Part 18 and Wireless Power Transfer Updates

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Note: The views expressed in this presentation are those of the authors and may not necessarily represent the views of the Federal Communications Commission.

Contents

Part I

Certification of § 2.1093-Portable Devices below 4 MHz

Extension of Policies for Certification of Portable Devices Below 4 MHz (I)

- This updated guidance supersedes previous applicable guidance (TCB Workshop Oct. 2021 "Wireless Power Transfer Updates), providing options for certification of *portable devices* (per § 2.1093) operating below 4 MHz (a frequency range not suitable for SAR evaluation)
- Provision now applies to all RF devices, removing previous restrictions to Part 18 only, and to power less than 15 W
- Re-iterating general requirements, applicable to both 2.1091-*mobile* and *2.1093-portable devices:*
  - Visual advisories, signs, or notes in the manual are not sufficient to establish a minimum approach distance for demonstrating compliance
  - If compliance can be demonstrated only beyond a minimum approach distance, physical constraints to prevent close contact, or proximity sensing power reduction, need to be present

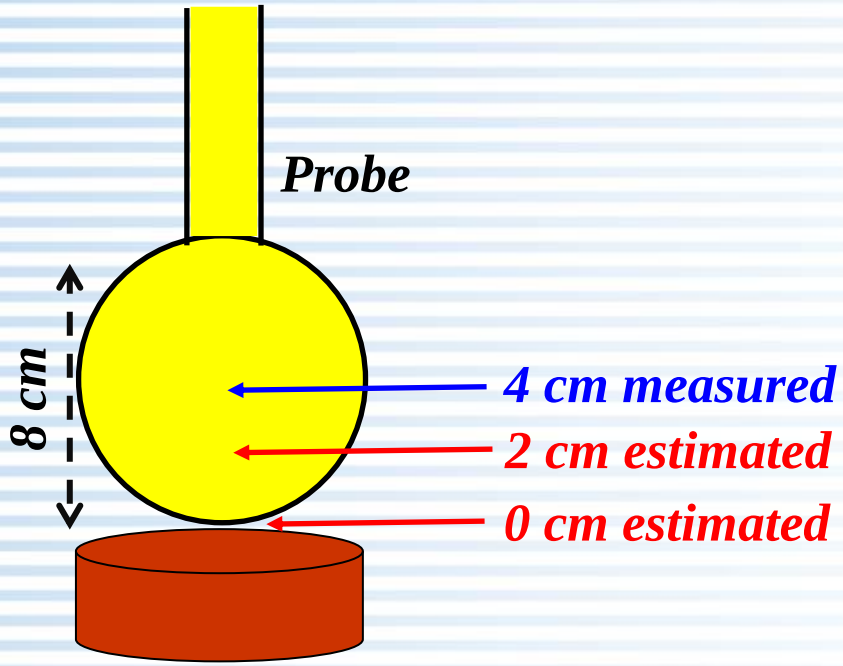
Extension of Policies for Certification of Portable Devices Below 4 MHz (II)

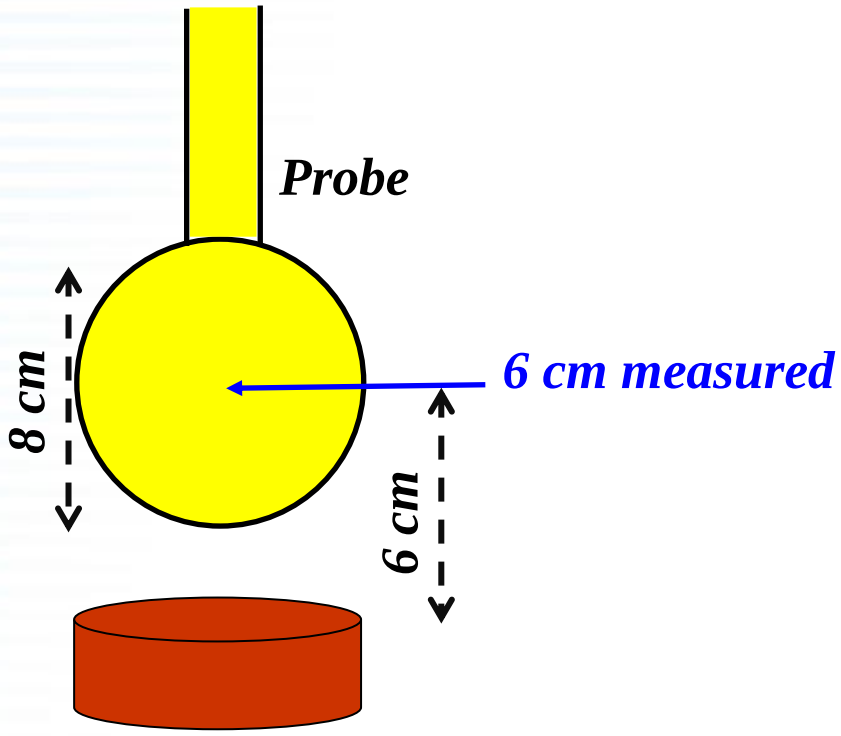
- New RF exposure compliance guidance for equipment authorization (including SDoC) of all RF devices, thus including, but not limited to, Part 18 and (e.g. WPT)
- For equipment authorization of RF devices operating between 100 kHz and 4 MHz, the use of MPE limits in 47 CFR §1.1310 (with the 300 kHz limit applicable all the way down to 100 kHz) for both E- and H-field strength is allowed in lieu of SAR
- In alternative, for all other cases of portable devices below 4 MHz, SAR numerical simulations compliance data may be submitted, and approval may be granted on a case-by-case basis, following KDB Inquiry for NUMSIM PAG Item
- For all RF devices operating below 100 kHz, the provision in KDB 680106-v03 apply, *i.e.* field strengths not to exceed 83 V/m and 90 A/m, for E- and H-fields, respectively

