



RF Exposure Procedures

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



Overview

- Disclaimers
- Mobile and Portable Exposure Conditions
- Sensors for Proximity Detection for Power Reduction
- Universal Phone Sleeves
- Dongle Updates



Disclaimers

- The views expressed in this presentation are those of the author and may not necessarily represent the views of the Federal Communications Commission
- The guidance presented in these slides is preliminary and has not yet been incorporated into established FCC KDB Guidance publications



Mobile and Portable Exposure Conditions (1)

- Definition of mobile device from 47 CFR §2.1091(b)
 - “A mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is **normally maintained** between the RF source's radiating structure(s) and the body of the user or nearby persons. In this context, the term “fixed location” means that the device is physically secured at one location and is not able to be easily moved to another location while transmitting. Transmitting devices designed to be used by consumers or workers that can be easily re-located, such as wireless devices associated with a personal desktop computer, are considered to be mobile devices if they meet the 20-centimeter separation requirement.” [Emphasis Added]



Mobile and Portable Exposure Conditions (2)

- Example of a mobile device
 - Wi-Fi Access Point/Router
 - Larger in size (Cannot fit in pocket)
 - Plugs into wall
 - Not normally operated in close proximity (< 20 cm) to body
 - Can easily be re-located



Mobile and Portable Exposure Conditions (3)

- Definition of portable device from 47 CFR §2.1093(b)
 - “A portable device is defined as a transmitting device designed to be used in other than fixed locations and to **generally be used in such a way** that the RF source's radiating structure(s) is/are within 20 centimeters of the body of the user.
[Emphasis Added]



Mobile and Portable Exposure Conditions (4)

- Example of a Portable device
 - Wireless Handset (Cellphone)
 - Smaller in Size (Can fit in pocket)
 - Battery-operated
 - Normally operated in close proximity (< 20 cm) to body



Mobile and Portable Exposure Conditions (5)

- Devices that aren't easily classified as either mobile or portable, per 47 CFR § 2.1091(d)(4):
 - “In some cases, e.g., modular or desktop transmitters, the potential conditions of use of a device may not allow easy classification of that device as either mobile or portable (also see § 2.1093). In such cases, applicants are responsible for determining minimum distances for compliance for the intended use and installation of the device based on evaluation of either specific absorption rate (SAR), field strength or power density, whichever is most appropriate.”



Mobile and Portable Exposure Conditions (6)

- Example of devices that aren't easily classified as either mobile or portable
 - Desktop Wireless Power Transfer device that is AC powered (i.e. Powermat)
 - Normally operated > 20 cm away from the body (classified as mobile) but there are brief times when it may be close to one's extremities if placed on the desk
 - Since use conditions are not easily defined a compromise approach is taken: It is classified as a mobile device but H-field strength measurements are taken at distance < 20 cm (per the provisions of FCC KDB Publication 680106 D01 RF Exposure Wireless Charging Apps v03r01) to evaluate the potential for RF Exposure



Mobile and Portable Exposure Conditions (7)

- Example of bad classifications:
 - Trying to classify devices as mobile when expected use cases may include operating conditions that are regularly in close proximity (< 20 cm) to the body
 - Toys for children that contain transmitters
 - Wireless Handsets: Stating the user must maintain a distance of 20 cm between themselves and their wireless handset
 - This is an unreasonable expectation of the use conditions for this type of device
 - Trying to utilize user manual statements alone to classify a device as mobile in order to avoid RF Exposure testing
 - User manual statements alone are not sufficient to demonstrate compliance. User manual statements must reflect actual expected use conditions



Mobile and Portable Exposure Conditions (8)

- FCC OET has not given precise interpretation on what is “normally maintained” or “generally used in such a way” mean
 - Difficult to define since so many varied implementations/potential exposure conditions/times/output powers
- Similarly, FCC OET has not given precise interpretation on what is “transient” or “intermittent” amount of RF exposure or exposure time for mobile and portable devices.



Mobile and Portable Exposure Conditions (9)

- New Guidance: For devices that are not easily classified as strictly mobile or strictly portable or when the use conditions are not well-defined a KDB Inquiry with the new Equipment Compliance Review (ECR) category should be submitted.
 - KDB Inquiries should include a proposal and an explanation/justification as to why this proposal is reasonable
 - All established FCC KDB guidance, publications, and presentations should be reviewed by the inquirer before submitting a KDB Inquiry (i.e. DO YOUR HOMEWORK)
 - Utilize good engineering judgement when submitting KDB Inquiries



Mobile and Portable Exposure Conditions (10)

- **DO NOT** submit inquiries without a proposal
 - Example of what not to do: An inquiry just saying “How to test SAR for this?” with a single photo of the device and no other supporting information.
- **DO NOT** submit inquiries without explanation/justification of the proposal
 - It wastes limited FCC OET Staff time and resources when inquiries just state, “Is this ok?” or “Does the FCC accept this?” without explanation/justification
- **DO NOT** submit inquiries for devices where clear guidance has been given in FCC KDB Publications or Workshop presentations



Sensors for Proximity Detection for Power Reduction (1)

- Sensors for proximity detection for power reduction have been used in wireless devices for many years now
- Section 6 of FCC KDB Publication 616217 D04 SAR for laptop and tablets v01r02 provides guidance on testing proximity sensors, including procedures for determining proximity sensor triggering distances, determining antenna and proximity sensor coverage, and for determining tablet tilt angle influences to proximity sensor triggering
- Even though originally written only for laptops and tablets, the procedures in section 6 of 616217 D04 have been successfully applied to devices of other form factors including handsets, phablets, hotspots, etc.



