



**FCC 47 CFR § 2.1093  
IEEE Std 1528-2013**

**SAR EVALUATION REPORT**

**FOR**

**GSM/WCDMA/LTE Phone + BT/BLE, DTS b/g/n and ANT+**

**MODEL NUMBER: SM-G611M/DS, SM-G611M**

**FCC ID: A3LSMG611M**

**REPORT NUMBER: 4788312281-S1V2**

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**TL-637**

**Revision History**

Rev.	Date	Revisions	Revised By
V1	2/20/2018	Initial Issue	SeongGon Lee
V2	2/27/2018	Revised "notes" in Sec.1.	SeongGon Lee

## Table of Contents

<b>1.</b>	<b>Attestation of Test Results .....</b>	<b>5</b>
<b>2.</b>	<b>Test Specification, Methods and Procedures.....</b>	<b>6</b>
<b>3.</b>	<b>Facilities and Accreditation.....</b>	<b>6</b>
<b>4.</b>	<b>SAR Measurement System &amp; Test Equipment .....</b>	<b>7</b>
4.1.	<i>SAR Measurement System.....</i>	7
4.2.	<i>SAR Scan Procedures.....</i>	8
4.3.	<i>Test Equipment.....</i>	10
<b>5.</b>	<b>Measurement Uncertainty.....</b>	<b>10</b>
<b>6.</b>	<b>Device Under Test (DUT) Information .....</b>	<b>11</b>
6.1.	<i>DUT Description .....</i>	11
6.2.	<i>Wireless Technologies.....</i>	11
6.3.	<i>Nominal and Maximum Output Power.....</i>	12
6.4.	<i>General LTE SAR Test and Reporting Considerations.....</i>	14
6.5.	<i>Power Reduction by Proximity Sensing .....</i>	15
6.5.1.	<i>Proximity Sensor Triggering Distance (KDB 616217 §6.2).....</i>	15
6.5.2.	<i>Resulting test positions for SAR measurements .....</i>	17
<b>7.</b>	<b>RF Exposure Conditions (Test Configurations).....</b>	<b>17</b>
<b>8.</b>	<b>Dielectric Property Measurements &amp; System Check .....</b>	<b>18</b>
8.1.	<i>Dielectric Property Measurements .....</i>	18
8.2.	<i>System Check.....</i>	23
<b>9.</b>	<b>Conducted Output Power Measurements.....</b>	<b>26</b>
9.1.	<i>GSM .....</i>	26
9.2.	<i>W-CDMA .....</i>	28
9.3.	<i>LTE.....</i>	34
9.4.	<i>Wi-Fi 2.4 GHz (DTS Band).....</i>	42
9.5.	<i>Bluetooth .....</i>	43
<b>10.</b>	<b>Measured and Reported (Scaled) SAR Results.....</b>	<b>44</b>
10.1.	<i>GSM 850.....</i>	46
10.2.	<i>GSM1900.....</i>	46
10.3.	<i>W-CDMA Band II.....</i>	46
10.4.	<i>W-CDMA Band IV .....</i>	47
10.5.	<i>W-CDMA Band V .....</i>	47
10.6.	<i>LTE Band 2 (20MHz Bandwidth).....</i>	48

10.7. LTE Band 4 (20MHz Bandwidth) ..... 48

10.8. LTE Band 5 (10MHz Bandwidth) ..... 49

10.9. LTE Band 17 (10MHz Bandwidth) ..... 49

10.10. Wi-Fi (DTS Band)..... 50

10.11. Bluetooth..... 51

**11. SAR Measurement Variability..... 52**

**12. Simultaneous Transmission SAR Analysis..... 53**

    12.1. Sum of the SAR for WWAN & Wi-Fi & BT..... 54

**Appendixes ..... 55**

    4788312281-S1V2 FCC Report SAR\_App A\_Photos & Ant. Locations..... 55

    4788312281-S1V2 FCC Report SAR\_App B\_Highest SAR Test Plots..... 55



    4788312281-S1V2 FCC Report SAR\_App C\_System Check Plots..... 55

    4788312281-S1V2 FCC Report SAR\_App D\_SAR Tissue Ingredients ..... 55

    4788312281-S1V2 FCC Report SAR\_App E\_Probe Cal. Certificates ..... 55

    4788312281-S1V2 FCC Report SAR\_App F\_Dipole Cal. Certificates..... 55

## 1. Attestation of Test Results

Applicant Name	SAMSUNG ELECTRONICS CO.,LTD.		
FCC ID	A3LSMG611M		
Model Number	SM-G611M/DS, SM-G611M		
Applicable Standards	FCC 47 CFR § 2.1093 Published RF exposure KDB procedures IEEE Std 1528-2013		
<b>SAR Limits (W/Kg)</b>			
Exposure Category	Peak spatial-average(1g of tissue)	Phablet (10g of tissue)	
General population / Uncontrolled exposure	1.6	4.0	
<b>The Highest Reported SAR (W/kg)</b>			
<b>RF Exposure Conditions</b>	<b>Equipment Class</b>		
	<b>Licensed</b>	<b>DTS</b>	<b>DSS(BT)</b>
Head	0.52	0.67	0.23
Body-worn	0.66	0.14	N/A
Hotspot	0.99	0.31	
Phablet	N/A		0.75
Simultaneous TX	Head	1.20	
	Body-worn	0.80	
	Hotspot	1.30	
<b>Notes:</b> SM-G611M/DS and SM-G611M are same hardware, but for different number of SIM card slot. SM-G611M has one slot and SM-G611M/DS is dual SIM version. The results for model SM-G611M/DS are worst case in All bands.			
Date Tested	1/22/2018 to 2/8/2018		
Test Results	Pass		
<p>UL Korea, Ltd. 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 Korea, Ltd. 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.</p> <p><b>Note:</b> 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 Korea, Ltd. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Korea, Ltd. 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 IAS, any agency of the Federal Government, or any agency of any government.</p>			
Approved & Released By:		Prepared By:	
			
Justin Park Lead Test Engineer UL Korea, Ltd. Suwon Laboratory		SeongGon Lee Laboratory Technician UL Korea, Ltd. Suwon Laboratory	

## 2. Test Specification, Methods and Procedures

The tests documented in this report were performed in accordance with FCC 47 CFR § 2.1093, IEEE STD 1528-2013, the following FCC Published RF exposure [KDB](#) procedures:

- 248227 D01 802.11 Wi-Fi SAR v02r02
- 447498 D01 General RF Exposure Guidance v06
- 648474 D04 Handset SAR v01r03
- 690783 D01 SAR Listings on Grants v01r03
- 865664 D01 SAR measurement 100 MHz to 6 GHz v01r04
- 865664 D02 RF Exposure Reporting v01r02
- 941225 D01 3G SAR Procedures v03r01
- 941225 D05 SAR for LTE Devices v02r05
- 941225 D06 Hotspot Mode v02r01
- 941225 D07 UMPC Mini Tablet v01r02

In addition to the above, the following information was used:

- [TCB workshop](#) October, 2016; Page 7, RF Exposure Procedures (Bluetooth Duty Factor)

## 3. Facilities and Accreditation

The test sites and measurement facilities used to collect data are located at

Suwon
SAR 1 Room
SAR 2 Room
SAR 3 Room

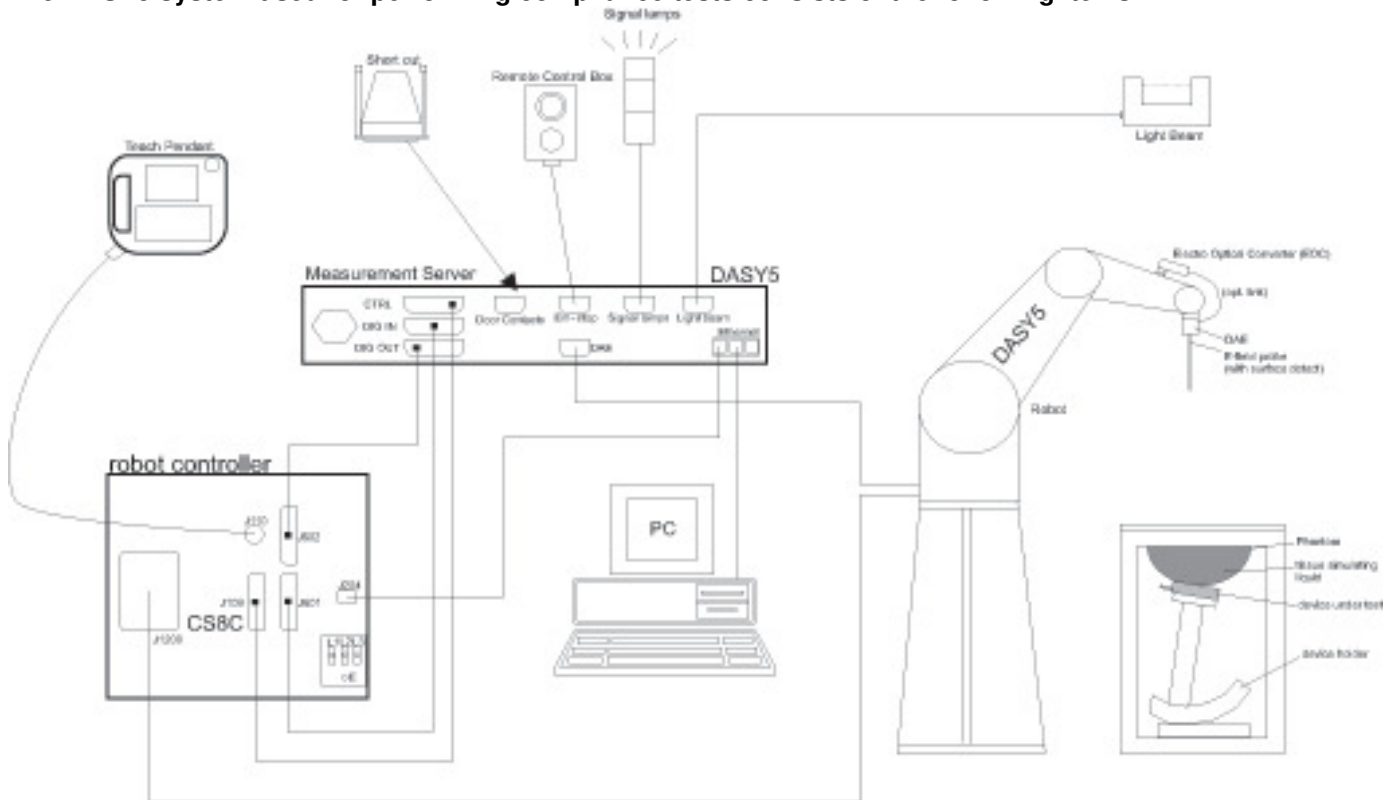
UL Korea, Ltd. is accredited by IAS, Laboratory Code TL-637.

The full scope of accreditation can be viewed at <http://www.iasonline.org/PDF/TL/TL-637.pdf>.

## 4. SAR Measurement System & Test Equipment

### 4.1. SAR Measurement System

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.

## 4.2. SAR Scan Procedures

### 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

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

			$\leq 3$ GHz	$> 3$ GHz
Maximum zoom scan spatial resolution: $\Delta x_{Zoom}, \Delta y_{Zoom}$			$\leq 2$ 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: $\Delta z_{Zoom}(n)$		$\leq 5$ mm	3 – 4 GHz: $\leq 4$ mm 4 – 5 GHz: $\leq 3$ mm 5 – 6 GHz: $\leq 2$ mm
	graded grid	$\Delta z_{Zoom}(1)$ : 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
		$\Delta z_{Zoom}(n>1)$ : between subsequent points	$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$	
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 <i>reported</i> SAR from the <i>area scan based 1-g SAR estimation</i> 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.

### 4.3. Test Equipment

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.

#### Dielectric Property Measurements

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Network Analyzer	Agilent	E5071C	MY46522054	8-8-2018
Dielectric Assessment Kit	SPEAG	DAK-3.5	1196	8-2-2018
Shorting block	SPEAG	DAK-3.5 Short	SM DAK 200 BA	N/A
Thermometer	LKM	DTM3000	3424	8-11-2018
Thermometer	Lutron	MHB-382SD	AH.91478	8-10-2018

#### System Check

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
MXG Analog Signal Generator	Agilent	N5181A	MY50145882	8-7-2018
Power Sensor	Agilent	U2000A	MY54260010	8-8-2018
Power Sensor	Agilent	U2000A	MY54260007	8-8-2018
Power Amplifier	EXODUS	1410025-AMP2027-10003	10003	8-8-2018
Directional Coupler	Agilent	772D	MY52180193	8-7-2018
Directional Coupler	Agilent	778D	MY52180432	8-7-2018
Low Pass Filter	MICROLAB	LA-15N	03943	8-7-2018
Low Pass Filter	FILTRON	L14012FL	1410003S	8-7-2018
Attenuator	Agilent	8491B/003	MY39269292	8-7-2018
Attenuator	Agilent	8491B/010	MY39269315	8-7-2018
Attenuator	Agilent	8491B/020	MY39269298	8-7-2018
E-Field Probe (SAR1)	SPEAG	EX3DV4	7376	8-22-2018
E-Field Probe (SAR3)	SPEAG	EX3DV4	7314	9-28-2018
Data Acquisition Electronics (SAR1)	SPEAG	DAE4	1468	8-22-2018
Data Acquisition Electronics (SAR3)	SPEAG	DAE4	1494	7-20-2018
System Validation Dipole	SPEAG	D750V3	1122	8-30-2017
System Validation Dipole	SPEAG	D835V2	4d194	7-19-2018
System Validation Dipole	SPEAG	D1750V2	1125	8-26-2017
System Validation Dipole	SPEAG	D1900V2	5d199	2-21-2018
System Validation Dipole	SPEAG	D2450V2	960	2-21-2018
Thermometer (SAR1)	Lutron	MHB-382SD	AH.91463	8-10-2018
Thermometer (SAR3)	Lutron	MHB-382SD	AH.50213	8-16-2018

#### Others

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Base Station Simulator	R & S	CMW500	150313	12-08-2018
Base Station Simulator	R & S	CMW500	150314	12-05-2018
Bluetooth Tester	TESCOM	TC-3000C	3000C000546	8-7-2018

#### Note(s):

Refer to Appendix F that mentioned about justification for Extended SAR Dipole Calibrations(D750V3, SN : 1122 and D1750V2, SN : 1125)

### 5. Measurement Uncertainty

Per KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg and the measured 10-g SAR within a frequency band is < 3.75 W/kg. The expanded SAR measurement uncertainty must be  $\leq 30\%$ , for a confidence interval of  $k = 2$ . If these conditions are met, extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval.