Testing Guidance (I)

- Conditions under which portable devices operating between 100 kHz and 4 MHz may obtain certification:
  - the E- and H-field strengths surrounding the device are below the applicable MPE limit in 47 CFR §1.1310
  - E- and H-field data are taken along all three axes the device, from 0 cm to 20 cm, in 2 cm minimum increment measured from the edge of the device, with one axis coincident with the axis of the main coil
  - For loop/coil emitting structures (dominant H-field near-field emission), only H-field measurements are acceptable for MPE limit compliance

Testing Guidance (II)





Example of probe measurements in points close to the device surface: estimates compared with measurements at 4 and 6 cm provide validation

Testing Guidance (III)

- "Large size" probes may prevent the measurement of E- and/or H-fields near the surface of the radiating structure (e.g., a WPT source coil)
- If the center of the probe sensing element is more than 5 mm from the probe outer edge, the field strengths need to be estimated for the positions that are not reachable (from the surface, in 2 cm increments)
- The estimate may be done either via numerical calculation, or via analytic model, provided that the estimates are validated
- For instance, approximated formulas for circular coils, dipoles, etc., may be acceptable
- For validation purposes, it is sufficient to show a 30% agreement between the model and the (E- and/or H-field) probe measurements for the two closest points to the device surface, and with 2-cm increments

Part II

Wireless Power Transfer “At A Distance”

Introducing Part 18, WPT "At A Distance"

- KDB 680106-DR04 draft has received comments, and is under revision towards final edition to provide a more extensive coverage for different industry-relevant options
- DR04 formalized the 1-meter distance threshold requirement for conventional WPT designs, beyond which devices are qualified as WPT "At A Distance" (AAD)
- WPT-AAD technologies may be authorized under Part 18 according to the new KDB 680106-DR04 provisions only via certification (no SDoC)
- No changes for policies affecting Part 15 WPT-AAD

Interim Certification of Part 18, WPT "At a Distance"

