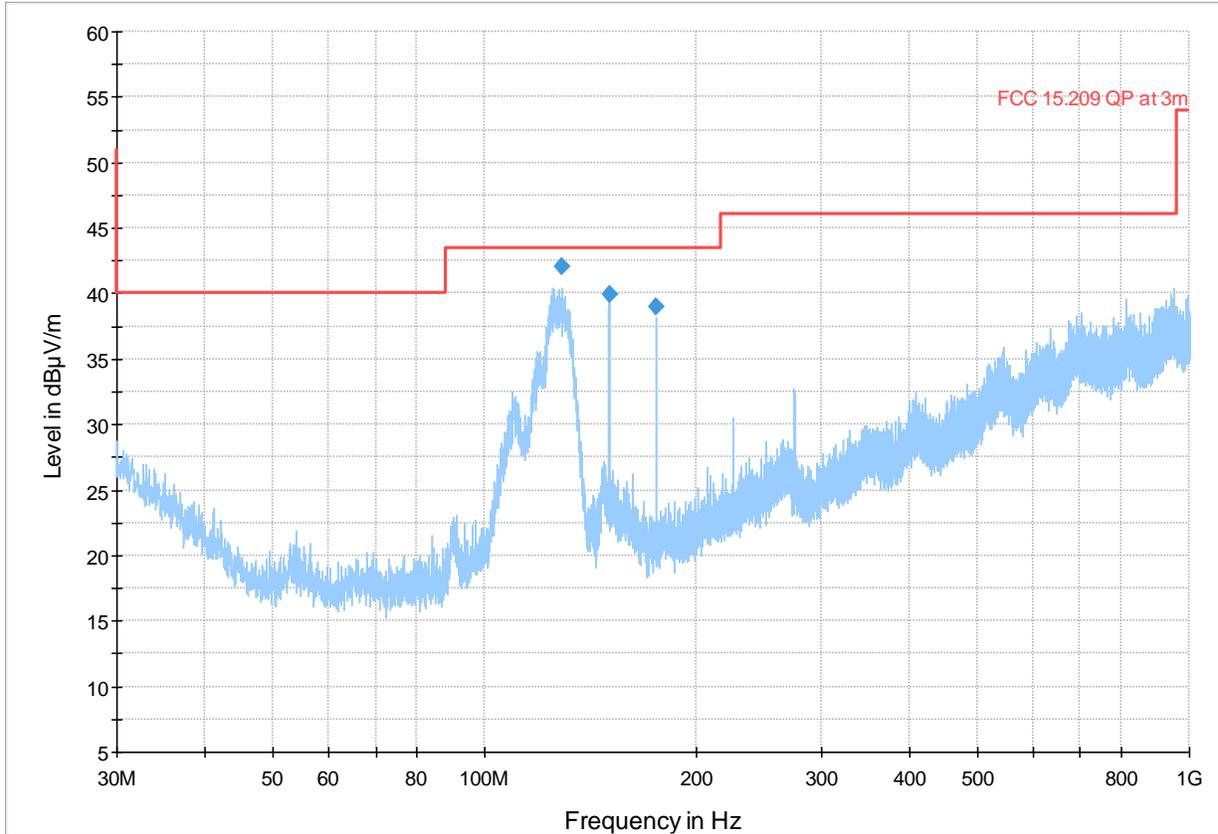
- ◆ Preview Result 1-PK+ ◆ FCC 15.209 PK at 1m ◆ FCC 15.209 AVG at 1m
- ◆ Final_Result PK+ ◆ Final_Result CAV

Plot # 9 Radiated Emissions: 30 MHz – 1 GHz

Tx Frequency: 2462 MHz

802.11g

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
128.552	42.050	43.50	1.45	500.0	120.000	285.0	H	64.0	15.4
149.989	39.957	43.50	3.54	500.0	120.000	217.0	H	80.0	17.1
174.983	39.047	43.50	4.45	500.0	120.000	196.0	H	309.0	17.1



