RF Exposure Procedures

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TCB Workshop

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Laboratory Division

Overview

- Wireless Power Transfer
- Handheld RFID/Barcode Scanners
- Miscellaneous SAR Testing Guidance
- KDB Inquires

Portable WPT Applications

- Presented guidance for testing of low power (<15 W), In-vehicle WPT applications with transmission frequencies > 100 KHz in Nov 2019 TCB Workshop RF Exposure Procedures presentation
  - **Old Guidance**: If the measured H-field values at the appropriate test distance are <10% of the limit no KDB inquiry is necessary
- **GUIDANCE UPDATE** (applicable from this point forward)
  - If the measured H-field values are below 100% of the applicable limit in 47 CFR §1.1310, no additional testing is necessary. If the measured values are > 100% of the applicable limit additional measurements, SAR, or numerical modeling may be required. Also, if the WPT does not operate in a continuous wave mode (e.g. with a <100% duty-cycle waveform) a KDB Inquiry is required.

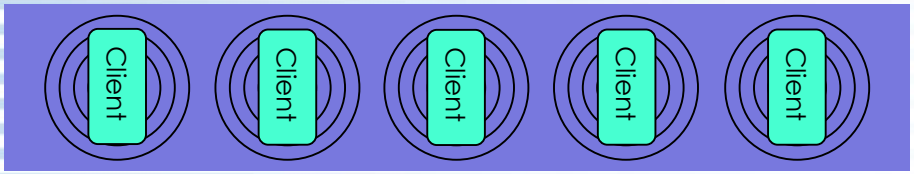
WPT – Multi Coil Devices

- The following guidance applies to desktop WPT devices with 4 or more primary transmit coils operating at > 100 KHz transmit frequency
- Can be in either a horizontal (ex: charging station) or vertical (ex: charging cabinet) configurations
- Coils must be identical, and evenly spaced from each other
  - If coils are not evenly spaced or are overlapping in layers submit a KDB Inquiry
- Power of each individual coil must be < 15W
  - Total Power can be > 15W
- In cases where multiple WPT devices can link or daisy chain together submit a KDB Inquiry

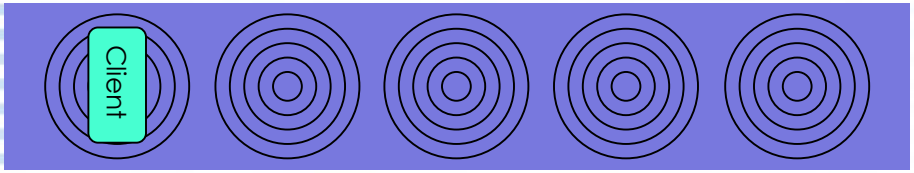
WPT – Multi Coil Devices

- Prerequisite to testing: Need a number of identical clients equal to the number of primary coils
  - Example: 16 coil charging cabinet, need 16 identical clients
- Apply the following testing procedure:
  - Fully load the host with identical clients, one per each coil
  - Measure H-Field at 15 cm from the edges and 20 cm from the top surface. No need to measure bottom surface if it will not face user. Remove clients.
  - Place one client on coil closest to end of the device. Repeat measurements. Remove client.
  - Place one client on coil on the other end of the device. Repeat measurements. Remove client.
  - Place one client on coil closest to the middle of the device. Repeat measurements. If even number of coils choose one of the coils closest to middle (but not both) to do measurements on.
- If fully loaded configuration is not expected to be the worst case, submit a KDB Inquiry

