Review of Selected Concepts from RF Exposure Basic KDB Publications

NOTE: This version inserts clarifications subsequent to 10/07/2008 FCC-TCB conference

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Overview

- Review of multi-transmitter evaluation criteria and application per KDBs 447498, 616217, and 64874
- Discuss selected items from KDB 447498
  - USB-dongle transmitters
  - VHF PTT portable devices
- Discuss existing and prospective approaches for grant conditions and grant remarks
- Minor clarifications identified for RF exposure KDBs if any can be candidates for roundtable discussions

KDB 447498 *FCC Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies*
KDB 616217 *SAR Evaluation Considerations for Laptop Computers with Antennas Built-in on Display Screens*
KDB 648474 *SAR Evaluation Considerations for Handsets with Multiple Transmitters and Antennas*

Overview RF exposure KDBs

- KDB 447498
  - Items 1) & 2): generic equipment authorization provisions for transmitter and module devices
    - General SAR test thresholds and conditions
    - Conditions for module-like and module devices that do not allow simultaneous-transmit operation
  - Item 3): generic provisions for simultaneous transmit SAR for multi-transmitter (multi-Tx) product configurations not covered by e.g. KDBs 616217 or 648474
  - Item 4): SAR test configurations and conditions for laptops, tablets, body-worn, and hand-held devices
  - Items 5) & 8): PTT and occup. limits, respectively
  - Items 6) & 7): single & multi-Tx mobile devices
- KDB 616217 multi-transmitter laptop – test reductions defined based on frequency-power-distance criteria
- KDB 648474 multi-transmitter handset – extend test reduction concepts to consider SAR distributions

NOTE Other RF exposure key KDB pubs. are listed for reference at end of this presentation.

KDB 616217 laptop criteria

	Antenna output power (mW)	
	$P_i \le P_{th}$	$P_i > P_{th}$
SAR for each individual transmitter or antenna i, {any r_i < 20 cm}	not required (i.e., $SAR_i := 0$ in $\Sigma_{all}\ SAR_{1g}$)	{$r_i \ge R_i$} test highest output channel only {$r_i < R_i$} test according to normal procedures
Simultaneous-transmit SAR for each antenna $i = x$ paired with each y_j, {r_x < 20 cm & any r_y} NOTE: {$\Sigma_{all}\ SAR_{1g}$} can be applied if all {$r_{i,j}$ < 20 cm}	not required: for each {$d_{xy} \ge 5$ cm} or {$r_x \ge 5$ cm}; or {$d_{xy} \ge 5$ cm} & {$\Sigma_{all}\ SAR_{1g} < 1.6$ W/kg}	not required: for each {$d_{xy} \ge D_{xy}$} & {$r_x \ge R_x$}; or {$d_{xy} \ge 5$ cm} & {$r_x \ge 5$ cm} & {$\Sigma_{all}\ SAR_{1g} < 1.6$ W/kg}
	Else, test antenna(s) using highest SAR configuration from each individual transmitter or antenna; TCB Exclusion List applies	

n = frequency-power parameter, R = frequency-power-distance parameter for r, D_{xy} = frequency-power-distance parameter for d_{xy}, r_i = antenna-to-user spacing for each antenna i, d_{xy} = antenna-to-antenna spacing for pair (x, y), all above distances are in units of cm	$P_{th} = 60/f_{(GHz)}$ mW, $n_i = (\{P_i / [60/f_{(GHz)}]\} - 1)$, $R_i = [5 + \text{round}(0.5n_i)]$, $D_{xy} = [5 + \text{round}(0.5n_x) + \text{round}(0.5n_y)]$, round to nearest integer, := is a symbol meaning “defined to be”

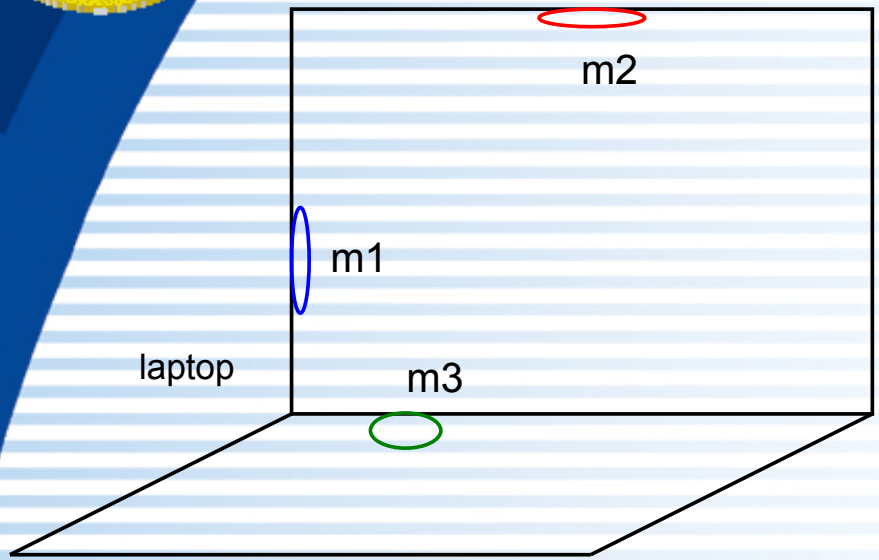
NOTE Tables are paraphrased from text and Table 2 of KDB 616217.