## 6. Device Under Test (DUT) Information

### 6.1. DUT Description

Device Dimension	Overall (Length x Width): 151.5 mm x 74.9 mm Overall Diagonal: 162.0 mm Display Diagonal: 139.0 mm															
Back Cover	<input checked="" type="checkbox"/> The Back Cover is not removable.															
Battery Options	<input checked="" type="checkbox"/> The rechargeable battery is not user accessible															
Wireless Router (Hotspot)	Wi-Fi Hotspot mode permits the device to share its cellular data connection with other Wi-Fi-enabled devices. <input checked="" type="checkbox"/> Mobile Hotspot (Wi-Fi 2.4 GHz)															
Wi-Fi Direct	Wi-Fi Direct enabled devices transfer data directly between each other <input checked="" type="checkbox"/> Wi-Fi Direct (Wi-Fi 2.4 GHz)															
Test Sample Information	<table border="1"> <thead> <tr> <th>No.</th> <th>S/N</th> <th>Notes</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>R38K102TG9V</td> <td>Wi-Fi/BT conduction</td> </tr> <tr> <td>2</td> <td>R38K102TD1Y</td> <td>Main conduction</td> </tr> <tr> <td>3</td> <td>R38K102TCFF</td> <td>SAR</td> </tr> <tr> <td>4</td> <td>R38K102TCNM</td> <td>SAR</td> </tr> </tbody> </table>	No.	S/N	Notes	1	R38K102TG9V	Wi-Fi/BT conduction	2	R38K102TD1Y	Main conduction	3	R38K102TCFF	SAR	4	R38K102TCNM	SAR
No.	S/N	Notes														
1	R38K102TG9V	Wi-Fi/BT conduction														
2	R38K102TD1Y	Main conduction														
3	R38K102TCFF	SAR														
4	R38K102TCNM	SAR														

### 6.2. Wireless Technologies

Wireless technologies	Frequency bands	Operating mode		Duty Cycle used for SAR testing
GSM	850 1900	Voice (GMSK)	GPRS Multi-Slot Class:	GSM Voice: 12.5% (E)GPRS: 1 Slot: 12.5% 2 Slots: 25% 3 Slots: 37.5% 4 Slots: 50%
		GPRS (GMSK)	<input type="checkbox"/> Class 8 - 1 Up, 4 Down <input type="checkbox"/> Class 10 - 2 Up, 4 Down <input type="checkbox"/> Class 12 - 4 Up, 4 Down <input checked="" type="checkbox"/> Class 33 - 4 Up, 5 Down	
Does this device support DTM (Dual Transfer Mode)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No				
W-CDMA (UMTS)	Band II Band IV Band V	UMTS Rel. 99 (Voice & Data) HSDPA (Release.5) HSUPA (Release.6) HSPA+ (Release.7) DC-HSDPA(Release 8)		100%
LTE	FDD Band 2 FDD Band 4 FDD Band 5 FDD Band 17	QPSK 16QAM <input checked="" type="checkbox"/> Rel. 10 Does not support Carrier Aggregation (CA)		100%
		Does this device support SV-LTE (1xRTT-LTE)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		
Wi-Fi	2.4 GHz	802.11b 802.11g 802.11n (HT20)		98.9%(802.11b) 93.5%(802.11g) 93.0%(802.11n HT20)
Bluetooth	2.4 GHz	Version 4.1 LE		76.9% (DH5)

#### Notes:

- The Bluetooth protocol is considered source-based averaging. Bluetooth GFSK (DH5) was verified to have the highest duty cycle of 76.9% and was considered and used for SAR Testing. Under LE mode, the duty cycle is at 62.3%

### 6.3. Nominal and Maximum Output Power

KDB 447498 sec.4.1. at the maximum rated output power and within the tune-up tolerance range specified for the product, but not more than 2 dB lower than the maximum tune-up tolerance limit

RF Air interface	Mode	Time Slots	Max. RF Output Power (dBm)	
			Tune-up Limit	Frame Power
GSM850	Voice/GPRS	1	33.0	24.0
	GPRS	2	31.0	25.0
	GPRS	3	29.0	24.7
	GPRS	4	28.0	25.0
	EGPRS	1	27.5	18.5
	EGPRS	2	25.5	19.5
	EGPRS	3	23.5	19.2
GSM1900	Voice/GPRS	1	30.0	21.0
	GPRS	2	29.0	23.0
	GPRS	3	26.5	22.2
	GPRS	4	25.5	22.5
	EGPRS	1	26.5	17.5
	EGPRS	2	25.0	19.0
	EGPRS	3	23.5	19.2
EGPRS	4	22.0	19.0	

RF Air interface	Mode	Max. RF Output Power (dBm)
W-CDMA Band II	R99	22.5
	HSDPA	22.5
	HSUPA	22.5
	DC-HSDPA	22.5
W-CDMA Band IV	R99	22.5
	HSDPA	22.5
	HSUPA	22.5
	DC-HSDPA	22.5
W-CDMA Band V	R99	24.5
	HSDPA	24.0
	HSUPA	24.0
	DC-HSDPA	24.0

RF Air interface	Mode	Max. RF Output Power (dBm)
LTE Band 2	QPSK	23.0
LTE Band 4	QPSK	22.5
LTE Band 5	QPSK	24.5
LTE Band 17	QPSK	24.5

#### Notes:

1. LTE QPSK configuration has the highest maximum average output power per 3GPP standard.

RF Air interface	Mode	Max. RF Output Power (dBm)	Reduced RF Output Power (dBm)
WiFi 2.4 GHz (Ch. 1~Ch. 11)	802.11b	17.5	14.5
	802.11g	16.5	14.5
	802.11n HT20	15.5	14.5
WiFi 2.4 GHz (Ch. 12~Ch. 13)	802.11b	5.5	
	802.11g	0.5	
	802.11n HT20	0.5	
Bluetooth		10.0	
Bluetooth LE		10.0	

**Note(s):**

This device uses an independent fixed level power reduction mechanism for WLAN operations during voice or VoIP held to ear scenarios. Per FCC Guidance, the held-to-ear exposure conditions were evaluated at reduced power according to the head SAR positions described in IEEE 1528-2013. Detailed descriptions of the power reduction mechanism are included in the operational description.

### 6.4. General LTE SAR Test and Reporting Considerations

Item	Description																																																														
Frequency range, Channel Bandwidth, Numbers and Frequencies	Band 2	Frequency range: 1850 – 1910 MHz																																																													
		Channel Bandwidth																																																													
		20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz																																																								
	Low	18700/ 1860	18675/ 1857.5	18650/ 1855	18625/ 1852.5	18615/ 1851.5	18607/ 1850.7																																																								
	Mid	18900/ 1880	18900/ 1880	18900/ 1880	18900/ 1880	18900/ 1880	18900/ 1880																																																								
	High	19100/ 1900	19125/ 1902.5	19150/ 1905	19175/ 1907.5	19185/ 1908.5	19193/ 1909.3																																																								
	Band 4	Frequency range: 1710 – 1755 MHz																																																													
		Channel Bandwidth																																																													
		20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz																																																								
	Low	20050/ 1720	20025/ 1717.5	20000/ 1715	19975/ 1712.5	19965/ 1711.5	19957/ 1710.7																																																								
	Mid	20175/ 1732.5	20175/ 1732.5	20175/ 1732.5	20175/ 1732.5	20175/ 1732.5	20175/ 1732.5																																																								
	High	20300/ 1745	20325/ 1747.5	20350/ 1750	20375/ 1752.5	20385/ 1753.5	20393/ 1754.3																																																								
	Band 5	Frequency range: 824 – 849 MHz																																																													
		Channel Bandwidth																																																													
		20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz																																																								
	Low			20450/ 829	20425/ 826.5	20415/ 825.5	20407/ 824.7																																																								
	Mid			20525/ 836.5	20525/ 836.5	20525/ 836.5	20525/ 836.5																																																								
	High			20600/ 844	20625/ 846.5	20635/ 847.5	20643/ 848.3																																																								
	Band 17	Frequency range : 704~716 MHz																																																													
		Channel Bandwidth																																																													
	20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz																																																									
Low			23780/ 709	23755/ 706.5																																																											
Mid			23790/ 710	23790/ 710																																																											
High			23800/ 711	23825/ 713.5																																																											
LTE transmitter and antenna implementation	Refer to Appendix A.																																																														
Maximum power reduction (MPR)	<p><b>Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 1, 2 and 3</b></p> <table border="1"> <thead> <tr> <th rowspan="2">Modulation</th> <th colspan="6">Channel bandwidth / Transmission bandwidth (N<sub>RB</sub>)</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> <tr> <td>64 QAM</td> <td>≤ 5</td> <td>≤ 4</td> <td>≤ 8</td> <td>≤ 12</td> <td>≤ 16</td> <td>≤ 18</td> <td>≤ 2</td> </tr> <tr> <td>64 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>≤ 3</td> </tr> <tr> <td>256 QAM</td> <td colspan="6">≥ 1</td> <td>≤ 5</td> </tr> </tbody> </table> <p>MPR Built-in by design                      The manufacturer MPR values are always within the 3GPP maximum MPR allowance but may not follow the default MPR values.                      A-MPR (additional MPR) was disabled during SAR testing</p>	Modulation	Channel bandwidth / Transmission bandwidth (N <sub>RB</sub> )						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	64 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 2	64 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 3	256 QAM	≥ 1						≤ 5
Modulation	Channel bandwidth / Transmission bandwidth (N <sub>RB</sub> )						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																																																								
64 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 2																																																								
64 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 3																																																								
256 QAM	≥ 1						≤ 5																																																								
Power reduction	No																																																														
Spectrum plots for RB configurations	A properly configured base station simulator was used for the SAR and power measurements; therefore, spectrum plots for each RB allocation and offset configuration are not included in the SAR report.																																																														

**Notes:**

- SAR Testing for LTE was performed with the same number of RB and RB offsets transmitting on all TTI frames (maximum TTI).

## 6.5. Power Reduction by Proximity Sensing

### 6.5.1. Proximity Sensor Triggering Distance (KDB 616217 §6.2)

Front of the DUT was placed directly below the flat phantom. The DUT was moved toward the phantom in accordance with the steps outlined in KDB 616217 §6.2 to determine the trigger distance for enabling power reduction. The DUT was moved away from the phantom to determine the trigger distance for resuming full power.

The DUT featured a visual indicator on its display that showed the status of the proximity sensor (Triggered or not triggered). This was used to determine the status of the sensor during the proximity sensor assessment as monitoring the output power directly was not practical without affecting the measurement.

It was confirmed separately that the output power was altered according to the proximity sensor status indication. This was achieved by observing the proximity sensor status at the same time as monitoring the conducted power. Section 9 contains both the full and reduced conducted power measurements.



**Proximity Sensor Trigger Distance Assessment  
KDB 616217 §6.2, Front**

#### LEGEND

- Direction of DUT travel for determination of power reduction triggering point
- Direction of DUT travel for determination of full power resumption triggering point

#### Summary of Trigger Distances

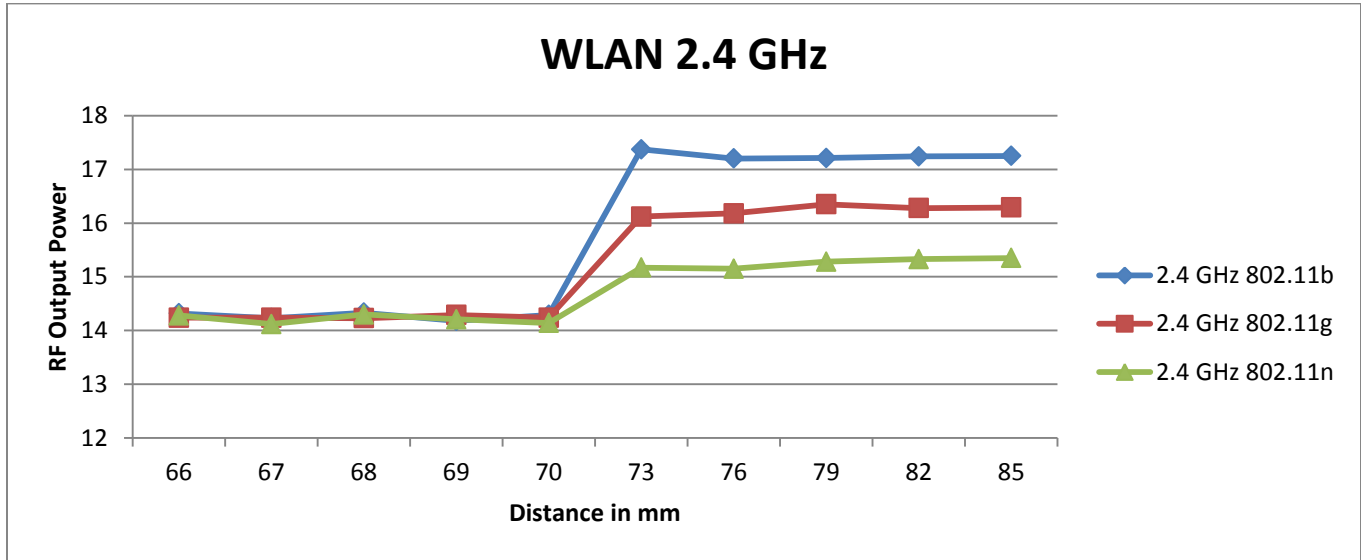
Tissue simulating liquid	Trigger distance - Front	
	Moving toward phantom	Moving from phantom
2450 Head	70 mm	79 mm

**Proximity Sensor Triggering Distance Measurement Results**

**WLAN 2.4 GHz**

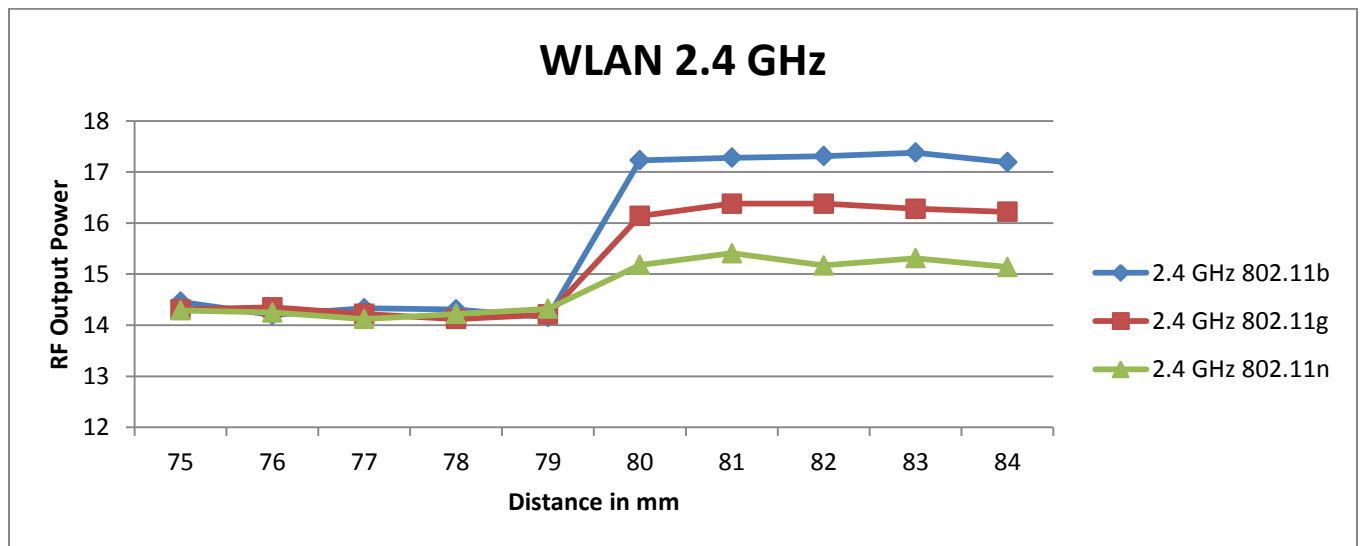
Front, DUT Moving Toward (Trigger) from the Phantom

Distance to DUT vs. Output Power in dBm										
Distance	66	67	68	69	70	73	76	79	82	85
2.4 GHz 802.11b	14.3	14.2	14.3	14.2	14.3	17.4	17.2	17.2	17.2	17.3
2.4 GHz 802.11g	14.2	14.2	14.2	14.3	14.2	16.1	16.2	16.4	16.3	16.3
2.4 GHz 802.11n	14.3	14.1	14.3	14.2	14.1	15.2	15.2	15.3	15.3	15.4



Front, DUT Moving Away (Release) from the Phantom

Distance to DUT vs. Output Power in dBm										
Distance (mm)	75	76	77	78	79	80	81	82	83	84
2.4 GHz 802.11b	14.5	14.2	14.3	14.3	14.2	17.2	17.3	17.3	17.4	17.2
2.4 GHz 802.11g	14.3	14.4	14.2	14.1	14.2	16.1	16.4	16.4	16.3	16.2
2.4 GHz 802.11n	14.3	14.3	14.1	14.2	14.3	15.2	15.4	15.2	15.3	15.1



## 6.5.2. Resulting test positions for SAR measurements

Wireless technologies	DUT Position	§6.2 Triggering Distance	§6.3 Coverage	§6.4 Tilt Angle	Worst case distance for SAR
WLAN	Front	70 mm	N/A	N/A	69 mm

### Notes:

Worst case distance for SAR is not considered for body exposure condition. Because Power reduction is applied only voice or VoIP held to ear scenarios.

