



SAR EVALUATION REPORT

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

For

GSM/WCDMA/LTE Tablet + Bluetooth, DTS/UNII a/b/g/n/ac and ANT+

**Model: SM-T805S, SM-T805K, SM-T805L
FCC ID: A3LSMT805KOR**

**Report Number: 14I18753-S1A
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NVLAP LAB CODE 200065-0

REVISION HISTORY

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--	10/07/2014	Initial Issue	--
A	10/13/2014	Section 10.2 – corrected dipole calibration date. Section 6.5 – corrected LTE band 5 description. Section 6.2 – corrected Bluetooth version	Dave Weaver

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1. Attestation of Test Results

Applicant Name	Samsung Electronics				
Application Purpose	☒ Original Grant ☐ Class II Permissive Change				
FCC ID	A3LSMT805KOR				
DUT Description	GSM/WCDMA/LTE Tablet + Bluetooth, DTS/UNII a/b/g/n/ac and ANT+				
Exposure Category	General Population/Uncontrolled Exposure (1g SAR limit: 1.6 W/kg)				
The highest reported SAR	RF Exposure Conditions	Equipment Class			
		Licensed	DTS	UNII	Bluetooth
	Stand-alone	1.08 W/kg	0.343 W/kg	N/A	0.430 W/kg
	Simultaneous Transmission	1.566 W/kg	1.566 W/kg	N/A	1.510 W/kg
Applicable Standards	FCC 47 CFR § 2.1093 Published RF exposure KDB procedures IEEE Std 1528-2013				
Test Results	Pass				
Date tested	09/09/2014 – 10/03/2014				
UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Verification Services Inc. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report. Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government (NIST Handbook 150, Annex A). This report is written to support regulatory compliance of the applicable standards stated above.					
Approved & Released By:		Prepared By:			
					
Dave Weaver Program Manager UL Verification Services Inc.		Mark Balauro Laboratory Technician UL Verification Services Inc.			

2. Test Specification, Methods and Procedures

The tests documented in this report were performed in accordance with FCC 47 CFR Parts 1 & 2, IEEE STD 1528-2013, the following FCC Published RF exposure KDB procedures, and TCB workshop updates:

- o 447498 D01 General RF Exposure Guidance v05r02
- o 616217 D04 SAR for Laptop and Tablets v01r01
- o 941225 D01 SAR test for 3G devices v02
- o 941225 D03 SAR Test Reduction GSM GPRS EDGE v01
- o 941225 D04 SAR for GSM E GPRS Dual Xfer Mode v01
- o 941225 D05 SAR for LTE Devices v02r03
- o 941225 D06 Hot Spot SAR v01r01
- o 248227 D01 SAR Meas for 802 11abg v01r02
- o 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r03
- o 865664 D02 SAR Reporting v01r01
- o 690783 D01 SAR Listings on Grants v01r02

3. Facilities and Accreditation

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

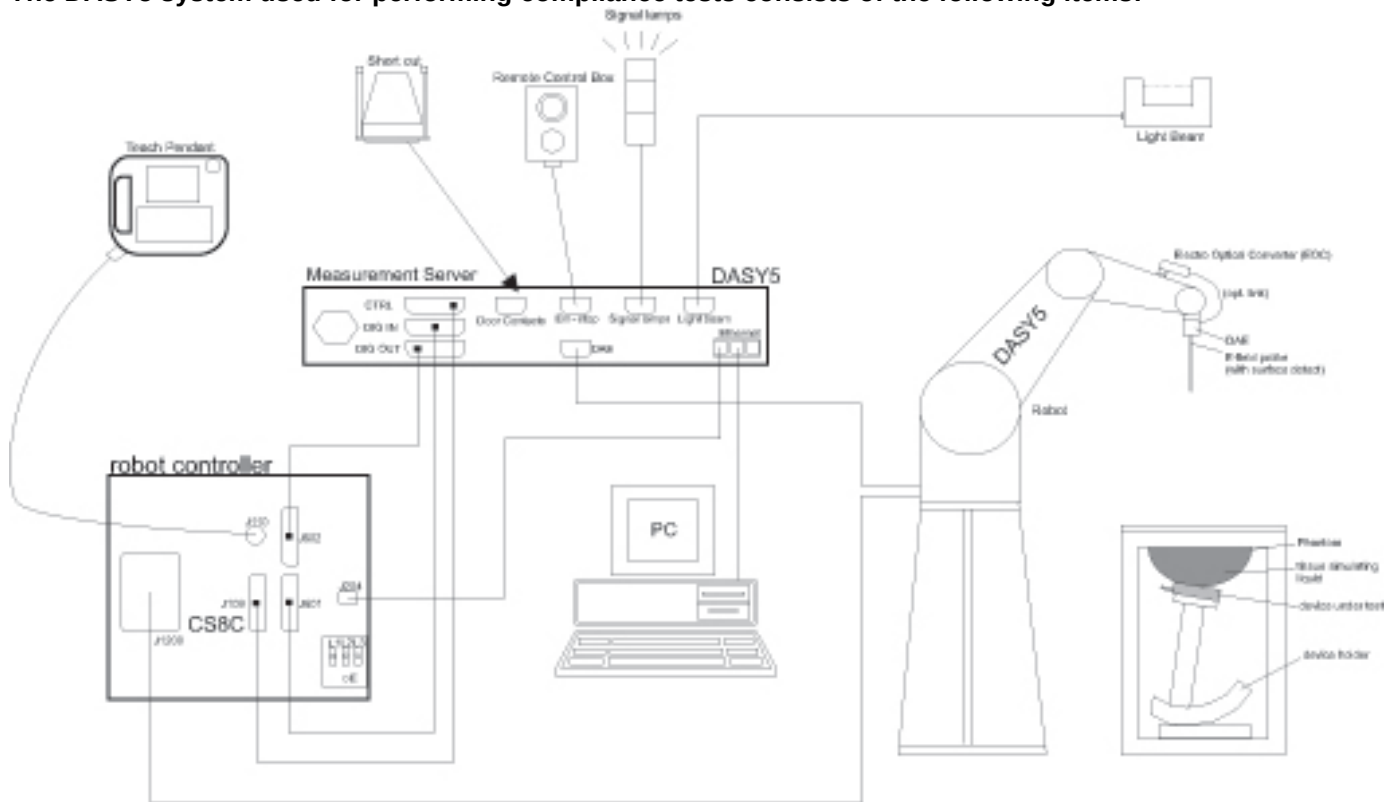
47173 Benicia Street	47266 Benicia Street
SAR Lab A	SAR Lab 1
SAR Lab B	SAR Lab 2
SAR Lab C	SAR Lab 3
SAR Lab D	SAR Lab 4
SAR Lab E	SAR Lab 5
SAR Lab F	
SAR Lab G	
SAR Lab H	

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://ts.nist.gov/standards/scopes/2000650.htm>.

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 Procedure

Step 1: Power Reference Measurement

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

Step 2: Area Scan

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

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

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

Step 3: Zoom Scan

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

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

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

Step 4: Power drift measurement

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

Step 5: Z-Scan (FCC only)

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

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	E753ES	MY40000980	4/7/2015
Dielectronic Probe kit	SPEAG	DAK-3.5	1087	11/13/2014
Dielectronic Probe kit	SPEAG	DAK-3.5 Short	SM DAK 200 BA	N/A
Thermometer	Cole-Parmer Instrument Co.	91100-50	1007	7/31/2015

System Check

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
HP Signal Generator	HP	8665B	3546A00784	6/23/2015
Power Meter	HP	437B	3125U16345	6/16/2015
Power Sensor	Agilent	8481A	2702A60780	6/16/2015
Amplifier	MITEQ	AMF-4D-00400600-50-30P	1622052	N/A
Bi-directional coupler	Werlatone, Inc.	C8060-102	2711	N/A
DC Power Supply	Sorensen Ametek	XT20-3	1318A00530	N/A
Synthesized Signal Generator	Agilent	8665B	3438A00633	7/10/2015
Power Meter	Agilent	N1911A	MY53060016	8/7/2015
Power Sensor	Agilent	E9323A	MY53070003	5/1/2015
Amplifier	MITEQ	AMF-4D-00400600-50-30P	1808938	N/A
Bi-directional coupler	Werlatone, Inc.	C8060-102	2710	N/A
DC Power Supply	HP	6296A	2841A-05955	N/A
E-Field Probe (SAR 1)	SPEAG	EX3DV4	3902	5/19/2015
E-Field Probe (SAR 2)	SPEAG	EX3DV3	3531	11/21/2014
E-Field Probe (SAR 5)	SPEAG	EX3DV4	3991	5/16/2015
Data Acquisition Electronics (SAR 1)	SPEAG	DAE3	427	1/21/2015
Data Acquisition Electronics (SAR 2)	SPEAG	DAE4	1359	2/17/2015
Data Acquisition Electronics (SAR 5)	SPEAG	DAE4	1439	5/14/2015
System Validation Dipole	SPEAG	D750V3	1071	11/15/2014
System Validation Dipole	SPEAG	D835V2	4d117	5/16/2015
System Validation Dipole	SPEAG	D835V2	4d002	11/15/2014
System Validation Dipole	SPEAG	D1900V2	5d043	11/12/2014
System Validation Dipole	SPEAG	D2450V2	706	5/20/2015
Thermometer (SAR Lab 1)	EXTECH	445703	CCS-205	3/24/2015
Thermometer (SAR Lab 2)	EXTECH	445703	CCS-203	3/28/2015
Thermometer (SAR Lab 5)	EXTECH	445703	CCS-239	6/3/2015

Others

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Power Meter	Agilent	N1912A	MY53040015	6/10/2015
Power Sensor	Agilent	N1921A	MY52020011	5/6/2015
Power Sensor	Agilent	N1921A	MY52260009	12/12/2014
Base Station Simulator	R & S	CMW500	135393-VQ	7/3/2015
Base Station Simulator	R & S	CMW500	125236-eS	5/29/2015
Base Station Simulator	R & S	CMW500	137873-WG	7/14/2015
Base Station Simulator	R & S	CMW500	104245-jz	3/26/2015
Bluetooth Tester	R & S	CBT	100900-ac	7/4/2015

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 1528-2003 & 2013 is not required in SAR reports submitted for equipment approval.

