



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

SAR EVALUATION REPORT

FOR

GSM/WCDMA/LTE Phone + BT/BLE, DTS/UNII a/b/g/n/ac/ax, UWB, WPT and NFC

MODEL NUMBER: SCG10

FCC ID: A3LSMG996JPN

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TL-637

Revision History


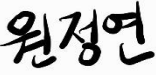
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V1	2/5/2021	Initial Issue	--
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1. Attestation of Test Results

Applicant Name		SAMSUNG ELECTRONICS CO.,LTD.			
FCC ID		A3LSMG996JPN			
Model Number		SCG10			
Applicable Standards		FCC 47 CFR § 2.1093 IEEE Std 1528-2013 Published RF exposure KDB procedures			
Exposure Category		SAR Limits (W/Kg)			
		Peak spatial-average (1g of tissue)		Product Specific 10g (10g of tissue)	
General population / Uncontrolled exposure		1.6		4.0	
RF Exposure Conditions		Equipment Class - The Highest Reported SAR (W/kg)			
		PCE	DTS	NII	DSS
Head		0.29	0.91	0.28	0.53
Body-worn		0.56	0.19	0.57	<0.10
Hotspot		1.25	0.42	N/A	<0.10
Product Specific 10g		1.66	N/A	2.16	N/A
Simultaneous TX	Head	1.30	1.30	1.30	1.10
	Body-worn	1.25	1.25	1.25	1.21
	Hotspot	1.45	1.45	N/A	1.04
	Product Specific 10g	3.82	N/A	3.82	N/A
Date Tested		12/4/2020 to 2/5/2021			
Test Results		Pass			
<p>UL Korea, Ltd. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Korea, Ltd. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.</p> <p>Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Korea, Ltd. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Korea, Ltd. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by IAS, any agency of the Federal Government, or any agency of any government.</p>					
Approved & Released By:			Prepared By:		
					
Justin Park Operations Leader UL Korea, Ltd. Suwon Laboratory			JeongYeon Won Senior Laboratory Technician UL Korea, Ltd. Suwon Laboratory		

1.1. The Highest Reported SAR for RF exposure conditions for each bands

Equipment Class	Band	The Highest Reported SAR (W/kg)			
		1g of tissue			10g of tissue
		Head Exposure condition	Body-worn Exposure condition	Hotspot Exposure condition	Product Specific Exposure condition
PCE	GSM 850	0.286	0.365	0.734	N/A
	GSM 1900	0.133	0.561	1.250	1.658
	WCDMA Band V	0.263	0.371	0.766	N/A
	LTE Band 5	0.276	0.381	0.776	N/A
	LTE Band 12	0.136	0.237	0.511	N/A
	LTE Band 13	0.181	0.312	0.735	N/A
	LTE Band 41	0.063	0.463	0.596	N/A
DTS	2.4GHz WLAN	0.914	0.191	0.421	N/A
UNII	5GHz WLAN	0.284	0.567	N/A	2.158
DSS	Bluetooth	0.527	0.081	0.035	N/A

2. Test Specification, Methods and Procedures

The tests documented in this report were performed in accordance with FCC 47 CFR § 2.1093, IEEE STD 1528-2013, ANSI C63.26-2015 the following FCC Published RF exposure [KDB](#) procedures:

- 248227 D01 802.11 Wi-Fi SAR v02r02
- 447498 D01 General RF Exposure Guidance v06
- 648474 D04 Handset SAR v01r03
- 690783 D01 SAR Listings on Grants v01r03
- 865664 D01 SAR measurement 100 MHz to 6 GHz v01r04
- 865664 D02 RF Exposure Reporting v01r02
- 941225 D01 3G SAR Procedures v03r01
- 941225 D05 SAR for LTE Devices v02r05
- 941225 D05A LTE Rel.10 KDB Inquiry Sheet v01r02
- 941225 D06 Hotspot Mode v02r01
- 941225 D07 UMPC Mini Tablet v01r02
- 971168 D01 Power Meas License Digital System v03r01

In addition to the above, the following information was used:

- [TCB workshop](#) October, 2014; Page 37, RF Exposure Procedures Update (Other LTE Considerations)
- [TCB workshop](#) October, 2016; Page 7, RF Exposure Procedures (Bluetooth Duty Factor)
- [TCB workshop](#) October, 2016; Page 18, RF Exposure Procedures (DUT Holder Perturbations)
- [TCB workshop](#) May, 2017; Page 6, RF Exposure Procedures (LTE Test Conditions)
- [TCB workshop](#) Nov, 2017; Page 3, RF Exposure Procedures (LTE UL/DL Carrier Aggregation SAR)
- [TCB workshop](#) April, 2018; Page 3, RF Exposure Procedures (LTE DL CA SAR Test Exclusion Update)
- [TCB workshop](#) April, 2019 Page 10, RF Exposure Procedures (802.11ax SAR Testing)
- [TCB workshop](#) April, 2019 Page 19, RF Exposure Procedures (Tissue Simulating Liquids (TSL))

3. Facilities and Accreditation

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

Suwon
SAR 1 Room
SAR 3 Room
SAR 4 Room
SAR 5 Room

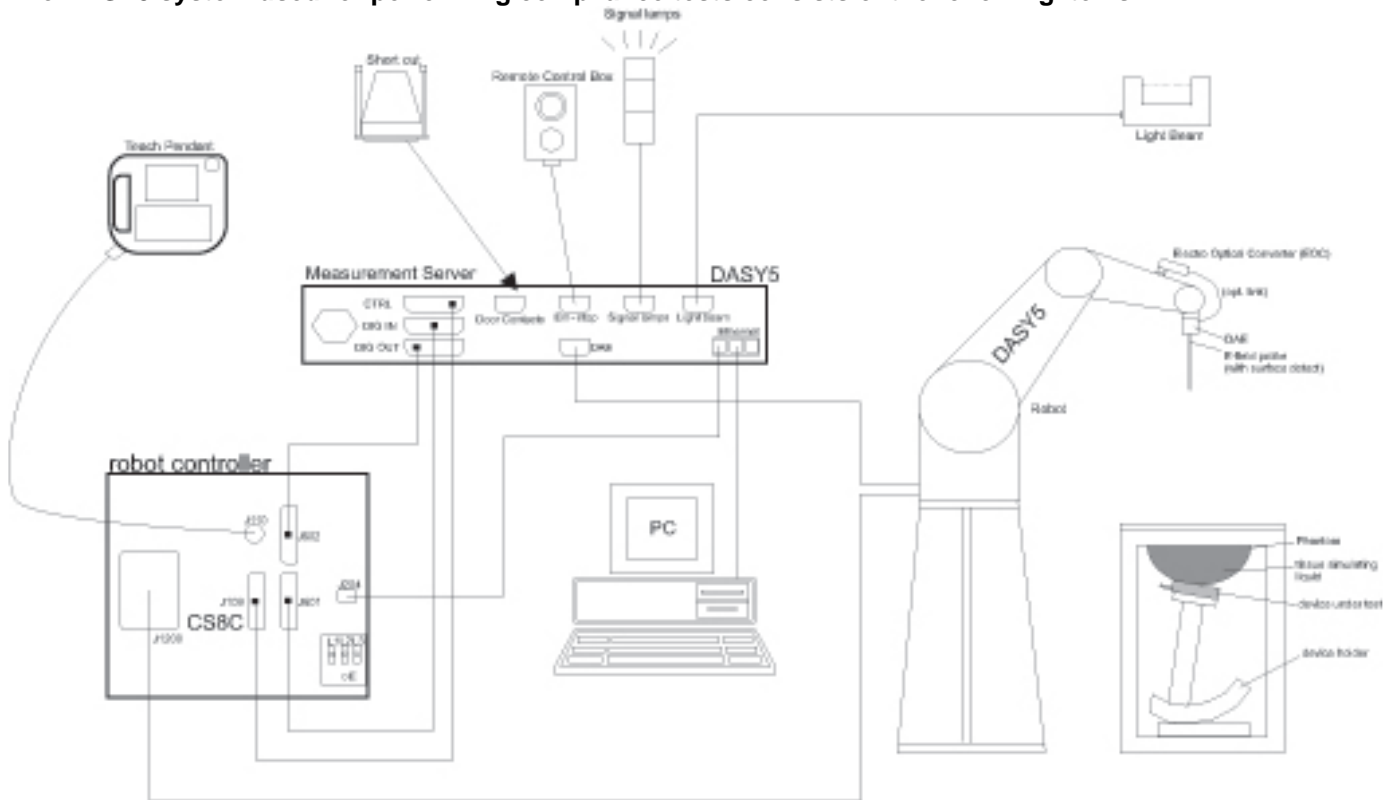
UL Korea, Ltd. is accredited by IAS, Laboratory Code TL-637.

The full scope of accreditation can be viewed at <https://www.iasonline.org/wp-content/uploads/2017/05/TL-637-cert-New.pdf>.

4. SAR Measurement System & Test Equipment

4.1. SAR Measurement System

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



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

4.2. SAR Scan Procedures

Step 1: Power Reference Measurement

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

Step 2: Area Scan

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

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

	≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 ± 1 mm	$\frac{1}{2} \cdot \delta \cdot \ln(2) \pm 0.5$ mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	$30^\circ \pm 1^\circ$	$20^\circ \pm 1^\circ$
Maximum area scan spatial resolution: 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 \leq the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

Step 3: Zoom Scan

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

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

			≤ 3 GHz	> 3 GHz
Maximum zoom scan spatial resolution: $\Delta x_{Zoom}, \Delta y_{Zoom}$			≤ 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 1 st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: 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 <i>reported</i> SAR from the <i>area scan based 1-g SAR estimation</i> procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.				

Step 4: Power drift measurement

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

Step 5: Z-Scan (FCC only)

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

4.3. Test Equipment

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

Dielectric Property Measurements

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Network Analyzer	Agilent	E5071C	MY46522054	8-4-2021
Dielectric Assessment Kit	SPEAG	DAK-3.5	1196	7-17-2021
Shorting block	SPEAG	DAK-3.5 Short	SM DAK 200 BA	N/A
Thermometer	LKM	DTM3000	3424	8-11-2021

System Check

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
MXG Analog Signal Generator	Agilent	N5181A	MY50145882	8-4-2021
Power Sensor	Agilent	U2000A	MY60180020	9-9-2021
Power Sensor	Agilent	U2000A	MY54260007	8-7-2021
Power Amplifier	EXODUS	1410025-AMP2027-10003	10003	8-4-2021
Directional Coupler	Agilent	772D	MY52180193	8-4-2021
Directional Coupler	Agilent	778D	MY52180432	8-4-2021
Low Pass Filter	MICROLAB	LA-15N	3943	8-4-2021
Low Pass Filter	FILTRON	L14012FL	1410003S	8-4-2021
Low Pass Filter	MICROLAB	LA-60N	3942	8-4-2021
Attenuator	Agilent	8491B/003	MY39271969	9-9-2021
Attenuator	Agilent	8491B/010	MY39271981	9-9-2021
Attenuator	Agilent	8491B/020	MY39271973	9-9-2021
E-Field Probe (SAR1)	SPEAG	EX3DV4	7376	7-31-2021
E-Field Probe (SAR3)	SPEAG	EX3DV4	7313	2-25-2021
E-Field Probe (SAR4)	SPEAG	EX3DV4	7330	2-21-2021
E-Field Probe (SAR5)	SPEAG	EX3DV4	3871	8-28-2021
Data Acquisition Electronics (SAR1)	SPEAG	DAE4	1468	8-25-2021
Data Acquisition Electronics (SAR3)	SPEAG	DAE4	1494	7-23-2021
Data Acquisition Electronics (SAR4)	SPEAG	DAE4	1591	8-25-2021
Data Acquisition Electronics (SAR5)	SPEAG	DAE4	1343	8-25-2021
System Validation Dipole	SPEAG	D750V3	1122	2-24-2022
System Validation Dipole	SPEAG	D835V2	4d174	2-24-2022
System Validation Dipole	SPEAG	D1900V2	5d199	3-19-2022
System Validation Dipole	SPEAG	D2450V2	939	7-25-2021
System Validation Dipole	SPEAG	D2600V2	1097	9-19-2021
System Validation Dipole	SPEAG	D5GHzV2	1209	2-27-2022
Thermometer (SAR1)	Lutron	MHB-382SD	AH.50215	8-11-2021
Thermometer (SAR3)	Lutron	MHB-382SD	AH.50213	8-11-2021
Thermometer (SAR4),(SAR5)	Lutron	MHB-382SD	AH.91463	8-11-2021

Others

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Base Station Simulator	R & S	CMW500	150313	8-4-2021
Base Station Simulator	R & S	CMW500	150314	8-4-2021
Base Station Simulator	R & S	CMW500	162790	8-4-2021
Wireless Connectivity Tester	R & S	CMW270	100982	8-3-2021

Note(s):

1. Refer to Appendix F that mentioned about justification for Extended SAR Dipole Calibrations. (D2450V2 (SN : 939), D2600V2 (SN : 1097))
2. According to KDB 865664, Dipole can be used for 3 years if performance is checked, so we calibration every 2 years and check performance according to the standard and write it on Appendix.

5. Measurement Uncertainty

Per KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg and the measured 10-g SAR within a frequency band is < 3.75 W/kg. The expanded SAR measurement uncertainty must be ≤ 30%, for a confidence interval of k = 2. If these conditions are met, extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval.

5.1. DECISION RULE

Decision rule for statement(s) of conformity is based on Procedures 1, Clause 4.4.2 in IEC Guide 115:2007.

6. Device Under Test (DUT) Information

6.1. DUT Description

Device Dimension	Refer to Appendix A.		
Back Cover	<input checked="" type="checkbox"/> The Back Cover is not removable.		
Battery Options	<input checked="" type="checkbox"/> The rechargeable battery is not user accessible		
Wireless Router (Hotspot)	Wi-Fi Hotspot mode permits the device to share its cellular data connection with other Wi-Fi-enabled devices. <input checked="" type="checkbox"/> Mobile Hotspot (Wi-Fi 2.4 GHz)		
Wi-Fi Direct	Wi-Fi Direct enabled devices transfer data directly between each other <input checked="" type="checkbox"/> Wi-Fi Direct (Wi-Fi 2.4 GHz)		
Test Sample Information	No.	S/N	Notes
	1	R3CNA0BB86X	Main Conducted
	2	R3CNA0BB9EY	Main Conducted
	3	R3CNA0BB96L	Wi-Fi & BT Conducted
	4	R3CNA0BB8SF	Wi-Fi & BT Conducted
	5	R3CNA0BB7CW	SAR
	6	R3CNA0BB7XH	SAR
	7	R3CNA0BB9DB	SAR
	8	R3CNC02X3VY	SAR
	9	R3CNC02XBLL	SAR
	10	R3CNC02XB5K	SAR

6.2. Wireless Technologies

Wireless technologies	Frequency bands	Operating mode		Duty Cycle used for SAR testing
GSM	850 1900	Voice (GMSK) GPRS (GMSK) EGPRS (8PSK)	GPRS Multi-Slot Class: <input type="checkbox"/> Class 8 - 1 Up, 4 Down <input type="checkbox"/> Class 10 - 2 Up, 4 Down <input type="checkbox"/> Class 12 - 4 Up, 4 Down <input checked="" type="checkbox"/> Class 33 - 4 Up, 5 Down	GSM Voice: 12.5% (E)GPRS: 1 Slot: 12.5% 2 Slots: 25% 3 Slots: 37.5% 4 Slots: 50%
		Does this device support DTM (Dual Transfer Mode)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		
W-CDMA (UMTS)	Band V	UMTS Rel. 99 (Voice & Data) HSDPA (Category 24) HSUPA (Category 6) HSPA+ (DL only)		100%
LTE	FDD Band 5 FDD Band 12 FDD Band 13 TDD Band 41	QPSK 16QAM 64QAM	Rel. 15 Carrier Aggregation (2 Uplink and 2 Downlinks)	100% (FDD) 63.3% (TDD)
	TDD Band 41 2CC			
Does this device support SV-LTE (1xRTT-LTE)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No				
Wi-Fi	2.4 GHz	802.11b 802.11g 802.11n (HT20) 802.11ax (HE20)		SISO mode : 98.9% _(802.11b) MIMO mode : 97.6% _(802.11g)
	5 GHz	802.11a 802.11n (HT20) 802.11n (HT40) 802.11ac (VHT20) 802.11ac (VHT40) 802.11ac (VHT80) 802.11ax (HE20) 802.11ax (HE40) 802.11ax (HE80)		<u>MIMO mode:</u> 97.6% _(802.11a) 97.1% _(802.11ac 80MHz BW)
	Does this device support bands 5.60 ~ 5.65 GHz? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No			
Does this device support Band gap channel(s)? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No				
Bluetooth	2.4 GHz	Version 5.0 LE		76.9% (DH5)
NFC	13.56 MHz	Type A/B/F		N/A ³
UWB	6.24 – 8.24 GHz	BPM-BPSK		N/A ³

Notes:

- The Bluetooth protocol is considered source-based averaging. Bluetooth GFSK (DH5) was verified to have the highest duty cycle of 76.9% and was considered and used for SAR Testing.
- Duty cycle for Wi-Fi is referenced from the DTS and UNII report.
- Measured Duty Cycle is not required due to SAR test exemption.

6.3. Nominal and Maximum Output Power

KDB 447498 sec.4.1. at the maximum rated output power and within the tune-up tolerance range specified for the product, but not more than 2 dB lower than the maximum tune-up tolerance limit

RF Air interface	Antenna	Mode	Time Slots	Max. RF Output Power (dBm)		Reduced. RF Output Power (Hotspot & Proximity sensor & Earjack back-off) (dBm)	
				Tune-up Limit	Frame Power	Tune-up Limit	Frame Power
GSM850	Main 1 Ant.	GPRS	1	33.2	24.2		
		GPRS	2	32.0	26.0		
		GPRS	3	30.5	26.2		
		GPRS	4	28.5	25.5		
		EGPRS	1	28.0	19.0		
		EGPRS	2	26.0	20.0		
		EGPRS	3	24.0	19.7		
		EGPRS	4	23.0	20.0		
GSM1900	Main 1 Ant.	GPRS	1	30.0	21.0	27.0	18.0
		GPRS	2	29.0	23.0	26.0	20.0
		GPRS	3	27.5	23.2	24.5	20.2
		GPRS	4	25.5	22.5	22.5	19.5
		EGPRS	1	27.0	18.0	27.0	18.0
		EGPRS	2	25.0	19.0	25.0	19.0
		EGPRS	3	23.0	18.7	23.0	18.7
		EGPRS	4	22.0	19.0	22.0	19.0

RF Air interface	Antenna	Mode	Max. RF Output Power (dBm)	Reduced. RF Output Power (Hotspot & Proximity sensor & Earjack back-off) (dBm)
W-CDMA Band V	Main 1 Ant.	R99	25.0	
		HSDPA	22.5	
		HSUPA	22.5	

RF Air interface	Antenna	Mode	Max. RF Output Power (dBm)	Reduced. RF Output Power (Hotspot & Proximity sensor & Earjack back-off) (dBm)
LTE Band 5	Main 1 Ant.	QPSK	25.5	
LTE Band 12	Main 1 Ant.	QPSK	25.5	
LTE Bands 13	Main 1 Ant.	QPSK	25.3	
LTE Band 41	Main 2 Ant.	QPSK	25.0	23.0

Normal WLAN mode Power

RF Air interface	Mode	Normal WLAN mode power (dBm)					
		Max. RF Output Power			Reduced RF Output Power		
		SISO	MIMO		SISO	MIMO	
		Ant.1, Ant.2	Ant.1, Ant.2	TOTAL	Ant.1, Ant.2	Ant.1, Ant.2	TOTAL
WiFi 2.4 GHz (Ch.1~10)	802.11b	19.0			17.0		
	802.11g		16.0	19.0			
	802.11n HT20		16.0	19.0			
	802.11ax HE20		16.0	19.0			
WiFi 2.4 GHz (Ch.11)	802.11b	19.0			17.0		
	802.11g		16.0	19.0			
	802.11n HT20		14.0	17.0			
	802.11ax HE20		14.0	17.0			
WiFi 2.4 GHz (Ch.12)	802.11b	10.0					
	802.11g		10.0	13.0			
	802.11n HT20		10.0	13.0			
	802.11ax HE20		10.0	13.0			
WiFi 2.4 GHz (Ch.13)	802.11b	8.0					
	802.11g		8.0	11.0			
	802.11n HT20		8.0	11.0			
	802.11ax HE20		6.0	9.0			
WiFi 5 GHz (UNII-1)	802.11a		17.0	20.0	13.0	16.0	
	802.11n HT20		17.0	20.0	13.0	16.0	
	802.11n HT40		15.0	18.0	13.0	16.0	
	802.11ac VHT20		38Ch : 13.0	38Ch : 16.0	13.0	16.0	
	802.11ac VHT40		17.0	20.0	13.0	16.0	
	802.11ac VHT80		15	18	13.0	16.0	
	802.11ac VHT80		38Ch : 13.0	38Ch : 16.0	13.0	16.0	
	802.11ac VHT80		14.0	17.0	13.0	16.0	
	802.11ax HE20		17.0	20.0	13.0	16.0	
802.11ax HE40		15.0	18.0	13.0	16.0		
802.11ax HE80		38Ch : 13.0	38Ch : 16.0	13.0	16.0		
802.11ax HE80		12.0	15.0	13.0	16.0		
WiFi 5 GHz (UNII-2A)	802.11a		17.0	20.0	13.0	16.0	
	802.11n HT20		17.0	20.0	13.0	16.0	
	802.11n HT40		15.0	18.0	13.0	16.0	
	802.11ac VHT20		62Ch : 14.5	62Ch : 17.5	13.0	16.0	
	802.11ac VHT40		17.0	20.0	13.0	16.0	
	802.11ac VHT80		15.0	18.0	13.0	16.0	
	802.11ac VHT80		62Ch : 14.5	62Ch : 17.5	13.0	16.0	
	802.11ac VHT80		14.0	17.0	13.0	16.0	
	802.11ax HE20		17.0	20.0	13.0	16.0	
802.11ax HE40		15.0	18.0	13.0	16.0		
802.11ax HE80		62Ch : 14.5	62Ch : 17.5	13.0	16.0		
802.11ax HE80		14.0	17.0	13.0	16.0		
WiFi 5 GHz (UNII-2C)	802.11a		17.0	20.0	13.0	16.0	
	802.11n HT20		17.0	20.0	13.0	16.0	
	802.11n HT40		140Ch : 16.0	140Ch : 19.0	13.0	16.0	
	802.11n HT40		15.0	18.0	13.0	16.0	
	802.11ac VHT20		102Ch : 12.0	102Ch : 15.0	102Ch ; 11.0	102Ch ; 14.0	
	802.11ac VHT40		17.0	20.0	13.0	16.0	
	802.11ac VHT40		140Ch : 16.0	140Ch : 19.0	13.0	16.0	
	802.11ac VHT80		15.0	18.0	13.0	16.0	
	802.11ac VHT80		102Ch : 12.0	102Ch : 15.0	102Ch ; 11.0	102Ch ; 14.0	
802.11ax HE20		17.0	20.0	13.0	16.0		
802.11ax HE40		140Ch : 14.0	140Ch : 17.0	13.0	16.0		
802.11ax HE40		15.0	18.0	13.0	16.0		
802.11ax HE80		102Ch : 12.0	102Ch : 15.0	102Ch ; 11.0	102Ch ; 14.0		
802.11ax HE80		14.0	17.0	13.0	16.0		
WiFi 5 GHz (UNII-3)	802.11a		17.0	20.0	13.0	16.0	
	802.11n HT20		17.0	20.0	13.0	16.0	
	802.11n HT40		15.0	18.0	13.0	16.0	
	802.11ac VHT20		17.0	20.0	13.0	16.0	
	802.11ac VHT40		15.0	18.0	13.0	16.0	
	802.11ac VHT80		14.0	17.0	13.0	16.0	
	802.11ac VHT80		17.0	20.0	13.0	16.0	
	802.11ax HE20		15.0	18.0	13.0	16.0	
	802.11ax HE40		17.0	20.0	13.0	16.0	
802.11ax HE80		15.0	18.0	13.0	16.0		

RSDB WLAN mode Power

RF Air interface	Mode	RSDB WLAN mode power (dBm)					
		Max. RF Output Power			Reduced RF Output Power		
		SISO		MIMO	SISO		MIMO
		Ant.1, Ant.2	Ant.1, Ant.2	TOTAL	Ant.1, Ant.2	Ant.1, Ant.2	TOTAL
WiFi 2.4 GHz (Ch.1~11)	802.11b	14.0			14.0		
	802.11g	14.0	14.0	17.0	14.0	14.0	17.0
	802.11n HT20	14.0	14.0	17.0	14.0	14.0	17.0
	802.11ax HE20	14.0	14.0	17.0	14.0	14.0	17.0
WiFi 2.4 GHz (Ch.12)	802.11b	10.0			10.0		
	802.11g	10.0	10.0	13.0	10.0	10.0	13.0
	802.11n HT20	10.0	10.0	13.0	10.0	10.0	13.0
	802.11ax HE20	10.0	10.0	13.0	10.0	10.0	13.0
WiFi 2.4 GHz (Ch.13)	802.11b	8.0			8.0		
	802.11g	8.0	8.0	11.0	8.0	8.0	11.0
	802.11n HT20	8.0	8.0	11.0	8.0	8.0	11.0
	802.11ax HE20	8.0	8.0	11.0	8.0	8.0	11.0
WiFi 5 GHz (UNII-1)	802.11a		13.0	16.0		13.0	16.0
	802.11n HT20		13.0	16.0		13.0	16.0
	802.11n HT40		13.0	16.0		13.0	16.0
	802.11ac VHT20		13.0	16.0		13.0	16.0
	802.11ac VHT40		13.0	16.0		13.0	16.0
	802.11ac VHT80		13.0	16.0		13.0	16.0
	802.11ax HE20		13.0	16.0		13.0	16.0
	802.11ax HE40		13.0	16.0		13.0	16.0
WiFi 5 GHz (UNII-2A)	802.11a		13.0	16.0		13.0	16.0
	802.11n HT20		13.0	16.0		13.0	16.0
	802.11n HT40		13.0	16.0		13.0	16.0
	802.11ac VHT20		13.0	16.0		13.0	16.0
	802.11ac VHT40		13.0	16.0		13.0	16.0
	802.11ac VHT80		13.0	16.0		13.0	16.0
	802.11ax HE20		13.0	16.0		13.0	16.0
	802.11ax HE40		13.0	16.0		13.0	16.0
WiFi 5 GHz (UNII-2C)	802.11a		13.0	16.0		13.0	16.0
	802.11n HT20		13.0	16.0		13.0	16.0
	802.11n HT40		13.0	16.0		13.0	16.0
	802.11ac VHT20		102Ch : 12.0	102Ch : 15.0		102Ch : 12.0	102Ch : 15.0
	802.11ac VHT40		13.0	16.0		13.0	16.0
	802.11ac VHT80		102Ch : 12.0	102Ch : 15.0		102Ch : 12.0	102Ch : 15.0
	802.11ac VHT80		13.0	16.0		13.0	16.0
	802.11ax HE20		13.0	16.0		13.0	16.0
	802.11ax HE40		13.0	16.0		13.0	16.0
	802.11ax HE80		102Ch : 12.0	102Ch : 15.0		102Ch : 12.0	102Ch : 15.0
WiFi 5 GHz (UNII-3)	802.11a		13.0	16.0		13.0	16.0
	802.11n HT20		13.0	16.0		13.0	16.0
	802.11n HT40		13.0	16.0		13.0	16.0
	802.11ac VHT20		13.0	16.0		13.0	16.0
	802.11ac VHT40		13.0	16.0		13.0	16.0
	802.11ac VHT80		13.0	16.0		13.0	16.0
	802.11ax HE20		13.0	16.0		13.0	16.0
	802.11ax HE40		13.0	16.0		13.0	16.0

Note(s):

1. This device uses an independent fixed level power reduction mechanism for WLAN mode operations during RCV operation. Detailed descriptions of the power reduction mechanism are included in the operational description.
2. 802.11g/n/a/ac/ax modes operate MIMO mode only.
3. BT tech uses Ant 1.
4. WLAN mode supports RSDB operation. Detail of RSDB operation scenario is mentioned in Sec.13.

6.4. Power Back-off Operation

This device supports multiple power back-off modes: WWAN (Ear-jack), WWAN (Hotspot), WWAN (Proximity sensor), and WLAN (RCV). Each of the power back-off operates within specific exposure conditions for certain technologies. For full details on how each power back-off mode operates, refer to the Operational Description.

Power Back-off mode	Technologies Supported	Exposure Conditions Active			
		Head	Body-worn	Hotspot	Product Specific 10-g
WWAN (Ear-jack)	GSM 1900 LTE B41	N/A	✓	N/A	✓
WWAN (Hotspot) ¹	GSM 1900 LTE B41	N/A	N/A	✓	N/A
WWAN (Proximity sensor) ¹	GSM 1900 LTE B41	N/A	N/A	N/A	✓
WLAN (RCV)	Wi-Fi 2.4GHz Wi-Fi 5GHz	✓	N/A	N/A	N/A

Note(s):

1. Tune-up Limits for WWAN (Hotspot) and WWAN (Proximity Sensor) are all Reduced Average Powers. Please refer to Sec.9 for all conducted power measurements.
2. WWAN Back-off priority: Ear-jack → Proximity Sensor → Hotspot
3. Body-worn SAR with ear-jack connected at reduced power is not required due to Body-worn measured at max power is not over 1.2 W/kg.
4. Ear-jack and Proximity sensor back-off mode have the same reduced power level.

