



TCB COUNCIL WORKSHOP

RF EXPOSURE

PORTABLE, MODULE,

OTHER

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OVERVIEW

- **Review eqpt. auth. issues pending update as part of RF exposure (RFx) open proceeding (NPRM)**
- **Review TCB SAR thresholds**
- **Status of 5 GHz SAR procedures and SAR standards**
- **Review/update SAR test guidelines for laptop, PDA, smartphone**
- **Review RF exposure guidelines for modules**
- **Review co-located co-transmitting guidelines**

PROPOSED RFX RULES 8 SEP '03



- **General SAR threshold for 15.247 devices**
 - Proposed as 100mW max. peak output power* all freqs.
- **15.247 modules**
 - Proposed max. 100mW max. peak cond. output power
 - Shown to comply with FCC RFX guidelines
 - Demonstrate that additional hosts will comply
- **15.247 module added to laptop keyboard**
 - No SAR evaluation if max. peak P_{cond} or EIRP $\leq 10\text{mW}$
- **Combination of module(s) into host which has a Tx**
 - Sum up individual SAR values

*In 15.247(b) the term maximum peak output power refers to conducted power

TCB SAR REVIEW POWER THRESHOLDS



- **Continue to apply July02 TCB Excl. List and subsequent TCB training notes**
- **No change in thresholds at least until RFX open proceeding (NPRM) progresses further**
- **Tx Categ. I) a) along with footnote 4 means portable devices with power above low threshold need SAR evaluation for TCB approval**

³ In the following table, f_{GHz} is mid-band frequency in GHz, and d is the distance to a person's body, excluding hands, wrists, feet, and ankles.

Exposure category	<u>low threshold</u>	<u>high threshold</u>
general population	$(60/f_{\text{GHz}})$ mW, $d < 2.5$ cm $(120/f_{\text{GHz}})$ mW, $d \geq 2.5$ cm	$(900/f_{\text{GHz}})$ mW, $d < 20$ cm
occupational	$(375/f_{\text{GHz}})$ mW, $d < 2.5$ cm $(900/f_{\text{GHz}})$ mW, $d \geq 2.5$ cm	$(2250/f_{\text{GHz}})$ mW, $d < 20$ cm

- **Power is source-based time-averaged, conducted or radiated - whichever is higher**
- **For PTT with body-worn and face-held modes, d is distance from device case to a person's body; for modules with antennas inside laptops, d is distance from antenna to a person's body**

2.4 & 5 GHz Thresholds (non-2.1093)



- **FCC filings - FYI:**
 - 2.4 GHz
 - d<2.5cm may need SAR if P>50-100mW
 - d>2.5cm 100-200mW may apply depending on device
 - 5 GHz
 - 15.407 is routine eval. = thresholds not applicable
 - Apply 2.4 GHz bullet above for 15.407 devices that have 2.4 GHz 15.247
 - For 15.407 devices that have 15.247, SAR requested for 15.247 mode if P>50mW
 - 15.247 d<2.5cm P>50mW
- **TCB and FCC Thresholds under re-evaluation as part of RFX NPRM and FCC Lab research**

5 GHZ SAR FYI – FCC FILINGS ONLY



- **FCC LAB** doing research on liquids, scan procedures, etc.
- **FCC Lab** also continuing to monitor and await 5GHz recommendations from IEC working group (WG)
- **Issues for standardized procedures**
 - At least six different types of SAR systems in use,* each with different system validations, probe calibrations, etc.
 - As of Jan04 reports with SPEAG used interim larger diameter probe
 - New smaller-diameter probe available and recommended by SPEAG and under consideration in IEC WG
 - Indexsar post-processing under evaluation in IEC WG
 - Methods for other test systems may need adjustment pending IEC and FCC guidelines

* Univ. Utah, Aprel, Aprel/IDX, Ultratech, SPEAG, Indexsar



FYI SAR Test Standards - IEEE

- **IEEE Std 1528™-2003 for 0.3-3GHz held-to-ear devices - published Dec. 19, 2003**
- **SCC34/SC2/WG1 work continues on corrigendum (or amendment TBD)**
 - 30 deg. probe tilt; *tolerance if any on cube tilt*
 - Other editorial and technical clarifications TBD – 1st draft ready
- **SCC34/SC2/WG2 work continues on SAM phantom verification by numerical modeling**
 - Results will be presented at May 13-14 2004 SC2 meeting in Rockville MD
 - IEEE P1529 next draft still mostly dormant