Sensors for Proximity Detection for Power Reduction (2)

- Over the years we have seen an increasing number of sensors in handsets and other small devices
- The most commonly used sensor is a capacitive proximity sensor but an increasing variety of sensors are being utilized including, but not limited to, infrared, sonic, and radar, among others.
- Additionally, sensors are being used in new and novel ways, not just for proximity detection



Sensors for Proximity Detection for Power Reduction (3)

- Key Point: Sensors that are being used to trigger power reduction based on proximity detection must have a measurable triggering distance that can be verified.
 - Example of sensor that may not meet this requirement: A motion sensor that reduces power if motion is detected. This sensor may not meet the requirement because the motion sensor may not provide a defined separation distance that can be verified.
- Due to the wide variety of sensors and applications, unless stated otherwise in FCC Guidance, a PAG is still required per the provisions of the TXSENS PAG Item in FCC KDB Publication 388624 D02 Pre-Approval Guidance List v18r03



Universal Phone Sleeves (1)

- FCC OET has provided guidance on phone sleeves/third-party accessories over the years
 - FCC KDB Publication 648474 D03 Wireless Chargers Battery Cover v01r04
 - Section 8 of FCC KDB Publication 648474 D04, Handset SAR v01r03
 - RF Exposure Procedures TCB workshop April 2016, Bluetooth Sleeve Accessories



Universal Phone Sleeves (2)

- However, much of this guidance no longer applies to modern devices
 - Many modern wireless handsets have non-removable batteries (meaning no removable battery covers)
 - Many modern phone sleeves are universal or near-universal, being able to attach on many different handsets
 - According to the provisions of Section 8 of FCC KDB Publication 648474 D04, Handset SAR v01r03, these sleeves would have to be tested with every wireless handset they could attach to. This is time-consuming and impractical.
 - Most modern wireless hands have many transmitters, making the “Bluetooth antenna is ≥ 2 cm from any antenna in the host device” condition set forth in the RF Exposure Procedures TCB workshop April 2016, Bluetooth Sleeve Accessories slide difficult to meet



Universal Phone Sleeves (3)

- FCC KDB Publications and guidance will be updated to reflect the realities of modern devices. However, until they are updated the following interim guidance can be applied for the universal or near universal phone sleeves that contain transmitters:
- New Interim Guidance:
 - RF exposure compliance of the phone sleeve shall be tested with the phone sleeve in actual operational conditions with the sleeve transmitters operating at maximum power. In this case, a representative “host” device, e.g., a handset, shall be chosen and the phone sleeve attached to the handset. The phone sleeve transmitter must be verified to be operating at maximum power.
 - In these conditions, when the evaluated RF Exposure figure of merit of the phone sleeve transmitter (i.e. SAR or MPE, applicable) is no larger than 25% of the corresponding limit (e.g., 0.4W/kg for 1-g SAR), then the phone sleeve can be certified for general use with any host.
 - If, instead, the mentioned 25% threshold is exceeded, then the certification shall be provided with a grant comment stating that the phone sleeve transmitter has not been tested for FCC compliance for those conditions where the host transmitters are also in operation.
 - If the sleeve manufacturer chooses to test one or more host devices for simultaneous transmissions, with the host(s) also operating at maximum power, as per design conditions (e.g. LTE plus Wi-Fi “hotspot”, etc.), then a list of models for which simultaneous transmissions compliance(per KDB 447498) was demonstrated may be added, as an exception to the previous grant comment.



Dongle Update (1)

- General guidance for dongle testing can be found in FCC KDB Publication 447498 D02
- Additional guidance for dongles with external swivel antennas was given in RF Exposure Procedures presentation at the November 2019 TCB Workshop
- In general, we are seeing less and less dongle certifications as people are accessing the internet now via alternate means, primarily via the hotspot mode on their wireless handsets, phablets, or tablets



Dongle Update (2)

- Also, as battery and laptop technology has advanced modern laptops are, in general, smaller, thinner, and lighter than older laptops.
 - Since laptops are thinner, many do not come equipped with vertical orientation USB ports
 - Difficult for test laboratories to acquire laptops that have vertical USB ports
- Guidance Clarification: As mentioned in the second paragraph of FCC KDB Publication 447498 D02, when testing a dongle, for the Vertical-Front and Vertical-Back orientations a laptop with vertical USB ports is not needed. A high-quality USB cable, 12 inches or less, may be used for testing these other orientations. It must be documented that the USB cable does not influence the radiating characteristics and output power of the transmitter.



Dongle Update (3)

- Seeing a number of KDB Inquiries asking about testing of dongles with long (> 15 inches), thin, flexible, non-detachable cables as part of their design.
- Some of these KDB Inquiries have proposed classifying these devices as mobile since they can be placed > 20 cm
- However, there is nothing preventing the user from placing the transmitting dongle close to or touching his/her body, i.e. nothing to guarantee a separation distance of > 20 cm is normally maintained. Therefore,
- Guidance Clarification: Dongles with long, flexible, non-detachable cables as part of their design should be classified and tested as portable devices according to the provisions of FCC KDB Publication 447498 D02



Questions?

Thank You!