FCC 47 CFR Parts 1 & 2
Published RF Exposure KDB Procedures
IEEE Std 1528-2013

SAR EVALUATION REPORT

For
GSM/WCDMA/LTE Tablet + Bluetooth, DTS/UNII abgn, ANT+ & NFC

Model: SM-T255S
FCC ID: A3LSMT255S

Report Number: 14U17414-S9B
Issue Date: 5/12/2014

Prepared for
SAMSUNG ELECTRONICS CO. LTD.
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SUWON CITY, GYEONGGI-DO, SOUTH KOREA, 443-742

Prepared by
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	5/1/2014	Initial Issue	--
A	5/7/2014	Remove LTE Band 7.	Devin Chang
B	5/12/2014	Section 12.8.1.: Updated Bluetooth Min. test separation distance to 5 mm.	Devin Chang

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1. Attestation of Test Results

Applicant	SAMSUNG ELECTRONICS CO. LTD			
DUT description	GSM/WCDMA/LTE Tablet + Bluetooth, DTS/UNII abgn, ANT+ & NFC			
Model	SM-T255S			
Test device is	An identical prototype			
Device category	Portable			
Exposure category	General Population/Uncontrolled Exposure			
Date tested	04/07/2014 – 04/25/2014			
The highest reported SAR values	RF exposure condition	Licensed	DTS	UNII
	Head	0.314 W/kg	0.165 W/kg	0.321 W/kg
	Body-worn	0.888 W/kg	0.710 W/kg	0.977 W/kg
	Simultaneous Transmission	1.383 W/kg		1.533 W/kg
Applicable Standards	FCC 47 CFR Parts 1 & 2 Published RF Exposure KDB Procedures, and TCB workshop updates IEEE Std 1528-2013			
Test Results	Pass			

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Verification Services Inc. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government (NIST Handbook 150, Annex A). This report is written to support regulatory compliance of the applicable standards stated above.

Approved & Released By:

Devin Chang
WiSE Senior Engineer
UL Verification Services Inc.

Prepared By:

Coltyce Sanders
WiSE Laboratory Engineer
UL Verification Services Inc.

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2. Test Methodology

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:

- 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 D02 HSPA and 1x Advanced v02r02
- 941225 D03 SAR Test Reduction GSM GPRS EDGE v01
- 941225 D04 SAR for GSM E GPRS Dual Xfer Mode v01
- 941225 D05 SAR for LTE Devices v02r03
- 941225 D06 Hotspot Mode 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 v01r03

3. Facilities and Accreditation

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

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 F	

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://www.ccsemc.com.

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4. Calibration and Uncertainty

4.1. Measuring Instrument Calibration

The measuring equipment used to perform the tests documented in this report has been calibrated in accordance with the manufacturers' recommendations, and is traceable to recognized national standards.

Tissue Dielectric Properties

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Network Analyzer	Agilent	E5071B	MY42100131	2/24/2015
Dielectronic Probe kit	SPEAG	DAK-3.5	2077	10/16/2014
Dielectronic Probe kit	SPEAG	DAK-3.5 Short	SM DAK 200 BA	N/A
Thermometer	TRACEABLE	4242	122529163	9/19/2014

System Performance Check

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Synthesized Signal Generator	HP	8665B	3438A00633	6/13/2014
Power Meter	HP	438A	2822A05684	10/10/2014
Power Sensor	HP	8481A	2237A31744	10/2/2014
Power Sensor	HP	8481A	2349A36506	9/3/2014
Amplifier	MITEQ	AMF-4D-00400600-50-30P	1808939	N/A
Directional coupler	Werlatone	C8060-102	2710	N/A
DC Power Supply	AMETEK	XT154	1319A02778	N/A
Thermometer	TRACEABLE	4242	122529163	9/19/2014
E-Field Probe	SPEAG	EX3DV4	3929	4/25/2014
E-Field Probe	SPEAG	EX3DV4	3871	8/18/2014
E-Field Probe	SPEAG	EX3DV4	3902	5/12/2014
E-Field Probe	SPEAG	EX3DV3	3531	11/10/2014
Data Acquisition Electronics	SPEAG	DAE4	1359	2/17/2015
Data Acquisition Electronics	SPEAG	DAE4	1377	8/18/2014
Data Acquisition Electronics	SPEAG	DAE3	427	1/14/2015
System Validation Dipole	SPEAG	D835V2	4d142	9/8/2014
System Validation Dipole	SPEAG	D1900V2	5d163	9/15/2014
System Validation Dipole	SPEAG	D2450V2	706	5/12/2014
System Validation Dipole	SPEAG	D5GHzV2	1138	11/10/2014

Others

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Base Station Simulator	R & S	CMU200	106301	7/3/2014
Base Station Simulator	R & S	CMW500	132911-tU	2/27/2015
Power Meter	Agilent	N1911A	MY53040015	6/29/2014
Power Sensor	Agilent	N1921A	MY52200012	9/25/2014

4.2. Measurement Uncertainty

Per KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg, the extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval.

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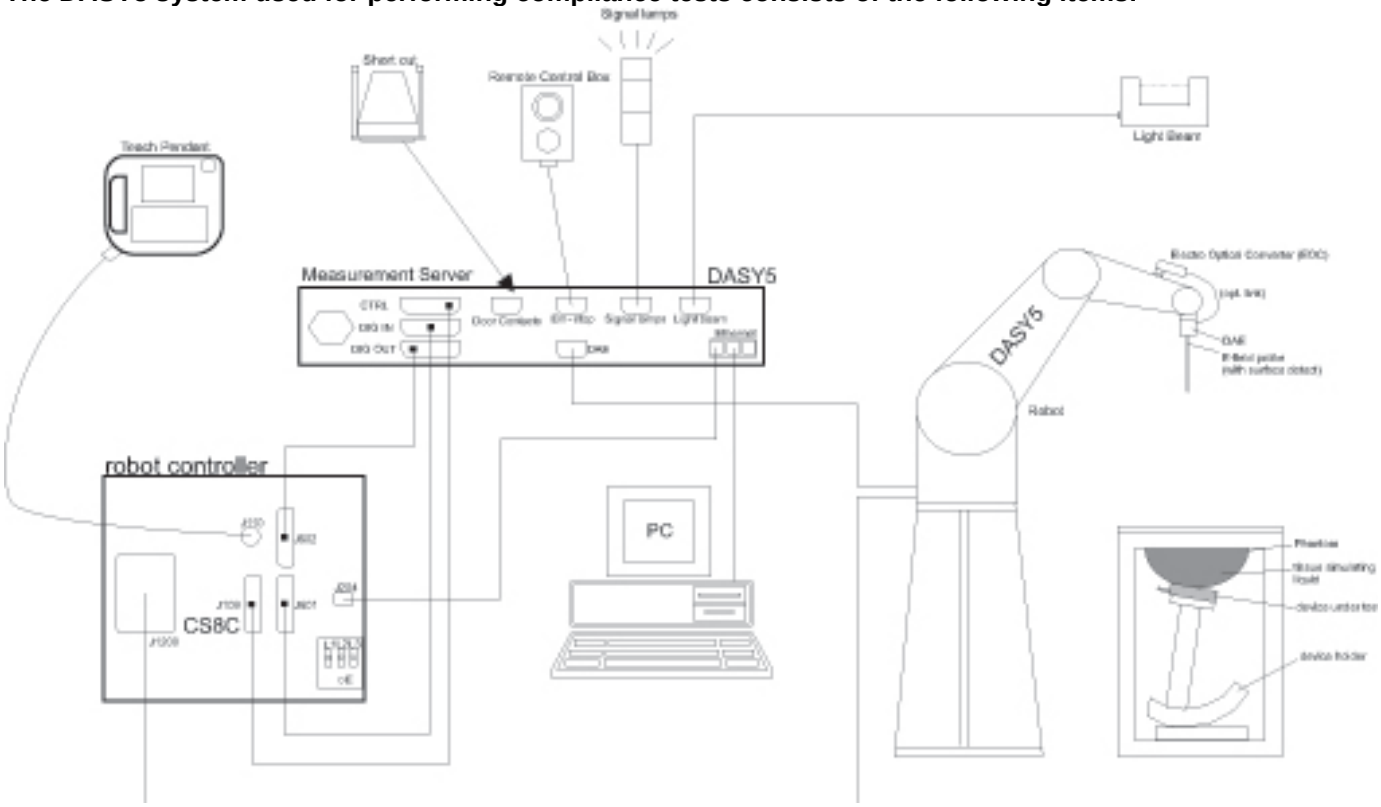
5. Measurement System Description and Setup

The DASY5 system used for performing compliance tests consists of the following items:



- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic Field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running WinXP or Win7 and the DASY5 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

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6. SAR Measurement Procedure

6.1. Normal SAR Measurement Procedure

Step 1: Power Reference Measurement

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

Step 2: Area Scan

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

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

	≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 ± 1 mm	½·δ·ln(2) ± 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}	≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
	When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

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Step 3: Zoom Scan

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

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

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

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

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

Step 4: Power drift measurement

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

Step 5: Z-Scan (FCC only)

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

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6.2. Volume Scan Procedures

Step 1: Repeat Step 1-4 in Section 6.1

Step 2: Volume Scan
Volume Scans are used to assess peak SAR and averaged SAR measurements in largely extended 3-dimensional volumes within any phantom. This measurement does not need any previous area scan. The grid can be anchored to a user specific point or to the current probe location.

Step 3: Power drift measurement
The Power Drift Measurement measures the field at the same location as the most recent power reference measurement within the same procedure, and with the same settings. The Power Drift Measurement gives the field difference in dB from the reading conducted within the last Power Reference Measurement. This allows a user to monitor the power drift of the device under test within a batch process. The measurement procedure is the same as Step 1.

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7. Device Under Test

7.1. General Information

Operating Configuration(s)	Held to head, Body-worn (Voice call)
Mobile 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) (FCC: Ch.1 ~ Ch.11) ☒ Mobile Hotspot (Wi-Fi 5 GHz) (FCC: Ch.149 ~ Ch.165)
Wi-Fi Direct	Wi-Fi Direct enabled devices transfer data directly between each other ☒ Wi-Fi Direct (Wi-Fi 2.4 GHz) (FCC: Ch.1 ~ Ch.11) ☒ Wi-Fi Direct (Wi-Fi 5 GHz) (FCC: Ch.149 ~ Ch.165)
Device dimension	Overall (Length x Width): 191.8 mm x 99.7mm Overall Diagonal: 205mm Display Diagonal: 180mm
Back Cover	☒ Normal Battery Cover ☐ Wireless Charger Battery Cover ☐ Normal Battery Cover with NFC
Accessory	☒ Headset
Battery Options	☒ Standard – Lithium-ion battery, Rating 3.8Vdc, 12.16Wh ☐ Extended (large capacity)

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7.2. Wireless Technologies

Wireless Technology and Frequency Bands	GSM: 1900 W-CDMA Band: V / II LTE Band 5 /7/17 Wi-Fi : 2.4 / 5 GHz Bluetooth: 2.4 GHz.
Mode	GSM - ☒ Voice (GMSK) - ☒ GPRS (GMSK) W-CDMA - ☒ UMTS Rel. 99 (Voice & Data) - ☒ HSDPA - ☒ HSUPA LTE - ☒ QPSK - ☒ 16QAM Wi-Fi 2.4GHz (802.11b/g/n) - ☒ 802.11b - ☒ 802.11g - ☒ 802.11n (HT20) Wi-Fi 5GHz - ☒ 802.11a - ☒ 802.11n (HT20) - ☒ 802.11n (HT40) Bluetooth Ver. 4.0 (LE)
Duty Cycle	GSM Voice: 12.5%; GPRS 1 Slot: 12.5%; 2 Slots: 25%, 3 Slots: 37.5%,4 Slots: 50%, W-CDMA: 100% LTE: 100% Wi-Fi 802.11a/b/g/n: 100%
GPRS Multi-Slot Class	☐ Class 8 - One Up ☐ Class 10 - Two Up ☒ Class 12 - Four Up ☐ Class 33 - Four Up
VoIP (GPRS)	☒ Supported

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7.3. RF Output Power Tolerance

Upper limit (dB): 0.5 ~ -1.5		Max. tune-up tolerance limit	
RF Air interface	Mode	Max. Power (dBm)	With Power Reduction (dBm)
GSM1900	Voice	**30.5**	**20.0**
	GPRS 1 slot	**30.5**	**20.0**
	GPRS 2 slots	**28.5**	**19.0**
	GPRS 3 slots	**27.5**	**18.0**
	GPRS 4 slots	**25.5**	**17.0**
W-CDMA Band V	R99	**22.5**	**20.5**
	HSDPA	**22.5**	**19.5**
	HSUPA	**21.5**	**19.5**
W-CDMA Band II	R99	**22.0**	**16.0**
	HSDPA	**22.0**	**15.0**
	HSUPA	**21.5**	**15.0**
LTE Band 5	QPSK	**24.5**	**19.0**
LTE Band 17	QPSK	**22.5**	**20.5**

Upper limit (dB): 0.5 ~ -1.5		RF Output Power (dBm)
RF Air interface	Mode	Max. tune-up tolerance limit
WiFi 2.4 GHz	802.11b	**17.5**
	802.11g	**13.5**
	802.11n HT20	**13.5**
WiFi 5 GHz	802.11a	**12.5**
	802.11n HT20	**12.5**
	802.11n HT40	**12.5**
Bluetooth		**9.0**
Bluetooth LE		**5.5**

7.4. Simultaneous Transmission Condition

RF Exposure Condition	Capable Transmit Configurations
Head	1. GSM 1900 Voice + Wi-Fi 2.4/5GHz 2. GSM 1900 GPRS + Wi-Fi 2.4/5GHz (VoIP) 3. WCDMA Band V/II + Wi-Fi 2.4/5GHz 4. LTE B5//B17 + Wi-Fi 2.4/5GHz
Body	5. GSM 1900 Voice + Wi-Fi 2.4/5GHz 6. GSM 1900 Voice + BT 7. GSM 1900 GPRS + Wi-Fi 2.4/5GHz (VoIP) 8. GSM 1900 GPRS + BT(VoIP) 9. WCDMA Band V/II + Wi-Fi 2.4/5GHz 10. WCDMA Band V/II + BT 11. LTE B5//B17 + Wi-Fi 2.4/5GHz 12. LTE B5//B17 + BT

Notes:
1. Wi-Fi 2.4 and 5.8 GHz support Hotspot and Wi-Fi Direct.
2. GPRS/EDGE, WCDMA and LTE support Hotspot.
3. VoIP is support in GPRS, 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.

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7.5. General LTE SAR Test and Reporting Considerations

<table>
<tr><th>Item</th><th>Description</th></tr>
<tr><td>Frequency range, Channel Bandwidth, Numbers and Frequencies</td><td>
<table>
<tr><td rowspan="3">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 rowspan="3">Band 17</td><td colspan="6">Frequency range: 704 - 716 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></td><td>23755/ 706.5</td><td></td><td></td></tr>
<tr><td>Mid</td><td></td><td></td><td>23790/ 710</td><td>23790/ 710</td><td></td><td></td></tr>
<tr><td>High</td><td></td><td></td><td></td><td>23825/ 713.5</td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>LTE transmitter and antenna implementation</td><td>LTE has two (2) TX/RX antennas and two (2) RX antennas
TX/RX Antenna : LTE Bands 5, 17 RX Antenna : LTE Bands 5, 17
Refer to Appendix 15.1. Photos and Antenna Locations.</td></tr>
<tr><td>Maximum power reduction (MPR)</td><td>
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>Yes</td></tr>
<tr><td>Spectrum plots for RB configurations</td><td>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>

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7.6. Power Reduction by Proximity Sensing

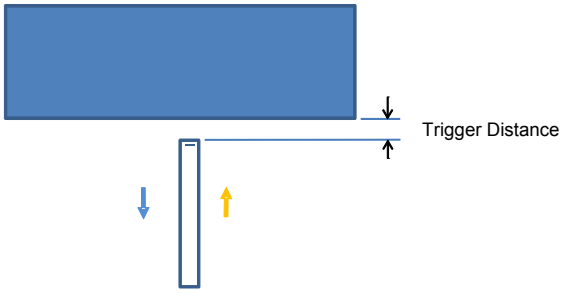
7.6.1. Proximity Sensor Triggering Distance (KDB 616217 §6.2)

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.

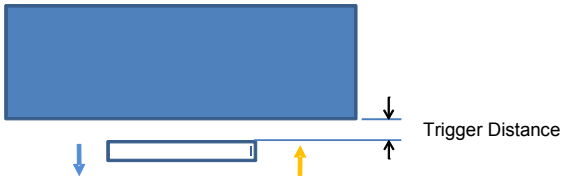
The measurement was then repeated for the Rear surface.

