SAR EVALUATION REPORT

CLASS II PERMISSIVE CHANGE

FCC 47 CFR § 2.1093
IEEE Std 1528-2013

For
WCDMA/LTE Wrist Device + Bluetooth & WLAN 2.4GHz b/g/n

FCC ID: A3LSMR765U
Model Name: SM-R765T, SM-R765A

Report Number: 4787713126-S1V2
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ACCREDITED

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Revision History

Rev.	Date	Revisions	Revised By
V1	12/12/2016	Initial Issue	Sunghoon.Kim
V2	12/13/2016	Revised Output power of Wi-Fi(DTS) and Bluetooth. -Sec1.2.,Sec 9.3.,Sec 9.4., Sec 10.7., Sec 10.8.,Sec 12.	Sunghoon.Kim

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1. Attestation of Test Results

Applicant Name	SAMSUNG ELECTRONICS CO.,LTD.			
FCC ID	A3LSMR765U			
Model Name	SM-R765T, SM-R765A			
Applicable Standards	FCC 47 CFR § 2.1093 Published RF exposure KDB procedures IEEE Std 1528-2013			
SAR Limits (W/Kg)				
Exposure Category	Peak spatial-average(1g of tissue)		Extremities (hands, wrists, ankles, etc.) (10g of tissue)	
General population / Uncontrolled exposure	1.6		4.0	
The Highest Reported SAR (W/kg)				
RF Exposure Conditions	**Equipment Class**			
	Licensed	**DTS**	**U-NII**	**DSS (BT)**
Next-to-Mouth 1g SAR	0.498	0.215	N/A	0.079
Extremity (Wrist) 10g SAR	1.005	0.269		0.097
Simultaneous TX – Next-to-Mouth 1-g SAR	0.713			0.577
Simultaneous TX – Extremity (Wrist) 10-g SAR	1.274			1.102
Note : This is to request a Class II permissive change for the 16K23793-S1V1, FCC ID A3LSMR765U. Detail of difference refer to C2PC Letter document.				
Date Tested	Original test : 8/8/2016 to 8/26/2016		C2PC test : 12/8/2016 to 12/10/2016	
Test Results	Pass			

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.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL 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.

Approved & Released By:	Prepared By:
Justin Park Senior Engineer UL Korea, Ltd. Suwon Laboratory	Sunghoon Kim Laboratory Engineer UL Korea, Ltd. Suwon Laboratory

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1.1. Introduction

This report referenced from the 16K23793-S1V1, FCC ID A3LSMR765U. (WCDMA Band II, IV, V, LTE Band 2, 4, 5, DTS, Bluetooth)

(FCC 47 CFR § 2.1093, IEEE 1528-2013).

And the applicant takes full responsibility that the test data as referenced in this report represent compliance for this FCC ID..

1.2. Spot Check Verification Data

SM-R765T

Band		Antenna	RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Original models				Modified models				Note
									Power (dBm)		1-g SAR (W/kg)		Power (dBm)		1-g SAR (W/kg)		
									Tune-up limit	Meas.	Meas.	Scaled	Tune-up limit	Meas.	Meas.	Scaled	
DTS	2.4GHz	Wi-Fi/BT	Next to mouth	802.11b	10	Front	6	2437.0	17.5	16.9	0.099	0.114	17.5	16.7	0.160	0.195	
			Extremity	802.11b	0	Rear	6	2437.0	17.5	16.9	0.135	0.156	17.5	16.7	0.203	0.247	
Bluetooth	2.4GHz	Wi-Fi/BT	Next to mouth	GFSK	10	Front	0	2402.0	14.5	14.5	0.028	0.028	14.5	14.5	0.079	0.079	1
			Extremity	GFSK	0	Rear	0	2402.0	14.5	14.5	0.039	0.039	14.5	14.5	0.096	0.097	1

SM-R765A

Band		Antenna	RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Original models				Modified models				Note
									Power (dBm)		1-g SAR (W/kg)		Power (dBm)		1-g SAR (W/kg)		
									Tune-up limit	Meas.	Meas.	Scaled	Tune-up limit	Meas.	Meas.	Scaled	
DTS	2.4GHz	Wi-Fi/BT	Next to mouth	802.11b	10	Front	6	2437.0	17.5	16.9	0.099	0.114	17.5	16.7	0.177	0.215	1
			Extremity	802.11b	0	Rear	6	2437.0	17.5	16.9	0.135	0.156	17.5	16.7	0.221	0.269	1
Bluetooth	2.4GHz	Wi-Fi/BT	Next to mouth	GFSK	10	Front	0	2402.0	14.5	14.5	0.028	0.028	14.5	14.5	0.062	0.062	
			Extremity	GFSK	0	Rear	0	2402.0	14.5	14.5	0.039	0.039	14.5	14.5	0.089	0.090	

Note(s):

1. For each bands, if the highest SAR of the modified devices for worst exposure is larger than the highest SAR for original devices for worst configuration, it change to worst modified SAR result. and also additional exposure was SAR tested if modified SAR is larger than original SAR in worst exposure.

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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
- 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

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.

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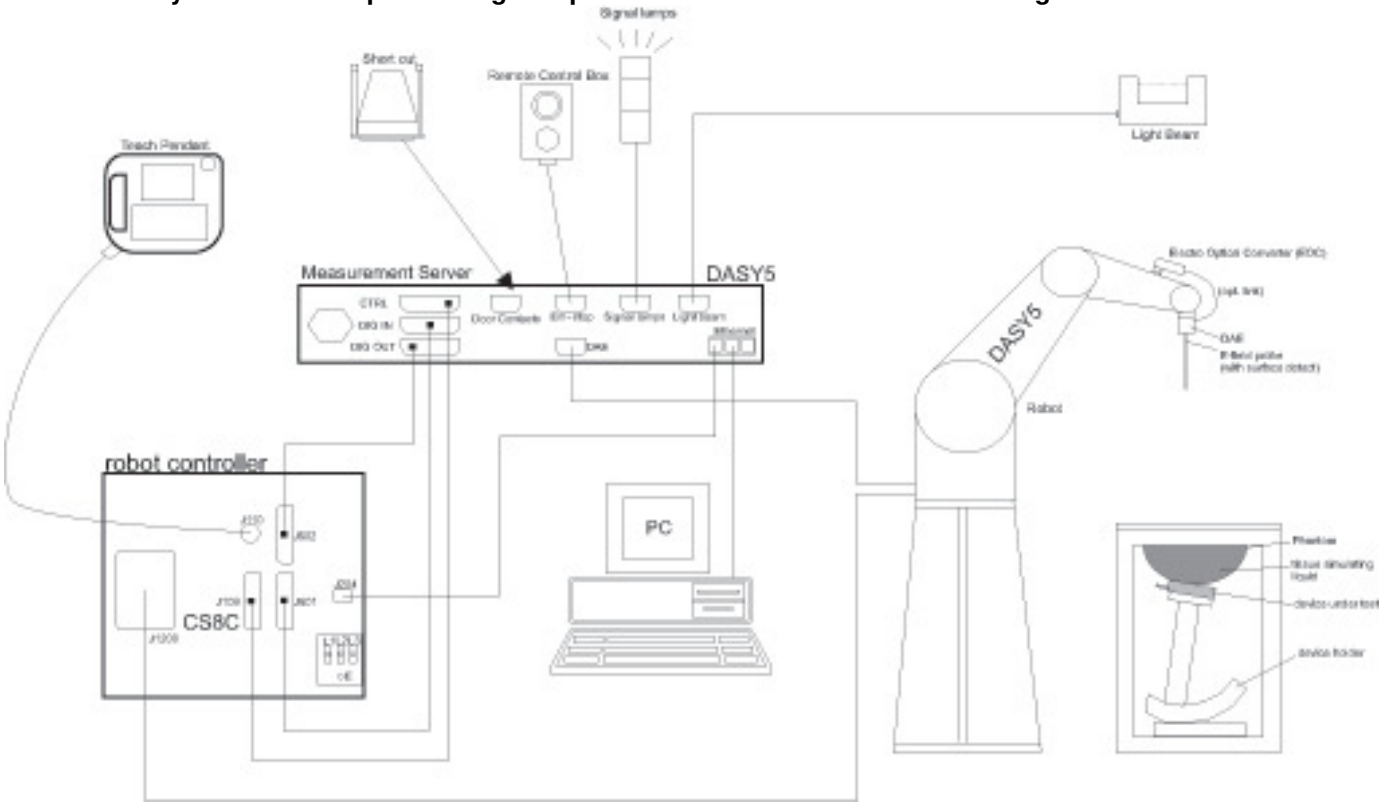
4. SAR Measurement System & Test Equipment

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.

