FCC / ISED Test Report

FOR:
Innophase Inc.

Model Name:
INP1014

Product Description:
Low Power WiFi/BLE IOT Module

FCC ID: 2AVAL-INP2045A
IC ID: 25715-INP2045A

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

REPORT #: EMC_INNOP-018-21001_INP1014_15.247_WLAN_DTS

DATE: 2022-01-10

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 #
Innophase Inc.	Low Power WiFi/BLE IOT Module	INP1014

Responsible for Testing Laboratory:

Date	Section	Name	Signature
2022-01-10	Compliance	Kevin Wang (Lab Manager)	kevin.wang@cetecom.com Digitally signed by: kevin.wang@cetecom.com DN: CN = kevin.wang@cetecom.com Date: 2022.01.10 11:04:30 -08'00'

Responsible for the Report:

Date	Section	Name	Signature
2022-01-10	Compliance	Yuchan Lu (Test Engineer)	Yuchan Lu Digitally signed by: Yuchan Lu DN: CN = Yuchan Lu email = Yuchan.Lu@cetecom.com C = US O = CETECOM Inc. OU = EMC Date: 2022.01.10 10:44:22 -08'00'

The test results of this test report relate exclusively to the test item specified in Section3.
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:	Kevin Wang
Responsible Project Leader:	Akanksha Baskaran

2.2 Identification of the Client

Client's Name:	Innophase Inc.
Street Address:	6815 Flanders Drive
City/Zip Code:	San Diego, CA 92121
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:	INP1014
HW Version :	REV1.0
SW Version :	Rel2.2
FCC-ID:	2AVAL-INP2045A
IC-ID:	25715-INP2045A
HVIN:	INP1014
PMN:	Talaria TWO
Product Description:	Low Power WiFi/BLE IOT Module
Frequency Range / number of channels:	Module name: Talaria TWO Module number: INP2045-H FCC/IC ID: 2AVAL-INP2045/25715-INP2045 Nominal band: 2400 MHz – 2483.5 MHz; Center to center: 2412 MHz (ch 1) – 2462 MHz (ch 11), 11 channels
Type(s) of Modulation:	BPSK, QPSK, 16-QAM, 64QAM
Modes of Operation:	802.11b/g/n, 20MHz
Antenna Information as declared:	PCB Antenna 5.33 dBi
Max. Output Power:	Conducted Avg Power 14.67 dBm
Power Supply/ Rated Operating Voltage Range:	Low 3.0 VDC, High 3.6 VDC
Operating Temperature Range:	Low -40ºC, High 85ºC
Other Radios included in the device:	❖ BT • Module name: Talaria TWO • Module number: INP2045-H • FCC/IC ID: 2AVAL-INP2045/25715-INP2045
Sample Revision:	☐Prototype Unit; ☐Production Unit; ■Pre-Production

3.2 EUT Sample details

EUT #	Serial Number	HW Version	SW Version	Notes/Comments
1	14120005	REV1.0	Rel2.2	Radiated Emissions

3.3 Accessory Equipment details

AE #	Type	Model	Manufacturer	Serial Number
1	USB Power Cable	-	-	-

3.4 Support Equipment (SE) details

SE #	Type	Model	Manufacturer	Serial Number
1	AC/DC Adapter	PSAI05R-050Q	Switching Power Supply	-

3.5 Test Sample Configuration

EUT Set-up #	Combination of AE used for test set up	Comments
1	EUT#1+ AE#1	Special commands through command window used to configure the WLAN radio to 802.11b low, mid and high channels provided by the client that will not be available to the end user.

3.6 Justification for Worst Case Mode of Operation

During the testing process, the EUT was tested with transmitter sets on WLAN 802.11b low, mid and high channels. The EUT was configured to the highest duty cycle and output power at 12.4 dBm through commands.

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 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	802.11 b/g/n	☐	☐	■	Note 1 Note 2
§15.247(e) RSS-247 5.2(2)	Power Spectral Density	Nominal	802.11 b/g/n	☐	☐	■	Note 1 Note 2
§15.247(b)(1) RSS-247 5.4(4)	Maximum Conducted Output Power and EIRP	Nominal	802.11 b/g/n	☐	☐	■	Note 1 Note 2
§15.247(d) RSS-247 5.5	Band edge compliance Unrestricted Band Edges	Nominal	802.11 b/g/n	☐	☐	■	Note 1 Note 2
§15.247; 15.209; 15.205 RSS-Gen 8.9; 8.10	Band edge compliance Restricted Band Edges	Nominal	802.11b	■	☐	☐	Complies
§15.247(d); §15.209 RSS-Gen 6.13	TX Spurious emissions-Radiated	Nominal	802.11b	■	☐	☐	Complies
§15.207(a) RSS Gen 8.8	AC Conducted Emissions	Nominal	802.11b	■	☐	☐	Complies

Note1: NA= Not Applicable; NP= Not Performed.
Note2: The conducted measurements are leveraged from report EMC_INNOP-018-21001-INP1015-15.247_WLAN_DTS for compliance against the applicable rules.

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=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)

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 3 dB to the limit.

