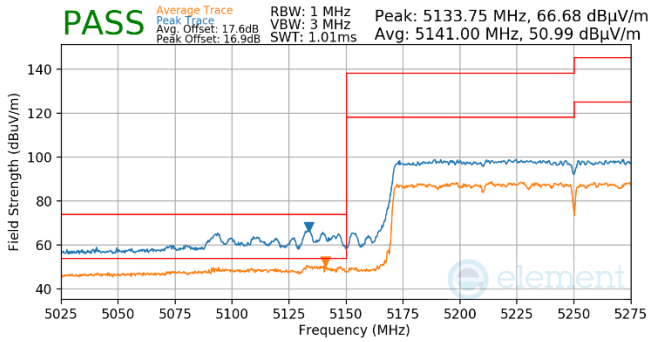
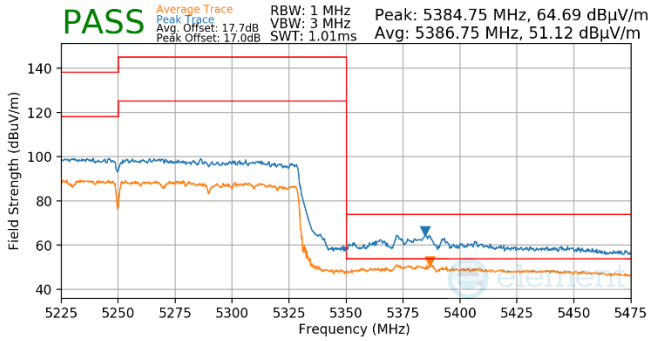
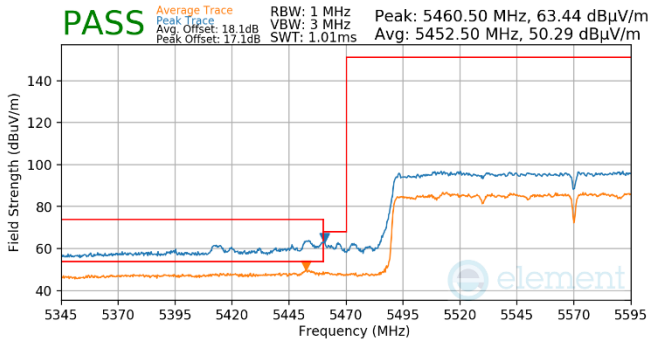
RU996x2



Plot 7-663. CDD (Pk & Avg, RU996x2, Index 68, Ch.50, MCS11)



Plot 7-664. CDD (Pk & Avg, RU996x2, Index 68, Ch.50, MCS11)



Plot 7-665. (FCC Only) CDD (Pk & Avg, RU996x2, Index 68, Ch.114, MCS11)

7.7 Radiated Spurious Emissions – Below 1GHz

§15.209; RSS-Gen [8.9]

Test Overview and Limit

All out of band radiated spurious emissions are measured with a spectrum analyzer connected to a receive antenna while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates and modes were investigated for radiated spurious emissions. Only the radiated emissions of the configuration that produced the worst case emissions are reported in this section.

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR and Table 7 of RSS-Gen (8.10) must not exceed the limits shown in Table 7-191 per Section 15.209 and RSS-Gen (8.9).

Frequency	Field Strength [µV/m]	Measured Distance [Meters]
0.009 – 0.490 MHz	2400/F (kHz)	300
0.490 – 1.705 MHz	24000/F (kHz)	30
1.705 – 30.00 MHz	30	30
30.00 – 88.00 MHz	100	3
88.00 – 216.0 MHz	150	3
216.0 – 960.0 MHz	200	3
Above 960.0 MHz	500	3

Table 7-191. Radiated Limits

Test Procedures Used

ANSI C63.10-2013

Test Settings

Quasi-Peak Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 120kHz (for emissions from 30MHz – 1GHz)
3. Detector = quasi-peak
4. Sweep time = auto couple
5. Trace mode = max hold
6. Trace was allowed to stabilize

Peak Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 120kHz (for emissions from 30MHz – 1GHz)
3. VBW = 300kHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

Test Setup

The EUT and measurement equipment were set up as shown in the diagrams below.