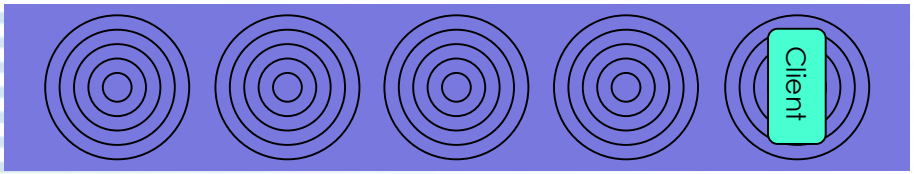
WPT – Multi Coil Devices



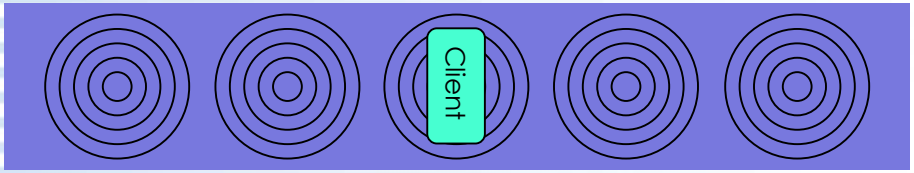
Step 1: Fully Loaded
5 Measurements



Step 2: One End Loaded
5 Measurements



Step 3: Other End Loaded
5 Measurements



Step 4: Middle Coil Loaded
5 Measurements

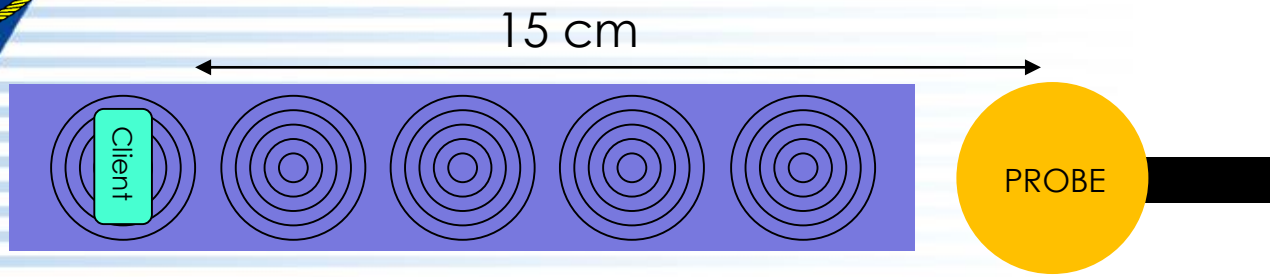
*Note: Diagrams not to scale

TOTAL:
20 Measurements

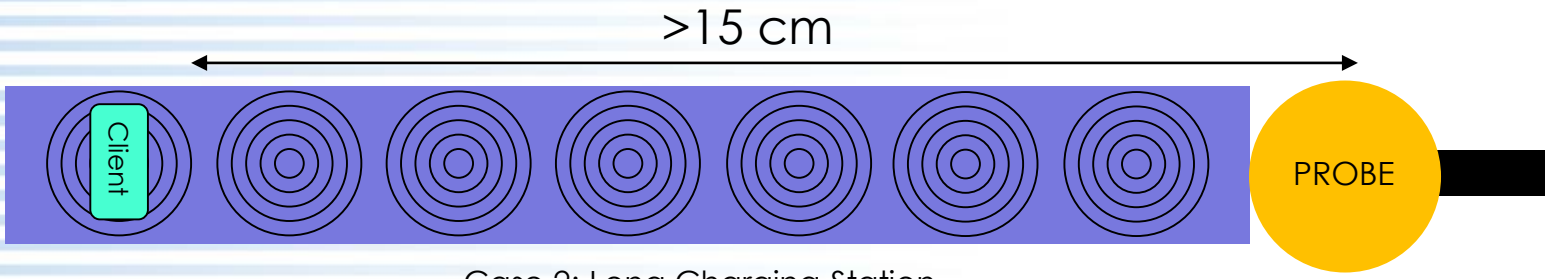
WPT – Multi Coil Devices

- For very long or tall devices, when measuring the middle or end coil configurations, some surfaces or edges may be very far away from the transmitting coil.
- For those far away edges or surfaces measure with center of probe 15 or 20 cm away from the edge of the transmitting coil, respectively
- If the edge or surface is greater than 15 or 20 cm away from the edge of the transmitting coil, respectively, measure with the probe touching that edge or surface
- See next two slides for examples

