SAR EVALUATION REPORT

FCC 47 CFR § 2.1093
IEEE Std 1528-2013

The model FCC ID: A3LSMT365 shares the same enclosure and circuit board as model FCC ID: A3LSMT365Y. The WLAN/Bluetooth circuitry and layout, including antenna, are almost identical between the two units. The WLAN/Bluetooth antenna and surrounding circuitry is the same between these two units, and tune up power targets are identical for WLAN and Bluetooth operations. For this reason the SAR data for the WLAN and Bluetooth operations for FCC ID: A3LSMT365 is considered representative for FCC ID: A3LSMT365Y.

For
GSM/WCDMA/LTE Phablet + Bluetooth, DTS/UNII a/b/g/n, ANT+ & NFC

Model: SM-T365Y
FCC ID: A3LSMT365Y

Report Number: 14U19505-S1B
Issue Date: 12/16/2014

Prepared for
Samsung Electronics Co., Ltd.
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NVLAP LAB CODE 200065-0

REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
--	12/10/2014	Initial Issue	--
A	12/15/2014	1. Added Cover Letter to Page 1 to justify the leverage of specific portions of SAR compliance information/data 2. Section 6.1: Updated DUT Description to show that Wi-Fi Hotspot Mode for 5GHz is not supported. 3. Section 6.4: Updated Simultaneous Transmission Conditions	AJ Newcomer
B	12/16/2014	Section 6.4: Updated Notes section	Coltyce Sanders

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1. Attestation of Test Results

Applicant Name	Samsung Electronics Co., Ltd.
FCC ID	A3LSMT365Y
DUT Description	GSM/WCDMA/LTE Phablet + Bluetooth, DTS/UNII a/b/g/n, ANT+ & NFC
Exposure Category	General Population/Uncontrolled Exposure
Applicable Standards	FCC 47 CFR § 2.1093 Published RF exposure KDB procedures IEEE Std 1528-2013
Date tested	12/1/2014 - 12/4/2014

The Highest Reported SAR (W/kg)

RF Exposure Conditions	Equipment Class			
	Licensed	DTS	U-NII	DSS
Head	0.082	0.539	0.090	N/A
Body	0.549	0.704	0.420	
Simultaneous Tx	Head: 0.621 Body: 1.120		Head: 0.172 Body: 0.836	

Note: The Wi-Fi (DTS/U-NII) and Bluetooth SAR measurement results from the original filling can be found in SAR test report 14U18519-S1A, FCC ID A3LSMT365. The standalone Wi-Fi and Bluetooth results from the original filling were used for Simultaneous Transmission Analysis purposes. Both models contain identical Wi-Fi/BT modules and antennas. Spot checks for 802.11a/b were performed to ensure that the SAR measurements for both devices are the same.

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:
	
Devin Chang Senior Engineer UL Verification Services Inc.	AJ Newcomer 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 § 2.1093, IEEE STD 1528-2013, the following FCC Published RF exposure KDB procedures, and TCB workshop updates:

- 447498 D01 General RF Exposure Guidance v05r02
- 648474 D04 Handset SAR v01r02
- 616217 D04 SAR for Laptop and Tablets v01r01
- 941225 D01 SAR test for 3G devices v02
- 941225 D05 SAR for LTE Devices v02r03
- 941225 D06 Hot Spot SAR v01r01
- 248227 D01 SAR Meas for 802 11abg v01r02
- 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r03
- 865664 D02 SAR Reporting v01r01
- 690783 D01 SAR Listings on Grants v01r02

3. Facilities and Accreditation

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

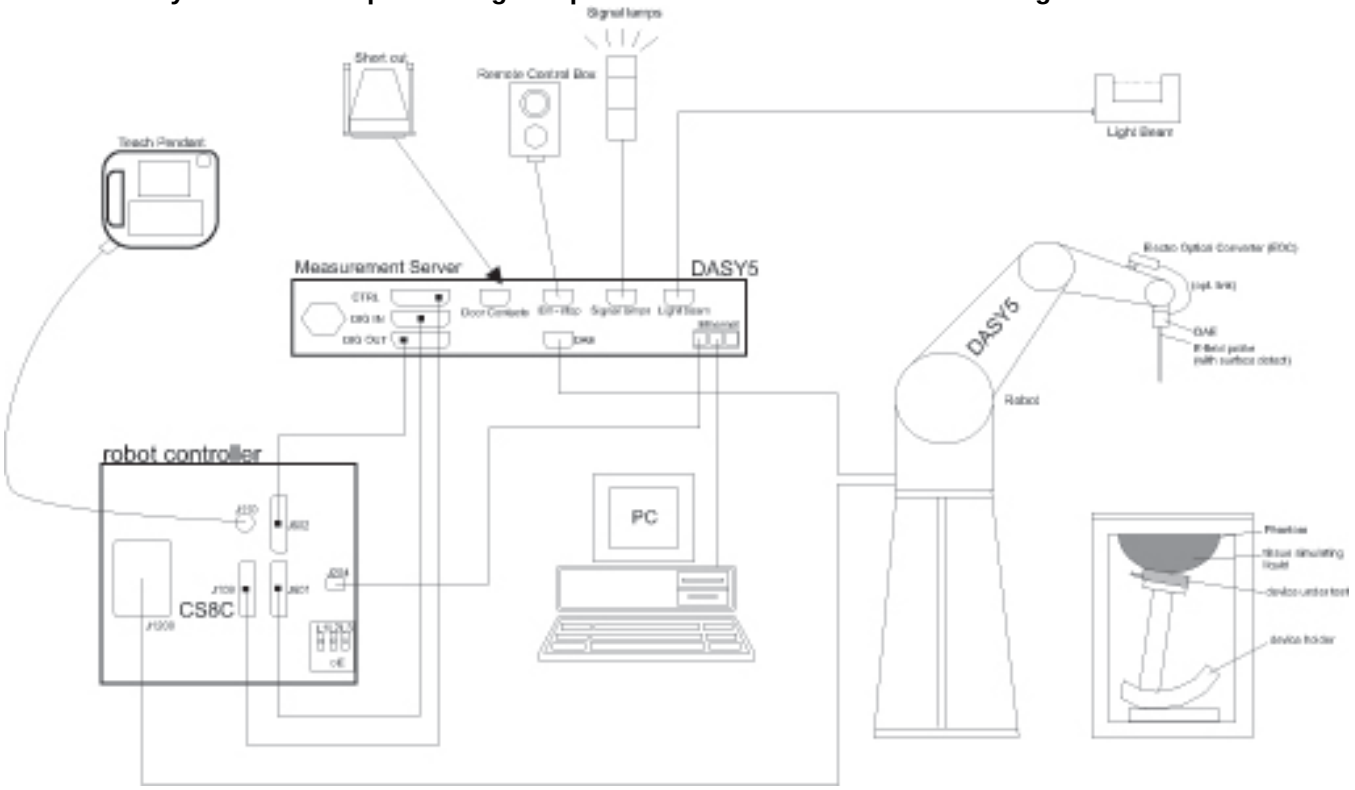
47173 Benicia Street	47266 Benicia Street
SAR Lab A	SAR Lab 1
SAR Lab B	SAR Lab 2
SAR Lab C	SAR Lab 3
SAR Lab D	SAR Lab 4
SAR Lab E	SAR Lab 5
SAR Lab F	
SAR Lab G	
SAR Lab H	

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0.