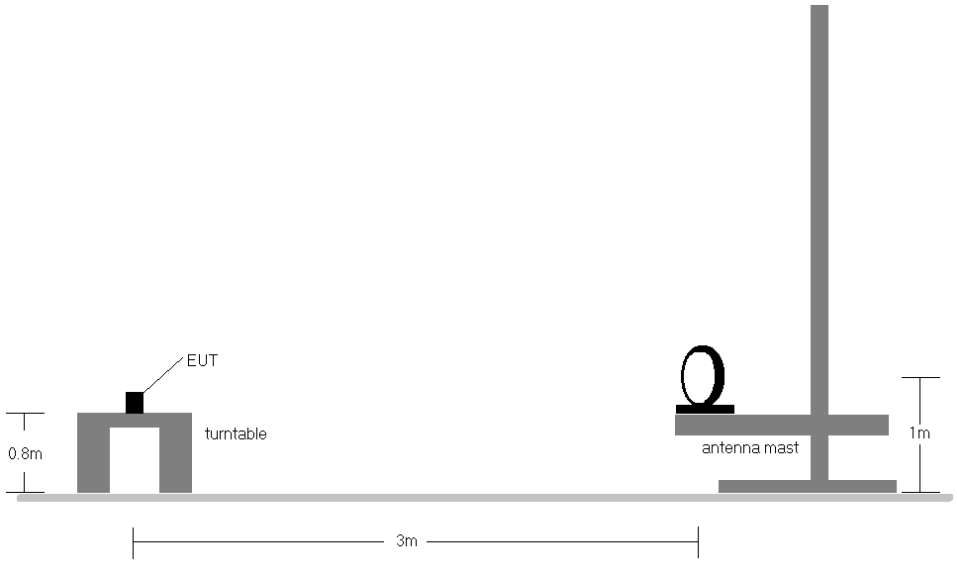


Figure 7-6. Radiated Test Setup < 30MHz

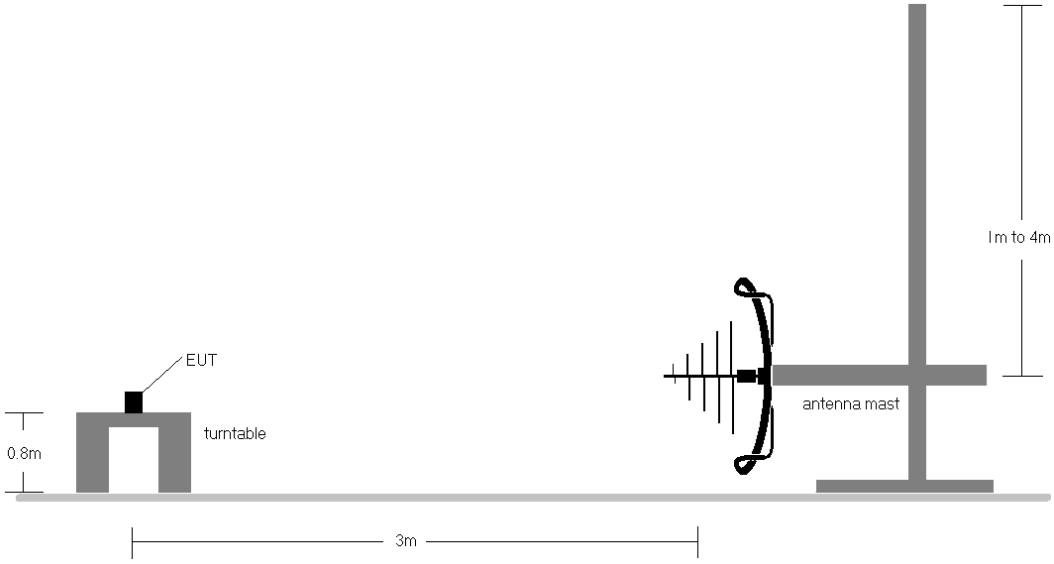


Figure 7-7. Radiated Test Setup < 1GHz

Test Notes

1. All emissions lying in restricted bands specified in §15.205 and RSS-Gen (8.10) are below the limit shown in Table 7-191.
2. The broadband receive antenna is manipulated through vertical and horizontal polarizations during the tests. The EUT is manipulated through three orthogonal planes. For below 30MHz the loop antenna was positioned in 3 orthogonal planes (X front, Y side, Z top) to determine the orientation resulting in the worst case emissions.
3. This unit was tested with its standard battery.
4. The spectrum is investigated using a peak detector and final measurements are recorded using CISPR quasi peak detector for emissions within 6dB of the limit.
5. Emissions were measured at a 3 meter test distance.
6. Emissions are investigated while operating on the center channel of the mode, band, and modulation that produced the worst case results during the transmitter spurious emissions testing.
7. No spurious emissions were detected within 20dB of the limit below 30MHz.
8. The results recorded using the broadband antenna is known to correlate with the results obtained by using a tuned dipole with an acceptable degree of accuracy. The VSWR for the measurement antenna was found to be less than 2:1.
9. All antenna configurations and data rates were investigated and only the worst case are reported.
10. Both configurations below were investigated, and the worst case has been reported.
    a. EUT powered by AC/DC adaptor via USB-C cable with wire charger
    b. EUT powered by host PC via USB-C cable with wire charger

