

Applicant: Apple Inc

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We seek additional information for previous item 6 (repeated below) as the table provided in Section 5.1 is somewhat confusing.

6] Need to identify the simultaneous transmission configurations applicable for this device with respect to the voice & data transmissions for the different wireless mode operating configurations and exposure/use conditions (head, body-worn, hotspot etc.).

- See the following two tables and Info below

WIFI HotSpot ON - Simultaneous Transmission					
	GSM voice	GPRS/Edge	UMTS voice	HSDPA/HSUPA	WIFI 2.4 GHz
GSM Voice	N/A	N	N	N	N
GPRS/Edge	N	N/A	N	N	Y
UMTS voice	N	N	N/A	Y	Y
HSDPA/HSUPA	N	N	Y	N/A	Y
WIFI 2.4	N	Y	Y	Y	N/A

Notes:

- BT and WIFI time-share same antenna and cannot transmit simultaneously.
- HS-DPCCH+EDCH Max power test case already requires R99 channels to

be added as per 34.121, 5.2B test case which is nothing but MRAB call. As per 34.121, test case 5.2B, UE will lower the MAX power as compared to CS only to compensate for the peak to average increase due to the additional Channels which are active during MRAB call. Power on the device is backed off based on cubic metric as shown below:

5.2B.2 Minimum Requirements

The UE Maximum Power Reduction (MPR) for the nominal maximum output power shall be within the value and tolerance specified in table 5.2B.1 for when the values of β_c , β_d , β_{hs} , β_{ec} and β_{ed} is fully or partially transmitted during a DPCCCH timeslot.

Table 5.2B.1: Maximum Output Power with HS-DPCCH and E-DCH

UE transmit channel configuration	CM (dB)	MPR (dB)
For all combinations of; DPDCH, DPCCCH, HS-DPCCH, E-DPDCH and E-DPCCH	$0 \leq CM \leq 3.5$	MAX (CM-1, 0)
Note 1: CM = 1 for $\beta_c/\beta_d=12/15$, $\beta_{hs}/\beta_{ec}=24/15$. For all other combinations of DPDCH, DPCCCH, HS-DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.		

Where Cubic Metric (CM) is based on the UE transmit channel configuration and is given by

$$CM = \text{CEIL} \{ [20 * \log_{10} ((v_{\text{norm}})^3)_{\text{rms}}] - 20 * \log_{10} ((v_{\text{norm_ref}})^3)_{\text{rms}} \} / k, 0.5 \}$$

Where

- CEIL{ x, 0.5 } means rounding upwards to closest 0.5dB, i.e. $CM \in [0, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5]$
- k is 1.85 for signals where all channelisations codes meet the following criteria $C_{SF,N}$ where $N < SF/2$
- k is 1.56 for signals where any channelisations codes meet the following criteria $C_{SF,N}$ where $N \geq SF/2$
- v_{norm} is the normalized voltage waveform of the input signal
- $v_{\text{norm_ref}}$ is the normalized voltage waveform of the reference signal (12.2 kbps AMR Speech) and $20 * \log_{10} ((v_{\text{norm_ref}})^3)_{\text{rms}} = 1.52$ dB

The normative reference for this requirement is TS 25.101 [1] clause 6.2.2.

MRAB testing is already covered as part of HSPA testing as per 34.121....

WIFI HotSpot OFF - Simultaneous Transmission					
	GSM voice	GPRS/ EDGE	UMTS voice	HSDPA/ HSUPA	WIFI 2.4 GHz
GSM Voice	N/A	N	N	N	Y
GPRS/ EDGE	N	N/A	N	N	N
UMTS voice	N	N	N/A	Y	Y
UMTS data	N	N	Y	N/A	N
WIFI 2.4	Y	N	Y	N	N/A

Note: BT and WIFI time-share same antenna and cannot transmit simultaneously

WCDMA/HSDPA generally allows simultaneous voice and data, which would enable hotspot mode to transmit in conjunction with a voice call next to the ear.

When this is the case, the earlier (original) head SAR data for all applicable modes (e.g. WCDMA/HSPA and Wi-Fi) relating to hotspot use at the head should be applied to determine simultaneous transmission SAR exclusion based on sum of 1-g or SAR to peak location ratio.

If SAR exclusion does not apply, volume scan measurement may be necessary.

- As indicated in original SAR reports shown below, the SAR exclusion based on SAR to peak location ratio does apply.