Product Specific 10g Adjusted SAR Calculation

Wireless technologies	Max Tune-up Limit (dBm)	Reduced Tune-Up Limit (dBm)	Power Factor	Reported SAR Limit (W/kg)
GSM 1900	23.2	20.2	2.00	0.601
LTE B41	25.0	23.0	1.58	0.757

Note(s):

1. Tune-up limit powers for GSM 1900 are frame power(dBm).
2. This device supports power reduction in Hotspot mode. According to KDB 648474 D01 §2.5 b, extremity 10-g SAR testing is not required if the adjusted SAR is < 1.2 W/kg when the measured SAR is scaled to the maximum tune-up limit. Refer to §10 for Reported SAR results. If the Reported SAR 1g value in §10 is less than the Reported SAR Limit listed above, then Extremity SAR is not required.
3. LTE 50% RB is scaled up to the Max Tune-Up Limit with MPR included.
4. For Reported SAR limit in above table, it was calculated using Max tune-up Limit & Reduced Tune-up limit & Reported SAR 1.2 W/kg. (Reported SAR Limit = 1.2 W/kg / Power factor, Power factor = 10^{(((Max tune-up limit – Reduced tune-up limit)/10)})

6.5. General LTE SAR Test and Reporting Considerations

Item	Description																																																																																																																																																																																																																																																				
Frequency range, Channel Bandwidth, Numbers and Frequencies	<table border="1"> <tr> <th rowspan="3">Band 5</th> <th colspan="6">Frequency range: 824 - 849 MHz</th> </tr> <tr> <th colspan="6">Channel Bandwidth</th> </tr> <tr> <th>20 MHz</th> <th>15 MHz</th> <th>10 MHz</th> <th>5 MHz</th> <th>3 MHz</th> <th>1.4 MHz</th> </tr> <tr> <td>Low</td> <td></td> <td></td> <td>20450/ 829</td> <td>20425/ 826.5</td> <td>20415/ 825.5</td> <td>20407/ 824.7</td> </tr> <tr> <td>Mid</td> <td></td> <td></td> <td>20525/ 836.5</td> <td>20525/ 836.5</td> <td>20525/ 836.5</td> <td>20525/ 836.5</td> </tr> <tr> <td>High</td> <td></td> <td></td> <td>20600/ 844</td> <td>20625/ 846.5</td> <td>20635/ 847.5</td> <td>20643/ 848.3</td> </tr> <tr> <th rowspan="3">Band 12</th> <th colspan="6">Frequency range: 699 – 716 MHz</th> </tr> <tr> <th colspan="6">Channel Bandwidth</th> </tr> <tr> <th>20 MHz</th> <th>15 MHz</th> <th>10 MHz</th> <th>5 MHz</th> <th>3 MHz</th> <th>1.4 MHz</th> </tr> <tr> <td>Low</td> <td></td> <td></td> <td>23060/ 704</td> <td>23035/ 701.5</td> <td>23025/ 700.5</td> <td>23017/ 699.7</td> </tr> <tr> <td>Mid</td> <td></td> <td></td> <td>23095/ 707.5</td> <td>23095/ 707.5</td> <td>23095/ 707.5</td> <td>23095/ 707.5</td> </tr> <tr> <td>High</td> <td></td> <td></td> <td>23130/ 711</td> <td>23155/ 713.5</td> <td>23165/ 714.5</td> <td>23173/ 715.3</td> </tr> <tr> <th rowspan="3">Band 13</th> <th colspan="6">Frequency range: 777 - 787 MHz</th> </tr> <tr> <th colspan="6">Channel Bandwidth</th> </tr> <tr> <th>20 MHz</th> <th>15 MHz</th> <th>10 MHz</th> <th>5 MHz</th> <th>3 MHz</th> <th>1.4 MHz</th> </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> <th rowspan="7">Band 41</th> <th colspan="6">Frequency range: 2496 - 2690 MHz</th> </tr> <tr> <th colspan="6">Channel Bandwidth</th> </tr> <tr> <th>20 MHz</th> <th>15 MHz</th> <th>10 MHz</th> <th>5 MHz</th> <th>3 MHz</th> <th>1.4 MHz</th> </tr> <tr> <td>Low</td> <td colspan="5">39750 / 2506.0</td> <td></td> </tr> <tr> <td>Low-Mid</td> <td colspan="5">40185 / 2549.5</td> <td></td> </tr> <tr> <td>Mid</td> <td colspan="5">40620 / 2593.0</td> <td></td> </tr> <tr> <td>Mid-High</td> <td colspan="5">41055 / 2636.5</td> <td></td> </tr> <tr> <td>High</td> <td colspan="5">41490 / 2680.0</td> <td></td> </tr> <tr> <td>LTE transmitter and antenna implementation</td> <td>Refer to Appendix A.</td> </tr> <tr> <td>Maximum power reduction (MPR)</td> <td> <p>Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 1, 2 and 3</p> <table border="1"> <thead> <tr> <th rowspan="2">Modulation</th> <th colspan="6">Channel bandwidth / Transmission bandwidth (N_{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> </thead> <tbody> <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> <tr> <td>64 QAM</td> <td>≤ 5</td> <td>≤ 4</td> <td>≤ 8</td> <td>≤ 12</td> <td>≤ 16</td> <td>≤ 18</td> <td>≤ 2</td> </tr> <tr> <td>64 QAM</td> <td>> 5</td> <td>> 4</td> <td>> 8</td> <td>> 12</td> <td>> 16</td> <td>> 18</td> <td>≤ 3</td> </tr> <tr> <td>256 QAM</td> <td colspan="6">≥ 1</td> <td>≤ 5</td> </tr> </tbody> </table> <p>MPR Built-in by design The manufacturer MPR values are always within the 3GPP maximum MPR allowance but may not follow the default MPR values. 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A-MPR (additional MPR) was disabled during SAR testing</p>	Modulation	Channel bandwidth / Transmission bandwidth (N _{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	64 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 2	64 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 3	256 QAM	≥ 1						≤ 5	Power reduction	Yes	Spectrum plots for RB configurations	A properly configured base station simulator was used for the SAR and power measurements; therefore, spectrum plots for each RB allocation and offset configuration are not included in the SAR report.
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		Channel Bandwidth																																																																																																																																																																																																																																																			
		20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz																																																																																																																																																																																																																																														
	Low			23060/ 704	23035/ 701.5	23025/ 700.5	23017/ 699.7																																																																																																																																																																																																																																														
	Mid			23095/ 707.5	23095/ 707.5	23095/ 707.5	23095/ 707.5																																																																																																																																																																																																																																														
	High			23130/ 711	23155/ 713.5	23165/ 714.5	23173/ 715.3																																																																																																																																																																																																																																														
	Band 13	Frequency range: 777 - 787 MHz																																																																																																																																																																																																																																																			
		Channel Bandwidth																																																																																																																																																																																																																																																			
		20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz																																																																																																																																																																																																																																														
	Low				23205/ 779.5																																																																																																																																																																																																																																																
	Mid			23230/ 782	23230/ 782																																																																																																																																																																																																																																																
	High				23255/ 784.5																																																																																																																																																																																																																																																
	Band 41	Frequency range: 2496 - 2690 MHz																																																																																																																																																																																																																																																			
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Low		39750 / 2506.0																																																																																																																																																																																																																																																			
Low-Mid		40185 / 2549.5																																																																																																																																																																																																																																																			
Mid		40620 / 2593.0																																																																																																																																																																																																																																																			
Mid-High		41055 / 2636.5																																																																																																																																																																																																																																																			
High	41490 / 2680.0																																																																																																																																																																																																																																																				
LTE transmitter and antenna implementation	Refer to Appendix A.																																																																																																																																																																																																																																																				
Maximum power reduction (MPR)	<p>Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 1, 2 and 3</p> <table border="1"> <thead> <tr> <th rowspan="2">Modulation</th> <th colspan="6">Channel bandwidth / Transmission bandwidth (N_{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> </thead> <tbody> <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> <tr> <td>64 QAM</td> <td>≤ 5</td> <td>≤ 4</td> <td>≤ 8</td> <td>≤ 12</td> <td>≤ 16</td> <td>≤ 18</td> <td>≤ 2</td> </tr> <tr> <td>64 QAM</td> <td>> 5</td> <td>> 4</td> <td>> 8</td> <td>> 12</td> <td>> 16</td> <td>> 18</td> <td>≤ 3</td> </tr> <tr> <td>256 QAM</td> <td colspan="6">≥ 1</td> <td>≤ 5</td> </tr> </tbody> </table> <p>MPR Built-in by design The manufacturer MPR values are always within the 3GPP maximum MPR allowance but may not follow the default MPR values. A-MPR (additional MPR) was disabled during SAR testing</p>	Modulation	Channel bandwidth / Transmission bandwidth (N _{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	64 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 2	64 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 3	256 QAM	≥ 1						≤ 5																																																																																																																																																																																						
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Power reduction	Yes																																																																																																																																																																																																																																																				
Spectrum plots for RB configurations	A properly configured base station simulator was used for the SAR and power measurements; therefore, spectrum plots for each RB allocation and offset configuration are not included in the SAR report.																																																																																																																																																																																																																																																				

Notes:

- Maximum bandwidth does not support at least three non-overlapping channels in certain channel bandwidths. When a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing per KDB 941225 D05 SAR for LTE devices.
- LTE Band 41 test channels in accordance with October 2014 TCB workshop for all channels bandwidths.
- SAR Testing for LTE was performed with the same number of RB and RB offsets transmitting on all TTI frames (maximum TTI).

6.6. LTE (TDD) Considerations

According to KDB 941225 D05 SAR for LTE Devices, for Time-Division Duplex (TDD) systems, SAR must be tested using a fixed periodic duty factor according to the highest transmission duty factor implemented for the device and supported by the defined 3GPP LTE TDD configurations.

LTE TDD Bands support 3GPP TS 36.211 section 4.2 for Type 2 Frame Structure and Table 4.2-2 for uplink-downlink configurations and Table 4.2-1 for Special subframe configurations.

Table 4.2-1: Configuration of special subframe (lengths of DwPTS/GP/UpPTS).

Special subframe configuration	Normal cyclic prefix in downlink			Extended cyclic prefix in downlink		
	DwPTS	UpPTS		DwPTS	UpPTS	
		Normal cyclic prefix in uplink	Extended cyclic prefix in uplink		Normal cyclic prefix in uplink	Extended cyclic prefix in uplink
0	$6592 \cdot T_s$	$2192 \cdot T_s$	$2560 \cdot T_s$	$7680 \cdot T_s$	$2192 \cdot T_s$	$2560 \cdot T_s$
1	$19760 \cdot T_s$			$20480 \cdot T_s$		
2	$21952 \cdot T_s$			$23040 \cdot T_s$		
3	$24144 \cdot T_s$			$25600 \cdot T_s$		
4	$26336 \cdot T_s$			$7680 \cdot T_s$		
5	$6592 \cdot T_s$	$4384 \cdot T_s$	$5120 \cdot T_s$	$20480 \cdot T_s$	$4384 \cdot T_s$	$5120 \cdot T_s$
6	$19760 \cdot T_s$			$23040 \cdot T_s$		
7	$21952 \cdot T_s$			$12800 \cdot T_s$		
8	$24144 \cdot T_s$			-		
9	$13168 \cdot T_s$			-		

Calculated Duty Cycle

Uplink-Downlink Configuration	Downlink-to-Uplink Switch-point Periodicity	Subframe Number										Calculated Duty Cycle (%)
		0	1	2	3	4	5	6	7	8	9	
0	5 ms	D	S	U	U	U	D	S	U	U	U	63.33
1	5 ms	D	S	U	U	D	D	S	U	U	D	43.33
2	5 ms	D	S	U	D	D	D	S	U	D	D	23.33
3	10 ms	D	S	U	U	U	D	D	D	D	D	31.67
4	10 ms	D	S	U	U	D	D	D	D	D	D	21.67
5	10 ms	D	S	U	D	D	D	D	D	D	D	11.67
6	5 ms	D	S	U	U	U	D	S	U	U	D	53.33

Calculated Duty Cycle = Extended cyclic prefix in uplink x (T_s) x # of S + # of U

Example for Calculated Duty Cycle for Uplink-Downlink Configuration 0:

Calculated Duty Cycle = $5120 \times [1/(15000 \times 2048)] \times 2 + 6 \text{ ms} = 63.33\%$

where

$T_s = 1/(15000 \times 2048)$ seconds

Note(s):

This device supports uplink-downlink configurations 0-6. The configuration with highest duty cycle was used for SAR Testing: configuration 0 at 63.3% (Power Class 3) and configuration 1 at 43.3% (Power Class 2) duty cycle.

6.7. LTE Carrier Aggregation

DL Intra-Band

E-UTRA CA configuration (BCS)	E-UTRA Band	Allowed Channel BW Per Carrier (MHz)				Max Aggregated BW
		1st Carrier	2nd Carrier	3rd Carrier	4th Carrier	
CA_41C (0),(1),(2),(3)	Band 41	10	20			40 MHz
		15	15,20			
		20	10,15,20			
	Band 41	5,10	20			40 MHz
		15	15,20			
		20	5,10,15,20			
	Band 41	10	15,20			40 MHz
		15	10,15,20			
		20	10,15,20			
	Band 41	10	20			40 MHz
		20	20			

UL Intra-Band

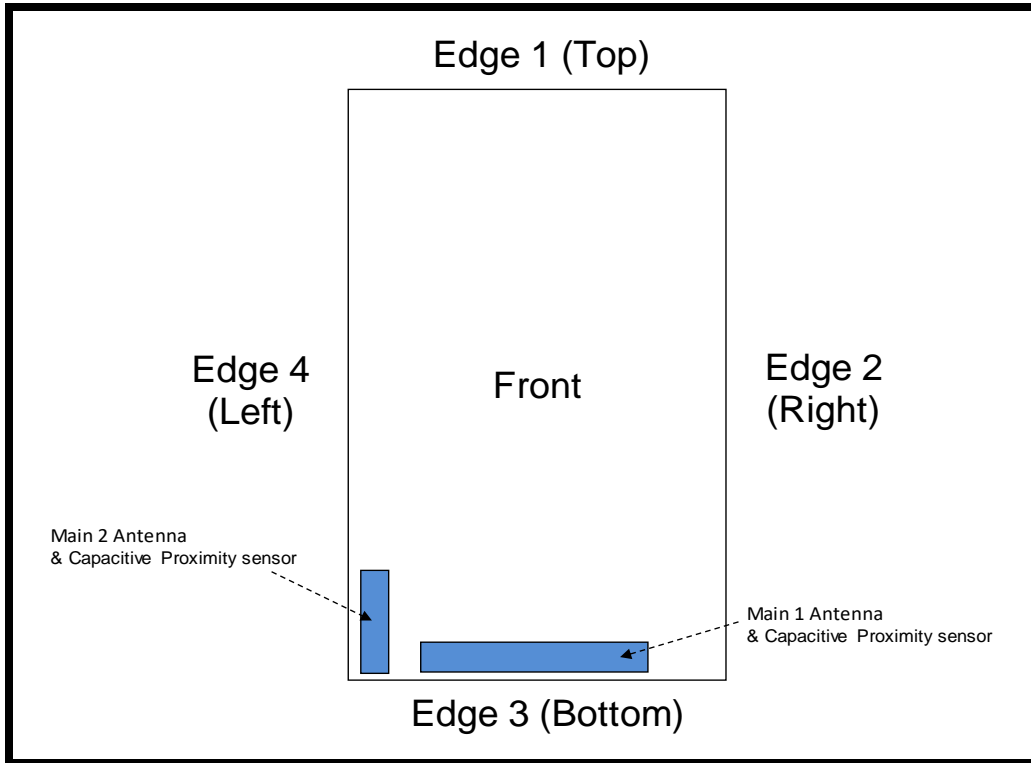
E-UTRA CA configuration (BCS)	E-UTRA Band	Allowed Channel BW Per Carrier (MHz)				Max Aggregated BW
		1st Carrier	2nd Carrier	3rd Carrier	4th Carrier	
CA_41C (0),(1),(2),(3)	Band 41	10	20			40 MHz
		15	15,20			
		20	10,15,20			
	Band 41	5,10	20			40 MHz
		15	15,20			
		20	5,10,15,20			
	Band 41	10	15,20			40 MHz
		15	10,15,20			
		20	10,15,20			
	Band 41	10	20			40 MHz
		20	20			

Note(s):

1. For supported channels, please refer to §6.5.
2. This device supports DL 4X4 MIMO for LTE Band 41. Please refer to Sec.9.3.1 for detailed LTE CA combination with 4X4 DL MIMO.

6.8. Proximity Sensor feature

The DUT has two proximity sensors to reduce the output power. The position of the sensors and antennas are as shown in the graphic.

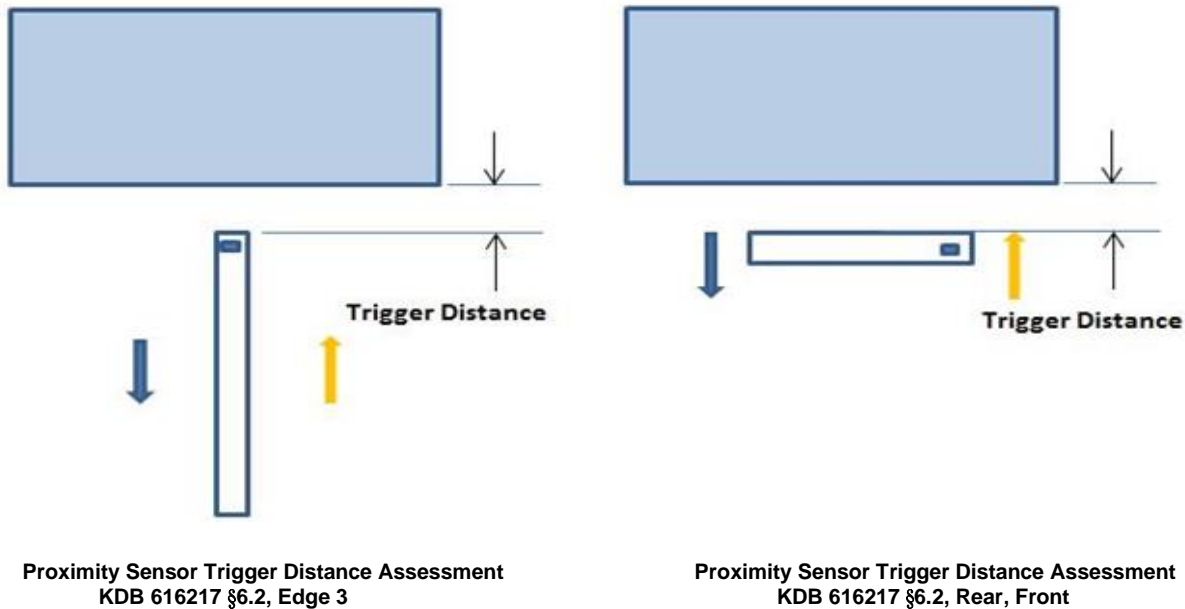


6.8.1. Proximity Sensor Triggering Distance (KDB 616217 §6.2)

Rear, Front and Edge 3 of the DUT was placed directly below the flat phantom. The DUT was moved toward the phantom in accordance with the steps outlined in KDB 616217 §6.2 to determine the trigger distance for enabling power reduction. The DUT was moved away from the phantom to determine the trigger distance for resuming full power.

The DUT featured a visual indicator on its display that showed the status of the proximity sensor (Triggered or not triggered). This was used to determine the status of the sensor during the proximity sensor assessment as monitoring the output power directly was not practical without affecting the measurement.

It was confirmed separately that the output power was altered according to the proximity sensor status indication. This was achieved by observing the proximity sensor status at the same time as monitoring the conducted power. Section 9 contains both the full and reduced conducted power measurements.



LEGEND

- ➔ Direction of DUT travel for determination of power reduction triggering point
- ➔ Direction of DUT travel for determination of full power resumption triggering point

Summary of Trigger Distances

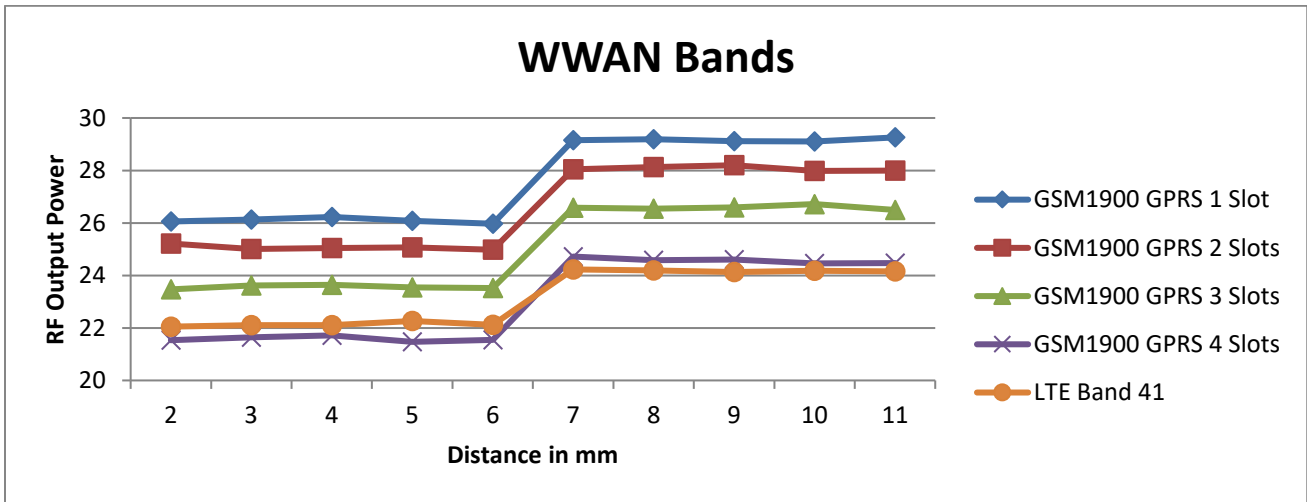
Tissue simulating liquid	Antenna	Trigger distance – Rear		Trigger distance - Front		Trigger distance – Edge 3	
		Moving toward phantom	Moving from phantom	Moving toward phantom	Moving from phantom	Moving toward phantom	Moving from phantom
1900 Head	Main 1 Ant.	6 mm	6 mm	5 mm	5 mm	11 mm	11 mm
2600 Head	Main 2 Ant.	6 mm	6 mm	5 mm	5 mm	11 mm	11 mm

Proximity Sensor Triggering Distance Measurement Results

WWAN Bands

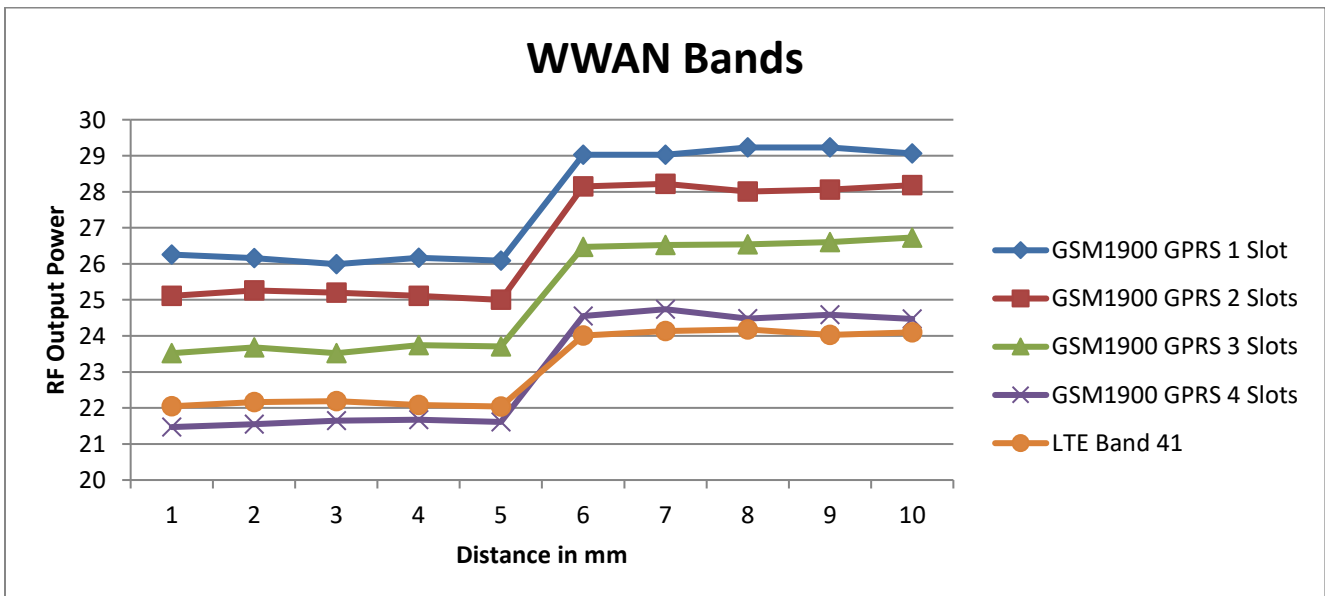
Rear, DUT Moving Toward (Trigger) and Away (Release) from the Phantom

Distance to DUT vs. Output Power in dBm										
Distance (mm)	2	3	4	5	6	7	8	9	10	11
GSM1900 GPRS 1 Slot	26.1	26.1	26.2	26.1	26.0	29.2	29.2	29.1	29.1	29.3
GSM1900 GPRS 2 Slots	25.2	25.0	25.0	25.1	25.0	28.1	28.1	28.2	28.0	28.0
GSM1900 GPRS 3 Slots	23.5	23.6	23.6	23.6	23.5	26.6	26.6	26.6	26.7	26.5
GSM1900 GPRS 4 Slots	21.5	21.6	21.7	21.5	21.5	24.7	24.6	24.6	24.5	24.5
LTE Band 41	22.1	22.1	22.1	22.3	22.1	24.2	24.2	24.1	24.2	24.2



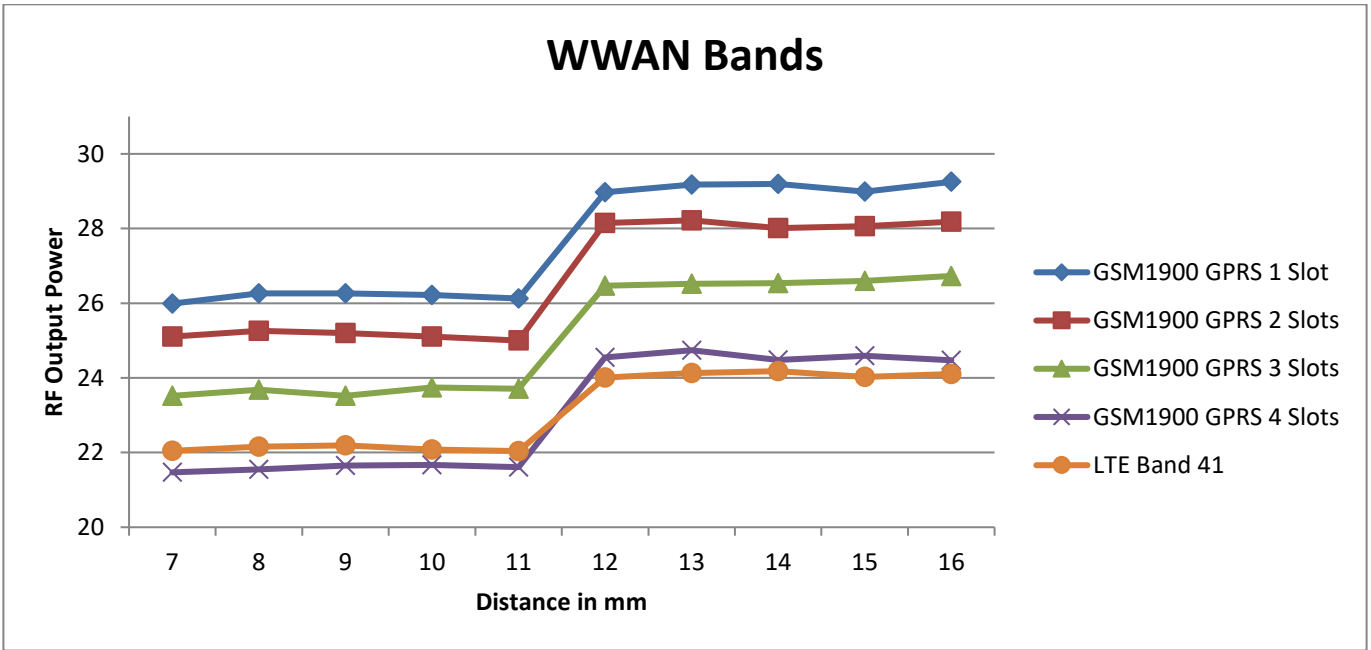
Front, DUT Moving Toward (Trigger) and Away (Release) from the Phantom

Distance to DUT vs. Output Power in dBm										
Distance (mm)	1	2	3	4	5	6	7	8	9	10
GSM1900 GPRS 1 Slot	26.3	26.2	26.0	26.2	26.1	29.0	29.0	29.2	29.2	29.1
GSM1900 GPRS 2 Slots	25.1	25.3	25.2	25.1	25.0	28.2	28.2	28.0	28.1	28.2
GSM1900 GPRS 3 Slots	23.5	23.7	23.5	23.7	23.7	26.5	26.5	26.5	26.6	26.7
GSM1900 GPRS 4 Slots	21.5	21.6	21.7	21.7	21.6	24.6	24.7	24.5	24.6	24.5
LTE Band 41	22.1	22.2	22.2	22.1	22.0	24.0	24.1	24.2	24.0	24.1



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

Distance to DUT vs. Output Power in dBm										
Distance (mm)	7	8	9	10	11	12	13	14	15	16
GSM1900 GPRS 1 Slot	26.0	26.3	26.3	26.2	26.1	29.0	29.2	29.2	29.0	29.3
GSM1900 GPRS 2 Slots	25.1	25.1	25.0	25.0	25.1	28.0	28.1	28.0	28.1	28.0
GSM1900 GPRS 3 Slots	23.5	23.6	23.6	23.7	23.6	26.5	26.6	26.5	26.8	26.6
GSM1900 GPRS 4 Slots	21.6	21.7	21.6	21.6	21.6	24.6	24.6	24.5	24.7	24.5
LTE Band 41	22.0	22.0	22.2	22.0	22.0	24.2	24.0	24.2	24.1	24.0



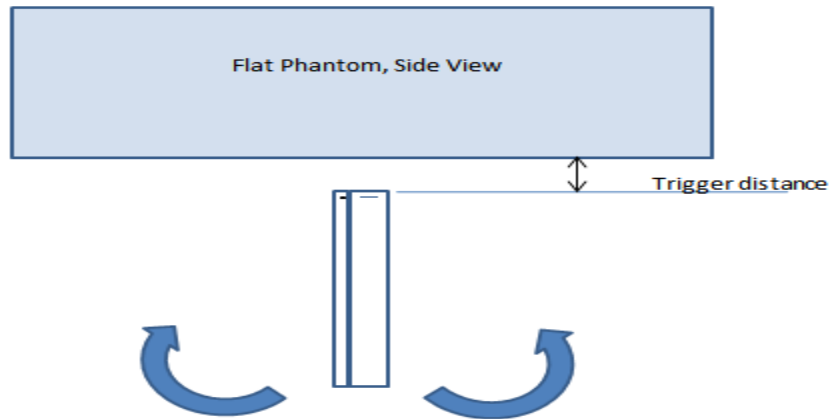
6.8.2. Proximity Sensor Coverage (KDB 616217 §6.3)

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

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

The DUT was positioned directly below the flat phantom at the minimum measured trigger distance with Edge 3 parallel to the base of the flat phantom for each band.

The EUT was rotated about Edge 3 for angles up to +/- 45°. If the output power increased during the rotation the DUT was moved 1mm toward the phantom and the rotation repeated. This procedure was repeated until the power remained reduced for all angles up to +/- 45°.