KDB 616217 laptop practice

Example tabulation format: laptop host containing 3 simultaneous-transmit devices

- Create a 1st table with:
  - 1 header row, and 1 row each for one transmit frequency and one mode of each device (4 rows total)
  - 1 column for descriptor, 5 columns for {P_i, n_i, r_i, R_i, SAR_i}, and 1 column for remarks (6 columns total)
- Insert device and host parameters P_i, r_i
- Calculate and tabulate n_i, R_i
- Using criteria, tabulate stand-alone SAR requirements
- Create a 2nd table with:
  - 1 header row, and 1 row for each (x, y) antenna pair (4 rows total)
  - 1 column for descriptor, 3 columns for {d_{xy}, D_{xy}, SAR_{xy}} and 1 column for remarks (5 columns total)
- Insert device and host parameters d_{xy}
- Calculate and tabulate D_{xy}
- Using criteria, tabulate simultaneous-Tx SAR requirements
- Repeat above for each frequency and mode of each device

KDB 616217 laptop example 1



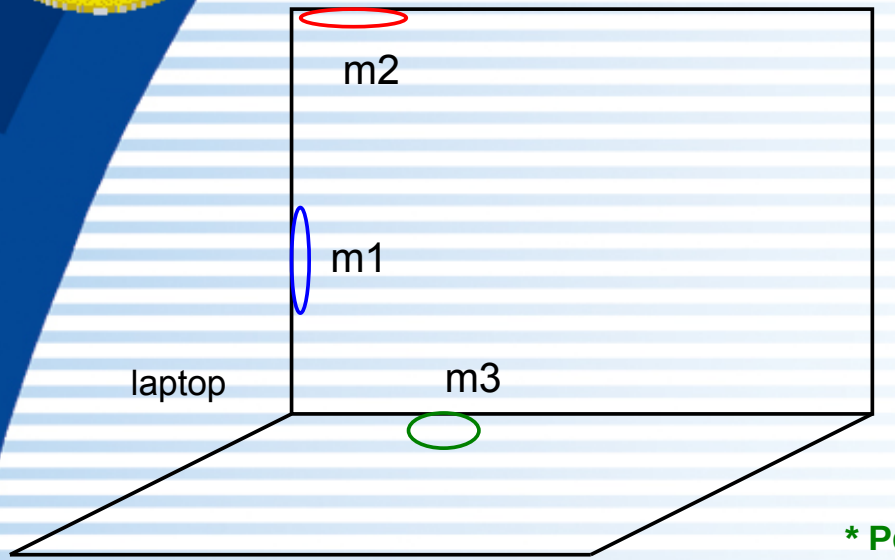
(*x*, *y*)	d_{xy}, cm	D_{xy}, cm	sim-Tx SAR	remarks
(1, 2)	23	10	N	$\{P_1 > P_{th}\}$ $\{d_{12} \geq D_{12}\}$ $\{r_1 \geq R_1\}$ $\{r_2 \geq R_1\}$
(1, 3)	10	9	N	$\{P_1 > P_{th}\}$ $\{d_{13} \geq 5$ cm$\}$
(2, 3)	26	6	N	$\{d_{23} \geq D_{23}\}$

device, mode, *f*	*P*, mW	*n*, cm	*r*, cm	*R*, cm	single SAR	remarks
m1, CDMA, 1900	255	7.075	10	9	1 ch.	$\{P_1 > P_{th}\}$ $\{r_1 \geq R_1\}$
m2, 802.11g, 2450	50	1.042	≥ 20	n/a	n/a	mobile
m3, Bluetooth, 2410	3	n/a	1.5	n/a	N	$\{P_3 \leq P_{th}\}$ $\{r_3 < 5$ cm$\}$

NOTE This configuration is as shown in Oct. 2007 Chan presentation.

n/a = not applicable

KDB 616217 laptop example 2



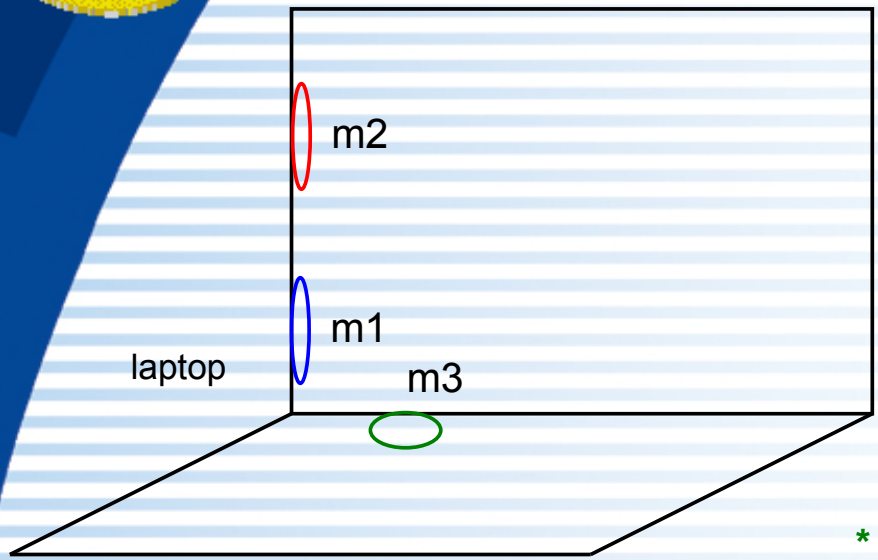
(*x*, *y*)	d_{xy}, cm	D_{xy}, cm	sim-Tx SAR	remarks
(1, 2)	9	10	Y *	$\{P_1 > P_{th}\}$ $\{d_{12} < D_{12}\}$
(1, 3)	11	9	N	$\{P_1 > P_{th}\}$ $\{d_{13} \geq 5$ cm$\}$
(2, 3)	24	6	N	$\{d_{23} \geq D_{23}\}$

*** Per KDB 616217 text, contact FCC Lab about measurement method**

device, mode, *f*	*P*, mW	*n*, cm	*r*, cm	*R*, cm	single SAR	remarks
m1, CDMA, 1900	255	7.075	10	9	1 ch.	$\{P_1 > P_{th}\}$ $\{r_1 \geq R_1\}$
m2, 802.11g, 2450	50	1.042	≥ 20	n/a	n/a	mobile
m3, Bluetooth, 2410	3	n/a	1.5	n/a	N	$\{P_3 \leq P_{th}\}$ $\{r_3 < 5$ cm$\}$

n/a = not applicable

KDB 616217 laptop example 3



(*x*, *y*)	d_{xy}, cm	D_{xy}, cm	sim-Tx SAR	remarks
(1, 2)	7	10	Y *	$\{P_1 > P_{th}\}$ $\{d_{12} < D_{12}\}$
(1, 3)	6	9	N	$\{P_1 > P_{th}\}$ $\{d_{13} \geq 5$ cm$\}$
(2, 3)	20	6	N	$\{d_{23} \geq D_{23}\}$

