



Ronald Williams, Chief
Laboratory Division, Office of Engineering and Technology
Federal Communications Commission
7435 Oakland Mills Rd
Columbia MD 21046-1609

Dear Ronald,

This document is being submitted to support the C2PC request in light of the recent publication of draft KDB 680106 Exposure Wireless Charging Apps DR04-44611, specifically section 5.2 which addresses Part 18 Wireless Power Transfer Devices Beyond 1 Meter Distances.

Section 5.2 of the draft KDB allows Part 18 devices that would otherwise meet the requirements of Section 5.1 to deliver electromagnetic energy to a target located at a distance beyond one meter from the transmitter if four conditions, labeled (e) through (h) in the draft KDB, are satisfied.

This device already meets the requirements for a Part 18 device and the corresponding requirements in KDB 680106 section 5.1 as demonstrated in the original filing. Operations at distances more than 1m can be enabled (refer to the cover letter in the filing) without increasing the output power or making any other changes that would impact the RF exposure assessment or Part 18 assessment detailed in the original filing. The device also satisfies the four new conditions in section 5.2 of the draft KDB as described below.

(e) The applicant must demonstrate that the RF field in all locations anywhere at or beyond one meter is at or below the level that would be present within 1 meter when all devices being charged are within 1 meter of the transmitter. In other words, the RF emissions must be unaffected by the placement of the load/target device.

This is addressed in the document *C2PC RF exposure filing - Orion 12-10-20* submitted as part of the C2PC filing. The document shows that the fields at distances greater than 1m from the device drop off with distance and the field measurements within the 1m radius therefore represent worst case.

(f) The devices may only operate indoors (i.e., the interior of a fully enclosed, weatherproof structure).

This system is not designed for outdoor use and is not in a weatherproof enclosure. The user manual submitted in the original filing clearly defines the limitations for the power source as indoor use only (section 5.1, page 5). The system is also noted as being for indoor use only on page 6.

(g) The indoor operations must be configured (e.g., through proper positioning of transmitter and/or attenuating material structures) such that when measured outdoors, the maximum fundamental and unwanted radiated emissions of the Part 18 device on any non-ISM frequency meet the limits in Part 15 of the Commission's rules. The distance specified in Part 15 (§ 15.209(a)) for evaluating field strength is to be measured from the outer surface of the structure delimiting the indoor operations.

In the original filing the radiated emissions for the Part 18 device complied with the general limits of Part 18.305(b) with a limit of 28 dBuV/m at 300m. This testing was performed at a WPT power level of 20dBm per port to verify compliance at the maximum system power. For production the output power is reduced to 13dBm for operational reasons and subsequent testing against CISPR 11 for international regulations was performed at the 13dBm power setting, as described in CKC Report 103895-4B, dated October 28, 2020 ("Part 18 Report"). The "Summary of Conditions" on page 6 of the Part 18 Report notes the following:

The production power setting for the device will limit the power output to 13 dBm. To verify compliance with the radiated field strength limits in Part 18 the output power was set to 20 dBm for the tests documented in this report. Additionally, an investigation was performed to check the worst-case harmonic emissions at both the 13 dBm and 20 dBm power settings, 20 dBm was found to be the worst-case.

As explained in the "WPT Theory of Operation," submitted as a part of the original equipment authorization, the Cota Tx203 power source transmits RF power at 2.450 GHz from 128 dual-polarized antenna elements (for a total of 256 antenna ports). This results in a maximum total RF conducted power for the entire array of 4.55 W (36.6 dBm).

Part 18 measurements were made at 3m and extrapolated to 300m using a $20\log(D_{\text{meas}}/D_{\text{limit}})$ extrapolation factor for all frequencies. The Part 15.209(a) limit varies with frequency and for measurements below 30MHz the extrapolation factor allowed is $40\log(D_{\text{meas}}/D_{\text{limit}})$. Table 1 takes the test data for the frequency range 9kHz – 30 MHz from the Part 18 report as measured at the 3m distance at the 20dBm power level and extrapolates that data using the Part 15 extrapolation factors to the relevant distance. This data from the Part 18 Report is provided to show compliance for frequencies below 30 MHz, because limited data was for those frequencies was shown in the CISPR 11 Report.

The CISPR 11 test data (refer to test report from Element Labs, OSSI0011 Rev 1 issued August 18, 2021) contains data measured at a distance of 3m. All measurement data between 30MHz and 1GHz complies with the CISPR 11 Class B limit which is very similar to the 15.209a limit.