## 7. RF Exposure Conditions (Test Configurations)

Refer to Appendix A for the specific details of the antenna-to-antenna and antenna-to-edge(s) distances.

Wireless technologies	RF Exposure Conditions	DUT-to-User Separation	Test Position	Antenna-to-edge/surface	SAR Required	Note
WWAN	Head	0 mm	Left Touch	N/A	Yes	
			Left Tilt (15°)	N/A	Yes	
			Right Touch	N/A	Yes	
			Right Tilt (15°)	N/A	Yes	
	Body	15 mm	Rear	N/A	Yes	
			Front	N/A	Yes	
	Hotspot	10 mm	Rear	< 25 mm	Yes	
			Front	< 25 mm	Yes	
			Edge 1 (Top)	> 25 mm	No	1
			Edge 2 (Right)	< 25 mm	Yes	
WLAN	Head	0 mm	Left Touch	N/A	Yes	
			Left Tilt (15°)	N/A	Yes	
			Right Touch	N/A	Yes	
			Right Tilt (15°)	N/A	Yes	
	Body	15 mm	Rear	N/A	Yes	
			Front	N/A	Yes	
	Hotspot / Wi-Fi Direct	10 mm	Rear	< 25 mm	Yes	
			Front	< 25 mm	Yes	
			Edge 1 (Top)	< 25 mm	Yes	
			Edge 2 (Right)	> 25 mm	No	1
			Edge 3 (Bottom)	> 25 mm	No	1
			Edge 4 (Left)	< 25 mm	Yes	

### Notes:

- SAR is not required because the distance from the antenna to the edge is > 25 mm as per KDB 941225 D06 Hot Spot SAR.
- When Hotspot Mode is not supported, 10-g Phablet SAR is required for all surfaces and edges with an antenna located at ≤ 25 mm from that surface or edge in direct contact with a flat phantom, to address interactive hand use exposure conditions.
- When hotspot mode applies, 10-g Phablet SAR is required only for the surfaces and edges with hotspot mode 1-g reported SAR > 1.2 W/kg. When hotspot mode does not apply, 10-g Phablet SAR is required for all surfaces and Edges within 25mm of the antenna.

## 8. Dielectric Property Measurements & System Check

### 8.1. Dielectric Property Measurements

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.

#### Tissue Dielectric Parameters

FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz

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

#### IEEE Std 1528-2013

Refer to Table 3 within the IEEE Std 1528-2013

**Dielectric Property Measurements Results:**

**SAR 1 Room**

Date	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit ±(%)	
1-29-2018	Head 750	e'	41.9000	Relative Permittivity ( $\epsilon_r$ ):	41.90	41.96	-0.15	5
		e"	21.5800	Conductivity ( $\sigma$ ):	0.90	0.89	0.77	5
	Head 700	e'	42.5900	Relative Permittivity ( $\epsilon_r$ ):	42.59	42.22	0.88	5
		e"	21.8200	Conductivity ( $\sigma$ ):	0.85	0.89	-4.49	5
	Head 790	e'	41.3900	Relative Permittivity ( $\epsilon_r$ ):	41.39	41.76	-0.88	5
		e"	21.3200	Conductivity ( $\sigma$ ):	0.94	0.90	4.50	5
1-29-2018	Body 750	e'	57.7800	Relative Permittivity ( $\epsilon_r$ ):	57.78	55.55	4.02	5
		e"	23.0500	Conductivity ( $\sigma$ ):	0.96	0.96	-0.19	5
	Body 700	e'	58.1900	Relative Permittivity ( $\epsilon_r$ ):	58.19	55.74	4.40	5
		e"	23.6200	Conductivity ( $\sigma$ ):	0.92	0.96	-4.16	5
	Body 790	e'	57.4200	Relative Permittivity ( $\epsilon_r$ ):	57.42	55.39	3.66	5
		e"	22.6700	Conductivity ( $\sigma$ ):	1.00	0.97	3.07	5
1-30-2018	Head 835	e'	40.0400	Relative Permittivity ( $\epsilon_r$ ):	40.04	41.50	-3.52	5
		e"	19.3100	Conductivity ( $\sigma$ ):	0.90	0.90	-0.38	5
	Head 820	e'	40.2300	Relative Permittivity ( $\epsilon_r$ ):	40.23	41.60	-3.30	5
		e"	19.3600	Conductivity ( $\sigma$ ):	0.88	0.90	-1.75	5
	Head 850	e'	39.8500	Relative Permittivity ( $\epsilon_r$ ):	39.85	41.50	-3.98	5
		e"	19.2700	Conductivity ( $\sigma$ ):	0.91	0.92	-0.46	5
2-01-2018	Head 1750	e'	39.7500	Relative Permittivity ( $\epsilon_r$ ):	39.75	40.08	-0.83	5
		e"	13.7000	Conductivity ( $\sigma$ ):	1.33	1.37	-2.62	5
	Head 1710	e'	39.9000	Relative Permittivity ( $\epsilon_r$ ):	39.90	40.15	-0.61	5
		e"	13.6700	Conductivity ( $\sigma$ ):	1.30	1.35	-3.46	5
	Head 1755	e'	39.7300	Relative Permittivity ( $\epsilon_r$ ):	39.73	40.08	-0.87	5
		e"	13.7000	Conductivity ( $\sigma$ ):	1.34	1.37	-2.54	5
2-02-2018	Head 2450	e'	38.5000	Relative Permittivity ( $\epsilon_r$ ):	38.50	39.20	-1.79	5
		e"	13.4000	Conductivity ( $\sigma$ ):	1.83	1.80	1.41	5
	Head 2400	e'	38.6800	Relative Permittivity ( $\epsilon_r$ ):	38.68	39.30	-1.57	5
		e"	13.2500	Conductivity ( $\sigma$ ):	1.77	1.75	0.94	5
	Head 2480	e'	38.3900	Relative Permittivity ( $\epsilon_r$ ):	38.39	39.16	-1.97	5
		e"	13.5000	Conductivity ( $\sigma$ ):	1.86	1.83	1.59	5
2-02-2018	Body 2450	e'	51.4300	Relative Permittivity ( $\epsilon_r$ ):	51.43	52.70	-2.41	5
		e"	14.4200	Conductivity ( $\sigma$ ):	1.96	1.95	0.74	5
	Body 2400	e'	51.5100	Relative Permittivity ( $\epsilon_r$ ):	51.51	52.77	-2.39	5
		e"	14.2900	Conductivity ( $\sigma$ ):	1.91	1.90	0.47	5
	Body 2480	e'	51.3600	Relative Permittivity ( $\epsilon_r$ ):	51.36	52.66	-2.47	5
		e"	14.5000	Conductivity ( $\sigma$ ):	2.00	1.99	0.37	5
2-05-2018	Body 750	e'	54.6700	Relative Permittivity ( $\epsilon_r$ ):	54.67	55.55	-1.58	5
		e"	23.0600	Conductivity ( $\sigma$ ):	0.96	0.96	-0.15	5
	Body 700	e'	55.1100	Relative Permittivity ( $\epsilon_r$ ):	55.11	55.74	-1.13	5
		e"	23.4200	Conductivity ( $\sigma$ ):	0.91	0.96	-4.97	5
	Body 790	e'	54.2800	Relative Permittivity ( $\epsilon_r$ ):	54.28	55.39	-2.01	5
		e"	22.6800	Conductivity ( $\sigma$ ):	1.00	0.97	3.12	5
2-05-2018	Head 1750	e'	39.1700	Relative Permittivity ( $\epsilon_r$ ):	39.17	40.08	-2.28	5
		e"	13.8000	Conductivity ( $\sigma$ ):	1.34	1.37	-1.91	5
	Head 1710	e'	39.3300	Relative Permittivity ( $\epsilon_r$ ):	39.33	40.15	-2.03	5
		e"	13.7300	Conductivity ( $\sigma$ ):	1.31	1.35	-3.04	5
	Head 1755	e'	39.1500	Relative Permittivity ( $\epsilon_r$ ):	39.15	40.08	-2.31	5
		e"	13.8100	Conductivity ( $\sigma$ ):	1.35	1.37	-1.76	5

**SAR 1 Room (Continued)**

Date	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit ±(%)	
2-08-2018	Head 2450	e'	39.6700	Relative Permittivity ( $\epsilon_r$ ):	39.67	39.20	1.20	5
		e"	13.0900	Conductivity ( $\sigma$ ):	1.78	1.80	-0.93	5
	Head 2400	e'	39.8800	Relative Permittivity ( $\epsilon_r$ ):	39.88	39.30	1.48	5
		e"	12.9900	Conductivity ( $\sigma$ ):	1.73	1.75	-1.04	5
	Head 2480	e'	39.5300	Relative Permittivity ( $\epsilon_r$ ):	39.53	39.16	0.94	5
		e"	13.1900	Conductivity ( $\sigma$ ):	1.82	1.83	-0.74	5
2-08-2018	Body 2450	e'	52.9600	Relative Permittivity ( $\epsilon_r$ ):	52.96	52.70	0.49	5
		e"	14.0900	Conductivity ( $\sigma$ ):	1.92	1.95	-1.57	5
	Body 2400	e'	53.1100	Relative Permittivity ( $\epsilon_r$ ):	53.11	52.77	0.64	5
		e"	13.9600	Conductivity ( $\sigma$ ):	1.86	1.90	-1.85	5
	Body 2480	e'	52.8700	Relative Permittivity ( $\epsilon_r$ ):	52.87	52.66	0.39	5
		e"	14.1800	Conductivity ( $\sigma$ ):	1.96	1.99	-1.85	5

**SAR 3 Room**

Date	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit ±(%)	
1-24-2018	Body 835	e'	53.6200	Relative Permittivity (ε <sub>r</sub> ):	53.62	55.20	-2.86	5
		e"	21.7600	Conductivity (σ):	1.01	0.97	4.15	5
	Body 820	e'	53.7700	Relative Permittivity (ε <sub>r</sub> ):	53.77	55.28	-2.73	5
		e"	21.8400	Conductivity (σ):	1.00	0.97	2.82	5
	Body 850	e'	53.4800	Relative Permittivity (ε <sub>r</sub> ):	53.48	55.16	-3.04	5
		e"	21.6900	Conductivity (σ):	1.03	0.99	3.85	5
1-26-2018	Head 1900	e'	40.6200	Relative Permittivity (ε <sub>r</sub> ):	40.62	40.00	1.55	5
		e"	13.4600	Conductivity (σ):	1.42	1.40	1.57	5
	Head 1850	e'	40.8600	Relative Permittivity (ε <sub>r</sub> ):	40.86	40.00	2.15	5
		e"	13.3600	Conductivity (σ):	1.37	1.40	-1.84	5
	Head 1910	e'	40.5500	Relative Permittivity (ε <sub>r</sub> ):	40.55	40.00	1.37	5
		e"	13.4900	Conductivity (σ):	1.43	1.40	2.33	5
1-29-2018	Body 1750	e'	53.7200	Relative Permittivity (ε <sub>r</sub> ):	53.72	53.44	0.52	5
		e"	14.7300	Conductivity (σ):	1.43	1.49	-3.56	5
	Body 1710	e'	53.8500	Relative Permittivity (ε <sub>r</sub> ):	53.85	53.54	0.57	5
		e"	14.7100	Conductivity (σ):	1.40	1.46	-4.30	5
	Body 1755	e'	53.7000	Relative Permittivity (ε <sub>r</sub> ):	53.70	53.43	0.51	5
		e"	14.7300	Conductivity (σ):	1.44	1.49	-3.48	5
1-29-2018	Body 1900	e'	53.1900	Relative Permittivity (ε <sub>r</sub> ):	53.19	53.30	-0.21	5
		e"	14.9200	Conductivity (σ):	1.58	1.52	3.70	5
	Body 1850	e'	53.3800	Relative Permittivity (ε <sub>r</sub> ):	53.38	53.30	0.15	5
		e"	14.8300	Conductivity (σ):	1.53	1.52	0.36	5
	Body 1910	e'	53.1500	Relative Permittivity (ε <sub>r</sub> ):	53.15	53.30	-0.28	5
		e"	14.9500	Conductivity (σ):	1.59	1.52	4.46	5
2-01-2018	Body 1900	e'	53.6200	Relative Permittivity (ε <sub>r</sub> ):	53.62	53.30	0.60	5
		e"	14.8500	Conductivity (σ):	1.57	1.52	3.21	5
	Body 1850	e'	53.7600	Relative Permittivity (ε <sub>r</sub> ):	53.76	53.30	0.86	5
		e"	14.9100	Conductivity (σ):	1.53	1.52	0.90	5
	Body 1910	e'	53.5700	Relative Permittivity (ε <sub>r</sub> ):	53.57	53.30	0.51	5
		e"	14.8700	Conductivity (σ):	1.58	1.52	3.90	5
2-05-2018	Head 750	e'	42.4800	Relative Permittivity (ε <sub>r</sub> ):	42.48	41.96	1.24	5
		e"	21.5800	Conductivity (σ):	0.90	0.89	0.77	5
	Head 700	e'	43.1100	Relative Permittivity (ε <sub>r</sub> ):	43.11	42.22	2.11	5
		e"	21.8300	Conductivity (σ):	0.85	0.89	-4.45	5
	Head 790	e'	41.9600	Relative Permittivity (ε <sub>r</sub> ):	41.96	41.76	0.49	5
		e"	21.2700	Conductivity (σ):	0.93	0.90	4.26	5
2-05-2018	Body 835	e'	53.3500	Relative Permittivity (ε <sub>r</sub> ):	53.35	55.20	-3.35	5
		e"	21.2300	Conductivity (σ):	0.99	0.97	1.62	5
	Body 820	e'	53.4600	Relative Permittivity (ε <sub>r</sub> ):	53.46	55.28	-3.29	5
		e"	21.2700	Conductivity (σ):	0.97	0.97	0.14	5
	Body 850	e'	53.2300	Relative Permittivity (ε <sub>r</sub> ):	53.23	55.16	-3.49	5
		e"	21.2100	Conductivity (σ):	1.00	0.99	1.55	5
2-05-2018	Body 1750	e'	52.0500	Relative Permittivity (ε <sub>r</sub> ):	52.05	53.44	-2.60	5
		e"	14.7500	Conductivity (σ):	1.44	1.49	-3.42	5
	Body 1710	e'	52.1600	Relative Permittivity (ε <sub>r</sub> ):	52.16	53.54	-2.58	5
		e"	14.7000	Conductivity (σ):	1.40	1.46	-4.37	5
	Body 1755	e'	52.0400	Relative Permittivity (ε <sub>r</sub> ):	52.04	53.43	-2.60	5
		e"	14.7500	Conductivity (σ):	1.44	1.49	-3.35	5