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%

6.3 Dates of Testing:

09/23/2021-10/07/2021

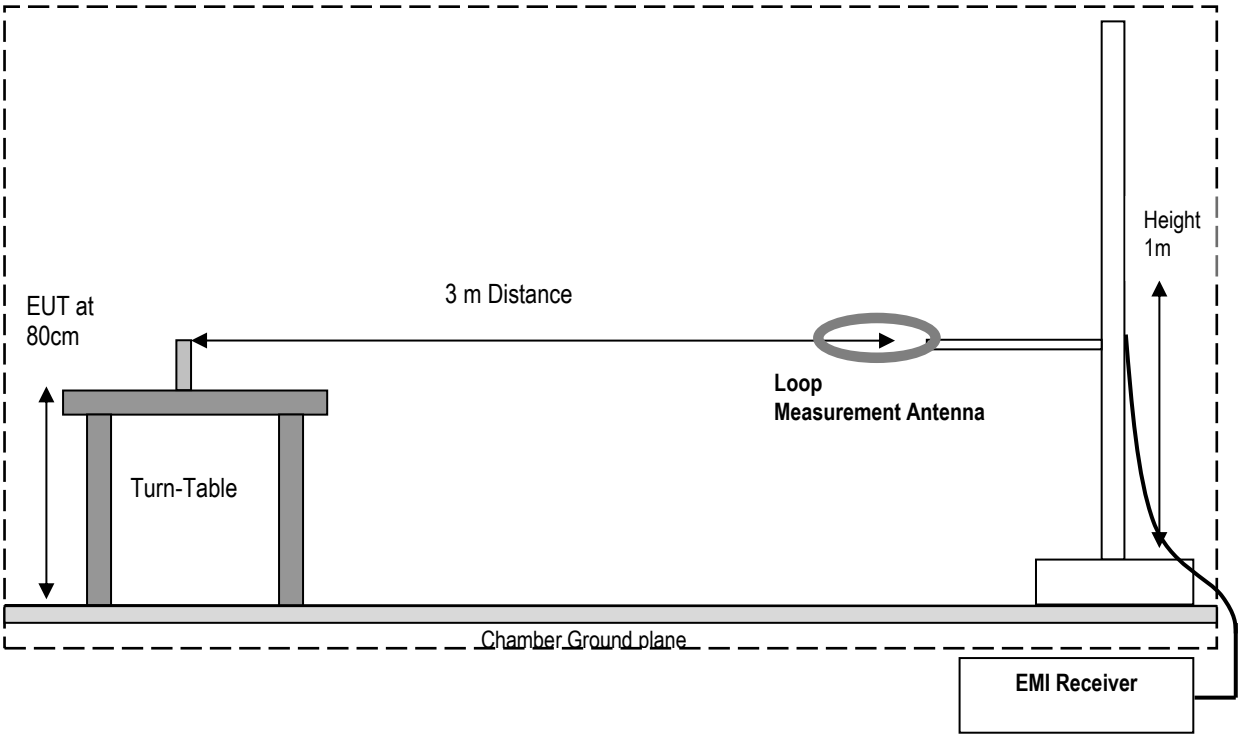
7 Measurement Procedures

7.1 Radiated Measurement

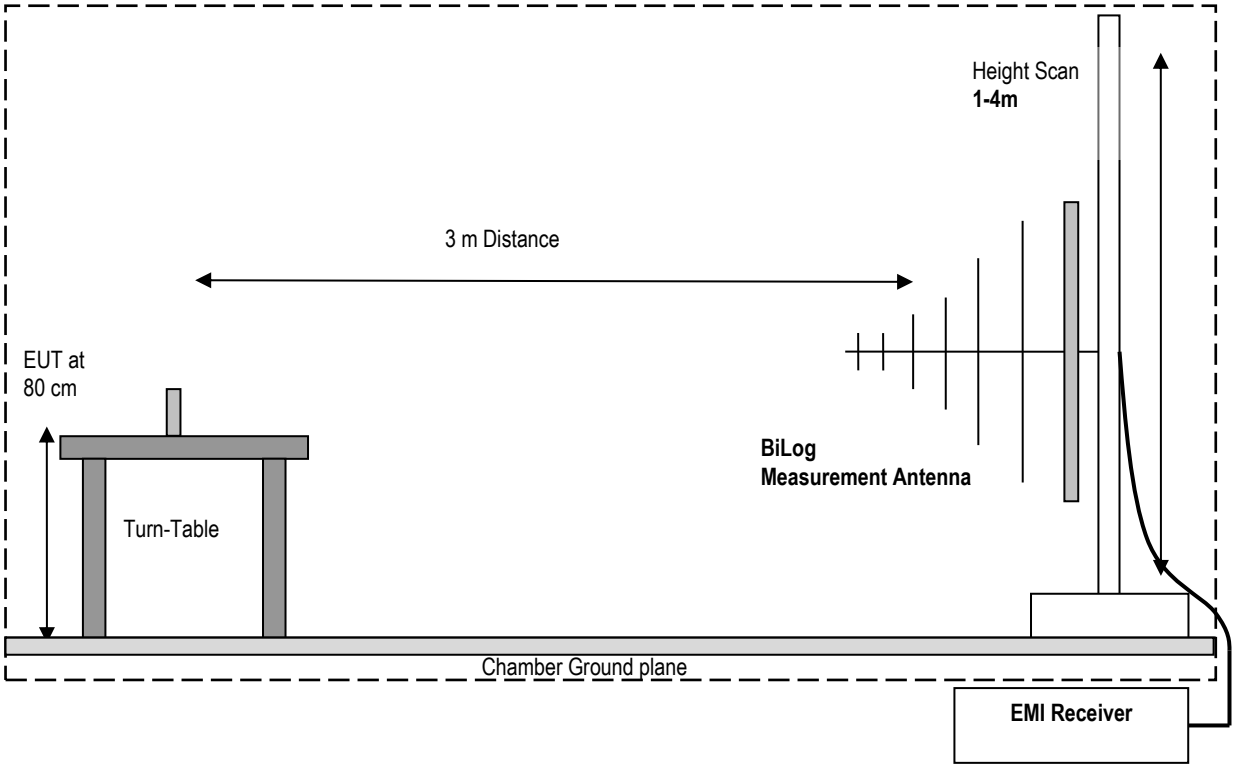
The radiated measurement is performed according to ANSI C63.10 (2013)

- 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.

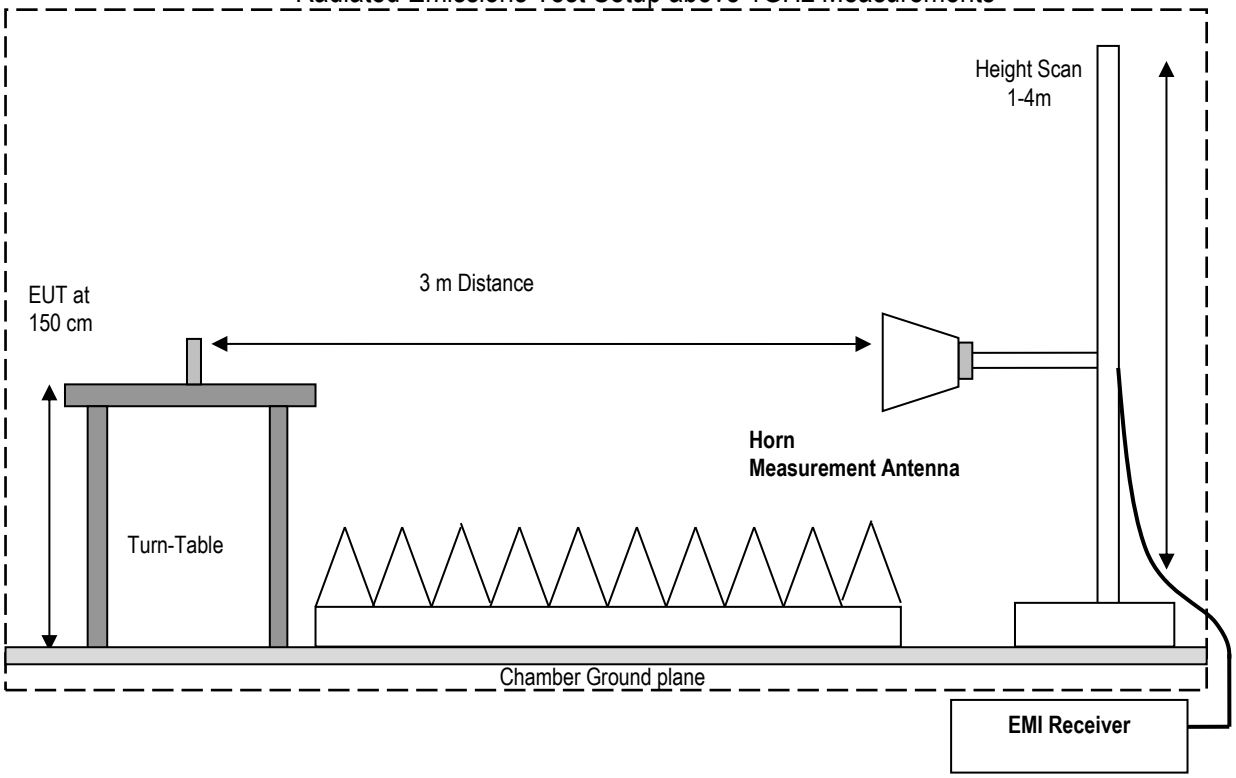
Radiated Emissions Test Setup below 30MHz Measurements



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 (dBµV/m) = Measured Value on SA (dBµV) + Cable Loss (dB) + 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

8 Test Result Data

8.1 Band Edge Compliance

8.1.1 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:

(b)

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
[1]0.495-0.505	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			

8.1.2 Test conditions and setup:

Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input	Single Antenna Gain
22° C	1	802.11b/g/n	5 VDC	5.33 dBi

8.1.3 Measurement result:

Plot #	EUT operating mode	Band Edge	Frequency (MHz)	Measured Peak Value (dBµV/m)	Corrected by duty cycle	Limit (dBµV/m @3m)	Result
1	802.11b	Lower Restricted peak	2389.0	50.97	NA	74 Peak	Pass
1	802.11b	Lower Restricted Average	2389.0	42.20	42.20	54 AVG	Pass
2	802.11g	Lower Restricted peak	2387.5	63.17	NA	74 Peak	Pass
2	802.11g	Lower Restricted Average	2387.5	43.99	44.05	54 AVG	Pass
3	802.11n_HT20	Lower Restricted peak	2389.4	61.66	NA	74 Peak	Pass
3	802.11n_HT20	Lower Restricted Average	2389.4	43.54	43.59	54 AVG	Pass
4	802.11b	Upper Restricted peak	2488.5	52.15	NA	74 Peak	Pass
4	802.11b	Upper Restricted Average	2485.0	40.10	40.10	54 AVG	Pass
5	802.11g	Upper Restricted peak	2483.6	64.24	NA	74 Peak	Pass
5	802.11g	Upper Restricted Average	2483.6	45.58	45.64	54 AVG	Pass
6	802.11n_HT20	Upper Restricted peak	2483.5	63.62	NA	74 Peak	Pass
6	802.11n_HT20	Upper Restricted Average	2483.5	44.22	44.27	54 AVG	Pass

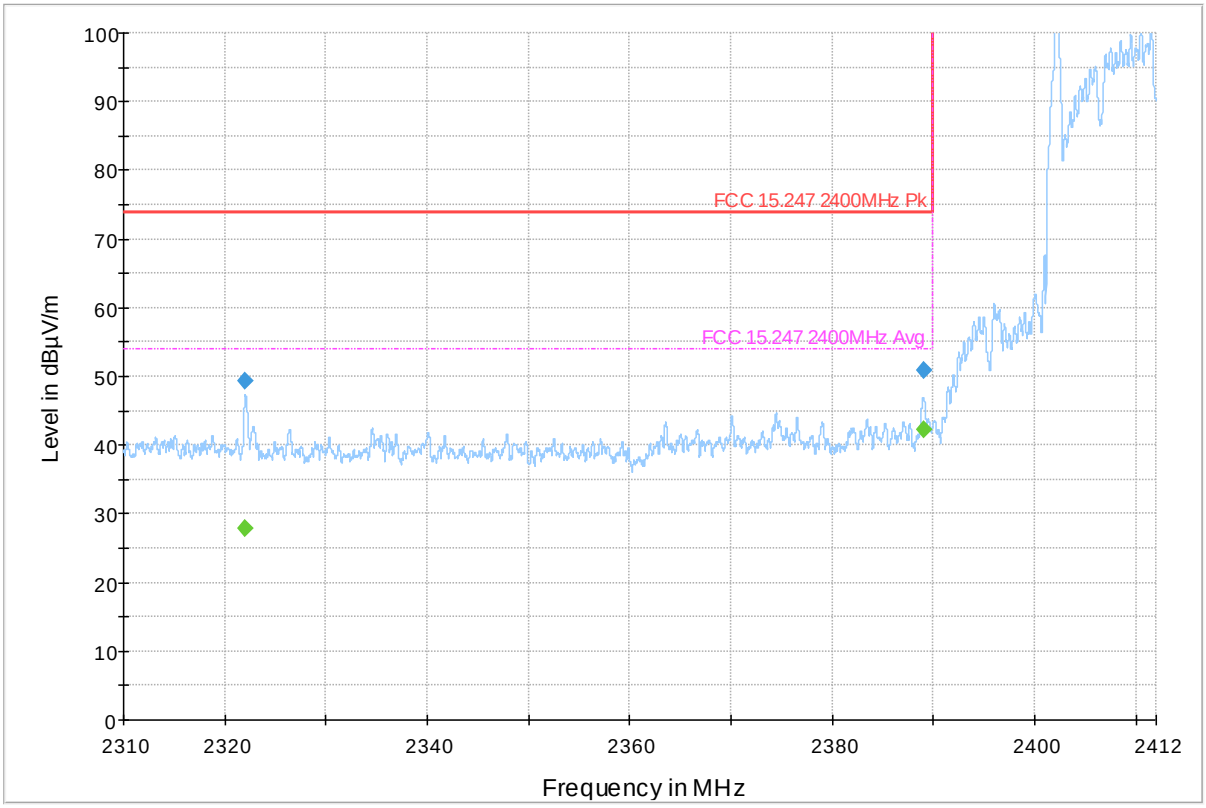
The value of above table shows worst case of each mode.

