FCC 47 CFR Parts 1 & 2
Published RF Exposure KDB Procedures
IEEE Std 1528-2003 and IEEE 1528a-2005

SAR EVALUATION REPORT

For
Tablet PC

Model: C7U3RE
FCC ID: S2F-6740

Report Number: 13U14986-1B
Issue Date: 10/9/2013

Prepared for
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Prepared by
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	10/4/2013	Initial Issue	--
A	10/7/2013	1. Section1. : Updated highest simultaneous values to 1.496 W/kg (DTS + WWAN). 2. Section 7.6.1. and 7.6.2. : Updated tables. 3. Section 8.1.2.: Revised Bluetooth maximum output power. 4. Section 8.1.2. and 8.1.3.: Revised table.	Devin Chang
B	10/9/2013	Section 9.3. : Revised LTE Band 13 table.	Devin Chang

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1. Attestation of Test Results

Applicant	Kilpatrick LLC			
DUT description	Tablet PC			
Model	C7U3RE			
Test device is	An identical prototype			
Device category	Portable			
Exposure category	General Population/Uncontrolled Exposure			
Date tested	8/18/2013 – 9/26/2013			
The highest reported SAR values	RF exposure condition	Licensed	DTS	UNII
	stand-alone	1.173 W/kg	1.197 W/kg	1.177 W/kg
	Simultaneous Transmission	1.549 W/kg	1.496 W/kg	1.549 W/kg
Applicable Standards	FCC 47 CFR Parts 1 & 2 Published RF Exposure KDB Procedures, and TCB workshop updates IEEE Std 1528-2003 and IEEE Std 1528a-2005			
Test Results	Pass			

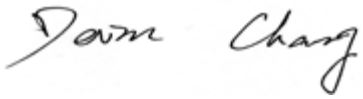
UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Verification Services Inc. based on interpretations and/or observations of test results. Measurement 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:

Sunny Shih
WiSE Operations Manager
UL Verification Services Inc.

Prepared By:



Devin Chang
WiSE Engineer
UL Verification Services Inc.

2. Test Methodology

The tests documented in this report were performed in accordance with FCC 47 CFR Parts 1 & 2, IEEE STD 1528-2003, IEEE Std 1528a-2005, the following FCC Published RF exposure KDB procedures, and TCB workshop updates:

- 447498 D01 General RF Exposure Guidance v05r01
- 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 v02r02
- 248227 D01 SAR Meas for 802 11abg v01r02
- 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r01
- 865664 D02 SAR Reporting v01r01
- 690783 D01 SAR Listings on Grants v01r02

3. Facilities and Accreditation

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

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.

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	8753ES	MY40000980	2/20/2014
Dielectronic Probe kit	SPEAG	DAK-3.5	1103	2/5/2014
Thermometer	Control Company	4242	122529163	9/19/2014

System Performance Check

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Synthesized Signal Generator	HP	8665B	3744A01084	5/7/2014
Power Meter	HP	437B	3125U12345	7/29/2014
Power Sensor	HP	8481A	1926A27048	7/29/2014
Amplifier	MITEQ	AMF-4D-00400600-50-30P	1620606	N/A
Directional coupler	Werlatone	C8060-102	2141	N/A
DC Power Supply	AMETEK	XHR60-18	1318A00530	N/A
Thermometer	EXTECH	445703	T35480662	3/19/2014
Thermometer	EXTECH	445703	T35480666	3/19/2014
E-Field Probe	SPEAG	EX3DV4	3929	6/24/2014
E-Field Probe	SPEAG	EX3DV4	3773	4/26/2014
E-Field Probe	SPEAG	EX3DV4	3902	7/12/2014
E-Field Probe	SPEAG	EX3DV4	3936	7/22/2014
Data Acquisition Electronics	SPEAG	DAE4	1259	2/7/2014
Data Acquisition Electronics	SPEAG	DAE4	1359	2/8/2014
Data Acquisition Electronics	SPEAG	DAE4	1377	7/15/2014
Data Acquisition Electronics	SPEAG	DAE4	1380	7/15/2014
System Validation Dipole	SPEAG	D750V2	1019	3/5/2014
System Validation Dipole	SPEAG	D835V2	4d117	5/28/2014
System Validation Dipole	SPEAG	D1750V2	1050	5/20/2014
System Validation Dipole	SPEAG	D1900V2	5d140	4/18/2014
System Validation Dipole	SPEAG	D2450V2	706	5/29/2014
System Validation Dipole	SPEAG	D2450V2	899	10/5/2013
System Validation Dipole	SPEAG	D5GHzV2	1138	10/9/2013

Others

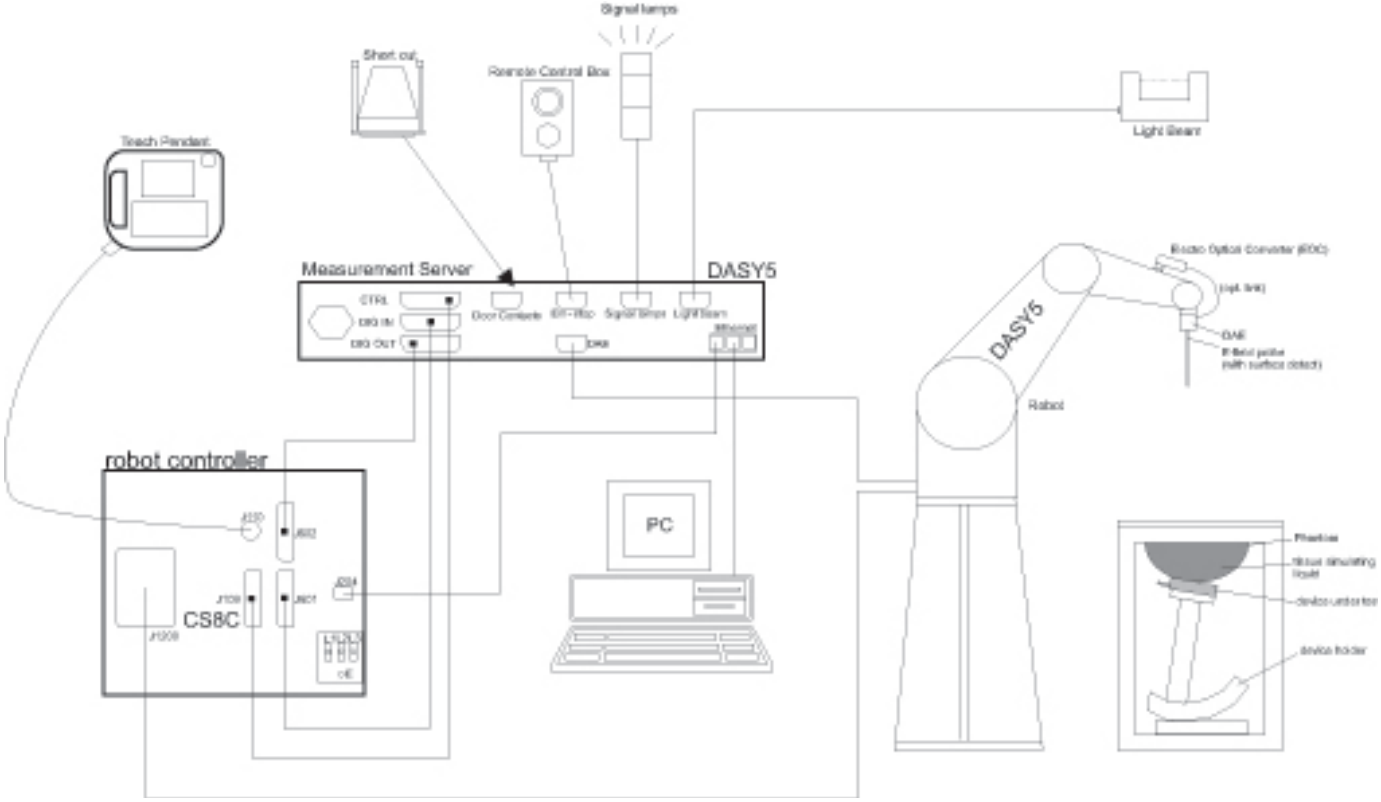
Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Base Station Simulator	Agilent	8960	GB46160222	11/10/2014
Base Station Simulator	R & S	CMU200	106301	7/3/2014
Base Station Simulator	R & S	CMW500	139915-IG	6/1/2014
Base Station Simulator	R & S	CMW500	124593-SS	7/25/2014
Power Meter	Agilent	N1912A	MY53040016	4/4/2014
Power Sensor	Agilent	N1921A	MY52020011	5/13/2014

4.2. Measurement Uncertainty

Per KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r01 Section 2.8.1., when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg, the extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2003 is not required in SAR reports submitted for equipment approval.

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.

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 v01r01

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

Step 3: Zoom Scan

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

Zoom Scan Parameters extracted from KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r01

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

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

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

Step 4: Power drift measurement

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

Step 5: Z-Scan (FCC only)

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

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.

7. Device Under Test

7.1. General Information

WiFi Direct	Wi-Fi Direct enabled devices transfer data directly between each other ☒ WiFi Direct WiFi 2.4 GHz (owner) ☒ WiFi Direct WiFi 5 GHz (client)
RF Exposure Condition(s)	Stand-alone
Device dimension	Overall (Length x Width): 187 mm x 128 mm Overall Diagonal: 217 mm Display Diagonal: 178 mm
Battery Options	☒ Standard – Lithium-ion battery, Rating 3.8 Vdc, 17.14 Wh ☐ Extended (large capacity)

7.2. Wireless Technologies

Wireless Technology and Frequency Bands	GSM: 850 / 1900 W-CDMA Band: II / V LTE Band 4 / 17 WiFi: 2.4 / 5 GHz Bluetooth: 2.4 GHz.
Mode	GSM - ☒ GPRS (GMSK) - ☒ EGPRS (8PSK) W-CDMA - ☒ UMTS Rel. 99 - ☒ HSDPA (Rel. 7) - ☒ HSUPA (Rel. 7) LTE - ☒ QPSK - ☒ 16QAM WiFi 2.4GHz - ☒ 802.11b - ☒ 802.11g - ☒ 802.11n (20MHz) WiFi 5GHz - ☒ 802.11a - ☒ 802.11n (20MHz) - ☒ 802.11n (40MHz) Bluetooth Ver. 3.0
Duty Cycle	GSM GPRS 1 Slot: 12.5%; 2 Slots: 25% W-CDMA: 100% LTE: 100% WiFi 802.11a/b/g/n: 100% Bluetooth: 77.52% (DH5)
GPRS Multi-Slot Class	☐ Class 8 - One Up ☒ Class 10 - Two Up ☐ Class 12 - Four Up

7.3. Simultaneous Transmission Condition

No	Simultaneous Transmission Condition	Supported
1	WWAN + Bluetooth	Yes
2	WWAN + WLAN Antenna 1 + WLAN Antenna 2	Yes

Notes:
1. WiFi 2.4 GHz Radio cannot transmit simultaneously with Bluetooth Radio.
2. WiFi 5 GHz Radio cannot transmit simultaneously with Bluetooth Radio.

7.4. General LTE SAR Test and Reporting Considerations

<table>
<tr><th>Item</th><th colspan="7">Description</th></tr>
<tr><td rowspan="8">Frequency range, Channel Bandwidth, Numbers and Frequencies</td><td rowspan="3">Band 4</td><td colspan="6">Frequency range: 1710 - 1755 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>20050/ 1720</td><td>20025/ 1717.5</td><td>20000/ 1715</td><td>19975/ 1712.5</td><td>19965/ 1711.5</td><td>19957/ 1710.7</td></tr>
<tr><td>Mid</td><td>20175/ 1732.5</td><td>20175/ 1732.5</td><td>20175/ 1732.5</td><td>20175/ 1732.5</td><td>20175/ 1732.5</td><td>20175/ 1732.5</td></tr>
<tr><td>High</td><td>20300/ 1745</td><td>20325/ 1747.5</td><td>20350/ 1750</td><td>20375/ 1752.5</td><td>20385/ 1753.5</td><td>20393/ 1754.3</td></tr>
<tr><td rowspan="3">Band 13</td><td colspan="6">Frequency range: 777 - 787 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>23205/ 779.5</td><td></td><td></td></tr>
<tr><td>Mid</td><td></td><td></td><td>23230/782</td><td>23230/ 782</td><td></td><td></td></tr>
<tr><td>High</td><td></td><td></td><td></td><td>23255/ 784.5</td><td></td><td></td></tr>
<tr><td>LTE transmitter and antenna implementation</td><td colspan="7">LTE 1 antenna is used for Tx/Rx for LTE and other wireless modes (GPRS/EGPRS/W-CDMA).
LTE 2 antenna is used for Rx only for LTE and other wireless modes (GPRS/EGPRS/W-CDMA).</td></tr>
<tr><td>Maximum power reduction (MPR)</td><td colspan="7">Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3
<table>
<tr><th rowspan="2">Modulation</th><th colspan="6">Channel bandwidth / Transmission bandwidth (RB)</th><th rowspan="2">MPR (dB)</th></tr>
<tr><th>1.4 MHz</th><th>3.0 MHz</th><th>5 MHz</th><th>10 MHz</th><th>15 MHz</th><th>20 MHz</th></tr>
<tr><td>QPSK</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 1</td></tr>
<tr><td>16 QAM</td><td>≤ 5</td><td>≤ 4</td><td>≤ 8</td><td>≤ 12</td><td>≤ 16</td><td>≤ 18</td><td>≤ 1</td></tr>
<tr><td>16 QAM</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 2</td></tr>
</table>
MPR Built-in by design in full power mode but disabled in power reduction mode
A-MPR (additional MPR) was disabled during SAR testing</td></tr>
<tr><td>Power reduction</td><td colspan="7">Yes, refer to Section 7.6.</td></tr>
<tr><td>Spectrum plots for RB configurations</td><td colspan="7">A properly configured base station simulator was used for the SAR and power measurements; therefore, spectrum plots for each RB allocation and offset configuration are not included in the SAR report.</td></tr>
</table>

7.5. Output Power Max. Tune-up Limit

Upper limit (dB): 1.0 ~ -1.0		Max. Power (dBm)		With Power Back-off (dBm)	
RF Air interface	Mode	1 Slot	2 Slot	1 Slot	2 Slot
GSM850	GPRS	**33.5**	**32.0**	**29.5**	**28.0**
	EGPRS	**27.5**	**27.5**	**23.5**	**23.5**
GSM1900	GPRS	**30.5**	**29.0**	**25.0**	**23.5**
	EGPRS	**26.5**	**26.5**	**21.0**	**21.0**

Upper limit (dB): 1.0 ~ -1.0		Max. Power (dBm)	With Power Back-off (dBm)
RF Air interface	Mode		
W-CDMA Band V	R99	**23.5**	**20.5**
	HSDPA	**22.5**	**20.0**
	HSUPA	**22.5**	**20.0**
W-CDMA Band II	R99	**23.5**	**16.5**
	HSDPA	**22.5**	**16.0**
	HSUPA	**22.5**	**16.0**

Upper limit (dB): 1.0 ~ -1.0		Max. Power (dBm)	With Power Back-off (dBm)
RF Air interface	Mode		
LTE Band 4	QPSK	**24.5**	**17.0**
LTE Band 13	QPSK	**23.5**	**20.5**

Upper limit (dB): 1.0 ~ -1.0		RF Output Power (dBm)	
RF Air interface	Mode	Max. tune-up limit	
		WiFi 1	WiFi 2
WiFi 2.4 GHz	802.11b/g/HT20	**15.0**	**14.0**

Upper limit (dB): 1.0 ~ -1.0		RF Output Power (dBm)	
RF Air interface	Mode	Max. tune-up limit	
		WiFi 1	WiFi 2
WiFi 5.2 GHz	802.11a/HT20/HT40	**13.0**	**9.5**
WiFi 5.3 GHz	802.11a/HT20/HT40	**13.0**	**9.5**
WiFi 5.5 GHz	802.11a/HT20/HT40	**13.0**	**10.0**
WiFi 5.8 GHz	802.11a/HT20/HT40	**13.0**	**10.0**

Upper limit (dB): 1.0 ~ -1.0		RF Output Power (dBm)
RF Air interface	Mode	WiFi 1 Max. tune-up limit
Bluetooth	GFSK	**5.5**

7.6. Power Reduction per Air-interface

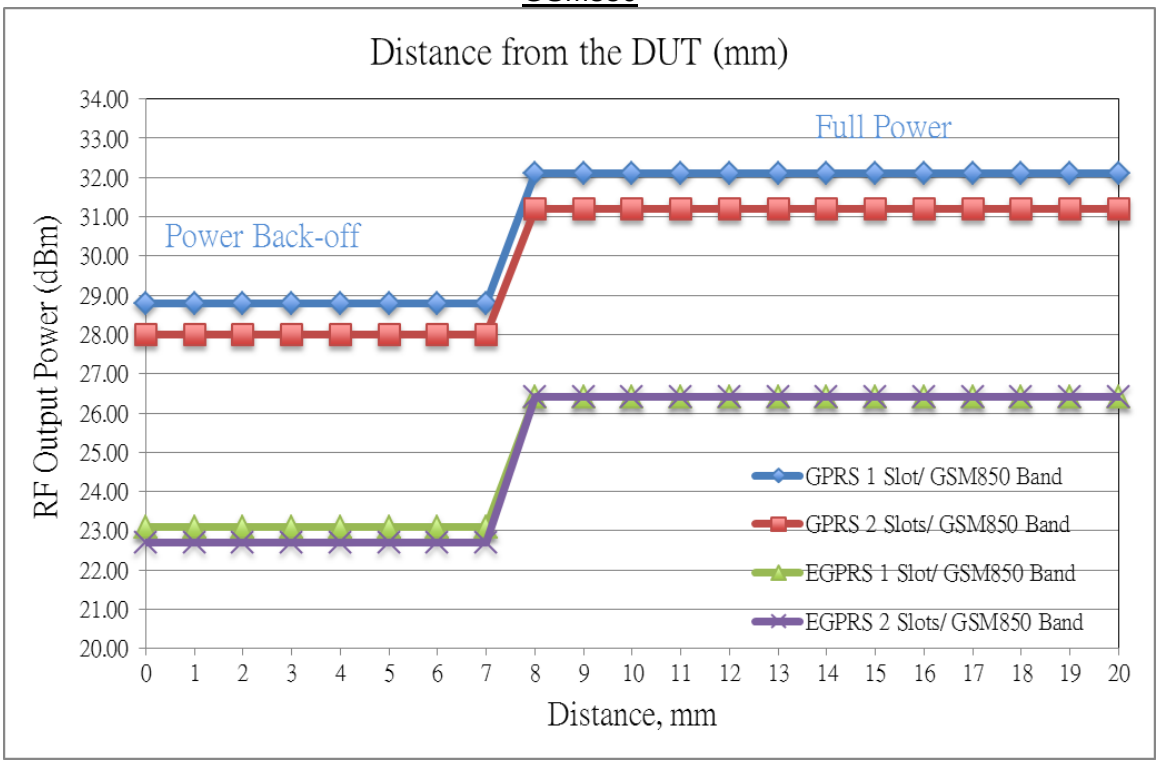
As the proximity sensor trigger distance is 13 mm for both Rear/Edge 1 slant and Edge 1, and 7 mm for both Rear/Edge 2 slant and Edge 2, the following graphs show the relation between power level and DUT to flat phantom distance applied to Rear/Edge 1 slant and Edge 1; and Rear/Edge 2 slant and Edge 2.

Measurement on EUT:

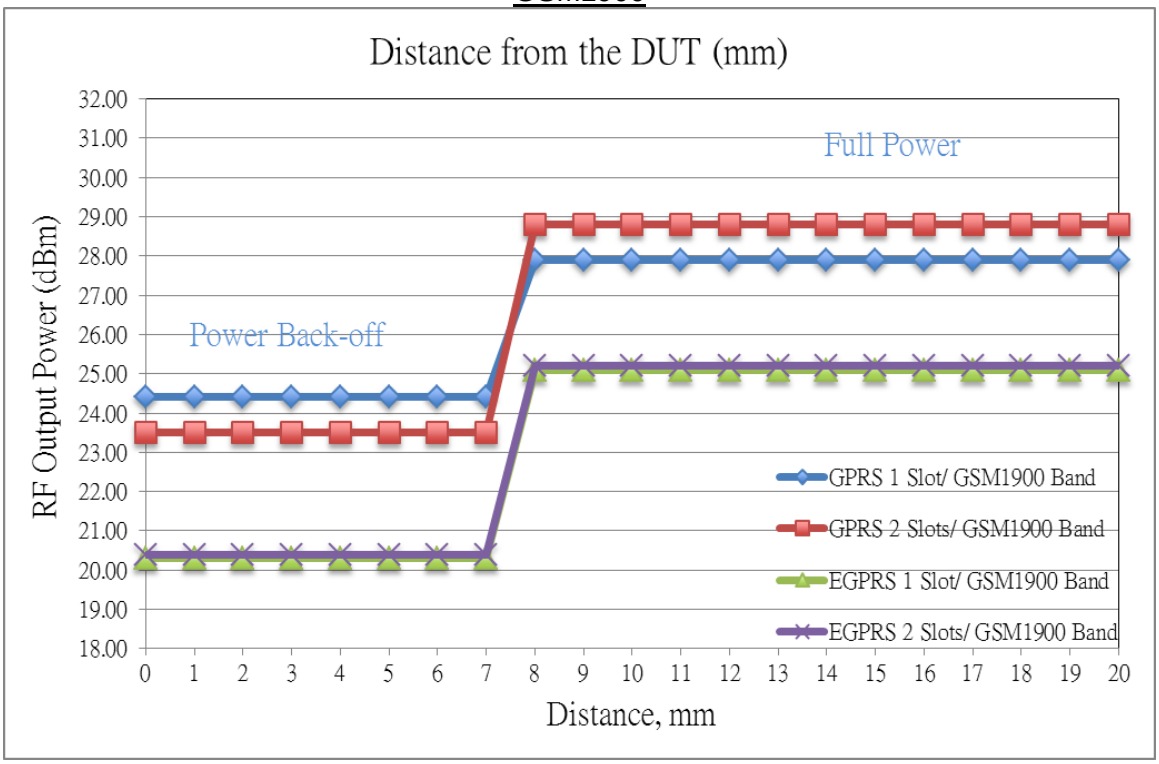
Band/Mode	Ch #	Measured power reduction (dBm)		Reduction Levels
		w/o power back-off (Full Power)	w/ power back-off	(dB)
GSM850 GPRS (GMSK 1 Tx slots)	251	32.1	28.8	3.3
GSM850 GPRS (GMSK 2 Tx slots)	251	31.8	28.0	3.8
GSM850 EGPRS (8PSK 1 Tx slots)	251	26.4	23.1	4.3
GSM850 EGPRS (8PSK 2 Tx slots)	251	26.4	22.7	3.7
GSM1900 GPRS (GMSK 1 Tx slots)	661	29.7	24.4	5.3
GSM1900 GPRS (GMSK 2 Tx slots)	661	28.8	23.5	5.3
GSM1900 EGPRS (8PSK 1 Tx slots)	661	25.1	20.3	4.8
GSM1900 EGPRS (8PSK 2 Tx slots)	661	25.2	20.4	4.8
WCDMA Band V (RMC 12.2Kbps)	4233	23.3	20.4	2.9
WCDMA Band II (RMC 12.2Kbps)	9262	23.1	16.3	6.8
LTE Band 4	20300	24.5	16.5	8.0
LTE Band 13	23230	23.4	20.3	3.1

