



**FCC OET BULLETIN 65 SUPPLEMENT C 01-01
IEEE Std 1528-2003 and IEEE Std 1528a-2005**

(Class II Permissive Change)

For

LTE Phone Bluetooth, WLAN (2.4GHz & 5GHz) and NFC

Model: LG-D500, LGD500, D500, LGMS500, LG-MS500, MS500

FCC ID: ZNFD500

Report Number: 13U15216-6

Issue Date: 7/1/2013

Prepared for

LG ELECTRONICS MOBILECOMM U.S.A., INC.

1000 SYLVAN AVE.

ENGLEWOOD CLIFFS, NJ 07632

Prepared by

UL Verification Services Inc.

47173 BENICIA STREET

FREMONT, CA 94538, U.S.A.

TEL: (510) 771-1000

FAX: (510) 661-0888



NVLAP LAB CODE 200065-0

Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
--	7/1/2013	Initial Issue	--

Table of Contents

1. Attestation of Test Results.....	7
2. Test Methodology	8
3. Facilities and Accreditation	8
4. Calibration and Uncertainty	9
4.1. Measuring Instrument Calibration	9
4.2. Measurement Uncertainty	10
5. Measurement System Description and Setup.....	11
6. SAR Measurement Procedure.....	12
6.1. Normal SAR Measurement Procedure.....	12
6.2. Volume Scan Procedures	14
7. Device Under Test.....	15
7.1. General Information	15
7.2. Wireless Technologies.....	16
7.3. Simultaneous Transmission Conditions	17
7.4. General LTE SAR Test and Reporting Considerations.....	18
8. RF Exposure Conditions	19
8.1. Head Exposure Conditions	19
8.2. Body-worn Accessory Exposure Conditions.....	19
8.3. Hotspot Exposure Conditions.....	19
8.4. Wi-Fi Direct Exposure Conditions	20
9. RF Output Power Measurement.....	21
9.1. GSM850	21
9.2. GSM1900	22
9.3. W-CDMA Band II	23
9.4. W-CDMA Band IV.....	29
9.5. W-CDMA Band V.....	35
9.6. LTE Band 2.....	41
9.7. LTE Band 4.....	45
9.8. LTE Band 17.....	51
9.9. Wi-Fi (2.4 GHz).....	55
9.10. Wi-Fi (5 GHz Bands)	56
9.11. Bluetooth.....	58

10. Tissue Dielectric Properties	59
10.1. Composition of Ingredients for the Tissue Material Used in the SAR Tests	60
10.2. Tissue Dielectric Parameter Check Results.....	61
11. System Performance Check	65
11.1. System Performance Check Measurement Conditions.....	65
11.2. Reference SAR Values for System Performance Check.....	66
11.3. System Performance Check Results	67
12. SAR Test Results	69
12.1. GSM850.....	69
12.1.1. Head Exposure Conditions.....	69
12.1.2. Body-worn Accessory & Hotspot Exposure Conditions.....	70
12.2. GSM1900.....	71
12.2.1. Head Exposure Conditions.....	71
12.2.2. Body-worn Accessory & Hotspot Exposure Conditions.....	72
12.3. W-CDMA Band II.....	73
12.3.1. Head Exposure Conditions.....	73
12.3.2. Body-worn Accessory & Hotspot Exposure Conditions.....	73
12.4. W-CDMA Band IV	74
12.4.1. Head Exposure Conditions.....	74
12.4.2. Body-worn Accessory & Hotspot Exposure Conditions.....	74
12.5. W-CDMA Band V	75
12.5.1. Head Exposure Conditions.....	75
12.5.2. Body-worn Accessory & Hotspot Exposure Conditions.....	75
12.6. LTE Band 2 (10MHz Bandwidth)	76
12.6.1. Head Exposure Conditions.....	76
12.6.2. Body-worn Accessory & Hotspot Exposure Conditions.....	77
12.7. LTE Band 4 (20MHz Bandwidth)	78
12.7.1. Head Exposure Conditions.....	78
12.7.2. Body-worn Accessory & Hotspot Exposure Conditions.....	79
12.8. LTE Band 17 (10MHz Bandwidth)	80
12.8.1. Head Exposure Conditions.....	80
12.8.2. Body-worn Accessory & Hotspot Exposure Conditions.....	81
12.9. Wi-Fi (2.4 GHz Band)	82
12.9.1. Head Exposure Conditions.....	82
12.9.2. Body-worn Accessory & Hotspot Exposure Conditions.....	82
12.10. Wi-Fi (5 GHz Bands)	83

12.10.1.	Head Exposure Conditions.....	83
12.10.2.	Body-worn Accessory Exposure Conditions.....	84
12.10.3.	WiFi Direct (Group Owner) Exposure Conditions	84
13.	SAR Measurement Variability.....	85
13.1.	<i>The Highest Measured SAR Configuration in Each Frequency Band</i>	<i>85</i>
13.2.	<i>Repeated Measurement Results</i>	<i>85</i>
13.2.1.	Head Exposure Condition	85
13.2.2.	Body-worn Accessory & Hotspot Exposure Condition	85
14.	Simultaneous Transmission SAR Analysis.....	86
14.1.	<i>Estimated SAR for Bluetooth.....</i>	<i>87</i>
14.1.1.	Standalone SAR Test Exclusion.....	87
14.1.2.	Estimated SAR.....	87
14.2.	<i>Head Exposure Conditions.....</i>	<i>88</i>
14.2.1.	Sum of the SAR for GSM850 (Voice) & Wi-Fi.....	88
14.2.2.	Sum of the SAR for GSM850 (VoIP) & Wi-Fi.....	88
14.2.3.	Sum of the SAR for GSM1900 (Voice) & Wi-Fi.....	89
14.2.4.	Sum of the SAR for GSM1900 (VoIP) & Wi-Fi.....	89
14.2.5.	Sum of the SAR for W-CDMA Band II & Wi-Fi.....	90
14.2.6.	Sum of the SAR for W-CDMA Band IV & Wi-Fi	91
14.2.7.	Sum of the SAR for W-CDMA Band V & Wi-Fi	92
14.2.8.	Sum of the SAR for LTE Band 2 & Wi-Fi	93
14.2.9.	Sum of the SAR for LTE Band 4 & Wi-Fi	94
14.2.10.	Sum of the SAR for LTE Band 17 & Wi-Fi	95
14.3.	<i>Body-worn Accessory Exposure Conditions</i>	<i>96</i>
14.3.1.	Sum of the SAR for GSM (Voice), Wi-Fi & Bluetooth.....	96
14.3.2.	Sum of the SAR for GSM (VoIP), Wi-Fi & Bluetooth.....	97
14.3.3.	Sum of the SAR for W-CDMA, Wi-Fi & Bluetooth	98
14.3.4.	Sum of the SAR for LTE, Wi-Fi & Bluetooth	99
14.4.	<i>Hotspot Exposure Conditions</i>	<i>100</i>
14.4.1.	Sum of the SAR for GSM (VoIP) & Wi-Fi.....	100
14.4.2.	Sum of the SAR for W-CDMA & Wi-Fi.....	100
14.4.3.	Sum of the SAR for LTE & Wi-Fi	101
14.5.	<i>Wi-Fi Direct Exposure Conditions.....</i>	<i>102</i>
14.5.1.	Sum of the SAR for GSM (VoIP) & Wi-Fi.....	102
14.5.2.	Sum of the SAR for W-CDMA & Wi-Fi.....	102
14.5.3.	Sum of the SAR for LTE & Wi-Fi	103

15. Appendixes	104
15.1. System Performance Check Plots	104
15.2. Highest SAR Test Plots for GSM.....	104
15.3. Highest SAR Test Plots for W-CDMA.....	104
15.4. Highest SAR Test Plots for LTE	104
15.5. Highest SAR Test Plots for Wi-Fi.....	104
15.6. Calibration Certificate for E-Field Probe EX3DV3 - SN 3749.....	104
15.7. Calibration Certificate for E-Field Probe EX3DV4 - SN 3751.....	104
15.8. Calibration Certificate for E-Field Probe EX3DV4 - SN 3686.....	104
15.9. Calibration Certificate for E-Field Probe EX3DV3 - SN 3531.....	104
15.10. Calibration Certificate for D750V3 - SN 1019	104
15.11. Calibration Certificate for D835V2 - SN 4d142	104
15.12. Calibration Certificate for D835V2 - SN 4d002	104
15.13. Calibration Certificate for D1750V2 - SN 1077	104
15.14. Calibration Certificate for D1750V2 - SN 1050	104
15.15. Calibration Certificate for D1900V2 - SN 5d163	104
15.16. Calibration Certificate for D2450V2 - SN 899	104
15.17. Calibration Certificate for D5GHzV2 - SN 1138	104
16. External Photos	105
17. Antenna Locations & Separation Distances.....	107
18. Setup Photos	108
18.1. Head RF Exposure Conditions	109
18.2. Body-worn Accessory and Hotspot RF Exposure Conditions	111
18.3. Hotspot RF Exposure Conditions	112

1. Attestation of Test Results

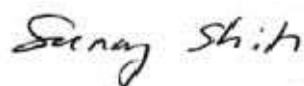
Applicant	LG ELECTRONICS MOBILECOMM U.S.A., INC.			
DUT description	LTE Phone Bluetooth, WLAN(2.4GHz & 5GHz) and NFC			
Model	LG-D500, LGD500, D500, LGMS500, LG-MS500, MS500			
Test device is	An identical prototype			
Device category	Portable			
Exposure category	General Population/Uncontrolled Exposure			
Date tested	05/30/2013 – 06/20/2013			
The highest reported SAR values	RF exposure condition	Licensed	DTS	UNII
	Head	0.983 W/kg	0.270 W/kg	0.042 W/kg
	Body-worn Accessory	1.259 W/kg	0.180 W/kg	0.184 W/kg
	Wireless Router (Hotspot)	1.259 W/kg	0.180 W/kg	N/A W/kg
	Wi-Fi Direct (5.8 GHz)	N/A W/kg	0.180 W/kg	N/A W/kg
	Simultaneous Transmission	1.439 W/kg	1.439 W/kg	1.443 W/kg
Applicable Standards	OET Bulletin 65 Supplement C IEEE Std 1528-2003 and IEEE Std 1528a-2005 FCC Published RF exposure KDB procedures, and TCB workshop updates			
Test Results	Pass			

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Verification Services Inc. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government (NIST Handbook 150, Annex A). This report is written to support regulatory compliance of the applicable standards stated above.

Approved & Released By:

Prepared By:




Sunny Shih
WiSE Operations Manager
UL Verification Services Inc.

Kenneth Mak
WiSE Laboratory Engineer
UL Verification Services Inc.

2. Test Methodology

The tests documented in this report were performed in accordance with FCC OET Bulletin 65 Supplement C Edition 01-01, IEEE STD 1528-2003, IEEE Std 1528a-2005, the following FCC Published RF exposure KDB procedures and TCB workshop updates:

- 447498 D01 General RF Exposure Guidance v05r01
- 648474 D04 Handset SAR v01r01
- 941225 D01 SAR test for 3G devices v02
- 941225 D02 HSPA and 1x Advanced v02r02
- 941225 D03 SAR Test Reduction GSM GPRS EDGE v01
- 941225 D04 SAR for GSM E GPRS Dual Xfer Mode v01
- 941225 D05 SAR for LTE Devices v02r02
- 941225 D06 Hot Spot SAR v01r01
- 248227 D01 SAR Meas for 802 11abg v01r02
- 865664 D01 SAR Measurement 100 MHz to 6 GHz v01
- 865664 D02 SAR Reporting v01r01
- 690783 D01 SAR Listings on Grants v01r02
- 2013 TCB workshop updates

3. Facilities and Accreditation

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://www.ccsemc.com>.

4. Calibration and Uncertainty

4.1. Measuring Instrument Calibration

The measuring equipment used to perform the tests documented in this report has been calibrated in accordance with the manufacturers' recommendations, and is traceable to recognized national standards.

Tissue Dielectric Properties

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due date
Network Analyzer	Agilent	8753ES	MY40001647	6/27/2013
Dielectronic Probe kit	SPEAG	DAK-3.5	1087	10/16/2013
Thermometer	Control Company	4242	122529162	9/19/2014

System Performance Check

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due date
Synthesized Signal Generator	HP	8665B	3546A00784	3/26/2014
Power Meter	HP	438A	3513U04320	9/24/2013
Power Sensor	HP	8481A	2237A31744	9/24/2013
Power Sensor	HP	8481A	2702A76223	8/21/2013
Amplifier	MITEQ	AMF-4D-00400600-50-30P	1795093	N/A
Directional coupler	Werlatone	C8060-102	2711	N/A
DC Power Supply	Sorensen	XHR 60-18	1308A01936	N/A
System Validation Dipole	SPEAG	D750V3	1019	3/5/2014
System Validation Dipole	SPEAG	D835V2	4d142	10/4/2013
System Validation Dipole	SPEAG	D835V2	4d002	10/24/2013
System Validation Dipole	SPEAG	D1750V2	1077	10/3/2013
System Validation Dipole	SPEAG	D1750V2	1050	4/20/2014
System Validation Dipole	SPEAG	D1900V2	5d163	10/4/2013
System Validation Dipole	SPEAG	D2450V2	899	10/5/2013
System Validation Dipole	SPEAG	D5GHzV2	1138	10/9/2013

DASY System

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due date
E-Field Probe (SAR A)	SPEAG	EX3DV4	3749	1/15/2014
Data Acquisition Electronics (SAR A)	SPEAG	DAE4	1343	8/20/2013
E-Field Probe (SAR B)	SPEAG	EX3DV4	3751	11/15/2013
Data Acquisition Electronics (SAR B)	SPEAG	DAE3	427	1/9/2014
E-Field Probe (SAR D)	SPEAG	EX3DV4	3686	3/11/2014
Data Acquisition Electronics (SAR D)	SPEAG	DAE4	1257	8/28/2013
E-Field Probe (SAR 1)	SPEAG	EX3DV3	3531	11/15/2013
Data Acquisition Electronics (SAR 1)	SPEAG	DAE4	1259	2/7/2014

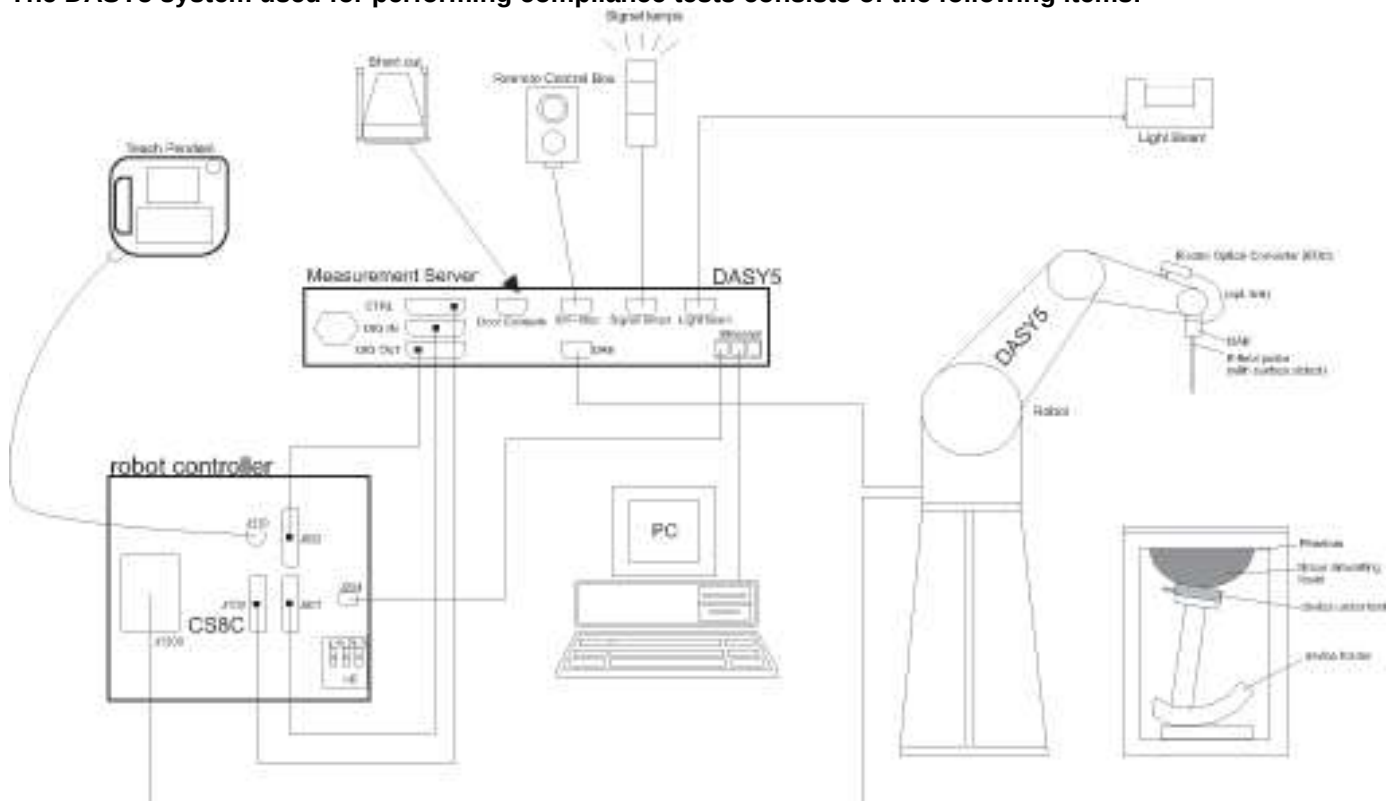
Others

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due date
Base Station Simulator	Agilent	8960	GB46160222	11/10/2013
Base Station Simulator	Agilent	8960	GB47050526	9/20/2013
Base Station Simulator	R & S	CMU200	106291	8/8/2013
Base Station Simulator	R & S	CMU200	838114/032	7/9/2013
Base Station Simulator	R & S	CMW500	124593-SS	7/11/2013

4.2. Measurement Uncertainty

Per KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r01 Section 2.8.1., when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg, the extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2003 is not required in SAR reports submitted for equipment approval.

The DASYS system used for performing compliance tests consists of the following items:



- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic Field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running WinXP or Win7 and the DASY5 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

6. SAR Measurement Procedure

6.1. Normal SAR Measurement Procedure

Step 1: Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. The minimum distance of probe sensors to surface is 2.1 mm. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

Step 2: Area Scan

The Area Scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum locations even in relatively coarse grids. When an Area Scan has measured all reachable points, it computes the field maximal found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE Standard 1528 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan). If only one Zoom Scan follows the Area Scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of Zoom Scans has to be increased accordingly.

Area Scan Parameters extracted from KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r01

	≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 ± 1 mm	$\frac{1}{2} \cdot \delta \cdot \ln(2) \pm 0.5$ mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	$30^\circ \pm 1^\circ$	$20^\circ \pm 1^\circ$
Maximum area scan spatial resolution: Δx_{Area} , Δy_{Area}	≤ 2 GHz: ≤ 15 mm $2 - 3$ GHz: ≤ 12 mm	$3 - 4$ GHz: ≤ 12 mm $4 - 6$ GHz: ≤ 10 mm
	When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be $\leq$ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

Step 3: Zoom Scan

Zoom Scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The Zoom Scan measures points (refer to table below) within a cube whose base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the Zoom Scan evaluates the averaged SAR for 1 g and 10 g and displays these values next to the job's label.

Zoom Scan Parameters extracted from KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r01

			≤ 3 GHz	> 3 GHz
Maximum zoom scan spatial resolution: $\Delta x_{\text{Zoom}}, \Delta y_{\text{Zoom}}$			≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{\text{Zoom}}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{\text{Zoom}}(1)$: between 1 st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{\text{Zoom}}(n>1)$: between subsequent points	$\leq 1.5 \cdot \Delta z_{\text{Zoom}}(n-1)$	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm
Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.				
* When zoom scan is required and the <u>reported</u> SAR from the area scan based <i>1-g SAR estimation</i> procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.				

Step 4: Power drift measurement

The Power Drift Measurement measures the field at the same location as the most recent power reference measurement within the same procedure, and with the same settings. The Power Drift Measurement gives the field difference in dB from the reading conducted within the last Power Reference Measurement. This allows a user to monitor the power drift of the device under test within a batch process. The measurement procedure is the same as Step 1.

Step 5: Z-Scan (FCC only)

The Z Scan measures points along a vertical straight line. The line runs along the Z-axis of a one-dimensional grid. In order to get a reasonable extrapolation the extrapolated distance should not be larger than the step size in Z-direction.

6.2. Volume Scan Procedures

Step 1: Repeat Step 1-4 in Section 6.1

Step 2: Volume Scan

Volume Scans are used to assess peak SAR and averaged SAR measurements in largely extended 3-dimensional volumes within any phantom. This measurement does not need any previous area scan. The grid can be anchored to a user specific point or to the current probe location.

Step 3: Power drift measurement

The Power Drift Measurement measures the field at the same location as the most recent power reference measurement within the same procedure, and with the same settings. The Power Drift Measurement gives the field difference in dB from the reading conducted within the last Power Reference Measurement. This allows a user to monitor the power drift of the device under test within a batch process. The measurement procedure is the same as Step 1.

7. Device Under Test

7.1. General Information

LTE Phone Bluetooth, WLAN(2.4GHz & 5GHz) and NFC Model: LG-D500, LGD500, D500, LGMS500, LG-MS500, MS500	
Operating Configuration(s)	Held to head, Body-worn (Voice call)
Mobile Hotspot	WiFi Hotspot mode permits the device to share its cellular data connection with other WiFi-enabled devices. ☒ Mobile Hotspot (WiFi 2.4 GHz) ☐ Mobile Hotspot (WiFi 5 GHz)
WiFi Direct	Wi-Fi Direct enabled devices transfer data directly between each other ☒ WiFi Direct (WiFi 2.4 GHz) ☒ WiFi Direct (WiFi 5 GHz) – GO (Group Owner) only for UNII Band 4 5.8GHz band
VoIP	Supported
Device Dimensions	Overall (Length x Width): 127.9 mm x 65.7 mm Overall Diagonal: 138.6 mm Display Diagonal: 114.0 mm
Accessory	Headset
Battery Options	☒ Standard: Li-Ion, 3.8V, 2460 mAh ☐ Extended (large capacity)

7.2.Wireless Technologies

Wireless Technology and Frequency Bands	GSM 850 / 1900 W-CDMA Band: II / IV/ V LTE Band 2 / 4 / 17 Wi-Fi: 2.4 / 5 GHz Bluetooth: 2.4 GHz
Mode	GSM - ☒ Voice (GMSK) - ☒ GPRS (GMSK) - ☒ EGPRS (8PSK) W-CDMA - ☒ UMTS Rel. 99 - ☒ HSDPA - ☒ HSUPA - ☒ DC-HSDPA - ☒ HSPA+ LTE - ☒ QPSK - ☒ 16QAM Wi-Fi 2.4GHz (802.11b/g/n) - ☒ 802.11b - ☒ 802.11g - ☒ 802.11n (20MHz) - ☐ 802.11n (40MHz) WiFi 5GHz - ☒ 802.11a - ☒ 802.11n (20MHz) - ☒ 802.11n (40MHz) - ☐ 802.11ac (80MHz) Bluetooth Ver. 4.0
Duty Cycle	GSM Voice: 12.5%; GPRS 1 Slot: 12.5%; 2 Slots: 25%; 3 Slots: 37.5%; 4 Slots: 50% W-CDMA: 100% LTE: 100% Wi-Fi 802.11a/b/g/n: 100%
GPRS Multi-Slot Class	☐ Class 8 - One Up; ☐ Class 10 - Two Up; ☒ Class 12 - Four Up
Mobile Phone Capability	☐ Class A - Mobile phones can be connected to both GPRS and GSM services simultaneously. ☒ Class B - Mobile phones can be attached to both GPRS and GSM services, using one service at a time. ☐ Class C - Mobile phones are attached to either GPRS or GSM voice service. You need to switch manually between services
VoIP (GPRS)	☒ Supported

7.3. Simultaneous Transmission Conditions

RF Exposure Condition	Capable Transmit Configurations
Head	GSM850/1900 MHz Voice + Wi-Fi 2.4 GHz GSM850/1900 MHz Voice + Wi-Fi 5 GHz bands GSM850/1900 MHz Data + Wi-Fi 2.4 GHz (VoIP) GSM850/1900 MHz Data+ Wi-Fi 5 GHz bands (VoIP) W-CDMA Band II / IV / V + Wi-Fi 2.4 GHz W-CDMA Band II / IV / V + Wi-Fi 5 GHz bands LTE Band 2 / 4 / 17 + Wi-Fi 2.4 GHz LTE Band 2 / 4 / 17 + Wi-Fi 5 GHz bands
Body-worn Accessory (Voice mode only)	GSM850/1900 MHz Voice + Wi-Fi 2.4 GHz GSM850/1900 MHz Voice + Wi-Fi 5 GHz bands GSM850/1900 MHz Data + Wi-Fi 2.4 GHz (VoIP) GSM850/1900 MHz Data+ Wi-Fi 5 GHz bands (VoIP) W-CDMA Band II / IV / V + Wi-Fi 2.4 GHz W-CDMA Band II / IV / V + Wi-Fi 5 GHz bands LTE Band 2 / 4 / 17 + Wi-Fi 2.4 GHz LTE Band 2 / 4 / 17 + Wi-Fi 5 GHz bands GSM850/1900 MHz Voice + BT GSM850/1900 MHz Data + BT (VoIP) W-CDMA Band II / IV / V + BT LTE Band 2 / 4 / 17 + BT
Hotspot (Data)	GPRS850/1900 MHz Data + Wi-Fi 2.4 GHz W-CDMA Band II / IV / V + Wi-Fi 2.4 GHz LTE Band 2 / 4 / 17 + Wi-Fi 2.4 GHz
Wi-Fi Direct	GPRS850/1900 MHz Data + Wi-Fi 2.4 GHz (GO/GC) GPRS850/1900 MHz Data + Wi-Fi 5 GHz bands (GC only) W-CDMA Band II / IV / V + Wi-Fi 2.4 GHz (GO/GC) W-CDMA Band II / IV / V + Wi-Fi 5 GHz bands (GC only) LTE Band 2 / 4 / 17 + Wi-Fi 2.4 GHz (GO/GC) LTE Band 2 / 4 / 17 + Wi-Fi 5 GHz bands (GC only)
Notes: 1. Wi-Fi 2.4GHz is supported Hotspot and Wi-Fi-Direct (GO/GC). 2. Wi-Fi 5GHz is not supported Hotspot and supported Wi-Fi-Direct (GC only). 3. LTE, WCDMA, GPRS/EDGE is supported Hotspot. 4. VoIP is supported in LTE, WCDMA, GSM (e.g. 3rd part VoIP and VoLTE) 5. Bluetooth and Wi-Fi cannot transmit simultaneously since they share the same chip. 6. GSM, WCDMA and LTE cannot transmit simultaneously since they share the same chip.	

