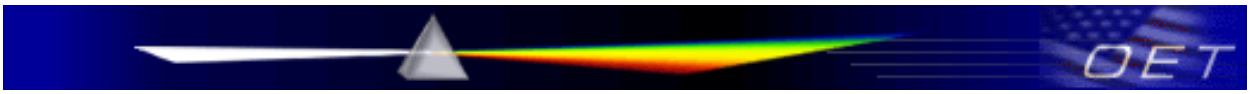

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SAR EVALUATION PROCEDURES FOR PORTABLE DEVICES WITH WIRELESS ROUTER CAPABILITIES

I. INTRODUCTION

This document describes the SAR test requirements for certain devices with wireless router or hotspot mode capabilities. A hotspot mode enabled device can provide wireless internet access to nearby Wi-Fi devices by routing the traffic through an available WWAN connection. This is different from the Wi-Fi access point hotspots that route Wi-Fi traffic through wired connections. The Wi-Fi and WWAN transmitters used for hotspot mode are usually built-in within the device, such as battery-operated personal wireless routers and wireless handsets. For some implementations, either the Wi-Fi or WWAN transmitter can be an externally attached device, such as a USB dongle, to support hotspot mode. This KDB publication does not address self-contained, built-in hotspot mode in peripheral transmitters, such as ExpressCards or USB dongles. These must be tested in conjunction with transmitters in applicable host platform configuration to determine SAR compliance.

Data from hotspot connected clients can transmit concurrently through a hotspot enabled device during head, body-worn accessories and other product specific use conditions, or in near-body, hand-held use conditions for texting and web-browsing. The simultaneous transmission configurations for these exposure conditions must be addressed for SAR compliance. This document identifies the hotspot mode SAR test requirements for near-body hand-held use conditions and also clarifies the simultaneous transmission SAR requirements for hotspot mode in head, body-worn accessory and other next to body exposure conditions. A PAG is required if the procedures are not followed.

II. GENERAL SAR TEST CONSIDERATIONS FOR HOTSPOT MODE

Hotspot mode transmissions are typically transparent and unattended because users normally do not know which transmitters or wireless modes are active at any particular time. Depending on the transmitters and antenna paths implemented in a handset, if hotspot mode is active during voice calls, up to 4 transmitters may transmit simultaneously. For example, hotspot mode traffic can be routed between Wi-Fi and LTE/Ev-Do/WiMax connections while a voice call in UMTS/1xRTT/GSM mode is routed to a Bluetooth headset. All applicable standalone and simultaneous transmission use conditions must be taken into consideration to determine SAR compliance.

The head, body-worn accessory, next to body and hotspot mode SAR results are used to determine simultaneous transmission SAR test exclusion for these exposure conditions. When simultaneous transmission SAR compliance is addressed in conjunction with hotspot mode for the applicable exposure conditions, additional information regarding RF exposure compliance for hotspot mode use is generally not required in user manuals. However, the separation distance required for body-worn accessories and other near-body use conditions to comply with RF exposure requirements, as described in KDB Publication 447498 D01, must be included in the manual instructions.

III. HOTSPOT MODE SAR TEST REQUIREMENTS FOR NEAR-BODY, HAND-HELD USE CONDITIONS

The SAR test separation distance for hotspot mode is determined according to device form factor. When the overall length and width of a device is > 9 cm x 5 cm (~3.5" x 2"), a test separation distance of 10 mm is required for hotspot mode SAR measurements. A test separation distance of 5 mm or less is required for smaller devices. The smaller test distance is established by the operating configurations and exposure conditions of a device in next to body use configurations. The combination of test distance and 1-g SAR measurements required for near-body exposure also supports hand-held exposure; therefore, separate 10-g extremity SAR evaluation is not necessary. When it is unclear, a KDB inquiry should be submitted to determine the test distance.

