Wireless Power Transfer for Consumer Devices

TCB Workshop
April 2013

Laboratory Division
Office of Engineering and Technology
Federal Communications Commission

KDB Update

- KDB680106 has been revised to reflect updates in FCC policy for Wireless Power Transfer
- Applies primarily to low power consumer devices using closely coupled, inductive power transfer techniques

KDB Update

- The following are not covered under the guidance provided in KDB680106 and are still subject to PBA
  - High power devices,
  - Devices designed for power transfer at distance
  - Magnetic resonance power devices that rely on loose inductive coupling and coupling at distance
  - Medical devices

Authorization

- May be approved under Part 15 or Part 18 or both Rule Parts depending on operating conditions
  - Transmitters and receivers are generally approved separately; however, they should satisfy compliance in both standalone mode and as a system
  - Wireless chargers should satisfy compliance in all charging conditions including variable loading from multiple clients and non-charging operation
  - Receivers may be approved as integral part of host device
  - Part 18 authorization must limit communication to power control and load management

Authorization

- Part 18 Authorization
  - Load and power management must be integral to wireless power transfer operation and frequency
  - May not communicate any information not related to power management and control
  - Proximity of the transmit and client device(s) must satisfy Part 18 requirement that the RF energy is locally generated and used

Authorization

- Part 15 Authorization Required
  - If primary transfer frequency includes information not related to power or load management
  - If a secondary frequency is used for communications (primary frequency may be authorized under Part 18 and secondary on Part 15)
  - Devices authorized under Part 15 may not transmit in the 90-110 kHz restricted band
- EMC Considerations
  - Transmitter must be evaluated with appropriate client(s) in place
  - The worst case transmitting conditions for the system as a whole must be evaluated for each applicable configuration

Radio Frequency Exposure

- Considerations for Evaluation
  - SAR and MPE limits do not cover the frequency range for wireless power transfer applications which operate below 100 kHz and 300 kHz respectively; therefore, RF exposure compliance needs to be determined with respect to 1.1307 (c) and (d) of the FCC rules.
    - MPE limits at 300 kHz are used for frequencies near 100 kHz: 614 V/m and 1.63 A/m

Radio Frequency Exposure

- Portable devices
  - Portable exposure conditions from 100 kHz to 6 GHz are determined with respect to SAR requirements.
  - Existing SAR systems and test procedures are generally intended for measurements above 100 MHz
  - When applicable, numerical modeling may be used to demonstrate SAR compliance for lower frequency devices; a KDB inquiry should be submitted to determine modeling parameters
  - Analytical analysis, field strength and radiated and conducted power measurements may also be considered to evaluate compliance by submitting a KDB inquiry

Radio Frequency Exposure

- Mobile devices
  - Typical desktop use conditions do not fully justify 20 cm separation distance; 2.1091(d)(4) generally needs consideration
  - For devices designed for typical desktop applications, such a wireless charging pads, RF exposure evaluation should be conducted assuming a user separation distance of 10 cm
  - 10 cm separation is generally acceptable for devices from 60 cm^2 to 400 cm^2

Radio Frequency Exposure

- Mobile devices (cont.)
  - The test separation distance is from the edge of the device to the geometric center of the probe sensors, which is typically the probe calibration point
  - RF exposure measurement probes with isotropic sensors should be used for field strength measurements
  - The diameter of measurement probes for the kHz frequency range is a significant percentage of the measurement distance
  - A KDB Inquiry should be submitted for power transfer devices that do meet the size limits or have an unusual form factor
  - E and H field strength measurements or analyses based on design details can be used to determine compliance

PBA Exclusion

- PBA and RF exposure evaluation may be excluded if all of the following requirements are met:
  - Power transfer frequency is less than 1 MHz
  - Output power from each primary coil is no more than 5 watts
  - The transfer system includes only single primary and secondary coils. This includes charging systems that may have multiple primary coils and clients that are able to detect and allow coupling only between individual pairs of coils

PBA Exclusion (cont)

- Client device is inserted in or placed directly in contact with the transmitter
- The maximum coupling surface area of the transmitting (charging) device is between 60 cm2 and 400 cm2.
- The maximum leakage fields at 10 cm surrounding the device from all simultaneous transmitting coils are demonstrated to be less than 30% of the MPE limit.

Conclusion

- A KDB Inquiry should be submitted for guidance for wireless power transfer applications that are not covered under KDB 680106
- Wireless power transfer remains on the PBA list except as specifically excluded or where guidance is available through published RF exposure KDB procedures for the specific implementation; for example, KDB Publication 648474 D03.

Questions and Answers

Thanks!