**SAR 3 Room (Continued)**

Date	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit ±(%)	
2-05-2018	Head 1900	e'	39.5200	Relative Permittivity ( $\epsilon_r$ ):	39.52	40.00	-1.20	5
		e"	13.6000	Conductivity ( $\sigma$ ):	1.44	1.40	2.63	5
	Head 1850	e'	39.7200	Relative Permittivity ( $\epsilon_r$ ):	39.72	40.00	-0.70	5
		e"	13.5500	Conductivity ( $\sigma$ ):	1.39	1.40	-0.44	5
	Head 1910	e'	39.4800	Relative Permittivity ( $\epsilon_r$ ):	39.48	40.00	-1.30	5
		e"	13.6400	Conductivity ( $\sigma$ ):	1.45	1.40	3.47	5
2-05-2018	Body 1900	e'	51.6200	Relative Permittivity ( $\epsilon_r$ ):	51.62	53.30	-3.15	5
		e"	14.8700	Conductivity ( $\sigma$ ):	1.57	1.52	3.35	5
	Body 1850	e'	51.7400	Relative Permittivity ( $\epsilon_r$ ):	51.74	53.30	-2.93	5
		e"	14.8300	Conductivity ( $\sigma$ ):	1.53	1.52	0.36	5
	Body 1910	e'	51.5800	Relative Permittivity ( $\epsilon_r$ ):	51.58	53.30	-3.23	5
		e"	14.8900	Conductivity ( $\sigma$ ):	1.58	1.52	4.04	5
2-06-2018	Head 835	e'	41.2200	Relative Permittivity ( $\epsilon_r$ ):	41.22	41.50	-0.67	5
		e"	19.5300	Conductivity ( $\sigma$ ):	0.91	0.90	0.75	5
	Head 820	e'	41.4100	Relative Permittivity ( $\epsilon_r$ ):	41.41	41.60	-0.46	5
		e"	19.5900	Conductivity ( $\sigma$ ):	0.89	0.90	-0.59	5
	Head 850	e'	41.0400	Relative Permittivity ( $\epsilon_r$ ):	41.04	41.50	-1.11	5
		e"	19.4800	Conductivity ( $\sigma$ ):	0.92	0.92	0.62	5

## 8.2. System 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 re-measured or sooner when marginal liquid parameters are used at the beginning of a series of measurements.

### System Performance Check Measurement Conditions:

- The measurements were performed in the flat section of the TWIN SAM or ELI phantom, shell thickness: 2.0 ±0.2 mm (bottom plate) filled with Body or Head simulating liquid of the following parameters.
- The depth of tissue-equivalent liquid in a phantom must be ≥ 15.0 cm for SAR measurements ≤ 3 GHz and ≥ 10.0 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 2.5 mm.  
For 5 GHz band - Distance between probe sensors and phantom surface was set to 1.4 mm
- The dipole input power (forward power) was 100 mW.
- The results are normalized to 1 W input power.

### Reference Target SAR Values

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 (W/kg)		
				1g/10g	Head	Body
D750V3	1122	8-30-2016	750	1g	8.32	8.69
				10g	5.41	5.72
D835V2	4d194	7-19-2017	835	1g	9.33	9.30
				10g	6.03	6.09
D1750V2	1125	8-26-2016	1750	1g	36.90	37.20
				10g	19.50	19.80
D1900V2	5d199	2-21-2017	1900	1g	41.30	40.40
				10g	21.40	21.30
D2450V2	960	2-21-2017	2450	1g	52.90	50.90
				10g	24.70	23.80

### Note(s):

Refer to Appendix F that mentioned about justification for Extended SAR Dipole Calibrations (D750V3, SN : 1122 and D1750V2, SN : 1125)

**System Check Results**

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

**SAR 1 Room**

Date Tested	System Dipole		T.S. Liquid	Measured Results		Target (Ref. Value)	Delta $\pm 10\%$	Plot No.	
	Type	Serial #		Zoom Scan to 100 mW	Normalize to 1 W				
1-29-2018	D750V3	1122	Head	1g	0.78	7.81	8.32	-6.13	1,2
				10g	0.52	5.17	5.41	-4.44	
1-29-2018	D750V3	1122	Body	1g	0.87	8.69	8.69	0.00	
				10g	0.58	5.80	5.72	1.40	
1-30-2018	D835V2	4d194	Head	1g	0.96	9.55	9.33	2.36	
				10g	0.63	6.28	6.03	4.15	
2-1-2018	D1750V2	1125	Head	1g	3.51	35.10	36.90	-4.88	
				10g	1.84	18.40	19.50	-5.64	
2-2-2018	D2450V2	960	Head	1g	5.15	51.50	52.90	-2.65	3,4
				10g	2.31	23.10	24.70	-6.48	
2-2-2018	D2450V2	960	Body	1g	5.16	51.60	50.90	1.38	
				10g	2.34	23.40	23.80	-1.68	
2-5-2018	D750V2	1122	Body	1g	0.89	8.88	8.69	2.19	
				10g	0.59	5.92	5.72	3.50	
2-5-2018	D1750V2	1125	Head	1g	3.46	34.60	36.90	-6.23	5,6
				10g	1.82	18.20	19.50	-6.67	
2-8-2018	D2450V2	960	Head	1g	5.19	51.90	52.90	-1.89	
				10g	2.33	23.30	24.70	-5.67	
2-8-2018	D2450V2	960	Body	1g	5.00	50.00	50.90	-1.77	
				10g	2.26	22.60	23.80	-5.04	

**SAR 3 Room**

Date Tested	System Dipole		T.S. Liquid	Measured Results		Target (Ref. Value)	Delta ±10 %	Plot No.	
	Type	Serial #		Zoom Scan to 100 mW	Normalize to 1 W				
1-24-2018	D835V2	4d194	Body	1g	0.99	9.94	9.30	6.88	
				10g	0.65	6.52	6.09	7.06	
1-26-2018	D1900V2	5d199	Head	1g	3.92	39.20	41.30	-5.08	7,8
				10g	2.00	20.00	21.40	-6.54	
1-29-2018	D1750V2	1125	Body	1g	3.64	36.40	37.20	-2.15	
				10g	1.92	19.20	19.80	-3.03	
1-29-2018	D1900V2	5d199	Body	1g	4.22	42.20	40.40	4.46	
				10g	2.15	21.50	21.30	0.94	
2-1-2018	D1900V2	5d199	Body	1g	4.12	41.20	40.40	1.98	
				10g	2.10	21.00	21.30	-1.41	
2-5-2018	D750V3	1122	Head	1g	0.82	8.16	8.32	-1.92	
				10g	0.54	5.39	5.41	-0.37	
2-5-2018	D835V2	4d194	Body	1g	0.96	9.62	9.30	3.44	
				10g	0.63	6.32	6.09	3.78	
2-5-2018	D1750V2	1125	Body	1g	3.60	36.00	37.20	-3.23	
				10g	1.90	19.00	19.80	-4.04	
2-5-2018	D1900V2	5d199	Head	1g	4.01	40.10	41.30	-2.91	
				10g	2.04	20.40	21.40	-4.67	
2-5-2018	D1900V2	5d199	Body	1g	4.02	40.20	40.40	-0.50	
				10g	2.04	20.40	21.30	-4.23	
2-6-2018	D835V2	4d194	Head	1g	1.00	9.99	9.33	7.07	9,10
				10g	0.65	6.54	6.03	8.46	

## 9. Conducted Output Power Measurements

### 9.1. GSM

#### Per KDB 941225 D01 3G SAR Procedures:

SAR test reduction for GPRS and EDGE modes is determined by the source-based time-averaged output power specified for production units, including tune-up tolerance. The data mode with highest specified time-averaged output power should be tested for SAR compliance in the applicable exposure conditions. For modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested.

#### GSM850 Measured Results

Mode	Coding Scheme	Time Slots	Ch No.	Freq. (MHz)	Full Power		
					Burst Pwr (dBm)	Frame Pwr (dBm)	Max. Frame Pwr (dBm)
GSM (Voice)	CS1	1	128	824.4	32.0	23.0	24.0
			190	836.6	32.1	23.0	
			251	848.8	31.9	22.9	
GPRS (GMSK)	CS1	1	128	824.4	32.0	23.0	24.0
			190	836.6	32.0	23.0	
			251	848.8	31.9	22.8	
		2	128	824.4	30.3	24.2	25.0
			190	836.6	30.2	24.2	
			251	848.8	30.3	24.3	
		3	128	824.4	28.8	24.6	24.7
			190	836.6	28.8	24.5	
			251	848.8	28.6	24.3	
		4	128	824.4	27.4	24.4	25.0
			190	836.6	27.6	24.6	
			251	848.8	27.3	24.3	
EGPRS (8PSK)	MCS5	1	128	824.4	26.9	17.9	18.5
			190	836.6	26.9	17.9	
			251	848.8	26.7	17.7	
		2	128	824.4	24.1	18.0	19.5
			190	836.6	24.1	18.0	
			251	848.8	23.8	17.8	
		3	128	824.4	22.3	18.0	19.2
			190	836.6	22.3	18.0	
			251	848.8	22.0	17.8	
		4	128	824.4	21.0	18.0	19.5
			190	836.6	21.1	18.1	
			251	848.8	20.6	17.6	

#### Notes:

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

- GMSK (GPRS) mode with 4 time slots for Max power, based on the Tune-up Procedure. Refer to §6.3.
- SAR is not required for EGPRS (8PSK) mode because the maximum output power and tune-up limit is  $\leq 1/4$ dB higher than GMSK GPRS or the adjusted SAR of the highest reported SAR of GMSK GPRS is  $\leq 1.2$ W/kg.

**GSM1900 Measured Results****Full Power**

Mode	Coding Scheme	Time Slots	Ch No.	Freq. (MHz)	Burst Pwr (dBm)	Frame Pwr (dBm)	Max. Frame Pwr (dBm)
GSM (Voice)	CS1	1	512	1850.2	29.4	20.4	21.0
			661	1880.0	29.4	20.4	
			810	1909.8	29.7	20.7	
GPRS (GMSK)	CS1	1	512	1850.2	29.4	20.4	21.0
			661	1880.0	29.5	20.5	
			810	1909.8	29.6	20.5	
		2	512	1850.2	28.1	22.1	23.0
			661	1880.0	28.3	22.3	
			810	1909.8	28.4	22.4	
		3	512	1850.2	26.2	21.9	22.2
			661	1880.0	26.3	22.0	
			810	1909.8	26.5	22.2	
		4	512	1850.2	24.7	21.7	22.5
			661	1880.0	24.8	21.8	
			810	1909.8	25.5	22.5	
EGPRS (8PSK)	MCS5	1	512	1850.2	25.7	16.7	17.5
			661	1880.0	25.6	16.6	
			810	1909.8	25.6	16.6	
		2	512	1850.2	23.7	17.7	19.0
			661	1880.0	23.7	17.7	
			810	1909.8	23.5	17.5	
		3	512	1850.2	22.4	18.1	19.2
			661	1880.0	22.3	18.1	
			810	1909.8	22.6	18.3	
		4	512	1850.2	20.7	17.7	19.0
			661	1880.0	20.7	17.7	
			810	1909.8	21.0	18.0	

**Notes:**

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

- GMSK (GPRS) mode with 2 time slots for Max power, based on the Tune-up Procedure. Refer to §6.3.
- SAR is not required for EGPRS (8PSK) mode because the maximum output power and tune-up limit is  $\leq 1/4$ dB higher than GMSK GPRS or the adjusted SAR of the highest reported SAR of GMSK GPRS is  $\leq 1.2$ W/kg.

