

Before the
FEDERAL COMMUNICATIONS COMMISSION

Washington, D.C. 20554

In the Matter of)	
)	
Amendment of the Commission’s)	RM-11815
Rules To Allow Next-Generation)	
Wireless Charging Technology for)	
Electric Vehicles Under Part 18)	

To: The Commission
Via: ECFS

**COMMENTS OF ARRL, THE NATIONAL ASSOCIATION
FOR AMATEUR RADIO**

ARRL, the national association for Amateur Radio, formally known as the American Radio Relay League, Incorporated (ARRL), by counsel and pursuant to Section 1.405(a) of the Commission’s Rules [47 C.F.R. § 1.405(a)], hereby respectfully submits its comments in response to the *Public Notice*, Report No. 3103, released September 21, 2018 (the Notice). The Notice called for comments from interested parties on the above-captioned *Petition for Rulemaking* (the Petition), filed jointly by BMW of North America, LLC, Ford Motor Company, Nissan North America, Inc., and Toyota Motor North America, Inc. The Petition proposes to amend Section 18.305 of the Commission’s Rules, which addresses field strength limits for industrial, scientific and medical (“ISM”) equipment, to adopt field strength limits that will allow high-power wireless charging technologies (i.e. Wireless Power Transfer, or WPT) for electric vehicles (WPT-EV) operating in the 79-90 kHz band. In ARRL’s view, this Petition is significantly premature, and as such it should be dismissed without prejudice pursuant to Section 1.401(e) of the Commission’s rules. 47 C.F.R. 1.401(e). Additionally, ARRL suggests that the

Petition inadequately justifies the relief requested; it therefore plainly is not deserving of further action; and it should be dismissed pursuant to the same rule section for that separate reason. For its comments, ARRL states as follows:

1. The instant Petition is typical of Petitions for Rulemaking filed with the Commission which tout a new application of old technology: so as to establish a sense of urgency, the bulk of the Petition is dedicated to establishing a public interest justification for making a rule change now, in order to accommodate the technology.¹ However, the Petition is in this case woefully incomplete and inadequate in analyzing and addressing issues of electromagnetic compatibility (EMC)², and it fails to justify the proposed technical parameters, including in this instance the proposed field strength of emissions. Also, the Petition makes assumptions which are not adequately supported by studies of the proper frequency range to be made available for WPT-EV. Finally, the precise subject of this Petition is in the early stages of international study and evaluation, and the soonest that the subject will be addressed internationally on any comprehensive level is at the 2019 World Radiocommunication Conference (“WRC-19”). To prejudge the outcome of WRC-19 by adoption or proposal by the Commission of the rule proposed in the Petition would make no sense at all.

2. The Petition, though lacking an Appendix of proposed rule changes, states that it seeks to commence a rulemaking proceeding to adopt field strength limits for WPT-EV in the 79-90 kHz band, ostensibly to enable “faster, higher power wireless charging capabilities for light duty EVs that are equivalent to wired alternating current technologies” now in use. To that end, the

¹ It should be noted that wireless charging technology is not the only means of charging electric vehicles, and there is no rush to judgment required with respect to it. Wired charging of EVs is obviously suitably efficient; there is not the issue of the effect on the power grid of wireless charging; and the electromagnetic compatibility issues are not present with wired charging technologies.

² In this case, the Petition is fatally silent on the critically important subject of out-of-band emissions of WPT-EV systems in the Low Frequency (LF) and Medium-Frequency (MF) ranges.

Petition seeks to permit a specific field strength limit for light duty EV wireless charging systems of 74.4 dBuA/m measured at 10 meters, *regardless of the operating environment of the charging system*. At present, the frequency-band 79–90 kHz is one of the bands under consideration internationally for use by WPT. Other bands under consideration include 19-21 kHz, 59-61 kHz and 100-300 kHz. Both a specific, permitted field strength and a specific frequency range are specifically requested in this Petition without sufficient technical support; without a sufficient discussion of alternatives; and without any limiting factors whatsoever, regardless of the installation or its location.

3. It is well-known that, although the proposed 79-90 kHz range is well below the MF bands, harmonic emissions (given the high power levels of charging systems) could be appreciable.³ The AM Broadcast Service and the Amateur Radio Service, among others, are potential interference victims. Traditionally, WPT has been used only for low- power devices. However, electric vehicle applications entail upward of eleven kilowatts. Interference potential from intentional radiators requires substantial evaluation. Nor is it clear that Part 18 ISM rules offer the appropriate regulatory paradigm for these extremely high-power devices which inevitably will be deployed in, among others, residential environments. Residential WPT-EV systems may not appropriately be considered industrial, scientific or medical devices in any sense of the regulatory category.

4. The 2015 World Radiocommunication Conference (“WRC-15”)⁴ Final Acts, at Resolution 958, requested studies concerning WPT-EV, in order to: (a) assess the impact of WPT for electric vehicles on radiocommunication services; and (b) study suitable harmonized frequency ranges which would minimize the impact on radiocommunication services from WPT-

³ See, e.g. CEPT Draft ECC Report 289, *Wireless Power Transmission (WPT) systems for electrical vehicles (EV) operating within 79-90 kHz band*.