WPT – Multi Coil Devices



Case 1: Short Charging Station

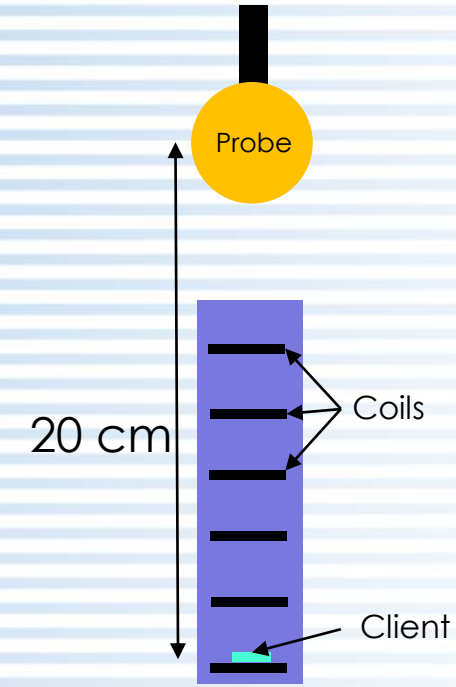


Case 2: Long Charging Station

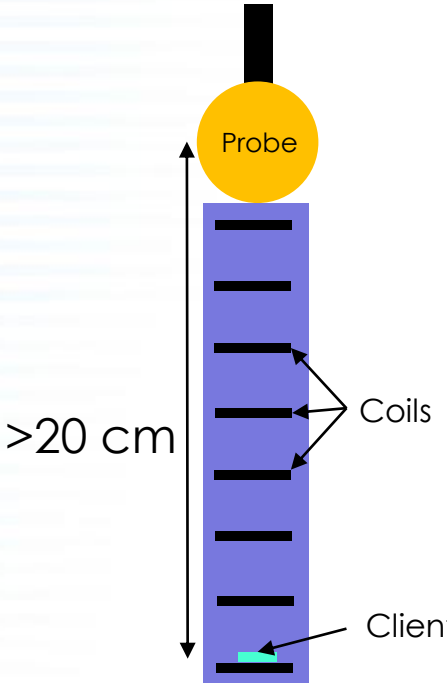
Horizontal Configuration Examples (Charging Stations)

*Note: Diagrams not to scale

WPT – Multi Coil Devices



Case 1: Short Charging Cabinet



Case 2: Tall Charging Cabinet

Vertical Configuration Examples (Charging Cabinets)

*Note: Diagrams not to scale

Handheld RFID/Barcode Scanner Form Factors

Handheld RFID/Barcode Scanners

- Provided guidance at May 2017 TCB Workshop
- Using this guidance, difficult to test back side of RFID antenna (the side that is facing the user's fingers during normal operation) due to pistol grip handle getting in the way
- What to do?
  - SAR Test Exclusion is still preferred
  - Device modification (Not the preferred option)
  - Provide an alternative test method

Handheld RFID/Barcode Scanners

- **Old Guidance**: Do not test front side (side facing away from user during normal operation)
- **GUIDANCE UPDATE**: If the RFID antenna is highly directional you may apply the following testing guidance:
  - Provide a directivity plot showing the directivity of the antenna
  - Provide a conservative minimum distance between the back of the RFID antenna and the fingers during normal operation
  - Measure the 10-g Extremity SAR from the front of the RFID antenna at that antenna-to-finger distance and use that SAR value in place of the back side SAR data
    - Example: Back side of RFID antenna is 25 mm away from user's finger during normal operation. Test front surface at 25 mm away from flat phantom and use that SAR data in place of back side SAR data
  - In the test setup section of the SAR report clearly explain the test setup and the fact the front side SAR was used in place of the back side SAR data

Miscellaneous SAR Testing Guidance

- Tissue Simulating Liquids
  - Per the April 2019 RF Exposure Procedures TCB Workshop presentation Head Tissue Simulating Liquid can be used for all SAR tests
  - Body Tissue Simulating Liquid can still be used for applicable test positions
- Proximity Sensor PAGs
  - No significant updates since April 2019 TCB Workshop
  - Hall Effect and G-sensors still require PAG
    - Follow testing guidance from Nov 2019 TCB Workshop

KDB Inquiries

- **DO NOT** submit general inquiry asking How do I test? or Is this ok? with no supporting information
- Helpful to propose test configurations based on existing KDB Guidance, sound engineering judgement with justification
- Info to provide: wireless modes, power, antenna info and location, use conditions, distances, dimensions, etc.
- May need to include a statement in SAR report saying a non-standard test setup was used
  - DO NOT put KDB Inquiry numbers in SAR Reports

KDB Inquiries

- **DO NOT** submit overly complex inquiries without highlighting deviations from standard guidance
- Examples of what **NOT** to do:
  - Submitting a 200 page test proposal with 199 pages being standard guidance and asking to exceed the SAR limit in one line on page 63
  - Submitting a 100 page test proposal and just asking is this ok? Do you approve?

Questions?

Thank You!