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	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.	

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	≤ 1.5·$\Delta z_{Zoom}(n-1)$	
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.

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	1082	9/16/2015
Dielectronic Probe kit	SPEAG	DAK-3.5 Short	SM DAK 200 BA	N/A
Thermometer	Control Company	4242	122529163	10/8/2015
Thermometer	EXTECH	445703	CCS-200	3/24/2015

System Check

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
HP Signal Generator	HP	8665B	3546A00784	6/23/2015
Power Meter	Agilent	N1911A	MY53060016	8/7/2015
Power Sensor	Agilent	E9323A	MY53070003	5/1/2015
Power Meter	HP	437B	3125U09516	10/6/2015
Power Sensor	HP	8481A	3318A95392	10/6/2015
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
E-Field Probe (SAR 3)	SPEAG	EX3DV4	3773	4/22/2015
Data Acquisition Electronics (SAR 3)	SPEAG	DAE4	1380	7/23/2015
System Validation Dipole	SPEAG	D835V2	4d142	9/9/2015
Thermometer (SAR Lab 3)	EXTECH	445703	CCS-237	6/3/2015

Others

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Base Station Simulator	R & S	CMW500	135393	7/3/2015
Power Meter	Agilent	N1912A	MY53040015	7/10/2015
Power Sensor	Agilent	N1921A	MY52200012	9/26/2015

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

6. Device Under Test (DUT) Information

6.1. DUT Description

Model: SM-T365Y	
Device Dimension	Overall (Length x Width): 212.95mm x 126.1mm Overall Diagonal: 239mm Display Diagonal: 203.1mm
Battery Back Cover	☒ Normal Battery Cover ☐ Normal Battery Cover with NFC ☐ Wireless Charger Battery Cover ☐ Wireless Charger Battery Cover with NFC
Battery Options	☒ Standard – Lithium-ion battery, Rating 3.8Vdc, 16.91Wh ☐ Extended (large capacity)
Accessory	Headset
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)

6.2. Wireless Technologies

Wireless technologies	Frequency bands	Operating mode	Duty Cycle used for SAR testing
WCDMA (UMTS)	Band V	UMTS Rel. 99 (Voice & Data) HSDPA HSUPA DC-HSDPA	100%
LTE (FDD)	Band 5	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)	100%
Bluetooth	2.4 GHz	Version 4.0 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
WCDMA Band V	R99	23.0	**23.5**	17.5	**18.0**
	HSDPA	23.0	**23.5**	17.5	**18.0**
	HSUPA	23.0	**23.5**	17.5	**18.0**
	DC-HSDPA	23.0	**23.5**	17.5	**18.0**
LTE Band 5	QPSK	23.0	**23.5**	17.5	**18.0**

6.4. Simultaneous Transmission Condition

RF Exposure Condition	Capable Transmit Configurations
Head	1. WCDMA Band V + Wi-Fi 2.4/5GHz 2. LTE B5 + Wi-Fi 2.4/5GHz
Body-worn	3. WCDMA Band V + Wi-Fi 2.4/5GHz 4. WCDMA Band V + BT 5. LTE B5 + Wi-Fi 2.4/5GHz 6. LTE B5 + BT

Notes:
1. Wi-Fi 2.4GHz supports Hotspot and Wi-Fi Direct.
2. WCDMA and LTE support Hotspot.
3. VoIP is support in WCDMA and LTE.
4. Wi-Fi 2.4 GHz Radio cannot transmit simultaneously with Bluetooth Radio.
5. Wi-Fi 5 GHz Radio can transmit simultaneously with Bluetooth Radio.

6.5. General LTE SAR Test and Reporting Considerations

<table>
<tr><th>Item</th><th colspan="7">Description</th></tr>
<tr><td rowspan="5">Frequency range, Channel Bandwidth, Numbers and Frequencies</td><td rowspan="2">Band 5</td><td colspan="6">Frequency range: 824 - 849 MHz</td></tr>
<tr><td colspan="6">Channel Bandwidth</td></tr>
<tr><td>20 MHz</td><td>15 MHz</td><td>10 MHz</td><td>5 MHz</td><td>3 MHz</td><td>1.4 MHz</td></tr>
<tr><td>Low</td><td></td><td></td><td>20450/ 829</td><td>20425/ 826.5</td><td>20415/ 825.5</td><td>20407/ 824.7</td></tr>
<tr><td>Mid</td><td></td><td></td><td>20525/ 836.5</td><td>20525/ 836.5</td><td>20525/ 836.5</td><td>20525/ 836.5</td></tr>
<tr><td>High</td><td></td><td></td><td>20600/ 844</td><td>20625/ 846.5</td><td>20635/ 847.5</td><td>20643/ 848.3</td></tr>
<tr><td>LTE transmitter and antenna implementation</td><td colspan="7">LTE has one (1) Tx/Rx antenna and one (1) Rx antenna
Tx/Rx Antenna : LTE Bands 5 Rx Antenna : LTE Bands 5
Refer to Appendix A. Photos and Antenna Locations.</td></tr>
<tr><td>Maximum power reduction (MPR)</td><td colspan="7">
Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3
<table>
<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
</td></tr>
<tr><td>Power reduction</td><td colspan="7">Yes, a Proximity Sensor is used to determine Power Reduction</td></tr>
<tr><td>Spectrum plots for RB configurations</td><td colspan="7">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.</td></tr>
</table>

6.6. Power Reduction by Proximity Sensing

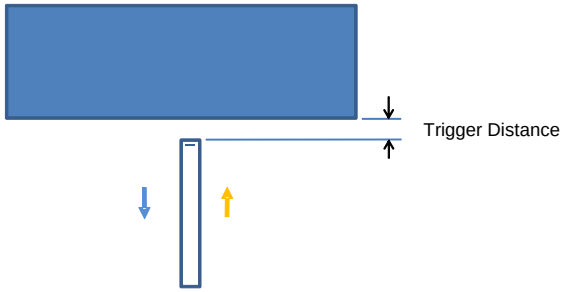
6.6.1. Proximity Sensor Triggering Distance (KDB 616217 §6.2)