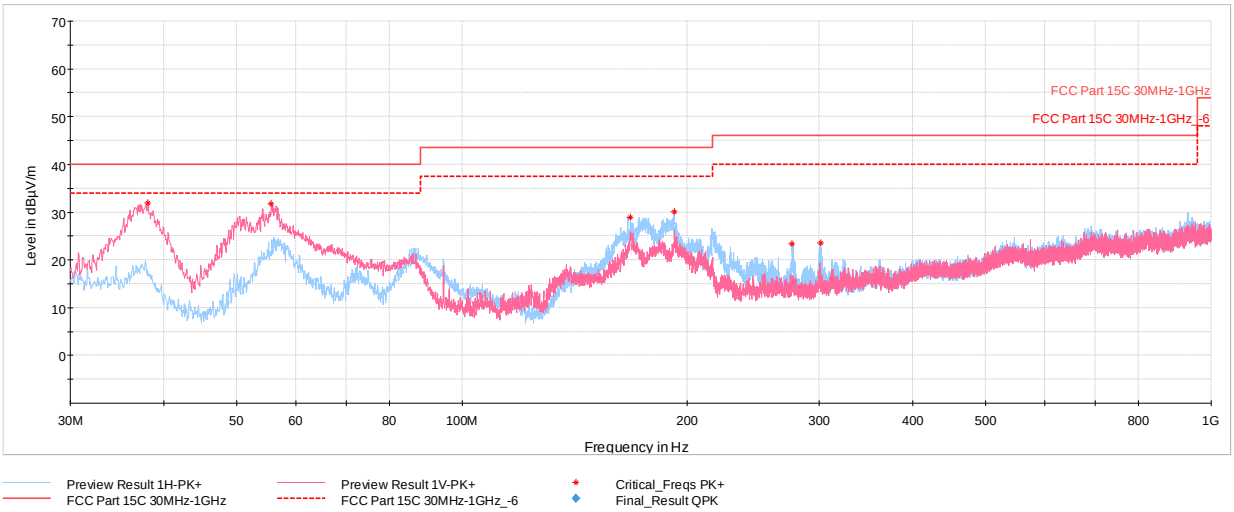
Sample Calculations

Determining Spurious Emissions Levels

- Field Strength Level $_{[dB\mu V/m]}$ = Analyzer Level $_{[dBm]}$ + 107 + AFCL $_{[dB/m]}$
- AFCL $_{[dB/m]}$ = Antenna Factor $_{[dB/m]}$ + Cable Loss $_{[dB]}$ – Preamplifier Gain $_{[dB]}$
- Margin $_{[dB]}$ = Field Strength Level $_{[dB\mu V/m]}$ – Limit $_{[dB\mu V/m]}$

CDD/SDM Radiated Spurious Emissions (Below 1GHz)

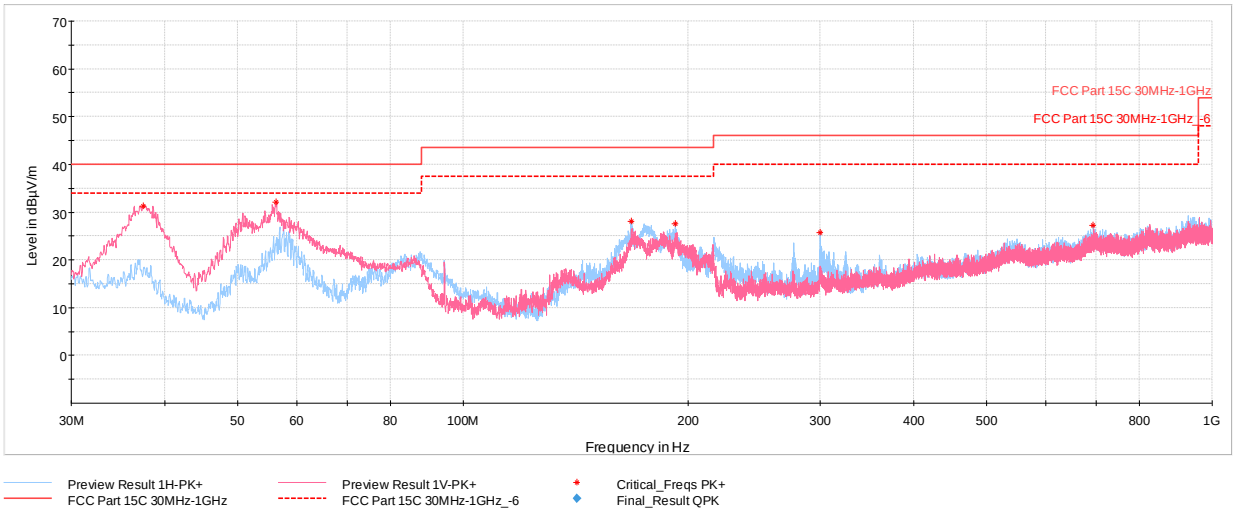
§15.209; RSS-Gen [8.9]