7.6.1. Rear/Edge 2 slant and Edge 2

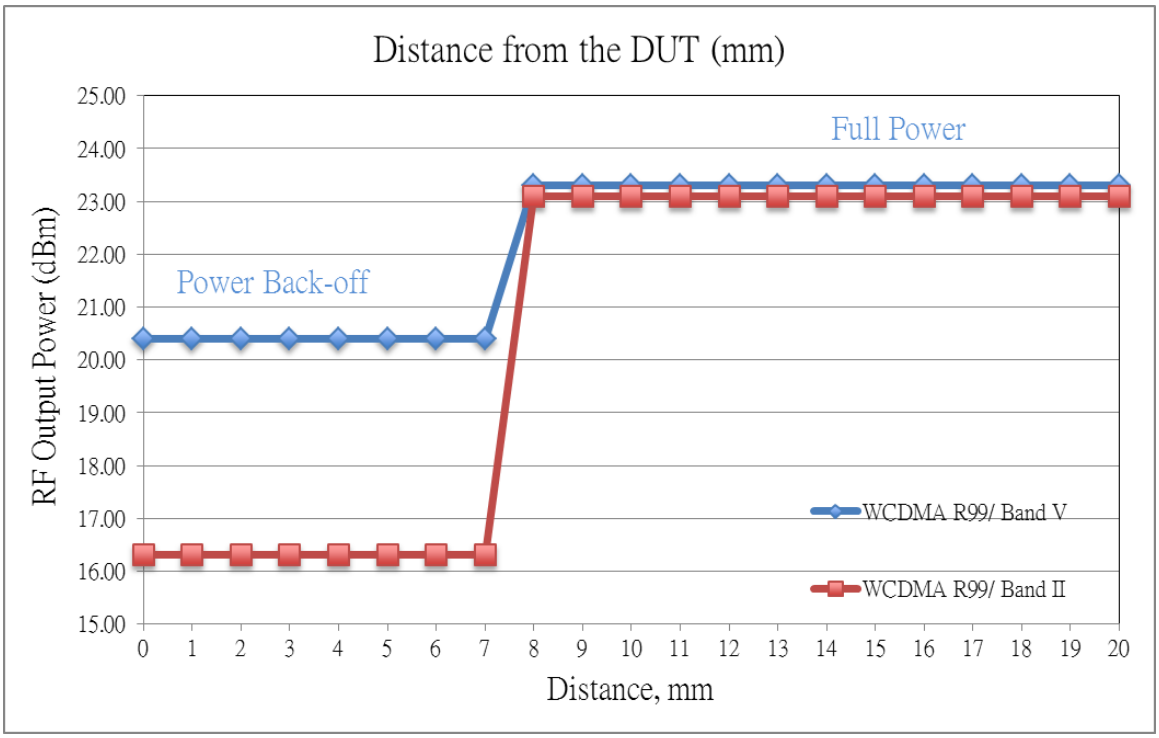
GSM850



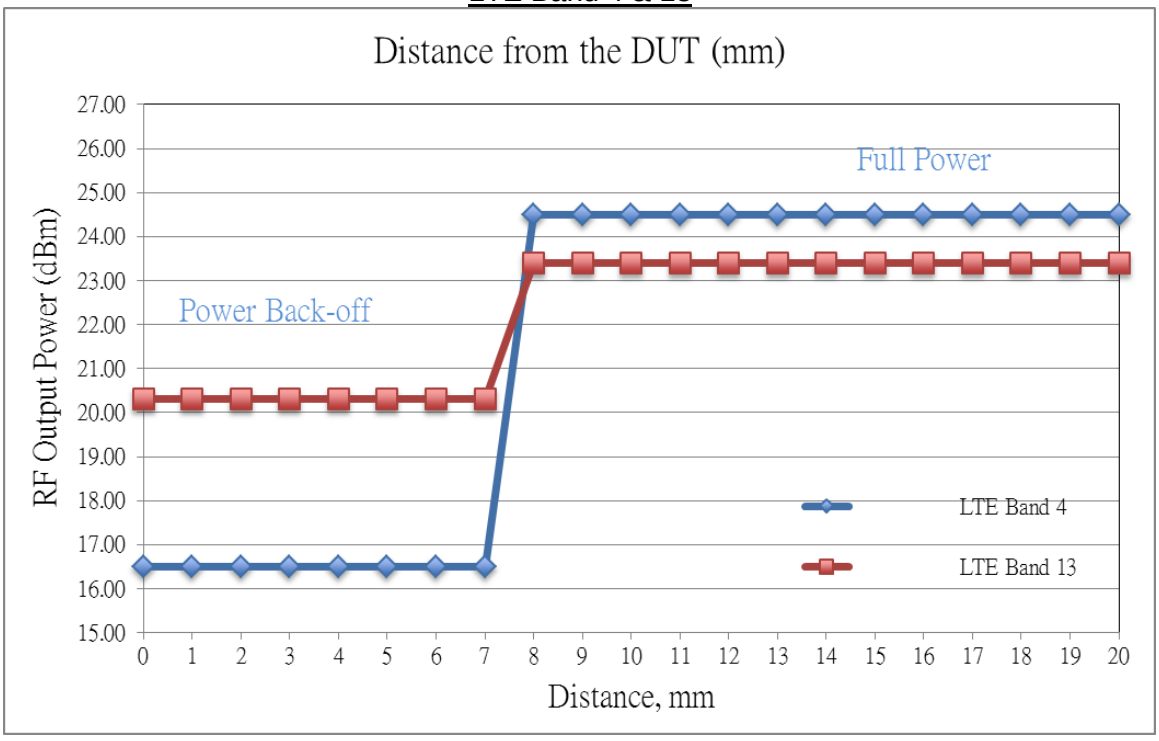
GSM1900



W-CDMA Band V & II

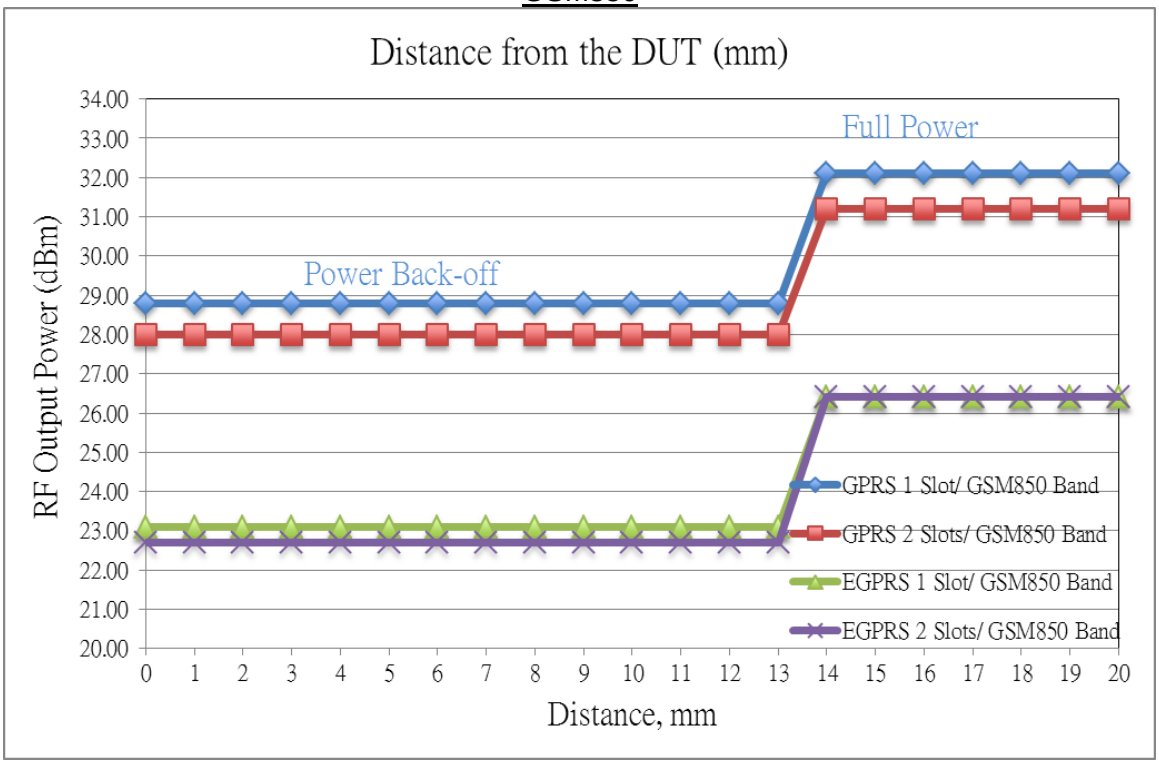


LTE Band 4 & 13

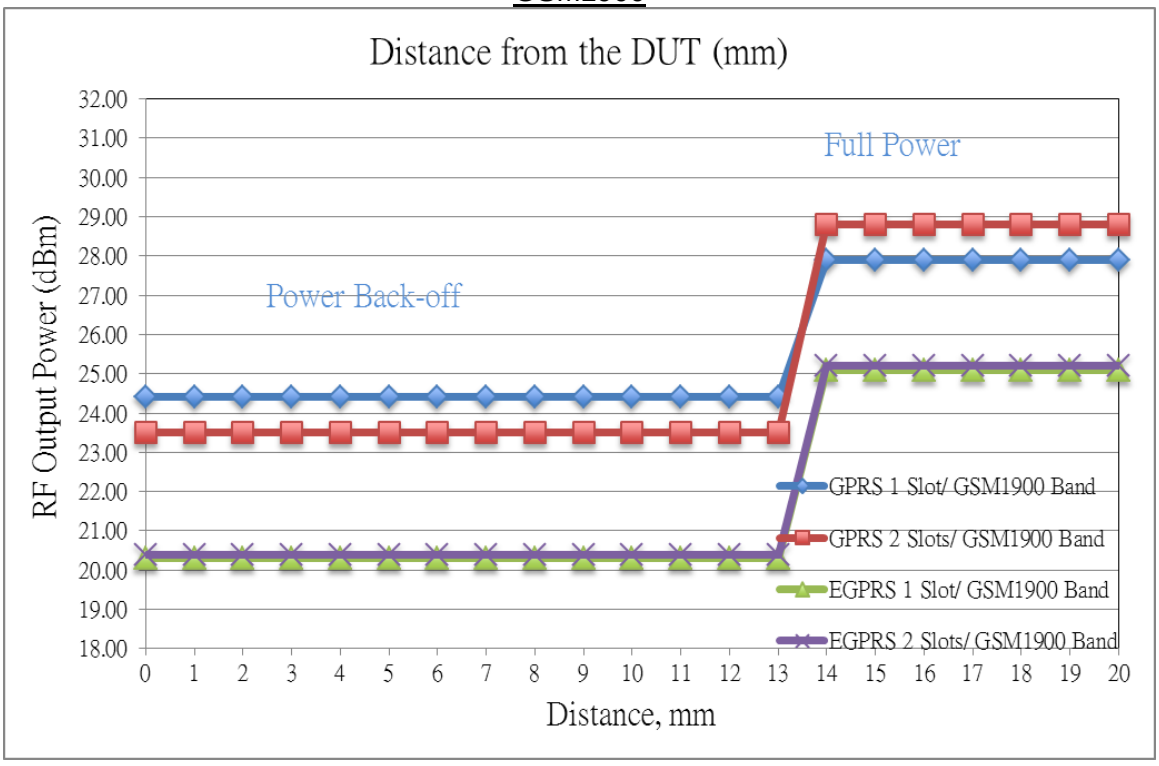


7.6.2. Rear/Edge 1 slant and Edge 1

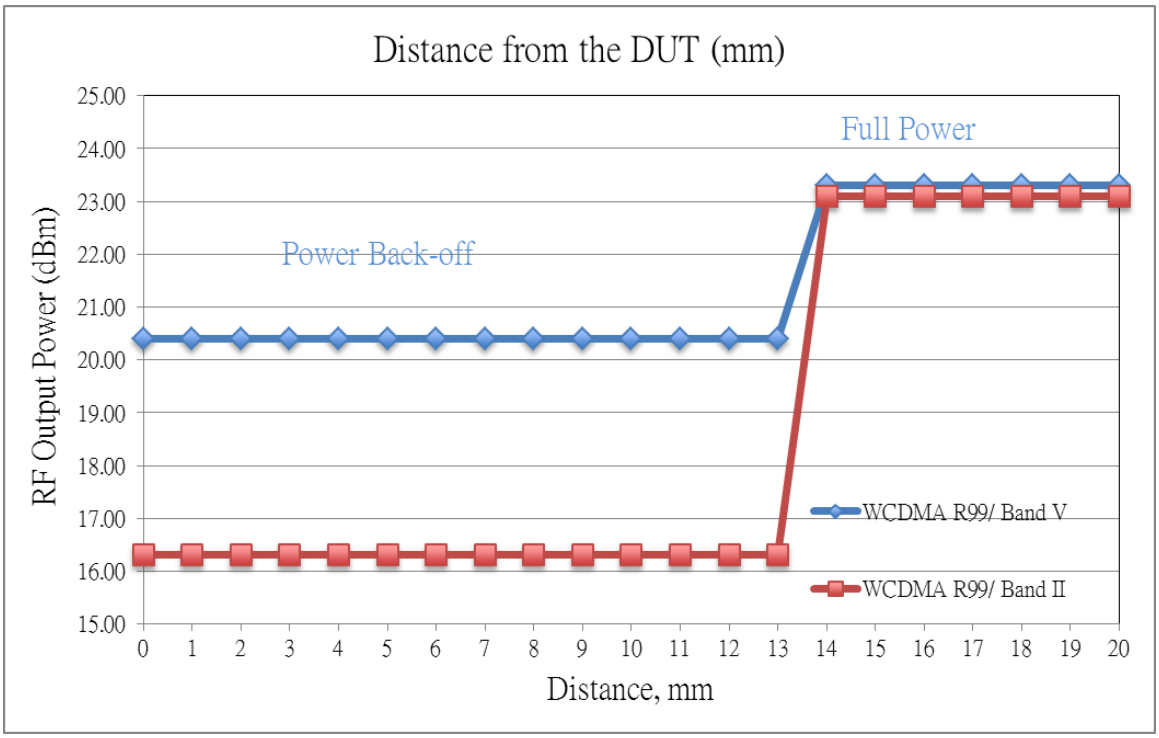
GSM850



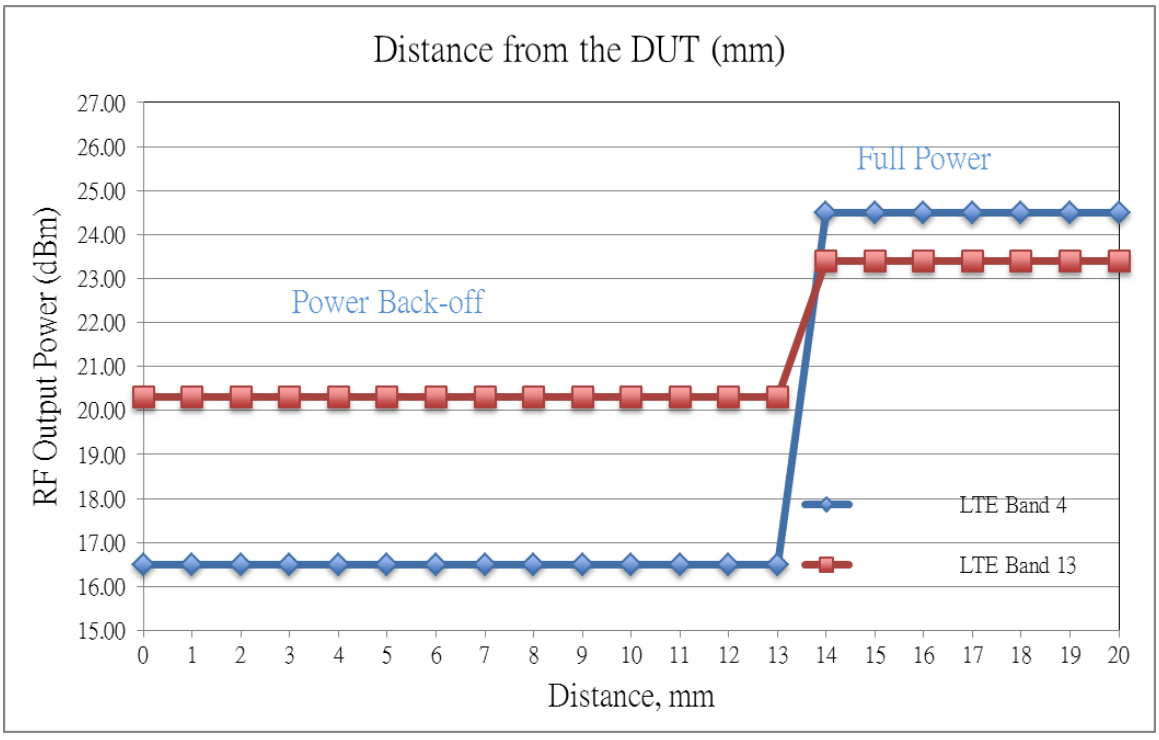
GSM1900



W-CDMA Band V & II



LTE Band 4 & 13



8. RF Exposure Conditions

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.

8.1. Standalone SAR Test Exclusion Considerations

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

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

Refer to “Operational Description of Power Reduction” for the specific details on the antenna-to-antenna and antenna-to-edge(s) distances used for test exclusion calculations.

8.1.1. SAR Test Exclusion Calculations for WWAN

Antennas < 50mm to adjacent edges

Antenna	Tx Interface	Freq. (MHz)	Output Power		Separation Distances (mm)						Calculated Threshold Value					
			dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front
Full Power, Proximity Sensor Off. A sensor triggering of 6 mm is included for both Rear/Edge 2 slant and Edge 2. 12 mmis included for Rear/Edge 1 slant and Edge 1																
Cellular	GPRS 2 Slots	836.6	32.00	396	11	17	11	95	115		32.9 -MEASURE-	21.3 -MEASURE-	32.9 -MEASURE-	> 50 mm	> 50 mm	N/A
Cellular	GPRS 2 Slots	188	29.00	199	11	17	11	95	115		7.8 -MEASURE-	5.1 -MEASURE-	7.8 -MEASURE-	> 50 mm	> 50 mm	N/A
Cellular	W-CDMA V	836.6	23.50	224	11	17	11	95	115		18.6 -MEASURE-	12.1 -MEASURE-	18.6 -MEASURE-	> 50 mm	> 50 mm	N/A
Cellular	W-CDMA II	1880	23.50	224	11	17	11	95	115		27.9 -MEASURE-	18.1 -MEASURE-	27.9 -MEASURE-	> 50 mm	> 50 mm	N/A
Cellular	LTE Band 4	1732.5	24.50	282	11	17	11	95	115		33.7 -MEASURE-	21.8 -MEASURE-	33.7 -MEASURE-	> 50 mm	> 50 mm	N/A
Cellular	LTE Band 13	782	23.50	224	11	17	11	95	115		18 -MEASURE-	11.7 -MEASURE-	18 -MEASURE-	> 50 mm	> 50 mm	N/A
Power Back-off, Proximity Sensor On																
Cellular	GPRS 2 Slots	836.6	28.00	158	5	5	5	95	115		28.9 -MEASURE-	28.9 -MEASURE-	28.9 -MEASURE-	> 50 mm	> 50 mm	N/A
Cellular	GPRS 2 Slots	188	23.50	56	5	5	5	95	115		4.9 -MEASURE-	4.9 -MEASURE-	4.9 -MEASURE-	> 50 mm	> 50 mm	N/A
Cellular	W-CDMA V	836.6	20.50	112	5	5	5	95	115		20.5 -MEASURE-	20.5 -MEASURE-	20.5 -MEASURE-	> 50 mm	> 50 mm	N/A
Cellular	W-CDMA II	1880	16.50	45	5	5	5	95	115		12.3 -MEASURE-	12.3 -MEASURE-	12.3 -MEASURE-	> 50 mm	> 50 mm	N/A
Cellular	LTE Band 4	1732.5	17.00	50	5	5	5	95	115		13.2 -MEASURE-	13.2 -MEASURE-	13.2 -MEASURE-	> 50 mm	> 50 mm	N/A
Cellular	LTE Band 13	782	20.50	112	5	5	5	95	115		19.8 -MEASURE-	19.8 -MEASURE-	19.8 -MEASURE-	> 50 mm	> 50 mm	N/A

Antennas > 50mm to adjacent edges

Antenna	Tx Interface	Freq. (MHz)	Output Power		Separation Distances (mm)						Calculated Threshold Value					
			dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front
Full Power, Proximity Sensor Off. A sensor triggering of 6 mm is included for both Rear/Edge 2 slant and Edge 2. 12 mmis included for Rear/Edge 1 slant and Edge 1																
Cellular	GPRS 2 Slots	836.6	32.00	396	11	17	11	95	115		< 50 mm	< 50 mm	< 50 mm	415 mW -EXEMPT-	526.5 mW -EXEMPT-	N/A
Cellular	GPRS 2 Slots	188	29.00	199	11	17	11	95	115		< 50 mm	< 50 mm	< 50 mm	402.3 mW -EXEMPT-	427.4 mW -EXEMPT-	N/A
Cellular	W-CDMA V	836.6	23.50	224	11	17	11	95	115		< 50 mm	< 50 mm	< 50 mm	415 mW -EXEMPT-	526.5 mW -EXEMPT-	N/A
Cellular	W-CDMA II	1880	23.50	224	11	17	11	95	115		< 50 mm	< 50 mm	< 50 mm	559.4 mW -EXEMPT-	759.4 mW -EXEMPT-	N/A
Cellular	LTE Band 4	1732.5	24.50	282	11	17	11	95	115		< 50 mm	< 50 mm	< 50 mm	564 mW -EXEMPT-	764 mW -EXEMPT-	N/A
Cellular	LTE Band 13	782	23.50	224	11	17	11	95	115		< 50 mm	< 50 mm	< 50 mm	404.2 mW -EXEMPT-	508.5 mW -EXEMPT-	N/A
Power Back-off, Proximity Sensor On																
Cellular	GPRS 2 Slots	836.6	28.00	158	5	5	5	95	115		< 50 mm	< 50 mm	< 50 mm	415 mW -EXEMPT-	526.5 mW -EXEMPT-	N/A
Cellular	GPRS 2 Slots	188	23.50	56	5	5	5	95	115		< 50 mm	< 50 mm	< 50 mm	402.3 mW -EXEMPT-	427.4 mW -EXEMPT-	N/A
Cellular	W-CDMA V	836.6	20.50	112	5	5	5	95	115		< 50 mm	< 50 mm	< 50 mm	415 mW -EXEMPT-	526.5 mW -EXEMPT-	N/A
Cellular	W-CDMA II	1880	16.50	45	5	5	5	95	115		< 50 mm	< 50 mm	< 50 mm	559.4 mW -EXEMPT-	759.4 mW -EXEMPT-	N/A
Cellular	LTE Band 4	1732.5	17.00	50	5	5	5	95	115		< 50 mm	< 50 mm	< 50 mm	564 mW -EXEMPT-	764 mW -EXEMPT-	N/A
Cellular	LTE Band 13	782	20.50	112	5	5	5	95	115		< 50 mm	< 50 mm	< 50 mm	404.2 mW -EXEMPT-	508.5 mW -EXEMPT-	N/A

Note(s):

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

8.1.2. SAR Test Exclusion Calculations for Bluetooth (WiFi 1 antenna) Transmit Conditions

Antennas < 50mm to adjacent edges

Antenna	Tx Interface	Freq. (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
WiFi 1 / Bluetooth																
WiFi 1	Bluetooth	2441	5.50	4.0	5.0	5.0	120.0	110.0	33.0		12 -EXEMPT-	12 -EXEMPT-	> 50 mm	> 50 mm	0.2 -EXEMPT-	N/A

Antennas > 50mm to adjacent edges

Antenna	Tx Interface	Freq. (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
WiFi 1 / Bluetooth																
WiFi 1	Bluetooth	2441	5.50	4	5	5	120	110	33		< 50 mm	< 50 mm	796 mW -EXEMPT-	696 mW -EXEMPT-	< 50 mm	N/A

8.1.3. SAR Test Exclusion Calculations for WiFi (2 Tx) Transmit Conditions

Antennas < 50mm to adjacent edges

Antenna	Tx Interface	Freq. (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
WiFi 1																
WiFi 1	2.4 GHz	2437	15.00	32.0	5.0	5.0	120.0	110.0	33.0		10 -MEASURE-	10 -MEASURE-	> 50 mm	> 50 mm	15 -EXEMPT-	N/A
WiFi 1	5.2 GHz	5200	13.00	20.0	5.0	5.0	120.0	110.0	33.0		9.1 -MEASURE-	9.1 -MEASURE-	> 50 mm	> 50 mm	14 -EXEMPT-	N/A
WiFi 1	5.3 GHz	5300	13.00	20.0	5.0	5.0	120.0	110.0	33.0		9.2 -MEASURE-	9.2 -MEASURE-	> 50 mm	> 50 mm	14 -EXEMPT-	N/A
WiFi 1	5.5 GHz	5600	13.00	20.0	5.0	5.0	120.0	110.0	33.0		9.5 -MEASURE-	9.5 -MEASURE-	> 50 mm	> 50 mm	14 -EXEMPT-	N/A
WiFi 1	5.8 GHz	5785	13.00	20.0	5.0	5.0	120.0	110.0	33.0		9.6 -MEASURE-	9.6 -MEASURE-	> 50 mm	> 50 mm	15 -EXEMPT-	N/A
WiFi 2																
WiFi 2	2.4 GHz	2437	14.00	25.0	5.0	114.0	26.0	5.2	129.0		7.8 -MEASURE-	> 50 mm	15 -EXEMPT-	7.8 -MEASURE-	> 50 mm	N/A
WiFi 2	5.2 GHz	5200	9.50	9.0	5.0	114.0	26.0	5.2	129.0		4.1 -MEASURE-	> 50 mm	0.8 -EXEMPT-	4.1 -MEASURE-	> 50 mm	N/A
WiFi 2	5.3 GHz	5300	9.50	9.0	5.0	114.0	26.0	5.2	129.0		4.1 -MEASURE-	> 50 mm	0.8 -EXEMPT-	4.1 -MEASURE-	> 50 mm	N/A
WiFi 2	5.5 GHz	5600	10.00	10.0	5.0	114.0	26.0	5.2	129.0		4.7 -MEASURE-	> 50 mm	0.9 -EXEMPT-	4.7 -MEASURE-	> 50 mm	N/A
WiFi 2	5.8 GHz	5785	10.00	10.0	5.0	114.0	26.0	5.2	129.0		4.8 -MEASURE-	> 50 mm	0.9 -EXEMPT-	4.8 -MEASURE-	> 50 mm	N/A

Antennas > 50mm to adjacent edges

Antenna	Tx Interface	Freq. (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
WiFi 1																
WiFi 1	2.4 GHz	2437	15.00	32	5	5	120	110	33		< 50 mm	< 50 mm	796.1 mW -EXEMPT-	696.1 mW -EXEMPT-	< 50 mm	N/A
WiFi 1	5.2 GHz	5200	13.00	20	5	5	120	110	33		< 50 mm	< 50 mm	765.8 mW -EXEMPT-	665.8 mW -EXEMPT-	< 50 mm	N/A
WiFi 1	5.3 GHz	5300	13.00	20	5	5	120	110	33		< 50 mm	< 50 mm	765.2 mW -EXEMPT-	665.2 mW -EXEMPT-	< 50 mm	N/A
WiFi 1	5.5 GHz	5600	13.00	20	5	5	120	110	33		< 50 mm	< 50 mm	763.4 mW -EXEMPT-	663.4 mW -EXEMPT-	< 50 mm	N/A
WiFi 1	5.8 GHz	5785	13.00	20	5	5	120	110	33		< 50 mm	< 50 mm	762.4 mW -EXEMPT-	662.4 mW -EXEMPT-	< 50 mm	N/A
WiFi 2																
WiFi 2	2.4 GHz	2437	14.00	25	5	114	26	5.17	129		< 50 mm	736.1 mW -EXEMPT-	< 50 mm	< 50 mm	886.1 mW -EXEMPT-	N/A
WiFi 2	5.2 GHz	5200	9.50	9	5	114	26	5.17	129		< 50 mm	705.8 mW -EXEMPT-	< 50 mm	< 50 mm	855.8 mW -EXEMPT-	N/A
WiFi 2	5.3 GHz	5300	9.50	9	5	114	26	5.17	129		< 50 mm	705.2 mW -EXEMPT-	< 50 mm	< 50 mm	855.2 mW -EXEMPT-	N/A
WiFi 2	5.5 GHz	5600	10.00	10	5	114	26	5.17	129		< 50 mm	703.4 mW -EXEMPT-	< 50 mm	< 50 mm	853.4 mW -EXEMPT-	N/A
WiFi 2	5.8 GHz	5785	10.00	10	5	114	26	5.17	129		< 50 mm	702.4 mW -EXEMPT-	< 50 mm	< 50 mm	852.4 mW -EXEMPT-	N/A

Note(s):

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

8.2. Required Test Configurations

The table below identifies the standalone test configurations required for this device according to the findings in Section 8.1:

Test Configurations	Rear	Edge 1 (Top Edge)	Rear/Edge 1 Slant	Edge 2 (Right Edge)	Rear/Edge 2 Slant	Edge 3 (Bottom Edge)	Rear/Edge 3 Slant	Edge 4 (Left Edge)
GSM850	Yes	Yes	Yes	Yes	Yes	No	No	No
GSM1900	Yes	Yes	Yes	Yes	Yes	No	No	No
W-CDMA Band V	Yes	Yes	Yes	Yes	Yes	No	No	No
W-CDMA Band II	Yes	Yes	Yes	Yes	Yes	No	No	No
LTE Band 4	Yes	Yes	Yes	Yes	Yes	No	No	No
LTE Band 17	Yes	Yes	Yes	Yes	Yes	No	No	No
WiFi Antenna 1	Yes	Yes	Yes	No	No	No	No	No
WiFi Antenna 2	Yes	No	No	No	No	Yes	Yes	No

Note(s):

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

9. RF Output Power Measurement

9.1. GSM

GPRS (GMSK) - Coding Scheme: CS1

Band	Ch No.	Freq. (MHz)	Max. Power		with Pwr back-off	
			1 slot	2 slots	1 slot	2 slots
850	Burst Power (dBm)					
	128	824.2	32.1	**31.7**	28.8	**27.9**
	190	836.6	32.1	**31.8**	28.7	**28.0**
	251	848.8	32.1	**31.8**	28.8	**28.0**
	Frame Power (dBm)					
	128	824.2	23.1	**25.7**	19.8	**21.9**
	190	836.6	23.1	**25.8**	19.7	**22.0**
	251	848.8	23.1	**25.8**	19.8	**22.0**

EGPRS (8PSK) - Coding Scheme: MCS5

Band	Ch No.	Freq. (MHz)	Max. Power		with Pwr back-off	
			1 slot	2 slots	1 slot	2 slots
850	Burst Power (dBm)					
	128	824.2	26.4	26.4	23.1	22.7
	190	836.6	26.5	26.4	23.2	22.7
	251	848.8	26.5	26.4	23.1	22.7
	Frame Power (dBm)					
	128	824.2	17.4	20.4	14.1	16.7
	190	836.6	17.5	20.4	14.2	16.7
	251	848.8	17.5	20.4	14.1	16.7

GPRS (GMSK) - Coding Scheme: CS1

Band	Ch No.	Freq. (MHz)	Max. Power		with Pwr back-off	
			1 slot	2 slots	1 slot	2 slots
1900	Burst Power (dBm)					
	512	1850.2	29.7	**28.8**	24.4	**23.5**
	661	1880.0	29.7	**28.8**	24.3	**23.5**
	810	1909.8	29.7	**28.8**	24.3	**23.4**
	Frame Power (dBm)					
	512	1850.2	20.7	**22.8**	15.4	**17.5**
	661	1880.0	20.7	**22.8**	15.3	**17.5**
	810	1909.8	20.7	**22.8**	15.3	**17.4**

EGPRS (8PSK) - Coding Scheme: MCS5

Band	Ch No.	Freq. (MHz)	Max. Power		with Pwr back-off	
			1 slot	2 slots	1 slot	2 slots
1900	Burst Power (dBm)					
	512	1850.2	25.0	25.0	20.3	20.4
	661	1880.0	25.1	25.2	20.3	20.4
	810	1909.8	25.3	25.4	20.3	20.3
	Frame Power (dBm)					
	512	1850.2	16.0	19.0	11.3	14.4
	661	1880.0	16.1	19.2	11.3	14.4
	810	1909.8	16.3	19.4	11.3	14.3

Notes:

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

- GMSK (GPRS) mode with 2 time slots, based on the output power measurements above
- SAR is not required for EGPRS (8PSK) mode because its output power is less than that of GPRS Mode

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)	Avg Pwr (dBm)	
				Max. Power	with Pwr Back-off
W-CDMA Band V	Rel 99 (RMC, 12.2 kbps)	4132	826.4	23.1	20.3
		4183	836.6	23.3	20.5
		4233	846.6	23.3	20.4
W-CDMA Band II	Rel 99 (RMC, 12.2 kbps)	9262	1852.4	23.1	16.3
		9400	1880.0	23.0	16.2
		9538	1907.6	23.0	16.2

HSDPA

The following 4 Sub-tests were completed according to Release 5 procedures in section 5.2 of 3GPP TS34.121. A summary of these settings are illustrated below:

	Mode	HSDPA	HSDPA	HSDPA	HSDPA
	Subtest	1	2	3	4
W-CDMA General Settings	Loopback Mode	Test Mode 1			
	Rel99 RMC	12.2kbps RMC			
	HSDPA FRC	H-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)	Avg Pwr (dBm)	
				Max. Power	with Pwr Back-off
W-CDMA Band V	Subtest 1	4132	826.4	22.2	19.3
		4183	836.6	22.5	19.5
		4233	846.6	22.3	19.5
	Subtest 2	4132	826.4	22.3	19.4
		4183	836.6	22.5	19.5
		4233	846.6	22.4	19.6
	Subtest 3	4132	826.4	21.7	18.8
		4183	836.6	22.1	19.1
		4233	846.6	22.0	19.2
	Subtest 4	4132	826.4	21.9	19.0
		4183	836.6	22.2	19.2
		4233	846.6	22.1	19.3
W-CDMA Band II	Subtest 1	9262	1852.4	21.9	15.2
		9400	1880.0	22.0	15.3
		9538	1907.6	21.9	15.2
	Subtest 2	9262	1852.4	21.9	15.2
		9400	1880.0	22.0	15.3
		9538	1907.6	22.0	15.3
	Subtest 3	9262	1852.4	21.5	14.8
		9400	1880.0	21.6	14.9
		9538	1907.6	21.6	14.9
	Subtest 4	9262	1852.4	21.6	14.9
		9400	1880.0	21.5	14.8
		9538	1907.6	21.6	14.9

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

HSPA (HSDPA & HSUPA)

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

	Mode	HSPA	HSPA	HSPA	HSPA	HSPA
	Subtest	1	2	3	4	5
WCDMA General Settings	Loopback Mode	Test Mode 1				
	Rel99 RMC	12.2kbps RMC				
	HSDPA FRC	H-Set1				
	HSUPA Test	HSUPA Loopback				
	Power Control Algorithm	Algorithm2				
	βc	11/15	6/15	15/15	2/15	15/15
	βd	15/15	15/15	9/15	15/15	15/15
	βec	209/225	12/15	30/15	2/15	24/15
	βc/βd	11/15	6/15	15/9	2/15	15/15
	βhs	22/15	12/15	30/15	4/15	30/15
	βed	1309/225	94/75	47/15 47/15	56/75	134/15
	CM (dB)	1.0	3.0	2.0	3.0	1.0
	MPR (dB)	0	2	1	2	0
HSDPA Specific Settings	DACK	8				
	DNAK	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				
HSUPA Specific Settings	D E-DPCCH	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	E-TFCI 11 E-TFCI PO 4 E-TFCI 67 E-TFCI PO 18 E-TFCI 71 E-TFCI PO 23 E-TFCI 75 E-TFCI PO 26 E-TFCI 81 E-TFCI PO 27		E-TFCI 11 E-TFCI PO 4 E-TFCI 92 E-TFCI PO 18	E-TFCI 11 E-TFCI PO 4 E-TFCI 67 E-TFCI PO 18 E-TFCI 71 E-TFCI PO 23 E-TFCI 75 E-TFCI PO 26 E-TFCI 81 E-TFCI PO 27	

Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm)	
				Max. Power	with Pwr Back-off
W-CDMA Band V	Subtest 1	4132	826.4	22.3	19.5
		4183	836.6	22.5	19.6
		4233	846.6	22.3	19.3
	Subtest 2	4132	826.4	21.8	18.9
		4183	836.6	22.0	19.0
		4233	846.6	21.7	18.9
	Subtest 3	4132	826.4	22.3	19.4
		4183	836.6	22.5	19.5
		4233	846.6	22.4	19.6
	Subtest 4	4132	826.4	22.3	19.4
		4183	836.6	22.5	19.5
		4233	846.6	22.3	19.5
	Subtest 5	4132	826.4	22.2	19.2
		4183	836.6	22.5	19.8
		4233	846.6	22.3	19.4
W-CDMA Band II	Subtest 1	9262	1852.4	22.0	15.3
		9400	1880.0	22.0	15.3
		9538	1907.6	22.0	15.3
	Subtest 2	9262	1852.4	21.4	14.7
		9400	1880.0	21.5	14.8
		9538	1907.6	21.4	14.7
	Subtest 3	9262	1852.4	22.0	15.3
		9400	1880.0	22.0	15.3
		9538	1907.6	22.1	15.4
	Subtest 4	9262	1852.4	21.9	15.2
		9400	1880.0	22.0	15.3
		9538	1907.6	21.9	15.2
	Subtest 5	9262	1852.4	21.9	15.2
		9400	1880.0	22.0	15.3
		9538	1907.6	22.0	15.3

9.3. LTE

The following tests were conducted according to the test requirements outlined in section 6.2 of the 3GPP TS36.101 specification.

UE Power Class: 3 (23 +/- 2dBm). The allowed Maximum Power Reduction (MPR) for the maximum output power due to higher order modulation and transmit bandwidth configuration (resource blocks) is specified in Table 6.2.3-1 of the 3GPP TS36.101.

Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3

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

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

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

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

LTE Band 4 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Avg Pwr (dBm)					
						Max. Power			with Pwr Back-off		
						1720 MHz	1732.5 MHz	1745 MHz	1720 MHz	1732.5 MHz	1745 MHz
LTE Band 4	20	QPSK	1	0	0	24.2	24.3	24.4	16.5	16.9	16.6
			1	49	0	24.3	24.3	24.4	16.6	16.9	16.8
			1	99	0	24.3	24.2	24.4	16.6	16.5	16.5
			50	0	1	23.0	23.1	23.0	16.7	16.7	16.6
			50	24	1	23.1	23.1	23.0	16.7	16.7	16.6
			50	50	1	23.1	23.1	23.0	16.6	16.6	16.5
			100	0	1	23.1	23.2	23.1	16.7	16.7	16.6
		16QAM	1	0	1	22.6	23.2	23.2	16.6	16.7	16.6
			1	49	1	22.7	23.3	23.3	16.6	16.6	16.5
			1	99	1	22.7	23.3	23.3	16.7	16.6	16.4
			50	0	2	22.1	22.1	22.0	16.7	16.7	16.4
			50	24	2	22.2	22.0	22.1	16.6	16.6	16.4
			50	50	2	22.2	22.1	22.1	16.6	16.6	16.4
			100	0	2	22.1	22.1	22.1	16.7	16.7	16.5

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Avg Pwr (dBm)					
						Max. Power			with Pwr Back-off		
						1717.5 MHz	1732.5 MHz	1747.5 MHz	1717.5 MHz	1732.5 MHz	1747.5 MHz
LTE Band 4	15	QPSK	1	0	0	24.3	24.4	24.3	16.6	16.8	16.1
			1	37	0	24.4	24.3	24.4	16.6	16.7	16.2
			1	74	0	24.4	24.3	24.4	16.6	16.7	16.2
			36	0	1	23.0	23.0	23.1	16.5	16.6	16.3
			36	20	1	23.0	23.1	23.0	16.6	16.5	16.3
			36	39	1	23.1	23.0	23.0	16.6	16.5	16.3
			75	0	1	23.0	23.0	23.0	16.5	16.6	16.2
		16QAM	1	0	1	23.2	23.5	23.5	16.5	16.4	16.1
			1	37	1	23.3	23.5	23.5	16.4	16.5	16.1
			1	74	1	23.3	23.5	23.5	16.5	16.3	16.1
			36	0	2	22.1	22.2	22.1	16.5	16.3	16.1
			36	20	2	22.1	22.1	22.1	16.5	16.3	16.2
			36	39	2	22.1	22.1	22.1	16.4	16.2	16.1
			75	0	2	22.0	22.0	21.9	16.4	16.2	16.2

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Avg Pwr (dBm)					
						Max. Power			with Pwr Back-off		
						1715 MHz	1732.5 MHz	1750 MHz	1715 MHz	1732.5 MHz	1750 MHz
LTE Band 4	10	QPSK	1	0	0	24.2	24.3	24.2	16.4	17.0	16.8
			1	25	0	24.3	24.3	24.2	16.4	16.6	16.4
			1	49	0	24.4	24.3	24.1	16.5	17.0	16.7
			25	0	1	23.1	23.2	23.2	16.2	16.7	16.7
			25	12	1	23.1	23.2	23.2	16.5	16.6	16.7
			25	25	1	23.2	23.2	23.1	16.7	16.7	16.6
			50	0	1	22.9	23.1	23.0	16.6	16.7	16.7
		16QAM	1	0	1	23.4	22.7	23.0	16.9	16.7	16.8
			1	25	1	23.5	22.7	22.9	16.7	16.4	16.5
			1	49	1	23.4	22.7	22.9	16.7	16.6	16.6
			25	0	2	22.2	22.3	22.3	16.6	16.8	16.7
			25	12	2	22.2	22.3	22.3	16.5	16.6	16.6
			25	25	2	22.3	22.3	22.2	16.6	16.8	16.5
			50	0	2	22.0	22.1	22.0	16.5	16.7	16.6

LTE Band 4 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Avg Pwr (dBm)					
						Max. Power			with Pwr Back-off		
						1712.5 MHz	1732.5 MHz	1752.5 MHz	1712.5 MHz	1732.5 MHz	1752.5 MHz
LTE Band 4	5	QPSK	1	0	0	24.3	24.5	24.3	16.6	16.5	16.5
			1	12	0	24.3	24.5	24.3	16.6	16.5	16.5
			1	24	0	24.4	24.4	24.3	16.5	16.5	16.4
			12	0	1	23.3	23.4	23.3	16.5	16.5	16.5
			12	7	1	23.3	23.4	23.3	16.5	16.5	16.5
			12	13	1	23.3	23.4	23.2	16.5	16.5	16.5
			25	0	1	23.1	23.2	23.1	16.5	16.5	16.5
		16QAM	1	0	1	23.5	23.4	23.4	16.6	16.9	16.0
			1	12	1	23.5	23.4	23.4	16.6	16.8	16.3
			1	24	1	23.5	23.4	23.3	16.5	17.0	16.0
			12	0	2	22.4	22.4	23.4	16.5	16.6	16.4
			12	7	2	22.4	22.4	22.4	16.5	16.6	16.5
			12	13	2	22.4	22.5	22.3	16.5	16.5	16.3
			25	0	2	22.4	22.3	22.2	16.5	16.5	16.4

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Avg Pwr (dBm)					
						Max. Power			with Pwr Back-off		
						1711.5 MHz	1732.5 MHz	1753.5 MHz	1711.5 MHz	1732.5 MHz	1753.5 MHz
LTE Band 4	3	QPSK	1	0	0	24.4	24.4	24.3	16.2	16.3	16.1
			1	8	0	24.3	24.4	24.3	16.3	16.3	16.2
			1	14	0	24.4	24.3	24.3	16.2	16.3	16.0
			8	0	1	23.4	23.4	23.3	16.2	16.3	16.3
			8	4	1	23.3	23.4	23.3	16.2	16.4	16.3
			8	7	1	23.4	23.4	23.3	16.3	16.3	16.3
			15	0	1	23.3	23.4	23.3	16.3	16.3	16.3
		16QAM	1	0	1	23.5	22.8	23.4	16.4	16.1	16.1
			1	8	1	23.4	22.8	23.5	16.6	16.1	16.0
			1	14	1	23.4	22.7	23.5	16.6	16.0	16.0
			8	0	2	22.4	22.3	22.3	16.3	16.2	16.2
			8	4	2	22.4	22.4	22.3	16.2	16.3	16.3
			8	7	2	22.4	22.3	22.4	16.3	16.2	16.2
			15	0	2	22.4	22.3	22.3	16.2	16.2	16.1

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Avg Pwr (dBm)					
						Max. Power			with Pwr Back-off		
						1710.7 MHz	1732.5 MHz	1754.3 MHz	1710.7 MHz	1732.5 MHz	1754.3 MHz
LTE Band 4	1.4	QPSK	1	0	0	24.4	24.4	24.3	16.4	16.4	16.7
			1	3	0	24.3	24.3	24.2	16.3	16.4	16.7
			1	5	0	24.4	24.4	24.3	16.3	16.4	16.5
			3	0	0	24.4	24.4	24.3	16.4	16.5	16.7
			3	1	0	24.4	24.3	24.3	16.2	16.6	16.7
			3	3	0	24.4	24.4	24.3	16.2	16.6	16.7
			6	0	1	23.3	23.5	23.3	16.0	16.5	16.6
		16QAM	1	0	1	23.5	23.5	23.4	16.3	16.3	16.7
			1	3	1	23.5	23.5	23.3	16.4	16.4	16.7
			1	5	1	23.4	23.5	23.4	16.3	16.3	16.7
			3	0	1	23.4	23.4	23.4	16.3	16.6	16.7
			3	1	1	23.4	23.5	23.2	16.4	16.6	16.7
			3	3	1	23.4	23.4	23.2	16.4	16.5	16.7
			6	0	2	22.2	22.2	22.1	15.9	16.3	16.4

LTE Band 13 Measured Result

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Avg Pwr (dBm)	
						Max. Power	with Pwr Back-off
						782 MHz	782 MHz
LTE Band 13	10	QPSK	1	0	0	23.4	20.3
			1	25	0	23.4	20.4
			1	49	0	23.5	20.4
			25	0	1	22.4	20.4
			25	12	1	22.5	20.4
			25	25	1	22.4	20.4
			50	0	1	22.4	20.3
		16QAM	1	0	1	22.2	20.0
			1	25	1	22.3	20.0
			1	49	1	22.3	20.1
			25	0	2	22.2	20.4
			25	12	2	22.2	20.4
			25	25	2	22.1	20.5
			50	0	2	22.1	20.4

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Avg Pwr (dBm)	
						Max. Power	with Pwr Back-off
						782 MHz	782 MHz
LTE Band 13	5	QPSK	1	0	0	23.2	20.4
			1	12	0	23.2	20.5
			1	24	0	23.3	20.5
			12	0	1	22.2	20.5
			12	7	1	22.2	20.4
			12	13	1	22.3	20.5
			25	0	1	22.1	20.5
		16QAM	1	0	1	21.9	19.7
			1	12	1	22.1	19.8
			1	24	1	22.1	20.0
			12	0	2	21.3	20.4
			12	7	2	21.3	20.4
			12	13	2	21.2	20.4
			25	0	2	21.1	20.4

Note(s):

10/5 MHz Bandwidths does not support at least three non-overlapping channels in certain channel bandwidths. When a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing per KDB941225 D05 SAR for LTE Devices v02r02

9.4. WiFi (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)
					WiFi 1	WiFi 2	WiFi 1+2	
2.4 (DTS)	802.11b	1 Mbps	1	2412	14.9	13.9	17.4	Yes
			6	2437	15.0	14.0	17.5	
			11	2462	14.9	14.0	17.5	
	802.11g	6 Mbps	1	2412	8.6	6.9	10.8	No
			6	2437	15.0	14.0	17.5	
			11	2462	9.6	7.7	11.8	
	802.11n (HT20)	MCS0	1	2412	7.4	5.8	9.7	No
			6	2437	15.0	14.0	17.5	
			11	2462	10.1	8.1	12.2	

Power measurements to determine worst-case data rates

Mode	Ch #	Freq. (MHz)	Data Rate	Avg Pwr (dBm)		SAR test (Yes/No)
				WiFi 1	WiFi 2	
802.11b	6	2437	1 Mbps	15.0	14.0	Yes
			2 Mbps	15.0	14.0	No
			5.5 Mbps	14.9	13.9	No
			11 Mbps	14.8	13.8	No

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.

9.5. WiFi (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.

Measured Results

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Avg Pwr (dBm)			SAR Test (Yes/No)
					WiFi 1	WiFi 2	WiFi 1+2	
5.2 (UNII)	802.11a	6 Mbps	36	5180	12.9	9.5	14.5	Yes
			40	5200	12.8	9.3	14.4	
			44	5220	12.9	9.3	14.5	
			48	5240	12.9	9.3	14.5	
	802.11n (HT20)	MCS0	36	5180	12.6	9.4	14.3	No
			40	5200	12.6	9.4	14.3	
			48	5240	12.5	9.4	14.2	
	802.11n (HT40)	MCS0	38	5190	12.6	9.5	14.3	No
			46	5230	13.0	9.5	14.6	
5.3 (UNII)	802.11a	6 Mbps	52	5260	12.7	9.4	14.4	Yes
			56	5280	12.8	9.5	14.5	
			60	5300	12.7	9.4	14.4	
			64	5320	12.7	9.4	14.4	
	802.11n (HT20)	MCS0	52	5260	12.6	9.4	14.3	No
			60	5300	12.8	9.5	14.5	
			64	5320	12.7	9.5	14.4	
	802.11n (HT40)	MCS0	54	5270	12.9	9.5	14.5	No
			62	5310	11.5	8.5	13.3	
5.5 (UNII)	802.11a	6 Mbps	100	5500	12.6	9.8	14.4	Yes
			104	5520	12.6	9.8	14.4	
			108	5540	12.5	10.0	14.4	
			112	5560	12.5	9.6	14.3	
			116	5580	12.6	9.9	14.5	
			120	5600	not supported			
			124	5620	not supported			
			128	5640	not supported			
			132	5660	12.9	9.9	14.7	
			136	5680	12.8	10.0	14.6	
			140	5700	13.0	9.7	14.7	
	802.11n (HT20)	MCS0	100	5500	12.5	10.0	14.4	No
			116	5580	12.9	9.5	14.5	
			140	5700	12.9	10.0	14.7	
	802.11n (HT40)	MCS0	102	5510	9.1	7.1	11.2	No
			110	5550	12.8	10.0	14.6	
			134	5670	12.6	10.0	14.5	
5.8 (DTS)	802.11a	6 Mbps	149	5745	13.0	9.8	14.7	Yes
			153	5765	12.7	9.7	14.5	
			157	5785	12.5	9.7	14.3	
			161	5805	12.5	10.0	14.4	
			165	5825	12.5	10.0	14.4	
	802.11n (HT20)	MCS0	149	5745	13.0	10.0	14.8	No
			157	5785	12.9	10.0	14.7	
			161	5805	12.7	10.0	14.6	
	802.11n (HT40)	MCS0	151	5755	12.9	10.0	14.7	No
			159	5795	12.5	9.9	14.4	

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.

Power measurements to determine worst-case data rates

Band	Mode	Ch #	Freq. (MHz)	Data Rate	Avg Pwr (dBm)		SAR test (Yes/No)
					WiFi 1	WiFi 2	
5.2 GHz (UNII)	802.11a	36	5180	6 Mbps	12.9	9.5	Yes
				9 Mbps	12.9	9.5	No
				12 Mbps	12.8	9.4	No
				18 Mbps	12.8	9.4	No
				24 Mbps	12.7	9.5	No
				36 Mbps	12.9	9.4	No
				48 Mbps	12.9	9.4	No
				54 Mbps	12.9	9.3	No
5.3 GHz (UNII)	802.11a	56	5280	6 Mbps	12.8	9.5	Yes
				9 Mbps	12.8	9.5	No
				12 Mbps	12.7	9.4	No
				18 Mbps	12.8	9.5	No
				24 Mbps	12.8	9.5	No
				36 Mbps	12.8	9.5	No
				48 Mbps	12.8	9.5	No
				54 Mbps	12.8	9.5	No
5.5 GHz (UNII)	802.11a	116	5580	6 Mbps	12.6	9.9	Yes
				9 Mbps	12.6	9.9	No
				12 Mbps	12.6	9.9	No
				18 Mbps	12.6	9.9	No
				24 Mbps	12.5	9.9	No
				36 Mbps	12.5	9.8	No
				48 Mbps	12.4	9.9	No
				54 Mbps	12.3	9.8	No
5.8 GHz (DTS)	802.11a	149	5745	6 Mbps	13.0	9.8	Yes
				9 Mbps	13.0	9.8	No
				12 Mbps	13.0	9.8	No
				18 Mbps	13.0	9.8	No
				24 Mbps	13.0	9.8	No
				36 Mbps	12.9	9.8	No
				48 Mbps	12.9	9.8	No
				54 Mbps	12.8	9.7	No

9.6. Bluetooth

Maximum tune-up tolerance limit is 5.5 dBm from the rated nominal maximum output power. This power level qualifies for exclusion of SAR testing.

Refer to Section 8.1.2. Standalone SAR Test Exclusion Considerations

10. Tissue Dielectric Properties

IEEE Std 1528-2003 Table 2

Target Frequency (MHz)	Head	
	ε_r	σ (S/m)
300	45.3	0.87
450	43.5	0.87
835	41.5	0.90
900	41.5	0.97
1450	40.5	1.20
1800 – 2000	40.0	1.40
2450	39.2	1.80
2600	39.0	1.96
3000	38.5	2.40

FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r01

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

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

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

	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
9/3/2013	Body 2450	e'	51.7700	Relative Permittivity (ε_r):	51.77	52.70	-1.76	5
		e"	14.0400	Conductivity (σ):	1.91	1.95	-1.92	5
	Body 2410	e'	51.8900	Relative Permittivity (ε_r):	51.89	52.76	-1.65	5
		e"	13.9000	Conductivity (σ):	1.86	1.91	-2.35	5
	Body 2475	e'	51.7000	Relative Permittivity (ε_r):	51.70	52.67	-1.84	5
		e"	14.1200	Conductivity (σ):	1.94	1.99	-2.11	5
9/4/2013	Body 5180	e'	47.6100	Relative Permittivity (ε_r):	47.61	49.05	-2.93	5
		e"	18.6300	Conductivity (σ):	5.37	5.27	1.79	5
	Body 5200	e'	47.4900	Relative Permittivity (ε_r):	47.49	49.02	-3.12	5
		e"	18.6000	Conductivity (σ):	5.38	5.29	1.57	5
	Body 5600	e'	46.8400	Relative Permittivity (ε_r):	46.84	48.48	-3.38	5
		e"	19.0700	Conductivity (σ):	5.94	5.76	3.07	5
	Body 5800	e'	46.3500	Relative Permittivity (ε_r):	46.35	48.20	-3.84	5
		e"	19.2200	Conductivity (σ):	6.20	6.00	3.31	5
	Body 5825	e'	46.3600	Relative Permittivity (ε_r):	46.36	48.20	-3.82	5
		e"	19.2400	Conductivity (σ):	6.23	6.00	3.86	5
9/6/2013	Body 2450	e'	50.6900	Relative Permittivity (ε_r):	50.69	52.70	-3.81	5
		e"	14.8200	Conductivity (σ):	2.02	1.95	3.53	5
	Body 2410	e'	50.8300	Relative Permittivity (ε_r):	50.83	52.76	-3.66	5
		e"	14.6800	Conductivity (σ):	1.97	1.91	3.13	5
	Body 2475	e'	50.6200	Relative Permittivity (ε_r):	50.62	52.67	-3.89	5
		e"	14.9400	Conductivity (σ):	2.06	1.99	3.57	5
9/15/2013	Body 2450	e'	54.0300	Relative Permittivity (ε_r):	54.03	52.70	2.52	5
		e"	14.3400	Conductivity (σ):	1.95	1.95	0.18	5
	Body 2410	e'	54.1800	Relative Permittivity (ε_r):	54.18	52.76	2.69	5
		e"	14.1700	Conductivity (σ):	1.90	1.91	-0.45	5
	Body 2475	e'	53.9500	Relative Permittivity (ε_r):	53.95	52.67	2.43	5
		e"	14.4500	Conductivity (σ):	1.99	1.99	0.17	5
9/25/2013	Body 2450	e'	52.7600	Relative Permittivity (ε_r):	52.76	52.70	0.11	5
		e"	14.6700	Conductivity (σ):	2.00	1.95	2.49	5
	Body 2410	e'	52.9400	Relative Permittivity (ε_r):	52.94	52.76	0.34	5
		e"	14.5200	Conductivity (σ):	1.95	1.91	2.01	5
	Body 2475	e'	52.7000	Relative Permittivity (ε_r):	52.70	52.67	0.06	5
		e"	14.8300	Conductivity (σ):	2.04	1.99	2.81	5
9/26/2013	Body 5180	e'	47.6500	Relative Permittivity (ε_r):	47.65	49.05	-2.85	5
		e"	18.8300	Conductivity (σ):	5.42	5.27	2.89	5
	Body 5200	e'	47.6700	Relative Permittivity (ε_r):	47.67	49.02	-2.75	5
		e"	18.8300	Conductivity (σ):	5.44	5.29	2.83	5
	Body 5600	e'	46.9400	Relative Permittivity (ε_r):	46.94	48.48	-3.17	5
		e"	19.1400	Conductivity (σ):	5.96	5.76	3.45	5
	Body 5800	e'	46.6600	Relative Permittivity (ε_r):	46.66	48.20	-3.20	5
		e"	19.3600	Conductivity (σ):	6.24	6.00	4.06	5
	Body 5825	e'	46.6200	Relative Permittivity (ε_r):	46.62	48.20	-3.28	5
		e"	19.3700	Conductivity (σ):	6.27	6.00	4.56	5

SAR Room 2

	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
8/18/2013	Body 5180	e'	47.8400	Relative Permittivity (ϵ_r):	47.84	49.05	-2.46	5
		e''	18.1800	Conductivity (σ):	5.24	5.27	-0.67	5
	Body 5200	e'	47.7900	Relative Permittivity (ϵ_r):	47.79	49.02	-2.51	5
		e''	18.2100	Conductivity (σ):	5.27	5.29	-0.56	5
	Body 5600	e'	47.1500	Relative Permittivity (ϵ_r):	47.15	48.48	-2.74	5
		e''	18.6100	Conductivity (σ):	5.79	5.76	0.59	5
	Body 5800	e'	46.7600	Relative Permittivity (ϵ_r):	46.76	48.20	-2.99	5
		e''	18.8200	Conductivity (σ):	6.07	6.00	1.16	5
	Body 5825	e'	46.6900	Relative Permittivity (ϵ_r):	46.69	48.20	-3.13	5
		e''	18.8600	Conductivity (σ):	6.11	6.00	1.81	5
9/3/2013	Body 5180	e'	47.4400	Relative Permittivity (ϵ_r):	47.44	49.05	-3.28	5
		e''	18.2200	Conductivity (σ):	5.25	5.27	-0.45	5
	Body 5200	e'	47.3900	Relative Permittivity (ϵ_r):	47.39	49.02	-3.32	5
		e''	18.1700	Conductivity (σ):	5.25	5.29	-0.78	5
	Body 5600	e'	46.6000	Relative Permittivity (ϵ_r):	46.60	48.48	-3.87	5
		e''	18.5500	Conductivity (σ):	5.78	5.76	0.26	5
	Body 5800	e'	46.1900	Relative Permittivity (ϵ_r):	46.19	48.20	-4.17	5
		e''	18.6900	Conductivity (σ):	6.03	6.00	0.46	5
	Body 5825	e'	46.1700	Relative Permittivity (ϵ_r):	46.17	48.20	-4.21	5
		e''	18.8500	Conductivity (σ):	6.11	6.00	1.75	5
9/6/2013	Body 5180	e'	48.5500	Relative Permittivity (ϵ_r):	48.55	49.05	-1.01	5
		e''	18.4000	Conductivity (σ):	5.30	5.27	0.54	5
	Body 5200	e'	48.4400	Relative Permittivity (ϵ_r):	48.44	49.02	-1.18	5
		e''	18.3800	Conductivity (σ):	5.31	5.29	0.37	5
	Body 5600	e'	47.8900	Relative Permittivity (ϵ_r):	47.89	48.48	-1.21	5
		e''	18.9200	Conductivity (σ):	5.89	5.76	2.26	5
	Body 5800	e'	47.4400	Relative Permittivity (ϵ_r):	47.44	48.20	-1.58	5
		e''	19.1400	Conductivity (σ):	6.17	6.00	2.88	5
	Body 5825	e'	47.4500	Relative Permittivity (ϵ_r):	47.45	48.20	-1.56	5
		e''	19.2000	Conductivity (σ):	6.22	6.00	3.64	5
9/10/2013	Body 5180	e'	47.9700	Relative Permittivity (ϵ_r):	47.97	49.05	-2.20	5
		e''	18.2100	Conductivity (σ):	5.24	5.27	-0.50	5
	Body 5200	e'	47.9700	Relative Permittivity (ϵ_r):	47.97	49.02	-2.14	5
		e''	18.2500	Conductivity (σ):	5.28	5.29	-0.34	5
	Body 5600	e'	47.3000	Relative Permittivity (ϵ_r):	47.30	48.48	-2.43	5
		e''	18.6200	Conductivity (σ):	5.80	5.76	0.64	5
	Body 5800	e'	47.0100	Relative Permittivity (ϵ_r):	47.01	48.20	-2.47	5
		e''	18.8700	Conductivity (σ):	6.09	6.00	1.43	5
	Body 5825	e'	46.9500	Relative Permittivity (ϵ_r):	46.95	48.20	-2.59	5
		e''	18.9300	Conductivity (σ):	6.13	6.00	2.19	5
9/13/2013	Body 5180	e'	48.6400	Relative Permittivity (ϵ_r):	48.64	49.05	-0.83	5
		e''	18.5000	Conductivity (σ):	5.33	5.27	1.08	5
	Body 5200	e'	48.5300	Relative Permittivity (ϵ_r):	48.53	49.02	-1.00	5
		e''	18.5200	Conductivity (σ):	5.35	5.29	1.14	5
	Body 5600	e'	47.8800	Relative Permittivity (ϵ_r):	47.88	48.48	-1.23	5
		e''	19.0100	Conductivity (σ):	5.92	5.76	2.75	5
	Body 5800	e'	47.4200	Relative Permittivity (ϵ_r):	47.42	48.20	-1.62	5
		e''	19.1400	Conductivity (σ):	6.17	6.00	2.88	5
	Body 5825	e'	47.4300	Relative Permittivity (ϵ_r):	47.43	48.20	-1.60	5
		e''	19.2500	Conductivity (σ):	6.23	6.00	3.91	5

SAR Room 2

	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
9/17/2013	Body 5180	e'	47.9200	Relative Permittivity (ϵ_r):	47.92	49.05	-2.30	5
		e''	18.4600	Conductivity (σ):	5.32	5.27	0.86	5
	Body 5200	e'	47.9300	Relative Permittivity (ϵ_r):	47.93	49.02	-2.22	5
		e''	18.5000	Conductivity (σ):	5.35	5.29	1.03	5
	Body 5600	e'	47.2100	Relative Permittivity (ϵ_r):	47.21	48.48	-2.62	5
		e''	18.9000	Conductivity (σ):	5.89	5.76	2.15	5
	Body 5800	e'	46.9100	Relative Permittivity (ϵ_r):	46.91	48.20	-2.68	5
		e''	19.0900	Conductivity (σ):	6.16	6.00	2.61	5
	Body 5825	e'	46.8700	Relative Permittivity (ϵ_r):	46.87	48.20	-2.76	5
		e''	19.1200	Conductivity (σ):	6.19	6.00	3.21	5

SAR Room 3

	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
8/20/2013	Body 2450	e'	51.4000	Relative Permittivity (ϵ_r):	51.40	52.70	-2.47	5
		e''	14.6700	Conductivity (σ):	2.00	1.95	2.49	5
	Body 2410	e'	51.5600	Relative Permittivity (ϵ_r):	51.56	52.76	-2.27	5
		e''	14.4900	Conductivity (σ):	1.94	1.91	1.79	5
	Body 2475	e'	51.2900	Relative Permittivity (ϵ_r):	51.29	52.67	-2.62	5
		e''	14.7700	Conductivity (σ):	2.03	1.99	2.39	5
8/28/2013	Body 1750	e'	52.1800	Relative Permittivity (ϵ_r):	52.18	53.44	-2.36	5
		e''	15.6400	Conductivity (σ):	1.52	1.49	2.40	5
	Body 1710	e'	52.3200	Relative Permittivity (ϵ_r):	52.32	53.54	-2.29	5
		e''	15.5500	Conductivity (σ):	1.48	1.46	1.16	5
	Body 1755	e'	52.1700	Relative Permittivity (ϵ_r):	52.17	53.43	-2.35	5
		e''	15.6600	Conductivity (σ):	1.53	1.49	2.61	5
9/3/2013	Body 1750	e'	53.4800	Relative Permittivity (ϵ_r):	53.48	53.44	0.07	5
		e''	14.9300	Conductivity (σ):	1.45	1.49	-2.25	5
	Body 1710	e'	53.5700	Relative Permittivity (ϵ_r):	53.57	53.54	0.05	5
		e''	14.8600	Conductivity (σ):	1.41	1.46	-3.33	5
	Body 1755	e'	53.4800	Relative Permittivity (ϵ_r):	53.48	53.43	0.10	5
		e''	14.9600	Conductivity (σ):	1.46	1.49	-1.97	5
9/6/2013	Body 1900	e'	52.6900	Relative Permittivity (ϵ_r):	52.69	53.30	-1.14	5
		e''	14.2000	Conductivity (σ):	1.50	1.52	-1.30	5
	Body 1850	e'	52.8600	Relative Permittivity (ϵ_r):	52.86	53.30	-0.83	5
		e''	14.1100	Conductivity (σ):	1.45	1.52	-4.51	5
	Body 1910	e'	52.6500	Relative Permittivity (ϵ_r):	52.65	53.30	-1.22	5
		e''	14.2200	Conductivity (σ):	1.51	1.52	-0.65	5
9/9/2013	Body 750	e'	54.5800	Relative Permittivity (ϵ_r):	54.58	55.55	-1.74	5
		e''	23.1700	Conductivity (σ):	0.97	0.96	0.33	5
	Body 710	e'	55.0400	Relative Permittivity (ϵ_r):	55.04	55.70	-1.18	5
		e''	23.5700	Conductivity (σ):	0.93	0.96	-3.07	5
	Body 790	e'	54.2000	Relative Permittivity (ϵ_r):	54.20	55.39	-2.15	5
		e''	22.8600	Conductivity (σ):	1.00	0.97	3.93	5
9/10/2013	Body 1900	e'	52.5200	Relative Permittivity (ϵ_r):	52.52	53.30	-1.46	5
		e''	14.1900	Conductivity (σ):	1.50	1.52	-1.37	5
	Body 1850	e'	52.7000	Relative Permittivity (ϵ_r):	52.70	53.30	-1.13	5
		e''	14.1400	Conductivity (σ):	1.45	1.52	-4.31	5
	Body 1910	e'	52.5000	Relative Permittivity (ϵ_r):	52.50	53.30	-1.50	5
		e''	14.2000	Conductivity (σ):	1.51	1.52	-0.79	5

	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
9/13/2013	Body 1750	e'	51.8000	Relative Permittivity (ϵ_r):	51.80	53.44	-3.07	5
		e''	15.1400	Conductivity (σ):	1.47	1.49	-0.87	5
	Body 1710	e'	51.8800	Relative Permittivity (ϵ_r):	51.88	53.54	-3.11	5
		e''	15.0300	Conductivity (σ):	1.43	1.46	-2.22	5
	Body 1755	e'	51.7000	Relative Permittivity (ϵ_r):	51.70	53.43	-3.23	5
		e''	15.2500	Conductivity (σ):	1.49	1.49	-0.07	5

SAR Room 4

	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
9/6/2013	Body 1750	e'	52.6800	Relative Permittivity (ϵ_r):	52.68	53.44	-1.42	5
		e''	15.1200	Conductivity (σ):	1.47	1.49	-1.00	5
	Body 1710	e'	52.8500	Relative Permittivity (ϵ_r):	52.85	53.54	-1.30	5
		e''	15.0100	Conductivity (σ):	1.43	1.46	-2.35	5
	Body 1755	e'	52.6600	Relative Permittivity (ϵ_r):	52.66	53.43	-1.44	5
		e''	15.1700	Conductivity (σ):	1.48	1.49	-0.60	5
9/9/2013	Body 835	e'	55.0600	Relative Permittivity (ϵ_r):	55.06	55.20	-0.25	5
		e''	21.7600	Conductivity (σ):	1.01	0.97	4.15	5
	Body 820	e'	55.2000	Relative Permittivity (ϵ_r):	55.20	55.28	-0.14	5
		e''	21.8300	Conductivity (σ):	1.00	0.97	2.77	5
	Body 850	e'	54.9000	Relative Permittivity (ϵ_r):	54.90	55.16	-0.47	5
		e''	21.6700	Conductivity (σ):	1.02	0.99	3.75	5
9/12/2013	Body 750	e'	54.5800	Relative Permittivity (ϵ_r):	54.58	55.55	-1.74	5
		e''	23.1700	Conductivity (σ):	0.97	0.96	0.33	5
	Body 710	e'	55.0400	Relative Permittivity (ϵ_r):	55.04	55.70	-1.18	5
		e''	23.5700	Conductivity (σ):	0.93	0.96	-3.07	5
	Body 790	e'	54.2000	Relative Permittivity (ϵ_r):	54.20	55.39	-2.15	5
		e''	22.8600	Conductivity (σ):	1.00	0.97	3.93	5

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	1019	03/05/2013	750	1g	8.50	8.68
				10g	5.59	5.75
D835V2	4d117	5/28/2013	835	1g	9.54	9.40
				10g	6.21	6.16
D1750V2	1050	04/20/2013	1750	1g	36.5	37.1
				10g	19.4	20.1
D1900V2	5d140	4/18/2013	1900	1g	41.2	41.5
				10g	21.5	22.0
D2450V2	706	5/29/2013	2450	1g	53.7	49.9
				10g	25.0	23.3
D2450V2	899	10/5/2012	2450	1g	53.6	51.7
				10g	25.0	24.3
D5GHzV2	1138	10/09/2012	5.2	1g	79.5	73.2
				10g	22.8	20.4
			5.5	1g	83.6	77.9
				10g	23.8	21.7
			5.8	1g	78.7	72.8
				10g	22.4	20.1