Plot #1

Low channel / 2412 MHz	Modulation/Packet Type: 802.11b 1Mbps Peak & Avg

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)
2322.007	49.43	---	74.00	24.57	500.0	1000.000	117.0	V	345.0	6.0
2322.007	---	27.84	54.00	26.16	500.0	1000.000	117.0	V	345.0	6.0
2388.999	50.97	---	74.00	23.03	500.0	1000.000	100.0	H	345.0	6.3
2388.999	---	42.20	54.00	11.80	500.0	1000.000	100.0	H	345.0	6.3



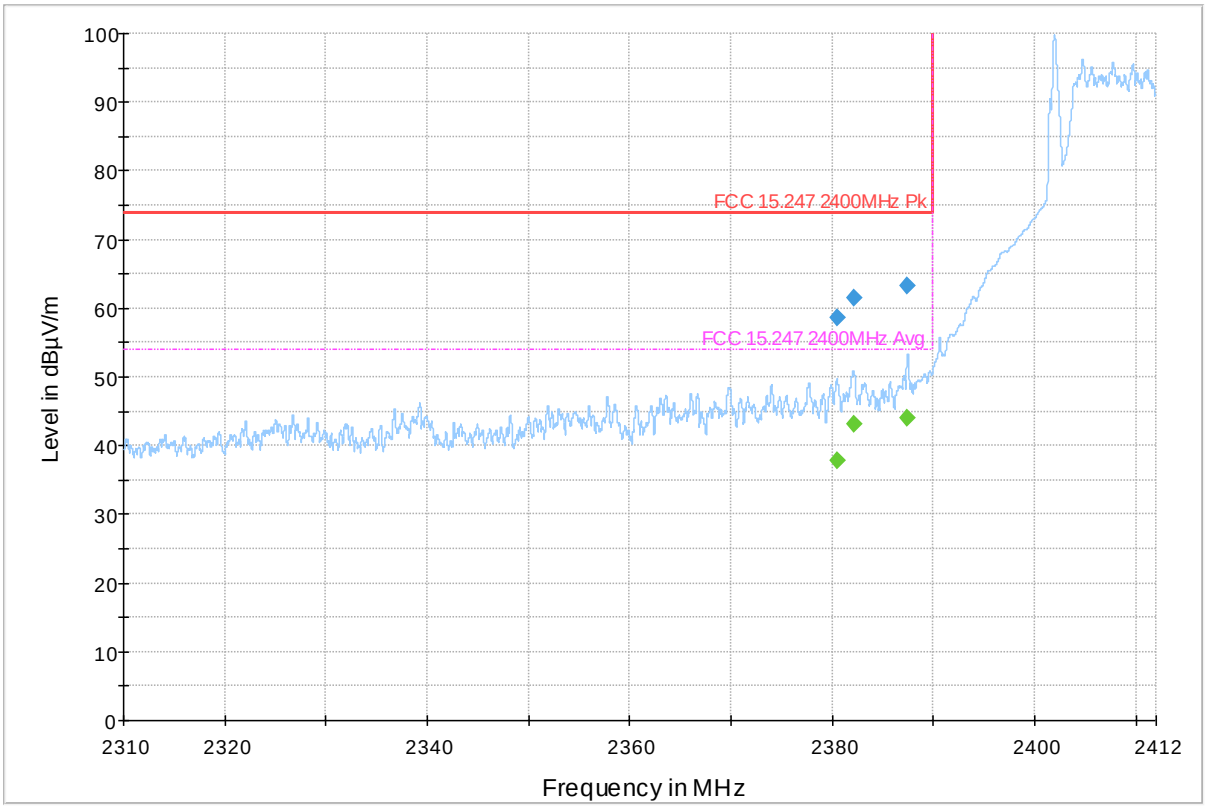
Preview Result 2-AVG
FCC 15.247 2400MHz Avg
Preview Result 1-PK+
Final_Result PK+
FCC 15.247 2400MHz Pk
Final_Result CAV

Plot #2

Low channel / 2412 MHz	Modulation/Packet Type: 802.11g 6Mbps Peak & Avg

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)
2380.482	---	37.85	54.00	16.15	500.0	1000.000	142.0	H	189.0	6.3
2380.482	58.62	---	74.00	15.38	500.0	1000.000	142.0	H	189.0	6.3
2382.099	---	43.20	54.00	10.80	500.0	1000.000	151.0	H	289.0	6.3
2382.099	61.56	---	74.00	12.44	500.0	1000.000	151.0	H	289.0	6.3
2387.469	---	43.99	54.00	10.01	500.0	1000.000	125.0	H	349.0	6.3
2387.469	63.17	---	74.00	10.83	500.0	1000.000	125.0	H	349.0	6.3



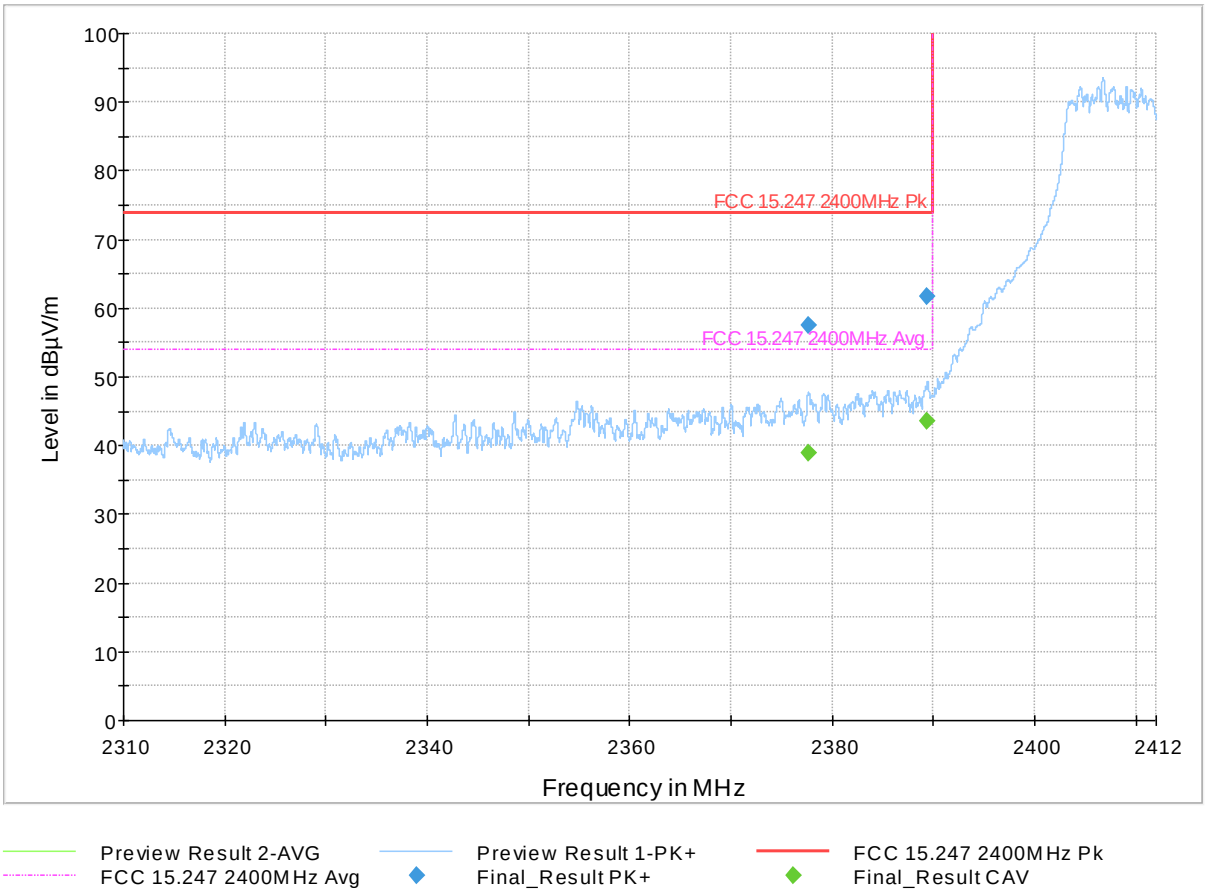
Preview Result 2-AVG
FCC 15.247 2400MHz Avg
Preview Result 1-PK+
Final_Result PK+
FCC 15.247 2400MHz Pk
Final_Result CAV