Plot 7-666. RSE below 1GHz SDM (RU26 – Ch.36), with AC/DC Adapter

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
38.10	Max Peak	V	100	69	-61.83	-13.30	31.87	40.00	-8.13
55.66	Max Peak	V	100	27	-56.98	-18.30	31.72	40.00	-8.28
167.84	Max Peak	H	100	217	-64.52	-13.50	28.98	43.52	-14.54
192.14	Max Peak	H	100	181	-63.25	-13.60	30.15	43.52	-13.37
275.75	Max Peak	H	100	168	-73.63	-10.00	23.37	46.02	-22.65
301.50	Max Peak	H	100	163	-73.58	-9.90	23.52	46.02	-22.50

Table 7-192. RSE below 1GHz SDM (RU26 – Ch.36), with AC/DC Adapter



Plot 7-667. RSE below 1GHz CDD (RU242 – Ch.36), with AC/DC Adapter

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
37.42	Max Peak	V	100	30	-62.69	-13.00	31.31	40.00	-8.69
56.34	Max Peak	V	100	11	-56.60	-18.30	32.10	40.00	-7.90
167.84	Max Peak	H	200	3	-65.40	-13.50	28.10	43.52	-15.42
192.18	Max Peak	H	100	200	-65.81	-13.60	27.59	43.52	-15.93
299.95	Max Peak	H	100	312	-71.23	-10.00	25.77	46.02	-20.25
694.06	Max Peak	H	200	144	-82.44	2.60	27.16	46.02	-18.86

Table 7-193. RSE below 1GHz CDD (RU242– Ch.36), with AC/DC Adapter

7.8 AC Line Conducted Emissions Measurement

§15.207; RSS-Gen [8.8]

Test Overview and Limit

All AC line conducted spurious emissions are measured with a receiver connected to a grounded LISN while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates and modes were investigated for AC Line conducted spurious emissions. All data rates and modes were investigated for AC Line conducted spurious emissions.

All conducted emissions must not exceed the limits shown in the table below, per Section 15.207 and RSS-Gen (8.8).

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

Table 7-194. Conducted Limits

*Decreases with the logarithm of the frequency.

Test Procedures Used

ANSI C63.10-2013, Subclause 6.2

Test Settings

Quasi-Peak Measurements

1. Analyzer center frequency was set to the frequency of the spurious emission of interest
2. RBW = 9kHz (for emissions from 150kHz – 30MHz)
3. Detector = quasi-peak
4. Sweep time = auto couple
5. Trace mode = max hold
6. Trace was allowed to stabilize

Average Measurements

1. Analyzer center frequency was set to the frequency of the spurious emission of interest
2. RBW = 9kHz (for emissions from 150kHz – 30MHz)
3. Detector = RMS
4. Sweep time = auto couple
5. Trace mode = max hold
6. Trace was allowed to stabilize