Proximity sensor tilt angle assessment (Edge 3) KDB 616217 §6.4

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

Band (MHz)	Minimum trigger distance measured according to KDB 616217 §6.2	Minimum distance at which power reduction was maintained over +/-45°	Power reduction status											
			-45°	-40°	-30°	-20°	-10°	0°	10°	20°	30°	40°	45°	
1900	11 mm	11 mm	On	On	On	On	On	On	On	On	On	On	On	On
2600	11 mm	11 mm	On	On	On	On	On	On	On	On	On	On	On	On

6.8.4. Resulting test positions for SAR measurements

Wireless technologies	DUT Position	§6.2 Triggering Distance	§6.3 Coverage	§6.4 Tilt Angle	Worst case distance for SAR
WWAN (Main 1 Ant & Main 2 Ant)	Rear	6 mm	N/A	N/A	5 mm
	Front	5 mm	N/A	N/A	4 mm
	Edge 3	11 mm	N/A	11 mm	10 mm

7. RF Exposure Conditions (Test Configurations)

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

Wireless technologies	RF Exposure Conditions	Antenna	DUT-to-User Separation	Test Position	Antenna-to-edge/surface	SAR Required	Note
WWAN	Head	Main 1 Ant. & Main 2 Ant.	0 mm	Left Touch	N/A	Yes	
				Left Tilt (15°)	N/A	Yes	
				Right Touch	N/A	Yes	
				Right Tilt (15°)	N/A	Yes	
	Body	Main 1 Ant. & Main 2 Ant.	15 mm	Rear	N/A	Yes	
				Front	N/A	Yes	
	Hotspot	Main 1 Ant.	10 mm	Rear	< 25 mm	Yes	1
				Front	< 25 mm	Yes	1
				Edge 1 (Top)	> 25 mm	No	1
				Edge 2 (Right)	< 25 mm	Yes	
				Edge 3 (Bottom)	< 25 mm	Yes	
				Edge 4 (Left)	< 25 mm	Yes	
	Hotspot	Main 2 Ant.	10 mm	Rear	< 25 mm	Yes	1
				Front	< 25 mm	Yes	1
				Edge 1 (Top)	> 25 mm	No	1
				Edge 2 (Right)	> 25 mm	No	1
				Edge 3 (Bottom)	< 25 mm	Yes	
				Edge 4 (Left)	< 25 mm	Yes	
	Product Specific 10-g	Main 1 Ant. & Main 2 Ant.	0 mm	Rear	Refer to notes 2 & 3		
				Front			
Edge 1 (Top)							
Edge 2 (Right)							
Edge 3 (Bottom)							
Edge 4 (Left)							
2.4GHz WLAN & BT & 5GHz WLAN	Head	WiFi/BT Ant.1	0 mm	Left Touch	N/A	Yes	
				Left Tilt (15°)	N/A	Yes	
				Right Touch	N/A	Yes	
				Right Tilt (15°)	N/A	Yes	
	Body	WiFi/BT Ant.1	15 mm	Rear	N/A	Yes	
				Front	N/A	Yes	
	Hotspot	WiFi/BT Ant.1	10 mm	Rear	< 25 mm	Yes	
				Front	< 25 mm	Yes	
				Edge 1 (Top)	> 25 mm	No	1
				Edge 2 (Right)	> 25 mm	No	1
				Edge 3 (Bottom)	> 25 mm	No	1
	Product Specific 10-g	WiFi/BT Ant.1	0 mm	Rear	Refer to notes 2 & 4		
				Front			
				Edge 1 (Top)			
				Edge 2 (Right)			
				Edge 3 (Bottom)			
2.4GHz WLAN & 5GHz WLAN	Head	WiFi Ant.2	0 mm	Left Touch	N/A	Yes	
				Left Tilt (15°)	N/A	Yes	
				Right Touch	N/A	Yes	
				Right Tilt (15°)	N/A	Yes	
	Body	WiFi Ant.2	15 mm	Rear	N/A	Yes	
				Front	N/A	Yes	
	Hotspot	WiFi Ant.2	10 mm	Rear	< 25 mm	Yes	
				Front	< 25 mm	Yes	
				Edge 1 (Top)	< 25 mm	Yes	
				Edge 2 (Right)	> 25 mm	No	1
				Edge 3 (Bottom)	> 25 mm	No	1
	Product Specific 10-g	WiFi Ant.2	0 mm	Rear	Refer to notes 2 & 4		
				Front			
				Edge 1 (Top)			
				Edge 2 (Right)			
				Edge 3 (Bottom)			
Edge 4 (Left)							

Notes:

- SAR is not required because the distance from the antenna to the edge is > 25 mm as per KDB 941225 D06 Hot Spot SAR.
- For Phablet devices: When hotspot mode applies, Product specific 10-g SAR is required only for the surfaces and edges with hotspot mode 1-g reported SAR > 1.2 W/kg.
- For Phablet devices: When hotspot mode applies and power reduction applies to hotspot mode, Product specific 10-g SAR is required for each test position that has and adjusted SAR to maximum power that is > 1.2 W/kg.
- For Phablet devices: When hotspot mode is not supported, Product specific 10-g SAR is required for all surfaces and edges with an antenna located at ≤ 25mm from that surface or edge in direct contact with a flat phantom, to address interactive hand use exposure conditions.

8. Dielectric Property Measurements & System Check

8.1. Dielectric Property Measurements

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

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

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

Tissue Dielectric Parameters

FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz

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

SAR test were performed in All RF exposure conditions using Head tissue according to TCB workshop note of April. 2019.

IEEE Std 1528-2013

Refer to Table 3 within the IEEE Std 1528-2013

**Dielectric Property Measurements Results:
SAR 1 Room**

Date	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit ±(%)		
12-21-2020	Head 5250	e'	36.9400	Relative Permittivity (ϵ_r):	36.94	35.93	2.80	5	
		e"	16.2000	Conductivity (σ):	4.73	4.70	0.57	5	
	Head 5260	e'	36.9100	Relative Permittivity (ϵ_r):	36.91	35.92	2.75	5	
		e"	16.2100	Conductivity (σ):	4.74	4.71	0.61	5	
	Head 5600	e'	36.3800	Relative Permittivity (ϵ_r):	36.38	35.53	2.38	5	
		e"	16.4000	Conductivity (σ):	5.11	5.06	0.92	5	
	Head 5750	e'	36.1500	Relative Permittivity (ϵ_r):	36.15	35.36	2.23	5	
		e"	16.4900	Conductivity (σ):	5.27	5.21	1.12	5	
	Head 5825	e'	36.0300	Relative Permittivity (ϵ_r):	36.03	35.30	2.07	5	
		e"	16.5400	Conductivity (σ):	5.36	5.27	1.65	5	
	12-28-2020	Head 5250	e'	36.9600	Relative Permittivity (ϵ_r):	36.96	35.93	2.86	5
			e"	15.9500	Conductivity (σ):	4.66	4.70	-0.98	5
Head 5260		e'	36.9300	Relative Permittivity (ϵ_r):	36.93	35.92	2.81	5	
		e"	15.9600	Conductivity (σ):	4.67	4.71	-0.94	5	
Head 5600		e'	36.3400	Relative Permittivity (ϵ_r):	36.34	35.53	2.27	5	
		e"	16.3300	Conductivity (σ):	5.08	5.06	0.49	5	
Head 5750		e'	36.0800	Relative Permittivity (ϵ_r):	36.08	35.36	2.03	5	
		e"	16.5100	Conductivity (σ):	5.28	5.21	1.24	5	
Head 5825		e'	35.9600	Relative Permittivity (ϵ_r):	35.96	35.30	1.87	5	
		e"	16.5900	Conductivity (σ):	5.37	5.27	1.96	5	
1-4-2021		Head 5180	e'	36.5100	Relative Permittivity (ϵ_r):	36.51	36.01	1.38	5
			e"	15.7400	Conductivity (σ):	4.53	4.63	-2.10	5
	Head 5200	e'	36.4700	Relative Permittivity (ϵ_r):	36.47	35.99	1.33	5	
		e"	15.7600	Conductivity (σ):	4.56	4.65	-2.03	5	
	Head 5600	e'	35.9200	Relative Permittivity (ϵ_r):	35.92	35.53	1.09	5	
		e"	16.0300	Conductivity (σ):	4.99	5.06	-1.36	5	
	Head 5800	e'	35.6300	Relative Permittivity (ϵ_r):	35.63	35.30	0.93	5	
		e"	16.2000	Conductivity (σ):	5.22	5.27	-0.86	5	
	Head 5825	e'	35.5800	Relative Permittivity (ϵ_r):	35.58	35.30	0.79	5	
		e"	16.2200	Conductivity (σ):	5.25	5.27	-0.31	5	

SAR 3 Room

Date	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit ±(%)	
12-10-2020	Head 1750	e'	39.7600	Relative Permittivity (ϵ_r):	39.76	40.08	-0.81	5
		e"	13.6700	Conductivity (σ):	1.33	1.37	-2.83	5
	Head 1710	e'	39.8100	Relative Permittivity (ϵ_r):	39.81	40.15	-0.84	5
		e"	13.7600	Conductivity (σ):	1.31	1.35	-2.83	5
	Head 1755	e'	39.7600	Relative Permittivity (ϵ_r):	39.76	40.08	-0.79	5
		e"	13.6600	Conductivity (σ):	1.33	1.37	-2.83	5
12-13-2020	Head 1750	e'	40.4000	Relative Permittivity (ϵ_r):	40.40	40.08	0.79	5
		e"	13.6500	Conductivity (σ):	1.33	1.37	-2.98	5
	Head 1710	e'	40.4700	Relative Permittivity (ϵ_r):	40.47	40.15	0.81	5
		e"	13.7100	Conductivity (σ):	1.30	1.35	-3.18	5
	Head 1755	e'	40.4000	Relative Permittivity (ϵ_r):	40.40	40.08	0.81	5
		e"	13.6500	Conductivity (σ):	1.33	1.37	-2.90	5
12-13-2020	Head 1900	e'	40.5200	Relative Permittivity (ϵ_r):	40.52	40.00	1.30	5
		e"	13.2200	Conductivity (σ):	1.40	1.40	-0.24	5
	Head 1850	e'	40.6400	Relative Permittivity (ϵ_r):	40.64	40.00	1.60	5
		e"	13.2600	Conductivity (σ):	1.36	1.40	-2.57	5
	Head 1910	e'	40.5200	Relative Permittivity (ϵ_r):	40.52	40.00	1.30	5
		e"	13.2200	Conductivity (σ):	1.40	1.40	0.28	5
12-16-2020	Head 1900	e'	39.7300	Relative Permittivity (ϵ_r):	39.73	40.00	-0.68	5
		e"	13.2900	Conductivity (σ):	1.40	1.40	0.29	5
	Head 1850	e'	39.8000	Relative Permittivity (ϵ_r):	39.80	40.00	-0.50	5
		e"	13.3300	Conductivity (σ):	1.37	1.40	-2.06	5
	Head 1910	e'	39.7200	Relative Permittivity (ϵ_r):	39.72	40.00	-0.70	5
		e"	13.2900	Conductivity (σ):	1.41	1.40	0.82	5
12-30-2020	Head 750	e'	41.9800	Relative Permittivity (ϵ_r):	41.98	41.96	0.04	5
		e"	21.1600	Conductivity (σ):	0.88	0.89	-1.19	5
	Head 700	e'	42.1400	Relative Permittivity (ϵ_r):	42.14	42.22	-0.18	5
		e"	22.2300	Conductivity (σ):	0.87	0.89	-2.70	5
	Head 790	e'	41.8600	Relative Permittivity (ϵ_r):	41.86	41.76	0.25	5
		e"	20.3600	Conductivity (σ):	0.89	0.90	-0.20	5
1-25-2021	Head 1900	e'	39.3400	Relative Permittivity (ϵ_r):	39.34	40.00	-1.65	5
		e"	13.6300	Conductivity (σ):	1.44	1.40	2.85	5
	Head 1850	e'	39.4400	Relative Permittivity (ϵ_r):	39.44	40.00	-1.40	5
		e"	13.6800	Conductivity (σ):	1.41	1.40	0.51	5
	Head 1910	e'	39.3000	Relative Permittivity (ϵ_r):	39.30	40.00	-1.75	5
		e"	13.6200	Conductivity (σ):	1.45	1.40	3.32	5

SAR 4 Room

Date	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit ±(%)	
12-8-2020	Head 2600	e'	38.2000	Relative Permittivity (ϵ_r):	38.20	39.01	-2.08	5
		e"	14.2000	Conductivity (σ):	2.05	1.96	4.62	5
	Head 2500	e'	38.5800	Relative Permittivity (ϵ_r):	38.58	39.14	-1.42	5
		e"	13.9400	Conductivity (σ):	1.94	1.85	4.52	5
	Head 2700	e'	37.8100	Relative Permittivity (ϵ_r):	37.81	38.88	-2.76	5
		e"	14.3800	Conductivity (σ):	2.16	2.07	4.28	5
12-23-2020	Head 2450	e'	37.7700	Relative Permittivity (ϵ_r):	37.77	39.20	-3.65	5
		e"	13.4400	Conductivity (σ):	1.83	1.80	1.72	5
	Head 2400	e'	37.8100	Relative Permittivity (ϵ_r):	37.81	39.30	-3.78	5
		e"	13.2400	Conductivity (σ):	1.77	1.75	0.87	5
	Head 2480	e'	37.8500	Relative Permittivity (ϵ_r):	37.85	39.16	-3.35	5
		e"	13.5900	Conductivity (σ):	1.87	1.83	2.27	5
1-4-2021	Head 2450	e'	40.0800	Relative Permittivity (ϵ_r):	40.08	39.20	2.24	5
		e"	13.3000	Conductivity (σ):	1.81	1.80	0.66	5
	Head 2400	e'	40.3000	Relative Permittivity (ϵ_r):	40.30	39.30	2.55	5
		e"	13.1700	Conductivity (σ):	1.76	1.75	0.33	5
	Head 2480	e'	39.9900	Relative Permittivity (ϵ_r):	39.99	39.16	2.11	5
		e"	13.4100	Conductivity (σ):	1.85	1.83	0.91	5
1-7-2021	Head 2450	e'	38.5300	Relative Permittivity (ϵ_r):	38.53	39.20	-1.71	5
		e"	13.6300	Conductivity (σ):	1.86	1.80	3.15	5
	Head 2400	e'	38.6800	Relative Permittivity (ϵ_r):	38.68	39.30	-1.57	5
		e"	13.4700	Conductivity (σ):	1.80	1.75	2.62	5
	Head 2480	e'	38.4200	Relative Permittivity (ϵ_r):	38.42	39.16	-1.90	5
		e"	13.7200	Conductivity (σ):	1.89	1.83	3.25	5

SAR 5 Room

Date	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit ±(%)	
12-9-2020	Head 835	e'	41.3400	Relative Permittivity (ϵ_r):	41.34	41.50	-0.39	5
		e"	20.0000	Conductivity (σ):	0.93	0.90	3.17	5
	Head 820	e'	41.4000	Relative Permittivity (ϵ_r):	41.40	41.60	-0.49	5
		e"	20.2300	Conductivity (σ):	0.92	0.90	2.66	5
	Head 850	e'	41.3000	Relative Permittivity (ϵ_r):	41.30	41.50	-0.48	5
		e"	19.7700	Conductivity (σ):	0.93	0.92	2.12	5
12-14-2020	Head 750	e'	43.3200	Relative Permittivity (ϵ_r):	43.32	41.96	3.24	5
		e"	21.0800	Conductivity (σ):	0.88	0.89	-1.57	5
	Head 700	e'	43.4700	Relative Permittivity (ϵ_r):	43.47	42.22	2.97	5
		e"	22.1200	Conductivity (σ):	0.86	0.89	-3.18	5
	Head 790	e'	43.2000	Relative Permittivity (ϵ_r):	43.20	41.76	3.46	5
		e"	20.3200	Conductivity (σ):	0.89	0.90	-0.40	5
12-14-2020	Head 835	e'	43.0700	Relative Permittivity (ϵ_r):	43.07	41.50	3.78	5
		e"	19.5700	Conductivity (σ):	0.91	0.90	0.96	5
	Head 820	e'	43.1000	Relative Permittivity (ϵ_r):	43.10	41.60	3.60	5
		e"	19.8100	Conductivity (σ):	0.90	0.90	0.53	5
	Head 850	e'	43.0500	Relative Permittivity (ϵ_r):	43.05	41.50	3.73	5
		e"	19.3300	Conductivity (σ):	0.91	0.92	-0.15	5
12-17-2020	Head 1750	e'	39.4000	Relative Permittivity (ϵ_r):	39.40	40.08	-1.71	5
		e"	13.8200	Conductivity (σ):	1.34	1.37	-1.77	5
	Head 1710	e'	39.4600	Relative Permittivity (ϵ_r):	39.46	40.15	-1.71	5
		e"	13.8800	Conductivity (σ):	1.32	1.35	-1.98	5
	Head 1755	e'	39.4000	Relative Permittivity (ϵ_r):	39.40	40.08	-1.69	5
		e"	13.8100	Conductivity (σ):	1.35	1.37	-1.76	5
12-17-2020	Head 1900	e'	39.1000	Relative Permittivity (ϵ_r):	39.10	40.00	-2.25	5
		e"	13.6800	Conductivity (σ):	1.45	1.40	3.23	5
	Head 1850	e'	39.2200	Relative Permittivity (ϵ_r):	39.22	40.00	-1.95	5
		e"	13.7400	Conductivity (σ):	1.41	1.40	0.96	5
	Head 1910	e'	39.0800	Relative Permittivity (ϵ_r):	39.08	40.00	-2.30	5
		e"	13.6800	Conductivity (σ):	1.45	1.40	3.77	5
12-20-2020	Head 1750	e'	40.2700	Relative Permittivity (ϵ_r):	40.27	40.08	0.46	5
		e"	13.7100	Conductivity (σ):	1.33	1.37	-2.55	5
	Head 1710	e'	40.3000	Relative Permittivity (ϵ_r):	40.30	40.15	0.38	5
		e"	13.7900	Conductivity (σ):	1.31	1.35	-2.62	5
	Head 1755	e'	40.2600	Relative Permittivity (ϵ_r):	40.26	40.08	0.46	5
		e"	13.6900	Conductivity (σ):	1.34	1.37	-2.62	5
12-30-2020	Head 835	e'	41.6900	Relative Permittivity (ϵ_r):	41.69	41.50	0.46	5
		e"	19.5000	Conductivity (σ):	0.91	0.90	0.60	5
	Head 820	e'	41.7200	Relative Permittivity (ϵ_r):	41.72	41.60	0.28	5
		e"	19.7500	Conductivity (σ):	0.90	0.90	0.23	5
	Head 850	e'	41.6700	Relative Permittivity (ϵ_r):	41.67	41.50	0.41	5
		e"	19.2700	Conductivity (σ):	0.91	0.92	-0.46	5
1-4-2021	Head 835	e'	41.2600	Relative Permittivity (ϵ_r):	41.26	41.50	-0.58	5
		e"	19.3800	Conductivity (σ):	0.90	0.90	-0.02	5
	Head 820	e'	41.2800	Relative Permittivity (ϵ_r):	41.28	41.60	-0.78	5
		e"	19.6300	Conductivity (σ):	0.90	0.90	-0.38	5
	Head 850	e'	41.2500	Relative Permittivity (ϵ_r):	41.25	41.50	-0.60	5
		e"	19.1500	Conductivity (σ):	0.91	0.92	-1.08	5
1-4-2021	Head 2600	e'	39.0000	Relative Permittivity (ϵ_r):	39.00	39.01	-0.03	5
		e"	13.3700	Conductivity (σ):	1.93	1.96	-1.49	5
	Head 2500	e'	39.2200	Relative Permittivity (ϵ_r):	39.22	39.14	0.21	5
		e"	13.2200	Conductivity (σ):	1.84	1.85	-0.88	5
	Head 2700	e'	38.7900	Relative Permittivity (ϵ_r):	38.79	38.88	-0.24	5
		e"	13.5100	Conductivity (σ):	2.03	2.07	-2.03	5
1-7-2021	Head 2600	e'	37.6200	Relative Permittivity (ϵ_r):	37.62	39.01	-3.57	5
		e"	13.4400	Conductivity (σ):	1.94	1.96	-0.98	5
	Head 2500	e'	37.8300	Relative Permittivity (ϵ_r):	37.83	39.14	-3.34	5
		e"	13.3600	Conductivity (σ):	1.86	1.85	0.17	5
	Head 2700	e'	37.4400	Relative Permittivity (ϵ_r):	37.44	38.88	-3.72	5
		e"	13.4800	Conductivity (σ):	2.02	2.07	-2.25	5
2-3-2021	Head 1900	e'	38.4100	Relative Permittivity (ϵ_r):	38.41	40.00	-3.98	5
		e"	13.5600	Conductivity (σ):	1.43	1.40	2.33	5
	Head 1850	e'	38.4600	Relative Permittivity (ϵ_r):	38.46	40.00	-3.85	5
		e"	13.6800	Conductivity (σ):	1.41	1.40	0.51	5
	Head 1910	e'	38.3700	Relative Permittivity (ϵ_r):	38.37	40.00	-4.08	5
		e"	13.5300	Conductivity (σ):	1.44	1.40	2.64	5

8.2. System Check

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

System Performance Check Measurement Conditions:

- The measurements were performed in the flat section of the TWIN SAM or ELI phantom, shell thickness: 2.0 ± 0.2 mm (bottom plate) filled with Body or Head simulating liquid of the following parameters.
- The depth of tissue-equivalent liquid in a phantom must be ≥ 15.0 cm for SAR measurements ≤ 3 GHz and ≥ 10.0 cm for measurements > 3 GHz.
- The DASY system with an E-Field Probe was used for the measurements.
- The dipole was mounted on the small tripod so that the dipole feed point was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10 mm (above 1 GHz) and 15 mm (below 1 GHz) from dipole center to the simulating liquid surface.
- The coarse grid with a grid spacing of 15 mm was aligned with the dipole.
For 5 GHz band - The coarse grid with a grid spacing of 10 mm was aligned with the dipole.
- Special 7x7x7 (below 3 GHz) and/or 8x8x7 (above 3 GHz) fine cube was chosen for the cube.
- Distance between probe sensors and phantom surface was set to 2.5 mm.
For 5 GHz band - Distance between probe sensors and phantom surface was set to 1.4 mm
- The dipole input power (forward power) was 100 mW.
- The results are normalized to 1 W input power.

Reference Target SAR Values

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

System Dipole	Serial No.	Cal. Date	Freq. (MHz)	Target SAR Values (W/kg)	
				1g/10g	Head
D750V3	1122	2-24-2020	750	1g	8.54
				10g	5.59
D835V2	4d174	2-24-2020	835	1g	9.59
				10g	6.24
D1750V2	1125	2-21-2020	1750	1g	36.50
				10g	19.20
D1900V2	5d199	3-19-2020	1900	1g	40.50
				10g	21.00
D2450V2	939	7-25-2019	2450	1g	53.20
				10g	25.10
D2600V2	1097	9-19-2019	2600	1g	57.30
				10g	25.70
D5GHzV2	1209	2-27-2020	5250	1g	79.90
				10g	22.60
			5600	1g	83.60
				10g	23.60
			5750	1g	80.20
				10g	22.60

Note(s):

Refer to Appendix F that mentioned about justification for Extended SAR Dipole Calibrations. (D2450V2 (SN : 939), D2600V2 (SN : 1097))

System Check Results

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

SAR 1 Room

Date Tested	System Dipole		T.S. Liquid	Measured Results		Target (Ref. Value)	Delta ±10 %	Plot No.	
	Type	Serial #		Zoom Scan to 100 mW	Normalize to 1 W				
12-21-2020	D5GHzV2 (5250)	1209	Head	1g	7.41	74.1	79.90	-7.26	1, 2
				10g	2.10	21.0	22.60	-7.08	
12-21-2020	D5GHzV2 (5600)	1209	Head	1g	8.39	83.9	83.60	0.36	
				10g	2.35	23.5	23.60	-0.42	
12-21-2020	D5GHzV2 (5750)	1209	Head	1g	7.98	79.8	80.20	-0.50	
				10g	2.26	22.6	22.60	0.00	
12-28-2020	D5GHzV2 (5250)	1209	Head	1g	7.45	74.5	79.90	-6.76	
				10g	2.11	21.1	22.60	-6.64	
12-28-2020	D5GHzV2 (5600)	1209	Head	1g	8.37	83.7	83.60	0.12	
				10g	2.35	23.5	23.60	-0.42	
12-28-2020	D5GHzV2 (5750)	1209	Head	1g	8.20	82.0	80.20	2.24	
				10g	2.31	23.1	22.60	2.21	
1-4-2021	D5GHzV2 (5250)	1209	Head	1g	7.43	74.3	79.90	-7.01	
				10g	2.08	20.8	22.60	-7.96	
1-4-2021	D5GHzV2 (5600)	1209	Head	1g	7.88	78.8	83.60	-5.74	
				10g	2.19	21.9	23.60	-7.20	
1-4-2021	D5GHzV2 (5750)	1209	Head	1g	7.45	74.5	80.20	-7.11	
				10g	2.08	20.8	22.60	-7.96	

SAR 3 Room

Date Tested	System Dipole		T.S. Liquid	Measured Results		Target (Ref. Value)	Delta ±10 %	Plot No.	
	Type	Serial #		Zoom Scan to 100 mW	Normalize to 1 W				
12-10-2020	D1750V2	1125	Head	1g	3.63	36.3	36.50	-0.55	
				10g	1.95	19.5	19.20	1.56	
12-13-2020	D1750V2	1125	Head	1g	3.43	34.3	36.50	-6.03	3, 4
				10g	1.86	18.6	19.20	-3.12	
12-13-2020	D1900V2	5d199	Head	1g	3.93	39.3	40.50	-2.96	
				10g	2.06	20.6	21.00	-1.90	
12-16-2020	D1900V2	5d199	Head	1g	3.91	39.1	40.50	-3.46	
				10g	2.06	20.6	21.00	-1.90	
12-30-2020	D750V3	1122	Head	1g	0.80	8.0	8.54	-6.32	5, 6
				10g	0.54	5.4	5.59	-3.94	
1-25-2021	D1900V2	5d199	Head	1g	3.88	38.8	40.50	-4.20	7, 8
				10g	2.05	20.5	21.00	-2.38	

SAR 4 Room

Date Tested	System Dipole		T.S. Liquid	Measured Results		Target (Ref. Value)	Delta ±10 %	Plot No.	
	Type	Serial #		Zoom Scan to 100 mW	Normalize to 1 W				
12-8-2020	D2600V2	1097	Head	1g	5.92	59.2	57.30	3.32	9, 10
				10g	2.57	25.7	25.70	0.00	
12-23-2020	D2450V2	939	Head	1g	5.59	55.9	53.20	5.08	11, 12
				10g	2.52	25.2	25.10	0.40	
1-4-2021	D2450V2	939	Head	1g	5.34	53.4	53.20	0.38	
				10g	2.33	23.3	25.10	-7.17	
1-7-2021	D2450V2	939	Head	1g	5.49	54.9	53.20	3.20	
				10g	2.48	24.8	25.10	-1.20	

SAR 5 Room

Date Tested	System Dipole		T.S. Liquid	Measured Results		Target (Ref. Value)	Delta ±10 %	Plot No.	
	Type	Serial #		Zoom Scan to 100 mW	Normalize to 1 W				
12-9-2020	D835V2	4d174	Head	1g	0.97	9.7	9.59	1.36	
				10g	0.63	6.3	6.24	1.60	
12-14-2020	D750V3	1122	Head	1g	0.85	8.5	8.54	-0.23	
				10g	0.57	5.7	5.59	1.43	
12-14-2020	D835V2	4d174	Head	1g	0.98	9.8	9.59	2.50	
				10g	0.66	6.6	6.24	5.45	
12-17-2020	D1750V2	1125	Head	1g	3.72	37.2	36.50	1.92	
				10g	2.02	20.2	19.20	5.21	
12-17-2020	D1900V2	5d199	Head	1g	4.20	42.0	40.50	3.70	
				10g	2.21	22.1	21.00	5.24	
12-20-2020	D1750V2	1125	Head	1g	3.77	37.7	36.50	3.29	
				10g	2.06	20.6	19.20	7.29	
12-30-2020	D835V2	4d174	Head	1g	0.92	9.2	9.59	-3.65	13, 14
				10g	0.60	6.0	6.24	-3.53	
1-4-2021	D835V2	4d174	Head	1g	0.95	9.5	9.59	-1.15	
				10g	0.64	6.4	6.24	3.21	
1-4-2021	D2600V2	1097	Head	1g	5.71	57.1	57.30	-0.35	
				10g	2.60	26.0	25.70	1.17	
1-7-2021	D2600V2	1097	Head	1g	5.78	57.8	57.30	0.87	
				10g	2.65	26.5	25.70	3.11	
2-3-2021	D1900V2	5d199	Head	1g	4.19	41.9	40.50	3.46	
				10g	2.18	21.8	21.00	3.81	

9. Conducted Output Power Measurements

9.1. GSM

Per KDB 941225 D01 3G SAR Procedures:

SAR test reduction for GPRS and EDGE modes is determined by the source-based time-averaged output power specified for production units, including tune-up tolerance. The data mode with highest specified time-averaged output power should be tested for SAR compliance in the applicable exposure conditions. For modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested.

GSM850 Measured Results

Mode	Coding Scheme	Time Slots	Ch No.	Freq. (MHz)	Maximum Average Power (dBm)			
					Measured		Tune-up Limit	
					Burst Pwr	Frame Pwr	Burst Pwr	Frame Pwr
GSM (Voice)	CS1	1	128	824.2	31.7	22.7	33.2	24.2
			190	836.6	32.3	23.3		
			251	848.8	32.3	23.3		
GPRS (GMSK)	CS1	1	128	824.2	31.8	22.8	33.2	24.2
			190	836.6	32.3	23.3		
			251	848.8	32.1	23.1		
		2	128	824.2	30.7	24.7	32.0	26.0
			190	836.6	30.8	24.8		
			251	848.8	30.9	24.9		
		3	128	824.2	29.0	24.7	30.5	26.2
			190	836.6	29.2	24.9		
			251	848.8	29.4	25.1		
		4	128	824.2	26.9	23.9	28.5	25.5
			190	836.6	27.3	24.3		
			251	848.8	27.5	24.5		
EGPRS (8PSK)	MCS5	1	128	824.2	26.3	17.3	28.0	19.0
			190	836.6	27.1	18.1		
			251	848.8	27.1	18.1		
		2	128	824.2	24.8	18.8	26.0	20.0
			190	836.6	25.1	19.1		
			251	848.8	25.1	19.1		
		3	128	824.2	22.8	18.5	24.0	19.7
			190	836.6	23.1	18.8		
			251	848.8	23.1	18.8		
		4	128	824.2	21.7	18.7	23.0	20.0
			190	836.6	22.3	19.3		
			251	848.8	22.1	19.1		

Notes:

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

- GMSK (GPRS) mode with 3 time slots for Max power, based on the Tune-up Procedure. Refer to §6.3.
- SAR is not required for EGPRS (8PSK) mode because the maximum output power and tune-up limit is ≤ 1/4dB higher than GMSK GPRS or the adjusted SAR of the highest reported SAR of GMSK GPRS is ≤ 1.2W/kg.

