

**Federal Communications Commission
Office of Engineering and Technology
Laboratory Division**

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SAR MEASUREMENT PROCEDURES FOR USB DONGLE TRANSMITTERS

The procedures in this attachment are intended for USB dongle transmitters with internal antennas, which are referred to as “simple dongles”.¹ If the dongle has a built-in external antenna or one that can swivel or rotate, there could be more than four orientations that may require testing. If the USB connector can swivel or rotate, there are also other conditions that may need consideration. For devices that connect to a USB port but do not operate like the typical simple dongle, a KDB inquiry should be submitted to determine test requirements.

SIMPLE DONGLE PROCEDURES

Test all USB orientations [see figure below: (A) Horizontal-Up, (B) Horizontal-Down, (C) Vertical-Front, and (D) Vertical-Back] with a device-to-phantom separation distance of 5 mm or less, according to KDB Publication 447498 D01 requirements. These test orientations are intended for the exposure conditions found in typical laptop/notebook/netbook or tablet computers with either horizontal or vertical USB connector configurations at various locations in the keyboard section of the computer. Current generation portable host computers should be used to establish the required SAR measurement separation distance. The same test separation distance must be used to test all frequency bands and modes in each USB orientation. The typical Horizontal-Up USB connection (A), found in the majority of host computers, must be tested using an appropriate host computer. A host computer with either Vertical-Front (C) or Vertical-Back (D) USB connection should be used to test one of the vertical USB orientations. If a suitable host computer is not available for testing the Horizontal-Down (B) or the remaining Vertical USB orientation, 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.

DONGLES WITH SWIVEL OR ROTATING CONNECTORS

A swivel or rotating USB connector may enable the dongle to connect in different orientations to host computers. When the antenna is built-in within the housing of a dongle, a swivel or rotating connector may allow the antenna to assume different positions. The combination of these possible configurations must be considered to determine the SAR test requirements. When the antenna is located near the tip of a dongle, it may operate at closer proximity to users in certain connector orientations where dongle tip testing may be required.

The 5 mm test separation distance used for testing simple dongles has been established based on the overall host platform (laptop/notebook/netbook) and device variations, and varying user operating configurations and exposure conditions expected for a peripheral device. The same test distance should generally apply to dongles with swivel or rotating connectors. The procedures described for simple dongles should be used to position the four surfaces of the dongle at 5 mm from the phantom to evaluate SAR. At least one of the horizontal and one of the vertical positions should be tested using an applicable host computer. If the antenna is within 1 cm from the tip of the dongle (the end without the USB connector), the tip of the dongle

¹ These simple dongles typically look like a USB memory stick.

should also be tested at 5 mm perpendicular to the phantom. For antennas located within 2.5 cm from the USB connector and if the dongle can be positioned at 45° to 90° from the horizontal position [(A) or (B)], testing in one or more of these configurations may need to be considered. A KDB inquiry should be submitted to determine the applicable test configurations.

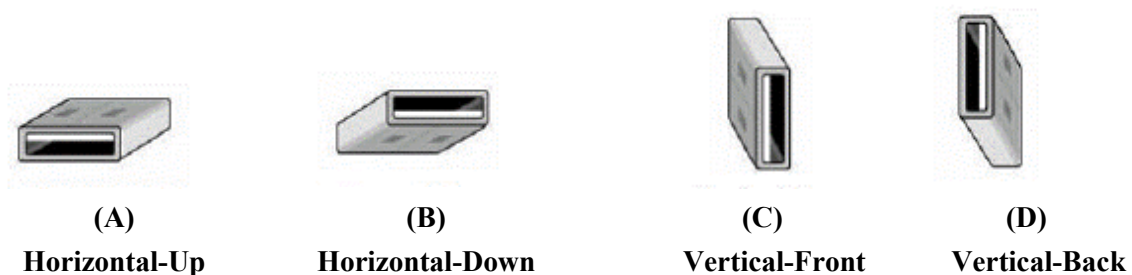
DONGLES WITH EXTERNAL, SWIVEL OR ROTATING ANTENNAS

For dongles with external antennas or antennas that may swivel or rotate, a KDB inquiry should be submitted to the FCC Laboratory to determine the applicable test configurations. The inquiry should identify if the antenna may transmit in its stowed position, and if a swivel or rotating USB connector is also used. Depending on the antenna configurations used in the individual dongle design and its operating configurations, different test separation distances may apply and must be determined on a case-by-case basis.

OTHER SAR TEST CONSIDERATIONS

USB dongles have a rather small footprint; therefore, the SAR scan resolutions should be smaller than those typically used for testing devices with larger form factors, to maintain acceptable uncertainty for the interpolation and extrapolation algorithms used in the 1-g SAR analysis. In addition, when USB cables are used to connect a dongle to the host for SAR testing, the dongle should be supported in several cm of foamed polystyrene (e.g., Styrofoam) to minimize any field perturbation effects due to test device holder used to position the dongle for SAR testing. Dongles with certain spacers, contours or tapering added to the housing should generally be tested according to the 5 mm test separation requirement required for simple dongles, which is based on overall host platform, device and user operating configurations and exposure conditions of a peripheral device as compared to individual use conditions.

USB dongle transmitters must show compliance at a test separation distance of 5 mm. When the SAR is ≥ 1.2 W/kg, applications for equipment certification require a KDB inquiry for equipment approval.² Preliminary data submitted through KDB inquiries showing compliance at test distances greater than 5 mm are usually inapplicable and insufficient for the FCC to determine if potential exposure concerns may be eliminated to enable the device to satisfy compliance. The information must clearly demonstrate that the likelihood of non-compliance is remote. When the SAR is ≥ 1.2 W/kg, especially for SAR > 1.5 W/kg, certain caution statements, labels and other means to ensure compliance may be required.



Note: These are USB connector orientations on laptop computers; USB dongles have the reverse configuration for plugging into the corresponding laptop computers.

Figure 1 – USB Connector Orientations Implemented on Laptop Computers

² See details in KDB Publication 447498 D01.

Change Notice

11/13/2009: 447498 D02 SAR Procedures for Dongle Xmtr v01 has been changed to a new version 447498 D02 SAR Procedures for Dongle Xmtr v02. Restructure and revise document, including: 1) Distinguish among simple dongle configurations, and certain types of rotatable configurations and antennas; 2) Revise corresponding with KDB 388624 revision that PBA is required for SAR \geq 1.2 W/kg.

10/23/2015: 447498 D02 SAR Procedures for Dongle Xmtr v02 has been changed to a new version 447498 D02 SAR Procedures for Dongle Xmtr v02r01. A KDB inquiry is now required to determine the need for RF exposure labeling due to removal of the 1.2 W/kg PBA requirement.