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

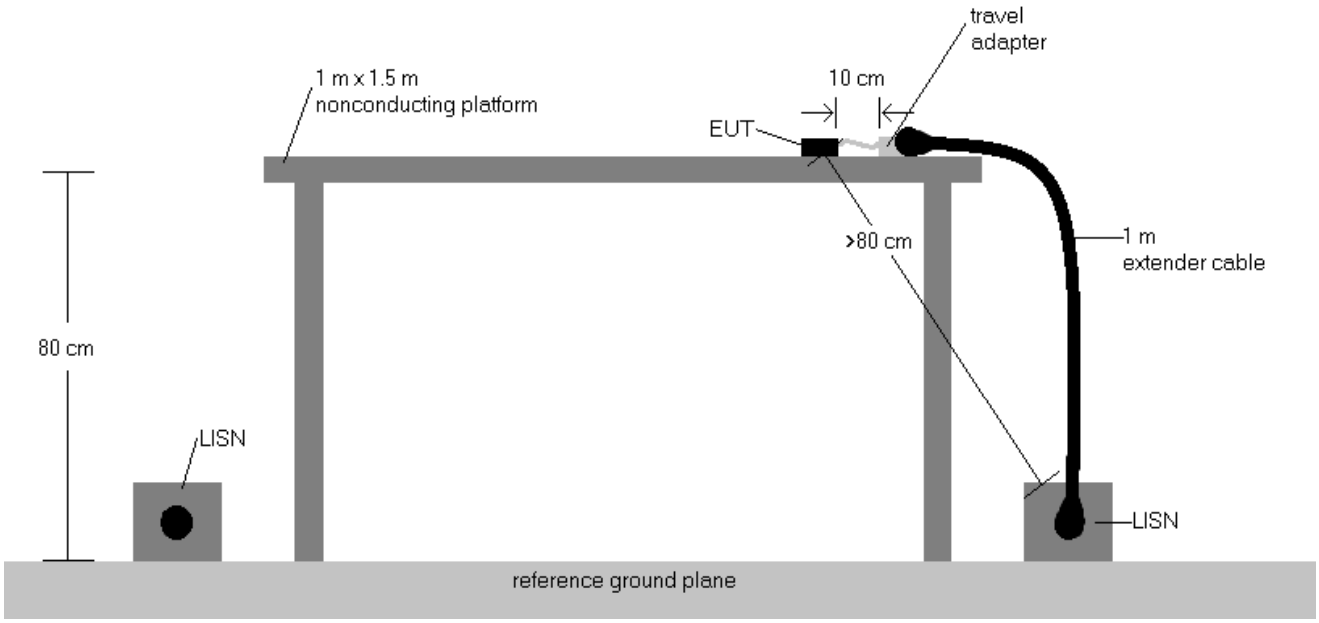
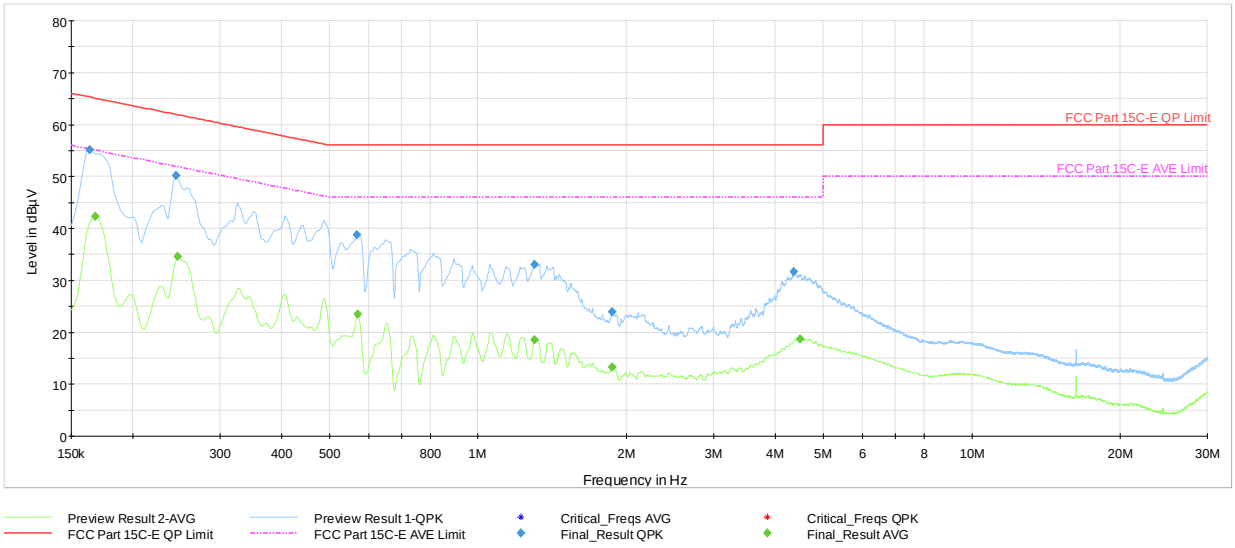


