



FCC / ISED Test Report

FOR: ChargePoint Inc.

Marketing name: CPNK

Model Name: CPNK500

Product Description: CPNK500 is to provide communication between the Chargepoint network and the charging station.

FCC ID: W38-28010106

IC ID: 8854A-28010106

Applied Rules and Standards:

47 CFR Part 15.407

RSS-247 Issue 2 & RSS-Gen Issue 5

REPORT #: EMC_CHARG_017_18501_FCC_15.407_ISED_WLAN

DATE: 11/27/2018



A2LA Accredited

IC recognized #
3462B-2

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1 **Assessment**

This test report is to support a request for new equipment authorization for the device as described in section 3.

Measurements:

CETECOM Inc. has assessed the transmitter spurious emission of the EUT according to the relevant requirements specified in FCC rules Part 15.407 of Title 47 of the Code of Federal Regulations and Radio Standard Specification RSS-247 Issue 2 of ISED Canada.

Company	Description	Model #
ChargePoint Inc.	CPNK500 is to provide communication between the Chargepoint network and the charging station.	CPNK500

Responsible for Testing Laboratory:

11/27/2018	Compliance	Cindy Li (Lab Manager)	
Date	Section	Name	Signature

Responsible for the Report:

11/27/2018	Compliance	Issa Ghanma (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
Lab Manager:	Cindy Li
Responsible Project Leader:	Cathy Palacios

2.2 Identification of the Client

Applicant's Name:	ChargePoint Inc.
Street Address:	254 E. Hacienda Ave.
City/Zip Code	Campbell, CA 95008-6617
Country	USA

2.3 Identification of the Manufacturer

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

3 Equipment under Test (EUT)

3.1 EUT Specifications

Model No:	CPNK500
FWIN:	7.0.3
HVIN:	27-010106
PMN:	CPNK500, CPNK
Module Information	
Module Name / Number:	Redpine TS9113
FCC ID:	XF6-RS9113DB
IC ID:	8407ARS9113DB
Frequency Range:	Nominal band: UNII-1 5150 – 5250 MHz UNII-3 5725 – 5850 MHz
Type(s) of Modulation:	Wi-Fi module will operate a/n modulation on Band 1 and Band 3 channel 36-48 and 149-165
Antenna type and gain as declared:	Embedded 2.4GHZ,WLAN Peak gain • 5.150 – 5.350: 2 – 3.5 dBi • 5.70 – 5.900: 2 – 3.5 dBi Manufacturer item number: 1000146
Max. declared output Powers form modular grant:	Conducted Power 0.01534 Watts
Power Supply/ Rated Operating Voltage Range:	Low 23 VDC, Nominal 24 VDC, High 25 VDC
Operating Temperature Range:	Low -30° C, Nominal 25° C, High 50° C
Sample Revision	☐ Prototype Unit; ☒ Production Unit; ☐ Pre-Production
EUT Dimensions	190x180x20
Weight	229
EUT Diameter	☒ < 60 cm ☐ Other _____

Other Radios included in the device:	Cellular Module: LTE module will operate on band 2, 4, 5, 13 and 17 with a fall back 3G band 2, 4, 5. FCC ID: QIPPLS8-X / IC ID: 7830A-PLS8X Redpine Module: Radios: • Bluetooth Classic 4.0 / Modulation: GFSK, DQPSK, 8DPSK • Bluetooth low energy GFSK modulation 2402 MHz (ch 0) – 2480 MHz (ch 39), 40 channels • 2.4GHz operate on b/g/n modulation on channel 1-11 FCC ID: XF6-RS9113DB / IC: 8407ARS9113DB
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3.2 EUT Sample details

EUT #	Unit number	HW Version	SW Version	Notes/Comments
1	#3	27-01016	7.0.3	Radiated Emissions

3.3 Accessory Equipment (AE) details

AE #	Comments
-	NA

3.4 Test Sample Configuration

EUT Set-up #	Combination of AE used for test set up	Comments
-	-	NA

3.5 Mode of Operation details

Mode of Operation	Description of Operating modes	Additional Information
Op. 1	UNII-1 802.11n	The customer provided special commands to configure the EUT to: • Low, Mid, High channel. • Maximum power. • Maximum duty cycle. • n modulation • 65 Mbps Data rate Configuration commands will not be available for the end user. Putty Terminal tool used for configuration. The internal antenna was connected.
Op. 2	UNII-3 802.11a	The customer provided special commands to configure the EUT to: • Low, Mid, High channel. • Maximum power. • Maximum duty cycle. • 1 modulation • 6 Mbps Data rate Configuration commands will not be available for the end user. Putty Terminal tool used for configuration. The internal antenna was connected.

3.6 Justification for Worst Case Mode of Operation

During the testing process the EUT was tested with transmitter sets on low, mid and high channels, the highest duty cycle, maximum output power and the worst case of the modulations supported base on the maximum conducted output power from the modular grant and reports.

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 Measurement and evaluation results summary

Specification reference	Test Case	Temperature and Voltage Conditions	Mode	Result
§15.407(a)(5) RSS-247 6.2.1 RSS-247 6.2.4.1	Emission Bandwidth	Nominal	-	Pass based on filing for integrated modules
§15.407(a)(1) i §15.407(a)(3) RSS-247 6.2.1.1 RSS-247 6.2.4.1	Power Spectral Density	Nominal	-	Pass based on filing for integrated modules
§15.407(a)(1) i §15.407(a)(3) RSS-247 6.2.1.1 RSS-247 6.2.4.1	Maximum Conducted Output Power and EIRP	Nominal	-	Pass based on filing for integrated modules
§15.407(b) §15.205 RSS-247 6.2.1.2 RSS-247 6.2.4.2 RSS-Gen 8.10	Band edge compliance	Nominal	-	Pass based on filing for integrated modules
§15.407(b) §15.209(a) RSS-247 6.2.1 RSS-247 6.2.4 RSS-Gen 8.9	TX Spurious emissions- Radiated	Nominal	Op. 1 Op. 2	Pass
§15.207 §15.107 RSS-Gen 8.8	AC Conducted Emissions	Nominal	-	NA. No AC mains connection

5 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)

5.1 Environmental Conditions During Testing:

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

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

5.2 Dates of Testing:

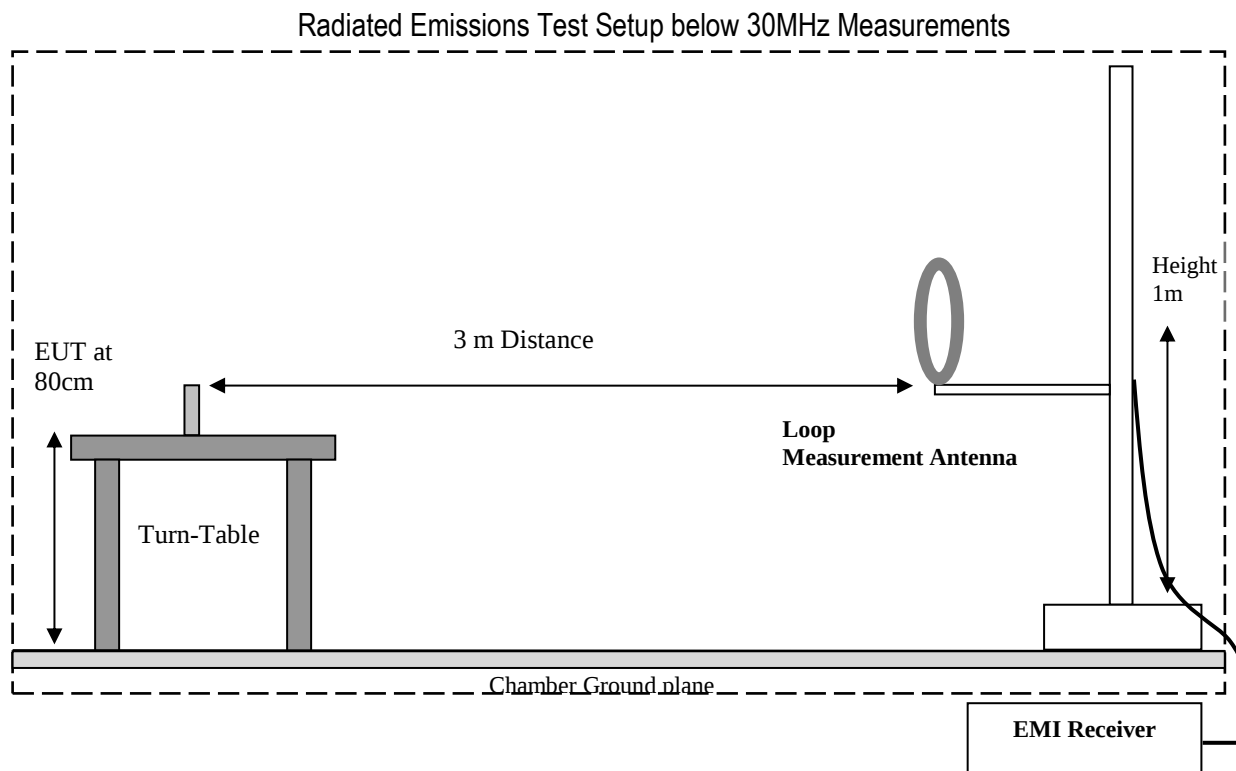
09/21/2018 – 09/26/2018

6 Measurement Procedures

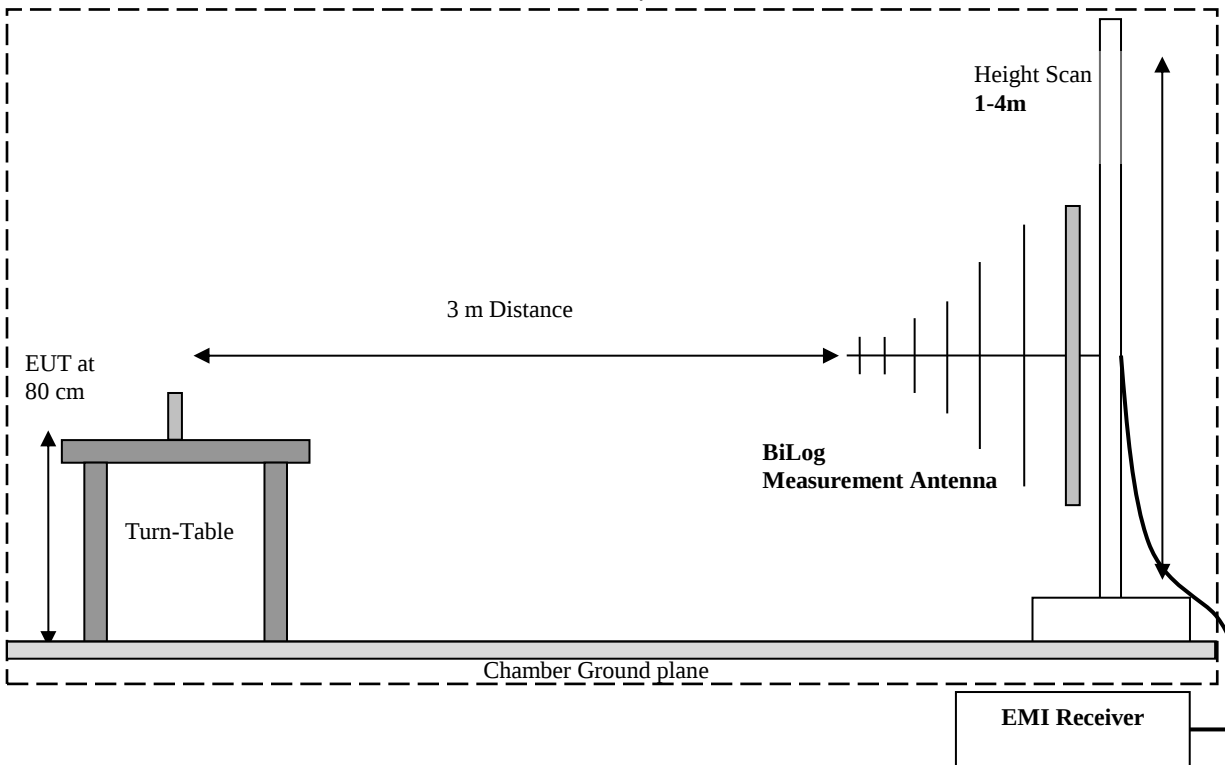
6.1 Radiated Measurement

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

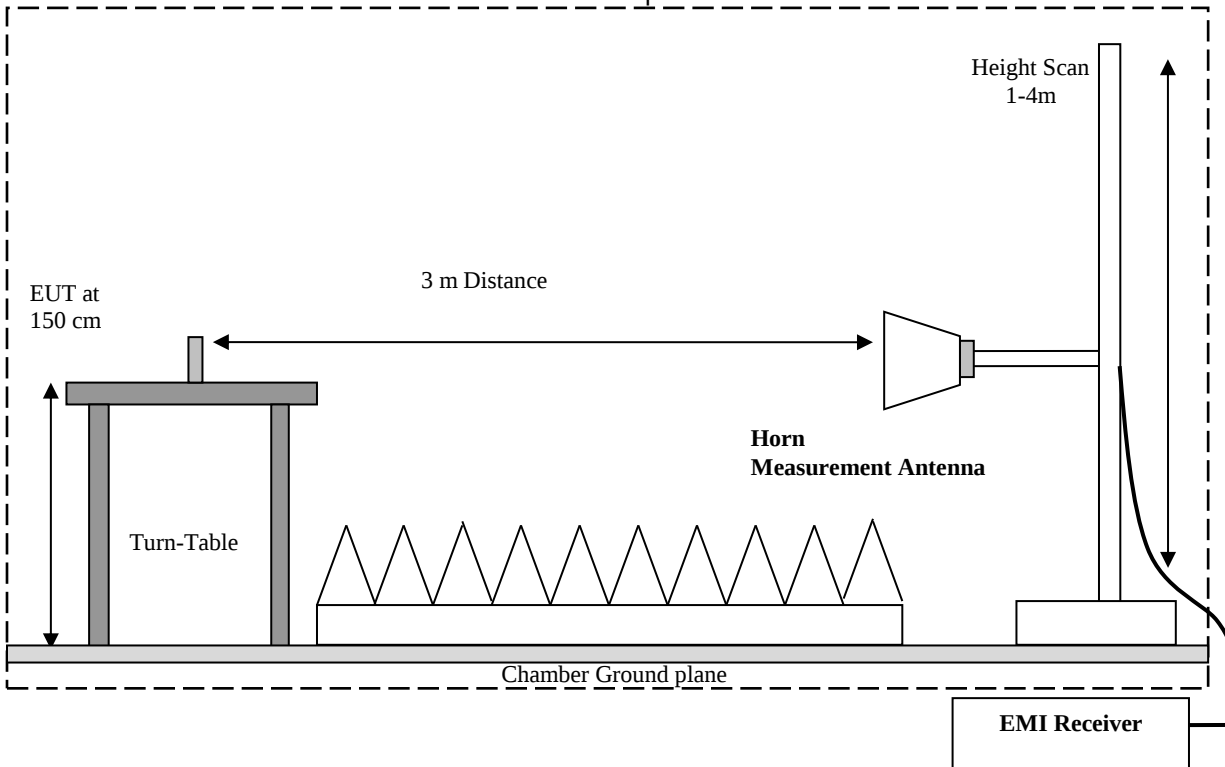
- The exploratory measurement is accomplished by running a matrix of 16 sweeps over the required frequency range with R&S Test-SW EMC32 for 4 positions of the turntable, two orthogonal positions of the EUT and both antenna polarizations. This procedure exceeds the requirement of the above standards to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



6.1.1 Sample Calculations for Field Strength Measurements

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

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

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

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

Example:

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

7 Test Result Data

7.1 Radiated Transmitter Spurious Emissions and Restricted Bands

7.1.1 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 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) = $40 \log (D/d) = 40 \log (300m / 3m) = 80dB$

7.1.2 Limits:

FCC §15.407(b)

- Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209.
- The provisions of §15.205 apply to intentional radiators operating under this section.