⁴ WRC-15 Final Acts, (Geneva, 2015).

EV.⁵ According to the WRC-15 Final Acts, these studies should take into account that the International Electrotechnical Commission (IEC), the International Organization for Standardization (ISO) and the Society of Automotive Engineers (SAE) were in the process of approving standards intended for global and regional harmonization of WPT technologies for electric vehicles. WRC-15 instructed the Director of the Radiocommunication Bureau to report on these studies as part of his overall report at WRC-19. WRC-19 would then decide on the next appropriate action. WRC-19 is scheduled for November of 2019. The Annex to Resolution 958 on this topic reads in relevant part as follows:

ANNEX TO RESOLUTION 958 (WRC-15)

Urgent studies required in preparation for the 2019 World Radiocommunication Conference

- 1) Studies concerning Wireless Power Transmission (WPT) for electric vehicles:
 - a) to assess the impact of WPT for electric vehicles on radiocommunication services;
 - b) to study suitable harmonized frequency ranges which would minimize the impact on radiocommunication services from WPT for electrical vehicles.

These studies should take into account that the International Electrotechnical Commission (IEC), the International Organization for Standardization (ISO) and the Society of Automotive Engineers (SAE) are in the process of approving standards intended for global and regional harmonization of WPT technologies for electric vehicles.

⁵ That resolution read as follows:

RESOLUTION 958 (WRC-15)

Urgent studies required in preparation for the 2019 World Radiocommunication Conference
The World Radiocommunication Conference (Geneva, 2015)
considering

- a) that the agenda of this conference included consideration of items for the agenda for the 2019 World Radiocommunication Conference (WRC-19);
- b) that the agenda of this conference included consideration of items for the preliminary agenda for the 2023 World Radiocommunication Conference (WRC-23);
- c) that items for the agenda for WRC-19 have been identified in Resolution 809 (WRC-15);
- d) that items for the preliminary agenda for WRC-23 have been identified in Resolution 810 (WRC-15),

Resolves

to complete studies on the topics identified in this Resolution and its annex, invites ITU-R as a matter of urgency, to complete the studies called for in this Resolution, instructs the Director of the Radiocommunication Bureau to report on these studies under agenda item 9.1 of WRC-19, as appropriate, based on the results of studies.

5. WRC-19 agenda item 9.1.6 addresses WPT-EV by consideration of the studies ordered by the WRC-15 Final Acts:

Studies concerning Wireless Power Transmission (WPT) for electric vehicles, to assess the impact of WPT for electric vehicles on radiocommunications services, and study suitable harmonized frequency ranges which would minimize the impact on radiocommunication services from WPT for electrical vehicles.

The instant Petition, therefore, quite obviously prejudges the outcome of WRC-19 Agenda Item 9.1.6; it presumes that the optimum, internationally harmonized frequency range for WPT-EV is already known to be 79-90 kHz; and that the optimum field strength in order to minimize the impact on radiocommunication services worldwide has already been determined to be 74.4 dBuA/m measured at 10 meters. The problem, however, is that there is nothing in the four corners of the Petition that would justify those assumptions. The Petition, at pages 14 and 15 makes what is, in context, a highly anomalous argument that international harmonization of the frequencies for WPT-EV is important. However, there is nothing offered therein that establishes that the optimum, internationally harmonized frequency range is in fact 79-90 kHz, other than the claim on page 18 that “the 79-90 kHz operating frequency range was selected based on a lack of other uses, both in the U.S. and internationally.” The sole citation of authority for this contention is an alleged recommendation of the Society of Automotive Engineers International (SAE), an automotive industry standard-setting entity. However, SAE is one of the entities whose recommendations are to be taken into account in the studies to be considered at WRC-19, and there is no indication what factors SAE considered in arriving at the decision that 79-90 kHz was appropriate in terms of out-of-band emissions. All we are told in the Petition is that the proposals contained therein “are consistent with” the SAE recommendations. No presentation or analysis of the SAE recommendations, and no consideration of alternatives, is offered in the

Petition. The obvious, better process, in terms of establishing international harmonization of this technology (including the frequency range and the permitted transmit power and field strength limits) would be to await the outcome of the evaluation of the studies to be considered at WRC-19. Those studies are intended to and will evaluate suitable harmonized frequency ranges which are intended to minimize the impact of WPT-EV on radiocommunication services.

6. As to the proposed field strength limit, the Petition notes only that the proposal to allow 74.4 dBuA/m measured at 10 meters “is consistent with” the SAE recommendations. However, the Petition fails to take into account the harmonic interference and other out-of-band emissions from WPT-EV systems that can be expected, given the power levels considered. Instead, it addresses only *in-band emissions* and the interference potential of those to 79-90 kHz incumbents. The impact on all radiocommunication services is a critical subject of study for devices transmitting at power levels in the range of 11 kilowatts, especially those in residential, non-industrial areas. Again, this is precisely the subject of the studies to be considered at WRC-19 and which are therefore prejudged by the instant Petition. The instant Petition should be dismissed and revisited after the conclusion of WRC-19 and after evaluation of actions taken and studies considered at that Conference.