Figure 7-8. Test Instrument & Measurement Setup

Test Notes

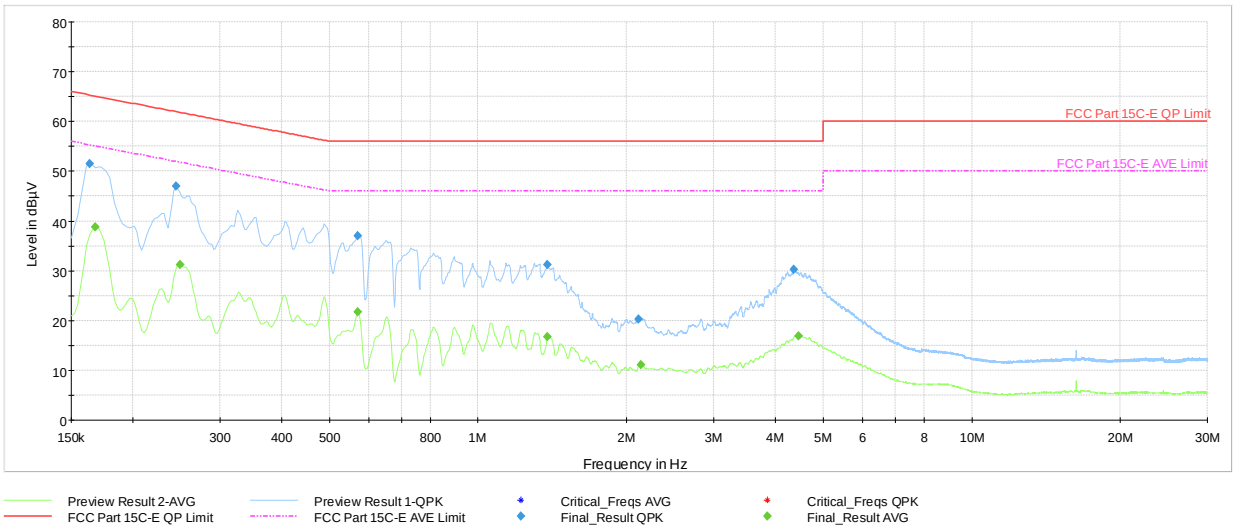
1. All modes of operation were investigated and the worst-case emissions are reported. The emissions found were not affected by the choice of channel used during testing.
2. Both configurations below were investigated, and the worst case has been reported.
    a. EUT powered by AC/DC adaptor via USB-C cable with wire charger
    b. EUT powered by host PC via USB-C cable with wire charger
3. The limit for an intentional radiator from 150kHz to 30MHz are specified in 15.207 and RSS-Gen (8.8).
4. Corr. (dB) = Cable loss (dB) + LISN insertion factor (dB)
5. QP/AV Level (dBμV) = QP/AV Analyzer/Receiver Level (dBμV) + Correction Factor (dB)
6. Margin (dB) = QP/AV Level (dBμV) - QP/AV Limit (dBμV)
7. Traces shown in plots are made using quasi-peak and average detectors.
8. Deviations to the Specifications: None.



Plot 7-668. AC Line Conducted Plot with 11ax UNII Band 1 SDM RU26 – Ch.36 (L1) with AC/DC Adapter

Frequency [MHz]	Process State	QuasiPeak [dBµV]	Average [dBµV]	Limit [dBµV]	Margin [dB]	Line	PE
0.164	FINAL	55.1	—	65.28	-10.14	L1	GND
0.168	FINAL	—	42.37	55.06	-12.69	L1	GND
0.245	FINAL	50.1	—	61.94	-11.82	L1	GND
0.247	FINAL	—	34.58	51.87	-17.29	L1	GND
0.569	FINAL	38.8	—	56.00	-17.17	L1	GND
0.571	FINAL	—	23.46	46.00	-22.54	L1	GND
1.300	FINAL	33.1	—	56.00	-22.93	L1	GND
1.302	FINAL	—	18.54	46.00	-27.46	L1	GND
1.867	FINAL	24.0	—	56.00	-32.00	L1	GND
1.869	FINAL	—	13.26	46.00	-32.74	L1	GND
4.367	FINAL	31.6	—	56.00	-24.40	L1	GND
4.493	FINAL	—	18.68	46.00	-27.32	L1	GND

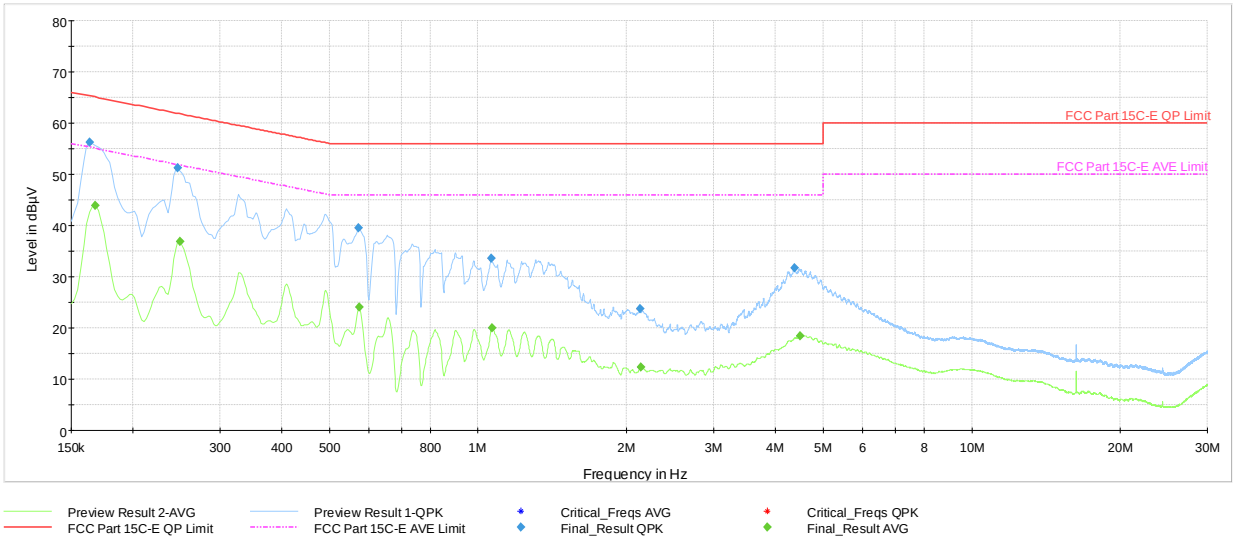
Table 7-195. AC Line Conducted with 11ax UNII Band 1 SDM RU26 – Ch.36 (L1) with AC/DC Adapter