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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	½·δ·ln(2) ± 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: Δx_{Area}, Δy_{Area}	≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
	When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

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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

			≤ 3 GHz	> 3 GHz
Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}			≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm

Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.

* When zoom scan is required and the *reported* SAR from the area scan based *1-g SAR estimation* procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.

Step 4: Power drift measurement

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

Step 5: Z-Scan (FCC only)

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

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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	8-18-2016
				8-18-2017
Dielectric Assessment Kit	SPEAG	DAK-3.5	1196	7-26-2017
Shorting block	SPEAG	DAK-3.5 Short	SM DAK 200 BA	N/A
Thermometer	LKM	DTM3000	3424	8-19-2016
				8-17-2017
Thermometer	Lutron	MHB-382SD	AH.91478	8-12-2016
				8-10-2017

System Check

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
MXG Analog Signal Generator	Agilent	N5181A	MY50145882	8-18-2016
				8-16-2017
Power Sensor	Agilent	U2000A	MY54260010	8-18-2016
				8-17-2017
Power Sensor	Agilent	U2000A	MY54260007	8-18-2016
				8-17-2017
Power Amplifier	EXODUS	1410025-AMP2027-10003	10003	8-18-2016
				8-17-2017
Directional Coupler	Agilent	772D	MY52180193	8-18-2016
				8-17-2017
Directional Coupler	Agilent	778D	MY52180432	8-18-2016
				8-17-2017
Low Pass Filter	MICROLAB	LA-15N	03943	8-18-2016
				8-17-2017
Low Pass Filter	FILTRON	L14012FL	1410003S	8-18-2016
				8-17-2017
Attenuator	Agilent	8491B/003	MY39269292	8-18-2016
				8-17-2017
Attenuator	Agilent	8491B/010	MY39269315	8-18-2016
				8-17-2017
Attenuator	Agilent	8491B/020	MY39269298	8-18-2016
				8-17-2017
E-Field Probe (SAR1)	SPEAG	EX3DV4	7376	8-30-2017
E-Field Probe (SAR2)	SPEAG	EX3DV4	7330	2-24-2017
E-Field Probe (SAR3)	SPEAG	EX3DV4	7313	12-30-2016
E-Field Probe (SAR3)	SPEAG	EX3DV4	7314	9-27-2017
Data Acquisition Electronics (SAR1)	SPEAG	DAE4	1447	9-19-2017
Data Acquisition Electronics (SAR2)	SPEAG	DAE4	912	11-19-2016
Data Acquisition Electronics (SAR2)	SPEAG	DAE4	1468	9-8-2017
Data Acquisition Electronics (SAR3)	SPEAG	DAE4	1494	7-18-2017
System Validation Dipole	SPEAG	D835V2	4d174	9-30-2016
System Validation Dipole	SPEAG	D835V2	4d194	7-20-2017
System Validation Dipole	SPEAG	D1750V2	1125	8-20-2016
				8-26-2017
System Validation Dipole	SPEAG	D1900V2	5d199	2-19-2017

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System Check (Continued)

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
System Validation Dipole	SPEAG	D2450V2	939	9-28-2016
				9-23-2017
Thermometer (SAR1)	Lutron	MHB-382SD	AH.91463	8-10-2017
Thermometer (SAR2)	Lutron	MHB-382SD	AH.50215	8-19-2016
				8-17-2017
Thermometer (SAR3)	Lutron	MHB-382SD	AH.50213	8-24-2016
				8-17-2017

Others

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Base Station Simulator	R & S	CMW500	150313	8-18-2016
				8-16-2017
Base Station Simulator	R & S	CMW500	150314	8-18-2016
				8-16-2017
Bluetooth Tester	TESCOM	TC-3000C	3000C000546	8-18-2016
				8-18-2017

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, the extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval.

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6. Device Under Test (DUT) Information

6.1. DUT Description

Intended Use	This device should be restricted to wrist-worn and no other operation configuration should be used
Device Dimension	Overall (Length x Width): 48.5 mm x 49.0 mm Overall Diagonal: 48.5 mm Display Diagonal: 33.5 mm
Back Cover	☒ The rechargeable battery is not user accessible.
Battery Options	☒ The rechargeable battery is not user accessible.
Wireless Router (Hotspot)	☒ Mobile Hotspot is not supported
Wi-Fi Direct	Wi-Fi Direct enabled devices transfer data directly between each other ☒ Wi-Fi Direct (Wi-Fi 2.4 GHz)
Test sample information	

No.	S/N	Notes	No.	S/N	Notes
1	R3AH700KEAE	Main Conduction	11	R3AH80076HN	SAR(C2PC)
2	R3AH700KEKX	Wi-Fi Conduction	12	R3AH80078JW	SAR(C2PC)
3	R3AH700KEQN	Bluetooth Conduction	13	R3AH800781V	SAR(C2PC)
4	R3AH700KEGM	SAR	14	R3AH8007F1W	SAR(C2PC)
5	R3AH700KEHT	SAR	15	R3AH9009ZMB	SAR(C2PC)
6	R3AH700KEJY	SAR	16	R3AH800B11R	SAR(C2PC)
7	R3AH700KEKX	SAR	17	R3AH800BCKJ	SAR(C2PC)
8	R3AH700KEZZ	SAR			
9	R3AH700KEYL	SAR			
10	R3AH700KEPA	SAR			

6.2. Wireless Technologies

Wireless technologies	Frequency bands	Operating mode	Duty Cycle used for SAR testing
W-CDMA (UMTS)	Band II Band IV Band V	UMTS Rel. 99 (Voice & Data) HSDPA (cat 14) HSUPA (cat 6) HSPA+ (Release 7)	100%
LTE	FDD Band 2 FDD Band 4 FDD Band 5	QPSK 16QAM ☒ Rel. 10 Does not support Carrier Aggregation (CA)	100% (FDD)
	Does this device support SV-LTE (1xRTT-LTE)? ☐ Yes ☒ No		
Wi-Fi	2.4 GHz	802.11b 802.11g 802.11n (HT20)	100%
Bluetooth	2.4 GHz	Version 4.2 LE	76.74 % (DH5)

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6.3. Nominal and Maximum Output Power

KDB 447498 sec.4.1.(3) 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

Upper limit (dB): -1.5 ~ 0.5		Max. RF Output Pow er (dBm)	
RF Air interface	Mode	Target	Max. tune-up tolerance limit
W-CDMA Band V	R99	23.5	**24.0**
	HSDPA	22.0	**22.5**
	HSUPA	21.0	**21.5**
W-CDMA Band IV	R99	22.5	**23.0**
	HSDPA	22.0	**22.5**
	HSUPA	21.0	**21.5**
W-CDMA Band II	R99	22.5	**23.0**
	HSDPA	22.0	**22.5**
	HSUPA	21.0	**21.5**
LTE Band 2	QPSK	22.5	**23.0**
LTE Band 4	QPSK	22.5	**23.0**
LTE Band 5	QPSK	23.0	**23.5**

Upper limit (dB): 0.5		Max. RF Output Pow er (dBm)	
RF Air interface	Mode	Target	Max. tune-up tolerance limit
WiFi 2.4 GHz	802.11b	17.0	**17.5**
	802.11g	15.0	**15.5**
	802.11n HT20	14.0	**14.5**
Bluetooth		14.0	**14.5**
Bluetooth LE		3.0	**3.5**

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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
LTE transmitter and antenna implementation	LTE has 1 Main TX/RX. Refer to Appendix A...						
Maximum power reduction (MPR)	**Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3**						
	Modulation	**Channel bandwidth / Transmission bandwidth (RB)**					**MPR (dB)**
		1.4 MHz	**3.0 MHz**	**5 MHz**	**10 MHz**	**15 MHz**	**20 MHz**
	QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1
	16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
	16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2
	MPR Built-in by design A-MPR (additional MPR) was disabled during SAR testing						
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.						