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 %	Plot No.
	Type	Serial #			Area Scan	Zoom Scan	Normalize to 1 W			
9/3/2013	D2450V2	706	Body	1g	5.18	5.18	51.80	49.90	3.81	
				10g	2.24	2.39	23.90	23.30	2.58	
9/4/2013	D5GHZV2 (5.2)	1138	Body	1g	5.82	7.36	73.60	73.20	0.55	1,2
				10g	1.69	2.11	21.10	20.40	3.43	
9/4/2013	D5GHZV2 (5.5)	1138	Body	1g	6.14	7.97	79.70	77.90	2.31	3,4
				10g	1.79	2.29	22.90	21.70	5.53	
9/4/2013	D5GHZV2 (5.6)	1138	Body	1g	6.30	8.11	81.10	77.90	4.11	5,6
				10g	1.80	2.31	23.10	21.70	6.45	
9/4/2013	D5GHZV2 (5.8)	1138	Body	1g	5.32	7.11	71.10	72.80	-2.34	
				10g	1.53	2.01	20.10	20.10	0.00	
9/6/2013	D2450V2	706	Body	1g	5.00	5.03	50.30	49.90	0.80	
				10g	2.17	2.31	23.10	23.30	-0.86	
9/15/2013	D2450V2	706	Body	1g	4.74	4.79	47.90	49.90	-4.01	9,10
				10g	2.06	2.21	22.10	23.30	-5.15	
9/25/2013	D2450V2	706	Body	1g	5.02	5.04	50.40	49.90	1.00	
				10g	2.19	2.31	23.10	23.30	-0.86	
9/26/2013	D5GHZV2 (5.8)	1138	Body	1g	7.35	7.83	78.30	72.80	7.55	7,8
				10g	2.00	2.20	22.00	20.10	9.45	

SAR Room 2

Date Tested	System Dipole		T.S. Liquid		Measured Results			Target (Ref. Value)	Delta ±10 %	Plot No.
	Type	Serial #			Area Scan	Zoom Scan	Normalize to 1 W			
8/18/2013	D5GHZV2 (5.2)	1138	Body	1g	7.21	7.45	74.50	73.20	1.78	
				10g	1.96	2.11	21.10	20.40	3.43	
8/18/2013	D5GHZV2 (5.5)	1138	Body	1g	7.76	8.08	80.80	77.90	3.72	
				10g	2.11	2.28	22.80	21.70	5.07	
8/18/2013	D5GHZV2 (5.6)	1138	Body	1g	7.50	7.88	78.80	77.90	1.16	
				10g	2.02	2.20	22.00	21.70	1.38	
8/18/2013	D5GHZV2 (5.8)	1138	Body	1g	6.45	6.87	68.70	72.80	-5.63	11,12
				10g	1.77	1.94	19.40	20.10	-3.48	
9/3/2013	D5GHZV2 (5.2)	1138	Body	1g	7.51	7.77	77.70	73.20	6.15	13,14
				10g	2.09	2.19	21.90	20.40	7.35	
9/3/2013	D5GHZV2 (5.5)	1138	Body	1g	8.00	8.33	83.30	77.90	6.93	
				10g	2.23	2.36	23.60	21.70	8.76	
9/3/2013	D5GHZV2 (5.6)	1138	Body	1g	8.01	8.37	83.70	77.90	7.45	
				10g	2.21	2.34	23.40	21.70	7.83	
9/3/2013	D5GHZV2 (5.8)	1138	Body	1g	6.79	7.11	71.10	72.80	-2.34	
				10g	1.90	2.01	20.10	20.10	0.00	
9/6/2013	D5GHZV2 (5.2)	1138	Body	1g	7.47	7.77	77.70	73.20	6.15	
				10g	2.08	2.20	22.00	20.40	7.84	
9/6/2013	D5GHZV2 (5.5)	1138	Body	1g	7.75	8.15	81.50	77.90	4.62	
				10g	2.15	2.31	23.10	21.70	6.45	

Date Tested	System Dipole		T.S. Liquid		Measured Results			Target (Ref. Value)	Delta ±10 %	Plot No.
	Type	Serial #			Area Scan	Zoom Scan	Normalize to 1 W			
9/6/2013	D5GHZV2 (5.6)	1138	Body	1g	7.80	8.28	82.80	77.90	6.29	
				10g	2.15	2.32	23.20	21.70	6.91	
9/6/2013	D5GHZV2 (5.8)	1138	Body	1g	6.85	7.33	73.30	72.80	0.69	
				10g	1.91	2.07	20.70	20.10	2.99	
9/10/2013	D5GHZV2 (5.2)	1138	Body	1g	6.88	7.14	71.40	73.20	-2.46	
				10g	2.00	2.00	20.00	20.40	-1.96	
9/10/2013	D5GHZV2 (5.5)	1138	Body	1g	8.10	7.51	75.10	77.90	-3.59	
				10g	2.33	2.15	21.50	21.70	-0.92	
9/10/2013	D5GHZV2 (5.6)	1138	Body	1g	6.72	8.27	82.70	77.90	6.16	
				10g	1.94	2.36	23.60	21.70	8.76	
9/10/2013	D5GHZV2 (5.8)	1138	Body	1g	6.96	7.55	75.50	72.80	3.71	
				10g	2.03	2.18	21.80	20.10	8.46	
9/13/2013	D5GHZV2 (5.2)	1138	Body	1g	7.31	7.77	77.70	73.20	6.15	
				10g	2.06	2.20	22.00	20.40	7.84	
9/13/2013	D5GHZV2 (5.5)	1138	Body	1g	7.90	8.17	81.70	77.90	4.88	
				10g	2.21	2.31	23.10	21.70	6.45	
9/13/2013	D5GHZV2 (5.6)	1138	Body	1g	7.86	8.10	81.00	77.90	3.98	
				10g	2.19	2.27	22.70	21.70	4.61	
9/13/2013	D5GHZV2 (5.8)	1138	Body	1g	7.32	7.66	76.60	72.80	5.22	
				10g	2.07	2.17	21.70	20.10	7.96	
9/17/2013	D5GHZV2 (5.2)	1138	Body	1g	7.19	7.59	75.90	73.20	3.69	
				10g	2.06	2.15	21.50	20.40	5.39	
9/17/2013	D5GHZV2 (5.5)	1138	Body	1g	7.87	8.34	83.40	77.90	7.06	15,16
				10g	2.23	2.36	23.60	21.70	8.76	
9/17/2013	D5GHZV2 (5.6)	1138	Body	1g	7.87	8.39	83.90	77.90	7.70	17,18
				10g	2.22	2.35	23.50	21.70	8.29	
9/17/2013	D5GHZV2 (5.8)	1138	Body	1g	6.50	7.05	70.50	72.80	-3.16	
				10g	1.85	1.99	19.90	20.10	-1.00	

SAR Room 3

Date Tested	System Dipole		T.S. Liquid		Measured Results			Target (Ref. Value)	Delta ±10 %	Plot No.
	Type	Serial #			Area Scan	Zoom Scan	Normalize to 1 W			
8/20/2013	D2450V2	899	Body	1g	5.53	5.27	52.70	51.70	1.93	19,20
				10g	2.39	2.45	24.50	24.30	0.82	
8/28/2013	D1750V2	1050	Body	1g	3.89	3.82	38.20	37.10	2.96	
				10g	2.05	2.05	20.50	20.10	1.99	
9/3/2013	D1750V2	1050	Body	1g	3.89	3.85	38.50	37.10	3.77	21,22
				10g	2.05	2.06	20.60	20.10	2.49	
9/6/2013	D1900V2	5d140	Body	1g	3.89	3.88	38.80	41.50	-6.51	23,24
				10g	1.98	2.04	20.40	22.00	-7.27	
9/9/2013	D750V2	1019	Body	1g	0.90	0.88	8.84	8.68	1.84	25,26
				10g	0.61	0.59	5.86	5.75	1.91	
9/10/2013	D1900V2	5d140	Body	1g	3.87	3.97	39.70	41.50	-4.34	
				10g	1.96	2.09	20.90	22.00	-5.00	
9/13/2013	D1750V2	1050	Body	1g	3.73	3.72	37.20	37.10	0.27	
				10g	1.96	1.99	19.90	20.10	-1.00	

SAR Room 4

Date Tested	System Dipole		T.S. Liquid		Measured Results			Target (Ref. Value)	Delta ±10 %	Plot No.
	Type	Serial #			Area Scan	Zoom Scan	Normalize to 1 W			
9/6/2013	D1750V2	1050	Body	1g	3.79	3.75	37.50	37.10	1.08	27,28
				10g	1.97	2.02	20.20	20.10	0.50	
9/9/2013	D835V2	4d117	Body	1g	0.99	0.986	9.86	9.40	4.89	29,30
				10g	0.65	0.649	6.49	6.16	5.36	
9/12/2013	D750V2	1019	Body	1g	0.92	0.91	9.06	8.68	4.38	31,32
				10g	0.63	0.60	5.98	5.75	4.00	

12. SAR Test Results

12.1. GSM850

Test Position	Mode	Pwr Back-off	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Rear	GPRS2 slots	on	0	190	836.6	28.0	28.0	0.734	0.734	
Edge 1	GPRS 2 slots	on	0	190	836.6	28.0	28.0	0.369	0.369	
Edge 2	GPRS 2 slots	on	0	190	836.6	28.0	28.0	0.341	0.341	
Rear/Edge 1 slant	GPRS 2 slots	on	0	128	824.2	28.0	27.9	0.622	0.636	
				190	836.6	28.0	28.0	0.706	0.706	
				251	848.8	28.0	28.0	0.950	0.950	
Rear/Edge 2 slant	GPRS 2 slots	on	0	128	824.2	28.0	27.9	0.731	0.748	
				190	836.6	28.0	28.0	0.754	0.754	
				251	848.8	28.0	28.0	0.954	0.954	
Edge 1	GPRS 2 slots	off	12	190	836.6	32.0	31.8	0.336	0.352	
Edge 2	GPRS 2 slots	off	6	190	836.6	32.0	31.8	0.342	0.358	
Rear/Edge 1 slant	GPRS 2 slots	off	12	190	836.6	32.0	31.8	0.469	0.491	
Rear/Edge 2 slant	GPRS 2 slots	off	6	128	824.2	32.0	31.7	1.090	**1.168**	1
				190	836.6	32.0	31.8	1.050	1.099	
				251	848.8	32.0	31.8	0.925	0.969	

Note(s):

1. 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

12.2. GSM1900

Test Position	Mode	Pwr Back-off	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Rear	GPRS 2 slots	on	0	661	1880.0	23.5	23.5	0.657	0.657	
Edge 1	GPRS 2 slots	on	0	661	1880.0	23.5	23.5	0.665	0.665	
Edge 2	GPRS 2 slots	on	0	661	1880.0	23.5	23.5	0.260	0.260	
Rear/Edge 1 slant	GPRS 2 slots	on	0	512	1850.2	23.5	23.5	0.961	0.961	
				661	1880.0	23.5	23.5	0.978	0.978	
				810	1909.8	23.5	23.4	1.050	**1.074**	2
Rear/Edge 2 slant	GPRS 2 slots	on	0	512	1850.2	23.5	23.5	0.852	0.852	
				661	1880.0	23.5	23.5	0.920	0.920	
				810	1909.8	23.5	23.4	1.050	1.074	
Rear	GPRS 2 slots	off	6	661	1880.0	29.0	28.8	0.670	0.702	
Edge 1	GPRS 2 slots	off	12	661	1880.0	29.0	28.8	0.402	0.421	
Edge 2	GPRS 2 slots	off	6	661	1880.0	29.0	28.8	0.276	0.289	
Rear/Edge 1 slant	GPRS 2 slots	off	12	661	1880.0	29.0	28.8	0.411	0.430	
Rear/Edge 2 slant	GPRS 2 slots	off	6	512	1850.2	29.0	28.8	0.847	0.887	
				661	1880.0	29.0	28.8	0.770	0.806	
				810	1909.8	29.0	28.8	0.847	0.887	

Note(s):

1. 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

12.3. W-CDMA Band V

Test Position	Mode	Pwr Back-off	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Rear	R99, RMC	on	0	4183	836.6	20.5	20.5	0.672	0.672	
Edge 1	R99, RMC	on	0	4183	836.6	20.5	20.5	0.375	0.375	
Edge 2	R99, RMC	on	0	4183	836.6	20.5	20.5	0.475	0.475	
Rear/Edge 1 slant	R99, RMC	on	0	4183	836.6	20.5	20.5	0.524	0.524	
Rear/Edge 2 slant	R99, RMC	on	0	4132	826.4	20.5	20.3	0.914	**0.957**	3
				4183	836.6	20.5	20.5	0.741	0.741	
				4233	846.6	20.5	20.4	0.800	0.819	
Edge 1	R99, RMC	off	12	4183	836.6	23.5	23.3	0.156	0.163	
Edge 2	R99, RMC	off	6	4183	836.6	23.5	23.3	0.265	0.277	
Rear/Edge 1 slant	R99, RMC	off	12	4183	836.6	23.5	23.3	0.286	0.299	
Rear/Edge 2 slant	R99, RMC	off	6	4183	836.6	23.5	23.3	0.571	0.598	

Note(s):

1. 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

12.4. W-CDMA Band II

Test Position	Mode	Pwr Back-off	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Rear	R99, RMC	on	0	9400	1880.0	16.5	16.2	0.560	0.600	
Edge 1	R99, RMC	on	0	9400	1880.0	16.5	16.2	0.434	0.465	
Edge 2	R99, RMC	on	0	9400	1880.0	16.5	16.2	0.255	0.273	
Rear/Edge 1 slant	R99, RMC	on	0	9262	1852.4	16.5	16.3	0.690	0.723	
				9400	1880.0	16.5	16.2	0.788	0.844	
				9538	1907.6	16.5	16.2	0.809	0.867	
Rear/Edge 2 slant	R99, RMC	on	0	9262	1852.4	16.5	16.3	0.709	0.742	
				9400	1880.0	16.5	16.2	0.879	0.942	
				9538	1907.6	16.5	16.2	0.943	1.010	
Edge 1	R99, RMC	off	12	9400	1880.0	23.5	23.0	0.533	0.599	
Edge 2	R99, RMC	off	6	9400	1880.0	23.5	23.0	0.359	0.404	
Rear/Edge 1 slant	R99, RMC	off	12	9400	1880.0	23.5	23.0	0.548	0.616	
Rear/Edge 2 slant	R99, RMC	off	6	9262	1852.4	23.5	23.1	0.965	1.070	
				9400	1880.0	23.5	23.0	0.999	1.123	
				9538	1907.6	23.5	23.0	1.020	**1.150**	4

Note(s):

1. 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

12.5. LTE Band 4 (BW=20 MHz)

Test Position	Mode	Pwr Back-off	Dist. (mm)	Ch #.	Freq. (MHz)	RB Allocation	RB offest	Power (dBm)		1-g SAR (W/kg)		Plot No.
								Tune-up limit	Meas.	Meas.	Scaled	
Rear	QPSK	on	0	20175	1732.5	1	49	17.0	16.9	0.697	0.713	
						50	24	17.0	16.7	0.701	0.751	
Edge 1	QPSK	on	0	20050	1720.0	1	49	17.0	16.6	0.953	1.045	
						50	24	17.0	16.7	0.901	0.965	
				20175	1732.5	1	49	17.0	16.9	0.954	0.976	
						50	24	17.0	16.7	0.950	1.018	
						100	0	17.0	16.7	0.994	1.065	
				20300	1745.0	1	49	17.0	16.8	1.020	1.068	
						50	24	17.0	16.6	1.020	1.118	
Edge 2	QPSK	on	0	20175	1732.5	1	49	17.0	16.9	0.123	0.126	
						50	24	17.0	16.7	0.125	0.134	
Rear/Edge 1 slant	QPSK	on	0	20050	1720.0	1	49	17.0	16.6	1.010	1.107	
						50	24	17.0	16.7	1.010	1.082	
				20175	1732.5	1	49	17.0	16.9	1.020	1.044	
						50	24	17.0	16.7	1.060	1.136	
						100	0	17.0	16.7	0.936	1.003	
				20300	1745.0	1	49	17.0	16.8	1.120	**1.173**	5
						50	24	17.0	16.6	1.060	1.162	
Rear/Edge 2 slant	QPSK	on	0	20175	1732.5	1	49	17.0	16.9	0.408	0.418	
						50	24	17.0	16.7	0.403	0.432	
Edge 1	QPSK	off	12	20050	1720.0	1	49	24.5	24.3	0.637	0.667	
				20175	1732.5	1	49	24.5	24.3	0.808	0.846	
						50	24	23.5	23.1	0.588	0.645	
				20300	1745.0	1	49	24.5	24.4	1.100	1.126	
Edge 2	QPSK	off	6	20175	1732.5	1	49	24.5	24.3	0.236	0.247	
						50	24	23.5	23.1	0.172	0.189	
Rear/Edge 1 slant	QPSK	off	12	20050	1720.0	1	49	24.5	24.3	0.545	0.571	
						50	24	23.5	23.1	0.400	0.439	
				20175	1732.5	1	49	24.5	24.3	0.663	0.694	
						50	24	23.5	23.1	0.485	0.532	
				20300	1745.0	1	49	24.5	24.4	0.942	0.964	
						50	24	23.5	23.0	0.686	0.770	
Rear/Edge 2 slant	QPSK	off	6	20050	1720.0	1	49	24.5	24.3	0.726	0.760	
				20175	1732.5	1	49	24.5	24.3	0.790	0.827	
						50	24	23.5	23.1	0.644	0.706	
				20300	1745.0	1	49	24.5	24.4	0.919	0.940	

Note(s):

1. 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
2. Per KDB 941225 D05 SAR for LTE Devices, SAR test reduction is applied using the following criteria:
   - Testing for Low and High Channel 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.

12.6. LTE Band 13 (BW=10 MHz)

Test Position	Mode	Pwr Back-off	Dist. (mm)	Ch #.	Freq. (MHz)	RB Allocation	RB offest	Power (dBm)		1-g SAR (W/kg)		Plot No.
								Tune-up limit	Meas.	Meas.	Scaled	
Rear	QPSK	on	0	23230	782.0	1	49	20.5	20.4	0.895	0.916	
						25	25	20.5	20.4	0.941	0.963	
						50	0	20.5	20.4	0.872	0.892	
Edge 1	QPSK	on	0	23230	782.0	1	49	20.5	20.4	0.287	0.294	
						25	25	20.5	20.4	0.277	0.283	
Edge 2	QPSK	on	0	23230	782.0	1	49	20.5	20.4	0.530	0.542	
						25	25	20.5	20.4	0.586	0.600	
Rear/Edge 1 slant	QPSK	on	0	23230	782.0	1	49	20.5	20.4	0.474	0.485	
						25	25	20.5	20.4	0.475	0.486	
Rear/Edge 2 slant	QPSK	on	0	23230	782.0	1	49	20.5	20.4	0.924	0.946	
						25	25	20.5	20.4	0.956	0.978	
						50	0	20.5	20.3	0.935	**0.979**	6
Edge 1	QPSK	off	12	23230	782.0	1	49	23.5	23.5	0.157	0.157	
						25	25	22.5	22.5	0.119	0.119	
Edge 2	QPSK	off	6	23230	782.0	1	49	23.5	23.5	0.430	0.430	
						25	25	22.5	22.5	0.363	0.363	
Rear/Edge 1 slant	QPSK	off	12	23230	782.0	1	49	23.5	23.5	0.267	0.267	
						25	25	22.5	22.5	0.221	0.221	
Rear/Edge 2 slant	QPSK	off	6	23230	782.0	1	49	23.5	23.5	0.795	0.795	
						25	25	22.5	22.5	0.657	0.657	

Note(s):

1. 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
2. Per KDB 941225 D05 SAR for LTE Devices, SAR test reduction is applied using the following criteria:
   - Testing for Low and High Channel 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 $\geq$ 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.

12.7. WiFi (DTS 2.4 and 5.8 GHz)

2.4 GHz Band

Test Position	Antenna	Mode	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
					Tune-up limit	Meas.	Meas.	Scaled	
Rear	WiFi 1	802.11b	1	2412	15.0	14.9	1.020	1.044	
			6	2437	15.0	15.0	0.939	0.939	
			11	2462	15.0	14.9	1.040	1.064	
Edge 1	WiFi 1	802.11b	6	2437	15.0	15.0	0.469	0.469	
Rear/edge 1 slant	WiFi 1	802.11b	1	2412	15.0	14.9	1.110	1.136	
			6	2437	15.0	15.0	1.060	1.060	
			11	2462	15.0	14.9	1.170	**1.197**	7
Test Position	Antenna	Mode	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
					Tune-up limit	Meas.	Meas.	Scaled	
Rear	WiFi 2	802.11b	1	2412	14.0	13.9	0.94	0.962	
			6	2437	14.0	14.0	0.971	0.971	
			11	2462	14.0	14.0	0.775	0.775	
Edge 3	WiFi 2	802.11b	6	2437	14.0	14.0	0.584	0.584	
Rear/edge 3 slant	WiFi 2	802.11b	1	2412	14.0	13.9	1.160	1.187	
			6	2437	14.0	14.0	1.190	1.190	
			11	2462	14.0	14.0	1.080	1.080	

5.8 GHz Band

Test Position	Antenna	Mode	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
					Tune-up limit	Meas.	Meas.	Scaled	
Rear	WiFi 1	802.11a	149	5745	13.0	13.0	0.320	0.320	
Edge 1	WiFi 1	802.11a	149	5745	13.0	13.0	0.758	0.758	
			153	5765	13.0	12.7	0.776	0.831	
			165	5825	13.0	12.5	0.644	0.723	
Rear/edge 1 slant	WiFi 1	802.11a	149	5745	13.0	13.0	0.695	0.695	
			153	5765	13.0	12.7	0.572	0.613	
			165	5825	13.0	12.5	0.547	0.614	
Test Position	Antenna	Mode	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
					Tune-up limit	Meas.	Meas.	Scaled	
Rear	WiFi 2	802.11a	161	5805	10.0	10.0	0.247	0.247	
Edge 3	WiFi 2	802.11a	161	5805	10.0	10.0	0.507	0.507	
Rear/edge 3 slant	WiFi 2	802.11a	149	5745	10.0	9.8	1.100	1.152	
			161	5805	10.0	10.0	1.180	**1.180**	8
			165	5825	10.0	10.0	1.090	1.090	

Note(s):

1. 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

12.8. WiFi (UNII 5.2, 5.3 and 5.5 GHz)

Test Position	Antenna	Mode	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
					Tune-up limit	Meas.	Meas.	Scaled	
Rear	WiFi 1	802.11a	36	5180	13.0	12.9	0.379	0.388	
			56	5280	13.0	12.8	0.426	0.446	
			104	5520	13.0	12.6	0.477	0.523	
			116	5580	13.0	12.6	0.446	0.489	
			140	5700	13.0	13.0	0.521	0.521	
Rear/edge 1 slant	WiFi 1	802.11a	36	5180	13.0	12.8	0.599	0.627	
			56	5280	13.0	12.8	0.435	0.456	
			104	5520	13.0	12.6	0.692	0.759	
			116	5580	13.0	12.6	0.589	0.646	
			140	5700	13.0	13.0	0.764	0.764	
Edge 1	WiFi 1	802.11a	36	5180	13.0	12.9	0.746	0.763	
			56	5280	13.0	12.8	0.643	0.673	
			104	5520	13.0	12.6	1.050	1.151	
			116	5580	13.0	12.6	0.686	0.752	
			140	5700	13.0	13.0	0.643	0.643	
Test Position	Antenna	Mode	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
					Tune-up limit	Meas.	Meas.	Scaled	
Rear	WiFi 2	802.11a	36	5180	9.5	9.5	0.311	0.311	
			56	5280	9.5	9.5	0.426	0.426	
			108	5540	10.0	10.0	0.358	0.358	
Rear/edge 3 slant	WiFi 2	802.11a	36	5180	9.5	9.5	1.060	1.060	
			48	5240	9.5	9.3	0.995	1.042	
			56	5280	9.5	9.5	1.110	1.110	
			64	5320	9.5	9.4	1.140	**1.167**	10
			108	5540	10.0	10.0	1.010	1.010	
			116	5580	10.0	9.9	1.140	1.167	
			136	5680	10.0	10.0	1.040	1.040	
Edge 3	WiFi 2	802.11a	36	5180	9.5	9.5	0.867	0.867	
			48	5240	9.5	9.3	1.090	1.141	
			56	5280	9.5	9.5	1.090	1.090	
			64	5320	9.5	9.4	0.839	0.859	
			108	5540	10.0	10.0	0.441	0.441	
			116	5580	10.0	9.9	0.452	0.463	
			136	5680	10.0	10.0	0.432	0.432	

Repeated Test

Test Position	Antenna	Mode	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
					Tune-up limit	Meas.	Meas.	Scaled	
Rear/edge 3 slant	WiFi 2	802.11a	36	5180	9.5	9.5	1.070	**1.070**	9
Rear/edge 3 slant	WiFi 2	802.11a	116	5580	10.0	9.9	1.150	**1.177**	11

Note(s):

1. 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

12.9. Bluetooth

Maximum tune-up tolerance limit is 5.5 dBm from the rated nominal maximum output power. This power level qualifies for exclusion of SAR testing.

Refer to Section 8.1.2. Standalone SAR Test Exclusion Considerations

13. SAR Measurement Variability

In accordance with published RF Exposure KDB procedure 865664 D01 SAR measurement 100 MHz to 6 GHz v01. 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	Stand-alone	Repeated SAR (Yes/No)
700	LTE Band 13	0.956 W/kg	Yes
850	GSM 850	1.090 W/kg	Yes
	W-CDMA Band V	0.914 W/kg	No
1700	LTE Band 4	1.120 W/kg	Yes
1900	GSM 1900	1.050 W/kg	Yes
	W-CDMA Band II	1.020 W/kg	No
2400	WiFi 802.11b	1.190 W/kg	Yes
5200	WiFi 802.11a	1.060 W/kg	Yes
5300	WiFi 802.11a	1.140 W/kg	Yes
5500	WiFi 802.11a	1.140 W/kg	Yes
5800	WiFi 802.11a	1.180 W/kg	Yes

13.2. Repeated Measurement Results

Frequency band	Test Position	Mode	Pwr Back-off	Dist. (mm)	Ch #.	Freq. (MHz)	Meas. SAR (W/kg)		Largest to Smallest SAR Ratio
							Original	Repeated	
LTE Band 13	Rear/Edge 2 slant	QPSK RB25/25	on	0	23230	782.0	0.956	0.949	1.01
GSM850	Rear/Edge 2 slant	GPRS 2 slots	off	6	810	1909.8	1.090	1.010	1.08
LTE Band 4	Rear/Edge 1 slant	QPSK RB1/49	on	0	20300	1745.0	1.120	1.080	1.04
GSM1900	Rear/Edge 1 slant	GPRS 2 slots	on	0	810	1909.8	1.050	0.978	1.07
Frequency band	Test Position	Mode	Antenna	Dist. (mm)	Ch #.	Freq. (MHz)	Meas. SAR (W/kg)		Largest to Smallest SAR Ratio
							Original	Repeated	
WiFi 2.4 GHz	Rear/Edge 3 slant	802.11b 1Mbps	WiFi 2	0	6	2437	1.190	1.160	1.03
WiFi 5.2 GHz	Rear/Edge 2 slant	802.11a 6Mbps	WiFi 2	0	36	5180	1.060	1.070	0.99
WiFi 5.3 GHz	Rear/Edge 2 slant	802.11a 6Mbps	WiFi 2	0	64	5320	1.140	1.100	1.04
WiFi 5.5 GHz	Rear/Edge 2 slant	802.11a 6Mbps	WiFi 2	0	116	5580	1.140	1.150	0.99
WiFi 5.8 GHz	Rear/Edge 2 slant	802.11a 6Mbps	WiFi 2	0	161	5805	1.180	1.080	1.09

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.