Plot 7-669. AC Line Conducted Plot with 11ax UNII Band 1 SDM RU26 – Ch.36 (N) with AC/DC Adapter

Frequency [MHz]	Process State	QuasiPeak [dBµV]	Average [dBµV]	Limit [dBµV]	Margin [dB]	Line	PE
0.164	FINAL	51.5	—	65.28	-13.76	N	GND
0.168	FINAL	—	38.84	55.06	-16.21	N	GND
0.245	FINAL	47.0	—	61.94	-14.91	N	GND
0.249	FINAL	—	31.21	51.79	-20.58	N	GND
0.571	FINAL	—	21.79	46.00	-24.21	N	GND
0.571	FINAL	37.0	—	56.00	-19.05	N	GND
1.381	FINAL	31.2	—	56.00	-24.76	N	GND
1.383	FINAL	—	16.72	46.00	-29.28	N	GND
2.110	FINAL	20.3	—	56.00	-35.75	N	GND
2.135	FINAL	—	11.05	46.00	-34.95	N	GND
4.362	FINAL	30.3	—	56.00	-25.75	N	GND
4.452	FINAL	—	16.88	46.00	-29.12	N	GND

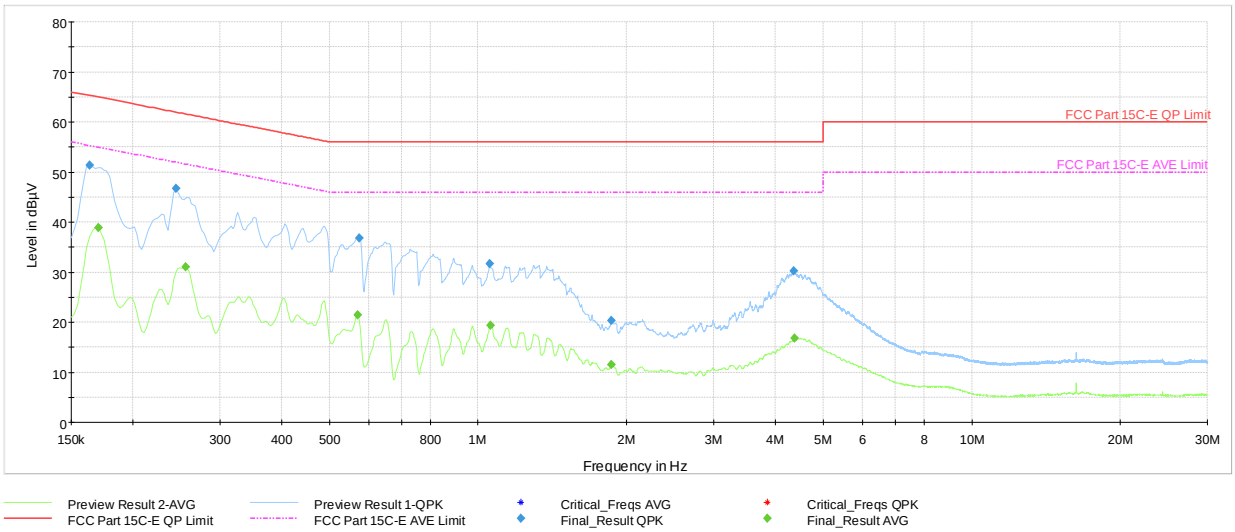
Table 7-196. AC Line Conducted with 11ax UNII Band 1 SDM RU26 – Ch.36 (N) with AC/DC Adapter