Plot #3

Low channel / 2412 MHz	Modulation/Packet Type: 802.11n_HT20 MCS0 Peak & Avg

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)
2377.684	57.54	---	74.00	16.46	500.0	1000.000	134.0	H	312.0	6.3
2377.684	---	38.95	54.00	15.05	500.0	1000.000	134.0	H	312.0	6.3
2389.414	61.66	---	74.00	12.34	500.0	1000.000	150.0	H	289.0	6.3
2389.414	---	43.54	54.00	10.46	500.0	1000.000	150.0	H	289.0	6.3

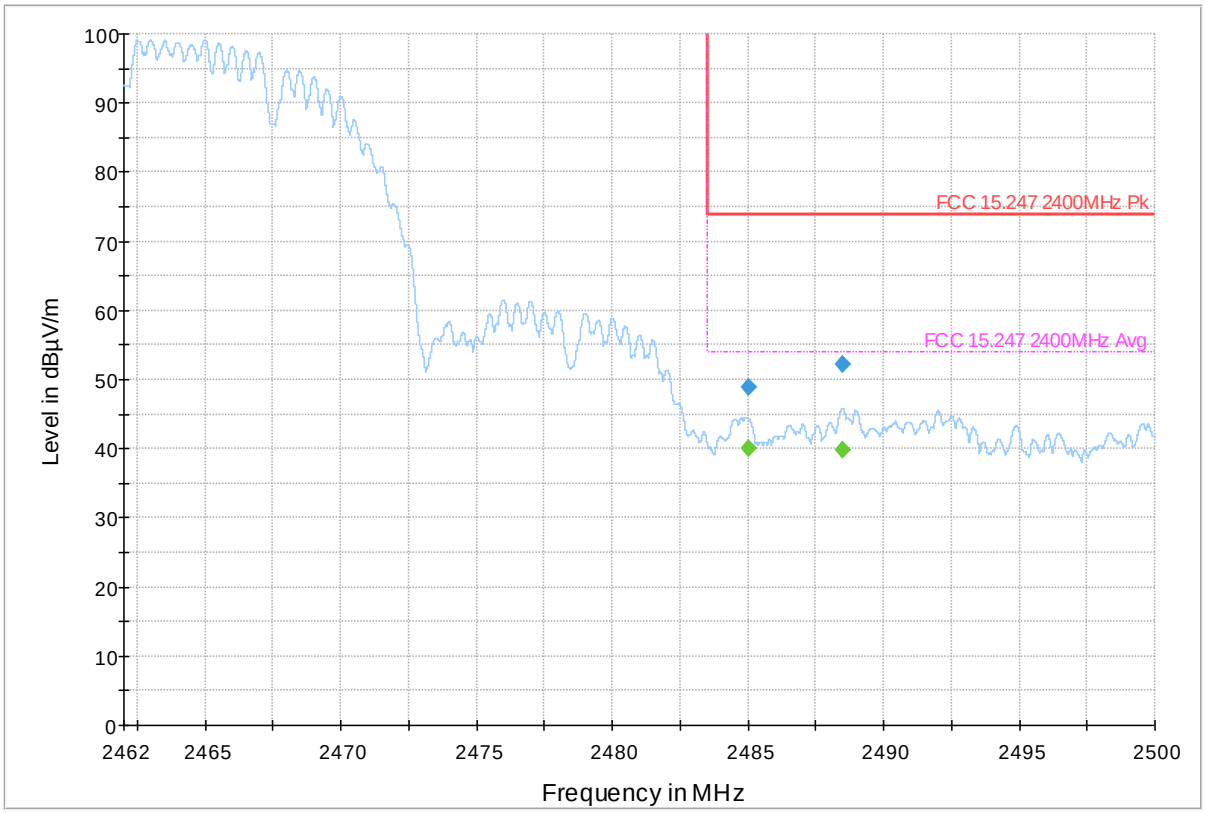


Plot #4

High channel/ 2462 MHz	Modulation/Packet Type: 802.11b 1Mbps Peak & Avg

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)
2484.998	---	40.10	54.00	13.90	500.0	1000.000	150.0	H	311.0	6.5
2484.998	49.00	---	74.00	25.00	500.0	1000.000	150.0	H	311.0	6.5
2488.464	---	39.77	54.00	14.23	500.0	1000.000	169.0	H	11.0	6.5
2488.464	52.15	---	74.00	21.85	500.0	1000.000	169.0	H	11.0	6.5



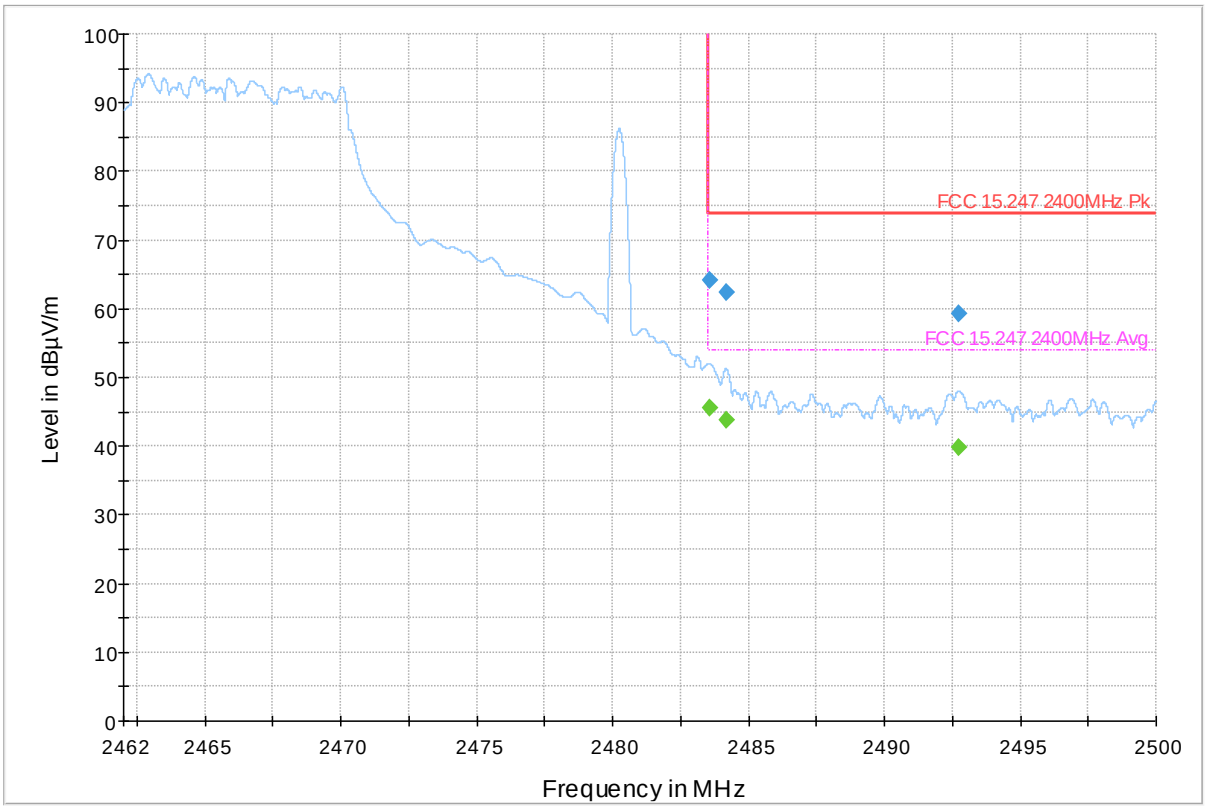
Preview Result 2-AVG
FCC 15.247 2400MHz Avg
Preview Result 1-PK+
Final_Result PK+
FCC 15.247 2400MHz Pk
Final_Result CAV

Plot #5

High channel/ 2462 MHz	Modulation/Packet Type: 802.11g 6Mbps Peak & Avg

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)
2483.592	---	45.58	54.00	8.42	500.0	1000.000	142.0	H	222.0	6.4
2483.592	64.24	---	74.00	9.76	500.0	1000.000	142.0	H	222.0	6.4
2484.187	---	43.87	54.00	10.13	500.0	1000.000	117.0	H	290.0	6.4
2484.187	62.49	---	74.00	11.51	500.0	1000.000	117.0	H	290.0	6.4
2492.709	---	39.75	54.00	14.25	500.0	1000.000	117.0	H	339.0	6.5
2492.709	59.38	---	74.00	14.62	500.0	1000.000	117.0	H	339.0	6.5