Tables 1 and 2 take the measurement data in the Part 18 and CISPR 11 test reports described above and compare the levels against the FCC 15.209(a) limits. The spurious / unwanted emissions¹ outside of the ISM bands are below the 15.209(a) limits at a 3m distance from the device without accounting for any attenuation provided by the buildings walls at all but two frequencies. [ITU recommendation P.2109-1](#) describes wall attenuation loss for both "traditionally-built" and "thermally-efficient" buildings. It concludes that the median

¹ The fundamental signal is contained within an ISM band and therefore the field strength of the fundamental outside of the building does not need to be considered. Emissions in the 5.7 GHz ISM band are similarly considered.



building loss for thermally-efficient buildings ranges from around 31 dB at 2 GHz to 55 dB at 100 GHz, while such loss for traditional buildings ranges from 14 dBm at 100 MHz to 24 dB at 100 GHz. At 9800 MHz, the median loss is 34 dB for thermally-efficient structures and about 17 dB for traditional buildings. We note that the Commission utilized wall loss figures from Recommendation P.2109-1 in evaluating possible harmful interference from indoor low-power access points.²

If the median attenuation loss detailed in [ITU recommendation P.2109-1](#) is taken into consideration the two frequencies that do exceed the 15.209(a) limits at 3m from the device would be expected to be at least 8 dB below the 15.209(a) limit at a distance of 3m from the outside of the building, even if the system were mounted as close as possible to an external wall. We can state with confidence that Cota Power Source will always be installed in a building constructed at least according to traditional construction techniques. Even without any wall attenuation being taken into account, the emission at 9800 MHz would be below the 15.209(a) limit at a distance of 10m from the device.

(h) Devices shall [be] professionally installed (i.e., by persons who have the necessary training and qualifications to follow manufacturer-provided guidance and conduct necessary measurements and calculations to verify that conditions (2), (3) and (4), stated above, have been met).

The TX 203 power source is only sold through authorized distributors. Ossia's contracts with its distributors require professional installation and that installers ensure that units are installed only in indoor locations and calibrated according to Ossia procedures. This is not only to ensure that operation is consistent with relevant grant conditions and FCC rules but essential to ensure optimal power delivery and correct functioning of the system.

We respectfully request that FCC OET review this request for a Class II permissive Change to enable charging at distances of more than 1m based on the latest draft guidance.

Regards,

Bob McDonald,
Senior Director, Legal

² [Unlicensed Use of the 6 GHz Band, Report and Order and Further Notice of Proposed Rulemaking](#), 35 FCC Rcd 3852 (2020), para. 102.

Assessment of spurious emissions below 30 MHz as measured at 3m on a test site against the 15.209(a) Limit

Part 15.209				Part 18 Test Report (Power = 20dBm per port, all ports active)				ITU-R P.2109-1 Attenuation ^{Note 5}
Frequency	Field Strength Limit			Frequency ^{Note 1}	Field Strength		Margin	
(MHz)	uV/m	dBuV/m*	Distance (m)		dBuV/m ^{Note 1}	dBuV/m ^{Note 3}	dB ^{Note 4}	
0.009-0.490	2400/F(kHz)	13.8	300	9.42 kHz	64.7	-15.3	29.1	Not stated
0.490-1.705	24000/F(kHz)	23.0	30	No emissions reported in this range				Not stated
1.705-30.0	30	29.5	30	30 MHz	32.0	-8.0	37.5	Not stated
<p>* Limit for frequencies below 1.705 MHz is the limit at the highest frequency within the range (i.e. the lowest value of the limit within that range)</p> <p>Note 1: Frequency at which the highest field strength was reported within the frequency range.</p> <p>Note 2: This value is the value measured at a 3m measurement distance in the Part 18 test report.</p> <p>Note 3: Field strength at 3m extrapolated to the FCC 15.209 limit distance using $40\log(3m/D_{lim})$ at frequencies at or below 30MHz.</p> <p>Note 4: Margin of spurious emissions to the Part 15.209(a) limit. Negative values are above the 15.209 limit.</p> <p>Note 5: Median attenuation loss from Figure 1 of ITU-R P.2109-1 for horizontal incidence.</p>								

Table 1: FCC Part 18 Test Data for Power Setting of 20 dBm for Spurious Emissions in the 9kHz – 30 MHz Frequency Range Compared to 15.209(a) Limits.

