



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

**SAR EVALUATION REPORT  
(Class II Permissive Change)**

*For*

**GSM850~1900 + WCDMA 850~1900 + LTE SMART PHONE with BLUETOOTH + BLE and  
WLAN 2.4GHz**

**Model: LGMS659, LG-MS659, MS659, LG-P659, LGP659 and P659**

**FCC ID: ZNFMS659**

**Report Number: 13U14990-5A  
Issue Date: 6/19/2013**

*Prepared for*

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**NVLAP LAB CODE 200065-0**

Revision History

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--	6/11/2013	Initial Issue	--
A	6/19/2013	Made the following modifications: 1. Updated model names 2. Updated Section 9.6 & 9.7 tune-up tolerance	Kenneth Mak

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## 1. Attestation of Test Results

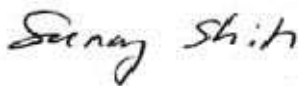
Applicant	LG ELECTRONICS MOBILECOMM U.S.A., INC.			
DUT description	GSM850~1900 + WCDMA 850~1900 + LTE SMART PHONE with BLUETOOTH + BLE and WLAN 2.4GHz			
Model	LGMS659, LG-MS659, MS659, LG-P659, LGP659 and P659			
Test device is	An identical prototype			
Device category	Portable			
Exposure category	General Population/Uncontrolled Exposure			
Date tested	5/10/2013 – 5/20/2013			
The highest reported SAR values	RF exposure conditions	Licensed	DTS	UNII
	Head	1.090 W/kg	0.398 W/kg	N/A W/kg
	Body-worn Accessory	1.289 W/kg	0.214 W/kg	N/A W/kg
	Wireless Router (Hotspot)	1.289 W/kg	0.227 W/kg	N/A W/kg
	Simultaneous Transmission	1.503 W/kg	1.503 W/kg	N/A 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:

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## 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 D03 SAR Test Reduction GSM GPRS EDGE 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 v01r01
- 865664 D02 SAR Reporting v01r01
- 690783 D01 SAR Listings on Grants v01r02

## 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	XT20-3	1318A00529	N/A
Synthesized Signal Generator	HP	8665B	3744A01084	5/7/2014
Power Meter	HP	437B	3125U15418	8/9/2013
Power Meter	HP	437B	3125U09248	9/24/2013
Power Sensor	HP	8481A	1926A16917	8/21/2013
Power Sensor	HP	8481A	3318A95392	9/24/2013
Amplifier	MITEQ	AMF-4D-00400600-50-30P	1620606	N/A
Directional coupler	Werlatone	C8060-102	2141	N/A
DC Power Supply	HP	6296A	2410A-05117	N/A
E-Field Probe (SAR F)	SPEAG	EX3DV4	3885	10/9/2013
E-Field Probe (SAR E)	SPEAG	EX3DV4	3901	2/13/2014
E-Field Probe (SAR D)	SPEAG	EX3DV4	3686	3/11/2014
Data Acquisition Electronics (SAR F)	SPEAG	DAE4	1352	10/8/2013
Data Acquisition Electronics (SAR E)	SPEAG	DAE4	1357	2/5/2014
Data Acquisition Electronics (SAR D)	SPEAG	DAE4	1257	8/28/2013
System Validation Dipole	SPEAG	D750V3	1071	10/5/2013
System Validation Dipole	SPEAG	D835V2	4d002	10/24/2013
System Validation Dipole	SPEAG	D1750V2	1053	8/15/2013
System Validation Dipole	SPEAG	D1900V2	5d043	11/6/2013
System Validation Dipole	SPEAG	D2450V2	899	10/5/2013

#### 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	CMU200	106301	6/6/2013
Bluetooth Tester	R & S	CBT	100900-aC	5/15/2013



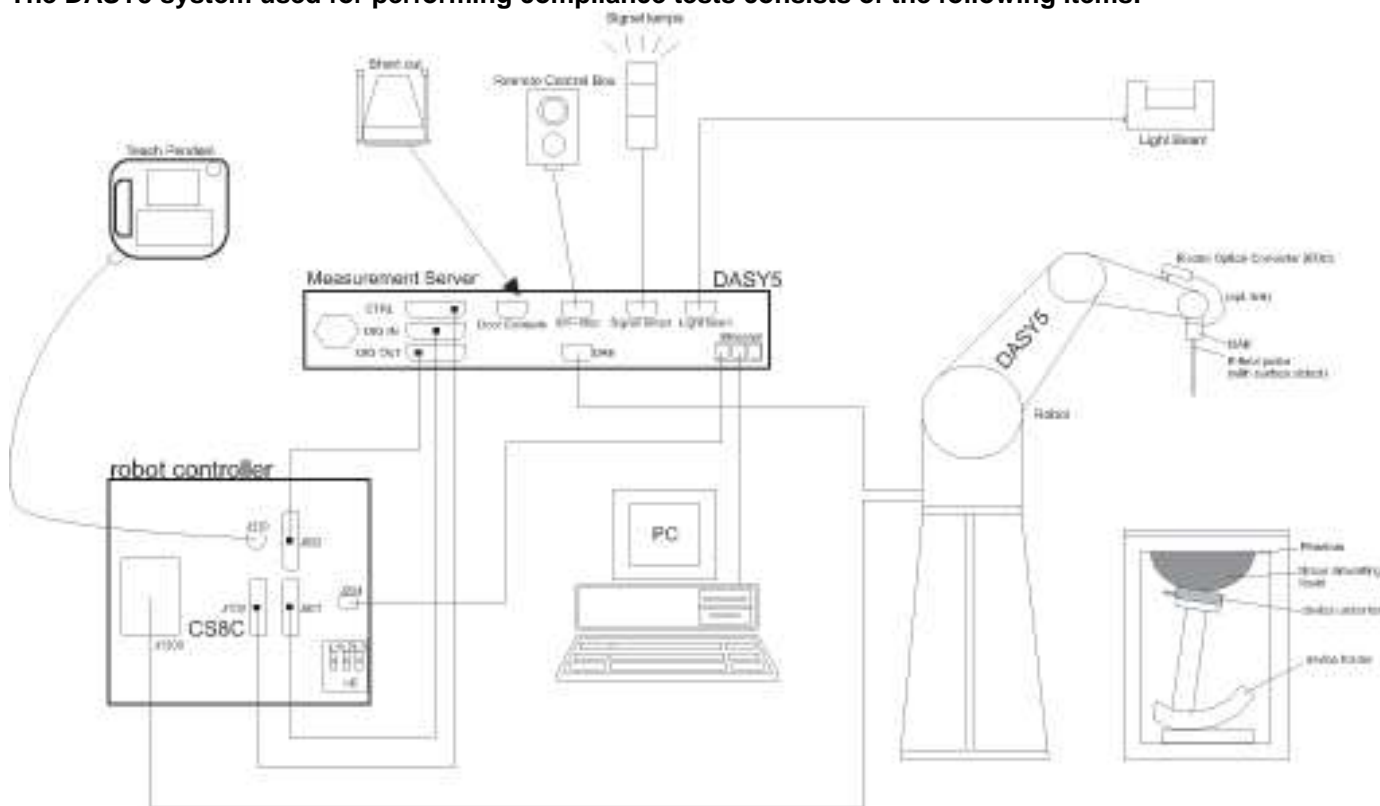
## 4.2. Measurement Uncertainty

Measurement uncertainty for 30 MHz to 3 GHz averaged over 1 gram (Head)					
Component	Error, ±%	Prob Dist	Divisor	Sensitivity	U (Xi), %
<b>Measurement System</b>					
Probe Calibration (k=1)	6.00	Normal	1	1	6.00
Axial Isotropy	1.15	Rectangular	1.732	0.7	0.46
Hemispherical Isotropy	2.30	Rectangular	1.732	0.7	0.93
Boundary Effect	0.90	Rectangular	1.732	1	0.52
Probe Linearity	3.45	Rectangular	1.732	1	1.99
Modulation Response	2.40	Rectangular	1.732	1	1.39
System Detection Limits	1.00	Rectangular	1.732	1	0.58
Readout Electronics	0.30	Normal	1	1	0.30
Response Time	0.80	Rectangular	1.732	1	0.46
Integration Time	2.60	Rectangular	1.732	1	1.50
RF Ambient Noise	3.00	Rectangular	1.732	1	1.73
RF Ambient Reflections	3.00	Rectangular	1.732	1	1.73
Probe Positioner	0.40	Rectangular	1.732	1	0.23
Probe Positioning	2.90	Rectangular	1.732	1	1.67
Max.SAR Eval.	2.00	Rectangular	1.732	1	1.15
<b>Test Sample Related</b>					
Test Sample Positioning	2.90	Normal	1	1	2.90
Device Holder	3.60	Normal	1	1	3.60
Power Drift	5.00	Rectangular	1.732	1	2.89
Power Scaling	0.00	Rectangular	1.732	1	0.00
<b>Phantom and Setup</b>					
Phantom Uncertainty	6.10	Rectangular	1.732	1	3.52
SAR Correction	1.90	Rectangular	1.732	1	1.10
Liquid Permittivity - measurement	-4.61	Rectangular	1.732	0.26	-0.69
Liquid Conductivity - measurement	4.96	Rectangular	1.732	0.78	2.23
Liquid Permittivity - temperature uncertainty	0.40	Rectangular	1.732	0.23	0.05
Liquid Conductivity - temperature uncertainty	3.40	Rectangular	1.732	0.78	1.53
Combined Standard Uncertainty Uc(y) =					10.19
Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence =				20.39 %	
Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence =				1.61 dB	

Measurement uncertainty for 30 MHz to 6 GHz averaged over 1 gram (Body)					
Component	Error, ±%	Prob Dist	Divisor	Sensitivity	U (Xi), %
<b>Measurement System</b>					
Probe Calibration (k=1)	6.55	Normal	1	1	6.55
Axial Isotropy	1.15	Rectangular	1.732	0.7	0.46
Hemispherical Isotropy	2.30	Rectangular	1.732	0.7	0.93
Boundary Effect	0.90	Rectangular	1.732	1	0.52
Probe Linearity	3.45	Rectangular	1.732	1	1.99
Modulation Response	2.40	Rectangular	1.732	1	1.39
System Detection Limits	1.00	Rectangular	1.732	1	0.58
Readout Electronics	0.30	Normal	1	1	0.30
Response Time	0.80	Rectangular	1.732	1	0.46
Integration Time	2.60	Rectangular	1.732	1	1.50
RF Ambient Noise	3.00	Rectangular	1.732	1	1.73
RF Ambient Reflections	3.00	Rectangular	1.732	1	1.73
Probe Positioner	0.80	Rectangular	1.732	1	0.46
Probe Positioning	6.70	Rectangular	1.732	1	3.87
Max.SAR Eval.	4.00	Rectangular	1.732	1	2.31
<b>Test Sample Related</b>					
Test Sample Positioning	2.90	Normal	1	1	2.90
Device Holder	3.60	Normal	1	1	3.60
Power Drift	5.00	Rectangular	1.732	1	2.89
Power Scaling	0.00	Rectangular	1.732	1	0.00
<b>Phantom and Setup</b>					
Phantom Uncertainty	7.90	Rectangular	1.732	1	4.56
SAR Correction	1.90	Rectangular	1.732	1	1.10
Liquid Permittivity - measurement	-3.67	Rectangular	1.732	0.26	-0.55
Liquid Conductivity - measurement	-4.44	Rectangular	1.732	0.78	-2.00
Liquid Permittivity - temperature uncertainty	0.40	Rectangular	1.732	0.23	0.05
Liquid Conductivity - temperature uncertainty	3.40	Rectangular	1.732	0.78	1.53
Combined Standard Uncertainty Uc(y) =					11.59
Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence =				23.18 %	
Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence =				1.81 dB	

## 5. Measurement System Description and Setup

The DASY5 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 v01

	$\leq 3$ GHz	$> 3$ GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	$5 \pm 1$ 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: $\Delta x_{Area}$ , $\Delta y_{Area}$	$\leq 2$ GHz: $\leq 15$ mm $2 - 3$ GHz: $\leq 12$ mm	$3 - 4$ GHz: $\leq 12$ mm $4 - 6$ GHz: $\leq 10$ 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 v01 (Draft)