7. The International Amateur Radio Union (IARU), the worldwide organization comprising national Amateur Radio societies, expressed concerns in April, 2017 about the out-of-band interference potential of WPT-EV. IARU observed that high-power WPT-EV is an emerging technology which will in time become deployed on a widespread basis, including ubiquitously in residences. IARU noted the ongoing work in ITU and within standards organizations to propose frequency ranges for WPT-EV and stated its view that radio frequency emissions resulting from any kind of WPT must be confined to the frequency ranges already

identified for equipment used for industrial, scientific, and medical (ISM) applications or if found necessary, to frequencies below 100 kHz. Nevertheless, since WPT-EV involves very large amounts of radiofrequency power and a WPT-EV installation involves components connected together in a system with associated power supplies and control equipment, the spurious emissions from all system parts must be carefully controlled in order to avoid degrading the radio spectrum and causing interference to other radiocommunication systems or services in accordance with RR 15.12 and RR 15.13.⁶ The Commission, should it proceed with the relief requested in this Petition despite the Petition's failure to adequately address interference to radiocommunication services outside the fundamental frequency, would clearly be noncompliant with the terms of RR 15.13. Sources of emissions on frequencies *other than the fundamental frequency* of the WPT-EV system include (a) high-order harmonics of the fundamental WPT frequency; (b) phase noise from the frequency control circuits ("jitter") causing wideband noise; (c) spurious signals from the switch-mode power supply on all control and power ports – conducted and common mode; and (d) common-mode signals on control cables and power lines from data communication networks associated with the control of the unit. To ensure adequate

⁶ The ITU Radio Regulations, at RR 15.12 and RR 15.13, state as follows:

Section II – Interference from electrical apparatus and installations of any kind except equipment used for industrial, scientific and medical applications

15.12 § 8 Administrations shall take all practicable and necessary steps to ensure that the operation of electrical apparatus or installations of any kind, including power and telecommunication distribution networks, but excluding equipment used for industrial, scientific and medical applications, does not cause harmful interference to a radiocommunication service and, in particular, to a radionavigation or any other safety service operating in accordance with the provisions of these Regulations.

Section III – Interference from equipment used for industrial, scientific and medical applications

15.13 § 9 Administrations shall take all practicable and necessary steps to ensure that radiation from equipment used for industrial, scientific and medical applications is minimal and that, outside the bands designated for use by this equipment, radiation from such equipment is at a level that does not cause harmful interference to a radiocommunication service and, in particular, to a radionavigation or any other safety service operating in accordance with the provisions of these Regulations.

protection to authorized radio services, noted the IARU, *proper compatibility and sharing studies should be conducted*. IARU's position concluded by noting that IARU regards cooperation between ITU and standards organizations to be essential in the evolution of standards and frequencies for high-power WPT operation. Quite obviously, the rollout of WPT-EV has profound implications in terms of its ubiquity in future years. To make a mistake now in ascertaining the potential for interference to radiocommunication systems from out-of-band emissions from high-power WPT-EV systems would result in widespread interference for which there would be no practical, after-the-fact remedy. The Commission gets only one chance to roll out WPT-EV correctly and the study process, already underway, should be allowed to take its course.

8. Quite clearly, therefore, the Petitioners herein have "jumped the gun" by filing this Petition now. It is understandable that they would do so: the Commission has not exhibited any reasonable degree of alacrity in addressing petitions for rulemaking in recent years, especially those dealing with spectrum management and since the rulemaking cycle can take years – sometimes quite a few years – in this context, it is understandable that the Petition was filed now. The trouble, however, is that the Petition is based on assumptions which have not yet been studied appropriately, and the Petition lacks substance in terms, at least, of (1) the justification for the choice of frequency range versus other candidate bands, and (2) the effect on radiocommunication services of the proposed field strength level. ARRL takes the position that no rollout of WPT-EV in the United States (other than that which is already permitted by the existing rules), should be commenced or authorized until the completion of WRC-19 and the evaluation of the studies that are to be considered at WRC-19 (which were ordered by the Final Acts of WRC-15) can be completed. In that way, the Commission can more accurately determine

the proper frequency range, power level and field strength that should be permitted to facilitate WPT-EV without compromising radiocommunication systems in and outside of the properly ascertained frequency range(s).

Therefore, the foregoing considered, ARRL, the national association for Amateur Radio, hereby respectfully requests that the Commission dismiss the instant Petition for Rulemaking without prejudice as being premature, subject to refileing at a later date, following the conclusion of WRC-19 and following the evaluation of the studies of WPT-EV to be considered at that Conference.

Respectfully submitted,

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