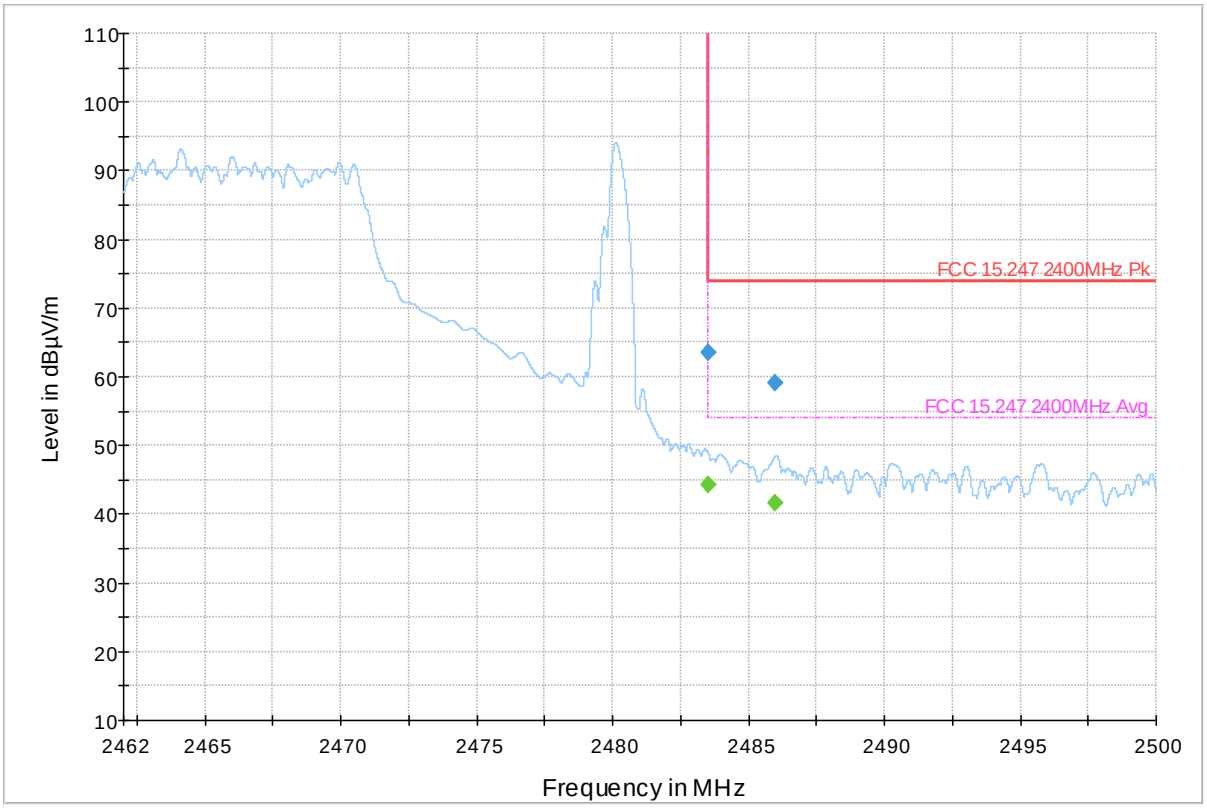


Plot #6

High channel/ 2462 MHz	Modulation/Packet Type: 802.11n_HT20 MCS0 Peak & Avg

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)
2483.513	63.62	---	74.00	10.38	500.0	1000.000	134.0	H	220.0	6.4
2483.513	---	44.22	54.00	9.78	500.0	1000.000	134.0	H	220.0	6.4
2485.992	59.05	---	74.00	14.95	500.0	1000.000	166.0	H	-15.0	6.5
2485.992	---	41.63	54.00	12.37	500.0	1000.000	166.0	H	-15.0	6.5



Preview Result 2-AVG
FCC 15.247 2400MHz Avg
Preview Result 1-PK+
Final_Result PK+
FCC 15.247 2400MHz Pk
Final_Result CAV

8.2 Radiated Transmitter Spurious Emissions and Restricted Bands

8.2.1 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

8.2.2 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
[1]0.495-0.505	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

8.2.3 Test conditions and setup:

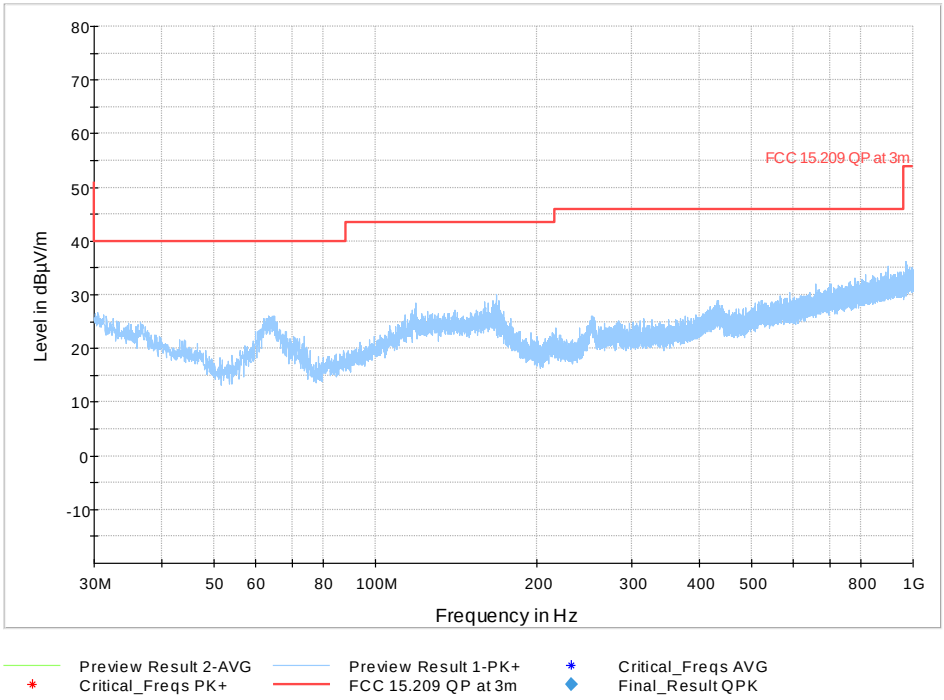
Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input
23° C	1	802.11b	110 VAC

8.2.4 Measurement result:

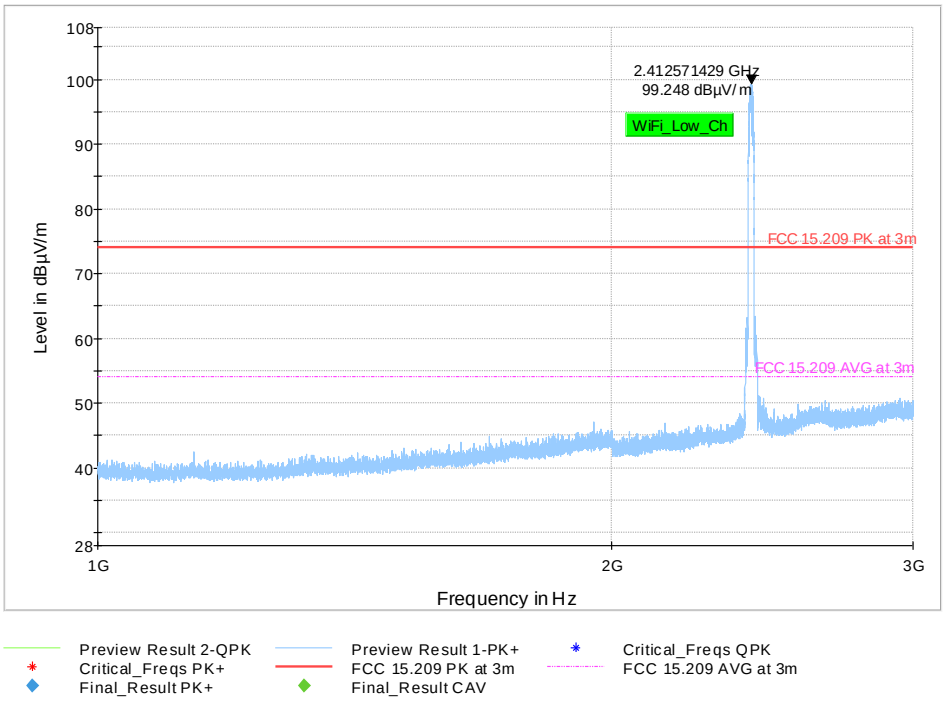
Plot #	Channel #	Scan Frequency	Limit	Result
1-3	Low	30 MHz – 18 GHz	See section 8.2.2	Pass
4-8	Mid	9 kHz – 26 GHz	See section 8.2.2	Pass
9-11	High	30 MHz – 18 GHz	See section 8.2.2	Pass