			$\leq 3$ GHz	$> 3$ GHz
Maximum zoom scan spatial resolution: $\Delta x_{\text{Zoom}}, \Delta y_{\text{Zoom}}$			$\leq 2$ GHz: $\leq 8$ mm 2 – 3 GHz: $\leq 5$ mm*	3 – 4 GHz: $\leq 5$ mm* 4 – 6 GHz: $\leq 4$ mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{\text{Zoom}}(n)$		$\leq 5$ mm	3 – 4 GHz: $\leq 4$ mm 4 – 5 GHz: $\leq 3$ mm 5 – 6 GHz: $\leq 2$ mm
	graded grid	$\Delta z_{\text{Zoom}}(1)$ : between 1 <sup>st</sup> two points closest to phantom surface	$\leq 4$ mm	3 – 4 GHz: $\leq 3$ mm 4 – 5 GHz: $\leq 2.5$ mm 5 – 6 GHz: $\leq 2$ 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		$\geq 30$ mm	3 – 4 GHz: $\geq 28$ mm 4 – 5 GHz: $\geq 25$ mm 5 – 6 GHz: $\geq 22$ mm
Note: $\delta$ 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 1-g SAR estimation procedures of KDB 447498 is $\leq 1.4$ W/kg, $\leq 8$ mm, $\leq 7$ mm and $\leq 5$ 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

Operating Configuration(s)	Held to head, Body-worn (Voice call)
Mobile Hotspot	<input checked="" type="checkbox"/> Mobile Hotspot (WiFi 2.4 GHz) <input type="checkbox"/> Mobile Hotspot (WiFi 5 GHz) WiFi Hotspot mode permits the device to share its cellular data connection with other WiFi-enabled devices.
VoIP	Supported
RF Exposure Condition(s)	Head, Body-worn Accessory, Hotspot (wireless router)
Device dimension	Overall (Length x Width): 116.2 mm x 64.0 mm Overall Diagonal: 129 mm Display Diagonal: 101 mm
Accessory	N/A
Battery Options	<input checked="" type="checkbox"/> Standard – Lithium-ion battery, Rating 3.8 Vdc, 2460 mAh <input type="checkbox"/> Extended (large capacity)

## 7.2. Wireless Technologies

Wireless Technology and Frequency Bands	GSM: 850 / 1900 W-CDMA Band: II / IV / V LTE Band 4 / 17 WiFi: 2.4 GHz Bluetooth: 2.4 GHz.
Mode	GSM (GMSK) / GPRS (GMSK) / EGPRS (8PSK), W-CDMA - UMTS Rel. 99 - HSDPA (Rel. 6) - HSUPA (Rel. 6) - DC-HSDPA (Rel. 8) - HSPA+ (Rel. 7) LTE: QPSK, 16QAM WiFi 802.11b/g/n HT20 Bluetooth 4.0+LE
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% WiFi 802.11a/b/g/n: 100% Bluetooth: 76%
GPRS Multi-Slot Class	<input type="checkbox"/> Class 8 - One Up <input type="checkbox"/> Class 10 - Two Up <input checked="" type="checkbox"/> Class 12 - Four Up
Mobile Phone Capability	<input type="checkbox"/> Class A - Mobile phones can be connected to both GPRS and GSM services simultaneously. <input checked="" type="checkbox"/> Class B - Mobile phones can be attached to both GPRS and GSM services, using one service at a time. <input type="checkbox"/> Class C - Mobile phones are attached to either GPRS or GSM voice service. You need to switch manually between services

### 7.3. Simultaneous Transmission Condition

RF Exposure Condition	Capable Transmit Configurations
Head	<ul style="list-style-type: none"> <li>• GSM850/1900 MHz Voice + 2.4GHz WiFi</li> <li>• GSM850/1900 MHz Data + 2.4GHz WiFi (VoIP)</li> <li>• W-CDMA Band II / IV / V + 2.4GHz WiFi</li> <li>• LTE B4 / B17 Data + 2.4GHz WiFi</li> </ul>
Body-worn Accessory (Voice mode only)	<ul style="list-style-type: none"> <li>• GSM850/1900 MHz Voice + 2.4GHz WiFi</li> <li>• GSM850/1900 MHz Data + 2.4GHz WiFi (VoIP)</li> <li>• W-CDMA Band II / IV / V + 2.4GHz WiFi</li> <li>• LTE B4 / B17 Data + 2.4GHz WiFi</li> <li>• GSM850/1900 MHz Voice + 2.4GHz Bluetooth</li> <li>• GSM850/1900 MHz Data + 2.4GHz Bluetooth (VoIP)</li> <li>• W-CDMA Band II / IV / V + 2.4GHz Bluetooth</li> <li>• LTE B4 / B17 Data + 2.4GHz Bluetooth</li> </ul>
Hotspot (Data)	<ul style="list-style-type: none"> <li>• GSM850/1900 MHz Data + 2.4GHz WiFi</li> <li>• W-CDMA Band II / IV / V + 2.4GHz WiFi</li> <li>• LTE B4 / B17 Data + 2.4GHz WiFi</li> </ul>
<b>Note:</b> <ol style="list-style-type: none"> <li>1. WiFi 2.4Ghz is supported Hotspot and WiFi-Direct(GO/GC).</li> <li>2. LTE, WCDMA data, GPRS/EDGE is supported Hotspot.</li> <li>3. VoIP is supported in GSM, LTE and WCDMA (e.g. 3rd part VoIP and VoLTE)</li> <li>4. Bluetooth and WiFi cannot transmit simultaneously since they share the same chip.</li> <li>5. GSM, WCDMA and LTE cannot transmit simultaneously since they share the same chip.</li> </ol>	



Item	Description																																						
Frequency range, Channel Bandwidth, Numbers and Frequencies	Band 4																																						
	Tx: 1710 – 1755 MHz	Rx: 2100 – 2155 MHz																																					
	Band 17																																						
	Tx: 704 – 716 MHz			Rx: 734 – 746 MHz																																			
	Band 4	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	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 has on TX/RX antenna and one Rx only antenna.																																						
Maximum power reduction (MPR)	<p>Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3</p> <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>&gt; 5</td><td>&gt; 4</td><td>&gt; 8</td><td>&gt; 12</td><td>&gt; 16</td><td>&gt; 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>16 QAM</td><td>&gt; 5</td><td>&gt; 4</td><td>&gt; 8</td><td>&gt; 12</td><td>&gt; 16</td><td>&gt; 18</td><td>≤ 2</td></tr> </tbody> </table> <p>MPR Built-in by design A-MPR (additional MPR) was disabled during SAR testing</p>	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
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																																
Power reduction	No																																						
Spectrum plots for RB configurations	When a properly configured basestation 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. Exposure Conditions

Refer to Section 17 “Antenna Dimensions and Separation Distances” for the specific details of the antenna-to-antenna and antenna-to-edge(s) distances.

### 8.1. Head Exposure Conditions

**For GSM, W-CDMA, LTE and WiFi**

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 GSM, W-CDMA and LTE Band 4**

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear	0.8 mm	Yes	
Front	4.8 mm	Yes	

**For LTE Band 17**

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear	0.8 mm	Yes	
Front	4.8 mm	Yes	

**For WiFi**

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear	0.9 mm	Yes	
Front	7.8 mm	Yes	

### 8.3. Hotspot Mode Exposure Conditions

#### For GSM, W-CDMA and LTE B4

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear	0.8 mm	Yes	
Front	4.8 mm	Yes	
Edge 1 (Top)	103.7 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 v01 r01
Edge 2 (Right)	32.5 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 v01 r01
Edge 3 (Bottom)	1.2 mm	Yes	
Edge 4 (Left)	1.2 mm	Yes	

#### For LTE Band B17

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear	0.8 mm	Yes	
Front	4.8 mm	Yes	
Edge 1 (Top)	103 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 (Right)	1.2 mm	Yes	
Edge 3 (Bottom)	1.2 mm	Yes	
Edge 4 (Left)	34.2 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

#### For WiFi

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear	0.9 mm	Yes	
Front	7.8 mm	Yes	
Edge 1 (Top)	10.4 mm	Yes	
Edge 2 (Right)	2.0 mm	Yes	
Edge 3 (Bottom)	89.9 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 (Left)	55.4 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

## 9. RF Output Power Measurement

### 9.1. GSM850

<b>Voice</b>	Min	Max
<b>Tune-up Tolerance (dB):</b>	-1.5	0.5

<b>GPRS &amp; EGPRS</b>	Min	Max
<b>Tune-up Tolerance (dB):</b>	-0.5	0.5

Output Power Tolerance	Voice (dBm)	GPRS 1 slot	GPRS 2 slots	GPRS 3 slots	GPRS 4 slots
Max	33.2	33.2	31.2	29.2	27.2
<b>Target</b>	<b>32.7</b>	<b>32.7</b>	<b>30.7</b>	<b>28.7</b>	<b>26.7</b>
Min	31.2	32.2	30.2	28.2	26.2

Output Power Tolerance	Voice (dBm)	EGPRS 1 slot	EGPRS 2 slots	EGPRS 3 slots	EGPRS 4 slots
Max		25.5	24.5	23.5	22.5
<b>Target</b>		<b>25.0</b>	<b>24.0</b>	<b>23.0</b>	<b>22.0</b>
Min		24.5	23.5	22.5	21.5

#### GSM (GMSK) - Voice Mode

Band	Ch No.	Freq. (MHz)	Avg burst Pwr (dBm)
850	128	824.2	33.0
	190	836.6	32.8
	251	848.8	32.8

#### GPRS (GMSK) - Coding Scheme: CS1

Band	Ch No.	Freq. (MHz)	Avg Power (dBm)				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	32.5	23.5	<b>30.6</b>	<b>24.6</b>	28.8	24.5	26.9	23.9
	190	836.6	32.5	23.5	<b>30.6</b>	<b>24.6</b>	28.5	24.2	26.9	23.9
	251	848.8	32.4	23.4	<b>30.5</b>	<b>24.5</b>	28.7	24.4	27.0	24.0

#### EGPRS (8PSK) - Coding Scheme: MCS5

Band	Ch No.	Freq. (MHz)	Power (dBm)				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	25.1	16.1	24.2	18.2	23.2	18.9	22.1	19.1
	190	836.6	24.8	15.8	24.0	18.0	22.9	18.6	22.0	19.0
	251	848.8	24.7	15.7	24.0	18.0	23.1	18.8	22.2	19.2

#### 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 2 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

<b>Voice</b>	Min	Max
<b>Tune-up Tolerance (dB):</b>	-1.5	0.5

<b>GPRS &amp; EGPRS</b>	Min	Max
<b>Tune-up Tolerance (dB):</b>	-0.5	0.5

Output Power Tolerance	Voice (dBm)	GPRS 1 slot	GPRS 2 slots	GPRS 3 slots	GPRS 4 slots
Max	30.7	30.7	28.7	26.7	25.7
<b>Target</b>	<b>30.2</b>	<b>30.2</b>	<b>28.2</b>	<b>26.2</b>	<b>25.2</b>
Min	28.7	29.7	27.7	25.7	24.7

Output Power Tolerance	Voice (dBm)	EGPRS 1 slot	EGPRS 2 slots	EGPRS 3 slots	EGPRS 4 slots
Max		24.5	23.5	22.5	21.5
<b>Target</b>		<b>24.0</b>	<b>23.0</b>	<b>22.0</b>	<b>21.0</b>
Min		23.5	22.5	21.5	20.5

### GSM (GMSK) - Voice Mode

Band	Ch No.	Freq. (MHz)	Avg burst Pwr (dBm)
1900	512	1850.2	30.5
	661	1880.0	30.5
	810	1909.8	30.5

### GPRS (GMSK) - Coding Scheme: CS1

Band	Ch No.	Freq. (MHz)	Avg Power (dBm)				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	29.8	20.8	<b>28.3</b>	<b>22.3</b>	26.2	21.9	25.1	22.1
	661	1880.0	29.7	20.7	<b>28.2</b>	<b>22.2</b>	26.2	21.9	24.9	21.9
	810	1909.8	29.8	20.8	<b>28.3</b>	<b>22.3</b>	26.1	21.8	25.0	22.0

### EGPRS (8PSK) - Coding Scheme: MCS5

Band	Ch No.	Freq. (MHz)	Power (dBm)				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	24.5	15.5	23.5	17.5	22.5	18.2	21.5	18.5
	661	1880.0	24.5	15.5	23.3	17.3	22.4	18.1	21.4	18.4
	810	1909.8	24.4	15.4	23.3	17.3	22.4	18.1	21.4	18.4