RSS-247 6.2.1.1 Power limits

- For OEM devices installed in vehicles, the maximum e.i.r.p. shall not exceed 30 mW or $1.76 + 10 \log_{10} B$, dBm, whichever is less. Devices shall implement transmitter power control (TPC) in order to have the capability to operate at least 3 dB below the maximum permitted e.i.r.p. of 30 mW.
- For other devices, the maximum e.i.r.p. shall not exceed 200 mW or $10 + 10 \log_{10} B$, dBm, whichever power is less. B is the 99% emission bandwidth in megahertz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

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

RSS-247 6.2.3

Until further notice, devices subject to this section shall not be capable of transmitting in the band 5600-5650 MHz. This restriction is for the protection of Environment Canada's weather radars operating in this band.

7.1.3 Test conditions and setup:

Ambient Temperature	Power Input
23° C	24V DC

7.1.4 Measurement result:

Mode	Plot #	Channel #	Scan Frequency	Limit	Frequency of highest emission in MHz	Highest peak emission in dBuV/m @ 3m	Result
Op. 1	1 – 4	36	30 MHz – 18 GHz	See section 7.1.2	15545	56.95	Pass
	5 – 10	40	9 kHz – 40 GHz		0.1	63.57	Pass
	11 – 14	48	30 MHz – 18 GHz		17784	51.14	Pass
Op. 2	15 – 18	149	30 MHz – 18 GHz		17228	59.55	Pass
	19 – 24	157	9 kHz – 40 GHz		0.1	63.65	Pass
	25 – 28	165	30 MHz – 18 GHz		17477	57.90	Pass

7.1.5 Measurement Plots:

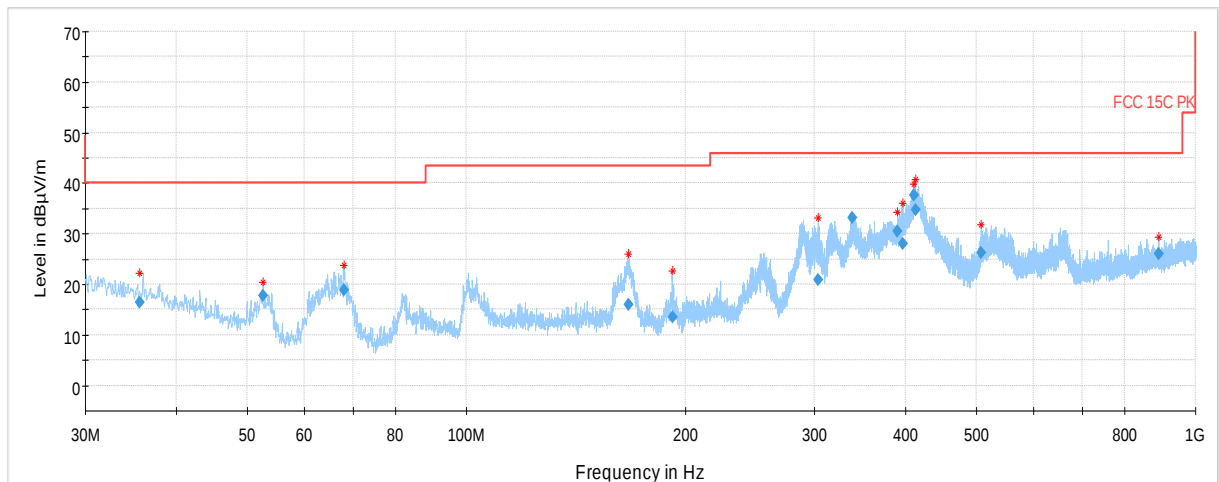
Plot #1 Radiated Emissions: 30MHz – 1GHz

Modulation: n

Channel: 36

Final_Result

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	PoI	Azimuth (deg)	Corr. (dB)	Comment
35.597900	16.51	40.00	23.49	500.0	100.000	279.0	H	-69.0	-11.0	10:40:25 AM - 9/26/2018
52.538050	17.75	40.00	22.25	500.0	100.000	100.0	V	2.0	-19.6	10:43:35 AM - 9/26/2018
67.932650	18.91	40.00	21.09	500.0	100.000	100.0	V	342.0	-25.0	10:46:29 AM - 9/26/2018
166.997950	15.94	43.50	27.56	500.0	100.000	107.0	V	-77.0	-19.8	10:49:40 AM - 9/26/2018
191.507800	13.63	43.50	29.87	500.0	100.000	127.0	V	155.0	-21.3	10:52:53 AM - 9/26/2018
303.138700	20.82	46.00	25.18	500.0	100.000	100.0	V	-21.0	-17.0	10:55:55 AM - 9/26/2018
337.962050	33.21	46.00	12.79	500.0	100.000	161.0	V	274.0	-16.8	10:58:58 AM - 9/26/2018
389.966700	30.54	46.00	15.46	500.0	100.000	123.0	V	220.0	-15.9	11:01:46 AM - 9/26/2018
396.291300	27.97	46.00	18.03	500.0	100.000	171.0	V	170.0	-15.7	11:04:35 AM - 9/26/2018
410.651000	37.65	46.00	8.35	500.0	100.000	300.0	H	116.0	-13.8	11:07:22 AM - 9/26/2018
412.794600	34.83	46.00	11.17	500.0	100.000	300.0	V	146.0	-14.5	11:10:05 AM - 9/26/2018
508.060300	26.29	46.00	19.71	500.0	100.000	100.0	H	133.0	-12.1	11:13:08 AM - 9/26/2018
890.927150	26.07	46.00	19.93	500.0	100.000	100.0	H	354.0	-5.8	11:15:54 AM - 9/26/2018

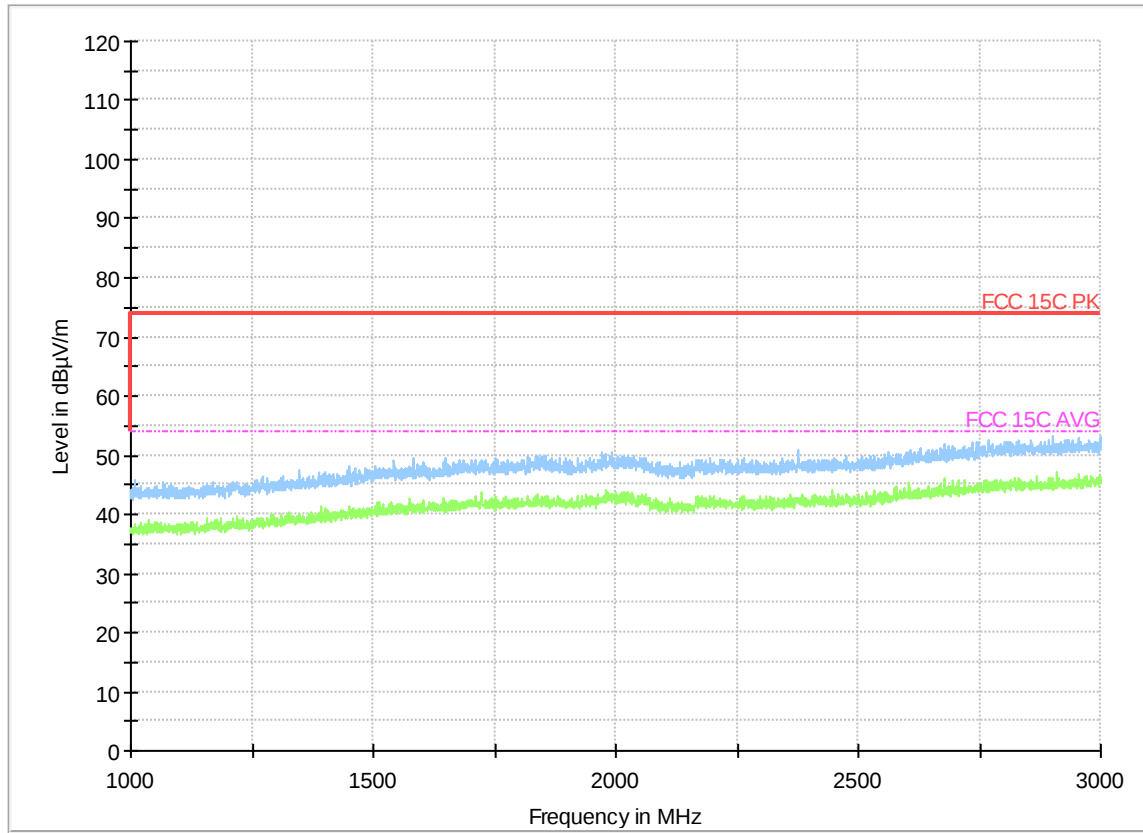


Preview Result 1-PK+ * Critical_Freqs PK+ — FCC 15C PK ♦ Final_Result QPK

Plot #2 Radiated Emissions: 1GHz – 3GHz

Modulation: n

Channel: 36



Preview Result 2-RMS	Preview Result 1-PK+	Critical_Freqs RMS
* Critical_Freqs PK+	FCC 15C PK	FCC 15C AVG
◆ Final_Result PK+	◆ Final_Result RMS	

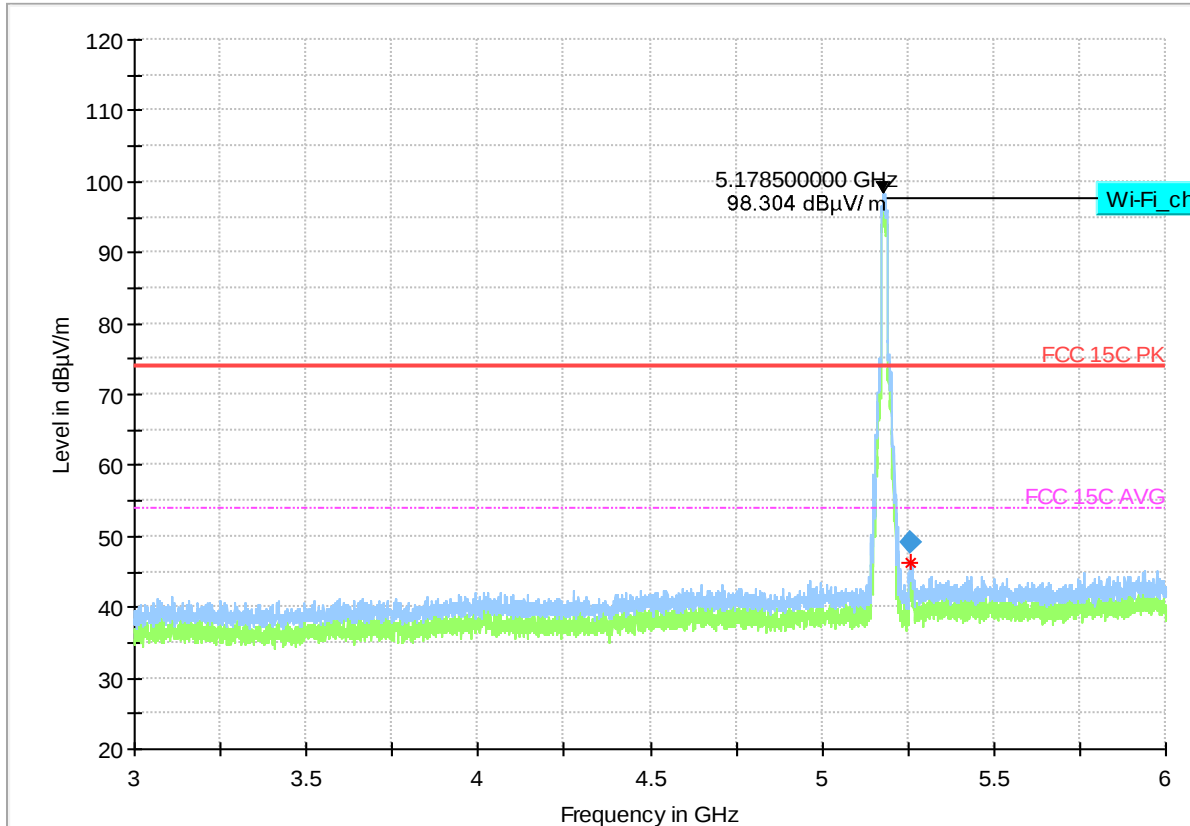
Plot # 3 Radiated Emissions: 3 – 6GHz

Modulation: n

Channel: 36

Final_Result

Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
5256.436667	49.02	73.99	24.97	100.0	1000.000	282.0	H	244.0	-5.4	1:07:31 PM - 9/25/2018



— Preview Result 2-RMS
— Preview Result 1-PK+
— FCC 15C PK
— Critical_Freqs RMS
◆ Final_Result PK+
◆ Final_Result RMS
* Critical_Freqs PK+
* FCC 15C AVG