## 9.2. W-CDMA

### Release 99 Setup Procedures used to establish the test signals

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 2
	Rel99 RMC	12.2kbps RMC
	Power Control Algorithm	Algorithm2
	$\beta_c/\beta_d$	8/15

### HSDPA Setup Procedures used to establish the test signals

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	Subtest	HSDPA	HSDPA	HSDPA	HSDPA
		1	2	3	4
W-CDMA General Settings	Loopback Mode	Test Mode 1			
	Rel99 RMC	12.2kbps RMC			
	HSDPA FRC	H-Set 1			
	Power Control Algorithm	Algorithm 2			
	$\beta_c$	2/15	11/15	15/15	15/15
	$\beta_d$	15/15	15/15	8/15	4/15
	Bd (SF)	64			
	$\beta_c/\beta_d$	2/15	11/15	15/8	15/4
	$\beta_{hs}$	4/15	24/15	30/15	30/15
MPR (dB)	0	0	0.5	0.5	
HSDPA Specific Settings	$D_{ACK}$	8			
	$D_{NAK}$	8			
	DCQI	8			
	Ack-Nack repetition factor	3			
	CQI Feedback (Table 5.2B.4)	4ms			
	CQI Repetition Factor (Table 5.2B.4)	2			
$A_{hs}=\beta_{hs}/\beta_c$	30/15				

**HSPA (HSDPA & HSUPA) Setup Procedures used to establish the test signals**

The following 5 Sub-tests were completed according to Release 6 procedures in table C,11.1.3 of 3GPP TS 34.121-1 v13. A summary of these settings are illustrated below:

	Mode	HSPA				
	Subtest	1	2	3	4	5
WCDMA General Settings	Loopback Mode	Test Mode 1				
	Rel99 RMC	12.2 kbps RMC				
	HSDPA FRC	H-Set 1				
	HSUPA Test	HSPA				
	Power Control Algorithm	Algorithm 2				Algorithm 1
	$\beta_c$	11/15	6/15	15/15	2/15	15/15
	$\beta_d$	15/15	15/15	9/15	15/15	0
	$\beta_{ec}$	209/225	12/15	30/15	2/15	5/15
	$\beta_c/\beta_d$	11/15	6/15	15/9	2/15	-
	$\beta_{hs}$	22/15	12/15	30/15	4/15	5/15
	$\beta_{ed}$	1309/225	94/75	47/15	56/75	47/15
CM (dB)	1	3	2	3	1	
MPR (dB)	0	2	1	2	0	
HSDPA Specific Settings	DACK	8				0
	DNAK	8				0
	DCQI	8				0
	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				
HSUPA Specific Settings	E-DPDCCH	6	8	8	5	0
	DHARQ	0	0	0	0	0
	AG Index	20	12	15	17	12
	ETFCI (from 34.121 Table C.11.1.3)	75	67	92	71	67
	Associated Max UL Data Rate kbps	242.1	174.9	482.8	205.8	308.9
	Reference E-TFCIs	5	5	2	5	1
	Reference E-TFCI	11	11	11	11	67
	Reference E-TFCI PO	4	4	4	4	18
	Reference E-TFCI	67	67	92	67	67
	Reference E-TFCI PO	18	18	18	18	18
	Reference E-TFCI	71	71	71	71	71
	Reference E-TFCI PO	23	23	23	23	23
	Reference E-TFCI	75	75	75	75	75
	Reference E-TFCI PO	26	26	26	26	26
	Reference E-TFCI	81	81	81	81	81
Reference E-TFCI PO	27	27	27	27	27	
Maximum Channelization Codes	2xSF2				SF4	

**DC-HSDPA Setup Procedures used to establish the test signals**

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

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

**Table E.5.0: Levels for HSDPA connection setup**

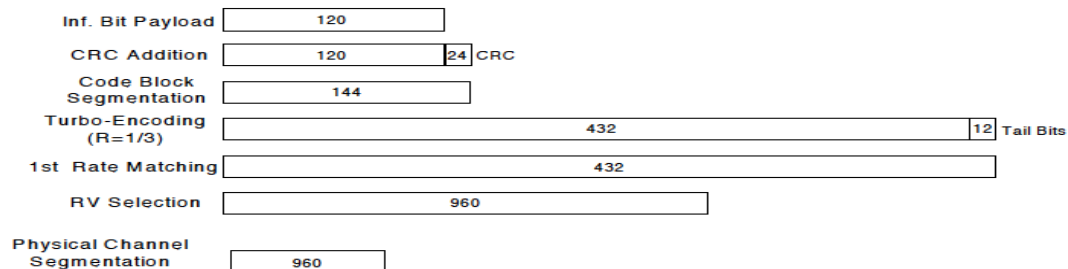
Parameter During Connection setup	Unit	Value
P-CPICH_Ec/Ior	dB	-10
P-CCPCH and SCH_Ec/Ior	dB	-12
PICH_Ec/Ior	dB	-15
HS-PDSCH	dB	off
HS-SCCH_1	dB	off
DPCH_Ec/Ior	dB	-5
OCNS_Ec/Ior	dB	-3.1

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

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

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

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



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

The following 4 Sub-tests for HSDPA were completed according to Release 8 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-Set 12			
	Power Control Algorithm	Algorithm2			
	$\beta_c$	2/15	11/15	15/15	15/15
	$\beta_d$	15/15	15/15	8/15	4/15
	$\beta_d$ (SF)	64			
	$\beta_c/\beta_d$	2/15	11/15	15/8	15/4
	$\beta_{hs}$	4/15	24/15	30/15	30/15
MPR (dB)	0	0	0.5	0.5	
HSDPA Specific Settings	DACK	8			
	DNAK	8			
	DCQI	8			
	Ack-Nack Repetition factor	3			
	CQI Feedback	4ms			
	CQI Repetition Factor	2			
	A <sub>hs</sub> = $\beta_{hs}/\beta_c$	30/15			

**HSPA+**

Since 16QAM is not used for uplink, the uplink Category and release is same as HSUPA, i.e., Rel. 7. Therefore, the RF conducted power is not measured.

**W-CDMA Band II Measured Results**

Band	Mode		UL Ch No.	Freq. (MHz)	MPR (dB)	Max. Meas. Avg Pwr (dBm)
W-CDMA Band II	Rel 99	RMC, 12.2 kbps	9262	1852.4	N/A	22.1
			9400	1880.0	N/A	22.1
			9538	1907.6	N/A	22.1
	HSDPA	Subtest 1	9262	1852.4	0	21.7
			9400	1880.0	0	21.7
			9538	1907.6	0	21.8
		Subtest 2	9262	1852.4	0	21.7
			9400	1880.0	0	21.6
			9538	1907.6	0	21.4
		Subtest 3	9262	1852.4	0.5	21.1
			9400	1880.0	0.5	21.2
			9538	1907.6	0.5	21.3
		Subtest 4	9262	1852.4	0.5	21.4
			9400	1880.0	0.5	21.3
			9538	1907.6	0.5	21.0
	HSUPA	Subtest 1	9262	1852.4	1	20.0
			9400	1880.0	1	20.1
			9538	1907.6	1	20.2
		Subtest 2	9262	1852.4	3	17.8
			9400	1880.0	3	17.8
			9538	1907.6	3	17.9
		Subtest 3	9262	1852.4	1	20.6
			9400	1880.0	1	20.6
			9538	1907.6	1	20.6
		Subtest 4	9262	1852.4	3	18.1
			9400	1880.0	3	18.1
			9538	1907.6	3	18.2
		Subtest 5	9262	1852.4	0	22.0
			9400	1880.0	0	22.0
			9538	1907.6	0	21.9
	DC-HSDPA	Subtest 1	9262	1852.4	0	21.7
			9400	1880.0	0	21.7
			9538	1907.6	0	21.9
		Subtest 2	9262	1852.4	0	21.7
			9400	1880.0	0	21.6
			9538	1907.6	0	21.5
		Subtest 3	9262	1852.4	0.5	20.6
			9400	1880.0	0.5	20.3
			9538	1907.6	0.5	20.1
		Subtest 4	9262	1852.4	0.5	21.4
			9400	1880.0	0.5	21.2
			9538	1907.6	0.5	20.9

**W-CDMA Band IV Measured Results**

Band	Mode		UL Ch No.	Freq. (MHz)	MPR (dB)	Max. Meas. Avg Pwr (dBm)	
W-CDMA Band IV	Rel 99	RMC, 12.2 kbps	1312	1712.4	N/A	22.3	
			1413	1732.6	N/A	22.1	
			1513	1752.6	N/A	22.3	
	HSDPA	Subtest 1	1312	1712.4	0	22.3	
			1413	1732.6	0	22.1	
			1513	1752.6	0	22.2	
		Subtest 2	1312	1712.4	0	22.4	
			1413	1732.6	0	22.1	
			1513	1752.6	0	22.3	
		Subtest 3	1312	1712.4	0	22.2	
			1413	1732.6	0	22.1	
			1513	1752.6	0	22.2	
			1312	1712.4	0	22.2	
			1413	1732.6	0	22.0	
			1513	1752.6	0	22.3	
		HSUPA	Subtest 1	1312	1712.4	0	21.4
				1413	1732.6	0	21.2
				1513	1752.6	0	21.3
	Subtest 2		1312	1712.4	0	21.3	
			1413	1732.6	0	21.2	
			1513	1752.6	0	21.4	
	Subtest 3		1312	1712.4	0	21.4	
			1413	1732.6	0	21.3	
			1513	1752.6	0	21.4	
	Subtest 4		1312	1712.4	0	21.3	
			1413	1732.6	0	21.2	
			1513	1752.6	0	21.3	
	Subtest 5		1312	1712.4	0	22.3	
			1413	1732.6	0	22.1	
			1513	1752.6	0	22.3	
	DC-HSDPA	Subtest 1	1312	1712.4	0	22.3	
			1413	1732.6	0	22.1	
			1513	1752.6	0	22.2	
		Subtest 2	1312	1712.4	0	22.3	
			1413	1732.6	0	22.1	
			1513	1752.6	0	22.2	
		Subtest 3	1312	1712.4	0	22.2	
			1413	1732.6	0	22.0	
			1513	1752.6	0	22.1	
		Subtest 4	1312	1712.4	0	22.2	
			1413	1732.6	0	22.0	
			1513	1752.6	0	22.1	

**W-CDMA Band V Measured Results**

Band	Mode		UL Ch No.	Freq. (MHz)	MPR (dB)	Max. Meas. Avg Pwr (dBm)	
W-CDMA Band V	Rel 99	RMC, 12.2 kbps	4132	826.4	N/A	23.8	
			4183	836.6	N/A	23.8	
			4233	846.6	N/A	23.6	
	HSDPA	Subtest 1	4132	826.4	0	23.9	
			4183	836.6	0	23.9	
			4233	846.6	0	23.7	
		Subtest 2	4132	826.4	0	23.2	
			4183	836.6	0	23.2	
			4233	846.6	0	23.0	
		Subtest 3	4132	826.4	0.5	22.2	
			4183	836.6	0.5	22.3	
			4233	846.6	0.5	22.0	
		Subtest 4	4132	826.4	0.5	22.3	
			4183	836.6	0.5	22.3	
			4233	846.6	0.5	22.0	
		HSUPA	Subtest 1	4132	826.4	2.5	20.0
				4183	836.6	2.5	20.0
				4233	846.6	2.5	20.0
	Subtest 2		4132	826.4	4	18.7	
			4183	836.6	4	18.6	
			4233	846.6	4	18.6	
	Subtest 3		4132	826.4	1	22.2	
			4183	836.6	1	22.3	
			4233	846.6	1	22.0	
	Subtest 4		4132	826.4	4	18.3	
			4183	836.6	4	18.2	
			4233	846.6	4	18.9	
	Subtest 5		4132	826.4	0	23.8	
			4183	836.6	0	23.8	
			4233	846.6	0	23.6	
	DC-HSDPA	Subtest 1	4132	826.4	0	24.0	
			4183	836.6	0	23.8	
			4233	846.6	0	23.7	
		Subtest 2	4132	826.4	0	23.3	
			4183	836.6	0	23.1	
			4233	846.6	0	22.9	
		Subtest 3	4132	826.4	0	22.4	
			4183	836.6	0	22.1	
			4233	846.6	0	22.0	
		Subtest 4	4132	826.4	0	22.4	
			4183	836.6	0	22.2	
			4233	846.6	0	22.0	

### 9.3. LTE

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 1, 2 and 3**

Modulation	Channel bandwidth / Transmission bandwidth (N <sub>RB</sub> )						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
64 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 2
64 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 3
256 QAM	≥ 1						≤ 5

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 Signaling Value of "NS\_01".

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

Network Signalling value	Requirements (subclause)	E-UTRA Band	Channel bandwidth (MHz)	Resources Blocks (N <sub>RB</sub> )	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	N/A
NS_03	6.6.2.2.1	2, 4, 10, 23, 25, 35, 36, 66, 70	3	>5	≤ 1
			5	>6	≤ 1
			10	>6	≤ 1
			15	>8	≤ 1
NS_04	6.6.2.2.2, 6.6.3.3.19	41	5, 10, 15, 20	Table 6.2.4-4, Table 6.2.4-4a	
			10, 15, 20	≥ 50 (NOTE 1)	≤ 1 (NOTE 1)
NS_05	6.6.3.3.1	1	15, 20	Table 6.2.4-18 (NOTE 2)	
			10, 15, 20	≥ 50	≤ 1 (NOTE 1)
			15, 20	Table 6.2.4-18 (NOTE 2)	
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	
NS_08	6.6.3.3.3	19	10, 15	> 44	≤ 3
NS_09	6.6.3.3.4	21	10, 15	> 40	≤ 1
				> 55	≤ 2
NS_10		20	15, 20	Table 6.2.4-3	
NS_11	6.6.2.2.1 6.6.3.3.13	23	1.4, 3, 5, 10, 15, 20	Table 6.2.4-5	
			1.4, 3, 5, 10, 15	Table 6.2.4-6	
NS_13	6.6.3.3.6	26	5	Table 6.2.4-7	
NS_14	6.6.3.3.7	26	10, 15	Table 6.2.4-8	
NS_15	6.6.3.3.8	26	1.4, 3, 5, 10, 15	Table 6.2.4-9 Table 6.2.4-10	
			3, 5, 10	Table 6.2.4-11, Table 6.2.4-12, Table 6.2.4-13	
NS_17	6.6.3.3.10	28	5, 10	Table 5.6-1	N/A
NS_18	6.6.3.3.11	28	5	≥ 2	≤ 1
			10, 15, 20	≥ 1	≤ 4
NS_19	6.6.3.3.12	44	10, 15, 20	Table 6.2.4-14	
NS_20	6.2.2 6.6.2.2.1 6.6.3.3.14	23	5, 10, 15, 20	Table 6.2.4-15	
			5, 10	Table 6.2.4-16	
NS_22	6.6.3.3.16	42, 43	5, 10, 15, 20	Table 6.2.4-17	
NS_23	6.6.3.3.17	42, 43	5, 10, 15, 20	N/A	
NS_24	6.6.3.3.20	65 (NOTE 4)	5, 10, 15, 20	Table 6.2.4-19	
NS_25	6.6.3.3.21	65 (NOTE 4)	5, 10, 15, 20	Table 6.2.4-20	
NS_26	6.6.3.3.22	68	10, 15	Table 6.2.4-21	
NS_27	6.6.2.2.5, 6.6.3.3.23	48	5, 10, 15, 20	Table 6.2.4-22	
NS_28	6.2.2A, 6.6.3.3.24	46 (NOTE 5)	20	Table 6.2.4-23	
			20	Table 6.2.4-24	
NS_29	6.2.2A, 6.6.2.3.1a, 6.6.3.3.25	46 (NOTE 5)	20	Table 6.2.4-24	
			20	Table 6.2.4-25	
NS_31	6.2.2A, 6.6.3.3.27	46 (NOTE 5)	20	Table 6.2.4-26	
NS_32	-	-	-	-	-

NOTE 1: Applicable when the lower edge of the assigned E-UTRA UL channel bandwidth frequency is larger than or equal to the upper edge of PHS band (1915.7 MHz) + 4 MHz + the channel BW assigned, where channel BW is as defined in subclause 5.6. A-MPR for