Edge 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**

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

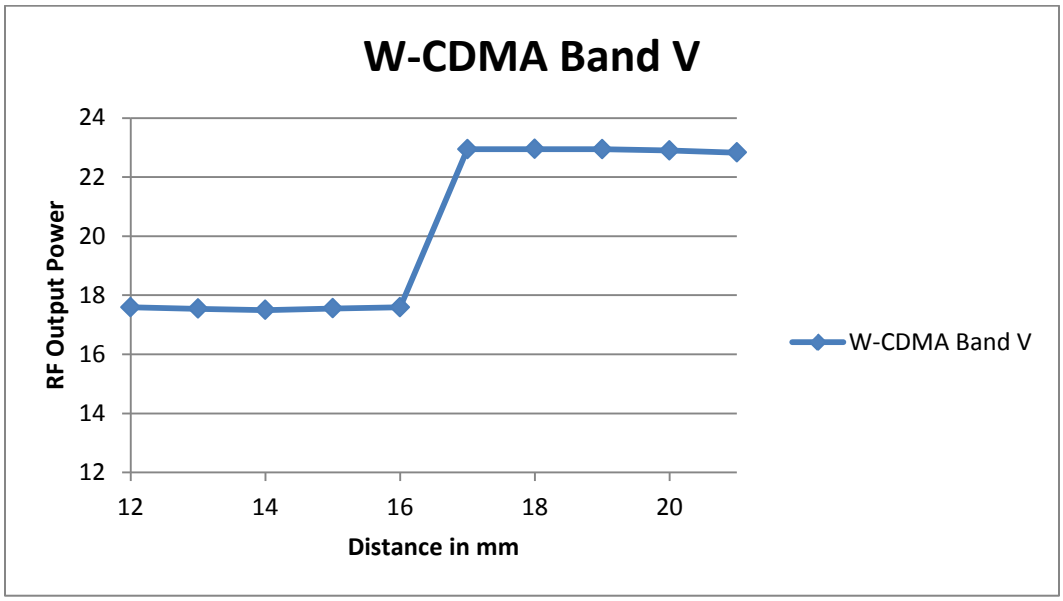
Tissue simulating liquid	Trigger distance - Edge 3		Trigger distance - Edge 4		Trigger distance - Rear	
	Moving toward phantom	Moving from phantom	Moving toward phantom	Moving from phantom	Moving toward phantom	Moving from phantom
850 muscle	15 mm	15 mm	0 mm	0 mm	15 mm	15 mm

6.6.2. Proximity Sensor Triggering Distance Measurement Results

WCDMA Bands V

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

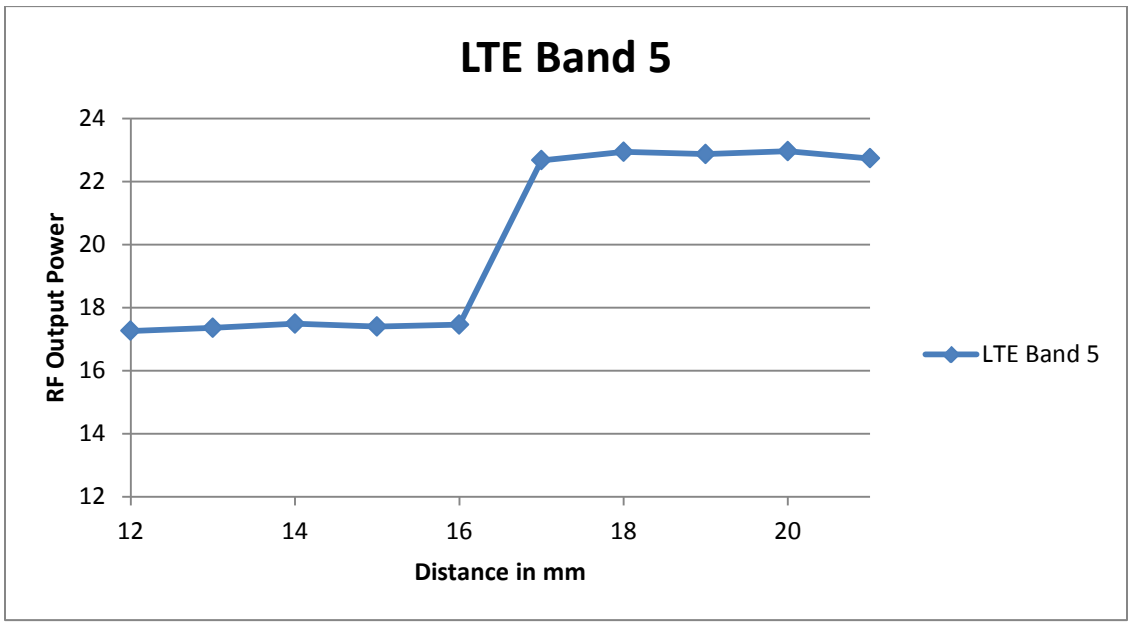
Distance to DUT vs. Output Power in dBm										
Distance	21	20	19	18	17	16	15	14	13	12
W-CDMA Band V	22.83	22.90	22.94	22.95	22.94	17.59	17.55	17.50	17.54	17.59



LTE Band 5

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

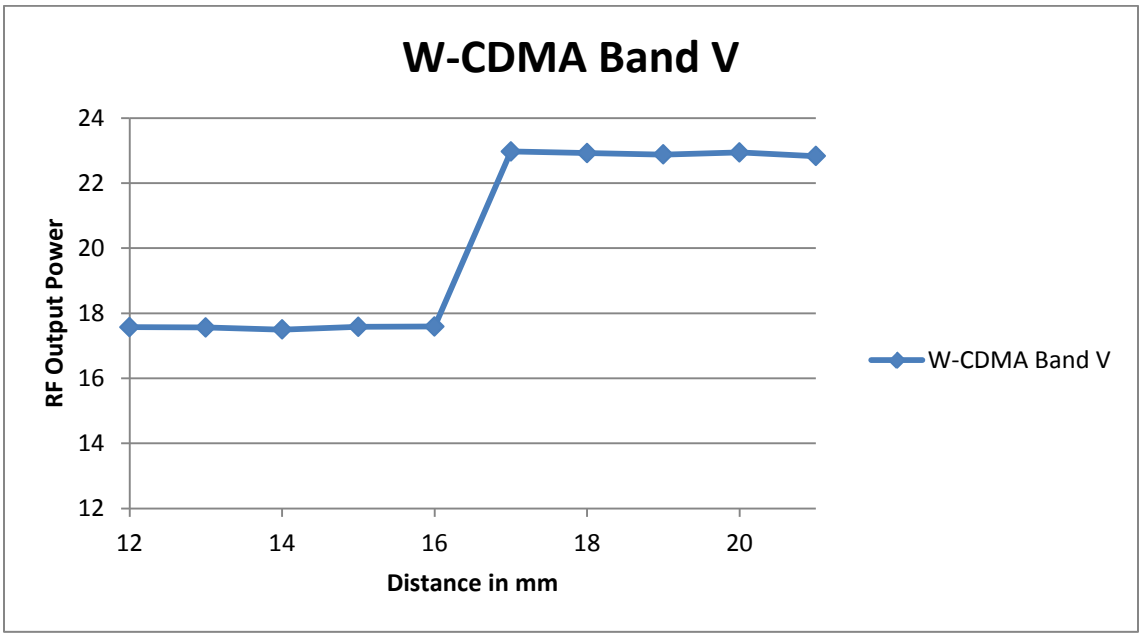
Distance to DUT vs. Output Power in dBm										
Distance	21	20	19	18	17	16	15	14	13	12
LTE Band 5	22.73	22.96	22.87	22.94	22.67	17.46	17.4	17.49	17.36	17.26