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**



Proximi ty 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 2 and 4		Trigger distance - Rear	
	Moving toward phantom	Moving from phantom	Moving toward phantom	Moving from phantom	Moving toward phantom	Moving from phantom
700 muscle	10 mm	10 mm	5 mm	5 mm	13 mm	13 mm
850 muscle	10 mm	10 mm	5 mm	5 mm	13 mm	13 mm
1900 muscle	10 mm	10 mm	5 mm	5 mm	13 mm	13 mm

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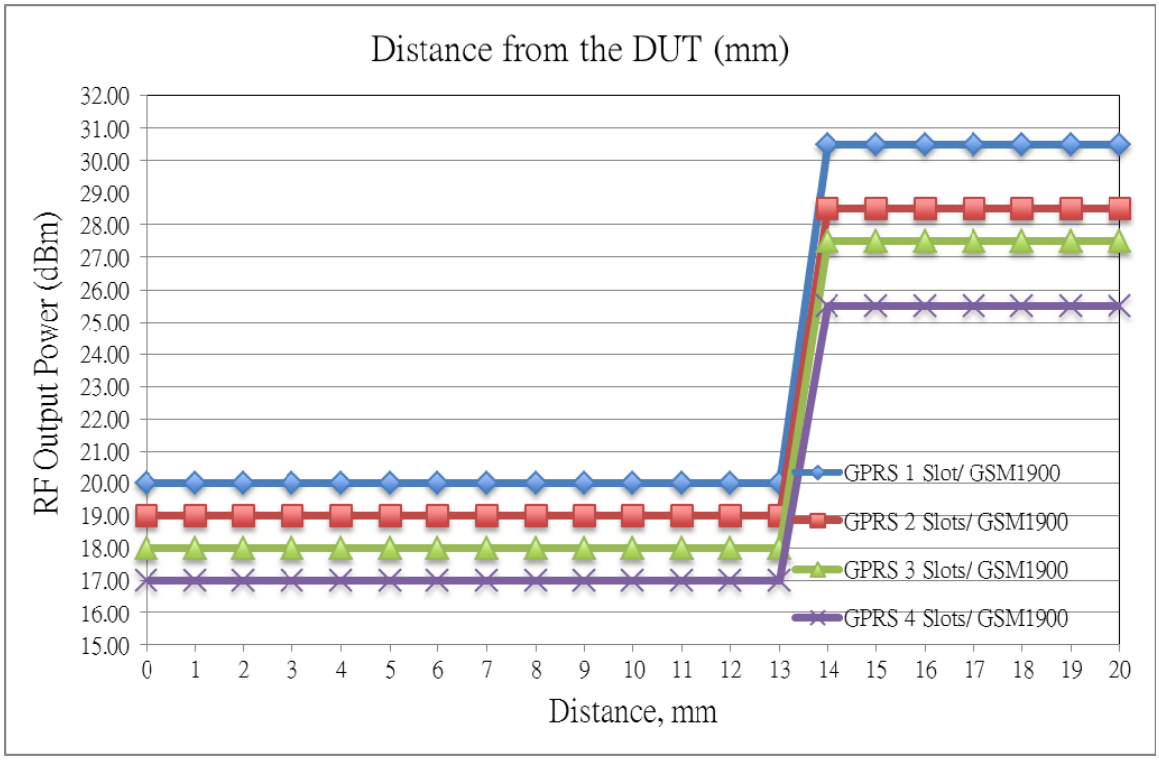
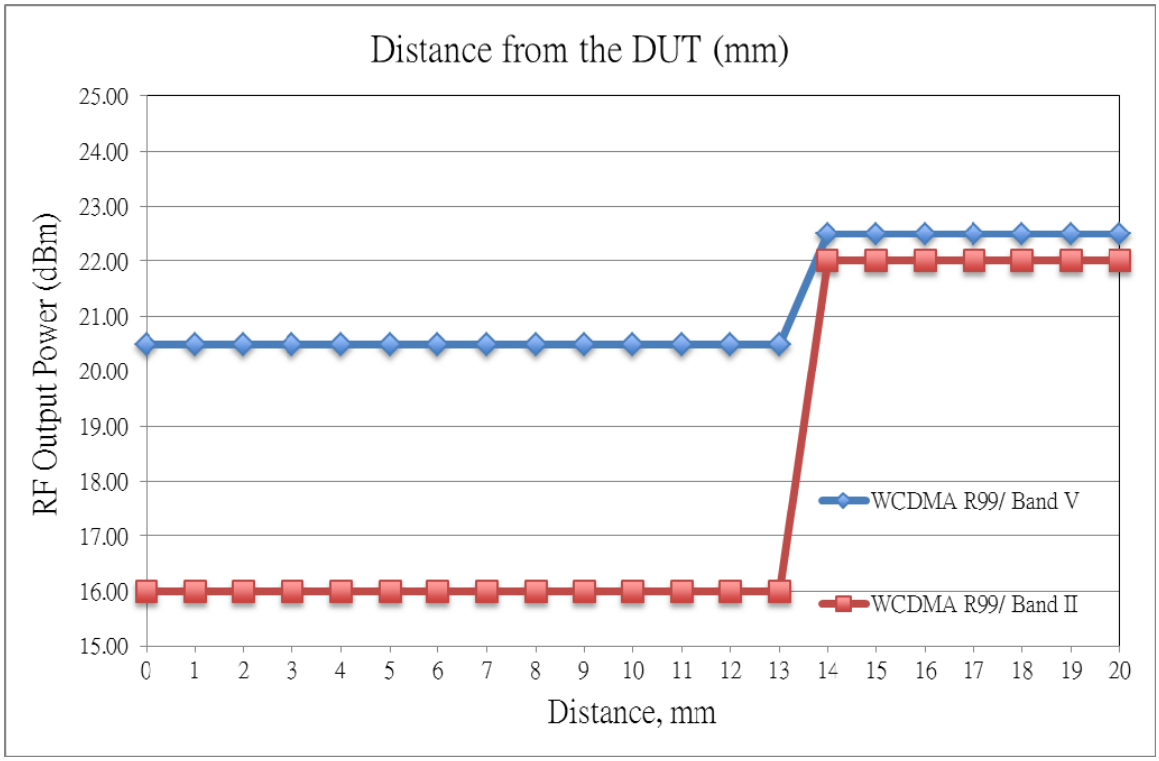
7.6.2. Proximity Sensor Triggering Distance Measurement Results

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

GSM



W-CDMA



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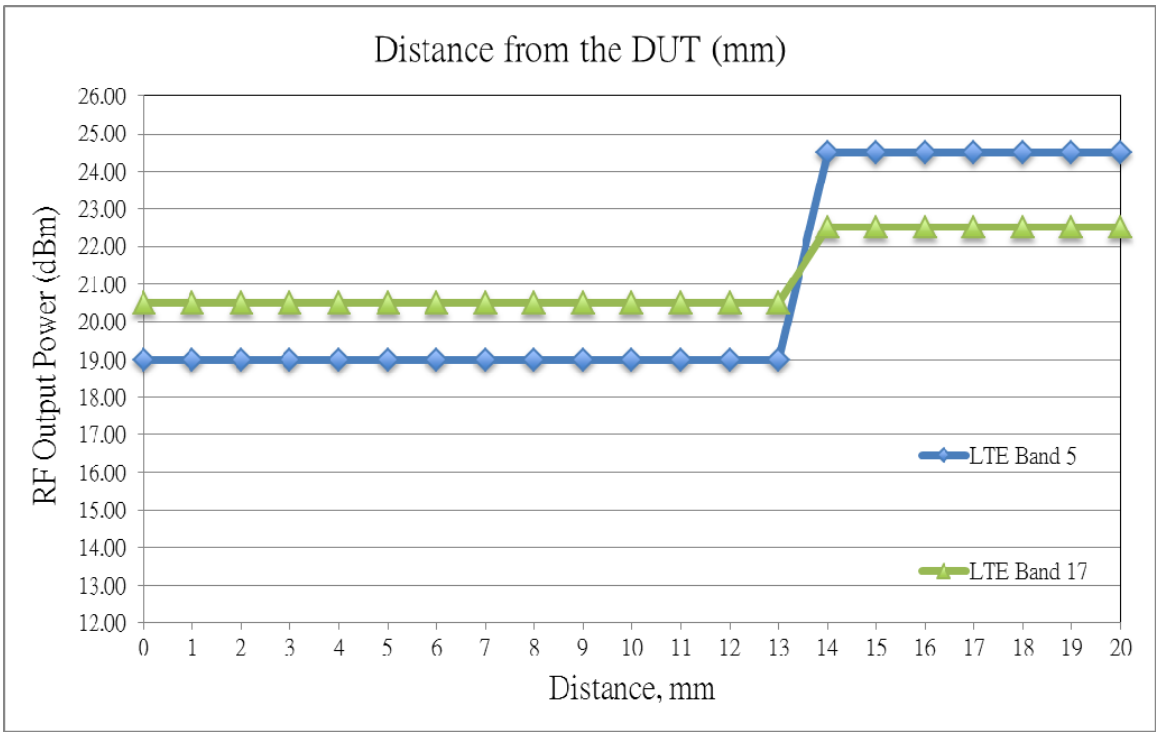
LTE



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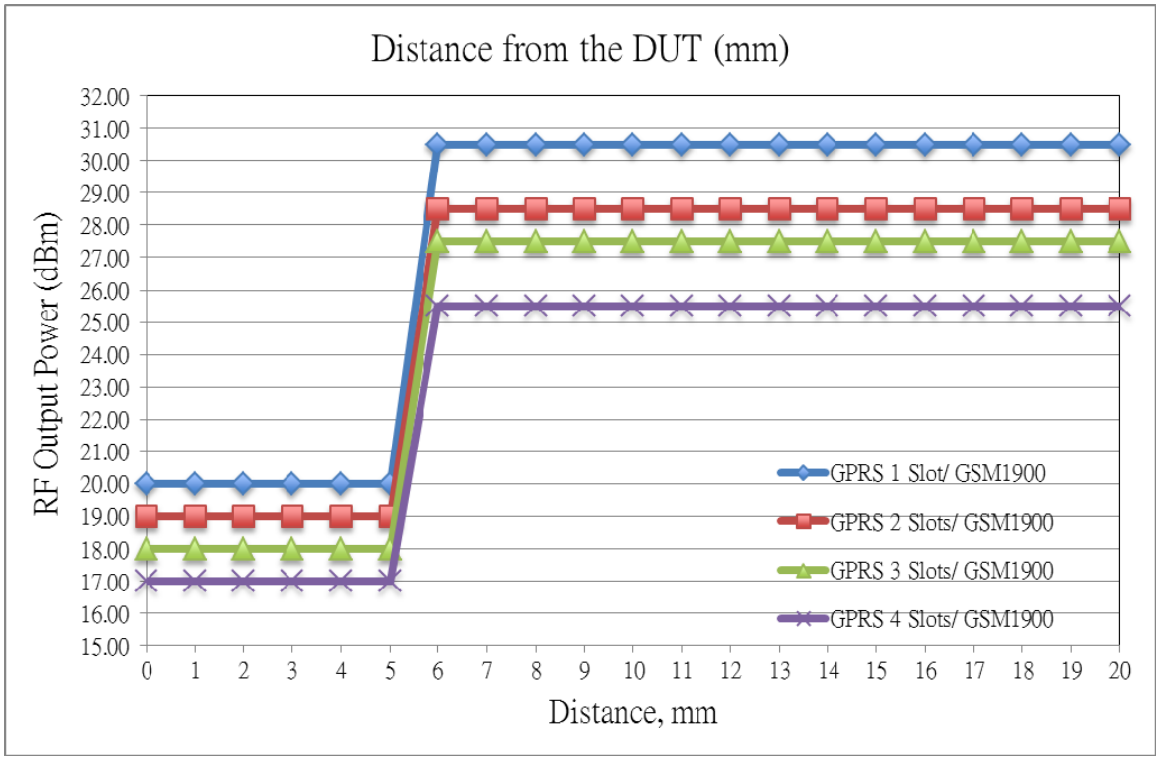
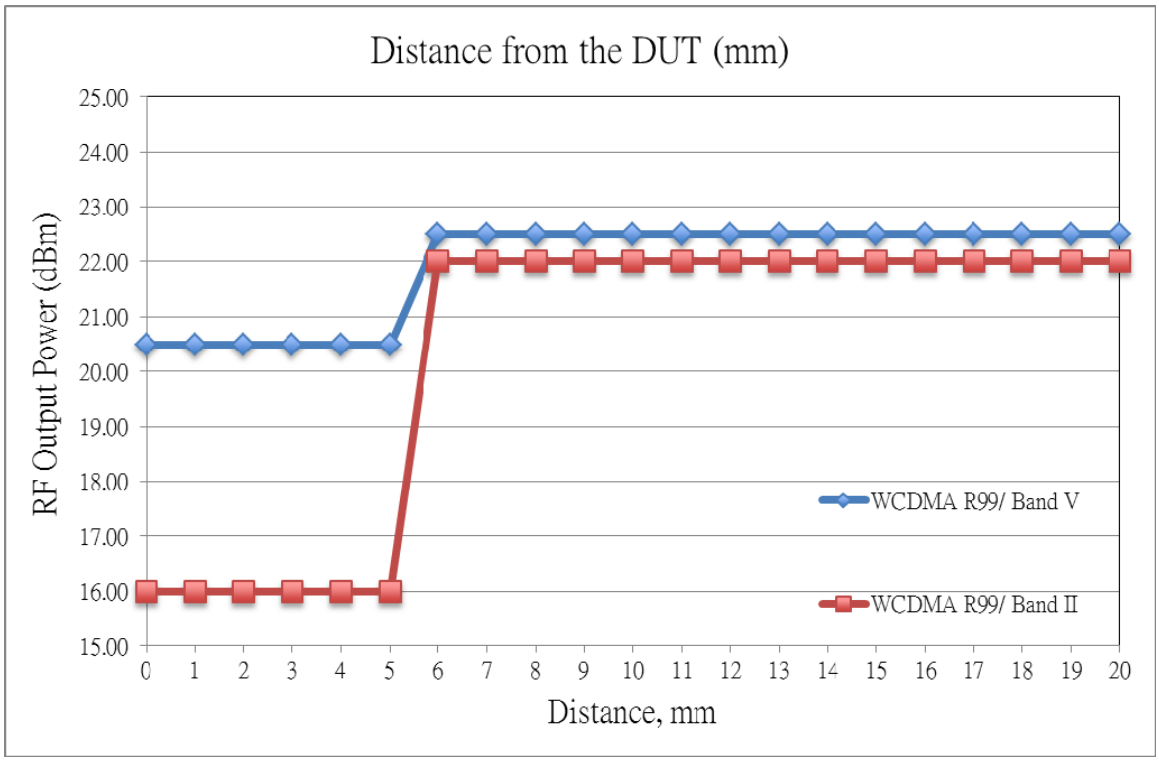
Edge 2 & 4, DUT Moving Toward (Trigger) and Away (Release) from the Phantom

GSM



W-CDMA



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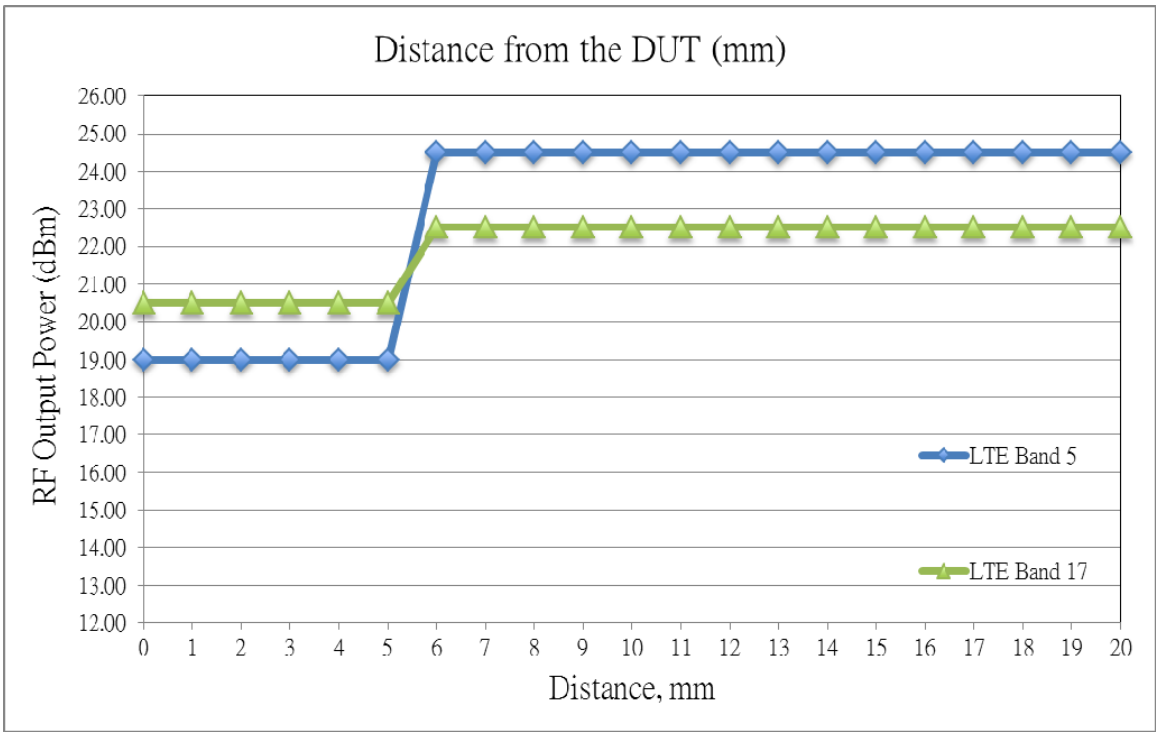
LTE



