



RF Exposure

An Update...

15 October 2004

Martin Perrine

Federal Communications Commission

Office of Engineering and Technology

Laboratory Division/Equipment Authorization Branch



RF Exposure Interpretations



The New

The Old



and the

The Updates



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Asterisk "*" on slides denotes supplemental information given in the note pages



New--WMTS portables

- §2.1093 requires routine evaluation for Part 95 WMTS devices to demonstrate RF exposure compliance.
- WMTS device filings with power under 1 mW require a statement of compliance. Review of supporting information is not expected to be necessary, but information can be requested by FCC.

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- 1 mW based on sourced based time average power
- Applies both to TCB and FCC filings.



New— Mobile to Portable and Portable to Mobile

- TCBs may process Class II filings for the following specific situations*¹:
 - ➔ Add passive vehicle-mount antenna to held-to-head, body-worn and hand-held devices (TNE, PCE, PCT, TNT).²
 - ➔ Add additional specific hosts/antennas to devices approved with Limited Modular Approval.³

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All operational conditions should be addressed in the original filing for TCB purposes to the extent possible.

FYI - similar to April 2002 TCB training notes:

“a Class II Permissive Change should not be used to modify a grant of equipment authorization processed by a TCB under inappropriate or incorrect equipment categories or RF exposure scopes (different exposure limits and requirements may apply when operating configurations and exposure conditions are different)”

¹ Only situations described here can be processed by TCBs. Additional details may follow. TCBs shall not process filings for all other situations - for example, Class II to add SAR data to handheld-only (20cm to body) transmitting-PDA.

² For Part 22/24 (and other devices with radiated power on grant line-item) a new Form731 line-item with applicable/measured radiated power should be included. MPE evaluation should be provided if applicable (routine evaluation). Alternatively provide MPE calculation and corresponding radiated power limitations to meet the exclusion levels of 2.1091. Appropriate grant comments should be included, with clear distinction between mobile and portable applicability conditions.

³ Considered allowed examples:

- Add specific-host laptop with display-top antennas (mobile condition/20cm) to LMA3 for specific-host laptop with keyboard-antennas (portable condition/with SAR if applicable).
- Add specific-host laptop or PDA (portable condition/with SAR if applicable) to LMA for access point or laptop (mobile condition/20cm).



Device Class

- Handheld and lap held devices are PCB or TNB
- Devices with body worn accessories are PCT or TNT
- Devices held at the ear are PCE/TNE
- Use the more “distinctive” class if a device has multiple use positions*

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(e.g. A cell phone which can be used at the ear or worn on the belt is TNE not TNT)



User Instructions and Grant Comments

- Information on test configurations, calculation assumptions, grant comments, other EAS exhibits and user instructions should be consistent.
- User instructions should assure compliant operation of the device and address relevant issues.
 - ➔ Collocation with other transmitters.
 - ➔ Definition of host devices for modular transmitters.
 - ➔ Body worn accessory information.
 - ➔ Minimal MPE distance, and installation and antenna requirements.
 - ➔ Occupational training.
 - ➔ PTT usage duty factor including VOX and data operations.*



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SAR Values in Grant Comment

- Recommended formats for PCE/TNE devices; two examples.

- ➔ Single band

*Highest reported SAR values are AMPS (Pt 22)-
head: 1.33 W/kg; body: 0.79 W/kg.*

- ➔ Dual band

*The highest reported SAR values are: CDMA 800
(Part 22) – head 0.09 W/kg; body 0.75 W/kg;
CDMA PCS (Part 24) – head 0.12 W/kg; body
1.41 W/kg.*

- State highest head and body value for each band of operation.



Face versus Ear SAR



- When held-to-ear is worse case configuration held-to-face results do not need to be reported for TNE/PCE.*
- When held-to-ear mode is applicable, PTTs need evaluation.
- Grant notes should list SAR as “head” not “face”. Add the following if desired, “SAR was evaluated for held-to-ear and held-to-face operating modes”

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Typically held to ear is thought to be the worse case position however devices with either higher power in the held to face mode or unusual antenna configurations may require additional testing.