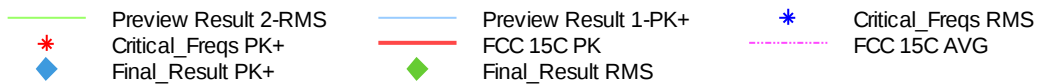
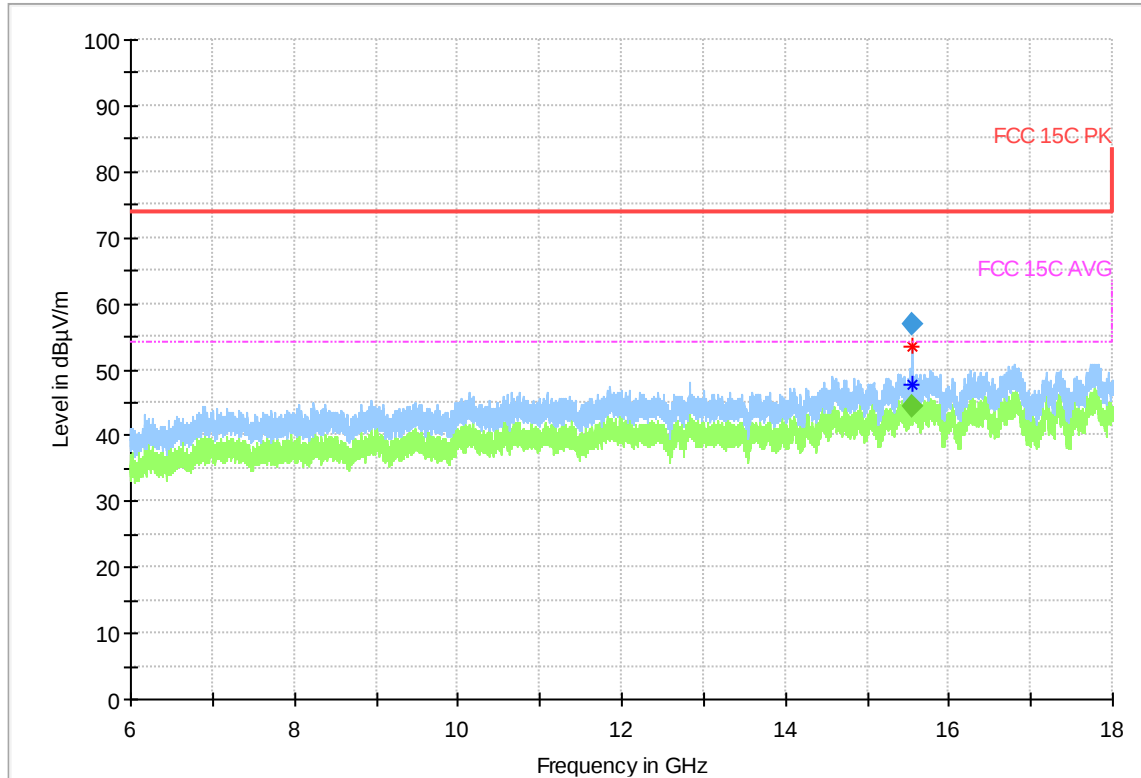
Plot # 4 Radiated Emissions: 6 – 18GHz

Modulation: n

Channel: 36

Final_Result

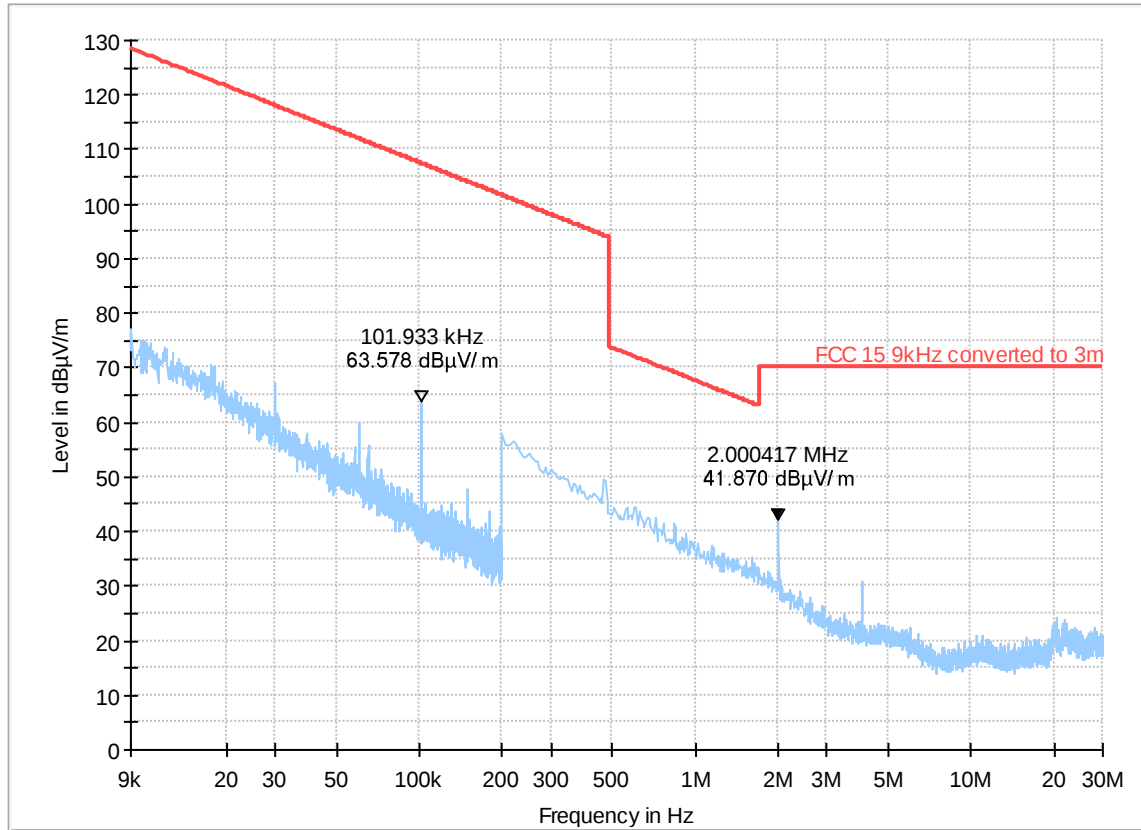
Frequency (MHz)	MaxPeak (dBμV/m)	RMS (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
15545.307500	56.95	---	73.98	17.03	100.0	1000.000	327.0	V	24.0	-16.8	2:33:32 PM - 9/25/2018
15547.335833	---	44.53	53.98	9.45	100.0	1000.000	261.0	V	25.0	-16.8	2:37:19 PM - 9/25/2018



Plot # 5 Radiated Emissions: 9KHz – 30MHz

Modulation: n

Channel: 40



Preview Result 1-PK+
FCC 15 9kHz converted to 3m
Final Result RMS
Critical_Freqs PK+
Final Result PK+

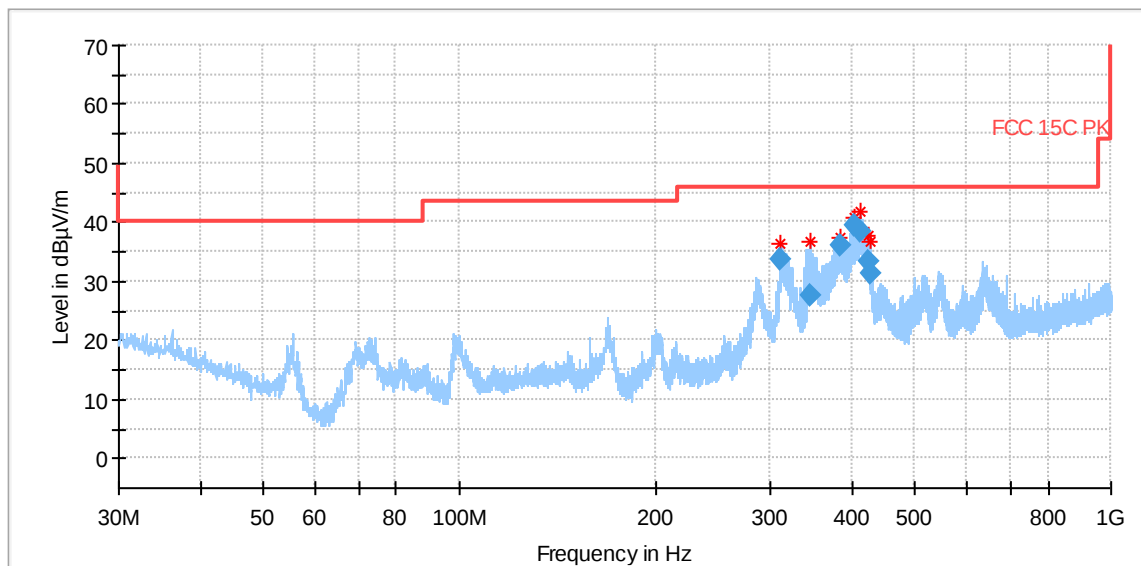
Plot #6 Radiated Emissions: 30MHz – 1GHz

Modulation: n

Channel: 40

Final_Result

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
311.812100	33.56	46.00	12.44	500.0	100.000	100.0	H	100.0	-17.2	5:01:21 PM - 9/25/2018
345.982650	27.46	46.00	18.54	500.0	100.000	100.0	H	154.0	-16.4	5:04:11 PM - 9/25/2018
383.932650	36.10	46.00	9.90	500.0	100.000	177.0	V	91.0	-15.5	5:07:07 PM - 9/25/2018
403.597100	39.51	46.00	6.49	500.0	100.000	100.0	H	149.0	-14.6	5:10:12 PM - 9/25/2018
412.004150	38.45	46.00	7.55	500.0	100.000	100.0	V	157.0	-14.5	5:12:57 PM - 9/25/2018
422.974100	33.21	46.00	12.79	500.0	100.000	158.0	V	105.0	-14.9	5:15:46 PM - 9/25/2018
426.187100	31.16	46.00	14.84	500.0	100.000	158.0	V	43.0	-14.9	5:18:43 PM - 9/25/2018

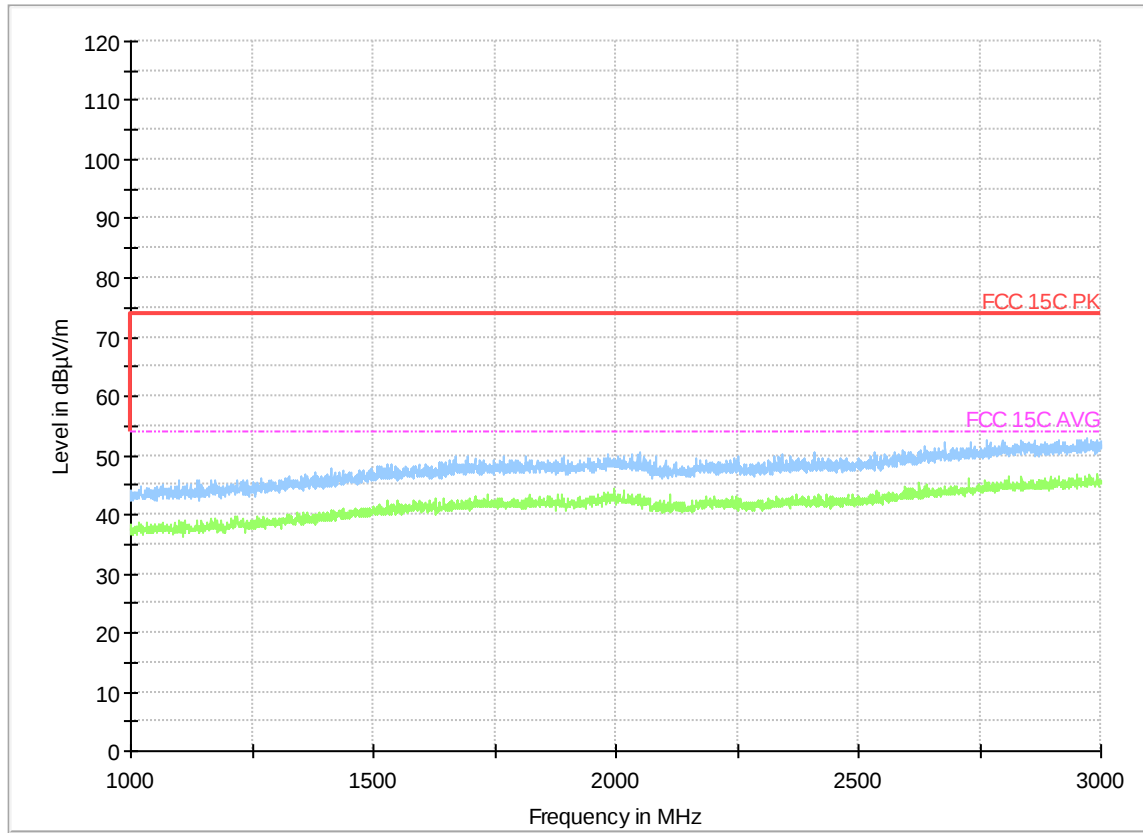


— Preview Result 1-PK+ * Critical_Freqs PK+
— FCC 15C PK ◆ Final_Result QPK

Plot #7 Radiated Emissions: 1 – 3GHz

Modulation: n

Channel: 40



Preview Result 2-RMS	Preview Result 1-PK+	Critical_Freqs RMS
* Critical_Freqs PK+	FCC 15C PK	FCC 15C AVG
◆ Final_Result PK+	◆ Final_Result RMS	