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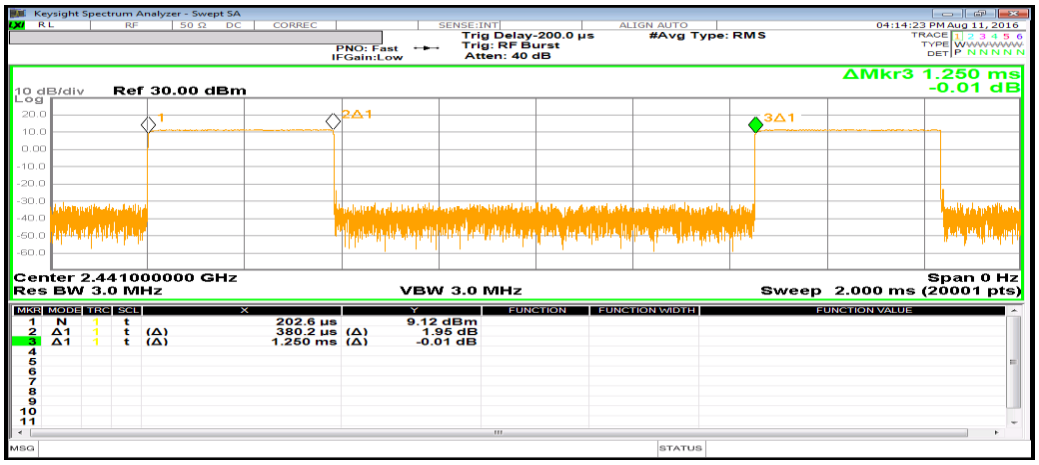
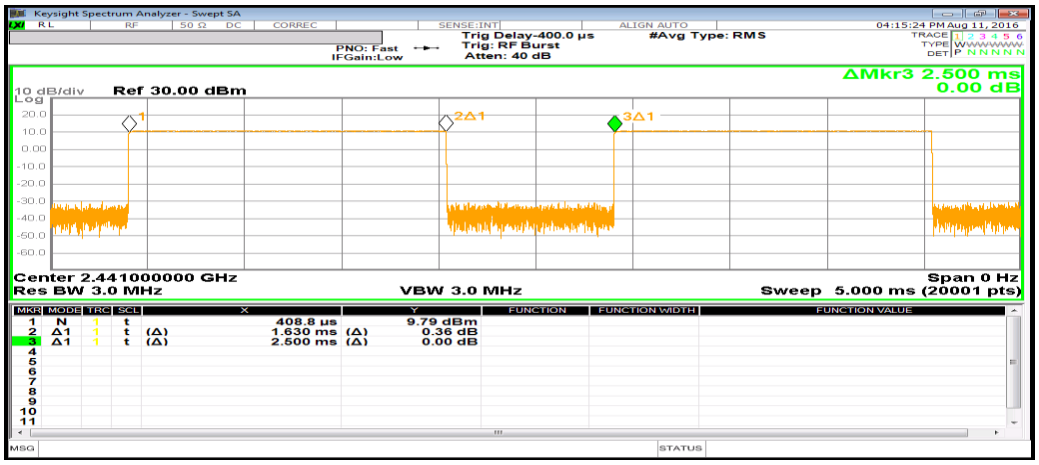
6.5. Bluetooth duty cycle Considerations

Time domain plots

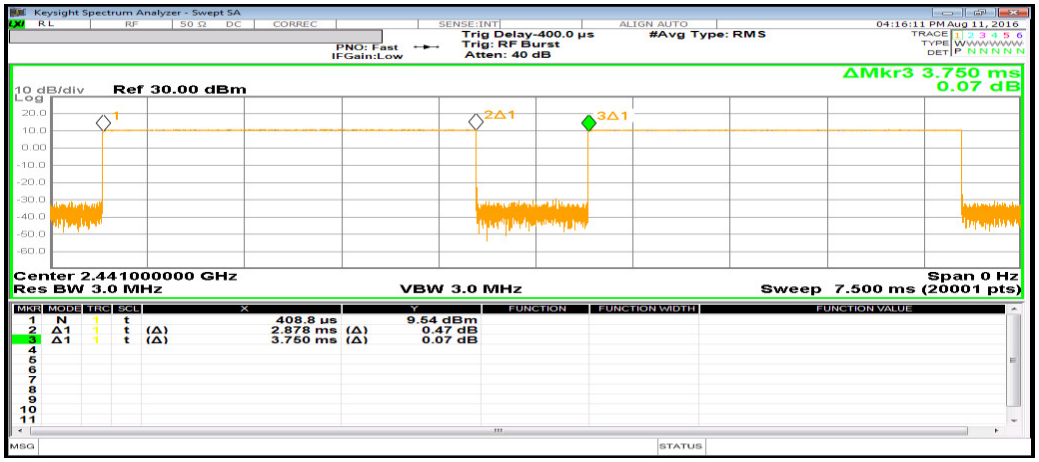
1. DH1 mode (Duty Cycle : (0.380 ms / 1.25 ms)*100 = 30.42 %)



2. DH3 mode (Duty Cycle : (1.63 ms / 2.5 ms)*100 = 65.2 %)



3. DH5 mode (Duty Cycle : (2.878 ms / 3.75 ms)*100 = 76.74 %)



Note(s):

Bluetooth duty cycle was measured using Bluetooth tester equipment with Bluetooth protocol. DH5 mode is highest duty cycle and both Conducted power and SAR test were performed at DH5 mode.

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7. RF Exposure Conditions (Test Configurations)

Refer to "SAR Photos and Ant locations" Appendix 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	Extremity (Hand/Wrist/Ankle)	0 mm	Rear	N/A	Yes	
	Next-to-Mouth	10 mm	Front	N/A	Yes	
WLAN / Bluetooth	Extremity (Hand/Wrist/Ankle)	0 mm	Rear	N/A	Yes	
	Next-to-Mouth	10 mm	Front	N/A	Yes	

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 ± 2°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	
	ε_r	σ (S/m)	ε_r	σ (S/m)
150	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800 – 2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	1.95
3000	38.5	2.40	52.0	2.73
5000	36.2	4.45	49.3	5.07
5100	36.1	4.55	49.1	5.18
5200	36.0	4.66	49.0	5.30
5300	35.9	4.76	48.9	5.42
5400	35.8	4.86	48.7	5.53
5500	35.6	4.96	48.6	5.65
5600	35.5	5.07	48.5	5.77
5700	35.4	5.17	48.3	5.88
5800	35.3	5.27	48.2	6.00

IEEE Std 1528-2013

Refer to Table 3 within the IEEE Std 1528-2013

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Dielectric Property Measurements Results:

SAR 1 Room

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
12-8-2016	Body 1900	e'	52.1400	Relative Permittivity (ε_r):	52.14	53.30	-2.18	5
		e"	14.4300	Conductivity (σ):	1.52	1.52	0.29	5
	Body 1850	e'	52.3000	Relative Permittivity (ε_r):	52.30	53.30	-1.88	5
		e"	14.2600	Conductivity (σ):	1.47	1.52	-3.50	5
	Body 1910	e'	52.1000	Relative Permittivity (ε_r):	52.10	53.30	-2.25	5
		e"	14.4700	Conductivity (σ):	1.54	1.52	1.10	5