Plot 7-670. AC Line Conducted Plot with 11ax UNII Band 1 CDD RU242 – Ch.36 (L1) with AC/DC Adapter

Frequency [MHz]	Process State	QuasiPeak [dBµV]	Average [dBµV]	Limit [dBµV]	Margin [dB]	Line	PE
0.164	FINAL	56.2	—	65.28	-9.08	L1	GND
0.168	FINAL	—	43.86	55.06	-11.20	L1	GND
0.247	FINAL	51.2	—	61.87	-10.64	L1	GND
0.249	FINAL	—	36.91	51.79	-14.88	L1	GND
0.573	FINAL	39.5	—	56.00	-16.55	L1	GND
0.575	FINAL	—	24.04	46.00	-21.96	L1	GND
1.064	FINAL	33.6	—	56.00	-22.43	L1	GND
1.068	FINAL	—	20.07	46.00	-25.93	L1	GND
2.126	FINAL	23.7	—	56.00	-32.32	L1	GND
2.137	FINAL	—	12.37	46.00	-33.63	L1	GND
4.371	FINAL	31.7	—	56.00	-24.28	L1	GND
4.484	FINAL	—	18.51	46.00	-27.49	L1	GND

Table 7-197. AC Line Conducted with 11ax UNII Band 1 CDD RU242 – Ch.36 (L1) with AC/DC Adapter



Plot 7-671. AC Line Conducted Plot with 11ax UNII Band 1 CDD RU242 – Ch.36 (N) with AC/DC Adapter

Frequency [MHz]	Process State	QuasiPeak [dBµV]	Average [dBµV]	Limit [dBµV]	Margin [dB]	Line	PE
0.164	FINAL	51.4	—	65.28	-13.89	N	GND
0.170	FINAL	—	38.87	54.95	-16.08	N	GND
0.245	FINAL	46.7	—	61.94	-15.21	N	GND
0.256	FINAL	—	31.00	51.57	-20.57	N	GND
0.571	FINAL	—	21.37	46.00	-24.63	N	GND
0.575	FINAL	36.7	—	56.00	-19.26	N	GND
1.055	FINAL	31.6	—	56.00	-24.38	N	GND
1.059	FINAL	—	19.36	46.00	-26.64	N	GND
1.862	FINAL	20.3	—	56.00	-35.73	N	GND
1.865	FINAL	—	11.51	46.00	-34.49	N	GND
4.353	FINAL	30.2	—	56.00	-25.83	N	GND
4.371	FINAL	—	16.78	46.00	-29.22	N	GND

Table 7-198. AC Line Conducted with 11ax UNII Band 1 CDD RU242 – Ch.36 (LN) with AC/DC Adapter

8.0 CONCLUSION

The data collected relate only the item(s) tested and show that the **Apple Tablet Device FCC ID: BCGA2435** and **IC: 579C-A2435** is in compliance with is in compliance with Part 15 Subpart E (15.407) of the FCC Rules and RSS-247 of the Innovation, Science and Economic Development Canada Rules.

9.0 APPENDIX A

Antenna gains provided by manufacturer:

Frequency (MHz)	Horizontal (dBi)	Vertical (dBi)
5180	3.7	1.0
5260	3.6	0.9
5320	3.4	1.0
5500	3.1	0.4
5600	3.3	-0.4
5700	3.5	0.2
5745	3.7	0.5
5785	3.7	1.0
5825	4.0	1.8
5955	4.2	2.4
6075	3.9	1.9
6135	3.9	1.5
6255	4.1	1.9
6375	4.2	1.8
6435	4.3	2.0
6555	3.4	1.4
6675	4.2	2.8
6735	4.1	3.3
6855	4.7	2.4
6975	4.2	2.0
7035	4.1	2.4
7115	4.1	3.0

Table 9-1. WiFI 5GHz (Antenna WF5b); Type: Cavity Backed

Frequency (MHz)	Horizontal (dBi)	Vertical (dBi)
5180	1.5	2.4
5260	1.4	2.3
5320	2.0	2.8
5500	0.1	0.7
5600	-0.5	-0.1
5700	-1.0	0.1
5745	-1.1	0.3
5785	-1.1	-0.2
5825	-2.1	-0.1
5955	-4.0	-0.7
6075	-3.7	-0.9
6135	-2.3	-0.6
6255	-1.1	0.6
6375	-0.5	1.0
6435	-0.3	1.2
6555	-0.7	-0.3
6675	-1.9	-1.6
6735	-1.9	-1.5
6855	-2.4	-2.7
6975	-3.3	-4.8
7035	-4.9	-5.9
7115	-4.9	-6.2

Table 9-2. WiFI 5GHz (Antenna WF4a); Type: IFA