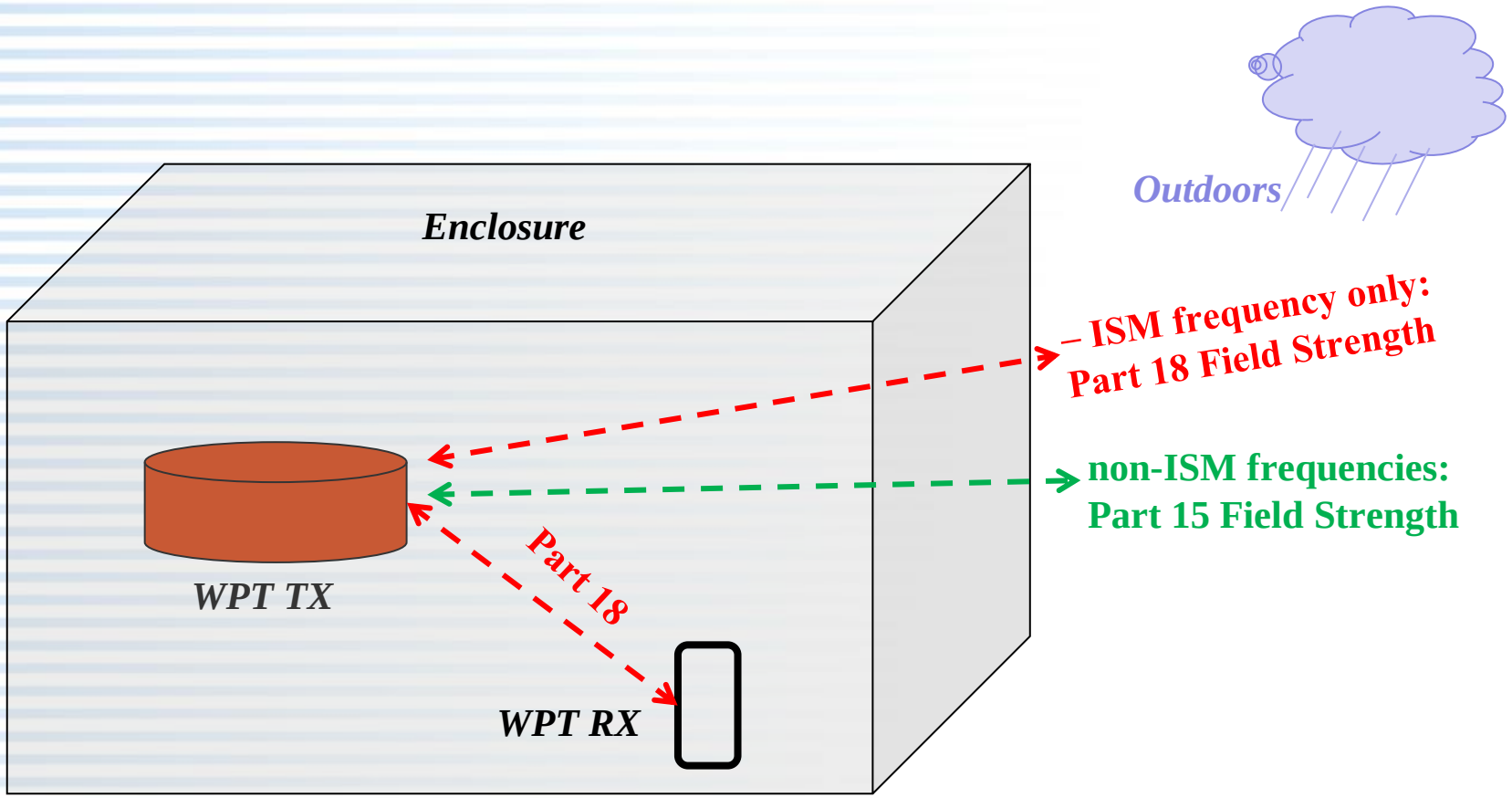
- In this context, "WPT distance" is the distance between the closest edges of the transmitter (TX) and receiver(s) (RX) device(s) during operations
- In all locations beyond one meter (where a person's body may be affected) E- and H-field strength shall be at or below the corresponding maximum levels at one meter
- Reference measurements are with all RX-devices being charged within 1-meter of the transmitter while operating at maximum power
- "All-locations" may be verified via field decay and spot checks (no need of measuring every point in space…)
- This policy ensures that a WPT-AAD will never exceed the field strength of an identical device presently authorized for up to 1 meter distance

Interim Certification of Part 18, WPT "At A Distance" (II)

- Part 18, WPT-AAD devices only certified for indoor operations: both TX and RX shall be in a fully-enclosed, weatherproof structure
- Indoor-defining structure shall provide an average EM field attenuation(*) (averaged over the outer surface average of the structure) at the WPT operating frequency of at least 8 dB
- Installations shall ensure that, when measured outdoors, the maximum fundamental and unwanted radiated emissions of the Part 18 device on any non-ISM frequency meet Part 15.209 limits
- These requirements are meant to provide a form of containment of the WPT operations, in line with Part 18 "local" character of operations

(*) A minimum average attenuation level of 8 dB is being considered

Interim Certification of Part 18, WPT "At A Distance" (III)



WPT-AAD Indoor Requirements

Equipment Authorization Considerations

- Per § 18.313, all Part 18 devices shall meet FCC RF exposure requirements
- Per § 18.305, all Part 18 devices are subject to field strength limits on non-ISM frequencies, to protect from harmful interference
- WPT-AAD certification is under PAG (WPTAPP Item in KDB Pub. 388624)
- Characterization of § 2.1093-Portable vs. § 2.1091-Mobile devices needs to be demonstrated in the certification filings

Concluding Remarks

- FCC is carefully examining all issues that pertain at-a-distance operations of Part 18 devices
- Recent feedback provided in the comments on the 680106-D04 draft is being considered to enhance certification flexibility
- Efforts to harmonize guidance for both industrial and consumer applications are in progress
- Provisions are being developed to allow certifications on a case-by-case basis for some policy deviations, based on analysis of field strength and attenuation data as provided in filings (as part of WPTAPP PAG item)
- In any case, new WPT-AAD provisions do not/will not relax compliance criteria, neither for RF Exposure protection, nor for protection from harmful interference