8.2.5 Measurement Plots:

Plot #1 Radiated Emissions: 30 MHz – 1GHz	
Modulation: 802.11b	**Channel: Low**



Plot #2 Radiated Emissions: 1-3 GHz	
Modulation: 802.11b	**Channel: Low**

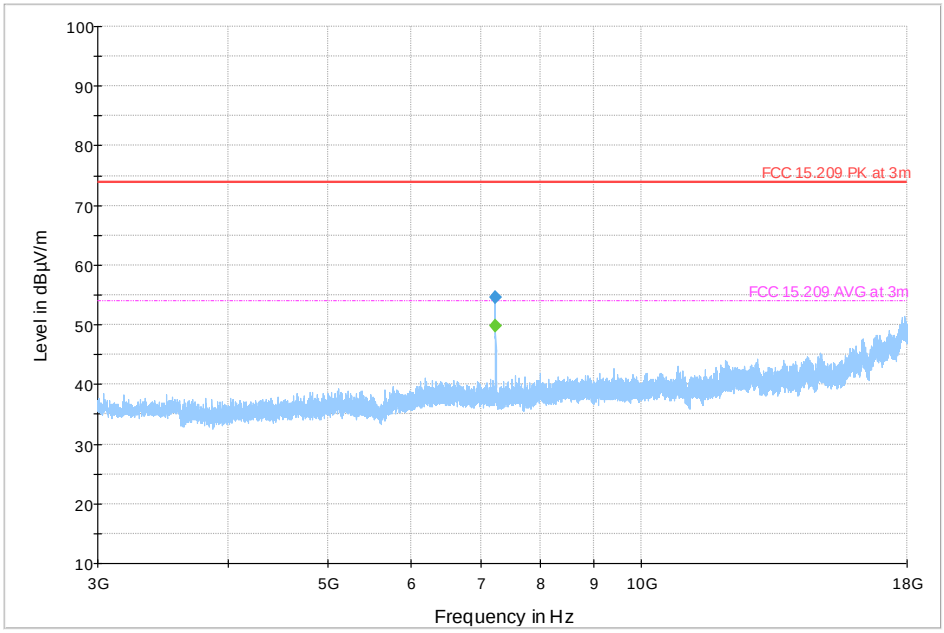


Plot #3 Radiated Emissions: 3-18 GHz

Modulation: 802.11b	Channel: Low

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
7237.000	---	49.82	53.98	4.16	500.0	1000.000	125.0	H	295.0	-0.6	
7237.000	54.64	---	73.98	19.34	500.0	1000.000	125.0	H	295.0	-0.6	



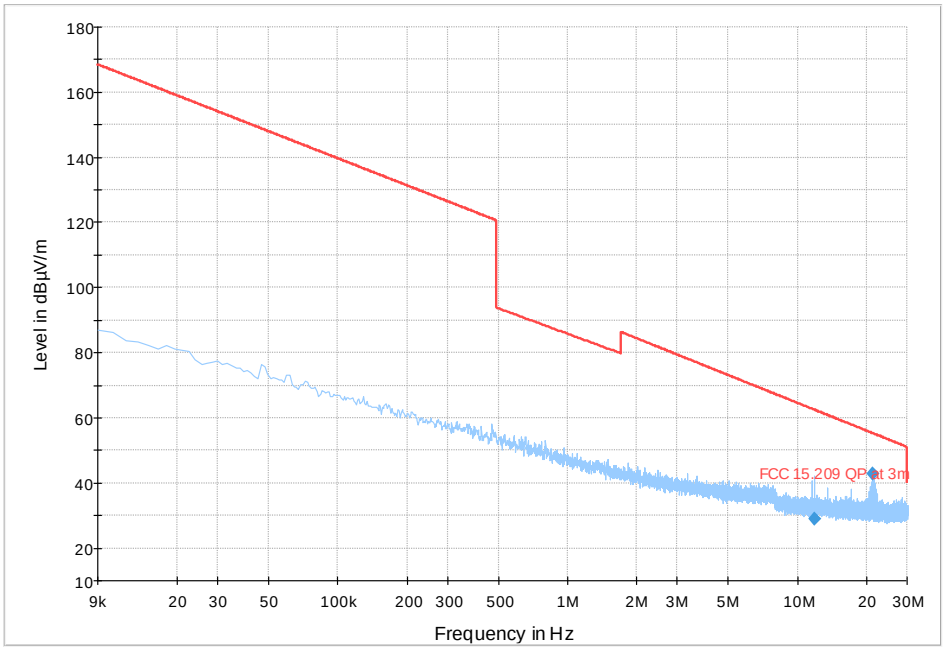
Preview Result 2-QPK
FCC 15.209 AVG at 3m
Preview Result 1-PK+
Final_Result PK+
FCC 15.209 PK at 3m
Final_Result CAV

Plot #4 Radiated Emissions: 9 KHz – 30 MHz

Modulation: 802.11b	Channel: Mid

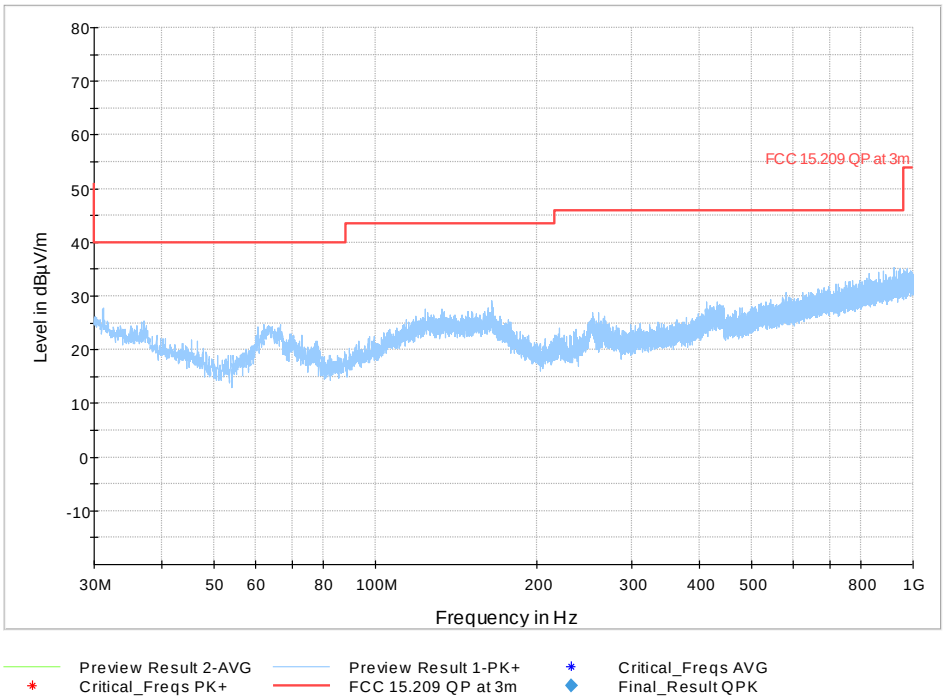
Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
11.906	28.83	62.42	33.59	500.0	9.000	210.0	V	-16.0	17.4	
21.348	42.98	55.23	12.25	500.0	9.000	140.0	V	-12.0	16.7	