*** Σ_{all} SAR_{1g} can be applied**

device, mode, *f*	*P*, mW	*n*, cm	*r*, cm	*R*, cm	single SAR	Remarks
m1, CDMA, 1900	255	7.075	5	9	full	$\{P_1 > P_{th}\}$ $\{r_1 < R_1\}$
m2, 802.11g, 2450	50	1.042	17	6	1 ch.	$\{P_2 > P_{th}\}$ $\{r_2 \geq R_2\}$
m3, Bluetooth, 2410	3	n/a	1.5	n/a	N	$\{P_3 \leq P_{th}\}$ $\{r_3 < 5$ cm$\}$

n/a = not applicable

KDB 616217 laptop filings

- Filings shall address:
  - End-use configurations allowed or subject to additional certification in accordance laptop RF exposure procedures
  - OEM installation and user operating requirements to implement laptop procedures
  - End-use configurations allowed or subject to additional certification per EMC/radio grant conditions and operating and installation requirements for all transmitters in a laptop, e.g., Part 15 modular, EMC, or mobile operating requirements
  - Two-way authentication for user-installable modules for use with antennas pre-installed into hosts
- Permissive change (i.e., C2pc) considerations:
  - Configurations leading to SAR evaluation are subject to C2pc or new certification, per criteria of KBD 616217 and KDB 4474987
  - Apply also KDB 178919 for all end-use and host configurations
  - Transmitters and modules approved prior to KDB 616217 may be used in laptops without additional certification when SAR test not required

KDB 616217 laptop filings

- For configuration of laptop example 1:
  - scenario 1: three single-module FCCIDs operated or marketed together within host
    - each with mobile-device grant remarks, and with or without no-colloc. grant remarks
    - C2pc to register SAR and collocation configuration for minimum one FCCID, e.g., m1
    - single C2pc has associated-equipment FCCIDs listed, e.g., Form 731 and/or cover letter exhibit
  - scenario 2: same as Case 1, except in place of m3 use a different WPAN (i.e., “m4”)
    - same location in host product, and $P_{m4} \leq P_{m3}$
    - C2pc not needed for m1, m2, m4

KDB 648474 cellphone criteria I)

	I) Individual Transmitter (stand-alone)
Licensed Transmitters	a) Routine evaluation required (Fig1)
Unlicensed Transmitters	b) When there is no simultaneous transmission 1) {$P \le 60/f$} SAR not required (Fig2 path7) 2) {$P > 60/f$} stand-alone SAR required (Fig2 path8) c) When there is simultaneous transmission 1) Stand-alone SAR not required (i.e., $SAR_x := 0$) when i) {$P_x \le 2P_{Ref}$} and {$d_{xy} \ge 5$ cm} (Fig2 path6), or ii) {$P_x \le P_{Ref}$} and {$d_{xy} \ge 2.5$ cm} (Fig2 path1), or iii) {$P_x \le P_{Ref}$} and {$d_{xy} < 2.5$ cm}, with each {$P_y \le P_{Ref}$} or {$SAR_y < 1.2$ W/kg} (Fig2 path3) 2) Otherwise stand-alone SAR is required (Fig2 path2, path4, path5)

f, GHz	2.45	5.15-5.35	5.47-5.85
P_{Ref}, mW	12	6	5

NOTE 1 Tables are paraphrased from text and Tables 1 & 2 of KDB 648474.
NOTE 2 A symbol meaning “defined to be” is given by :=
NOTE 3 Figure numbers are as in KDB 648474 or repeated herein; path numbers are for figures herein.

KDB 648474 cellphone criteria II)

	II) Simultaneous Transmission
Licensed Transmitters, Unlicensed Transmitters	a) SAR not required when: 1) Unlicensed only i) {stand-alone SAR not required} and {$d_{xi} \geq 5$ cm} (Fig2 path6) ii) {stand-alone SAR not required} and {$P_x \leq P_{Ref}$} and {$d_{xi} < 2.5$ cm}, with each {$P_i \leq P_{Ref}$} or {$SAR_i < 1.2$ W/kg} (Fig2 path3) 2) Licensed & Unlicensed i) {$\Sigma_{all}\ SAR_{1g} < 1.6$ W/kg} for all simultaneous-transmit antennas *i* (Fig4 path1), or ii) {$SPLSR_{xy} < 0.3$} for all simultaneous-transmit pairs (*x*, *y*) (Fig4 path2) b) SAR required (Licensed & Unlicensed): 1) each antenna pair (*x*, *y*) with {$SPLSR_{xy} \geq 0.3$} (Fig4 path3) 2) test required only for each configuration which had highest stand-alone SAR for each wireless mode and exposure condition (i.e. head, body) 3) TCB Exclusion List applies (KDB 628591)

$SPLSR_{xy}$ = SAR-to-(peak-locations spacing) ratio = $(SAR_x+SAR_y)/L_{xy}$	L_{xy} = peak-locations spacing, cm

NOTE Table paraphrased from text and Table 2 of KDB 648474.