WCDMA Bands V

Edge 3, DUT Moving Toward (Trigger) and Away (Release) from the Phantom

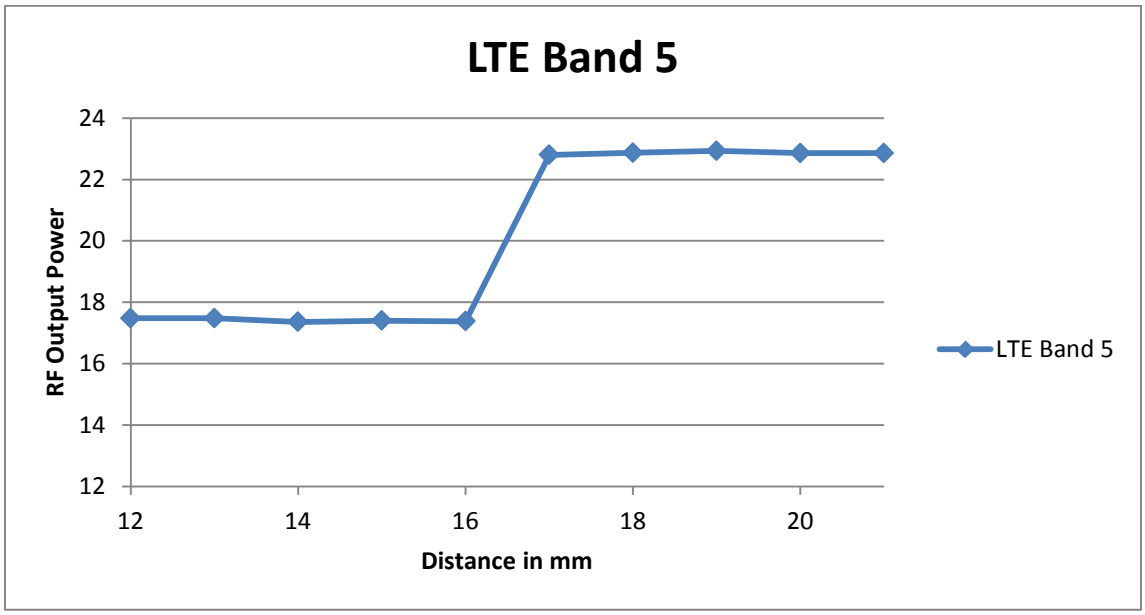
Distance to DUT vs. Output Power in dBm										
Distance	21	20	19	18	17	16	15	14	13	12
W-CDMA Band V	22.83	22.94	22.88	22.92	22.97	17.59	17.58	17.5	17.56	17.57



LTE Band 5

Edge 3, DUT Moving Toward (Trigger) and Away (Release) from the Phantom

Distance to DUT vs. Output Power in dBm										
Distance	21	20	19	18	17	16	15	14	13	12
LTE Band 5	22.86	22.86	22.93	22.87	22.8	17.38	17.4	17.36	17.48	17.48



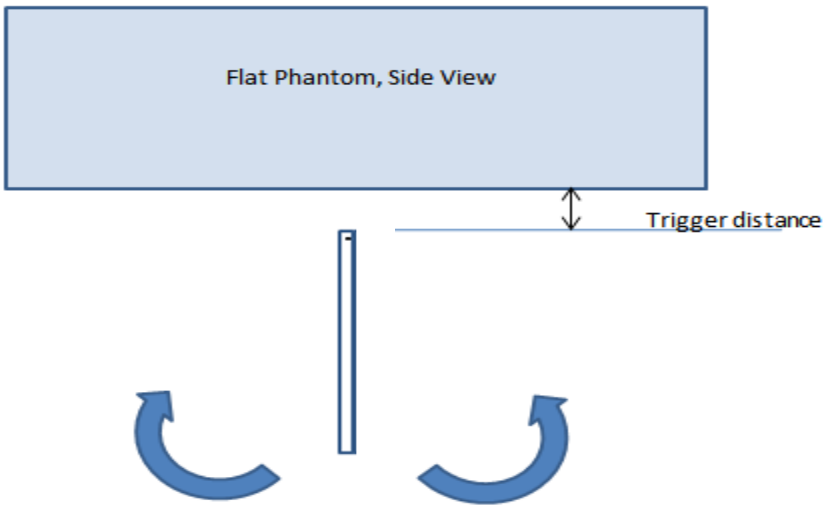
6.6.3. Proximity Sensor Coverage (KDB 616217 §6.3)

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 Edges 2, 3 and 4 parallel to the base of the flat phantom for each band.

The EUT was rotated about Edges 2, 3 and 4 for angles up to +/- 45°. 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 +/- 45°.



Proximity sensor tilt angle assessment (Edges 2, 3 and 4) KDB 616217 §6.4

Summary of Tablet Tilt Angle Influence to Proximity Sensor Triggering for Edge 3

Band (MHz)	Minimum trigger distance measured according to KDB 616217 §6.2	Minimum distance at which power reduction was maintained over +/-45°	Power reduction status										
			-45°	-40°	-30°	-20°	-10°	0°	10°	20°	30°	40°	45°
850	15 mm	15 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 11 mm. Full Power SAR measurements for the Edge 3 were performed at 10mm separation distance from the phantom.

Summary of Tablet Tilt Angle Influence to Proximity Sensor Triggering for Edge 4

Band (MHz)	Minimum trigger distance measured according to KDB 616217 §6.2	Minimum distance at which power reduction was maintained over +/-45°	Power reduction status										
			-45°	-40°	-30°	-20°	-10°	0°	10°	20°	30°	40°	45°
850	0 mm	0 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 0 mm. Full Power SAR measurements for the Edge 4 were performed at 0 mm separation distance from the phantom.

6.7. Protrusions on the DUT

The DUT features protrusions at each corner. Although the protrusions do not affect the antenna to user separation distance they do increase the distance of the antennas from the flat phantom by 0.7 mm at the edges. The DUT also has protruding feet and a protruding camera lens on the rear. The feet protrusions are 0.7 mm and the camera protrusion is 1.2 mm. Again these protrusions do not affect the antenna to user separation distance but they do affect the antenna to flat phantom separation distance.