Duty Factor and GSM

- Test with maximum average power for both body-worn and head positions.*
 - ➔ Typically use only GSM (1 time slot) mode when testing at ear unless
 - ➔ If GPRS Class A capable (allows simultaneous voice and data)—use GPRS
- GPRS capabilities of the device should be clearly stated in the filing. Please include the two GPRS classes (e.g. class 10 and class A).
- Apply this concept when evaluating non GSM devices with duty factors.
- Duty factor need not be included on the grant comment when clear or standard protocol is used.*

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Source based time average power.

Duty factor should be included on the grant when it is unclear what duty cycle was used for testing or a nonstandard protocol was used.



Next to Body Use

- Devices with Neck worn lanyards or that are intended to be next to the body should be tested with 0 gap and body tissue liquid. *

- Check user manual for references to such use conditions.

- An eyelet on the device does not necessitate use of neck lanyards. Instructions to the user should be considered.

User Manual Extract

...2. ACCESSORIES

- Ni-MH Battery Pack
- 120VAC Wall Charger for CD-26
- CLIP-14 Belt Clip with screw
- Lanyard
- Owner's Manual.....

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A small gap (2 mm) can be used to simulate clothing.

Test both front and back of a device.



3-host SAR Policy

We clarify that TCBs are required to apply the exclusion list “low threshold” to determine when a SAR test is required.

To Test or not to...



The “no test” threshold mentioned in the IDB RFx Procedure post for *modules/3 host* is for FCC filings only.*

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IDB URL: (<https://gulfoss2.fcc.gov/prod/oet/cf/ri/FccEasRi.cfm>)

web version:

(http://hraunfoss.fcc.gov/eas_public/SilverStream/Pages/pg_html_fts_res.html?letter=1371)

pdf version:

(http://hraunfoss.fcc.gov/eas_public/LSI_GET/60)

IDB RFx Post item 4) b) i) (2):

“3-host tests are requested for 15.247 devices operating at frequencies ≤ 3 GHz and with output power > 100 mW; no test is requested when output < 50 mW; otherwise test in one host”

Should be understood to mean:

*3-host tests are requested for 15.247 devices operating at frequencies ≤ 3 GHz and with output power > 100 mW; no test is requested **for FCC filings** when output < 50 mW **and for TCB filings per 3) a) ii)**; otherwise test in one host*

IDB RFx Post item 4) b) i) (3):

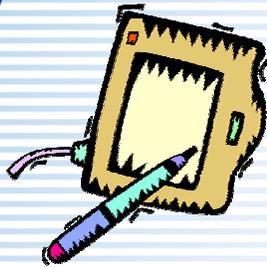
3-host tests are requested for 15.247 devices operating at frequencies > 3 GHz and with output power > 50 mW; no test is requested if output < 25 mW; otherwise test in one host.

Should be interpreted to mean:

3-host tests are requested for 15.247 devices operating at frequencies > 3 GHz and with output power > 50 mW; no test is requested **for FCC filings** if output < 25 mW otherwise test in one host. **TCBs can process these filings only if the device is below the exclusion list low threshold per 3) a) ii) and no SAR review is performed.**



Tablet Devices



- Tablet device screen sizes range 8-14” and weights range 2-8 lbs
- In general consumer tablet PCs are expected to have lap-held use position*
- Smaller devices may qualify for handheld-only operations, but filing must include strong justification for such – contact FCC for guidance if needed*

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In general consumer tablet PCs are expected to have lap-held use position per [IDB RfX 7) d) ii)]

Smaller devices may qualify for handheld-only operations, but filing must include strong justification for such – contact FCC for guidance if needed