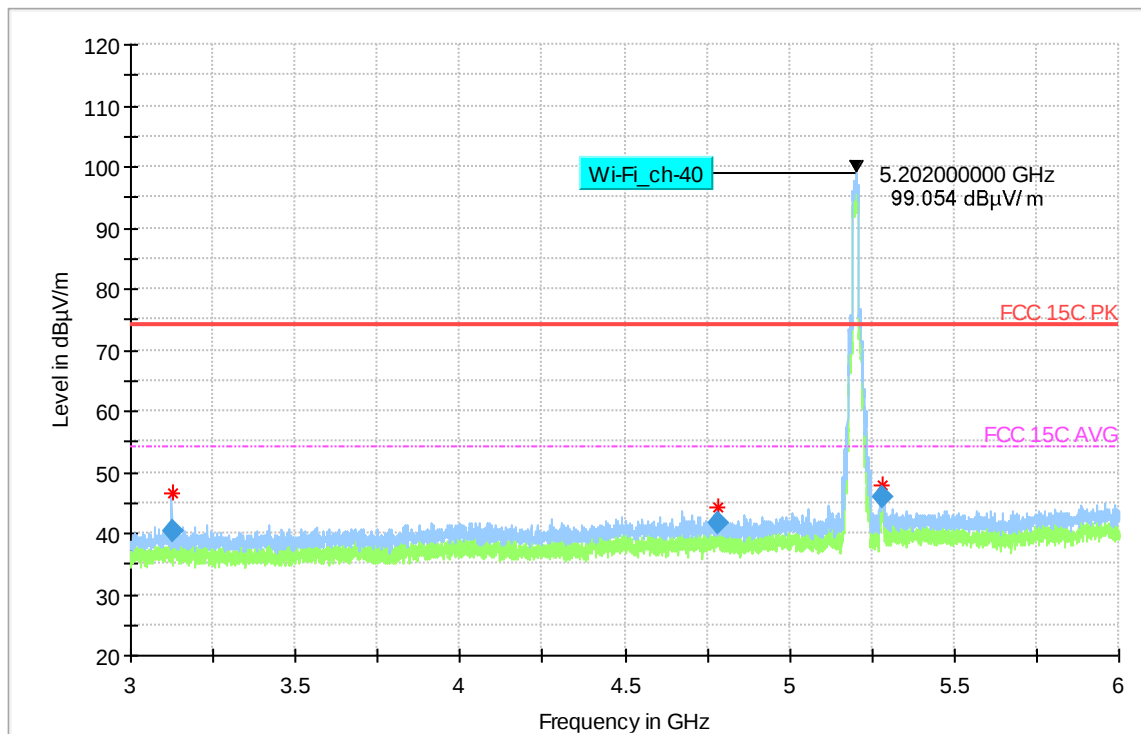
Plot #8 Radiated Emissions: 3 – 6GHz

Modulation: n

Channel: 40

Final_Result

Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
3129.050000	40.43	73.99	33.56	100.0	1000.000	124.0	V	50.0	-9.9	11:53:18 AM - 9/25/2018
4781.706667	41.80	73.99	32.19	100.0	1000.000	240.0	V	154.0	-6.5	11:56:16 AM - 9/25/2018
5280.906667	45.90	73.99	28.09	100.0	1000.000	304.0	H	312.0	-5.2	11:59:28 AM - 9/25/2018



— Preview Result 2-RMS — Preview Result 1-PK+ * Critical_Freqs RMS
* Critical_Freqs PK+ — FCC 15C PK --- FCC 15C AVG
◆ Final_Result PK+ ◆ Final_Result RMS

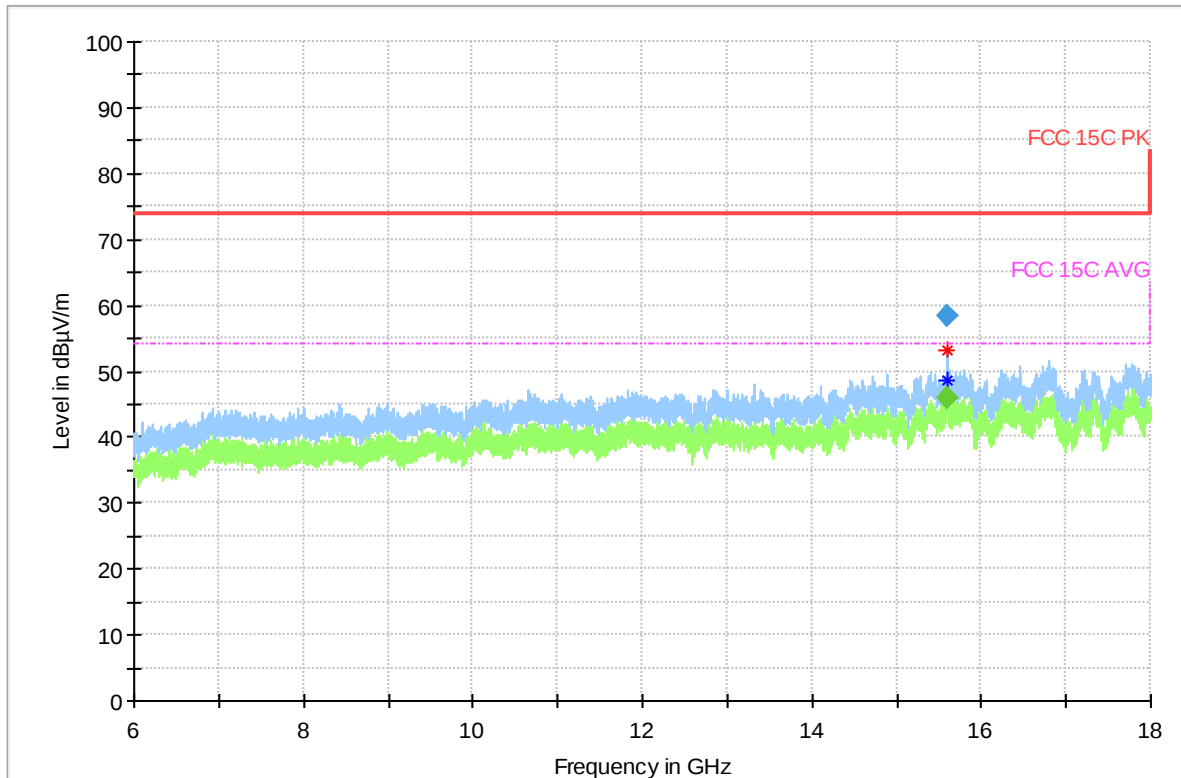
Plot #9 Radiated Emissions: 6 – 18GHz

Modulation: n

Channel: 40

Final Result

Frequency (MHz)	MaxPeak (dBμV/m)	RMS (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
15601.564167	---	46.01	53.98	7.97	100.0	1000.000	241.0	V	24.0	-17.0	2:22:39 PM - 9/25/2018
15602.340000	58.49	---	73.98	15.49	100.0	1000.000	326.0	V	25.0	-17.0	2:18:26 PM - 9/25/2018

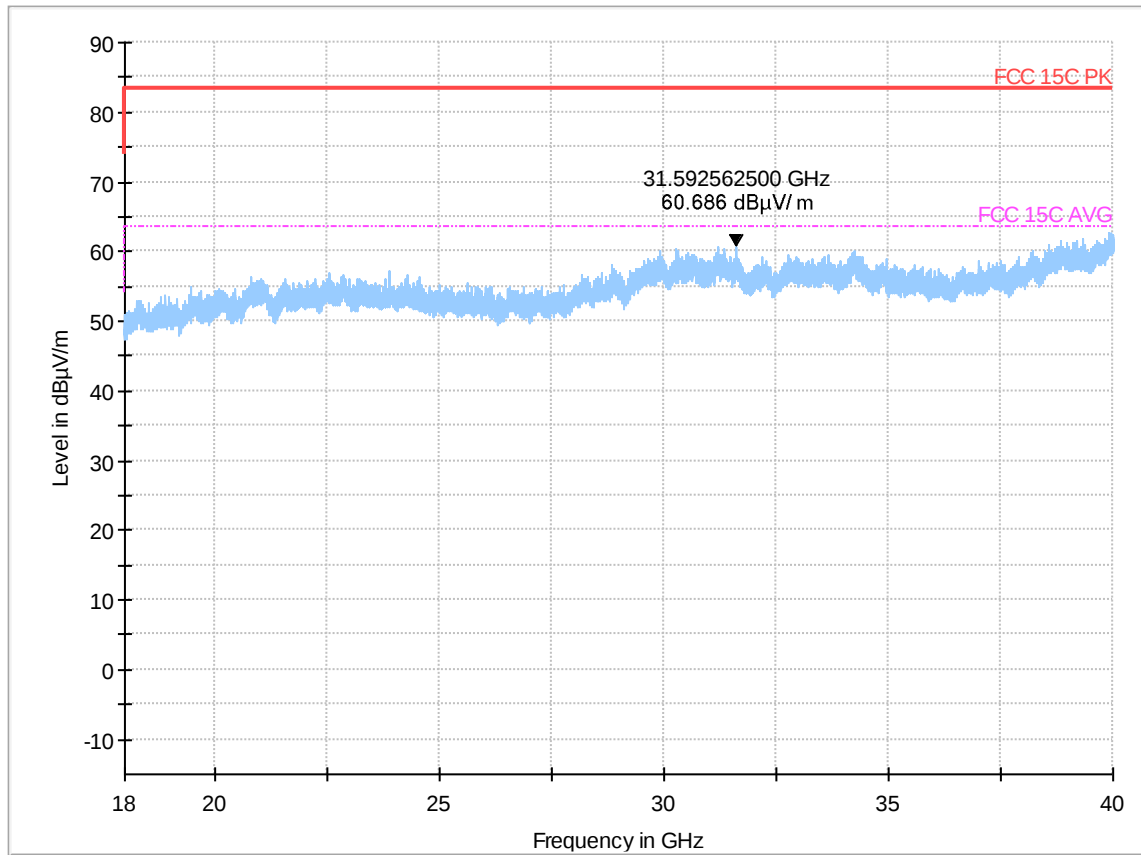


— Preview Result 2-RMS — Preview Result 1-PK+ * Critical_Freqs RMS
* Critical_Freqs PK+ — FCC 15C PK --- FCC 15C AVG
◆ Final_Result PK+ ◆ Final_Result RMS

Plot #10 Radiated Emissions: 18 – 40GHz

Modulation: n

Channel: 40



Preview Result 1-PK+
FCC 15C AVG

* Critical_Freqs PK+
◆ Final_Result PK+

— FCC 15C PK
◆ Final_Result RMS

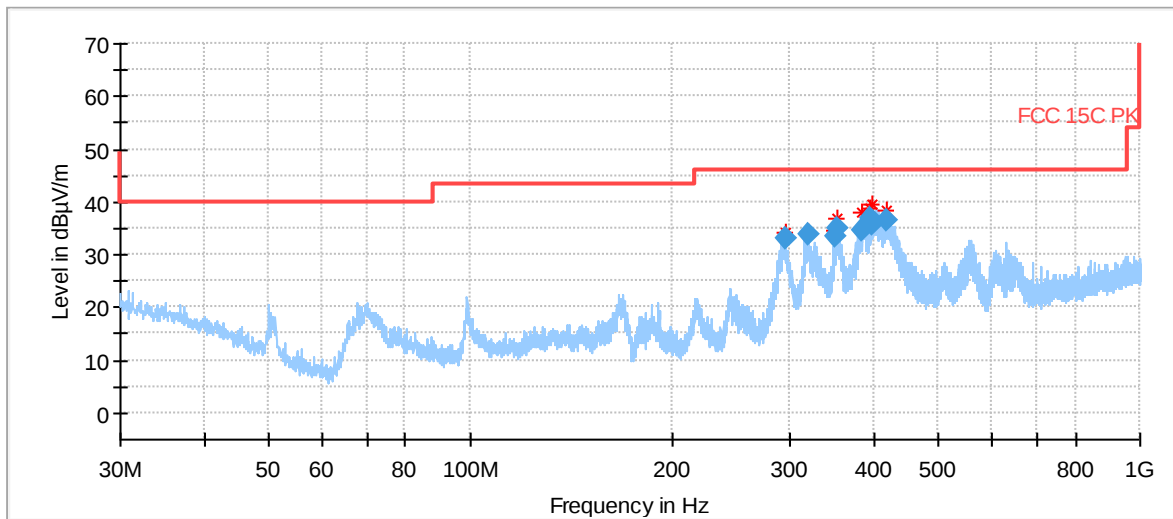
Plot #11 Radiated Emissions: 30MHz – 1GHz

Modulation: n

Channel: 48

Final_Result

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
294.717200	32.98	46.00	13.02	500.0	100.000	125.0	H	294.0	-17.8	4:04:42 PM - 9/25/2018
319.180400	33.78	46.00	12.22	500.0	100.000	120.0	H	280.0	-17.0	4:07:33 PM - 9/25/2018
350.284250	33.40	46.00	12.60	500.0	100.000	177.0	V	205.0	-16.5	4:10:33 PM - 9/25/2018
353.803250	35.10	46.00	10.90	500.0	100.000	107.0	H	116.0	-16.1	4:13:43 PM - 9/25/2018
384.849700	34.56	46.00	11.44	500.0	100.000	107.0	H	121.0	-15.0	4:16:31 PM - 9/25/2018
394.674350	36.82	46.00	9.18	500.0	100.000	100.0	H	124.0	-15.4	4:19:15 PM - 9/25/2018
398.977200	35.89	46.00	10.11	500.0	100.000	107.0	H	122.0	-15.1	4:22:00 PM - 9/25/2018
418.754450	36.42	46.00	9.58	500.0	100.000	107.0	H	301.0	-13.7	4:25:06 PM - 9/25/2018

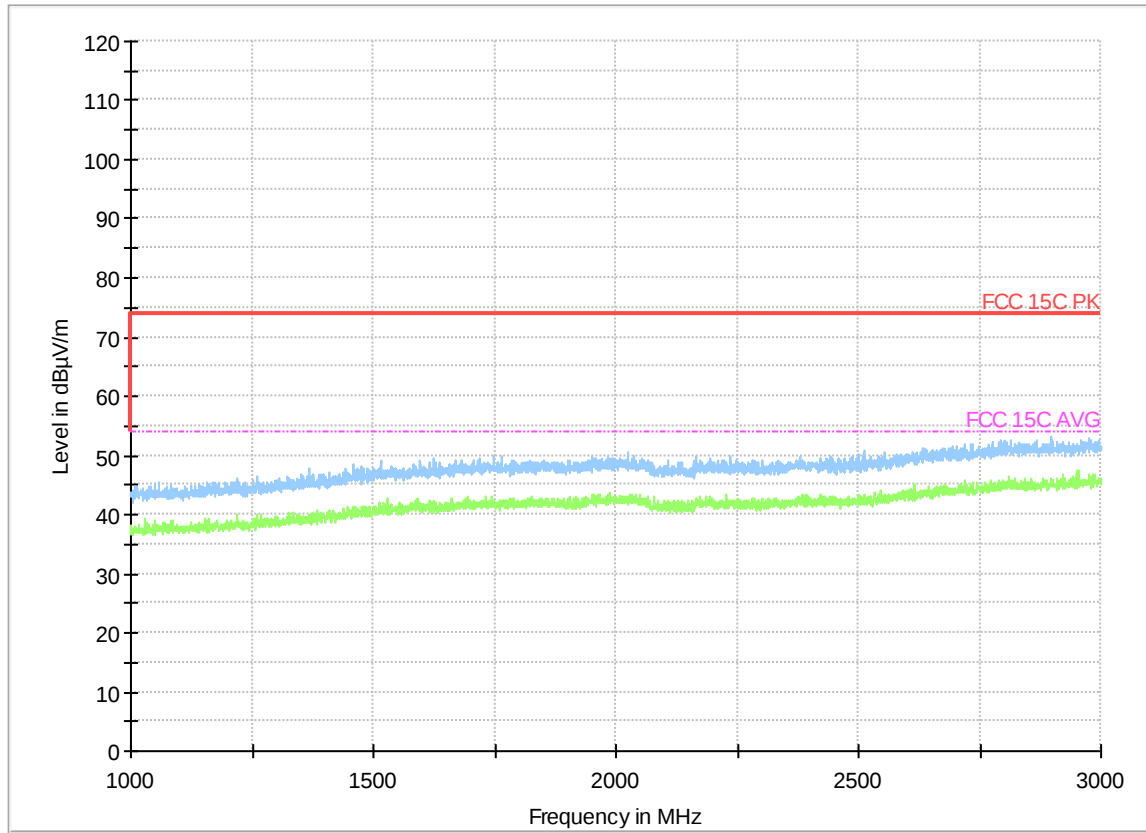


— Preview Result 1-PK+ * Critical_Freqs PK+
— FCC 15C PK ◆ Final_Result QPK

Plot #12 Radiated Emissions: 1GHz – 3GHz

Modulation: n

Channel: 48



Preview Result 2-RMS	Preview Result 1-PK+	Critical_Freqs RMS
Critical_Freqs PK+	FCC 15C PK	FCC 15C AVG
Final_Result PK+	Final_Result RMS	