6. Device Under Test (DUT) Information

6.1. DUT Description

Model: SM-T805S, SM-T805K, SM-T805L	
Device Dimension	Overall (Length x Width): 177.3 mm x 247.3 mm Overall Diagonal: 298 mm Display Diagonal: 267 mm
Battery Back Cover	The rechargeable battery is not user accessible.
Battery Options	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. ☒ Mobile Hotspot (Wi-Fi 2.4 GHz) ☒ Mobile Hotspot (Wi-Fi 5 GHz)
Wi-Fi Direct	Wi-Fi Direct enabled devices transfer data directly between each other ☒ Wi-Fi Direct (Wi-Fi 2.4 GHz) ☒ Wi-Fi Direct (Wi-Fi 5 GHz)
SIM Information	☒ Single SIM ☐ Dual SIM

6.2. Wireless Technologies

Wireless technologies	Frequency bands	Operating mode	Duty Cycle used for SAR testing
GSM	1900	Voice (GMSK) GPRS (GMSK) EGPRS (8PSK)	GSM Voice: 12.5%; GPRS/EGPRS: 1 Slot: 12.5%; 2 Slots: 25%, 3 Slots: 37.5%, 4 Slots: 50%,
	GPRS Multi-Slot Class: ☐ Class 8 - One Up ☒ Class 10 - Two Up ☐ Class 12 - Four Up ☐ Class 33 - Four Up DTM (Dual Transfer Mode): Not support		
W-CDMA (UMTS)	Band V and II	UMTS Rel. 99 (Voice & Data) HSDPA HSUPA	100%
LTE (FDD)	Band 5 / 17	QPSK, 16QAM	100%
	Does this device SV-LTE (1xRTT-LTE)? ☐ Yes ☒ No		
Wi-Fi	2.4 GHz	802.11b 802.11g 802.11n (HT20)	100%
	5 GHz	802.11a 802.11n (HT20) 802.11n (HT40) 802.11ac (20MHz) 802.11ac (40MHz) 802.11ac (80MHz)	100%
Bluetooth	2.4 GHz	Version 4.1 + LE	32.25% (DH1), 66.68% (DH3), 77.52% (DH5)

6.3. Nominal and Maximum Output Power

Upper limit (dB): 0.5 ~ -1.5		RF Output Power (MAX) (dBm)		RF Output Power with Power Reduction(dBm)	
RF Air interface	Mode	Target	Max. tune-up tolerance limit	Target	Max. tune-up tolerance limit
GSM 1900	Voice	29.0	29.5	17.5	18.0
	GPRS 1 Slot	29.0	29.5	17.5	18.0
	GPRS 2 Slot	26.5	27.0	17.5	18.0
W-CDMA Band V	R99	23.0	23.5	19.0	19.5
	HSDPA	23.0	23.5	19.0	19.5
	HSUPA	23.0	23.5	19.0	19.5
W-CDMA Band II	R99	22.5	23.0	12.0	12.5
	HSDPA	22.5	23.0	12.0	12.5
	HSUPA	22.5	23.0	12.0	12.5
LTE Band 5	QPSK	23.0	23.5	18.5	19.0
LTE Band 17	QPSK	23.0	23.5	19.0	19.5

Upper limit (dB): 0.5		RF Output Power (dBm)	
RF Air interface	Mode	Target	Max. tune-up tolerance limit
WiFi 2.4 GHz	802.11b	11.0	11.5
	802.11g	10.0	10.5
	802.11n HT20	9.0	9.5
WiFi 5 GHz	802.11a	6.0	6.5
	802.11n HT20	6.0	6.5
	802.11n HT40	6.0	6.5
	802.11ac 20MHz	6.0	6.5
	802.11ac 40MHz	6.0	6.5
	802.11ac 80MHz	6.0	6.5
Bluetooth		11.0	11.5
Bluetooth LE		6.8	7.3

6.4. Simultaneous Transmission Condition

RF Exposure Condition	Capable Transmit Configurations
Body	WWAN, Wi-Fi and BT - WWAN + 2.4GHz (Wi-Fi 1) + 2.4GHz(Wi-Fi 2) - WWAN + 5GHz (Wi-Fi 1) + 5GHz(Wi-Fi 2) - WWAN + BT (Wi-Fi 2)
Refer to Appendix for antenna locations Bluetooth cannot transmit simultaneously with Wi-Fi Wi-Fi MIMO: - Does not support simultaneous transmission between 2.4 GHz and 5 GHz. - Is supported in all Wi-Fi bands and is possible during WWAN transmission.	

6.5. General LTE SAR Test and Reporting Considerations

Item	Description																																																				
Frequency range, Channel Bandwidth, Numbers and Frequencies	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																																																
	Mid			20525/ 836.5	20525/ 836.5																																																
	High			20600/ 844	20625/ 846.5																																																
	Band 17	Frequency range: 704 - 716 MHz																																																			
		Channel Bandwidth																																																			
		20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz																																														
	Low				23755/ 706.5																																																
	Mid			23790/ 710	23790/ 710																																																
	High				23825/ 713.5																																																
LTE transmitter and antenna implementation	LTE has one (1) TX/RX antennas and one (1) RX antennas Refer to Appendix "Photos and Antenna Locations."																																																				
Maximum power reduction (MPR)	<table><tr><th colspan="8">Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3</th></tr><tr><th rowspan="2">Modulation</th><th colspan="6">Channel bandwidth / Transmission bandwidth (RB)</th><th rowspan="2">MPR (dB)</th></tr><tr><th>1.4 MHz</th><th>3.0 MHz</th><th>5 MHz</th><th>10 MHz</th><th>15 MHz</th><th>20 MHz</th></tr><tr><td>QPSK</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 1</td></tr><tr><td>16 QAM</td><td>≤ 5</td><td>≤ 4</td><td>≤ 8</td><td>≤ 12</td><td>≤ 16</td><td>≤ 18</td><td>≤ 1</td></tr><tr><td>16 QAM</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 2</td></tr></table> MPR Built-in by design A-MPR (additional MPR) was disabled during SAR testing MPR not supported during power back-off.							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
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																																														
Power reduction	Yes																																																				
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.																																																				

6.6. Power Reduction by Proximity Sensing

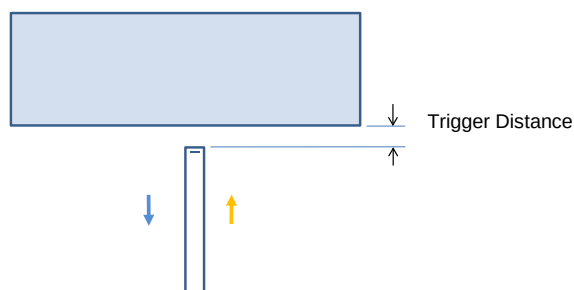
6.6.1. Proximity Sensor Triggering Distance (KDB 616217 §6.2)

Edge 1 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.

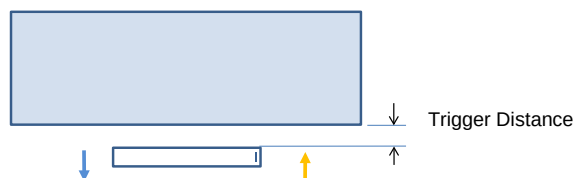
The measurement was then repeated for the Rear surface.

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, **Edge 1**



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

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

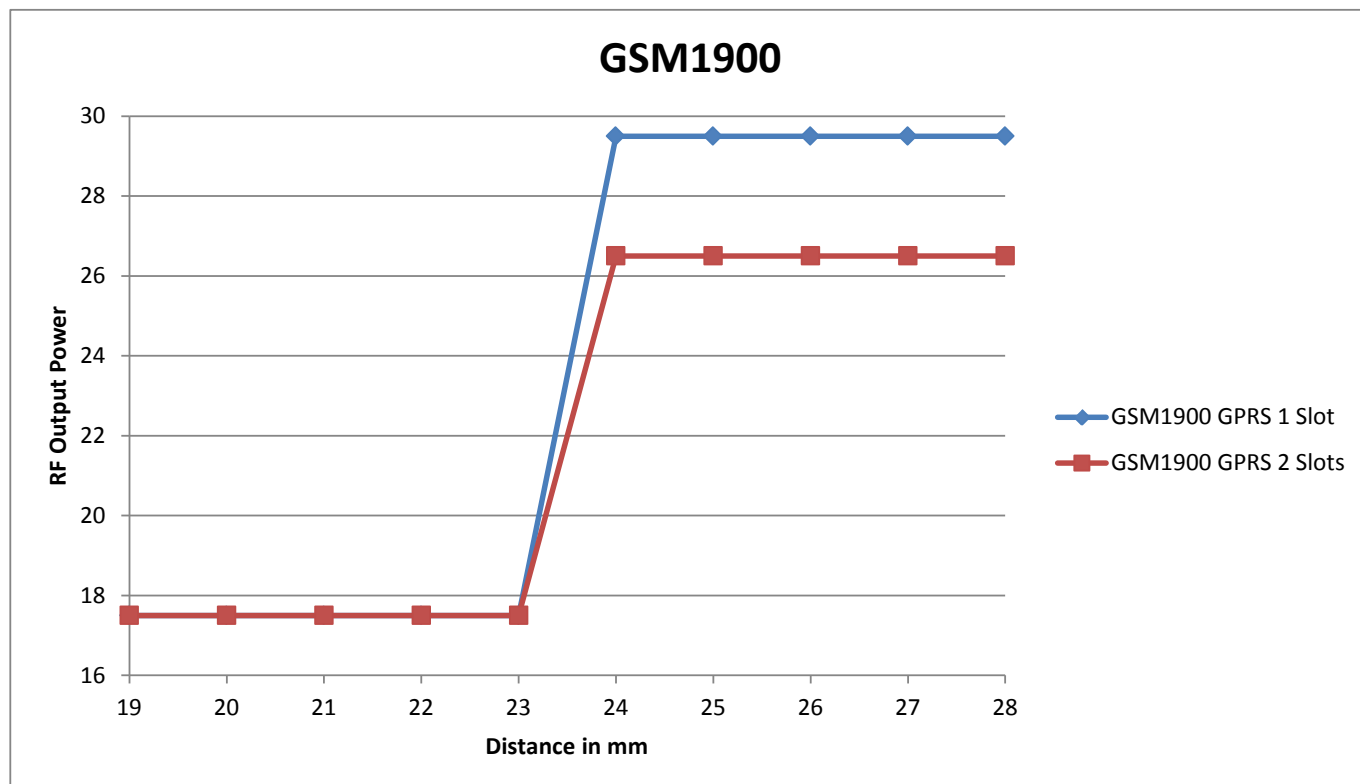
Tissue simulating liquid	Trigger distance - Edge 1		Trigger distance - Rear	
	Moving toward phantom	Moving from phantom	Moving toward phantom	Moving from phantom
750 muscle	23 mm	23 mm	23 mm	23 mm
850 muscle	23 mm	23 mm	23 mm	23 mm
1900 muscle	23 mm	23 mm	23 mm	23 mm