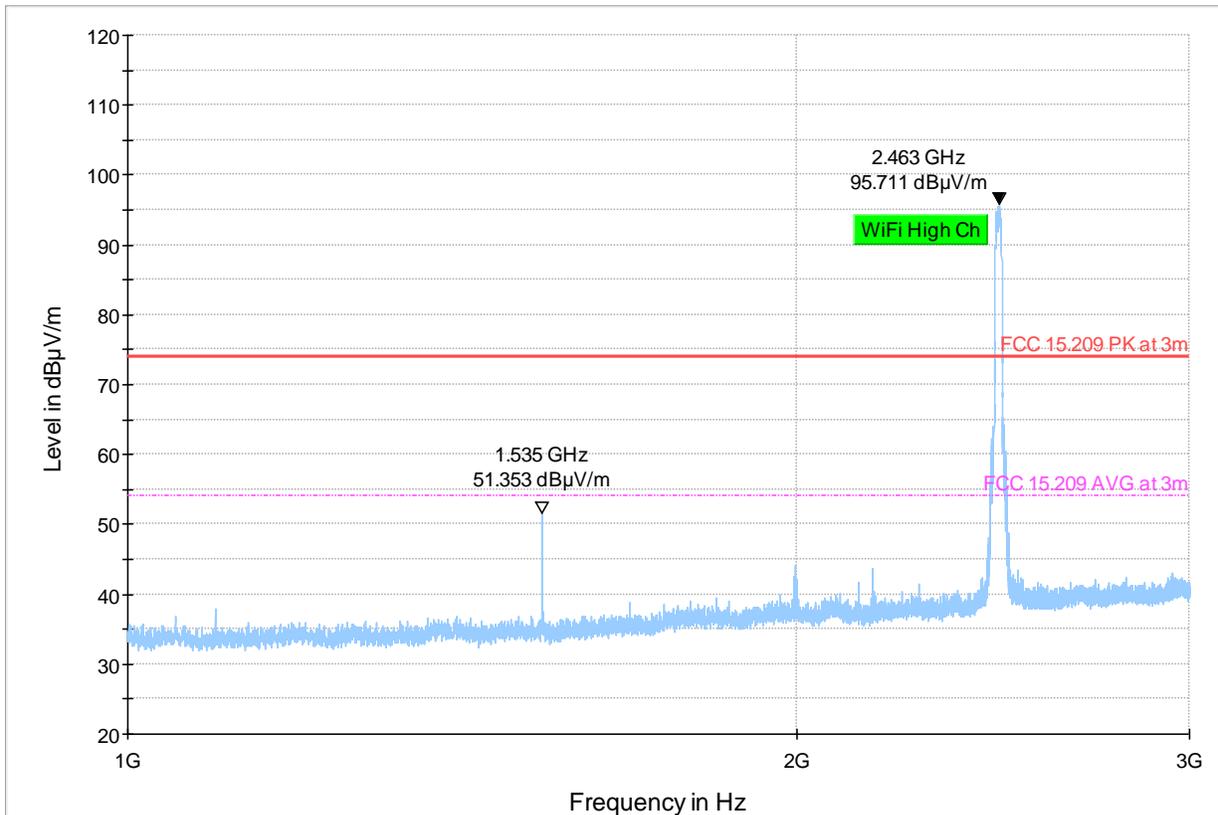
— Preview Result 1-PK+
 — FCC 15.209 QP at 3m
 ◆ Final_Result QPK