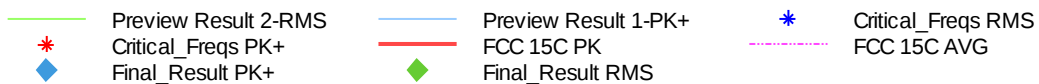
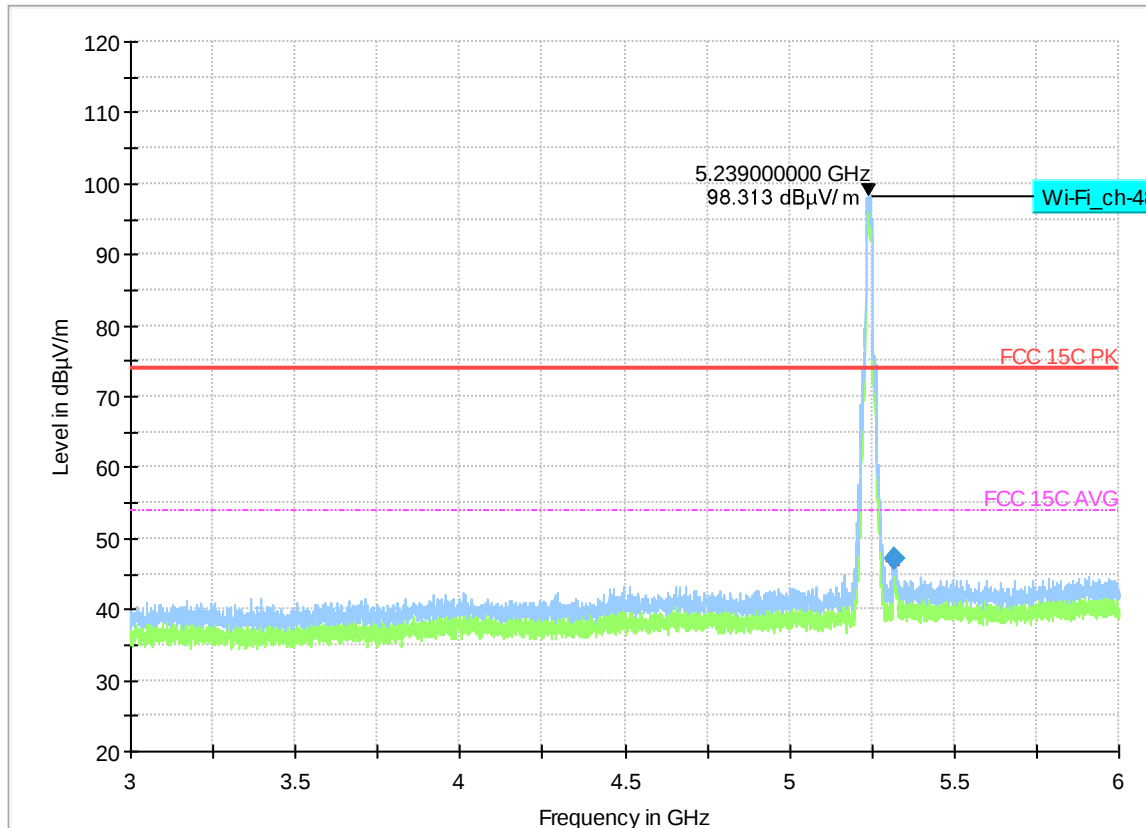
Plot # 13 Radiated Emissions: 3 – 6GHz

Modulation: n

Channel: 48

Final_Result

Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
5316.200000	46.99	73.99	27.00	100.0	1000.000	188.0	H	215.0	-4.9	1:20:01 PM - 9/25/2018



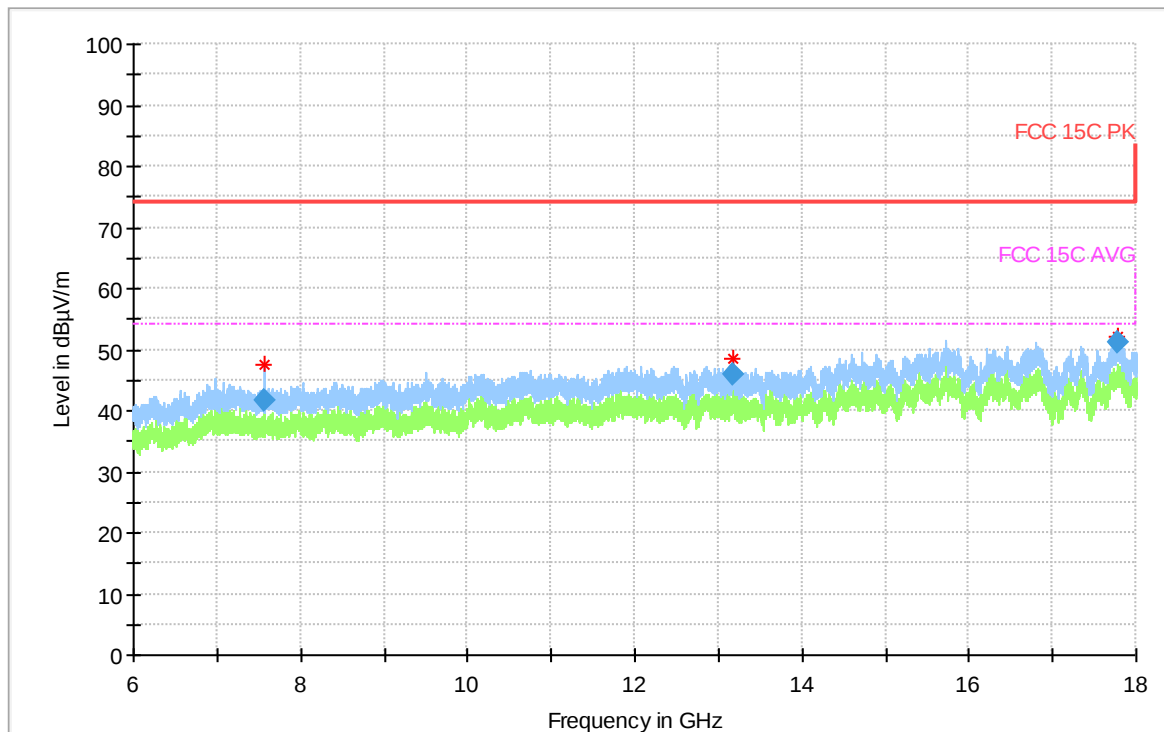
Plot # 14 Radiated Emissions: 6 – 18GHz

Modulation: n

Channel: 48

Final_Result

Frequency (MHz)	MaxPeak (dBμV/m)	RMS (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
7570.555833	41.59	---	73.99	32.40	100.0	1000.000	290.0	V	153.0	-29.2	1:41:57 PM - 9/25/2018
13178.065833	45.89	---	73.98	28.10	100.0	1000.000	350.0	V	263.0	-21.1	1:49:22 PM - 9/25/2018
17784.478333	51.14	---	73.98	22.84	100.0	1000.000	303.0	H	208.0	-12.8	1:52:43 PM - 9/25/2018



— Preview Result 2-RMS
* Critical_Freqs PK+
◆ Final_Result PK+

— Preview Result 1-PK+
— FCC 15C PK
◆ Final_Result RMS

* Critical_Freqs RMS
--- FCC 15C AVG

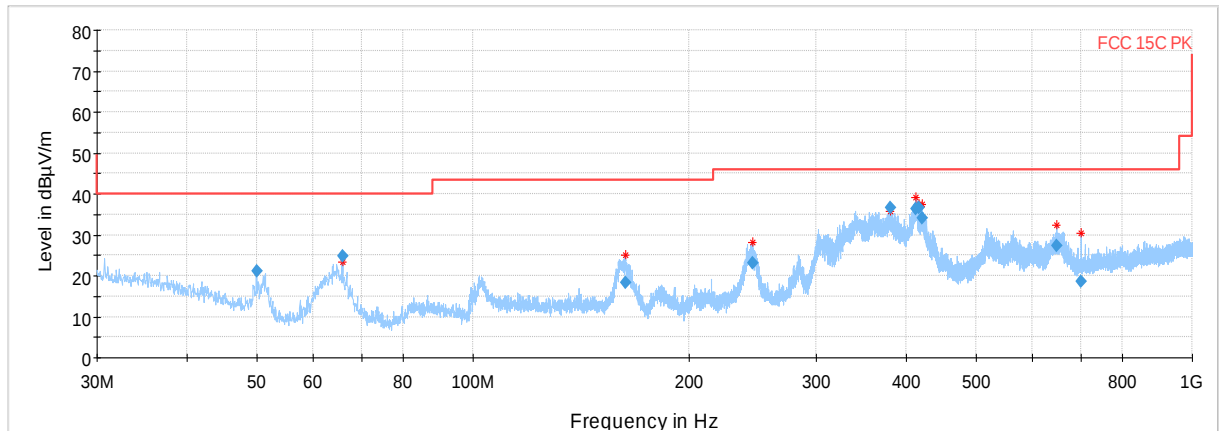
Plot #15 Radiated Emissions: 30MHz – 1GHz

Modulation: a

Channel: 149

Final_Result

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
50.022400	21.09	40.00	18.91	500.0	100.000	153.0	V	34.0	-18.7	11:35:25 AM - 9/26/2018
65.891300	24.71	40.00	15.29	500.0	100.000	100.0	V	282.0	-24.6	11:38:36 AM - 9/26/2018
162.775350	18.30	43.50	25.20	500.0	100.000	116.0	V	3.0	-19.8	11:41:37 AM - 9/26/2018
244.637950	23.01	46.00	22.99	500.0	100.000	148.0	H	-14.0	-18.3	11:44:40 AM - 9/26/2018
380.376700	36.67	46.00	9.33	500.0	100.000	164.0	V	279.0	-15.5	11:47:55 AM - 9/26/2018
412.412450	36.44	46.00	9.56	500.0	100.000	300.0	H	298.0	-13.7	11:50:38 AM - 9/26/2018
416.693150	36.63	46.00	9.37	500.0	100.000	202.0	V	317.0	-14.8	11:53:33 AM - 9/26/2018
420.604100	34.03	46.00	11.97	500.0	100.000	189.0	V	305.0	-14.9	11:56:20 AM - 9/26/2018
647.648750	27.26	46.00	18.74	500.0	100.000	107.0	V	-40.0	-9.7	11:59:36 AM - 9/26/2018
699.970150	18.70	46.00	27.30	500.0	100.000	107.0	V	109.0	-8.5	12:02:10 PM - 9/26/2018



Preview Result 1-PK+ * Critical_Freqs PK+ FCC 15C PK ♦ Final_Result QPK

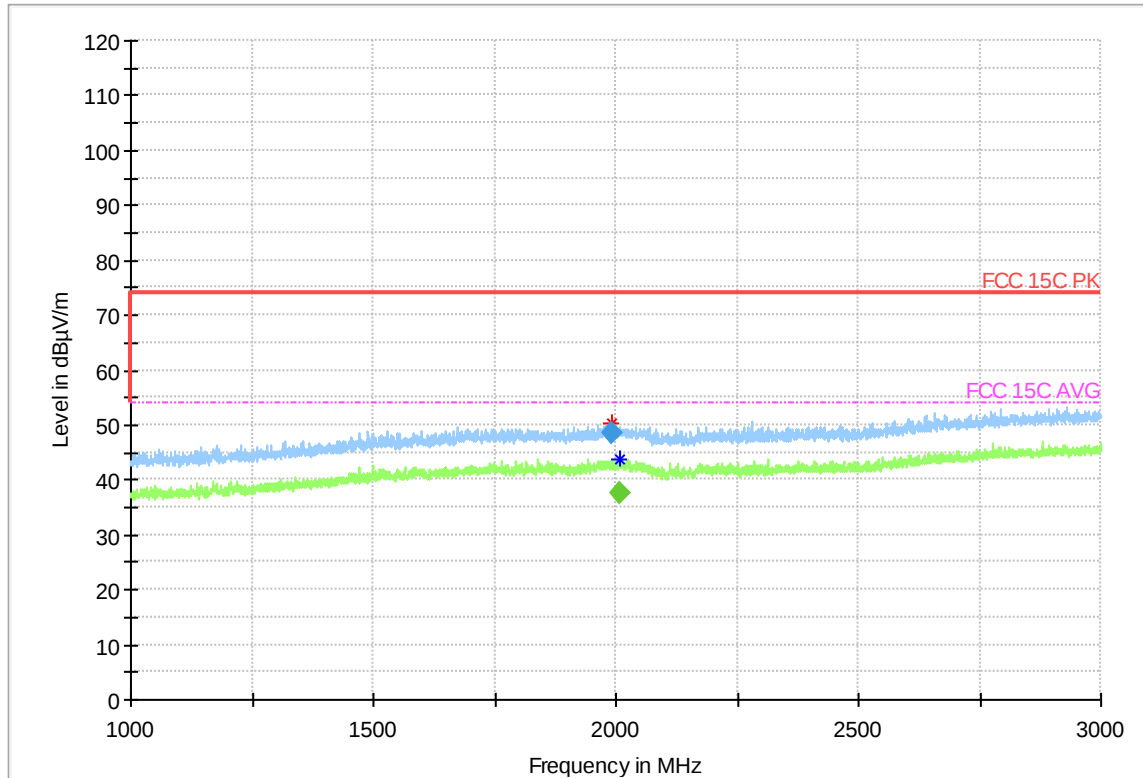
Plot #16 Radiated Emissions: 1GHz – 3GHz