14. Simultaneous Transmission SAR Analysis

KDB 447498 D01 General RF Exposure Guidance v05, introduces a new formula for calculating the SAR to Peak Location Ratio (SPLSR) between pairs of simultaneously transmitting antennas:

$$SPLSR = (SAR_1 + SAR_2)^{1.5} / Ri$$

Where:

SAR_1 is the highest measured or estimated SAR for the first of a pair of simultaneous transmitting antennas, in a specific test operating mode and exposure condition

SAR_2 is the highest measured or estimated SAR for the second of a pair of simultaneous transmitting antennas, in the same test operating mode and exposure condition as the first

Ri is the separation distance between the pair of simultaneous transmitting antennas. When the SAR is measured, for both antennas in the pair, it is determined by the actual x, y and z coordinates in the 1-g SAR for each SAR peak location, based on the extrapolated and interpolated result in the zoom scan measurement, using the formula of $[(x_1-x_2)^2 + (y_1-y_2)^2 + (z_1-z_2)^2]$

A new threshold of 0.04 is also introduced in the draft KDB. Thus, in order for a pair of simultaneous transmitting antennas with the sum of 1-g SAR > 1.6 W/kg to qualify for exemption from Simultaneous Transmission SAR measurements, it has to satisfy the condition of:

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

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

14.1.1. Estimated SAR for WWAN

Antenna	Tx Interface	Freq. (MHz)	Output Power		Separation Distances (mm)						Estimated 1-g SAR Value (W/kg)					
			dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front
Full Power, Proximity Sensor Off. A sensor triggering of 6 mm is included for both Rear/Edge 2 slant and Edge 2. 12 mmis included for Rear/Edge 1 slant and Edge 1																
Cellular	GPRS 2 Slots	836.6	32.00	396	11	17	11	95	115		-MEASURE-	-MEASURE-	-MEASURE-	0.400	0.400	N/A
Cellular	GPRS 2 Slots	188	29.00	199	11	17	11	95	115		-MEASURE-	-MEASURE-	-MEASURE-	0.400	0.400	N/A
Cellular	W-CDMA V	836.6	23.50	224	11	17	11	95	115		-MEASURE-	-MEASURE-	-MEASURE-	0.400	0.400	N/A
Cellular	W-CDMA II	1880	23.50	224	11	17	11	95	115		-MEASURE-	-MEASURE-	-MEASURE-	0.400	0.400	N/A
Cellular	LTE Band 4	1732.5	24.50	282	11	17	11	95	115		-MEASURE-	-MEASURE-	-MEASURE-	0.400	0.400	N/A
Cellular	LTE Band 13	782	23.50	224	11	17	11	95	115		-MEASURE-	-MEASURE-	-MEASURE-	0.400	0.400	N/A

14.1.2. Estimated SAR for WiFi and Bluetooth

Antenna	Tx Interface	Freq. (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 1 / Bluetooth																
WiFi 1	2.4 GHz	2437	15.00	32	5	5	120	110	33		-MEASURE-	-MEASURE-	0.400	0.400	0.202	N/A
WiFi 1	5.2 GHz	5200	13.00	20	5	5	120	110	33		-MEASURE-	-MEASURE-	0.400	0.400	0.184	N/A
WiFi 1	5.3 GHz	5300	13.00	20	5	5	120	110	33		-MEASURE-	-MEASURE-	0.400	0.400	0.186	N/A
WiFi 1	5.5 GHz	5600	13.00	20	5	5	120	110	33		-MEASURE-	-MEASURE-	0.400	0.400	0.191	N/A
WiFi 1	5.8 GHz	5785	13.00	20	5	5	120	110	33		-MEASURE-	-MEASURE-	0.400	0.400	0.194	N/A
WiFi 1	Bluetooth	2441	5.50	4	5	5	120	110	33		0.167	0.167	0.400	0.400	0.025	N/A
Wi-Fi 2																
WiFi 2	2.4 GHz	2437	14.00	25	5	114	26	5.17	129		-MEASURE-	0.400	0.200	-MEASURE-	0.400	N/A
WiFi 2	5.2 GHz	5200	9.50	9	5	114	26	5.17	129		-MEASURE-	0.400	0.105	-MEASURE-	0.400	N/A
WiFi 2	5.3 GHz	5300	9.50	9	5	114	26	5.17	129		-MEASURE-	0.400	0.106	-MEASURE-	0.400	N/A
WiFi 2	5.5 GHz	5600	10.00	10	5	114	26	5.17	129		-MEASURE-	0.400	0.121	-MEASURE-	0.400	N/A
WiFi 2	5.8 GHz	5785	10.00	10	5	114	26	5.17	129		-MEASURE-	0.400	0.123	-MEASURE-	0.400	N/A

14.2. Sum of the SAR for GSM850, WiFi, and BT

RF Exposure condition	Test Position		Simultaneous Transmission Scenario						∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			GSM 850	WiFi 1 DTS Band	WiFi 2 DTS Band	WiFi 1 UNII Band	WiFi 2 UNII Band	Bluetooth		
Stand-alone	Rear	WWAN +WiFi (DTS)	0.734	1.064	0.971				2.769	**Yes**
		WWAN +WiFi (UNII)	0.734			0.523	0.426		1.683	**Yes**
		WWAN + BT	0.734					0.167	0.901	No
	Edge 1	WWAN +WiFi 1(DTS)	0.369	0.831					1.200	No
		WWAN +WiFi 1(UNII)	0.369			1.151			1.520	No
		WWAN + BT	0.369					0.167	0.536	No
	Edge 3	WWAN +WiFi 2(DTS)	0.400		0.584				0.984	No
		WWAN +WiFi 2(UNII)	0.400				1.141		1.541	No
	Rear/Edge 1 slant	WWAN +WiFi 1(DTS)	0.950	1.197					2.147	**Yes**
		WWAN +WiFi 1(UNII)	0.950			0.764			1.714	**Yes**
		WWAN + BT	0.950					0.167	1.117	No
	Rear/Edge 3 slant	WWAN +WiFi 2(DTS)	0.400		1.190				1.590	No
		WWAN +WiFi 2(UNII)	0.400				1.177		1.577	No

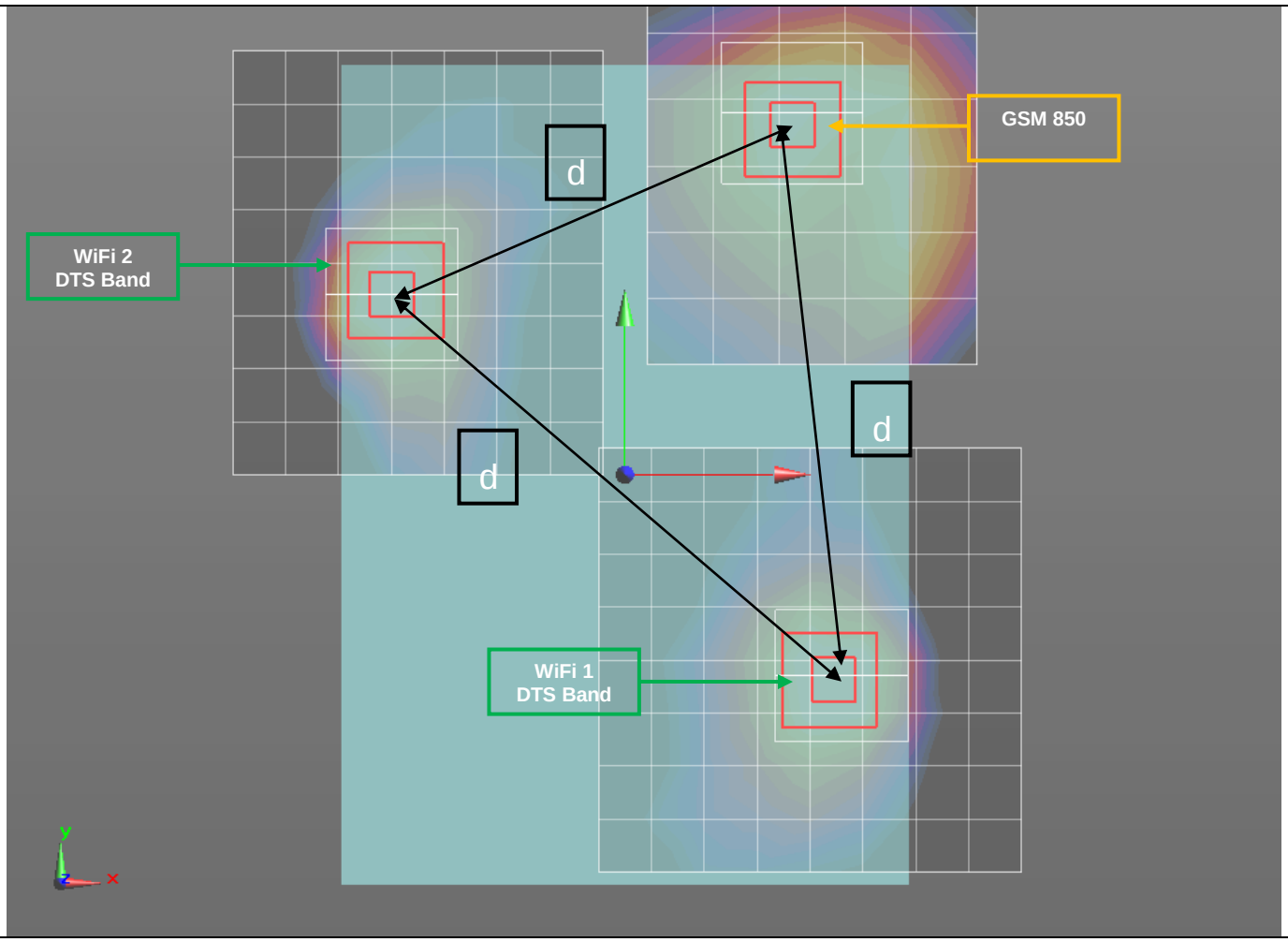
SAR to Peak Location Separation Ratio (SPLSR)

Case #	Test Position	Test Position	Worst-case combination					∑ 1-g SAR (mW/g)	Calculated distance (mm)	SPLSR (≤ 0.04)	Volume Scan (Yes/ No)	Figure
			GSM 850	WiFi 1 DTS Band	WiFi 2 DTS Band	WiFi 1 UNII Band	WiFi 2 UNII Band					
1	Rear	WWAN + WiFi(DTS)	0.734	1.064	0.971			2.769				1
		WWAN + WiFi 1(DTS)	0.734	1.064				1.798	128.1	0.019	No	
		WWAN + WiFi 2(DTS)	0.734		0.971			1.705	99.9	0.022	No	
		WiFi 1 + WiFi 2(DTS)		1.064	0.971			2.035	133.8	0.022	No	
		WWAN + WiFi(UNII)	0.734			0.523	0.426	1.683				2
		WWAN + WiFi 1(UNII)	0.734			0.523		1.257	129.7	0.011	No	
		WWAN + WiFi 2(UNII)	0.734				0.426	1.160	102.8	0.012	No	
		WiFi 1 + WiFi 2(UNII)				0.523	0.426	0.949	148.1	0.006	No	
	Rear/Edge 1 slant	WWAN +WiFi 1(DTS)	0.950	1.197				2.147	114.8	0.027	No	3
		WWAN +WiFi 1(UNII)	0.950			0.764		1.714	115.1	0.019	No	4

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.

Figure (1)



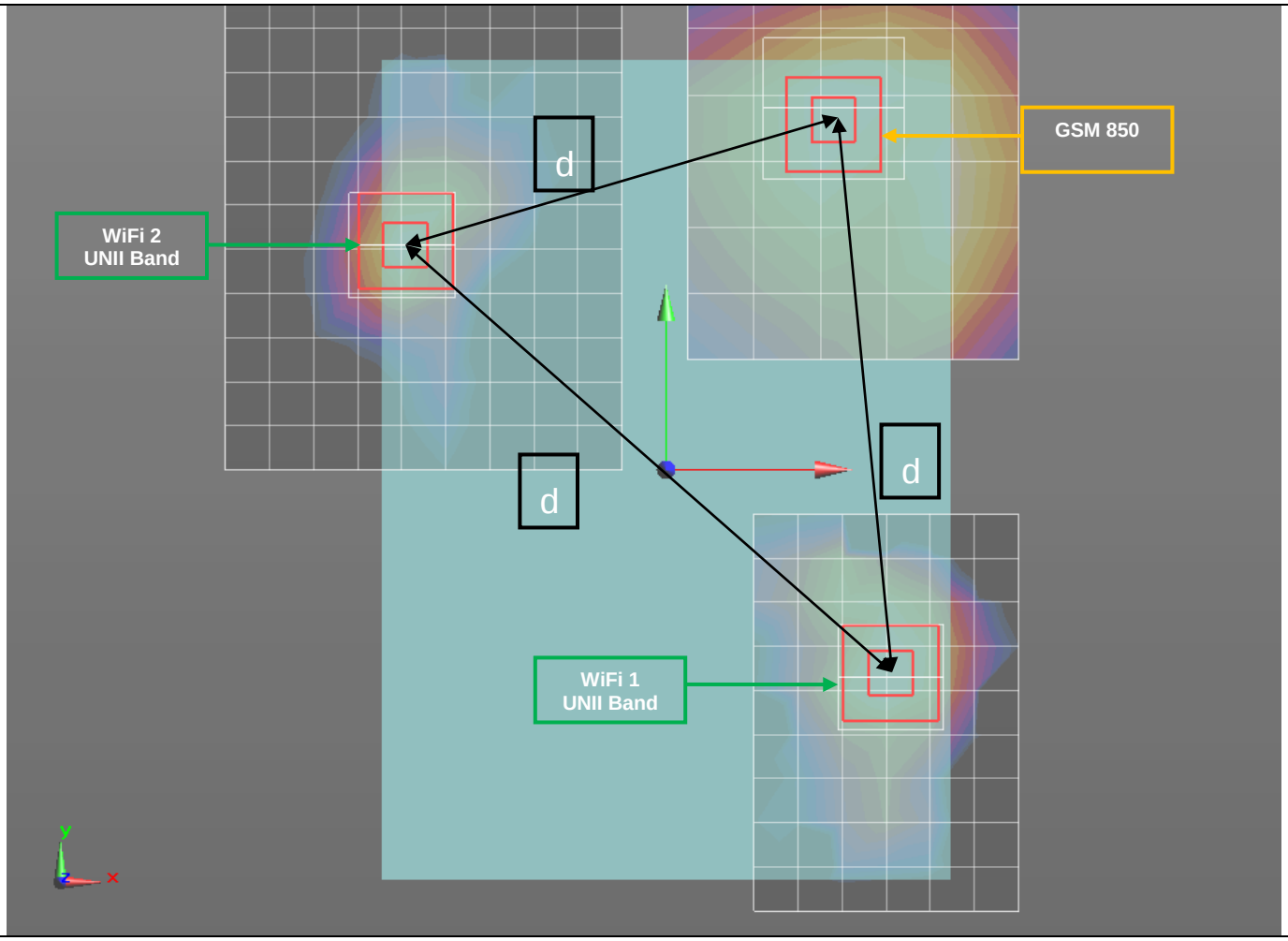
Mode	Peak SAR	X	Y	Z
	mW/g	m	m	m
GSM850	0.953	0.038	0.082	-0.183
WiFi 1 DTS Band	1.51	0.0492	-0.0456	-0.181
WiFi 2 DTS Band	1.48	-0.053	0.0408	-0.18

d: Calculated distance (mm)	WWAN + WiFi 1(DTS)	128.1
	WWAN + WiFi 2(DTS)	99.9
	WiFi 1 + WiFi 2(DTS)	133.8

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

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

Figure (2)



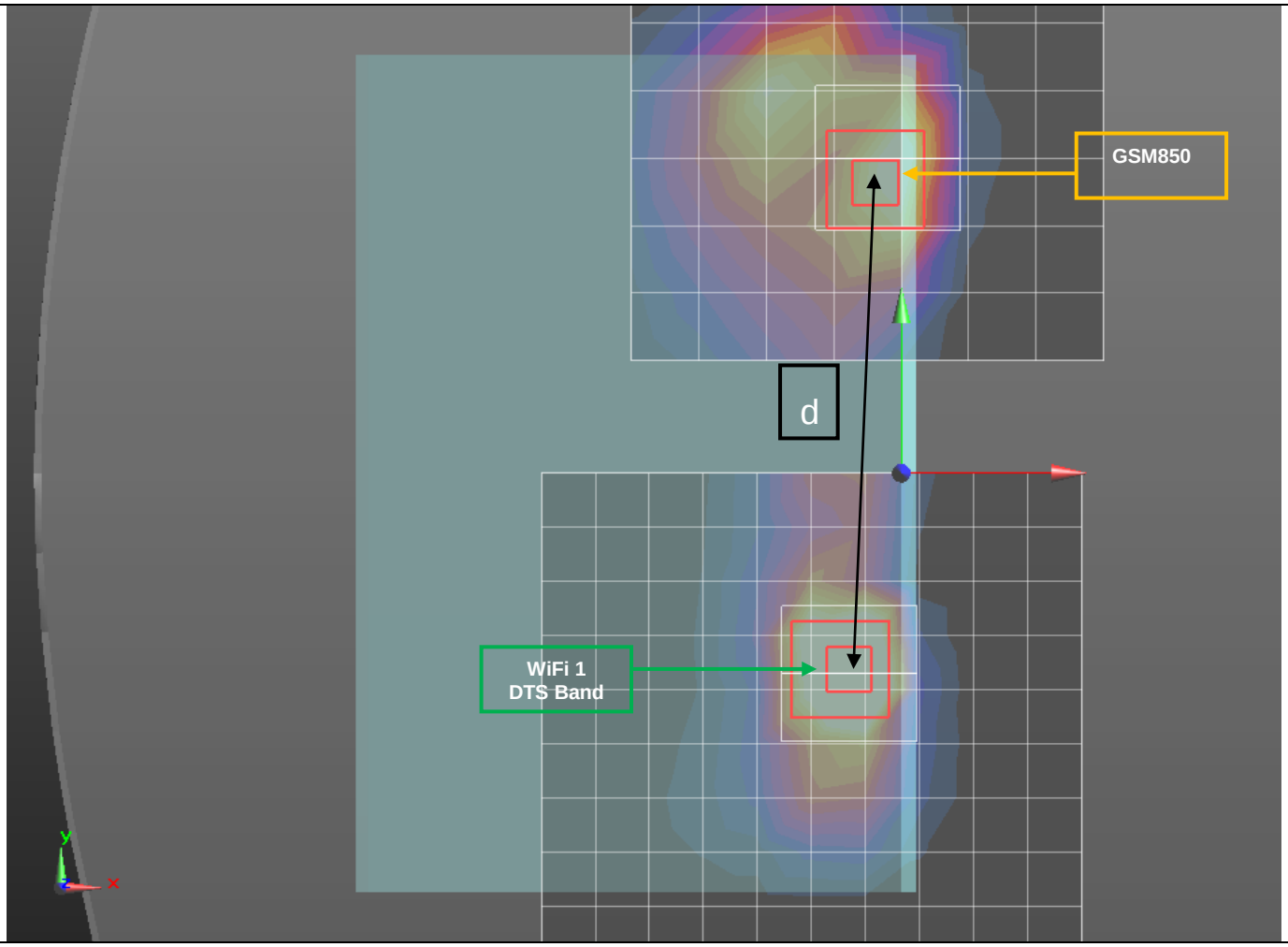
Mode	Peak SAR	X	Y	Z
	mW/g	m	m	m
GSM 850	0.953	0.038	0.082	-0.183
WiFi 1 UNII Band	0.993	0.051	-0.047	-0.18
WiFi 2 UNII Band	0.902	-0.06	0.051	-0.181

d: Calculated distance (mm)	WWAN + WiFi 1(UNII)	129.7
	WWAN + WiFi 2(UNII)	102.8
	WiFi 1 + WiFi 2(UNII)	148.1

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

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

Figure (3)



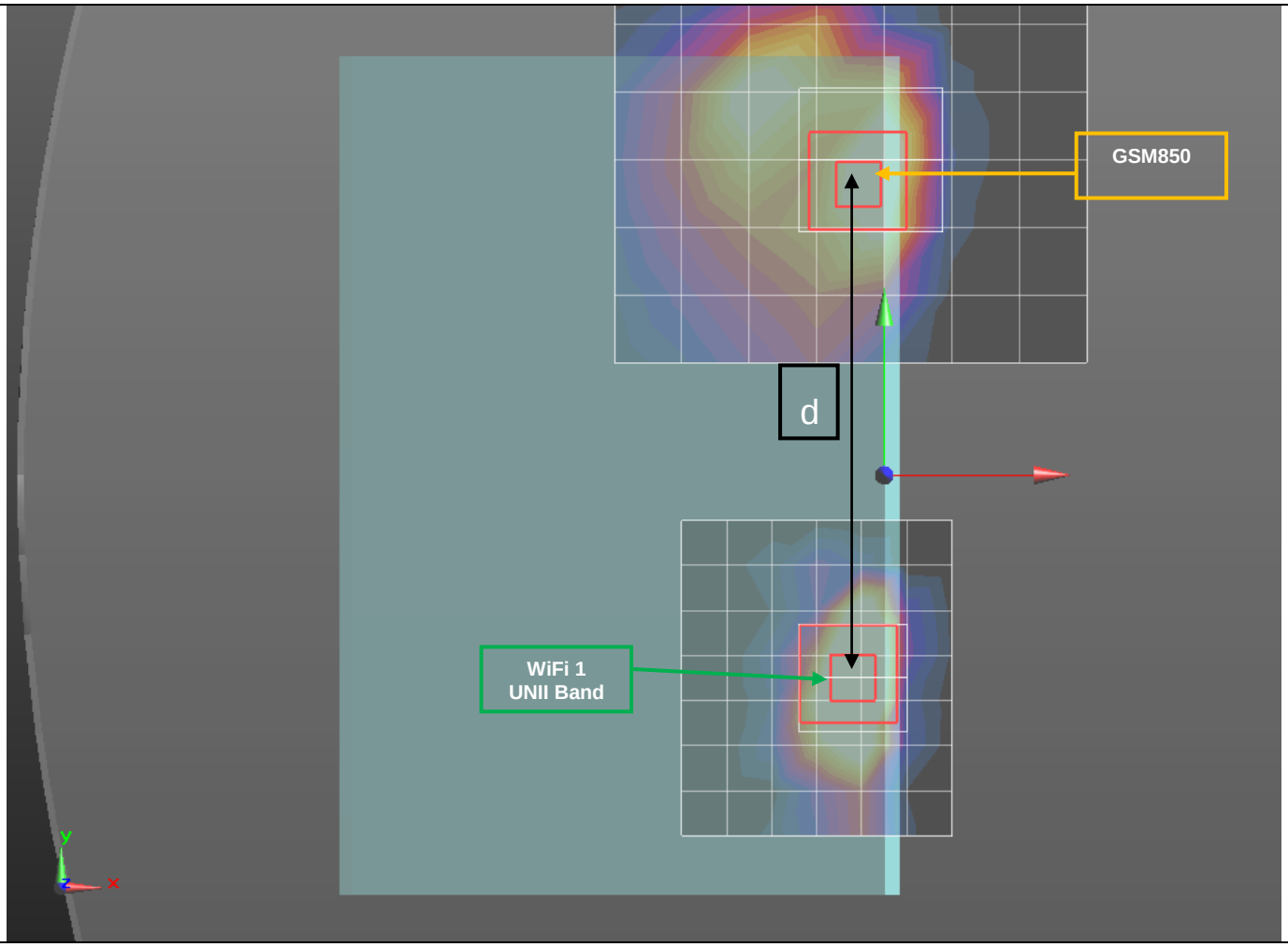
Mode	Peak SAR	X	Y	Z
	mW/g	m	m	m
GSM850	1.23	-0.003	0.07	-0.177
WiFi 1 DTS Band	1.72	-0.0116	-0.0444	-0.181

d: Calculated distance (mm)
114.8

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

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

Figure (4)



Mode	Peak SAR	X	Y	Z
	mW/g	m	m	m
GSM850	1.23	-0.003	0.07	-0.177
WiFi 1 UNII Band	1.73	-0.007	-0.045	-0.18

d: Calculated distance (mm)
115.1

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

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

14.3. Sum of the SAR for GSM1900, WiFi, and BT

RF Exposure condition	Test Position		Simultaneous Transmission Scenario						∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			GSM 1900	WiFi 1 DTS Band	WiFi 2 DTS Band	WiFi 1 UNII Band	WiFi 2 UNII Band	Bluetooth		
Stand-alone	Rear	WWAN +WiFi (DTS)	0.657	1.064	0.971				2.692	**Yes**
		WWAN +WiFi (UNII)	0.657			0.523	0.426		1.606	**Yes**
		WWAN + BT	0.657					0.167	0.824	No
	Edge 1	WWAN +WiFi 1(DTS)	0.665	0.831					**1.496**	No
		WWAN +WiFi 1(UNII)	0.665			1.151			1.816	**Yes**
		WWAN + BT	0.665					0.167	0.832	No
	Edge 3	WWAN +WiFi 2(DTS)	0.400		0.584				0.984	No
		WWAN +WiFi 2(UNII)	0.400				1.141		1.541	No
	Rear/Edge 1 slant	WWAN +WiFi 1(DTS)	1.074	1.197					2.271	**Yes**
		WWAN +WiFi 1(UNII)	1.074			0.764			1.838	**Yes**
		WWAN + BT	1.074					0.167	1.241	No
	Rear/Edge 3 slant	WWAN +WiFi 2(DTS)	0.400		1.190				1.590	No
		WWAN +WiFi 2(UNII)	0.400				1.177		1.577	No

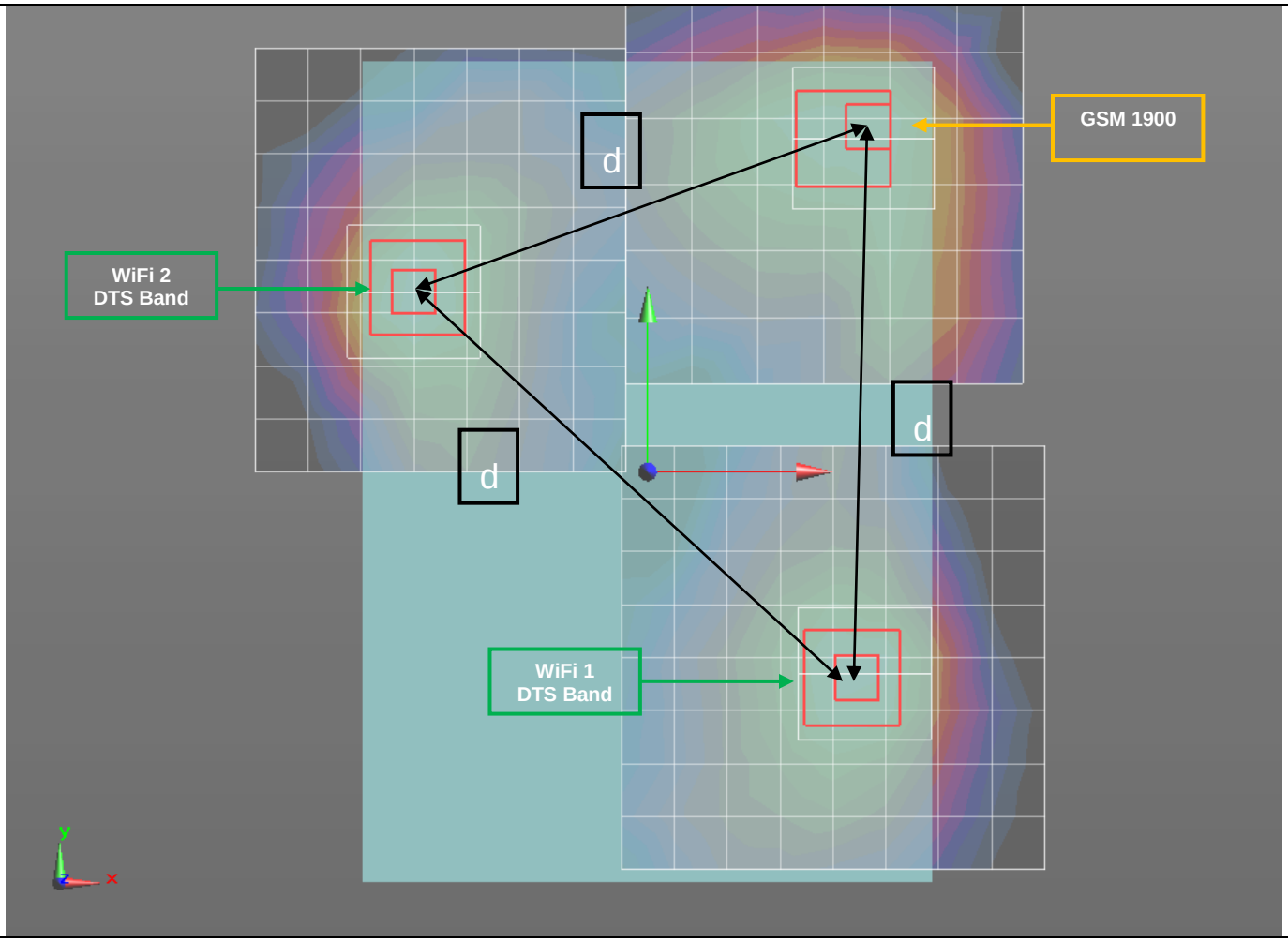
SAR to Peak Location Separation Ratio (SPLSR)

Case #	Test Position	Test Position	Worst-case combination					∑ 1-g SAR (mW/g)	Calculated distance (mm)	SPLSR (≤ 0.04)	Volume Scan (Yes/ No)	Figure
			GSM 850	WiFi 1 DTS Band	WiFi 2 DTS Band	WiFi 1 UNII Band	WiFi 2 UNII Band					
2	Rear	WWAN + WiFi(DTS)	0.657	1.064	0.971			2.692				1
		WWAN + WiFi 1(DTS)	0.657	1.064				1.721	122.2	0.018	No	
		WWAN + WiFi 2(DTS)	0.657		0.971			1.628	92.7	0.022	No	
		WiFi 1 + WiFi 2(DTS)		1.064	0.971			2.035	133.8	0.022	No	
		WWAN + WiFi(UNII)	0.657			0.523	0.426	1.606				2
		WWAN + WiFi 1(UNII)	0.657			0.523		1.180	123.8	0.010	No	
		WWAN + WiFi 2(UNII)	0.657				0.426	1.083	96.2	0.012	No	
		WiFi 1 + WiFi 2(UNII)				0.523	0.426	0.949	148.1	0.006	No	
	Edge 1	WWAN +WiFi 1(UNII)	0.665			1.151		1.816	105.0	0.023	No	3
	Rear/Edge 1 slant	WWAN +WiFi 1(DTS)	1.074	1.197				2.271	122.9	0.028	No	4
		WWAN +WiFi 1(UNII)	1.074			0.764		1.838	123.6	0.020	No	5

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.

Figure (1)



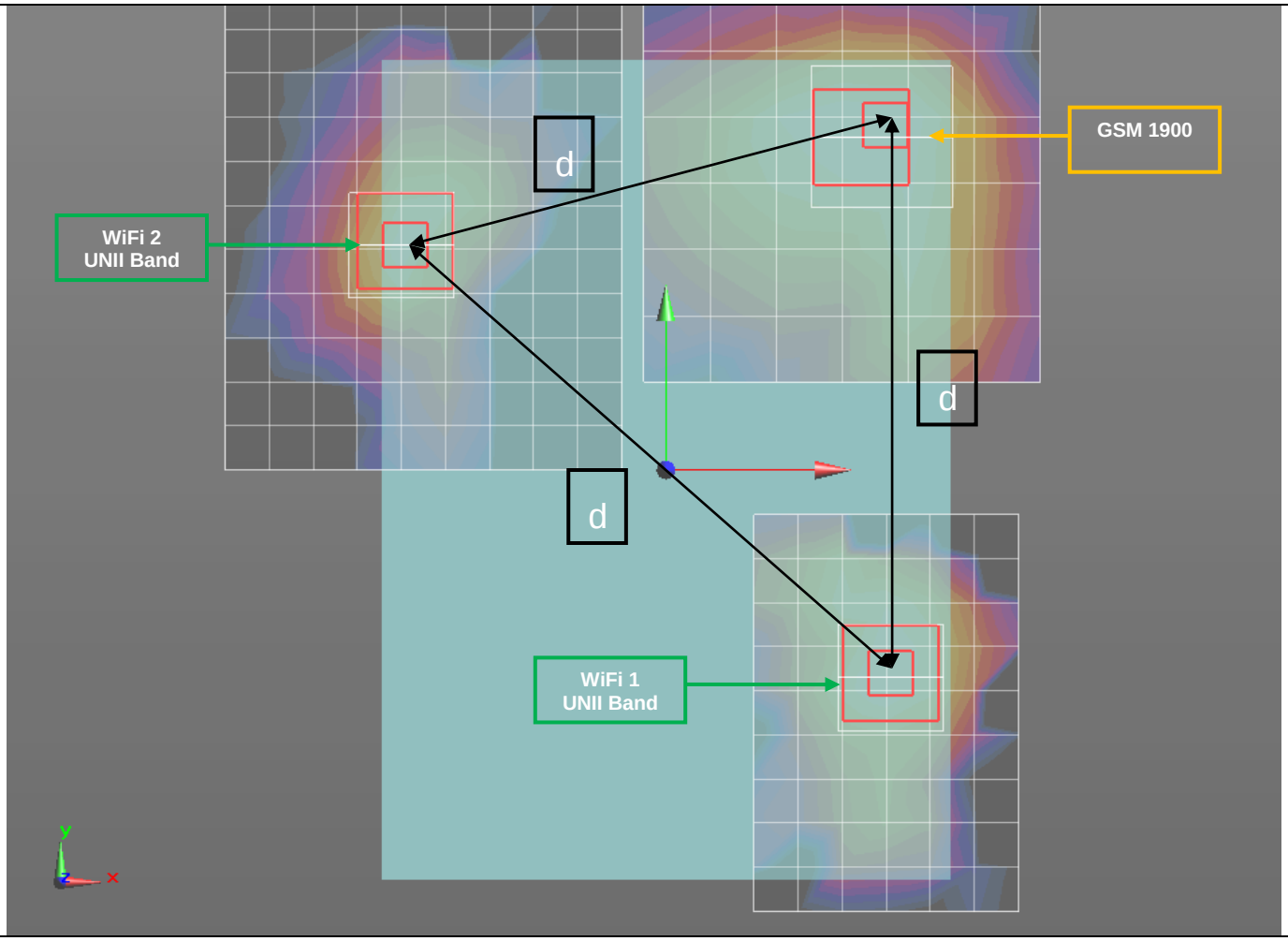
Mode	Peak SAR	X	Y	Z
	mW/g	m	m	m
GSM1900	0.882	0.033	0.0755	-0.181
WiFi 1 DTS Band	1.51	0.0492	-0.0456	-0.181
WiFi 2 DTS Band	1.48	-0.053	0.0408	-0.18

d: Calculated distance (mm)	WWAN + WiFi 1(DTS)	122.2
	WWAN + WiFi 2(DTS)	92.7
	WiFi 1 + WiFi 2(DTS)	133.8

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

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

Figure (2)