KDB 648474 cellphone criteria

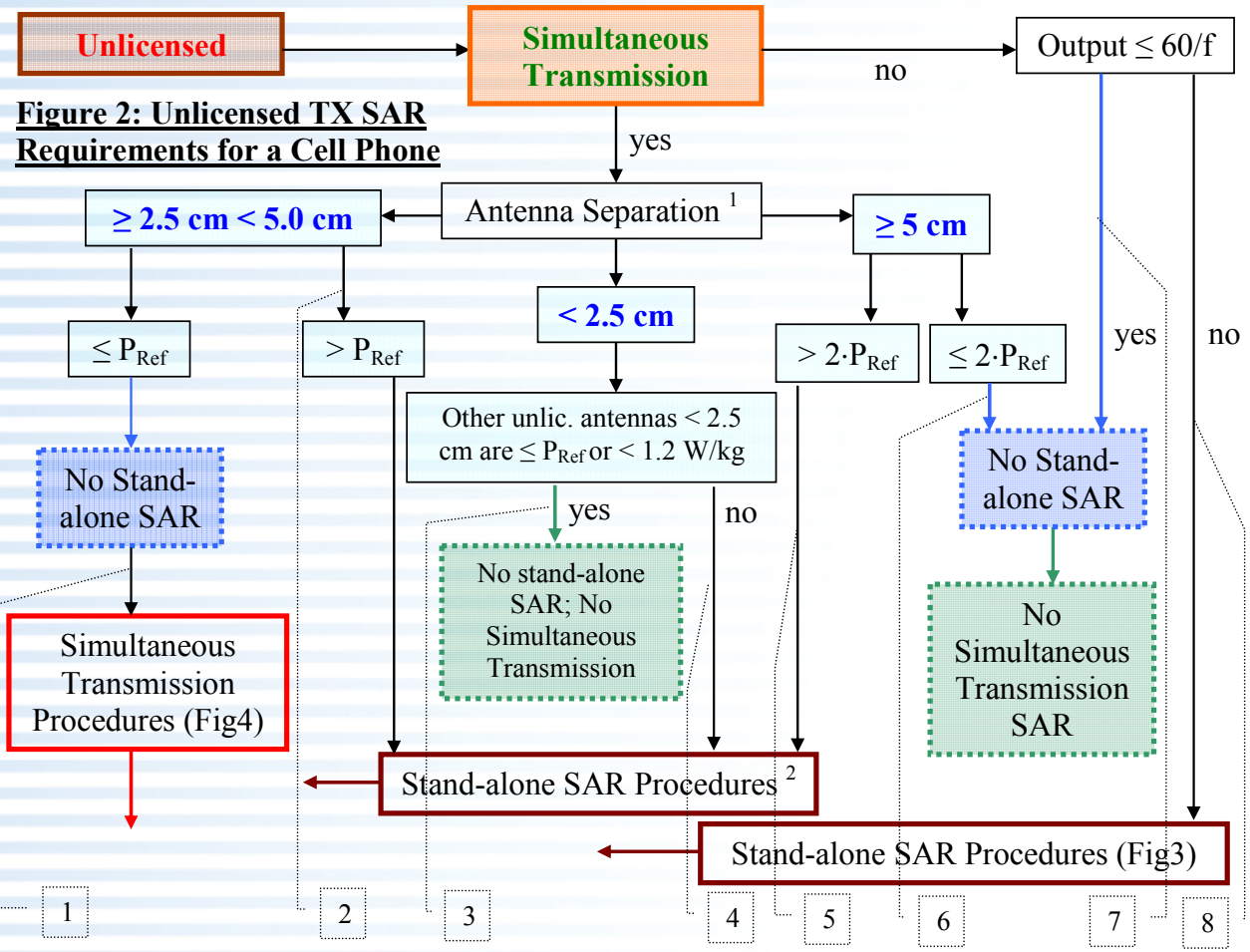


Figure 2: Unlicensed TX SAR Requirements for a Cell Phone

1: sim-Tx, 2.5cm≤dxy<5cm, P≤Pref, no stand-alone SAR, GOTO sim-Tx SAR Fig4

2: sim-Tx, 2.5cm ≤ dxy<5cm, P>Pref, GOTO stand-alone SAR Fig3

3: sim-Tx, dxy<2.5cm, each y at dxy<2.5cm has P≤Pref or SAR<1.2W/kg, no sim-Tx SAR

4: sim-Tx, dxy<2.5cm, each y at dxy<2.5cm has P>Pref or SAR≥1.2W/kg, GOTO stand-alone SAR Fig3