GSM1900 Measured Results

Mode	Coding Scheme	Time Slots	Ch No.	Freq. (MHz)	Maximum Average Power (dBm)			
					Measured		Tune-up Limit	
					Burst Pwr	Frame Pwr	Burst Pwr	Frame Pwr
GSM (Voice)	CS1	1	512	1850.2	29.8	20.8	30.0	21.0
			661	1880.0	29.8	20.8		
			810	1909.8	29.6	20.6		
GPRS (GMSK)	CS1	1	512	1850.2	29.4	20.4	30.0	21.0
			661	1880.0	29.4	20.4		
			810	1909.8	29.4	20.4		
		2	512	1850.2	28.4	22.4	29.0	23.0
			661	1880.0	28.5	22.5		
			810	1909.8	28.2	22.2		
		3	512	1850.2	26.3	22.0	27.5	23.2
			661	1880.0	26.3	22.0		
			810	1909.8	26.3	22.0		
		4	512	1850.2	24.8	21.8	25.5	22.5
			661	1880.0	24.8	21.8		
			810	1909.8	24.8	21.8		
EGPRS (8PSK)	MCS5	1	512	1850.2	25.1	16.1	27.0	18.0
			661	1880.0	25.5	16.5		
			810	1909.8	25.3	16.3		
		2	512	1850.2	24.5	18.5	25.0	19.0
			661	1880.0	24.8	18.8		
			810	1909.8	24.7	18.7		
		3	512	1850.2	22.3	18.0	23.0	18.7
			661	1880.0	22.2	17.9		
			810	1909.8	22.0	17.7		
		4	512	1850.2	21.1	18.1	22.0	19.0
			661	1880.0	21.3	18.3		
			810	1909.8	21.3	18.3		

GSM1900 Measured Results (Continued)

Mode	Coding Scheme	Time Slots	Ch No.	Freq. (MHz)	Reduced Average Power (dBm)				Reduced Average Power (dBm)			
					Hotspot back-off		Proximity sensor back-off					
					Measured		Tune-up Limit		Measured		Tune-up Limit	
Burst Pwr	Frame Pwr	Burst Pwr	Frame Pwr	Burst Pwr	Frame Pwr	Burst Pwr	Frame Pwr					
GSM (Voice)	CS1	1	512	1850.2					29.8	20.8	30.0	21.0
			661	1880.0					29.8	20.8		
			810	1909.8					29.6	20.6		
GPRS (GMSK)	CS1	1	512	1850.2	26.8	17.8	27.0	18.0	26.2	17.2	27.0	18.0
			661	1880.0	26.7	17.7			26.5	17.5		
			810	1909.8	26.5	17.5			26.6	17.6		
		2	512	1850.2	25.7	19.7	26.0	20.0	25.9	19.9	26.0	20.0
			661	1880.0	25.2	19.2			25.9	19.9		
			810	1909.8	25.0	19.0			25.2	19.2		
		3	512	1850.2	24.0	19.7	24.5	20.2	24.0	19.7	24.5	20.2
			661	1880.0	24.1	19.8			24.1	19.8		
			810	1909.8	23.4	19.1			23.4	19.1		
		4	512	1850.2	21.8	18.8	22.5	19.5	22.0	19.0	22.5	19.5
			661	1880.0	21.8	18.8			21.8	18.8		
			810	1909.8	21.6	18.6			21.7	18.7		
EGPRS (8PSK)	MCS5	1	512	1850.2	25.6	16.6	27.0	18.0	25.2	16.2	27.0	18.0
			661	1880.0	25.7	16.7			25.4	16.4		
			810	1909.8	25.5	16.5			25.3	16.3		
		2	512	1850.2	24.4	18.4	25.0	19.0	24.5	18.5	25.0	19.0
			661	1880.0	24.1	18.1			24.8	18.8		
			810	1909.8	23.9	17.9			24.6	18.6		
		3	512	1850.2	22.2	17.9	23.0	18.7	22.4	18.1	23.0	18.7
			661	1880.0	22.0	17.7			22.2	17.9		
			810	1909.8	21.9	17.6			22.0	17.7		
		4	512	1850.2	21.1	18.1	22.0	19.0	21.3	18.3	22.0	19.0
			661	1880.0	21.3	18.3			21.3	18.3		
			810	1909.8	21.0	18.0			21.3	18.3		

Notes:

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

- GMSK (GPRS) mode with 3 time slots for Max power & 3 time slots for Reduced power(Hotspot back-off), based on the Tune-up Procedure. Refer to §6.3.
- For Reduced power(Proximity sensor back-off), GSM Voice has the highest frame average power in All modes.
- SAR is not required for EGPRS (8PSK) mode because the maximum output power and tune-up limit is ≤ 1/4dB higher than GMSK GPRS or the adjusted SAR of the highest reported SAR of GMSK GPRS is ≤ 1.2W/kg.

9.2. W-CDMA

Release 99 Setup Procedures used to establish the test signals

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

Mode	Subtest	Rel99
WCDMA General Settings	Loopback Mode	Test Mode 2
	Rel99 RMC	12.2kbps RMC
	Power Control Algorithm	Algorithm2
	β_c/β_d	8/15

HSDPA Setup Procedures used to establish the test signals

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

	Mode	HSDPA	HSDPA	HSDPA	HSDPA
	Subtest	1	2	3	4
W-CDMA General Settings	Loopback Mode	Test Mode 1			
	Rel99 RMC	12.2kbps RMC			
	HSDPA FRC	H-Set 1			
	Power Control Algorithm	Algorithm 2			
	β_c	2/15	11/15	15/15	15/15
	β_d	15/15	15/15	8/15	4/15
	Bd (SF)	64			
	β_c/β_d	2/15	11/15	15/8	15/4
	β_{hs}	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			
	$A_{hs}=\beta_{hs}/\beta_c$	30/15			

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

The following 5 Sub-tests were completed according to Release 6 procedures in table C,11.1.3 of 3GPP TS 34.121-1 v13. A summary of these settings are illustrated below:

	Mode	HSPA				
	Subtest	1	2	3	4	5
WCDMA General Settings	Loopback Mode	Test Mode 1				
	Rel99 RMC	12.2 kbps RMC				
	HSDPA FRC	H-Set 1				
	HSUPA Test	HSPA				
	Power Control Algorithm	Algorithm 2				Algorithm 1
	β_c	11/15	6/15	15/15	2/15	15/15
	β_d	15/15	15/15	9/15	15/15	0
	β_{ec}	209/225	12/15	30/15	2/15	5/15
	β_c/β_d	11/15	6/15	15/9	2/15	-
	β_{hs}	22/15	12/15	30/15	4/15	5/15
	β_{ed}	1309/225	94/75	47/15	56/75	47/15
CM (dB)	1	3	2	3	1	
MPR (dB)	0	2	1	2	0	
HSDPA Specific Settings	DACK	8				0
	DNAK	8				0
	DCQI	8				0
	Ack-Nack repetition factor	3				
	CQI Feedback (Table 5.2B.4)	4ms				
	CQI Repetition Factor (Table 5.2B.4)	2				
	A _{hs} = β_{hs}/β_c	30/15				
HSUPA Specific Settings	E-DPDCH	6	8	8	5	0
	DHARQ	0	0	0	0	0
	AG Index	20	12	15	17	12
	ETFCI (from 34.121 Table C.11.1.3)	75	67	92	71	67
	Associated Max UL Data Rate kbps	242.1	174.9	482.8	205.8	308.9
	Reference E-TFCIs	5	5	2	5	1
	Reference E-TFCI	11	11	11	11	67
	Reference E-TFCI PO	4	4	4	4	18
	Reference E-TFCI	67	67	92	67	67
	Reference E-TFCI PO	18	18	18	18	18
	Reference E-TFCI	71	71	71	71	71
	Reference E-TFCI PO	23	23	23	23	23
	Reference E-TFCI	75	75	75	75	75
	Reference E-TFCI PO	26	26	26	26	26
Reference E-TFCI	81	81	81	81	81	
Reference E-TFCI PO	27	27	27	27	27	
Maximum Channelization Codes	2xSF2				SF4	

HSPA+

HSPA+ is only supported to down link. Therefore, the RF conducted power is not measured.

W-CDMA Band V Measured Results

Mode		UL Ch No.	Freq. (MHz)	Maximum Average Power (dBm)		
				Measured Pwr	MPR	Tune-up Limit
Release 99	Rel 99 (RMC, 12.2 kbps)	4132	826.4	24.2	N/A	25.0
		4183	836.6	24.2		
		4233	846.6	24.4		
HSDPA	Subtest 1	4132	826.4	22.2	0	22.5
		4183	836.6	22.2		
		4233	846.6	22.3		
	Subtest 2	4132	826.4	22.2	0	22.5
		4183	836.6	22.2		
		4233	846.6	22.3		
	Subtest 3	4132	826.4	20.7	0.5	22.0
		4183	836.6	20.7		
		4233	846.6	20.9		
	Subtest 4	4132	826.4	20.7	0.5	22.0
		4183	836.6	20.7		
		4233	846.6	20.9		
HSUPA	Subtest 1	4132	826.4	22.2	0	22.5
		4183	836.6	22.2		
		4233	846.6	22.4		
	Subtest 2	4132	826.4	19.2	2	20.5
		4183	836.6	19.2		
		4233	846.6	19.4		
	Subtest 3	4132	826.4	20.2	1	21.5
		4183	836.6	20.2		
		4233	846.6	20.4		
	Subtest 4	4132	826.4	19.2	2	20.5
		4183	836.6	19.3		
		4233	846.6	19.4		
	Subtest 5	4132	826.4	20.8	0	22.5
		4183	836.6	20.9		
		4233	846.6	21.0		

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 1, 2 and 3

Modulation	Channel bandwidth / Transmission bandwidth (N_{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
64 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 2
64 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 3
256 QAM	≥ 1						≤ 5

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

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

Network Signalling value	Requirements (subclause)	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	N/A

Maximum Output Power (Tune-up Limit) for LTE

Maximum bandwidth does not support at least three non-overlapping channels in certain channel bandwidths.

When a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing per KDB 941225 D05 SAR for LTE Devices.

LTE QPSK configuration has the highest maximum average output power per 3GPP standard.

SAR measurement is not required for Higher order modulations. When the highest maximum output power for Higher order modulations are ≤ 0.5 dB higher than the QPSK or when the reported SAR for QPSK configuration is ≤ 1.45 W/kg.

1. Max power Results

LTE Band 5 Measured Results

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				Measured Pwr (dBm)			MPR	Tune-up Limit
				20525	836.5 MHz	20525		
10 MHz	QPSK	1	0	24.5			0.0	25.5
		1	25	24.4			0.0	25.5
		1	49	24.5			0.0	25.5
		25	0	23.5			1.0	24.5
		25	12	23.5			1.0	24.5
		25	25	23.5			1.0	24.5
	16QAM	50	0	23.5			1.0	24.5
		1	0	23.5			1.0	24.5
		1	25	23.5			1.0	24.5
		1	49	23.5			1.0	24.5
		25	0	22.6			2.0	23.5
		25	12	22.5			2.0	23.5
	64QAM	25	25	22.6			2.0	23.5
		50	0	22.5			2.0	23.5
		1	0	22.6			2.0	23.5
		1	25	22.7			2.0	23.5
		1	49	22.8			2.0	23.5
		25	0	21.6			3.0	22.5
	25	12	21.6			3.0	22.5	
	25	25	21.6			3.0	22.5	
	50	0	21.5			3.0	22.5	
BW (MHz)	Mode	RB Allocation	RB offset	Measured Pwr (dBm)			MPR	Tune-up Limit
				20425	20525	20625		
				826.5 MHz	836.5 MHz	846.5 MHz		
5 MHz	QPSK	1	0	24.4	24.5	24.5	0.0	25.5
		1	12	24.4	24.6	24.6	0.0	25.5
		1	24	24.5	24.6	24.6	0.0	25.5
		12	0	23.5	23.5	23.7	1.0	24.5
		12	7	23.5	23.5	23.7	1.0	24.5
		12	13	23.5	23.6	23.7	1.0	24.5
	16QAM	25	0	23.5	23.5	23.7	1.0	24.5
		1	0	23.5	23.7	24.1	1.0	24.5
		1	12	23.7	23.8	24.3	1.0	24.5
		1	24	23.7	23.8	24.2	1.0	24.5
		12	0	22.5	22.5	22.8	2.0	23.5
		12	7	22.6	22.6	22.8	2.0	23.5
	64QAM	12	13	22.6	22.6	22.9	2.0	23.5
		25	0	22.4	22.5	22.8	2.0	23.5
		1	0	22.7	22.3	23.0	2.0	23.5
		1	12	22.8	22.5	22.9	2.0	23.5
		1	24	22.8	22.5	22.4	2.0	23.5
		12	0	21.6	21.5	21.6	3.0	22.5
	12	7	21.6	21.5	21.6	3.0	22.5	
	12	13	21.5	21.6	21.5	3.0	22.5	
	25	0	21.5	21.4	21.6	3.0	22.5	

LTE Band 5 Measured Results (Continued)

BW (MHz)	Mode	RB Allocation	RB offset	Measured Pwr (dBm)			MPR	Tune-up Limit
				20415	20525	20635		
				825.5 MHz	836.5 MHz	847.5 MHz		
3 MHz	QPSK	1	0	24.4	24.4	24.6	0.0	25.5
		1	8	24.4	24.4	24.7	0.0	25.5
		1	14	24.4	24.5	24.6	0.0	25.5
		8	0	23.5	23.5	23.7	1.0	24.5
		8	4	23.5	23.5	23.7	1.0	24.5
		8	7	23.5	23.6	23.8	1.0	24.5
	16QAM	15	0	23.5	23.5	23.6	1.0	24.5
		1	0	23.6	23.4	24.1	1.0	24.5
		1	8	23.5	23.4	24.1	1.0	24.5
		1	14	23.5	23.5	24.1	1.0	24.5
		8	0	22.5	22.6	22.8	2.0	23.5
		8	4	22.5	22.6	22.8	2.0	23.5
	64QAM	8	7	22.6	22.7	22.9	2.0	23.5
		15	0	22.5	22.5	22.7	2.0	23.5
		1	0	22.7	22.7	22.7	2.0	23.5
		1	8	22.7	22.8	22.6	2.0	23.5
		1	14	22.6	22.8	22.2	2.0	23.5
		8	0	21.4	21.5	21.7	3.0	22.5
1.4 MHz	QPSK	8	4	21.5	21.6	21.7	3.0	22.5
		8	7	21.5	21.6	21.6	3.0	22.5
		15	0	21.5	21.5	21.5	3.0	22.5
		1	0	23.5	24.5	23.5	0.0	25.5
		1	3	24.4	24.4	24.4	0.0	25.5
		1	5	24.5	24.5	24.5	0.0	25.5
	16QAM	3	0	24.5	24.4	24.4	0.0	25.5
		3	1	24.4	24.4	24.4	0.0	25.5
		3	3	24.5	24.5	24.4	0.0	25.5
		6	0	24.5	24.5	24.5	1.0	24.5
		1	0	23.5	23.5	23.5	1.0	24.5
		1	3	23.5	23.4	23.5	1.0	24.5
	64QAM	1	5	23.6	23.5	23.6	1.0	24.5
		3	0	23.9	23.9	23.7	1.0	24.5
		3	1	23.9	23.9	23.7	1.0	24.5
		3	3	23.8	23.9	23.7	1.0	24.5
		6	0	22.6	22.8	22.3	2.0	23.5
		1	0	23.5	22.7	22.6	2.0	23.5
16QAM	1	3	22.7	22.7	22.6	2.0	23.5	
	1	5	22.8	22.8	22.7	2.0	23.5	
	3	0	22.7	22.7	22.5	2.0	23.5	
	3	1	22.6	22.7	22.4	2.0	23.5	
	3	3	22.7	22.7	22.5	2.0	23.5	
	6	0	21.9	21.7	21.2	3.0	22.5	

LTE Band 12 Measured Results

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				Measured Pwr (dBm)			MPR	Tune-up Limit
				23095	707.5 MHz			
10 MHz	QPSK	1	0	24.6			0.0	25.5
		1	25	24.6			0.0	25.5
		1	49	24.7			0.0	25.5
		25	0	23.6			1.0	24.5
		25	12	23.8			1.0	24.5
		25	25	23.7			1.0	24.5
	16QAM	1	0	23.6			1.0	24.5
		1	25	23.6			1.0	24.5
		1	49	23.7			1.0	24.5
		25	0	22.7			2.0	23.5
		25	12	22.8			2.0	23.5
		25	25	22.8			2.0	23.5
	64QAM	50	0	22.6			2.0	23.5
		1	0	22.9			2.0	23.5
		1	25	22.9			2.0	23.5
		1	49	23.0			2.0	23.5
		25	0	21.7			3.0	22.5
		25	12	21.9			3.0	22.5
		25	25	21.8			3.0	22.5
		50	0	21.7			3.0	22.5
BW (MHz)	Mode	RB Allocation	RB offset	Measured Pwr (dBm)			MPR	Tune-up Limit
				23035	23095	23155		
				701.5 MHz	707.5 MHz	713.5 MHz		
5 MHz	QPSK	1	0	24.6	24.7	24.8	0.0	25.5
		1	12	24.6	24.8	24.8	0.0	25.5
		1	24	24.6	24.8	24.8	0.0	25.5
		12	0	23.7	23.8	23.7	1.0	24.5
		12	7	23.7	23.9	23.8	1.0	24.5
		12	13	23.7	23.8	23.8	1.0	24.5
	16QAM	25	0	23.7	23.8	23.7	1.0	24.5
		1	0	24.2	23.9	24.0	1.0	24.5
		1	12	24.2	23.9	24.0	1.0	24.5
		1	24	24.2	24.0	24.0	1.0	24.5
		12	0	22.8	22.8	22.9	2.0	23.5
		12	7	22.9	22.9	22.9	2.0	23.5
	64QAM	12	13	22.9	22.9	22.9	2.0	23.5
		25	0	22.7	22.8	22.8	2.0	23.5
		1	0	22.5	23.0	23.0	2.0	23.5
		1	12	22.6	23.1	23.1	2.0	23.5
		1	24	22.6	23.0	22.9	2.0	23.5
		12	0	21.7	21.7	21.8	3.0	22.5
		12	7	21.8	21.7	21.9	3.0	22.5
		12	13	21.7	21.7	21.9	3.0	22.5
		25	0	21.7	21.8	21.8	3.0	22.5

LTE Band 12 Measured Results (Continued)

BW (MHz)	Mode	RB Allocation	RB offset	Measured Pwr (dBm)			MPR	Tune-up Limit
				23025	23095	23165		
				700.5 MHz	707.5 MHz	714.5 MHz		
3 MHz	QPSK	1	0	24.7	24.7	24.7	0.0	25.5
		1	8	24.6	24.6	24.7	0.0	25.5
		1	14	24.6	24.7	24.7	0.0	25.5
		8	0	23.7	23.7	23.7	1.0	24.5
		8	4	23.6	23.8	23.8	1.0	24.5
		8	7	23.7	23.8	23.8	1.0	24.5
	16QAM	15	0	23.7	23.8	23.8	1.0	24.5
		1	0	24.0	23.8	23.7	1.0	24.5
		1	8	24.0	23.8	23.7	1.0	24.5
		1	14	24.0	23.9	23.7	1.0	24.5
		8	0	22.7	22.8	22.8	2.0	23.5
		8	4	22.7	22.9	22.9	2.0	23.5
	64QAM	8	7	22.8	22.9	22.9	2.0	23.5
		15	0	22.7	22.7	22.8	2.0	23.5
		1	0	22.8	23.0	23.1	2.0	23.5
		1	8	22.7	22.9	23.1	2.0	23.5
		1	14	22.8	23.0	22.9	2.0	23.5
		8	0	21.7	21.7	21.8	3.0	22.5
1.4 MHz	QPSK	8	4	21.8	21.8	21.8	3.0	22.5
		8	7	21.8	21.8	21.8	3.0	22.5
		15	0	21.7	21.8	21.7	3.0	22.5
		1	0	24.4	24.6	24.7	0.0	25.5
		1	3	24.6	24.7	24.7	0.0	25.5
		1	5	24.5	24.7	24.6	0.0	25.5
	16QAM	3	0	24.5	24.6	24.6	0.0	25.5
		3	1	24.5	24.7	24.7	0.0	25.5
		3	3	24.5	24.6	24.6	0.0	25.5
		6	0	23.6	23.7	23.7	1.0	24.5
		1	0	23.6	23.7	24.1	1.0	24.5
		1	3	23.7	23.8	24.1	1.0	24.5
	64QAM	1	5	23.6	23.9	24.1	1.0	24.5
		3	0	23.7	23.7	23.9	1.0	24.5
		3	1	23.8	23.8	23.9	1.0	24.5
		3	3	23.8	23.8	23.9	1.0	24.5
		6	0	22.7	22.8	22.6	2.0	23.5
		1	0	23.0	22.8	22.9	2.0	23.5
64QAM	1	3	23.1	22.9	22.9	2.0	23.5	
	1	5	23.0	22.8	22.7	2.0	23.5	
	3	0	23.0	22.8	22.7	2.0	23.5	
	3	1	23.0	22.9	22.7	2.0	23.5	
	3	3	23.0	22.9	22.7	2.0	23.5	
	6	0	21.6	22.0	21.8	3.0	22.5	

LTE Band 13 Measured Results

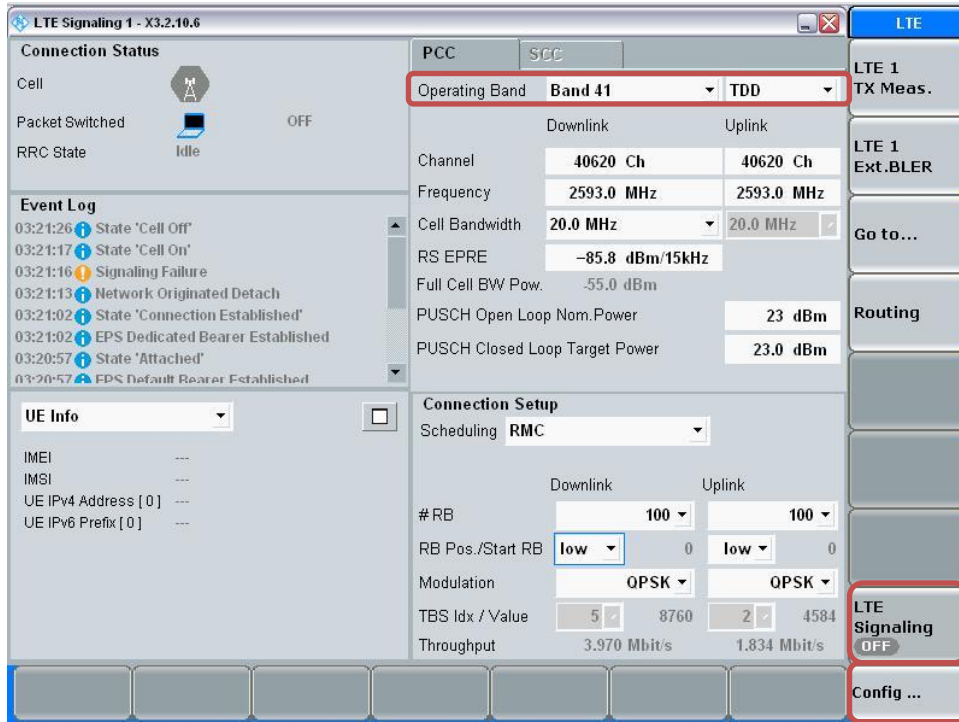
BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			
				Measured Pwr (dBm)		MPR	Tune-up Limit
				23230	782 MHz		
10 MHz	QPSK	1	0	24.1		0.0	25.3
		1	25	24.1		0.0	25.3
		1	49	24.1		0.0	25.3
		25	0	23.3		1.0	24.3
		25	12	23.2		1.0	24.3
		25	25	23.3		1.0	24.3
	16QAM	50	0	23.1		1.0	24.3
		1	0	23.3		1.0	24.3
		1	25	23.2		1.0	24.3
		1	49	23.2		1.0	24.3
		25	0	22.3		2.0	23.3
		25	12	22.3		2.0	23.3
	64QAM	25	25	22.3		2.0	23.3
		50	0	22.2		2.0	23.3
		1	0	21.5		2.0	23.3
		1	25	22.4		2.0	23.3
		1	49	22.3		2.0	23.3
		25	0	21.3		3.0	22.3
		25	12	21.3		3.0	22.3
		25	25	21.4		3.0	22.3
		50	0	21.2		3.0	22.3
BW (MHz)	Mode	RB Allocation	RB offset	Measured Pwr (dBm)			
				Measured Pwr (dBm)		MPR	Tune-up Limit
				23230	782 MHz		
5 MHz	QPSK	1	0	24.2		0.0	25.3
		1	12	24.2		0.0	25.3
		1	24	24.1		0.0	25.3
		12	0	24.2		1.0	24.3
		12	7	24.2		1.0	24.3
		12	13	24.2		1.0	24.3
	16QAM	25	0	23.3		1.0	24.3
		1	0	23.3		1.0	24.3
		1	12	23.3		1.0	24.3
		1	24	23.2		1.0	24.3
		12	0	23.3		2.0	23.3
		12	7	23.3		2.0	23.3
	64QAM	12	13	23.3		2.0	23.3
		25	0	22.3		2.0	23.3
		1	0	22.0		2.0	23.3
		1	12	22.6		2.0	23.3
		1	24	22.6		2.0	23.3
		12	0	22.3		3.0	22.3
		12	7	20.9		3.0	22.3
		12	13	21.0		3.0	22.3
		25	0	21.3		3.0	22.3

LTE Band TDD Measured Results

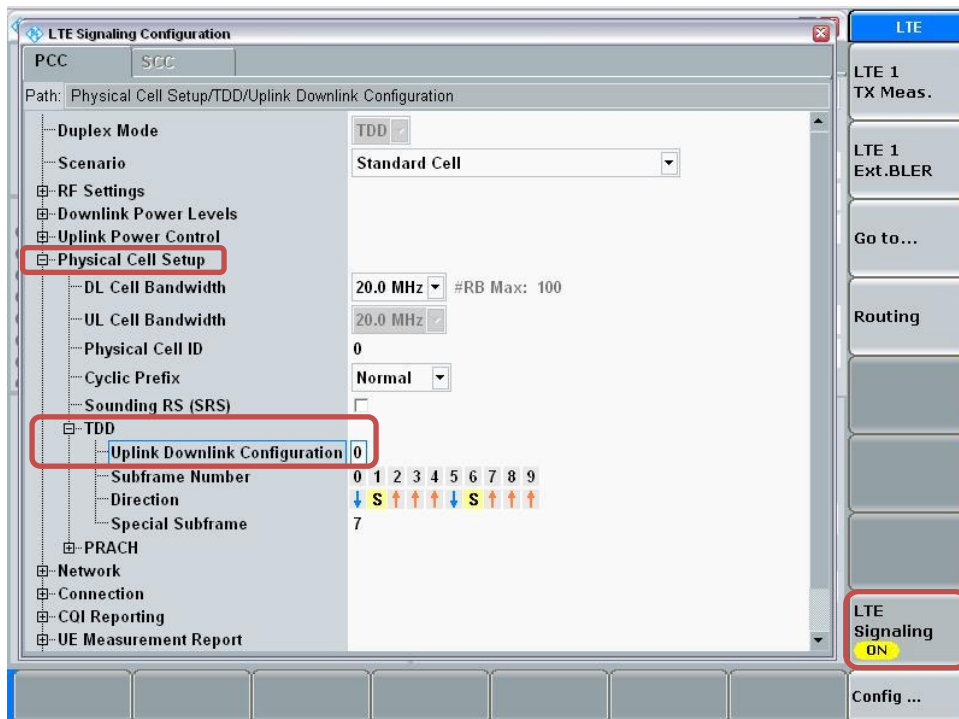
Procedure used to establish SAR test signal for LTE TDD Band

Set to CMW-500 with following parameters:

- Turn the LTE Signaling off using “ON | OFF” key
- Operating Band: Select Band 41 and TDD
- Go to “Config...”