FYI SAR Test Standards - IEC

- **IEC 62209-1 (approx. IEC version of IEEE 1528)**
 - Committee-draft-for-voting (CDV) closed 1/9/04
 - Subsequent stage is 2-month final-draft-int'l-std (FDIS) vote - therefore release expected no sooner than mid- to late-2004
- **Draft IEC 62209-2, 30MHz to 6GHz**
 - Procedures & positions for body-worn, laptop, co-transmitting, wireless PDA, PTT, wireless wrist-phone, etc.
 - Committee draft for IEC member-country comments - **target Mar04**
 - Final issues expected to be worked out at Feb 26-27 project team (PT) meeting

SAR for laptops, PDAs, smart-phones



- **When required by 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**
- **SAR test positions for tablet (notepad) PCs are same as used for laptops with antenna(s) in the keyboard section**
 - Except may also need evaluation of edge position for torso & forearm contact
- **Tilting of final-product/host not needed, e.g., to bring tip of PCMCIA card into contact with phantom, unless it is normal-use position**

SAR for laptops, PDAs, smart-phones



- **Laptops with antennas installed at least 20cm from the user in the lid-open position (e.g., at top of display section) operate in mobile exposure conditions - no SAR test**
- **For laptops with antennas in display section and with laptop lid closed, SAR tests for lap position not required, unless that is normal-use position**
 - When submitted by applicant's choice, SAR data for laptop-lid-closed in lap-held position or underarm position (like a book) is reviewed for compliance

SAR for laptops, PDAs, smart-phones



- **Wireless-PDA generally can be approved as hand-held-only **portable** (with respect to hand) device which operates at 20cm from the body (mobile exposure condition wrt body)**
 - When submitted by applicant's choice, wireless-PDA lap-held SAR data is reviewed for compliance
- **User instructions may be appropriate for wireless-PDA lap-held or in-pocket incidental transmitting conditions, or evaluate SAR by applicant's choice**

SAR for laptops, PDAs, smart-phones



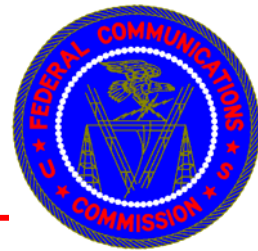
- **Suppl C body-worn test position and user instruction guidelines can be applied when body-worn accessories are intended and available for wireless-PDA**
- **Voice-over-WLAN mode for wireless-PDAs = new technology - contact FCC Lab**
 - may be able to handle like cordless phones, but duty factor TBD
- **For cellphones having neck-strap (lanyard) and headset jack, evaluate SAR in contact with flat phantom**

Device usage and SAR test positions



- For undefined or unclear device usage positions, when existing test positions are not applicable, applicants must declare/define product normal use positions and evaluate SAR accordingly
 - In general FCC filings should include SAR only for normal use positions, but data from incidental or secondary use conditions can be reported if properly justified
- SAR data for “side/bystander” 1.5cm position* of antenna-in-keyboard laptops **not required** (e.g., mini-PCI and similar, integral-antenna PCMCIA), unless that is normal-use position
 - However, applicants can provide such data if it is declared or defined as a normal-use position

* Sep02 Interpretations Database webpost



Modules for use in portable conditions

- **SAR data of module tested in one host product is generally applicable only for that product**
- **SAR test procedures for “stand-alone” modules are not defined and therefore are not applicable for compliance demonstration purposes (e.g., un-installed bare antenna tests for mini-PCI cards, “extender card” tests for integral-antenna-PCMCIA type cards)**
- **Module SAR issues under re-evaluation with NPRM and FCC Lab research**



Modules for use in portable conditions

- **“Portable modules” can be approved for use only in specific hosts, except for the following:**
 - Lower-power (below thresholds, no SAR test) “host-independent” modules
 - 3-host SAR testing* for PCMCIA cards and similar packages intended for use in multiple laptops and (lap-held) PDAs
 - 3-host tests requested for licensed-service devices Parts 22H, 24E, 90-SMR
 - 3-host tests requested for 15.247 with $P > 100$ mW and $f < 3$ GHz; no test if $P < 50$ mW; otherwise 1-host test
 - 3-host tests requested for 15.247 with $P > 50$ mW and $f > 3$ GHz; no test if $P < 25$ mW; otherwise 1-host test
 - 3-host tests requested for 15.407 (5 GHz) $P > 50$ mW; otherwise 1-host test (= 2.1093 routine evaluation)

* Sep02 Interpretations Database webpost



Tx Categ. II) h) – Part 15 module

- **July02 TCB Excl List Tx Categ. II) h) unlicensed modules used alone or with another transmitter**
 - without simultaneous transmission, and the output power of any transmitter is greater than 100 mW with operating frequency less than or equal to 3 GHz, or 50 mW with frequency greater than 3 GHz but less than or equal to 6 GHz
 - with simultaneous transmission, and the sum of the individual ratios of the output power divided by the low threshold is greater than one

Tx Categ. II) h) – Part 15 module (cont.)