SAR 2 Room

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
8-23-2016	Head 2450	e'	37.5800	Relative Permittivity (ε_r):	37.58	39.20	-4.13	5
		e"	13.7100	Conductivity (σ):	1.87	1.80	3.76	5
	Head 2410	e'	37.7400	Relative Permittivity (ε_r):	37.74	39.28	-3.92	5
		e"	13.6100	Conductivity (σ):	1.82	1.76	3.60	5
	Head 2475	e'	37.4700	Relative Permittivity (ε_r):	37.47	39.17	-4.34	5
		e"	13.7800	Conductivity (σ):	1.90	1.83	3.80	5
8-24-2016	Body 2450	e'	52.1500	Relative Permittivity (ε_r):	52.15	52.70	-1.04	5
		e"	14.3800	Conductivity (σ):	1.96	1.95	0.46	5
	Body 2410	e'	52.2500	Relative Permittivity (ε_r):	52.25	52.76	-0.97	5
		e"	14.3000	Conductivity (σ):	1.92	1.91	0.46	5
	Body 2475	e'	52.0800	Relative Permittivity (ε_r):	52.08	52.67	-1.12	5
		e"	14.4600	Conductivity (σ):	1.99	1.99	0.24	5
8-25-2016	Head 835	e'	40.7800	Relative Permittivity (ε_r):	40.78	41.50	-1.73	5
		e"	20.1500	Conductivity (σ):	0.94	0.90	3.95	5
	Head 820	e'	40.9200	Relative Permittivity (ε_r):	40.92	41.60	-1.64	5
		e"	20.2100	Conductivity (σ):	0.92	0.90	2.56	5
	Head 850	e'	40.6500	Relative Permittivity (ε_r):	40.65	41.50	-2.05	5
		e"	20.1100	Conductivity (σ):	0.95	0.92	3.87	5
12-6-2016	Head 835	e'	42.6500	Relative Permittivity (ε_r):	42.65	41.50	2.77	5
		e"	19.6100	Conductivity (σ):	0.91	0.90	1.16	5
	Head 820	e'	42.8100	Relative Permittivity (ε_r):	42.81	41.60	2.90	5
		e"	19.6400	Conductivity (σ):	0.90	0.90	-0.33	5
	Head 850	e'	42.4800	Relative Permittivity (ε_r):	42.48	41.50	2.36	5
		e"	19.5900	Conductivity (σ):	0.93	0.92	1.19	5
12-7-2016	Head 2450	e'	38.2200	Relative Permittivity (ε_r):	38.22	39.20	-2.50	5
		e"	13.6500	Conductivity (σ):	1.86	1.80	3.31	5
	Head 2410	e'	38.3600	Relative Permittivity (ε_r):	38.36	39.28	-2.34	5
		e"	13.5200	Conductivity (σ):	1.81	1.76	2.91	5
	Head 2475	e'	38.1200	Relative Permittivity (ε_r):	38.12	39.17	-2.68	5
		e"	13.7300	Conductivity (σ):	1.89	1.83	3.42	5
12-7-2016	Body 2450	e'	51.8700	Relative Permittivity (ε_r):	51.87	52.70	-1.57	5
		e"	14.8600	Conductivity (σ):	2.02	1.95	3.81	5
	Body 2410	e'	52.0100	Relative Permittivity (ε_r):	52.01	52.76	-1.42	5
		e"	14.6900	Conductivity (σ):	1.97	1.91	3.20	5
	Body 2475	e'	51.7800	Relative Permittivity (ε_r):	51.78	52.67	-1.69	5
		e"	14.9700	Conductivity (σ):	2.06	1.99	3.78	5

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SAR 3 Room

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
8-8-2016	Body 1750	e'	52.1200	Relative Permittivity (ε_r):	52.12	53.44	-2.47	5
		e"	15.0200	Conductivity (σ):	1.46	1.49	-1.66	5
	Body 1710	e'	52.2000	Relative Permittivity (ε_r):	52.20	53.54	-2.51	5
		e"	15.0200	Conductivity (σ):	1.43	1.46	-2.29	5
	Body 1755	e'	52.1300	Relative Permittivity (ε_r):	52.13	53.43	-2.43	5
		e"	15.0400	Conductivity (σ):	1.47	1.49	-1.45	5
8-10-2016	Head 1750	e'	39.6000	Relative Permittivity (ε_r):	39.60	40.08	-1.21	5
		e"	13.6600	Conductivity (σ):	1.33	1.37	-2.91	5
	Head 1710	e'	39.6900	Relative Permittivity (ε_r):	39.69	40.15	-1.14	5
		e"	13.6300	Conductivity (σ):	1.30	1.35	-3.75	5
	Head 1755	e'	39.6100	Relative Permittivity (ε_r):	39.61	40.08	-1.17	5
		e"	13.6700	Conductivity (σ):	1.33	1.37	-2.76	5
8-10-2016	Head 1900	e'	39.0800	Relative Permittivity (ε_r):	39.08	40.00	-2.30	5
		e"	13.8100	Conductivity (σ):	1.46	1.40	4.21	5
	Head 1850	e'	39.3300	Relative Permittivity (ε_r):	39.33	40.00	-1.68	5
		e"	13.8100	Conductivity (σ):	1.42	1.40	1.47	5
	Head 1910	e'	39.0300	Relative Permittivity (ε_r):	39.03	40.00	-2.43	5
		e"	13.7900	Conductivity (σ):	1.46	1.40	4.61	5
8-11-2016	Body 1750	e'	54.6200	Relative Permittivity (ε_r):	54.62	53.44	2.21	5
		e"	14.8100	Conductivity (σ):	1.44	1.49	-3.03	5
	Body 1710	e'	54.7300	Relative Permittivity (ε_r):	54.73	53.54	2.22	5
		e"	14.8200	Conductivity (σ):	1.41	1.46	-3.59	5
	Body 1755	e'	54.6100	Relative Permittivity (ε_r):	54.61	53.43	2.21	5
		e"	14.8000	Conductivity (σ):	1.44	1.49	-3.02	5
8-11-2016	Body 1900	e'	54.2700	Relative Permittivity (ε_r):	54.27	53.30	1.82	5
		e"	15.0000	Conductivity (σ):	1.58	1.52	4.26	5
	Body 1850	e'	54.4100	Relative Permittivity (ε_r):	54.41	53.30	2.08	5
		e"	14.9400	Conductivity (σ):	1.54	1.52	1.11	5
	Body 1910	e'	54.2300	Relative Permittivity (ε_r):	54.23	53.30	1.74	5
		e"	15.0000	Conductivity (σ):	1.59	1.52	4.80	5
8-25-2016	Body 835	e'	55.0700	Relative Permittivity (ε_r):	55.07	55.20	-0.24	5
		e"	21.5200	Conductivity (σ):	1.00	0.97	3.00	5
	Body 820	e'	55.1900	Relative Permittivity (ε_r):	55.19	55.28	-0.16	5
		e"	21.5900	Conductivity (σ):	0.98	0.97	1.64	5
	Body 850	e'	54.9500	Relative Permittivity (ε_r):	54.95	55.16	-0.38	5
		e"	21.4700	Conductivity (σ):	1.01	0.99	2.79	5
12-7-2016	Body 835	e'	53.6100	Relative Permittivity (ε_r):	53.61	55.20	-2.88	5
		e"	21.2600	Conductivity (σ):	0.99	0.97	1.76	5
	Body 820	e'	53.7200	Relative Permittivity (ε_r):	53.72	55.28	-2.82	5
		e"	21.3300	Conductivity (σ):	0.97	0.97	0.42	5
	Body 850	e'	53.5000	Relative Permittivity (ε_r):	53.50	55.16	-3.00	5
		e"	21.2200	Conductivity (σ):	1.00	0.99	1.60	5
12-7-2016	Head 1750	e'	39.5200	Relative Permittivity (ε_r):	39.52	40.08	-1.41	5
		e"	13.5200	Conductivity (σ):	1.32	1.37	-3.90	5
	Head 1710	e'	39.6500	Relative Permittivity (ε_r):	39.65	40.15	-1.24	5
		e"	13.4600	Conductivity (σ):	1.28	1.35	-4.95	5
	Head 1755	e'	39.5100	Relative Permittivity (ε_r):	39.51	40.08	-1.41	5
		e"	13.5200	Conductivity (σ):	1.32	1.37	-3.82	5

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SAR 3 Room (Continued)

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
12-7-2016	Body 1750	e'	54.8100	Relative Permittivity (ε_r):	54.81	53.44	2.56	5
		e"	14.6000	Conductivity (σ):	1.42	1.49	-4.41	5
	Body 1710	e'	54.9100	Relative Permittivity (ε_r):	54.91	53.54	2.55	5
		e"	14.6300	Conductivity (σ):	1.39	1.46	-4.82	5
	Body 1755	e'	54.8000	Relative Permittivity (ε_r):	54.80	53.43	2.57	5
		e"	14.6000	Conductivity (σ):	1.42	1.49	-4.33	5
12-7-2016	Head 1900	e'	39.0400	Relative Permittivity (ε_r):	39.04	40.00	-2.40	5
		e"	13.7700	Conductivity (σ):	1.45	1.40	3.91	5
	Head 1850	e'	39.2100	Relative Permittivity (ε_r):	39.21	40.00	-1.98	5
		e"	13.6800	Conductivity (σ):	1.41	1.40	0.51	5
	Head 1910	e'	39.0100	Relative Permittivity (ε_r):	39.01	40.00	-2.48	5
		e"	13.7900	Conductivity (σ):	1.46	1.40	4.61	5
12-7-2016	Body 1900	e'	54.5500	Relative Permittivity (ε_r):	54.55	53.30	2.35	5
		e"	14.7200	Conductivity (σ):	1.56	1.52	2.31	5
	Body 1850	e'	54.6500	Relative Permittivity (ε_r):	54.65	53.30	2.53	5
		e"	14.6400	Conductivity (σ):	1.51	1.52	-0.92	5
	Body 1910	e'	54.5300	Relative Permittivity (ε_r):	54.53	53.30	2.31	5
		e"	14.7300	Conductivity (σ):	1.56	1.52	2.92	5

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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 3 mm.
  For 5 GHz band - Distance between probe sensors and phantom surface was set to 2.5 mm
- The dipole input power (forward power) was 100 mW.
- The results are normalized to 1 W input power.