Simultaneous Transmission Scenario - Wi-Fi direct

No.	Capable scenario	support
1	WiFi-Direct + voice call	yes
2	WiFi-Direct + data call	yes
3	WiFi-Direct + hotspot(tethering)	no

7.4. General LTE SAR Test and Reporting Considerations

Item	Description																																												
Frequency range, Channel Bandwidth, Numbers and Frequencies	Band 2	Frequency range: 1850 – 1910 MHz																																											
		Channel Bandwidth																																											
		20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz																																						
	Low			18650/ 1855	18625/ 1852.5																																								
	Mid			18900/ 1880	18900/ 1880																																								
	High			19150/ 1905	19175/ 1907.5																																								
	Band 4	Frequency range: 1710 – 1755 MHz																																											
		Channel Bandwidth																																											
		20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz																																						
	Low	20050/ 1720	20025/ 1717.5	20000/ 1715	19975/ 1712.5																																								
	Mid	20175/ 1732.5	20175/ 1732.5	20175/ 1732.5	20175/ 1732.5																																								
	High	20300/ 1745	20325/ 1747.5	20350/ 1750	20375/ 1752.5																																								
	Band 17	Frequency range: 1704 – 1716 MHz																																											
		Channel Bandwidth																																											
		20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz																																						
	Low			23780/ 709	23755/ 706.5																																								
	Mid			23790/ 710	23790/ 710																																								
	High			23800/ 711	23825/ 713.5																																								
LTE transmitter and antenna implementation	LTE, GSM and WCDMA share the same Tx antenna																																												
Maximum power reduction (MPR)	Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3 <table border="1"> <thead> <tr> <th rowspan="2">Modulation</th><th colspan="6">Channel bandwidth / Transmission bandwidth (RB)</th><th rowspan="2">MPR (dB)</th></tr> <tr> <th>1.4 MHz</th><th>3.0 MHz</th><th>5 MHz</th><th>10 MHz</th><th>15 MHz</th><th>20 MHz</th></tr> </thead> <tbody> <tr> <td>QPSK</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 1</td></tr> <tr> <td>16 QAM</td><td>≤ 5</td><td>≤ 4</td><td>≤ 8</td><td>≤ 12</td><td>≤ 16</td><td>≤ 18</td><td>≤ 1</td></tr> <tr> <td>64 QAM</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 2</td></tr> </tbody> </table> MPR Built-in by design A-MPR (additional MPR) was disabled during SAR testing							Modulation	Channel bandwidth / Transmission bandwidth (RB)						MPR (dB)	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1	16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1	64 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2
Modulation	Channel bandwidth / Transmission bandwidth (RB)						MPR (dB)																																						
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz																																							
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1																																						
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1																																						
64 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2																																						
Power reduction	No																																												
Spectrum plots for RB configurations	When a properly configured base station simulator is not used for the SAR and power measurements, spectrum plots for each RB allocation and offset configuration should be included in the SAR report to demonstrate that the tested RB allocations have been correctly established at the maximum output power conditions.																																												

8. RF Exposure Conditions

Refer to Section 17 “Antenna Locations and Separation Distances” for the specific details of the antenna-to-antenna, antenna-to-edge(s) distances, and device orientation description.

8.1. Head Exposure Conditions

For WWAN and Wi-Fi

Test Configurations	SAR Required	Note
Left Touch	Yes	
Left Tilt (15°)	Yes	
Right Touch	Yes	
Right Tilt (15°)	Yes	

8.2. Body-worn Accessory Exposure Conditions

For WWAN

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear	1 mm	Yes	
Front	9.5 mm	Yes	

For Wi-Fi/BT

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear	1 mm	Yes	
Front	9.5 mm	Yes	

8.3. Hotspot Exposure Conditions

For WWAN

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear	1 mm	Yes	
Front	9.5 mm	Yes	
Edge 1	83 mm	No	SAR is not required because the distance from the antenna to the edge is > 25 mm as per KDB 941225 D06 Hot Spot SAR v01r01
Edge 2	1.5mm	Yes	
Edge 3	1.5mm	Yes	
Edge 4	1.5mm	Yes	

For Wi-Fi

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear	1 mm	Yes	
Front	9.0 mm	Yes	
Edge 1	4.1mm	Yes	
Edge 2	47mm	No	SAR is not required because the distance from the antenna to the edge is > 25 mm as per KDB 941225 D06 Hot Spot SAR v01r01
Edge 3	97.1 mm	No	SAR is not required because the distance from the antenna to the edge is > 25 mm as per KDB 941225 D06 Hot Spot SAR v01r01
Edge 4	2.4mm	Yes	

8.4. Wi-Fi Direct Exposure Conditions

For Wi-Fi 5.8GHz Band only

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear	1 mm	Yes	
Front	9.0 mm	Yes	
Edge 1	4.1mm	Yes	
Edge 2	47mm	No	SAR is not required because the distance from the antenna to the edge is > 25 mm as per KDB 941225 D06 Hot Spot SAR v01r01
Edge 3	97.1 mm	No	SAR is not required because the distance from the antenna to the edge is > 25 mm as per KDB 941225 D06 Hot Spot SAR v01r01
Edge 4	2.4mm	Yes	

9. RF Output Power Measurement

9.1. GSM850

Output Power Tolerance (dBm)	Voice	GPRS				EGPRS			
		1 Slot	2 Slots	3 Slots	4 Slots	1 Slot	2 Slots	3 Slots	4 Slots
Max	33.2	33.2	31.2	30.2	29.2	27.2	27.2	26.2	25.2
Target	32.7	32.7	30.7	29.7	28.7	26.7	26.7	25.7	24.7

GSM (GMSK) - Voice Mode

Band	Ch No.	Freq. (MHz)	Avg burst Pwr (dBm)
850	128	824.2	33.2
	190	836.6	33.2
	251	848.8	33.1

GPRS (GMSK) - Coding Scheme: CS1

Band	Ch No.	Freq. (MHz)	Avg Power (dBm)							
			1 time slot		2 time slots		3 time slots		4 time slots	
			Burst	Frame	Burst	Frame	Burst	Frame	Burst	Frame
850	128	824.2	33.2	24.2	31.1	25.1	30.1	25.8	29.0	26.0
	190	836.6	33.2	24.2	31.0	25.0	29.9	25.6	28.9	25.9
	251	848.8	33.1	24.1	30.8	24.8	29.8	25.5	28.8	25.8

EGPRS (8PSK) - Coding Scheme: MCS5

Band	Ch No.	Freq. (MHz)	Avg Power (dBm)							
			1 time slot		2 time slots		3 time slots		4 time slots	
			Burst	Frame	Burst	Frame	Burst	Frame	Burst	Frame
850	128	824.2	27.2	18.2	27.1	21.1	26.2	21.9	25.2	22.2
	190	836.6	27.2	18.2	27.0	21.0	26.1	21.8	25.1	22.1
	251	848.8	27.0	18.0	26.9	20.9	26.0	21.7	25.1	22.1

Notes:

The worst-case configuration and mode for SAR testing is determined to be as follows:

- Head & Body-worn Accessory: GMSK Voice Mode
- Hotspot mode: GMSK (GPRS) mode with 4 time slots, based on the output power measurements above
- SAR is not required for EGPRS (8PSK) Mode because its output power is less than that of GPRS Mode

9.2. GSM1900

Output Power Tolerance (dBm)	Voice	GPRS				EGPRS			
		1 Slot	2 Slots	3 Slots	4 Slots	1 Slot	2 Slots	3 Slots	4 Slots
Max	31.2	31.2	28.7	27.7	26.7	26.2	26.2	25.9	25.4
Target	30.7	30.7	28.2	27.2	26.2	25.7	25.7	25.4	24.9

GSM (GMSK) - Voice Mode

Band	Ch No.	Freq. (MHz)	Avg burst Pwr (dBm)
1900	512	1850.2	31.0
	661	1880.0	31.2
	810	1909.8	31.0

GPRS (GMSK) - Coding Scheme: CS1

Band	Ch No.	Freq. (MHz)	Avg Power (dBm)							
			1 time slot		2 time slots		3 time slots		4 time slots	
			Burst	Frame	Burst	Frame	Burst	Frame	Burst	Frame
1900	512	1850.2	31.1	22.1	28.7	22.7	27.5	23.2	26.6	23.6
	661	1880.0	31.2	22.2	28.5	22.5	27.6	23.3	26.6	23.6
	810	1909.8	31.1	22.1	28.7	22.7	27.6	23.3	26.5	23.5

EGPRS (8PSK) - Coding Scheme: MCS5

Band	Ch No.	Freq. (MHz)	Avg Power (dBm)							
			1 time slot		2 time slots		3 time slots		4 time slots	
			Burst	Frame	Burst	Frame	Burst	Frame	Burst	Frame
1900	512	1850.2	26.2	17.2	26.0	20.0	25.7	21.4	25.4	22.4
	661	1880.0	26.2	17.2	26.0	20.0	25.8	21.5	25.4	22.4
	810	1909.8	26.1	17.1	25.9	19.9	25.6	21.3	25.3	22.3

Notes:

The worst-case configuration and mode for SAR testing is determined to be as follows:

- Head & Body-worn Accessory: GMSK Voice Mode
- Hotspot mode: GMSK (GPRS) mode with 4 time slots, based on the output power measurements above
- SAR is not required for EGPRS (8PSK) Mode because its output power is less than that of GPRS Mode

9.3. W-CDMA Band II

Output Power Tolerance	Release 99 (dBm)
Max	24.2
Target	23.7

Release 99

The following tests were completed according to the test requirements outlined in section 5.2 of the 3GPP TS34.121-1 specification. The DUT supports power Class 3, which has a nominal maximum output power of 24 dBm (+1.7/-3.7).

Mode	Subtest	Rel99
WCDMA General Settings	Loopback Mode	Test Mode 1
	Rel99 RMC	12.2kbps RMC
	Power Control Algorithm	Algorithm2
	β_c/β_d	8/15

Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm)
W-CDMA Band II	Rel 99 (RMC, 12.2 kbps)	9262	1852.4	24.1
		9400	1880.0	24.1
		9538	1907.6	24.2

HSDPA

The following 4 Sub-tests were completed according to Release 6 procedures in section 5.2 of 3GPP TS34.121. A summary of these settings are illustrated below:

	Mode	HSDPA	HSDPA	HSDPA	HSDPA
	Subtest	1	2	3	4
W-CDMA General Settings	Loopback Mode	Test Mode 1			
	Rel99 RMC	12.2kbps RMC			
	HSDPA FRC	H-Set1			
	Power Control Algorithm	Algorithm 2			
	β_c	2/15	12/15	15/15	15/15
	β_d	15/15	15/15	8/15	4/15
	Bd (SF)	64			
	β_c/β_d	2/15	12/15	15/8	15/4
	β_{hs}	4/15	24/15	30/15	30/15
HSDPA Specific Settings	MPR (dB)	0	0	0.5	0.5
	D _{ACK}	8			
	D _{NAK}	8			
	DCQI	8			
	Ack-Nack repetition factor	3			
	CQI Feedback (Table 5.2B.4)	4ms			
	CQI Repetition Factor (Table 5.2B.4)	2			
	A _{hs} = β_{hs}/β_c	30/15			

Output Power Tolerance	HSDPA (dBm)			
	subtest 1	subtest 2	subtest 3	subtest 4
Max	24.2	24.2	23.7	23.7
Target	23.7	23.7	23.2	23.2

Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm)
W-CDMA Band II	Subtest 1	9262	1852.4	24.0
		9400	1880.0	24.0
		9538	1907.6	24.0
	Subtest 2	9262	1852.4	24.0
		9400	1880.0	24.1
		9538	1907.6	24.1
	Subtest 3	9262	1852.4	23.6
		9400	1880.0	23.6
		9538	1907.6	23.7
	Subtest 4	9262	1852.4	23.5
		9400	1880.0	23.5
		9538	1907.6	23.7

Maximum output power levels that are possible for all subtests reported.

Note(s):

KDB 941225 D01 – Body SAR is not required for HSDPA when the maximum average output of each RF channel with HSDPA active is less than ¼ dB higher than that measured without HSDPA using 12.2 kbps RMC or the maximum SAR for 12.2 kbps RMC is < 75% of the SAR limit.

HSPA (HSDPA & HSUPA)

The following 5 Sub-tests were completed according to Release 6 procedures in section 5.2 of 3GPP TS34.121. A summary of these settings are illustrated below:

Mode	HSPA	HSPA	HSPA	HSPA	HSPA
Subtest	1	2	3	4	5
WCDMA General Settings	Test Mode 1				
	12.2kbps RMC				
	H-Set1				
	HSUPA Loopback				
	Algorithm2				
	β_c	11/15	6/15	15/15	2/15
	β_d	15/15	15/15	9/15	15/15
	β_{ec}	209/225	12/15	30/15	2/15
	β_c/β_d	11/15	6/15	15/9	2/15
	β_{hs}	22/15	12/15	30/15	4/15
	β_{ed}	1309/225	94/75	47/15	56/75
	CM (dB)	1.0	3.0	2.0	3.0
HSDPA Specific Settings	DACK	8			
	DNAK	8			
	DCQI	8			
	Ack-Nack repetition factor	3			
	CQI Feedback (Table 5.2B.4)	4ms			
	CQI Repetition Factor (Table 5.2B.4)	2			
	Ahs = β_{hs}/β_c	30/15			
HSUPA Specific Settings	D E-DPCCH	6	8	8	5
	DHARQ	0	0	0	0
	AG Index	20	12	15	17
	ETFCI (from 34.121 Table C.11.1.3)	75	67	92	71
	Associated Max UL Data Rate kbps	242.1	174.9	482.8	205.8
	Reference E_TFCIs	E-TFCI 11 E-TFCI PO 4 E-TFCI 67 E-TFCI PO 18 E-TFCI 71 E-TFCI PO 23 E-TFCI 75 E-TFCI PO 26 E-TFCI 81 E-TFCI PO 27	E-TFCI 11 E-TFCI PO 4 E-TFCI 92 E-TFCI PO 18		E-TFCI 11 E-TFCI PO 4 E-TFCI 67 E-TFCI PO 18 E-TFCI 71 E-TFCI PO 23 E-TFCI 75 E-TFCI PO 26 E-TFCI 81 E-TFCI PO 27

Output Power Tolerance	HSUPA (dBm)				
	subtest 1	subtest 2	subtest 3	subtest 4	subtest 5
Max	24.2	22.2	23.2	22.2	24.2
Target	23.7	21.7	22.7	21.7	23.7

Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm)
W-CDMA Band II	Subtest 1	9262	1852.4	22.7
		9400	1880.0	23.6
		9538	1907.6	23.4
	Subtest 2	9262	1852.4	21.7
		9400	1880.0	21.6
		9538	1907.6	21.2
	Subtest 3	9262	1852.4	22.2
		9400	1880.0	22.3
		9538	1907.6	22.7
	Subtest 4	9262	1852.4	22.5
		9400	1880.0	22.6
		9538	1907.6	22.3
	Subtest 5	9262	1852.4	23.6
		9400	1880.0	23.5
		9538	1907.6	23.2

Note(s):

KDB 941225 D01 – Body SAR is not required for handsets with HSPA capabilities when the maximum average output of each RF channel with HSUPA/HSDPA active is less than ¼ dB higher than that measured without HSUPA/HSDPA using 12.2 kbps RMC and the maximum SAR for 12.2kbps RMC is ≤ 75% of the SAR limit.

DC-HSDPA

The following tests were completed according to procedures in section 7.3.13 of 3GPP TS34.108 v9.5.0. A summary of these settings are illustrated below:

Downlink Physical Channels are set as per 3GPP TS34.121-1 v9.0.0 E.5.0

Table E.5.0: Levels for HSDPA connection setup

Parameter During Connection setup	Unit	Value
P-CPICH_Ec/Ior	dB	-10
P-CCPCH and SCH_Ec/Ior	dB	-12
PICH_Ec/Ior	dB	-15
HS-PDSCH	dB	off
HS-SCCH_1	dB	off
DPCH_Ec/Ior	dB	-5
OCNS_Ec/Ior	dB	-3.1

Call is set up as per 3GPP TS34.108 v9.5.0 sub clause 7.3.13

The configurations of the fixed reference channels for HSDPA RF tests are described in 3GPP TS 34.121, annex C for FDD and 3GPP TS 34.122.

Table C.8.1.12: Fixed Reference Channel H-Set 12

Parameter	Unit	Value
Nominal Avg. Inf. Bit Rate	kbps	60
Inter-TTI Distance	TTI's	1
Number of HARQ Processes	Processes	6
Information Bit Payload (N_{INF})	Bits	120
Number Code Blocks	Blocks	1
Binary Channel Bits Per TTI	Bits	960
Total Available SML's in UE	SML's	19200
Number of SML's per HARQ Proc.	SML's	3200
Coding Rate		0.15
Number of Physical Channel Codes	Codes	1
Modulation		QPSK
Note 1: The RMC is intended to be used for DC-HSDPA mode and both cells shall transmit with identical parameters as listed in the table.		
Note 2: Maximum number of transmission is limited to 1, i.e., retransmission is not allowed. The redundancy and constellation version 0 shall be used.		

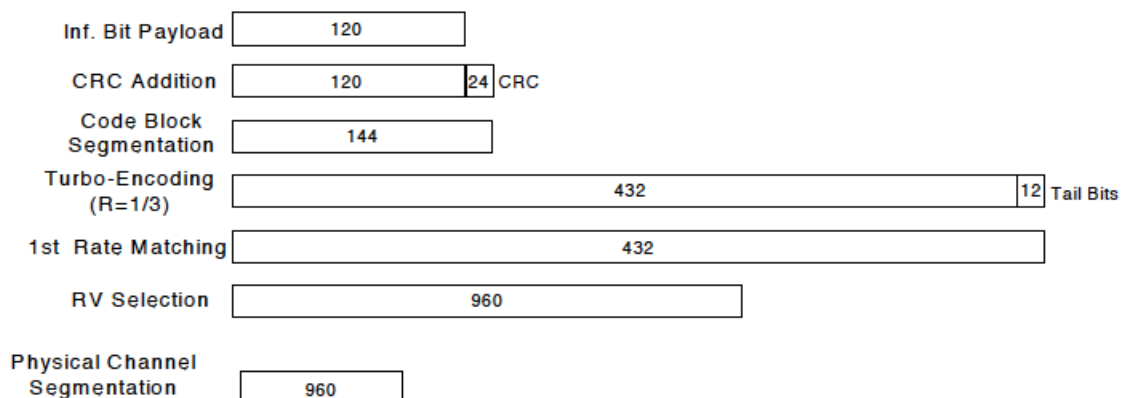


Figure C.8.19: Coding rate for Fixed reference Channel H-Set 12 (QPSK)

The following 4 Sub-tests for HSDPA were completed according to Release 6 procedures in section 5.2 of 3GPP TS34.121. A summary of subtest settings are illustrated below:

	Mode	HSDPA	HSDPA	HSDPA	HSDPA
	Subtest	1	2	3	4
WCDMA General Settings	Loopback Mode	Test Mode 1			
	Rel99 RMC	12.2kbps RMC			
	HSDPA FRC	H-Set1			
	Power Control Algorithm	Algorithm2			
	β_c	2/15	12/15	15/15	15/15
	β_d	15/15	15/15	8/15	4/15
	β_d (SF)	64			
	β_c/β_d	2/15	12/15	15/8	15/4
	β_{hs}	4/15	24/15	30/15	30/15
	MPR	0	0	0.5	0.5
HSDPA Specific Settings	DACK	8			
	DNAK	8			
	DCQI	8			
	Ack-Nack Repetition factor	3			
	CQI Feedback	4ms			
	CQI Repetition Factor	2			
	Ahs = β_{hs}/β_c	30/15			

Up commands are set continuously to set the UE to Max power.

Output Power Tolerance	DC-HSDPA (dBm)			
	subtest 1	subtest 2	subtest 3	subtest 4
Max	24.2	24.2	23.7	23.7
Target	23.7	23.7	23.2	23.2

Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm)
W-CDMA Band II	Subtest 1	9262	1852.4	24.2
		9400	1880.0	24.1
		9538	1907.6	23.8
	Subtest 2	9262	1852.4	24.2
		9400	1880.0	24.2
		9538	1907.6	23.9
	Subtest 3	9262	1852.4	23.7
		9400	1880.0	23.7
		9538	1907.6	23.5
	Subtest 4	9262	1852.4	23.7
		9400	1880.0	23.7
		9538	1907.6	23.5

HSPA+

Since 16QAM is not used for uplink, the uplink Category and release is same as HSUPA, i.e., CAT 6 Rel 6. Therefore, the RF conducted power is not measured.

9.4. W-CDMA Band IV

Output Power Tolerance	Release 99 (dBm)
Max	23.9
Target	23.4

Release 99

The following tests were completed according to the test requirements outlined in section 5.2 of the 3GPP TS34.121-1 specification. The DUT supports power Class 3, which has a nominal maximum output power of 24 dBm (+1.7/-3.7).