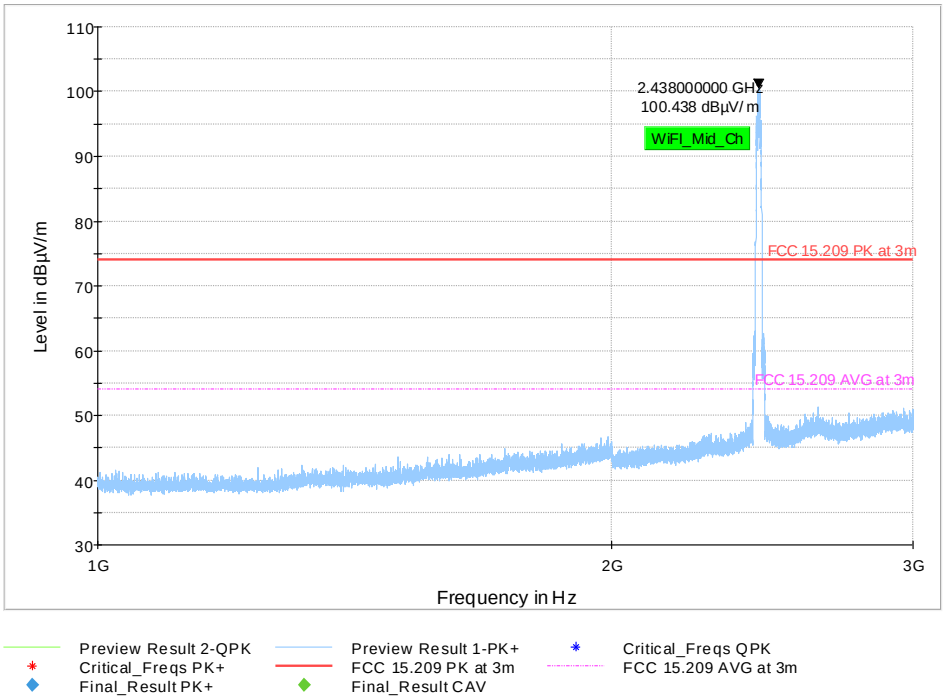


Preview Result 2-QPK Preview Result 1-PK+ FCC 15.209 QP at 3m Final_Result Q

Plot #5 Radiated Emissions: 30 MHz – 1GHz	
Modulation: 802.11b	**Channel: Mid**



Plot #6 Radiated Emissions: 1-3 GHz	
Modulation: 802.11b	**Channel: Mid**

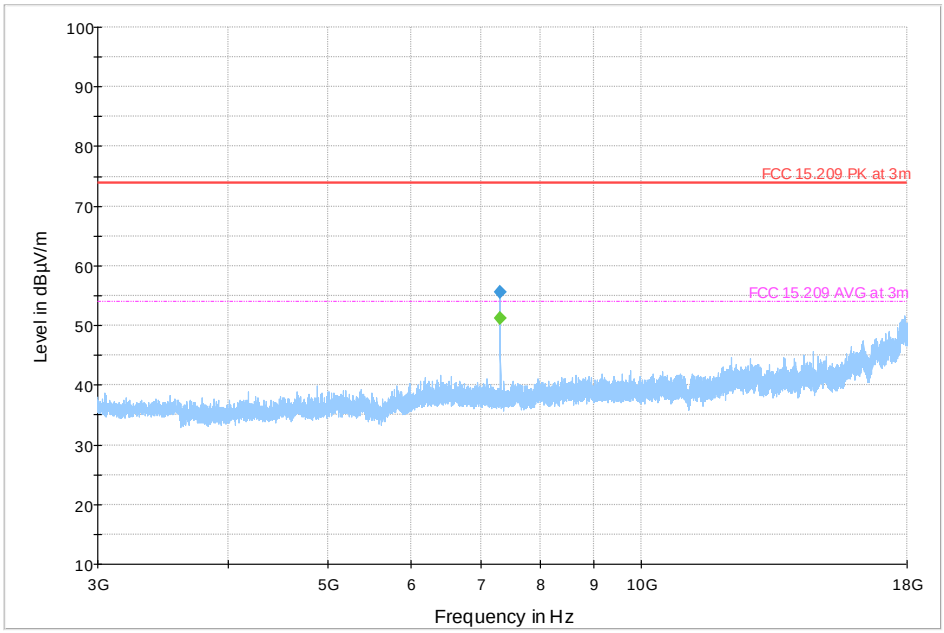


Plot #7 Radiated Emissions: 3-18 GHz

Modulation: 802.11b | **Channel: Mid**

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
7312.000	---	51.27	53.98	2.71	500.0	1000.000	125.0	H	297.0	-0.5	
7312.000	55.59	---	73.98	18.39	500.0	1000.000	125.0	H	297.0	-0.5	

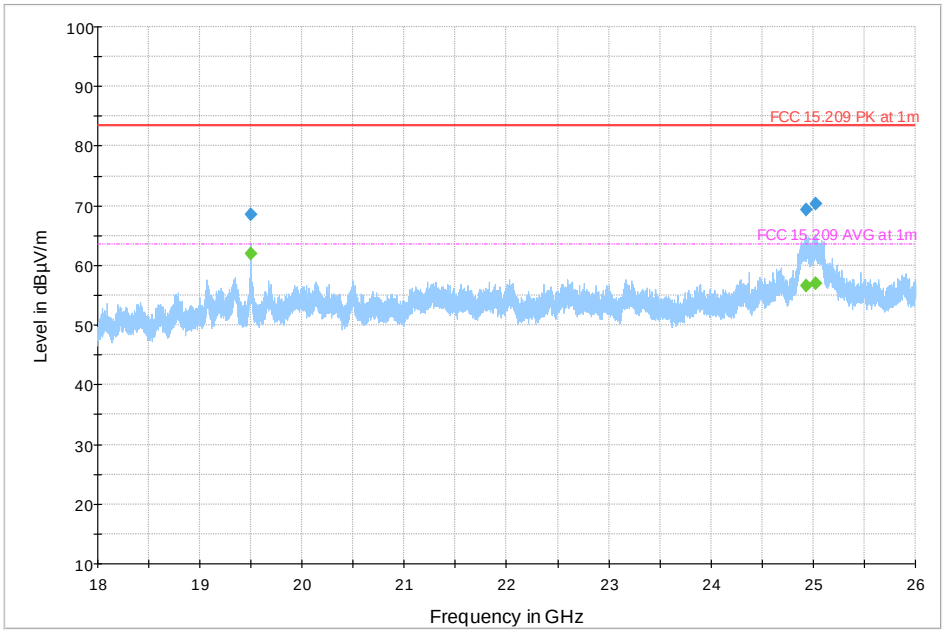


Plot #8 Radiated Emissions: 18-26 GHz

Modulation: 802.11b | **Channel: Mid**

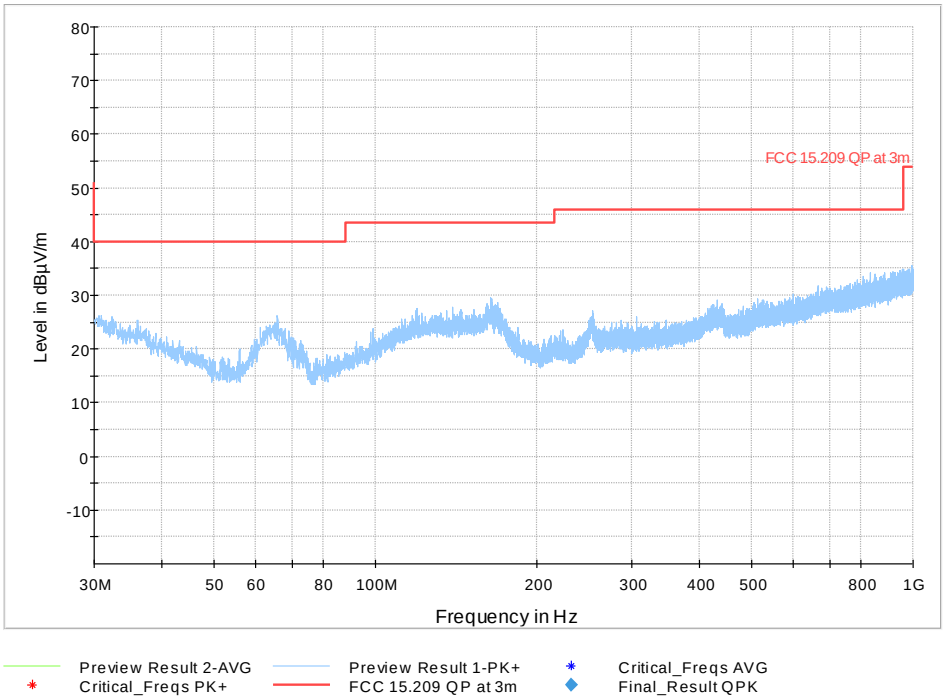
Final_Result

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
19496.000	---	61.99	63.50	1.51	500.0	1000.000	100.0	V	119.0	23.0	
19496.000	68.49	---	83.50	15.01	500.0	1000.000	100.0	V	119.0	23.0	
24932.750	69.30	---	83.50	14.20	500.0	1000.000	100.0	H	149.0	30.1	
24932.750	---	56.64	63.50	6.86	500.0	1000.000	100.0	H	149.0	30.1	
25028.000	70.24	---	83.50	13.26	500.0	1000.000	172.0	H	352.0	30.5	
25028.000	---	57.06	63.50	6.44	500.0	1000.000	172.0	H	352.0	30.5	

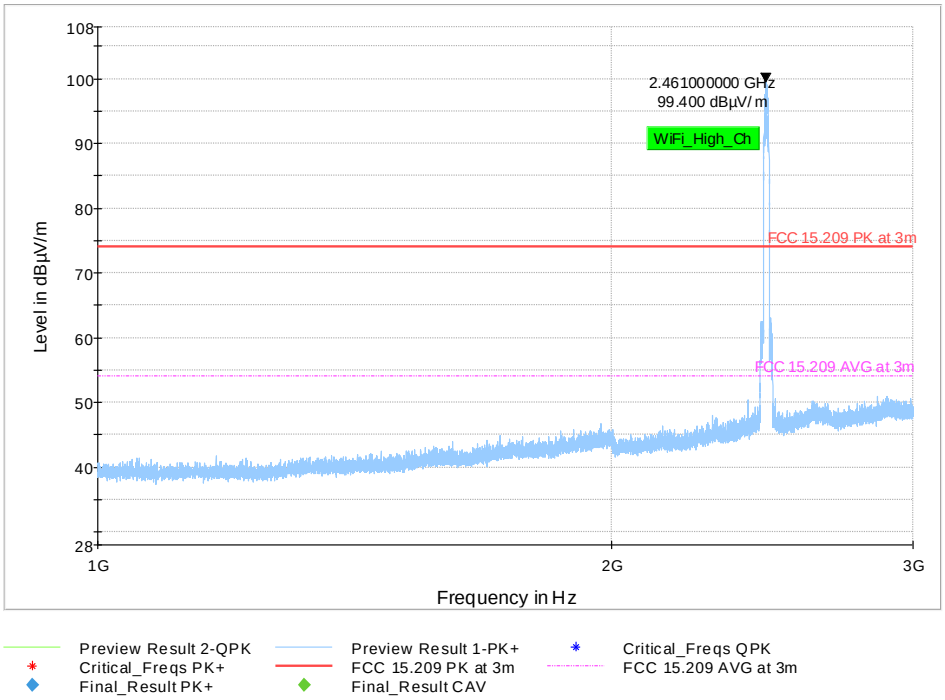


Preview Result 2-QPK
FCC 15.209 AVG at 1m
Preview Result 1-PK+
Final_Result PK+
FCC 15.209 PK at 1m
Final_Result CAV