5: sim-Tx, dxy≥ 5cm, P>2Pref, GOTO stand-alone SAR Fig3

6: sim-Tx, dxy≥ 5cm, P≤2Pref, no stand-alone SAR, no sim-Tx SAR

7: no sim-Tx, P≤60/f, no stand-alone SAR, no sim-Tx SAR

8: no sim-Tx, P>60/f, GOTO stand-alone SAR Fig3

KDB 648474 cellphone criteria

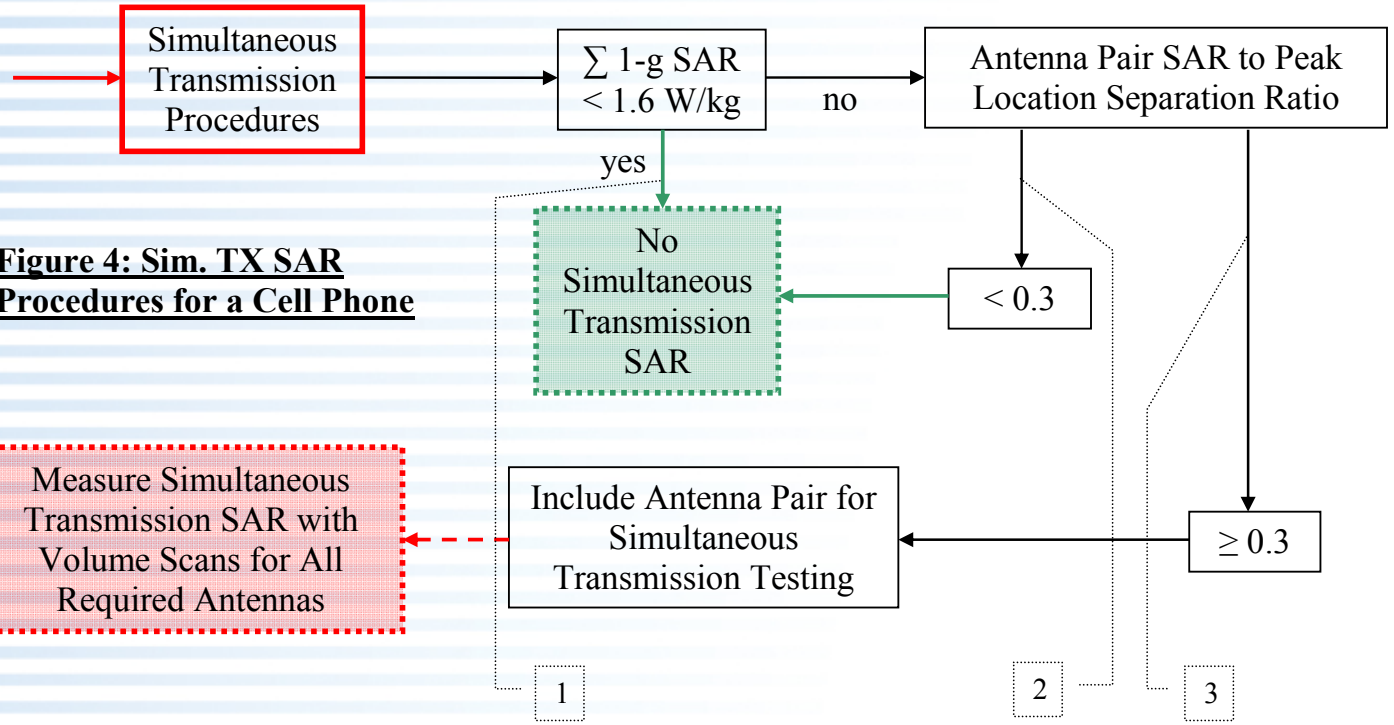


Figure 4: Sim. TX SAR Procedures for a Cell Phone

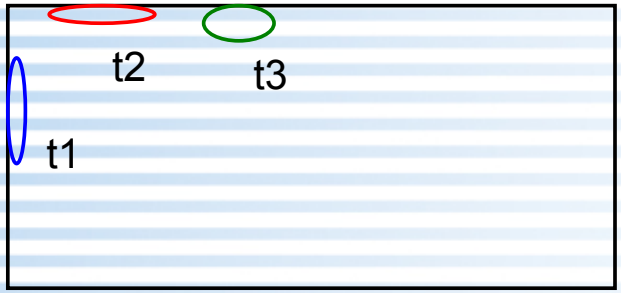
1: sim-Tx, sum-SAR<1.6W/kg, no sim-Tx SAR
2: sim-Tx, sum-SAR≥1.6W/kg, SPLSRxy<0.3, no sim-Tx SAR
3: sim-Tx, sum-SAR≥1.6W/kg, SPLSRxy≥0.3, DO sim-Tx SAR

KDB 648474 cellphone practice

Example tabulation format: cellphone containing 3 simultaneous-transmit devices

- Create a 1st table with:
  - 1 header row, 1 row each for one transmit frequency and one mode of each device (4 rows total), and 1 row for $\sum SAR_i$
  - 1 column for descriptor, 2 columns for $\{P_i, SAR_i\}$, and 1 column for remarks (4 columns total)
- Insert device parameters P_i
- Based on criteria, tabulate stand-alone SAR
- Create a 2nd table with:
  - 1 header row, and 1 row for each (x, y) antenna pair (4 rows total)
  - 1 column for descriptor, 3 columns for $\{d_{xy}, L_{xy}, SPLSR_{xy}\}$ and 1 column for remarks (5 columns total)
- Insert device parameters d_{xy}
- Based on criteria, tabulate L_{xy}, $SPLSR_{xy}$, and simultaneous-Tx SAR requirements
- Repeat above for each frequency, mode, head & body configurations of the cellphone

KDB 648474 cellphone example 1



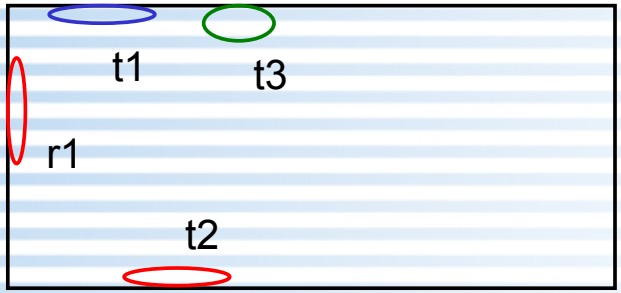
cellphone handset

device, mode, *f*	*P*, mW	single SAR, W/kg	remarks
t1, CDMA, 800	252	1.2	routine eval.
t2, 802.11b, 2450	50	0.3	{d_{12} < 2.5 cm} {$P_1 > P_{Ref}$} {$SAR_1 \geq 1.2$ W/kg} {d_{23} < 2.5 cm} {$P_3 \leq P_{Ref}$}
t3, Bluetooth, 2410	6	:= 0	{d_{23} < 2.5 cm} {$P_3 \leq P_{Ref}$} {$P_2 > P_{Ref}$} {SAR_2 < 1.2 W/kg}
$\sum_{all} SAR_{1g}$		1.5	

(*x*, *y*)	d_{xy}, cm	L_{xy}, cm	$SPLSR_{xy}$	sim-Tx SAR	remarks
(1, 2)	2	3	0.5	N	{$\sum_{all} SAR_{1g} < 1.6$ W/kg} {$SPLSR_{xy} \geq 0.3$}
(1, 3)	4.5	n/a	n/a	N	{no stand-alone}
(2, 3)	2	n/a	n/a	N	{no stand-alone} {$P_2 > P_{Ref}$} {SAR_2 < 1.2 W/kg}

NOTE This is similar to Mar. 2008 FCC-TCB call minutes, modified per subsequent KDB 648474 updates.