Modulation: a

Channel: 149

Final_Result

Frequency (MHz)	MaxPeak (dBμV/m)	RMS (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
1992.3650	48.46	---	74.00	25.54	100.0	1000.000	161.0	H	20.0	8.9	5:46:26 PM - 9/21/2018
2006.7700	---	37.56	53.98	16.42	100.0	1000.000	190.0	H	90.0	8.9	5:49:33 PM - 9/21/2018



◆ Preview Result 2-RMS
* Critical_Freqs PK+
◆ Final_Result PK+

— Preview Result 1-PK+
— FCC 15C PK
- - - FCC 15C AVG

* Critical_Freqs RMS
- - - FCC 15C AVG

◆ Final_Result RMS



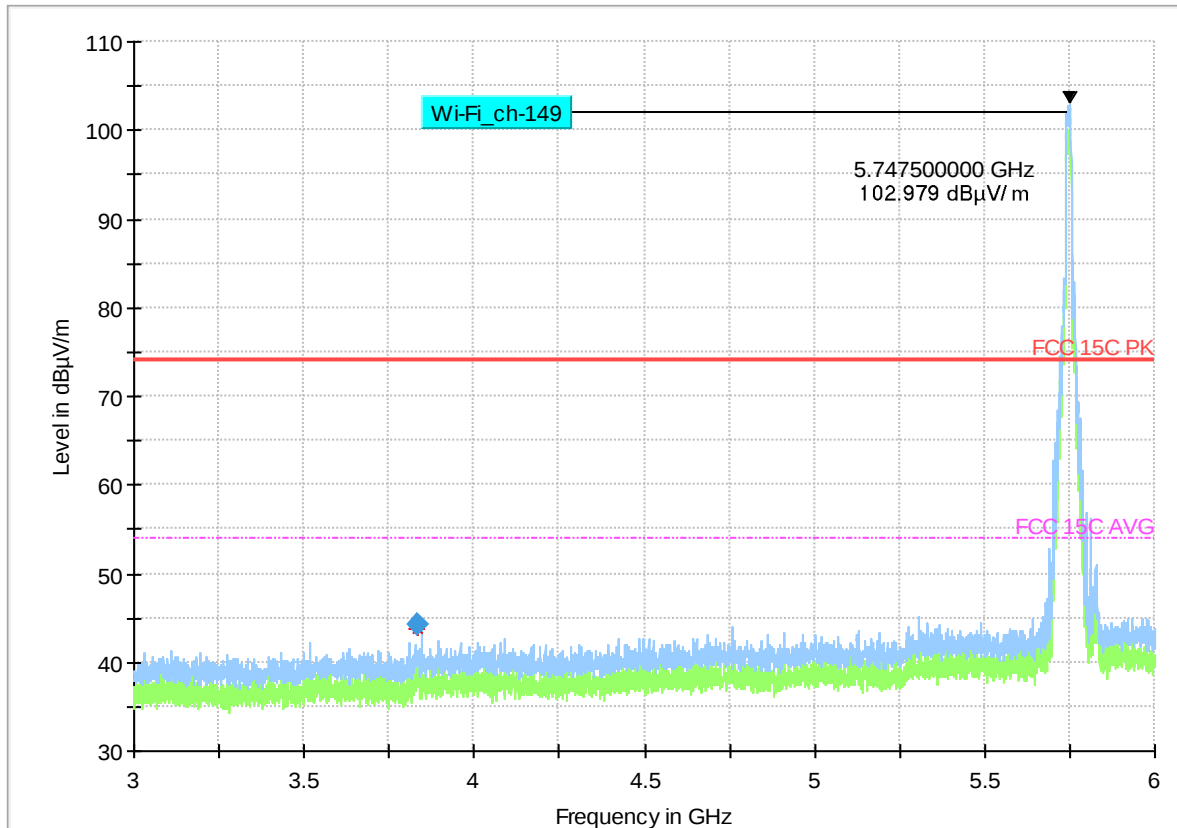
Plot # 17 Radiated Emissions: 3 – 6GHz

Modulation: a

Channel: 149

Final_Result

Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
3833.660000	44.29	73.99	29.70	100.0	1000.000	210.0	H	158.0	-8.1	3:25:05 PM - 9/21/2018



— Preview Result 2-RMS
— Preview Result 1-PK+
— FCC 15C PK
— FCC 15C AVG
◆ Final_Result PK+
◆ Final_Result RMS
* Critical_Freqs RMS
* Critical_Freqs PK+

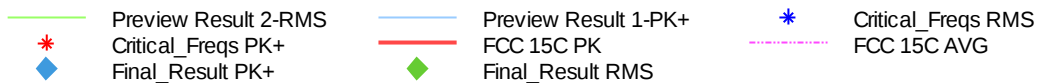
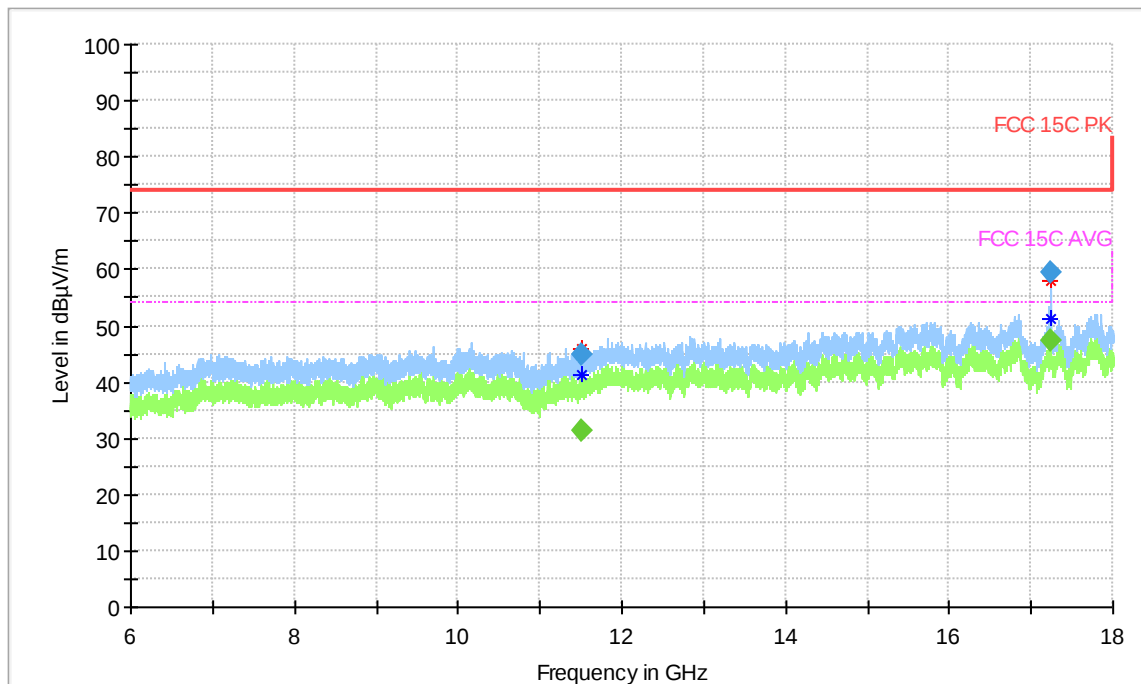
Plot # 18 Radiated Emissions: 6 – 18GHz

Modulation: a

Channel: 149

Final_Result

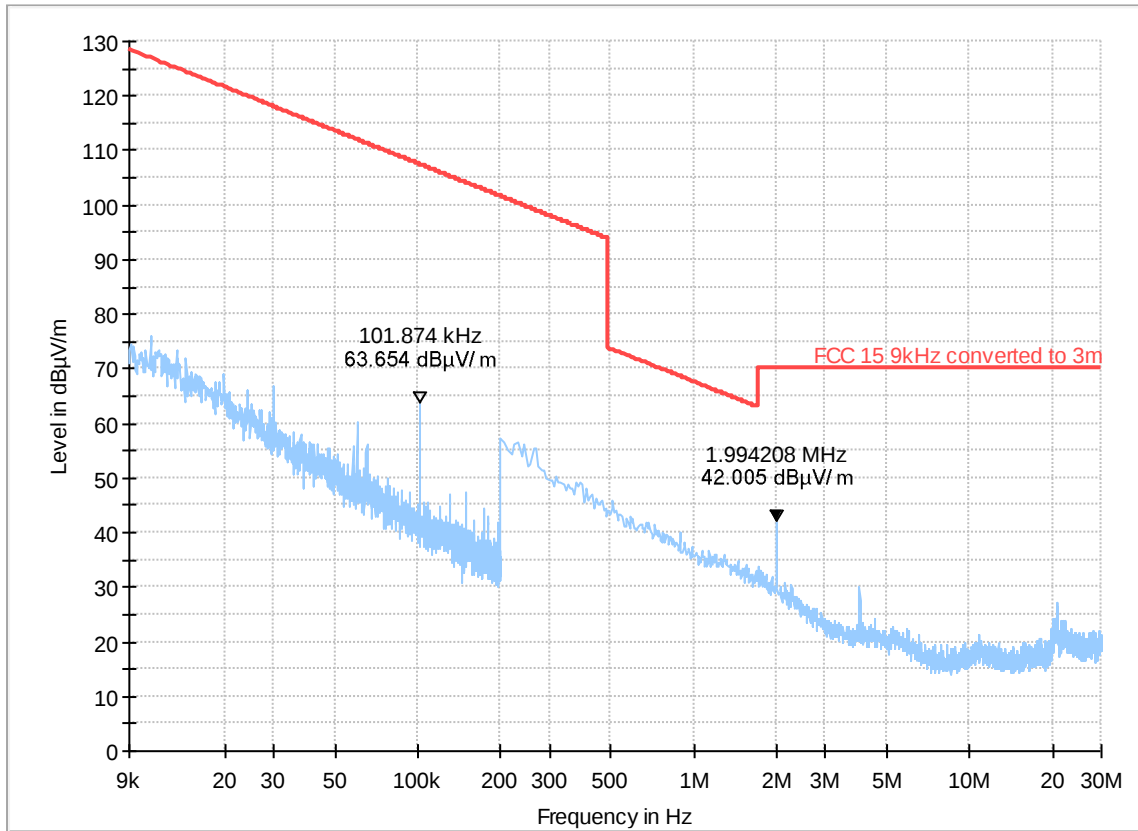
Frequency (MHz)	MaxPeak (dBμV/m)	RMS (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
11498.165833	44.87	---	73.98	29.11	100.0	1000.000	252.0	V	268.0	-24.0	3:42:46 PM - 9/21/2018
11507.883333	---	31.39	53.98	22.59	100.0	1000.000	309.0	V	341.0	-23.9	3:49:22 PM - 9/21/2018
17228.927500	59.55	---	73.98	14.43	100.0	1000.000	350.0	V	147.0	-15.3	3:45:56 PM - 9/21/2018
17239.945000	---	47.16	53.98	6.82	100.0	1000.000	346.0	V	146.0	-15.2	3:52:43 PM - 9/21/2018



Plot # 19 Radiated Emissions: 9KHz – 30MHz

Modulation: a

Channel: 157



Preview Result 1-PK+
FCC 15 9kHz converted to 3m
Final Result RMS
Critical_Freqs PK+
Final Result PK+

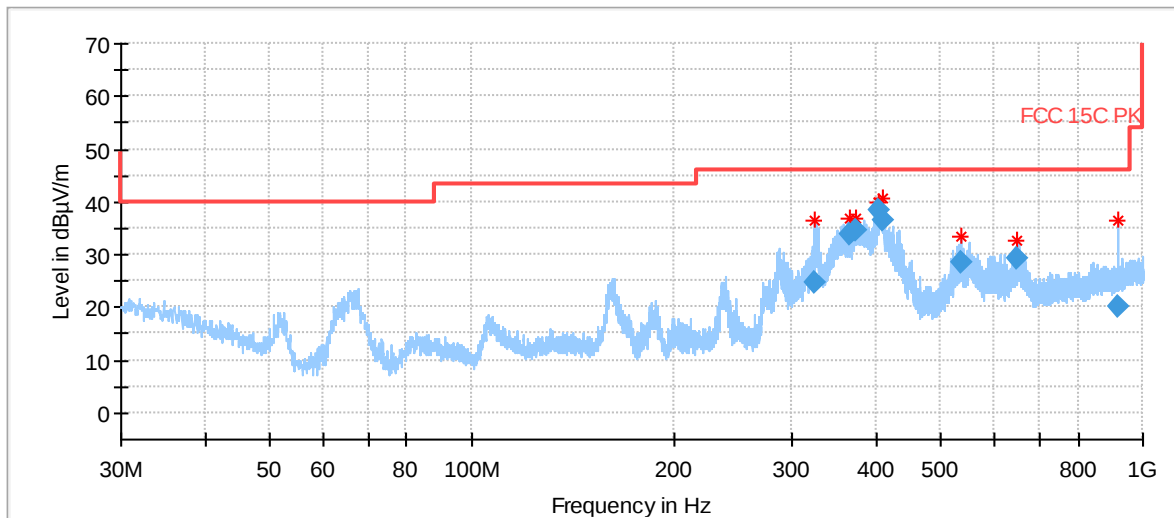
Plot #20 Radiated Emissions: 30MHz – 1GHz

Modulation: a

Channel: 157

Final_Result

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
324.928550	24.69	46.00	21.31	500.0	100.000	124.0	H	121.0	-16.6	12:19:03 PM - 9/26/2018
366.779200	33.82	46.00	12.18	500.0	100.000	181.0	V	250.0	-15.5	12:22:03 PM - 9/26/2018
373.423850	34.53	46.00	11.47	500.0	100.000	182.0	V	342.0	-15.6	12:24:39 PM - 9/26/2018
402.848650	38.42	46.00	7.58	500.0	100.000	165.0	V	319.0	-15.1	12:27:17 PM - 9/26/2018
408.682500	36.55	46.00	9.45	500.0	100.000	100.0	V	272.0	-14.6	12:30:03 PM - 9/26/2018
537.421200	28.35	46.00	17.65	500.0	100.000	279.0	H	165.0	-12.0	12:32:48 PM - 9/26/2018
648.274950	29.13	46.00	16.87	500.0	100.000	100.0	V	45.0	-9.7	12:35:59 PM - 9/26/2018
915.957250	20.06	46.00	25.94	500.0	100.000	270.0	V	56.0	-5.9	12:48:35 PM - 9/26/2018



