



RF Exposure Procedures

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Sensor Array Measurement Considerations

- Discussed in previous FCC presentations at TCB workshop
- Current plan is to allow these systems for making 3G technology SAR measurements
 - To be used in conjunction with a limited number of measurements on traditional SAR measurement systems
 - Further FCC consideration is pending before use for 4G and Wi-Fi is allowed
- Working on draft KDB Publication



Millimeter Wave Assessment

- Above 6 GHz, Maximum Permissible Exposure (MPE) limits apply to portable exposure conditions according to 47 CFR §2.1093(d)
- Combination of simulation and measurement should be used for compliance
- For devices that employ antenna arrays, signal coherence must be addressed
 - Simulation may be used to identify subsets of worst case transmission exposure conditions
 - Validation of the model is key



Millimeter Wave Measurement Systems

- Commercial millimeter wave measurement systems, probes, and verification (system check) sources are available
- These systems allow for power density, H-field, and far-field analysis using total field reconstruction
- Reporting of both total field and normal component of derived power density is now available. Should be included in test reports



Millimeter Wave Measurement

- For simultaneous transmission, need to assess the degree of overlap between SAR and Power density distributions
- Depending on overlap, total exposure ratio may be applicable
- Total exposure ratio calculated by taking ratio of reported SAR divided by SAR limit and adding it to measured power density divided by power density limit. Numerical sum of the two ratios should be less than 1
- 4 cm² averaging area may now be considered
 - This is subject to change
 - Draft KDB Publication is planned
- Submit a KDB Inquiry before testing
- Will require a PAG



LTE Inter-Band Uplink Carrier Aggregation – Interim Procedures

- Provide the single uplink SAR values you have obtained for the relevant SAR configurations and frequency bands that employ inter-band uplink carrier aggregation
- PAG is not required for either Intra-Band or Inter-Band Uplink CA if the guidance below is applied or as provided in previous TCBC presentations is followed; otherwise PAG is required as noted below:
- Case 1: If the single uplink 1-g SAR values for each band are both less than 0.8 W/kg and the algebraic summation of the 1-g SAR values are less than 1.45 W/kg no additional measurements need to be performed. No PAG required for this case
- Case 2: If one of the single uplink 1-g SAR values is greater than 0.8 W/kg, instead of algebraically summing the 1-g SAR values, sum up the SAR distributions, similar to the enlarged zoom scan (volume scan) procedures found in FCC KDB Publication 865664 D01. PAG is required for this case
- Case 3: If the algebraic sum of the 1-g SAR values is > 1.45 W/kg additional measurements may have to be made. Submit a KDB inquiry for additional guidance. PAG is required for this case

(Note: Slide changed to add clarification after presentation)



Dynamic Time-Averaging of SAR

- A number of proposals for applying time-averaging are being evaluated
- A draft KDB is planned to incorporate the interim parameters for different frequency blocks
- The test procedures for algorithm validation and evaluation of the final system will depend on a range of parameters and algorithms used, for example:
 - the algorithms may use different control parameters
 - combinations of transmission duration, time interval, duty factor and power level etc. may be adjusted in a dynamic manner
 - the implementations may apply different time-averaging criteria
 - for example, continuous compliance in any 20 ms durations vs. averaging over a 100 sec window
 - SAR testing and algorithm verification considerations may vary with other factors like margins to the limit and number of simultaneous transmitters



Dynamic Time-Averaging of SAR – Interim Guidance

- When the time-averaging implementation is based on maximum power where the transmission duty factor of all relevant transmitters are adjusted to ensure the aggregate transmission duty factor satisfies SAR compliance
 - The normally required SAR measurements for standalone operations are sufficient for demonstrating SAR compliance
 - Validation of the transmission duty factors to demonstrate the control algorithms can never allow transmissions to exceed the applicable maximum duty to ensure compliance is required



Dynamic Time-Averaging of SAR – Interim Guidance (cont'd)

- When the time-averaging implementation adjusts output power dynamically to ensure SAR compliance
 - Current proposal is to establish a “not-to-exceed” equivalent continuous average power level at which the device will comply with the SAR limit
 - SAR measurements are performed at this not-to-exceed continuous time-averaged power level according to normally required SAR procedures
 - Algorithm will then needs to be validated using specific test sequences
 - KDB inquiries are required to establish test sequences
 - Demonstrate SAR compliance for the time averaging window chosen, according to a combination of conducted and single point SAR measurements



Wireless Power Transfer

- Still seeing many inquiries regarding test distance and requirements for low power, inductive, desktop wireless power transfer devices
- See guidance from April 2018 TCB Workshop.
 - 15 cm from edges, 20 cm from top
 - No need to report E-field measurements. Only H-field required
- The guidance for low power desktop WPT devices found in KDB 680106 D01 does not apply to low frequency applications (<100 kHz) applications. Submit a KDB Inquiry for guidance



Wireless Power Transfer (cont'd)

- Seeing an increasing number of devices classified as portable utilizing WPT
- For inductive applications where the primary does not physically attach (clip, lock on) to the client, and it is intended for desktop use, the desktop guidance in KDB 680106 D01 may be applied
- For applications where the primary device attaches to the client device, guidance will be given on a case-by-case basis. Submit a KDB Inquiry before testing
 - The guidance for phone sleeves found in other FCC Guidance Publications may be applicable



Questions?

Thank You!