Applicants are reminded to ensure that all LTE testing and approval issues have been fully addressed through prior KDB inquiries and that copies are provided to the TCB to support review and approval. The TCB will verify that all LTE test requirements have been satisfied.

II. General LTE SAR test and reporting considerations

In addition to the requirements in KDB 865664 for reporting RF exposure compliance, the following should be documented in SAR test reports to identify the wireless operating parameters and test configurations for LTE.

A. List the frequency range and channel bandwidths used in each LTE band; 1.4, 3, 5, 10, 15, 20 MHz, etc.

B. Identify the high, middle and low (H, M, L) channel numbers and channel frequencies for each LTE bandwidth and frequency band according to the minimum channel requirements in KDB 447498;[2] these are referred to in this document as the *required test channels*.[3]

C. Include descriptions of the LTE transmitter and antenna implementation, and identify if the transmitter operates independently of the other wireless transmitters in the device; i.e., whether the LTE hardware, components and/or antenna(s) are shared with other transmitters.

D. Identify the voice and data transmission requirements for all LTE operating modes and exposure conditions, for standalone and simultaneous transmission, with respect to the required head and body test configurations, antenna locations, handset flip or slide cover positions, antenna diversity requirements, etc.

These LTE test procedures must be applied separately to each device operating configuration and exposure condition, in each frequency band and channel bandwidth; for example, different test positions are required for head SAR and various surfaces and edges may be required by the *published KDB procedures*.[4]

E. Identify if Maximum Power Reduction (MPR) is implemented as an optional or permanent feature, i.e., built-in by design.

 1. MPR may be considered during SAR testing only when the maximum output power is permanently limited by the MPR implemented within the device, according to the RB (resource block) configurations specified in 3GPP/LTE standards.

 2. Regardless of network requirements, only those RB configurations allowed (see 3GPP standards) for the channel bandwidth and modulation combinations may be tested with MPR active. Configurations with RB allocations less than the RB thresholds required by 3GPP must be tested without MPR.

 3. A-MPR (additional MPR) must be disabled during SAR testing.

F. When power reduction is required for one or more LTE modes to satisfy SAR compliance for simultaneous transmission or other equipment certification and operating requirements, maximum

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[2] For LTE bands that do not support at least 3 channels in certain channel bandwidths, test the available channels instead. Also note that the channel plan may enable devices to support overlapping channels in each channel bandwidth configuration, which should be taken into consideration to determine the test channels.

[3] If a transmission band is > 100 MHz, the channel selection criteria in KDB 447498 must be applied.

[4] See KDB 447498 for *published KDB procedures*.

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Comment [1]: This edit to the statement will allow small bands with few channels can still apply KDB 447498 minimum channel criteria.

For example LTE Band 17 that may operate with overlapping channels of 709, 710 and 711 MHz should not required to test all 3 channels but allow 1 channel based on KDB 447498.

In essence, KDB 447498 # of channel procedure should not be limited to only transmission bandwidths > 100 MHz.

I. Spectrum plots should be included in SAR reports to demonstrate the tested RB allocations have been established correctly at the maximum output power conditions when a base station simulator is not used.[5]

III. SAR test procedures for LTE devices

A. SAR testing for LTE voice and data operations

The general test requirements for VoIP support are described in KDB 648474. The head, body-worn accessory and other required test considerations in KDB 447498 and other *published KDB procedures* should be applied to configure LTE devices for standalone and simultaneous transmission in voice and data modes for the required exposure conditions.

B. Standalone SAR test requirements

1. The SAR test reduction and exclusion provisions in KDB 447498 should be applied.

2. These test procedures apply to all exposure conditions – head, body-worn accessories and other use conditions.

3. For each LTE frequency band:

   (i) Start with the largest channel bandwidth and measure SAR in QPSK with 100% RB allocation.

      (a) when the maximum output power variation across the *required test channels* is ≤ ½ dB, begin SAR measurement with the middle channel; otherwise, begin with the highest output power channel

      (b) then apply the test reduction provisions in KDB 447498 to determine if testing is required for the remaining *required test* channels

   (ii) For QPSK with 50% RB allocated at the upper and lower edges of the channel, and also in the middle of the channel[6]

      (a) when the highest SAR measured in III.B.3.(i) is > 1.2 W/kg, repeat the channels tested in III.B.3.(i) for QPSK with 50% RB allocation for the three RB offset configurations

      (b) when the highest maximum output power for the *required test channels* in QPSK with 50% RB allocation in each of the three RB offset configurations is more than ½ dB higher than that in QPSK with 100% RB allocation, repeat the channels tested in III.B.3.(i) for QPSK with 50% RB allocation.