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
D835V2	4d174	9-30-2015	835	1g	9.23	9.49
				10g	6.01	6.22
D835V2	4d194	7-20-2016	835	1g	9.52	9.65
				10g	6.22	6.28
D1750V2	1125	8-20-2015	1750	1g	36.70	37.20
				10g	19.50	20.00
D1750V2	1125	8-26-2016	1750	1g	36.90	37.20
				10g	19.50	19.80
D1900V2	5d199	2-19-2016	1900	1g	39.80	39.50
				10g	20.70	20.90
D2450V2	939	9-28-2015	2450	1g	51.60	50.70
				10g	23.90	23.70
D2450V2	939	9-23-2016	2450	1g	52.10	49.90
				10g	24.40	23.70

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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 ±10 %	Plot No.
	Type	Serial #			Zoom Scan to 100 mW	Normalize to 1 W			
12-8-2016	D1900V2	5d199	Body	1g	4.28	42.80	39.50	8.35	1, 2
				10g	2.21	22.10	20.90	5.74	

SAR 2 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			
8-23-2016	D2450V2	939	Head	1g	5.33	53.30	51.60	3.29	3, 4
				10g	2.41	24.10	23.90	0.84	
8-24-2016	D2450V2	939	Body	1g	5.06	50.60	50.70	-0.20	
				10g	2.32	23.20	23.70	-2.11	
8-25-2016	D835V2	4d174	Head	1g	0.99	9.90	9.23	7.26	
				10g	0.65	6.52	6.01	8.49	
12-6-2016	D835V2	4d194	Head	1g	1.03	10.30	9.52	8.19	5, 6
				10g	0.67	6.73	6.22	8.20	
12-7-2016	D2450V2	939	Head	1g	5.49	54.90	52.10	5.37	7, 8
				10g	2.47	24.70	24.40	1.23	
12-7-2016	D2450V2	939	Body	1g	4.83	48.30	49.90	-3.21	
				10g	2.22	22.20	23.70	-6.33	

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			
8-8-2016	D1750V2	1125	Body	1g	3.62	36.20	37.20	-2.69	
				10g	1.92	19.20	20.00	-4.00	
8-10-2016	D1750V2	1125	Head	1g	3.34	33.40	36.70	-8.99	9, 10
				10g	1.79	17.90	19.50	-8.21	
8-10-2016	D1900V2	5d199	Head	1g	3.93	39.30	39.80	-1.26	
				10g	2.02	20.20	20.70	-2.42	
8-11-2016	D1750V2	1125	Body	1g	3.68	36.80	37.20	-1.08	
				10g	1.95	19.50	20.00	-2.50	
8-11-2016	D1900V2	5d199	Body	1g	4.14	41.40	39.50	4.81	11, 12
				10g	2.12	21.20	20.90	1.44	
8-25-2016	D835V2	4d174	Body	1g	1.02	10.20	9.49	7.48	13, 14
				10g	0.67	6.68	6.22	7.40	
12-7-2016	D835V2	4d194	Body	1g	1.01	10.10	9.7	4.66	
				10g	0.66	6.58	6.3	4.78	
12-7-2016	D1750V2	1125	Head	1g	3.42	34.20	36.9	-7.32	15, 16
				10g	1.83	18.30	19.5	-6.15	
12-7-2016	D1750V2	1125	Body	1g	3.58	35.80	37.2	-3.76	
				10g	1.89	18.90	19.8	-4.55	
12-7-2016	D1900V2	5d199	Head	1g	4.03	40.30	39.8	1.26	
				10g	2.07	20.70	20.7	0.00	
12-7-2016	D1900V2	5d199	Body	1g	4.05	40.50	39.50	2.53	
				10g	2.06	20.60	20.90	-1.44	

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9. Conducted Output Power Measurements

9.1. 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
	βc/βd	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	HSDPA	HSDPA	HSDPA	HSDPA
	Subtest	1	2	3	4
W-CDMA General Settings	Loopback Mode	Test Mode 1			
	Rel99 RMC	12.2kbps RMC			
	HSDPA FRC	H-Set 1			
	Power Control Algorithm	Algorithm 2			
	βc	2/15	11/15	15/15	15/15
	βd	15/15	15/15	8/15	4/15
	Bd (SF)	64			
	βc/βd	2/15	11/15	15/8	15/4
	βhs	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			
	Ahs=βhs/βc	30/15			

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

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

	Mode	HSPA				
	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
	βc	11/15	6/15	15/15	2/15	15/15
	βd	15/15	15/15	9/15	15/15	0
	βec	209/225	12/15	30/15	2/15	5/15
	βc/βd	11/15	6/15	15/9	2/15	15/1
	βhs	22/15	12/15	30/15	4/15	5/15
	βed	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				
	Ahs = βhs/βc	30/15				
HSUPA Specific Settings	E-DPDCCH	6	8	8	5	7
	DHARQ	0	0	0	0	0
	AG Index	20	12	15	17	21
	ETFCI (from 34.121 Table C.11.1.3)	75	67	92	71	81
	Associated Max UL Data Rate kbps	242.1	174.9	482.8	205.8	308.9
	Reference E-TFCIs	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

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.

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W-CDMA Band II Measured Results

Band	Mode		UL Ch No.	Freq. (MHz)	MPR (dB)	Max. Pwr (dBm)
W-CDMA Band II	Rel 99	RMC, 12.2 kbps	9262	1852.4	N/A	22.2
			9400	1880.0	N/A	22.3
			9538	1907.6	N/A	22.3
	HSDPA	Subtest 1	9262	1852.4	0	21.2
			9400	1880.0	0	21.2
			9538	1907.6	0	21.2
		Subtest 2	9262	1852.4	0	22.0
			9400	1880.0	0	22.1
			9538	1907.6	0	22.0
		Subtest 3	9262	1852.4	0.5	21.3
			9400	1880.0	0.5	21.3
			9538	1907.6	0.5	21.2
		Subtest 4	9262	1852.4	0.5	20.3
			9400	1880.0	0.5	20.3
			9538	1907.6	0.5	20.3
	HSUPA	Subtest 1	9262	1852.4	0	19.6
			9400	1880.0	0	19.7
			9538	1907.6	0	19.7
		Subtest 2	9262	1852.4	2	18.1
			9400	1880.0	2	18.1
			9538	1907.6	2	18.1
		Subtest 3	9262	1852.4	1	19.2
			9400	1880.0	1	19.2
			9538	1907.6	1	19.2
		Subtest 4	9262	1852.4	2	18.0
			9400	1880.0	2	18.1
			9538	1907.6	2	18.1
		Subtest 5	9262	1852.4	0	21.2
			9400	1880.0	0	21.3
			9538	1907.6	0	21.4

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W-CDMA Band IV Measured Results

Band	Mode		UL Ch No.	Freq. (MHz)	MPR (dB)	Max. Pwr (dBm)
W-CDMA Band IV	Rel 99	RMC, 12.2 kbps	1312	1712.4	N/A	22.2
			1413	1732.6	N/A	22.1
			1513	1752.6	N/A	22.3
	HSDPA	Subtest 1	1312	1712.4	0	21.1
			1413	1732.6	0	21.0
			1513	1752.6	0	21.2
		Subtest 2	1312	1712.4	0	22.1
			1413	1732.6	0	21.9
			1513	1752.6	0	22.2
		Subtest 3	1312	1712.4	0.5	21.3
			1413	1732.6	0.5	21.1
			1513	1752.6	0.5	21.4
		Subtest 4	1312	1712.4	0.5	20.3
			1413	1732.6	0.5	20.1
			1513	1752.6	0.5	20.4
	HSUPA	Subtest 1	1312	1712.4	0	19.6
			1413	1732.6	0	19.5
			1513	1752.6	0	19.7
		Subtest 2	1312	1712.4	2	18.2
			1413	1732.6	2	18.2
			1513	1752.6	2	18.3
		Subtest 3	1312	1712.4	1	19.2
			1413	1732.6	1	19.2
			1513	1752.6	1	19.4
		Subtest 4	1312	1712.4	2	18.2
			1413	1732.6	2	18.3
			1513	1752.6	2	18.3
		Subtest 5	1312	1712.4	0	21.5
			1413	1732.6	0	21.4
			1513	1752.6	0	21.0