Plot #9 Radiated Emissions: 30 MHz – 1GHz	
Modulation: 802.11b	**Channel: High**



Plot #10 Radiated Emissions: 1-3 GHz	
Modulation: 802.11b	**Channel: High**

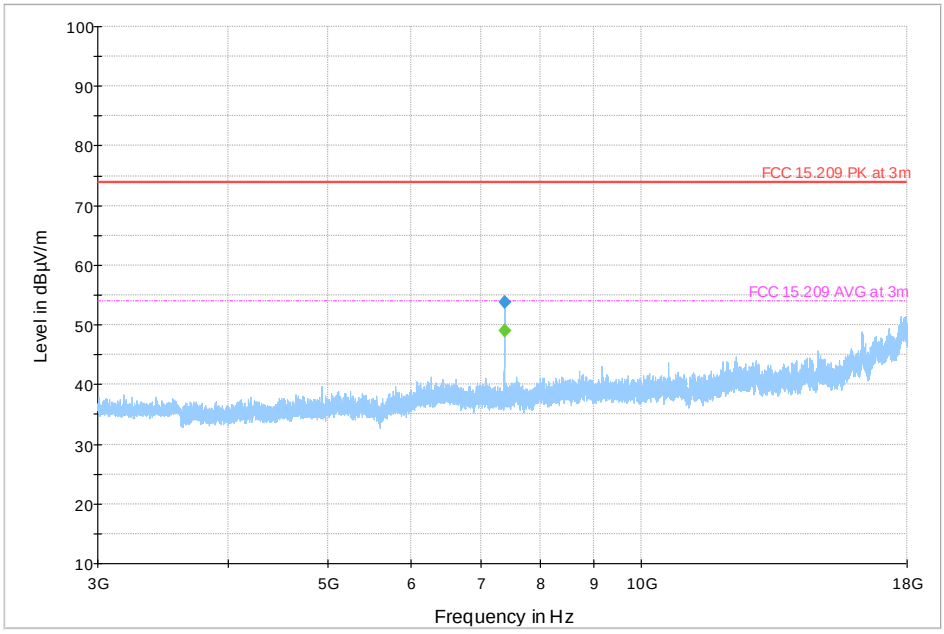


Plot #11 Radiated Emissions: 3-18 GHz

Modulation: 802.11b | **Channel: High**

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
7384.500	---	48.94	53.98	5.04	500.0	1000.000	280.0	H	297.0	-0.3	
7384.500	53.82	---	73.98	20.16	500.0	1000.000	280.0	H	297.0	-0.3	



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

8.3 AC Power Line Conducted Emissions

8.3.1 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

8.3.2 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 µH/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 (dBµV)	
	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.

8.3.3 Test conditions and setup:

Ambient Temperature ©	EUT Set-Up #	EUT operating mode	Power line (L1, L2, L3, N)	Power Input
22° C	1	802.11b	Line & Neutral	110VAC

8.3.4 Measurement Result:

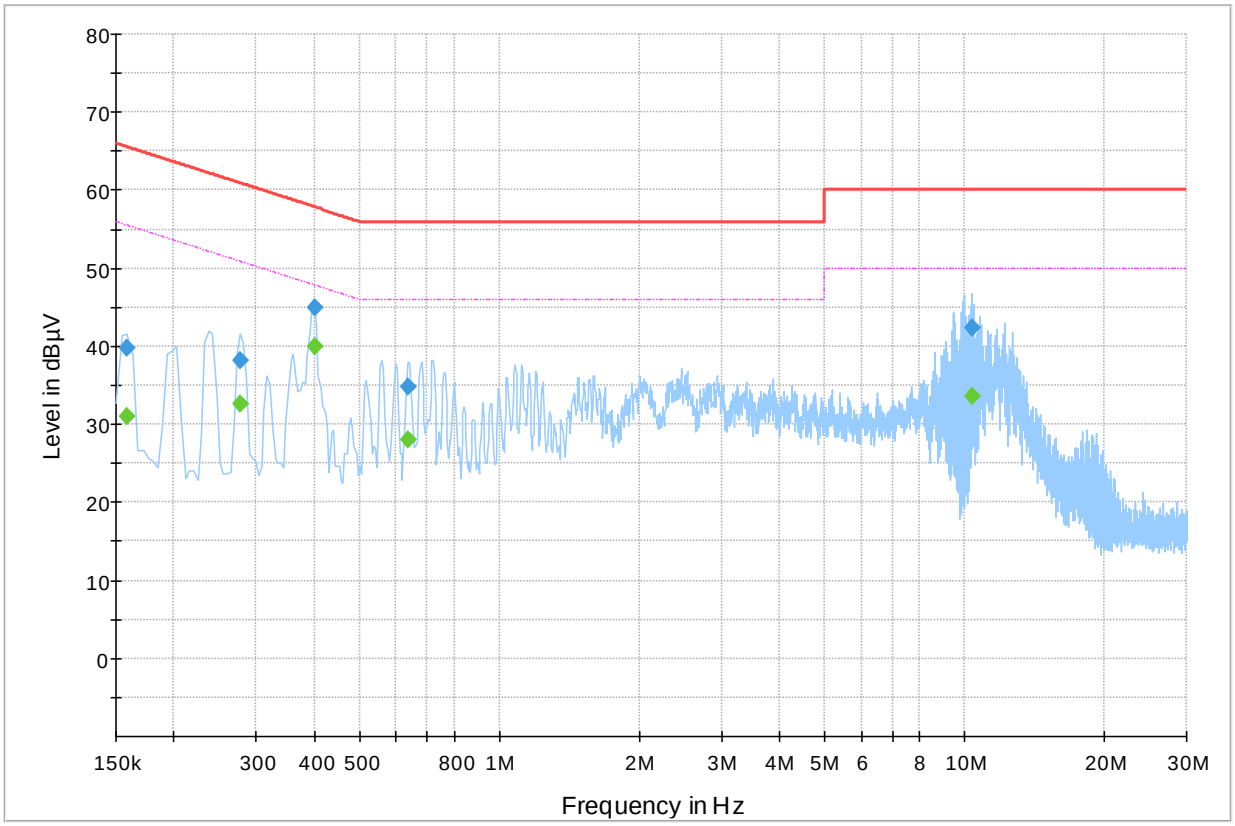
Plot #	Port	EUT Set-Up #:	EUT operating mode	Scan Frequency	Limit	Result
1	AC Mains	1	802.11b	150 kHz – 30 MHz	See section 8.3.2	Pass

8.3.5 Measurement Plots:

Plot # 1

Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	PE	Corr. (dB)	Comment
0.159	39.72	---	65.53	25.81	500.0	9.000	N	GND	10.4	
0.159	---	31.06	55.53	24.47	500.0	9.000	N	GND	10.4	
0.277	38.18	---	60.90	22.72	500.0	9.000	L1	GND	10.1	
0.277	---	32.62	50.90	18.27	500.0	9.000	L1	GND	10.1	
0.400	44.91	---	57.85	12.94	500.0	9.000	L1	GND	10.0	
0.400	---	40.05	47.85	7.80	500.0	9.000	L1	GND	10.0	
0.637	---	28.10	46.00	17.90	500.0	9.000	L1	GND	10.0	
0.637	34.86	---	56.00	21.14	500.0	9.000	L1	GND	10.0	
10.374	42.29	---	60.00	17.71	500.0	9.000	L1	GND	10.1	
10.374	---	33.65	50.00	16.35	500.0	9.000	L1	GND	10.1	



Preview Result 1-PK+ | EN 55032 Voltage on Mains QP | EN 55032 Voltage on Mains AV
Final_Result QPK | Final_Result CAV

9 Test setup photos

Setup photos are included in supporting file name: “EMC_INNOP-018-21001_INP1014_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
LINE IMPEDANCE STABILIZATION NETWORK	FCC	FCC-LISN-50-25-2-08	08014	2 YEARS	08/31/2021

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
2022-01-10	EMC_INNOP-018-21001_INP1014_15.247_WLAN_DTS	Initial version	Yuchan Lu

<<The End>>