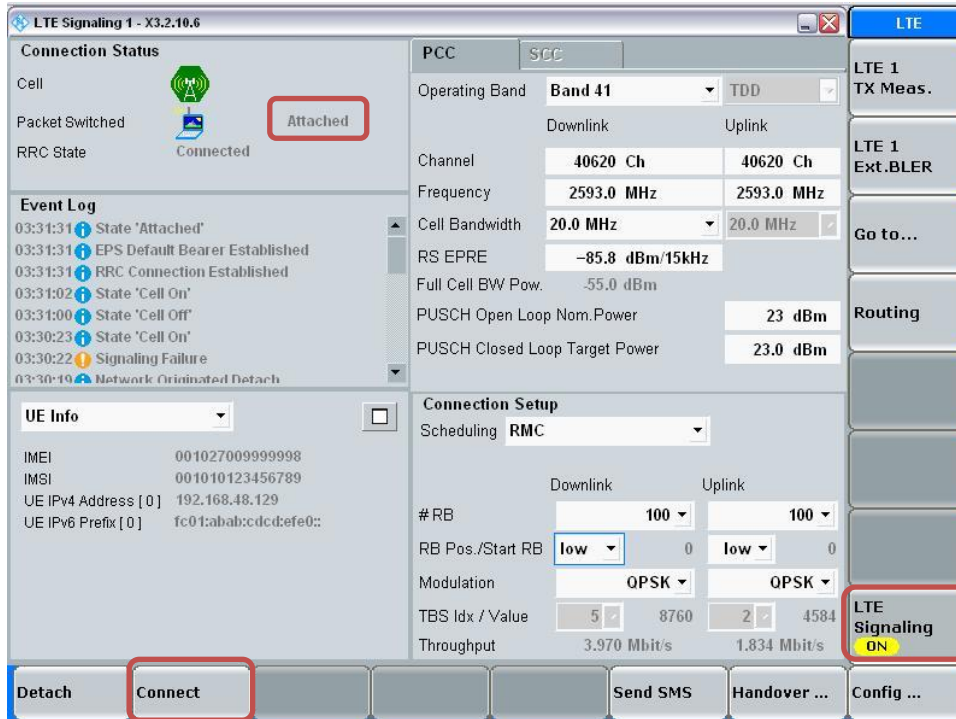


- Go to “Physical Cell Setup”
- Select “TDD” and Set “Uplink Downlink Configuration” to “0”
- Turn the cell on using “ON | OFF” key



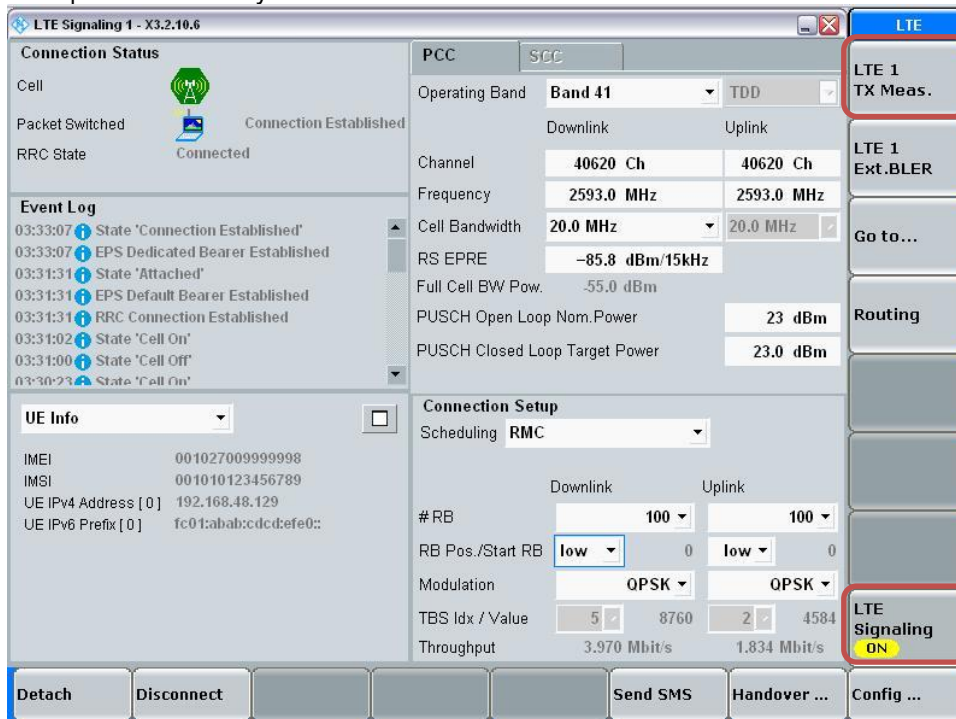
Connect to EUT

- Turn the cell on using “ON | OFF” key
- After EUT is Attached
- Select “Connect”

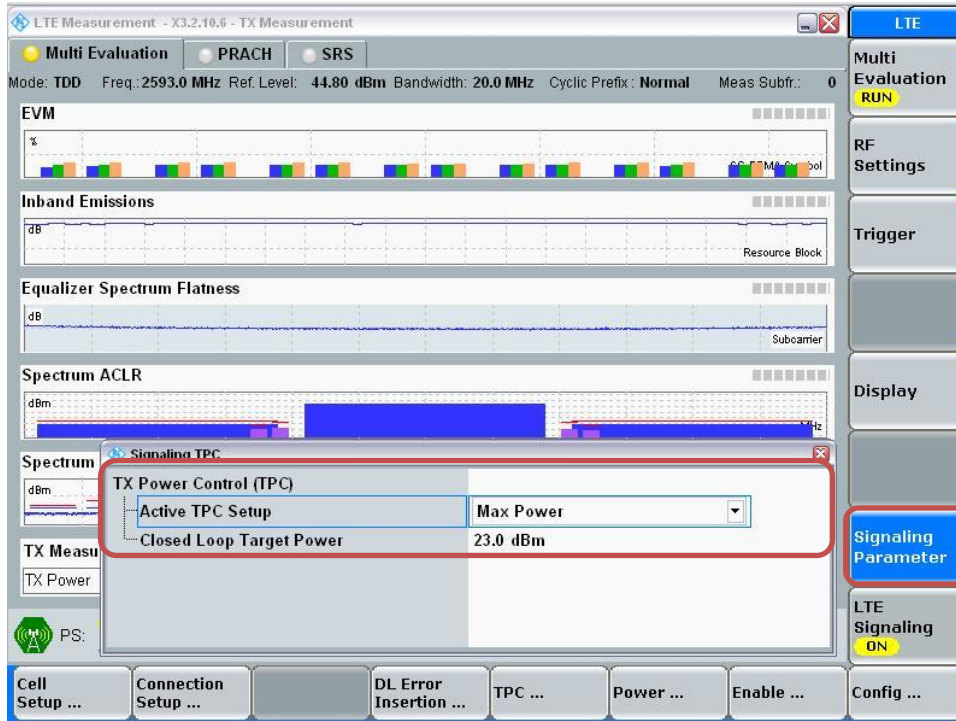


Max Power Setting

- Select “LTE 1 TX Meas.”
- Press “RESTART | STOP” Soft key



- Select “Signaling Parameter”
- Select “TX Power Control (TPC)” > Select “Active TPC Setup” to “Max Power” > Set “Closed Loop Target Power” to “23 dBm”



View TX Power

- Go to “Display”
- Select “Select View...”
- Select “Spectrum Emission Mask”



1. Max power Results

LTE Band 41 Measured Results

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)							MPR	Tune-up Limit
				Measured Pwr (dBm)								
				39750 2506 MHz	40185 2549.5 MHz	40620 2593 MHz	41055 2636.5 MHz	41490 2680 MHz				
20 MHz	QPSK	1	0	24.2	24.3	24.3	24.2	24.3	0.0	25.0		
		1	49	24.2	24.2	24.0	24.0	23.9	0.0	25.0		
		1	99	24.2	24.2	24.0	23.7	24.2	0.0	25.0		
		50	0	23.1	23.1	23.3	23.3	23.4	1.0	24.0		
		50	24	23.3	23.3	23.1	23.2	23.2	1.0	24.0		
		50	50	23.2	23.2	23.2	23.1	23.4	1.0	24.0		
	16QAM	100	0	23.2	23.2	23.2	23.2	23.2	1.0	24.0		
		1	0	23.2	23.4	22.8	23.0	23.0	1.0	24.0		
		1	49	23.2	23.4	22.8	23.2	23.5	1.0	24.0		
		1	99	23.2	23.4	22.8	22.7	23.3	1.0	24.0		
		50	0	22.1	22.2	22.2	22.1	22.2	2.0	23.0		
		50	24	22.3	22.3	22.3	22.3	22.4	2.0	23.0		
	64QAM	50	50	22.2	22.2	22.2	22.1	22.4	2.0	23.0		
		100	0	22.2	22.2	22.2	22.2	22.2	2.0	23.0		
		1	0	22.2	22.6	21.8	22.0	22.1	2.0	23.0		
		1	49	22.2	22.6	22.2	22.2	22.6	2.0	23.0		
		1	99	22.1	22.5	21.8	21.7	22.5	2.0	23.0		
		50	0	21.1	21.1	21.1	21.1	21.1	3.0	22.0		
	15 MHz	QPSK	50	24	21.3	21.3	21.3	21.3	21.3	3.0	22.0	
			50	50	21.2	21.1	21.2	21.1	21.3	3.0	22.0	
			100	0	21.2	21.1	21.2	21.1	21.2	3.0	22.0	
1			0	24.1	24.0	24.0	24.1	24.0	0.0	25.0		
1			37	24.1	24.2	24.2	24.1	24.3	0.0	25.0		
1			74	24.1	23.9	24.0	23.9	24.3	0.0	25.0		
16QAM		36	0	23.1	23.1	23.2	23.2	23.2	1.0	24.0		
		36	20	23.3	23.3	23.3	23.2	23.3	1.0	24.0		
		36	39	23.3	23.2	23.3	23.2	23.4	1.0	24.0		
		75	0	23.2	23.2	23.2	23.2	23.3	1.0	24.0		
		1	0	23.2	23.1	23.1	23.1	23.1	1.0	24.0		
		1	37	23.2	23.3	23.3	23.2	23.4	1.0	24.0		
64QAM		1	74	23.1	23.1	23.1	22.9	23.4	1.0	24.0		
		36	0	22.1	22.2	22.1	22.2	22.2	2.0	23.0		
		36	20	22.3	22.3	22.2	22.2	22.3	2.0	23.0		
		36	39	22.2	22.2	22.3	22.2	22.4	2.0	23.0		
		75	0	22.2	22.2	22.3	22.2	22.2	2.0	23.0		
		1	0	22.1	21.6	22.3	21.9	21.5	2.0	23.0		
64QAM		1	37	22.0	21.8	22.5	22.0	21.9	2.0	23.0		
		1	74	22.0	21.5	22.3	21.7	21.7	2.0	23.0		
		36	0	21.1	21.2	21.2	21.1	21.2	3.0	22.0		
	36	20	21.2	20.9	21.3	21.1	21.3	3.0	22.0			
	36	39	21.2	21.0	21.3	21.1	21.3	3.0	22.0			
	75	0	21.2	21.2	21.2	21.2	21.2	3.0	22.0			

LTE Band 41 Measured Results (Continued)

BW (MHz)	Mode	RB Allocation	RB offset	Measured Pwr (dBm)					MPR	Tune-up Limit
				39750	40185	40620	41055	41490		
				2506 MHz	2549.5 MHz	2593 MHz	2636.5 MHz	2680 MHz		
10 MHz	QPSK	1	0	24.1	24.0	24.0	23.9	24.1	0.0	25.0
		1	25	24.2	24.3	24.2	24.2	24.3	0.0	25.0
		1	49	24.2	23.9	24.0	23.9	24.0	0.0	25.0
		25	0	23.2	23.2	23.2	23.2	23.3	1.0	24.0
		25	12	23.4	23.4	23.4	23.3	23.4	1.0	24.0
		25	25	23.3	23.3	23.3	23.2	23.3	1.0	24.0
	16QAM	50	0	23.2	23.3	23.3	23.2	23.4	1.0	24.0
		1	0	23.2	23.2	23.0	23.0	23.2	1.0	24.0
		1	25	23.2	23.4	23.3	23.2	23.4	1.0	24.0
		1	49	23.2	23.1	23.0	22.9	23.2	1.0	24.0
		25	0	22.2	22.2	22.2	22.2	22.3	2.0	23.0
		25	12	22.3	22.4	22.4	22.3	22.4	2.0	23.0
	64QAM	25	25	22.3	22.3	22.3	22.2	22.4	2.0	23.0
		50	0	22.2	22.3	22.3	22.2	22.4	2.0	23.0
		1	0	22.4	21.7	22.3	22.0	21.6	2.0	23.0
		1	25	22.4	21.9	22.5	22.3	21.9	2.0	23.0
		1	49	22.4	21.7	22.3	22.0	21.7	2.0	23.0
		25	0	21.2	21.3	21.2	21.1	21.3	3.0	22.0
5 MHz	QPSK	25	25	21.3	21.3	21.3	21.1	21.3	3.0	22.0
		50	0	21.2	21.3	21.2	21.2	21.2	3.0	22.0
		1	0	24.1	24.2	24.2	24.1	24.3	0.0	25.0
		1	12	24.1	24.2	24.2	24.2	24.4	0.0	25.0
		1	24	24.2	24.2	24.2	24.1	24.4	0.0	25.0
		12	0	23.3	23.4	23.3	23.2	23.4	1.0	24.0
	16QAM	12	7	23.3	23.3	23.3	23.3	23.5	1.0	24.0
		12	13	23.3	23.3	23.3	23.3	23.5	1.0	24.0
		25	0	23.3	23.3	23.3	23.3	23.4	1.0	24.0
		1	0	23.2	23.4	23.3	23.2	23.5	1.0	24.0
		1	12	23.2	23.4	23.2	23.2	23.6	1.0	24.0
		1	24	23.2	23.4	23.3	23.2	23.6	1.0	24.0
	64QAM	12	0	22.3	22.4	22.3	22.2	22.5	2.0	23.0
		12	7	22.3	22.4	22.3	22.3	22.6	2.0	23.0
		12	13	22.3	22.4	22.3	22.3	22.5	2.0	23.0
		25	0	22.3	22.3	22.4	22.3	22.4	2.0	23.0
		1	0	22.0	22.7	22.5	22.0	21.8	2.0	23.0
		1	12	22.0	22.8	22.5	22.0	22.1	2.0	23.0
64QAM	1	24	22.1	22.8	22.5	22.0	22.2	2.0	23.0	
	12	0	21.4	21.5	21.3	22.0	21.9	3.0	22.0	
	12	7	21.4	21.5	21.3	21.4	21.5	3.0	22.0	
	12	13	21.4	21.5	21.3	21.3	21.3	3.0	22.0	
	25	0	21.4	21.4	21.3	21.1	21.0	3.0	22.0	
	25	0	21.4	21.4	21.3	21.1	21.0	3.0	22.0	

2. Reduced power Results

LTE Band 41 Measured Results

BW (MHz)	Mode	RB Allocation	RB offset	Reduced Average Power (dBm) Hotspot back-off					Reduced Average Power (dBm) Proximity sensor back-off					MPR	Tune-up Limit			
				Measured Pwr (dBm)					Measured Pwr (dBm)									
				39750 2506 MHz	40185 2549.5 MHz	40620 2593 MHz	41055 2636.5 MHz	41490 2680 MHz	39750 2506 MHz	40185 2549.5 MHz	40620 2593 MHz	41055 2636.5 MHz	41490 2680 MHz					
20 MHz	QPSK	1	0	22.0	22.0	22.0	22.0	22.1	0.0	23.0	22.1	22.2	22.2	22.2	22.3	0.0	23.0	
		1	49	22.0	22.1	21.7	21.8	21.6	0.0	23.0	22.1	22.2	22.0	21.9	21.7	0.0	23.0	
		1	99	22.0	22.0	21.7	21.5	22.0	0.0	23.0	22.1	22.2	21.8	21.6	22.0	0.0	23.0	
		50	0	21.9	21.9	22.1	22.0	22.1	0.0	23.0	22.1	22.1	22.3	22.1	22.3	0.0	23.0	
		50	24	22.1	22.1	21.9	21.9	21.9	0.0	23.0	22.2	22.2	22.0	22.1	22.0	0.0	23.0	
		50	50	22.1	21.9	22.0	21.9	22.1	0.0	23.0	22.2	22.0	22.2	22.1	22.2	0.0	23.0	
	100	0	22.0	22.0	22.0	21.9	22.0	0.0	23.0	22.2	22.0	22.2	22.1	22.2	0.0	23.0		
	16QAM	1	0	22.0	22.0	21.8	21.8	21.5	0.0	23.0	22.4	22.0	21.8	22.5	21.7	0.0	23.0	
		1	49	22.0	22.1	22.2	22.0	22.0	0.0	23.0	22.3	22.1	22.3	22.0	21.8	0.0	23.0	
		1	99	22.1	22.0	21.9	21.5	21.8	0.0	23.0	22.4	22.0	21.9	21.4	22.1	0.0	23.0	
		50	0	21.9	22.0	22.0	21.9	21.9	0.0	23.0	22.0	22.0	22.1	22.1	22.1	0.0	23.0	
		50	24	22.1	22.1	22.2	22.0	22.0	0.0	23.0	22.2	22.1	22.2	22.1	22.3	0.0	23.0	
		50	50	22.0	22.0	22.1	21.9	22.1	0.0	23.0	22.1	22.0	22.1	22.0	22.4	0.0	23.0	
	100	0	22.0	22.0	22.1	21.9	21.9	0.0	23.0	22.1	22.1	22.1	21.9	22.2	0.0	23.0		
	64QAM	1	0	21.4	21.8	22.1	22.0	22.1	0.0	23.0	22.1	22.5	21.7	21.9	22.0	0.0	23.0	
		1	49	21.9	22.1	22.5	22.0	22.0	0.0	23.0	22.2	22.5	22.1	22.2	22.5	0.0	23.0	
		1	99	21.8	21.5	22.1	21.9	22.0	0.0	23.0	22.2	22.5	21.8	21.6	22.4	0.0	23.0	
		50	0	20.9	21.0	21.0	21.0	21.0	0.0	23.0	21.0	21.1	21.1	21.1	21.1	0.0	23.0	
		50	24	21.1	21.0	21.2	21.2	21.2	0.0	23.0	21.2	21.2	21.3	21.1	21.2	0.0	23.0	
		50	50	21.1	20.9	21.1	21.0	21.1	0.0	23.0	21.2	21.1	21.2	21.0	21.3	0.0	23.0	
	100	0	21.0	20.9	21.0	21.0	21.1	0.0	23.0	21.1	21.1	21.2	21.1	21.1	0.0	23.0		
	15 MHz	QPSK	1	0	22.0	21.9	21.9	21.9	21.7	0.0	23.0	22.1	21.9	21.9	21.9	21.8	0.0	23.0
			1	37	22.0	22.0	22.0	21.9	22.0	0.0	23.0	22.0	22.0	22.0	22.0	22.0	0.0	23.0
			1	74	22.0	21.8	21.8	21.6	22.0	0.0	23.0	22.0	21.8	21.9	21.7	22.0	0.0	23.0
36			0	21.9	22.0	22.0	21.9	21.9	0.0	23.0	22.0	22.0	22.0	22.0	22.0	0.0	23.0	
36			20	22.4	22.1	22.1	22.0	22.0	0.0	23.0	22.1	22.1	22.1	22.0	22.1	0.0	23.0	
36			39	22.3	22.1	22.1	21.9	22.1	0.0	23.0	22.1	22.1	22.1	22.0	22.2	0.0	23.0	
75		0	22.3	22.0	22.1	21.9	22.0	0.0	23.0	22.1	22.1	22.1	21.9	22.0	0.0	23.0		
16QAM		1	0	22.5	22.0	22.1	21.9	21.8	0.0	23.0	22.2	21.8	21.9	22.1	21.9	0.0	23.0	
		1	37	22.4	22.1	22.2	22.0	22.0	0.0	23.0	22.2	22.2	22.1	22.1	22.2	0.0	23.0	
		1	74	22.3	21.8	22.0	21.7	22.0	0.0	23.0	22.1	21.9	22.0	21.8	22.1	0.0	23.0	
		36	0	22.2	22.0	22.0	21.9	21.9	0.0	23.0	22.0	22.0	22.0	22.0	22.0	0.0	23.0	
		36	20	22.4	22.1	22.1	22.0	22.0	0.0	23.0	22.2	22.1	22.1	22.0	22.1	0.0	23.0	
		36	39	22.4	22.1	22.1	21.9	22.1	0.0	23.0	22.2	22.1	22.1	22.0	22.1	0.0	23.0	
75		0	22.3	22.1	22.1	21.9	22.0	0.0	23.0	22.1	22.1	22.1	22.0	22.0	0.0	23.0		
64QAM		1	0	22.0	21.8	21.4	22.1	21.9	0.0	23.0	21.9	21.5	22.2	21.8	21.4	0.0	23.0	
		1	37	22.3	21.9	21.7	22.3	21.9	0.0	23.0	21.9	21.7	22.4	21.9	21.8	0.0	23.0	
		1	74	22.3	21.6	21.5	22.1	21.9	0.0	23.0	21.9	21.5	22.3	21.6	21.7	0.0	23.0	
		36	0	21.0	20.9	21.1	21.1	20.9	0.0	23.0	21.0	21.2	21.1	21.1	21.1	0.0	23.0	
		36	20	21.1	21.0	21.2	21.2	21.1	0.0	23.0	21.1	21.3	21.2	21.1	21.2	0.0	23.0	
		36	39	21.2	20.9	21.2	21.1	21.1	0.0	23.0	21.1	21.2	21.2	21.0	21.3	0.0	23.0	
75		0	21.0	20.9	21.1	21.1	21.1	0.0	23.0	21.1	21.1	21.2	21.0	21.1	0.0	23.0		

LTE Band 41 Measured Results (Continued)

BW (MHz)	Mode	RB Allocation	RB offset	Measured Pwr (dBm)					MPR	Tune-up Limit	Measured Pwr (dBm)					MPR	Tune-up Limit	
				39750	40185	40620	41055	41490			39750	40185	40620	41055	41490			
				2506 MHz	2549.5 MHz	2593 MHz	2636.5 MHz	2680 MHz			2506 MHz	2549.5 MHz	2593 MHz	2636.5 MHz	2680 MHz			
10 MHz	QPSK	1	0	22.0	22.0	22.0	22.0	22.1	0.0	23.0	22.0	21.9	21.8	21.8	21.8	0.0	23.0	
		1	25	22.0	22.3	22.3	22.3	22.3	0.0	23.0	22.2	22.1	22.0	22.0	22.0	0.0	23.0	
		1	49	22.0	22.1	22.0	22.0	22.1	0.0	23.0	22.0	21.9	21.8	21.7	21.8	0.0	23.0	
		25	0	22.0	22.3	22.3	22.2	22.4	0.0	23.0	22.1	22.2	22.1	22.0	22.0	0.0	23.0	
		25	12	22.4	22.5	22.4	22.4	22.5	0.0	23.0	22.2	22.3	22.2	22.1	22.1	0.0	23.0	
		25	25	22.4	22.4	22.4	22.3	22.4	0.0	23.0	22.1	22.2	22.1	22.0	22.1	0.0	23.0	
	50	0	22.4	22.4	22.4	22.3	22.4	0.0	23.0	22.1	22.2	22.1	22.0	22.0	0.0	23.0		
	16QAM	1	0	22.3	22.1	22.2	22.1	22.2	0.0	23.0	22.2	22.0	21.9	21.9	21.9	0.0	23.0	
		1	25	22.3	22.4	22.4	22.2	22.3	0.0	23.0	22.2	22.2	22.1	22.1	22.1	0.0	23.0	
		1	49	22.3	22.1	22.2	22.0	22.2	0.0	23.0	22.2	21.9	21.8	21.9	21.9	0.0	23.0	
		25	0	22.3	22.3	22.3	22.3	22.3	0.0	23.0	22.1	22.2	22.0	22.0	22.1	0.0	23.0	
		25	12	22.4	22.4	22.5	22.4	22.5	0.0	23.0	22.2	22.2	22.2	22.1	22.1	0.0	23.0	
		25	25	22.4	22.3	22.4	22.3	22.4	0.0	23.0	22.2	22.2	22.1	22.0	22.1	0.0	23.0	
	50	0	22.3	22.4	22.4	22.3	22.4	0.0	23.0	22.1	22.2	22.1	22.0	22.0	0.0	23.0		
	64QAM	1	0	22.2	21.5	22.1	21.9	21.4	0.0	23.0	22.2	21.5	22.2	22.0	21.5	0.0	23.0	
		1	25	22.2	21.8	22.3	22.1	21.6	0.0	23.0	22.2	21.8	22.4	22.2	21.7	0.0	23.0	
		1	49	22.3	21.5	22.1	21.9	21.4	0.0	23.0	22.3	21.5	22.2	22.0	21.6	0.0	23.0	
		25	0	21.0	21.2	21.0	20.9	21.1	0.0	23.0	21.1	21.3	21.1	21.0	21.2	0.0	23.0	
		25	12	21.1	21.2	21.2	20.9	21.1	0.0	23.0	21.1	21.3	21.2	21.0	21.2	0.0	23.0	
		25	25	21.1	21.2	21.1	20.9	21.1	0.0	23.0	21.1	21.2	21.1	21.0	21.2	0.0	23.0	
	50	0	21.1	21.1	21.0	20.9	21.0	0.0	23.0	21.1	21.2	21.1	21.0	21.1	0.0	23.0		
	5 MHz	QPSK	1	0	22.0	22.3	22.2	22.3	22.3	0.0	23.0	22.1	22.1	22.0	21.9	22.1	0.0	23.0
			1	12	22.0	22.3	22.3	22.3	22.4	0.0	23.0	22.0	22.1	22.1	21.9	22.1	0.0	23.0
			1	24	22.0	22.3	22.3	22.3	22.4	0.0	23.0	22.0	22.1	22.1	21.9	22.1	0.0	23.0
12			0	22.1	22.4	22.4	22.4	22.4	0.0	23.0	22.1	22.3	22.2	22.0	22.1	0.0	23.0	
12			7	22.1	22.4	22.4	22.4	22.5	0.0	23.0	22.2	22.3	22.2	22.0	22.2	0.0	23.0	
12			13	22.4	22.4	22.4	22.4	22.5	0.0	23.0	22.1	22.2	22.2	22.1	22.1	0.0	23.0	
25		0	22.4	22.4	22.4	22.4	22.5	0.0	23.0	22.1	22.2	22.2	22.0	22.1	0.0	23.0		
16QAM		1	0	22.3	22.5	22.3	22.3	22.5	0.0	23.0	22.0	22.1	22.2	21.9	22.0	0.0	23.0	
		1	12	22.3	22.1	22.4	22.3	22.3	0.0	23.0	22.1	22.1	22.3	22.0	22.1	0.0	23.0	
		1	24	22.3	22.5	22.3	22.3	22.6	0.0	23.0	22.1	22.1	22.3	21.9	22.1	0.0	23.0	
		12	0	22.4	22.5	22.3	22.3	22.5	0.0	23.0	22.2	22.2	22.1	22.0	22.1	0.0	23.0	
		12	7	22.4	22.5	22.4	22.3	22.5	0.0	23.0	22.2	22.2	22.2	22.1	22.1	0.0	23.0	
		12	13	22.4	22.5	22.4	22.4	22.6	0.0	23.0	22.2	22.2	22.2	22.1	22.1	0.0	23.0	
25		0	22.4	22.4	22.4	22.4	22.5	0.0	23.0	22.2	22.2	22.1	22.0	22.1	0.0	23.0		
64QAM		1	0	21.8	21.8	22.4	22.1	21.8	0.0	23.0	21.8	22.6	22.3	21.8	22.5	0.0	23.0	
		1	12	21.8	21.9	22.5	22.2	21.8	0.0	23.0	21.9	22.6	22.4	21.8	22.6	0.0	23.0	
		1	24	21.9	21.8	22.5	22.2	21.8	0.0	23.0	21.9	22.6	22.3	21.8	22.6	0.0	23.0	
		12	0	21.1	21.2	21.2	20.9	21.1	0.0	23.0	21.2	21.4	21.1	21.1	21.3	0.0	23.0	
		12	7	21.1	21.2	21.3	20.9	21.1	0.0	23.0	21.2	21.3	21.1	21.1	21.3	0.0	23.0	
		12	13	21.1	21.2	21.2	21.0	21.1	0.0	23.0	21.2	21.3	21.2	21.1	21.3	0.0	23.0	
25		0	21.1	21.2	21.1	20.9	21.1	0.0	23.0	21.2	21.2	21.1	21.1	21.2	0.0	23.0		

9.3.1. LTE Up-Link Carrier Aggregation

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

For intra-band carrier aggregation with uplink assigned to one E-UTRA band (Table 5.6A-1), the requirement in subclause 6.2.3 apply.

For intra-band carrier aggregation with one component carrier per operating band and the uplink active in two E-UTRA bands, the requirements in subclause 6.2.3 apply for each uplink component carrier.

For intra-band contiguous carrier aggregation the allowed Maximum Power Reduction (MPR) for the maximum output power applicable to the DUT in the table below. In case the modulation format is different on different component carriers the MPR is determined by the rules applied to higher order of those modulations.

Modulation	CA bandwidth Class B and C / Smallest Component Carrier Transmission Bandwidth Configuration				MPR (dB)
	25 RB	50 RB	75 RB	100 RB	
QPSK	> 8 and ≤ 25	> 12 and ≤ 50	> 16 and ≤ 75	> 18 and ≤ 100	≤ 1
QPSK	> 25	> 50	> 75	> 100	≤ 2
16 QAM	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
16 QAM	> 8 and ≤ 25	> 12 and ≤ 50	> 16 and ≤ 75	> 18 and ≤ 100	≤ 2
16 QAM	> 25	> 50	> 75	> 100	≤ 3
64 QAM	≤ 8 and allocation wholly contained within a single CC	≤ 12 and allocation wholly contained within a single CC	≤ 16 and allocation wholly contained within a single CC	≤ 18 and allocation wholly contained within a single CC	≤ 2
64 QAM	> 8 or allocation extends across two CC's	> 12 or allocation extends across two CC's	> 16 or allocation extends across two CC's	> 18 or allocation extends across two CC's	≤ 3

For PUCCH and SRS transmissions, the allowed MPR is according to that specified for PUSCH QPSK modulation for the corresponding transmission bandwidth.

For intra-band contiguous carrier aggregation bandwidth class C with non-contiguous resource allocation, the allowed Maximum Power Reduction (MPR) for the maximum output power in Table 6.2.2A-1 is specified as follows

$$\text{MPR} = \text{CEIL} \{ \min(M_A, M_{\text{IMS}}), 0.5 \}$$

Where M_A is defined as follows

$M_A =$	8.2	; $0 \leq A < 0.025$
	9.2 – 40A	; $0.025 \leq A < 0.05$
	8 – 16A	; $0.05 \leq A < 0.25$
	4.83 – 3.33A	; $0.25 \leq A \leq 0.4$
	3.83 – 0.83A	; $0.4 \leq A \leq 1$

and M_{IMS} is defined as follows

$M_{\text{IMS}} =$	4.5	; $\Delta_{\text{IMS}} < 1.5 * \text{BW}_{\text{Channel_CA}}$
	6.0	; $1.5 * \text{BW}_{\text{Channel_CA}} \leq \Delta_{\text{IMS}} < \text{BW}_{\text{Channel_CA}}/2 + \Delta f_{\text{00B}}$
	M_A	; $\Delta_{\text{IMS}} \geq \text{BW}_{\text{Channel_CA}}/2 + \Delta f_{\text{00B}}$

Where

$$A = N_{\text{RB_alloc}} / N_{\text{RB_agg}}$$

$$\Delta_{\text{IMS}} = \max \left(\left| F_{\text{C_agg}} - (3 * F_{\text{agg_alloc_low}} - 2 * F_{\text{agg_alloc_high}}) \right|, \left| F_{\text{C_agg}} - (3 * F_{\text{agg_alloc_high}} - 2 * F_{\text{agg_alloc_low}}) \right| \right)$$

CEIL{ M_A , 0.5} means rounding upwards to closest 0.5dB, i.e. $\text{MPR} \in [3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5, 7.0, 7.5, 8.0, 8.5]$

For intra-band carrier aggregation, the MPR is evaluated per slot and given by the maximum value taken over the transmission(s) on all component carriers within the slot; the maximum MPR over the two slots is then applied for the entire subframe.