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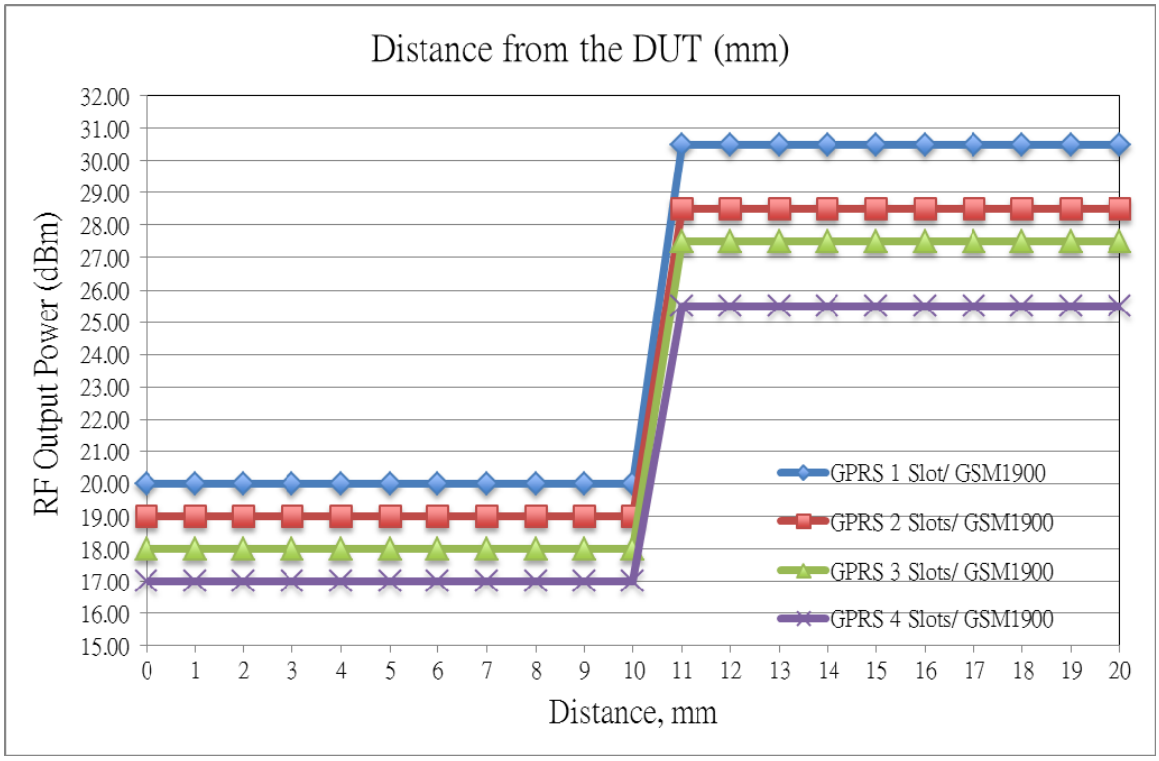
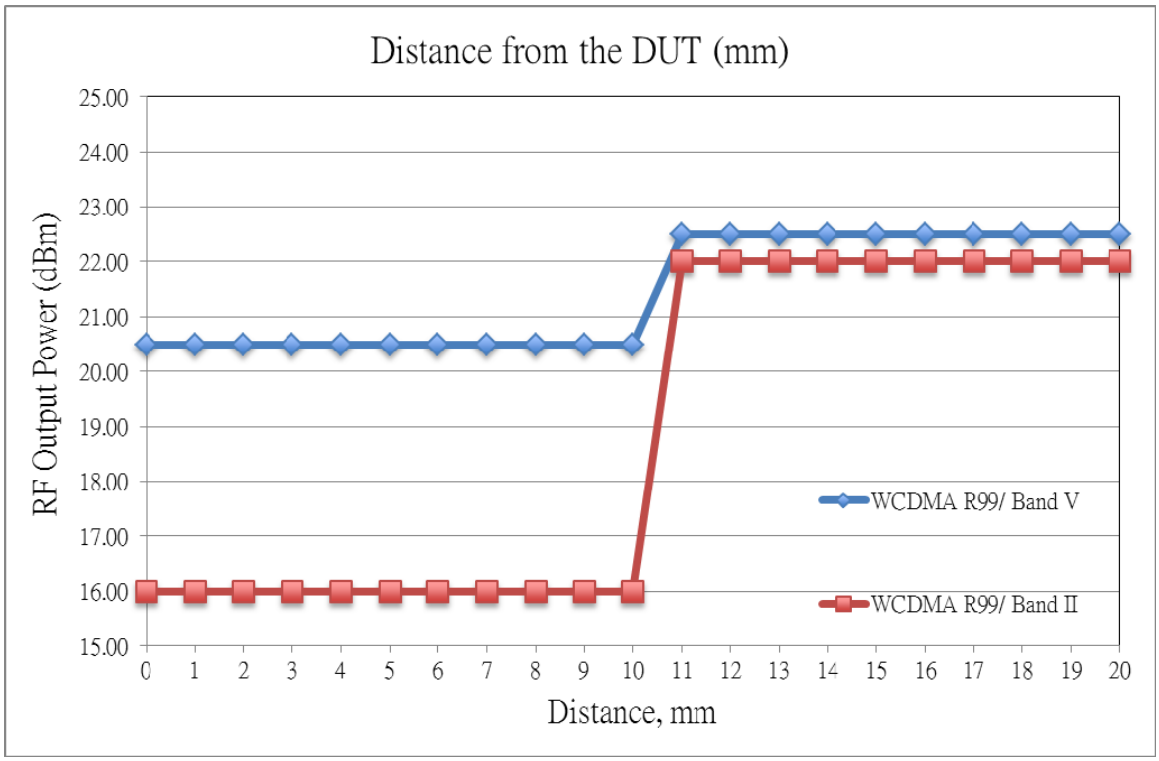
Edge 3, DUT Moving Toward (Trigger) and Away (Release) from the Phantom

GSM



W-CDMA



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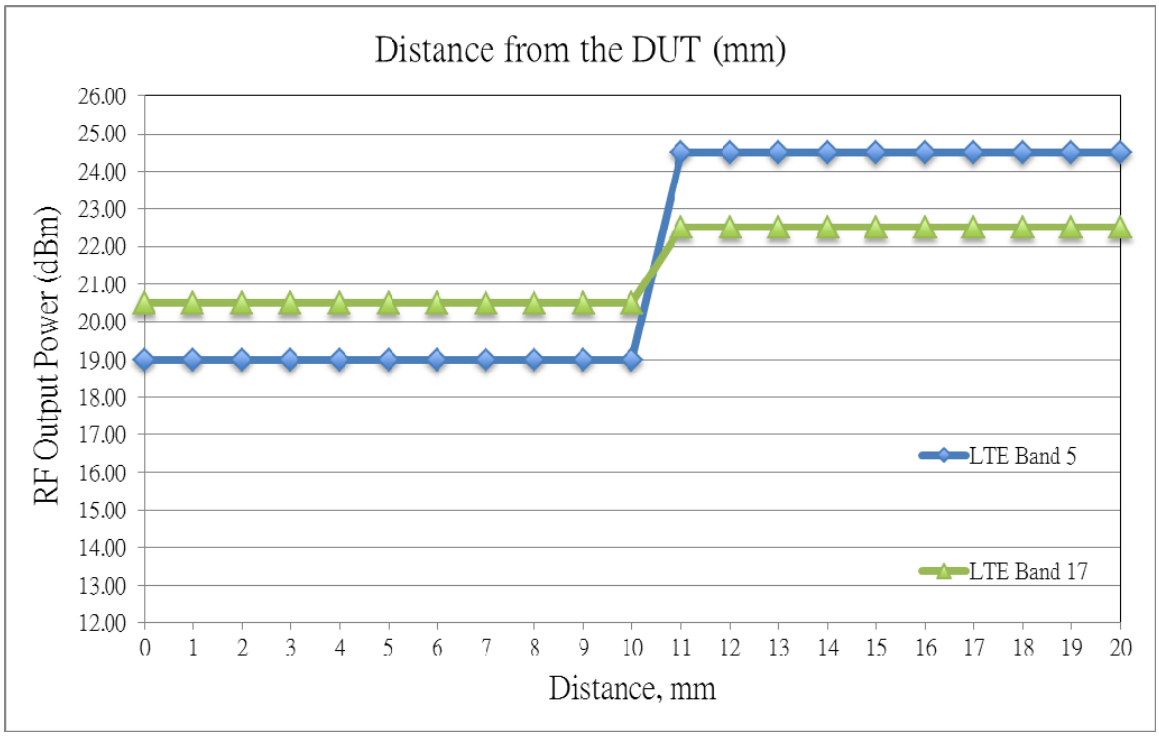
LTE



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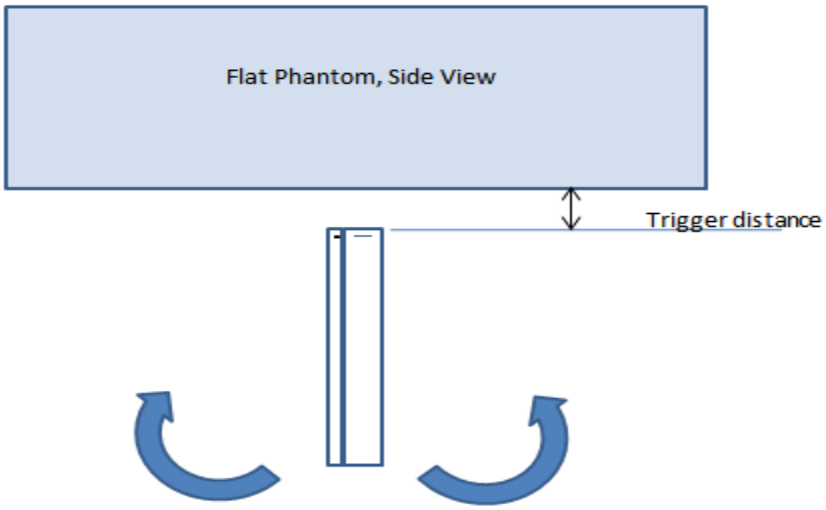
7.6.3. Proximity Sensor Coverage (KDB 616217 §6.3)

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

7.6.4. 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

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Summary of Tablet Tilt Angle Influence to Proximity Sensor Triggering for Edge 2 & 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°
700	5 mm	5 mm	on	on	on	on	on	on	on	on	on	on	on
850	5 mm	5 mm	on	on	on	on	on	on	on	on	on	on	on
1900	5 mm	5 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 5 mm. Full Power SAR measurements for the Edge 2 & 4 were performed at 4mm separation distance from the phantom.

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°
700	10 mm	10 mm	on	on	on	on	on	on	on	on	on	on	on
850	10 mm	10 mm	on	on	on	on	on	on	on	on	on	on	on
1900	10 mm	10 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 10 mm. Full Power SAR measurements for the Edge 3 were performed at 9 mm separation distance from the phantom.

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8. RF Exposure Conditions

This product is a phone supporting next to ear operations with diagonal dimensions greater than 20 cm. As such, testing in accordance with both KDB 648474 and 616217 is required in order to satisfy, respectively, the 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 requirements for tablets.

Refer to Appendix "Antenna Locations and Separation Distances" for the specific details of the antenna-to-antenna and antenna-to-edge(s) distances.

8.1. Head Exposure Conditions

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 the Appendix "Antenna Locations and Separation Distances" 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.

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8.2. 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

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
Main	Wi-Fi 2.4 GHz	2462	17.50	56	5	5	84	170	11		17.6 -MEASURE-	17.6 -MEASURE-	*> 50 mm*	*> 50 mm*	8 -MEASURE-	
Main	Wi-Fi 5.2 GHz	5240	12.50	18	5	5	84	170	11		8.2 -MEASURE-	8.2 -MEASURE-	*> 50 mm*	*> 50 mm*	3.7 -MEASURE-	
Main	Wi-Fi 5.3 GHz	5320	12.50	18	5	5	84	170	11		8.3 -MEASURE-	8.3 -MEASURE-	*> 50 mm*	*> 50 mm*	3.8 -MEASURE-	
Main	Wi-Fi 5.5 GHz	5700	12.50	18	5	5	84	170	11		8.6 -MEASURE-	8.6 -MEASURE-	*> 50 mm*	*> 50 mm*	3.9 -MEASURE-	
Main	Wi-Fi 5.8 GHz	5825	12.50	18	5	5	84	170	11		8.7 -MEASURE-	8.7 -MEASURE-	*> 50 mm*	*> 50 mm*	3.9 -MEASURE-	
Main	Bluetooth	2480	9.00	8	5	5	84	170	11		2.5 -EXEMPT-	2.5 -EXEMPT-	*> 50 mm*	*> 50 mm*	1.1 -EXEMPT-	

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
Main	Wi-Fi 2.4 GHz	2462	17.50	56	5	5	84	170	11		*< 50 mm*	*< 50 mm*	435.6 mW -EXEMPT-	1295.6 mW -EXEMPT-	*< 50 mm*	
Main	Wi-Fi 5.2 GHz	5240	12.50	18	5	5	84	170	11		*< 50 mm*	*< 50 mm*	405.5 mW -EXEMPT-	1265.5 mW -EXEMPT-	*< 50 mm*	
Main	Wi-Fi 5.3 GHz	5320	12.50	18	5	5	84	170	11		*< 50 mm*	*< 50 mm*	405 mW -EXEMPT-	1265 mW -EXEMPT-	*< 50 mm*	
Main	Wi-Fi 5.5 GHz	5700	12.50	18	5	5	84	170	11		*< 50 mm*	*< 50 mm*	402.8 mW -EXEMPT-	1262.8 mW -EXEMPT-	*< 50 mm*	
Main	Wi-Fi 5.8 GHz	5825	12.50	18	5	5	84	170	11		*< 50 mm*	*< 50 mm*	402.2 mW -EXEMPT-	1262.2 mW -EXEMPT-	*< 50 mm*	
Main	Bluetooth	2480	9.00	8	5	5	84	170	11		*< 50 mm*	*< 50 mm*	435.3 mW -EXEMPT-	1295.3 mW -EXEMPT-	*< 50 mm*	

Note(s):

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

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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. The sensor triggering distance is 12 mm for Rear, 9 mm for Edge 3, and 4 mm for Edge 2 and Edge 4.																
Cellular	GPRS 3 Slots	1909.8	27.50	211	5	170	67.7	5	5		58.3 -MEASURE-	> 50 mm	> 50 mm	58.3 -MEASURE-	58.3 -MEASURE-	
Cellular	W-CDMA V	846.6	22.50	178	5	170	5	5	72		32.8 -MEASURE-	> 50 mm	32.8 -MEASURE-	32.8 -MEASURE-	> 50 mm	
Cellular	W-CDMA II	1907.6	22.00	158	5	170	67.7	5	5		43.6 -MEASURE-	> 50 mm	> 50 mm	43.6 -MEASURE-	43.6 -MEASURE-	
Cellular	LTE Band 5	844	24.50	282	5	170	5	5	72		51.8 -MEASURE-	> 50 mm	51.8 -MEASURE-	51.8 -MEASURE-	> 50 mm	
Cellular	LTE Band 17	710	22.50	178	5	170	5	5	72		30 -MEASURE-	> 50 mm	30 -MEASURE-	30 -MEASURE-	> 50 mm	
Power Back-off, Grip Sensor On																
Cellular	GPRS 4 Slot	1909.8	17.00	25	5	170	67.7	5	5		6.9 -MEASURE-	> 50 mm	> 50 mm	6.9 -MEASURE-	6.9 -MEASURE-	
Cellular	W-CDMA V	846.6	20.50	112	5	170	5	5	72		20.6 -MEASURE-	> 50 mm	20.6 -MEASURE-	20.6 -MEASURE-	> 50 mm	
Cellular	W-CDMA II	1907.6	16.00	40	5	170	67.7	5	5		11 -MEASURE-	> 50 mm	> 50 mm	11 -MEASURE-	11 -MEASURE-	
Cellular	LTE Band 5	844	19.00	79	5	170	5	5	72		14.5 -MEASURE-	> 50 mm	14.5 -MEASURE-	14.5 -MEASURE-	> 50 mm	
Cellular	LTE Band 17	710	20.50	112	5	170	5	5	72		18.9 -MEASURE-	> 50 mm	18.9 -MEASURE-	18.9 -MEASURE-	> 50 mm	