6.6.2. Proximity Sensor Triggering Distance Measurement Results

GSM1900

Rear and Edge 1, DUT Moving Toward (Trigger) and Away (Release) from the Phantom

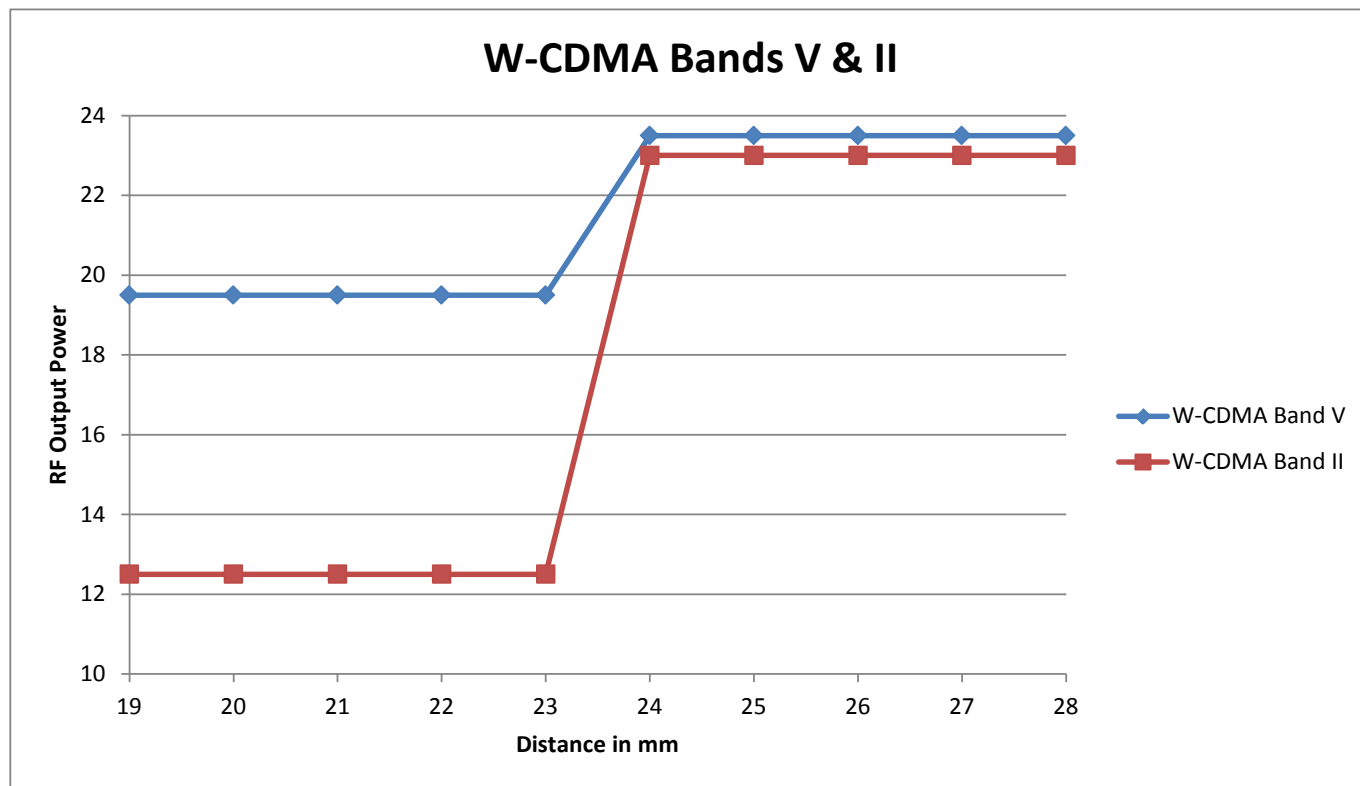
Distance to DUT vs. Output Power in dBm										
Distance	28	27	26	25	24	23	22	21	20	19
GSM1900 GPRS 1 Slot	29.5	29.5	29.5	29.5	29.5	17.5	17.5	17.5	17.5	17.5
GSM1900 GPRS 2 Slots	26.5	26.5	26.5	26.5	26.5	17.5	17.5	17.5	17.5	17.5



WCDMA Bands V & II

Rear and Edge 1, DUT Moving Toward (Trigger) and Away (Release) from the Phantom

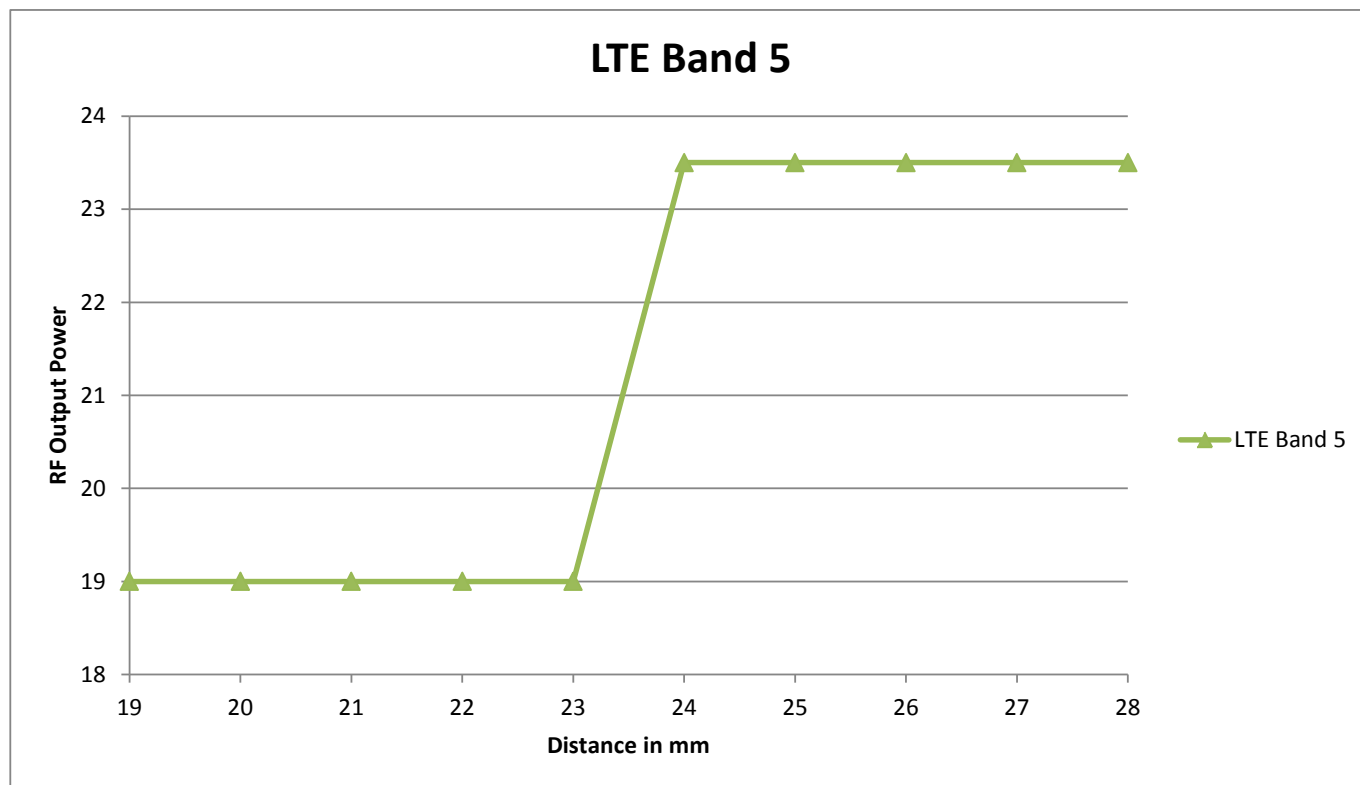
Distance to DUT vs. Output Power in dBm										
Distance	28	27	26	25	24	23	22	21	20	19
W-CDMA Band V	23.5	23.5	23.5	23.5	23.5	19.5	19.5	19.5	19.5	19.5
W-CDMA Band II	23.0	23.0	23.0	23.0	23.0	12.5	12.5	12.5	12.5	12.5



LTE Band 5

Rear and Edge 1, DUT Moving Toward (Trigger) and Away (Release) from the Phantom

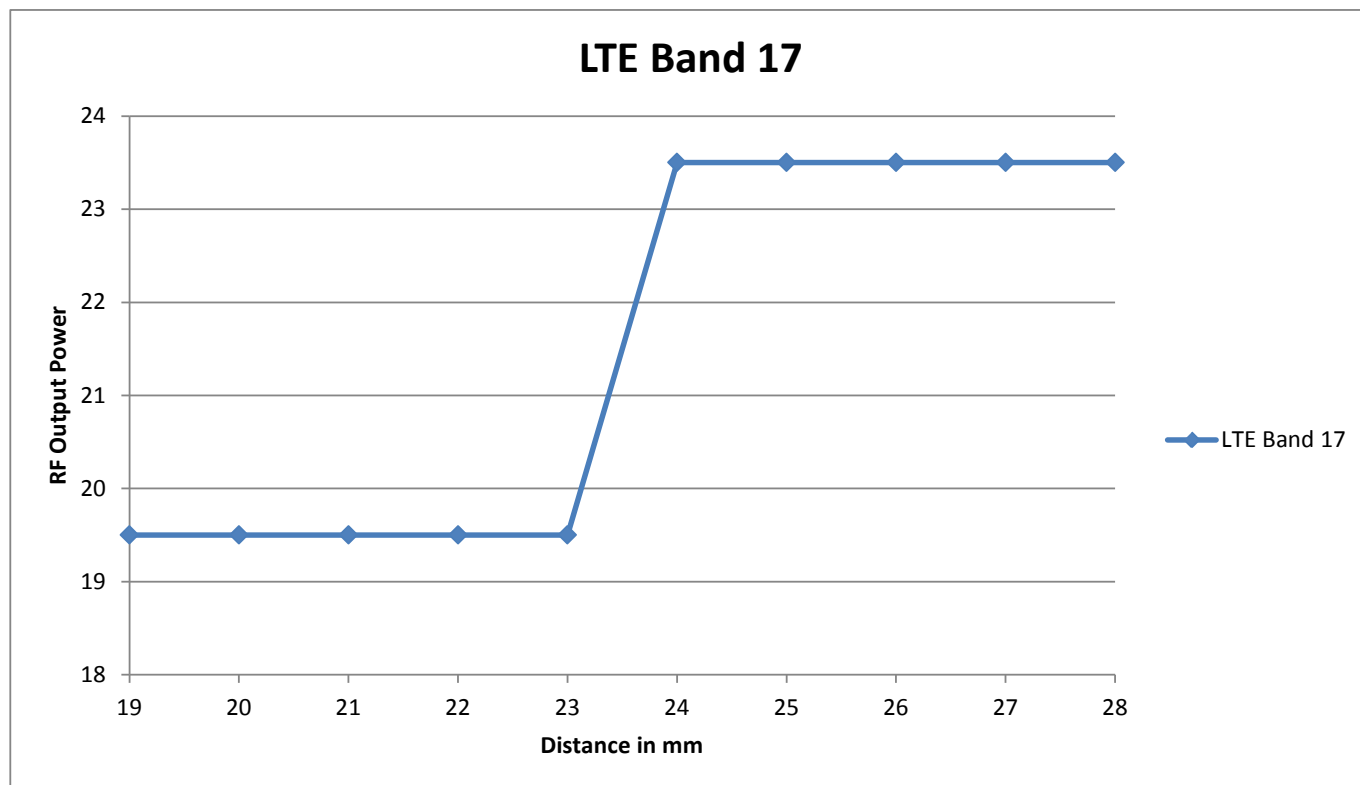
Distance to DUT vs. Output Power in dBm										
Distance	28	27	26	25	24	23	22	21	20	19
LTE Band 5	23.5	23.5	23.5	23.5	23.5	19	19	19	19	19



LTE Band 17

Rear and Edge 1, DUT Moving Toward (Trigger) and Away (Release) from the Phantom

Distance to DUT vs. Output Power in dBm										
Distance	28	27	26	25	24	23	22	21	20	19
LTE Band 17	23.5	23.5	23.5	23.5	23.5	19.5	19.5	19.5	19.5	19.5



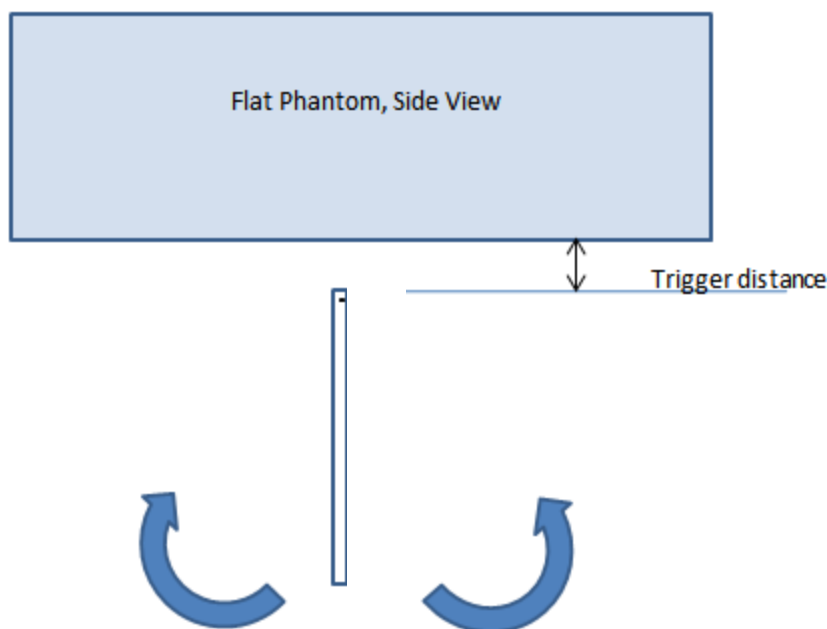
6.6.3. Proximity Sensor Coverage (KDB 616217 §6.3)

As there is no spatial offset between the antenna and the proximity sensor element, proximity sensor coverage did not need to be assessed.