Mode	Subtest	Rel99
WCDMA General Settings	Loopback Mode	Test Mode 1
	Rel99 RMC	12.2kbps RMC
	Power Control Algorithm	Algorithm2
	β_c/β_d	8/15

Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm)
W-CDMA Band IV	Rel 99 (RMC, 12.2 kbps)	1312	1712.4	23.8
		1413	1732.6	23.8
		1513	1752.6	23.9

HSDPA

The following 4 Sub-tests were completed according to Release 6 procedures in section 5.2 of 3GPP TS34.121. A summary of these settings are illustrated below:

	Mode	HSDPA	HSDPA	HSDPA	HSDPA
	Subtest	1	2	3	4
W-CDMA General Settings	Loopback Mode	Test Mode 1			
	Rel99 RMC	12.2kbps RMC			
	HSDPA FRC	H-Set1			
	Power Control Algorithm	Algorithm 2			
	β_c	2/15	12/15	15/15	15/15
	β_d	15/15	15/15	8/15	4/15
	Bd (SF)	64			
	β_c/β_d	2/15	12/15	15/8	15/4
	β_{hs}	4/15	24/15	30/15	30/15
HSDPA Specific Settings	MPR (dB)	0	0	0.5	0.5
	D _{ACK}	8			
	D _{NAK}	8			
	DCQI	8			
	Ack-Nack repetition factor	3			
	CQI Feedback (Table 5.2B.4)	4ms			
	CQI Repetition Factor (Table 5.2B.4)	2			
	A _{hs} = β_{hs}/β_c	30/15			

Output Power Tolerance	HSDPA (dBm)			
	subtest 1	subtest 2	subtest 3	subtest 4
Max	23.9	23.9	23.4	23.4
Target	23.4	23.4	22.9	22.9

Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm)
W-CDMA Band IV	Subtest 1	1312	1712.4	23.8
		1413	1732.6	23.9
		1513	1752.6	23.8
	Subtest 2	1312	1712.4	23.9
		1413	1732.6	23.9
		1513	1752.6	23.9
	Subtest 3	1312	1712.4	23.4
		1413	1732.6	23.4
		1513	1752.6	23.4
	Subtest 4	1312	1712.4	23.3
		1413	1732.6	23.4
		1513	1752.6	23.3

Maximum output power levels that are possible for all subtests reported.

Note(s):

KDB 941225 D01 – Body SAR is not required for HSDPA when the maximum average output of each RF channel with HSDPA active is less than ¼ dB higher than that measured without HSDPA using 12.2 kbps RMC or the maximum SAR for 12.2 kbps RMC is < 75% of the SAR limit.

HSPA (HSDPA & HSUPA)

The following 5 Sub-tests were completed according to Release 6 procedures in section 5.2 of 3GPP TS34.121. A summary of these settings are illustrated below:

	Mode	HSPA	HSPA	HSPA	HSPA	HSPA
	Subtest	1	2	3	4	5
WCDMA General Settings	Loopback Mode	Test Mode 1				
	Rel99 RMC	12.2kbps RMC				
	HSDPA FRC	H-Set1				
	HSUPA Test	HSUPA Loopback				
	Power Control Algorithm	Algorithm2				
	β_c	11/15	6/15	15/15	2/15	15/15
	β_d	15/15	15/15	9/15	15/15	15/15
	β_{ec}	209/225	12/15	30/15	2/15	24/15
	β_c/β_d	11/15	6/15	15/9	2/15	15/15
	β_{hs}	22/15	12/15	30/15	4/15	30/15
	β_{ed}	1309/225	94/75	47/15 47/15	56/75	134/15
	CM (dB)	1.0	3.0	2.0	3.0	1.0
	MPR (dB)	0	2	1	2	0
HSDPA Specific Settings	DACK	8				
	DNAK	8				
	DCQI	8				
	Ack-Nack repetition factor	3				
	CQI Feedback (Table 5.2B.4)	4ms				
	CQI Repetition Factor (Table 5.2B.4)	2				
HSUPA Specific Settings	Ahs = β_{hs}/β_c	30/15				
	D E-DPCCH	6	8	8	5	7
	DHARQ	0	0	0	0	0
	AG Index	20	12	15	17	21
	ETFCI (from 34.121 Table C.11.1.3)	75	67	92	71	81
	Associated Max UL Data Rate kbps	242.1	174.9	482.8	205.8	308.9
	Reference E_TFCIs	E-TFCI 11 E-TFCI PO 4 E-TFCI 67 E-TFCI PO 18 E-TFCI 71 E-TFCI PO 23 E-TFCI 75 E-TFCI PO 26 E-TFCI 81 E-TFCI PO 27		E-TFCI 11 E-TFCI PO 4 E-TFCI 92 E-TFCI PO 18		E-TFCI 11 E-TFCI PO 4 E-TFCI 67 E-TFCI PO 18 E-TFCI 71 E-TFCI PO 23 E-TFCI 75 E-TFCI PO 26 E-TFCI 81 E-TFCI PO 27

Output Power Tolerance	HSUPA (dBm)				
	subtest 1	subtest 2	subtest 3	subtest 4	subtest 5
Max	23.9	21.9	22.9	21.9	23.9
Target	23.4	21.4	22.4	21.4	23.4

Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm)
W-CDMA Band IV	Subtest 1	1312	1712.4	23.0
		1413	1732.6	22.9
		1513	1752.6	22.9
	Subtest 2	1312	1712.4	21.6
		1413	1732.6	21.3
		1513	1752.6	21.5
	Subtest 3	1312	1712.4	22.0
		1413	1732.6	22.6
		1513	1752.6	22.3
	Subtest 4	1312	1712.4	22.1
		1413	1732.6	22.3
		1513	1752.6	22.3
	Subtest 5	1312	1712.4	22.9
		1413	1732.6	22.7
		1513	1752.6	22.7

Note(s):

KDB 941225 D01 – Body SAR is not required for handsets with HSPA capabilities when the maximum average output of each RF channel with HSUPA/HSDPA active is less than ¼ dB higher than that measured without HSUPA/HSDPA using 12.2 kbps RMC and the maximum SAR for 12.2kbps RMC is ≤ 75% of the SAR limit.

DC-HSDPA (Rel 8, CAT 24)

The following tests were completed according to procedures in section 7.3.13 of 3GPP TS34.108 v9.5.0. A summary of these settings are illustrated below:

Downlink Physical Channels are set as per 3GPP TS34.121-1 v9.0.0 E.5.0

Table E.5.0: Levels for HSDPA connection setup

Parameter During Connection setup	Unit	Value
P-CPICH E_c/I_{or}	dB	-10
P-CCPCH and SCH E_c/I_{or}	dB	-12
PICH E_c/I_{or}	dB	-15
HS-PDSCH	dB	off
HS-SCCH_1	dB	off
DPCH E_c/I_{or}	dB	-5
OCNS E_c/I_{or}	dB	-3.1

Call is set up as per 3GPP TS34.108 v9.5.0 sub clause 7.3.13

The configurations of the fixed reference channels for HSDPA RF tests are described in 3GPP TS 34.121, annex C for FDD and 3GPP TS 34.122.

Table C.8.1.12: Fixed Reference Channel H-Set 12

Parameter	Unit	Value
Nominal Avg. Inf. Bit Rate	kbps	60
Inter-TTI Distance	TTI's	1
Number of HARQ Processes	Processes	6
Information Bit Payload (N_{INF})	Bits	120
Number Code Blocks	Blocks	1
Binary Channel Bits Per TTI	Bits	960
Total Available SML's in UE	SML's	19200
Number of SML's per HARQ Proc.	SML's	3200
Coding Rate		0.15
Number of Physical Channel Codes	Codes	1
Modulation		QPSK
Note 1: The RMC is intended to be used for DC-HSDPA mode and both cells shall transmit with identical parameters as listed in the table. Note 2: Maximum number of transmission is limited to 1, i.e., retransmission is not allowed. The redundancy and constellation version 0 shall be used.		

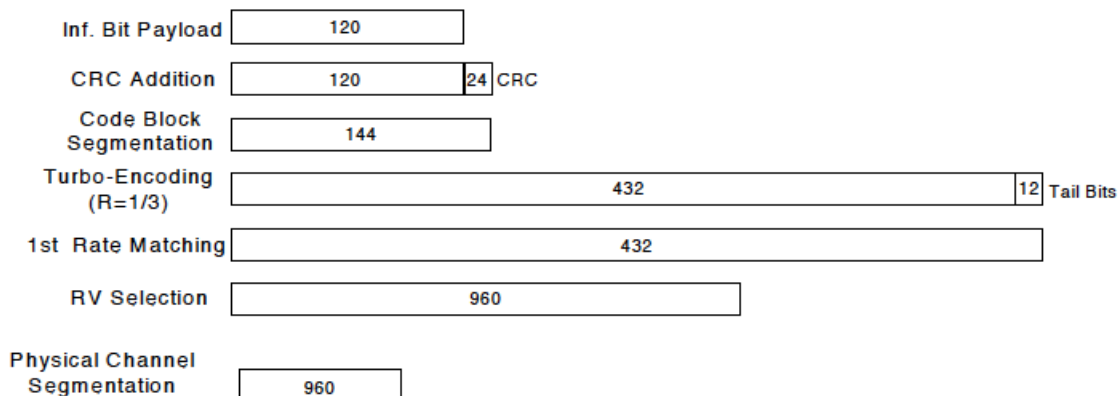


Figure C.8.19: Coding rate for Fixed reference Channel H-Set 12 (QPSK)

The following 4 Sub-tests for HSDPA were completed according to Release 6 procedures in section 5.2 of 3GPP TS34.121. A summary of subtest settings are illustrated below:

	Mode	HSDPA	HSDPA	HSDPA	HSDPA
	Subtest	1	2	3	4
WCDMA General Settings	Loopback Mode	Test Mode 1			
	Rel99 RMC	12.2kbps RMC			
	HSDPA FRC	H-Set1			
	Power Control Algorithm	Algorithm2			
	β_c	2/15	12/15	15/15	15/15
	β_d	15/15	15/15	8/15	4/15
	β_d (SF)	64			
	β_c/β_d	2/15	12/15	15/8	15/4
	β_{hs}	4/15	24/15	30/15	30/15
	MPR	0	0	0.5	0.5
HSDPA Specific Settings	DACK	8			
	DNAK	8			
	DCQI	8			
	Ack-Nack Repetition factor	3			
	CQI Feedback	4ms			
	CQI Repetition Factor	2			
	$A_{hs} = \beta_{hs}/\beta_c$	30/15			

Up commands are set continuously to set the UE to Max power.

Output Power Tolerance	DC-HSDPA (dBm)			
	subtest 1	subtest 2	subtest 3	subtest 4
Max	23.9	23.9	23.4	23.4
Target	23.4	23.4	22.9	22.9

Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm)
W-CDMA Band IV	Subtest 1	1312	1712.4	23.9
		1413	1732.6	23.8
		1513	1752.6	23.9
	Subtest 2	1312	1712.4	23.8
		1413	1732.6	23.9
		1513	1752.6	23.9
	Subtest 3	1312	1712.4	23.3
		1413	1732.6	23.4
		1513	1752.6	23.4
	Subtest 4	1312	1712.4	23.4
		1413	1732.6	23.4
		1513	1752.6	23.4

HSPA+

Since 16QAM is not used for uplink, the uplink Category and release is same as HSUPA, i.e., CAT 6 Rel 6. Therefore, the RF conducted power is not measured.

9.5. W-CDMA Band V

Output Power Tolerance	Release 99 (dBm)
Max	24.2
Target	23.7

Release 99

The following tests were completed according to the test requirements outlined in section 5.2 of the 3GPP TS34.121-1 specification. The DUT supports power Class 3, which has a nominal maximum output power of 24 dBm (+1.7/-3.7).

Mode	Subtest	Rel99
WCDMA General Settings	Loopback Mode	Test Mode 1
	Rel99 RMC	12.2kbps RMC
	Power Control Algorithm	Algorithm2
	β_c/β_d	8/15

Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm)
W-CDMA Band V	Rel 99 (RMC, 12.2 kbps)	4132	826.4	24.1
		4183	836.6	24.0
		4233	846.6	24.2

HSDPA

The following 4 Sub-tests were completed according to Release 6 procedures in section 5.2 of 3GPP TS34.121. A summary of these settings are illustrated below:

	Mode	HSDPA	HSDPA	HSDPA	HSDPA
	Subtest	1	2	3	4
W-CDMA General Settings	Loopback Mode	Test Mode 1			
	Rel99 RMC	12.2kbps RMC			
	HSDPA FRC	H-Set1			
	Power Control Algorithm	Algorithm 2			
	β_c	2/15	12/15	15/15	15/15
	β_d	15/15	15/15	8/15	4/15
	Bd (SF)	64			
	β_c/β_d	2/15	12/15	15/8	15/4
	β_{hs}	4/15	24/15	30/15	30/15
HSDPA Specific Settings	MPR (dB)	0	0	0.5	0.5
	D _{ACK}	8			
	D _{NAK}	8			
	DCQI	8			
	Ack-Nack repetition factor	3			
	CQI Feedback (Table 5.2B.4)	4ms			
	CQI Repetition Factor (Table 5.2B.4)	2			
	A _{hs} = β_{hs}/β_c	30/15			

Output Power Tolerance	HSDPA (dBm)			
	subtest 1	subtest 2	subtest 3	subtest 4
Max	24.2	24.2	23.7	23.7
Target	23.7	23.7	23.2	23.2

Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm)
W-CDMA Band V	Subtest 1	4132	826.4	24.2
		4183	836.6	24.1
		4233	846.6	24.2
	Subtest 2	4132	826.4	24.2
		4183	836.6	24.0
		4233	846.6	24.2
	Subtest 3	4132	826.4	23.7
		4183	836.6	23.6
		4233	846.6	23.6
	Subtest 4	4132	826.4	23.7
		4183	836.6	23.6
		4233	846.6	23.7

Maximum output power levels that are possible for all subtests reported.

Note(s):

KDB 941225 D01 – Body SAR is not required for HSDPA when the maximum average output of each RF channel with HSDPA active is less than ¼ dB higher than that measured without HSDPA using 12.2 kbps RMC or the maximum SAR for 12.2 kbps RMC is < 75% of the SAR limit.

HSPA (HSDPA & HSUPA)

The following 5 Sub-tests were completed according to Release 6 procedures in section 5.2 of 3GPP TS34.121. A summary of these settings are illustrated below:

	Mode	HSPA	HSPA	HSPA	HSPA	HSPA
	Subtest	1	2	3	4	5
WCDMA General Settings	Loopback Mode	Test Mode 1				
	Rel99 RMC	12.2kbps RMC				
	HSDPA FRC	H-Set1				
	HSUPA Test	HSUPA Loopback				
	Power Control Algorithm	Algorithm2				
	β_c	11/15	6/15	15/15	2/15	15/15
	β_d	15/15	15/15	9/15	15/15	15/15
	β_{ec}	209/225	12/15	30/15	2/15	24/15
	β_c/β_d	11/15	6/15	15/9	2/15	15/15
	β_{hs}	22/15	12/15	30/15	4/15	30/15
	β_{ed}	1309/225	94/75	47/15 47/15	56/75	134/15
	CM (dB)	1.0	3.0	2.0	3.0	1.0
	MPR (dB)	0	2	1	2	0
HSDPA Specific Settings	DACK	8				
	DNAK	8				
	DCQI	8				
	Ack-Nack repetition factor	3				
	CQI Feedback (Table 5.2B.4)	4ms				
	CQI Repetition Factor (Table 5.2B.4)	2				
HSUPA Specific Settings	Ahs = β_{hs}/β_c	30/15				
	D E-DPCCH	6	8	8	5	7
	DHARQ	0	0	0	0	0
	AG Index	20	12	15	17	21
	ETFCI (from 34.121 Table C.11.1.3)	75	67	92	71	81
	Associated Max UL Data Rate kbps	242.1	174.9	482.8	205.8	308.9
	Reference E_TFCIs	E-TFCI 11 E-TFCI PO 4 E-TFCI 67 E-TFCI PO 18 E-TFCI 71 E-TFCI PO 23 E-TFCI 75 E-TFCI PO 26 E-TFCI 81 E-TFCI PO 27		E-TFCI 11 E-TFCI PO 4 E-TFCI 92 E-TFCI PO 18		E-TFCI 11 E-TFCI PO 4 E-TFCI 67 E-TFCI PO 18 E-TFCI 71 E-TFCI PO 23 E-TFCI 75 E-TFCI PO 26 E-TFCI 81 E-TFCI PO 27

Output Power Tolerance	HSUPA (dBm)				
	subtest 1	subtest 2	subtest 3	subtest 4	subtest 5
Max	24.2	22.2	23.2	22.2	24.2
Target	23.7	21.7	22.7	21.7	23.7

Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm)
W-CDMA Band V	Subtest 1	4132	826.4	22.9
		4183	836.6	23.0
		4233	846.6	23.6
	Subtest 2	4132	826.4	21.6
		4183	836.6	21.6
		4233	846.6	22.2
	Subtest 3	4132	826.4	23.1
		4183	836.6	22.3
		4233	846.6	22.7
	Subtest 4	4132	826.4	22.4
		4183	836.6	22.5
		4233	846.6	22.6
	Subtest 5	4132	826.4	23.2
		4183	836.6	23.1
		4233	846.6	23.4

Note(s):

KDB 941225 D01 – Body SAR is not required for handsets with HSPA capabilities when the maximum average output of each RF channel with HSUPA/HSDPA active is less than ¼ dB higher than that measured without HSUPA/HSDPA using 12.2 kbps RMC and the maximum SAR for 12.2kbps RMC is ≤ 75% of the SAR limit.

HSPA+

Since 16QAM is not used for uplink, the uplink Category and release is same as HSUPA, i.e., CAT 6 Rel 6. Therefore, the RF conducted power is not measured.

DC-HSDPA (Rel 8, CAT 24)

The following tests were completed according to procedures in section 7.3.13 of 3GPP TS34.108 v9.5.0. A summary of these settings are illustrated below:

Downlink Physical Channels are set as per 3GPP TS34.121-1 v9.0.0 E.5.0

Table E.5.0: Levels for HSDPA connection setup

Parameter During Connection setup	Unit	Value
P-CPICH E_c/I_{or}	dB	-10
P-CCPCH and SCH E_c/I_{or}	dB	-12
PICH E_c/I_{or}	dB	-15
HS-PDSCH	dB	off
HS-SCCH_1	dB	off
DPCH E_c/I_{or}	dB	-5
OCNS E_c/I_{or}	dB	-3.1

Call is set up as per 3GPP TS34.108 v9.5.0 sub clause 7.3.13

The configurations of the fixed reference channels for HSDPA RF tests are described in 3GPP TS 34.121, annex C for FDD and 3GPP TS 34.122.

Table C.8.1.12: Fixed Reference Channel H-Set 12

Parameter	Unit	Value
Nominal Avg. Inf. Bit Rate	kbps	60
Inter-TTI Distance	TTI's	1
Number of HARQ Processes	Processes	6
Information Bit Payload (N_{INF})	Bits	120
Number Code Blocks	Blocks	1
Binary Channel Bits Per TTI	Bits	960
Total Available SML's in UE	SML's	19200
Number of SML's per HARQ Proc.	SML's	3200
Coding Rate		0.15
Number of Physical Channel Codes	Codes	1
Modulation		QPSK
Note 1: The RMC is intended to be used for DC-HSDPA mode and both cells shall transmit with identical parameters as listed in the table. Note 2: Maximum number of transmission is limited to 1, i.e., retransmission is not allowed. The redundancy and constellation version 0 shall be used.		

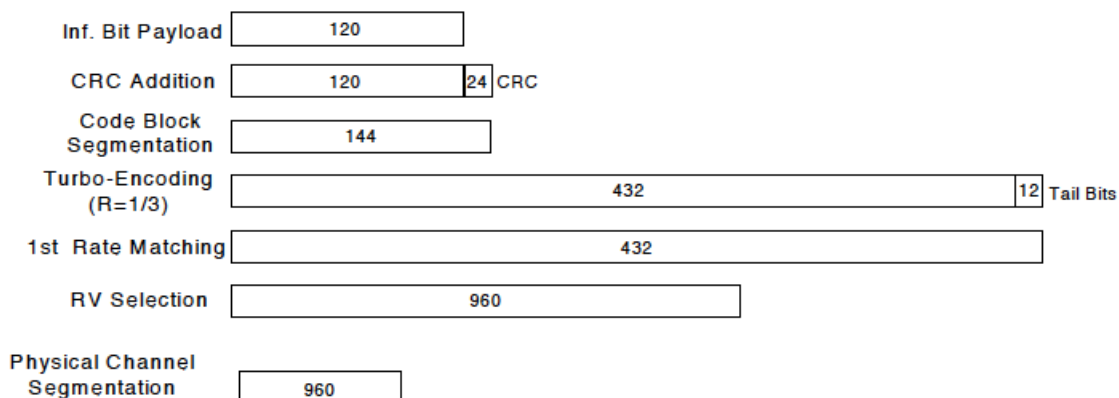


Figure C.8.19: Coding rate for Fixed reference Channel H-Set 12 (QPSK)

The following 4 Sub-tests for HSDPA were completed according to Release 6 procedures in section 5.2 of 3GPP TS34.121. A summary of subtest settings are illustrated below:

	Mode	HSDPA	HSDPA	HSDPA	HSDPA
	Subtest	1	2	3	4
WCDMA General Settings	Loopback Mode	Test Mode 1			
	Rel99 RMC	12.2kbps RMC			
	HSDPA FRC	H-Set1			
	Power Control Algorithm	Algorithm2			
	β_c	2/15	12/15	15/15	15/15
	β_d	15/15	15/15	8/15	4/15
	β_d (SF)	64			
	β_c/β_d	2/15	12/15	15/8	15/4
	β_{hs}	4/15	24/15	30/15	30/15
HSDPA Specific Settings	MPR	0	0	0.5	0.5
	DACK	8			
	DNAK	8			
	DCQI	8			
	Ack-Nack Repetition factor	3			
	CQI Feedback	4ms			
	CQI Repetition Factor	2			
	Ahs = β_{hs}/β_c	30/15			

Up commands are set continuously to set the UE to Max power.

Output Power Tolerance	DC-HSDPA (dBm)			
	subtest 1	subtest 2	subtest 3	subtest 4
Max	24.2	24.2	23.7	23.7
Target	23.7	23.7	23.2	23.2

Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm)
W-CDMA Band V	Subtest 1	4132	826.4	24.0
		4180	836.0	24.2
		4230	846.0	24.1
	Subtest 2	4132	826.4	24.2
		4180	836.0	22.2
		4230	846.0	24.2
	Subtest 3	4132	826.4	23.6
		4180	836.0	23.6
		4230	846.0	23.6
	Subtest 4	4132	826.4	23.6
		4180	836.0	23.6
		4230	846.0	23.7

HSPA+

Since 16QAM is not used for uplink, the uplink Category and release is same as HSUPA, i.e., CAT 6 Rel 6. Therefore, the RF conducted power is not measured.

9.6. LTE Band 2

Output Power Tolerance	QPSK (dBm)
Max	23.7
Target	23.2

The following tests were conducted according to the test requirements outlined in section 6.2 of the 3GPP TS36.101 specification.

UE Power Class: 3 (23 +/- 2dBm). The allowed Maximum Power Reduction (MPR) for the maximum output power due to higher order modulation and transmit bandwidth configuration (resource blocks) is specified in Table 6.2.3-1 of the 3GPP TS36.101.

Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3

Modulation	Channel bandwidth / Transmission bandwidth (RB)						MPR (dB)
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2

The allowed A-MPR values specified below in Table 6.2.4.-1 of 3GPP TS36.101 are in addition to the allowed MPR requirements. All the measurements below were performed with A-MPR disabled, by using Network Signalling Value of "NS_01".³

Table 6.2.4-1: Additional Maximum Power Reduction (A-MPR)

Network Signalling value	Requirements (sub-clause)	E-UTRA Band	Channel bandwidth (MHz)	Resources Blocks (N_{RB})	A-MPR (dB)
NS_01	6.6.2.1.1	Table 5.5-1	1.4, 3, 5, 10, 15, 20	Table 5.6-1	NA
NS_03	6.6.2.2.1	2, 4, 10, 23, 25, 35, 36	3	>5	≤ 1
			5	>6	≤ 1
			10	>6	≤ 1
			15	>8	≤ 1
			20	>10	≤ 1
NS_04	6.6.2.2.2	41	5	>6	≤ 1
			10, 15, 20	See Table 6.2.4-4	
NS_05	6.6.3.3.1	1	10, 15, 20	≥ 50	≤ 1
NS_06	6.6.2.2.3	12, 13, 14, 17	1.4, 3, 5, 10	Table 5.6-1	n/a
NS_07	6.6.2.2.3 6.6.3.3.2	13	10	Table 6.2.4-2	Table 6.2.4-2
NS_08	6.6.3.3.3	19	10, 15	> 44	≤ 3
NS_09	6.6.3.3.4	21	10, 15	> 40	≤ 1
				> 55	≤ 2
NS_10		20	15, 20	Table 6.2.4-3	Table 6.2.4-3
NS_11	6.6.2.2.1	23 ¹	1.4, 3, 5, 10	Table 6.2.4-5	Table 6.2.4-5
..					
NS_32	-	-	-	-	-

Note 1: Applies to the lower block of Band 23, i.e. a carrier placed in the 2000-2010 MHz region.

Measured Results

BW (MHz)	Ch	Freq. (MHz)	Mode	UL RB Allocation	UL RB Start	MPR	Avg Pwr (dBm)
10	18650	1855.0	QPSK	1	0	0	23.7
				1	24	0	23.6
				1	49	0	23.6
				25	0	1	22.5
				25	12	1	22.5
				25	24	1	22.5
				50	0	1	22.5
			16QAM	1	0	1	22.6
				1	24	1	22.7
				1	49	1	22.7
				25	0	2	21.6
				25	12	2	21.5
				25	24	2	21.6
				50	0	2	21.5
	18900	1880.0	QPSK	1	0	0	23.5
				1	24	0	23.6
				1	49	0	23.5
				25	0	1	22.5
				25	12	1	22.5
				25	24	1	22.4
				50	0	1	22.4
			16QAM	1	0	1	22.2
				1	24	1	22.3
				1	49	1	22.2
				25	0	2	21.5
				25	12	2	21.5
				25	24	2	21.4
				50	0	2	21.4
	19150	1905.0	QPSK	1	0	0	23.6
				1	24	0	23.6
				1	49	0	23.6
				25	0	1	22.5
				25	12	1	22.4
				25	24	1	22.3
				50	0	1	22.3
			16QAM	1	0	1	22.3
				1	24	1	22.3
				1	49	1	22.2
				25	0	2	21.5
				25	12	2	21.5
				25	24	2	21.5
				50	0	2	21.4

LTE Band 2 Measured Results (continued)

BW (MHz)	Ch	Freq. (MHz)	Mode	UL RB Allocation	UL RB Start	MPR	Avg Pwr (dBm)
5	18625	1852.5	QPSK	1	0	0	23.6
				1	12	0	23.7
				1	24	0	23.6
				12	0	1	22.6
				12	6	1	22.6
				12	11	1	22.6
				25	0	1	22.5
			16QAM	1	0	1	22.7
				1	12	1	22.7
				1	24	1	22.7
				12	0	2	21.5
				12	6	2	21.5
				12	11	2	21.5
				25	0	2	21.4
	18900	1880.0	QPSK	1	0	0	23.5
				1	12	0	23.5
				1	24	0	23.4
				12	0	1	22.6
				12	6	1	22.5
				12	11	1	22.5
				25	0	1	22.5
			16QAM	1	0	1	22.2
				1	12	1	22.2
				1	24	1	22.2
				12	0	2	21.5
				12	6	2	21.5
				12	11	2	21.5
				25	0	2	21.5
	19175	1907.5	QPSK	1	0	0	23.6
				1	12	0	23.6
				1	24	0	23.6
				12	0	1	22.4
				12	6	1	22.3
				12	11	1	22.4
				25	0	1	22.4
			16QAM	1	0	1	22.5
				1	12	1	22.5
				1	24	1	22.6
				12	0	2	21.5
				12	6	2	21.5
				12	11	2	21.5
				25	0	2	21.4

9.7. LTE Band 4

Output Power Tolerance	QPSK (dBm)
Max	23.7
Target	23.2

The following tests were conducted according to the test requirements outlined in section 6.2 of the 3GPP TS36.101 specification.

UE Power Class: 3 (23 +/- 2dBm). The allowed Maximum Power Reduction (MPR) for the maximum output power due to higher order modulation and transmit bandwidth configuration (resource blocks) is specified in Table 6.2.3-1 of the 3GPP TS36.101.

Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3

Modulation	Channel bandwidth / Transmission bandwidth (RB)						MPR (dB)
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2

The allowed A-MPR values specified below in Table 6.2.4.-1 of 3GPP TS36.101 are in addition to the allowed MPR requirements. All the measurements below were performed with A-MPR disabled, by using Network Signalling Value of "NS_01".³

Table 6.2.4-1: Additional Maximum Power Reduction (A-MPR)

Network Signalling value	Requirements (sub-clause)	E-UTRA Band	Channel bandwidth (MHz)	Resources Blocks (N_{RB})	A-MPR (dB)
NS_01	6.6.2.1.1	Table 5.5-1	1.4, 3, 5, 10, 15, 20	Table 5.6-1	NA
NS_03	6.6.2.2.1	2, 4, 10, 23, 25, 35, 36	3	>5	≤ 1
			5	>6	≤ 1
			10	>6	≤ 1
			15	>8	≤ 1
			20	>10	≤ 1
NS_04	6.6.2.2.2	41	5	>6	≤ 1
			10, 15, 20	See Table 6.2.4-4	
NS_05	6.6.3.3.1	1	10, 15, 20	≥ 50	≤ 1
NS_06	6.6.2.2.3	12, 13, 14, 17	1.4, 3, 5, 10	Table 5.6-1	n/a
NS_07	6.6.2.2.3 6.6.3.3.2	13	10	Table 6.2.4-2	Table 6.2.4-2
NS_08	6.6.3.3.3	19	10, 15	> 44	≤ 3
NS_09	6.6.3.3.4	21	10, 15	> 40	≤ 1
				> 55	≤ 2
NS_10		20	15, 20	Table 6.2.4-3	Table 6.2.4-3
NS_11	6.6.2.2.1	23 ¹	1.4, 3, 5, 10	Table 6.2.4-5	Table 6.2.4-5
..					
NS_32	-	-	-	-	-

Note 1: Applies to the lower block of Band 23, i.e. a carrier placed in the 2000-2010 MHz region.

Measured Results

BW (MHz)	Ch	Freq. (MHz)	Mode	UL RB Allocation	UL RB Start	MPR	Avg Pwr (dBm)
20	20050	1720.0	QPSK	1	0	0	23.7
				1	49	0	23.6
				1	99	0	23.6
				50	0	1	22.4
				50	24	1	22.4
				50	49	1	22.4
				100	0	1	22.4
			16QAM	1	0	1	22.5
				1	49	1	22.4
				1	99	1	22.5
				50	0	2	21.5
				50	24	2	21.4
				50	49	2	21.4
				100	0	2	21.4
	20175	1732.5	QPSK	1	0	0	23.7
				1	49	0	23.7
				1	99	0	23.5
				50	0	1	22.6
				50	24	1	22.5
				50	49	1	22.4
				100	0	1	22.4
			16QAM	1	0	1	22.6
				1	49	1	22.5
				1	99	1	22.7
				50	0	2	21.6
				50	24	2	21.4
				50	49	2	21.4
				100	0	2	21.4
	20300	1745.0	QPSK	1	0	0	23.6
				1	49	0	23.6
				1	99	0	23.6
				50	0	1	22.4
				50	24	1	22.3
				50	49	1	22.3
				100	0	1	22.3
			16QAM	1	0	1	22.7
				1	49	1	22.6
				1	99	1	22.6
				50	0	2	21.4
				50	24	2	21.4
				50	49	2	21.4
				100	0	2	21.4

LTE Band 4 Measured Results (continued)

BW (MHz)	Ch	Freq. (MHz)	Mode	UL RB Allocation	UL RB Start	MPR	Avg Pwr (dBm)
15	20025	1717.5	QPSK	1	0	0	23.5
				1	37	0	23.5
				1	74	0	23.6
				36	0	1	22.4
				36	16	1	22.4
				36	35	1	22.4
				75	0	1	22.4
			16QAM	1	0	1	22.4
				1	37	1	22.5
				1	74	1	22.5
				36	0	2	21.2
				36	16	2	21.3
				36	35	2	21.3
				75	0	2	21.3
	20175	1732.5	QPSK	1	0	0	23.6
				1	37	0	23.7
				1	74	0	23.5
				36	0	1	22.5
				36	16	1	22.5
				36	35	1	22.6
				75	0	1	22.4
			16QAM	1	0	1	22.3
				1	37	1	22.4
				1	74	1	22.2
				36	0	2	21.5
				36	16	2	21.5
				36	35	2	21.5
				75	0	2	21.4
	20325	1747.5	QPSK	1	0	0	23.5
				1	37	0	23.5
				1	74	0	23.6
				36	0	1	22.4
				36	16	1	22.3
				36	35	1	22.3
				75	0	1	22.4
			16QAM	1	0	1	22.5
				1	37	1	22.6
				1	74	1	22.7
				36	0	2	21.5
				36	16	2	21.5
				36	35	2	21.4
				75	0	2	21.4

LTE Band 4 Measured Results (continued)

BW (MHz)	Ch	Freq. (MHz)	Mode	UL RB Allocation	UL RB Start	MPR	Avg Pwr (dBm)
10	20000	1715.0	QPSK	1	0	0	23.6
				1	24	0	23.5
				1	49	0	23.6
				25	0	1	22.4
				25	12	1	22.3
				25	24	1	22.4
				50	0	1	22.3
			16QAM	1	0	1	22.6
				1	24	1	22.6
				1	49	1	22.7
				25	0	2	21.4
				25	12	2	21.3
				25	24	2	21.4
				50	0	2	21.2
	20175	1732.5	QPSK	1	0	0	23.5
				1	24	0	23.6
				1	49	0	23.4
				25	0	1	22.5
				25	12	1	22.5
				25	24	1	22.5
				50	0	1	22.4
			16QAM	1	0	1	22.2
				1	24	1	22.2
				1	49	1	22.2
				25	0	2	21.6
				25	12	2	21.5
				25	24	2	21.6
				50	0	2	21.5
	20350	1750.0	QPSK	1	0	0	23.6
				1	24	0	23.4
				1	49	0	23.6
				25	0	1	22.3
				25	12	1	22.3
				25	24	1	22.3
				50	0	1	22.3
			16QAM	1	0	1	22.4
				1	24	1	22.3
				1	49	1	22.4
				25	0	2	21.4
				25	12	2	21.3
				25	24	2	21.4
				50	0	2	21.4

LTE Band 4 Measured Results (continued)

BW (MHz)	Ch	Freq. (MHz)	Mode	UL RB Allocation	UL RB Start	MPR	Avg Pwr (dBm)
5	19975	1712.5	QPSK	1	0	0	23.5
				1	12	0	23.5
				1	24	0	23.5
				12	0	1	22.4
				12	6	1	22.4
				12	11	1	22.4
				25	0	1	22.4
			16QAM	1	0	1	22.6
				1	12	1	22.6
				1	24	1	22.5
				12	0	2	21.3
				12	6	2	21.3
				12	11	2	21.3
				25	0	2	21.3
	20175	1732.5	QPSK	1	0	0	23.7
				1	12	0	23.7
				1	24	0	23.6
				12	0	1	22.5
				12	6	1	22.5
				12	11	1	22.5
				25	0	1	22.5
			16QAM	1	0	1	22.7
				1	12	1	22.7
				1	24	1	22.7
				12	0	2	21.4
				12	6	2	21.5
				12	11	2	21.5
				25	0	2	21.4
	20375	1752.5	QPSK	1	0	0	23.4
				1	12	0	23.5
				1	24	0	23.6
				12	0	1	22.4
				12	6	1	22.3
				12	11	1	22.6
				25	0	1	22.4
			16QAM	1	0	1	22.7
				1	12	1	22.1
				1	24	1	22.2
				12	0	2	21.4
				12	6	2	21.4
				12	11	2	21.5
				25	0	2	21.4

9.8. LTE Band 17

Output Power Tolerance	QPSK (dBm)
Max	23.7
Target	23.2

The following tests were conducted according to the test requirements outlined in section 6.2 of the 3GPP TS36.101 specification.

UE Power Class: 3 (23 +/- 2dBm). The allowed Maximum Power Reduction (MPR) for the maximum output power due to higher order modulation and transmit bandwidth configuration (resource blocks) is specified in Table 6.2.3-1 of the 3GPP TS36.101.

Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3

Modulation	Channel bandwidth / Transmission bandwidth (RB)						MPR (dB)
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2

The allowed A-MPR values specified below in Table 6.2.4.-1 of 3GPP TS36.101 are in addition to the allowed MPR requirements. All the measurements below were performed with A-MPR disabled, by using Network Signalling Value of "NS_01".³

Table 6.2.4-1: Additional Maximum Power Reduction (A-MPR)

Network Signalling value	Requirements (sub-clause)	E-UTRA Band	Channel bandwidth (MHz)	Resources Blocks (N_{RB})	A-MPR (dB)
NS_01	6.6.2.1.1	Table 5.5-1	1.4, 3, 5, 10, 15, 20	Table 5.6-1	NA
NS_03	6.6.2.2.1	2, 4, 10, 23, 25, 35, 36	3	>5	≤ 1
			5	>6	≤ 1
			10	>6	≤ 1
			15	>8	≤ 1
			20	>10	≤ 1
NS_04	6.6.2.2.2	41	5	>6	≤ 1
			10, 15, 20	See Table 6.2.4-4	
NS_05	6.6.3.3.1	1	10, 15, 20	≥ 50	≤ 1
NS_06	6.6.2.2.3	12, 13, 14, 17	1.4, 3, 5, 10	Table 5.6-1	n/a
NS_07	6.6.2.2.3 6.6.3.3.2	13	10	Table 6.2.4-2	Table 6.2.4-2
NS_08	6.6.3.3.3	19	10, 15	> 44	≤ 3
NS_09	6.6.3.3.4	21	10, 15	> 40	≤ 1
				> 55	≤ 2
NS_10		20	15, 20	Table 6.2.4-3	Table 6.2.4-3
NS_11	6.6.2.2.1	23 ¹	1.4, 3, 5, 10	Table 6.2.4-5	Table 6.2.4-5
..					
NS_32	-	-	-	-	-

Note 1: Applies to the lower block of Band 23, i.e. a carrier placed in the 2000-2010 MHz region.

Measured Results

BW (MHz)	Ch	Freq. (MHz)	Mode	UL RB Allocation	UL RB Start	MPR	Avg Pwr (dBm)
10	23780	709.0	QPSK	1	0	0	23.6
				1	24	0	23.6
				1	49	0	23.6
				25	0	1	22.4
				25	12	1	22.4
				25	24	1	22.4
				50	0	1	22.4
			16QAM	1	0	1	22.7
				1	24	1	22.7
				1	49	1	22.7
				25	0	2	21.5
				25	12	2	21.5
				25	24	2	21.5
				50	0	2	21.4
	23790	710.0	QPSK	1	0	0	23.5
				1	24	0	23.7
				1	49	0	23.6
				25	0	1	22.5
				25	12	1	22.5
				25	24	1	22.4
				50	0	1	22.4
			16QAM	1	0	1	22.1
				1	24	1	22.2
				1	49	1	22.1
				25	0	2	21.5
				25	12	2	21.5
				25	24	2	21.5
				50	0	2	21.5
	23800	711.0	QPSK	1	0	0	23.5
				1	24	0	23.5
				1	49	0	23.5
				25	0	1	22.4
				25	12	1	22.6
				25	24	1	22.5
				50	0	1	22.4
			16QAM	1	0	1	22.3
				1	24	1	22.2
				1	49	1	22.2
				25	0	2	21.6
				25	12	2	21.5
				25	24	2	21.5
				50	0	2	21.5

LTE Band 17 Results (continued)

BW (MHz)	Ch	Freq. (MHz)	Mode	UL RB Allocation	UL RB Start	MPR	Avg Pwr (dBm)
5	23755	706.5	QPSK	1	0	0	23.5
				1	12	0	23.5
				1	24	0	23.5
				12	0	1	22.4
				12	6	1	22.5
				12	11	1	22.4
				25	0	1	22.4
			16QAM	1	0	1	22.6
				1	12	1	22.6
				1	24	1	22.6
				12	0	2	21.4
				12	6	2	21.5
				12	11	2	21.4
				25	0	2	21.4
	23790	710.0	QPSK	1	0	0	23.5
				1	12	0	23.6
				1	24	0	23.6
				12	0	1	22.5
				12	6	1	22.4
				12	11	1	22.5
				25	0	1	22.4
			16QAM	1	0	1	22.5
				1	12	1	22.7
				1	24	1	22.7
				12	0	2	21.5
				12	6	2	21.6
				12	11	2	21.5
				25	0	2	21.5
	23825	713.5	QPSK	1	0	0	23.5
				1	12	0	23.5
				1	24	0	23.5
				12	0	1	22.5
				12	6	1	22.5
				12	11	1	22.4
				25	0	1	22.4
			16QAM	1	0	1	22.5
				1	12	1	22.6
				1	24	1	22.5
				12	0	2	21.4
				12	6	2	21.5
				12	11	2	21.5
				25	0	2	21.3

9.9. Wi-Fi (2.4 GHz)

Output Power Tolerance	IEEE 802.11 (dBm)		
	b	g	n (HT20)
Max	15.7	13.7	12.7
Target	15.0	13.0	12.0

Required Test Channels per KDB 248227 D01

Mode	Band	GHz	Channel	"Default Test Channels"	
				802.11b	802.11g
802.11b/g	2.4 GHz	2.412	1 [#]	√	▽
		2.437	6	√	▽
		2.462	11 [#]	√	▽

Notes:

√ = "default test channels"

▽ = possible 802.11g channels with maximum average output ¼ dB ≥ the "default test channels"

[#] = when output power is reduced for channel 1 and /or 11 to meet restricted band requirements the highest output channels closest to each of these channels should be tested.

Measured Results

Band (MHz)	Mode	Ch #	Freq. (MHz)	Avg Pwr (dBm)
2.4	802.11b	1	2412	15.1
		6	2437	14.9
		11	2462	15.1
	802.11g	1	2412	12.0
		6	2437	11.7
		11	2462	12.0
	802.11n (HT20)	1	2412	9.7
		6	2437	10.4
		11	2462	10.8

Note(s):

Per KDB 248227 D01, SAR is not required for 802.11g/HT20 channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11b channels.

9.10. Wi-Fi (5 GHz Bands)

Output Power Tolerance	IEEE 802.11 (dBm)		
	a	n (HT20)	n (HT40)
Max	12.1	11.1	11.1
Target	11.0	10.0	10.0

Required Test Channels per KDB 248227 D01

Mode		Band	GHz	Channel	"Default Test Channels"	
					802.11a	
802.11a	UNII (15.407)	5.2 GHz	5.180	36	√	
			5.200	40		*
			2.220	44		*
			5.240	48	√	
		5.3 GHz	5.260	52	√	
			5.280	56		*
			5.300	60		*
			5.320	64	√	
		5.5 GHz	5.500	100		
			5.520	104	√	
			5.540	108		*
			5.560	112		*
			5.580	116	√	
			5.600	120		*
			5.620	124	√	
			5.640	128		*
			5.660	132		*
			5.680	136	√	
			5.700	140		*
	DTS (15.247)	5.8 GHz	5.745	149	√	
			5.765	153		*
			5.785	157	√	
			5.805	161		*
			5.825	165	√	

√ = "default test channels"

* = possible 802.11a channels with maximum average output > the "default test channels"

= when output power is reduced for channel 1 and /or 11 to meet restricted band requirements the highest output channels closest to each of these channels should be tested.

Measured Results

Band (MHz)	Mode	Ch #	Freq. (MHz)	Avg Pwr (dBm)
5.2	802.11a	36	5180	11.1
		40	5200	11.1
		44	5220	11.1
		48	5240	11.1
	802.11n (HT20)	36	5180	9.0
		40	5200	9.1
		48	5240	9.2
	802.11n (HT40)	38	5190	9.8
		46	5230	10.0
5.3	802.11a	52	5260	11.3
		56	5280	11.3
		60	5300	11.3
		64	5320	11.3
	802.11n (HT20)	52	5260	9.0
		60	5300	9.0
		64	5320	8.8
	802.11n (HT40)	54	5270	9.4
		62	5310	9.5
5.5	802.11a	100	5500	11.2
		104	5520	11.3
		108	5540	11.2
		112	5560	11.2
		116	5580	11.3
		120	5600	not supported
		124	5620	not supported
		128	5640	not supported
		132	5660	11.0
		136	5680	11.3
		140	5700	11.0
	802.11n (HT20)	100	5500	9.4
		120	5600	9.5
		140	5700	9.1
	802.11n (HT40)	102	5510	10.1
		118	5590	not supported
		134	5670	10.1
5.8	802.11a	149	5745	11.3
		153	5765	11.1
		157	5785	11.3
		161	5805	11.3
		165	5825	11.3
	802.11n (HT20)	149	5745	9.3
		157	5785	9.5
		161	5805	9.6
	802.11n (HT40)	151	5755	10.2
		159	5795	10.1

Note(s):

- SAR is not required for 802.11n HT20/HT40 channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11a/b channels. As per KDB 248227

9.11. Bluetooth

Maximum tune-up tolerance limit is 11 dBm from the rated nominal maximum output power. This power level qualifies for exclusion of SAR testing. Refer to Section 14.1. Standalone SAR Test Exclusion Considerations

10. Tissue Dielectric Properties

IEEE Std 1528-2003 Table 2

Target Frequency (MHz)	Head	
	ϵ_r	σ (S/m)
300	45.3	0.87
450	43.5	0.87
835	41.5	0.90
900	41.5	0.97
1450	40.5	1.20
1800 – 2000	40.0	1.40
2450	39.2	1.80
2600	39.0	1.96
3000	38.5	2.40

FCC OET Bulletin 65 Supplement C 01-01

Target Frequency (MHz)	Head		Body	
	ϵ_r	σ (S/m)	ϵ_r	σ (S/m)
150	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800 – 2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	1.95
3000	38.5	2.40	52.0	2.73
5000	36.2	4.45	49.3	5.07
5100	36.1	4.55	49.1	5.18
5200	36.0	4.66	49.0	5.30
5300	35.9	4.76	48.9	5.42
5400	35.8	4.86	48.7	5.53
5500	35.6	4.96	48.6	5.65
5600	35.5	5.07	48.5	5.77
5700	35.4	5.17	48.3	5.88
5800	35.3	5.27	48.2	6.00

10.1. Composition of Ingredients for the Tissue Material Used in the SAR Tests

The following tissue formulations are provided for reference only as some of the parameters have not been thoroughly verified. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation.

Ingredients (% by weight)	Frequency (MHz)									
	450		835		915		1900		2450	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	38.56	51.16	41.45	52.4	41.05	56.0	54.9	40.4	62.7	73.2
Salt (NaCl)	3.95	1.49	1.45	1.4	1.35	0.76	0.18	0.5	0.5	0.04
Sugar	56.32	46.78	56.0	45.0	56.5	41.76	0.0	58.0	0.0	0.0
HEC	0.98	0.52	1.0	1.0	1.0	1.21	0.0	1.0	0.0	0.0
Bactericide	0.19	0.05	0.1	0.1	0.1	0.27	0.0	0.1	0.0	0.0
Triton X-100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.8	0.0
DGBE	0.0	0.0	0.0	0.0	0.0	0.0	44.92	0.0	0.0	26.7
Dielectric Constant	43.42	58.0	42.54	56.1	42.0	56.8	39.9	54.0	39.8	52.5
Conductivity (S/m)	0.85	0.83	0.91	0.95	1.0	1.07	1.42	1.45	1.88	1.78

Salt: 99+% Pure Sodium Chloride

Sugar: 98+% Pure Sucrose

Water: De-ionized, 16 MΩ+ resistivity

HEC: Hydroxyethyl Cellulose

DGBE: 99+% Di(ethylene glycol) butyl ether, [2-(2-butoxyethoxy)ethanol]

Triton X-100 (ultra pure): Polyethylene glycol mono [4-(1,1, 3, 3-tetramethylbutyl)phenyl]ether

Simulating Liquids for 5 GHz, Manufactured by SPEAG

Ingredients	(% by weight)
Water	78
Mineral oil	11
Emulsifiers	9
Additives and Salt	2

10.2. Tissue Dielectric Parameter Check Results

The temperature of the tissue-equivalent medium used during measurement must also be within 18°C to 25°C and within $\pm 2^\circ\text{C}$ of the temperature when the tissue parameters are characterized.

The dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements. The parameters should be re-measured after each 3 – 4 days of use; or earlier if the dielectric parameters can become out of tolerance; for example, when the parameters are marginal at the beginning of the measurement series.

Tissue dielectric parameters were measured at the low, middle and high frequency of each operating frequency range of the test device.

SAR Room A

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
6/5/2013	Head 1750	e'	39.6900	Relative Permittivity (ε _r):	39.69	40.08	-0.98	5
		e"	14.1600	Conductivity (σ):	1.38	1.37	0.65	5
	Head 1710	e'	39.8600	Relative Permittivity (ε _r):	39.86	40.15	-0.71	5
		e"	14.0800	Conductivity (σ):	1.34	1.35	-0.57	5
	Head 1755	e'	39.6600	Relative Permittivity (ε _r):	39.66	40.08	-1.04	5
		e"	14.1900	Conductivity (σ):	1.38	1.37	0.94	5
6/5/2013	Body 1750	e'	52.4700	Relative Permittivity (ε _r):	52.47	53.44	-1.82	5
		e"	15.0000	Conductivity (σ):	1.46	1.49	-1.79	5
	Body 1710	e'	52.5900	Relative Permittivity (ε _r):	52.59	53.54	-1.78	5
		e"	14.9400	Conductivity (σ):	1.42	1.46	-2.81	5
	Body 1755	e'	52.4400	Relative Permittivity (ε _r):	52.44	53.43	-1.85	5
		e"	15.0100	Conductivity (σ):	1.46	1.49	-1.65	5
6/10/2013	Head 1750	e'	40.7500	Relative Permittivity (ε _r):	40.75	40.08	1.66	5
		e"	14.3700	Conductivity (σ):	1.40	1.37	2.14	5
	Head 1710	e'	41.0300	Relative Permittivity (ε _r):	41.03	40.15	2.20	5
		e"	14.2700	Conductivity (σ):	1.36	1.35	0.77	5
	Head 1755	e'	40.7100	Relative Permittivity (ε _r):	40.71	40.08	1.58	5
		e"	14.3800	Conductivity (σ):	1.40	1.37	2.29	5
6/10/2013	Body 1750	e'	51.0500	Relative Permittivity (ε _r):	51.05	53.44	-4.47	5
		e"	15.7900	Conductivity (σ):	1.54	1.49	3.38	5
	Body 1710	e'	51.3100	Relative Permittivity (ε _r):	51.31	53.54	-4.17	5
		e"	15.6500	Conductivity (σ):	1.49	1.46	1.81	5
	Body 1755	e'	51.0300	Relative Permittivity (ε _r):	51.03	53.43	-4.49	5
		e"	15.8300	Conductivity (σ):	1.54	1.49	3.73	5

SAR Room B

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
5/30/2013	Head 1900	e'	40.4900	Relative Permittivity (ϵ_r):	40.49	40.00	1.23	5
		e''	13.6900	Conductivity (σ):	1.45	1.40	3.31	5
	Head 1850	e'	40.7200	Relative Permittivity (ϵ_r):	40.72	40.00	1.80	5
		e''	13.6000	Conductivity (σ):	1.40	1.40	-0.07	5
	Head 1910	e'	40.4400	Relative Permittivity (ϵ_r):	40.44	40.00	1.10	5
		e''	13.7200	Conductivity (σ):	1.46	1.40	4.08	5
5/30/2013	Body 1900	e'	53.6500	Relative Permittivity (ϵ_r):	53.65	53.30	0.66	5
		e''	14.4100	Conductivity (σ):	1.52	1.52	0.16	5
	Body 1850	e'	53.8600	Relative Permittivity (ϵ_r):	53.86	53.30	1.05	5
		e''	14.3100	Conductivity (σ):	1.47	1.52	-3.16	5
	Body 1910	e'	53.5800	Relative Permittivity (ϵ_r):	53.58	53.30	0.53	5
		e''	14.4200	Conductivity (σ):	1.53	1.52	0.75	5
6/2/2013	Head 1900	e'	39.5800	Relative Permittivity (ϵ_r):	39.58	40.00	-1.05	5
		e''	13.5800	Conductivity (σ):	1.43	1.40	2.48	5
	Head 1850	e'	39.8400	Relative Permittivity (ϵ_r):	39.84	40.00	-0.40	5
		e''	13.4900	Conductivity (σ):	1.39	1.40	-0.88	5
	Head 1910	e'	39.5500	Relative Permittivity (ϵ_r):	39.55	40.00	-1.13	5
		e''	13.6200	Conductivity (σ):	1.45	1.40	3.32	5
6/2/2013	Body 1900	e'	51.6700	Relative Permittivity (ϵ_r):	51.67	53.30	-3.06	5
		e''	14.3100	Conductivity (σ):	1.51	1.52	-0.54	5
	Body 1850	e'	51.9000	Relative Permittivity (ϵ_r):	51.90	53.30	-2.63	5
		e''	14.2000	Conductivity (σ):	1.46	1.52	-3.90	5
	Body 1910	e'	51.6300	Relative Permittivity (ϵ_r):	51.63	53.30	-3.13	5
		e''	14.3400	Conductivity (σ):	1.52	1.52	0.19	5
6/6/2013	Body 1900	e'	51.4600	Relative Permittivity (ϵ_r):	51.46	53.30	-3.45	5
		e''	14.5400	Conductivity (σ):	1.54	1.52	1.06	5
	Body 1850	e'	51.6000	Relative Permittivity (ϵ_r):	51.60	53.30	-3.19	5
		e''	14.4500	Conductivity (σ):	1.49	1.52	-2.21	5
	Body 1910	e'	51.4100	Relative Permittivity (ϵ_r):	51.41	53.30	-3.55	5
		e''	14.5600	Conductivity (σ):	1.55	1.52	1.73	5
6/10/2013	Head 1900	e'	39.0500	Relative Permittivity (ϵ_r):	39.05	40.00	-2.38	5
		e''	13.7700	Conductivity (σ):	1.45	1.40	3.91	5
	Head 1850	e'	39.2700	Relative Permittivity (ϵ_r):	39.27	40.00	-1.82	5
		e''	13.6900	Conductivity (σ):	1.41	1.40	0.59	5
	Head 1910	e'	38.9900	Relative Permittivity (ϵ_r):	38.99	40.00	-2.53	5
		e''	13.8000	Conductivity (σ):	1.47	1.40	4.68	5
6/17/2013	Head 1900	e'	39.2500	Relative Permittivity (ϵ_r):	39.25	40.00	-1.88	5
		e''	13.5700	Conductivity (σ):	1.43	1.40	2.40	5
	Head 1850	e'	39.4700	Relative Permittivity (ϵ_r):	39.47	40.00	-1.33	5
		e''	13.4900	Conductivity (σ):	1.39	1.40	-0.88	5
	Head 1910	e'	39.2300	Relative Permittivity (ϵ_r):	39.23	40.00	-1.93	5
		e''	13.5800	Conductivity (σ):	1.44	1.40	3.02	5
6/17/2013	Body 1900	e'	52.1000	Relative Permittivity (ϵ_r):	52.10	53.30	-2.25	5
		e''	14.4500	Conductivity (σ):	1.53	1.52	0.43	5
	Body 1850	e'	52.2700	Relative Permittivity (ϵ_r):	52.27	53.30	-1.93	5
		e''	14.3600	Conductivity (σ):	1.48	1.52	-2.82	5
	Body 1910	e'	52.0900	Relative Permittivity (ϵ_r):	52.09	53.30	-2.27	5
		e''	14.4600	Conductivity (σ):	1.54	1.52	1.03	5

SAR Room D

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
6/17/2013	Body 835	e'	53.0600	Relative Permittivity (ϵ_r):	53.06	55.20	-3.88	5
		e''	21.6900	Conductivity (σ):	1.01	0.97	3.82	5
	Body 820	e'	53.2000	Relative Permittivity (ϵ_r):	53.20	55.28	-3.76	5
		e''	21.7600	Conductivity (σ):	0.99	0.97	2.44	5
	Body 850	e'	52.8700	Relative Permittivity (ϵ_r):	52.87	55.16	-4.15	5
		e''	21.6100	Conductivity (σ):	1.02	0.99	3.46	5
6/17/2013	Head 835	e'	40.4500	Relative Permittivity (ϵ_r):	40.45	41.50	-2.53	5
		e''	19.5300	Conductivity (σ):	0.91	0.90	0.75	5
	Head 820	e'	40.6400	Relative Permittivity (ϵ_r):	40.64	41.60	-2.31	5
		e''	19.5900	Conductivity (σ):	0.89	0.90	-0.59	5
	Head 850	e'	40.2700	Relative Permittivity (ϵ_r):	40.27	41.50	-2.96	5
		e''	19.4800	Conductivity (σ):	0.92	0.92	0.62	5

SAR Room 1

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
6/10/2013	Head 5180	e'	36.3800	Relative Permittivity (ϵ_r):	36.38	36.01	1.02	10
		e''	15.6600	Conductivity (σ):	4.51	4.63	-2.59	5
	Head 5200	e'	36.3600	Relative Permittivity (ϵ_r):	36.36	35.99	1.03	10
		e''	15.6500	Conductivity (σ):	4.52	4.65	-2.71	5
	Head 5600	e'	35.8000	Relative Permittivity (ϵ_r):	35.80	35.53	0.75	10
		e''	15.8600	Conductivity (σ):	4.94	5.06	-2.41	5
	Head 5800	e'	35.4800	Relative Permittivity (ϵ_r):	35.48	35.30	0.51	10
		e''	15.9400	Conductivity (σ):	5.14	5.27	-2.46	5
	Head 5825	e'	35.4700	Relative Permittivity (ϵ_r):	35.47	35.30	0.48	10
		e''	15.9800	Conductivity (σ):	5.18	5.27	-1.79	5
6/12/2013	Body 5180	e'	47.7500	Relative Permittivity (ϵ_r):	47.75	49.05	-2.64	10
		e''	18.2900	Conductivity (σ):	5.27	5.27	-0.07	5
	Body 5200	e'	47.6900	Relative Permittivity (ϵ_r):	47.69	49.02	-2.71	10
		e''	18.3200	Conductivity (σ):	5.30	5.29	0.04	5
	Body 5600	e'	47.1200	Relative Permittivity (ϵ_r):	47.12	48.48	-2.80	10
		e''	18.7000	Conductivity (σ):	5.82	5.76	1.07	5
	Body 5800	e'	46.7600	Relative Permittivity (ϵ_r):	46.76	48.20	-2.99	10
		e''	18.8300	Conductivity (σ):	6.07	6.00	1.21	5
	Body 5825	e'	46.7700	Relative Permittivity (ϵ_r):	46.77	48.20	-2.97	10
		e''	18.8300	Conductivity (σ):	6.10	6.00	1.65	5
6/16/2013	Body 5180	e'	49.4700	Relative Permittivity (ϵ_r):	49.47	49.05	0.86	10
		e''	17.9400	Conductivity (σ):	5.17	5.27	-1.98	5
	Body 5200	e'	49.5200	Relative Permittivity (ϵ_r):	49.52	49.02	1.02	10
		e''	18.0500	Conductivity (σ):	5.22	5.29	-1.43	5
	Body 5600	e'	48.3600	Relative Permittivity (ϵ_r):	48.36	48.48	-0.24	10
		e''	17.9100	Conductivity (σ):	5.58	5.76	-3.20	5
	Body 5800	e'	47.7900	Relative Permittivity (ϵ_r):	47.79	48.20	-0.85	10
		e''	17.9500	Conductivity (σ):	5.79	6.00	-3.52	5
	Body 5825	e'	47.6400	Relative Permittivity (ϵ_r):	47.64	48.20	-1.16	10
		e''	17.9300	Conductivity (σ):	5.81	6.00	-3.21	5
6/18/2013	Body 750	e'	55.3100	Relative Permittivity (ϵ_r):	55.31	55.55	-0.43	5
		e''	23.7700	Conductivity (σ):	0.99	0.96	2.93	5
	Body 700	e'	55.8200	Relative Permittivity (ϵ_r):	55.82	55.74	0.15	5
		e''	24.3300	Conductivity (σ):	0.95	0.96	-1.28	5
	Body 710	e'	55.7200	Relative Permittivity (ϵ_r):	55.72	55.70	0.04	5
		e''	24.1900	Conductivity (σ):	0.95	0.96	-0.52	5
6/19/2013	Head 750	e'	41.2200	Relative Permittivity (ϵ_r):	41.22	41.96	-1.77	5
		e''	21.6000	Conductivity (σ):	0.90	0.89	0.86	5
	Head 700	e'	41.8900	Relative Permittivity (ϵ_r):	41.89	42.22	-0.78	5
		e''	21.9800	Conductivity (σ):	0.86	0.89	-3.79	5
	Head 710	e'	41.7600	Relative Permittivity (ϵ_r):	41.76	42.17	-0.96	5
		e''	21.9000	Conductivity (σ):	0.86	0.89	-2.86	5

11. System Performance Check

SAR system verification is required to confirm measurement accuracy, according to the tissue dielectric media, probe calibration points and other system operating parameters required for measuring the SAR of a test device. The system verification must be performed for each frequency band and within the valid range of each probe calibration point required for testing the device. The same SAR probe(s) and tissue-equivalent media combinations used with each specific SAR system for system verification must be used for device testing. When multiple probe calibration points are required to cover substantially large transmission bands, independent system verifications are required for each probe calibration point. A system verification must be performed before each series of SAR measurements using the same probe calibration point and tissue-equivalent medium. Additional system verification should be considered according to the conditions of the tissue-equivalent medium and measured tissue dielectric parameters, typically every three to four days when the liquid parameters are remeasured or sooner when marginal liquid parameters are used at the beginning of a series of measurements.

11.1. System Performance Check Measurement Conditions

- The measurements were performed in the flat section of the TWIN SAM or ELI phantom, shell thickness: 2.0 ± 0.2 mm (bottom plate) filled with Body or Head simulating liquid of the following parameters.
- The depth of tissue-equivalent liquid in a phantom must be ≥ 15.0 cm ± 0.5 cm for SAR measurements ≤ 3 GHz and ≥ 10.0 cm ± 0.5 cm for measurements > 3 GHz.
- The DASY system with an E-Field Probe was used for the measurements.
- The dipole was mounted on the small tripod so that the dipole feed point was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10 mm (above 1 GHz) and 15 mm (below 1 GHz) from dipole center to the simulating liquid surface.
- The coarse grid with a grid spacing of 15 mm was aligned with the dipole.
For 5 GHz band - The coarse grid with a grid spacing of 10 mm was aligned with the dipole.
- Special 7x7x7 (below 3 GHz) and/or 8x8x7 (above 3 GHz) fine cube was chosen for the cube.
- Distance between probe sensors and phantom surface was set to 3 mm.
For 5 GHz band - Distance between probe sensors and phantom surface was set to 2.5 mm
- The dipole input power (forward power) was 100 mW.
- The results are normalized to 1 W input power.

11.2. Reference SAR Values for System Performance Check

The reference SAR values can be obtained from the calibration certificate of system validation dipoles

System Dipole	Serial No.	Cal. Date	Freq. (MHz)	Target SAR Values (mW/g)		
				1g/10g	Head	Body
D750V3	1019	03/05/2013	750	1g	8.50	8.68
				10g	5.59	5.75
D835V2	4d142	10/04/2012	835	1g	9.45	9.50
				10g	6.23	6.29
D835V2	4d002	10/24/12	835	1g	9.58	9.48
				10g	6.28	6.26
D1750V2	1077	10/03/2012	1750	1g	36.1	37.7
				10g	19.3	20.3
D1750V2	1050	4/20/2013	1750	1g	36.5	37.1
				10g	19.4	20.1
D1900V2	5d163	10/04/12	1900	1g	39.4	39.6
				10g	20.7	21.1
D2450V2	899	10/05/12	2450	1g	53.6	51.7
				10g	25.0	24.3
D5GHzV2	1138	10/09/2012	5.2GHz	1g	79.5	73.2
				10g	22.8	20.4
			5.5GHz	1g	83.6	77.9
				10g	23.8	21.7
			5.8GHz	1g	78.7	72.8
				10g	22.4	20.1

11.3. System Performance Check Results

The 1-g and 10-g SAR measured with a reference dipole, using the required tissue-equivalent medium at the test frequency, must be within 10% of the manufacturer calibrated dipole SAR target.

SAR Room A

CNK ROOM 1											
Date Tested	System Dipole		T.S. Liquid		Measured Results			Target (Ref. Value)	Delta ±10 %	Est./Zoo m Ratio ±2.0 %	Plot No.
	Type	Serial #			Area Scan	Zoom Scan	Normalize to 1 W				
6/5/2013	D1750V2	1077	Head	1g	3.76	3.58	35.8	36.1	-0.83	4.79	
				10g	2.01	1.88	18.8	19.3	-2.59		
6/5/2013	D1750V2	1077	Body	1g	3.96	3.87	38.7	37.7	2.65	2.27	1,2
				10g	2.05	2.05	20.5	20.3	0.99		
6/10/2013	D1750V2	1050	Head	1g	3.89	3.72	37.2	37.1	0.27	4.37	3,4
				10g	2.07	1.92	19.2	20.1	-4.48		
6/10/2013	D1750V2	1050	Body	1g	3.73	3.53	35.3	36.5	-3.29	5.36	
				10g	1.93	1.86	18.6	19.4	-4.12		

SAR Room B

Date Tested	System Dipole		T.S. Liquid		Measured Results			Target (Ref. Value)	Delta ±10 %	Est./Zoo	Plot No.
	Type	Serial #			Area Scan	Zoom Scan	Normalize to 1 W			m Ratio ±2.0%	
5/30/2013	D1900V2	5d163	Head	1g	4.00	4.03	40.3	39.4	2.28	-0.75	
				10g	2.10	2.07	20.7	20.7	0.00		
5/30/2013	D1900V2	5d163	Body	1g	4.16	3.96	39.6	39.6	0.00	4.81	
				10g	2.08	2.05	20.5	21.1	-2.84		
6/2/2013	D1900V2	5d163	Head	1g	4.08	3.99	39.9	39.4	1.27	2.21	
				10g	2.16	2.06	20.6	20.7	-0.48		
6/2/2013	D1900V2	5d163	Body	1g	4.05	4.02	40.2	39.6	1.52	0.74	
				10g	2.05	2.09	20.9	21.1	-0.95		
6/6/2013	D1900V2	5d163	Body	1g	4.06	4.03	40.3	39.6	1.77	0.74	
				10g	2.05	2.10	21.0	21.1	-0.47		
6/10/2013	D1900V2	5d163	Head	1g	4.24	4.16	41.6	39.4	5.58	1.89	5,6
				10g	2.24	2.13	21.3	20.7	2.90		
6/17/2013	D1900V2	5d163	Head	1g	4.22	4.10	41.00	39.4	4.06	2.84	
				10g	2.22	2.11	21.10	20.7	1.93		
6/17/2013	D1900V2	5d163	Body	1g	4.20	4.18	41.80	39.6	5.56	0.48	
				10g	2.15	2.16	21.60	21.1	2.37		

SAR Room D

Date Tested	System Dipole		T.S. Liquid	Measured Results			Target (Ref. Value)	Delta ±10 %	Est./Zoo	Plot No.	
	Type	Serial #		Area Scan	Zoom Scan	Normalize to 1 W			m Ratio ±2.0%		
6/17/2013	D835V2	4d002	Body	1g	0.997	0.980	9.8	9.48	3.38	1.71	7,8
				10g	0.671	0.647	6.5	6.26	3.35		
6/17/2013	D835V2	4d002	Head	1g	1.02	0.957	9.6	9.58	-0.10	6.18	
				10g	0.684	0.627	6.3	6.28	-0.16		

SAR Room 1

Date Tested	System Dipole		T.S. Liquid		Measured Results			Target (Ref. Value)	Delta ±10 %	Est./200 m Ratio ±2.0%	Plot No.
	Type	Serial #			Area Scan	Zoom Scan	Normalize to 1 W				
6/10/2013	D5 GHz (5.2 GHz)	1138	Head	1g	6.84	7.24	72.4	79.5	-8.93	-5.85	9,10
				10g	1.94	2.14	21.4	22.8	-6.14		
6/10/2013	D5 GHz (5.5 GHz)	1138	Head	1g	7.76	8.35	83.5	83.6	-0.12	-7.60	
				10g	2.14	2.41	24.1	23.8	1.26		
6/10/2013	D5 GHz (5.8 GHz)	1138	Head	1g	7.12	7.73	77.3	78.7	-1.78	-8.57	
				10g	1.98	2.25	22.5	22.4	0.45		
6/12/2013	D5 GHz (5.2 GHz)	1138	Body	1g	7.02	7.50	75.0	73.2	2.46	-6.84	
				10g	1.97	2.19	21.9	20.4	7.35		
6/12/2013	D5 GHz (5.5 GHz)	1138	Body	1g	7.23	7.86	78.60	77.9	0.90	-8.71	
				10g	2.06	2.31	23.10	21.7	6.45		
6/12/2013	D5 GHz (5.8 GHz)	1138	Body	1g	6.26	6.78	67.80	72.8	-6.87	-8.31	
				10g	1.75	1.96	19.60	20.1	-2.49		
6/16/2013	D5 GHz (5.2 GHz)	1138	Body	1g	6.95	7.44	74.40	73.2	1.64	-7.05	
				10g	1.97	2.19	21.90	20.4	7.35		
6/16/2013	D5 GHz (5.5 GHz)	1138	Body	1g	7.32	7.84	78.40	77.9	0.64	-7.10	
				10g	2.06	2.31	23.10	21.7	6.45		
6/16/2013	D5 GHz (5.8 GHz)	1138	Body	1g	6.45	6.950	69.50	72.8	-4.53	-7.75	
				10g	1.790	2.040	20.40	20.1	1.49		
6/18/2013	D750V3	1019	Body	1g	0.917	0.897	8.97	8.68	3.34	2.18	11,12
				10g	0.622	0.603	6.03	5.75	4.87		
6/19/2013	D750V3	1019	Head	1g	0.844	0.817	8.17	8.50	-3.88	3.20	
				10g	0.574	0.540	5.40	5.59	-3.40		

12. SAR Test Results

12.1. GSM850

12.1.1. Head Exposure Conditions

Head Exposure Conditions (Voice mode)

Test Position	Mode	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
				Tune-up limit	Meas.	Meas.	Scaled		
Left Touch	Voice	128	824.2	33.2	33.2				1
		190	836.6	33.2	33.2	0.177	0.177	1	
		251	848.8	33.2	33.1				1
Left Tilt (15°)	Voice	128	824.2	33.2	33.2				1
		190	836.6	33.2	33.2	0.123	0.123		
		251	848.8	33.2	33.1				1
Right Touch	Voice	128	824.2	33.2	33.2				1
		190	836.6	33.2	33.2	0.163	0.163		
		251	848.8	33.2	33.1				1
Right Tilt (15°)	Voice	128	824.2	33.2	33.2				1
		190	836.6	33.2	33.2	0.112	0.112		
		251	848.8	33.2	33.1				1

Head Exposure Conditions (VoIP mode)

Test Position	Mode	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
				Tune-up limit	Meas.	Meas.	Scaled		
Left Touch	GPRS 4 Slots	128	824.2	29.2	29.0				1
		190	836.6	29.2	28.9	0.274	0.294	2	
		251	848.8	29.2	28.8				1
Left Tilt (15°)	GPRS 4 Slots	128	824.2	29.2	29.0				1
		190	836.6	29.2	28.9	0.194	0.208		
		251	848.8	29.2	28.8				1
Right Touch	GPRS 4 Slots	128	824.2	29.2	29.0				1
		190	836.6	29.2	28.9	0.264	0.283		
		251	848.8	29.2	28.8				1
Right Tilt (15°)	GPRS 4 Slots	128	824.2	29.2	29.0				1
		190	836.6	29.2	28.9	0.186	0.199		
		251	848.8	29.2	28.8				1