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. The sensor triggering distance is 12 mm for Rear, 9 mm for Edge 3, and 4 mm for Edge 2 and Edge 4.																
Cellular	GPRS 1 Slot	1909.8	27.50	70	5	170	67.7	5	5		< 50 mm	1308.5 mW -EXEMPT-	285.5 mW -EXEMPT-	< 50 mm	< 50 mm	
Cellular	W-CDMA V	846.6	22.50	178	5	170	5	5	72		< 50 mm	840.3 mW -EXEMPT-	< 50 mm	< 50 mm	287.2 mW -EXEMPT-	
Cellular	W-CDMA II	1907.6	22.00	158	5	170	67.7	5	5		< 50 mm	1308.6 mW -EXEMPT-	285.6 mW -EXEMPT-	< 50 mm	< 50 mm	
Cellular	LTE Band 5	844	24.50	282	5	170	5	5	72		< 50 mm	838.5 mW -EXEMPT-	< 50 mm	< 50 mm	287.1 mW -EXEMPT-	
Cellular	LTE Band 17	710	22.50	178	5	170	5	5	72		< 50 mm	746 mW -EXEMPT-	< 50 mm	< 50 mm	282.2 mW -EXEMPT-	
Power Back-off, Grip Sensor On																
Cellular	GPRS 4 Slots	1909.8	17.00	25	5	170	67.7	5	5		< 50 mm	1308.5 mW -EXEMPT-	285.5 mW -EXEMPT-	< 50 mm	< 50 mm	
Cellular	W-CDMA V	846.6	20.50	112	5	170	5	5	72		< 50 mm	840.3 mW -EXEMPT-	< 50 mm	< 50 mm	287.2 mW -EXEMPT-	
Cellular	W-CDMA II	1907.6	16.00	40	5	170	67.7	5	5		< 50 mm	1308.6 mW -EXEMPT-	285.6 mW -EXEMPT-	< 50 mm	< 50 mm	
Cellular	LTE Band 5	844	19.00	79	5	170	5	5	72		< 50 mm	838.5 mW -EXEMPT-	< 50 mm	< 50 mm	287.1 mW -EXEMPT-	
Cellular	LTE Band 17	710	20.50	112	5	170	5	5	72		< 50 mm	746 mW -EXEMPT-	< 50 mm	< 50 mm	282.2 mW -EXEMPT-	

Note(s):

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

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8.3. Required Test Configurations

The table below identifies the standalone test configurations required for this device according to the findings in Section 8.2:

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

Note(s):

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

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9. RF Output Power Measurement

9.1. 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	28.9	19.8	19.9	10.9
				661	1880.0	28.7	19.7	20.0	11.0
				810	1909.8	28.7	19.6	20.0	11.0
	GPRS (GMSK)	CS1	1	512	1850.2	29.1	20.1	19.9	10.9
				661	1880.0	29.2	20.1	20.0	11.0
				810	1909.8	28.7	19.7	20.0	11.0
			2	512	1850.2	28.3	22.3	19.0	13.0
				661	1880.0	28.1	22.0	19.0	13.0
				810	1909.8	27.9	21.8	18.6	12.6
			3	512	1850.2	**27.4**	**23.2**	18.0	13.7
				661	1880.0	**27.2**	**23.0**	18.0	13.7
				810	1909.8	**27.1**	**22.8**	17.9	13.6
			4	512	1850.2	25.5	22.5	**16.9**	**13.9**
				661	1880.0	25.4	22.4	**17.0**	**14.0**
				810	1909.8	25.3	22.2	**17.0**	**14.0**

EGPRS(8PSK) is Rx only

Notes:

EGPRS (8PSK) is Not Supported

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

- Head: GMSK Voice Mode
- Body mode: GMSK (GPRS) mode max. power with 3 time slots, based on the output power measurements above
- Body mode: GMSK (GPRS) mode reduced power with 4 time slots, based on the output power measurements above

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9.2. 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 1
	Rel99 RMC	12.2kbps RMC
	Power Control Algorithm	Algorithm2
	βc/βd	8/15

Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	Max. Avg Pwr (dBm)	with Pwr Back-off Avg Pwr (dBm)
W-CDMA Band V	Rel 99 (RMC, 12.2 kbps)	4132	826.4	22.3	19.8
		4183	836.6	22.2	19.8
		4233	846.6	22.1	19.7
W-CDMA Band II	Rel 99 (RMC, 12.2 kbps)	9262	1852.4	22.0	15.8
		9400	1880.0	21.9	15.9
		9538	1907.6	21.8	15.8

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HSDPA

The following 4 Sub-tests were completed according to Release 6 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-Set1			
	Power Control Algorithm	Algorithm 2			
	βc	2/15	12/15	15/15	15/15
	βd	15/15	15/15	8/15	4/15
	Bd (SF)	64			
	βc/βd	2/15	12/15	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)	Max. Avg Pwr (dBm)	with Pwr Back-off Avg Pwr (dBm)
W-CDMA Band V	Subtest 1	4132	826.4	21.2	19.1
		4183	836.6	21.2	19.2
		4233	846.6	21.1	19.1
	Subtest 2	4132	826.4	20.7	18.7
		4183	836.6	20.6	18.6
		4233	846.6	20.6	18.5
	Subtest 3	4132	826.4	20.6	18.6
		4183	836.6	20.6	18.6
		4233	846.6	20.5	18.5
	Subtest 4	4132	826.4	20.7	18.7
		4183	836.6	20.5	18.5
		4233	846.6	20.6	18.5
W-CDMA Band II	Subtest 1	9262	1852.4	21.1	14.5
		9400	1880.0	20.9	14.6
		9538	1907.6	20.7	14.3
	Subtest 2	9262	1852.4	21.0	14.5
		9400	1880.0	20.9	14.4
		9538	1907.6	20.7	14.2
	Subtest 3	9262	1852.4	20.5	14.0
		9400	1880.0	20.4	13.9
		9538	1907.6	20.2	13.7
	Subtest 4	9262	1852.4	20.4	13.9
		9400	1880.0	20.2	13.7
		9538	1907.6	20.1	13.6

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

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HSPA (HSDPA & HSUPA)

The following 5 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	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
	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 Channelisation Codes	2xSF2				SF4

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Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	Max. Avg Pwr (dBm)	with Pwr Back-off Avg Pwr (dBm)
W-CDMA Band V	Subtest 1	4132	826.4	21.1	19.1
		4183	836.6	20.5	19.1
		4233	846.6	20.5	18.9
	Subtest 2	4132	826.4	19.8	17.8
		4183	836.6	19.5	17.5
		4233	846.6	19.9	17.9
	Subtest 3	4132	826.4	20.0	18.0
		4183	836.6	20.0	18.0
		4233	846.6	19.7	17.7
	Subtest 4	4132	826.4	20.0	18.0
		4183	836.6	19.9	17.9
		4233	846.6	20.4	18.4
	Subtest 5	4132	826.4	21.2	19.2
		4183	836.6	21.1	19.3
		4233	846.6	21.0	19.2
W-CDMA Band II	Subtest 1	9262	1852.4	21.2	14.5
		9400	1880.0	21.0	14.6
		9538	1907.6	20.5	14.0
	Subtest 2	9262	1852.4	19.7	13.2
		9400	1880.0	19.5	13.0
		9538	1907.6	19.8	13.3
	Subtest 3	9262	1852.4	20.0	13.5
		9400	1880.0	20.0	13.5
		9538	1907.6	19.8	13.3
	Subtest 4	9262	1852.4	19.9	13.4
		9400	1880.0	20.5	14.0
		9538	1907.6	20.1	13.6
	Subtest 5	9262	1852.4	21.1	14.6
		9400	1880.0	20.7	14.2
		9538	1907.6	20.8	14.3

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

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9.3. LTE Band

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.					

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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	24.43	24.40	24.40	18.57	18.40	18.50
			1	50	0	0	24.42	24.34	24.47	18.42	18.39	18.54
			1	99	0	0	24.36	24.44	24.41	18.41	18.48	18.73
			50	0	1	1	22.59	22.57	22.61	17.11	17.21	17.33
			50	25	1	2	22.57	22.66	22.61	17.10	17.11	17.11
			50	50	1	2	22.58	22.61	22.71	17.00	17.17	17.21
			100	0	1	2	22.58	22.62	22.72	17.09	17.00	17.02
		16QAM	1	0	1	1	23.44	23.41	23.34	17.50	17.36	17.42
			1	50	1	1	23.36	23.44	23.42	17.40	17.33	17.50
			1	99	1	1	23.35	23.19	23.19	17.41	17.41	17.63
			50	0	2	2	22.44	22.44	22.14	16.62	16.66	16.66
			50	25	2	2	22.41	22.46	22.19	16.63	16.62	16.74
			50	50	2	2	22.45	22.49	22.49	16.62	16.65	16.83
			100	0	2	2	22.42	22.33	22.44	16.65	16.63	16.73

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	5	QPSK	1	0	0	0	24.50	24.49	24.49	18.54	18.58	18.77
			1	12	0	0	24.33	24.44	24.47	18.40	18.49	18.84
			1	24	0	0	24.47	24.41	24.44	18.52	18.68	18.91
			12	0	1	1	22.60	22.70	22.76	17.15	17.20	17.33
			12	7	1	2	22.52	22.60	22.73	17.00	17.17	17.21
			12	13	1	2	22.57	22.55	22.77	17.09	17.00	17.02
			25	0	1	2	22.54	22.57	22.70	17.50	17.36	17.42
		16QAM	1	0	1	1	23.38	23.43	23.45	17.40	17.33	17.50
			1	12	1	1	23.28	23.41	23.29	17.31	17.53	17.00
			1	24	1	1	23.39	23.50	23.44	17.45	17.69	17.25
			12	0	2	2	22.50	22.50	22.45	16.72	16.61	16.80
			12	7	2	2	22.49	22.49	22.35	16.61	16.60	16.81
			12	13	2	2	22.44	22.44	22.36	16.61	16.60	16.84
			25	0	2	2	22.42	22.48	22.37	16.76	16.58	16.79

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	3	QPSK	1	0	0	0	24.20	24.20	24.39	18.57	18.45	18.76
			1	8	0	0	24.19	24.40	24.47	18.38	18.39	18.66
			1	14	0	0	24.35	24.13	24.41	18.42	18.53	18.76
			8	0	1	0	23.11	23.10	22.76	17.65	17.11	17.35
			8	4	1	1	23.00	22.80	22.80	17.45	17.24	17.27
			8	7	1	1	22.80	22.70	22.89	17.20	17.12	17.45
			15	0	1	1	22.90	22.80	22.69	17.11	17.22	17.00
		16QAM	1	0	1	1	22.70	22.68	22.55	17.50	17.39	17.67
			1	8	1	0	23.30	23.14	22.64	17.36	17.32	17.63
			1	14	1	0	23.10	23.50	22.79	17.36	17.42	17.68
			8	0	2	0	22.50	22.50	22.45	16.71	16.67	16.86
			8	4	2	0	22.10	22.43	22.46	16.60	16.66	16.86
			8	7	2	0	22.44	22.44	22.25	16.60	16.67	16.84
			15	0	2	0	22.15	22.46	22.37	16.71	16.54	16.85

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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		
							829 MHz	836.5 MHz	844 MHz	829 MHz	836.5 MHz	844 MHz
LTE Band 5	1.4	QPSK	1	0	0	0	24.20	24.15	24.41	18.59	18.56	18.83
			1	3	0	0	24.10	24.40	24.47	18.52	18.45	18.78
			1	5	0	0	24.00	24.13	24.41	18.52	18.54	18.84
			3	0	0	0	23.60	23.87	24.00	18.71	18.48	18.95
			3	1	0	0	23.55	23.80	24.06	18.67	18.52	18.89
			3	3	0	0	23.56	23.90	24.02	18.64	18.51	18.90
			6	0	1	1	22.90	22.80	22.69	17.69	17.77	17.68
		16QAM	1	0	1	1	22.70	22.68	22.55	17.79	17.76	17.98
			1	3	1	0	23.30	23.14	22.64	17.69	17.75	17.91
			1	5	1	0	23.10	23.50	22.79	17.64	17.72	17.99
			3	0	1	0	22.50	22.78	22.74	17.65	17.52	17.85
			3	1	1	0	22.55	22.89	22.89	17.65	17.49	17.84
			3	3	1	0	22.69	22.66	22.81	17.63	17.51	17.82
			6	0	2	0	22.15	22.45	22.37	16.75	16.45	16.97

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LTE Band 17 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm) Max. Power 710 MHz	Avg Pwr (dBm) with Pwr Back-off 710 MHz
LTE Band 17	10	QPSK	1	0	0	0	22.24	20.17
			1	25	0	0	22.16	20.13
			1	49	0	0	22.27	20.21
			25	0	1	1	21.15	19.12
			25	12	1	1	21.17	19.09
			25	25	1	1	21.14	19.11
			50	0	1	1	21.15	18.98
		16QAM	1	0	1	1	20.99	18.90
			1	25	1	1	20.91	18.89
			1	49	1	1	20.96	18.93
			25	0	2	2	20.22	18.16
			25	12	2	2	20.17	18.15
			25	25	2	2	20.16	18.15
			50	0	2	2	20.19	18.10

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm) Max. Power 710 MHz	Avg Pwr (dBm) with Pwr Back-off 710 MHz
LTE Band 17	5	QPSK	1	0	0	0	22.08	20.15
			1	12	0	0	22.05	20.11
			1	24	0	0	22.08	20.19
			12	0	1	0	21.10	19.10
			12	6	1	0	21.13	19.07
			12	11	1	0	21.10	19.09
			25	0	1	0	21.12	18.96
		16QAM	1	0	1	0	20.68	18.88
			1	12	1	0	20.60	18.87
			1	24	1	0	20.75	18.91
			12	0	2	0	20.17	18.15
			12	6	2	0	20.18	18.14
			12	11	2	0	20.16	18.14
			25	0	2	0	20.22	18.09

Note(s):

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

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9.4. Wi-Fi (2.4 GHz Band)

Required Test Channels per KDB 248227 D01

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

Notes:
√ = "default test channels"
∇ = possible 802.11g channels with maximum average output ¼ dB ≥ the "default test channels"
= when output power is reduced for channel 1 and /or 11 to meet restricted band requirements the highest output channels closest to each of these channels should be tested.

Measured Results

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Avg Pwr (dBm)	SAR Test (Yes/No)
2.4 (DTS)	802.11b	1 Mbps	1	2412	16.7	Yes
			6	2437	17.3	
			11	2462	17.1	
	802.11g	6 Mbps	1	2412	13.1	No
			6	2437	12.9	
			11	2462	13.4	
	802.11n (HT20)	MCS0	1	2412	13.1	Yes
			6	2437	12.9	
			11	2462	12.5	

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)	Data Rate	Avg Pwr (dBm)	SAR test (Yes/No)
802.11b	6	2437	1 Mbps	17.3	Yes
			2 Mbps	17.3	No
			5.5 Mbps	17.0	No
			11 Mbps	17.0	No

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9.5. Wi-Fi (5 GHz Bands)

Required Test Channels per KDB 248227 D01

Mode		Band	GHz	Channel	"Default Test Channels"	
					802.11a	
802.11a	UNII (15.407)	5.2 GHz	5.180	36	√	
			5.200	40		*
			2.220	44		*
			5.240	48	√	
		5.3 GHz	5.260	52	√	
			5.280	56		*
			5.300	60		*
			5.320	64	√	
		5.5 GHz	5.500	100		
			5.520	104	√	
			5.540	108		*
			5.560	112		*
			5.580	116	√	
			5.600	120		*
			5.620	124	√	
			5.640	128		*
			5.660	132		*
			5.680	136	√	
			5.700	140		*
	DTS (15.247)	5.8 GHz	5.745	149	√	
			5.765	153		*
			5.785	157	√	
			5.805	161		*
			5.825	165	√	

√ = "default test channels"

* = possible 802.11a channels with maximum average output > the "default test channels"

= when output power is reduced for channel 1 and /or 11 to meet restricted band requirements the highest output channels closest to each of these channels should be tested.