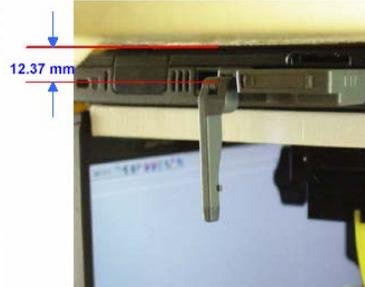
IDB RfX 7) a) For undefined or unclear device usage positions, where existing or standardized test procedures are not applicable, SAR should be evaluated according to the normal operating configurations which are intended for the device



Setup Documentation

● Key test setup details affecting SAR should be provided

- Belt clip and air gap thickness.
- PCMCIA card distance to phantom for laptop and PDA testing.
- P1528 device reference lines for held to ear testing.



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LAN Transmitters 802.11

- **SAR testing should be tested according to the operating configurations of the device.**
- **Devices have multiple transmission and data modes.**
- **Justify that the modes selected for testing cover the RF exposure for all transmission modes.**
- **The report should fully document the test configurations that support compliance. ***

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Include

--a comparison of device test modes/configurations to actual operational modes/configurations.

--test positions

transmitter, host and phantom positions

--test configurations

data rates, data modes, channels, output levels

--SAR distribution plots

identify peaks for antennas tested



LAN Transmitters 802.11

- **Device test configurations to address include.**
 - **test mode software configuration**
 - data modes
 - data rates (modulation)
 - frame rate/duty factor
 - **production unit operating parameters***
 - output power across frequency bands and channels
 - **Multiple antenna and diversity***

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* Low, Middle and High channels may not catch the maximum power.

* Which antenna were transmitting . Are all antennas measured?



SAR Testing

- Supplement C recommends that phantom should be twice the size in critical dimensions of the DUT.



- For laptops the DUT is generally considered the transmitting module and/or antenna.



Update--NPRM FCC 03-132

“Proposed Changes in the Commission's Rules Regarding Human Exposure to Radiofrequency Electromagnetic Fields”

Comment deadline is closed and R&O is being written.

NPRM and filed comments are online.

* Related WEB URLs

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http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-03-132A1.doc

http://gullfoss2.fcc.gov/prod/ecfs/comsrch_v2.cgi



Update—Routine Evaluation Devices

- Mobile and Portable devices defined under 2.1091 and 2.1093
 - Part 22, subpart H - Cellular Radiotelephone Service
 - Part 24 - Personal Communications Services (PCS)
 - Part 25 - Satellite Communications Services
 - General Wireless Communications Service 4.6 GHz (old Part 26 removed)
 - Part 27 - Wireless Communications Service-- all bands 0.7, 1.4, 1.6 and 2.3 GHz.
 - Part 80 - Maritime Services (ship earth stations only)
 - Part 90 - Specialized Mobile Radio Service, and 4.9 GHz 90.1217
 - Part 15 - UPCS, UNII (new 5.4 GHz band), mm-wave devices (§§ 15.319(i), 15.407(f), 15.253(f) and 15.255(g))

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Update—SAR for Simultaneous Transmission

- **Recent email clarification given for multiple higher powered devices***

“...use of spatial distribution summation techniques...”

- 1 gm SAR is calculated from a volume array created by point by point summation of local SAR values from matching volume scans taken for each transmitter

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- on/off method is allowed if secondary transmitter is very low powered.

- *Email sent*

“Until test procedures are further standardized, the FCC will consider use of spatial distribution summation techniques to determine collocated SAR. This assumes device responses are linear. It is understood that such summation routines are implemented in commercial SAR systems. “



Update-5-6 GHz SAR Measurements

- TCB procedures are being developed
- Areas of investigation
 - ➔ Tissue simulating liquid
 - ➔ Field probe
 - ➔ Area scan
 - ➔ Zoom scan
 - ➔ Interpolation & extrapolation
 - ➔ Effects on final 1 gm SAR

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In Summary



- Introduced two new policies to provide considerable relaxation to the current TCB procedures.



- Reviewed recurring issues to improve filings and reduce follow-on issues.



- Provided an update of key RF safety items.

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