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W-CDMA Band V Measured Results

Band	Mode		UL Ch No.	Freq. (MHz)	MPR (dB)	Max. Pwr (dBm)
W-CDMA Band V	Rel 99	RMC, 12.2 kbps	4132	826.4	N/A	23.3
			4183	836.6	N/A	23.2
			4233	846.6	N/A	23.3
	HSDPA	Subtest 1	4132	826.4	0	21.3
			4183	836.6	0	21.2
			4233	846.6	0	21.3
		Subtest 2	4132	826.4	0	22.1
			4183	836.6	0	22.0
			4233	846.6	0	22.1
		Subtest 3	4132	826.4	0.5	21.4
			4183	836.6	0.5	21.3
			4233	846.6	0.5	21.4
		Subtest 4	4132	826.4	0.5	20.4
			4183	836.6	0.5	20.3
			4233	846.6	0.5	20.4
	HSUPA	Subtest 1	4132	826.4	0	19.5
			4183	836.6	0	19.6
			4233	846.6	0	19.7
		Subtest 2	4132	826.4	2	18.0
			4183	836.6	2	18.1
			4233	846.6	2	18.2
		Subtest 3	4132	826.4	1	19.1
			4183	836.6	1	19.2
			4233	846.6	1	19.2
		Subtest 4	4132	826.4	2	18.1
			4183	836.6	2	18.1
			4233	846.6	2	18.2
		Subtest 5	4132	826.4	0	21.4
			4183	836.6	0	21.3
			4233	846.6	0	21.4

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9.2. 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 3

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

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

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

Network Signalling value	Requirements (sub-clause)	E-UTRA Band	Channel bandwidth (MHz)	Resources Blocks (N_{RB})	A-MPR (dB)
NS_01	6.6.2.1.1	Table 5.5-1	1.4, 3, 5, 10, 15, 20	Table 5.6-1	NA
NS_03	6.6.2.2.1	2, 4,10, 23, 25, 35, 36	3	>5	≤ 1
			5	>6	≤ 1
			10	>6	≤ 1
			15	>8	≤ 1
			20	>10	≤ 1
NS_04	6.6.2.2.2	41	5	>6	≤ 1
			10, 15, 20	See Table 6.2.4-4	
NS_05	6.6.3.3.1	1	10,15,20	≥ 50	≤ 1
NS_06	6.6.2.2.3	12, 13, 14, 17	1.4, 3, 5, 10	Table 5.6-1	n/a
NS_07	6.6.2.2.3 6.6.3.3.2	13	10	Table 6.2.4-2	Table 6.2.4-2
NS_08	6.6.3.3.3	19	10, 15	> 44	≤ 3
NS_09	6.6.3.3.4	21	10, 15	> 40	≤ 1
				> 55	≤ 2
NS_10		20	15, 20	Table 6.2.4-3	Table 6.2.4-3
NS_11	6.6.2.2.1	23[1]	1.4, 3, 5, 10	Table 6.2.4-5	Table 6.2.4-5
..					
NS_32	-	-	-	-	-
Note 1: Applies to the lower block of Band 23, i.e. a carrier placed in the 2000-2010 MHz region.					

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LTE Band 2 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)		
						1860 MHz	1880 MHz	1900 MHz
LTE Band 2	20	QPSK	1	0	0	22.7	22.6	22.8
			1	49	0	22.7	22.6	22.9
			1	99	0	22.8	22.9	22.7
			50	0	1	21.6	21.7	21.9
			50	24	1	21.6	21.8	21.9
			50	50	1	21.6	21.9	21.8
			100	0	1	21.6	21.8	21.8
		16QAM	1	0	1	21.4	21.6	22.0
			1	49	1	21.5	21.7	22.0
			1	99	1	21.6	21.8	21.7
			50	0	2	20.6	20.8	20.9
			50	24	2	20.6	20.8	20.9
			50	50	2	20.6	20.9	20.8
			100	0	2	20.6	20.9	20.9
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)		
						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	22.8	22.9	22.8
			1	74	0	22.8	23.0	22.6
			36	0	1	21.6	21.7	21.9
			36	18	1	21.6	21.8	21.8
			36	37	1	21.7	21.8	21.8
			75	0	1	21.7	21.8	21.8
		16QAM	1	0	1	21.5	21.9	21.9
			1	36	1	21.6	22.0	21.8
			1	74	1	21.6	22.0	21.5
			36	0	2	20.6	20.8	20.9
			36	18	2	20.6	20.9	20.8
			36	37	2	20.7	20.9	20.8
			75	0	2	20.7	20.8	20.9
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)		
						1855 MHz	1880 MHz	1905 MHz
LTE Band 2	10	QPSK	1	0	0	22.7	22.7	22.9
			1	25	0	22.6	22.8	22.7
			1	49	0	22.7	22.8	22.6
			25	0	1	21.6	21.7	21.7
			25	12	1	21.5	21.7	21.7
			25	25	1	21.6	21.7	21.6
			50	0	1	21.6	21.7	21.7
		16QAM	1	0	1	21.4	21.9	21.8
			1	25	1	21.4	21.9	21.7
			1	49	1	21.5	22.0	21.6
			25	0	2	20.6	20.7	20.8
			25	12	2	20.6	20.8	20.7
			25	25	2	20.6	20.8	20.7
			50	0	2	20.6	20.7	20.7

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LTE Band 2 Measured Results (continued)

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)		
						1852.5 MHz	1880 MHz	1907.5 MHz
LTE Band 2	5	QPSK	1	0	0	22.8	22.9	22.8
			1	12	0	22.7	22.9	22.8
			1	24	0	22.8	22.9	22.7
			12	0	1	21.6	21.7	21.7
			12	6	1	21.6	21.8	21.7
			12	11	1	21.6	21.8	21.7
			25	0	1	21.6	21.8	21.7
		16QAM	1	0	1	21.5	22.0	21.6
			1	12	1	21.5	22.0	21.6
			1	24	1	21.5	21.6	21.4
			12	0	2	20.6	20.8	20.7
			12	6	2	20.6	20.8	20.7
			12	11	2	20.6	20.8	20.6
			25	0	2	20.7	20.7	20.7

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)		
						1851.5 MHz	1880 MHz	1908.5 MHz
LTE Band 2	3	QPSK	1	0	0	22.7	22.8	22.8
			1	7	0	22.7	22.8	22.7
			1	14	0	22.7	22.9	22.6
			8	0	1	21.6	21.7	21.7
			8	4	1	21.7	21.8	21.7
			8	7	1	21.7	21.8	21.6
			15	0	1	21.7	21.7	21.6
		16QAM	1	0	1	21.5	21.8	21.6
			1	7	1	21.5	21.8	21.6
			1	14	1	21.5	21.9	21.5
			8	0	2	20.7	20.6	20.7
			8	4	2	20.7	20.7	20.7
			8	7	2	20.7	20.7	20.7
			15	0	2	20.6	20.8	20.7

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)		
						1850.7 MHz	1880 MHz	1909.3 MHz
LTE Band 2	1.4	QPSK	1	0	0	22.7	22.6	22.7
			1	2	0	22.7	22.6	22.6
			1	5	0	22.7	22.7	22.6
			3	0	0	22.6	22.6	22.6
			3	1	0	22.6	22.6	22.6
			3	2	0	22.6	22.7	22.6
			6	0	1	21.6	21.7	21.6
		16QAM	1	0	1	21.5	21.7	21.4
			1	2	1	21.5	21.7	21.4
			1	5	1	21.5	21.7	21.4
			3	0	1	21.5	21.7	21.5
			3	1	1	21.5	21.7	21.5
			3	2	1	21.5	21.7	21.5
			6	0	2	20.7	20.6	20.7

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LTE Band 4 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)		
						1720 MHz	1732.5 MHz	1745 MHz
LTE Band 4	20	QPSK	1	0	0		22.7	
			1	49	0		22.6	
			1	99	0		22.9	
			50	0	1		21.5	
			50	24	1		21.5	
			50	50	1		21.5	
			100	0	1		21.5	
		16QAM	1	0	1		21.5	
			1	49	1		21.4	
			1	99	1		21.7	
			50	0	2		20.4	
			50	25	2		20.4	
			50	50	2		20.5	
			100	0	2		20.5	