For intra-band non-contiguous carrier aggregation with one uplink carrier on the PCC, the requirements in the subclause 6.2.3 apply. For intra-band non-contiguous aggregation with two uplink carriers the MPR is defined for those E-UTRA bands where maximum possible $W_{\text{GAP}} \leq 42.2$ MHz as follows

$$\text{MPR} = \text{CEIL} \{ M_N, 0.5 \}$$

Where M_N is defined as follows

$M_N =$	-0.125N + 18.25	; $2 \leq N \leq 50$
	-0.0333 N + 13.67	; $50 < N \leq 200$

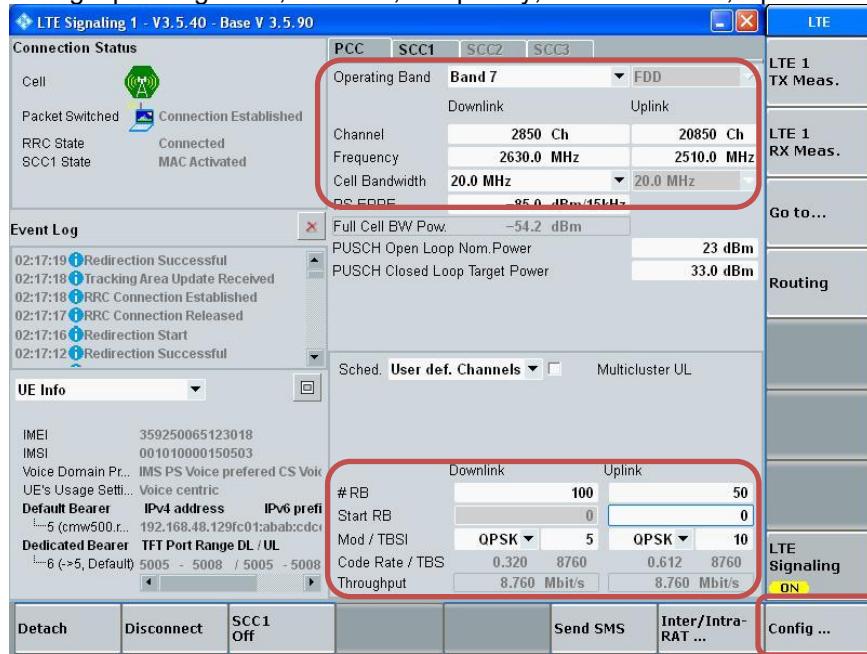
Where $N = N_{\text{RB_alloc}}$ is the number of allocated resource blocks.

For the UE maximum output power modified by MPR, the power limits specified in subclause 6.2.5A apply.

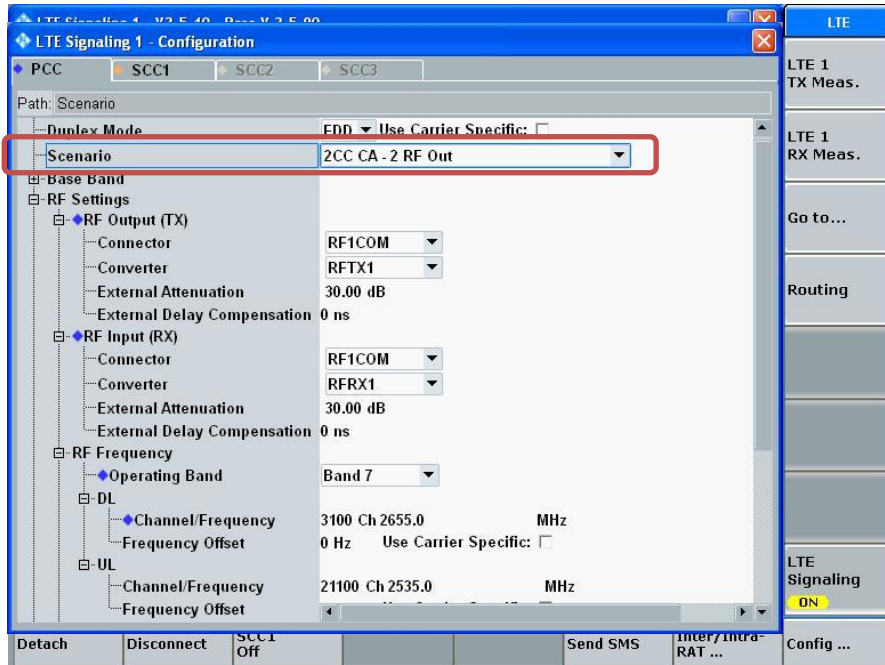
LTE Carrier Aggregation Test Signal Set-up Procedure
 (Use normal LTE set-up procedure in addition with the following steps)

Set to CMW-500 with following parameters:

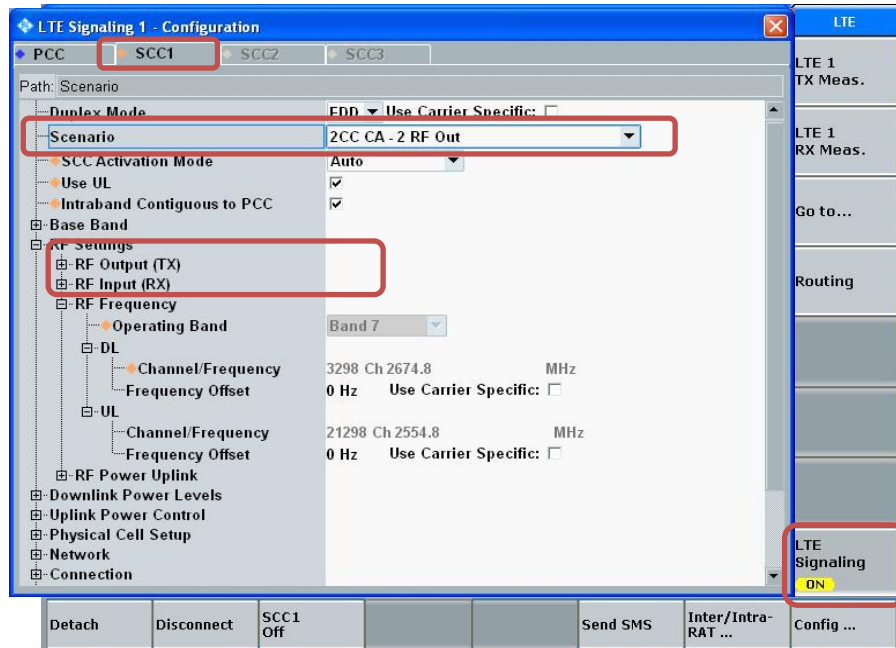
- PCC tab:
 - Select the testing Operating Band, Channel, Frequency, Cell Bandwidth, Uplink RBs



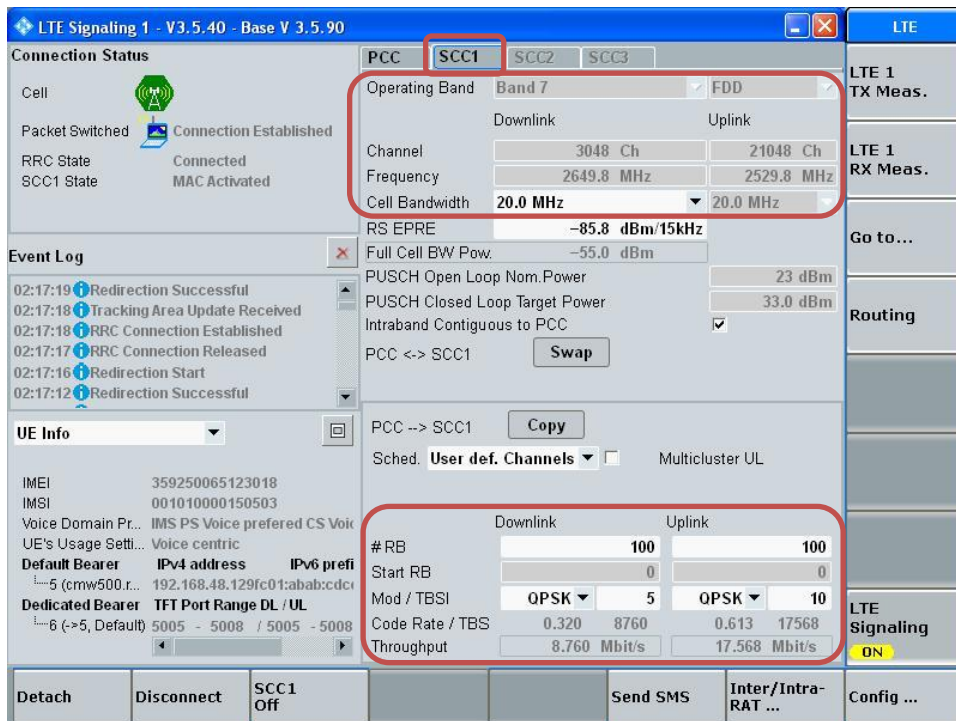
- Go to “Config...”
- Go to “Scenario”
- Set to “2CC CA – 2 RF Out”



- Select “SCC1” tab
- Go to “Scenario”
- Set to “2CC CA – 2 RF Out”
- Enable “Use UL”
- Enable “Intraband Contiguous to PCC”
- Select “LTE Signaling” button

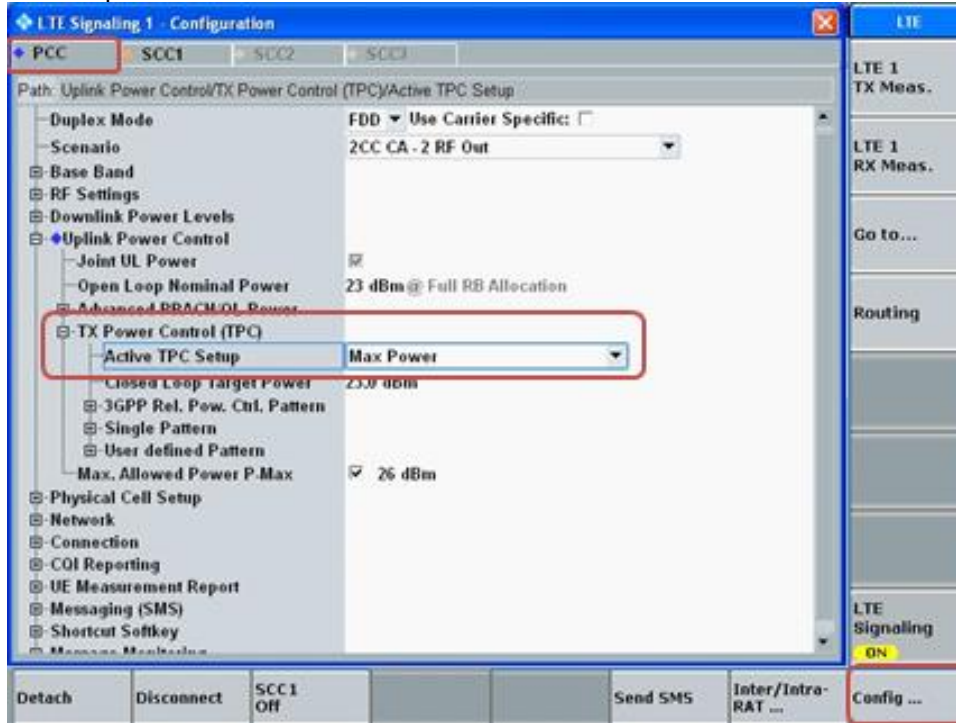


- Select “SCC1” tab
 - Select the testing Cell Bandwidth, Uplink RBs

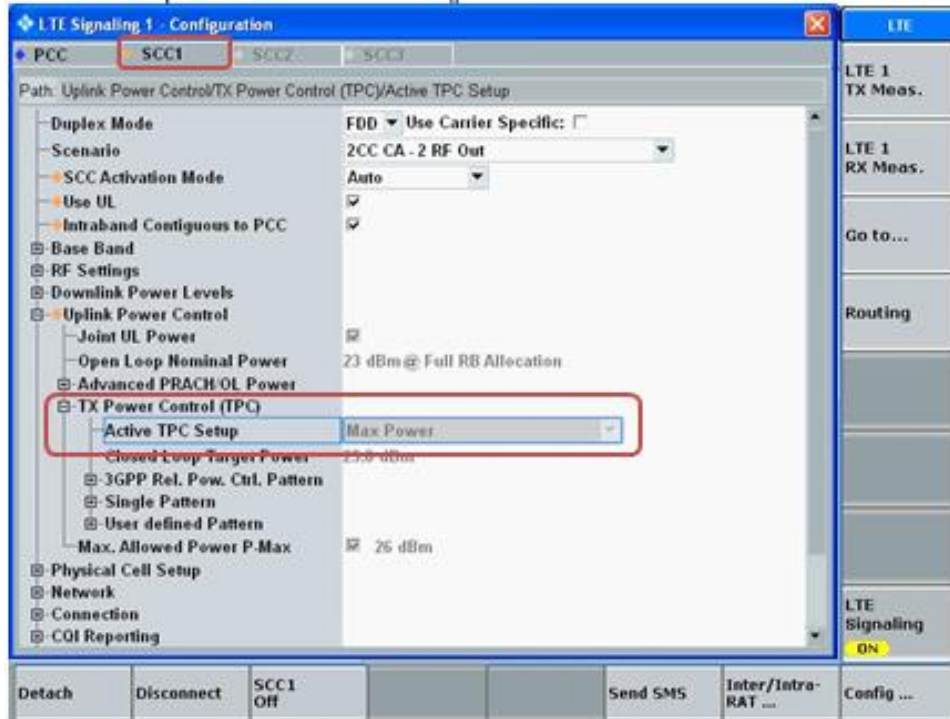


Max Power Setting

- Select “Config ...” button
- Select PCC tab
- Set “Active TPC Setup” to “Max Power”

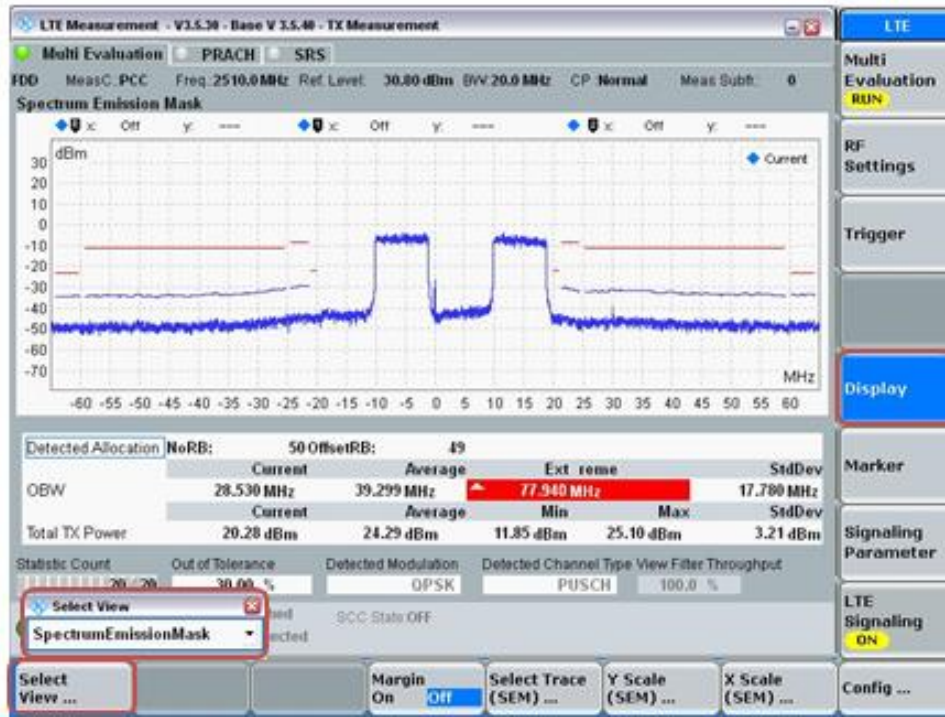


- Select SCC1 tab
- Verify that “Active TPC Setup” is set to “Max Power”



View TX Power

- Go to “Display”
- Select “Select View...”
- Select “Spectrum Emission Mask”



LTE Carrier Aggregation Up Link Combinations:

Maximum Output Power (Tune-up Limit) for LTE UL Carrier Aggregation

UL CA shall be tested based on the worst-case SAR configuration determined from non-CA SAR testing result. The channel BW, channel number, RB allocation, etc. would be selected to allow contiguous CA of PCC and SCC. Uplink output power for UL CA is the total power measured across the PCC and SCC.

UL CA power measurements were performed with QPSK modulation based on the worst-case standalone SAR. The tune-up limits are provided in table below.

The UL CA mode power measurements represent the total power across both carriers. Measurements were made for all supported PCC bandwidths using the channel/RB combination resulting in the highest standalone output power at the least MPR (0 dB). SCCs were set to use configurations similar to the PCC to establish conservative or worst case equivalent SAR test conditions (highest maximum power with MPR of 0 dB).

The standalone power measurement is the power for the PCC in the non-CA mode (i.e. single carrier power). In all cases the UL CA power is less than or equal to the standalone power, which is in accordance with the tune-up limits in table below.

According to November 2017 TCB workshop, Uplink CA SAR Test Guidance as follows:

- a) When the maximum output for UL CA is ≤ standalone LTE mode (without CA)
 - PCC is configured according to the highest standalone SAR configuration tested
 - SCC and subsequent CCs are configured according to procedures used for power measurement and parameters (BW, RB etc.) similar to that used for the PCC.
- b) When the Reported SAR for UL CA configuration, described above, is > 1.2 W/kg, UL CA SAR is also required for all required test channels(PCC based).
- c) UL CA SAR is also required for standalone SAR configurations > 1.2 W/kg when they are scaled to the UL CA power level.

SAR measurement is not required for the 16QAM and 64QAM. When the highest maximum output power for 16QAM and 64QAM is ≤ ½ dB higher than the QPSK or when the reported SAR for the QPSK configuration is ≤ 1.45 W/kg.

LTE-uplink 2CA Band 41 for SAR testing

E-UTRA CA configurations	RF exposure conditions	Bands		UL																LTE Rel.8 Power (dBm)	Delta	
		PCC	SCC	PCC						SCC						MPR	PCC+SCC					
				1st	2nd	Mod	RB	Offset	BW	Freq	Ch	Mod	RB	Offset	BW		Freq	Ch	Aggregated BW			Tune-Up Limit
CA_41C(0)(1)(2)(3)	Head	41C	41C	QPSK	1	0	20	2680.0	41490	QPSK	1	99	20	2660.2	41292	0	40	25.0	24.2	15	24.3	-0.1
	Body-worn	41C	41C	QPSK	1	0	20	2680.0	41490	QPSK	1	99	20	2660.2	41292	0	40	23.0	22.0	15	22.1	-0.1
	Hotspot	41C	41C	QPSK	1	0	20	2680.0	41490	QPSK	1	99	20	2660.2	41292	0	40	23.0	22.2	15	22.3	-0.1

Note(s):

Standalone output power & SAR are reference from Sec.9.3 & Sec.10.7.

9.3.2. LTE Down-Link Carrier Aggregation

LTE Carrier Aggregation Down Link Combinations:

The DL CA power measurement conditions for various CC's combinations were determined according to LTE DL CA SAR Test Exclusion guidance in TCB workshop note (April 2018). Only yellow highlighted cells need power measurement. The following power measurements were performed with a single carrier uplink; CA for this particular project only supports one (1) uplink and up to four (2) downlinks.

LTE Release 10 Carrier Aggregation

Index	2CC	Restriction	Completely Covered by Measurement Supersrt	Reverse
2CC #1	CA_41C			-

Note:

Only yellow highlight cells need power measurement according to LTE DL CA SAR test Exclusion in TCB workshop (April.2018).

LTE Release 10 Carrier Aggregation with 4x4 MIMO

Index	2CC	Restriction	Completely Covered by Measurement Supersrt	Reverse
2CC #1	[41C]			-

[*] is 4X4 MIMO configuration.

Note:

Only yellow highlight cells need power measurement according to LTE DL CA SAR test Exclusion in TCB workshop (April.2018).

1. Single Carrier 4x4 Downlink MIMO

LTE Band	Bandwidth (MHz)	Channel	Frequency (MHz)	Modulation	RB/Offset	LTE Rel 8 Tx. Power [dBm]	4x4 DL MIMO LTE Rel 8 Tx. Power [dBm]	Delta
LTE Band 41	20 Mhz	41490	2680.0 MHz	QPSK	1/0	24.3	24.2	-0.1

Note:

1. According to LTE Test Conditions in TCB workshop (May, 2017), SAR is excluded for LTE downlink 4x4 MIMO operation when uplink output with DL MIMO does not exceed highest uplink output power configuration without DL MIMO by more than a 1/4 dB. And for DL MIMO with carrier aggregation, the same SAR test exclusion procedure is considered.

2. DL CA output power results

E-UTRA CA configuration (BCS)	Bands		UL					DL					LTE Rel 8 Tx. Power [dBm]	LTE Rel 10 Tx. Power [dBm]	Delta	
	PCC	SCC1	PCC					PCC		SCC1						
	1st	2nd	Mode	BW (MHz)	Channel	Freq. (MHz)	RB/Offset	BW (MHz)	Channel	Freq. (MHz)	BW (MHz)	Channel				Freq. (MHz)
41C	41C	41C	QPSK	20	41490	2680.0	1/0	20	41490	2680.0	20	41292	2660.2	24.3	24.3	0.0

Note:

- Per KDB 941225 D05A LTE Rel. 10 KDB Inquiry Sheet: SAR is excluded for Carrier Aggregation when measured power does not exceed LTE Release 8 by more than a 1/4 dB.
- When the same frequency band is used for both contiguous and non-contiguous in DL CA Intra band, power was measured using the configuration with the largest aggregated bandwidth and maximum output power among the contiguous and non-contiguous in DL CA Intra band configurations

DL CA with downlink 4x4 MIMO output power results

E-UTRA CA configuration (BCS)	Bands		UL					DL					LTE Rel 8 Tx. Power [dBm]	LTE Rel 10 Tx. Power [dBm]	Delta	
	PCC	SCC1	PCC					PCC		SCC1						
	1st	2nd	Mode	BW (MHz)	Channel	Freq. (MHz)	RB/Offset	BW (MHz)	Channel	Freq. (MHz)	BW (MHz)	Channel				Freq. (MHz)
[41C]	41C	41C	QPSK	20	41490	2680.0	1/0	20	41490	2680.0	20	41292	2660.2	24.3	24.3	0.0

Note:

- Per KDB 941225 D05A LTE Rel. 10 KDB Inquiry Sheet: SAR is excluded for Carrier Aggregation when measured power does not exceed LTE Release 8 by more than a 1/4 dB.
- When the same frequency band is used for both contiguous and non-contiguous in DL CA Intra band, power was measured using the configuration with the largest aggregated bandwidth and maximum output power among the contiguous and non-contiguous in DL CA Intra band configurations

9.4. Wi-Fi 2.4 GHz (DTS Band)

When the RCV is activated in a held-to-ear user scenario, the output power level is reduced. The maximum allowed output powers in all conditions are included in the maximum power document. Refer to Operational Description for WLAN explanation.

Measured Results

Antenna	Mode	Data Rate	Ch #	Freq. (MHz)	Normal WLAN mode					
					Max. Average Power			Reduced Average Power		
					Meas. Avg Pwr (dBm)	Max. Tune-up Limit (dBm)	SAR Test (Yes/No)	Meas. Avg Pwr (dBm)	Max. Tune-up Limit (dBm)	SAR Test (Yes/No)
WiFi SISO Ant.1	802.11b	1 Mbps	1	2412.0	17.7	19.0	Yes	16.4	17.0	Yes
			6	2437.0	17.8			16.8		
			11	2462.0	17.8			16.7		
			12	2467.0	8.5	10.0	No			
			13	2472.0	6.8	8.0				
WiFi SISO Ant.2	802.11b	1 Mbps	1	2412.0	17.4	19.0	Yes	16.4	17.0	Yes
			6	2437.0	17.8			16.8		
			11	2462.0	17.7			16.9		
			12	2467.0	9.0	10.0	No			
			13	2472.0	7.6	8.0				
WiFi MIMO Ant.1	802.11g	6 Mbps	1	2412.0	14.9	16.0	Yes	16.0	No	
			6	2437.0	15.1					
			11	2462.0	14.8					
			12	2467.0	8.4	10.0				
			13	2472.0	7.2	8.0				
	802.11n (HT20)	6.5 Mbps	1	2412.0	Not Required	16.0	No			
			6	2437.0		14.0				
			11	2462.0		10.0				
			13	2472.0		8.0				
	802.11ax (HE20)	7.3 Mbps	1	2412.0	Not Required	16.0	No			
			6	2437.0		14.0				
			11	2462.0		10.0				
			13	2472.0		6.0				
WiFi MIMO Ant.2	802.11g	6 Mbps	1	2412.0	15.1	16.0	Yes	16.0	No	
			6	2437.0	15.4					
			11	2462.0	15.3					
			12	2467.0	8.5	10.0				
			13	2472.0	7.5	8.0				
	802.11n (HT20)	6.5 Mbps	1	2412.0	Not Required	16.0	No			
			6	2437.0		14.0				
			11	2462.0		10.0				
			13	2472.0		8.0				
	802.11ax (HE20)	7.3 Mbps	1	2412.0	Not Required	16.0	No			
			6	2437.0		14.0				
			11	2462.0		10.0				
			13	2472.0		6.0				

Note(s):

- SAR is not required for 802.11g/n modes when the adjusted SAR for 802.11b is < 1.2 W/kg.
- For "Not required", SAR Test reduction was applied from KDB 248227 guidance, Sec. 2.1, b), 1) when the same maximum power is specified for multiple transmission modes in a frequency band, the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order 802.11n/g/ax mode is used for SAR measurement, on the highest measured output power channel in the initial test configuration, for each frequency band. Additional output power measurements were not deemed necessary.
- Additionally, SAR is not required for Channels 12 and 13 because the tune-up limit and the measured output power for these two channels are no greater than those for the default test channels. Refer to §6.3.
- RSDB mode's output power are same or lower than Normal mode's output power. So Normal SAR value were used for determining simultaneous transmission SAR (WWAN + RSDB scenarios) exclusion.
- MIMO SAR test were additionally performed for determining simultaneous transmission SAR exclusion.

9.5. Wi-Fi 5GHz (U-NII Bands)

When the RCV is active in a held-to-ear user scenario, the output power level is reduced. The maximum allowed output powers in all conditions are included in the maximum power document. Refer to Operational Description for WLAN explanation.

Measured Results of WiFi MIMO Ant.1

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Normal MIMO Ant.1					
					Avg Pwr (dBm)	Max. Tune-up Limit (dBm)	SAR Test (Yes/No)	Avg Pwr (dBm)	Reduced Tune-up Limit (dBm)	SAR Test (Yes/No)
5.3 (U-NII 2A)	802.11a	6 Mbps	52	5260	16.4	17.0	Yes	Not Required	13.0	No
			56	5280	16.4					
			60	5300	16.6					
	802.11n (HT20)	6.5 Mbps	64	5320	16.5	17.0	No	Not Required	13.0	No
			52	5260						
			56	5280						
	802.11n (HT40)	13.5 Mbps	60	5300		15.0	No	Not Required	13.0	No
			62	5310						
	802.11ac (VHT20)	6.5 Mbps	54	5270		17.0	No	Not Required	13.0	No
			52	5260						
			56	5280						
	802.11ac (VHT40)	13.5 Mbps	60	5300		15.0	No	Not Required	13.0	No
			62	5310						
	802.11ac (VHT80)	29.3 Mbps	58	5290		14.0	No	11.8	13.0	Yes
			52	5260						
802.11ax (HE20)	7.3 Mbps	56	5280		17.0	No	Not Required	13.0	No	
		60	5300							
		64	5320							
802.11ax (HE40)	14.6 Mbps	54	5270		15.0	No	Not Required	13.0	No	
		62	5310							
802.11ax (HE80)	30.6 Mbps	58	5290		14.0	No	Not Required	13.0	No	
5.5 (U-NII 2C)	802.11a	6 Mbps	100	5500	16.4	17.0	Yes	Not Required	13.0	No
			120	5600	16.7					
			124	5620	16.7					
			144	5720	16.9					
	802.11n (HT20)	6.5 Mbps	100	5500		17.0	No	Not Required	13.0	No
			120	5600						
			124	5620						
			144	5720						
	802.11n (HT40)	13.5 Mbps	102	5510		12.0	No	Not Required	12.0	No
			118	5590						
			126	5630						
			142	5710						
	802.11ac (VHT20)	6.5 Mbps	100	5500		17.0	No	Not Required	13.0	No
			120	5600						
			124	5620						
			144	5720						
	802.11ac (VHT40)	13.5 Mbps	102	5510		12.0	No	Not Required	13.0	No
			118	5590						
			126	5630						
			142	5710						
	802.11ac (VHT80)	29.3 Mbps	106	5530		14.0	No	12.0	13.0	Yes
122			5610		12.1					
138			5690		12.4					
100			5500							
802.11ax (HE20)	7.3 Mbps	120	5600		17.0	No	Not Required	13.0	No	
		124	5620							
		144	5720							
		102	5510							
802.11ax (HE40)	14.6 Mbps	118	5590		12.0	No	Not Required	12.0	No	
		126	5630							
		142	5710							
		106	5530							
802.11ax (HE80)	30.6 Mbps	122	5610		14.0	No	Not Required	13.0	No	
		138	5690							
		100	5500							
		120	5600							
5.8 (U-NII 3)	802.11a	6 Mbps	149	5745	16.6	17.0	Yes	Not Required	13.0	No
			157	5785	16.7					
			165	5825	16.7					
	802.11n (HT20)	6.5 Mbps	149	5745		17.0	No	Not Required	13.0	No
			157	5785						
			165	5825						
	802.11n (HT40)	13.5 Mbps	151	5755		15.0	No	Not Required	13.0	No
			159	5795						
	802.11ac (VHT20)	6.5 Mbps	149	5745		17.0	No	Not Required	13.0	No
			157	5785						
			165	5825						
	802.11ac (VHT40)	13.5 Mbps	151	5755		15.0	No	Not Required	13.0	No
			159	5795						
	802.11ac (VHT80)	29.3 Mbps	155	5775		14.0	No	12.0	13.0	Yes
			149	5745						
802.11ax (HE20)	7.3 Mbps	157	5785		17.0	No	Not Required	13.0	No	
		165	5825							
		151	5755							
802.11ax (HE40)	14.6 Mbps	159	5795		15.0	No	Not Required	13.0	No	
		151	5755							
802.11ax (HE80)	30.6 Mbps	155	5775		14.0	No	Not Required	13.0	No	