KDB 648474 cellphone example 2



cellphone handset

r1 = receive only

device, mode, *f*	*P*, mW	single SAR, W/kg	remarks
t1, CDMA, 800	252	1.2	routine eval.
t2, 802.11b, 2450	50	0.3	$\{d_{12} \geq 5$ cm$\}$ $\{P_2 > 2P_{Ref}\}$ $\{d_{23} \geq 5$ cm$\}$
t3, Bluetooth, 2410	6	0.05	$\{d_{13} < 2.5$ cm$\}$ $\{P_1 > P_{Ref}\}$ $\{SAR_1 \geq 1.2$ W/kg$\}$
$\sum_{all} SAR_{1g}$		1.55	

(*x*, *y*)	d_{xy}, cm	L_{xy}, cm	$SPLSR_{xy}$	sim-Tx SAR	remarks
(1, 2)	7	6	0.25	N	$\{SPLSR_{xy} < 0.3\}$
(1, 3)	2	3	0.42	Y	$\{\sum_{all} SAR_{1g} < 1.6$ W/kg$\}$ $\{SPLSR_{xy} \geq 0.3\}$
(2, 3)	7	7	0.05	N	$\{SPLSR_{xy} < 0.3\}$

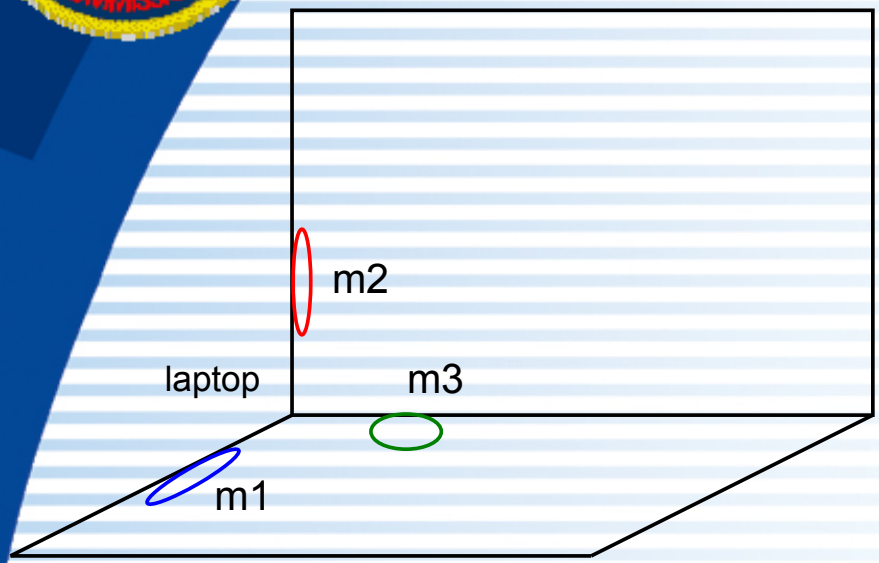
NOTE This is similar to Mar. 2008 FCC-TCB call minutes, modified per subsequent KDB 648474 updates.

KDB 447498 generic portable criteria

- Simultaneous-transmit SAR is not required for devices and/or antennas located
  - {r < 5 cm} and
    - {d_{xy} ≥ 5 cm} for all simultaneous-transmit antennas within the host or device, and
    - {$\sum_{all}$ SAR_{1g} < 1.6 W/kg} for all simultaneous-transmit antennas with {stand-alone SAR evaluation required}; or {$SPLSR_{xy}$ < 0.3} for all simultaneous-transmit antennas, and
    - {$P \leq 60/f_{(GHz)}$ mW} for any simultaneous-transmit antenna(s) with {stand-alone SAR evaluation not required}
    - Contact FCC Laboratory in case of other configurations
  - {r ≥ 5 cm} contact FCC Laboratory concerning whether e.g. KDB 616217 may be adapted

d_{xy} = antenna-to-antenna spacing for pair (x, y)
r = antenna-to-user spacing
$SPLSR_{xy}$ = SAR-to-(peak-locations spacing) ratio

KDB 447498 generic example 1

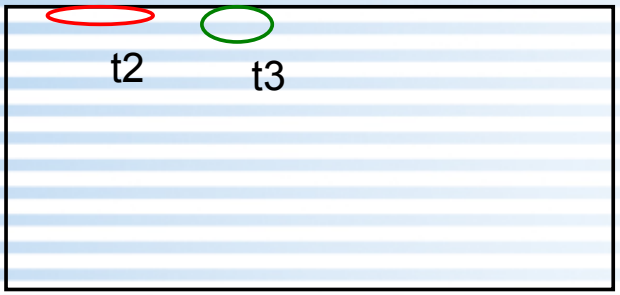


(*x*, *y*)	d_{xy}, cm	L_{xy}, cm	$SPLSR_{xy}$	sim-Tx SAR	Remarks
(1, 2)	12	7	0.16	N	$\{\sum_{all} SAR_{1g} < 1.6$ W/g$\}$ $\{SPLSR_{xy} < 0.3\}$
(1, 3)	11	n/a	n/a	n/a	$\{P_3 \le P_{th}\}$ $\{d_{13} \ge 5$ cm$\}$
(2, 3)	9	n/a	n/a	n/a	$\{d_{23} \ge 5$ cm$\}$

device, mode, *f*	*P*, mW	*n*, cm	*r*, cm	*R*, cm	single SAR, W/kg	Remarks
m1, CDMA, 1900	255	n/a	1.5	n/a	1	$\{r_1 < 5$ cm$\}$
m2, 802.11g, 2450	50	1.042	5	6	0.1	$\{P_2 > P_{th}\}$ $\{r_2 \ge R_2\}$
m3, Bluetooth, 2410	3	n/a	1.5	n/a	:= 0	$\{P_3 \le P_{th}\}$ $\{r_3 < 5$ cm$\}$
				$\sum_{all} SAR_{1g}$	1.1	$\{d_{xy} \ge 5$ cm$\}$

n/a = not applicable

KDB 447498 generic example 2



cordless / VoIP handset

device, mode, *f*	*P*, mW	single SAR, W/kg	remarks
t2, 802.11b, 2450	50	0.8	$\{d_{23} < 2.5$ cm$\}$ $\{P_2 > P_{th}\}$ $\{P_2 > P_{Ref}\}$
t3, Bluetooth, 2410	6	:= 0	$\{d_{23} < 2.5$ cm$\}$ $\{SAR_2 < 1.2$ W/kg$\}$ $\{P_2 > P_{Ref}\}$ $\{P_3 \leq P_{Ref}\}$
$\sum_{all} SAR_{1g}$		0.8	

(*x*, *y*)	d_{xy}, cm	L_{xy}, cm	$SPLSR_{xy}$	sim-Tx SAR	remarks
(2, 3)	2	3	0.27	N	$\{\sum_{all} SAR_{1g}\}$ $\{SPLSR_{xy} < 0.3\}$

NOTE KDB 616217 applies only for multi-transmitter handsets containing one or more of 22H, 24E, 27L, 90 SMR; per KDB 447498 please contact FCC Lab concerning evaluation procedures for other devices.