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Measured Results

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Avg Pwr (dBm)	SAR Test (Yes/No)
5.2 (UNII)	802.11a	6 Mbps	36	5180	11.8	Yes
			40	5200	11.8	
			44	5220	12.1	
			48	5240	12.2	
	802.11n (HT20)	MCS0	36	5180	11.7	No
			40	5200	11.7	
			48	5240	12.0	
	802.11n (HT40)	MCS0	36	5190	11.7	Yes
			46	5230	12.1	
5.3 (UNII)	802.11a	6 Mbps	52	5260	12.5	Yes
			56	5280	12.4	
			60	5300	12.0	
			64	5320	11.7	
	802.11n (HT20)	MCS0	52	5260	12.5	No
			60	5300	12.0	
			64	5320	11.5	
	802.11n (HT40)	MCS0	54	5280	12.4	Yes
			62	5310	12.0	
5.5 (UNII)	802.11a	6 Mbps	100	5500	12.3	Yes
			104	5520	12.4	
			108	5540	12.4	
			112	5560	11.9	
			116	5580	12.3	
			120	5600	12.3	
			124	5620	12.4	
			128	5640	12.4	
			132	5660	12.0	
			136	5680	12.5	
			140	5700	12.5	
	802.11n (HT20)	MCS0	100	5500	12.5	Yes
			120	5600	12.3	
			140	5700	12.4	
	802.11n (HT40)	MCS0	102	5510	12.3	Yes
			118	5590	12.4	
			134	5670	12.0	
5.8 (DTS)	802.11a	6 Mbps	149	5745	12.3	Yes
			153	5765	12.4	
			157	5785	12.5	
			161	5805	12.1	
			165	5825	12.1	
	802.11n (HT20)	MCS0	149	5745	12.3	No
			157	5785	12.4	
			165	5825	12.1	
	802.11n (HT40)	MCS0	151	5755	12.3	Yes
			161	5805	11.9	

Note(s):

Per KDB 248227, SAR is not required for 802.11n HT20/HT40 channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11a channels.

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Power measurements to determine worst-case data rates

Band	Mode	Ch #	Freq. (MHz)	Data Rate	Avg Pwr (dBm)	SAR test (Yes/No)
5.2 GHz (UNII)	802.11a	36	5180	6 Mbps	11.8	Yes
				9 Mbps	11.6	No
				12 Mbps	11.6	No
				18 Mbps	11.4	No
				24 Mbps	11.0	No
				36 Mbps	10.7	No
				48 Mbps	10.3	No
				54 Mbps	10.2	No
5.3 GHz (UNII)	802.11a	56	5280	6 Mbps	12.5	Yes
				9 Mbps	12.4	No
				12 Mbps	12.3	No
				18 Mbps	12.3	No
				24 Mbps	11.8	No
				36 Mbps	11.5	No
				48 Mbps	11.1	No
				54 Mbps	11.0	No
5.5 GHz (UNII)	802.11a	116	5580	6 Mbps	12.3	Yes
				9 Mbps	12.0	No
				12 Mbps	11.8	No
				18 Mbps	11.6	No
				24 Mbps	11.6	No
				36 Mbps	11.2	No
				48 Mbps	10.9	No
				54 Mbps	10.8	No
5.8 GHz (DTS)	802.11a	149	5745	6 Mbps	12.3	Yes
				9 Mbps	12.2	No
				12 Mbps	12.0	No
				18 Mbps	11.8	No
				24 Mbps	11.8	No
				36 Mbps	11.4	No
				48 Mbps	11.1	No
				54 Mbps	11.0	No

9.6. Bluetooth

Maximum tune-up tolerance limit is 9 dBm from the rated nominal maximum output power. This power level qualifies for exclusion of SAR testing.

Refer to Standalone SAR Test Exclusion Considerations Section.

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10. Tissue Dielectric Properties

IEEE Std 1528-2013

Target Frequency (MHz)	Head	
	ε_r	σ (S/m)
300	45.3	0.87
450	43.5	0.87
750	*41.9*	*0.89*
835	41.5	0.90
900	41.5	0.97
1450	40.5	1.20
1500	*40.4*	*1.23*
1640	*40.2*	*1.31*
1750	*40.1*	*1.37*
1800	40.0	1.40
1900	40.0	1.40
2000	40.0	1.40
2100	*39.8*	*1.49*
2300	*39.5*	*1.67*
2450	39.2	1.80
2600	*39.0*	*1.96*
3000	38.5	2.40
3500	*37.9*	*2.91*
4000	*37.4*	*3.43*
4500	*36.8*	*3.94*
5000	*36.2*	*4.45*
5200	*36.0*	*4.66*
5400	*35.8*	*4.86*
5600	*35.5*	*5.07*
5800	35.3	5.27
6000	*35.1*	*5.48*

NOTE—For convenience, permittivity and conductivity values at some frequencies that are not part of the original data from Drossos et al. [B60] or the extension to 5800 MHz are provided (i.e., the values shown in italics). These values were linearly interpolated between the values in this table that are immediately above and below these values, except the values at 6000 MHz that were linearly extrapolated from the values at 3000 MHz and 5800 MHz.

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

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10.1. Composition of Ingredients for the Tissue Material Used in the SAR Tests

The following tissue formulations are provided for reference only as some of the parameters have not been thoroughly verified. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation.

Ingredients (% by weight)	Frequency (MHz)									
	450		835		915		1900		2450	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	38.56	51.16	41.45	52.4	41.05	56.0	54.9	40.4	62.7	73.2
Salt (NaCl)	3.95	1.49	1.45	1.4	1.35	0.76	0.18	0.5	0.5	0.04
Sugar	56.32	46.78	56.0	45.0	56.5	41.76	0.0	58.0	0.0	0.0
HEC	0.98	0.52	1.0	1.0	1.0	1.21	0.0	1.0	0.0	0.0
Bactericide	0.19	0.05	0.1	0.1	0.1	0.27	0.0	0.1	0.0	0.0
Triton X-100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.8	0.0
DGBE	0.0	0.0	0.0	0.0	0.0	0.0	44.92	0.0	0.0	26.7
Dielectric Constant	43.42	58.0	42.54	56.1	42.0	56.8	39.9	54.0	39.8	52.5
Conductivity (S/m)	0.85	0.83	0.91	0.95	1.0	1.07	1.42	1.45	1.88	1.78

Salt: 99+% Pure Sodium Chloride
Sugar: 98+% Pure Sucrose
Water: De-ionized, 16 MΩ+ resistivity
HEC: Hydroxyethyl Cellulose
DGBE: 99+% Di(ethylene glycol) butyl ether, [2-(2-butoxyethoxy)ethanol]
Triton X-100 (ultra pure): Polyethylene glycol mono [4-(1,1, 3, 3-tetramethylbutyl)phenyl]ether

MSL/HSL750 (Body and Head liquids for 700 – 800 MHz)

Item	Head Tissue Simulation Liquids HSL750 Muscle (body) Tissue Simulation Liquids MSL750
Type No	SL AAH 075
Manufacturer	SPEAG
The item is composed of the following ingredients:	
H^2O	Water, 35 – 58%
Sucrese	Sugar, white, refined, 40-60%
NaCl	Sodium Chloride, 0-6%
Hydroxyethel-cellulsoe	Medium Viscosity (CAS# 9004-62-0), <0.3%
Preventol-D7	Preservative: aqueous preparation, (CAS# 55965-84-9), containing 5-chloro-2-methyl-3(2H)-isothiazolone and 2-methyyl-3(2H)-isothiazolone, 0.1-0.7%

MSL/HSL1750 (Body and Head liquids for 1700 – 1800 MHz)

Item	Head Tissue Simulation Liquids HSL1750 Muscle (body) Tissue Simulation Liquids MSL1750
Type No	SL AAM 175
Manufacturer	SPEAG
-The item is composed of the following ingredients:	
H^2O	Water, 52 – 75%
C8H18O3	Diethylene glycol monobutyl ether (DGBE), 25-48%
NaCl	Sodium Chloride, <1.0%

Simulating Liquids for 5 GHz, Manufactured by SPEAG

Ingredients	(% by weight)
Water	78
Mineral oil	11
Emulsifiers	9
Additives and Salt	2

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10.2. Tissue Dielectric Parameter Check Results

The temperature of the tissue-equivalent medium used during measurement must also be within 18°C to 25°C and within ± 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 Room 1

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
4/23/2014	Head 750	e'	40.2300	Relative Permittivity (ε_r):	40.23	41.96	-4.13	5
		e"	21.6600	Conductivity (σ):	0.90	0.89	1.14	5
	Head 700	e'	40.8700	Relative Permittivity (ε_r):	40.87	42.22	-3.19	5
		e"	22.0200	Conductivity (σ):	0.86	0.89	-3.62	5
	Head 790	e'	39.6900	Relative Permittivity (ε_r):	39.69	41.76	-4.95	5
		e"	21.4200	Conductivity (σ):	0.94	0.90	4.99	5
4/23/2014	Body 750	e'	53.5000	Relative Permittivity (ε_r):	53.50	55.55	-3.68	5
		e"	23.1200	Conductivity (σ):	0.96	0.96	0.11	5
	Body 700	e'	53.9700	Relative Permittivity (ε_r):	53.97	55.74	-3.17	5
		e"	23.5200	Conductivity (σ):	0.92	0.96	-4.56	5
	Body 790	e'	53.0800	Relative Permittivity (ε_r):	53.08	55.39	-4.17	5
		e"	22.8600	Conductivity (σ):	1.00	0.97	3.93	5
4/10/2014	Head 835	e'	40.2300	Relative Permittivity (ε_r):	40.23	41.50	-3.06	5
		e"	19.2700	Conductivity (σ):	0.89	0.90	-0.59	5
	Head 820	e'	40.4200	Relative Permittivity (ε_r):	40.42	41.60	-2.84	5
		e"	19.3100	Conductivity (σ):	0.88	0.90	-2.01	5
	Head 850	e'	40.0500	Relative Permittivity (ε_r):	40.05	41.50	-3.49	5
		e"	19.2200	Conductivity (σ):	0.91	0.92	-0.72	5
4/14/2014	Head 835	e'	41.5300	Relative Permittivity (ε_r):	41.53	41.50	0.07	5
		e"	19.5500	Conductivity (σ):	0.91	0.90	0.85	5
	Head 820	e'	41.6900	Relative Permittivity (ε_r):	41.69	41.60	0.21	5
		e"	19.6100	Conductivity (σ):	0.89	0.90	-0.48	5
	Head 850	e'	41.3800	Relative Permittivity (ε_r):	41.38	41.50	-0.29	5
		e"	19.5200	Conductivity (σ):	0.92	0.92	0.83	5
4/15/2014	Body 835	e'	52.7000	Relative Permittivity (ε_r):	52.70	55.20	-4.53	5
		e"	21.9300	Conductivity (σ):	1.02	0.97	4.97	5
	Body 820	e'	52.8700	Relative Permittivity (ε_r):	52.87	55.28	-4.35	5
		e"	22.0000	Conductivity (σ):	1.00	0.97	3.57	5
	Body 850	e'	52.5300	Relative Permittivity (ε_r):	52.53	55.16	-4.76	5
		e"	21.8700	Conductivity (σ):	1.03	0.99	4.71	5
4/8/2014	Head 1900	e'	39.2700	Relative Permittivity (ε_r):	39.27	40.00	-1.82	5
		e"	13.5000	Conductivity (σ):	1.43	1.40	1.87	5
	Head 1850	e'	39.5900	Relative Permittivity (ε_r):	39.59	40.00	-1.02	5
		e"	13.3900	Conductivity (σ):	1.38	1.40	-1.62	5
	Head 1910	e'	39.2400	Relative Permittivity (ε_r):	39.24	40.00	-1.90	5
		e"	13.5200	Conductivity (σ):	1.44	1.40	2.56	5

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Tissue Dielectric Parameter Check Results (continued)

SAR Room 1 (continued)

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
4/14/2014	Head 1900	e'	40.3600	Relative Permittivity (ε_r):	40.36	40.00	0.90	5
		e"	13.5700	Conductivity (σ):	1.43	1.40	2.40	5
	Head 1850	e'	40.5800	Relative Permittivity (ε_r):	40.58	40.00	1.45	5
		e"	13.4200	Conductivity (σ):	1.38	1.40	-1.40	5
	Head 1910	e'	40.3200	Relative Permittivity (ε_r):	40.32	40.00	0.80	5
		e"	13.5900	Conductivity (σ):	1.44	1.40	3.09	5
4/18/2014	Body 1900	e'	51.7100	Relative Permittivity (ε_r):	51.71	53.30	-2.98	5
		e"	14.8500	Conductivity (σ):	1.57	1.52	3.21	5
	Body 1850	e'	51.9000	Relative Permittivity (ε_r):	51.90	53.30	-2.63	5
		e"	14.7300	Conductivity (σ):	1.52	1.52	-0.31	5
	Body 1910	e'	51.6700	Relative Permittivity (ε_r):	51.67	53.30	-3.06	5
		e"	14.9100	Conductivity (σ):	1.58	1.52	4.18	5
4/21/2014	Body 1900	e'	52.0900	Relative Permittivity (ε_r):	52.09	53.30	-2.27	5
		e"	14.5500	Conductivity (σ):	1.54	1.52	1.13	5
	Body 1850	e'	52.2500	Relative Permittivity (ε_r):	52.25	53.30	-1.97	5
		e"	14.5000	Conductivity (σ):	1.49	1.52	-1.87	5
	Body 1910	e'	51.9600	Relative Permittivity (ε_r):	51.96	53.30	-2.51	5
		e"	14.5400	Conductivity (σ):	1.54	1.52	1.59	5
4/12/2014	Head 2450	e'	38.5800	Relative Permittivity (ε_r):	38.58	39.20	-1.58	5
		e"	13.7400	Conductivity (σ):	1.87	1.80	3.99	5
	Head 2410	e'	38.7400	Relative Permittivity (ε_r):	38.74	39.28	-1.37	5
		e"	13.6300	Conductivity (σ):	1.83	1.76	3.75	5
	Head 2475	e'	38.4800	Relative Permittivity (ε_r):	38.48	39.17	-1.76	5
		e"	13.8200	Conductivity (σ):	1.90	1.83	4.10	5
4/17/2014	Body 2450	e'	51.9100	Relative Permittivity (ε_r):	51.91	52.70	-1.50	5
		e"	14.8100	Conductivity (σ):	2.02	1.95	3.46	5
	Body 2410	e'	52.0300	Relative Permittivity (ε_r):	52.03	52.76	-1.38	5
		e"	14.7100	Conductivity (σ):	1.97	1.91	3.34	5
	Body 2475	e'	51.8500	Relative Permittivity (ε_r):	51.85	52.67	-1.55	5
		e"	14.8700	Conductivity (σ):	2.05	1.99	3.08	5
4/21/2014	Body 2450	e'	51.9900	Relative Permittivity (ε_r):	51.99	52.70	-1.35	5
		e"	14.9000	Conductivity (σ):	2.03	1.95	4.09	5
	Body 2410	e'	52.1300	Relative Permittivity (ε_r):	52.13	52.76	-1.19	5
		e"	14.8900	Conductivity (σ):	2.00	1.91	4.61	5
	Body 2475	e'	51.8700	Relative Permittivity (ε_r):	51.87	52.67	-1.52	5
		e"	15.0600	Conductivity (σ):	2.07	1.99	4.40	5
4/10/2014	Head 5180	e'	36.1100	Relative Permittivity (ε_r):	36.11	36.01	0.27	5
		e"	15.4100	Conductivity (σ):	4.44	4.63	-4.15	5
	Head 5200	e'	36.0700	Relative Permittivity (ε_r):	36.07	35.99	0.22	5
		e"	15.4200	Conductivity (σ):	4.46	4.65	-4.14	5
	Head 5600	e'	35.5200	Relative Permittivity (ε_r):	35.52	35.53	-0.04	5
		e"	15.6100	Conductivity (σ):	4.86	5.06	-3.95	5
	Head 5800	e'	35.2600	Relative Permittivity (ε_r):	35.26	35.30	-0.11	5
		e"	15.7400	Conductivity (σ):	5.08	5.27	-3.68	5
	Head 5825	e'	35.2200	Relative Permittivity (ε_r):	35.22	35.30	-0.23	5
		e"	15.7500	Conductivity (σ):	5.10	5.27	-3.20	5

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Tissue Dielectric Parameter Check Results (continued)