6.6.4. Proximity Sensor Tilt Angle Assessment (KDB 616217 §6.4)

The DUT was positioned directly below the flat phantom at the minimum measured trigger distance with Edge 1 parallel to the base of the flat phantom for each band.

The EUT was rotated about Edge 1 for angles up to $\pm 45^\circ$. If the output power increased during the rotation the DUT was moved 1mm toward the phantom and the rotation repeated. This procedure was repeated until the power remained reduced for all angles up to $\pm 45^\circ$.



Proximity sensor tilt angle assessment (Edge 4) KDB 616217 §6.4

Summary of Tablet Tilt Angle Influence to Proximity Sensor Triggering

Band (MHz)	Minimum trigger distance measured according to KDB 616217 §6.2	Minimum distance at which power reduction was maintained over $\pm 45^\circ$	Power reduction status										
			-45°	-40°	-30°	-20°	-10°	0°	10°	20°	30°	40°	45°
750	23 mm	23 mm	On	On	On	On	On	On	On	On	On	On	On
850	23 mm	23 mm	On	On	On	On	On	On	On	On	On	On	On
1900	23 mm	23 mm	On	On	On	On	On	On	On	On	On	On	On

The minimum trigger distance measured for any of the steps required in KDB 616217 §6.2, §6.3 and §6.4 was 23 mm. Full Power SAR measurements for the Rear and Edge 1 were performed at 22 mm separation distance from the phantom.

7. RF Exposure Conditions (Test Configurations)

The EUT implements the power reduction scheme for SAR compliance, for specific device configuration and orientations, as described below. The complete description of the implementation and functionality is provided in the "Operational Description of Power Reduction" exhibit.

7.1. Standalone SAR Test Exclusion Considerations

Since the *Dedicated Host Approach* is applied, the standalone SAR test exclusion procedure in KDB 447498 § 4.3.1 is applied in conjunction with KDB 616217 § 4.3 to determine the minimum test separation distance:

- o When the separation distance from the antenna to an adjacent edge is ≤ 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.
- o When the separation distance from the antenna to an adjacent edge is > 5 mm, the actual antenna-to-edge separation distance is applied to determine SAR test exclusion.

SAR Test Exclusion Calculations for WWAN

Antennas < 50mm to adjacent edges

Intracell - 20mm to adjacent edges														
Antenna	Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)					Calculated Threshold Value				
			dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Rear	Edge 1	Edge 2	Edge 3	Edge 4
Full Power, Proximity Sensor Off. A sensor triggering of 22 mm is included for both Rear and Edge 1														
Cellular	GPRS 2 Slots	1909.8	29.50	223	5	2	17	166	175	61.6 -MEASURE-	61.6 -MEASURE-	18.1 -MEASURE-	> 50 mm	> 50 mm
Cellular	W-CDMA 5	846.6	23.50	224	5	2	17	166	175	41.2 -MEASURE-	41.2 -MEASURE-	12.1 -MEASURE-	> 50 mm	> 50 mm
Cellular	W-CDMA 2	1907.6	23.00	200	5	2	17	166	175	55.2 -MEASURE-	55.2 -MEASURE-	16.2 -MEASURE-	> 50 mm	> 50 mm
Cellular	LTE Band 5	844	23.50	224	5	2	17	166	175	41.2 -MEASURE-	41.2 -MEASURE-	12.1 -MEASURE-	> 50 mm	> 50 mm
Cellular	LTE Band 17	710	23.50	224	5	2	17	166	175	37.7 -MEASURE-	37.7 -MEASURE-	11.1 -MEASURE-	> 50 mm	> 50 mm
Second Stage Power Back-off, Proximity Sensor On														
Cellular	GPRS 2 Slots	1909.8	18.00	16	5	2	17	166	175	4.4 -MEASURE-	4.4 -MEASURE-	1 -EXEMPT-	> 50 mm	> 50 mm
Cellular	W-CDMA 5	846.6	19.50	89	5	2	17	166	175	16.4 -MEASURE-	16.4 -MEASURE-	4.8 -MEASURE-	> 50 mm	> 50 mm
Cellular	W-CDMA 2	1907.6	12.50	18	5	2	17	166	175	5 -MEASURE-	5 -MEASURE-	1 -EXEMPT-	> 50 mm	> 50 mm
Cellular	LTE Band 5	844	19.00	79	5	2	17	166	175	14.5 -MEASURE-	14.5 -MEASURE-	4.3 -MEASURE-	> 50 mm	> 50 mm
Cellular	LTE Band 17	710	19.50	89	5	2	17	166	175	15 -MEASURE-	15 -MEASURE-	4.4 -MEASURE-	> 50 mm	> 50 mm

Note(s):

- According to KDB 447498, if the calculated threshold value is >3 then SAR testing is required.

Antennas > 50mm to adjacent edges

Antenna	Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)					Calculated Threshold Value				
			dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Rear	Edge 1	Edge 2	Edge 3	Edge 4
Full Power, Proximity Sensor Off. A sensor triggering of 22 mm is included for both Rear and Edge 1														
Cellular	GPRS 2 Slots	1909.8	29.50	281	5	2	17	166	175	< 50 mm	< 50 mm	< 50 mm	1268.5 mW -EXEMPT-	1358.5 mW -EXEMPT-
Cellular	W-CDMA 5	846.6	23.50	224	5	2	17	166	175	< 50 mm	< 50 mm	< 50 mm	817.7 mW -EXEMPT-	868.5 mW -EXEMPT-
Cellular	W-CDMA 2	1907.6	23.00	224	5	2	17	166	175	< 50 mm	< 50 mm	< 50 mm	1268.6 mW -EXEMPT-	1358.6 mW -EXEMPT-
Cellular	LTE Band 5	844	23.50	224	5	2	17	166	175	< 50 mm	< 50 mm	< 50 mm	816 mW -EXEMPT-	866.6 mW -EXEMPT-
Cellular	LTE Band 17	710	23.50	224	5	2	17	166	175	< 50 mm	< 50 mm	< 50 mm	727.1 mW -EXEMPT-	769.7 mW -EXEMPT-
Second Stage Power Back-off, Proximity Sensor On														
Cellular	GPRS 2 Slots	1909.8	18.00	40	5	2	17	166	175	< 50 mm	< 50 mm	< 50 mm	1268.5 mW -EXEMPT-	1358.5 mW -EXEMPT-
Cellular	W-CDMA 5	846.6	12.50	141	5	2	17	166	175	< 50 mm	< 50 mm	< 50 mm	817.7 mW -EXEMPT-	868.5 mW -EXEMPT-
Cellular	W-CDMA 2	1907.6	19.50	18	5	2	17	166	175	< 50 mm	< 50 mm	< 50 mm	1268.6 mW -EXEMPT-	1358.6 mW -EXEMPT-
Cellular	LTE Band 5	844	19.00	89	5	2	17	166	175	< 50 mm	< 50 mm	< 50 mm	816 mW -EXEMPT-	866.6 mW -EXEMPT-
Cellular	LTE Band 17	710	19.50	89	5	2	17	166	175	< 50 mm	< 50 mm	< 50 mm	727.1 mW -EXEMPT-	769.7 mW -EXEMPT-

Note(s):

- According to KDB 447498, if the calculated Power threshold is less than the output power then SAR testing is required.

SAR Test Exclusion Calculations for WLAN**Antennas < 50mm to adjacent edges**

Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)					Calculated Threshold Value				
		dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Rear	Edge 1	Edge 2	Edge 3	Edge 4
Wi-Fi Antenna 1													
Wi-Fi 2.4 GHz	2462	11.50	14	5	9	190	165	39	4.4 -MEASURE-	2.4 -EXEMPT-	> 50 mm	> 50 mm	0.6 -EXEMPT-
Wi-Fi 5.2 GHz	5240	6.50	4	5	9	190	165	39	1.8 -EXEMPT-	1 -EXEMPT-	> 50 mm	> 50 mm	0.2 -EXEMPT-
Wi-Fi 5.3 GHz	5320	6.50	4	5	9	190	165	39	1.8 -EXEMPT-	1 -EXEMPT-	> 50 mm	> 50 mm	0.2 -EXEMPT-
Wi-Fi 5.5 GHz	5700	6.50	4	5	9	190	165	39	1.9 -EXEMPT-	1.1 -EXEMPT-	> 50 mm	> 50 mm	0.2 -EXEMPT-
Wi-Fi 5.8 GHz	5825	6.50	4	5	9	190	165	39	1.9 -EXEMPT-	1.1 -EXEMPT-	> 50 mm	> 50 mm	0.2 -EXEMPT-
Wi-Fi Antenna 2													
Wi-Fi 2.4 GHz	2462	11.50	14	5	2	164	165	70	4.4 -MEASURE-	4.4 -MEASURE-	> 50 mm	> 50 mm	> 50 mm
Wi-Fi 5.2 GHz	5240	6.50	4	5	2	164	165	70	1.8 -EXEMPT-	1.8 -EXEMPT-	> 50 mm	> 50 mm	> 50 mm
Wi-Fi 5.3 GHz	5320	6.50	4	5	2	164	165	70	1.8 -EXEMPT-	1.8 -EXEMPT-	> 50 mm	> 50 mm	> 50 mm
Wi-Fi 5.5 GHz	5700	6.50	4	5	2	164	165	70	1.9 -EXEMPT-	1.9 -EXEMPT-	> 50 mm	> 50 mm	> 50 mm
Wi-Fi 5.8 GHz	5825	6.50	4	5	2	164	165	70	1.9 -EXEMPT-	1.9 -EXEMPT-	> 50 mm	> 50 mm	> 50 mm
Bluetooth	2480	11.50	14	5	2	164	165	70	4.4 -MEASURE-	4.4 -MEASURE-	> 50 mm	> 50 mm	> 50 mm

Note(s):

- According to KDB 447498, if the calculated threshold value is >3 then SAR testing is required.