KDB 447498 mobile multi-Tx

- Transmitters and modules can be incorporated in mobile host products without further testing or certification when:
  - Already certified for use in mobile or portable exposure conditions, and
  - Categorically excluded by 2.1091(c), and
  - The closest separation among all simultaneous-transmit antennas is ≥ 20 cm, or
  - For the multiple antennas incorporated within the host, antenna separation distance and MPE compliance-boundary requirements are specified in an application filing for at least one of the certified transmitters incorporated within the host product

KDB 447498 mobile multi-Tx

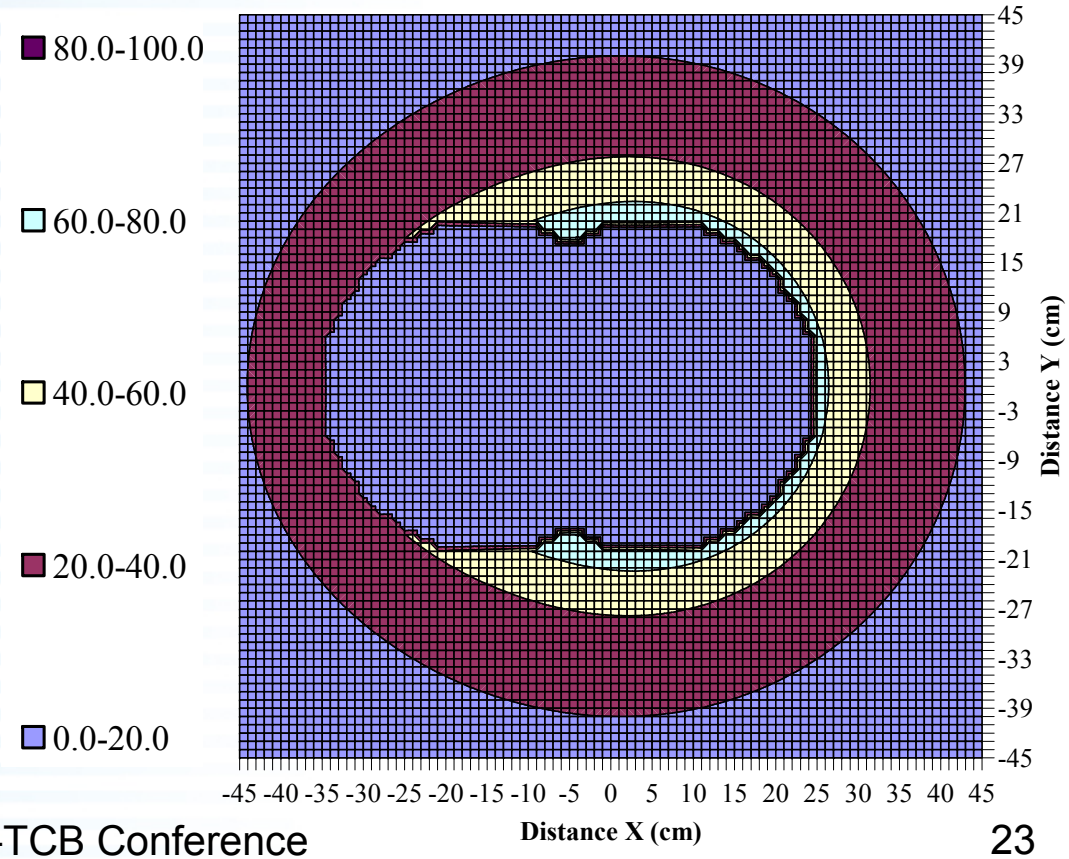
- In addition, when transmitters certified for portable use are incorporated in a mobile host device the antenna(s) must be ≥ 5 cm from all other simultaneous-transmit antennas
- All antennas must be at least 20 cm from users and nearby persons, per mobile device requirement
- Spreadsheet for multi-transmitter mobile device compliance boundary and MPE estimation can be used

(http://www.fcc.gov/oet/ea/presentations/files/oct05/MPE-mobile.xls)

KDB 447498 mobile multi-Tx example

- WWAN module installed in integral-WLAN access point (e.g., “gateway” device) [device pair (*x*, *y*)]
- Fantasy inputs $\{f_i, P_i, G_i, d_{offset}\}$: *x*{1900,0.4,4,-15}, *y*{2450,0.8,6,5}
- Figure-8 shaped region in middle is composite of 20 cm radius for each (*x*, *y*)
- By inspection of percent-MPE contour plot, compliance boundary is ellipse with major & minor axes lengths approx. 87 cm & 80 cm

Antenna No.		Total	1	2
Tx Status			On	On
Frequency	MHz		1900	2450
MPE Limit	mW/cm^2		1.00	1.00
Max % MPE	%	80.5	20.0	63.4
Power	(W)	1.200	0.400	0.800
Antenna Gain	dBi		4.00	6.00
EIRP	(W)	4.19	1.005	3.185
X	(cm)		-15.0	5.0
Y	(cm)		0.0	0.0



KDB 447498 USB dongles a)

- Different from for example integral-antenna CardBus transmitters, USB dongle transmitters have only the connector/plug enclosed by a host, while circuit-board and antenna portions are outside of the host
- USB dongle transmitters without permanently attached cable are expected to have normal use position installed directly into laptop computers
- Current-marketplace laptop computers commonly have USB receptacles spaced 0 mm to 5 mm from bottom surface
- Use of a cable in SAR testing is unrelated to whether accessory cable is furnished or available
- For dongles with swivel plugs or swivel antennas, please contact FCC Lab before SAR testing to confirm device positions

KDB 447498 USB dongles b)

