



RF Exposure & 3G Technologies

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FCC 3G Roundtable Fall 2005

Determine means on how to establish a selected set of “protocol based” radio operating configurations for SAR testing

- using base-station simulation equipment
 - standardize code channel combinations, uplink/downlink output power settings, data rates, voice/data modes etc. (test modes & reference measurement channels as defined in 3GPP2 & 3GPP standards)
- should proprietary test codes be discouraged or not accepted?



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- Determine how to define core/basic and supplemental configurations for RF exposure evaluations
 - “operation based” - voice/video/data, handsets/modem etc.
 - to minimize unnecessary testing while able to demonstrate compliance
- Address SAR crest factor issues; especially when higher order modulations are used (QAM etc.)



FCC TCB procedure

From October 2005 training

- 1) TCBs must ask advise from FCC prior to certifying a 3G device. Preferably a KDB correspondence should be used for this communication.
- 2) Current advise that we will give for CDMA-2000 and UMTS is: to digest preliminary info documents provided by OET/Lab (CDMA-2000 or WCDMA), then perform reviews of tests to the best extent possible according to provided device setup information. TCBs in their review should apply good engineering judgment and current procedures such as Supplement C to the extent applicable. Additional guidance information is under development. Info documents for other technologies have not been developed at present.
- 3) When unsure how to address a particular point in their review, TCB should again contact OET/Lab for specific advise.
- 4) Request-for-info correspondence and FCC response must be included as EAS cover-letter exhibit in the filing, to demonstrate that TCB has requested and reviewed info prior to certification.



FCC TCB procedure

- CDMA-2000 Rev. 0 TCB review procedure is being developed and should be available soon.



TCB audits

● Current RT issues

- Applying FCC procedure.
- Lacking detailed description of 3 G capabilities.
- Justification of subset tested.
- need to consider setup procedures in 3GGP and 3GGP2 documents.



RFx Miscellaneous Review Items and Interpretations



Mobile and Portable REx

- Repeat of clarification for: **4) b) i) (2) of KDB Pub. No. 447498** Mar. 2004 *“Mobile and Portable Device RF Exposure Equipment Authorization Procedures”*
- We clarify that TCBs are required to apply the “low threshold” of July 2002 Exclusion List to determine whether a SAR test is required
 - The “no test” threshold mentioned in KDB447498 4) b) i) (2) for is for FCC filings only
 - Output power for portable-transmitter RF exposure purposes is the higher of the conducted or radiated (EIRP) source-based time-averaged output



SAR for Notebook & Tablet PCs

- When required by TCB thresholds or 2.1093, laptops are tested in lap-held position by placing the bottom of the laptop in direct contact against a flat phantom
 - No “floating” laptops
 - Normal-use position: display on & **OPEN** (90-deg.)
- SAR test positions for tablet PCs
 - Bottom in contact with phantom for lapheld position (similar to laptops with antenna(s) in the keyboard section)
 - Also edge-on (side edge) positions for devices that have 0/180-deg. landscape/portrait screen modes
 - slate (one-section) or convertible (hinged two-section, reversible display) are common types



Lic.-service Module-like Devices - Review

- Modular Approval procedures in FCC Public Notice DA-00-1407 are for Part 15 devices only
- FCC does not have corresponding procedures for modules in licensed radio services
- 15.203 unique-antenna and 15.204 marketed-as-system requirements are not directly applicable for licensed radio-services devices
- Filing guidelines have been established by OET/Lab under which certain types and configurations of licensed-service module-like devices (not Modular Approval) subject to SAR routine evaluation can be approved for use in portable RFX conditions - see KDB Pub. 447498



Lic.-service Module-like Devices

- As an additional part of this filing guidance, OET/Lab is requesting that licensed-service module-like devices intended for end-user installation in final-products having pre-installed antennas to operate in portable RFX conditions, should include some type of authentication function to ensure card is used with final-product where applicable SAR routine evaluation has been performed
 - Applications for radio cards using a BIOS-lock function, similar as has been used for some Part 15 modules, can be filed at TCBs
 - Applications using other authentication techniques should file at FCC



The following slides are for support information only



CDMA-2000

- FCC information document
- MS P_REV 6 & higher = CDMA-2000
- 3X versions are not being pursued
- Pilot added in reverse link for coherent detection
- Closed loop power control added to forward link



CDMA-2000

- Allows multiple channels at different relative levels. Uses “Complex scrambling” techniques at the I&Q level. Requires rake receiver integrating over the Welsh code length.
- Special Welsh code processing (rotator) to reduce zero crossings on the reverse link called “HPSK” scrambling.
- Radio configurations 1,2 are IS-95 compatible.
- Radio configurations 3, 4 has continuous transmission. But levels can vary during a call.



CDMA-2000

- Other factors should be investigated that might effect SAR test. HAC, and EMC also might be effected e.g. max. power, duty factor, and PAR.
 - ➔ Device Radio Configurations
 - ➔ Device Service options
 - ➔ Supplemental data channels
 - ➔ Simultaneous voice and data (later revisions)
- Low PAR modes should give highest average power and high PAR modes gives highest peak power.
- 1X -EVDV
 - ➔ Rev C and D (RC10/RC7)
 - ➔ Not being developed by industry, possibly by Koreans



CDMA-2000 1X-EVDO

- FCC information document
- IP/packet data based structure (fundamentally different)
- Power control different for forward link. Uses maximum power. Rate control is used to reduce average power. Reverse link still uses open and closed loop control.



CDMA-2000 1X-EVDO

- Release 0 is data mode only. No voice. Only body and hand held applications.
- Release A has voice (VOIP) and data. Next year.
- Release B, scalable BW, combining carriers (future).
- Continuous transmission but power varies with time/usage.



WCDMA/UMTS

- FCC information document
- 5 MHz channels but modulation similar to CDMA-2000
- Similar spectral usage efficiency as CDMA-2000 reported
- HSDPA- high speed data mode coming but mostly for card devices. Some grants already.