- Following data is extracted from the test report:

12. KDB 648474 SIMULTANEOUS TRANSMISSION CONSIDERATION

SUMMARY OF SAR EVALUATION FOR A CELL PHONE WITH MULTIPLE TRANSMITTERS

<u>Individual Transmitter</u>	<u>Stand-alone SAR</u>
3G	Yes
WiFi	Yes
Bluetooth	Not required (average output is $< P_{Ref} / 12mW$)

SIMULTANEOUS TRANSMISSION

- 3G can transmit simultaneously with WiFi
- 3G can transmit simultaneously with Bluetooth
- WiFi can not transmit simultaneously with Bluetooth

Highest SAR value and the sum of the 1-g SAR for 3G & WiFi

Tes position	Highest 1-g SAR (W/kg)			Σ 1-g SAR (W/kg)
	3G		WiFi	
Head (LHS Touch)	UMTS850	1.00	0.651	1.651
	UMTS1900	1.17		1.821
Body (LCD down)	GPRS850 2 slots	1.11	0.073	1.183
	UMTS1900	0.433		0.433

Antenna Pair SAR to Peak Location Separation Ratio if Σ 1-g SAR > 1.6 W/kg

Σ 1-g SAR (W/kg)	Separation distance (cm) (3G-to-WiFi antenna)	Antenna Pair SAR to Peak Location Separation Ratio
1.651	8.7	0.19
1.821	8.7	0.21

Highest SAR value and the sum of the 1-g SAR for WiFi & 3G

Tes position	Highest 1-g SAR (W/kg)			Σ 1-g SAR (W/kg)
	WiFi	3G		
Head (LHS Tilt)	0.871	UMTS850	0.433	1.304
		UMTS1900	0.411	1.282
Body (LCD down)	0.073	GPRS850 2 slots	1.110	1.183
		UMTS1900	0.433	0.506

CONCLUSION:

<u>Simultaneous transmission</u>	<u>Simultaneous SAR</u>
3G & Bluetooth	No (Stand-alone SAR not required for Bluetooth)
WiFi & Bluetooth	No (Stand-alone SAR not required for Bluetooth)
3G & WiFi	No (see note below)

Note: SAR not required:

- o when the sum of the 1-g SAR is < 1.6 W/kg for 3G and WiFi
- o when SAR to peak location separation ration of simultaneous transmitting antenna pair is < 0.3

- Following data is extracted from the test report:

12. KDB 648474 SIMULTANEOUS TRANSMISSION CONSIDERATION

SUMMARY OF SAR EVALUATION FOR A CELL PHONE WITH MULTIPLE TRANSMITTERS

Individual Transmitter	Stand-alone SAR
3G	Yes
WiFi	Yes
Bluetooth	Not required (average output is $< P_{ref} / 12mW$)

SIMULTANEOUS TRANSMISSION

- 3G can transmit simultaneously with WiFi
- 3G can transmit simultaneously with Bluetooth
- WiFi can not transmit simultaneously with Bluetooth

Highest SAR value and the sum of the 1-g SAR for 3G & WiFi

Tes position	Highest 1-g SAR (W/kg)		WiFi	Σ 1-g SAR (W/kg)
	3G			
Head (LHS Touch)	UMTS850	1.09	0.695	1.785
	UMTS1900	1.18		1.875
Body (Face down)	GPRS850 2 slots	1.11	0.067	1.177
	UMTS1900	0.433		0.433

Antenna Pair SAR to Peak Location Separation Ratio if Σ 1-g SAR > 1.6 W/kg

Σ 1-g SAR (W/kg)	Separation distance (cm) (3G-to-WiFi antenna)	Antenna Pair SAR to Peak Location Separation Ratio (Σ 1-g SAR / Antenna separation distance)
1.785	8.7	0.21
1.875	8.7	0.22

Highest SAR value and the sum of the 1-g SAR for WiFi & 3G

Tes position	Highest 1-g SAR (W/kg)		Σ 1-g SAR (W/kg)	
	WiFi	3G		
Head (LHS Tilt)	0.881	UMTS850	0.447	1.328
		UMTS1900	0.418	1.299
Body (Face down)	0.067	GPRS850 2 slots	1.110	1.177
		UMTS1900	0.437	0.504

CONCLUSION:

<u>Simultaneous transmission</u>	<u>Simultaneous SAR</u>
3G & Bluetooth	No (Stand-alone SAR not required for Bluetooth)
WiFi & Bluetooth	No (Stand-alone SAR not required for Bluetooth)
3G & WiFi	No (see note below)

Note: SAR not required:

- when the sum of the 1-g SAR is < 1.6 W/kg for 3G and WiFi
- when SAR to peak location separation ration of simultaneous transmitting antenna pair is < 0.3

If device allows DTM in GSM/GPRS/EDGE, similar issues may apply for hotspot in conjunction with voice call next to the ear. After addressing all these, the numbers in the SAR report may need revision.

- DTM (according 3GPP 51.010-1) is not supported in this device.

According to Table 5.1, GSM voice and EGPRS or HSDPA can transmit simultaneously. This would seem to require dual transfer mode (DTM), which we have been informed is not utilized.

- DTM (according 3GPP 51.010-1) is not supported in this device.

What we believe is missing from the simultaneous considerations in Section 12 is the combination of UMTS (voice and data) and hotspot mode summed for the head position. The UMTS data can be pulled from the original filing as noted above.

WiFi + HSDPA/HSUPA + UMTS (voice) - We have investigated this test case at our outside test lab's. UL-CCS and Cetecom and they do not have equipment to support testing this configuration.