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)		
						1717.5 MHz	1732.5 MHz	1747.5 MHz
LTE Band 4	15	QPSK	1	0	0	22.8	22.6	22.7
			1	36	0	22.7	22.6	22.7
			1	74	0	22.7	22.7	22.8
			36	0	1	21.6	21.6	21.6
			36	18	1	21.6	21.6	21.7
			36	37	1	21.6	21.6	21.7
			75	0	1	21.6	21.6	21.7
		16QAM	1	0	1	21.5	21.7	21.6
			1	36	1	21.4	21.7	21.7
			1	74	1	21.4	21.8	21.7
			36	0	2	20.6	20.6	20.6
			36	18	2	20.5	20.6	20.6
			36	37	2	20.5	20.6	20.6
			75	0	2	20.5	20.6	20.6

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)		
						1715 MHz	1732.5 MHz	1750 MHz
LTE Band 4	10	QPSK	1	0	0	22.7	22.6	22.8
			1	25	0	22.6	22.6	22.8
			1	49	0	21.5	22.6	22.9
			25	0	1	21.6	21.5	21.6
			25	12	1	21.6	21.5	21.7
			25	25	1	21.5	21.5	21.7
			50	0	1	21.5	21.5	21.7
		16QAM	1	0	1	21.7	21.4	21.8
			1	25	1	21.7	21.3	21.8
			1	49	1	21.6	21.4	21.8
			25	0	2	20.6	20.5	20.6
			25	12	2	20.6	20.5	20.7
			25	25	2	20.5	20.5	20.7
			50	0	2	20.5	20.5	20.6

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LTE Band 4 Measured Results (continued)

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)		
						1712.5 MHz	1732.5 MHz	1752.5 MHz
LTE Band 4	5	QPSK	1	0	0	22.7	22.7	22.7
			1	12	0	22.6	22.6	22.7
			1	24	0	22.6	22.8	22.7
			12	0	1	21.6	21.5	21.7
			12	6	1	21.6	21.5	21.7
			12	11	1	21.5	21.5	21.7
			25	0	1	21.6	21.5	21.7
		16QAM	1	0	1	21.4	21.8	21.5
			1	12	1	21.4	21.7	21.5
			1	24	1	21.4	21.9	21.5
			12	0	2	20.5	20.5	20.6
			12	6	2	20.5	20.4	20.6
			12	11	2	20.5	20.5	20.6
			25	0	2	20.6	20.4	20.6
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)		
						1711.5 MHz	1732.5 MHz	1753.5 MHz
LTE Band 4	3	QPSK	1	0	0	22.6	22.6	22.8
			1	7	0	22.6	22.5	22.7
			1	14	0	22.6	22.5	22.8
			8	0	1	21.5	21.5	21.7
			8	4	1	21.5	21.5	21.7
			8	7	1	21.5	21.5	21.6
			15	0	1	21.5	21.5	21.7
		16QAM	1	0	1	21.3	21.5	21.6
			1	7	1	21.3	21.5	21.4
			1	14	1	21.3	21.5	21.5
			8	0	2	20.5	20.4	20.6
			8	4	2	20.5	20.4	20.6
			8	7	2	20.6	20.3	20.5
			15	0	2	20.4	20.4	20.6
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)		
						1710.7 MHz	1732.5 MHz	1754.3 MHz
LTE Band 4	1.4	QPSK	1	0	0	22.5	22.5	22.8
			1	2	0	22.5	22.4	22.8
			1	5	0	22.5	22.5	22.8
			3	0	0	22.5	22.4	22.7
			3	1	0	22.5	22.3	22.7
			3	2	0	22.6	22.3	22.7
			6	0	1	21.5	21.4	21.7
		16QAM	1	0	1	21.3	21.5	21.5
			1	2	1	21.3	21.5	21.6
			1	5	1	21.4	21.5	21.5
			3	0	1	21.4	21.4	21.7
			3	1	1	21.5	21.5	21.8
			3	2	1	21.5	21.4	21.8
			6	0	2	20.5	20.3	20.7

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

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LTE Band 5 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)		
						829 MHz	836.5 MHz	844 MHz
LTE Band 5	10	QPSK	1	0	0		22.8	
			1	25	0		22.8	
			1	49	0		22.8	
			25	0	1		21.6	
			25	12	1		21.6	
			25	25	1		21.6	
			50	0	1		21.7	
		16QAM	1	0	1		21.9	
			1	25	1		21.8	
			1	49	1		21.8	
			25	0	2		20.7	
			25	12	2		20.7	
			25	25	2		20.7	
			50	0	2		20.6	

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)		
						826.5 MHz	836.5 MHz	846.5 MHz
LTE Band 5	5	QPSK	1	0	0	22.7	22.8	22.7
			1	12	0	22.6	22.7	22.7
			1	24	0	22.7	22.7	22.7
			12	0	1	21.6	21.6	21.6
			12	6	1	21.6	21.6	21.6
			12	11	1	21.6	21.6	21.6
			25	0	1	21.6	21.6	21.6
		16QAM	1	0	1	21.7	21.8	21.4
			1	12	1	21.6	21.7	21.4
			1	24	1	21.6	21.7	21.4
			12	0	2	20.6	20.6	20.6
			12	6	2	20.6	20.6	20.5
			12	11	2	20.6	20.6	20.6
			25	0	2	20.6	20.6	20.6

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)		
						825.5 MHz	836.5 MHz	847.5 MHz
LTE Band 5	3	QPSK	1	0	0	22.6	22.7	22.7
			1	7	0	22.6	22.7	22.7
			1	14	0	22.6	22.7	22.7
			8	0	1	21.6	21.6	21.6
			8	4	1	21.5	21.6	21.6
			8	7	1	21.5	21.6	21.6
			15	0	1	21.5	21.6	21.6
		16QAM	1	0	1	21.4	21.8	21.4
			1	7	1	21.4	21.8	21.4
			1	14	1	21.4	21.8	21.4
			8	0	2	20.6	20.5	20.6
			8	4	2	20.5	20.5	20.7
			8	7	2	20.5	20.5	20.7
			15	0	2	20.5	20.6	20.6

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LTE Band 5 Measured Results (continued)

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)		
						824.7 MHz	836.5 MHz	848.3 MHz
LTE Band 5	1.4	QPSK	1	0	0	22.7	22.6	22.7
			1	2	0	22.7	22.6	22.7
			1	5	0	22.7	22.6	22.7
			3	0	0	22.6	22.5	22.6
			3	1	0	22.6	22.6	22.6
			3	2	0	22.6	22.5	22.6
			6	0	1	21.5	21.6	21.6
		16QAM	1	0	1	21.5	21.7	21.6
			1	2	1	21.5	21.7	21.6
			1	5	1	21.5	21.7	21.6
			3	0	1	21.5	21.6	21.6
			3	1	1	21.5	21.6	21.6
			3	2	1	21.5	21.6	21.6
			6	0	2	20.5	20.5	20.6

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

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9.3. Wi-Fi 2.4GHz (DTS Band)

Measured Results

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Avg Pwr (dBm)	Max Output Power (dBm)	SAR Test (Yes/No)	Note(s)
2.4	802.11b	1 Mbps	1	2412	16.4	17.5	Yes	
			6	2437	16.7			
			11	2462	15.9			
	802.11g	6 Mbps	1	2412	Not PWR Meas. require	15.5	No	1
			6	2437				
			11	2462				
	802.11n (HT20)	6.5 Mbps	1	2412	Not PWR Meas. require	14.5	No	1
			6	2437				
			11	2462				

Note(s):

1. Output Power and SAR is not required for 802.11g/n HT20 channels 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 ≤ 1.2 W/kg.

9.4. Bluetooth

Measured Results

Band (GHz)	Mode	Ch #	Freq. (MHz)	Avg Pwr (dBm)
2.4	V3.0 + BDR, GFSK	0	2402	14.5
		39	2441	13.5
		78	2480	13.4
	V3.0 + EDR, π/4 DQPSK	0	2402	9.1
		39	2441	7.7
		78	2480	7.8
	V3.0 + EDR, 8-DPSK	0	2402	9.1
		39	2441	7.8
		78	2480	7.9
	V4.0 LE, GFSK	0	2402	2.5
		19	2440	2.9
		39	2480	1.9

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10. Measured and Reported (Scaled) SAR Results

SAR Test Reduction criteria are as follows:

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:

- ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
- ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
- ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz

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 ≤ ¼ 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 ≤ 1.2 W/kg, SAR measurement is not required for the secondary mode

KDB 941225 D05 SAR for LTE Devices:
SAR must be measured with the maximum TTI(transmit time interval) supported by the device in each LTE configuration.
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.

KDB 248227 D01 SAR meas for 802.11 v02:
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:

- ≤ 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 ≤ 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.