### 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 2 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

<b>Voice</b>	Min	Max
<b>Tune-up Tolerance (dB):</b>	-1.5	0.5

Output Power Tolerance	Release 99 (dBm)	HSDPA (dBm)	HSUPA (dBm)	DC-HSPA (dBm)
Max	23.2	23.2	23.2	23.2
<b>Target</b>	<b>22.7</b>	<b>22.7</b>	<b>22.7</b>	<b>22.7</b>
Min	21.2			

#### 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
	$\beta_c/\beta_d$	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	23.2
		9400	1880.0	23.1
		9538	1907.6	23.2

## HSDPA

The following 4 Sub-tests were completed according to Release 5 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			
	$\beta_c$	2/15	12/15	15/15	15/15
	$\beta_d$	15/15	15/15	8/15	4/15
	Bd (SF)	64			
	$\beta_c/\beta_d$	2/15	12/15	15/8	15/4
	$\beta_{hs}$	4/15	24/15	30/15	30/15
HSDPA Specific Settings	MPR (dB)	0	0	0.5	0.5
	D <sub>ACK</sub>	8			
	D <sub>NAK</sub>	8			
	DCQI	8			
	Ack-Nack repetition factor	3			
	CQI Feedback (Table 5.2B.4)	4ms			
	CQI Repetition Factor (Table 5.2B.4)	2			
	A <sub>hs</sub> = $\beta_{hs}/\beta_c$	30/15			

HSDPA & HSUPA	Min	Max
Tune-up Tolerance (dB):	-0.5	0.5

## Output Power Tolerance

	Subtest 1 (dBm)	Subtest 2 (dBm)	Subtest 3 (dBm)	Subtest 4 (dBm)
Max	23.2	23.2	22.7	22.7
<b>Target</b>	22.7	22.7	22.2	22.2
Min	22.2	22.2	21.7	21.7

## Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm)
W-CDMA Band II	Subtest 1	9262	1852.4	23.0
		9400	1880.0	22.9
		9538	1907.6	23.0
	Subtest 2	9262	1852.4	23.1
		9400	1880.0	22.9
		9538	1907.6	23.1
	Subtest 3	9262	1852.4	22.5
		9400	1880.0	22.5
		9538	1907.6	22.5
	Subtest 4	9262	1852.4	22.5
		9400	1880.0	22.5
		9538	1907.6	22.5

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

### 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				
	$\beta_c$	11/15	6/15	15/15	2/15
	$\beta_d$	15/15	15/15	9/15	15/15
HSDPA Specific Settings	$\beta_{ec}$	209/225	12/15	30/15	2/15
	$\beta_c/\beta_d$	11/15	6/15	15/9	2/15
	$\beta_{hs}$	22/15	12/15	30/15	4/15
	$\beta_{ed}$	1309/225	94/75	47/15	56/75
	CM (dB)	1.0	3.0	2.0	3.0
	MPR (dB)	0	1.5	1	0
HSUPA 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 = $\beta_{hs}/\beta_c$	30/15			
	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 11
		E-TFCI PO 4			E-TFCI PO 4
		E-TFCI 67			E-TFCI 67
		E-TFCI PO 18			E-TFCI PO 18
		E-TFCI 71			E-TFCI 71
		E-TFCI PO 23			E-TFCI PO 23
		E-TFCI 75			E-TFCI 75
		E-TFCI PO 26			E-TFCI PO 26
		E-TFCI 81			E-TFCI 81
		E-TFCI PO 27			E-TFCI PO 27
			E-TFCI 11		
			E-TFCI PO 4		
			E-TFCI 92		
			E-TFCI PO 18		



### Output Power Tolerance

	Subtest 1 (dBm)	Subtest 2 (dBm)	Subtest 3 (dBm)	Subtest 4 (dBm)	Subtest 5 (dBm)
Max	23.2	21.7	22.2	22.2	23.2
Target	22.7	21.2	21.7	21.7	22.7
Min	22.2	20.7	21.2	21.2	22.2

### Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm)
W-CDMA Band II	Subtest 1	9262	1852.4	22.5
		9400	1880.0	22.6
		9538	1907.6	22.7
	Subtest 2	9262	1852.4	20.8
		9400	1880.0	20.8
		9538	1907.6	20.9
	Subtest 3	9262	1852.4	21.7
		9400	1880.0	21.8
		9538	1907.6	21.6
	Subtest 4	9262	1852.4	21.7
		9400	1880.0	21.7
		9538	1907.6	21.7
	Subtest 5	9262	1852.4	23.0
		9400	1880.0	22.8
		9538	1907.6	23.0

## 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**

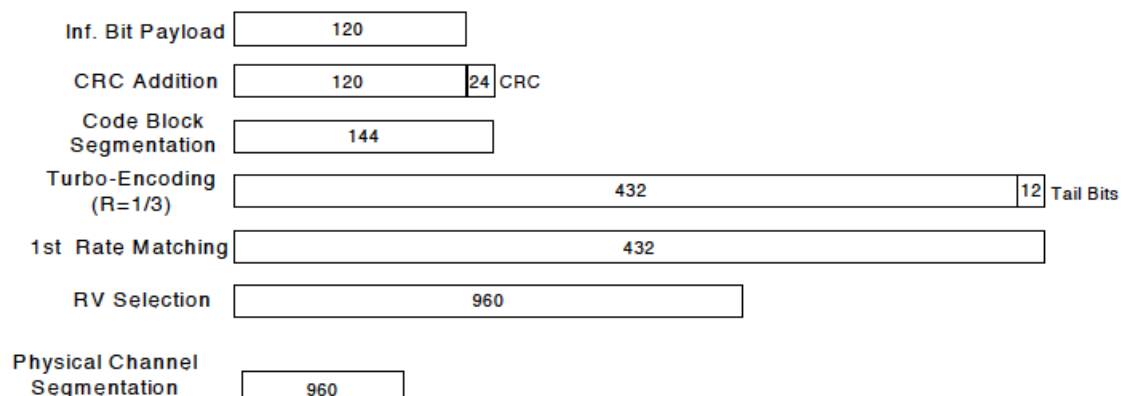
Parameter During Connection setup	Unit	Value
P-CPICH_Ec/Ior	dB	-10
P-CCPCH and SCH_Ec/Ior	dB	-12
PICH_Ec/Ior	dB	-15
HS-PDSCH	dB	off
HS-SCCH_1	dB	off
DPCH_Ec/Ior	dB	-5
OCNS_Ec/Ior	dB	-3.1

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
<p>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.</p> <p>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.</p>		



**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			
	$\beta_c$	2/15	12/15	15/15	15/15
	$\beta_d$	15/15	15/15	8/15	4/15
	$\beta_d$ (SF)	64			
	$\beta_c/\beta_d$	2/15	12/15	15/8	15/4
	$\beta_{hs}$	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 = $\beta_{hs}/\beta_c$	30/15			

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

#### Output Power Tolerance

	Subtest 1 (dBm)	Subtest 2 (dBm)	Subtest 3 (dBm)	Subtest 4 (dBm)
Max	23.2	23.2	22.7	22.7
<b>Target</b>	22.7	22.7	22.2	22.2
Min	22.2	22.2	21.7	21.7

#### Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm)
W-CDMA Band II	Subtest 1	9262	1852.4	23.2
		9400	1880.0	23.2
		9538	1907.6	23.2
	Subtest 2	9262	1852.4	22.4
		9400	1880.0	22.4
		9538	1907.6	22.6
	Subtest 3	9262	1852.4	21.8
		9400	1880.0	22.2
		9538	1907.6	22.2
	Subtest 4	9262	1852.4	22.1
		9400	1880.0	22.1
		9538	1907.6	22.1

#### 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

Voice	Min	Max
<b>Tune-up Tolerance (dB):</b>	-1.5	0.5

Output Power Tolerance	Release 99 (dBm)	HSDPA (dBm)	HSUPA (dBm)	DC-HSPA (dBm)
Max	23.7	23.7	23.7	23.7
<b>Target</b>	<b>23.2</b>	<b>23.2</b>	<b>23.2</b>	<b>23.2</b>
Min	21.7			

### 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
	$\beta_c/\beta_d$	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	23.5
		1413	1732.6	23.5
		1513	1752.6	23.5

## HSDPA

The following 4 Sub-tests were completed according to Release 5 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			
	$\beta_c$	2/15	12/15	15/15	15/15
	$\beta_d$	15/15	15/15	8/15	4/15
	Bd (SF)	64			
	$\beta_c/\beta_d$	2/15	12/15	15/8	15/4
	$\beta_{hs}$	4/15	24/15	30/15	30/15
HSDPA Specific Settings	MPR (dB)	0	0	0.5	0.5
	D <sub>ACK</sub>	8			
	D <sub>NAK</sub>	8			
	DCQI	8			
	Ack-Nack repetition factor	3			
	CQI Feedback (Table 5.2B.4)	4ms			
	CQI Repetition Factor (Table 5.2B.4)	2			
	A <sub>hs</sub> = $\beta_{hs}/\beta_c$	30/15			

HSDPA & HSUPA	Min	Max
Tune-up Tolerance (dB):	-0.5	0.5

## Output Power Tolerance

	Subtest 1 (dBm)	Subtest 2 (dBm)	Subtest 3 (dBm)	Subtest 4 (dBm)
Max	23.7	23.7	23.2	23.2
<b>Target</b>	23.2	23.2	22.7	22.7
Min	22.7	22.7	22.2	22.2

## Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm)
W-CDMA Band IV	Subtest 1	1312	1712.4	23.5
		1413	1732.6	23.4
		1513	1752.6	23.3
	Subtest 2	1312	1712.4	23.3
		1413	1732.6	22.9
		1513	1752.6	23.0
	Subtest 3	1312	1712.4	22.7
		1413	1732.6	22.6
		1513	1752.6	22.5
	Subtest 4	1312	1712.4	22.6
		1413	1732.6	22.5
		1513	1752.6	22.4

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

### 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				
	$\beta_c$	11/15	6/15	15/15	2/15	15/15
	$\beta_d$	15/15	15/15	9/15	15/15	15/15
	$\beta_{ec}$	209/225	12/15	30/15	2/15	24/15
	$\beta_c/\beta_d$	11/15	6/15	15/9	2/15	15/15
	$\beta_{hs}$	22/15	12/15	30/15	4/15	30/15
	$\beta_{ed}$	1309/225	94/75	47/15	56/75	134/15
	CM (dB)	1.0	3.0	2.0	3.0	1.0
	MPR (dB)	0	1.5	1	1	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 = $\beta_{hs}/\beta_c$	30/15				
HSUPA Specific Settings	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

	Subtest 1 (dBm)	Subtest 2 (dBm)	Subtest 3 (dBm)	Subtest 4 (dBm)	Subtest 5 (dBm)
Max	23.7	22.2	22.7	22.7	23.7
Target	23.2	21.7	22.2	22.2	23.2
Min	22.7	21.2	21.7	21.7	22.7

### 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	22.7
		1513	1752.6	22.7
	Subtest 2	1312	1712.4	22.1
		1413	1732.6	21.5
		1513	1752.6	21.8
	Subtest 3	1312	1712.4	22.2
		1413	1732.6	22.1
		1513	1752.6	22.1
	Subtest 4	1312	1712.4	22.5
		1413	1732.6	22.4
		1513	1752.6	22.5
	Subtest 5	1312	1712.4	23.6
		1413	1732.6	23.3
		1513	1752.6	23.5

## 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**

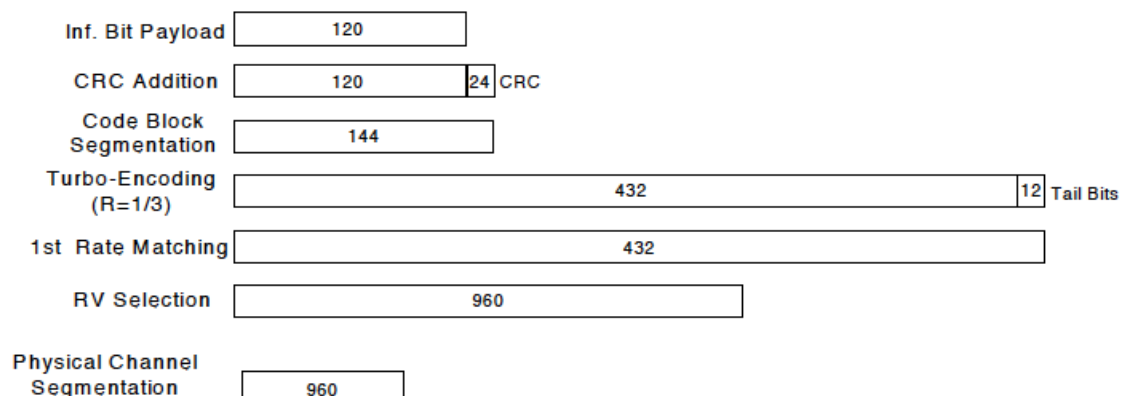
Parameter During Connection setup	Unit	Value
P-CPICH_Ec/Ior	dB	-10
P-CCPCH and SCH_Ec/Ior	dB	-12
PICH_Ec/Ior	dB	-15
HS-PDSCH	dB	off
HS-SCCH_1	dB	off
DPCH_Ec/Ior	dB	-5
OCNS_Ec/Ior	dB	-3.1