As these additional distances are less than 5 mm and the reported SAR is less than 1.2 W/kg a KDB enquiry was not required in accordance with KDB 616217 § 4.1.

7. RF Exposure Conditions (Test Configurations)

This product is a phone supporting next to ear operations with diagonal dimensions greater than 20 cm. As such, it is categorized as a phablet and requires testing in accordance with the phablet procedures described in both KDB 648474 and 616217 in order to, respectively, demonstrate compliance for head SAR and body SAR exposure conditions. The usual body-worn accessory and hotspot mode testing required for phones are however not performed as they are effectively covered by the more conservative test procedures for tablets.

For WWAN, LTE and Wi-Fi

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

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

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:

- 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.
- 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 WLAN

Though this device is capable of simultaneous transmission between WLAN and WWAN, standalone SAR test exclusion is, along with the associated SAR Estimation, only considered for the WWAN antenna in the body of this report, with WLAN-related considerations and test results being leveraged from SAR report 14U18519-S1A, submitted under **FCC ID A3LSMT365.**

SAR Test Exclusion Calculations for WWAN

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	Front	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front
Full Power, Proximity Sensor Off. A sensor triggering of 15 mm is included for both Rear and Edge 3																
Cellular	WCDMA V	836.6	23.50	224	2	198	82.5	6.8	19.3		41 -MEASURE-	> 50 mm	> 50 mm	29.3 -MEASURE-	10.8 -MEASURE-	
Cellular	LTE Band 5	836.5	23.50	224	2	198	82.5	6.8	19.3		41 -MEASURE-	> 50 mm	> 50 mm	29.3 -MEASURE-	10.8 -MEASURE-	
Power Back-off, Proximity Sensor On																
Cellular	WCDMA V	836.6	18.00	63	2	198	82.5	6.8	19.3		11.5 -MEASURE-	> 50 mm	> 50 mm	8.2 -MEASURE-	3 -MEASURE-	
Cellular	LTE Band 5	836.5	18.00	63	2	198	82.5	6.8	19.3		11.5 -MEASURE-	> 50 mm	> 50 mm	8.2 -MEASURE-	3 -MEASURE-	

Conclusion:

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	Front	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front
Full Power, Proximity Sensor Off. A sensor triggering of 15 mm is included for both Rear and Edge 3																
Cellular	WCDMA 5	836.6	23.50	224	2	198	82.5	6.8	19.3		< 50 mm	989.4 mW -EXEMPT-	345.3 mW -EXEMPT-	< 50 mm	< 50 mm	
Cellular	LTE Band 5	836.5	23.50	224	2	198	82.5	6.8	19.3		< 50 mm	989.4 mW -EXEMPT-	345.2 mW -EXEMPT-	< 50 mm	< 50 mm	
Power Back-off, Proximity Sensor On																
Cellular	WCDMA 5	836.6	18.00	63	2	198	82.5	6.8	19.3		< 50 mm	989.4 mW -EXEMPT-	345.3 mW -EXEMPT-	< 50 mm	< 50 mm	
Cellular	LTE Band 5	836.5	18.00	63	2	198	82.5	6.8	19.3		< 50 mm	989.4 mW -EXEMPT-	345.2 mW -EXEMPT-	< 50 mm	< 50 mm	

Conclusion:

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 test configurations required for this device according to the findings in Section 8.1:

Test Configurations	Rear	Edge 1 (Top Edge)	Edge 2 (Right Edge)	Edge 3 (Bottom Edge)	Edge 4 (Left Edge)
W-CDMA Band V Full Power	Yes	No	No	Yes	Yes
WCDMA Band V w/ Power Reduction	Yes	No	No	Yes	Yes
LTE Band 5 Full Power	Yes	No	No	Yes	Yes
LTE Band 5 w/ Power Reduction	Yes	No	No	Yes	Yes

Note(s):

- Yes = Testing is required.
- No = Testing is not required.

8. Conducted Output Power Measurements

8.1. WCDMA Band V

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	Algorithm2
	βc/βd	8/15

Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm)	
				Max	Pwr Back-off
WCDMA Band V	Rel 99 (RMC, 12.2 kbps)	4132	826.4	23.1	17.6
		4183	836.6	23.2	17.6
		4233	846.6	23.1	17.5

HSDPA

The following 4 Sub-tests were completed according to Release 7 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
WCDMA 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			

Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm)	
				Max	Pwr Back-off
WCDMA Band V	Subtest 1	4132	826.4	22.8	17.5
		4183	836.6	22.8	17.5
		4233	846.6	22.7	17.5
	Subtest 2	4132	826.4	22.8	17.6
		4183	836.6	22.9	17.6
		4233	846.6	22.8	17.5
	Subtest 3	4132	826.4	21.8	17.5
		4183	836.6	21.8	17.6
		4233	846.6	21.8	17.6
	Subtest 4	4132	826.4	21.7	17.5
		4183	836.6	21.9	17.6
		4233	846.6	21.8	17.4

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

HSPA (HSDPA & HSUPA)

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

	Mode	HSPA				
	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	11/15	15/9	2/15	15/0
	βhs	22/15	12/15	30/15	4/15	5/15
	βed	1309/225	94/75	47/15 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

Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm)	
				Max	Pwr Back-off
W-CDMA Band V	Subtest 1	4132	826.4	22.5	17.0
		4183	836.6	22.4	16.5
		4233	846.6	22.6	17.0
	Subtest 2	4132	826.4	20.7	16.9
		4183	836.6	20.6	17.1
		4233	846.6	20.1	16.7
	Subtest 3	4132	826.4	20.5	16.5
		4183	836.6	20.5	17.2
		4233	846.6	20.5	17.0
	Subtest 4	4132	826.4	20.7	16.9
		4183	836.6	20.6	17.1
		4233	846.6	20.1	16.7
	Subtest 5	4132	826.4	22.5	17.0
		4183	836.6	22.7	16.5
		4233	846.6	22.3	17.0