Antennas > 50mm to adjacent edges

Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)					Calculated Threshold Value				
		dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Rear	Edge 1	Edge 2	Edge 3	Edge 4
Wi-Fi Antenna 1													
Wi-Fi 2.4 GHz	2462	11.50	28	5	9	190	165	39	< 50 mm	< 50 mm	1495.6 mW -EXEMPT-	1245.6 mW -EXEMPT-	< 50 mm
Wi-Fi 5.2 GHz	5240	6.50	11	5	9	190	165	39	< 50 mm	< 50 mm	1465.5 mW -EXEMPT-	1215.5 mW -EXEMPT-	< 50 mm
Wi-Fi 5.3 GHz	5320	6.50	11	5	9	190	165	39	< 50 mm	< 50 mm	1465 mW -EXEMPT-	1215 mW -EXEMPT-	< 50 mm
Wi-Fi 5.5 GHz	5700	6.50	11	5	9	190	165	39	< 50 mm	< 50 mm	1462.8 mW -EXEMPT-	1212.8 mW -EXEMPT-	< 50 mm
Wi-Fi 5.8 GHz	5825	6.50	11	5	9	190	165	39	< 50 mm	< 50 mm	1462.2 mW -EXEMPT-	1212.2 mW -EXEMPT-	< 50 mm
Wi-Fi Antenna 2													
Wi-Fi 2.4 GHz	2462	11.50	28	5	2	164	165	70	< 50 mm	< 50 mm	1235.6 mW -EXEMPT-	1245.6 mW -EXEMPT-	295.6 mW -EXEMPT-
Wi-Fi 5.2 GHz	5240	6.50	11	5	2	164	165	70	< 50 mm	< 50 mm	1205.5 mW -EXEMPT-	1215.5 mW -EXEMPT-	265.5 mW -EXEMPT-
Wi-Fi 5.3 GHz	5320	6.50	11	5	2	164	165	70	< 50 mm	< 50 mm	1205 mW -EXEMPT-	1215 mW -EXEMPT-	265 mW -EXEMPT-
Wi-Fi 5.5 GHz	5700	6.50	11	5	2	164	165	70	< 50 mm	< 50 mm	1202.8 mW -EXEMPT-	1212.8 mW -EXEMPT-	262.8 mW -EXEMPT-
Wi-Fi 5.8 GHz	5825	6.50	11	5	2	164	165	70	< 50 mm	< 50 mm	1202.2 mW -EXEMPT-	1212.2 mW -EXEMPT-	262.2 mW -EXEMPT-
Bluetooth	2480	11.50	11	5	2	164	165	70	< 50 mm	< 50 mm	1235.3 mW -EXEMPT-	1245.3 mW -EXEMPT-	295.3 mW -EXEMPT-

Note(s):

- According to KDB 447498, if the calculated Power threshold is less than the output power then SAR testing is required.

7.2. Required Test Configurations

The table below identifies the standalone WWAN test configurations required for this device according to the findings in Section 7.1:

Test Configurations	Rear	Edge 1	Edge 2	Edge 3	Edge 4
		(Top Edge)	(Right Edge)	(Bottom Edge)	(Left Edge)
GSM1900 Full Pow er	Yes	Yes	Yes	No	No
GSM1900 w / Pow er Reduction	Yes	Yes	No	No	No
W-CDMA Band 2 Full Pow er	Yes	Yes	Yes	No	No
W-CDMA Band 2 w / Pow er Reduction	Yes	Yes	No	No	No
W-CDMA Band 5 Full Pow er	Yes	Yes	Yes	No	No
W-CDMA Band 5 w / Pow er Reduction	Yes	Yes	Yes	No	No
LTE Band 5 Full Pow er	Yes	Yes	Yes	No	No
LTE Band 5 w / Pow er Reduction	Yes	Yes	Yes	No	No
LTE Band 17 Full Pow er	Yes	Yes	Yes	No	No
LTE Band 17 w / Pow er Reduction	Yes	Yes	Yes	No	No
Wi-Fi 2.4 GHz MIMO	Yes	Yes	No	No	No
Wi-Fi 5 GHz MIMO	No	No	No	No	No
Bluetooth	Yes	Yes	No	No	No

Note(s):

1. Yes = Testing is required.
2. No = Testing is not required.

8. RF Output Power Measurement

8.1. GSM

Band	Mode	Coding Scheme	Time Slots	Ch No.	Freq. (MHz)	Max. Power		with Pwr Back-off	
						Burst Pwr (dBm)	Frame Pwr (dBm)	Burst Pwr (dBm)	Frame Pwr (dBm)
1900	GSM (Voice)	CS1	1	512	1850.2	29.5	20.5	17.7	8.8
				661	1880.0	29.5	20.5	17.8	8.8
				810	1909.8	29.5	20.5	17.8	8.8
	GPRS (GMSK)	CS1	1	512	1850.2	29.5	20.5	17.7	8.7
				661	1880.0	29.5	20.5	17.9	8.9
				810	1909.8	29.5	20.5	17.9	8.9
			2	512	1850.2	27.0	21.0	17.7	11.7
				661	1880.0	27.0	21.0	17.9	11.9
				810	1909.8	27.0	21.0	17.9	11.9

Notes:

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

- GMSK (GPRS) mode with 2 time slots, based on the output power measurements above
- SAR is not required for EGPRS (8PSK) mode because EGPRS is not supported.

8.2. W-CDMA

Release 99

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

Mode	Subtest	Rel99
WCDMA General Settings	Loopback Mode	Test Mode 2
	Rel99 RMC	12.2kbps RMC
	Power Control Algorithm	Algorithm 2
	β_c/β_d	8/15

Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm)	Avg Pwr with Power Back-off (dBm)
W-CDMA Band V	Rel 99 (RMC, 12.2 kbps)	4132	826.4	22.8	19.2
		4183	836.6	22.7	19.3
		4233	846.6	22.8	19.3
W-CDMA Band II	Rel 99 (RMC, 12.2 kbps)	9262	1852.4	22.0	11.8
		9400	1880.0	22.3	11.9
		9538	1907.6	22.5	12.0

HSDPA

The following 4 Sub-tests were completed according to Release 7 procedures in section 5.2 of 3GPP TS34.121-1. 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			
	β_c	2/15	11/15	15/15	15/15
	β_d	15/15	15/15	8/15	4/15
	Bd (SF)	64			
	β_c/β_d	2/15	12/15	15/8	15/4
	β_{hs}	4/15	24/15	30/15	30/15
HSDPA Specific Settings	MPR (dB)	0	0	0.5	0.5
	D _{ACK}	8			
	D _{NAK}	8			
	DCQI	8			
	Ack-Nack repetition factor	3			
	CQI Feedback (Table 5.2B.4)	4ms			
	CQI Repetition Factor (Table 5.2B.4)	2			
	A _{hs} = β_{hs}/β_c	30/15			

Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm)	Avg Pwr with Power Back-off (dBm)
W-CDMA Band V	Subtest 1	4132	826.4	22.5	19.3
		4183	836.6	23.0	19.5
		4233	846.6	22.5	19.5
	Subtest 2	4132	826.4	22.9	19.5
		4183	836.6	23.0	19.5
		4233	846.6	22.5	19.5
	Subtest 3	4132	826.4	23.0	19.5
		4183	836.6	23.0	19.5
		4233	846.6	22.7	19.5
	Subtest 4	4132	826.4	21.5	19.5
		4183	836.6	22.0	19.5
		4233	846.6	21.7	19.5
W-CDMA Band II	Subtest 1	9262	1852.4	22.0	11.7
		9400	1880.0	22.4	11.7
		9538	1907.6	22.3	11.9
	Subtest 2	9262	1852.4	21.6	11.5
		9400	1880.0	22.5	12.0
		9538	1907.6	22.5	12.0
	Subtest 3	9262	1852.4	21.4	11.5
		9400	1880.0	21.7	12.0
		9538	1907.6	21.7	11.5
	Subtest 4	9262	1852.4	20.5	11.0
		9400	1880.0	20.6	11.0
		9538	1907.6	20.6	10.8

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

HSPA (HSDPA & HSUPA)

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

	Mode	HSPA				
	Subtest	1	2	3	4	5
WCDMA General Settings	Loopback Mode	Test Mode 1				
	Rel99 RMC	12.2kbps RMC				
	HSDPA FRC	H-Set 1				
	HSUPA Test	HSPA				
	Power Control Algorithm	Algorithm 2				Algorithm 1
	β_c	11/15	6/15	15/15	2/15	15/15
	β_d	15/15	15/15	9/15	15/15	0
	β_{ec}	209/225	12/15	30/15	2/15	5/15
	β_c/β_d	11/15	11/15	15/9	2/15	15/0
	β_{hs}	22/15	12/15	30/15	4/15	5/15
	β_{ed}	1309/225	94/75	47/15 47/15	56/75	47/15
HSDPA Specific Settings	CM (dB)	1	3	2	3	1
	MPR (dB)	0	2	1	2	0
	DACK	8				0
	DNAK	8				0
	DCQI	8				0
	Ack-Nack repetition factor	3				
	CQI Feedback (Table 5.2B.4)	4ms				
HSUPA Specific Settings	CQI Repetition Factor (Table 5.2B.4)	2				
	$A_{hs} = \beta_{hs}/\beta_c$	30/15				
	E-DPDCCCH	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 Channelisation Codes	2xSF2				SF4

Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm)	Avg Pwr with Power Back-off (dBm)
W-CDMA Band V	Subtest 1	4132	826.4	22.5	19.1
		4183	836.6	22.7	19.5
		4233	846.6	22.2	19.4
	Subtest 2	4132	826.4	20.5	18.3
		4183	836.6	20.7	18.6
		4233	846.6	20.2	18.5
	Subtest 3	4132	826.4	21.3	18.3
		4183	836.6	21.6	18.6
		4233	846.6	21.1	18.4
	Subtest 4	4132	826.4	20.5	18.3
		4183	836.6	20.8	18.6
		4233	846.6	20.2	18.5
	Subtest 5	4132	826.4	22.5	19.2
		4183	836.6	22.7	19.5
		4233	846.6	22.2	19.5
W-CDMA Band II	Subtest 1	9262	1852.4	21.0	11.6
		9400	1880.0	21.1	11.8
		9538	1907.6	21.6	11.9
	Subtest 2	9262	1852.4	20.8	11.6
		9400	1880.0	19.1	11.8
		9538	1907.6	19.9	11.9
	Subtest 3	9262	1852.4	20.7	11.7
		9400	1880.0	20.2	11.9
		9538	1907.6	20.9	11.9
	Subtest 4	9262	1852.4	19.8	11.7
		9400	1880.0	19.1	11.9
		9538	1907.6	20.0	11.9
	Subtest 5	9262	1852.4	21.0	11.9
		9400	1880.0	21.1	12.0
		9538	1907.6	21.6	12.1

8.3. LTE Band 5 and 17

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.