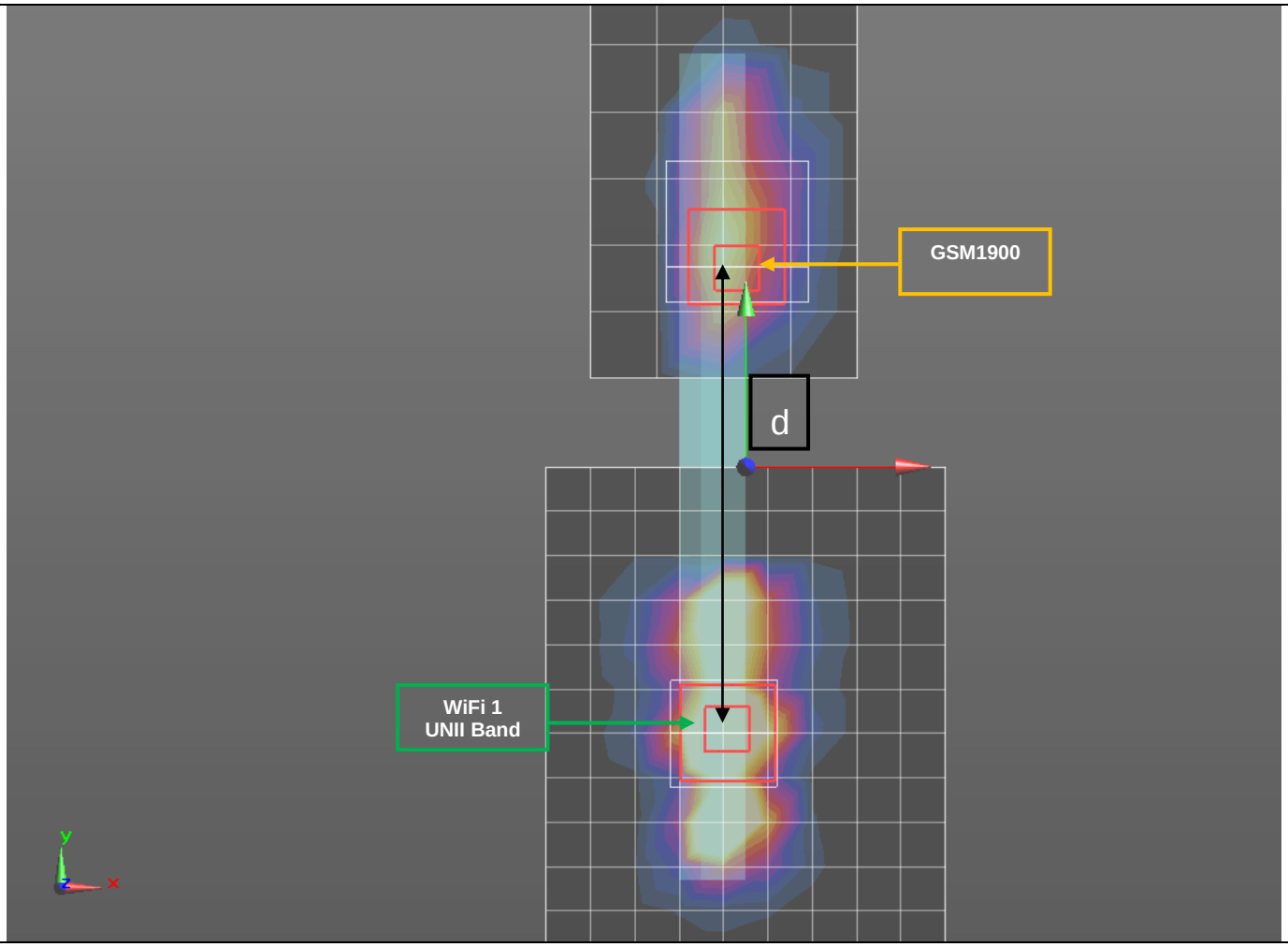
Mode	Peak SAR	X	Y	Z
	mW/g	m	m	m
GSM1900	0.882	0.033	0.0755	-0.181
WiFi 1 UNII Band	0.993	0.051	-0.047	-0.18
WiFi 2 UNII Band	0.902	-0.06	0.051	-0.181

d: Calculated distance (mm)	WWAN + WiFi 1(UNII)	123.8
	WWAN + WiFi 2(UNII)	96.2
	WiFi 1 + WiFi 2(UNII)	148.1

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

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

Figure (3)



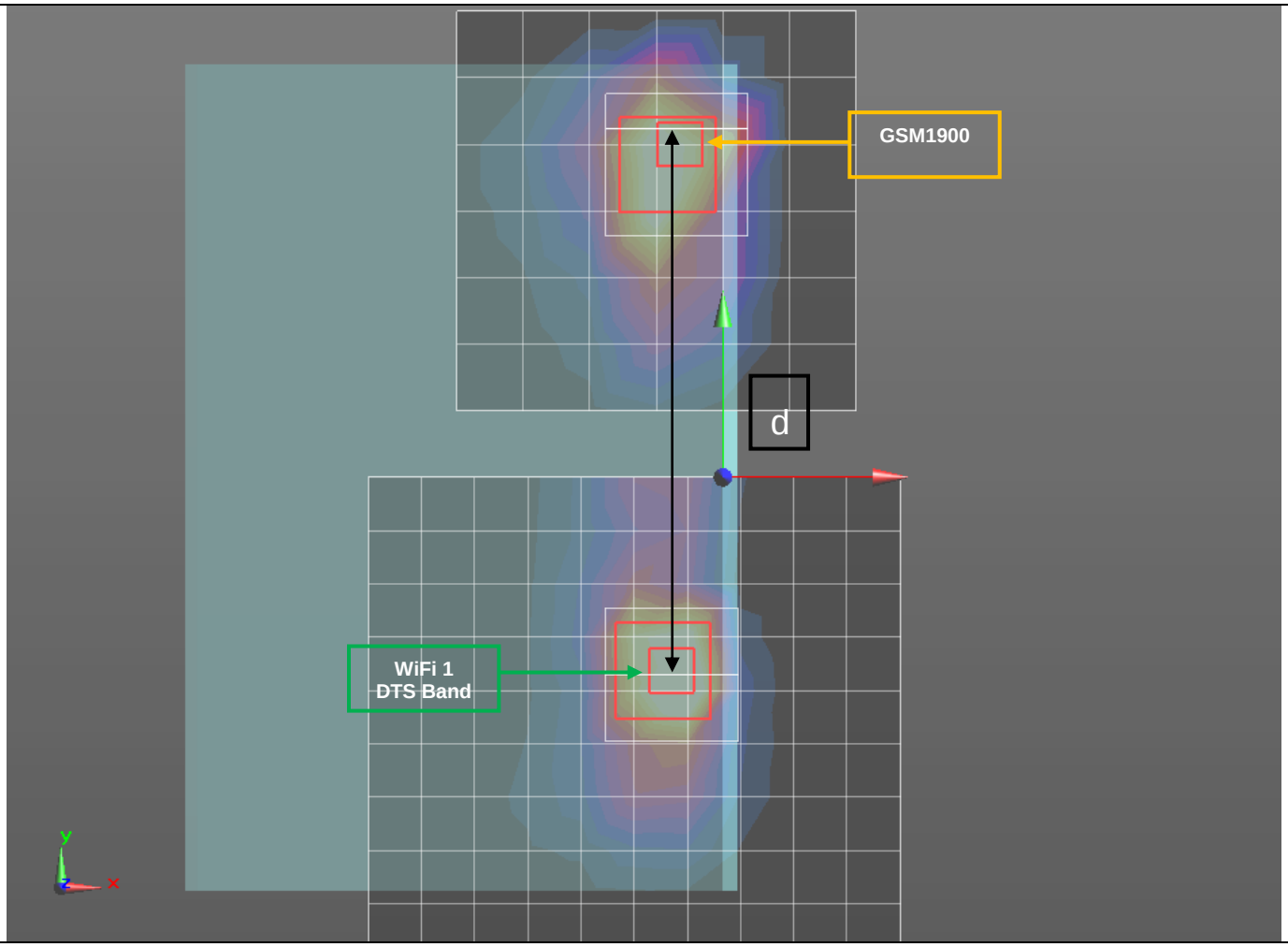
Mode	Peak SAR	X	Y	Z
	mW/g	m	m	m
GSM1900	0.907	-0.002	0.045	-0.181
WiFi 1 UNII Band	2.31	-0.005	-0.06	-0.181

d: Calculated distance (mm)
105.0

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

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

Figure (4)



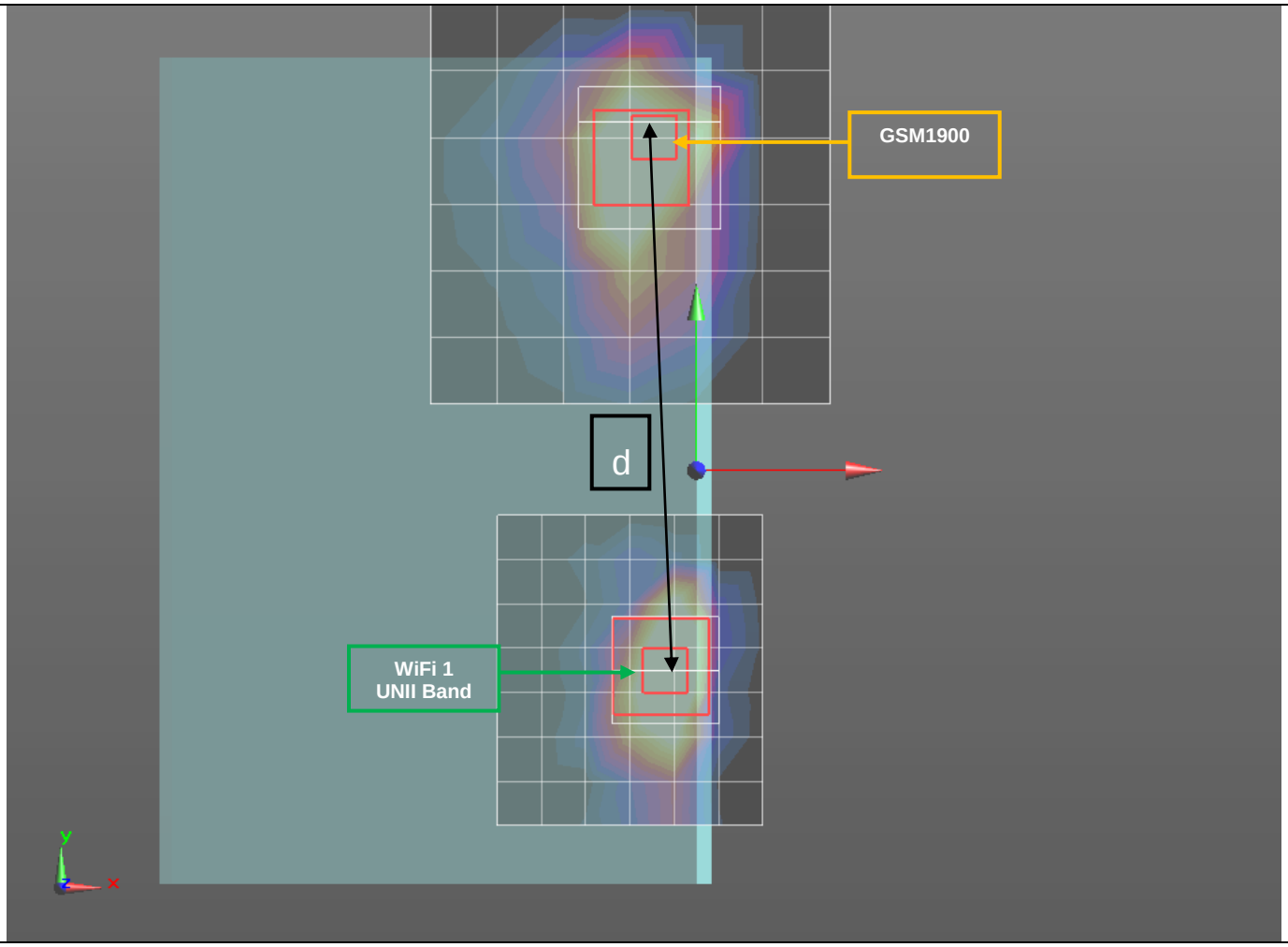
Mode	Peak SAR	X	Y	Z
	mW/g	m	m	m
GSM1900	1.45	-0.0105	0.0785	-0.182
WiFi 1 DTS Band	1.72	-0.0116	-0.0444	-0.181

d: Calculated distance (mm)
122.9

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

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

Figure (5)



Mode	Peak SAR	X	Y	Z
	mW/g	m	m	m
GSM1900	1.45	-0.0105	0.0785	-0.182
WiFi 1 UNII Band	1.73	-0.007	-0.045	-0.18

d: Calculated distance (mm)
123.6

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

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

14.4. Sum of the SAR for W-CDMA Band V, WiFi, and BT

RF Exposure condition	Test Position		Simultaneous Transmission Scenario						∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			W-CDMA Band V	WiFi 1 DTS Band	WiFi 2 DTS Band	WiFi 1 UNII Band	WiFi 2 UNII Band	Bluetooth		
Stand-alone	Rear	WWAN +WiFi (DTS)	0.672	1.064	0.971				2.707	**Yes**
		WWAN +WiFi (UNII)	0.672			0.523	0.426		1.621	**Yes**
		WWAN + BT	0.672					0.167	0.839	No
	Edge 1	WWAN +WiFi 1(DTS)	0.375	0.831					1.206	No
		WWAN +WiFi 1(UNII)	0.375			1.151			1.526	No
		WWAN + BT	0.375					0.167	0.542	No
	Edge 3	WWAN +WiFi 2(DTS)	0.400		0.584				0.984	No
		WWAN +WiFi 2(UNII)	0.400				1.141		1.541	No
	Rear/Edge 1 slant	WWAN +WiFi 1(DTS)	0.524	1.197					1.721	**Yes**
		WWAN +WiFi 1(UNII)	0.524			0.764			1.288	No
		WWAN + BT	0.524					0.167	0.691	No
	Rear/Edge 3 slant	WWAN +WiFi 2(DTS)	0.400		1.190				1.590	No
		WWAN +WiFi 2(UNII)	0.400				1.177		1.577	No

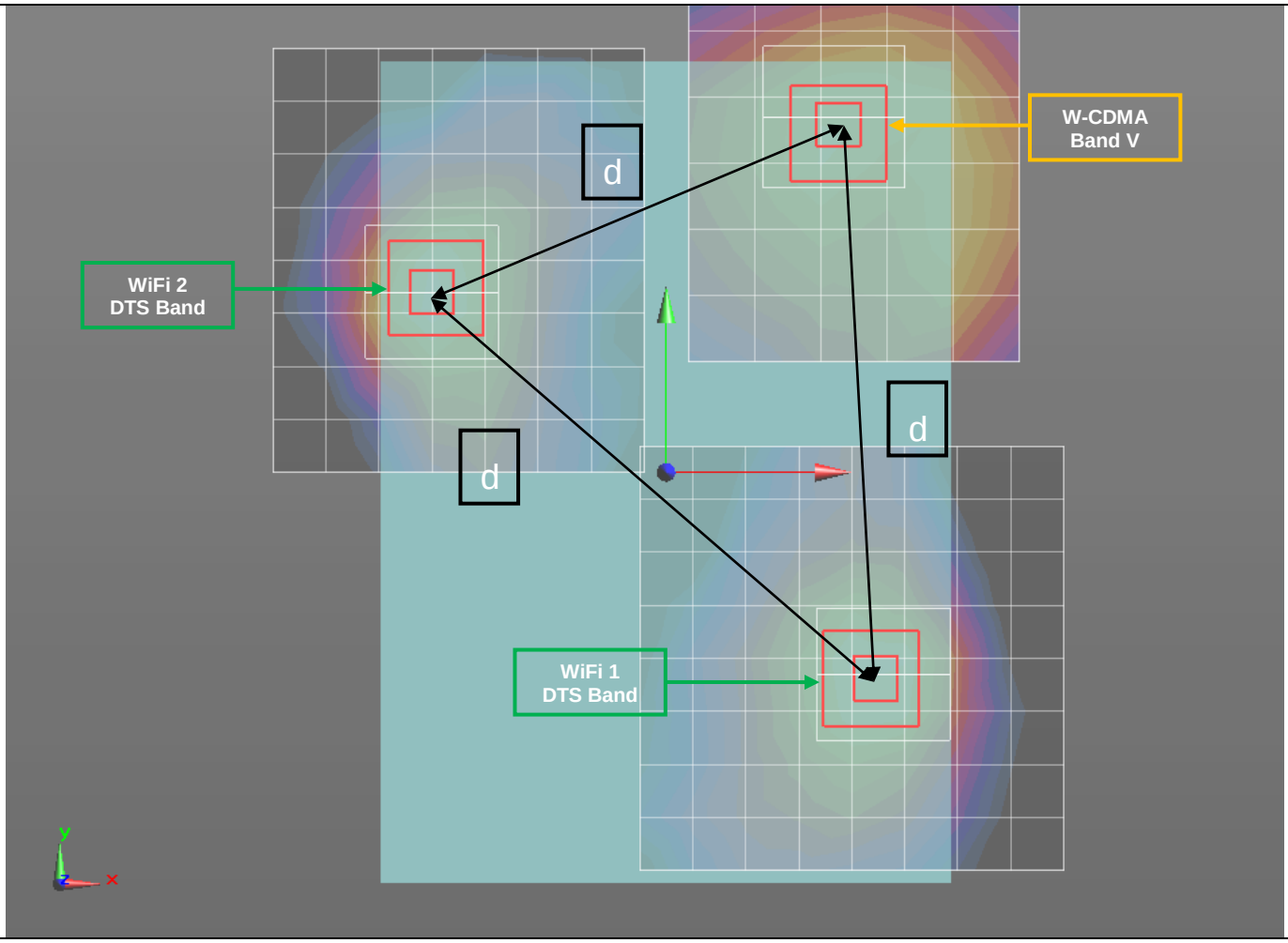
SAR to Peak Location Separation Ratio (SPLSR)

Case #	Test Position	Test Position	Worst-case combination					∑ 1-g SAR (mW/g)	Calculated distance (mm)	SPLSR (≤ 0.04)	Volume Scan (Yes/ No)	Figure
			W-CDMA Band V	WiFi 1 DTS Band	WiFi 2 DTS Band	WiFi 1 UNII Band	WiFi 2 UNII Band					
3	Rear	WWAN + WiFi(DTS)	0.672	1.064	0.971			2.707				1
		WWAN + WiFi 1(DTS)	0.672	1.064				1.736	126.6	0.018	No	
		WWAN + WiFi 2(DTS)	0.672		0.971			1.643	99.3	0.021	No	
		WiFi 1 + WiFi 2(DTS)		1.064	0.971			2.035	133.8	0.022	No	
		WWAN + WiFi(UNII)	0.672			0.523	0.426	1.621				2
		WWAN + WiFi 1(UNII)	0.672			0.523		1.195	128.2	0.010	No	
		WWAN + WiFi 2(UNII)	0.672				0.426	1.098	102.4	0.011	No	
		WiFi 1 + WiFi 2(UNII)				0.523	0.426	0.949	148.1	0.006	No	
	Rear/Edge 1 slant	WWAN +WiFi 1(DTS)	0.524	1.197				1.721	107.3	0.021	No	3

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.

Figure (1)



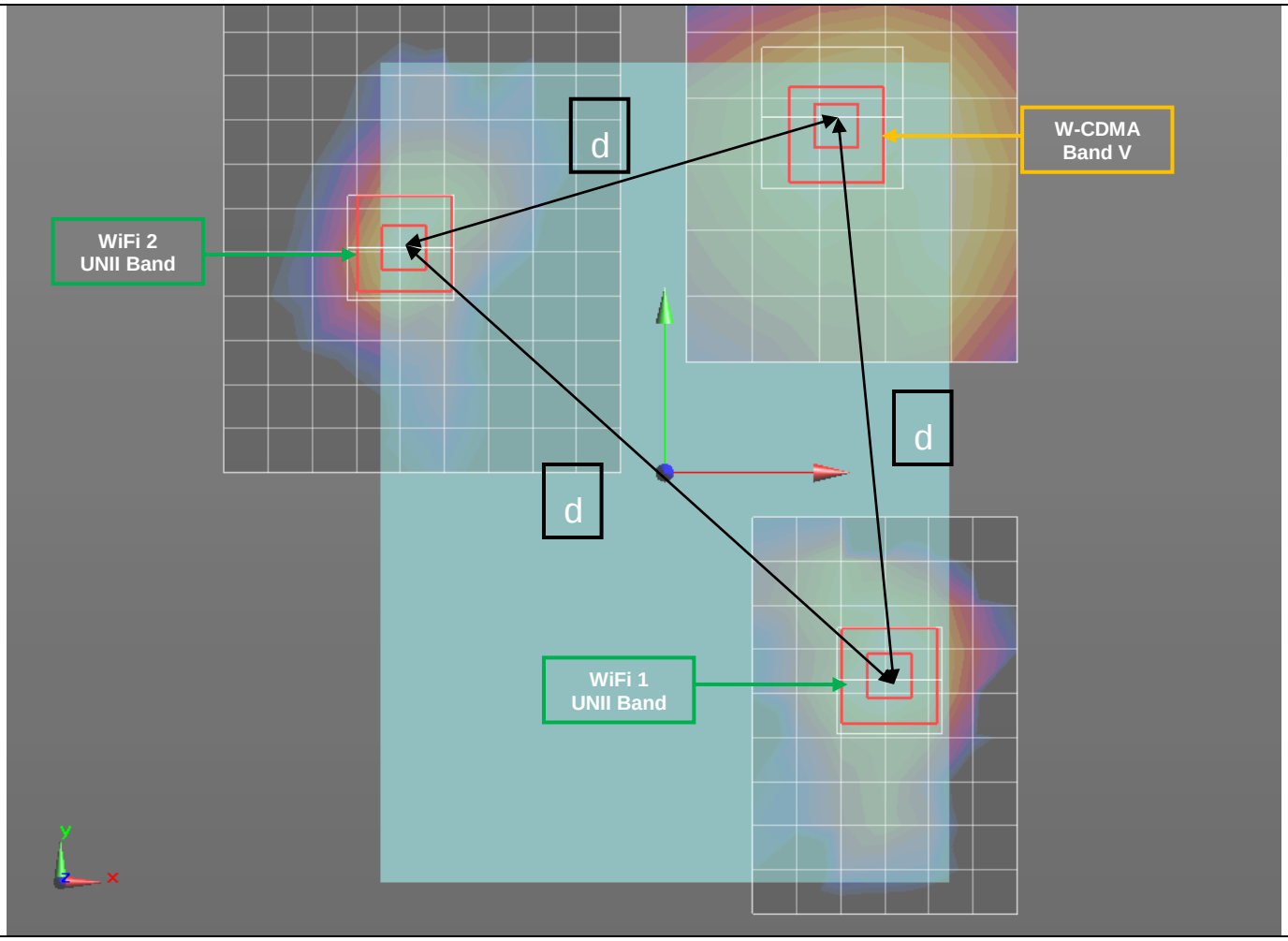
Mode	Peak SAR	X	Y	Z
	mW/g	m	m	m
WCDMA Band V	0.877	0.038	0.0805	-0.183
WiFi 1 DTS Band	1.51	0.0492	-0.0456	-0.181
WiFi 2 DTS Band	1.48	-0.053	0.0408	-0.18

d: Calculated distance (mm)	WWAN + WiFi 1(DTS)	126.6
	WWAN + WiFi 2(DTS)	99.3
	WiFi 1 + WiFi 2(DTS)	133.8

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

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

Figure (2)



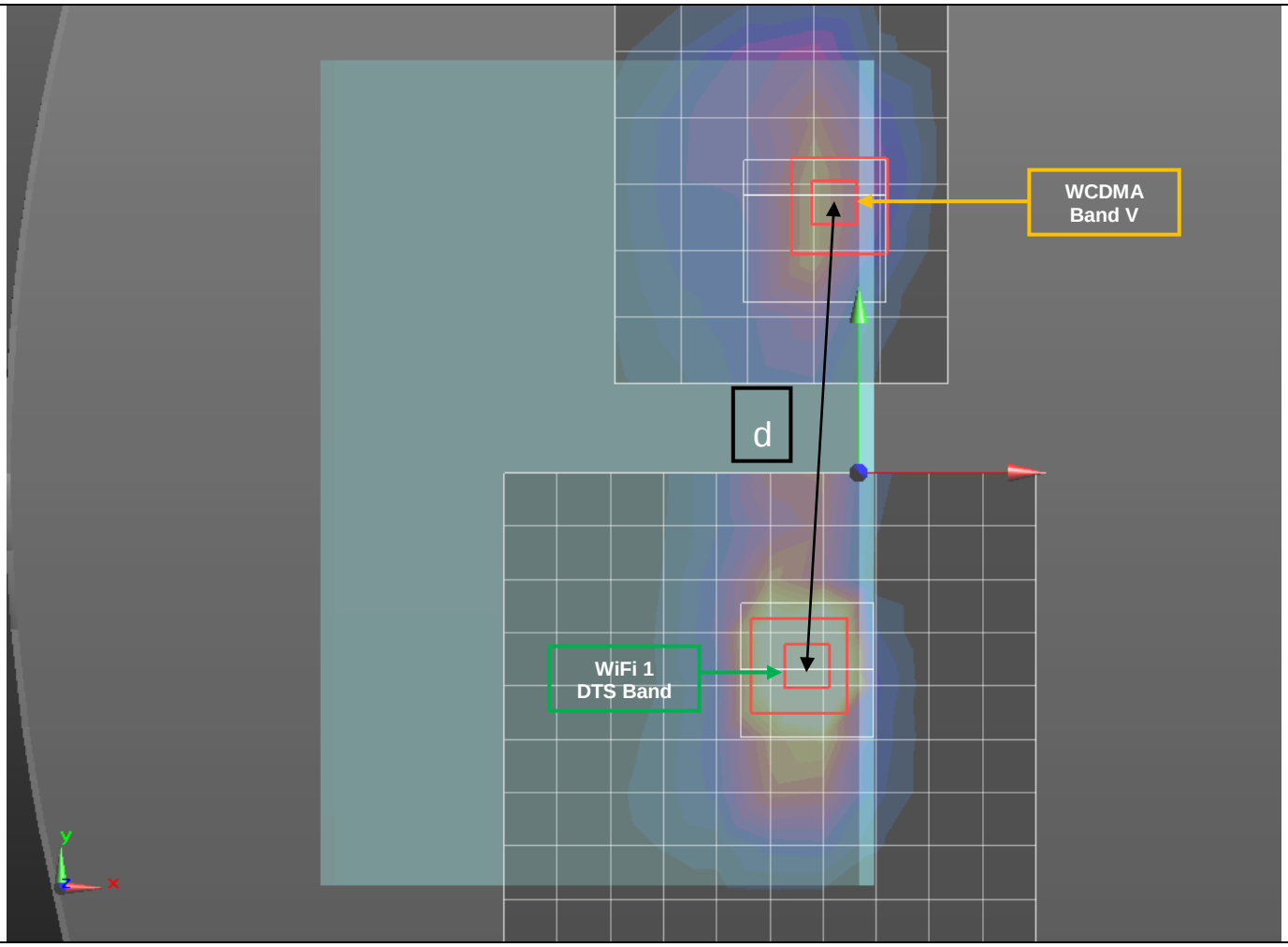
Mode	Peak SAR	X	Y	Z
	mW/g	m	m	m
WCDMA Band V	0.877	0.038	0.0805	-0.183
WiFi 1 UNII Band	0.993	0.051	-0.047	-0.18
WiFi 2 UNII Band	0.902	-0.06	0.051	-0.181

d: Calculated distance (mm)	WWAN + WiFi 1(UNII)	128.2
	WWAN + WiFi 2(UNII)	102.4
	WiFi 1 + WiFi 2(UNII)	148.1

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

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

Figure (3)



Mode	Peak SAR	X	Y	Z
	mW/g	m	m	m
WCDMA Band V	0.619	-0.002	0.0625	-0.183
WiFi 1 DTS Band	1.72	-0.0116	-0.0444	-0.181

d: Calculated distance (mm)
107.3

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

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

14.5. Sum of the SAR for W-CDMA Band II, WiFi, and BT

RF Exposure condition	Test Position		Simultaneous Transmission Scenario						∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			W-CDMA Band II	WiFi 1 DTS Band	WiFi 2 DTS Band	WiFi 1 UNII Band	WiFi 2 UNII Band	Bluetooth		
Stand-alone	Rear	WWAN +WiFi (DTS)	0.600	1.064	0.971				2.635	**Yes**
		WWAN +WiFi (UNII)	0.600			0.523	0.426		**1.549**	No
		WWAN + BT	0.600					0.167	0.767	No
	Edge 1	WWAN +WiFi 1(DTS)	0.465	0.831					1.296	No
		WWAN +WiFi 1(UNII)	0.465			1.151			1.616	**Yes**
		WWAN + BT	0.465					0.167	0.632	No
	Edge 3	WWAN +WiFi 2(DTS)	0.400		0.584				0.984	No
		WWAN +WiFi 2(UNII)	0.400				1.141		1.541	No
	Rear/Edge 1 slant	WWAN +WiFi 1(DTS)	0.867	1.197					2.064	**Yes**
		WWAN +WiFi 1(UNII)	0.867			0.764			1.631	**Yes**
		WWAN + BT	0.867					0.167	1.034	No
	Rear/Edge 3 slant	WWAN +WiFi 2(DTS)	0.400		1.190				1.590	No
		WWAN +WiFi 2(UNII)	0.400				1.177		1.577	No

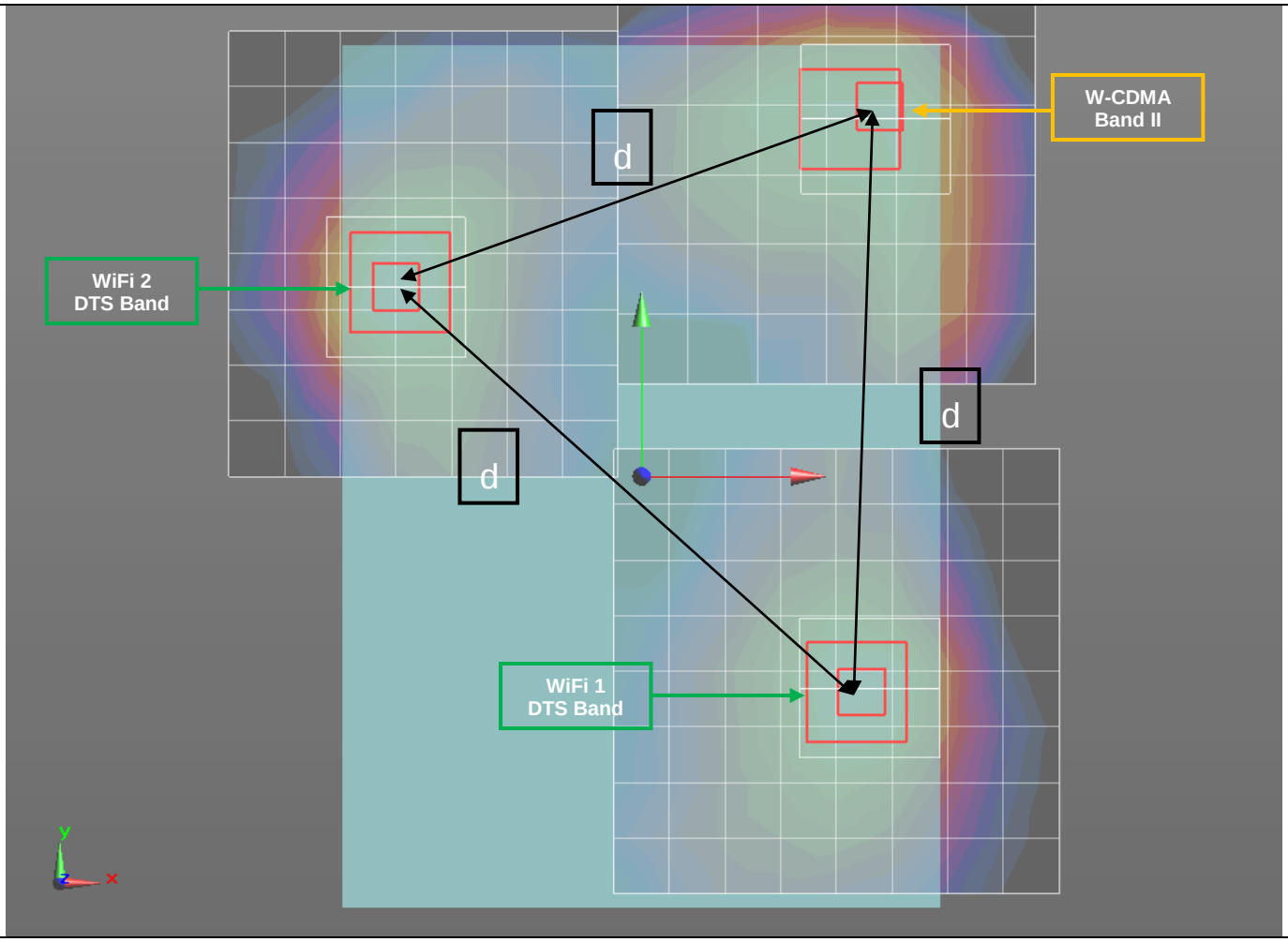
SAR to Peak Location Separation Ratio (SPLSR)

Case #	Test Position	Test Position	Worst-case combination					∑ 1-g SAR (mW/g)	Calculated distance (mm)	SPLSR (≤ 0.04)	Volume Scan (Yes/ No)	Figure
			W-CDMA Band II	WiFi 1 DTS Band	WiFi 2 DTS Band	WiFi 1 UNII Band	WiFi 2 UNII Band					
4	Rear	WWAN + WiFi(DTS)	0.600	1.064	0.971			2.635				1
		WWAN + WiFi 1(DTS)	0.600	1.064				1.664	123.5	0.017	No	
		WWAN + WiFi 2(DTS)	0.600		0.971			1.571	94.7	0.021	No	
		WiFi 1 + WiFi 2(DTS)		1.064	0.971			2.035	133.8	0.022	No	
		WWAN + WiFi(UNII)	0.600			0.523	0.426	1.549				2
		WWAN + WiFi 1(UNII)	0.600			0.523		1.123	125.1	0.010	No	
		WWAN + WiFi 2(UNII)	0.600				0.426	1.026	98.0	0.011	No	
		WiFi 1 + WiFi 2(UNII)				0.523	0.426	0.949	148.1	0.006	No	
	Edge 1	WWAN +WiFi 1(UNII)	0.465			1.151		1.616	134.0	0.015	No	3
	Rear/Edge 1 slant	WWAN +WiFi 1(DTS)	0.867	1.197				2.064	122.9	0.024	No	4
		WWAN +WiFi 1(UNII)	0.867			0.764		1.631	123.5	0.017	No	5

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.