**LTE Band 2 Measured Results**

Band	BW (MHz)	Mode	RB Allocation	RB offset	Max. Meas. Avg Pwr (dBm)			
					MPR	1860 MHz	1880 MHz	1900 MHz
LTE Band 2	20	QPSK	1	0	0	22.7	22.7	22.9
			1	49	0	22.8	22.7	22.8
			1	99	0	22.8	22.6	22.9
			50	0	1	21.6	21.6	21.8
			50	24	1	21.6	21.5	21.8
			50	50	1	21.6	21.5	21.8
		16QAM	100	0	1	21.6	21.5	21.8
			1	0	1	21.5	21.6	21.8
			1	49	1	21.5	21.5	21.7
			1	99	1	21.6	21.6	21.8
			50	0	2	20.6	20.6	20.7
			50	24	2	20.6	20.5	20.7
			50	50	2	20.6	20.5	20.7
			100	0	2	20.6	20.6	20.8
Band	BW (MHz)	Mode	RB Allocation	RB offset	Max. Meas. Avg Pwr (dBm)			
					MPR	1857.5 MHz	1880 MHz	1902.5 MHz
LTE Band 2	15	QPSK	1	0	0	22.7	22.7	22.9
			1	36	0	22.7	22.7	23.0
			1	74	0	22.7	22.7	23.0
			36	0	1	21.6	21.6	21.9
			36	18	1	21.6	21.6	21.9
			36	37	1	21.6	21.6	21.9
		16QAM	75	0	1	21.6	21.6	21.9
			1	0	1	21.9	21.8	21.8
			1	36	1	21.8	21.7	21.7
			1	74	1	21.9	21.8	21.8
			36	0	2	20.6	20.6	20.8
			36	18	2	20.7	20.5	20.8
			36	37	2	20.7	20.5	20.8
			75	0	2	20.6	20.6	20.8
Band	BW (MHz)	Mode	RB Allocation	RB offset	Max. Meas. Avg Pwr (dBm)			
					MPR	1855 MHz	1880 MHz	1905 MHz
LTE Band 2	10	QPSK	1	0	0	22.6	22.7	22.9
			1	25	0	22.6	22.6	22.9
			1	49	0	22.7	22.6	23.0
			25	0	1	21.5	21.5	21.8
			25	12	1	21.6	21.5	21.8
			25	25	1	21.6	21.5	21.8
		16QAM	50	0	1	21.6	21.5	21.8
			1	0	1	21.7	21.6	21.6
			1	25	1	21.6	21.5	21.6
			1	49	1	21.7	21.4	21.7
			25	0	2	20.6	20.6	20.8
			25	12	2	20.6	20.6	20.8
			25	25	2	20.6	20.6	20.8
			50	0	2	20.5	20.6	20.8

**LTE Band 2 Measured Results (continued)**

Band	BW (MHz)	Mode	RB Allocation	RB offset	Max. Meas. Avg Pwr (dBm)			
					MPR	1852.5 MHz	1880 MHz	1907.5 MHz
LTE Band 2	5	QPSK	1	0	0	22.7	22.5	22.8
			1	12	0	22.7	22.5	22.8
			1	24	0	22.8	22.5	22.8
			12	0	1	21.5	21.6	21.8
			12	6	1	21.5	21.6	21.8
			12	11	1	21.5	21.5	21.8
		16QAM	25	0	1	21.5	21.5	21.8
			1	0	1	21.7	21.4	21.5
			1	12	1	21.7	21.4	21.4
			1	24	1	21.7	21.4	21.5
			12	0	2	20.5	20.6	20.7
			12	6	2	20.5	20.6	20.7
			12	11	2	20.5	20.6	20.7
25	0	2	20.5	20.5	20.8			
Band	BW (MHz)	Mode	RB Allocation	RB offset	Max. Meas. Avg Pwr (dBm)			
					MPR	1851.5 MHz	1880 MHz	1908.5 MHz
LTE Band 2	3	QPSK	1	0	0	22.6	22.7	23.0
			1	7	0	22.6	22.7	23.0
			1	14	0	22.7	22.7	22.9
			8	0	1	21.5	21.5	21.9
			8	4	1	21.5	21.5	21.9
			8	7	1	21.5	21.5	21.9
		16QAM	15	0	1	21.5	21.6	21.8
			1	0	1	21.6	21.7	21.6
			1	7	1	21.9	21.7	21.7
			1	14	1	21.8	21.7	21.6
			8	0	2	20.3	20.5	20.7
			8	4	2	20.4	20.5	20.7
			8	7	2	20.4	20.5	20.7
15	0	2	20.5	20.5	20.7			
Band	BW (MHz)	Mode	RB Allocation	RB offset	Max. Meas. Avg Pwr (dBm)			
					MPR	1850.7 MHz	1880 MHz	1909.3 MHz
LTE Band 2	1.4	QPSK	1	0	0	22.6	22.6	22.9
			1	2	0	22.6	22.6	22.9
			1	5	0	22.6	22.6	23.0
			3	0	0	22.6	22.7	22.9
			3	1	0	22.6	22.7	22.9
			3	2	0	22.6	22.7	22.9
		16QAM	6	0	1	21.5	21.5	21.8
			1	0	1	21.4	21.8	21.7
			1	2	1	21.4	21.7	21.7
			1	5	1	21.4	21.8	21.7
			3	0	1	21.7	21.7	21.7
			3	1	1	21.7	21.7	22.0
			3	2	1	21.6	21.7	22.0
6	0	2	20.5	20.4	20.7			

**LTE Band 4 Measured Results**

Band	BW (MHz)	Mode	RB Allocation	RB offset	Max. Meas. Avg Pwr (dBm)			
					MPR	1720 MHz	1732.5 MHz	1745 MHz
LTE Band 4	20	QPSK	1	0	0		22.2	
			1	49	0		22.1	
			1	99	0		22.1	
			50	0	1		21.1	
			50	24	1		21.1	
			50	50	1		21.1	
		16QAM	100	0	1		21.1	
			1	0	1		21.3	
			1	49	1		21.2	
			1	99	1		21.2	
			50	0	2		20.1	
			50	25	2		20.1	
			50	50	2		20.0	
		100	0	2		20.1		
Band	BW (MHz)	Mode	RB Allocation	RB offset	Max. Meas. Avg Pwr (dBm)			
					MPR	1717.5 MHz	1732.5 MHz	1747.5 MHz
LTE Band 4	15	QPSK	1	0	0	22.5	22.2	22.3
			1	36	0	22.5	22.1	22.3
			1	74	0	22.4	22.1	22.3
			36	0	1	21.4	21.2	21.2
			36	18	1	21.4	21.1	21.2
			36	37	1	21.3	21.1	21.2
			75	0	1	21.4	21.1	21.2
		16QAM	1	0	1	21.5	21.4	21.4
			1	36	1	21.3	21.3	21.4
			1	74	1	21.2	21.2	21.4
			36	0	2	20.4	20.1	20.3
			36	18	2	20.4	20.0	20.3
			36	37	2	20.3	20.0	20.2
			75	0	2	20.3	20.1	20.2
Band	BW (MHz)	Mode	RB Allocation	RB offset	Max. Meas. Avg Pwr (dBm)			
					MPR	1715 MHz	1732.5 MHz	1750 MHz
LTE Band 4	10	QPSK	1	0	0	22.4	22.2	22.3
			1	25	0	22.3	22.1	22.3
			1	49	0	22.5	22.1	22.3
			25	0	1	21.5	21.1	21.3
			25	12	1	21.4	21.1	21.3
			25	25	1	21.4	21.1	21.3
			50	0	1	21.4	21.1	21.3
		16QAM	1	0	1	21.3	21.4	21.0
			1	25	1	21.4	21.4	21.0
			1	49	1	21.3	21.3	21.1
			25	0	2	20.4	20.2	20.3
			25	12	2	20.5	20.1	20.3
			25	25	2	20.4	20.1	20.3
			50	0	2	20.4	20.1	20.3

**LTE Band 4 Measured Results (continued)**

Band	BW (MHz)	Mode	RB Allocation	RB offset	Max. Meas. Avg Pwr (dBm)			
					MPR	1712.5 MHz	1732.5 MHz	1752.5 MHz
LTE Band 4	5	QPSK	1	0	0	22.4	22.0	22.2
			1	12	0	22.4	22.0	22.2
			1	24	0	22.5	22.0	22.2
			12	0	1	21.4	21.1	21.3
			12	6	1	21.4	21.1	21.3
			12	11	1	21.4	21.1	21.3
		16QAM	25	0	1	21.4	21.1	21.3
			1	0	1	21.4	21.0	21.2
			1	12	1	21.4	21.0	21.2
			1	24	1	21.4	21.0	21.2
			12	0	2	20.5	20.2	20.4
			12	6	2	20.4	20.2	20.3
			12	11	2	20.4	20.1	20.3
			25	0	2	20.4	20.1	20.3
Band	BW (MHz)	Mode	RB Allocation	RB offset	Max. Meas. Avg Pwr (dBm)			
					MPR	1711.5 MHz	1732.5 MHz	1753.5 MHz
LTE Band 4	3	QPSK	1	0	0	22.5	22.2	22.2
			1	7	0	22.5	22.1	22.2
			1	14	0	22.5	22.1	22.3
			8	0	1	21.4	21.1	21.3
			8	4	1	21.4	21.1	21.3
			8	7	1	21.4	21.1	21.3
		16QAM	15	0	1	21.4	21.1	21.3
			1	0	1	21.4	20.9	21.4
			1	7	1	21.4	21.0	21.2
			1	14	1	21.5	21.0	21.4
			8	0	2	20.4	20.0	20.1
			8	4	2	20.5	20.0	20.2
			8	7	2	20.5	20.0	20.2
			15	0	2	20.4	20.1	20.3
Band	BW (MHz)	Mode	RB Allocation	RB offset	Max. Meas. Avg Pwr (dBm)			
					MPR	1710.7 MHz	1732.5 MHz	1754.3 MHz
LTE Band 4	1.4	QPSK	1	0	0	22.4	22.1	22.3
			1	2	0	22.4	22.0	22.2
			1	5	0	22.5	22.1	22.3
			3	0	0	22.4	22.1	22.4
			3	1	0	22.4	22.1	22.3
			3	2	0	22.4	22.1	22.3
		16QAM	6	0	1	21.4	21.1	21.4
			1	0	1	21.3	20.9	21.3
			1	2	1	21.3	20.9	21.2
			1	5	1	21.3	20.9	21.2
			3	0	1	21.3	21.0	21.2
			3	1	1	21.5	20.9	21.2
			3	2	1	21.4	20.9	21.2
			6	0	2	20.5	20.0	20.1

**Note(s):**

20 MHz Bandwidths does not support at least three non-overlapping channels in certain channel bandwidths. When a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing per KDB 941225 D05 SAR for LTE Devices

**LTE Band 5 Measured Results**

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Meas. Avg Pwr (dBm)		
						829 MHz	836.5 MHz	844 MHz
LTE Band 5	10	QPSK	1	0	0		24.4	
			1	25	0		24.3	
			1	49	0		24.3	
			25	0	1		23.2	
			25	12	1		23.2	
			25	25	1		23.1	
		16QAM	50	0	1		23.2	
			1	0	1		23.2	
			1	25	1		23.1	
			1	49	1		23.1	
			25	0	2		22.2	
			25	12	2		22.2	
			25	25	2		22.1	
			50	0	2		22.2	
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Meas. Avg Pwr (dBm)		
						826.5 MHz	836.5 MHz	846.5 MHz
LTE Band 5	5	QPSK	1	0	0	24.2	24.1	24.0
			1	12	0	24.2	24.1	24.0
			1	24	0	24.1	24.1	24.0
			12	0	1	23.1	23.2	22.9
			12	7	1	23.1	23.1	22.9
			12	13	1	23.1	23.1	22.9
		16QAM	25	0	1	23.0	23.1	22.9
			1	0	1	23.2	22.8	22.7
			1	12	1	23.2	22.8	22.7
			1	24	1	23.2	22.8	22.7
			12	0	2	22.0	22.2	21.8
			12	7	2	22.0	22.1	21.8
			12	13	2	22.0	22.1	21.8
			25	0	2	22.0	22.2	21.9
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Meas. Avg Pwr (dBm)		
						825.5 MHz	836.5 MHz	847.5 MHz
LTE Band 5	3	QPSK	1	0	0	24.2	24.2	24.2
			1	8	0	24.2	24.2	24.2
			1	14	0	24.2	24.2	24.2
			8	0	1	23.1	23.2	22.9
			8	4	1	23.1	23.1	22.9
			8	7	1	23.1	23.2	22.9
		16QAM	15	0	1	23.0	23.2	22.9
			1	0	1	23.3	23.3	23.1
			1	8	1	23.2	23.2	23.0
			1	14	1	23.3	23.2	23.0
			8	0	2	22.0	22.1	21.7
			8	4	2	22.0	22.0	21.7
			8	7	2	22.0	22.0	21.7
			15	0	2	22.0	22.2	21.8

**LTE Band 5 Measured Results (continued)**

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Meas. Avg Pwr (dBm)		
						824.7 MHz	836.5 MHz	848.3 MHz
LTE Band 5	1.4	QPSK	1	0	0	24.3	24.4	24.1
			1	3	0	24.3	24.4	24.1
			1	5	0	24.3	24.4	24.1
			3	0	0	24.3	24.4	24.2
			3	1	0	24.3	24.4	24.2
			3	3	0	24.3	24.4	24.2
		16QAM	6	0	1	23.1	23.2	23.0
			1	0	1	23.1	23.2	23.2
			1	3	1	23.1	23.2	23.0
			1	5	1	23.2	23.2	23.1
			3	0	1	23.2	23.3	23.1
			3	1	1	23.2	23.3	23.2
			3	3	1	23.2	23.3	23.2
			6	0	2	22.2	22.1	22.1

**Note(s):**

10 MHz Bandwidths does not support at least three non-overlapping channels in certain channel bandwidths. When a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing per KDB 941225 D05 SAR for LTE Devices

**LTE Band 17 Measured Results**

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Meas. Avg Pwr (dBm)
						710 MHz
LTE Band 17	10	QPSK	1	0	0	23.9
			1	25	0	23.8
			1	49	0	23.8
			25	0	1	22.7
			25	12	1	22.7
			25	25	1	22.6
			50	0	1	22.7
		16QAM	1	0	1	22.6
			1	25	1	22.5
			1	49	1	22.5
			25	0	2	21.6
			25	12	2	21.6
			25	25	2	21.6
			50	0	2	21.6
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Meas. Avg Pwr (dBm)
						710 MHz
LTE Band 17	5	QPSK	1	0	0	23.8
			1	12	0	23.8
			1	24	0	23.8
			12	0	1	22.7
			12	7	1	22.7
			12	13	1	22.6
			25	0	1	22.7
		16QAM	1	0	1	22.4
			1	12	1	22.4
			1	24	1	22.4
			12	0	2	21.6
			12	7	2	21.6
			12	13	2	21.5
			25	0	2	21.6

**Note(s):**

10/5 MHz Bandwidths does not support at least three non-overlapping channels in certain channel bandwidths. When a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing per KDB 941225 D05 SAR for LTE Devices

## 9.4. Wi-Fi 2.4 GHz (DTS Band)

### Measured Results (Max Power)

Mode	Data Rate	Ch #	Freq. (MHz)	Meas. Avg Pwr (dBm)	Max Output Power (dBm)	SAR Test (Yes/No)
802.11b	1 Mbps	1	2412	16.9	17.5	Yes
		6	2437	17.1		
		11	2462	17.0		
		12	2467	5.2	5.5	
		13	2472	5.0		
802.11g	6 Mbps	1	2412	Not Require	16.5	No
		6	2437			
		11	2462			
		12	2467		0.5	
		13	2472			
802.11n (HT20)	6.5 Mbps	1	2412	Not Require	15.5	No
		6	2437			
		11	2462			
		12	2467		0.5	
		13	2472			

### Measured Results (Reduction Power)

Mode	Data Rate	Ch #	Freq. (MHz)	Meas. Avg Pwr (dBm)	Max Output Power (dBm)	SAR Test (Yes/No)
802.11b	1 Mbps	1	2412	13.7	14.5	Yes
		6	2437	14.0		
		11	2462	13.9		
		12	2467	5.2	5.5	
		13	2472	5.0		
802.11g	6 Mbps	1	2412	13.6	14.5	No
		6	2437	13.9		
		11	2462	13.8	0.5	
		12	2467	-0.2		
		13	2472	-0.3		
802.11n (HT20)	6.5 Mbps	1	2412	13.6	14.5	No
		6	2437	13.8		
		11	2462	13.6	0.5	
		12	7.05	-0.1		
		13	1.31	-0.6		

### Note(s):

- SAR is not required for 802.11g/n modes when the adjusted SAR for 802.11b is < 1.2 W/kg.
- For "Not required", SAR Test reduction was applied from KDB 248227 guidance, Sec. 2.1, b), 1) when the same maximum power is specified for multiple transmission modes in a frequency band, the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order 802.11a/g/n/ac mode is used for SAR measurement, on the highest measured output power channel in the initial test configuration, for each frequency band. Additional output power measurements were not deemed necessary.
- Additionally, SAR is not required for Channels 12 and 13 because the tune-up limit and the measured output power for these two channels are no greater than those for the default test channels. Refer to §6.3.