— Preview Result 1-PK+ * Critical_Freqs PK+
— FCC 15C PK ◆ Final_Result QPK

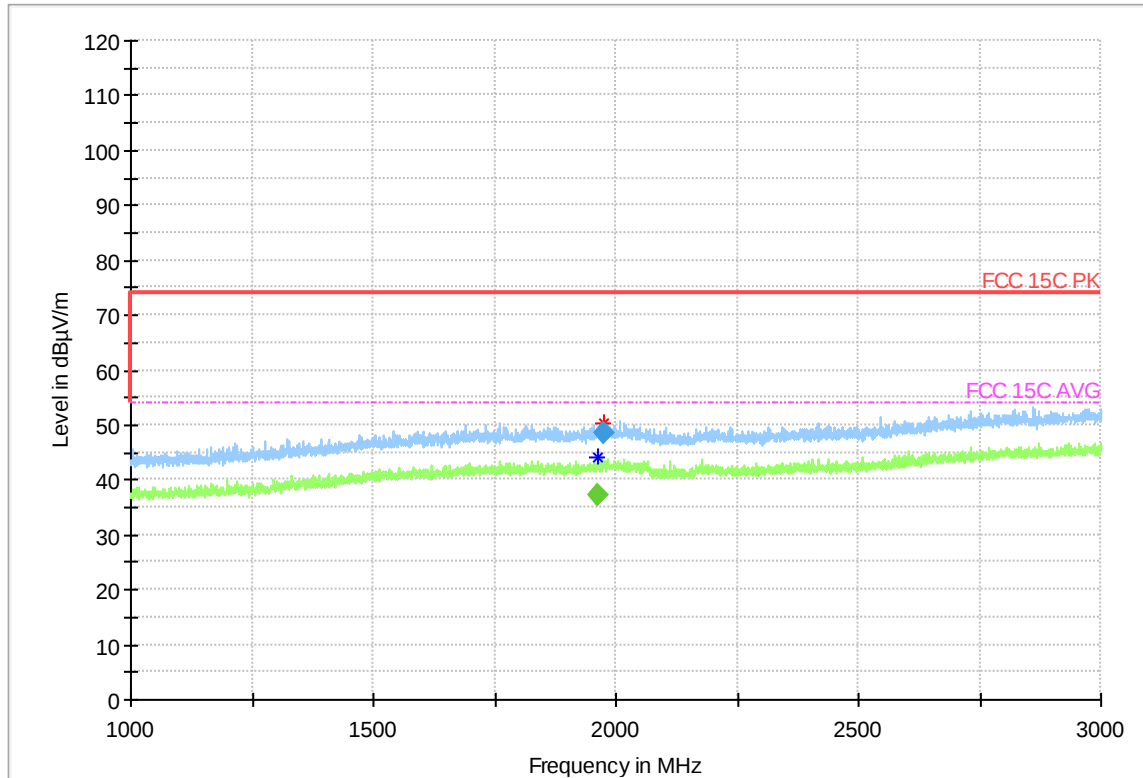
Plot #21 Radiated Emissions: 1 – 3GHz

Modulation: a

Channel: 157

Final_Result

Frequency (MHz)	MaxPeak (dBμV/m)	RMS (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
1964.8100	---	37.34	53.98	16.64	100.0	1000.000	134.0	V	314.0	8.9	5:35:53 PM - 9/21/2018
1973.2050	48.66	---	74.00	25.34	100.0	1000.000	187.0	V	315.0	8.9	5:32:54 PM - 9/21/2018



— Preview Result 2-RMS — Preview Result 1-PK+ * Critical_Freqs RMS
◆ Final_Result PK+ — FCC 15C PK - - - FCC 15C AVG
◆ Final_Result RMS

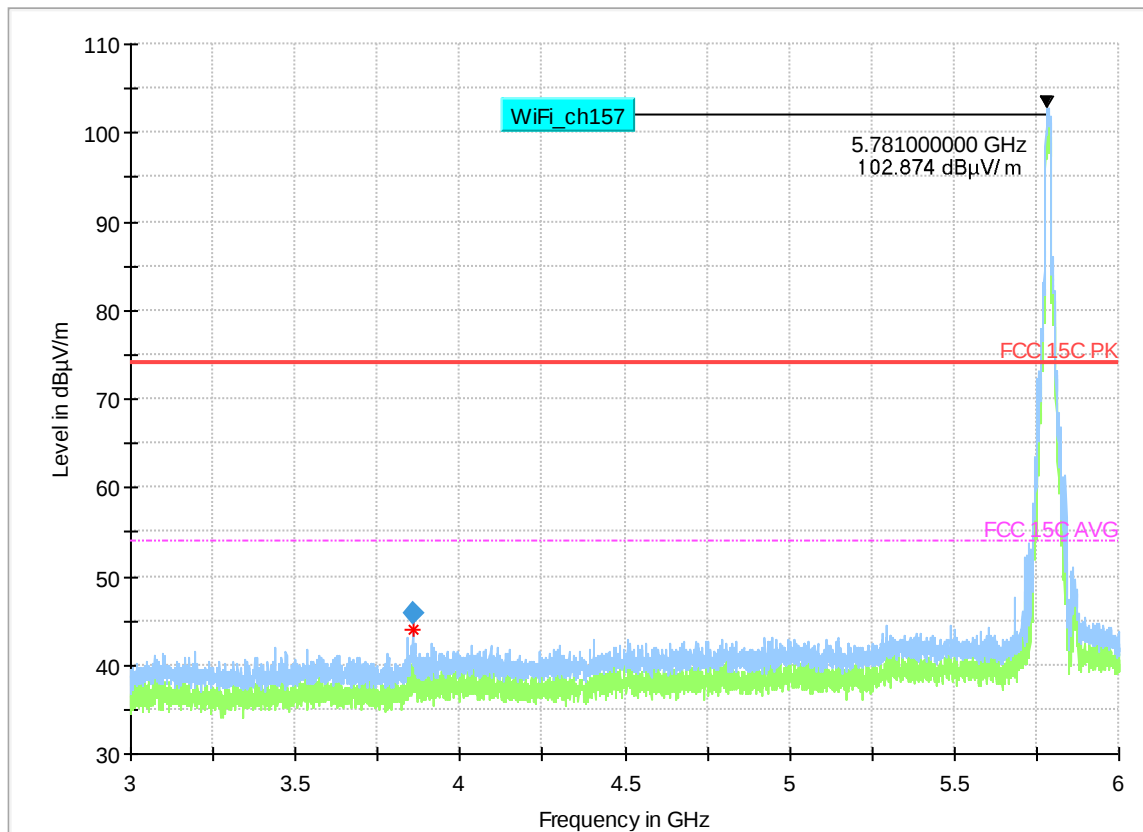
Plot #22 Radiated Emissions: 3 – 6GHz

Modulation: a

Channel: 157

Final_Result

Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
3859.483333	45.75	73.99	28.24	100.0	1000.000	100.0	H	159.0	-8.0	3:03:33 PM - 9/21/2018



— Preview Result 2-RMS
— Preview Result 1-PK+
— FCC 15C PK
— FCC 15C AVG
◆ Final_Result PK+
◆ Final_Result RMS
✱ Critical_Freqs RMS

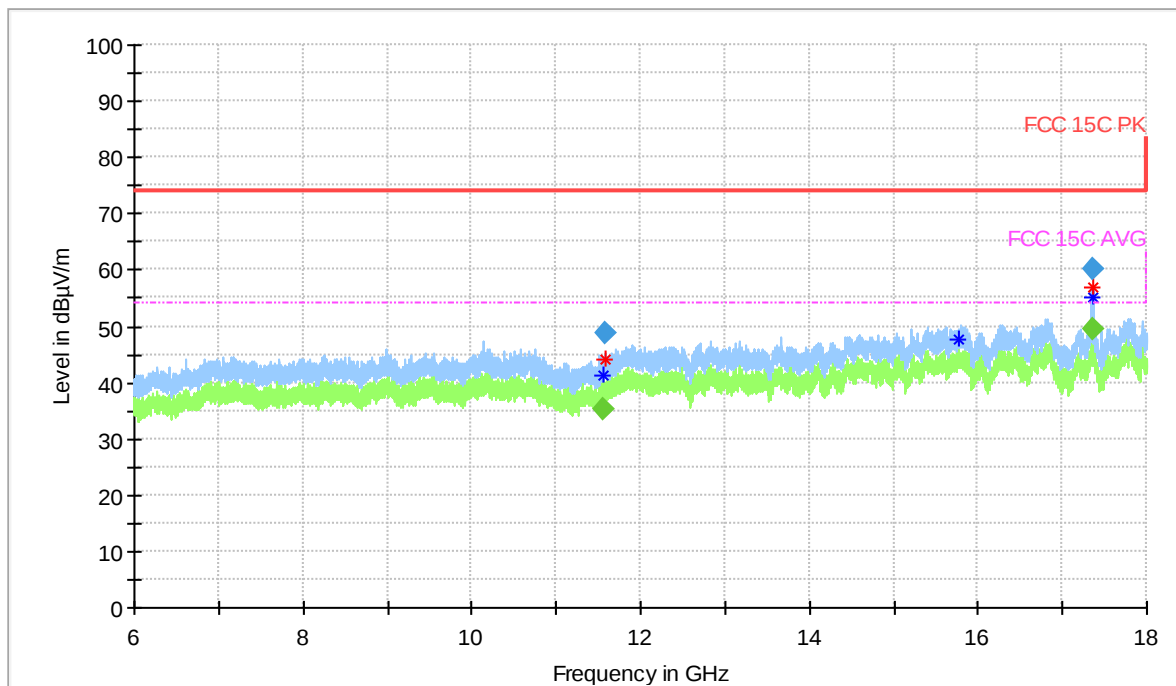
Plot #23 Radiated Emissions: 6 – 18GHz

Modulation: a

Channel: 157

Final Result

Frequency (MHz)	MaxPeak (dBμV/m)	RMS (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
11571.203333	---	35.31	53.98	18.66	100.0	1000.000	201.0	V	207.0	-23.5	4:13:03 PM - 9/21/2018
11571.710833	48.61	---	73.98	25.37	100.0	1000.000	326.0	V	232.0	-23.5	4:06:17 PM - 9/21/2018
17353.430000	---	49.35	53.98	4.63	100.0	1000.000	335.0	V	131.0	-15.0	4:19:04 PM - 9/21/2018
17354.990000	60.21	---	73.98	13.77	100.0	1000.000	324.0	V	130.0	-15.0	4:09:34 PM - 9/21/2018

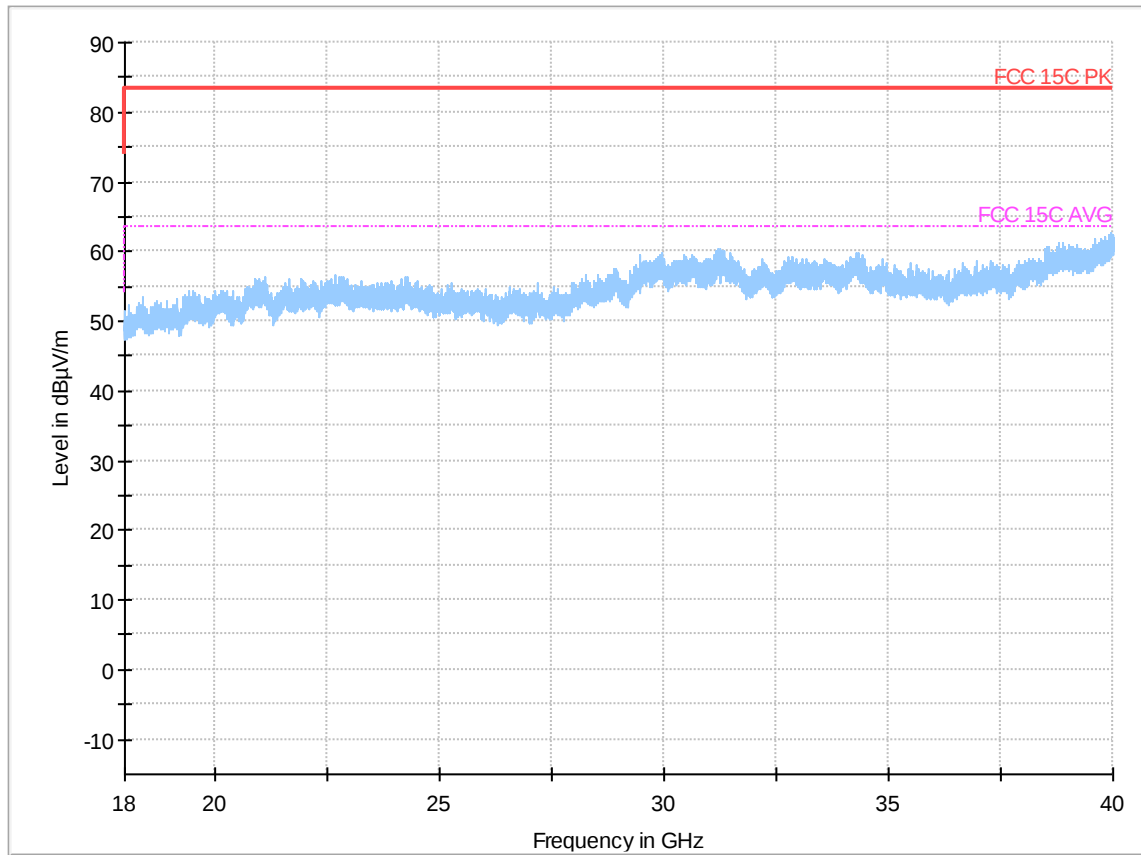


— Preview Result 2-RMS
— Preview Result 1-PK+
— FCC 15C PK
--- FCC 15C AVG
◆ Final_Result PK+
◆ Final_Result RMS
★ Critical_Freqs RMS