Figure (1)



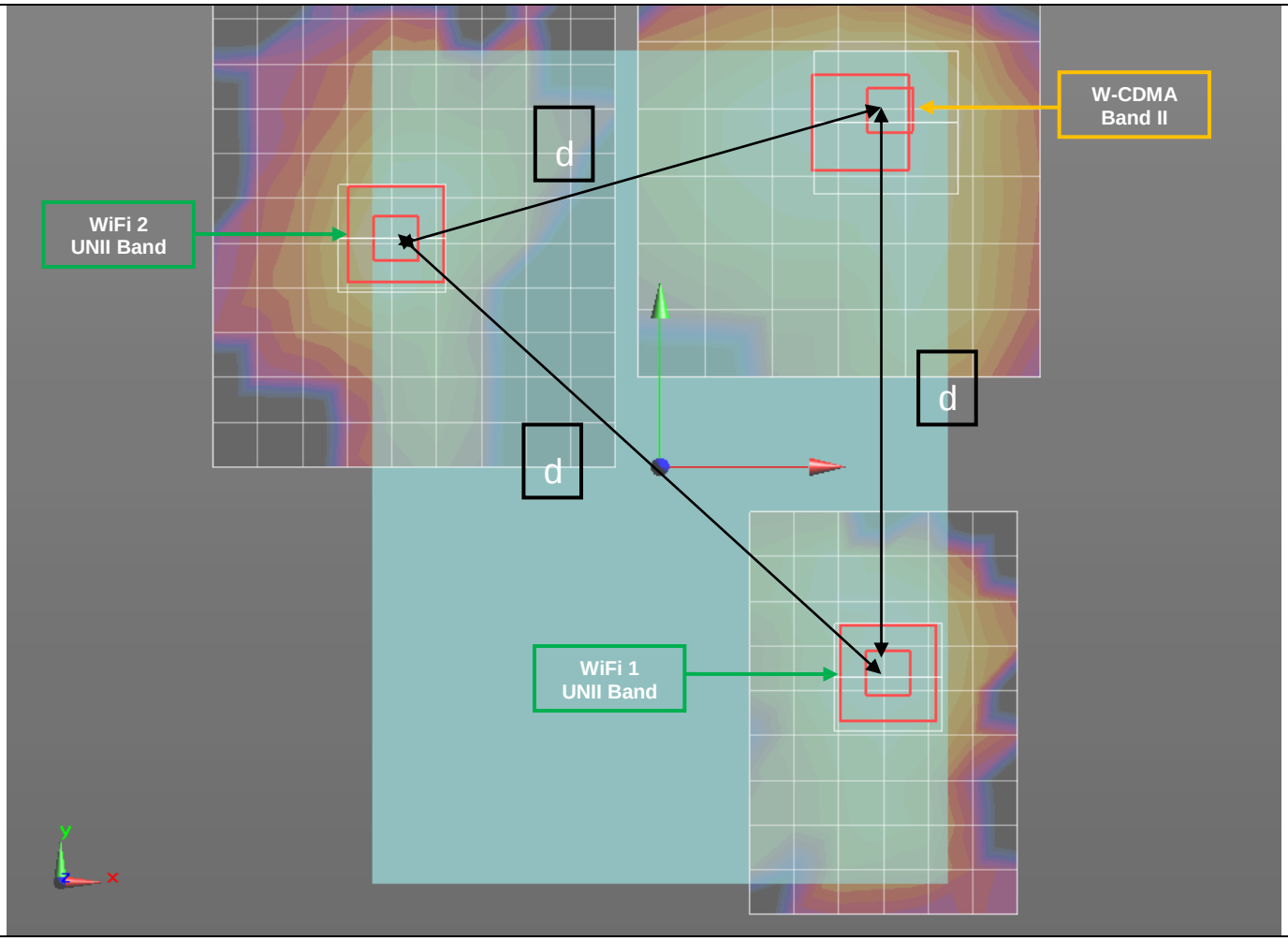
Mode	Peak SAR	X	Y	Z
	mW/g	m	m	m
WCDMA Band II	0.752	0.0345	0.077	-0.181
WiFi 1 DTS Band	1.51	0.0492	-0.0456	-0.181
WiFi 2 DTS Band	1.48	-0.053	0.0408	-0.18

d: Calculated distance (mm)	WWAN + WiFi 1(DTS)	123.5
	WWAN + WiFi 2(DTS)	94.7
	WiFi 1 + WiFi 2(DTS)	133.8

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

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

Figure (2)



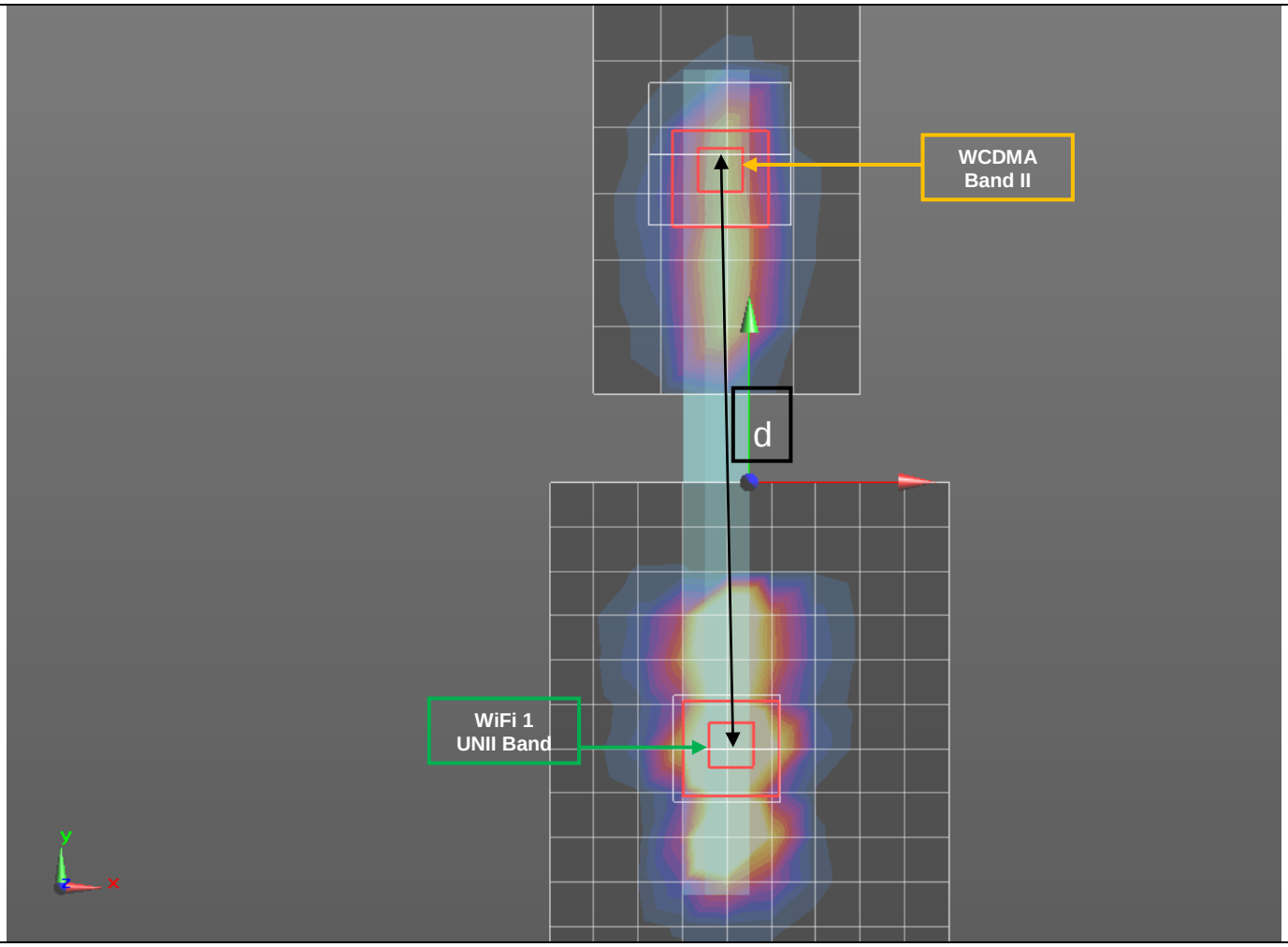
Mode	Peak SAR	X	Y	Z
	mW/g	m	m	m
WCDMA Band II	0.752	0.0345	0.077	-0.181
WiFi 1 UNII Band	0.993	0.051	-0.047	-0.18
WiFi 2 UNII Band	0.902	-0.06	0.051	-0.181

d: Calculated distance (mm)	WWAN + WiFi 1(UNII)	125.1
	WWAN + WiFi 2(UNII)	98.0
	WiFi 1 + WiFi 2(UNII)	148.1

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

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

Figure (3)



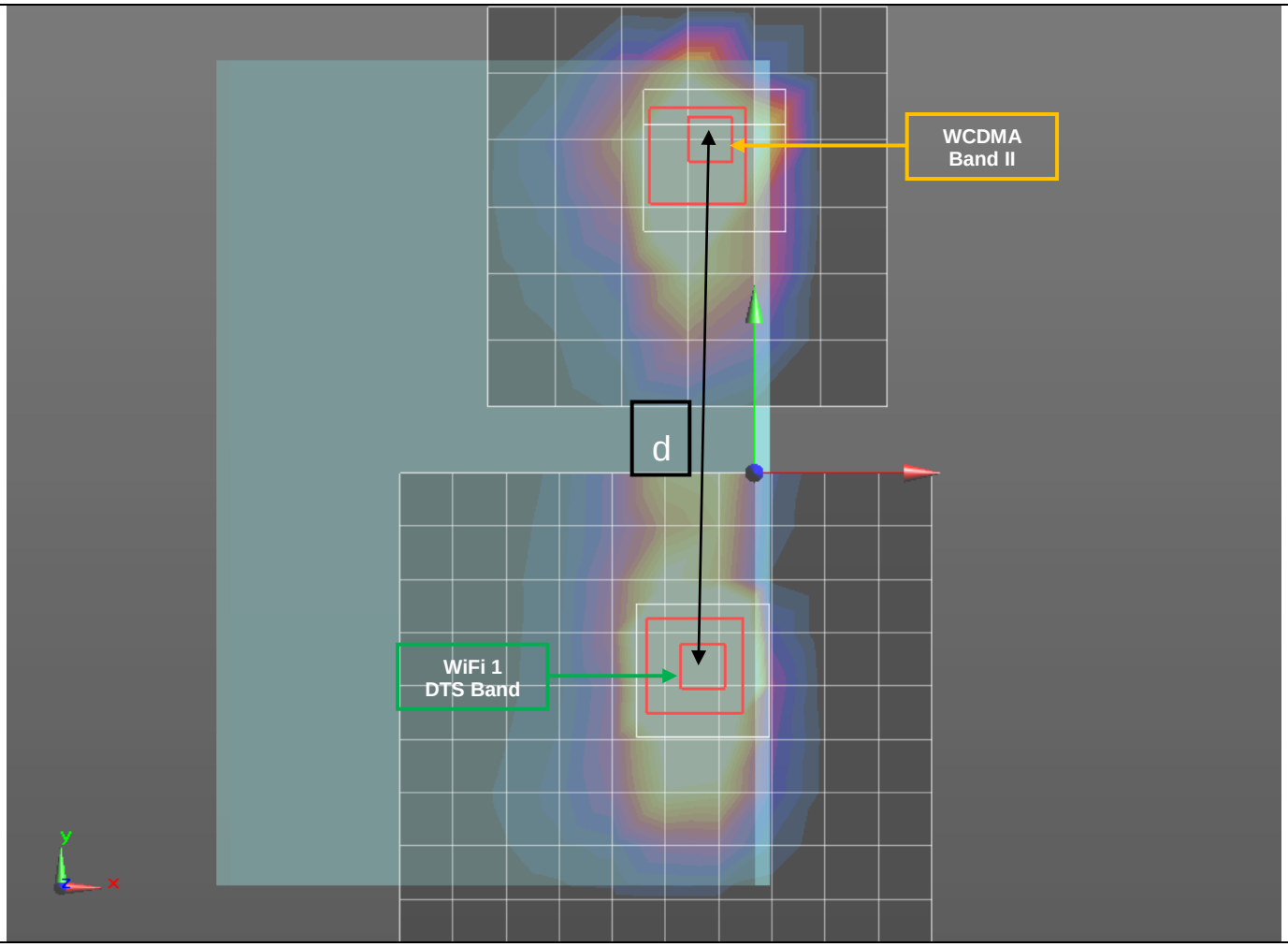
Mode	Peak SAR	X	Y	Z
	mW/g	m	m	m
WCDMA Band II	0.624	-0.0065	0.074	-0.181
WiFi 1 UNII Band	2.31	-0.005	-0.06	-0.181

d: Calculated distance (mm)
134.0

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

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

Figure (4)



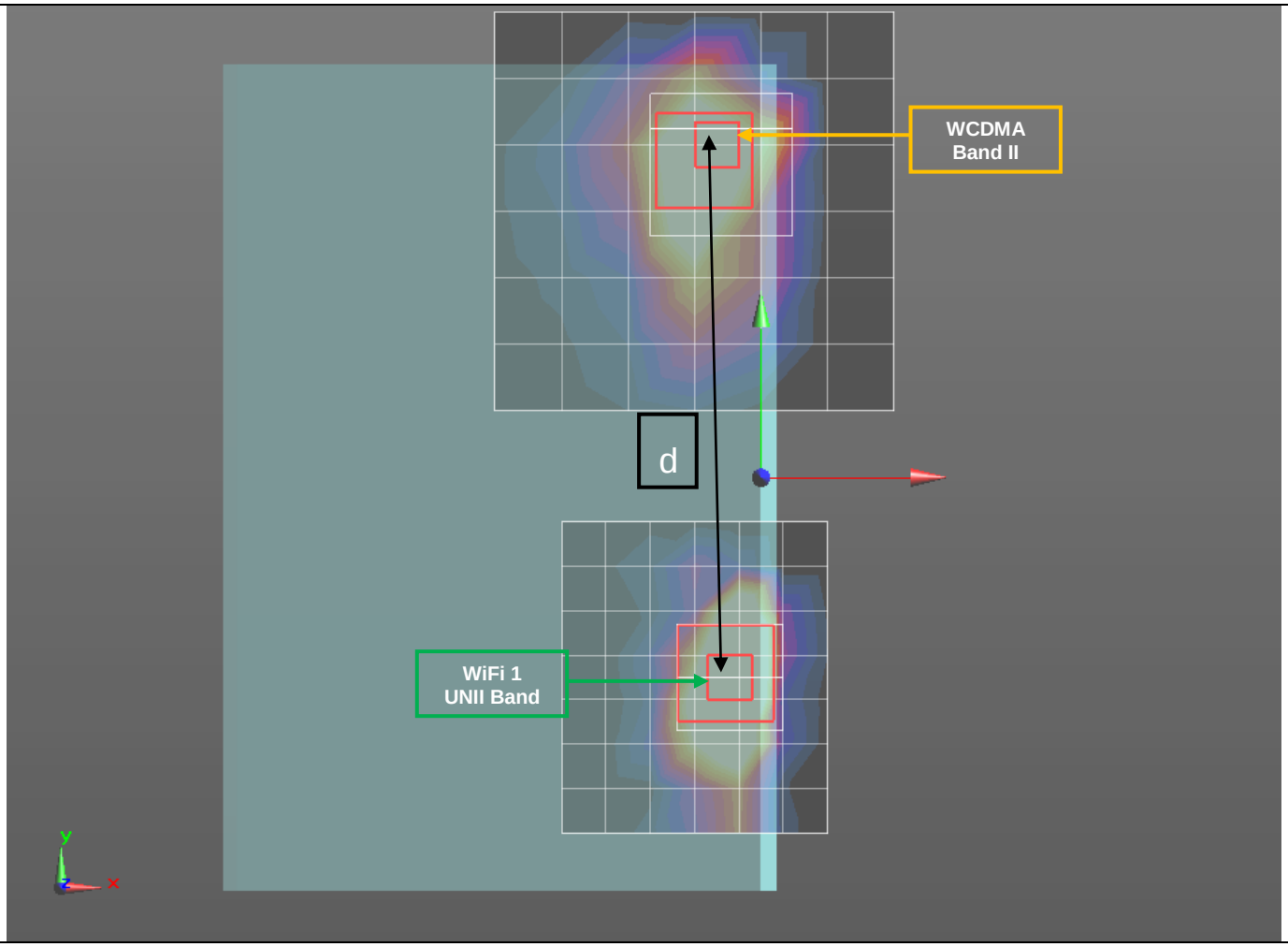
Mode	Peak SAR	X	Y	Z
	mW/g	m	m	m
WCDMA Band II	1.13	-0.009	0.0785	-0.182
WiFi 1 DTS Band	1.72	-0.0116	-0.0444	-0.181

d: Calculated distance (mm)
122.9

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

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

Figure (5)



Mode	Peak SAR	X	Y	Z
	mW/g	m	m	m
WCDMA Band II	1.13	-0.009	0.0785	-0.182
WiFi 1 UNII Band	1.73	-0.007	-0.045	-0.18

d: Calculated distance (mm)
123.5

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

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

14.6. Sum of the SAR for LTE Band 4, WiFi, and BT

RF Exposure condition	Test Position		Simultaneous Transmission Scenario						∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			LTE Band 4	WiFi 1 DTS Band	WiFi 2 DTS Band	WiFi 1 UNII Band	WiFi 2 UNII Band	Bluetooth		
Stand-alone	Rear	WWAN +WiFi (DTS)	0.751	1.064	0.971				2.786	**Yes**
		WWAN +WiFi (UNII)	0.751			0.523	0.426		1.700	**Yes**
		WWAN + BT	0.751					0.167	0.918	No
	Edge 1	WWAN +WiFi 1(DTS)	1.118	0.831					1.949	**Yes**
		WWAN +WiFi 1(UNII)	1.118			1.151			2.269	**Yes**
		WWAN + BT	1.118					0.167	1.285	No
	Edge 3	WWAN +WiFi 2(DTS)	0.400		0.584				0.984	No
		WWAN +WiFi 2(UNII)	0.400				1.141		1.541	No
	Rear/Edge 1 slant	WWAN +WiFi 1(DTS)	1.173	1.197					2.370	**Yes**
		WWAN +WiFi 1(UNII)	1.173			0.764			1.937	**Yes**
		WWAN + BT	1.173					0.167	1.340	No
	Rear/Edge 3 slant	WWAN +WiFi 2(DTS)	0.400		1.190				1.590	No
		WWAN +WiFi 2(UNII)	0.400				1.177		1.577	No

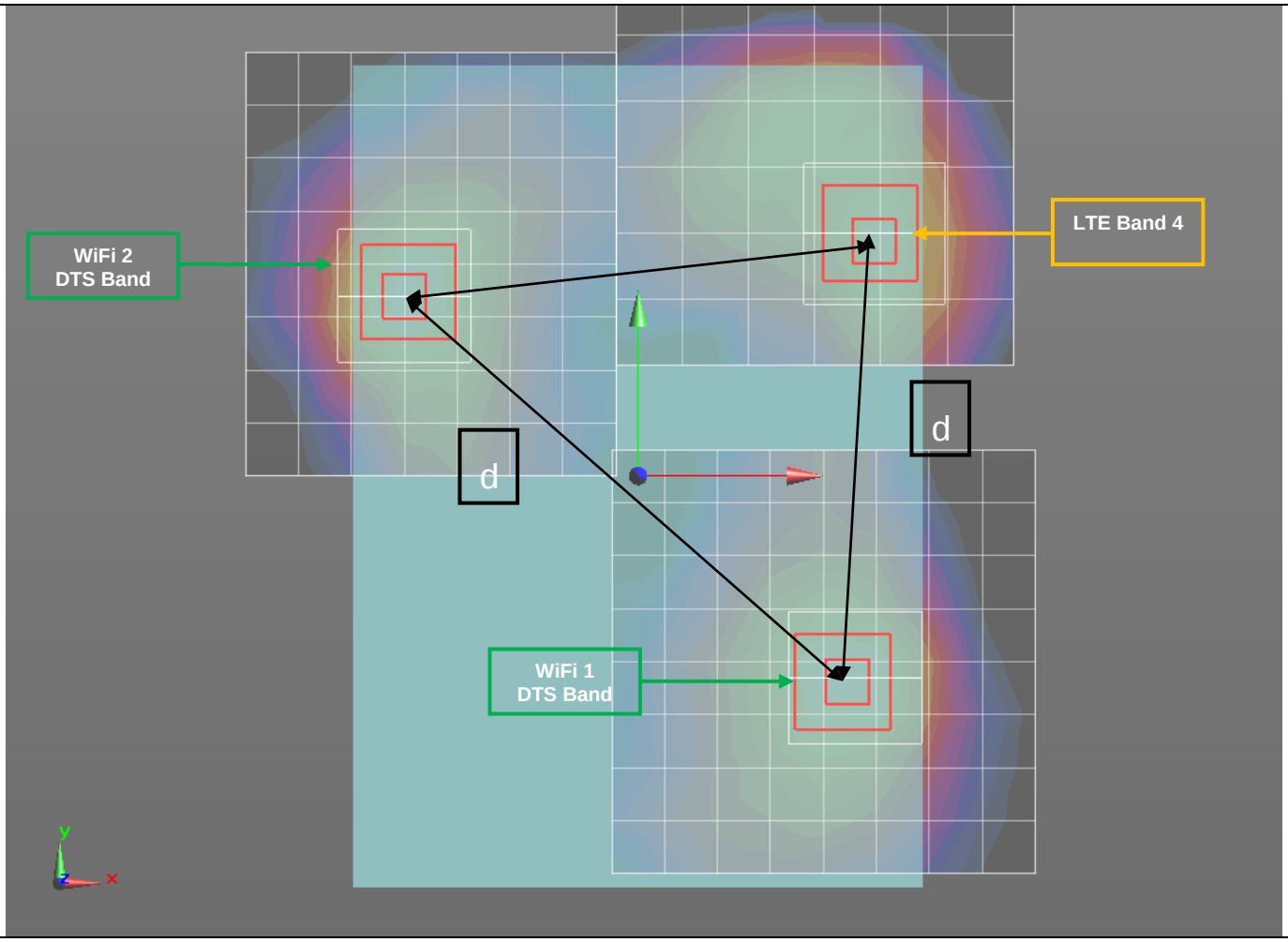
SAR to Peak Location Separation Ratio (SPLSR)

Case #	Test Position	Test Position	Worst-case combination					∑ 1-g SAR (mW/g)	Calculated distance (mm)	SPLSR (≤ 0.04)	Volume Scan (Yes/ No)	Figure
			LTE Band 4	WiFi 1 DTS Band	WiFi 2 DTS Band	WiFi 1 UNII Band	WiFi 2 UNII Band					
5	Rear	WWAN + WiFi(DTS)	0.751	1.064	0.971			2.786				1
		WWAN + WiFi 1(DTS)	0.751	1.064				1.815	100.7	0.024	No	
		WWAN + WiFi 2(DTS)	0.751		0.971			1.722	107.4	0.021	No	
		WiFi 1 + WiFi 2(DTS)		1.064	0.971			2.035	133.8	0.022	No	
		WWAN + WiFi(UNII)	0.751			0.523	0.426	1.700				2
		WWAN + WiFi 1(UNII)	0.751			0.523		1.274	102.0	0.014	No	
		WWAN + WiFi 2(UNII)	0.751				0.426	1.177	113.6	0.011	No	
		WiFi 1 + WiFi 2(UNII)				0.523	0.426	0.949	148.1	0.006	No	
	Edge 1	WWAN +WiFi 1(DTS)	1.118	0.831				1.949	115.5	0.024	No	3
		WWAN +WiFi 1(UNII)	1.118			1.151		2.269	113.5	0.030	No	4
	Rear/Edge 1 slant	WWAN +WiFi 1(DTS)	1.173	1.197				2.370	95.0	0.038	No	5
		WWAN +WiFi 1(UNII)	1.173			0.764		1.937	95.5	0.028	No	6

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.

Figure (1)



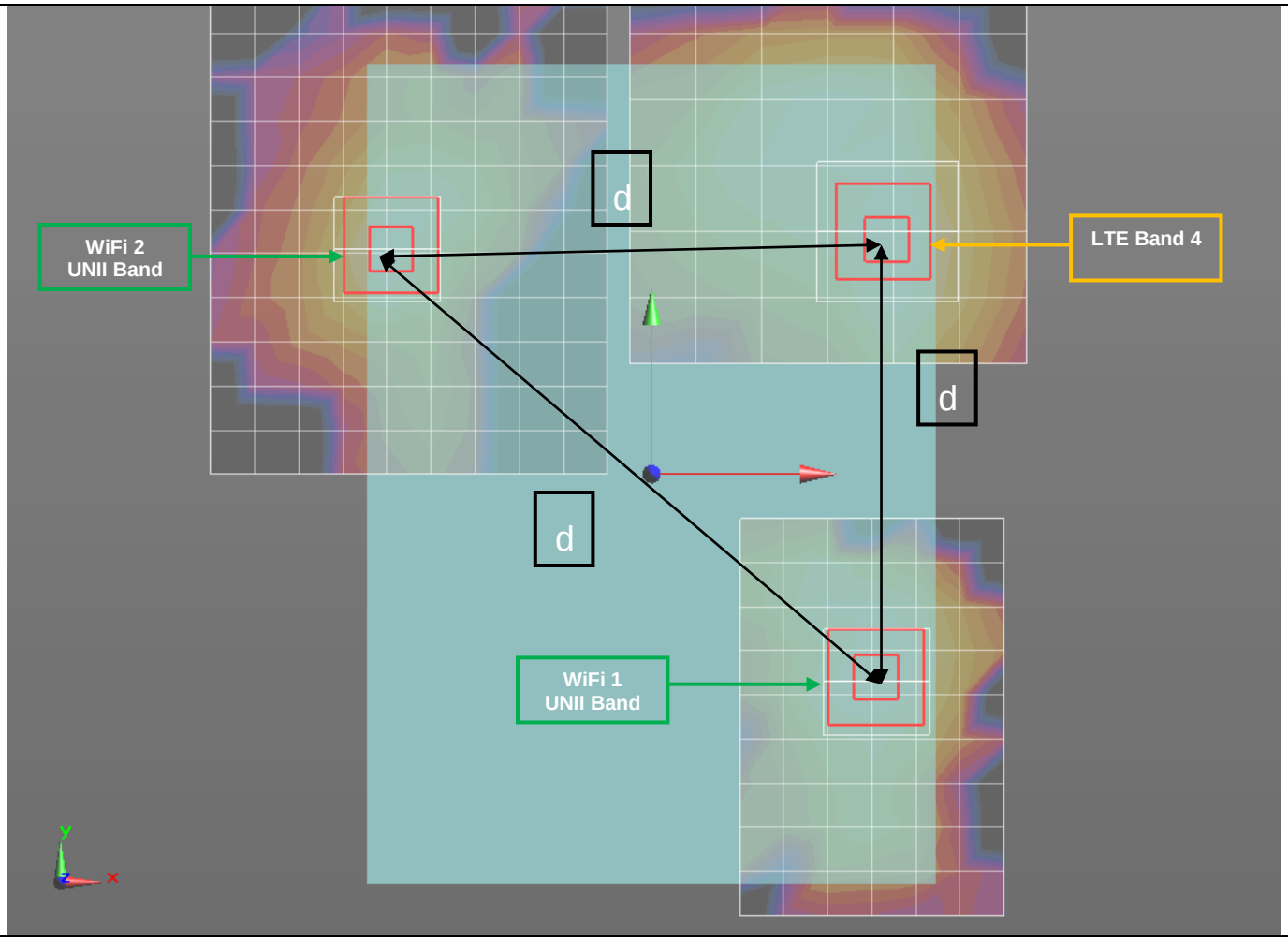
Mode	Peak SAR	X	Y	Z
	mW/g	m	m	m
LTE Band 4	0.957	0.0535	0.055	-0.181
WiFi 1 DTS Band	1.51	0.0492	-0.0456	-0.181
WiFi 2 DTS Band	1.48	-0.053	0.0408	-0.18

d: Calculated distance (mm)	WWAN + WiFi 1(DTS)	100.7
	WWAN + WiFi 2(DTS)	107.4
	WiFi 1 + WiFi 2(DTS)	133.8

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

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

Figure (2)