LTE Band 5 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)					
							Max. Power			with Pwr Back-off		
							829 MHz	836.5 MHz	844 MHz	829 MHz	836.5 MHz	844 MHz
LTE Band 5	10	QPSK	1	0	0	0	23.50	23.50	23.50	19.00	19.00	19.00
			1	25	0	0	23.50	23.50	23.50	19.00	19.00	19.00
			1	49	0	0	23.50	23.50	23.50	19.00	19.00	18.90
			25	0	1	1	22.27	22.23	22.17	18.90	18.90	18.00
			25	12	1	1	22.24	22.23	22.21	18.90	18.90	18.90
			25	25	1	1	22.21	22.17	22.18	19.00	18.90	18.90
			50	0	1	1	22.14	22.17	22.11	18.90	18.90	18.80
		16QAM	1	0	1	1	22.50	22.50	22.49	19.00	18.80	19.00
			1	25	1	1	22.50	22.50	22.45	19.00	19.00	18.90
			1	49	1	1	22.50	22.50	22.45	19.00	18.70	19.00
			25	0	2	2	21.03	21.00	20.97	18.90	19.00	18.90
			25	12	2	2	20.99	20.98	21.01	19.00	19.00	18.90
			25	25	2	2	21.01	20.97	21.02	19.00	18.90	18.90
			50	0	2	3	20.97	20.95	20.96	18.90	19.00	18.90
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)					
							Max. Power			with Pwr Back-off		
							826.5 MHz	836.5 MHz	846.5 MHz	826.5 MHz	836.5 MHz	846.5 MHz
LTE Band 5	5	QPSK	1	0	0	0	23.50	23.50	23.50	18.70	19.00	19.00
			1	12	0	0	23.50	23.50	23.50	19.00	19.00	19.00
			1	24	0	0	23.50	23.50	23.50	18.70	18.80	18.80
			12	0	1	1	22.22	22.19	22.16	18.90	18.90	18.80
			12	7	1	1	22.22	22.22	22.13	18.90	18.90	18.80
			12	13	1	1	22.24	22.19	22.17	18.90	18.90	18.80
			25	0	1	1	22.28	22.23	22.18	19.00	18.90	18.80
		16QAM	1	0	1	1	22.50	22.50	22.50	18.90	19.00	19.00
			1	12	1	1	22.50	22.50	22.50	18.90	18.90	19.00
			1	24	1	1	22.50	22.50	22.50	19.00	18.90	19.00
			12	0	2	2	21.06	21.05	20.96	18.90	19.00	18.90
			12	7	2	2	21.04	21.01	20.92	18.90	19.00	18.90
			12	13	2	2	21.05	21.08	20.91	18.90	19.00	18.80
			25	0	2	2	21.06	21.00	21.05	18.90	18.90	19.00

Note(s):

1. MPR not supported during power back-off.

LTE Band 17 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)	
							Max. Power	with Pwr Back-off
							710 MHz	710 MHz
LTE Band 17	10	QPSK	1	0	0	0	23.50	19.24
			1	25	0	0	23.50	19.12
			1	49	0	0	23.50	19.10
			25	0	1	1	22.10	19.11
			25	12	1	1	22.09	19.07
			25	25	1	1	22.09	19.11
			50	0	1	1	22.08	19.06
		16QAM	1	0	1	1	22.50	19.40
			1	25	1	1	22.50	19.45
			1	49	1	1	22.50	19.48
			25	0	2	2	21.01	19.10
			25	12	2	3	20.95	19.10
			25	25	2	3	20.99	19.10
			50	0	2	3	20.91	19.12
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)	
							Max. Power	with Pwr Back-off
							710 MHz	710 MHz
LTE Band 17	5	QPSK	1	0	0	0	23.50	19.50
			1	12	0	0	23.50	19.50
			1	24	0	0	23.50	19.30
			12	0	1	1	22.17	19.15
			12	6	1	1	22.15	19.13
			12	11	1	1	22.17	19.16
			25	0	1	1	22.12	19.15
		16QAM	1	0	1	1	22.50	19.50
			1	12	1	1	22.50	19.42
			1	24	1	1	22.50	19.40
			12	0	2	2	21.13	19.13
			12	6	2	2	21.08	19.13
			12	11	2	2	21.12	19.16
			25	0	2	3	20.99	19.13

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 KDB941225 D05 SAR for LTE Devices v02r02c
- MPR not supported during power back-off.

8.4. Wi-Fi (2.4 GHz Band)

Required Test Channels per KDB 248227 D01

Measured Results

Band (GHz)	Mode	Mode	No. of Transmitters	Ch #	Freq. (MHz)	Avg Pwr (dBm)		SAR Test (Yes/No)
						ANT 1	ANT 2	
2.4 (DTS)	802.11b	1 Mbps	1 Tx	1	2412	11.4	11.1	Yes
				6	2437	11.1	11.1	
				11	2462	11.2	11.5	
			2 Tx	1	2412	11.2	11.1	Yes
				6	2437	11.1	11.1	
				11	2462	10.8	10.5	
	802.11g	6 Mbps	1 Tx	1	2412	10.5	10.5	No
				6	2437	10.5	10.5	
				11	2462	10.5	10.2	
			2 Tx	1	2412	10.4	10.5	No
				6	2437	10.5	10.5	
				11	2462	10.4	10.2	
	802.11n (HT20)	MCS0	1 Tx	1	2412	9.3	9.3	No
				6	2437	9.3	9.0	
				11	2462	9.2	9.0	
			2 Tx	1	2412	9.2	9.1	No
				6	2437	9.3	9.0	
				11	2462	9.0	8.8	

Note(s):

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

Power measurements to determine worst-case data rates

Mode	Ch #	Freq. (MHz)	No. of Transmitters	Data Rate	Avg Pwr (dBm)		SAR test (Yes/No)
					ANT 1	ANT 2	
802.11b	6	2437	1 Tx	1 Mbps	11.4	11.5	Yes
				2 Mbps	11.4	11.5	No
				5.5 Mbps	11.4	11.5	No
				11 Mbps	11.4	11.5	No

8.5. Wi-Fi (5 GHz Bands)

Maximum tune-up tolerance limit is 6.5 dBm. This power level qualifies for exclusion of SAR testing. Please refer to Section 13.1.2 for more details.

8.6. Bluetooth

Band (GHz)	Mode	Ch #	Freq. (MHz)	Avg Pwr (dBm)
				ANT 2
2.4	V3.0 + EDR, GFSK	0	2402	10.2
		39	2441	11.5
		78	2480	9.7
	V3.0 + EDR, $\pi/4$ DQPSK	0	2402	6.0
		39	2441	7.4
		78	2480	5.2
	V3.0 + EDR, 8-DPSK	0	2402	6.0
		39	2441	7.4
		78	2480	5.2
	V4.0 LE, GFSK	0	2402	6.1
		19	2440	7.3
		39	2480	4.6

9. 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.

9.1. 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

9.2. Dielectric Property Measurements Results

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

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

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

SAR Lab 1

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
9/18/2014	Body 835	e'	52.8600	Relative Permittivity (ϵ_r):	52.86	55.20	-4.24	5
		e''	21.8400	Conductivity (σ):	1.01	0.97	4.54	5
	Body 820	e'	53.0100	Relative Permittivity (ϵ_r):	53.01	55.28	-4.10	5
		e''	21.8900	Conductivity (σ):	1.00	0.97	3.06	5
	Body 850	e'	52.6800	Relative Permittivity (ϵ_r):	52.68	55.16	-4.49	5
		e''	21.7700	Conductivity (σ):	1.03	0.99	4.23	5
9/29/2014	Body 2450	e'	50.8100	Relative Permittivity (ϵ_r):	50.81	52.70	-3.59	5
		e''	14.7800	Conductivity (σ):	2.01	1.95	3.25	5
	Body 2410	e'	50.8900	Relative Permittivity (ϵ_r):	50.89	52.76	-3.54	5
		e''	14.6300	Conductivity (σ):	1.96	1.91	2.78	5
	Body 2475	e'	50.8000	Relative Permittivity (ϵ_r):	50.80	52.67	-3.55	5
		e''	14.7800	Conductivity (σ):	2.03	1.99	2.46	5
10/3/2014	Body 2450	e'	51.4800	Relative Permittivity (ϵ_r):	51.48	52.70	-2.31	5
		e''	14.3700	Conductivity (σ):	1.96	1.95	0.39	5
	Body 2410	e'	51.6500	Relative Permittivity (ϵ_r):	51.65	52.76	-2.10	5
		e''	14.2100	Conductivity (σ):	1.90	1.91	-0.17	5
	Body 2475	e'	51.4000	Relative Permittivity (ϵ_r):	51.40	52.67	-2.41	5
		e''	14.5000	Conductivity (σ):	2.00	1.99	0.52	5

SAR Lab 2

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit $\pm$ (%)
9/11/2014	Body 835	e'	53.5400	Relative Permittivity (ϵ_r):	53.54	55.20	-3.01	5
		e''	21.8700	Conductivity (σ):	1.02	0.97	4.68	5
	Body 820	e'	53.6900	Relative Permittivity (ϵ_r):	53.69	55.28	-2.87	5
		e''	21.9500	Conductivity (σ):	1.00	0.97	3.34	5
	Body 850	e'	53.3700	Relative Permittivity (ϵ_r):	53.37	55.16	-3.24	5
		e''	21.7800	Conductivity (σ):	1.03	0.99	4.28	5

SAR Lab 5

	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
9/9/2014	Body 835	e'	53.3900	Relative Permittivity (ϵ_r):	53.39	55.20	-3.28	5
		e"	21.8900	Conductivity (σ):	1.02	0.97	4.78	5
	Body 820	e'	53.5300	Relative Permittivity (ϵ_r):	53.53	55.28	-3.16	5
		e"	21.9500	Conductivity (σ):	1.00	0.97	3.34	5
	Body 850	e'	53.2200	Relative Permittivity (ϵ_r):	53.22	55.16	-3.51	5
		e"	21.8400	Conductivity (σ):	1.03	0.99	4.57	5
9/10/2014	Body 1900	e'	53.5400	Relative Permittivity (ϵ_r):	53.54	53.30	0.45	5
		e"	14.3100	Conductivity (σ):	1.51	1.52	-0.54	5
	Body 1850	e'	53.7300	Relative Permittivity (ϵ_r):	53.73	53.30	0.81	5
		e"	14.1900	Conductivity (σ):	1.46	1.52	-3.97	5
	Body 1910	e'	53.5000	Relative Permittivity (ϵ_r):	53.50	53.30	0.38	5
		e"	14.3200	Conductivity (σ):	1.52	1.52	0.05	5
9/10/2014	Body 750	e'	53.3200	Relative Permittivity (ϵ_r):	53.32	55.55	-4.01	5
		e"	23.3200	Conductivity (σ):	0.97	0.96	0.98	5
	Body 700	e'	53.8600	Relative Permittivity (ϵ_r):	53.86	55.74	-3.37	5
		e"	23.8500	Conductivity (σ):	0.93	0.96	-3.23	5
	Body 790	e'	52.9700	Relative Permittivity (ϵ_r):	52.97	55.39	-4.37	5
		e"	23.0200	Conductivity (σ):	1.01	0.97	4.66	5
9/11/2014	Body 1900	e'	51.0100	Relative Permittivity (ϵ_r):	51.01	53.30	-4.30	5
		e"	14.4700	Conductivity (σ):	1.53	1.52	0.57	5
	Body 1850	e'	51.2000	Relative Permittivity (ϵ_r):	51.20	53.30	-3.94	5
		e"	14.3900	Conductivity (σ):	1.48	1.52	-2.62	5
	Body 1910	e'	50.9700	Relative Permittivity (ϵ_r):	50.97	53.30	-4.37	5
		e"	14.4800	Conductivity (σ):	1.54	1.52	1.17	5
9/19/2014	Body 1900	e'	50.7400	Relative Permittivity (ϵ_r):	50.74	53.30	-4.80	5
		e"	14.4100	Conductivity (σ):	1.52	1.52	0.16	5
	Body 1850	e'	50.9200	Relative Permittivity (ϵ_r):	50.92	53.30	-4.47	5
		e"	14.2600	Conductivity (σ):	1.47	1.52	-3.50	5
	Body 1910	e'	50.7000	Relative Permittivity (ϵ_r):	50.70	53.30	-4.88	5
		e"	14.4400	Conductivity (σ):	1.53	1.52	0.89	5
9/19/2014	Body 750	e'	52.9000	Relative Permittivity (ϵ_r):	52.90	55.55	-4.76	5
		e"	23.3100	Conductivity (σ):	0.97	0.96	0.93	5
	Body 700	e'	53.4800	Relative Permittivity (ϵ_r):	53.48	55.74	-4.05	5
		e"	23.8600	Conductivity (σ):	0.93	0.96	-3.18	5
	Body 725	e'	53.2200	Relative Permittivity (ϵ_r):	53.22	55.64	-4.35	5
		e"	23.6100	Conductivity (σ):	0.95	0.96	-0.98	5

10. 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 remeasured or sooner when marginal liquid parameters are used at the beginning of a series of measurements.