Measured Results of WiFi MIMO Ant.2

Antenna	Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Normal MIMO Ant.2					
						Avg Pwr (dBm)	Max. Tune-up Limit (dBm)	SAR Test (Yes/No)	Avg Pwr (dBm)	Reduced Tune-up Limit (dBm)	SAR Test (Yes/No)
MIMO Ant.2	5.3 (UNII 2A)	802.11a	6 Mbps	52	5260	16.3	17.0	Yes	Not Required	13.0	No
				56	5280	16.4					
				60	5300	16.5					
				64	5320	16.5					
		802.11n (HT20)	6.5 Mbps	52	5260	Not Required	17.0	No	Not Required	13.0	No
				56	5280						
				60	5300						
				64	5320						
		802.11n (HT40)	13.5 Mbps	54	5270	Not Required	15.0	No	Not Required	13.0	No
				62	5310						
		802.11ac (VHT20)	6.5 Mbps	52	5260	Not Required	17.0	No	Not Required	13.0	No
				56	5280						
				60	5300						
				64	5320						
		802.11ac (VHT40)	13.5 Mbps	54	5270	Not Required	15.0	No	Not Required	13.0	No
				62	5310						
		802.11ac (VHT80)	29.3 Mbps	58	5290	Not Required	14.0	No	12.5	13.0	Yes
		802.11ax (HE20)	7.3 Mbps	52	5260	Not Required	17.0	No	Not Required	13.0	No
				56	5280						
	60			5300							
	64			5320							
	802.11ax (HE40)	14.6 Mbps	54	5270	Not Required	15.0	No	Not Required	13.0	No	
			62	5310							
	802.11ax (HE80)	30.6 Mbps	58	5290	Not Required	14.0	No	Not Required	13.0	No	
	5.5 (U-NII 2C)	802.11a	6 Mbps	100	5500	16.6	17.0	Yes	Not Required	13.0	No
				120	5600	16.5					
				124	5620	16.5					
				144	5720	16.6					
		802.11n (HT20)	6.5 Mbps	100	5500	Not Required	17.0	No	Not Required	13.0	No
				120	5600						
				124	5620						
				144	5720						
		802.11n (HT40)	13.5 Mbps	102	5510	Not Required	12.0	No	Not Required	12.0	No
				118	5590						
				126	5630						
				142	5710						
		802.11ac (VHT20)	6.5 Mbps	100	5500	Not Required	17.0	No	Not Required	13.0	No
				120	5600						
				124	5620						
				144	5720						
		802.11ac (VHT40)	13.5 Mbps	102	5510	Not Required	12.0	No	Not Required	13.0	No
				118	5590						
				126	5630						
				142	5710						
	802.11ac (VHT80)	29.3 Mbps	106	5530	Not Required	14.0	No	12.8	13.0	Yes	
			122	5610				12.6			
			138	5690				12.6			
			100	5500							
	802.11ax (HE20)	7.3 Mbps	120	5600	Not Required	17.0	No	Not Required	13.0	No	
			124	5620							
			144	5720							
			102	5510							
	802.11ax (HE40)	14.6 Mbps	118	5590	Not Required	15.0	No	Not Required	13.0	No	
			126	5630							
			142	5710							
			106	5530							
	802.11ax (HE80)	30.6 Mbps	122	5610	Not Required	14.0	No	Not Required	13.0	No	
			138	5690							
			149	5745							
			157	5785							
	5.8 (U-NII 3)	802.11a	6 Mbps	149	5745	16.6	17.0	Yes	Not Required	13.0	No
				157	5785	16.7					
				165	5825	16.7					
				149	5745						
		802.11n (HT20)	6.5 Mbps	149	5745	Not Required	17.0	No	Not Required	13.0	No
				157	5785						
				165	5825						
				151	5755						
		802.11n (HT40)	13.5 Mbps	159	5795	Not Required	15.0	No	Not Required	13.0	No
				149	5745						
		802.11ac (VHT20)	6.5 Mbps	149	5745	Not Required	17.0	No	Not Required	13.0	No
				157	5785						
				165	5825						
				151	5755						
		802.11ac (VHT40)	13.5 Mbps	159	5795	Not Required	15.0	No	Not Required	13.0	No
				149	5745						
		802.11ac (VHT80)	29.3 Mbps	155	5775	Not Required	14.0	No	13.0	13.0	Yes
		802.11ax (HE20)	7.3 Mbps	149	5745	Not Required	17.0	No	Not Required	13.0	No
				157	5785						
	165			5825							
	151			5755							
	802.11ax (HE40)	14.6 Mbps	159	5795	Not Required	15.0	No	Not Required	13.0	No	
			149	5745							
	802.11ax (HE80)	30.6 Mbps	155	5775	Not Required	14.0	No	Not Required	13.0	No	

Note(s):

- For "Not required", SAR Test reduction was applied from KDB 248227 guidance, Sec. 2.1, b), 1) when the same maximum power is specified for multiple transmission modes in a frequency band, the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order 802.11a/g/n/ac mode is used for SAR measurement, on the highest measured output power channel in the initial test configuration, for each frequency band.
- When the same transmission mode configurations have the same maximum output power on the same channel for the 802.11 a/g/n/ac/ax modes, the channel in the lower order/sequence 802.11 mode (i.e. a, g, n ac then ax) is selected.
- When the specified maximum output power is the same for both UNII band I and UNII band 2A, begin SAR measurement in UNII band 2A; and if the highest reported SAR for UNII band 2A is
 - ≤ 1.2 W/kg, SAR is not required for UNII band I
 - > 1.2 W/kg, both bands should be tested independently for SAR.
- RSDB mode's output power are same or lower than Normal mode's output power. So Normal SAR value were used for determining simultaneous transmission SAR (WWAN + RSDB scenarios) exclusion.
- 5GHz WLAN only operate MIMO mode.

9.6. Bluetooth

Measured Results

Band (GHz)	Mode	Ch #	Freq. (MHz)	Maximum Average Power (dBm)	
				Meas Pwr	Tune-up Limit
2.4	GFSK	0	2402	15.6	16.5
		39	2441	16.0	
		78	2480	14.8	
	EDR, 8-DPSK	0	2402	10.7	12.0
		39	2441	10.8	
		78	2480	9.5	
	LE, GFSK, 1M (37 pkt)	0	2402	8.0	10.0
		19	2440	9.9	
		39	2480	8.9	
	LE, GFSK, 2M (37 pkt)	0	2402	7.7	10.0
		19	2440	9.7	
		39	2480	8.7	

Note(s):

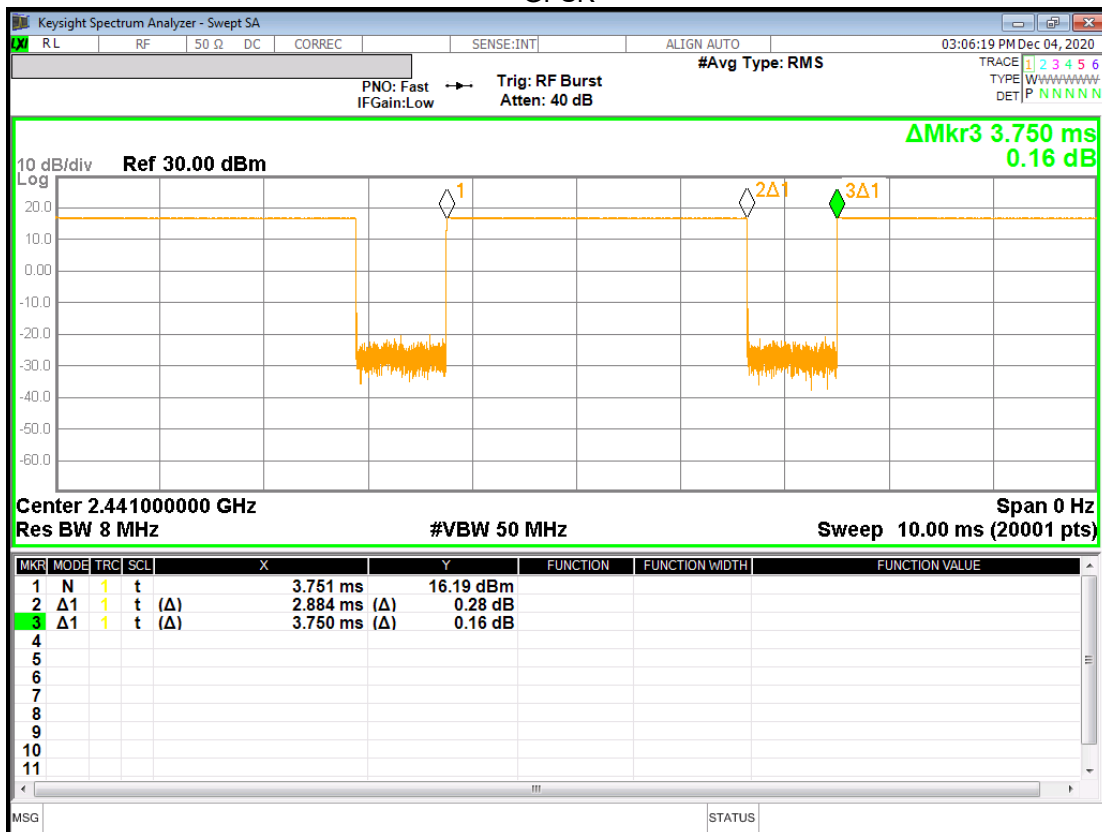
SAR test is evaluated at GFSK mode in Bluetooth

Duty Factor Measured Results

Mode	Type	T on (ms)	Period (ms)	Duty Cycle	Crest Factor (1/duty cycle)
GFSK	DH5	2.884	3.750	76.9%	1.30

Duty Cycle plots

GFSK



10. Measured and Reported (Scaled) SAR Results

SAR Test Reduction criteria are as follows:

- Reported SAR(W/kg) for WWAN= Measured SAR *Tune-up Scaling Factor
- Reported SAR(W/kg) for Wi-Fi and Bluetooth= Measured SAR * Tune-up scaling factor * Duty Cycle scaling factor
- Duty Cycle scaling factor = 1 / Duty cycle (%)

KDB 447498 D01 General RF Exposure Guidance:

Testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is:

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

KDB 648474 D04 Handset SAR:

With headset attached, when the reported SAR for body-worn accessory, measured without a headset connected to the handset, is > 1.2 W/kg, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a headset attached to the handset.

KDB 648474 D04 Handset SAR (Phablet Only):

For smart phones, with a display diagonal dimension > 15.0 cm or an overall diagonal dimension > 16.0 cm.

When hotspot mode does not apply, 10-g extremity SAR is required for all surfaces and edges with an antenna located at ≤ 25 mm from that surface or edge in direct contact with a flat phantom, to address interactive hand use exposure conditions. When hotspot mode applies, 10-g extremity SAR is required only for the surfaces and edges with hotspot mode 1-g reported SAR > 1.2 W/kg; However, when power reduction applies to hotspot mode the measured SAR must be scaled to the maximum output power, including tolerance, allowed for phablet modes to compare with the 1.2 W/kg SAR test reduction threshold.

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

KDB 941225 D01 SAR test for 3G devices:

When the maximum output power and tune-up tolerance specified for production units in a secondary mode is $\leq 1/4$ dB higher than the primary mode or when the highest reported SAR of the primary mode is scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for the secondary mode.

KDB 941225 D05 SAR for LTE Devices:

SAR test reduction is applied using the following criteria:

- Start with the largest channel bandwidth and measure SAR for QPSK with 1 RB, and 50% RB allocation, using the RB offset and required test channel combination with the highest maximum output power among RB offsets at the upper edge, middle and lower edge of each required test channel.
- When the reported SAR is > 0.8 W/kg, testing for other Channels is performed at the highest output power level for 1RB, and 50% RB configuration for that channel.
- Testing for 100% RB configuration is performed at the highest output power level for 100% RB configuration across the Low, Mid and High Channel when the highest reported SAR for 1 RB and 50% RB are > 0.8 W/kg. Testing for the remaining required channels is not needed because the reported SAR for 100% RB Allocation < 1.45 W/kg.
- Testing for 16-QAM modulation is not required because the reported SAR for QPSK is < 1.45 W/Kg and its output power is not more than 0.5 dB higher than that of QPSK.
- Testing for the other channel bandwidths is not required because the reported SAR for the highest channel bandwidth is < 1.45 W/Kg and its output power is not more than 0.5 dB higher than that of the highest channel bandwidth.
- For LTE bands that do not support at least three non-overlapping channels in certain channel bandwidths, test the available non-overlapping channels instead. 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; therefore, the requirement for H, M and L channels may not fully apply.

KDB 248227 D01 SAR meas for 802.11:

SAR test reduction for 802.11 Wi-Fi transmission mode configurations are considered separately for DSSS and OFDM. An initial test position is determined to reduce the number of tests required for certain exposure configurations with multiple test positions. An initial test configuration is determined for each frequency band and aggregated band according to maximum output power, channel bandwidth, wireless mode configurations and other operating parameters to streamline the measurement requirements. For 2.4 GHz DSSS, either the initial test position or DSSS procedure is applied to reduce the number of SAR tests; these are mutually exclusive. For OFDM, an initial test position is only applicable to next to the ear, UMPC mini-tablet and hotspot mode configurations, which is tested using the initial test configuration to facilitate test reduction. For other exposure conditions with a fixed test position, SAR test reduction is determined using only the initial test configuration.

The multiple test positions require SAR measurements in head, hotspot mode or UMPC mini-tablet configurations may be reduced according to the highest reported SAR determined using the initial test position(s) by applying the DSSS or OFDM SAR measurement procedures in the required wireless mode test configuration(s). The initial test position(s) is measured using the highest measured maximum output power channel in the required wireless mode test configuration(s). When the reported SAR for the initial test position is:

- ≤ 0.4 W/kg, further SAR measurement is not required for the other test positions in that exposure configuration and wireless mode combination within the frequency band or aggregated band. DSSS and OFDM configurations are considered separately according to the required SAR procedures.
- > 0.4 W/kg, SAR is repeated using the same wireless mode test configuration tested in the initial test position to measure the subsequent next closet/smallest test separation distance and maximum coupling test position, on the highest maximum output power channel, until the reported SAR is ≤ 0.8 W/kg or all required test positions are tested.
 - For subsequent test positions with equivalent test separation distance or when exposure is dominated by coupling conditions, the position for maximum coupling condition should be tested.
 - When it is unclear, all equivalent conditions must be tested.
- For all positions/configurations tested using the initial test position and subsequent test positions, when the reported SAR is > 0.8 W/kg, measure the SAR for these positions/configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required test channels are considered.
 - The additional power measurements required for this step should be limited to those necessary for identifying subsequent highest output power channels to apply the test reduction.
- When the specified maximum output power is the same for both UNII 1 and UNII 2A, begin SAR measurements in UNII 2A with the channel with the highest measured output power. If the reported SAR for UNII 2A is ≤ 1.2 W/kg, SAR is not required for UNII 1; otherwise treat the remaining bands separately and test them independently for SAR.
- When the specified maximum output power is different between UNII 1 and UNII 2A, begin SAR with the band that has the higher specified maximum output. If the highest reported SAR for the band with the highest specified power is ≤ 1.2 W/kg, testing for the band with the lower specified output power is not required; otherwise test the remaining bands independently for SAR.

To determine the initial test position, Area Scans were performed to determine the position with the *Maximum Value of SAR (measured)*. The position that produced the highest *Maximum Value of SAR* is considered the worst case position; thus used as the initial test position.

10.1. GSM 850

Antenna	RF Exposure Conditions	Mode	PWR Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
								Tune-up limit	Meas.	Meas.	Scaled	
Main 1 Ant.	Head	GPRS 3 Slots	N/A	0	Left Touch	190	836.6	30.5	29.2	0.158	0.215	1
					Left Tilt	190	836.6	30.5	29.2	0.092	0.125	
					Right Touch	190	836.6	30.5	29.2	0.210	0.286	
					Right Tilt	190	836.6	30.5	29.2	0.088	0.120	
	Body-worn	GPRS 3 Slots	N/A	15	Rear	190	836.6	30.5	29.2	0.268	0.365	2
					Front	190	836.6	30.5	29.2	0.226	0.308	
	Hotspot	GPRS 3 Slots	N/A	10	Rear	190	836.6	30.5	29.2	0.539	0.734	3
					Front	190	836.6	30.5	29.2	0.352	0.479	
					Edge 2	190	836.6	30.5	29.2	0.280	0.381	
					Edge 3	190	836.6	30.5	29.2	0.348	0.474	
				Edge 4	190	836.6	30.5	29.2	0.073	0.100		

10.2. GSM 1900

Antenna	RF Exposure Conditions	Mode	PWR Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
								Tune-up limit	Meas.	Meas.	Scaled	
Main 1 Ant.	Head	GPRS 3 Slot	Off	0	Left Touch	661	1880.0	27.5	26.3	0.102	0.133	4
					Left Tilt	661	1880.0	27.5	26.3	0.044	0.057	
					Right Touch	661	1880.0	27.5	26.3	0.062	0.080	
					Right Tilt	661	1880.0	27.5	26.3	0.064	0.083	
	Body-worn	GPRS 3 Slot	Off	15	Rear	661	1880.0	27.5	26.3	0.430	0.561	5
					Front	661	1880.0	27.5	26.3	0.344	0.449	
	Hotspot	GPRS 3 Slots	On	10	Rear	512	1850.2	24.5	24.0	0.904	1.024	
						661	1880.0	24.5	24.1	0.753	0.826	
						810	1909.8	24.5	23.4	0.554	0.709	
					Front	512	1850.2	24.5	24.0	0.842	0.953	
						661	1880.0	24.5	24.1	0.751	0.823	
						810	1909.8	24.5	23.4	0.540	0.691	
					Edge 2	661	1880.0	24.5	24.1	0.088	0.096	
					Edge 3	512	1850.2	24.5	24.0	0.954	1.080	
						661	1880.0	24.5	24.1	1.090	1.195	
						810	1909.8	24.5	23.4	0.977	1.250	6
Edge 4	661	1880.0	24.5	24.1	0.082	0.090						
Antenna	RF Exposure Conditions	Mode	PWR Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		10-g SAR (W/kg)		Plot No.
Main 1 Ant.	Product specific 10-g SAR	GPRS 3 Slots	Off	5	Rear	661	1880.0	27.5	26.3	1.130	1.475	
				4	Front	661	1880.0	27.5	26.3	1.270	1.658	7
				10	Edge 3	661	1880.0	27.5	26.3	1.090	1.423	
		Voice	On	0	Rear	661	1880.0	30.0	29.8	1.420	1.487	
					Front	661	1880.0	30.0	29.8	1.360	1.424	
					Edge 3	661	1880.0	30.0	29.8	1.100	1.152	

10.3. W-CDMA Band V

Antenna	RF Exposure Conditions	Mode	PWR Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
								Tune-up limit	Meas.	Meas.	Scaled	
Main 1 Ant.	Head	Rel 99 RMC	N/A	0	Left Touch	4183	836.6	25.0	24.2	0.158	0.188	
					Left Tilt	4183	836.6	25.0	24.2	0.095	0.113	
					Right Touch	4183	836.6	25.0	24.2	0.221	0.263	8
					Right Tilt	4183	836.6	25.0	24.2	0.101	0.120	
	Body-worn	Rel 99 RMC	N/A	15	Rear	4183	836.6	25.0	24.2	0.312	0.371	9
					Front	4183	836.6	25.0	24.2	0.268	0.319	
	Hotspot	Rel 99 RMC	N/A	10	Rear	4183	836.6	25.0	24.2	0.644	0.766	10
					Front	4183	836.6	25.0	24.2	0.446	0.531	
					Edge 2	4183	836.6	25.0	24.2	0.285	0.339	
					Edge 3	4183	836.6	25.0	24.2	0.395	0.470	
					Edge 4	4183	836.6	25.0	24.2	0.062	0.073	

10.4. LTE Band 5 (10MHz Bandwidth)

Antenna	RF Exposure Conditions	Mode	PWR Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offset	Power (dBm)		1-g SAR (W/kg)		Plot No.
										Tune-up limit	Meas.	Meas.	Scaled	
Main 1 Ant.	Head	QPSK	N/A	0	Left Touch	20525	836.5	1	49	25.5	24.5	0.135	0.169	
								25	25	24.5	23.5	0.108	0.135	
					Left Tilt	20525	836.5	1	49	25.5	24.5	0.077	0.097	
								25	25	24.5	23.5	0.062	0.077	
					Right Touch	20525	836.5	1	49	25.5	24.5	0.221	0.276	11
								25	25	24.5	23.5	0.171	0.213	
					Right Tilt	20525	836.5	1	49	25.5	24.5	0.093	0.116	
								25	25	24.5	23.5	0.069	0.086	
	Body-worn	QPSK	N/A	15	Rear	20525	836.5	1	49	25.5	24.5	0.305	0.381	12
								25	25	24.5	23.5	0.234	0.292	
					Front	20525	836.5	1	49	25.5	24.5	0.250	0.313	
								25	25	24.5	23.5	0.186	0.232	
	Hotspot	QPSK	N/A	10	Rear	20525	836.5	1	49	25.5	24.5	0.621	0.776	13
								25	25	24.5	23.5	0.464	0.579	
					Front	20525	836.5	1	49	25.5	24.5	0.434	0.543	
								25	25	24.5	23.5	0.325	0.406	
					Edge 2	20525	836.5	1	49	25.5	24.5	0.233	0.291	
								25	25	24.5	23.5	0.177	0.221	
					Edge 3	20525	836.5	1	49	25.5	24.5	0.400	0.500	
								25	25	24.5	23.5	0.304	0.380	
					Edge 4	20525	836.5	1	49	25.5	24.5	0.066	0.082	
								25	25	24.5	23.5	0.049	0.062	

10.5. LTE Band 12 (10MHz Bandwidth)

Antenna	RF Exposure Conditions	Mode	PWR Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offset	Power (dBm)		1-g SAR (W/kg)		Plot No.
										Tune-up limit	Meas.	Meas.	Scaled	
Main 1 Ant.	Head	QPSK	N/A	0	Left Touch	23095	707.5	1	49	25.5	24.7	0.106	0.127	
								25	12	24.5	23.8	0.088	0.105	
					Left Tilt	23095	707.5	1	49	25.5	24.7	0.048	0.057	
								25	12	24.5	23.8	0.044	0.052	
					Right Touch	23095	707.5	1	49	25.5	24.7	0.114	0.136	14
								25	12	24.5	23.8	0.091	0.108	
					Right Tilt	23095	707.5	1	49	25.5	24.7	0.037	0.045	
								25	12	24.5	23.8	0.037	0.044	
	Body-worn	QPSK	N/A	15	Rear	23095	707.5	1	49	25.5	24.7	0.198	0.237	15
								25	12	24.5	23.8	0.155	0.184	
					Front	23095	707.5	1	49	25.5	24.7	0.154	0.184	
								25	12	24.5	23.8	0.129	0.153	
	Hotspot	QPSK	N/A	10	Rear	23095	707.5	1	49	25.5	24.7	0.427	0.511	16
								25	12	24.5	23.8	0.327	0.388	
					Front	23095	707.5	1	49	25.5	24.7	0.196	0.235	
								25	12	24.5	23.8	0.152	0.181	
					Edge 2	23095	707.5	1	49	25.5	24.7	0.195	0.233	
								25	12	24.5	23.8	0.174	0.207	
					Edge 3	23095	707.5	1	49	25.5	24.7	0.184	0.220	
								25	12	24.5	23.8	0.145	0.172	
					Edge 4	23095	707.5	1	49	25.5	24.7	0.070	0.083	
								25	12	24.5	23.8	0.060	0.071	

10.6. LTE Band 13 (10MHz Bandwidth)

Antenna	RF Exposure Conditions	Mode	PWR Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offset	Power (dBm)		1-g SAR (W/kg)		Plot No.
										Tune-up limit	Meas.	Meas.	Scaled	
Main 1 Ant.	Head	QPSK	N/A	0	Left Touch	23230	782.0	1	0	25.3	24.1	0.116	0.151	
								25	0	24.3	23.3	0.095	0.120	
					Left Tilt	23230	782.0	1	0	25.3	24.1	0.058	0.076	
								25	0	24.3	23.3	0.046	0.058	
					Right Touch	23230	782.0	1	0	25.3	24.1	0.139	0.181	17
								25	0	24.3	23.3	0.113	0.143	
					Right Tilt	23230	782.0	1	0	25.3	24.1	0.056	0.074	
								25	0	24.3	23.3	0.049	0.062	
	Body-worn	QPSK	N/A	15	Rear	23230	782.0	1	0	25.3	24.1	0.239	0.312	18
								25	0	24.3	23.3	0.193	0.244	
					Front	23230	782.0	1	0	25.3	24.1	0.212	0.276	
								25	0	24.3	23.3	0.175	0.221	
	Hotspot	QPSK	N/A	10	Rear	23230	782.0	1	0	25.3	24.1	0.564	0.735	19
								25	0	24.3	23.3	0.462	0.585	
					Front	23230	782.0	1	0	25.3	24.1	0.304	0.396	
								25	0	24.3	23.3	0.251	0.318	
					Edge 2	23230	782.0	1	0	25.3	24.1	0.225	0.293	
								25	0	24.3	23.3	0.175	0.221	
					Edge 3	23230	782.0	1	0	25.3	24.1	0.261	0.340	
								25	0	24.3	23.3	0.208	0.263	
					Edge 4	23230	782.0	1	0	25.3	24.1	0.093	0.121	
								25	0	24.3	23.3	0.089	0.113	

10.7. LTE Band 41 (20MHz Bandwidth)

Antenna	RF Exposure Conditions	Mode	PWR Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offset	Power (dBm)		1-g SAR (W/kg)		Plot No.
										Tune-up limit	Meas.	Meas.	Scaled	
Main 2 Ant.	Head	QPSK	Off	0	Left Touch	41490	2680.0	1	0	25.0	24.3	0.054	0.063	20
								50	0	24.0	23.4	0.042	0.048	
					Left Tilt	41490	2680.0	1	0	25.0	24.3	0.015	0.018	
								50	0	24.0	23.4	0.011	0.013	
					Right Touch	41490	2680.0	1	0	25.0	24.3	0.044	0.051	
								50	0	24.0	23.4	0.038	0.044	
					Right Tilt	41490	2680.0	1	0	25.0	24.3	0.040	0.046	
								50	0	24.0	23.4	0.030	0.035	
	Body-worn	QPSK	Off	15	Rear	41490	2680.0	1	0	25.0	24.3	0.359	0.419	21
								50	0	24.0	23.4	0.285	0.328	
					Front	41490	2680.0	1	0	25.0	24.3	0.312	0.364	
								50	0	24.0	23.4	0.252	0.290	
	Hotspot	QPSK	On	10	Rear	41490	2680.0	1	0	23.0	22.1	0.404	0.494	
								50	0	23.0	22.1	0.405	0.496	
					Front	41490	2680.0	1	0	23.0	22.1	0.310	0.379	
								50	0	23.0	22.1	0.339	0.415	
Edge 3					41490	2680.0	1	0	23.0	22.1	0.450	0.550		
							50	0	23.0	22.1	0.487	0.596	22	
Edge 4					41490	2680.0	1	0	23.0	22.1	0.181	0.221		
							50	0	23.0	22.1	0.258	0.316		

10.8. Wi-Fi (DTS Band)

Antenna	Frequency Band	Mode	RF Exposure Conditions	PWR Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Duty Cycle (%)	Power (dBm)		1-g SAR (W/kg)		Note	Plot No.
											Tune-up limit	Meas.	Meas.	Scaled		
SISO (WiFi Ant.1)	2.4GHz	802.11b 1 Mbps	Head	On	0	Left Touch	6	2437.0	0.841	98.9%	17.0	16.8	0.473	0.496	2	
						Left Tilt	6	2437.0	0.089	98.9%	17.0	16.8				
						Right Touch	6	2437.0	1.165	98.9%	17.0	16.8	0.650	0.682		
						Right Tilt	6	2437.0	0.184	98.9%	17.0	16.8				
		Body-w orn	Off	15	Rear	6	2437.0	0.149	98.9%	19.0	17.8	0.090	0.122	1		
					Front	6	2437.0	0.146	98.9%	19.0	17.8					
		Hotspot	Off	10	Rear	6	2437.0	0.288	98.9%	19.0	17.8	0.173	0.233	4		
					Front	6	2437.0	0.286	98.9%	19.0	17.8					
					Edge 4	6	2437.0	0.462	98.9%	19.0	17.8	0.270	0.364	1		
		SISO (WiFi Ant.2)	2.4GHz	802.11b 1 Mbps	Head	On	0	Left Touch	11	2462.0	0.038	98.9%	17.0	16.9		
Left Tilt	11							2462.0	0.033	98.9%	17.0	16.9				
Right Touch	11							2462.0	0.062	98.9%	17.0	16.9	0.044	0.046	1	
Right Tilt	11							2462.0	0.044	98.9%	17.0	16.9				
Body-w orn	Off			15	Rear	6	2437.0	0.233	98.9%	19.0	17.8	0.144	0.191	1	23	
					Front	6	2437.0	0.022	98.9%	19.0	17.8					
Hotspot	Off			10	Rear	6	2437.0	0.528	98.9%	19.0	17.8	0.318	0.421		24	
					Front	6	2437.0	0.031	98.9%	19.0	17.8					
					Edge 1	6	2437.0	0.058	98.9%	19.0	17.8	0.038	0.050	2		
					Edge 4	6	2437.0	0.016	98.9%	19.0	17.8					
MIMO (WiFi Ant.1)	2.4GHz	802.11g 6Mbps	Head	NA	0	Left Touch	11	2462.0	0.946	97.6%	16.0	14.8	0.499	0.672	2	
						Left Tilt	11	2462.0	0.103	97.6%	16.0	14.8				
						Right Touch	6	2437.0	0.734	97.6%	16.0	15.1	0.407	0.518	3	
						Right Tilt	11	2462.0	0.875	97.6%	16.0	14.8	0.678	0.914	25	
		Body-w orn	NA	15	Rear	6	2437.0	0.104	97.6%	16.0	15.1	0.043	0.054			
					Front	6	2437.0	0.065	97.6%	16.0	15.1					
		Hotspot	NA	10	Rear	6	2437.0	0.474	97.6%	16.0	15.1					
					Front	6	2437.0	0.127	97.6%	16.0	15.1					
					Edge 1	6	2437.0	0.040	97.6%	16.0	15.1					
					Edge 4	6	2437.0	0.217	97.6%	16.0	15.1					
MIMO (WiFi Ant.2)	2.4GHz	802.11g 6Mbps	Head	NA	0	Left Touch	11	2462.0	0.946	97.6%	16.0	15.3				
						Left Tilt	11	2462.0	0.103	97.6%	16.0	15.3				
						Right Touch	6	2437.0	0.734	97.6%	16.0	15.4				
						Right Tilt	11	2462.0	0.875	97.6%	16.0	15.3				
		Body-w orn	NA	15	Rear	6	2437.0	0.104	97.6%	16.0	15.4	0.066	0.077	1		
					Front	6	2437.0	0.065	97.6%	16.0	15.4					
		Hotspot	NA	10	Rear	6	2437.0	0.474	97.6%	16.0	15.4	0.270	0.318	1		
					Front	6	2437.0	0.127	97.6%	16.0	15.4					
					Edge 1	6	2437.0	0.040	97.6%	16.0	15.4					
					Edge 4	6	2437.0	0.217	97.6%	16.0	15.4					

Note(s):

1. When the Highest reported SAR is ≤ 0.4 or 1.0 W/kg (1-g or 10-g respectively). Therefore, further SAR measurements within this exposure condition are not required.
2. Highest reported SAR is > 0.4 or 1.0 W/kg (1-g or 10-g respectively). Due to the highest reported SAR for this test position, other test positions in this exposure condition were evaluated until a SAR ≤ 0.8 or 2.0 W/kg (1-g or 10-g respectively) was reported.
3. Testing for a second channel was required because the reported SAR for this test position was > 0.8 or 2.0 W/kg (1-g or 10-g respectively).
4. Additional testing required in order satisfying FCC simultaneous transmission limit criteria.
5. SAR testing is not required for OFDM mode(s) when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.