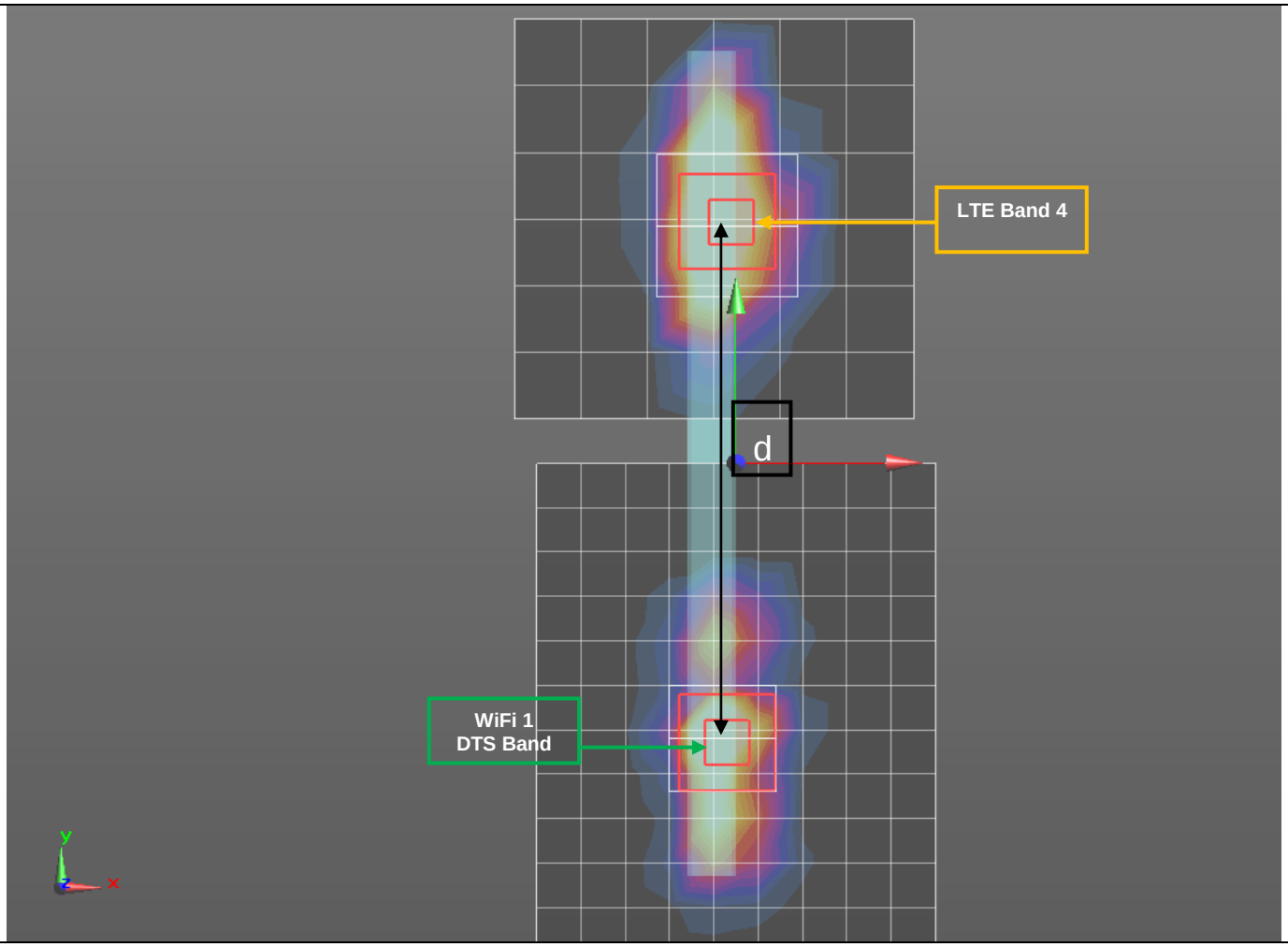
Mode	Peak SAR	X	Y	Z
	mW/g	m	m	m
LTE Band 4	0.957	0.0535	0.055	-0.181
WiFi 1 UNII Band	0.993	0.051	-0.047	-0.18
WiFi 2 UNII Band	0.902	-0.06	0.051	-0.181

d: Calculated distance (mm)	WWAN + WiFi 1(UNII)	102.0
	WWAN + WiFi 2(UNII)	113.6
	WiFi 1 + WiFi 2(UNII)	148.1

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

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

Figure (3)



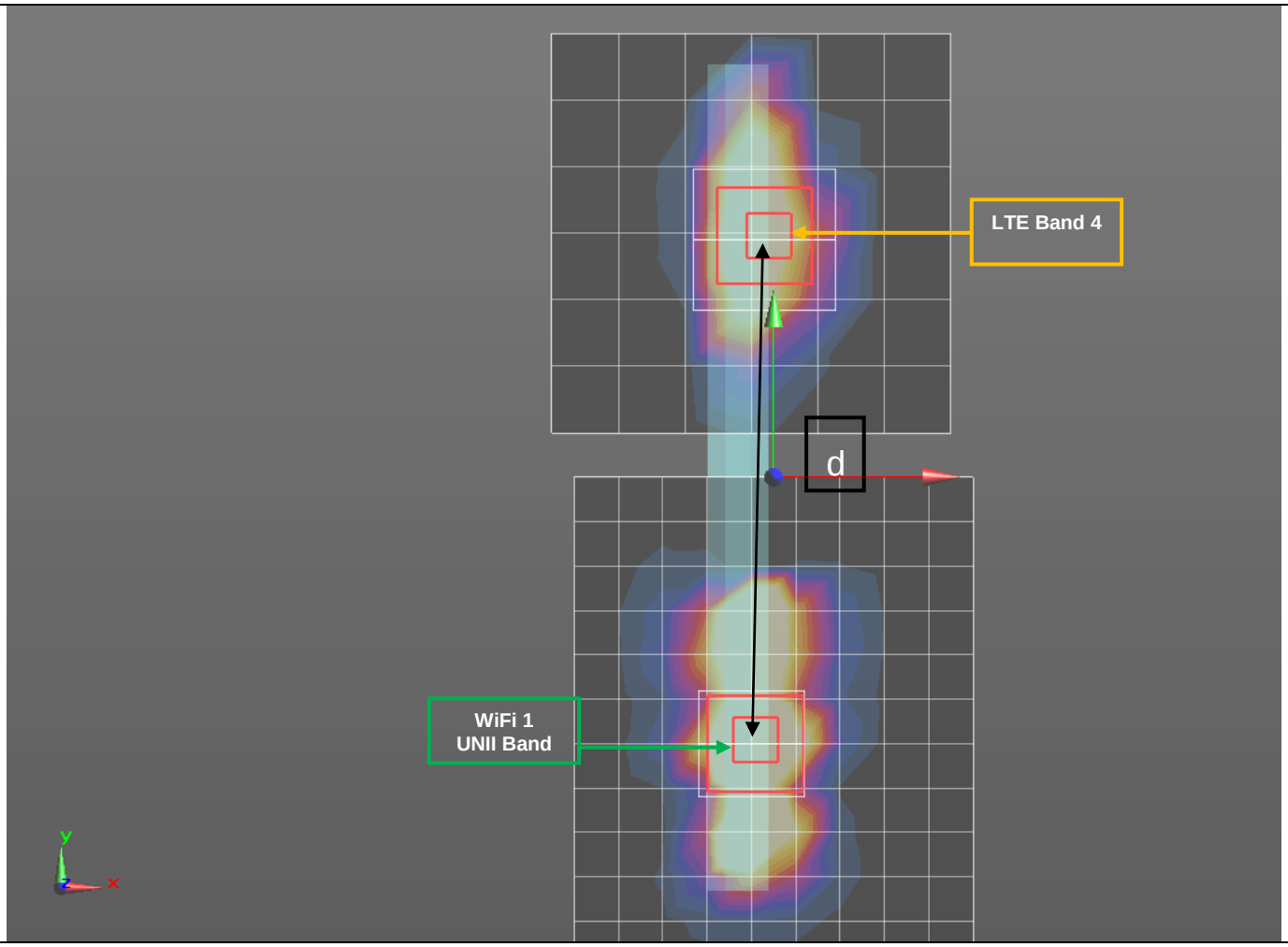
Mode	Peak SAR	X	Y	Z
	mW/g	m	m	m
LTE Band 4	1.45	-0.002	0.0535	-0.181
WiFi 1 DTS Band	1.71	-0.003	-0.062	-0.181

d: Calculated distance (mm)
115.5

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

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

Figure (4)



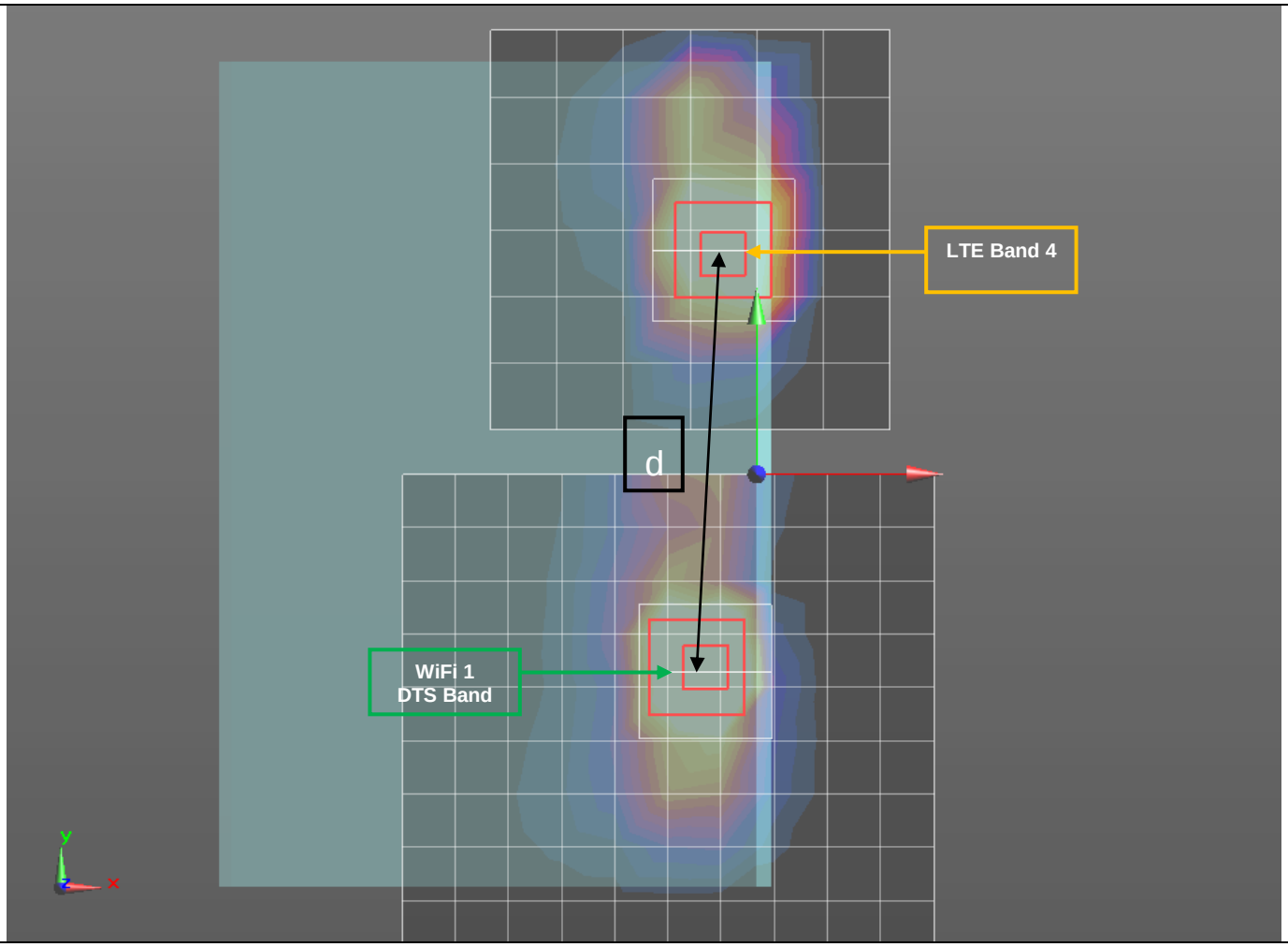
Mode	Peak SAR	X	Y	Z
	mW/g	m	m	m
LTE Band 4	1.45	-0.002	0.0535	-0.181
WiFi 1 UNII Band	2.31	-0.005	-0.06	-0.181

d: Calculated distance (mm)
113.5

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

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

Figure (5)



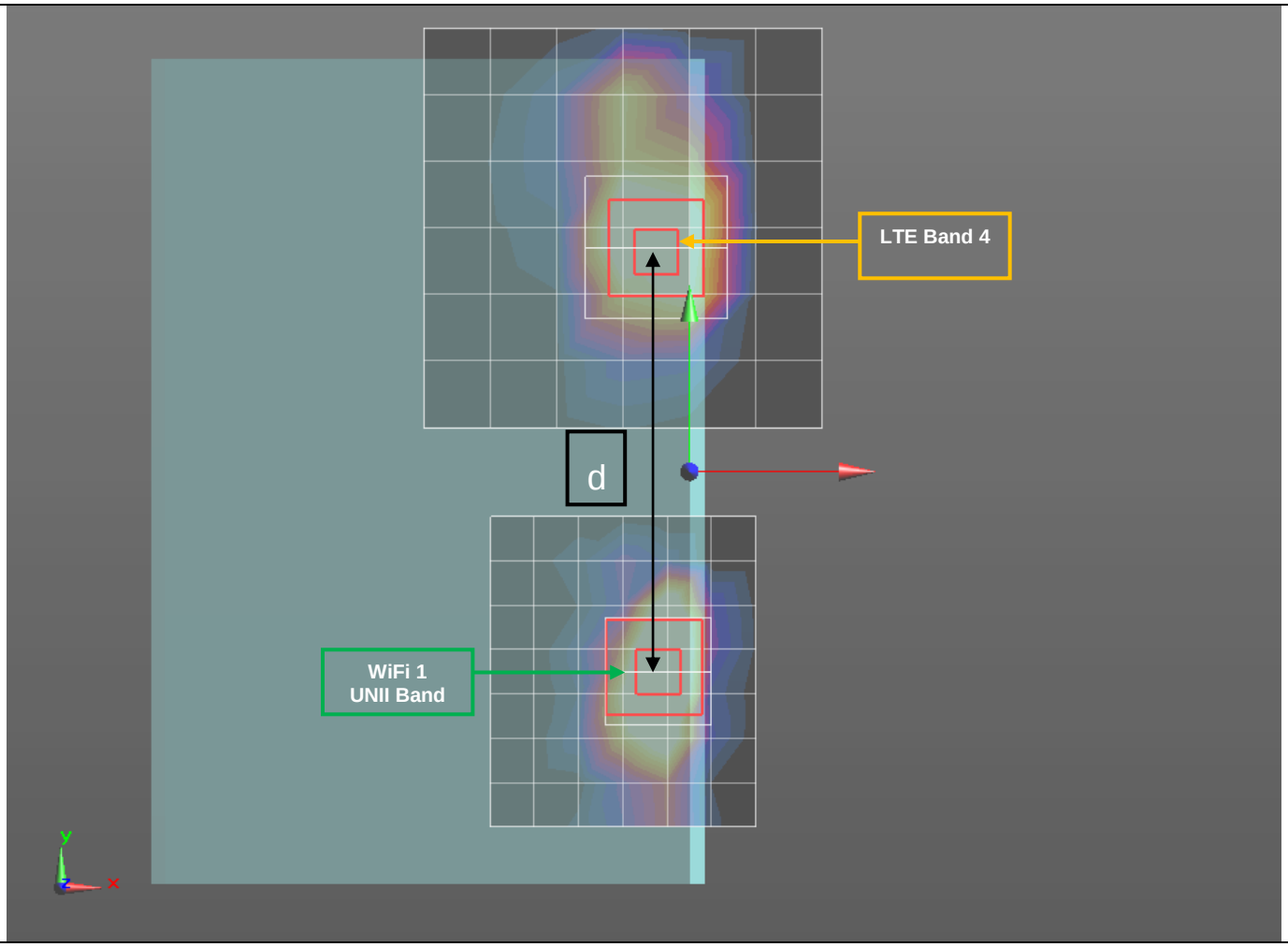
Mode	Peak SAR	X	Y	Z
	mW/g	m	m	m
LTE Band 4	1.57	-0.0075	0.0505	-0.181
WiFi 1 DTS Band	1.72	-0.0116	-0.0444	-0.181

d: Calculated distance (mm)
95.0

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

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

Figure (6)



Mode	Peak SAR	X	Y	Z
	mW/g	m	m	m
LTE Band 4	1.57	-0.0075	0.0505	-0.181
WiFi 1 UNII Band	1.73	-0.007	-0.045	-0.18

d: Calculated distance (mm)
95.5

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

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

14.7. Sum of the SAR for LTE Band 13, WiFi, and BT

RF Exposure condition	Test Position		Simultaneous Transmission Scenario						∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			LTE Band 13	WiFi 1 DTS Band	WiFi 2 DTS Band	WiFi 1 UNII Band	WiFi 2 UNII Band	Bluetooth		
Stand-alone	Rear	WWAN +WiFi (DTS)	0.963	1.064	0.971				2.998	**Yes**
		WWAN +WiFi (UNII)	0.963			0.523	0.426		1.912	**Yes**
		WWAN + BT	0.963					0.167	1.130	No
	Edge 1	WWAN +WiFi 1(DTS)	0.294	0.831					1.125	No
		WWAN +WiFi 1(UNII)	0.294			1.151			1.445	No
		WWAN + BT	0.294					0.167	0.461	No
	Edge 3	WWAN +WiFi 2(DTS)	0.400		0.584				0.984	No
		WWAN +WiFi 2(UNII)	0.400				1.141		1.541	No
	Rear/Edge 1 slant	WWAN +WiFi 1(DTS)	0.486	1.197					1.683	**Yes**
		WWAN +WiFi 1(UNII)	0.486			0.764			1.250	No
		WWAN + BT	0.486					0.167	0.653	No
	Rear/Edge 3 slant	WWAN +WiFi 2(DTS)	0.400		1.190				1.590	No
		WWAN +WiFi 2(UNII)	0.400				1.177		1.577	No

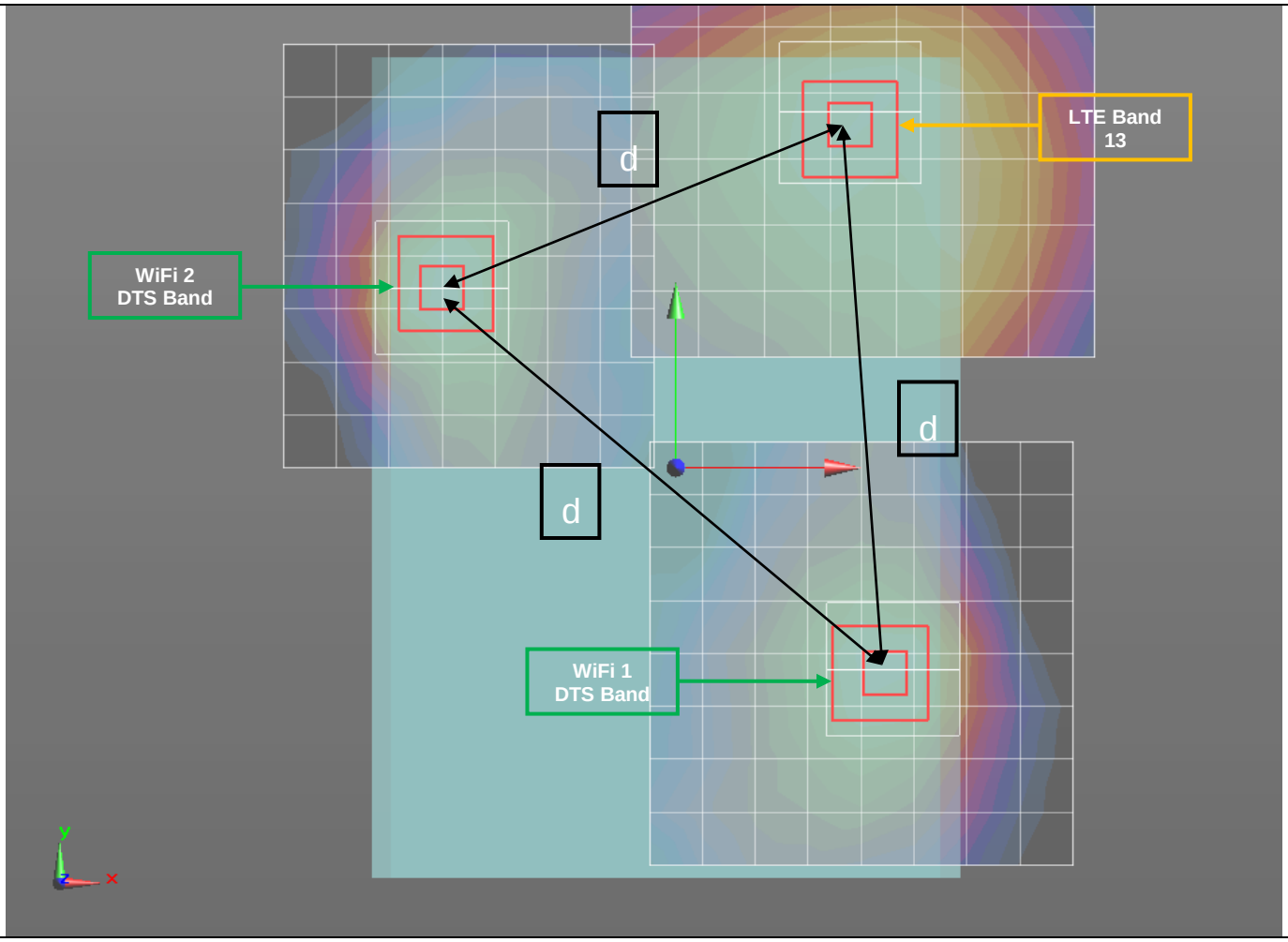
SAR to Peak Location Separation Ratio (SPLSR)

Case #	Test Position	Test Position	Worst-case combination					∑ 1-g SAR (mW/g)	Calculated distance (mm)	SPLSR (≤ 0.04)	Volume Scan (Yes/ No)	Figure
			LTE Band 13	WiFi 1 DTS Band	WiFi 2 DTS Band	WiFi 1 UNII Band	WiFi 2 UNII Band					
6	Rear	WWAN + WiFi(DTS)	0.963	1.064	0.971			2.998				1
		WWAN + WiFi 1(DTS)	0.963	1.064				2.027	126.5	0.023	No	
		WWAN + WiFi 2(DTS)	0.963		0.971			1.934	100.7	0.027	No	
		WiFi 1 + WiFi 2(DTS)		1.064	0.971			2.035	133.8	0.022	No	
		WWAN + WiFi(UNII)	0.963			0.523	0.426	1.912				2
		WWAN + WiFi 1(UNII)	0.963			0.523		1.486	128.0	0.014	No	
		WWAN + WiFi 2(UNII)	0.963				0.426	1.389	103.8	0.016	No	
		WiFi 1 + WiFi 2(UNII)				0.523	0.426	0.949	148.1	0.006	No	
	Rear/Edge 1 slant	WWAN +WiFi 1(DTS)	0.486	1.197				1.683	114.2	0.019	No	3

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.

Figure (1)



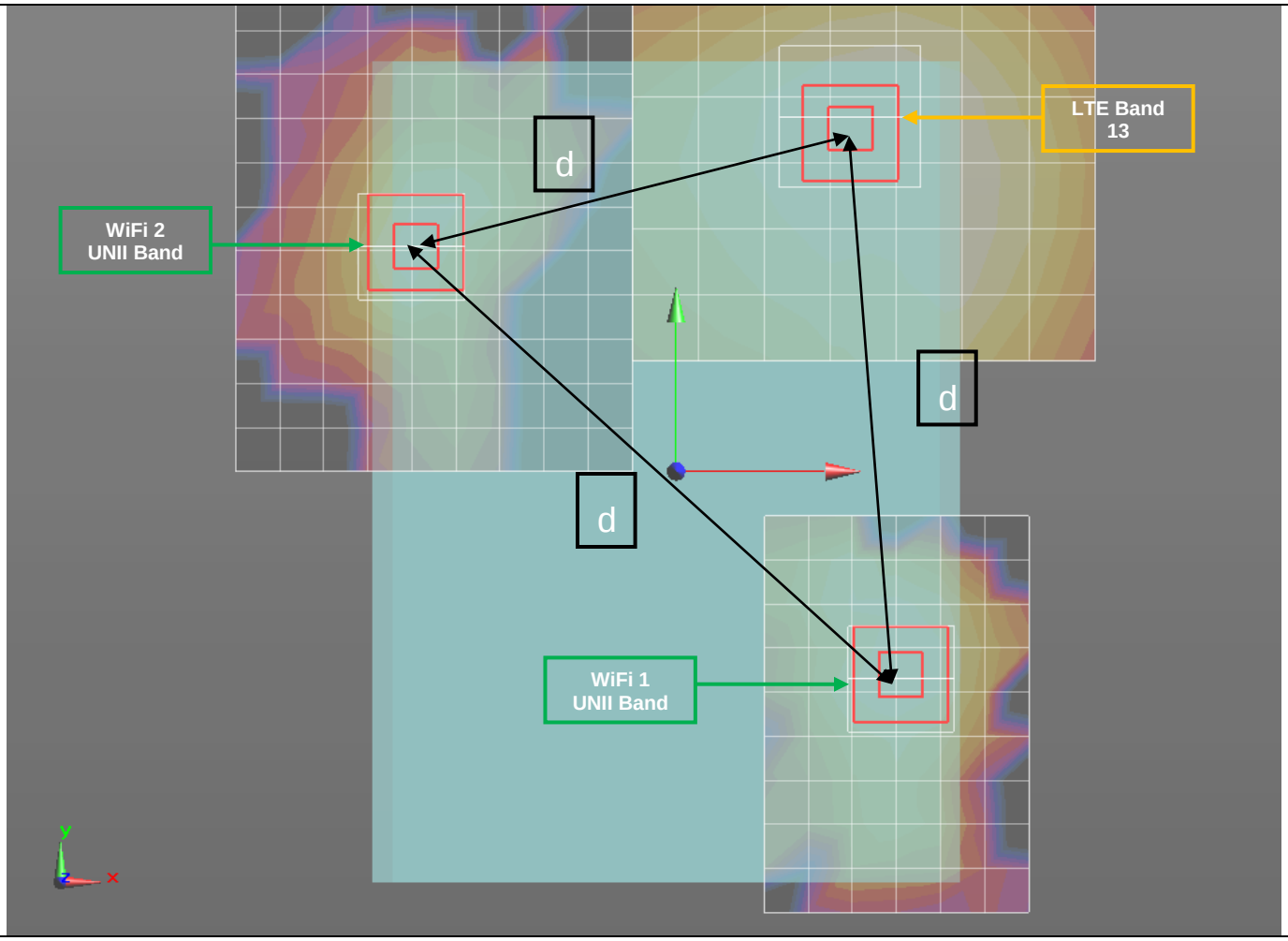
Mode	Peak SAR	X	Y	Z
	mW/g	m	m	m
LTE Band 13	1.24	0.0395	0.0805	-0.182
WiFi 1 DTS Band	1.51	0.0492	-0.0456	-0.181
WiFi 2 DTS Band	1.48	-0.053	0.0408	-0.18

d: Calculated distance (mm)	WWAN + WiFi 1(DTS)	126.5
	WWAN + WiFi 2(DTS)	100.7
	WiFi 1 + WiFi 2(DTS)	133.8

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

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

Figure (2)



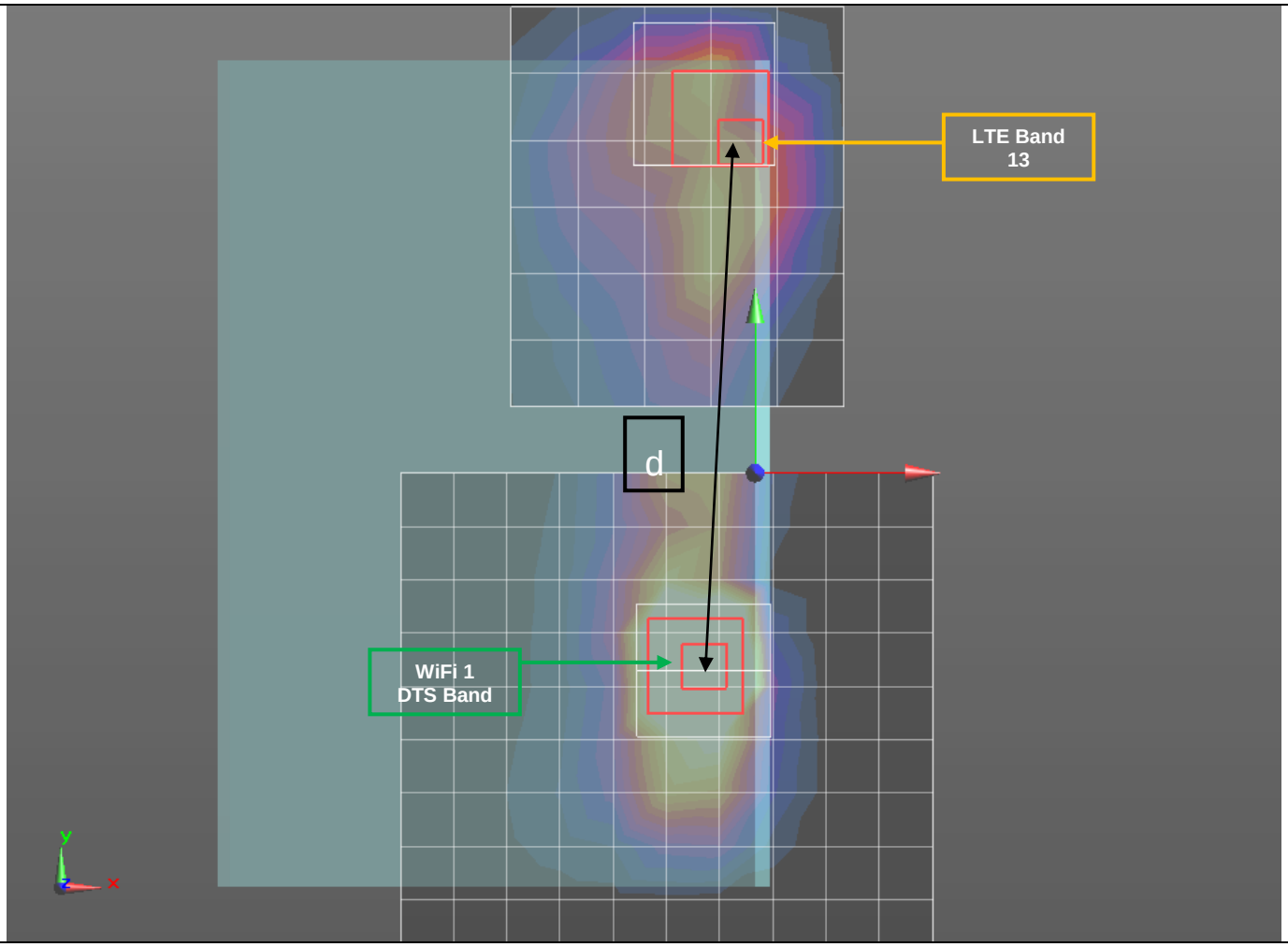
Mode	Peak SAR	X	Y	Z
	mW/g	m	m	m
LTE Band 13	1.24	0.0395	0.0805	-0.182
WiFi 1 UNII Band	0.993	0.051	-0.047	-0.18
WiFi 2 UNII Band	0.902	-0.06	0.051	-0.181

d: Calculated distance (mm)	WWAN + WiFi 1(UNII)	128.0
	WWAN + WiFi 2(UNII)	103.8
	WiFi 1 + WiFi 2(UNII)	148.1

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

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

Figure (3)



Mode	Peak SAR	X	Y	Z
	mW/g	m	m	m
LTE Band 13	0.804	-0.0035	0.0695	-0.182
WiFi 1 DTS Band	1.72	-0.0116	-0.0444	-0.181

d: Calculated distance (mm)
114.2

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

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

15. Appendixes

Refer to separated files for the following appendixes.

15.1. DUT and SAR setup Photos

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 3773

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

15.7. Calibration Certificate for E-Field Probe EX3DV4 - SN 3936

15.8. Calibration Certificate for D750V3 - SN 1019

15.9. Calibration Certificate for D835V2 - SN 4d117

15.10. Calibration Certificate for D1750V2- SN 1050

15.11. Calibration Certificate for D1900V2- SN 5d140

15.12. Calibration Certificate for D2450V2 - SN 706

15.13. Calibration Certificate for D2450V2 - SN 899

15.14. Calibration Certificate for D5GHzV2 - SN 1138

END OF REPORT