10.1. System Performance Check Measurement Conditions

- The measurements were performed in the flat section of the TWIN SAM or ELI phantom, shell thickness: 2.0 $\pm$ 0.2 mm (bottom plate) filled with Body or Head simulating liquid of the following parameters.
- The depth of tissue-equivalent liquid in a phantom must be $\geq$ 15.0 cm for SAR measurements $\leq$ 3 GHz and $\geq$ 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.

10.2. 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	1071	11/15/2013	750	1g	8.46	8.64
				10g	5.51	5.72
D835V2	4d117	5/16/2014	835	1g	9.23	9.61
				10g	5.98	6.31
D835V2	4d002	11/15/2013	835	1g	9.49	9.43
				10g	6.18	6.21
D1900V2	5d043	11/12/2013	1900	1g	40.1	39
				10g	21.1	20.8
D2450V2	706	5/20/2014	2450	1g	53.0	50.2
				10g	24.5	23.4

10.3. 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 Lab 1

Date Tested	System Dipole		T.S. Liquid	Measured Results			Target (Ref. Value)	Delta $\pm 10\%$	Est./Zoom Ratio	Plot No.
	Type	Serial #		Area Scan	Zoom Scan	Normalize to 1 W				
9/18/2014	D835V2	4d002	Body	1g	0.96	0.95	9.5	9.43	0.85	1.35
				10g	0.65	0.63	6.3	6.21	1.45	
9/29/2014	D2450V2	706	Body	1g	5.03	5.08	50.8	50.20	1.20	-0.99
				10g	2.16	2.34	23.4	23.40	0.00	
10/3/2014	D2450V2	706	Body	1g	5.09	5.12	51.20	50.20	1.99	-0.59
				10g	2.19	2.35	23.50	23.40	0.43	

SAR Lab 2

Date Tested	System Dipole		T.S. Liquid	Measured Results			Target (Ref. Value)	Delta $\pm 10\%$	Est./Zoom Ratio	Plot No.
	Type	Serial #		Area Scan	Zoom Scan	Normalize to 1 W				
9/11/2014	D835V2	4d002	Body	1g	0.95	0.95	9.5	9.43	0.42	0.53
				10g	0.64	0.66	6.6	6.21	6.12	

SAR Lab 5

Date Tested	System Dipole		T.S. Liquid	Measured Results			Target (Ref. Value)	Delta $\pm 10\%$	Est./Zoom Ratio	Plot No.
	Type	Serial #		Area Scan	Zoom Scan	Normalize to 1 W				
9/9/2014	D835V2	4d117	Body	1g	1.04	1.02	10.2	9.61	6.14	1.92
				10g	0.70	0.67	6.7	6.31	6.81	
9/10/2014	D1900V2	5d043	Body	1g	3.83	3.77	37.7	39.0	-3.33	1.57
				10g	1.93	1.98	19.8	20.8	-4.81	
9/10/2014	D750V3	1071	Body	1g	0.95	0.93	9.3	8.64	7.41	2.21
				10g	0.64	0.62	6.2	5.72	8.22	
9/11/2014	D1900V2	5d043	Body	1g	4.29	4.25	42.5	39.0	8.97	0.93
				10g	2.15	2.22	22.2	20.8	6.73	
9/19/2014	D1900V2	5d043	Body	1g	4.07	4.11	41.1	39.0	5.38	-0.98
				10g	2.03	2.16	21.6	20.8	3.85	
9/19/2014	D750V3	1071	Body	1g	0.93	0.92	9.2	8.64	5.90	1.61
				10g	0.63	0.61	6.1	5.72	6.47	

11. 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 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 941225 D01 SAR test for 3G devices:

Body SAR is also measured for HSPA when the maximum average output of each RF channel with HSPA active is at least $\frac{1}{4}$ dB higher than that measured without HSPA using 12.2 kbps RMC or the maximum SAR for 12.2 kbps RMC is above 75% of the SAR limit. Body SAR for HSPA is measured with E-DCH Sub-test 5, using H-Set 1 and QPSK for FRC and a 12.2 kbps RMC configured in Test Loop Mode 1 with power control algorithm 2.

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.

KDB 248227 D01 SAR Measurements Procedures for 802.11 a/b/g Transmitters v01r02 (pg.6):

Each channel should be tested at the lowest data rate in each a-b/g mode or 4.9 GHz channel BW configuration.

When the extrapolated maximum peak SAR for the maximum output channel is ≤ 1.6 W/kg and the 1-g averaged SAR is ≤ 0.8 W/kg, testing of other channels in the "default test channels" or "required test channels" configuration is optional.

April 2013 TCB Workshop Updates:

Apply usual 802.11 test exclusion considerations, but include 802.11ac SAR for highest 802.11a configuration in each frequency band and each exposure condition.

11.1. GSM1900

Mode	Pwr Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Voice	On	0	Rear	661	1880.0	18.0	17.8	0.252	0.264	1
			Edge 1	661	1880.0	18.0	17.8	0.217	0.227	
	Off	22	Rear	661	1880.0	29.5	29.5	0.345	0.345	2
		22	Edge 1	661	1880.0	29.5	29.5	0.303	0.303	
		0	Edge 2	661	1880.0	29.5	29.5	0.091	0.091	

Mode	Pwr Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
GPRS 2 slots	On	0	Rear	661	1880.0	18.0	17.9	0.270	0.276	3
			Edge 1	661	1880.0	18.0	17.9	0.232	0.237	
	Off	22	Rear	661	1880.0	27.0	27.0	0.404	0.404	4
		22	Edge 1	661	1880.0	27.0	27.0	0.363	0.363	
		0	Edge 2	661	1880.0	27.0	27.0	0.101	0.101	

11.2. WCDMA Band V

Mode	Pwr Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Rel 99 RMC	On	0	Rear	4132	826.4	19.5	19.2	0.821	0.880	5
				4183	836.6	19.5	19.3	0.788	0.825	
				4233	846.6	19.5	19.3	0.788	0.825	
			Edge 1	4183	836.6	19.5	19.3	0.225	0.236	
			Edge 2	4183	836.6	19.5	19.3	0.073	0.076	
	Off	22	Rear	4183	836.6	23.5	22.7	0.114	0.137	
		22	Edge 1	4183	836.6	23.5	22.7	0.019	0.023	
		0	Edge 2	4183	836.6	23.5	22.7	0.230	0.277	6

11.3. W-CDMA Band II

Mode	Pwr Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Rel 99 RMC	On	0	Rear	9400	1880.0	12.5	11.9	0.509	0.584	7
			Edge 1	9400	1880.0	12.5	11.9	0.430	0.494	
	Off	22	Rear	9400	1880.0	23.0	22.3	0.506	0.594	8
		22	Edge 1	9400	1880.0	23.0	22.3	0.491	0.577	
		0	Edge 2	9400	1880.0	23.0	22.3	0.126	0.148	

11.4. LTE Band 5

Mode	Pwr Back-off	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	
QPSK	on	0	Rear	20450	829.0	1	0	19.0	19.0	0.978	0.978	9
						25	25	19.0	19.0	1.030	1.030	
				20525	836.6	1	0	19.0	19.0	1.080	1.080	
						25	0	19.0	18.9	1.010	1.034	
						50	0	19.0	18.9	1.010	1.034	
						1	0	19.0	19.0	1.000	1.000	
			Edge 1	20525	836.6	1	0	19.0	19.0	0.293	0.293	
						25	0	19.0	18.9	0.288	0.295	
				20525	836.6	1	0	19.0	19.0	0.089	0.089	
						25	0	19.0	18.9	0.091	0.093	
						1	0	19.0	19.0	0.089	0.089	
						25	0	19.0	18.9	0.091	0.093	
	off	22	Rear	20525	836.6	1	0	23.5	23.5	0.117	0.117	
						25	0	22.5	22.2	0.094	0.100	
		22	Edge 1	20525	836.6	1	0	23.5	23.5	0.019	0.019	
						25	0	22.5	22.2	0.016	0.016	
		0	Edge 2	20525	836.6	1	0	23.5	23.5	0.202	0.202	
						25	0	22.5	22.2	0.158	0.168	

11.5. LTE Band 17

Mode	Pwr Back-off	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	
QPSK	on	0	Rear	23790	710.0	1	0	19.5	19.2	0.349	0.371	11
						25	0	19.5	19.1	0.364	0.398	
			Edge 1	23790	710.0	1	0	19.5	19.2	0.042	0.045	
						25	0	19.5	19.1	0.048	0.053	
			Edge 2	23790	710.0	1	0	19.5	19.2	0.007	0.008	
						25	0	19.5	19.1	0.007	0.008	
	off	22	Rear	23790	710.0	1	0	23.5	23.5	0.015	0.015	12
						25	0	22.5	22.1	0.011	0.012	
		22	Edge 1	23790	710.0	1	0	23.5	23.5	0.005	0.005	
						25	0	22.5	22.1	0.003	0.004	
		0	Edge 2	23790	710.0	1	0	23.5	23.5	0.000	0.000	
						25	0	22.5	22.1	0.011	0.012	

11.6. Wi-Fi DTS Band

Mode		Dist. (mm)	Test Position	Antenna	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
							Tune-up limit	Meas.	Meas.	Scaled	
2.4 (DTS)	802.11b	0	Rear	1	1	2412	11.5	11.4	0.140	0.143	13
				2	11	2462	11.5	11.5	0.343	0.343	
			Edge 1	2	11	2462	11.5	11.5	0.135	0.135	

11.7. Bluetooth

Mode		Dist. (mm)	Test Position	Antenna	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
							Tune-up limit	Meas.	Meas.	Scaled	
Bluetooth	802.11b	0	Rear	2	39	2441	11.5	11.5	0.430	0.430	14
Bluetooth	802.11b	0	Edge 1	2	39	2441	11.5	11.5	0.261	0.261	

12. SAR Measurement Variability

In accordance with published RF Exposure KDB procedure 865664 D01 SAR measurement 100 MHz to 6 GHz v01r03. These additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