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- 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 ≤ 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 ≤ 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 ≤ 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*.

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10.1. WCDMA Band II

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		10-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	Meas.	Scaled	
Next-to-mouth	Rel 99 RMC 12.2 kbps	10	Flat / Front	9400	1880.0	23.0	22.3	0.408	0.482			1
Extremity	Rel 99 RMC 12.2 kbps	0	Flat / Rear	9400	1880.0	23.0	22.3			0.850	1.005	2

10.2. WCDMA Band IV

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		10-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	Meas.	Scaled	
Next-to-mouth	Rel 99 RMC 12.2 kbps	10	Flat / Front	1413	1732.6	23.0	22.1	0.199	0.246			3
Extremity	Rel 99 RMC 12.2 kbps	0	Flat / Rear	1413	1732.6	23.0	22.1			0.552	0.683	4

10.3. WCDMA Band V

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		10-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	Meas.	Scaled	
Next-to-mouth	Rel 99 RMC 12.2 kbps	10	Flat / Front	4183	836.6	24.0	23.2	0.026	0.031			5
Extremity	Rel 99 RMC 12.2 kbps	0	Flat / Rear	4183	836.6	24.0	23.2			0.350	0.416	6

10.4. LTE Band 2 (20MHz Bandwidth)

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offest	Power (dBm)		1-g SAR (W/kg)		10-g SAR (W/kg)		Plot No.
								Tune-up limit	Meas.	Meas.	Scaled	Meas.	Scaled	
Next-to-Mouth	QPSK	10	Flat / Front	18900	1880.0	1	99	23.0	22.9	0.482	0.498			7
						50	50	22.0	21.9	0.413	0.426			
Extremity	QPSK	0	Flat / Rear	18900	1880.0	1	99	23.0	22.9			0.876	0.905	8
						50	50	22.0	21.9			0.692	0.713	

10.5. LTE Band 4 (20MHz Bandwidth)

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offest	Power (dBm)		1-g SAR (W/kg)		10-g SAR (W/kg)		Plot No.
								Tune-up limit	Meas.	Meas.	Scaled	Meas.	Scaled	
Next-to-Mouth	QPSK	10	Flat / Front	20175	1732.5	1	99	23.0	22.9	0.341	0.350			9
						50	50	22.0	21.5	0.260	0.290			
Extremity	QPSK	0	Flat / Rear	20175	1732.5	1	99	23.0	22.9			0.693	0.711	10
						50	50	22.0	21.5			0.508	0.567	

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10.6. LTE Band 5 (10MHz Bandwidth)

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offest	Power (dBm)		1-g SAR (W/kg)		10-g SAR (W/kg)		Plot No.
								Tune-up limit	Meas.	Meas.	Scaled	Meas.	Scaled	
Next-to-Mouth	QPSK	10	Flat / Front	20525	836.5	1	0	23.5	22.8	0.029	0.033			11
						25	0	22.5	21.6	0.017	0.020			
Extremity	QPSK	0	Flat / Rear	20525	836.5	1	0	23.5	22.8			0.342	0.398	12
						25	0	22.5	21.6			0.206	0.251	

10.7. Wi-Fi (DTS Band)

Frequency Band	Mode	RF Exposure Conditions	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		10-g SAR (W/kg)		Plot No.
							Tune-up limit	Meas.	Meas.	Scaled	Meas.	Scaled	
2.4GHz	802.11b 1 Mbps	Next-to-Mouth	10	Flat / Front	6	2437.0	17.5	16.7	0.177	0.215			13
		Extremity	0	Flat / Rear	6	2437.0	17.5	16.7			0.221	0.269	14

Note(s):

1. Testing for a second channel wasn't required because the reported SAR for this test position was <0.8/2.0 W/kg, for1-g and 10-g respectively.
2. Worst SAR result of Both Modified models is reported as standalone and simultaneous transmission SAR analysis.

10.8. Bluetooth

Frequency Band	Mode	RF Exposure Conditions	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		10-g SAR (W/kg)		Plot No.
							Tune-up limit	Meas.	Meas.	Scaled	Meas.	Scaled	
2.4GHz	GFSK	Next-to-Mouth	10	Flat / Front	0	2402.0	14.5	14.5	0.079	0.079			15
		Extremity	0	Flat / Rear	0	2402.0	14.5	14.5			0.096	0.097	16

Note(s):

1. Worst SAR result of Both Modified models is reported as standalone and simultaneous transmission SAR analysis.

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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 < 0.80 or 2.0 W/kg (1-g or 10-g respectively); steps 2) through 4) do not apply.
2) When the original highest measured SAR is ≥ 0.80 or 2.0 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 ≥ 1.45 or 3.6 W/kg (~ 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 ≥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.

Next-to-Mouth

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
835	WCDMA Band V	Next to Mouth	Flat / Front	No	0.026	N/A	N/A
	LTE Band 5	Next to Mouth	Flat / Front	No	0.029	N/A	N/A
1750	WCDMA Band IV	Next to Mouth	Flat / Front	No	0.199	N/A	N/A
	LTE Band 4	Next to Mouth	Flat / Front	No	0.341	N/A	N/A
1900	WCDMA Band II	Next to Mouth	Flat / Front	No	0.408	N/A	N/A
	LTE Band 2	Next to Mouth	Flat / Front	No	0.482	N/A	N/A
2400	Wi-Fi 802.11b/g/n	Next to Mouth	Flat / Front	No	0.177	N/A	N/A
	Bluetooth	Next to Mouth	Flat / Front	No	0.079	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 > 1.2.

Extremity

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
835	WCDMA Band V	Extremity (Hand/Wrist/Ankle)	Flat / Rear	No	0.35	N/A	N/A
	LTE Band 5	Extremity (Hand/Wrist/Ankle)	Flat / Rear	No	0.342	N/A	N/A
1750	WCDMA Band IV	Extremity (Hand/Wrist/Ankle)	Flat / Rear	No	0.552	N/A	N/A
	LTE Band 4	Extremity (Hand/Wrist/Ankle)	Flat / Rear	No	0.693	N/A	N/A
1900	WCDMA Band II	Extremity (Hand/Wrist/Ankle)	Flat / Rear	No	0.85	N/A	N/A
	LTE Band 2	Extremity (Hand/Wrist/Ankle)	Flat / Rear	No	0.876	N/A	N/A
2400	Wi-Fi 802.11b/g/n	Extremity (Hand/Wrist/Ankle)	Flat / Rear	No	0.221	N/A	N/A
	Bluetooth	Extremity (Hand/Wrist/Ankle)	Flat / Rear	No	0.096	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 > 1.2.

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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_1 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_2 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		
Next-to-Mouth	1	WCDMA	+	DTS
	2	WCDMA	+	BT
	3	LTE	+	DTS
	4	LTE	+	BT
Extremity	5	WCDMA	+	DTS
	6	WCDMA	+	BT
	7	LTE	+	DTS
	8	LTE	+	BT

Notes:
1. VoIP is supported in LTE and WCDMA
2. DTS Radio cannot transmit simultaneously w ith Bluetooth Radio.

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12.1. Sum of the SAR for WWAN & Wi-Fi & BT in Next-to-Mouth

RF Exposure conditions	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)
Next-to-Mouth	0.498	0.215	0.079	0.713	No	0.577	No

12.2. Sum of the SAR for WWAN & Wi-Fi & BT in Extremity

RF Exposure conditions	① WWAN	② DTS	③ BT	① + ② WWAN + DTS		① + ③ WWAN + BT	
				∑ 10-g SAR (mW/g)	SPLSR (Yes/ No)	∑ 10-g SAR (mW/g)	SPLSR (Yes/ No)
Extremity	1.005	0.269	0.097	1.274	No	1.102	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(10-g SAR is < 4.0 W/kg) or the 1-g SAR SPLSR is < 0.04 (10-g SAR is < 0.1) for all circumstances that require SPLSR calculation.

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Appendixes

Refer to separated files for the following appendixes.

4787713126-S1V2 FCC Report SAR_App A_Photos & Ant. Locations

4787713126-S1V2 FCC Report SAR_App B_Highest SAR Test Plots

4787713126-S1V2 FCC Report SAR_App C_System Check Plots

4787713126-S1V2 FCC Report SAR_App D_SAR Tissue Ingredients

4787713126-S1V2 FCC Report SAR_App E_Probe Cal. Certificates

4787713126-S1V2 FCC Report SAR_App F_Dipole Cal. Certificates

END OF REPORT

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