Note(s):

- Testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is:
 - ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
 - ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
 - ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz

12.1.2. Body-worn Accessory & Hotspot Exposure Conditions

Body-worn Accessory (Voice mode)

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
					Tune-up limit	Meas.	Meas.	Scaled		
Rear	Voice	10	128	824.2	33.2	33.2				1
			190	836.6	33.2	33.2	0.503	0.503	3	
			251	848.8	33.2	33.1				1
Front	Voice	10	128	824.2	33.2	33.2				1
			190	836.6	33.2	33.2	0.205	0.205		
			251	848.8	33.2	33.1				1

Body-worn Accessory (VoIP mode) & Hotspot Exposure Conditions

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
					Tune-up limit	Meas.	Meas.	Scaled		
Rear	GPRS 4 Slots	10	128	824.2	29.2	29.0				1
			190	836.6	29.2	28.9	0.719	0.770	4	
			251	848.8	29.2	28.8				1
Front	GPRS 4 Slots	10	128	824.2	29.2	29.0				1
			190	836.6	29.2	28.9	0.313	0.335		
			251	848.8	29.2	28.8				1

Hotspot Exposure Conditions

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
					Tune-up limit	Meas.	Meas.	Scaled		
Edge 2	GPRS 4 Slots	10	128	824.2	29.2	29.0				1
			190	836.6	29.2	28.9	0.264	0.283		
			251	848.8	29.2	28.8				1
Edge 3	GPRS 4 Slots	10	128	824.2	29.2	29.0				1
			190	836.6	29.2	28.9	0.071	0.076		
			251	848.8	29.2	28.8				1
Edge 4	GPRS 4 Slots	10	128	824.2	29.2	29.0				1
			190	836.6	29.2	28.9	0.309	0.331		
			251	848.8	29.2	28.8				1

Note(s):

- Testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is:
 - ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
 - ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
 - ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz

12.2. GSM1900

12.2.1. Head Exposure Conditions

Head Exposure Conditions (Voice mode)

Test Position	Mode	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
				Tune-up limit	Meas.	Meas.	Scaled		
Left Touch	Voice	512	1850.2	31.2	31.0				1
		661	1880.0	31.2	31.2	0.537	0.537	5	
		810	1909.8	31.2	31.0				1
Left Tilt (15°)	Voice	512	1850.2	31.2	31.0				1
		661	1880.0	31.2	31.2	0.169	0.169		
		810	1909.8	31.2	31.0				1
Right Touch	Voice	512	1850.2	31.2	31.0				1
		661	1880.0	31.2	31.2	0.404	0.404		
		810	1909.8	31.2	31.0				1
Right Tilt (15°)	Voice	512	1850.2	31.2	31.0				1
		661	1880.0	31.2	31.2	0.161	0.161		
		810	1909.8	31.2	31.0				1

Head Exposure Conditions (VoIP mode)

Test Position	Mode	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
				Tune-up limit	Meas.	Meas.	Scaled		
Left Touch	GPRS 4 slots	512	1850.2	26.7	26.6				1
		661	1880.0	26.7	26.6	0.729	0.746	6	
		810	1909.8	26.7	26.5				1
Left Tilt (15°)	GPRS 4 slots	512	1850.2	26.7	26.6				1
		661	1880.0	26.7	26.6	0.234	0.239		
		810	1909.8	26.7	26.5				1
Right Touch	GPRS 4 slots	512	1850.2	26.7	26.6				1
		661	1880.0	26.7	26.6	0.563	0.576		
		810	1909.8	26.7	26.5				1
Right Tilt (15°)	GPRS 4 slots	512	1850.2	26.7	26.6				1
		661	1880.0	26.7	26.6	0.226	0.231		
		810	1909.8	26.7	26.5				1

Note(s):

- Testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is:
 - ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
 - ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
 - ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz

12.2.2. Body-worn Accessory & Hotspot Exposure Conditions

Body-worn Accessory (Voice mode)

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
					Tune-up limit	Meas.	Meas.	Scaled		
Rear	Voice	10	512	1850.2	31.2	31.0				1
			661	1880.0	31.2	31.2	0.743	0.743	7	
			810	1909.8	31.2	31.0				1
Front	Voice	10	512	1850.2	31.2	31.0				1
			661	1880.0	31.2	31.2	0.630	0.630		
			810	1909.8	31.2	31.0				1

Body-worn Accessory (VoIP mode) & Hotspot Exposure Conditions

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
					Tune-up limit	Meas.	Meas.	Scaled		
Rear	GPRS 4 slots	10	512	1850.2	26.7	26.6	0.980	1.003		
			661	1880.0	26.7	26.6	1.040	1.064		
			810	1909.8	26.7	26.5	1.110	1.162	8	
Front	GPRS 4 slots	10	512	1850.2	26.7	26.6	0.851	0.871		
			661	1880.0	26.7	26.6	0.867	0.887		
			810	1909.8	26.7	26.5	0.958	1.003		

Hotspot Exposure Conditions

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
					Tune-up limit	Meas.	Meas.	Scaled		
Edge 2	GPRS 4 slots	10	512	1850.2	26.7	26.6				1
			661	1880.0	26.7	26.6	0.195	0.200		
			810	1909.8	26.7	26.5				1
Edge 3	GPRS 4 slots	10	512	1850.2	26.7	26.6				1
			661	1880.0	26.7	26.6	0.744	0.761		
			810	1909.8	26.7	26.5				1
Edge 4	GPRS 4 slots	10	512	1850.2	26.7	26.6				1
			661	1880.0	26.7	26.6	0.371	0.380		
			810	1909.8	26.7	26.5				1

Note(s):

- Testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is:
 - ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
 - ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
 - ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz

12.3. W-CDMA Band II

12.3.1. Head Exposure Conditions

Test Position	Mode	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
				Tune-up limit	Meas.	Meas.	Scaled		
Left Touch	Rel 99 RMC 12.2kbps	9262	1852.4	24.2	24.1	0.961	0.983	1	
		9400	1880.0	24.2	24.1	0.933	0.955		
		9538	1907.6	24.2	24.2	0.810	0.810		
Left Tilt (15°)	Rel 99 RMC 12.2kbps	9262	1852.4	24.2	24.1				1
		9400	1880.0	24.2	24.1	0.309	0.316		
		9538	1907.6	24.2	24.2				1
Right Touch	Rel 99 RMC 12.2kbps	9262	1852.4	24.2	24.1				1
		9400	1880.0	24.2	24.1	0.758	0.776		
		9538	1907.6	24.2	24.2				1
Right Tilt (15°)	Rel 99 RMC 12.2kbps	9262	1852.4	24.2	24.1				1
		9400	1880.0	24.2	24.1	0.327	0.335		
		9538	1907.6	24.2	24.2				1

12.3.2. Body-worn Accessory & Hotspot Exposure Conditions

Body-worn Accessory & Hotspot Exposure Conditions

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
					Tune-up limit	Meas.	Meas.	Scaled		
Rear	Rel 99 RMC 12.2kbps	10	9262	1852.4	24.2	24.1	1.180	1.207		
			9400	1880.0	24.2	24.1	1.230	1.259	2	
			9400	1880.0	24.2	24.1	1.140	1.167		2
			9538	1907.6	24.2	24.2	1.160	1.160		
Front	Rel 99 RMC 12.2kbps	10	9262	1852.4	24.2	24.1	1.170	1.197		
			9400	1880.0	24.2	24.1	1.180	1.207		
			9538	1907.6	24.2	24.2	1.010	1.010		

Hotspot Exposure Conditions

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
					Tune-up limit	Meas.	Meas.	Scaled		
Edge 2	Rel 99 RMC 12.2kbps	10	9262	1852.4	24.2	24.1				1
			9400	1880.0	24.2	24.1	0.258	0.264		
			9538	1907.6	24.2	24.2				1
Edge 3	Rel 99 RMC 12.2kbps	10	9262	1852.4	24.2	24.1	1.010	1.034		
			9400	1880.0	24.2	24.1	0.811	0.830		
			9538	1907.6	24.2	24.2	0.629	0.629		
Edge 4	Rel 99 RMC 12.2kbps	10	9262	1852.4	24.2	24.1				1
			9400	1880.0	24.2	24.1	0.437	0.447		
			9538	1907.6	24.2	24.2				1

Note(s):

- Testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is:
 - ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
 - ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
 - ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz
- With headset attached. According to KDB 648474 Section 2.3, when the reported SAR for body-worn accessory, measured without a headset connected to the handset, is > 1.2 W/kg, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a headset attached to the handset.

12.4. W-CDMA Band IV

12.4.1. Head Exposure Conditions

Test Position	Mode	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
				Tune-up limit	Meas.	Meas.	Scaled		
Left Touch	Rel 99 RMC 12.2kbps	1312	1712.4	23.9	23.8				1
		1413	1732.6	23.9	23.8	0.758	0.776		
		1513	1752.6	23.9	23.9				1
Left Tilt (15°)	Rel 99 RMC 12.2kbps	1312	1712.4	23.9	23.8				1
		1413	1732.6	23.9	23.8	0.249	0.255		
		1513	1752.6	23.9	23.9				1
Right Touch	Rel 99 RMC 12.2kbps	1312	1712.4	23.9	23.8	0.658	0.673		
		1413	1732.6	23.9	23.8	0.795	0.814	3	
		1513	1752.6	23.9	23.9	0.802	0.802		
Right Tilt (15°)	Rel 99 RMC 12.2kbps	1312	1712.4	23.9	23.8				1
		1413	1732.6	23.9	23.8	0.223	0.228		
		1513	1752.6	23.9	23.9				1

12.4.2. Body-worn Accessory & Hotspot Exposure Conditions

Body-worn Accessory & Hotspot Exposure Conditions

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
					Tune-up limit	Meas.	Meas.	Scaled		
Rear	Rel 99 RMC 12.2kbps	10	1312	1712.4	23.9	23.8	1.000	1.023		
			1413	1732.6	23.9	23.8	1.070	1.095		
			1513	1752.6	23.9	23.9	1.230	1.230	4	
			1513	1752.6	23.9	23.9	1.080	1.080		2
Front	Rel 99 RMC 12.2kbps	10	1312	1712.4	23.9	23.8	0.885	0.906		
			1413	1732.6	23.9	23.8	0.991	1.014		
			1513	1752.6	23.9	23.9	1.100	1.100		

Hotspot Exposure Conditions

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
					Tune-up limit	Meas.	Meas.	Scaled		
Edge 2	Rel 99 RMC 12.2kbps	10	1312	1712.4	23.9	23.8				1
			1413	1732.6	23.9	23.8	0.184	0.188		
			1513	1752.6	23.9	23.9				1
Edge 3	Rel 99 RMC 12.2kbps	10	1312	1712.4	23.9	23.8	0.678	0.694		
			1413	1732.6	23.9	23.8	0.776	0.794		
			1513	1752.6	23.9	23.9	0.853	0.853		
Edge 4	Rel 99 RMC 12.2kbps	10	1312	1712.4	23.9	23.8				1
			1413	1732.6	23.9	23.8	0.469	0.480		
			1513	1752.6	23.9	23.9				1

Note(s):

- Testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is:
 - ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
 - ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
 - ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz
- With headset attached. According to KDB 648474 Section 2.3, when the reported SAR for body-worn accessory, measured without a headset connected to the handset, is > 1.2 W/kg, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a headset attached to the handset.

12.5. W-CDMA Band V

12.5.1. Head Exposure Conditions

Test Position	Mode	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
				Tune-up limit	Meas.	Meas.	Scaled		
Left Touch	Rel 99 RMC 12.2kbps	4132	826.4	24.2	24.1				1
		4183	836.6	24.2	24.0	0.205	0.215	5	
		4233	846.6	24.2	24.2				1
Left Tilt (15°)	Rel 99 RMC 12.2kbps	4132	826.4	24.2	24.1				1
		4183	836.6	24.2	24.0	0.152	0.159		
		4233	846.6	24.2	24.2				1
Right Touch	Rel 99 RMC 12.2kbps	4132	826.4	24.2	24.1				1
		4183	836.6	24.2	24.0	0.194	0.203		
		4233	846.6	24.2	24.2				1
Right Tilt (15°)	Rel 99 RMC 12.2kbps	4132	826.4	24.2	24.1				1
		4183	836.6	24.2	24.0	0.135	0.141		
		4233	846.6	24.2	24.2				1

12.5.2. Body-worn Accessory & Hotspot Exposure Conditions

Body-worn Accessory & Hotspot Exposure Conditions

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
					Tune-up limit	Meas.	Meas.	Scaled		
Rear	Rel 99 RMC 12.2kbps	10	4132	826.4	24.2	24.1				1
			4183	836.6	24.2	24.0	0.544	0.570	6	
			4233	846.6	24.2	24.2				1
Front	Rel 99 RMC 12.2kbps	10	4132	826.4	24.2	24.1				1
			4183	836.6	24.2	24.0	0.240	0.251		
			4233	846.6	24.2	24.2				1

Hotspot Exposure Conditions

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
					Tune-up limit	Meas.	Meas.	Scaled		
Edge 2	Rel 99 RMC 12.2kbps	10	4132	826.4	24.2	24.1				1
			4183	836.6	24.2	24.0	0.218	0.228		
			4233	846.6	24.2	24.2				1
Edge 3	Rel 99 RMC 12.2kbps	10	4132	826.4	24.2	24.1				1
			4183	836.6	24.2	24.0	0.049	0.052		
			4233	846.6	24.2	24.2				1
Edge 4	Rel 99 RMC 12.2kbps	10	4132	826.4	24.2	24.1				1
			4183	836.6	24.2	24.0	0.252	0.264		
			4233	846.6	24.2	24.2				1

Note(s):

- Testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is:
 - ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
 - ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
 - ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz

12.6. LTE Band 2 (10MHz Bandwidth)

12.6.1. Head Exposure Conditions

Test Position	Mode	UL Ch #.	Freq. (MHz)	UL RB Allocation	UL RB Start	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
						Tune-up limit	Meas.	Meas.	Scaled		
Left Touch	QPSK	18650	1855.0	1	0	23.7	23.7	0.865	0.865	1	
				25	0	22.7	22.5	0.713	0.747		
				50	0	22.7	22.5	0.679	0.711		
		18900	1880.0	1	24	23.7	23.7	0.855	0.855		
				25	0	22.7	22.5				1
		19150	1905.0	1	24	23.7	23.7	0.821	0.821		
				25	0	22.7	22.5				1
Left Tilt (15°)	QPSK	18650	1855.0	1	0	23.7	23.7	0.321	0.321		
				25	0	22.7	22.5	0.257	0.269		
		18900	1880.0	1	24	23.7	23.7				1
				25	0	22.7	22.5				1
		19150	1905.0	1	24	23.7	23.7				1
				25	0	22.7	22.5				1
Right Touch	QPSK	18650	1855.0	1	0	23.7	23.7	0.749	0.749		
				25	0	22.7	22.5	0.590	0.618		
		18900	1880.0	1	24	23.7	23.7				1
				25	0	22.7	22.5				1
		19150	1905.0	1	24	23.7	23.7				1
				25	0	22.7	22.5				1
Right Tilt (15°)	QPSK	18650	1855.0	1	0	23.7	23.7	0.345	0.345		
				25	0	22.7	22.5	0.276	0.289		
		18900	1880.0	1	24	23.7	23.7				1
				25	0	22.7	22.5				1
		19150	1905.0	1	24	23.7	23.7				1
				25	0	22.7	22.5				1

Note(s):

- Per KDB 941225 D05 SAR for LTE Devices v02, SAR test reduction is applied using the following criteria:
 - Testing for Low and High Channel is performed at the highest output power level for 1RB, and 50% RB configuration for that channel.
 - Testing for 100% RB configuration is performed at the highest output power level for 100% RB configuration across the Low, Mid and High Channel when the highest reported SAR for 1 RB and 50% RB are ≥ 0.8 W/kg. Testing for the remaining required channels is not needed because the reported SAR for 100% RB Allocation < 1.45 W/kg.
 - Testing for 16-QAM modulation is not required because the reported SAR for QPSK is < 1.45 W/Kg and its output power is not more than 0.5 dB higher than that of QPSK.
 - Testing for the other channel bandwidths is not required because the reported SAR for the highest channel bandwidth is < 1.45 W/Kg and its output power is not more than 0.5 dB higher than that of the highest channel bandwidth.

12.6.2. Body-worn Accessory & Hotspot Exposure Conditions

Body-worn Accessory & Hotspot Exposure Conditions

Test Position	Mode	Dist. (mm)	UL Ch #.	Freq. (MHz)	UL RB Allocation	UL RB Start	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
							Tune-up limit	Meas.	Meas.	Scaled		
Rear	QPSK	10	18650	1855.0	1	0	23.7	23.7	1.210	1.210		
					25	0	22.7	22.5	0.955	1.000		
					50	0	22.7	22.5	0.923	0.966		
			18900	1880.0	1	24	23.7	23.7	1.230	1.230	2	
					25	0	22.7	22.5	0.964	1.009		
					1	24	23.7	23.7	1.180	1.180		
Front	QPSK	10	18650	1855.0	1	0	23.7	23.7	1.160	1.160		
					25	0	22.7	22.5	0.928	0.972		
					50	0	22.7	22.5	0.884	0.926		
			18900	1880.0	1	24	23.7	23.7	1.100	1.100		
					25	0	22.7	22.5	0.857	0.897		
					1	24	23.7	23.7	0.978	0.978		
			19150	1905.0	25	0	22.7	22.5	0.744	0.779		

Hotspot Exposure Conditions

Test Position	Mode	Dist. (mm)	UL Ch #.	Freq. (MHz)	UL RB Allocation	UL RB Start	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
							Tune-up limit	Meas.	Meas.	Scaled		
Edge 2	QPSK	10	18650	1855.0	1	0	23.7	23.7	0.233	0.233		
					25	0	22.7	22.5	0.184	0.193		
			18900	1880.0								1
												1
			19150	1905.0								1
												1
Edge 3	QPSK	10	18650	1855.0	1	0	23.7	23.7	1.040	1.040		
					25	0	22.7	22.5	0.843	0.883		
					50	0	22.7	22.5	0.822	0.861		
			18900	1880.0	1	24	23.7	23.7	0.896	0.896		
					25	0	22.7	22.5	0.696	0.729		
					1	24	23.7	23.7	0.705	0.705		
Edge 4	QPSK	10	18650	1855.0	25	0	22.7	22.5	0.533	0.558		
					1	0	23.7	23.7	0.497	0.497		
					25	0	22.7	22.5	0.391	0.409		
			18900	1880.0								1
												1
												1

Note(s):

- Per KDB 941225 D05 SAR for LTE Devices v02, SAR test reduction is applied using the following criteria:
 - Testing for Low and High Channel is performed at the highest output power level for 1RB, and 50% RB configuration for that channel.
 - Testing for 100% RB configuration is performed at the highest output power level for 100% RB configuration across the Low, Mid and High Channel when the highest reported SAR for 1 RB and 50% RB are ≥ 0.8 W/kg. Testing for the remaining required channels is not needed because the reported SAR for 100% RB Allocation < 1.45 W/kg.
 - Testing for 16-QAM modulation is not required because the reported SAR for QPSK is < 1.45 W/Kg and its output power is not more than 0.5 dB higher than that of QPSK.
 - Testing for the other channel bandwidths is not required because the reported SAR for the highest channel bandwidth is < 1.45 W/Kg and its output power is not more than 0.5 dB higher than that of the highest channel bandwidth.

12.7. LTE Band 4 (20MHz Bandwidth)

12.7.1. Head Exposure Conditions

Test Position	Mode	UL Ch #.	Freq. (MHz)	UL RB Allocation	UL RB Start	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
						Tune-up limit	Meas.	Meas.	Scaled		
Left Touch	QPSK	20050	1720.0	1	0	23.7	23.7				1
				50	0	22.7	22.4				1
		20175	1732.5	1	0	23.7	23.7	0.739	0.739		
				50	0	22.7	22.6	0.564	0.577		
		20300	1745.0	1	0	23.7	23.6				1
				50	0	22.7	22.4				1
Left Tilt (15°)	QPSK	20050	1720.0	1	0	23.7	23.7				1
				50	0	22.7	22.4				1
		20175	1732.5	1	0	23.7	23.7	0.224	0.224		
				50	0	22.7	22.6	0.170	0.174		
		20300	1745.0	1	0	23.7	23.6				1
				50	0	22.7	22.4				1
Right Touch	QPSK	20050	1720.0	1	0	23.7	23.7				1
				50	0	22.7	22.4				1
		20175	1732.5	1	0	23.7	23.7	0.740	0.740	3	
				50	0	22.7	22.6	0.568	0.581		
		20300	1745.0	1	0	23.7	23.6				1
				50	0	22.7	22.4				1
Right Tilt (15°)	QPSK	20050	1720.0	1	0	23.7	23.7				1
				50	0	22.7	22.4				1
		20175	1732.5	1	0	23.7	23.7	0.184	0.184		
				50	0	22.7	22.6	0.134	0.137		
		20300	1745.0	1	0	23.7	23.6				1
				50	0	22.7	22.4				1

Note(s):

- Per KDB 941225 D05 SAR for LTE Devices v02, SAR test reduction is applied using the following criteria:
 - Testing for Low and High Channel is performed at the highest output power level for 1RB, and 50% RB configuration for that channel.
 - Testing for 100% RB configuration is performed at the highest output power level for 100% RB configuration across the Low, Mid and High Channel when the highest reported SAR for 1 RB and 50% RB are ≥ 0.8 W/kg. Testing for the remaining required channels is not needed because the reported SAR for 100% RB Allocation < 1.45 W/kg.
 - Testing for 16-QAM modulation is not required because the reported SAR for QPSK is < 1.45 W/Kg and its output power is not more than 0.5 dB higher than that of QPSK.
 - Testing for the other channel bandwidths is not required because the reported SAR for the highest channel bandwidth is < 1.45 W/Kg and its output power is not more than 0.5 dB higher than that of the highest channel bandwidth.

12.7.2. Body-worn Accessory & Hotspot Exposure Conditions

Body-worn Accessory & Hotspot Exposure Conditions

Test Position	Mode	Dist. (mm)	UL Ch #.	Freq. (MHz)	UL RB Allocation	UL RB Start	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
							Tune-up limit	Meas.	Meas.	Scaled		
Rear	QPSK	10	20050	1720.0	1	0	23.7	23.7	1.060	1.060	4	
					50	0	22.7	22.4				1
			20175	1732.5	1	0	23.7	23.7	0.984	0.984		
					50	0	22.7	22.6	0.754	0.772		
			20300	1745.0	100	0	22.7	22.4	0.768	0.823		
					1	0	23.7	23.6	1.000	1.023		
Front	QPSK	10	20050	1720.0	50	0	22.7	22.4				1
					1	0	23.7	23.7	0.816	0.816		
			20175	1732.5	1	0	23.7	23.7	0.867	0.867		
					50	0	22.7	22.6	0.675	0.691		
			20300	1745.0	100	0	22.7	22.4	0.741	0.794		
					1	0	23.7	23.6	0.871	0.891		
					50	0	22.7	22.4				1

Hotspot Exposure Conditions

Test Position	Mode	Dist. (mm)	UL Ch #.	Freq. (MHz)	UL RB Allocation	UL RB Start	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
							Tune-up limit	Meas.	Meas.	Scaled		
Edge 2	QPSK	10	20050	1720.0	1	0	23.7	23.7				1
					50	0	22.7	22.4				1
			20175	1732.5	1	0	23.7	23.7	0.175	0.175		
					50	0	22.7	22.6	0.134	0.137		
			20300	1745.0	1	0	23.7	23.6				1
					50	0	22.7	22.4				1
Edge 3	QPSK	10	20050	1720.0	1	0	23.7	23.7				1
					50	0	22.7	22.4				1
			20175	1732.5	1	0	23.7	23.7	0.733	0.733		
					50	0	22.7	22.6	0.577	0.590		
			20300	1745.0	1	0	23.7	23.6				1
					50	0	22.7	22.4				1
Edge 4	QPSK	10	20050	1720.0	1	0	23.7	23.7				1
					50	0	22.7	22.4				1
			20175	1732.5	1	0	23.7	23.7	0.432	0.432		
					50	0	22.7	22.6	0.344	0.352		
			20300	1745.0	1	0	23.7	23.6				1
					50	0	22.7	22.4				1

Note(s):

- Per KDB 941225 D05 SAR for LTE Devices v02, SAR test reduction is applied using the following criteria:
 - Testing for Low and High Channel is performed at the highest output power level for 1RB, and 50% RB configuration for that channel.
 - Testing for 100% RB configuration is performed at the highest output power level for 100% RB configuration across the Low, Mid and High Channel when the highest reported SAR for 1 RB and 50% RB are ≥ 0.8 W/kg. Testing for the remaining required channels is not needed because the reported SAR for 100% RB Allocation < 1.45 W/kg.
 - Testing for 16-QAM modulation is not required because the reported SAR for QPSK is < 1.45 W/Kg and its output power is not more than 0.5 dB higher than that of QPSK.
 - Testing for the other channel bandwidths is not required because the reported SAR for the highest channel bandwidth is < 1.45 W/Kg and its output power is not more than 0.5 dB higher than that of the highest channel bandwidth.