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
<p>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.</p> <p>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.</p>		



**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			
	$\beta_c$	2/15	12/15	15/15	15/15
	$\beta_d$	15/15	15/15	8/15	4/15
	$\beta_d$ (SF)	64			
	$\beta_c/\beta_d$	2/15	12/15	15/8	15/4
	$\beta_{hs}$	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 = $\beta_{hs}/\beta_c$	30/15			

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

#### Output Power Tolerance

	Subtest 1 (dBm)	Subtest 2 (dBm)	Subtest 3 (dBm)	Subtest 4 (dBm)
Max	23.7	23.7	23.2	23.2
<b>Target</b>	23.2	23.2	22.7	22.7
Min	22.7	22.7	22.2	22.2

#### Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm)
W-CDMA Band IV	Subtest 1	1312	1712.4	23.6
		1413	1732.6	23.5
		1513	1752.6	23.6
	Subtest 2	1312	1712.4	22.8
		1413	1732.6	22.8
		1513	1752.6	23.0
	Subtest 3	1312	1712.4	22.6
		1413	1732.6	22.8
		1513	1752.6	22.7
	Subtest 4	1312	1712.4	22.4
		1413	1732.6	22.5
		1513	1752.6	22.6

#### 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

<b>Voice</b>	Min	Max
<b>Tune-up Tolerance (dB):</b>	-1.5	0.5

Output Power Tolerance	Release 99 (dBm)	HSDPA (dBm)	HSUPA (dBm)	DC-HSPA (dBm)
Max	23.2	23.2	23.2	23.2
<b>Target</b>	<b>22.7</b>	<b>22.7</b>	<b>22.7</b>	<b>22.7</b>
Min	21.2			

### 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
	$\beta_c/\beta_d$	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	23.2
		4183	836.6	23.1
		4233	846.6	23.2

## 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			
	$\beta_c$	2/15	12/15	15/15	15/15
	$\beta_d$	15/15	15/15	8/15	4/15
	Bd (SF)	64			
	$\beta_c/\beta_d$	2/15	12/15	15/8	15/4
	$\beta_{hs}$	4/15	24/15	30/15	30/15
HSDPA Specific Settings	MPR (dB)	0	0	0.5	0.5
	D <sub>ACK</sub>	8			
	D <sub>NAK</sub>	8			
	DCQI	8			
	Ack-Nack repetition factor	3			
	CQI Feedback (Table 5.2B.4)	4ms			
	CQI Repetition Factor (Table 5.2B.4)	2			
	A <sub>hs</sub> = $\beta_{hs}/\beta_c$	30/15			

HSDPA & HSUPA	Min	Max
Tune-up Tolerance (dB):	-0.5	0.5

## Output Power Tolerance

	Subtest 1 (dBm)	Subtest 2 (dBm)	Subtest 3 (dBm)	Subtest 4 (dBm)
Max	23.2	23.2	22.7	22.7
<b>Target</b>	22.7	22.7	22.2	22.2
Min	22.2	22.2	21.7	21.7

## Measured Results

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

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

### 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				
	$\beta_c$	11/15	6/15	15/15	2/15	15/15
	$\beta_d$	15/15	15/15	9/15	15/15	15/15
	$\beta_{ec}$	209/225	12/15	30/15	2/15	24/15
	$\beta_c/\beta_d$	11/15	6/15	15/9	2/15	15/15
	$\beta_{hs}$	22/15	12/15	30/15	4/15	30/15
	$\beta_{ed}$	1309/225	94/75	47/15	56/75	134/15
	CM (dB)	1.0	3.0	2.0	3.0	1.0
	MPR (dB)	0	1.5	1	1	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 = $\beta_{hs}/\beta_c$	30/15				
HSUPA Specific Settings	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

	Subtest 1 (dBm)	Subtest 2 (dBm)	Subtest 3 (dBm)	Subtest 4 (dBm)	Subtest 5 (dBm)
Max	23.2	21.7	22.2	22.2	23.2
Target	22.7	21.2	21.7	21.7	22.7
Min	22.2	20.7	21.2	21.2	22.2

### Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm)
W-CDMA Band V	Subtest 1	4132	826.4	22.2
		4183	836.6	22.3
		4233	846.6	22.2
	Subtest 2	4132	826.4	21.2
		4183	836.6	21.4
		4233	846.6	21.4
	Subtest 3	4132	826.4	21.5
		4183	836.6	21.7
		4233	846.6	21.8
	Subtest 4	4132	826.4	21.3
		4183	836.6	21.4
		4233	846.6	21.5
	Subtest 5	4132	826.4	23.1
		4183	836.6	23.1
		4233	846.6	23.1

## 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**

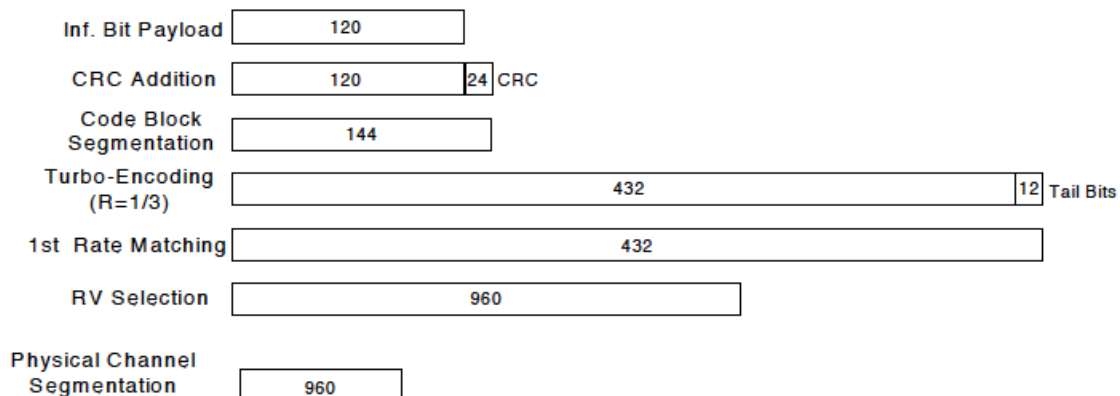
Parameter During Connection setup	Unit	Value
P-CPICH_Ec/Ior	dB	-10
P-CCPCH and SCH_Ec/Ior	dB	-12
PICH_Ec/Ior	dB	-15
HS-PDSCH	dB	off
HS-SCCH_1	dB	off
DPCH_Ec/Ior	dB	-5
OCNS_Ec/Ior	dB	-3.1

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
<p>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.</p> <p>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.</p>		



**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			
	$\beta_c$	2/15	12/15	15/15	15/15
	$\beta_d$	15/15	15/15	8/15	4/15
	$\beta_d$ (SF)	64			
	$\beta_c/\beta_d$	2/15	12/15	15/8	15/4
	$\beta_{hs}$	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 = $\beta_{hs}/\beta_c$	30/15			

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

#### Output Power Tolerance

	Subtest 1 (dBm)	Subtest 2 (dBm)	Subtest 3 (dBm)	Subtest 4 (dBm)
Max	23.2	23.2	22.7	22.7
<b>Target</b>	22.7	22.7	22.2	22.2
Min	22.2	22.2	21.7	21.7

#### Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm)
W-CDMA Band V	Subtest 1	4132	826.4	23.2
		4183	836.6	23.2
		4233	846.6	23.2
	Subtest 2	4132	826.4	22.6
		4183	836.6	22.4
		4233	846.6	22.6
	Subtest 3	4132	826.4	22.2
		4183	836.6	22.2
		4233	846.6	21.9
	Subtest 4	4132	826.4	22.1
		4183	836.6	22.0
		4233	846.6	22.1

#### 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 4

<b>Tune-up Tolerance (dB):</b>	Min	Max
	-1.5	0.5

Output Power Tolerance	QPSK (dBm)	16QAM (dBm)
Max	23.7	22.7
<b>Target</b>	<b>23.2</b>	<b>22.2</b>
Min	21.7	20.7

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".<sup>3</sup>

**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	$\leq 1$
			5	>6	$\leq 1$
			10	>6	$\leq 1$
			15	>8	$\leq 1$
			20	>10	$\leq 1$
NS_04	6.6.2.2.2	41	5	>6	$\leq 1$
			10, 15, 20	See Table 6.2.4-4	
NS_05	6.6.3.3.1	1	10, 15, 20	$\geq 50$	$\leq 1$
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	$\leq 3$
NS_09	6.6.3.3.4	21	10, 15	> 40	$\leq 1$
				> 55	$\leq 2$
NS_10		20	15, 20	Table 6.2.4-3	Table 6.2.4-3
NS_11	6.6.2.2.1	23 <sup>1</sup>	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	23.2
				1	49	0	23.5
				1	99	0	23.6
				50	0	1	22.3
				50	24	1	22.3
				50	49	1	22.4
				100	0	1	22.3
			16QAM	1	0	1	22.1
				1	49	1	22.4
				1	99	1	22.4
				50	0	2	21.3
				50	24	2	21.3
				50	49	2	21.4
				100	0	2	21.4
	20175	1732.5	QPSK	1	0	0	23.7
				1	49	0	23.4
				1	99	0	23.2
				50	0	1	22.4
				50	24	1	22.2
				50	49	1	22.1
				100	0	1	22.2
			16QAM	1	0	1	22.5
				1	49	1	22.2
				1	99	1	22.2
				50	0	2	21.5
				50	24	2	21.4
				50	49	2	21.2
				100	0	2	21.3
	20300	1745.0	QPSK	1	0	0	23.3
				1	49	0	23.3
				1	99	0	23.6
				50	0	1	22.1
				50	24	1	22.1
				50	49	1	22.1
				100	0	1	22.1
			16QAM	1	0	1	22.2
				1	49	1	22.2
				1	99	1	22.4
				50	0	2	21.2
				50	24	2	21.2
				50	49	2	21.2
				100	0	2	21.2

**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	23.3
				1	37	0	23.5
				1	74	0	23.7
				36	0	1	22.5
				36	16	1	22.4
				36	35	1	22.5
				75	0	1	22.3
			16QAM	1	0	1	22.3
				1	37	1	22.7
				1	74	1	22.7
				36	0	2	21.5
				36	16	2	21.4
				36	35	2	21.5
				75	0	2	21.4
	20175	1732.5	QPSK	1	0	0	23.7
				1	37	0	23.4
				1	74	0	23.3
				36	0	1	22.4
				36	16	1	22.3
				36	35	1	22.2
				75	0	1	22.2
			16QAM	1	0	1	22.6
				1	37	1	22.2
				1	74	1	22.2
				36	0	2	21.3
				36	16	2	21.2
				36	35	2	21.0
				75	0	2	21.1
	20325	1747.5	QPSK	1	0	0	23.2
				1	37	0	23.4
				1	74	0	23.5
				36	0	1	22.1
				36	16	1	22.1
				36	35	1	22.3
				75	0	1	22.1
			16QAM	1	0	1	22.2
				1	37	1	22.5
				1	74	1	22.5
				36	0	2	21.2
				36	16	2	21.2
				36	35	2	21.4
				75	0	2	21.3