SAR Room 1 (continued)

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
4/16/2014	Body 5180	e'	48.5300	Relative Permittivity (ε_r):	48.53	49.05	-1.05	5
		e"	18.5600	Conductivity (σ):	5.35	5.27	1.41	5
	Body 5200	e'	48.5000	Relative Permittivity (ε_r):	48.50	49.02	-1.06	5
		e"	18.5800	Conductivity (σ):	5.37	5.29	1.46	5
	Body 5600	e'	47.8200	Relative Permittivity (ε_r):	47.82	48.48	-1.36	5
		e"	18.9500	Conductivity (σ):	5.90	5.76	2.42	5
	Body 5800	e'	47.5000	Relative Permittivity (ε_r):	47.50	48.20	-1.45	5
		e"	19.1700	Conductivity (σ):	6.18	6.00	3.04	5
	Body 5825	e'	47.4500	Relative Permittivity (ε_r):	47.45	48.20	-1.56	5
		e"	19.1800	Conductivity (σ):	6.21	6.00	3.54	5

SAR Room 2

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
4/18/2014	Body 835	e'	53.4000	Relative Permittivity (ε_r):	53.40	55.20	-3.26	5
		e"	21.6200	Conductivity (σ):	1.00	0.97	3.48	5
	Body 820	e'	53.5300	Relative Permittivity (ε_r):	53.53	55.28	-3.16	5
		e"	21.7500	Conductivity (σ):	0.99	0.97	2.40	5
	Body 850	e'	53.2500	Relative Permittivity (ε_r):	53.25	55.16	-3.46	5
		e"	21.6200	Conductivity (σ):	1.02	0.99	3.51	5
4/24/2014	Body 835	e'	53.9600	Relative Permittivity (ε_r):	53.96	55.20	-2.25	5
		e"	21.6400	Conductivity (σ):	1.00	0.97	3.58	5
	Body 820	e'	54.0200	Relative Permittivity (ε_r):	54.02	55.28	-2.27	5
		e"	21.6900	Conductivity (σ):	0.99	0.97	2.12	5
	Body 850	e'	53.8300	Relative Permittivity (ε_r):	53.83	55.16	-2.41	5
		e"	21.6100	Conductivity (σ):	1.02	0.99	3.46	5

SAR Room 3

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
4/21/2014	Body 1900	e'	52.2900	Relative Permittivity (ε_r):	52.29	53.30	-1.89	5
		e"	14.5400	Conductivity (σ):	1.54	1.52	1.06	5
	Body 1850	e'	52.4500	Relative Permittivity (ε_r):	52.45	53.30	-1.59	5
		e"	14.5000	Conductivity (σ):	1.49	1.52	-1.87	5
	Body 1910	e'	52.1600	Relative Permittivity (ε_r):	52.16	53.30	-2.14	5
		e"	14.5300	Conductivity (σ):	1.54	1.52	1.52	5
4/22/2014	Head 2450	e'	38.4800	Relative Permittivity (ε_r):	38.48	39.20	-1.84	5
		e"	13.5800	Conductivity (σ):	1.85	1.80	2.78	5
	Head 2410	e'	38.7200	Relative Permittivity (ε_r):	38.72	39.28	-1.42	5
		e"	13.5100	Conductivity (σ):	1.81	1.76	2.84	5
	Head 2475	e'	38.4100	Relative Permittivity (ε_r):	38.41	39.17	-1.94	5
		e"	13.6800	Conductivity (σ):	1.88	1.83	3.04	5
4/23/2014	Body 5180	e'	48.1400	Relative Permittivity (ε_r):	48.14	49.05	-1.85	5
		e"	18.5800	Conductivity (σ):	5.35	5.27	1.52	5
	Body 5200	e'	48.1000	Relative Permittivity (ε_r):	48.10	49.02	-1.88	5
		e"	18.6000	Conductivity (σ):	5.38	5.29	1.57	5
	Body 5600	e'	47.4300	Relative Permittivity (ε_r):	47.43	48.48	-2.16	5
		e"	18.9600	Conductivity (σ):	5.90	5.76	2.48	5
	Body 5800	e'	47.0900	Relative Permittivity (ε_r):	47.09	48.20	-2.30	5
		e"	19.1600	Conductivity (σ):	6.18	6.00	2.98	5
	Body 5825	e'	47.0700	Relative Permittivity (ε_r):	47.07	48.20	-2.34	5
		e"	19.2000	Conductivity (σ):	6.22	6.00	3.64	5

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11. System Performance Check

SAR system verification is required to confirm measurement accuracy, according to the tissue dielectric media, probe calibration points and other system operating parameters required for measuring the SAR of a test device. The system verification must be performed for each frequency band and within the valid range of each probe calibration point required for testing the device. The same SAR probe(s) and tissue-equivalent media combinations used with each specific SAR system for system verification must be used for device testing. When multiple probe calibration points are required to cover substantially large transmission bands, independent system verifications are required for each probe calibration point. A system verification must be performed before each series of SAR measurements using the same probe calibration point and tissue-equivalent medium. Additional system verification should be considered according to the conditions of the tissue-equivalent medium and measured tissue dielectric parameters, typically every three to four days when the liquid parameters are remeasured or sooner when marginal liquid parameters are used at the beginning of a series of measurements.

11.1. System Performance Check Measurement Conditions

- The measurements were performed in the flat section of the TWIN SAM or ELI phantom, shell thickness: 2.0 ±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 ± 0.5 cm for SAR measurements ≤ 3 GHz and ≥ 10.0 cm ± 0.5 cm for measurements > 3 GHz.
- The DASY system with an E-Field Probe was used for the measurements.
- The dipole was mounted on the small tripod so that the dipole feed point was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10 mm (above 1 GHz) and 15 mm (below 1 GHz) from dipole center to the simulating liquid surface.
- The coarse grid with a grid spacing of 15 mm was aligned with the dipole.
  For 5 GHz band - The coarse grid with a grid spacing of 10 mm was aligned with the dipole.
- Special 7x7x7 (below 3 GHz) and/or 8x8x7 (above 3 GHz) fine cube was chosen for the cube.
- Distance between probe sensors and phantom surface was set to 3 mm.
  For 5 GHz band - Distance between probe sensors and phantom surface was set to 2.5 mm
- The dipole input power (forward power) was 100 mW.
- The results are normalized to 1 W input power.

11.2. Reference SAR Values for System Performance Check

The reference SAR values can be obtained from the calibration certificate of system validation dipoles

System Dipole	Serial No.	Cal. Date	Freq. (MHz)	Target SAR Values (mW/g)		
				1g/10g	Head	Body
D750V3	1024	05/28/2013	750	1g	8.52	8.71
				10g	5.58	5.71
D835V2	4d142	9/17/2013	835	1g	9.4	9.36
				10g	6.1	6.2
D1900V2	5d163	9/17/2013	1900	1g	40.9	40.1
				10g	21.2	21.2
D2450V2	706	5/29/2013	2450	1g	53.7	49.9
				10g	25.00	23.3
D5GHzV2	1138	11/1/2013	5200	1g	78.5	72.9
				10g	22.5	20.4
			5500	1g	82.7	78.3
				10g	23.5	21.7
			5800	1g	78.3	72.8
				10g	22.4	20.1

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11.3. System Performance Check Results

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

SAR Room 1

Date Tested	System Dipole		T.S. Liquid		Measured Results			Target (Ref. Value)	Delta ±10 %	Est./Zoom Ratio	Plot No.
	Type	Serial #			Area Scan	Zoom Scan	Normalize to 1 W				
4/23/2014	D750V3	1024	Body	1g	0.88	0.87	8.68	8.71	-0.34	1.70	1,2
				10g	0.60	0.58	5.76	5.71	0.88		
4/14/2014	D835V2	4d142	Head	1g	0.99	0.96	9.63	9.44	2.01	2.92	3,4
				10g	0.67	0.63	6.29	6.12	2.78		
4/18/2014	D1900V2	5d163	Body	1g	4.02	4.07	40.70	40.1	1.50	-1.24	5,6
				10g	2.03	2.20	22.00	21.2	3.77		
4/21/2014	D2450V2	706	Body	1g	5.18	5.27	52.70	49.90	5.61	-1.74	7,8
				10g	2.25	2.43	24.30	23.30	4.29		
4/16/2014	D5GHzV2 (5200)	1138	Body	1g	6.65	6.95	69.50	72.90	-4.66	-4.51	9,10
				10g	1.84	1.97	19.70	20.40	-3.43		
4/10/2014	D5GHzV2 (5600)	1138	Head	1g	7.50	8.24	82.40	82.70	-0.36	-9.87	11,12
				10g	2.05	2.35	23.50	23.50	0.00		
4/16/2014	D5GHzV2 (5800)	1138	Body	1g	7.37	7.21	72.10	72.80	-0.96	2.17	13,14
				10g	2.00	2.02	20.20	20.10	0.50		

SAR Room 2

Date Tested	System Dipole		T.S. Liquid		Measured Results			Target (Ref. Value)	Delta ±10 %	Est./Zoom Ratio	Plot No.
	Type	Serial #			Area Scan	Zoom Scan	Normalize to 1 W				
4/18/2014	D835V2	4d142	Body	1g	0.95	0.94	9.4	9.36	0.11	1.16	15,16
				10g	0.638	0.621	6.2	6.20	0.16		

SAR Room 3

Date Tested	System Dipole		T.S. Liquid		Measured Results			Target (Ref. Value)	Delta ±10 %	Est./Zoom Ratio	Plot No.
	Type	Serial #			Area Scan	Zoom Scan	Normalize to 1 W				
4/21/2014	D1900V2	5d163	Body	1g	4.07	4.05	40.5	40.10	1.00	0.49	17,18
				10g	2.040	2.120	21.2	21.20	0.00		
4/22/2014	D2450V2	706	Head	1g	5.35	5.32	53.2	53.70	-0.93	0.56	19,20
				10g	2.330	2.440	24.4	25.00	-2.40		
4/23/2014	D5GHzV2 (5600)	1138	Body	1g	8.05	7.91	79.1	78.3	1.02	1.74	21,22
				10g	2.27	2.20	22.0	21.7	1.38		

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12. SAR Test 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 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.

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12.1. GSM1900

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	Voice	off	0	Left Touch	661	1880.0	30.5	29.2	0.070	0.094	
				Left Tilt	661	1880.0	30.5	29.2	0.025	0.034	
				Right Touch	661	1880.0	30.5	29.2	0.136	0.183	
				Rightt Tilt	661	1880.0	30.5	29.2	0.087	0.117	
Head VoIP	GPRS 3 Slots	off	0	Left Touch	661	1880.0	27.5	27.2	0.062	0.066	
				Left Tilt	661	1880.0	27.5	27.2	0.020	0.021	
				Right Touch	661	1880.0	27.5	27.2	0.293	0.314	1
				Rightt Tilt	661	1880.0	27.5	27.2	0.184	0.197	
Body	GPRS 4 Slots	on	0	Rear	661	1880.0	17.0	17.0	0.631	0.631	2
				Edge 3	661	1880.0	17.0	17.0	0.229	0.229	
				Edge 4	661	1880.0	17.0	17.0	0.190	0.190	
	GPRS 3 Slots	off	12	Rear	661	1880.0	27.5	27.2	0.106	0.114	
			9	Edge 3	661	1880.0	27.5	27.2	0.119	0.128	
			4	Edge 4	661	1880.0	27.5	27.2	0.206	0.221	

12.2. W-CDMA 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	22.5	22.2	0.105	0.113	
				Left Tilt	4183	836.6	22.5	22.2	0.062	0.066	
				Right Touch	4183	836.6	22.5	22.2	0.114	0.122	3
				Rightt Tilt	4183	836.6	22.5	22.2	0.068	0.073	
Body	Rel 99 RMC 12.2 kbps	on	0	Rear	4183	836.6	20.5	19.8	0.573	0.673	4
				Edge 2	4183	836.6	20.5	19.8	0.355	0.417	
				Edge 3	4183	836.6	20.5	19.8	0.361	0.424	
		off	12	Rear	4183	836.6	22.5	22.2	0.225	0.241	
			4	Edge 2	4183	836.6	22.5	22.2	0.283	0.303	
			9	Edge 3	4183	836.6	22.5	22.2	0.193	0.207	

12.3. W-CDMA Band II

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	9400	1880.0	22.0	21.9	0.296	0.303	5
				Left Tilt	9400	1880.0	22.0	21.9	0.110	0.113	
				Right Touch	9400	1880.0	22.0	21.9	0.234	0.239	
				Rightt Tilt	9400	1880.0	22.0	21.9	0.136	0.139	
Body	Rel 99 RMC 12.2 kbps	on	0	Rear	9262	1852.4	16.0	15.8	0.805	0.843	
					9400	1880.0	16.0	15.9	0.791	0.809	
					9538	1907.6	16.0	15.8	0.848	0.888	6
				Edge 3	9400	1880.0	16.0	15.9	0.340	0.348	
				Edge 4	9400	1880.0	16.0	15.9	0.195	0.200	
		off	12	Rear	9400	1880.0	22.0	15.9	0.063	0.257	
			9	Edge 3	9400	1880.0	22.0	15.9	0.066	0.269	
			4	Edge 4	9400	1880.0	22.0	15.9	0.172	0.701	

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12.4. 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	49	24.5	24.4	0.181	0.185	
							25	12	23.5	22.7	0.106	0.127	
				Left Tilt	20525	836.6	1	49	24.5	24.4	0.116	0.119	
							25	12	23.5	22.7	0.073	0.088	
				Right Touch	20525	836.6	1	49	24.5	24.4	0.207	0.212	7
							25	12	23.5	22.7	0.135	0.162	
				Rightt Tilt	20525	836.6	1	49	24.5	24.4	0.117	0.120	
							25	12	23.5	22.7	0.075	0.090	
Body	QPSK	on	0	Rear	20600	844.0	1	49	19.0	18.7	0.411	0.440	
							25	0	18.0	17.3	0.279	0.328	
				Edge 2	20600	844.0	1	49	19.0	18.7	0.262	0.281	
							25	0	18.0	17.3	0.160	0.188	
				Edge 3	20600	844.0	1	49	19.0	18.7	0.223	0.239	
							25	0	18.0	17.3	0.150	0.176	
		off	12	Rear	20600	844.0	1	24	24.5	24.5	0.533	0.533	
							25	24	23.5	22.7	0.342	0.411	
			4	Edge 2	20600	844.0	1	24	24.5	24.5	0.758	0.758	
							25	24	23.5	22.7	0.479	0.576	
			9	Edge 3	20450	829.0	1	0	24.5	24.4	0.717	0.734	
					20525	836.6	1	49	24.5	24.4	0.823	0.842	8
					20600	844.0	1	24	24.5	24.5	0.802	0.802	
							25	24	23.5	22.7	0.532	0.640	
							50	0	23.5	22.7	0.527	0.634	

12.5. LTE Band 17 (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	23790	710.0	1	49	22.5	22.3	0.072	0.075	
							25	12	21.5	21.2	0.044	0.047	
				Left Tilt	23790	710.0	1	49	22.5	22.3	0.028	0.029	
							25	12	21.5	21.2	0.017	0.018	
				Right Touch	23790	710.0	1	49	22.5	22.3	0.084	0.088	9
							25	12	21.5	21.2	0.049	0.053	
				Rightt Tilt	23790	710.0	1	49	22.5	22.3	0.038	0.040	
							25	12	21.5	21.2	0.021	0.023	
Body	QPSK	on	0	Rear	23790	710.0	1	49	20.5	20.2	0.512	0.549	
							25	0	19.5	19.1	0.507	0.556	10
				Edge 3	23790	710.0	1	49	20.5	20.2	0.380	0.407	
							25	0	19.5	19.1	0.374	0.410	
				Edge 2	23790	710.0	1	49	20.5	20.2	0.037	0.040	
							25	0	19.5	19.1	0.037	0.041	
		off	12	Rear	23790	710.0	1	49	22.5	22.3	0.155	0.162	
							25	12	21.5	21.2	0.097	0.104	
			9	Edge 3	23790	710.0	1	49	22.5	22.3	0.262	0.274	
							25	12	21.5	21.2	0.144	0.154	
			4	Edge 2	23790	710.0	1	49	22.5	22.3	0.086	0.090	
							25	12	21.5	21.2	0.056	0.060	

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12.6. Wi-Fi (DTS Band)