- Test all USB orientations (Horizontal-up, Horizontal-down, Vertical-front, and Vertical-back) with a device-to-phantom separation distance of 5 mm or less
- The same test separation distance should be used for all frequency bands and modes in each USB orientation; that is, the frequency band with the highest SAR dictates the test distance in each orientation
- The typical Horizontal-up USB connection, found in the majority of laptop computers, must be tested using an appropriate laptop computer
- A laptop with either Vertical-front or Vertical-back USB connection should be used to test one of the vertical USB orientations.
- If laptop computers are not available for testing the Horizontal-down or remaining Vertical USB orientation, a short USB cable (12” or less) may be used for testing these other orientations; it should be ensured that the USB cable does not affect device output power

KDB 447498 generic module a)

- End-use host platform criteria for module and module-like devices based on SAR testing
  - {SAR_{1g} < 1.2 W/kg} – single platform having substantially similar operating configurations, product constructions, exposure conditions
  - {SAR_{1g} < 0.8 W/kg} – multiple platforms, each type having substantially similar operating configurations, product constructions, exposure conditions
  - {SAR_{1g} < 0.4 W/kg} – no platform restrictions
  - {1.2 W/kg ≤ SAR_{1g} ≤ 1.6 W/kg} – specific host
- SAR tests per KDB 447498 item 2) b)

KDB 447498 generic module b)

- KDB 447498 item 2) b) ii) enhanced energy coupling (back-off) SAR test
  - highest SAR configuration from items 2) a) and 2) b) ii) used for back-off SAR test for each host platform and device configuration
  - use for all item 2) a) transmitters and modules
- KDB 447498 item 2) b) i) devices not having built-in mechanisms to provide a minimum separation distance
  - intended mostly for devices with unknown or undefined platforms
  - items 2) a) and 2) b) iii) determine allowed end-use configurations

KDB 447498 VHF portable PTT

- SAR required for $f \leq 500$ MHz portable PTT with:
  - maximum output power greater than below thresholds
  - separation distances smaller than those below
  - TCB Exclusion List has $f < 300$ MHz SAR-required portables
- Contact FCC Laboratory to determine if SAR evaluation is necessary for other frequencies or when the SAR is expected to be very low

Exposure Conditions	*P* mW (gen. pop.)	*P* mW (occup.)
Held to face, $d \geq 2.5$ cm	250	1250
Body-worn, $d \geq 1.5$ cm	200	1000
Body-worn, $d \geq 1.0$ cm	150	750

1) The time-averaged output power, corresponding to the required PTT duty factor, is compared with these thresholds.
2) The closest distance between the user and the device or its antenna is used to determine the power thresholds.

Grant remarks – PRESENT

- The usual no-collocation grant remark is taken to mean that some configurations may be subject to separate Equipment Authorization, e.g. multi-transmitter products, composite system configurations
- Authorized collocations are as documented within the filings for specific FCC ID(s), or per exceptions or conditions established by FCC where appropriate
  - Permissive change filings have not been required for all associated device FCC IDs, e.g. categ. excl. mobile devices
  - Example grant remark: The antenna(s) used for this transmitter must not be collocated or operating in conjunction with any other antenna or transmitter within a host device, except in accordance with FCC multi-transmitter product procedures.

Grant remarks – PENDING

- Rather than grant note list, FCC Lab are working to prepare uniform filing contents guidance to support and allow minimal grant remarks
- Items we are compiling and to consider all together in preparing procedures for device categories include:
  - device installation requirements
  - operation configurations & usage conditions
  - end-user or OEM / integrator instructions
  - authorized operating frequency ranges & modes, SAR, HAC, modular
- Other feedback welcome

Admin. / PBA items

- TCB may no longer process applications containing 3-host SAR tests
- USB-dongle SAR testing and review / approval must be in accordance with KDB 447498
  - alternative testing requests and applications may be submitted at FCC not TCB
  - case-by-case filings are generally subject to longer processing times
- KDB 388624 PBA list amended to include LTE (3GPP) and IEEE 802.20 portable devices

KDB references

1) KDB 178919, *Permissive Change Policies*, 10/1/08 (v04r01)
2) KDB 248227, *SAR Measurement Procedures for 802.11 a/b/g Transmitters*, 5/29/07 (rev1.2)
3) KDB 388624, *Permit But Ask Procedure*, 10/2/08 (v06)
4) KDB 447498, *FCC Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies*, 7/27/08 (v03r02)
5) KDB 450824, *SAR Probe Calibration and System Verification Considerations for Measurements at 150 MHz - 3 GHz*, 1/07 (rev1.1)
6) KDB 616217 D01, *SAR Evaluation Considerations for Laptop Computers with Antennas Built-in on Display Screens*, 12/6/07 (v01)
7) KDB 616217 D02, *Review and Approval Policies for SAR Evaluation of Laptop Computers with Antennas Built-in on Display Screens*, 4/9/08 (v01r01)
8) KDB 628591, *TCB Exclusion List*, 8/21/08 (v11r02)
9) KDB 648474 D01, *SAR Evaluation Considerations for Handsets with Multiple Transmitters and Antennas*, 5/08 (v01r03)
10) KDB 648474 D02, *Review and Approval Policies for SAR Evaluation of Handsets with Multiple Transmitters and Antennas*, 4/9/08 (v01r01)
11) KDB 865664, *SAR Measurement Requirements for 3-6 GHz*, 10/06 (rev1.1)
12) KDB 941225, *SAR Measurement Procedures for 3G Devices - CDMA 2000 / Ev-Do - - WCDMA / HSDPA / HSPA -*, 10/4/07 (v02)

Available from Internet site: (http://www.fcc.gov/labhelp), e.g. “Detail Criteria Search” menu.
Dates or version numbers listed are as indicated within attachments from each KDB webpage.

In closing

- TCBs please continue to diligently and exhaustively practice and apply policies and procedures in existing documents
- For example, most filings that include RF exposure info still use some type of grant remark
- After completely familiarizing with relevant documents, whenever anything is unclear please request guidance from FCC Lab, whatever the issue