**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	23.3
				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	22.3
			16QAM	1	0	1	22.3
				1	24	1	22.5
				1	49	1	22.6
				25	0	2	21.5
				25	12	2	21.5
				25	24	2	21.5
				50	0	2	21.4
	20175	1732.5	QPSK	1	0	0	23.4
				1	24	0	23.3
				1	49	0	23.2
				25	0	1	22.2
				25	12	1	22.2
				25	24	1	22.2
				50	0	1	22.0
			16QAM	1	0	1	22.5
				1	24	1	22.3
				1	49	1	22.3
				25	0	2	21.3
				25	12	2	21.2
				25	24	2	21.0
				50	0	2	21.1
	20350	1750.0	QPSK	1	0	0	23.1
				1	24	0	23.3
				1	49	0	23.3
				25	0	1	22.3
				25	12	1	22.3
				25	24	1	22.3
				50	0	1	22.3
			16QAM	1	0	1	22.3
				1	24	1	22.5
				1	49	1	22.5
				25	0	2	21.3
				25	12	2	21.4
				25	24	2	21.5
				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	23.2
				1	12	0	23.4
				1	24	0	23.4
				12	0	1	22.3
				12	6	1	22.4
				12	11	1	22.5
				25	0	1	22.3
			16QAM	1	0	1	22.4
				1	12	1	22.5
				1	24	1	22.6
				12	0	2	21.5
				12	6	2	21.6
				12	11	2	21.7
				25	0	2	21.4
	20175	1732.5	QPSK	1	0	0	23.2
				1	12	0	23.1
				1	24	0	23.1
				12	0	1	22.3
				12	6	1	22.3
				12	11	1	22.3
				25	0	1	22.2
			16QAM	1	0	1	22.3
				1	12	1	22.3
				1	24	1	22.2
				12	0	2	21.3
				12	6	2	21.3
				12	11	2	21.3
				25	0	2	21.3
	20375	1752.5	QPSK	1	0	0	23.6
				1	12	0	23.6
				1	24	0	23.5
				12	0	1	22.5
				12	6	1	22.5
				12	11	1	22.5
				25	0	1	22.5
			16QAM	1	0	1	22.2
				1	12	1	22.2
				1	24	1	22.2
				12	0	2	21.6
				12	6	2	21.6
				12	11	2	21.6
				25	0	2	21.6

## 9.7. LTE Band 17

<b>Tune-up Tolerance (dB):</b>	Min	Max
	-1.5	0.5

Output Power Tolerance	QPSK (dBm)	16QAM (dBm)
Max	23.2	22.2
<b>Target</b>	<b>22.7</b>	<b>21.7</b>
Min	21.2	20.2

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".<sup>3</sup>

**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	$\leq 1$
			5	>6	$\leq 1$
			10	>6	$\leq 1$
			15	>8	$\leq 1$
			20	>10	$\leq 1$
NS_04	6.6.2.2.2	41	5	>6	$\leq 1$
			10, 15, 20	See Table 6.2.4-4	
NS_05	6.6.3.3.1	1	10, 15, 20	$\geq 50$	$\leq 1$
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	$\leq 3$
NS_09	6.6.3.3.4	21	10, 15	> 40	$\leq 1$
				> 55	$\leq 2$
NS_10		20	15, 20	Table 6.2.4-3	Table 6.2.4-3
NS_11	6.6.2.2.1	23 <sup>1</sup>	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	23.1
				1	24	0	23.1
				1	49	0	23.0
				25	0	1	22.1
				25	12	1	22.1
				25	24	1	22.0
				50	0	1	22.0
			16QAM	1	0	1	22.2
				1	24	1	22.2
				1	49	1	22.2
				25	0	2	21.1
				25	12	2	21.0
				25	24	2	21.0
				50	0	2	20.9
	23790	710.0	QPSK	1	0	0	23.2
				1	24	0	23.0
				1	49	0	23.0
				25	0	1	22.2
				25	12	1	22.0
				25	24	1	22.0
				50	0	1	22.0
			16QAM	1	0	1	21.6
				1	24	1	21.5
				1	49	1	21.3
				25	0	2	21.0
				25	12	2	21.0
				25	24	2	21.0
				50	0	2	20.9
	23800	711.0	QPSK	1	0	0	23.0
				1	24	0	22.9
				1	49	0	22.8
				25	0	1	22.0
				25	12	1	22.0
				25	24	1	22.0
				50	0	1	21.9
			16QAM	1	0	1	21.6
				1	24	1	21.6
				1	49	1	21.4
				25	0	2	21.1
				25	12	2	21.0
				25	24	2	21.0
				50	0	2	21.0



**LTE Band 17 Measured 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	23.1
				1	12	0	23.2
				1	24	0	23.1
				12	0	1	22.1
				12	6	1	22.2
				12	11	1	22.2
				25	0	1	22.1
			16QAM	1	0	1	22.2
				1	12	1	22.2
				1	24	1	22.2
				12	0	2	21.1
				12	6	2	21.1
				12	11	2	21.2
				25	0	2	21.0
	23790	710.0	QPSK	1	0	0	23.2
				1	12	0	23.1
				1	24	0	23.1
				12	0	1	22.2
				12	6	1	22.1
				12	11	1	22.0
				25	0	1	21.9
			16QAM	1	0	1	22.2
				1	12	1	22.1
				1	24	1	22.1
				12	0	2	21.1
				12	6	2	21.0
				12	11	2	21.0
				25	0	2	21.1
	23825	713.5	QPSK	1	0	0	23.1
				1	12	0	23.1
				1	24	0	23.0
				12	0	1	22.0
				12	6	1	22.0
				12	11	1	22.0
				25	0	1	22.0
			16QAM	1	0	1	22.2
				1	12	1	22.2
				1	24	1	22.1
				12	0	2	21.0
				12	6	2	21.0
				12	11	2	20.9
				25	0	2	20.9

## 9.8. WiFi (2.4 GHz Band)

**Output Power Tolerance Table**

	IEEE 802.11 (dBm)		
	b	g	n (HT20)
Max	17.5	15.5	13.5
<b>Target</b>	<b>17.0</b>	<b>15.0</b>	<b>13.0</b>

**Required Test Channels per KDB 248227 D01**

Mode	Band	GHz	Channel	"Default Test Channels"	
				802.11b	802.11g
802.11b/g	2.4 GHz	<b>2.412</b>	1 <sup>#</sup>	√	∇
		<b>2.437</b>	6	√	∇
		<b>2.462</b>	11 <sup>#</sup>	√	∇

**Notes:**

√ = "default test channels"

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

<sup>#</sup> = 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.

Band (MHz)	Mode	Ch #	Freq. (MHz)	Avg Pwr (dBm)
2.4	802.11b	1	2412	16.6
		6	2437	17.0
		11	2462	17.1
	802.11g	1	2412	13.9
		6	2437	14.1
		11	2462	14.4
	802.11n (HT20)	1	2412	12.1
		6	2437	12.5
		11	2462	12.8

**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.

## 9.9. Bluetooth

**Output Power Tolerance Table**

	IEEE 802.15 (dBm)
Max	11.5
Target	10.0

Band (MHz)	Mode	Ch #	Freq. (MHz)	Conducted Avg Power	
				(dBm)	(mW)
2.4	V3.0 + EDR, GFSK	0	2402	9.8	9.5
		39	2441	10.4	10.8
		78	2480	10.6	11.5
	V3.0 + EDR, $\pi/4$ DQPSK	0	2402	7.2	5.3
		39	2441	8.2	6.5
		78	2480	8.5	7.1
	V3.0 + EDR, 8-DPSK	0	2402	7.4	5.4
		39	2441	8.1	6.5
		78	2480	8.2	6.5
	V4.0 LE, GFSK	0	2402	4.4	2.7
		19	2440	5.0	3.2
		39	2480	5.3	3.4

## 10. Tissue Dielectric Properties

IEEE Std 1528-2003 Table 2

Target Frequency (MHz)	Head	
	$\epsilon_r$	$\sigma$ (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

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Target Frequency (MHz)	Head		Body	
	$\epsilon_r$	$\sigma$ (S/m)	$\epsilon_r$	$\sigma$ (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.

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
5/10/2013	Head 1900	e'	38.7600	Relative Permittivity ( $\epsilon_r$ ):	38.76	40.00	-3.10	5
		e"	13.5100	Conductivity ( $\sigma$ ):	1.43	1.40	1.95	5
	Head 1850	e'	38.9600	Relative Permittivity ( $\epsilon_r$ ):	38.96	40.00	-2.60	5
		e"	13.4100	Conductivity ( $\sigma$ ):	1.38	1.40	-1.47	5
	Head 1910	e'	38.6900	Relative Permittivity ( $\epsilon_r$ ):	38.69	40.00	-3.28	5
		e"	13.5300	Conductivity ( $\sigma$ ):	1.44	1.40	2.64	5
5/10/2013	Body 1900	e'	54.0000	Relative Permittivity ( $\epsilon_r$ ):	54.00	53.30	1.31	5
		e"	14.2400	Conductivity ( $\sigma$ ):	1.50	1.52	-1.03	5
	Body 1850	e'	54.1700	Relative Permittivity ( $\epsilon_r$ ):	54.17	53.30	1.63	5
		e"	14.1200	Conductivity ( $\sigma$ ):	1.45	1.52	-4.44	5
	Body 1910	e'	53.9600	Relative Permittivity ( $\epsilon_r$ ):	53.96	53.30	1.24	5
		e"	14.2700	Conductivity ( $\sigma$ ):	1.52	1.52	-0.30	5
5/13/2013	Body 1750	e'	51.8200	Relative Permittivity ( $\epsilon_r$ ):	51.82	53.44	-3.03	5
		e"	15.2500	Conductivity ( $\sigma$ ):	1.48	1.49	-0.15	5
	Body 1710	e'	51.9400	Relative Permittivity ( $\epsilon_r$ ):	51.94	53.54	-2.99	5
		e"	15.1600	Conductivity ( $\sigma$ ):	1.44	1.46	-1.38	5
	Body 1755	e'	51.8000	Relative Permittivity ( $\epsilon_r$ ):	51.80	53.43	-3.05	5
		e"	15.2700	Conductivity ( $\sigma$ ):	1.49	1.49	0.06	5
5/13/2013	Head 1750	e'	38.6700	Relative Permittivity ( $\epsilon_r$ ):	38.67	40.08	-3.53	5
		e"	13.9200	Conductivity ( $\sigma$ ):	1.35	1.37	-1.06	5
	Head 1710	e'	38.8000	Relative Permittivity ( $\epsilon_r$ ):	38.80	40.15	-3.35	5
		e"	13.8300	Conductivity ( $\sigma$ ):	1.31	1.35	-2.33	5
	Head 1755	e'	38.6300	Relative Permittivity ( $\epsilon_r$ ):	38.63	40.08	-3.61	5
		e"	13.9300	Conductivity ( $\sigma$ ):	1.36	1.37	-0.91	5
5/13/2013	Body 2450	e'	52.3000	Relative Permittivity ( $\epsilon_r$ ):	52.30	52.70	-0.76	5
		e"	14.9100	Conductivity ( $\sigma$ ):	2.03	1.95	4.16	5
	Body 2410	e'	52.5000	Relative Permittivity ( $\epsilon_r$ ):	52.50	52.76	-0.49	5
		e"	14.7400	Conductivity ( $\sigma$ ):	1.98	1.91	3.55	5
	Body 2475	e'	52.2200	Relative Permittivity ( $\epsilon_r$ ):	52.22	52.67	-0.85	5
		e"	15.0200	Conductivity ( $\sigma$ ):	2.07	1.99	4.12	5
5/14/2013	Head 2450	e'	39.0600	Relative Permittivity ( $\epsilon_r$ ):	39.06	39.20	-0.36	5
		e"	13.5300	Conductivity ( $\sigma$ ):	1.84	1.80	2.40	5
	Head 2410	e'	39.2200	Relative Permittivity ( $\epsilon_r$ ):	39.22	39.28	-0.15	5
		e"	13.4000	Conductivity ( $\sigma$ ):	1.80	1.76	2.00	5
	Head 2475	e'	38.9800	Relative Permittivity ( $\epsilon_r$ ):	38.98	39.17	-0.48	5
		e"	13.6100	Conductivity ( $\sigma$ ):	1.87	1.83	2.52	5
5/15/2013	Body 2450	e'	52.2300	Relative Permittivity ( $\epsilon_r$ ):	52.23	52.70	-0.89	5
		e"	14.7400	Conductivity ( $\sigma$ ):	2.01	1.95	2.97	5
	Body 2410	e'	52.3500	Relative Permittivity ( $\epsilon_r$ ):	52.35	52.76	-0.78	5
		e"	14.5800	Conductivity ( $\sigma$ ):	1.95	1.91	2.43	5
	Body 2475	e'	52.1100	Relative Permittivity ( $\epsilon_r$ ):	52.11	52.67	-1.06	5
		e"	14.7900	Conductivity ( $\sigma$ ):	2.04	1.99	2.53	5