10.9. Wi-Fi (U-NII Bands)

U-NII 2A Results

Antenna	Frequency Band	Mode	RF Exposure Conditions	PWR Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Duty Cycle (%)	Power (dBm)		1-g SAR (W/kg)		10-g SAR (W/kg)		Note	Plot No.	
											Tune-up limit	Meas.	Meas.	Scaled	Meas.	Scaled			
MIMO (WiFi Ant.1)	5.3 GHz U-NII 2A	802.11ac VHT 80 29.3 Mbps	Head	On	0	Left Touch	58	5290.0	0.410	97.1%	13.0	11.8	0.148	0.201			1		
						Left Tilt	58	5290.0	0.103	97.1%	13.0	11.8							
						Right Touch	58	5290.0	0.337	97.1%	13.0	11.8	0.209	0.284			4	26	
						Right Tilt	58	5290.0	0.192	97.1%	13.0	11.8							
	802.11a 6 Mbps	Body-worn	Off	15	Rear	60	5300.0	1.095	97.6%	17.0	16.6								
					Front	60	5300.0	0.071	97.6%	17.0	16.6	0.031	0.035						
		Product Specific 10-g	Off	0	Rear	60	5300.0	17.218	97.6%	17.0	16.6								
					60	5320.0	11.778	97.6%	17.0	16.5									
					Front	60	5300.0	3.345	97.6%	17.0	16.6								
					Edge 1	60	5300.0	1.260	97.6%	17.0	16.6								
					Edge 4	60	5300.0	4.646	97.6%	17.0	16.6					0.590	0.671	2	
					60	5300.0	4.646	97.6%	17.0	16.5									

U-NII 2C Results

Antenna	Frequency Band	Mode	RF Exposure Conditions	PWR Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Duty Cycle (%)	Power (dBm)		1-g SAR (W/kg)		10-g SAR (W/kg)		Note	Plot No.
											Tune-up limit	Meas.	Meas.	Scaled	Meas.	Scaled		
MIMO (WiFi Ant.1)	5.5 GHz U-NII 2C	802.11ac VHT 80 29.3 Mbps	Head	On	0	Left Touch	106	5530.0	0.133	97.1%	13.0	12.0						
						Left Tilt	106	5530.0	0.145	97.1%	13.0	12.0						
						Right Touch	106	5530.0	0.290	97.1%	13.0	12.0	0.126	0.163			1	29
						Right Tilt	106	5530.0	0.183	97.1%	13.0	12.0						
	802.11a 6 Mbps	Body-worn	Off	15	Rear	144	5720.0	1.022	97.6%	17.0	16.9							
					Front	144	5720.0	0.059	97.6%	17.0	16.9	0.024	0.026			2		
		Product Specific 10-g	Off	0	Rear	144	5720.0	14.270	97.6%	17.0	16.9							
					Front	144	5720.0	3.398	97.6%	17.0	16.9							
					Edge 1	144	5720.0	1.352	97.6%	17.0	16.9							
					Edge 4	144	5720.0	3.460	97.6%	17.0	16.9					0.477	0.506	2

Note(s):

- When the Highest reported SAR is ≤ 0.4 or 1.0 W/kg (1-g or 10-g respectively). Therefore, further SAR measurements within this exposure condition are not required.
- Highest reported SAR is > 0.4 or 1.0 W/kg (1-g or 10-g respectively). Due to the highest reported SAR for this test position, other test positions in this exposure condition were evaluated until a SAR ≤ 0.8 or 2.0 W/kg (1-g or 10-g respectively) was reported.
- Testing for a second channel was required because the reported SAR for this test position was > 0.8 or 2.0 W/kg (1-g or 10-g respectively).
- Additional testing required in order satisfying FCC simultaneous transmission limit criteria.

U-NII 3 Results

Antenna	Frequency Band	Mode	RF Exposure Conditions	PWR Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Duty Cycle (%)	Power (dBm)		1-g SAR (W/kg)		10-g SAR (W/kg)		Note	Plot No.					
											Tune-up limit	Meas.	Meas.	Scaled	Meas.	Scaled							
MIMO (WiFi Ant.1)	5.8 GHz U-NII 3	802.11ac VHT 80 29.3 Mbps	Head	On	0	Left Touch	155	5775.0	0.136	97.1%	13.0	12.0											
						Left Tilt	155	5775.0	0.189	97.1%	13.0	12.0											
						Right Touch	155	5775.0	0.173	97.1%	13.0	12.0	0.071	0.092					1				
						Right Tilt	155	5775.0	0.266	97.1%	13.0	12.0											
		802.11a 6Mbps	Body-worn	Off	15	Rear	157	5785.0	1.063	97.6%	17.0	16.7											
						Front	157	5785.0	0.075	97.6%	17.0	16.7	0.032	0.034									
						Product specific 10-g SAR	Off	0	Rear	157	5785.0	11.941	97.6%	17.0	16.7								
									Front	157	5785.0	2.079	97.6%	17.0	16.7								
			Edge 1	157	5785.0				1.576	97.6%	17.0	16.7											
			Edge 4	157	5785.0				7.528	97.6%	17.0	16.7				0.712	0.775	2					

Note(s):

1. When the Highest reported SAR is ≤ 0.4 or 1.0 W/kg (1-g or 10-g respectively). Therefore, further SAR measurements within this exposure condition are not required.
2. Highest reported SAR is > 0.4 or 1.0 W/kg (1-g or 10-g respectively). Due to the highest reported SAR for this test position, other test positions in this exposure condition were evaluated until a SAR ≤ 0.8 or 2.0 W/kg (1-g or 10-g respectively) was reported.
3. Testing for a second channel was required because the reported SAR for this test position was > 0.8 or 2.0 W/kg (1-g or 10-g respectively).
4. Additional testing required in order satisfying FCC simultaneous transmission limit criteria.

10.10. Bluetooth

Antenna	Frequency Band	Mode	RF Exposure Conditions	PWR Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Duty Cycle (%)	Power (dBm)		1-g SAR (W/kg)		Plot No.
										Tune-up limit	Meas.	Meas.	Scaled	
BT	2.4 GHz	GFSK	Head	N/A	0	Left Touch	39	2441.0	76.9%	16.5	16.0	0.242	0.350	
						Left Tilt	39	2441.0	76.9%	16.5	16.0	0.041	0.059	
						Right Touch	39	2441.0	76.9%	16.5	16.0	0.364	0.527	35
						Right Tilt	39	2441.0	76.9%	16.5	16.0	0.090	0.130	
		GFSK	Body-worn	N/A	15	Rear	39	2441.0	76.9%	16.5	16.0	0.056	0.081	36
						Front	39	2441.0	76.9%	16.5	16.0	0.022	0.032	
		GFSK	Hotspot	N/A	10	Rear	39	2441.0	76.9%	16.5	16.0	0.011	0.016	
						Front	39	2441.0	76.9%	16.5	16.0	0.016	0.023	
						Edge 4	39	2441.0	76.9%	16.5	16.0	0.024	0.035	37

10.11. LTE-uplink 2CA Band 41 (20MHz + 20MHz BW)

Antenna	RF Exposure Conditions	Mode	PWR Back-off	Dist. (mm)	Test Position	PCC UL				SCC UL				Power (dBm)		1-g SAR (W/kg)		Plot No.
						Ch #.	Freq. (MHz)	RB Allocation	RB offset	Ch #.	Freq. (MHz)	RB Allocation	RB offset	Tune-up limit	Meas.	Meas.	Scaled	
Body-worn	QPSK	Off	15	Rear	41490	2680.0	1	0	41292	2660.2	1	99	25.0	24.2	0.386	0.463	39	
Hotspot	QPSK	On	10	Edge 3	41490	2680.0	50	0	41292	2660.2	50	50	23.0	22.1	0.360	0.441	40	

11. SAR Measurement Variability

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

- 1) Repeated measurement is not required when the original highest measured SAR is < 0.8 or 2 W/kg (1-g or 10-g respectively); steps 2) through 4) do not apply.
- 2) When the original highest measured SAR is ≥ 0.8 or 2 W/kg (1-g or 10-g respectively), repeat that measurement once.
- 3) Perform a second repeated measurement only if the **ratio of largest to smallest SAR** for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ≥ 1.45 or 3.6 W/kg (~ 10% from the 1-g or 10-g respective SAR limit).
- 4) Perform a third repeated measurement only if the original, first, or second repeated measurement is ≥ 1.5 or 3.75 W/kg (1-g or 10-g respectively) and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20 .

Peak spatial-average (1g of tissue)

Frequency Band (MHz)	Air Interface	RF Exposure Conditions	Test Position	Repeated SAR (Yes/No)	Highest Measured SAR (W/kg)	Repeated Measured SAR (W/kg)	Largest to Smallest SAR Ratio
700	LTE Band 12	Hotspot	Rear	No	0.427	N/A	N/A
	LTE Band 13	Hotspot	Rear	No	0.564	N/A	N/A
835	GSM 850	Hotspot	Rear	No	0.539	N/A	N/A
	WCDMA Band V	Hotspot	Rear	No	0.644	N/A	N/A
	LTE Band 5	Hotspot	Rear	No	0.621	N/A	N/A
1900	GSM 1900	Hotspot	Edge 3	Yes	1.090	1.07	1.02
2400	Wi-Fi 802.11b/g/n	Head	Right Touch	No	0.678	N/A	N/A
	Bluetooth	Head	Right Touch	No	0.364	N/A	N/A
2600	LTE Band 41	Hotspot	Edge 3	No	0.487	N/A	N/A
5300	Wi-Fi 802.11a/n	Body-w orn	Rear	No	0.489	N/A	N/A
5500	Wi-Fi 802.11a/n	Body-w orn	Rear	No	0.497	N/A	N/A
5800	Wi-Fi 802.11a/n	Body-w orn	Rear	No	0.511	N/A	N/A

Peak spatial-average (10g of tissue)

Frequency Band (MHz)	Air Interface	RF Exposure Conditions	Test Position	Repeated SAR (Yes/No)	Highest Measured SAR (W/kg)	Repeated Measured SAR (W/kg)	Largest to Smallest SAR Ratio
1900	GSM 1900	Product Specific 10g	Front	No	1.270	N/A	N/A
5300	Wi-Fi 802.11a/n	Product Specific 10g	Rear	No	1.860	N/A	N/A
5500	Wi-Fi 802.11a/n	Product Specific 10g	Rear	No	1.530	N/A	N/A
5800	Wi-Fi 802.11a/n	Product Specific 10g	Rear	No	1.700	N/A	N/A

Note(s):

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

12. Simultaneous Transmission SAR Analysis

Simultaneous Transmission Condition

RF Exposure Condition	Item	Capable Transmit Configurations				
Head & Body-w orn & Phablet-10g	1	GSM(Voice/GPRS)	+	DTS_Ant.1	and / or	DTS_Ant.2
	2	GSM(Voice/GPRS)	+	UNII MIMO		
	3	GSM(Voice/GPRS)	+	BT		
	4	GSM(Voice/GPRS)	+	UNII MIMO	+	BT
	5	GSM(Voice/GPRS)	+	RSDB scenario		
	6	WCDMA or LTE	+	DTS_Ant.1	and / or	DTS_Ant.2
	7	WCDMA or LTE	+	UNII MIMO		
	8	WCDMA or LTE	+	BT		
	9	WCDMA or LTE	+	UNII MIMO	+	BT
	10	WCDMA or LTE	+	RSDB scenario		
Hotspot	11	GSM(GPRS)	+	DTS_Ant.1	and / or	DTS_Ant.2
	12	GSM(GPRS)	+	UNII MIMO		
	13	GSM(GPRS)	+	BT		
	14	GSM(GPRS)	+	UNII MIMO	+	BT
	15	GSM(GPRS)	+	RSDB scenario		
	16	WCDMA or LTE	+	DTS_Ant.1	and / or	DTS_Ant.2
	17	WCDMA or LTE	+	UNII MIMO		
	18	WCDMA or LTE	+	BT		
	19	WCDMA or LTE	+	UNII MIMO	+	BT
	20	WCDMA or LTE	+	RSDB scenario		

Notes:

1. DTS supports Wi-Fi Direct, Hotspot and VoIP.
2. U-NII supports Wi-Fi Direct and VoIP. But Hotspot is not support.
3. GPRS, W-CDMA, LTE supports Hotspot and VoIP.
5. U-NII Radio can transmit simultaneously with Bluetooth Radio.
6. DTS Radio cannot transmit simultaneously with Bluetooth Radio.
7. DTS Radio can only transmit simultaneously with U-NII Radio in RSDB scenarios.
8. DTS Radio can operating both SISO and MIMO modes.
9. U-NII Radio can operating MIMO mode only.
10. BT tethering is considered about each RF exposure conditions.

RSDB scenarios

Mode	Scenario	# of TX	5GHz		2.4GHz	
			Ant1	Ant2	Ant1	Ant2
2.4GHz + 5GHz RSDB & MIMO	1	3	On	On	On	-
	2	3	On	On	-	On
2.4GHz + 5GHz RSDB MIMO	3	4	On	On	On	On

Simultaneous transmission SAR test exclusion considerations

KDB 447498 D01 General RF Exposure Guidance provides two procedures for determining simultaneous transmission SAR test exclusion: Sum of SAR and SAR to Peak Location Ratio (SPLSR)

Sum of SAR

To qualify for simultaneous transmission SAR test exclusion based upon Sum of SAR the sum of the reported standalone SARs for all simultaneously transmitting antennas shall be below the applicable standalone SAR limit. If the sum of the SARs is above the applicable limit then simultaneous transmission SAR test exclusion may still apply if the requirements of the SAR to Peak Location Ratio (SPLSR) evaluation are met.

12.1. Sum of the SAR for GSM 850 & Wi-Fi & BT

RF Exposure	Test Position	Standalone SAR (W/kg)										Sum of SAR (W/kg)								
		WWAN					BT	WLAN (RSDB mode)				WWAN+ DTS Ant.1	WWAN+ DTS Ant.2	WWAN+ DTS MIMO	WWAN+ UNII MIMO	WWAN+BT	WWAN+ BT+ UNII MIMO	WWAN + DTS Ant.1+ UNII MIMO	WWAN+ DTS Ant.2+ UNII MIMO	WWAN+ DTS MIMO+ UNII MIMO
		DTS Ant.1	DTS Ant.2	DTS MIMO	UNII MIMO	DTS Ant.1		DTS Ant.2	DTS MIMO	UNII MIMO										
1	2	3	4	5	6	7	8	9	10	1+2	1+3	A: 1+2+3 1+4	1+5	1+6	1+5+6	A: 1+2+5 1+7+10	A: 1+3+5 1+8+10	A: 1+2+3+5 1+9+10		
Head (A) (1-g SAR)	All Positions	0.286	0.682	0.046	0.914	0.284	0.527	0.682	0.046	0.914	0.284	0.968	0.332	1.014	0.570	0.813	1.097	1.252	0.616	1.298
Body-worn (1-g SAR)	All Positions	0.365	0.122	0.191	0.077	0.567	0.081	0.122	0.191	0.077	0.567	0.487	0.556	0.442	0.932	0.446	1.013	1.054	1.123	1.009
Hotspot (1-g SAR)	Rear	0.734	0.233	0.421	0.318		0.016	0.233	0.421	0.318		0.967	1.155	1.052		0.750				
	Front	0.479	0.364	0.421	0.318		0.023	0.364	0.421	0.318		0.843	0.900	0.797		0.502				
	Edge 1			0.050	0.318				0.050	0.318										
	Edge 2	0.381																		
	Edge 3	0.474																		
	Edge 4	0.100	0.364	0.421	0.318		0.035	0.364	0.421	0.318		0.464	0.521	0.418		0.135				

Note(s):

- Blue values are reference from highest SAR value of *initial test position* procedure in each RF exposure of each bands.
- RSDB mode's output power are same or lower than Normal mode's output power. So Normal SAR value were used for determining simultaneous transmission SAR (WWAN + RSDB scenarios) exclusion.

12.2. Sum of the SAR for GSM 1900 & Wi-Fi & BT

RF Exposure	Test Position	Standalone SAR (W/kg)										Sum of SAR (W/kg)								
		WWAN					BT	WLAN (RSDB mode)				WWAN+ DTS Ant.1	WWAN+ DTS Ant.2	WWAN+ DTS MIMO	WWAN+ UNII MIMO	WWAN+BT	WWAN+ BT+ UNII MIMO	WWAN + DTS Ant.1+ UNII MIMO	WWAN+ DTS Ant.2+ UNII MIMO	WWAN+ DTS MIMO+ UNII MIMO
		DTS Ant.1	DTS Ant.2	DTS MIMO	UNII MIMO	DTS Ant.1		DTS Ant.2	DTS MIMO	UNII MIMO										
1	2	3	4	5	6	7	8	9	10	1+2	1+3	A: 1+2+3 1+4	1+5	1+6	1+5+6	A: 1+2+5 1+7+10	A: 1+3+5 1+8+10	A: 1+2+3+5 1+9+10		
Head (A) (1-g SAR)	All Positions	0.133	0.682	0.046	0.914	0.284	0.527	0.682	0.046	0.914	0.284	0.815	0.179	0.861	0.417	0.660	0.944	1.099	0.463	1.145
Body-worn (1-g SAR)	All Positions	0.561	0.122	0.191	0.077	0.567	0.081	0.122	0.191	0.077	0.567	0.683	0.752	0.638	1.128	0.642	1.209	1.250	1.319	1.205
Hotspot (1-g SAR)	Rear	1.024	0.233	0.421	0.318		0.016	0.233	0.421	0.318		1.257	1.445	1.342		1.040				
	Front	0.953	0.364	0.421	0.318		0.023	0.364	0.421	0.318		1.317	1.374	1.271		0.976				
	Edge 1			0.050	0.318				0.050	0.318										
	Edge 2	0.096																		
	Edge 3	1.250																		
	Edge 4	0.090	0.364	0.421	0.318		0.035	0.364	0.421	0.318		0.454	0.511	0.408		0.125				
Phablet (10-g SAR)	Rear	1.658				2.158					2.158					3.816				

Note(s):

- Blue values are reference from highest SAR value of *initial test position* procedure in each RF exposure of each bands.
- RSDB mode's output power are same or lower than Normal mode's output power. So Normal SAR value were used for determining simultaneous transmission SAR (WWAN + RSDB scenarios) exclusion.

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

RF Exposure	Test Position	Standalone SAR (W/kg)										Sum of SAR (W/kg)								
		WLAN (Normal mode)					BT	WLAN (RSDB mode)				WWAN+ DTS Ant.1	WWAN+ DTS Ant.2	WWAN+ DTS MIMO	WWAN+ UNII MIMO	WWAN+BT	WWAN+ BT+ UNII MIMO	WWAN + DTS Ant.1+ UNII MIMO	WWAN+ DTS Ant.2+ UNII MIMO	WWAN+ DTS MIMO+ UNII MIMO
		1	2	3	4	5		6	7	8	9	10	1+2	1+3	A: 1+2+3 1+4	1+5	1+6	1+5+6	A: 1+2+5 1+7+10	A: 1+3+5 1+8+10
Head (A) (1-g SAR)	All Positions	0.263	0.682	0.046	0.914	0.284	0.527	0.682	0.046	0.914	0.284	0.945	0.309	0.991	0.547	0.790	1.074	1.229	0.593	1.275
Body-worn (1-g SAR)	All Positions	0.371	0.122	0.191	0.077	0.567	0.081	0.122	0.191	0.077	0.567	0.493	0.562	0.448	0.938	0.452	1.019	1.060	1.129	1.015
Hotspot (1-g SAR)	Rear	0.766	0.233	0.421	0.318		0.016	0.233	0.421	0.318		0.999	1.187	1.084		0.782				
	Front	0.531	0.364	0.421	0.318		0.023	0.364	0.421	0.318		0.895	0.952	0.849		0.554				
	Edge 1			0.050	0.318				0.050	0.318										
	Edge 2	0.339																		
	Edge 3	0.470																		
	Edge 4	0.073	0.364	0.421	0.318		0.035	0.364	0.421	0.318		0.437	0.494	0.391		0.108				

Note(s):

- Blue values are reference from highest SAR value of *initial test position* procedure in each RF exposure of each bands.
- RSDB mode's output power are same or lower than Normal mode's output power. So Normal SAR value were used for determining simultaneous transmission SAR (WWAN + RSDB scenarios) exclusion.

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

RF Exposure	Test Position	Standalone SAR (W/kg)										Sum of SAR (W/kg)								
		WLAN (Normal mode)					BT	WLAN (RSDB mode)				WWAN+ DTS Ant.1	WWAN+ DTS Ant.2	WWAN+ DTS MIMO	WWAN+ UNII MIMO	WWAN+BT	WWAN+ BT+ UNII MIMO	WWAN + DTS Ant.1+ UNII MIMO	WWAN+ DTS Ant.2+ UNII MIMO	WWAN+ DTS MIMO+ UNII MIMO
		1	2	3	4	5		6	7	8	9	10	1+2	1+3	A: 1+2+3 1+4	1+5	1+6	1+5+6	A: 1+2+5 1+7+10	A: 1+3+5 1+8+10
Head (A) (1-g SAR)	All Positions	0.276	0.682	0.046	0.914	0.284	0.527	0.682	0.046	0.914	0.284	0.958	0.322	1.004	0.560	0.803	1.087	1.242	0.606	1.288
Body-worn (1-g SAR)	All Positions	0.381	0.122	0.191	0.077	0.567	0.081	0.122	0.191	0.077	0.567	0.503	0.572	0.458	0.948	0.462	1.029	1.070	1.139	1.025
Hotspot (1-g SAR)	Rear	0.776	0.233	0.421	0.318		0.016	0.233	0.421	0.318		1.009	1.197	1.094		0.792				
	Front	0.543	0.364	0.421	0.318		0.023	0.364	0.421	0.318		0.907	0.964	0.861		0.566				
	Edge 1			0.050	0.318				0.050	0.318										
	Edge 2	0.291																		
	Edge 3	0.500																		
	Edge 4	0.082	0.364	0.421	0.318		0.035	0.364	0.421	0.318		0.446	0.503	0.400		0.117				

Note(s):

- Blue values are reference from highest SAR value of *initial test position* procedure in each RF exposure of each bands.
- RSDB mode's output power are same or lower than Normal mode's output power. So Normal SAR value were used for determining simultaneous transmission SAR (WWAN + RSDB scenarios) exclusion.

12.5. Sum of the SAR for LTE Band 12 & Wi-Fi & BT

RF Exposure	Test Position	Standalone SAR (W/kg)										Sum of SAR (W/kg)								
		WLAN (Normal mode)					BT	WLAN (RSDB mode)				WWAN+ DTS Ant.1	WWAN+ DTS Ant.2	WWAN+ DTS MIMO	WWAN+ UNII MIMO	WWAN+BT	WWAN+ BT+ UNII MIMO	WWAN + DTS Ant.1+ UNII MIMO	WWAN+ DTS Ant.2+ UNII MIMO	WWAN+ DTS MIMO+ UNII MIMO
		1	2	3	4	5		6	7	8	9	10	1+2	1+3	A: 1+2+3 1+4	1+5	1+6	1+5+6	A: 1+2+5 1+7+10	A: 1+3+5 1+8+10
Head (A) (1-g SAR)	All Positions	0.136	0.682	0.046	0.914	0.284	0.527	0.682	0.046	0.914	0.284	0.818	0.182	0.864	0.420	0.663	0.947	1.102	0.466	1.148
Body-worn (1-g SAR)	All Positions	0.237	0.122	0.191	0.077	0.567	0.081	0.122	0.191	0.077	0.567	0.359	0.428	0.314	0.804	0.318	0.885	0.926	0.995	0.881
Hotspot (1-g SAR)	Rear	0.511	0.233	0.421	0.318		0.016	0.233	0.421	0.318		0.744	0.932	0.829		0.527				
	Front	0.235	0.364	0.421	0.318		0.023	0.364	0.421	0.318		0.599	0.656	0.553		0.258				
	Edge 1			0.050	0.318				0.050	0.318										
	Edge 2	0.233																		
	Edge 3	0.220																		
	Edge 4	0.083	0.364	0.421	0.318		0.035	0.364	0.421	0.318		0.447	0.504	0.401		0.118				

Note(s):

- Blue values are reference from highest SAR value of *initial test position* procedure in each RF exposure of each bands.
- RSDB mode's output power are same or lower than Normal mode's output power. So Normal SAR value were used for determining simultaneous transmission SAR (WWAN + RSDB scenarios) exclusion.

12.6. Sum of the SAR for LTE Band 13 & Wi-Fi & BT

RF Exposure	Test Position	Standalone SAR (W/kg)										Sum of SAR (W/kg)								
		WLAN (Normal mode)					BT	WLAN (RSDB mode)				WWAN+ DTS Ant.1	WWAN+ DTS Ant.2	WWAN+ DTS MIMO	WWAN+ UNII MIMO	WWAN+BT	WWAN+ BT+ UNII MIMO	WWAN + DTS Ant.1+ UNII MIMO	WWAN+ DTS Ant.2+ UNII MIMO	WWAN+ DTS MIMO+ UNII MIMO
		1	2	3	4	5		6	7	8	9	10	1+2	1+3	A: 1+2+3 1+4	1+5	1+6	1+5+6	A: 1+2+5 1+7+10	A: 1+3+5 1+8+10
Head (A) (1-g SAR)	All Positions	0.181	0.682	0.046	0.914	0.284	0.527	0.682	0.046	0.914	0.284	0.863	0.227	0.909	0.465	0.708	0.992	1.147	0.511	1.193
Body-worn (1-g SAR)	All Positions	0.312	0.122	0.191	0.077	0.567	0.081	0.122	0.191	0.077	0.567	0.434	0.503	0.389	0.879	0.393	0.960	1.001	1.070	0.956
Hotspot (1-g SAR)	Rear	0.735	0.233	0.421	0.318		0.016	0.233	0.421	0.318		0.968	1.156	1.053		0.751				
	Front	0.396	0.364	0.421	0.318		0.023	0.364	0.421	0.318		0.760	0.817	0.714		0.419				
	Edge 1			0.050	0.318				0.050	0.318										
	Edge 2	0.293																		
	Edge 3	0.340																		
	Edge 4	0.121	0.364	0.421	0.318		0.035	0.364	0.421	0.318		0.485	0.542	0.439		0.156				

Note(s):

- Blue values are reference from highest SAR value of *initial test position* procedure in each RF exposure of each bands.
- RSDB mode's output power are same or lower than Normal mode's output power. So Normal SAR value were used for determining simultaneous transmission SAR (WWAN + RSDB scenarios) exclusion.

12.7. Sum of the SAR for LTE Band 41 & Wi-Fi & BT

RF Exposure	Test Position	Standalone SAR (W/kg)										Sum of SAR (W/kg)								
		WLAN (Normal mode)					BT	WLAN (RSDB mode)				WWAN+ DTS Ant.1	WWAN+ DTS Ant.2	WWAN+ DTS MIMO	WWAN+ UNII MIMO	WWAN+BT	WWAN+ BT+ UNII MIMO	WWAN + DTS Ant.1+ UNII MIMO	WWAN+ DTS Ant.2+ UNII MIMO	WWAN+ DTS MIMO+ UNII MIMO
		1	2	3	4	5		6	7	8	9	10	1+2	1+3	A: 1+2+3 1+4	1+5	1+6	1+5+6	A: 1+2+5 1+7+10	A: 1+3+5 1+8+10
Head (A) (1-g SAR)	All Positions	0.063	0.682	0.046	0.914	0.284	0.527	0.682	0.046	0.914	0.284	0.745	0.109	0.791	0.347	0.590	0.874	1.029	0.393	1.075
Body-worn (1-g SAR)	All Positions	0.463	0.122	0.191	0.077	0.567	0.081	0.122	0.191	0.077	0.567	0.585	0.654	0.540	1.030	0.544	1.111	1.152	1.221	1.107
Hotspot (1-g SAR)	Rear	0.496	0.233	0.421	0.318		0.016	0.233	0.421	0.318		0.729	0.917	0.814		0.512				
	Front	0.415	0.364	0.421	0.318		0.023	0.364	0.421	0.318		0.779	0.836	0.733		0.438				
	Edge 1			0.050	0.318				0.050	0.318										
	Edge 2																			
	Edge 3	0.596																		
	Edge 4	0.316	0.364	0.421	0.318		0.035	0.364	0.421	0.318		0.680	0.737	0.634		0.351				

Note(s):

- Blue values are reference from highest SAR value of *initial test position* procedure in each RF exposure of each bands.
- RSDB mode's output power are same or lower than Normal mode's output power. So Normal SAR value were used for determining simultaneous transmission SAR (WWAN + RSDB scenarios) exclusion.

12.8. Sum of the SAR for Wi-Fi (RSDB)

RF Exposure	Test Position	Standalone SAR (W/kg)				Σ SAR (W/kg)		
		DTS Ant 1	DTS Ant 2	DTS MIMO	UNII MIMO	DTS Ant 1 + UNII MIMO	DTS Ant 2 + UNII MIMO	DTS MIMO + UNII MIMO
		1	2	3	4	1 + 4	2 + 4	3 + 4
Head (1-g SAR)	All positions	0.682	0.046	0.914	0.284	0.966	0.330	1.198
Body-worn (1-g SAR)	All positions	0.122	0.191	0.077	0.567	0.689	0.758	0.644

Note(s):

- RSDB mode's output power are same or lower than Normal mode's output power. So Normal SAR value were used for determining simultaneous transmission SAR (RSDB scenarios) exclusion.

Conclusion:

Simultaneous transmission SAR measurement is not required because sum of the 1-g SAR (10-g SAR) is < 1.6 W/kg (4.0 W/kg).

Appendixes

Refer to separated files for the following appendixes.

4789754188-S1 FCC Report SAR_App A_Photos & Ant. Locations

4789754188-S1 FCC Report SAR_App B_Highest SAR Test Plots

4789754188-S1 FCC Report SAR_App C_System Check Plots

4789754188-S1 FCC Report SAR_App D_SAR Tissue Ingredients

4789754188-S1 FCC Report SAR_App E_Probe Cal. Certificates

4789754188-S1 FCC Report SAR_App F_Dipole Cal. Certificates

END OF REPORT