Plot # 10 Radiated Emissions: 1 – 3 GHz

Tx Frequency: 2462 MHz

802.11g

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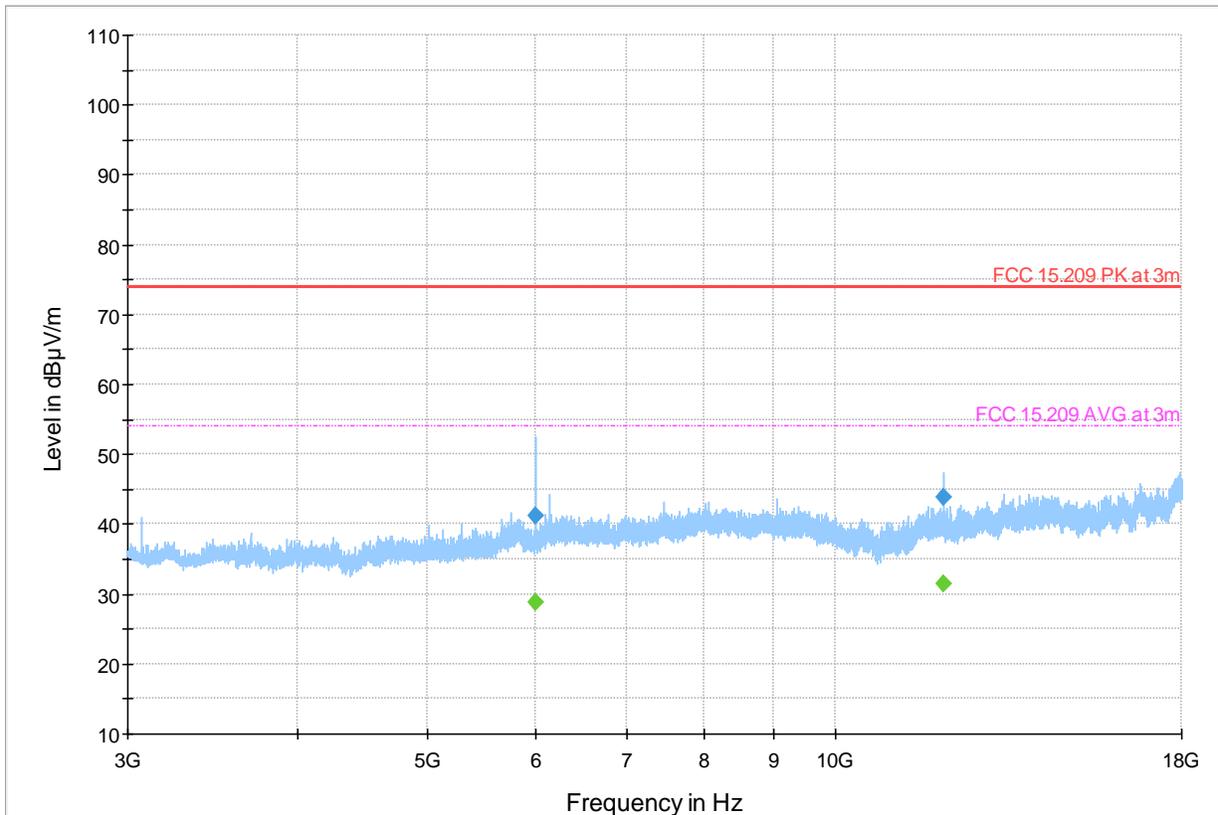
- ◆ Preview Result 1-PK+
Final_Result PK+
- ◆ FCC 15.209 PK at 3m
Final_Result CAV
- ◆ FCC 15.209 AVG at 3m

Plot # 11 Radiated Emissions: 3 – 18 GHz

Tx Frequency: 2462 MHz

802.11g

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)
6000.000	---	28.737	53.98	25.24	500.0	1000.000	315.0	V	82.0	-2.1
6000.000	41.218	---	73.98	32.76	500.0	1000.000	315.0	V	82.0	-2.1
12000.500	---	31.359	53.98	22.62	500.0	1000.000	267.0	V	186.0	1.7
12000.500	43.924	---	73.98	30.06	500.0	1000.000	267.0	V	186.0	1.7



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

9 Test setup photos

Setup photos are included in supporting file name: “EMC_GARMI_116_23001_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	3 YEARS	10/30/2020
BILOG ANTENNA	ETS.LINDGREN	3142E	00166067	3 YEARS	10/21/2021
HORN ANTENNA	EMCO	3115	00035111	3 YEARS	09/30/2021
HORN ANTENNA	ETS.LINDGREN	3117	00215984	3 YEARS	01/31/2021
HORN ANTENNA	ETS.LINDGREN	3116	00070497	3 YEARS	11/23/2020
TEST RECEIVER	R&S	ESU40	100251	3 YEARS	09/13/2021
DIGITAL THRMMOMETER	CONTROL COMPANY	36934-164	181230565	3 YEARS	10/20/2021

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 Revision History

Date	Report Name	Changes to report	Report prepared by
2023-09-05	EMC_GARMI_116_23001_FCC_15_247_WLAN	Initial Version	Art Thammanavarat

<<The End>>