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
5/15/2013	Head 1900	e'	39.1400	Relative Permittivity (ε <sub>r</sub> ):	39.14	40.00	-2.15	5
		e"	13.6800	Conductivity (σ):	1.45	1.40	3.23	5
	Head 1850	e'	39.3800	Relative Permittivity (ε <sub>r</sub> ):	39.38	40.00	-1.55	5
		e"	13.5400	Conductivity (σ):	1.39	1.40	-0.51	5
	Head 1910	e'	39.1100	Relative Permittivity (ε <sub>r</sub> ):	39.11	40.00	-2.23	5
		e"	13.6900	Conductivity (σ):	1.45	1.40	3.85	5
5/15/2013	Body 1900	e'	51.7800	Relative Permittivity (ε <sub>r</sub> ):	51.78	53.30	-2.85	5
		e"	14.4500	Conductivity (σ):	1.53	1.52	0.43	5
	Body 1850	e'	51.5700	Relative Permittivity (ε <sub>r</sub> ):	51.57	53.30	-3.25	5
		e"	14.6000	Conductivity (σ):	1.50	1.52	-1.19	5
	Body 1910	e'	51.5500	Relative Permittivity (ε <sub>r</sub> ):	51.55	53.30	-3.28	5
		e"	14.6400	Conductivity (σ):	1.55	1.52	2.29	5
5/16/2013	Body 1750	e'	51.4800	Relative Permittivity (ε <sub>r</sub> ):	51.48	53.44	-3.67	5
		e"	15.3800	Conductivity (σ):	1.50	1.49	0.70	5
	Body 1710	e'	51.6500	Relative Permittivity (ε <sub>r</sub> ):	51.65	53.54	-3.54	5
		e"	15.2500	Conductivity (σ):	1.45	1.46	-0.79	5
	Body 1755	e'	51.4700	Relative Permittivity (ε <sub>r</sub> ):	51.47	53.43	-3.67	5
		e"	15.3900	Conductivity (σ):	1.50	1.49	0.84	5
5/16/2013	Head 1750	e'	39.0600	Relative Permittivity (ε <sub>r</sub> ):	39.06	40.08	-2.56	5
		e"	14.1900	Conductivity (σ):	1.38	1.37	0.86	5
	Head 1710	e'	39.2700	Relative Permittivity (ε <sub>r</sub> ):	39.27	40.15	-2.18	5
		e"	14.0900	Conductivity (σ):	1.34	1.35	-0.50	5
	Head 1755	e'	39.0500	Relative Permittivity (ε <sub>r</sub> ):	39.05	40.08	-2.56	5
		e"	14.2000	Conductivity (σ):	1.39	1.37	1.01	5
5/17/2013	Head 750	e'	40.4400	Relative Permittivity (ε <sub>r</sub> ):	40.44	41.96	-3.63	5
		e"	21.7100	Conductivity (σ):	0.91	0.89	1.38	5
	Head 700	e'	41.1000	Relative Permittivity (ε <sub>r</sub> ):	41.10	42.22	-2.65	5
		e"	22.0900	Conductivity (σ):	0.86	0.89	-3.31	5
	Head 790	e'	39.8300	Relative Permittivity (ε <sub>r</sub> ):	39.83	41.76	-4.61	5
		e"	21.4000	Conductivity (σ):	0.94	0.90	4.90	5
5/17/2013	Body 750	e'	53.9900	Relative Permittivity (ε <sub>r</sub> ):	53.99	55.55	-2.80	5
		e"	23.3100	Conductivity (σ):	0.97	0.96	0.93	5
	Body 700	e'	54.5100	Relative Permittivity (ε <sub>r</sub> ):	54.51	55.74	-2.20	5
		e"	23.7000	Conductivity (σ):	0.92	0.96	-3.83	5
	Body 790	e'	53.5200	Relative Permittivity (ε <sub>r</sub> ):	53.52	55.39	-3.38	5
		e"	22.9700	Conductivity (σ):	1.01	0.97	4.43	5
5/18/2013	Head 835	e'	42.7200	Relative Permittivity (ε <sub>r</sub> ):	42.72	41.50	2.94	5
		e"	20.3400	Conductivity (σ):	0.94	0.90	4.93	5
	Head 820	e'	42.8700	Relative Permittivity (ε <sub>r</sub> ):	42.87	41.60	3.05	5
		e"	20.3800	Conductivity (σ):	0.93	0.90	3.42	5
	Head 850	e'	42.5100	Relative Permittivity (ε <sub>r</sub> ):	42.51	41.50	2.43	5
		e"	20.3200	Conductivity (σ):	0.96	0.92	4.96	5
5/20/2013	Body 835	e'	53.4700	Relative Permittivity (ε <sub>r</sub> ):	53.47	55.20	-3.13	5
		e"	21.5700	Conductivity (σ):	1.00	0.97	3.24	5
	Body 820	e'	53.5900	Relative Permittivity (ε <sub>r</sub> ):	53.59	55.28	-3.05	5
		e"	21.6400	Conductivity (σ):	0.99	0.97	1.88	5
	Body 850	e'	53.3000	Relative Permittivity (ε <sub>r</sub> ):	53.30	55.16	-3.37	5
		e"	21.5200	Conductivity (σ):	1.02	0.99	3.03	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:  $2.0 \pm 0.2$  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  $\geq 15.0$  cm  $\pm 0.5$  cm for SAR measurements  $\leq 3$  GHz and  $\geq 10.0$  cm  $\pm 0.5$  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	1071	10/05/12	750	1g	8.29	8.79
				10g	5.49	5.82
D835V2	4d002	10/24/12	835	1g	9.58	9.48
				10g	6.28	6.26
D1750V2	1053	08/15/2012	1750	1g	35.9	37.5
				10g	19.1	20.2
D1900V2	5d043	11/06/12	1900	1g	39.9	40.9
				10g	20.9	21.6
D2450V2	899	10/05/12	2450	1g	53.6	51.7
				10g	25.0	24.3



### 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.

Date Tested	System Dipole		T.S. Liquid		Measured Results			Target (Ref. Value)	Delta ±10 %	Est./Zoom Ratio ±3 %	Plots No.
	Type	Serial #			Area Scan	Zoom Scan	Normalize to 1 W				
5/10/2013	D1900V2	5D043	Head	1g	4.23	4.11	41.1	39.9	3.01	2.84	
				10g	2.18	2.14	21.4	20.9	2.39		
5/10/2013	D1900V2	5d043	Body	1g	3.88	3.86	38.6	40.9	-5.62	0.52	1,2
				10g	1.96	2.04	20.4	21.6	-5.56		
5/13/2013	D1750V2	1053	Body	1g	3.76	3.72	37.2	37.5	-0.80	1.06	
				10g	1.98	1.99	19.9	20.2	-1.49		
5/13/2013	D1750V2	1053	Head	1g	3.90	3.75	37.5	35.9	4.46	3.85	
				10g	2.08	1.98	19.8	19.1	3.66		
5/13/2013	D2450V2	899	Body	1g	5.36	5.46	54.60	51.7	5.61	-1.87	3,4
				10g	2.32	2.51	25.10	24.3	3.29		
5/14/2013	D2450V2	899	Head	1g	5.53	5.46	54.60	53.6	1.87	1.27	
				10g	2.42	2.47	24.70	25.0	-1.20		
5/15/2013	D1900V2	5D043	Head	1g	4.17	4.05	40.5	39.9	1.50	2.88	
				10g	2.15	2.11	21.1	20.9	0.96		
5/15/2013	D1900V2	5d043	Body	1g	4.03	4.02	40.2	40.9	-1.71	0.25	
				10g	2.03	2.12	21.2	21.6	-1.85		
5/15/2013	D2450V2	899	Body	1g	5.27	5.32	53.2	51.7	2.90	-0.95	
				10g	2.28	2.48	24.8	24.3	2.06		
5/16/2013	D1750V2	1053	Head	1g	4.01	3.84	38.40	35.9	6.96	4.24	5,6
				10g	2.13	2.02	20.20	19.1	5.76		
5/16/2013	D1750V2	1053	Body	1g	3.76	3.67	36.70	37.5	-2.13	2.39	
				10g	1.96	1.97	19.70	20.2	-2.48		
5/17/2013	D750V3	1071	Head	1g	0.88	0.85	8.51	8.29	2.65	2.96	7,8
				10g	0.60	0.56	5.55	5.49	1.09		
5/17/2013	D750V3	1071	Body	1g	0.89	0.88	8.77	8.79	-0.23	1.90	
				10g	0.61	0.58	5.83	5.82	0.17		
5/18/2013	D835V2	4d002	Head	1g	1.05	1.02	10.20	9.58	6.47	2.86	9,10
				10g	0.70	0.67	6.65	6.28	5.89		
5/20/2013	D835V2	4d002	Body	1g	1.01	0.99	9.89	9.48	4.32	2.08	
				10g	0.68	0.65	6.53	6.26	4.31		

## 12. SAR Test Results

### 12.1. GSM850

#### 12.1.1. 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	Voice	128	824.2	33.2	33.0				1
		190	836.6	33.2	32.8	0.311	0.341		
		251	848.8	33.2	32.8				1
Left Tilt (15°)	Voice	128	824.2	33.2	33.0				1
		190	836.6	33.2	32.8	0.202	0.221		
		251	848.8	33.2	32.8				1
Right Touch	Voice	128	824.2	33.2	33.0				1
		190	836.6	33.2	32.8	0.249	0.273		
		251	848.8	33.2	32.8				1
Right Tilt (15°)	Voice	128	824.2	33.2	33.0				1
		190	836.6	33.2	32.8	0.191	0.209		
		251	848.8	33.2	32.8				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 2 slots	128	824.2	31.2	30.6				1
		190	836.6	31.2	30.6	0.346	<b>0.397</b>	1	
		251	848.8	31.2	30.5				1
Left Tilt (15°)	GPRS 2 slots	128	824.2	31.2	30.6				1
		190	836.6	31.2	30.6	0.232	0.266		
		251	848.8	31.2	30.5				1
Right Touch	GPRS 2 slots	128	824.2	31.2	30.6				1
		190	836.6	31.2	30.6	0.277	0.318		
		251	848.8	31.2	30.5				1
Right Tilt (15°)	GPRS 2 slots	128	824.2	31.2	30.6				1
		190	836.6	31.2	30.6	0.208	0.239		
		251	848.8	31.2	30.5				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

### 12.1.2. Body-worn Accessory 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	Voice	10	128	824.2	33.2	33.0				1
			190	836.6	33.2	32.8	0.541	0.593		
			251	848.8	33.2	32.8				1
Front	Voice	10	128	824.2	33.2	33.0				1
			190	836.6	33.2	32.8	0.301	0.330		
			251	848.8	33.2	32.8				1

### Body-worn Accessory Exposure Conditions (VoIP 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	GPRS 2 slots	10	128	824.2	31.2	30.6				1
			190	836.6	31.2	30.6	0.564	<b>0.648</b>	2	
			251	848.8	31.2	30.5				1
Front	GPRS 2 slots	10	128	824.2	31.2	30.6				1
			190	836.6	31.2	30.6	0.327	0.375		
			251	848.8	31.2	30.5				1

### 12.1.3. Hotspot Mode 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 2 slots	10	128	824.2	31.2	30.6				1
			190	836.6	31.2	30.6	0.564	<b>0.648</b>	2	
			251	848.8	31.2	30.5				1
Front	GPRS 2 slots	10	128	824.2	31.2	30.6				1
			190	836.6	31.2	30.6	0.327	0.375		
			251	848.8	31.2	30.5				1
Edge 3	GPRS 2 slots	10	128	824.2	31.2	30.6				1
			190	836.6	31.2	30.6	0.106	0.122		
			251	848.8	31.2	30.5				1
Edge 4	GPRS 2 slots	10	128	824.2	31.2	30.6				1
			190	836.6	31.2	30.6	0.460	0.528		
			251	848.8	31.2	30.5				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. GSM1900