Part 15.209				CISPR 11 Test Report, power = 13dBm/port, all ports active			ITU-R P.2109-1 Attenuation ^{Note 4}	Expected margin 3m from the building ^{Note 5}
Frequency	Field Strength Limit			Frequency ^{Note 1}	Field Strength	Margin		
(MHz)	uV/m	dBuV/m	Distance (m)		dBuV/m ^{Note 2}	dB ^{Note 3}		
30-88 (QP)	100	40.0	3	All emissions below 35 dBuV/m*		> 5dB	Not stated	> 5 dB
88-216 (QP)	150	43.5	3	153.13 MHz	36.6	6.9	> 10dB	> 16.9 dB
216-960 (QP)	200	46.0	3	918 MHz	46.0	0.0	> 10dB	> 10.0 dB
960 – 1,000 (QP)	500	54.0	3	All emissions below 46 dBuV/m*		> 8dB	> 10dB	> 18dB
1,000 – 3,000 (Pk)	500	54.0	3	2474 MHz*	53.6	0.4	> 15dB	> 15.4 dB
3,000 – 9,000 (Pk)	500	54.0	3	7350 MHz *	54.5	-0.5	> 17dB	> 16.5 dB
9,000 - 40,000 (Pk)	500	54.0	3	9800 MHz	63.0	-9.0	> 17dB	> 8.0 dB
<p>* Values taken from preliminary scan data.</p> <p>Note 1: Frequency at which the highest field strength was reported within the frequency range. Emissions falling in the ISM bands are excluded from consideration.</p> <p>Note 2: This value is the value measured at a 3m measurement distance in the CISPR 11 test report.</p> <p>Note 3: Margin of spurious emissions to the Part 15.209(a) limit. Negative values are above the 15.209 limit. This does not include any consideration for attenuation loss by the structure of the building and represents the worst-case margin at a distance of 3m within the building.</p> <p>Note 4: Median attenuation loss from Figure 1 of ITU-R P.2109-1 for horizontal incidence.</p> <p>Note 5: Expected margin relative to the 15.209 limits for emissions measured at a distance of 3m from the external walls of the building.</p>								

Table 2: CISPR 11 Test Data for Power Setting of 13 dBm for Spurious Emissions in the 30 MHz – 40 GHz Frequency Range Compared to 15.209(a) Limits.

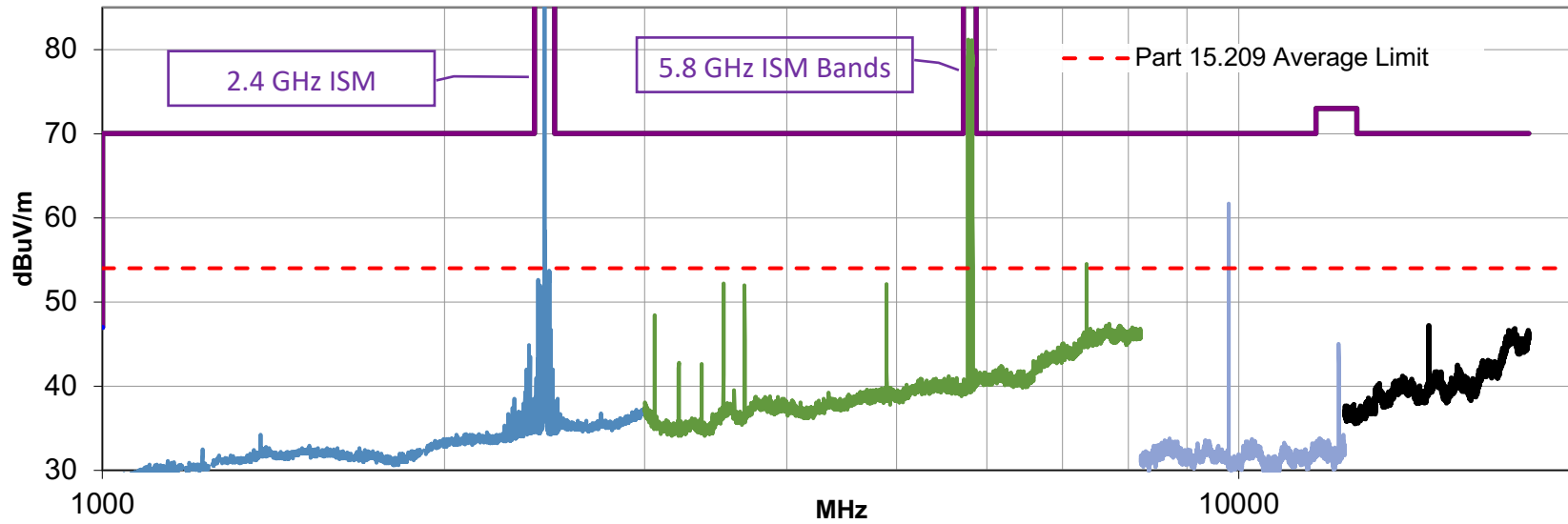


Figure 1 Preliminary Scan Data for CISPR 11 Test Report