DC-HSDPA

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

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

Table E.5.0: Levels for HSDPA connection setup

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

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

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

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

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

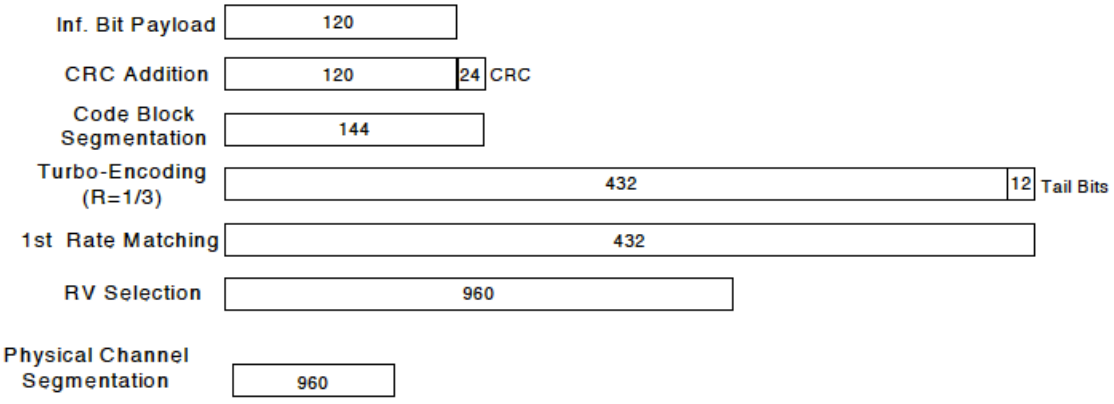


Figure C.8.19: Coding rate for Fixed reference Channel H-Set 12 (QPSK)

The following 4 Sub-tests for HSDPA were completed according to Release 8 procedures in section 5.2 of 3GPP TS34.121. A summary of subtest settings are illustrated below:

	Mode	HSDPA	HSDPA	HSDPA	HSDPA
	Subtest	1	2	3	4
WCDMA General Settings	Loopback Mode	Test Mode 1			
	Rel99 RMC	12.2kbps RMC			
	HSDPA FRC	H-Set 1			
	Power Control Algorithm	Algorithm2			
	βc	2/15	11/15	15/15	15/15
	βd	15/15	15/15	8/15	4/15
	βd (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	DACK	8			
	DNAK	8			
	DCQI	8			
	Ack-Nack Repetition factor	3			
	CQI Feedback	4ms			
	CQI Repetition Factor	2			
	Ahs = βhs/ βc	30/15			

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

Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	MPR	Avg Pwr (dBm)	
					Max	Pwr Back-off
WCDMA Band V	Subtest 1	4132	826.4	0	22.8	17.5
		4183	836.6	0	22.8	17.5
		4233	846.6	0	22.7	17.5
	Subtest 2	4132	826.4	0	22.8	17.7
		4183	836.6	0	22.9	17.5
		4233	846.6	0	22.8	17.5
	Subtest 3	4132	826.4	0.5	21.8	17.7
		4183	836.6	0.5	21.8	17.5
		4233	846.6	0.5	21.8	17.5
	Subtest 4	4132	826.4	0.5	21.7	17.5
		4183	836.6	0.5	21.9	17.6
		4233	846.6	0.5	21.8	17.5

8.2. LTE Band 5

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 Signaling 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	23.1	23.1	23.1	17.5	17.6	17.5
			1	25	0	0	23.0	23.1	23.0	17.4	17.5	17.4
			1	49	0	0	23.1	23.0	22.9	17.4	17.6	17.4
			25	0	1	0	22.1	22.1	22.1	17.5	17.5	17.5
			25	12	1	1	22.1	22.1	22.1	17.5	17.5	17.5
			25	25	1	1	22.1	22.1	22.1	17.5	17.5	17.5
			50	0	1	1	22.1	22.1	22.2	17.5	17.5	17.5
		16QAM	1	0	1	1	22.0	21.9	22.0	17.3	17.6	17.3
			1	25	1	1	21.9	21.9	21.9	17.3	17.6	17.2
			1	49	1	1	22.0	21.9	21.9	17.3	17.6	17.2
			25	0	2	2	21.2	21.2	21.2	17.4	17.4	17.5
			25	12	2	2	21.2	21.2	21.2	17.4	17.4	17.5
			25	25	2	2	21.1	21.2	21.1	17.4	17.4	17.5
			50	0	2	2	21.2	21.2	21.2	17.4	17.4	17.4

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	23.1	23.2	23.0	17.5	17.7	17.5
			1	12	0	0	23.0	23.2	23.0	17.5	17.6	17.5
			1	24	0	0	23.1	23.2	23.0	17.5	17.6	17.5
			12	0	1	0	22.2	22.1	22.1	17.5	17.5	17.5
			12	7	1	0	22.1	22.1	22.1	17.5	17.5	17.5
			12	13	1	0	22.1	22.1	22.1	17.5	17.5	17.5
			25	0	1	0	22.1	22.1	22.1	17.5	17.5	17.5
		16QAM	1	0	1	0	22.0	22.4	21.9	17.3	17.8	17.3
			1	12	1	0	21.9	22.4	21.9	17.3	17.8	17.2
			1	24	1	0	22.0	22.4	21.9	17.3	17.8	17.3
			12	0	2	0	21.2	21.2	21.2	17.5	17.4	17.5
			12	7	2	0	21.2	21.1	21.2	17.5	17.4	17.4
			12	13	2	0	21.2	21.1	21.2	17.5	17.4	17.4
			25	0	2	0	21.3	21.1	21.2	17.5	17.4	17.5

LTE Band 5 Measured Results (continued)

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)					
							Max. Power			with Pwr Back-off		
							825.5 MHz	836.5 MHz	847.5 MHz	825.5 MHz	836.5 MHz	847.5 MHz
LTE Band 5	3	QPSK	1	0	0	0	23.1	23.1	23.0	17.5	17.5	17.6
			1	8	0	0	23.1	23.1	23.0	17.4	17.5	17.5
			1	14	0	0	23.1	23.1	23.0	17.5	17.5	17.6
			8	0	1	0	22.2	22.1	22.1	17.6	17.5	17.5
			8	4	1	1	22.1	22.1	22.1	17.5	17.5	17.5
			8	7	1	1	22.2	22.1	22.0	17.5	17.5	17.5
			15	0	1	1	22.1	22.1	22.1	17.5	17.6	17.5
		16QAM	1	0	1	1	22.0	22.0	22.0	17.4	17.3	17.7
			1	8	1	1	21.9	21.9	21.9	17.2	17.3	17.6
			1	14	1	1	22.0	21.9	21.9	17.3	17.3	17.7
			8	0	2	2	21.2	21.2	21.2	17.5	17.5	17.2
			8	4	2	2	21.2	21.2	21.2	17.4	17.5	17.2
			8	7	2	2	21.2	21.2	21.2	17.4	17.5	17.2
			15	0	2	2	21.2	21.1	21.2	17.5	17.4	17.5
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)					
							Max. Power			with Pwr Back-off		
							824.7 MHz	836.5 MHz	848.3 MHz	824.7 MHz	836.5 MHz	848.3 MHz
LTE Band 5	1.4	QPSK	1	0	0	0	23.2	23.2	23.1	17.6	17.6	17.5
			1	3	0	0	23.2	23.1	23.0	17.6	17.6	17.5
			1	5	0	0	23.2	23.2	23.1	17.6	17.6	17.6
			3	0	0	0	23.3	23.2	23.1	17.7	17.6	17.6
			3	1	0	0	23.3	23.1	23.1	17.7	17.6	17.6
			3	3	0	0	23.2	23.1	23.1	17.7	17.6	17.6
			6	0	1	0	22.3	22.1	22.1	17.6	17.5	17.5
		16QAM	1	0	1	0	22.3	22.2	22.2	17.6	17.7	17.3
			1	3	1	0	22.2	22.1	22.1	17.6	17.7	17.2
			1	5	1	0	22.3	22.1	22.2	17.7	17.7	17.4
			3	0	1	0	22.1	22.0	22.1	17.5	17.5	17.6
			3	1	1	0	22.2	22.0	22.0	17.5	17.4	17.6
			3	3	1	0	22.2	22.1	22.0	17.5	17.4	17.6
			6	0	2	0	21.3	21.2	21.2	17.5	17.3	17.5

9. Dielectric Property Measurements

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 Standard 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 ± 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.