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Head	802.11b 1 Mbps	0	Left Touch	6	2437.0	17.5	17.3	0.052	0.054	
			Left Tilt	6	2437.0	17.5	17.3	0.049	0.051	
			Right Touch	6	2437.0	17.5	17.3	0.158	0.165	11
			Rightt Tilt	6	2437.0	17.5	17.3	0.115	0.120	
Body	802.11b 1 Mbps	0	Rear	6	2437.0	17.5	17.3	0.522	0.547	12
			Edge 1	6	2437.0	17.5	17.3	0.204	0.214	
			Edge 4	6	2437.0	17.5	17.3	0.045	0.047	
Body	802.11n MCS0 (HT20)	0	Rear	6	2437	13.5	12.9	0.28	0.321	

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Head	802.11a 6 Mbps	0	Left Touch	157	5785.0	12.5	12.5	0.044	0.044	
			Left Tilt	157	5785.0	12.5	12.5	0.046	0.046	
			Right Touch	157	5785.0	12.5	12.5	0.159	0.159	13
			Rightt Tilt	157	5785.0	12.5	12.5	0.075	0.075	
Body	802.11a 6 Mbps	0	Rear	149	5745.0	12.5	12.3	0.674	0.706	
				157	5785.0	12.5	12.5	0.624	0.624	
				165	5825.0	12.5	12.1	0.516	0.566	
			Edge 1	157	5785.0	12.5	12.5	0.071	0.071	
			Edge 4	157	5785.0	12.5	12.5	0.055	0.055	
Body	802.11n MCS0 (HT40)	0	Rear	151	5755.0	12.5	12.3	0.678	0.710	14
				161	5795.0	12.5	11.9	0.390	0.448	

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12.7. Wi-Fi (UNII Band)

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Head	802.11a 6 Mbps	0	Left Touch	48	5240.0	12.5	12.2	0.121	0.130	
				52	5260.0	12.5	12.5	0.128	0.128	
				136	5680.0	12.5	12.5	0.072	0.072	
			Left Tilt	48	5240.0	12.5	12.2	0.145	0.155	
				52	5260.0	12.5	12.5	0.181	0.181	
				136	5680.0	12.5	12.5	0.072	0.072	
			Right Touch	48	5240.0	12.5	12.2	0.210	0.225	15
				52	5260.0	12.5	12.5	0.321	0.321	16
				136	5680.0	12.5	12.5	0.232	0.232	17
			Rightt Tilt	48	5240.0	12.5	12.2	0.179	0.192	
				52	5260.0	12.5	12.5	0.255	0.255	
				136	5680.0	12.5	12.5	0.141	0.141	
Body	802.11a 6 Mbps	0	Rear	48	5240.0	12.5	12.2	0.579	0.620	
				52	5260.0	12.5	12.5	0.728	0.728	
				104	5520.0	12.5	12.4	0.801	0.820	
				116	5580.0	12.5	12.3	0.745	0.780	
				124	5620.0	12.5	12.4	0.739	0.756	
				136	5680.0	12.5	12.5	0.630	0.630	
			Edge 1	48	5240.0	12.5	12.2	0.338	0.362	
				52	5260.0	12.5	12.5	0.345	0.345	
				136	5680.0	12.5	12.5	0.123	0.123	
			Edge 4	48	5240.0	12.5	12.2	0.252	0.270	
				52	5260.0	12.5	12.5	0.255	0.255	
				136	5680.0	12.5	12.5	0.074	0.074	
Body	802.11n MCS0 (HT40)	0	Rear	46	5230.0	12.5	12.1	0.581	0.637	18
				54	5270.0	12.5	12.4	0.718	0.735	19
				102	5510.0	12.5	12.3	0.691	0.724	
				118	5590.0	12.5	12.4	0.861	0.881	
				134	5580.0	12.5	12.4	0.768	0.786	
Body	802.11n MCS0 (HT20)	0	Rear	100	5500.0	12.5	12.5	0.854	0.854	
				120	5600.0	12.5	12.3	0.933	0.977	20
				140	5700.0	12.5	12.4	0.810	0.829	

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12.8. Bluetooth

12.8.1. Standalone SAR Test Exclusion Considerations

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

[(max. power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)]·[√f(GHz)] ≤ 3.0, for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where

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

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

Body-worn Accessory Exposure Conditions

Max. tune-up tolerance limit		Min. test separation distance (mm)	Frequency (GHz)	Result
(dBm)	(mW)			
9.0	8	5	2.480	2.5

Conclusion:

The computed value is < 3; therefore, Bluetooth qualifies for Standalone SAR test exclusion.

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13. 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 < 0.80 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.

13.1. The Highest Measured SAR Configuration in Each Frequency Band

Frequency Band (MHz)	Air Interface	Head (W/kg)	Body-worn (W/kg)	Repeated SAR (Yes/No)
750	LTE Band 17		0.512	No
850	WCDMA Band V		0.573	No
	LTE Band 5		0.823	Yes
1900	GSM 1900		0.631	No
	WCDMA Band II		0.848	Yes
2400	Wi-Fi 802.11b/g/n		0.522	No
5200	Wi-Fi 802.11a/n		0.581	No
5300	Wi-Fi 802.11a/n		0.728	No
5500	Wi-Fi 802.11a/n		0.933	Yes
5800	Wi-Fi 802.11a/n		0.678	No

13.2. Repeated Measurement Results

Head Exposure Condition

Not Applicable.

Body-worn Accessory Exposure Condition

Frequency band	Test Position	Mode	Ch #.	Freq. (MHz)	Meas. SAR (W/kg)		Largest to Smallest SAR Ratio	Note
					Original	Repeated		
WCDMA Band II	Rear	Rel. 99 RMC 12.2 kbps	9538	1907.6	0.848	0.837	1.01	1
LTE Band 5	Edge 3	QPSK	20525	836.6	0.823	0.814	1.01	1
WiFi 5.6GHz	Rear	802.11n HT20	120	5600.0	0.933	0.911	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.

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14. Simultaneous Transmission SAR Analysis

14.1. 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. Test positions Edge 2, 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.

14.1.1. Estimated SAR

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
Wi-Fi 2.4 GHz	2462	17.50	56	5	5	84	170	11		-MEASURE-	-MEASURE-	0.400	0.400	-MEASURE-	
Wi-Fi 5.2 GHz	5230	12.50	18	5	5	84	170	11		-MEASURE-	-MEASURE-	0.400	0.400	-MEASURE-	
Wi-Fi 5.3 GHz	5300	12.50	18	5	5	84	170	11		-MEASURE-	-MEASURE-	0.400	0.400	-MEASURE-	
Wi-Fi 5.5 GHz	5680	12.50	18	5	5	84	170	11		-MEASURE-	-MEASURE-	0.400	0.400	-MEASURE-	
Wi-Fi 5.8 GHz	5825	12.50	18	5	5	84	170	11		-MEASURE-	-MEASURE-	0.400	0.400	-MEASURE-	
Bluetooth	2441	9.00	8	5	5	84	170	11		0.333	0.333	0.400	0.400	0.152	

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
Power Back-off, Grip Sensor On															
GPRS 3 Slots	1909.8	17.00	19	5	170	67.7	5	5		-MEASURE-	0.400	0.400	-MEASURE-	-MEASURE-	
W-CDMA V	846.6	20.50	112	5	170	5	5	72		-MEASURE-	0.400	-MEASURE-	-MEASURE-	0.400	
W-CDMA II	1907.6	16.00	40	5	170	67.7	5	5		-MEASURE-	0.400	0.400	-MEASURE-	-MEASURE-	
LTE Band 5	844	19.00	79	5	170	5	5	72		-MEASURE-	0.400	-MEASURE-	-MEASURE-	0.400	
LTE Band 17	710	20.50	112	5	170	5	5	72		-MEASURE-	0.400	-MEASURE-	-MEASURE-	0.400	

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

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario				∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			GSM 1900	Wi-Fi (DTS)	Wi-Fi (UNII)	Bluetooth		
Head	Left Touch	WWAN + Wi-Fi(DTS)	0.094	0.055			0.149	No
		WWAN + Wi-Fi(UNII)	0.094		0.130		0.224	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.034	0.051			0.085	No
		WWAN + Wi-Fi(UNII)	0.034		0.181		0.215	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.183	0.165			0.348	No
		WWAN + Wi-Fi(UNII)	0.183		0.321		0.504	No
	Right Tilt	WWAN + Wi-Fi(DTS)	0.117	0.120			0.237	No
		WWAN + Wi-Fi(UNII)	0.117		0.255		0.372	No
Body-worn	Rear	WWAN + Wi-Fi(DTS)	0.631	0.710			1.341	No
		WWAN + Wi-Fi(UNII)	0.631		0.977		1.608	**Yes**
		WWAN + BT	0.631			0.333	0.964	No
	Edge 1	Wi-Fi(DTS)		0.214			0.214	No
		Wi-Fi(UNII)			0.362		0.362	No
	Edge 2	N/A					0	No
	Edge 3	WWAN	0.229				0.229	No
	Edge 4	WWAN + Wi-Fi(DTS)	0.221	0.055			0.276	No
		WWAN + Wi-Fi(UNII)	0.221		0.270		0.491	No
		WWAN + BT	0.221			0.162	0.383	No

SAR to Peak Location Separation Ratio (SPLSR)

Case #	Test Position	Worst-case combination		∑ 1-g SAR (mW/g)	Calculated distance (mm)	SPLSR (≤ 0.04)	Volume Scan (Yes/ No)	Figure
		GSM 1900	Wi-Fi UNII Band					
1	Rear	0.631	0.977	1.608	177.0	0.012	No	1

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.

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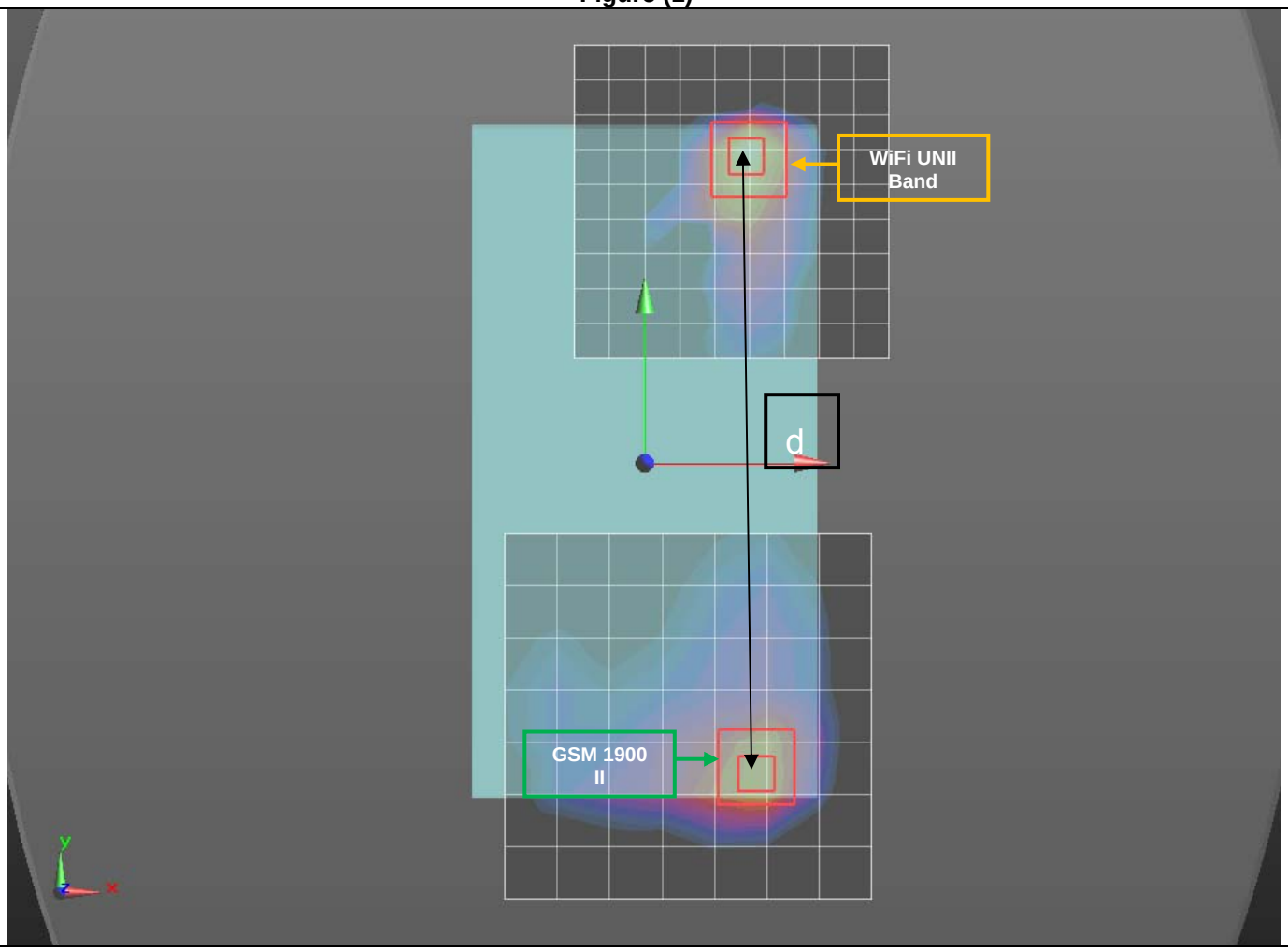
Figure (1)



Mode	Peak SAR	X	Y	Z
	mW/g	m	m	m
GSM 1900	0.978	0.032	-0.089	-0.183
WiFi UNII Band	2.18	0.03	0.088	-0.183

d: Calculated distance (mm)
177.0

The Peak Location Separation Distance is computed by using the formula below:

SQRT((X1-X2)^2+(Y1-Y2)^2+(Z1-Z2)^2)

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14.3. 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)	0.113	0.055			0.168	No
		WWAN + Wi-Fi(UNII)	0.113		0.130		0.243	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.066	0.051			0.117	No
		WWAN + Wi-Fi(UNII)	0.066		0.181		0.247	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.122	0.165			0.287	No
		WWAN + Wi-Fi(UNII)	0.122		0.321		0.443	No
	Right Tilt	WWAN + Wi-Fi(DTS)	0.073	0.120			0.193	No
		WWAN + Wi-Fi(UNII)	0.073		0.255		0.328	No
Body-worn	Rear	WWAN + Wi-Fi(DTS)	0.673	0.710			**1.383**	No
		WWAN + Wi-Fi(UNII)	0.673		0.977		1.650	**Yes**
		WWAN + BT	0.673			0.333	1.006	No
	Edge 1	Wi-Fi(DTS)		0.214			0.214	No
		Wi-Fi(UNII)			0.362		0.362	No
	Edge 2	WWAN	0.417				0.417	No
	Edge 3	WWAN	0.424				0.424	No
	Edge 4	Wi-Fi(DTS)		0.055			0.055	No
		Wi-Fi(UNII)			0.270		0.270	No

SAR to Peak Location Separation Ratio (SPLSR)

Case #	Test Position	Worst-case combination		∑ 1-g SAR (mW/g)	Calculated distance (mm)	SPLSR (≤ 0.04)	Volume Scan (Yes/ No)	Figure
		WCDMA Band V	Wi-Fi UNII Band					
2	Rear	0.673	0.977	1.650	178.0	0.012	No	1

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.