### 9.5. Bluetooth

#### Average Power Measured Results

Band (GHz)	Mode	Ch #	Freq. (MHz)	Meas. Avg Pwr (dBm)	Meas. Avg Pwr (mW)
2.4	GFSK	0	2402	8.3	6.77
		39	2441	9.0	7.97
		78	2480	8.3	6.71
	EDR, $\pi/4$ DQPSK	0	2402	4.2	2.61
		39	2441	5.2	3.34
		78	2480	4.6	2.91
	EDR, 8-DPSK	0	2402	4.2	2.63
		39	2441	5.3	3.35
		78	2480	4.7	2.95
	LE, GFSK	0	2402	8.2	6.60
		19	2440	9.3	8.47
		39	2480	6.9	4.90

#### Duty Factor Measured Results

Mode	Type	T on (ms)	Period (ms)	Duty Cycle	Crest Factor (1/duty cycle)
GFSK	DH5	2.885	3.750	76.93%	1.30

### Duty Cycle plots

GFSK



## 10. Measured and Reported (Scaled) SAR Results

### SAR Test Reduction criteria are as follows:

Reported SAR(W/kg) for WWAN= Measured SAR \*Tune-up Scaling Factor

Reported SAR(W/kg) for Wi-Fi and Bluetooth= Measured SAR \* Tune-up scaling factor \* Duty Cycle scaling factor

### KDB 447498 D01 General RF Exposure Guidance:

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

### KDB 648474 D04 Handset SAR:

With headset attached, when the reported SAR for body-worn accessory, measured without a headset connected to the handset, is  $> 1.2$  W/kg, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a headset attached to the handset.

### KDB 648474 D04 Handset SAR (Phablet Only):

When hotspot mode does not apply, 10-g Extremity SAR is required for all surfaces and edges with an antenna located at  $\leq 25$  mm from that surface or edge in direct contact with a flat phantom, to address interactive hand use exposure conditions. When hotspot mode applies, 10-g extremity SAR is required only for the surfaces and edges with hotspot mode 1-g reported SAR  $> 1.2$  W/kg .

Additional 1-g SAR testing at 5 mm is not required when hotspot mode 10-g extremity SAR is not required for the surfaces and edges; since all 1-g reported SAR  $< 1.2$  W/kg.

### KDB 941225 D01 SAR test for 3G devices:

When the maximum output power and tune-up tolerance specified for production units in a secondary mode is  $\leq \frac{1}{4}$  dB higher than the primary mode or when the highest reported SAR of the primary mode is scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode and the adjusted SAR is  $\leq 1.2$  W/kg, SAR measurement is not required for the secondary mode.

### KDB 941225 D05 SAR for LTE Devices:

SAR test reduction is applied using the following criteria:

- Start with the largest channel bandwidth and measure SAR for QPSK with 1 RB, and 50% RB allocation, using the RB offset and required test channel combination with the highest maximum output power among RB offsets at the upper edge, middle and lower edge of each required test channel.
- When the reported SAR is  $> 0.8$  W/kg, testing for other Channels is performed at the highest output power level for 1RB, and 50% RB configuration for that channel.
- Testing for 100% RB configuration is performed at the highest output power level for 100% RB configuration across the Low, Mid and High Channel when the highest reported SAR for 1 RB and 50% RB are  $> 0.8$  W/kg. Testing for the remaining required channels is not needed because the reported SAR for 100% RB Allocation  $< 1.45$  W/kg.
- Testing for 16-QAM modulation is not required because the reported SAR for QPSK is  $< 1.45$  W/Kg and its output power is not more than 0.5 dB higher than that of QPSK.
- Testing for the other channel bandwidths is not required because the reported SAR for the highest channel bandwidth is  $< 1.45$  W/Kg and its output power is not more than 0.5 dB higher than that of the highest channel bandwidth.
- For LTE bands that do not support at least three non-overlapping channels in certain channel bandwidths, test the available non-overlapping channels instead. When a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing; therefore, the requirement for H, M and L channels may not fully apply.

**KDB 248227 D01 SAR meas for 802.11:**

SAR test reduction for 802.11 Wi-Fi transmission mode configurations are considered separately for DSSS and OFDM. An initial test position is determined to reduce the number of tests required for certain exposure configurations with multiple test positions. An initial test configuration is determined for each frequency band and aggregated band according to maximum output power, channel bandwidth, wireless mode configurations and other operating parameters to streamline the measurement requirements. For 2.4 GHz DSSS, either the initial test position or DSSS procedure is applied to reduce the number of SAR tests; these are mutually exclusive. For OFDM, an initial test position is only applicable to next to the ear, UMPC mini-tablet and hotspot mode configurations, which is tested using the initial test configuration to facilitate test reduction. For other exposure conditions with a fixed test position, SAR test reduction is determined using only the initial test configuration.

The multiple test positions require SAR measurements in head, hotspot mode or UMPC mini-tablet configurations may be reduced according to the highest reported SAR determined using the initial test position(s) by applying the DSSS or OFDM SAR measurement procedures in the required wireless mode test configuration(s). The initial test position(s) is measured using the highest measured maximum output power channel in the required wireless mode test configuration(s). When the reported SAR for the initial test position is:

- $\leq 0.4$  W/kg, further SAR measurement is not required for the other test positions in that exposure configuration and wireless mode combination within the frequency band or aggregated band. DSSS and OFDM configurations are considered separately according to the required SAR procedures.
- $> 0.4$  W/kg, SAR is repeated using the same wireless mode test configuration tested in the initial test position to measure the subsequent next closet/smallest test separation distance and maximum coupling test position, on the highest maximum output power channel, until the reported SAR is  $\leq 0.8$  W/kg or all required test positions are tested.
  - For subsequent test positions with equivalent test separation distance or when exposure is dominated by coupling conditions, the position for maximum coupling condition should be tested.
  - When it is unclear, all equivalent conditions must be tested.
- For all positions/configurations tested using the initial test position and subsequent test positions, when the reported SAR is  $> 0.8$  W/kg, measure the SAR for these positions/configurations on the subsequent next highest measured output power channel(s) until the reported SAR is  $\leq 1.2$  W/kg or all required test channels are considered.
  - The additional power measurements required for this step should be limited to those necessary for identifying subsequent highest output power channels to apply the test reduction.
- When the specified maximum output power is the same for both UNII 1 and UNII 2A, begin SAR measurements in UNII 2A with the channel with the highest measured output power. If the reported SAR for UNII 2A is  $\leq 1.2$  W/kg, SAR is not required for UNII 1; otherwise treat the remaining bands separately and test them independently for SAR.
- When the specified maximum output power is different between UNII 1 and UNII 2A, begin SAR with the band that has the higher specified maximum output. If the highest reported SAR for the band with the highest specified power is  $\leq 1.2$  W/kg, testing for the band with the lower specified output power is not required; otherwise test the remaining bands independently for SAR.

To determine the initial test position, Area Scans were performed to determine the position with the *Maximum Value of SAR (measured)*. The position that produced the highest *Maximum Value of SAR* is considered the worst case position; thus used as the initial test position.

**10.1. GSM 850**

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Head (VoIP)	GPRS 4 Slot	0	Left Touch	190	836.6	28.0	27.6	0.479	0.522	1
			Left Tilt	190	836.6	28.0	27.6	0.310	0.338	
			Right Touch	190	836.6	28.0	27.6	0.361	0.393	
			Right Tilt	190	836.6	28.0	27.6	0.279	0.304	
Body-worn	GPRS 4 Slot	15	Rear	190	836.6	28.0	27.6	0.606	0.660	2
			Front	190	836.6	28.0	27.6	0.547	0.596	
Hotspot	GPRS 4 Slot	10	Rear	190	836.6	28.0	27.6	0.702	0.765	
			Front	190	836.6	28.0	27.6	0.609	0.663	
			Edge 2	190	836.6	28.0	27.6	0.380	0.414	
			Edge 3	190	836.6	28.0	27.6	0.474	0.516	
			Edge 4	128	824.2	28.0	27.4	0.868	0.988	3
				190	836.6	28.0	27.6	0.848	0.924	
251	848.8	28.0	27.3	0.634	0.737					

**10.2. GSM1900**

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Head (VoIP)	GPRS 2 Slot	0	Left Touch	661	1880.0	29.0	28.3	0.312	0.368	4
			Left Tilt	661	1880.0	29.0	28.3	0.098	0.116	
			Right Touch	661	1880.0	29.0	28.3	0.137	0.162	
			Right Tilt	661	1880.0	29.0	28.3	0.119	0.140	
Body-worn	GPRS 2 Slot	15	Rear	661	1880.0	29.0	28.3	0.272	0.321	5
			Front	661	1880.0	29.0	28.3	0.207	0.244	
Hotspot	GPRS 2 Slot	10	Rear	661	1880.0	29.0	28.3	0.651	0.768	6
			Front	661	1880.0	29.0	28.3	0.432	0.510	
			Edge 2	661	1880.0	29.0	28.3	0.085	0.100	
			Edge 3	661	1880.0	29.0	28.3	0.176	0.208	
			Edge 4	661	1880.0	29.0	28.3	0.275	0.325	

**10.3. W-CDMA Band II**

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Head	Rel 99 RMC	0	Left Touch	9400	1880.0	22.5	22.1	0.396	0.438	7
			Left Tilt	9400	1880.0	22.5	22.1	0.125	0.138	
			Right Touch	9400	1880.0	22.5	22.1	0.191	0.211	
			Right Tilt	9400	1880.0	22.5	22.1	0.159	0.176	
Bod-worn	Rel 99 RMC	15	Rear	9400	1880.0	22.5	22.1	0.284	0.314	8
			Front	9400	1880.0	22.5	22.1	0.207	0.229	
Hotspot	Rel 99 RMC	10	Rear	9400	1880.0	22.5	22.1	0.670	0.741	9
			Front	9400	1880.0	22.5	22.1	0.486	0.538	
			Edge 2	9400	1880.0	22.5	22.1	0.113	0.125	
			Edge 3	9400	1880.0	22.5	22.1	0.227	0.251	
			Edge 4	9400	1880.0	22.5	22.1	0.333	0.369	

**10.4. W-CDMA Band IV**

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Head	Rel 99 RMC	0	Left Touch	1413	1732.6	22.5	22.1	0.338	0.368	10
			Left Tilt	1413	1732.6	22.5	22.1	0.080	0.087	
			Right Touch	1413	1732.6	22.5	22.1	0.155	0.169	
			Rightt Tilt	1413	1732.6	22.5	22.1	0.078	0.085	
Bod-worn	Rel 99 RMC	15	Rear	1413	1732.6	22.5	22.1	0.373	0.406	11
			Front	1413	1732.6	22.5	22.1	0.250	0.272	
Hotspot	Rel 99 RMC	10	Rear	1413	1732.6	22.5	22.1	0.728	0.793	12
			Front	1413	1732.6	22.5	22.1	0.447	0.487	
			Edge 2	1413	1732.6	22.5	22.1	0.051	0.055	
			Edge 3	1413	1732.6	22.5	22.1	0.151	0.164	
			Edge 4	1413	1732.6	22.5	22.1	0.370	0.403	

**10.5. W-CDMA Band V**

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Head	Rel 99 RMC	0	Left Touch	4183	836.6	24.5	23.8	0.346	0.404	13
			Left Tilt	4183	836.6	24.5	23.8	0.228	0.266	
			Right Touch	4183	836.6	24.5	23.8	0.270	0.315	
			Rightt Tilt	4183	836.6	24.5	23.8	0.203	0.237	
Body-worn	Rel 99 RMC	15	Rear	4183	836.6	24.5	23.8	0.526	0.614	14
			Front	4183	836.6	24.5	23.8	0.458	0.534	
Hotspot	Rel 99 RMC	10	Rear	4183	836.6	24.5	23.8	0.560	0.653	
			Front	4183	836.6	24.5	23.8	0.525	0.613	
			Edge 2	4183	836.6	24.5	23.8	0.289	0.337	
			Edge 3	4183	836.6	24.5	23.8	0.377	0.440	
			Edge 4	4183	836.6	24.5	23.8	0.618	0.721	15