SAR Lab 3

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
12/1/2014	Head 835	e'	41.6400	Relative Permittivity (ϵ_r):	41.64	41.50	0.34	5
		e''	19.4800	Conductivity (σ):	0.90	0.90	0.49	5
	Head 820	e'	41.7900	Relative Permittivity (ϵ_r):	41.79	41.60	0.45	5
		e''	19.5900	Conductivity (σ):	0.89	0.90	-0.59	5
	Head 850	e'	41.4500	Relative Permittivity (ϵ_r):	41.45	41.50	-0.12	5
		e''	19.4100	Conductivity (σ):	0.92	0.92	0.26	5
12/1/2014	Body 835	e'	52.8800	Relative Permittivity (ϵ_r):	52.88	55.20	-4.20	5
		e''	21.4800	Conductivity (σ):	1.00	0.97	2.81	5
	Body 820	e'	53.0500	Relative Permittivity (ϵ_r):	53.05	55.28	-4.03	5
		e''	21.5800	Conductivity (σ):	0.98	0.97	1.60	5
	Body 850	e'	52.7100	Relative Permittivity (ϵ_r):	52.71	55.16	-4.44	5
		e''	21.4000	Conductivity (σ):	1.01	0.99	2.46	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 re-measured 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 ±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.

10.2. Reference Target SAR Values

The reference SAR values are obtained from the calibration certificate of system validation dipoles. The measured values are normalised to 1 Watt.

System Dipole	Serial No.	Cal. Date	Freq. (MHz)	Target SAR Values (W/kg)		
				1g/10g	Head	Body
D835V2	4d142	9/9/2014	835	1g	8.91	9.22
				10g	5.77	6.05

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 3

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			
12/1/2014	D835V2	4d142	Head	1g	0.96	9.6	8.91	7.30	1,2
				10g	0.63	6.3	5.77	8.32	
12/1/2014	D835V2	4d142	Body	1g	0.97	9.7	9.22	5.10	
				10g	0.64	6.4	6.05	5.45	

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.

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

KDB 941225 D01 SAR test for 3G devices:
Body SAR is also measured for HSPA when the maximum average output of each RF channel with HSPA active is at least ¼ 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.

11.1. WCDMA Band V

RF Exposure Conditions	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	
Head	Rel 99 RMC 12.2 kbps	off	0	Left Touch	4183	836.6	23.5	23.2	0.071	**0.076**	1
				Left Tilt	4183	836.6	23.5	23.2	0.068	0.073	
				Right Touch	4183	836.6	23.5	23.2	0.043	0.046	
				Right Tilt	4183	836.6	23.5	23.2	0.069	0.074	
Body	Rel 99 RMC 12.2 kbps	on	0	Rear	4183	836.6	18.0	17.6	0.374	**0.410**	2
				Edge 3	4183	836.6	18.0	17.6	0.187	0.205	
	Rel 99 RMC 12.2 kbps	off	15	Rear	4183	836.6	23.5	23.2	0.242	0.259	
			15	Edge 3	4183	836.6	23.5	23.2	0.112	0.120	
			0	Edge 4	4183	836.6	23.5	23.2	0.510	**0.546**	3

11.2. LTE Band 5 (10MHz Bandwidth)

RF Exposure Conditions	Mode	PWR back off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offest	Power (dBm)		1-g SAR (W/kg)		Plot No.
									Tune-up limit	Meas.	Meas.	Scaled	
Head	QPSK	off	0	Left Touch	20525	836.6	1	25	23.5	23.1	0.075	**0.082**	4
							25	0	22.5	22.1	0.053	0.058	
				Left Tilt	20525	836.6	1	25	23.5	23.1	0.063	0.069	
							25	0	22.5	22.1	0.044	0.048	
				Right Touch	20525	836.6	1	25	23.5	23.1	0.043	0.047	
							25	0	22.5	22.1	0.032	0.035	
				Right Tilt	20525	836.6	1	25	23.5	23.1	0.061	0.067	
							25	0	22.5	22.1	0.044	0.048	
Body	QPSK	on	0	Rear	20525	836.6	1	0	18.0	17.5	0.371	**0.416**	5
							25	0	18.0	17.5	0.361	0.405	
				Edge 3	20525	836.6	1	0	18.0	17.5	0.185	0.208	
							25	0	18.0	17.5	0.182	0.204	
		off	15	Rear	20525	836.6	1	25	23.5	23.1	0.236	0.259	
							25	0	22.5	22.1	0.186	0.204	
			15	Edge 3	20525	836.6	1	25	23.5	23.1	0.109	0.120	
							25	0	22.5	22.1	0.082	0.090	
			0	Edge 4	20525	836.6	1	25	23.5	23.1	0.501	**0.549**	6
							25	0	22.5	22.1	0.397	0.435	

12. SAR Measurement Variability

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

1) Repeated measurement is not required when the original highest measured SAR is <0.8 or 2 W/kg (1-g or 10-g respectively); steps 2) through 4) do not apply.
2) When the original highest measured SAR is ≥ 0.8 or 2 W/kg (1-g or 10-g respectively), repeat that measurement once.
3) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or 3 (1-g or 10-g respectively) 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 or 3 (1-g or 10-g respectively).

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
850	WCDMA Band V	Body	Edge 4	No	0.510	N/A	N/A
	LTE Band 5	Body	Edge 4	No	0.501	N/A	N/A

Conclusion:

Repeated measurement not required since no measured SAR values were greater than 0.8W/kg.