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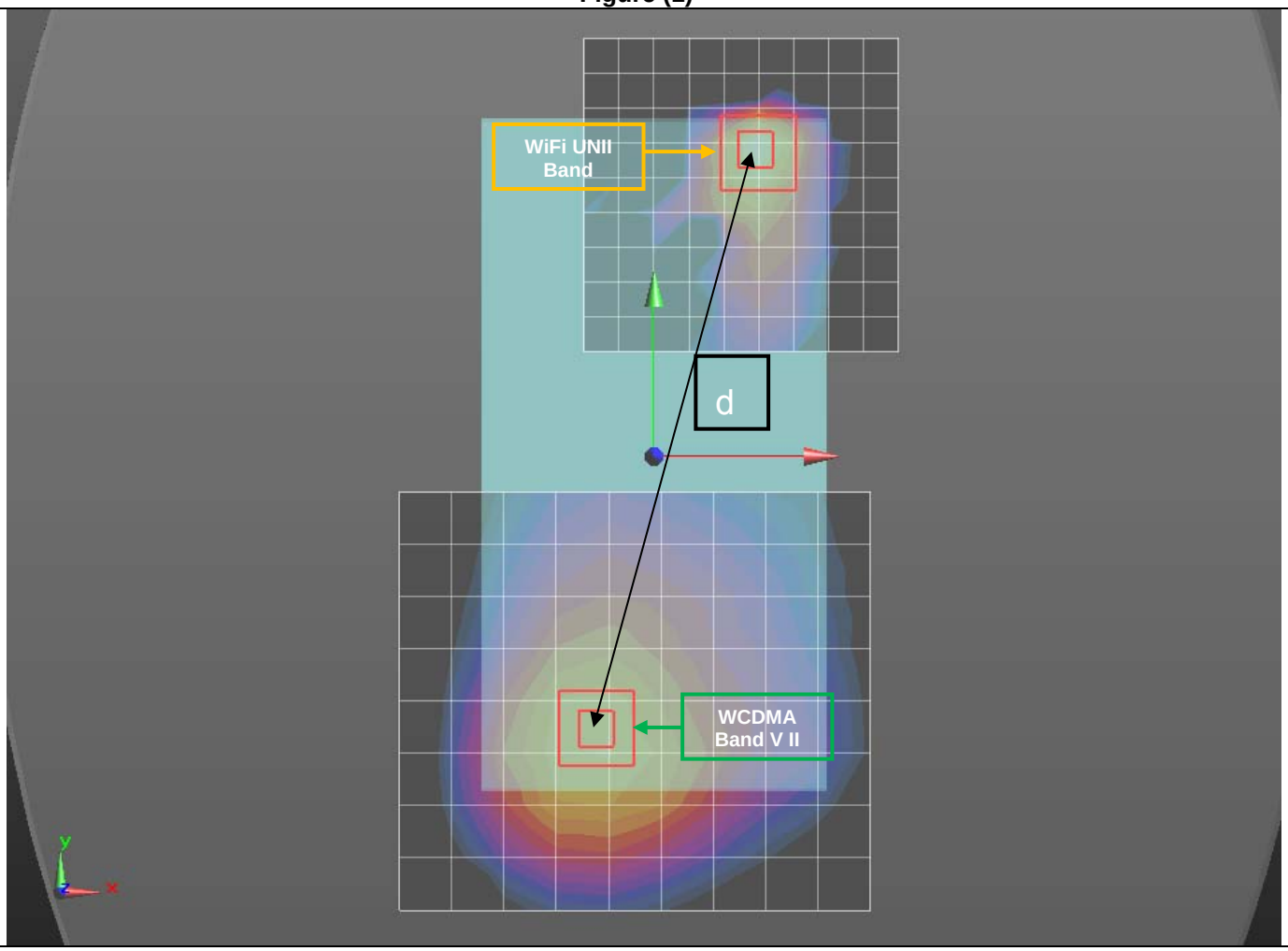
Figure (1)



Mode	Peak SAR	X	Y	Z
	mW/g	m	m	m
WCDMA Band V	0.743	-0.0175	-0.0835	-0.182
WiFi UNII Band	2.18	0.03	0.088	-0.183

d: Calculated distance (mm)
178.0

The Peak Location Separation Distance is computed by using the formula below:

SQRT((X1-X2)^2+(Y1-Y2)^2+(Z1-Z2)^2)

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

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario				∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			WCDMA Band II	Wi-Fi (DTS)	Wi-Fi (UNII)	Bluetooth		
Head	Left Touch	WWAN + Wi-Fi(DTS)	0.303	0.055			0.358	No
		WWAN + Wi-Fi(UNII)	0.303		0.130		0.433	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.113	0.051			0.164	No
		WWAN + Wi-Fi(UNII)	0.113		0.181		0.294	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.239	0.165			0.404	No
		WWAN + Wi-Fi(UNII)	0.239		0.321		0.560	No
	Right Tilt	WWAN + Wi-Fi(DTS)	0.139	0.120			0.259	No
		WWAN + Wi-Fi(UNII)	0.139		0.255		0.394	No
Body-worn	Rear	WWAN + Wi-Fi(DTS)	0.888	0.710			1.598	**Yes**
		WWAN + Wi-Fi(UNII)	0.888		0.977		1.865	**Yes**
		WWAN + BT	0.888			0.333	1.221	No
	Edge 1	WWAN + Wi-Fi(DTS)		0.214			0.214	No
		WWAN + Wi-Fi(UNII)			0.362		0.362	No
	Edge 2	N/A					0	No
	Edge 3	WWAN	0.348				0.348	No
	Edge 4	WWAN + Wi-Fi(DTS)	0.200	0.055			0.255	No
		WWAN + Wi-Fi(UNII)	0.200		0.270		0.470	No
		WWAN + BT	0.200			0.162	0.362	No

SAR to Peak Location Separation Ratio (SPLSR)

Case #	Test Position	Worst-case combination			∑ 1-g SAR (mW/g)	Calculated distance (mm)	SPLSR (≤ 0.04)	Volume Scan (Yes/ No)	Figure
		WCDMA Band II	Wi-Fi DTS Band	Wi-Fi UNII Band					
3	Rear	0.888	0.710		1.598	168.5	0.012	No	1
	Rear	0.888		0.977	1.865	170.5	0.015	No	2

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.

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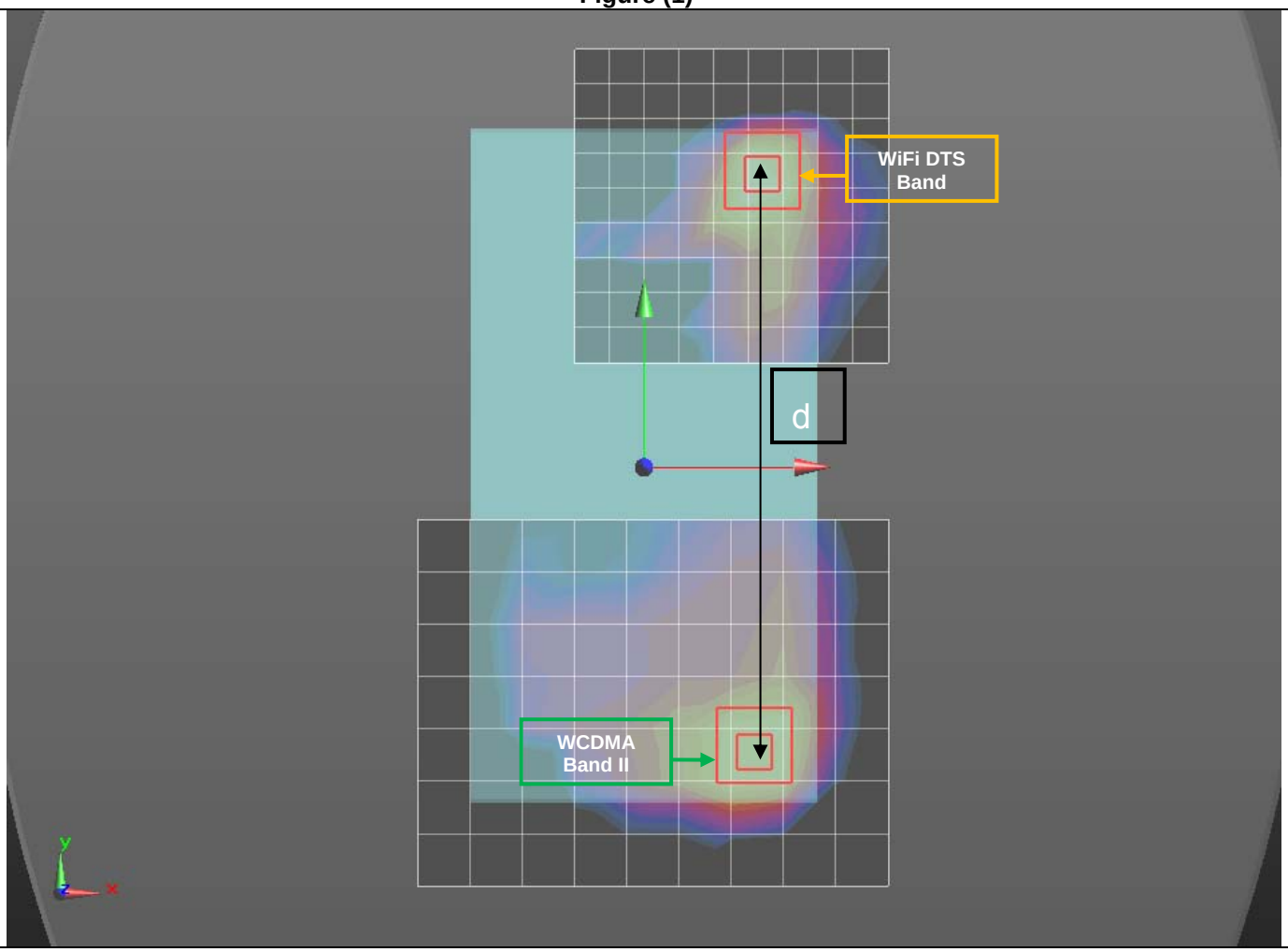
Figure (1)



Mode	Peak SAR	X	Y	Z
	mW/g	m	m	m
WCDMA Band II	1.21	0.0325	-0.0825	-0.183
WiFi DTS Band	1.47	0.033	0.086	-0.183

d: Calculated distance (mm)
168.5

The Peak Location Separation Distance is computed by using the formula below:

SQRT((X1-X2)^2+(Y1-Y2)^2+(Z1-Z2)^2)

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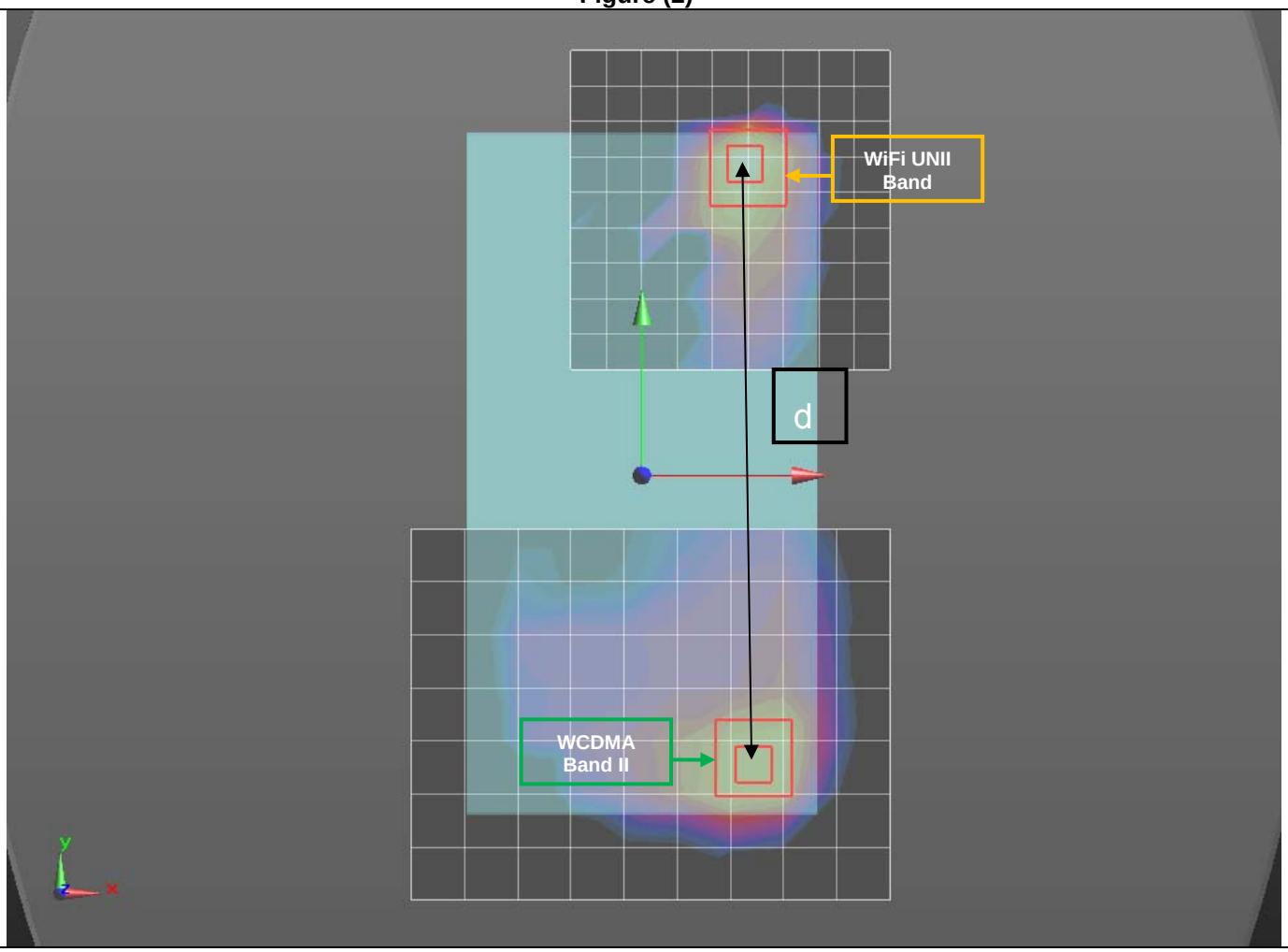
Figure (2)



Mode	Peak SAR	X	Y	Z
	mW/g	m	m	m
WCDMA Band II	1.21	0.0325	-0.0825	-0.183
WiFi UNII Band	2.18	0.03	0.088	-0.183

d: Calculated distance (mm)
170.5

The Peak Location Separation Distance is computed by using the formula below:

SQRT((X1-X2)^2+(Y1-Y2)^2+(Z1-Z2)^2)

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14.5. 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)	0.185	0.055			0.240	No
		WWAN + Wi-Fi(UNII)	0.185		0.130		0.315	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.119	0.051			0.170	No
		WWAN + Wi-Fi(UNII)	0.119		0.181		0.300	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.212	0.165			0.377	No
		WWAN + Wi-Fi(UNII)	0.212		0.321		0.533	No
	Right Tilt	WWAN + Wi-Fi(DTS)	0.120	0.120			0.240	No
		WWAN + Wi-Fi(UNII)	0.120		0.255		0.375	No
Body-worn	Rear	WWAN + Wi-Fi(DTS)	0.533	0.710			1.243	No
		WWAN + Wi-Fi(UNII)	0.533		0.977		1.510	No
		WWAN + BT	0.533			0.333	0.866	No
	Edge 1	Wi-Fi(DTS)		0.214			0.214	No
		Wi-Fi(UNII)			0.362		0.362	No
	Edge 2	WWAN	0.758				0.758	No
	Edge 3	WWAN	0.842				0.842	No
	Edge 4	Wi-Fi(DTS)		0.055			0.055	No
		Wi-Fi(UNII)			0.270		0.270	No

SAR to Peak Location Separation Ratio (SPLSR)

As the Sum of the SAR is not greater than 1.6 W/kg SPLSR assessment is not required.

Conclusion:

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

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

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario				∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			LTE Band 17	Wi-Fi (DTS)	Wi-Fi (UNII)	Bluetooth		
Head	Left Touch	WWAN + Wi-Fi(DTS)	0.075	0.055			0.130	No
		WWAN + Wi-Fi(UNII)	0.075		0.130		0.205	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.029	0.051			0.080	No
		WWAN + Wi-Fi(UNII)	0.029		0.181		0.210	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.088	0.165			0.253	No
		WWAN + Wi-Fi(UNII)	0.088		0.321		0.409	No
	Right Tilt	WWAN + Wi-Fi(DTS)	0.040	0.120			0.160	No
		WWAN + Wi-Fi(UNII)	0.040		0.255		0.295	No
Body-worn	Rear	WWAN + Wi-Fi(DTS)	0.556	0.710			1.266	No
		WWAN + Wi-Fi(UNII)	0.556		0.977		1.533	No
		WWAN + BT	0.556			0.168	0.724	No
	Edge 1	Wi-Fi(DTS)		0.214			0.214	No
		Wi-Fi(UNII)			0.362		0.362	No
	Edge 2	WWAN	0.090				0.090	No
	Edge 3	WWAN	0.410				0.410	No
	Edge 4	Wi-Fi(DTS)		0.055			0.055	No
		Wi-Fi(UNII)			0.270		0.270	No

SAR to Peak Location Separation Ratio (SPLSR)

As the Sum of the SAR is not greater than 1.6 W/kg SPLSR assessment is not required.

Conclusion:

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

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15. Appendixes

Refer to separated files for the following appendixes.

15.1. Photos and Antenna Locations

15.2. System Performance Check Plots

15.3. Highest SAR Test Plots

15.4. Calibration Certificate for E-Field Probe EX3DV4 - SN 3929

15.5. Calibration Certificate for E-Field Probe EX3DV4 – SN 3871

15.6. Calibration Certificate for E-Field Probe EX3DV4 – SN 3902

15.7. Calibration Certificate for E-Field Probe EX3DV3 – SN 3531

15.8. Calibration Certificate for D750V3 - SN 1024

15.9. Calibration Certificate for D835V2 - SN 4d142

15.10. Calibration Certificate for D1900V2- SN 5d163

15.11. Calibration Certificate for D2450V2 - SN 706

15.12. Calibration Certificate for D5GHzV2 - SN 1138

END OF REPORT

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