### 12.2.1. 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	Voice	512	1850.2	30.7	30.5				1
		661	1880	30.7	30.5	0.574	0.601		
		810	1909.8	30.7	30.5				1
Left Tilt (15°)	Voice	512	1850.2	30.7	30.5				1
		661	1880	30.7	30.5	0.170	0.178		
		810	1909.8	30.7	30.5				1
Right Touch	Voice	512	1850.2	30.7	30.5				1
		661	1880	30.7	30.5	0.299	0.313		
		810	1909.8	30.7	30.5				1
Right Tilt (15°)	Voice	512	1850.2	30.7	30.5				1
		661	1880	30.7	30.5	0.179	0.187		
		810	1909.8	30.7	30.5				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 2 Slots	512	1850.2	28.7	28.3	0.821	0.900		
		661	1880.0	28.7	28.2	0.813	<b>0.912</b>	3	
		810	1909.8	28.7	28.3	0.769	0.843		
Left Tilt (15°)	GPRS 2 Slots	512	1850.2	28.7	28.3				1
		661	1880.0	28.7	28.2	0.227	0.255		
		810	1909.8	28.7	28.3				1
Right Touch	GPRS 2 Slots	512	1850.2	28.7	28.3				1
		661	1880.0	28.7	28.2	0.443	0.497		
		810	1909.8	28.7	28.3				1
Right Tilt (15°)	GPRS 2 Slots	512	1850.2	28.7	28.3				1
		661	1880.0	28.7	28.2	0.248	0.278		
		810	1909.8	28.7	28.3				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:
  - $\leq 0.8$  W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is  $\leq 100$  MHz
  - $\leq 0.6$  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
  - $\leq 0.4$  W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is  $\geq 200$  MHz

### 12.2.2. Body-worn Accessory 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	Voice	10	512	1850.2	30.7	30.5				1
			661	1880.0	30.7	30.5	0.705	0.738		
			810	1909.8	30.7	30.5				1
Front	Voice	10	512	1850.2	30.7	30.5				1
			661	1880.0	30.7	30.5	0.467	0.489		
			810	1909.8	30.7	30.5				1

### Body-worn Accessory Exposure Conditions (VoIP 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	GPRS 2 slots	10	512	1850.2	28.7	28.3	1.120	<b>1.228</b>	4	
			661	1880.0	28.7	28.2	1.060	1.189		
			810	1909.8	28.7	28.3	0.933	1.023		
Front	GPRS 2 slots	10	512	1850.2	28.7	28.3				1
			661	1880.0	28.7	28.2	0.654	0.734		
			810	1909.8	28.7	28.3				1

### 12.2.3. Hotspot Mode 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 2 slots	10	512	1850.2	28.7	28.3	1.120	<b>1.228</b>	4	
			661	1880.0	28.7	28.2	1.060	1.189		
			810	1909.8	28.7	28.3	0.933	1.023		
Front	GPRS 2 slots	10	512	1850.2	28.7	28.3				1
			661	1880.0	28.7	28.2	0.654	0.734		
			810	1909.8	28.7	28.3				1
Edge 3	GPRS 2 slots	10	512	1850.2	28.7	28.3				1
			661	1880.0	28.7	28.2	0.562	0.631		
			810	1909.8	28.7	28.3				1
Edge 4	GPRS 2 slots	10	512	1850.2	28.7	28.3				1
			661	1880.0	28.7	28.2	0.450	0.505		
			810	1909.8	28.7	28.3				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	23.2	23.2	0.905	0.905		
		9400	1880.0	23.2	23.1	0.910	0.931		
		9538	1907.6	23.2	23.2	1.090	1.090	5	
Left Tilt (15°)	Rel 99 RMC 12.2kbps	9262	1852.4	23.2	23.2				1
		9400	1880.0	23.2	23.1	0.275	0.281		
		9538	1907.6	23.2	23.2				1
Right Touch	Rel 99 RMC 12.2kbps	9262	1852.4	23.2	23.2				1
		9400	1880.0	23.2	23.1	0.551	0.564		
		9538	1907.6	23.2	23.2				1
Right Tilt (15°)	Rel 99 RMC 12.2kbps	9262	1852.4	23.2	23.2				1
		9400	1880.0	23.2	23.1	0.268	0.274		
		9538	1907.6	23.2	23.2				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

## 12.3.2. Body-worn Accessory & Hotspot Mode Exposure Conditions

### Body-worn Accessory & Hotspot Mode 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	23.2	23.2	1.210	1.210		
			9400	1880.0	23.2	23.1	1.240	1.269		
			9400	1880.0	23.2	23.1	1.260	<b>1.289</b>	6	2
			9538	1907.6	23.2	23.2	1.230	1.230		
Front	Rel 99 RMC 12.2kbps	10	9262	1852.4	23.2	23.2	0.803	0.803		
			9400	1880.0	23.2	23.1	0.890	0.911		
			9538	1907.6	23.2	23.2	0.831	0.831		

### Hotspot Mode 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 3	Rel 99 RMC 12.2kbps	10	9262	1852.4	23.2	23.2				1
			9400	1880.0	23.2	23.1	0.754	0.772		
			9538	1907.6	23.2	23.2				1
Edge 4	Rel 99 RMC 12.2kbps	10	9262	1852.4	23.2	23.2				1
			9400	1880.0	23.2	23.1	0.455	0.466		
			9538	1907.6	23.2	23.2				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 1.3, when the reported SAR for a 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	23.7	23.5	0.627	0.657	7	
		1413	1732.6	23.7	23.5	0.847	<b>0.887</b>		
		1513	1752.6	23.7	23.5	0.830	0.869		
Left Tilt (15°)	Rel 99 RMC 12.2kbps	1312	1712.4	23.7	23.5				1
		1413	1732.6	23.7	23.5	0.237	0.248		
		1513	1752.6	23.7	23.5				1
Right Touch	Rel 99 RMC 12.2kbps	1312	1712.4	23.7	23.5				1
		1413	1732.6	23.7	23.5	0.496	0.519		
		1513	1752.6	23.7	23.5				1
Right Tilt (15°)	Rel 99 RMC 12.2kbps	1312	1712.4	23.7	23.5				1
		1413	1732.6	23.7	23.5	0.234	0.245		
		1513	1752.6	23.7	23.5				1

### 12.4.2. Body-worn Accessory & Hotspot Mode Exposure Conditions

#### Body-worn Accessory & Hotspot Mode 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	23.7	23.5	0.846	0.886	8	
			1413	1732.6	23.7	23.5	1.090	1.141		
			1513	1752.6	23.7	23.5	1.130	<b>1.183</b>		
Front	Rel 99 RMC 12.2kbps	10	1312	1712.4	23.7	23.5				1
			1413	1732.6	23.7	23.5	0.711	0.745		
			1513	1752.6	23.7	23.5				1

#### Hotspot Mode 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 3	Rel 99 RMC 12.2kbps	10	1312	1712.4	23.7	23.5				1
			1413	1732.6	23.7	23.5	0.658	0.689		
			1513	1752.6	23.7	23.5				1
Edge 4	Rel 99 RMC 12.2kbps	10	1312	1712.4	23.7	23.5				1
			1413	1732.6	23.7	23.5	0.417	0.437		
			1513	1752.6	23.7	23.5				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



## 12.5. 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	23.2	23.2			9	1
		4183	836.6	23.2	23.1	0.410	<b>0.420</b>		
		4233	846.6	23.2	23.2				1
Left Tilt (15°)	Rel 99 RMC 12.2kbps	4132	826.4	23.2	23.2				1
		4183	836.6	23.2	23.1	0.262	0.268		
		4233	846.6	23.2	23.2				1
Right Touch	Rel 99 RMC 12.2kbps	4132	826.4	23.2	23.2				1
		4183	836.6	23.2	23.1	0.326	0.334		
		4233	846.6	23.2	23.2				1
Right Tilt (15°)	Rel 99 RMC 12.2kbps	4132	826.4	23.2	23.2				1
		4183	836.6	23.2	23.1	0.249	0.255		
		4233	846.6	23.2	23.2				1

### 12.5.2. Body-worn Accessory & Hotspot Mode Exposure Conditions

#### Body-worn Accessory & Hotspot Mode 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	23.2	23.2			10	1
			4183	836.6	23.2	23.1	0.676	<b>0.692</b>		
			4233	846.6	23.2	23.2				1
Front	Rel 99 RMC 12.2kbps	10	4132	826.4	23.2	23.2				1
			4183	836.6	23.2	23.1	0.407	0.416		
			4233	846.6	23.2	23.2				1

#### Hotspot Mode 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 3	Rel 99 RMC 12.2kbps	10	4132	826.4	23.2	23.2				1
			4183	836.6	23.2	23.1	0.154	0.158		
			4233	846.6	23.2	23.2				1
Edge 4	Rel 99 RMC 12.2kbps	10	4132	826.4	23.2	23.2				1
			4183	836.6	23.2	23.1	0.584	0.598		
			4233	846.6	23.2	23.2				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 4 (20MHz 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	20050	1720.0								1
				50	49	23.7	22.4	0.564	0.761		
		20175	1732.5	1	0	23.7	23.7	0.741	0.741		
				50	0	23.7	22.4	0.595	0.803		
		20300	1745.0								1
				50	0	23.7	22.1	0.649	<b>0.938</b>	11	
Left Tilt (15°)	QPSK	20050	1720.0								1
											1
		20175	1732.5	1	0	23.7	23.7	0.195	0.195		
				50	0	23.7	22.4	0.136	0.183		
		20300	1745.0								1
											1
Right Touch	QPSK	20050	1720.0								1
											1
		20175	1732.5	1	0	23.7	23.7	0.434	0.434		
				50	0	23.7	22.4	0.356	0.480		
		20300	1745.0								1
											1
Right Tilt (15°)	QPSK	20050	1720.0								1
											1
		20175	1732.5	1	0	23.7	23.7	0.158	0.158		
				50	0	23.7	22.4	0.136	0.183		
		20300	1745.0								1
											1

#### Note(s):

- Per KDB 941225 D05 SAR for LTE Devices v02r02, 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  $\geq 0.8$  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 Mode Exposure Conditions

### Body-worn Accessory & Hotspot Mode 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	99	23.7	23.6	0.957	0.979		
					50	49	23.7	22.4	0.692	0.933		
			20175	1732.5	1	0	23.7	23.7	0.880	0.880		
					50	0	23.7	22.4	0.731	0.986		
			20300	1745.0	1	0	23.7	23.3	0.988	1.083		
					50	0	23.7	22.1	0.776	1.122	12	
Front	QPSK	10	20050	1720.0								1
												1
			20175	1732.5	1	0	23.7	23.7	0.531	0.531		
					50	0	23.7	22.4	0.534	0.720		
			20300	1745.0								1
												1

### Hotspot Mode 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 3	QPSK	10	20050	1720.0								1
												1
			20175	1732.5	1	0	23.7	23.7	0.528	0.528		
					50	0	23.7	22.4	0.418	0.564		
			20300	1745.0								1
												1
Edge 4	QPSK	10	20050	1720.0								1
												1
			20175	1732.5	1	0	23.7	23.7	0.291	0.291		
					50	0	23.7	22.4	0.248	0.335		
			20300	1745.0								1
												1

#### Note(s):

- Per KDB 941225 D05 SAR for LTE Devices v02r02, 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  $\geq 0.8$  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 17 (10MHz 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	23780	709.0	1	0	23.2	23.2				1
				25	0	23.2	22.2				1
		23790	710.0	1	0	23.2	23.2	0.200	0.200		
				25	0	23.2	22.2	0.156	0.196		
		23800	711.0	1	0	23.2	23.0				1
				25	12	23.2	22.0				1
Left Tilt (15°)	QPSK	23780	709.0	1	0	23.2	23.2				1
				25	0	23.2	22.2				1
		23790	710.0	1	0	23.2	23.2	0.113	0.113		
				25	0	23.2	22.2	0.090	0.113		
		23800	711.0	1	0	23.2	23.0				1
				25	12	23.2	22.0				1
Right Touch	QPSK	23780	709.0	1	0	23.2	23.2				1
				25	0	23.2	22.2				1
		23790	710.0	1	0	23.2	23.2	0.243	<b>0.243</b>	13	
				25	0	23.2	22.2	0.193	0.243		
		23800	711.0	1	0	23.2	23.0				1
				25	12	23.2	22.0				1
Right Tilt (15°)	QPSK	23780	709.0	1	0	23.2	23.2				1
				25	0	23.2	22.2				1
		23790	710.0	1	0	23.2	23.2	0.123	0.123		
				25	0	23.2	22.2	0.096	0.121		
		23800	711.0	1	0	23.2	23.0				1
				25	12	23.2	22.0				1

#### Note(s):

- Per KDB 941225 D05 SAR for LTE Devices v02r02, 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  $\geq 0.8$  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 Mode Exposure Conditions