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

12.1. The Highest Measured SAR Configuration in Each Frequency Band

Frequency Band (MHz)	Air Interface	Stand-alone (W/kg)	Repeated SAR (Yes/No)
700	LTE Band 17	0.364	No
850	LTE Band 5	1.080	Yes
	W-CDMA Band V		
1900	GSM 1900		
	W-CDMA Band II	0.509	No
2400	WiFi 802.11b/g/n	0.343	No
	Bluetooth	0.430	No

12.2. Repeated Measurement Results

Frequency band	Test Position	Mode	Pwr Back-off	Dist. (mm)	Ch #.	Freq. (MHz)	Meas. SAR (W/kg)		Largest to Smallest SAR Ratio	Note
							Original	Repeated		
LTE Band 5	Rear	QPSK	On	0	20525	836.6	1.080	1.060	1.02	1

Note(s):

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

13. Simultaneous Transmission SAR Analysis

13.1. Estimated SAR for Simultaneous Transmission SAR Analysis

Considerations for SAR estimation

- When standalone SAR test exclusion applies, standalone SAR must also be estimated to determine simultaneous transmission SAR test exclusion.
- Dedicated Host Approach criteria for SAR test exclusion is likewise applied to SAR estimation, with certain distinctions between test exclusion and SAR estimation:
 - When the separation distance from the antenna to an adjacent edge is ≤ 5 mm, a distance of 5 mm is applied for SAR estimation; this is the same between test exclusion and SAR estimation calculations.
 - When the separation distance from the antenna to an adjacent edge is > 5 mm but ≤ 50 mm, the actual antenna-to-edge separation distance is applied for SAR estimation.
 - When the minimum test separation distance is > 50 mm, the estimated SAR value is 0.4 W/kg
- Test positions Edge 3 and Edge 4 are inherently compliant as they consist of only estimated SAR values for all applicable transmitters and consequently will always have sum of SAR values < 1.2 W/kg. Simultaneous transmission SAR analysis was therefore not performed for these test positions.

13.1.1. Estimated SAR for WWAN

Antenna	Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)					Estimated 1-g SAR Value (W/kg)				
			dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Rear	Edge 1	Edge 2	Edge 3	Edge 4
Full Power, Proximity Sensor Off. A sensor triggering of 14 mm is included for both Rear and Edge 1														
Cellular	GPRS 2 Slots	1909.8	29.50	223	5	2	17	166	175	-MEA SURE-	-MEA SURE-	-MEA SURE-	0.400	0.400
Cellular	W-CDMA 5	846.6	23.50	224	5	2	17	166	175	-MEA SURE-	-MEA SURE-	-MEA SURE-	0.400	0.400
Cellular	W-CDMA 2	1907.6	23.00	200	5	2	17	166	175	-MEA SURE-	-MEA SURE-	-MEA SURE-	0.400	0.400
Cellular	LTE Band 5	844	23.50	224	5	2	17	166	175	-MEA SURE-	-MEA SURE-	-MEA SURE-	0.400	0.400
Cellular	LTE Band 17	710	23.50	224	5	2	17	166	175	-MEA SURE-	-MEA SURE-	-MEA SURE-	0.400	0.400
Second Stage Power Back-off, Proximity Sensor On														
Cellular	GPRS 2 Slots	1909.8	18.00	16	5	2	17	166	175	-MEA SURE-	-MEA SURE-	0.173	0.400	0.400
Cellular	W-CDMA 5	846.6	19.50	89	5	2	17	166	175	-MEA SURE-	-MEA SURE-	-MEA SURE-	0.400	0.400
Cellular	W-CDMA 2	1907.6	12.50	18	5	2	17	166	175	-MEA SURE-	-MEA SURE-	0.195	0.400	0.400
Cellular	LTE Band 5	844	19.00	79	5	2	17	166	175	-MEA SURE-	-MEA SURE-	-MEA SURE-	0.400	0.400
Cellular	LTE Band 17	710	19.50	89	5	2	17	166	175	-MEA SURE-	-MEA SURE-	-MEA SURE-	0.400	0.400

13.1.2. Estimated SAR for WLAN

Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)					Estimated 1-g SAR Value (W/kg)				
		dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Rear	Edge 1	Edge 2	Edge 3	Edge 4
Wi-Fi Antenna 1													
Wi-Fi 2.4 GHz	2462	11.50	14	5	9	190	165	39	-MEASURE-	0.325	0.400	0.400	0.075
Wi-Fi 5.2 GHz	5240	6.50	4	5	9	190	165	39	0.244	0.136	0.400	0.400	0.031
Wi-Fi 5.3 GHz	5320	6.50	4	5	9	190	165	39	0.246	0.137	0.400	0.400	0.032
Wi-Fi 5.5 GHz	5700	6.50	4	5	9	190	165	39	0.255	0.141	0.400	0.400	0.033
Wi-Fi 5.8 GHz	5825	6.50	4	5	9	190	165	39	0.257	0.143	0.400	0.400	0.033
Wi-Fi Antenna 2													
Wi-Fi 2.4 GHz	2462	11.50	14	5	2	164	165	70	-MEASURE-	-MEASURE-	0.400	0.400	0.400
Wi-Fi 5.2 GHz	5240	6.50	4	5	2	164	165	70	0.244	0.244	0.400	0.400	0.400
Wi-Fi 5.3 GHz	5320	6.50	4	5	2	164	165	70	0.246	0.246	0.400	0.400	0.400
Wi-Fi 5.5 GHz	5700	6.50	4	5	2	164	165	70	0.255	0.255	0.400	0.400	0.400
Wi-Fi 5.8 GHz	5825	6.50	4	5	2	164	165	70	0.257	0.257	0.400	0.400	0.400
Bluetooth	2480	11.50	14	5	2	164	165	70	-MEASURE-	-MEASURE-	0.400	0.400	0.400

13.2. Sum of the SAR for GSM1900 + Wi-Fi & BT

Test Position		Simultaneous Transmission Scenario						Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
		① GSM 1900	② Wi-Fi 1 (DTS)	③ Wi-Fi 2 (DTS)	④ Wi-Fi 1 (UNII)	⑤ Wi-Fi 2 (UNII)	⑥ Bluetooth		
Rear	① + ② + ③	0.404	0.143	0.343				0.890	No
	① + ④ + ⑤	0.404			0.257	0.257		0.918	No
	① + ⑥	0.404					0.430	0.834	No
Edge 1	① + ② + ③	0.363	0.325	0.135				0.823	No
	① + ④ + ⑤	0.363			0.143	0.257		0.763	No
	① + ⑥	0.363					0.280	0.643	No

Simultaneous transmission SAR test exclusion

As the Sum of the SAR is not greater than 1.6 W/kg simultaneous transmissions SAR testing is excluded.

13.3. Sum of the SAR for WCDMA Band V + Wi-Fi & BT

Test Position		Simultaneous Transmission Scenario						Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
		① W-CDMA Band V	② Wi-Fi 1 (DTS)	③ Wi-Fi 2 (DTS)	④ Wi-Fi 1 (UNII)	⑤ Wi-Fi 2 (UNII)	⑥ Bluetooth		
Rear	① + ② + ③	0.880	0.143	0.343				1.366	No
	① + ④ + ⑤	0.880			0.257	0.257		1.394	No
	① + ⑥	0.880					0.430	1.310	No
Edge 1	① + ② + ③	0.236	0.325	0.135				0.696	No
	① + ④ + ⑤	0.236			0.143	0.257		0.636	No
	① + ⑥	0.236					0.280	0.516	No

Simultaneous transmission SAR test exclusion

As the Sum of the SAR is not greater than 1.6 W/kg simultaneous transmissions SAR testing is excluded.

13.4. Sum of the SAR for WCDMA Band II + Wi-Fi & BT

Test Position		Simultaneous Transmission Scenario						Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
		① W-CDMA Band II	② Wi-Fi 1 (DTS)	③ Wi-Fi 2 (DTS)	④ Wi-Fi 1 (UNII)	⑤ Wi-Fi 2 (UNII)	⑥ Bluetooth		
Rear	① + ② + ③	0.594	0.143	0.343				1.080	No
	① + ④ + ⑤	0.594			0.257	0.257		1.108	No
	① + ⑥	0.594					0.430	1.024	No
Edge 1	① + ② + ③	0.577	0.325	0.135				1.037	No
	① + ④ + ⑤	0.577			0.143	0.257		0.977	No
	① + ⑥	0.577					0.280	0.857	No

Simultaneous transmission SAR test exclusion

As the Sum of the SAR is not greater than 1.6 W/kg simultaneous transmissions SAR testing is excluded.

13.5. Sum of the SAR for LTE Band 5 + Wi-Fi & BT

Test Position		Simultaneous Transmission Scenario						Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
		① LTE Band 5	② Wi-Fi 1 (DTS)	③ Wi-Fi 2 (DTS)	④ Wi-Fi 1 (UNII)	⑤ Wi-Fi 2 (UNII)	⑥ Bluetooth		
Rear	① + ② + ③	1.080	0.143	0.343				1.566	No
	① + ④ + ⑤	1.080			0.257	0.257		1.594	No
	① + ⑥	1.080					0.430	1.510	No
Edge 1	① + ② + ③	0.295	0.325	0.135				0.755	No
	① + ④ + ⑤	0.295			0.143	0.257		0.695	No
	① + ⑥	0.295					0.280	0.575	No

Simultaneous transmission SAR test exclusion

As the Sum of the SAR is not greater than 1.6 W/kg simultaneous transmissions SAR testing is excluded.

13.6. Sum of the SAR for LTE Band 17 + Wi-Fi & BT

Test Position		Simultaneous Transmission Scenario						Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
		① LTE Band 17	② Wi-Fi 1 (DTS)	③ Wi-Fi 2 (DTS)	④ Wi-Fi 1 (UNII)	⑤ Wi-Fi 2 (UNII)	⑥ Bluetooth		
Rear	① + ② + ③	0.398	0.143	0.343				0.884	No
	① + ④ + ⑤	0.398			0.257	0.257		0.912	No
	① + ⑥	0.398					0.430	0.828	No
Edge 1	① + ② + ③	0.053	0.325	0.135				0.513	No
	① + ④ + ⑤	0.053			0.143	0.257		0.453	No
	① + ⑥	0.053					0.280	0.333	No

Simultaneous transmission SAR test exclusion

As the Sum of the SAR is not greater than 1.6 W/kg simultaneous transmissions SAR testing is excluded.

14. Appendixes

Refer to separated files for the following appendixes.

- 14.1. Photos and Antenna Locations
- 14.2. System Performance Check Plots
- 14.3. Highest SAR Test Plots
- 14.4. Calibration Certificate for E-Field Probe EX3DV4 - SN 3902
- 14.5. Calibration Certificate for E-Field Probe EX3DV3 - SN 3531
- 14.6. Calibration Certificate for E-Field Probe EX3DV4 - SN 3991
- 14.7. Calibration Certificate for D750V3 - SN 1071
- 14.8. Calibration Certificate for D835V2 - SN 4d117
- 14.9. Calibration Certificate for D835V2 - SN 4d002
- 14.10. Calibration Certificate for D1900V2- SN 5d043
- 14.11. Calibration Certificate for D2450V2 - SN 706

END OF REPORT