   (iii) For QPSK with 1 RB allocated at the upper and lower edges of the channel, and also in the middle of the channel

      (a) when the highest SAR measured in III.B.3.(i) or III.B.3.(ii) is > 1.2 W/kg, repeat the channels tested in III.B.3.(i) for QPSK with 1 RB allocation for the three RB offset configurations

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[5] Throughout this document, maximum output power means maximum average conducted output power.

[6] Use 3, 8, 12, 25, 36 and 50 RB allocations, respectively, for 1.4, 3, 5, 10, 15 and 20 MHz channel bandwidths. Use XXXX RB Offsets, for XXXX channel bandwidths, respectively.

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Comment [2]: Is this required even when a base station simulator is used? We added verbiage if not.

If so, it should be defined how many. For example, "for each band and RB configuration, provide the spectrum plots to confirm the band and RB size and offsets were configured correctly" etc

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Comment [3]: It would make testing and reviews consistent if RB offsets were also defined here for 50% RB configurations.

(b) when the highest maximum output power for the *required test channels* in QPSK with 1 RB allocation in each of the three RB offset configurations is more than ½ dB higher than that in QPSK for both 50% and 100% RB allocations, repeat the channels tested in III.B.3.(i) for that RB offset configuration in QPSK with 1 RB allocation.

(iv) For each modulation besides QPSK (e.g., 16-QAM, 64-QAM)

Apply the procedures in III.B.3.(i), III.B.3.(ii) and III.B.3.(iii) to determine the channels and configurations (channel bandwidth, RB allocation, RB offset etc.) that need SAR testing but measure SAR only when the maximum output power for a channel and configuration combination is more than ½ dB higher than the same channel and configuration in III.B.3.(i), III.B.3.(ii) and III.B.3.(iii) or the SAR measured in III.B.3.(i), III.B.3.(ii) and III.B.3.(iii) is > 1.2 W/kg.

4. For the other channel bandwidths used by the device in each LTE frequency band

(i) Apply all the procedures in III.B.3. to determine the channels and configurations that need SAR testing but

(a) only measure SAR when the maximum output power of a configuration in the smaller channel bandwidth is more than ½ dB higher than the equivalent channel configurations in III.B.3.(i), III.B.3.(ii) and III.B.3.(iii) or the measured SAR in III.B.3.(i), III.B.3.(ii) and III.B.3.(iii) for the equivalent condition is > 1.2 W/kg.

(b) The equivalent channel configuration for the RB allocation, RB offset and modulation etc. is determined for the smaller channel bandwidth according to the same number of RB allocated in the largest channel bandwidth. For example, 50 RB in 10 MHz channel bandwidth does not apply to 5 MHz channel bandwidth; therefore, this cannot be tested in the smaller channel bandwidth. However, 50% RB allocation in 10 MHz channel bandwidth is equivalent to 100% RB allocation in 5 MHz channel bandwidth; therefore, these are the equivalent configurations to be compared to determine the specific channel and configuration in the smaller channel bandwidth that need SAR testing.

(ii) The configurations and conditions that qualify for SAR test exclusion or require testing must be clearly described in the SAR report.

C. **Simultaneous transmission SAR test considerations for LTE**

1. The standalone SAR results of individual transmitters and transmitting antennas in the frequency bands, operating modes, device operating configurations and exposure conditions are required to determine simultaneous transmission SAR test requirements, with respect to the applicable *published KDB procedures*; for example, voice and data modes in LTE, 1xRTT, WCDMA, GSM, EvDo, HSPA, GPRS/EDGE, WiMax, Wi-Fi, Bluetooth etc.

The SAR test reduction and exclusion provisions in KDB 447498 must be applied separately to the exposure conditions for head, body-worn accessory and other use test configurations for the channel bandwidths, modulations, RB offsets and allocations in each frequency band.

The conditions and configurations that qualify for test exclusion or reduction must be clearly described in a tabulated format in the SAR report.

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Comment [4]: Need reference updates for this section

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