### Body-worn Accessory & Hotspot Mode 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	23780	709.0	1	0	23.2	23.2				1
					25	0	23.2	22.2				1
			23790	710.0	1	0	23.2	23.2	0.414	0.414		
					25	0	23.2	22.2	0.331	<b>0.417</b>	14	
			23800	711.0	1	0	23.2	23.0				1
					25	12	23.2	22.0				1
Front	QPSK	10	23780	709.0	1	0	23.2	23.2				1
					25	0	23.2	22.2				1
			23790	710.0	1	0	23.2	23.2	0.250	0.250		
					25	0	23.2	22.2	0.191	0.240		
			23800	711.0	1	0	23.2	23.0				1
					25	12	23.2	22.0				1

### Hotspot Mode 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	23780	709.0	1	0	23.2	23.2				1
					25	0	23.2	22.2				1
			23790	710.0	1	0	23.2	23.2	0.223	0.223		
					25	0	23.2	22.2	0.179	0.225		
			23800	711.0	1	0	23.2	23.0				1
					25	12	23.2	22.0				1
Edge 3	QPSK	10	23780	709.0	1	0	23.2	23.2				1
					25	0	23.2	22.2				1
			23790	710.0	1	0	23.2	23.2	0.125	0.125		
					25	0	23.2	22.2	0.099	0.125		
			23800	711.0	1	0	23.2	23.0				1
					25	12	23.2	22.0				1

#### Note(s):

- Per KDB 941225 D05 SAR for LTE Devices v02r02, 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  $\geq 0.8$  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. Wi-Fi (2.4 GHz Band)

### 12.8.1. 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	17.5	16.6				1
		6	2437	17.5	17.0	0.281	0.315		
		11	2462	17.5	17.1				1
Left Tilt (15°)	802.11b	1	2412	17.5	16.6				1
		6	2437	17.5	17.0	0.355	0.398	15	
		11	2462	17.5	17.1				1
Right Touch	802.11b	1	2412	17.5	16.6				1
		6	2437	17.5	17.0	0.178	0.200		
		11	2462	17.5	17.1				1
Right Tilt (15°)	802.11b	1	2412	17.5	16.6				1
		6	2437	17.5	17.0	0.222	0.249		
		11	2462	17.5	17.1				1

### 12.8.2. Body-worn Accessory & Hotspot Mode Exposure Conditions

#### Body-worn Accessory & Hotspot Mode 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	17.5	16.6				1
			6	2437	17.5	17.0	0.191	0.214	16	
			11	2462	17.5	17.1				1
Front	802.11b	10	1	2412	17.5	16.6				1
			6	2437	17.5	17.0	0.075	0.084		
			11	2462	17.5	17.1				1

#### Hotspot Mode 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	17.5	16.6				1
			6	2437	17.5	17.0	0.202	0.227	17	
			11	2462	17.5	17.1				1
Edge 2	802.11b	10	1	2412	17.5	16.6				1
			6	2437	17.5	17.0	0.150	0.168		
			11	2462	17.5	17.1				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

## 12.9. Bluetooth

### 12.9.1. Body-worn Accessory Exposure Considerations

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	GFSK	10	0	2402						1
			39	2441						1
			78	2480	11.5	10.6	0.038	<b>0.047</b>	18	
Front	GFSK	10	0	2402						1
			39	2441						1
			78	2480	11.5	10.6	0.008	0.010		

#### 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

### 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  $\geq 0.80$  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  $\geq 1.45$  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  $\geq 1.5$  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

##### Head Exposure Condition

Not Applicable. Highest measured SAR is  $< 0.80$  W/kg.

##### Body-worn Accessory Exposure Condition

Frequency band	Test Position	Mode	Ch. #	Freq. (MHz)	Measured 1g SAR (W/kg)
WCDMA Band II	Rear	Rel. 99 RMC 12.2 kbps	9400	1880.0	1.260
WCDMA Band IV	Rear	Rel. 99 RMC 12.2 kbps	1513	1752.6	1.110

##### Hotspot Mode Exposure Conditions

Not Applicable. Highest measured SAR is  $< 0.80$  W/kg.



## 13.2. Repeated Measurement Results

### Head Exposure Condition

Not Applicable. Highest measured SAR is < 0.80 W/kg.

### Body-worn Accessory Exposure Condition

Frequency band	Test Position	Mode	Ch #.	Freq. (MHz)	Meas. SAR (W/kg)		Largest to Smallest SAR Ratio	Note
					Original	Repeated		
WCDMA Band II	Rear	Rel. 99 RMC 12.2 kbps	9400	1880.0	1.260	1.250	1.01	1
WCDMA Band IV	Rear	Rel. 99 RMC 12.2 kbps	1513	1752.6	1.110	1.130	1.02	1

### Hotspot Mode Exposure Conditions

Not Applicable. Highest measured SAR is < 0.80 W/kg.

#### 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:

**SAR<sub>1</sub>** 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

**SAR<sub>2</sub>** 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. Head Exposure Conditions

### 14.1.1. Sum of the SAR for WWAN & WiFi

Test Position	Voice		Data				$\Sigma$ 1-g SAR (mW/g)
	GSM 850	GSM 1900	W-CDMA Band II	W-CDMA Band IV	W-CDMA Band V	WiFi 2.4 GHz	
Left Touch	0.341					0.315	0.656
		0.601				0.315	0.916
			1.090			0.315	1.405
				0.887		0.315	1.202
					0.420	0.315	0.735
Left Tilt	0.221					0.398	0.619
		0.178				0.398	0.576
			0.281			0.398	0.679
				0.248		0.398	0.646
					0.268	0.398	0.666
Right Touch	0.273					0.200	0.473
		0.313				0.200	0.513
			0.564			0.200	0.764
				0.519		0.200	0.719
					0.334	0.200	0.534
Right Tilt	0.209					0.249	0.458
		0.187				0.249	0.436
			0.274			0.249	0.523
				0.245		0.249	0.494
					0.255	0.249	0.504

#### **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.

#### 14.1.2. Sum of the SAR for WWAN (VoIP) & WiFi

Test Position	VoIP (GPRS)		Data				$\Sigma$ 1-g SAR (mW/g)
	GSM 850	GSM 1900	W-CDMA Band II	W-CDMA Band IV	W-CDMA Band V	WiFi 2.4 GHz	
Left Touch	0.397					0.315	0.712
		0.912				0.315	1.227
			1.090			0.315	1.405
				0.887		0.315	1.202
					0.420	0.315	0.735
Left Tilt	0.266					0.398	0.664
		0.255				0.398	0.653
			0.281			0.398	0.679
				0.248		0.398	0.646
					0.268	0.398	0.666
Right Touch	0.318					0.200	0.518
		0.497				0.200	0.697
			0.564			0.200	0.764
				0.519		0.200	0.719
					0.334	0.200	0.534
Right Tilt	0.239					0.249	0.488
		0.278				0.249	0.527
			0.274			0.249	0.523
				0.245		0.249	0.494
					0.255	0.249	0.504

#### 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.

### 14.1.3. Sum of the SAR for LTE & WiFi

Test Position	Data		Data	$\Sigma$ 1-g SAR (mW/g)
	LTE Band 4	LTE Band 17	WiFi 2.4 GHz	
Left Touch	0.938		0.315	1.253
		0.200	0.315	0.515
Left Tilt	0.195		0.398	0.593
		0.113	0.398	0.511
Right Touch	0.480		0.200	0.680
		0.243	0.200	0.443
Right Tilt	0.183		0.249	0.432
		0.123	0.249	0.372

#### **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. Body-worn Accessory Exposure Conditions

### 14.2.1. Sum of the SAR for WWAN & WiFi/BT

Test Position	Voice		Data					$\Sigma$ 1-g SAR (mW/g)
	GSM 850	GSM 1900	W-CDMA Band II	W-CDMA Band IV	W-CDMA Band V	WiFi 2.4 GHz	Bluetooth	
Rear	0.593					0.214		0.807
		0.738				0.214		0.952
			1.289			0.214		1.503
				1.183		0.214		1.397
					0.692	0.214		0.906
	0.593						0.047	0.640
		0.738					0.047	0.785
			1.289				0.047	1.336
				1.183			0.047	1.230
					0.692		0.047	0.739
Front	0.330					0.084		0.414
		0.489				0.084		0.573
			0.911			0.084		0.995
				0.745		0.084		0.829
					0.416	0.084		0.500
	0.330						0.010	0.340
		0.489					0.010	0.499
			0.911				0.010	0.921
				0.745			0.010	0.755
					0.416		0.010	0.426

#### 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.

#### 14.2.2. Sum of the SAR for WWAN & WiFi/BT

Test Position	VoIP (GPRS)		Data					$\Sigma$ 1-g SAR (mW/g)
	GSM 850	GSM 1900	W-CDMA Band II	W-CDMA Band IV	W-CDMA Band V	WiFi 2.4 GHz	Bluetooth	
Rear	0.648					0.214		0.862
		1.228				0.214		1.442
			1.289			0.214		1.503
				1.183		0.214		1.397
					0.692	0.214		0.906
	0.648						0.047	0.695
		1.228					0.047	1.275
			1.289				0.047	1.336
				1.183			0.047	1.230
					0.692		0.047	0.739
Front	0.375					0.084		0.459
		0.734				0.084		0.818
			0.911			0.084		0.995
				0.745		0.084		0.829
					0.416	0.084		0.500
	0.375						0.010	0.385
		0.734					0.010	0.744
			0.911				0.010	0.921
				0.745			0.010	0.755
					0.416		0.010	0.426

#### 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 LTE & WiFi/BT

Test Position	Data				$\Sigma$ 1-g SAR (mW/g)
	LTE Band 4	LTE Band 17	WiFi 2.4 GHz	Bluetooth	
Rear	1.122		0.214		1.336
		0.417	0.214		0.631
	1.122			0.047	1.169
		0.417		0.047	0.464
Front	0.720		0.084		0.804
		0.250	0.084		0.334
	0.720			0.010	0.730
		0.250		0.010	0.260

#### **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. Hotspot Mode Exposure Conditions

### 14.3.1. Sum of the SAR for GSM & WiFi

Test Position	Data			$\Sigma$ 1-g SAR (mW/g)
	GSM 850	GSM 1900	WiFi 2.4 GHz	
Rear	0.648		0.214	0.862
		1.228	0.214	1.442
Front	0.375		0.084	0.459
		0.734	0.084	0.818
Edge 1	0		0.227	0.227
		0	0.227	0.227
Edge 2	0		0.168	0.168
		0	0.168	0.168
Edge 3	0.122		0	0.122
		0.631	0	0.631
Edge 4	0.528		0	0.528
		0.505	0	0.505

#### 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 W-CDMA & WiFi

Test Position	Data				$\Sigma$ 1-g SAR (mW/g)
	W-CDMA Band II	W-CDMA Band IV	W-CDMA Band V	WiFi 2.4 GHz	
Rear	1.289			0.214	1.503
		1.183		0.214	1.397
			0.692	0.214	0.906
Front	0.911			0.084	0.995
		0.745		0.084	0.829
			0.416	0.084	0.500
Edge 1	0.000			0.227	0.227
		0.000		0.227	0.227
			0.000	0.227	0.227
Edge 2	0.000			0.168	0.168
		0.000		0.168	0.168
			0.000	0.168	0.168
Edge 3	0.772			0	0.772
		0.689		0	0.689
			0.158	0	0.158
Edge 4	0.466			0	0.466
		0.437		0	0.437
			0.598	0	0.598

#### **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 LTE & WiFi

Test Position	Data			$\Sigma$ 1-g SAR (mW/g)
	LTE Band 4	LTE Band 17	WiFi 2.4 GHz	
Rear	1.122		0.214	1.336
		0.417	0.214	0.631
Front	0.720		0.084	0.804
		0.250	0.084	0.334
Edge 1	0.000		0.227	0.227
		0.000	0.227	0.227
Edge 2	0.000		0.168	0.168
		0.225	0.168	0.393
Edge 3	0.564		0	0.564
		0.125	0	0.125
Edge 4	0.335		0	0.335
		0.000	0	0.000

#### **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**
- 15.3. Calibration Certificate for E-Field Probe EX3DV4 - SN 3901**
- 15.4. Calibration Certificate for E-Field Probe EX3DV4 - SN 3885**
- 15.5. Calibration Certificate for E-Field Probe EX3DV4 - SN 3686**
- 15.6. Calibration Certificate for D750V3 - SN 1071**
- 15.7. Calibration Certificate for D835V2 - SN 4d002**
- 15.8. Calibration Certificate for D1750V2 - SN 1053**
- 15.9. Calibration Certificate for D1900V2- SN 5d043**
- 15.10. Calibration Certificate for D2450V2 - SN 899**