Hotspot mode SAR is measured for all edges and surfaces of the device with a transmitting antenna located within 25 mm from that surface or edge; for the data modes, wireless technologies and frequency bands supporting hotspot mode. The SAR results are used to determine simultaneous transmission SAR test exclusion for hotspot mode; otherwise, simultaneous transmission SAR measurement is required. The simultaneous transmission configurations must be clearly identified in SAR reports to support the test exclusion analysis and measurement results.

For standalone battery-operated wireless router devices that require an external peripheral transmitter, such as an approved Wi-Fi or WWAN USB dongle or ExpressCard, to support hotspot mode, a *reported* SAR of 1.6 W/kg is used for the external transmitter to determine simultaneous transmission SAR test exclusion. This excludes the use of sum of 1-g simultaneous transmission SAR test exclusion; the SAR to peak location separation ratio exclusion must be applied. For USB dongles, the peak SAR location is assumed to be at 1 cm or less from the router surface, on the USB dongle. For transmitter cards, SAR test exclusion is determined with peak SAR located at the edge of the router surface, centered along the plug-in card slot. If the built-in transmitter qualifies for SAR test exclusion; for example, a Wi-Fi module, the estimated SAR procedures in KDB Publication 447498 D01 is applied in conjunction with the 1.6 W/kg assumed for an external transmitter to determine SAR to peak location ratio SAR test exclusion.

IV. HEAD AND BODY-WORN ACCESSORY SAR TEST CONSIDERATIONS FOR HANDSETS WITH HOTSPOT MODE

The hotspot mode and body-worn accessory SAR test configurations may overlap for handsets. When the same wireless mode transmission configurations for voice and data are required for SAR measurements, the more conservative configuration with a smaller separation distance should be tested for the overlapping SAR configurations.[1] This typically applies to the back and front surfaces of a handset when SAR is required for both hotspot mode and body-worn accessory exposure conditions. Depending on the form factor and dimensions of a device, the test separation distance used for hotspot mode SAR measurement is either 10 mm or that used in the body-worn accessory configuration, whichever is less for devices with dimension > 9 cm x 5 cm. For smaller devices with dimensions ≤ 9 cm x 5 cm because of a greater potential for next to body use a test separation of ≤ 5 mm must be used. The combination of test distance and 1-g SAR measurements required for near-body exposure also supports hand-held exposure; therefore, separate 10-g extremity SAR evaluation is not necessary.

[1] See KDB Publication 648474 D04.

When hotspot mode is enabled during voice calls, SAR compliance must be addressed for simultaneous voice and hotspot mode data in head (next to the ear) and body-worn accessory use conditions.[2] Hotspot mode support may depend on the transmitter and antenna paths used by wireless modes in a handset. For example, hotspot mode is not feasible with Ev-Do or GPRS during 1xRTT or GSM voice calls if the same transmitter is used for 1xRTT and Ev-Do or GSM and GPRS (without DTM support). When separate transmitters are used, simultaneous transmission SAR for voice and hotspot mode data must be addressed; for example, Ev-Do, LTE or WiMAX may be used for data while voice calls are transmitted through a separate UMTS or 1xRTT transmitter. GSM/GPRS handsets with DTM capability may also support hotspot mode during voice calls through additional time slots. These technology dependent implementations must be considered to determine the voice and hotspot mode configurations requiring head and body-worn accessory SAR evaluation.

Change Notice

10/16/2014: 941225 D06 Hot Spot SAR v02 replaces 941225 D06 Hot Spot Mode SAR v01r01. Document has been reorganized for clarify and updated to realign with other recent KDB publications to address discontinued references and procedures in Supplement C, TCB exclusion list and 60/f etc.

10/23/2015: 941225 D06 Hot Spot SAR v02r01 replaces 941225 D06 Hot Spot Mode SAR v02. Replaced PBA with PAG and included minor editorial clarification for hotspot mode and body-worn accessory test consideration. Added heading numbering.

[2] Some devices have used hardware or firmware control to restrict hotspot mode use in selected wireless modes, frequency bands, operating configurations or exposure conditions.