13. Simultaneous Transmission SAR Analysis

13.1. Estimated SAR for Simultaneous Transmission SAR Analysis

Considerations for SAR estimation

1. When standalone SAR test exclusion applies, standalone SAR must also be estimated to determine simultaneous transmission SAR test exclusion.
2. 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
3. Please refer to Estimated SAR Tables to see which test positions 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	Front	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front
Full Power, Proximity Sensor Off. A sensor triggering of 15 mm is included for both Rear and Edge 3																
Cellular	W-CDMA 5	836.6	23.50	224	5	198	82.5	6.8	19.3		-MEASURE-	0.400	0.400	-MEASURE-	-MEASURE-	
Cellular	LTE Band 5	836.5	23.50	224	5	198	82.5	6.8	19.3		-MEASURE-	0.400	0.400	-MEASURE-	-MEASURE-	
Power Back-off, Proximity Sensor On																
Cellular	W-CDMA 5	836.6	18.00	63	5	198	82.5	6.8	19.3		-MEASURE-	0.400	0.400	-MEASURE-	-MEASURE-	
Cellular	LTE Band 5	836.5	18.00	63	5	198	82.5	6.8	19.3		-MEASURE-	0.400	0.400	-MEASURE-	-MEASURE-	

13.1.2. Estimated SAR for WLAN

All Wi-Fi and Bluetooth SAR values- measured or estimated- used in this report were taken from SAR report 14U18519-S1A, submitted under **FCC ID A3LSMT365**

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

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario				∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			WCDMA Band V	Wi-Fi (DTS)	Wi-Fi (UNII)	Bluetooth		
Head	Left Touch	WWAN + Wi-Fi(DTS)	0.076	0.539			0.615	No
		WWAN + Wi-Fi(UNII)	0.076		0.090		0.166	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.073	0.539			0.612	No
		WWAN + Wi-Fi(UNII)	0.073		0.090		0.163	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.046	0.539			0.585	No
		WWAN + Wi-Fi(UNII)	0.046		0.090		0.136	No
	Right Tilt	WWAN + Wi-Fi(DTS)	0.074	0.539			0.613	No
		WWAN + Wi-Fi(UNII)	0.074		0.090		0.164	No
Body	Rear	WWAN + Wi-Fi(DTS)	0.410	0.704			1.114	No
		WWAN + Wi-Fi(UNII)	0.410		0.420		0.830	No
		WWAN + BT	0.410			0.250	0.660	No
		Wi-Fi(UNII) + BT			0.420	0.250	0.670	No
		WWAN + Wi-Fi(UNII) + BT	0.410		0.420	0.250	1.080	No
	Edge 1	WWAN + Wi-Fi(DTS)	0.400	0.352			0.752	No
		WWAN + Wi-Fi(UNII)	0.400		0.272		0.672	No
		WWAN + BT	0.400			0.096	0.496	No
		Wi-Fi(UNII) + BT			0.272	0.096	0.368	No
		WWAN + Wi-Fi(UNII) + BT	0.400		0.272	0.096	0.768	No
	Edge 2	WWAN + Wi-Fi(DTS)	0.400	0.082			0.482	No
		WWAN + Wi-Fi(UNII)	0.400		0.104		0.504	No
		WWAN + BT	0.400			0.179	0.579	No
		Wi-Fi(UNII) + BT			0.104	0.179	0.283	No
		WWAN + Wi-Fi(UNII) + BT	0.400		0.104	0.179	0.683	No
	Edge 3	WWAN + Wi-Fi(DTS)	0.205	0.400			0.605	No
		WWAN + Wi-Fi(UNII)	0.205		0.400		0.605	No
		WWAN + BT	0.205			0.400	0.605	No
		Wi-Fi(UNII) + BT			0.400	0.400	0.800	No
		WWAN + Wi-Fi(UNII) + BT	0.205		0.400	0.400	1.005	No
	Edge 4	WWAN + Wi-Fi(DTS)	0.546	0.400			0.946	No
		WWAN + Wi-Fi(UNII)	0.546		0.400		0.946	No
		WWAN + BT	0.546			0.400	0.946	No
		Wi-Fi(UNII) + BT			0.400	0.400	0.800	No
		WWAN + Wi-Fi(UNII) + BT	0.546		0.400	0.400	1.346	No

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

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario				∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			LTE Band 5	Wi-Fi (DTS)	Wi-Fi (UNII)	Bluetooth		
Head	Left Touch	WWAN + Wi-Fi(DTS)	0.082	0.539			**0.621**	No
		WWAN + Wi-Fi(UNII)	0.082		0.090		**0.172**	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.069	0.539			0.608	No
		WWAN + Wi-Fi(UNII)	0.069		0.090		0.159	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.047	0.539			0.586	No
		WWAN + Wi-Fi(UNII)	0.047		0.090		0.137	No
	Right Tilt	WWAN + Wi-Fi(DTS)	0.067	0.539			0.606	No
		WWAN + Wi-Fi(UNII)	0.067		0.090		0.157	No
Body-worn	Rear	WWAN + Wi-Fi(DTS)	0.416	0.704			**1.120**	No
		WWAN + Wi-Fi(UNII)	0.416		0.420		**0.836**	No
		WWAN + BT	0.416			0.250	0.666	No
		Wi-Fi(UNII) + BT			0.420	0.250	0.670	No
		WWAN + Wi-Fi(UNII) + BT	0.416		0.420	0.250	1.086	No
	Edge 1	WWAN + Wi-Fi(DTS)	0.400	0.352			0.752	No
		WWAN + Wi-Fi(UNII)	0.400		0.272		0.672	No
		WWAN + BT	0.400			0.096	0.496	No
		Wi-Fi(UNII) + BT			0.272	0.096	0.368	No
		WWAN + Wi-Fi(UNII) + BT	0.400		0.272	0.096	0.768	No
	Edge 2	WWAN + Wi-Fi(DTS)	0.400	0.082			0.482	No
		WWAN + Wi-Fi(UNII)	0.400		0.104		0.504	No
		WWAN + BT	0.400			0.179	0.579	No
		Wi-Fi(UNII) + BT			0.104	0.179	0.283	No
		WWAN + Wi-Fi(UNII) + BT	0.400		0.104	0.179	0.683	No
	Edge 3	WWAN + Wi-Fi(DTS)	0.208	0.400			0.608	No
		WWAN + Wi-Fi(UNII)	0.208		0.400		0.608	No
		WWAN + BT	0.208			0.400	0.608	No
		Wi-Fi(UNII) + BT			0.400	0.400	0.800	No
		WWAN + Wi-Fi(UNII) + BT	0.208		0.400	0.400	1.008	No
	Edge 4	WWAN + Wi-Fi(DTS)	0.549	0.400			0.949	No
		WWAN + Wi-Fi(UNII)	0.549		0.400		0.949	No
		WWAN + BT	0.549			0.400	0.949	No
		Wi-Fi(UNII) + BT			0.400	0.400	0.800	No
		WWAN + Wi-Fi(UNII) + BT	0.549		0.400	0.400	1.349	No

Conclusion:

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

14. Appendixes

Refer to separated files for the following appendixes.

A. Photos and Antenna Locations

B. System Performance Check Plots

C. Highest SAR Test Plots

D. Tissue Material Ingredients

E. Calibration Certificate for E-Field Probes

F. Calibration Certificate for Dipoles

END OF REPORT