12.8. LTE Band 17 (10MHz Bandwidth)

12.8.1. Head Exposure Conditions

Test Position	Mode	UL Ch #.	Freq. (MHz)	UL RB Allocation	UL RB Start	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
						Tune-up limit	Meas.	Meas.	Scaled		
Left Touch	QPSK	23789	709.0	1	24	23.7	23.6				1
				25	12	22.7	22.4				1
		23790	710.0	1	24	23.7	23.7	0.202	0.202		
				25	12	22.7	22.5	0.148	0.155		
		23800	711.0	1	24	23.7	23.5				1
				25	12	22.7	22.6				1
Left Tilt (15°)	QPSK	23789	709.0	1	24	23.7	23.6				1
				25	12	22.7	22.4				1
		23790	710.0	1	24	23.7	23.7	0.092	0.092		
				25	12	22.7	22.5	0.075	0.078		
		23800	711.0	1	24	23.7	23.5				1
				25	12	22.7	22.6				1
Right Touch	QPSK	23789	709.0	1	24	23.7	23.6				1
				25	12	22.7	22.4				1
		23790	710.0	1	24	23.7	23.7	0.286	0.286	5	
				25	12	22.7	22.5	0.217	0.227		
		23800	711.0	1	24	23.7	23.5				1
				25	12	22.7	22.6				1
Right Tilt (15°)	QPSK	23789	709.0	1	24	23.7	23.6				1
				25	12	22.7	22.4				1
		23790	710.0	1	24	23.7	23.7	0.128	0.128		
				25	12	22.7	22.5	0.096	0.100		
		23800	711.0	1	24	23.7	23.5				1
				25	12	22.7	22.6				1

Note(s):

- Per KDB 941225 D05 SAR for LTE Devices v02, SAR test reduction is applied using the following criteria:
 - Testing for Low and High Channel is performed at the highest output power level for 1RB, and 50% RB configuration for that channel.
 - Testing for 100% RB configuration is performed at the highest output power level for 100% RB configuration across the Low, Mid and High Channel when the highest reported SAR for 1 RB and 50% RB are ≥ 0.8 W/kg. Testing for the remaining required channels is not needed because the reported SAR for 100% RB Allocation < 1.45 W/kg.
 - Testing for 16-QAM modulation is not required because the reported SAR for QPSK is < 1.45 W/Kg and its output power is not more than 0.5 dB higher than that of QPSK.
 - Testing for the other channel bandwidths is not required because the reported SAR for the highest channel bandwidth is < 1.45 W/Kg and its output power is not more than 0.5 dB higher than that of the highest channel bandwidth.

12.8.2. Body-worn Accessory & Hotspot Exposure Conditions

Body-worn Accessory & Hotspot Exposure Conditions

Test Position	Mode	Dist. (mm)	UL Ch #.	Freq. (MHz)	UL RB Allocation	UL RB Start	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
							Tune-up limit	Meas.	Meas.	Scaled		
Rear	QPSK	10	23789	709.0	1	24	23.7	23.6				1
					25	12	22.7	22.4				1
			23790	710.0	1	24	23.7	23.7	0.511	0.511	6	
					25	12	22.7	22.5	0.397	0.416		
			23800	711.0	1	24	23.7	23.5				1
					25	12	22.7	22.6				1
Front	QPSK	10	23789	709.0	1	24	23.7	23.6				1
					25	12	22.7	22.4				1
			23790	710.0	1	24	23.7	23.7	0.328	0.328		
					25	12	22.7	22.5	0.248	0.260		
			23800	711.0	1	24	23.7	23.5				1
					25	12	22.7	22.6				1

Hotspot Exposure Conditions

Test Position	Mode	Dist. (mm)	UL Ch #.	Freq. (MHz)	UL RB Allocation	UL RB Start	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
							Tune-up limit	Meas.	Meas.	Scaled		
Edge 2	QPSK	10	23789	709.0	1	24	23.7	23.6				1
					25	12	22.7	22.4				1
			23790	710.0	1	24	23.7	23.7	0.377	0.377		
					25	12	22.7	22.5	0.295	0.309		
			23800	711.0	1	24	23.7	23.5				1
					25	12	22.7	22.6				1
Edge 3	QPSK	10	23789	709.0	1	24	23.7	23.6				1
					25	12	22.7	22.4				1
			23790	710.0	1	24	23.7	23.7	0.108	0.108		
					25	12	22.7	22.5	0.085	0.089		
			23800	711.0	1	24	23.7	23.5				1
					25	12	22.7	22.6				1
Edge 4	QPSK	10	23789	709.0	1	24	23.7	23.6				1
					25	12	22.7	22.4				1
			23790	710.0	1	24	23.7	23.7	0.089	0.089		
					25	12	22.7	22.5	0.070	0.073		
			23800	711.0	1	24	23.7	23.5				1
					25	12	22.7	22.6				1

Note(s):

- Per KDB 941225 D05 SAR for LTE Devices v02, SAR test reduction is applied using the following criteria:
 - Testing for Low and High Channel is performed at the highest output power level for 1RB, and 50% RB configuration for that channel.
 - Testing for 100% RB configuration is performed at the highest output power level for 100% RB configuration across the Low, Mid and High Channel when the highest reported SAR for 1 RB and 50% RB are ≥ 0.8 W/kg. Testing for the remaining required channels is not needed because the reported SAR for 100% RB Allocation < 1.45 W/kg.
 - Testing for 16-QAM modulation is not required because the reported SAR for QPSK is < 1.45 W/Kg and its output power is not more than 0.5 dB higher than that of QPSK.
 - Testing for the other channel bandwidths is not required because the reported SAR for the highest channel bandwidth is < 1.45 W/Kg and its output power is not more than 0.5 dB higher than that of the highest channel bandwidth.

12.9. Wi-Fi (2.4 GHz Band)

12.9.1. Head Exposure Conditions

Test Position	Mode	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
				Tune-up limit	Meas.	Meas.	Scaled		
Left Touch	802.11b	1	2412	15.7	15.1	0.140	0.161		
		6	2437	15.7	14.9				1
		11	2462	15.7	15.1				1
Left Tilt (15°)	802.11b	1	2412	15.7	15.1	0.115	0.132		
		6	2437	15.7	14.9				1
		11	2462	15.7	15.1				1
Right Touch	802.11b	1	2412	15.7	15.1	0.235	0.270	1	
		6	2437	15.7	14.9				1
		11	2462	15.7	15.1				1
Right Tilt (15°)	802.11b	1	2412	15.7	15.1	0.130	0.149		
		6	2437	15.7	14.9				1
		11	2462	15.7	15.1				1

12.9.2. Body-worn Accessory & Hotspot Exposure Conditions

Body-worn Accessory & Hotspot Exposure Conditions

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
					Tune-up limit	Meas.	Meas.	Scaled		
Rear	802.11b	10	1	2412	15.7	15.1	0.152	0.175	2	
			6	2437	15.7	14.9				1
			11	2462	15.7	15.1				1
Front	802.11b	10	1	2412	15.7	15.1	0.054	0.062		
			6	2437	15.7	14.9				1
			11	2462	15.7	15.1				1

Hotspot Exposure Conditions

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
					Tune-up limit	Meas.	Meas.	Scaled		
Edge 1	802.11b	10	1	2412	15.7	15.1	0.041	0.047		
			6	2437	15.7	14.9				1
			11	2462	15.7	15.1				1
Edge 4	802.11b	10	1	2412	15.7	15.1	0.083	0.095		
			6	2437	15.7	14.9				1
			11	2462	15.7	15.1				1

Note(s):

- Testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is:
 - ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
 - ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
 - ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz

12.10. Wi-Fi (5 GHz Bands)

12.10.1. Head Exposure Conditions

Band	Test Position	Mode	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	
					Tune-up limit	Meas.	Meas.	Scaled		
5.2GHz	Left Touch	802.11a	36	5180	12.1	11.1	0.013	0.016	3	
			48	5240	12.1	11.1	0.024	0.030		
	Left Tilt (15°)	802.11a	36	5180	12.1	11.1	0.019	0.024		
			48	5240	12.1	11.1	0.021	0.026		
	Right Touch	802.11a	36	5180	12.1	11.1	0.021	0.026		
			48	5240	12.1	11.1	0.021	0.026		
	Right Tilt (15°)	802.11a	36	5180	12.1	11.1	0.020	0.020		
			48	5240	12.1	11.1	0.023	0.029		
5.3GHz	Left Touch	802.11a	52	5260	12.1	11.3	0.025	0.030	4	
			64	5320	12.1	11.3	0.021	0.025		
	Left Tilt (15°)	802.11a	52	5260	12.1	11.3	0.021	0.025		
			64	5320	12.1	11.3	0.020	0.024		
	Right Touch	802.11a	52	5260	12.1	11.3	0.020	0.024		
			64	5320	12.1	11.3	0.019	0.023		
	Right Tilt (15°)	802.11a	52	5260	12.1	11.3	0.019	0.023		
			64	5320	12.1	11.3	0.020	0.024		
5.5GHz	Left Touch	802.11a	104	5520	12.1	11.3	0.022	0.026		
			116	5580	12.1	11.3	0.025	0.030		
			124	5620	not supported					
			136	5680	12.1	11.3	0.027	0.032		
	Left Tilt (15°)	802.11a	104	5520	12.1	11.3	0.032	0.039	5	
			116	5580	12.1	11.3	0.031	0.038		
			124	5620	not supported					
			136	5680	12.1	11.3	0.031	0.037		
	Right Touch	802.11a	104	5520	12.1	11.3	0.025	0.030		
			116	5580	12.1	11.3	0.026	0.031		
			124	5620	not supported					
			136	5680	12.1	11.3	0.032	0.038		
	Right Tilt (15°)	802.11a	104	5520	12.1	11.3	0.022	0.026		
			116	5580	12.1	11.3	0.025	0.030		
			124	5620	not supported					
			136	5680	12.1	11.3	0.031	0.037		
5.8GHz	Left Touch	802.11a	149	5745	12.1	11.3	0.029	0.035		
			157	5785	12.1	11.3	0.027	0.032		
			165	5825	12.1	11.3	0.033	0.040		
	Left Tilt (15°)	802.11a	149	5745	12.1	11.3	0.029	0.035		
			157	5785	12.1	11.3	0.032	0.038		
			165	5825	12.1	11.3	0.032	0.038		
	Right Touch	802.11a	149	5745	12.1	11.3	0.035	0.042	6	
			157	5785	12.1	11.3	0.031	0.037		
			165	5825	12.1	11.3	0.028	0.034		
	Right Tilt (15°)	802.11a	149	5745	12.1	11.3	0.030	0.036		
			157	5785	12.1	11.3	0.028	0.034		
			165	5825	12.1	11.3	0.028	0.034		

12.10.2. Body-worn Accessory Exposure Conditions

Band	Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
5.2	Rear	802.11a	10	36	5180	12.1	11.1	0.082	0.103	7
				48	5240	12.1	11.1	0.089	0.112	
	Front	802.11a	10	36	5180	12.1	11.1	0.030	0.038	
				48	5240	12.1	11.1	0.027	0.034	
5.3	Rear	802.11a	10	52	5260	12.1	11.3	0.100	0.120	8
				64	5320	12.1	11.3	0.095	0.114	
	Front	802.11a	10	52	5260	12.1	11.3	0.035	0.042	
				64	5320	12.1	11.3	0.032	0.038	
5.5	Rear	802.11a	10	104	5500	12.1	11.3	0.120	0.144	9
				116	5580	12.1	11.3	0.141	0.170	
				124						
				136	5680	12.1	11.3	0.153	0.184	
	Front	802.11a	10	104	5500	12.1	11.3	0.019	0.023	
				116	5580	12.1	11.3	0.001	0.001	
				124						
				136	5680	12.1	11.3	0.030	0.036	
5.8	Rear	802.11a	10	149	5745	12.1	11.3	0.150	0.180	10
				157	5785	12.1	11.3	0.147	0.177	
				165	5825	12.1	11.3	0.126	0.151	
	Front	802.11a	10	149	5745	12.1	11.3	0.038	0.046	
				157	5785	12.1	11.3	0.038	0.046	
				165	5825	12.1	11.3	0.044	0.053	

12.10.3. WiFi Direct (Group Owner) Exposure Conditions

Band	Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
5.8	Rear	802.11a	10	149	5745	12.1	11.3	0.150	0.180	10
				157	5785	12.1	11.3	0.147	0.177	
				165	5825	12.1	11.3	0.126	0.151	
	Front	802.11a	10	149	5745	12.1	11.3	0.038	0.046	
				157	5785	12.1	11.3	0.038	0.046	
				165	5825	12.1	11.3	0.044	0.053	
	Edge 1	802.11a	10	149	5745	12.1	11.3	0.039	0.047	
				157	5785	12.1	11.3	0.028	0.033	
				165	5825	12.1	11.3	0.038	0.046	
	Edge 4	802.11a	10	149	5745	12.1	11.3	0.085	0.102	
				157	5785	12.1	11.3	0.062	0.075	
				165	5825	12.1	11.3	0.053	0.064	

13. SAR Measurement Variability

In accordance with published RF Exposure KDB procedure 865664 D01 SAR measurement 100 MHz to 6 GHz v01. These additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

- 1) Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps 2) through 4) do not apply.
- 2) When the original highest measured SAR is ≥ 0.80 W/kg, repeat that measurement once.
- 3) Perform a second repeated measurement only if the **ratio of largest to smallest SAR** for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).
- 4) Perform a third repeated measurement only if the original, first or second repeated measurement is ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

13.1. The Highest Measured SAR Configuration in Each Frequency Band

Frequency Band (MHz)	Air Interface	Head	Body-worn Accessory	Hotspot/WiFi Direct
710	LTE Band 17	0.286	0.511	0.511
850	GSM 850	0.274	0.719	0.719
	W-CDMA Band V	0.205	0.544	0.544
1750	W-CDMA Band IV	0.802	1.230	1.230
	LTE Band 4	0.740	1.060	1.060
1900	GSM 1900	0.729	1.110	1.110
	W-CDMA Band II	0.961	1.230	1.230
	LTE Band 2	0.865	1.230	1.230
2400	WiFi 802.11b/g/n	0.235	0.152	0.152
5000	WiFi 802.11a/n	0.035	0.153	0.150

13.2. Repeated Measurement Results

13.2.1. Head Exposure Condition

Not Applicable.

13.2.2. Body-worn Accessory & Hotspot Exposure Condition

Frequency band	Test Position	Mode	Ch #.	Freq. (MHz)	Meas. SAR (W/kg)		Largest to Smallest SAR Ratio	Note
					Original	Repeated		
W-CDMA Band IV	Rear	Rel. 99, RMC 12.2 kbps	1513	1752.6	1.230	1.210	1.02	1
W-CDMA Band II	Rear	Rel. 99, RMC 12.2 kbps	9400	1880.0	1.230	1.170	1.05	1
LTE Band 2	Rear	QPSK	18900	1880.0	1.230	1.150	1.07	1

Note(s):

1. Second Repeated Measurement is not required since the ratio of the largest to smallest SAR for the original and first repeated measurement is not > 1.20.

14. Simultaneous Transmission SAR Analysis

KDB 447498 D01 General RF Exposure Guidance v05, introduces a new formula for calculating the SAR to Peak Location Ratio (SPLSR) between pairs of simultaneously transmitting antennas:

$$SPLSR = (SAR_1 + SAR_2)^{1.5} / Ri$$

Where:

SAR₁ is the highest measured or estimated SAR for the first of a pair of simultaneous transmitting antennas, in a specific test operating mode and exposure condition

SAR₂ is the highest measured or estimated SAR for the second of a pair of simultaneous transmitting antennas, in the same test operating mode and exposure condition as the first

Ri is the separation distance between the pair of simultaneous transmitting antennas. When the SAR is measured, for both antennas in the pair, it is determined by the actual x, y and z coordinates in the 1-g SAR for each SAR peak location, based on the extrapolated and interpolated result in the zoom scan measurement, using the formula of $[(x_1 - x_2)^2 + (y_1 - y_2)^2 + (z_1 - z_2)^2]$

A new threshold of 0.04 is also introduced in the draft KDB. Thus, in order for a pair of simultaneous transmitting antennas with the sum of 1-g SAR > 1.6 W/kg to qualify for exemption from Simultaneous Transmission SAR measurements, it has to satisfy the condition of:

$$(SAR_1 + SAR_2)^{1.5} / Ri < 0.04$$

14.1. Estimated SAR for Bluetooth

14.1.1. Standalone SAR Test Exclusion

Based on the criteria for Standalone SAR test exclusion listed in Section 4.3.1. of KDB 447498 D01 General RF Exposure Guidance v05:

$$[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0, \text{ for 1-g SAR}$$

Body-worn Accessory Exposure Conditions

Max. Power of Channel		Min. Test Separation Distance (mm)	Frequency (GHz)	Result
(dBm)	(mW)			
11.0	13	10	2.480	2.0

Conclusion:

The computed value is < 3; therefore, Bluetooth qualifies for Standalone SAR test exclusion.

14.1.2. Estimated SAR

As SAR was not measured for Bluetooth, estimated Standalone SAR values were computed for Bluetooth for the purpose of Simultaneous Transmission SAR Analysis using the following formula:

$$[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})/x}] \text{ W/kg,}$$

With x = 7.5 for 1-g SAR

This standalone SAR estimation was performed in accordance with the separation distances listed in Section 17. "Antenna Locations" and only at the applicable simultaneous transmission test positions. The estimated SAR results are as follow:

Test Position	Max. Power of Channel (mW)	Min. Test Separation Distance (mm)	Frequency (GHz)	Estimated 1-g SAR Values (W/kg)
Rear/Front	13	10	2.480	0.273

Note(s):

1. Power and distance are rounded to the nearest mW and mm before calculation
2. If the minimum test separation distance is <5mm then 5mm is used in the calculation

14.2. Head Exposure Conditions

14.2.1. Sum of the SAR for GSM850 (Voice) & Wi-Fi

Test Position	GSM	Wi-Fi					Σ 1-g SAR (mW/g)
	850	2.4 GHz	5.2 GHz	5.3 GHz	5.5 GHz	5.8 GHz	
Left Touch	0.177	0.161					0.338
	0.177		0.030				0.207
	0.177			0.030			0.207
	0.177				0.032		0.209
	0.177					0.040	0.217
Left Tilt (15°)	0.123	0.132					0.255
	0.123		0.026				0.149
	0.123			0.025			0.148
	0.123				0.039		0.162
	0.123					0.038	0.161
Right Touch	0.163	0.270					0.433
	0.163		0.026				0.189
	0.163			0.024			0.187
	0.163				0.038		0.201
	0.163					0.042	0.205
Right Tilt (15°)	0.112	0.149					0.261
	0.112		0.029				0.141
	0.112			0.024			0.136
	0.112				0.037		0.149
	0.112					0.036	0.148

14.2.2. Sum of the SAR for GSM850 (VoIP) & Wi-Fi

Test Position	GSM (GPRS)	Wi-Fi					Σ 1-g SAR (mW/g)
	850	2.4 GHz	5.2 GHz	5.3 GHz	5.5 GHz	5.8 GHz	
Left Touch	0.294	0.161					0.455
	0.294		0.030				0.324
	0.294			0.030			0.324
	0.294				0.032		0.326
	0.294					0.040	0.334
Left Tilt (15°)	0.208	0.132					0.340
	0.208		0.026				0.234
	0.208			0.025			0.233
	0.208				0.039		0.247
	0.208					0.038	0.246
Right Touch	0.283	0.270					0.553
	0.283		0.026				0.309
	0.283			0.024			0.307
	0.283				0.038		0.321
	0.283					0.042	0.325
Right Tilt (15°)	0.199	0.149					0.348
	0.199		0.029				0.228
	0.199			0.024			0.223
	0.199				0.037		0.236
	0.199					0.036	0.235

SAR to Peak Location Separation Ratio (SPLSR)

As the Sum of the SAR is not greater than 1.6 W/kg SPLSR assessment is not required.

Conclusion:

Simultaneous transmission SAR measurement (Volume Scan) is not required because the either sum of the 1-g SAR is < 1.6 W/kg or the SPLSR is < 0.04 for all circumstances that require SPLSR calculation.

14.2.3. Sum of the SAR for GSM1900 (Voice) & Wi-Fi

Test Position	GSM	Wi-Fi					Σ 1-g SAR (mW/g)
	1900	2.4 GHz	5.2 GHz	5.3 GHz	5.5 GHz	5.8 GHz	
Left Touch	0.537	0.161					0.698
	0.537		0.030				0.567
	0.537			0.030			0.567
	0.537				0.032		0.569
	0.537					0.040	0.577
Left Tilt (15°)	0.169	0.132					0.301
	0.169		0.026				0.195
	0.169			0.025			0.194
	0.169				0.039		0.208
	0.169					0.038	0.207
Right Touch	0.404	0.270					0.674
	0.404		0.026				0.430
	0.404			0.024			0.428
	0.404				0.038		0.442
	0.404					0.042	0.446
Right Tilt (15°)	0.161	0.149					0.310
	0.161		0.029				0.190
	0.161			0.024			0.185
	0.161				0.037		0.198
	0.161					0.036	0.197

14.2.4. Sum of the SAR for GSM1900 (VoIP) & Wi-Fi

Test Position	GSM (GPRS)	Wi-Fi					Σ 1-g SAR (mW/g)
	1900	2.4 GHz	5.2 GHz	5.3 GHz	5.5 GHz	5.8 GHz	
Left Touch	0.746	0.161					0.907
	0.746		0.030				0.776
	0.746			0.030			0.776
	0.746				0.032		0.778
	0.746					0.040	0.786
Left Tilt (15°)	0.239	0.132					0.371
	0.239		0.026				0.265
	0.239			0.025			0.264
	0.239				0.039		0.278
	0.239					0.038	0.277
Right Touch	0.576	0.270					0.846
	0.576		0.026				0.602
	0.576			0.024			0.600
	0.576				0.038		0.614
	0.576					0.042	0.618
Right Tilt (15°)	0.231	0.149					0.380
	0.231		0.029				0.260
	0.231			0.024			0.255
	0.231				0.037		0.268
	0.231					0.036	0.267

SAR to Peak Location Separation Ratio (SPLSR)

As the Sum of the SAR is not greater than 1.6 W/kg SPLSR assessment is not required.

Conclusion:

Simultaneous transmission SAR measurement (Volume Scan) is not required because the either sum of the 1-g SAR is < 1.6 W/kg or the SPLSR is < 0.04 for all circumstances that require SPLSR calculation.