- **II) h) derived from Apr02 TCB training notes which states “Clearly defined standalone independently operated” means limited modular approval for use in specific device types, e.g., notebook, PDA, etc., and no co-transmission**
 - OEM coordination/control or specific hosts are best strategies for non-standard packages
 - Grant note template given in Oct03 TCB training notes
 - Contact FCC Lab if case-by-case guidance needed



Card vs host-with-slot issues

- **SAR evaluations should be done when user-plug-in cards are intended and declared for use with a specific final-product, or when a final product declares use with specific cards having previous SAR data not applicable to new configuration**
- **For transmitter cards to be used in slot available on multiple smartphones & PDAs (SDIO, Memory-Stick, Compact-Flash, etc. card package)**
 - **New technology – contact FCC Lab**

Co-transmission within portable devices



- **For both portable and mobile conditions, when co-location is not evaluated in a filing, FCC and TCB approvals use a “no co-location” grant note for single module and single transmitter approvals**
 - This grant note is applied for both routine evaluation and categorically excluded devices
 - Subsequent transmitter and module combinations are handled as Class II permissive changes to add co-location with specific FCC ID(s), or with a new FCC ID for the combination
 - Grant notes also state that each co-located combination requires a separate evaluation



Co-transmission within portable devices

- **Co-located approvals are allowed only for specific combinations and configurations, i.e., based on relative positions and spacing of antennas in a specific host device**
- **Co-location is generally defined as simultaneously transmitting (co-transmitting or co-Tx) antennas within 20 cm of each other**



Co-transmission within portable devices

- **TCBs can approve co-located mobile devices, and the following co-located portable device configurations**
 - July02 TCB Excl List II) e)
 - Cellphone with Bluetooth $P < 5\text{mW}$
 - July02 TCB Excl List II) f):
 - Final product with multiple transmitters within same band when SAR evaluation is required (sum of powers above threshold), e.g., laptop with Bluetooth and 802.11g
 - July02 TCB Excl List II) h):
 - Low power modules and transmitters (sum of powers below threshold) – see Oct03 notes for example grant comments
 - When SAR evaluation is not required

Co-transmission test considerations



- **Typical SAR evaluation procedures for TCB approval**
 - Test SAR with dominant transmitter ON, other co-located transmitter OFF and identify configuration with highest SAR
 - Test with dominant transmitter and all relevant groups of co-located transmitters (one group at a time) ON using the configuration that produced the highest SAR for the dominant transmitter
 - Procedure is only applicable when dominant transmitter is always ON along with one or more of the co-located transmitters
 - otherwise TCB may not approve (submit to FCC)
- **Co-loc Co-Tx guidelines under evaluation in RFx NPRM**
 - Sum of SARs
 - IEC 62209 draft method
 - Refined IEC method in Motorola comments to RFx NPRM

CLASS II EXPOSURE CATEG. = FCC ONLY



- **July02 TCB Excl List Tx Categ I) b) – no C2pc by TCB for change in eqpt. usage exposure conditions**
 - No mobile to portable, no fixed to mobile, etc.
 - FCC Lab will consider such applications on case-by-case basis
- **Some issues**
 - What happens for devices already on market in use?
 - May be problems if equipment recall is ever needed
 - Need to establish reasons why different exposure conditions were not considered or declared in original filing
 - Mobile users manual and warning labels may be obsolete but may still be in distribution
 - Original grant should not prohibit exposure condition change



CUT&PASTE LINKS

- **ET Docket No. 03-137 RFX NPRM**
 - <http://frwebgate4.access.gpo.gov/cgi-bin/waisgate.cgi?WAISdocID=5158129135+8+1+0&WAISaction=retrieve>
 - http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-03-132A1.pdf
- **ET Docket No. 03-201 modular approval & smart antennas NPRM**
 - <http://frwebgate6.access.gpo.gov/cgi-bin/waisgate.cgi?WAISdocID=515944266015+8+1+0&WAISaction=retrieve>
 - http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-03-223A1.pdf
- **ET Docket No. 03-108 cognitive radio and rural WISP NPRM**
 - Fed Reg version not available as of 2/11/04
 - http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-03-322A1.pdf
- **Comments per docket**
 - http://gullfoss2.fcc.gov/prod/ecfs/comsrch_v2.cgi
- **Documents per docket**
 - Choose EDOCS Advanced Search at http://hraunfoss.fcc.gov/edocs_public/SilverStream/Pages/edocs.html



THE END

Questions ...?

Need clarifications ...?

Remember 2.962 (c)(4) and (f)(5)(i)
about interpretations, then if needed
ask FCC Lab EAB before you grant !!!