### 10.6. LTE Band 2 (20MHz Bandwidth)

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offset	Power (dBm)		1-g SAR (W/kg)		Plot No.	
								Tune-up limit	Meas.	Meas.	Scaled		
Head	QPSK	0	Left Touch	19100	1900.0	1	99	23.0	22.9	0.389	0.396	16	
						50	0	22.0	21.8	0.348	0.362		
			Left Tilt	19100	1900.0	1	99	23.0	22.9	0.117	0.119		
						50	0	22.0	21.8	0.103	0.107		
			Right Touch	19100	1900.0	1	99	23.0	22.9	0.221	0.225		
						50	0	22.0	21.8	0.175	0.182		
Right Tilt	19100	1900.0	1	99	23.0	22.9	0.152	0.155					
			50	0	22.0	21.8	0.135	0.140					
Body-worn	QPSK	15	Rear	19100	1900.0	1	99	23.0	22.9	0.373	0.379	17	
						50	0	22.0	21.8	0.279	0.290		
			Front	19100	1900.0	1	99	23.0	22.9	0.297	0.302		
						50	0	22.0	21.8	0.238	0.248		
Hotspot	QPSK	10	Rear	19100	18700	1860.0	1	99	23.0	22.8	0.817	0.862	18
					18900	1880.0	1	0	23.0	22.6	0.791	0.864	
					19000	1900.0	1	99	23.0	22.9	0.886	0.901	
					50	0	22.0	21.8	0.637	0.663			
			Front	19100	1900.0	1	99	23.0	22.9	0.578	0.588		
						50	0	22.0	21.8	0.465	0.484		
			Edge 2	19100	1900.0	1	99	23.0	22.9	0.137	0.139		
						50	0	22.0	21.8	0.104	0.108		
			Edge 3	19100	1900.0	1	99	23.0	22.9	0.298	0.303		
						50	0	22.0	21.8	0.201	0.209		
			Edge 4	19100	1900.0	1	99	23.0	22.9	0.427	0.434		
						50	0	22.0	21.8	0.314	0.327		

### 10.7. LTE Band 4 (20MHz Bandwidth)

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offset	Power (dBm)		1-g SAR (W/kg)		Plot No.
								Tune-up limit	Meas.	Meas.	Scaled	
Head	QPSK	0	Left Touch	20175	1732.5	1	0	22.5	22.2	0.357	0.379	19
						50	0	21.5	21.1	0.279	0.304	
			Left Tilt	20175	1732.5	1	0	22.5	22.2	0.113	0.120	
						50	0	21.5	21.1	0.076	0.083	
			Right Touch	20175	1732.5	1	0	22.5	22.2	0.151	0.160	
						50	0	21.5	21.1	0.112	0.122	
Right Tilt	20175	1732.5	1	0	22.5	22.2	0.070	0.074				
			50	0	21.5	21.1	0.052	0.057				
Body-worn	QPSK	15	Rear	20175	1732.5	1	0	22.5	22.2	0.339	0.360	20
						50	0	21.5	21.1	0.272	0.296	
			Front	20175	1732.5	1	0	22.5	22.2	0.241	0.256	
						50	0	21.5	21.1	0.196	0.213	
Hotspot	QPSK	10	Rear	20175	1732.5	1	0	22.5	22.2	0.662	0.702	21
						50	0	21.5	21.1	0.529	0.576	
			Front	20175	1732.5	1	0	22.5	22.2	0.447	0.474	
						50	0	21.5	21.1	0.362	0.394	
			Edge 2	20175	1732.5	1	0	22.5	22.2	0.047	0.050	
						50	0	21.5	21.1	0.037	0.040	
			Edge 3	20175	1732.5	1	0	22.5	22.2	0.136	0.144	
						50	0	21.5	21.1	0.112	0.122	
Edge 4	20175	1732.5	1	0	22.5	22.2	0.323	0.343				
			50	0	21.5	21.1	0.257	0.280				

### 10.8. LTE Band 5 (10MHz Bandwidth)

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offset	Power (dBm)		1-g SAR (W/kg)		Plot No.			
								Tune-up limit	Meas.	Meas.	Scaled				
Head	QPSK	0	Left Touch	20525	836.5	1	0	24.5	24.4	0.309	0.319	22			
						25	0	23.5	23.2	0.305	0.325				
			Left Tilt	20525	836.5	1	0	24.5	24.4	0.177	0.183				
						25	0	23.5	23.2	0.172	0.183				
			Right Touch	20525	836.5	1	0	24.5	24.4	0.242	0.250				
						25	0	23.5	23.2	0.234	0.249				
			Right Tilt	20525	836.5	1	0	24.5	24.4	0.166	0.172				
						25	0	23.5	23.2	0.164	0.175				
			Body-worn	QPSK	15	Rear	20525	836.5	1	0	24.5	24.4	0.480	0.496	23
									25	0	23.5	23.2	0.452	0.481	
Front	20525	836.5				1	0	24.5	24.4	0.416	0.430				
						25	0	23.5	23.2	0.396	0.422				
Hotspot	QPSK	10	Rear	20525	836.5	1	0	24.5	24.4	0.511	0.528				
						25	0	23.5	23.2	0.494	0.526				
			Front	20525	836.5	1	0	24.5	24.4	0.500	0.517				
						25	0	23.5	23.2	0.477	0.508				
			Edge 2	20525	836.5	1	0	24.5	24.4	0.261	0.270				
						25	0	23.5	23.2	0.252	0.268				
			Edge 3	20525	836.5	1	0	24.5	24.4	0.400	0.414				
						25	0	23.5	23.2	0.351	0.374				
			Edge 4	20525	836.5	1	0	24.5	24.4	0.571	0.590	24			
						25	0	23.5	23.2	0.527	0.561				

### 10.9. LTE Band 17 (10MHz Bandwidth)

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offset	Power (dBm)		1-g SAR (W/kg)		Plot No.			
								Tune-up limit	Meas.	Meas.	Scaled				
Head	QPSK	0	Left Touch	23790	710.0	1	0	24.5	23.9	0.081	0.094	25			
						25	0	23.5	22.7	0.096	0.116				
			Left Tilt	23790	710.0	1	0	24.5	23.9	0.043	0.050				
						25	0	23.5	22.7	0.051	0.061				
			Right Touch	23790	710.0	1	0	24.5	23.9	0.061	0.071				
						25	0	23.5	22.7	0.077	0.092				
			Right Tilt	23790	710.0	1	0	24.5	23.9	0.040	0.047				
						25	0	23.5	22.7	0.051	0.061				
			Body-worn	QPSK	15	Rear	23790	710.0	1	0	24.5	23.9	0.136	0.157	26
									25	0	23.5	22.7	0.152	0.184	
Front	23790	710.0				1	0	24.5	23.9	0.120	0.139				
						25	0	23.5	22.7	0.139	0.168				
Hotspot	QPSK	10	Rear	23790	710.0	1	0	24.5	23.9	0.182	0.210	27			
						25	0	23.5	22.7	0.204	0.246				
			Front	23790	710.0	1	0	24.5	23.9	0.161	0.186				
						25	0	23.5	22.7	0.185	0.223				
			Edge 2	23790	710.0	1	0	24.5	23.9	0.061	0.071				
						25	0	23.5	22.7	0.071	0.086				
			Edge 3	23790	710.0	1	0	24.5	23.9	0.081	0.093				
						25	0	23.5	22.7	0.088	0.106				
			Edge 4	23790	710.0	1	0	24.5	23.9	0.115	0.133				
						25	0	23.5	22.7	0.139	0.168				

### 10.10. Wi-Fi (DTS Band)

Frequency Band	Mode	RF Exposure Conditions	PWR Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Power (dBm)		Duty Cycle (%)	1-g SAR (W/kg)		Plot No.
									Tune-up limit	Meas.		Meas.	Scaled	
2.4GHz	802.11b 1 Mbps	Head	On	0	Left Touch	6	2437.0	0.360	14.5	14.0	98.9			
					Left Tilt	6	2437.0	0.324	14.5	14.0	98.9			
					Right Touch	6	2437.0	0.779	14.5	14.0	98.9	0.590	0.673	28
					Right Tilt	6	2437.0	0.558	14.5	14.0	98.9	0.430	0.490	
		Body-worn	Off	15	Rear	6	2437.0	0.136	17.5	17.1	98.9			
					Front	6	2437.0	0.160	17.5	17.1	98.9	0.126	0.140	29
		Hotspot & Wi-Fi Direct	Off	10	Rear	6	2437.0	0.302	17.5	17.1	98.9			
					Front	6	2437.0	0.345	17.5	17.1	98.9	0.281	0.313	30
					Edge 1	6	2437.0	0.186	17.5	17.1	98.9			
					Edge 4	6	2437.0	0.175	17.5	17.1	98.9			

**Note(s):**

1. When the 802.11b reported SAR of the highest measured maximum output power channel is  $\leq 0.8$  W/kg, no further SAR testing is required. If SAR is  $> 0.8$  W/kg and  $\leq 1.2$  W/kg, SAR is required for the next highest measured output power channel. Finally, if SAR is  $> 1.2$  W/kg, SAR is required for the third channel.
2. SAR testing is not required for OFDM mode(s) when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is  $\leq 1.2$  W/kg.

## 10.11. Bluetooth

Frequency Band	Mode	RF Exposure Conditions	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		Duty Cycle (%)	1-g SAR (W/kg)		Plot No.
							Tune-up limit	Meas.		Meas.	Scaled	
2.4GHz	GFSK	Head	0	Left Touch	39	2441.0	10.0	9.0	76.9	0.060	0.098	
				Left Tilt	39	2441.0	10.0	9.0	76.9	0.055	0.090	
				Right Touch	39	2441.0	10.0	9.0	76.9	0.141	0.230	31
				Right Tilt	39	2441.0	10.0	9.0	76.9	0.127	0.207	

### Standalone SAR Test Exclusion Considerations & Estimated SAR

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances  $\leq 50$  mm are determined by:

$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0$ , for 1-g SAR and  $\leq 7.5$  for 10-g extremity SAR, where

- $f_{(\text{GHz})}$  is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison

The test exclusions are applicable only when the minimum test separation distance is  $\leq 50$  mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is  $< 5$  mm, a distance of 5 mm is applied to determine SAR test exclusion.

When the standalone SAR test exclusion is applied to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to following to determine simultaneous transmission SAR test exclusion:

- $(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm}) \cdot [\sqrt{f_{(\text{GHz})}/x}] \text{ W/kg}$  for test separation distances  $\leq 50$  mm;  
where  $x = 7.5$  for 1-g SAR, and  $x = 18.75$  for 10-g SAR.
- 0.4 W/kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the test separation distances is  $> 50$  mm.

### Body-worn Accessory & Hotspot Exposure Conditions

RF Air interface	RF Exposure Conditions	Frequency (GHz)	Max. tune-up tolerance Power		Min. test separation distance (mm)	SAR test exclusion Result*	Estimated 1-g SAR (W/kg)
			(dBm)	(mW)			
Bluetooth	Body-worn	2.480	10.0	10	15	1.0	0.140
	Hotspot	2.480	10.0	10	10	1.6	0.210

#### Conclusion:

\*: The computed value is  $\leq 3$ ; therefore, this qualifies for Standalone SAR test exclusion.

## 11. SAR Measurement Variability

In accordance with published RF Exposure KDB 865664 D01 SAR measurement 100 MHz to 6 GHz. 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  $< 0.8$  or  $2$  W/kg (1-g or 10-g respectively); steps 2) through 4) do not apply.
- 2) When the original highest measured SAR is  $\geq 0.8$  or  $2$  W/kg (1-g or 10-g respectively), 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  $\geq 1.45$  or  $3.6$  W/kg ( $\sim 10\%$  from the 1-g or 10-g respective SAR limit).
- 4) Perform a third repeated measurement only if the original, first, or second repeated measurement is  $\geq 1.5$  or  $3.75$  W/kg (1-g or 10-g respectively) and the ratio of largest to smallest SAR for the original, first and second repeated measurements is  $> 1.20$ .

### Peak spatial-average (1g of tissue)

Frequency Band (MHz)	Air Interface	RF Exposure Conditions	Test Position	Repeated SAR (Yes/No)	Highest Measured SAR (W/kg)	Repeated Measured SAR (W/kg)	Largest to Smallest SAR Ratio
750	LTE Band 17	Hotspot	Rear	No	0.204	N/A	N/A
835	GSM 850	Hotspot	Edge 4	Yes	0.868	0.870	1.00
	WCDMA Band V	Hotspot	Edge 4	No	0.618	N/A	N/A
	LTE Band 5	Hotspot	Edge 4	No	0.571	N/A	N/A
1750	WCDMA Band IV	Hotspot	Rear	No	0.728	N/A	N/A
	LTE Band 4	Hotspot	Rear	No	0.662	N/A	N/A
1900	GSM 1900	Hotspot	Rear	No	0.651	N/A	N/A
	WCDMA Band II	Hotspot	Rear	No	0.670	N/A	N/A
	LTE Band 2	Hotspot	Rear	Yes	0.886	0.897	1.01
2400	Wi-Fi 802.11b/g/n	Head	Right Touch	No	0.590	N/A	N/A
	Bluetooth	Head	Right Touch	No	0.141	N/A	N/A

### Note(s):

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

## 12. Simultaneous Transmission SAR Analysis

KDB 447498 D01 General RF Exposure Guidance 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  $[(x_1-x_2)^2 + (y_1-y_2)^2 + (z_1-z_2)^2]$

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:

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

### Simultaneous Transmission Condition

RF Exposure Condition	Item	Capable Transmit Configurations	
Head	1	GSM(Voice/GPRS)	+ DTS
	2	GSM(Voice/GPRS)	+ BT
	3	W-CDMA	+ DTS
	4	W-CDMA	+ BT
	5	LTE	+ DTS
	6	LTE	+ BT
Body-w orn	7	GSM(Voice/GPRS)	+ DTS
	8	GSM(Voice/GPRS)	+ BT
	9	W-CDMA	+ DTS
	10	W-CDMA	+ BT
	11	LTE	+ DTS
	12	LTE	+ BT
Hotspot	13	GSM(GPRS)	+ DTS
	14	GSM(GPRS)	+ BT
	15	WCDMA	+ DTS
	16	WCDMA	+ BT
	17	LTE	+ DTS
	18	LTE	+ BT

Notes:

1. DTS supports Wi-Fi Direct, Hotspot and VoIP.
2. GPRS, W-CDMA, LTE supports Hotspot and VoIP.
3. DTS Radio cannot transmit simultaneously with Bluetooth Radio.
4. BT tethering is consider about each RF exposure conditions

### 12.1. Sum of the SAR for WWAN & Wi-Fi & BT

RF Exposure conditions	Test Position	① WWAN	② DTS	③ BT	① + ② WWAN + DTS		① + ③ WWAN + BT	
					∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)	∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)
					Head	All Position	0.522	0.673
Body-worn	All Position	0.660	0.140	0.140	0.800	No	0.800	No
Hotspot	All Position	0.988	0.313	0.210	1.301	No	1.198	No

**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.

## **Appendixes**

**Refer to separated files for the following appendixes.**

**4788312281-S1V2 FCC Report SAR\_App A\_Photos & Ant. Locations**

**4788312281-S1V2 FCC Report SAR\_App B\_Highest SAR Test Plots**

**4788312281-S1V2 FCC Report SAR\_App C\_System Check Plots**

**4788312281-S1V2 FCC Report SAR\_App D\_SAR Tissue Ingredients**

**4788312281-S1V2 FCC Report SAR\_App E\_Probe Cal. Certificates**

**4788312281-S1V2 FCC Report SAR\_App F\_Dipole Cal. Certificates**

**END OF REPORT**