14.2.5. Sum of the SAR for W-CDMA Band II & Wi-Fi

Test Position	W-CDMA	Wi-Fi					Σ 1-g SAR (mW/g)
	Band II	2.4 GHz	5.2 GHz	5.3 GHz	5.5 GHz	5.8 GHz	
Left Touch	0.983	0.161					1.144
	0.983		0.030				1.013
	0.983			0.030			1.013
	0.983				0.032		1.015
	0.983					0.040	1.023
Left Tilt (15°)	0.316	0.132					0.448
	0.316		0.026				0.342
	0.316			0.025			0.341
	0.316				0.039		0.355
	0.316					0.038	0.354
Right Touch	0.776	0.270					1.046
	0.776		0.026				0.802
	0.776			0.024			0.800
	0.776				0.038		0.814
	0.776					0.042	0.818
Right Tilt (15°)	0.335	0.149					0.484
	0.335		0.029				0.364
	0.335			0.024			0.359
	0.335				0.037		0.372
	0.335					0.036	0.371

SAR to Peak Location Separation Ratio (SPLSR)

As the Sum of the SAR is not greater than 1.6 W/kg SPLSR assessment is not required.

Conclusion:

Simultaneous transmission SAR measurement (Volume Scan) is not required because the either sum of the 1-g SAR is < 1.6 W/kg or the SPLSR is < 0.04 for all circumstances that require SPLSR calculation.

14.2.6. Sum of the SAR for W-CDMA Band IV & Wi-Fi

Test Position	W-CDMA	Wi-Fi					Σ 1-g SAR (mW/g)
	Band IV	2.4 GHz	5.2 GHz	5.3 GHz	5.5 GHz	5.8 GHz	
Left Touch	0.776	0.161					0.937
	0.776		0.030				0.806
	0.776			0.030			0.806
	0.776				0.032		0.808
	0.776					0.040	0.816
Left Tilt (15°)	0.255	0.132					0.387
	0.255		0.026				0.281
	0.255			0.025			0.280
	0.255				0.039		0.294
	0.255					0.038	0.293
Right Touch	0.814	0.270					1.084
	0.814		0.026				0.840
	0.814			0.024			0.838
	0.814				0.038		0.852
	0.814					0.042	0.856
Right Tilt (15°)	0.228	0.149					0.377
	0.228		0.029				0.257
	0.228			0.024			0.252
	0.228				0.037		0.265
	0.228					0.036	0.264

SAR to Peak Location Separation Ratio (SPLSR)

As the Sum of the SAR is not greater than 1.6 W/kg SPLSR assessment is not required.

Conclusion:

Simultaneous transmission SAR measurement (Volume Scan) is not required because the either sum of the 1-g SAR is < 1.6 W/kg or the SPLSR is < 0.04 for all circumstances that require SPLSR calculation.

14.2.7. Sum of the SAR for W-CDMA Band V & Wi-Fi

Test Position	W-CDMA	Wi-Fi					Σ 1-g SAR (mW/g)
	Band V	2.4 GHz	5.2 GHz	5.3 GHz	5.5 GHz	5.8 GHz	
Left Touch	0.215	0.161					0.376
	0.215		0.030				0.245
	0.215			0.030			0.245
	0.215				0.032		0.247
	0.215					0.040	0.255
Left Tilt (15°)	0.159	0.132					0.291
	0.159		0.026				0.185
	0.159			0.025			0.184
	0.159				0.039		0.198
	0.159					0.038	0.197
Right Touch	0.203	0.270					0.473
	0.203		0.026				0.229
	0.203			0.024			0.227
	0.203				0.038		0.241
	0.203					0.042	0.245
Right Tilt (15°)	0.141	0.149					0.290
	0.141		0.029				0.170
	0.141			0.024			0.165
	0.141				0.037		0.178
	0.141					0.036	0.177

SAR to Peak Location Separation Ratio (SPLSR)

As the Sum of the SAR is not greater than 1.6 W/kg SPLSR assessment is not required.

Conclusion:

Simultaneous transmission SAR measurement (Volume Scan) is not required because the either sum of the 1-g SAR is < 1.6 W/kg or the SPLSR is < 0.04 for all circumstances that require SPLSR calculation.

14.2.8. Sum of the SAR for LTE Band 2 & Wi-Fi

Test Position	LTE	Wi-Fi					Σ 1-g SAR (mW/g)
	Band 2	2.4 GHz	5.2 GHz	5.3 GHz	5.5 GHz	5.8 GHz	
Left Touch	0.865	0.161					1.026
	0.865		0.030				0.895
	0.865			0.030			0.895
	0.865				0.032		0.897
	0.865					0.040	0.905
Left Tilt (15°)	0.321	0.132					0.453
	0.321		0.026				0.347
	0.321			0.025			0.346
	0.321				0.039		0.360
	0.321					0.038	0.359
Right Touch	0.749	0.270					1.019
	0.749		0.026				0.775
	0.749			0.024			0.773
	0.749				0.038		0.787
	0.749					0.042	0.791
Right Tilt (15°)	0.345	0.149					0.494
	0.345		0.029				0.374
	0.345			0.024			0.369
	0.345				0.037		0.382
	0.345					0.036	0.381

SAR to Peak Location Separation Ratio (SPLSR)

As the Sum of the SAR is not greater than 1.6 W/kg SPLSR assessment is not required.

Conclusion:

Simultaneous transmission SAR measurement (Volume Scan) is not required because the either sum of the 1-g SAR is < 1.6 W/kg or the SPLSR is < 0.04 for all circumstances that require SPLSR calculation.

14.2.9. Sum of the SAR for LTE Band 4 & Wi-Fi

Test Position	LTE	Wi-Fi					Σ 1-g SAR (mW/g)
	Band 4	2.4 GHz	5.2 GHz	5.3 GHz	5.5 GHz	5.8 GHz	
Left Touch	0.739	0.161					0.900
	0.739		0.030				0.769
	0.739			0.030			0.769
	0.739				0.032		0.771
	0.739					0.040	0.779
Left Tilt (15°)	0.224	0.132					0.356
	0.224		0.026				0.250
	0.224			0.025			0.249
	0.224				0.039		0.263
	0.224					0.038	0.262
Right Touch	0.740	0.270					1.010
	0.740		0.026				0.766
	0.740			0.024			0.764
	0.740				0.038		0.778
	0.740					0.042	0.782
Right Tilt (15°)	0.184	0.149					0.333
	0.184		0.029				0.213
	0.184			0.024			0.208
	0.184				0.037		0.221
	0.184					0.036	0.220

SAR to Peak Location Separation Ratio (SPLSR)

As the Sum of the SAR is not greater than 1.6 W/kg SPLSR assessment is not required.

Conclusion:

Simultaneous transmission SAR measurement (Volume Scan) is not required because the either sum of the 1-g SAR is < 1.6 W/kg or the SPLSR is < 0.04 for all circumstances that require SPLSR calculation.

14.2.10. Sum of the SAR for LTE Band 17 & Wi-Fi

Test Position	LTE	Wi-Fi					Σ 1-g SAR (mW/g)
	Band 17	2.4 GHz	5.2 GHz	5.3 GHz	5.5 GHz	5.8 GHz	
Left Touch	0.202	0.161					0.363
	0.202		0.030				0.232
	0.202			0.030			0.232
	0.202				0.032		0.234
	0.202					0.040	0.242
Left Tilt (15°)	0.092	0.132					0.224
	0.092		0.026				0.118
	0.092			0.025			0.117
	0.092				0.039		0.131
	0.092					0.038	0.130
Right Touch	0.286	0.270					0.556
	0.286		0.026				0.312
	0.286			0.024			0.310
	0.286				0.038		0.324
	0.286					0.042	0.328
Right Tilt (15°)	0.128	0.149					0.277
	0.128		0.029				0.157
	0.128			0.024			0.152
	0.128				0.037		0.165
	0.128					0.036	0.164

SAR to Peak Location Separation Ratio (SPLSR)

As the Sum of the SAR is not greater than 1.6 W/kg SPLSR assessment is not required.

Conclusion:

Simultaneous transmission SAR measurement (Volume Scan) is not required because the either sum of the 1-g SAR is < 1.6 W/kg or the SPLSR is < 0.04 for all circumstances that require SPLSR calculation.

14.3. Body-worn Accessory Exposure Conditions

14.3.1. Sum of the SAR for GSM (Voice), Wi-Fi & Bluetooth

Test Position	GSM	Wi-Fi						Σ 1-g SAR (mW/g)
	850	2.4 GHz	5.2 GHz	5.3 GHz	5.5 GHz	5.8 GHz	Bluetooth	
Rear	0.503	0.175						0.678
	0.503		0.112					0.615
	0.503			0.120				0.623
	0.503				0.184			0.687
	0.503					0.180		0.683
	0.503						0.273	0.776
Front	0.205	0.062						0.267
	0.205		0.038					0.243
	0.205			0.042				0.247
	0.205				0.036			0.241
	0.205					0.053		0.258
	0.205						0.273	0.478
Test Position	GSM	Wi-Fi						Σ 1-g SAR (mW/g)
	1900	2.4 GHz	5.2 GHz	5.3 GHz	5.5 GHz	5.8 GHz	Bluetooth	
Rear	0.743	0.175						0.918
	0.743		0.112					0.855
	0.743			0.120				0.863
	0.743				0.184			0.927
	0.743					0.180		0.923
	0.743						0.273	1.016
Front	0.630	0.062						0.692
	0.630		0.038					0.668
	0.630			0.042				0.672
	0.630				0.036			0.666
	0.630					0.053		0.683
	0.630						0.273	0.903

SAR to Peak Location Separation Ratio (SPLSR)

As the Sum of the SAR is not greater than 1.6 W/kg SPLSR assessment is not required.

Conclusion:

Simultaneous transmission SAR measurement (Volume Scan) is not required because the either sum of the 1-g SAR is < 1.6 W/kg or the SPLSR is < 0.04 for all circumstances that require SPLSR calculation.

14.3.2. Sum of the SAR for GSM (VoIP), Wi-Fi & Bluetooth

Test Position	GSM (GPRS)	Wi-Fi						Σ 1-g SAR (mW/g)
	850	2.4 GHz	5.2 GHz	5.3 GHz	5.5 GHz	5.8 GHz	Bluetooth	
Rear	0.770	0.175						0.945
	0.770		0.112					0.882
	0.770			0.120				0.890
	0.770				0.184			0.954
	0.770					0.180		0.950
	0.770						0.273	1.043
Front	0.335	0.062						0.397
	0.335		0.038					0.373
	0.335			0.042				0.377
	0.335				0.036			0.371
	0.335					0.053		0.388
	0.335						0.273	0.608
Test Position	GSM (GPRS)	Wi-Fi						Σ 1-g SAR (mW/g)
	1900	2.4 GHz	5.2 GHz	5.3 GHz	5.5 GHz	5.8 GHz	Bluetooth	
Rear	1.162	0.175						1.337
	1.162		0.112					1.274
	1.162			0.120				1.282
	1.162				0.184			1.346
	1.162					0.180		1.342
	1.162						0.273	1.435
Front	1.003	0.062						1.065
	1.003		0.038					1.041
	1.003			0.042				1.045
	1.003				0.036			1.039
	1.003					0.053		1.056
	1.003						0.273	1.276

SAR to Peak Location Separation Ratio (SPLSR)

As the Sum of the SAR is not greater than 1.6 W/kg SPLSR assessment is not required.

Conclusion:

Simultaneous transmission SAR measurement (Volume Scan) is not required because the either sum of the 1-g SAR is < 1.6 W/kg or the SPLSR is < 0.04 for all circumstances that require SPLSR calculation.

14.3.3. Sum of the SAR for W-CDMA, Wi-Fi & Bluetooth

Test Position	W-CDMA Band II	Wi-Fi						Σ 1-g SAR (mW/g)
		2.4 GHz	5.2 GHz	5.3 GHz	5.5 GHz	5.8 GHz	Bluetooth	
Rear	1.259	0.175						1.434
	1.259		0.112					1.371
	1.259			0.120				1.379
	1.259				0.184			1.443
	1.259					0.180		1.439
	1.259						0.273	1.532
Front	1.207	0.062						1.269
	1.207		0.038					1.245
	1.207			0.042				1.249
	1.207				0.036			1.243
	1.207					0.053		1.260
	1.207						0.273	1.480
Test Position	W-CDMA Band IV	Wi-Fi						Σ 1-g SAR (mW/g)
		2.4 GHz	5.2 GHz	5.3 GHz	5.5 GHz	5.8 GHz	Bluetooth	
Rear	1.230	0.175						1.405
	1.230		0.112					1.342
	1.230			0.120				1.350
	1.230				0.184			1.414
	1.230					0.180		1.410
	1.230						0.273	1.503
Front	1.100	0.062						1.162
	1.100		0.038					1.138
	1.100			0.042				1.142
	1.100				0.036			1.136
	1.100					0.053		1.153
	1.100						0.273	1.373
Test Position	W-CDMA Band V	Wi-Fi						Σ 1-g SAR (mW/g)
		2.4 GHz	5.2 GHz	5.3 GHz	5.5 GHz	5.8 GHz	Bluetooth	
Rear	0.570	0.175						0.745
	0.570		0.112					0.682
	0.570			0.120				0.690
	0.570				0.184			0.754
	0.570					0.180		0.750
	0.570						0.273	0.843
Front	0.251	0.062						0.313
	0.251		0.038					0.289
	0.251			0.042				0.293
	0.251				0.036			0.287
	0.251					0.053		0.304
	0.251						0.273	0.524

SAR to Peak Location Separation Ratio (SPLSR)

As the Sum of the SAR is not greater than 1.6 W/kg SPLSR assessment is not required.

Conclusion:

Simultaneous transmission SAR measurement (Volume Scan) is not required because the either sum of the 1-g SAR is < 1.6 W/kg or the SPLSR is < 0.04 for all circumstances that require SPLSR calculation.

14.3.4. Sum of the SAR for LTE, Wi-Fi & Bluetooth

Test Position	LTE	Wi-Fi						Σ 1-g SAR (mW/g)
	Band 2	2.4 GHz	5.2 GHz	5.3 GHz	5.5 GHz	5.8 GHz	Bluetooth	
Rear	1.230	0.175						1.405
	1.230		0.112					1.342
	1.230			0.120				1.350
	1.230				0.184			1.414
	1.230					0.180		1.410
	1.230						0.273	1.503
Front	1.160	0.062						1.222
	1.160		0.038					1.198
	1.160			0.042				1.202
	1.160				0.036			1.196
	1.160					0.053		1.213
	1.160						0.273	1.433
Test Position	LTE	Wi-Fi						Σ 1-g SAR (mW/g)
	Band 4	2.4 GHz	5.2 GHz	5.3 GHz	5.5 GHz	5.8 GHz	Bluetooth	
Rear	1.060	0.175						1.235
	1.060		0.112					1.172
	1.060			0.120				1.180
	1.060				0.184			1.244
	1.060					0.180		1.240
	1.060						0.273	1.333
Front	0.891	0.062						0.953
	0.891		0.038					0.929
	0.891			0.042				0.933
	0.891				0.036			0.927
	0.891					0.053		0.944
	0.891						0.273	1.164
Test Position	LTE	Wi-Fi						Σ 1-g SAR (mW/g)
	Band 17	2.4 GHz	5.2 GHz	5.3 GHz	5.5 GHz	5.8 GHz	Bluetooth	
Rear	0.511	0.175						0.686
	0.511		0.112					0.623
	0.511			0.120				0.631
	0.511				0.184			0.695
	0.511					0.180		0.691
	0.511						0.273	0.784
Front	0.328	0.062						0.390
	0.328		0.038					0.366
	0.328			0.042				0.370
	0.328				0.036			0.364
	0.328					0.053		0.381
	0.328						0.273	0.601

SAR to Peak Location Separation Ratio (SPLSR)

As the Sum of the SAR is not greater than 1.6 W/kg SPLSR assessment is not required.

Conclusion:

Simultaneous transmission SAR measurement (Volume Scan) is not required because the either sum of the 1-g SAR is < 1.6 W/kg or the SPLSR is < 0.04 for all circumstances that require SPLSR calculation.

14.4. Hotspot Exposure Conditions

14.4.1. Sum of the SAR for GSM (VoIP) & Wi-Fi

Test Position	GSM (GPRS)		Wi-Fi	Σ 1-g SAR (mW/g)
	850	1900	2.4 GHz	
Rear	0.770		0.175	0.945
		1.162	0.175	1.337
Front	0.335		0.062	0.397
		1.003	0.062	1.065
Edge 1	N/A		0.047	0.047
		N/A	0.047	0.047
Edge 2	0.283		N/A	0.283
		0.200	N/A	0.200
Edge 3	0.076		N/A	0.076
		0.761	N/A	0.761
Edge 4	0.331		0.095	0.426
		0.380	0.095	0.475

SAR to Peak Location Separation Ratio (SPLSR)

As the Sum of the SAR is not greater than 1.6 W/kg SPLSR assessment is not required.

Conclusion:

Simultaneous transmission SAR measurement (Volume Scan) is not required because the either sum of the 1-g SAR is < 1.6 W/kg or the SPLSR is < 0.04 for all circumstances that require SPLSR calculation.

14.4.2. Sum of the SAR for W-CDMA & Wi-Fi

Test Position	WCDMA			Wi-Fi	Σ 1-g SAR (mW/g)
	Band II	Band IV	Band V	2.4 GHz	
Rear	1.259			0.175	1.434
		1.230		0.175	1.405
			0.570	0.175	0.745
Front	1.207			0.062	1.269
		1.100		0.062	1.162
			0.251	0.062	0.313
Edge 1	N/A			0.047	0.047
		N/A		0.047	0.047
			N/A	0.047	0.047
Edge 2	0.264			N/A	0.264
		0.188		N/A	0.188
			0.228	N/A	0.228
Edge 3	1.034			N/A	1.034
		0.853		N/A	0.853
			0.052	N/A	0.052
Edge 4	0.447			0.095	0.542
		0.480		0.095	0.575
			0.264	0.095	0.359

SAR to Peak Location Separation Ratio (SPLSR)

As the Sum of the SAR is not greater than 1.6 W/kg SPLSR assessment is not required.

Conclusion:

Simultaneous transmission SAR measurement (Volume Scan) is not required because the either sum of the 1-g SAR is < 1.6 W/kg or the SPLSR is < 0.04 for all circumstances that require SPLSR calculation.

14.4.3. Sum of the SAR for LTE & Wi-Fi

Test Position	LTE			Wi-Fi	Σ 1-g SAR (mW/g)
	Band 2	Band 4	Band 17	2.4 GHz	
Rear	1.230			0.175	1.405
		1.060		0.175	1.235
			0.511	0.175	0.686
Front	1.160			0.062	1.222
		0.891		0.062	0.953
			0.328	0.062	0.390
Edge 1	N/A			0.047	0.047
		N/A		0.047	0.047
			N/A	0.047	0.047
Edge 2	0.233			N/A	0.233
		0.175		N/A	0.175
			0.377	N/A	0.377
Edge 3	1.040			N/A	1.040
		0.733		N/A	0.733
			0.108	N/A	0.108
Edge 4	0.497			0.095	0.592
		0.432		0.095	0.527
			0.089	0.095	0.184

SAR to Peak Location Separation Ratio (SPLSR)

As the Sum of the SAR is not greater than 1.6 W/kg SPLSR assessment is not required.

Conclusion:

Simultaneous transmission SAR measurement (Volume Scan) is not required because the either sum of the 1-g SAR is < 1.6 W/kg or the SPLSR is < 0.04 for all circumstances that require SPLSR calculation.

14.5. Wi-Fi Direct Exposure Conditions

14.5.1. Sum of the SAR for GSM (VoIP) & Wi-Fi

Test Position	GSM (GPRS)		Wi-Fi	Σ 1-g SAR (mW/g)
	850	1900	5.8 GHz	
Rear	0.770		0.180	0.950
		1.162	0.180	1.342
Front	0.335		0.053	0.388
		1.003	0.053	1.056
Edge 1	N/A		0.047	0.047
		N/A	0.047	0.047
Edge 2	0.283		N/A	0.283
		0.200	N/A	0.200
Edge 3	0.076		N/A	0.076
		0.761	N/A	0.761
Edge 4	0.331		0.102	0.433
		0.380	0.102	0.482

SAR to Peak Location Separation Ratio (SPLSR)

As the Sum of the SAR is not greater than 1.6 W/kg SPLSR assessment is not required.

Conclusion:

Simultaneous transmission SAR measurement (Volume Scan) is not required because the either sum of the 1-g SAR is < 1.6 W/kg or the SPLSR is < 0.04 for all circumstances that require SPLSR calculation.

14.5.2. Sum of the SAR for W-CDMA & Wi-Fi

Test Position	WCDMA			Wi-Fi	Σ 1-g SAR (mW/g)
	Band II	Band IV	Band V	5.8 GHz	
Rear	1.259			0.180	1.439
		1.230		0.180	1.410
			0.570	0.180	0.750
Front	1.207			0.053	1.260
		1.100		0.053	1.153
			0.251	0.053	0.304
Edge 1	N/A			0.047	0.047
		N/A		0.047	0.047
			N/A	0.047	0.047
Edge 2	0.264			N/A	0.264
		0.188		N/A	0.188
			0.228	N/A	0.228
Edge 3	1.034			N/A	1.034
		0.853		N/A	0.853
			0.052	N/A	0.052
Edge 4	0.447			0.102	0.549
		0.480		0.102	0.582
			0.264	0.102	0.366

SAR to Peak Location Separation Ratio (SPLSR)

As the Sum of the SAR is not greater than 1.6 W/kg SPLSR assessment is not required.

Conclusion:

Simultaneous transmission SAR measurement (Volume Scan) is not required because the either sum of the 1-g SAR is < 1.6 W/kg or the SPLSR is < 0.04 for all circumstances that require SPLSR calculation.

14.5.3. Sum of the SAR for LTE & Wi-Fi

Test Position	LTE			Wi-Fi	Σ 1-g SAR (mW/g)
	Band 2	Band 4	Band 17	5.8 GHz	
Rear	1.230			0.180	1.410
		1.060		0.180	1.240
			0.511	0.180	0.691
Front	1.160			0.053	1.213
		0.891		0.053	0.944
			0.328	0.053	0.381
Edge 1	N/A			0.047	0.047
		N/A		0.047	0.047
			N/A	0.047	0.047
Edge 2	0.233			N/A	0.233
		0.175		N/A	0.175
			0.377	N/A	0.377
Edge 3	1.040			N/A	1.040
		0.733		N/A	0.733
			0.108	N/A	0.108
Edge 4	0.497			0.102	0.599
		0.432		0.102	0.534
			0.089	0.102	0.191

SAR to Peak Location Separation Ratio (SPLSR)

As the Sum of the SAR is not greater than 1.6 W/kg SPLSR assessment is not required.

Conclusion:

Simultaneous transmission SAR measurement (Volume Scan) is not required because the either sum of the 1-g SAR is < 1.6 W/kg or the SPLSR is < 0.04 for all circumstances that require SPLSR calculation.

15. Appendixes

Refer to separated files for the following appendixes.

- 15.1. System Performance Check Plots
- 15.2. Highest SAR Test Plots for GSM
- 15.3. Highest SAR Test Plots for W-CDMA
- 15.4. Highest SAR Test Plots for LTE
- 15.5. Highest SAR Test Plots for Wi-Fi
- 15.6. Calibration Certificate for E-Field Probe EX3DV3 - SN 3749
- 15.7. Calibration Certificate for E-Field Probe EX3DV4 - SN 3751
- 15.8. Calibration Certificate for E-Field Probe EX3DV4 - SN 3686
- 15.9. Calibration Certificate for E-Field Probe EX3DV3 - SN 3531
- 15.10. Calibration Certificate for D750V3 - SN 1019
- 15.11. Calibration Certificate for D835V2 - SN 4d142
- 15.12. Calibration Certificate for D835V2 - SN 4d002
- 15.13. Calibration Certificate for D1750V2 - SN 1077
- 15.14. Calibration Certificate for D1750V2 - SN 1050
- 15.15. Calibration Certificate for D1900V2 - SN 5d163
- 15.16. Calibration Certificate for D2450V2 - SN 899
- 15.17. Calibration Certificate for D5GHzV2 - SN 1138