Plot #24 Radiated Emissions: 18 – 40GHz

Modulation: a

Channel: 157



Preview Result 1-PK+
FCC 15C AVG

* Critical_Freqs PK+
◆ Final_Result PK+

— FCC 15C PK
◆ Final_Result RMS

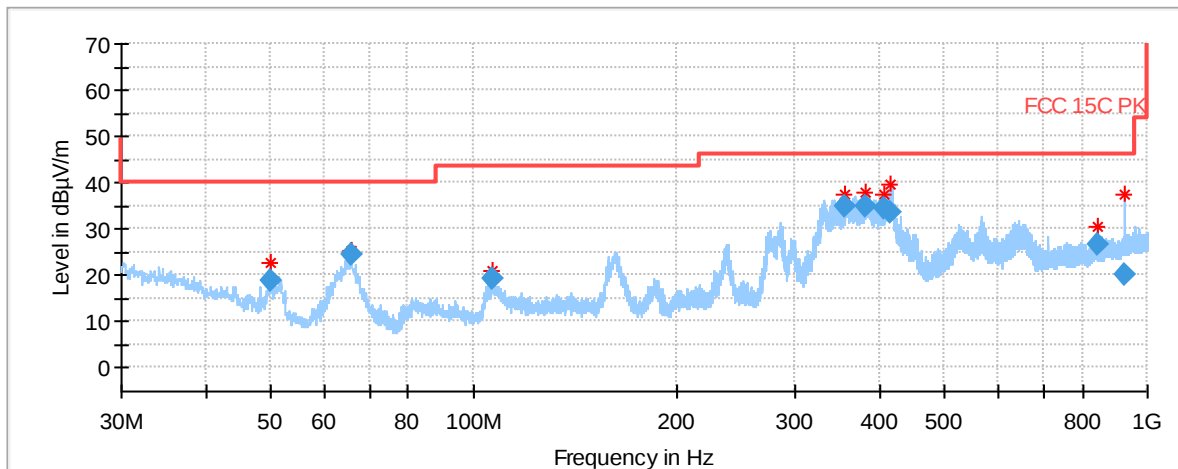
Plot #25 Radiated Emissions: 30MHz – 1GHz

Modulation: a

Channel: 165

Final_Result

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
49.990950	18.96	40.00	21.04	500.0	100.000	100.0	V	26.0	-18.7	1:21:07 PM - 9/26/2018
65.881050	24.49	40.00	15.51	500.0	100.000	148.0	V	243.0	-24.6	1:23:46 PM - 9/26/2018
106.843750	19.34	43.50	24.16	500.0	100.000	172.0	V	39.0	-20.9	1:26:52 PM - 9/26/2018
356.386700	35.10	46.00	10.90	500.0	100.000	100.0	H	144.0	-16.0	1:29:58 PM - 9/26/2018
381.320900	35.08	46.00	10.92	500.0	100.000	157.0	V	267.0	-15.6	1:33:00 PM - 9/26/2018
405.497400	34.26	46.00	11.74	500.0	100.000	300.0	H	155.0	-14.4	1:35:51 PM - 9/26/2018
416.142100	33.64	46.00	12.36	500.0	100.000	100.0	H	303.0	-13.6	1:38:59 PM - 9/26/2018
841.453950	26.74	46.00	19.26	500.0	100.000	107.0	H	206.0	-6.7	1:41:48 PM - 9/26/2018
924.307250	20.28	46.00	25.72	500.0	100.000	284.0	V	281.0	-5.5	1:44:39 PM - 9/26/2018



— Preview Result 1-PK+ * Critical_Freqs PK+
— FCC 15C PK ◆ Final_Result QPK

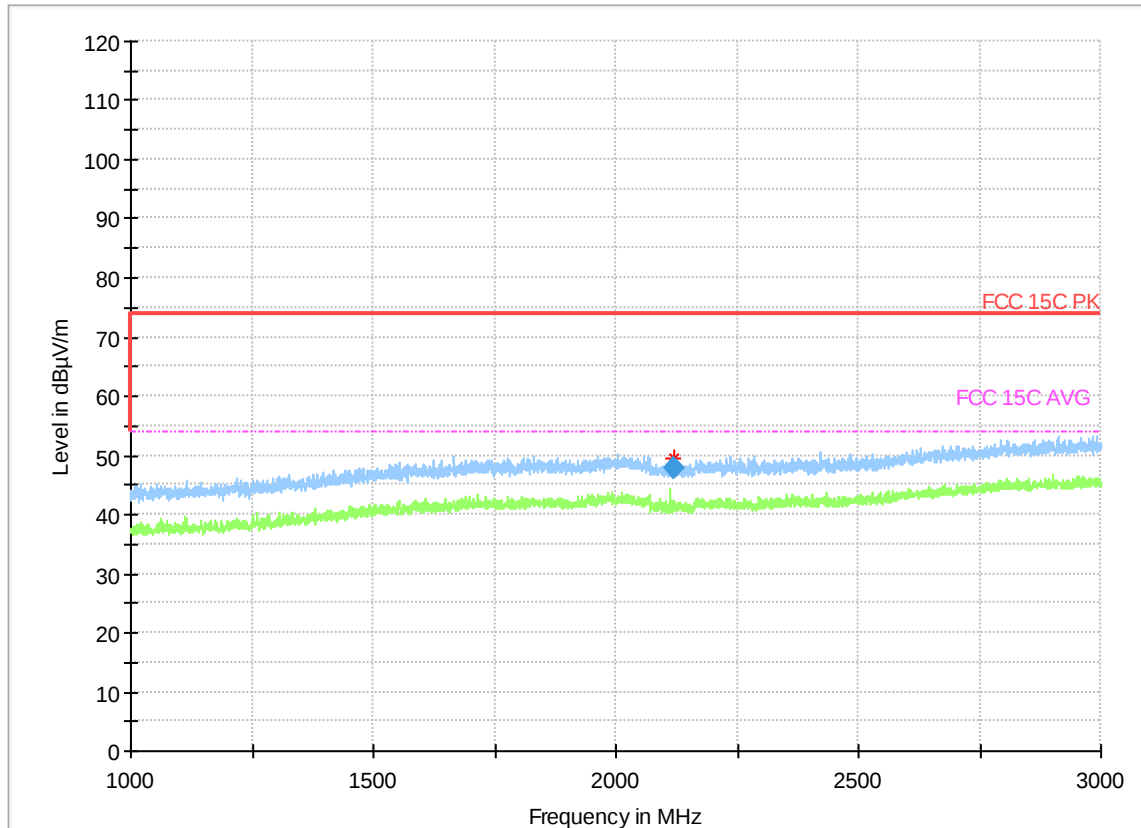
Plot #26 Radiated Emissions: 1GHz – 3GHz

Modulation: a

Channel: 165

Final_Result

Frequency (MHz)	MaxPeak (dBμV/m)	RMS (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
2117.9000	47.70	---	74.00	26.30	100.0	1000.000	107.0	V	301.0	8.2	5:11:03 PM - 9/21/2018



— Preview Result 2-RMS
— Preview Result 1-PK+
— FCC 15C PK
--- FCC 15C AVG
★ Critical_Freqs PK+
◆ Final_Result PK+
◆ Final_Result RMS
★ Critical_Freqs RMS

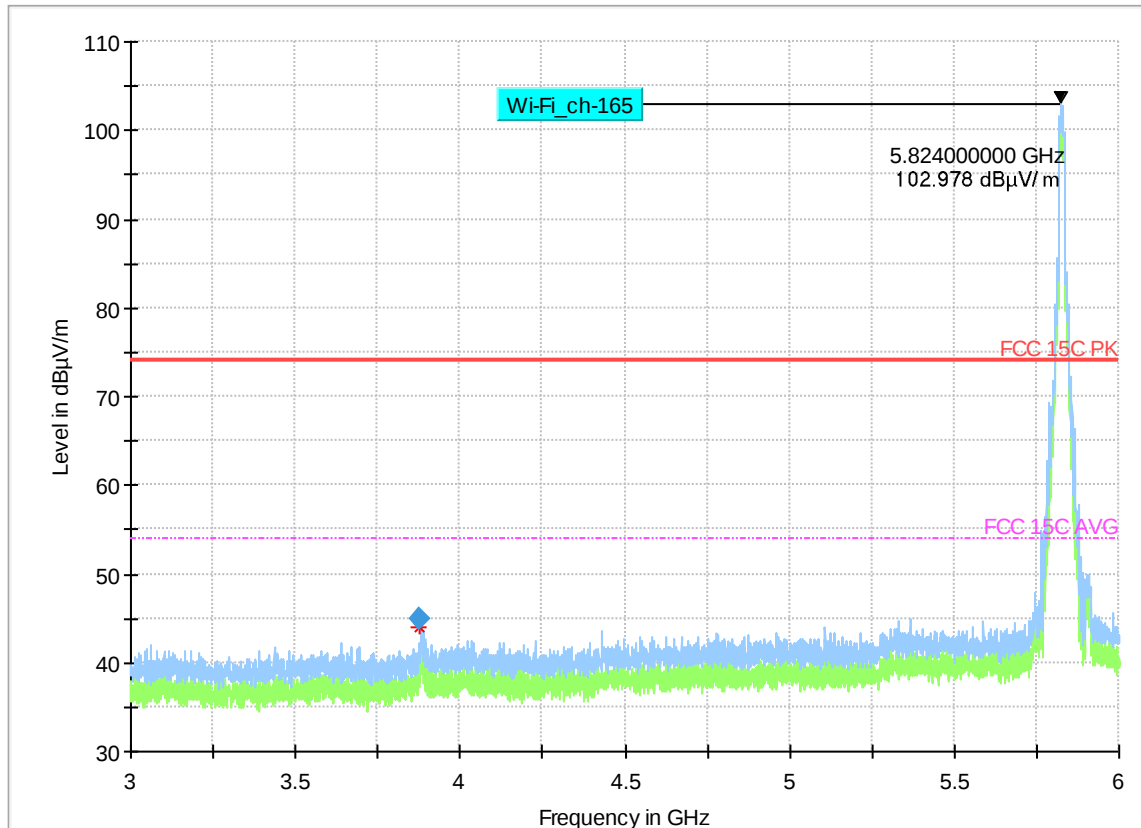
Plot # 27 Radiated Emissions: 3 – 6GHz

Modulation: a

Channel: 165

Final_Result

Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
3878.060000	44.81	73.99	29.18	100.0	1000.000	173.0	H	164.0	-7.9	2:34:28 PM - 9/21/2018



— Preview Result 2-RMS — Preview Result 1-PK+ * Critical_Freqs RMS
* Critical_Freqs PK+ — FCC 15C PK --- FCC 15C AVG
◆ Final_Result PK+ ◆ Final_Result RMS

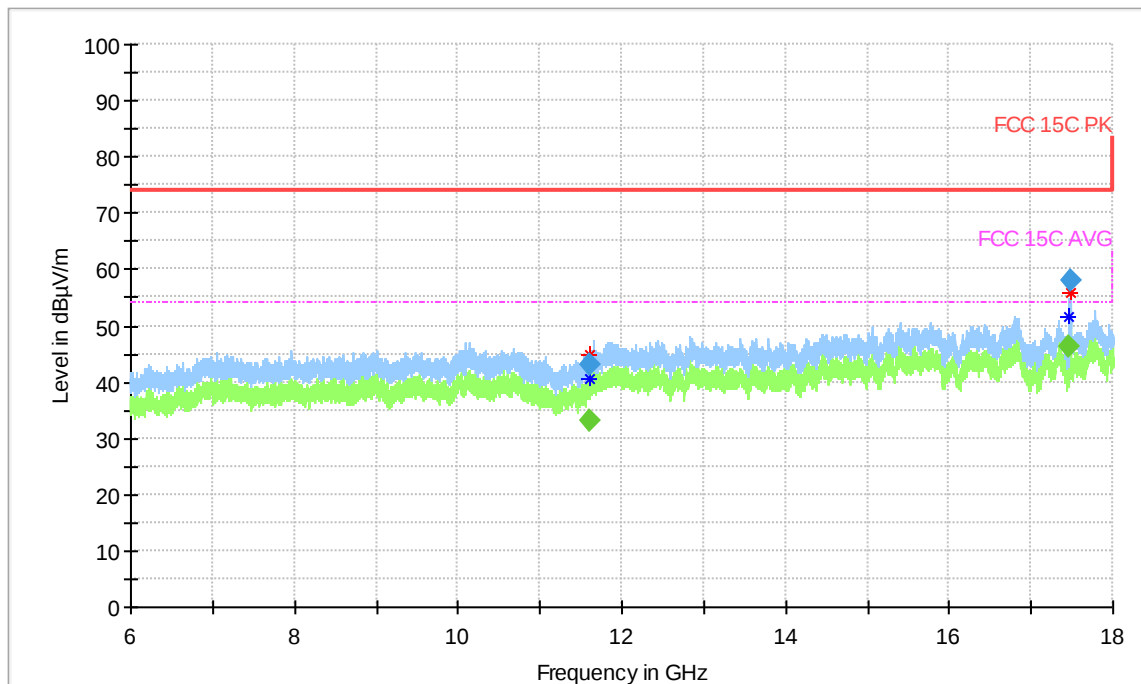
Plot # 28 Radiated Emissions: 6 – 18GHz

Modulation: a

Channel: 165

Final_Result

Frequency (MHz)	MaxPeak (dBμV/m)	RMS (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Comment
11613.296667	---	33.04	53.98	20.94	100.0	1000.000	129.0	H	32.0	-23.3	4:38:11 PM - 9/21/2018
11615.989167	42.96	---	73.98	31.02	100.0	1000.000	251.0	H	100.0	-23.2	4:31:28 PM - 9/21/2018
17468.459167	---	46.10	53.98	7.87	100.0	1000.000	335.0	V	131.0	-16.0	4:41:24 PM - 9/21/2018
17477.414167	57.90	---	73.98	16.08	100.0	1000.000	350.0	V	131.0	-16.1	4:34:36 PM - 9/21/2018



— Preview Result 2-RMS — Preview Result 1-PK+ * Critical_Freqs RMS
* Critical_Freqs PK+ — FCC 15C PK --- FCC 15C AVG
◆ Final_Result PK+ ◆ Final_Result RMS

8 Test setup photos

Setup photos are included in supporting file name: "EMC_CHARG_017_18501_FCC_ISED_Setup_Photos.pdf"

9 Test Equipment And Ancillaries Used For Testing

Equipment Type	Manufacturer	Model	Serial #	Calibration Cycle	Last Calibration Date
PASSIVE LOOP ANTENNA	ETS Lindgren	6512	00164698	3 YEARS	08/08/2017
BILOG ANTENNA	TESEO	CBL 6141B	41106	3 YEARS	11/01/2017
HORN ANTENNA	ETS LINDGREN	3115	00035111	3 YEARS	11/17/2015
HORN ANTENNA	ETS LINDGREN	3117	00167061	3 YEARS	08/08/2017
SPECTRUM ANALYZER	R&S	FSV40	101022	3 YEARS	7/5/2017
COMPACT DIGITAL BAROMETER	CONTROL COMPANY	35519-055	91119547	2 YEARS	6/20/2017
THRMOMETER HUMIDIY	DICKSON	TM320	16253639	3 YEARS	11/02/2017

Note:

1. 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.

10 Revision History

Date	Report Name	Changes to report	Report prepared by
11/27/2018	EMC_CHARG_017_18501_FCC_15.407_ISED_WLAN	Initial Version	Issa Ghanma